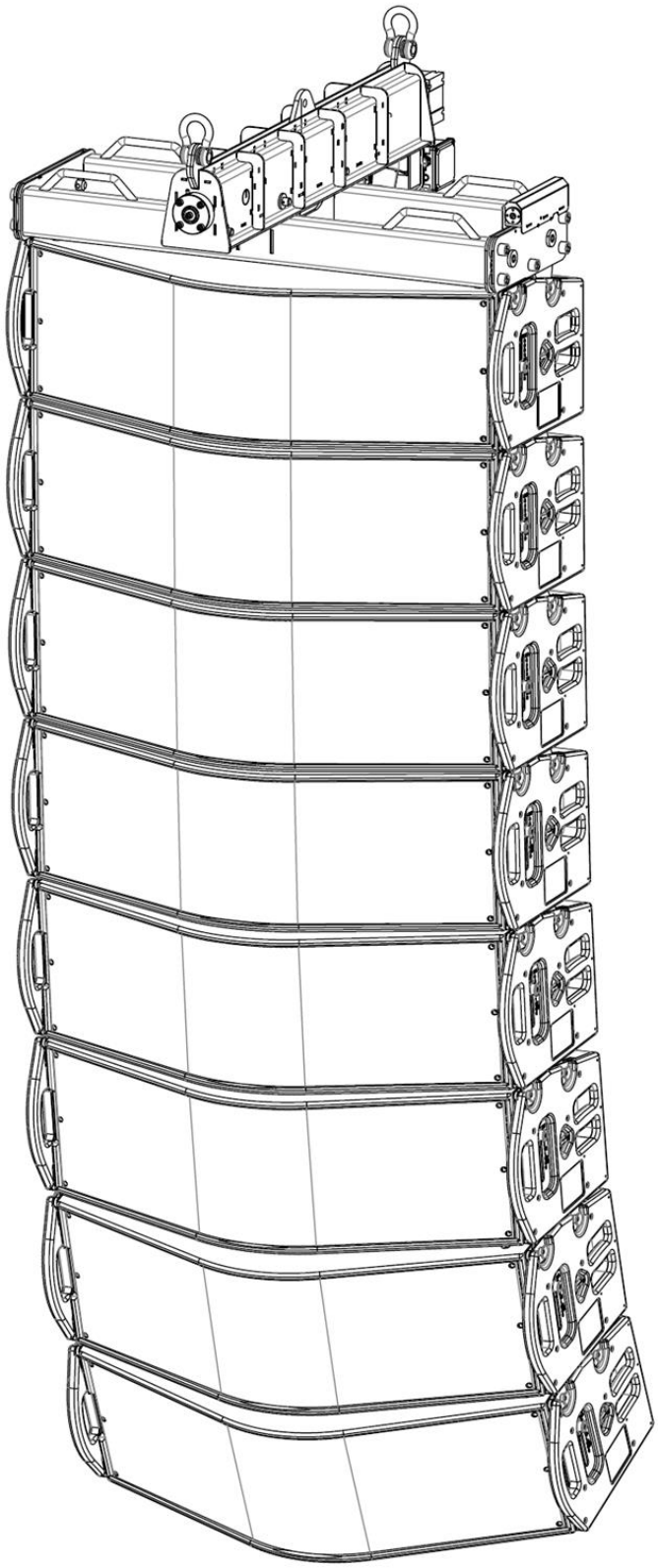
VERO® VX90 Rigging Manual v1.3



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Contents

1.0 Rigging Safety

Suspending loudspeaker systems is potentially hazardous, please note the following:

- Read the manual
- Keep this manual
- Follow all safety instructions
- Heed all warnings
- Safety precautions vary in different regions. Full compliance with these regulations must be your priority.
- Do not carry out rigging operations if you are tired, distracted, unwell or suffering from the effects or after-effects of prescription medication, alcohol or drugs.
- Rigging and stacking must only be undertaken by fully qualified and experienced riggers in full compliance with local, national and international regulations.
- Remember that all personnel have a duty of care to themselves, to their assistants, to the venue staff and to the public
- Wear suitable personal protective equipment
- Always design the array using Funktion-One's *Projection* software to confirm safety
    - **Incorrectly designed arrays may exert unsafe forces on rigging components**
- Ensure rigging points are suitable and confirm with the house/site rigging manager before starting work
- Adhere to all relevant Health & Safety protocols during work
- Wear suitable personal protective equipment
- Inspect all equipment before use, remove from use immediately if damaged or defective
- Do not transport loudspeakers with frames or beams connected – risk of tipping
- Avoid the use the VX Dolly on uneven ground – risk of tipping
- Never move the dolly normal to its short dimension (front/rear) – risk of tipping
- Ensure all pins are inserted and locked before lifting
- Do not over-tighten lever hoist or ratchet strap
- Ensure Index knob positions are the same on both sides of the cabinet before lifting
- Ensure no tools or loose objects are present on the array before lifting
- Ensure third party rigging accessories are correctly specified and WLLs are respected. Funktion-One is not responsible for third party rigging equipment
- Do not exceed WLLs of any system component
- Do not subject any rigging component to dynamic loads, especially during lifting
- Do not stand underneath the array
- Do not climb on the array
- Be aware of pinch points (see Section 3)
- Attach safeties/secondary bonds as soon as is practical
- Do not suspend loudspeaker systems in wind forces higher than 6bft (25-31mph)
- If wind forces in excess of 6bft develop, evacuate the area surrounding the array(s) and lower and secure them.
- Only assemble ground stacks on flat, stable surfaces, using the dolly with outriggers
- Check the load bearing capacity of any structure or platform before ground stacking
- Secure ground stacks from sliding, moving or tipping
- Use pins and T-strap to secure ground stacked cabinets to the dolly as detailed in section 4.4.

- Laser safety: Do not look directly into the beam. Do not aim the laser towards people. Do not aim at reflective surfaces. Do not use the laser when the venue is open to the public. Do not connect the laser pod or remote to a network port.
- Noise safety: Vero VX systems are capable of producing dangerously high sound pressure levels at close range. Never stand close to operating loudspeakers, and wear hearing protection when exposed to noise levels above 80dBA.

1.1 Limitations

This guide is provided to help familiarise the user with the loudspeaker system and its accessories. It is not intended to provide comprehensive mechanical, electrical, fire and noise training and is not a substitute for industry-approved training. This guide does not absolve the user of their obligation to comply with all relevant safety legislation and codes of practice.

While every care has been taken in creating this guide, safety is user dependant and Funktion-One Research Ltd cannot guarantee complete safety whenever a system is rigged and operated.

1.2 System Compliance

The Vero VX flying system conforms to Machinery Directive 2006/42/EC and BGV-C1*
*(*under specific conditions, see below).*

The Machinery Directive specifies a minimum safety factor of 4:1.
The Vero VX rigging system is designed to a minimum safety factor of 5:1.

To comply with BGV-C1 (Safety Factor of 10:1) the maximum number of enclosures is **12.**

WLLs are only an indication of static load bearing capacity.
Flying systems with variable angles produce complex loads on rigging components, all suspended systems **must** be designed using Funktion-One's Projection software to calculate loads and confirm safety.

Check with the house/site rigging manager that suspension points are suitably rated before starting work.

Product	Standards Applied	Limitations of use
F-Beam and Frame Single point	BGV-C1	**12** VX90 enclosures
	BS7906-1 Category A	**15** VX90 enclosures
	BS7906-1 Category B	**20** VX90 enclosures as a static load with secondary (safety) suspension
M-Beam and Frame Single point	BGV-C1	**12** VX90 enclosures
	BS7906-1 Category A	**15** VX90 enclosures
	BGV D8 and BS7906-1 Category B	**20** VX90 enclosures as a static load with secondary (safety) suspension

Product	Standards Applied	Limitations of use
F-Beam and Frame Two points	BGV-C1	**12** VX90 enclosures
	BS7906-1 Category A	**15** VX90 enclosures
	BGV D8 and BS7906-1 Category B	**24** VX90 enclosures as a static load with Secondary (safety) suspension
M-Beam and Frame Two points	BGV-C1	**12** VX90 enclosures
	BS7906-1 Category A	**15** VX90 enclosures
	BGV D8 and BS7906-1 Category B	**24** VX90 enclosures as a static load with Secondary (safety) suspension

Product	Standards Applied	Limitations of use
Vero VX integrated Fly plates	BGV-C1	**12** VX90 enclosures
	BS7906-1 Category A	**15** VX90 enclosures
	BGV D8 and BS7906-1 Category B	**24** VX90 enclosures as a static load with Secondary (safety) suspension

Product	Configuration	Limitations of use
Vero VX Dolly	Transport	**4** x VX90 enclosures (280kg) recommended **5** x VX90 enclosures (350Kg) Maximum
	Ground stack with legs deployed	**4** x VX90 enclosures (280kg) recommended **6** x VX90 enclosures (420Kg) Maximum

Always consider weather conditions when suspending loudspeaker systems.
Extreme weather conditions can dynamically and unpredictably reduce the safety factor.

Do not suspend loudspeaker systems in wind forces higher than 6bft (25-31mph)
If wind forces in excess of 6bft are forecast, evacuate the area surrounding the array(s) and lower and secure them.

In the UK, from one year after purchase, lifting equipment must be inspected by a competent person under LOLER (1998) every six months.
Similar inspections and certification may be required in your country, ensure you comply with local health & safety regulations.

1.3 Safety – pinch points

Crush hazard
Keep fingers and all other appendages clear of the red indicated areas at all times.
Always use the handles to support and move cabinets.

1.4 Safety – Lambda mechanism

- Before inserting pins and lifting, check that the lambda has dropped into position on both sides of the cabinet.

Attempting to lift with only one Lambda connected will cause terminal damage to the flying system!

- Before lifting, ensure angle settings are the same both sides of the cabinet

1.5 Important Safety Information – M-Beam

The extreme inclination/declination limits of the M-Beam can produce unsafe loads on rigging components in certain configurations. Always re-check the array configuration in *Projection* before making significant changes.

Do not exceed the inclination/declination limits of +10° and -10°.

When adjusting the motorised beam, watch the array closely for hazards and collisions (cables etc.) Ensure at least one other person is also watching the array for hazards.

Maintenance

The moving parts of the M-Beam (lead screw and nut) are subject to wear, and should be inspected by a competent person every six months. If the mechanism develops noise, play, seizes or any other unusual behaviour, immediately remove the M-Beam from use and contact Funktion One directly for service.

The lead screw and nut should be periodically greased with a specialist low speed high pressure grease such as **SKF LGEM 2.**

1.6 Electrical Safety – M-Beam

This equipment must be earthed
Do not open – risk of electric shock
Do not expose to rain or moisture

The M-Beam requires a 3 phase + Earth supply in a Star configuration.
Use only with a dedicated motor controller with overload and fault protection.

1.7 Electrical specifications – M-Beam

Input: 208-415V 3P+E Star 50-60Hz
Maximum power consumption: 700W

Grn/Yel: Earth
1: L1/Phase 1
2: L2/Phase 2
3: L3/Phase 3

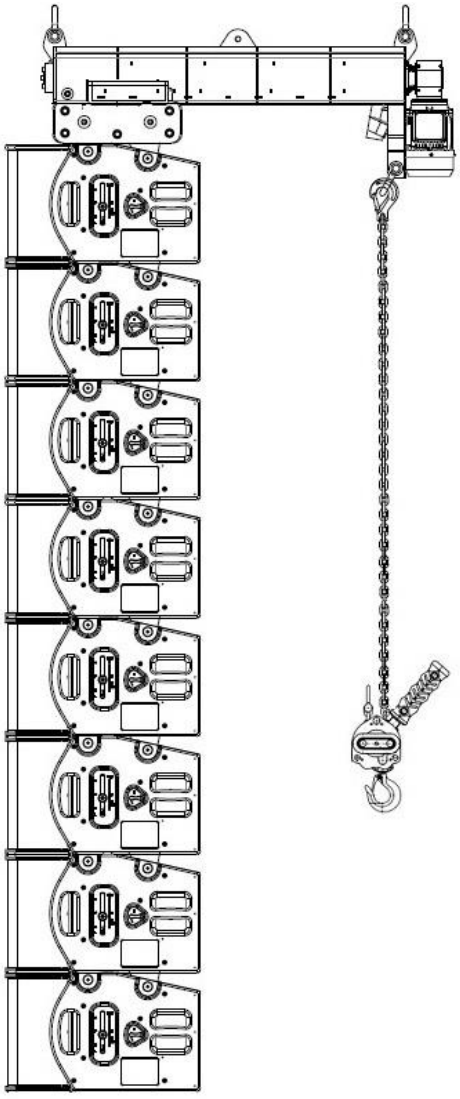
2.0 Vero VX Lambda rigging system introduction

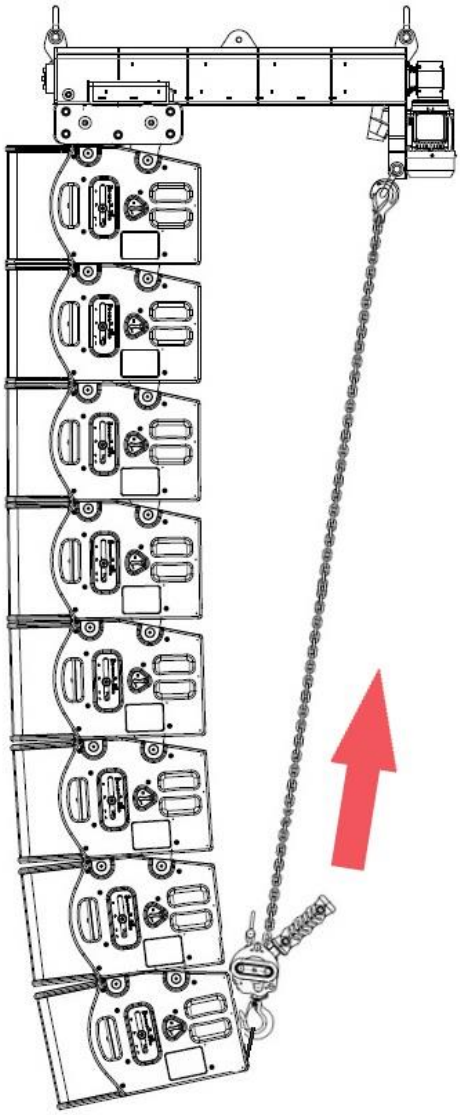
Note: Please take the time to read this section, even if you are experienced at flying loudspeaker arrays, as the Lambda system is significantly different to flying systems you may have used before.

The Lambda rigging system performs the essential functions of safe, easy suspension of Vero arrays, and optimised acoustic alignment between array elements.

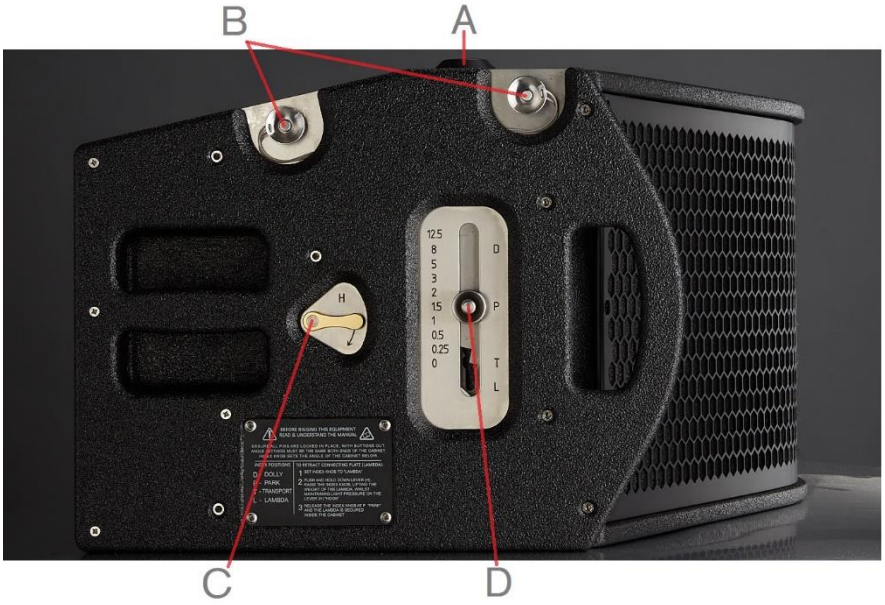
The Lambda rigging system is designed around the concept of a single pivot point unifying the acoustic centre and centre of mass.
This simplifies array assembly and disassembly, enables angles to be adjusted under load and ensures optimised acoustic summation across the full range of inter-cabinet angles.
Arrays are constructed and disassembled hanging straight, inter-cabinet angles are pre-set before tensioning the lever hoist to curve the array into the pre-set angles.

The Vero Laser Pod on the frame provides the additional function of a tension indicator, flashing high brightness white LEDs when maximum tension is achieved.



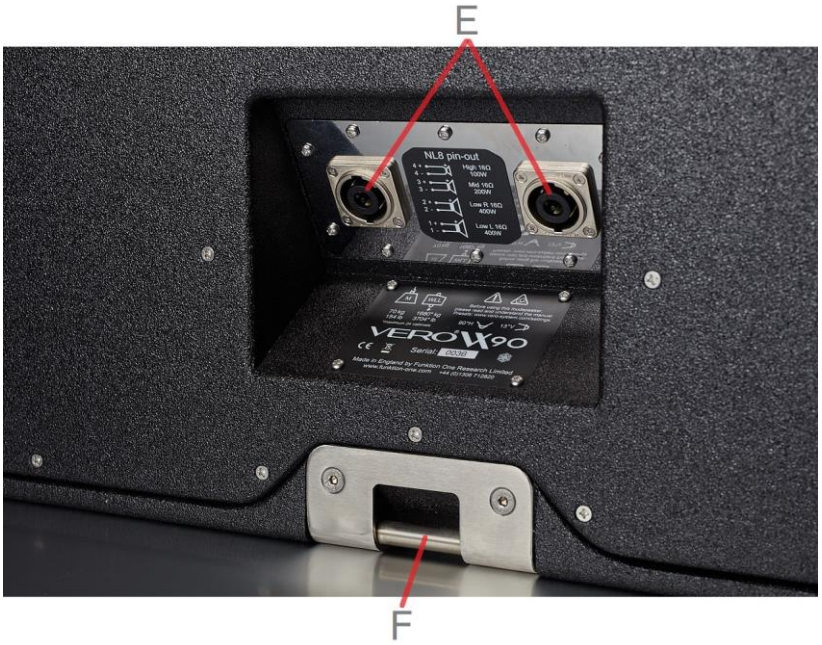


2.1 VX90 side panel in detail



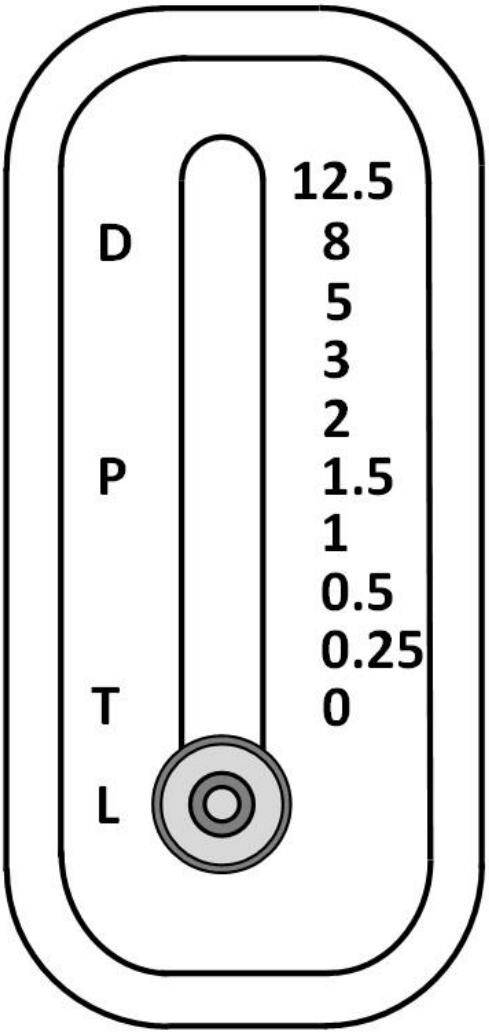
A: Location cone
B: 12mm pip-pins
C: Hook lever (for retracting Lambda)
D: Index knob (see next section)

2.3 VX90 rear panel in detail



E: Neutrik NL8 speakon input and link through
F: Kelping bracket

2.4 Index knob in detail



Inter-cabinet angle is displayed to the right hand side of the index knob. The following rigging angles are available; 0, 0.25, 0.5, 1, 1.5, 2, 3, 5, 8 and 12.5

With the cabinets connected press and hold the central locking button on the Index knob, slide the index knob to the required angle, releasing the push button will lock the Index knob at the designated position

Note: The selected angle is for the cabinet below!

Displayed on the left hand side of the index knob are the secondary functions of the rigging system;

D: Dolly: Use this position to pin the cabinet to the VX dolly.

P: Park: Use this position to park and lock the Lambda system internally in the rigging system.

T: Transport: Use this position for cabinets stacked on the Dolly to secure them at 0°

L: Lambda: Set to this position to hook the Lambda and retract (see section 2.5)

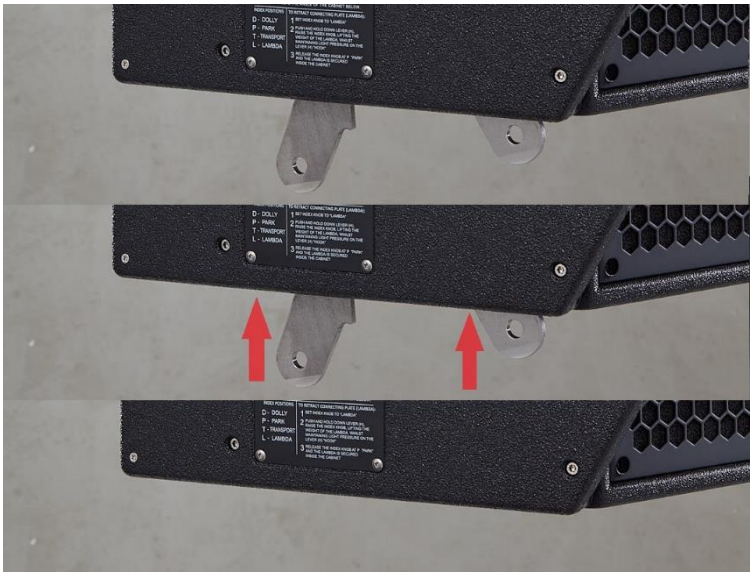
The Index Knob sets the angle of the cabinet *below* when the array is hanging freely.

The Hook Lever allows the Lambda to be retracted inside the cabinet when not in use.

The Lambda name comes from the shape of the moveable load-bearing element inside the flying plates. When not in use, this remains retracted inside the cabinet for protection.

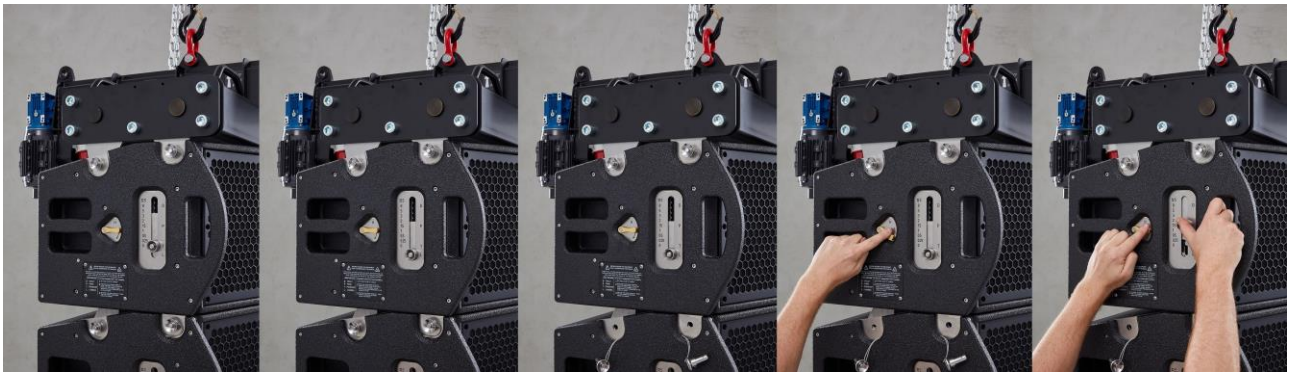
2.5 Retracting the Lambda using the Hook lever

The procedure for stowing the lambda must be carried out in the correct order, improper stowage will lead to damage to the Lambda rigging system,

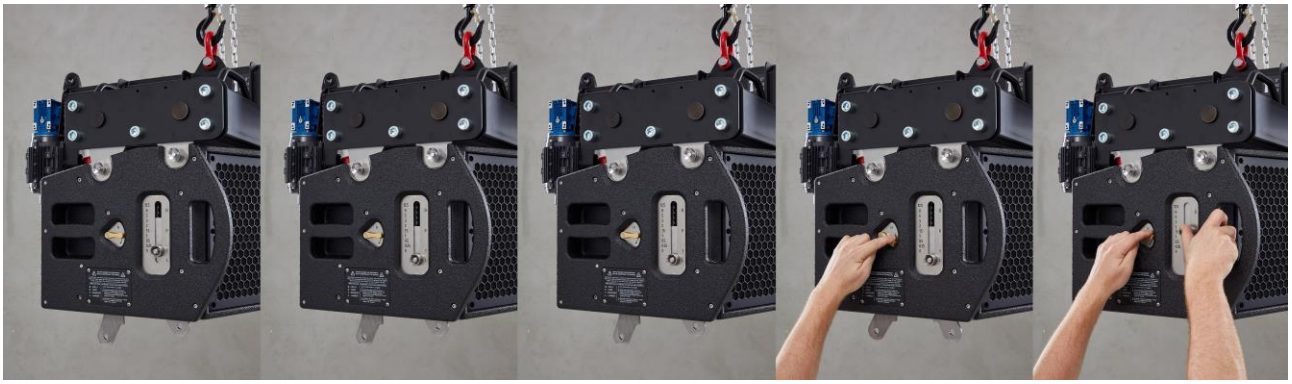


1. Press the central button on the index knob to unlock the mechanism and slide the index knob down to the “L” (Lambda) position.
2. Remove locking pins from adjacent cabinet.
3. Whilst maintaining pressure on the hook lever, press the central lock button on the index knob and slide the mechanism to the P (Park) position. The Lambda will be retracted and stowed in the fly plate. Releasing the central button will lock the index knob in this position.
4. Repeat on the adjacent side
   Note: If the lambda has not retracted repeat steps 3 and 4, always ensure correct lambda stowage.

Lambda retraction with cabinet below



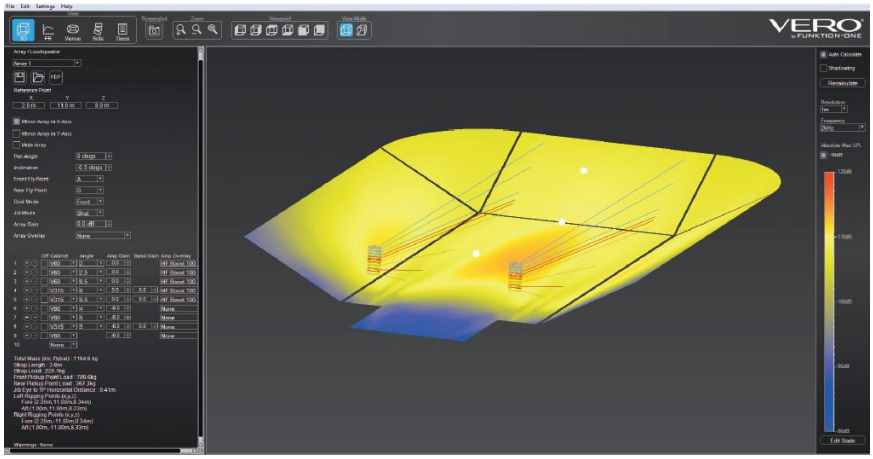
Lambda retraction with no cabinet below



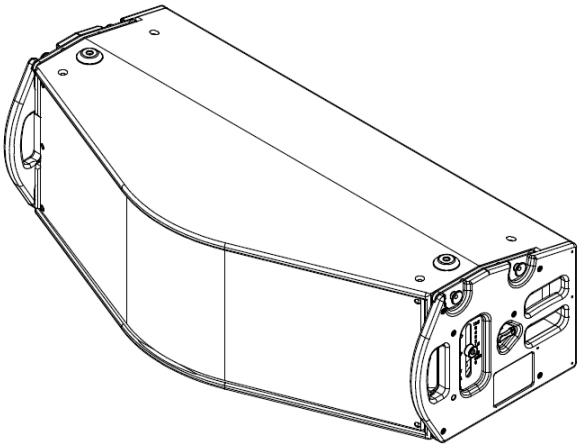
3.0 Rigging components

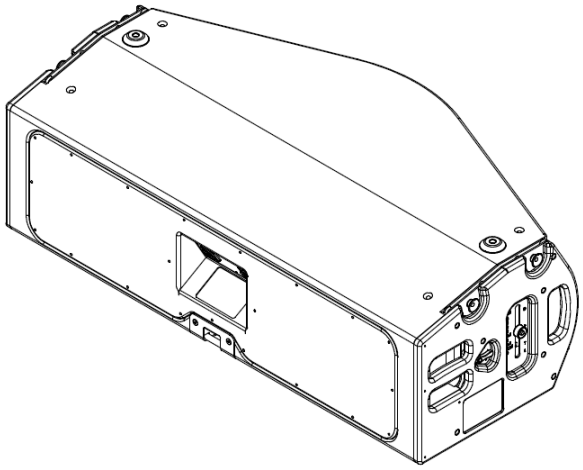
3.1 Projection Software

Used for predicting acoustic performance and designing safe arrays. Please contact your local Funktion-One dealer for a license key and installer.



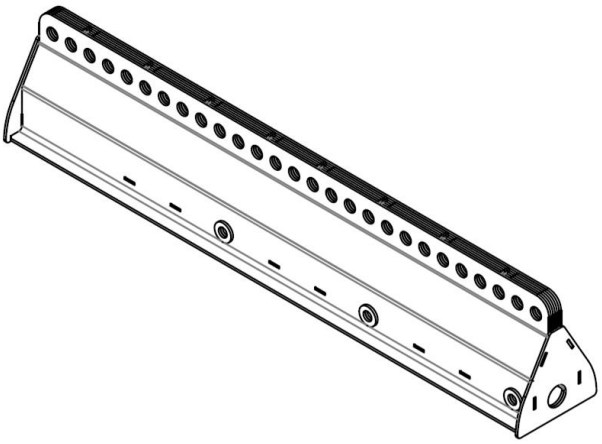
3.2 Vero VX90 array loudspeaker



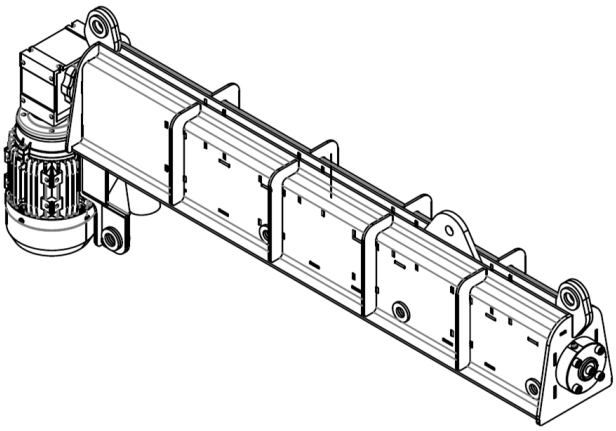


Horizontal dispersion:	90°
Vertical splay angle range	0° - 12.5°
Fittings:	Integrated Lambda rigging plates
Working load limit:	1,680kg (3,704lb)
Weight:	70kg (154.3lb)
Dimensions:	1120mm (3’ 8 3/32”) wide x 340mm (1’ 1 25/64”) high x 559mm (22’ 0 1/64”) deep

3.3 VX Fixed Point Beam (F-Beam)



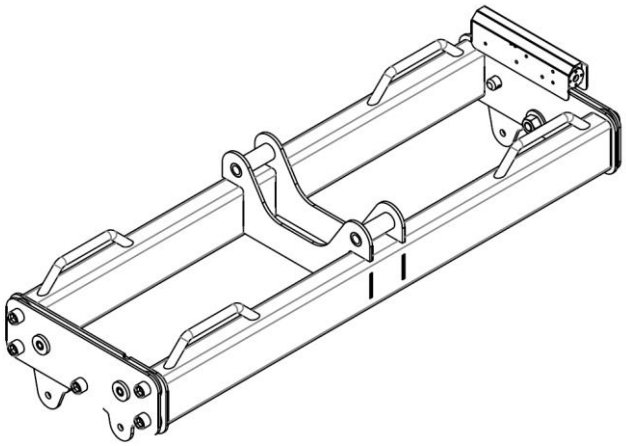
This is the standard beam for conventional single or two-point flying.
Connects to the VX frame via 2x 16mm pins.
Maximum load: Refer to table 1.2



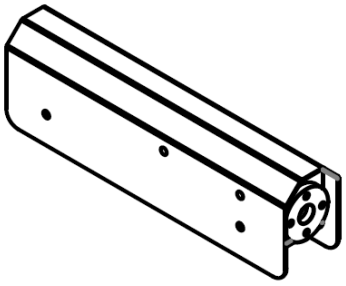
3.4 VX Moving Point Beam (M-Beam)

This beam has a motorised moving suspension point for remote adjustment of array inclination and declination whilst under load. Connects to the VX frame via 2x 16mm pins.
Maximum load: Refer to table 1.2

3.5 VX frame



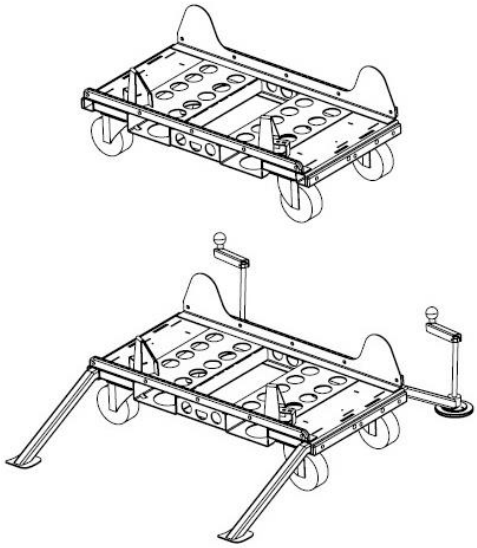
Common frame for both beam types.
Connects to F-Beam or M-Beam with two 16mm pins.
Connects directly to VX90 cabinet via 12mm pins.
Maximum load 24 Vero VX90 cabinets (WLL: 1680kg)



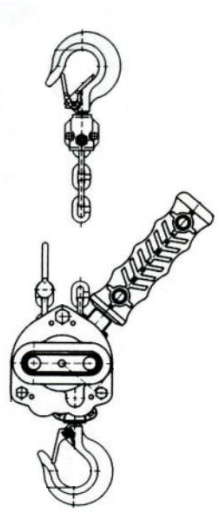
3.6 Vero Laser Pod

Aiming laser, inclinometer and rear pick up tension indicator. Attaches to VX frame.

3.7 VX Dolly

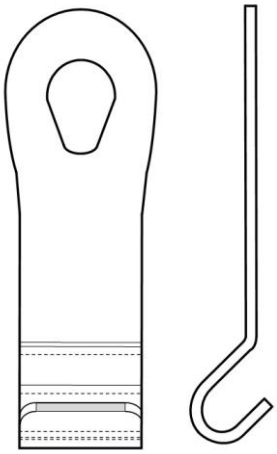


Robust transport and ground stack dolly for up to five VX90 cabinets.
Forklift tubes/guides are provided.
Removable outriggers (pictured) enable inclination or declination of the array whilst on the dolly.
Strap loops are on the underside for securing the dolly when ground stacked on a structure.



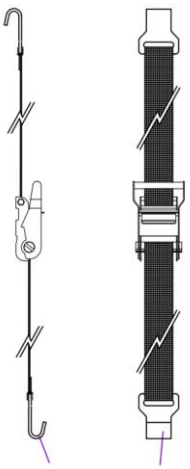
3.8 VX Lever Hoist

Tension to set array angles is achieved with the VX lever hoist.
WLL: 1000kg



3.9 Kelping hook

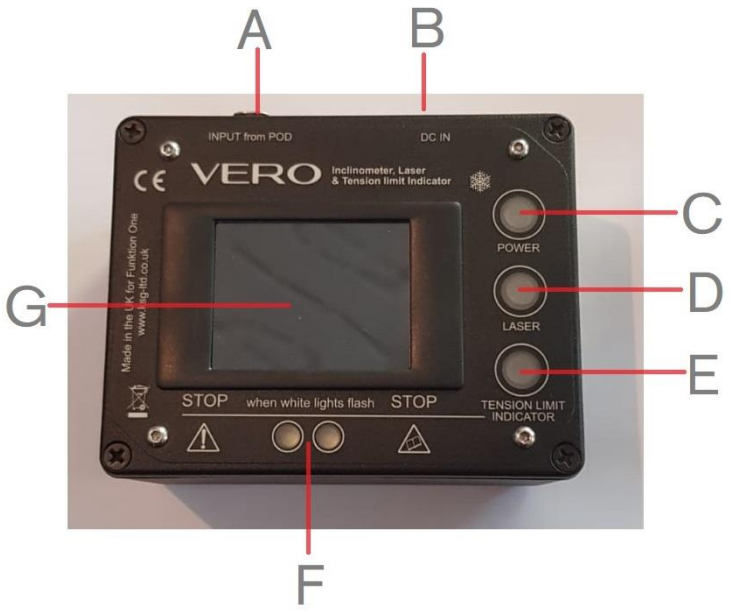
The kelping hook is attached to the kelping bracket on the bottom VX enclosure in a flown array to provide a fixing point for the lever hoist.



3.10 T-Strap (For use in ground stacking configuration)

For ground stacks on the VX Dolly, the familiar Res/Evo T-Strap is used to set the pre-set angles. Connects the top box on the central corner bracket to the strap point on the dolly.

3.12 Inclinometer, laser and tension limit Indicator Overview



A: Ethercon input from inclinometer
B: 15V DC power in
C: Power button
D: Laser ON button
E: Tension Limit indicator
F: Over tension indicators
G: Screen

To allow fast and accurate deployment of the Vero VX loudspeaker system Funktion-One engineers have incorporated a proprietary inclinometer with additional laser and array tension indication functions. This allows the end user to view real time grid inclination//declination angles as well as confirming the aiming point of the top enclosure. A tension limit indicator is included that operates when the lever hoist tension is optimal, avoiding undue stress on the rigging system whilst indicating to the user when the pre-set inter-cabinet angles have been achieved.

The laser inclinometer pod and indicator use a proprietary wiring configuration based around standard etherCON//RJ45 cabling, this helps reduce the number of specific cable types required to operate this system allowing for easy substitution in the field should you have a fault or failure with your cable infrastructure. Do not connect the inclinometer to a network port.

The inclinometer display unit contains a rechargeable battery, this can be recharged using a 15VDC adaptor and allows the unit to be operated away from a fixed power source. Ensure your unit is charged before use, if the power LED begins to flash this indicates the battery is low and needs to be charged.

3.13 Inclinometer operation

Caution- The Funktion-One Vero inclinometer uses a proprietary wiring standard. Do not plug the inclinometer into any Ethernet switches, computer networks or POE adaptors as this will cause damage to the hardware.

Class 3R laser safety: Before turning on the laser pointer, always be sure it's pointed in safe direction. Do not look directly into the beam. Do not aim the laser towards people. Do not aim at reflective surfaces. Do not use the laser when the venue is open to the public.

- Connect an ethercon to the laser pod.
- Connect the other end of the ethercon to the display unit.
- Press and hold the power button until the red LED flashes and the screen powers up. The current grid angle will be displayed on the screen.

  Note: The bar graph on the screen and alarm symbol are additional visual indications of grid inclination and declination. If the alarm symbol is present this indicates the inclinometer is out of limits.

- Turn on the tension limit indicator by pressing the button (E)
  1. Whilst operating the LED light will flash blue
  2. Once the optimum lever hoist tension has been passed the white LED on the pod and display unit will flash.
  3. To activate the laser on the pod, press and hold the laser ON button. The laser will power off once the button is released. The laser pod will not function until the optimum lever hoist tension has been reached.

  Note: Confirm area is clear prior to activating the laser.

- Once correct beam angle has been achieved, power off the display unit by pressing the power button.
- Proceed to the next array(s) and repeat the above process.

4.0 Array configuration overview

Fly grid with M-Beam introduction

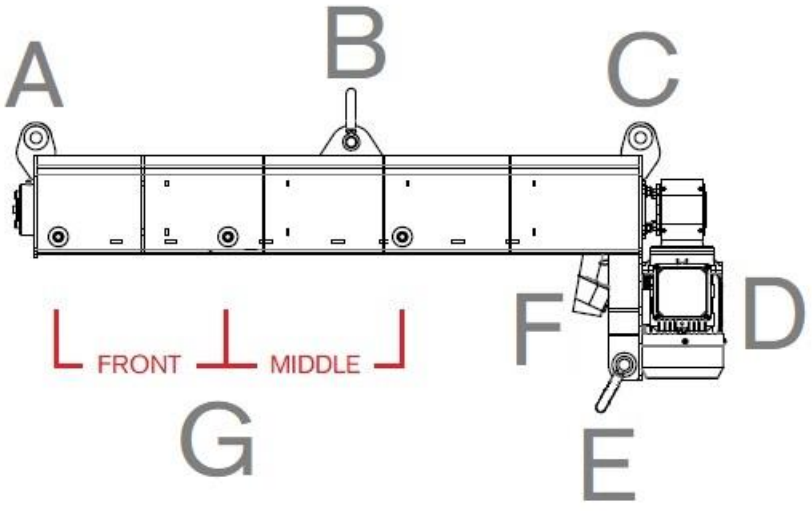
The Funktion One Lambda® rigging system allows Vero VX arrays, designed using Funktion One's Projection software, to be deployed accurately and efficiently.
Vero VX inter-cabinet splay angles can be easily adjusted with the system in suspension.

The motorised beam is unique to Funktion-One, it uses a proprietary motor, gear box, lead screw and trolley system that allows the end user to adjust the angle of inclination or declination of the fly grid and loudspeaker array. The M-Beam also allows continuous adjustment of the motorised single point to accommodate centre of gravity shifts during rigging and de-rigging operations.

4.1 Fly grid

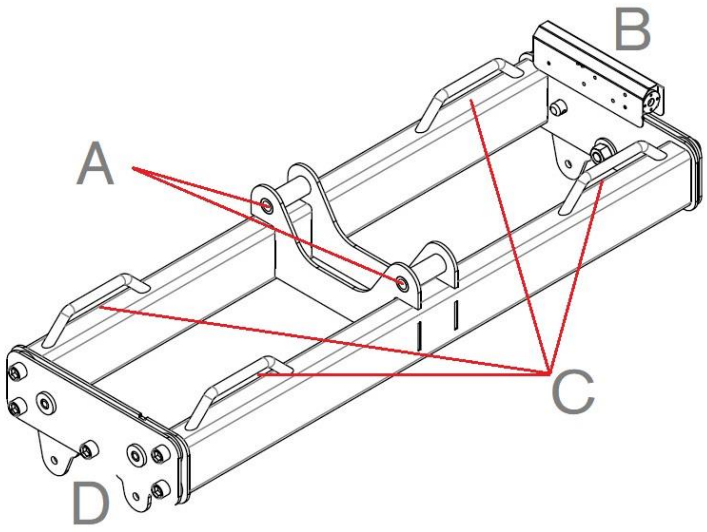
The fly grid assembly comprises of a beam plus a frame which connects to the top cabinet of the array.

4.2 Motorized Beam



A: Front flying point (Dual point)
B: Motorized single rigging point
C: Rear flying point (Dual point)
D: Electric motor and gearbox
E: Rear pickup point
F: 4 pin cee form power connector
G: Frame positions

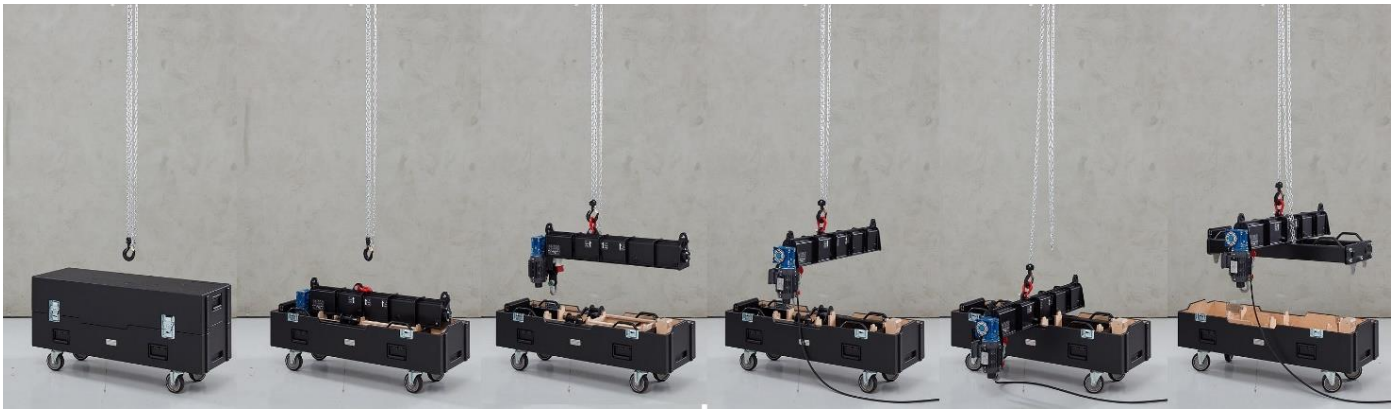
4.3 Frame



A: Frame pin locations
B: Laser inclinometer
C: Carry handles
D: Frame Lambda points

4.4 Assembling the Fly Grid

1. Position the flying trunk underneath the house fly point hook, noting the front of the beam.
2. Connect hook(s) to the motorised beam using either dual flying points or single flying point.
3. Using the house motor, lift the motorised beam to float above the trunk.
4. Connect the 4 pin Ceeform power cable for the M-Beam motor control
5. Rotate the beam 90 degrees.
6. Release the two frame pip-pins from the frame.
7. Lower the beam so that it engages in the position suggested by the **Projection** software *(either front or middle).*
8. Connect the beam to the frame with the two frame pip-pins.
9. Motor the M-Beam single flying point to level the grid prior to lifting.
10. After checking the fly grid assembly is exactly as determined in the **Projection** software use the house motor to lift the main grid clear of the trunk and remove the trunk from the work area.



5.0 Vero VX cabinet preparation and flying

5.1 Initial preparation and first cabinet lift

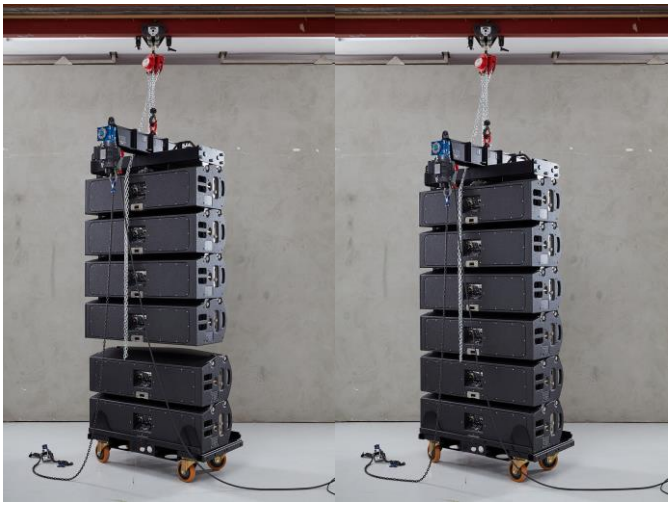
- Fly the grid assembly to just above 4-cabinet dolly height.
- Wheel the 4-cabinet dolly into place beneath the grid assembly.
- Remove the top loudspeaker's pip-pins
- Lower the grid onto the top loudspeaker ensuring that the free plates nestle into the fly plate gap.
- The fly grid Lambda "armpits" locate on bosses at the top of the fly plate ensuring the Lambda holes line up with the pip-pin fly plate holes
- Re-insert the pip-pins; making sure they are fully home and that the wire lanyard is not snagged and lays nicely
- Lift up the four cabinets so that they float free from the Dolly.
- Using the M-Beam, motor the grid until it is level.
- Move the empty dolly to a safe distance ready for stacking
- Check all pins are securely in place and cross-check both sides before proceeding
- Attach lever hoist

5.2 Addition of more cabinets

- Manoeuver the next dolly of cabinets beneath the previously flown cabinets.
- Lower the flown cabinets so that the cone receptacles locate onto the cones of the dollied cabinets.
- **Note:** The locating cones optimise the cabinet positioning before the lambda arms are deployed.

  Mind your fingers

- Remove the top pip-pins from the dollied cabinets



- Press the central button on the index knob to unlock the mechanism then slide the index knob down to the “L” (Lambda) position, gravity will drop the Lambda to its free position, ready to connect to the next cabinet.

  Mind your fingers

- Now the Lambda arms have dropped into the adjacent cabinets fly plates replace the two 12mm pip-pins to secure the load.

Once you’ve cross-checked that both sides of the array are secured:

- Lift the whole system clear of the dolly and select the required angles **(next step)**
- Wheel the next dolly of VX into position under the flown enclosures and repeat the process 5.2 until your array is complete.

5.3 Applying inter-cabinet angles

Ensure angle settings are the same on both sides of the enclosure!

With the cabinets now floating just off the ground you can the set the inter-cabinet angles suggested by **projection** software.

Inter-cabinet angles can be set as follows;

1. Starting with the top enclosure, press the central button on the index knob to unlock the mechanism then slide the index knob up to required angle. (0, 0.25, 0.5, 1, 1.5, 2, 3, 5, 8 or 12.5)
2. Release the push button ensuring the mechanism is locked at the required angle.
3. Repeat steps 1 and 2 from this procedure on the adjacent side then move onto the next cabinet in the array.

Shown below is an example of a floating array with index knobs set at predefined angles taken from Projection software. Note the bottom enclosure in the array has the lambda set in **P**, this is so that the lambda is parked internally in the rigging system protecting it from damage.

5.4 Example of a 6 enclosure Vero VX array with angles pre-set (not applied)

Shown below is an example of a floating array with index knobs set at predefined angles taken from Projection software. Note the bottom enclosure in the array has the lambda set in **P**, this is so that the lambda is parked internally in the rigging system protecting it from damage.

Remember that the angle setting is for the cabinet below!

Enclosure 1: 1 degree

Enclosure 2: 2 degrees

Enclosure 3: 3 degrees

Enclosure 4: 5 degrees

Enclosure 5: 12.5 degrees

Enclosure 6: P

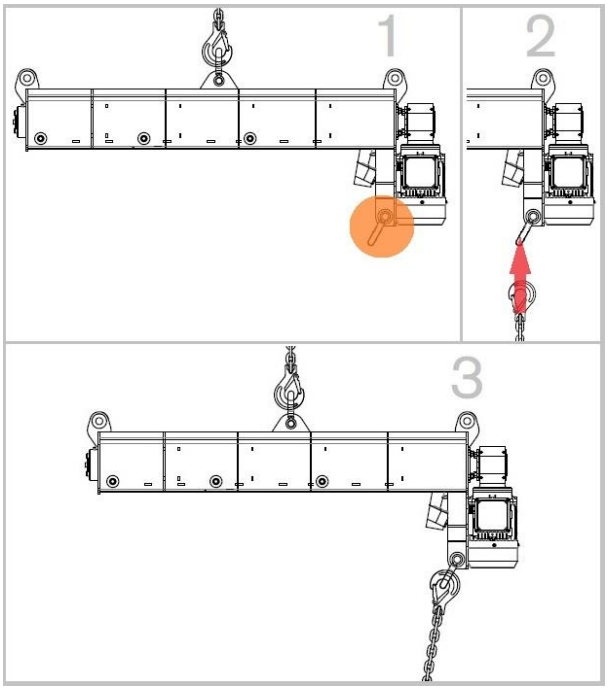
Note: As this is the bottom enclosure this setting stores the lambda inside the rigging system to protect it from damage.

*These inter-cabinet angles are diagrammatical, array design should be carried out using **Projection** array design software

6.0 Fixing the lever hoist and curving the array

6.1 Attaching the lever hoist

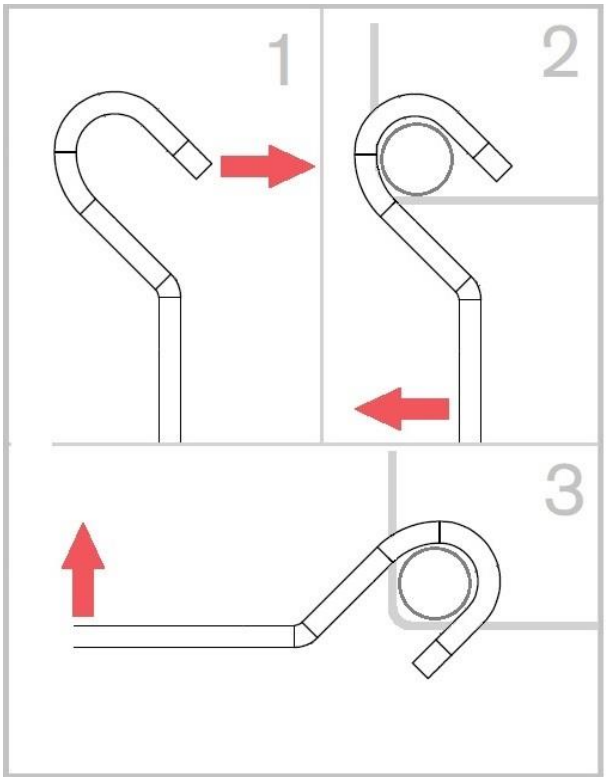
1. Attach a 3 ¼ tonne shackle to the rear pick up point on the M-Beam, ensure the shackle has been inspected and certified in accordance with local health and safety regulations.
2. Attach the lever hoist hook to the shackle.
3. Ensure the hook is fixed securely and carry out cable husbandry so as to avoid “snags and traps” during the tension procedure.



6.2 Attaching the kelping hook

1. Attach the kelping hook to the kelping bracket on the back of the bottom flown VX cabinet as shown in the diagram
2. Attach the lever hoist hook to the kelping hook fixing hole.
3. Confirming the lever hoist is in the correct operating mode take up the slack in the chain

   Note: Carry out a final “idiot check” of array angles and confirm all pip-pins are in and locked



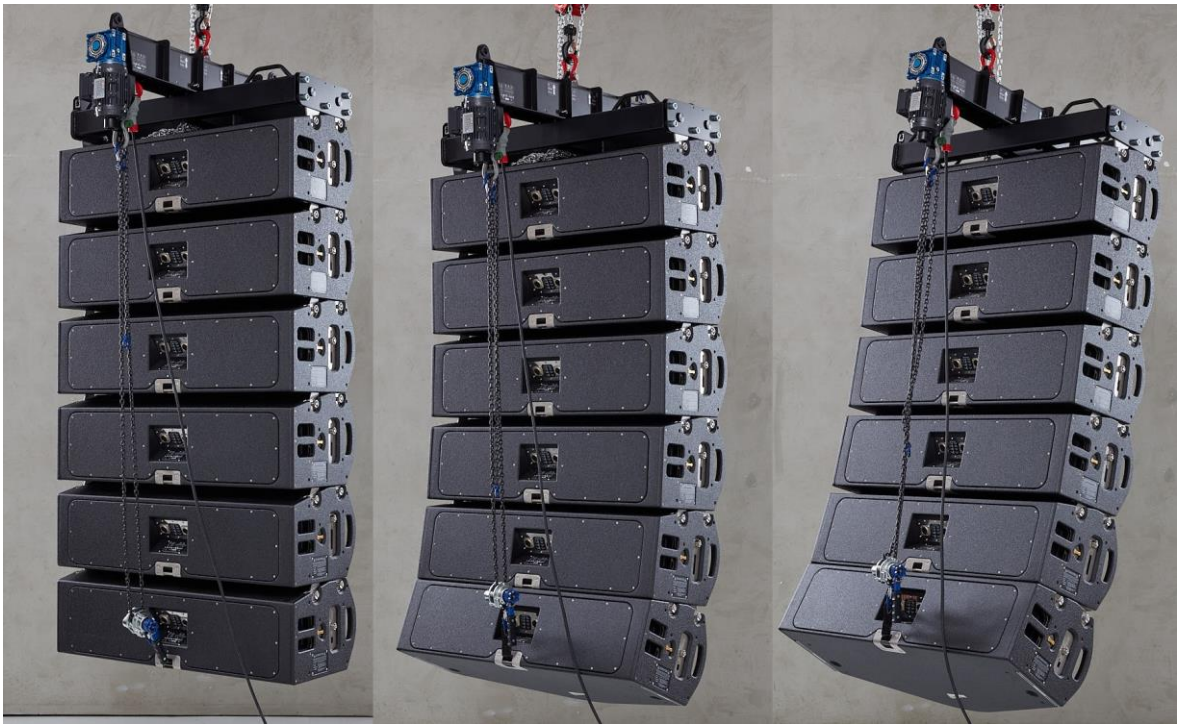
6.3 Tensioning the lever hoist to set array angles

Check angles are the same on both sides of the cabinets

- Using the lever hoist, apply tension to the rear pull up chain until the tension indicator flashes on the frame and the Laser controller/Inclinometer.

Do not over tension the lever hoist! Risk of damage!
Stop tensioning when the white warning LEDs on the frame flash, and incrementally release tension until the flashing stops

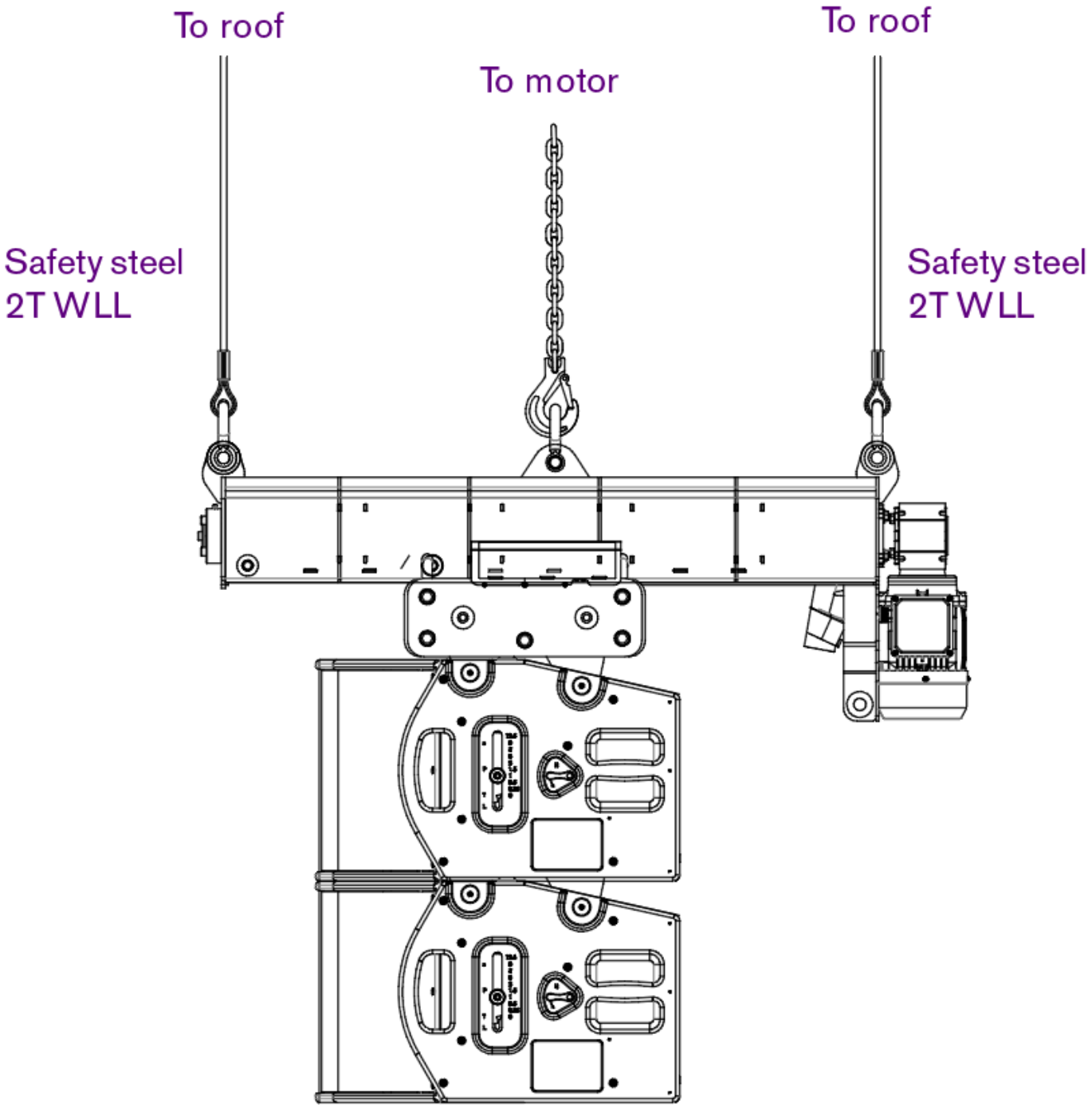
- Lift the array to trim height and aim using the laser and inclinometer.



6.4 Safety connection points (for single point mode)

When flying a VX array using the M-Beam ensure safety steels are applied and that local safety regulations are followed. Do not over-tension the steels as this will affect the beam angle.

Caution: Do not use the M-Beam motor with safety steels in place



7.0 De-rigging procedure

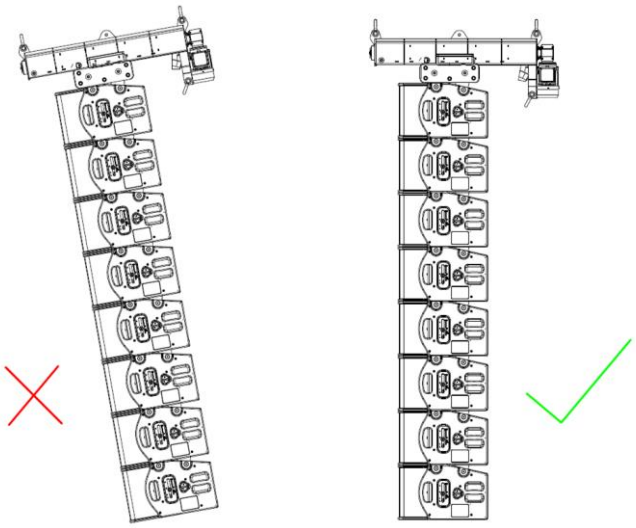
1. Using the M-beam motor level the grid (0° on the inclinometer)
2. Lower the array to float above the ground with the lever hoist accessible.

   Note: Enough distance should be left between the ground and the bottom flown enclosure to allow for the array to uncurl and hang straight.

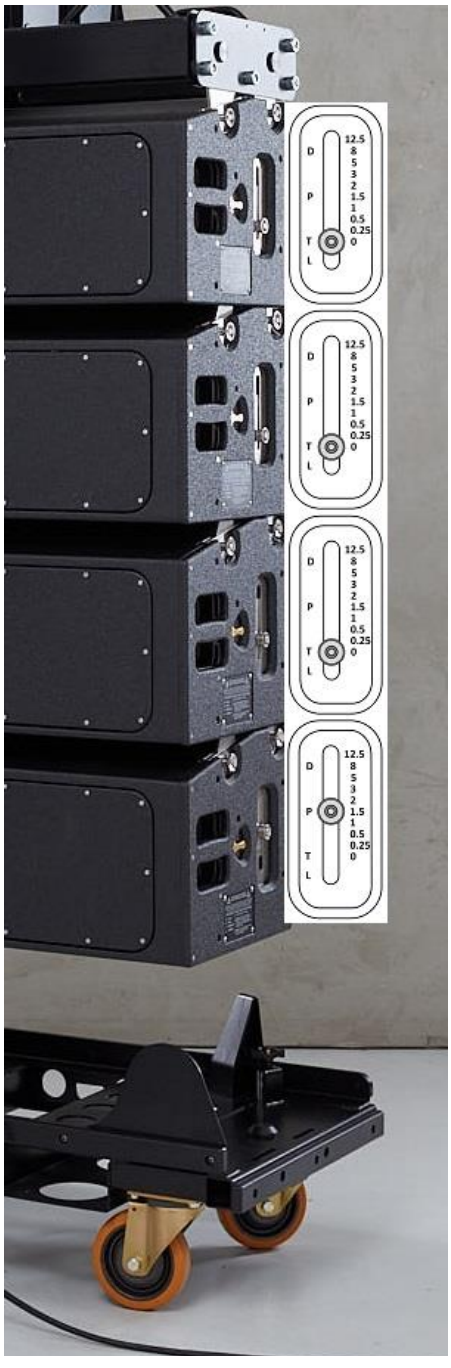
3. Slowly release the lever hoist until the angles are released and the array hangs straight

Caution: The array will swing forwards when the lever hoist is released
Release the hoist incrementally

4. Using the M-Beam motor adjust the angle of the frame back to 0° as required to avoid stressing the flying system (see diagram)

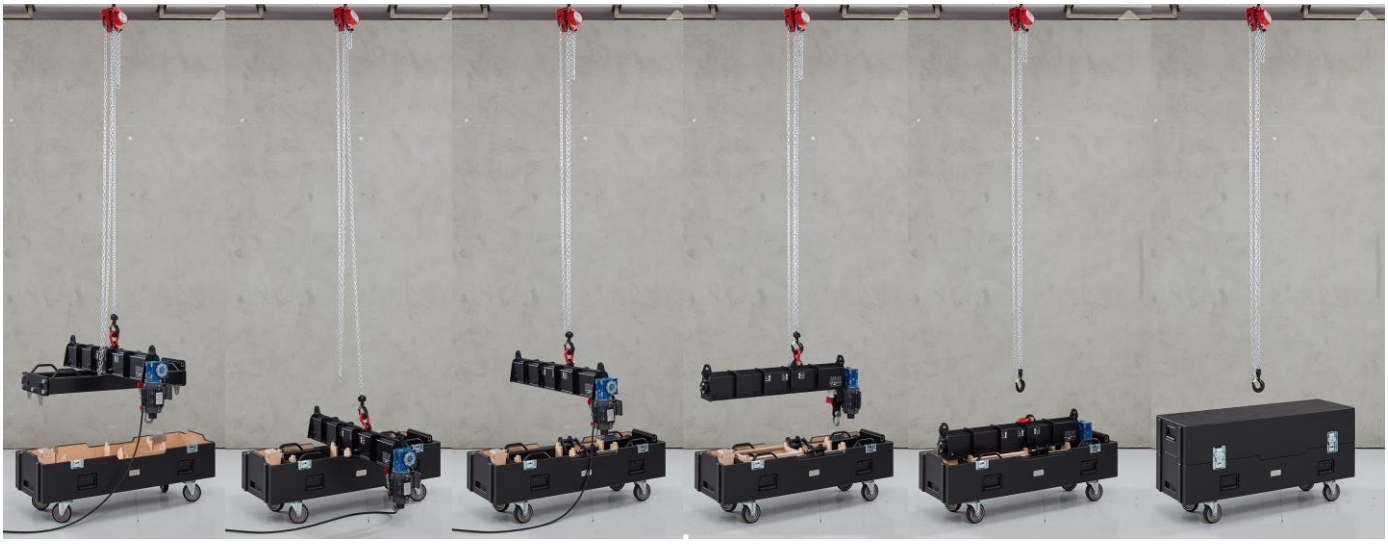


5. Position a dolly under the array
6. Before lowering the array onto the dolly ensure the Lambdas on the enclosure to be landed on the dolly are stored and the Index knob is in position **P** (Park).
7. Set the index knobs to **T** (Transport) on all enclosures other than the enclosure adjacent to the dolly.
   Note: The index knob is easier to adjust when the array is suspended.
8. Carefully lower the array towards the dolly, allowing the cone guides to position the cabinet into the correct location on the dolly.
9. Remove the pip-pins on the fourth cabinet up from the dolly.
10. Carry out the lambda stowage procedure on the now bottom flown enclosure (Section 2.5)
11. Re-insert the pip-pins ensuring they are fully home and that the wire lanyard is flush.
12. Using the M-Beam motor level the grid.
13. Lift the remaining flown enclosures clear then remove the loaded dolly from the work area.



Index positions for dolly stowage

14. Repeat from section 1 until all cabinets are removed from the array.
15. Using the M-Beam level the grid.
16. Position the grid trunk under the frame.
17. Lower the grid into the trunk, allowing the guides to position the frame into the correct location.
18. With the frame landed in the trunk, remove the 16mm pins from the beam.
19. Using the M-Beam motor level the beam.
20. Raise the beam clear of the trunk.
21. Store the 16mm pins in the frame.
22. Remove and store the M-Beam ceeform power cable.
23. Remove and store the laser inclinometer cable.
24. Rotate the beam 90°.
25. Lower the beam into the trunk allowing the guides to position the beam into the correct location
26. Land the beam into the trunk
27. Unhook the beam from the motor(s)



8.0 Ground stack dolly configurations with outriggers

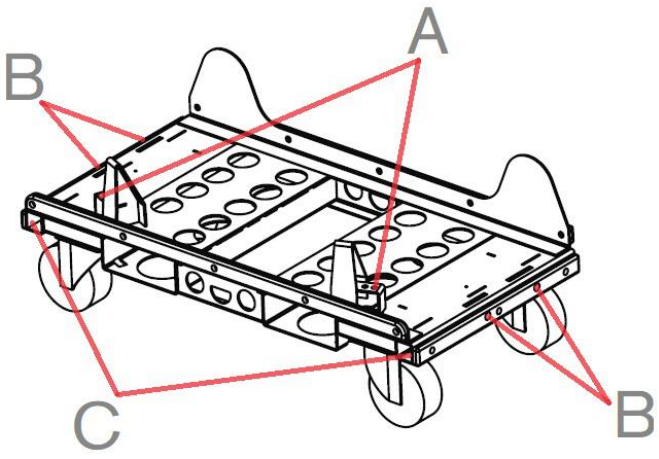
The Vero VX transportation dolly also includes additional hardware to allow it to be used as a ground stacking frame where there is no infrastructure available for suspending an array. The dolly can be used in this configuration to hold up to 6 Vero VX enclosures set to angles defined by **Projection.**

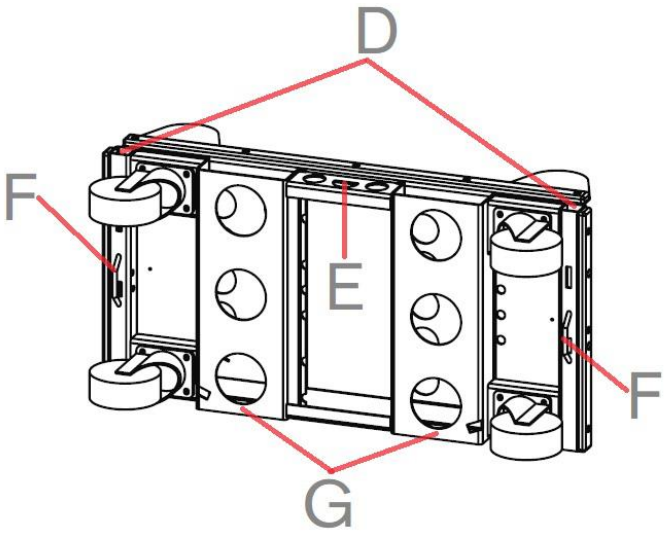
8.1 Ground stack dolly

Using the supplied outriggers and T strap it's possible to quickly deploy arrays with positive or negative inclination which can then be easily and safely secured to your supporting infrastructure.

Inclination *Declination*

8.2 Dolly detailed





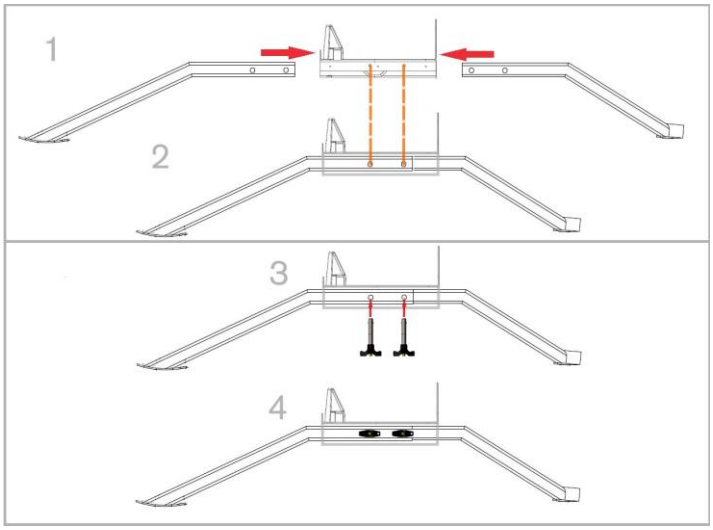
A: 12mm T handle locking pin stowage
B: Outrigger and Lambda locking pin position
C: Front outrigger tubes
D: Rear outrigger tubes
E: Tension strap fixing point
F: Ground anchor strapping point
G: Forklift tubes

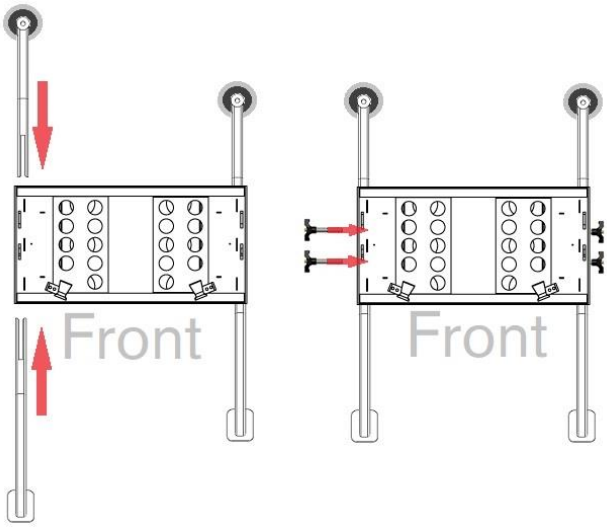
8.3 Securing the outriggers to the VX dolly

- Confirm the ground is solid and level, and that any platforms or structures used to support the dolly are strong enough to support the proposed system weight.
- Move the dolly into position
- On the cabinet adjacent to the dolly, drop the lambdas into the dolly by moving the index knob to the **L** (lambda) position

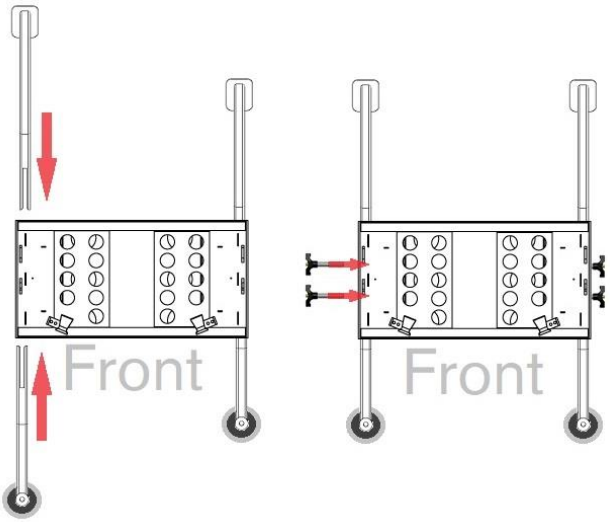
For declination, slide the outriggers with screw jacks into the tubes on the rear of the dolly.
For inclination, slide the outriggers with screw jacks into the tubes on the front of the dolly.

1. Configure the outriggers and slide them into the outrigger guides on the dolly
2. Confirm visually the alignment of the dolly/outriggers/lambda
3. Remove the four 12mm T-handle pip-pin from their stowage position on the VX dolly
4. Insert the 12mm T-handle pins into the dolly ensuring they pass through the whole assembly including the outriggers and the lambda.

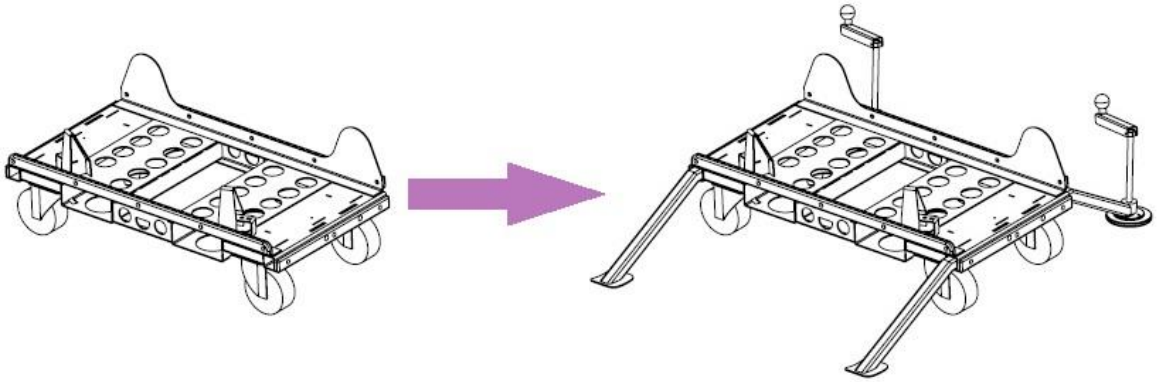




Declination Configuration



Inclination Configuration



8.4 Applying Declination

Note: Use two people to extend and retract the screw jacks. Un-even extension and retraction can overly stress the outrigger and screw jack assembly.

> **Tip**: Count out the number of turns to ensure synchronous extension/retraction of the screw jacks.

- With the outriggers and Vero VX secured to the dolly, extend the screw jacks to half length. This is -6.7° on the dolly.
- Using the Index knob apply the inter-cabinet angles as defined by the projection simulation.

Do not over tighten the ratchet on the T-strap

- Connect a T-Strap to the kelping bracket on the top enclosure then fix it to the strapping point on the dolly
- Take up the slack in the T-strap then tension it using the ratchet. In turn the boxes will take up the angles defined by the index knobs.

- Once all angles are set and the assembly is tight, wind the screw jacks in synchronisation to achieve the desired tilt

Note: To apply Inclination follow the procedure above however configure the outriggers to inclination mode.

8.5 De-Rig

1. Together with another person, retract the screw jacks in synchronisation to half length.
2. Release the rear T-strap and using the handles on the front of the Vero VX straighten the array

⚠ Caution – the cabinets may swing forwards when the strap is released. Maintain pressure on the strap to control the tension release and keep clear of pinch points shown here;

Pinch points detailed in red

3. Set the index knobs to T for Transport (0°) on the top three enclosures.
4. With another person, wind the screw jacks down in synchronisation until all four wheels are on the ground. Fully retract the screw jacks for stowage.
5. Remove the 12mm T-handle pip-pins and place them in the stowage position on the dolly
6. Remove the outriggers
7. Retract the lambdas on the bottom enclosure (See retracting the lambda section **)

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