



nightscan[®] ^{iQ}

Night Scan Powerlite IQ and Night Scan Xtreme IQ Operating Instructions



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Original Instructions



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1 Safety Summary

This section describes safety instructions for the Night Scan Powerlite IQ that personnel must understand and apply throughout all product activities such as transportation, handling, installation, operation, maintenance, storage, disposal and troubleshooting. Read and understand this entire document, and contact The Will-Burt Company with any questions, before performing any procedure outlined in this document. Keep this document during the entire duration of use of the device. Pass this document along to trained and qualified end users.

1.1 Signal Word Definitions

The following signal words and definitions are used to indicate hazardous situations:

DANGER

DANGER indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

CAUTION

CAUTION indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury or equipment damage. It is also used to alert against unsafe practices.

1.2 Safety Instructions

DANGER

Electrocution Hazard! Contact with high voltage will result in death or serious injury. Observe general safety precautions for handling equipment using high voltage. Do not locate or operate mast near electrical lines, cables or other unwanted sources of electricity. Allow sufficient clearance on all sides of mast to allow for side sway. Do not operate mast during an electrical storm. Be certain electrical cables are undamaged and properly terminated. Do not touch live wires. Follow OSHA or other national safety regulations when working near energized power lines. Personnel working with or near high voltages should be familiar with methods of resuscitation.

DANGER

Disconnect Power for Service! Always disconnect all power sources following proper lock-out tag-out procedures before performing service, repair or test operations. Remove the tethered hand held control where applicable for added protection during maintenance.

DANGER

Mast Tip Over Hazard! Mast tip over could result in death or serious injury. Before operation, be certain mounting structure is capable of resisting forces generated from all loading and

environmental conditions, including, but not limited to, mast size and weight, payload and cable size and weight, payload sail area, wind speed, guy line arrangement, support bracket or roof line location, and base plate assembly. Do not operate in wind speed conditions exceeding the maximum rated wind speed. Do not operate on slopes exceeding the maximum deployment angle. Do not install a payload that exceeds the maximum payload lifting capacity of mast. Do not install a payload with the center of gravity offset from mast centerline exceeding the maximum allowed offset. Stand clear of mast and mast payload during operation. Be certain mast is level and secure before and during installation, operation, and maintenance.

⚠ DANGER

Falling Objects from Mast Hazard! Wear a protective hard hat when working on mast or situated near mast operating area while mast is extending, retracting or deployed in any position above the nested position. Improperly secured payload or mast components, ice formations, etc. could be dislodged from mast and fall. Be sure the payload is properly installed and secured.

⚠ DANGER

Relocation/Driving Hazard! Do not relocate the system during operation or while mast is extended to any height above the nested position or powered up. Do not move vehicle until mast has been securely nested and isolated from power. Power-up and operate mast only if the vehicle is stationary and securely parked with the parking brake properly applied. Do not put mast in service or operate without the vehicle interlock warning circuit or magnetic warning kit installed to provide confirmation mast is nested prior to moving the vehicle. Contact The Will-Burt Company Engineering for special on-the-move situations for military only use on specialized products.

⚠ DANGER

Burst Hazard! For pneumatically operated masts, do not operate without the over-pressure safety valve installed. Keep personnel clear of safety valve exhaust direction. Do not exceed the maximum rated pressure of mast. If the mast air pressure is not fully discharged prior to removing air hoses, a rapid release of air pressure will occur requiring hearing and eye protection.

⚠ WARNING

Payload Lifting Hazard - Intended Use! The mast is intended to lift a specific payload for lighting, surveillance or communication use only. Any other use without written consent is prohibited and could cause death or serious injury. Do not use mast to lift personnel. Do not exceed specified payload capacity. Large payload wind sail areas can reduce payload capacity. Consult The Will-Burt Company engineering.

⚠ WARNING

Read Operating Instructions! Read and observe the operating instructions. Non-observance of the instructions, operation which is not in accordance with use as prescribed in the instructions, wrong installation or incorrect handling can seriously affect the safety of operators and machinery. Adhere to the safety instructions when carrying out any activity relating to the Night Scan Powerlite IQ.

⚠ WARNING

Trained Personnel Only! This product is intended for use by trained professionals only. It is not intended for general use by the public or untrained personnel. Handling, installation, operation

and maintenance to be performed by trained and authorized personnel only. Only a properly trained and qualified certified electrician should perform electric installations and service.

⚠ WARNING

Erratic Mast Operation Impact Hazard! The mast should operate smoothly during extension and retraction. If erratic mast motion is observed during extension or retraction that results in impact loading between the tube and the tube collar (mechanical travel stop), cease use of the mast and contact The Will-Burt Company service department. Repeated operation with impact loading can damage tubes and lead to mast separation.

⚠ WARNING

Over-current Protection! Over-current protection or power switching by the installer on mast incoming power supply as specified in this document should be a type suitable to allow lock-out tag-out procedures for power disconnect.

⚠ WARNING

Safety Instruction - Explosion! For outdoor use only. Do not use in explosive areas or areas that have been classified as hazardous as defined in Article 500 of the National Electric Code or equivalent national standards. Do not use in the presence of flammable gases or liquids such as paint, gasoline or solvents. Do not use in areas of limited ventilation or where high ambient temperatures are present.

⚠ WARNING

Safety Equipment (PPE)! Proper personal protective equipment (PPE) like hard hats, gloves, and safety shoes shall be properly worn while working on mast or near the deployment area of mast. In addition, eye protection shall be worn during maintenance procedures. Follow national PPE guidelines in your area of operation.

⚠ WARNING

Pinch Point Hazard! Keep clear of all moving parts like mast collars nesting. Be sure to stay clear of system during operation. Moving parts can crush and cut resulting in serious injury. The mast shall be mounted out of reach of the operator during operation.

⚠ WARNING

Crush Hazard - Mast Failure! Do not stand directly beneath mast or its payload. Be certain the payload is properly installed and secured.

⚠ WARNING

Entanglement Hazard! Tangled cables can cause equipment damage. Ensure payload cables, Nycoil®, trip lines, guy lines or other cables are not tangled and are free to pay out as mast is deployed. Cables that get tangled or snagged on mast or other objects can cause mast tubes to lurch upward suddenly when the cable is freed. This can cause damage to mast and lead to mast separation if repeatedly allowed to continue.

⚠ WARNING

Health and Safety Hazard while Cleaning! Solvent used to clean parts is potentially dangerous. Avoid inhalation of fumes and prolonged contact to skin.

⚠ WARNING

Fire Hazard Solvent! Cleaning solvent, used for maintenance, is flammable and can be explosive. Do not smoke near solvent. Use cleaning solvent in a well-ventilated area. Keep cleaning solvent away from ignition sources. Always store cleaning solvent in the proper marked container and in a proper location.

⚠ WARNING

Bright Light Radiation Hazard! For systems equipped with scene lighting or look-up lights, do not look directly into lights when they are illuminated. Temporary impairment or permanent vision damage could occur.

⚠ WARNING

Personnel Freezing/Burn Hazard! If the system is equipped with lights, make sure the lights are completely cool before attempting to clean the lens, replace bulbs or perform maintenance. Wear gloves to protect from contact with exposed metal that may be at extremes of hot and cold temperatures from sun or cold outdoor exposure.

⚠ WARNING

Mast Extension Hazard - Obstruction! Extending mast into obstructions could result in death or serious injury and could render mast inoperable and partially extended. Before applying power and operating mast, be certain there is sufficient clearance above and to all sides of the expected location of the fully extended mast and payload. Keep all persons clear of mast and mast extension. Do not lean directly over mast. Locate the operator station such that the operator has a clear view of the operating space of mast and payload prior to deployment to avoid contact with overhead objects.

⚠ WARNING

Manual Retraction! For powered masts, make sure all power sources have been disconnected from the system prior to manually lowering mast to avoid unexpected start-up motion and/or damage to mast.

⚠ WARNING

Mast Lifting/Handling! Use extreme caution while lifting mast System and when mast System is suspended to avoid injury and equipment damage. Be certain mast is properly secured using at least two sling points at the center of gravity label. All operators should be aware of and follow the applicable local, regional, and national standards and codes of practice for slinging and transporting equipment. Never lift Mast System over people. Ensure lifting equipment including, but not limited to, lifting straps and hoist, are capable of handling the forces generated from lifting the system. Observe manufacturer instructions on lifting equipment.

⚠ WARNING

Remove Payload! For mast systems shipped with no payload (customer installed payloads), remove payload before performing maintenance on mast system. The Will-Burt Company installed devices can remain installed.

⚠ WARNING

Equipment Damage - Submerged! Do not submerge mast in liquid or operate the vehicle in a fording situation that would result in a submerged mast.

⚠ WARNING

Safety Instruction – Keep Clear! Keep personnel clear of the system during operation.

⚠ WARNING

Safety Instruction - Potential Air Contaminants! If internally mounted in a vehicle, air from mast and any accumulated water will discharge into the vehicle. Install appropriate drainage and venting.

⚠ WARNING

Fastener Vibration Hazard! Mast system and payload mounting hardware must include proper means to resist vibration loosening such as thread-locking compound, locking hardware, or equivalent. Use specified assembly torques appropriate for the fastener size.

⚠ CAUTION

Frozen Water Hazard! Water freezing inside mast or air fittings may render mast inoperable and cause major equipment damage such as tube deformation. Ensure water is free to exit at the base of mast. Open drain cock when mast is not in operation. The drain cock shall be installed at the lowest position in the pneumatic system. If mounted internally in a vehicle or structure, direct the draining water to a suitable location. Cover locking masts when not in use to limit water ingress. Non-locking masts stored outdoors should be covered if possible. A cover is available from The Will-Burt Company.

⚠ CAUTION

Safety Instruction - Guy Anchors! For masts using Guy Lines, verify the Guy Anchor point strength is adequate to support the Guy Line forces.

⚠ CAUTION

Lubrication! Do not lubricate the exterior of mast moving tubes. The lubricant will attract dust and other environmental contaminants into mast.

⚠ CAUTION

Equipment Damage - Forces! Before unloading the system, be certain the unloading region is capable of resisting forces generated from unloading the system including but not limited to system weight. Ensure the unloading region is level and has sufficient room and strength to hold the system. If the unloading region is incapable of meeting the requirements of the system, damage to the system and/or unloading region could occur.

⚠ CAUTION

Equipment Damage - Support Bracket! For masts using an upper support bracket, do not over-tighten mast support bracket. Over-tightening may damage the Base Tube causing mast tubes to stick.

⚠ CAUTION

Mast and Payload Access! The operator must provide safe means to access mast and payload during installation, removal and maintenance.

⚠ CAUTION

Tripping Hazard! Cables, trip lines, guy lines and guy anchors can be hard to see during and after installation. Any equipment posing trip hazards should be clearly marked.

⚠ WARNING

Manual Tilt! Ensure all power has been disconnected from the system prior to manually operating the mast to avoid unexpected motion and/or damaging mast components. Use the 6mm hex wrench supplied with the mast system. Use of a drill or powered driver will damage the actuator.

⚠ CAUTION

Safety Instruction - Polarity! Reversing polarity of the source incoming DC power will damage components.

1.3 Symbols Used on Product Labels

The following symbols are displayed on the product. The symbol meanings are as follows:



This symbol indicates an electrocution hazard or hazardous voltage hazard. There is voltage present inside mast and control box. Do not operate mast near electrical lines or during electrical storms. Contact with high voltage will result in death or serious injury.



This symbol indicates a pinch point hazard. Keep fingers and hands clear of moving parts.



This symbol indicates a tip-over hazard. The mast must be properly supported during transport, handling, installation, maintenance, operation and decommissioning. System tip-over could result in death or serious injury.



This symbol indicates a general warning. In this unit, this symbol indicates a frozen water hazard. Water must be permitted to exit mast to avoid ice damage to mast.



This symbol is used to remind users to read and understand the operator's manual before operating the mast system. Failure to follow operating instructions could result in death or serious injury. Read and understand operating instructions before handling, installing, operating, or maintaining the mast system.



This symbol indicates an electrical ground connection point.



This symbol is used to indicate the center of gravity (COG) of a fully nested mast in a horizontal transport position.

2 Specification Compliance

2.1 NFPA 1901-2016

The mast systems are designed to be compliant with the following sections of National Fire Protection Agency NFPA-1901-2016 Edition:

22.14 Powered Operated Light Masts

23.13 Power Operated Masts

2.2 CE Declaration of Conformity

Refer to the Product page at www.willburt.com for the latest Declaration of Conformity.

The Night Scan Powerlite IQ and Night Scan Xtreme IQ systems conform to CE standards when used with CE approved lights.

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3 Introduction

Thank you for selecting The Will-Burt Company for your critical payload elevation needs. These operating instructions describe transporting, handling, installing, operating, maintaining, storing, and troubleshooting procedures for the Night Scan Powerlite IQ and Night Scan Xtreme IQ. These procedures assume the use of standard mast systems. Procedures and characteristics for mast systems customized to meet customer-specific needs may vary.

These operating instructions are intended for professionals who are qualified by their appropriate training and experience to perform the procedures. Review this document in its entirety. Contact The Will-Burt Company with any questions before performing any procedure outlined in this manual.

The views depicted in this manual are provided for clarification and are subject to change without notice. Views are not to scale.

The Night Scan Powerlite IQ and Night Scan Xtreme IQ mast models tilt to vertical and extend upwards to provide directional scene lighting and surveillance. The masts retract and fold down for transport. The following models are covered in these operating instructions:

- Night Scan Powerlite IQ
- Night Scan Xtreme IQ

The Night Scan Powerlite IQ and Night Scan Xtreme IQ mast models are available with many options installed by The Will-Burt Company, including the option to come with a Profiler, which is a space-saving roof-mounted unit designed to enable installation on vehicles with limited available mounting space. There are also different light fixture types and manufactures, camera types and manufacturers, and optional beacon lighting.



Figure 3-1 Left: Night Scan Powerlite IQ; Right: Night Scan Powerlite HDT with Profiler

3.1 Intended Use

The Night Scan Powerlite IQ and Night Scan Xtreme IQ are intended for use by professionals in the fire/rescue/first responder/security industries to provide elevated and directional emergency scene lighting and surveillance or communication capabilities. It is not intended for use by non-professionals. Do not use the mast to lift personnel. The mast systems are intended to be installed on the roof or in a roof well of fire/rescue/first responder vehicles with the vehicle interconnect safety circuit installed and operational.

The Night Scan Powerlite IQ and Night Scan Xtreme IQ are intended to be used only when the vehicle is stationary and the vehicle parking brake is properly applied. Do not supply input supply voltage or operate the mast system when the vehicle is in motion. The mast shall remain in the powered-down, nested position during vehicle motion.

3.2 Mast Position Definition

An actuator electrically tilts the mast from the stowed position to the 90° position. The mast is then pneumatically moved by air pressure to the extended position. The following positions (see Figure 3-2) are used throughout this manual:

- **Stowed:** is the horizontal position in which the mast is firmly seated in the saddle. This position is sometimes referred to as the nested position.
- **90°:** is the position that the mast electrically goes to from the stowed position. At 90°, the mast has angled up, but no mast sections have risen. The mast remains retracted.
- **Extended:** is the partial or full raised position that the mast pneumatically goes after the 90° position. In the extended position, some or all of the mast sections have risen.

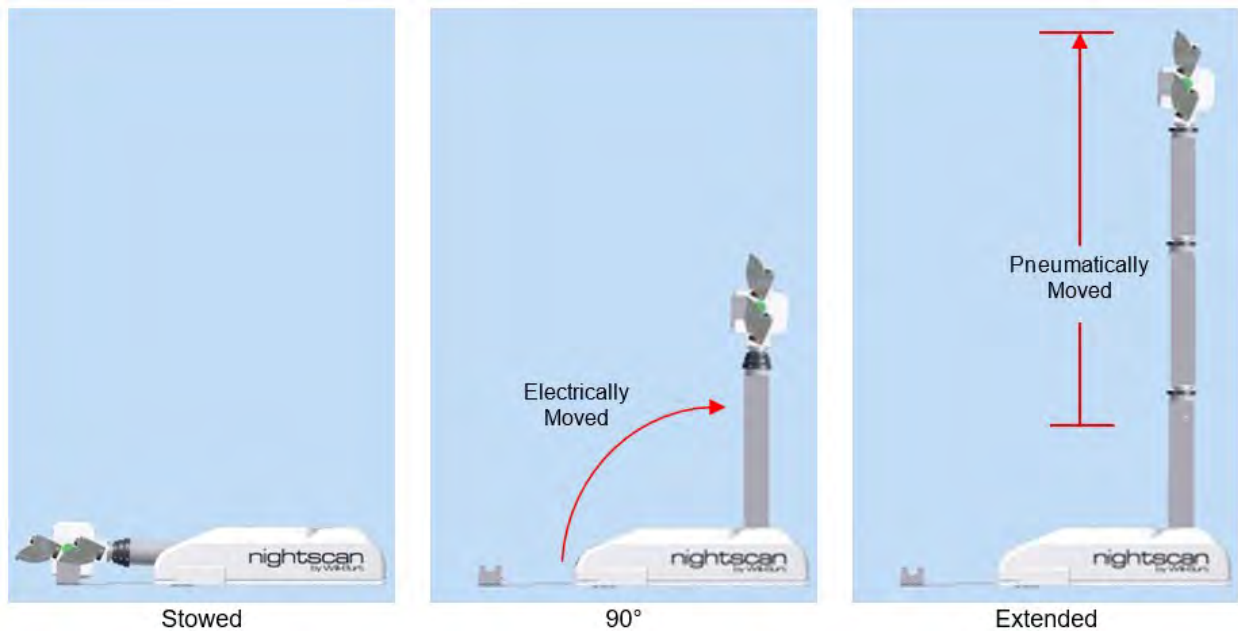


Figure 3-2 Mast Positions

3.3 Mast Component Descriptions

Figure 3-3, Figure 3-4, Figure 3-5, Figure 3-6, and Figure 3-7 show major components of the Night Scan Powerlite IQ and Night Scan Xtreme IQ systems.

Mast: The mast consists of concentric tube sections that extend as air pressure is applied. These tubes are protected by low friction synthetic bearings. The exterior surfaces of the tubes are anodized and sealed for long life. The mast contains a coiled cord in the center for power and data. Optionally, an external Nycoil® may be included (not shown) for camera or other accessory cables.

RCP: The Remote Control Positioner (RCP) pans and tilts the lights. The RCP does not become active until the mast tilts up to the 90° position. Standard Night Scan Powerlite IQ masts come equipped with a dual-tilt RCP. This means the left and right lights tilt independently to direct light at a desired position(s).

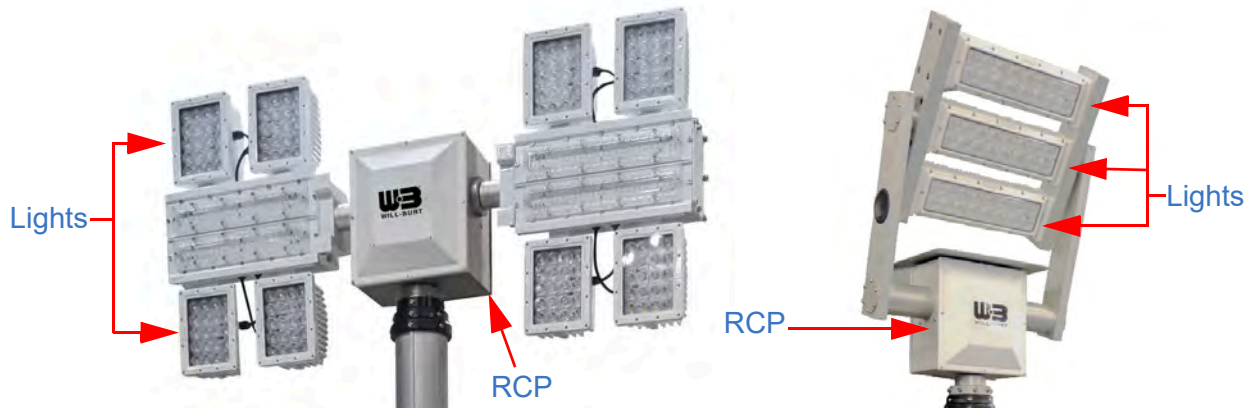


Figure 3-3 RCP (Left: Night Scan Powerlite IQ; Right: Profiler Lights on Night Scan Mast)

Magnetic Down Switch: The magnetic down switch is activated by a magnet in the mast top tube section. The position is factory set to indicate when the mast is fully retracted. Once activated, the mast is free to tilt back to the stowed position. See Section 7.6 for optional adjustment.

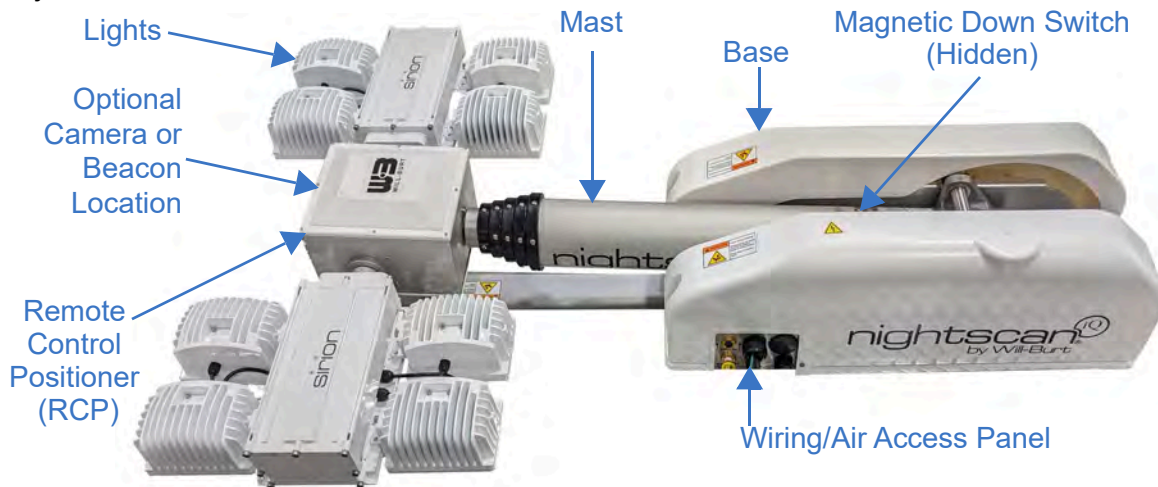


Figure 3-4 Night Scan Powerlite IQ Top/Side View

Wiring/Air Access Panel: The wiring/air access panel provides interface points to attach supply air and power/data cables.

Look-Up Lights: The Look-Up Lights illuminate the operating space of the mast during any mast motion to allow the operator to identify and avoid contacting unwanted obstructions during operation.

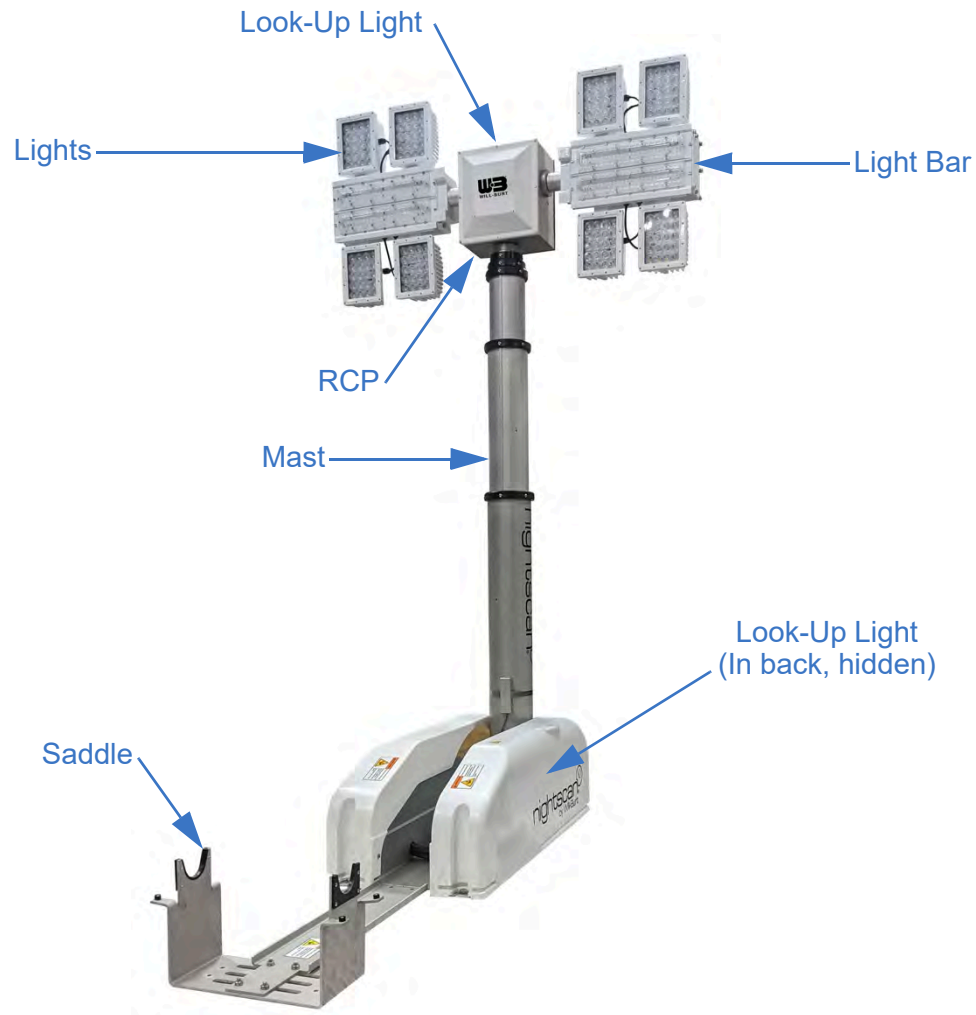


Figure 3-5 Night Scan Powerlite IQ Parts

Saddle: The saddle supports the RCP and lights when nested for stable vehicle transit. The saddle position varies by model.

Lights: The Night Scan Powerlite IQ and Night Scan Xtreme IQ systems can come with a variety of LED or Halogen lighting packages. Go to www.willburt.com for additional information on available light packages.

Camera/Beacon: Go to www.willburt.com for the latest optional cameras and beacon lights.

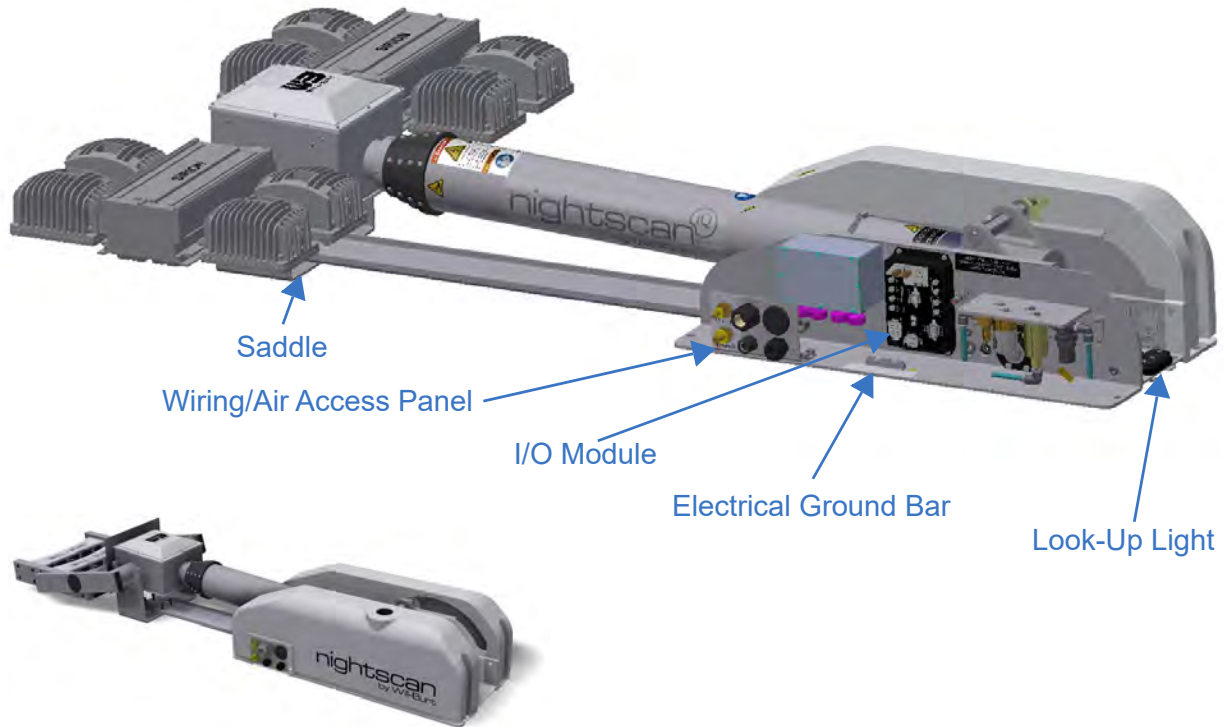


Figure 3-6 Above: Night Scan Powerlite IQ and Night Scan Xtreme IQ Components (Left Cover Removed); Below: Night Scan Powerlite with Profiler Parts

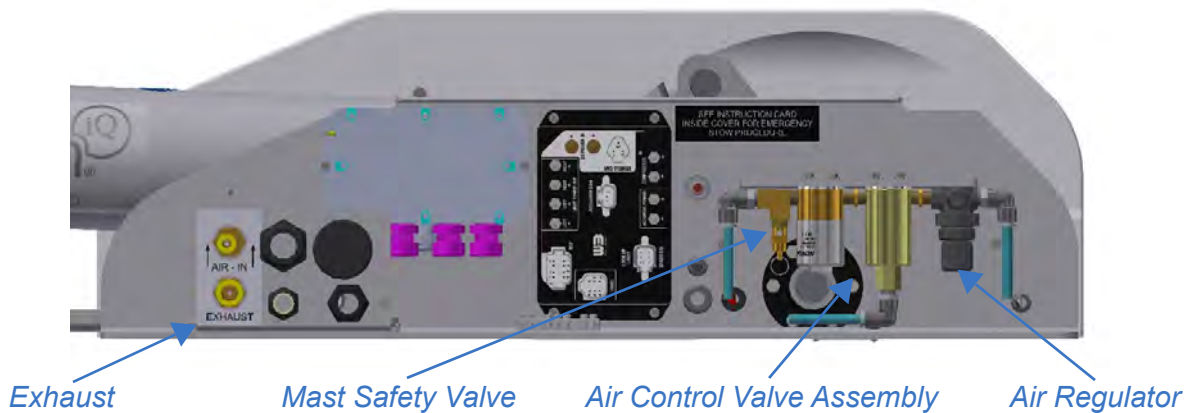


Figure 3-7 Night Scan Powerlite IQ and Night Scan Xtreme IQ (Left Cover Removed)

Tilt Actuator: This actuator tilts the mast.

90° Limit: This limit activates when the mast reaches the 90° vertical position. The mast is driven into a spring under the mast. The lights and RCP functions are disabled until this 90° limit is activated. Once activated, the RCP and lights are active for use. The limit is adjustable and set at the factory. See Section 7.6.2 for optional adjustment procedure.

0° Limit: This limit activates when the mast reaches the horizontal stowed position. This drives the RCP into the saddle ensuring a tight fit for vehicle transport. The limit location is adjustable and is factory set for a horizontal mounting surface. If the vehicle surface is not flat, this limit may need to be adjusted for proper stowing of the mast. See Section 7.6.2 for optional adjustment procedure.

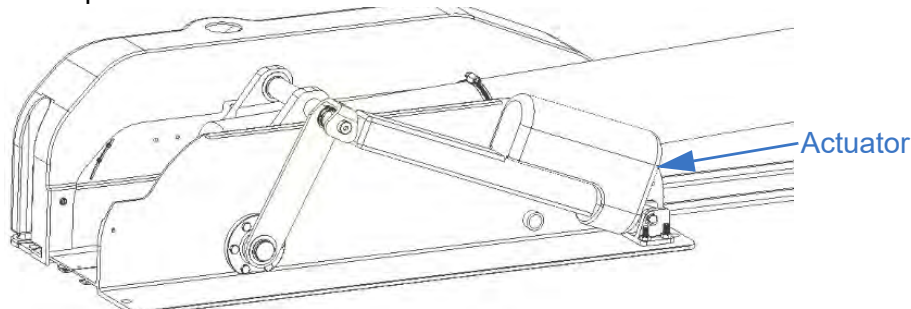


Figure 3-8 Right Side of the Base (Right Cover Removed)

Safety Valve: This valve prevents over-pressurization of the mast system.

I/O Module: The I/O module distributes power to the other devices in the mast system. It is controlled by the master controller located in the RCP via CAN bus communication. There is a 12 volt model (P/N: 5692401) and a 24 volt model (P/N: 5795101).



Figure 3-9 I/O Module

Air Control Valve Assembly: The air control valve assembly consists of the extend and exhaust valve and factory set regulator to control pressure into the mast. Optionally, an air compressor can replace the air control valve assembly. The mast does not have a switch indicating the mast has reached its full extended height. When the mast is deployed, the operator should release the extension button on the hand held control. If the operator keeps the button pressed, the system will continue to build pressure until the safety valve blows off to relieve pressure.

Labels: Extra warning labels are provided to attach near the operator control station.

AC Light Module Assembly: The AC Light Module Assembly turns the AC lights on and off. This assembly is only installed when AC lights are installed on the mast.

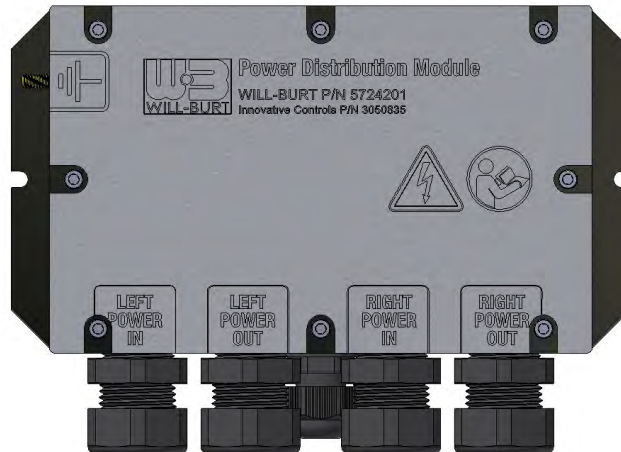


Figure 3-10 AC Light Module Assembly

3.4 System Controllers

The mast comes with a Panel Mount Control (PMC) that mounts to a panel. The PMC controls mast functions and provides full system control. The PMC comes with an emergency stop (E-Stop) button and a connector to plug in an optional HHRC (sold separately).



Figure 3-11 Panel Mount Control (PMC)

An optional Wired Hand-Held Remote Control (HHRC) can be ordered as an extra system controller. The HHRC comes with a 25 ft (7.6 m) quick connect coil cord. This connects to the PMC. Two HHRCs can be ordered if desired.



Figure 3-12 Wired Hand-Held Remote Control (HHRC)

If the mast system arrives with an HHRC, it can be plugged into a HHRC power junction that can be located remotely on the vehicle at the operator's station (Figure 3-13). The HHRC power junction connects to the back of the PMC. Refer to the wiring diagram (WD-5823101) in the Appendix (Section 11).

Note: Do not connect or disconnect the HHRC cable when power is on.

Note: If two HHRCs are used with a mast system, there must be two different communication addresses. Ensuring that the HHRCs are on different communication addresses can be done by checking the HHRCs' part numbers. They should have different part numbers. P/N: 5831101 goes to communication address 1, and P/N: 5831102 goes to communication address 2. Either HHRC can be used independently and will plug to either port.



Figure 3-13 HHRC Power Junction

4 Technical Data

Night Scan Powerlite IQ (includes standard, Xtreme and Profiler models)	2.3	3.0	4.5	Xtreme 6.0	Xtreme 7.5
Extended Height (ft / m)	7.5 / 2.3	10 / 3.0	15 / 4.5	20 / 6.0	25 / 7.5
System Weight Range (lb / kg)	125 - 179 / 57- 81			161 - 199 / 73 - 91	
Mast Control System Input Voltage	12VDC - 24VDC				
Mast Control System Current	14A Max at 12VDC 10A Max at 24VDC				
Lighting Input Voltage(DC lights)	12VDC - 24VDC				
Lighting Current (DC lights)	50A Max at 12VDC 25A Max at 24 VDC				
Lighting Input Voltage (AC lights)	110VAC - 220VAC (50 or 60 Hz)				
Lighting Current (AC lights)	40A Max at 120VAC 28A Max at 220VAC				
Mast Operating Pressure (psi/bar)	20 / 1.4 Max into Mast		[100 / 6.9 Max into Regulator]		
Approximate Mast Air Volume (cubic feet / cubic meters)	1.7 / 0.05	2.6 / 0.07	3.9 / 0.11	5.5 / 0.16	6.6 / 0.19
Number of Tubes	3	5			
Tube Diameter Range (in / mm)	3.5 to 2.5 (89 to 64)	5 to 3 (127 to 76)			
System Operating Temperature	-22 to 149 °F / -30 to 65 °C				
System Storage Temperature	-40 to 149 °F / -40 to 65 °C				
Maximum Deployment Angle	±10° (17.6% Grade)			±5° (9% Grade)	
Deployment Wind Speed (mph/km/h)	40 max / 64 max				
Altitude Above Sea Level (ft / m)	15,000 / 4572 Max				
Time to Light (seconds)	8	12	14	17	21
*Survival Wind Speed (mph / km/h)	114 - 140/ 184 - 225	86 - 140/ 138 - 225	69 - 118/ 111 - 190	69 - 94/ 103 - 151	62 - 78/ 100 - 126
Auto Deploy and Auto Stow®	Yes				
Number of Lights Available	4	4 or 6		2,4,or 6	2 or 4
Light Type Available	LED				
Maximum Lumens	80000	220000		210000	140000
Full Pan and Tilt Positioning	Yes				
Opposable Light Fixtures	Yes				
Profiler - Space Saving Fixture Option	No	Yes (2 or 3 lights)		No	
Beacon Light Option Available	Yes				
Camera Option Available	Yes				
D-TEC Option Available	Yes				
Airborn Noise Emissions Per EN ISO 3744:2010	equivalent A-weighted sound pressure level at the operating position is less than 70 dB(A)				

*Varies depending on light package - NFPA 125% Safety Factor

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5 Installation

This section describes the physical and electrical installation of the Night Scan Powerlite IQ and Night Scan Xtreme IQ and provides the general procedures that must be followed to ensure a successful installation. Be sure to read and understand the entire installation procedure and the Safety Summary Section 1 before beginning installation.

5.1 Mounting Location Requirements

The following factors must be included when selecting an appropriate mounting location.

1. Your system is designed to withstand adverse weather conditions, however it cannot be submerged in water. If the system is mounted in a well, provide adequate drainage. A minimum of four 1 inch (25 mm) diameter drain holes (one per corner) are recommended.
2. Ensure that the mast base and saddle are on a flat surface and in the same plane. The mast stowed position is set at the factory based on a level surface. If the system is not level, the stowed position may need adjusted as described in Section 7.6.
3. The installed elevation of the bottom of the mast base shall be at least 2.7 meters (8.8 feet) above ground level to prevent reach of upper extremities during operation. Alternatively, lower elevations are permitted if the mast is properly guarded by the installer or offset towards the middle of the roof with reach limited by vehicle structure to prevent contact with the mast during operation.
4. It is important that both the base and the saddle be securely mounted to a sturdy roof or platform which will not overturn during operational loading of the mast. The surface must be reinforced to withstand the load at the different points on the mast that can be expected during operation as shown in Figure 5-1. These are maximum load estimates placed downward and sometimes upward on the vehicle top by the mast. Note the loading is reduced for the 2.3 model (see TP-4602001).



Figure 5-1 Reaction Loads on Mounting Structure

5.2 Recommended Installation Tools

Table 5-1 lists recommended tools and materials for installation.

Table 5-1 Recommended Installation Tools & Materials

Tools and Materials		
Safety Glasses	Safety Gloves	Safety Shoes
Hard Hat or Helmet	Hearing Protection	Crimping Tool or Solder Set
Wrenches	Screwdrivers	Multimeter (to verify power is turned off)
Torque Wrench	Drill	Knife or Scissors to Cut Crate Band
Wire Cutter/Stripper	RTV Silicone	1/2 inch or M12 Mounting Hardware (6 each)
Shop Rags	Hoist (minimum 500 lb (227 kg) capacity)	
Note: Depending on the national and local standards and codes of practice, and the environment, additional personal protective equipment may be necessary.		

5.3 Unpacking & Handling

Unpack and handle the items as follows:

1. Carefully remove all the small cartons from the large crate or carton.
2. Remove all the items from the small cartons.
3. Ensure all components are included and that the required tools are readily available. The components in the system shipment are shown in Table 5-2.

Table 5-2 Components in the System Ship

Base Assembly	RCP Assembly	Lights	Wired HHRC (Optional)
Light Power Cable	Power Cable	Exhaust Hose	Supply Air Hose
Ferrite	Label Kit*	Wrench, HEX L-Key 6 mm**	Wrench, HEX L-Key 1.5 mm
Beacon Light (Optional)	Operator's Manual	D-TEC (Optional)	Drawings of your system to assist in the installation process

*The labels from the label kit can be applied where the operator deems appropriate in site of the operating station.

**The 6 mm wrench is used to emergency stow the mast. If necessary, it can also be used in conjunction with the 1.5 mm wrench to assist in disassembling the actuator. Contact The Will-Burt Company's Service for detailed instructions on this process.

4. Inspect for any shipping damage. If damage has occurred, notify the carrier.
5. Unbolt (for wooden crates) and remove any banding fixing the mast to the shipping crate or carton. Remove any banding fixing the mast.
6. Using a hoist, lift the unit from the shipping container by the mast tube at the labeled center of gravity symbol (Figure 5-2) position. Do not lift using the RCP or lights/camera. Lifting from locations other than those indicated could result in equipment damage. Use two point contact for slings to keep the load stable while moving.

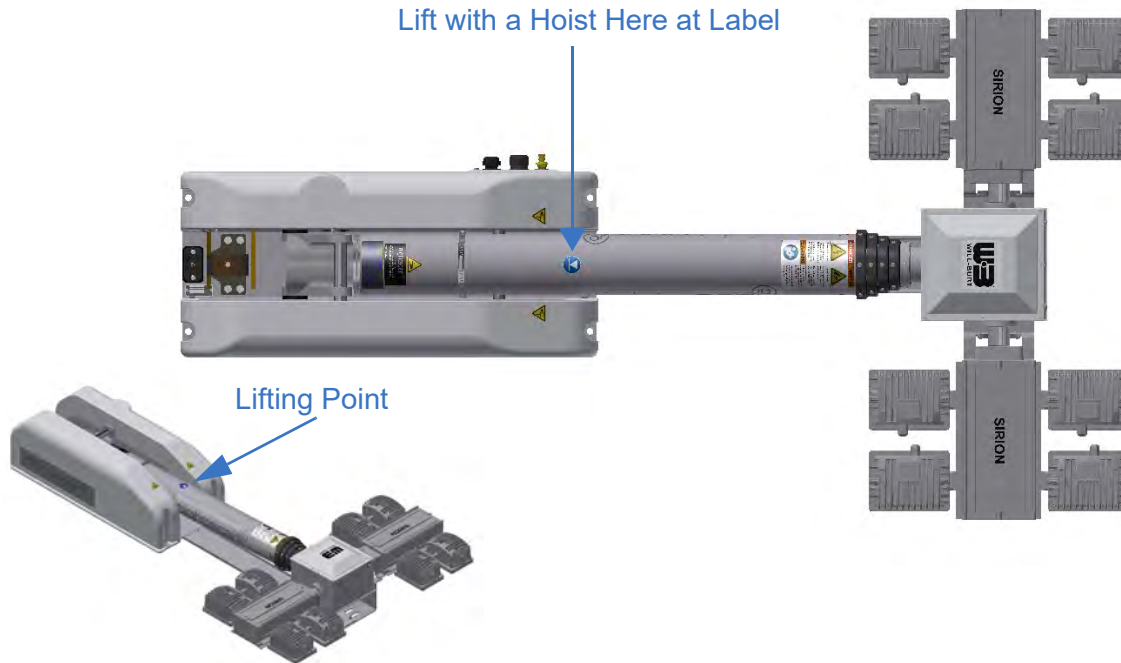


Figure 5-2 Center of Gravity Hoisting Position

5.4 Attaching to Mounting Location

Physically attach the system as follows:

1. Reference Figure 5-3 and Table 5-3 for standard mounting hole locations. These locations will vary based on which system you are using. Measure the hole locations to confirm or use the unit as a template to mark before drilling. Drill six $\varnothing 9/16$ inch (or $\varnothing 14$ mm) mounting holes into the vehicle mounting structure in the mounting locations. There are four holes for the base, and two holes for the saddle. Drill appropriate holes for cable installation and remove any sharp edges that might damage the cables.
2. Mounting hardware is supplied by the customer. Stainless steel or stronger bolts are recommended. It is up to the installer to ensure proper thread locking methods are used to keep the bolts from backing out due to vehicle vibration. Attach the base and saddle to the mounting surface in six locations using 1/2 inch (or M12) bolts/washers. Torque all hardware as appropriate for its material and size. The recommended installation torque value for 1/2 inch stainless steel bolts is 38.3-44.17 ft.-lb. (52-60 Nm). The recommended installation torque for M12 stainless steel is 29.58-35.42 ft.-lb. (40-48 Nm). For other materials, use appropriate torque values. The two saddle bolts can be attached later when power is available since the mast has to be partially raised to insert the bolts. Adjust the location of the saddle if necessary so that the saddle flanges do not hang up on the lights when the unit is raised.

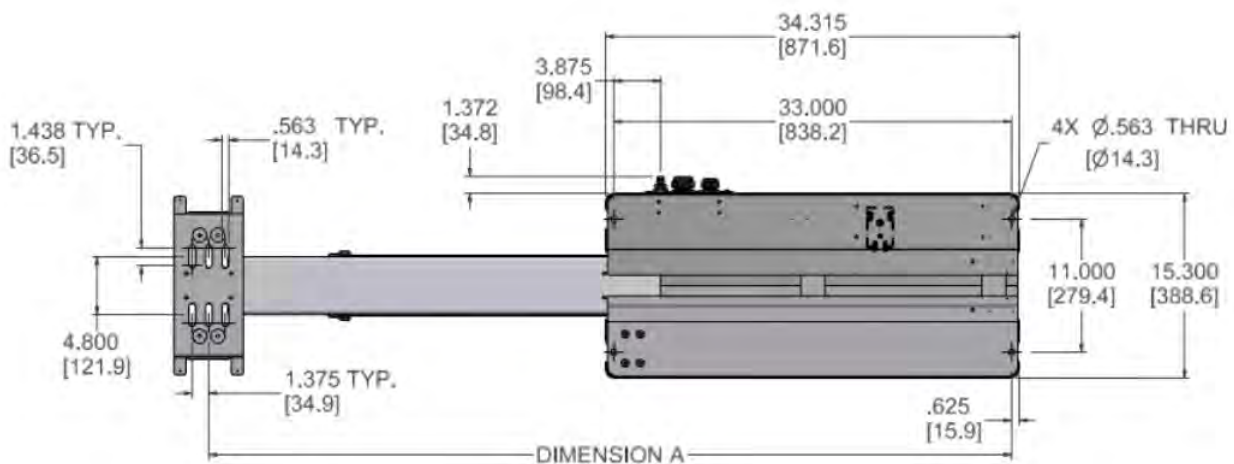


Figure 5-3 Installation Dimensions (Bottom View) Inches [mm]

Table 5-3 Installation Dimensions

Model	Dimension A Value (from Figure 5-3)
2.3	46.190 inches [1173.2 mm]
3.0	54.531 inches [1385 mm]
4.5	66.573 inches [1691 mm]
Night Scan Xtreme IQ 6.0	83.231 inches [2114 mm]
Night Scan Xtreme IQ 7.5	94.231 inches [2393.5 mm]

Note: The exact dimensions of your system will vary based on the components included. Additional room may be required for additional components, such as optional cameras or beacon lights.

5.5 Attaching the Air Connections

Two barbed fittings are provided for connecting the air-lines required to pressurize and exhaust the system (see Figure 5-4). Air may be supplied externally by a compressor or other source of clean, dry air with a maximum pressure of 100 psi (6.9 bar). Your system has an internal regulator factory set to 20 psi (1.4 bar). The inlet fitting is to be used with a 3/8 inch (or equivalent metric) inside diameter air hose rated for the pressure supplied in combination with environmental factors, which may derate the hose (e.g. high temperatures). The unit is supplied with 20 feet (6m) of air hose labeled SUPPLY to designate the pressurized air to be routed to the INLET of the unit. The exhaust fitting is to be used with a 1/2 inch (or equivalent metric) inside diameter air hose. The unit is supplied with 20 feet (6 m) of air hose labeled EXHAUST to designate its use to route exhausted air to a location where it will not expel air or water onto personnel or equipment sensitive to moisture. The different size hose with the labeled intention of the hose is designed to prevent pressurized air to be routed into the EXHAUST of the unit.

If the unit was provided with an optional on-board air compressor (replacing the air valve assembly), only the exhaust hose need be connected. The exhaust hose must be routed to a location where it will not expel air or water onto personnel or equipment sensitive to moisture.



Figure 5-4 Air Supply Connections

5.6 Installing Remote Control

This section provides information to install the remote control. Several options are available. Follow the instructions appropriate for your system.

5.6.1 Panel Mount Control (PMC)

Go to Section 5.6.2 if you are installing the wired Hand Held Remote Control (HHRC).

Note: The PMC must already be installed before the HHRC can be installed.

The PMC should be located where the operator has line-of-sight to the mast operating space. The PMC should be located in a protected, dry location (the PMC is IP54). To attach the PMC:

1. Cut the panel according to the dimensions shown in Figure 5-5.
2. Place the PMC through the panel cutout and secure with the provided M6 screws. It is recommended to install with a torque of 20-24 in.-lb. (2.2-2.7 Nm).

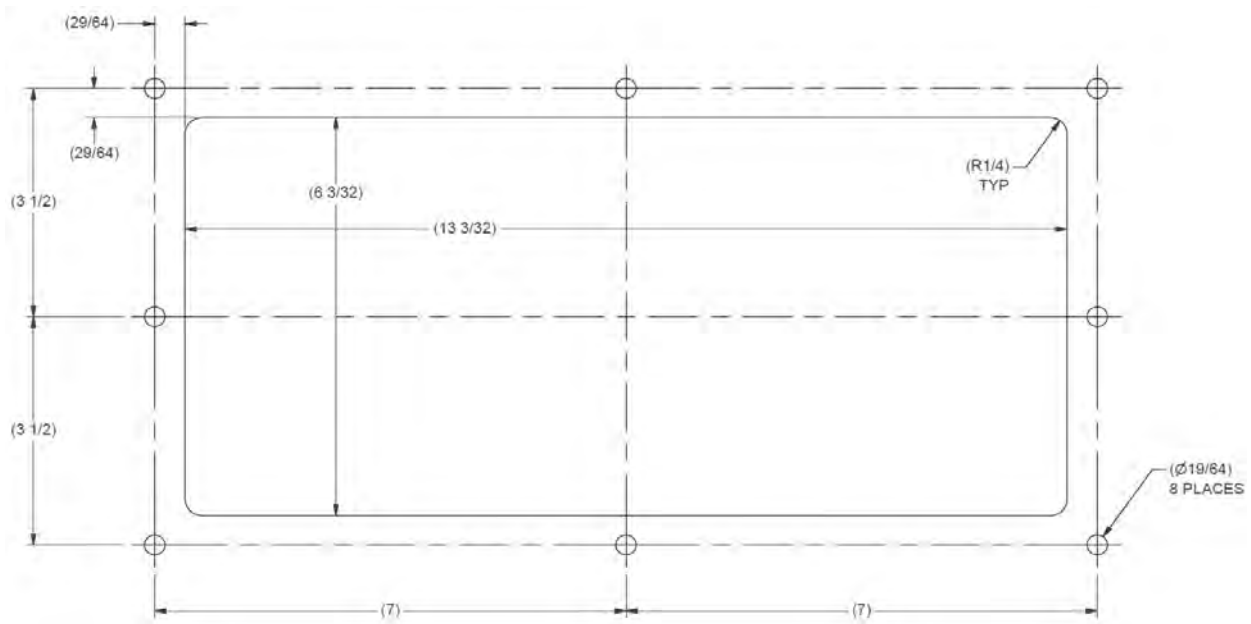


Figure 5-5 PMC Cutout Dimensions

3. To wire the PMC, plug the PMC connectors into the matching I/O module connectors (I/O module located on the base of the mast, on the opposite side of the actuator). Match wires with like colors (red connects with red, black connects with black, etc.) (Figure 5-6).



Figure 5-6 Plug PMC Connectors Into Matching I/O Module Connectors

5.6.2 Wired Hand Held Remote Control (HHRC)

Go to section 5.6.1 if you are installing the Panel Mount Control (PMC). This section describes how to install the Wired HHRC.

Note: The PMC must already be installed and powered down before the HHRC can be installed. Do not connect or disconnect the HHRC cable when power is on.

To install the HHRC, plug the HHRC cable into the PMC (Figure 5-7).



Figure 5-7 Plug HHRC Cable into PMC

If desired, the HHRC can be installed with a bulkhead connector. Installing the HHRC with the provided bulkhead connector allows the operator to remotely install the connection point for the HHRC at the operator control location. The operator station should be located where the operator has line-of-sight to the mast operating space. The bulkhead and HHRC should be located in a protected, dry location (the HHRC is IP67).

To attach the bulkhead:

1. Drill clearance holes for 1/4-20 screws located per Figure 5-8. Either two hole pattern can be selected according to the space available.
2. Using the screws, washers, and nuts provided, attach the bulkhead to the vehicle. Torque the 1/4-20 screws to 62-70 in.-lb. (7-8 Nm). Alternative M6 stainless steel hardware (not provided) can be used.
3. Attach the ground wire to the vehicle.

- Attach the HHRC connector to the bulkhead connector by rotating the lug until it locks in place. Note: Do not connect or disconnect the HHRC cable when power is on.

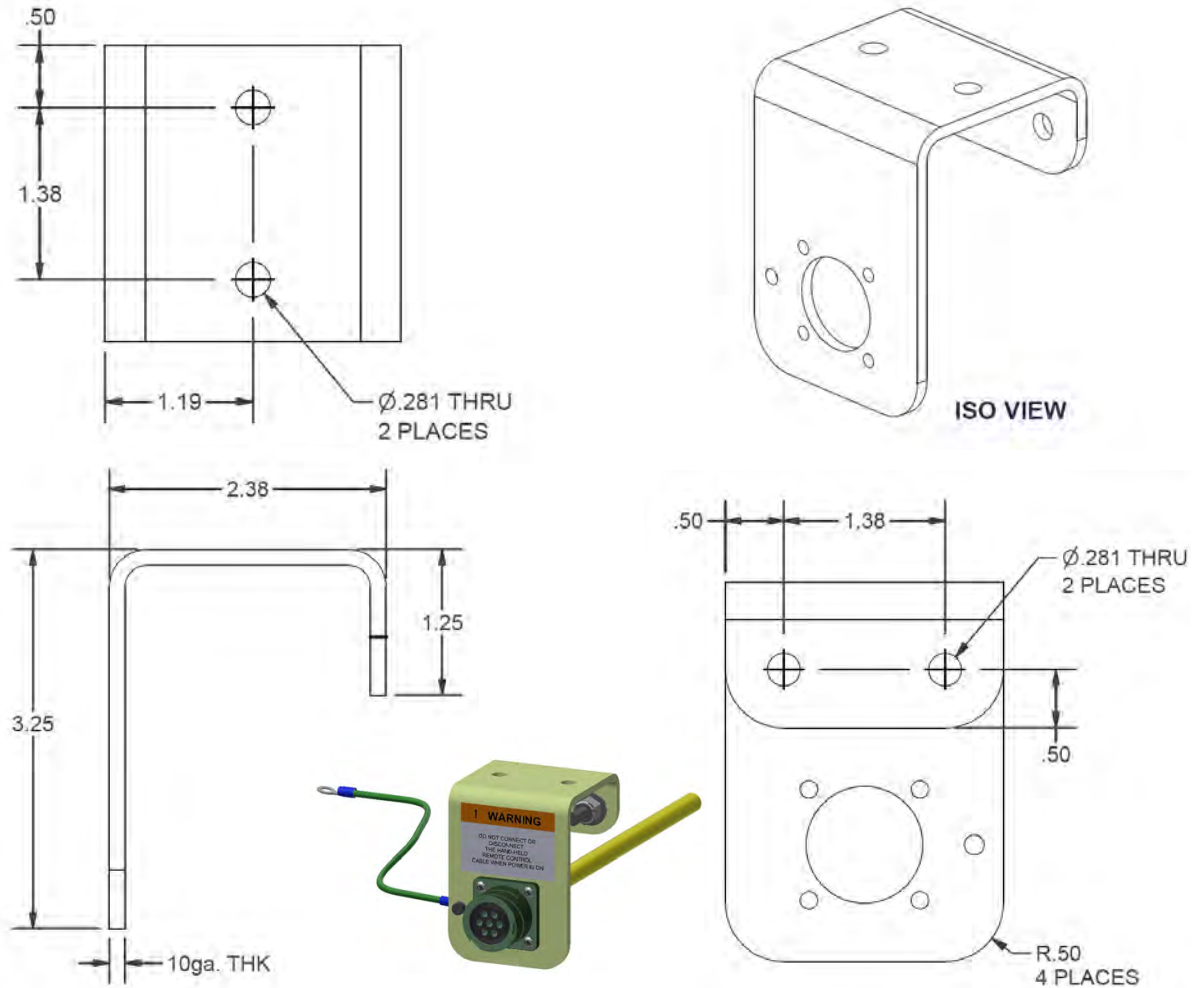


Figure 5-8 HHRC Bulkhead Bracket Installation Dimensions

- Attach the bulkhead connector to the back of the PMC. Terminate wires to the terminal strip as shown in the wiring diagram (WD-5823101) in the Appendix in Section 11.

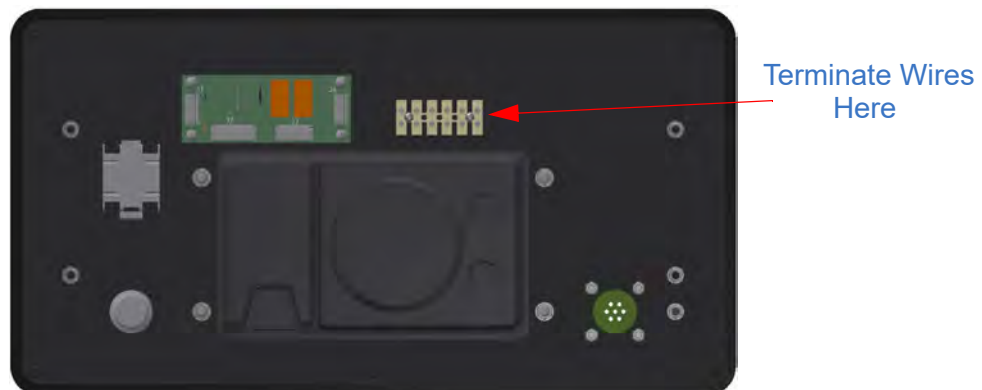


Figure 5-9 Plug Bulkhead Connectors Here

The HHRC comes with a holder (see Figure 5-10) to hang the HHRC. Attach the HHRC holder at a convenient location to hang the HHRC in a dry, protected environment. To install the holder:

1. Drill two holes 1.25 inches (31.75 mm) apart as appropriate for the screws and mounting method (nut/bolt or sheet metal screw or other) selected.
2. The mounting screws are provided by the installer based on the method of attaching selected. The recommended screw size is M4 flat head to sit flush with the surface after installation. Use the proper installation torque for the screw selected and use thread locking techniques to prevent the screws from backing out due to vibration.
3. Place the HHRC on the holder.

Warning labels are shipped loose with the mast. These labels should be posted in view of the operator.

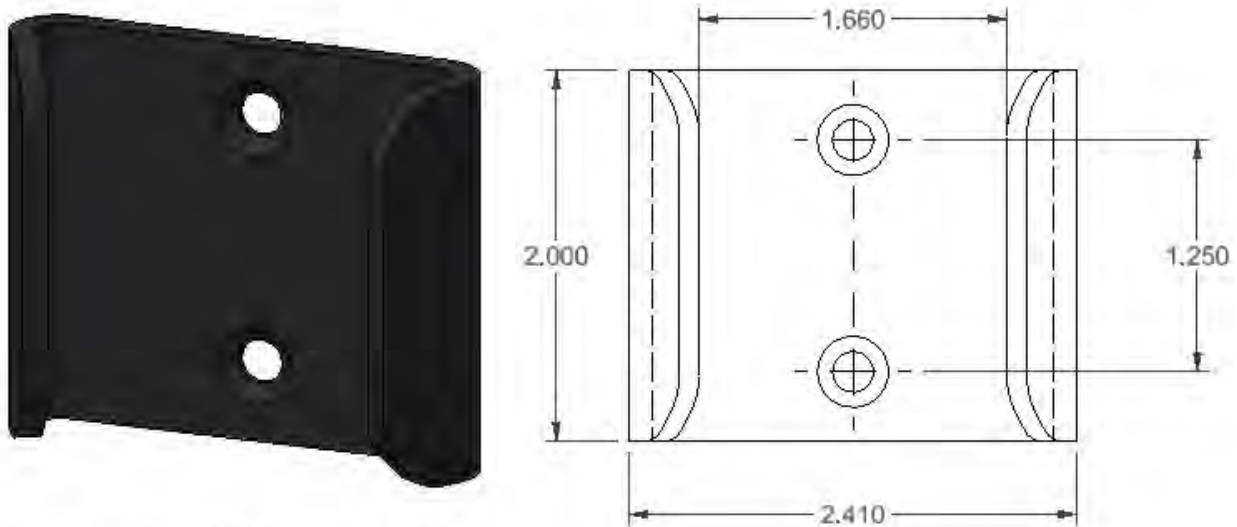


Figure 5-10 HHRC Holder

5.7 Electrical Installation

Refer to the wiring diagrams in the Appendix section for electrical connections. These diagrams are also available at www.willburt.com. Be sure to follow the torque requirements shown on the wiring diagram. See Figure 5-11 for wiring access panel. To electrically connect the mast system, proceed as follows:

1. Remove the screws from the left cover of the base (as viewed from the back of the unit) and remove the cover.
2. Run the PMC control cable into the base through the access panel. Run all power/data cables into the base through the access panel.

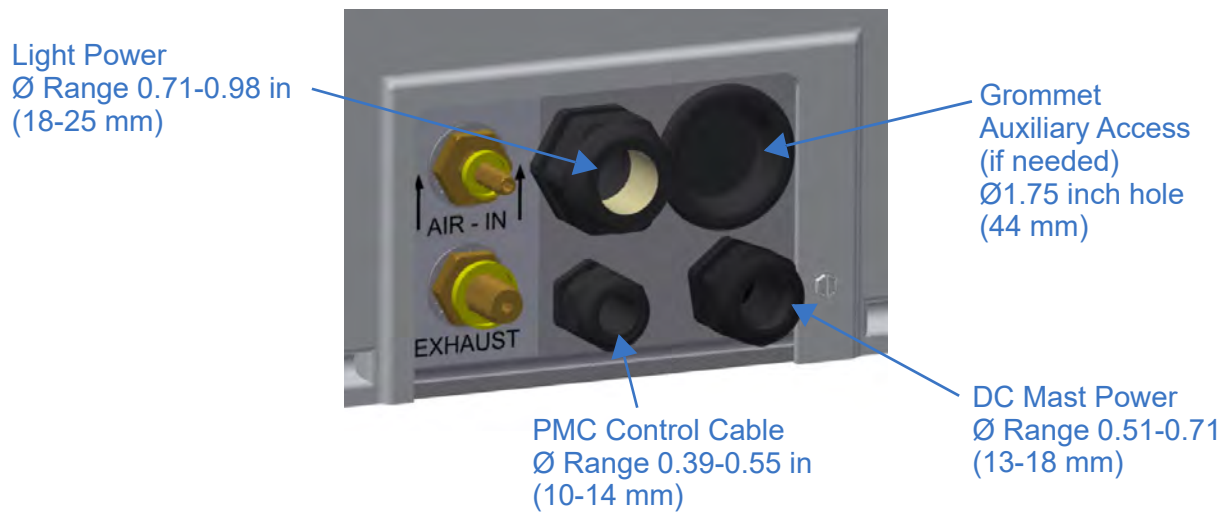


Figure 5-11 Wiring Access Panel

5.7.1 Wiring DC Source Power to the System

The mast control system requires DC power regardless of what power is required by the lighting circuits (AC or DC). Source DC power is provided by the installer from the vehicle battery. The power supply must be capable of supplying the minimum Amps to the mast as instructed below.

The installer is responsible for providing the means to remove/isolate power from the mast and permit the operator to follow proper lock-out tag-out procedures for maintenance or troubleshooting. Power cables for the mast controls are provided by the installer. See the wiring diagrams in the Appendix (Section 11) for additional information on over-current protection and calculating cable size.

For 12V systems with DC lights, the cables must:

- Be type SJOOW or equivalent.
- Be 2 AWG (or 35mm²) conductors or (2) size 4 AWG (or 25mm²) per phase.
- Have a maximum length for acceptable voltage drop of 20 feet (6.1 meters).
- The power supply must be capable of supplying 70A.
- The installer must provide over-current protection set to 100A (see WD-5753601 in the Appendix, Section 11).

For 24V systems with DC lights, the cables must:

- Be type SJOOW or equivalent.
- Be 8 AWG (or 10mm²) conductors or (2) size 10 AWG (or 6mm²) per phase.
- Have a maximum length for acceptable voltage drop of 20 feet (6.1 meters).
- The power supply must be capable of supplying 40A.
- The installer must provide over-current protection set to 50A (see WD-5753601 in the Appendix, Section 11).

If 12 VDC lights, because of the higher current draw, line drop from the source to the unit may be a problem. The user should calculate the line drop for the lights used based on the cable size/length of run. The lights need 12 VDC minimum at the I/O module under all expected operating conditions.

For 12V systems with AC lights, the cables must:

- Be type SOOW, SJOOW or equivalent.
- Be 8 AWG (or 10mm²) conductors or (2) size 10 AWG (or 6mm²) per phase.
- Have a maximum length for acceptable voltage drop of 20 feet (6.1 meters).
- The power supply must be capable of supplying 14A.
- The installer must provide over-current protection set at 30A (see WD-5753601 in the Appendix, Section 11).

For 24V systems with AC lights, the cables must:

- Be type SOOW, SJOOW or equivalent.
 - Be 14 AWG (or 2.5mm²) conductors.
 - Have a maximum length for acceptable voltage drop of 20 feet (6.1 meters).
 - The power supply must be capable of supplying 10A.
 - The installer must provide over-current protection set at 10A (see WD-5753601 in the Appendix, Section 11).
1. Secure all loose wires and ferrites with wire ties.
 2. Attach the 0.709" inside diameter ferrite (P/N: 211001, shipped with the mast) around the DC power cable (ships loose with mast) as it enters the base. This ferrite provides EMI (electromagnetic interference) filtering.
 3. Connect the DC battery power to the DC Power In + (red or white) and - (black) connections on the I/O module. Torque the 1/4"-20 nuts to 62-70 in-lb (7-8Nm).



Figure 5-12 Connect DC Power

4. Once all wiring connections are complete, replace the base cover.

5.7.2 Wiring AC Source Power to the Light Circuits (AC Lights Only)

If DC lights are used, the AC module assembly is not installed. This step is only applicable when AC lights are installed. Depending on the light package installed on the unit, the source power for the left and right light circuits will change to match the light fixtures. Be sure to confirm the installed light fixture voltage requirements before applying light power to avoid damaging equipment.

Power cables for the light power are provided by the installer. It is the responsibility of the installer to provide over-current protection for both lighting circuits.

Note: Installer to add 1 ferrite (P/N: 211009) on the incoming power line and the second ferrite (P/N: 211009) on the neutral for AC lights.

The over-current protection on each circuit should be sized for the calculated current draw for the installed lights (and not based on wire size current capacity). It is also the responsibility of the installer to provide a means to remove/isolate power from the mast light circuits and permit the operator to follow proper lock-out tag-out procedures for maintenance or troubleshooting. See the wiring diagrams in the Appendix (Section 11) for additional information on over-current protection and calculating cable size.

To wire the light power to the AC module assembly, the cables must:

- Be type SOOW, SJOOW or equivalent.
- Be a minimum of 14 AWG (or 2.5mm²) conductors.
- Have a maximum length for acceptable voltage drop of 50 feet (15.24 meters).
- The power supply must be capable of supplying 10A.
- The installer must provide over-current protection set at 10A per side. See WD-5753601 in the Appendix (Section 11).

1. Remove the AC module assembly cover by loosening the #6-32 screws.
2. Connect the AC light power to the “LEFT POWER IN” (LEFT POWER) and “RIGHT POWER IN” (RIGHT POWER) on the AC module assembly. Refer to the wiring diagram (WD-5753601 Sheet 3) in the Appendix in Section 11.

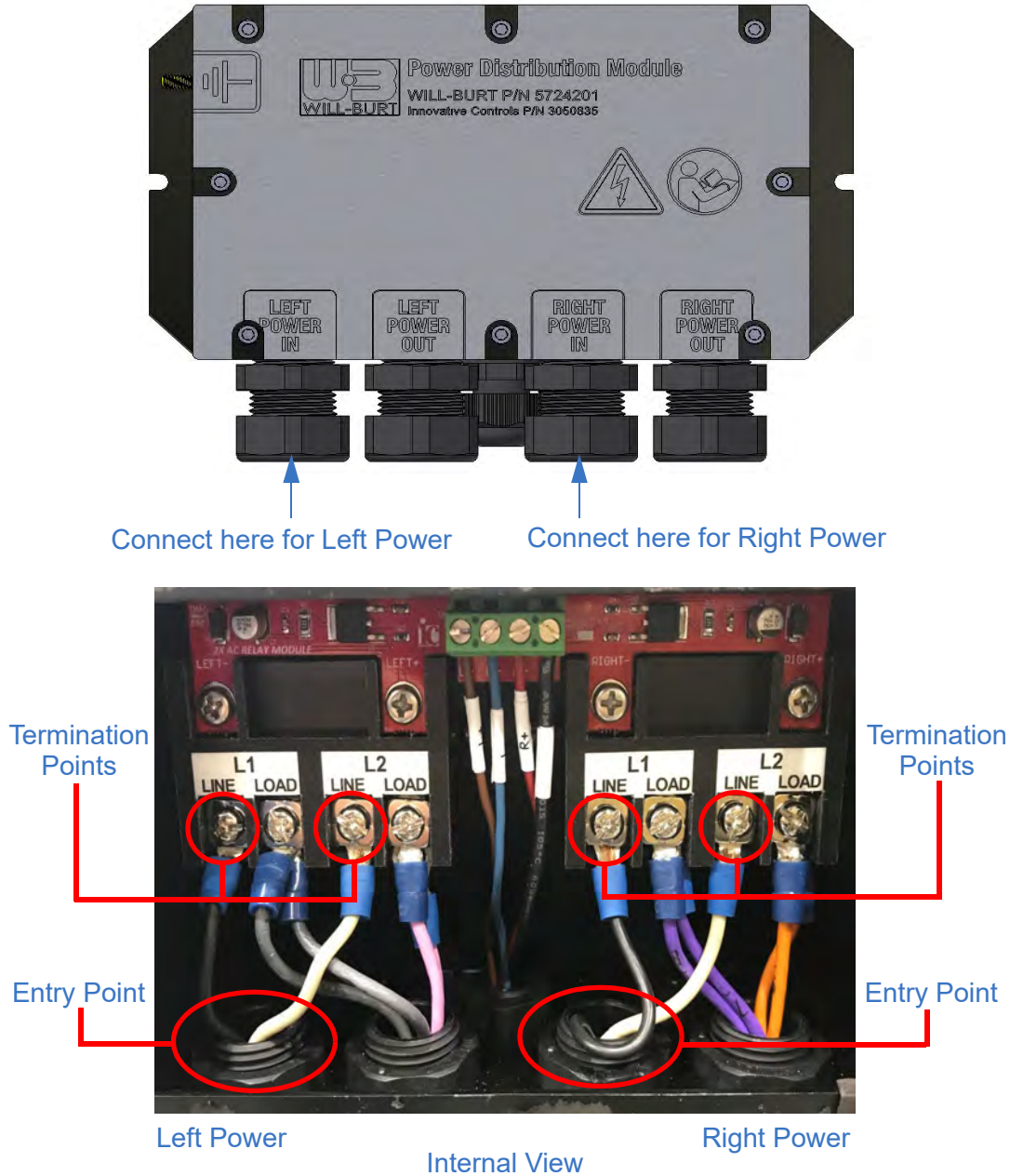


Figure 5-13 Connect Light Power to AC Module Assembly (P/N: 5724201)

3. Attach the 8.99mm inside diameter ferrite (P/N: 211009, shipped with the mast) around the AC power cable as it enters the base. This ferrite provides EMI filtering for the lights. Attach the other ferrite to the neutral for AC lights.
4. Secure all loose wires and ferrites with wire ties.

5. Replace the AC module assembly cover. Torque the #6-32 screws to 8-10 in-lb (0.9-1.1 Nm).
6. Connect the ground to the ground bar mounted on the base below the I/O module.
7. Replace the base cover.

Light power cables can be purchased from The Will-Burt Company or provided by the installer. For CE conformity, the installer must provide the light power cables in conformance with applicable Directives. Cables supplied by The Will-Burt Company do not have blue color for conductor identification.

5.7.3 Wiring Vehicle Interlock on Sensor

The Night Scan Powerlite IQ and Night Scan Xtreme IQ are designed to allow for integration into vehicle safety circuitry to eliminate the possibility of driving with the mast extended. Usage shall be used to comply with various safety standards such as NFPA-1901. Possible Vehicle Interlock systems include a customer-supplied flashing warning lamp in the cab, or wiring into the parking brake or transmission circuit. The customer is responsible for determining which system works best for the specific application. The installer shall ensure that voltage is only supplied to the mast system when the vehicle is stationary.

Vehicle safety circuitry interfaces with the mast system through a dedicated proximity sensor located on the mast base. This sensor and associated customer provided wiring are completely independent from the mast control system and no wiring connections are made within the mast control box or junction box. The interlock circuit should be wired directly to the sensor.

5.7.3.1 Sensor Adjustment Procedure:

The proximity sensor is located on the base (Figure 5-14). It is factory set to the proper distance from the moving base section. Over time, it may be necessary to adjust the sensor distance if it is no longer sensing the base section when nested or too close to the moving base section. The sensor should never be allowed to contact the moving base section. To achieve this, with the mast nested and the interlock circuit powered, loosen the nut and move the sensor to the location when the LED indicator light activates (approximately 6 mm from the base section). From that position, adjust the sensor 1 mm closer to the moving base section and tighten the nut to 67-80 N·m. Ensure the lock washer is seated on both sides. The end of the sensor should be approximately 5 mm away from the moving base section after adjustment.

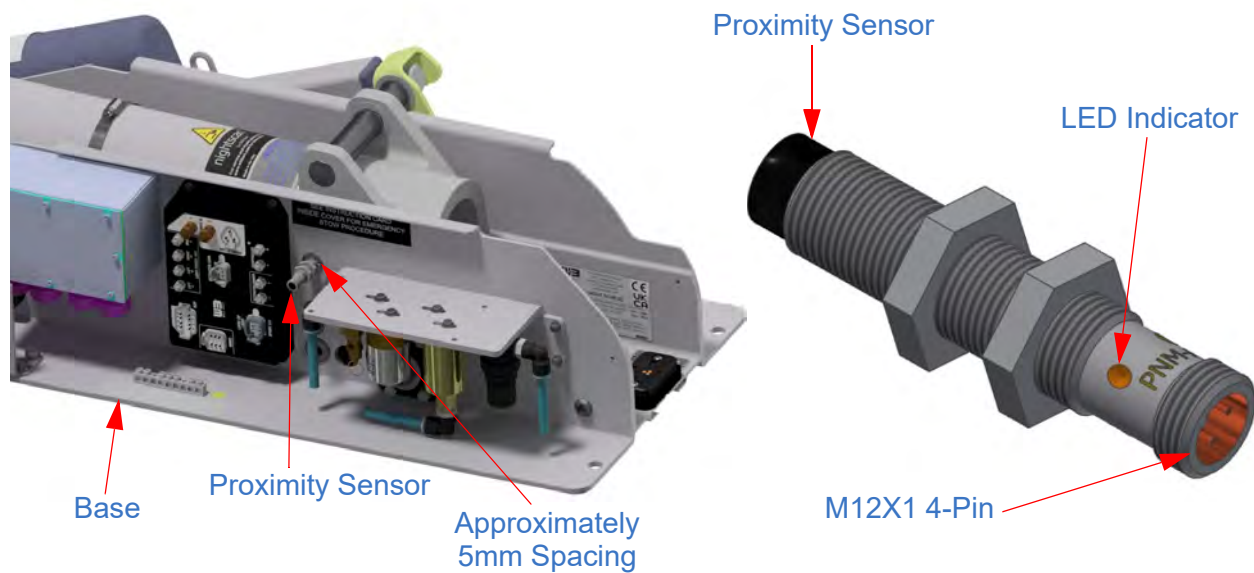


Figure 5-14 Proximity Sensor

Proximity Sensor Specifications:

- 10-30VDC Input Power
- 100 mA max
- Normally Open (closes when mast is nested)
- NPN
- 7mm sensing range
- IP 65/66/67/68/69K

The following diagram (Figure 5-15) shows a possible vehicle interlock circuit. Other arrangements can also be constructed. The customer is responsible for choosing the proper components and providing power to the circuit. The proximity sensor switch is closed when the mast is nested.

The customer-supplied proximity sensor cable and mating connector are as follows:

- Standard female M12x1 Sealed 4-Socket Connector
- Wire 22 AWG (0.5 mm²)

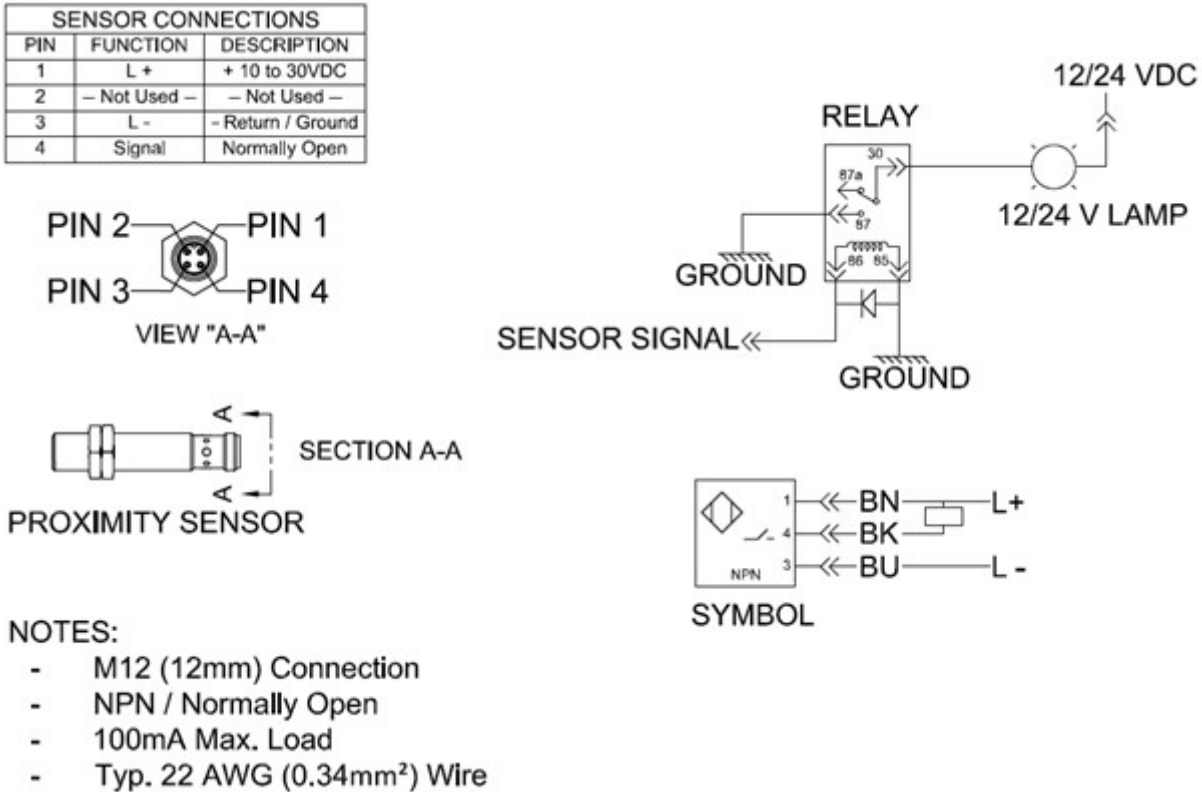


Figure 5-15 Vehicle Interlock Circuit Wiring Diagram

5.8 Test the Installation

Review the Operation Section (Section 6) and Safety Summary (Section 1) and observe all safety dangers, warnings, and cautions before proceeding to test the installation. If any part of the testing fails, check the PMC display and I/O module.

To test the installation, proceed as follows:

1. Reconnect power to the mast and light circuits.
2. Turn the E-Stop button to reset and enable the system (if it was pressed).

3. Push and hold the start button until the system begins power-up.
4. Check for proper clearance above the mast.
5. Press the “Mast Up” button until the mast tilts to vertical and the mast starts to raise. Once the mast starts to raise, release the “Mast Up” button.
6. Press each “Light” button several times to turn the lights on and off.
7. If equipped with optional HHRC: Swivel the “Tilt-Up” and “Tilt-Down” joystick one direction at a time. Swivel the “Pan-Left” and “Pan-Right” joystick one direction at a time. Check the lights again.
8. Press and hold the “Mast Up” button. When the mast is fully extended, release the “Mast Up” button.
9. Press each “Light” button several times to turn the lights on and off.
10. Tilt and pan the lights using the PMC, and check the lights again.
11. If the optional beacon light is installed, press the “AUX” button several times to turn the light on and off.
12. To ensure that the mast is properly sealed, while the mast is fully extended, watch for any type of mast lowering.
13. Press and hold the “Mast Down” button until the mast has completely stowed and then release the button once the PMC display shows the “Mast Stowed” green bar. The mast will power off automatically upon reaching the stowed position.
14. If using HHRC: Restart the system and rapidly press the “Mast Up” button two times to invoke the Auto Up feature. Once the mast has fully tilted to the vertical position, press the “Mast Down” button two times rapidly to invoke the Auto Stow® feature. The mast will stow and power itself off.

Note: Using the HHRC will only let you auto extend the mast to the 90° quadrant.

15. If using PMC: Restart the system and select “Auto Up”. The display will show quadrant options. These options are different angles the light pan can be positioned. Select the desired quadrant. Once the mast has fully extended, select the Auto Stow® feature. The mast will stow and power itself off.

Note: Before delivery of a new system, the 90° and 0° limits are set and tested for a flat surface. If the mounting surface is not flat, the 90° and 0° limits may need adjusted to function properly. If necessary, refer to Section 7.6 for details on adjusting the 90° and 0° limits.

6 Operation

This section describes the operation of the system. Be sure to read and understand the entire operation procedure and the Safety Summary (Section 1) before beginning operation.

6.1 Pre-Operation Check

Before operating the system:

1. Ensure that there are no overhead obstructions, and that there are no power lines within 20 feet (6 meters) of the mast.
2. Visually inspect the system for damage. If damage is apparent, do not use the mast and have it serviced prior to use.
3. Check for and remove any objects which might obstruct motion of the mast, cause binding or hinder mast function.

6.2 Control Functions

Using the PMC (Figure 6-1) and/or the HHRC (Figure 6-2), the operator can perform an emergency stop, move the mast up and down, tilt the lights up and down, pan the lights right and left, turn the lights on and off, and turn the optional beacon light on and off.

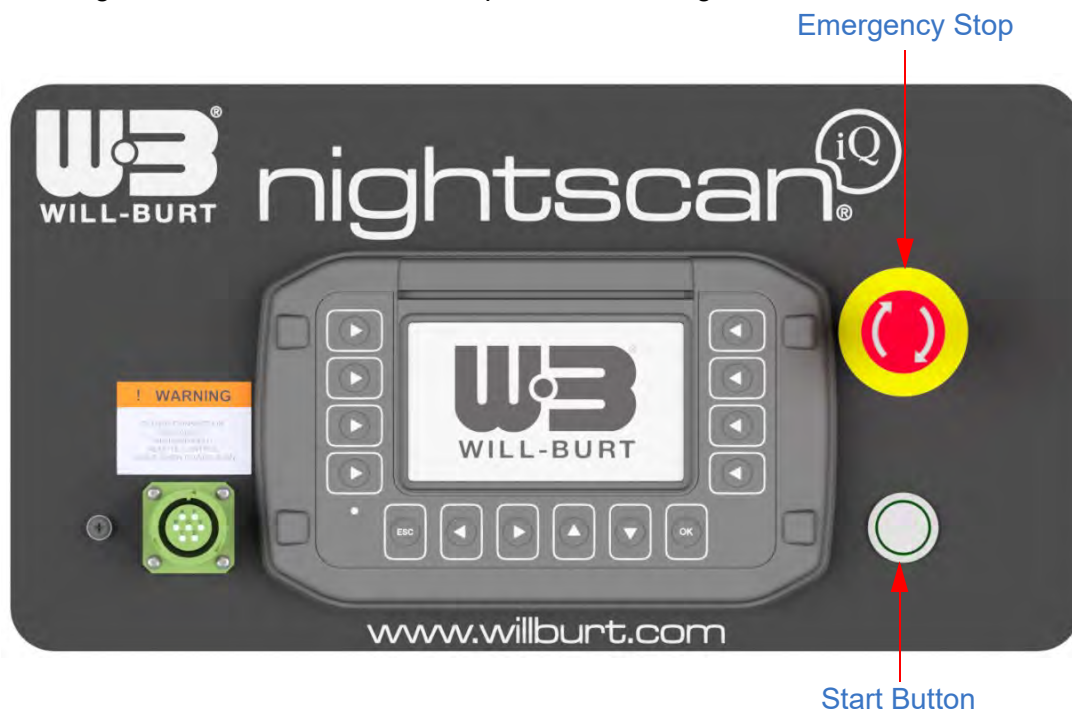


Figure 6-1 PMC Control Functions

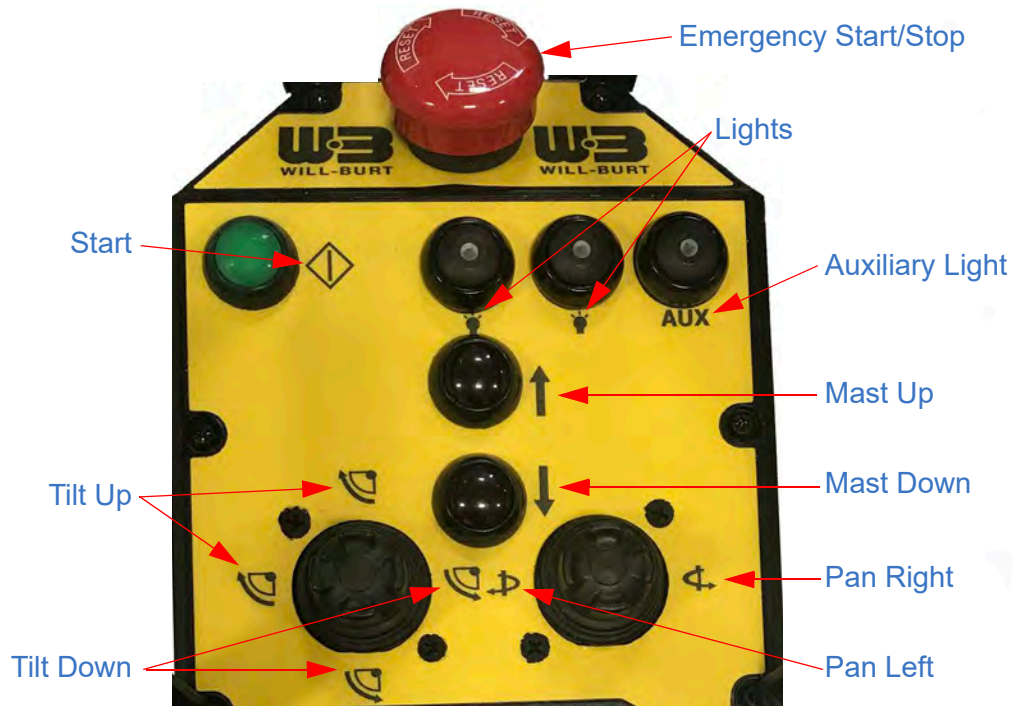


Figure 6-2 Optional HHRC Control Functions

6.3 Quick Operation Summary

The following is a quick summary of the operation of the system. Detailed steps follow the quick summary.

If an emergency stop (E-Stop) is required at any time, press the “E-Stop” button. This will halt motion and disable all operation. When the E-Stop is used, a red block will appear informing the operator that the mast has been stopped (Figure 6-3).



Figure 6-3 Emergency Stop Screen

The quick operation summary is as follows:

1. Ensure the vehicle is stationary and the parking brake is engaged.
2. Ensure there are no obstructions in the mast operating space.
3. If the “E-Stop” was activated, it must be reset by turning to enable system operation. Do not reset the “E-Stop” until the cause of the event is corrected. Turn the red “E-Stop” button if needed.
4. Raise the mast to 90° and turn on the lights by performing one of the following steps:
 - HHRC Auto Up feature: Quickly press "Mast Up" twice to move mast to 90° and turn both banks of lights on. To abort the Auto Up feature, press any controller button.
 - HHRC manual extension: Press and hold "Mast Up" to raise the mast. Wait until the PMC display shows the RCP/Mast Control screen. Then press “Lights” to turn the lights on. The RCP will become active when the mast is at 90°.
 - PMC Auto Up feature: Press "Auto Up". The display will show quadrant options. These options are different angles the light pan can be positioned. Select the desired quadrant. Press “OK” to confirm. Turn both banks of lights on. To abort the Auto Up feature, press any controller button.
 - PMC manual extension: Press and hold "Mast Up" to raise the mast. Then press “Lights” to turn the lights on. The RCP will become active when the mast is at 90°.
5. If desired, raise the mast further by pressing "Mast Up".
6. Position the lights vertically by swiveling "Tilt Down" and "Tilt Up".
7. Position the lights horizontally by swiveling "Pan Right" and "Pan Left".
8. Use the "AUX" button to turn on the beacon light (if equipped).
9. If desired, lower the mast by pressing "Mast Down".

10. Stow the mast by performing one of the following steps:

- HHRC Auto Stow® feature: Quickly press "Mast Down" twice. It is recommended to use the Auto Stow® feature to stow the mast. To abort Auto Stow®, press any controller button.
- HHRC manual stow: Press and hold "Mast Down", releasing the button once the PMC display shows the "Mast Stowed" green bar. Ensure that the "Mast Down" button is released only after the PMC display shows the "Mast Stowed" green bar, which means the mast is stowed. The mast will power off automatically upon reaching the stowed position.
- PMC Auto Stow® feature: Press "Auto Stow". Press "OK" to confirm. It is recommended to use the Auto Stow® feature to stow the mast. To abort Auto Stow®, press any controller button.
- PMC manual stow: Press and hold "Mast Down", releasing the button once the PMC display shows the "Mast Stowed" green bar. Ensure that the "Mast Down" button is released only after the PMC display shows the "Mast Stowed" green bar, which means the mast is stowed. The mast will power off automatically upon reaching the stowed position.

Note: If a button was hit by mistake, a confirmation window for the unwanted function will pop up for 5 seconds. Hit "ESC" or ignore the window for 5 seconds and the window will clear.

6.3.1 NFPA Mode

For NFPA compliance, there are certain timers and functions the mast will follow:

- If the mast is powered up and does not move after minute, it will shut off automatically.
- Auto Stow® or manual stow will shut off the mast once the mast is fully in the saddle.

6.3.2 Conflicting Commands

Conflicting commands is when different commands on different controllers are given to the mast system at the same time. For example, if the HHRC "Mast Up" button was pressed at the same time as the PMC "Mast Down" button was pressed, the mast system is receiving conflicting commands.

If there are conflicting commands given to the mast system, whichever command was given first is the one the mast will perform. For example, if the HHRC "Mast Up" button was pressed at the same time as the PMC "Mast Down" button was pressed, the mast system will follow the command of whichever button was pressed first.

After the conflicting commands are given to the mast, the mast system will prevent the other controller(s) (the controller(s) that the mast system did not obey) from operating until both (or all) controllers are not used for 2 seconds. This 2 second pause gives the mast system time to reset and function properly. Once the pause is given, the mast system will be able to receive input from both (or all) controllers once again.

6.4 Initiating (Power-Up)

Perform the following to power up the system:

1. If the E-Stop was activated during prior use, it must be reset by turning to enable the system to power-up. Do not reset the E-Stop until the cause of the event is corrected. Turn the red E-Stop button if needed.
2. Press the start button on HHRC or the start button on panel to power-up the mast.

On initiation, the master controller in the RCP establishes communication with the other modules in the system. A screen will flash that shows that the mast is set up correctly and that it is ready for use (Figure 6-4). This screen will flash for a few seconds before going to the Tilt Control screen (Figure 6-5).

Note: The optional HHRC must be connected prior to power-up to be recognized by the controller.

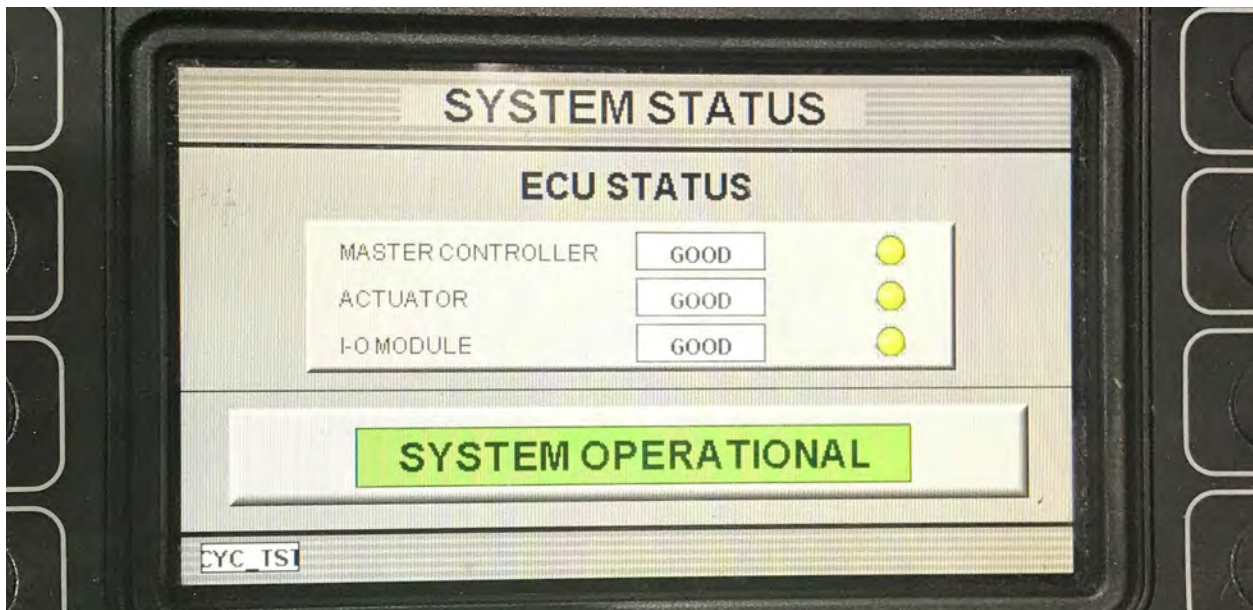


Figure 6-4 System Operational Screen



Figure 6-5 Mast is Fully and Properly Initiated Screen

If the master controller in the RCP cannot establish communication with the other modules in the system, an error is shown on the PMC display and the communication system stops (Figure 6-6). If this screen shows on the display, check the connections, resolve the issue and restart the mast system.

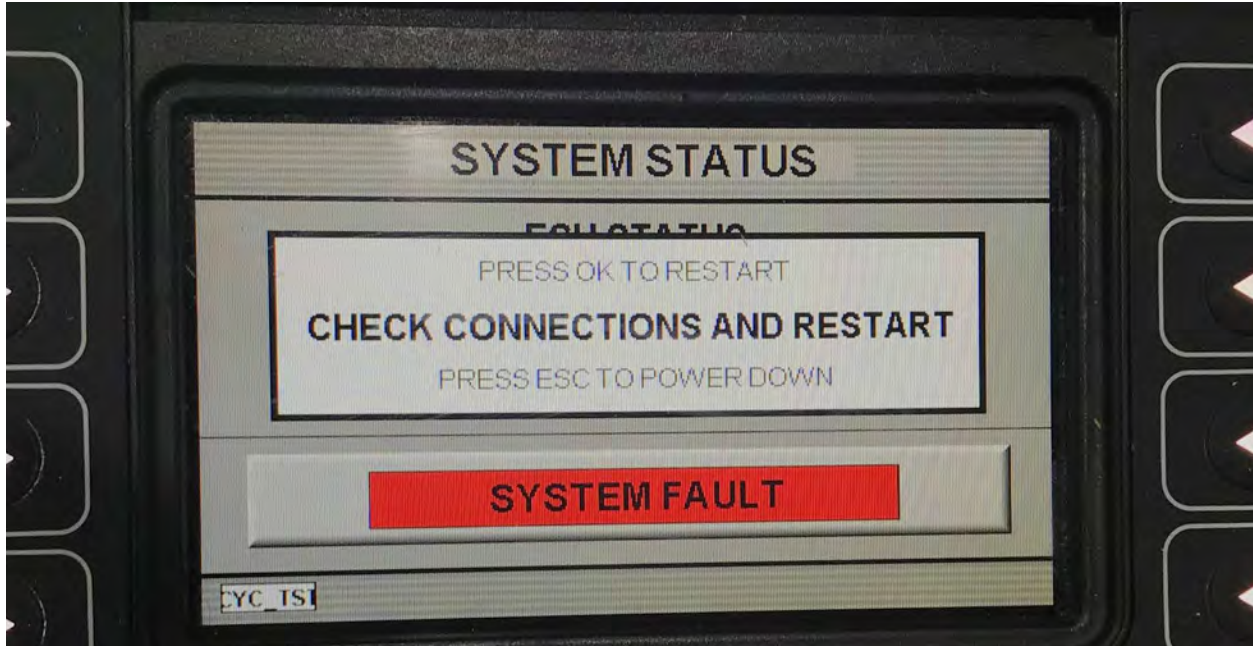


Figure 6-6 Check Connections Screen

6.5 Raising and Extending Mast

The mast is fully raised/tilted when it reaches the 90° position that is set in the Actuator Calibration screen (Section 7.6.2). Once the mast reaches this position, it can be extended.

The mast can be raised and extended by using:

- Auto Up® Feature
- "Mast Up"

6.5.1 Using Auto Up Feature

The Auto Up feature is the quickest and most reliable method to raise the mast to 90°, fully extend the mast, turn on the lights, and pan the lights. Using the Auto Up feature does not require the operator to stop the mast exactly at 90° before turning on the lights.

Using the Auto Up feature allows the user to fully tilt and extend the mast and have the lights automatically turn on and go to a preset position. The different position options are preset at the factory.

There are several advantages in using the Auto Up feature to raise the mast to 90°:

- The Auto Up feature automatically tilts the mast to 90°.
- The Auto Up feature allows the system to check its switches and better determine the 90° position.
- The Auto Up feature automatically turns on the lights.
- After the mast is tilted to 90°, the mast will also extend.
- When using PMC: While the mast is extending, the lights will turn on and tilt and pan to the chosen quadrant position.

The Auto Up sequence can be aborted by pushing any of the buttons on the controller at any point during the Auto Up sequence. If the Auto Up sequence is aborted, the mast will stop and wait for input from the controller or display panel. "Auto Up" will be shown on the PMC display, and after the mast leaves the stowed position and begins moving toward 90° (takes about 2 seconds), the PMC display will have the button options "Mast Down" and "Mast Up" appear.

To raise the mast to 90° using the Auto Up feature:

- HHRC: Press the "Mast Up" button twice quickly in successive depressions (two depressions within a ½ second). The mast will raise to 90° and automatically turn on all the lights.

Note: Using the HHRC will only let you auto extend the mast to the 0° quadrant.

- PMC: Press the "Auto Up" button. The display will show quadrant options (Figure 6-7). These options are different angles the light pan can be positioned. Select the desired quadrant. The mast will tilt to 90°, automatically turn on all the lights, pan the lights to the desired quadrant angle, and raise the mast.

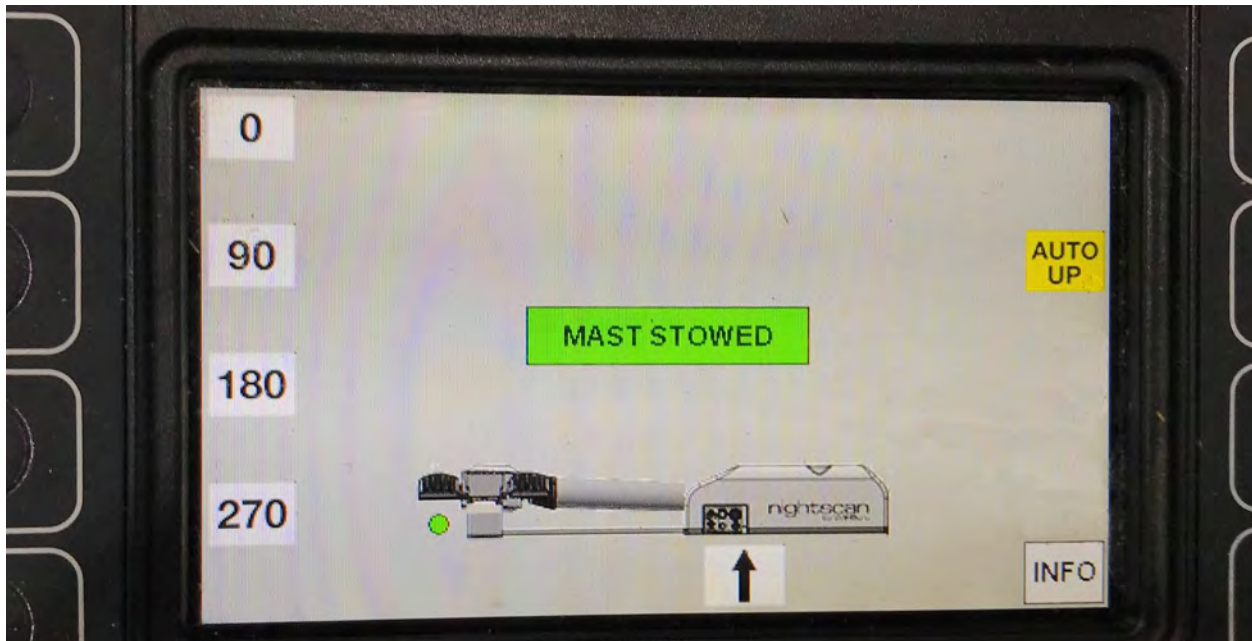


Figure 6-7 Auto Up to Quadrants Screen

Note: Quadrant options are only available from the mast stowed position and only from the PMC. The Auto-Up to the 0° quadrant will only be available if the mast is not stowed.

6.5.2 Using the Mast Up Button

The mast uses a DC powered actuator to drive the mast from stow to 90°. The actuator communicates its position to the master controller. The master controller memorizes the position of the actuator for the stowed and the 90° position. When the master controller determines the mast is at 90°, the RCP functions become available.

6.5.2.1 Raising Mast to 90°

To raise/tilt the mast to 90° using the "Mast Up" button:

1. Press and hold "Mast Up" until the mast is at 90°. The software will automatically stop the mast from tilting any further. When the mast has reached 90°, the Tilt Control screen will switch to the RCP/Mast Control screen (Figure 6-8). Once this screen is visible, the RCP functions will be available.

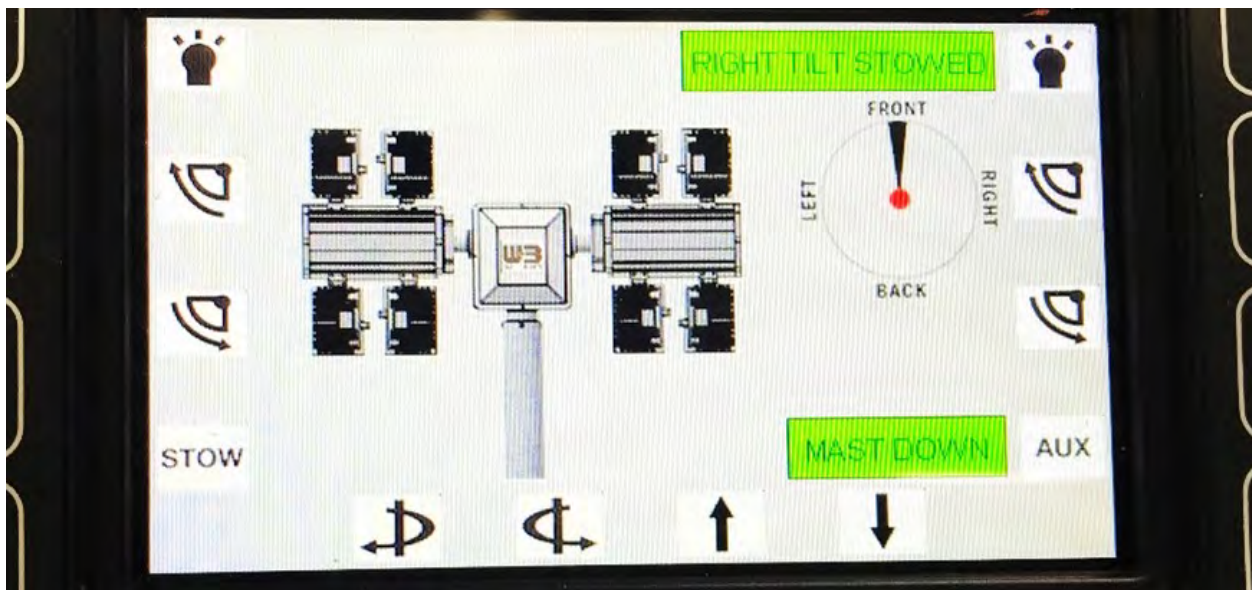


Figure 6-8 RCP/Mast Control Screen

6.5.2.2 Extending the Mast

After reaching 90°, the mast can be extended to full or partial height. To extend the mast when it is at 90°, press and hold "Mast Up" until the mast reaches the desired height.

Pushing the "Mast Up" button will cause the mast to rise until the "Mast Up" button is released. If the "Mast Up" button is not released, the mast will reach its fully extended height, the air pressure will rise to 20 psi (1.4 bar), and then the safety valve will open and exhaust any more air that enters the mast, leaving the mast at its maximum extended height.

6.6 Controlling the Lights

The lights can be turned on and off from the remote control and display when the RCP/Mast Control screen is visible. The RCP can be panned either clockwise or counterclockwise.

To pan and tilt the lights:

- Holding "Tilt Down" (or "Tilt Up") tilts the lights down (or up) and all the way around to 10° beyond the 180° point. Once the tilt limit in that direction is reached, an alert will appear on the display to show the lights cannot be tilted further.
- Holding "Pan Right" (or "Pan Left") turns the lights to the right (or left) to 10° beyond the 180° point. Once the pan limit in that direction is reached, an alert will appear on the display to show the lights cannot be panned further.
- Pressing "Lights" toggles the lights on and off.

6.7 Lowering the Mast

Pressing "Mast Down" on the RCP/Mast Control screen will lower the mast. Continue to press "Mast Down" until the mast reaches the desired height and then release the button.

6.8 Stowing the Mast

The "stowed" position is also called the "nested" position. The stowed position is the position of the mast when it is folded down and firmly seated in the saddle. The mast is stowed when it reaches the 0° position that is set in the Actuator Calibration screen (Section 7.6.2). Once the mast reaches this position, it should be driven into the saddle. Driving into the saddle ensures the RCP and lights do not "bounce" when in transit.

The mast can be stowed by using:

- Auto Stow®
- "Mast Down"
- Emergency Stow Without Power

The mast will stop when the stowed position is reached. It will power down 2 seconds after it is stowed. To operate the mast again, the system needs to be re-initiated. This is a safety feature that prevents the mast from being inadvertently raised to comply with standards.

6.8.1 Using the Auto Stow® Feature

When the Auto Stow® feature is used, the mast will pan and tilt the RCP to the home position, lower the mast (if not already there), turn off any lights and tilt the mast to the stowed position. The mast will power down automatically after stowing. It is recommended to use the Auto Stow® feature to stow the mast.

This automatic sequence can be aborted by pushing any of the buttons on the controller or PMC at any point during the Auto Stow®. If a button is pressed, the mast will not stow by itself, and will await further operator input.

To use the Auto Stow® feature:

1. HHRC: Press "Mast Down" twice quickly in successive depressions (two depressions within ½ second).

PMC: Press "Auto Stow". Read caution window that appears. Confirm and press "OK" button.

2. Visually inspect that the mast is properly stowed and powered down. Ensure that the payload will not bounce as the vehicle drives down the road. Once stowed, the Vehicle Interlock on Sensor (proximity sensor) signals it is safe to move the vehicle.
3. Store remote controls if used so they will not be damaged during transportation.

6.8.2 Using the Mast Down Button

Another method used to stow the mast is to press and hold "Mast Down" button. This method is not as reliable as using the Auto Stow® feature. Care must be taken to ensure that the operator does not release the button before the mast is completely stowed and powered down. If the mast is not completely stowed, equipment may be damaged during transportation.

To stow the mast using "Mast Down":

1. Press and hold "Mast Down", releasing the button once the PMC display shows the "Mast Stowed" green bar. Ensure that the "Mast Down" button is released only after the PMC display shows the "Mast Stowed" green bar, which means the mast is stowed. The mast will lower (if not already there), then go to the RCP home position, and then stow the mast. The mast will power off automatically upon reaching the stowed position. Once stowed, the Mast Stowed Safety Interlock Contact signals it is safe to move the vehicle.
2. Visually inspect that the mast is properly stowed and powered down. Ensure that the payload will not bounce as the vehicle drives down the road. Once stowed, the Mast Stowed Safety Interlock Contact signals it is safe to move the vehicle.
3. Store remote controls if used so they will not be damaged during transportation.

6.8.3 Emergency Stow Without Power

If power is lost or an unrecoverable error occurs, the mast must be manually stowed. Note: Ensure all power has been disconnected from the system prior to manually operating the mast. Manually operating the actuator with power applied will damage the actuator.

To stow the mast without power:

1. Ensure power is removed from the actuator and mast.
2. Remove base cover on left side of mast.
3. To remove the air pressure from mast, pull down and hold ring while mast tubes lower. Continue pulling until all air is expelled, even after mast tubes have fully nested (Figure 6-9). If the lights are not in the proper stowed pan/tilt position, the mast may need to be stopped during lowering to properly adjust the lights to the stowed pan/tilt position.



Figure 6-9 Expel Air

4. Carefully, physically tilt lights to home position by slowly turning by hand.
5. Carefully, physically turn pan to home position by slowly turning by hand.
6. Remove base cover on right side of mast to access the actuator.

7. Confirm the mast is fully retracted and the RCP is in the stowed position. Remove the actuator cover plug with a Phillips head screw driver (Figure 6-10).



Figure 6-10 Remove Actuator Cover Plug

8. Insert the provided 6 mm deep-well socket into the actuator (Figure 6-11). Turn the socket clockwise to lower the mast tilt to 0° degrees. Ensure the mast is firmly seated in the saddle. You may need to continue lowering until mechanical play is removed from the mast and the RCP is firm in the saddle. Do not over-tighten.

Note: Use the provided deep-well socket. Do not use a cordless drill for the actuator manual override function. This will damage the actuator.

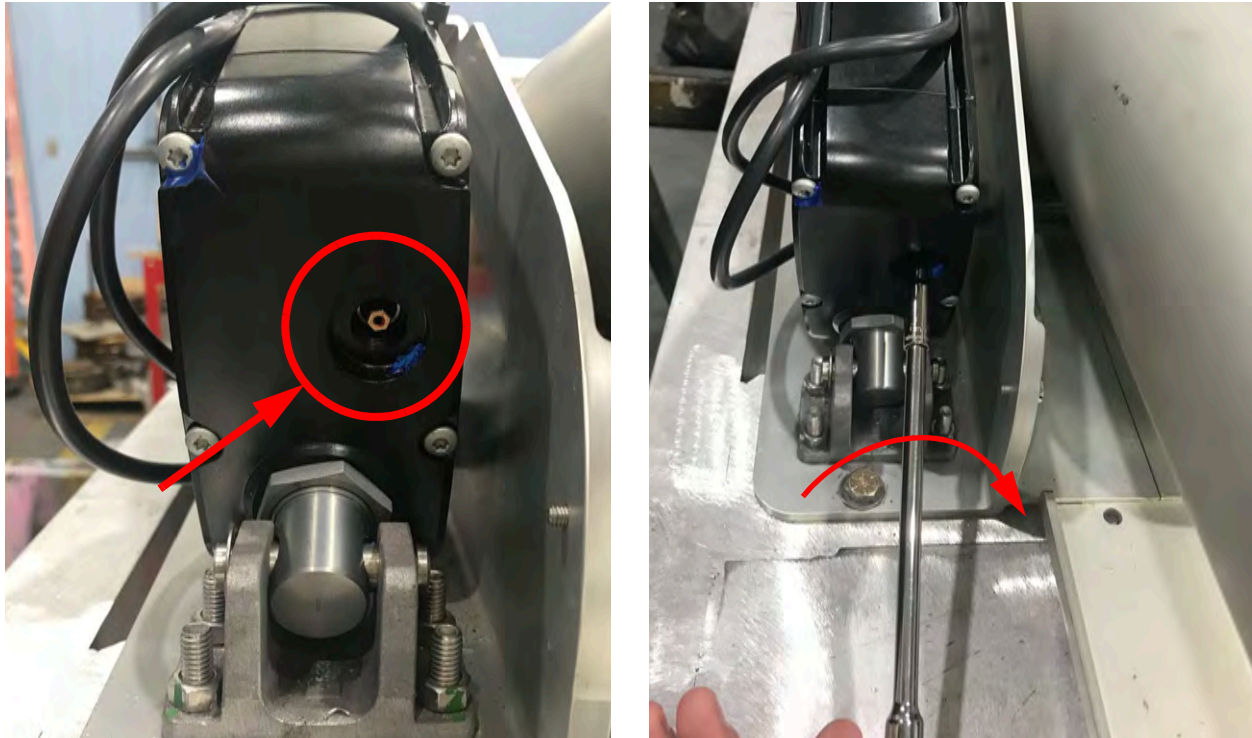


Figure 6-11 Insert Provided Allen Wrench and Turn Clockwise

9. Once the problem has been fixed and power has been reestablished, replace the actuator cover plug and the right side base cover.
10. Restart the mast. Once the mast is restarted, an Actuator Position Fault will appear.
11. Recalibrate the actuator (see Section 7.6.2).

Note: The mast will operate at half speed as a safety precaution until the issue is corrected.

12. After the actuator is re-calibrated, the Actuator Position Fault will clear. Regular operation can resume.

7 Maintenance, Adjustments and Disposal

This section describes the routine maintenance and adjustment procedures required to keep your system operational. Be sure to read and understand the entire operation procedure and the Safety Summary Section 1 before beginning any maintenance or adjustment procedure.

7.1 Info Screen

If information about the mast and the software is needed, the user can see that information by using the Info screen (Figure 7-1). This screen says the serial number, the software version, the voltage, the temperature, etc.

To access the Info screen, get to the Mast Stowed screen. Select the Info button in the bottom right. Press "OK" to confirm.

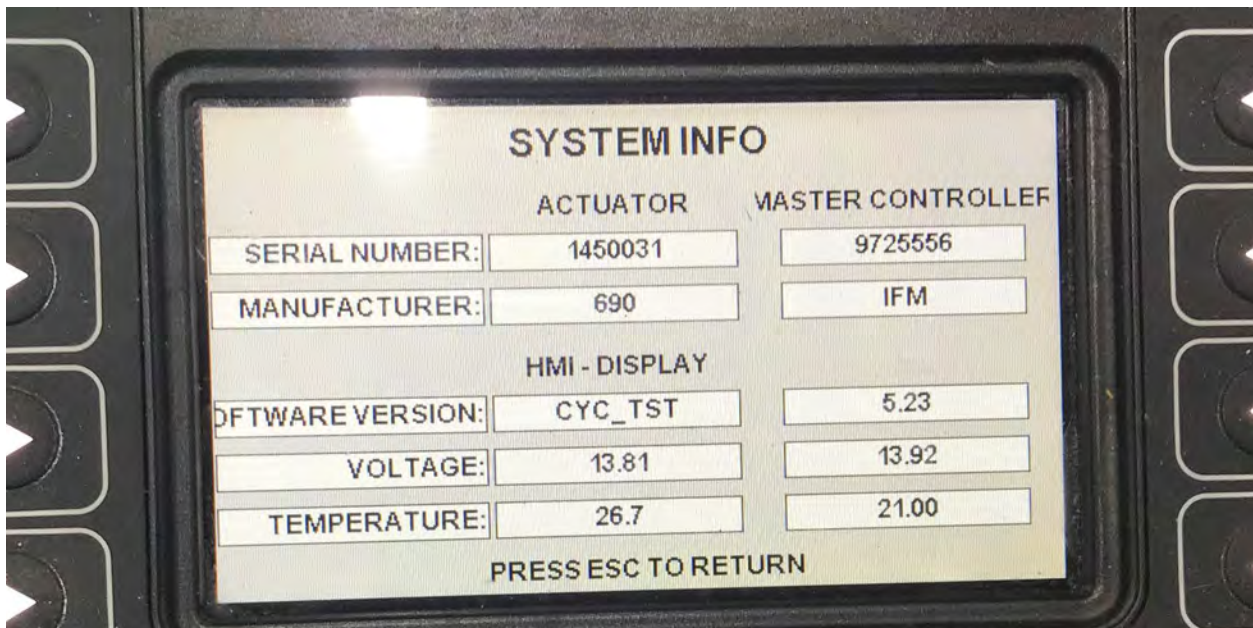


Figure 7-1 Info Screen

7.2 Power Isolating Procedure

Remove all power sources from the mast system including mast controls, lighting power, auxiliary device power before performing any maintenance operation on the mast system other than optional cleaning and lubricating. Use proper lock-out tag-out procedures.

To isolate power to the mast system:

1. Operate the mast to the desired position for the maintenance procedure.
2. Press and hold down the “ESC” and “OK” buttons simultaneously until the mast system powers down.
3. Disconnect all power sources using lock-out tag-out procedures. It is recommended that the vehicle ignition keys be held by the maintenance engineer as an additional precaution to prohibit unexpected power up.

Refer to Section 6.4 for power-up procedure once maintenance is complete.

7.3 Cleaning and Lubricating the System

The Will-Burt Company’s pneumatic telescoping masts from come from the factory pre-lubricated and require no scheduled lubrication under normal operating conditions for the life of the product. In extremely harsh environmental conditions, cleaning and lubrication of the mast might be required.

Signs that cleaning and lubrication are needed can be:

- A noticeable gritty film on the exterior surfaces of the mast sections
- Erratic extension or retraction of the mast
- Noisy operation of the mast
- Sticking of one or more mast sections when mast is extending or retracting

To clean the system:

1. While at 90°, wipe down the base using a soft cloth or sponge and a mild solution of soapy water.
2. Wipe down the RCP using a soft cloth or sponge and a mild solution of soapy water.
3. After light fixtures cool, clean the light lenses using a soft cloth and standard glass cleaner.

After cleaning the mast, if the mast is in extremely harsh environmental conditions, lubricate the mast with TMD Mast Lubricant (P/N: 900600). TMD Mast Lubricant is specifically formulated for cold weather use, but is also suitable for year around use. Regular winter maintenance and frequent use of TMD Mast Lubricant should significantly reduce the potential for mast freeze-ups.

To clean and lubricate the mast:

1. While at the 90° position, have one person press the "Mast Up" button to slowly pressurize the mast just enough to extend the desired mast section. A second person may have to hold down the larger mast section collars to ensure the desired tube extends. Release "Mast Up" button as soon as the desired mast section is fully exposed.
2. Wipe down the desired mast section using a non-abrasive cleanser or solvent such as lacquer thinner. Do not allow the cleaning fluid or solvent to run down inside the collar.
3. Inject approximately ½ oz. of TMD Mast Lubricant into the weep hole (drain) of the exposed mast section. The weep holes are located approximately 10" below the collar on each tube except the top tube.
4. Repeat steps 1-3 for the next larger mast section. Do not lubricate the exterior of the mast. This will cause the lubricant to attract dust and contaminants from the air.
5. Using the "Mast Down" button, lower the mast to 90°.
6. Wait several minutes to allow the lubricant to settle and spread around the wear ring and seal at the bottom of each mast section.
7. Using the "Mast Up" button, extend the mast one section at a time. For each section wipe off any excess lubricant which flows out the weep holes.

7.4 Spare Parts

To order spare or replacement parts, always refer to the mast model number and serial number. The model number, serial number, and additional information is located on the mast Identification Plate on the mast base. To order spare parts, contact The Will-Burt Company.

7.5 Periodic Inspections

This section describes the systematic care and inspection of equipment to keep it in safe operating condition and to prevent breakdowns. If the system does not perform as required, see Section 9 for troubleshooting. If anything looks wrong and cannot be diagnosed and/or fixed, contact The Will-Burt Company. Table 7-1 provides a schedule of periodic inspections and procedures required to keep the mast system in safe operating condition.

Table 7-1 Periodic Inspections

Frequency	Inspection	Action
As Needed; In salt water or sandy environments, clean the mast every 3 months.	Inspect to ensure the Mast System is kept clean and free from foreign material. Dirt, grease, oil, sand and debris may cover up a serious problem.	Clean the mast per the procedure in section 7.3.
During Operation	Inspect for damage during operation.	If damage is apparent, do not use the mast, and have it serviced prior to use.
Monthly	Visually observe tube motion during extension and retraction to ensure the tubes move smoothly and do not cause excessive impact loads when each tube fully extends or retracts.	Clean and lubricate the mast per the procedure in section 7.3. If the condition remains after lubrication, cease all mast use and contact Will-Burt Service immediately.
Monthly	Inspect for any damage to electric cables and pneumatic tubes.	Replace cables/tubes as required.
Monthly	Test the Vehicle Interconnect safety warning circuit to ensure the vehicle driver is warned or prevented from driving with the mast deployed.	Repair the interconnect circuit if not functioning properly.
Monthly	Inspect the Look-Up light lens for debris or dirty lens that prevent light from reaching the operating space.	Make sure the lens is cool and clean the lens with a mild cleaner and soft cloth.
Monthly	Inspect all hardware to ensure fasteners are not damaged, loosening, backing out or missing. Take special note of hardware keeping the payload mounted, mast collar bolts, and hardware used to mount the mast to the support structure.	Tighten or replace any loose, damaged or missing fasteners.
Every 6 Months (3 months in salt water environment)	If the mast remains idle for long periods of time, operate the mast to full extension at least once every six months (3 months in salt water environment).	Exercise mast.

Table 7-1 Periodic Inspections (Continued)

Frequency	Inspection	Action
Every 6 Months	With the mast fully stowed, carefully lift up on the RCP housing (do not lift by the light fixtures). The RCP housing should not have any mechanical play allowing it to bounce when being transported on a vehicle.	If mechanical play is observed, adjust the mast stowed limit switch position to allow the RCP to drive tightly into the saddle according to Section 7.6.
Every 6 Months	Extend the mast to the 90° position and make sure the mast is rigidly driven into the rubber pad below the mast. There should be no mast wobble observed when pulling on the base tube.	If the mast shows mechanical play, adjust the mast 90° limit switch according to Section 7.6.
Yearly	Test the function of the emergency stop button to ensure it is working properly.	Replace defective parts.

7.6 Adjusting and Calibrating Positions

The following sections define and explain procedures regarding the positions available for adjustment, which are:

- Actuator Tilt Angle (Section 7.6.2)
- RCP Pan (Section 7.6.3)
- RCP Left Tilt (Section 7.6.4)
- RCP Right Tilt (Section 7.6.5)
- Mast Down Limit Switch Height (Section 7.6.6)

For more information, see www.willburt.com or contact The Will-Burt Company.

7.6.1 Enter Adjustment Mode and Screen

To adjust the actuator, the system will need to be in the Tilt Control screen with the depiction of the mast visible. See Figure 7-2. This screen automatically comes on as soon as the mast is powered on.



Figure 7-2 Tilt Control Screen

To adjust the RCP parameters, the system will need to be in the RCP/Mast Control screen with the depiction of the RCP visible. See Figure 7-3. To get to this screen, the mast needs to be tilted to the 90° position. Once the mast is at 90°, this screen automatically comes on.

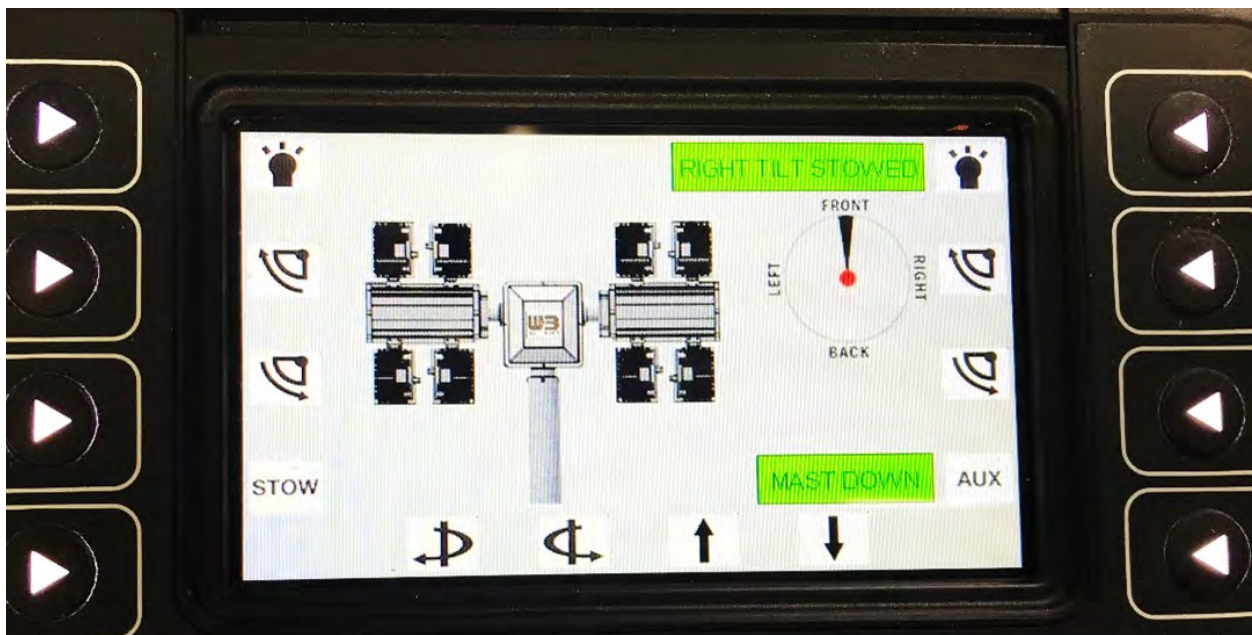


Figure 7-3 RCP/Mast Control Screen

In general, to enter an adjustment mode screen, simultaneously press opposing motion buttons for the desired adjustment. For example, if you needed to adjust the actuator travel limits, you would press both the “UP” and “DOWN” buttons at the same time (see Figure 7-4).

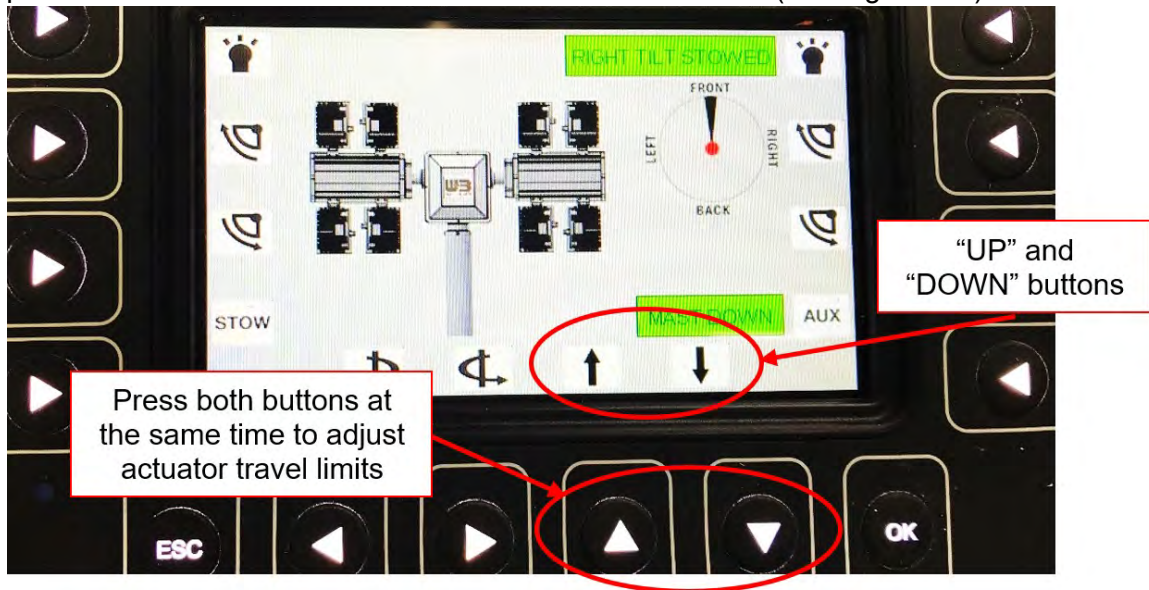


Figure 7-4 Press Opposing Buttons Simultaneously

After pressing opposing buttons, a window will pop up asking if you want to enter the calibration mode (see Figure 7-5). Press “OK” to confirm. If you wait more than 5 seconds or press “ESC”, the window will disappear and normal operation will resume.

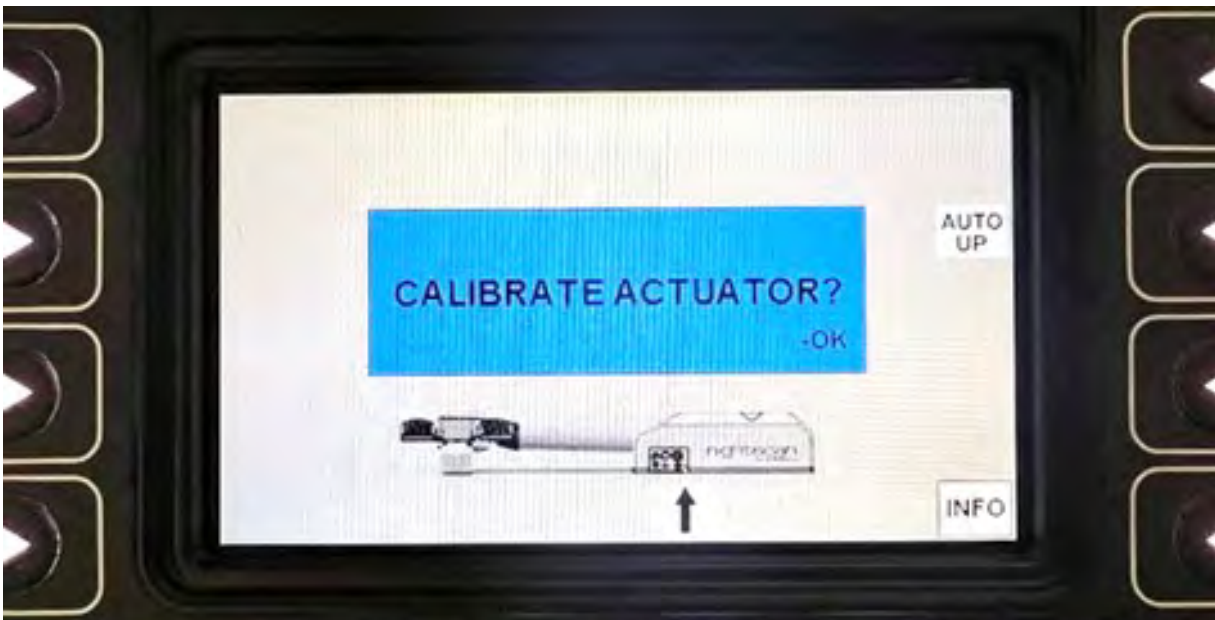


Figure 7-5 Calibration Mode Screen

Note: The first time the system is powered up or new software is loaded to the mast controller, there are no stored parameters. The system will take you directly to the calibration screens. Also, auto operation is disabled until values are stored for all parameters.

7.6.2 Actuator Calibration and Adjustment to Set Mast Tilt Horizontal and Vertical Travel Limits

1. Make sure that the Tilt Control screen (Figure 7-2) is active.
2. Press “UP” and “DOWN” buttons at the same time.

Note: If the screen indicates that the mast is stowed, the down arrow icon will not be visible. The “DOWN” button will still be active for entering the calibration screen.

3. Press “OK”. The Actuator Calibration screen should now be visible (Figure 7-6).

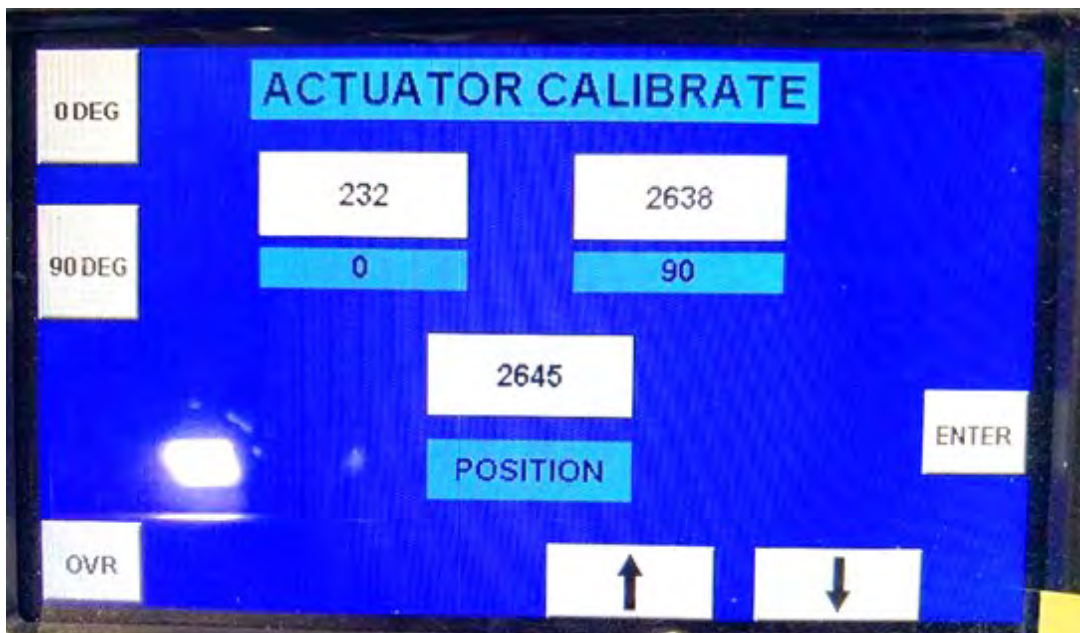


Figure 7-6 Actuator Calibration Screen

4. The parameter labeled "POSITION" is the current position of the actuator. Press either the "UP" or "DOWN" button to tilt the mast. The parameter labeled "0" is the stowed position for the mast. The parameter labeled "90" is the extended position for the mast. When the mast is at the 90 degree position, the system will go to the RCP/Mast Control screen (Figure 7-3).

To change the 0° or 90° position: Move the mast up or down to the desired position. If you attempt to move the mast below the stored "0" position or above the "90" position, the system will not allow you to exceed those limits. In order to go beyond the stored limits, press and hold the "OVR" button. The screen will indicate that limit override is active. You can now move the mast beyond the limits.

Note: Use caution as the system will not stop you from crashing the mast if you go beyond the limit.

To enter a new "0" position: Move the mast to the desired position (carefully jog the mast tilt down until you visually see the mechanical play between mast tubes is removed). Press the "0 DEG" button. You will be asked to confirm the new position. Press and hold the "ENTER" button until you see the new value appear in the "0" parameter slot. Once set, lift up on the RCP. There should be no mechanical play between the light bars and the saddle and the RCP should be firm in the saddle.

Note: Do not over-travel; this could damage the mast.

To enter a new "90" position: Move the mast to the desired position (carefully jog the mast tilt up until the mast base tube reaches an angle of 88-90 degrees from horizontal). Press the "90 DEG" button. You will be asked to confirm the new position. Press and hold the "ENTER" button until you see the new value appear in the "90" parameter slot.

All speed zones, i.e., soft start/stop and full speed zones are computed from the values entered for 0 and 90 degrees.

To return to the Tilt Control screen (Figure 7-2): Simultaneously press the "UP" and "DOWN" keys. Press "OK" to acknowledge.

Note: You cannot go to the RCP/Mast Control screen from the Actuator Calibration screen. Return to Tilt Control screen and press up until mast is fully tilted to the 90° position. The mast will stop tilting and the screen will change to the RCP/Mast Control screen.

7.6.3 RCP Pan Rotation Calibration and Adjustment

1. Make sure that the RCP/Mast Control screen (Figure 7-3) is active.
2. Press “PAN CLOCKWISE” and “PAN COUNTERCLOCKWISE” buttons at the same time.
3. Press “OK”. The Pan Calibration screen should now be visible. See Figure 7-7.



Figure 7-7 Pan Calibration Screen

The parameter labeled “POSITION” is the current pan position of the RCP. The position labeled “HOME” is the position the RCP will be at when the pan position is stowed and the mast is tilted back into the saddle. The position marked “180” is the pan position when the RCP is facing opposite of the “HOME” position.

To change the “HOME” position value: Move the RCP to the desired position. Press the “HOME” button. Press and hold the “ENTER” button until the value appears in the “HOME” slot.

To enter the “180” position: Press either “PAN CLOCKWISE” or “PAN COUNTERCLOCKWISE”. Move the RCP until it is facing opposite the “HOME” position. Press the “180” button. Press and hold the “ENTER” button until the value appears in the “180” slot. Do not over-rotate as damage to internal wires can occur.

Note: The limit of the RCP rotation is computed from the “HOME” and “180” values. If you need to exceed a limit, press and hold the limit override “OVR” button while pressing “PAN CLOCKWISE” or “PAN COUNTERCLOCKWISE”. Use caution while doing this.

To return to the RCP/Mast Control screen: Press the “PAN CLOCKWISE” and “PAN COUNTERCLOCKWISE” buttons at the same time. Press “OK”.

During final assembly: Make sure to set the “HOME” position with the lights facing toward the front of the mast (lights pointing toward the ground when the mast is nested in the saddle).

7.6.4 RCP Left Tilt/Single Tilt Rotation Calibration and Adjustment

Note: If the system detects that the RCP is a single tilt, RCP Right Tilt will not be available. RCP Left Tilt will serve as the single tilt parameter.

1. Make sure that the RCP/Mast Control screen (Figure 7-3) is active.
2. Press the left side “TILT UP” and “TILT DOWN” buttons at the same time.
3. Press “OK”. The Tilt Calibration screen should now be visible. See Figure 7-8.



Figure 7-8 Tilt Calibration Screen

The parameter labeled “POSITION” is the current position of the left tilt or single tilt. The position labeled “HOME” represents the stowed position of the left tilt or single tilt. The position marked “180” is the left tilt or single tilt position when facing opposite of the “HOME” position.

To change the “HOME” position value: Move the left tilt or single tilt to the desired position. Press the “HOME” button. Press and hold the “ENTER” button until the value appears in the “HOME” slot.

Note: Set “HOME” position so the lights are parallel to the base plate when the RCP is stowed in the nested saddle. Light bars shall be in contact and supported by cradle standoffs when present when the mast is nested in the saddle.

To enter the “180” position: Press either “TILT UP” or “TILT DOWN”. Move the RCP light bar tilt until it is facing opposite the “HOME” position. Press the “180” button. Press and hold the “ENTER” button until the value appears in the “180” slot. Do not over-rotate as damage to internal wires can occur.

Note: The limit of the RCP light bar tilt is computed from the “HOME” and “180” values. If you need to exceed a limit, press and hold the limit override “OVR” button while pressing “TILT UP” or “TILT DOWN”. Use caution while doing this.

To return to the RCP/Mast Control screen: Press the “TILT UP” and “TILT DOWN” buttons at the same time. Press “OK”.

7.6.5 RCP Right Tilt Rotation Calibration and Adjustment

Note: If the system detects that the RCP is a single tilt, RCP Right Tilt will not be available. RCP Left Tilt will serve as the single tilt parameter.

1. Make sure that the RCP/Mast Control screen (Figure 7-3) is active.
2. Press the right side “TILT UP” and “TILT DOWN” buttons at the same time.
3. Press “OK”. The Tilt Calibration screen should now be visible. See Figure 7-9.



Figure 7-9 Right Tilt Calibration Screen

The parameter labeled “POSITION” is the current position of the right tilt. The position labeled “HOME” represents the stowed position of the right tilt. The position marked “180” is the right tilt position when facing opposite of the “HOME” position.

To change the “HOME” position value: Move the right tilt to the desired position. Press the “HOME” button. Press and hold the “ENTER” button until the value appears in the “HOME” slot.

Note: Set “HOME” position so the lights are parallel to the base plate when the RCP is stowed in the nested saddle. Light bars shall be in contact and supported by cradle standoffs when present when the mast is nested in the saddle.

To enter the “180” position: Press either “TILT UP” or “TILT DOWN”. Move the RCP light bar tilt until it is facing opposite the “HOME” position. Press the “180” button. Press and hold the “ENTER” button until the value appears in the “180” slot. Do not over-rotate as damage to internal wires can occur.

Note: The limit of the RCP light bar tilt is computed from the “HOME” and “180” values. If you need to exceed a limit, press and hold the limit override “OVR” button while pressing “TILT UP” or “TILT DOWN”. Use caution while doing this.

To return to the RCP/Mast Control screen: Press the “TILT UP” and “TILT DOWN” buttons at the same time. Press “OK”.

7.6.6 Mast Down Limit Switch Height Adjustment

1. The Mast Down Limit Switch location is shown in Figure 7-10.

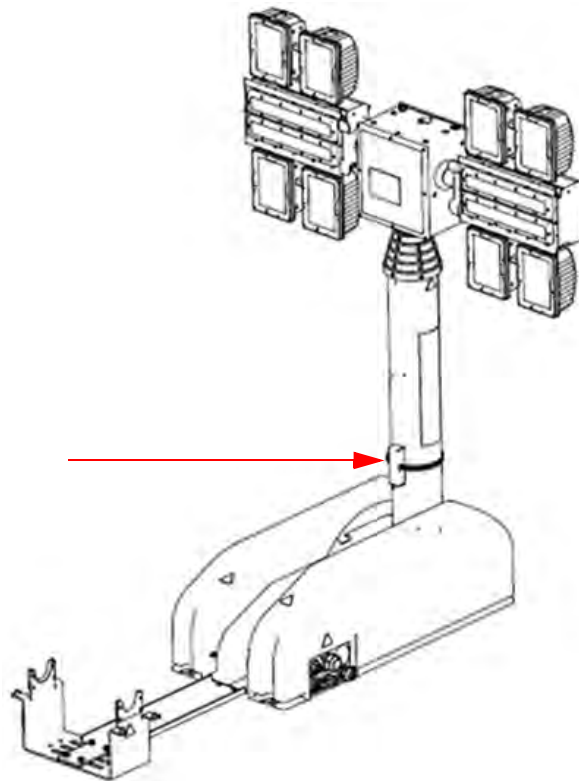


Figure 7-10 Mast Down Limit Switch Location

2. To accurately position the Mast Down Limit Switch height, make sure that the RCP/Mast Control screen (Figure 7-3) is active.
3. Raise the mast to 90 degrees by holding the “MAST UP” button until the mast is at 90 degrees. Do not use the Auto Up feature to raise the mast to 90 degrees. Use a level to ensure that the mast is at 90 degrees. A value range of 88° to 90° is acceptable. Ensure the mast is fully nested (all mast collars touching) prior to adjusting the Mast Down Limit Switch.
4. Loosen the screws on the Band Clamp to allow for the Mast Down Limit Switch adjustment. Keep the switch housing oriented as shown to avoid contacting the base when nested.
5. Lower the Mast Down Limit Switch to ensure the green bar that says “MAST DOWN” is not visible. Slowly slide the Band Clamp that holds the Mast Down Limit Switch upwards until it senses the magnet. This will be indicated by the appearance of a green bar that says “MAST DOWN” on the display (see Figure 7-11).

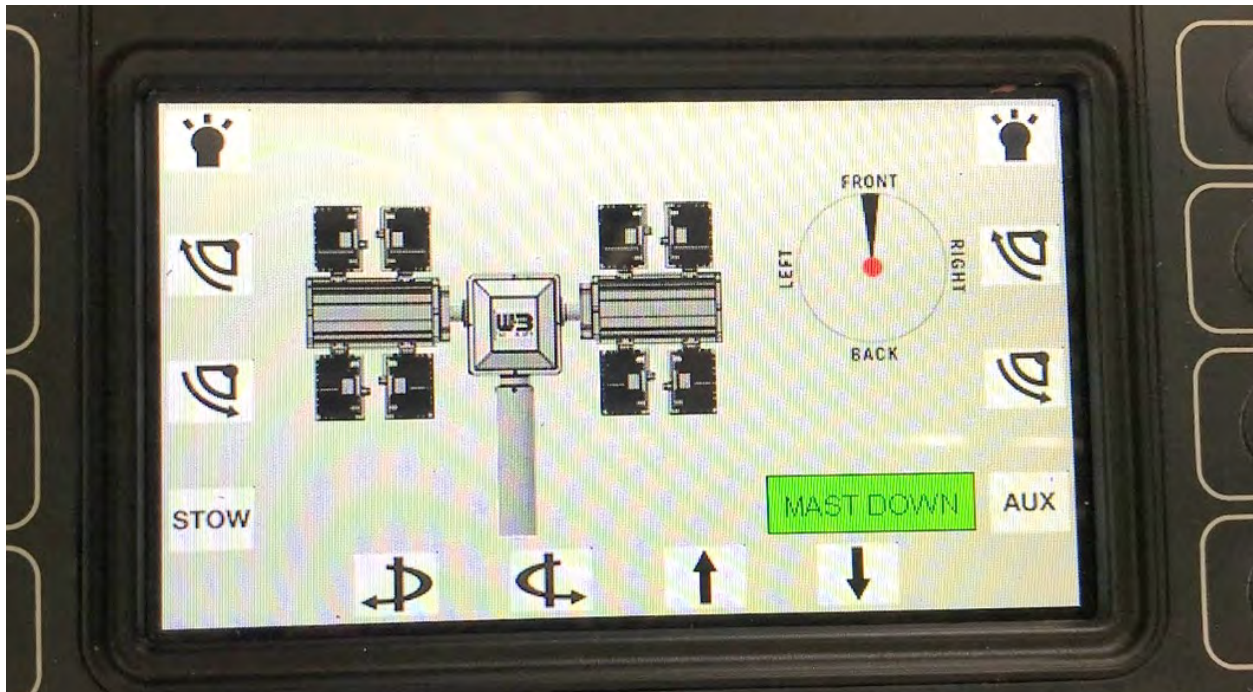


Figure 7-11 Mast Down Limit Switch Indicator

6. From the position that triggered the green “MAST DOWN” on the display, raise the height an extra ¼ inch (6 mm) higher than the observed trigger point for each unit and tighten the Band Clamp. This additional height allows for temperature variations in magnet position and magnetic field strength in the field.

7.7 System Disposal

Dispose of the mast in accordance with the national environmental regulations.

8 Reference Information

This section describes reference information for your system including some optional equipment.

8.1 Beacon Light

The optional beacon light (Figure 8-1) provides visibility and safety by mounting on top the RCP and brightly showing the height of the mast. The beacon lights are available in amber, blue, clear, red, and green. The beacon light can be turned on by pressing the "AUX" controller button when the mast is at 90° or extended. Pressing the button again will turn the beacon light off. When ordered, the optional beacon light is shipped installed and no additional wiring is required.



Figure 8-1 Optional Beacon Light

8.2 D-TEC® Sensor

The D-TEC® Sensor is an optional accessory that is mounted on the backside of the RCP to detect and prevent operation near power lines. The D-TEC® Sensor senses electric field strength and prevents the mast from raising if the field strength is above the alarm threshold.

8.2.1 D-TEC® Sensor Location

When using the D-TEC® Sensor with a Will-Burt RCP, the unit will be mounted on the side of the RCP cover plate opposite of the RCP circuit board. This typically is installed by The Will-Burt

Company. The Sensor unit must be mounted in the upright position with the look-up light pointing up.

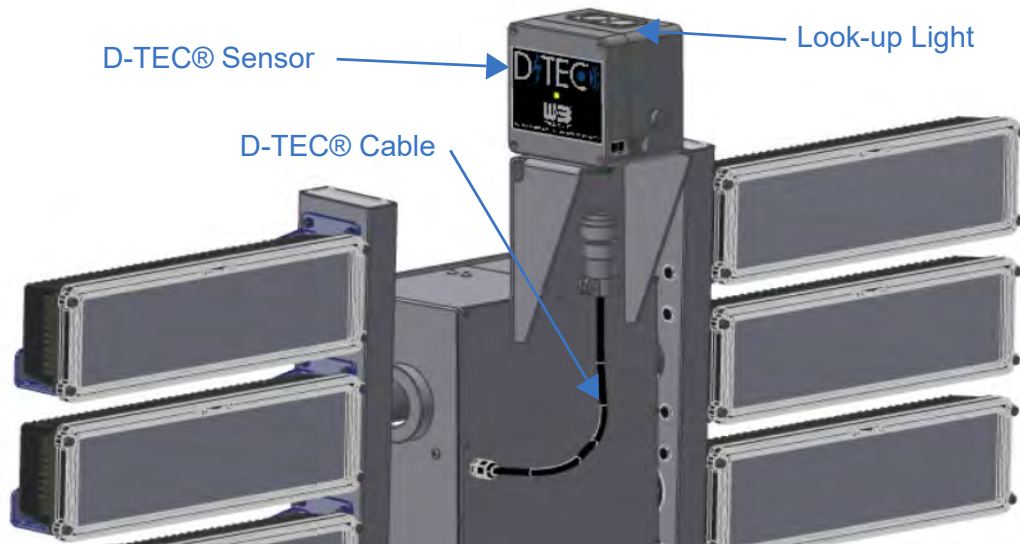


Figure 8-2 D-TEC® Sensor Installed on RCP

The cable used to connect the Sensor unit to the RCP should be connected to the bottom of the Sensor unit and wired into the RCP PC board as shown.

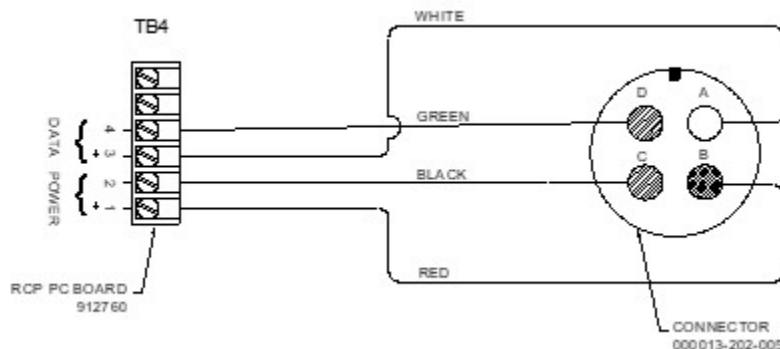


Figure 8-3 D-TEC® Wiring Schematic

8.2.2 D-TEC® Functionality

The optional D-TEC® Sensor provides additional limited protection against raising the mast into power lines. On Night Scan fold-down units, as soon as the mast begins tilting, the control begins initiating the D-TEC® Sensor and self-tests it until it either passes, or the mast reaches the point where the RCP becomes active (at 90°). Assuming that it passes, the operator is then permitted to extend the mast. For vertical mast applications, the self-test is performed during power up and the unit begins actively sensing. If the mast senses an electrical field strength above the alarm threshold, the mast will stop extending even though the operator continues to push the "Mast Up" button. In this case, there will be a message displayed on the alphanumeric display of the Remote Control(s) (for Night Scan models). If the operator believes the sensed condition to be

false, they may clear it in either of two ways: momentarily initiating an Auto Stow® function, or lowering the mast to the bottom of the 90° position (for fold-down models). This will clear the alarm and allow the operator another chance to raise the mast to its full extension.

The following table contains possible D-TEC® messages:

Table 8-1 D-TEC® Messages

Message	Meaning	Root Issue
D-TEC® Testing	The D-TEC® Sensor is performing a self-test.	The D-TEC® has repeatedly been trying to pass the self-test while moving to the RCP active position. Normally, it will pass one of these attempts and no message will be displayed. If not, once there it tries one more time to pass and this message will displayed during the self-test.
Power Line E-Field	The D-TEC® has sensed voltage from a power line.	A power line may be in close proximity. If so, move the vehicle to a location away from the power line, and then redeploy the system.
Power Line H-Field	The D-TEC® has sensed current from a power line.	A power line may be in close proximity. If so, move the vehicle to a location away from the power line, and then redeploy the system.
D-TEC OSHA Limit	The D-TEC® has sensed voltage from a very high power line.	A power line may be in close proximity. If so, move the vehicle to a location away from the power line, and then redeploy the system.

The D-TEC® Sensor is not serviceable, so most issues will end with returning the sensor to The Will-Burt Company for repair. The following table shows D-TEC® error code meanings:

Table 8-2 D-TEC® Sensor Error Codes

Message	Meaning	Root Issue	Potential Cause
5,01	Lamp Fault	The D-TEC® has sensed a fault in the LED lamp circuit.	This check is made when the mast thinks it has just arrived at 90°. The D-TEC® Sensor measures the current through the look-up LED's to see if it is within a certain range. If it is not, the fault occurs.
5,03	SPI Fault	A communications bus internal to the D-TEC® Sensor has failed during self-test.	Defective Sensor.

Table 8-2 D-TEC® Sensor Error Codes (Continued)

Message	Meaning	Root Issue	Potential Cause
5,07	Unrecoverable Communication Error	No successful communication for 250ms.	Check connection (data lines, ground) for continuity. This error may also be displayed on systems without a D-TEC® if the Base Board is missing the 4710801 DIP Switch Shunt Board.
5,09	E-Field Fault	E-Field portion of the D-TEC® Sensor failed its self-test.	Defective Sensor.
5,10	H-Field 1 Fault	One axis of the Magnetic Field portion of the D-TEC® failed its self-test.	Defective Sensor.
5,11	H-Field 2 Fault	One axis of the Magnetic Field portion of the D-TEC® failed its self-test.	Defective Sensor.
5,12	H-Field 3 Fault	One axis of the Magnetic Field portion of the D-TEC® failed its self-test.	Defective Sensor.
5,16	Supply Voltage Fault	The power supply section of the D-TEC® sensor is outside proper operational limits.	Check power connections, voltage level and induced noise on power source.

8.3 Nycoil® (Optional)

The Nycoil® Cable Conduit (Figure 5 2) is an optional external coiled hose used to house electrical wiring, camera and positioner cables.



Figure 8-4 Nycoil® Conduit

Nycoil® conduit comes in a variety of sizes. Depending on the system being used, some restrictions on the size of the Nycoil® may occur. The standard sizes are:

- 1/2 inch inside diameter of the conduit with the outside diameter of the coil being 8 inches
- 3/4 inch inside diameter of the conduit with the outside diameter of the coil being 13 inches

Consult engineering on specific applications for other Nycoil® sizes.

Note: Nycoil® is a registered trademark of the Nycoil company.

8.4 Bulb Replacement

This section contains bulb replacement procedures provided by Fire Research Corporation (FRC) - Focus, Optimum Lights, and Magnafire.

Note: There are no bulb replacement procedures for LED lights.

Document Number
XM-LGT1PMEX-R1A

LGTR1A-Rev0806



FRC

FIRE RESEARCH CORPORATION
26 Southern Blvd., Nesconset, NY 11767
TEL 631.724.8888 FAX 631.360.9727
TOLL FREE 1.800.645.0074
www.fireresearch.com

OPTIMUM

FOCUS



SAFETY SUMMARY

FRC lighting products are engineered and manufactured with safety in mind. It is critical that FRC scene lights are installed, maintained, and operated correctly. Read and understand all instructions before installing, performing maintenance, or operating.

All components, equipment, and installation procedures shall conform to NFPA 1901, *Standard for Automotive Fire Apparatus* and NFPA 70 *National Electrical Code*.

The following safety precautions shall be observed.

General Safety Precautions

Ensure power is off prior to connecting or disconnecting wires and plugs or performing maintenance.

Scene lighting lampheads are designed for outdoor use and will be extremely hot when operating. Do not use in areas of limited ventilation.

Installation Safety Precautions

Ensure power is off prior to connecting wires or cable to the power source.

Connect only to the type of power source as indicated on the lamphead identification label.

Ensure an appropriate sized circuit protection device is installed (circuit breaker or fuse).

Use a minimum of 16 AWG wire to connect AC lights and 12 AWG to connect DC lights.

FRC lights are intended for mounting to a noncombustible surface only. Do not install insulation within 76 mm (3 in) of any part of the light, lighting fixture, or its components.

Install approved rubber or plastic grommets or bushings where wires or cable will pass through a surface.

Ensure all wire connectors or terminals provide a positive mechanical and electrical connection.

Electrical connections not enclosed in a box must be covered with an insulation equivalent to that on the conductors.

Lampheads will be extremely hot when operating, do not mount such that personnel or equipment could inadvertently come in contact with the lamphead.

Recessed lights require a minimum of 3 inch clearance between wall insulation and the light housing.

Operation Safety Precautions

Operate portable lighting products only from the power source indicated on the identification label.

During operation use the handle to move the light, the housing will be extremely hot.

Ensure that all lighting components are clear of obstructions when raising telescopic poles.

Ensure that telescopic poles are lowered and stowed before moving the vehicle.

Maintenance Safety Precautions

Ensure power is off prior to removing the front glass or opening covers.

Do not operate the light with the front glass removed or cover opened.

Ensure replacement bulbs have the same voltage and wattage rating.

When handling a new quartz halogen, HIR, or HID bulb avoid touching it except on the flat seal at either end.

Use a clean soft cloth to wipe the reflector clean if necessary, do not use liquid or aerosol cleaners.

MAINTENANCE

Bulb Replacement Optimum and Focus

1. Ensure power is OFF and the lamphead is cool to the touch prior to replacing the bulb.
2. Ensure the replacement bulb has the same voltage and wattage rating. (If there are two bulbs installed, each bulb will be half the listed wattage.)
3. Hold the glass in place while removing the bezels. Remove the four cap head screws and remove the bezels. Remove the glass.

Note: Optimum gasket is attached, the Focus gasket may come off.

4. Slide the bulb sideways into the spring contact and lift it out from the opposite side.

Note: When handling the new bulb avoid touching it except on the flat seal at either end. (Grease or oily fingerprints can cause damage the quartz bulb.) If the bulb is accidentally touched, gently wipe it clean with alcohol.

5. Check both lamp base contacts to be sure they are perfectly clean.
6. Push one end of the bulb into the spring contact until the other end can be placed into the opposite contact. Rotate the lamp back and forth about its axis to ensure adequate seating of contacts.

Caution: Do not operate the light with the front glass removed.

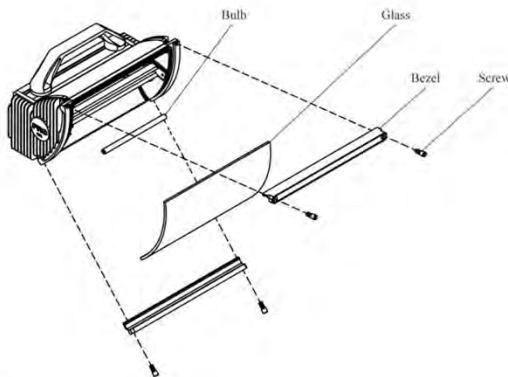
7. Insert the Focus gasket in the groove with the splice positioned down.
8. Hold the glass in position. Ensure the glass is inside the lip on all four sides.
9. Install the bezels and secure with the four screws.

Note: Bulb life is extended when the lamphead is mounted so the bulb is in a horizontal position.

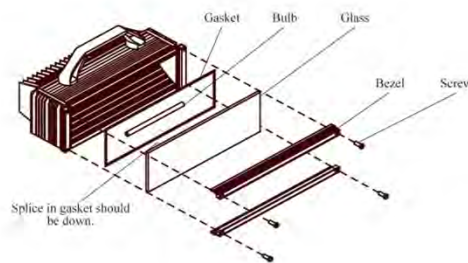
Cleaning

High intensity lights may, over time, develop a powdery white film on the reflector. If this happens remove the glass (see bulb replacement procedure) and gently wipe the reflector clean with a soft cloth.

OPTIMUM
LAMPHEAD



FOCUS
LAMPHEAD



Wiring

12/24 VDC

Connect the BLACK wire to GROUND.

Connect the WHITE or RED wire to POWER.

120/240 VAC

Connect the GREEN wire to chassis GROUND.

Connect the WHITE wire to RETURN.

Connect the BLACK wire to POWER.



CAUTION
Position the glass inside the housing lip on all four sides. Failure to do so may result in racking the glass when the screws are tightened.

Bulb Replacement Optimum and Focus Lampheads



Havis, Inc.
75 Jacksonville Road, PO Box 2099
Warminster, PA 18974
T 800-524-9900 F 215-957-0729
www.havis.com

Changing Lamps: Magnafire Series Fixtures (Halogen)



1. Remove (4) screws.



2. Remove lens cover.



3. Obtain a napkin or towel free from debris, dirt, oil, etc. to remove the lamp with.



4. Holding the lamp with the napkin, push in as far as possible on spring-loaded lamp holder on the left. This should release or free the lamp for removal (see step #5)

Left lamp holder



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www.havis.com



5. Right side of lamp will free if the left, spring-loaded side is pushed all the way in. This may require strong force as the lamp holders are tight.



6. Remove and discard old lamp.



7. Holding the new replacement lamp with a napkin or clean cloth, insert the lamp into the left, spring-loaded lamp holder first. Push in all the way on the left spring-loaded lamp holder, until the right side of lamp clicks into place. This could require using some strong force as the lamp holders are factory set exceptionally tight.



8. Replace lens cover and (4) screws. Test to ensure normal working conditions.



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T 800-524-9900 F 215-957-0729
www.havis.com

**Changing Lamps:
Magnafire Series Fixtures (H.I.D.)**



1. Remove (4) screws.



2. Remove lens cover.



3. Obtain a napkin or towel free from debris, dirt, oil, etc. to remove the lamp.



4. Holding the lamp with the napkin, push in as far as possible on spring-loaded lamp holder on the left. This should release or free the lamp for removal (see step #5)

Lamp holder



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75 Jacksonville Road, PO Box 2099
Warminster, PA 18974
T 800-524-9900 F 215-957-0729
www.havis.com



5. Right side of lamp will free if the left, spring-loaded side is pushed all the way in. This may require strong force as the lamp holders are tight.



6. Remove and discard old lamp.



7. Holding the new replacement lamp with a napkin or clean cloth, insert the lamp into the left, spring-loaded lamp holder first. Push in all the way on the left spring-loaded lamp holder, until the right side of lamp clicks into place. This could require using some strong force as the lamp holders are tight.



8. Replace lens cover and (4) screws. Test to ensure normal working conditions.

8.5 The Will-Burt Company Mast Oil Safety Data Sheet

SAFETY DATA SHEET

Will-Burt Company Orrville, Ohio 330-682-7015

SECTION 1: PRODUCT AND COMPANY Identification

Etna Products, Inc.
16824 Park Circle Drive
Chagrin Falls, Ohio 44023

Company Phone Number: (440) 543-9845
Emergency Phone Number: (800) 229-3862
CHEMTREC Phone Number: (800) 424-9300

Product Name: MASTERDRAW® B985B
Product Code: G-E-000826
Issue Date: 06/03/2015
Revision Date: 07/18/2016

Will-Burt Product Name: Mast Lubrication
Will-Burt Part Number: 900600
Recommended use: Industrial Lubricant
Recommended restrictions: Use only as directed.

SECTION 2: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Physical hazards: Not classified
Health hazards: Acute toxicity, oral Category 4
Environmental hazards: Not classified
OSHA defined hazards: Not classified
Signal word: Warning
Hazard statement: Harmful if swallowed
Precautionary statement:
Prevention: Wash thoroughly after handling. Do not eat, drink or smoke when using this product.
Response: If swallowed, call a poison center/doctor if you feel unwell. Rinse mouth.
Storage: Store away from incompatible materials.
Disposal: Dispose of contents/container in accordance with local/regional/national/international regulations.
Hazard(s) not otherwise classified (HNOC): Combustible
Supplemental information: 99.6% of the mixture consists of component(s) of unknown acute oral toxicity.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

The table below will only list hazardous ingredients. If the table below is blank, none are present.

Component	Chemical Abstracts Number (CAS)	% by Weight
2, 6-Di-tert-butyl-4-cresol	128-37-0	< 1
BENZOTRIAZOLE	95-14-7	< 0.2

Other components below reportable levels 90-100

SECTION 4: FIRST-AID MEASURES

Skin contact: Wash off with soap and water. Get medical attention if irritation develops and persists.
Eye contact: Rinse with water. Get medical attention if irritation develops and persists.
Inhalation: Move to fresh air. Call a physician if symptoms develop or persist.
Ingestion: Rinse mouth. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Get medical advice/attention if you feel unwell.
Most important symptoms/effects, acute and delayed: Direct contact with eyes may cause temporary irritation.
Indication of immediate medical attention and special treatment needed: Provide general supportive measures and treat symptomatically. Keep victim warm. Keep victim under observation. Symptoms may be delayed.
General information: Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

SECTION 5: FIRE-FIGHTING MEASURES

Suitable extinguishing media: Foam. Dry chemicals. Carbon dioxide (CO2).
Unsuitable extinguishing media: Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical: During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters: Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions: Cool containers exposed to heat with water spray and remove container, if no risk is involved.
Specific methods: Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards: Combustible. No unusual fire or explosion hazards noted.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures: Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Wear appropriate protective equipment and clothing during clean-up. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up: Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Cover with plastic sheet to prevent spreading. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water.

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.
Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.

Environmental precaution: Avoid discharge into drains, water courses or onto the ground.

SECTION 7: HANDLING AND STORAGE

Precautions for safe handling: Avoid prolonged or repeated contact with skin. Avoid prolonged exposure. Do not taste or swallow. When using, do not eat, drink or smoke. Use only in well-ventilated areas. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities: Keep away from heat and sources of ignition. Store in original tightly closed container. Store away from incompatible materials (see Section 10 of the SDS).

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational Exposure Guidelines

US. ACGIH Threshold Limit Values

Components	Type	Value	Form
2, 6-Di-tert-butyl-4-cresol (CAS 128-37-0)	TWA	2 mg/m ³	Inhalable fraction and vapor.

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
2, 6-Di-tert-butyl-4-cresol (CAS 128-37-0)	TWA	10 mg/m ³

Biological limit values: No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls: Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Individual protection measures, such as personal protective equipment:

Eye/face protection: Wear safety glasses with side shields (or goggles).

Skin protection: Wear appropriate chemical resistant gloves. Suitable gloves can be recommended by the glove supplier.

Hand protection: Other Wear suitable protective clothing.

Respiratory protection: In case of insufficient ventilation, wear suitable respiratory equipment.

Thermal hazards: Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations: Keep away from food and drink. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Transparent Blue Liquid	Vapor pressure:	Unknown
Physical state:	Liquid	Vapor density:	Unknown
Form:	Liquid	Relative density:	Not available
Color:	Not available	Solubility(ies):	
Odor:	Petroleum Odor	Solubility (water):	Nil
Odor threshold:	Not available.	Partition coefficient (n-octanol/water):	Not available
pH:	Not available.	Auto-ignition temperature:	Unknown
pH concentration:	N/A	Decomposition temperature:	Not available
Melting point/freezing point:	Not available.	Viscosity:	Not available
Initial boiling point and boiling range:	> 500 °F (> 260 °C)	Other information	
Flash point:	> 300.0 °F (> 148.9 °C)	Explosive properties:	Not explosive
Evaporation rate:	> 1	Kinematic viscosity 43 mm ² /s	
Flammability (solid, gas):	Not applicable.	Kinematic viscosity temperature:	104 °F (40 °C)
Upper/lower flammability or explosive limits		Oxidizing properties:	Not oxidizing
Flammability limit - lower (%):	Not available	Specific gravity:	0.87
Flammability limit - lower (%) temperature:	Unknown		
Flammability limit - upper (%):	Not available		
Flammability limit - upper (%) temperature:	Unknown		
Explosive limit - lower (%):	Not available		
Explosive limit - upper (%):	Not available		

SECTION 10: STABILITY AND REACTIVITY

Reactivity: The product is stable and non-reactive under normal conditions of use, storage and transport.

Chemical stability: Material is stable under normal conditions.

Possibility of hazardous reactions: No dangerous reaction known under conditions of normal use.

Conditions to avoid: Contact with incompatible materials.

Incompatible materials: Strong oxidizing agents.

Hazardous decomposition products: No hazardous decomposition products are known.

SECTION 11: TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Inhalation:	Prolonged inhalation may be harmful.
Skin contact:	No adverse effects due to skin contact are expected.
Eye contact:	Direct contact with eyes may cause temporary irritation.
Ingestion:	Harmful if swallowed.

Symptoms related to the physical, chemical and toxicological characteristics: Direct contact with eyes may cause temporary irritation.

Information on toxicological effects

Acute toxicity: Harmful if swallowed.

Product	Species	Test Results
MASTERDRAW® B985B		
Acute Inhalation LD50	Rat	1900 mg/l estimated

Components	Species	Test Results
2, 6-Di-tert-butyl-4-cresol (CAS 128-37-0)		
Acute Oral LD50	Guinea pig Mouse Rat	10700 mg/kg 1040 mg/kg 890 mg/kg
BENZOTRIAZOLE (CAS 95-14-7)		
Acute Inhalation LD50	Rat	1.9 mg/l
Oral LD50	Mouse Rat	615 mg/kg 600 mg/kg

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation:	Prolonged skin contact may cause temporary irritation.
Serious eye damage/eye irritation:	Direct contact with eyes may cause temporary irritation.
Respiratory or skin sensitization	
Respiratory sensitization:	Not a respiratory sensitizer.
Skin sensitization:	This product is not expected to cause skin sensitization.
Germ cell mutagenicity:	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity:	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.
IARC Monographs. Overall Evaluation of Carcinogenicity	
2, 6-Di-tert-butyl-4-cresol (CAS 128-37-0) 3:	Not classifiable as to carcinogenicity to humans.
OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):	Not listed.
Reproductive toxicity:	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure:	Not classified
Specific target organ toxicity - repeated exposure:	Not classified
Chronic effects:	Aspiration hazard Not an aspiration hazard. Prolonged inhalation may be harmful.

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity: The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Persistence and degradability: No data is available on the degradability of this product.

Bioaccumulative potential:
Partition coefficient n-octanol / water (log Kow)
BENZOTRIAZOLE 1.44

Mobility in soil: No data available.

Other adverse effects: No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

SECTION 13: DISPOSAL CONSIDERATIONS

Disposal instructions: Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Dispose of contents/ container in accordance with local/regional/national/international regulations.

Local disposal regulations: Dispose in accordance with all applicable regulations.

Hazardous waste code: The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products: Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging: Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

SECTION 14: TRANSPORT INFORMATION

DOT: Not regulated as dangerous goods.

SECTION 15: REGULATORY INFORMATION

US federal regulations: This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D): Not regulated
 CERCLA Hazardous Substance List (40 CFR 302.4): Not listed
 SARA 304 Emergency release notification: Not regulated
 OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050): Not listed

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories: Immediate Hazard - Yes
 Delayed Hazard - No
 Fire Hazard - No
 Pressure Hazard - No
 Reactivity Hazard - No
 Not listed
 Yes
 Not regulated

SARA 302 Extremely hazardous substance:
 SARA 311/312 Hazardous chemical:
 SARA 313 (TRI reporting):

Other federal regulations:

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List: Not regulated
 Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130): Not regulated
 Safe Drinking Water Act (SDWA): Not regulated

US state regulations:

US. California Controlled Substances. CA Department of Justice Not listed
 (California Health and Safety Code Section 11100);

US. Massachusetts RTK - Substance List

2, 6-Di-tert-butyl-4-cresol (CAS 128-37-0)
 BENZOTRIAZOLE (CAS 95-14-7)

US. New Jersey Worker and Community Right-to-Know Act

2, 6-Di-tert-butyl-4-cresol (CAS 128-37-0)

US. Pennsylvania Worker and Community Right-to-Know Law

2, 6-Di-tert-butyl-4-cresol (CAS 128-37-0)

US. Rhode Island RTK

Not regulated

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	No
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	No
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	No
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	No
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

SECTION 16. OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Disclaimer: The information contained herein is based on the data available to us and is believed to be correct. Etna Products Inc. does not warrant or guarantee their accuracy or reliability and Etna Products, Inc. shall not be liable for any loss or damage arising out of the use thereof. The information and recommendations are offered for the user's consideration and examination and it is the users responsibility to satisfy itself that they are suitable and complete for its particular use.

Revision Information: Exposure controls/personal protection: Eye/face protection
 Physical & Chemical Properties: Multiple Properties
 Regulatory information: US federal regulations
 Other information, including date of preparation or last revision: Disclaimer
 HazReg Data: North America

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9 Troubleshooting

This section describes system troubleshooting information. Please contact The Will-Burt Company if these guides do not solve the issue. Be sure to read and understand the entire operation procedure and the Safety Summary Section 1 before beginning any maintenance or troubleshooting procedure.

9.1 Error Screens

When something is not working correctly, the PMC will show an error screen. These screens are either a red fault screen or a yellow warning screen. At the top of the error notice box, it will either say “FAULT” or “WARNING” with the reason for the error written underneath.

When a fault screen occurs, the mast is completely disabled and will not move until the issue is fixed. Below is an example of a fault error.

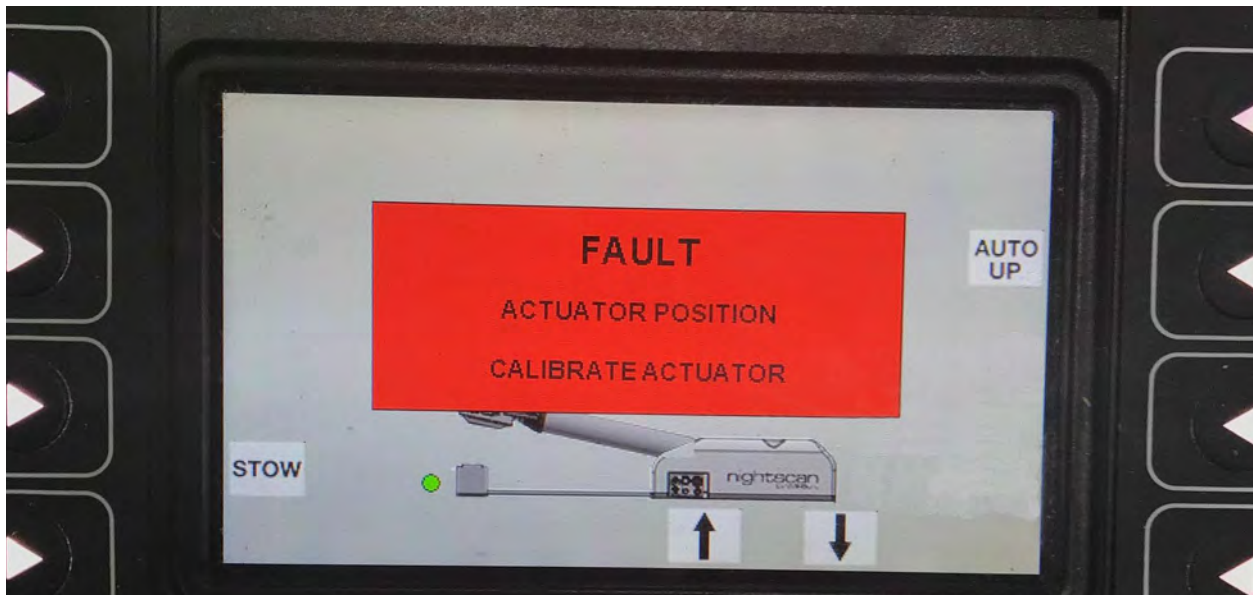


Figure 9-1 Example of a Fault Screen

When a warning screen occurs, the mast can still be used and moved, but the operator should fix the issue. Below is an example of a warning error.



Figure 9-2 Example of a Warning Screen

9.2 Troubleshooting Electrical

This section includes a list of warning and fault notices and their potential causes. Warning notices do not stop motion or use, but let you know of potential issues. Fault codes point out problems and usually inhibit operation to prevent potential damage. These notices are shown on the panel mount display.

Table 9-1 Mast System Errors, Warnings and Faults

Description	Type	Probable Cause	Remedy
12V			
System Low Voltage	Warning	Voltage input is below 10.5 VDC and higher than 10	Replace/charge batteries or power supply
System Below 10VDC	Fault	Voltage input is below 10VDC. System is disabled	Replace/Charge batteries or power supply
System Voltage Is High	Warning	Voltage is over 16VDC and less than 17VDC	Decrease voltage to system
System Voltage Too High	Fault	Voltage is higher than 17VDC	Decrease voltage to system

Table 9-1 Mast System Errors, Warnings and Faults (Continued)

Description	Type	Probable Cause	Remedy
24V			
System Low Voltage	Warning	Voltage input is below 20 VDC	Replace/charge batteries or power supply
System Low Voltage	Fault	Voltage input is too low. System is disabled	Replace/Charge batteries or power supply
System Voltage Is High	Warning	Voltage is over 28VDC	Decrease voltage to system
System Voltage Too High	Fault	Voltage is higher than 29VDC	Decrease voltage to system
General			
Actuator CAN bus Error	Fault	Actuator lost communication with Master Controller	1) Check and repair wiring to the actuator 2) Turn off/Turn on power to reboot system
Actuator Over-Current	Fault	Actuator or actuator wiring problem	1) Check wiring to actuator and repair 2) Replace actuator
Actuator	Fault	Undefined actuator fault	1) Cycle power and reboot system 2) Check and repair wiring to actuator 3) Replace actuator
Actuator Position	Fault	Manual stow or operation of mast	Calibrate actuator
Actuator Over Temperature	Fault	1) Duty cycle of actuator exceeded 2) Ambient temperature too high	1) Turn off power and wait 30 minutes to restart 2) Ventilate and cool down actuator
Mast Controller Over-Current	Fault	Master Controller or I/O Module Fault	Contact Will-Burt service
Master Controller Over Temperature	Fault	Ambient temperature too high	Ventilate and cool down RPC
Exhaust Valve	Fault	Exhaust valve failure or wiring open	1) Check wiring to air exhaust valve 2) Replace exhaust valve

Table 9-1 Mast System Errors, Warnings and Faults (Continued)

Description	Type	Probable Cause	Remedy
Look-Up Light	Fault	Look-Up Light failure or wiring open	1) Check wiring to Look-Up Light 2) Replace Look-Up Light
Left Light Over-Current	Fault	Problem with left side lights	1) Check wiring to left side lights and repair 2) Replace left side lights
Right Light Over-Current	Fault	Problem with right side lights	1) Check wiring to right side lights and repair 2) Replace right side lights
Compressor Over-Current	Fault	Problem with air compressor	1) Check wiring to air compressor and repair 2) Replace air compressor
Pan Position Lost	Fault	Master Controller not receiving pan position from sensor - Auto functions are disabled	1) Pan clockwise or counterclockwise to clear error 2) Check wiring to pan position with sensor 3) Check gear engagement with motor 4) Replace sensor
LTilt Position Lost	Fault	Master Controller not receiving left tilt position from sensor - Auto functions are disabled	1) Tilt left lights clockwise or counterclockwise to clear error 2) Check wiring to tilt position with sensor 3) Check gear engagement with motor 4) Replace sensor
RTilt Position Lost	Fault	Master Controller not receiving right tilt position from sensor - Auto functions are disabled	1) Tilt right lights clockwise or counterclockwise to clear error 2) Check wiring to tilt position with sensor 3) Check gear engagement with motor 4) Replace sensor

9.3 Troubleshooting Mechanical Symptoms

This section describes mechanical troubleshooting. Table 9-2 lists some problems that may be observed, but may not generate an error or warning code on the controller.

Table 9-2 Mechanical Symptoms and Troubleshooting Sequence

Symptom	Root Issue	Troubleshooting Sequence
Mast sticking during extension or retraction	Mast is dirty and/or requires lubrication	1) Clean and lubricate mast 2) If condition continues, mast requires overhaul
Mast leaks down when extended	Air leak in mast or valve/compressor assembly	Use a soapy water solution to pinpoint the leak. If the mast is leaking, it will require new seals. If the valve or compressor assembly is leaking at a fitting, remove the fitting, clean and reinstall using thread tape or sealant. Replace a faulty valve or compressor.
Erratic or noisy when raising to 90° (fold-down units only)	Bent or worn actuator or pivot shaft	Replace damaged component
RCP continually pans or tilts	“Loss of position”, meaning that the mast no longer remembers proper calibration positioning	1) Press E-Stop button 2) Follow Emergency Stow without Power procedure 3) Contact Will-Burt Service
Pan or tilt motor will not respond with no errors displayed on PMRC	“Loss of position”, meaning that the mast no longer remembers proper calibration positioning	1) Press E-Stop button 2) Follow Emergency Stow without Power procedure 3) Contact Will-Burt Service
Mast fails to fully nest in saddle and disconnects power	The mast no longer remembers the proper actuator calibration positioning	Recalibrate actuator. See Actuator Calibration Section

Table 9-2 Mechanical Symptoms and Troubleshooting Sequence (Continued)

Symptom	Root Issue	Troubleshooting Sequence
Mast will not begin to lower from 90° position (fold-down unit only)	Mast tube sections do not fully collapse to nested position	<ol style="list-style-type: none"> 1) Follow Emergency Stow without Power procedure 2) Start mast system again 3) Recalibrate actuator. See Actuator Calibration Section 3) If this still does not resolve the problem, contact Will-Burt Service
Mast will not begin to lower from 90° position (fold-down unit only)	Mast Down Limit Switch band-clamped to mast is not activated	<ol style="list-style-type: none"> 1) Mast Down Limit Switch may be out of adjustment. Loosen clamp and slide switch up and down the mast until contact is established (see Mast Down Limit Switch Height Adjustment procedure) 2) Check wiring 3) Replace defective Mast Down Limit Switch

10 Document History

Table 10-1 Document History

Document Revision	Date	Change Details	Changes Backward Compatible with Previous Manual Version
TP-5817501-P1	Nov. 2022	Preliminary Draft	--
TP-5817501-00	Jan. 2023	Initial Release	--
TP-5817501-A	March 2023	Updated NS IQ logo and drawings	Yes

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