

MARTIN AUDIO MLA MINI

MLA MINI ADVANCED USER GUIDE

(INCLUDING DISPLAY 2.2 AND VU-NET 2.0 FOR MLA MINI)





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SAFETY INFORMATION

IMPORTANT SAFETY INSTRUCTIONS

1. Read these Instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. No naked flames such as lighted candles should be placed on the apparatus.
6. Do not block any ventilation openings.
7. Install in accordance with manufacturer's instructions.
8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9. Do not defeat the safety purpose of the polarized or grounding type plug, a polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong is provided for your safety. If the provided plug does not fit into your outlet consult an electrician for replacement of the obsolete outlet.
10. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit the apparatus.
11. Only use attachments and accessories specified by the manufacturer.
12. Use only with the cart, stand, tripod, bracket or table specified by the manufacturer or sold with the apparatus. when a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over
13. Unplug the apparatus during lightning storms or when unused for long periods of time.
14. No user-serviceable parts inside, refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as a power supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
15. This equipment must be earthed.
16. Do not remove any covers.



CAUTION AVIS
RISK OF ELECTRIC SHOCK
DO NOT OPEN
RISQUE DE CHOC ELECTRIQUE
NE PAS OUVRIR



CAUTION

To reduce the risk of electric shock do not remove any covers. There are no user serviceable parts inside the units. Refer servicing to qualified service personnel only. Call Martin Audio Ltd on +44 (0) 1494 535312 or e-mail info@martin-audio.com for service.

APPROVALS



Safety: IEC60065:2002 + A1:2006

Environmental: IP25 when fitted with MSX cowl assembly (Martin Audio Part No. ASF15027) and used with mains connectors/cords rated to at least IP25.

IP2X when NOT fitted with cowl assembly or not used with mains connector/cords rated to at least IP25.

Country of origin: United Kingdom

EMC Emission: EN55103-1:2009

EMC Immunity: EN55103-2:2009

FCC: CFR47 Part 15B-2010

This is a class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.



Please think of our environment.

When the product has reached the end of its useful life, please dispose of it responsibly through a recycling centre.

SAFETY RULES

- The MSX sub-bass/electronics unit must be powered exclusively by an earth-connected mains socket in an electrical network compliant to IEC 364 or similar local rules. It is absolutely vital that the user verifies this fundamental safety requirement. If you are in any doubt, get the installation checked by qualified personnel before use.
- The means of disconnection from the mains is the mains plug. We strongly recommend that you power the MSX from a professionally installed mains supply with an easily accessible on/off switch or circuit breaker. A comprehensive mains distribution system with circuit breakers is available from Martin Audio.
- Before powering the MSX via the Neutrik® PowerCON TRUE1 connector, make sure that the unit is supplied with the correct mains operating voltage: 100 – 240 V, 50 – 60 Hz
- The MSX power section is protected by four fuses:
 - F1, F2, F3: 3 x 3.15 A Type “T” (power amplifiers)
 - F4: 1 x 4 A Quick blow (aux power supply)
- Do not use this unit if the electrical power cord is frayed or broken
- Do not remove the cover. Removing the cover will expose you to potentially dangerous voltages.
- When not fitted with the optional MSX rain cowl (Martin Audio Pt No ASF15027) or not used with mains connector/cords rated to at least IP25, the MSX must not be exposed to dripping, or splashing and no objects filled with liquids, such as vases should be placed on the apparatus.

MLA MINI HARDWARE



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INTRODUCTION

ABOUT THIS MANUAL

This manual explains in detail the individual components that may comprise an MLA Mini system. System wiring and rigging is explained and the two key software packages are covered. It is not however the intention for this manual to be the sole tutorial medium for those wishing to use the system. Each system sale is accompanied by a one-day training course which covers use of the system and includes hands-on setting up and de-rigging. A growing number of trained technicians have completed the course. In no circumstances should a system be used without a trained MLA technician present. This manual is intended as a reference for those who have completed the course, NOT as a replacement for it.

ABOUT THE MLA MINI DESIGN PHILOSOPHY

MLA Mini is the latest Martin Audio product to utilise a revolutionary multicellular approach to sound distribution in venues of all sizes. Unlike other line array designs which concentrate on generating a coherent wavefront of the sound leaving the front of the array, the MLA approach is to aim to achieve as coherent a wavefront as possible at the audience position. Benefiting from Martin Audio's superb acoustic design, the system makes it possible to achieve a phenomenally even distribution of sound to each and every audience member and to ensure minimum sound leakage into areas where it is not wanted, something that no other system can offer.



The combination of integral amplification and DSP offers a hitherto unheard-of level of control in an ultra-lightweight loudspeaker system. In conjunction with Martin Audio's two software applications - Display 2.2 for system design and VU-Net for network control, outstanding levels of consistent, high quality audio can be distributed to every point throughout the audience in a venue.

The rigging design of MLA Mini systems has been based on the existing popular and efficient Martin Audio line array systems, but with some innovative improvements. This allows phenomenally quick system rigging and de-rigging, particularly aided by the absence of separate amplifier racks.

MLA Mini systems are designed for use indoors or outdoors in virtually any weather conditions. Basic unit rating is IP2X, but the MSX may be protected by a waterproof flexible cowl which gives it an IP25 rating.

The cabinets are elegantly styled with a wrap over grille, and are designed for easy and stable stacking in trucks or warehouses. Handling and rigging the system is easy as each set of four MLA Mini cabinets can be mounted on the base of their flightcase (optional).

UNPACKING THE MLA MINI COMPONENTS

After unpacking the units, please check them carefully for any damage. If any is found, immediately notify the carrier concerned - you, the consignee, must instigate any claim. Please retain all packaging in case you need to return any units.



Please think of our environment.

When the product has reached the end of its useful life, please dispose of it responsibly through a recycling centre.

OVERVIEW

Like the MLA and MLA Compact systems from which it is derived, the MLA Mini is a precision multicellular loudspeaker array designed to accurately deliver a required SPL (acoustic loudness) within a defined area. Smaller and lighter than the MLA and MLA Compact systems, the MLA Mini will reproduce high quality sound in smaller venues, as either a fixed or portable installation.

All MLA Mini systems consist of multiples of four MLA Mini full-range cabinets (individually referred to throughout this User Guide simply as 'Minis') used in conjunction with a single MSX sub-woofer. This '4+1' combination constitutes the basic "building block" element of all MLA Mini system configurations and is also the minimum configuration in which the system can be used. The MSX incorporates all the power amplification and other electronics for the 4 Minis as well as the sub-woofer. The power amplification and electronics is also available as a rack mounting unit for installation elsewhere.

Used in stereo pairs, this minimum configuration will be adequate for many outdoor and indoor venues with a capacity of up to approximately 250 people. Additional Minis can be added, in sets of four, plus additional MSXs, to create more powerful systems.

Each cabinet is a two-way cellular-drive loudspeaker array element, comprising two 6.5" (165 mm) dia. LF drivers and three 1.4" (35 mm) dia. HF compression drivers. Each MSX contains a 15" (380 mm) dia. reflex loaded LF driver, a 9-channel Class D power amplifier and a powerful, programmable DSP processor.

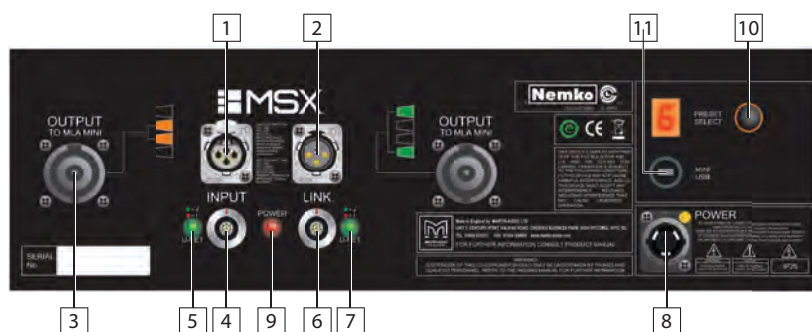
The MSX electronics rack has audio inputs which can accept either standard balanced analogue audio, or an AES3 (AES/EBU) digital audio signal. A parallel connection is available to daisy-chain between cabinets. The MSX features network control via a U-Net™ interface, which carries all control and configuration data for the on-board DSP. U-Net connections are made via a pair of very high quality, rugged 8-way push-pull latching connectors rated for high speed data applications.

Mains connection is via a Neutrik® powerCON TRUE1 connector. Various adaptor cables are available as accessories: to distribute AC mains to multiple MSXs, and to interface with Ceeform power connectors.

Each of the nine channels of DSP (four two-way MLA Mini cabinets plus the MSX itself) provides extensive software-controlled processing optimised for the driver being controlled; this includes delay, parametric EQ, high- and low-pass filters, IIR all-pass filters, FIR low pass filter and EQ, gain, phase and limiting. In addition, user-definable processing is available through the U-Net software application: delay, 10-band parametric EQ, high-pass filtering, gain, phase and muting.

MSX – REAR PANEL

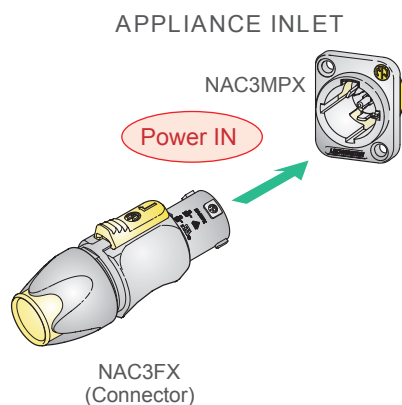
All connections for one system element (comprising 4 Minis plus one MSX) are made to the electronics unit mounted in the rear of the MSX cabinet.



1. **INPUT** – a 3-pin female XLR audio input connector. The MLA Mini system can be fed with either balanced analogue audio or AES3 digital audio. The same connector is used for both formats, and the analogue/digital selection is made via VU-NET control software. **The default setting is analogue.** Please refer to page 32 for details about using the MLA Mini with digital audio.
2. **LINK** – a 3-pin male XLR connector in parallel with the INPUT XLR. This allows the audio input to be conveniently “daisy-chained” to further MLA Mini systems.
3. **OUTPUT** – two Neutrik® NL8 multi-pin connectors. Use the pre-made cable supplied with the system to connect each OUTPUT socket to two Minis. If a longer cable is required, please refer to page 28 for assembly details and cable specifications. The diagrams on the panel show clearly which Minis should be wired to each connector. The system will not operate correctly if this wiring is not observed. See “Cabling, connecting up” on page 28.
4. **U-NET 1** – a LEMO-pattern K Series network connector. This can be used to connect the MSX to a computer running VU-NET control software, via a Merlin interface. This allows the system to be tailored more precisely to suit the venue and application in situations where a configuration other than those provided by the internal presets is required. When using the internal presets, the U-NET connectors may be ignored. Please see page 31 for more details.
5. **U-NET 1 status** – bi-colour LED indicating network status.
6. **U-NET 2** – a second network port for connection to additional MLA systems. VU-NET is able to determine the order in which cabinets are connected by analysing the inter-port latencies.
7. **U-NET 2 status**.
8. **POWER** connector – a Neutrik® powerCON TRUE1 connector for AC mains input. A mating connector is included. Pre-made power cables of various lengths are available from Martin Audio; alternatively, If making up your own power cables, please follow the Neutrik® assembly instructions on page 14 carefully. Please note that Neutrik tool Part No. HTAC is NOT supplied. Tightening the connector assembly with the tool to the specified torque is only necessary if the MSX is required to meet IP65 environmental protection conditions. If IP65 compliance is required, please contact Martin Audio for additional information and the necessary additional parts.
9. **POWER** LED – illuminates when AC power is applied to the MSX. Note that the MSX electronics unit has no power switch; it is operative as soon as power is applied.
10. **PRESET SELECT** – this push-button selects one of the factory-designed internal presets, optimising the MLA Mini system for a particular rigging configuration or required coverage area. See page 23 for full details of each preset. The adjacent numeric display confirms the currently loaded preset.
11. **MINI USB** – Type B USB port. Allows connection of a PC for system control and monitoring purposes. For simple set-ups using the internal presets, this connector may be ignored. Please refer to page 37 for more details.

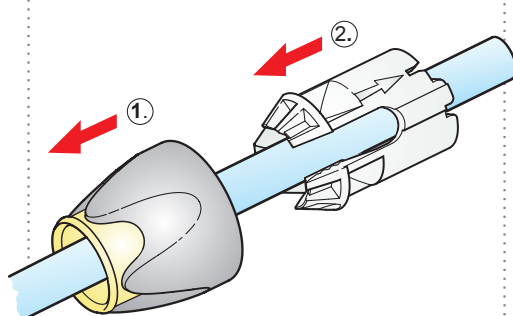
Neutrik® powerCON TRUE1 connector assembly instructions

The PowerCON TRUE1 system is certified as a connector with breaking capacity according to IEC60320 and VDE0625. It is intended for use as an appliance and interconnection coupler. It serves to supply power to an appliance. It should be installed by qualified personnel only.

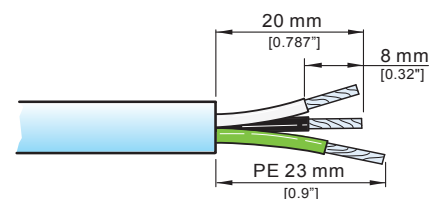
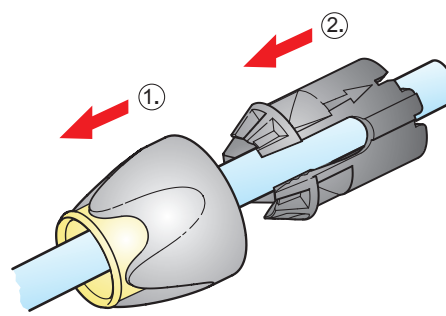
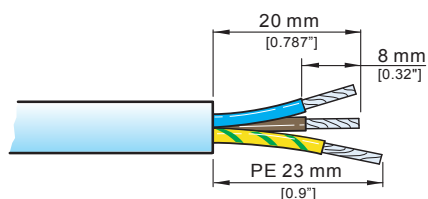


Approval based:	VDE EN 60320-1/EN60320-2-2	UL UL 498 / CSA C22.2 No. 182.3
Rating:	250 V ac / 16 A	250 V ac / 20 A
Cable Type:	H05VV-F3G 1.0 mm ² , Length max. 2 m H05VV-F3G 1.5 - 2.5 mm ²	SJT 3 x 12 AWG
Strain Relief:	White chuck	Black chuck
Cable O.D.:	6.3 - 11.4 mm	9.5 - 12.0 mm

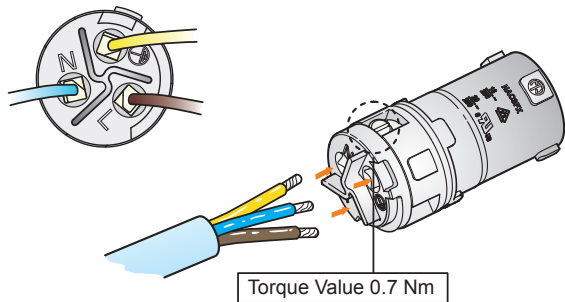
- A** Place bushing and chuck over the cable.



- B** Prepare cable as shown.



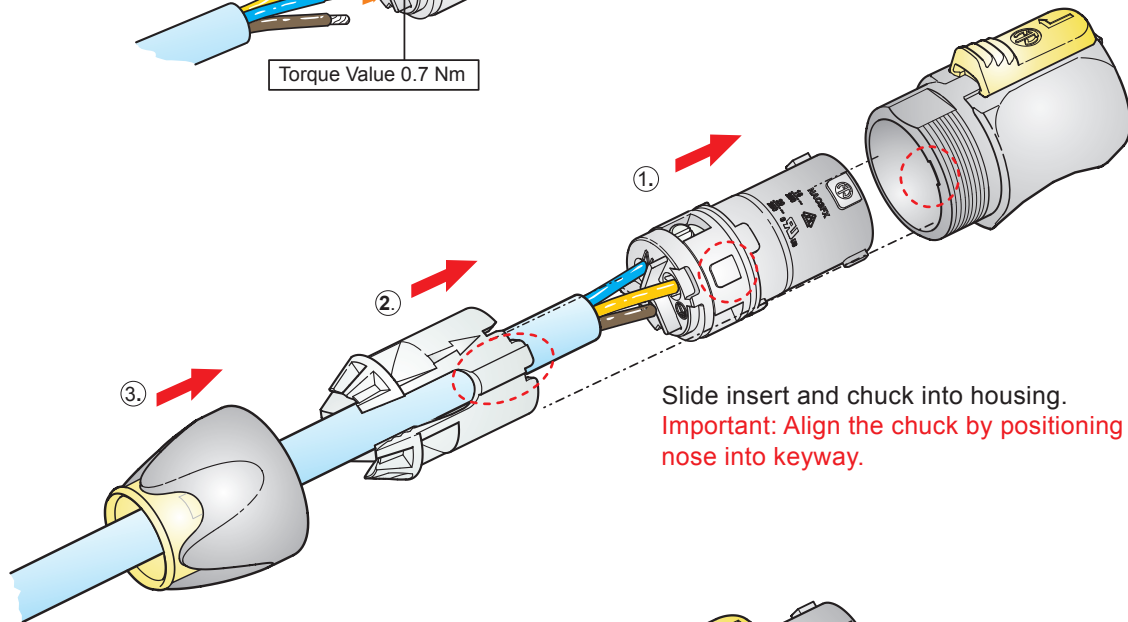
③



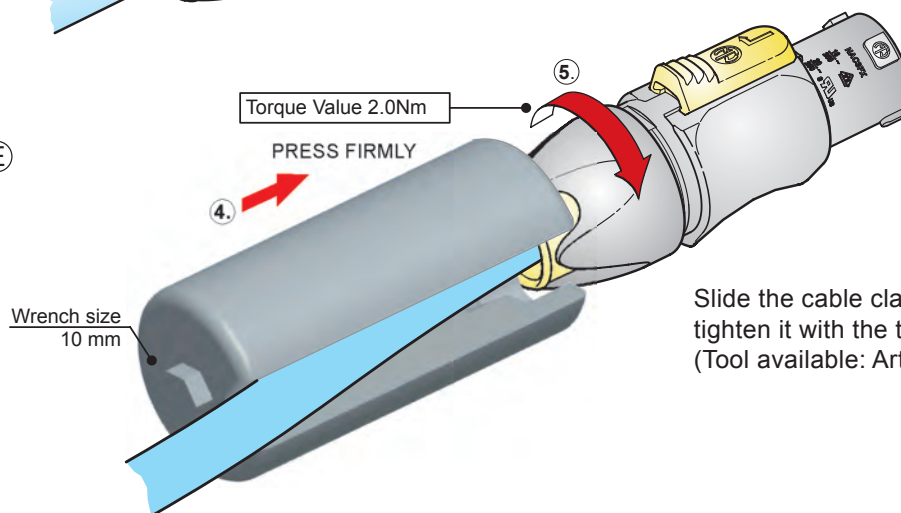
Slide the cable into the contacts and clamp with the screw.

Wiring	VDE	UL
L	brown	black
N	blue	white
⏏	green / yellow	green

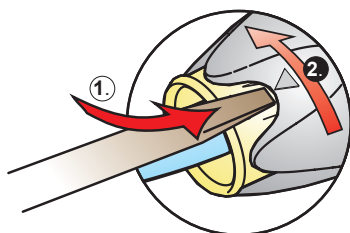
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⑤



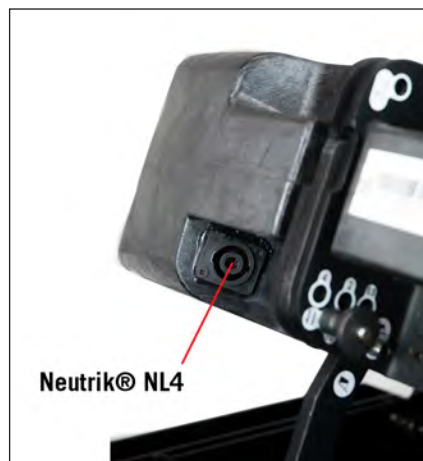
Slide the cable clamp bushing up the cable and tighten it with the tool as shown.
(Tool available: Art. No. HTAC)



Disassembly (open twist lock):

1. Press with screw driver to unlock (at ▼)
2. Turn bushing while still pressing locking.

MLA MINI CONNECTION



The MLA Mini system only has one other connection. This is a Neutrik® NL4 on the Mini cabinets themselves. Connect the cables referred to in Item [3] above here, taking care to observe the colour coding of the connectors.

MLA MINI SYSTEM MECHANICAL COMPONENTS

A range of rigging accessories is available for the MLA Mini system. The accessories required for each rigging configuration differ; depending on what was specified at the time of order, you may not have all the components shown below.

Before rigging a MLA Mini system for the first time in any configuration, you should first familiarise yourself with each of the various components and their purpose.

Flying Frame



This steel assembly is required when an MLA Mini system is to be flown using one or two chain hoists; it attaches either to the Mini array or to the topmost MSX, depending whether one or more MSXs are being flown as part of the array. It is also used to attach an array of Minis to one or more MSX subs in a ground stack arrangement, or an array of Minis directly to the Ground Stack Baseplate in a situation where the MSX sub(s) are located separately.

The Flying Frame is available either pre-fitted with a clinometer (as Martin Audio Part No. ASF20064), or without (as Martin Audio Part No. ASF20054). The clinometer will be unnecessary in fixed installations, as the angle will be set and fixed as the cabinets are mounted. The clinometer checks the angle at which the MLA Mini array is flown at (relative to the horizontal). It consists of a sensor (mounted within the Flying Frame) and a remote display unit. Interconnection is via a standard XLR mic cable. It is normally only supplied with the touring package.

Two Flying Frames with clinometers and two Transition Frames (see below) are also available in a purpose-designed flightcase as Martin Audio Part No. ASF17026.

Transition Frame (Martin Audio Part No. ASF20055)



This is used in a flown arrangement to attach a Mini array to the underside of an MSX sub.

Variable Height Pole Mount (Martin Audio Part No. ASF20071)



This is used to elevate an array of 4 Minis above the MSX as a single assembly. The height of the array can be set to that required (either determined by the Preset in use or according to the Display 2.2 specifications) by turning the handle, and then locked in position with the integral clamp.

Universal tilt bracket (Martin Audio Part No. ASF20051)



This can allow an array of 4 Minis to be fitted to the Variable Height Pole Mount at a range of tilt angles. The bracket's fixing is via a single 12 mm dia. hole, which is fitted with a boss to fit the Pole Mount. By replacing the boss with a trigger clamp, the bracket can also be used inverted, to fly a single 4 x Mini array (without an MSX sub). Note that it is not possible to mount more than 4 Minis on a Pole Mount by any method, and that the Flying Frame (see above) must be used to fly all other system configurations.

Fixed Tilt Bracket (Martin Audio Part No. ASF20053)



This is a simpler alternative to the Universal Tilt Bracket, for use with the Vertical Height Pole Mount. It provides a single tilt angle (14.5°), which is correct for use with two of the Presets most likely to be used with pole mount configurations. The maximum number of Minis that can be mounted using the Fixed Tilt Bracket is four.

Ground Stack Baseplate (Martin Audio Part No. ASF20062)



This is normally fitted to the base of the MSX for ground-stack configurations where the MSX is attached to an array of Minis (either directly or with the Variable Height Pole Mount) to give greater stability. It can also be used with an array of Minis alone, with the Flying Frame as an intermediate adaptor. The Ground Stack Baseplate is often referred to as an “Outrigger” or “Duck’s Foot”.

Ground Stack Bars (Martin Audio Part Nos. ASF20056/7)



These precision alignment bars are used in conjunction with the Flying Frame to define the angle between the Mini array and an MSX sub when the system is configured for ground stacking. They will also be needed when the Mini array is to be ground stacked alone. Two versions are available, long (Martin Audio Part No. ASF20056) and short (ASF20057); the two sizes allow different ranges of angles to be set.

Flying Pins



The pins are used to lock the individual Mini cabinets into position at the defined inter-cabinet angle, and also to lock a Mini array to the Transition Frame or Flying Frame at the required angle. The pins are supplied with the relevant components.

19" rack mount kit (Martin Audio Part No. HAM09223)



This option is required if the MSX electronics unit is to be mounted in a separate 19" equipment rack. If the electronics unit is ordered separately, the rack mount kit is pre-fitted at the factory.

Flight case for 4 Minis (Martin Audio Part No. CAR00072)



An optional, dedicated flightcase is available for an array of 4 Mini cabinets. This will allow safe transportation and convenient rigging and de-rigging if your system is to be portable. Note that all rigging accessories (except the flying pins – but see below) should be removed before stowing the Minis in the flightcase for shipment.

Four MLA Mini cabinets may be ordered complete with the flightcase as Martin Audio Part No. ASF17024.

Wheelboard with castors (Martin Audio Part No. ASF90011)



This is a wheeled base board which is fitted to the front of the MSX sub (for speaker protection) to allow easy attachment of the Ground Stack Baseplate, and also for convenient transportation. It does not form part of an assembled system.

MSX Transit Cover (Martin Audio Part No. COV00021)



A tough flexible cover for the MSX with an integral plywood lid for shipping purposes.

SYSTEM CONFIGURATION USING ON-BOARD PRESETS

An MLA Mini system can be rigged in a wide variety of ways, in both ground-stacked and flown configurations. The system size and rigging option to be used will generally be dictated by the venue's size and physical restrictions.

To achieve the best performance from the system it should be optimised both physically and electronically. This optimisation can be achieved in two ways – by using internal factory Presets, or through the use of two software applications: **Display 2.2** and **Vu-Net**.

The use of Presets greatly simplifies the system optimisation procedure, but note that the six Presets pre-loaded into the MSX sub are only applicable to the minimum MLA Mini configurations consisting of one MSX sub plus four MLA Mini cabinets (per side). For all larger configurations, the two software applications must be used.

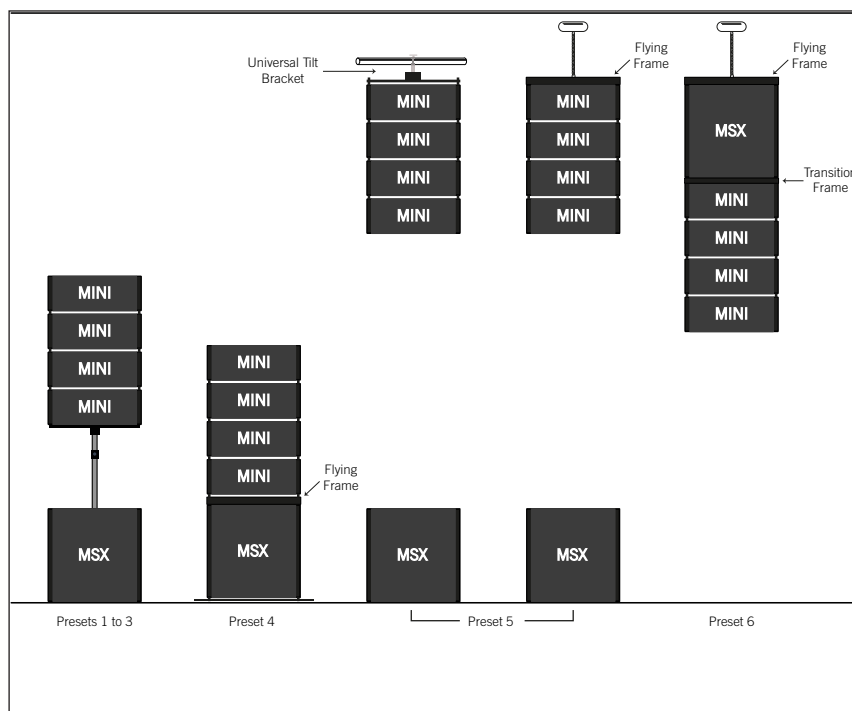
The configuration options using Presets are discussed below. Configuring systems using Display 2.2 follows at page 30.

Using Presets

4 MLA Minis and one MSX can be rigged in four basic arrangements: two ground stacked, and two flown. The option chosen for any particular situation will be largely determined by the physical arrangements of the venue. Whichever arrangement is used, at least one factory preset is available for optimising the system's performance in that configuration. In the manual section on Rigging, the Preset appropriate to each rigging configuration is indicated by an icon thus:



The rigging possibilities are illustrated below; see page 54 for full details of how to perform the actual physical rigging for each.



CHOOSING A PRESET



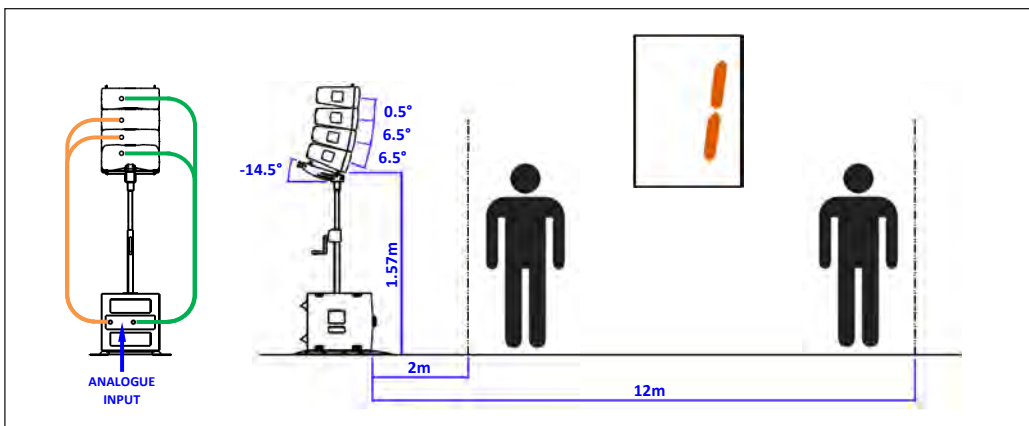
The MLA Mini system comes with six factory-designed presets which optimise the system for use in the most commonly-encountered rigging configurations. Presets are loaded by pressing the PRESET SELECT button on the MSX rear panel; press the button until the number of the required preset is displayed:



The diagrams below summarise the intended application for each preset. Note that the MSX-to-Mini cabling is the same for all presets, and the audio input is set to *analogue* in all cases.

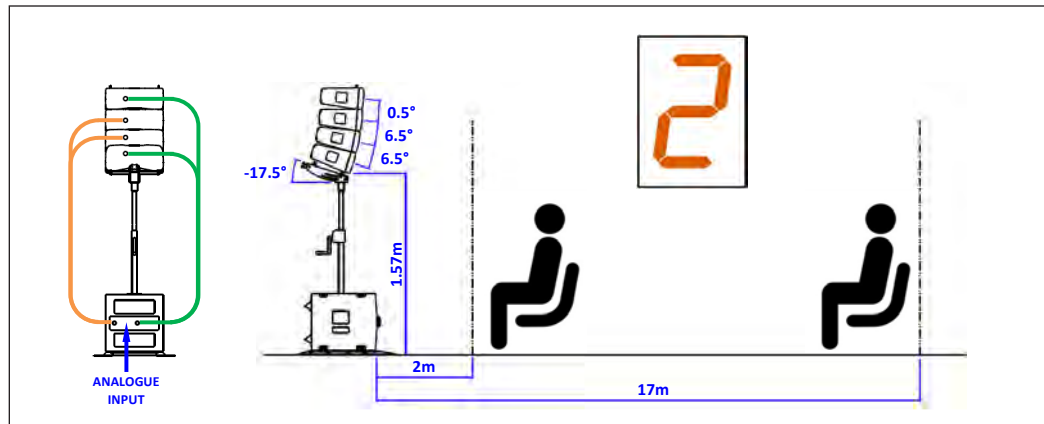
The diagrams indicate the various angles which will need to be set; these include the inter-cabinet angles and the angle between the mounting and the first Mini. The selected preset optimises the MLA Mini system for the dimensions and heights shown in the diagrams, but good performance will still be obtained if, for example, the room is a different size or if it necessary to use a different mounting height. Always use the preset which most closely represents the rigging configuration you are using.

Preset 1



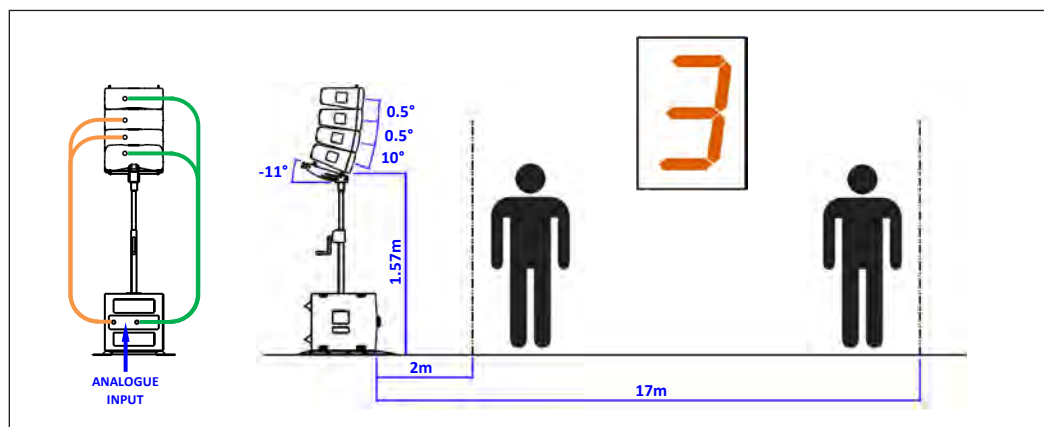
Preset 1 optimises the system for use with the 4 x Mini array attached to the MSX sub using the Variable Height Mount Pole. This will be an appropriate setup for venues where there is no stage; it is assumed that the standing audience will be on the same level as the MSX. The system will be able to provide effective coverage from 2 m to 12 m from the loudspeakers.

Preset 2



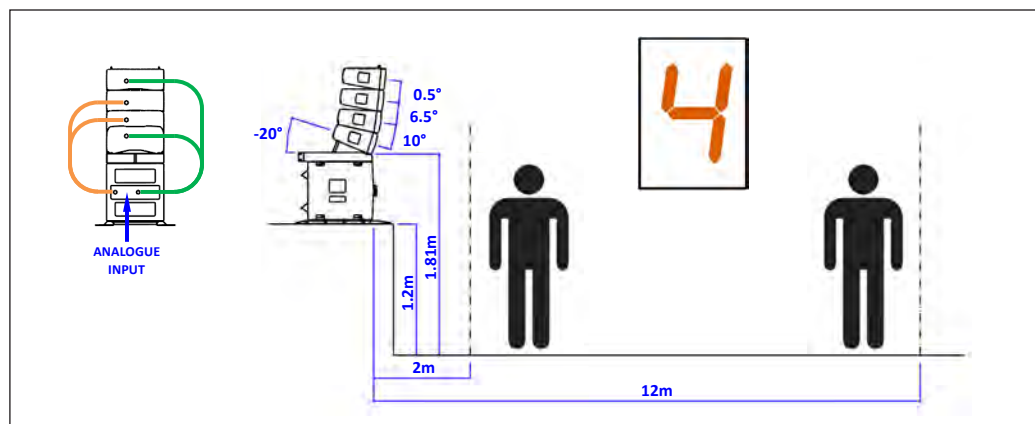
Preset 2 is similar to Preset 1, but is suited better for a seated audience over a larger area. Good coverage is provided between 2 m and 17 m from the loudspeakers. Note the array tilt angle differs from that used by Preset 1.

Preset 3



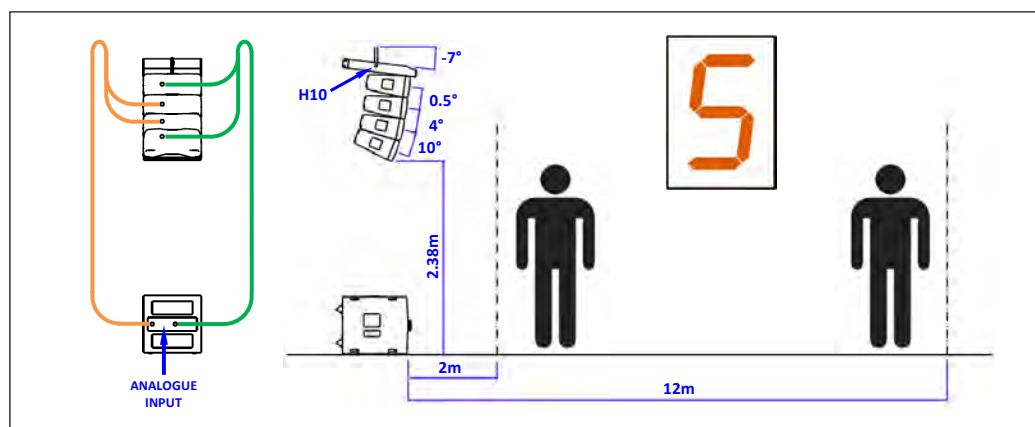
Preset 3 assumes the same size audience area as Preset 2, but is optimised for a standing audience. Note the array tilt and inter-cabinet angles differ again.

Preset 4



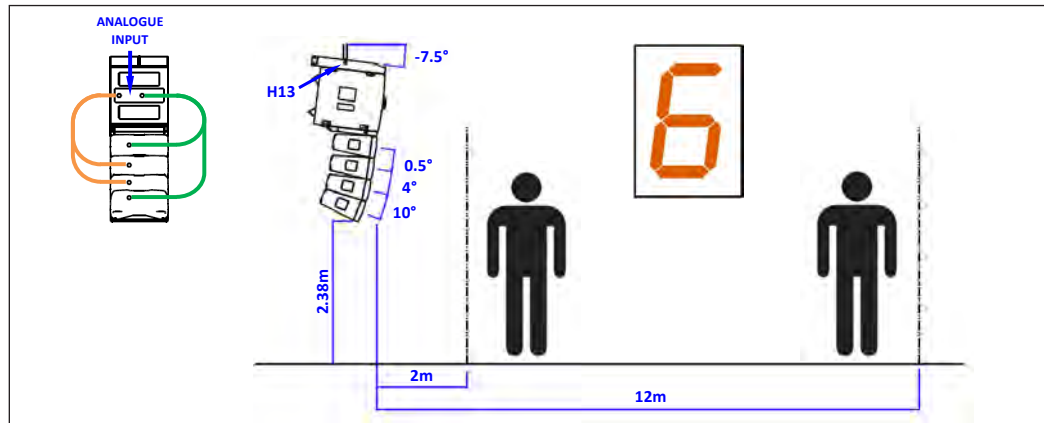
This preset is suitable for a ground stack system mounted on a stage approximately 1.2 m high. Here the 4 x Mini array is mounted on the MSX sub using the Flying Frame. The long Ground Stack Bar provides the overall array tilt angle. The system will provide coverage between 2 m and 12 m from the loudspeakers.

Preset 5



This preset should be used when the 4 x Mini array is flown, with the MSX sub remaining on the floor. The preset is most effective with the bottom array cabinet 2.38 m above floor level, and for a standing audience between 2 m and 12 m from the loudspeakers. The Flying Frame may be used to hang the array and define the basic tilt angle, or the Universal Tilt Bracket may be used if the 4 x Mini array is to be suspended from a rigging pole or truss. Note however that when using the Universal Tilt Bracket ONLY a single 4 x Mini array can be suspended. Do not use it to suspend Mini arrays in excess of four cabinets, nor for fully-flown configurations where the MSX sub is also flown (see Preset 6).

Preset 6



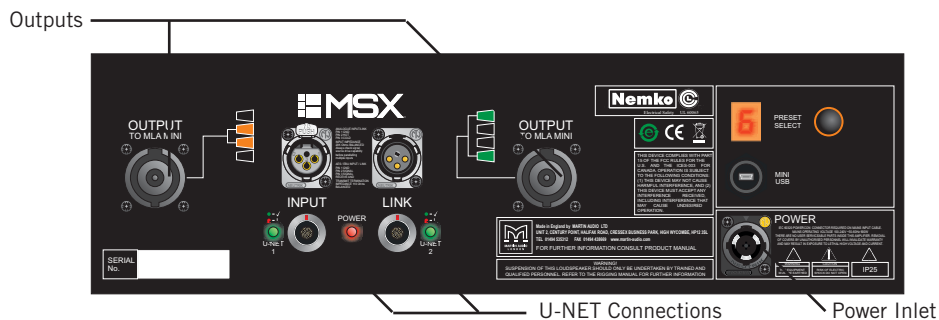
This preset applies to a fully-flown configuration; the ground stack configuration is effectively 'inverted', with the MSX sub at the top of the array. The Flying Frame and Transition Frame are both required to achieve this configuration. The audience coverage is the same as for Preset 5.

Summary of Presets:

Preset	Rigging	Location	Coverage	Audience
1	Pole mount	Floor-standing	2 – 12 m	Standing
2	Pole mount	Floor-standing	2 – 17 m	Seated
3	Pole mount	Floor-standing	2 - 17 m	Standing
4	Ground stack	On stage	2 – 12 m	Standing
5	Flown array	Sub on floor, array flown	2 – 12 m	Standing
6	Fully flown	Fully flown	2 – 12 m	Standing

CABLING, CONNECTING UP

The electrical connections for a single 4 x Mini array plus an MSX sub are straightforward.



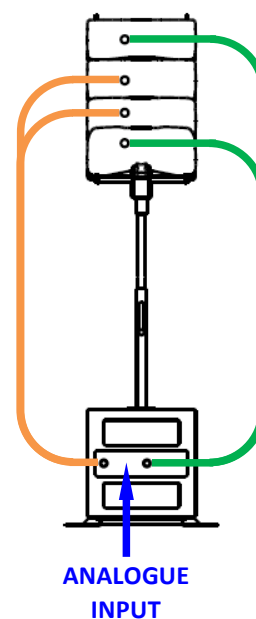
1. AC Mains – connect the power supply cable to the Neutrik® PowerCON TRUE1 connector on the rear panel of the MSX sub. Do not connect the other end of the cable to a live AC supply at this stage.
2. Connect the amplifier outputs to the MLA Mini cabinets using the pre-made cable assembly supplied (if length permits - configuration-dependent. Some configurations will require longer cables). Note the colour-coding (orange and green); also note the wiring diagram on the MSX rear panel adjacent to each of the OUTPUT connectors.

Plug the orange NL8 connector into the left-hand OUTPUT socket. Plug the green NL8 connector into the right-hand OUTPUT socket. Note that the other ends of the cable have different lengths of 'tail'. This is to identify which cable connects to which cabinet.

IMPORTANT: The wiring instructions differ between ground stack configurations and flown configurations. Use the correct set of instructions for the arrangement you are using.

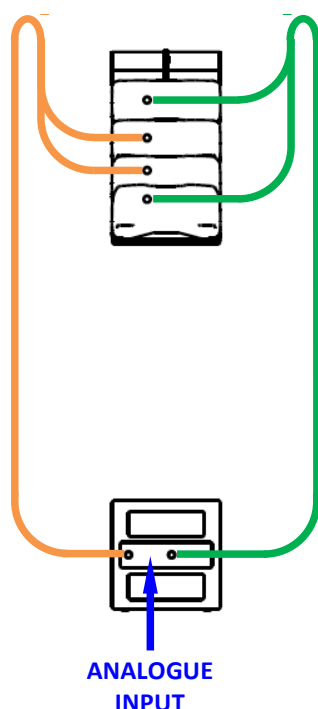
Ground stack configurations:

- Plug the orange-coded NL4 with the shorter tail into Cabinet 2 (the second cabinet from the bottom of the array)
- Plug the orange-coded NL4 with the longer tail into Cabinet 3 (the third cabinet from the bottom of the array)
- Plug the green-coded NL4 with the shorter tail into Cabinet 1 (the bottom cabinet in the array)
- Plug the green-coded NL4 with the longer tail into Cabinet 4 (the top cabinet in the array)

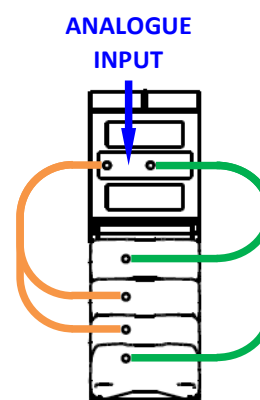


Flown configurations:

- Plug the orange-coded NL4 with the shorter tail into Cabinet 2 (the second cabinet from the top of the array)
- Plug the orange-coded NL4 with the longer tail into Cabinet 3 (the third cabinet from the top of the array)
- Plug the green-coded NL4 with the shorter tail into Cabinet 1 (the top cabinet in the array)
- Plug the green-coded NL4 with the longer tail into Cabinet 4 (the bottom cabinet in the array)



Flown array with MSX on stage



Fully flown

3. Connect the audio source (e.g., analogue mixing console output) to the INPUT connector. Ensure that the mixing console main output is muted or faded down.
4. If Vu-Net software is being used to monitor the system's operation, connect the MSX into the U-Net ring with two cables, from the Merlin unit and/or the adjacent cabinet(s), as appropriate (see Network Options illustrations on pages 28 to 31).
5. Apply power to the MSX electronics rack; check that the POWER LED is illuminated.
6. If required, select the preset to be used using the PRESET SELECT button.
7. Gradually raise the output level of the mixing console.

ADVANCED SYSTEM CONFIGURATION

Display 2.2 – Introduction

Display 2.2 is a version of Martin Audio's MLA/MLA Compact Display 2.2 system design application, re-versioned specifically for the MLA Mini system. Display 2.2 should always be used when the requirements of the venue call for a MLA Mini System configuration larger than the minimum 4 x Mini + MSX per-side. It should also be used with minimum system configurations if the venue is not suitable for any of the factory Presets to be used.

Display 2.2 is used in conjunction with Vu-Net and an MLA Mini system to calculate i) the inter-cabinet angles to be used when rigging the system, and ii) the DSP parameters to optimise the loudspeaker management system. These parameters can then be quickly and easily uploaded to the hardware using Vu-Net, either directly into an MSX via a USB connection, or via the U-Net system network. Display 2.2 also provides an accurate prediction of the system response in the venue.

The application has a straightforward, logical workflow; in fact, it does not allow the user to skip ahead in the design sequence and it is necessary to complete each stage in the correct, logical order.

Display 2.2 uses numerical optimisation to calculate the correct cabinet angles and DSP coefficients for the particular venue scenario. Taking the cabinet angles as an example, this means that it tries every combination of possible values, checking the result by comparing the computer model of the array response to the desired response until it arrives at the closest match. In the case of the cabinet angles, it has the facility to “polish” the array further, by performing a second pass, thus fine-tuning the array angles. Although highly complex, this process only takes a few minutes, certainly no longer than a conventional line-array prediction application. When the cabinet angles have been calculated, the array can be rigged. While this is being done, the second stage of the optimisation process can be executed. This also uses numerical optimisation, but now works through the EQ, FIR, gain and phase parameters available in the DSP, evaluating all possible combinations until the output response is obtained which is as close as possible to the desired response. With a large array and complex venue this process may take up to ten minutes to complete, however, this will be far quicker than the time it takes to rig the arrays so should not impact on the show build. The computer model used by Display 2.2 is one of the most accurate yet devised for any audio system and achieves predictions within 1 dB of actual measured parameters.

In touring applications, a Display 2.2 design can be completed offline beforehand for each venue. With drawings of the space and details of the flying positions and trim height of the arrays, the rigging design and DSP parameter calculations can be performed off-site, which makes set-up much quicker and efficient.

A note about Numerical Optimisation

Numerical Optimisation is an easily misunderstood concept; some people assume that it is some sort of “averaging” procedure, resulting in a “compromise”. This is not the case.

Multicellular systems have been made possible by the parallel development of a highly accurate computer model of the system, which works in conjunction with the precision acoustic design of the cabinets. Many factors affect an array's performance: the specification of individual drivers, the horn design, the angle between enclosures, the number of enclosures and so on. Martin Audio have taken software analysis of array performance to the most advanced level yet achieved; this includes boundary effect modelling, which takes into account the effect that every cabinet in an array has on a single driver; essentially each individual cabinet can be considered as having a baffle extending above and below it formed by the other enclosures in the array. For cabinets in the middle of the array this is fairly symmetrical, but for cabinets towards the top and bottom it becomes more and more asymmetric, which has a significant effect on the individual module performance and therefore the overall array performance.

Martin Audio's computer model for its multicellular systems achieves a degree of accuracy that results in the predicted performance is within 1 dB of measured results.

Numerical optimisation uses the computer model to check the performance expected from a given mechanical orientation and DSP configuration, and compares the result on the venue slice (a vertical section through the venue space, in a plane parallel to the stage) with what the system needs to achieve. It then tries an alternative option to see if the prediction is closer or to the desired result. If it is not, it ignores that configuration and uses other angles or EQ curves, trying successive configurations until it has attempted all possible combinations and has reached a predicted result as close as possible to the desired performance.

To take an example: consider an initial optimisation which calculates the splay angles. In an MLA Mini system there are five possible angles available between each cabinet; 0.5, 2, 4, 6.5 and 10°. With a 12-cabinet array there are 48,828,100 possible combinations of angles between all cabinets. Clearly analysing each of these combinations involves a significant amount of processing, but even this is minimal compared to the number of calculations required when running numerical optimisation for the DSP: frequency, bandwidth and gain in every EQ band, phase and FIR filter parameters must be calculated for each cell in every cabinet in the array. This is why a powerful PC is required and the EQ optimisation can take up to ten minutes or so for a large array in a complex arena. Even powerful PCs cannot try all possible combinations in a reasonable time, so algorithms are used that abandon some calculation "avenues" when a certain sequence of filter parameters are consistently demonstrating negative results. This allows highly accurate parameters to be produced within a reasonable time frame.

While this approach is processor-hungry, it is a realistic and practical method for obtaining the best possible results for an array with so many variables. Attempting to manually adjust several thousand DSP parameters is unrealistic, however good a system technician believes his ears might be.

A full description of the operation of Display 2.2 can be found in the "DISPLAY 2.2.0 for MLA Mini" on page 81.

Vu-Net - Introduction

Vu-Net is the monitoring and control application used with MLA Mini systems (or other MLA family products). Connection between a PC and the MLA system may be made:

- directly on a one-to-one basis to an MSX sub directly via USB, if USB cable length is less than 5 m,
- directly on a one-to-one basis to an MSX sub via a Silex Ethernet-to-USB converter, or
- by using a Merlin system processor as a PC-to-network hub. When a Merlin is in use, interconnection between the various MSX subs in the system is via the U-Net network protocol.

Vu-Net is also used to upload DSP parameters calculated by Display 2.2 to the MLA Mini system; system firmware checks and updates can also be carried out.

It is important to realise that once the DSP settings have been uploaded into the system, the presence or absence of a U-Net network in no way affects normal audio operation; all MLA Mini systems will continue to pass audio with their last known configuration even without a operational U-Net network.

A full description of the operation of Vu-Net can be found in the "VU-NET 2.0.0 for MLA Mini" on page 165

Using MLA Mini with digital audio sources

The MLA Mini's audio input may be configured as either analogue or AES3 digital. The same XLR connector is used in both cases.

Selection of an analogue or digital audio input is made via Vu-Net software. The six factory Presets all configure the input connector for analogue audio; however, if a Preset configuring the MLA Mini for use with AES3 audio is saved in one of the User memories, the XLR input will be switched from analogue to digital when that Preset is selected by whatever means. This implies that configuring the input connector as analogue or digital may be performed from the cabinet itself, without a network connection of any kind, provided that a Preset has been previously saved which uses the AES3 input capability.

Optional system components

Merlin

Merlin (Part No. ASF80001) is a 1U 19" rackmounting unit combining U-Net and Ethernet hubs with a 4-in, 10-out audio DSP section. When used with an MLA Mini system, Merlin generally acts as a network interface and hub, interfacing the MSX onboard DSPs to the computer running the Display 2.2 and Vu-Net software applications. Merlin also offers an extensive range of audio processing functions which can be used to provide audio matrix functions: e.g., to feed other speakers such as side or front fills, or delays. The DSP can also be used to provide crossover functionality when using separate passive speakers as part of the system, etc.

Front Panel:



1. **ENTER** - depending on the screen presently selected, switches to a selected menu or sub menu with subsequent presses
2. **RIGHT** - navigates to the next menu screen to the right
3. **LEFT** - navigates to the next menu screen to the left.
4. **BACK** - returns to the previous screen displayed.
5. **PC** - two indicators (**CON** and **ACT**) show the activity of the Ethernet port on the rear panel (the primary PC connection). The **CON** LED ('Connected') will illuminate when an Ethernet connection is established via this port. The **ACT** LED ('Activity') will flash whenever there is data transfer in progress.
6. **U-NET** - The **U-NET** LEDs for the rear panel U-NET ports 1 & 2 indicate U-NET connections, data transfer and errors.
7. **USB 2.0 Type B port** - the USB connection is used as a service port for Firmware upgrades and Merlin diagnostics. A standard USB Type A to Type B cable will be required.

THE REMAINING FRONT PANEL CONTROLS AND INDICATORS ARE CONCERNED WITH MERLIN'S AUDIO AND DSP FUNCTIONS, WHICH ARE NOT ESSENTIAL FOR USE WITH AN MLA MINI SYSTEM.

Rear Panel:



8. Mains Switch - turns the unit's mains supply off and on. Merlin has a universal PSU suitable for connection to any mains voltage between 100 and 240 V AC.
9. Mains Inlet - connection to the Merlin is via a captive cable fitted with a UK 13A mains plug. For other territories a suitable approved mains adaptor must be used. Alternatively the UK plug may be removed and an alternative mains plug wired in its place by a suitably qualified electrical engineer. Wire the plug as follows:

Brown:	Live
Blue:	Neutral
Green/Yellow:	Earth (Ground)
10. **ETHERNET** - the primary PC connection is via a standard RJ45 Ethernet port. This can be wired either directly to a PC, or to a wired or wireless Ethernet switch. The Ethernet connection is suitable for a standard 100Base-T computer network. Standard Cat 5 patch cables with RJ45 connections may be used to connect between the Merlin and a PC or an Ethernet switch.
11. **U-NET PORTS**—two Neutrik® Ethercon RJ45 connectors; these form the “start” and “end” of the redundant network ring. U-Net connections also use Cat 5 cables. If long cable runs are required (e.g., to flown MSX subs), a robust Cat 5 cable should be used such as Neutrik Etherflex or Belden 1304A, with Neutrik Ethercon RJ45 connectors. This will ensure reliable network connections up to 105 metres.
12. U-Net activity indicators - a pair of LEDs indicating data activity on the two U-Net ports.

The remaining rear panel connectors are concerned with Merlin's audio and DSP functions, which are not essential for use with an MLA Mini system.

NOTE: Use of Merlin as a U-Net hub is covered at page 36 in this Advanced User Guide.

MLA Master Rack

The MLA Master Rack (Part No. ASF17031) is a 4U flightcased rack containing:

- a Merlin unit
- a 2U connector panel providing easy access to all Merlin's inputs and outputs (audio and network)
- a 6-port Ethernet switch
- a Rukus Wi-Fi router

Front of Rack:



MLA SLAVE RACK

This optional component (Part No. ASF17032) has been developed to facilitate simple network connections to larger MLA systems, where the arrays are fully flown either side of a wide stage. In this situation, it is useful to have a second U-Net/Ethernet switch (plus the possibility of additional derived fill feeds) on stage. The MLA Slave Rack is a 4U flightcase with the same components as the MLA Master Rack, except that the Wi-Fi router is omitted.



MLA Front of House (FOH) Rack

This is a simple flightcased rack intended for location at the FOH position. A common problem in larger venues is that while the wireless link to a laptop or tablet works satisfactorily when the venue is empty, access may be severely compromised or even interrupted when it is full. The MLA Master and FOH Racks both include a CopperLink Ethernet extension interface, which permits hardwired connection over long distances (in excess of 1 km). The CopperLink interface uses a single twisted pair, i.e., a spare core in a multicore cable.

The FOH Rack also provides a connection point for a Wi-Fi antenna; this connects to the Ethernet network via the Wi-Fi router in the Merlin Master Rack. By virtue of the venue-central FOH position, this is the best location to make Wi-Fi connectivity as reliable as possible.

A laptop may be connected directly to the FOH Rack using a standard Cat 5 patchcord, thus wireless connectivity can be avoided altogether if preferred. This may be particularly useful in areas with high Wi-fi traffic, resulting in congestion which may impact on connectivity, or when performing firmware updates – in fact, a cable connection is very highly recommended for this procedure.

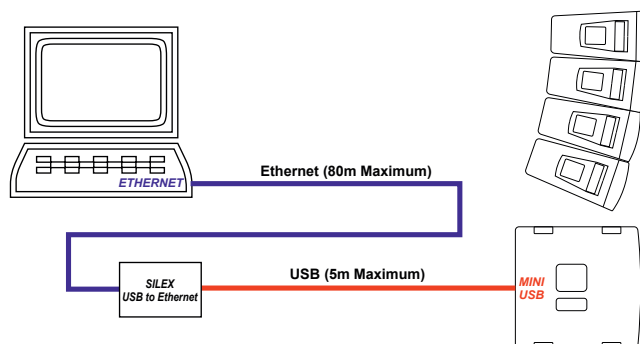
Silex USB to Ethernet Device Server



With smaller MLA Mini systems, it may not be cost-effective or appropriate to install one or more Merlin units or Racks to implement U-Net control of the system, and it also may not be practical to connect directly to the MSX unit via its USB port due to the 5 m maximum cable length that USB operation imposes. In these cases, a simpler control method can be implemented by using the Silex USB-to-Ethernet converter (Part No. ASF14013). This is a self-contained, physically small unit which can be attached with Velcro or similar to a flown MSX sub. This connects to the sub using a standard USB cable, and back to the laptop running Vu-Net via Ethernet. This solution overcomes the 5 m single-cable USB limit.

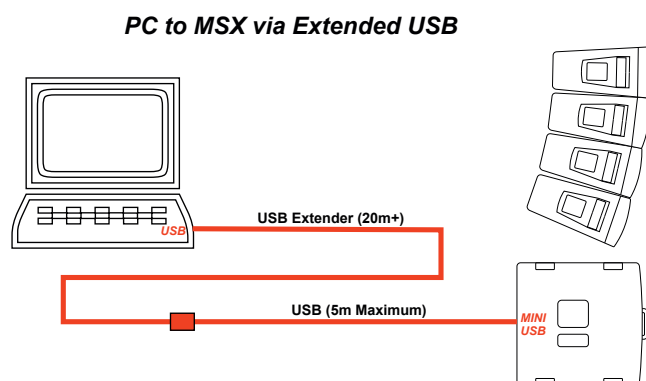
A single Silex converter – to one MSX sub - is required for the whole system. Connections to the remaining units can then be run as a U-Net network.

PC to MSX via Silex Ethernet Convertor & USB



This method is of particular relevance to systems with flown MSX subs, as it is the height of the sub that causes the USB cable length problem. Ground-stacked MSX subs can be interfaced directly to a laptop with standard length USB cables.

Industry-standard USB extenders may alternatively be used to implement a simpler solution if the maximum overall USB cable run is less than 20 m; this option is illustrated above.



Using Merlin

Merlin provides MLA Mini systems with a control network interface, allowing a U-Net network to interconnect system elements, and to monitor and control them from a PC connected via Ethernet to the Merlin.

NOTE: Merlin also incorporates a powerful and versatile DSP based audio processor, which was developed for use with Martin Audio or third-party speaker systems. This functionality is not required when Merlin is used with MLA Mini systems, as all necessary DSP is contained within the MSX power plant. This MLA Mini Advanced User Guide ignores the audio I/O and DSP aspects of Merlin; these topics are fully covered in the separate MLA System User Guide document.

When used with MLA Mini systems, Merlin acts as a full U-NET interface allowing digital audio* and control over Cat 5 cable using a redundant ring fault tolerant topology.

* Multichannel digital audio transmission via U-Net will be implemented in a future system update.

Using MLA Master Rack

Using an MLA Master Rack simplifies network connections and enables configuration and control of the system to be carried out from a wireless-enabled laptop or tablet device. This is particularly beneficial in a touring situation. It does not affect the range of U-Net topologies that may be employed, and any of the network options described below may be implemented with an MLA Master Rack instead of just a Merlin, and the system controlled wirelessly. Two specific examples (Options 7 and 8) are illustrated on page 40 and page 41.

For installed systems, a Merlin processor is likely to be sufficient, as the flightcase, patch panel and Wi-fi router will generally be superfluous.

U-Net topologies

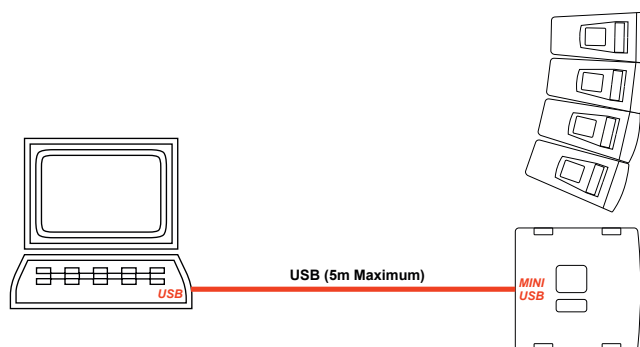
The U-Net protocol uses a fault-tolerant redundant ring topology, so connections “daisy-chain” between all units on the network, going first to **U-NET 1** on the first network device, e.g., an MSX sub; then from **U-NET 2** on that sub to **U-NET 1** on the next MSX sub and so on, before finally making a return connection back to the unused U-Net port on the first network device to complete the loop. Note that a loop topology may employed with or without using a Merlin processor: examples of each scenario are given in the options shown below. The U-Net network will operate perfectly well without a closed loop but it is strongly recommended to use this topology so that the network will continue to work in the event of a cable break or unplugged connector.

Network options

Bearing in mind the points made above (“U-Net topologies”), the diagrams below show the possible data interconnections that can be used with MLA Mini systems of two different sizes. Option 1 to 3 are for a single 4 x Mini + MSX array; Options 4 and 5 are for a pair of arrays of the same configuration, and Options 6 to 10 are for systems double this size – eight Minis + 2 MSX subs per side. The interconnection principles in these examples can easily be adapted for use with larger systems.

Option 1

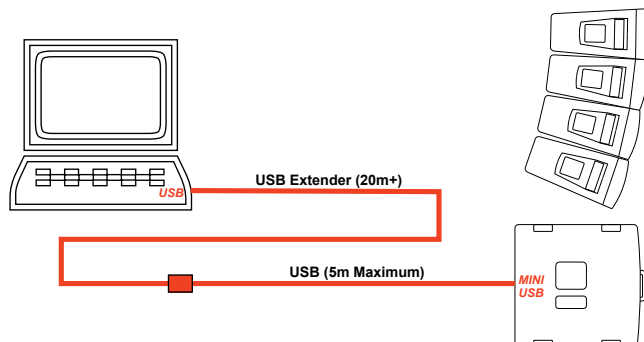
Option 1 *PC to MSX via USB*



In this simple example, a single USB connection is used between the PC and the MSX's USB port. No operational redundancy is provided by this arrangement.

Option 2

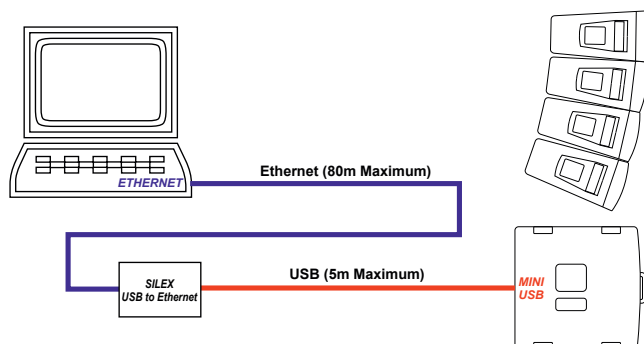
Option 2 **PC to MSX via Extended USB**



This is as Option 1, but a USB extender is required where the USB cable run is in excess of 5 m.

Option 3

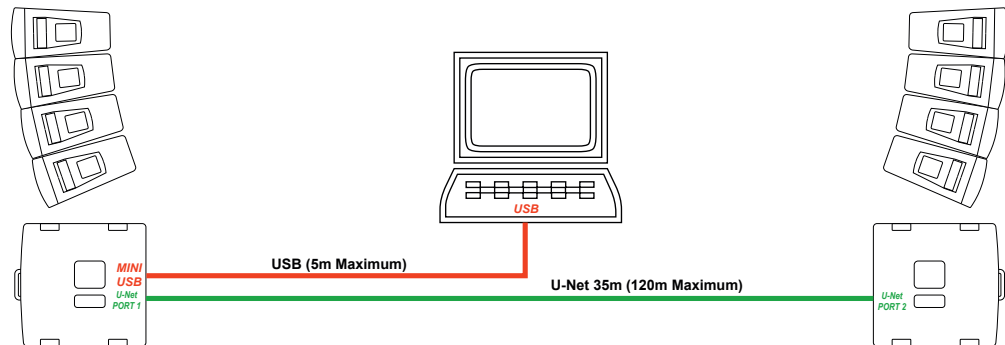
Option 3 **PC to MSX via Silex Ethernet Converter & USB**



This uses a Silex USB-to-Ethernet converter to extend the maximum cable run to 85 m.

Option 4

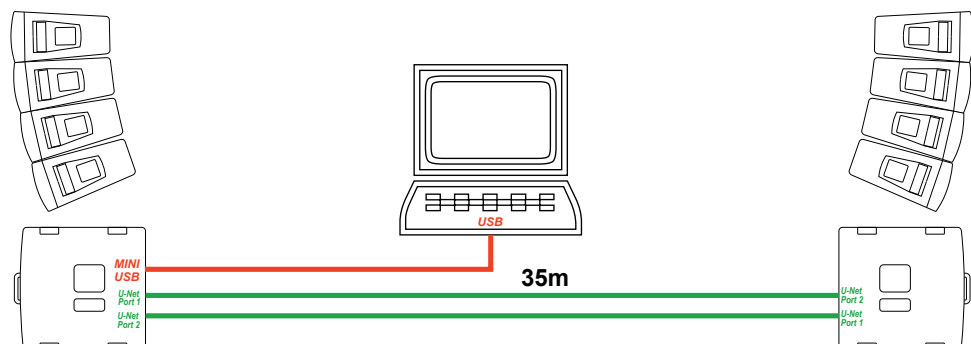
Option 4 *PC to MSX via USB, U-Net link to second MSX*



When more than a single MLA Mini array is in use, a USB connection may be made to one MSX's USB port as in Option 1, and a single U-Net interconnection made between the two subs. No operational redundancy is provided by this arrangement.

Option 5

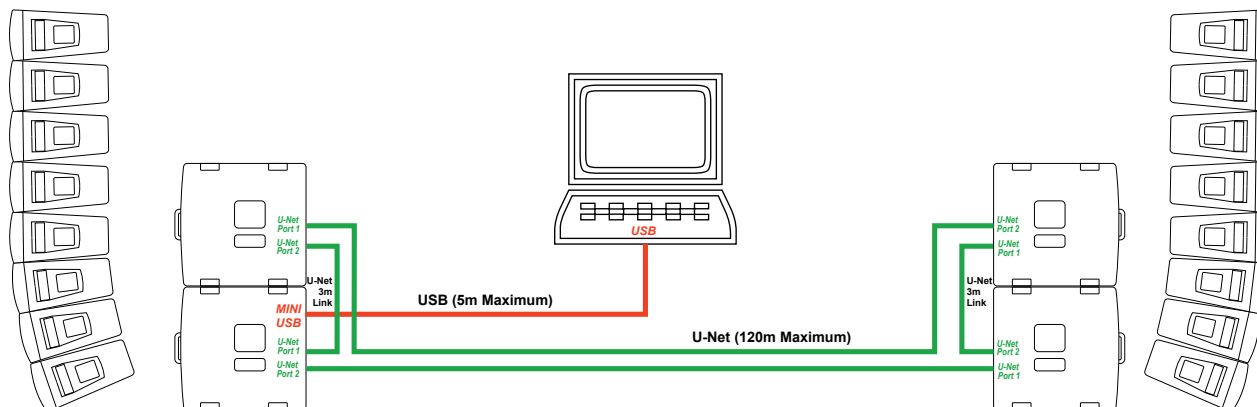
Option 5 *PC to MSX via USB, U-Net redundant loop to second MSX*



This configuration differs from that shown in Option 4 by the addition of a second U-Net connection between the two MSX subs. U-NET 2 on one sub should be connected to U-NET 1 on the other, and vice-versa, thus producing a loop. This arrangement will provide redundancy; if one U-net connector or one U-Net cable should be damaged, the monitoring and control system will still operate normally.

Option 6

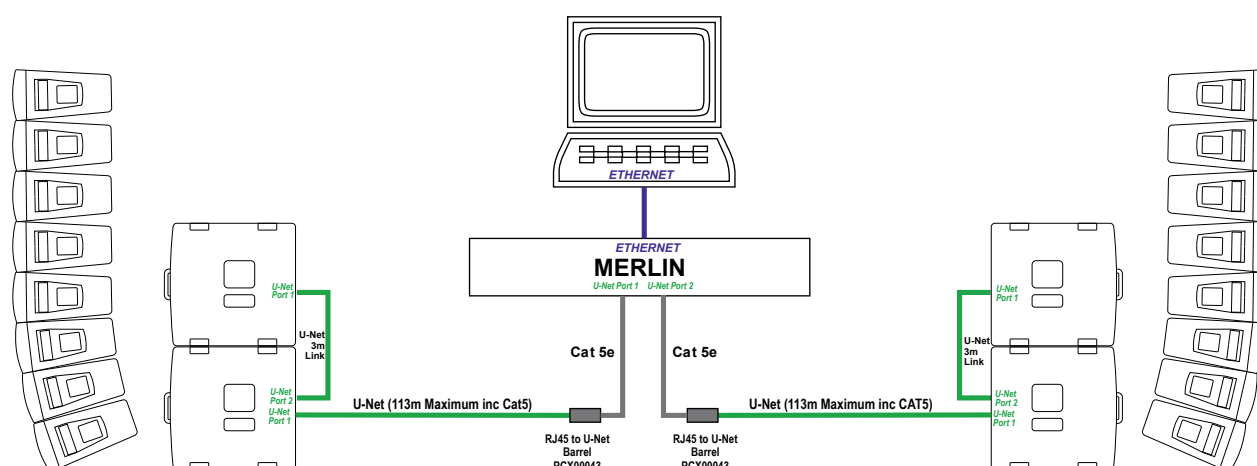
Option 6 PC to MSX via USB, U-Net redundant loop four (or more) MSX



Here we have a system of two MSX subs and eight MLA Minis per side, and the U-Net loop must now take in all four subs in the same “daisy-chain” manner as in Option 5. Again, full redundancy is obtained. This arrangement can be easily extended to accommodate larger systems.

Option 7

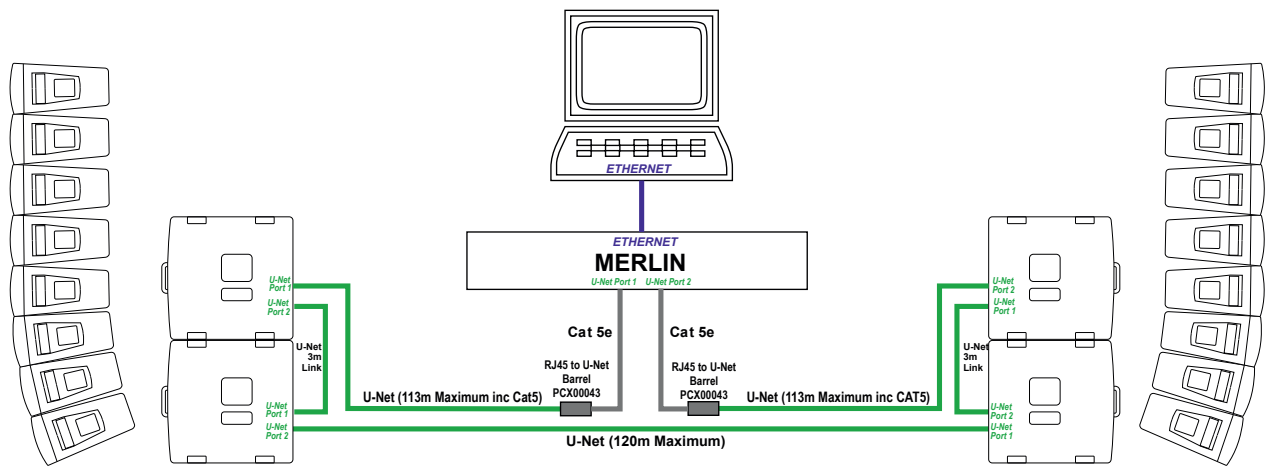
Option 7 PC Via a “Merlin-spur” configuration



This arrangement shows the same MLA Mini array configuration as Option 6, but demonstrates how a Merlin processor can be used as a U-Net hub. The connection between the PC and the Merlin is now via Ethernet. Each of the Merlin's two U-Net ports feed the arrays on one side of the stage, which are themselves daisy-chained together. As the U-Net ports on the Merlin are Neutrik Ethercons, RJ45-to-U-Net adaptors are required. The arrangement in Option 7 does not provide redundant operation.

Option 8

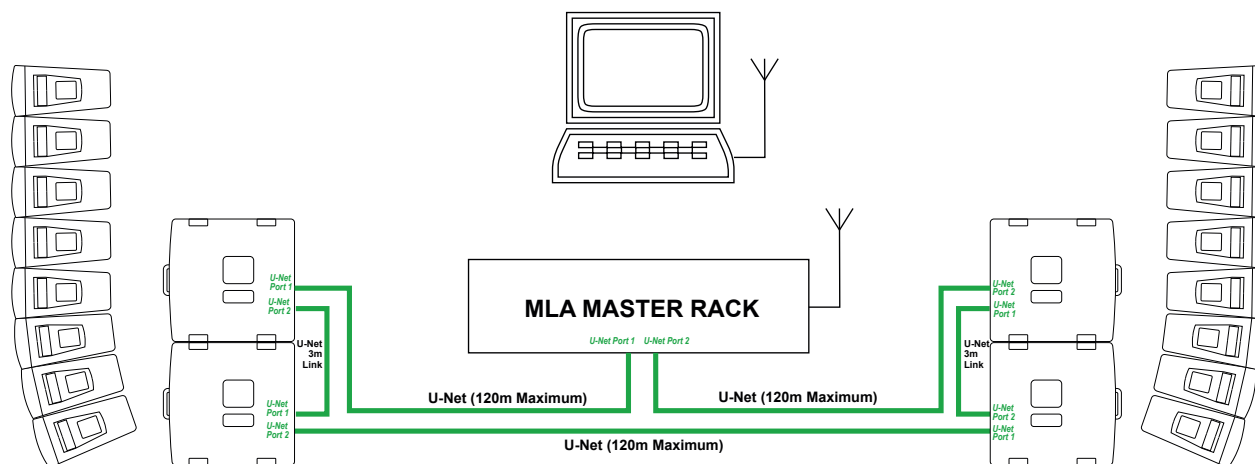
Option 8 PC Via a Merlin- redundant loop



Option 8 is an adaption of Option 7 to provide redundant operation; the U-Net loop running around the four subs and the Merlin is now a complete loop.

Option 9

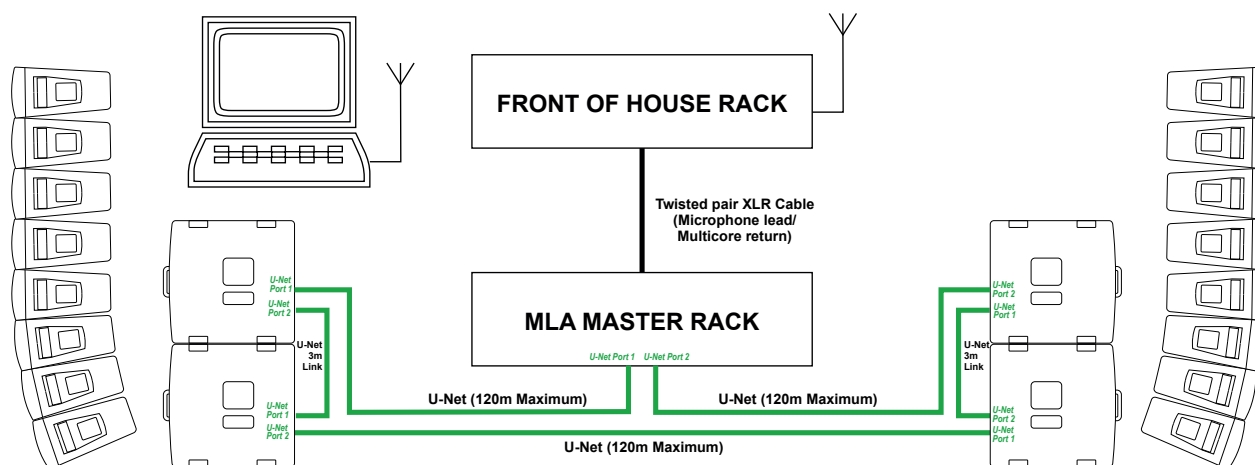
Option 9 PC Via Wi-Fi & MLA Master Rack



Option 9 uses the same U-Net topology as Option 8, but an MLA Master Rack replaces the Merlin. The rack's wireless router now replaces the Ethernet connection to the laptop, and the laptop may be used anywhere in the venue provided it is within wireless range. Note also now that as the breakout panel in the MLA Master rack is fitted with Lemo connectors instead of Etherconns, the RJ45-to-U-Net barrels are no longer required.

Option 10

Option 10 PC Via Wi-Fi using FoH and Merlin Rack



This shows the same U-Net topology again, but here the Wi-Fi antenna is in an FOH Rack at the mix position. Connection between the MLA Master Rack and the Front of House Rack is via a single twisted pair cable, which will typically be a spare channel of the audio multicore cable. This arrangement overcomes the problem of degraded wireless access when the venue is full.

Cabling, Connecting up

All larger MLA Mini physical configurations – i.e., those of more than 4 Minis plus one MSX sub per side - are built up from multiples of the basic 4 Minis plus one MSX combination. This applies to all physical rigging options, ground stacked, partially flown or fully flown. Thus all MLA Mini arrays must consist of 4, 8, 12 or 16 cabinets; no other quantities are possible. These array sizes will require 1, 2, 3 or 4 MSX subs respectively.

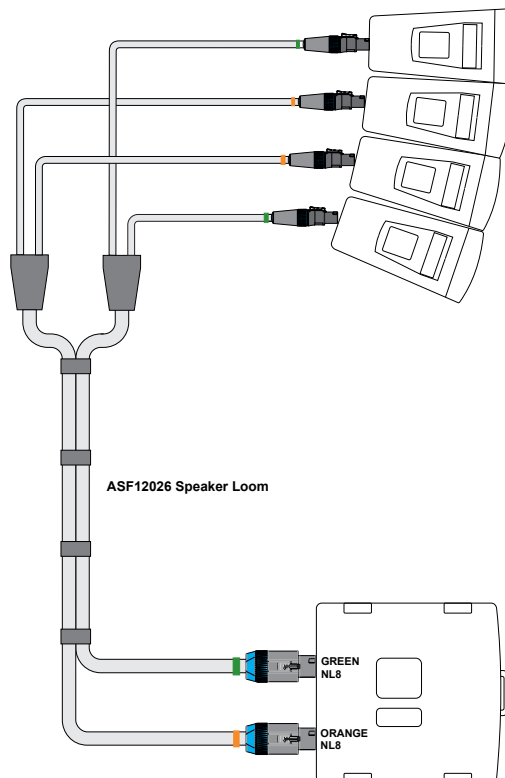
The simplicity of this “modular” approach means that cabling is limited to that required by a single 4 Mini plus one MSX sub combination; apart from the necessity for different cable lengths due to rigging requirements, only one wiring method is employed between the MSX power plant and the MLA Mini cabinets.

The MLA Mini system is intended for both fixed installations and touring; a rather different approach can be used for fixed installations as all system cabling will be in place for the long term. For touring use, advance knowledge of the venue and of the system configuration to be deployed is vital to ensure that cables of the right length are available on the day.

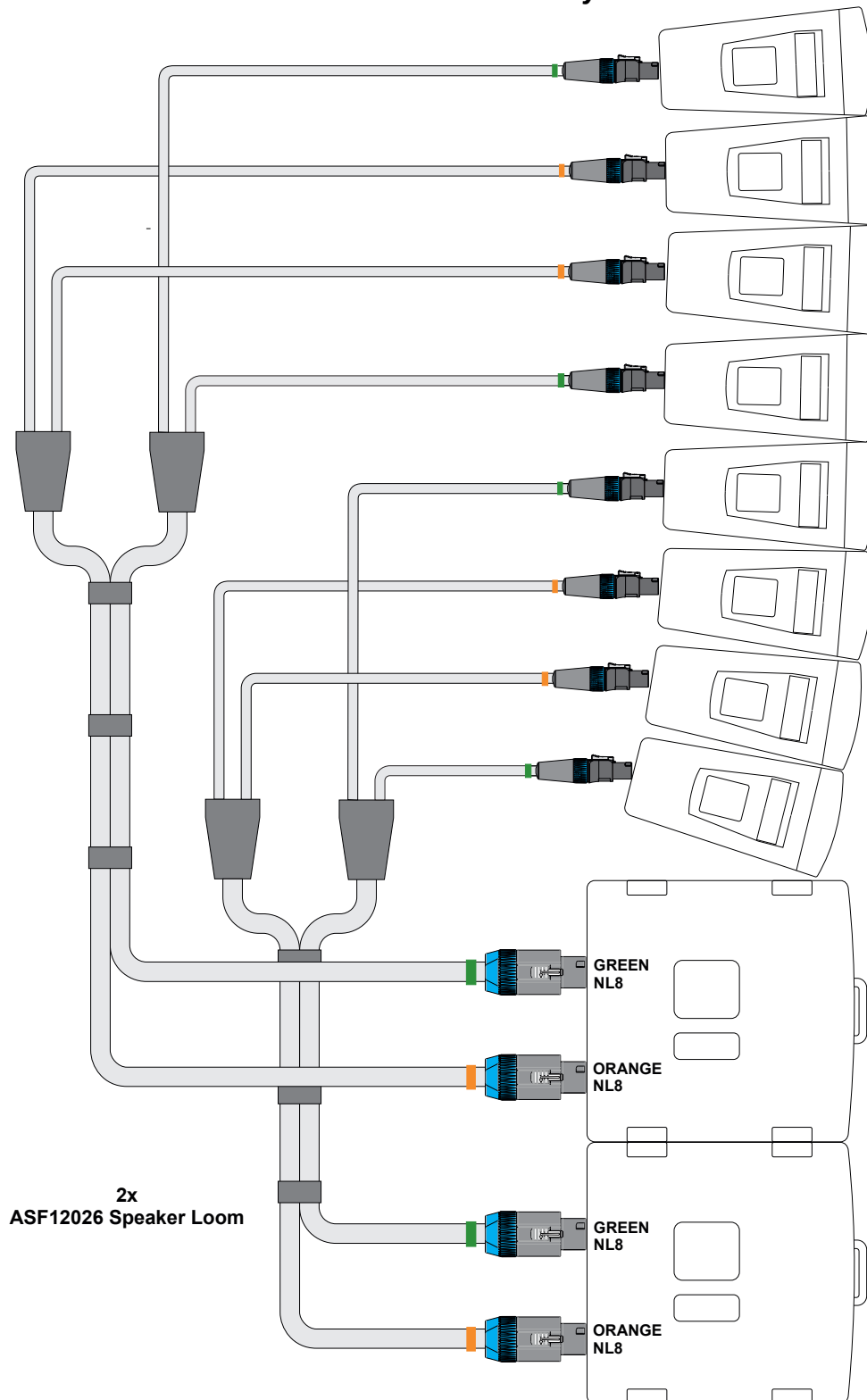
In fully-flown configurations, consideration must be given to longer cables for power, audio (analogue or digital) and the U-Net network, as all these are connected at the MSX sub, which will be at height. In partially-flown configurations (where the MLA Minis are flown but the MSX subs remain at stage level), different cable lengths are likely to be required for power, audio and U-Net, but speaker cables will inevitably be longer.

The diagrams below show some commonly used configurations, with the cabling that will be required.

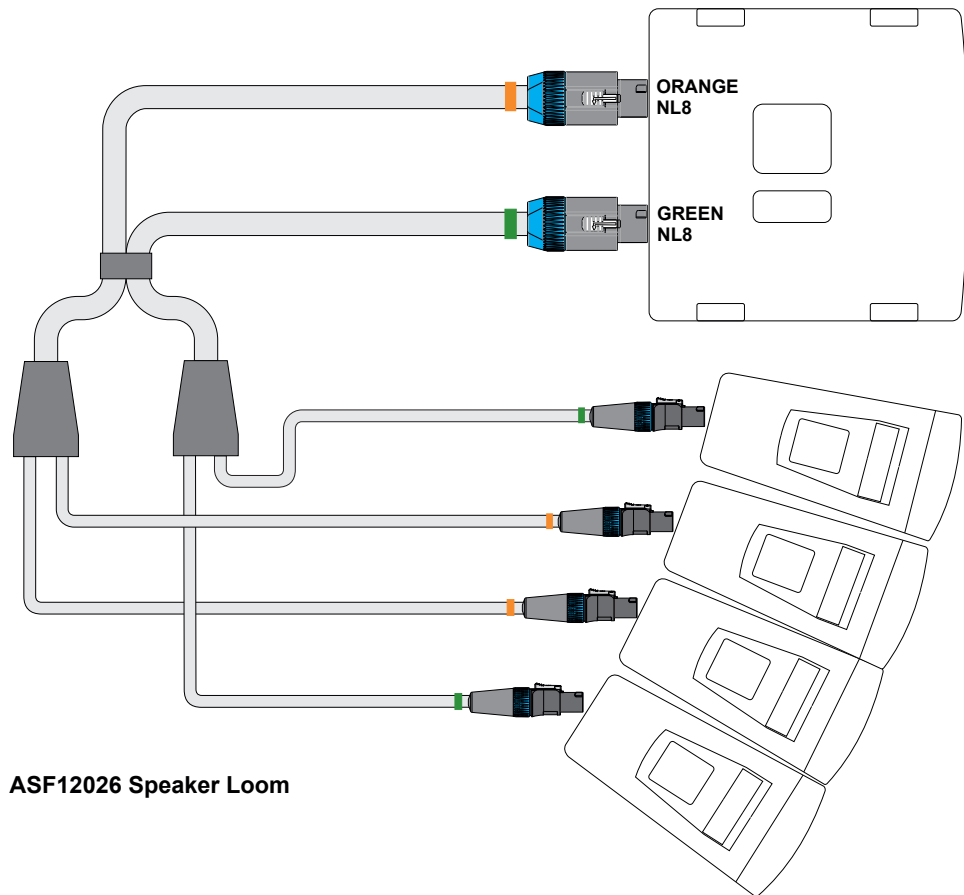
Option 1
Pole mount or Ground Stack systems



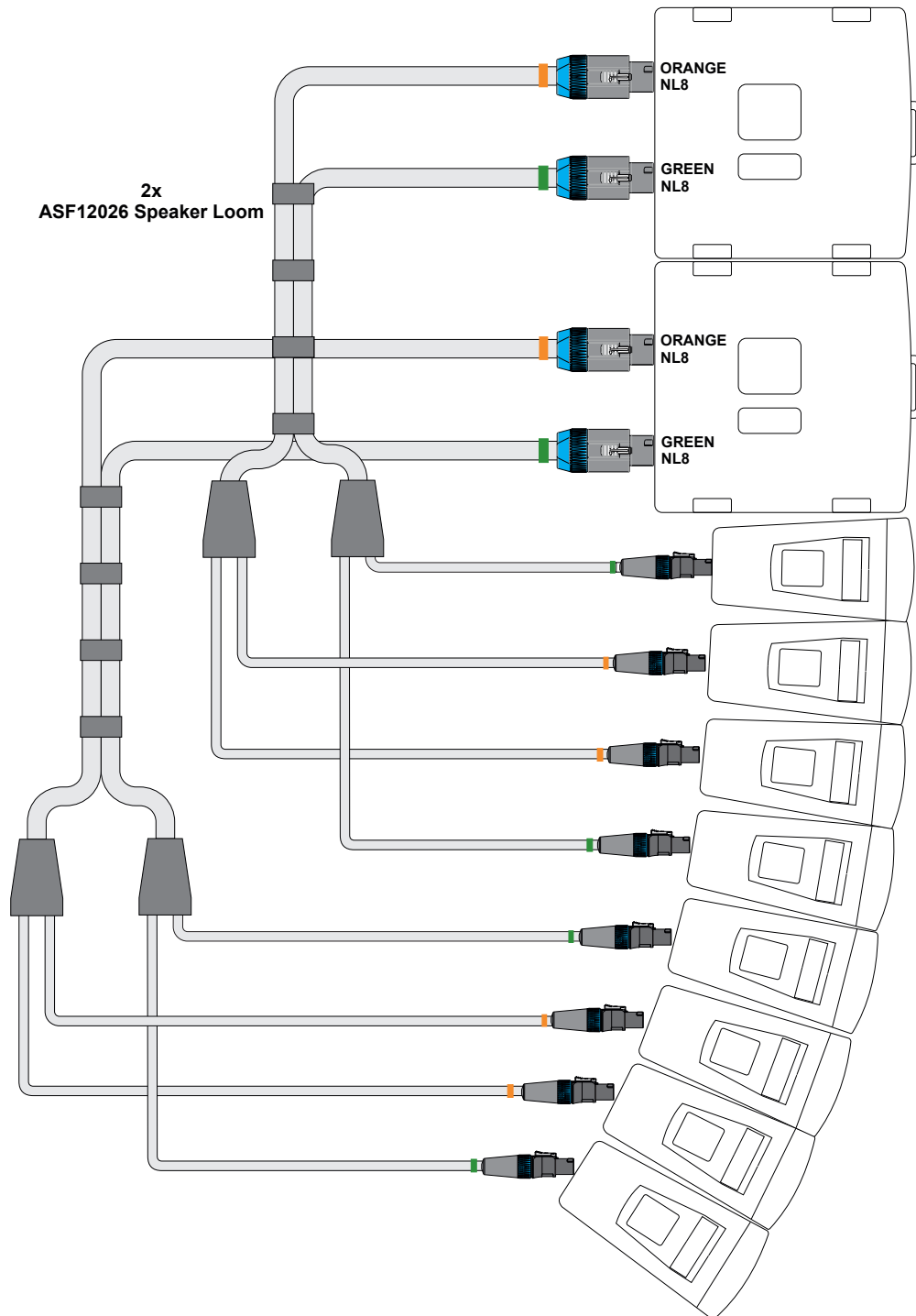
Option 2
8 Mini Ground Stack systems



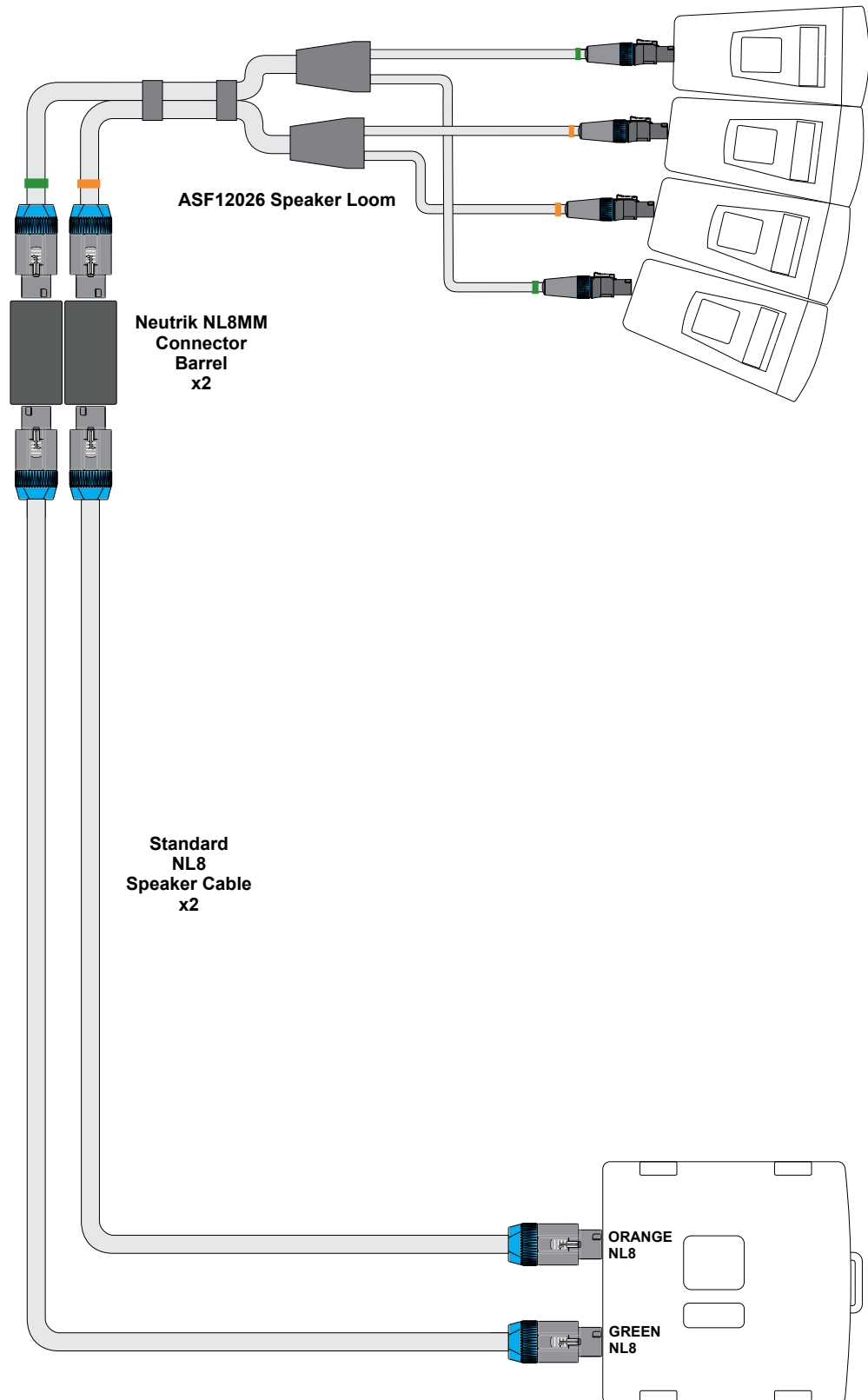
Option 3
MLA Mini Flown Below MSX



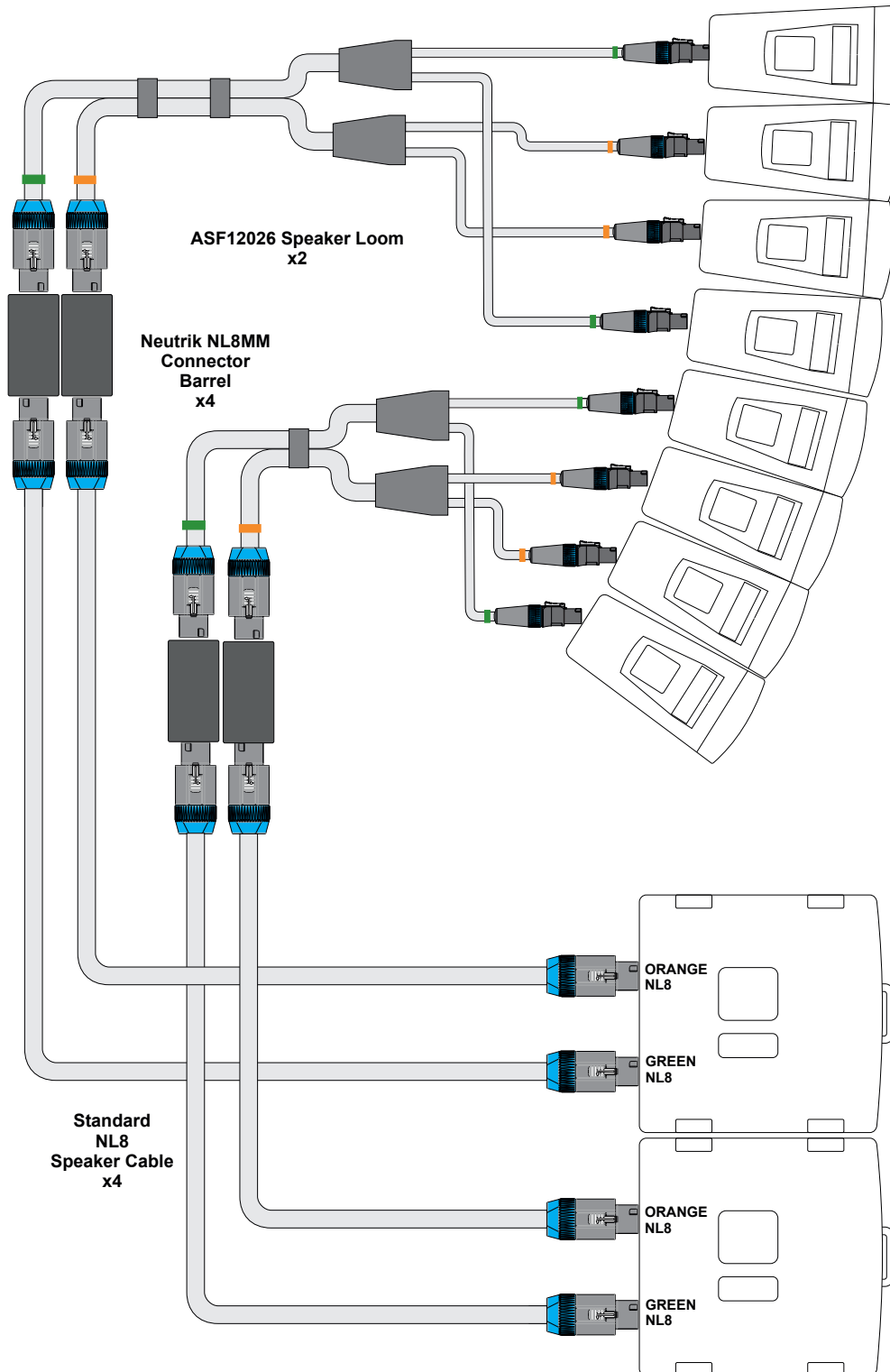
Option 4 8 x MLA Mini Flown Below MSX



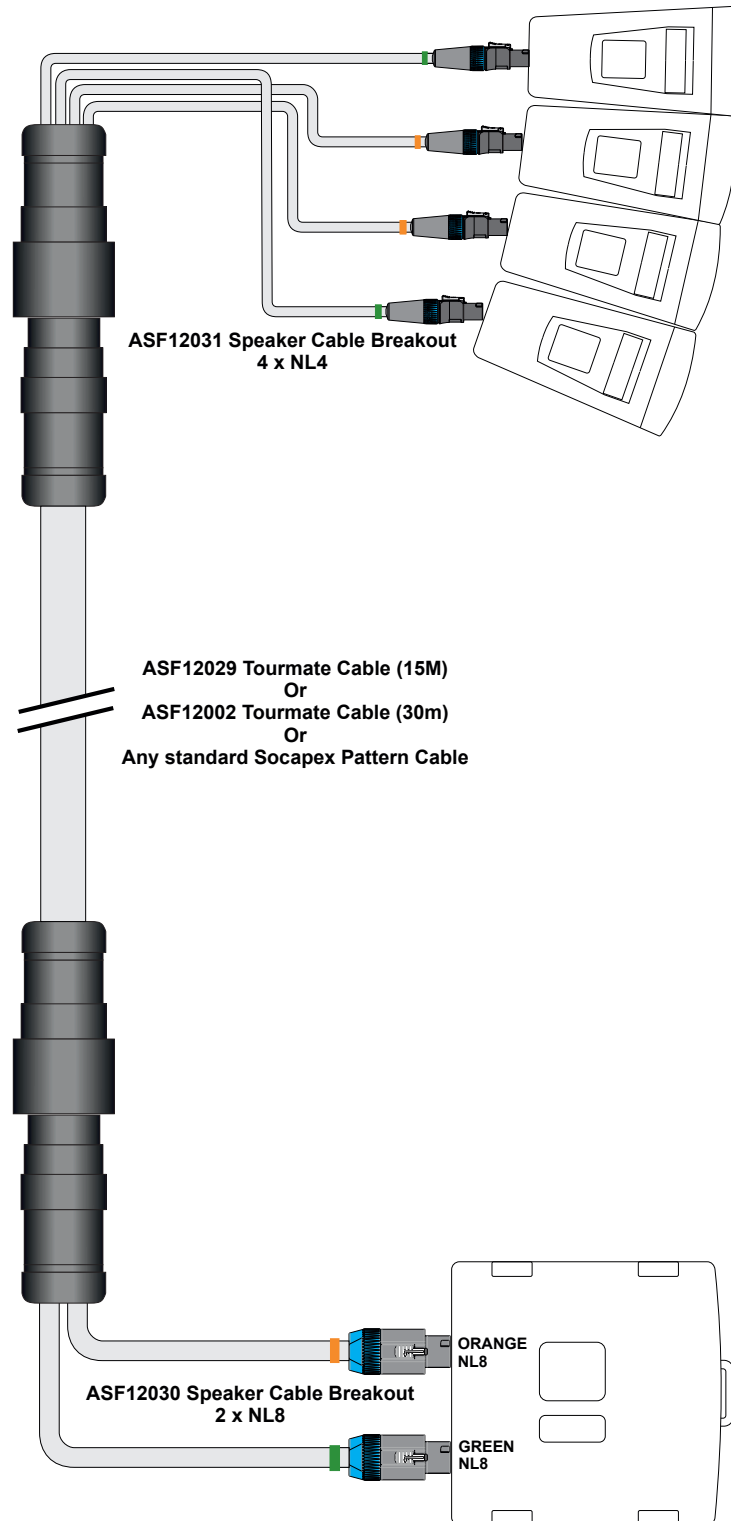
Option 5 *Flown MLA Mini, Ground Stack MSX*



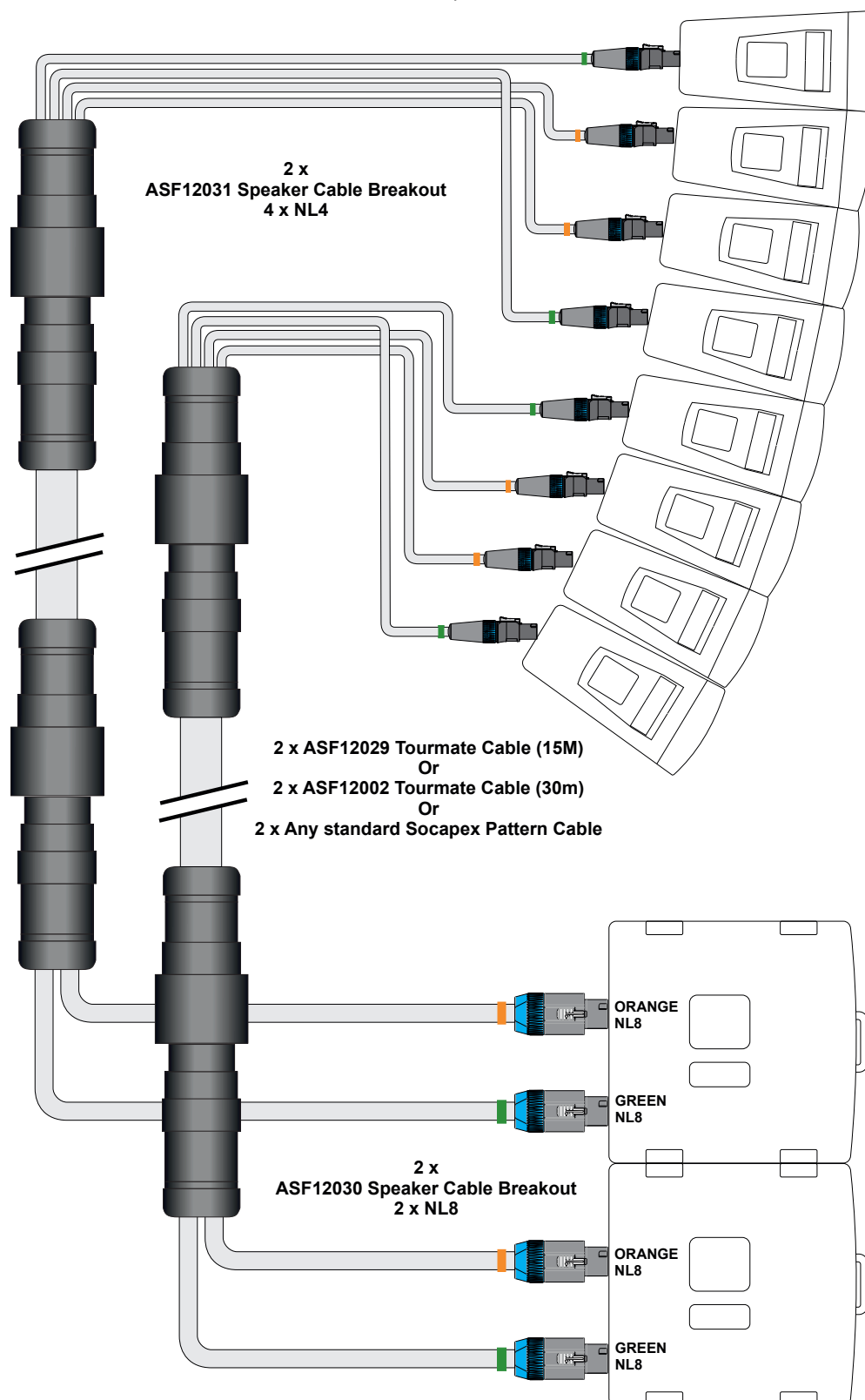
Option 6 8 x Flown MLA Mini, Ground Stack MSX



Option 7 Flown MLA Mini, Ground Stack MSX



Option 8 8 x Flown MLA Mini, Ground Stack MSX



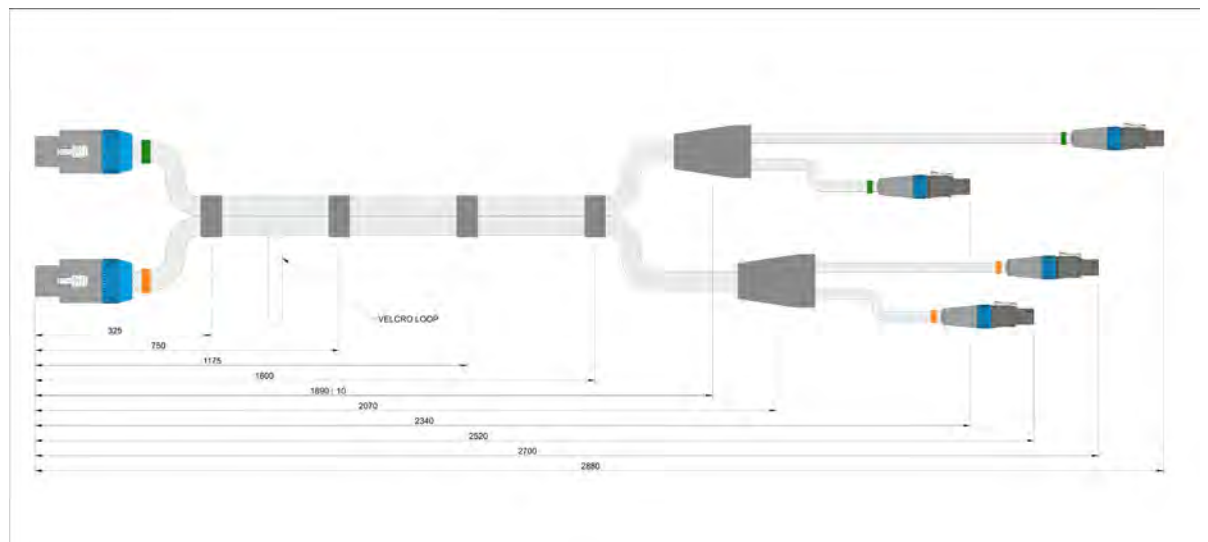
Standard cable looms

Martin Audio Part No. ASF12026

ASF12026 is a speaker cable loom designed to connect one MSX to four MLA Mini cabinets. It has two NL8 connectors at one end (the MSX) and four NL4 connectors at the other for the MLA Minis. The cables are colour coded orange and green to match the coding on the MSX outputs. The cable lengths at the MLA Mini ends are staggered to ensure that the connections are unambiguous and as neat as possible.

The overall length of the loom is adequate for use with a fully-flown '12+3' system (12 MLA cabinets plus 3 MSX subs). It uses two eight-core speaker cables, each core being 2.5 mm² (13 AWG). Each eight core cable is split to two four-core cables using IP44-rated splitter blocks. Each NL4 is fitted with a Neutrik water-resistant drip boot.

The loom is supplied with a length of transparent heat-shrinkable sleeve, which protects an ident label, and includes a Velcro tie to allow the loom to be neatly coiled for storage.



Martin Audio Part Nos. ASF12030 and ASF12031

In situations where the MLA Mini cabinets are flown but the MSX sub is ground stacked, a longer cable loom must be run from the ground (or stage level) up to the array. There are two ways to achieve this. The simpler method is to use the standard ASF12026 loom and extend it (at MSX end) using standard NL8 to NL8 cables; these will be a standard item in many rental companies' inventory.

Neutrik NL8MM in-line connector barrels can be used to extend the standard loom (see below).



The second, and possibly more elegant solution, is to use Tourmate adaptors (Martin Audio Part Nos. ASF12030 and ASF12031). These allow the use of a single 8-channel Tourmate cable between the adaptors. These use the very common Socapex pattern, and cables of various lengths are readily available. Martin Audio's Tourmate adaptors are rated to IP67 so are suitable for outdoor use.

Martin Audio Part No. ASF12030 is an adaptor with two NL8 connectors wired to a Tourmate 19-pin Female connector. This can be connected to the MSX sub. The connectors are colour coded orange and green as with the ASF12026 loom.

At the MLA Mini end, Martin Audio Part No. ASF12031 can be used: this adaptor is a Tourmate 19-pin male connector wired to four Neutrik NL4s. The connectors have staggered lengths and colour coding as per the ASF12026.

Tourmate or Socapex cables of any necessary length can be used between the pairs of adaptors. A further advantage of this approach is that the cable to a flown array now comprises a single cable, thus the loom remains discreet.

Alternatively, the adaptors can even be plugged directly together when using ground stacked or pole mounted configurations, thus requiring only one cable type to be carried.

Making Custom Cables

If you wish to make your own cables, the wiring configuration is as follows:

MLA Mini Wiring Connections Table					
Orange Connections			Green Connections		
NL8	NL4 (Long Tail)	NL4 (Short Tail)	NL8	NL4 (Long Tail)	NL4 (Short Tail)
1+		1+	1+		1+
1-		1-	1-		1-
2+		2+	2+		2+
2-		2-	2-		2-
3+	1+		3+	1+	
3-	1-		3-	1-	
4+	2+		4+	2+	
4-	2-		4-	2-	

We recommend cable of a minimum gauge of 2.5 mm² (13 AWG) is used for lengths up to 35 m, and 4 mm² (11 AWG) for lengths in excess of 35 m. However, the MLA Mini is a relatively low power system: 300W LF, 90W HF per cabinet, thus only a minimal effect on performance should be observed if a smaller gauge is used – e.g., 1.5mm² (15 AWG).

RIGGING

This section of the Advanced User Guide covers the mechanical aspects of assembling the various components of the MLA Mini system into the various possible rigging configurations. The components required for each are summarised in the table below. Note that the component count applies to a single system; for stereo, the quantities should be doubled.

	Component	Pole Mount	Universal Tilt Bracket	Fixed Tilt Bracket	Ground Stack Baseplate	Ground Stack Bar (long)	Transition Frame	Flying Frame
Preset	Configuration							
1&2	Pole Mount	1	1		1			
3	Pole Mount	1	1	1	1			
4	Ground stack				1	1		1
5*	Flown array (Flying Frame)/ Floor sub							1
	Flown array (Universal Tilt Bracket)/Floor sub		1					
6	Fully flown						1	1

*The configuration for Preset 5 can be flown either using the Flying Frame or the Universal Tilt Bracket inverted.

RIGGING OPTION 1: POLE MOUNT WITH UNIVERSAL OR FIXED TILT BRACKET



Shown using the Fixed Tilt Bracket

This option is limited to configurations of 4 Mini cabinets; the Pole Mount is not designed for larger arrays.



According to the type of Tilt Bracket employed, this rigging configuration is suitable for use with factory Presets 1, 2 or 3.

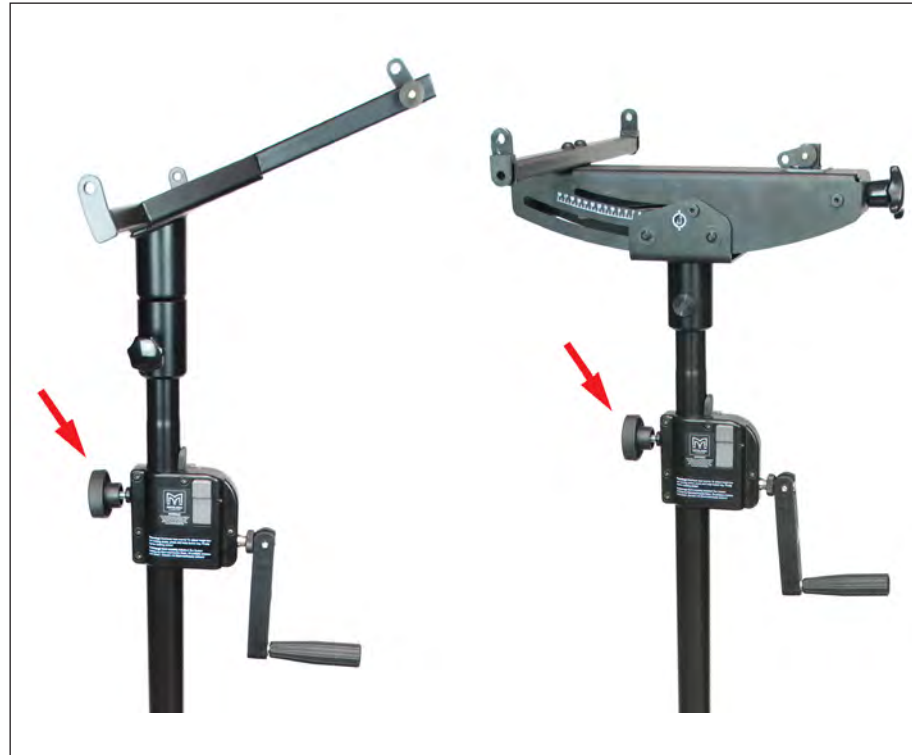
Step1: Start with the MSX sub face down on its wheelboard. Rotate the four dropdown brackets located in the base of the MSX so they are protruding outwards. Attach the Ground Stack Baseplate to the bottom of the MSX cabinet by mating these dropdown brackets with the holes in the baseplate box sections as shown. Use the front location as indicated on the baseplate membrane for this configuration (the rear location is only needed for larger configurations). With the MSX on its wheelboard and the front edge of the Baseplate on the floor, the dropdown brackets should align with the correct holes. Secure all four dropdown brackets with Flying Pins.




Step 2: Rotate the MSX and Ground Stack Baseplate through 90° so that the assembly is standing on the Baseplate. Remove the wheelboard. Take the Pole Mount and ensure that the pole is fully retracted. Screw the pole securely into the threaded plate on the top of the MSX.




Step 3: If using Preset 1, which calls for a bracket tilt angle of 14.5°, either the Universal Tilt Bracket or the Fixed Tilt Bracket may be used. If using Presets 2 or 3, or if rigging the system to a different angle calculated by Display 2.2, the Universal Tilt Bracket must be used. Attach the bracket to be used to the top of the telescopic pole and secure by tightening the boss onto the pole using the knob.



Step 4a (with Universal Tilt Bracket): Lift the first MLA Mini cabinet onto the Universal Tilt Bracket. The lugs on the ends of the main cross-arm should mate with the slots in the front corners of the cabinet. Secure these points with flying pins. Attach the rear lug of the bracket to the Ground Stack hole (marked with a ) in the cabinet's rear mounting plate. Secure with a Flying Pin. Using the rear adjustment knob, set the tilt angle to the correct angle (14.5° in the case of Preset 1, 17.5° for Preset 2 and 11° for Preset 3); the angle can be seen by observing the calibration hole at the right-hand side.



Step 4b (with Fixed Tilt Bracket): Lift the first MLA Mini cabinet onto the bracket. The lugs on the ends of the main cross-arm should mate with the slots in the front corners of the cabinet. Secure these points with Flying Pins. Attach the Tilt Bracket Swing Arm to the rear of the tilt bracket in the Ground Stack hole (marked with a ) and secure with the Flying Pin supplied. Ensure the swing arm is pointed upwards as shown.



Step 5: Lift the next cabinet on top of the previous one and secure both the front corners with further Flying Pins. At the rear, rotate the upper cabinet's mounting plate so that it engages with the slot in the lower cabinet's bracket, and set the angle between the first and second cabinets by fitting a Flying Pin in the appropriate hole on the lower bracket; this will be the one that sets the angle calculated by Display 2.2. (If using Preset 1 or 2, use the "6.5" hole; if using Preset 3, use the "10" hole.)





Step 6: Repeat Step 5 twice to add the two remaining MLA Mini cabinets, while referring to the angles which have been defined by Display 2.2, or if using Presets 1, 2 or 3, to the tables below. Note that the inter-cabinet angles for cabinets 2 to 3 and 3 to 4 will generally differ. Take care to set the correct angles.

Step 7: The connections to the 4 x Mini array (see page 28) are most conveniently made at this stage.

Step 8: Depress the safety catch to unlock the height adjustment, and turn the handle to raise the telescopic pole mount so that the vertical distance between the front lower edge of the bottom Mini and the level that the MSX is standing on is at the height defined by Display 2.2 (or the Preset if one is being used). Lock it in place by tightening the knob on the opposite side of the pole from the handle.

Summary of angles for Preset 1:

		Preset 1
Bracket tilt angle		14.5°
Inter-cabinet angles	Cabinets 1 & 2	6.5°
	Cabinets 2 & 3	6.5°
	Cabinets 3 & 4	0.5°

Summary of angles for Preset 2:

		Preset 2
Bracket tilt angle		17.5°
Inter-cabinet angles	Cabinets 1 & 2	6.5°
	Cabinets 2 & 3	6.5°
	Cabinets 3 & 4	0.5°

Summary of angles for Preset 3:

		Preset 3
Bracket tilt angle		11°
Inter-cabinet angles	Cabinets 1 & 2	10°
	Cabinets 2 & 3	0.5°
	Cabinets 3 & 4	0.5°

RIGGING OPTION 2: GROUND STACKED MLA MINI ARRAY ON MSX SUB(S)



The Ground Stack Baseplate is used in combination with the Flying Frame to build floor-standing MLA Mini configurations. Two options are permissible:

- a single MSX sub may be fitted to the Baseplate, with an array of four MLA Mini cabinets attached to the top using the Flying Frame, or,
- two MSX subs may be stacked vertically on the Baseplate, with eight MLA Mini cabinets attached to the top of the second (upper) one using the Flying Frame.



Note that a 4 Mini array is rigged in this way (with a single MSX sub) is suitable for use with Preset 4.

(Note that it is also possible to mount four or eight MLA Mini cabinets directly to the Baseplate and locate the sub(s) elsewhere; this configuration is described in Rigging Option 3.)

Step1: Start with an MSX sub face down on its wheelboard. Rotate the four dropdown brackets

in the base of the MSX so they are protruding outwards. Attach the Ground Stack Baseplate to the bottom of the MSX cabinet by mating these dropdown brackets with the holes in the baseplate box sections as shown. Refer to the diagram on the base plate membrane; note there are two mounting positions for the MSX. A rig of four Minis on a single MSX will always use the pair of slots nearer the front of the baseplate. A rig of eight Minis on two MSXs may use either of the two slot pairs, the correct position to use will be defined by Display 2.2. With the MSX on its wheelboard and the front edge of the Baseplate on the floor, the dropdowns should align with the correct holes. Secure all four dropdown brackets with Flying Pins.



Step 2: Rotate the MSX and Ground Stack Baseplate through 90° so that the assembly is standing on the Baseplate. Remove the wheelboard.

Step 2a (if a second MSX sub is being added): Rotate the MSX and Ground Stack Baseplate through 90° so that the assembly is standing on the Baseplate. Remove the wheelboard.

Step 3: Place the Flying Frame on top of the MSX sub (or the upper MSX sub if you are rigging an 8+2 configuration) as shown and secure the dropdown brackets using four Flying Pins.




Step 4: The angle between the Flying Frame and the bottom Mini will be defined by Display 2.2 and set physically by a Ground Stack Bar. If the required angle is in the range -4° to +4°, use the Short Ground Stack Bar, if the angle is outside this range, use the Long Ground Stack Bar. Fit the lower end of the bar into the Flying Frame at the correct mark and secure with a Flying Pin.

For the 4+1 configuration used by Preset 4 the angle between is 20°, so the Long Ground Stack Bar must be used in this case.



Step 5: Next, raise the two front lugs of the Flying Frame to their upright position, and secure. These will mate with the front slots of the first Mini. Fit the first MLA Mini cabinet onto the Flying Frame, locking the two front slots into place with Flying Pins. Note that the front of the Flying Frame should be flush with the lower front edge of the cabinet.



Step 6: Lift the rear of the cabinet and attach the top end of the Ground Stack bar to the rear bracket by matching the Ground Stack symbol  on the bar to the Ground Stack symbol on the bracket. Secure with a Flying Pin.



Step 7: Lift the next cabinet on top of the previous one and secure both the front corners with further Flying Pins. At the rear, rotate the upper cabinet's flip-down bracket so that it engages with the slot in the lower cabinet, and set the angle between the first and second cabinets to that defined by Display 2.2 by fitting a Flying Pin in the appropriate hole on the lower bracket. If you are rigging for use with Preset 4, set the angle to 10° by inserting the pin in the hole marked "10".



Step 8: Repeat Step 7 either twice (for a 4+1 rig) or six times (for an 8+2 rig) to add the remaining MLA Mini cabinets, while referring to the results obtained from Display Mini 2.1 to set the correct angles. Alternatively, refer to the table below if Preset 4 is to be used.

Step 9: The connections to the Mini array (see page 28) are most conveniently made at this stage.

Summary of angles (Preset 4):

		Preset 4
Bracket tilt angle		20°
Inter-cabinet angles between:	Cabinets 1 & 2	10°
	Cabinets 2 & 3	6.5°
	Cabinets 3 & 4	0.5°

RIGGING OPTION 3: GROUND STACKED MLA MINI ARRAY WITH SEPARATE MSX SUB(S)



An alternative method of rigging four- and eight-MLA Mini arrays is to mount them directly onto the Ground Stack Baseplate using the Flying Frame. In this situation, the MSX subs – either one or two per side depending on array size – will be positioned alongside the arrays. In the case of eight-cabinet arrays, the two MSX subs can either be stacked or positioned next to each other, but not with one on each side of the MLA Mini array.


The rigging procedure is very similar to that used for Rigging Option 2.

Step 1: Refer to the diagram on the Ground Stack Baseplate membrane; note there are two possible mounting positions for the Flying Frame. A rig of four Minis will always use the pair of slots nearer the front of the baseplate. A rig of eight Minis may use either of the two slot pairs, the correct position to use will be defined by Display 2.2. Attach the Flying Frame on the Ground Stack Baseplate as shown and secure with four Flying Pins.

Step 2: The angle between the Flying Frame and the bottom Mini will be defined by Display 2.2 and set physically by a Ground Stack Bar. If the required angle is in the range -4° to $+4^{\circ}$, use the Short Ground Stack Bar, if the angle is outside this range, use the Long Ground Stack Bar. Fit the lower end of the bar into the Flying Frame at the correct mark and secure with a Flying Pin.



Step 3: Next, raise the two front lugs of the Flying Frame to their upright position, and secure. These will mate with the front slots of the first Mini. Fit the first MLA Mini cabinet onto the Flying Frame, locking the two front slots into place with Flying Pins. Note that the front of the Flying Frame should be flush with the lower front edge of the cabinet.

Step 4: Lift the rear of the cabinet and attach the top end of the Ground Stack bar to the rear bracket by matching the Ground Stack symbol  on the bar to the Ground Stack symbol on the bracket. Secure with a Flying Pin.

Step 5: Lift the next cabinet on top of the previous one and secure both the front corners with further Flying Pins. At the rear, rotate the upper cabinet's flip-down bracket so that it engages with the slot in the lower cabinet, and set the angle between the first and second cabinets to that defined by Display Mini 2.1 by fitting a Flying Pin in the appropriate hole on the lower bracket.

Step 6: Repeat Step 5 either twice (for a four-cabinet array) or six times (for an eight-cabinet array) to add the remaining MLA Mini cabinets, while referring to the results obtained from Display Mini 2.1 to set the correct angles.

Step 7: The connections to the Mini array (see page 28) are most conveniently made at this stage.

RIGGING OPTION 4: FLOWN MINI ARRAY, WITH MSX SUB(S) ON FLOOR

Arrays comprised of four, eight, twelve or sixteen MLA Mini cabinets may be flown using the Flying Frame. This rigging option assumes that the MSX subs will be positioned on the stage, or platform or in some other suitable location. Cable lengths should be borne in mind from the outset with this option, as the standard length cables will not be long enough and either extension cables or custom length cables will be needed.

Note that it is also possible to fly a four-cabinet array using the Universal Tilt Bracket. See Rigging Option 4a below.

When the MSX sub is used in isolation there is no necessity to fit the Ground Stack Baseplate to it.



This rigging option is suitable for use with Preset 5 when using a 4+1 configuration.

The Flying Frame allows a Mini array to be suspended using either one or two chain hoists. The Flying Frame may be fitted with a clinometer to allow the tilt of the array to be set accurately. Rigging with a single hoist is quicker and simpler; however, the tilt angle achieved will not be as accurate as with two hoists.

The weight of the MLA Mini cabinet is such that even a 16-cabinet array with four MSX subs should not exceed the safe working limit of a normal hoist. Weights of the arrays and the Flying Frame are summarised below. **It is essential that the safe working load of any hoist(s) used should be checked in all situations before rigging commences.**

	Weight (kg)	Weight (lbs)
Flying Frame	17 kg	38 lbs
4-cabinet array	54 kg	121 lbs
8-cabinet array	108 kg	242 lbs
12-cabinet array	162 kg	363 lbs
16-cabinet array	216 kg	484 lbs

Note that the order of cabinets in a flown array is effectively reversed relative to their order in a Pole Mount or Ground Stack configuration. Thus the top cabinet in the array is assembled first.

Step 1: Start with the first four MLA Mini cabinets face down on their flightcase base. The cabinets should be locked together with Flying Pins at the front and rear, with the rear pins in the “0.5” position so that the four cabinets form a “flat” array. Attach the Flying Frame to the top cabinet, noting that the cabinet’s top lugs mate with slots in the base of the Flying Frame. Use two Flying Pins to secure the front corners. Note that there are two available mounting positions on the frame; ensure that the correct ones are used (according to the Display 2.2 Rigging data). With smaller arrays, the front of the top cabinet should be approximately flush with the front (at the bottom at this stage) of the Flying Frame. The second position would commonly be used with larger arrays requiring a significant up-tilt.



Step 2: Unlatch the rear dropdown bracket from the centre of the Flying Frame. Note that there are two of these; in this rigging option, use the lower one (that nearer the front of the array). This will mate with the upper section of the rear bracket of the first Mini. Secure with a Flying Pin.



Step 3: Attach the suspension cable(s) to the Flying Frame using shackles. If using a single-point suspension, the correct hole in the Flying Frame to which the shackle should be attached will be supplied in the data obtained from Display 2.2 software. If using two-point suspension, the shackles should be connected to the front-most and rear-most holes.

Use the hoist to start raising the array up off the flightcase base. As the array rises, insert Flying Pins in the rear brackets to define the inter-cabinet angles according to the data provided by Display 2.2. If using Preset 5, see the table below for the correct angles to use.



Step 4: If easy access is available to the array at its flown height, it is probably better to leave connecting the cabinets up (see page 28) until the array has been raised to height, as hanging cables may constitute a hazard. However, if it is easier to connect up at ground level, perform this step next. Note that the supplied NL8-to-NL4 cables will not be long enough for this configuration, and two standard NL8-to-NL8 cables of the appropriate length and NL8 couplers will need to be added for each 4-cabinet section of the MLA Mini array.

Step 5: (This step may be omitted if the flown array is now complete.) Wheel the next set of four MLA Mini cabinets on their flightcase base into position below the suspended array. Adjust the hoist and the flightcase base so that the lowest cabinet in the array is in a convenient position to be mated with the top cabinet in the next set of four cabinets. Attach the front of the two cabinets with Flying Pins.

Raise the hoist further to bring the next set of MLA Minis off the flightcase base. As they rise up, set the correct inter-cabinet angles (refer to the Display 2.2 data) at the rear fixing with Flying Pins as before.

If appropriate, make the electrical connections to the next set of four cabinets as in Step 4.

Repeat Step 5 either once more (for a 12-cabinet array) or twice more (for a 16-cabinet array).

Step 6: Continue raising the array on the hoist until the lower edge of the bottom MLA Mini cabinet is at the height defined by Display Mini 2.1. If the Flying Frame is fitted with a clinometer, the forward tilt angle can be checked with the clinometer display, and adjusted by differential adjustment of the two hoists. (If using Preset 5, this angle will be 7°.) If a single hoist attachment is being employed, the approximated angle will be determined by Flying Frame hole to which the hoist is attached, which is in turn determined by Display 2.2.

Summary of angles (Preset 5):

		Preset 5
Flying Frame tilt angle		7°
Inter-cabinet angles between:	Cabinets 1 & 2	0.5°
	Cabinets 2 & 3	4°
	Cabinets 3 & 4	10°

RIGGING OPTION 4A: FLOWN FOUR-MINI ARRAY USING UNIVERSAL TILT BRACKET, MSX SUB ON FLOOR

The Universal Tilt Bracket may be used inverted (relative to its use with the Pole Mount), with a standard Trigger Clamp attached to its 13 mm fixing hole instead of the boss that secures it to the Pole Mount. For a four-cabinet array, this is the simpler method, and is ideal if a scaf pole or truss is available. Note that 4 x Minis is the ONLY MLA configuration that may be flown using this method; all other configurations MUST employ the Flying Frame.



This rigging option is suitable for use with Preset 5 when using a 4+1 configuration.

Step 1: Remove the Pole Mount boss from the Universal Tilt Bracket (if one is attached). Attach a standard Trigger Clamp to the bracket's fixing hole with an M12 nut and bolt.



Start with the first four MLA Mini cabinets face down on their flightcase base. The cabinets should be locked together with Flying Pins at the front and rear, with the rear pins in the '0.5' position so that the four cabinets form a "flat" array. Attach the Universal Tilt Bracket to the top of the first Mini. The lugs on the ends of the main cross-arm should mate with the slots in the front corners of the cabinet. Secure these points with flying pins. Attach the rear lug of the bracket to the Ground Stack hole in the cabinet's rear mounting plate. Secure with a Flying Pin.



Using the rear adjustment knob, set the tilt angle to the angle defined by Display Mini 2.1. If you are intending to use Preset 5, this angle will be 7°. The angle can be seen by observing the calibration hole at the right-hand side.



Step 2: Lift the four-cabinet array and suspend it from the truss or scaffolding pole by the trigger clamp. How this is best achieved will depend on the venue and other circumstances on the day. The easiest solution, wherever possible, is to lower the scaffolding pole or truss section from which the array is to be flown to a sensible working height, attach the array and raise the pole/truss back up to the height specified by Display Mini 2.1. If this option is not available, a mechanical hoist (e.g., Genie or picker) or adequate manpower can be employed. Ensure that the T-clamp is tightened.



Step 3: If easy access is available to the array at its flown height, it is probably better to leave connecting the cabinets up (see page 28) until the array has been raised to height, as hanging cables may constitute a hazard. However, if it is easier to connect up at ground level, perform this step next. Note that the supplied NL8-to-NL4 cables will not be long enough for this configuration, and two standard NL8-to-NL8 cables of the appropriate length and NL8 couplers will need to be added.

Step 4: As the array is being raised, and as the cabinets reach a suitable height, set each of the inter-cabinet angles in turn. Refer to the data from Display Mini 2.1, or, if using Preset 5, refer to the table above.

Step 5: The correct height for the array will be defined by Display Mini 2.1. If using Preset 5, this height is 2.38 m (measured from the stage or other floor to the bottom of the lowest cabinet).

RIGGING OPTION 5: FULLY-FLOWN ARRAYS

MSX subs may be assembled with MLA Mini cabinets to form a full-range flying array. Three configurations are possible:

- four MLA Mini cabinets plus one MSX sub
- eight MLA cabinets plus two MSX subs
- twelve MLA Mini cabinets plus three MSX subs

The Flying Frame is used to support the full array. Fully-flown systems always have the sub(s) at the top of the array, with the MLA cabinets suspended underneath from a Transition Frame attached to the lowest sub.



Note that the 12+3 configuration is the maximum size of full-range array that may be flown. If a single flown array of 16 cabinets is required, the MSX cabinets must be positioned elsewhere, as described in Rigging Option 4.

As with arrays of MLA Minis alone, either a single hoist or two hoists may be used to fly arrays which include MSX sub(s). Weights of the arrays and the Flying Frame are summarised below. **It is essential that the safe working load of any hoist(s) used should be checked in all situations before rigging commences.**

	Weight (kg)	Weight (lbs)
Flying Frame	17 kg	38 lbs
4-cabinet array + 1 MSX sub	112 kg	251 lbs
8-cabinet array + 2 MSX subs	224 kg	502 lbs
12-cabinet array + 3 MSX subs	336 kg	753 lbs



Rigging Option 5 is suitable for use with Preset 6 when used to rig a 4+1 system.

Step 1: With an MSX sub on its wheelboard, begin by attaching the Flying Frame to the cabinet. Extend the four dropdown brackets and engage them into the four slots in the top of the sub. The front edge of the Flying Frame should be aligned with the front face of the MSX. Secure the dropdown brackets in place with four Flying Pins.



Step 2: Attach the suspension cable(s) to the Flying Frame using shackles.

If using single-point suspension, attach the chain hoist to the H13 suspension hole of the Flying Frame and raise the MSX upwards. With two-point suspension, attach the hoists to the front and rear suspension points. Raise the hoist(s); remove the wheelboard when it is clear of the ground.



Step 3: If you are rigging a 4+1 array, proceed to Step 4. If you are rigging an 8+2 array, wheel the second MSX sub into position so that its top face is aligned with the bottom face of the first sub. Extend the dropdown brackets from the bottom of the first sub and engage them with the four slots in the top of the second. Secure the dropdown brackets with Flying Pins. Raise the hoists further to clear the wheelboard.

If you are rigging a 12+3 array, perform Step 3 once again, to attach the third MSX sub.

Step 4: Assemble the first array of four MLA Mini cabinets face down on their flightcase base. Attach the Transition Frame to the upper MLA Mini cabinet with Flying Pins. The frame connects at three points: two are the cabinet's front location points, which engage with slots in the frame; the other is at the rear, where the swinging arm can mate with the upper section of the cabinet rear bracket in three positions to produce an angle between the Transition frame and the Mini of 0°, 2.5° or 5°. Set the angle defined by Display Mini 2.1. If you are rigging a 4+1 array for use with Preset 6, it should be set at 0°



Step 5: Position the Transition Frame below the lowest of the suspended MSX subs. Attach the Transition Frame to the two dropdown brackets on the bottom rear of the MSX cabinet. Secure with two Flying Pins.



Step 6: Gradually raise the chain hoist; this will swing the four Minis up and free of the flightcase base. As the array ascends, set the inter-cabinet angles of the Minis according to the data derived from Display Mini 2.1. If you are rigging a 4+1 system for use with Preset 6, refer to table below for the correct angles. When setting angles, remember that when flown, Cabinet 1 is at the top, nearest to the lowest MSX sub. Steady the assembly as it is raised. When the array is completely free, push it forwards so that the front location points of the Transition Frame are able to engage with the front dropdowns of the MSX. Secure these points with two more Flying Pins.



Step 7: The connections between the MSX(s) and the first set of four Minis (see page 28) are most conveniently made at this stage. In this case, the supplied cable can be used as the MSX is adjacent to the Minis. AC mains, the analogue audio input and any network in use should also be connected at this time. With larger arrays, it is also advisable to plug the cables for all the MLA Minis into the correct connectors on their respective MSX subs, leaving the other ends to temporarily hang loose.

Step 8: (This step may be omitted if the flown array is now complete.) Wheel the next set of four MLA Mini cabinets on their flightcase base into position below the suspended array. Adjust the hoist and the flightcase base so that the lowest cabinet in the array is in a convenient position to be mated with the top cabinet in the next set of four cabinets. Attach the front of the two cabinets with Flying Pins.

Raise the hoist further to bring the next set of MLA Minis off the flightcase base. As they rise up, set the correct inter-cabinet angles (refer to the Display 2.2 data) at the rear fixing with Flying Pins as before.

Now make the electrical connections to the next set of four cabinets, using the loose cables connected in Step 7.

Repeat Step 8 once more for a 12+3 array.

Step 9: Continue raising the array on the hoist until the lower edge of the bottom MLA Mini cabinet is at the height defined by Display Mini 2.1. If the Flying Frame tilt angle is fitted with a clinometer, the tilt can be checked with the clinometer display. If a single hoist attachment is being employed, the suspension employed will ensure that the array's centre of gravity will set the tilt at the correct angle. If using two hoists, adjust the rear relative to the front to set the back-to-front tilt to the angle defined by Display Mini 2.1. (If using Preset 6, this angle will be 7.5°).

Summary of angles (Preset 6):

		Preset 6
Flying Frame tilt angle		7.5°
Transition Frame angle		0°
Inter-cabinet angles between:	Cabinets 1 & 2	0.5°
	Cabinets 2 & 3	4°
	Cabinets 3 & 4	10°

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WARRANTY

Martin Audio Loudspeaker Systems are warranted against manufacturing defects in materials or craftsmanship over a period of 5 years from the date of original purchase.

During the warranty period Martin Audio will, at its discretion, either repair or replace products which prove to be defective provided that the product is returned in its original packaging, shipping prepaid, to an authorised Martin Audio service agent or distributor.

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E&OE

DISPLAY 2.2.0 FOR MLA MINI



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INTRODUCTION

Display 2.2 is the application that is used in conjunction with Vu-Net and a Martin Audio Multicellular System, either MLA, MLA Compact, MLA Mini or a combination of any of these systems to generate the inter-cabinet angles and the DSP optimisation parameters which can then be quickly and easily uploaded to the hardware over the U-Net system network or in the case of MLA Mini directly using a USB connection. It also shows accurate analysis of the system response in the venue.

The application has an entirely straightforward, logical workflow; in fact it does not allow jumping to advance stages of the design, it is necessary to complete each stage in a logical order.

Display 2.2 uses numerical optimisation to arrive at the resulting cabinet angles and DSP coefficients. Taking the cabinet angles as an example, to explain the process in slightly crude manner this means that it tries a great many combinations of possible angles, checks the result using the computer model of the array response and compares it to the desired response. It continues to check through a huge number of possible combinations until it arrives at the closest match to what has been asked of it. In the case of the cabinet angles, it has the facility to “polish” the array which means it does a second pass having arrived at a set of angles to fine tune the array angles. This process although highly complex, actually only takes a few minutes, certainly no longer than a conventional line-array prediction application. Having specified the cabinet angles the array can be rigged and whilst that is being done the second stage of the optimisation process is done. This also uses numerical optimisation but this time addresses the EQ, FIR, gain and phase parameters available in the DSP, going through the hundreds of thousands of possible combinations possible until the output is as close as possible to the desired response. With a large array and complex venue this could take up to ten minutes to complete however this will be far quicker than the time it takes to rig all arrays so in no way slows down the show build-up. To actually try every possible combination of DSP would take months even on the most powerful computer- there are millions of possible combinations and that is where the unique digital algorithm comes into play, examining batches of results to see if certain parameter changes are taking you closer or further from your desired performance characteristics. It will reject a series of parameter changes that are heading towards a “dead end” and instead will focus on those which get you closer to the desired result, gradually honing all parameters until it reaches a result which is as close as possible to the specifications that the technician has requested. This method allows phenomenal accuracy in a highly realistic and practical length of time. The accuracy of the resulting design hinges on the computer model which predicts how the array will perform for a given set of cabinet angles and DSP coefficients. The computer model devised for Display 2.2 is one of the most sophisticated and accurate ever devised for an audio system and is capable of achieving results to closer than 1dB of actual measured parameters.

A Display design can easily be done prior to arriving at the venue in the comfort of your office. If you have drawings of the space and details of the flying position and the trim height of the arrays you can complete the rigging and DSP design which makes set-up on site extremely quick and efficient. It is possible to try several different DSP optimisations with priority given to a variety of performance characteristics. These can be uploaded to the array and stored in snapshots to be recalled in a few seconds.

INSTALLATION

MLA and MLA Compact touring system owners will have a Tablet PC as part of their system package which will be pre-loaded with all necessary software including the latest version of Vu-Net. For owners of Installed systems, MLA Mini or trained M-Techs, Display 2.2 can be downloaded from the Martin Audio ftp website, please contact your local distributor or Martin Audio Technical Support for more details

SYSTEM REQUIREMENTS

Display2.2 requires a Windows PC running either Windows Vista, Windows 7, Windows 8 or

Windows 10; no other operating systems are supported. We would recommend a 64 bit i7 processor running at 2.6GHz minimum with a minimum of 8GB of RAM. File sizes are not particularly huge so a high-capacity Hard Drive is not necessary but an SSD drive will be faster and more reliable. The mathematical calculations involved in creating optimisations use an application called MatLab Components and when running this uses a great deal of computational power so it is best not to scrimp on CPU power and speed when specifying a PC to run the application.

Users have reported that Display2.2 works perfectly well on an Apple Mac using Bootcamp or under a virtual platform such as VM Ware Fusion or Parallels, (these options still require a copy of Windows Vista, 7, 8 or 10 to be installed) however this is not supported by Martin Audio.

LATEST VERSION

From version 2.2 onwards there is greater interaction with Vu-Net v2.0 so it is important to use that version or later to get the best performance from one of our multicellular systems. It is perfectly ok to use older versions of Display2 with Vu-Net v2.0, or optimisations created in Display 2.2 with Vu-Net v1.2.5, there is complete cross compatibility but the best results will definitely be obtained using the latest versions of both applications.

One particular step forward is a lowering of the frequencies at which the optimisation is effective. This is always difficult as part of the optimisation process involves attempting to contain the audio distribution within areas you have specified which is very difficult to do with lower frequencies as they become more omnidirectional the lower the frequency. The Martin Audio R&D team have however continued to research methods to extend the low frequency control and we learnt a great deal developing the MLA Mini system which has always had LF included in the optimisation. Version 2.2 now optimises lower frequencies using FIR filtering but without increasing latency which is a remarkable achievement. Note that your multicellular system MUST be running the latest firmware for the optimisations to be effective at low frequencies. MLA and MLA Compact must be running 2.2.57 and 2.12.44 respectively. These were released in 2015 so all system should be running them as a matter of course.

Note that if opening .mat files created in Display version prior to version 2.2, the low frequency optimisation will not be used. If you wish to re-optimize older projects, the best option is to import the venue shell and then add the array manually to create a new project with all the latest benefits.

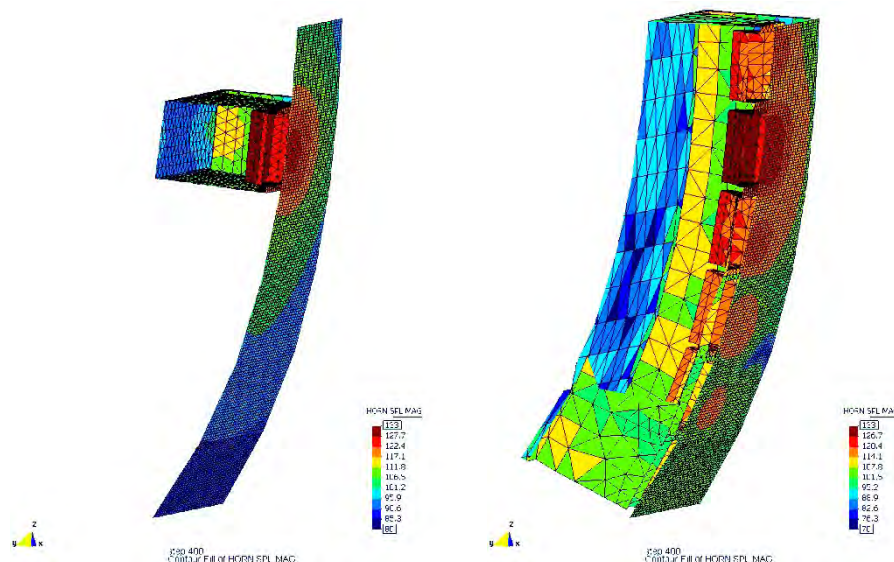
NUMERICAL OPTIMISATION

At this point it is worth taking a moment to explain in detail one of the concepts behind how Display operates; Numerical Optimisation is an easily misunderstood concept, a few people make the incorrect assumption that it is some sort of “averaging” system meaning that the result is a compromise which couldn’t be further from the truth.

What made multicellular systems possible was the development of a phenomenally accurate computer model of the system which works hand in hand with the precision acoustic design of the cabinets. There are a colossal number of factors that affect an array performance; the performance of individual drivers, the horn design, the angle between enclosures, the number of enclosures et cetera. Martin Audio have taken the analysis of array performance to the most advanced level ever attempted, including boundary effect modelling which includes the effect that all other cabinets in an array have on a single driver; essentially each individual cabinet has a baffle extending above and below it formed by the other enclosures in the array. For cabinets in the middle of the array this is fairly symmetrical but for cabinets towards the top and bottom it becomes more and more asymmetrical which has a highly significant effect on the individual module performance and therefore the overall array performance.

The diagrams below show the response of a single array element which is the second box down in a six box array. The first picture ignores the effect of its neighbouring enclosures. The second picture shows the dramatic effect that the enclosure above and the four below have on the response. Ignoring this effect will clearly compromise the ability to accurately predict how the array will perform, in fact measurements show that ignoring the boundary effect can result in

inaccuracies of up to 8dB which fairly obviously would make the system unusable.



Martin Audio have perfected the computer model for our Multicellular systems to such a degree that the predicted performance can reach accuracy of as close as 1dB of measured results which has made the whole system not only possible but extremely accurate.

Numerical optimisation uses the computer model to check the performance for a given mechanical orientation or DSP configuration, and compares the result on the venue slice to what you have asked the system to achieve. It will then try an alternative option to see if it is getting closer or further from the desired result. If it is further from what you want it to achieve it will ignore that configuration and pursue the more successful angles or EQ curves, trying configuration after configuration before it has attempted close to every possible combination and has got as close as possible to the desired result.

If you consider the first optimisation which calculates the splay angles, for an MLA system there are eight possible angles available between each cabinet; 0.5, 1, 2, 3, 4, 5, 6 and 7.5°. If you have a reasonable size array of say 16 enclosures that means a total of $8 \times 8 \times 8 \times \dots \times 8$, (fifteen 8's!) or 35,184,372,088,832 possible combinations of angles between all cabinets. Clearly analysing each of these combinations involves a substantial amount of processing but pales into insignificance compared to the hundreds of thousands of calculations required when running numerical optimisation for the DSP; every band of EQ frequency, bandwidth and gain, phase and FIR filters for every one of the cells of every cabinet. This is why a powerful PC is required and the EQ optimisation can take up to fifteen minutes or so for a large array in a complex arena. Even the most powerful PC available today couldn't try every possible combination in a reasonable time scale so complex algorithms are used so that when a certain sequence of filter parameters are consistently demonstrating results further from the goals that have been set, the system will abandon those avenues and try others. With this system highly accurate parameters can be produced that are as close as possible to the desired goals in a reasonable time frame. This is a very basic explanation, in fact it is Martin Audio's development of the revolutionary but phenomenally complex digital algorithm that the application uses to refine the optimisation which give the best possible results in a reasonable time frame. Not only that but key parts of the optimisation process are multithreaded which means that the system is able to exploit the latest 64-bit, quad core processors to speed up the entire process.

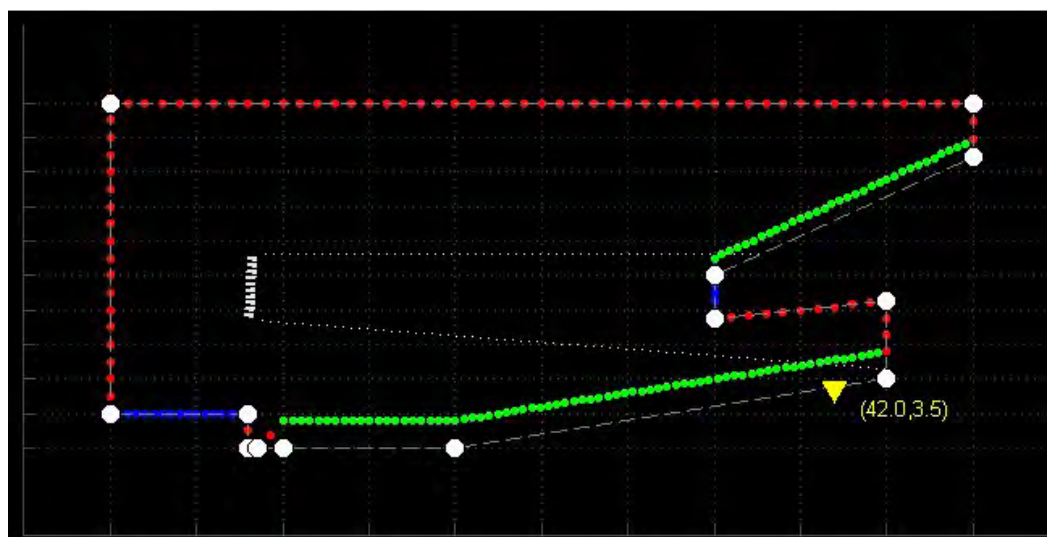
Whilst this system is processor hungry clearly it is a very realistic and practical method to obtain the best possible results from an array where so many variables are at your disposal. Trying to

manually adjust several thousand DSP parameters is obviously not going to be realistic however good a system technician believes his ears might be.

INDEX PLOTS

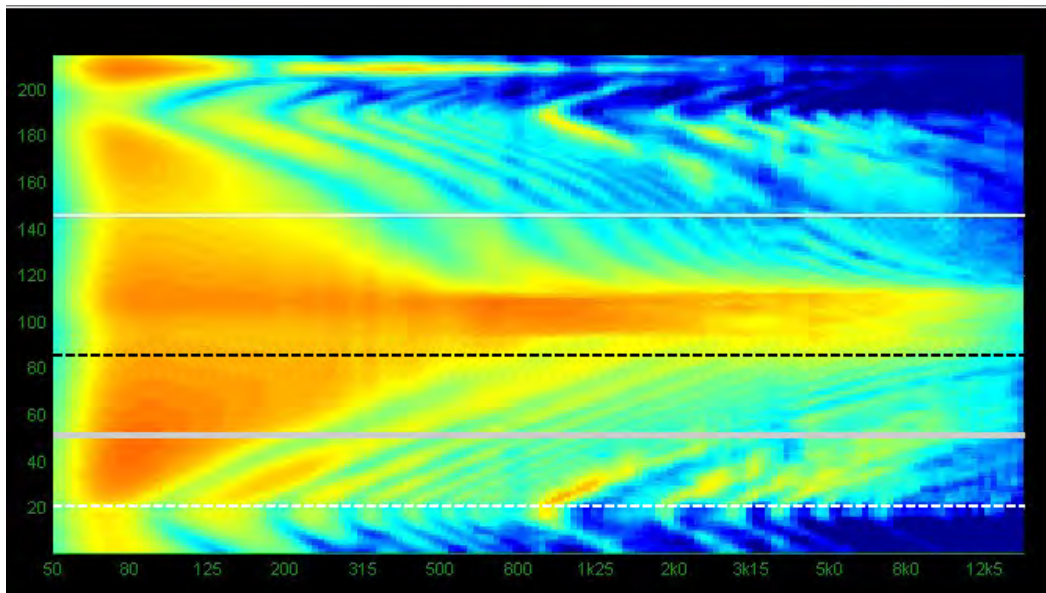
The other concept which Martin Audio developed as part of the MLA system is the index plot. We needed a method to display the results of the system optimisation that was clear and easy to interpret. Because the whole basis of the system is that the radiated signal is coherent where it arrives at all parts of the audience as opposed to when it leaves the array we needed a method of displaying the frequency response at dozens of positions simultaneously. There are a few methods in existence for achieving this, 3D graphs for example but they don't really meet the brief of being quick and easy to interpret. The Index plot solves this problem.

As we will see when we look at the application in more detail, we draw a two dimensional slice of the venue in which we are deploying our array. It then gets presented in Display like so:

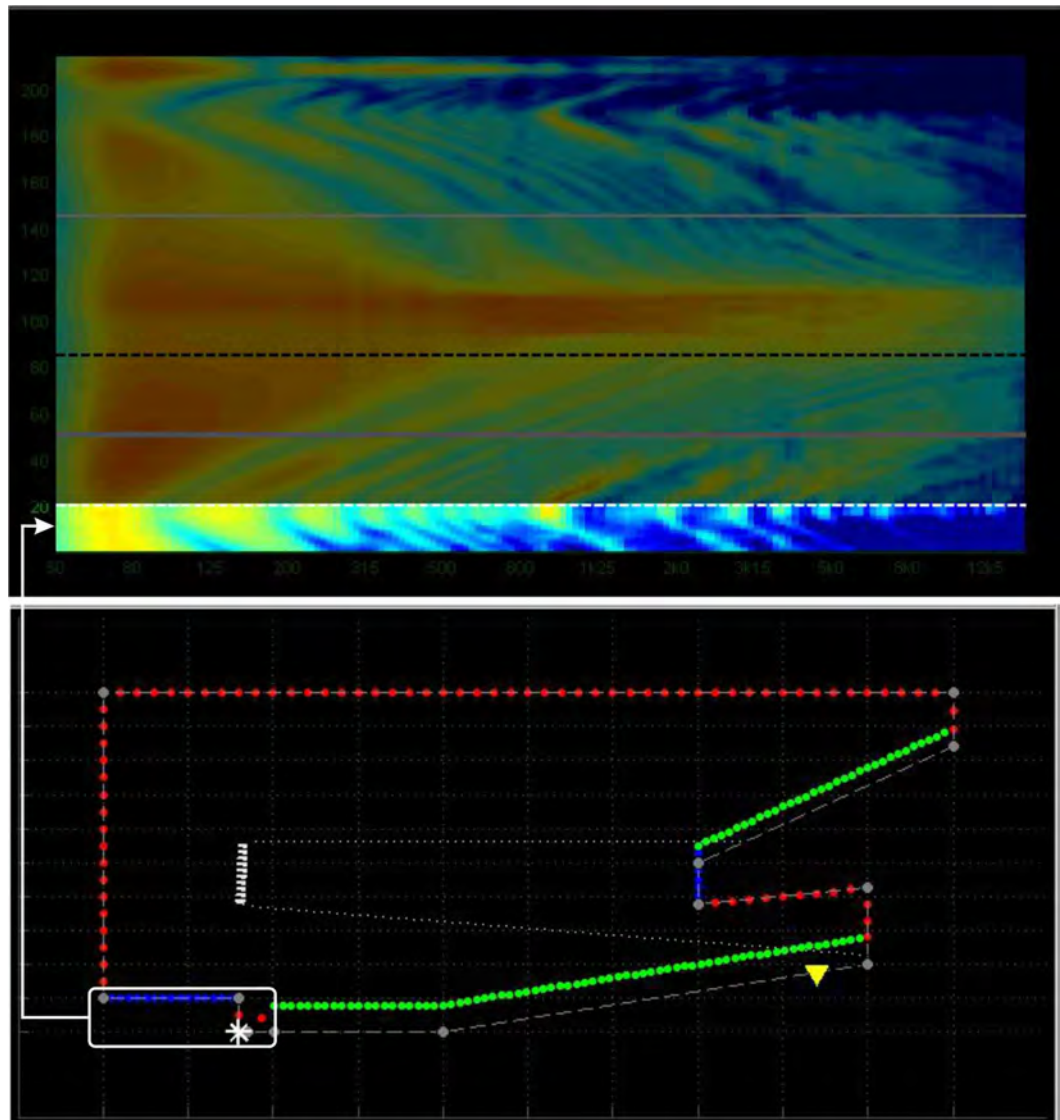


The colours represent the three types of plane; the audience area are green, non-audience, areas around the venue which we are not concerned about are red, and finally areas where we would like the system to actively steer sound away from known as hard avoid are blue. By default the hard avoid is the stage but this could also be reflective back walls or balcony fronts, or noise sensitive areas beyond an arena at an outdoor event. The planes are represented by a series of dots. These are spaced closer together in the audience region where we need the most detail. Ideally we would like to be able to view the frequency response at each of these dots so each becomes a sort of virtual measurement mic.

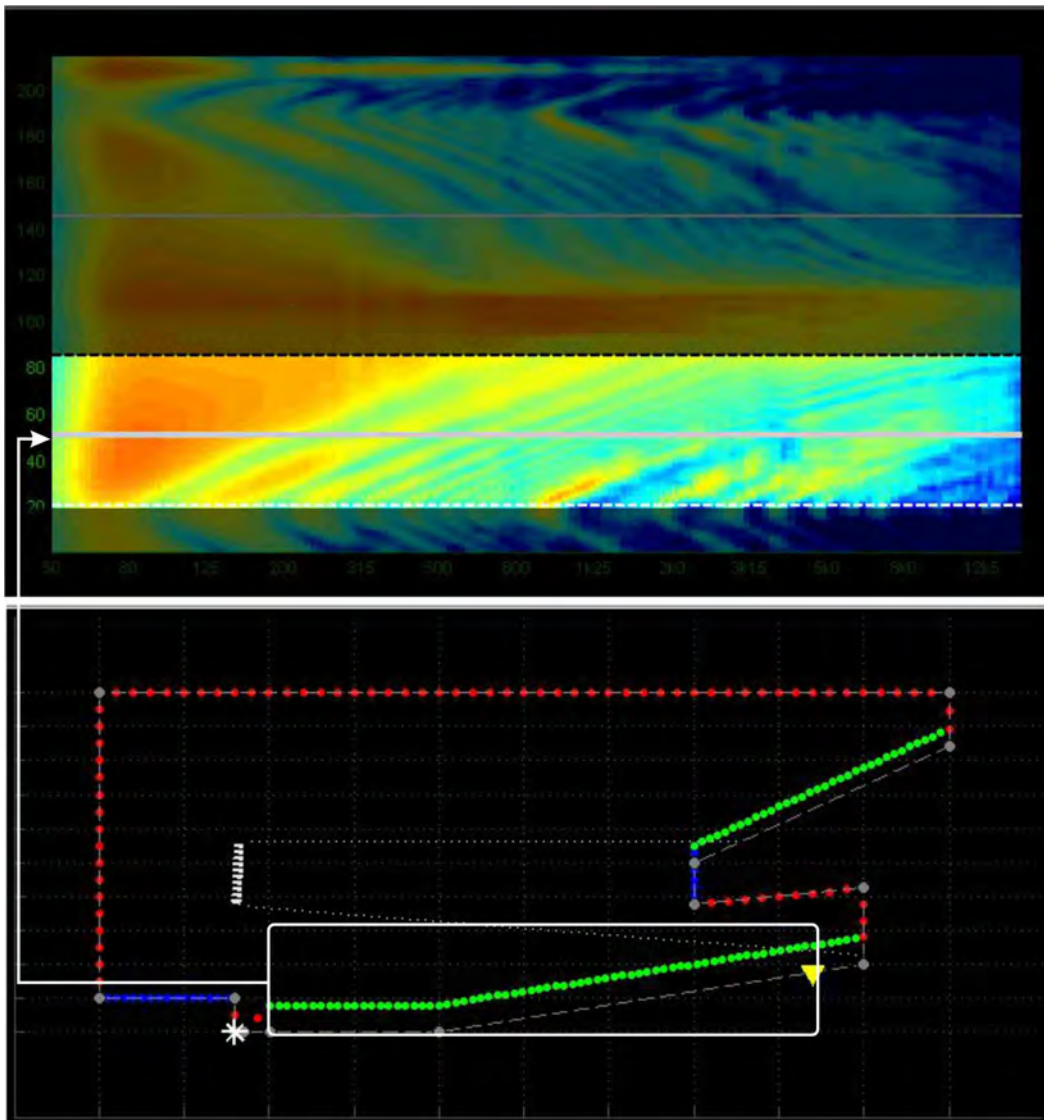
The normal way to present a graph of frequency response is of course for the horizontal 'x' axis to be frequency, usually from 20Hz to 20KHz, and for the vertical 'y' axis to display magnitude, usually in dB. If however we display magnitude with colours we can easily show many response plots simultaneously. If we make red the highest magnitude- the loudest- and blue the quietest, by running through the colours in the spectrum we can very easily identify the peaks and troughs in a response. This frees up the vertical axis which we can use for all of our "virtual mics":



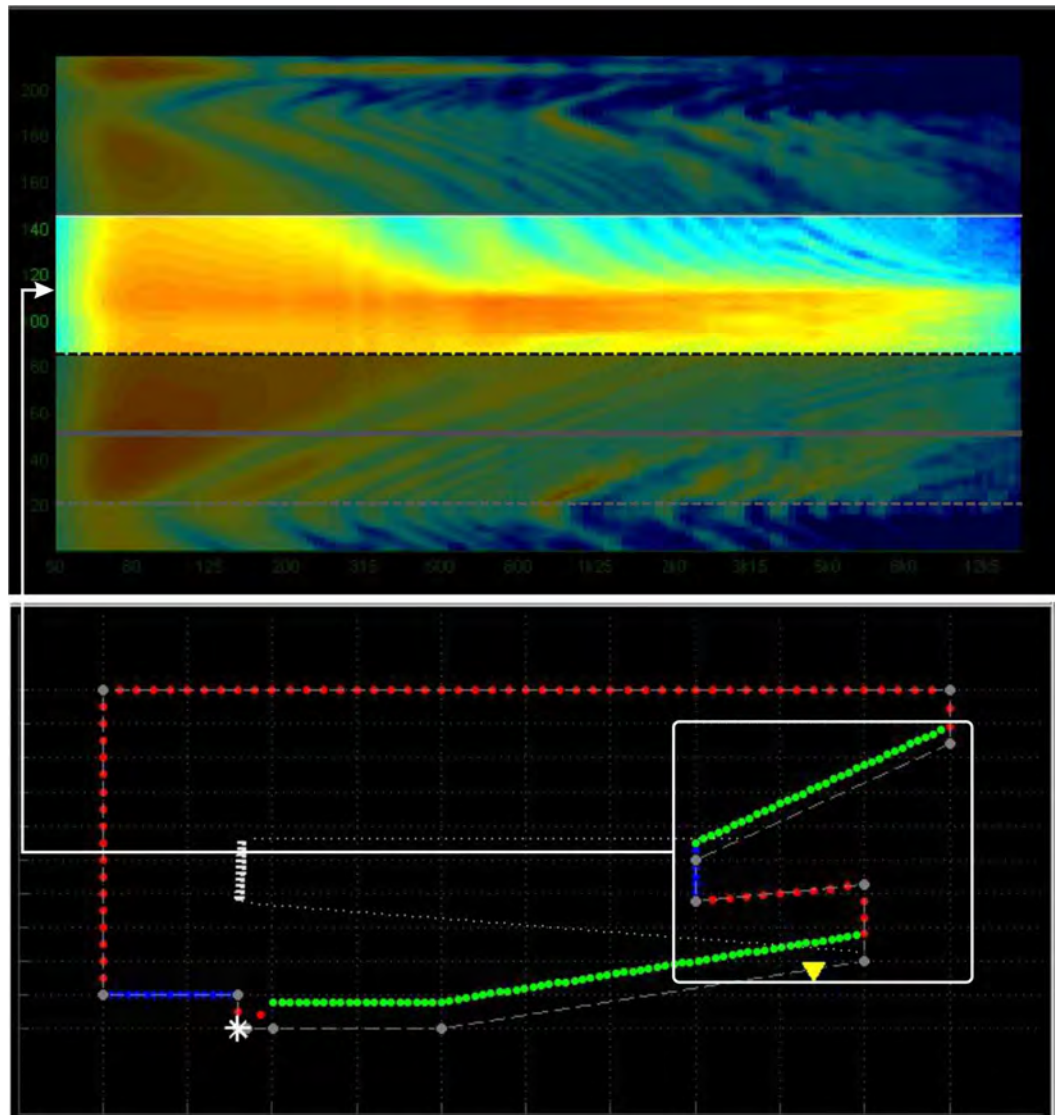
This is the Index plot of a completely un-optimised system. The horizontal axis as mentioned is frequency. As we cannot optimise very low frequencies the graph starts at 50Hz going all the way up to 20KHz. The vertical axis is now the 2D slice of the venue “unravelling”. At the bottom is the starting point for our 2D slice at the back of the stage then move vertically upward and at point 20 we see a dashed white line which represents the audience start point that we identify on our venue slice. We continue upwards moving back through the audience, the thick grey line is where we have placed our cursor which gives us the facility to obtain a standard frequency response graph. Continuing up the axis going further back in the venue we find a dashed black line which is a reference point which we also determine. The solid white line is where the audience coverage finishes. Just above this is the back wall and then up to the number 200 is the venue ceiling and the last section of the graph is the back of the venue behind the array.



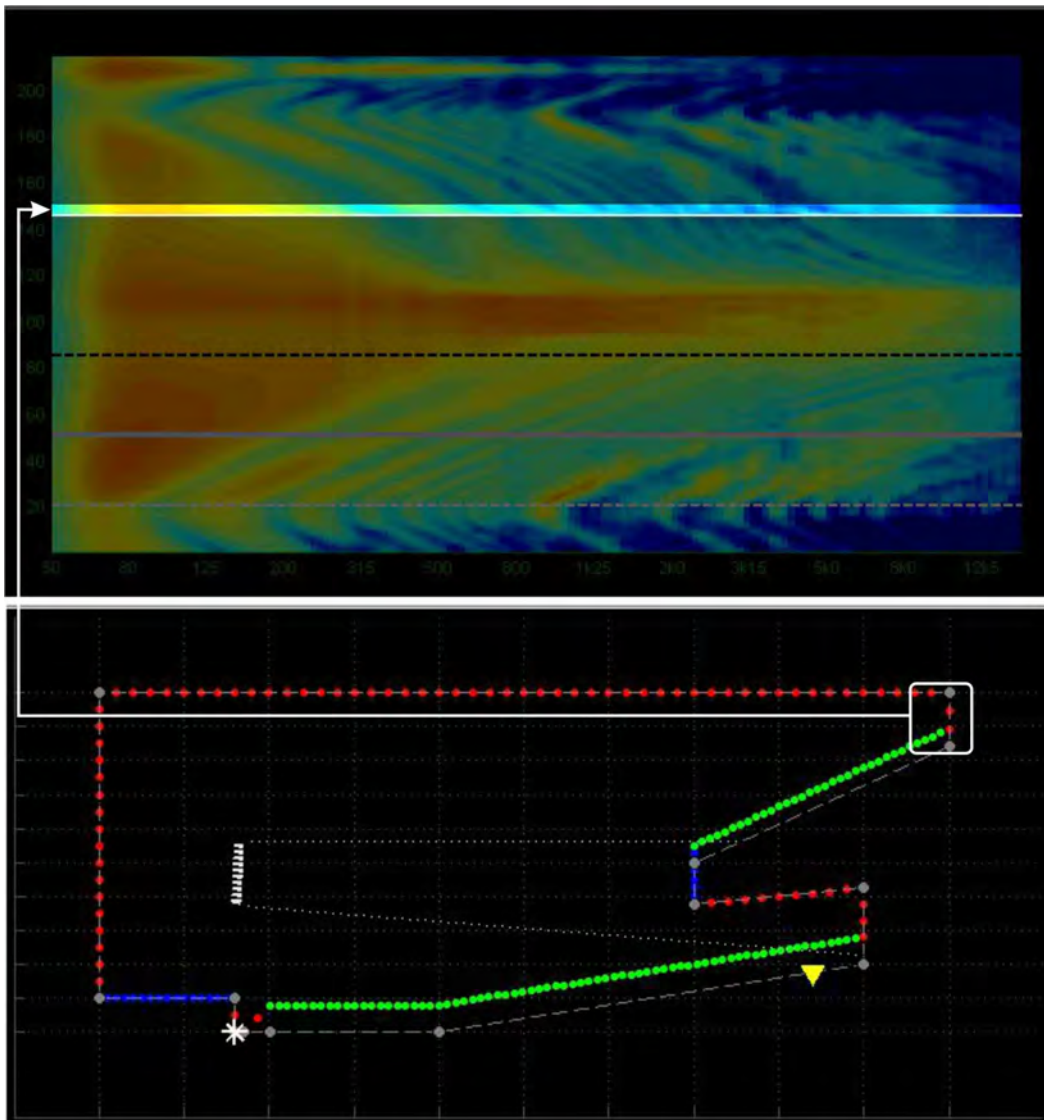
This shows the bottom portion of the index plot corresponds to the stage and “pit” leading up to the start of the audience coverage.



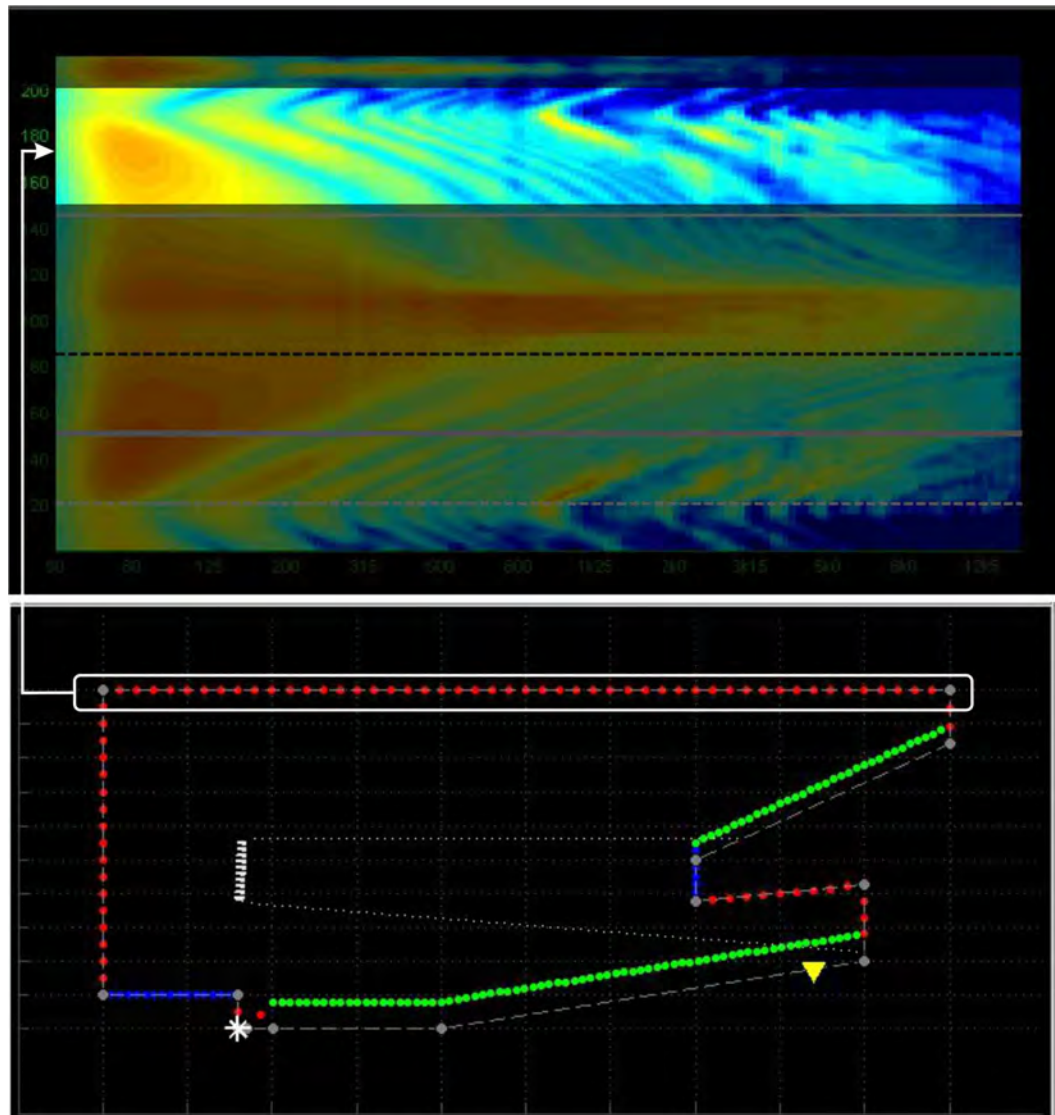
This section of the index plot corresponds to the first portion of the audience plane up to the reference point.



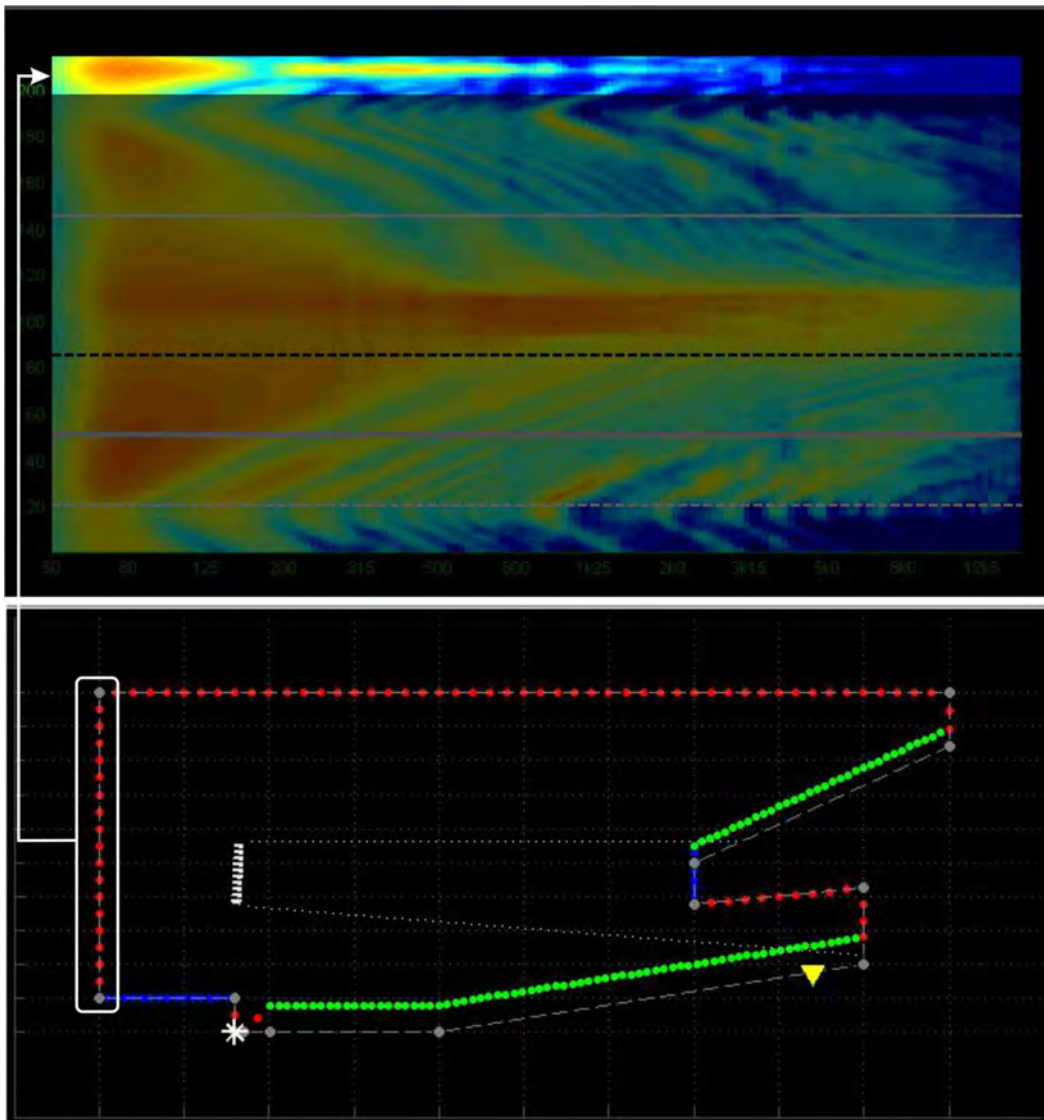
This is the section from the reference point to the back of the audience area. The strong band of red indicated the front of the balcony which is getting a great deal of direct sound prior to optimising the system.



This is the narrow section corresponding to the rear wall.

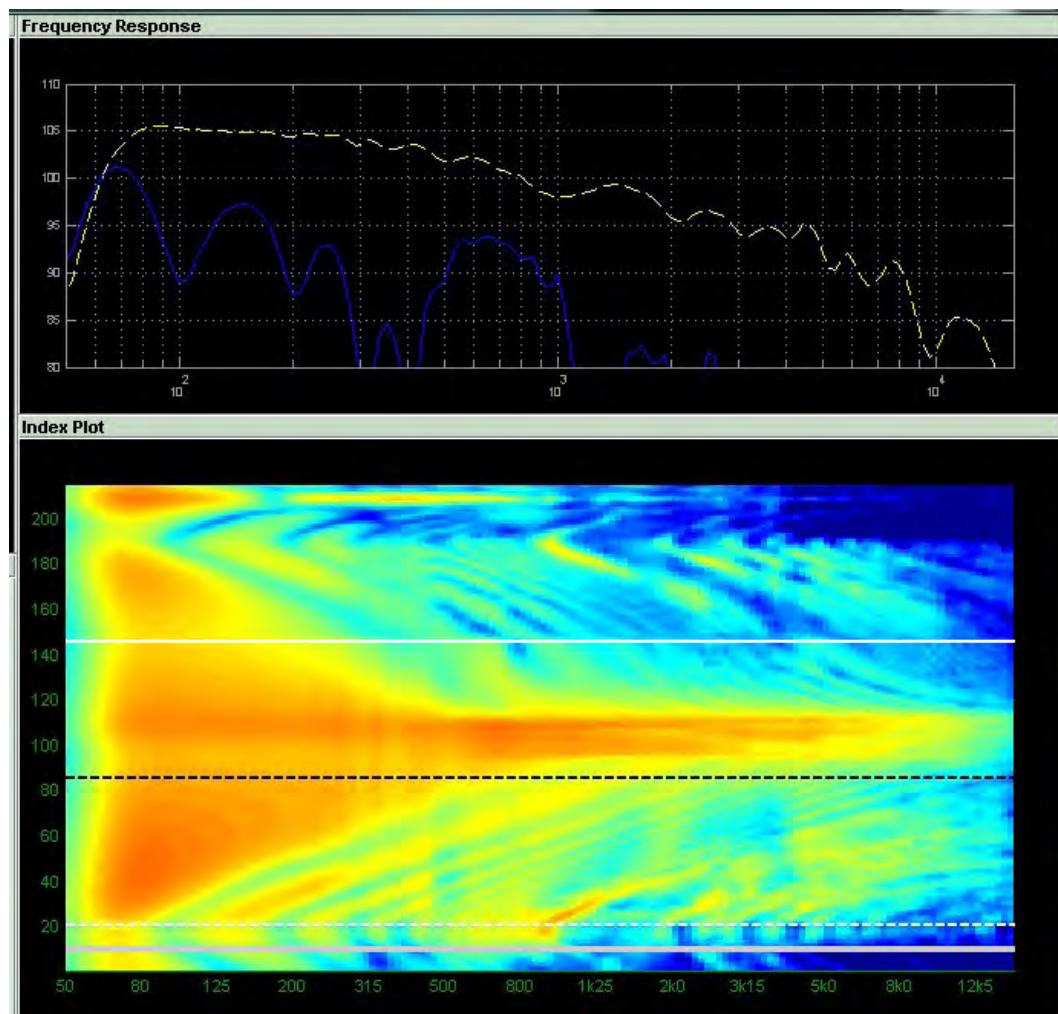


This is the response on the ceiling.



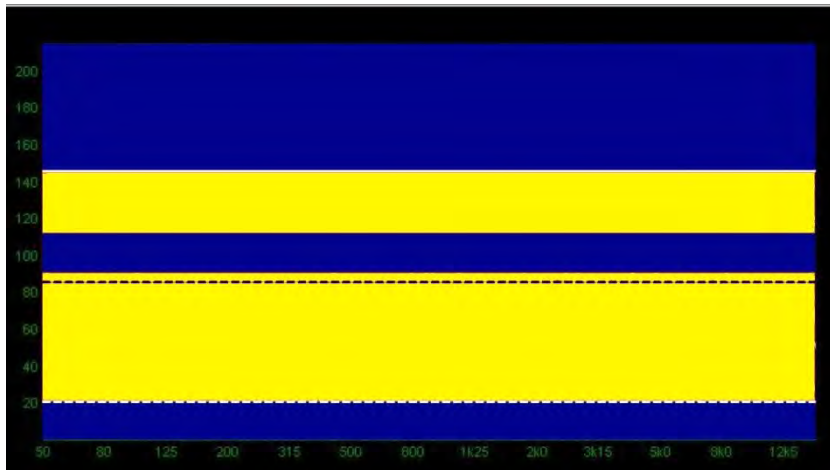
And finally the rear wall.

We can also take a look at the actual frequency response on a conventional graph at any specific point on the plot to better understand what we are looking at. Just to re-emphasis, these plots are prior to any system optimisation; they show the response of an array flown with all angles at 0.5°!

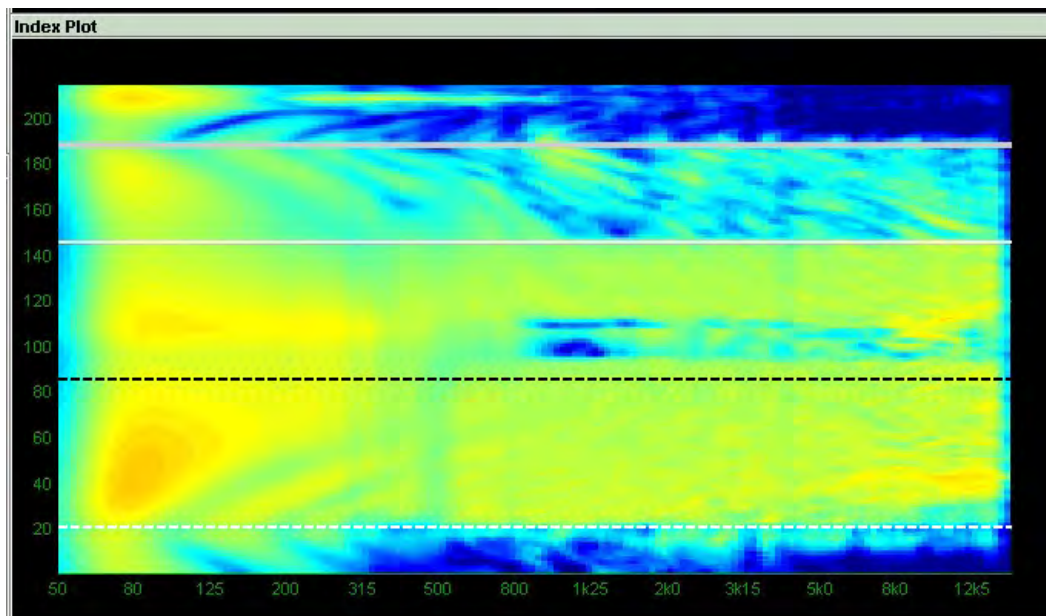


The plot at the bottom now has the thick solid white line at the bottom indicating that the cursor is over the stage area. The frequency response graph at the top shows two traces. The dashed yellow line is the response at the reference position indicated by the dashed black line on the index plot. The blue response is on stage where our cursor position has been placed. It is easy to see from these how the colours respond to the peaks and troughs on the graph. The on stage response for example has little or no high frequency, it is not even registering anything above around 2.5KHz, on the index plot it is an even band of blue in this region. The response at the reference position is reasonably flat in the low frequencies, gradually tapering off as the frequencies increase. On the index plot we see a block of orange which gradually fades through yellow, green and indigo to blue at the highest frequencies.

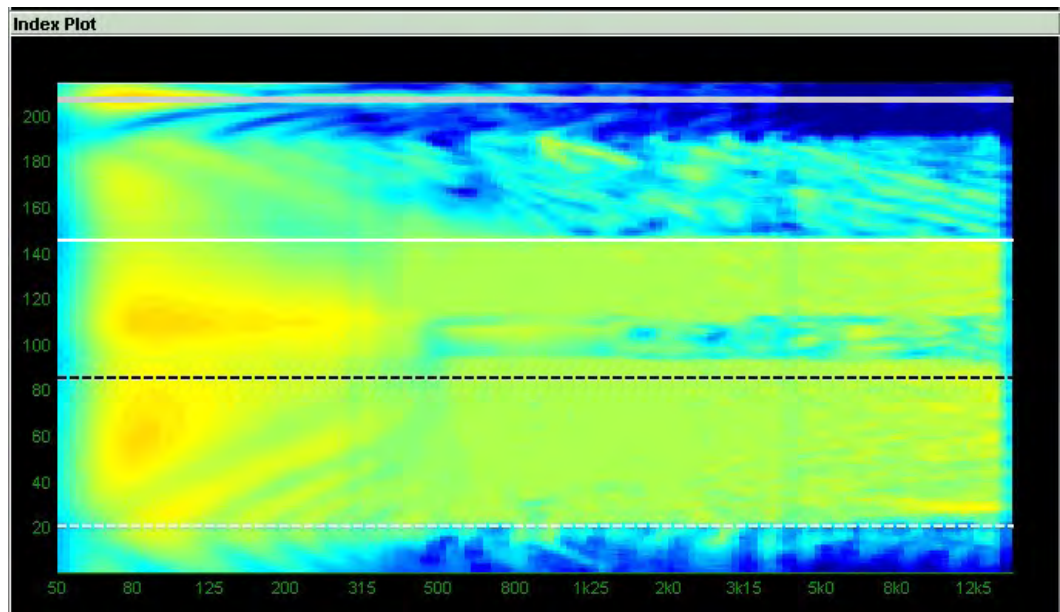
We can now look at an optimised system, this is what a perfect system would look like if it wasn't for little inconveniences such as the laws of physics, the impossible dream of perfect coverage at all frequencies for the entire audience with no spill whatsoever anywhere else:



Here we have a real world optimisation with a 10 box system:



And to demonstrate how close the system can get to the perfect coverage, here is the same venue with an array consisting of 16 MLA plus 1 MLD optimised to obtain a front to back differential of 0 dB - exactly the same SPL everywhere. The audience target has been given maximum priority ignoring non-audience and hard avoid areas:



As you can see the vast bulk of the audience region is a consistent green with a band of blue indicating the underneath and front of the balcony. Quite a respectable result.

Note that using the hard avoid feature whilst extremely useful does have some limitations, whilst superb at rejecting sound behind the array on stage, if used for a balcony front for example it relies on the array being physically positioned exactly as it is depicted in the software to a fraction of a degree, not easy to achieve with standard electric hoists, plus if the array is not directly in front of the balcony the hard avoid region which will form an arc from the array, may miss the balcony at the extremes of the horizontal coverage giving some members of the audience a very poor experience.

APPLICATION MENU

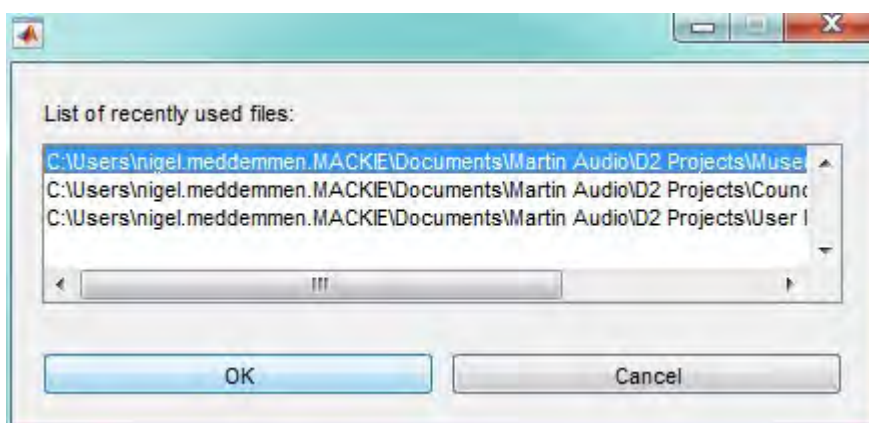
When Display 2.2 is first launched, the Dashboard below is shown. This remains visible at all stages of the project design and as will be seen, tabs will appear in a logical order to prompt you to enter the required data at each stage of the design process.



As you can see, the application prompts you to enter the details of your array as the first step however it is worth taking a look at the options available under each menu item first.



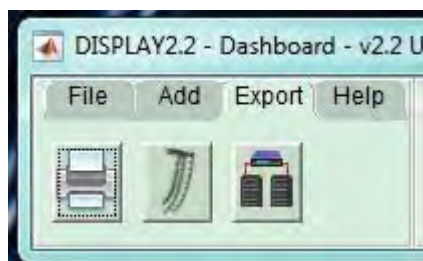
The file menu offers four options; first you can load recent projects you have been working on, clicking this option will bring up a list of recent projects:



If the project hasn't been opened recently you can select 'Load' to open an existing project to continue working on it. Next you can save the current project and finally you can start a new project. Note that until you have actually started on a project and saved it, the 'create new project' option will have no effect.



The Add menu prompts you to add the details of your Multicellular array.



The Export menu is where the finished optimisation(s) and 3D models are uploaded to a file. This is the final stage of the design process and we will look at this process later in this guide.



The Help menu brings up a set of options for the project which can be selected to suit the design you are working on.

GETTING STARTED

The Options in the Help menu are a good place to start to ensure that the design process is tailored to how you would like to work for a given project. Clicking on the icon in the help menu brings up this window, the options selected are the defaults for all new Display 2.2 installations”



General

Metric allows you to select metric in place of imperial measurements.

Equal scale refers to the x and y scales for the 2D slice drawing required of the venue. For a venue with say a very long x axis and very little height, it may be easier to depict the layout with unequal scales.

SPL View

dB/div allows selection of the Decibel per division on the optimisation of either 5 or 10.

Show extreme is active when Multi-plot has been enabled. The response at the start and finish of the audience region will be highlighted in green and red respectively so they are easy to pick out particularly when large numbers of audience plots have been selected.

Num Aud Plots dictates the number of audience plots to show if the Multi-plot option has been enabled. This can be as many plots as there green “virtual microphone” dots, the display would however look very confused so not more than around 12 is a more practical number.

Enable Multi-Plot when checked will display the number of response graphs specified in the Audience Plots window.

Fixed response allows you to select the fixed responses displayed when in Multi Plot is enabled. With Multi-plot disabled the SPL window will show the response at the reference position as a dashed yellow line, plus the average response over the entire audience region as a dashed white line. In Multi Plot mode you have the option to display simultaneously with the audience plots you have specified, either the reference response, still with a yellow line, the average audience response or neither.

Slice

Show Coord allows you to turn off the display of the coordinate number for each node on the drawing. This might be useful for a very complex drawing where the numbers would clutter the view but for the vast majority of projects this should be left on.

Splay Tool

Auto Use Splay will instantly apply the optimised angles to the array model. With this disabled you can review the array shape before applying the angles to the project. In most cases this can be left enabled.

EQ Tool

EQ% Achievement will display the percentage achievement that the optimisation has produced related to the goals that you have set. With this disabled it will display raw figures for equalisation.

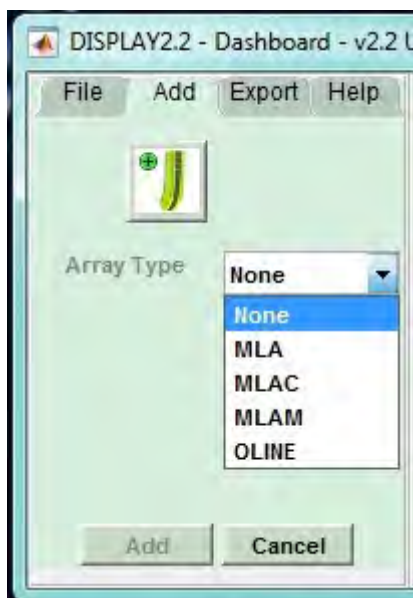
Auto use EEQ acts in the same way as the auto function for optimised splay angles, it will instantly apply them to the project as soon as the optimisation is complete. If you wish to review the optimisation before applying the filters you can leave this disabled and an additional 'Apply' button will appear when the optimisation is complete.

Export

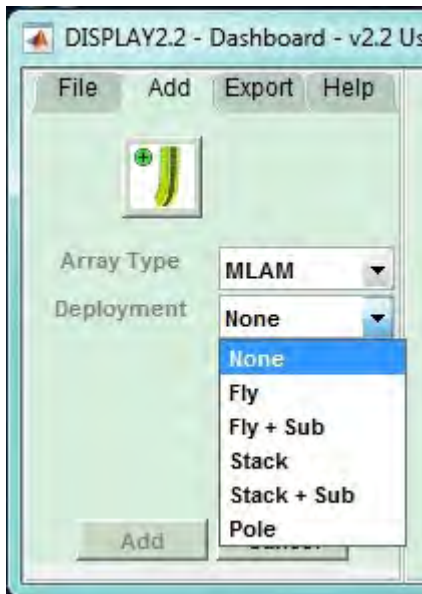
Clip d2p filename ensures that the exported filename matches the array name making it easier to identify which optimisation corresponds to a given Display optimisation when uploading to the system via Vu-Net.

ADD AN ARRAY

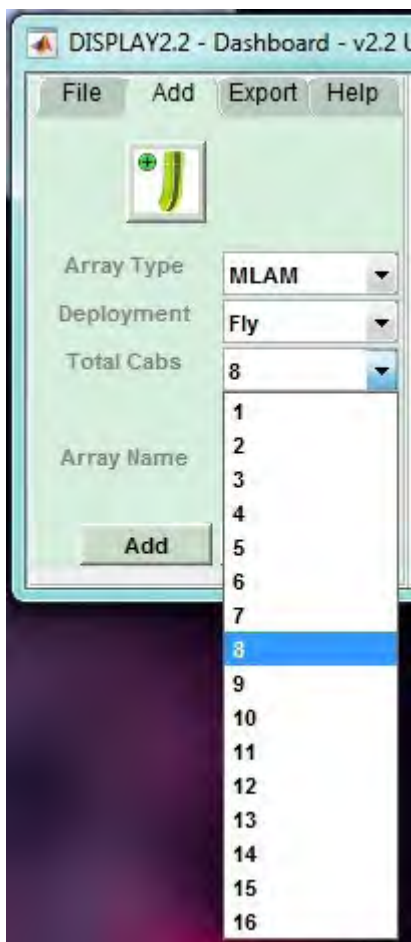
One you have selected the preferences that you wish to use, the first step is to add an array. Go to the 'Add' tab and click on the array icon. The following window will appear:



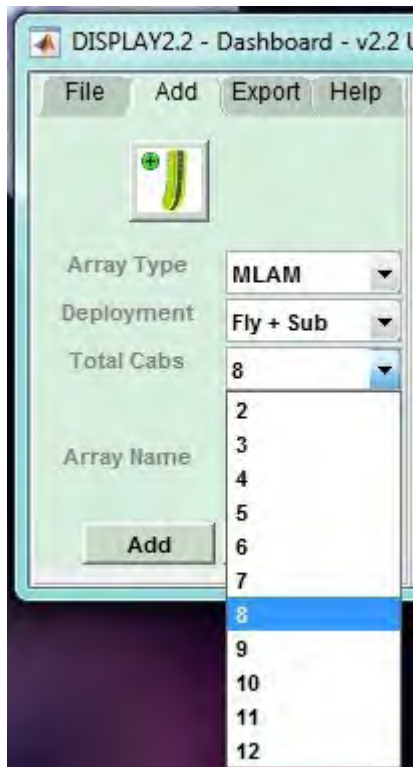
In the first drop-down you must select the type of array, 'MLAM' meaning MLA Mini. "None" has very limited use (perhaps for silent discos?).



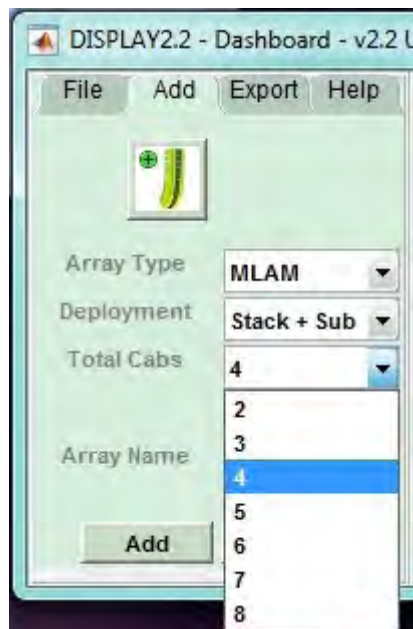
Next you need to select your method of deployment which will in turn determine a number of other factors in how the design process operates. The options for MLA Mini are flown with sub, ground stacked, ground stacked on sub and pole mount:



Next you need to select the total number of cabs. The options change according to the maximum number for each type of deployment, for a flown system with the MSX ground stacked or rack mount amplifier modules you can fly from 2 to 16 in increments of one cabinet:



When flying with subs the maximum is 12 MLA Mini:



For ground stacked systems either on the floor or on top of the MSX, the maximum is 8 cabinets:



And finally for a pole mount system the maximum is 4 cabinets:

Note that it is essential that the array design in Display 2.2 matches the physical array being used. The optimisation files that Display creates can only be uploaded to an array that exactly matches the file. The option to create arrays that are not multiples of four is to future proof the system for developments in system hardware that may allow powering of arrays that are any number from two to sixteen

Finally you need to give the array a name. This is important as the D2P file created with the optimisation for that array will have the name that you assign at this point. If you wish to try several optimisations one method is to duplicate the design adding another array and entering the same venue and array properties but to give the array a different name that is appropriate to the optimisation that you are attempting.

Once you have entered the array details the dashboard will change, the array details section will turn green and the design process tabs will appear:



You will notice on the right hand side the 'Rename' box. This gives you the opportunity to rename your array. Simply click in the box, type in the new name and press return. The Rename box will briefly turn green and the array name will change on the tab.

Next try clicking on any of the icons other than the 'Slice'. You will find that a window appears as shown:



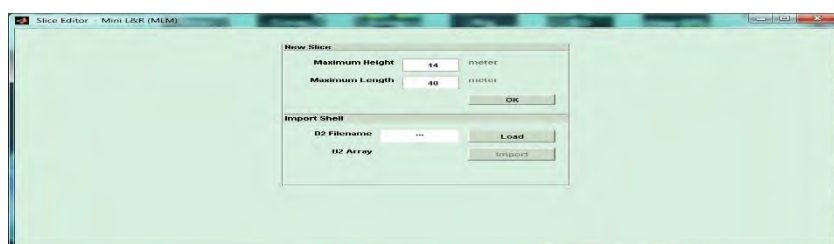
This window will appear if you attempt to access any of the process icons out of sequence, meaning before the preceding process has been completed. This feature forces you to complete the project design process in the correct, logical order. Once you have completed each section you are then able to go back and access any of the completed parts of the design.

SLICE TAB

SLICE SETUP

The first stage is to draw a 2D slice of the venue. For most cases with a conventional stereo pair of arrays this can be a slice down the centre of the venue and many venue architects plans will include a suitable side view.

Clicking on the 2D Slice icon will initially bring up a window prompting you to enter the basic length and height of the venue. This only needs to be approximate; enter a figure larger than the biggest dimension (but it's not a problem if you don't know the dimensions at this stage and the initial figures are too small).

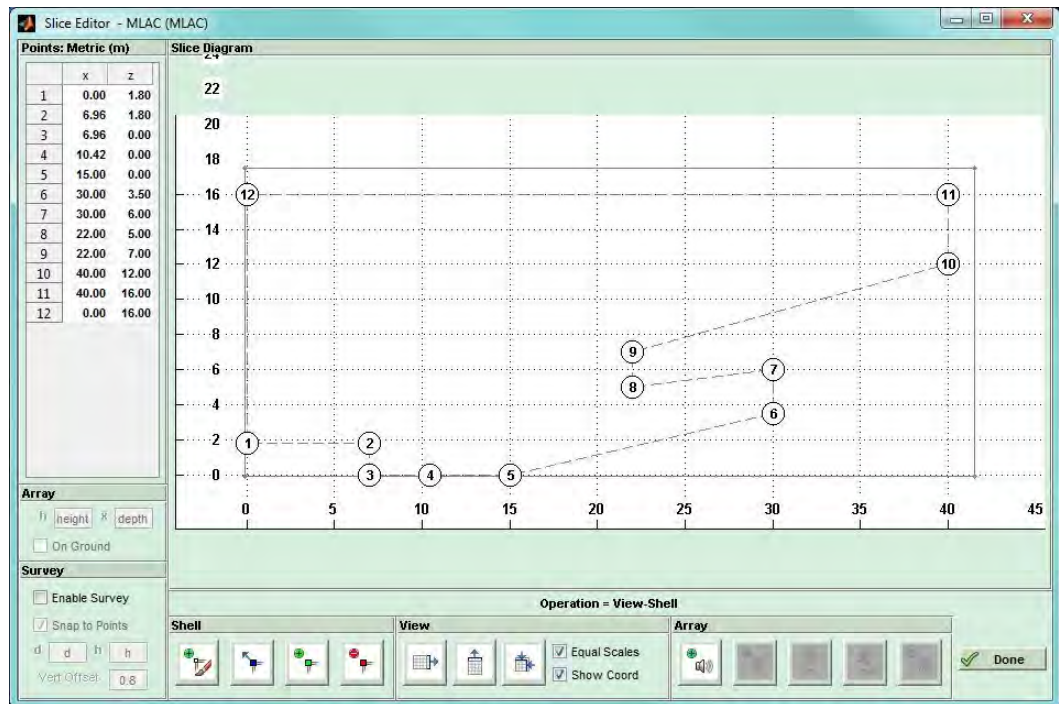


The other option is to import a Shell from an existing D2 file, this is extremely useful when creating designs for venues in which you have already deployed a multicellular system and still have the designs. It is also very useful when you wish to try several optimisations in a project as we will see later.

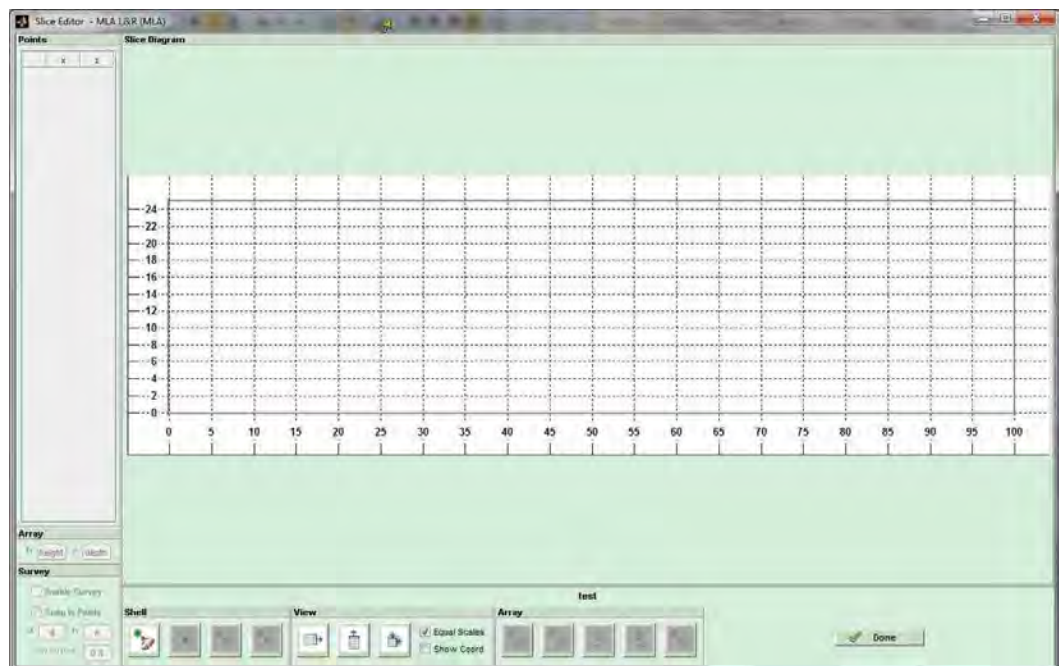
To load a Shell simply click on the 'Load' button, navigate to the file containing the shell you wish to use and click on it. The filename will appear in the D2 Filename box. A drop-down box will appear next to the 'D2 Array' which will contain a list of all the arrays in the project you have selected. Choose the one which has the shell you wish to use. Note that only the shell data is imported, the array and other optimisation parameters are ignored:



Click import and the Slice Editor window appears with the shell already drawn (see following page).



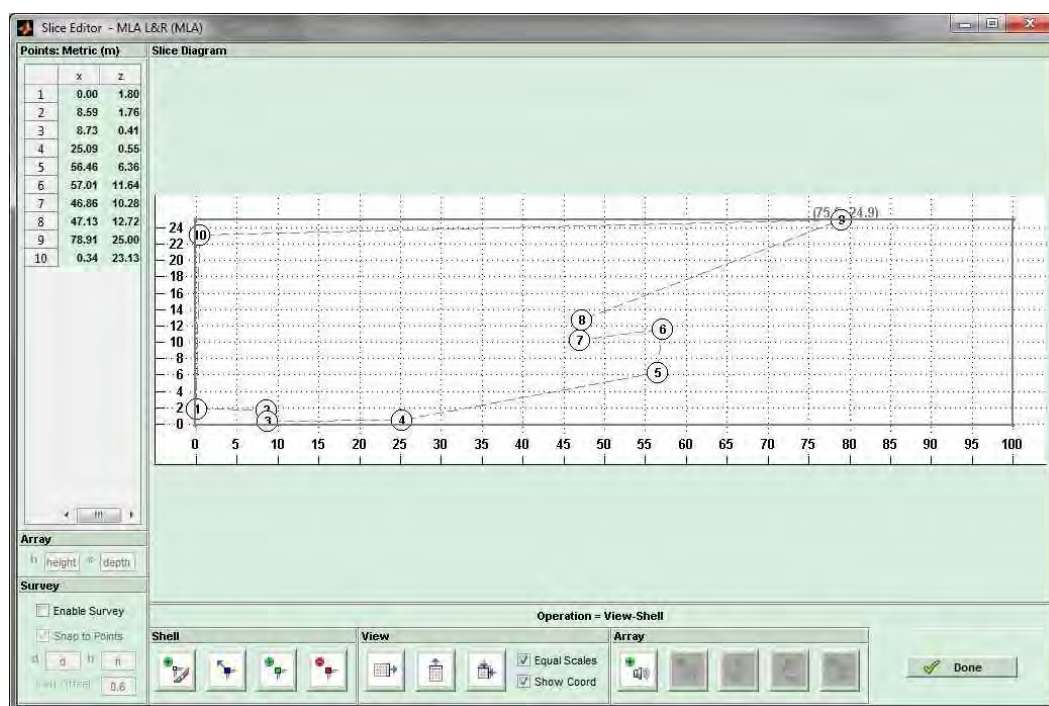
However, if we assume that we have to draw a shell from scratch, ignore the 'Import Shell' section, enter very approximate maximum dimensions for the length and height of the venue and click OK, the 2D Slice window will appear:



DRAW A SHELL

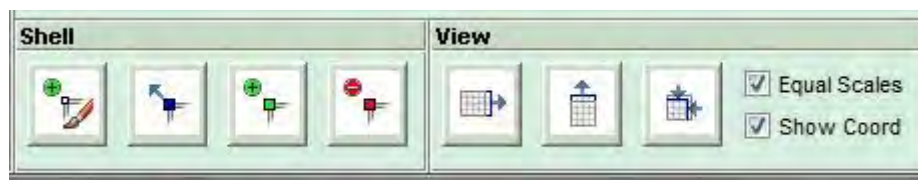
Note that the window opens as a floating window and can be enlarged or maximised as any standard Windows application, this is obviously worth doing if you are working on a notebook PC or Tablet PC. As you can see, most of the controls are greyed out and remain so until you have drawn the venue slice. To do this click on the Shell icon and move your mouse over to the drawing grid. A starting node is added at the zero point on the x axis but at 1.8 metres on the y axis to represent the back of a stage that is 1.8 metres high (this can be edited once you have completed the drawing). Next move the mouse in an anticlockwise direction moving the mouse to the approximate position of each node and click to add the node. You **MUST** draw the shell anticlockwise, the optimisation will be completely wrong if the venue is drawn clockwise. When you arrive at the final node double click which will complete the drawing.

Note that you do not need to spend time or effort positioning the nodes in exactly the right position as it is extremely quick and easy to edit the precise node coordinates to match your measurements.



You will now see that a number of additional buttons are active and these can be used to perfect the venue drawing.

EDIT THE SHELL



The first button is the shell entry that you have already used. If you have completely messed up the venue drawing you can click on this and start again, the initial drawing will be completely replaced.

The next button enables you to move any of the nodes. Click on the button and move your cursor over to the drawing. You will find that the cursor changes to a cross over the drawing area and when you hover over one of the nodes the circle around the node number will turn green. Click on the node that you need to move and drag and drop it to its new position.

The next button gives you the opportunity to add nodes if you missed any out in your initial pass. Click on the button and move your cursor over the drawing, as you move over the dashed lines between nodes you will see a small green circle appear. When you have the circle in the desired position single-click and a new node is added and the numbering shifts to accommodate the new node. If necessary you can use the move node button to reposition the new node however there is a much quicker way to precisely position the nodes as we will mention shortly.

If it's not entirely obvious the red \ominus button is for removing unwanted nodes than can easily appear if you accidentally clicked whilst drawing the slice. As with the 'move' button, click on the Delete button then move your cursor over the offending node and left click to consign it to history.

Points: Metric (m)		
	x	z
1	0.00	1.80
2	6.96	1.75
3	6.87	0.24
4	10.42	0.33
5	18.77	0.15
6	43.29	3.88
7	43.12	9.21
8	31.48	7.35
9	31.21	9.92
10	48.62	16.85
11	48.62	21.56
12	0.92	21.38

The View buttons help to maximise the drawing, to either the width of the slice, the height, or to fit the drawing into the extents of the available window. There are also two check boxes, the first by default makes the horizontal and vertical scales equal so you get a good proportional view of the venue shape hover if you have a situation where this makes it difficult to place the array for example a very long venue with a low ceiling, uncheck this box and the vertical and horizontal scales will maximise to the window to allow the maximum detail to be visible. Finally you can uncheck the Show Coordinates button which removes the numbering from all nodes.

As mentioned, there is no need whatsoever to enter the nodes accurately when first drawing the slice, it is time consuming, particularly on a small screen, and inaccurate. Instead, you can edit all points shown on the top left list of nodes:

Click on the x coordinate for node 1, in most cases this is likely to be 0.00 but if not type the correct value and hit the Tab key. The z coordinate for the node 1 is highlighted and you can type the correct value. Tab again and the x figure for node 2 is highlighted and so on. You will get very quick at tabbing through all the coordinates entering the correct values to give you a perfectly accurate 2D slice drawing. This obviously is a far quicker method of working.

USING SURVEY

The process of drawing a shell as described above is fine particularly if you have architects drawings of a venue and are able to create a Display 2.2 project in advance of arriving on site, but in a touring situation this luxury is rarely available and therefore you may need to measure the venue when you get to site. The best method is to use a laser measure such as the Leica Disto D510 which is supplied as part of full MLA and MLA Compact systems and is available from Martin Audio as an optional accessory. The Distos have been in widespread use for accurately measuring venues for line array software so most technicians are familiar with their operation and accuracy. The D510 is one of the most advanced models and has a host of functions to make getting an accurate interpretation of the venue as quick and easy as possible.

Points: Metric (m)		
	Dist	Angle
1	10.45	3.68
2	3.52	10.17
3	3.66	-14.04
4	0.80	-90.00
5	8.41	-6.68
6	32.98	4.79
7	33.68	13.89
8	21.95	16.45
9	22.57	22.93
10	41.31	22.37
11	43.32	28.14
12	22.37	64.86

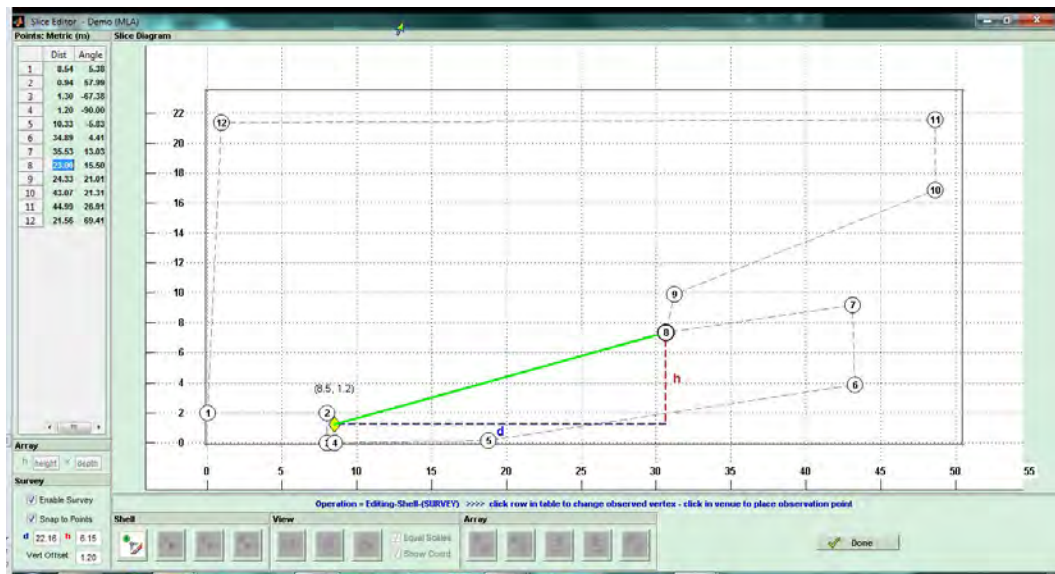
Display 2.2 Mini allows entry of points using a Survey method instead of entering points as distances on the x and y axis which may be impossible or at least very difficult to measure on site. Survey allows you to enter the distance to a specific point and the angle from where you are taking the measurement. This means that you can stand say directly under where the array points are and measure from there to all of the nodes in the venue taking note of the distance and angle which the Disto can display by selecting the angle display option. (See the guide supplied with the D510 for more details).

To enter the measurements you first need to enter an approximate 2D slice with the correct number of nodes as described above. Now click in the Enable Survey check box. By default leave the Snap to Points box checked. You will notice that the points list has now changed to Distance and Angle for each node:

You now need to enter the vertical offset from which you are taking your measurements, a tripod is strongly recommended to keep things accurate, the only other way to keep a constant accurate figure is to measure from the floor in which case enter zero for your vertical offset but sitting around on cold venue floors is an over-rated pastime so invest in a reasonable tripod and the job becomes far more civilised. Measure from the ground to the tripod height you have set up and enter this figure into the Vertical Offset box. Now click on whichever point you intend to take your measurements from, you will see the

measurement point selected shown as a yellow diamond. Having checked the Snap to Points box you can select any position on the slice and drag along it but when you get close to the nodes the measurement diamond will jump directly onto the node, without it you can select any point along the venue without the snap action close to the nodes.

Now click on one of the positions on the list of points top left that you wish to enter the dimensions, in the following picture, the stage is 2 metres high and 8 metres deep with the flying points 0.5 metres off stage. All points were entered very quickly and using the method described above, the first 4 nodes were corrected. Enable Survey was then selected and the array flying point node 4 was selected. We want to measure to node 8 at the bottom of the front of the balcony so we click on the distance figure for that node:



You can now enter the distance figure that the Disto has measure from that point to the bottom of the balcony, hit Tab and enter the angle. You will see the drawing adjust to your figures and in the Survey box you will see the distance and height coordinates from your measurement position to what you are measuring calculated from the diagonal distance and angle you have entered. If desired you can enter figures into these boxes if you do not have the facility to measure angles. This makes it more convenient than measuring from the back of the stage if that area is crowded with lighting techs or backline crew etc. As before you can quickly tab between node figures to enter all of the measurements first typing the Distance figure followed by the angle. Once you have finished entering all figures you can un-check Enable Survey to return to standard mode and you will be able to add the array. Once your drawing is perfectly accurate, click on the Fit drawing to Extents button to maximise it in your window.

POSITION THE ARRAY

Now click on the array button and move your cursor into the drawing window. You will see a rough rectangular representation of the array showing the x coordinates and the top and bottom trim heights. Once again, there is no need to worry about being 100% accurate when placing the array, put it in an approximate position and left click to drop it in place. If for any reason you want to start again just click on the array button again and have another go. Once positioned you will see over on the left the array position coordinates.

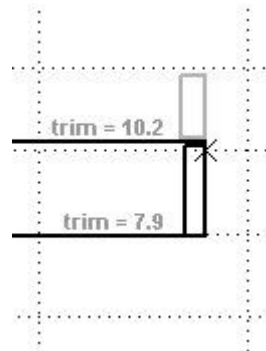


The 'Array' dialog box shows the following fields:

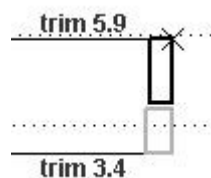
- h** (height): 3.71
- x** (depth): 1.72
- ☐ On Ground

This is where you can accurately correct the position of the array. Note that the height figure is to the centre of the upper flying pin on the top cabinet in the array, what is shown in the slice drawing is the figure for the trim height to the top of the flying hardware and the lower trim from the lowest point on the array, so effectively the maximum and minimum rigging positions. The 'On Ground' option is available for any array that has been specified as a ground stack. This will ignore the figure for the height and lock the array to the lowest point on the slice according to where the x position is specified. If for example the stage is 5 metres deep and the x figure is 3m

the array will be positioned on stage, if the x position were 6m the array would be on the floor. For MLA Mini systems a grey box will appear above the array if flown with sub has been selected:



Or below the array if stack with sub has been selected:



It shows the space occupied by the MSX subs. The size of the rectangle expands depending on how many MSX may possibly be above the MLA Mini, one for four Mini, two for eight Mini and so on. The rigging tab allows accurate calculations when this mode is selected as we will see.

ADD THE AUDIENCE REGION

Now you need to determine the audience area that we need to cover. Click on the Add Audience button:



Then hover over the slice drawing. You will see a green inverted triangle moving left and right along the slice outline corresponding to the left and right movement of your cursor. Position the triangle where the audience position starts and click once. Now move the cursor to the right tracing the slice along the audience area and you will see a green line following your movement with a red inverted triangle at the end of the line. When the red triangle is over the furthest point of the audience region click again and the audience area is defined. Don't worry at this point that it includes underneath and on the front of balconies et cetera that is corrected at the next stage.

EDITING THE AUDIENCE REGION

If you didn't get either the start or finish points correct it is easy to adjust them by using the Move Coverage Marker buttons, either the green one for the start position or the red one for the stop position.



Just click on either of the buttons and move the cursor to the correct position, the triangle marker will move for whichever point you are adjusting without disturbing the other. When you have the point in the correct new position click again to finalise it.

You can also delete the audience region entirely but clicking on the 'Add Audience' button again automatically deletes what you have already entered allowing you to start again, or click on the Delete Audience button which removes the audience region you have drawn but you have the option to re-draw a new region at a later time.

Assuming you have drawn an accurate representation of the venue (and remember that the more accurate the D2 project, the better the audible results), you have now finished entering the venue slice and can click on 'Done' to close the window.

COVERAGE TAB

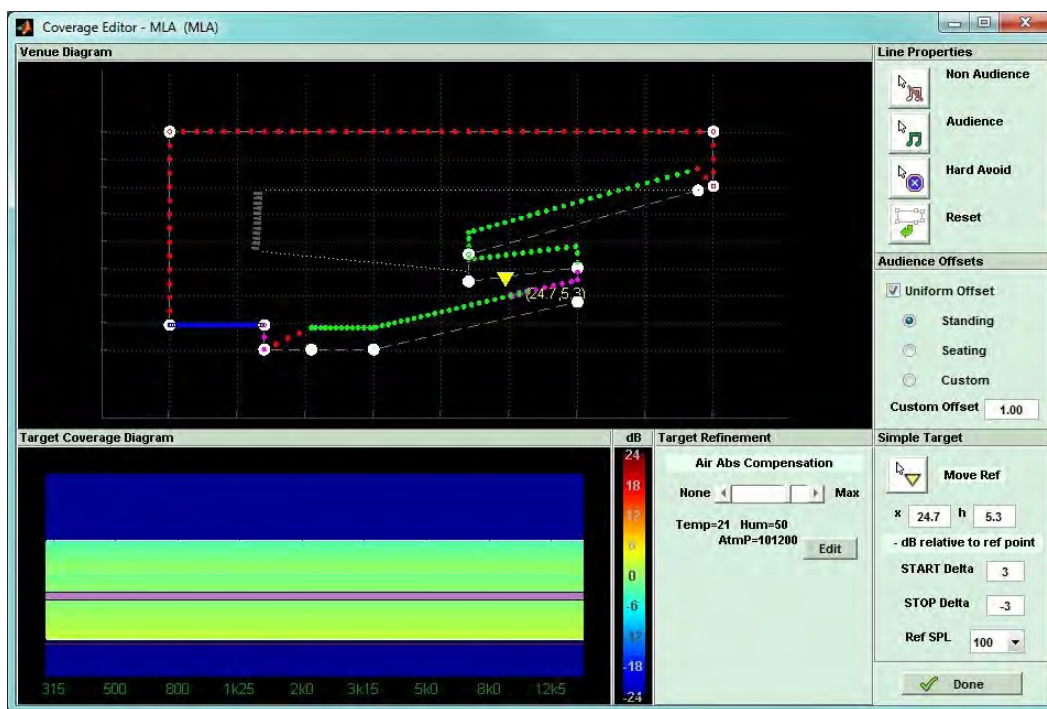
The next step is to precisely define the coverage but as with any application it is very good practice to save your project as you go along. Click on File on the Dashboard if it is not visible and click on the Save icon. Choose a suitable file location, you might wish to create a dedicated folder for a given show to hold all files in one place, then name the file and click save.

Having completed the venue slice, the Coverage ("Cover") tab will now be active. A single mouse click will open the Coverage Editor window.

DEFINING VENUE PLANES

As with the Slice Editor, the Coverage Editor will open as a floating window, this is definitely worth maximising as you may need to work on quite small sections and there is no zoom function in the current version (it is on the wish list for a future version)

You will see the venue that you have previously drawn looking as shown:



Each node entered in your Venue slice is shown as a white circle with each plane now allocated a colour between the nodes. There are three types of plane, Audience which is shown green, non audience which is red and hard avoid which is blue. The system by default makes the stage hard avoid, the coverage planes from where specified in the venue slice start to finish will be audience and all other planes non-audience. The first step is to edit these to reflect exactly how you need the system to react to the venue.

In the example above, the audience area includes the stalls, the wall at the back of the stalls, under the balcony, the front of the balcony and the balcony itself. Clearly this is not correct and we need to change some of these planes.

At this stage we have to make a decision on where our priorities lie. There is a temptation to make all areas other than the genuine audience planes hard avoid to try and make the system reduce spill onto anywhere other than the audience, however we have to be realistic about what can be achieved. Whilst we have a tremendous amount of processing power available, we

cannot change the laws of physics so there is a limit to just how much we can get the system to do. We are more likely to get good results if we are sensible with how much demand we put on the DSP. In the example we have shown, we are obviously not going to get any direct sound arriving under the balcony, it is essentially in “shadow” so there is little point in making this area hard avoid, likewise it clearly shouldn’t be defined as audience or the system will waste DSP attempting coverage over an area it cannot reach so it should definitely be non audience. With a little experience you will learn what works well and what not to attempt. In our example I would keep the stage as hard avoid, perhaps also have a hard avoid on the balcony front which could give problems with a slap-back echo on stage and make all other areas non audience. The default setting usually has the stage hard avoid also including the stage front and the “pit” between the stage and audience start as hard avoid. This is not only unnecessary but trying to get the DSP to get the signal from hard avoid immediately to audience is expecting far too much, it is much more realistic to keep the stage floor as hard avoid and the front of the stage and pit non audience.

You will also notice a pink area at the back of the stalls in our example. This indicates any part of the venue plane that is not in line of site of the array, essentially in “shadow”. In many venues, particularly theatre style rooms with one or more balcony, this is very common and additional balcony fills may need to be deployed. You can of course close the Cover tab and return to the Slice tab to try alternative array positions to try and minimise any such shaded areas if audience areas are affected. In our example it is only under the balcony and on the rear wall at the back of the stalls that are not in line of site and so there is no need for any remedial action.

CHANGING PLANE PROPERTIES

On the right hand side of the window is the section for adjusting the plane line properties:



Each plane between nodes needs to be adjusted individually, to do this, click on the required plane property first, and then select the line you wish to change. For example, on our example, we want to make the balcony from hard avoid and under the balcony non audience. As it’s the top button, let’s do the non audience first. Click on the Non audience button and then hover over the planes, as you hover over each line you will see the feint dashed lines turn a bright white, thick dashed line. When you are over the plane you need to change, under the balcony in this case, a single mouse click changes the plane colour to red. Now we can do the same for the balcony front, click the Hard Avoid button and then select the small vertical balcony front which will change to blue to show it is now hard avoid.

You can click on the Audience button to change any planes to audience but this is rarely required as long as you initially defined the audience areas correctly in the Venue slice, you are more likely to have too many audience planes rather than not enough although you may need to change a plane back to audience if you have accidentally changed it to something else. If you get several wrong you can click on the Reset which returns all planes to the default that you started with.

Here is our example with all planes changed to what we need:



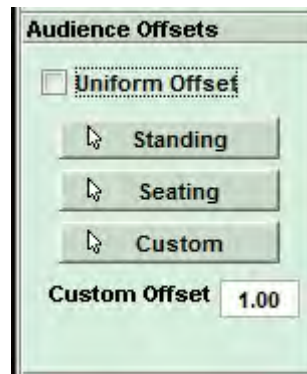
AUDIENCE OFFSETS

You will notice that the green lines showing the audience area are hovering above the planes which is to represent the offset of the position of the audience members' ears. By default this will be a uniform offset for all audience areas set to standing. Changes are made using the Audience Offsets panel:



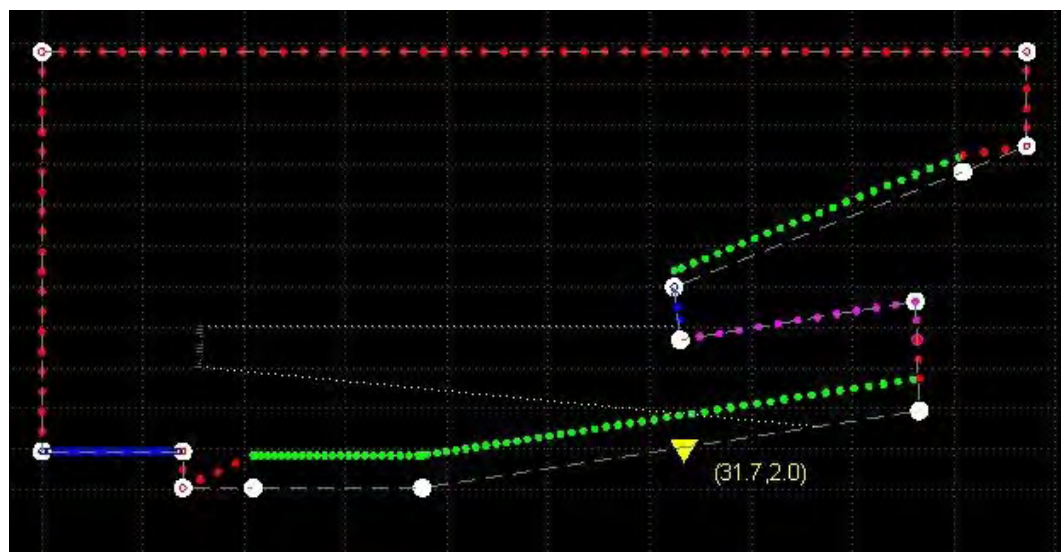
If for example the entire audience is seated, you can simply click the seating button and you will see the green audience line drop accordingly. The Standing offset is 1.6m and the Seating is 0.8. If you have a particularly unusual audience, very tall standing or perhaps very low seats, you can use the Custom offset to define the offset height in metres.

You will often encounter venues where you have a non uniform offset, for example a room with a seated balcony but standing downstairs in the stalls. In these instances you need to un-check the Uniform Offset button and define the offset for each plane individually. When you uncheck the box the controls change and look like this:



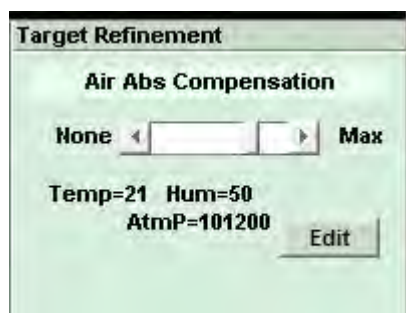
In a similar fashion to changing Plane properties, you click on the Offset type first, and then hover over the required audience plane and click when the correct plane is highlighted with the same bold white dashed line. Note that all planes have to be defined individually, in our example for instance, the stalls audience area comprises two planes, the flat section at the front, and the raked section rising towards the back. Both of these will have to be changed to whatever the desired offset is. This can be useful as there are plenty of venues with a standing area down at the front and seating towards the back. When you are using Custom offsets, you can define a different custom height for each plane if required, you are not restricted to a single global figure.

Our example now has a standing audience downstairs and a seated upstairs:



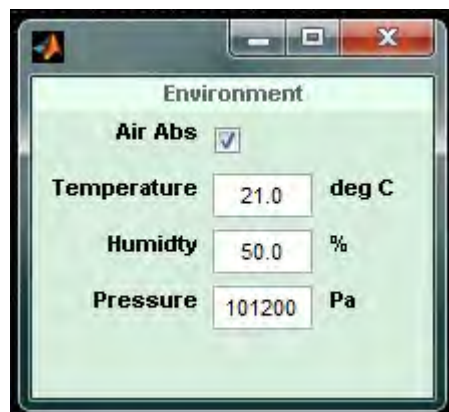
AIR ABSORPTION COMPENSATION

Display 2.2 can compensate for the effects of air absorption which can have a very significant effect on the upper frequency bands. The compensation is added in this section on the Coverage page:



The fader bar adjusts the amount of compensation from zero to a maximum level. This is best used for higher amounts where weather conditions are extreme or where you have particularly long throws as the compensation will help ensure that higher frequencies are not lost. However, be careful not to overdo it if not really necessary as you could run the risk of running out of headroom in the upper frequency bands.

The Edit button brings up the window into which you can enter the necessary environmental conditions:



If you un-check the air absorption there will be no compensation applied to the optimisation, you can still enter the Temperature, Humidity and Pressure so if you need to create a new optimisation including air absorption it is as quick and easy as checking the box. Be aware that environmental conditions change drastically throughout the day! A 6.00 am load-in is going to give very, very different readings compared to a packed, 8.00pm show with all lighting, smoke machines and pyrotechnics going full tilt!

TARGET DELTA SELECTION

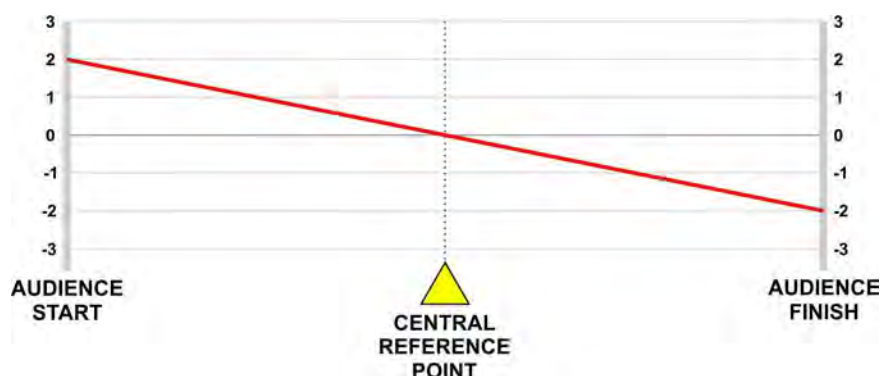
The target Delta selection is located in the bottom right corner and is where the SPL variation from audience start to finish is entered:



This unassuming little box is one of the most powerful features of Martin Audio multicellular systems, whilst all other systems on the market are trying desperately to achieve a 3dB drop in level for every doubling of distance away from their arrays, with MLA Mini you can simply specify the precise loudness contour you desire across the venue. If you want the back row to be as loud as the front then you simply type 0 in both the start and stop delta positions and the system will give you exactly that. It can even make it louder at the back than the front if that is what you want.

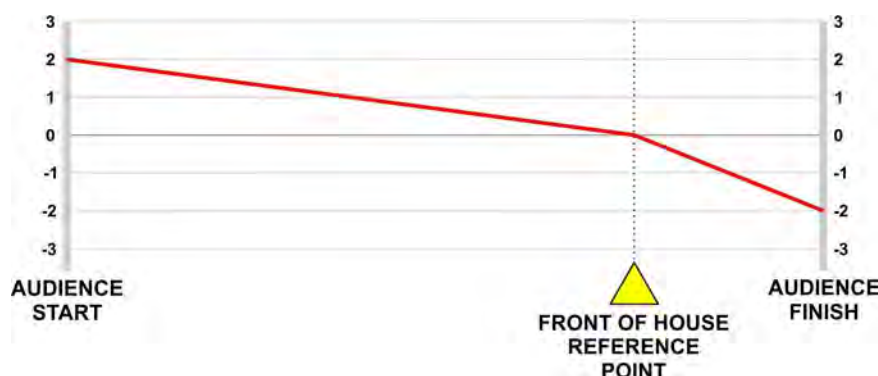
The start and finish deltas are referenced to the yellow triangle which nominally is placed in the middle of the audience region when you enter the coverage area in the venue slice. You have the opportunity to move it and if you didn't do so in the venue slice you can click on the 'Move Ref' button and move your cursor around the venue planes. The triangle will follow your cursor sticking to the planes until you are happy with its position and a further mouse click will cement it in its new position. Alternatively you can enter either an x or h figure to specify the horizontal position or height of the reference point and it will jump to the closest position on the venue shell that corresponds to the coordinates you have entered.

It is tempting to automatically position the reference position wherever front of house is positioned but this is not in the least bit necessary. The reference is used to adjust the contour so its position should be dictated by how you want the volume to change from the start to the finish of the audience region. Take a look at the following diagrams:



This shows a system that has been set up with the reference point in the centre of the audience region and a start and finish delta of + and – 2dB respectively. Because the reference point is central, the SPL drops evenly from start to finish, down 4dB from the loudest point at the start of the coverage.

The next diagram shows a system where the front of house position is around three-quarters of the way back from the front but the start and stop deltas are still at +/-2dB:



As you can see, the level drops gradually over three quarters of the venue back to front of house and then drops rapidly back to the audience finish. Decidedly strange and in most (but not necessarily all) circumstance, unwanted. To get the same smooth 4dB drop you should enter the start delta as +3dB and the finish at -1dB. But that only works if front of house is exactly three quarters of the way back! In the majority of cases you are far better of leaving the reference at the halfway point to make it easier to easily calculate how the loudness contour will flow from start to finish.

Of course they are many applications when it may be desirable to have the SPL rapidly drop off behind the reference point, at outdoor events where noise pollution is an issue, the ability to move the reference point to dictate the contour in front and behind it individually is another very useful tool at the system technicians disposal to create the ideal coverage for difficult environmental conditions.

The default setting is +/-3dB with the reference point in the centre, this is unquestionably a very good place to start and works very well, unless you have a very large array or need to try something slightly unusual it is advisable to stock with these settings.

As mentioned, setting the start and stop delta is simply a case of entering the required figure in dB. As with entering hard avoid regions, it is prudent to be mindful of how hard your DSP is going to have to work to achieve the results you have requested. With a huge array of 22 MLA enclosures, it was possible to achieve a 0dB start/stop delta in the Tokyo Dome, the furthest seat being around 550 feet from the array. It would however be very difficult to get such an astonishing result from say an eight box MLA Mini array. The height of the array also has a significant effect, a ground stacked system will not be able to achieve low figures for start and stop as a flown array. In actual fact, a 0dB start/stop sounds very unnatural and because you are used to hearing an array get louder as you get closer, you actually get the distinct impression that it is getting quieter as you get closer to the array. The other issue is that multicellular optimisation is only effective down to around 300Hz, low and sub frequencies will still behave as you would expect reducing in SPL by 6dB for every doubling of distance. If the optimisation from front to back is set to a target of as little as a few dB this will obviously differ drastically from the behaviour of low frequencies meaning that there will be a very noticeable difference in tonal balance across the audience coverage with the loss of low frequencies being very apparent as you go towards the back as the mid and high frequencies hardly drop in level. It is recommended therefore that unless you have specific reasons to do otherwise, that you use figures of +/-3dB.

For most medium to large sized array this should be easily achievable and will leave plenty of DSP power for other tasks and will retain a far more natural and subtle change of tonal balance throughout the audience.

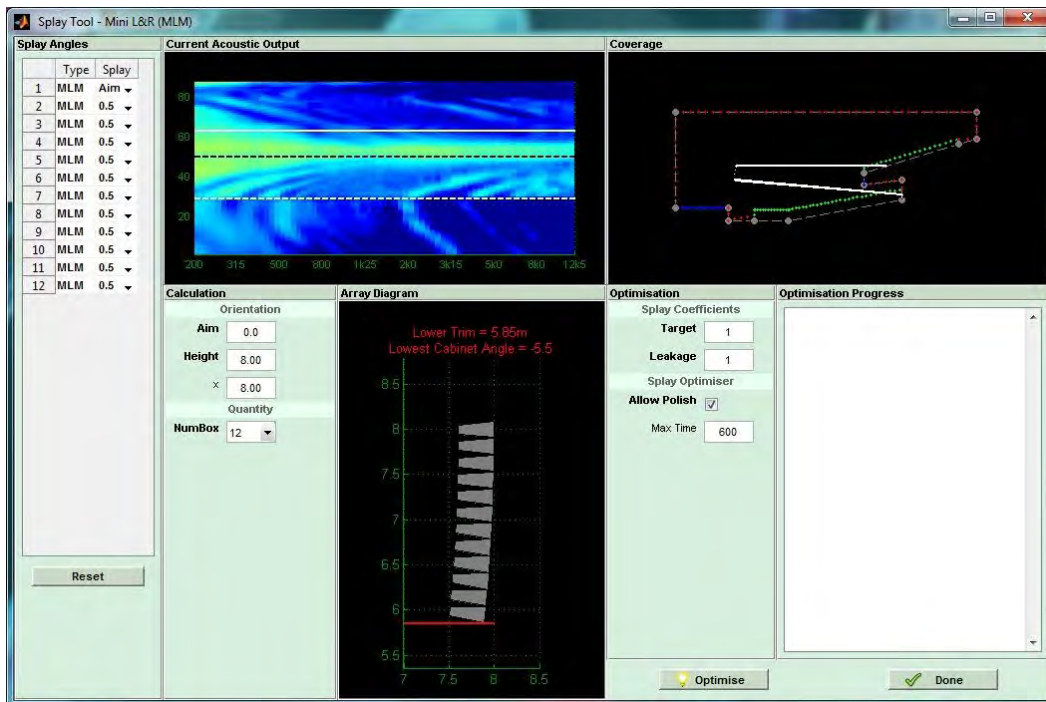
The final option is to set the reference SPL at which Display 2 will attempt to achieve the smoothest coverage as close as possible to the targets that you have specified. If you select 85dB you stand a better chance of achieving the system goals as it gives the option to allow great cancellation or gain shading to reduce levels in areas closer to the array thus making the coverage as even as possible and potentially closer to your SPL deltas. If however you need as much SPL as possible and have set your SPL deltas to allow a greater variation from start to stop you can select a higher SPL, 100 or 105dB and you will achieve a higher output from the system. The trade-off however is that Choosing SPL levels that are very low means that a high input signal level will be necessary to drive the arrays to high SPL's. In some instances this could cause the input to the cabinets to limit, as MLA series can accept a maximum of +18dBu peak input level. Choosing levels that are higher than the default will increase the noise floor. The default levels are set to provide a compromise between noise floor vs input level required to drive the system to high SPL's. So unless you have a very good reason to choose otherwise we would strongly recommend using the default figures. These are 110dB for MLA, 105dB for MLA Compact and 100dB for MLA Mini.

From version 2.2 onwards the reference figure is calibrated so that you will measure that figure at the reference position with 0dBu applied to the array input. With the array gain structure now calibrated it was necessary to look at the subwoofer gains to maintain a good balance. Vu-Net v2.0 will detect the optimisation reference figure in the Display d2p file and will automatically trim the sub input gain. For an MLA system or other system optimised at 110dB or higher, the sub gain will be increased to +10dB, for MLA Compact or other system optimised at 105dB the input gain will be set to +5dB and for MLA Mini or other system optimised at 100dB or less the gain will remain at 0dB

Once you have determined your Start and Stop Deltas you can click on Done to close the Coverage window and you can move on to the Splay tab.

SPLAY ANGLE TAB

Having completed the Coverage you will be able to open the Splay tab and the default window will appear as follows:



There are a number of sections to the window, these are: Splay angles, Current Acoustic Output, Optimised Acoustic Output, Calculation, Array Diagram, Optimisation and Optimisation Progress.

SPLAY ANGLES

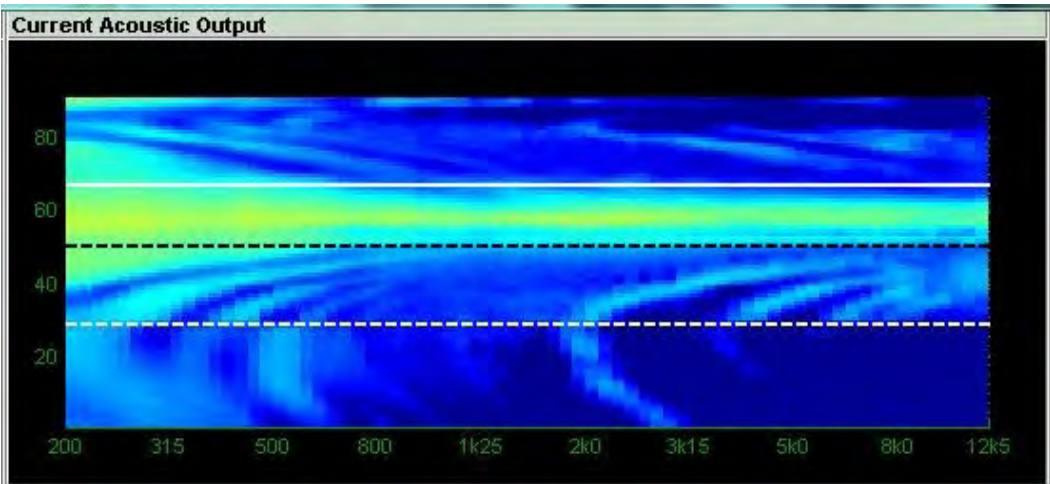
This shows a list of all cabinets in the array and initially this will show all angles between cabinets at the default of 0.5°:

Splay Angles		
	Type	Angle
1	MLM	Aim ▼
2	MLM	0.5 ▼
3	MLM	0.5 ▼
4	MLM	0.5 ▼
5	MLM	0.5 ▼
6	MLM	0.5 ▼
7	MLM	0.5 ▼
8	MLM	0.5 ▼
9	MLM	0.5 ▼
10	MLM	0.5 ▼
11	MLM	0.5 ▼
12	MLM	0.5 ▼

There is a drop-down arrow next to each cabinet allowing you to manually select a cabinet angle. We will discuss this option later. At the bottom of the list is a rest button which will return all angles to 0.5°.

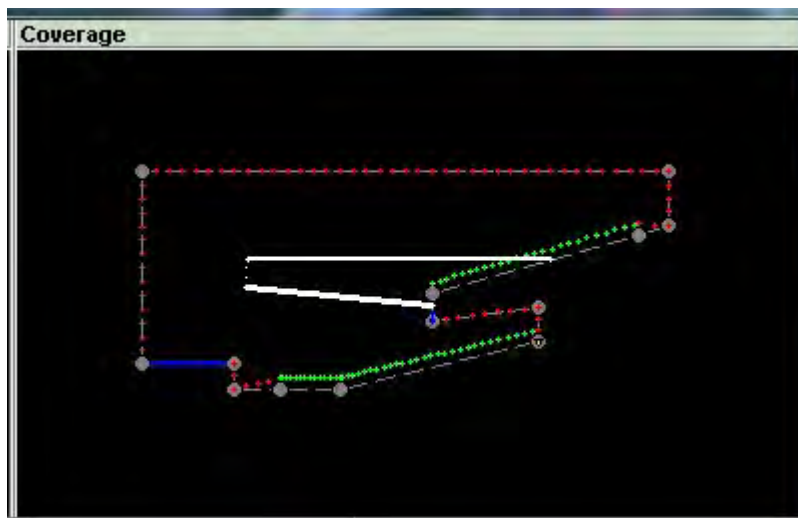
CURRENT ACOUSTIC OUTPUT

This shows an Index Plot of the system prior to the optimisation process.

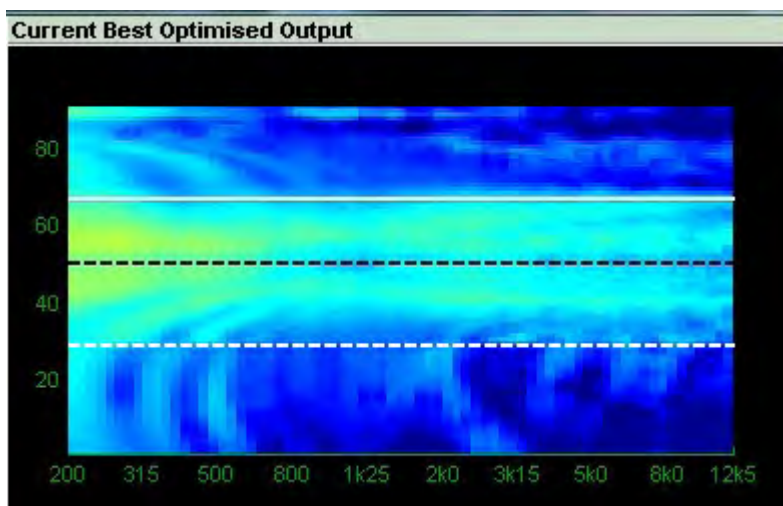


COVERAGE / CURRENT BEST OPTIMISED OUTPUT

Prior to starting the optimisation this shows the coverage diagram with the array shown with all angles at the default 0.5°. Note that the white lines from the top and bottom of the array are the acoustic centres of the top and bottom cabinets, NOT the furthest points of the coverage which will be 3.25° beyond the upper line and 3.25° lower than the bottom line for MLA or 10° lower if MLD are used at the bottom of the array. For MLA Compact and MLA Mini it will be 5° higher and 5° lower. The lines are not intended to show the vertical coverage, just where the array is actually mechanically pointing by default.

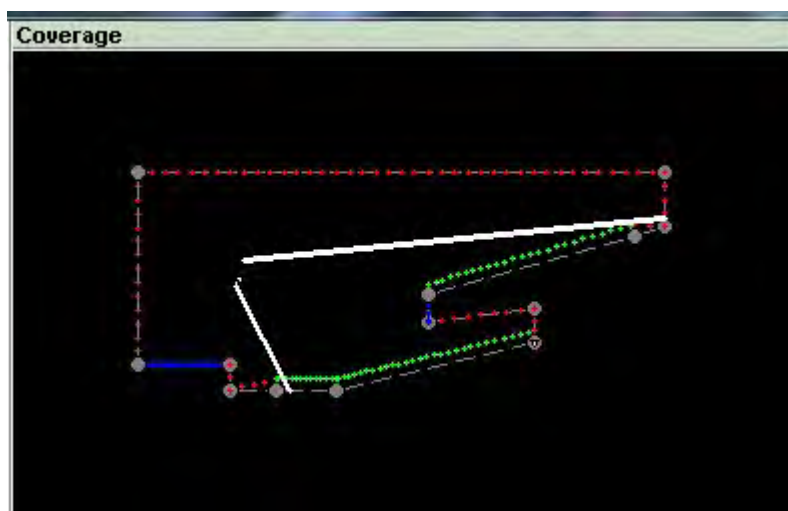


When you start the optimisation process which window switches to an index plot showing in real time the acoustic performance as different inter cabinet angles are tried:



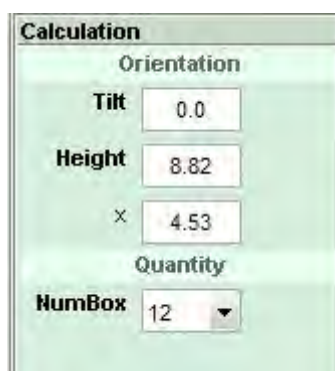
This gives you an instant comparison to the Current Acoustic Output; essentially a “before” and “after” to see how manually articulating the array has improved the coverage.

Once completed the window reverts to the coverage diagram showing the articulated array with the white lines from the centre of the upper and lower cabinets again showing where the acoustic centres are pointing:



CALCULATION

The Calculation section shows the physical orientation of the overall array. From here the number of boxes is defined and can be changed if for any reason the initial array size was incorrect. You have the option to change the number of cabinets. You can however only change the number to a quantity that is appropriate to the deployment method selected so a maximum of 6 for ground stacked MLA or MLA Compact, 8 for ground stacked MLA Mini 12 for MLA Mini flown with MSX.



The Calculation window is a green-themed dialog box with the following settings:

Orientation	
Tilt	0.0
Height	8.82
x	4.53
Quantity	
NumBox	12

The height to the top of the array and distance from the origin is also shown and can be edited to match the physical deployment of the system, very useful if for example it wasn't possible to fly the array exactly where you planned, perhaps the points couldn't be placed as high as you wanted.

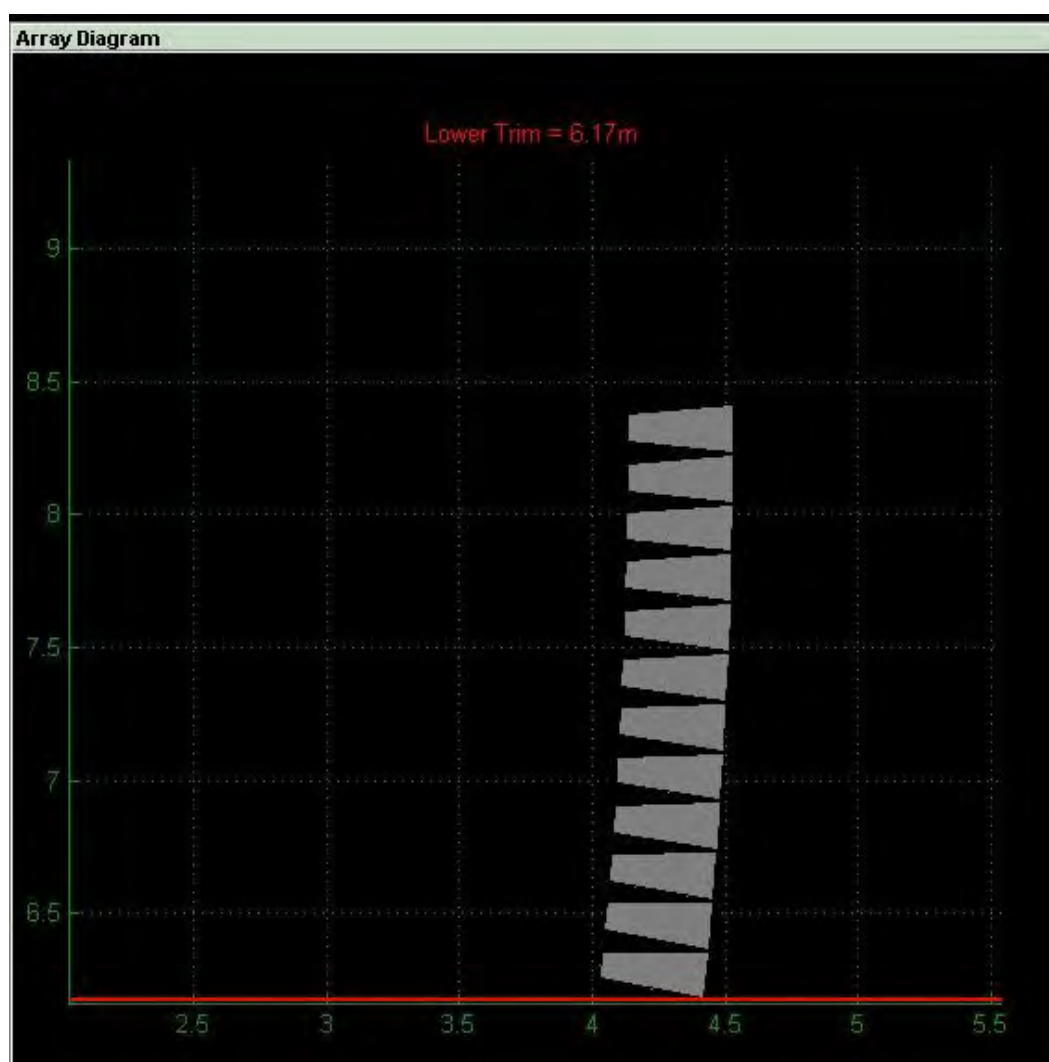
The tilt of the entire array is shown and will be automatically generated as part of the optimisation process. It is also possible to overwrite this if necessary to match the actual tilt of the array, given the resolution of most chain hoists it is frequently difficult to exactly match a given tilt angle even with front and back motors.

The number of enclosures can also be edited at this stage. Perhaps a cabinet has been damaged

in transit and won't physically attach to the array or perhaps you decide to add MLD cabinets to the bottom of an MLA array you can over-type the number shown to the maximum number allowed.

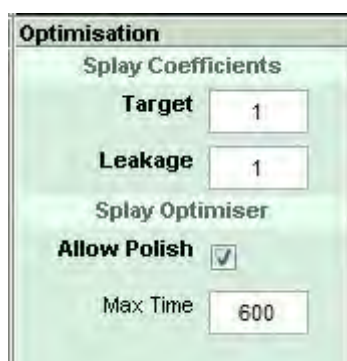
ARRAY DIAGRAM

The Array diagram shows a representation of the array and most importantly for flown arrays shows the lower trim point, the distance from the lowest point on the array to the ground. The diagram will adjust in real time when the optimisation is taking place and the lower trim will change accordingly. In most instances the lower trim at the start will be lower than when the optimisation is complete. This is because the array starting point is with an almost straight array with all angles at 0.5°, once the optimisation is complete some of the angles will inevitably be higher thus reducing the overall height of the array and raising the lower trim height.



OPTIMISATION

The Optimisation section is where the optimisation characteristics are defined. The splay coefficients determine the priority given to either the target response or the leakage. The actual numbers entered are not important, it is the ratio between them that determine how much priority is given to each coefficient so if you want the Target coefficient to be twice as important as Leakage you can enter '2' in Target and leave leakage as '1' or you could leave Target as '1' and change Leakage to '0.5' the result would be exactly the same.



Allow Polish lets the software take a second run at refining the inter-cabinet angles after it has completed the first pass. It re-starts the optimisation when it has completed the first attempt with the angles it has already calculated as a starting point and further refines them to get the best possible result. If you are in a rush you may want to disable this feature, particularly for very large arrays which may take some time to optimise.

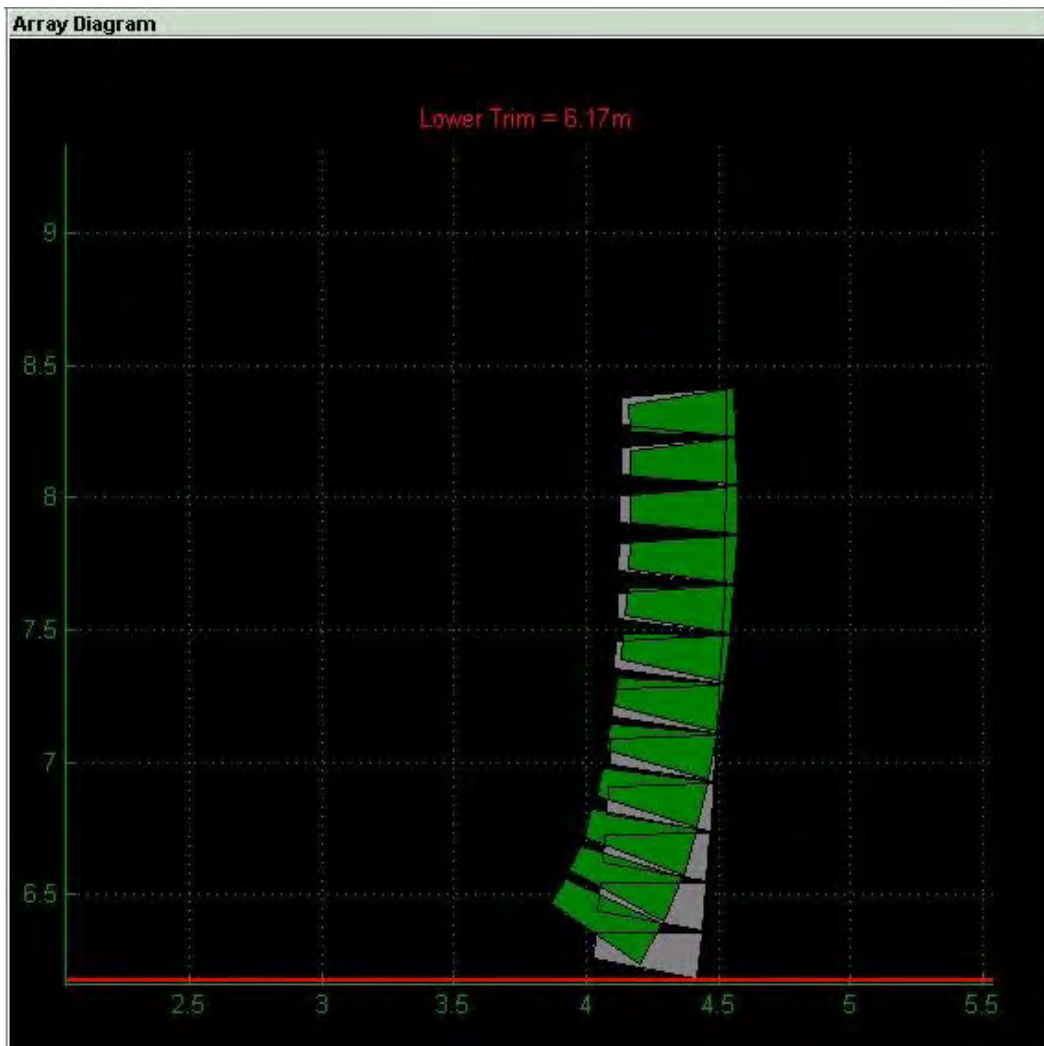
The Max Time is the time in seconds that the system will allow for the optimisation to run. For the vast majority of systems the default setting of 600 seconds (10 minutes) will be more than adequate, particularly when Display 2.2 is run on a high spec PC. With very large arrays in complex venues you may need to increase this time to get the best optimisation assuming you have the time at your disposal. If you don't have sufficient time the optimisation will time out and you will see a warning suggesting that you increase the Maximum Time. You can however, accept the angles it has calculated at any stage or even enter your own angles manually and the Equalisation optimisation will work from these angles albeit with a slight compromise on the system performance. Whilst some array angles may look strange to those used to working with conventional line arrays, always trust the software! Multicellular systems are NOT line arrays so don't try and use them in the same way.

Optimisation Progress

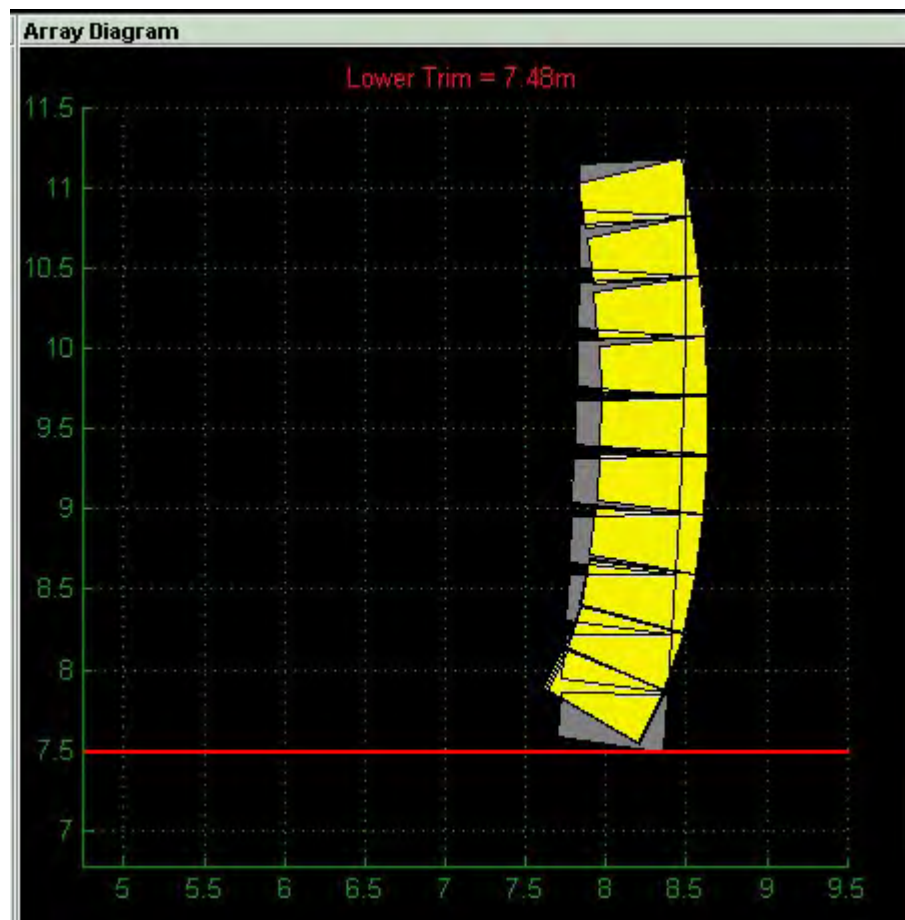
The Optimisation Progress shows the code trying all possible angles of the array cabinets in real time as the optimisation is running. This is simply a reference so you can see that the software is actually doing something!

Run the optimisation

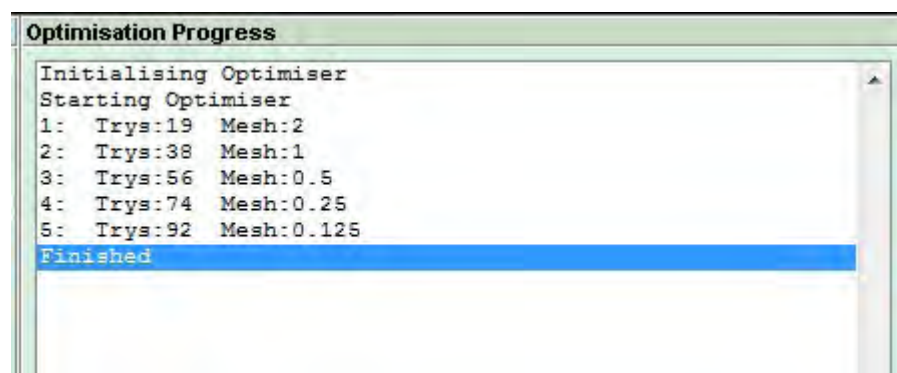
Click on the Optimise button and the system will run through all possibly array angle configurations. The drawing will show the array moving through the various positions and will be green:



When it has completed its first pass it will start again on its polish cycle if you have checked this option. The array will change colour to yellow. When the optimisation is finished you will see the array diagram with the array now stationary. The yellow polished version will be superimposed above the green un-polished version. The accurate lower trim height is also displayed:



In the Optimisation Progress you will see a list of code corresponding to all the attempts it has made to perfect the angles. At the bottom of the list it will display "Finished":



If you have de-selected the Auto Use Splay option in preferences, a new button will appear on the bottom right of the window:



If we click on 'Use' the angles calculated will be imposed onto the Splay Angles list. With the Auto Use Splay enabled we will see the calculated angles immediately applied to the array. Here we see a "before" and "after":

	Type	Angle
1	MLM	Aim ▼
2	MLM	0.5 ▼
3	MLM	0.5 ▼
4	MLM	0.5 ▼
5	MLM	0.5 ▼
6	MLM	0.5 ▼
7	MLM	0.5 ▼
8	MLM	0.5 ▼
9	MLM	0.5 ▼
10	MLM	0.5 ▼
11	MLM	0.5 ▼
12	MLM	0.5 ▼

	Type	Angle
1	MLM	Aim ▼
2	MLM	0.5 ▼
3	MLM	2 ▼
4	MLM	2 ▼
5	MLM	2 ▼
6	MLM	2 ▼
7	MLM	4 ▼
8	MLM	4 ▼
9	MLM	6.5 ▼
10	MLM	10 ▼
11	MLM	10 ▼
12	MLM	10 ▼

We also have the Calculation window showing the complete mechanical articulation of the array including the array tilt:

Calculation

Orientation

Tilt

Height

×

Quantity

NumBox

The tilt figure is reasonably logical; a positive figure means the array is tilting up at the top, a negative figure means the array is tilting down. The touring array grids feature an integral inclinometer system so these figures can be matched when the system is flow.

One major advantage of the MLA family of systems optimised with D2.2 is that real-world figures for the rigging can be entered if they don't actually exactly match what the system has recommended. If for example there are constraints on the curvature of the array you can click on the down arrow for each of the intercabinet angles you need to change and select the angle you would like to use from the drop down. It is always best to accept the splay optimisation results wherever possible (always trust the software!) but there will always be a few venues where there are physical limitations on exactly how you can deploy the system.

Likewise with the enclosure quantities and orientation. Most common is perhaps array height; it is very common for flying points to end up lower than you have originally been told. It is vital to make any changes in Display 2.2 to match as closely as possible the actual physical deployment of the system. The EQ optimisation will use the data on this page regardless whether it was entered automatically by the splay optimisation or manually by you. Simply overwrite the number for tilt, height, 'x' position or box quantities and press enter. If the number entered is a valid entry the box will briefly flash green and your new value will be displayed. If you enter an invalid number, for example if you try and enter more than 16 MLA Mini, the box will briefly flash red and will default to the maximum value.

We have completed the Splay optimisation so can click 'Done' to close the window and move to the next stage.

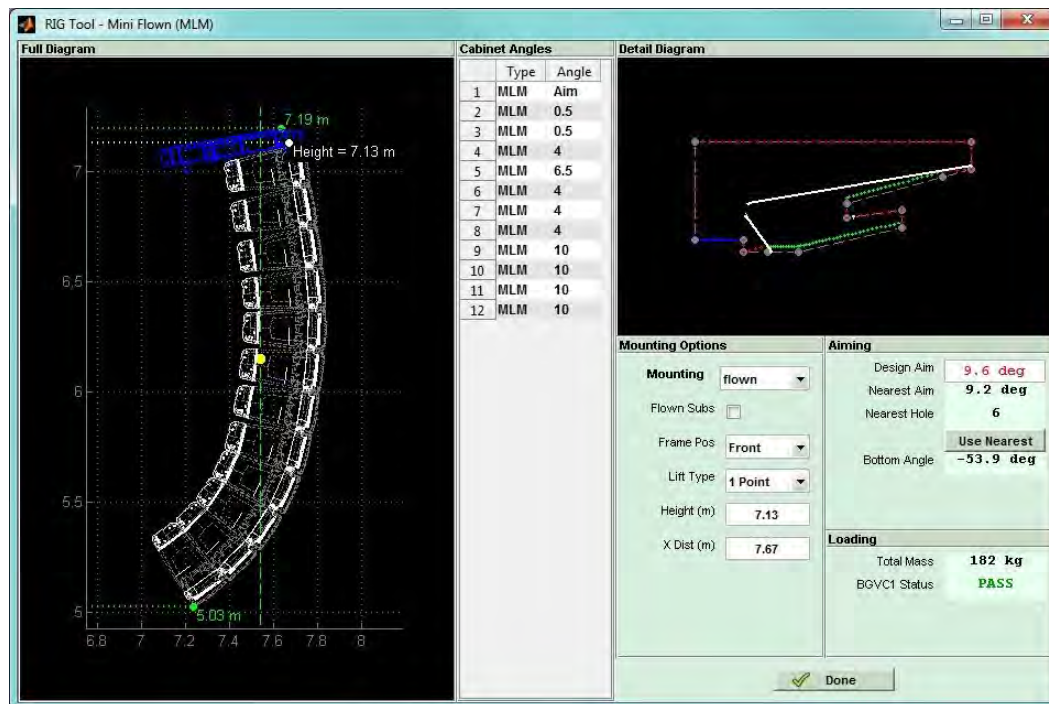
RIG TAB

The rigging tab displays all the mechanical information required for rigging a system including the array height, lower trim, mass and all splay angles.

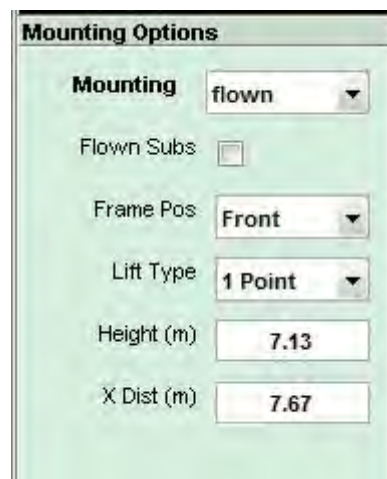
MLA Mini has several deployment option for both flown and ground stacked systems. This changes the options and information in the rigging panel.

FLOWN SYSTEM

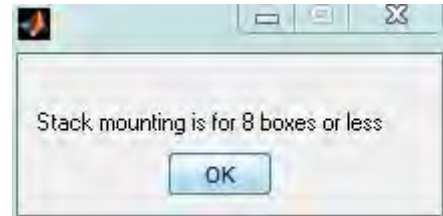
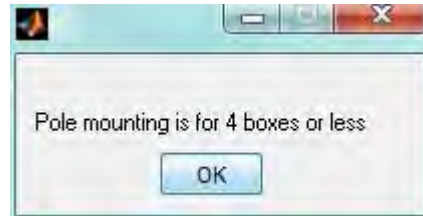
The Window for a flown MLA mini system appears like this:



If we look first at the Mounting panel we have a number of options:

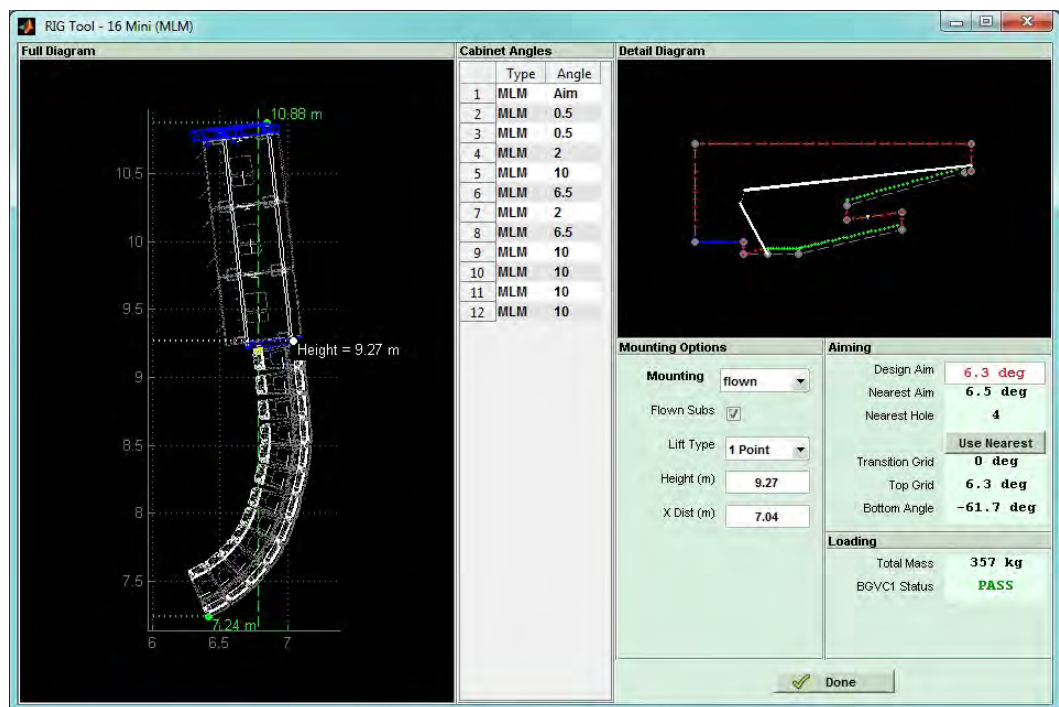


First we have the 'Mounting' drop-down which gives us the option of flown, stacked or pole mount. Availability of these modes is dependent on the number of boxes. Flown can be the full complement of 16, ground stacked up to 8 and pole mount up to 4. As the array in the example has 12 enclosures we cannot select stacked or pole mount, if we try we will see the following windows:



Next we have the option to fly the MSX subs with the arrays if this wasn't selected when the array was initially added to the project. This again has the limitation that it is only available for up to 12 enclosures, if the array is more than 12 cabinets the flown subs option will not appear.

Here is the system above with flown subs:



You can select 1 or 2 point hangs, even with the maximum flown MLA Mini, either 16 alone or 12 with 3 MSX, they will still be within BGVC1 limits from a single point. 2 point does of course give you the flexibility of trimming the array angle by fine adjustment of one or other hoists.

The Aiming panel shows the array design angle and what is achievable with the nearest hole on the flying grid:

Aiming	
Design Aim	6.3 deg
Nearest Aim	6.5 deg
Nearest Hole	4
	Use Nearest
Transition Grid	0 deg
Top Grid	6.3 deg
Bottom Angle	-61.7 deg

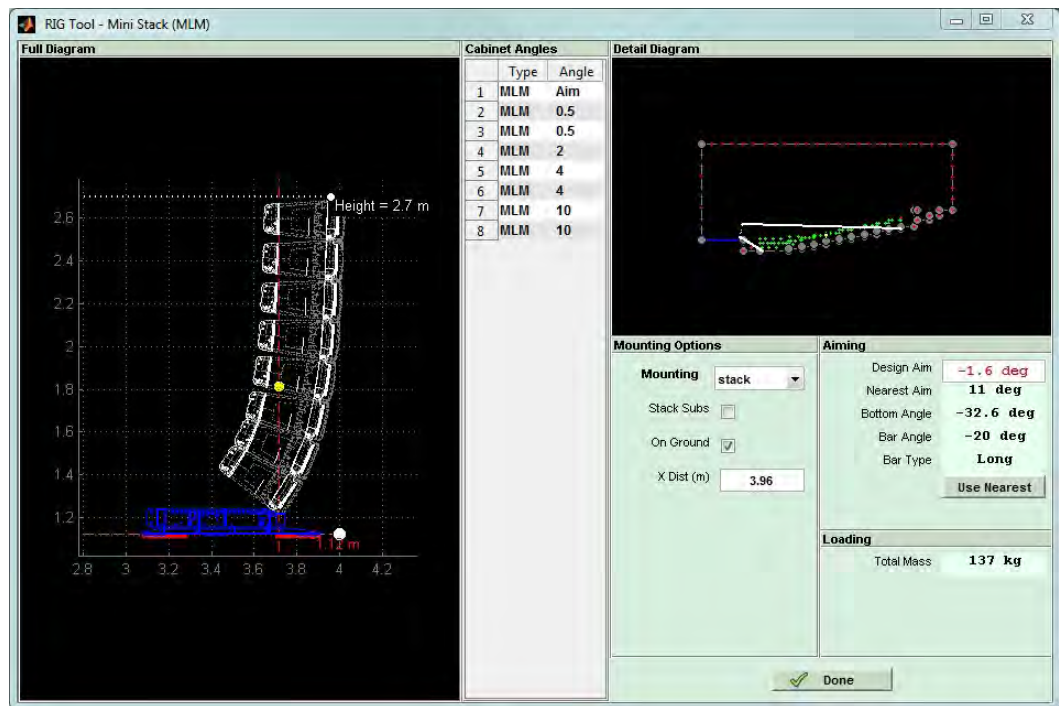
Again by clicking on 'Use Nearest' the Design Aim will change to match the available angle and will turn green:

Aiming	
Design Aim	6.5 deg
Nearest Aim	6.5 deg
Nearest Hole	4
Transition Grid	0 deg
Top Grid	6.5 deg
Bottom Angle	-61.5 deg

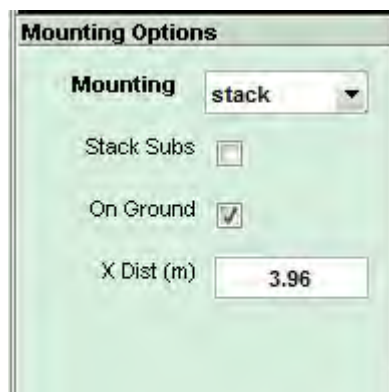
Note that there are two angles that need to be defined when flying with MSX subs. The main array angle set by using the appropriate hole in the flying grid, and the angle between the MSX and the MLA Mini which is set using the rear rigging bracket on the MLA Mini Transition frame. There are three positions, the angle will be shown in the aiming panel. The example above is zero degrees but Display will attempt to keep the MSX subs as close to horizontal as possible so will add the additional tilt that may be required by using the extra angles that are available from the transition frame.

GROUND STACKING

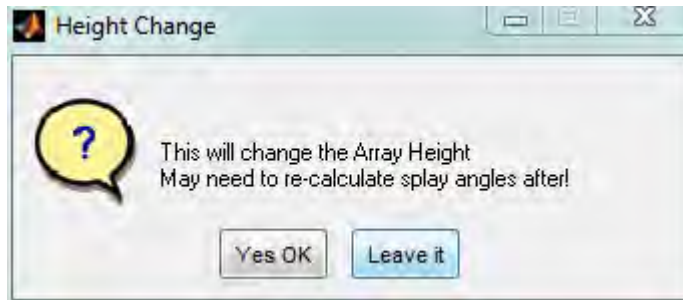
Here we see an eight box MLA Mini ground stack:



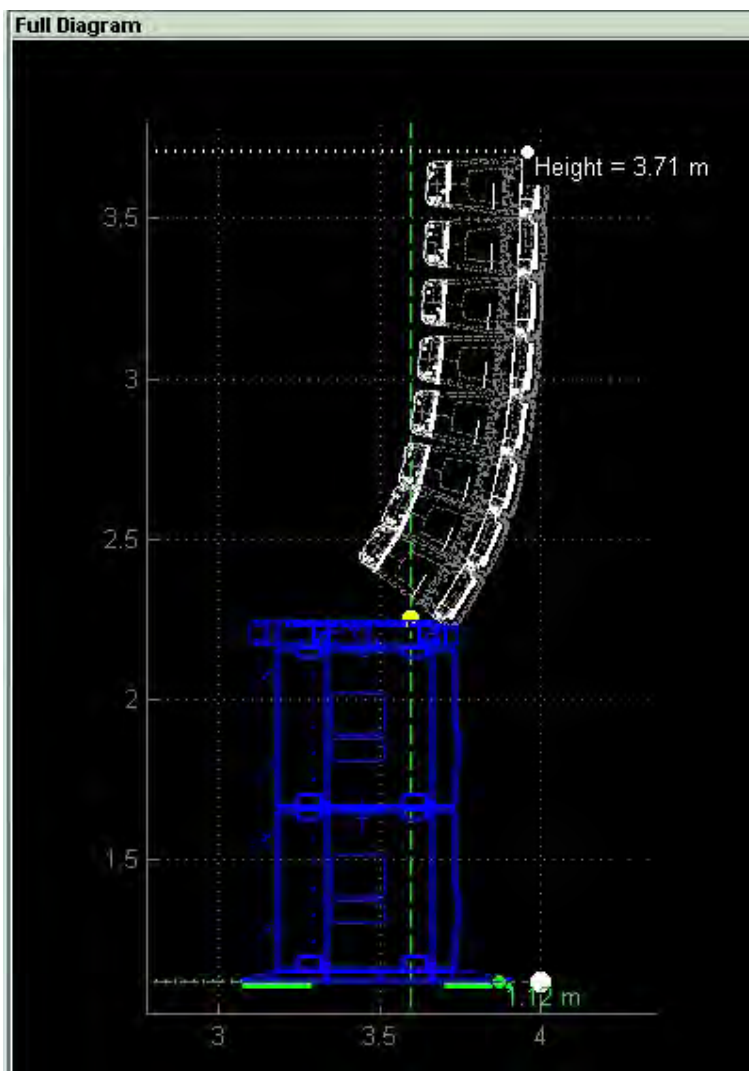
The principal difference with MLA Mini is in the Mounting Options:



We now have the option to stack on top of the subs. This option will add the MSX subs below the array, a single sub for 1 to 4 cabinets and two MSX for 5 to 8 cabinets. This will naturally change the height of the array so you will see this window to prompt you to recalculate splay angles in the splay Tab.



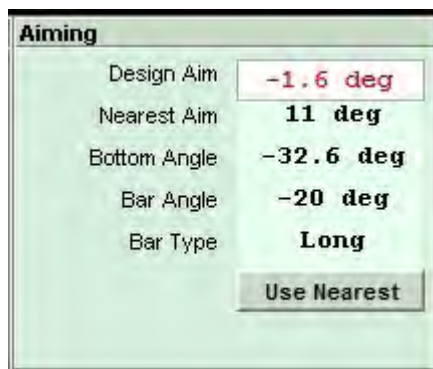
The Array Diagram will update to show the Subs:



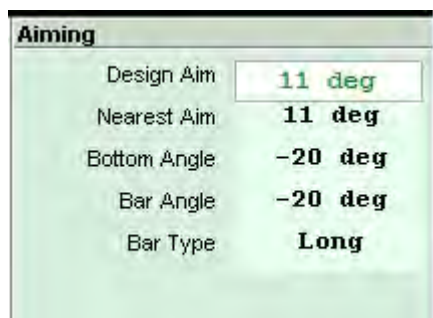
If the array is not already locked to the ground using the option in the Slice tab, you can select it here:



As this may change the array height you will see the same pop-up window prompting you to re-calculate splay angles.



Display will calculate the closest angle available using the ground stack bar and if this doesn't match the Design aim it will be displayed in red with the option to 'Use Nearest'. Once again this option will change the Design angle to match the actual angle of the array so the EQ optimisation will be based on exactly where how the array is angled:



There are two types of ground stack bar, a long and a short. For ground stack arrays which require a down-tilt on the bottom enclosure the long bar is used as in the above example, for array which require an up-tilt the short bar is used:



The screenshot shows a software interface titled "Aiming". It contains several input fields and a button. The "Design Aim" field is highlighted in red and contains the text "15 deg". The "Nearest Aim" field contains "15.5 deg". The "Bottom Angle" field contains "3.5 deg". The "Bar Angle" field contains "4 deg". The "Bar Type" field contains "Short". At the bottom right of the panel is a button labeled "Use Nearest".

Field	Value
Design Aim	15 deg
Nearest Aim	15.5 deg
Bottom Angle	3.5 deg
Bar Angle	4 deg
Bar Type	Short

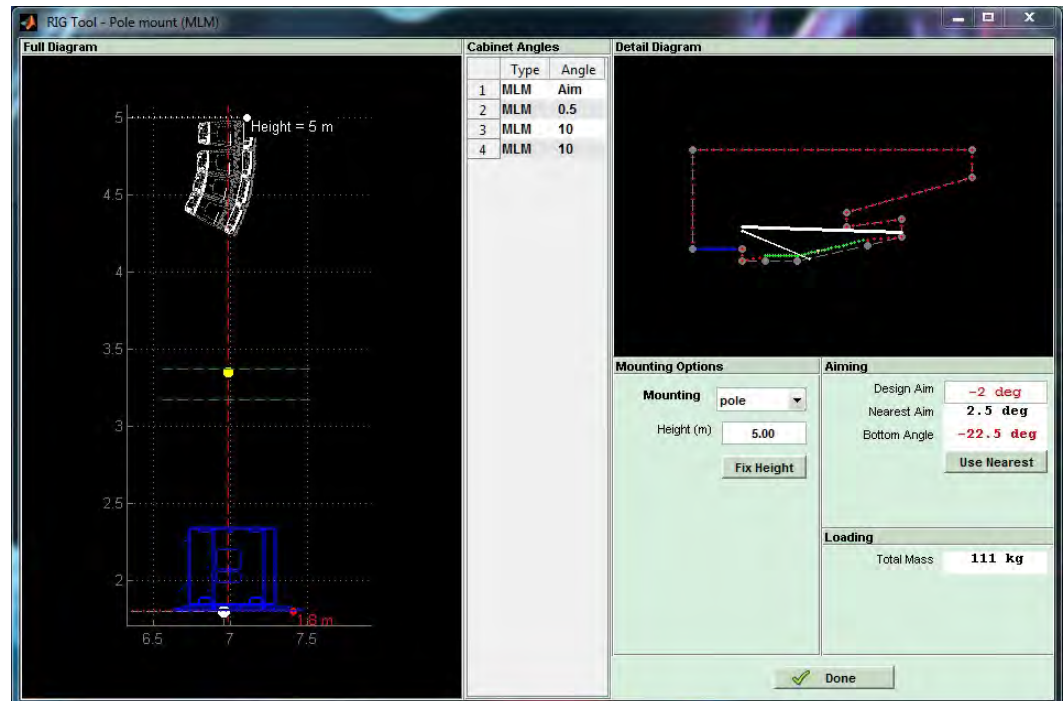
Use Nearest

The ground stack bars are labelled with the angles that they can produce so that is shown in the Aiming panel rather than which particular holes in the bar and cabinet to use.

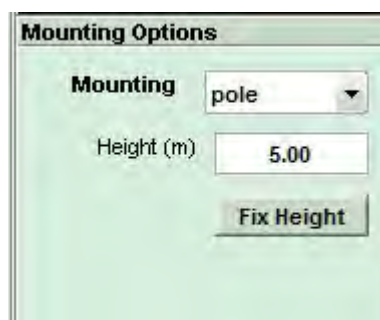
POLE MOUNT

The final option for rigging is pole mount available for two to four MLA Mini on top of a single MSX using the ASF20071 wind-up distance pole which is supplied with either the fixed or adjustable pole mount assemblies or can be purchased as an accessory and used with the MLA Mini Universal Bracket (ASF20051) and the Pole Mount Adaptor (ASF20045).

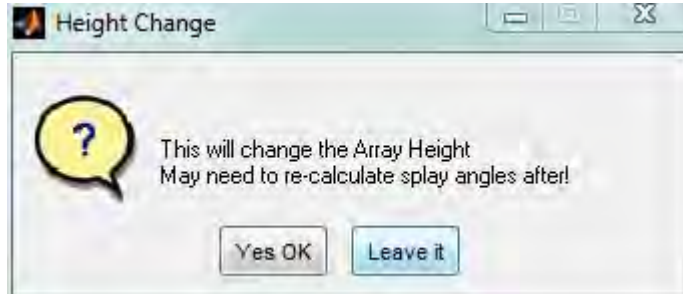
Here is an initial Rig Tool Window for a pole mount system following a 4 cabinet optimisation:



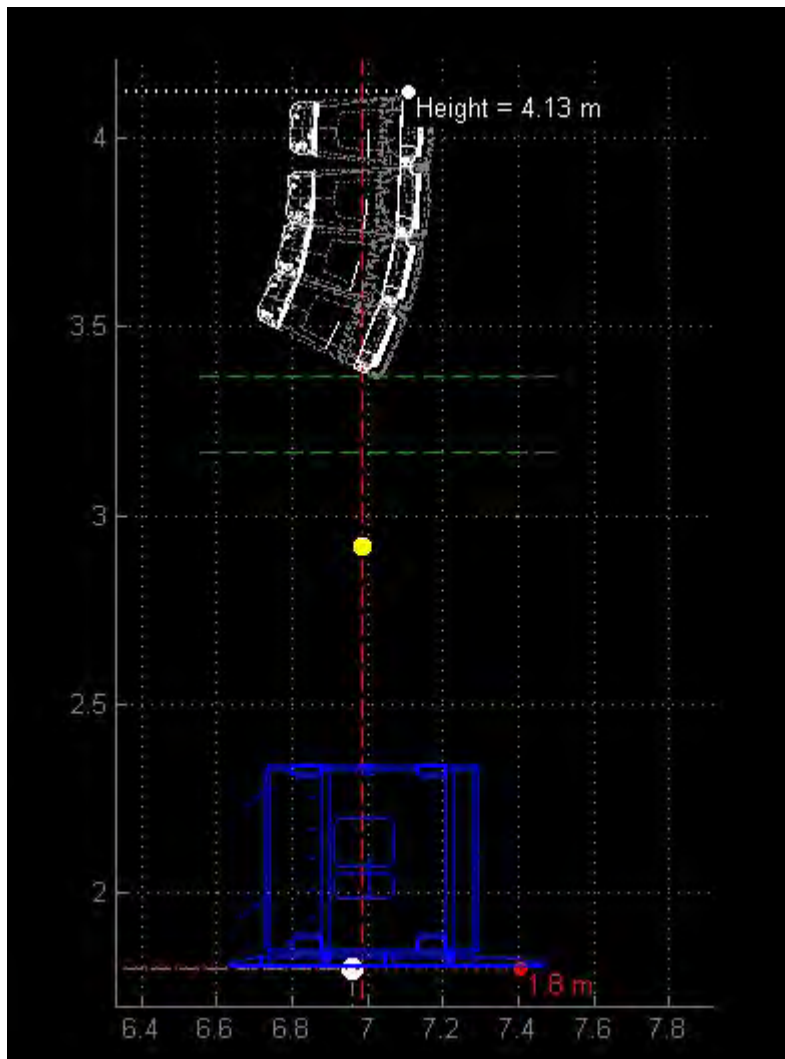
We can see that the array is far too high to fit on the standard pole so the first job is to correct the height to something that is usable in the real world. This is provided for pole mount deployment by the 'Fix Height' button:



Clicking this will lower the array, again showing the warning pop-up that the array height will change:



The array is now at a sensible height above the MSX:



Note that the array height displayed is the height from the ground NOT above the MSX. You can see that the MSX is at 1.8m, perhaps on a stage so the top trim of the array is at $4.13 - 1.8 = 2.33\text{m}$ above the surface on which the MSX is placed.

The next issue is the array angle. The Universal bracket allows for a tilt from 0 to -18° (18° down) if the optimisation has created an angle greater than -18° the angle will be displayed in red with the option to 'Use Nearest':



By clicking 'Use Nearest' the angle will revert to -18° the array diagram will update and the design aim will update and turn green:



The same applies in the unlikely event of the optimisation arriving at an array angle that requires the bottom cabinet to have an angle greater than 0° , an up-tilt in other words:



Clicking on 'Use Nearest' will change the Bottom angle to zero and update the diagram and Design Aim:

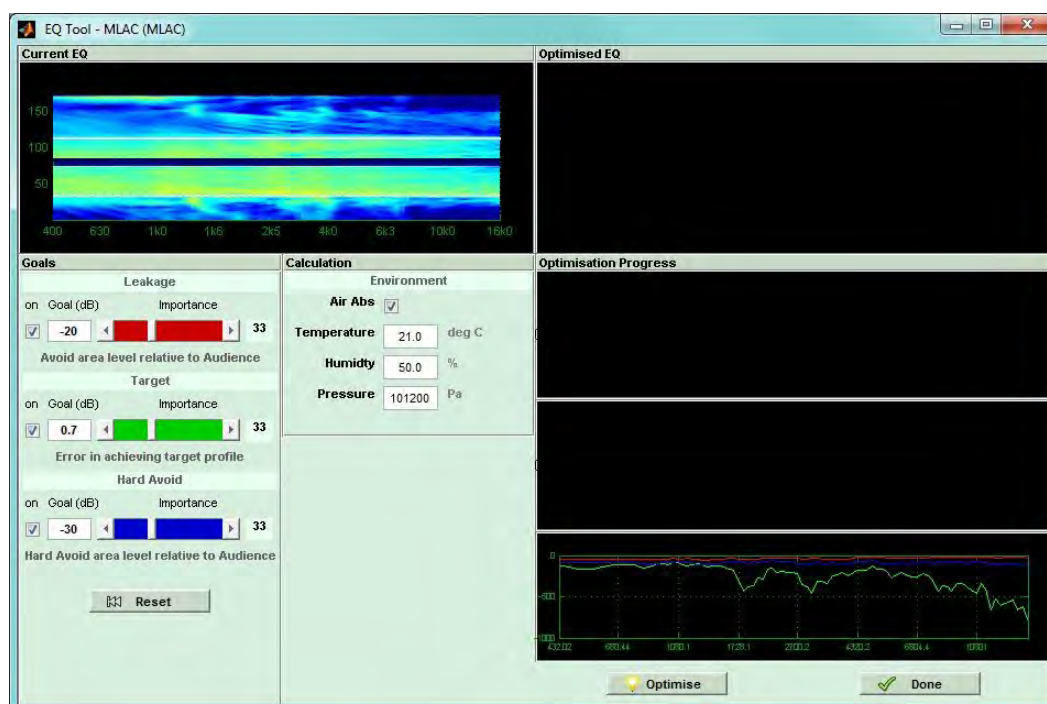


Once you have finished with the Rig Tool, click 'Done' to close the window so you can advance to the Equalisation optimisation using the EQ tab.

EQ TAB

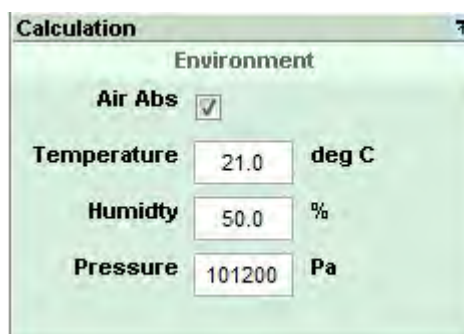
The EQ tab is where we make the decision on how we want the system to perform. In a perfect world we could get the system to achieve an even coverage over the audience area with absolutely no spill whatsoever outside of this. Of course the laws of physics dictate that this is impossible to achieve even with the colossal processing power available in a multicellular system. We therefore have to balance our requirements between the three principal objective functions; our audience target, the spill into non audience areas and spill onto areas defined as hard avoid.

This is the EQ Window:



The Current EQ section shows the system response that we saw when we had finished the splay optimisation. The blank windows to the right will show the Optimised response as the optimisation is taking place.

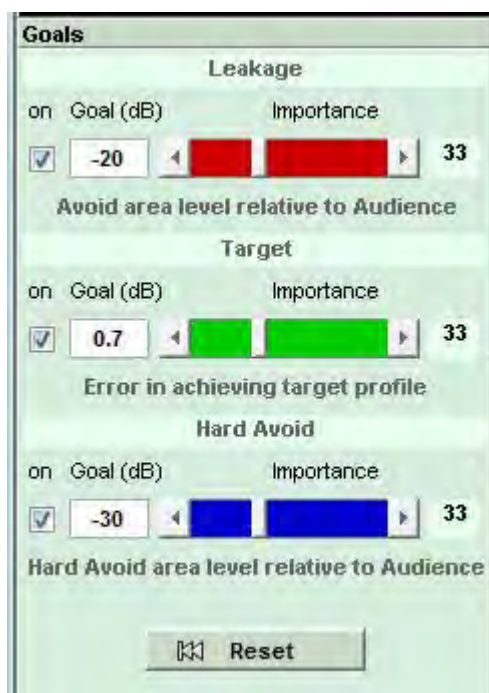
AIR ABSORPTION



The Environment window allows you to activate the air absorption system which will compensate for the environmental conditions in the same way as the system did for the splay angles. The temperature, humidity and pressure can be entered into this window.

GOALS

The Goals section is the critical point where we activate and set the values and balance of goals for the EQ optimisation.



The three goals are Leakage, Target and Hard Avoid. The relative balance for each of these is controlled by the horizontal faders with the numeric percentage value of each showing to the right. The default starting position is each with equal importance so a level of 33% for all three (yes that equals 99% not 100, get over it...).

Leakage is the spill onto non-audience areas the importance slider is coloured red to match the red non-audience planes in the Coverage tab. It can be deactivated by un-checking the 'on' box. The default value is 20 which means that the system will attempt to achieve a level at least 20dB below the audience level.

Target controls the audience level, as with the other goals it can be deactivated. The option is primarily there for consistency, it would be highly unusual not to want to optimise the audience area but not impossible, for example, if you had an area off site where it was crucial to keep levels to an absolute minimum you would make the area hard avoid and give maximum priority to the Hard Avoid goal by deactivating Leakage and Target. Target is shown with a green slider also to match the green audience region in the Coverage tab. The goal figure is 0.7dB by default so the optimisation will attempt to match the magnitude contour set in the Coverage Tab to within 0.5dB.

Hard Avoid also has an 'on' check box and a blue importance slider. The default Goal is 30dB lower than the audience level for any plane selected as hard avoid.

The importance sliders allow you to set the relative importance of each of the three goals, two if you have one of the goals switched off. If you have two switched off the fader for the remaining function will automatically go to 100% and will no longer be adjustable. If you attempt to switch

off all three goals the system will automatically turn Target back on (see, it's not so easy to break it!). When you adjust any of the three sliders, the other two will automatically compensate for example if you move target to the right towards the maximum, both Leakage and Hard Avoid will move down. If you think in percentage terms, all three start with equal precedence at 33%. If you move Target up to say 70%, Leakage and Hard Avoid will decrease equally to 15%. Now if we move Hard Avoid up to 35% both Leakage and Target will move down an equal amount from their previous position so will end up at 5% and 60%. The actual figures are not particularly vital, what the sliders give you is a quick, easy way of balancing the relative importance of the three goals to achieve the results you want at a glance. There is a reset function which will turn on all three goals and return all three faders to the default, 33% position. It will not however reset the figures for the goals, if you have changed these you will need to change them back manually.

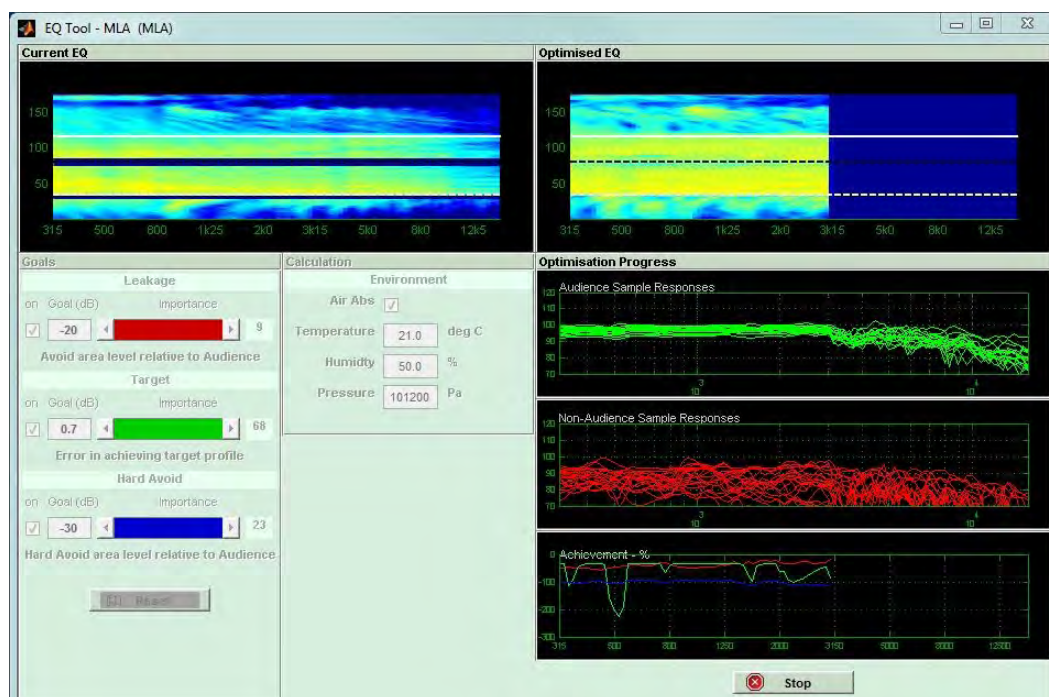
To show the optimisation results, we have set the faders as follows:



We have given the target the greatest importance, hard avoid comes second with little importance to leakage. We want to get the best coverage for our audience whilst minimising sound on stage and reflections from the balcony. The rest of our venue is not too reverberant so we are not too concerned about spill onto non audience areas.

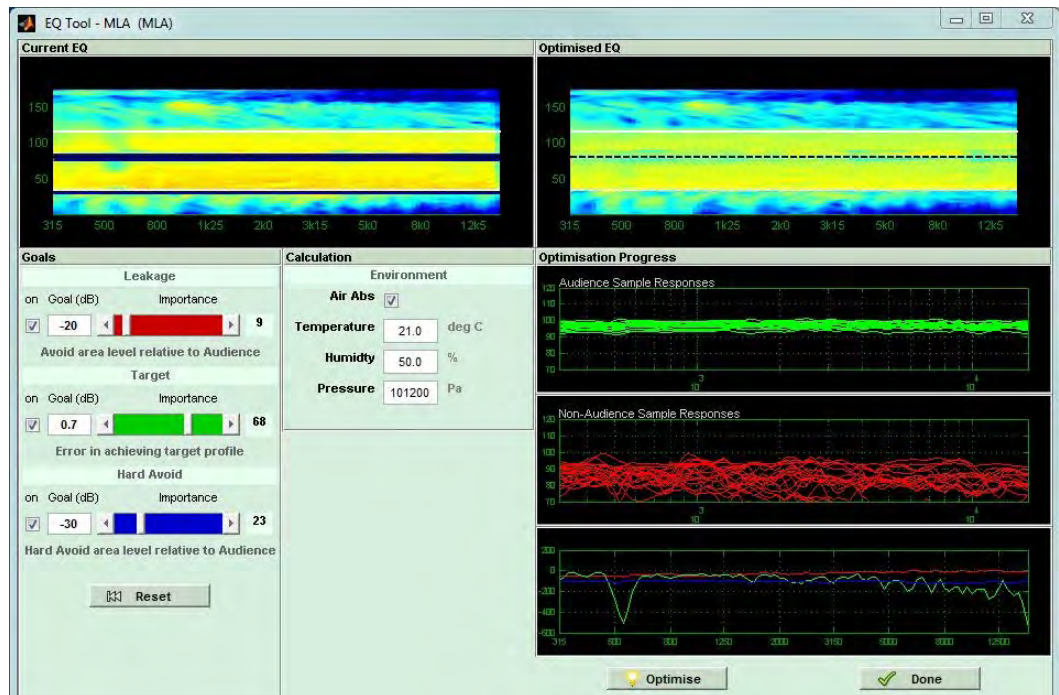
OPTIMISE EQ'S

Once we are happy with the goals we have set we can start the optimisation process by clicking the Optimise button;



The Optimisation starts with low frequencies and moves up, displaying the result on the upper index plot as well as showing plots for the response in the audience and non audience areas. As we have given the audience a high priority we can see the individual measurement points previously wildly varied, starting to cluster much closer together. We have requested a start to finish differential of +/- 3dB and the spread of magnitude certainly looks close to 6dB. The non-audience plot shows that the response is still quite varied which is expected as it was low priority on our goals setting. The lowest plot shows how close to the requested goal each of the three parameters has got to as a percentage. The levels closely match the relative importance that was allocated to each of the three objective functions, target in green is close to 100%, hard avoid in blue hovering around 80% and non-audience around the 50% mark.

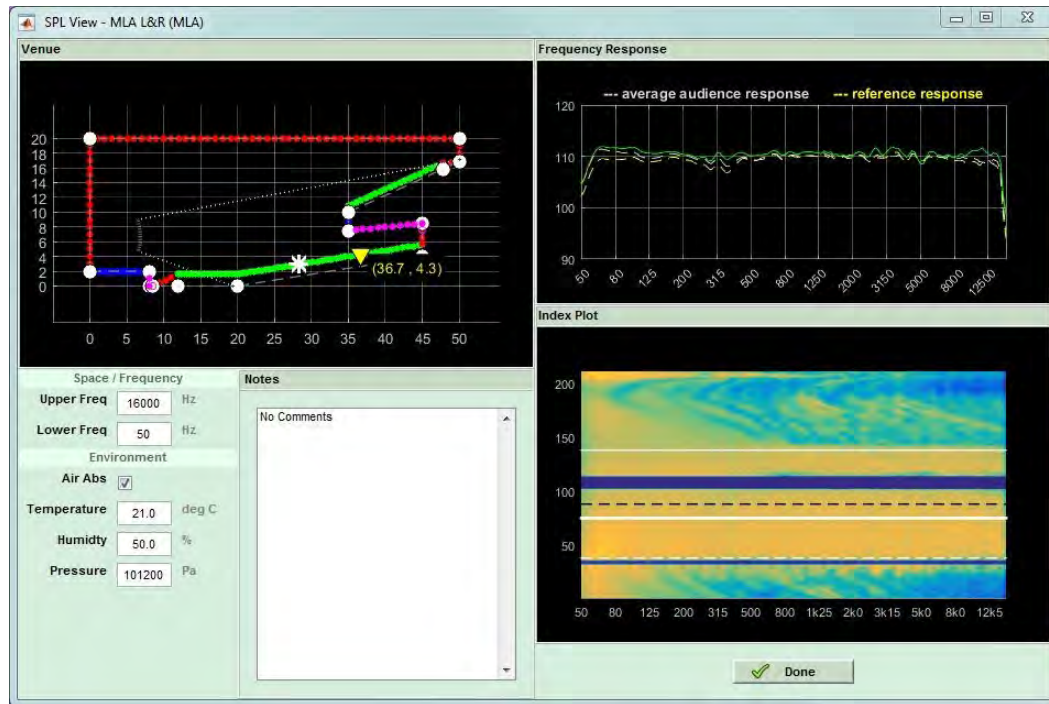
Here is the finished optimisation:



This looks like a very good achievement with an even block of orange over the audience region and a decent band of blue both on stage and where the balcony front is. If we are not happy with the optimisation we can go back and change some of the objective functions and click Optimise again. If you are happy with the results click 'Use' which will store the EQ files ready for export then click done and we can look at the result in more detail.

VIEW THE SPL

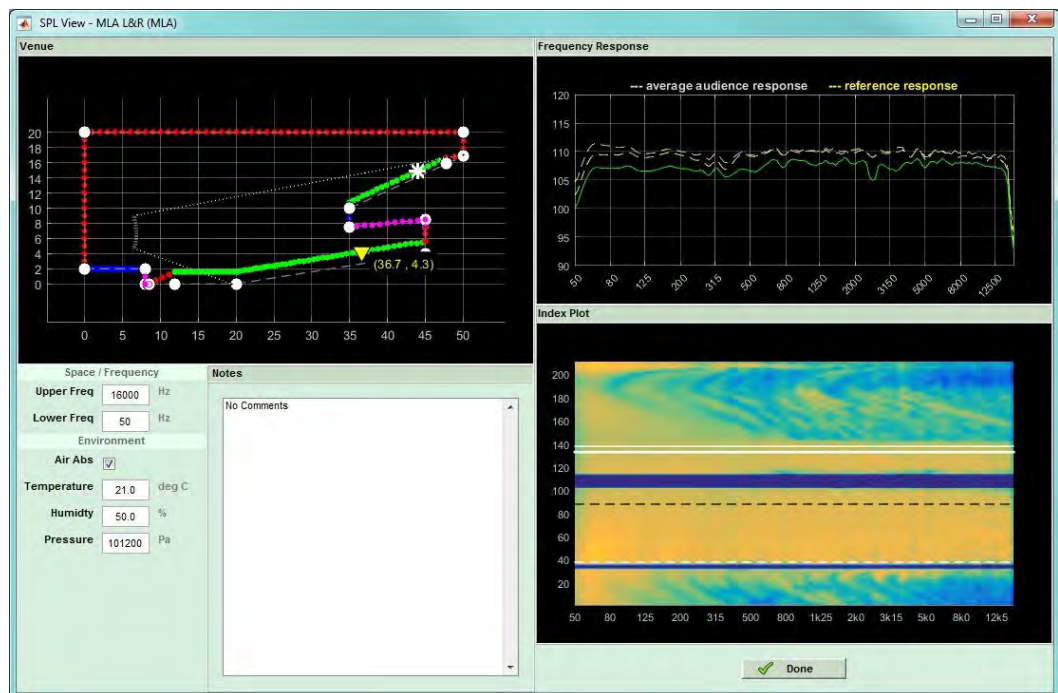
The final tab is the SPL View which gives us the opportunity to view the optimised result in more detail. Here is our test venue:



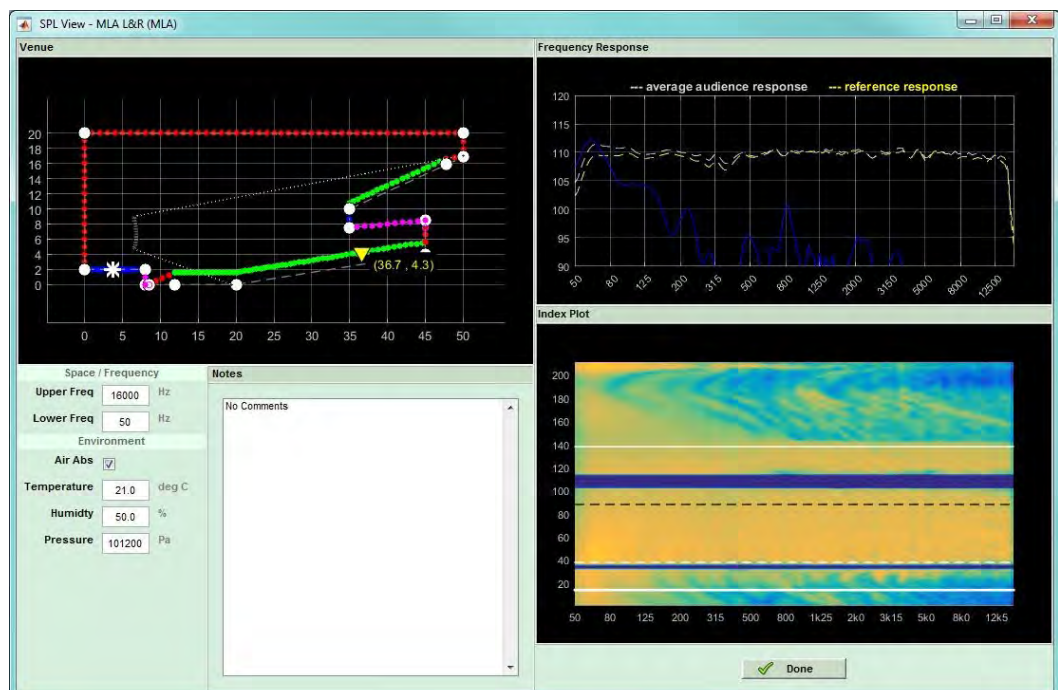
On the top left we see our coverage slice, the bottom right is the index plot and the top right shows the frequency where our cursor is placed on the index plot which will show green when the cursor is over an audience area, red when it is over a non-audience area and blue when over a hard avoid area. The response at the reference position is also shown as a dashed yellow line and the average response over the entire audience region as a dashed white line.

The cursor is shown as a thicker white line on the Index plot. The cursor position is also shown on the venue slice as a white asterisk. As you move your cursor position on the index plot the white asterisk moves on the Venue diagram and the frequency response plot updates instantaneously.

The performance looks very good, even lower frequencies are looking remarkably consistent benefitting from the LF optimisation in version 2.2. Let's take a look at the results in other positions:

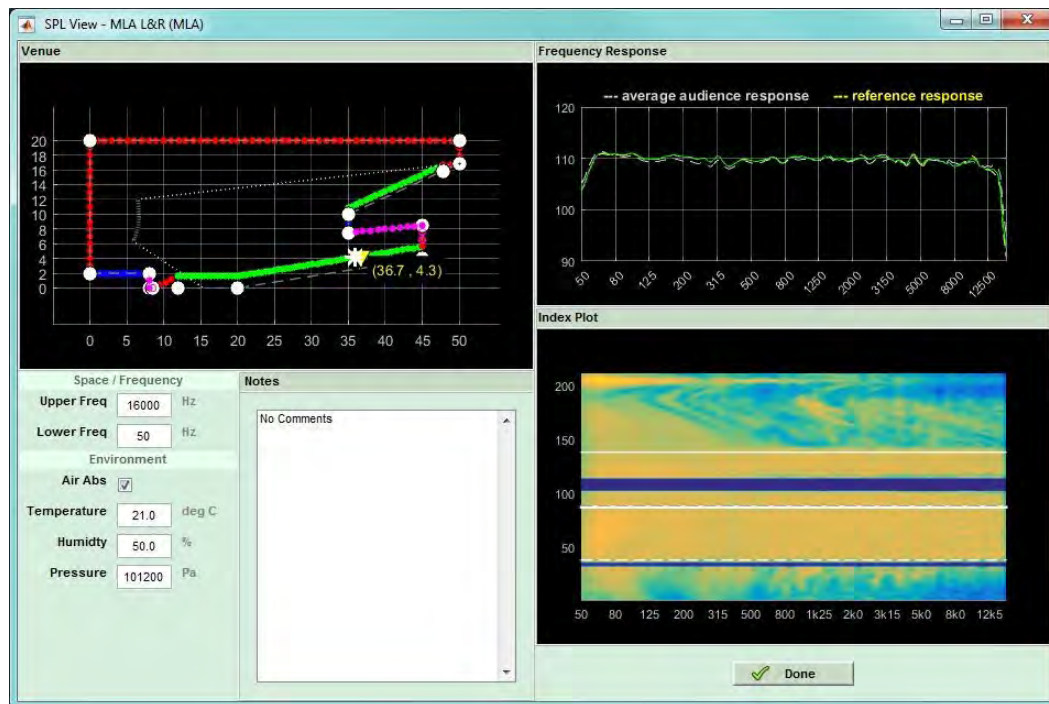


Here we see the response right at the back of the balcony which is still quite astonishingly flat. We can be very satisfied that we have achieved an extremely good even coverage for all audience members in this venue. It is also worth taking a look at how well we have avoided the stage:



This shows the response on stage and the hard avoid here has done an astonishing job of reducing levels on stage, the attenuation is dramatic, it is fair to say that the array will be almost inaudible on stage.

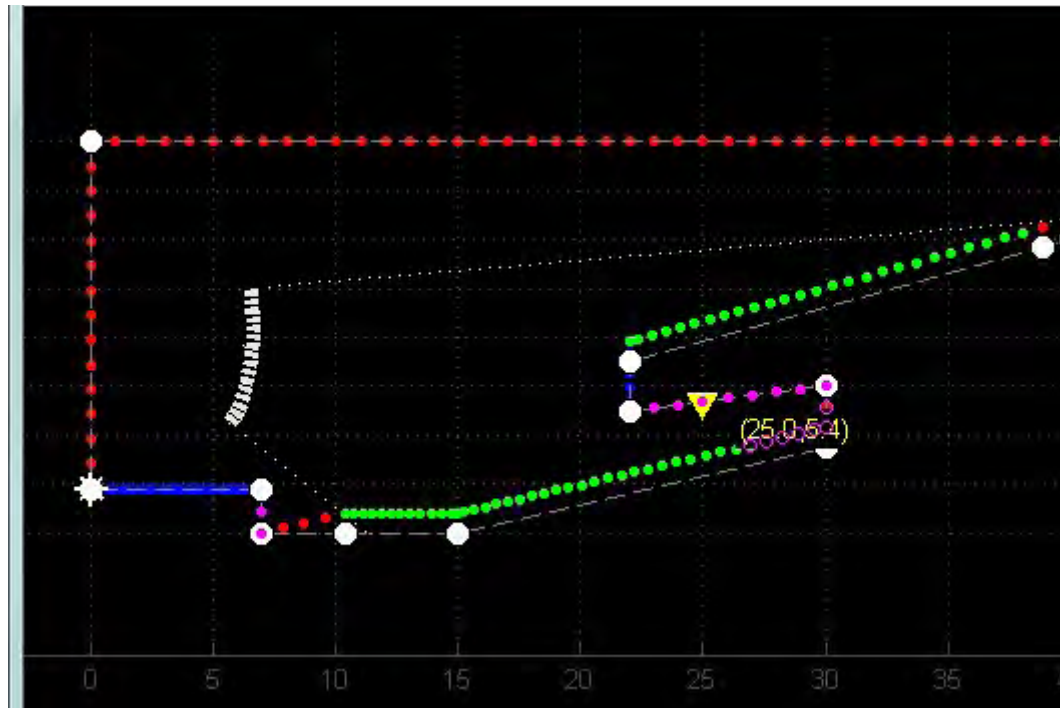
A ten box system is actually a little bit of a stretch for this venue so here is the optimisation shown in the chapter on index plots with a 16 box system, first optimised purely for the target ignoring non-audience and hard avoid. The SPL profile has been set to 0dB from audience start to finish:



As you can see, the response right to the back of the balcony is incredibly flat across virtually the entire frequency spectrum at every position in the audience region. The even “block” of colour is close to the perfect response that we saw in the index plot description. The fact that this is possible in the real world shows exactly how powerful a multicellular system in tandem with Display 2.2 can be. Not forgetting that these optimised predictions will be within +/- 1dB of measurable results given the accuracy of the computer model.

Many of the graphical views produced in Display 2 can be opened in an independent floating Window and the file saved as a file. This includes the following views:

The Window can be very useful for comparing graphs from different optimisations, storing them for future use or looking at them in more detail. The window is opened by right clicking on the horizontal or vertical scale in any of the views listed above, this is an example of a Venue Diagram from the Coverage Tab:



The Window has the following menu bar which is the same regardless of which view is opened:



This offers a host of extra functions for further manipulation of the graph. The first icon is for creating a new figure as they are referred to, this obviously has little use within Display 2:



Next you have the option for opening a file, this would be used for opening a figure you have saved previously.



The save function allows you to store the current figure in a file location of your choice. Navigate to a suitable location, the name will default to a highlighted “untitled” prompting you to give it an appropriate name before clicking ‘Save’ to store the file.



Print will open the Print dialog for your default printer.



The zoom function, as you would expect the + allows zooming in, click on the + symbol then click on the graph and you will zoom in 100% (double the original size), further clicks will zoom in by another 100%. Clicking on the – has the reverse affect, each click will reduce the size by half (-100%). A more useful zoom function is available using click and hold. This function is available by selecting either the + or – zoom buttons. If you click and hold and move the mouse forward you will gradually zoom in, move the mouse backward you will zoom out.



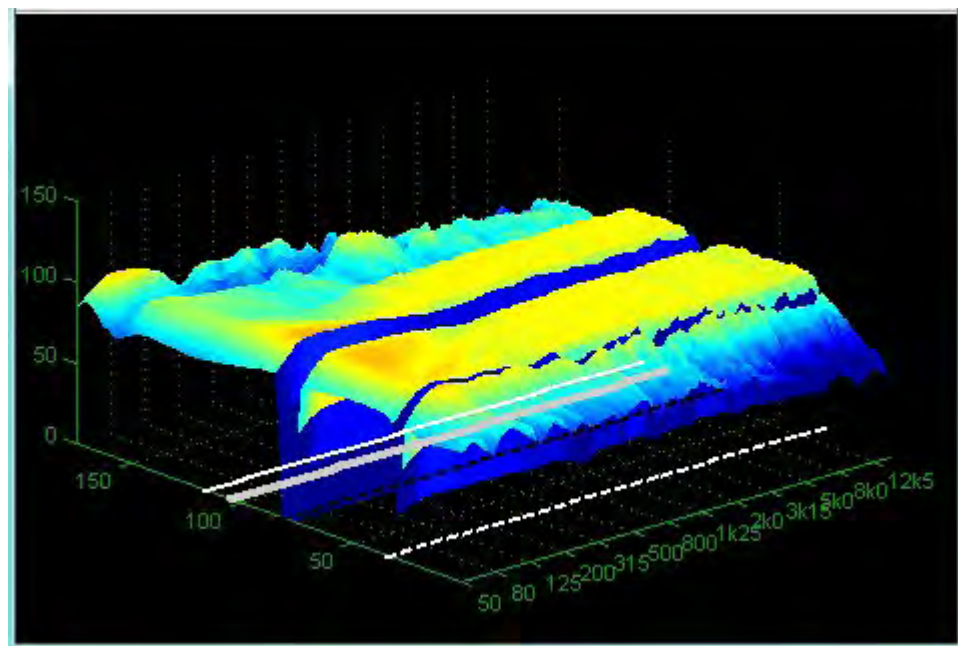
The Pan icon allows you to click and drag the graph to a new position, useful for examining areas of the graph once it has been enlarged using the zoom command.



The Rotate 3D command is extremely powerful for certain types of graph. In particular an Index plot quite literally has an extra dimension when viewed using this command.



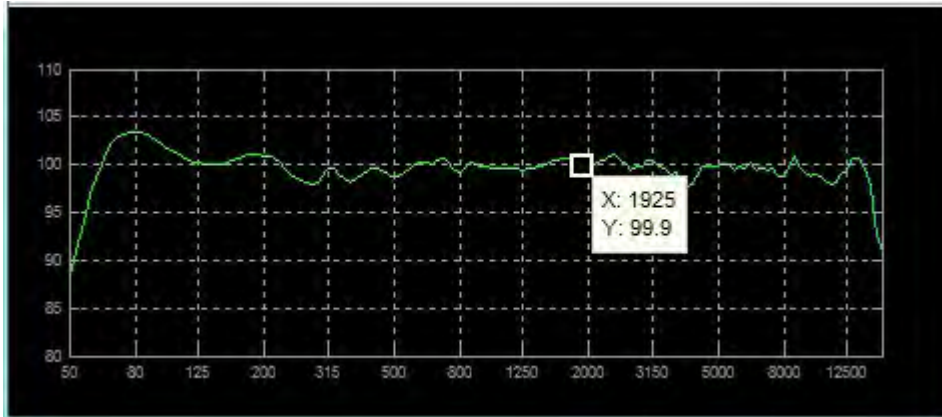
By clicking on the graph and dragging you can manipulate the 3D view to give a very helpful view to assist in visualising the system performance. The 3D view below is one of our sample venues. The SPL colours now also correspond to the vertical axis “z” axis of the graph so you can very easily identify peaks and troughs in the SPL profile.



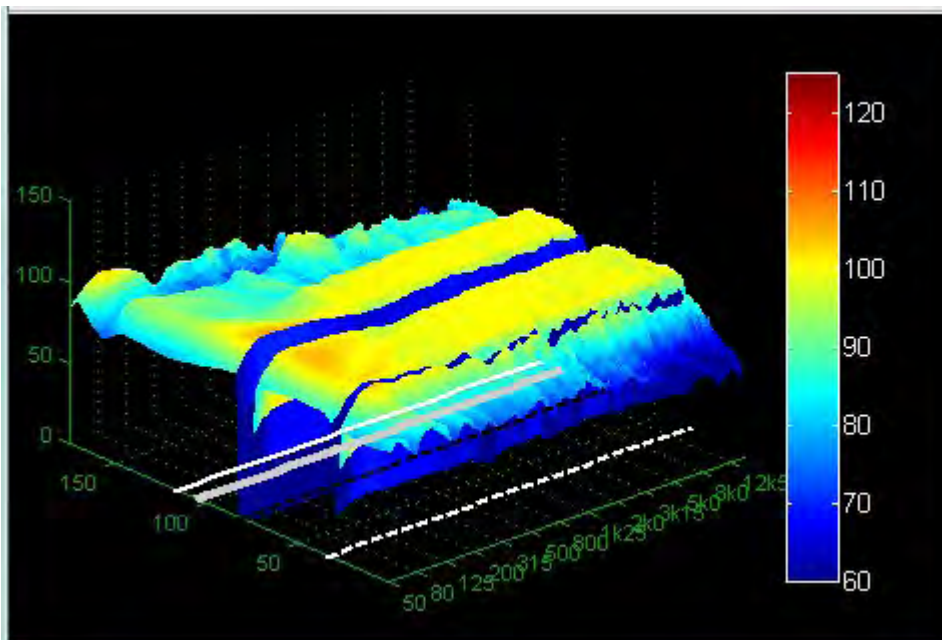
The Data Cursor is useful on graphs such as the frequency response as you can click on any point of the graph and see a value for both x and y positions:



You can continue to click on new positions on the graph to obtain readings for as long as the Data Cursor button is selected.



Insert Colorbar adds a reference bar to the graph:



Insert Legend is a function to add a key to the graph but this has not been adopted in Display 2.2.



ADDING ADDITIONAL ARRAYS

It is very common to have additional arrays deployed at a venue, particularly side hangs in venues where the stage projects out into the arena and there is perhaps banked seating either side of stage. With MLA Mini having a horizontal dispersion of 100° it is obviously impossible to achieve coverage right round the sides of a stage so side hangs are often essential. You may also have to deploy delay hangs larger auditoriums. These can all be catered for in the same Display 2.2 Mini project by adding the extra arrays as required and going through the same design process we have already used for each array.

If we select the Add tab and click on the add array button, we will see the same dialog window open that we used when we created the original array. You will notice however that the tab for the first array is still present:



We will add a second array of eight MLA Mini to be used as side hangs so will name them "Sides". Once you have entered the name, click on Add and a new tab will be created:



You can now go through the same design process defining the 2D slice, array position, audience planes and optimisation coefficients exactly as we did for the main array, we can return to edit the main array at any time by clicking on the tab. As mentioned previously, we can rename either of the arrays by selecting the correct tab, typing the new name in the Rename box and pressing enter.

You can enter dozens of arrays, only seven will be visible at any one time as the dashboard cannot be expended on the present version. Arrays added above seven cannot be accessed until you delete one of the visible arrays.

DELETING AN ARRAY

To keep your Display project tidy and the file size reasonable you may need to delete arrays that are no longer required. This is very simple, select the array by clicking on its tab and type 'delete' in the Rename box and press Return. The array tab will disappear. Note that you must type 'delete' or 'Delete', if you or type the whole word in upper case you will simply rename the array "DELETE".

EXPORTING THE OPTIMISATION

Once you have completed your array designs you need to export the file so it can be uploaded into the system via Vu-Net. Note that you **MUST** click “Use” when you have finished an EQ optimisation to make it possible to export the files. On the Dashboard select the Export tab, you will see three options, the first is to generate a TXT balloon file, the next will produce a DXF wireframe model of the array and the third will export D2P files of your optimisation which can be uploaded into the system via Vu-Net.



EXPORTING D2P FILES

First we will look at Exporting D2P files of your EQ Optimisations. Click the Export to VU-NET button.



You will see the export window open:



The First step is to create a file into which the D2P optimisations will be loaded. The Export Root defaults to your PC C: drive but it is good practice to save your files to a dedicated folder which can be used to store all files created for a particular project. Click on the small box on the right of the Export Root section, navigate to a convenient file location, and if necessary create a new folder first to drop the file into. The Export Root will show the file location:



You have now created a file but until you run the next stage there will not be any optimisation files present! You will see a list of all the arrays you have created which will have a green OK symbol if the optimisation files were saved by pressing 'Use' when the optimisation was completed. If the design process was incomplete for any reason there will be a red exclamation mark showing:



If this is an array that is not required you can continue, if it is one that is needed you should click 'Done' to close the Export window and return to the array to complete the optimisation process.

If you have all the required arrays present you can select them for export using the check box on the left. By default this will be all completed arrays but if there are some which were unsuccessful attempts you can un-check them so they cannot accidentally get used.

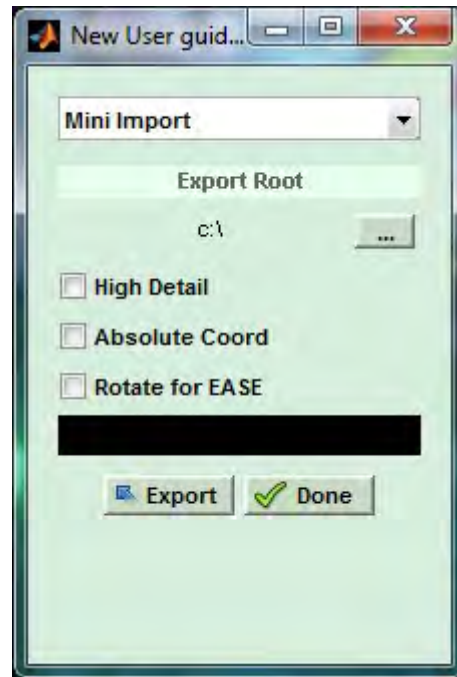
Click Export and a line of text in green appears at the bottom of the window showing the export process taking place. Once this disappears the export is complete and you can click done to close the window.

EXPORTING TO DXF

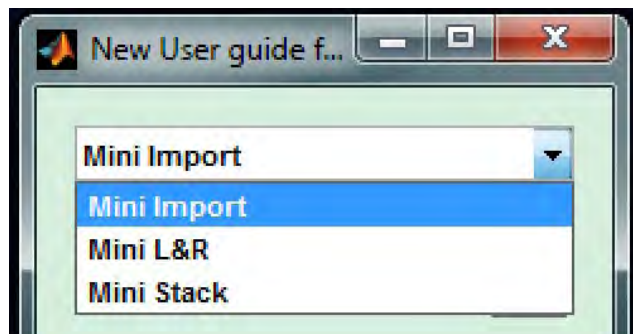
The final button on the Export section allows the exporting of a wireframe model of the array for use with AutoCad:



Clicking on the button brings up the following Window:



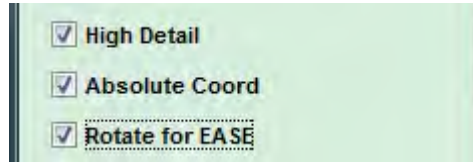
As with Balloon Exports the first stage is to select which of the arrays in your project you wish to Export using the drop-down at the top of the window:



Next click on the box on the right to navigate to a suitable file location in which to save the exported file:



Next you have three options to adjust the parameters of the exported DXF:

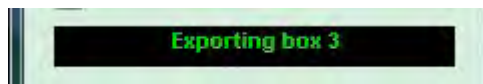


High detail will produce the best quality of drawing but with a larger file size, with large arrays it may be necessary to select standard detail to keep the files size manageable.

Absolute coordinates will position the model according to its position within the venue. With this un-checked the model will not have any location parameters specified, it will essentially be free-floating.

Finally, if you intend to import the DXF into EASE you need to click the Rotate for EASE option to ensure that the model will be correctly orientated which used with EASE.

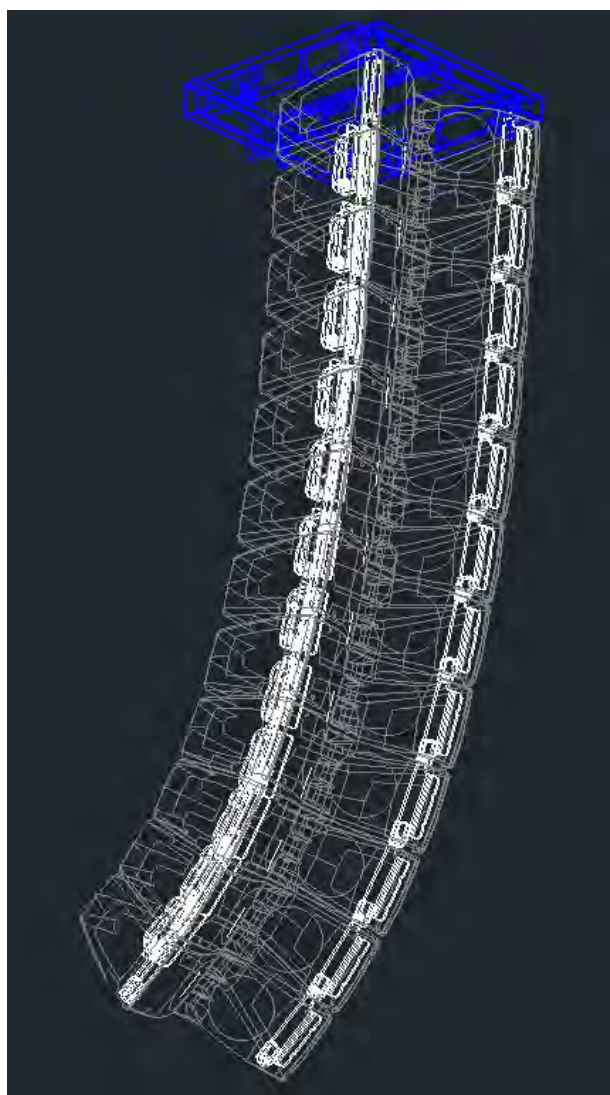
When you are happy with your choice of parameters, click the Export button. The black window will show the progress of the Export:



When the Export is finished you will see an indication in the window:



Click the Done button to close the Export window. Here is an example of a DXF export viewed in AutoCad:

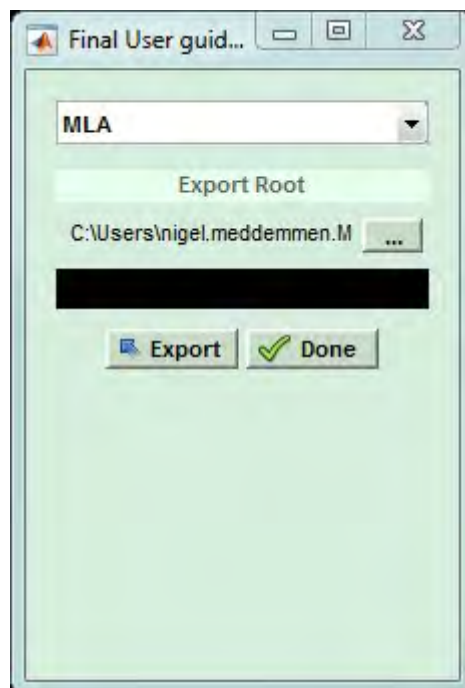


PRINTABLE REPORTS

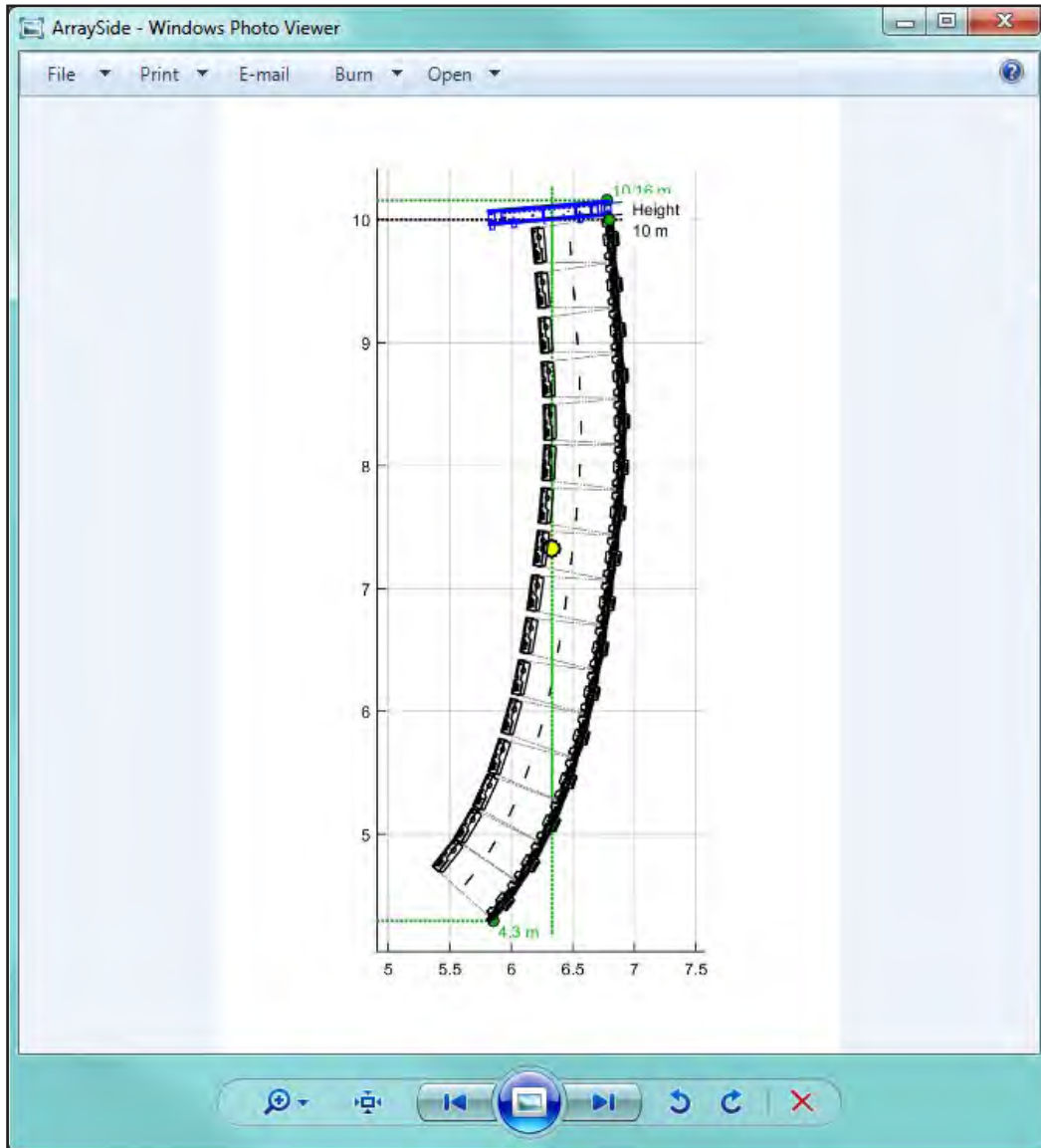
A new feature for Display 2.2 is the ability to export a report which can be filed or printed.



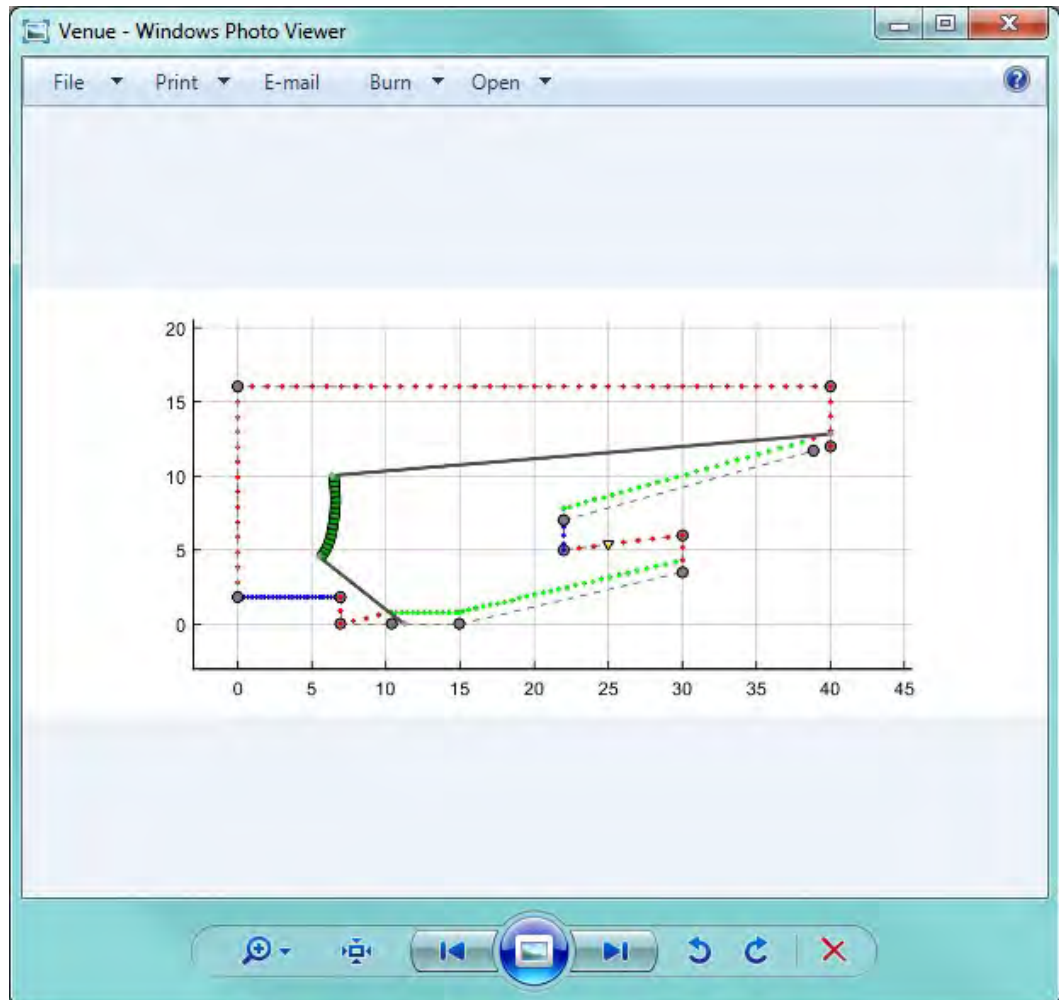
Clicking on the icon brings up the following window:



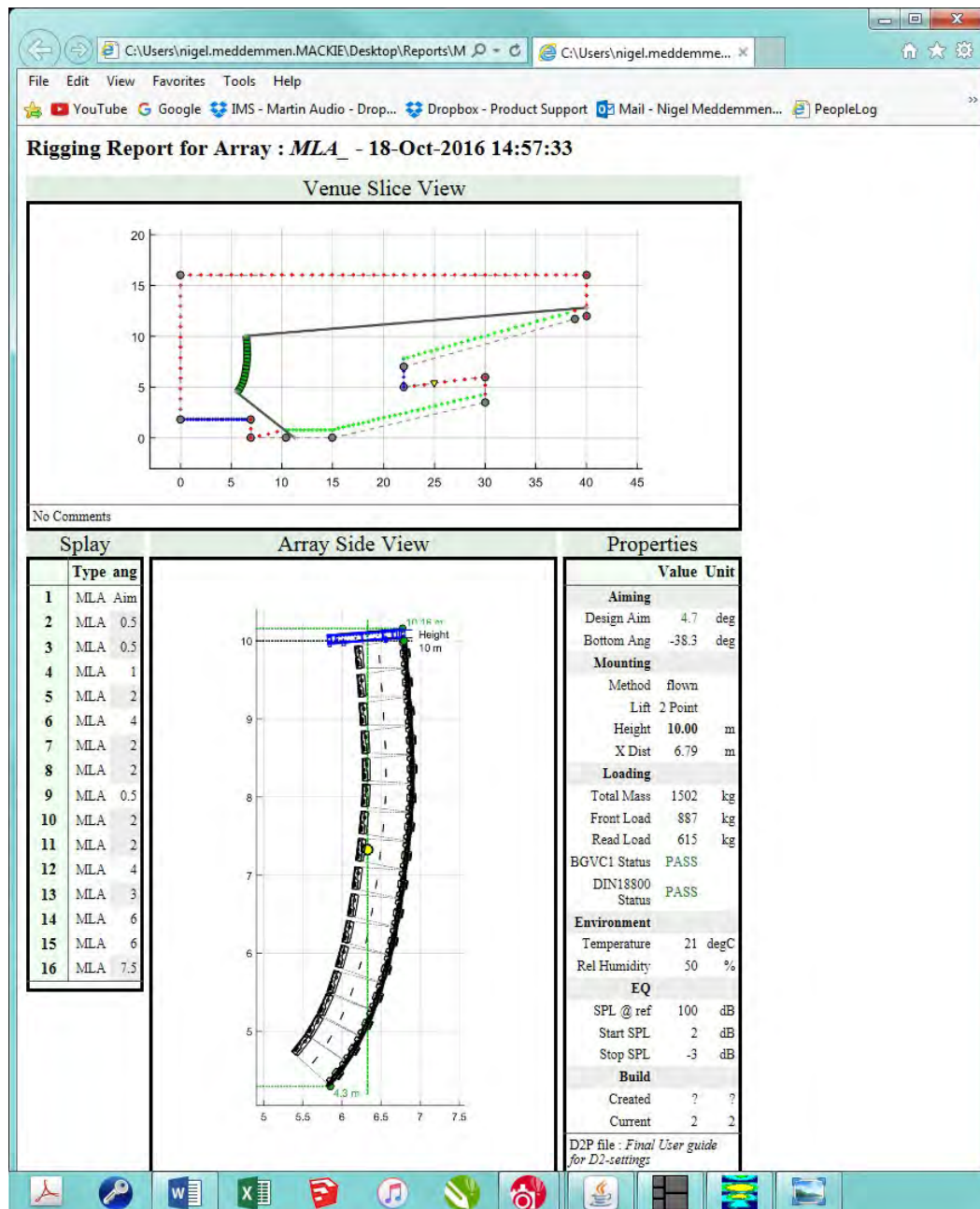
In similar fashion to the optimisation files, the first step is to select the directory to wish you would like to export the report, note that the report will generate information for just the currently selected array, if you have several arrays in the project you will have to use the Export Report function individually for all those for which you need a report. Click 'Export' and a new folder will be created in the selected file location and three files will be uploaded, a png image of the array:



A png image of the venue slice:



And an HTML file which contains both images plus a full rigging report:



VU-NET 2.0.0 FOR MLA MINI



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INTRODUCTION

Vu-Net is the application used to connect to a U-Net enabled device such as the multicellular family of products, the DD12, PSX, CDD Live or Merlin processor. Connection to the cabinets is achieved using the U-Net network protocol. Vu-Net is used to monitor and control the system, EQ optimisations for multicellular arrays are uploaded from the program and cabinet firmware is checked and updated. Vu-Net is supplied ready installed on the Panasonic tablet PC supplied with MLA and MLA Compact systems. It is an optional method of control for full use of MLA Mini, DD12, PSX and CDD Live.

INSTALLATION

MLA and MLA Compact touring system owners will have a Tablet PC as part of their system package which will be pre-loaded with all necessary software including the latest version of Vu-Net. For owners of Installed systems, MLA Mini, DD12, PSX or CDD Live systems, Vu-Net can be downloaded from the Martin Audio website at <https://martin-audio.com/software/software/> and installed on a PC of your choice.

SYSTEM REQUIREMENTS

Vu-Net requires a Windows PC running either Windows Vista, Windows 7, Windows 8 or Windows 10; no other operating systems are supported. We would recommend a 64 bit i7 processor running at 2.6GHz minimum with a minimum of 8GB of RAM. File sizes are not particularly huge so a high-capacity Hard Drive is not necessary but an SSD drive will be faster and more reliable. It may be useful for a portable system to use a tablet-style PC which can be connected wirelessly to the network to allow freedom to listen to the system in all points in the venue and make any adjustments in real time.

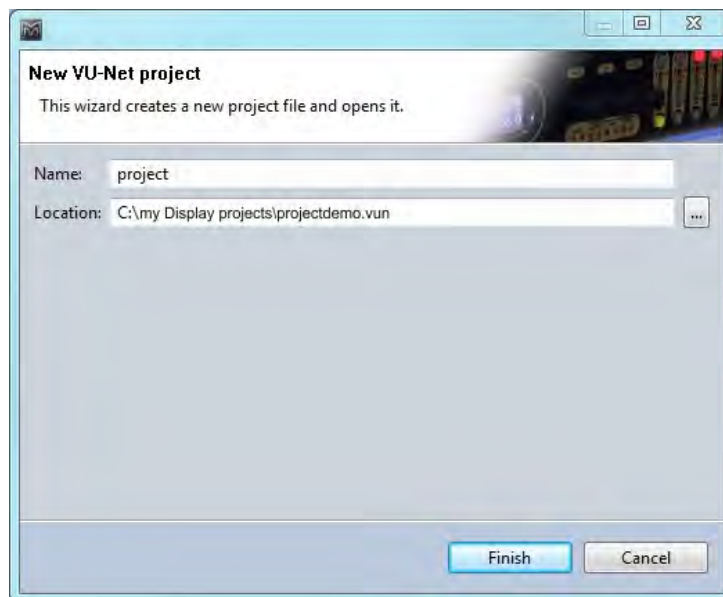
Users have reported that Vu-Net works perfectly well on an Apple Mac using Bootcamp or under a virtual platform such as VM Ware Fusion or Parallels, (these options still require a copy of Windows Vista, 7, 8 or 10 to be installed) however this is not supported by Martin Audio.

MENUS

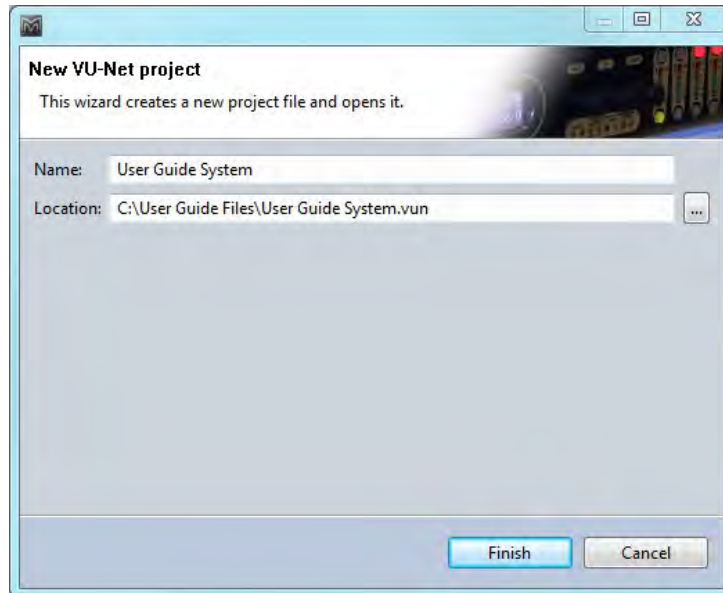
Before we look at the design process that is used with a system it is worth taking a look at the file structure which we will refer back to throughout the chapter. When you run Vu-Net you will see the following Window:



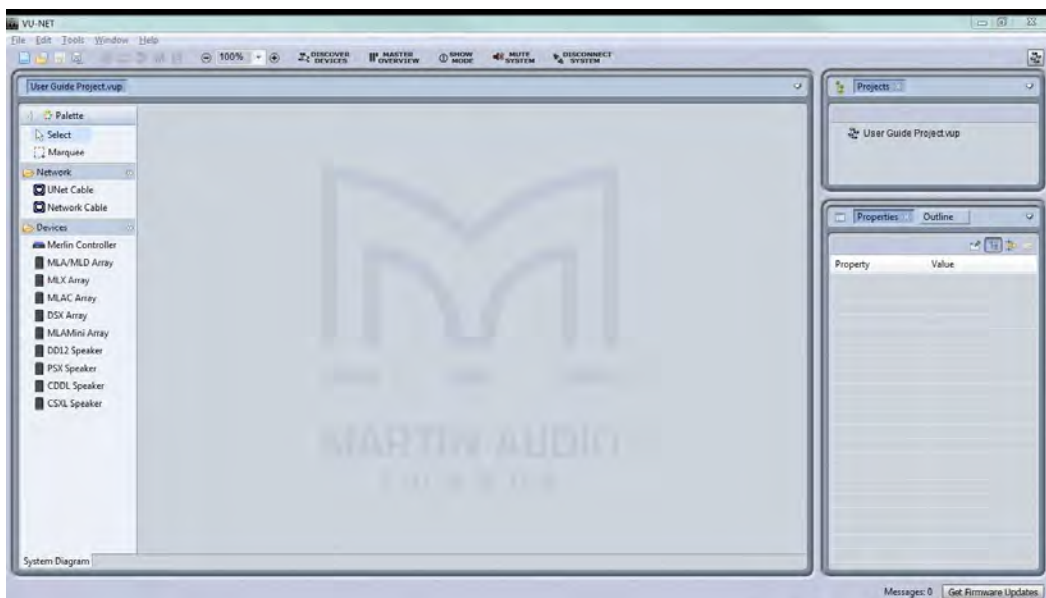
This is a blank screen with only 'New Project' and 'Open Project' active prompting you to start by using one or the other. Start by clicking on 'New Vu-Net project. You will see the following window:



Type a name for your project and select a suitable file location. As with Display 2.2 we would recommend creating one folder for all related files for a given event.



Once you have selected an appropriate name and file location click finish and a new project will be created:

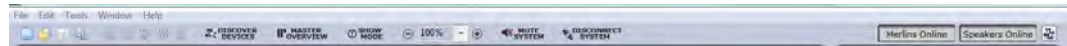


You will notice that the top left of the main window has your project name and a number of options on the toolbar are now available.

WINDOW COMPONENTS

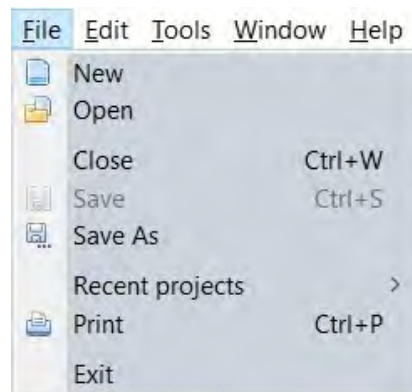
The window has a number of distinct sections with their own function:

MENU AND TOOLBAR

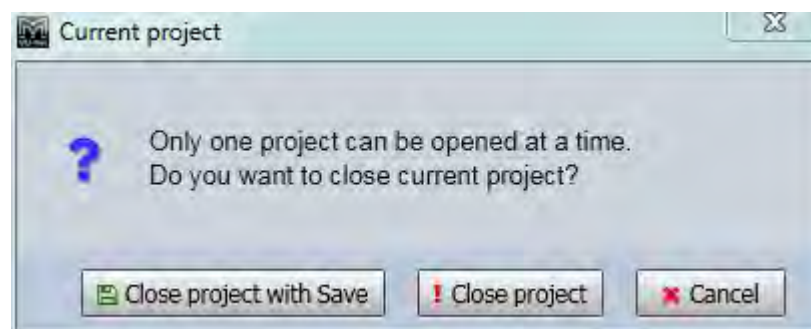


Along the top of the window is a standard file menu and tool bar which gives quick access to a number of functions:

FILE



The File menu controls all file management tools. The 'New' duplicates this function on the tool bar and is how you create a new project. Note that you cannot have several projects open simultaneously. If you select 'New' with another project already open you will see a warning Window as shown below.



‘Open’ enables you to open a project you have previously created and saved. As Vu-Net does not have an auto-save function it is wise to save your work at every step as is good practice for any application.

‘Close’ closes the presently active project.

‘Save’ is the standard Windows function to save the project, if it is the first time you have saved the project a window will appear giving you the opportunity to give the project a name and to choose a convenient file locations. As with Display 2.2 it is sensible practice to save the file in a folder dedicated to a specific event. All subsequent Saves will overwrite the existing file. As shown, the keyboard shortcut Ctrl+S can be used to save a project. It is a good idea to frequently save your work. Vu-Net files are saved with a .vun file extension.

‘Save As’ gives you the facility to save your project with a different file name, retaining the original project. This could be useful if you wanted to try something but still have the option of returning to you original project file.

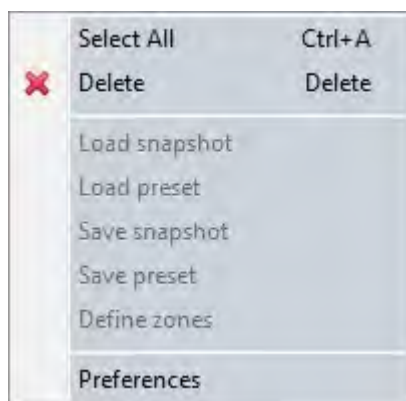
‘Recent Projects’ lists all VU-NET projects recently opened making it easy to find a project you may need to re-open.

‘Print’ will print the system layout in the main system overview window.

‘Exit’ will close the application

EDIT

The Edit menu has a number of functions available:



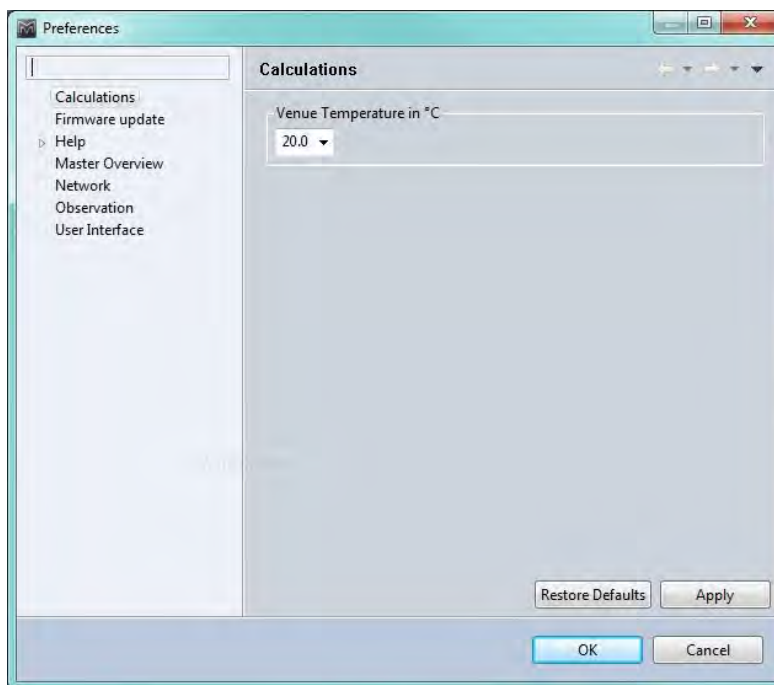
Note that exactly which of these menu items is displayed will depend on what active devices have been selected in the System diagram overview, Product such as MLA and MLA Compact have Presets that can be loaded, other devices such as DD12 or CDD-Live have Snapshots.

‘Select All’ selects every item on the main project window. All selected items will show four square black dots in the corners around the object or objects.

Load snapshot, Save snapshot, Save Preset and Define zones are functions relating to the relevant devices in the project and will be covered later in this manual.

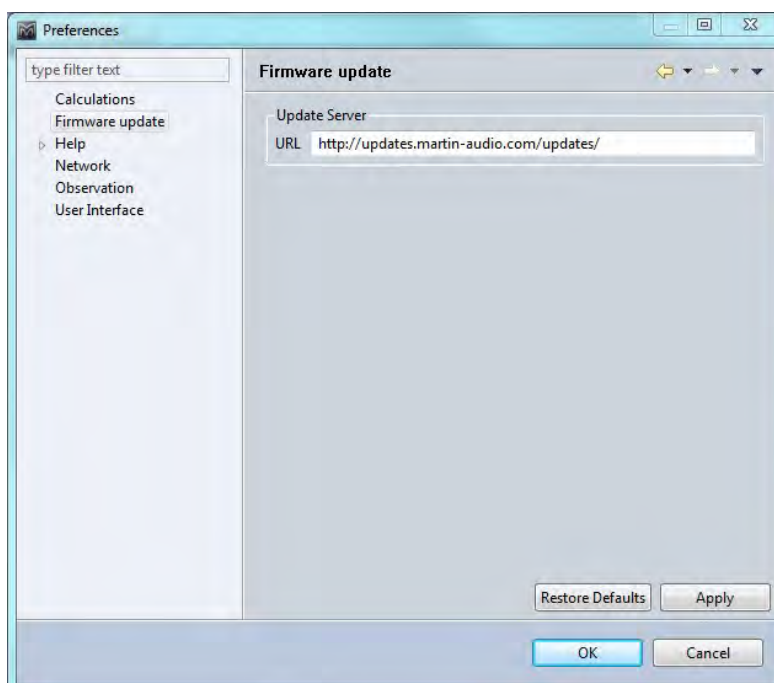
PREFERENCES

Preferences have some important options for how Vu-Net operates:



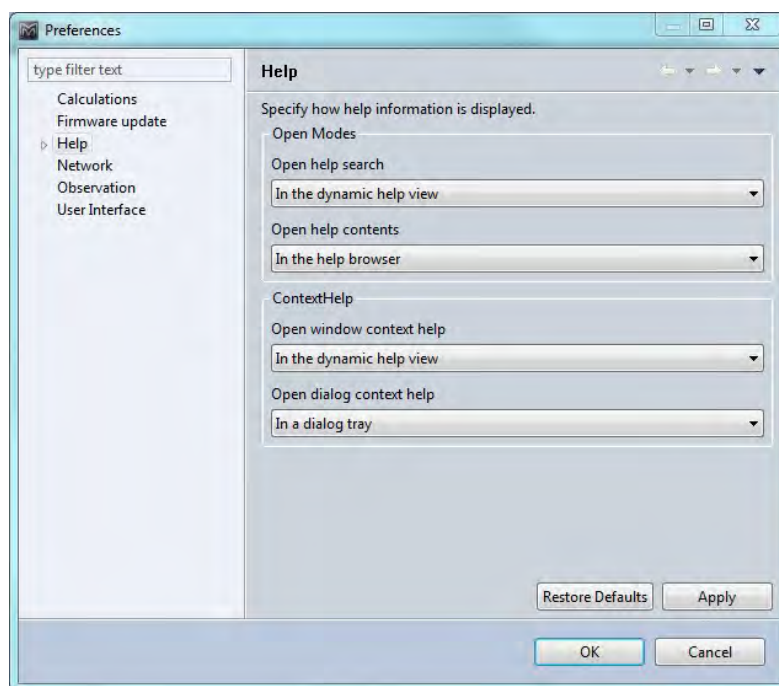
Calculations: The first option is labelled 'Calculations' and allows you to select the venue temperature in steps of 5°. This is used when the option is selected in the Merlin Controller to read delay figures as a distance as opposed to time. The temperature adjustment calculates the delay time according to the speed of sound at that temperature. Select the desired temperature using the drop down box or an exact value may be typed directly into the box and click 'Apply'. Note that if you have a Merlin open in the project window the change will not be visible until you close it and reopen.

Firmware update: The next option is Firmware update:



This shows the web URL for the system to search for firmware updates which will be covered in the Firmware chapter. This should not be changed unless notification is received from Martin Audio to do so. If however it accidentally gets changed or deleted it is possible to reset all Default parameters by clicking on the Restore Defaults button. Note that this restores ALL Preferences so any that you wish to retain will have to be re-entered.

Help: Next are options for how the Help menu is displayed:

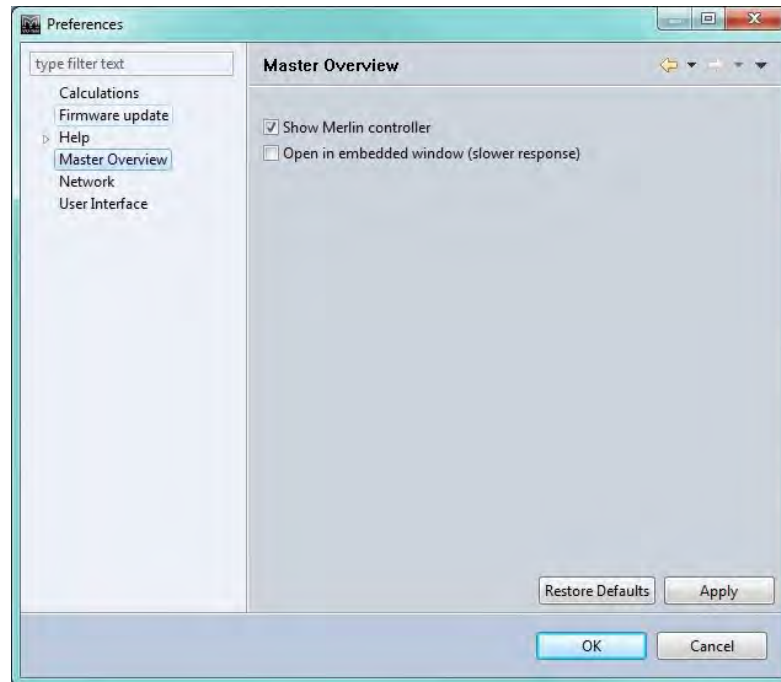


By default the help window is displayed in a dedicated help browser but you can select it to open in your default Internet Browser. Context help which responds dynamically to objects selected can be displayed as a window on the application or as an “Infopop”

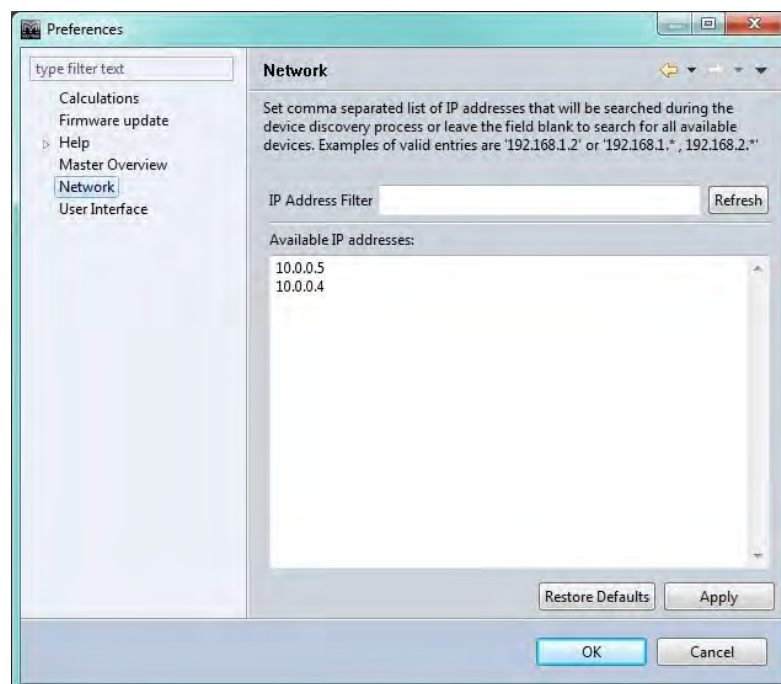
Help includes a sub-menu for accessing help from remote infocenters. This is not currently operational and will be a future upgrade.

Master Overview: There is an option within Master Overview to show the Merlin Controllers in the system in the Overview tab. This is for systems where Merlins are used purely as a network interface with no audio passing through them which would make it unnecessary to monitor them in the Master Overview screen

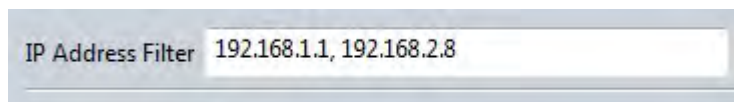
By default the Master Overview opens in a secondary floating window, particularly useful when monitoring large systems with your PC connected to two or more screens. You can select the option to display the Master Overview as an embedded window within Vu-Net- it will appear as another tab in the same way as double clicking on any of the devices:



Network: The Network option is an important section for determining how devices are found on the Ethernet network:



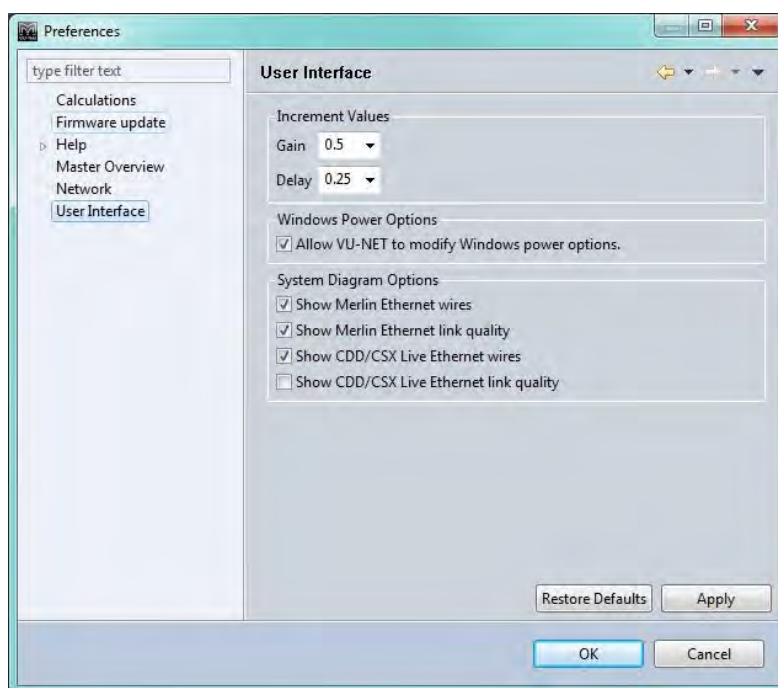
Running the application off line will display a blank window. When you have one or more Merlins connected (usually at least two for MLA and MLA Compact systems) their unique IP address will appear listed in the bottom 'Available IP addresses'. You can set an IP address Filter in the smaller window which will search only for IP addresses within the range of values between the two entered which should be separated with a comma:



This could be used if you have two systems running on the same Ethernet network and need to control them independently. Only devices with their IP address set to values within the filter range will be found and the system will work completely independently as if there were no other devices on the network.

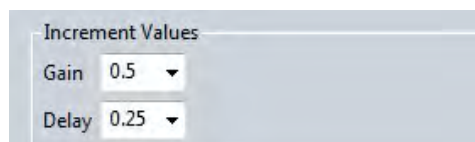
Note that if you are connecting to MLA Mini, DD12 or PSX via their integral USB port, no IP address will be visible. This function is only applicable to networks supported by Merlins or Ethernet connected devices such as the CDD Live range.

User Interface: The final option in the Preferences window is User interface:



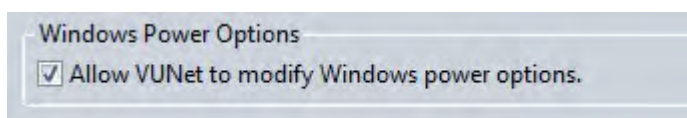
This allows customisation of certain functions within the application.

Increment Values:



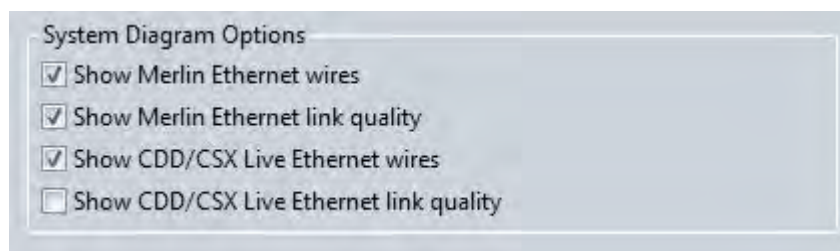
These allow the default increment values for both Gain and Delay to be changed as required. The default for Gain is 0.5dB but the options are for increments of 0.1, 0.2, 0.25, 0.5 or 1dB. For delay, the default is 25ms, the options are 0.1, 0.2, 0.25, 0.5 or 1ms.

The Windows Power Option:



Allows Vu-Net to prevent Windows from implementing changes to the power settings that can effect network operation. This should be left checked unless there is a very specific need to do otherwise

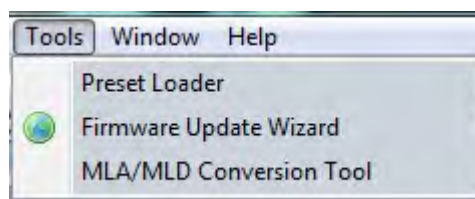
Finally there are a number of options for how the system diagram is displayed:



This is intended to reduce the number of lines on the System Diagram overview which may get cluttered in large systems with a high number of devices.

TOOLS

The tools menu:



This has three important functions for system operation.

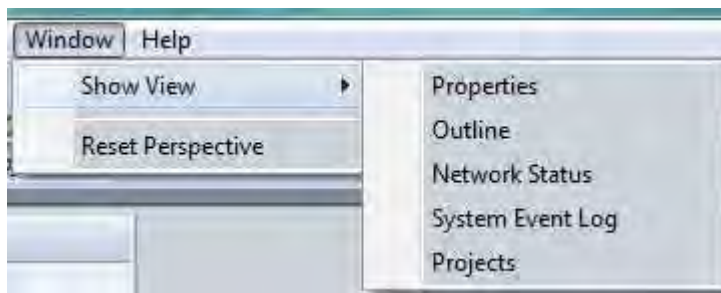
Preset Loader is used to upload EQ optimisations into the arrays.

Firmware Update Wizard is used to check and upload the latest firmware into the system components.

MLA/MLD Conversion Tool is used to convert the amplifier modules used in MLA and MLD cabinets from one type to another. Mechanically and electrically these are identical, they simply need a firmware conversion so the system is aware of what type of enclosure they are powering. An MLD module can be converted to an MLA or more commonly an MLA module to an MLD.

WINDOW

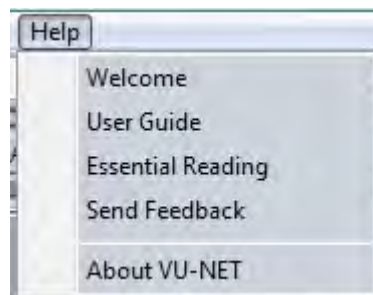
The Window menu is used to determine which sections of the project window are displayed:



The System Diagram is always visible but the other windows can be closed and reopened as required. By default they are all open but if closed they can be reopened by selecting them from the Window menu. The Reset Perspective option will restore the project layout to the default view.

HELP

The help menu has a number of options:

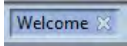


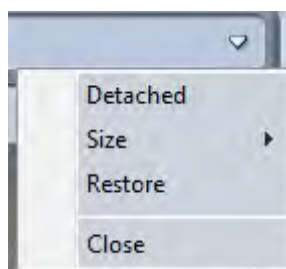
'Welcome' opens the splash screen that is displayed when Vu-Net is run for the first time:



The lines 'Go to Martin Audio website' and 'Go to MLA website' are hyperlinks and clicking on them will take you directly to the respective website if your PC is connected to the internet.

The window can be closed in one of three ways:

1. Click on 'Start using the software'
2. Click on the x in the Welcome box in the top left of the window: 
3. Click on the drop down arrow in the top right of the window and select 'close':



Any of these will close the welcome screen to reveal the project window.

User Guide: This is essentially a link to this very guide slightly rearranged for use in the field when running the software. The contents page features links directly to the specific subject so you can very quickly navigate to where you need to be to discover the answer to something you don't fully understand.

Essential Reading: This opens a pdf document that outlines the new features in the latest version of Display 2.2 and how they affect their implementation in Vu-Net.

Send Feedback: opens a communication window which gives you an opportunity to communicate any issues or ideas for new features straight back to Martin Audio:



Note that an internet connection is required for your Feedback to reach Martin Audio.

TOOL BAR

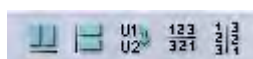
The toolbar has a number of icons which offer either quicker access to commonly used functions from the file menus or specific functions which are essential to system set up and operation.

The first 4 icons are file management tools:



These are New Project, Open existing project, Save and Save As.

The next group are graphic alignment tools for making your system diagrams look neat:

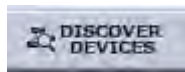


The first, second, fourth and fifth of these are only active when two or more components are selected; the third is only active when one or more Merlin controllers are selected.

The first icon aligns all selected components horizontally on the page. The second aligns all selected objects vertically. The third tool is used with the Merlin. When a system is discovered its network connections are drawn in place. The two U-Net nodes on the Merlin, usually run as a closed loop will go off to the first cabinet in the array and back from the last cabinet. Depending on the layout of your system diagram this may mean that network cables are crossing over looking a little messy. This tool reverses the two network nodes in the diagram to try and neaten the diagram. Note that it is only adjusting the graphic representation; it is not making any electrical changes to the U-Net nodes in the Merlin.

The final pair of icons will reverse the position of any selected objects. Perhaps you have an MLA array to the right of an MLX array and you would rather position them round the other way, you just select both arrays and click on the 'Reverse order horizontally' button and their order will be reversed maintaining their connections and keeping them aligned. Likewise if you wish to reverse the vertical order, position DSX subs under an MLA Compact array when the diagram has the subs on top, select the required components and click the 'Reverse order vertically button'

Discover Devices is the method by which U-Net connects to all system components once all hardware connections have been made:



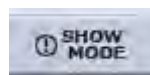
This will interrogate the U-Net network and find all connected devices opening Wizards for each type of device; MLA & MLD, MLX, MLA Compact, DSX, MLA Mini, MSX, DD12, CDD Live and Merlin. All devices on the same U-Net loop will be grouped together by type by the discovery process. Note that Vu-Net will discover devices regardless of how they are connected, either directly by USB in the case of MLA Mini, DD12 or PSX, via Ethernet for CDD Live and CSX Live, or over a U-Net loop via a Merlin acting as a network bridge

Master Overview:



Gives an overview of all devices in the project displaying all bargraph level meters giving access to essential functions such as gain, mute and Delay and with a link to EQ functions. This is designed to be used once a show is in progress to allow easy monitoring of an entire system from a single page. The Master Overview is opened as another tab next to the Project System diagram and any other open arrays or components.

Show Mode:

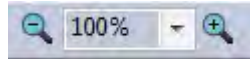


As the name suggests, this is intend for use during a show once set-up is complete. It changes the operation of the Mute function for all products. When disabled, all mutes can be selected and de-selected freely, when show mode is active:



Any click on a mute button will bring up a pop-up window asking you to confirm that you want to Mute or Un-Mute that array or channel. It also disables the output cell check function, see later in this guide for details.

The zoom function:

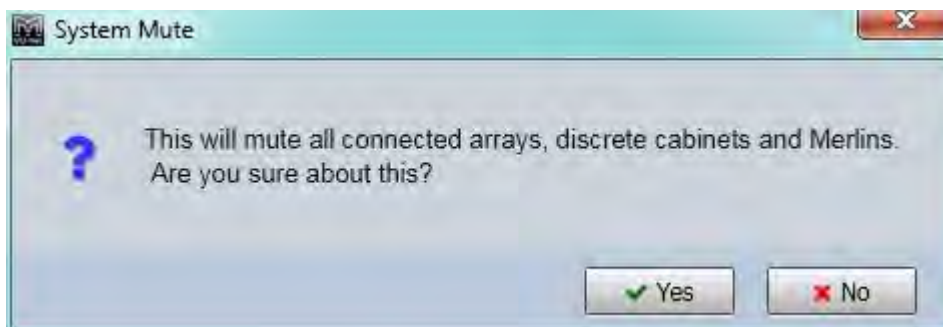


Allows you to adjust the system diagram size to suit the complexity of the system on your PC display. The '-' and '+' buttons will decrease or increase the zoom in increments of 25%. Alternatively you can use the drop-down box to select either 10%, 25%, 50%, 100%, 125%, 150%, 200%, 300%, 400%, 600% or 800%. Particularly useful are 'Page' which will zoom to the maximum size that the page will allow, 'Width' which will zoom to the maximum width of the diagram and 'Height' which will maximise the size to fit the height of the diagram.

Mute is essentially an "emergency" function if something is causing severe noise through the system you can click on the mute button:



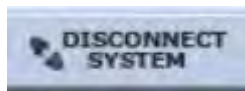
This will bring up the following window:



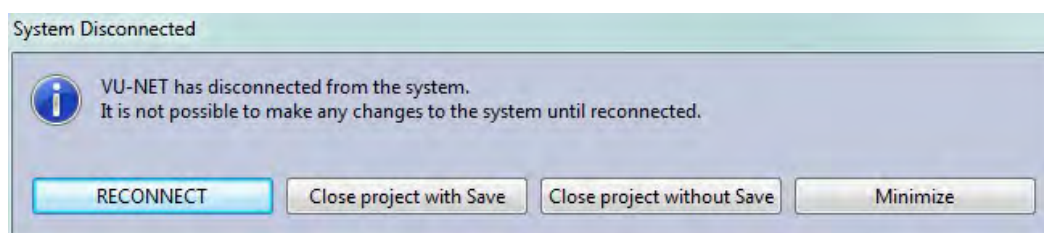
As you can see it is a very drastic measure which will shut down the entire system which is why it should be considered as an emergency measure only and not an everyday means for muting the system. If you are sure you wish to proceed you can select 'Yes' if not click on 'No' and the window will disappear, the audio will remain routed. This function mutes every input and output on connected Merlins and every zone on all arrays. Once used there is no global un-mute, all Merlins and arrays will have to be individually un-muted. Note that Show Modes does not change operation of the System Mute, the confirmation window will always appear.

Our advice is never to leave a system muted within Vu-Net, always use a mute that can be defeated manually such as a Merlin output. If a system has been muted within Vu-Net and for some reason you lose network connectivity you will be unable to un-mute and will have an unusable system!

System Disconnect

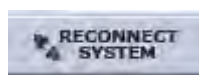


This will disconnect the project from the hardware in the system. A Window will pop up giving you a selection of options:



As you can see, once you are disconnected from the system you are unable to make any changes to the project, this is to ensure compatibility and accurate synchronisation when you reconnect. You have the option to reconnect straight from the window or can close the project with or without saving. Finally you can minimise the project. This is particularly useful if you have disconnected to switch from a Wi-Fi to a hard-wired connection, having minimised to can access the PC network setting to make the switch to a cable Ethernet connection.

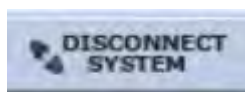
Once Disconnected the Disconnect button will change to reconnect also allowing you to reconnect to the project:



PROJECT WORKSPACE

The workspace is divided into several sections which can each be opened, closed or in the case of the ancillary section, "detached" as a floating window.

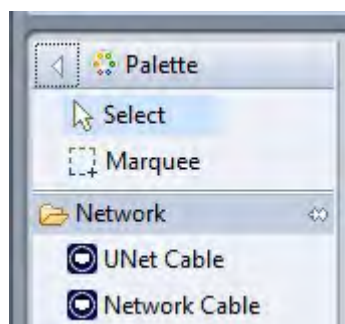
By default the workspace appears like this:



There are three main sections, the first is the system diagram:

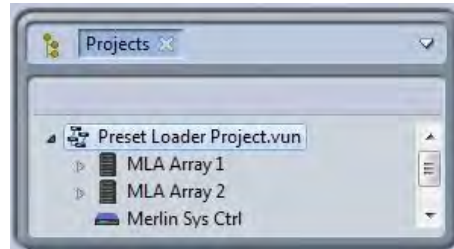


This window will show all array components on the network and is used for all configuration changes and system monitoring. The palette on the left is used to manually enter system components when working off line (in normal use, Device Discovery is used to find all connected components). If you need to maximise the workspace the palette can be minimised by clicking on the white triangle in the top left corner of the palette:

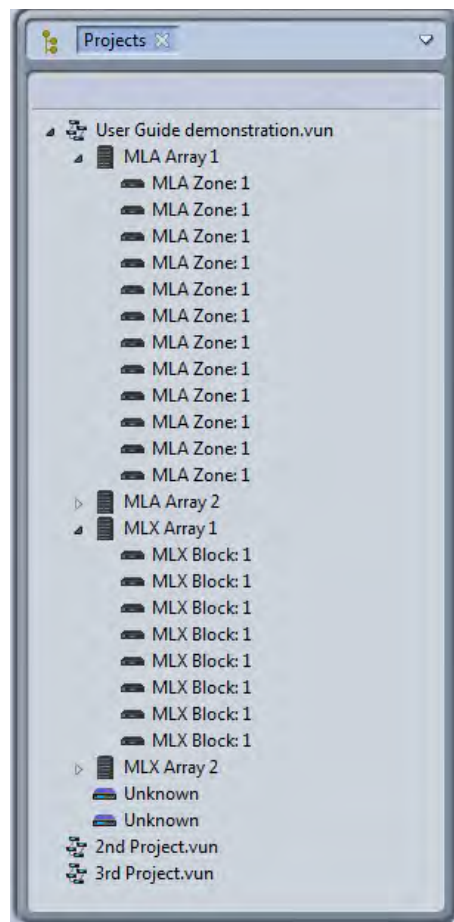


The overall size of the System Diagram can be increased or decreased by clicking and holding on the gap between its right-hand edge and the left hand edge of the other windows. You can then drag either left or right to adjust the relative sizes of the windows. Alternatively, the white drop-down arrow gives you the option to maximise the screen. The other windows will not be closed; they will be represented by an icon on the right side of the page with the option to restore. Clicking restore will return the windows to their previous state.

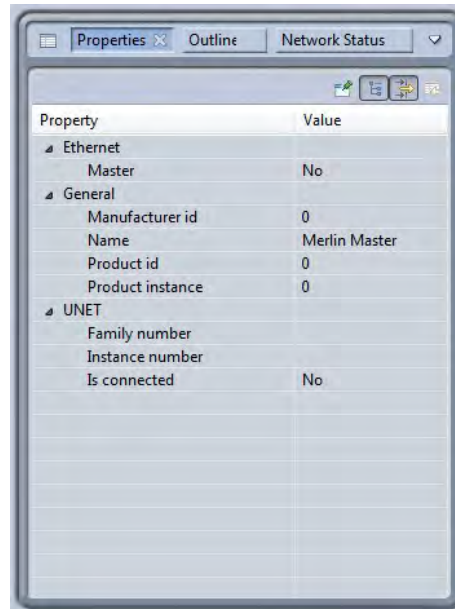
On the right side of the window are two further windows:



The first is a project overview window showing the open project. The window can be maximised, detached or closed by clicking on the white arrow in the top right corner. The project icon can be expanded if they have a small arrow to the left (a project that doesn't yet have any components added or discovered will not show an arrow). This will then show all connected components as in the picture above. Arrays will have a further arrow which if clicked will show all individual cabinets. This screen grab shows an enlarged project window in which the User Guide system has been expanded and one of the MLA arrays and one of the MLX arrays have also been expanded:



The final window by default has Properties and Outline available but by using the 'Show View' option in the Window menu, you can also select Network Status. This shows all three options available:



Any of the three options can be viewed by clicking on the relevant button. As with the Project window any of the selected options can be detached as a floating window, maximised or closed by clicking on the white arrow. If all options in the window are closed the project window will fill the space, if that is also closed the Project window will fill the space.

The Properties window will show the properties for any element selected in the System diagram. The example above shows the properties for a Merlin in an off line project. There are a number of options available for the Properties display selected by the icons in the top right corner of the window:



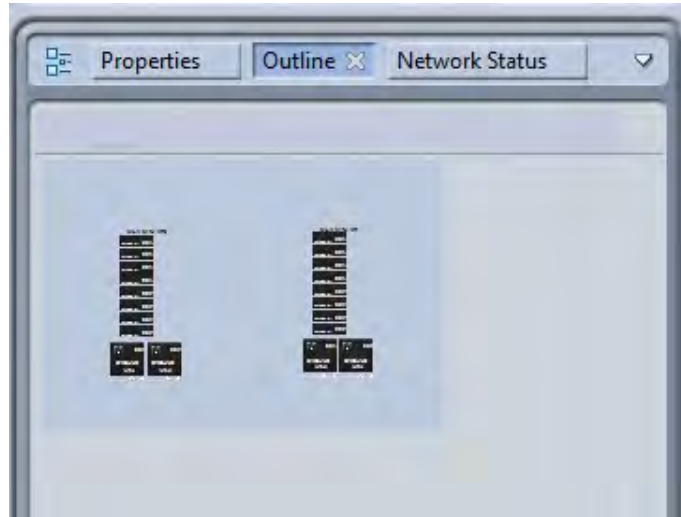
The first pins the Property view of the selected element so it remains on view regardless of whether an alternative element or even project is selected. A second click on the icon will un-pin the view and any new selected element can have its properties displayed.

The next is the Show Categories button which is selected by default. This shows the categories for each of the properties and gives the option to display or hide any of the properties in a particular category by clicking on the small arrow leaving just the category heading.

The third icon displays advanced properties for the selected element.

The final icon will reset any modified properties to their default values.

The Outline window displays a miniature thumbnail of the system diagram for whichever project is selected:



The network status shows the status of the network connection to all elements in all projects running in Vu-Net. This screen shot shows the network status of the elements in an MLA/MLD & MLX system (currently off line):

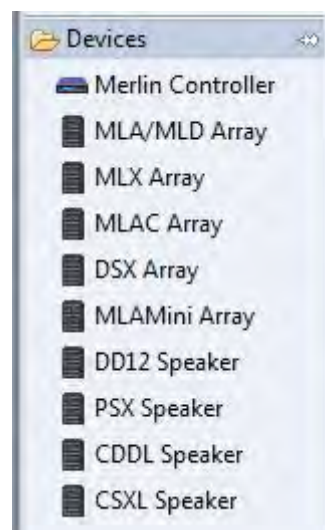
Available controllers :	
Controller	Status
Unknown	
Unknown	OFFLINE
Unknown	OFFLINE
MLA 001	OFFLINE
MLA 002	OFFLINE
MLA 003	OFFLINE
MLA 004	OFFLINE
MLA 005	OFFLINE
MLA 006	OFFLINE
MLA 007	OFFLINE
MLA 008	OFFLINE
MLA 009	OFFLINE
MLA 010	OFFLINE
MLA 011	OFFLINE
MLD 001	OFFLINE
MLA 012	OFFLINE
MLA 013	OFFLINE
MLA 014	OFFLINE
MLA 015	OFFLINE

WORKING OFFLINE

Before we move on to look at adding elements to projects it is important to understand the difference between working off line and normal on-line operation at an event. When working off line the Palette allows you to drop elements into the System Diagram, you can open arrays, speakers and Merlins as you would for an on-line system. This is useful as a means to get used to system operation in Vu-Net but very little beyond that. Unlike some systems you CANNOT create a system design off line and connect to a system on site. When connecting to a system you have to use Device Discovery which searches all available connected devices for system elements and automatically drops them into the system diagram showing their Ethernet and Vu-Net Connections. This is vital as every Vu-Net element has a unique factory set IP address which Vu-Net records so it can provide real-time monitoring of the system and can display the status of every device. If for example you re-connect to a system having used it on one day and shut down over night, Vu-Net will be able to detect that every cabinet has been turned back on and the status of all parameters of every DSP. We will show how to introduce all available elements into a project off line but will cover Device Discovery and on-line operation in a later chapter.

ADDING MERLIN

Adding any devices to a System diagram is a simple case of clicking on the required item in the Palette:

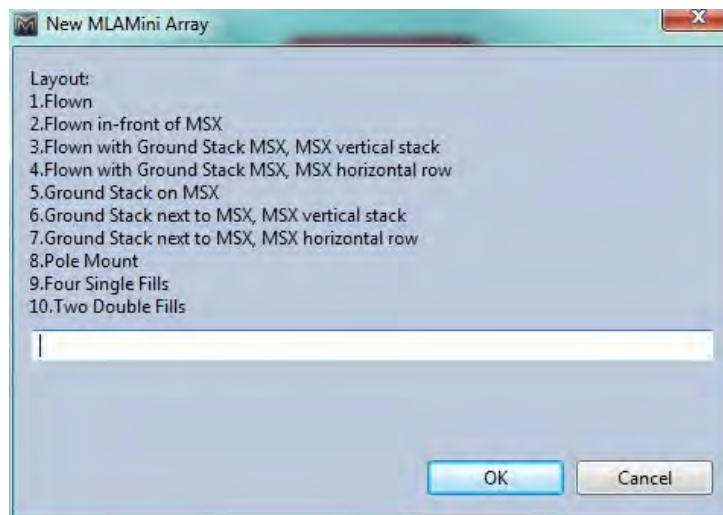


Then click on the System Diagram workspace. The cursor will have a small white box with a cross in the centre prompting you to click where you wish to deposit the device. Here we see a new Merlin added to a project:



ADDING MLA MINI

MLA Mini is deployed in blocks of four MLA Mini plus an MSX sub or amplifier module to driver them. This makes entry to Vu-Net a little different. First you need to specify how the system is to be physically deployed, the following window appears when you select MLA Mini Array and click in the System Diagram workspace:



1. Flown refers to a system with MLA Mini flown below the MSX sub using the flying frame and transition grid. The maximum configuration for this mode is three sets of Mini and MSX (twelve MLA Mini cabinets).
2. Flown in Front of MSX allows the maximum flown array of MLA Mini which is sixteen cabinets and allows for configurations with the MLA Mini flown using the flying grid with up to four MSX on a second grid flown behind the Mini.
3. Flown with Ground stack MSX, MSX vertical stack is from four to sixteen MLA Mini flown using a Universal Bracket (maximum four cabinets) or flying grid with the MSX on the ground under the array stacked on top of each other vertically.
4. Flown with Ground stack MSX, MSX horizontal row is from four to sixteen MLA Mini flown using a Universal Bracket (maximum four cabinets) or flying grid with the MSX on the ground under the array in a row horizontally.
5. Ground Stack on MSX is possible with one or two MSX and four or eight MLA Mini.
6. Ground Stack next to MSX, MSX vertical stack allows ground stack arrays with the MLA Mini stacked directly onto the ground, perhaps at the front of a stage for example, using the flying grid and the ground stack base plate. Two systems (eight MLA Mini) can be used in this configuration. The MSX would be placed to one side of the MLA Mini array stacked on top of each other when two are used with eight MLA Mini.
7. Ground Stack next to MSX, MSX horizontal array allows ground stack arrays as option 6 but with the MSX to one side of the MLA Mini array placed horizontally in a row when two are used with eight MLA Mini.
8. Pole Mount adds a single system of one MSX with four MLA Mini above on a pole mount.
9. Four Single fills is for using the MLA Mini individually as stage front fills for example.
10. Two double fills pairs the Mini to create two fills for various applications.

If you have selected the deployment options 1, 2, 3, 4, 5, 6 or 7 you will next be asked to select the number MLA Mini cabinets:



If you select a number greater than is possible for the desired deployment Vu-Net will automatically restrict the number to the maximum allowed.

Following are a few examples of MLA Mini arrays, first a single flown array:



Next a systems with MSX ground stacked horizontally and MLA Mini flown:



Finally a single system with the MLA Mini pole mounted:

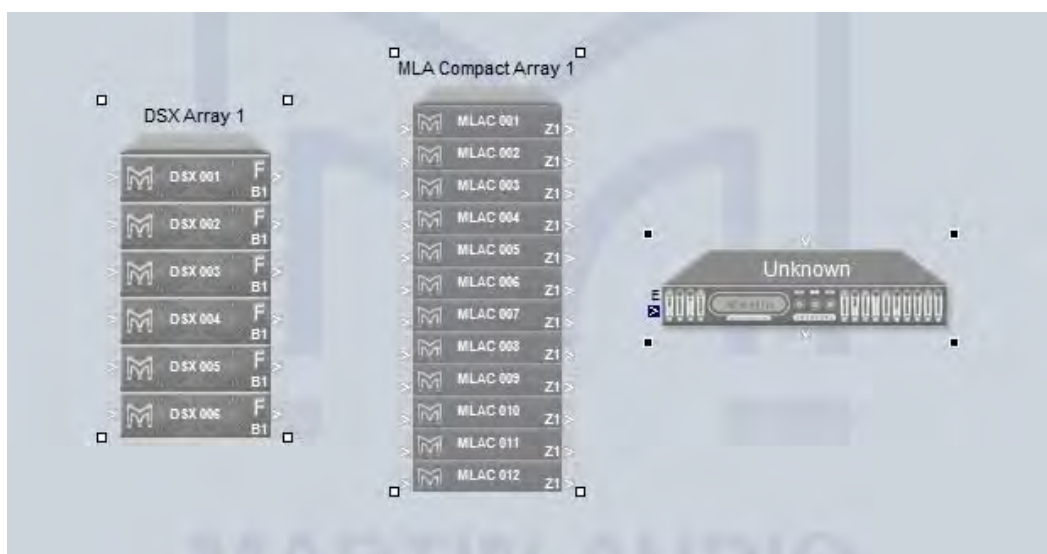


ARRANGING THE ARRAY COMPONENTS

Vu-Net has a number of tools available to help keep the system diagram looking tidy.

Selecting elements can be done in a variety of ways. The most obvious is a single mouse click; the selected object will show the small black squares in the four corners around it. A subsequent click anywhere else will de-select the object, as will click on a second object. The selected element can also be changed using the left, right, up and down arrow keys, the object selected will jump in the direction of the keys.

Selecting multiple objects can be done two ways. First you can draw a box around multiple items. Click and hold in the corner of a group of objects and drag over all of them diagonally. A box will appear round all selected items until you release the mouse button whereupon all objects within the box will be selected. You can draw the box from any corner in any direction.

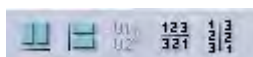


If you need to repeat this action several times you can select the Marquee tool from the Palette menu which changes the mouse cursor to a cross and enables box-drawing mode. Click on the Select icon in the Palette to return to normal select mode.

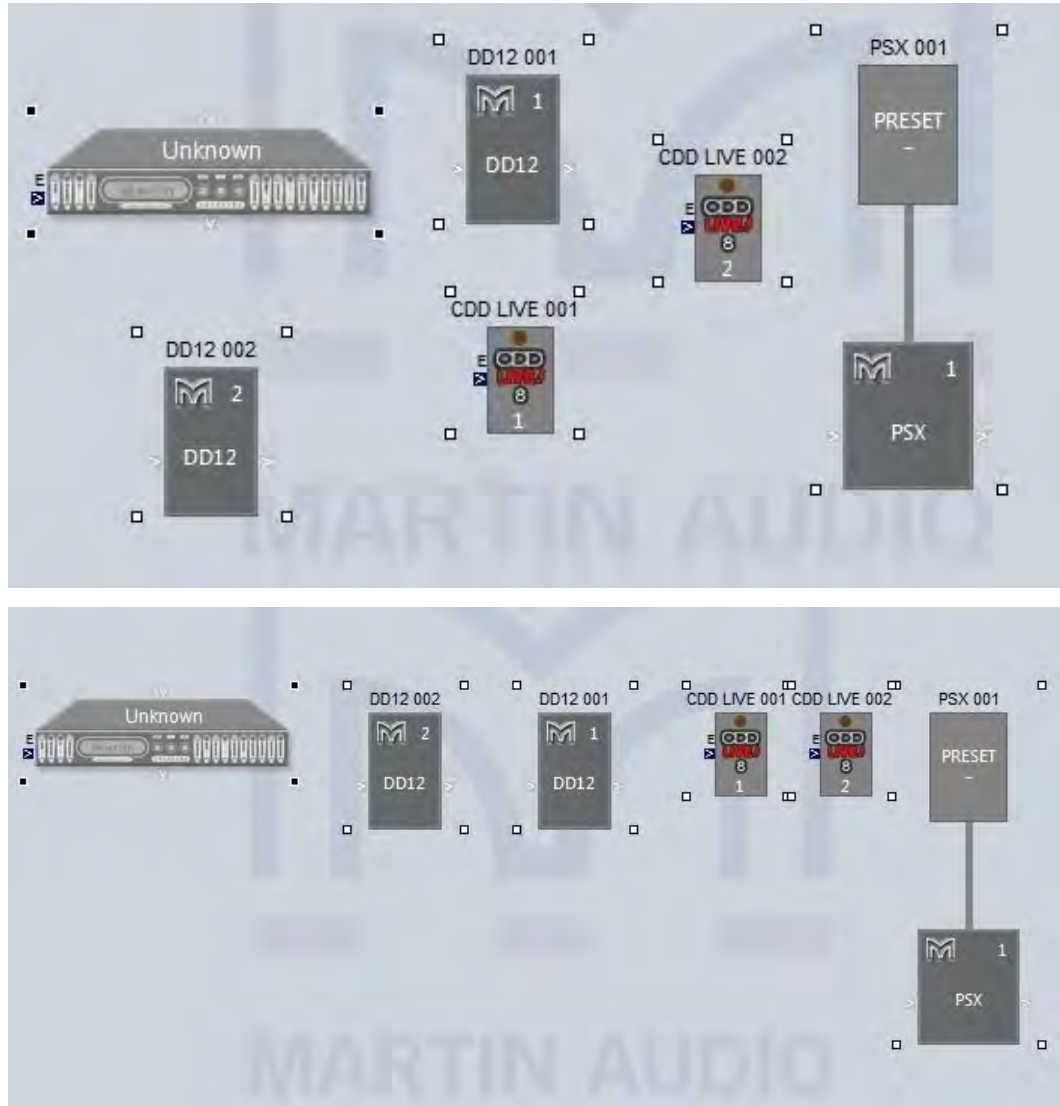
Secondly you can click to select an element then press and hold either Ctrl or Shift and click on all other elements you wish to select. Note that you can use a combination of selection modes if necessary; use the box-drawing method initially then Ctrl or Shift click to add additional elements to the selection.

Deselecting an element from a multiple selection must be done with Ctrl + click. With a multiple selection there is always one primary element, by default the last one added to the selection. This will have the familiar black squares in the corners; all other selected items will have white squares. You can change the primary element by a further Shift + Click on an object. Deselecting all objects is done in the same way as a single item by clicking anywhere on the work surface.

The icons on the tool bar offer quick and easy alignment of multiple objects, there are five tools available:

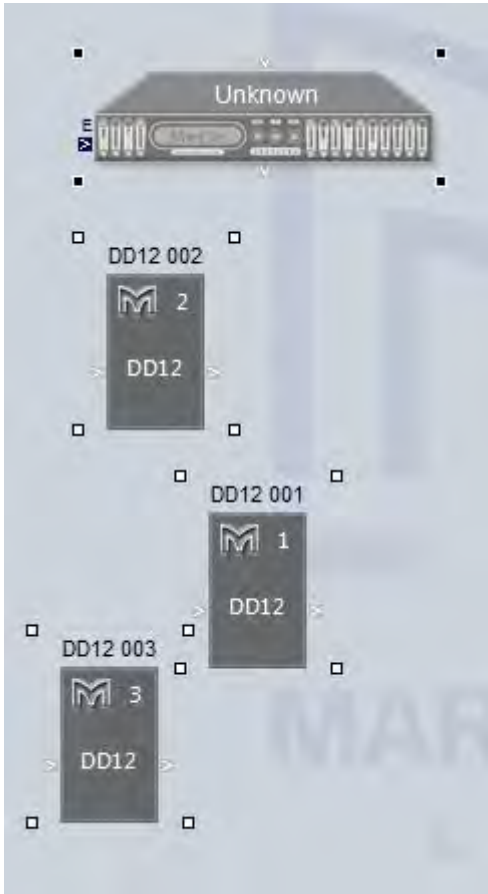


The first aligns objects horizontally, here is a before and after of four arrays that have been selected:



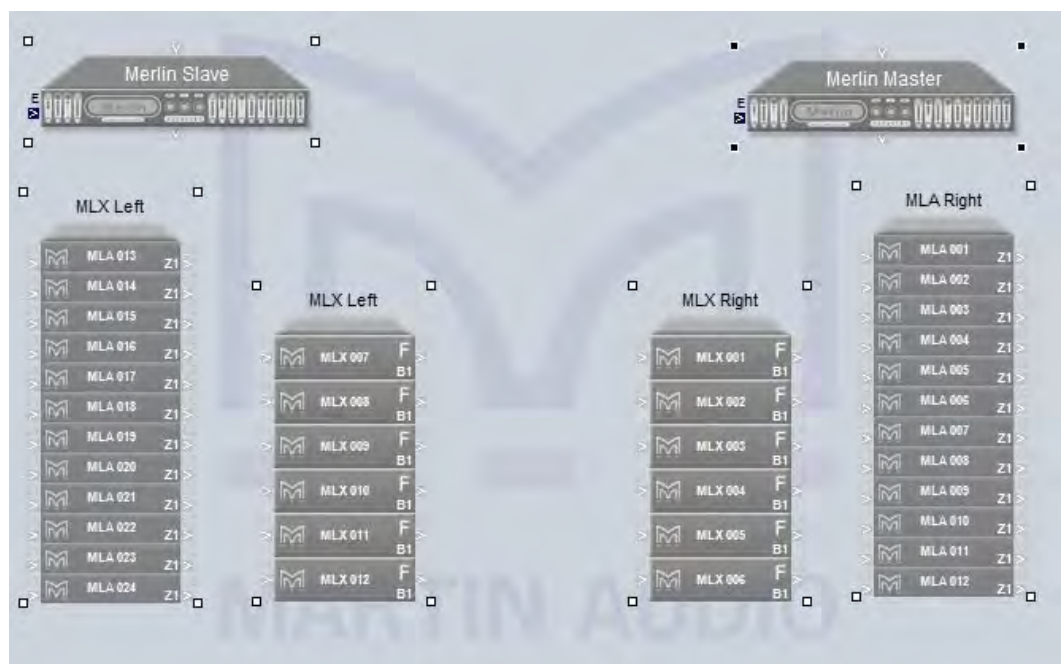
In the upper shot the arrays have been positioned roughly in a line and all selected the lower shot shows them all neatly lined up in a horizontal line.

The second allows alignment in the vertical:



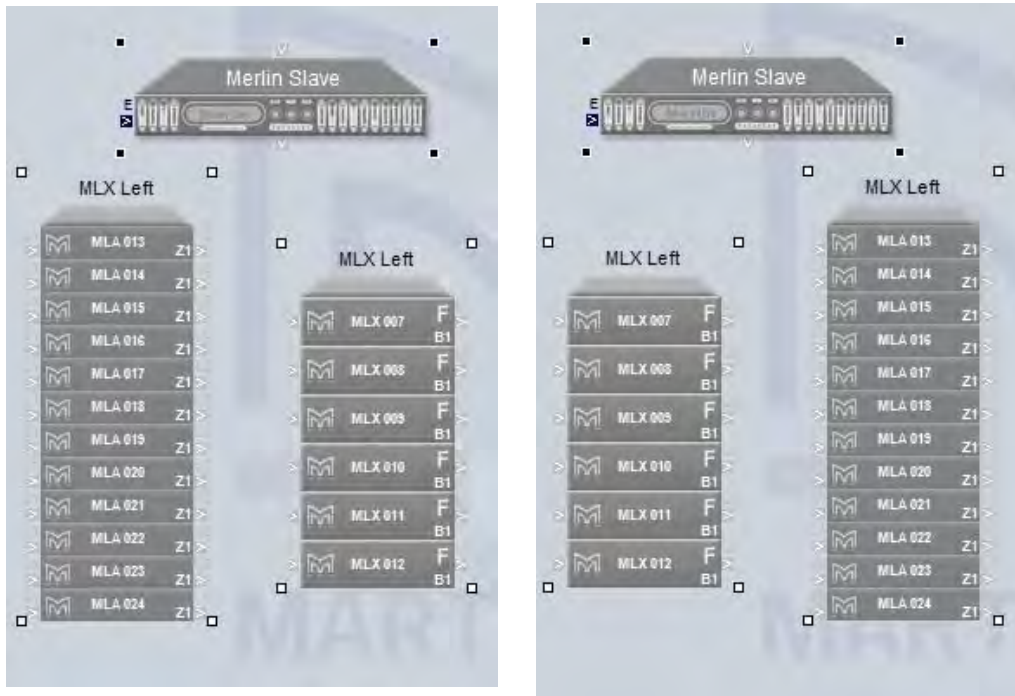
Again the arrays are not very well aligned but a simple click of the vertical alignment button and they are perfectly in line.

The fourth button will swap the horizontal position of all selected elements:

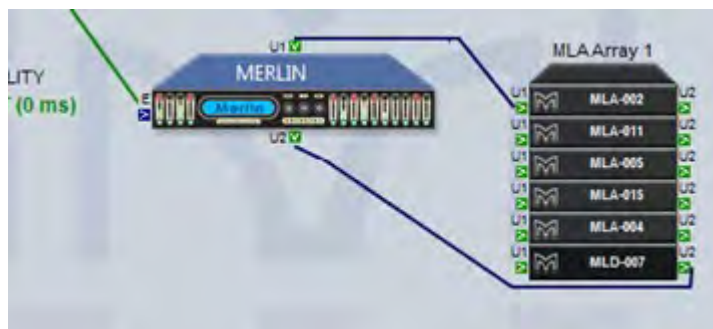


The upper shot shows a system drawn with the left and right arrays placed on the wrong sides, the lower shot has been corrected with the reverse order horizontally button.

The fifth button swaps the order of all selected items in the vertical plane:



The third button applies only to the Merlin. When a system is discovered online all U-Net connections are shown from the Merlin to all arrays:



The U-Net ports on the Merlin are on the top and bottom of the Merlin icon, in most cases this allows Vu-Net to draw the system connections neatly as in the above example but they may be instances where the position of the arrays and complexity of the system means that the network connections cross and the system diagram looks untidy:



If this is the case, select the Merlin and click on the 'Reverse U-Net ports' button and the port position is reversed in the system diagram hopefully making the network connections look neater:



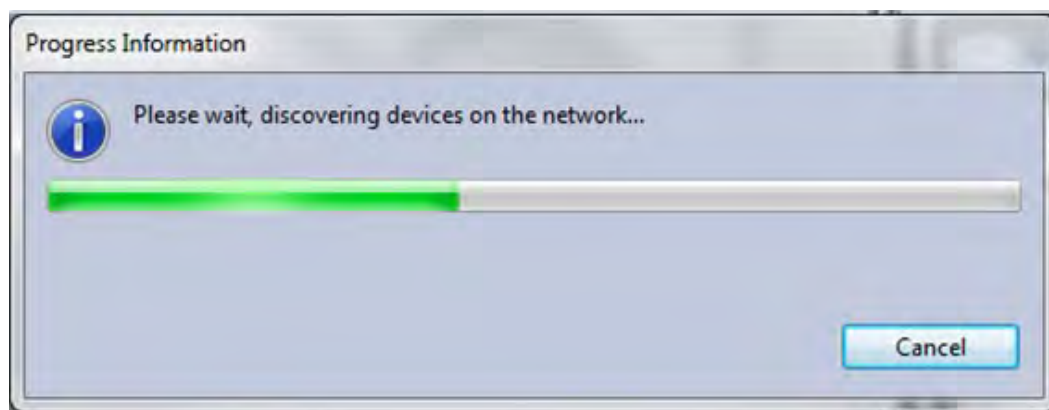
Note: this button reverses the port positions in the system diagram ONLY. It does NOT make and electrical changes to the two U-Net ports, it is purely and simply a graphical change.

DEVICE DISCOVERY

The normal method for operating a system following completing the system rigging and connection is to run Vu-Net is to run Device Discovery. It is good practice to check your network connectivity, first by using the network icon on the PC task bar which should show connection to your system (it will flag that there is no internet connectivity which can be ignored). Then by going into Preferences and selecting 'Network' and making sure that the Available IP addresses window has an IP address for every Merlin in use with your system. If all is ok you can proceed by clicking on the Discover Devices button:

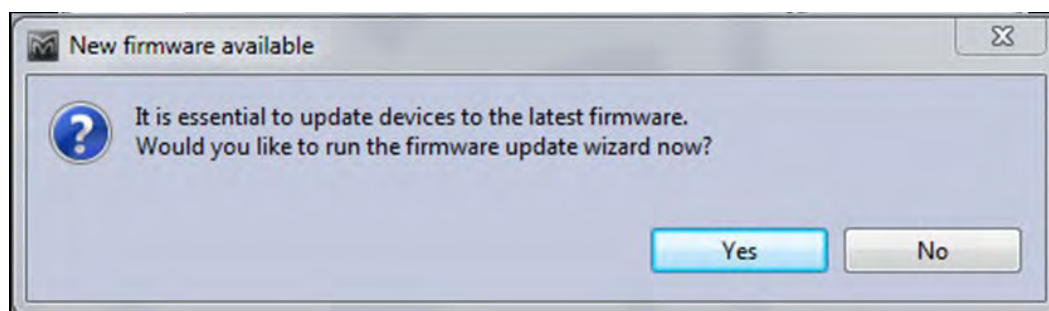


Assuming everything is OK with your network connection you will see the following window:



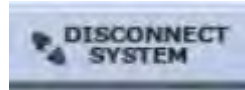
The meter bar will gradually move across until it is completely green and all devices have been found. This may take a few seconds on bigger systems with large arrays of many cabinets.

There are a couple of other windows that may appear at this stage, as well as discovering all devices on the network and identifying their type and IP address, Vu-Net also checks their Firmware to ensure it matches the latest version stored in its internal Firmware database. If it detects an older Firmware version you will see the following window:



For more detail on Firmware updates please see the relevant Firmware chapter.

Finally, it is possible you may see this window:

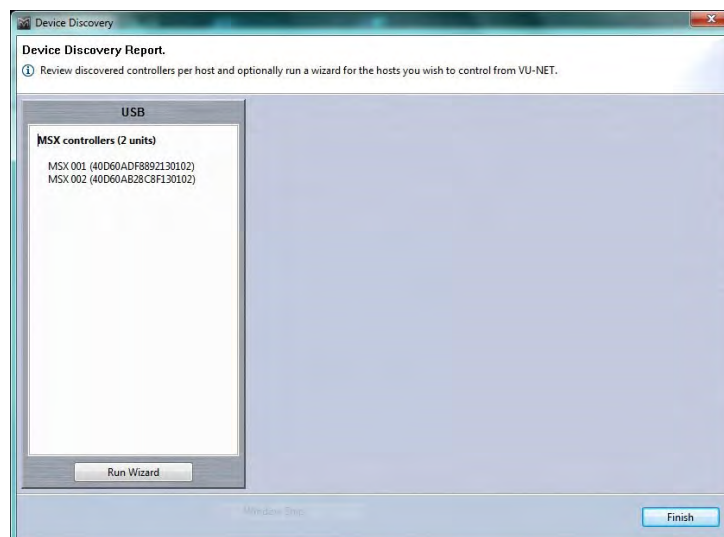


This would indicate a problem up-stream of the Merlin; are the cabinets powered? Are all the network connections made? Is one of the Merlins set to Static IP instead of Dynamic? Can you see two green U-Net LEDs on all devices including the Merlin? If everything is ok try power cycling the Merlin and run Device Discovery again.

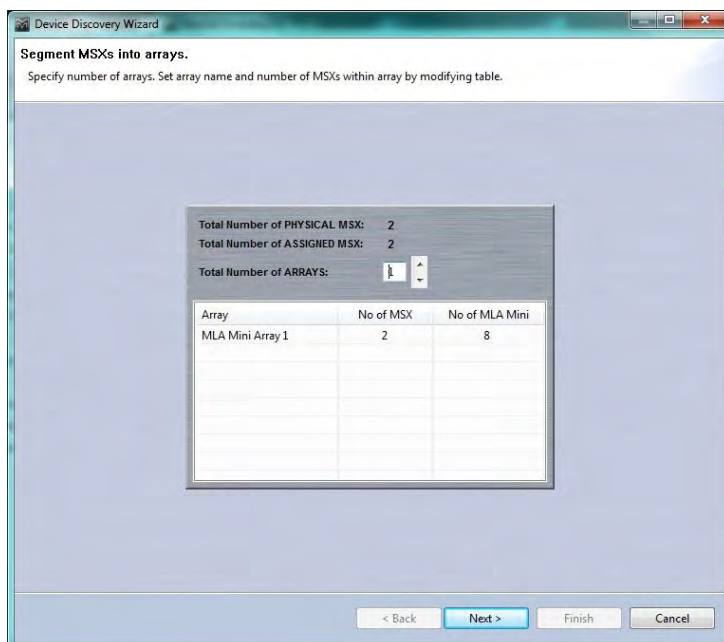
Note: It is not essential to have the complete system wired before you run Device Discovery; for example, you may wish to check each array individually as they are rigged so they can be flown out which is perfectly acceptable. Every subsequent press of Device Discovery will find any new elements that have been introduced to the network ignoring those already discovered.

Device Discovery for MLA Mini is a little more involved than other multicellular products as it is necessary to determine the deployment to ensure that the amplifier module is correctly configured, particularly between ground stacked and flown options as the software compensates for the fact that the cabling is done in different directions; for flown systems the cables attach from above so the longest NL4 on the Speaker cable loom going to the lowest cabinet, the opposite is true for ground stacked systems where the speaker loom comes from below with the longest NL4 reaching the upper-most cabinet.

Here is a small MLA Mini system with a pair of MSX Subs and 8 MLA Mini. We have connected via the USB connection on one of the MSX and the two are linked together with U-Net cables:



If we click on 'Run Wizard' we see the following Window:



Device Discovery Wizard

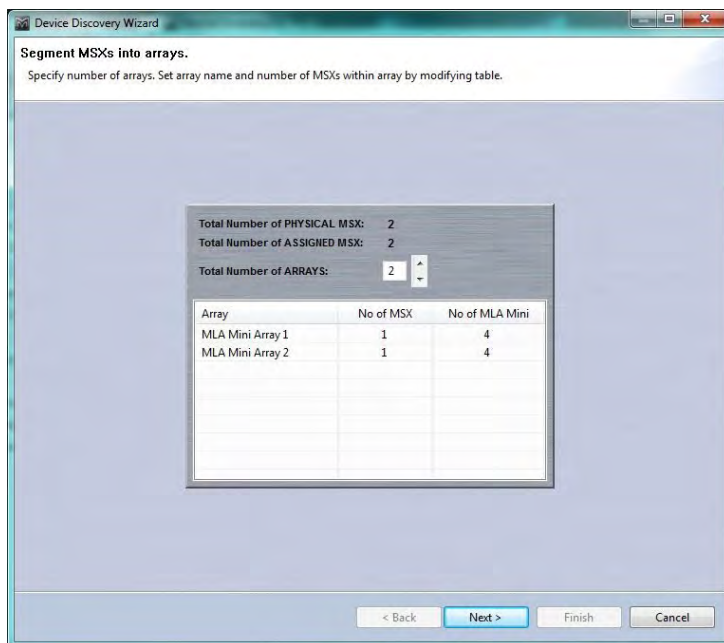
Segment MSXs into arrays.
Specify number of arrays. Set array name and number of MSXs within array by modifying table.

Total Number of PHYSICAL MSX: 2
Total Number of ASSIGNED MSX: 2
Total Number of ARRAYS: 1

Array	No of MSX	No of MLA Mini
MLA Mini Array 1	2	8

< Back Next > Finish Cancel

The first task is to determine how many arrays are deployed. By default Display assumes a single array comprising all of the MSX discovered, if the system is actually stereo for example we need to select 2 in the 'Number of ARRAYS' box:



Device Discovery Wizard

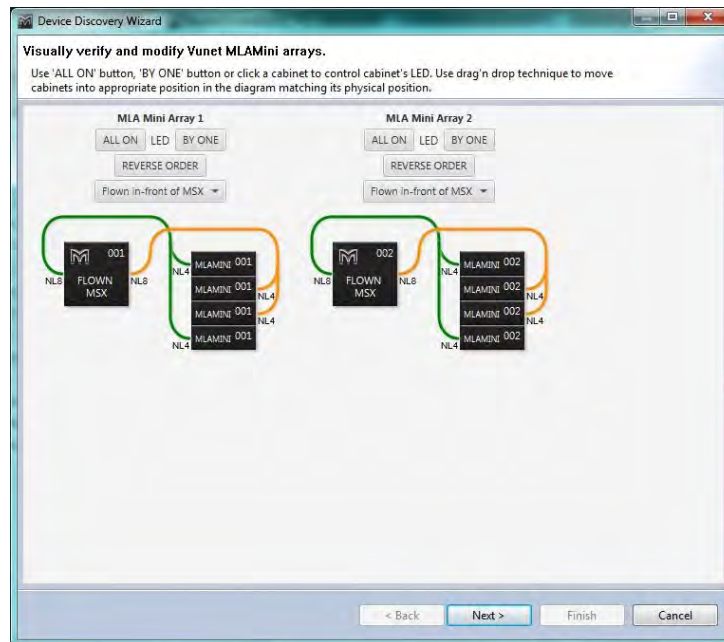
Segment MSXs into arrays.
Specify number of arrays. Set array name and number of MSXs within array by modifying table.

Total Number of PHYSICAL MSX: 2
Total Number of ASSIGNED MSX: 2
Total Number of ARRAYS: 2

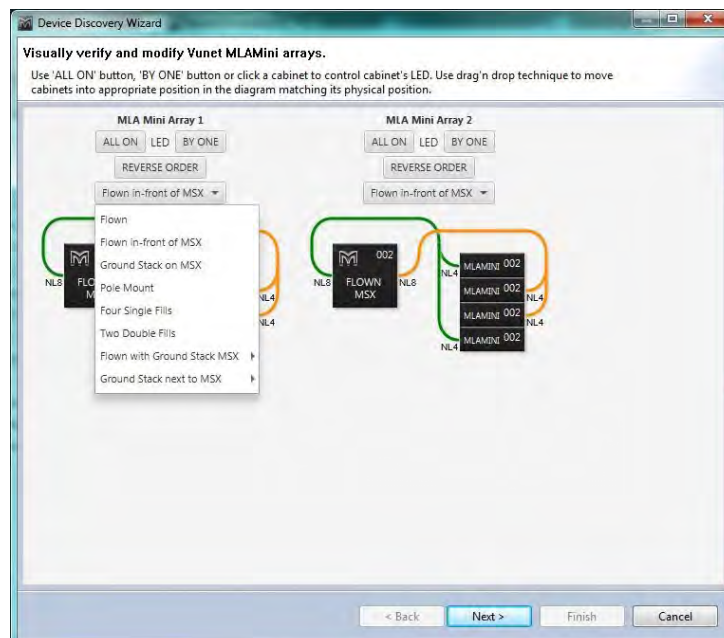
Array	No of MSX	No of MLA Mini
MLA Mini Array 1	1	4
MLA Mini Array 2	1	4

< Back Next > Finish Cancel

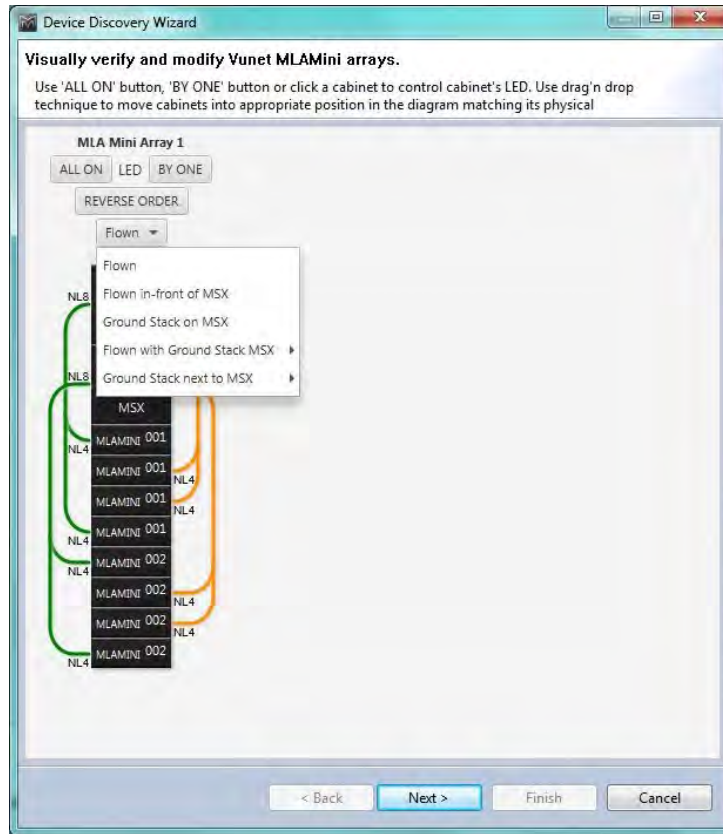
This now shows two arrays each comprising of a single MSX and 4 MLA Mini. Click 'Next' and the next window is where we select the desired deployment:



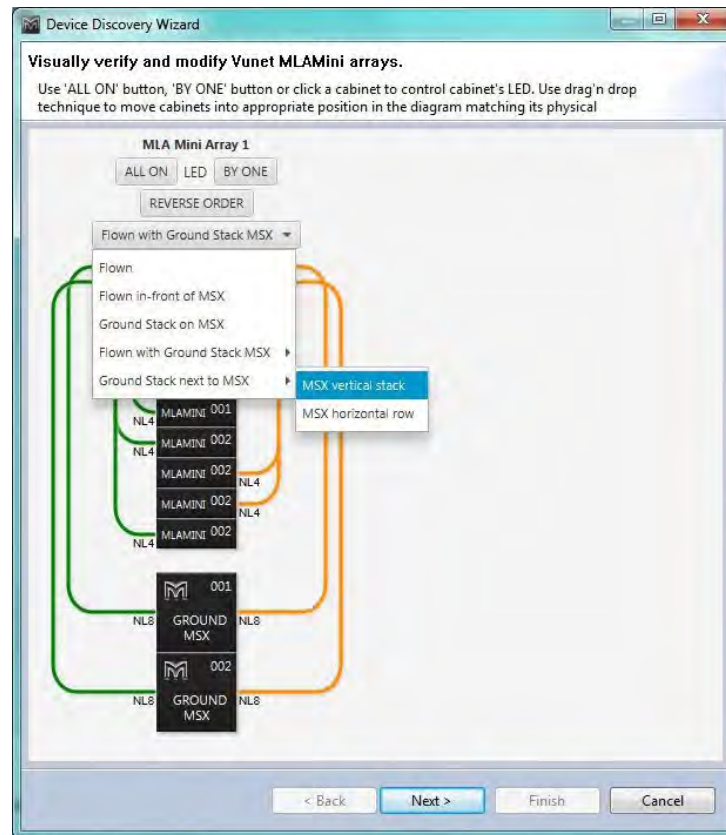
This shows the two MLA Mini array which are deployed in the fault methods of Flown in front of MSX. The drop-down box shows all other options:



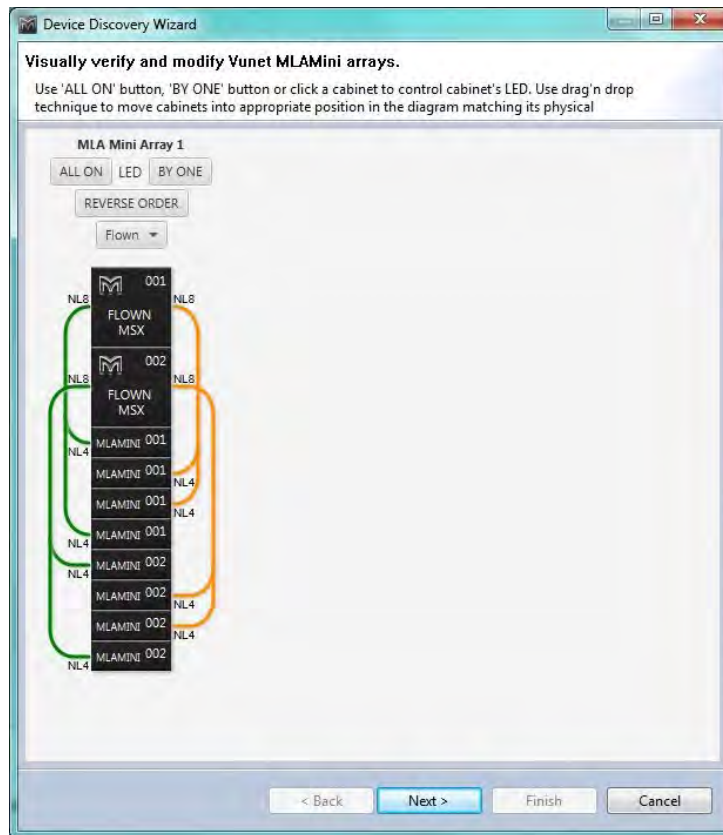
For a larger system the options will change, for example, as the maximum for pole mount is 4 cabinets, 8 or more in an array will remove this option:



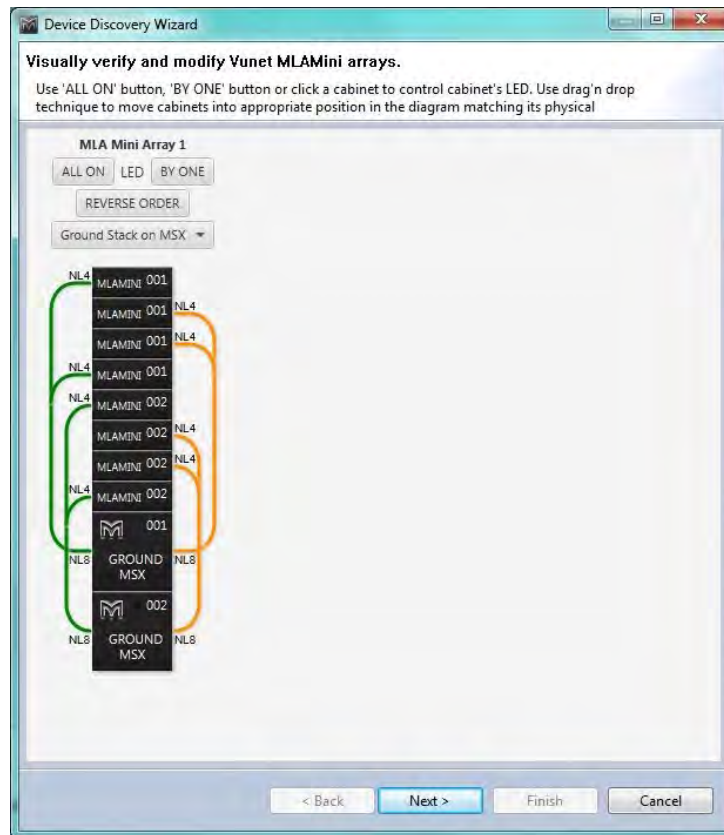
There are however additional options for ground stacked systems of eight or more MLA Mini, the black arrow against these brings out the option for stacking the MSX either horizontally or vertically:



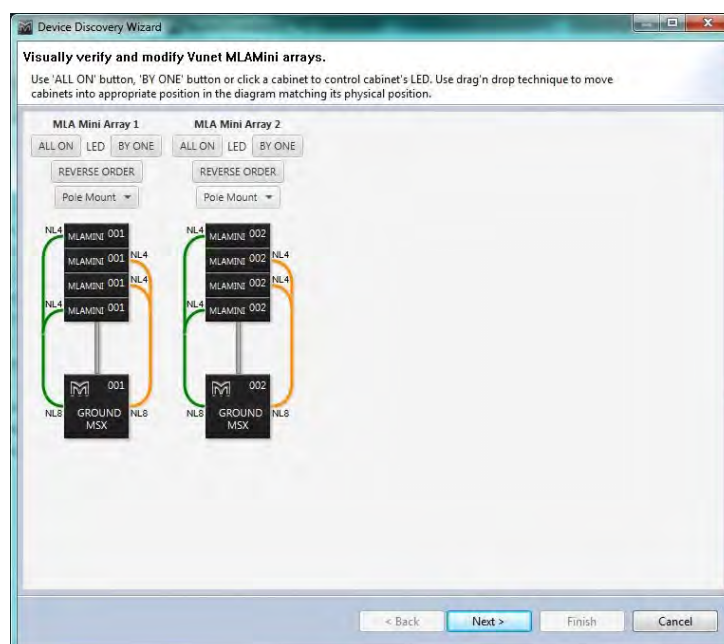
Selecting the various modes will change the array thumbnails accordingly and also importantly shows how the arrays should be cabled. This is particularly important as flown systems are cabled the opposite way to ground stacked with the longest NL4 cable reaching down to the lowest cabinet. For example Flown will appear like so:



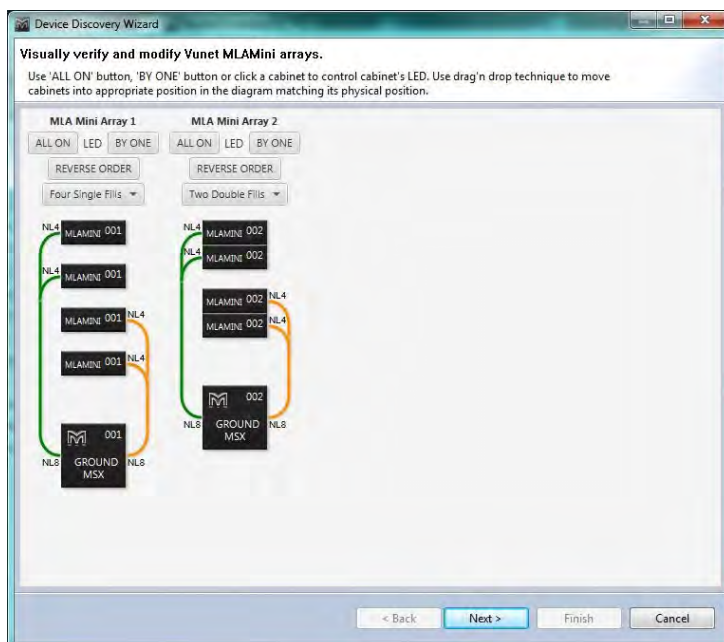
Ground stacked on MSX which is available for up to 8 cabinets appears like this, not the cable which unlike flown has the longer NL4s running up to the top cabinet:



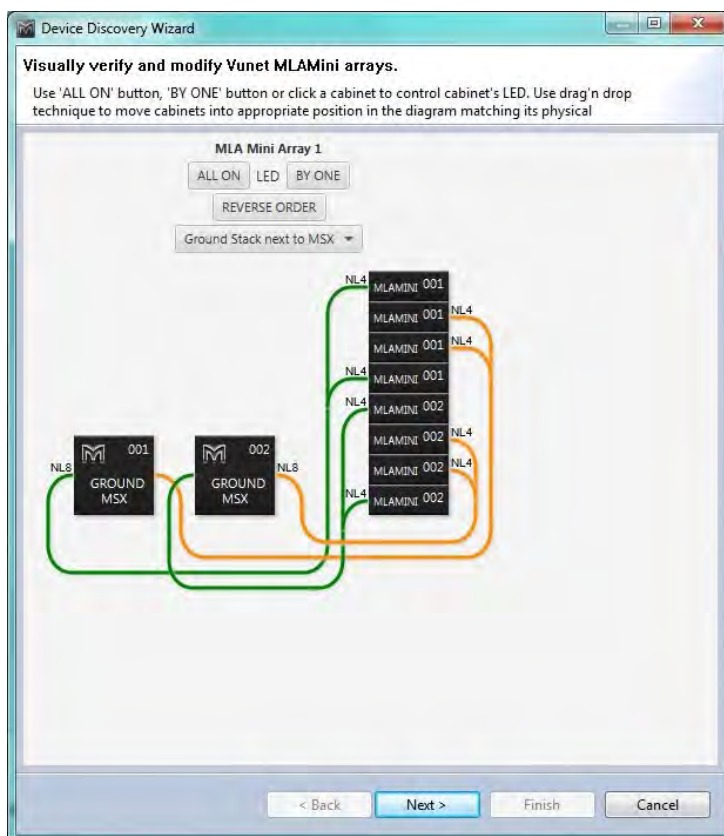
Pole mounted (only available for four cabinets), adds a pole:



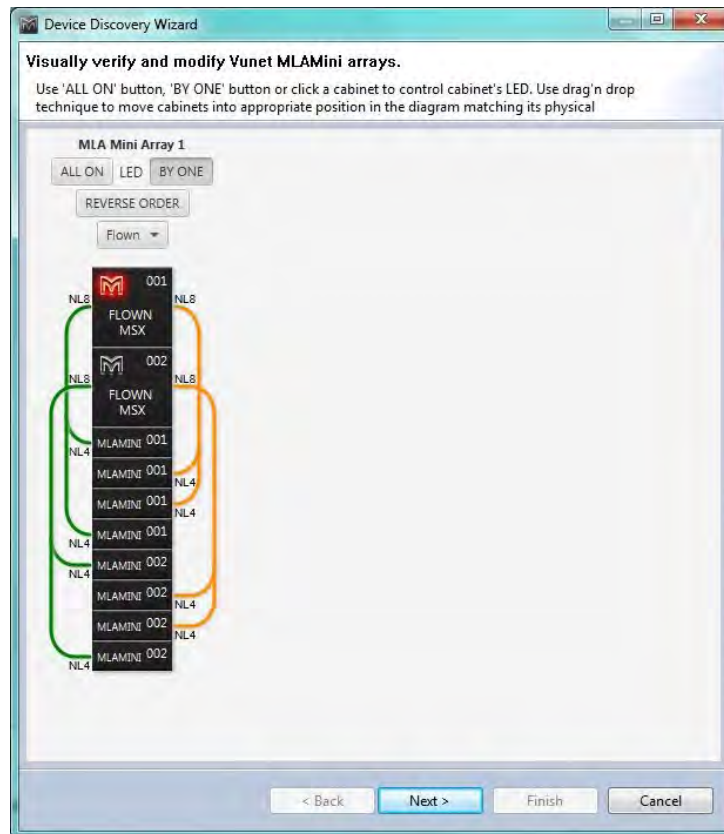
There are two options to use Mini as front fills, either as four single cabinets or two pairs:



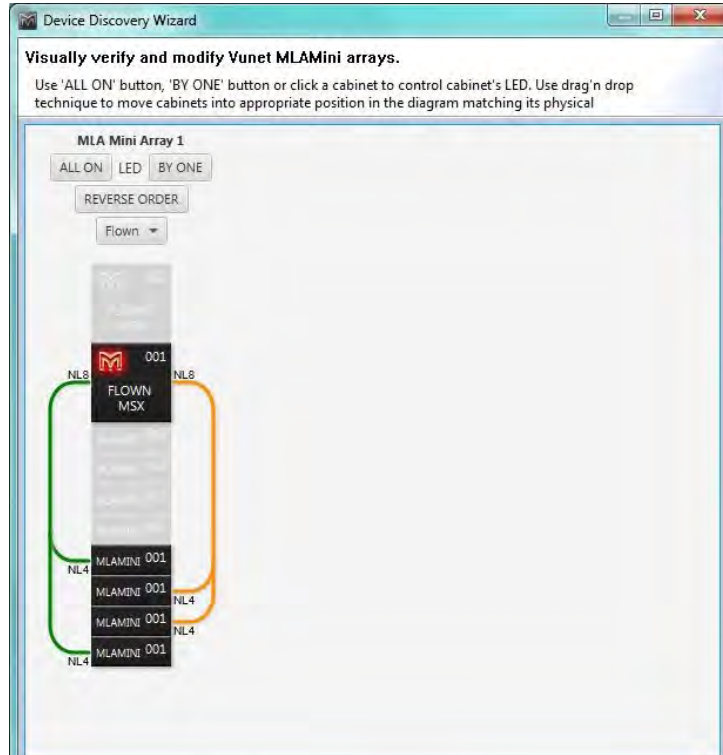
Finally you can ground stack the Mini next to the MSX:



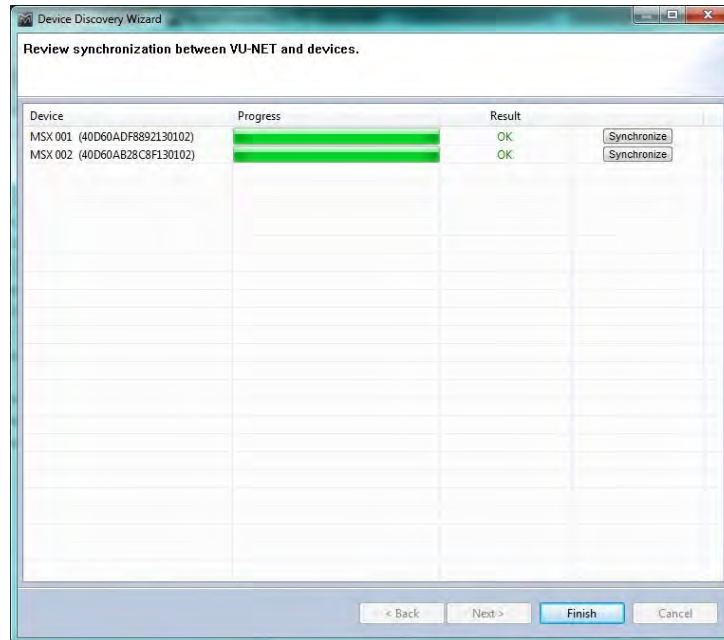
Once you have selected the appropriate deployment you can check the arrays by flashing the LED's on the front of the MSX as with MLA and MLA Compact cabinets. You can select 'ALL ON' to illuminate every cabinet in an array useful for identifying which array is which where two or more are in use, and 'BY ONE' which will flash all MSX in an array sequentially so you can check that they are in the correct order:



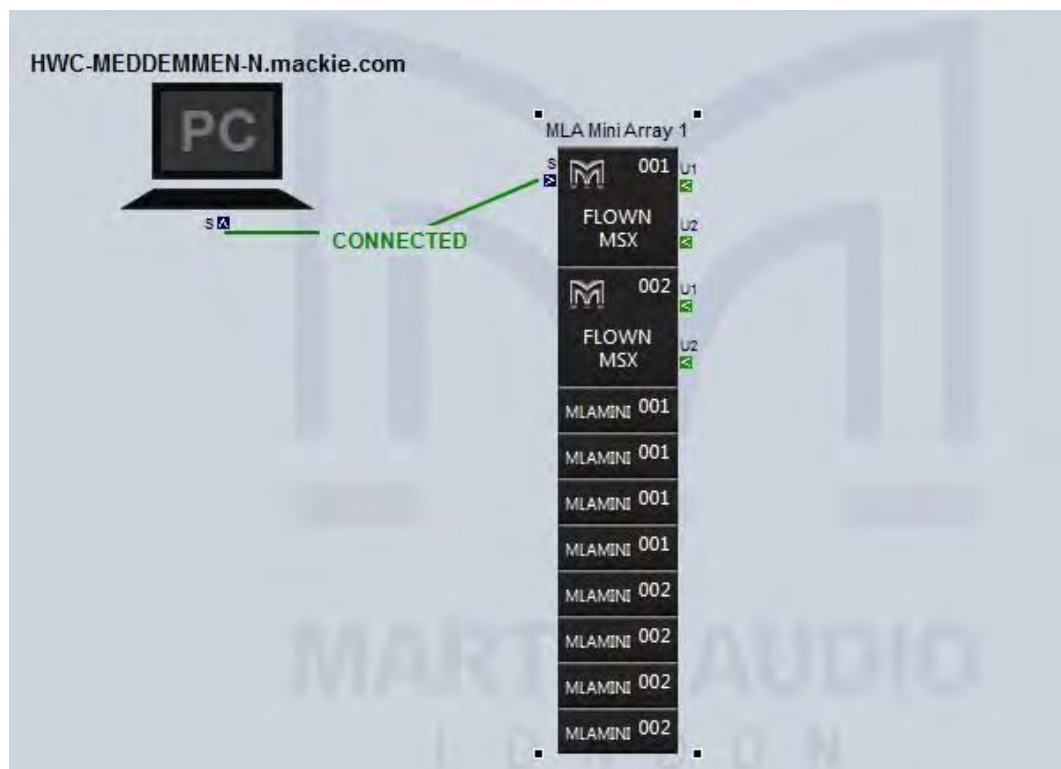
If they are not they can be drag and dropped into the correct positions until the Vu-Net flashing sequence matches the real-world cabinets. Clicking on one MSX will grey out all others until it has been dragged and dropped to the desired position:



Once the cabinet sequence is corrected you can proceed by clicking next and synchronising the system:



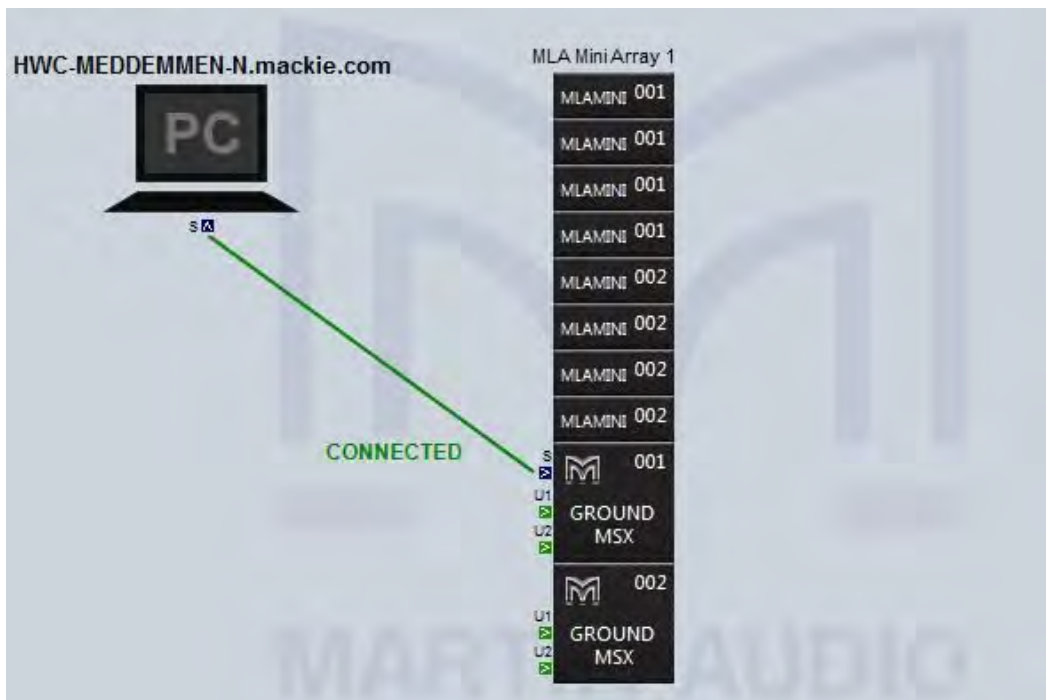
Once complete the arrays will appear on the System Diagram window with the thumbnail representing how you have selected the system deployment. Here is an eight box system flown from MSX:



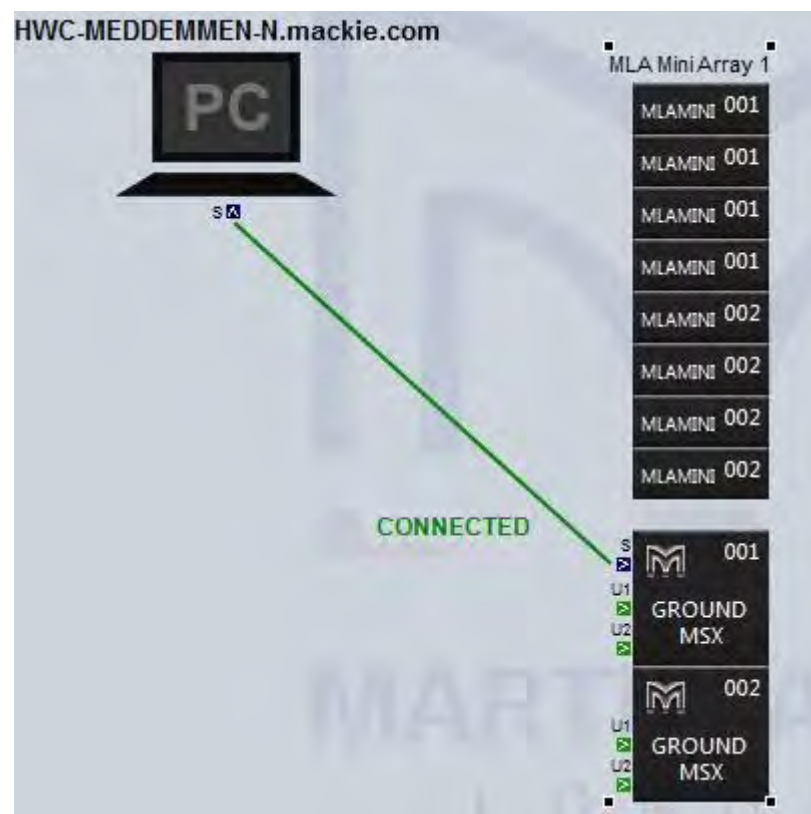
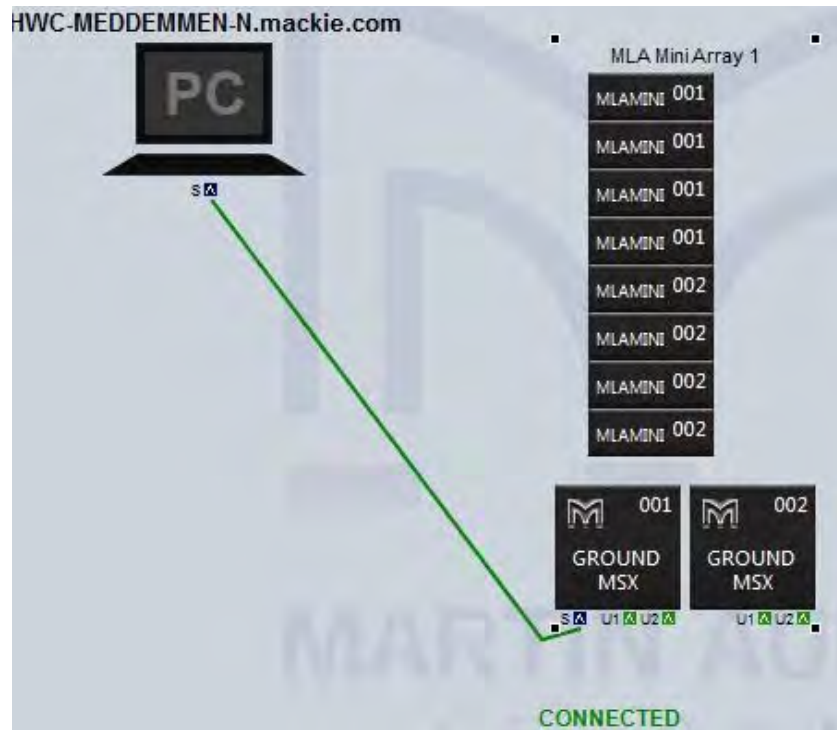
This is a flown system with the MSX flown behind the Mini:



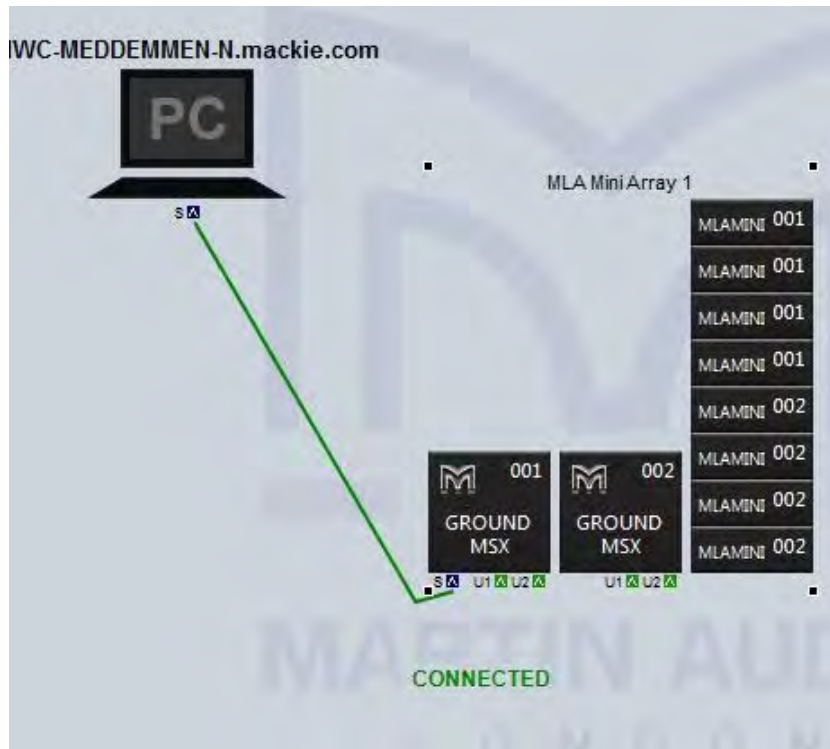
Eight mini ground-stacked on their MSX:



Eight flown Mini with ground-stacked MSX stacked vertically and horizontally:



Similarly ground stacked with MSX in both horizontal and vertical modes:

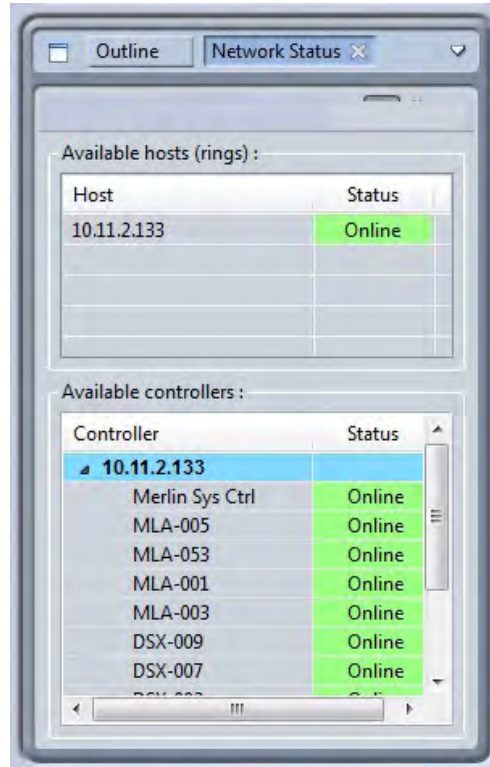


ON LINE OPERATION

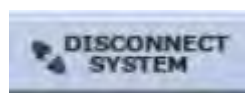
Note the differences from the off line mode of operation. First in the top tight corner you can see the indication that the Merlin and connected speakers are on line:



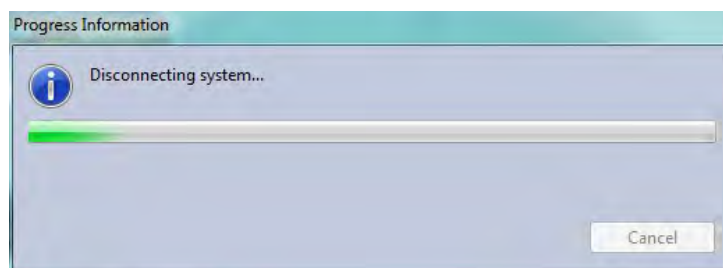
In the right hand corner we have selected network status and we now see all connected elements showing as Online:



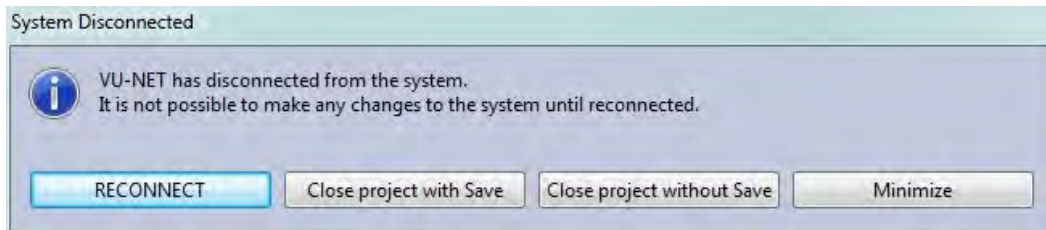
We now have the facility to Disconnect from the system whenever necessary, at the end of the night when a show is finished for example. Click on the 'DISCONNECT' button:



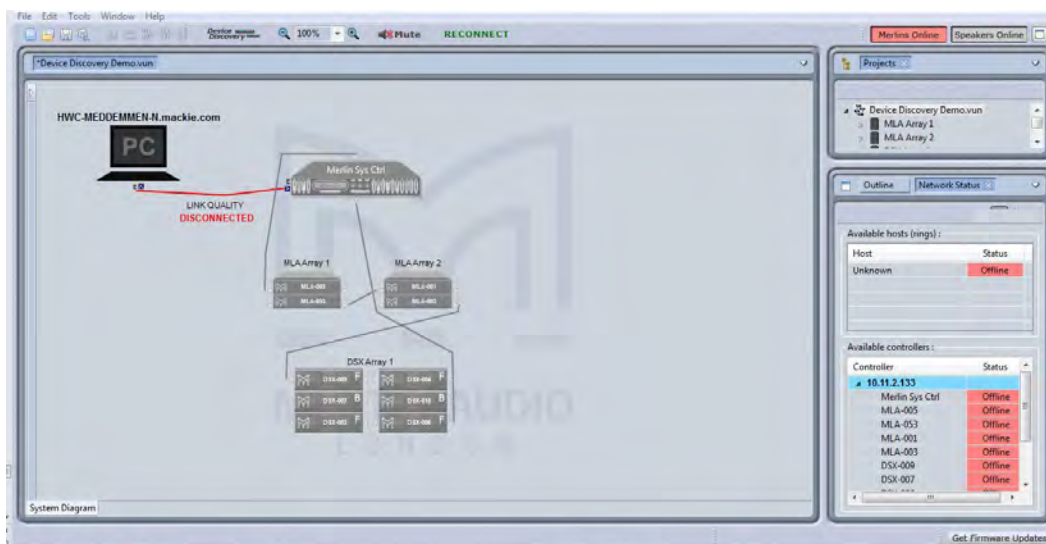
You will see the Disconnecting System Window appear:



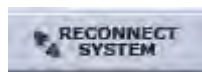
Next you will see the following message:



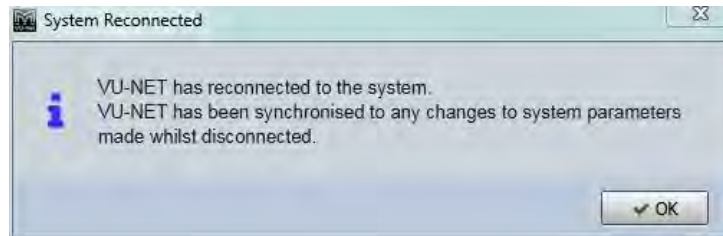
The Vu-Net Window will now appear as follows, note that the connection between PC and Merlin is showing as 'Disconnected' and the system in the Diagram window is greyed out. As the pop up window mentions, it is not possible to make any changes to the system whilst the system is in this state. We recommend using disconnect and re-connect when changing from a wi-fi to a wired connection for example when set-up is complete before the show start:



The 'DISCONNECT' button is now a 'RECONNECT':



And a click will restore the connection to the system. If the project has been saved, when re-opened you will be prompted to re-connect immediately. Once reconnected you will see the following message:



As you can see, the System diagram detects and draws all network connections. Note that Ethernet connections from PC to Merlins are shown as a line regardless of whether it is a hard-wired cable, copper link or wireless connection. The Unet ports on individual devices also show the network integrity. Good connections will show as a green U1 and U2 port. A faulty or missing connection between devices in an array will be shown as either a grey (no connection) or a red (connection with network errors) U-Net port. By hovering your mouse over a port displaying an error you will see details outlining the nature of the issue:



In most cases this is not critical as a U-Net topology is a redundant ring so if there is a break in the network connection, every device will still remain on line as the A cabinet or array off-line will appear in red, an individual off line cabinet will be shown at the position in the array:

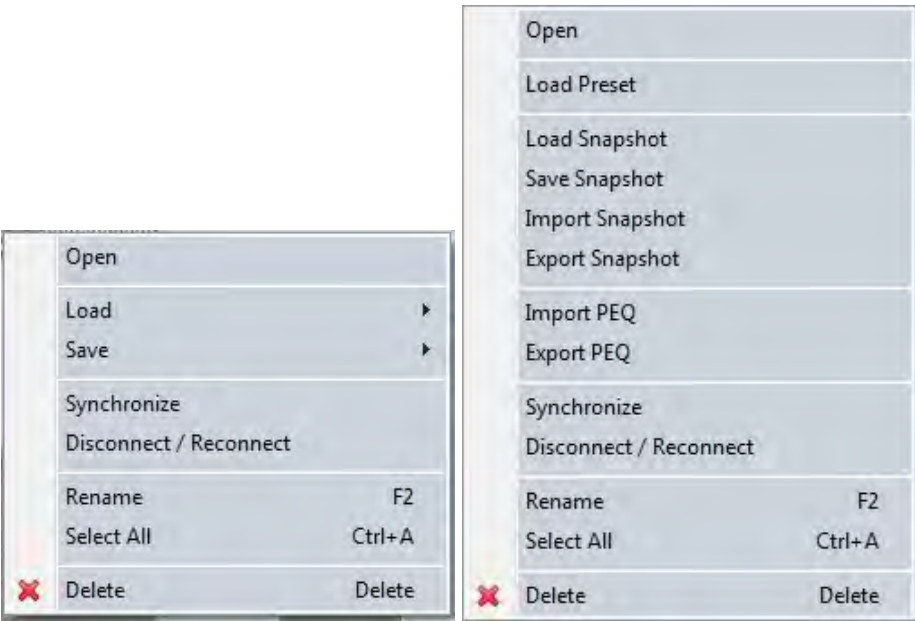


The network is monitored in real time so as soon as any network or cabinet issues have been resolved the connections and cabinets will return to the regular colour scheme:



RIGHT-CLICK MENU

Access to array or Merlin functions are achieved in two ways; double clicking or right clicking, first we will look at the options available when selecting an element with a right mouse click as there are some configuration options that you may need to select first from this page. The right click menu varies according to the device selected:



From left to right these are the right-click menus for the Merlin and MLA Mini

‘Open’ will open the full configuration page in exactly the same way as a double click

‘Load’ for a Merlin offers two options, either load a saved Merlin Configuration file created using the Save function, or load a Preset file which will import a binary file created in XTA’s Library Manager.

'Load Preset' will open the preset selection panel for the array.

'Save' is also a function available for Merlin. There are three options, 'All', 'Inputs' and 'Outputs'. These will save the Merlin configuration as a Merlin *.meq file in a location of your choice on your hard drive. As the options suggest, 'All' will save the entire Merlin configuration, 'Inputs' just the input PEQ and delays and 'Outputs', all parameters from the output channels ignoring the inputs. The *.meq file can be saved and re-used in future projects or distributed to other MLA partners for use with other systems. It is loaded using the 'Load' function.

'Load Snapshot' will open the Load Snapshot Window.

'Save Snapshot' allows you to store the configuration that you have created to a free user snapshot location.

'Import Snapshot' allows you to import a snapshot stored as a file.

'Export Snapshot' is an option for storing the configuration that you have created as a file on your PC so it can be used in other cabinets of the same type in the project or in the future with other systems.

'Select All' will select all components in the system design. The keyboard shortcut for this is Ctrl + A. PEQs

'PEQ' has two options, Import and Export. As we will see, it is possible to tailor the EQ of an array to suit personal preference. This is in addition to the array optimisation from Display 2.2 which will equalise the system to suit the response requested in the design. If there is a particular sound required for a style of music or requested by a sound engineer, the curve can be stored as a file and recalled for any future shows using these commands. Using the house EQ will be covered later in this chapter.

'Define Zones' is used with MLA and MLA Compact to zone the array up to a maximum of six zones.

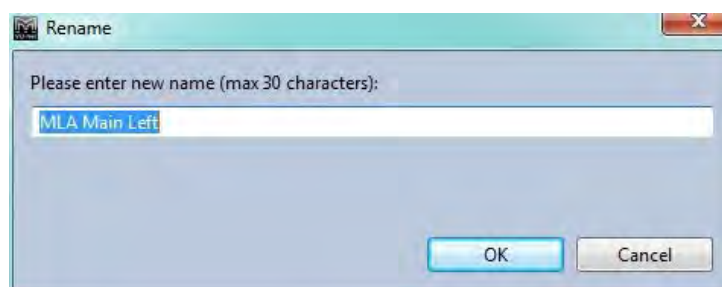
'Synchronize' is a manual synchronise between the PC and connected device. This happens automatically when a device is first discovered.

'Disconnect/Reconnect' Allows you to disconnect a single device from the network turning it red in the Vu-Net window.

'Rename' allows you to give the Merlin, array or cabinet a name to suit the event and location if desired. Function key F2 is a shortcut to this option.

RENAMING

Selecting 'Rename' from the right-click menu or pressing F2 with a device selected brings up the following window:



Type the required name which can be up to 30 characters. Press OK and the name will be shown on the device label in the System Diagram, Master Overview and when that device is selected.

PRESETS & SNAPSHOTS

We use two distinct terms for stored parameters when referencing recalling system memories within devices in Vu-Net but there are clear differences between a Snapshot and a Preset. “Snapshot” in common with digital mixing console terminology, is a memory which saves every setting of the devices at the moment that “Store” is pressed. This includes all gain, mute, input routing, EQ, phase and time delay. Any parameter that can be modified will be stored as part of a Snapshot

Presets are unique to the Multicellular products and are the optimised files created using Display 2 which enable MLA Mini to deliver the coverage exactly as specified by the system technician when the system was designed in Display. A Preset or a number of presets are uploaded to the system using the Preset Loader tool and are recalled as shown. Recalling a Preset only recalls the optimisation in the User Preset location. It does not alter any other parameter that may have been modified such as input gain or parametric EQ.

LOADING PRESETS

As we will see, system configurations for MLA Mini including different optimisations can be stored as Presets. These are stored in the DSP of each MSX once uploaded so recalling is a simple network instruction to load whichever snapshot has been selected. This could be extremely useful if you have done a number of optimisations for an outdoor space with different environmental conditions to compensate for the variation in air absorption during the day as the conditions change from bright sunlight to cool evening. If you need to save or select presets for several arrays simultaneously you would select the necessary arrays as already described, then use the Load or Save presets commands in the Edit menu, however if you just need to select presets in a single array you can do so using the menu functions available by right clicking. Selecting Recall Preset will bring up the following Window:



Note that this is an off-line array which is why the Presets are showing “Undefined”. Preset A is a factory default with no eq, phase or gain modifications. This is useful to load as a system test

option so when listening to pink noise through individual cells it is easier to hear and differences between drivers. It is also valuable as an emergency setting, say you had a catastrophically late load-in and don't have time to create an optimisation file you can recall preset A and use the system essentially as a standard line array. You can easily upload an optimised Preset at a later stage, see the chapter on Preset Uploading.

Presets are loaded by clicking on the desired Preset number after which a window will show the upload progress ending with 'preset load success' Depending on the size of the array and complexity or the optimisation this may take anything from a few seconds to 10 or 15.

SYNCHRONIZE

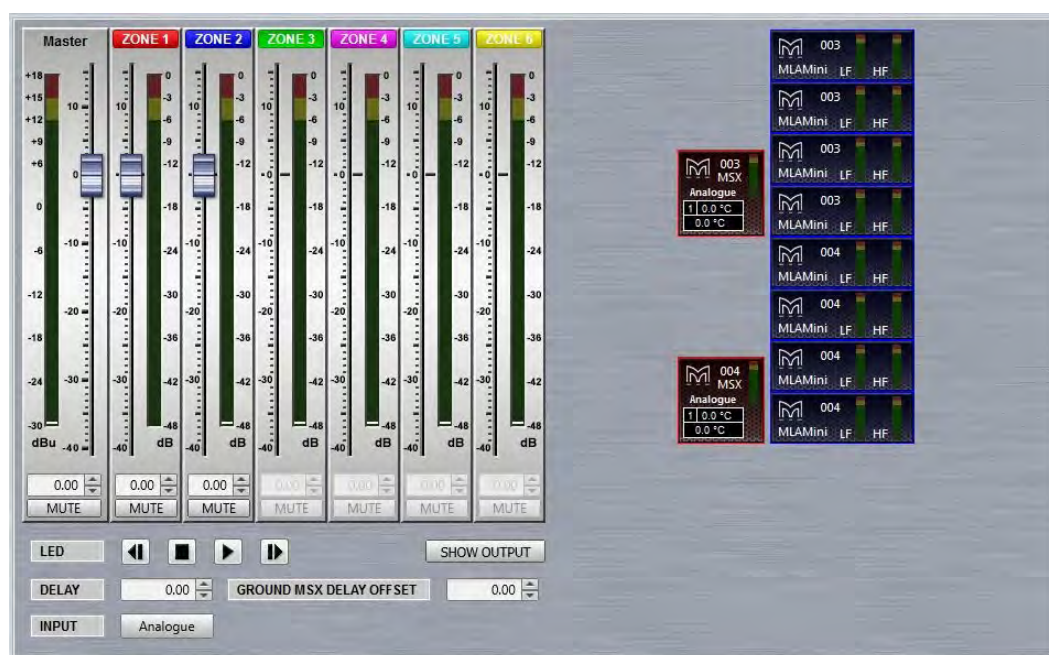
When connecting or reconnecting to any system the cabinets will be synchronised, there is also the facility to re-synchronise at any stage using the right-click menu.

DELETE

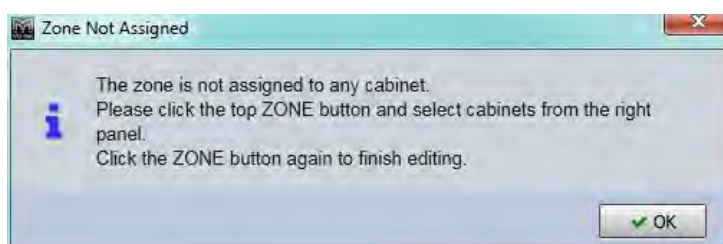
Any array or Merlin can also be deleted from the right-click menu. This can also be achieved by selecting the item or items and pressing the 'Delete' Key.

MLA MINI

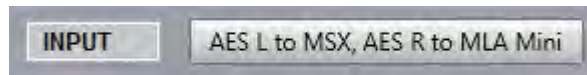
MLA Mini retains many of the network features of its bigger brothers but with a slightly different approach to the implementation within Vu-Net. Double clicking on an array (regardless of how the system has been deployed), brings up the following Window:



As you can see, the main array window is almost identical to the other MLA System components; there are the usual six zones available each with a gain fader and mute switch. As with other systems, unassigned zones do not have a fader and the gain read-out and mute switch are greyed out. If you attempt to adjust gain or mute an un-assigned zone you will see the following window:



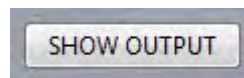
There is the same LED badge option, up to 1,000ms of delay and a similar input select from either the back panel or U-Net (not presently implemented) and back panel input can be either Analogue, AES3 Left or AES3 right with the addition of an AES split mode which routes AESL to the MSX and AESR to the MLA Mini:



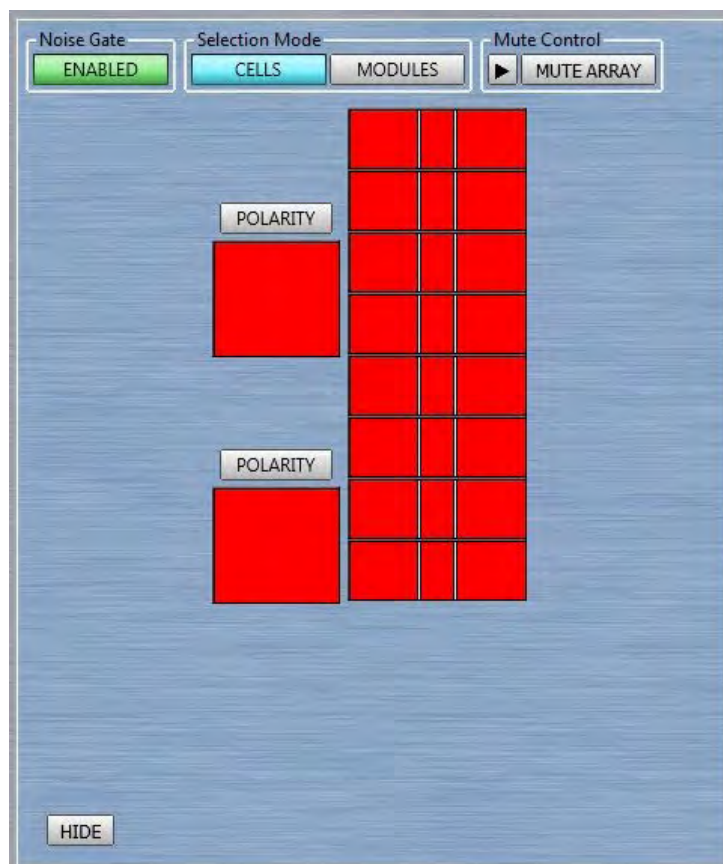
In common with sub arrays there is a SHOW OUTPUT button to access array utility functions rather than double clicking on the array thumbnail.

MLA MINI CELL CHECK

As long as Show mode is not active, clicking on the SHOW OUTPUT button:



Brings up an array diagram with each cell individually accessible as with MLA and MLA Compact systems. Clicking on the MUTE ARRAY button will mute every cell:

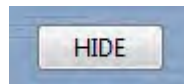


A test signal such as Pink Noise can be applied to the array and each cell can be individually un-muted by clicking on it to test that everything is operating correctly and all components are in the correct position in the array. This can be done by individual cells if the Selection mode is in the 'CELLS' position or by an entire MLX and 4 Mini group if you click on 'MODULES'. This is particularly important as the amplifier modules are all in the MSX sub, it is possible to incorrectly wire from the MSX to the MLA Mini. You can either click on cells manually to unmute them and there is a "play" function to cycle through all cells in the array. Unlike the other systems, unmuting a cell will mute all others which speeds up the testing process as you no longer need to manually mute the last cell you listened to before un-muting the next.

As with the other cabinets, the array noise gate is accessible but in MLA Mini there is only the option to Enable or Disable the gate:



When you have completed any testing, click on the HIDE button:



Which will un-mute all cells and return you to the main array window.

ASSIGNING ZONES IN MLA MINI

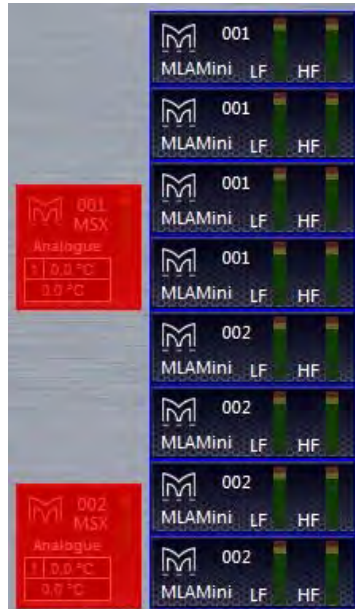
As with MLA, MLD and MLA Compact, there are up to six zones available for the system as the Array Overview shows. How these are defined is however different from the other MLA components. You may have noticed that the right-click function in the System diagram does not allow zone definition for an MLA Mini Array. Instead, zones are defined using the zone faders. If you look at the Array Overview thumbnail, you will notice that the MSX (two in our example) have a red border and the 8 MLA Mini have a blue border:



By default, MSX are assigned to zone 1 and all MLA Mini to zone 2. Reassigning zones is extremely simple. In our example we will keep the MSX assigned to zone 1, the top four MLA Mini to zone 2, the next two to zone 3 and the final two to zone 4. First click on the Zone 1 label:



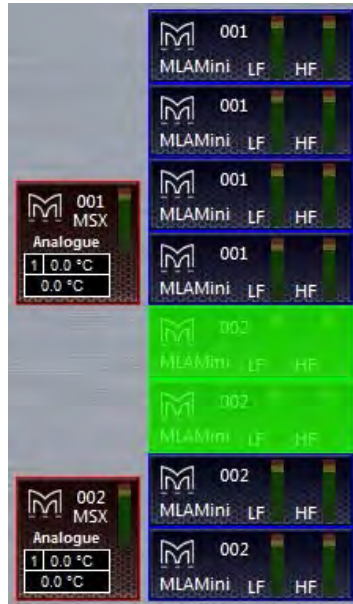
You will notice All components that are already part of the zone will turn red:



Click the Zone 1 label a second time and the two MSX will return to the normal view. Click on the Zone 2 label and you will see all of the MLA Mini turn blue:



Now click on Zone 3 and there will not be any illuminated cabinets. Next click on boxes five and six, these will turn green:



This indicates that these cabinets are now part of zone three. Finally click on Zone 4 and then the final two MLA Mini:



If we click again on zone four the solid block of colour disappears leaving just the coloured outline to show which boxes are members of which zone. The array is now fully zoned as we wanted it:

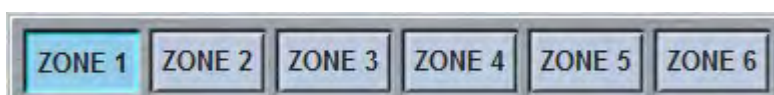


MLA MINI PEQ

The MLA Mini Zone PEQ window appears like this:



It is a slightly simplified version of the PEQ Tab that is available in all other array components. The six available zones can be selected by using the Zone buttons at the top of the window:



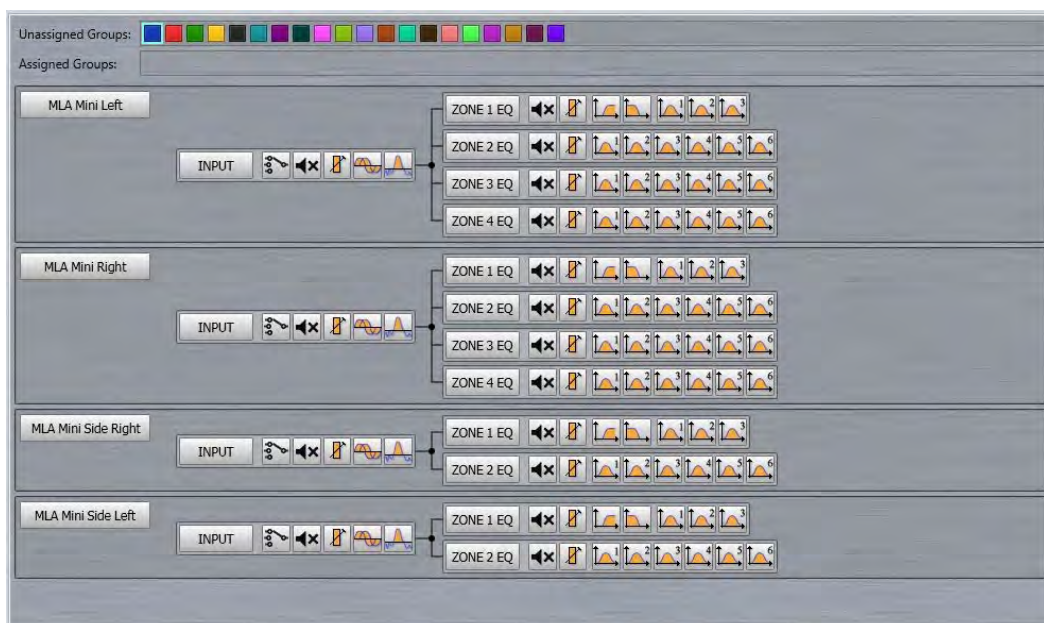
Zone 1 is always the MSX sub so the EQ bands available are slightly different. There is a high pass filter, low pass filter and three bands of PEQ all of which may be adjusted in the same way as the PEQ in all other array types; grabbing the points on the graph, adjusting the controls in the EQ panel on the right or directly entering the required values in the windows at the bottom of the EQ panel.

Zones 2 to 6 all have a high pass filter and six bands of PEQ:



MLA MINI GANGING

Ganging for MLA Mini is handled in an identical way to all other devices. If you select the Array/Zone Ganging tab we see the following view. Note that for this example we have a Vu-Net project consisting of two main left and right arrays each with two MSX and eight MLA Mini, plus two “side” arrays each with a single MSX and four Mini. The larger array has four zones; one for MSX and three for the array, the side arrays have the default two zones:



In exactly the same way as other devices you can choose to gang the entire arrays, just the input parameters, the output parameters by zone or individual parameters. Note that all gain and delay parameters are offset ganged. If there is already a value entered before ganging is implemented this will be retained and subsequent changes to a value to any ganged gain or delay will increase or decrease all values according to any edits you make but will retain the offset between all values.

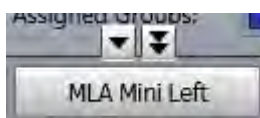
There are the same 20 independent groups available for both types of ganging, selected by the coloured Group buttons along the top of the window in the Unassigned Groups section

Array Ganging

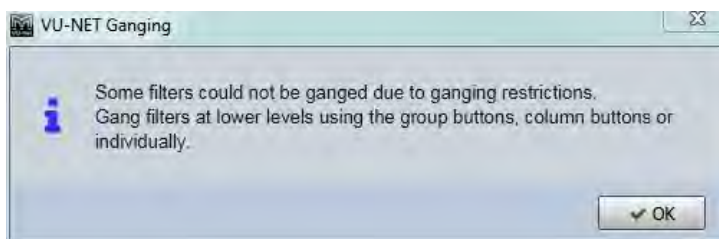
To gang an entire array, click on all arrays you wish to be ganged together. In our example we will gang the main left and right arrays and on a second group the two side arrays. There is no need to select a group they will be assigned automatically with different groups for each zone. You will need to select a different group to zone the side hangs:



If you wanted all four arrays zoned together you can use the double arrows that appear on any of the buttons when you hover the cursor over them for over a second:



When you gang arrays which have different numbers of zones you will see this message:



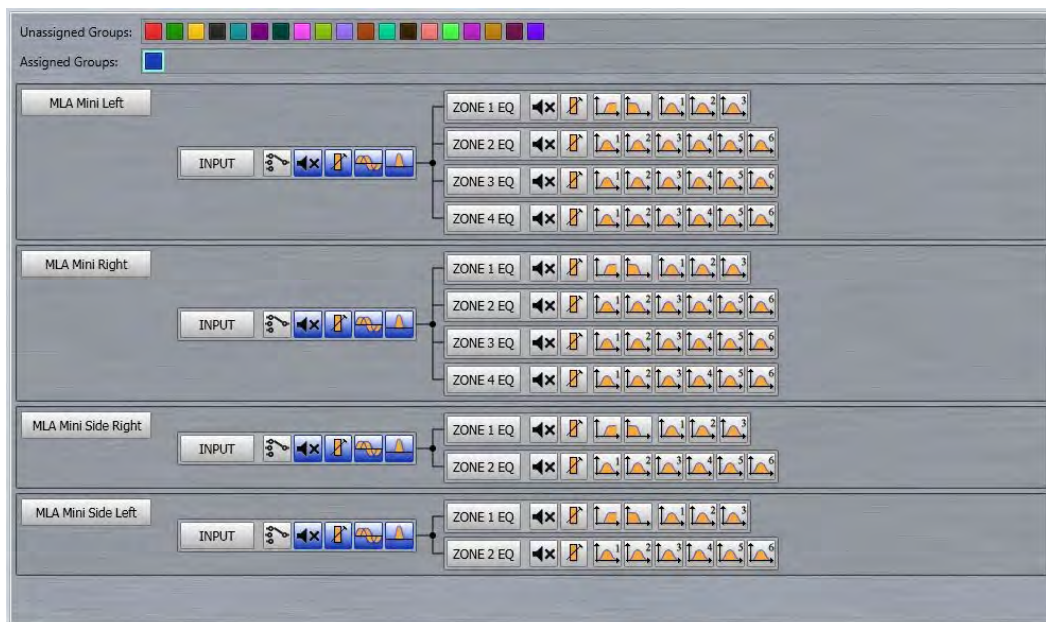
Any of the individual parameters can be excluded from a ganged system simply by clicking on them. A typical example might be to gang everything other than mute so you can ensure that arrays are matched left and right but have the ability to mute them independently, useful during set-up. All parameters other than input source are ganged when using the array buttons so click one any you wish to exclude. Here we have added the input source and removed Mute from the ganging for both main and side arrays:



Note that the reason for input source not being automatically included in array or input gangs is to cater for systems using an AES3 input where it is likely that the left array will use AESL and the right AESR. It is perfectly reasonable to gang the input source on all arrays if the signal feed is analogue.

Input Ganging

You can also choose to gang just the input functions of mute, gain, delay and noise gate by selecting the INPUT button for all arrays that you wish to gang. As with complete array ganging you can use the double arrow or click on input buttons individually.



Zone Ganging

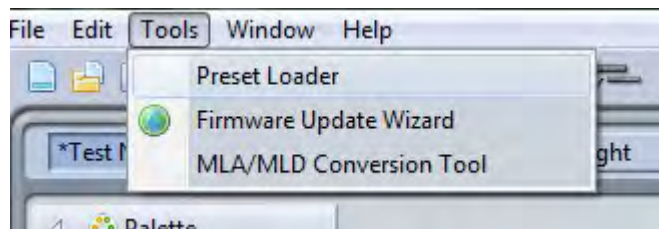
Zones are ganged in exactly the same way by first selecting a group and then clicking on the required zone. Ganging can run across the zones of all arrays or just across some. In this example we have ganged Zone 1 (the MSX sub) on all arrays and all other zones are paired across the main and side arrays. We have removed the ganging on the zone mutes so these can be independently muted and un muted during set-up



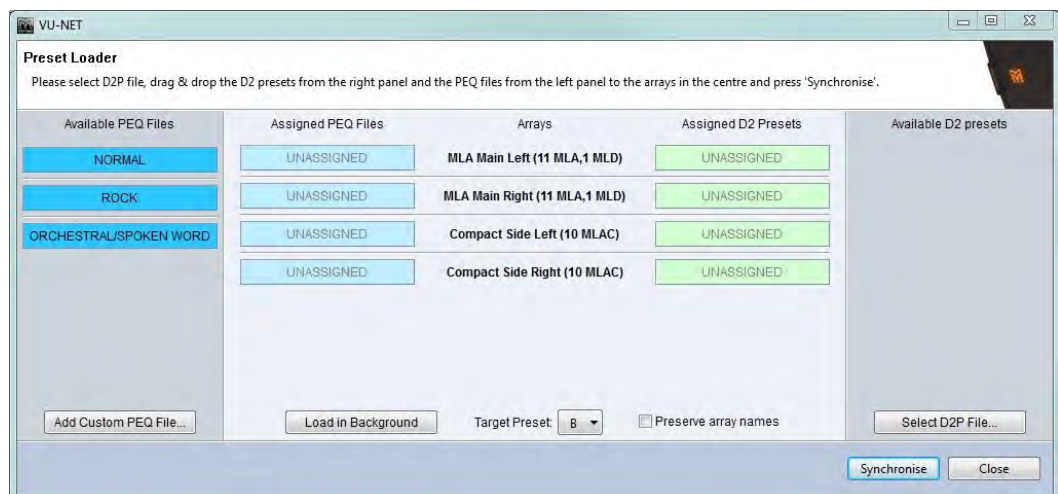
Individual parameter zoning is simply a case of selecting an unassigned group and clicking on individual parameter icons to add them to the gang.

LOADING PRESETS

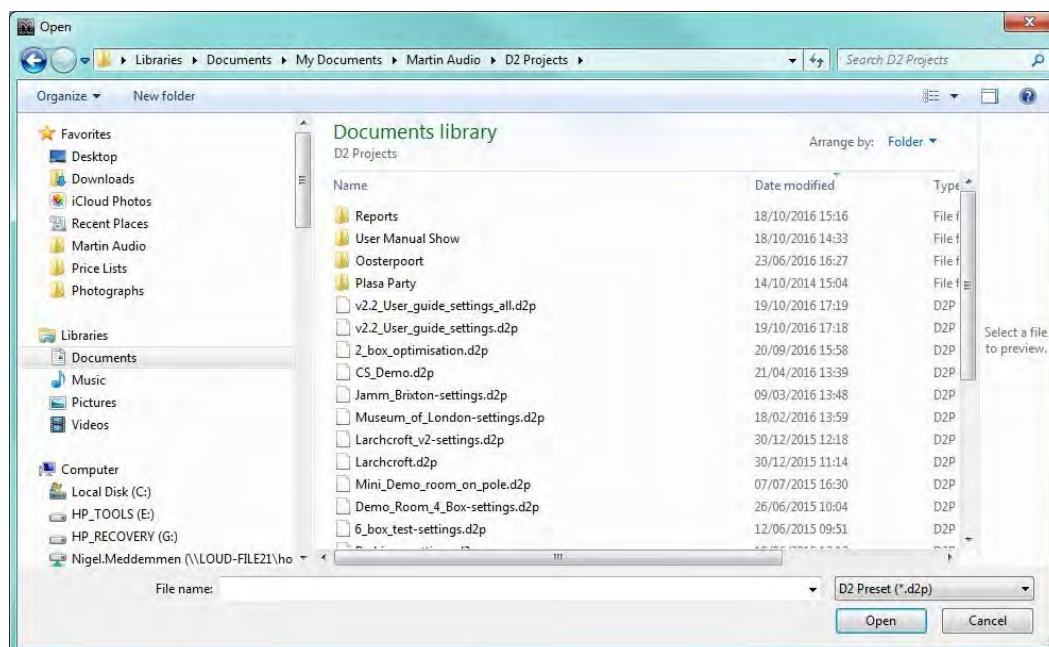
Once an array has been discovered and tested, the next stage is to upload the optimisation file that has been created using Display 2. This is done using the Preset Loader which is found in the Tools menu:



This brings up the Preset Loader window. In this example we have a small MLA system with two 6 box arrays:

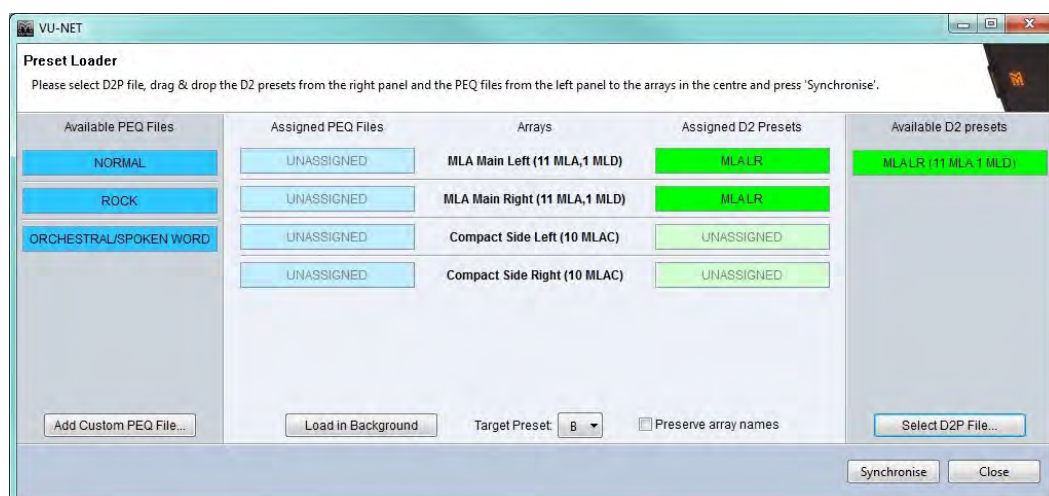


There are a number of options available but particularly when loading the first preset into an array the first step should always be to click on 'Select D2P File' to navigate to wherever you have saved the D2P file saved when you did your Display 2 optimisation:



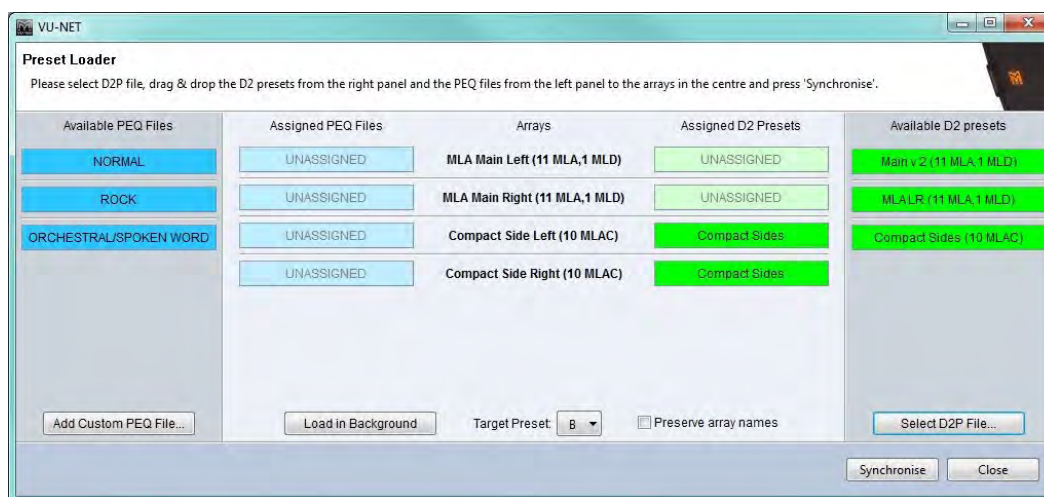
It is essential that you select a d2p file which matches the array configuration size and type that matches the array to which you wish to upload optimisations. You cannot load a non-matching d2p file!

There are a couple of possible outcomes when you have selected a d2p file. If you have only created one optimisation for your project it will be automatically placed in the array thumbnails ready for synchronisation. In the above list of d2p files, "v2.2_User_guide_settings.d2p" is an example of this. Note that the optimisation will always specify the type of cabinet, in this case MLA. You will be able to select any d2p file but will not be able to synchronise a file created for the wrong type of cabinet. The Window will appear like this:

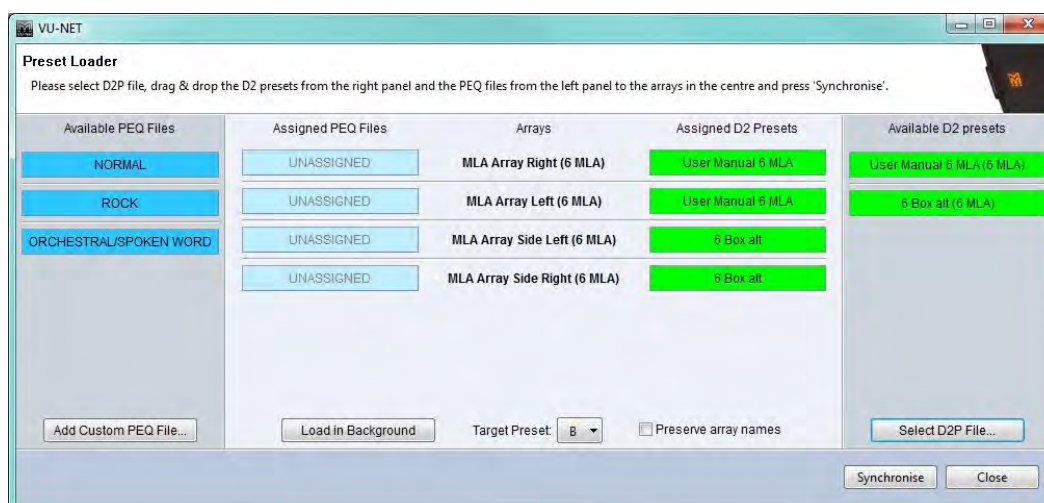


You can see that the optimisation contained within the file called “Main LR” appears in the Available D2 presets list on the right. It is also already showing in the Assigned D2 Presets for both of the Main left and right arrays in our system.

If we created several optimisation for the array, trying a few different goals for example which was done in the file “v2.2_User_guide_settings.d2p_all” in our examples, this is how the window will appear:



This example has three optimisations contained within the file, “Compact sides (10 MLAC)” which has been immediately added to the two MLA Compact arrays as there is only one matching optimisation for the Compact side hangs. There is also “Main v2 (11 MLA, 1 MLD)” and “MLA LR (11 MLA, 1 MLD)”. Neither of these have been added to our MLA arrays as they both match therefore we can make the choice of which one we would like to synchronise. At this point you are able to select which file you would like to use by simply clicking and holding with the left mouse button and dragging and dropping from the available list onto the Assigned Presets boxes. Note that you do not necessarily have to load the same optimisation into each array. In the following example, we now have main and side hangs of six cabinets, our d2p file is the same as the previous example and contains two optimisations. We have dragged “User Manual 6 MLA” over to the Main left and right arrays, and “6 Box alt” over to the side hangs:



Note that as well as uploading the optimisation file to each array, optimisation files created in Display version 2.2 onwards also contain detail of the spl reference set during the design process, Vu-Net uses this information to make changes to the gain of the subs to maintain a good balance between the arrays and subs. These are the gain changes:

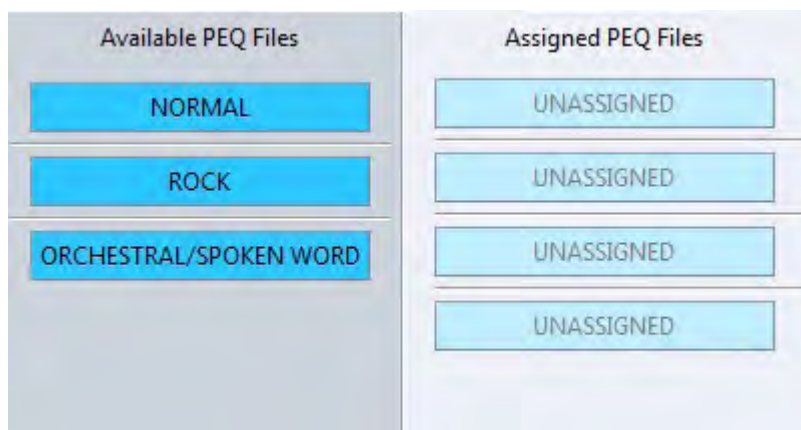
Optimisation reference of 110db or more: Sub Output Gain +10dB

Optimisation reference 105dB: Sub Output Gain +5dB

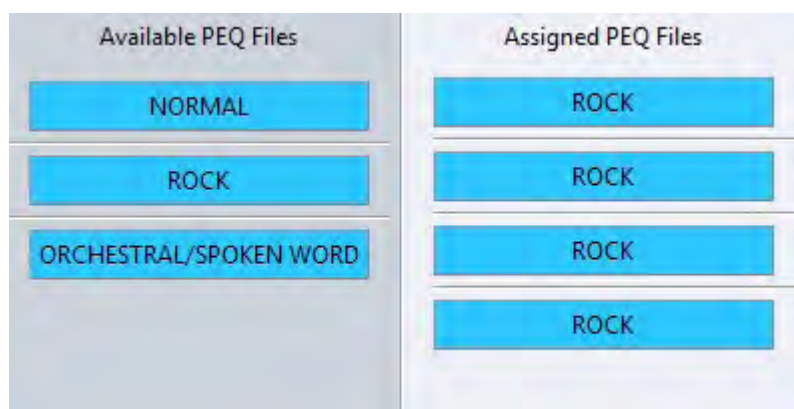
Optimisation reference 100dB or less: Sub Output Gain 0dB

PEQ FILES

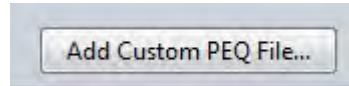
On the left side of the Window you can see three available PEQ files, Normal, Rock, and Orchestra/Spoken Word. Note that the available list of PEQ files may change depending on the product, MLA Mini for example only has a 'Normal' PEQ available. These may also be dragged over to the Assigned PEQ file position:



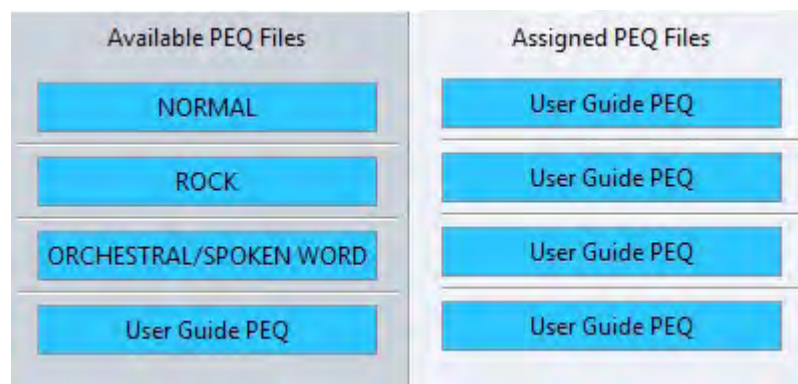
It is important to do this not only to add some tonal EQ to the system but the PEQ synchronisation also performs a reset function on certain parameters in the array. It matches the input setting for every cabinet in the array to the first enclosure and resets the array delay to the default setting. Here we have applied the Rock PEQ to all arrays:



There is also the option to load a Custom PEQ file:

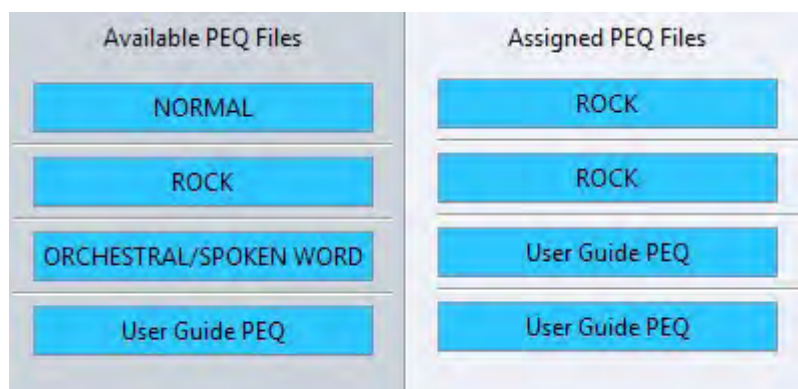


A PEQ file that has been created in an array can be saved as a file by right-clicking on the array in the System Diagram window. To up-load the file at the same time as synchronising Optimisations, click on the 'Add Custom PEQ File...' button and navigate to the file location where the .mlap PEQ file is saved. Click on the file and it will appear in the list of available PEQ files and can be dragged across in the same way as any other:



It is important to understand that a Custom PEQ will NOT perform the same system reset as one of the factory PEQ's so we would always recommend using a Factory PEQ for your first Sync and then add your own PEQ if you load any subsequent new Optimisations or use the right-click 'PEQ- Load PEQ' function in the array thumbnail on the System Diagram Window.

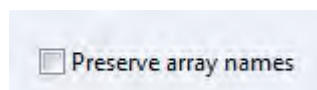
Note that you do not have to have the same PEQ applied to every array and if you wish to change the file prior to Synchronisation just drag the new file over to the array and it will replace the existing file type:



Note that Optimisations created using Version 2.2 onwards contain version information that Vu-net uses to make subtle changes to the default EQ curves loaded.

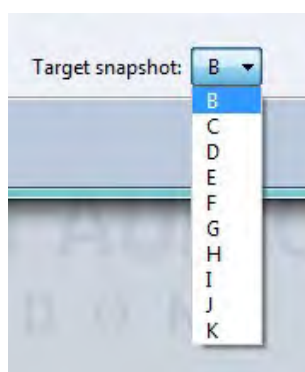
OTHER OPTIONS

There are some other options available in the Preset Loader. From right to left you will find 'Preserve array names':



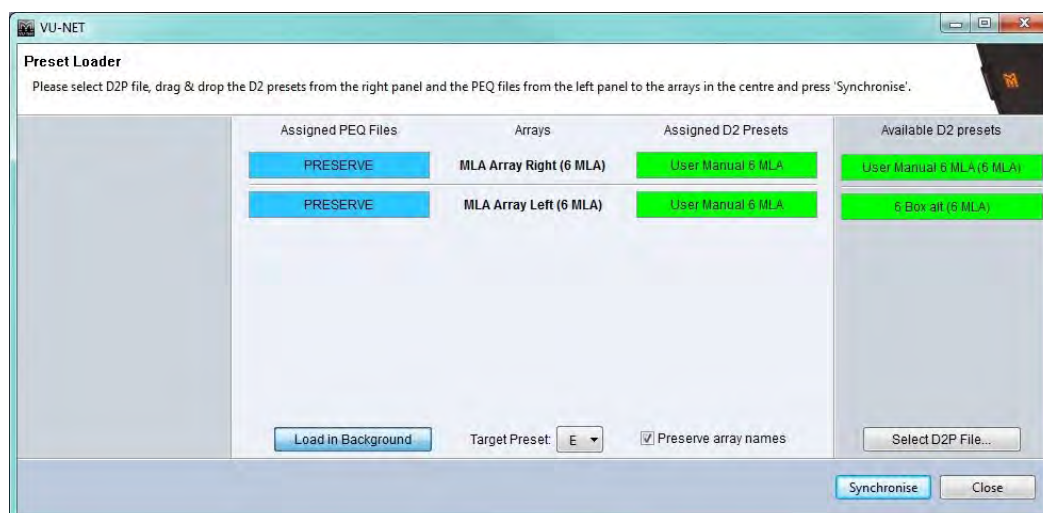
If you have already named your arrays check with box prior to synchronisation. Without it the arrays will be renamed with the same name as the D2 optimisation.

Target snapshot allows you to select the cabinet snapshot into which an optimisation will be loaded:



There are ten available labelled from B to K. A is the default factory preset with basic box EQ which may be used whilst checking a system or in an emergency, all other are available for your optimisations and once uploaded can be selected in a few seconds. Select the desired location using the drop down button.

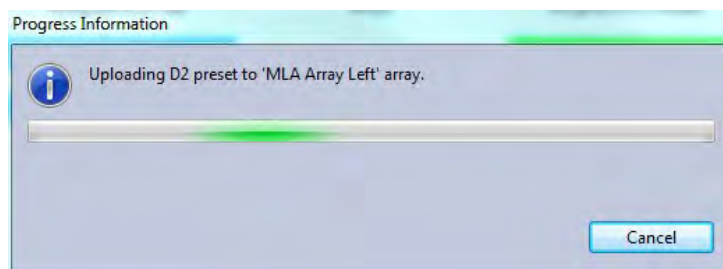
Load in Background is very useful for uploading new optimisations after your first files have been synchronised. Clicking on the Load in Background button removes the PEQ options and the window appears as follows:



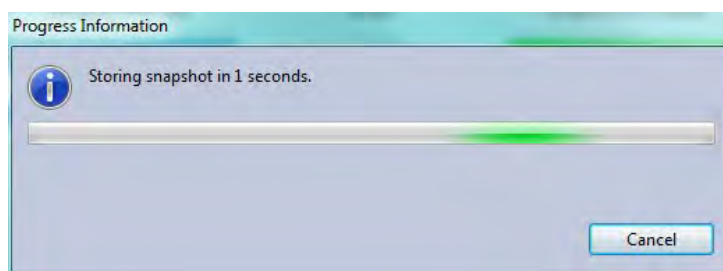
The PEQ already uploaded will be preserved and if you select an alternative snapshot to the one currently being used you can even synchronise while the system is in use. It will synchronise in the background as the name suggests without disturbing system performance and you can then wait for an appropriate break in a show or rehearsal to select the new snapshot.

SYNCHRONISE

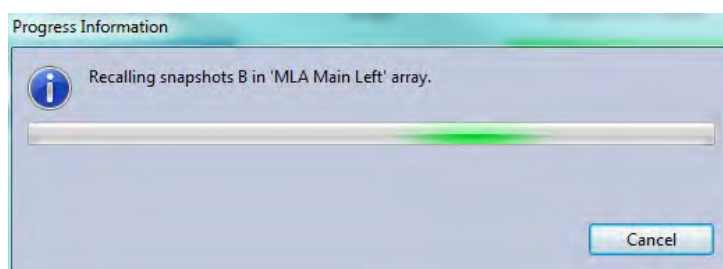
Once you have completed your selection of the available options, the final step is to click on the Synchronise button to start the Preset upload. You will see a series of Windows that show the process of the upload including the following:



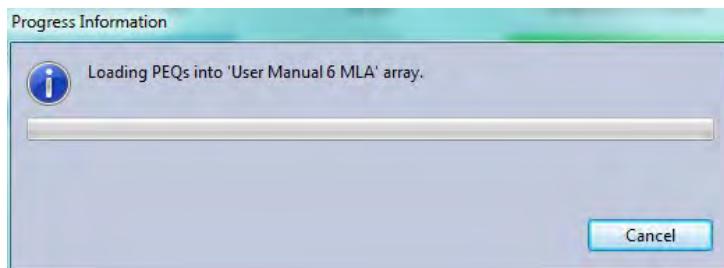
The presets are loaded to each array in turn, in our example first the left array. The optimisation is then stored in a snapshot:



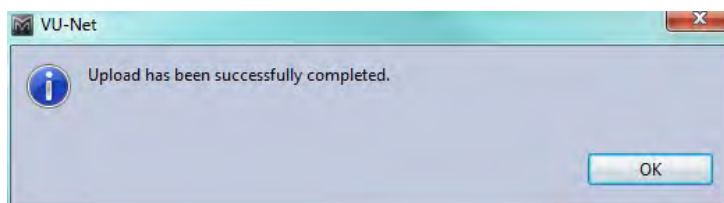
The snapshot will be recalled:



The PEQ's will be loaded. This step will not take place if you selected 'Load in Background':



It will repeat these steps for all arrays on the network. Once finished you will see this window:

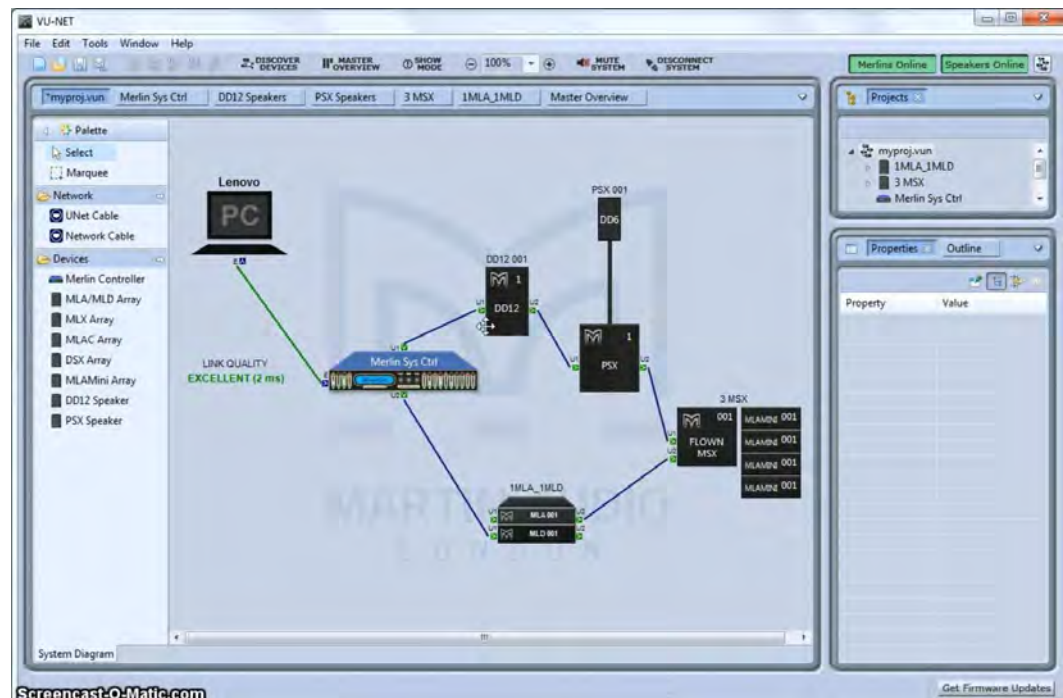


You can then close the Preset Loader. It can be re-used whenever you wish to upload new optimisations. In particular if you have created several optimisations for an array in the same D2P file or independently, just repeat the Preset Loading process selecting the same D2p file but dragging the alternative optimisations into the array. Select the load in Background option as there is no need to keep uploading PEQ files, and select a different target preset. Once uploaded you can compare your optimisations by selecting the different presets by right-clicking on the array thumbnail and choosing the 'Load Preset' option.

MASTER OVERVIEW

Vu-Net features a Master Overview window intended for use following set-up when it is useful to view the entire system on a single page with the ability to monitor all levels and make changes to essential functions.

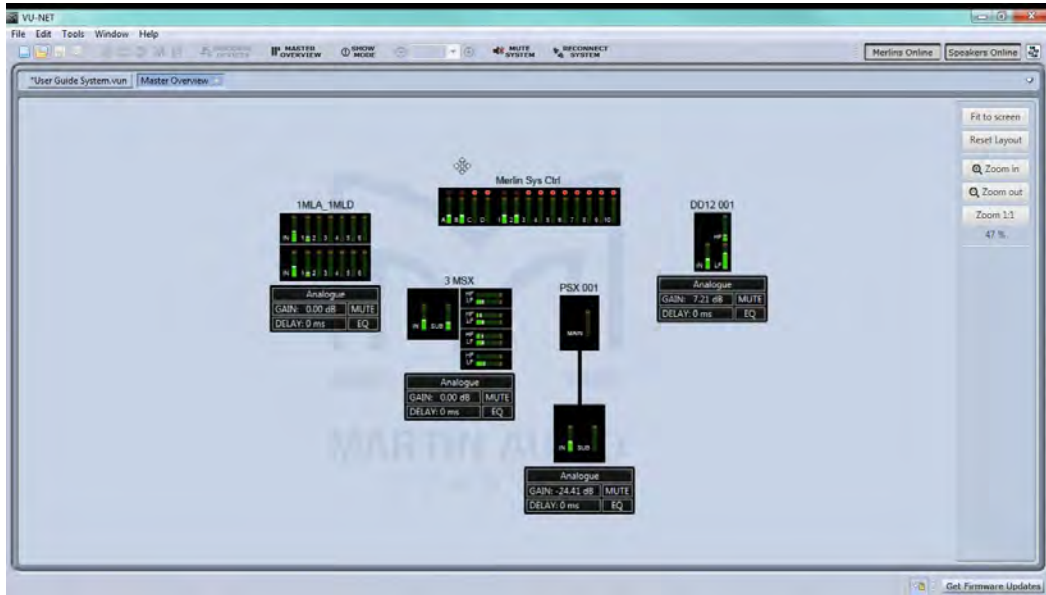
Here we see a project with a variety of U-Net enabled devices connected including an array of one MLA and an MLD, a flown MLA Mini system, a PSX, DDD12 and a Merlin:



If we click on the Master Overview button:



A new tab is opened with a window showing all devices in operation:



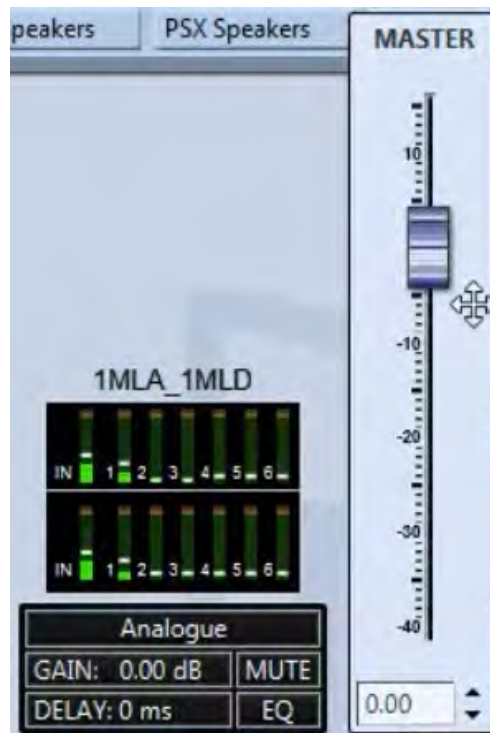
The MLA array shows the input bargraph plus all Cell output bargraphs for all cabinets in the array, all other arrays and speakers show input and output levels and all Merlins display input and output meters. All bargraphs are updated in real time which makes monitoring an entire system very easy from a single page.

In addition to monitoring the meter response, essential features are accessible. The function control is the same for all Array and speaker types:

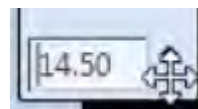


The top line shows the input configuration for the array, if this needs to be changed clicking on the top line takes you to the array input overview screen where you can change the input configuration. If the array isn't already open it will be opened by clicking on this button.

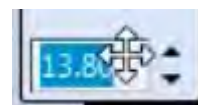
On the second row is GAIN. Gain adjustments can be made by clicking on this button. A pop out fader appears which can be adjusted in real time, either by dragging and dropping the fader knob until the desired gain value is displayed.



Using the up/down arrows to adjust the gain up or down in 0.1dB increments:



Or by directly typing the gain figure you need:



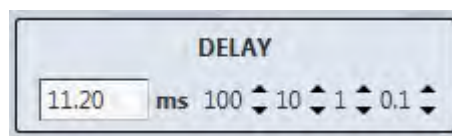
A click anywhere in the Master Overview Window away from the gain control will close it once you have made any necessary adjustments.

Next to the gain is Mute, clicking on this will mute the array and the button will turn red:



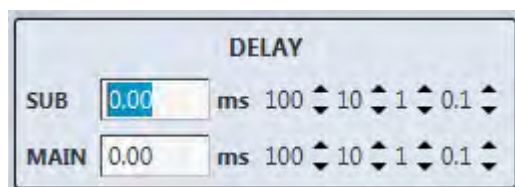
Note that when in Show Mode a pop-out Window will appear to confirm that you want to mute the array.

Clicking on Delay opens a pop-out window showing the gain figure with a series of arrows for adjustment:



Clicking on the arrows will adjust the delay up or down by either 100's, 10s, individual or tenths of a millisecond making it very quick and easy to enter a precise figure. As with gain, clicking anywhere else once you have completed adjustments will close the window.

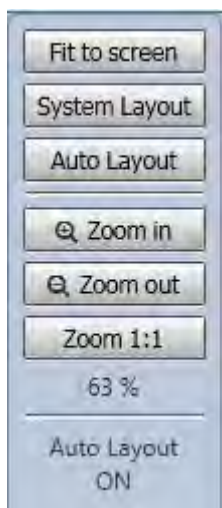
The Window for PSX is slightly different in that it has individual delay adjustment for both the sub and main outputs:



The EQ button will take you directly to the EQ Window for the array, opening it in a new tab if it is not already present.

Double clicking on Merlin will also open it in a new tab, the tab on view will be the last tab that was in use if the Merlin has already been opened, or the Gain/Mute/Limiters tab if it is not already open.

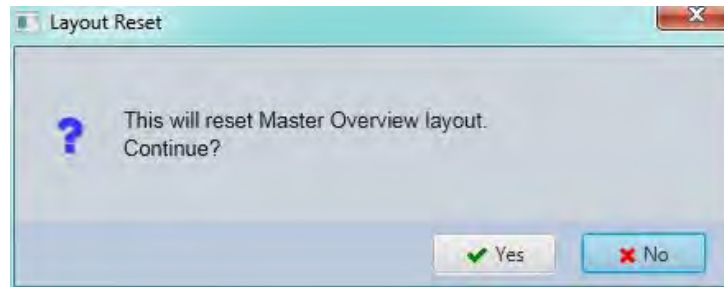
The layout of the Master Overview screen will by default show the arrays in size order. This will automatically re-size to ensure that all elements fit in the window. Elements can be dragged and dropped to arrange the system to your requirements. A series of buttons and a display on the right hand side of the window allow adjustment of the view and shows the current zoom:



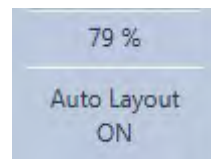
'Fit to screen' offers a quick method of re-sizing the window to ensure that all elements are visible.

'System Layout' will move all elements to match the layout in the system diagram, If you moved all devices during set-up in the system diagram to represent their actual physical positions around the venue default, clicking on this button will duplicate your layout in the Master Overview.

You can choose to return to the default Auto layout by clicking the Auto Layout button, this will bring up a confirmation window



Clicking 'Yes' or pressing Return will reset the layout to the default and the display will confirm the new zoom and that Automatic layout has been activated:

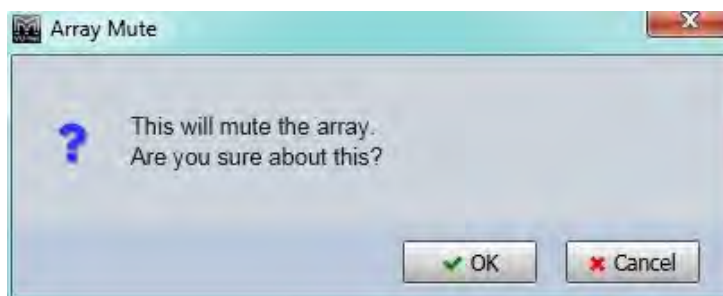


As soon as you move any elements or zoom in or out the Auto Layout will disappear.

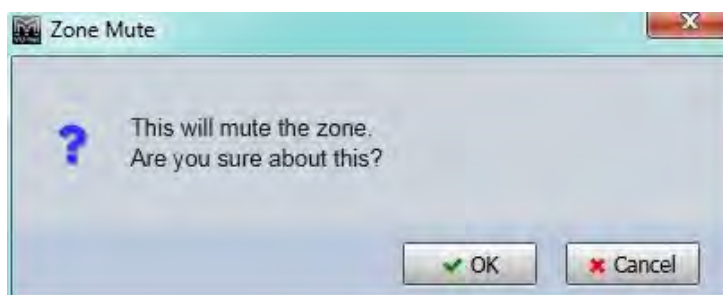
The Zoom in and out buttons will change the zoom in steps of 10% up or down. This can also be achieved if you have a mouse connected with a scroll wheel. Zoom 1:1 restores the window to 100% regardless of whether any elements will be outside of the view.

SHOW MODE

Show mode is designed to offer a degree of protection once set-up is complete and a show has started to prevent the user from muting part of the system accidentally. With Show Mode inactive during set-up, all mutes can be used as and when required with a simple mouse click; the array will mute and unmute instantly under command of the button. When Show Mode is activated, clicking a Mute button anywhere in the system will bring up a confirmation window:

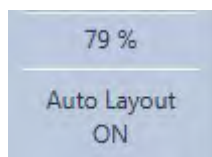


The window is slightly different for a zone mute:



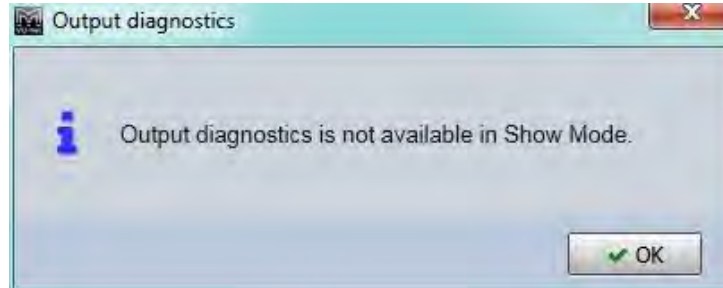
If you definitely want to mute the array, zone or speaker, click 'Yes' or press Return. If you accidentally clicked on a Mute, click 'No' and the window will disappear with no change to the mute state.

Un-muting part of the system could also potentially be destructive so a similar message will prompt you to confirm the action:

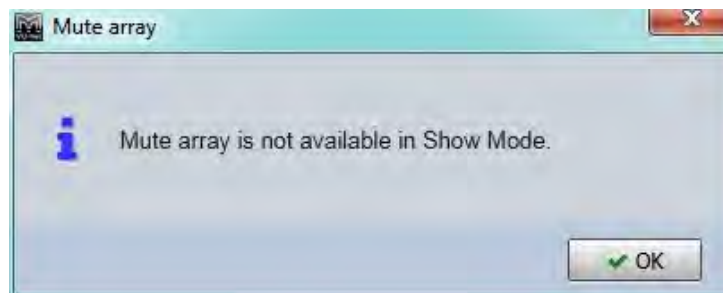


Note that the Master system Mute on the toolbar is not affected by Show Mode, as it is so destructive it always produces a prompt to verify that you wish to proceed.

The Output diagnostics for MLAS, MLA Compact or MLA Mini is also unavailable in Show Mode. Double clicking on the array thumbnail will bring up the following window:



If an array has the diagnostics window already open before activating Show Mode, the Mute Array button and individual cell mutes for each cabinet will be unavailable, you will see the following window if you click on any of these:



You will however be able to click on the 'Hide' button to close the diagnostics screen and any muted cells will be un-muted. You will not be able to go back to the diagnostics page until Show mode is switched off.

FIRMWARE UPDATES

Martin Audio is constantly striving to make improvements to the MLA family of products. The phenomenal processing power available makes them extremely future proof so as Martin Audio improve the optimisation capabilities of Display2 or add additional functions to Vu-Net. The MLA Series will seamlessly run the improvements. Occasionally an update to the cabinet Firmware is needed which is catered for in Vu-Net using the Firmware update Wizard.

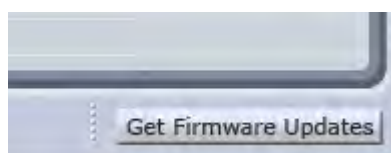
If you have sub-rented additional cabinets you may find that your rental partner has not been quite so diligent in keeping their system firmware up to date and device discovery will show some cabinets with a differing firmware versions. In this instance it is essential to update firmware on the mismatched cabinets, do not try to run a system with a mixture of firmware, it could cause compatibility

In common with many digital systems, a firmware update puts the product in a venerable state known as “boot mode”. It is vital that the firmware update is not interrupted by either a mains outage, cable disconnect or closing Vu-Net. Any of these could render the product unusable which may mean a return to Martin Audio for repair therefore you should take every possible precaution before commencing a firmware update. ALWAYS use a hard wired connection from your PC to the system, do not rely on Wi-Fi. Always use your PC with its mains PSU, do not rely on battery power. Try and ensure that your mains supply is reliable and is not likely to fail mid-update. Finally, the update process takes around 13 minutes per enclosure so on a large system is very time consuming. It is strongly recommended that firmware is checked when a system is prepped prior to a show back at your warehouse, it is not a task for set-up on a show day.

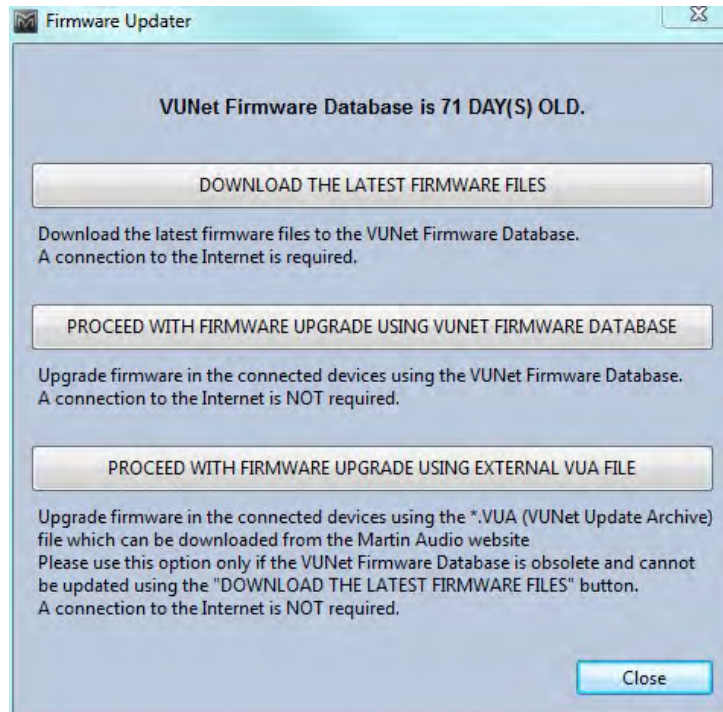
GET FIRMWARE UPDATES

To make sure that you are loading the latest updates Vu-Net includes a system for checking that you have the latest firmware files installed so they are available to upgrade your system. The files are held in a server at Martin Audio and are accessed over the internet so to get the latest files you will need internet connectivity to your PC. Note that you can get Firmware update files completely independently, you do not need to be connected to an MLA system, the simple method is to take the tablet PC supplied with your system to your office, connect to the web and check for updates. Note also that whenever new firmware is released you will be notified by e-mail.

The Get Firmware Updates button is in the bottom right corner of the Vu-Net window:



Click on the button and the following Window gives you three options:

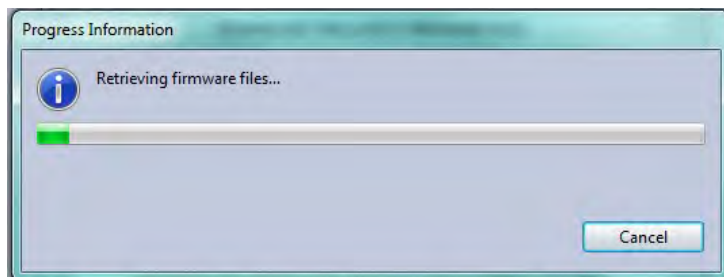


The first option as described accesses the firmware server via the internet. The URL for the Update file location is retained in the Vu-Net Preferences:

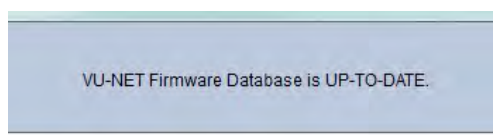


Do not change this unless told to do so by Martin Audio!

Click on the 'DOWNLOAD THE LATEST FIRMWARE FILES' option and you will see the flowing window:



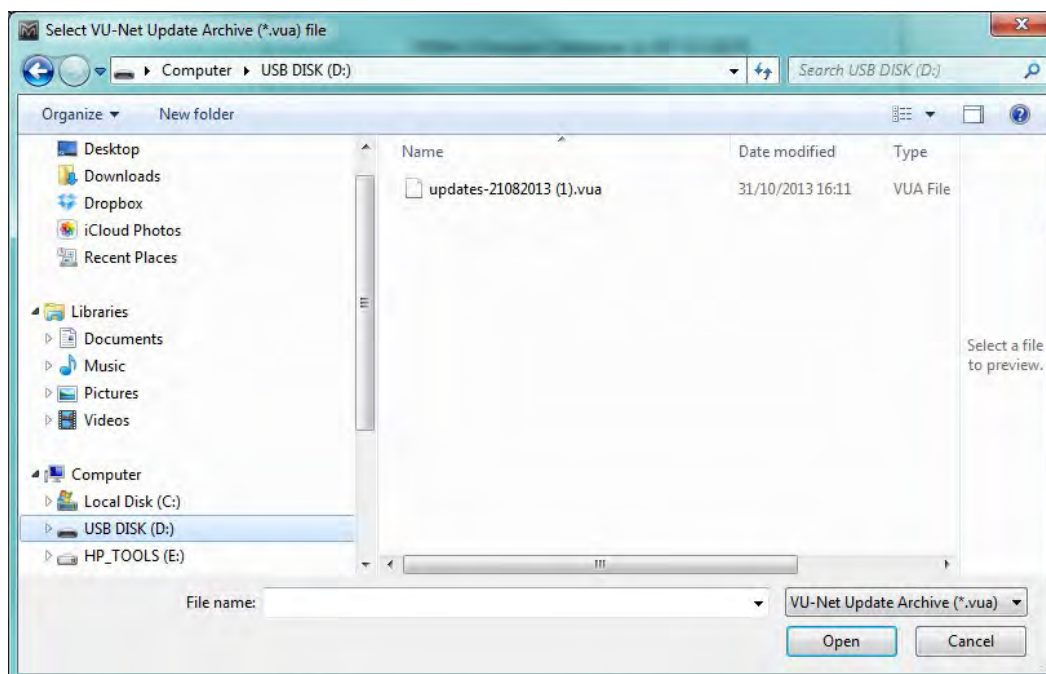
This is usually very rapid but depends on the speed of your internet connection. The latest files are now saved within Vu-Net ready for an upgrade. At the top of the Firmware Update window you will see:



The Second option is to proceed with the update using the already installed firmware files. This is perfectly acceptable if you have already uploaded the latest files following a message from Martin Audio that there is a new release, or if you have periodically gone on line to load the latest files routinely. Clicking the 'PROCEED WITH FIRMWARE UPGRADE USING VUNET FIRMWARE DATABASE' button and the window closes and the Firmware Update process starts.

The final option is to update the Firmware using an external VUA file. If for any reason you are unable to update the Firmware database via the internet if it is impractical to connect the Tablet PC for example, but have access to the web on another computer, it is possible to download the firmware file and transfer it to the system Tablet via a USB drive or similar.

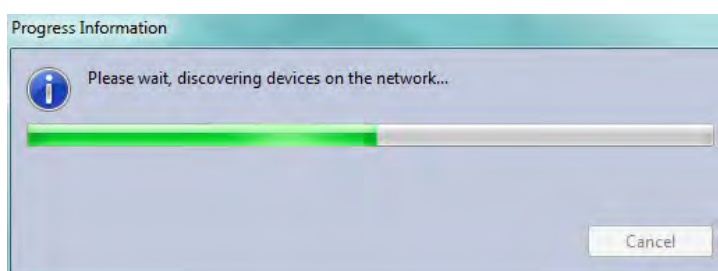
Clicking on the 'PROCEED WITH FIRMWARE UPGRADE USING EXTERNAL VUA FILE' button will bring up a file browser. Navigate to the drive where the VUA file is located, in this case on a Martin Audio USB Key:



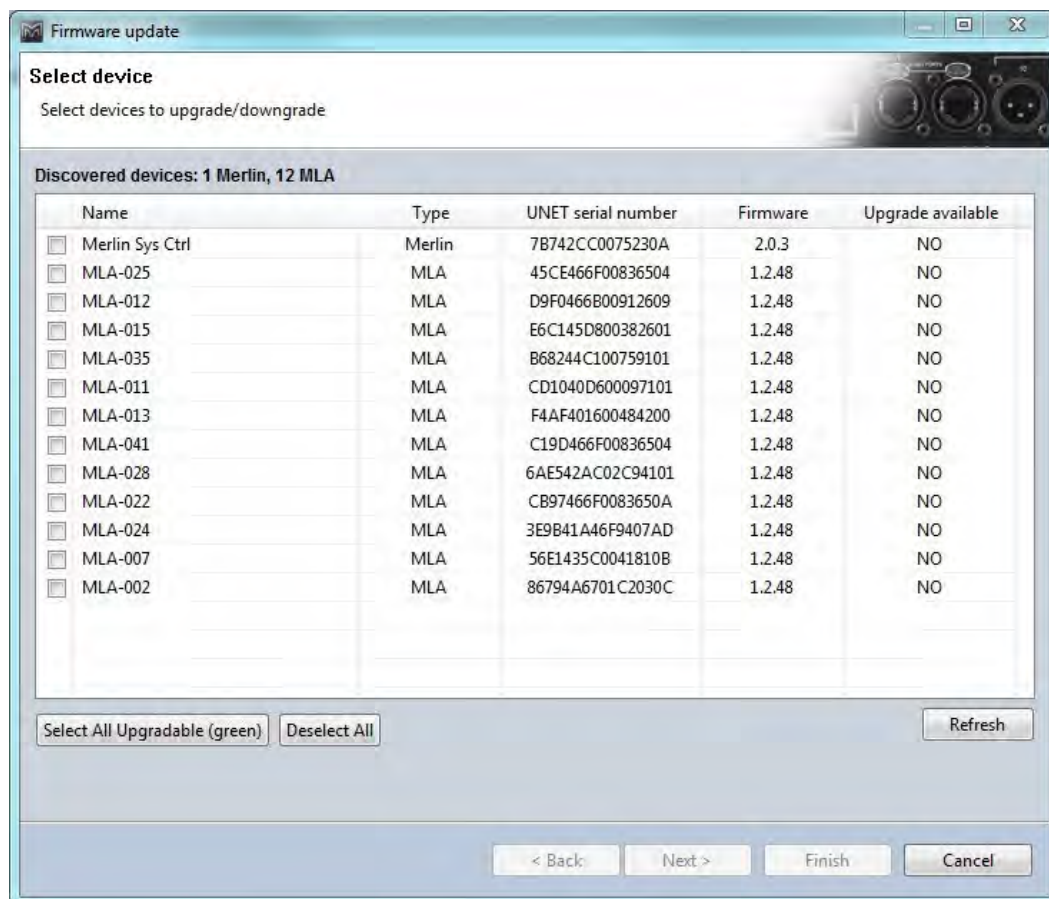
Select the VUA file, it will be saved and the update wizard will commence.

STARTING A FIRMWARE UPDATE

Selecting the Firmware Update Wizard in the Vu-Net Tools menu opens the same window as the Get Firmware updates to double-check that you have the latest versions. Assuming that you have definitely installed the very latest versions you can click on 'PROCEED WITH FIRMWARE UPGRADE USING VUNET FIRMWARE DATABASE'. Vu-Net will scan the U-Net network for connected devices in the same way as a Device Discovery:



When the scan is complete, a window will appear with a list of all devices found together with their type, Serial number and the installed firmware:

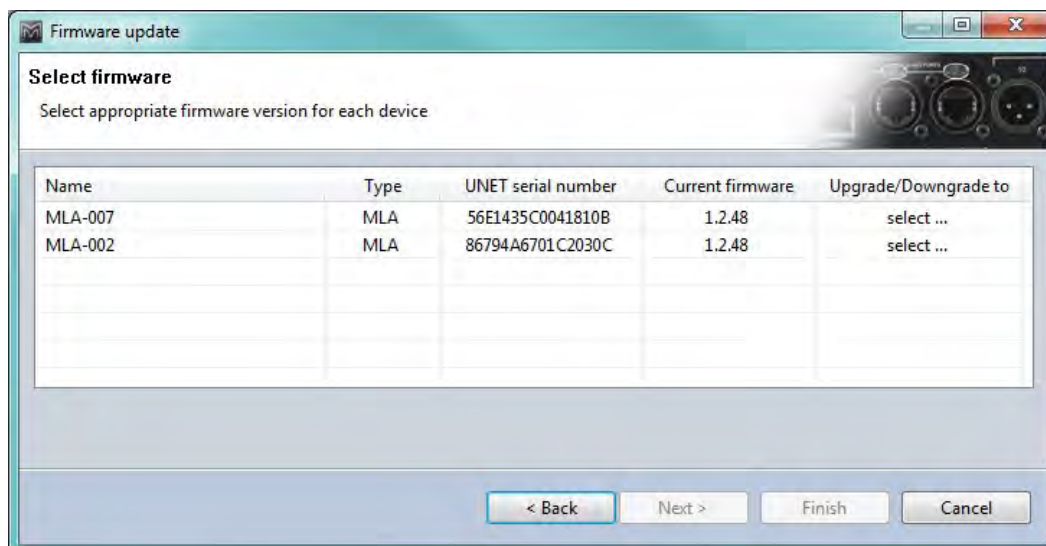


Vu-Net compares the discovered Firmware version with the latest version stored in its database and will indicate in the final column whether an upgrade is available. In this instance a single Merlin and twelve MLA have been found and all have up to date firmware however we can still proceed with an update to show how the process works.

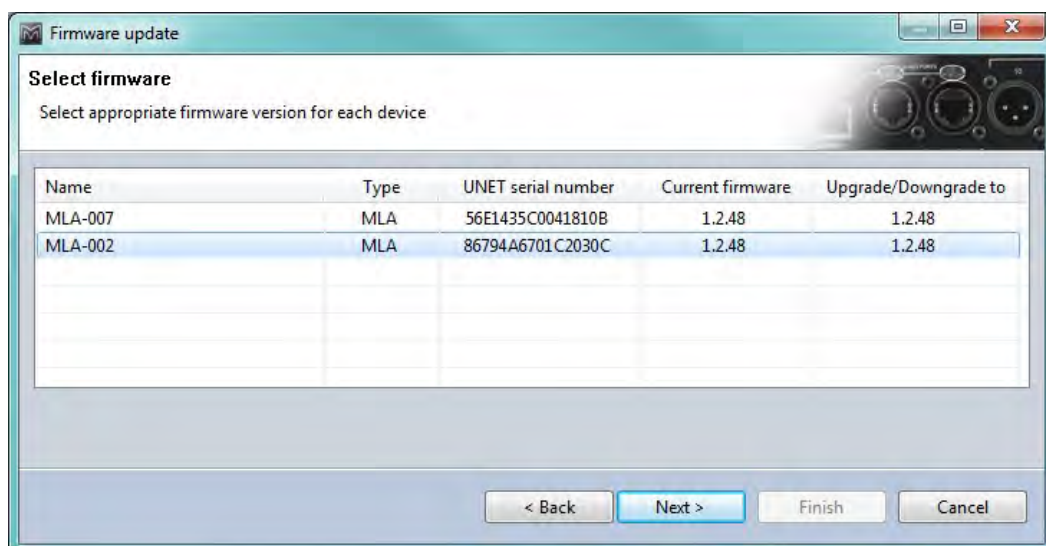
In the left hand column there is a check box to select any device which you would like to update. The button at the bottom gives you the option to select all cabinets if required with a single click. If you have made an error in selecting devices you can use the 'Deselect' all switch to start again. We will do an update on the final two MLA:

<input type="checkbox"/>	MLA-024	MLA	3E9B41A46F9407AD	1.2.48	NO
<input checked="" type="checkbox"/>	MLA-007	MLA	56E1435C0041810B	1.2.48	NO
<input checked="" type="checkbox"/>	MLA-002	MLA	86794A6701C2030C	1.2.48	NO

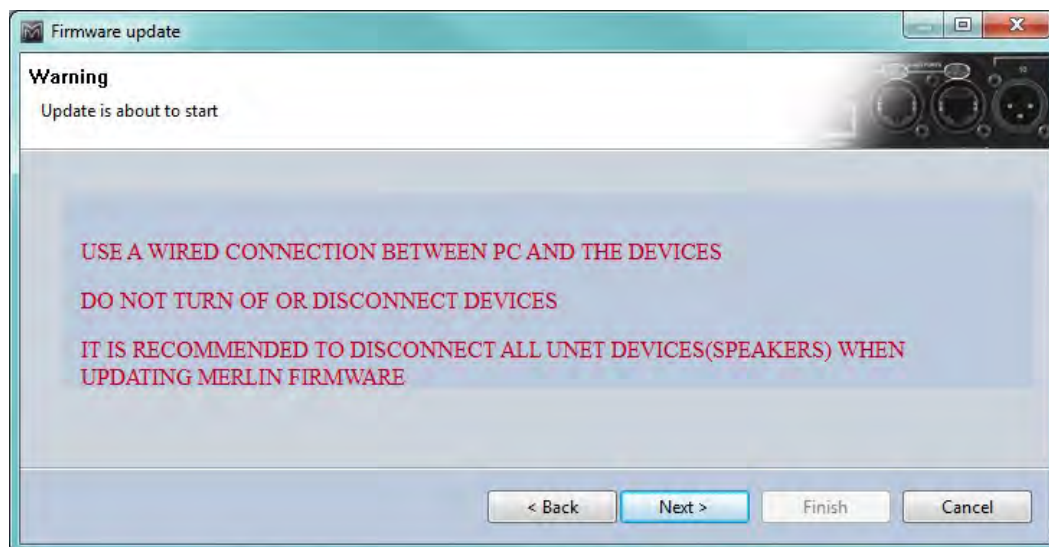
Click next and you see the following window:



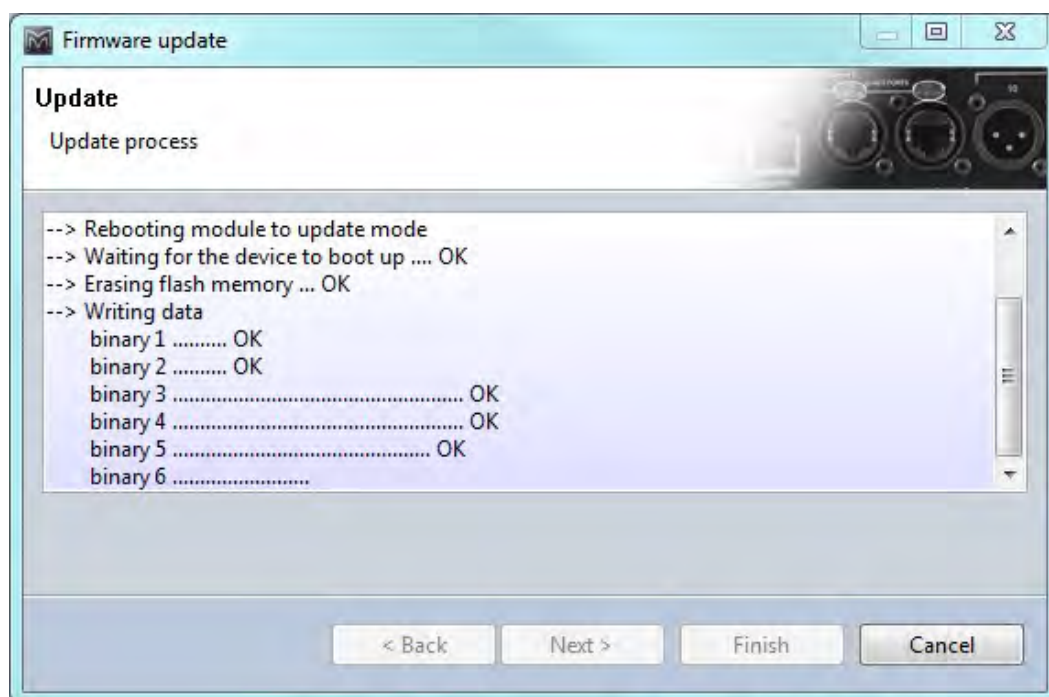
The current firmware is shown and the final column has an option to select the required firmware which in most cases would be a new version but could be an old firmware if say a bug has been found in a current version and it is necessary to downgrade to an earlier version. If there are several versions available, clicking on the Upgrade/Downgrade cell will bring up a drop-down showing the version numbers. Select the version you wish to use and it will appear in the final column:

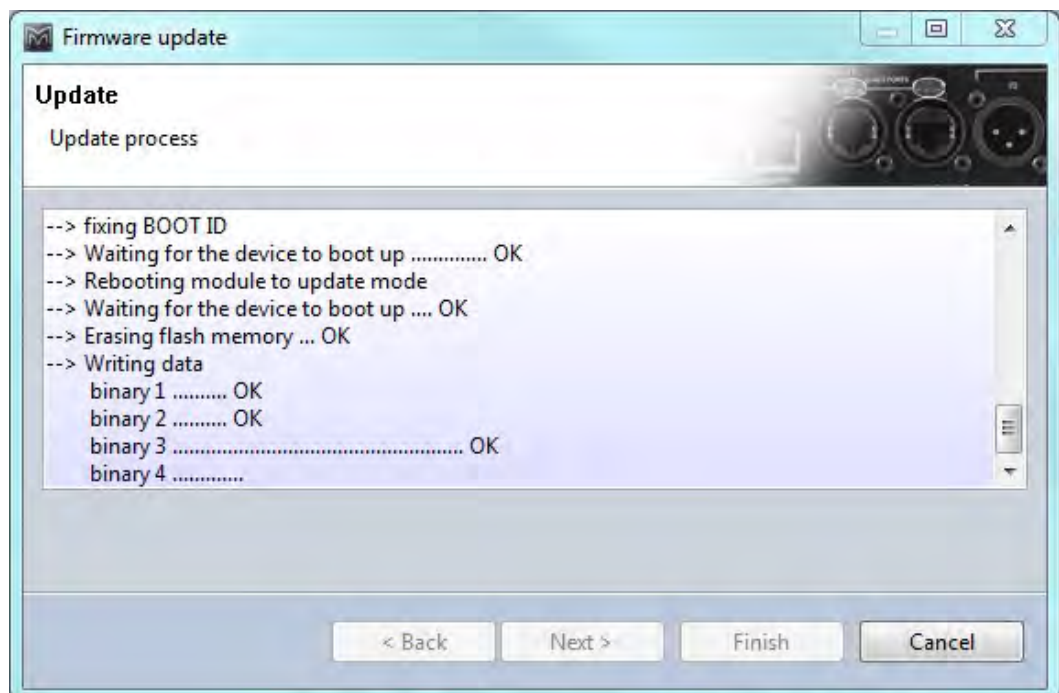
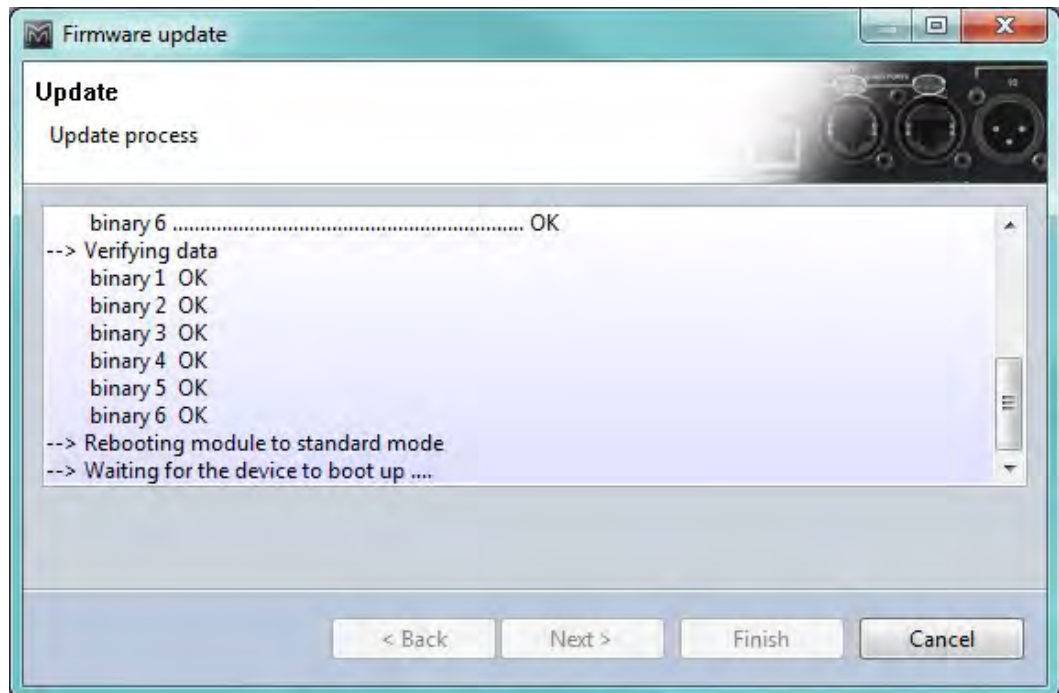


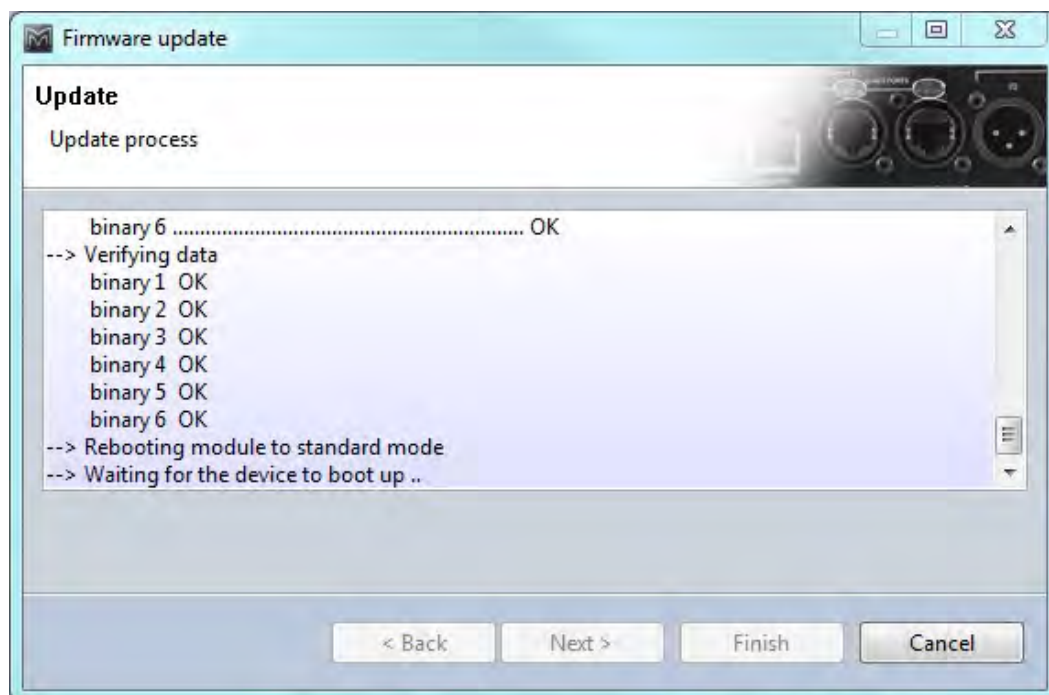
Click on 'Next' to start the update. You will first see the following warning to ensure that every measure has been taken to ensure that the update will complete successfully:



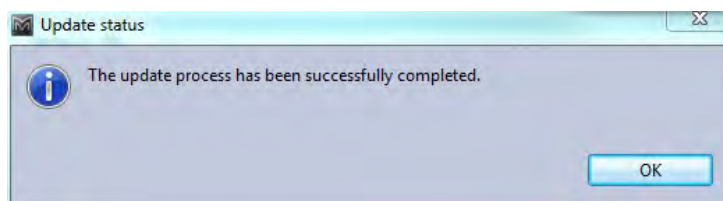
Click 'Next' and the upgrade will start. A progress window will appear showing the processes in the upgrade taking place. The system tackles one device at a time, placing it into Boot Mode, uploading the firmware and rebooting the device back into an operating mode:







Once completed you will see the following:



Click 'OK' and then click on 'Finish' on the Update Progress Window. The update is complete.



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