BlokCam Camera System Manual

Systems covered:

X3L	M3L

Parts covered:

T3	B6	S5	R5	P3	M2	M3	CH3

Contents

Remarks

1. Always adhere to the machine manufacturer's instructions.

2. Crosby BlokCam ® should be used to assist the operator's judgement, not replace it.

3. All aspects of installation, removal, charging, use and fault finding should only be carried out by trained and competent persons

4. Ensure Crosby BlokCam ® parts and components do not interfere with machine manufacturers and/or third-party components, parts and systems, moving or otherwise.

5. Prior to adverse weather conditions or in any situation where Crosby BlokCam parts or components may become dislodged or come into unfavourable contact with the machine and/or third-party components, moving or otherwise, all magnetically mounted Crosby BlokCam parts and components must be removed.

6. Always ensure that Lanyards are connected, and Rapid Links are tightened. Consider that the machine and/or mounting point may change configuration, shape, and size.

7. High powered magnets in use. Neodymium magnets are permanent and strong, use correct protective equipment to avoid trapping hazard.

8. If possible, installation work should be completed at ground level to avoid working at height. For working at height, please refer to regional and site-specific regulations and guidelines and ensure installation team are competent and adequately trained.

9. In Wi-Fi networking, a point-to-point wireless bridge lets users wirelessly connect two or more locations together. This bridge connects two or more locations to share data across the network.

10. Crosby BlokCam ® transceivers operate within the 5GHz band. For best results ensure a direct line of sight between paired wireless transceivers and antennas.

11. Frequency selection and transmit power may vary. Please refer to regional regulations, guidelines, and authorities to ensure legal operation.

12. A competent person should carry out pre-use checks prior to the commencement of work. Pre-use check sheets are available online from www.blokcam.com

13. Parts and components may differ from renders.

14. Manual subject to change without notice

15. Subject to Copyright

Introduction

Crosby BlokCam ® is a wireless camera system that can be quickly and easily deployed to a ferrous surface, such as steel. The sound and view captured by the camera is then transmitted and received wirelessly to a viewing platform such as a Monitor, tablet, smart phone, or laptop. This allows the operator to see and hear the load and surroundings, giving an unobstructed, live, audio-visual feed of the previously unseen critical areas.

The Process Explained – M3L System

1. A Battery provides power to the Transmitter and the Sensors.

2. The Sensors capture, encode, and push the data through the transmitter to the next wireless transceiver.

3. Depending on the required configuration, the data may be transmitted through one or more battery powered transceivers.

4. Finally, the data will reach the transceiver and decoder within the M3 display which projects the image and audio through the Monitor.

What's Included – M3L

Qty	Description
4	6mm Rapid Links.
2	90 Degree N-Type Connector.
1	Ram Mount Arm - Double Socket Arm - 4.5 inch.
2	7 dBi Duck Bill Antenna.
1	USB Memory Stick - 2GB.
1	3mm x 600mm Lanyard - Stainless.
1	Triple Suction Cup c/w Monitor Mount Stickers.
3	Stainless Lanyard c/w Retaining Magnet.
1	M3L Camera System Case.
1	PC3 - Power Cable - Battery to Transceiver.
2	PSC1 - Power Supply Cable (DC-DC).
1	PSU1 - Power Supply Unit (AC-DC).
1	AN1 - 14dBi Flat Panel Antenna Assembly
2	B6 - Battery Pack
1	CH3 - Battery Charger
1	M3 - All in One Monitor
1	S5 - Sensor
1	T3 - Transmitter
1	Power Lead – (Regional – C8 Figure 8)

The Process Explained – X3L System

1. The Battery provides power to the Transmitter and the Sensor. The Sensor captures the audio-visual feed and sends it to the transmitter. Each component is magnetically attached and tethered to the desired surface. The signal is transmitted through one or more repeaters depending on the required configuration.

2. The Repeater is a modular transceiver which can be powered over ethernet (POE), by the BlokCam ® Battery or an alternative 12-24Vdc supply. The Repeater receives the wireless signal from the transmitter and relays the data back to a Processor and Monitor. The quantity and position of the repeater/s vary depending on the required configuration.

3. The final Repeater will be connected to, and powered over ethernet by the Processor. The Processor can be powered by mains or a 9-36vdc supply. The processor decodes the data and transfers the image and audio onto the Monitor. The Processor also powers the Monitor.
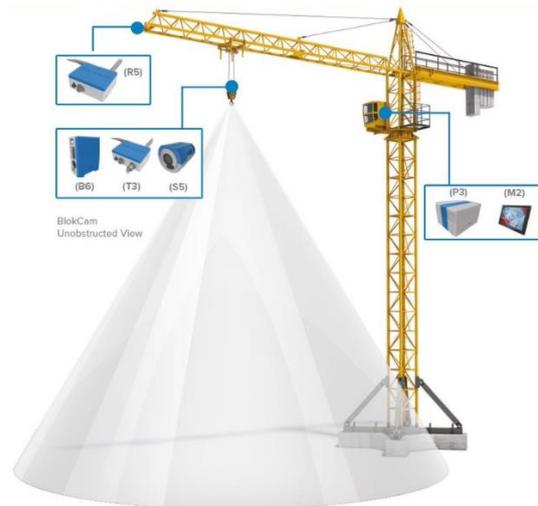
What's Included – X3L

Qty	Description
5	6mm Rapid Links.
3	90 Degree N-Type Connector.
1	Ram Mount with U Bolts
4	7 dBi Duck Bill Antenna.
1	3m HDMI Lead
1	Strap Base with 1.5" Ball
1	USB Memory Stick - 2GB.
1	3mm x 600mm Lanyard - Stainless.
1	Twin Suction Cup c/w Monitor Mount Stickers.
2	Double Arm Socket c/w Lanyard
3	Stainless Lanyard c/w Retaining Magnet.
1	T3L Camera System Case.
1	Jib Cable - 75m
1	PC3 - Power Cable - Battery to Transceiver.
1	PSU1 - Power Supply Unit (AC-DC).
1	AN1 - 14dBi Flat Panel Antenna Assembly
2	B6 - Battery Pack
1	CH3 - Battery Charger
1	M2 - Monitor Assembly
1	P3 - Processor
1	PL-M2 Power Lead – Monitor
1	R5 - Repeater
1	S5 - Sensor
1	T3 - Transmitter
1	Power Lead – (Regional - C13 Kettle)
1	Power Lead – (Regional – C8 Figure 8)

Antennas

Foreword

A Flat Panel Antenna is an antenna which radiates or receives greater power in specific directions allowing increased performance and reduced interference from unwanted sources.

In general, Flat Panel Antennas provide increased performance over omnidirectional antennas when greater concentration of radiation in a certain direction is desired.

Duck Bill Antennas are omni directional. Omnidirectional antennas are a class of antenna which radiates equal radio power in all directions perpendicular to an axis. This radiation pattern is often described as doughnut shaped. Omni directional antennas do not emit a signal out of the tip of the antenna.

For best performance, the orientation between the transmitting and receiving antennas must remain parallel and in-line (not offset), consistent and with a direct line of sight.

Antenna Relationships

Flat Panel Antenna to Flat Panel Antenna
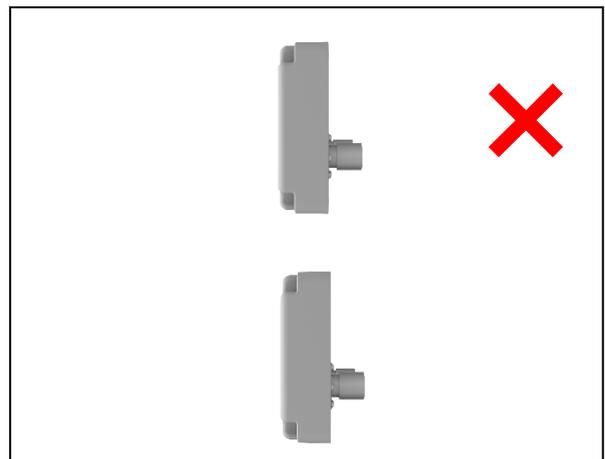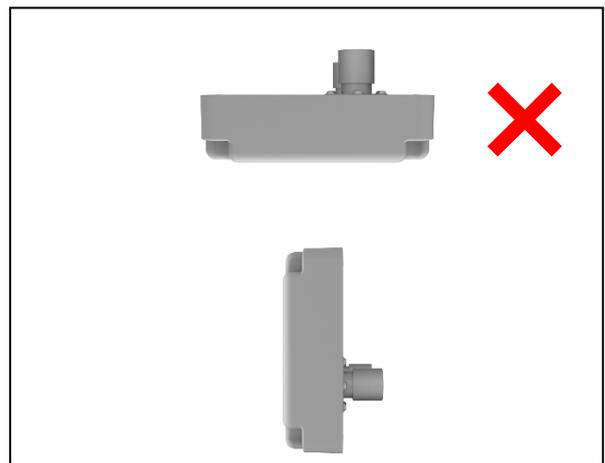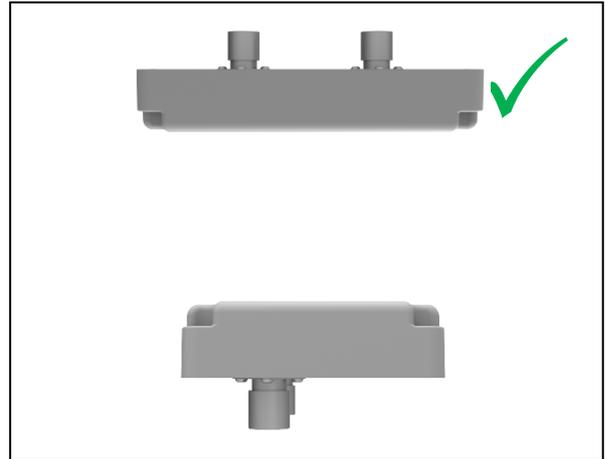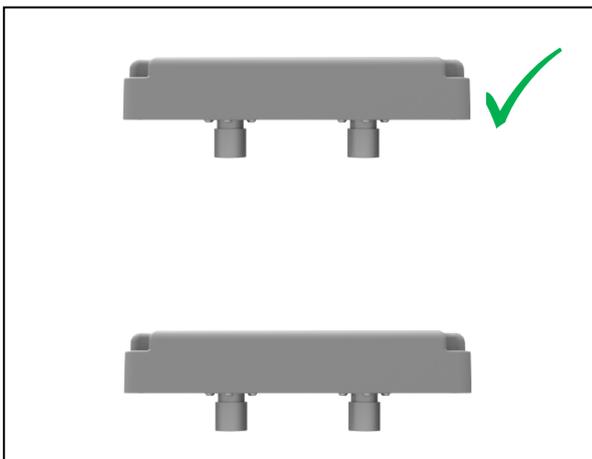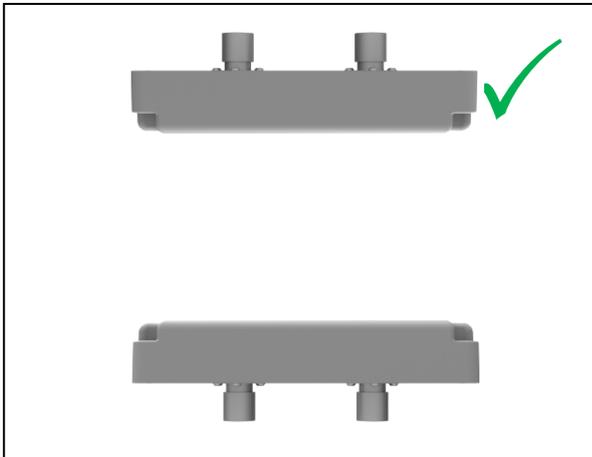
Duck Bill Antenna to Duck Bill Antenna
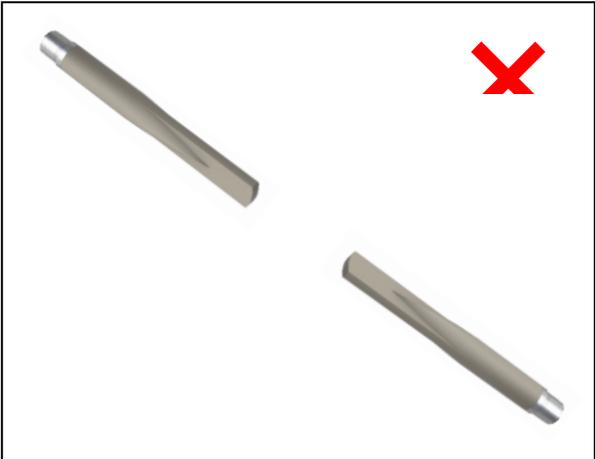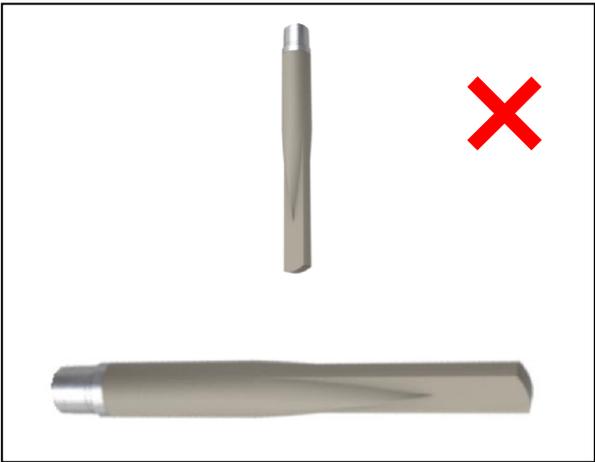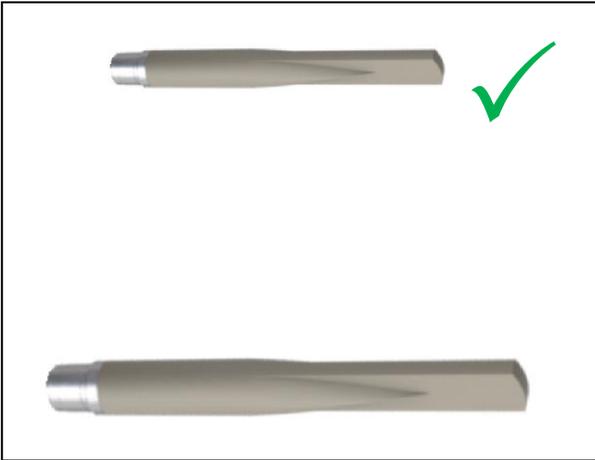
Flat Panel Antenna to Duck Bill Antenna
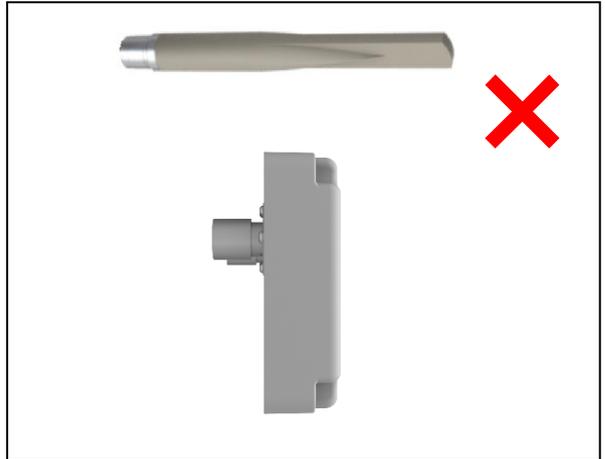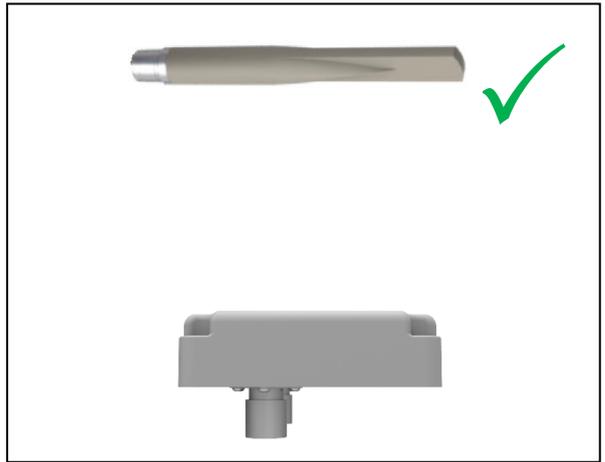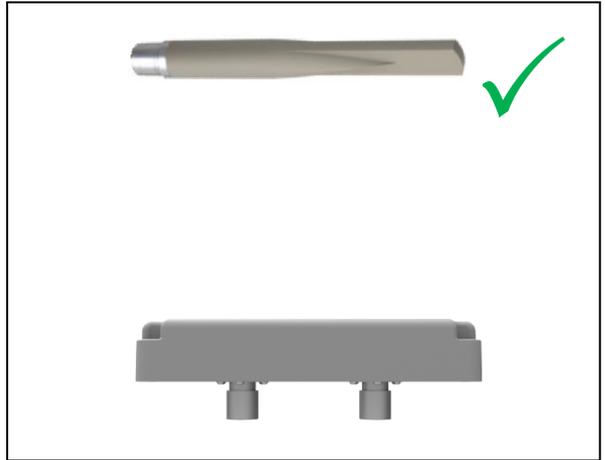
Installation & Technical Information

Foreword

The Transmitter, Sensor/s and Battery connect with cables. Prior to installation, plan a compatible layout and consider:

a. the intended position of the Sensor
b. the view from the intended Sensor position;
c. the Sensor cable length and route;
d. the lanyard length and distance to a secure point;
e. the orientation of the Sensor;
f. the distance to the Transmitter;
g. the intended position of the Transmitter;
h. lanyard length and distance to a secure point;
i. the position and/or intended position of other paired transceivers;
j. the most suitable antenna for the operation;
k. the intended position of the Battery;
l. the power cable length and route;
m. the distance between the Battery and Transmitter;
n. the lanyard length and distance to a secure point;
o. that the battery is changed on a regular basis.

T3 - Transmitter
Shown with Duck Bill Antennas fitted
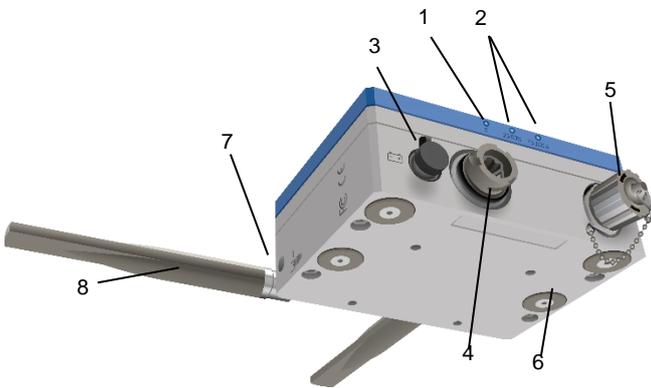
1. LED - Data
2. LED's - Signal Strength 25% - 100%
3. Input Socket - 12-24Vdc
4. Sensor Socket
5. Lan Port/Socket and Cover
6. Mounting Magnets (x4)
7. Rapid Link Anchor Points (x2)
8. 7dBi Duck Bill Antenna (x2)
9. Antenna Ports (not visible)

Technical Specifications

Video compression: H.264 (MPEG-4 Part 10/AVC) Baseline, Main and High Profiles Motion JPEG
Resolution: 1920x1200/1080
Frame Rate: 25/30 fps (50/60 Hz)
Video streaming: Multiple, individually configurable streams in H.264 and Motion JPEG
Image settings: Compression, colour, brightness, sharpness, contrast, white balance, exposure value, exposure control, exposure zones, local contrast, rotation, Corridor Format, text and image overlay, privacy mask, mirroring of images
Audio streaming: One-way
Audio input: External microphone input
Transmission Frequency: 5 GHz
Transmit Power: 19-25dBm
Size and Weight:
Height: 128mm (5.04 inches)
Width: 170mm (6.69 inches)
Depth: 71mm (2.8 inches)
Weight: 2250g (4.96 pounds)
Casing: Aluminium.
Power: 12-24Vdc
Power Consumption: Max 13.3 W
Antenna Connector: N-Type
Storage: One internal SD/SDHC/SDXC slot supporting memory card, 64Gb card included.
Operating Conditions: -20 °C to 60 °C (-4 °F to 140 °F) Humidity 10-85% RH (non-condensing)
Storage Conditions: -40 °C to 65 °C (-40 °F to 149 °F)
IP Rating: IP 67 (with external ports connected)

Mount & Secure the Transmitter/s

1. Magnetically mount the Transmitter to a clean and flat surface.

2. Choose the most suitable antenna/s based on the location of other transceivers.

3. Connect the antenna/s to the antenna ports. On the top side of the Transmitter

4. If required, use the N-type right angle connectors (elbow joints) to achieve the desired position.

5. Once the optimum position has been achieved, firmly tighten the fittings.

6. Fit Rapid Link to Transmitter anchor point.

7. Choke and secure a lanyard to a fixed and secure point.

8. Attach the loose end of Lanyard to the Rapid Link.

9. Firmly tighten the Rapid Link.

When necessary, reverse the above steps for removal.

B6 - Battery
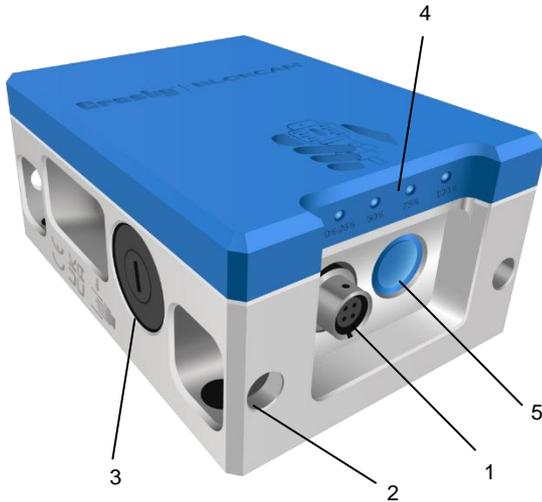
1. Power Socket
   a. Pin 1 - Negative Output
   b. Pin 2 - Positive Output
   c. Pin 3 - Negative Charge Input
   d. Pin 4 - Positive Charge Input
2. Rapid Link Anchor Points x 4
3. External Fuse Holder
4. Charge Status LED's
5. Charge Status Push Button
6. Mounting Magnets x3 (on rear, not shown)

Technical Specifications

Capacity: 14.54V 7Ah
Cell Manufacturer: LG Chemical Ltd
Cell Type: Lithium-Ion
Easy Access Fuse: 500mA
Size and Weight:
Height: 140mm (5.51 inches)
Width: 105mm (4.1 inches)
Depth: 65mm (2.56 inches)
Weight: 1600g (3.53 pounds)
MSDS: available from www.blokcam.com
IP Rating: IP 67 (with external ports connected)

Mount, Connect & Secure the Battery

1. Check for sufficient charge level prior to fitting: Push the Charge Status Button and check the Charge Status LED's

2. Magnetically mount the Battery to a clean and flat surface.

3. Connect the Power Cable between the Power socket on the Battery and the Input Socket ⊡ on the Transceiver.

4. Secure the cable to a clean and flat surface using the pre-installed cable magnets.

5. Fit Rapid Link to Battery.

6. Choke and secure a lanyard to fixed and secure point.

7. Attach the loose end of lanyard to the Rapid Link.

8. Firmly tighten the Rapid Link.

When necessary, reverse the above steps for removal.

S5 - Sensor
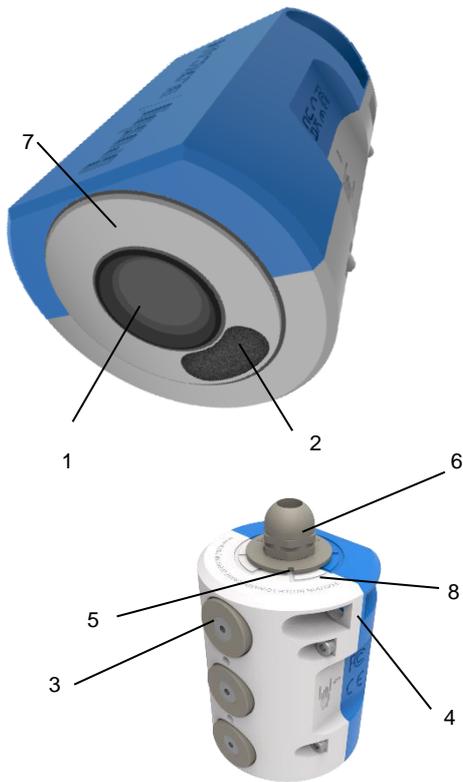
1. Video Sensor
2. Audio Sensor
3. Mounting Magnets
4. Rapid Link Anchor Points (x2)
5. Notch - Orientation Indicator Plate
6. Cable Gland
7. Sprung Loaded Rotary Boss
8. Map - Orientation Guide
9. Sensor Cable and Plug (not shown)

Technical Specifications

Video Sensor: Fixed Iris, 1080p
Resolutions: Max1920x1200/1080
Minimum illumination: Colour: 0.3 lux
Frame Rate: Max 50/60 fps (50/60 Hz)
Audio streaming: One-way
Audio input: External microphone input
Transmission Frequency: 5 GHz
Transmit Power: 19-25dBm
Size and Weight:
Height: 100mm (3.94 inches)
Width: 75mm (2.95 inches)
Depth: 69mm (2.72 inches)
Weight: 1250g (2.76 pounds)
Casing: Aluminium.
Power: Provided by Transmitter
Operating Conditions: -20 °C to 55 °C (-4 °F to 131 °F)
Humidity up to 75% RH (non-condensing)
Storage Conditions: -20 °C to 60 °C (-4 °F to 140 °F)
IP Rating: IP 67 (with external ports connected, excludes IP65 Audio Sensor)

Mount, Connect & Secure the Sensor/s

Foreword

The installation and orientation of the Sensor should correctly correlate with the monitor and machinery movements. Following installation, test to ensure the relationship between the Sensor, monitor and machinery are fixed, permanent and accurate i.e. is the image the correct orientation, all the time?

Note: When mounting a Sensor to a rotating surface, the added variable may cause a lack of synchronicity between the Sensor, monitor and machinery.

1. Changing the orientation of the camera is a tool free operation. The Camera and Rotary Boss are sprung loaded into locator slots. To rotate the camera, lift, rotate and lower the Sprung Loaded Rotary Boss. Use the engraved text, map, and notch as a guide to relocate correctly. As indicated the Rotary Boss will not rotate past 315 degrees due to the rotation stop.
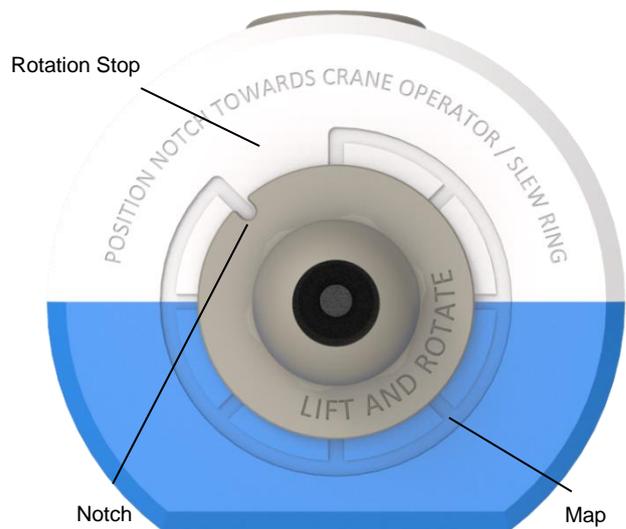
2. Magnetically mount the Sensor to a clean and flat surface.

3. Connect the Sensor Plug to the Sensor Socket 1 on the underside of the Transmitter.

4. Secure the cable to a clean and flat surface using the pre-installed cable magnets.

5. Fit Rapid Link to Sensor anchor point.

6. Choke and secure a lanyard to a fixed and secure point.

7. Attach the loose end of lanyard to the Rapid Link.

8. Firmly tighten the Rapid Link.

9. For twin camera systems, repeat step 1-8 connecting the second Sensor Plug to Sensor Socket 2.

When necessary, reverse the above steps for removal.

R5 – Repeater
Shown with Duck Bill Antennas fitted
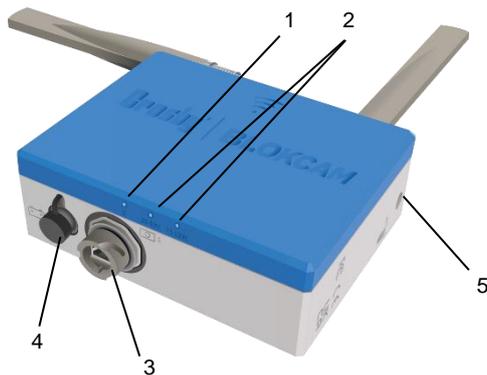
1. LED - Data
2. LED's – Signal Strength 25% - 100%
3. Socket - PoE LAN Port
4. Input Socket – 12-24Vdc ⊡
5. Rapid Link Anchor Points (x2)
6. Antenna Ports x2 (on top, not shown)
7. Mounting Magnets x 4 (on rear, not shown)

Technical Specifications

Transmission Frequency: 5 GHz
Transmit Power: 19 to 25dBm
Receiver Sensitivity: -90 to -75 dBm
Size and Weight:
Height: 128mm (5.04 inches)
Width: 170mm (6.69 inches)
Depth: 58mm (2.28 inches)
Weight: 1930g (4.25 pounds)
Casing: Aluminium.
Power: 12-24Vdc, Passive PoE 24V
Power Consumption: Max 5.5 W
Antenna Connector: N-Type
Operating Conditions: -20 °C to 70 °C (-4 °F to 158 °F)
Humidity up to 5 to 95% (non-condensing)
Storage Conditions: -40 °C to 90 °C (-40 °F to 194 °F)
Humidity Max 90% (non-condensing)
IP Rating: IP 67 (with external ports connected)

Mount & Secure the Repeater/s

Foreword

The Repeater is a modular transceiver that relays the wireless signal. The Repeater can be powered over ethernet (POE), by the Crosby BlokCam ® Battery or an alternative 12-24Vdc supply.

To protect against ingress, it is necessary to cap and seal all un-used ports using the supplied blanking plug/s.

The installation, quantity, mounting position, location and orientation are dependent on the required configuration. Systems with multiple Repeaters must be connected in the correct series order.

T3L system only: The final Repeater in the series must be connected to, and powered over ethernet by the Processor's POE Ports (Ports 1 – 4).

Prior to installation, plan the scope of works and consider:

    a.   the data output method, wired or wireless;
    b.   the best suited power supply option;
    c.   the intended position of the Repeater;
    d.   lanyard length and distance to a secure point;
    e.   the position and/or intended position of other paired transceivers;

    f.   the most suitable antenna/s for the operation;
    g.   the dynamics of machine.

1. Attach the best suited RAM Mount, Ball Joint Bracket to a fixed and secure point. If the supplied brackets are not suitable please seek advice from an authorised BlokCam ® dealer.

2. Connect the Double Socket Ram Mount Arm complete with lanyard to the RAM Mount Ball Joint Bracket.

3. Connect the Ball Joint attached to the rear of the Repeater to the Double Socket Ram Mount Arm.

4. Fit Rapid Link to Repeater.

5. Connect Double Socket Arm lanyard to Rapid Link.

6. Choke and secure a second lanyard to fixed and secure point.

7. Attach the loose end of lanyard to the Rapid Link.

8. Firmly tighten the Rapid Link.

9. Choose the most suitable antenna/s based on the location of other transceivers.

10. Connect the antenna/s to the antenna ports. On the top side of the Transmitter

11. If required, use the N-type right angle connectors (elbow joints) to achieve the desired position.

12. Once the optimum position has been achieved, firmly tighten the Ram Mount Brackets, Antenna's and N-type connector.

Connecting & Powering the Repeater/s

Wired (Typical for T3L System, POE)

1. Fit 1 x Input Socket Blanking Plug to the 12-24v Input Socket. ⊡

2. Connect the Bayonet fitting from the '75m Jib Cable' to the LAN Port Socket on the Repeater.

3. Install and secure the cable from the Repeater to the anticipated Processor location using zip ties.

Wireless (Typical for M3L System, battery powered)

1. Fit 1 x Lan Port Blanking Plug to the LAN Port Socket.

2. Mount, connect and secure the Crosby BlokCam ® Battery as instructed on page 8.

Wireless (alternative 12-24Vdc supply)

1. Fit 1 x Lan Port Blanking Plug to the LAN Port Socket.

2. Obtain any required permissions to tap into a suitable supply.

3. Connect the supply to the 12-24Vdc Input Socket. ⊡

When necessary, reverse the above steps for removal.

P3 - Processor
T3L System Only

Technical Specifications

Video Compression: H.264
Latency: >150mS
Frame Rate: Max 60 fps
Resolution: 1920 x 1080
Video and Audio Output: HDMI
Monitor Output: 12Vdc 3.3A
Size and Weight:
Height: 121mm (4.76 inches)
Width: 190mm (7.48 inches)
Depth: 161mm (6.34 inches)
Weight: 3800g (8.38 pounds)
Casing: Aluminium.
Power: 9-36Vdc 5A
Operating Conditions: 0 °C to 40 °C (32 °F to 104 °F)
Humidity up to 10% to 90% (non-condensing)
Storage Conditions: -40 °C to 70 °C (-40 °F to 158 °F)
Humidity 5% to 90% (non-condensing)

Position & Connect the Processor

Pre-empt the position of the Processor and consider:
   a.   the IP Rating, the Processor must be kept indoors;
   b.   the type of power supply, AC or DC;
   c.   the PSU/Power Cable, length and route;
   d.   the 75m Jib Cable length and route;
   e.   the monitor position;
   f.   the distance to the Monitor.

Systems with additional accessories may require considerations for:

   a.   connecting and positioning additional cameras;
   b.   connecting and positioning a footswitch;
   c.   connecting and positioning a joystick;
   d.   connecting and positioning additional Repeaters;
   e.   connecting a laptop.

1.   Connect the 75m Jib Cable from the Repeater to one of the Processor's POE Ports (Ports 1 – 4).

2.   Connect the 3m HDMI Lead to the HDMI Socket

3.   Connect the Monitor's Power Lead to the Yellow Output Socket (12Vdc 3.3A).

4.
   a.   Connect the AC-DC Power Supply Unit and associated PSU Mains Lead between the Red Input Socket and a mains supply socket.

      or

   b.   Connect the DC-DC Power Supply Cable between the Red Input Socket and a suitable DC supply socket.

6.   Route and secure the Monitor's HDMI and Power Lead from the Processor to the anticipated Monitor location using zip ties.

When necessary, reverse the above steps for removal.

1.   Input Socket - 9-36Vdc 5A
2.   Input Socket - Colour Code - Red
3.   Switch Socket - Multi Camera
4.   Switch Socket - Colour Code – Blue
5.   Output Socket - Monitor - 12Vdc 3.3A
6.   Output Socket - Colour Code – Yellow
7.   Output Socket - HDMI
8.   POE Ports (Ports 1 – 4)
9.   LAN Port (Ports 5 & 6)
10. LED - Power
11. LED - Data
12. LED - 1 - 6 Port related
13. Cable release port

M2 - Monitor
X3L System Only
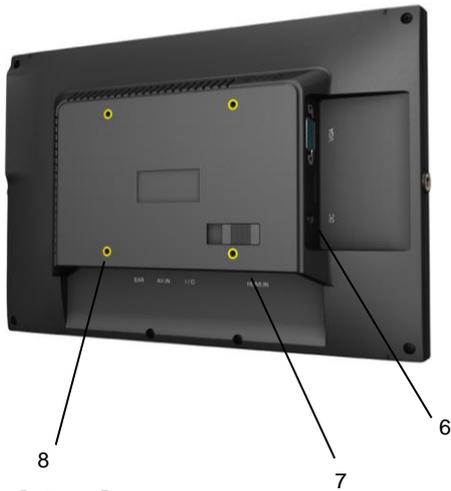
1. Button - Power
2. Button - Input
3. Button - FN (Function)
4. Button - MENU/EXIT
5. Navigation Wheel
6. Input Socket - 12Vdc
7. Input Socket – HDMI
8. 4 x Threaded Holes for Vesa Mount with 1.5" Ball Joint
9. Vesa Mount with 1.5" Ball Joint (Not Shown)

Technical Specifications

Screen Size: 10.1"
Aspect Ratio: 16:9
Resolution (pixels): 1920 x 1080
Scan Frequency (Hz): 60-72
Response time (ms): 20
Viewing Angle (degrees) 170 x, 170 y
Brightness (cd/m²): 350
Contrast Ratio: 800:1
LCD backlight: LED
Video and Audio Input: HDMI
Audio Output: <1.2W Speaker, 3.5mm Headphone Output
Size and Weight:
Height: 121mm (4.76 inches)
Width: 190mm (7.48 inches)
Depth: 161mm (6.34 inches)
Weight: 3800g (8.38 pounds)
Casing: Plastic
Power: 12Vdc 3.3A - Provided by Processor
Operating Conditions: -20 °C to 60 °C (-4 °F to 140 °F)

Mount, Connect & Secure the Monitor

Pre-empt the position of the monitor and consider:
    a.   the mounting options;
    b.   the lanyard length and distance to a secure point;
    c.   the HDMI and power cable length and route.

1. Attach the best suited RAM Mount, Ball Joint Bracket to a fixed and secure point. If the supplied brackets are not suitable please seek advice from an authorised BlokCam ® dealer.

2. Connect the Double Socket Ram Mount Arm complete with lanyard to the RAM Mount Ball Joint Bracket.

3. Route the Double Socket Arm Lanyard to a fixed and secure point. If necessary, fit and firmly tighten a Rapid Link to secure.

4. Connect the Ball Joint attached to the rear of the Monitor to the Double Socket Ram Mount Arm.

5. Connect the HDMI Cable to the HDMI Port.

6. Connect the Power Cable to the 12Vdc Input Socket.

7. Adjust the mounting system to achieve the desired position and firmly tighten the Ram Mount Brackets.

When necessary, reverse the above steps for removal.

M3 – All in One Monitor

M3L System Only
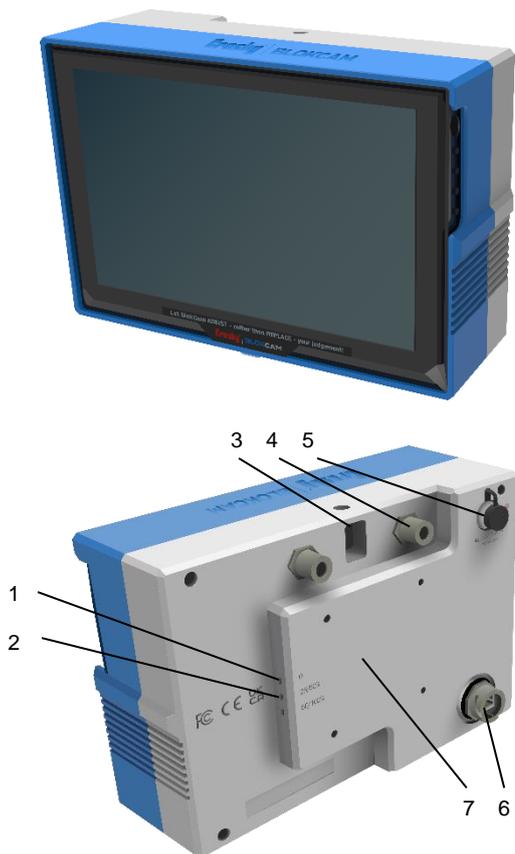
1. LED - Data
2. LED's - Signal Strength 25% - 100%
3. Rapid Link Anchor Points (x1)
4. Antenna Ports (x2)
5. Input Socket - 9-30Vdc
6. Cat5e LAN Port
7. Vesa Mount complete with ball joint and triple suction cup mount (not shown)
8. Flat Panel Antenna (not shown)

Technical Specifications

Transmission Frequency: 5 GHz
Transmit Power: 19 to 25dBm
Receiver Sensitivity: -90 to -75 dBm
Size and Weight:
Height: 180mm (7.09 inches)
Width: 265mm (10.43 inches)
Depth: 115mm (4.5 inches)
Weight: 3300g (7.28 pounds)
Casing: Aluminium.
Power: 9-30Vdc
Power Consumption: Max 16.5 W
Antenna Connector: N-Type
Operating Conditions: -20 °C to 70 °C (-4 °F to 158 °F)
Humidity up to 5 to 95% (non-condensing)
Storage Conditions: -40 °C to 90 °C (-40 °F to 194 °F)
Humidity Max 90% (non-condensing

Mount, Connect & Secure the M3 Monitor

Foreword

A flat panel antenna and mounting bracket are preinstalled to the rear of the M3 Monitor. Prior to installation consider:

    a.   the intended position of the Sensor
    b.   the operators view;
    c.   the power supply cable length and route;
    d.   the lanyard length and distance to a secure point;
    e.   the position and/or intended position of other paired transceivers;

1. With the Triple Suction Cup, attach the monitor to suitable, clean, flat, smooth, non-porous surface (typically, the side window of crane cab).

2. Adjust the mounting system to achieve the desired position and firmly tighten the Ram Mount Brackets.

3. Connect the Power Supply Cable between the Input socket on the rear of the M3 display and a suitable power supply.

4. Fit Rapid Link to Anchor Point.

5. Choke and secure a lanyard to fixed and secure point.

6. Attach the loose end of lanyard to the Rapid Link.

7. Firmly tighten the Rapid Link.

When necessary, reverse the above steps for removal.

CH3 - Charger

1. Charge Indicator Plate
2. Socket - Power input
3. LED - Status Indicator
4. Plug – Charge Output

Technical Specifications

Input: 100-240VAC
Frequency: 50-60Hz
Amps: Max 0.9A

Charge Indicator Plate

Led	Mode	Output
Orange	Fast Charge	2.0A 16.8V
Yellow	Top-off Charge	<0.85A 16.8V
Green	Charged	<0.1A
Green	Ready / Standby	N/A

Charging Status Indicator

Step 1 - Constant Current Charge

To start a charge cycle; connect the charger to the mains. The charger is in constant current mode, charging with the maximum current indicated on the charger, the LED-indication on the charger is ORANGE. This step allows rapid charging of your battery until the battery voltage has increased to a certain set level

Step 2 - Constant Voltage Charge

When the battery voltage has increased to a certain set level the charger enters constant voltage mode, charging with a decreasing current until the current is below the chargers charge termination level (indicated on the charger). The LED indication on the charger is ORANGE. When the battery has reached typically 90 - 95% of its full capacity the charge current has dropped below a set level and the LED-indication on the charger changes to YELLOW to indicate that the battery is almost fully charged and may be ready for use. The constant voltage charge continues and the battery reaches its full capacity at the end of this step

Step 3 - Charge Complete

The LED-indication on the charger is GREEN and the battery is fully charged. For Li-Ion batteries the charge current is zero and the battery has been charged to its full capacity. After end of charge battery voltage will remain at "Step 2" level even if output voltage of charger is indicated as lower in the diagram. The charger will return to Step 1 if the battery is used. A load larger than the cut-off current will initiate a new charge cycle.

Battery Charging Instructions

Foreword

The Crosby BlokCam ® T3L camera system runs on Lithium-ion batteries. Under normal operating conditions each battery should provide approximately 11-12 hours of use. Certain operating conditions will decrease the standard runtime of the battery, including extreme hot or cold temperatures. The battery takes approximately 2 hours to fully charge.

Spare batteries should be kept in a clean and dry environment. Crosby BlokCam ® recommend swapping and charging the battery at the beginning of every shift.

Updates and language specific user manuals for Li-Ion Battery Chargers are available on www.mascot.no/downloads/usermanuals

1. Connect the charger to the mains and to the power socket on the B6 Battery.

2. Ensure the charger is powered up and refer to the Charge Indicator LED.

3. Disconnect the Charger when the charge LED is green.

Operating Instructions

X3L System

Operation is reliant on correct installation, charged batteries and/or reliable power source.

1. Power up all transceivers with a fully charged battery. Wired transceivers should power up automatically.

2. Power up the Processor via a suitable power supply.

3. The Monitor should power up automatically. If the Monitor does not power up automatically, press the power button on the right-hand side of the Monitor.

4. Following completion of the start-up procedure the camera system should be fully functional and ready to use.

5. If required, re-position the sensor to achieve the desired view.

If you are experiencing difficulties, please refer to the fault-finding guide.

M3L System

Operation is reliant on correct installation, charged batteries and/or a reliable power source.

1. Power up all transceivers with a fully charged battery. Wired transceivers should power up automatically.

2. Power up the M3 Monitor via a suitable power supply. The Monitor should power up automatically. If the Monitor does not power up automatically, press the power button on the right-hand side of the Monitor.

3. Following completion of the start-up procedure the camera system should be fully functional and ready to use.

4. If required, re-position the sensor to achieve the desired view.

If you are experiencing difficulties, please refer to the fault-finding guide.

Axis Companion

Accessing & Downloading Saved Data

Foreword

These instructions are only valid for the features within AXIS Companion Classic. Axis Companion is third party video management software, for more information please visit https://www.axis.com/products/axis-companion-classic/support

To access and download saved data, ensure the Crosby BlokCam ® system and components are installed correctly and fully operational.

You will need a Laptop with VMS installed (Video Management Software), a Cat5e RJ45 Patch Cable of suitable length, basic networking and IT skills and access to the Processor/M3 Display. Laptop/System recommendations and VMS are available from www.blokcam.com

Connecting to the Network

1. Connect the Cat5e RJ45 Patch Cable between the laptop and LAN Port 5 or 6 on the processor, or the LAN Port on the rear of the M3 Display.

2. To avoid conflict, ensure all other networks, wired or otherwise are disconnected and/or disabled.

3. Ensure the Laptop Internet Protocol Version 4 Properties are configured to 'Obtain an IP address automatically'.

4. Ensure the Laptop Internet Protocol Version 4 Properties are configured to 'Obtain DNS server address automatically'.

In some scenarios it may be necessary to manually configure the Laptops IP Address.

An IPv4 IP Address is made up of 4 Octets. The first, second and third Octet must be identical for connectivity across all paired units. The fourth Octet must be unique to avoid conflicting IP Addresses.

IPv4	1st Octet	2nd Octet	3rd Octet	4th Octet
Laptop	192	168	0	189
Camera	192	168	0	191
Transmitter	192	168	0	192
1st Repeater	192	168	0	193
2nd Repeater	192	168	0	194
Office Link	192	168	0	195

Set up the Video Management Software

1. Open the VMS application.

2. Select 'Create new site' or 'GET STARTED'.
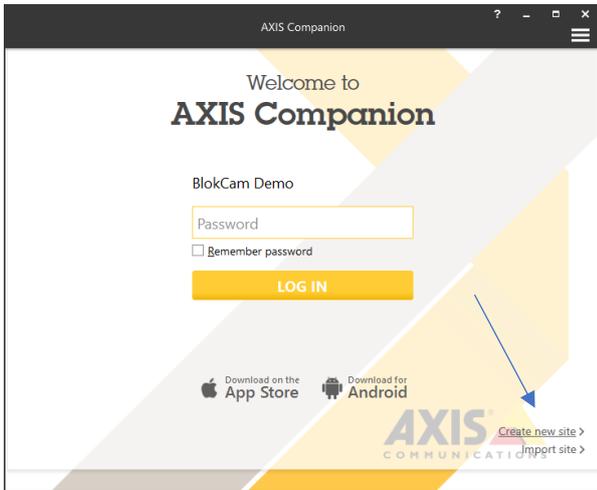
or

3. Choose and type your preferred site name into the 'Site name' box.

4. Obtain the Site password from an authorised BlokCam ® dealer. Do not create a password. Creating a password will lead to system failure.

5. Type the procured password into the 'Site password' box.

6. Re-type the procured password into the 'Confirm password' box.

7. Select 'Next'.

8. The VMS will attempt to automatically search and discover all available network cameras. If the desired camera is discovered, skip to step 12.
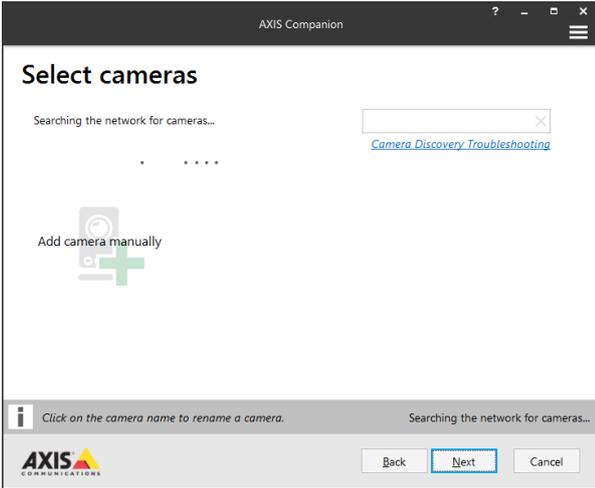
9. If the desired camera is not automatically discovered, obtain the cameras IP Address from an authorised BlokCam ® dealer and add the camera manually.

10. Type the procured IP Address into the 'Enter camera address' box.
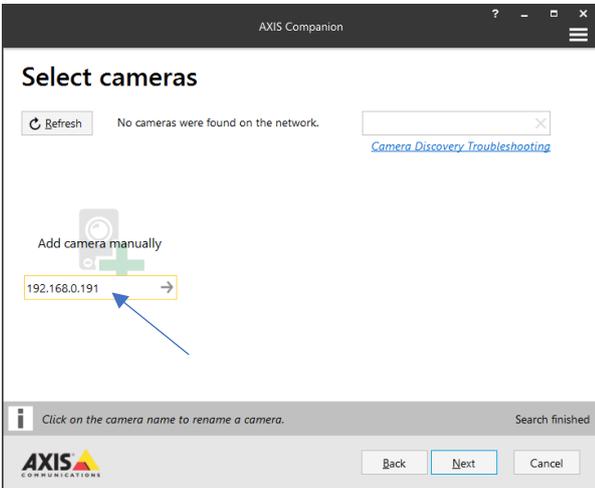
11. Select the 'ADD' arrow to the right of the IP Address
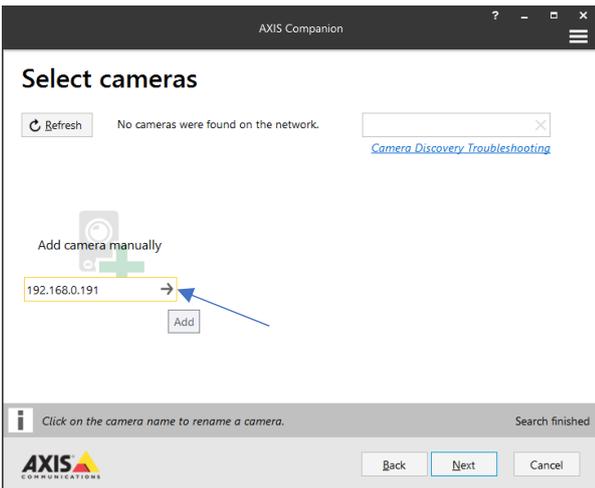
12. Ensure the desired camera/s is/are selected.
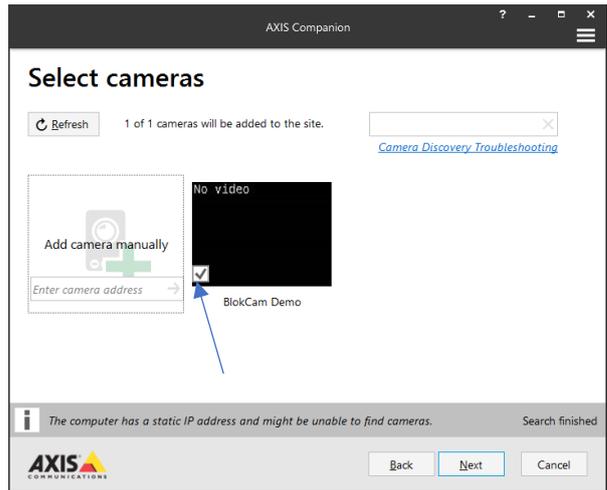
13. Select 'Next'.
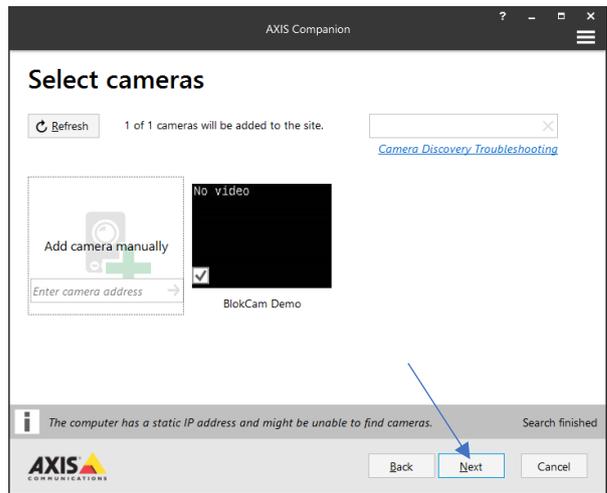
14. Wait until the VMS contacts the selected camera/s.
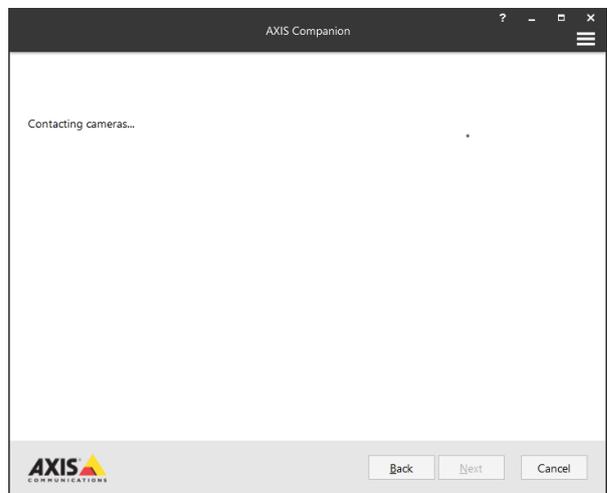
15. Select 'Finish' on the 'Ready to install' page.
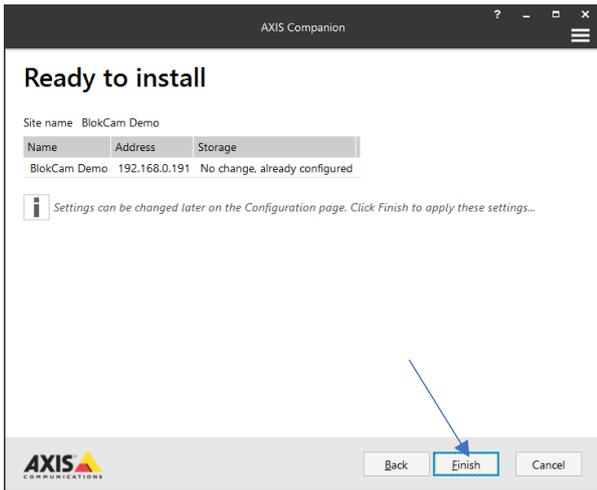
16. Wait until the VMS installs the selected camera/s.

Crosby BlokCam Camera System Manual V1.0.1   **Issue Date 26/03/2022**
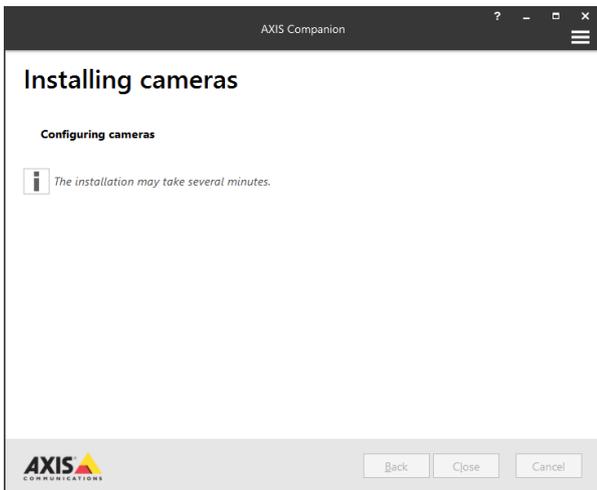
Selecting the Storage Location

1. Locate 3 icons on the top left of the VMS software screen. Select 'Go to Configuration'.

2. Select 'Customize' on the 'Go to Configuration' Screen.
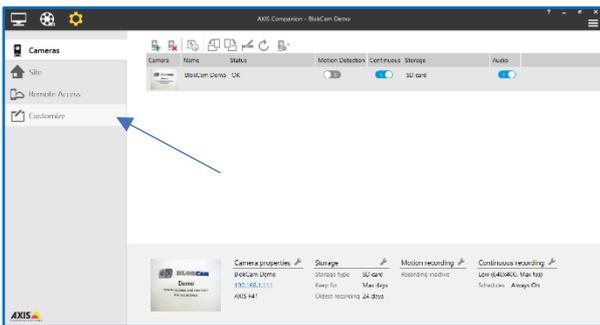
3. Under the heading 'Snapshot folder' locate and select 'Browse…'.
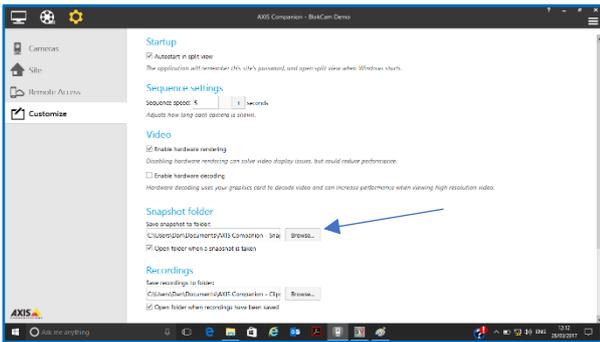
4. Select the desired storage location.
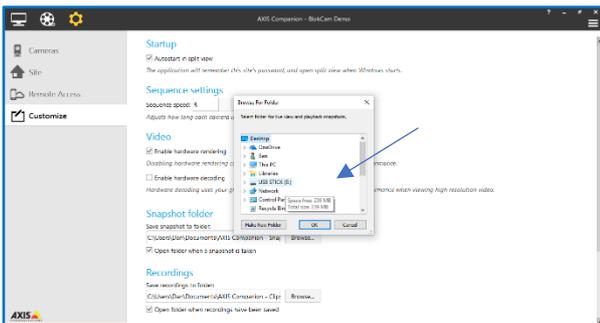
5. Select 'OK'.
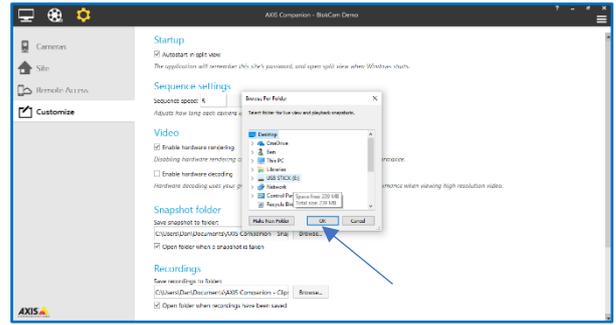
6. Check the storage location has changed and select 'Open folder when snapshot is taken' box.
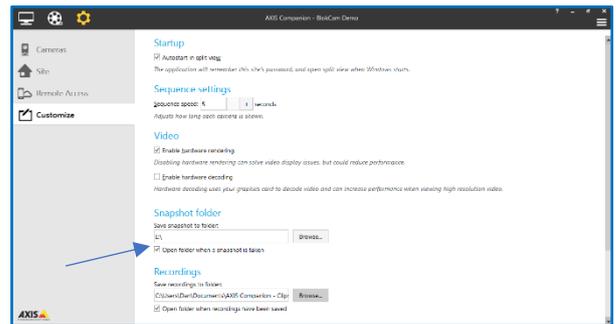
7. Repeat steps 3 – 6 for the 'Recordings' section.

Viewing & Downloading the Recordings

1. Locate the 3 icons on the top left of the VMS software screen. Select 'Go to Recordings'.
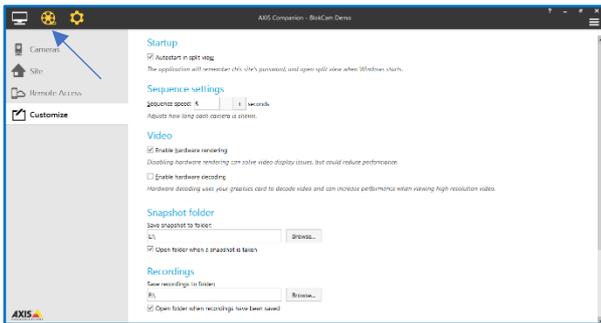
2. Select the footage from the date required by scrolling through the dates using the arrows left and/or right of the date displayed.
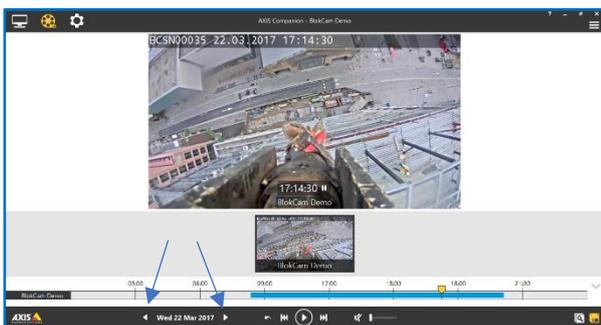
3. Locate and select the 'Save Recordings' icon on the bottom right of the VMS screen.

4. The blue timeline indicates the duration of recording on the selected date. Use the grey trimming arrows to reduce or increase the duration of the required interval. For speed and storage reasons, please keep the download duration to a minimum.
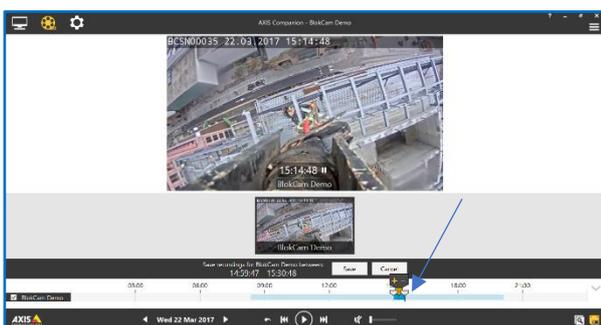
5. If required, select the yellow arrow. Then magnify the timeline using the + and/or – option/s.
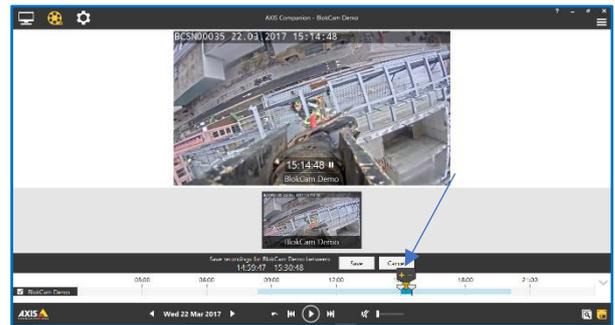
6. If necessary, repeat and refine step 4.

7. When the required interval has been found, select 'Save'.
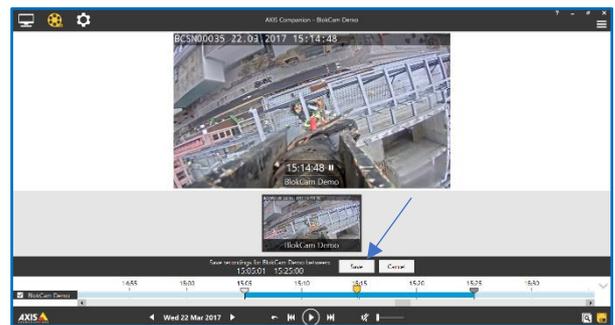
8. Wait whilst the selected recoding interval is saved to the desired location.
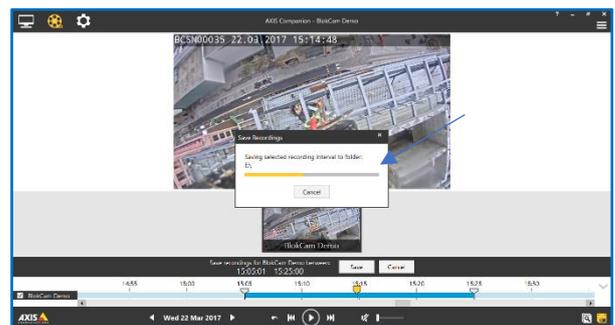
9. When the recording interval is saved, the folder containing the file will open. Check the file is stored in the required location and close the folder using the 'X' at the top right of the 'Folder' page.
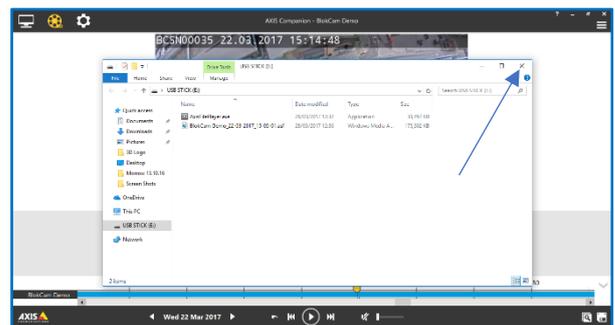
10. Repeat Steps 1 – 9 to extract more recorded intervals if required.

Viewing & Downloading the Screenshots

1. Access the 'Go to Recordings' screen. Locate the 3 icons on the top left of the VMS screen. Select 'Go to Recordings'.
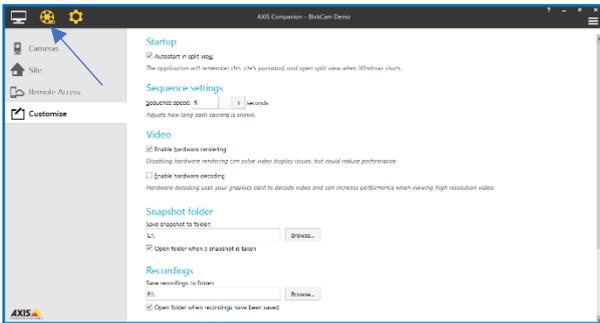
2. Select the footage from the date required by scrolling through the dates using the arrows left and/or right of the date displayed.
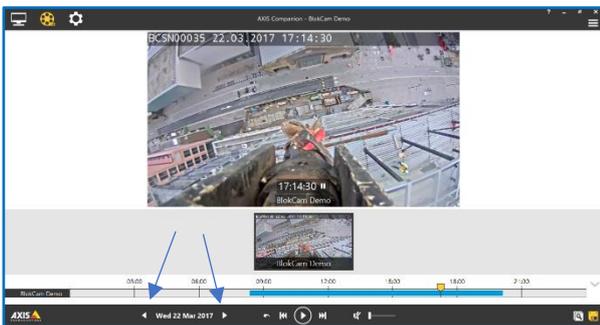
3. Select and slide the yellow arrow to magnify, locate and refine your search.
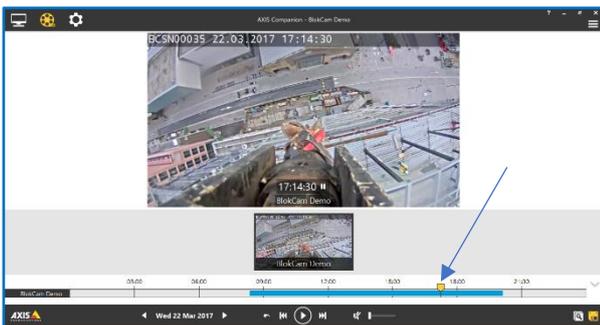
4. Locate the required image and select the 'Investigation Mode' icon on the bottom right of the VMS screen.
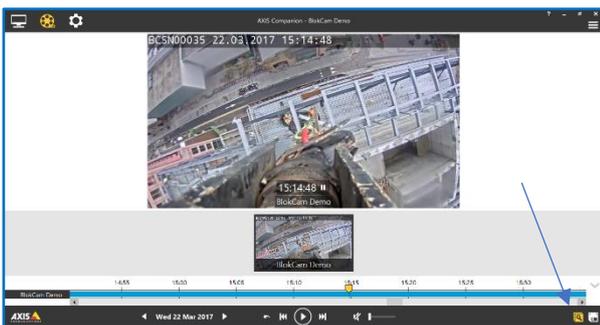
5. Use the slide bar and thumbnail icons to skip and view the footage frame by frame.
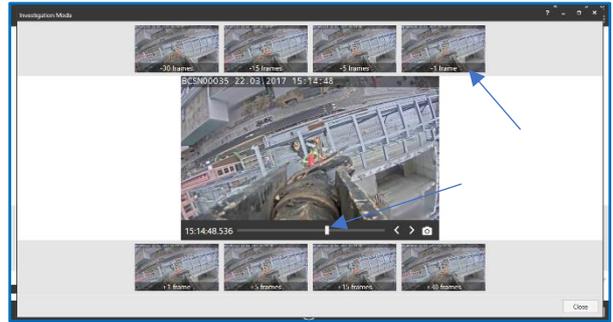
6. Select the Camera icon to save the individual image/frame.
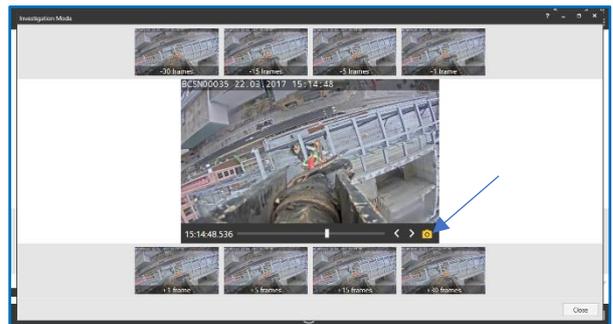
7. When the image is saved, the folder containing the file will open. Check the file is stored in the required location and close the folder using the 'X' at the top right of the 'Folder' page.
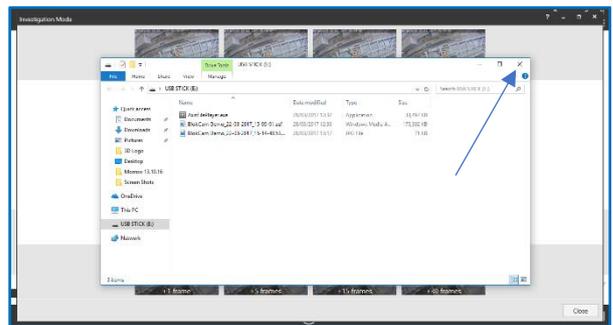
8. Repeat Steps 5 – 7 to extract more images if required.

9. Exit Investigation mode using the 'X' at the top right of the 'Investigation Mode' page.
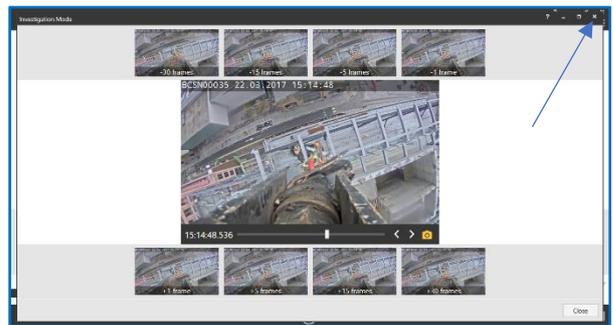
Logging Out & Disconnecting the Laptop

1. On the top right of the VMS software screen, locate and select the menu icon (the three horizontal bars).
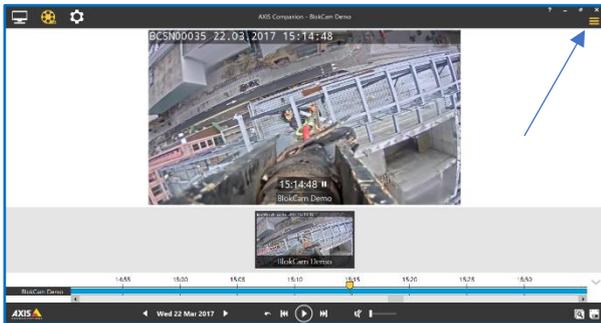
2. On the drop-down menu select 'Log Out'.
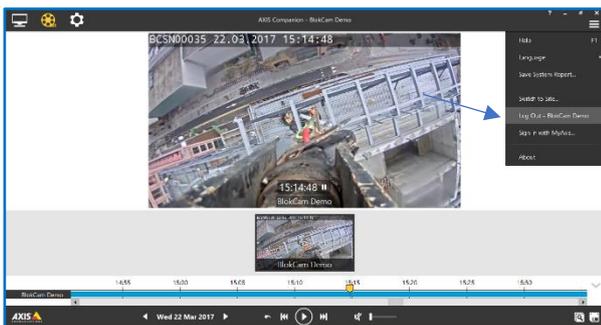
3. Locate and select the 'X' at the top right of the VMS to close application.
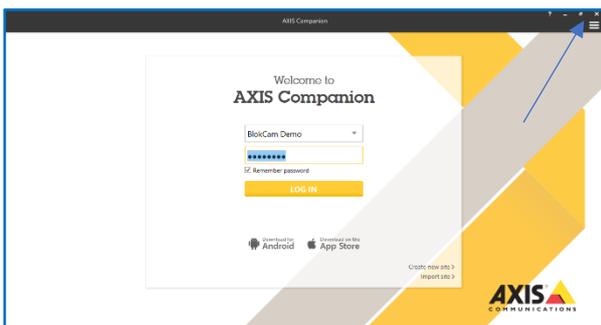
4. Disconnect the Cat5e RJ45 Patch Cable from the Laptop.

5. The Processor is manufactured with an anti-tamper system. Insert a suitable tool (not supplied) into the cable release port, push the patch cable latch and simultaneously disconnect the Cat5e RJ45 Patch Cable from the Processor.

Logging In

Foreword

Logging in is only possible once the VMS has been set up as detailed on page 17.

1. Connect to the network as detailed on page 16.

2. Open the Video Management Software.

3. Select the arrow to activate the drop-down menu and select the desired 'Camera site'.
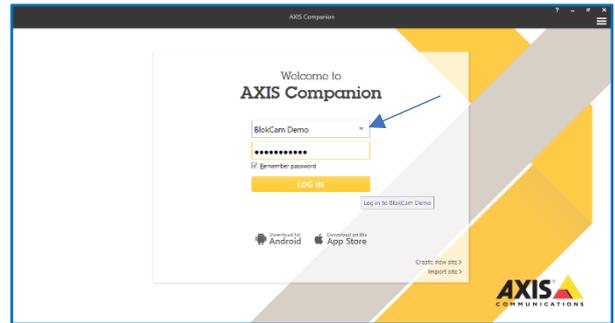
4. Type the password into the 'Site password' box.
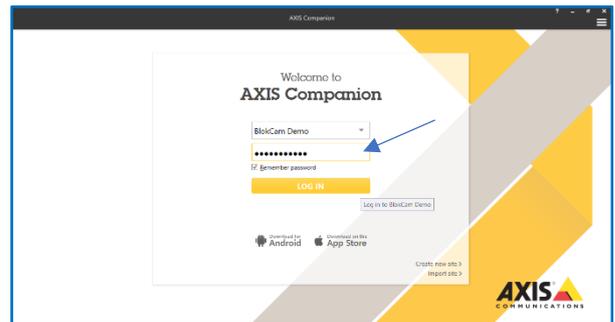
5. Select 'Remember password' box if required.
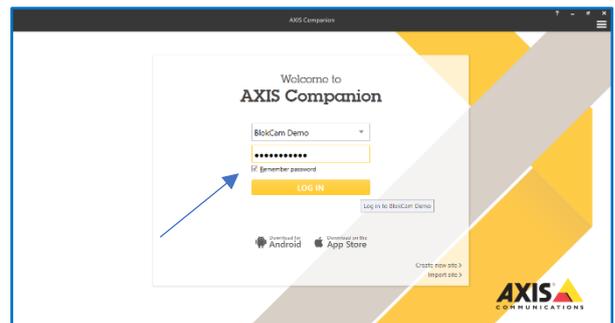
6. Select 'LOG IN'.
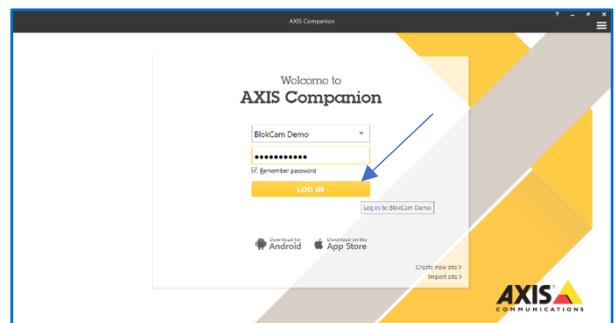
Accessories

Office Link
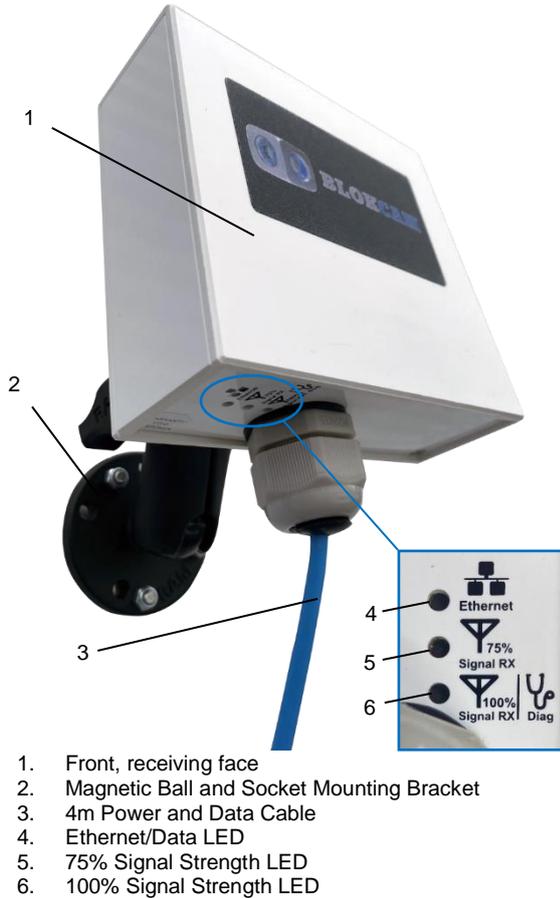
1. Front, receiving face
2. Magnetic Ball and Socket Mounting Bracket
3. 4m Power and Data Cable
4. Ethernet/Data LED
5. 75% Signal Strength LED
6. 100% Signal Strength LED

Overview

BlokCam Office Link allows the data from your BlokCam to be captured in a site office for site and crane monitoring and surveillance. Your host computer could monitor and record data from multiple systems. BlokCam Office Link and software comes with many additional benefits and features including:

- Quick and easy to install;
- Take screen shots;
- Extract footage for training and investigation;
- Integrated 12dBi antenna;
- Designed for outdoor applications;
- 1km transmission distance;
- Rugged mounting bracket;
- IP66.

Technical Specifications

Transmission Frequency: 5 GHz
Transmit Power: 19 to 25dBm
Receiver Sensitivity: -90 to -75 dBm
Size (Excluding Mounting Bracket) and Weight :
Height: 119mm (4.69 inches)
Width: 123mm (4.84 inches)
Depth: 45mm (1.77 inches)
Weight: 700g (1.55 pounds)
Casing: Plastic.
Power: 12-24Vdc, Passive PoE 24V
Power Consumption: Max 5.5 W
Antenna Connector: N/A (Built in Antenna)

Operating Conditions: -20 °C to 70 °C (-4 °F to 158 °F)
Humidity up to 5 to 95% (non-condensing)
Storage Conditions: -40 °C to 90 °C (-40 °F to 194 °F)
Humidity Max 90% (non-condensing)
IP Rating: IP 67 (with external ports connected)

Mount and Connect the Office Link

Foreword
The Office Link is powered over ethernet (POE) using the supplied POE Injector.

Pre-empt the position of the Office Link and consider:
  a. the position and/or intended position of other paired transceivers;
  b. Data cable length, route and distance to the host computer/laptop;
  c. Power supply availability;
  d. the dynamics of operation;
  e. possible changes to the surroundings.

1. Position, mount and secure the Office Link with the receiving face, with a clear line of sight, towards the transmitting transceiver.

2. To avoid potential hazards, secure and tidy the cable from the Office Link to the anticipated Laptop location.

3. Connect the 4m Power and Data Cable to the output socket on the POE Injector.

4. Connect the 1m Cat5e RJ45 Patch Cable to the input socket on the POE Injector

5. Connect the loose end of the 1m Cat5e RJ45 Patch Cable to the USB to LAN Adapter.

6. Connect the USB to Lan Adapter to a USB Port on the laptop.

7. Connect the POE Injector to a suitable mains supply socket with the supplied power cable.

8. Power up the POE Injector.

9. Power up the laptop.

10. For daily use, see the **Axis Companion** section.

When necessary, reverse the above steps for removal.

VC4 - V-Cam

Mounting Magnets
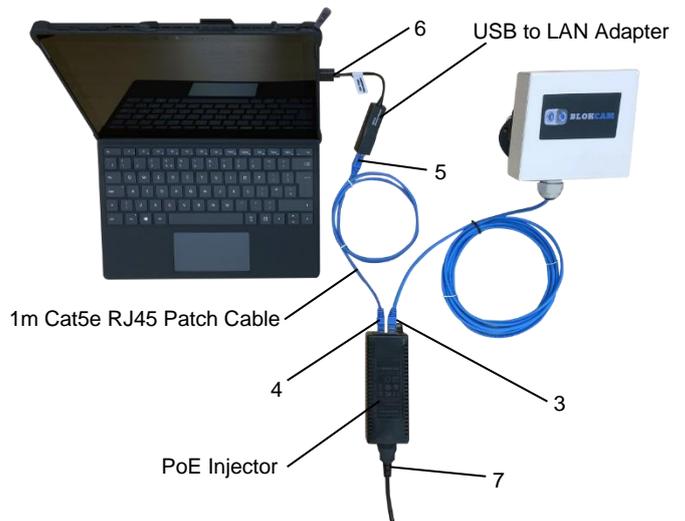
Overview

The Versatile-Cam is our hardwired option which gives you the ability to expand your BlokCam ® system to include additional Sensors. The build quality of the VC4 coupled with its non-intrusive size and mounting versatility means it can be deployed in seconds and used in a multitude of scenarios. Ideal for visual monitoring and data logging of the Hoist Drum, Luffing Drum, Slew Ring, Tail Swing and the Operators Cab.

- Quick and easy to install;
- Uses high powered neodymium magnets;
- The lens is auto-focus and always gives clear views;
- HD1080p Resolution;
- Durable all-weather design, manufactured to IP66;
- Available with audio sensor as the (VC4a).

Installation

Foreword

V-Cam's are factory programmed with a specific IP Address and paired to a specific system. Please seek advice from an authorised BlokCam ® dealer for further programming and pairing options.

The V-Cam is powered over ethernet (POE) via a connection to a Processor POE Port (Ports 1 – 4).

The installation of two or more cameras will require the installation of a footswitch or similar control mechanism to select the desired camera/s in single or split screen mode.

Pre-empt the position of the V-Cam and consider:
  a. the sensor cable length and route;
  b. the distance to the Processor;
  c. the view from the intended position;
  d. the lanyard length and distance to a secure point;
  e. the orientation of the camera;
  f. the dynamics of the machine.

1. Magnetically mount the V-Cam to a clean and flat surface.

2. Choke a lanyard to the V-Cam and secure with a zip tie.

3. Attach the loose end of the Lanyard to a fixed and secure point. If necessary, fit and firmly tighten a Rapid Link to secure.

4. Secure the cable from the V-Cam to the Processor using zip ties.

5. Connect the hardwired LAN Cable from the V-Cam to one of the Processor's POE Ports (Ports 1 – 4).

6. After start up, if required, re-position the sensor to achieve the desired view.

When necessary reverse the above steps for removal.

VC4a - V-Cam (Audio)

Overview

The VC4a is our hardwired camera with a built-in microphone. The build quality coupled with its non-intrusive size and mounting versatility means it can be deployed in seconds. The VC4a is most commonly used for audio-visual monitoring and data logging of the Operators Cab.

- Quick and easy to install;
- Uses high powered neodymium magnets;
- The lens is auto-focus and always gives clear views;
- HD1080p Resolution;
- Built-in microphone;
- PIR motion sensor;
- Bracket for wall and corner mount;
- Day & night with IR illumination.

Installation

See VC4 - V-Cam Installation Instructions

FS1 - Footswitch

Overview

When using multiple cameras, the Footswitch provides the hands-free operation that a crane operator needs to flick between single and split screen mode.

- Quick and easy to install;
- IP67.

Installation

Pre-empt the position of the switch and consider:
    a. the Footswitch cable length and route;
    b. the distance to the processor.

1. Place the switch in a suitable position for the operator.

2. Secure the cable from the Footswitch to the Processor using zip ties.

3. Plug the Footswitch into the Processor's Blue Multi Camera Switch Socket

Multi Camera Switch Socket
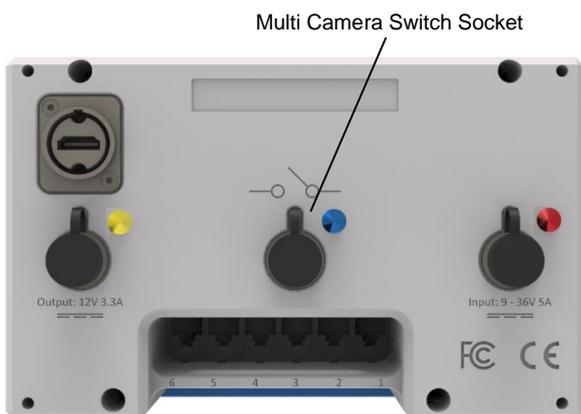
When necessary reverse the above steps for removal.

BP1 - Pendulum

Thread
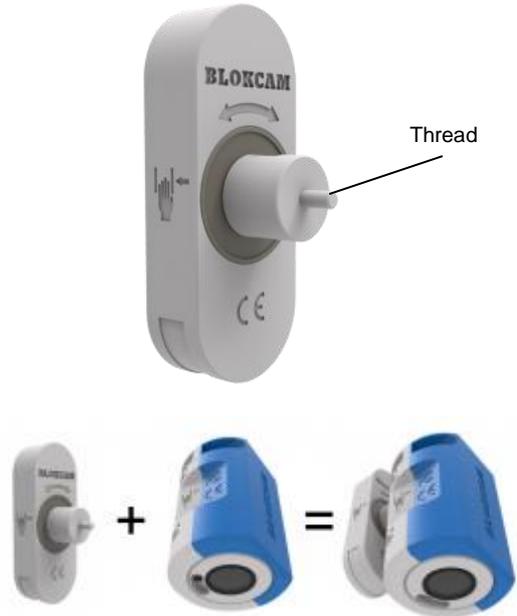
Overview

BP1 allows you to install your existing sensor to the boom tip of a crane. The pendulum allows the sensor to pivot and focus on the hook block, load and surrounding area regardless of the angle of the jib.

Installation

Foreword

Some assembly required, Installation of the Pendulum requires the use of medium strength thread lock and a 24mm spanner/wrench.

1. Follow the instruction on the thread lock.

2. Apply thread lock to the Pendulum thread.

3. Screw the Pendulum thread into the rear, top recess of the Sensor, as pictured below and tighten using a spanner/wrench.

4. Allow the thread lock to dry thoroughly prior to use.

5. Install and secure the sensor as instructed on page 9.

6. Ensure the sensor cable does not limit or dictate the rotation of the Pendulum.

BM1 - BlokMag
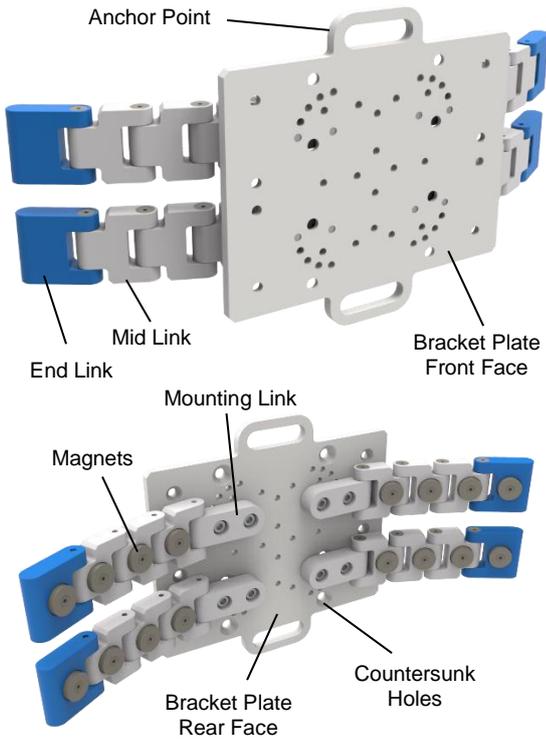
The above images show the Transmitter BlokMag ® (BM1-X) configured for installation on a cylindrical surface.

The below images show the Transmitter BlokMag ® (BM1-X) configured for installation on a spherical surface.
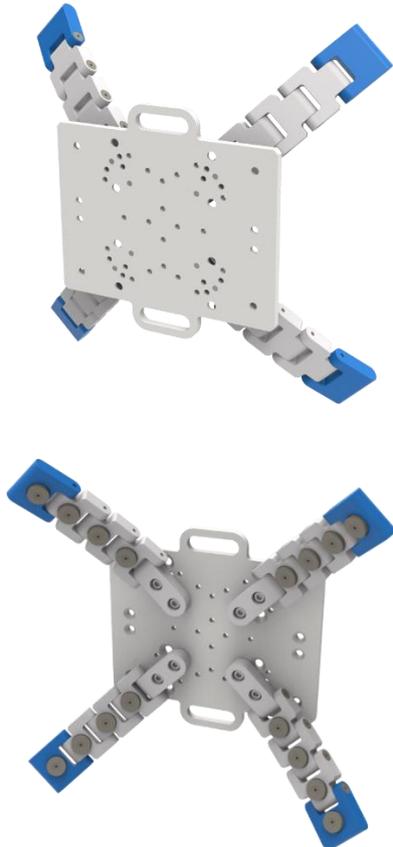
Overview

Attach your crane camera system to a curved surface. Flat, spherical, cylindrical, narrow, short or tall, our modular BlokMag ® system allows flat surfaces to mate with curved surfaces flawlessly. Mount your Transmitter, Sensor and/or Battery to the matching BlokMag ® magnetically, or if preferred, use the countersunk holes on rear of the Bracket Plate using countersunk fixings.

Assembly

Foreword

Some assembly required. BlokMag's ® are dispatched partially assembled to improve modularity and increase installation options.

Each Bracket Plate comes with four Link Arms and associated fixings. Link Arms are factory assembled and retained with high strength thread lock. Each Link Arm includes :

1 x Mounting link
3 x Mid Link's, complete with magnets
1 x End Link, complete with magnet

Multiple threaded holes on the Bracket Plate allows the Link Arms to be installed at increments of 22.5-degree angles. You will need a 3mm hex key to fit the Link Arms to the Bracket Plate.
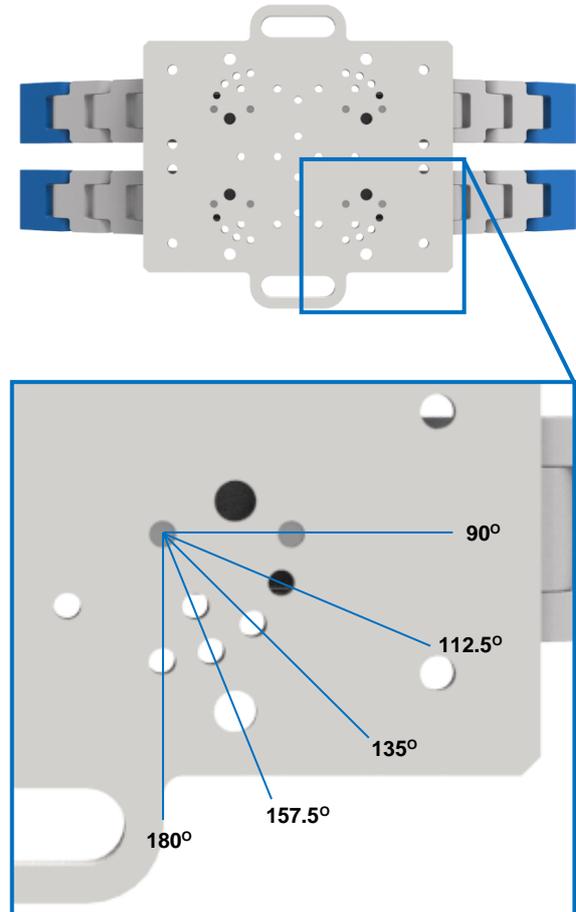
1. Position the 4 x Link Arms on the countersunk, rear face of the Bracket Plate to achieve the most suitable configuration.

2. Place an M5 spring washer (supplied) onto an M5 Button Head Socket Bolt (supplied).

3. Insert the bolt and spring washer into counterbored hole in the Mounting Link and screw to the Bracket Plate.

4. Repeat steps 2 and 3 until each Mounting Link and corresponding Link Arm has been fitted with two fixings.

5. Use a 3mm Hex Key (not supplied) to tighten the fixings and secure the Mounting Links to the Bracket Plate.

6. If desired, use countersunk fixings (not supplied) and medium strength thread lock (not supplied) to fix the Transmitter, Sensor and/or Battery to the matching BlokMag ®.

Installation

Pre-empt the position of the BlokMag ® and consider:
   a. the installation requirements of the mating Transmitter, Sensor and/or Battery;
   b. the lanyard length and distance to a secure point.

1. Magnetically mount the BlokMag ® to a clean surface.

2. Ensure the assembly and configuration of the link arms are suitable and adjust if necessary.

3. Check each link arm is taught and correctly magnetised to the curved surface.

4. Fit Rapid Link to BlokMag ®.

5. Choke and secure a lanyard to fixed and secure point.

6. Attach the loose end of lanyard to the Rapid Link.

7. Firmly tighten the Rapid Link.

8. Refer to the installation guide for the mating Transmitter, Sensor and/or Battery.

When necessary reverse the above steps for removal.

Wireless Programming

Foreword

In Wi-Fi networking, a point-to-point wireless bridge lets users wirelessly connect two or more locations together. This bridge connects two or more locations to share data across the network.

Crosby BlokCam ® transceivers operate within the 5GHz band. For best results ensure a direct line of sight between all wireless transceivers and antennas.

Frequency selection and transmit power may vary. Please refer to regional regulations, guidelines, and authorities to ensure legal operation.

You will need a Laptop with BlokView ® Software installed, a Cat5e RJ45 Patch Cable of suitable length and basic networking and IT skills. Laptop/System recommendations and Software are available from www.blokcam.com

To program or modify the wireless settings, ensure the Crosby BlokCam ® system and components are installed and/or connected as per the installation guide.

With the correct credentials, the transceivers can be programmed using a wired and/or wireless connection. When programming using a wireless connection, take note of the changes and new credentials. If wireless connectivity is not possible due to unknown and/or incorrect credentials, please revert to a wired connection.

Transmitters and Office Links are usually configured as a 'Station WDS'. Repeaters and M3 Displays are usually configured as an 'Access Point WDS'.

Unit Discovery

1. Connect to the network as detailed on page 16.

2. Open the BlokView ® Software application.

3. Type 'password' into the password box.
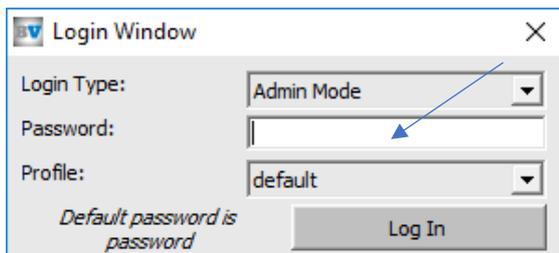
4. Select 'Log In'.
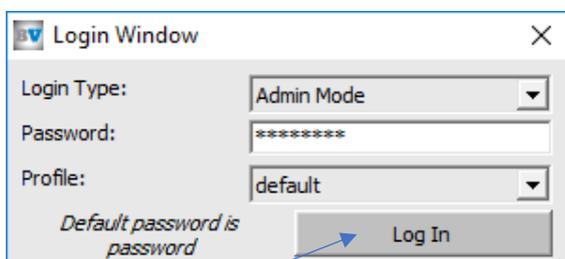
5. If prompted 'refresh IP address'.

6. Select 'Discover Units' in the top left of the application.

7. When the search is complete select ALL visible units and 'Add Selected Units to Site'
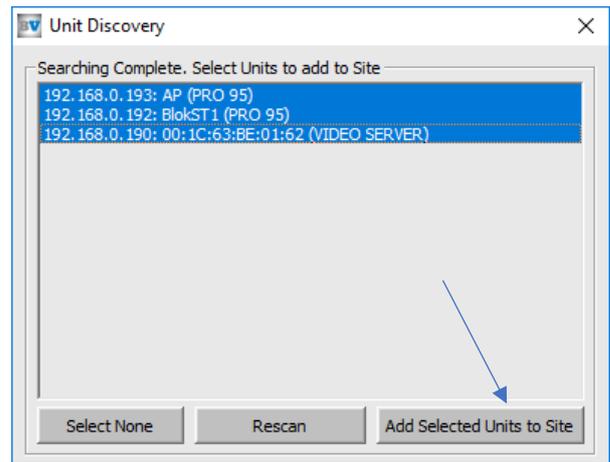
8. Select 'Replace'.
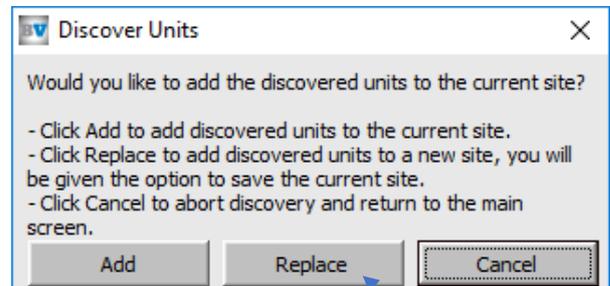
9. Select 'No'.
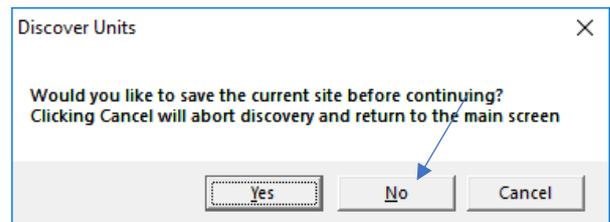
Accessing the Wireless Configuration Settings

1. Right Click on the desired connection.
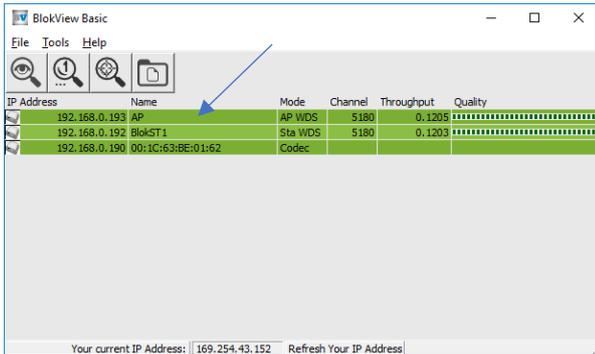
2. Select 'Quick Config' in the pop-up window.

3. Type 'admin' in to the 'Login' box.
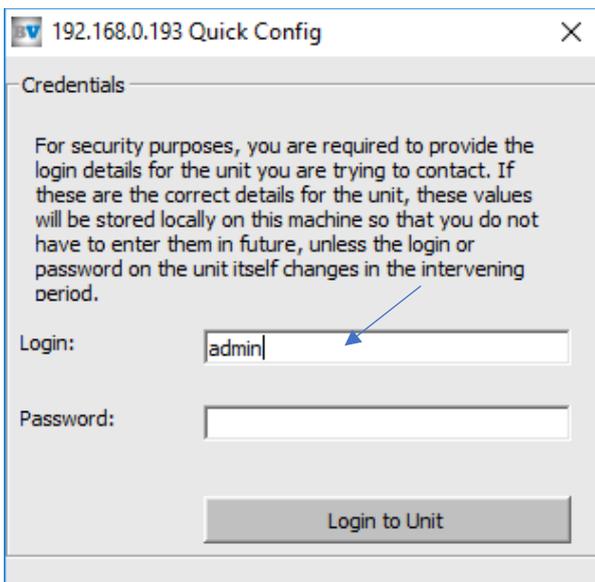
4. Obtain the password from an authorised Crosby BlokCam ® dealer.

5. Type the precured password into the 'Password' box.
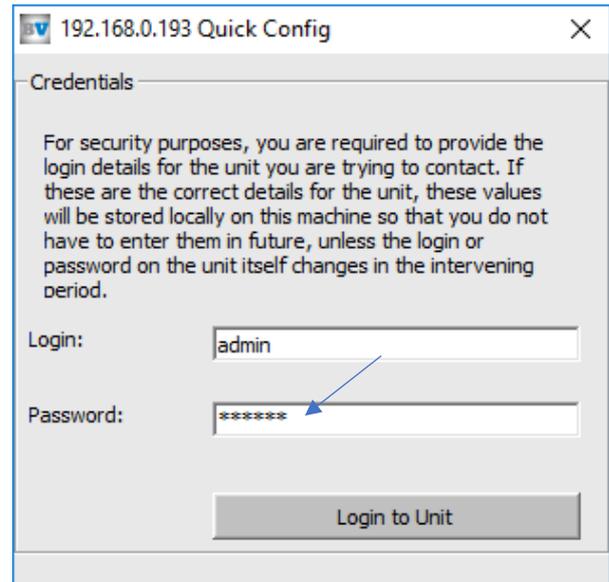
6. Select 'Login to Unit'.

7. The Quick Config window will open allowing several changes to be made to the configuration of the chosen device.
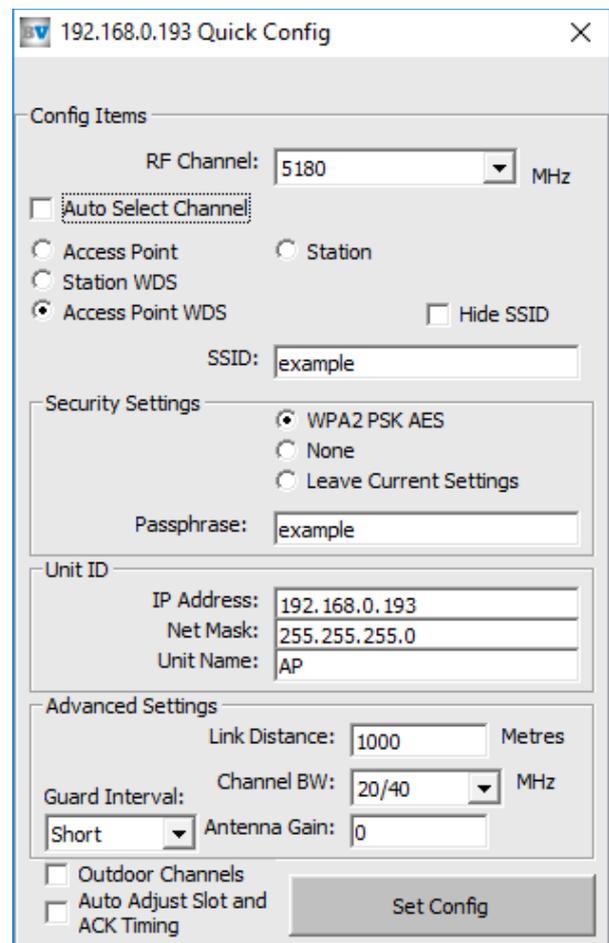
Changing the Channel

Foreword

The Access Point controls the channel selection. It is not possible to change the channel through the configuration of a Station.

1. Select the desired RF Channel from the dropdown menu using the drop-down arrow or select the 'Auto Select Channel'.

An IPv4 IP Address is made up of 4 Octets. The first, second and third Octet must be identical for connectivity across all paired units. The fourth Octet must be unique to avoid conflicting IP Addresses.

IPv4	1st Octet	2nd Octet	3rd Octet	4th Octet
Laptop	192	168	0	189
Camera	192	168	0	191
Transmitter	192	168	0	192
1st Repeater	192	168	0	193
2nd Repeater	192	168	0	194
Office Link	192	168	0	195

1. Type your chosen SSID in to the 'SSID' box.

2. Type your chosen Passphrase in to the 'Passphrase' box.

3. Type your chosen IP Address in to the 'IP Address' box.

2. If no further programming is required, select 'Set Config'.

3. Allow the transceiver to reboot.

4. Test the system and if required, change the channel again.

Changing the SSID, Passphrase & IP Address

Foreword

When programming multiple transceivers from a single point of access, such as the Processor, always start by reprogramming the last in line connection.

The SSID is case sensitive and must be identical across all paired units.

The Passphrase is case sensitive and must be identical across all paired units.

Changing the IP Address may result in loss of communication through the BlokView Software, and the need to rediscover units.

4. Select 'Set Config'.

5. Allow the transceiver to reboot.

6. Continue programming until all devices are as required.

7. Test the system and change the settings if required.

Fault Finding Guide

Foreword

The fault-finding guide is written with the assumption that installation has been carried out in accordance with the installation guide.

Transmitter, Repeater and M3 Display LED Key

- ●   LED – On
- ◓   LED – Consistent Flashing
- ○   LED – Off
- ◑   LED – Inconstant Flashing

Transmitter, Wired Repeater and M3 LED Indicator Table

	Signal Strength ≥					
Data	25/50%	75/100%	Status	Description	Wireless Signal Strength	Solution
◓	●	●	Normal		100%	N/A
◓	●	◓	Normal		75% to 99%	N/A
◓	●	○	Normal		50% to 74%	N/A
◓	◓	○	Normal		25% to 49%	N/A
◑	○	○	Fault	Transceiver - Poor or no wireless signal	Less than 25%	Refer to section 1.0
○	○	○	Fault	Transceiver - No power/lights	0%	Refer to section 1.1
○	●	●	Fault	Transceiver - No data input/output	100%	Refer to section 1.3
○	●	◓	Fault	Transceiver - No data input/output	75% to 99%	Refer to section 1.3
○	●	○	Fault	Transceiver - No data input/output	50% to 74%	Refer to section 1.3
○	◓	○	Fault	Transceiver - No data input/output	25% to 49%	Refer to section 1.3
○	○	○	Fault	Transceiver - No data input/output	Less than 25%	Refer to section 1.3
◑	○	◓	Fault	WiFi PCB memory loss. PCB in diagnostics mode.	0%	Replace WiFi PCB.

Wireless Repeater LED Indicator Table

| Data | Signal Strength ≥ | | Status | Description | Wireless Signal Strength | Solution |
	25/50%	75/100%				
○	●	●	Normal		100%	N/A
○	●	◒	Normal		75% to 99%	N/A
○	●	○	Normal		50% to 74%	N/A
○	◒	○	Normal		25% to 49%	N/A
○	○	○	Fault	Transceiver - Poor or no wireless signal	Less than 25%	Refer to section 1.0
○	○	○	Fault	Transceiver - No power/lights	0%	Refer to section 1.1
◐	○	○	Fault	WiFi PCB memory loss. PCB in diagnostics mode.	0%	Replace WiFi PCB.

AV PCB LED Key
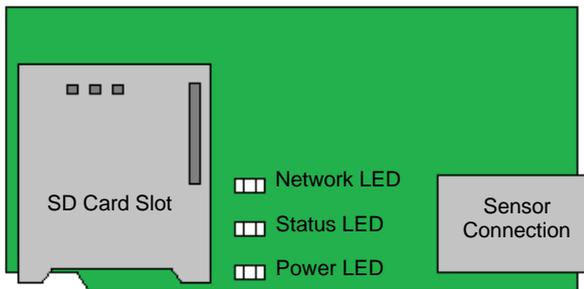
AV PCB LED Indicator Table

Power LED	Indication	Solution
Green	Normal operation.	N/A
Amber	Flashes green/amber during firmware upgrade.	Refer to section 1.3
Status LED	**Indication**	**Solution**
Green	Steady green for normal operation.	N/A
Amber	Steady during start-up. Flashes when restoring settings.	Refer to section 1.3
Red	Firmware upgrade failure.	Refer to section 1.3
Network LED	**Indication**	**Solution**
Green	Steady for connection to a 100 Mbit/s network. Flashes for network activity.	N/A
Amber	Steady for connection to a 10 Mbit/s network. Flashes for network activity.	Refer to section 1.3
Unlit	No network connection.	Refer to section 1.3

Processor LED Key

10/100Mbps	🟡	Link/Act
1000Mbps	🟢	

PoE Fault	✳️	PoE Status
Delivering Power	🟢	

Note: Allow two minutes for system start up before analysing LED's. Rapid and consistent Link/Act blinking is normal. Slow and/or inconsistent blinking may be indicative of the start-up procedure, or a lack of data being transferred from the source and to the Processor.

Processor LED Indicator Table

Normal Operation. PoE Port 1 in use.

Power: 🟢

	D	6	5	4	3	2	1
Link /Act	🟢	◯	◯	◯	◯	◯	🟡
PoE Status				◯	◯	◯	🟢

PoE Ports (ports 1–4). PoE MAX: ◯

Normal Operation. PoE Port 1 & 2 in use.

Power: 🟢

	D	6	5	4	3	2	1
Link /Act	🟢	◯	◯	◯	◯	🟡	🟡
PoE Status				◯	◯	🟢	🟢

PoE Ports (ports 1–4). PoE MAX: ◯
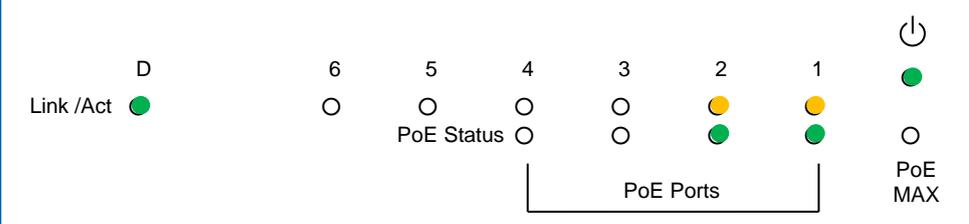
Faulty Operation. No power/lights on PoE injector.

Refer to section 1.2

Power: ◯

	D	6	5	4	3	2	1
Link /Act	◯	◯	◯	◯	◯	◯	◯
PoE Status				◯	◯	◯	◯

PoE Ports (ports 1–4). PoE MAX: ◯
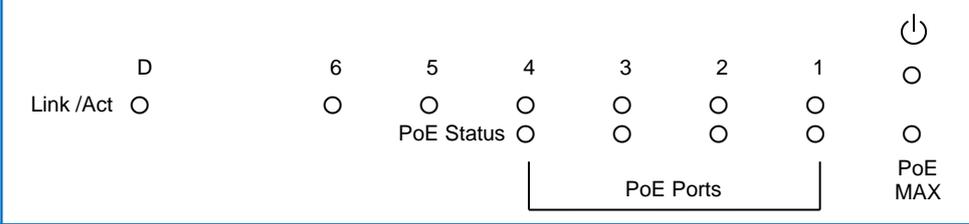
Faulty Operation. PoE Port 1 in use.

Port 1: No PoE to load

Refer to section 1.2

Power: 🟢

	D	6	5	4	3	2	1
Link /Act	🟢	◯	◯	◯	◯	◯	◯
PoE Status				◯	◯	◯	◯

PoE Ports (ports 1–4). PoE MAX: ◯
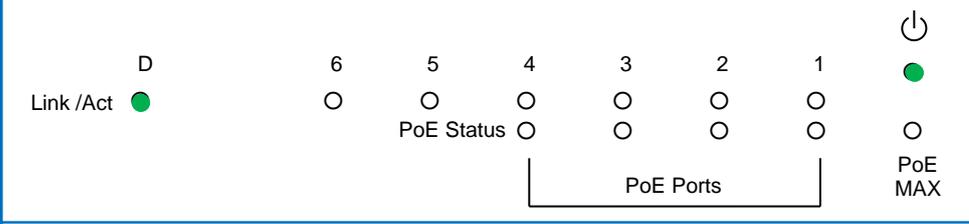
Faulty Operation. PoE Port 1 in use.

Port 1: PoE to the load. No data transfer from source to PoE Injector.

Refer to section 1.2

Power: 🟢

	D	6	5	4	3	2	1
Link /Act	🟢	◯	◯	◯	◯	◯	◯
PoE Status				◯	◯	◯	🟢

PoE Ports (ports 1–4). PoE MAX: ◯
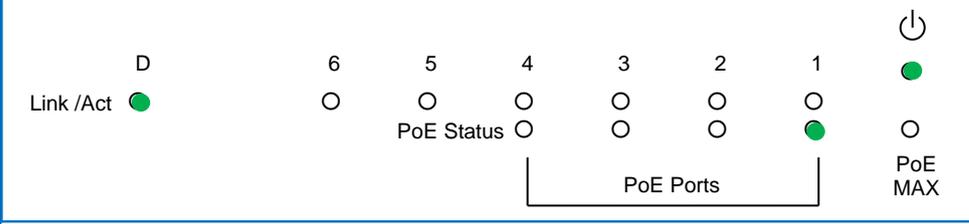
Faulty Operation. PoE Port 1 in use.

No 'D' LED. No data transfer from PoE injector to Processor PCB.

Refer to section 1.4

Power: 🟢

	D	6	5	4	3	2	1
Link /Act	◯	◯	◯	◯	◯	◯	🟡
PoE Status				◯	◯	◯	🟢

PoE Ports (ports 1–4). PoE MAX: ◯

Section 1.0 - Transceiver - Poor or no wireless signal, less than 25%, Flow Chart

```
┌─────────────────┐
│   Does the      │        No      ┌──────────────────┐
│ adjacent point  │───────────────▶│ Please refer to  │
│ to point        │                │   Section 1.1    │
│ relationship    │                └──────────────────┘
│  have power?    │
└─────────────────┘
         │ Yes
         ▼
┌─────────────────┐        ┌──────────────────┐        ┌──────────────────┐
│  Check antenna  │  Yes   │ Replace the      │   No   │ Replace the      │
│ configuration on│───────▶│ original         │───────▶│ adjacent         │
│ both transceivers.│      │ transceiver.     │        │ transceiver.     │
│ Is this correct?│        │ Re-program if    │        │ Re-program if    │
└─────────────────┘        │ required. Did this│       │ required. Did this│
         │ No              │ rectify the fault?│       │ rectify the fault?│
         ▼                 └──────────────────┘        └──────────────────┘
┌─────────────────┐                │ Yes                       │ Yes
│ Rectify antenna │                ▼                           ▼
│ configuration.  │        ┌──────────────────┐
└─────────────────┘        │ Check wiring,    │
                           │ connections and  │
                           │ LED loom inside  │◀──────────────
                           │ faulty transceiver. If │
                           │ OK, replace WiFi │
                           │ PCB.             │
                           └──────────────────┘
```

Section 1.1 - Transceiver - No power/lights, Flow Chart

Is the Transceiver powered by an alternative 12-24Vdc supply? — **No** → Is the Transceiver powered by Battery? — **No** → Is the Transceiver Powered over Ethernet (PoE) via the Processor? — **Yes** → Please refer to section 1.2

Is the Transceiver powered by an alternative 12-24Vdc supply? — **Yes** → Check power supply. Are supply volts available at the output socket? — **No** → Rectify Fault.

Check power supply. Are supply volts available at the output socket? — **Yes** → Check the Battery. Are volts available at the output socket?

Is the Transceiver powered by Battery? — **Yes** → Check the Battery. Are volts available at the output socket?

Check the Battery. Are volts available at the output socket? — **No** → Charge the battery. Refer to the Charge Indicator Plate. Did the Battery charge correctly?

Charge the battery. Refer to the Charge Indicator Plate. Did the Battery charge correctly? — **Yes** → Check the Battery fuse. Is it blown? — **No** → Check wiring, connections, cell pack, low voltage cut off PCB. Rectify fault.

Charge the battery. Refer to the Charge Indicator Plate. Did the Battery charge correctly? — **No** → For Battery charging issues, please refer to section 1.5

Check the Battery. Are volts available at the output socket? — **Yes** → Check inside Battery. Check wiring, connections, and cell pack. Rectify fault.

Check the Battery fuse. Is it blown? — **Yes** → Test Battery for short circuit and resistance to earth. Is a short circuit or earthing problem present? — **Yes** → Check wiring and connections. Rectify fault and replace fuse.

Test Battery for short circuit and resistance to earth. Is a short circuit or earthing problem present? — **No** → Test Power Cable for short circuit and resistance to earth. Is a short circuit or earthing problem present? — **Yes** → Check wiring and connections. Rectify fault and replace fuse.

Test Power Cable for short circuit and resistance to earth. Is a short circuit or earthing problem present? — **No** → Test Transceiver for short circuit and resistance to earth. Is a short circuit or earthing problem present? — **Yes** → Check wiring, connections and PCB's. Rectify fault and replace fuse.

Test Transceiver for short circuit and resistance to earth. Is a short circuit or earthing problem present? — **No** → Replace fuse.

Is supply voltage available through the Power Cable? — **No** → Repair or replace Power Cable.

Is supply voltage available through the Power Cable? — **Yes** → Is supply voltage available inside the Transceiver?

Is supply voltage available inside the Transceiver? — **Yes** → Is supply voltage available at the WiFi PCB?

Is supply voltage available inside the Transceiver? — **No** → Check Input Socket. Rectify fault.

Is supply voltage available at the WiFi PCB? — **Yes** → Check the Data LED on the WiFi PCB. Is this flashing?

Is supply voltage available at the WiFi PCB? — **No** → Check wiring and connections to WiFi PCB. Rectify Fault.

Check the Data LED on the WiFi PCB. Is this flashing? — **No** → Replace WiFi PCB.

Check the Data LED on the WiFi PCB. Is this flashing? — **Yes** → Replace LED loom. Did this rectify the fault? — **No** → Replace WiFi PCB.

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Section 1.2 - Transceiver - No power/lights (Continued), Flow Chart

Is the Transceiver Powered over Ethernet (PoE) via the Processor? → **Yes** → Check the Processor. Are any LED's illuminated? → **No** → Is supply voltage for the Processor available? → **No** → Seek advice from a competent electrician. Rectify Fault.

Is the Transceiver Powered over Ethernet (PoE) via the Processor? ↓ **No** → Please refer to section 1.1

Check the Processor. Are any LED's illuminated? ↓ **Yes** → Check the status of the related PoE port. Is the PoE Status LED illuminated? → **Yes**

Check the status of the related PoE port. Is the PoE Status LED illuminated? ↓ **No**

Connect the Transceiver to an alternative PoE port. Check the status of the related PoE port. Is the PoE Status LED illuminated? → **No** → Replace the Transceiver. Re-program if required. Did this rectify the fault? → **No**

Connect the Transceiver to an alternative PoE port. Check the status of the related PoE port. Is the PoE Status LED illuminated? ↓ **Yes** → Replace the Processor's PoE Injector due to faulty PoE port.

Replace the Transceiver. Re-program if required. Did this rectify the fault? ↓ **Yes** → Check wiring, connections and LED loom inside faulty transceiver. If OK, replace WiFi PCB.

Is supply voltage for the Processor available? ↓ **Yes** → Is the Processor powered by an AC/DC PSU? → **Yes** → Is 24Vdc available at the PSU output socket? → **Yes**

Is 24Vdc available at the PSU output socket? ↓ **No** → Replace AC/DC PSU.

Is the Processor powered by an AC/DC PSU? ↓ **No** → Is supply voltage available at the DC/DC Power Supply Cable output socket? → **No** → Replace Power Supply Cable.

Is supply voltage available at the DC/DC Power Supply Cable output socket? ↓ **Yes**

Is voltage available inside the Processor? → **No** → Check Input Socket on Processor. Rectify fault.

Is voltage available inside the Processor? ↓ **Yes** → Is voltage available to the 48Vdc Power Invertor input? → **No** → Check wiring and connections to Power Invertor. Rectify Fault.

Is voltage available to the 48Vdc Power Invertor input? ↓ **Yes** → Is voltage available at the 48Vdc Power Invertor output? → **No** → Replace Power Invertor. Rectify Fault.

Is voltage available at the 48Vdc Power Invertor output? ↓ **Yes** → Is voltage available at the Processor's POE Injector? → **No** → Check wiring and connections to POE Injector. Rectify Fault.

Is voltage available at the Processor's POE Injector? ↓ **Yes** → Replace the Processor's PoE Injector.

Check the faulty LAN Cable and Connectors for fault and/or damage. Rectify Fault. ← **Yes** ← Replace the associated LAN Cable. Did this rectify the fault?

Replace the associated LAN Cable. Did this rectify the fault? ↓ **No** → Replace the Processor's PoE Injector.

Section 1.3 - Transceiver - No data input/output, Flow Charts

Transmitter

Open the transmitter. Is supply voltage available at the AV PCB? — No → Check wiring and connections to AV PCB. Rectify Fault.

Yes ↓

Check the Power LED on the AV PCB. Is it green? — No → Replace AV PCB. Re-program if required.

Yes ↓

Check the Status LED on the AV PCB. Is it green? — No → Restart the Transmitter. Allow 60 seconds to complete start-up. Is the Status LED green? — No ↑ Replace AV PCB. Re-program if required.

Yes ↓ (from Restart) → Did this rectify the fault? — No →

Yes ↓

Check the Network LED on the AV PCB. Is it green? — Yes → Check the Data LED on the WiFi PCB. Is this flashing? — Yes → Replace LED loom. Did this rectify the fault? — No → Replace WiFi PCB. Re-program if required. Did this rectify the fault?

No ↓ (Network LED)

Replace LAN Cable between the AV PCB and the WiFi PCB. Did this rectify the fault?

No ↓

Replace WiFi PCB. Re-program if required. Did this rectify the fault?

No →

Repeater (wired)

Check the Processor. Is the port related Link/Act LED illuminated? — No → Connect the Transceiver to an alternative PoE port. Check the status of the related Link /Act port. Is the Link/Act LED illuminated? — Yes → Replace the Processor's PoE Injector due to faulty PoE port.

No (alternative PoE) ↓

Yes (Processor) ↓

Replace the Transceiver. Re-program if required. Did this rectify the fault? — Yes → Check wiring, connections and LED loom inside faulty transceiver. If OK, replace WiFi PCB.

No ↓

Replace the associated LAN Cable. Did this rectify the fault? — No → Replace the Processor's PoE Injector.

Yes ↓

Check the faulty LAN Cable and connectors for fault and/or damage. Rectify Fault.

Section 1.4 - Processor - No 'D' LED, Flow Chart *(X3L System Only)*

```
┌─────────────────┐         ┌─────────────────┐        ┌─────────────────┐
│ Check inside the│  Yes    │ Replace PoE to  │  No    │ Replace the PoE │
│ Processor. Are  │────────▶│ PCB LAN Cable.  │───────▶│ Injector. Did   │
│ the Processor   │         │ Did this rectify│        │ this rectify the│
│ PCB LED's       │         │ the fault?      │        │ fault?          │
│ illuminated?    │         └─────────────────┘        └─────────────────┘
└─────────────────┘                                             │
        │ No                                                    │ No
        ▼                                                       │
┌─────────────────┐         ┌─────────────────┐               │
│ Is voltage      │  No     │ Check wiring and│               │
│ available to the│────────▶│ connections to  │               │
│ 12Vdc Power     │         │ Power Invertor. │               │
│ Invertor input? │         │ Rectify Fault.  │               │
└─────────────────┘         └─────────────────┘               │
        │ Yes                                                   │
        ▼                                                       │
┌─────────────────┐         ┌─────────────────┐               │
│ Is voltage      │  No     │ Replace Power   │               │
│ available at the│────────▶│ Invertor.       │               │
│ 12Vdc Power     │         │ Rectify Fault.  │               │
│ Invertor output?│         └─────────────────┘               │
└─────────────────┘                                            │
        │ Yes                                                   │
        ▼                                                       │
┌─────────────────┐         ┌─────────────────┐               │
│ Is voltage      │  No     │ Check wiring and│               │
│ available at the│────────▶│ connections to  │               │
│ Processor PCB?  │         │ PCB.            │               │
└─────────────────┘         │ Rectify Fault.  │               │
        │ Yes               └─────────────────┘               │
        ▼                                                       │
┌─────────────────┐                                            │
│ Replace the     │◀───────────────────────────────────────────┘
│ Processor PCB.  │
│ Re-program if   │
│ required.       │
└─────────────────┘
```

Section 1.5 – Battery charging issues, Flow Chart

```
┌─────────────────┐         ┌─────────────────┐         ┌───────────────────────────────┐
│ Place the       │  Yes    │ Refer to the    │  Yes    │ Consider that the condition of │
│ discharged      │ ──────> │ Charge Indicator │ ──────> │ the Battery fuse has no        │
│ Battery on      │         │ Plate. Does the │         │ bearing on the charging        │
│ charge. Is the  │         │ battery appear  │         │ application and that the        │
│ Charge          │         │ to be charging  │         │ problem may not be charge      │
│ Indicator LED   │         │ correctly?      │         │ related. Refer to Section 1.1 -│
│ illuminated?    │         │                 │         │ No power/lights on Transceiver.│
└─────────────────┘         └─────────────────┘         │ If problems persist replace    │
        │ No                        │ No               │ Charger.                       │
        v                           v                  └───────────────────────────────┘
```

Place the discharged Battery on charge. Is the Charge Indicator LED illuminated? — Yes → Refer to the Charge Indicator Plate. Does the battery appear to be charging correctly? — Yes → Consider that the condition of the Battery fuse has no bearing on the charging application and that the problem may not be charge related. Refer to Section 1.1 - No power/lights on Transceiver. If problems persist replace Charger.

No ↓

Is supply voltage for the Charger available? — No → Seek advice from a competent electrician. Rectify Fault.

Yes ↓

Is supply voltage available at the C8 Power Supply Cable output socket? — No → Replace Power Cable or, if applicable, Power Supply Cable fuse.

Yes ↓

Check the Battery. Is there battery voltage at Pin 3 and 4 of the power socket? — No → Check inside Battery. Check wiring, connections, cell pack. Rectify fault.

Yes ↓ → Replace Charger.

Place an alternative Battery on charge. Does the battery appear to be charging correctly? — No → Replace Charger. / Yes → Check inside Battery. Check wiring, connections, cell pack. Rectify fault.

Section 1.6 – M2 Monitor - No power/lights, Flow Chart *(X3L System Only)*

```
┌──────────────────┐              ┌──────────────────┐              ┌──────────────────┐              ┌──────────────────┐
│   Check the      │    Yes       │  Is 12Vdc        │    Yes       │  Is 12Vdc        │    No        │  Check the faulty│
│   Processor. Are │─────────────▶│  available       │─────────────▶│  available       │─────────────▶│  Power Cable and │
│   any LED's      │              │  at the          │              │  at the          │              │  connectors for  │
│   illuminated?   │              │  Processor's     │              │  Monitor's       │              │  fault and/or    │
│                  │              │  output socket?  │              │  power cable     │              │  damage.         │
└──────────────────┘              └──────────────────┘              │  output?         │              │  Rectify Fault.  │
         │ No                              │ No                      └──────────────────┘              └──────────────────┘
         ▼                                 ▼                                 │ Yes
┌──────────────────┐              ┌──────────────────┐              ┌──────────────────┐
│                  │    Yes       │  Check inside the│              │                  │
│  Refer to section│◀────────────┐│  Processor. Are  │              │  Replace Monitor.│
│  1.2             │             ││  the Processor   │              │                  │
│                  │             ││  PCB LED's       │              └──────────────────┘
└──────────────────┘             ││  illuminated?    │
                                 │└──────────────────┘
                                 │         │ No
                                 │         ▼
                                 │┌──────────────────┐    No        ┌──────────────────┐
                                 ││  Is voltage      │─────────────▶│  Check wiring and│
                                 ││  available to the│              │  connections to  │
                                 ││  12Vdc Power     │              │  Power Invertor. │
                                 ││  Invertor input? │              │  Rectify Fault.  │
                                 │└──────────────────┘              └──────────────────┘
                                 │         │ Yes
                                 │         ▼
                                 │┌──────────────────┐    No        ┌──────────────────┐
                                 ││  Is voltage      │─────────────▶│  Replace Power   │
                                 ││  available at the│              │  Invertor.       │
                                 ││  12Vdc Power     │              │  Rectify Fault.  │
                                 ││  Invertor output?│              └──────────────────┘
                                 │└──────────────────┘
                                 │         │ Yes
                                 │         ▼
                                 │┌──────────────────┐    No        ┌──────────────────┐
                                 ││  Is voltage      │─────────────▶│  Check wiring and│
                                 └▶│  available to the│              │  connections to  │
                                  │  inside of the   │              │  output socket.  │
                                  │  output socket?  │              │  Rectify Fault.  │
                                  └──────────────────┘              └──────────────────┘
                                           │ Yes
                                           ▼
                                  ┌──────────────────┐
                                  │  Replace the     │
                                  │  output socket.  │
                                  └──────────────────┘
```

Section 1.7 – Monitor - 'No video' message, Flow Chart

```
┌─────────────────┐           ┌─────────────────┐           ┌─────────────────┐
│ Check the Sensor.│   Yes    │  Replace the    │   Yes     │ Check the faulty │
│ Are there any   │ ───────> │  Sensor. Did this│ ───────>  │ Sensor and      │
│ obvious signs of│          │  rectify the     │           │ connectors for  │
│ damage?         │          │  fault?          │           │ fault and/or    │
└─────────────────┘          └─────────────────┘           │ damage.         │
         │                            │                     │ Rectify Fault.  │
         │ No                         │ No                  └─────────────────┘
         ▼                            ▼
┌─────────────────┐          ┌─────────────────┐           ┌─────────────────┐
│ Is the Video    │          │ Does the Video  │   Yes     │ Replace Video   │
│ Sensor Plug and │          │ Sensor Socket   │ ───────>  │ Sensor Socket   │
│ Socket connection│         │ show signs of   │           └─────────────────┘
│ loose?          │          │ damage or       │
└─────────────────┘          │ corrosion?      │
         │                   └─────────────────┘
         │ No                         │ No
         ▼                            ▼
┌─────────────────┐          ┌─────────────────┐           ┌─────────────────┐
│ Repair          │          │ Open the        │   No      │ Replace AV PCB. │
│ connection. Did │          │ Transmitter.    │ ───────>  │ Re-program if   │
│ this rectify the│          │ Replace the     │           │ required.       │
│ fault?          │          │ internal LAN cable│         └─────────────────┘
└─────────────────┘          │ from the Video  │
         │                   │ Sensor Socket.  │
         │ No                │ Did this rectify│
                             │ the fault Rectify│
                             │ Fault?          │
                             └─────────────────┘
```

Yes (from "Is the Video Sensor Plug and Socket connection loose?" to "Repair connection. Did this rectify the fault?")

Section 1.8 – M2 Monitor - Black Screen, Flow Chart *(X3L System Only)*

```
┌─────────────────────┐        Yes   ┌─────────────────┐       No    ┌─────────────────┐      No    ┌─────────────────┐
│ Is power available  │─────────────>│ Is the Monitor  │────────────>│ Press the Power │──────────> │ Replace Monitor.│
│ and/or is the       │              │ LED Green?      │             │ Button. Did this│            │                 │
│ Monitor LED         │              │                 │             │ rectify the     │            │                 │
│ illuminated?        │              │                 │             │ fault?          │            │                 │
└─────────────────────┘              └─────────────────┘             └─────────────────┘            └─────────────────┘
          │ No                                │ Yes
          ▼                                   ▼
┌─────────────────────┐              ┌─────────────────┐       Yes   ┌─────────────────┐
│ Refer to section    │              │ Press the       │────────────>│ Refer to section│
│ 1.6                 │              │ Function Button.│             │ 1.7             │
│                     │              │ Ensure under    │             │                 │
└─────────────────────┘              │ scan is on. Is a│             └─────────────────┘
                                     │ 'No video'      │
                                     │ message         │
                                     │ displayed in the│
                                     │ top left hand   │
                                     │ corner?         │
                                     └─────────────────┘
                                             │ No
                                             ▼
                                     ┌─────────────────┐       Yes   ┌─────────────────┐      No    ┌─────────────────┐
                                     │ Is this system  │────────────>│ Use the Multi   │──────────> │ Cross reference │
                                     │ running multiple│             │ Camera Switch.  │            │ Processor status│
                                     │ cameras?        │             │ Is the problem  │            │ against         │
                                     └─────────────────┘             │ isolated to one │            │ corresponding   │
                                             │ No                    │ Camera?         │            │ LED indicator   │
                                             ▼                       └─────────────────┘            │ table. Refer to │
                                     ┌─────────────────┐                      │ Yes                 │ relevant section│
                                     │ Check ALL port  │<─────────────────────┘                     └─────────────────┘
                                     │ related parts.  │
                                     │ Cross reference │
                                     │ status against  │
                                     │ corresponding   │
                                     │ LED Indicator   │
                                     │ tables. Refer to│
                                     │ relevant section│
                                     └─────────────────┘
```

Section 1.9 - M2 Monitor - Blue screen with 'no signal' message, Flow Chart *(X3L System Only)*

```
┌──────────────────┐          ┌──────────────────┐          ┌──────────────────┐          ┌──────────────────┐
│ Check the HDMI   │   Yes    │ Use the input    │   No     │ Select the correct│         │ Check wiring and │
│ lead. Is the HDMI│ ───────▶ │ button on the    │ ───────▶ │ input.           │         │ connections to   │
│ lead connected   │          │ Monitor. Is the  │          │ Rectify Fault.   │         │ PCB.             │
│ between the      │          │ HDMI Input       │          │                  │         │ Rectify Fault.   │
│ Monitor and the  │          │ selected?        │          │                  │         │                  │
│ Processor?       │          │                  │          │                  │         │                  │
└──────────────────┘          └──────────────────┘          └──────────────────┘         └──────────────────┘
         │ No                          │ Yes                                                        ▲ No
         ▼                             ▼                                                            │
┌──────────────────┐          ┌──────────────────┐   No     ┌──────────────────┐   No    ┌──────────────────┐
│                  │          │ Check the        │ ───────▶ │ Check inside the │ ──────▶ │ Is voltage       │
│ Rectify Fault.   │          │ Processor. Is the│          │ Processor. Are   │         │ available from   │
│                  │          │ 'D' LED          │          │ the Processor    │         │ the 12Vdc Power  │
│                  │          │ illuminated?     │          │ PCB LED's        │         │ Invertor to the  │
│                  │          │                  │          │ illuminated?     │         │ Processor PCB?   │
└──────────────────┘          └──────────────────┘          └──────────────────┘         └──────────────────┘
                                       │ Yes                         │ Yes
                                       ▼                             ▼
                              ┌──────────────────┐          ┌──────────────────┐   No    ┌──────────────────┐
                              │ Remove HDMI      │          │ Replace internal │ ──────▶ │ Replace the      │
                              │ lead. Clean HDMI │          │ HDMI Cable. Did  │         │ Processor PCB.   │
                              │ plugs and sockets│          │ this rectify the │         │ Re-program if    │
                              │ then re-fit. Did │          │ fault?           │         │ required.        │
                              │ this rectify the │          │                  │         │                  │
                              │ fault?           │          │                  │         │                  │
                              └──────────────────┘          └──────────────────┘         └──────────────────┘
                                       │ No                          ▲
                                       ▼                             │
                              ┌──────────────────┐                   │
                              │ Replace HDMI     │                   │
                              │ Lead. Did this   │                   │
                              │ rectify the fault?│                  │
                              └──────────────────┘                   │
                                       │ No                          │
                                       ▼                             │
                              ┌──────────────────┐                   │
                              │ Replace Monitor. │                   │
                              │ Did this rectify │                   │
                              │ the fault?       │                   │
                              └──────────────────┘                   │
                                       │ No                          │
                                       ▼                             │
                              ┌──────────────────┐   No              │
                              │ Replace the      │ ──────────────────┘
                              │ Processor's HDMI │
                              │ output socket. Did│
                              │ this rectify the │
                              │ fault?           │
                              └──────────────────┘
```

Section 1.10 - M3 Transceiver - No data input/output, Flow Charts *(M3L System Only)*

M3 Display

Open the unit. Is supply voltage available at the Processor PCB? — **No** → Check wiring and connections to PCB. Rectify Fault.

↓ **Yes**

Check the Power LED on the Processor PCB. Is it Red? — **No** → Replace the PCB. Re-program if required.

↓ **Yes**

Check the Status LED on the Processor PCB. Is it green? — **Yes** → Check the Data LED on the WiFi PCB. Is this flashing?

↓ **No**

Replace LAN Cable between the Processor PCB and the WiFi PCB. Did this rectify the fault?

↓ **No**

Replace WiFi PCB. Re-program if required. Did this rectify the fault?

↓ **No**

Check the Data LED on the WiFi PCB. Is this flashing? — **No** → (to Replace WiFi PCB)

↓ **Yes**

Replace LED loom. Did this rectify the fault?

↓ **No** → (to Replace WiFi PCB)

Section 2.0 – B6 Battery Schematic
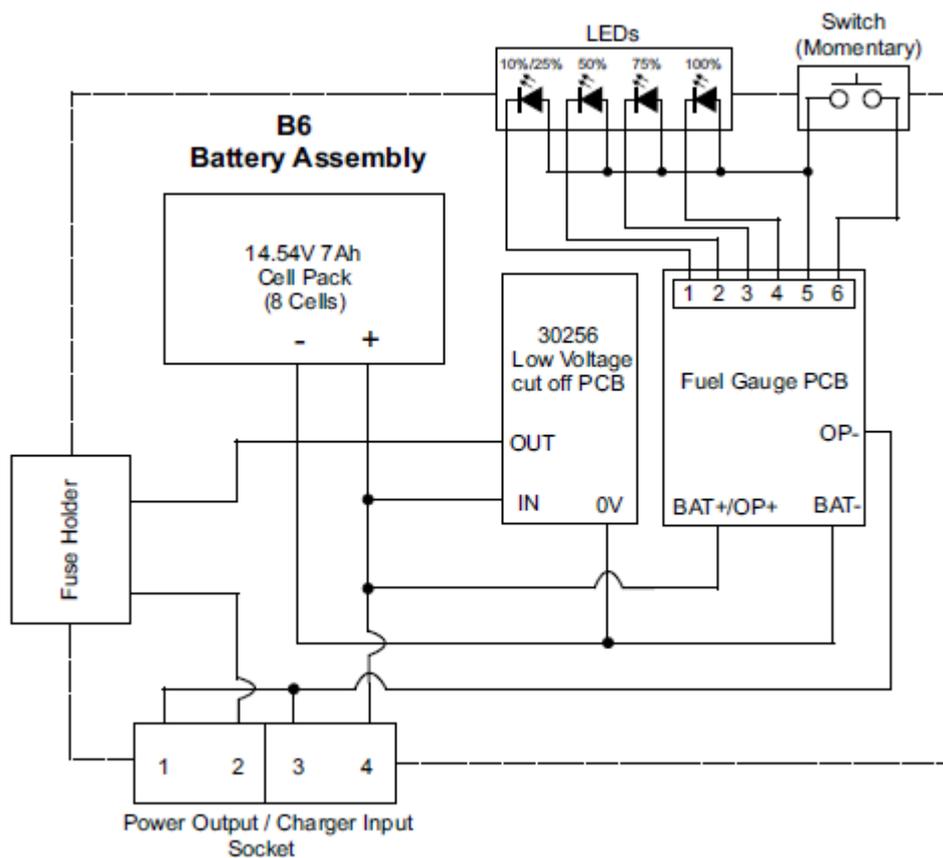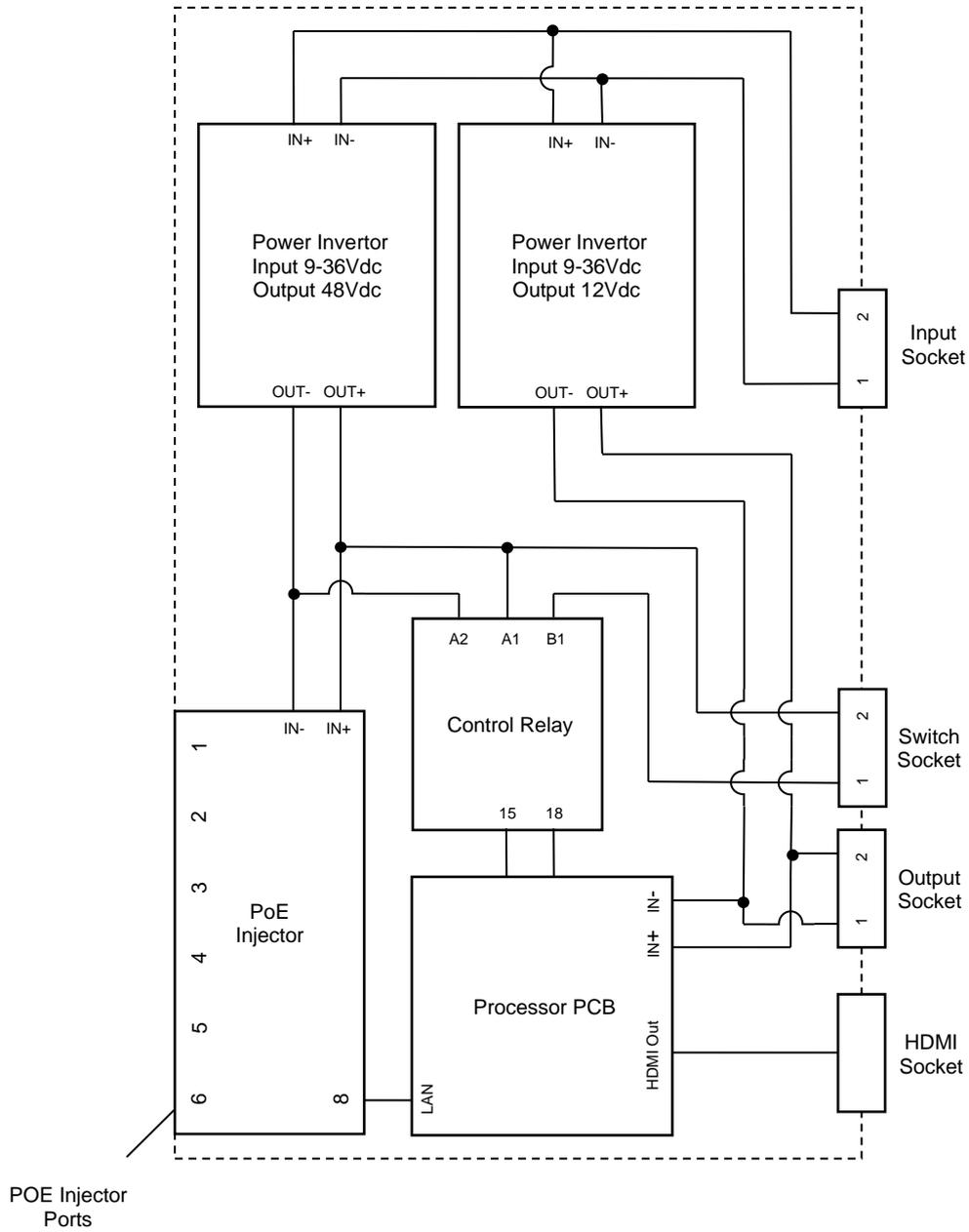

14.54V 7Ah Cell Pack

Low Voltage Cut Off PCB (LVCOP)
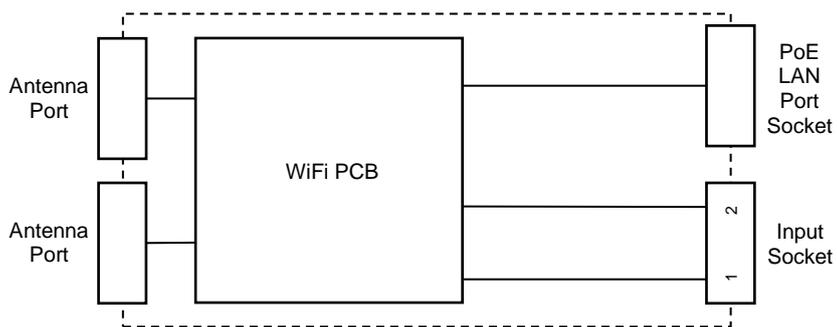To prevent over discharge, the LVCOP analyses the condition of the cell pack.

The LVCOP will cut power to the load when the cell pack voltage drops below 12.2Vdc.

The charging process will reset the LVCOP when voltage input reaches 15.86Vdc or higher.
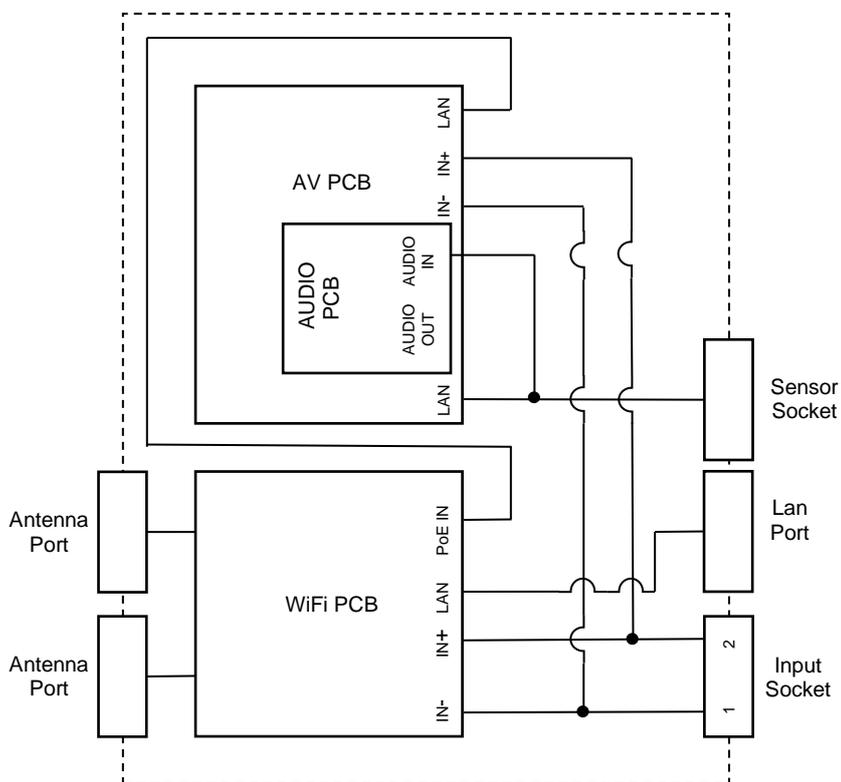
Section 2.1 – Processor Schematic

Section 2.2 - Repeater Schematic

Section 2.3 - Transmitter Schematic