WILL-BURT

nightscan®

Night Scan Chief Operating Instructions



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Original Instructions

CE

Warranty

Will-Burt warrants its Night Scan Chief to be free from defects in material and workmanship for a period of two (2) years, with such time period running from the date of shipment by Will-Burt. Will-Burt shall not be responsible for any damage resulting to or caused by its products by reason of failure to properly install, maintain or store the product; use of the product in a manner inconsistent with its design; unauthorized service, alteration of products, neglect, abuse, accident, or acts of God. This warranty does not extend to any component parts not manufactured by Will-Burt; provided, however, Will-Burt's warranty herein shall not limit any warranties by manufacturers of component parts which extend to the buyer.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, AND NO REPRESENTATIONS, GUARANTEES OR WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO, A WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NONINFRINGEMENT ARE MADE BY WILL-BURT IN CONNECTION WITH THE MANUFACTURE OR SALE OF ITS PRODUCTS. NO EMPLOYEE, DISTRIBUTOR, OR REPRESENTATIVE IS AUTHORIZED TO CHANGE THIS WARRANTY IN ANY WAY OR GRANT ANY OTHER WARRANTY ON BEHALF OF WILL-BURT.

Claims for defects in material and workmanship shall be made in writing to Will-Burt within thirty (30) days of the discovery of defect. Failure to provide notice as required hereby shall be conclusive evidence that the product was in conformity with the warranty, and Will-Burt shall be released from any and all liability relating to the product. Will-Burt may either send a service representative or have the product returned to its factory at Buyer's expense for inspection. If judged by Will-Burt to be defective in material or workmanship, the product will be replaced or repaired at the option of Will-Burt, free from all charges except authorized transportation.

THE REMEDIES OF BUYER SET FORTH HEREIN ARE EXCLUSIVE AND ARE IN LIEU OF ALL OTHER REMEDIES. THE LIABILITY OF WILL-BURT WHETHER IN CONTRACT, TORT, UNDER ANY WARRANTY, OR OTHERWISE, SHALL NOT EXTEND BEYOND ITS OBLIGATION TO REPAIR OR REPLACE, AT ITS OPTION, ANY PRODUCT OR PART FOUND BY WILL-BURT TO BE DEFECTIVE IN MATERIAL OR WORKMANSHIP. WILL-BURT SHALL NOT BE LIABLE FOR COST OF INSTALLATION AND/OR REMOVAL, OR BE RESPONSIBLE FOR DIRECT, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE.

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1 Safety Summary

This section describes safety instructions for the Night Scan Chief 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 Chief.

⚠ 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! 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 - 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.

The following list contains reasonably foreseeable misuses of the mast system according to EN ISO 12100 5.3.2. These uses shall be avoided:

- Operating the mast with an obstruction in the functional space that prevents full extension or retraction
- Operating the mast near overhead power lines
- Operating the mast without the mast and operating space visible to the operator
- Driving the vehicle with the mast in a deployed position (any height above the nested position) or powered-up or without opening venting the mast to atmosphere
- Operating the mast or leaving deployed in wind speeds higher than the specified maximum velocity
- Operating the mast on a non-level surface greater than the specified maximum angle
- Installing a payload greater than the maximum rated payload (weight and sail area) of the mast

⚠ 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

Emergency Stow! Using the emergency stow button causes the actuator to lower mast without regard to any faults, switches, or system interlocks. It is totally up to the operator to ensure safe operation during an emergency stow attempt. When using the emergency stow button, normal operation switches are disabled. The mast can be overdriven into saddle and cause damage to the unit. Disengage the emergency stow button when the payload reaches the saddle and is tight. Do not drive mast beyond this position.

⚠ WARNING

Manual Tilt! If manually tilting mast, make sure all power has been disconnected from the system prior to manually lowering mast to avoid unexpected motion and/or damaging mast components.

⚠ WARNING

Safety Instruction - Motion on Power Interruption or Emergency Stop! Mast uses a normally open air control valve. If power is lost or turned off or the emergency stop is activated while mast is extended, mast will begin releasing air pressure and retracting at a controlled rate until power is restored or mast fully retracts. Masts that fold down will not initiate any tilt motion.

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.

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2 Specification Compliance

2.1 NFPA 1901-2016

The mast system is designed to be compliant with the following sections of National Fire Protection Agency NPFA-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.

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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 Night Scan Chief. 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 Chief is available in 1.0 meter (3.25 feet), 1.8 meter (6 feet) and 2.3 meter (7.5 feet) heights and comes standard with a built-in air compressor. The mast tilts to vertical and extends upward to provide directional scene lighting and surveillance. The mast retracts and folds down for transport. The following models are covered in these operating instructions:

- Night Scan Chief 1.0 (this model only tilts - it does not extend telescopically)
- Night Scan Chief 1.8
- Night Scan Chief 2.3
- Night Scan Chief Heavy Duty Towing (HDT) (2.3 m / 7.5 ft)

The Night Scan Chief is available with many options installed by The Will-Burt Company, including the option to come with a Profiler (for 1.8 m and 2.3 m), 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 strobe lighting available.

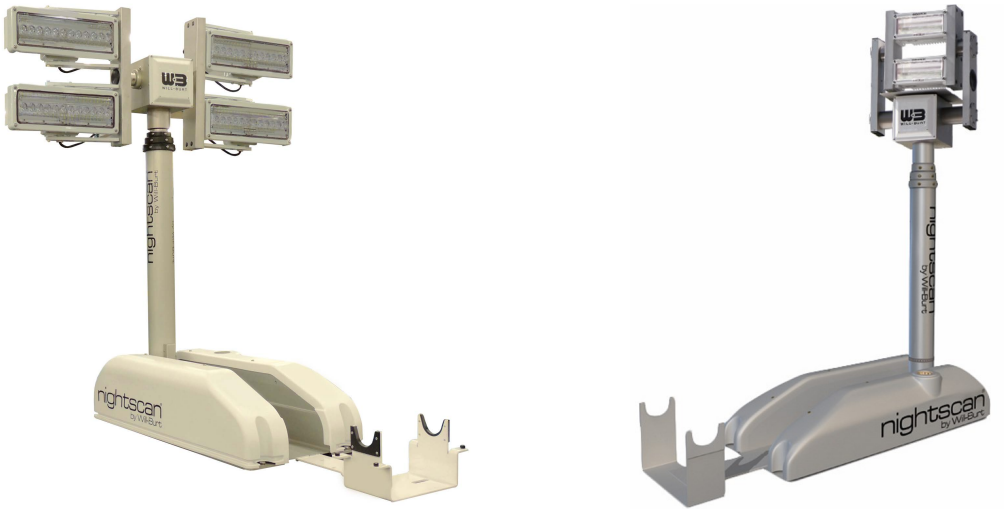


Figure 3-1 Left: Standard Night Scan Chief; Right: Night Scan Chief with Profiler

3.1 Intended Use

The Night Scan Chief is 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 Night Scan Chief is 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 Chief is 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.

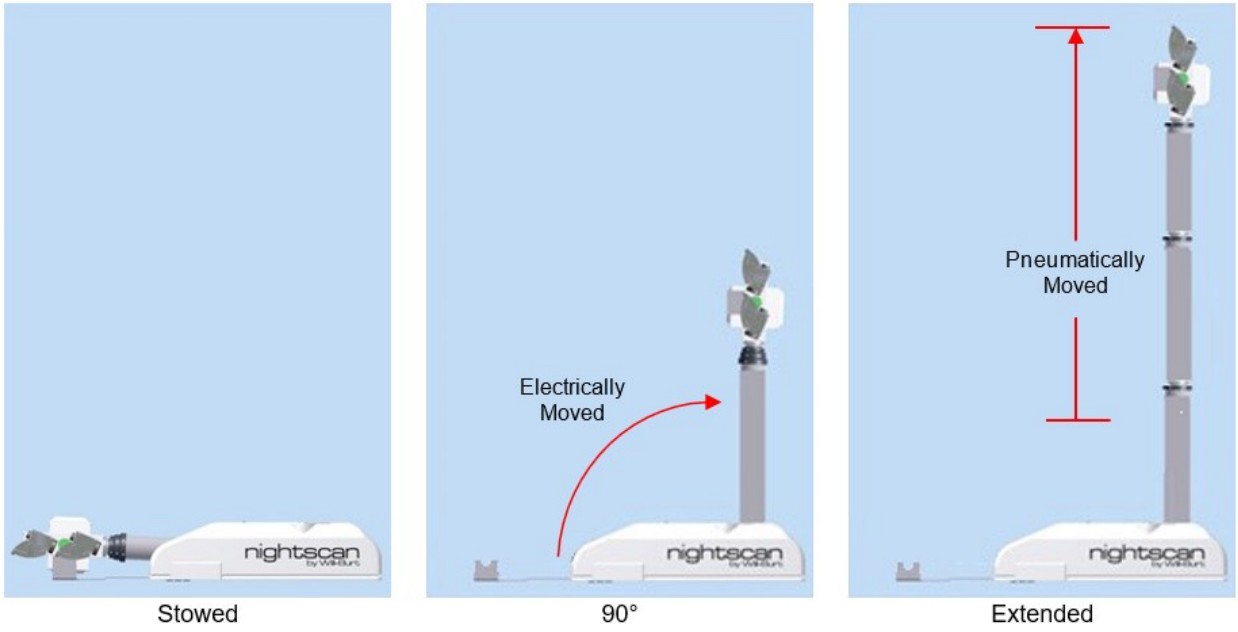


Figure 3-2 Mast Positions

3.3 Mast Component Descriptions

Figure 3-4, Figure 3-6, and Figure 3-7 show major components of the Night Scan Chief system.

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 Chief models come equipped with a single-tilt RCP. This means the left and right lights tilt together to direct at a desired position.

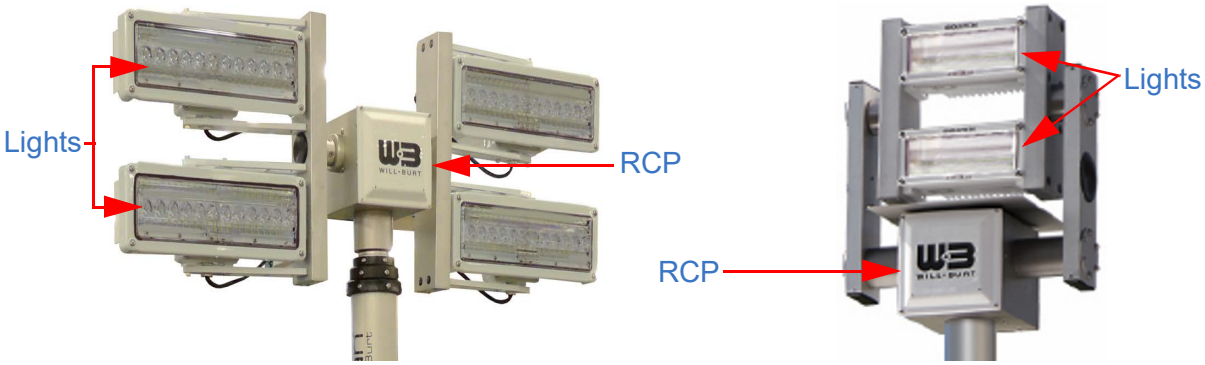


Figure 3-3 RCP (Left: Standard Night Scan Chief; Right: Night Scan Chief with Profiler)

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 7.5.4 for optional adjustment.

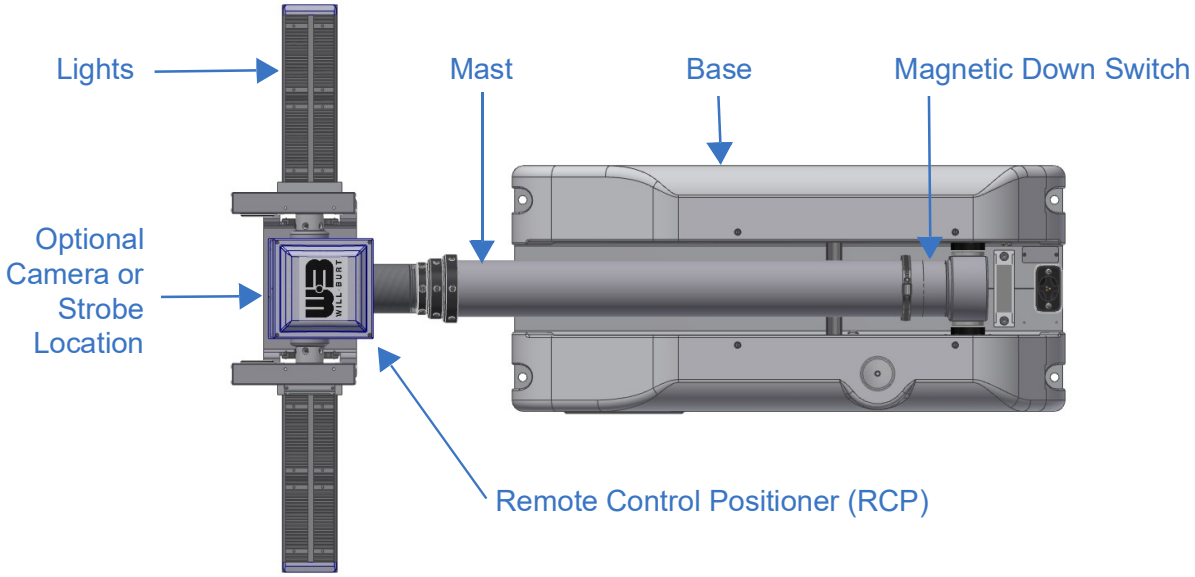


Figure 3-4 Night Scan Chief Top View

Base Board: The PC Board (PCB) contains the system logical controller and provides landing points for customer power supply and vehicle interlock cables. The PCB also distributes DC (and optional AC light) power to components in the system.

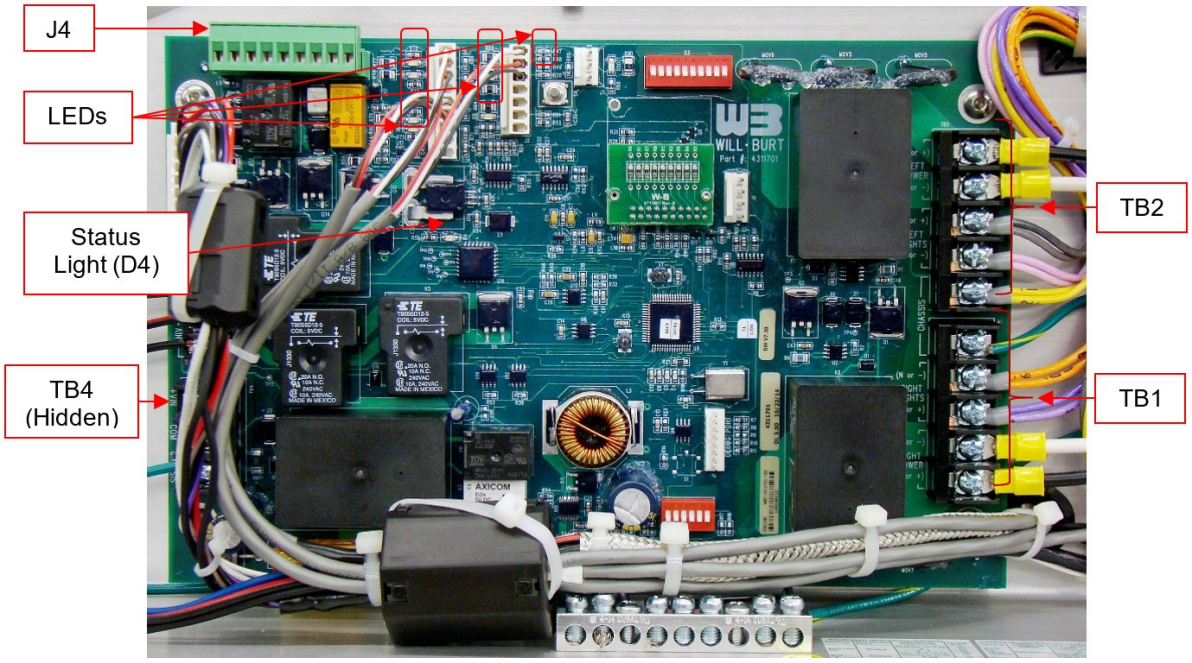


Figure 3-5 Base Board (P/N: 4311701)

Wiring Access Holes: Holes are provided in the bottom of the base to route power and data cables into the mast system. The holes are protected by rubber grommets installed in the sheet metal cutouts.

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

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

Lights: The Night Scan Chief 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/Strobe: Go to www.willburt.com for the latest optional cameras and strobe lights.

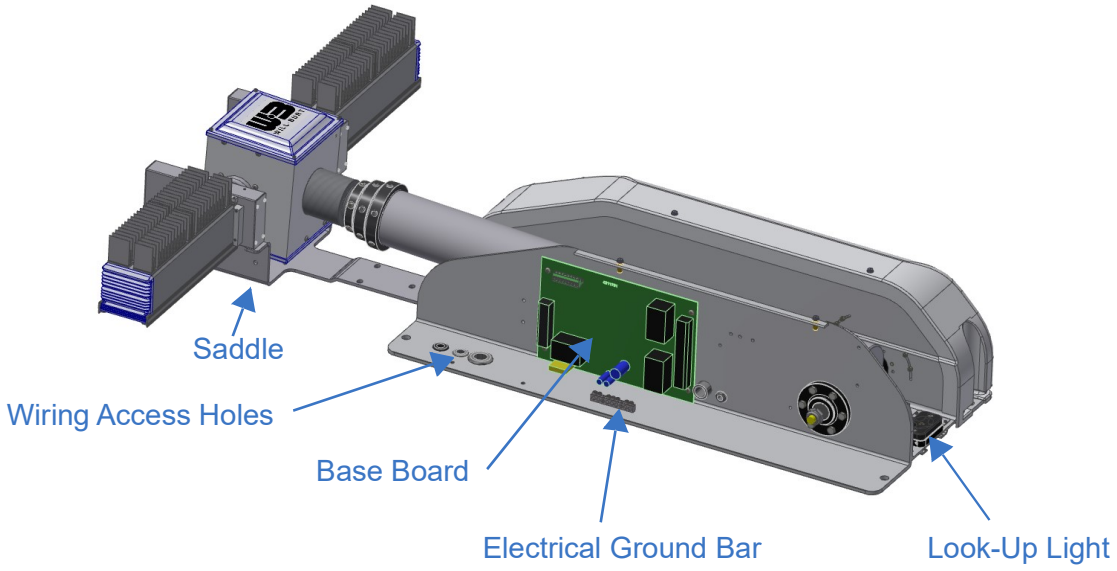


Figure 3-6 Night Scan Chief Components (Left Cover Removed)

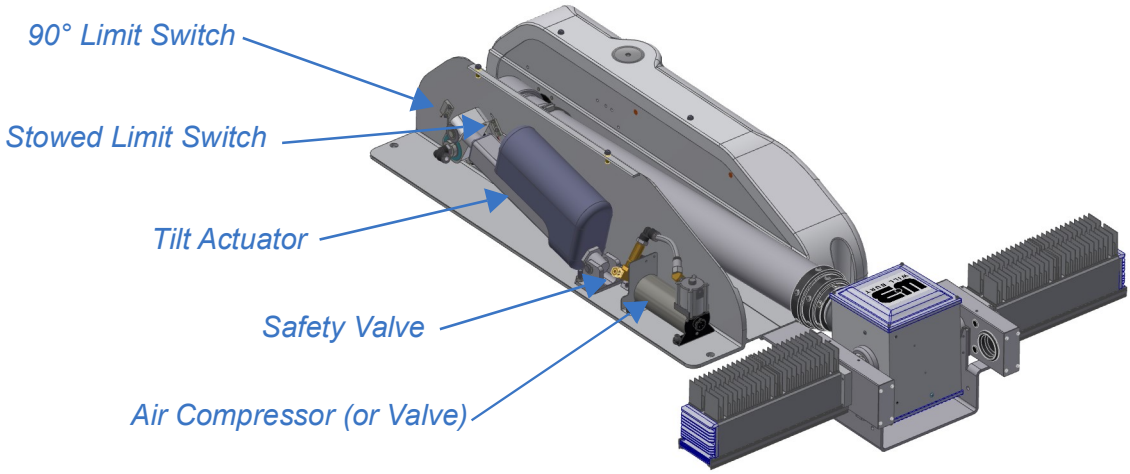


Figure 3-7 Night Scan Chief Components (Right Cover Removed)

90° Limit Switch: This limit switch activates when the mast reaches the 90° vertical position. The mast is driven into a rubber pad under the mast. It is activated by a magnet located on the tilt mechanism. The lights and RCP functions are disabled until this 90° limit switch is activated. Once activated, the RCP and lights are active for use. The limit switch is adjustable and set at the factory. See Section 7.5.2 for optional adjustment procedure.

Stowed Limit Switch: This limit switch activates when the mast reaches the horizontal stowed position. After this switch activates, the controller drives the RCP into the saddle until a specified current limit is achieved for 0.5 seconds. This drives the RCP into the saddle ensuring a tight fit for vehicle transport. The stowed limit switch is activated by a magnet located on the tilt mechanism. The switch location is adjustable and is factory set for a horizontal mounting surface. If the vehicle surface is not flat, this switch may need to be adjusted for proper stowing of the mast. See Section 7.5.3 for optional adjustment procedure.

Tilt Actuator: This actuator tilts the mast.

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

Air Compressor: The air compressor provides the air pressure required to raise the mast. Attached is a valve used for exhausting air. Optionally, the compressor is replaced by air valves (not shown) when auxiliary air is provided by the vehicle. 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.

Power Converter: The Power Converter is standard with the Night Scan Chief Heavy Duty Towing (HDT), but it is optional with other Night Scan Chief models. The system uses a 12 to 48 volt DC to DC power converter (Figure 5-11). The power converter has a 58 volt, 30 amp fuse (P/N: 221033) on the output side. Operating the power converter above 150°F (65°C) may cause damage to the unit.

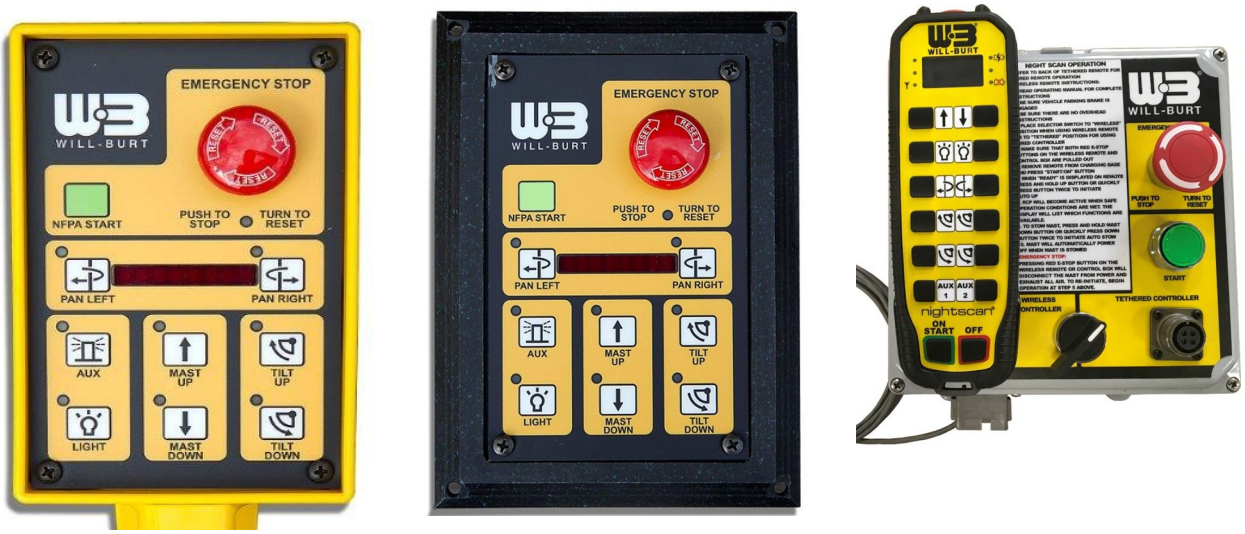
3.4 Remote Control Options

There are three options for controlling the mast functions. Each option provides full system control. See Figure 3-8 for a picture of each option.

1. **Wired Hand-Held Remote Control (HHRC):** This option includes a 25 foot (7.6 meters) quick connect coil cord and LED display.

2. **Panel Mount Remote Control (PMRC):** This option mounts to a panel and has LED display.

3. **Wireless Hand-Held Remote Control (WHHRC).** This option comes with a separate control box that contains the transceiver. This control box is mounted separately from the mast. A HHRC can be plugged into the wireless control box and used with the wireless control. Refer to operating instructions TP-5543301 for installation and operation for the optional WHHRC.



HHRC PMRC WHHRC

Figure 3-8 Remote Control Options (not to scale)

The HHRC plugs into a bulkhead connector that can be located remotely on the vehicle at the operator's station. See Figure 3-9.

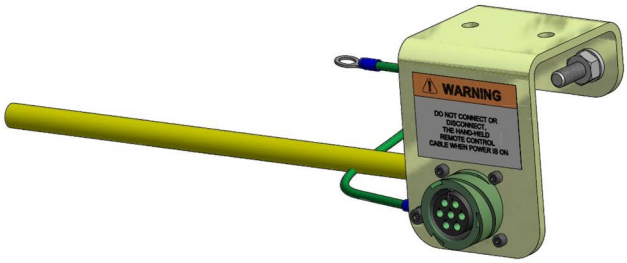


Figure 3-9 HHRC Bulkhead Connection

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4 Technical Data

Night Scan Chief (includes Standard, HDT, and Profiler models)	1.0	1.8	2.3
Extended Height (ft / m)	3.25 / 1.0	6 / 1.8	7.5 / 2.3
System Weight Range (lb / kg)	97-135 / 44-61		
Mast Control System Input Voltage	12VDC - 24VDC		
Mast Control System Current	14A Max at 12VDC 10A Max at 24VDC		
Lighting Input Voltage (for DC	12VDC - 24VDC		
Lighting Current (for DC lights)	50A Max at 12VDC 25A Max at 24 VDC		
Lighting Input Voltage (for AC	110VAC - 220VAC (50 or 60 Hz)		
Lighting Current (for AC lights)	38A Max at 110VAC 28A Max at 220VAC		
System Operating Temperature	-22 to 149 °F / -30 to 65 °C		
System Storage Temperature	-40 to 149 °F / -40 to 65 °C		
Deployment Angle	±10° (17.6% Grade) Maximum		
Deployment Wind Speed (mph /	40 max / 64 max		
Altitude Above Sea Level (ft / m)	15,000 / 4572 Maximum		
Time to Light (seconds)	8	8	10
*Survival Wind Speed (mph / km/h)	140+/225+	140+/225+	114-140/184-225
Auto Deploy and Auto Stow®	Yes		
Number of Lights Available	2 or 4		
Light Type Available	LED or Halogen		
Maximum Lumens	80000	140000	140000
Full Pan and Tilt Light Positioning	Yes		
Opposable Light Fixtures	No		
Profiler - Space Saving Fixture	No	Yes (2 or 3 lights)	
Strobe Light Option Available	Yes		
Camera Option Available	Yes		
**Airborn Noise Emissions	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

**Measured according to EN ISO 3744:2010

See Appendix for additional air supply requirements for optional models without a compressor

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5 Installation

This section describes the physical and electrical installation of the Night Scan Chief 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 (25mm) 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 Stowed Limit Switch is set at the factory based on a level surface. If the system is not level, these switches may need adjusted as described in Section 7.5.3.

3. The mounting location needs to have access holes to install the necessary wiring through the access holes in the bottom of the mast base (see Figure 3-6 for location of holes).

4. 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.

5. The mounting surface needs to be strong enough to support the mast loading under all operating conditions. The following are static weights for the Night Scan Chief with various lights:

   - 100 lb (45 kg) for DC and 1,800 watt AC lights
   - 110 lb (50 kg) for 3,000 watt AC lights
   - 120 lb (54 kg) for 5,400 watt AC lights
   - 130 lb (59 kg) for 6,000 watt AC lights

6. 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.

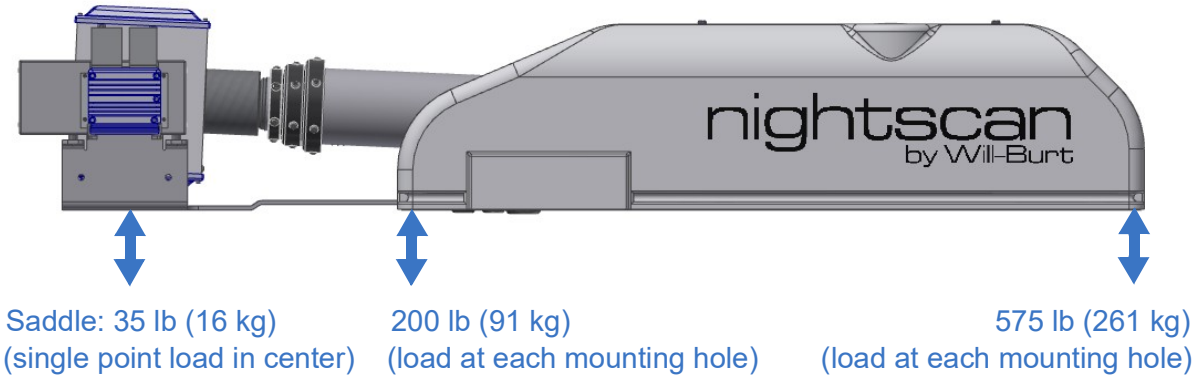


Figure 5-1 Night Scan Chief Reaction Loads on Mounting Structure

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)	
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 Night Scan Chief System Ship

Base Assembly	RCP Assembly	Lights	Bulkhead Control Cable
Light Power Cable (Optional)	Strobe Light (Optional)	Controller (Selected from the following:) • HHRC with Bulkhead • WHHRC • PMRC	Drawings of your system to assist in the installation process
Ferrite	Operators Manual	Label Kit*	

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

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 Night Scan Chief 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.

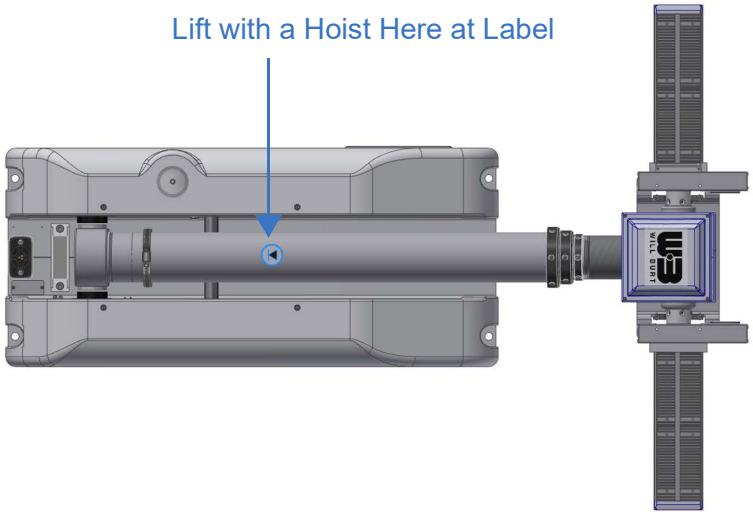


Figure 5-2 Center of Gravity Hoisting Position

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 Ø9/16 inch (or Ø14 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 460-530 in.-lb. (52-60 Nm). The recommended installation torque for M12 stainless steel is 355-425 in.-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.

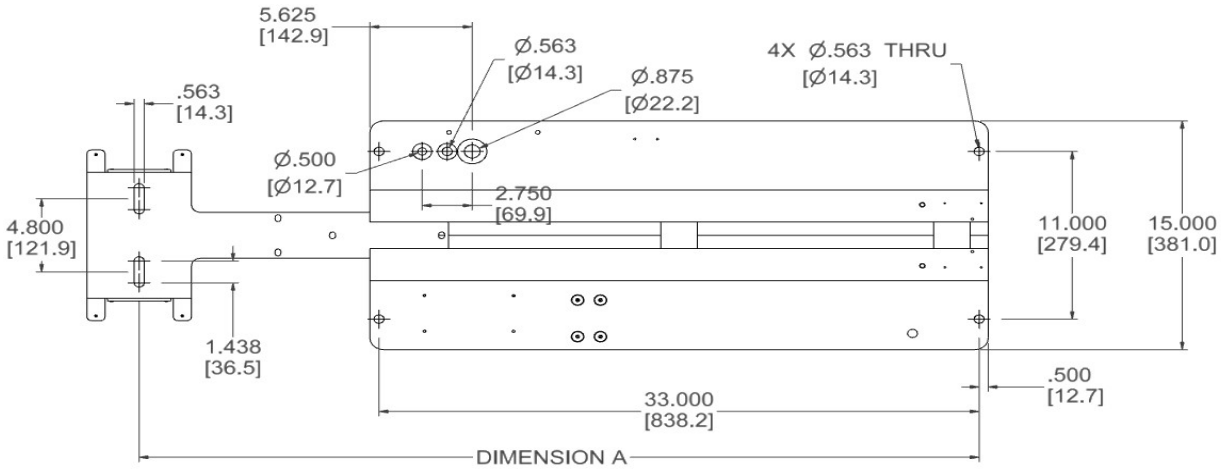


Figure 5-3 Night Scan Chief Installation Dimensions (Bottom View) Inches [mm]

Table 5-3 Installation Dimensions

Model	Dimension A Value (from Figure 5-3)
Night Scan Chief 1.0	44.283 inches [1124.8 mm]
Night Scan Chief 1.8	40.130 inches [1019.3 mm]
Night Scan Chief 2.3	46.190 inches [1173.2 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 strobe lights.

5.5 Installing Remote Control

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

5.5.1 Wired Hand Held Remote Control (HHRC)

Go to section 5.5.2 to if you are installing the Panel Mount Remote Control (PMRC) or section 5.5.3 for the wireless control option. This section will describe how to install the HHRC with a bulkhead.

The bulkhead connector is provided 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 IP54).

To attach the bulkhead:

1. Drill clearance holes for 1/4-20 screws located per Figure 5-4. 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.

4. Attach the HHRC connector to the bulkhead connector by rotating the lug until it locks in place.

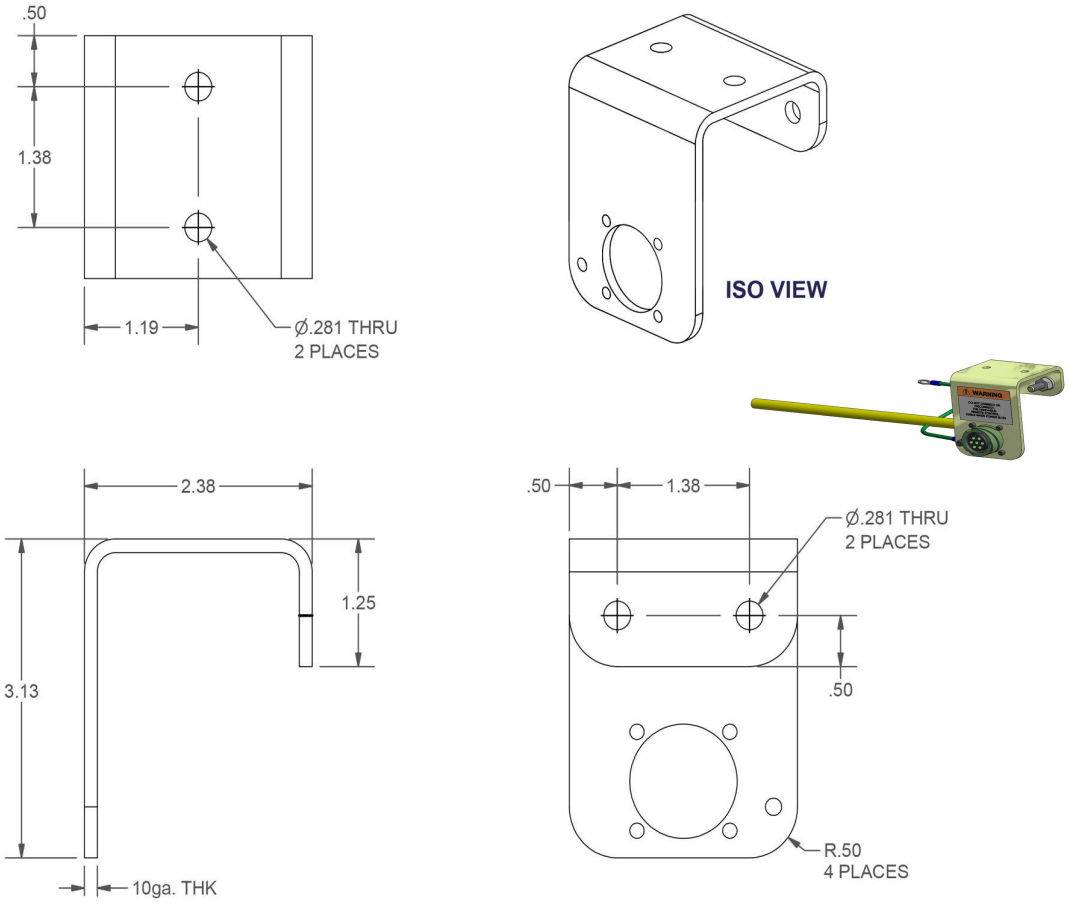


Figure 5-4 HHRC Bulkhead Bracket Installation Dimensions

The HHRC comes with a holder (see Figure 5-5) 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 1.125 inches (28.6 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. Mount the holder ensuring the wedged side in the groove is facing upward to mate to the HHRC.

3. Place the HHRC on the holder.

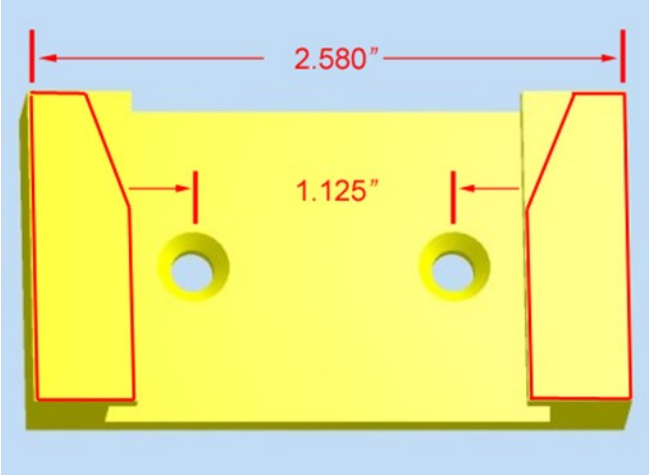


Figure 5-5 HHRC Holder

5.5.2 Panel Mount Remote Control (PMRC)

If your system was not ordered with the optional PMRC, go to section 5.6.

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

1. Cut the panel according to the dimensions shown in Figure 5-6.

2. The screws are provided by the installer. #10 stainless steel screws are recommended with an installation torque of 20-24 in.-lb. (2.2-2.7 Nm).

3. Place the PMRC through the panel cutout and secure with screws.

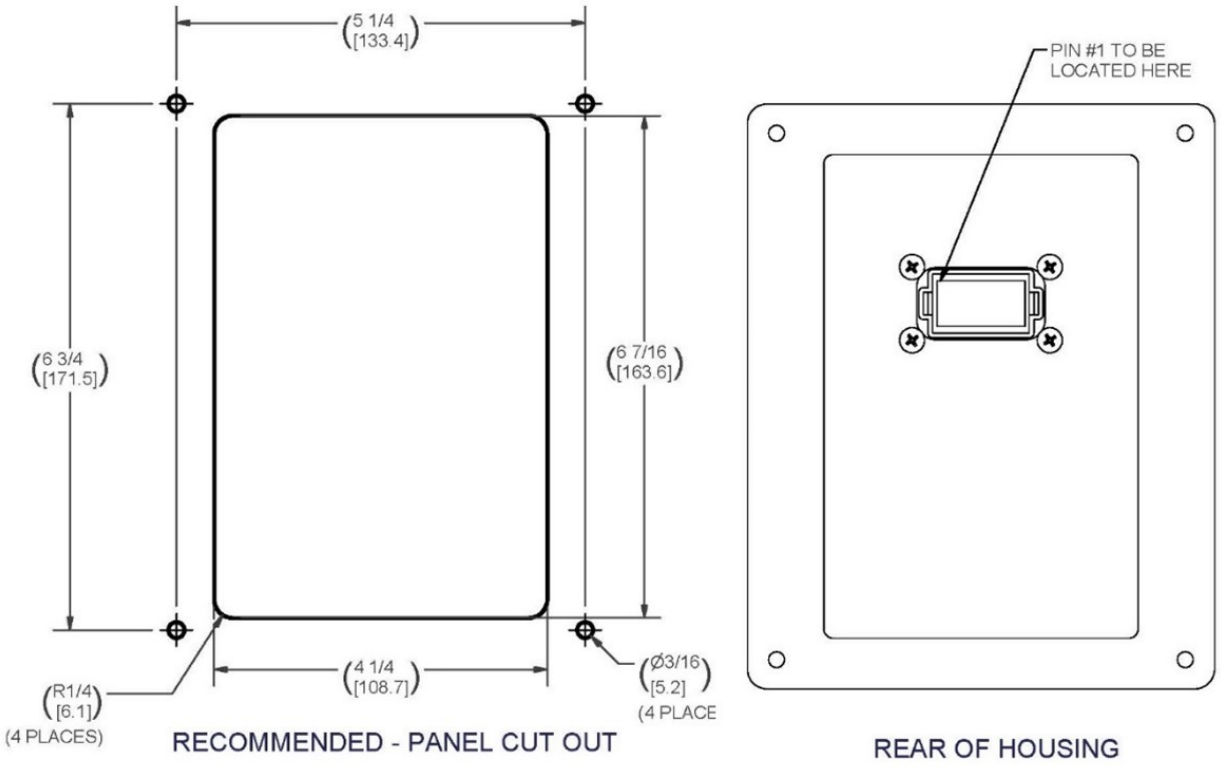


Figure 5-6 PMRC Panel Cutout Dimensions

A loose wiring connector is shipped with the PMRC to allow cable routing in the vehicle. Once the cable is routed, wire the connector and attach the connector to the back of the PMRC.

To wire the PMRC connector:

1. See the Wiring Diagrams provided in the Appendix.
2. Ensure power is properly disconnected from the system.
3. Connect the wires from the Control Cable to the supplied PMRC plug according to the wiring diagram.
4. Plug the cable into the back of the PMRC.

5.5.3 Wireless Hand-Held Remote Control (WHHRC)

Refer to TP-5543301 for installation instructions for the WHHRC option.

5.6 Electrical Installation

Refer to wiring diagram WD-46276 for electrical connections. The wiring diagram is located in the Appendix section and is available at www.willburt.com. Be sure to follow the torque requirements shown on the wiring diagram. To electrically connect the Night Scan Chief, proceed as follows:

1. Remove the three screws from the left cover of the base (as viewed from the back of the unit) and remove the cover.

2. Run the Bulkhead Cable from the HHRC connected to the bulkhead or the PMRC Control Cable into the bottom of the base. Run all power cables into the bottom of the base.

5.6.1 Wiring Remote Control Cable to the Base Board

The Bulkhead Cable (or PMRC Control Cable) connects the bulkhead, Remote Control, and Base Board.

3. Connect the wires from the Bulkhead Cable (or PMRC Control Cable) to the green J4 connector located on the top left of the Base Board ensuring the wires match the color strip on the J4 connector. Connect the J4 connector to the Base Board.

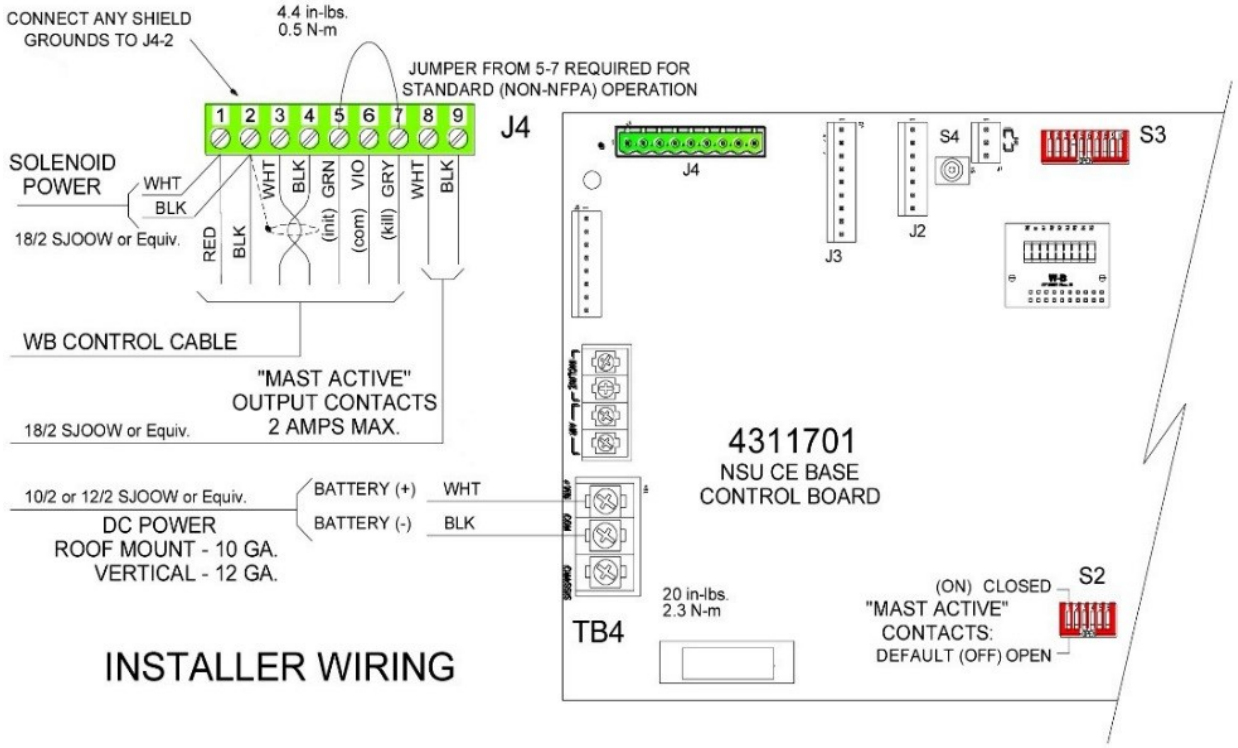


Figure 5-7 Wiring J4

5.6.2 Wiring DC Source Power to the Mast Control Circuit

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 mast system will operate with 12VDC or 24VDC source power. The power supply must be capable of supplying 14 Amps to the mast at 12VDC (or 10 Amps at 24VDC).

The Base Board contains a 20 Amp fuse to protect the mast control circuits from over-current. events. 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. The cables must:

- Be type SJOOW or equivalent.
- Be 10 AWG (or 6mm^2) conductors.
- Have a maximum length for acceptable voltage drop of 70 feet (21 meters).

4. Connect the DC battery power to the +VIN (red or white) and COM (black) connections on terminal block TB4 on the lower left side of the Base Board.

5.6.3 Wiring Source Power to the Light Circuits

The lighting circuits consist of two (2) independently powered circuits: left and right. 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.

It is important to calculate the current draw for the wires in each lighting circuit. To calculate the current draw for the wires:

- Divide the total watts of the entire mast unit by two (since there are two circuits).
- Divide the result by the voltage.
- This final result is the amperage required for each side light circuit.

Table 5-4 shows some example current calculations. Your mast may have different results based on the installed light type and number of lights. In Example 1 (Table 5-4), the lights in the system are a total of 500 watts. This is divided by two to get the watts per side. The result is then divided by the voltage (12) to get the amps (21 rounded). The wires in this example should be able to carry at least 21 amps with minimal voltage drop.

IMPORTANT: The use of 8 gauge wires provide minimal voltage drop, especially for 12 VDC lights. The circuit protection should be sized for the required amperage of the lights, not two 8-gauge wires.

Table 5-4 Sample Light Circuit Current Draw Calculation

	Total Watts	Voltage	Current Draw Per Side (Amps)
Example 1	500 W	12 VDC	21 Amps per side
Example 2	1500 W	120 VAC	6.25 Amps per side

It is the responsibility of the installer to provide over-current protection for both lighting circuits. 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.

There are two inputs on the base Board: LEFT POWER and RIGHT POWER. To wire the Light Power to the Base Board:

1. If AC, connect the light power to TB1 terminal block (RIGHT POWER) and TB2 (LEFT POWER).

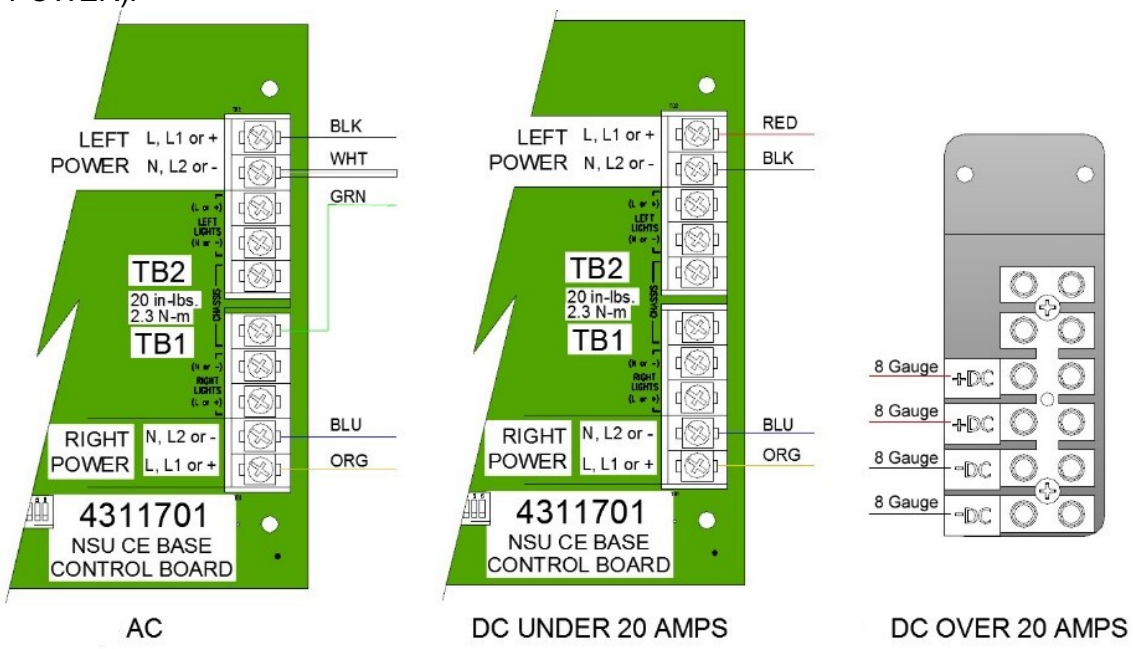


Figure 5-8 Light Power Inputs

2. 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 board under all expected operating conditions. It is recommended that two separate 12 VDC power feeds be run to the base board (four wires total). For lower total wattage lights kits, one ± pair of 12 VDC lines connect to the bottom (RIGHT POWER) on TB1 terminal block. The other ± pair of 12 VDC lines connect to the top (LEFT POWER) of TB2 terminal block. Note: 10-gauge max.

3. For higher total wattage light packages, connect four 8-gauge DC cables to the terminal block mounted to the Look-Up light. The connection to the system is pre-wired at the factory.

4. Secure all loose wires with wire ties.

5. Attach the 0.709″ inside diameter ferrite (shipped with the mast) around the Control/DC cable as it enters the base. This ferrite provides EMI (electromagnetic interference) filtering.

6. 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.

If the cables are supplied by the installer, the cables must:

Condition #1: 120/240 VAC, 24 VDC and 12 VDC (with current ≤ 20 Amps per circuit)

- Be type SOOW or equivalent
- Be 10 AWG (or 6mm^2) conductors
- Have a maximum length for acceptable voltage drop of 70 feet (21 meters)

Condition #2: 12 VDC with current > 20 Amps per circuit using added solenoid

- Be type SOOW or equivalent
- Be 8 AWG (or 10mm^2) conductors or two pairs of 10 AWG (6mm^2)
- Have a maximum length for acceptable voltage drop of 30 feet (9 meters)

For Condition #1 there are two inputs on the right side of the Base Board for attaching the light power conductors.

7. Connect the light power to TB1 terminal block (RIGHT POWER) and TB2 terminal block (LEFT POWER) following the polarity labeled on the Base Board. For AC lights, connect the ground to the ground bar mounted on the base below the Base Board.

For Condition #2 (12 VDC with >20 Amps per circuit) a solenoid valve is added to the system to manage the higher current load. This solenoid valve assembly includes a separate terminal block to land the 12 VDC light power. Connect the left and right light power to the terminal block as shown in Figure 5-9 following the polarity listed on the terminal block label. Note this only applies to 12 VDC high current applications. The solenoid valve is not installed for systems under Condition #1.

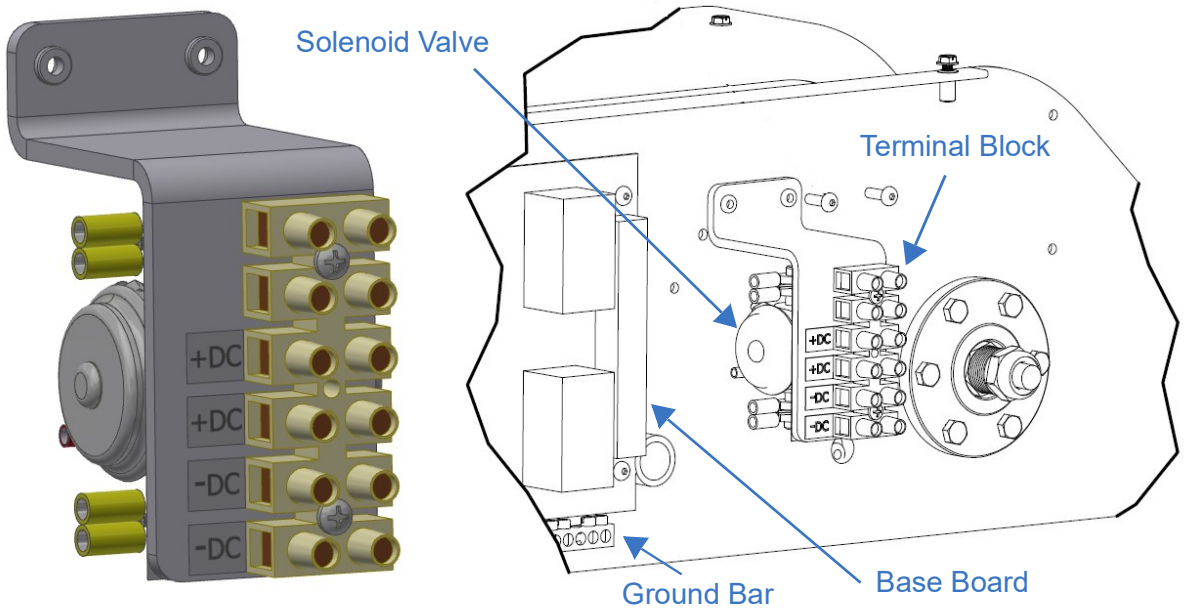


Figure 5-9 Solenoid Valve Light Power Connection Point (for 12VDC High Current)

5.6.4 Wiring Vehicle Safety Interconnect Circuit

The mast provides an isolated relay contact output to enhance integration into vehicle safety circuitry. This output indicates whether or not the mast is stowed to indicate it is safe to move the vehicle. The use of this vehicle safety interconnect is required for vehicle NFPA (National Fire Protection Association) regulation compliance. The Will-Burt Company does not recommend installing the mast on a vehicle without connecting to the vehicle safety interconnect circuit to warn the driver or prevent the driver from moving the vehicle with the mast extended.

This relay output is from a bi-stable (latching) relay whose contacts either open or close (switch selectable) when the mast is active (not stowed). Its state is not affected by whether or not there is power to the mast. This contact is capable of carrying up to two (2) amperes and is available on pins J4-8 and 9 (data cable supplied by the installer). Figure 5-10 shows an example vehicle safety interconnect circuit. It can be used in conjunction with a customer-supplied relay to drive a flashing warning light. Other arrangements are possible.

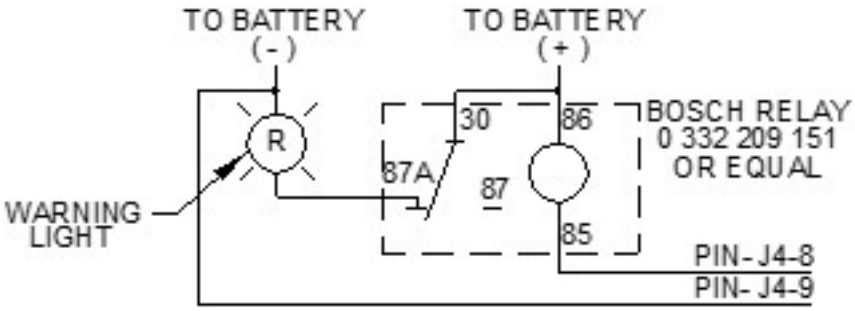


Figure 5-10 Example Vehicle Safety Interconnect Circuit

The contact output is set at the factory to be OPEN when the mast is active (not stowed) by setting the S2-1 dip switch to the OFF (OPEN) position. To change the contact output to be CLOSED when the mast is active, set the S2-1 dip switch to the ON (CLOSED) position. Mast power needs to be cycled for this change to take effect.

5.6.5 Wiring Optional Enable Circuit

Some safety standards requires preventing operation of the mast unless other conditions are first met. An example might be having the parking brake set. This can be accomplished by inserting an isolated contact in series with the stop circuit of the "E-Stop" button. Inserting these contacts in line with the wire connected to pin J4-7 on the base circuit board breaks continuity and will inhibit operation of the mast and prevent operation until the parking brake is set. After use, and properly stowing the mast, when the parking brake is released, the mast is again prohibited from energizing until the parking brake is set.

Note: Using this parking brake feature is the same as pushing the E-stop button. Power to the control is opened, the mast immediately exhausts air, and the mast comes down without regard to the proper RCP alignment (stowing to the home position). The parking brake should not be released until the mast is safely (and automatically) stowed by the controls.

5.6.6 Secure Wiring and Attach Cover

8. Secure all loose wires with wire ties.

9. Attach the 0.709 inch (18 mm) inside diameter ferrite (shipped loose with the mast) around the Control/DC cable as it enters the base. This ferrite provides EMI (electromagnetic interference) filtering.

10. Once all wiring connections are complete, replace the base cover and tighten the three mounting screws.

5.6.7 Attaching the Power Converter

Mount the power converter vertically (fins up and down) for better heat dissipation (Figure 5-11). The best practice is to mount the power converter in a fan-cooled enclosure. Do not mount the power converter in the engine compartment or an enclosed space without ventilation.

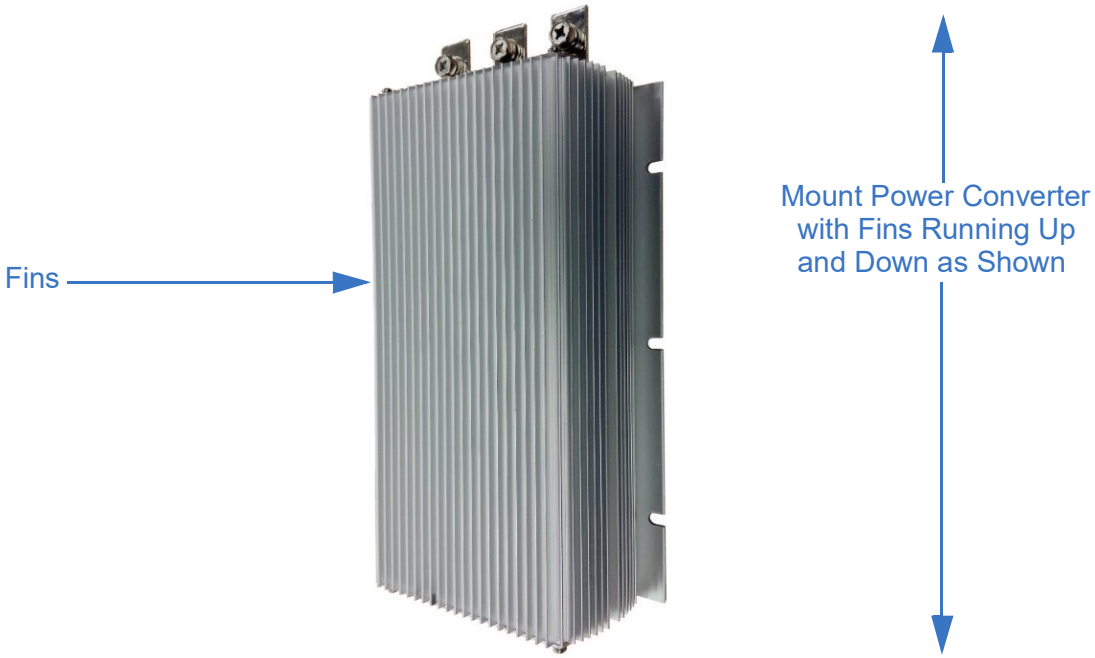


Figure 5-11 Power Converter Mounting

5.7 Test the Installation

Review the Operation 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 LEDs on the controller and Base Board.

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 green “NFPA Start” button until the system begins power-up.
4. Check for proper clearance above the mast.
5. Press and hold 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. Press “Tilt-Up” and “Tilt-Down” buttons one at a time. Press “Pan-Left” and “Pan-Right” buttons one at a time. Check the lights again.

8. Press and hold the “Mast-Up” button. When the mast is fully extended and the blow-off valve opens, 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, and check the lights again.

11. If the optional strobe/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 LED indicators turn off on the HHRC. The mast will power off automatically upon reaching the stowed position.

14. Restart the system and rapidly press the “Mast-Up” button two times to invoke the Auto-Up feature. Once the mast has fully deployed to the vertical position, press the “Mast-Down” button two time rapidly to invoke the Auto Stow® feature. The mast will stow and power itself off.

Note: Before delivery of a new system, the 90° and Mast Stowed (Near 0°) switches are set and tested for a flat surface. If the mounting surface is not flat, the 90° and Mast Stowed switches may need adjusted to function properly. If necessary, refer to Section 7.5 for details on adjusting the 90° and Mast Stowed (Near 0°) switches.

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 Remote Control Functions

Using the Remote Control, 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 strobe light on and off. The following are the Remote Control buttons:



6.3 Quick Operation Summary

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 disconnect the unit from power and cause all air to be exhausted from the mast. The mast will fully lower (if it was raised) regardless of the orientation of the RCP, but not tilt.

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 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. Then press "NFPA Start" to power up the mast.

4. Raise the mast to 90° and turn on the lights by performing one of the following steps:

   - Quickly press "Mast Up" twice (Auto-Up feature) to move mast to 90° and turn both banks of lights on. To abort the Auto-Up feature, press any controller button.

   - 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°. Only the controller buttons that have a lit LED are active.

5. If desired, raise the mast further by pressing "Mast Up".

6. Position the lights vertically by pressing "Tilt Down" and "Tilt Up".

7. Position the lights horizontally by pressing "Pan Right" and "Pan Left".

8. Use the "AUX" button to turn on the strobe/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:

    - Quickly press "Mast Down" twice (Auto Stow® feature). It is recommended to use the Auto Stow® feature to stow the mast. To abort Auto Stow®, press any controller button.

    - Press and hold "Mast Down" until all LEDs on the controller turn off. Ensure that "Mast Down" is released only after the controller LEDs turn off which means the mast is stowed.

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 "NFPA Start" to power up the mast.

On initiation, the Base Board establishes communication with the other boards in the system. If communication cannot be established, an error code is shown on the display and the communication system is shut down. The HHRC must be connected prior to power-up to be recognized by the controller.

6.5 Raising the Mast to 90°

The mast uses a DC powered actuator to drive the mast from stow to 90°. When at 90°, a proximity sensor detects the actuator then drives the actuator a bit further. Driving the actuator a bit further causes the mast to seat firmly into the rubber mast pad. Do not overdrive the actuator or damage to the system could occur. Once the mast is at 90°, all RCP functions are available.

There are two ways to raise the mast to 90°.

- Use the Auto-Up feature.
- Press and hold the "Mast Up" button.

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

- The Auto-Up feature automatically moves the mast to 90°, whereas the "Mast Up" method requires the operator to press the controls throughout the process.
- 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 at 90°, whereas using the "Mast Up" button does not.

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

Two common operator errors can occur when the operator does not use the Auto-Up feature:

1. On uneven ground, an operator may believe the mast has reached 90° and release the "Mast Up" button too early. Then when the operator attempts to turn on the lights, the lights do not turn on as the 90° Switch is not active. If the operator used the Auto-Up feature, the mast would unfold until it reached exactly 90° and then automatically turned on the lights.

2. During high winds, if an operator stops the mast before it is firmly seated at 90°, the mast may initially be at 90°, but be pushed off of 90° by the high winds. This could cause an error when the operator wants to use certain controller functions like panning the lights since the mast must be at 90° to pan the lights.

When using the "Mast Up" button, press the button until the software stops the mast in order to ensure the mast has reached 90°.

6.5.1 Using the Auto-Up Feature

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. "Auto-Up" will be shown on the controller, and after the mast leaves the stowed position and begins moving toward 90° (takes about 2 seconds); the controller "Mast Down" and "Mast Up" LEDs will light.

To raise the mast to 90° using the Auto-Up feature, 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. The mast will not extend upward by itself, but will await further operator input from the controller.

6.5.2 Using the Mast Up Button

Raise the mast to 90° using the "Mast Up" button as follows:

1. Press and hold "Mast Up" until the mast is at 90°. Press the button until the software stops the mast to ensure 90° has been reached.

2. Release "Mast Up" button when the additional controller LEDs like "Tilt Down" and "Pan Right" light. The lighting of the LED indicators indicate the mast has reached 90°.

6.6 Extending the Mast

After reaching 90°, the mast can be extended to full or partial height (not available on 1.0 models). To extend the mast when it is at 90°, press and hold "Mast Up" until the mast reaches the desired height.

Pushing "Mast Up" button will cause the mast to rise until the "Mast Up" button is released, or the mast reaches its maximum extended height. 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 exhaust valve will open and exhaust any more air that enters the mast, leaving the mast at its maximum extended height.

6.7 Controlling the Lights

The lights can be turned on and off from the Remote Control when at the 90° position or while extended. At the 90° position, the RCP and lights are enabled. From the 90° position, the RCP can initially position the lights down and to the right only. Once the RCP reaches a 350° position, the RCP can only rotate back in the other direction.

To pan and tilt the lights:

- Holding "Tilt Down" turns the lights down and all the way around to 350°.
- Holding "Tilt Up" turns the lights back in the other direction.
- Holding "Pan Right" turns the lights to the right.
- Holding "Pan Left" turns the lights to the left.
- Pressing "Lights" toggles the lights on and off.

6.8 Lowering the Mast

Once the mast has been extended, pressing "Mast Down" will lower the mast. Continue to press "Mast Down" until the mast reaches the desired height and then release the button.

6.9 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 considered stowed when the Mast Stowed Switch is closed, and the brief over current condition is met when the mast is 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 With Power
- Emergency Stow Without Power

All power is automatically removed after the mast contacts the saddle and the current limit is reached. 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.

6.9.1 Using the Auto Stow® Feature

To use the Auto Stow® feature:

1. Press "Mast Down" twice quickly in successive depressions (two depressions within ½ second). 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. This automatic sequence can be aborted by pushing any of the buttons on the controller 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. The mast will power down automatically after stowing.

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.

6.9.2 Using the Mast Down Button

Another method used to stow the mast is to press and hold "Mast Down" on the controller. 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" until the mast stops and the "Mast Down" LED is turned off indicating the mast has powered-down. The mast will lower (if not already there), then to the RCP home position, and then stow the mast. 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.

6.9.3 Emergency Stow with Power

If the mast cannot be stowed using the Auto Stow® feature or "Mast Down" button, the emergency stow button (S4) on the Base Board can be used to stow the mast if the following are both true:

- Power is still applied to the system.
- The actuator is still functional.

Using the emergency stow button causes the actuator to lower the mast without regard to any faults, switches, or system interlocks. It is totally up to the operator to ensure safe operation during an emergency stow attempt. Also, the current limiting feature is not used so it is possible to over-drive the actuator. Release the S4 button once the saddle is reached. Pressing the emergency stow button causes the system to generate an "ERR 1,20" error. Errors cause the mast to automatically:

- Move the RCP to the home position (provided there are no electrical or mechanical issues with the RCP).
- Exhaust all air from the mast, which lowers the mast to its nested position.

Once the mast has lowered to its nested position, pressing and holding S4 will drive the tilt actuator to stow the mast. The mast will continue to tilt and drive in the saddle until S4 is released. Do not over-drive the actuator into the saddle.

To stow the mast using the emergency stow button:

1. Remove the left side cover (as viewed from the back of the mast).

2. Tap S4 on the Base Board. Do not hold down S4; just press, then immediately release S4 once. This will cause the controller to show an "ERR 1,20". The error will cause the RCP to go to its home position and exhaust all air from the mast.

3. Wait until all air has exhausted from the mast. The mast should now be retracted and in the 90° position.

4. Ensure the RCP and lights are in the home position. If the RCP and lights are not in the home position, manually adjust the pan or tilt of the RCP. Before adjusting the RCP or lights, make sure that the lights have cooled completely. To adjust the pan, grasp the horizontal light shafts and rotate to perpendicular to the base. To adjust the tilt, grasp the top and bottom of the light, and slowly rotate the lights so they are face down.

5. Ensure there are no obstructions in the path of the mast.

6. While observing the RCP, lights, and mast, press and hold S4 on the Base Board.

7. Ensure that the RCP and lights are properly positioned as the mast goes from 90° to the stowed position.

8. Immediately release the S4 button as soon as the RCP shaft is in the saddle. Do not over-drive the mast into the saddle.

9. Visually check that the mast is properly stowed. Ensure that the lights do not bounce as the vehicle drives on the road.

6.9.4 Emergency Stow without Power

If power is lost or an unrecoverable error occurs, the mast will automatically exhaust all air and lower to its nested height. However, the mast will not return to its fully stowed, horizontal position. Since there is no power to run the actuator, the emergency stow button cannot be used and the mast must be stowed manually.

To manually stow:

1. Ensure all power has been properly disconnected from the system.

2. Adjust the pan and tilt, if necessary, to place the payload in the stow position. Ensure that the payload will not make contact with the saddle or mounting surface when the mast stows. If your system includes lights, make sure any lights have cooled completely before manually panning and tilting. Lights should be rotated so they will be facing down when the mast is stowed.

3. Remove the base right side cover to access the actuator.

4. Remove the 6 mm hex head bolt on the end of the actuator cover (Figure 6-1). This bolt acts as a cap/seal and when removed exposes the manual actuation shaft in the actuator.

5. Place a long 6 mm hex head wrench into the hole to reach another 6 mm bolt. A socket hex head wrench may be used, but care must be taken not to damage the adjacent components.

6. Turn the hex head wrench clockwise to lower the mast. Lower the mast until it seats firmly in the saddle.

7. Replace the right side base cover.

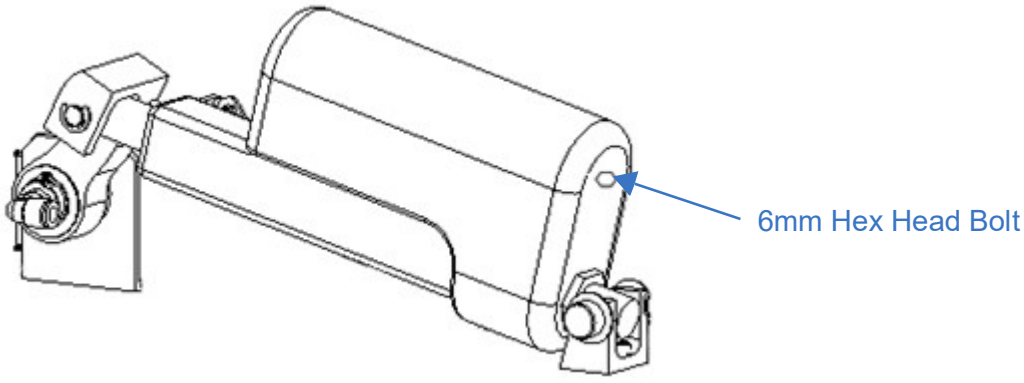


Figure 6-1 Actuator Override for Manual Retraction

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 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. Activate the emergency stop if the location is not in the nested position to turn off the mast. Note: The mast will descend if extended because air will be removed from the mast.

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.

4. Unplug the mast hand held remote control and keep it with the maintenance engineer during maintenance to avoid unexpected mast operation.

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

7.2 Cleaning and Lubricating the System

The Will-Burt Company’s pneumatic telescoping masts 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.

7.2.1 Cleaning with Air Valve (Night Scan Chief with Profiler)

Prior to cleaning the Night Scan Chief with Profiler with Air Valve, reduce the regulator (Figure 7-1) setting so that it pressurizes the mast to between 5 and 10 PSIG. Pull up on the regulator cap and rotate counterclockwise. Push cap down to lock into place.

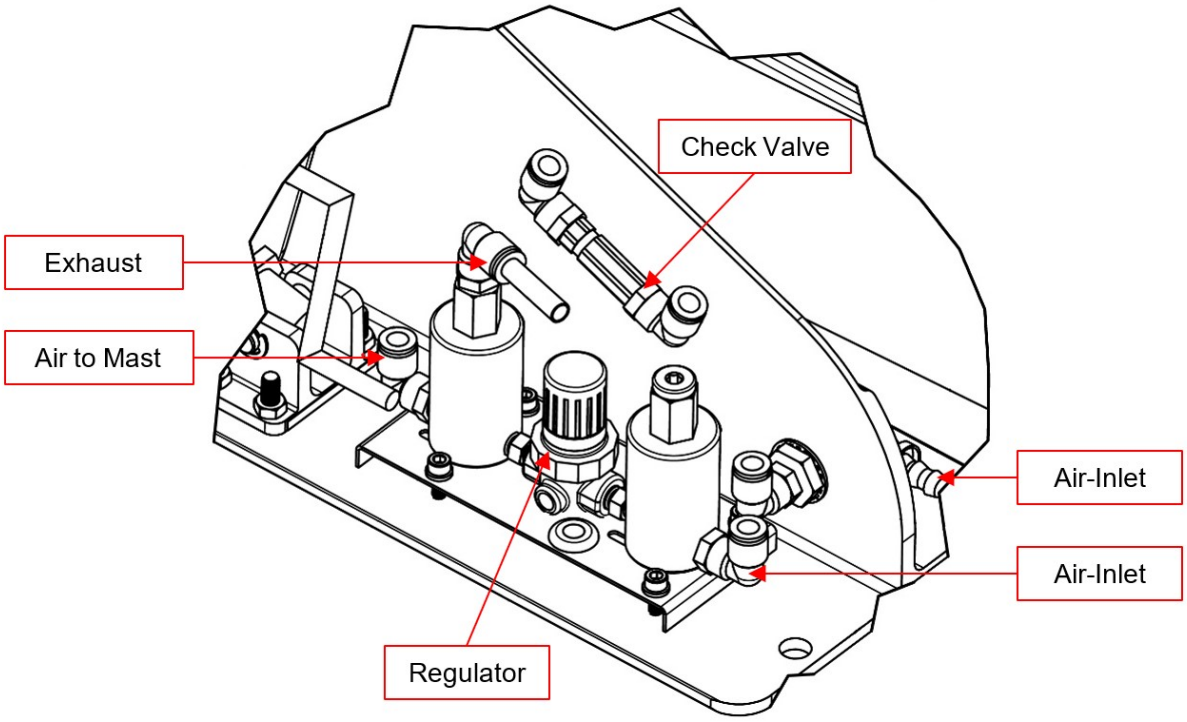


Figure 7-1 Regulator

All other maintenance remains the same as the standard Night Scan Chief.

7.3 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.

7.4 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 7.2.
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 7.2. 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 7.5.3.
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 7.5.2.
Yearly	Test the function of the emergency stop button to ensure it is working properly.	Replace defective parts.

7.5 Adjusting the 90° and Mast Stowed Limit Switches

Before delivery of a new system, all switches are properly set and tested at the factory and normally no switch adjustment is necessary. However, if a switch needs adjusted, for example if the actuator was replaced or if the mounting surface is not flat, follow the steps outlined in this section to make the adjustment.

7.5.1 Diagnostic LEDs on the Base PC Board

The PC Board mounted at the mast Base has LED indicator lights useful for diagnostics for circuits. Table 7-2 charts the colors of the relevant diagnostic LEDs for the various mast positions. An example of the diagnostic LEDs showing the mast in the stowed position is shown in Figure 7-2. These diagnostic LEDs can be used to help determine if an adjustment is necessary, for example if D7 / D8 shows Yellow when the mast is supposed to be stowed. They are also useful in assisting to determine when the switches have been properly adjusted.

Table 7-2 Mast Positions Shown by Diagnostic LEDs

Mast Position	D7/D8	D10/D11	D13/D14
Mast Stowed	Green	Green	Green
Mast Between 0° and 90°	Yellow	Green	Green
Mast at 90°	Yellow	Yellow	Green
Mast Fully Extended	Yellow	Yellow	Yellow

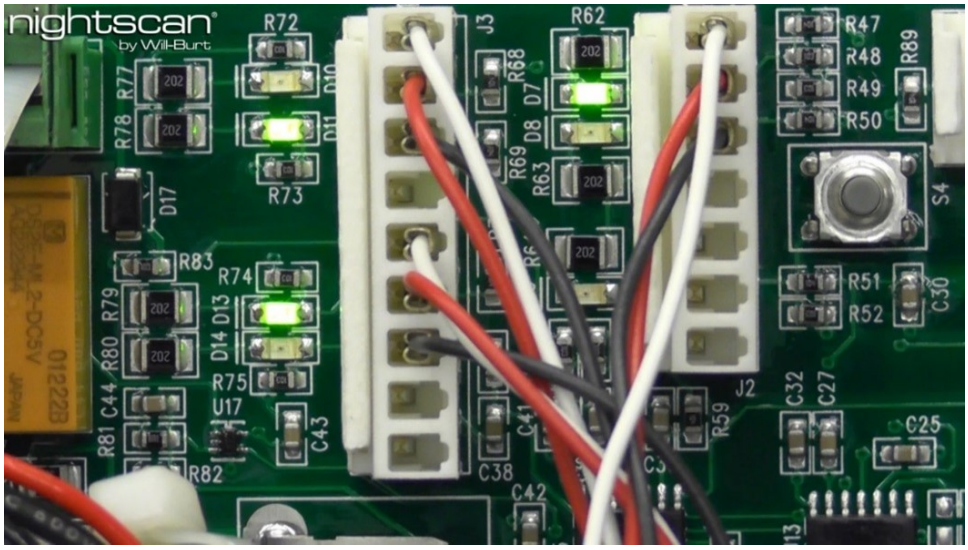


Figure 7-2 Diagnostic LEDs (stowed position example)

7.5.2 Adjusting the mast 90° Limit Switch

The 90° Switch (Figure 7-3) senses when the mast is at 90° by checking the position of the actuator. There is a magnet mounted to the actuator arm that triggers the limit switch. When the mast is being raised from the stowed position and the 90° Switch is sensed, power to the actuator is removed thus allowing the mast to remain at 90°. The mast will not extend and the RCP will not function if the mast is not at 90°.

To adjust the 90° Limit Switch:

1. Make certain that the base is level.
2. Remove the two base covers to access the Limit Switches and Base Board.
3. Loosen the lock nuts to adjust the switch position in the slot.
4. Raise the mast to 90° by holding the "Mast Up" button until the mast is at 90°. Do not use the Auto-Up feature to raise the mast to 90°.
5. Check that the mast is at 90° by using a level, ensuring that the mast is square to the sheet metal side plate on the base. A value range of 89.5 to 90.5° is acceptable.
6. Adjust the 90° Switch until it senses the actuator. This will be indicated by the diagnostic LEDs on the Base Board (Figure 7-2).
7. Secure the switch in position using the lock nuts.
8. Raise and lower the mast several times, checking that the mast is plumb each time, and adjust the switch if necessary. The mast should drive into the rubber pad slightly for stability.
9. Replace the base covers.

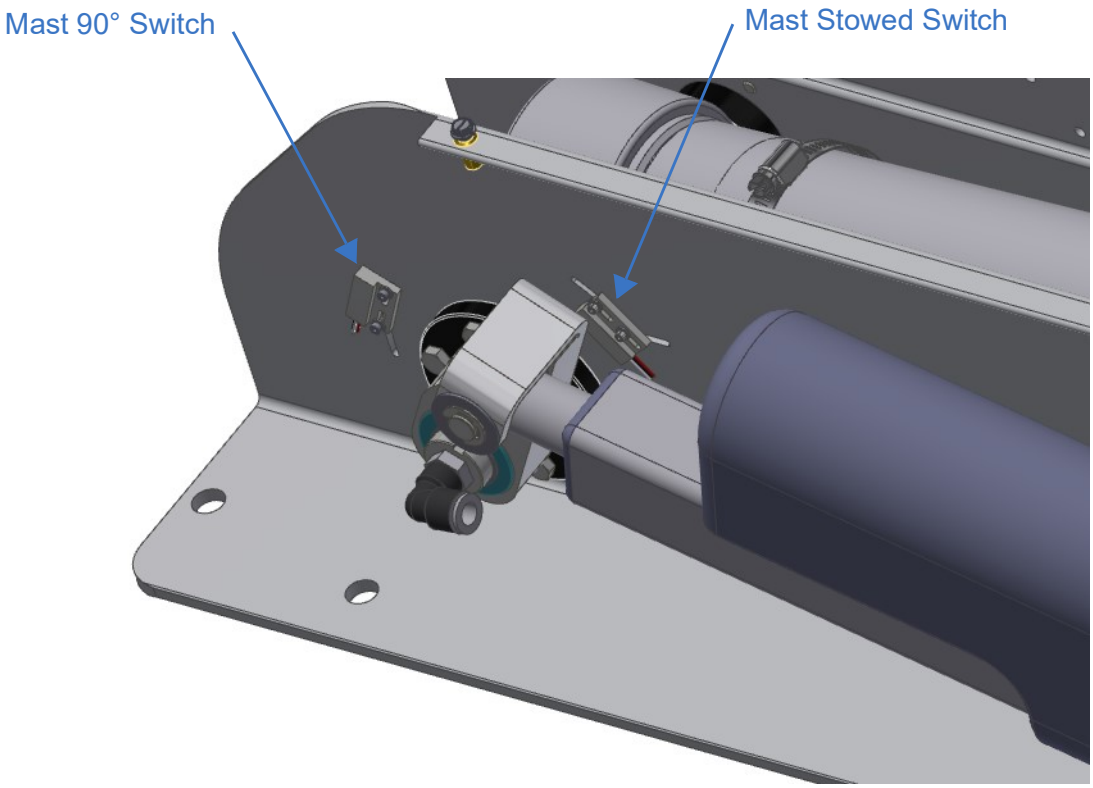


Figure 7-3 Mast Stowed and Mast 90° Limit Switch Locations (Cover Removed)

7.5.3 Adjusting the Mast Stowed Limit Switch

The Mast Stowed (near 0°) Switch (Figure 7-3) senses that the mast is in the saddle upon power-up, and when the mast is nearing the saddle during stowing. The circuit then looks for a pre-determined current rise (for a maximum of 0.5 seconds) to indicate a solid nesting before shutting off. This current monitoring allows the controls to drive the RCP into the saddle to remove all mechanical play for vehicle transport. The limit switch is activated by a magnet located on the actuator arm.

To adjust the Mast Stowed Switch:

1. Make certain that the base is level.

2. Remove the two base covers to access the switches and Base Board.

3. Raise the mast to gain access to the Mast Stowed Switch.

4. Loosen the lock nuts to adjust the switch position in the slot.

5. Lower the mast to the stowed position by holding the "Mast Down" button until the mast is stowed. Immediately release the "Mast Down" button when the mast is stowed. If you drive the mast too far into the saddle, you may receive a "1,04" error (excessive amp draw during actuator decline). Do not use the Auto Stow® feature to stow the mast.

6. Check that the mast is properly stowed. This will be indicated by the diagnostic LEDs on the Base Board. As the mast comes down D11 and D13 will be green, and D7 will be yellow. Once stowed, D7 will also turn green (see Figure 7-2).

7. Raise the mast to gain access to the Mast Stowed Switch.

8. Secure the switch in position by tightening the lock nuts.

9. Raise and lower the mast several times, checking that the mast stows each time, and adjust the switch if necessary. There should be no mechanical play between the RCP and the saddle when properly stowed.

10. Replace the base covers.

7.5.4 Adjusting the Mast Magnetic Down Switch

The Mast Magnetic Down Switch tells the control system the mast is fully retracted and allows the mast to tilt back to the stowed position. The Magnetic Down Switch is band-clamped to the base tube. This switch senses a magnet in the top tube when the mast is at 90°, or stowed, but not extended. The magnet is located in a recess at the bottom of the top tube and is not visible from outside the tube. If the Magnetic Down Switch is mis-adjusted, the mast may give an error code upon power up, or may not stow from 90°. When adjusting the Magnetic Down Switch, ensure that the mast is at 90° or stowed with all collars stacked and no gap between them.

Before delivery of a new system, all switches are properly set and tested and normally no switch adjustment is necessary. However, if an adjustment is required, adjust as follows:

1. Deploy the mast to some point between 0° and 90°.

2. Loosen the band-clamp that holds the Magnetic Down Switch and lower the clamp to the bottom of the mast.

3. Remove the left base cover to expose the base PC Board diagnostic LEDs (see Figure 7-2).

4. Ensure the mast is fully nested (no gaps between collars). While observing the Base Board diagnostic "Mast Down" LED, slowly move the band-clamp up until the "Mast Down" LED turns green.

5. To test:

   a. Initiate the mast.

   b. Press the "Mast Down" button on the controller until the mast stows. If the mast does not stow, repeat steps one and two several more times or until the mast stows.

6. If repeated adjustments do not succeed, use a small piece of steel or iron filings to locate the magnet in the tube and move the Banded Magnetic Switch to the magnet's location.

7. If the mast still will not stow, hold a separate magnet up to the Banded Magnetic Switch. Press the "Mast Down" button and ensure that the mast begins to stow. Be careful not to pinch hands during mast movement.

8. If the mast stows while using the separate magnet, repeat the switch adjustment steps above until the switch senses the magnet.

9. If the mast does not stow using a separate magnet, check the wiring to the Base Board for loose or disconnected wires. See the wiring diagrams for the system. If the wiring is intact, replace the magnetic switch.

7.6 Adjusting the RCP Home Position

The RCP home position is the position of the RCP and lights where the light bars are parallel to the axis of the mast and the lights are facing down when stowed. If the RCP home position is set properly, when being stowed the RCP shafts should contact the saddle simultaneously. The home position is established by positioning small flags in the RCP that engage photo interrupters on the RCP PC board. Adjusting the RCP home position should be done indoors. Adjusting the home position outside can cause improper RCP operation due to sunlight reaching the photo sensors. Before delivery of a new system, the RCP home position is adjusted and tested and normally no adjustment is necessary.

If an adjustment is required, adjust the RCP home position as follows:

1. Disconnect all light power to the system using proper lock-out tag-out procedures (see Section 7.1). Keep the DC power connected to the mast control system.

2. Initiate the mast and raise the mast to the 90° position. Ensure that the "Pan Right" and "Tilt Down" controller LEDs turn on.

3. Remove the RCP cover to access the flags. The flags are attached to the timing rings on the horizontal and vertical shaft gears (Figure 7-4). The tilt timing ring has two set screws that must be loosened. The pan timing ring has two cap screws that must be loosened. It may be necessary to loosen one in each, then pan and tilt the unit to access the others. Note: The flags have sharp edges which may cause cuts.

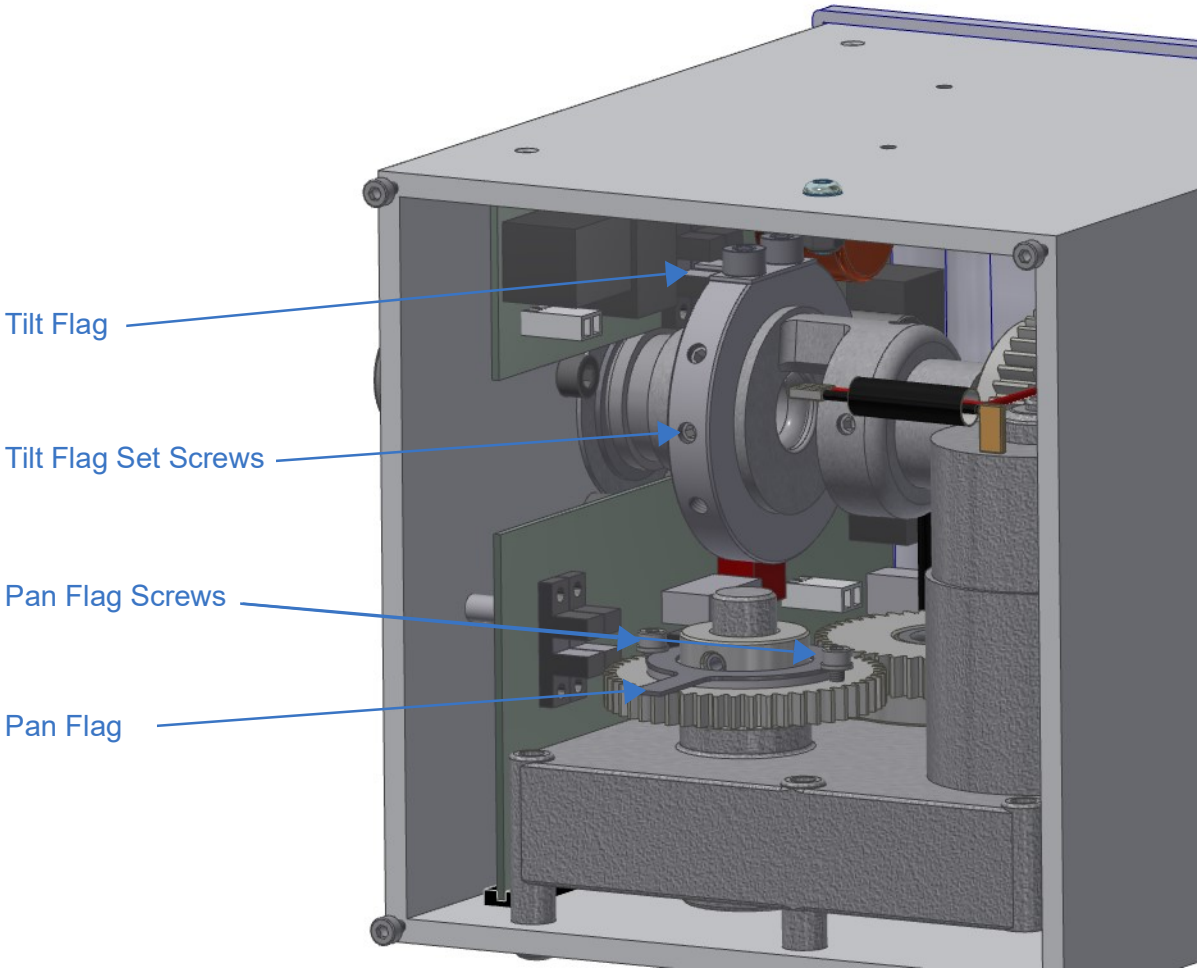


Figure 7-4 RCP Flags (RCP cover removed)

4. Once the set screws are loose, pan and tilt the unit to the correct home position. Be careful that the flags do not come into contact when panning and tilting, or they may be bent.

5. The pan and tilt functions have two photo sensors for each function. It is important that the flags engage the correct photo sensor from the proper direction when setting the home position (Figure 7-5). To set the Tilt Home Position, turn the timing ring on the tilt shaft such that it rotates counterclockwise toward the photo sensor (see Figure 7-5). As you approach the sensor, watch the controller. As soon as the "Tilt Down" LED goes out, stop rotating the ring and tighten the set screw. This should be roughly 80% penetration into the sensor with the flag.

6. To set the Pan Home Position, turn the flag clockwise (looking from above the RCP) until the "Pan Right" LED goes out (see Figure 7-5). Tighten the adjustment screws to secure the ring.

7. Tilt the unit until the second set screw for the tilt flag is accessible. Tighten the second set screw.

8. Stow the mast, watching for the RCP and lights to become oriented as described in the beginning of this section. If it does not look like the RCP is properly positioned during stowing, use the Emergency Stop to stop motion and re-adjust the flags.

9. Once proper positioning is achieved, raise the mast high enough and replace the RCP cover.

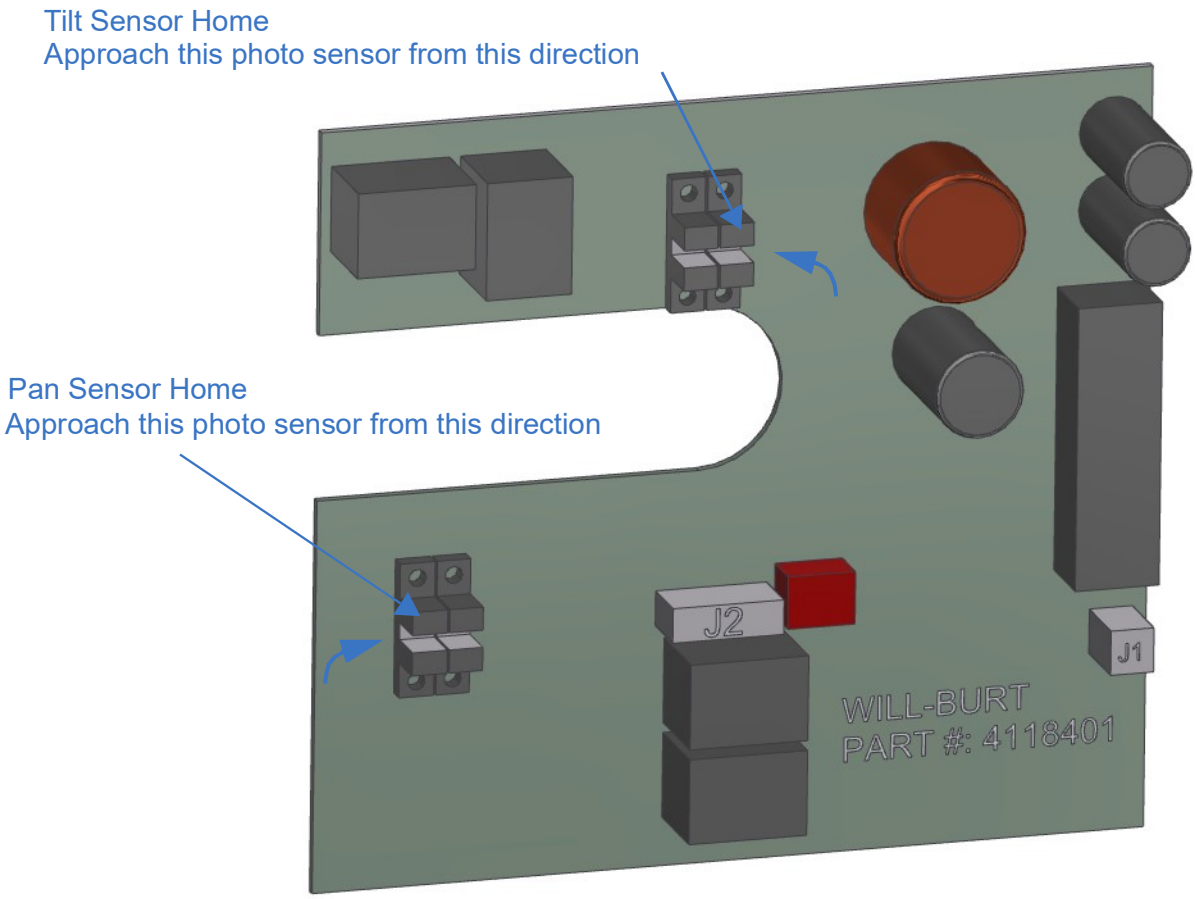


Figure 7-5 RCP PCB Photo Sensors

7.7 System Disposal

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

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8 Reference Information

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

8.1 DIP Switch Definitions

DIP Switches on the Base Board and the RCP PC board are set at the factory and normally do not have to be changed. The DIP Switches on the Base Board define the warning light signal, if an RCP is present, and if the mast is a Vertical or a fold-down type. The RCP DIP Switches define if the system should stow automatically while on a fault, if the RCP is a Profiler unit, and if the system stows before or while lowering. For additional information on the DIP Switches and their settings, see the wiring diagram in the Appendix.

Note: The controls check the status of the DIP switches only during initialization. After flipping a DIP switch, the system will need restarted for the change to take effect.

8.2 Strobe/Beacon Light

The optional strobe/beacon light (Figure 8-1) provides visibility and safety by mounting on top the RCP and brightly showing the height of the mast. The strobe/beacon light can be used at any voltage from 12 to 48 VDC. The strobe/beacon lights are available in amber, blue, clear, read, and green. The strobe/beacon light can be turned on by pressing the "AUX" controller button when the mast is at 90° or extended. Pressing the button again would turn the strobe/beacon light off. When ordered, the optional strobe/beacon light is shipped installed and no additional wiring is required.



Figure 8-1 Optional Strobe/Beacon Light

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 8-2 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 accidently 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.

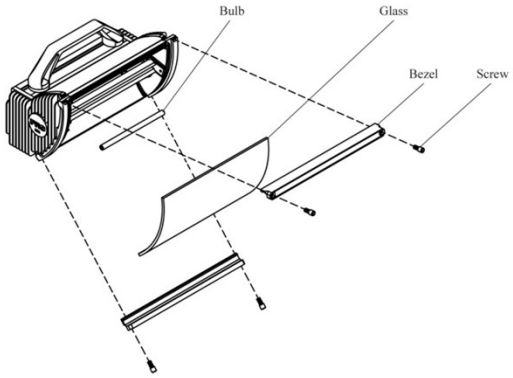
7. Insert the Focus gasket in the groove with the splice positioned down.
8. Hold the glass in position. Ensure the glass is inside the lip on all four sides.
9. Install the bezels and secure with the four screws.

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

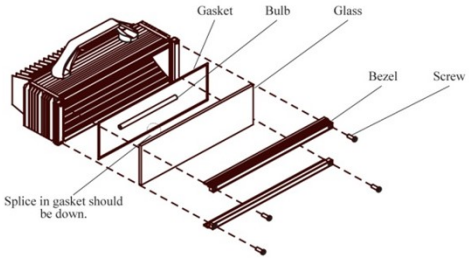
Cleaning

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 refelctor clean with a soft cloth.

OPTIMUM LAMPHEAD



FOCUS LAMPHEAD



Wiring

12/24 VDC

Connect the BLACK wire to GROUND.

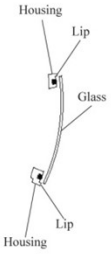
Connect the WHITE or RED wire to POWER.

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

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75 Jacksonville Road, PO Box 2099
Warminster, PA 18974
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Changing Lamps:
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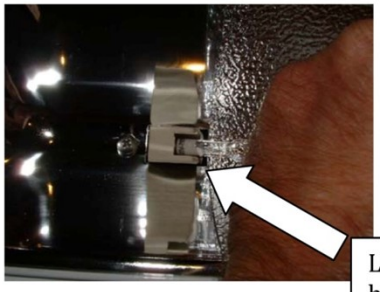
1. Remove (4) screws.



2. Remove lens cover.



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

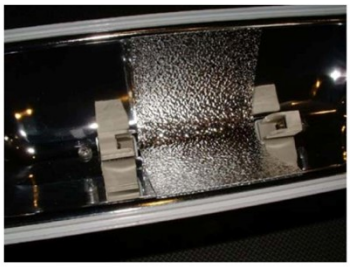


4. Holding the lamp with the napkin, push in as far as possible on spring-loaded lamp holder on the left. This should release or free the lamp for removal (see step #5)

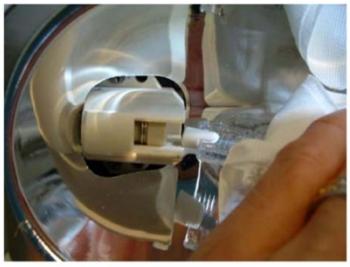
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Warminster, PA 18974
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5. Right side of lamp will free if the left, spring-loaded side is pushed all the way in. This may require strong force as the lamp holders are tight.



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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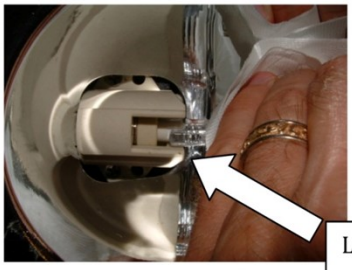
1. Remove (4) screws.



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)

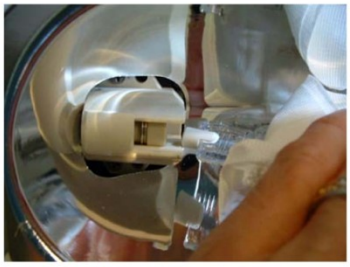
Havis, Inc.
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6. Remove and discard old lamp.



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.

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	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 Guidlines
US. ACGIH Threshold Limit Values

Components	Type	Value	Form
2, 6-Di-tert-butyl-4-cresol (CAS 128-37-0)	TWA	2 mg/m3	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/m3

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
Physical state:	Liquid
Form:	Liquid
Color:	Not available
Odor:	Petroleum Odor
Odor threshold:	Not available.
pH:	Not available.
pH concentration:	N/A
Melting point/freezing point:	Not available.
Initial boiling point and boiling range:	> 500 °F (> 260 °C)
Flash point:	> 300.0 °F (> 148.9 °C)
Evaporation rate:	> 1
Flammability (solid, gas):	Not applicable.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%):	Not available
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

Vapor pressure:	Unknown
Vapor density:	Unknown
Relative density:	Not available
Solubility(ies)	
Solubility (water):	Nil
Partition coefficient (n-octanol/water):	Not available
Auto-ignition temperature:	Unknown
Decomposition temperature:	Not available
Viscosity:	Not available
Other information	
Explosive properties:	Not explosive
Kinematic viscosity 43 mm^2/s	
Kinematic viscosity temperature:	104 °F (40 °C)
Oxidizing properties:	Not oxidizing
Specific gravity:	0.87

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	10700 mg/kg
	Mouse	1040 mg/kg
	Rat	890 mg/kg
BENZOTRIAZOLE (CAS 95-14-7)		
Acute		
Inhalation		
LD50	Rat	1.9 mg/l
Oral		
LD50	Mouse	615 mg/kg
	Rat	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 Aspiration hazard Not an aspiration hazard.
Chronic effects:	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.

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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
SARA 302 Extremely hazardous substance:	Not listed
SARA 311/312 Hazardous chemical:	Yes
SARA 313 (TRI reporting):	Not regulated

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 (California Health and Safety Code Section 11100): Not listed

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

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 Troubleshooting Electrical

This section includes a list of warning and error codes and their potential causes. Warning codes do not stop motion or use, but let you know of potential issues. Error codes point out problems and usually inhibit operation to prevent potential damage. These codes are shown on the Hand Held Remote Control (HHRC) display.

Table 9-1 Error and Warning Codes for Base Board

Message	Meaning	Root Issue	Potential Cause
WRN 1,04	Look-Up Light is burned out	The control circuit is not sensing the Look-Up Light current	Look-up Light is burned out or disconnected
WRN 1,05	Well cover switches indicate closed when they should be open. This stops all vertical movement of the mast to prevent damage to the mast, covers, or load	Well cover switches indicate closed when they should be open	Wiring error or defective switch
WRN 1,06	RCP Stow (Vertical, upper mag switch) - Sensor State Error	Switch outputs are valid (opposite), but switch shows wrong polarity for nested state	Defective mag switch, defective base board
WRN 1,07 (Vertical Only)	At power up, the lower mag switch is indicating "up" (yellow) when it should be "down" (green). If you ignore the warning and continue, the mast will go up, but will shut down after a few seconds with an ERR 1,14	The lower mag switch needs to be adjusted. D13 should be green when it "sees" the magnet	Wiring error, defective mag switch
1,01	Mast Down (mag switch) - Sensor State Error	This is only checked at power up, if stowed. Sensor outputs are O.K., but it is indicating that the mast is extended (not down)	1. The magnetic sensor is not being energized or is defective 2. Mag switch out of position

Table 9-1 Error and Warning Codes for Base Board (Continued)

Message	Meaning	Root Issue	Potential Cause
1,02	Mast Stowed (near 0°) - Sensor Output Error	Sensor outputs are bad	Defective sensor or defective board
1,03	Mast Stowed (near 0°) - Sensor State Error	Sensor outputs are O.K., but sensor shows wrong polarity for nested state. The board remembers where it was (0° or 90°) when it was shut off, and this time it powered up, it's sensing the opposite condition	Base board was changed or software was updated with the mast at 90°
1,04	Excessive amp draw during actuator decline	Current sensor indicating it has exceeded: (12v systems) 10A for 100ms (24v systems) 6.0 amps AND less than 10 amps for (100 msec)	If mast stops at ~70° and issues error, replace Base Board. Current sense circuit has failed. If error occurs during nesting, check LED D7 "MAST STOWED (near 0°)". Once the sensor "sees" the magnet, it allows 0.5 sec to see the (nesting) current rise. If the circuit does not see the sensor, it does not look for nesting current to shut down. It will keep driving into the saddle and then issue a 1,04. Re-adjust Near 0° sensor. Bad actuator - AC component in current wave shape due to internal mechanical problem. Replace actuator.
1,05	Well Open (Vertical with well cover) - Switch Output Error	Sensor outputs are bad	Defective switch or wiring error. Refer to System Wiring Diagram
1,06	Well Open (vertical with well cover) - Switch State Error	Switch outputs are O.K., but show wrong polarity for closed state	Well cover open or wiring error. System is expecting the well cover to be closed at power-up
1,07	Microprocessor Error	No successful poll / response communication for 250ms	Defective processor on the board

Table 9-1 Error and Warning Codes for Base Board (Continued)

Message	Meaning	Root Issue	Potential Cause
1,08	Internal firmware detected error	Internal state machine logic has detected an invalid state transition. Firmware logic error	
1,09	Initiate Pushbutton input error	Initiate input has remained active for 5 seconds. Input is stuck, or has been hot-wired	1. Unit is in NFPA mode and connected to a Non-NFPA J-box. (Note: if the unit is in Non-NFPA mode and connected to an NFPA junction box, the unit will look normal (UP led on HHRC on), but will not respond to the HHRC. The software is expecting to see the init signal always on. No error message is generated). 2. Wiring short in the control cable or defective switch/wiring
1,10	Memory Error	Memory Error	Memory Error
1,11	Actuator current has unexpectedly stopped	During decline, the Base board senses actuator current. After the "Near 0°" sensor is detected, it is expecting to see the current level rise before it stops. This error indicates the sensed current has stopped before nesting	If it occurs near the nested position: Actuator has reached its internal stop before nesting completed, most likely saddle too low or saddle not secured causing sideways movement when nesting
1,12	Sensor Output Error Roof-mount - Actuator at 90° magnetic sensor Vertical - Upper magnetic sensor switch	Sensor outputs are bad	Wiring error, faulty sensor (Vertical only) mag switch positioning. Note: Sensor is only active as mast tube magnet goes by. Software watches for direction of travel and sensor activation to determine if mast is "up" or "down"

Table 9-1 Error and Warning Codes for Base Board (Continued)

Message	Meaning	Root Issue	Potential Cause
1,13	RCP STOWED magnetic sensor - Sensor Output Error (Upper magnetic sensor on Vertical)	Sensor outputs are bad	Wiring problem, defective magnetic sensor
1,14	Mast Down (lower magnetic sensor) 1. Sensor Output Error 2. Sensor State Error	1. Sensor outputs bad. They have not been opposite for >250ms. or 2. Mast was told to go up, and the sensor indicates it did not move after 8 seconds (v7.2), or 15 seconds (v7.3). 3. Sensor is not seeing magnet when mast is fully retracted	1. There may be a wiring problem, or a defective magnetic sensor. or 2. Defective magnetic sensor, air supply inadequate, or external magnet affecting sensor. 3. Sensor not seeing magnet - sensor needs to be re-aligned
1,15	At 90° (Actuator) - Sensor State Error	Checked at power up after stowing. Sensor outputs are O.K., but sensor shows wrong polarity for nested state	Board was changed or updated while the mast was at 90°
1,16	Not Used	Not Used	Not Used
1,17	Well Closed (Vertical with well cover) - Switch Output Error	Sensor outputs are bad	D7 Green = Closed D8 Yellow = Not Closed
1,18	Well Closed (Vertical with well cover) - Sensor State Error	Switch outputs are O.K., but show wrong polarity for Well Closed	Switch wiring, defective switch, board
1,19	Both Near 0° and 90° - Sensor State Error	Both the Nested LS and the 90° LS have been detected active at the same time. This is an invalid condition, and indicates a problem with one or both sensors	Both sensors indicate proximity, one may be bad
1,20	Forced Stow has been activated	This fault is set when the Forced Stow switch is activated to assure the system is not in normal operation during the forced stow operation	Forced Stow button has been activated

Table 9-2 Error and Warning Codes for RCP

Message	Meaning	Root Issue	Potential Cause
WRN,2.04	Single-tilt - Tilt Stuck Dual-tilt - Left Tilt Stuck	Checked only when moving out of a limit position. The software indicates the state of the (left) tilt photo sensor has not changed even though the motor has been told to move for more than 1/2 second	Something is preventing movement of left tilt mechanism, the motor is defective, or the RCP board is defective
WRN 2.05	Right Tilt Stuck	Checked only when moving out of a limit position. The software indicates the state of the right tilt photo sensor has not changed even though the motor has been told to move for more than 1/ 2 second	Something is preventing movement of right tilt mechanism, the motor is defective, or the RCP board is defective
WRN 2,06	Pan Stuck	Checked only when moving out of a limit position. The software indicates the state of the pan photo sensor has not changed even though the motor has been told to move for more than 1/ 2 second	Something is preventing movement of pan mechanism, the motor is defective, or the RCP board is defective
2,01	Pan Limit Overlap	The software indicates both pan photo sensors are blocked simultaneously	Foreign material in one of the photos sensors or faulty photo sensor
2,03 Positioner Only	TILT pot stuck	No movement detected in expected direction for 2.0 seconds	Soft stops are not set, something is preventing the sense voltage (pot) movement, the motor is defective, the sense voltage is going the wrong way (miswire), or the P/T drive board is defective
2,04 Positioner Only	PAN pot stuck		

Table 9-2 Error and Warning Codes for RCP (Continued)

Message	Meaning	Root Issue	Potential Cause
2,07	Communication Timeout	The RCP or P-T Drive board has not sent out communications recently	Bad board or connection in communications link
2,08	Microprocessor error	The RCP board has sent an invalid message	Indicates a software problem
2,09 RCP Only	(Left) Tilt Up wrap around	The software indicates the same photo sensor was made before the opposite limit photo sensor was made to stop rotation. This indicates wrap around	1. The flag that interrupts the light may need to be adjusted to go deeper into the photo sensor 2. The limit photo sensor is defective
2,10 RCP Only	(Left) Tilt Down wrap around		
2,09 Positioner Only	Pan Pot Failure	The Positioner software indicates the pot feedback voltage is out of acceptable operating range	Defective pot, incorrect wiring, bad connection, defective P-T board
2,10 Positioner Only	Tilt Pot Failure		
2,11	Right Tilt Up wrap around	The software indicates the same photosensor was made before the opposite limit photosensor was made to stop rotation. This indicates wrap around	1. The flag that interrupts the light may need to be adjusted to go deeper into the photocell. 2. The limit photo sensor is defective
2,12	Right Tilt Down wrap around		
2,13	Pan Right wrap around	The software indicates the same photo sensor was made before the opposite limit photo sensor was made to stop rotation. This indicates wrap around	The limit photo sensor is defective
2,14	Pan Left wrap around		
2,15	Left Tilt Limit Overlap	The software indicates both tilt photo sensors appear to be blocked simultaneously	Foreign material in one of the photo sensors or faulty photo sensor
2,16	Right Tilt Limit Overlap		

Table 9-3 Error and Warning Codes for HHRC

Message	Meaning	Root Issue	Potential Cause
WRN 3,02	Dual HHRC simultaneous inputs	Two HHRCs are sending commands simultaneously. If commands are not conflicting, they will be allowed (Base Board decides). If commands are conflicting, no action/ movement will be allowed by the Base Board. Warning appears regardless of conflicting or not conflicting to alert operators that someone else is trying to operate the unit simultaneously	Multiple users controlling the mast
WRN 3.07	Unrecoverable Communication Error	The display board in the HHRC or PMRC has power, but the Base Board is not communicating with it. It may be caused by the HHRC, Base Board, RCP Board, or any other device that is using the RS-485 communication lines in the system. On an error, the Base Board stops the program, sends out the error code to the display devices and 'flashes' the code on the Base Board LED. Because one error can cause others to follow, the only code that is displayed/flashed is the first one that occurs. Other errors may happen after that, but they are not displayed.	Defective HHRC or defective base board. Bad or improper connection in communications link, or HHRC is not properly powered. Check continuity of the data lines from the DC power cable connector to the HHRC connector. Refer to System schematic. Also check that the shield in the junction box has a good electrical connection to the electronics common at one end or the other, but not both
3,08	Microprocessor Error	Internal firmware detected error	Replace HHRC or HHRC Display pcb

Table 9-3 Error and Warning Codes for HHRC (Continued)

Message	Meaning	Root Issue	Potential Cause
3,09	RF module Error	Wireless Transmitter/ Receiver did not properly initialize	Return HHRC to factory for repair

Table 9-4 Error and Warning Codes for Wireless HHRC

Message	Meaning	Root Issue	Potential Cause
8,07	Unrecoverable communication error	No successful poll / response communication for 250ms	Wireless Control Box is not 'talking' to any other board. Check Base Board flashes and HHRC display for x,07
8,08	Internal firmware detected error	Internal state machine logic has detected an invalid state transition	Firmware logic error
8,09	RF module error	Wireless plug-in module did not properly initialize	Bad module
8,10	Memory Error	Memory Error	
8,11	HHRC power up negotiation failed	Unit could not establish communication with any HHRC (wired or wireless) when the NS 3.0 / 4.5 was powered up. Panel Mount = unit 3, Wireless HHRC = unit 6, J-Box = unit 8. System can have a panel mount remote and an HHRC, or 2 HHRCs, but never 3 remote units. Negotiation happens every time the Base unit is powered up	Wireless HHRC is not plugged in during power-up
8,12	In-system reprogramming failed	Dip-switch activated in-system reprogramming of attached devices was not able to successfully complete	

9.2 Troubleshooting Mechanical Symptoms

This section describes mechanical troubleshooting. The following table lists some problems that may be observed, but may not generate an error or warning code on the controller.

Table 9-5 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	Bent flag in RCP	1) Remove RCP cover straighten or replace flag 2) Make sure wiring is not wound tight. Reset home position
Pan or tilt motor will not respond with no errors displayed on remote control(s)	Broken or loose motor wire lead or faulty motor	1) Reconnect wire lead 2) Replace motor
Mast fails to fully nest in saddle and disconnects power	Binding of actuator, software fault or control erroneously sensed an increase in current	1) Check that Base Board has software version 2.6 or later. Contact Will-Burt if update is required 2) Check actuator or mast for binding. Replace actuator if binding or remove source of binding
Mast will not begin to lower from 90° position (fold-down unit only)	Mast tube sections do not fully collapse to nested position	1) Extend and retract mast 2) Check tube sections for damage 3) Internal coil cord may be binding, contact The Will-Burt Company

Table 9-5 Mechanical Symptoms and Troubleshooting Sequence (Continued)

Symptom	Root Issue	Troubleshooting Sequence
Mast will not begin to lower from 90° position (fold-down unit only)	Magnetic switch band-clamped to mast is not activated	1) Magnetic switch may be out of adjustment. Loosen clamp and slide switch up and down the mast until contact is established (see procedure in instructions) 2) Check wiring 3) Replace defective magnetic switch

10 Document History

Table 10-1 Document History

Document Revision	Date	Change Details	Changes Backward Compatible with Previous Manual Version
TP-4602001-P	Mar. 2016	General update	Yes
TP-4602001-Q	Jun. 2016	Updated Sections 2.1, 2.2, 2.9, 2.11, 3.9, 4.3 and 8	Yes
TP-4602001-R	Oct. 2016	Updated Sections 2.3 and 2.8	Yes
TP-4602001-S	Nov. 2016	Updated Section 4.3.1	Yes
TP-4602001-T	Dec. 2020	Reformatted including section number and page number changes; updated Look-Up light location; updated to latest wireless control; added 1.0 model to technical data; added inspection interval table; added high current solenoid.	Yes for all but the wireless HHRC (No longer covers Zigbee model)
TP-4602001-U	Mar. 2021	Updated Wiring Diagram	Yes
TP-4602001-V	Apr. 2021	Added information about the Profiler	Yes
TP-4602001-W	May 2021	Added information about the Chief HDT	Yes

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11 Appendix

11.1 Model with Auxiliary Air Supply (No Compressor)

The Night Scan Chief comes standard with an air compressor to deliver air to the mast, however an optional air valve in conjunction with customer supplied air source may be used instead. This section discusses the differences a Night Scan Chief with air valve will have from a standard model. Be sure to read and understand the Safety Summary Section 1 before beginning any installation procedure.

11.1.1 Supply Air Requirements

Table 11-1 describes specifications for supply air that apply to the Night Scan Chief with air valve.

Table 11-1 Night Scan Chief with Air Valve Specifications

Parameter	Value
Mast Air Volume (NSC 1.8)	1.4 cubic feet (0.04 cubic meters)
Mast Air Volume (NSC 2.3)	1.7 cubic feet (0.05 cubic meters)
Maximum Mast Operating Air Pressure	20 psi (1.4 bar) in the mast
Maximum Supply Air Pressure	90 psi (6.2 bar) applied to regulator inlet

11.1.2 Installing Supply Air Connections

A barbed fitting is provided for connecting the air-line required to pressurize the system. Air may be supplied externally by a compressor or other source of clean, dry air with a maximum pressure of 90 psi (6.2 bar). The unit has an internal regulator factory set to 20 psi (1.4 bar). Figure 11-1 shows the location of the air inlet. 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 (6 m) of air hose labeled SUPPLY to designate the pressurized air to be routed to the INLET of the unit. As with standard models, mast air exhausts within the base cover during retraction.

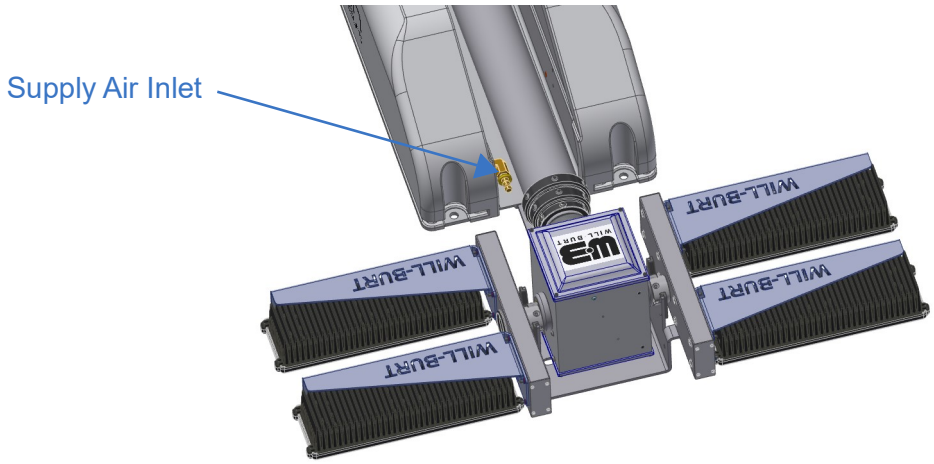


Figure 11-1 Supply Air Inlet Location

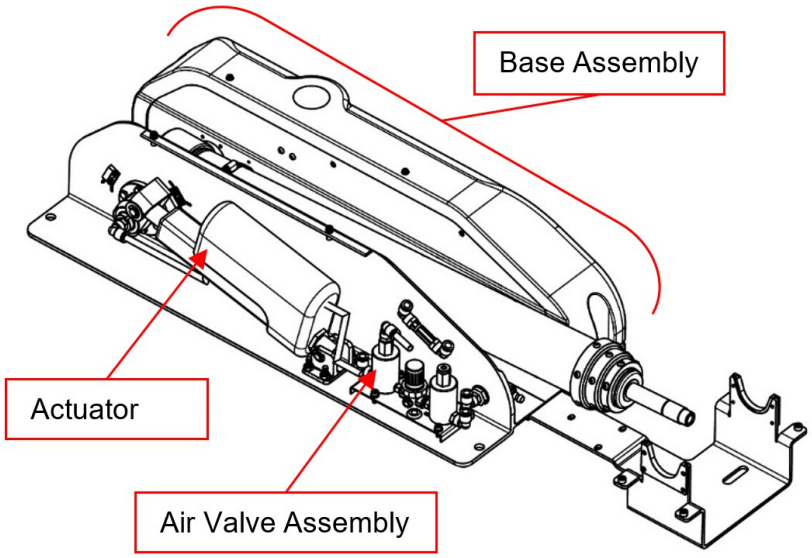
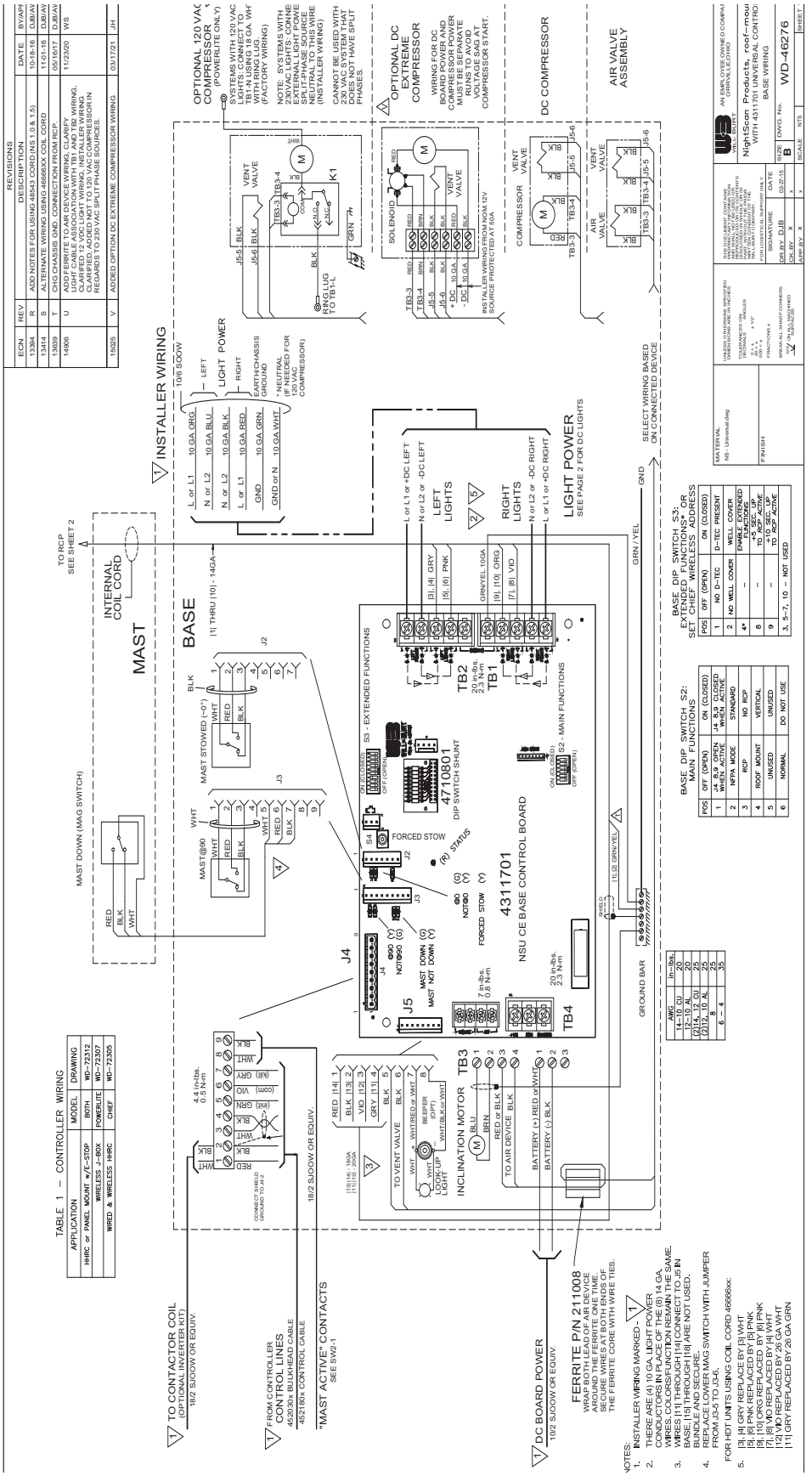
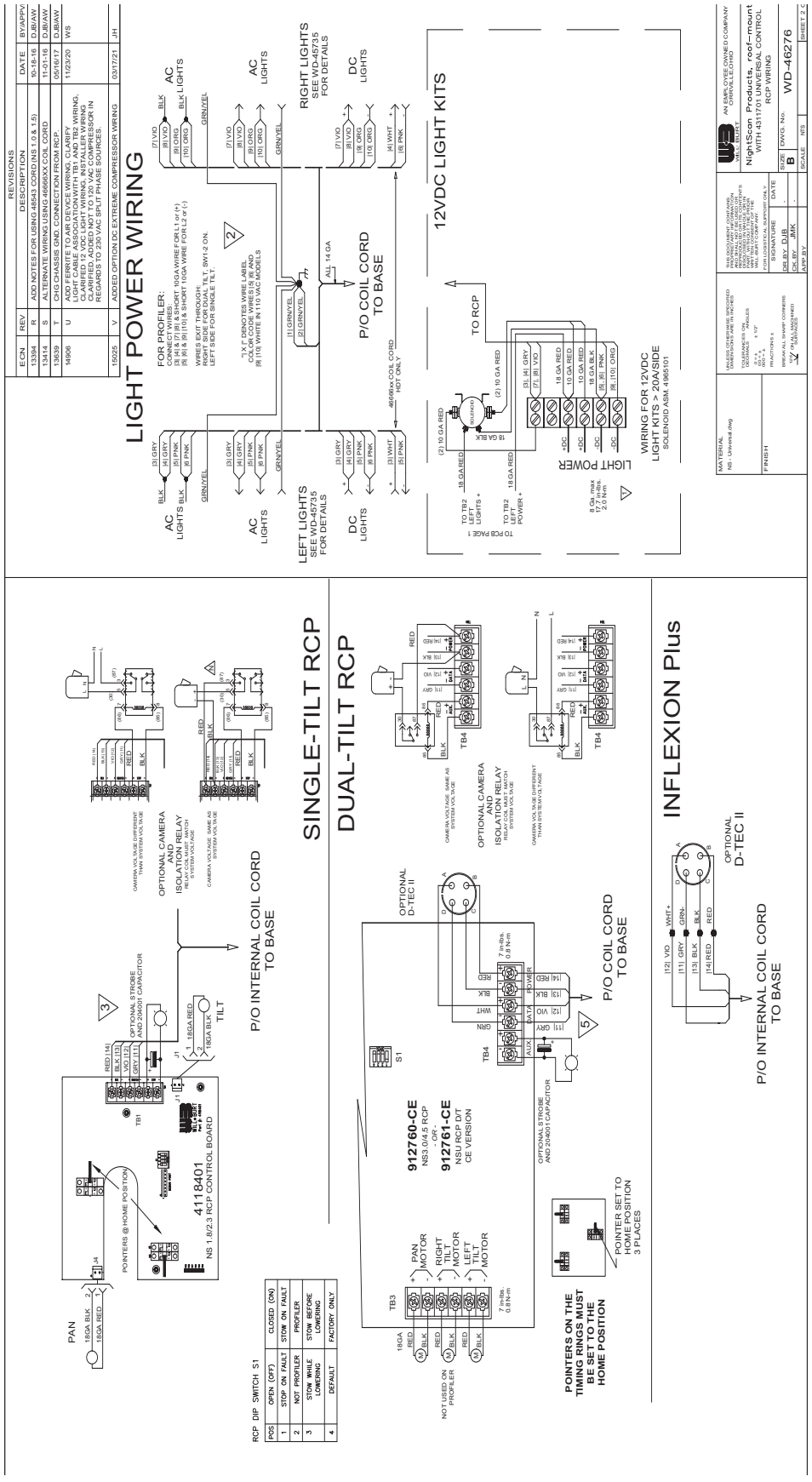


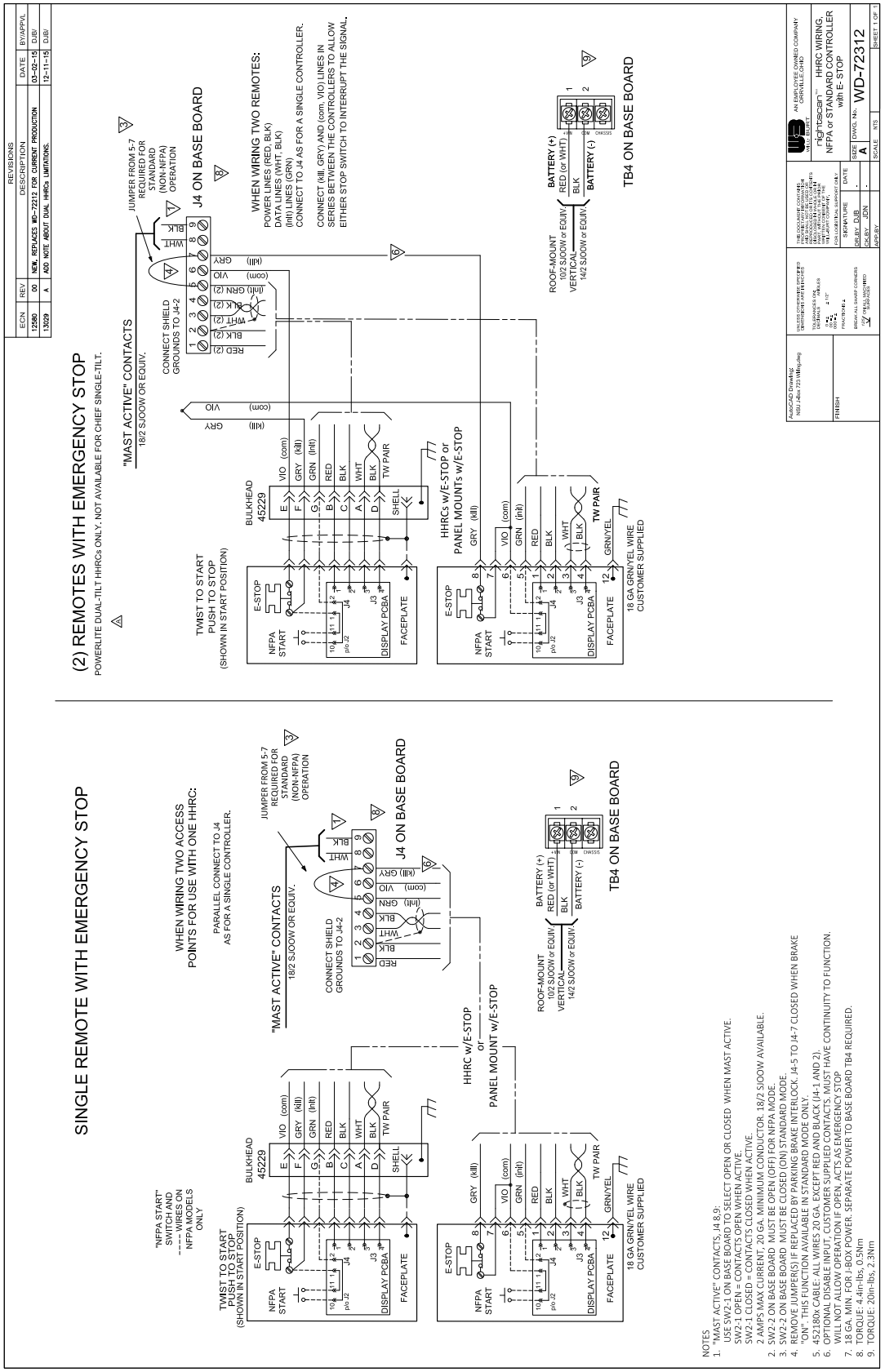
Figure 11-2 Night Scan Chief Base with Air Valve Assembly

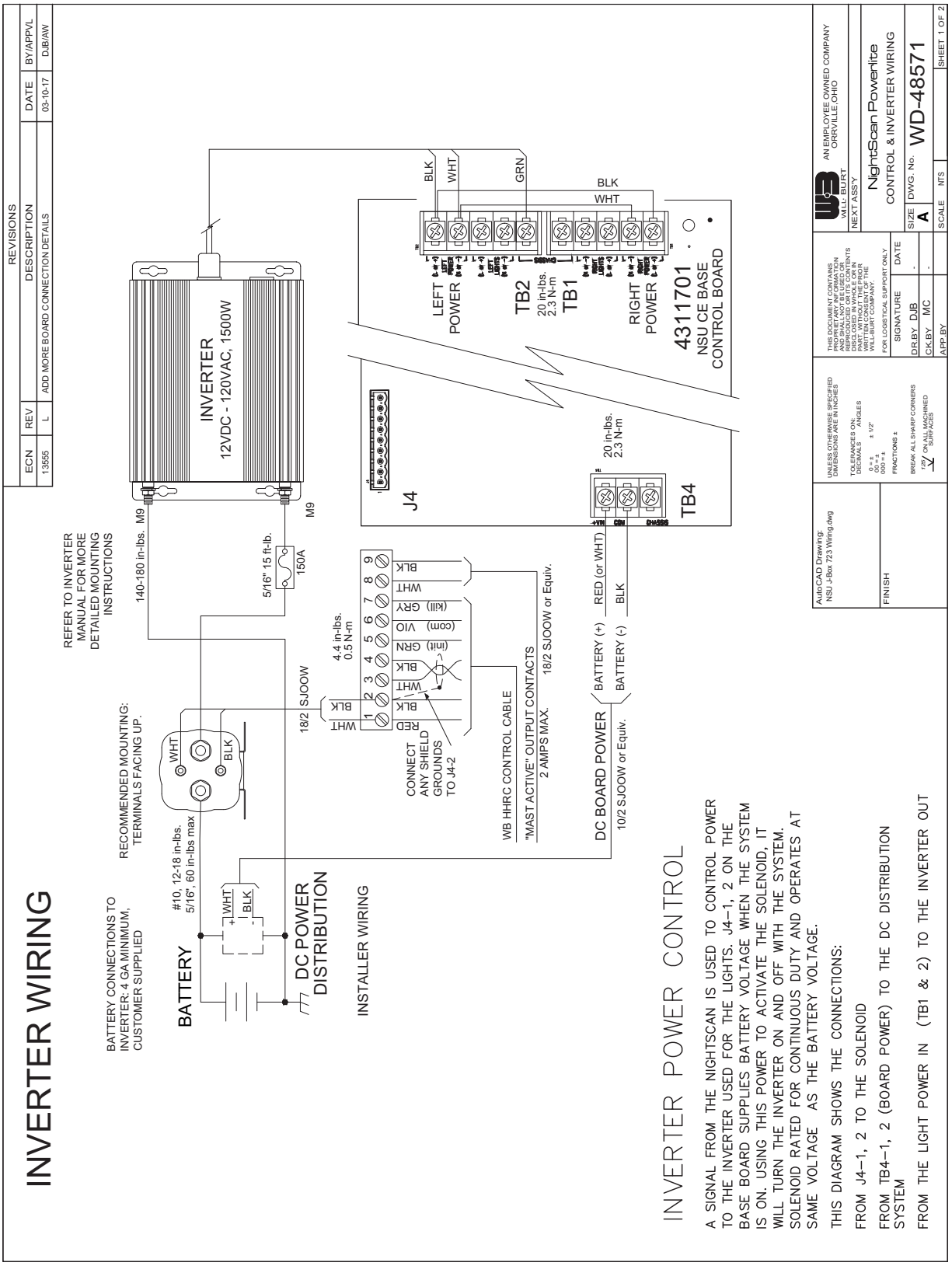
11.2 System Wiring Diagram

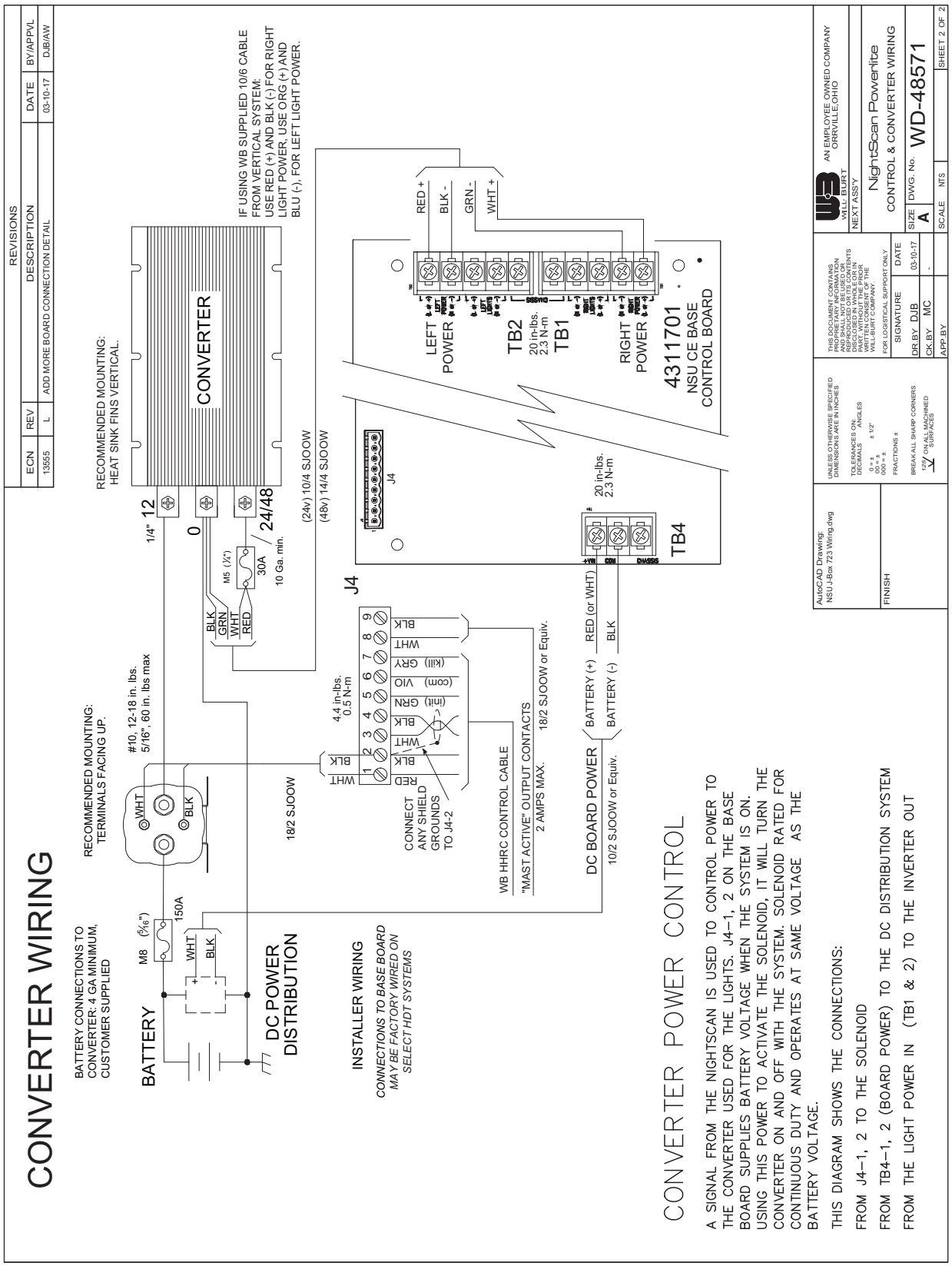
The system wiring diagrams are as follows:


REVISIONS
ECN | REV | DESCRIPTION | DATE | BY/APP
13394 | R | ADD NOTES FOR USING 46543 CORD (NS 1.0 & 1.5) | 10-18-16 | DJB/AV
13414 | S | ALTERNATE WIRING USING 466660X COIL CORD | 11-01-16 | DJB/AV
13839 | T | CHG CHASSIS GND. CONNECTION FROM RCP. | 05/16/17 | DJB/AV
14906 | U | ADD FERRITE TO AIR DEVICE WIRING, CLARIFY WIRE LABELS ON TB1, ADD TB1 WIRING, CLARIFIED, 12 VDC LIGHT WIRING, INSTALLER WIRING CLARIFIED, ADDED NOT TO 120 VAC COMPRESSOR IN REVERSED, 12 VDC SYSTEMS, 3 PHASE SOURCES | 11/23/20 | WS
15025 | V | ADDED OPTION DC EXTREME COMPRESSOR WIRING | 03/17/21 | JH
TABLE 1 – CONTROLLER WIRING
APPLICATION | MODEL | DRAWING
HHRC or PANEL MOUNT w/E-STOP | BOTH | WD-72312
WIRELESS J-BOX | POWERLITE | WD-72307
WIRED & WIRELESS HHRC | CHIEF | WD-72305
INSTALLER WIRING
MAST DOWN (MAG SWITCH)
MAST STOWED (~0°)
MAST@90
FORCED STOW
4711080 1
DIP SWITCH SHUNT
4311701
NSU CE BASE CONTROL BOARD
BASE
MAST
INTERNAL COIL CORD
TO RCP SEE SHEET 2
TO CONTACTOR COIL
(OPTIONAL INVERTER KIT)
18/2 SJOOW OR EQUIV.
FROM CONTROLLER
CONTROL LINES
462300x BULKHEAD CABLE
462160x CONTROL CABLE
"MAST ACTIVE" CONTACTS
SEE SW2-1
18/2 SJOOW OR EQUIV.
DC BOARD POWER
10/2 SJOOW OR EQUIV.
FERRITE P/N 211008
WRAP WITH SUPPLIED VELCRO STRAP
AROUND THE FERRITE ONE TIME;
SECURE WIRES AT BOTH ENDS OF
THE FERRITE CORE WITH WIRE TIES.
TO VENT VALVE
LOOK-UP LIGHT
INCLINATION MOTOR
TO AIR DEVICE
BATTERY (+) RED or WHT
BATTERY (-) BLK
GROUND BAR
S3 - EXTENDED FUNCTIONS
S2 - MAIN FUNCTIONS
TB1
TB2
TB3
TB4
J1
J2
J3
J4
J5
S4
FORCED STOW
STATUS
BASE DIP SWITCH S2: MAIN FUNCTIONS
POS | OFF (OPEN) | ON (CLOSED)
1 | #4 &/0 OPEN WHEN ACTIVE | #4 &/0 CLOSED WHEN ACTIVE
2 | NFPA MODE | STANDARD
3 | RCP | NO RCP
4 | ROOF MOUNT | VERTICAL
5 | UNUSED | UNUSED
6 | NORMAL | DO NOT USE
BASE DIP SWITCH S3: EXTENDED FUNCTIONS + WIRELESS ADDRESS
POS | OFF (OPEN) | ON (CLOSED)
1 | NO D–TEC | D–TEC PRESENT
2 | NO WELL COVER | WELL COVER
3* | – | ENABLE EXTENDED FUNCTIONS
4 | – | TO #SP ACTIVE
8 | – | TO #SP ACTIVE
9 | – | TO SBC–UP
10 | – | TO SBC–ACTIVE
3, 5–7, 10 – NOT USED
WIRE SIZE TABLE
AWG | In-lbs.
14–10 CU | 20
12–10 AL | 20
(2)14 – 10 CU | 25
(2)12 – 10 AL | 25
8 | 25
6 – 4 | 35
OPTIONAL 120 VAC COMPRESSOR
(POWERLITE ONLY)
SYSTEMS WITH 120 VAC COMPRESSOR CONNECT TO TB1-N USING 18 GA. WHT WITH RING LUG. (FACTORY WIRING)
NOTE: SYSTEMS WITH 230 VAC LIGHTS, REQUIRE EXTERNAL LIGHT POWER SPLIT-PHASE SOURCE SELECTION AT THIS WIRE (INSTALLER WIRING)
CANNOT BE USED WITH 230 VAC SYSTEM THAT DOES NOT HAVE SPLIT PHASES.
OPTIONAL DC EXTREME COMPRESSOR
WIRING FOR DC BOOST POWER AND COMPRESSOR POWER MUST BE SEPARATE AND ADJUSTED TO VOLTAGE SAG AT COMPRESSOR START.
INSTALLER WIRING FROM NOM 12V SOURCE PROTECTED AT 50A
DC COMPRESSOR
AIR VALVE ASSEMBLY
SELECT WIRING BASED ON CONNECTED DEVICE
LIGHT POWER
SEE PAGE 2 FOR DC LIGHTS
LEFT LIGHTS
RIGHT LIGHTS
NOTES:
1. INSTALLER WIRING MARKED - 1
2. THERE ARE (4) 10 GA. LIGHT POWER CONNECTIONS IN THE SYSTEM. TWO (2) 14 GA. WIRES COLORS FUNCTION REMAIN THE SAME.
3. WIRES [11] THROUGH [14] CONNECT TO J5 IN BASE. [15] THROUGH [18] ARE NOT USED. BUNDLE AND SECURE.
4. REPLACE FACTORY MAG SWITCH WITH JUMPER FROM J3-5 TO J3-6.
FOR HOT UNITS USING COIL CORD 46666xx:
5. [3] [4] GRY REPLACE BY [3] WHT
[5] [6] PNK REPLACED BY [5] PNK
[9] [10] ORG REPLACED BY [8] PNK
[7] [8] VIO REPLACED BY [4] WHT
[12] VIO REPLACED BY 26 GA WHT
[11] GRY REPLACED BY 26 GA GRN
MATERIAL
NS - Unwired.dwg
FINISH
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND ARE NOMINAL. DO NOT SCALE PRINT. WILL-BURT ASSUMES NO RESPONSIBILITY FOR USE OF DIMENSIONS NOT SHOWN.
TOLERANCES ON DECIMALS: .XX ± .1 .XXX ± .01 FRACTIONS ± 1/64
BREAK ALL SHARP CORNERS .010 - .020 RADIUS
WILL-BURT
AN EMPLOYEE OWNED COMPANY
CHISHOLM, OHIO
NightScan Products, roof–mou
WITH 4311701 UNIVERSAL CONTRO
BASE WIRING
SIZE B
DWG. No. WD-46276
SCALE NTS
SHEET 1
DR. BY DJB 03-27-15
CK. BY X
APP. BY X
SIGNATURE
DATE


LIGHT POWER WIRING
REVISIONS
E.C.N. | REV | DESCRIPTION | DATE | BY/APP'D
13394 | R | ADD NOTES FOR USING 46643 CORD (14 & 15) | 10-16-16 | DJB/AW
14144 | S | ALTERNATE WIRING USING 46643 CORD | 04-14-16 | DJB/AW
13839 | T | CHG CHASSIS GND. CONNECTION FROM RCP | 05/16/17 | DJB/AW
14906 | U | ADD FERRITE TO AIR DEVICE WIRING, CLARIFY LIGHT CABLE ASSOCIATION WITH TB1 AND TB2 WIRING, CLARIFIED 12 VDC LIGHT WIRING, INSTALLER WIRING CAUTIONS, ADD NOTE TO DC LIGHTS, ADDRESS EMI REGARDS TO 230 VAC SPLIT PHASE SOURCES. | 11/23/20 | WS
15025 | V | ADDED OPTION DC EXTREME COMPRESSOR WIRING | 03/17/21 | JH
FOR PROFILER:
CONNECT WIRES
[6] & [7] TOGETHER FOR 10GA WIRE FOR L1 or (+)
[8] & [9] [10] & SHORT 10GA WIRE FOR L2 or (-)
WIRES EXIT THROUGH:
RIGHT SIDE FOR DUAL TILT, SW1-2 ON.
LEFT SIDE FOR SINGLE TILT.
"1X" DENOTES WIRE LABEL
COLOR CODE WIRES [1-5] AND [6-10] ARE WHITE IN 110 VAC MODELS
AC LIGHTS
DC LIGHTS
LEFT LIGHTS SEE WD-45735 FOR DETAILS
RIGHT LIGHTS SEE WD-45735 FOR DETAILS
P/O COIL CORD TO BASE
46589 in COIL CORD HOT ONLY
12VDC LIGHT KITS
TO RCP
LIGHT POWER
WIRING FOR 12VDC LIGHT KITS > 20A/SIDE SOLENOID ASM 4965101
TO TB2 LEFT LIGHTS +
TO TB2 LEFT POWER +
TO PCB PAGE 1
8 Ga. max 17.7 in-lbs. 2.0 Nm
SINGLE-TILT RCP
DUAL-TILT RCP
INFLEXION Plus
4118401
NS 1.8/2.3 RCP CONTROL BOARD
912760-CE
NS3.0/4.5 RCP
- OR -
912761-CE
NSU RCP D/T
CE VERSION
PAN MOTOR
RIGHT TILT MOTOR
LEFT TILT MOTOR
7 in-lbs. 0.8 Nm
POINTERS @ HOME POSITION
POINTERS ON THE TIMING RINGS MUST BE SET TO THE HOME POSITION
POINTER SET TO HOME POSITION 3 PLACES
OPTIONAL STROBE AND 204001 CAPACITOR
OPTIONAL CAMERA AND ISOLATION RELAY
OPTIONAL D-TEC II
P/O INTERNAL COIL CORD TO BASE
P/O COIL CORD TO BASE
RCP DIP SWITCH S1
POS | OPEN (OFF) | CLOSED (ON)
1 | STOP ON FAULT | STOW ON FAULT
2 | NOT PROFILER | PROFILER
3 | STOW WHILE LOWERED | STOW BEFORE LOWERED
4 | DEFAULT | FACTORY ONLY
MATERIAL
NS - Universal.dwg
FINISH
APP'D BY
DR. BY JMK
CHK. BY
Night Scan Products, roof-mount
With HST/DTD LIGHTING CONTROL
RCP WIRING
SIZE B
DWG. No: WD-46276
SCALE: NTS
SHEET 2 C


SINGLE REMOTE WITH EMERGENCY STOP
(2) REMOTES WITH EMERGENCY STOP
POWERLITE DUAL-TILT HHRCs ONLY. NOT AVAILABLE FOR CHIEF SINGLE-TILT.
"MAST ACTIVE" CONTACTS
18/2 SJOOW OR EQUIV.
J4 ON BASE BOARD
TB4 ON BASE BOARD
HHRC w/E-STOP
or
PANEL MOUNT w/E-STOP
HHRCs w/E-STOP or
PANEL MOUNTs w/E-STOP
WHEN WIRING TWO REMOTES:
POWER LINES (RED, BLK)
DATA LINES (WHT, BLK)
(Inh) LINES (GRN)
CONNECT TO J4 AS FOR A SINGLE CONTROLLER.
CONNECT (kill, GRY) AND (com, VIO) LINES IN SERIES BETWEEN THE CONTROLLERS TO ALLOW EITHER STOP SWITCH TO INTERRUPT THE SIGNAL.
WHEN WIRING TWO ACCESS POINTS FOR USE WITH ONE HHRC:
PARALLEL CONNECT TO J4 AS FOR A SINGLE CONTROLLER.
JUMPER FROM 5-7 REQUIRED FOR STANDARD (NON-NFPA) OPERATION
CONNECT SHIELD GROUNDS TO J4-2
TWIST TO START
PUSH TO STOP
(SHOWN IN START POSITION)
"NFPA START" SWITCH AND ---- WIRES ON NFPA MODELS ONLY
E-STOP
NFPA START
BULKHEAD 45229
DISPLAY PCBA
FACEPLATE
TW PAIR
ROOF-MOUNT 10/2 SJOOW or EQUIV. VERTICAL 14/2 SJOOW or EQUIV.
BATTERY (+) RED (or WHT)
BATTERY (-) BLK
18 GA GRN/YEL WIRE CUSTOMER SUPPLIED
NOTES
1. "MAST ACTIVE" CONTACTS, J4 8,9:
USE SW2-1 ON BASE BOARD TO SELECT OPEN OR CLOSED WHEN MAST ACTIVE.
SW2-1 OPEN = CONTACTS OPEN WHEN ACTIVE.
SW2-1 CLOSED = CONTACTS CLOSED WHEN ACTIVE.
2. AMPS MAX CURRENT, 20 GA. MINIMUM CONDUCTOR. 18/2 SJOOW AVAILABLE.
2. SW2-2 ON BASE BOARD MUST BE OPEN (OFF) FOR NFPA MODE.
3. SW2-2 ON BASE BOARD MUST BE CLOSED (ON) STANDARD MODE.
4. REMOVE JUMPER(S) IF REPLACED BY PARKING BRAKE INTERLOCK. J4-5 TO J4-7 CLOSED WHEN BRAKE "ON". THIS FUNCTION AVAILABLE IN STANDARD MODE ONLY.
5. 45218Ox CABLE: ALL WIRES 20 GA. EXCEPT RED AND BLACK (J4-1 AND 2).
6. CONTROL CABLE: WHITE TO OTHER CONTACTS (J4-3,4) MUST HAVE CONTINUITY TO FUNCTION.
7. WILL NOT ALLOW OPERATION IF OPEN. ACTS AS EMERGENCY STOP.
7. 18 GA. MIN. FOR J-BOX POWER. SEPARATE POWER TO BASE BOARD TB4 REQUIRED.
8. TORQUE: 4.4in-lbs, 0.5Nm
9. TORQUE: 20in-lbs, 2.3Nm
REVISIONS
ECN 12580 REV 00 DESCRIPTION NEW, REPLACES WD-72212 FOR CURRENT PRODUCTION DATE 03-02-15 BY/APPVL DJB/
ECN 13229 REV A DESCRIPTION ADD NOTE ABOUT DUAL HHRCs LIMITATIONS. DATE 12-11-15 BY/APPVL DJB/
AutoCAD Drawing: NSU-J-Rev 7(3).WMF
FINISH
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONS ±1/32" DECIMALS ±.015 ANGLES ±2°
FRACTION ± 1/32"
BREAK ALL SHARP CORNERS
DRAWN DJB 12-11-15
CHK'D JDN 12-11-15
APP'D
SIZE A
DWG. No. WD-72312
SCALE NTS
SHEET 1 OF 1
Night Scan™ HHRC WIRING, NFPA or STANDARD CONTROLLER with E- STOP


INVERTER WIRING
REVISIONS
ECN 13555
REV L
DESCRIPTION ADD MORE BOARD CONNECTION DETAILS
DATE 03-10-17
BY/APPVL DJB/AW
INVERTER
12VDC - 120VAC, 1500W
REFER TO INVERTER MANUAL FOR MORE DETAILED MOUNTING INSTRUCTIONS
140-180 in-lbs.
M9
5/16" 15 ft-lb.
150A
LEFT POWER
TB2
20 in-lbs. 2.3 N-m
TB1
RIGHT POWER
4311701
NSU CE BASE CONTROL BOARD
BLK
WHT
GRN
J4
TB4
20 in-lbs. 2.3 N-m
RECOMMENDED MOUNTING: TERMINALS FACING UP.
BATTERY CONNECTIONS TO INVERTER: 4 GA MINIMUM, CUSTOMER SUPPLIED
BATTERY
#10, 12-18 in-lbs. 5/16", 60 in-lbs max
DC POWER DISTRIBUTION
INSTALLER WIRING
18/2 SJOOW
4.4 in-lbs. 0.5 N-m
CONNECT ANY SHIELD GROUNDS TO J4-2
WB HHRC CONTROL CABLE
"MAST ACTIVE" OUTPUT CONTACTS
2 AMPS MAX.
18/2 SJOOW or Equiv.
DC BOARD POWER
10/2 SJOOW or Equiv.
BATTERY (+)
BATTERY (-)
RED (or WHT)
BLK
INVERTER POWER CONTROL
A SIGNAL FROM THE NIGHTSCAN IS USED TO CONTROL POWER TO THE INVERTER USED FOR THE LIGHTS. J4–1, 2 ON THE BASE BOARD SUPPLIES BATTERY VOLTAGE WHEN THE SYSTEM IS ON. USING THIS POWER TO ACTIVATE THE SOLENOID, IT WILL TURN THE INVERTER ON AND OFF WITH THE SYSTEM. SOLENOID RATED FOR CONTINUOUS DUTY AND OPERATES AT SAME VOLTAGE AS THE BATTERY VOLTAGE.
THIS DIAGRAM SHOWS THE CONNECTIONS:
FROM J4–1, 2 TO THE SOLENOID
FROM TB4–1, 2 (BOARD POWER) TO THE DC DISTRIBUTION SYSTEM
FROM THE LIGHT POWER IN (TB1 & 2) TO THE INVERTER OUT
AutoCAD Drawing: NSU J-Box 723 Wiring.dwg
FINISH
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS ± ANGLES ± 1/2°
0 = ± .00 = ± .000 = ±
FRACTIONS ±
BREAK ALL SHARP CORNERS
125√ ON ALL MACHINED SURFACES
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND IS LOANED SUBJECT TO AGREEMENT THAT IT WILL NOT BE REPRODUCED OR ITS CONTENTS REVEALED TO OTHERS IN WHOLE OR PART, WITHOUT THE PRIOR WRITTEN CONSENT OF THE WILL-BURT COMPANY.
FOR LOGISTICAL SUPPORT ONLY
SIGNATURE DATE
DR.BY DJB -
CK.BY MC -
APP.BY -
WILL-BURT
AN EMPLOYEE OWNED COMPANY ORRVILLE,OHIO
NEXT ASSY
NightScan Powerlite
CONTROL & INVERTER WIRING
SIZE A
DWG. No. WD-48571
SCALE NTS
SHEET 1 OF 2


CONVERTER WIRING
BATTERY CONNECTIONS TO CONVERTER: 4 GA MINIMUM, CUSTOMER SUPPLIED
BATTERY
M8 (5/16")
150A
WHT
BLK
DC POWER DISTRIBUTION
RECOMMENDED MOUNTING: TERMINALS FACING UP.
#10, 12-18 in. lbs. 5/16", 60 in. lbs max
WHT
BLK
INSTALLER WIRING
CONNECTIONS TO BASE BOARD MAY BE FACTORY WIRED ON SELECT HDT SYSTEMS
18/2 SJOOW
RECOMMENDED MOUNTING: HEAT SINK FINS VERTICAL.
1/4"
12
0
24/48
CONVERTER
IF USING WB SUPPLIED 10/6 CABLE FROM VERTICAL SYSTEM: USE RED (+) AND BLK (-) FOR RIGHT LIGHT POWER, USE ORG (+) AND BLU (-), FOR LEFT LIGHT POWER.
(24v) 10/4 SJOOW
(48v) 14/4 SJOOW
BLK
GRN
WHT
RED
M5 (1/4")
30A
10 Ga. min.
J4
4.4 in-lbs. 0.5 N-m
WHT
BLK
1 2 3 4 5 6 7 8 9
RED
BLK
WHT
BLK
(init) GRN
(com) VIO
(kill) GRY
WHT
BLK
CONNECT ANY SHIELD GROUNDS TO J4-2
WB HHRC CONTROL CABLE
"MAST ACTIVE" OUTPUT CONTACTS
2 AMPS MAX.
18/2 SJOOW or Equiv.
DC BOARD POWER
10/2 SJOOW or Equiv.
BATTERY (+)
BATTERY (-)
RED (or WHT)
BLK
20 in-lbs. 2.3 N-m
TB4
+VB
GND
CHASSIS
J4
LEFT POWER
RED +
BLK -
GRN -
WHT +
TB2
20 in-lbs. 2.3 N-m
TB1
RIGHT POWER
4311701
NSU CE BASE CONTROL BOARD
CONVERTER POWER CONTROL
A SIGNAL FROM THE NIGHTSCAN IS USED TO CONTROL POWER TO THE CONVERTER USED FOR THE LIGHTS. J4-1, 2 ON THE BASE BOARD SUPPLIES BATTERY VOLTAGE WHEN THE SYSTEM IS ON. USING THIS POWER TO ACTIVATE THE SOLENOID, IT WILL TURN THE CONVERTER ON AND OFF WITH THE SYSTEM. SOLENOID RATED FOR CONTINUOUS DUTY AND OPERATES AT SAME VOLTAGE AS THE BATTERY VOLTAGE.
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FROM J4-1, 2 TO THE SOLENOID
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FROM THE LIGHT POWER IN (TB1 & 2) TO THE INVERTER OUT
REVISIONS
ECN 13555 | REV L | DESCRIPTION ADD MORE BOARD CONNECTION DETAIL | DATE 03-10-17 | BY/APPVL DJB/AW
AutoCAD Drawing: NSU J-Box 723 Wiring.dwg
FINISH
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS ANGLES
.X = ± ± 1/2°
.00 = ±
.000 = ±
FRACTIONS ±
BREAK ALL SHARP CORNERS .125 / .250 MACHINED 125 / 250 MACHINED
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FOR LOGISTICAL SUPPORT ONLY
SIGNATURE DATE
DR. BY DJB 03-10-17
CK. BY MC
APP. BY
WILL BURT AN EMPLOYEE OWNED COMPANY ORRVILLE,OHIO
NEXT ASS'Y
NightScan Powerlite
CONTROL & CONVERTER WIRING
SIZE A | DWG. No. WD-48571
SCALE NTS | SHEET 2 OF 2

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