**Stiletto® and Stiletto® HD Warranty**

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

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

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

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

The following are general safety precautions that are not 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.

SHOCK HAZARD

Observe general safety precautions for handling equipment using high voltage. Always disconnect power before performing repair or test operations.

HEALTH AND SAFETY HAZARD

Solvent used to clean parts is potentially dangerous. Avoid inhalation of fumes and also prolonged contact to skin.

RESUSCITATION

Personnel working with or near high voltages should be familiar with modern methods of resuscitation. Such information may be obtained from the Bureau of Medicine and Surgery, United States Navy.

RELATED SYMBOLS

Please refer to Chapter 5, Reference Drawings, for photographs of the location of these symbols along with photographs of required labels and nameplates of the Stiletto mast.

This symbol indicates/designates an electrical ground.

This symbol indicates/designates an electrical shock/hazardous voltage hazard. In the case of this particular unit, it indicates the presence of DC power.

This symbol indicates a general warning.
A WARNING is used to call your attention to a potentially hazardous situation, which, if not avoided could result in death or serious injury.

A CAUTION is used to call your attention to a potentially hazardous situation, which, if not avoided, may result in minor to moderate injury and/or property damage.

The following warnings appear in the text and are repeated here for emphasis.

**WARNING**

Do not operate the mast system until you have made certain that the area of operation is free of overhead power lines and other unwanted sources of electricity.

**WARNING**

Death or serious injury could occur if alcohol is not handled carefully. Use it in a well-ventilated area away from open flame, arcing equipment, ignition sources, heaters or excessive heat. Always store alcohol in a properly marked container. Do not smoke.

**WARNING**

Do not move the mast while it is being raised. This applies especially to vehicle mounted masts. The payload must be locked down and secured to the vehicle in the nested position or removed prior to driving the vehicle to prevent damage to the mast and payload.

**WARNING**

Do not move the mast once it has been extended. This applies especially to vehicle mounted masts. Do not drive with the mast extended.

**WARNING**

Make sure there is adequate clearance above the mast system before applying power and operating the system.
At all times prior to system operation you should ensure that:

- The mast extension path is free of personnel and mechanical obstruction.
- All electrical cables are undamaged and properly terminated.
- The control is receiving proper voltage and current.
- The payload is properly installed.
- The payload should be bolted to the mast using all six of the provided threaded holes; it should also be tethered to the top of the mast to prevent it from falling in the event of a failure.
- Any transit tie-downs on the payload have been removed.
- The mast base is not moving.
- The area above the mast is free of mechanical obstructions. Striking an overhead obstruction can damage the mast and leave it partially extended. It can also damage the payload.
- Ensure the area above the mast is free of electrical wires. Operator death may occur by extending the mast into power lines.
- Coaxial and payload control cables are not tangled and that they are free to pay out as the mast is extended.

Deviation from standard operating conditions could cause mast failure.

Use care when manually extending or retracting the mast tubes because the normal stops and protections are being bypassed.

Voltage may be present which can cause severe electrical shock. Always ensure that all electrical circuits to the mast are de-energized and properly tagged during manual operation.

This Stiletto Mast System is supplied with a friction slip clutch to prevent serious damage to the mast in the event of a jam. There is no way to detect the action of the slip clutch other than operator observation. When the clutch begins to slip, that is, when the motor is running and the mast is neither extending nor retracting, release the extend/retract toggle switch immediately to avoid overheating the clutch.
Always turn off power before servicing the mast system.

Make sure all personnel stay clear of the mast and the direction of travel in which it is pointed.

Remove payload before performing maintenance on the mast.

Do not disconnect the power cable from the control box J1 port or the power source while the mast is in motion (extending or retracting). This could result in damage to the control box.

Do not modify the mast lock mechanism or lock housing or attach any components to the lock housing. Do not remove the locks with the mast extended.

Cabling or Nycoil™ should be routed such that it cannot become trapped/pinched between the mast collars during retraction. This can interfere with the lock mechanism functionality.

Do not attempt to deploy or retrieve this mast during electrical storms or when winds exceed 25 mph (40 kph). Helmets or hard hats, eye protection, gloves, and safety shoes or combat boots must be worn while working in the mast deployment area.
Only trained and qualified personnel should install, use and service this equipment.

**CAUTION**

Before performing maintenance or repair, make sure that the Stiletto Mast System is level and secure. Injury to personnel or damage to equipment could occur if the Stiletto Mast System tips over.

**CAUTION**

Any attempt to electrically energize the Stiletto Mast System when manually operating the mast may result in injury. Always ensure that all electrical circuits to the mast are de-energized and properly tagged to prevent injury during manual operations.

**CAUTION**

Be sure that electrical mains polarity is correct before initializing the system.

**CAUTION**

Wear gloves when handling the ground strap to avoid getting cut.

**CAUTION**

Wear gloves when handling the ice breakers to avoid getting cut.

**CAUTION**

Wear gloves when using the hand crank to prevent possible injury.

**CAUTION**

Use caution when operating hand crank to avoid strain.
CHAPTER 1 INTRODUCTION

Refer to the Safety Summary for precautions to be observed while operating or servicing this equipment.

This manual covers the operation, maintenance, troubleshooting and installation instructions for the Stiletto Mast System. The Stiletto Mast System consists of a control system (with cables), telescoping mast, 28 VDC drive unit, support bracket assembly, hardware, an intermediate height readout option, a handheld remote control option and a 90° gear drive option.

1.1 Control System

The control system combines a control box with customer input, power input, sensor input and power output to allow the customer to raise and lower the mast without running past sensor limits. It also keeps track of cycles to aid in preventative maintenance, and has some self-diagnosing capability. It is housed in a NEMA 4X box. The control system also includes fully extended and nested sensors that mount on the mast. It includes an eight digit, IR secure, green LED display which displays status, error codes and intermediate heights. The control box is protected by an internal auto-resetting thermal fuse. This fuse will trip if reverse polarity on the input power is detected or if there is excessive resistance to mast movement. Once the fuse is tripped, there is an approximate 15 second wait until the fuse thermally resets and power is once again restored to the unit. Please refer to the label on the control box.

Control System Cables: Two cables, one for power and one for signals, are permanently attached to the 28 VDC Drive Unit. They have a length of 3 meters, and have MS screw type connectors to attach to the bottom of the control system box.

1.2 Telescoping Mast

The telescoping mast provides the structure that supports the payload. It consists of (9) concentric carbon epoxy composite tubes. Each tube has two internal keys that match with keyways on the adjacent tube to establish azimuth integrity.

1.3 28 VDC Drive Unit

The Screw Drive Stiletto Mast has an ACME screw located in the center of the telescoping mast. As the screw rotates it sequentially lifts up the mast sections. Each moving mast section (all but the base tube) has an ACME nut attached to its bottom. The drive unit extends and retracts the telescoping mast in response to either input from the control system, or by manually cranking the drive (with all power disconnected and the motor brake released).

1.4 Support Bracket Assembly and Mounting Structure Requirements

The support bracket assembly attaches to the telescoping mast and to the customer’s vehicle or structure. Along with the mounting holes in the base of the drive it is an essential part of the mounting of the Stiletto Mast System. The upper support bracket is designed to withstand loading in the horizontal direction and is not intended to bear the vertical forces of the mast and payload. The weight of the mast and payload system must be completely supported by structures supporting the mast base plate. For vehicle applications, it is recommended that the bottom mast mounting bracket is designed to withstand at least a 10G (10 times the load due to gravity) static load. The bracket deflection under the 10G load should be less than 0.125 inches to prevent excessive vertical loads on the upper support bracket. The customer must confirm this design criteria is adequate for each application. The best practice is to rigidly tie the upper support bracket and the lower mounting bracket together to prevent dynamic loads from transferring through the mast due to vehicle deflection.
1.5 **Hardware**

Hardware includes nuts and bolts for the support bracket assembly, a grease gun and a manual crank handle.

1.6 **Intermediate Height Readout**

The intermediate height readout utilizes a proximity sensor that reads the drive sprocket and converts the reading into an extension height of the mast. The readout (in either feet or meters) is incorporated into the control system display. When the mast is fully extended the control box display will read, “DEPLOYED”, and when the mast is nested the control box will read, “NESTED”.

1.7 **90° Gear Drive Variant**

The Will-Burt Company offers variants of its standard models with a 90° gear drive installed on the manual crank point. This allows the user to access the manual crank point from the side or the rear rather than from above. The 90° gear drive should only be used for manual extension and retraction in the event of an electrical power loss. Damage to the 90° gear drive could result from trying to input too much torque by hand, such as breaking through ice, or other similar high torque applications.

1.8 **Optional Hand Held Remote Control**

This option consists of a small box containing a switch that will raise and lower the mast. It includes an extension cable with a MS screw connector that screws into the bottom of the control box. In addition to the control switch there are three indicator lights that indicate the status of the Stiletto Mast System; nested, partially deployed and deployed.

1.9 **Optional PC Interface**

A Personal Computer Interface is an option for controlling the mast height. Standard functions include controls for raising, lowering, stowing and stopping the mast. Additional operational functions include the ability to move the mast to a desired height and to monitor the various mast parameters and limit switch inputs in real time.

1.10 **Optional CE Compliance**

For optional CE compliance an Emergency Stop (E-Stop) switch must be installed in the system. An optional Will-Burt Emergency Stop Switch Kit (Part Number 4792701) can be ordered separately. This kit consists of a panel mounted, push-pull E-Stop switch and a legend plate. The switch must be wired into the precondition contact closure circuit (see Section 2.4) per the following wiring diagram:

![Figure 1-1 E-Stop Wiring Diagram](image-url)
1.11 Reference Data

Reference data for the Stiletto Mast System is given in Table 1-1.

<table>
<thead>
<tr>
<th>Functional Characteristic</th>
<th>3 Meter</th>
<th>4 Meter</th>
<th>6 Meter</th>
<th>10 Meter</th>
<th>15 Meter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mast System Weight (mast control box, cables, bracket)</td>
<td>176 lbs.</td>
<td>190 lbs.</td>
<td>203 lbs.</td>
<td>246 lbs.</td>
<td>320 lbs.</td>
</tr>
<tr>
<td>Fully Nested Height</td>
<td>41”, +1, -0</td>
<td>39”, +1, -0</td>
<td>46”, +1, -0</td>
<td>67”, +1, -0</td>
<td>94.5”, +1, -0</td>
</tr>
<tr>
<td>Fully Extended Height</td>
<td>117”, +4, -0</td>
<td>162”, +4, -0</td>
<td>226”, +4, -0</td>
<td>390”, +4, -0</td>
<td>590.5”, +4, -0</td>
</tr>
<tr>
<td>Rated Payload</td>
<td>220 lbs.</td>
<td>200 lbs.</td>
<td>200 lbs.</td>
<td>175 lbs.</td>
<td>125 lbs.</td>
</tr>
<tr>
<td>*Maximum Payload</td>
<td>270 lbs.</td>
<td>250 lbs.</td>
<td>250 lbs.</td>
<td>250 lbs.</td>
<td>200 lbs.</td>
</tr>
<tr>
<td>Extension Time (28 VDC)</td>
<td>&lt;45 sec.</td>
<td>&lt;60 sec.</td>
<td>&lt;90 sec.</td>
<td>&lt;200 sec.</td>
<td>&lt;330 sec.</td>
</tr>
<tr>
<td>Extension Time (18.1 VDC)</td>
<td>&lt;70 sec.</td>
<td>&lt;135 sec.</td>
<td>&lt;180 sec.</td>
<td>&lt;300 sec.</td>
<td>&lt;500 sec.</td>
</tr>
<tr>
<td>Operating Voltage Range</td>
<td>18.1-33 VDC</td>
<td>18.1-33 VDC</td>
<td>18.1-33 VDC</td>
<td>18.1-33 VDC</td>
<td>18.1-33 VDC</td>
</tr>
<tr>
<td>** Max Tilt from Vertical</td>
<td>10°</td>
<td>10°</td>
<td>10°</td>
<td>10°</td>
<td>5°</td>
</tr>
<tr>
<td>Operational Wind Speed</td>
<td>Consult Factory</td>
<td>Consult Factory</td>
<td>Consult Factory</td>
<td>Consult Factory</td>
<td>Consult Factory</td>
</tr>
<tr>
<td>Survival Wind Speed</td>
<td>Consult Factory</td>
<td>Consult Factory</td>
<td>Consult Factory</td>
<td>Consult Factory</td>
<td>Consult Factory</td>
</tr>
<tr>
<td>†Current Draw, 125 lbs. Payload at 28 V</td>
<td>12-15A</td>
<td>12-15A</td>
<td>12-15A</td>
<td>12-15A</td>
<td>12-15A</td>
</tr>
<tr>
<td>Inrush Current</td>
<td>120A</td>
<td>120A</td>
<td>120A</td>
<td>120A</td>
<td>120A</td>
</tr>
<tr>
<td>Operating Range</td>
<td>-40°F to +131°F (-40°C to +55°C) / 90 % RH non-condensing / 15,000 ft. (4572 m) above mean sea level</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage/Transportation</td>
<td>-40°F to +160°F (-40°C to +71°C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1-1  Reference Data

* Maximum payload weight will impact other performance specifications. Consult factory.

** With “rated Payload” as specified in this table.

† For proper operation under full load conditions, power supply must maintain 18.1 Volts at control, at up to 60 Amps for 2 second intervals and 40 Amps continuous. If voltage drops below 5 Volts at any time, damage to the control may occur.

For repairs, ship in the original crate or purchase another crate if the original crate is not available.
CHAPTER 2 INSTALLATION

This section provides instructions for installing the Stiletto Mast System.

2.1 Mast

Refer to the top level assembly drawing supplied with your mast.

2.1.1 Align the Base

Align (match) the base of the mast and the support bracket holes, and create mounting places in the host site. The mast should be as plumb as possible. Make sure the installation site does not interfere with the cables. See section 1.4 for requirements for the mast mounting structure.

2.1.2 Locate Drain Holes

Note that there are (14) drain holes (3/8” diameter, quantity 13; 7/16” diameter, quantity 1) on the bottom of the mast to drain off rain water and condensation. Refer to drawing B-54878, Stiletto Drain Hole Locations, in your reference drawings. The surface to which the base of the mast bolts must allow for drainage; optional drain plate is available.

2.1.3 Mount Support Bracket

Mount the support bracket using customer supplied 3/8 inch diameter or M10 stainless steel fasteners with a stainless steel flat washer and means to prevent loosening. Torque the fastener to 250 ±10 inch-pounds (28.2 ± 1.1 Nm).

2.1.4 Secure Mast Base

Secure the base of the mast with customer supplied ½ inch diameter or M12 stainless steel fasteners with a heavy duty extra thick (MS 15795-819) stainless steel flat washer and means to prevent loosening. Torque the fastener to 500 ± 20 inch-pounds (56.5 ± 2.2 Nm). Be sure to attach one end of the provided grounding strap to the mast at any of the designated locations. The other end of this strap is to be attached to the chassis of the vehicle or a known earth ground. These locations on the mast are designated with the symbol referenced at the beginning of the manual. Please refer to Chapter 5 for pictures of these labels on the unit.

⚠️ CAUTION

Wear gloves when handling the ground strap to avoid getting cut.

2.1.5 Mount Payload

Mount the customer-supplied payload or an adapter plate to the top tube of the mast via the 6 threaded Inserts in the top tube. Choose the appropriate length of screw in order to allow maximum thread engagement with these threaded inserts. The payload mounting should be concentric with the centerline of the mast. Consult the factory for payloads offset from the mast centerline. Please refer to the reference drawings located in Chapter 5 of this manual for details regarding the payload interface.

⚠️ CAUTION

Striking an obstruction with an extended mast could generate in excess of 1,000,000 inch-pounds (113,000 N-m) of over-turning moment before breaking the mast. The mounting structure must be designed accordingly.
Be sure that electrical mains polarity is correct before initializing the system.

2.2 Controls
Refer to Figure 7-6 Stiletto Control Box for the hole pattern. Use either ¼ inch diameter or M6 stainless steel fasteners and means to prevent loosening. Be sure to attach one end of the provided grounding strap to the control box at the designated ground location. The other end of this strap is to be attached to the chassis of the vehicle or a known earth ground. The ground location on the control box is designated with the symbol referenced at the beginning of the manual. Please refer to Section 5 for pictures of these labels on the control box.

Refer to Drawing 46002, located in Section 5 for the location of the connector for the user supplied power. This mast system is designed to operate on 28 VDC power per MIL-STD 1275. The mast system does NOT have a master power switch. If such a switch is desired the integrator must provide it with the supplied power.

2.3 Power Cable Requirements
The unit requires a customer supplied 10 gauge power cable. With long cable runs, a heavier gauge wire may be needed. Power is applied through a supplied P/N 213075 (MS3106E24-11S) connector or equivalent.

The previous control box (P/N 4494601 or 4086801) power cable will not connect to control box 4600201. An adapter cable (4681701) is available to connect the previous control box power cable to control box 4600201.

A field replacement kit (P/N 4681801) Figure 2-1 is available to adapt control box 4600201 to the previous control box mounting hole pattern with an interface plate. This kit also contains the power cable adapter mentioned above.

2.4 Additional Control Features
The control has three handshaking features detailed in section 3.1.5:

1. Precondition Contact closure,
2. Fully Nested Enable circuit,
3. Fully Extended Enable circuit.

These circuits use the power connector 000013-409-001 to connect with the world. For the mast to operate the Precondition Contact closure must be made either with a purposeful switch OR WITH A JUMPER (See Figure 7-7 and Figure 7-8). Any jumper must be part of the cable because the control box is sealed for warranty purposes. See Section 1.10 for optional E-Stop switch use in the precondition contact closure circuit.
Figure 2-1 Stiletto Control Box (4600201) Kit.
CHAPTER 3  CONTROLS OVERVIEW

3.1 Description of Controls

3.1.1 Enclosure - The controls are contained in an aluminum NEMA 4X box. Please refer to drawings 46002 in the reference section for its size and for the location of the mounting holes. The box contains the screw bulkhead connectors for the signal and power cables from the mast, for the cable for the optional hand held remote, and for the customer-supplied power and handshake signals. It also contains an up/down switch and an 8-character alphanumeric display.

**WARNING**

Deviation from standard operating conditions could cause mast failure.

3.1.2 MOSFETS – The control box uses MOSFETS for electrical switching purposes. The main function of the control is to manage motor direction and to dynamically brake the motor for a short period of time at the end of each motion. The motor draws about 10 Amperes continuously and about 120 Amperes on start-up under "normal" conditions (See Table 1-1). However, to ensure proper operation under high load and/or icing conditions, a minimum 18.1 Volt supply voltage must be maintained at the control at up to 60 Amps for 2 second intervals and 40 Amps continuous.

**CAUTION**

Damage to the controls may occur if voltage drops below 5 Volts during operation of the mast.

3.1.3 Sensors - The control relies upon two limit sensors attached to the mast. The fully nested sensor is a mechanical limit switch, which is triggered when a probe attached to the bottom of the center tube hits the lever on the switch. The full extension sensor is a reed switch attached to the outside of the base tube which detects the approach of a permanent magnet attached to the bottom of the largest moving tube. A proximity sensor is used to determine the height readout of the mast sections during deployment and retraction. The mast height is displayed on the control box.

3.1.4 Capabilities - The control allows for the powered extension and retraction of the Stiletto Mast System. It uses the input from two extreme limit switches to prevent the user from over-extending or over-nesting the mast. When a directional command is terminated, the control automatically shorts the motor leads to dynamically brake the motor for a short period of time. The control is wired for an optional handheld remote control. The alphanumeric display shows status of the mast (nested, intermediate height readout and fully deployed), the number of cycles on the mast and any error messages.

3.1.5 Handshaking - The control system has three handshake signals (see Figure 7-7 and Figure 7-8). The first is an input for a hatch switch or other pre-condition contact closure. An open circuit will cause the control to display its software revision and will inhibit extension. This input must be driven by an isolated contact closure capable of handling 20 milliamperes at 28 volts. The second signal is for a remote enable output. This is an isolated relay contact that closes when the mast is fully nested; this could be used to inhibit (prevent) an external
operation. The third signal is an isolated relay contact that closes when the mast is fully extended. These contacts are rated for 1 Ampere at 28 VDC.

3.1.6 Intermediate Height Readout - This mast is supplied with intermediate height readout. It consists of a proximity sensor that reads the drive sprocket and converts the reading into an extension height of the mast. The readout in the control display window is zeroed out at the nested height. If the mast is never nested, because of a saddle type mounting system, then the displayed height will compound in error the more times the mast is extended. In Metric units mode the display reads “XX.XX M” where XX.XX is the extension of the mast in meters. The resolution is .01 meters and the accuracy is ± .02 meters. In English units mode the display reads “XX.XX F” where XX.XX is the extension of the mast in feet. The resolution is .01 feet and the accuracy is ± .05 feet. As the mast extends, the display shows the extension rather than enunciating “PARTIAL”. Remember, extended height equals extension PLUS the nested height.

3.1.7 Auto-Resettable Thermal Breaker – The control is protected by an internal auto-resetting thermal circuit-breaker. This circuit-breaker will trip if reverse polarity on the input power is detected or if there is excessive resistance to mast movement. Once the circuit-breaker is tripped, there is an approximate 15-30 second wait until the circuit-breaker thermally resets and power is once again restored to the unit. If the circuit breaker trips more than once, consult the troubleshooting section of this manual. Please refer to the label on the control box.

3.2 Human-Machine Interface (HMI)

3.2.1 Display - On front of the control box is an eight character green LED alphanumeric display. This shows the status of the mast, either NESTED (intermediate height), or fully DEPLOYED. With the intermediate height readout gives the extension of the mast in at a height above the nested height. It can also give the number of cycles on the mast, and a variety of error messages.

3.2.2 Guarded Raise/Off/Lower Switch - On the side of the main control box is an SPDT (Mom-Off-Mom) toggle switch that is used by the operator for raising or lowering the mast. The switch is protected by a switch guard and a waterproof boot.

3.2.3 Guarded Override Switch - The override switch is SPST (Off-Mom) toggle protected by a switch guard and a waterproof boot. This switch is to be used in conjunction with the Mast Operation Switch to ignore any errors returned by the control box in order to raise or lower the mast. The override switch must be engaged and held in the engaged position while the Mast Operation Switch is used to raise or lower the mast.

**WARNING**

This override switch is only to be used for emergency operation of the mast.

When using the override switch (in conjunction with the Mast Operation Switch), use extreme caution, specifically at the fully extended and fully nested areas of the mast deployment. When
the override switch is engaged, all sensors and faults generated by the controls of the mast are ignored. Power to the drive motor will continue as long as the button is held, even at the extreme high and low ends of travel. The switches typically used to prevent the mast from over-travelling at the extreme ends of travel will not function normally. Holding the Mast Operation Switch beyond the limits of travel may result in damage of the mast.

**WARNING**

**Prior to system operation ensure that:**

- The mast area is free of personnel and mechanical obstruction.
- All electrical cables are undamaged and properly terminated.
- A power source capable of delivering specified system voltage and current has been properly connected to the Control Enclosure.

### 3.3 Options

3.3.1 **Hand Held Remote** - This mast may be supplied with a hand held remote control (See Drawing B-3766). It consists of a small box that contains an SPDT (Mom-Off-Mom) toggle switch that is used by the operator for raising or lowering the mast. This switch is protected by a switch guard and a waterproof boot. It also has three red LED indicators that light appropriately when the mast is fully nested, partially extended or fully deployed. They backlight appropriate text to enunciate these messages. The hand held remote does NOT have an alphanumeric readout displaying extended height. The hand held remote control attaches via an extension cable to a bulkhead connector on the bottom of the control box.
4.1 Turn System On

The mast control does not have a master power switch. The operator powers up the system at the level of the vehicle or shelter by supplying power to the proper contacts on the control box connector. If desired, the integrator can provide a master power switch upstream from the mast system. The control will generate a sign-on message of “STILETTO” at power up for a short period of time, and finally will display NESTED, intermediate height, DEPLOYED or some error code as appropriate.

4.2 Raise the Mast

Place the Mast UP / DOWN switch in the UP position. As long as the switch is held in the UP position the mast will raise. If the switch is engaged long enough, the mast will automatically stop when the full extension limit switch is made. At that point the alphanumeric display will say DEPLOYED. If the UP / DOWN switch is released before the maximum extension the mast will quickly stop, and the alphanumeric display will say display the intermediate height. Be sure to stay clear of the collars during operation as they create a pinch point hazard.

4.3 Lower the Mast

Place the Mast UP / DOWN switch in the DOWN position. As long as the switch is held in the DOWN position the mast will continue to lower. If the switch is engaged long enough the mast will automatically stop when the full nested limit switch is made. At that point the alphanumeric display will say NESTED. If the UP / DOWN switch is released before nesting the mast will quickly stop, and the alphanumeric display will display the intermediate height. Be sure to stay clear of the collars during operation as they create a pinch point hazard.

4.4 Access the Number of Cycles

When the mast is nested releasing the toggle switch and then reapplying the toggle switch in the DOWN direction will cause the control to display the number of cycles on the mast.
CHAPTER 5 Manual Operation

5.1 Hand Crank (Direct)

This mast may be raised or lowered manually. Refer to your top level assembly drawing to find the square end shaft on the drive unit that is the manual input point. Use the hand crank provided to raise (clockwise) or to lower (counter-clockwise) the mast. Be sure to stay clear of the collars during operation as they create a pinch point hazard. When the mast is not powered the motor leads are not shorted together thus disabling dynamic braking. The normal limit switches are not in effect during manual operation. There are mechanical hard stops just beyond both the upper and lower limit switch locations that will stop the mast safely. Nevertheless, it is good practice to stop the mast at the normal positions. The manual crank handle should be stored in an accessible area in close proximity to the mast when not in use.

⚠️ WARNING

Never override the mast while power is still applied to the unit. With the manual brake disengaged the mast can back-drive. Potentially destructive kinetic energy may be generated. You must use the hand crank not only to move the mast, but also to keep the mast from moving on its own.

⚠️ CAUTION

Wear gloves when using the hand crank to prevent possible injury.

⚠️ CAUTION

Use caution when operating hand crank to avoid strain.

5.2 Hand Crank (90° Gear Drive Option)

The manual input point can normally only be accessed from above. The Will-Burt Company offers a 90 degree gear box variant which bolts onto the manual input point and provides an identical ½ inch square interface to the hand crank. This variant can be oriented either to the side or to the rear per customer instruction. The operation is identical to hand crank operation. The 90° gear drive should only be used for manual extension and retraction in the event of an electrical power loss. Damage to the 90° gear drive could result from trying to input too much torque by hand, such as breaking through ice, or other similar high torque applications.
5.3 Error Messages

There are two possible Error Messages and their meanings are shown in Table 5-1.

<table>
<thead>
<tr>
<th>Message</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>“CONFLICT”</td>
<td>Conflicting requests between the local UP / DOWN and the remote UP / DOWN switches have occurred. The mast will come to a stop, and normal operation will resume when at least one of the switches is returned to the “OFF” position.</td>
</tr>
<tr>
<td>“L.S. ERR”</td>
<td>Both the Upper and Lower limit switches are open, indicating the impossible state of being fully extended and fully nested at the same time. The fault can only be cleared by turning off the control and correcting the problem. This will most often mean that there is a broken wire connection, one of the limit switches is defective, or the sensor cable is disconnected.</td>
</tr>
</tbody>
</table>

Table 5-1 Error Messages

5.4 Overriding Errors Codes and Warnings

**CAUTION**

Use extreme caution when performing this override function as a hazardous situation may exist.

The override function is provided to allow operation of the mast under abnormal conditions so that the mission can be completed even if the mast control system has active System Faults. *Extreme caution must be exercised when using the Override switch as damage to the mast can occur.* The indication of a System Fault indicates that maintenance is required. System Faults will be displayed on the on-board display as well as the control box (within the enclosure). It is important to note that all mast motion stops and all normal inputs are ignored when a System Fault occurs.

The following steps will allow manual override of the errors:

1. Engage the Override switch – the switch must be held into position while another command (mast UP/DOWN) is engaged (hold both switches simultaneously).
2. Engage the UP or DOWN switch to further control the mast. The error message will remain on the on-board display until that error is no longer valid. If the error requires reset, replacement, or repair of a component of the system, the error will remain until that action is performed.

**NOTE:** Powering down the mast system for more than 10 seconds will clear any faults, provided the fault condition(s) no longer exists on power-up.
CHAPTER 6  MAINTENANCE AND SERVICE INSTRUCTIONS

6.1 Preventative Maintenance Checks and Services (PMCS)

Preventive Maintenance Checks and Services (PMCS) is the systematic care, inspection and servicing of equipment to keep the system in good condition and to prevent breakdowns. When received for maintenance, the assembly has been removed from the site on which it was mounted and is otherwise fully assembled. Removal typically requires disconnecting the power and signal cables from the mast control box, removal of the mast payload, removal of the mast support bracket assembly and removal of the mounting screws from the base plate. Consult vehicle manual for specific installation details. All procedures must be performed by trained personnel only. The Will-Burt Company recommends that the owner create and maintain a maintenance log for each mast.

6.1.1 Schedule

The Preventative Maintenance Schedule provided in Table 6-1 lists inspections and care required for keeping the Stiletto Mast System in good operating condition.

Record all inspection and maintenance activities in the mast system's maintenance record log. When doing PMCS, several soft, clean rags will always be required. The following are common procedures and checks:

a. Keep it clean. Dirt, grease, oil and debris only get in the way and may cover up a serious problem. Clean as you work and as needed. Use denatured alcohol on all metal surfaces. Use water when cleaning rubber or plastic material. Use soap and water when cleaning the mast tube’s exterior surfaces.

b. Rust and Corrosion. Check for rust and corrosion. If any bare metal or corrosion exists, remove corrosion with a wire brush and repair with touchup paint.

c. Bolts, Nuts and Screws. Check for obvious looseness, missing, bent or broken condition. It is not practical to check all hardware installation torques, but look for chipped paint, bare metal or rust around bolt heads. If you find a bolt, nut or screw that is loose, tighten it.

d. Electric Wires and Connectors. Look for cracked, frayed or broken insulation, bare wires and loose or broken connectors. Replace as required. Tighten loose connectors.
<table>
<thead>
<tr>
<th>Item No.</th>
<th>Interval</th>
<th>Location/Item to Check</th>
<th>Procedure</th>
<th>Not Fully Mission Capable if:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>During operation</td>
<td>Base of Mast Tube Assemblies</td>
<td>During extension and retraction of the mast and payload (i.e.: antenna), observe the outer surface of the tubes for damage and accumulation of foreign material.</td>
<td>Tubes are damaged</td>
</tr>
<tr>
<td>2</td>
<td>Weekly</td>
<td>Mast Exterior Surfaces</td>
<td>Visually check for foreign material, damage or obstructions. Remove any foreign material or obstructions as necessary.</td>
<td>Tubes are damaged</td>
</tr>
<tr>
<td>3</td>
<td>Weekly</td>
<td>Mast Exterior Coating</td>
<td>Check condition of coating. Coating shall be in good condition with no bare metal or composite material exposed.</td>
<td>Tubes are damaged</td>
</tr>
<tr>
<td>4</td>
<td>Weekly</td>
<td>Mast Exterior Fasteners</td>
<td>Visually check that all fasteners are tight. Pay special attention to those attaching the Stiletto Mast System to the site, the mast to the drive unit, the motor to the drive unit, and the payload to the mast.</td>
<td>Loose fasteners joining major components cannot be tightened.</td>
</tr>
<tr>
<td>5</td>
<td>Weekly</td>
<td>Mast Exterior Operation</td>
<td>During extension and retraction of the mast, observe the mast operation for evidence of binding.</td>
<td>Binding is observed.</td>
</tr>
<tr>
<td>6</td>
<td>Weekly</td>
<td>Cycle Counter</td>
<td>Check that counter is operating properly by noting that during initial cycle of the mast the counter increases by one. Refer to paragraph 3.3.6 for cycle counter operation.</td>
<td>N.A.</td>
</tr>
<tr>
<td>7</td>
<td>Weekly</td>
<td>Cables and Bulkhead Connectors</td>
<td>Check that connectors are clean, pins are undamaged, and threads are in good condition. Check for looseness and damage to insulation.</td>
<td>Connector is damaged too severely to mate with corresponding cables.</td>
</tr>
<tr>
<td>8</td>
<td>Weekly</td>
<td>Mast Top Mounting Adapter</td>
<td>Check that plate is firmly attached to top tube assembly, threaded holes are in good condition, and no damage has penetrated anodizing. Replace damaged adapter plate or tighten to composite top tube as required.</td>
<td>Plate is loose or threaded inserts are missing or damaged.</td>
</tr>
<tr>
<td>9</td>
<td>Weekly</td>
<td>Mast Exterior Surfaces</td>
<td>Check all visible surfaces of the mast for damage, especially cracking. Pay particular attention to the base of the mast.</td>
<td>Cracks are visible in mast composite material.</td>
</tr>
<tr>
<td>10</td>
<td>250 Cycles</td>
<td>Lube port on side of mast</td>
<td>See Section 6.2 Lubrication Instructions</td>
<td>Mast will not work.</td>
</tr>
<tr>
<td>11</td>
<td>500 Cycles</td>
<td>Base of Mast Drive Unit</td>
<td>See Section 6.2 Lubrication Instructions</td>
<td>Mast will not work.</td>
</tr>
<tr>
<td>12</td>
<td>2500 Cycles</td>
<td>Replacement of Nuts</td>
<td>Special Training Requirements. Contact Will-Burt Co. for details about factory training and/or factory rebuild.</td>
<td>Mast will not work.</td>
</tr>
<tr>
<td>13</td>
<td>10,000 Cycles</td>
<td>Mast</td>
<td>Recommended to return to factory for complete overall and rebuild.</td>
<td>N. A.</td>
</tr>
</tbody>
</table>

Table 6-1 Preventive Maintenance Schedule
6.1.2 Expendable and Durable Items Required

Table 6-2 lists the expendable and durable items required to perform preventive maintenance on the Stiletto Mast System.

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Item Name, Description, Part Number</th>
<th>U/M</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alcohol, denatured</td>
<td>OZ</td>
</tr>
<tr>
<td>2</td>
<td>Lubricant, Drive Screw, Will-Burt P/N 912542</td>
<td>OZ</td>
</tr>
<tr>
<td>3</td>
<td>Oil, engine, SAE 30 (preferred) or 15W40</td>
<td>QT</td>
</tr>
<tr>
<td>4</td>
<td>Rags, wiping, clean</td>
<td>EA</td>
</tr>
</tbody>
</table>

Table 6-2 Expendable and Durable Items Required.

6.2 Lubrication Instructions

6.2.1 External Lubrication- Refer to Table 6-1 and perform the following procedure every 500 cycles.

a. Remove protective cap over manual drive shaft. (Figure 6-2)

b. Using an oil can or eye dropper, apply 3 to 5 drops of SAE 30 (preferred) or 15W40 engine oil (Item 3, Table 6-2) to bushing supporting the manual drive shaft.

c. Wipe off excess oil. Replace protective cap.
6.2.2 **Gear Box Lubrication** – Lubricate the 90 degree Manual Crank Input Gear Box (if option is installed). Refer to Table 6-1 and perform the following procedure every 500 cycles.

a. Remove the four #8-32 X ¾ SHCS, SSTL bolts attaching the 90 degree gear box to the upper tension slider. (see Figure 6-1 and Figure 6-3)

b. Remove the 90 degree gear box from the upper tension slider. (see Figure 6-1 and Figure 6-3)

c. Use a clean screw driver or punch to pack drive screw lubricant part number 912542 into the driven hollow shaft. Fill the cavity between the driven hollow shaft and the bearing plug with lubricant completely. (see Figure 6-1)

d. Wipe off excess lubricant before assembly, and ensure that the hollow shaft keyway is not packed with lubricant to allow clearance for the 90 degree gear box shaft to fit.

e. Replace the 90 degree gear box onto the upper tension slider, and check for alignment of the bolt holes. Also, check that the gear motor keyway is aligned in the driven hollow shaft. (see Figure 6-1)

f. Apply Loctite 242 and tighten the four #8-32 X ¾ bolts.

---

**Figure 6-1 Manual Crank Input Gear Box Assembly**
Figure 6-2 Lubrication Point on Mast Drive

Figure 6-3 Lubrication Point on Mast Drive-90 degree Manual Crank Input Gear Box (if Applicable)
6.2.3  **Lubricating the ACME Screw.** Refer to Figure 6-4 and perform the following procedure every 250 cycles.

a. Charge the Grease Gun Assembly (Item No. 912541), supplied with each mast, with a cartridge of Drive Screw Lubricant, Will-Burt part number 912542, ordered separately.

⚠️ **CAUTION**

Do not substitute any grease for the Will-Burt Drive Screw Lubricant, 912542. This is a super-premium aerospace grade product, and is required for specified performance and life.

⚠️ **WARNING**

Remove payload before performing maintenance on the mast.

⚠️ **WARNING**

Before performing maintenance or repair, make sure that the Stiletto Mast System is level and secure. Injury to personnel or damage to equipment could occur if the Stiletto Mast System tips over.

b. Extend the mast completely.

c. Remove the hex shaped plug from the grease port about 16 inches up on the side of the mast base tube. See Figure 6-3

d. Remove the hydraulic coupling (cap) from the output tube of the grease gun assembly. Insert the tube through the access hole and apply a generous dab of grease onto the screw. Jog the mast about ½ inch (one half revolution of the screw) and apply another dab of grease. It is not necessary to use the entire cartridge of grease during one maintenance procedure.

e. Replace the access plug into the access plate. Screw the hydraulic coupling (cap) back onto the output tube of the grease gun.

f. Retract the mast completely, extend it completely and retract it completely to distribute the grease over all the nuts and the complete screw.

g. Record the date, cycle count and procedure in the mast’s maintenance record.
6.3 Routine Maintenance
Specific to the control system, only nominal routine maintenance is required. Refer to Table 6-1 for detailed mechanical maintenance requirements. On a routine basis —WEEKLY— perform the following:

a. Ensure that all mounting fasteners are tight, particularly on the motor.
b. Ensure that all cable connections are snug.
c. Inspect all cables for frayed and damaged wiring.
d. Using a soft, non-abrasive cloth, wipe the bezel clean on the alphanumeric display.
e. Refrain from applying a stream or high pressure water directly to the control box.

6.4 Troubleshooting
The following pages show many of the more probable error conditions. Where more than one probable cause can explain an error condition, they are listed in an “indented” fashion, with specific corrective actions for each situation further indented. Causes are listed in order of probability from highest to lowest. It should be noted that some “errors” are more aptly called “states”, and do not necessarily indicate improper operation.

6.4.1 Pre-Condition Contact
Provisions have been made (see paragraph 3.1.5) for a pre-condition contact “handshake” circuit. If the circuit is open the operation of the mast is prevented and the software revision level is displayed on the alphanumeric display. This feature is normally disabled by a jumper installed across the connector pins. The typical application of this capability is a sensor on a hatch above the mast. Correcting the condition will clear this error.
a. Pre-condition is not present (i.e. the hatch is closed).
   **Corrective Action**: Establish the proper pre-condition (i.e. open the hatch).

b. Damaged/inoperative pre-condition switch.
   **Corrective Action**: Check the switch for continuity and replace if necessary.

c. Missing connector wire (no handshaking used). (There is no hatch.)
   **Corrective Action**: Refer to drawing 46002, and replace a jumper between the two appropriate contacts.

d. Malfunctioning mast control panel.
   **Corrective Action**: Contact authorized service center for evaluation and possible return for repair.

### 6.4.2 The Mast Has Stopped Moving Upward or Is Moving Very Slowly.

⚠️ **WARNING**

This Stiletto Mast System is supplied with a friction slip clutch to prevent serious damage to the mast in the event of a jam. There is no way to detect the action of the slip clutch other than operator observation. When the clutch begins to slip, that is, when the motor is running and the mast is neither extending nor retracting, release the UP / DOWN toggle switch immediately to avoid overheating the clutch.

a. Interference to mast.
   **Corrective Action**: Inspect and remove obstructions, tangled payload cables or lighten the payload.

b. Damaged motor cable.
   **Corrective Action**: Disconnect the motor cable from the mast. Inspect the cable for continuity and shorts. Replace faulty cable.

c. Damaged/inoperative motor.
   **Corrective Action**: Replace the motor.

d. Malfunctioning mast control panel.
   **Corrective Action**: Contact authorized service center for evaluation and possible return for repair.

e. ACME nuts fail to synchronize with ACME drive screw.
   **Corrective Action**: Try retracting the mast three inches and approach that region again. If this does not work the nuts may be worn out and will need to be replaced.

   **Corrective Action**: Try raising the mast with the hand crank. There may be a burr on the nut, and action with the hand crank, which is not limited by the torque limits on the friction safety clutch set at the factory, may power through it. If this does not work the nuts may be worn out and will need to be replaced.

f. Clutch is out of adjustment.
   **Corrective Action**: If power is to the motor and the motor is running with no movement or little movement of the mast, the clutch may be in need of tightening. Contact authorized service center for evaluation and possible return for repair.
6.4.3 The Mast Has Stopped Moving Downward.

**WARNING**

This Stiletto Mast System is supplied with a friction slip clutch to prevent serious damage to the mast in the event of a jam. Detection of the clutch slipping is when the tube section does not extend/retract when electrical power is applied via the UP/DOWN toggle switch. Release the switch to avoid overheating the clutch.

- **a.** Damaged motor cable.
  
  **Corrective Action:** Disconnect the motor cable from the mast. Inspect the cable for continuity and shorts. Replace faulty cable.

- **b.** Damaged/inoperative motor.
  
  **Corrective Action:** Replace the motor.

- **c.** Malfunctioning mast control panel.
  
  **Corrective Action:** Contact authorized service center for evaluation and possible return for repair.

- **d.** ACME nuts fail to synchronize with ACME drive screw.
  
  **Corrective Action:** Try raising the mast three inches and approach that region again. If this does not work the nuts may be worn out and will need to be replaced.

  **Corrective Action:** Try lowering the mast with the hand crank. There may be a burr on the nut, and action with the hand crank, which is not limited by the torque limits on the friction safety clutch set at the factory, may power through it. If this does not work the nuts may be worn out and will need to be replaced.

- **e.** Clutch out of adjustment.
  
  **Corrective Action:** The clutch may be in need of tightening. Contact authorized service center for evaluation and possible return for repair.

6.4.4 Nothing Works and the Display does not illuminate.

- **a.** Power to the mast is interrupted at the shelter or vehicle level.
  
  **Corrective Action:** Refer to shelter or vehicle level maintenance procedures.

- **b.** Internal Breaker Tripped
  
  **Corrective Action:** Wait 15 seconds (per the label on the box) for the thermal breaker to cool/auto reset and retry. After three consecutive attempts, contact authorized service center for evaluation and possible return for repair.

- **c.** The control box has been damaged.
  
  **Corrective Action:** Contact Authorized Service facility for repair disposition.

6.4.5 Mast prematurely stops upward travel and control box indicates “DEPLOYED.”

- **a.** A heavy object struck the mast during deployment causing the “DEPLOYED” limit switch to falsely activate.
  
  **Corrective Action:** Look over mast for damage and secure any loose objects.
Corrective Action: Lower the mast using the toggle switch for 3 (three) seconds until the Control Box display no longer reads “DEPLOYED”. Use the toggle switch again, for 3 (three) seconds, to raise the mast to full deployment height.

6.4.6 Control Box display reads “NESTED” when mast is partially extended.
   a. Misinterpreted Electronic Limit Switch Status

   Corrective Action: Motor needs to be operated continuously for 3 (three) seconds, for display to change from “NESTED” to intermediate height status.

6.4.7 After Power cycle (switching main power off, then back on), the display does not read correct “NESTED/ACTUAL INTERMEDIATE HEIGHT/DEPLOYED” status.
   a. Must fully nest mast to re-zero height readout
   b. Misinterpreted Electronic Limit Switch Status

   Corrective Action: Motor needs to be operated continuously for 3 (three) seconds, for display to change from “NESTED” to “PARTIAL” status.

6.4.8 Mast does not move up/down when switch is activated and control box display goes blank or restarts.
   a. Insufficient voltage at control under load

   Corrective Action: Check supply voltage and power cabling.

6.5 Special instructions for clearing HEAVY ice buildup

During periods of heavy precipitation and high ice buildup on the mast there is a chance of jamming during retraction of a deployed mast. This high ice buildup on the collar sections (horizontal surfaces) of the mast could cause the tube locks mechanisms to become “out of time” and cause internal damage. This ice buildup must be cleared away during retraction just before the individual tube and collars contact each other. Shown on Page 20 are the areas to clear the ice away from the tubes and collars prior to nesting. For instruction on how to remove ice from a jammed lock assembly refer to Step 5.

⚠️ CAUTION ⚠️

Wear gloves when handling the ice breakers to avoid getting cut.

The order of operations concerning ice removal is as follows:

Note: Only retract the mast with electrical power, do not attempt to use the manual crank input. Internal damage may occur using the manual crank during high torque applications.

Step 1. Attempt to retract the mast with electrical power only. If the mast begins to break the ice on its own, proceed to Step 4. If the mast stalls and does not retract, proceed to Step 2. Do not continue to labor the motor with a stalled tube set; because this will cause wear on the slip-clutch.

Step 2. Begin clearing away the ice on horizontal surfaces (collar) closest to the operator. Utilizing non-piercing tools, begin by breaking the ice bond and using a striking motion away from the tube (tangent to the tube). Continue to do this ice clearing around the collar. Then remove the remaining ice from the vertical lock post on
the collar. Next, begin to remove the ice buildup on the “nesting” tube. Use extreme caution when removing ice from the circumference of the tube, only 1-2 vertical inches of ice will need to be removed. Use a tangential clearing motion to keep from piercing the tube. Proceed to Step 3.

**Step 3.** Once again, attempt to electrically retract the mast. If the tube set is still stalled and will not retract, then ice has built up internally and the unit will need to be thawed in order to regain functionality. Do not continue to labor the motor with a stalled tube set; save the slip-clutch. If the mast does retract, proceed to Step 4.

**Step 4.** Continue to retract the tube until it is a few inches from nesting and contacting the lower collar. Begin clearing away the ice on horizontal surfaces (collar) closest to the operator. Utilizing non-piercing tools, begin by breaking the ice bond and using a striking motion away from the tube (tangent to the tube). Continue to do this ice clearing around the collar. Next, remove the remaining ice from the vertical lock post on the collar. Then operate the mast until the collars contact and the next tube begins to retract. At this point repeat Step 1 and 4.

**Step 5.** If the mast will continue to break ice during retraction but experiences trouble only near a locking transition, then ice has frozen inside the lock body. This ice in the lock body is interfering with the normal unlocking of the interfaces. To clear the ice, use a small, hard tool to reach inside the opening at the bottom of the housing. Manually chip and clear the ice from the internal parts, then set the latch to the proper “Locked” orientation, as illustrated on Page 21. Attempt to retract the mast again under electrical power.

Utilizing non-piercing tools, remove the ice buildup from the indicated areas:

![Figure 4-3 Ice Removal Areas](image-url)
Utilizing a small, hard tool, remove the ice buildup from the housing and internal parts:

Once the internal ice is cleared away, observe the orientation of the lock mechanism. If it is witnessed to be in the “Un-locked” position then push on the rocker to trip it back to the “Locked” position. When the mast operator has clear access to the internal parts of the lock housing, the orientation should only be “Locked.” Under no circumstance should the locks be simultaneously set in the “Un-locked” orientation, while the mast is being operated.
CHAPTER 7  WARNING LABELS AND REFERENCE DRAWINGS

This section provides reference drawings and photographs for use with the Stiletto Mast System.

- **Product Plate**
- **Hazardous Voltage Label**
- **Warning Label**
- **Control Box Labeling**
Figure 7-3  6m Stiletto Interface Dwg
Figure 7-4  10m Stiletto Interface Dwg
Figure 7-5  15m Stiletto Interface Dwg
Figure 7-7 Wiring Diagram
Figure 7-9 Hand Held Remote Control
Figure 7-10 Hand Held Remote Control

**ASSEMBLY PIN TABLE**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>FT</td>
<td>IN/ASSEMBLY</td>
<td>PRIMER</td>
<td>PRIMER</td>
<td>PAINT</td>
<td>PAINT</td>
<td>REDUCER</td>
<td>COLOR</td>
</tr>
<tr>
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**REVISED HISTORY**

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CHAPTER 8 STORAGE PROCEDURE

In the event that the mast, controls and cables need to be stored for a length of time greater than one month, the following procedures should be followed:

Totally clean the mast. Dirt, grease, oil and debris only serve to collect additional dirt during storage. Use denatured alcohol to clean all painted surfaces. Use water when cleaning rubber or plastic material.

1. Inspect for rust and corrosion. If any bare metal or corrosion exists, remove it with a wire brush, repair with touchup paint.
2. Inspect bolts, nuts and screws. Check for obvious looseness, missing, bent, corrosion, chipped paint or broken condition. If you find a bolt, nut or screw that is loose, tighten it. If you find chipped paint or corrosion, repair as specified in (b.) above. If a bolt, nut or screw is missing, replace it.
3. Electric wires and connectors. Look for cracked, frayed/broken insulation, bare wires and loose or broken connectors. Tighten loose connectors. Repair all connector and insulation problems.
4. Once the mast has been inspected and repaired as specified above it should be stored as specified below:
   a. In a dry, indoor environment.
   b. Out of direct sunlight.
   c. Store in crate.
   d. Storage temperature: -60°F (-51°C) to 160°F (71°C)
   e. If the mast and controls are stored for a period of time greater than 7 years, the mast is to be returned to the factory for rebuild.