

Tycon® Pneumatic Telescopic Mast (5700059) User Manual



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1. WARRANTY POLICY

Tycon Systems® warrants its products to be free from defects in material and workmanship for a period of one year from the date of shipment from the factory. Tycon Systems® shall not be responsible for any damage resulting to or caused by its products by reason of improper installation, improper storage, unauthorized service, alteration of products, neglect or abuse, or use of the product in a manner inconsistent with its design, accident, acts of weather, or failure to properly maintain this product. This policy does not extend to any component parts not manufactured by Tycon Systems®.

Claims for defects in material and workmanship shall be made in writing to Tycon Systems® within thirty 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 policy, and Tycon Systems® shall be released from any and all liability relating to the product. Tycon Systems® may either send a service representative or have the product returned to its factory at Buyer's expense for inspection. If judged by Tycon Systems® to be defective in material or workmanship, the product will be replaced or repaired at the option of Tycon Systems®, free from all charges except authorized transportation.

2. SAFETY PRECAUTIONS

GENERAL SAFETY PRECAUTIONS

The following are general safety precautions which are related to any specific procedures and therefore do not appear elsewhere in this publication. These are recommended precautions that personnel must understand and apply during many phases of operation and maintenance.

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 un-wanted sources of electricity. Do not operate mast in lightning. Be certain electrical cables are undamaged and properly terminated. Always disconnect power before performing service, repair or test operations.

SAFETY INSTRUCTION-READ MANUAL!

Failure to follow operating instructions could result in death or serious injury. Read and understand the operator's manual before using the mast.

TIP OVER HAZARD!

Mast tip over could result in death or serious injury. Do not operate in high winds. Operate on level ground only. Stand clear of mast and mast payload during operation. Be certain mast is level and secure before and during installation, operation and maintenance.

SAFETY INSTRUCTION-TRAINED PERSONNEL ONLY!

Death or serious injury could result if proper inspection, installation, operation and maintenance procedures are not observed. Installation, operation and maintenance to be performed by trained and authorized personnel only. Proper eye protection should be worn when servicing the mast

PINCH POINT HAZARD!

Moving parts can crush and cut resulting in death or serious injury. Keep clear of moving parts while operating mast.

CRUSH HAZARD!

Death or serious injury could result if mast fails suddenly. Do not stand directly beneath the mast or its payload. Be certain payload is properly installed and secured.

BURST HAZARD!

Over pressurizing mast will trip safety valve and could result in death or serious injury. Do not exceed maximum operating pressure of 20 psi for standard duty masts. Keep personnel clear of safety valve exhaust direction.

RELOCATION HAZARD!

Relocating the mast during operation or after extension could result in death or serious injury. Do not relocate the mast during operation or while extended. This applies especially to masts mounted to vehicles. Operate the mast only if the vehicle is stationary and the vehicle engine is off.

LIFTING HAZARD!

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.

MAST EXTENSION HAZARD!

Extending mast into obstructions could result in death or serious injury and could render the mast inoperable and partially extended. Before applying power and operating the 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 the mast.

MOUNTING STRUCTURE HAZARD!

Mounting mast into a structure unable to resist the forces generated from customer-specific loading scenario could result in death or serious injury and could damage the mast. 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 size and weight, sail size, wind speed, guy line arrangement, support bracket or roof line location and base plate assembly.

PRESSURIZED DEVICE HAZARD!

Mast disassembly prior to depressurization may release pressurized air jet. Completely lower the mast, depressurized and shut down power before disassembly.

SAFETY INSTRUCTION-ROOF ACCESS!

If mast will be mounted to a vehicle, user must provide safe means to access the roof of the vehicle during installation and maintenance.

ENTANGLEMENT HAZARD!

Tangled cables can cause equipment damage. Ensure control cables are not tangled and are free to pay out as mast is extended.

SAFETY INSTRUCTION-INSTALLATION!

At all times while using pipe and hose during installation, recognize that:

- 1.) pipe and hose should be routed, mounted and restrained to protect from damage;
- 2.) do not use second hand piping for installation;
- 3.) do not bend air pipe and hose at a radius less than specified by the manufacture;
- 4.) pipes should be marked to avoid hazards from incorrect connection;
- 5.) the exhaust should be fitted with a silencer and be directed away from personnel;
- 6.) when routing piping, install in such a way as to minimize torsion on the joints;
- 7.) mounting air pipe and hose shall be accomplished only by the use of tools to prevent readily disconnecting air pipe and hose from mast.

SAFETY INSTRUCTION-CONTROL VALVE!

Improper positioning and operation of Control Valve can result in operator injury or equipment damage. Control valve must be mounted in a location such that the operator has full view of the mast but does not make contact with the mast during operation.

SAFETY INSTRUCTION-FOLLOWING PROCEDURE!

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.

FROZEN WATER HAZARD!

Water freezing inside mast or air fittings may render mast inoperable and cause major equipment damage. Open drain, when mast is not in operation, in temperatures near or below freezing.

3. INTRODUCTION

3.1 SAFETY PRECAUTIONS

Refer to the SAFETY PRECAUTIONS to be observed while installing, operating or maintaining telescopic mast

3.2 INTRODUCTION

This manual covers the installation, operation, and maintenance for the mast, mast models covered include non-locking mast, locking mast, mast with internal spiral cables.

The whole pneumatic mast system comprises a locking mast with internal spiral cables, a top flange, a bottom flange, an air hose pipe. A hardware bag, a drain kit, a mast lubricant, a non-rotating base plate, a rotating hardware kit, a support bracket assembly, an internal mounting kit, an external shelf bracket assembly, a pneumatic system, a mast top cover or a guy line kit may also be included.

3.3 DESCRIPTION

3.3.1 PNEUMATIC TELESCOPIC MAST

The Pneumatic Telescopic Mast is the structure used to raise the payload to an operational level. It consists of several concentric, nesting mast sections, fabricated from Aluminum alloy tube part # 6063T5, that extend and retract pneumatically.

The locking mast can be depressurized once the desired sections are raised and locked into position. That is to mean the external air supply system can be shut off when the locking mast is extended in operational position. The base mast section is constructed from the tube with the largest diameter and the top mast section is constructed from the tube with the smallest diameter. The intermediate mast sections are any mast section in between the base and top mast sections. Aluminum collars are fitted to the top end of each mast section, except for the top mast section that is fitted with a top tube stop. When the telescopic mast is completely retracted, the collars nest on top of each other. The collars on a locking mast are fitted with a locking mechanism including a "T" shape assembly. Each mast section except for the base mast section, has two rectangular keys along the length of the tube. The keys match with keyways on the larger, adjacent mast section's collar. The keys and keyways are used to establish azimuth (rotational) integrity between the sections.

3.3.2 HARDWARE BAG

The hardware bag is a cloth bag that includes screws for fastening a non-rotating base plate to the base mast section, and bolts, washers and nuts that may be used for securing the mast to a mounting structure. The hardware bag also contains a safety valve, for protection from over pressurization, and brass fittings for water drainage and connecting the mast to the air supply line. Do not operate the mast until the safety valve has been properly installed.

3.3.3 WEEP HOLE DRAIN KIT

The drain kit, sealed in a clear plastic bag, includes installation instructions, a length of clear plastic tube and fittings to outfit the telescoping mast with a means to drain water that has entered the top and intermediate mast sections and may cause damage. Use the drain cock from the hardware bag to drain water from the base mast section. The

fittings are used to attach one end of the plastic tube to the weep hole in the base mast section and to route the other end of the tube outside the mounting structure or vehicle to drain water.

3.3.4 MAST LUBRICANT

The mast lubricant is a mineral oil or grease specifically designed for telescoping masts and their operating environment that is contained in a plastic bottle. The mast lubricant is to be used on regular basis to insure smooth operation and prolong useful life of the mast.

3.3.5 NON-ROTATING BASE PLATE

The non-rotating base plate is a square or round aluminum plate used to stabilize the mast and to provide a means of securing the mast to a mounting structure. Countersunk holes in the plate match threaded holes on the base mast section. Screws included in the hardware bag are sized for the through-holes in the corners of the plate, so the mast can be secured to a mounting structure. A larger hole in the center of the plate allows the option of routing air to the bottom of the base mast section.

3.3.6 ROTATING HARDWARE KIT

The rotating hardware kit is used to stabilize the mast and to provide a means of, not only securing the mast to a mounting structure, but also enabling the mast to be rotated. The kit includes a rotating base plate assembly, a turning handle assembly, bolts, nuts and an instruction sheet.

3.3.7 SUPPORT BRACKET ASSEMBLY

The support bracket assembly, used to brace standard and heavy-duty masts against a mounting structure, is constructed from a sheet stand-off, aluminum support brackets, a plastic bearing and fasteners to secure the assembly together. The stand-off is a formed sheet metal piece that positions the support brackets away from the mounting structure. The C-shaped support brackets close around the base mast section and are bolted together to hold the mast against the mounting structure and allows the mast to be rotated.

3.3.9 EXTERNAL SHELF BRACKET ASSEMBLY

The external shelf bracket assembly is a painted, steel welded that can be bolted into a mounting structure and used to position and support an externally mounted mast.

3.3.10 MAST TOP COVER

The mast top cover is a large canvas bag with drawstrings. The mast top cover is drawn over the collars of a fully retracted locking mast to protect the locking mechanism from dust, debris and other foreign material when the mast is not being operated. It may be used on a non-locking mast.

3.3.11 PNEUMATIC SYSTEM

The pneumatic system refers to a means of safely controlling the pressurization and depressurization of the telescoping mast. Components in the hardware bag and a port near the bottom of the base mast section are provided to connect an air supply to the telescoping mast.

3.3.12 GUY LINE KIT

The guy line kit includes guy lines, guy stakes or anchors and a ground anchor location drawing. The kit components are used to further stabilize the telescoping mast by resisting environmental conditions that may cause tip over and horizontal payload movement. Specific installation instructions will be provided with any guyed mast

4. MASTS REFERENCE CATALOG

Please refer to the catalogue 2018 version

Note:

- 1) Tube diameter listed as Top Mast Section Diameter to Base Mast Section 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) Customer design purposes, please supply mast Extended Height, Retracted Height, Payload, Internal Cables requirements.

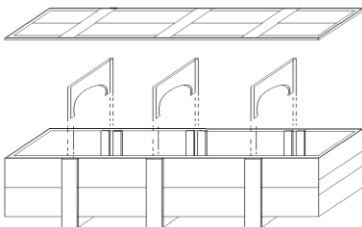
5. INSTALLATION

5.1 TOOLS AND MATERIALS REQUIRED FOR INSTALLATION

Wrenches, Screwdrivers, Thread tape, Safety gloves, Sling/strap, Measuring tape, Silicone sealant, String or thin wire, Plumb-bob, Hoist, Torque wrench, Safety glasses, Hammer, Level, Saw, Drill, Air supply, Sockets

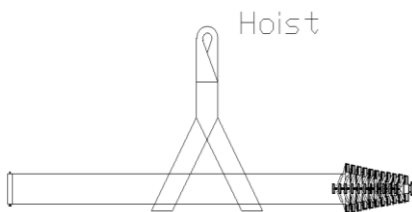
5.2 UNPACKING

5.2.1 Unpack the pneumatic Mast as follows:



5.2.2 Inspect for any shipping damage. Notify carrier if damage is evident.

5.2.3 Using the center of gravity label as a reference, outfit the mast with a sling capable of supporting the mast weight. The sling should support the mast from at least 2 points. Attach the sling such 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 in to the desired position



5.3.1 Mast Installation-internal mounting

WARNING: Mounting Structure Hazard!

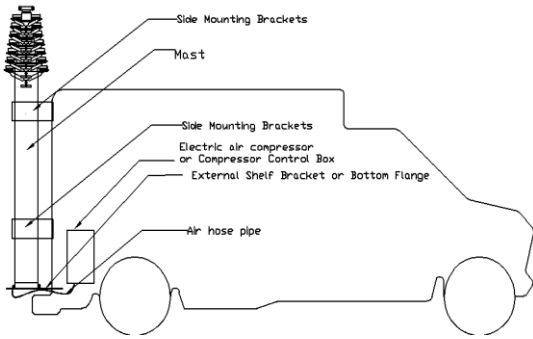
Mounting mast into a structure unable to resist the forces generated from customer specific loading scenario could result in death or serious injury and could damage the mast. Before operation, be certain mounting structure is capable of resisting forces generated from all loading and environmental conditions, including, but not limited to, mast size and weight, payload size and weight, sail size, wind speed, guy line arrangement, support bracket or roof line location and base plate assembly.

5.3.2 Mast Installation-External Mounting

Mounting Structure Hazard! Mounting mast into a structure unable to resist the forces generated from customer specific loading scenario could result in death or serious injury and could damage the mast. 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 size and weight, sail size, wind speed, guy line arrangement, support bracket or roof line location and base plate assembly.

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

- 1). When selecting the location for the mast on the vehicle, check the strength and rigidity of the body where the mast is to be externally attached.
- 2). Make sure the vehicle is on a flat level area.
- 3). If using the external shelf bracket, securely attach it to the vehicle. Be certain the shelf bracket is level.
- 4). Attach the base plate to the external shelf bracket or other mounting structure.
- 5). Attach the external support bracket around the mast base section.
- 6). Secure the support bracket to the wall structure. Spacers may be added between the support bracket and the wall as needed to keep the correct alignment between the support bracket and the shelf bracket.
- 7). Periodically inspect all fasteners and welds to make sure the mast is securely attached.
- 8). A bottom air inlet is available on all standard model masts. The base plates and external shelf brackets are machined to allow access to the bottom air inlet.
- 9). 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.
- 10). For rotating masts, locate the turning handles at a desired height (preferably above the weep hole if feasible). Tighten the turning handle bolts just enough to allow the turning handles to rotate the mast without slipping. Tightening the turning handles too much can deform the base tube and impede the movement of the next internal mast section. Lock the mast in place by tightening the locking screws located on the base plate. The locking screws should be tightened in against the mast at all times unless the mast is to be rotated. See Chapter 3 for instructions on rotating the mast.
- 11). The weep hole drain kit, intended to protect the interior of a vehicle from damage due to water drainage, is not required for externally mounted masts. However, the elbow from the kit may be used to shield the weep hole from blow sand, dust and other debris.



5.3.3 Installation-Electric Pneumatic System

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

- 1.) Pipe and hose should be routed, mounted and restrained to protect from damage;
- 2.) Do not use second hand piping for installation;
- 3.) Do not bend air pipe and hose at a radius less than specified by the manufacturer;
- 4.) Pipes should be marked to avoid hazards from incorrect connection;
- 5.) The exhaust should be fitted with a silencer and be directed away from personnel;
- 6.) When routing piping, install in such a way as to minimize torsion on the joints;
- 7.) Mounting air pipe and hose shall be accomplished only by the use of tools to prevent readily disconnecting air pipe and hose from mast.

Safety Instruction – Control Valve! Improper positioning and operation of Control Valve can result in moderate injury or equipment damage. Control valve must be mounted in a location such that the operator has full view of the mast but does not contact the mast during operation. Use only a Hold-To-Run type control valve.

1. **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 the inside workspace of the vehicle.

2. **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 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.

NOTE: A qualified electrician should perform installation and adjustments.

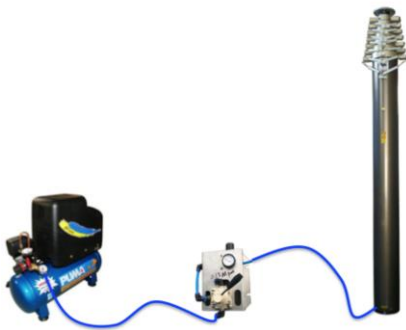
3. **AIR SUPPLY** – The compressor should always have adequate ventilation to provide clean dry air at the air intake. The recommended temperature range for inlet air is 0° to 35° C, so it works best when located in a heated compartment. The compressor should not be operated without the air filters in place.

4. **CONTROL VALVE** – A 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.

5. **DRAIN & RELIEF FITTINGS** – A drain cock and a safety valve should be installed at the air inlet at the base of the mast. The drain cock empties water that 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 on any mast should be left open once the mast is fully retracted and once a locking mast is completely extended and locked into position. The safety valve prevents the mast from being over pressurized.

6. **PLUMBING** –The hose can be cut to the required length at installation. Do not remove any hose or piping without first completely exhausting all air from the mast and then disconnecting the power supply.



6. OPERATING INSTRUCTIONS

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

- 1.) The mast area is free of personnel and mechanical obstruction;
- 2.) All electrical cables are undamaged and properly terminated;
- 3.) The operator must have full view of the mast during use;
- 4.) Any transit tie-downs on the payload have been removed;
- 5.) The vehicle is not moving;
- 6.) The area above the mast is free of mechanical obstructions.

Relocation Hazard! Relocating the mast during operation or after extension could result in death or serious injury. Do not relocate the mast during operation or while extended. This applies especially to masts mounted to vehicles. Operate the mast only if the vehicle is stationary and the vehicle engine is off.

Mast Extension Hazard! Extending mast into obstructions could result in death or serious injury and could render the mast inoperable and partially extended. Before applying power and operating the mast, be certain there is enough 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 the mast.

Lifting Hazard! 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.

Pinch Point Hazard! Moving parts can crush and cut resulting in death or serious injury. Keep clear of moving parts while operating mast.

Crush Hazard! Death or serious injury could result if mast fails suddenly. Do not stand directly beneath the mast or its payload. Be certain payload is properly installed and secured.

Burst Hazard! Over pressurizing mast will trip safety valve and could result in death or serious injury. Do not exceed maximum operating pressure of 20 psi (138 kPa) for Standard Duty masts. Keep personnel clear of safety valve exhaust direction.

Entanglement Hazard! Tangled cables can cause equipment damage. Ensure control cables are not tangled and are free to pay out as mast is extended.

Frozen Water Hazard! Water freezing inside mast or air fittings may render mast inoperable and cause major equipment damage. Open drain, when mast is not in operation, in temperatures near or below freezing.

6.1 INTRODUCTION

The chapter provides instructions for operating the Pneumatic Mast.

6.3.1 MASTS WITH T-HANDLE YOKE ASSEMBLIES

EXTENDING THE MAST

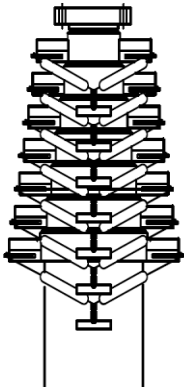
- ① Select an area free of power lines or other overhead obstructions. Mast should be no closer than a horizontal distance equal to the extended height of the mast away from any overhead power lines.
- ② The mast should be located on level terrain.
- ③ Remove the canvas top cover (if used) and secure the payload to the mast. If guy lines are used, attach the lines to the color-coded lugs on the collars.
- ④ Attach the pneumatic system to the mast.
- ⑤ Make sure all persons and obstructions are clear of the extension path of the mast. Before tripping any yoke assemblies make sure the mast is not pressurized.
- ⑥ For masts with T handle yokes extend the mast sections from the smallest to largest. Pull down firmly on the top T handle attached to the smallest collar. While holding down the T handle, pressurize the mast using the air control valve to extend the first internal mast section. Continue holding down on the T handle while the section is extending. When the section is fully extended, release the T handle and stop pressurizing the mast. The spring-loaded latch pins will lock this section in the extended position. Exhaust all air from the mast to confirm that the section is locked. If the section comes down, repeat this step.
- ⑦ Follow the same procedure for each subsequent mast section going from smallest to largest. Watch carefully that none of the cables become tangled or snag on anything as each mast section is extended.
- ⑧ Any combination of sections can be extended if the full height of the mast is not required.

ROTATING THE MAST

If the mast is a manually rotating model, loosen the locking screws bracket holder. Using its turning handles, rotate the mast to the desired direction. Re-tighten the locking screws to hold the position.

LOWERING THE MAST

- ① Before lowering the mast, rotate the mast or payload to allow for enough clearance in the stowed position.
- ② For masts with T handles, pressurize the mast to lift the load until the base section yoke assembly latch pins can be disengaged by pulling the bottom T handle. Once the latch pins are disengaged, exhaust the air from the mast while firmly holding down the T handle. Continue holding down the T handle while the first internal mast section above is retracting. When this section is fully retracted, stop exhausting air pressure and release the T handle, locking the retracted section into position. Keep hands clear of retracting mast sections and collars. ***Pinch Point Hazard! Moving parts can crush and cut resulting in death or serious injury. Keep clear of moving parts while operating mast.***
- ③ Follow the same procedure for each subsequent mast section, working from largest to smallest.
- ④ Periodically, open the drain cock when exhausting the mast to drain off any accumulated water.
- ⑤ Once all sections are nested remove the payload and fit the mast top cover (if used) over the mast.



Frozen Water Hazard! Water freezing inside mast or air fittings may render mast inoperable and cause major equipment damage. Open drain, when mast is not in operation, in temperatures near or below freezing.

7. MAINTENANCE AND SERVICE INSTRUCTIONS

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

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

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

Lifting Hazard!

7.1 INTRODUCTION

The chapter provides instructions for maintaining and servicing a Pneumatic Mast. To order spare or replacement parts, always refer to the mast model number and serial number. This information is included in the operator's manual supplied with each mast. The mast serial number is stamped at the bottom of the base mast section. Model number, serial number and additional information is also engraved on the mast identification plate(s). The plate(s) are fixed to the base mast section's collar.

7.2 TOOLS & MATERIALS RECOMMENDED/REQUIRED

Safety Glasses; Safety Gloves; Thread Tape; Level; Rags, Clean & Dry; Non-abrasive cleanser; Utility Knife; Acetone (or other solvent) Mast Lubricant; Sling; Hoist; Ratchet Straps; Allen Wrenches; Chisel; Screwdrivers; Wrenches; Flat Punch ; Saw Horses; Sockets Measuring Tape; Hammer; Torque Wrench; Air Supply; Silicone Sealant; Drill ; String or Thin Wire

7.3 SCHEDULED MAINTENANCE

7.3.1 Mast Cleaning and Lubrication

Pneumatic telescoping masts should be cleaned and lubricated on a regular basis to insure smooth operation and to prolong useful life. This maintenance should be performed typically once a month depending upon local environmental conditions and frequency of use. Signs that cleaning and lubrication are needed can be:

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

PROCEDURE:

① Remove top load from the mast. This will allow the sections of a non-locking mast to more easily be extended from smallest to largest. See Step 3. On locking masts, the sequence of extension can be controlled by the locking collars.

② When a regulator exists in the pneumatic system, reduce its pressure to between 5 and 10 PSIG.

NOTE: 10 PSIG should be sufficient pressure to extend all sections of the mast without a top load. If any section will not extend with 10 PSIG the mast may require overhaul. Consult the factory.

③ One person operating the air control valve should slowly pressurize the mast just enough to extend the top mast section. Another person may need to hold down the larger mast section collars to assure the proper sequence of extension. Close the air control valve as soon as the mast section is up.

④ Dampen a rag with a non-abrasive cleanser or solvent such as lacquer thinner to wipe down the extended mast section. Do not allow the cleaning fluid or solvent to run down inside the collar.

⑤ Repeat steps 3 and 4 for the next larger mast section.

⑥ Inject Mast Lubricant or a lightweight machine oil into the weep hole (drain) of the exposed mast section.

The weep holes are located between one and three feet below the collar on each tube except the top one.

- ⑦ Repeat steps 3, 4 and 6 for each of the remaining mast sections. The larger diameter sections should be injected with approximately lubricant.
- ⑧ Lower the mast completely. Allow several minutes for the lubricant to settle and spread around the wear ring and seal at the bottom of each mast section.

Pinch Point Hazard! Moving parts can crush and cut resulting in death or serious injury. Keep clear of moving parts while operating mast.

- ⑨ Extend the mast again one section at a time in the same sequence (smallest to largest). Wipe off any excess lubricant that flows out of the weep holes.

NOTE: Do not lubricate the exterior of the mast. This will attract dust and contaminants from the air.

Mast Lubricant is specifically formulated for cold weather use but is suitable for year around use. Regular winter maintenance and the frequent use of Mast Lubricant should significantly reduce the potential for mast freeze ups. Mast Lubricant is also intended for use in air in-line lubricators.

7.4 CORRECTIVE MAINTENANCE

7.4.1 REPLACING SEALS

- ① Place the mast horizontally on a pair of sawhorses or similar supports. Secure the mast base tube to the supports so that the mast does not roll off. To disassemble the mast, start with the top section and work toward the base section. Remove any plugs from air inlet ports.
- ② To remove the top mast section pull it out several inches away from the collar and remove the top tube stop. On locking collar models, it is necessary to retract the latch pins to allow the mast section to be pulled out. Remove the collar bolts on the top collar and slide the collar over the end of the mast section. On locking collar models, retract the latch pins fully to allow the collar to slide off the end of the mast section. Slide the top section out. Do not drop the mast section as it comes out.
- ③ Remove the wear ring from the butt plate and wipe it clean. Remove the old seal and clean the seal groove. The mast section should be cleaned inside and outside with a solvent such as lacquer thinner. Do not use anything that might scratch the inside surface of the mast section. Repeat this procedure for each subsequent mast section.
- ④ Refer to 4.5.3 for replacement of collar bearing strips; 4.5.4 for replacement of wear rings; 4.5.5 for replacement of collar inserts; 4.5.6 for replacement of internal bumpers; and 4.5.7 for replacement of external bumpers.
- ⑤ Apply a coat of Mast Lubricant or lightweight machine oil such as SAE 10 to the inside surface of all mast sections except the top section. Oil the new seal. With the lip edge of the seal toward the bottom end of the mast section, slide it on the butt plate and into the seal groove. Replace the wear ring on the butt plate. Repeat this procedure for each mast section.
- ⑥ When reassembling the mast, start with the base section and work toward the top section.
- ⑦ Secure the base mast section of the mast horizontally on saw horses or similar supports. Using a second person or using some other brace to support the top end, hold the next mast section so that the top end of

the section is at a lower elevation than the seal end. Next, rest the lip of the seal on the inside of the receiving section. Slowly raise the lower end of the mast section to horizontal while carefully pressing the lip of the seal into the receiving section. Use your thumbs and forefingers on both sides of the seal to simultaneously press both sides of the seal in an upward motion. Work this way until your fingers meet at the top. Make sure that the seal is in correctly. If not, the mast will eventually leak air. If the seal has not been inserted into the receiving tube correctly, remove the mast section and try again. Once the seal is inserted, guide the wear ring into position within its groove, and slide in the mast section. 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 section.

- ⑧ Slide the section in leaving several inches protruding. Rotate the section so that the match mark "O" stamped on one of the keys at the end of the section is in line with the "O" stamped on the end of the base section.
- ⑨ Replace the collar on the mast section. Line up the match mark "O" on the collar with the "O" on the mast section. On locking collar masts, retract the latch pins to allow the collar to slide onto the end of the mast section. Make certain that all the bolt holes in the collar align exactly with the holes in the mast section. Install and hand tighten the collar bolts and lock washers. Torque the collar bolts to 80 lbs-in maximum.
- ⑩ Repeat steps 6 through 9 for each subsequent mast section.

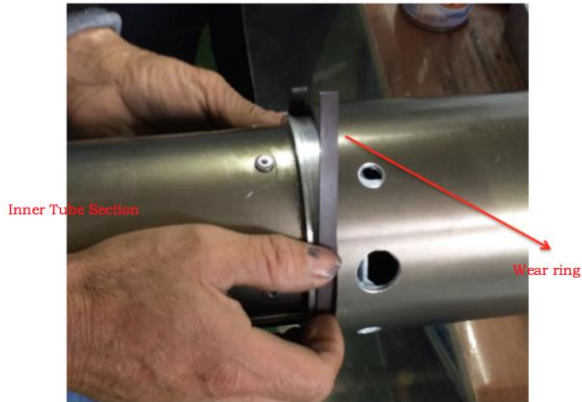


Seals Replacement

7.4.4 REPLACING WEAR RINGS

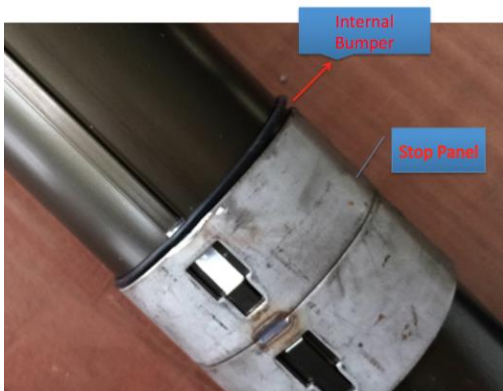
- ① Wear rings are preformed split synthetic bearings that fit around the butt plate above the seal on each interior mast section. Wear rings can be replaced when the mast is disassembled for seal replacement. Check the wear rings for wear. If the wear ring is worn down to the butt plate surface, it must be replaced.
- ② Clean the butt plate and wear ring groove. 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 3mm clearance between the two ends. If necessary, cut enough off one end to get the required gap.
- ③ The wear ring must be held in place until this mast section is inserted into the receiving mast section. 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 Section from sliding inside the next Section, grind the Wear Ring OD as necessary.

Before reassembling the mast section, slide each mast section inside its mating mast section. If the smaller mast section does not slide freely inside the next largest mast section, 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.



7.4.5 REPLACING INTERNAL BUMPERS

- ① The internal bumper, which looks like an O ring, is located on the top edge of the stop panel on each internal mast section. When the mast is disassembled, check the condition of the internal bumper. If the internal bumper has deteriorated, it should be replaced.
- ② Remove the old bumper and carefully stretch the new bumper over the end of the mast section and insert it into the groove machined in the keys. The bumper should fit tightly against the mast section immediately above the stop panel.



8. TROUBLE SHOOTING

PROBLEM	POSSIBLE CAUSE(S)	POSSIBLE SOLUTION(S)
Mast frozen in extended position	Mast base section not drained routinely. Typically freezes around collar area	<ol style="list-style-type: none"> 1) Wrap warming blankets around collar until ice melts. Use heat gun or 500W quartz light. 2) Depressurize mast. Inject anti-freeze, suited for aluminum engines, where top of collar and intermediate tube meet.
Mast frozen in nested position	Mast base section not drained routinely. Typically damages tubes.	Send to manufacture for repair or replacement
Mast will not lower without rocking	<ol style="list-style-type: none"> 1) Mast not oiled routinely 2) Not enough weight 3) Bent tube 4) Broken internal bumper 5) Inserts tight 	<ol style="list-style-type: none"> 1) See mast cleaning and lubrication 2) Add weight to platform or stub adapter 3) Check tube trueness. Order replacement if bent 4) Depressurize. Remove collar and lift tube to check internal bumper. Order replacement. 5) Depressurize. Disassemble. File and grind to profit collar inserts as necessary.
Largest intermediate tube section stuck	<p>Turning handles tight</p> <p>Support bracket tight</p>	<ol style="list-style-type: none"> 1) Remove turning handles and cycle. 2) Loosen bolts
Rotational movement in mast sections	Bearing strips or inserts worn	<ol style="list-style-type: none"> 1) Locking strip collar: order insert collar 2) Non-locking insert collar: order insert collar