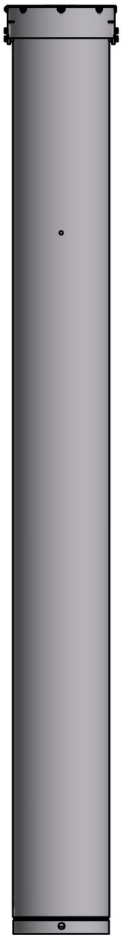
Pneumatic Mast Operating Instructions

(Low-Profile Heavy Duty Non-Locking Model)



(710305000 Shown)

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TP-5252001-H, November 2021

Original Instructions

Warranty

Will-Burt warrants its Low-Profile to be free from defects in material and workmanship for a period of five (5) years when used in commercial applications and two (2) years when used in military applications, 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.

Contents

1 Safety Summary

This section describes safety instructions for the Low-Profile 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 Low-Profile.

⚠ WARNING

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

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ CAUTION

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

⚠ CAUTION

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

⚠ CAUTION

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

⚠ CAUTION

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

⚠ CAUTION

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

⚠ CAUTION

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

⚠ CAUTION

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

⚠ WARNING

Lifting Hazard! Manually lifting over 55 lb. (25 kg) is prohibited. In the UK, all lifting equipment must be thoroughly examined annually by a competent person according to the Lifting Operations and Lift Equipment Regulations 1998. Equivalent regulations exist in other EU states.

⚠ WARNING

Safety Instruction – Roof Access! If the mast will be mounted to a vehicle, the operator must provide a safe means to access the roof of the vehicle during installation.

⚠ WARNING

Pressurized Device Hazard! Mast disassembly prior to depressurization may release pressurized air jet. Completely lower the mast, depressurize and shut down power before disassembly.

⚠ WARNING

Safety Instruction – Remote Control! The equipment is subject to remote control and may be operated at any time. Persons working on the equipment should take appropriate precautions to ensure that any unexpected movement does not occur as this could lead to injury.

⚠ WARNING

Safety Instruction – Lightning! Lightning protection is not part of this system. A proper means of electrical grounding should be provided. Failure to observe this warning could result in death or serious injury.

⚠ WARNING

Crush Hazard – Hoist Failure! Use extreme caution while installing the base plate to the mast. Be certain mast is properly secured during installation of base plate. Death or serious injury could occur if hoist fails or mast slips suddenly.

⚠ WARNING

Safety Instruction – Operation! At all times prior to mast operation, ensure:

- The mast area is free of personnel and mechanical obstruction
- Be certain mast is level, stable, and secure before and during installation, operation, maintenance, and transportation. Operate on level ground only.
- Any transit tie-downs on the payload have been removed
- The base section shall be within:
    - 5° of vertical for Low-Profile masts with extended heights ≤ 60 feet (18 meters)
    - 3° of vertical for Low-Profile masts with extended heights > 60 feet (18 meters)

All values assume a maximum of 12-inch (30.5 cm) payload offset. If offsetting any payload greater than 600 lb. (272 kg), the payload offset direction must be in-line with the tube keys, and not perpendicular to the keys.

⚠ WARNING

Burst Hazard! Do not exceed maximum operating pressure of 35 psi for heavy-duty masts. Keep personnel clear of safety valve exhaust direction. Over pressurizing mast will trip safety valve and could result in death or serious injury.

⚠ WARNING

Mounting Structure Hazard! Mounting the system into a structure unable to resist the forces generated from the customer-specific loading scenario could result in death or serious injury, and could damage the mast and mounting surface.

The payload mounting bolts must be installed from the bottom of the can with the nut and excess bolt length on the top. Mounting the payload bolts from the top down such that the bolt or nut contacts the mast collars in the nested or retracted position could result in death or serious injury, and could damage the mast.

Operating the mast without both wedges properly adjusted to contact the can on both sides of the mast could result in death or serious injury and could damage the mast.

⚠ CAUTION

Safety Instruction – Air Control Valve! Improper positioning and operation of Air Control Valve can result in moderate injury or equipment damage. Air Control Valve must be mounted in a location where the operator has full view of the mast and mast operating space but does not make contact with the mast during operation (except for yokes). Only use a Hold-To-Run type Air Control Valve or switch. The Air Control Valve shall be normally open to atmosphere when the mast is in transit or not in use.

⚠ CAUTION

Equipment Damage! Before installing the drain kit, read and understand the installation instructions. Failure to follow drain kit installation instructions could damage the mast and render the mast inoperable.

⚠ CAUTION

Safety Instruction - Motion on Power Interruption or Emergency Stop! When using a normally open control valve as required for vehicle applications, if power is lost or turned off or the emergency stop is activated while the mast is extended, the mast will begin releasing air pressure and retracting at a controlled rate until power is restored or the mast fully retracts.

⚠ CAUTION

Safety Instruction – Mast Access! The operator must provide safe means to access the top of the mast during installation and removal of the payload.

⚠ CAUTION

Equipment Damage – Deviation! Deviation from standard operating conditions and procedures could cause system failure.

⚠ CAUTION

Safety Instruction – Hose Installation! At all times while using pipe and hose during installation, recognize that:

- Pipe and hose should be routed, mounted and restrained to protect from damage
- Do not use second hand piping for installation. Use piping adhering to regional standards.
- Do not bend air pipe and hose at a radius less than specified by the manufacturer
- Pipes should be marked to avoid hazards from incorrect connection
- The exhaust should be fitted with a silencer and be directed away from personnel

- When routing piping, install in such a way as to minimize torsion on the joints
- Mounting of air pipe and hose shall be done with tools and in such a way to prevent air pipe and hose from easily disconnecting from the mast

⚠ CAUTION

Drain Valve Kit Installation! Failure to follow Drain Kit installation instructions could damage the mast and render the mast inoperable. Read and understand the installation instructions before installing the Drain Kit.

⚠ CAUTION

Equipment Damage – Band Clamp Fasteners! Do not overtighten the band clamp fasteners. Overtightening may damage the base tube causing the mast tubes to stick.

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
- 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

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 burst hazard. The mast contains air pressure. Never install the mast without installing the overpressure safety valve. Never operate the mast above the maximum rated pressure.

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 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 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 the installation, operation, transportation, maintenance, storage, and troubleshooting procedures for the Low-Profile Heavy Duty Non-Locking (HDNL) Pneumatic Mast system. These procedures assume the use of standard catalog mast systems with a clear anodized finish. Procedures and characteristics for mast systems customized to meet customer-specific needs may vary. 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 Low-Profile Heavy Duty Non-Locking Pneumatic Mast comprises of:

- A telescoping mast
- A pneumatic system
- Mounting hardware

The mast is designed to:

- Minimize the nested height
- Minimize mast twist while extended
- Stabilize the payload while in transit

This manual is not for the following pneumatic masts:

- Standard Duty Non-Locking Pneumatic Masts
- Heavy Duty Non-Locking and Locking Pneumatic Masts (HDNL and HDL)
- Super Heavy Duty Non-Locking and Locking Pneumatic Masts (SHDNL and SHDL)
- Ultra Heavy Duty Pneumatic Masts (UHD)
- Internally Wired Pneumatic Masts (IWM)
- Yacht Masts
- Night Scan®, Inflexion™, and InflexionPlus™ Masts

The mast has:

- Internal, non-locking collars
- A can lock which also serves as the payload platform

The Low-Profile Heavy Duty Non-Locking Pneumatic Mast does not currently support the following:

- Internally wired options

The Low-Profile Heavy Duty Non-Locking Pneumatic Mast is available in the following models:

- 7-27 (P/N: 710303004)
- 6-29 (P/N: 710303005)
- 5.3-32 (P/N: 710303200)
- 7-42 (P/N: 710304202)
- 6-42 (P/N: 710304204)
- 7.3-50 (P/N: 710305000)

Note: Model numbers listed are for catalog masts only. Masts with other heights, capacities, and finishes are available. For more information on additional mast sizes, capabilities, and finishes, see www.willburt.com.

3.1 Intended Use

The Low-Profile Heavy Duty Non-Locking Pneumatic Mast is intended for use by professionals in the fire/rescue/first responder/security/towing/broadcast/cellular 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 Low-Profile Heavy Duty Non-Locking Pneumatic Mast is intended to be installed on fire/rescue/towing/first responder/broadcast/cellular vehicles with the magnetic warning kit installed and operational.

The Low-Profile Heavy Duty Non-Locking Pneumatic Mast 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. Contact The Will-Burt Company with any questions on the intended use or available training programs for installation and operation.

3.2 Definition of Terms and Abbreviations

Throughout this manual, the following terms and abbreviations are used.

General Terms:

- **Mast** refers to the telescoping Low-Profile Heavy Duty Non-Locking Pneumatic Mast
- **System** refers to the entire Low-Profile Heavy Duty Non-Locking Pneumatic Mast system (telescoping mast, pneumatic system, mounting hardware, and additional accessories)
- **Payload** refers to the object or equipment being raised by the mast to an operational height

Mast Positions (Figure 3-1):

- **Nested** refers to the position of the mast were no tubes of the mast have risen. The mast remains retracted. This position is sometimes referred to as “stowed”.
- **Extended** refers to the partial- or full-raised position of the mast that the mast pneumatically goes to from the nested position. In the extended position, some or all the mast tubes have risen.

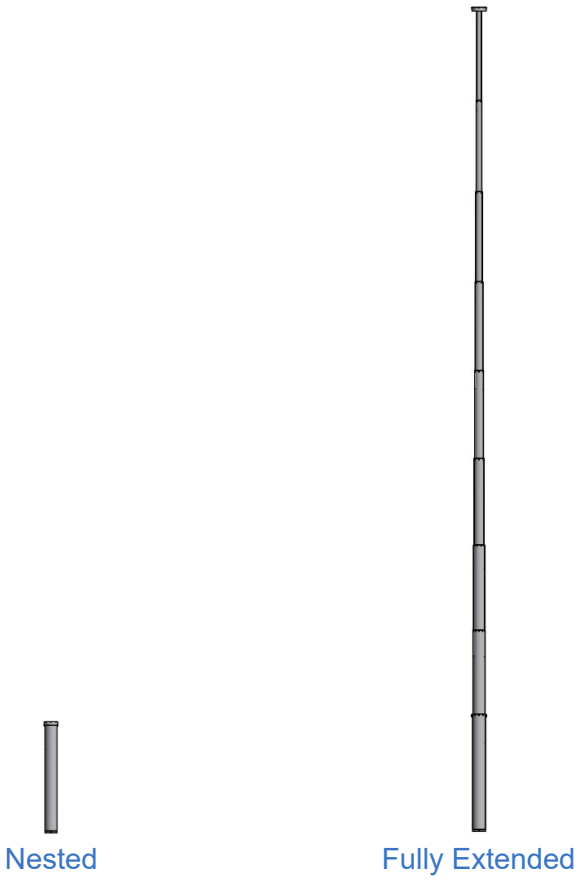


Figure 3-1 Nested and Fully Extended Heights

Mast Terms:

- **Bearing Strips** (Figure 3-2) refer to plastic strips located in the collars where tubes make contact with each other. Bearing strips are sometimes referred to as collar inserts or Delrins.
- **Collars** (Figure 3-2) attach to the top of each mast tube except the top tube. When the mast is nested, each collar is stored inside the next larger collar to minimize the nested height.

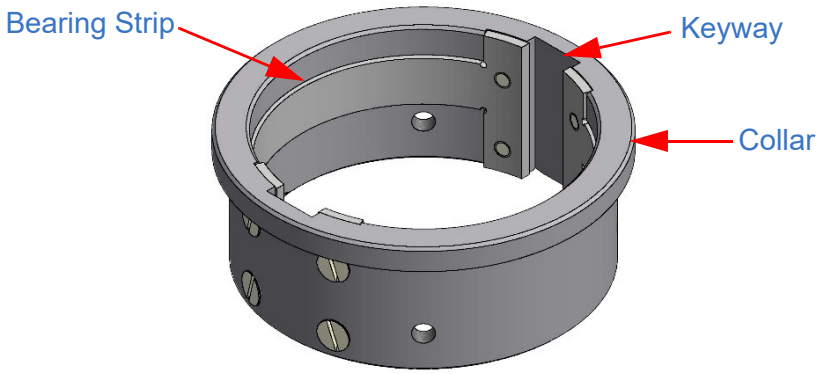


Figure 3-2 Bearing Strip and Collar (P/N: 5099109)

- **Can Lock** (Figure 3-3) refers to the system used to lock the nested mast in place. The can lock is attached to the top of the top tube. The top of the can lock also serves as the payload platform.
- **Can Lock Wedge** (Figure 3-3) refers to the wedges that secure the can lock in position when the mast is nested.

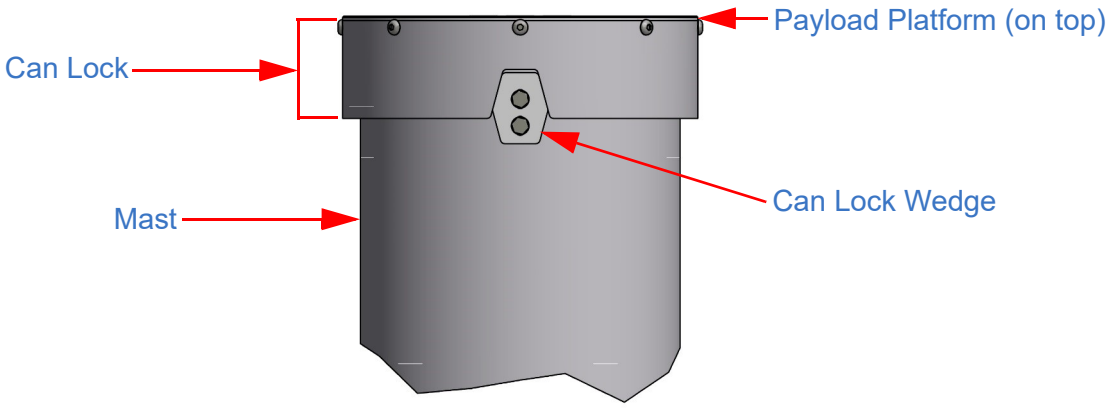


Figure 3-3 Can Lock and Can Lock Wedge

- **Backup washers** (Figure 3-4) fit inside the expanders.
- **Expanders** (Figure 3-4) fit inside the seals and over the backup washers.
- **Orifice Bolts** (Figure 3-4) attach the backup washers, expanders, and seals to the tube butt plates.
- A **Pipe Plug** (Figure 3-4) is located at the bottom of the mast. A second pipe plug is located at the bottom side of the base tube (not shown).
- **Seals** (Figure 3-4) fit over the expanders.
- **Wear Rings** (Figure 3-4) are preformed split synthetic bearings that fit in the wear ring groove around the butt plate above the seal on each interior mast tube. The wear rings guide the bottom of the tube through the next larger tube.

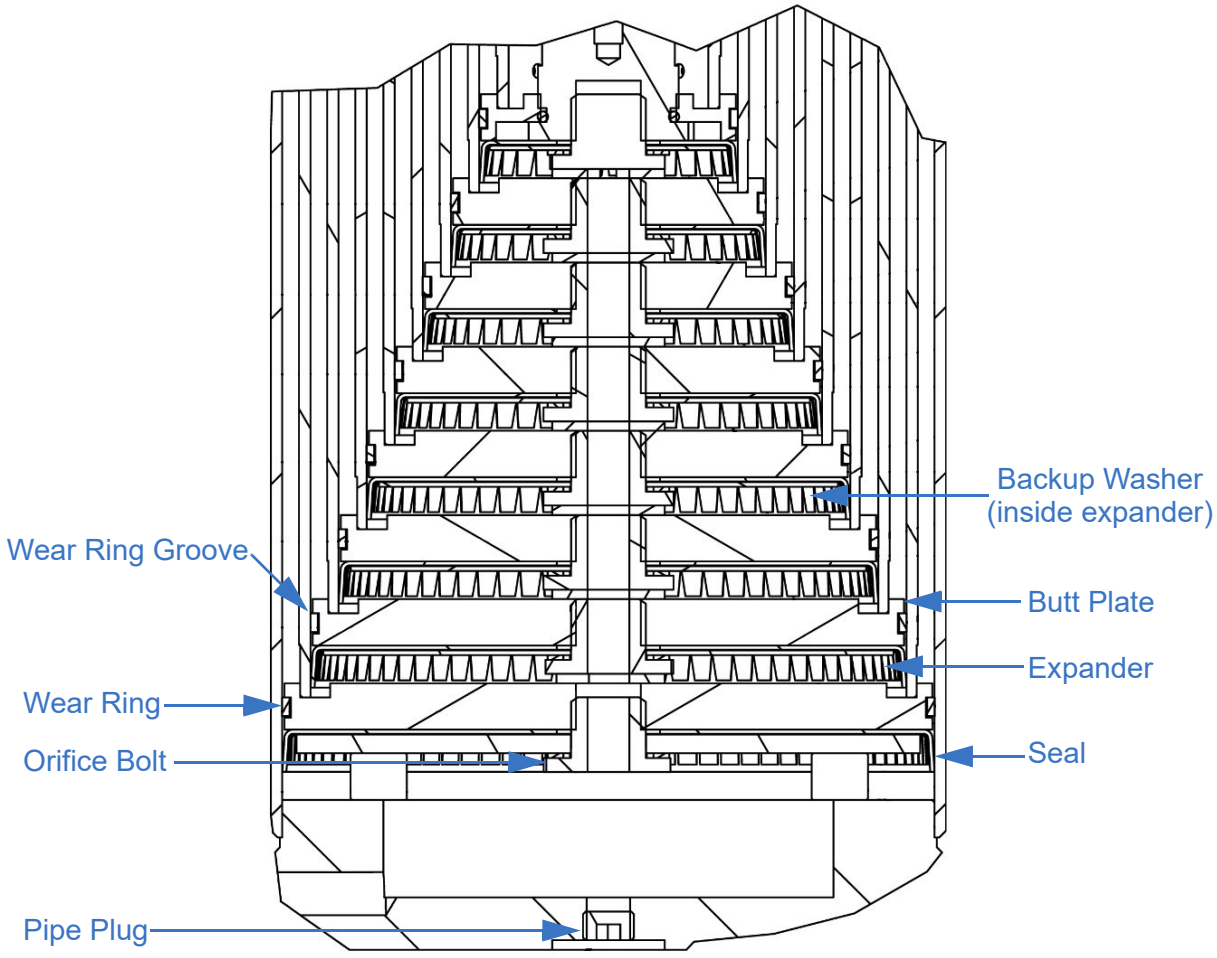


Figure 3-4 Mast Parts

- **Weep Holes** (Figure 3-5) refer to holes on each mast tube except the top tube which are designed to facilitate the drainage of water during periods of extension. Weep holes are sometimes referred to as drain holes.

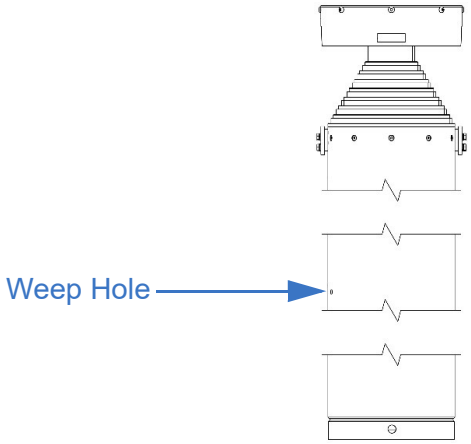
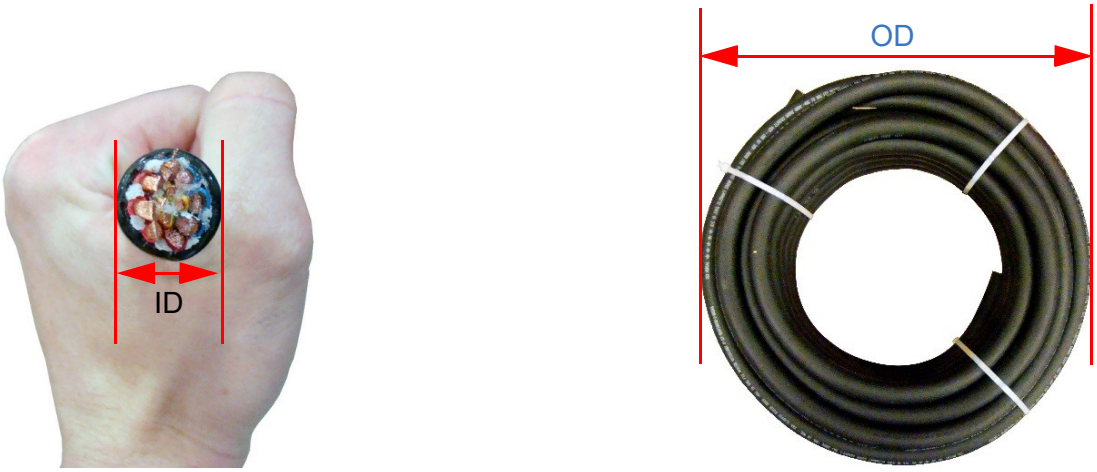


Figure 3-5 Weep Hole

Abbreviations:

- **ID** stands for Inside Diameter (Figure 3-6) or the diameter to the inside edge of a circle
- **OD** stands for Outside Diameter (Figure 3-6) or the diameter to the outside edge of a circle



ID of Cable OD of Cable

Figure 3-6 Inside and Outside Diameters

- **NPT** stands for National Pipe Thread, a United States standard for thread specifications on pipes and fittings.
- **PSI** stands for pound-force per square inch.
- **PSIG** stands for pound-force per square inch gauge. PSIG refers to a gauge that has been calibrated to read zero at sea level.
- **BAR** is a metric until of pressure approximately equal to the atmospheric pressure at sea level.

3.3 Major Components

This section describes major components of a mast system assuming the use of standard catalog mast systems. Characteristics of components customized to meet customer-specific needs may vary. If necessary, contact The Will-Burt Company for additional details.

Major components of the mast system include:

- Telescoping Mast
  - Hardware Bag (P/N: 902853)
  - Drain Kit (P/N: 902982)
  - Magnetic Warning Kit (P/N: 5170701)
  - Identification Plate (P/N: 902851)
  - Label Kit (P/N: 913918)

- Pneumatic System Options (Sold Separately)
  - Compressors
  - Filter Regulator Lubricator (P/N: 900484)
  - Filter Lubricator (P/N: 900634)
  - Solenoid Air Valve Kit
  - Hand Pump (P/N: 5050101)

- Mounting Hardware Options (Sold Separately)
  - Base Plate
  - Support Bracket
    - Internal (Roof)
    - External
  - Shelf Bracket

- Additional Accessories Options (Sold Separately)
  - Nycoil®
  - D-TEC®

3.3.1 Telescoping Mast

The telescoping mast (Figure 3-7):

- Is the structure used to raise the payload to an operational height
- Extends and retracts pneumatically
- Is constructed with concentric nesting mast tubes
- Is made from aluminum tube
- Must remain pressurized to support the payload at an extended height
- Has a can lock which also serves as the payload platform

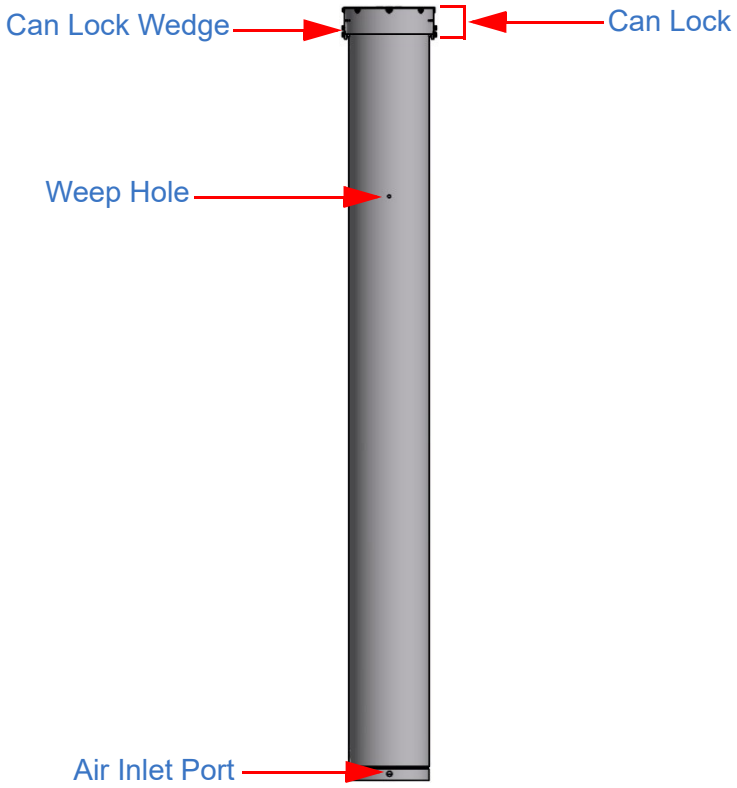


Figure 3-7 Telescoping Mast (710305000 Shown)

The mast tubes are as follows:

- Base Tube which is the tube with the largest diameter
- Top Tube which is the tube with the smallest diameter
- Intermediate Tubes which are the tubes between the base tube and top tube

To establish azimuth (rotational) integrity between tubes, each mast tube, except the base tube, has (2) rectangular keys along the length of the tube. The keys match with keyways on the larger, adjacent mast tube's collar.

Items shipping with the mast include:

- Hardware Bag
- Drain Kit
- Magnet Warning Kit
- Identification Plate (ships installed on mast)
- Label Kit (ships installed on mast)

3.3.1.1 Hardware Bag (P/N: 902853)

The mast system includes a 4 x 6 inch (102 x 152 mm) plain cloth hardware bag. The contents of the hardware bag are used to secure the mast to the base plate, to mount the mast, to protect the mast from over pressurization, to drain water, and to connect to the air supply line.

The hardware bag includes (Figure 3-8):

- (1) Safety Valve ¼ in. (6.35 mm) NPT, 55 PSI (P/N: 913962) (Note: Do not operate mast without safety valve properly installed)
- (2) Close Nipple ¼ in. (6.35 mm) Brass (P/N: 900508)
- (1) Cross Brass (P/N: 900516)
- (1) Air Cock #64-T (P/N: 900382)
- (1) ⅜ x ¼ in. (9.5 x 6.35 mm) Bushing, Reducing, 125 LB Red Brass, NPT (P/N: 900522)
- (4) Bolt ⅜-16 x 1-½ in. (9.5-406.4 x 38 mm), Stainless Steel (P/N: 901594) (used to mount the mast)
- (4) Flat Washer, ⅜ in. (9.5 mm), Stainless Steel (P/N: 2054) (used to mount the mast)
- (4) Lock Washer, ⅜ in. (9.5 mm), Stainless Steel (P/N: 0801) (used to mount the mast)
- (4) Nut ⅜-16 in. (9.5-406.4 mm), Hex, Heavy-Duty, Stainless Steel (P/N: 901593) (used to mount the mast)
- (4) Screw ⅜-16 x 1 (9.5-406.4 x 25.4 mm) Flathead Stainless Steel (P/N: 2772) (used attach the base plate to the mast)
- (1) Bushing Threaded Hex ¼-½ in. (6.35-12.7 mm) NPT Brass (P/N: 912293)
- (1) Parts Bag (P/N: 17337) (not shown)

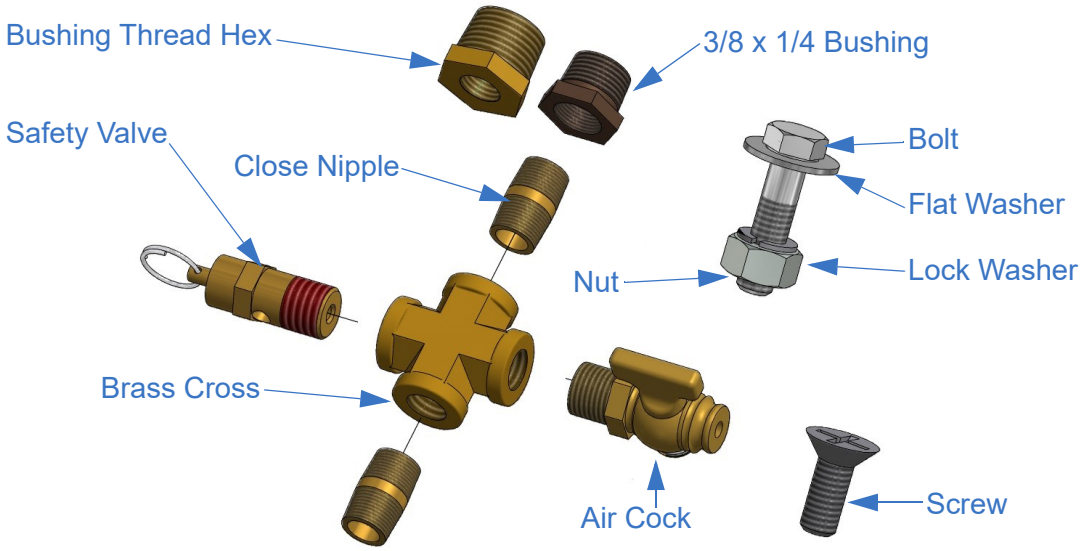


Figure 3-8 Hardware Bag Contents

3.3.1.2 Drain Kit (P/N: 902982)

The drain kit outfits the mast with a means to drain water which has entered the top and intermediate mast tubes which may cause damage. The fittings are used to attach one end of the tube to the weep hole in the base mast tube and route the other end of the tube outside the mounting structure or vehicle to drain water. The air cock (Figure 3-8) from the hardware bag drains water from the base mast tube.

The drain kit includes (Figure 3-9):

- (1) Washer ⅜ in. (9.5 mm), ID x ¾ (19 mm), OD x 1/16 (1.9 mm) Thick (P/N: 900555)
- (1) Locknut ⅛ in. (3.2 mm) Brass (P/N: 900556)
- (1) ¼ in. (6.35 mm) Hose Adaptor (P/N: 900564)
- (1) ¼ in. (6.35 mm) Bulkhead Fitting (P/N: 900565)
- 8 ft. (2.4 m), ¼ in. (6.35 mm) ID, Clear Polyethlene Tube (P/N: 900566)
- (1) Service Sheet 414 (P/N: 4306601) (not shown)
- (1) Polyethlene Bag 11 x 18, 2 MILS (P/N: 4306301) (not shown)

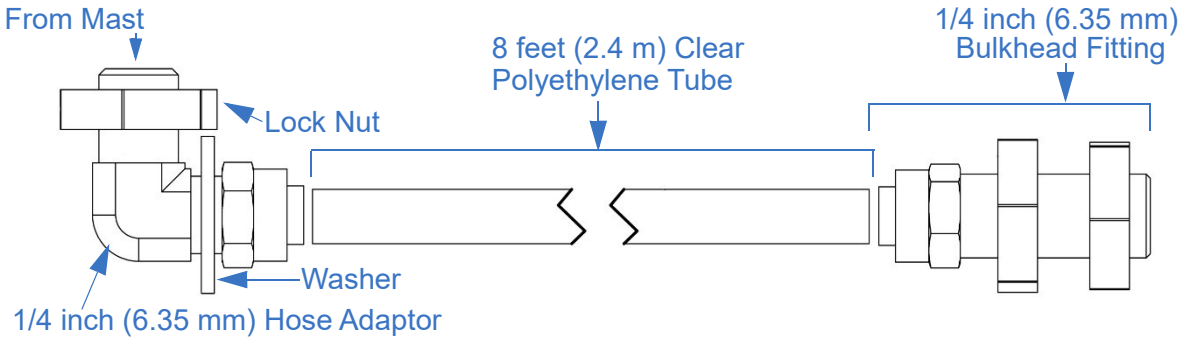


Figure 3-9 Drain Kit

3.3.1.3 Magnetic Warning Kit (P/N: 5170701)

The magnet warning kit is a system designed to warn against moving a vehicle while the telescoping mast is partially or fully extended. The magnet warning kit is packaged in a brown cardboard box.

The magnet warning kit includes:

- (1) Hose Clamp 7-⅛-10 (P/N: 900725)
- (1) Reed Switch (P/N: 5060601)
- (1) Notice Label (P/N: 900747)
- (1) Flasher (P/N: 900405)
- (2) Lights (P/N: 900408)
- (1) Relay (P/N: 901065)
- (1) Carton (P/N: 34240)
- (1) ATC Inline Fuse Holder (P/N: 299084)
- (1) Fuse 3A, 32 Violet ATC (P/N: 221017)
- (2) MTG. BRKT MAG Warning Kit GRI Switch (P/N: 5057801)
- (2) Screw Cap #8-32x1.000 (P/N: 1860)
- (2) Nylock Hex Nuts (P/N: 2465)

3.3.1.4 Identification Plate (P/N: 902851)

An identification plate is secured to the can lock base and centered to the front can lock cap screw. The identification plate is engraved with information pertaining to the mast (Figure 3-10).

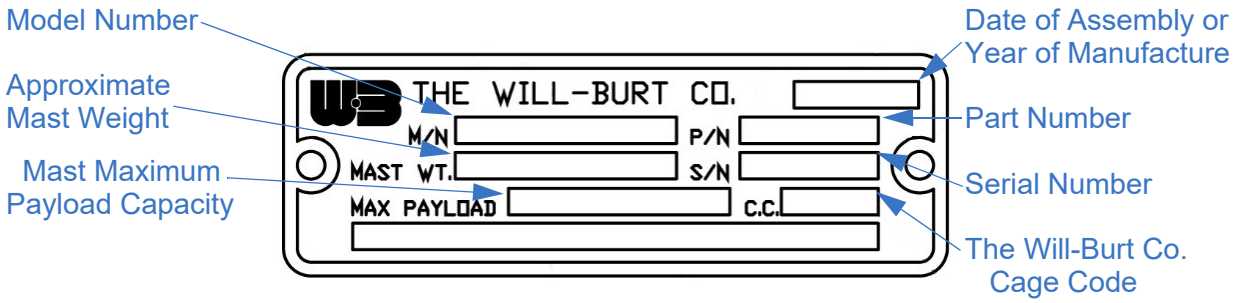


Figure 3-10 Identification Plate (P/N: 902851)

3.3.1.5 Label Kit (P/N: 913918)

The label kit is used to identify potential hazards within the system. These labels come installed on the system.

The label kit includes (Figure 3-11):

- (2) Pinch Point Hazard Labels (P/N: 900878)
- (1) Sales and Service Label (P/N: 911956)
- (1) Electrocution Hazard Label (P/N: 900711)
- (1) Read Manual Hazard Label (P/N: 900710)
- (1) Burst Hazard Label (P/N: 900763)
- (1) CE Mark (P/N: 913869)
- (1) Center of Gravity (P/N: 913865)
- (1) Frozen Water Hazard Label (P/N: 4007401)
- (2) Combination Hazard Labels (P/N: 4022201)

Additional labels are provided with the operator's manual. These labels should be applied where the operator will have a clear view of them while operating the mast.

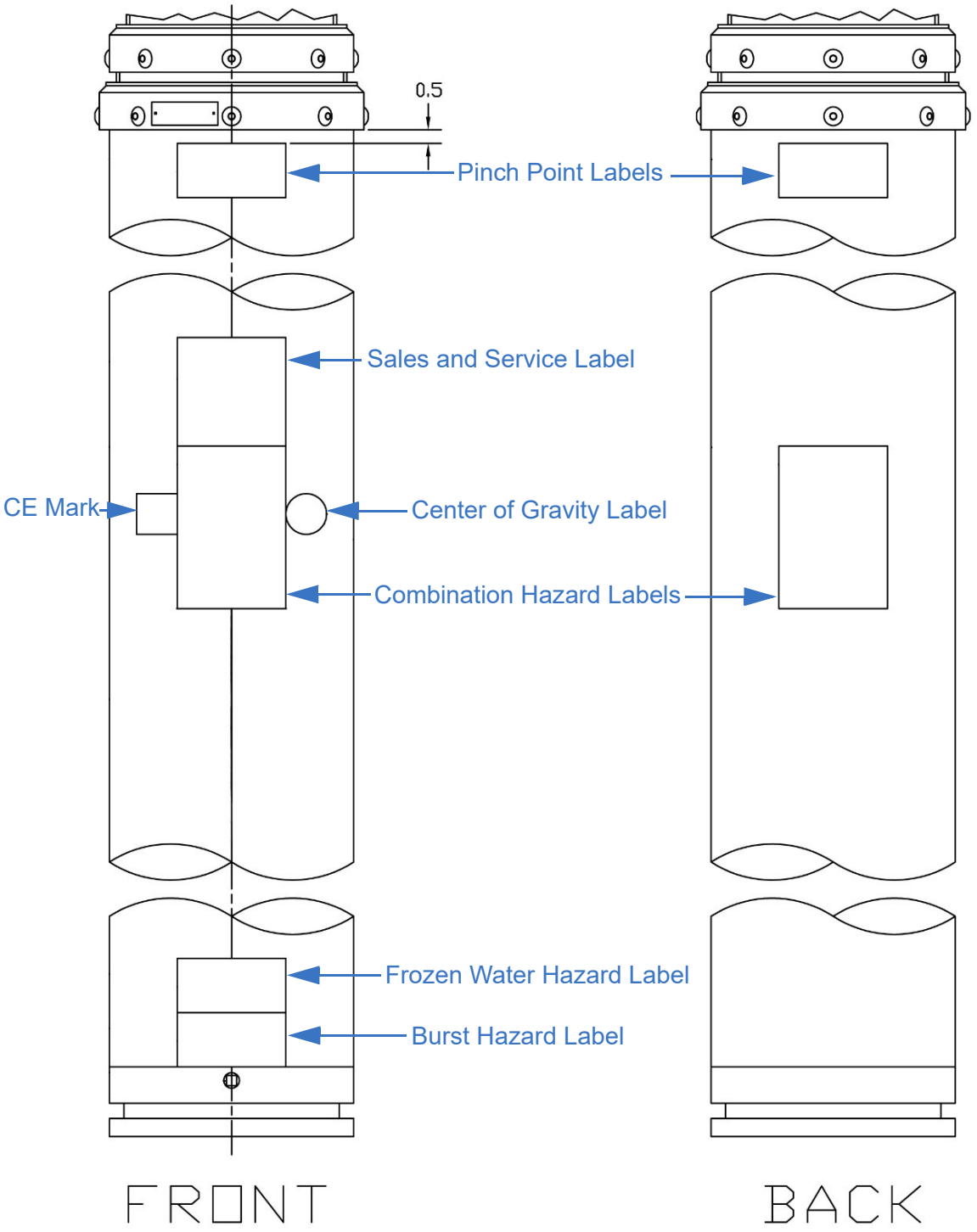


Figure 3-11 Label Kit

3.3.2 Pneumatic System Options (Sold Separately)

The pneumatic system refers to a means of safely controlling the pressurization and depressurization of the mast. Components in the hardware bag and a port near the bottom of the base tube are provided to connect an air supply to the mast. A CE rated pneumatic system shall be selected for use in European Member States.

Possible options for the pneumatic system include:

- Compressor
- Filter Regulator Lubricator
- Filter Lubricator
- Solenoid Air Valve Kit
- Hand Pump

3.3.2.1 Compressors

The Will-Burt Company offers a variety of low-maintenance, oil-less air compressor systems, including those listed in Table 3-1.

Compressors are available for input power of:

- 12 VDC
- 24 VDC
- 110 VAC (60 Hz)
- 220 VAC (50 and 60 Hz)

Table 3-1 Air Compressor Specifications

Functional Characteristic	Specification
12 VDC Compressor (P/N: 5058501)* (CE Rated for use in EU)	
System Weight	29.8 lb. (13.5 kg)
Dimensions (W x H x D)	8 x 11.6 x 11.7 inches (203 x 295 x 298 mm)
Operating Temperature Range	-4 to 122°F (-20 to 50°C)
Air Flow	6.1 CFM (173 LPM)
Current Draw at 2.4 Bar	55 Amps
Check Valve Cut Out	32 ± 2 psi
24 VDC Compressor (P/N: 5058502)* (CE Rated for use in EU)	
System Weight	29.8 lb. (13.5 kg)
Dimensions (W x H x D)	8 x 11.6 x 11.7 inches (203 x 295 x 298 mm)
Operating Temperature Range	-4 to 122°F (-20 to 50°C)

Table 3-1 Air Compressor Specifications (Continued)

Functional Characteristic	Specification
Air Flow	6.7 CFM (191 LPM)
Current Draw at 2.4 Bar	30 Amps
Check Valve Cut Out	32 ± 2 psi
230 VAC 50Hz/60Hz Compressor (P/N: 5255801)* (CE Rated for use in EU)	
System Weight	36.4 lb. (16.5 kg)
Dimensions (W x H x D)	8 x 11.6 x 11.9 inches (203 x 295 x 302 mm)
Operating Temperature Range	-4 to 122°F (-20 to 50°C)
Air Flow	6.5 CFM (185 LPM)
Current Draw at 2.4 Bar	5.1 Amps
Check Valve Cut Out	32 ± 2 psi
110 VAC 50Hz/60Hz Compressor (P/N: 5255802)* (CE Rated for use in EU)	
System Weight	25.4 lb. (11.5 kg)
Dimensions (W x H x D)	8 x 11.6 x 11.9 inches (203 x 295 x 302 mm)
Operating Temperature Range	-4 to 122°F (-20 to 50°C)
Air Flow	6.5 CFM (185 LPM)
Current Draw at 2.4 Bar	10 Amps
Check Valve Cut Out	32 ± 2 psi
110 VAC 60Hz Compressor (P/N: 902404)**	
System Weight	45 lb. (20.4 kg)
Dimensions (W x H x D)	15 x 8.91 x 11.61 inches (381 x 227 x 295 mm)
Operating Temperature Range	50° to 104°F (10° to 40°C)
Air Flow	4.4 CFM (125 LPM)
Current Draw at 2.4 Bar	10.6 Amp
Check Valve Cut Out	32 ± 2 psi
220 VAC 60Hz Compressor (P/N: 912361)**	
System Weight	45 lb. (20.4 kg)
Dimensions (W x H x D)	15 x 8.91 x 11.61 (381 x 227 x 295 mm)
Operating Temperature Range	50° to 104°F (10° to 40°C)

Table 3-1 Air Compressor Specifications (Continued)

Functional Characteristic	Specification
Air Flow	3.6 CFM (101 LPM)
Current Draw at 2.4 Bar	5.3 Amp
Check Valve Cut Out	32 ± 2 psi
* Includes a Hand-Held Remote Control (optional 16 feet (5 m) extension cable (P/N: 5346601) available) ** Includes in-line manual Air Control Valve Note: Specifications provided are for reference only and may be subject to change without notice	

For more information on the compressors, see www.willburt.com.

3.3.2.2 Filter Regulator Lubricator (P/N: 900484)

A filter regulator lubricator (Figure 3-12) is available for use with the following compressors:

- P/N: 912361 (220 VAC)
- P/N: 902404 (220 VAC)

Figure 3-12 Filter Regulator Lubricator

3.3.2.3 Filter Lubricator (P/N: 900634)

A filter lubricator (Figure 3-13) is available for use with the following air compressors:

- P/N: 912361 (220 VAC)
- P/N: 902404 (220 VAC)

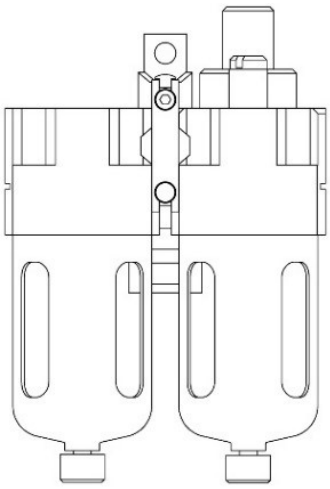


Figure 3-13 Filter Lubricator

3.3.2.4 Solenoid Air Valve Kits

The Will-Burt Company offers a variety of solenoid air valve kits. A hand-held remote controller (HHRC) (P/N: 912247) (Figure 3-14) is available with the solenoid air valve kit.

Solenoid air valve kits are available for input power of:

- 12 VDC
- 24 VDC
- 110 VAC
- 220 VAC (50 Hz)

Figure 3-14 Hand-Held Remote Controller

For more information on the solenoid air valve kits, see www.willburt.com.

3.3.2.5 Hand Pump (P/N: 5050101)

The hand pump (Figure 3-15) is used to deploy the mast where electric or pneumatic power is not available.

Features:

- Constructed of steel and aluminum
- Pumps air in both downward and upward stroke
- Operates between -4°F and 140°F (-20°C and 60°C)

The hand pump includes:

- (1) Hand Pump (P/N: 5050001)
- 6 feet (1.8 m) of Air Hose (P/N: 108768)
- (2) Push Connector Fittings (P/N: 4024001)

Figure 3-15 Hand Pump (5050001 Shown)

3.3.3 Mounting Hardware Options

Mounting hardware is used to secure the mast in place.

Possible options for the mounting hardware include:

- Base Plate
- Support Bracket
- Shelf Bracket

3.3.3.1 Base Plate

The base plate is used to stabilize and secure the mast to the mounting structure and is designed for non-rotating masts.

The non-rotating base plate (Figure 3-16) is a square aluminum plate with countersunk holes that match threaded holes on the base mast tube. Screws, included in the hardware bag, can be used to attach the non-rotating base plate to the base mast tube. Bolts, nuts, and washers, included in the hardware bag, are sized for the through-holes in the corners of the non-rotating base plate so the mast can be secured to a mounting structure. A hole in the center of the plate allows the option of routing air to the bottom of the base tube.

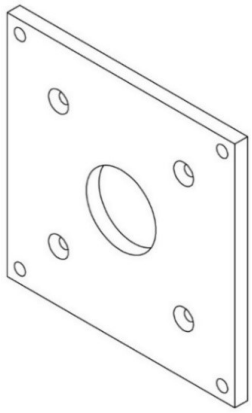


Figure 3-16 Non-Rotating Base Plate

3.3.3.2 Support Bracket

Support brackets can be for internal or external mounting to position and support the mast.

Internal (Roof)

The internal mounting (Figure 3-17) kit contains the hardware used to position and support an internally mounted mast.

The kit includes:

- (1) Weather Bonnet
- (2) Gaskets
- (1) Bearing Strip
- (1) Ceiling Plate
- (1) Roof Flange
- (1) O-Ring

Bolts, lock washers, and hex nuts, ¼ in. (M6), not provided, can be used as fasteners. Bolt length will depend on the specific application and is to be determined by the customer.

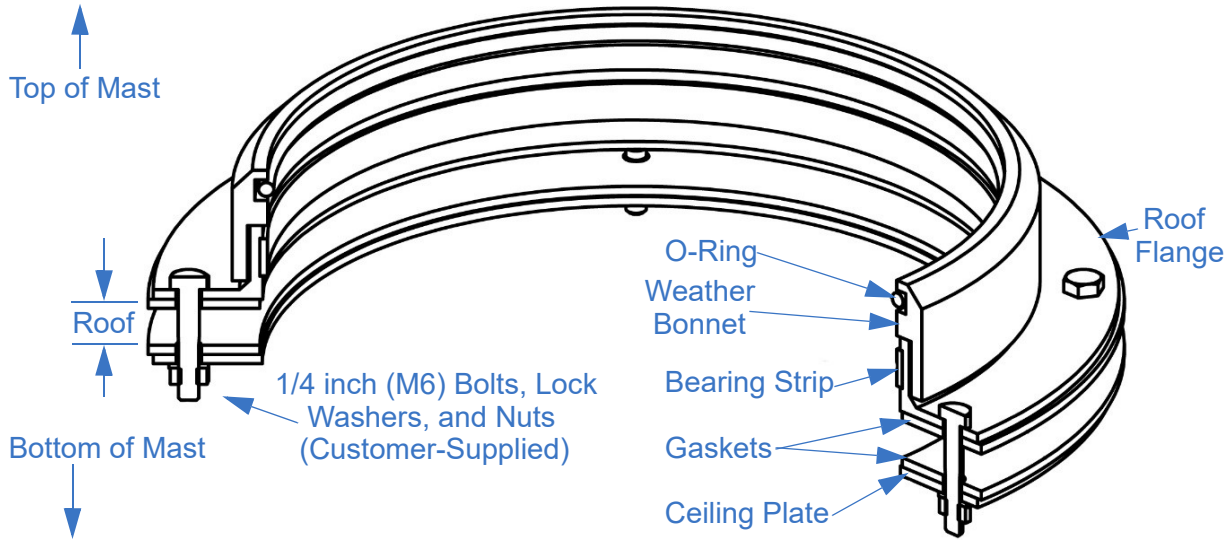


Figure 3-17 Internal Support Bracket (P/N: 905733 Shown)

External

External mounting is used to brace masts against a mounting structure. The external support bracket (Figure 3-18) includes:

- (1) Stand-Off which is a steel sheet metal that positions the support brackets away from the mounting structure.
- (2) Aluminum Support Brackets which are C-shaped support brackets that are bolted together around the base mast tube to hold the mast against the support structure.
- (1) Bearing Strip which attaches inside the support brackets to protect the mast from being scraped by the support brackets.
- Fasteners which secure the assembly together.

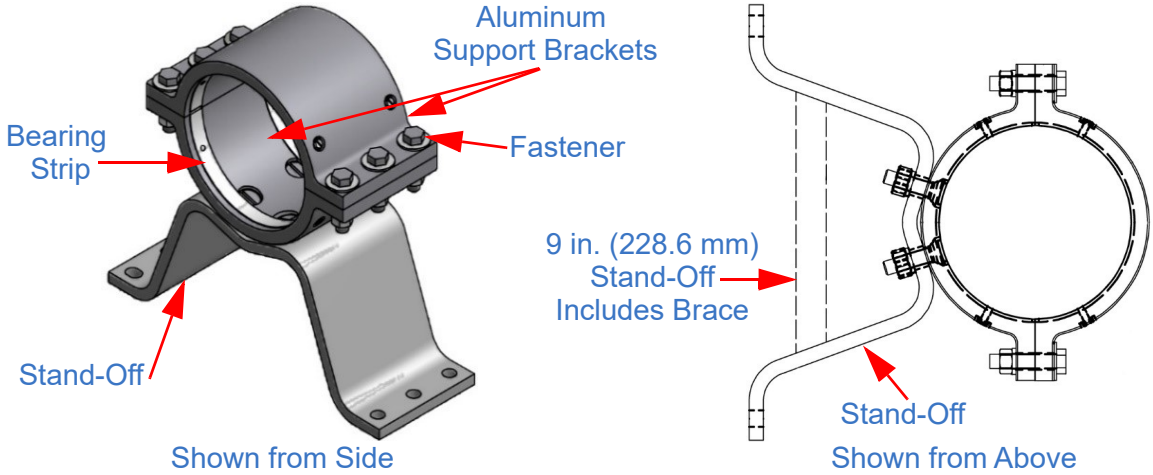


Figure 3-18 External Support Bracket

If the support bracket is too tight and hindering rotation processes, customer-provided shims may need to be added to allow for slight variation.

3.3.3.3 Shelf Bracket

The shelf bracket (Figure 3-19) is a painted, steel weldment that can be bolted into a mounting structure and used to position and support an externally mounted mast.

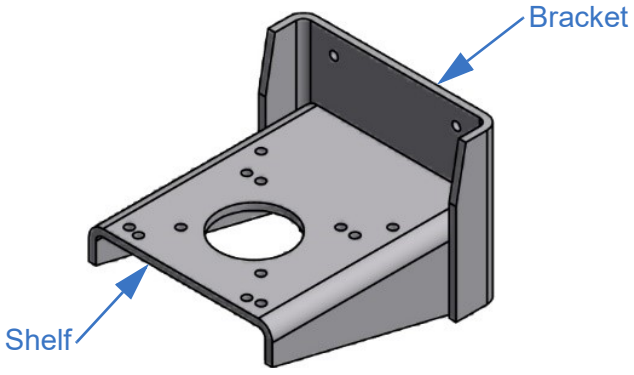


Figure 3-19 Shelf Bracket (P/N: 4454001 Shown)

For more information on the shelf bracket options, see www.willburt.com.

3.3.4 Additional Accessory Options

Additional accessories are available for the system.

Possible accessories include:

- Nycoil®
- D-TEC®

For additional options, see www.willburt.com.

3.3.4.1 Nycoil® (P/N: Varies)

The Nycoil® cable conduit (Figure 3-20) is an external coiled hose used to house electrical wiring, antenna RF, and positioner cables.

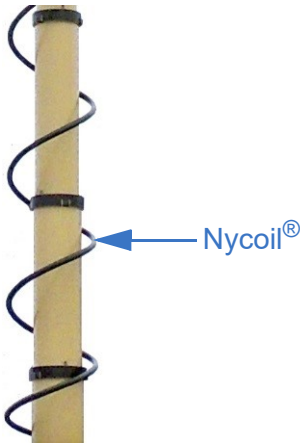


Figure 3-20 Nycoil® Cable

Features:

- Compactly retracts when mast is nested.
- Extends neatly with mast.

Available sizes of cable:

- ½ in. (12.7 mm) cable ID, 9 in. (229 mm) coil OD
- ¾ in. (19 mm) cable ID, 13 in. (330 mm) coil OD
- 1 in. (25.4 mm) cable ID, 16.5 in. (419 mm) coil OD
- 1 ¼ in. (31.8 mm) cable ID, 21.5 in. (546 mm) coil OD

The Nycoil® length should be (2) times the difference between the mast extended and nested heights. Depending on the system being used, some restrictions on the size of the Nycoil® may occur. Consult engineering on specific applications.

For more information on the Nycoil®, see www.willburt.com.

3.3.4.2 D-TEC®

The D-TEC® (Figure 3-21) safety system provides overheard power field detection, and above the mast illumination. The built-in anti-collision system automatically stops mast extension providing added protection for the operator and equipment from overheard powerline hazards.

The D-TEC® comes in (2) packages:

- D-TEC® Package with Rack Mount (P/N: 5354501) includes sensor, rack mount, installation kit, and mounting bracket.
- D-TEC® Package with Wall Mount (P/N: 5354601) includes sensor, wall mount, installation kit, and mounting bracket.

Figure 3-21 D-TEC®

Features:

- (2) detection modes that operate simultaneously:
  - Electric Field (E-Field) detection to sense the presence of nearby high voltage AC.
  - Magnetic Field (H-Field) detection to sense the presence of nearby high current AC.
- A look-up light with ultra-bright white LEDs
- An ambient light sensor to ensure the look-up light only illuminates when it is dark
- An (8) character alphanumeric LED display
- Audible alarms and messages
- Built-in emergency bypass
- Weather resistant enclosures

Table 3-2 lists specifications for the D-TEC®.

Table 3-2 D-TEC® Specifications

Functional Characteristics	Limits
Temperature limits	-40°F to 160° F (-40°C to 71°C)
Duty Cycle	100%
Power Supply	11 to 33 VDC, 5 Amp
Minimum Voltage Detection	2.3 Kilovolts / Meter
Distance of Ultrasonic Detection	10 ft. (3 m)

For more information on the D-TEC®, see www.willburt.com.

See Section 10.3 for wind load and sail area ratings.

4 Technical Data

The model numbers listed in this section are for catalog masts with a clear anodized finish only. Masts with other heights, capacities, and finishes are available. For more information on additional mast sizes, capabilities, and finishes, see www.willburt.com.

4.1 Specifications for all Low-Profile HDNL Pneumatic Masts

See Mast Wind Load Capacity (Section 10.3) for wind load specifications for various masts. If the mast model is not listed, contact The Will-Burt Company. If payload extends beyond the boundaries defined for the wind analysis, contact The Will-Burt Company.

Mast Storage Temperature: -40°C to +70°C (-40°F to 158°F)

Maximum Altitude Above Sea Level: 4572 meters (15,000 feet)

Airborn Noise Emissions are as follows per ISO 3744:2010 when compared to a certified similar product. (A-weighted sound pressure level: <70 dB(A); C-weighted instantaneous pres level: <79.7 dB; A-weighted sound power level: 80 dB(A) (note this is for the mast and not the air delivery system).

Refer to Section 10.3 for mast wind load and sail area ratings.

Deployment and retraction wind speeds are payload dependent, however, the mast can typically be deployed and retracted in wind speeds up to 25 mph (40 km/h) when the mast is deployed within the maximum payload and deployment angle specifications. Check with The Will-Burt Company's Engineering team for additional customer specific loading scenarios.

Table 4-1 Low-Profile Heavy Duty Pneumatic Mast Specifications

	Rated Payload Capacity	Nested Height	Extended Height	Approx. Mast Weight	No. of Tubes	Tube Diameter	Maximum Operating Pressure
7-27	300 lb.	6.5 ft.	26.7 ft.	118 lb.	5	6.75-3.75 in.	35 psig
	(136.1 kg)	(2 m)	(8.2 m)	(53 kg)		17.15-9.53 cm	2.4 bar
6-29	200 lb.	6 ft.	28.4 ft.	119 lb.	6	6.75-3 in.	35 psig
	(90.7 kg)	(1.8 m)	(8.7 m)	(54 kg)		17.15-7.62 cm	2.4 bar
5.3-32	200 lb.	5.3 ft.	32 ft.	261 lb.	9	9-3 in.	35 psig
	(90.7 kg)	(1.6 m)	(9.75 m)	(118 kg)		22.86-7.62 cm	2.4 bar
7-42	300 lb.	6.8 ft.	41.2 ft.	230 lb.	8	9-3.75 in.	35 psig
	(136.1 kg)	(2.1 m)	(12.5 m)	(104 kg)		22.86-9.53 cm	2.4 bar
6-42	200 lb.	6.3 ft.	41.2 ft.	223 lb.	9	9-3 in.	35 psig
	(90.7 kg)	(1.9 m)	(12.5 m)	(101 kg)		22.86-7.62 cm	2.4 bar
7.3-50	200 lb.	7.3 ft.	50 ft.	257 lb.	9	9-3 in.	35 psig
	(90.7 kg)	(2.3 m)	(15.3 m)	(117 kg)		22.86-7.62 cm	2.4 bar

Note:

1. Tube Diameter listed as Base Tube Diameter – Top Tube Diameter
2. Dimensions and specifications provided are for reference only and are not intended for vehicle design purposes
3. Specifications may be subject to change without notice
4. Payload Capacity assumes:

- 12 inch maximum offset payload from mast centerline
- Mast deployment angle is 0° to 5°
- Operating temperature is -20° to 60°C
- Mast maximum pressure of 35 PSIG (2.4 Bar)
- Not applicable to internally wired masts

4.2 Tube Diameters

Table 4-2 Tube Diameters

Heavy Duty Tube			
	Tube	A	
		in.	mm
	3	3.00	76
	3 ¾	3.75	95
	4 ½	4.50	114
	5 ¼	5.25	133
	6	6.00	152
B	6 ¾	6.75	171
	6 ¾	6.75	171
	7 ½	7.50	191
	8 ¼	8.25	210
B	9	9.00	229
* “B” designates a base tube			

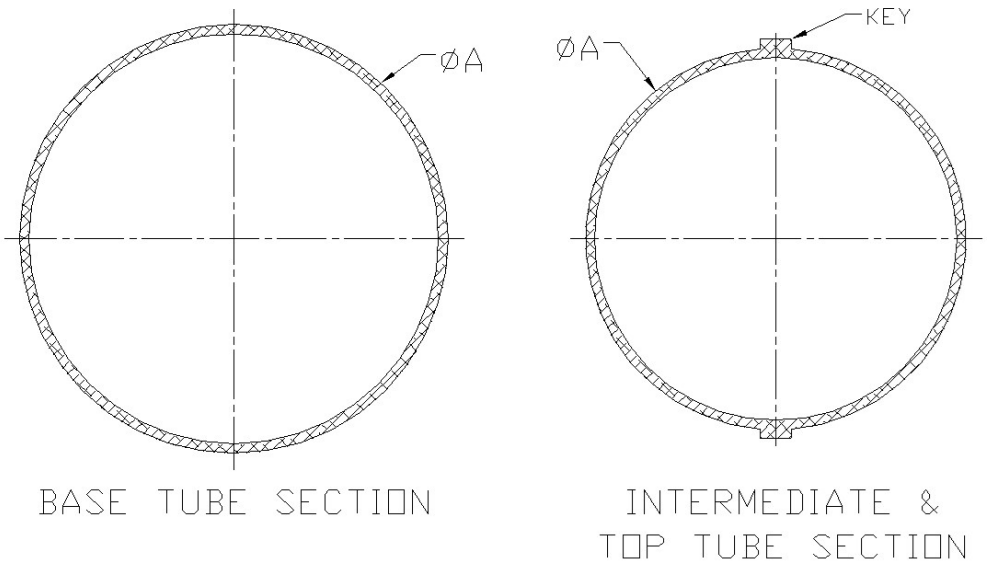


Figure 4-1 Tube Diameters

4.3 Collar Information

Table 4-3 Collar Information

Heavy Duty Collar			
Tube	Non-Locking OD		Collar Bolts
	in.	mm	
3 ¾	4.50	114	8
4 ½	5.20	132	8
5 ¼	6.00	152	8
6	6.75	171	8
6 ¾	7.50	191	8
7 ½	8.25	210	8
8 ¼	9.00	229	8
9	9.75	248	8

Figure 4-2 OD on Non-Locking Collar (P/N: 5099101 Shown)

4.4 Mast Installation Dimensions

Dimensions and specifications provided are for reference only and are not intended for vehicle design purposes. Depending on the mast system and components being used, the exact design of components may vary. Masts with other heights, capacities, and finishes are available. For more information on additional mast sizes, capabilities, and finishes, see www.willburt.com.

Table 4-4 Mast Installation Dimensions

		A		B		C	
P/N	MODEL	inch	mm	inch	mm	inch	mm
710303004	7-27	78.7	1998.9	61.9	1572.3	75.4	1915.2
710303005	6-29	71.9	1826.3	55.0	1397	68.6	1742.4
710303200	5.3-32	63.6	1615.4	41.2	1046.5	60.0	1524
710304202	7-42	82	2082.8	59.8	1518.9	78.3	1988.8
710304204	6-42	75.25	1911.4	53.0	1346.2	71.6	1818.6
710305000	7.3-50	87	2209.8	65.5	1663.7	83.3	2115.8

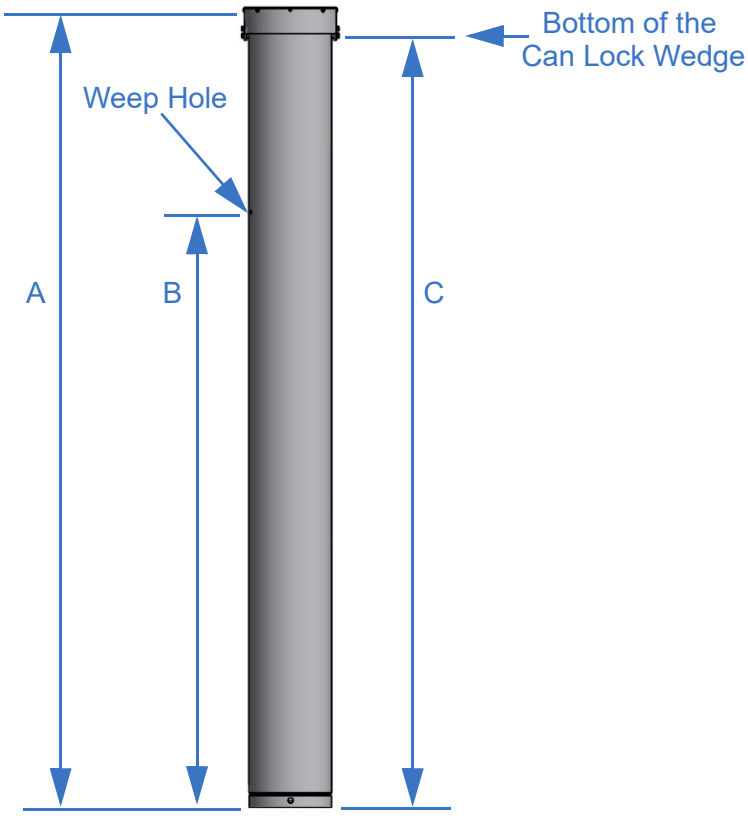


Figure 4-3 Mast Installation Dimensions

4.5 Non-Rotatable Base Plate Dimensions

Table 4-5 Non-Rotatable Base Plate Dimensions

	A		B		Ø C	
Base Tube	inch	mm	inch	mm	inch	mm
6.75	6.75	171	5.75	146	0.44	11
9	9	229	8	203	0.44	11

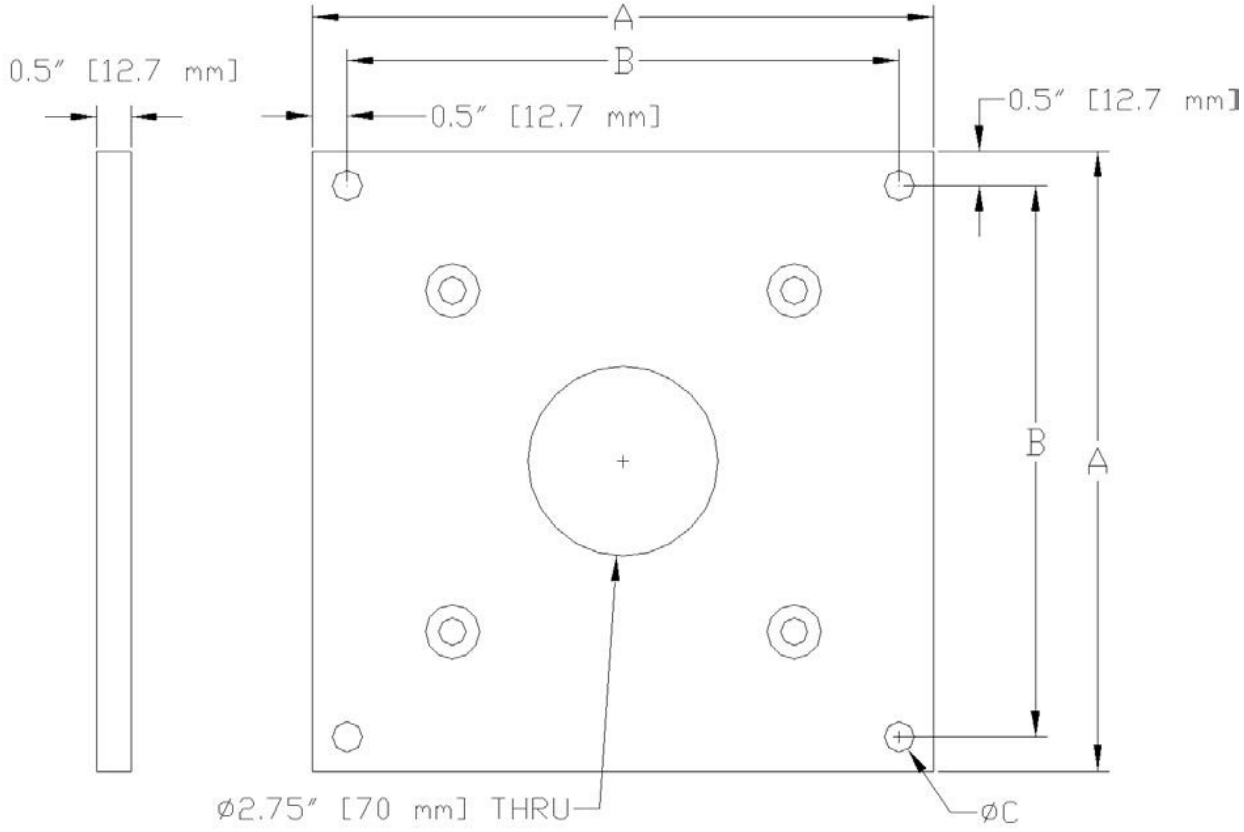


Figure 4-4 Non-Rotatable Base Plate Dimensions

4.6 Internal (Roof) Support Bracket Mounting Information

Table 4-6 Internal (Roof) Support Bracket Mounting Information

	A		B	Ø C	
Base Tube	inch	mm		inch	mm
6.75	9.75	248	8	8.75	222
9	12	305	8	11	279

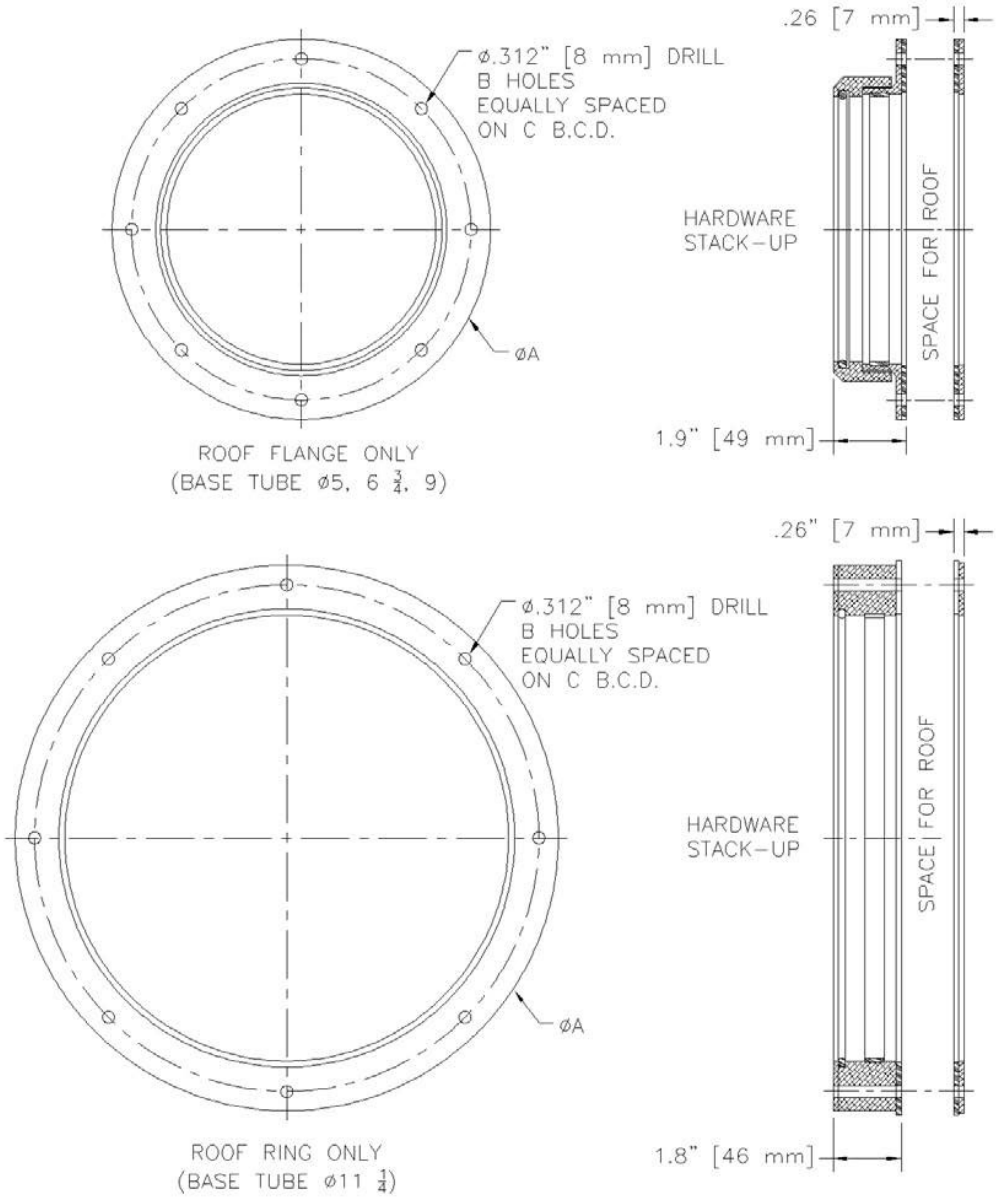


Figure 4-5 Internal (Roof) Support Bracket Mounting Information

4.7 External Support Bracket Mounting Information

Table 4-7 External Support Bracket Mounting Information

	OD		A		B		Est. Wt.	
Base Tube	inch	mm	inch	mm	inch	mm	lb.	kg
6.75	7.75	197	8.25	210	12.10	307	6.7	3
9	10.5	267	9.75	248	13.84	352	12.1	5.5

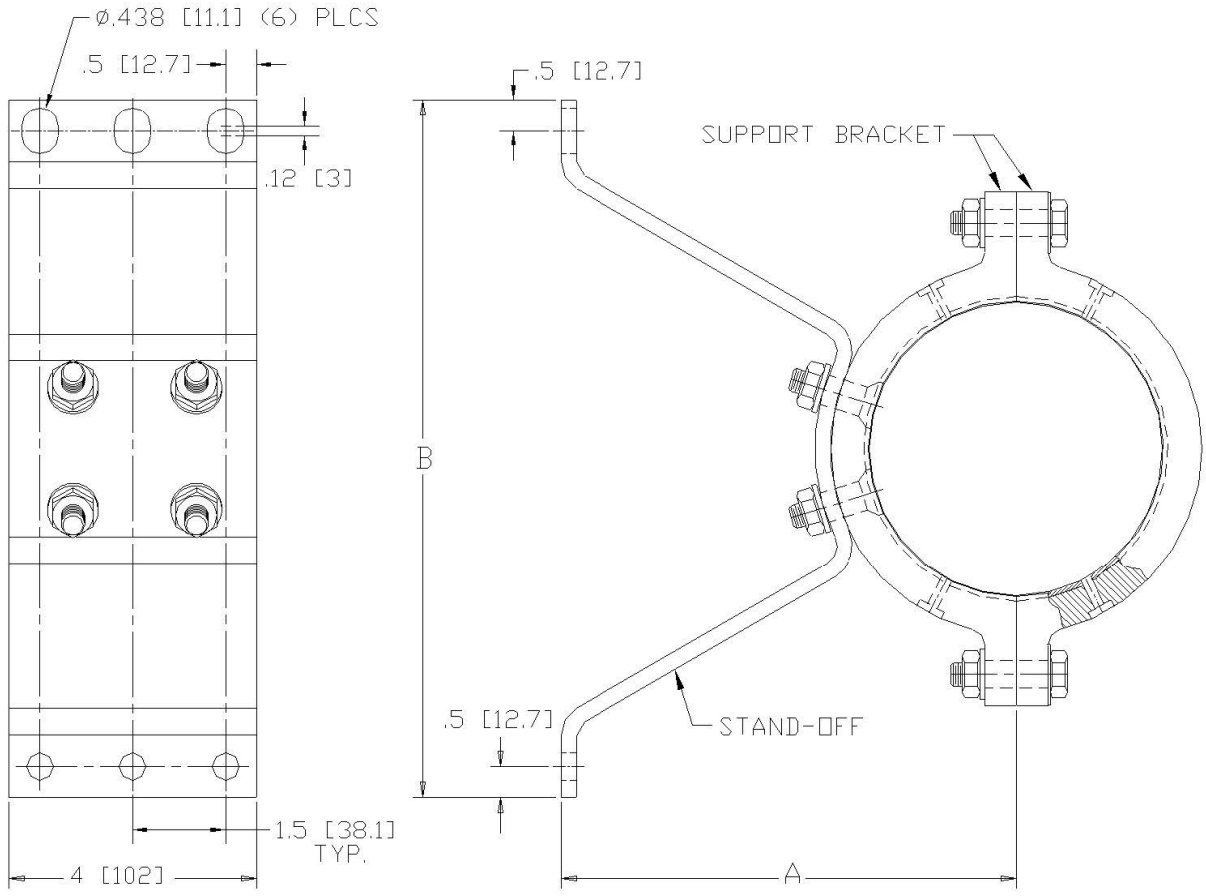


Figure 4-6 External Support Bracket Mounting Information

4.8 Shelf Bracket Mounting Information

Table 4-8 Shelf Bracket Mounting Information

Base Tube	A		B		C		D		E		F		G	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
6.75	9.8	249	14.3	363	7.75	197	10.94	278	8.44	214	6.0	152	0.56	14
9	10.0	254	15.8	401	8.00	203	13.25	337	10.75	273	6.3	160	0.56	14

Base Plate		U		V		W		X		Y		Z	
		in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
6.75	Non-Rotating	3.75	95	4.38	111	3.78	96	1.5	38	0.52	13	5.75	146
9	Non-Rotating	5.25	133	5.22	133	5.25	133	1.23	31	0.50	13	8.00	203

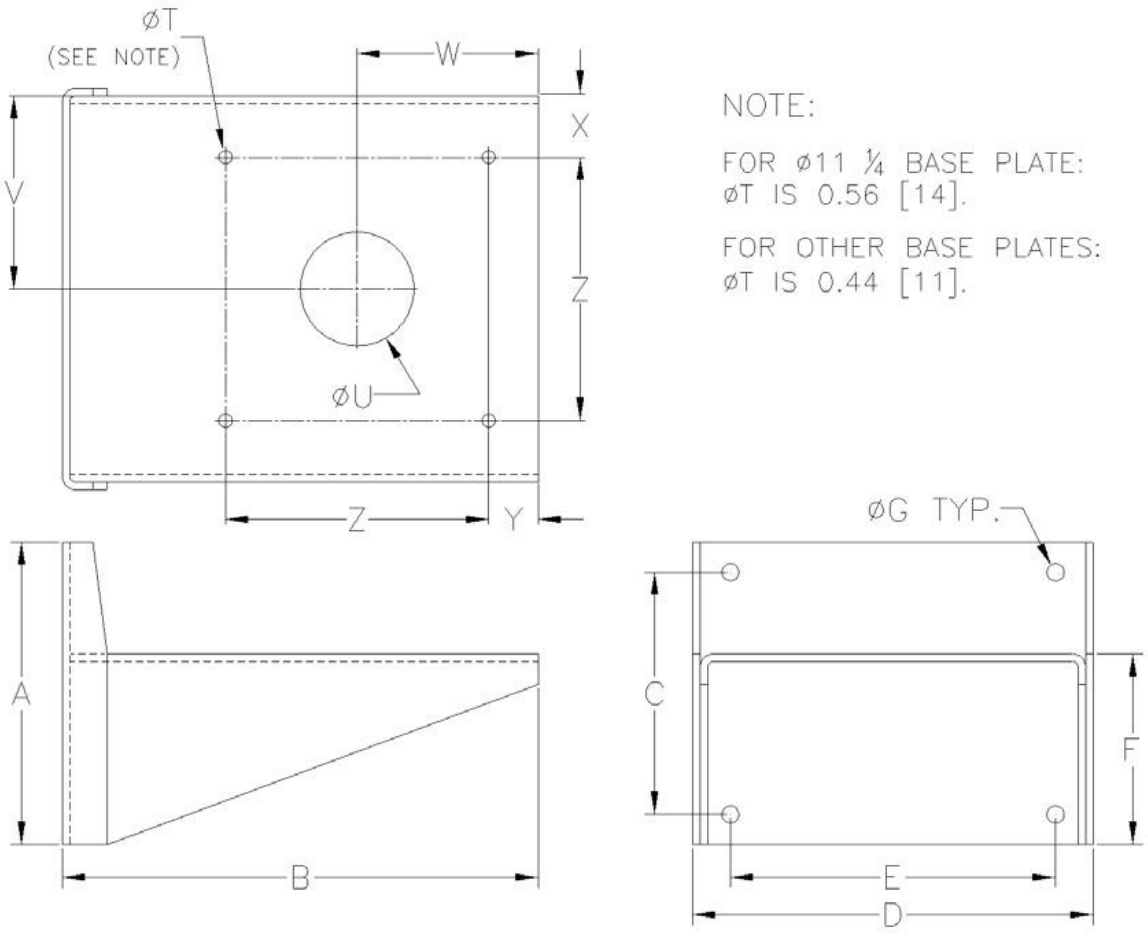


Figure 4-7 Shelf Bracket Mounting Information

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5 Installation

This section describes the installation of the Low-Profile Heavy Duty Non-Locking Pneumatic Mast System 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 in Section 1 before beginning installation. Use care to follow all precautions while installing.

For component installation dimensions and geometry, refer to Section 4.

5.1 Pre-Installation Check

Before installing the mast system, ensure:

- All installers read and understand the entire installation procedure.
- Only a properly trained and qualified certified electrician performs electric installations and maintenance.
- All purchased components are included (Section 3.3).
- All required equipment is readily available (Section 5.2).
- When installing in a vehicle, that the vehicle is stationary and on a level surface.

5.2 Installation Equipment

Table 5-1 lists general equipment recommended for installation. Depending on the mast system configuration, additional equipment may be required.

Table 5-1 Equipment Recommended for Installation

Recommended Equipment*		
Personal Protective		
Safety Glasses	Work Gloves	Safety Shoes
Hard Hat or Helmet	Hearing Protection	Nitrile or Vinyl Gloves
Hand Tools		
Wrenches	Screwdrivers	Hammer
Torque Wrench	Drill	Saw
Plumb-Bob	Measuring Tape	Level
Sockets	Appropriate Hardware (Section 5.4)	
Equipment		
Compressed Air Supply	Hoist	Sling / Strap
Expendables		
Pipe Thread Sealant or PTFE Tape	Rags (Clean and Dry)	Silicone Sealant

*Note:

- Depending on the local, regional, and national standards and codes of practice, and the environment, additional personal protective equipment may be necessary.
- Depending on the mast system configuration, additional equipment, including but not limited to, rubber washers or grommets (for the pneumatic system), electrical components (e.g. wire, fuses, circuit breakers, etc.), and air control valves, switches, air hose and fittings, may be required.
- When disposing of any disposables or components, do so according to any applicable local, regional, and national standards and codes of practice.

5.3 Installation Hardware

This section describes hardware that may be used during installation as follows:

- Table 5-2 Hardware for Internal Mount Application Installation
- Table 5-3 Hardware for External Mount Application Installation

Table 5-2 Hardware for Internal Mount Application Installation

Hardware*	Supplied By	Notes
Internal Mounting Kit (To the Roof)		
¼ Inch (M6) Bolts	Customer	Internal Mounting Kits for 6.75, 9.0, and 11.25 inch base tubes require eight sets of hardware. Internal Mounting Kits for 5.0 inch base tubes require six sets of hardware. The bolts should be sized to length to allow for the thickness of the Internal Mounting Kit, lock washer, nut, roof, and any spacers.
¼ Inch (M6) Lock Washers	Customer	
¼ Inch (M6) Nuts	Customer	
Non-Rotatable Base Plate (To the Mast)		
(4) ⅜-16x1 Flathead Screws (P/N: 2772)	The Will-Burt Company	Found in the Hardware Bag
Non-Rotatable and Rotatable Base Plate (To the Mounting Surface)		
(4) ⅜-16x1-½ Inch Bolts (P/N: 901594)	The Will-Burt Company	Found in the Hardware Bag
(4) Flat Washers (P/N: 2054)	The Will-Burt Company	Found in the Hardware Bag
(4) Lock Washers (P/N: 0801)	The Will-Burt Company	Found in the Hardware Bag
(4) Nuts (P/N: 901593)	The Will-Burt Company	Found in the Hardware Bag
* Unless otherwise indicated, the mounting hardware must include proper means to resist vibration loosening such as thread-locking compound or locking hardware. Torque all hardware as appropriate for its size and grade. Torque values in these instructions assume the use of The Will-Burt Company provided hardware. Depending on the specific installation application, all hardware may not be used. Additional hardware may be required for additional accessories, or customer-specific applications.		

Table 5-3 Hardware for External Mount Application Installation

Hardware*	Supplied By	Notes
Shelf Bracket (Optional) (To the Support Structure)		
(4) Bolts	Customer	Bolts should be sized to length to allow for the thickness of the Shelf Bracket, support structure, and any spacers and mounting hardware. Shelf Bracket P/N: 4434101 uses ⅜ inch hardware. This Shelf Bracket is used for non-rotating and rotating masts with 5.0 inch Base Tubes and non-rotating masts with 6.75 inch Base Tubes. Shelf Brackets P/N: 4454001, P/N: 4454101, and P/N: 913947 use ½ inch hardware. (Part Numbers for clear anodized finish only.)
(4) Flat Washers	Customer	
(4) Lock Washers	Customer	
(4) Nyloc Nuts	Customer	
Non-Rotatable Base Plate (To the Mast)		
(4) ⅜-16x1 Flathead Screws (P/N: 2772)	The Will-Burt Company	Found in the Hardware Bag
External Support Bracket (P/N: 4443601) (To the Support Structure)		
(6) Sets of ⅜ Inch Hardware	Customer	The bolts should be sized to length to allow for the thickness of the External Support Bracket, support structure, any spacers, and all mounting hardware (e.g. flat washers, lock washers, and nuts).
External Support Bracket (P/N: 909984 and P/N: 4894901) (To Support Structure)		
(6) Sets of ½ Inch Hardware	Customer	The bolts should be sized to length to allow for the thickness of the External Support Bracket, support structure, any spacers, and all mounting hardware (e.g. flat washers, lock washers, and nuts).

Table 5-3 Hardware for External Mount Application Installation (Continued)

Hardware*	Supplied By	Notes
Non-Rotatable and Rotatable Base Plate (To the Mounting Surface)		
(4) ⅜-16x1-½ Inch Bolts (P/N: 901594)	The Will-Burt Company	Found in the Hardware Bag
(4) Flat Washers (P/N: 2054)	The Will-Burt Company	Found in the Hardware Bag
(4) Lock Washers (P/N: 0801)	The Will-Burt Company	Found in the Hardware Bag
(4) Nuts (P/N: 901593)	The Will-Burt Company	Found in the Hardware Bag
* Unless otherwise indicated, the mounting hardware must include proper means to resist vibration loosening such as thread-locking compound or locking hardware. Torque all hardware as appropriate for its size and grade. Torque values in these instructions assume the use of The Will-Burt Company provided hardware. Depending on the specific installation application, all hardware may not be used. Additional hardware may be required for additional accessories, or customer-specific applications.		

5.4 Lift the Mast System

During installation, it will be necessary to lift the mast. The process described in this manual represents a possible method of lifting the mast. Depending on the environment and equipment available, other methods may work better. Use the best and safest method for your circumstances.

5.5 Unpack the Mast System

Unpack the system as follows:

1. Carefully open the shipping crate.

2. Remove all loose components, the 2 x 4 inch (38 x 89 mm) block at the top end of the mast, and the top half of the wooden mast saddles (Figure 5-1).

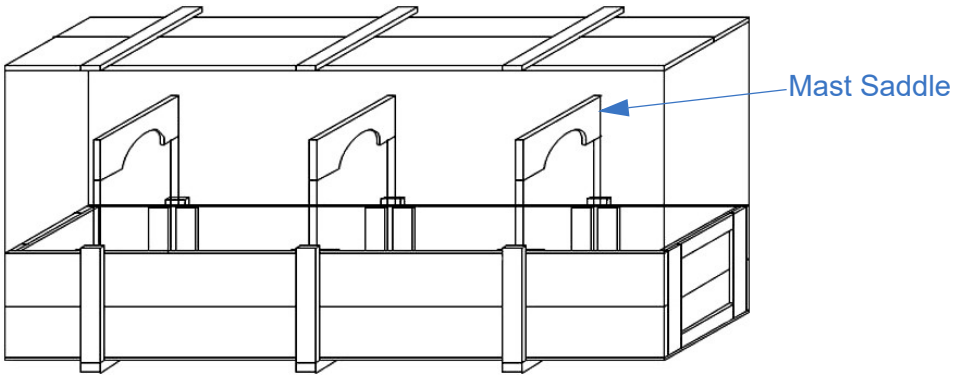


Figure 5-1 Shipping Crate

3. Ensure all components are included and that the required tools are readily available. The components your system includes will vary based upon your order.

4. Inspect for any shipping damage. Notify the carrier if damage is evident.

5. Using the center of gravity (COG) label as a reference, outfit the mast with a sling capable of supporting the mast weight (Figure 5-2). The sling must support the mast from at least two points. Attach the sling so that horizontal balance and control can be maintained while positioning the mast. Hoist and slowly lift the mast until just free of the mast saddles. Lower the mast and adjust the sling as necessary to balance the mast. Hoist the mast free from the crate and carefully move the mast into the desired position.

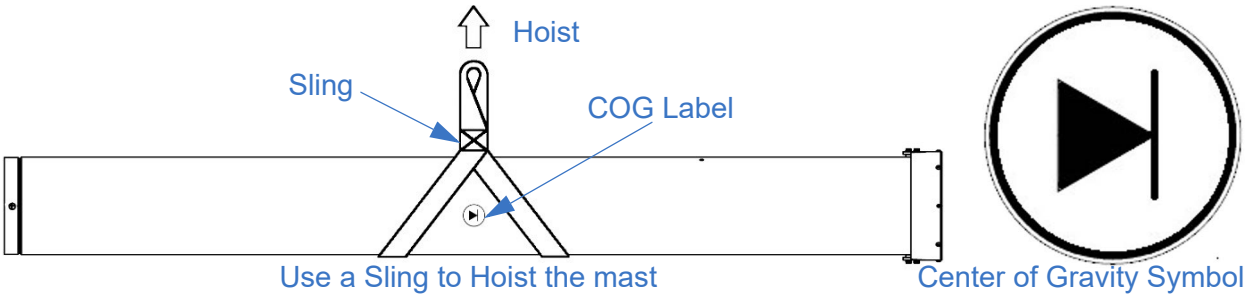


Figure 5-2 Hoist the Mast

The Will-Burt Company recommends keeping the shipping crate for transporting the mast, for example if shipping the mast back to the factory for refurbishment.

5.6 Mast Installation: Internal Mount

This section describes installation of an internally mounted mast. Internal mounting uses an internal support bracket (Section 3.3.3.2). For information on mounting the mast externally, see Section 5.7.

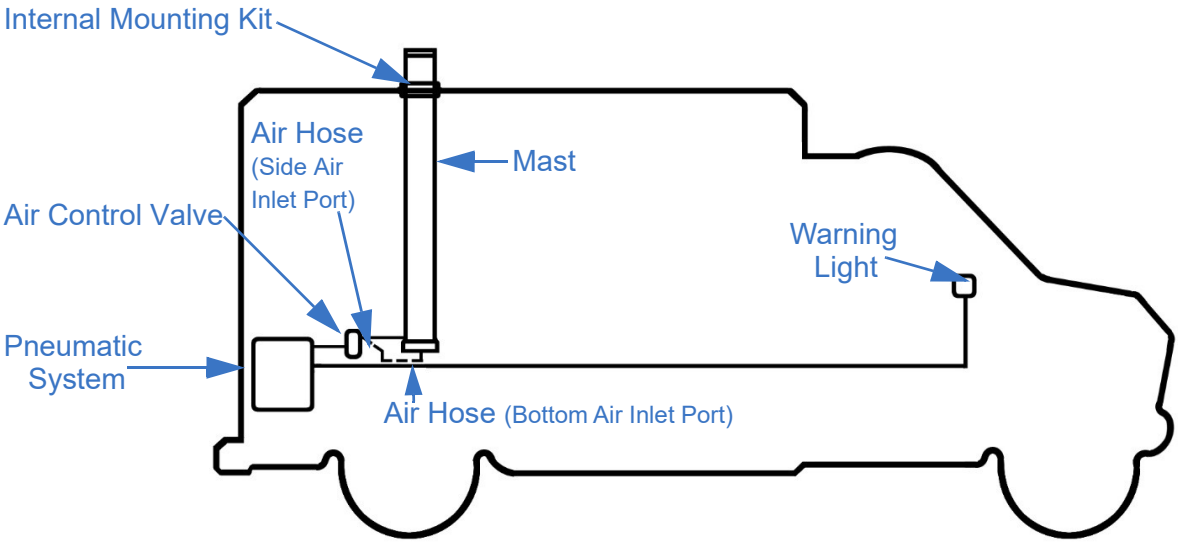


Figure 5-3 Internal Mount Installation (Not to Scale)

5.6.1 Internal Mount: Quick Summary

The following is a quick summary of the installation of an internally mounted mast. Detailed steps follow the quick summary (Section 5.6.2).

Install an internally mounted mast as follows:

1. Select a Suitable Mounting Location (Section 5.6.2.1)
2. Prepare the Roof (Section 5.6.2.2)
3. Install the Internal Support Bracket (Section 5.6.2.3)
4. Lower the Mast Through the Hole (Section 5.6.2.4)
5. Position the Mast (Section 5.6.2.5)
6. Secure the Base Plate (Section 5.6.2.6)
7. Position the Weather Bonnet (Section 5.6.2.7)

5.6.2 Internal Mount: Detailed Instructions

The following are detailed steps describing the installation of an internally mounted mast.

5.6.2.1 Select a Suitable Mounting Location

To select a suitable mounting location, consider the following:

- The mounting area must have sufficient room to mount the mast system. The roof area must be as flat as possible at the location of the mast. The roofline must lie between the weep hole and the can lock wedge. Mounting hardware must be at least 1 inch (25 mm) above the weep hole, and at least 3 inches (76 mm) below the bottom of the can lock wedge. The exact dimensions of the mast system will vary based on the components included. Refer to Section 4 for dimension information.
- The mounting structure must be level, solid, and capable of holding the forces required by the bolts. Check the strength and rigidity of the mounting structure (e.g. vehicle body) where the mast system is to be attached. Reinforce as necessary.
- The area underneath the mast must be free of obstructions to allow for accessibility to base plate fasteners and, if used, the bottom air inlet port.
- Before cutting the hole in the roof, it is advised to hang a plumb-bob from the roof to find the base plate location and ensure proper alignment between the roof hole and intended base plate location. This is particularly helpful when attempting to hit specific structural members beneath a vehicle.

5.6.2.2 Prepare the Roof

To prepare the roof for installation:

1. Remove any roof liner or ceiling panels.

2. Cut a round hole in the roof ¼ in. (6.35 mm) larger than the diameter of the mast base tube. Cut the same size hole in the roof liner or ceiling panels so that the hole properly aligns with the roof hole when reinstalled.

3. Center the ceiling plate (Figure 3-17) over the hole and use it as a template to drill bolt holes for attachment.

4. If necessary, use washers or short spacers made of ¼ in. (6.35 mm) pipe to level out any irregularities that exist in the roof.

5.6.2.3 Install the Internal Support Bracket

To install the internal support bracket (Figure 3-17):

5. Size the bolts, ¼ in. (M6), to length allowing for the thickness of any bolt fasteners and the internal mounting kit hardware. Bolts and fasteners are not provided.

6. Apply a bead of silicone sealant to both sides of (1) gasket.

7. Line up all holes and fit the gasket between the roof flange and the roof.

8. Replace any roof liner or ceiling panel.

9. Fit the other gasket against the inside of the roof. This gasket does not need sealant. It will be held in place by the ceiling plate.

10. Line up all holes, and fasten this assembly together using appropriately sized fasteners. Securely tighten all nuts. Clean off any silicone sealant that may have squeezed out into the hole cut for the mast.

5.6.2.4 Lower the Mast Through the Hole

To lower the mast through the roof hole:

11. Slide the weather bonnet (Figure 3-17) over the bottom of the mast base tube and up the mast past the weep hole towards the collar. If the weather bonnet is difficult to maneuver, put soapy water or oil on the mast to allow it to slide more freely.

12. Lower the mast partially through the roof.

13. Attach the base plate (Figure 3-16) to the mast. Hardware to attach the base plate to the mast can be found in the hardware bag (Section 3.3.1.1). Torque all hardware as appropriate for its material and size.

14. Lower the mast the rest of the way to the floor.

5.6.2.5 Position the Mast

To position the mast:

15. Move the mast into position ensuring the mast is level. It is necessary to check the mast in (2) places 90° apart when leveling. Be certain to orient the mast so that the operator has a clear view of the mast hazard labels. Additional labels are provided with the operator's manual and can be applied where the operator deems appropriate.

5.6.2.6 Secure the Base Plate

To secure the base plate (Figure 3-16):

16. Use the base plate as a template to drill holes through the mounting structure.

17. Secure the base plate to the mounting structure with appropriate hardware (Table 4-5). Ensure the base plate is level in all directions. Torque all hardware as appropriate for its material and size.

5.6.2.7 Position the Weather Bonnet

To position the weather bonnet (Figure 3-17):

18. After the mast is secured to the base plate, and the base plate is secured to the mounting structure, slide the weather bonnet down the mast and over the roof flange. If the weather bonnet is difficult to maneuver, put soapy water or oil on the mast to allow it to slide more freely.

5.6.2.8 Install the Drain Kit

Install the drain kit (Figure 3-9) provided with the mast. See Section 5.8.1 for information on installation of the drain kit.

5.6.2.9 Install the Pneumatic System

Air to operate the mast may be provided by an air compressor or other source of clean, dry air (Section 3.3.2). The air system must be regulated not to exceed the maximum operating pressure of the mast being used (Table 4-1). See Section 5.8.2 for information on installation of the pneumatic system.

5.6.2.10 Install the Magnet Warning Kit

Install the magnetic warning kit. See Section 5.8.3 for information on installation of the magnetic warning kit.

5.7 Mast Installation: External Mount

This section describes installation of an externally mounted mast (Figure 5-4). For information on mounting the mast internally, see Section 5.6.

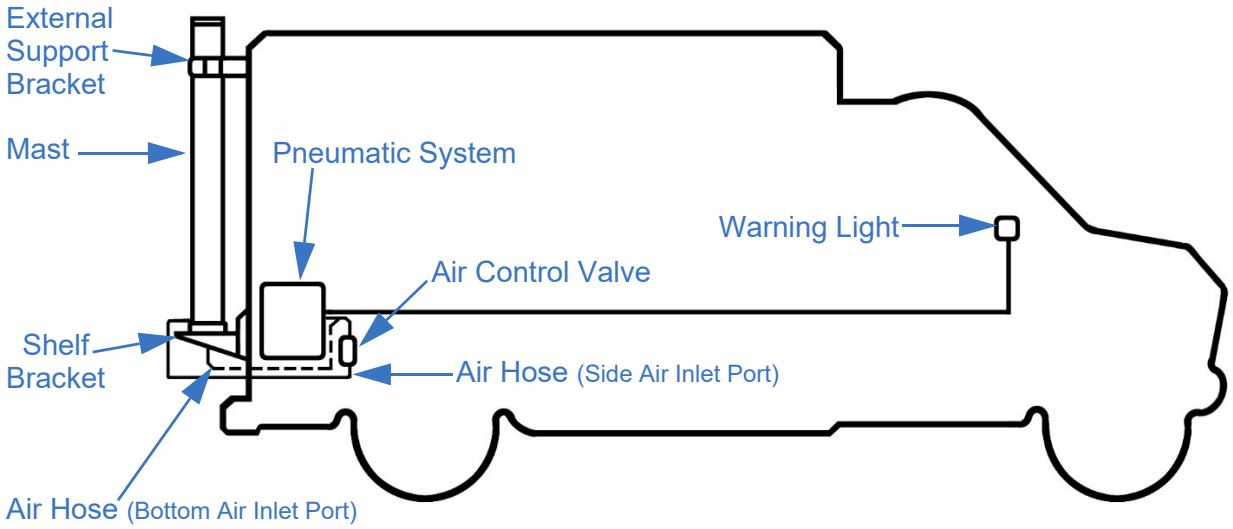


Figure 5-4 External Mount Installation (Not to Scale)

5.7.1 External Mount: Quick Summary

The following is a quick summary of installation of an externally mounted mast. Detailed steps follow the quick summary (Section 5.7.2).

Install an externally mounted mast as follows:

1. Select a Suitable Mounting Location (Section 5.7.2.1)
2. Install the Shelf Bracket (Optional) (Section 5.7.2.2)
3. Attach the Base Plate (Section 5.7.2.3)
4. Attach the External Support Bracket (Section 5.7.2.4)
5. Secure the External Support Bracket (Section 5.7.2.4)

5.7.2 External Mount: Detailed Instructions

The following are detailed steps of installation of an externally mounted mast (Figure 5-4).

5.7.2.1 Select a Suitable Mounting Location

When selecting a suitable mounting location, consider the following:

- The mounting area must have sufficient room to mount the mast system. The exact dimensions of the mast system will vary based on the components included. Refer to Section 4 for dimension information.
- The mounting surface must be level, solid, and capable of holding the forces required by the bolts. Check the strength and rigidity of the mounting structure (e.g. vehicle body) where the mast system is to be attached. Reinforce as necessary.
    - Note: High forces to the mounting structure may result, depending on the payload, wind load, and if the mast is guyed or not. The mounting surface to which the base plate is secured will also see high downward forces and moments. For example, a typical unguyed mast can cause a 500 ft.-lb. (677.9 N m) torque, whereas a typical guyed mast can produce 3,500 lb. (1587.6 kg) of downward force onto the base plate. The Will-Burt Company's engineering should be consulted for specific payload and mounting requirements for your mast application.
- The area underneath the mast must be free of obstructions to allow for accessibility to base plate fasteners and, if used, the bottom air inlet port.

5.7.2.2 Install the Shelf Bracket (Optional)

To install a shelf bracket (Figure 3-19) (if used):

1. Position the shelf bracket and ensure it is level.

2. Use the shelf bracket as a template to drill holes through the support structure.

3. Securely attach the shelf bracket to the mounting surface with appropriate hardware (Table 4-8). Ensure the shelf bracket is level in all directions. Torque all hardware as appropriate for its material and size.

5.7.2.3 Attach the Base Plate

This section describes installing the mast and base plate. The exact procedures may vary depending on your mast. Follow the appropriate installation instructions for your mast system.

To install a non-rotatable base plate:

1. If necessary, use a hoist to lift the mast so the bottom of the mast can be accessed.

2. Position the base plate against the base of the mast so the mounting holes align. Ensure the countersunk holes are facing away from the mast.

3. Secure the base plate to the mast with the (4) ⅜-16x1 flathead screws (P/N: 2772) from the hardware bag. Apply Loctite® 242/243 (Blue) or equivalent. Torque to 190-240 in.-lb.

5.7.2.4 Attach the External Support Bracket

To attach the external support bracket (Figure 3-18):

4. Attach the external support bracket around the mast base tube with the provided hardware. The external support bracket should be at least 1 in. (25.4 mm) above the base tube weep hole and close to, but at least 1 in. (25.4 mm) below the bottom of the can lock wedge. Do not cover the weep hole. Do not overtighten the external support bracket. The stand-off should be facing the support structure.

5.7.2.5 Secure the External Support Bracket

To secure the external support bracket:

5. Position the external support bracket so that the stand-offs are against the support structure.

6. Use the external support bracket as a template to drill holes through the support structure.

7. Secure the external support bracket to the support structure with (6) sets of ⅜ inch hardware. The bolts should be sized to length to allow for the thickness of the external support bracket, support structure, any spaces, and all mounting hardware (e.g. flat washers, lock washers, and nuts). The mounting hardware must include a proper means to resist vibration loosening such as thread-locking compound or locking hardware. Torque all hardware as appropriate for its size and grade.

5.7.2.6 Install the Drain Kit

The drain kit (Figure 3-9) is intended to protect the interior of a vehicle or other water sensitive area from damage due to water drainage and is not required for externally mounted masts. See Section 5.8.1.

5.7.2.7 Install the Pneumatic System

Air to operate the mast may be provided by an air compressor or other source of clean, dry air (Section 3.3.2). The air system should be regulated not to exceed the maximum operating pressure of the mast being used (Table 4-1). See Section 5.8.2 for information on installation of the pneumatic system.

5.7.2.8 Install the Magnet Warning Kit

8. Install the magnetic warning kit. See Section 5.8.3 for information on installation of the magnetic warning kit.

5.8 Complete Mast System Installation

The process and images shown in this section describe a possible method of installing the:

- Drain Kit
- Pneumatic System
- Magnetic Warning Kit

Depending on the environment, other methods of installation may work better. Use the best and safest method for your circumstances. Complete mast installation before installing these components.

5.8.1 Drain Kit Installation

Water can enter the mast through condensation in the air supply, or by rain running down the mast tubes and entering at the collars. Water can freeze in the mast causing the mast to work erratically or not at all. Keeping water out of the mast is very important to avoid potential delays in operations and damage to the mast.

Weep holes (Figure 3-7) on each mast tube except the top tube are located to facilitate the drainage of water during periods of extension. The drain kit (Figure 3-9) is designed to route water, from inside the mast, to outside a vehicle or enclosure.

A drain cock, provided in the hardware bag, should also be connected to the air inlet port near the base of the mast. The drain cock should be periodically used to empty water which may have accumulated inside the base tube, particularly after the mast has been exposed to rain.

Complete internal mast installation before installing the weep hole drain kit.

To install the Drain Kit (Figure 5-5):

1. Be certain the locknut and washer are thread over the end of the ¼ in. (6.35 mm) hose adaptor.
2. Fasten the hose adaptor to the mast base tube weep hole. Turn the hose adaptor in only (1 ½) to (2) turns after initial engagement of threads. Turning further will damage the mast. Tighten the locknut to secure in place.
3. Drill a hole in the vehicle or enclosure to route the water outside. Fasten the bulkhead fitting to the hole.
4. Attach the drain tube to the hose adaptor and the bulkhead fitting.

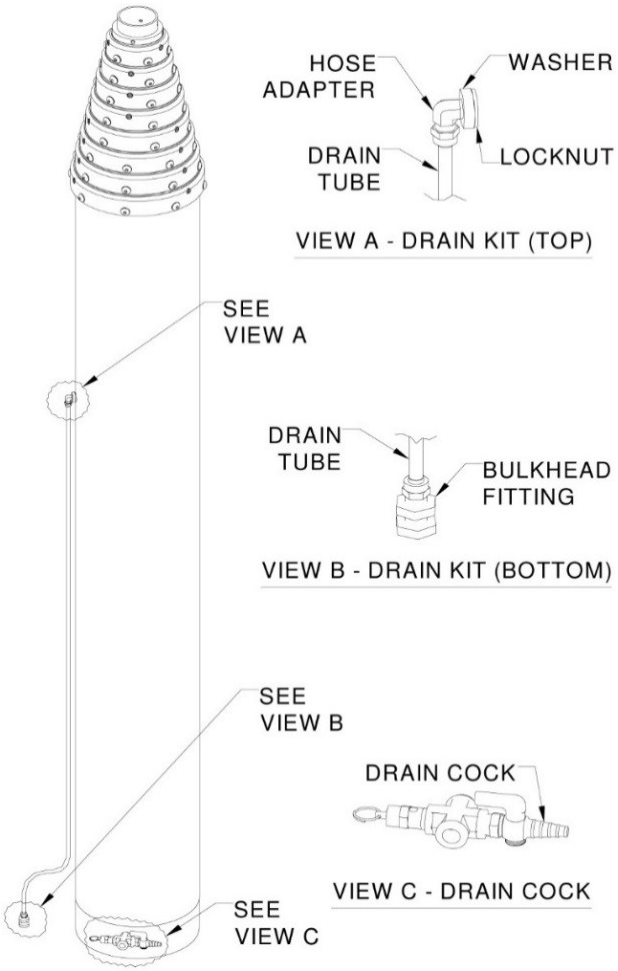


Figure 5-5 Drain Kit Installation

5.8.2 Pneumatic System Installation

Air to operate the mast may be provided by an air compressor or other source of clean dry air. The air system should be regulated to not exceed the maximum operating pressure of the mast being used (Table 4-1).

5.8.2.1 General Concepts

When installing the Pneumatic System, keep the following in mind:

- Mounting: When mounting the pneumatic system, leave enough space around the unit for ventilation and for access to make initial installation, periodic adjustments, and future maintenance procedures as easy as possible. To reduce vibration in the system, place rubber washers or grommets on the bolts between the mounting pads and the mounting surface. To reduce noise, separate the system from inside the workspace (e.g. the workspace of vehicle).
- Electrical: In accordance with applicable electrical codes, select the proper wiring size, circuit breakers, or fuse size according to the maximum current draw of the pneumatic system being installed. Refer to the rating information plate on the compressor motor. Be sure to properly ground the compressor motor and all other electrical components. Operation of the compressor may cause interference unless proper isolation or shielding is used. A qualified electrician should perform installation and adjustments.
- Air Supply: The compressor should have adequate ventilation to provide a sufficient amount of clean, dry air at the air intake at all times. The compressor should not be operated without the air filters in place.
- Air Control Valve: An air control valve should be installed to direct airflow in and out of the mast. The control valve should be positioned to avoid unintentional operation. Mast movement should stop when the controller is released (hold-to-run type). If the controller is not a hold-to-run type, an emergency stop must be provided. The control valve should be operable by a person wearing gloves and mounted so it can be used with the mast in full view. The control valve should be suitable for outdoor use, and marked “Up”, “Down”, or similar. A check valve or similar device should be installed directly to the mast through rigid piping that would prevent an extended mast from exhausting uncontrollably if there is a pneumatic failure such as a hose burst.
- Drain and Relief Fittings: A drain cock and safety valve should be installed at the air inlet port at the base of the mast. The drain cock empties water which may have accumulated inside the mast. The drain cock should be opened periodically to drain the mast, particularly after the mast has been operated in the rain. The drain cock should be left open once the mast is fully retracted. The safety valve prevents the mast from being over-pressurized.
- Plumbing: A length of air hose with an ID of ⅜ in. (9.5 mm), plus additional loose fittings, are supplied with a Will-Burt pneumatic system if purchased. The hose can be cut to the required length at installation. A drain hose should be attached to the exhaust port of the control valve to drain condensation or oil mist which may exhaust from the mast. Do not remove any hose without first completely exhausting all air from the mast and then disconnecting the power supply.

5.8.2.2 General Procedures

Figure 5-6 shows the general layout of a pneumatic system. The exact configuration will vary based on the components being used in the specific system.

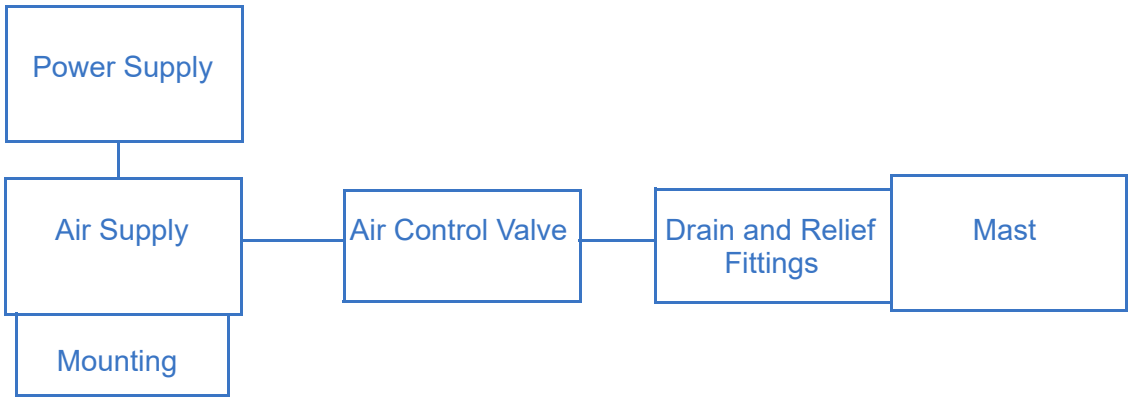


Figure 5-6 General Pneumatic System Layout

5.8.3 Magnetic Warning Kit Installation

As a warning against moving a vehicle while the telescoping mast is extended, the vehicle should be equipped with a mast warning kit (P/N: 5170701) system. The magnet assembly ships installed inside the mast.

To install the Magnetic Warning Kit:

1. Assemble the magnetic switch assembly and the stainless steel band. Attach the magnetic switch assembly around the base tube approximately 6-20 in. (152-508 mm) above the base plate (Figure 5-7).

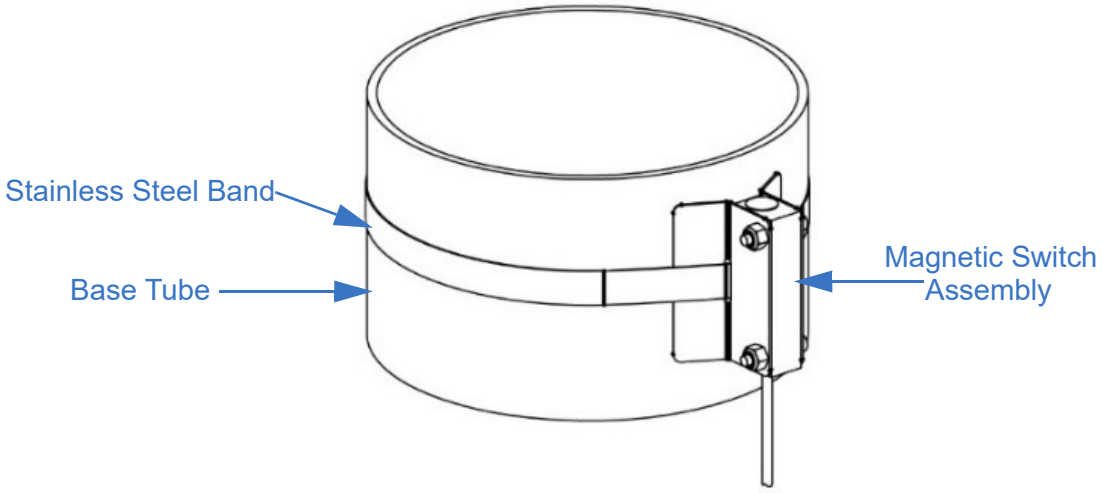


Figure 5-7 Magnetic Switch Assembly Attached to Base Tube

2. Use 16 AWG stranded wire (customer-supplied) to connect the flasher, lights, and relay to the wires exiting the magnetic switch assembly (Figure 5-8 and Figure 5-9).

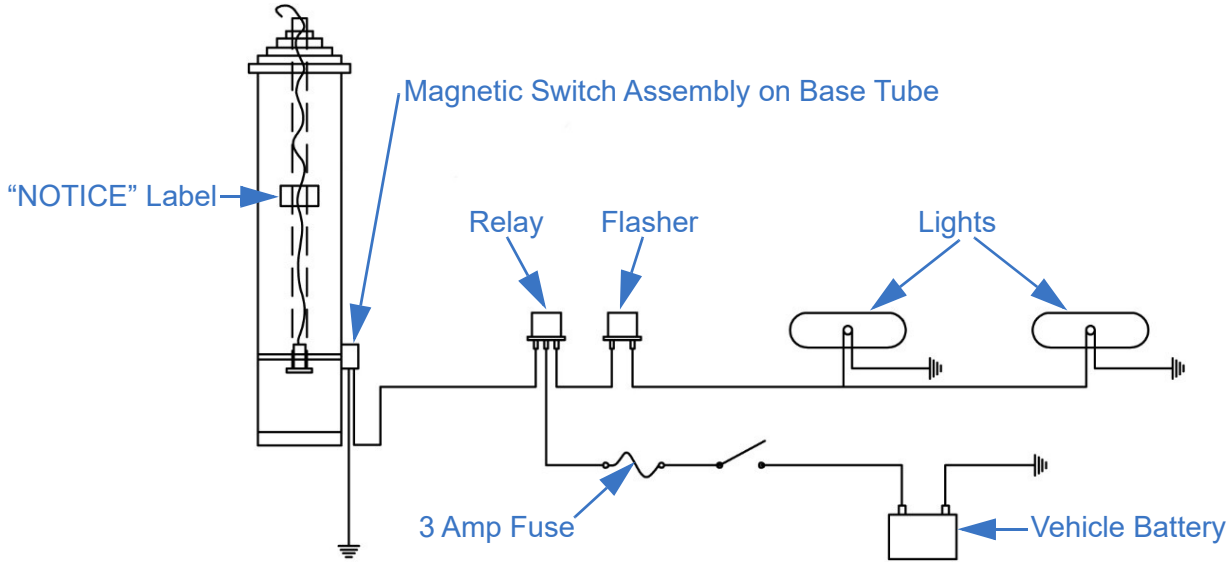


Figure 5-8 Wire the Magnetic Switch Assembly Kit

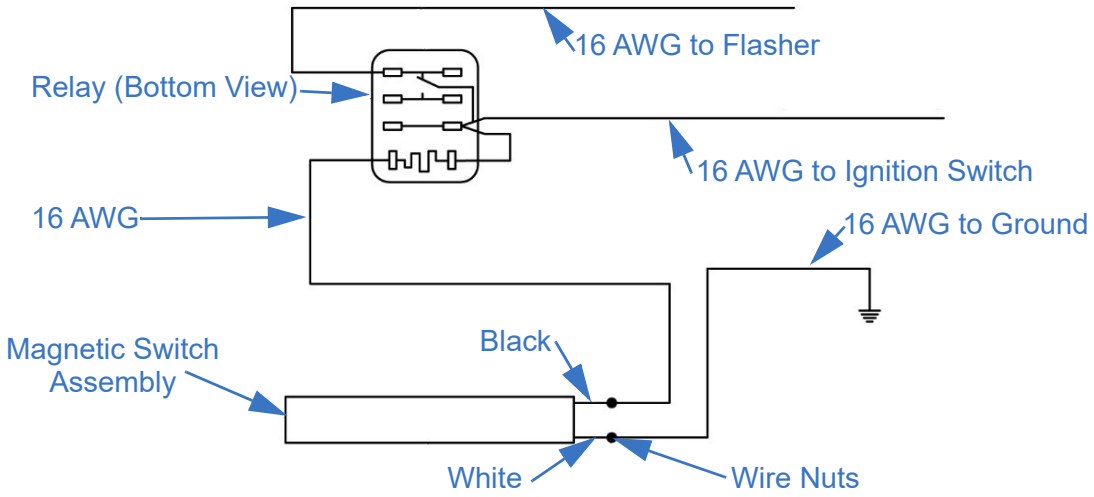


Figure 5-9 Relay and Magnetic Switch Assembly Wiring

3. With the mast fully nested and the flasher and lights installed and connected to the battery (the light should be flashing unless the switch is in contact with the magnet assembly), slide the magnetic switch assembly up and down the lower 2 feet (0.6 m) of the mast base tube to locate the magnet assembly inside the tube (by deactivating the flashing lights). The vertical sensing range should be about 1-3 inches (25-76 mm). Tighten the band to clamp the magnetic switch assembly in the sensing range, but not lower than 1 inch (25 mm) above the lower limit. The switch can be located anywhere around the perimeter of the base tube.

4. Pressurize the mast to extend 1-2 feet (0.3-0.6 m) several times to test the magnetic warning kit.

5. Attach the “NOTICE” label in a visible area on the base tube (Figure 5-8).

5.9 Install the Payload

To install the payload:

1. Ensure the air supply is disconnected or the drain cock is opened while installing the payload to eliminate the possibility of inadvertent mast extension.

2. Reference the installation drawing for your system for the mounting hole locations for the payload.

3. Raise the can lock enough to access the underside of the platform. Brace can lock in the lifted position during installation to prevent it from dropping.

4. Attach the payload to the can lock using appropriate hardware. Appropriate measures must be employed to prevent the mounting hardware from backing out due to dynamic loading conditions inherent in mast operation and transport. The bolt heads will fit into countersunk holes on the bottom of the can lock platform. The bolts must be installed from the bottom of the can lock platform (Figure 5-10). Torque all hardware as appropriate for its material and size.

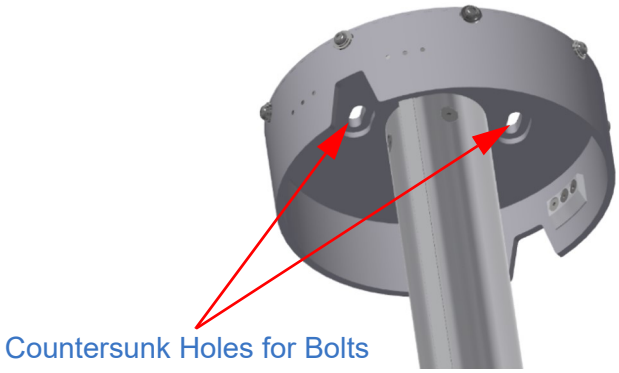


Figure 5-10 Countersunk Holes on Bottom of Can Lock Platform

5. The can lock and can lock wedges on both sides must be adjusted in height and azimuth rotation after the payload has been mounted or anytime the payload weight is altered. Follow the procedure outlined in Sections 8.5 and 8.6 to adjust the can and can wedges. The components are factory set with a 50 lb. (22.7 kg) payload installed and will need adjusted for each unique payload weight and configuration.

5.10 Test the Installation

Follow all precautions while testing the mast system installation.

To test the installation:

1. Review the Pre-Operation Check.
2. Prepare the mast system for operation.
3. Extend the mast.
4. Lower the mast.

Note: The drain cock shall remain open to drain water when the mast is not in use. The drain cock shall be opened while a locking mast is deployed and depressurized to drain water. It is not uncommon to have mast grease exit the drain or exhaust valve on initial mast use.

See Section 6 for additional details on these procedures.

6 Operation

This section describes the general operation of the mast system. Use care to understand and follow all precautions while operating.

6.1 Pre-Operation Check

Before operating the mast system, ensure:

- All operators read and understand the entire operation procedure and are properly trained.
- The system is undamaged. If damage is apparent, do not use the system and have it serviced prior to use.
- All electrical cables are undamaged and properly terminated.
- Any objects which might obstruct motion of the mast, cause binding, or hinder mast function are removed.
- The mast area is free of personnel.
- The operator has full view of the mast during use.
- The area is free of power lines or other overhead obstructions. Mast location should be no closer than a horizontal distance equal to the extended height of the mast away from any overhead power lines.
- The mast is on level terrain and within mast specification values.
- The system and payload are properly installed.
- That when using a vehicle, the vehicle is not moving.

6.2 Operation Equipment

Table 6-1 lists recommended equipment for operation.

Table 6-1 Equipment Recommended for Operation

Recommended Equipment*		
Personal Protective		
Safety Glasses	Work Gloves	Nitrile or Vinyl Gloves
Hearing Protection	Hard Hat or Helmet	Safety Shoes
* Depending on the local, regional, and national standards and codes of practice, and the environment, additional personal protective equipment may be necessary.		

6.3 Prepare the System

To prepare the system for operation:

- If necessary, remove any transit tie-downs on the system
- If necessary, attach the pneumatic system to the mast (Section 5.8.2)
- If necessary, secure any cables to the mast
- If necessary, secure the payload to the mast (Section 5.9)

6.4 Extend the Mast

To extend the mast:

1. Ensure the payload will have enough clearance as the mast is extended.

2. Use the air control valve to pressurize the mast. Do not exceed the maximum recommended operating pressure of 35 psig (2.4 bar) of the mast at any time. Maintain visual contact throughout extension to avoid overhead obstructions and cable entanglements.

3. Close the air control valve when desired height is achieved. The mast must remain pressurized to maintain its height.

6.5 Lower the Mast

To lower the mast:

1. Ensure the payload will have enough clearance when nested.

2. Exhaust air from the mast. The mast will retract by its own weight, and the weight of the payload. Maintain visual contact with the mast during retraction to avoid cable and/or payload hang-ups.

3. Periodically open the drain cock when exhausting the mast to drain off any accumulated water.

4. Disconnect the air supply while the mast is not in use to eliminate the possibility of inadvertent mast extension.

5. Open the drain cock when the mast is not in use.

Note: The operator should always visually confirm the mast is entirely retracted before moving the vehicle. For further information on transporting the mast system, see Section 7.

7 Transportation

Before transporting the mast system, the mast system needs to be secured. The process described in this manual represents a possible method of transporting the mast. Depending on the environment and equipment available, other methods may work better. Use the best and safest method for your circumstances.

7.1 General Transportation

To prepare the mast system for transportation:

1. Ensure the mast is fully nested (Section 6.3). Do not transport the mast system with the mast and payload extended. Always visually confirm the mast is fully retracted before moving the mast.

2. Disconnect the air supply or open the drain cock while the mast is not in use to eliminate the possibility of inadvertent mast extension.

3. If desired, remove the payload.

4. If necessary, secure any additional components in the system. Note that it is the responsibility of the customer to properly secure the payload for transportation.

5. Confirm the nest lock can wedges are contacting the can on both sides of the mast.

Note: The operator should always visually confirm the mast is entirely retracted before moving the vehicle.

7.2 Shipping

When shipping the mast system, The Will-Burt Company recommends shipping the mast in the original shipping crate. If the original shipping crate is not available, contact The Will-Burt Company to order a replacement.

When shipping:

1. As necessary, remove the payload.

2. As necessary, prepare the mast system for transportation (Section 7.1).

3. As necessary, uninstall the mast system from the mounting structure (Section 5).

4. Secure the mast system in the shipping crate:

   a. Carefully position the mast in the crate.

   b. When shipping by air, ensure the air inlet port is open.

   c. Secure the block at the top of the mast to prevent the mast from shifting in the shipping crate during transportation.

   d. Secure the top half of the wooden mast saddles.

   e. As necessary, carefully pack any additional components in the shipping crate.

   f. Secure the lid on the shipping crate.

8 Maintenance and Adjustments

This section describes maintenance and adjustment procedures required to keep the mast system operational. Use care to understand and follow all precautions while performing these procedures. If the system does not perform as required, see Section 9.

Disconnect power to any devices mounted to the mast and pneumatic systems with lock-out tag-out procedures as appropriate before performing mast maintenance.

8.1 Pre-Maintenance Check

Before performing maintenance procedures, ensure:

- All operators read and understand the entire maintenance procedure and are properly trained.
- The payload is removed prior to performing maintenance on the system.
- The system is level and secure.

8.2 Maintenance Equipment

(Table 8-1) lists recommended equipment for maintenance.

Table 8-1 Equipment Recommended for Maintenance

Recommended Equipment*		
Personal Protective		
Safety Glasses	Work Gloves	Safety Shoes
Hard Hat or Helmet	Hearing Protection	Nitrile or Vinyl Gloves
Hand Tools		
Chisel	Drill	File
Flat Punch	Hammer	Allen Wrenches
Screwdrivers	Measuring Tape	Level
Sockets	Torque Wrenches	Utility Knife
Wrenches		
Equipment		
Compressed Air Supply	Hoist	Sling
Ratchet Straps	Saw Horses or Similar Supports	
Expendables		
Acetone, Alcohol, or other solvent	Pipe Thread Sealant or PTFE Tape	Rags (Clean and Dry)
Loctite® 242/243 or Equal	Loctite® 380 or Equal	Loctite® 495 Instant Adhesive or Equal
Silicone Sealant	Non-Abrasive Cleaners (Soap and Water)	Mast Lubricant or Lightweight Machine Oil

* Note:

- Depending on the local, regional, and national standards and codes of practice, and the environment, additional personal protective equipment may be necessary.
- When disposing of any disposables or components, do so according to any applicable local, regional, and national standards and codes of practice.

8.3 Replacement 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 engraved on the mast Identification Plate (Section Figure 3-10). The identification plate is fixed to the can lock base (Figure 3-7). Throughout this manual, “P/N” followed by a number represents the part number for that component. To order spare parts, or for the part numbers for additional components, contact The Will-Burt Company.

8.4 Periodic Maintenance

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 8-2 provides a schedule of periodic inspections and procedures required to keep the mast system in safe operating condition.

Table 8-2 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 8.4.
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 8.4. If the condition remains after lubrication, cease all mast use and contact The Will-Burt Company Service immediately.
Monthly	Inspect for any damage to electric cables and pneumatic tubes.	Replace cables/tubes as required.
Monthly	Inspect for any damage to hoses or electrical cables.	Replace hoses/cables as required.
Monthly	Inspect to ensure the can lock wedges on both sides are properly positioned and in contact with the can.	Adjust can lock wedges as necessary (Sections 8.5 and 8.6)
Monthly	Inspect all collar bolts in all tube sections to ensure they are not backing out.	Add Loctite™ 263 and re-tighten to 60-65 in.-lb. installation torque if they are loose.

Table 8-2 Periodic Inspections

Frequency	Inspection	Action
Monthly	Test the magnetic warning kit to ensure the vehicle driver is warned or prevented from driving with the mast deployed.	Repair the magnetic warning kit if not functioning properly.
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.
As every use	Inspect to ensure the Drain Cock is left open when the mast is not in use to drain water from the mast.	Open the Drain Cock.
In potentially freezing conditions.	Ensure the mast is weatherized (Section 8.4.2).	Weatherize the mast (Section 8.4.2)

8.4.1 Mast Cleaning and Lubrication

The Will-Burt Company's Pneumatic Masts come from the factory pre-lubricated. Under normal operating conditions, the grease applied at the factory is sufficient and no scheduled maintenance is required. In extremely harsh environmental conditions, maintenance of the mast may be required.

The Will-Burt Company recommends removing the payload before performing the mast cleaning and lubrication process.

Signs cleaning and lubrication might be needed can be:

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

8.4.1.1 Cleaning Fixture Assembly (P/N: 5346001)

This manual assumes the use of the Low-Profile Cleaning Fixture Assembly (P/N: 5346001) (Figure 8-1).

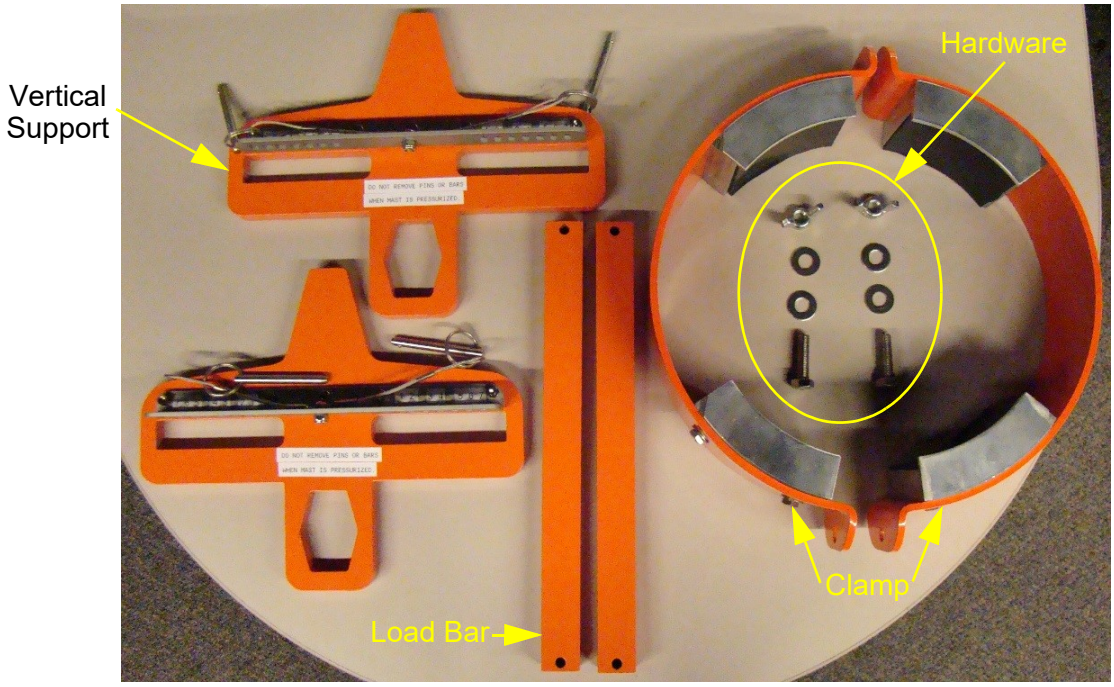


Figure 8-1 Cleaning Fixture Assembly

8.4.1.2 Cleaning Instructions

Cleaning the mast requires:

- (2) People
- (1) Cleaning Fixture Assembly (P/N: 5346001)

When cleaning the mast:

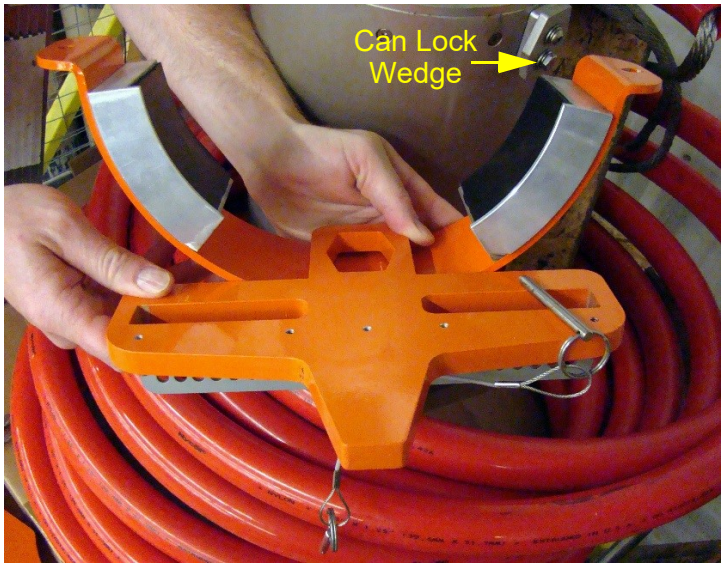
- Understand and follow all precautions listed in the Safety Summary (Section 1).
- The payload may remain installed on the mast.
- Bring the air source near the mast, if possible, to simplify the process.
- Begin with the innermost tube (position 1) and work tube-by-tube outwards.

To clean the mast:

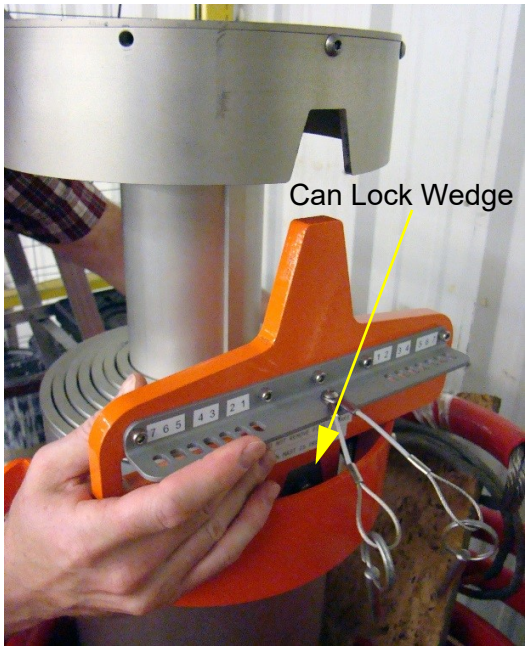
1. Extend the mast approximately (12) inches to install the cleaning fixture (Figure 8-2).

Figure 8-2 Extend the Mast

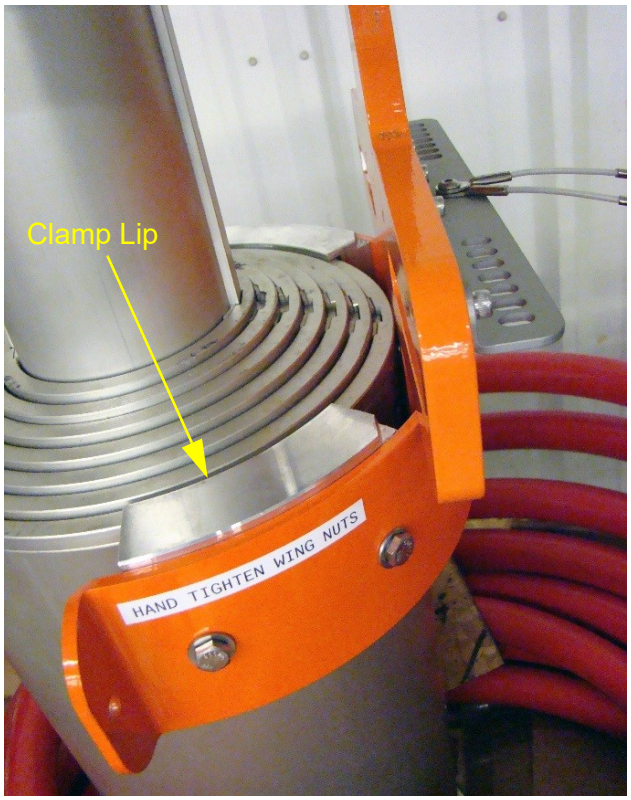
2. Position one half of the clamp and one vertical support on the mast (Figure 8-3). The vertical support will fit onto the can lock wedge. The lip of the clamp will fit over the edge of the mast.



Clamp and Vertical Support



Vertical Support Goes Over
Can Lock Wedge



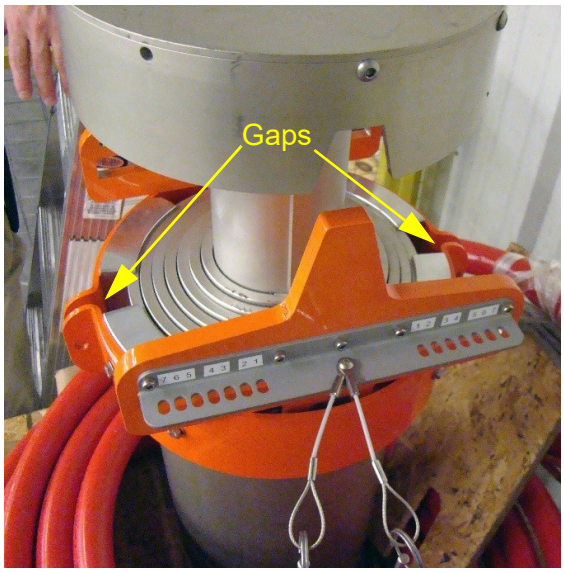
Clamp Lip Goes Over Edge of Mast

Clamp and Vertical Support on Mast

Figure 8-3 Clamp and Vertical Support on Mast

3. Repeat this process for the second half of the clamp and the second vertical support (Figure 8-4). Space the gaps between the clamp halves so that they are approximately equal distant apart.

Both Clamps and Vertical Support on Mast



Gaps Between Clamps

Figure 8-4 Both Clamps and Vertical Supports on Mast

4. Secure the clamp halves together with (2) bolts and (2) wingnuts (Figure 8-5). There will be (1) bolt and (1) wingnut per side. Hand tighten the wingnuts. Do NOT overtighten the wingnuts or damage to the mast could occur.

Figure 8-5 Secure the Clamp

5. Insert the (2) load bars into the slots in the vertical supports (Figure 8-6). Ensure both ends of both load bars are set to the same number as shown on the vertical supports. Pin the load bars in place and ensure the load bars remain in the correct positions.

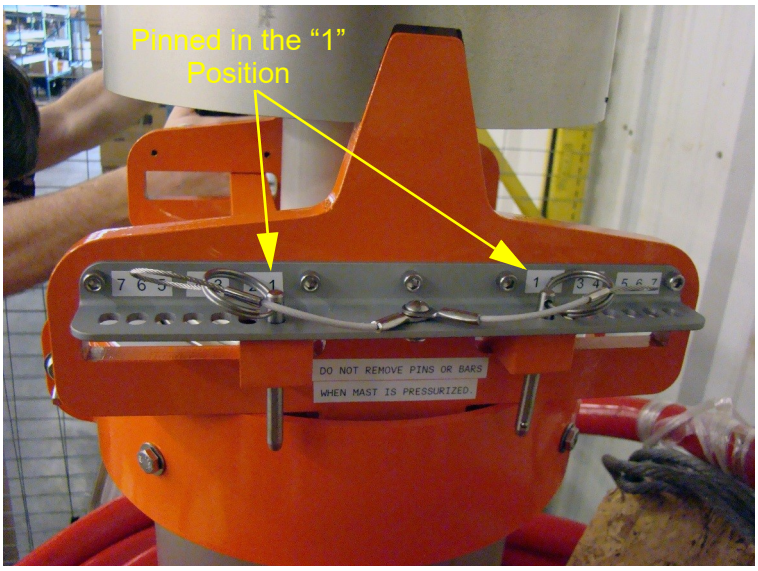
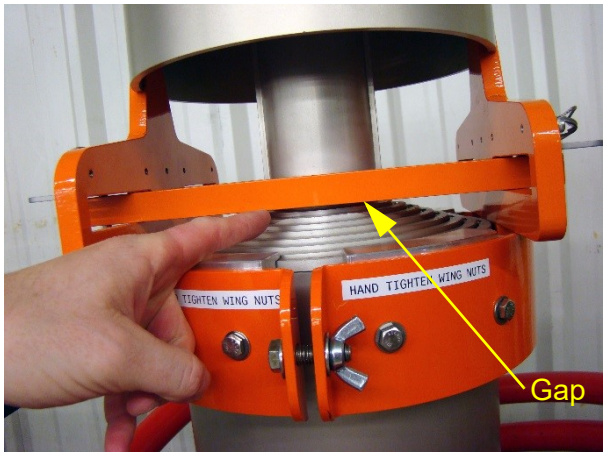


Figure 8-6 Load Bars in Position

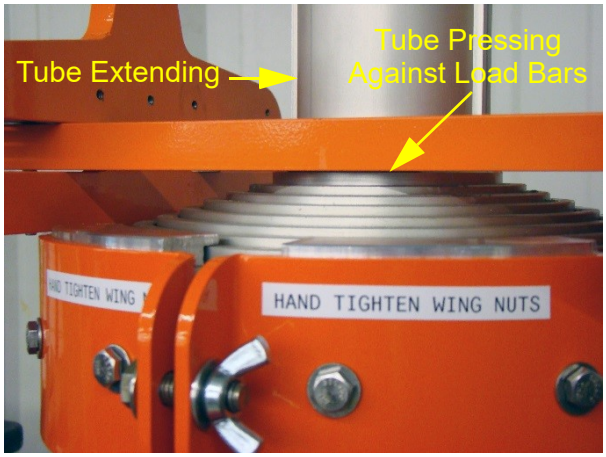
The numbers on the vertical supports correspond to the mast tubes as follows:

- 1: Allows only the inner top tube to extend.
- 2: Allows only the top tube and the next larger intermediate tube to extend, starting with the intermediate tube.
- 3: Allows only the top tube and the next larger two intermediate tubes to extend, starting with the outermost of the intermediate tubes.
- 4: Allows only the top tube and next larger three intermediate tubes to extend, starting with the outermost of the intermediate tubes.
- 5: Allows only the top tube and next larger four intermediate tubes to extend, starting with the outermost of the intermediate tubes.
- 6: Allows only the top tube and next larger five intermediate tubes to extend, starting with the outermost of the intermediate tubes.
- 7: Allows only the top tube and next larger six intermediate tubes to extend, starting with the outermost of the intermediate tubes.
- None (Cleaning Fixture Assembly Removed): Allows the top tube and all intermediate tubes to extend starting with the outermost tube.

6. Pressurize the mast to extend the mast tube. Once the mast tube is fully extended, stop pressurizing the mast. The lower mast tubes are prevented from extending by the load bars. These tubes will press against the load bars (Figure 8-7).



Before Mast Tube is Raised



With Mast Tube Raised

Figure 8-7 Mast Tubes Prevented from Extending

7. Wipe down the extended mast tube.

8. Lower the mast tube by depressurizing the mast.

9. With the mast completely depressurized and the can safely sitting on the vertical supports, unpin the load bars and move them to the next position. Re-pin the load bars in the new position and repeat steps 5 though 9 for each remaining tube.

10. After the last tube is cleaned, and with the mast pressurized, remove the cleaning fixture assembly (P/N: 5346001) by removing the wing nuts and all the hardware.

11. Clean the last intermediate tube and base tube.

12. Depressurize the mast and allow the mast to nest.

8.4.2 Weatherizing

For weatherizing your mast in extremely harsh environmental conditions, The Will-Burt Company recommends following the *Weatherizing Instructions for Pneumatic Masts* (TP-4744301). See www.willburt.com for these instructions. These instructions assume the use of the Pneumatic Mast Antifreeze Kit (P/N: 4725801).

The Pneumatic Mast Antifreeze Kit includes:

- (2) Flush Caution Labels (P/N: 4770001)
- (1) Gallon Will-Burt Non-Toxic Pneumatic Mast Antifreeze (P/N: 4735801)
- (1) Will-Burt Non-Toxic Pneumatic Mast Antifreeze Application Bottle (P/N: 4726101)
- (1) Will-Burt Antifreeze MSDS (P/N: 4746201)
- (1) Will-Burt Lubricant, MSDS, and Service Sheet (P/N: 900600)
- The Weatherizing Instructions for the Locking and Non-Locking Pneumatic Masts (TP-4744301)

Figure 8-8 Application Bottle (Left) and Gallon of Will-Burt Non-Toxic Pneumatic Mast Antifreeze (Right)

8.5 Can Lock Wedge Adjustment

To adjust the can lock wedges:

1. Nest the mast ensuring the mast is depressurized. The payload should be left on the mast when adjusting the can lock wedges to ensure the mast is fully compressed when nested.

2. Loosen the bolts holding the can lock wedges in place (Figure 8-9).

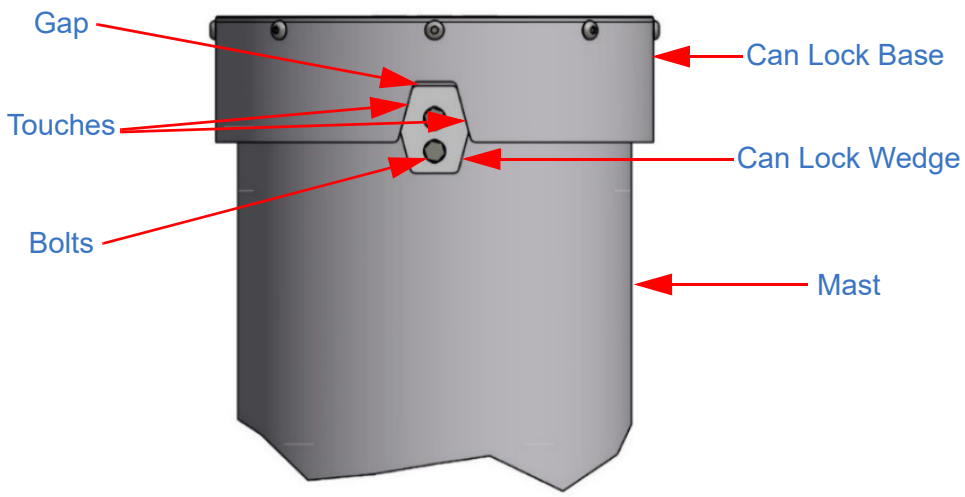


Figure 8-9 Can Lock and Can Lock Wedge

3. Slide the can lock wedges up snuggly against the can lock (Figure 8-9). The can lock wedges should touch both sides. The top of the wedge will have a small gap.

4. Secure the can lock wedges with the bolts. Use Loctite® 242/243 on the bolts. Torque to 74-80 in.-lb.

8.6 Can Lock Base Adjustment

The can lock base has slot holes to allow for adjustment. To adjust the can lock base:

1. Adjust the can lock wedges (Section 8.5).

2. Loosen the cap screws securing the can lock base to the payload platform (Figure 8-10). It is not necessary to completely remove the cap screws to adjust the can lock base.

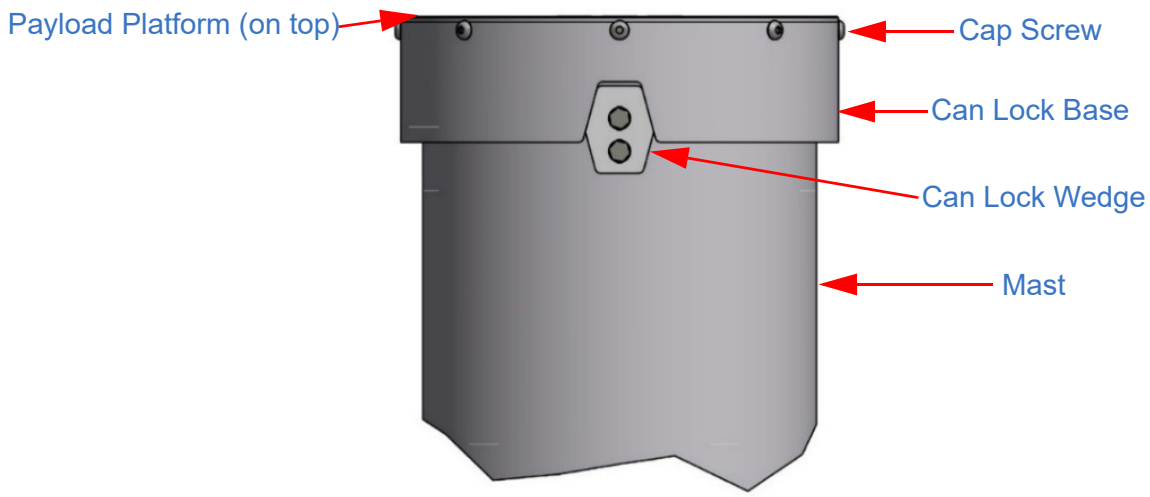


Figure 8-10 Can Lock

3. Adjust the can lock base as necessary. Ensure the flat washers do not stick above the payload platform. Torque the cap screw to 62-70 in.-lb.

   Note: If the hardware securing the can lock base was completely removed, secure by ordering the hardware as follows:

   a. Flat Washer (closest to can lock base)

   b. Lock Washer

   c. Cap Screw

4. Cycle the mast up and down once to ensure the can lock wedges and can lock base align properly. There should be no relative movement between the can lock assembly and the mast base tube. As necessary, repeat this procedure.

8.7 Corrective Maintenance

This section describes corrective maintenance for the system. For reference information on tube diameters and collar dimensions, see Section 4.

8.7.1 Disassemble the Mast

Disassemble the mast starting with the top section and working towards the base section.

To disassemble the mast:

1. Place the mast horizontally on a pair of sawhorses or similar supports. Secure the mast base tube to the supports so the mast does not roll off.

2. Remove the top tube by pulling firmly on the can lock until the collar bolts on the next tube are exposed.

3. Remove the collar bolts and pull the tube out with the collar. Be careful not to drop it as it comes out.

4. Remove the orifice bolt, lock washer, backup washer, expander, and seal.

5. Thoroughly clean and inspect all parts. The mast tube should be cleaned inside and outside with a solvent such as lacquer thinner. Do not use anything that might scratch the honed inside surface of the mast tube. Mast tubes may need cleaned repeatedly before reassembly to remove all debris.

6. Repeat steps 2 through 5 for each subsequent mast tube. Be careful not to damage or oblong collar bolt holes when removing the mast tubes.

7. As necessary, refer to the appropriate section for replacement steps for the following:

   a. Replace Seals and Expanders (Section 8.7.2)

   b. Replace Collar Bearing Strips (Section 8.7.3)

   c. Replace Wear Rings (Section 8.7.4)

8. Reassemble the orifice bolt, lock washer, backup washer, expander, and seal on the bottom of the mast tube. As the orifice bolt is being tightened, center the seal, expander, and backup washer on the butt plate. Use Teflon Tape. Torque the orifice bolt to 16 ft.-lb. Repeat this procedure for each mast tube.

   Note that the orifice bolt for the top tube screws into the ceramic ring magnet assembly (P/N: 5200601) (Figure 8-11) which may have come loose during disassembly. If the ceramic ring magnet assembly is loose:

   a. Check the O-ring (P/N: 5521) on the ceramic ring magnet assembly. Replace the O-ring if damaged.

   b. Using Teflon Tape on the bolt threads, secure the ceramic ring magnet assembly to the butt plate. Torque the orifice bolt to 16 ft.-lb.

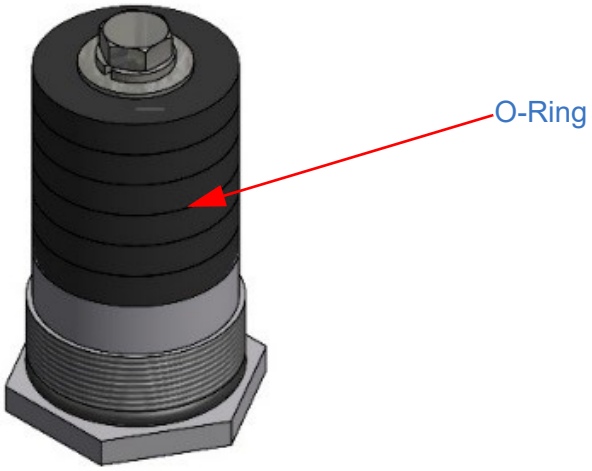


Figure 8-11 Ceramic Ring Magnet Assembly (P/N: 5200601)

9. Before reassembling the mast, lightly oil the lip of the seal and the inside honed surface of each mast tube with mast lubricant or lightweight machine oil. When reassembling the mast, begin with the base tube and work towards the top tube.

10. Secure the base tube horizontally on saw horses.

11. Using a second person or a brace to support the top end, hold the next mast tube so that the top end of the tube is at a lower elevation than the seal end. Rest the lip of the seal on the inside of the receiving tube.

12. Slowly raise the lower end of the tube to horizontal while carefully pressing the lip of the seal into the receiving tube. Press on both sides of the seal to simultaneously push both side of the seal in an upward motion. Use caution as pressing too hard will bend the expander. Work this way until your fingers meet at the top. Be careful not to damage the seal as it slides past the collar bolt holes that are located near the insertion end of the receiving tube.

13. Ensure the seal is in properly. If not, the mast will eventually leak air. If the seal has not been inserted into the receiving tube correctly, remove the tube and repeat the process.

14. Slide the tube in leaving several inches protruding. The “0” stamps on the tubes should be aligned.

15. Replace the collar on the mast section. Align the “0” stamp on the collar with the “0” stamp on the tube. Install and hand-tighten the collar bolts and lock washers. Ensure the collar bolts are wiped free of grease prior to installation. Use Loctite® 242/243 on the collar bolts. Torque the collar bolts to 60 in.-lb.

16. Repeat steps 9 through 15 for each subsequent mast section.

8.7.2 Replace Seals and Expanders

Inspect the seals and expanders for wear. If necessary, replace the seals and expanders.

8.7.3 Replace Collar Bearing Strips

Inspect the bearing strip (Figure 8-12) and the machined keyways of the collar for wear. If the keyways of the collar are badly worn, the collar should be replaced. If the bearing strips are worn down to the metal collar, they should be replaced.

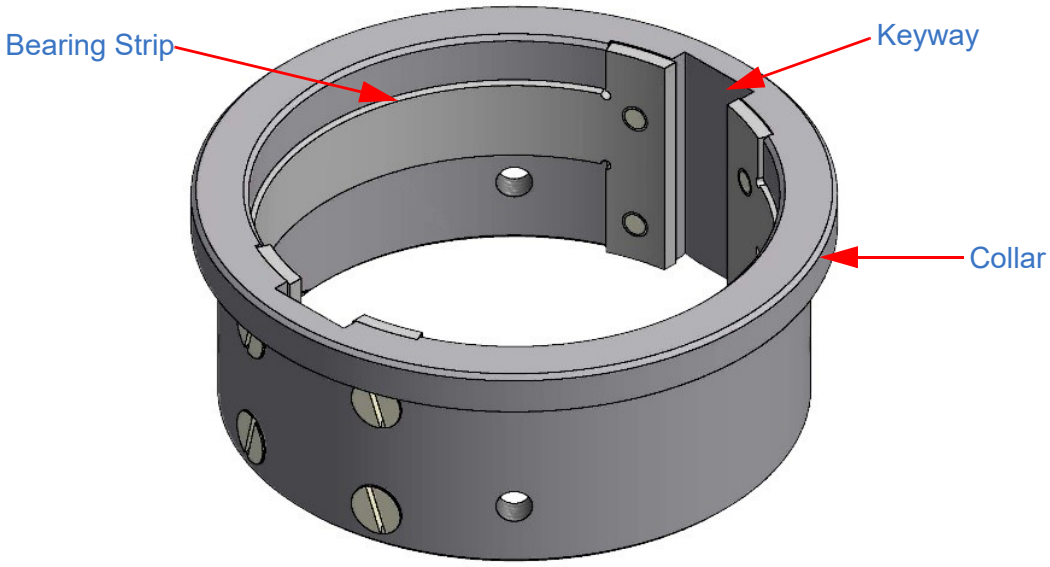


Figure 8-12 Bearing Strip and Keyway (P/N: 5099108 Shown)

To replace the collar bearing strips:

1. Remove the old bearing strips by removing the nylon screws from the collar. Pull out the bearing strips and clean the collar.

2. Press the new bearing strips firmly into the groove. Align the holes in the bearing strip with those in the collar (Figure 8-13). Install new nylon screws through the collars into the threaded holes in the bearing strip. Apply Loctite® 495 adhesive or equivalent to the nylon screws before installation. Do not over-tighten the nylon screws.

3. Cut off or file off the ends of the nylon screws protruding through the bearing strip until they are flush.

4. Before reassembling the mast, slide each collar over its mating mast tube. If the collar does not slide freely over the tube, it will be necessary to sand high spots on the bearing strip to fit. The high spots will be evident by shiny or gray marks on the white bearing strip.

5. Wipe the collars clean before reassembling the mast (Figure 8-13).

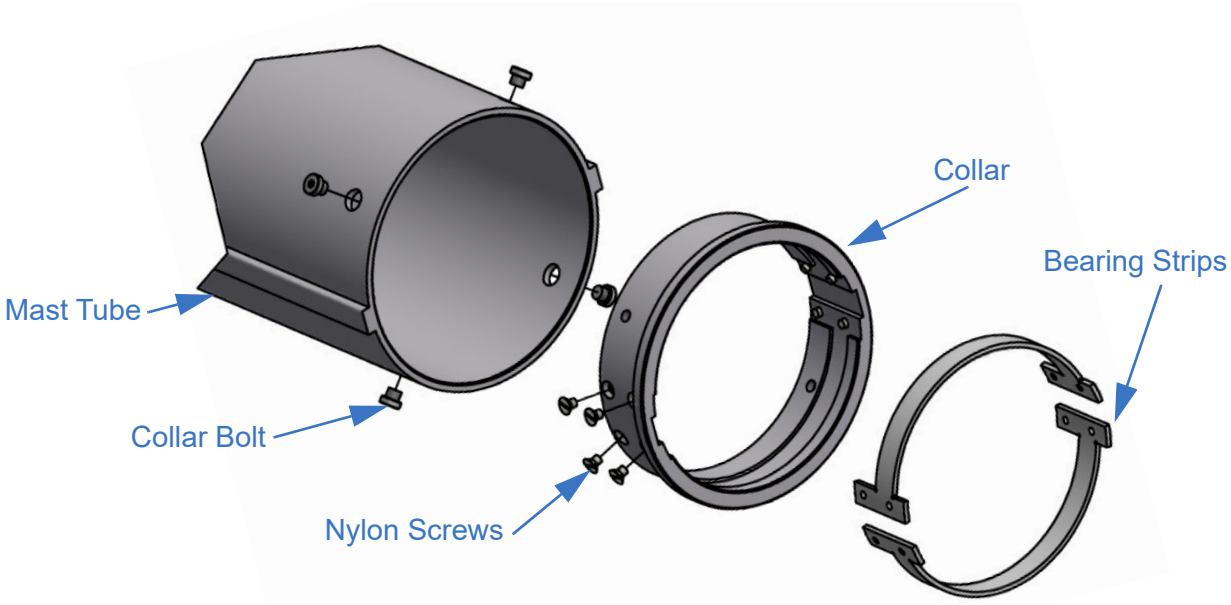


Figure 8-13 Replacing Bearing Strips (Number of collar bolts will vary)

8.7.4 Replace Wear Rings

Wear rings can be replaced when the mast is disassembled for seal replacement. Check the wear rings for wear. If the wear ring is worn down to the butt plate surface, it must be replaced.

To replace the wear rings (Figure 8-14):

1. Clean the butt plate and wear ring groove.

2. Slide the wear ring over the mast and into the groove. Press the wear ring into the groove to make sure there is at least ¼ in. (6.3 mm) clearance between the (2) ends. If necessary, cut enough off (1) end to get the required gap.

3. The wear ring must be held in place until this mast tube is inserted into the receiving mast tube. Apply a bead of adhesive inside the groove on the butt plate to bond the wear ring in place. If the wear ring prevents the mast tube from sliding inside the next tube, grind the wear ring OD as necessary.

4. Before reassembling the mast tube, slide each mast tube inside its mating mast tube. If the smaller mast tube does not slide freely inside the next largest mast tube, it will be necessary to sand high spots on the wear ring to fit. The high spots will appear as shiny or discolored marks on the outside diameter of the wear ring.

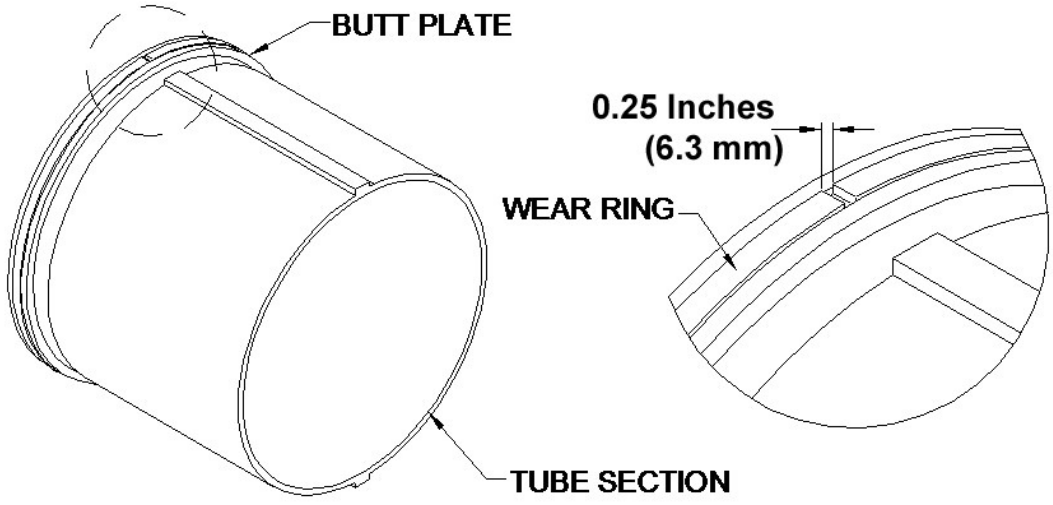


Figure 8-14 Replacing Wear Rings

8.8 Long-Term Storage

When putting the system into long-term storage, ensure the:

- Mast is fully nested (Section 6.3).
- Drain cock is open to eliminate the possibility of inadvertent mast extension.
- Mast is stored in a clean and dry environment.
- Mast is stored vertically when storing for more than six months with provisions to keep the mast from tipping over.
- Mast is extended and lowered every six months (Section 6.3).

8.9 System Disposal

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

9 Troubleshooting

This section describes troubleshooting for the mast system. Use care to understand and follow all precautions while troubleshooting the mast system.

Table 9-1 Troubleshooting

Symptom	Possible Cause	Possible Solution
Mast tube(s) stuck		
Largest Intermediate Tube Stuck	Support bracket tight.	Loosen bolts. Shim as necessary between clamp halves.
Mast frozen in nested position.	Mast base tube not drained routinely. Potential for tube damage.	Send to manufacturer for repair or replacement.
Mast frozen in extended position.	Mast base tube not drained routinely. Typically freezes around collar area.	Wrap warming blankets around collar until ice melts. Use heat gun or 500w quartz light. (or) Depressurize mast. Inject 1 oz. Will-Burt Anti-Freeze, suited for aluminum engines, where top of collar and Intermediate tube meet.
Mast rocks while lowering		
Mast will not lower without rocking	Not enough weight.	Add weight to platform or stub adaptor.
	Bent tube.	Check tube trueness. Order replacement if bent.
	Bearing strips tight.	Depressurize. Disassemble. File and grind to pre-fit bearing strips as necessary.
Rotational Movement in Mast Sections		
Rotational movement occurs in mast tubes.	Bearing strips are worn.	Order new bearing strips. Customer must pre-fit.
Weather Bonnet does not slide over base tube		
There is difficulty in sliding the weather bonnet over the base tube.	Weather bonnets are designed to be tight.	Use soapy water. (or) Oil O-ring and use mallet to tap evenly around diameter of the bonnet.

For additional information, please contact The Will-Burt Company's Customer Service at +1 330 684 4000.

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10 Reference

This section provides reference information for the system as follows:

- Extended Glossary of Terms (Section 10.1)
- Drawings (Section 10.2)
- Mast Wind Load Capacity (Section 10.3)

10.1 Extended Glossary of Terms

This section defines terms used within this manual as follows:

- General Terms and Abbreviations (Section 10.1.1)
- Mounting Position Terms (Section 10.1.2)

10.1.1 General Terms and Abbreviations

This section describes general terms and abbreviations used within this manual.

- **Amp:** stands for ampere, which is a unit of electric current.
- **AWG:** stands for American Wire Gauge.
- **Bar:** is a metric unit of pressure. One bar is approximately equal to the atmospheric pressure at sea level.
- **Base Tube:** refers to the tube with the largest diameter. When the mast is fully extended, this is the tube closest to the mounting surface.
- **BCD:** stands for Bolt Circle Diameter.
- **Bearing Strips:** refer to plastic strips located in some collars where tubes make contact with each other.
- **Butt Plate:** refers to the bottommost plate on each intermediate tube.
- **CFM:** stands for Cubic Feet per Minute.
- **Collar Inserts:** refer to machined pieces of plastic with a notch for the key located in some collars.
- **Collars:** attach to the top of each tube except the top tube.
- **Drain Hole:** refers to the threaded hole on the side of the base tube designed to facilitate the water drainage during periods of extension. A Drain Kit may be installed to the drain hole to route water away from the mast system. The base tube has one drain hole.
- **Extended:** refers to the partial- or full-raised position of the mast that the mast pneumatically goes to from the nested position. In the extended position, some or all the tubes have risen.
- **ft.-lb.:** stands for foot-pounds, which is a unit of torque equal to the force in pounds multiplied by the distance in feet to the pivot point.
- **HDNL:** stands for Heavy Duty Non-Locking.
- **Hz:** stands for Hertz and is defined as one cycle per second.
- **ID:** stands for Inside Diameter or the diameter to the inside edge of a circle.
- **in.-lb.:** stands for inch-pounds, which is a unit of torque equal to the force in pounds multiplied by the distance in inches to the pivot point.
- **Intermediate Tubes:** refer to the tubes between the base tube and the top tube.
- **LPM:** stands for liters per minute.

- **Mast:** refers to the telescoping Low-Profile.
- **Mast System:** refers to the entire Low-Profile System (telescoping mast, pneumatic system, mounting hardware, and additional accessories).
- **Nested:** refers to the position of the mast where no tubes have risen. The mast remains retracted. This position is sometimes referred to as “stowed”.
- **N m:** stands for Newton-Meter, which is a form of torque.
- **NPT:** stands for “American National Standard Pipe Thread” or “National Pipe Thread” for short; a United States standard for thread specifications on pipes and fittings. NPT threads are tapered.
- **OD:** stands for Outside Diameter or the diameter to the outside edge of a circle.
- **Payload:** refers to the object or equipment being raised by the mast to an operational height.
- **PSI:** stands for pound-force per square inch.
- **PSIG:** stands for pound-force per square inch gauge. PSIG refers to a gauge that has been calibrated to read zero at sea level.
- **P/N:** stands for Part Number. These are The Will-Burt Company part numbers for various components in the mast system.
- **SCFM:** stands for standard cubic feet per minute, or CFM adjusted to 14.7 PSI (1 Bar) and 68°F (20°C).
- **Top Tube:** refers to the tube with the smallest diameter. When the mast is fully extended, this is the tube furthest from the mounting surface.
- **Top Tube Stop:** refers to the component at the top of the top tube. The top tube stop prevents the top tube from sliding too far down into a nested mast.
- **Tube Head:** refers to the component at the base of the base tube. The tube head can be set up for either non-rotating masts (without a groove in the tube head) or rotating masts (with a groove in the tube head). The type of tube head will impact the nested height of the mast.
- **Wear Rings:** refers to the preformed split synthetic bearings that fit in the wear ring groove around the butt plate above the seal on each interior tube. The wear rings guide the bottom of the tube through the next larger tube.
- **Weep Holes:** refer to the holes on the intermediate tubes which are designed to facilitate the drainage of water during periods of extension. Each intermediate tube has four weep holes.
- **Ø:** stands for diameter.

10.1.2 Mounting Position Terms

For the purposes of this manual, regions of the mounting location are defined as follows:

- **Mounting Structure:** the overall structure where the mast is mounted.
- **Mounting Surface:** the surface to which the base plate is secured. When the shelf bracket is used (in external mount applications only), it serves as the mounting surface for the base plate. When installing inside a vehicle, this will likely be the floor.
- **Roof:** the horizontal surface to which the internal mounting kit is secured. This term applies to internal mount applications only.
- **Support Structure:** the vertical surface to which the external support bracket is secured. This term applies to external mount applications only.

10.2 Drawings

Refer to the www.willburt.com for drawings of your mast system.

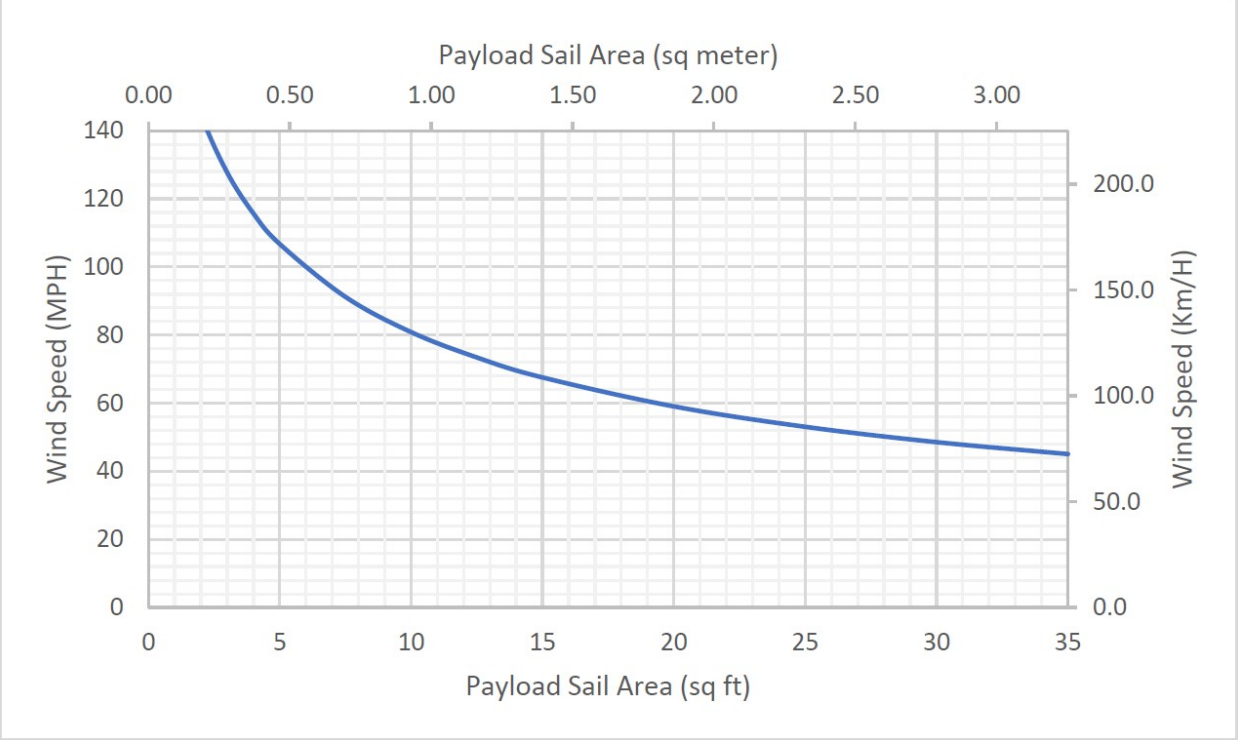
10.3 Mast Wind Load Capacity

The following graphs define the survival wind speed capacity as a function of payload sail area. Note carefully the assumptions at the bottom of each graph. If your payload application exceeds any of these assumption values, contact The Will-Burt Company's Engineering for the wind load capacity for your specific application. These graphs are generic in nature and not intended to cover every possible payload situation. The wind load values represent a theoretical prediction of mast performance based on the assumptions used. Actual performance may vary slightly.

10.3.1 Catalog Model 5.3-32 Low-Profile HDNL

5.3-32 Low-Profile Heavy Duty Non-Locking Pneumatic Mast

Survival Wind Speed
Un-Guyed Performance Curve



Mast	No Guying Available

• 5.3-32 Low-Profile HDNL Pneumatic Mast
  • Nest Height = 5 ft. 4 in. [1.62 m]
  • Fully Extended Height = 32 ft. [9.75 m]
  • No. of Tubes = 9
  • Tube Set = 3.00″ – 9.00″
  • Max Payload Capacity = 200 lb. [90 kg]	

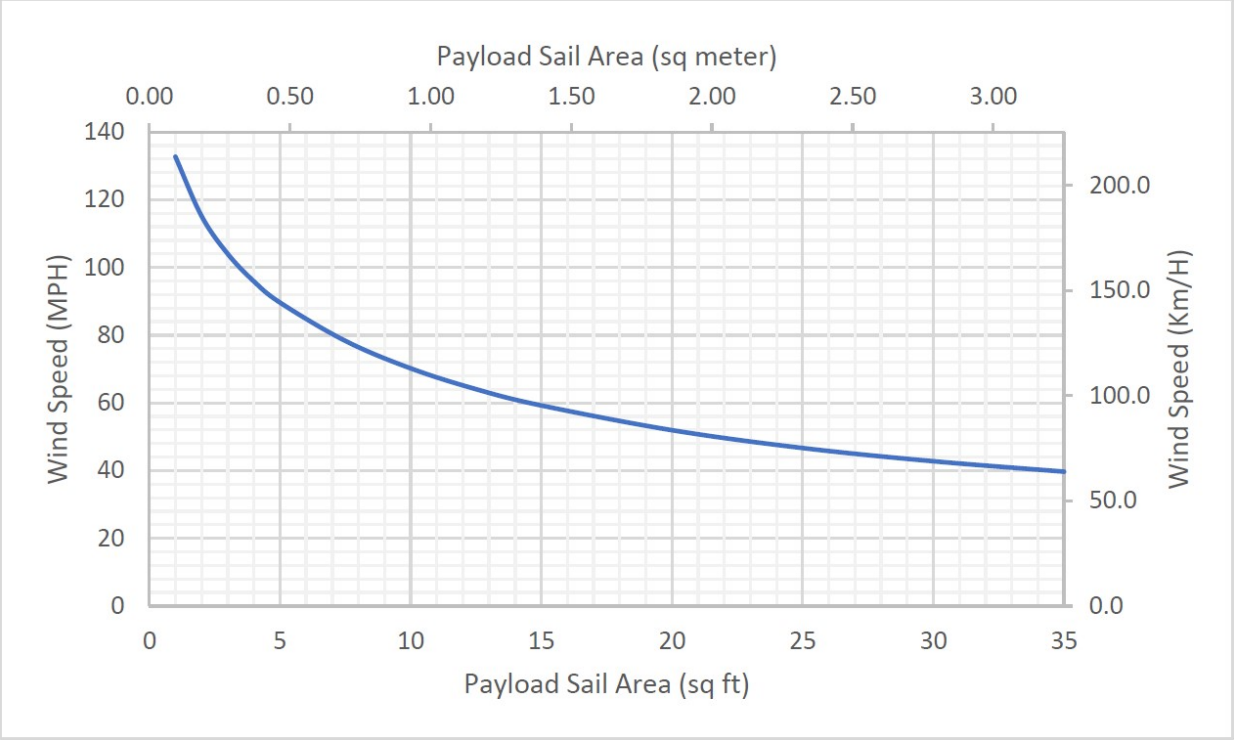
Survival Wind Speed Assumptions

- Payload Weight = 200 lb. [90 kg]
- Payload Coefficient of Drag = 1.3
- Payload centroid is on mast axis and 12″ [304.8 mm] above top of mast
- Mast securely constrained at bottom of mast as well as approximately 5″ [127 mm] below collar of base tube by WB supplied hardware or equivalent
- 0 degree mast base deployment angle
- All wind speeds measured at 33 ft above ground level
- Cabling is secured together and fixed to the mast
- Survival wind speed will be reduced for increasing payload centroid distance above top of mast
- This analysis does not include any evaluation of the stability of a trailer, the trailer, outriggers, and anchors are assumed fixed.

10.3.2 Catalog Model 6-29 Low-Profile HDNL

6-29 Low-Profile Heavy Duty Non-Locking Pneumatic Mast

Survival Wind Speed Un-Guyed Performance Curve



Mast	No Guying Available

• 6-29 Low-Profile HDNL Pneumatic Mast
  • Nest Height = 6 ft. [1.83 m]
  • Fully Extended Height = 28 ft. 4 in. [8.66 m]
  • No. of Tubes = 6
  • Tube Set = 3.00″ – 6.75″
  • Max Payload Capacity = 200 lb. [90 kg]	

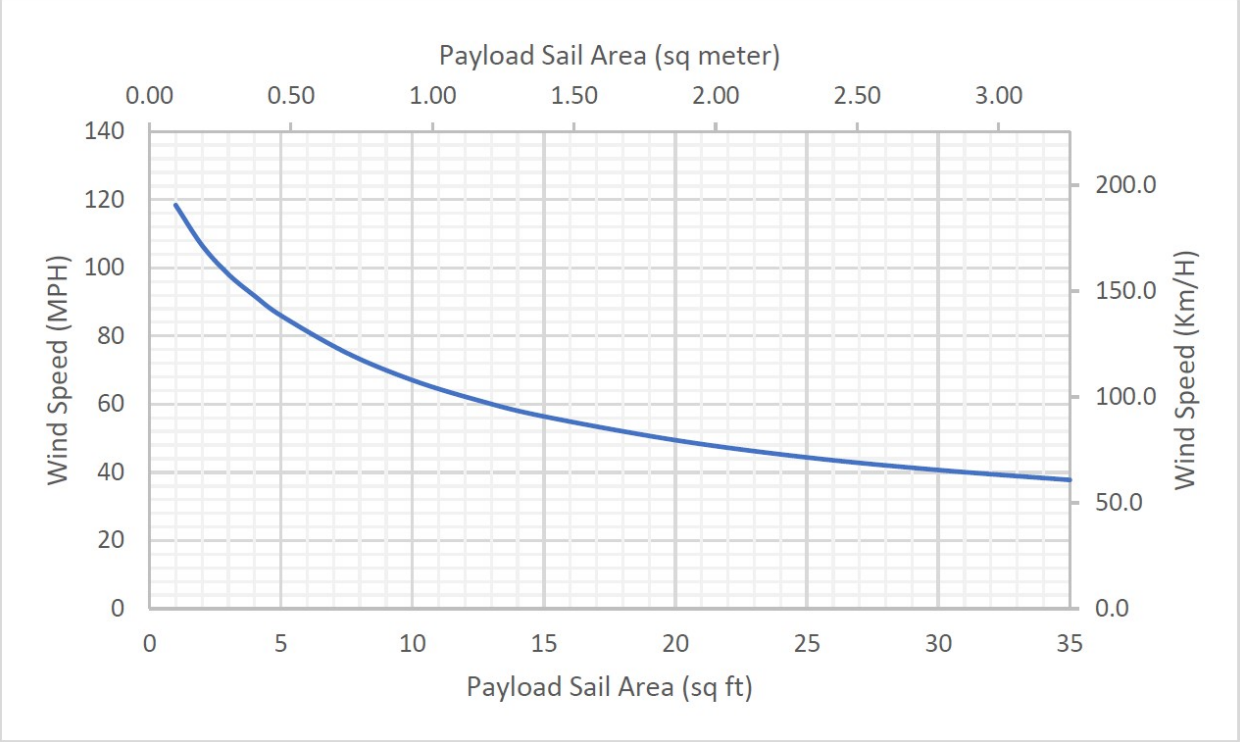
Survival Wind Speed Assumptions

- Payload Weight = 200 lb. [90 kg]
- Payload Coefficient of Drag = 1.3
- Payload centroid is on mast axis and 12″ [304.8 mm] above top of mast
- Mast securely constrained at bottom of mast as well as approximately 5″ [127 mm] below collar of base tube by WB supplied hardware or equivalent
- 0 degree mast base deployment angle
- All wind speeds measured at 33 ft above ground level
- Cabling is secured together and fixed to the mast
- Survival wind speed will be reduced for increasing payload centroid distance above top of mast
- This analysis does not include any evaluation of the stability of a trailer, the trailer, outriggers, and anchors are assumed fixed.

10.3.3 Catalog Model 6-42 Low-Profile HDNL

6-42 Low-Profile Heavy Duty Non-Locking Pneumatic Mast

Survival Wind Speed Un-Guyed Performance Curve



Mast	No Guying Available

• 6-42 Low-Profile HDNL Pneumatic Mast
  • Nest Height = 6 ft. 3 in. [1.91 m]
  • Fully Extended Height = 41 ft. 3 in. [12.6 m]
  • No. of Tubes = 9
  • Tube Set = 3.00″ – 9.00″
  • Max Payload Capacity = 200 lb. [90 kg]	

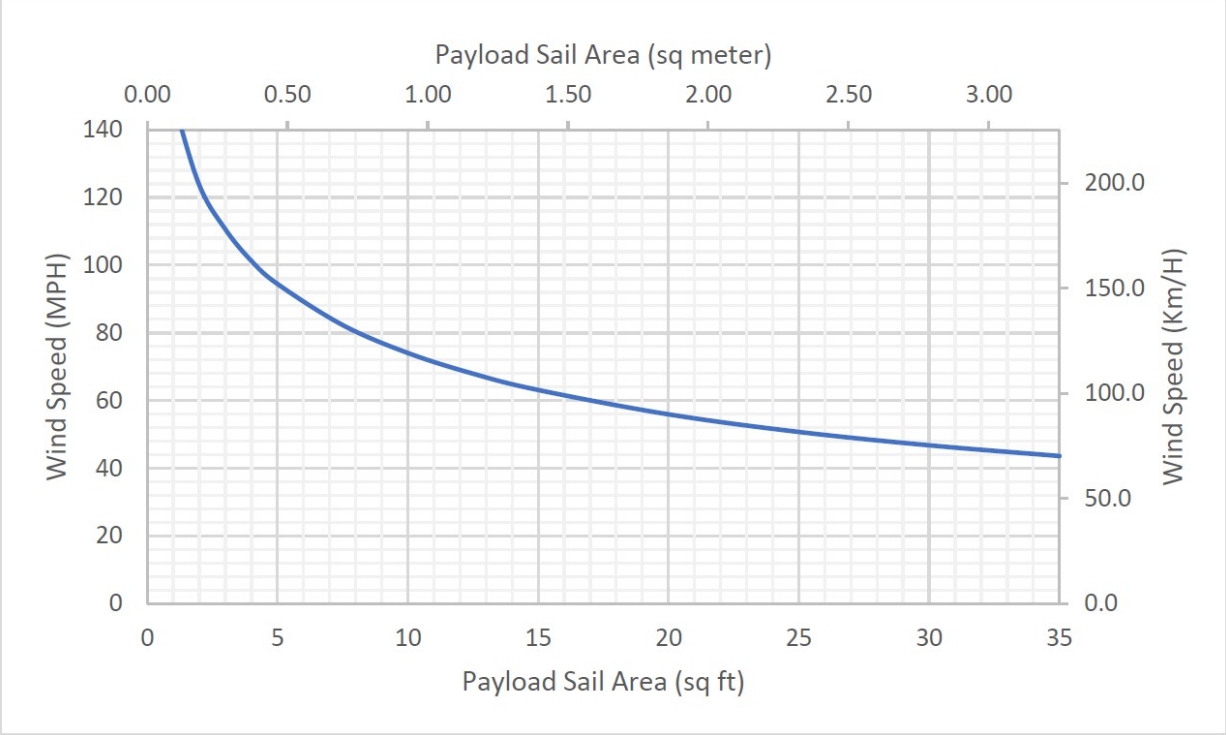
Survival Wind Speed Assumptions

- Payload Weight = 200 lb. [90 kg]
- Payload Coefficient of Drag = 1.3
- Payload centroid is on mast axis and 12″ [304.8 mm] above top of mast
- Mast securely constrained at bottom of mast as well as approximately 5″ [127 mm] below collar of base tube by WB supplied hardware or equivalent
- 0 degree mast base deployment angle
- All wind speeds measured at 33 ft above ground level
- Cabling is secured together and fixed to the mast
- Survival wind speed will be reduced for increasing payload centroid distance above top of mast
- This analysis does not include any evaluation of the stability of a trailer, the trailer, outriggers, and anchors are assumed fixed.

10.3.4 Catalog Model 7-27 Low-Profile HDNL

7-27 Low-Profile Heavy Duty Non-Locking Pneumatic Mast

Survival Wind Speed
Un-Guyed Performance Curve



Mast	No Guying Available

• 7-27 Low-Profile HDNL Pneumatic Mast
  • Nest Height = 6 ft. 7 in. [2.00 m]
  • Fully Extended Height = 26 ft. 8 in. [8.11 m]
  • No. of Tubes = 5
  • Tube Set = 3.75″ – 6.75″
  • Max Payload Capacity = 300 lb. [136 kg]	

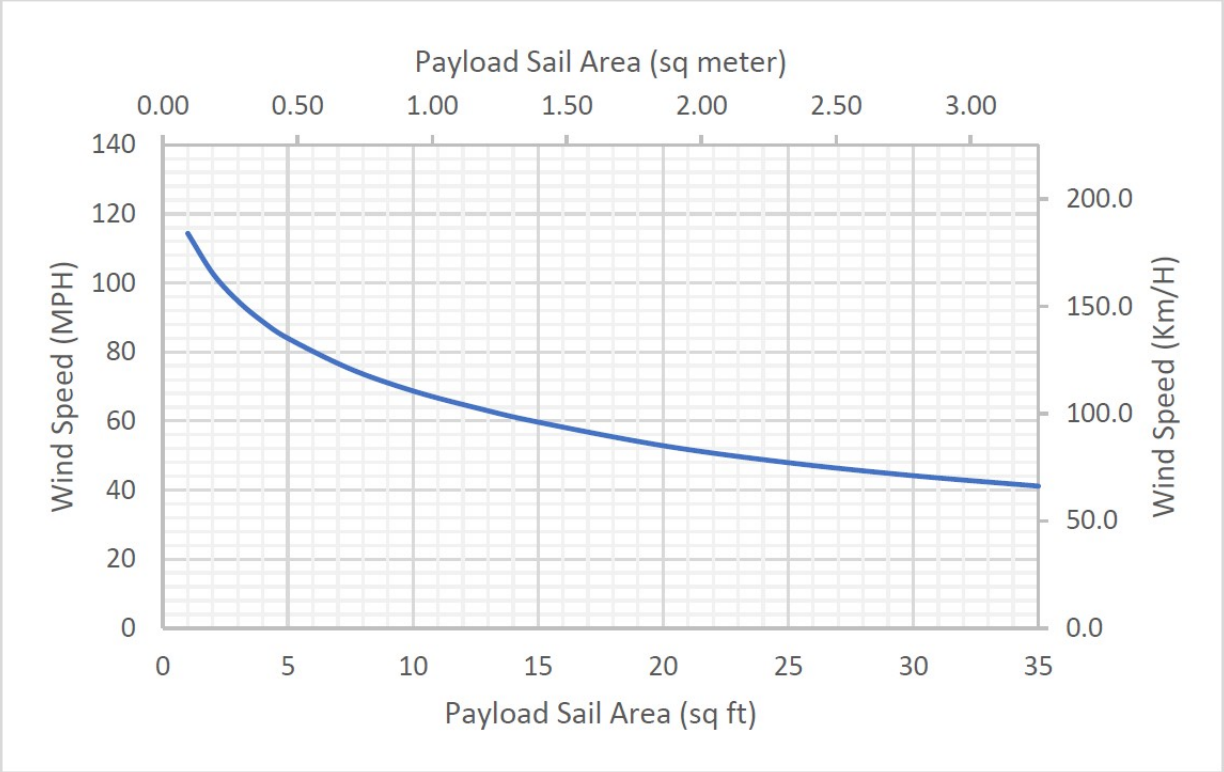
Survival Wind Speed Assumptions

- Payload Weight = 300 lb. [136 kg]
- Payload Coefficient of Drag = 1.3
- Payload centroid is on mast axis and 12″ [304.8 mm] above top of mast
- Mast securely constrained at bottom of mast as well as approximately 5″ [127 mm] below collar of base tube by WB supplied hardware or equivalent
- 0 degree mast base deployment angle
- All wind speeds measured at 33 ft above ground level
- Cabling is secured together and fixed to the mast
- Survival wind speed will be reduced for increasing payload centroid distance above top of mast
- This analysis does not include any evaluation of the stability of a trailer, the trailer, outriggers, and anchors are assumed fixed.

10.3.5 Catalog Model 7-42 Low-Profile HDNL

7-42 Low-Profile Heavy Duty Non-Locking Pneumatic Mast

Survival Wind Speed
Un-Guyed Performance Curve



Mast	No Guying Available

• 7-42 Low-Profile HDNL Pneumatic Mast
  • Nest Height = 6 ft. 10 in. [2.08 m]
  • Fully Extended Height = 41 ft. 3 in. [12.57 m]
  • No. of Tubes = 8
  • Tube Set = 3.75″ – 9.00″
  • Max Payload Capacity = 300 lb. [136.1 kg]	

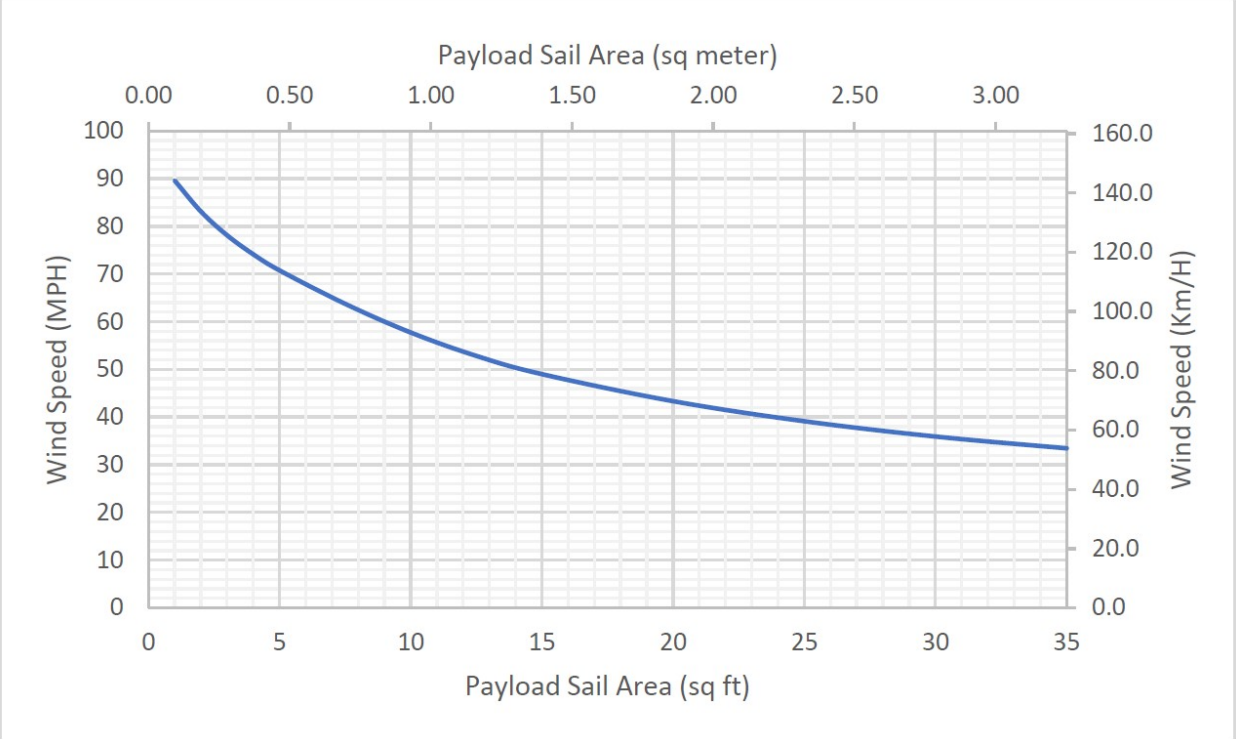
Survival Wind Speed Assumptions

- Payload Weight = 300 lb. [136.1 kg]
- Payload Coefficient of Drag = 1.3
- Payload centroid is on mast axis and 12″ [304.8 mm] above top of mast
- Mast securely constrained at bottom of mast as well as approximately 5″ [127 mm] below collar of base tube by WB supplied hardware or equivalent
- 0 degree mast base deployment angle
- All wind speeds measured at 33 ft above ground level
- Cabling is secured together and fixed to the mast
- Survival wind speed will be reduced for increasing payload centroid distance above top of mast
- This analysis does not include any evaluation of the stability of a trailer, the trailer, outriggers, and anchors are assumed fixed.

10.3.6 Catalog Model 7.3-50 Low-Profile HDNL

7.3-50 Low-Profile Heavy Duty Non-Locking Pneumatic Mast

Survival Wind Speed
Un-Guyed Performance Curve



Mast	No Guying Available

• 7.3-50 Low-Profile HDNL Pneumatic Mast
  • Nest Height = 7 ft. 3 in. [2.21 m]
  • Fully Extended Height = 49 ft. 6 in. [15.1 m]
  • No. of Tubes = 9
  • Tube Set = 3.00″ – 9.00″
  • Max Payload Capacity = 200 lb. [90 kg]	

Survival Wind Speed Assumptions

- Payload Weight = 200 lb. [90 kg]
- Payload Coefficient of Drag = 1.3
- Payload centroid is on mast axis and 12″ [304.8 mm] above top of mast
- Mast securely constrained at bottom of mast as well as approximately 5″ [127 mm] below collar of base tube by WB supplied hardware or equivalent
- 0 degree mast base deployment angle
- All wind speeds measured at 33 ft above ground level
- Cabling is secured together and fixed to the mast
- Survival wind speed will be reduced for increasing payload centroid distance above top of mast
- This analysis does not include any evaluation of the stability of a trailer, the trailer, outriggers, and anchors are assumed fixed.

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11 Document History

Table 11-1 Document History

Document Revision	Date	Change Details	Changes Backward Compatible with Previous Manual Version
TP-5252001-00	June 2015	Initial Release.	--
TP-5252001-A	July 2015	Updated Figure 1-6. Updated sections 1.5.1.4, 4.3, and 4.6.	Yes
TP-5252001-B	July 2015	Updated section 4.6.	Yes
TP-5252001-C	Jan. 2016	Added can lock base adjustment procedure.	Yes
TP-5252001-D	May 2016	Updated Table 1-1 and Section 4.7	Yes
TP-5252001-E	Dec. 2016	Updated Tables 1-1, 2-2, and 5-1. Updated Figure 4-7. Updated Introduction and Sections 1.5, 2.11, 3.1, 3.6, 4.2, 4.8, 4.9, and 4.10.4	Yes
TP-5252001-F	Feb. 2017	Corrected a part number in Section 1.5.2.5	Yes
TP-5252001-G	Dec. 2017	Updated the 7.3-50 mast from P/N 710305202 to 710305000.	Yes
TP-5252001-H	Nov. 2021	Updated formatting and implemented CE	Yes

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