Warranty

Will-Burt warrants its Inflexion™ 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.
## Document History

<table>
<thead>
<tr>
<th>Document Numbers</th>
<th>Dates</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP-5211901-00</td>
<td>May 29, 2015</td>
<td>Initial release</td>
</tr>
<tr>
<td>TP-5211901-A</td>
<td>April 22, 2016</td>
<td>General update.</td>
</tr>
<tr>
<td>TP-5211901-B</td>
<td>November 8, 2016</td>
<td>Updated Section 4.5.1</td>
</tr>
</tbody>
</table>
# Table of Contents

**Section 1 Introduction** .............................................................................................................. 1-1

1.1 Safety Precautions ............................................................................................................. 1-1
1.2 Manual Organization ......................................................................................................... 1-1
1.3 Additional Documentation ............................................................................................... 1-2
1.4 Specifications ..................................................................................................................... 1-2
1.5 Power Requirements ......................................................................................................... 1-3
1.6 Definitions .......................................................................................................................... 1-4
1.7 Major Components ............................................................................................................ 1-5
    1.7.1 Inflexion Plus ............................................................................................................. 1-5
        1.7.1.1 Mast ................................................................................................................... 1-7
        1.7.1.2 Base .................................................................................................................. 1-7
        1.7.1.3 Saddle ............................................................................................................... 1-9
    1.7.2 Controller ................................................................................................................... 1-10
    1.7.3 Optional Accessories ............................................................................................... 1-11
        1.7.3.1 Nycoil ............................................................................................................... 1-11
        1.7.3.2 D-TEC II ......................................................................................................... 1-12
    1.7.3.3 Integrated PositionIt PI-75 (P/N: 5191201) ......................................................... 1-13

**Section 2 Installation** .............................................................................................................. 2-1

2.1 Pre-Installation Check ....................................................................................................... 2-1
2.2 Ensuring That it Fits ......................................................................................................... 2-2
    2.2.1 Dimensions .............................................................................................................. 2-2
    2.2.2 Mast Loads .............................................................................................................. 2-2
2.3 Installation Tools ............................................................................................................... 2-3
2.4 Components ...................................................................................................................... 2-3
2.5 Unpacking ........................................................................................................................ 2-4
2.6 Attaching to the Vehicle ................................................................................................. 2-4
2.7 Attaching the Air Connections ....................................................................................... 2-6
2.8 Attaching the Controller ............................................................................................... 2-7
2.9 Attaching the Holder ....................................................................................................... 2-8
2.10 Wiring the Base Board ................................................................................................. 2-8
    2.10.1 Wiring the DC Board Power Cable to the Base Board ........................................... 2-9
    2.10.2 Wiring the DC Power to the Base Board .............................................................. 2-10
2.11 Connecting the Warning Light/ Interlock Output Contact ........................................... 2-10
2.12 Connecting the Interlock Input Contact ...................................................................... 2-11
2.13 Testing the Installation ................................................................................................. 2-11

**Section 3 Operation** .............................................................................................................. 3-1

3.1 Pre-Operation Check ....................................................................................................... 3-1
3.2 Operation Tools ............................................................................................................... 3-2
3.3 Controllers ...................................................................................................................... 3-3
3.4 Quick Summary ............................................................................................................... 3-3
3.5 Initiating .......................................................................................................................... 3-4
3.6 Raising the Mast to 90° ................................................................................................. 3-5
    3.6.1 Using the Auto-Up Feature .................................................................................. 3-5
3.6.2 Using the Mast Up Button .................................................. 3-6
3.7 Extending the Mast ............................................................... 3-6
3.8 Lowering the Mast ............................................................... 3-6
3.9 Stowing the Mast ................................................................. 3-6
  3.9.1 Using the Auto Stow® Feature ....................................... 3-7
  3.9.2 Using the Mast Down Button ....................................... 3-7
  3.9.3 Emergency Stow with Power ....................................... 3-8
  3.9.4 Emergency Stow without Power ................................... 3-8

Section 4 Maintenance and Adjustments ........................................ 4-1
  4.1 Pre-Maintenance Check ...................................................... 4-1
  4.2 Maintenance Tools ........................................................... 4-2
  4.3 Cleaning the System ......................................................... 4-2
  4.4 Functional Test ............................................................... 4-4
    4.4.1 Emergency Circuit Test .......................................... 4-4
    4.4.2 Brake Function Test (Standard Only) ......................... 4-4
  4.5 Adjusting the 90° and Mast Stowed Switches ....................... 4-4
    4.5.1 Diagnostic LEDs .................................................. 4-4
    4.5.2 Adjusting the 90° Switch ....................................... 4-5
    4.5.3 Adjusting the Mast Stowed Switch ............................. 4-7
  4.6 Adjusting the Magnetic Down Switch .................................. 4-7

Section 5 Reference Information .................................................. 5-1
  5.1 D-TEC II Sensor .............................................................. 5-1
    5.1.1 D-TEC II Functionality ......................................... 5-1
    5.1.2 D-TEC II Sensor Faults .......................................... 5-1

Section 6 Troubleshooting .......................................................... 6-1
  6.1 Troubleshooting Electrical ................................................ 6-1
  6.2 Troubleshooting Mechanical Symptoms .................................. 6-7

Section 7 Appendix .................................................................. 7-1
  7.1 Installing the PMRC .......................................................... 7-1
    7.1.1 Attaching the PMRC ............................................... 7-1
    7.1.2 Wiring the Base Board .............................................. 7-2
    7.1.3 Wiring the PMRC .................................................... 7-2
  7.2 Installing a Wired HHRC with J-Box .................................. 7-3

Section 8 Drawings ................................................................... 8-1

Table of Figures
Figure 1-1 System Orientations (Inflexion Plus 4.5 Shown) ............... 1-4
Figure 1-2 Left Side of Models 1.5 and 2.3 ................................ 1-5
Figure 1-3 Right Side of Models 1.5 and 2.3 ................................. 1-6
Figure 1-4 Left Side of Models 3.0, 4.5, 6.0, and 7.5 .................... 1-6
Figure 1-5 Right Side of Models 3.0, 4.5, 6.0, and 7.5 .................. 1-6
Figure 1-6 Base Circuit Board (P/N: 4311701) ............................ 1-8
Figure 1-7 Single-tilt controller options. .................................... 1-10
Table 1-1 Inflexion Plus Specifications ................................................................. 1-2
Table 1-2 D-TEC II Specifications....................................................................... 1-13
Table 2-1 Tools and Materials Recommended for Installation ...................... 2-3
Table 3-1 Tools and Materials Recommended for Operation .......................... 3-2
Table 4-1 Tools and Materials Recommended for Maintenance ...................... 4-2
Table 4-2 Mast Positions Shown by Diagnostic LEDs ......................................... 4-5
Table 5-1 D-TEC II Error Codes ........................................................................ 5-1
Table 6-1 Base Codes ......................................................................................... 6-1
Table 6-2 RCP and Positioner Codes .................................................................. 6-4
Table 6-3 HHRC Codes ....................................................................................... 6-5
Table 6-4 D-Tec II Sensor Board Codes ............................................................... 6-6
Table 6-5 Mechanical Symptoms and Troubleshooting Sequence .................. 6-7
Safety Summary

This section describes safety information for the system. These are recommended precautions that personnel must understand and apply throughout installation, operation, maintenance, and troubleshooting. Be sure to read and understand the entire manual before performing any procedure outlined in this manual. Contact the Will-Burt Company with any questions before performing any procedure outlined in this manual.

Signal Word Definitions

**WARNING**

Warnings highlight an essential operating or maintenance procedure, practice, condition, statement, etc., which, if not strictly observed, could result in injury to, or death of, personnel or long-term health hazards.

**CAUTION**

Cautions highlight an essential operating or maintenance procedure, practice, condition, statement, etc., which, if not strictly observed, could result in damage to, or destruction of, equipment or loss of mission effectiveness.

**Note:** Notes highlight an essential operating or maintenance procedure, condition, or statement.

General Safety Instructions

The following are general safety precautions that are not related to any specific procedures. These are recommended precautions that personnel must understand and apply throughout installation, operation, maintenance, and troubleshooting. Additional precautions which apply to specific procedures and steps may be listed with the procedure or step to which they apply.

**WARNING**

**Safety Instruction – Read Manual!** Read and understand the operator’s manual before using the system. Failure to follow procedures could result in death or serious injury.

**WARNING**

**Safety Instruction – Trained Personnel Only!** Installation, operation, and maintenance is to be performed by trained and authorized personnel only. Failure to follow installation, operation, and maintenance procedures could result in death or serious injury.

**WARNING**

**Safety Equipment!** Helmets or hard hats, eye protection, gloves, and safety shoes or combat boots must be properly worn while working in the deployment area. Death or serious injury could result if proper safety equipment is not properly worn.
Electrocution Hazard! Observe general safety precautions for handling equipment using high voltage. Do not touch live wires. Do not locate or operate equipment near electrical lines, cables, or other unwanted sources of electricity. Follow OSHA safety regulations when working near energized power lines. Be sure to allow sufficient clearance on all sides of the mast to allow for side sway. Do not operate the system during an electrical storm. Ensure all power has been disconnected prior to performing installation or maintenance. Ensure electrical cables are undamaged and properly terminated. Death or serious injury could result if proper precautions are not performed.

Shock Hazard! Hazardous voltages are present in this equipment and may also be present in any associated items. Observe general safety precautions for handling equipment using high voltage. Always disconnect power before performing repair or test operations. Contact with high voltage will result in death or serious injury.

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.

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

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

Pinch Point Hazard! Keep clear of moving parts. Be sure to stay clear of the system during operation. Moving parts can crush and cut resulting in serious injury.

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

Payload Lifting Hazard! Do not exceed specified payload capacity. Do not use mast to lift personnel. 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.

Equipment Damage! All persons installing and maintaining this equipment should be suitably qualified and work to national and local standards and codes of practice.
Section 1 Introduction

Review this manual in its entirety. Contact the Will-Burt Company with any questions before performing any procedure outlined in this manual.

The Inflexion Plus is:

- A roof-mounted, fold-down telescoping mast
- Used for smaller payloads such as cameras, positioners, and broadcast devices
- Designed for installation onto nearly any vehicle

This manual is for the following models:

- Inflexion® Plus 1.5
- Inflexion® Plus 2.3
- Inflexion® Plus 3.0
- Inflexion® Plus 4.5
- Inflexion® Plus 6.0
- Inflexion® Plus 7.5

1.1 Safety Precautions

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

1.2 Manual Organization

This manual is organized into the following sections:

Section 1 Introduction
Section 2 Installation
Section 3 Operation
Section 4 Maintenance and Adjustments
Section 5 Reference Information
Section 6 Troubleshooting
Section 8 Drawings
1.3 Additional Documentation
In addition to this manual, your system ships with top-level drawings. These drawings can be referenced during the installation process.

1.4 Specifications
This section describes specifications for the system as follows:

- Table 1-1 Inflexion Plus Specifications

<table>
<thead>
<tr>
<th>Functional Characteristic</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflexion Plus 1.8</td>
<td></td>
</tr>
<tr>
<td>Extended Height</td>
<td>62 in. (1575 mm)</td>
</tr>
<tr>
<td>Maximum Payload Capacity*</td>
<td>54 lb. (24.5 kg)</td>
</tr>
<tr>
<td>Stowed Dimensions (L x W x H)</td>
<td>37 x 16 x 10 in. (940 x 406 x 254 mm)</td>
</tr>
<tr>
<td>Approximate System Weight</td>
<td>62.8 lb. (28.5 kg)</td>
</tr>
<tr>
<td>Wind Survival Speed**</td>
<td>140 mph (225 km/h)</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>-22° to 149°F (-30° to 65°C)</td>
</tr>
<tr>
<td>Inflexion Plus 2.3</td>
<td></td>
</tr>
<tr>
<td>Extended Height</td>
<td>79 in. (2007 mm)</td>
</tr>
<tr>
<td>Maximum Payload Capacity*</td>
<td>46 lb. (20.9 kg)</td>
</tr>
<tr>
<td>Stowed Dimensions (L x W x H)</td>
<td>43 x 16 x 11 in. (1092 x 406 x 279 mm)</td>
</tr>
<tr>
<td>Approximate System Weight</td>
<td>66 lb. (29.9 kg)</td>
</tr>
<tr>
<td>Wind Survival Speed**</td>
<td>140 mph (225 km/h)</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>-22° to 149°F (-30° to 65°C)</td>
</tr>
<tr>
<td>Inflexion Plus 3.0</td>
<td></td>
</tr>
<tr>
<td>Extended Height</td>
<td>108 in. (2743 mm)</td>
</tr>
<tr>
<td>Maximum Payload Capacity*</td>
<td>100 lb. (45 kg)</td>
</tr>
<tr>
<td>Stowed Dimensions (L x W x H)</td>
<td>57 x 16 x 12 in. (1448 x 406 x 305 mm)</td>
</tr>
<tr>
<td>Approximate System Weight</td>
<td>104.6 lb. (47.4 kg)</td>
</tr>
<tr>
<td>Wind Survival Speed**</td>
<td>124 mph (199 km/h)</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>-22° to 149°F (-30° to 65°C)</td>
</tr>
</tbody>
</table>

Continued
<table>
<thead>
<tr>
<th>Functional Characteristic</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflexion Plus 4.5</td>
<td></td>
</tr>
<tr>
<td>Extended Height</td>
<td>168 in. (4267 mm)</td>
</tr>
<tr>
<td>Maximum Payload Capacity*</td>
<td>84 lb. (38.1 kg)</td>
</tr>
<tr>
<td>Stowed Dimensions (L x W x H)</td>
<td>69 x 16 x 12 in. (1752 x 406 x 305 mm)</td>
</tr>
<tr>
<td>Approximate System Weight</td>
<td>113 lb. (51.3 kg)</td>
</tr>
<tr>
<td>Wind Survival Speed**</td>
<td>94 mph (151 km/h)</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>-22° to 149°F (-30° to 65°C)</td>
</tr>
<tr>
<td>Inflexion Plus 6.0</td>
<td></td>
</tr>
<tr>
<td>Extended Height</td>
<td>228 in. (5791 mm)</td>
</tr>
<tr>
<td>Maximum Payload Capacity*</td>
<td>60 lb. (27.2 kg)</td>
</tr>
<tr>
<td>Stowed Dimensions (L x W x H)</td>
<td>82 x 16 x 12 in. (2083 x 406 x 305 mm)</td>
</tr>
<tr>
<td>Approximate System Weight</td>
<td>123.5 lb. (56 kg)</td>
</tr>
<tr>
<td>Wind Survival Speed**</td>
<td>76 mph (122 km/h)</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>-22° to 149°F (-30° to 65°C)</td>
</tr>
<tr>
<td>Inflexion Plus 7.5</td>
<td></td>
</tr>
<tr>
<td>Extended Height</td>
<td>287 in. (7290 mm)</td>
</tr>
<tr>
<td>Maximum Payload Capacity*</td>
<td>50 lb. (22.7 kg)</td>
</tr>
<tr>
<td>Stowed Dimensions (L x W x H)</td>
<td>96 x 16 x 12 in. (2438 x 406 x 305 mm)</td>
</tr>
<tr>
<td>Approximate System Weight</td>
<td>142.3 lb. (64.5 kg)</td>
</tr>
<tr>
<td>Wind Survival Speed**</td>
<td>64 mph (102 km/h)</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>-22° to 149°F (-30° to 65°C)</td>
</tr>
</tbody>
</table>

*Maximum payload capacity assumes a payload center of gravity (1) foot above the top of the mast. Note that the added weight of a positioner, Nycoil, or D-TEC II will reduce the maximum payload capacity which can be affected by wind sail area. Consult the factory for more information.

**Data based upon:
- Payload center of gravity and sail area center of pressure are in line with mast centerline.
- Mast angle is 0° ±½° when extended.
- Payload coefficient of drag = 2.0.
- Center of pressure of 24 inches.
- A sail area of 1.25 ft.²

### 1.5 Power Requirements

All electrical devices on the system are nominal 12 volt devices. The boards driving them monitor and chop the battery voltage at 300 Hz adjusting the duty cycle to deliver 12 volts. During mast incline at 13.8 volts the system may draw up to 13 amps. During mast incline at 28.8 volts the system may draw up to 9 amps.
1.6 Definitions

General Terms:

- “System” refers to the entire Inflexion Plus, controller, optional Nycoil, and optional D-TEC II system
- “Hand-Held Remote Controller” (HHRC) refers to the controller used to operate the mast
- “Payload” refers to the object or equipment being extended by the mast to an operational height

Mast Positions:

- “Stowed” refers to the horizontal position in which the mast is firmly seated in the saddle. This position is sometimes referred to as the Nested position.
- “90°” refers to the position that the mast electronically goes to from the nested position. At 90°, the mast has angled up, but not mast tubes have risen. At 90°, the mast has angled up, but no mast tubes have risen. The mast remains retracted.
- “Extended” refers to the partial- or full-raised position that the mast pneumatically goes after the 90° position. In the extended position, some or all of the mast tubes have risen.

System Orientations:

For the purposes of location identification, Figure 1-1 lists the orientation on the system.
1.7 Major Components

Major components of the system include the:

- Inflexion Plus
- Controller
- Optional Accessories:
  - Nycoil
  - D-TEC II
  - Integrated PositionIt PI-75 (P/N: 5191201)

1.7.1 Inflexion Plus

The Inflexion Plus normally mounts to a vehicle roof and consists of:

- Mast
- Base
- Saddle

The exact configuration of the Inflexion Plus may vary. The general layouts for each model are as follows:

- Models 1.8 and 2.3
- Models 3.0, 4.5, 6.0, and 7.5

For detailed information on the locations of components in your system, see the drawings that shipped with the system.

Figure 1-2 Left Side of Models 1.5 and 2.3 (Base Cover Removed)
Figure 1-3 Right Side of Models 1.5 and 2.3 (Base Cover Removed)

Figure 1-4 Left Side of Models 3.0, 4.5, 6.0, and 7.5 (Base Cover Removed)

Figure 1-5 Right Side of Models 3.0, 4.5, 6.0, and 7.5 (Base Cover Removed)
1.7.1.1 Mast
The bottom of the mast connects to the actuator. The bottom of the mast also connects to the air compressor which extends the mast. When at 90°, the mast bottom rests on a firm rubber padding on the base.

The mast contains:

- Tube Sections
- Magnetic Down Switch
- Internal Coil Cord (Optional)

**Tube Sections**

The mast consists of concentric sections that extend as air is applied. Each tube and collar is protected by low friction synthetic bearings for smooth operation and long life. Bumpers reduce shock on extension and retraction. The exterior surfaces of the tubes are anodized and sealed for long life. The fasteners are corrosion-resistant stainless steel.

**Magnetic Down Switch**

The mast contains a Magnetic Down Switch fastened to the outside of the bottom tube section with a clamp. This switch senses a magnet in the top tube which indicates the mast is fully retracted (all air exhausted) and ready to be stowed. This switch is adjusted at the factory.

**Internal Coil Cord (Optional)**

The center of the tubes route an internal coil cord from the bottom of the mast to the payload platform. The flexible internal coil cord contains communications and payload power.

1.7.1.2 Base
The base is covered with a plastic housing and contains:

- Base Circuit Board
- Actuator
- Air Compressor
- Look-Up Light
- 90° Switch
- Mast Stowed Switch (Near 0° Switch)
- Access Holes
Base Circuit Board

InflexionPlus systems use a Base Circuit Board (P/N: 4311701) with v7.2 or higher software. The Base Circuit Board is the main board in the system. It handles communication between the controller and payload. The Base Circuit Board contains diagnostic LEDs that show sensor positions, a status light which shows errors, and terminal strips for wire connections. Communications and payload power to the mast are controlled at the Base Circuit Board.

![Base Circuit Board](image)

**Figure 1-6 Base Circuit Board (P/N: 4311701)**

Actuator

The actuator moves when it receives a command from the operator at the controller. Electrically DC driven, it moves the mast upward from the stowed position to the 90° position and downward from the 90° position to the stowed position.

Air Compressor

The air compressor supplies air to raise the mast when the operator presses the “Mast Up” button on the controller, after the mast electrically reaches the 90° position. There is no mast fully extended switch. Once full extension is reached, if the “Mast Up” button is not released, the maximum air pressure is reached and the blow-off valve opens. At this point, excess air is vented and the mast remains at the fully extended height.

Look-Up Light

The look-up light allows the operator to see obstructions and power lines and helps keep the operator and equipment safe. Whenever an operator at the controller moves the mast, the look-up light automatically turns on. The look-up light automatically turns off when the mast motion stops. For example, the look-up light turns on when the mast moves to leave the stowed position and when the mast is raised or lowered.
90° Switch

The 90° Switch senses the actuator position to determine when the mast is at 90°.

Mast Stowed Switch (Near 0° Switch)

The Mast Stowed Switch senses the actuator position to determine when the mast is stowed and firmly seated in the saddle. The circuit looks for a pre-determined current rise (for a maximum of 0.5 seconds) to indicate a solid nesting before shutting off.

Access Holes

The access holes on the left side of the base provide holes for the required cables. These cables are for payload power, base power, and control lines for the system.

1.7.1.3 Saddle

The saddle is connected to the bottom of the base and extends outward to provide a curved surface for the mast to rest on when the mast is stowed. The saddle, along with the base plate, has holes that are used to secure the base to the vehicle roof. The distance the saddle extends out from the base will vary based on your system.
1.7.2 Controller

Several controllers are available for your system (Figure 1-7). These controllers can be used to operate all functions of the system and are as follows:

Wired Hand-Held Remote Controller (HHRC)

The wired HHRC has the following features:

- Connects with a 25 foot (7.62 meter) quick-disconnect coiled cord
- Integrated emergency stop button
- LED display that includes alphanumeric feedback

Panel Mount Remote Controller (PMRC)

The PMRC has the following features:

- Integrated emergency stop button
- LED display that includes alphanumeric feedback

The wired HHRC connects through a bulkhead (Figure 1-8). The PMRC connects directly to the system. The “Start/Stop” button on the controller serves as an emergency stop.
1.7.3 Optional Accessories

This section describes optional accessories for the Inflexion Plus as follows:

- Nycoil
- D-TEC II
- Integrated PositionIt PI-75 (P/N: 5191201)

1.7.3.1 Nycoil

The Nycoil Cable Conduit (Figure 1-9) is an optional external coiled hose used to house electrical wiring, antenna RF, and positioner cables.

![Nycoil Cable](image)

Figure 1-9 Nycoil Cable

Features:

- Completely retracts when mast is stowed
- Extends neatly with the mast

Nycoil cables come in a variety of sizes. Depending on the system being used, some restrictions on the size of the Nycoil may occur. The standard sizes for the Nycoil are:

- ½ inch inside diameter of the cable with the outside diameter of the coil being 8 inch
- ¾ inch inside diameter of the cable with the outside diameter of the coil being 13 inch

For more information on the Nycoil, see [www.willburt.com](http://www.willburt.com).
1.7.3.2 D-TEC II

The D-TEC II® (Figure 1-10) safety system provides overheard power line and obstacle detection, and above the mast illumination. The built-in anti-collision system automatically stops mast extension providing added protection for the operator and equipment from overheard hazards.

The D-TEC II comes in (2) packages:

- D-TEC II Package with Rack Mount (P/N: 4370401) includes sensor, rack mount, installation kit, and mounting bracket.
- D-TEC II Package with Wall Mount (P/N: 4370402) includes sensor, wall mount, installation kit, and mounting bracket.

![Figure 1-10 D-TEC II](image)

Features:

- (4) detection modes that operate simultaneously:
  - Electric Field (E-Field) detection to sense the presence of nearby high voltage AC.
  - Magnetic Field (H-Field) detection to sense the presence of nearby high current AC.
  - Ultrasonic detection to sense the presence of nearby and overhead physical obstructions.
  - Inclinometer to sense the orientation of the device and ensure proper operation of the aforementioned modes.
- A look-up light with (2) ultra-bright white LEDs
- An ambient light sensor to ensure the look-up light only illuminates when it is dark
- An (8) character alphanumeric LED display
- Audible alarms and messages
- Built-in “Override” (Requires two simultaneous switch operations)
- Weather resistant enclosures (Sensor and Wall Mount only)
Table 1-2 lists specifications for the D-TEC II.

Table 1-2 D-TEC II Specifications

<table>
<thead>
<tr>
<th>Functional Characteristics</th>
<th>Operational Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature limits</td>
<td>-40°F to 185°F (-40°C to 85°C)</td>
</tr>
<tr>
<td>Duty Cycle</td>
<td>100%</td>
</tr>
<tr>
<td>Power Supply</td>
<td>11 to 33 VDC, 5 Amp Max</td>
</tr>
<tr>
<td>Allowable Vertical Tilt</td>
<td>±10°</td>
</tr>
<tr>
<td>Minimum Voltage Detection</td>
<td>2.3 Kilovolts / Meter</td>
</tr>
<tr>
<td>Distance of Ultrasonic Detection</td>
<td>10 ft. (3 m)</td>
</tr>
</tbody>
</table>

For more information on the D-TEC II, see [www.willburt.com](http://www.willburt.com).

1.7.3.3 Integrated PositionIt PI-75 (P/N: 5191201)

The Inflexion Plus 3.0, 4.5, and 6.0 can be configured to ship with an integrated PositionIt™ PI-75 to allow the payload to be remotely positioned. This product line is covered in the *Inflexion Plus 3.0, 4.5, & 6.0 with PositionIt PI-75 Operator’s Manual* (TP-5354001). To obtain this document, see [www.willburt.com](http://www.willburt.com).
Section 2 Installation

This section describes the installation of the system and provides general procedures that must be followed to ensure a successful installation. Use care to follow all precautions while installing.

2.1 Pre-Installation Check

Before installing the system, ensure:

- All installers read and understand the entire installation procedure
- Only a properly trained and qualified certified electrician performs electric installations and maintenance
- The mounting structure is level and has sufficient room and strength to mount the system
- All components are included
- All required tools and materials are readily available
- When installing in a vehicle, that the vehicle is on a level surface
- That the following warnings are understood and followed:

**WARNING**

**Mounting Structure Hazard!** Before operation, be certain the mounting structure is capable of resisting forces generated from all loading and environmental conditions including, but not limited to system size and weight, payload size and weight, sail size, and wind speed. The mounting hardware must include proper means to resist vibration loosening such as thread-locking compound or locking hardware. Mounting the system to a structure unable to resist the forces generated from customer-specific loading scenario could result in death or serious injury and could damage the system.

**WARNING**

**Safety Instruction – Mounting Instructions!** Be sure to understand all mounting instructions. The mounting hardware must include proper means to resist vibration loosening such as thread-locking compound or locking hardware. Failure to follow mounting instructions can result in death or injury.

**WARNING**

**Safety Instruction – Roof Access!** If the mast will be mounted to a vehicle, the operator must provide a safe means to access the roof of the vehicle during installation.
Safety Instruction – Hose Installation! At all times while using hose during installation:

- Hose should be routed, mounted, and restrained to protect from damage
- Second-hand hose should not be used for installation
- Hose should not be bent at a radius less than specified by the manufacturer
- Hose should be marked to avoid hazards from incorrect connections
- The exhaust should be fitted with a silencer and directed away from personnel
- Hose should be routed and installed in such a way as to minimize torsion on the joints
- Hose mounting should be accomplished only by the use of tools to prevent readily disconnecting hose from the mast

2.2 Ensuring That it Fits

Roof-mounted systems are often stowed in a compartment on the vehicle roof. Ensure that the mounting surface is flat, and that the base and saddle are in the same plane. Be sure to mount the system out of reach of anyone who may be near the vehicle to allow the mast to be safely raised and lowered. Ensure that there is sufficient room and roof strength to mount the system.

2.2.1 Dimensions

The exact dimensions of your system will vary based on the components included. Refer to the drawings which ship with the mast for detailed information on the size of the base. Additional room may be required for optional components.

2.2.2 Mast Loads

It is important that both the base and the saddle be securely mounted to a sturdy roof or platform which will not overturn during operational loading of the mast. The surface must be reinforced to withstand the load at the different points on the mast that can be expected during operation as shown in Figure 2-1. All values are given in lb. These are maximum load estimates placed downward and sometimes upward on the vehicle top by the mast.

![Figure 2-1 Load Distribution](image-url)
2.3 Installation Tools

Table 2-1 lists recommended tools and materials for installation.

<table>
<thead>
<tr>
<th>Tools and Materials</th>
<th>Tools and Materials</th>
<th>Tools and Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Glasses</td>
<td>Safety Gloves</td>
<td>Safety Shoes</td>
</tr>
<tr>
<td>Hard Hat or Helmet</td>
<td>Hearing Protection</td>
<td>Multimeter (To verify power is turned off)</td>
</tr>
<tr>
<td>Torque Wrench</td>
<td>Drill</td>
<td>Knife or Scissors to Cut Plastic Band</td>
</tr>
<tr>
<td>Wire Cutter / Stripper</td>
<td>RTV Silicone</td>
<td>½ inch or M12 Mounting hardware (6 each)</td>
</tr>
<tr>
<td>Crimping Tool of Solder Set</td>
<td>Clean shop rags</td>
<td>Hoist (minimum 500 lb. capacity)</td>
</tr>
<tr>
<td>Screwdrivers</td>
<td>Wrenches</td>
<td>Thread-Locking Compound or Locking Hardware</td>
</tr>
<tr>
<td>Note: Depending on the national and local standards and codes of practice, and the environment, additional personal protective equipment may be necessary.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.4 Components

When unpacking, check to ensure all ordered components have arrived. Your system should ship with the following components:

- Base Assembly
- Controller (Selected from the following)
  - Wired HHRC with Bulkhead
  - PMRC
- DC Board Power Cable
- Exhaust Hose
- Supply Air Hose
- Ferrite
- Label Kit
- Wrench, HEX L-Key 6 mm (Models 4.5, 6.0, and 7.5)
- Wrench, HEX L-Key 1.5 mm (Models 4.5, 6.0, and 7.5)
- Nycoil (Optional)
- D-TEC II (Optional)
- Operator’s Manual (this manual) on CD

Additionally, you should receive drawings of your system to assist in the installation process.

The labels from the label kit can be applied where the operator deems appropriate.

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

Unpack the items as follows:

1. Carefully remove all the cartons.
2. Remove all the items from the cartons.
3. Ensure that all components are included and that the required tools are readily available.
4. Inspect for any shipping damage. If damage has occurred, notify your carrier.
5. Lift the base out with a hoist. Lift the unit from the shipping container by the base tube at the center of gravity of the mast shown by the symbol. Lifting from locations other than those indicated could result in equipment damage.

2.6 Attaching to the Vehicle

Your system is designed to withstand adverse weather conditions, however it cannot be submerged in water. Hardware for attaching the base to a roof is not included with the shipped items.

Physically attach the system as follows:

1. If the system is mounted in a well, provide adequate drainage. A minimum of (4) one inch diameter drain holes (one per corner) are recommended.
2. Ensure that the mast base and saddle are on a flat surface and in the same plane. Switches set at the factory are based on a level surface. If the system is not level, these switches may need adjusted.
3. The areas to which the unit is mounted must be reinforced to withstand mast loads. Be sure to mount the unit out of reach in order to ensure safety distances and prevent hazardous zones being reached by upper extremities of operator or bystanders.
4. Reference Figure 2-2 for mounting hole locations for your system. These locations will vary based on which system you are using. Drill (6) 9/16 inch mounting holes into the vehicle mounting structure in the mounting locations. There are (4) holes for the base, and (2) holes for the saddle.
5. Attach the base to the roof using 9/16 inch bolts. Torque all hardware as appropriate for its material and size. The (2) saddle bolts can be attached later when power is available since the mast has to be partially raised to insert the bolts. Adjust the location of the saddle if necessary so that the saddle flanges do not hang up on the payload when the unit is raised.

It is the responsibility of the customer to properly secure the payload for vehicle travel.
Figure 2-2 Mounting Hole Locations
2.7 Attaching the Air Connections

This section describes how to make the air connections for 4.5, 6.0, and 7.5 models.

Two barbed fittings are provided for connecting the air-lines required to pressurize and exhaust the system. Air may be supplied externally by a compressor or other source of clean, dry air with a maximum pressure of 100 psi. Your system has an internal regulator factory set to 20 psi. The inlet fitting is to be used with a ¾ inches inside diameter air hose rated for the pressure supplied in combination with environmental factors, which may derate the hose (e.g. high temperatures). The unit is supplied with 20 feet of air hose labeled SUPPLY to designate the pressurized air to be routed to the INLET of the unit. The exhaust fitting is to be used with a ½ inches inside diameter air hose. The unit is supplied with 20 feet of air hose labeled EXHAUST to designate its use to route exhausted air to a location where it will not expel air or water onto personnel or equipment sensitive to moisture. The different size hose with the labeled intention of the hose is designed to prevent pressurized air to be routed into the EXHAUST of the unit. If pressurized air is routed into the EXHAUST port of the mast, the unit is equipped with a blow-off valve that will prevent this pressurized air from entering the mast. An audible air leak will be evident to alert you that air has been improperly connected to the unit.

Refer to Figure 2-3 for identification of the air fittings located adjacent to the power and control connectors. If the unit was provided with the optional on-board air compressor, only the exhaust hose need be connected. The exhaust hose must be routed to a location where it will not expel air or water onto personnel or equipment sensitive to moisture.

Figure 2-3  Air Valve Assembly
2.8 Attaching the Controller

There are several types of controllers available for your system. This section will describe how to install the Wired HHRC with a bulkhead. The installation process for other controllers will be described in the Appendix.

To attach the bulkhead:

1. Find a convenient, dry location to mount the bulkhead.
2. Drill the mounting holes as indicated (Figure 2-4).

   ![Figure 2-4 Bulkhead Dimensions](image)

3. Using the screws, washers, and nuts provided, attach the bulkhead to the vehicle.
4. Attach the ground wire to the vehicle.
2.9 Attaching the Holder

The HHRC has a holder to hang the controller on. To install the holder:

1. Using the (2) screws and the holder provided, attach the holder where the HHRC will hang. The inside of the holder is angled to better hold the HHRC (Figure 2-5). Ensure that the wider end of the bevel is up.

![Figure 2-5 Holder for the Controller](image)

2. Place the HHRC onto the holder.

2.10 Wiring the Base Board

To electrically connect the base, proceed as follows:

1. Loosen the three screws from the cover of the base and remove the cover.
   a. For models 1.5 and 2.3, run the DC Board Power Cable connected to the bulkhead into the bottom of the base.

![Figure 2-6 Models 1.5 and 2.3 Access Holes](image)
b. For models 4.5, 6.0, and 7.5, run DC Board Power cable connected to the bulkhead into the interface panel (Figure 2-7).

2.10.1 Wiring the DC Board Power Cable to the Base Board

The DC Board Power Cable connects the bulkhead, controller, and Base Board.

2. Connect the wires from the DC Board Power Cable to the green J4 connector ensuring the wires match the color strip on the J4 connector (Figure 2-8).
If using the “Mast Active” contacts, note that they are factory set to be OPEN when the mast is active; S2-1 is OFF (open). To set them to be CLOSED when the mast is active, set S2-1 ON (closed).

Important! Be aware of the different “look” of the ON position of rocker and slide switches. Both are shown (Figure 2-9) with position 1 ON (closed).

2.10.2 Wiring the DC Power to the Base Board
Incoming DC power is provided by the customer from the vehicle battery.

3. Connect the DC battery power to the +VIN (red or white) and COM (black) connections on terminal block TB4 on the Base Board (Figure 2-8). The source must be capable of delivering 15 amps minimum.

2.11 Connecting the Warning Light/ Interlock Output Contact
The mast provides an isolated relay contact output to enhance integration into vehicle safety circuitry (Figure 2-10). This relay output is from a bi-stable (latching) relay whose contacts either open or close (switch selectable) when the mast is active (not stowed). Its state is not affected by whether or not there is power to the mast. This contact is capable of carrying up to two amperes and is available on pins J4-8 and 9. Its usage is highly recommended by Will-Burt and should be used to comply with various safety standards. It can be used in conjunction with a customer-supplied relay to drive a flashing warning light.
2.12 Connecting the Interlock Input Contact

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

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

For Standard (non-NFPA) mode, to force the mast to Auto Stow® if the vehicle emergency brake is off, replace the jumper on connector J4, wires 5 and 7, with the contacts from the parking brake. The contacts should close when the brake is on.

2.13 Testing the Installation

Review the operation section of this manual and observe all safety dangers, warnings, and cautions in this manual before proceeding to test the installation. If any part of the testing fails, check the LEDs on the controller and Base Board.

To test the installation, proceed as follows:

1. Reconnect power.
2. Turn the red “Start/Stop” button to enable the system, then push the green “Start” button.
3. Check for proper clearance above the mast.
4. Press the “Mast Up” button twice rapidly. This invokes the Auto-Up feature.
5. Press and hold the “Mast Up” button. When the mast is fully extended and the blow-off valve opens, release the “Mast Up” button.
6. To ensure that the mast is properly sealed, while the mast is fully extended, watch for any type of mast settling.
7. Press the “Mast Down” button twice rapidly. This invokes the Auto Stow® feature that places the mast into the saddle and turns power off.

Note: Before delivery of a new system, the 90° and Mast Stowed (Near 0°) switches are set and tested for a flat surface. If the mounting surface is not flat, the 90° and Mast Stowed switches may need adjusted to function properly. If necessary, see Section 4 for details on adjusting the 90° and Mast Stowed (Near 0°) switches.
Section 3 Operation
This section describes the operation of the system. Be sure to read and understand the entire operation procedure before beginning operation.

3.1 Pre-Operation Check
Before operating the system, ensure:

- All operators read and understand the entire operation procedure and are properly trained.
- That the system is undamaged. If damage is apparent, do not use the system, and have it serviced prior to use.
- All electrical cables are undamaged and properly terminated.
- The area is free of power lines or other overhead obstructions. The system location should be no closer than a horizontal distance equal to the extended height of the mast away from power lines.
- Any objects that might obstruct motion of the system, cause binding, or hinder system function are removed.
- Any transit tie-downs have been removed.
- The system and payload are properly installed. The payload must be tethered to the top of the mast to prevent it from falling in the event of a failure.
- When using a vehicle, that the vehicle is not moving and the parking brake is engaged.
- The system area is free of personnel.
- The operator has full view of the system during use.
- Ensure that the following warnings are understood and followed:

  ![WARNING]

**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.

  ![WARNING]

**Mast Extension Hazard!** 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 personnel clear of mast and mast extension. Do not lean directly over the mast. Extending the mast into obstructions could result in death or serious injury, and could render the mast inoperable and partially extended.
Relocation Hazard! Do not relocate the mast during operation or while raised. This applies especially to masts mounted to vehicles. Operate the mast only if the vehicle is stationary and the vehicle engine is off. Relocating the mast during operation or after being raised could result in death or serious injury.

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

Ignition Hazard! Do not use in the presence of flammable gases or liquids such as paint, gasoline, or solvents. Do not use in areas of limited ventilation or where high ambient temperatures are present. Contact with combustible materials can cause ignition resulting in fire or explosion.

Safety Instruction – Operation! For outdoor use only. Do not use in areas that have been classified as hazardous as defined in Article 500 of the National Electric Code.

Equipment Damage! Check for and remove any objects which might obstruct motion, cause binding, or hinder function of the system. Hitting obstructions will cause damage to the positioner.

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

3.2 Operation Tools

Table 2-1 lists recommended tools and materials for operation.

<table>
<thead>
<tr>
<th>Tools and Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Glasses</td>
</tr>
<tr>
<td>Safety Gloves</td>
</tr>
<tr>
<td>Safety Shoes</td>
</tr>
<tr>
<td>Hard Hat or Helmet</td>
</tr>
<tr>
<td>Hearing Protection</td>
</tr>
</tbody>
</table>

Note: Depending on the national and local standards and codes of practice, and the environment, additional personal protective equipment may be necessary.
3.3 Controllers

The following controllers are available on your system:

- Single-Tilt Wired Hand-Held Remote Controller (HHRC)
- Single-Tilt Panel Mount Remote Controller (PMRC)

Using the controller, the operator can move the mast up and down. The following are the controller buttons for the wired HHRC:

- Start/Stop
- Auxiliary Light
- Lights
- Mast Up
- Tilt Up
- NFPA Start
- Pan Left
- Pan Right
- Mast Down
- Tilt Down

Depending on which system you are using, some buttons may be disabled. The “NFPA Start” button is only found on NFPA controllers.

3.4 Quick Summary

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

If an emergency stop is required at any time, press the “Start/Stop” button. This will disconnect the unit from power and cause all air to be exhausted from the mast.

1. Ensure that the vehicle parking brake is engaged.
2. Ensure that there are no obstructions overhead.
3. Turn the red “Start/Stop” button. For NFPA systems, then press the green “NFPA Start” button.
4. Raise the mast to 90° by performing one of the following steps:
   - Quickly press the “Mast Up” button twice (Auto-up feature) to move mast to 90°. To abort the Auto-up feature, press any controller button.
   - Press and hold the “Mast Up” button to raise the mast. Only the controller buttons that have a lit LED are active.
5. If desired, raise the mast further by pressing “Mast Up”.
6. If desired, lower the mast by pressing “Mast Down”. 
7. Stow the mast by performing one of the following steps:
   - Quickly press the “Mast Down” \[\text{button}\] twice (Auto Stow\textsuperscript{®} feature). It is recommended to use the Auto Stow\textsuperscript{®} feature to stow the mast. To abort Auto Stow\textsuperscript{®}, press the any controller button.
   - Press and hold “Mast Down” \[\text{button}\] until all LEDs on the controller turn off. Ensure that “Mast Down” \[\text{button}\] is released only after the controller LEDs turn off which means the mast is stowed.

3.5 Initiating

Before operating a stowed mast, the “Start/Stop” \[\text{button}\] must be turned. This will enable the system to power up and initiate. NFPA systems must also then press the green “NFPA Start” \[\text{button}\]. On initiation, the Base Board establishes communication with the other boards in the system. If communication cannot be established, an error code is shown on the display and the communication system is shut down.

To initiate the system:

1. If using a wired HHRC, ensure it is plugged in before initiation. This allows the board to establish communication between all boards. If the wired HHRC is connected after the unit is powered up, then an error will occur.
2. Turn the “Start/Stop” \[\text{button}\] while viewing the display.
3. For NFPA operation, wait until the system initializes before releasing the “Start/Stop” \[\text{button}\]. When the first letter “N” of NightScan is shown on the controller display, release the “Start/Stop” \[\text{button}\].
4. The letter “N” of NightScan is normally displayed a couple of seconds after turning the “Start/Stop” \[\text{button}\]. You may also be able to hear the initiate relay click into place. Do not release the “Start/Stop” \[\text{button}\] before seeing the first letter on the display. Releasing too early may cause a communication error between the Base Board and the controller. After the letter “N” of NightScan is displayed, the “Mast Up” LED is lit showing that the “Mast Up” \[\text{button}\] is enabled.
5. For NFPA controllers, press the green “NFPA Start” \[\text{button}\].
3.6 Raising the Mast to 90°

The mast uses a DC powered actuator to drive the mast from stow to 90°. When at 90°, a proximity sensor detects the actuator then drives the actuator a bit further. Driving the actuator a bit further causes the mast to seat firmly into the foam mast pad.

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

- Use the Auto-up feature.
- Press the “Mast Up” button.

There are several advantages in using the Auto-up feature instead of the “Mast Up” button to raise the mast to 90°:

- The Auto-up feature automatically moves the mast to 90°, whereas the “Mast Up” method requires the operator to press the controls throughout the process.
- The Auto-up feature allows the system to check its switches and better determine the 90° position.

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

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

1. On uneven ground, an operator may believe the mast has reached 90° and release the “Mast Up” button too early. If the operator used the Auto-up feature, the mast would unfold until it reached exactly 90°.

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

3.6.1 Using the Auto-Up Feature

The Auto-up sequence can be aborted by pushing any of the buttons on the controller at any point during the Auto-up sequence. If the Auto-up sequence is aborted, the mast will stop and wait for input from the controller. “AutoUp” will be shown on the controller, and after the mast leaves the stowed position and begins moving toward 90° (takes about 2 seconds); the controller “Mast Down” and “Mast Up” LEDs will light.

To raise the mast to 90° using the Auto-up feature, press the “Mast Up” button twice quickly in successive depressions (two depressions within a ½ second). The mast will raise to 90°. The mast will not extend upward by itself, but will await further operator input from the controller.
3.6.2 Using the Mast Up Button

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

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

2. Release the “Mast Up” button when the additional controller LEDs like “Tilt Down” and “Pan Right” light.

3.7 Extending the Mast

The mast can be extended to full or partial height. To extend the mast when it is at 90°, press the “Mast Up” button until the mast reaches the desired height.

Pushing the “Mast Up” button will cause the mast to rise until the “Mast Up” button is released, or the mast reaches its maximum extended height. If the “Mast Up” button is not released, the mast will reach its fully extended height, the air pressure will rise to 20 lb., and then the exhaust valve will open and exhaust any more air that enters the mast, leaving the mast at its maximum extended height.

3.8 Lowering the Mast

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

3.9 Stowing the Mast

The “stowed” position is also called the “nested” position. The stowed position is the position of the mast when it is folded down and firmly seated in the saddle. The mast is considered stowed when the Mast Stowed Switch is closed, and the brief over current condition is met when the mast is driven into the saddle.

It is the responsibility of the operator to ensure the payload is in the “home” position before stowing the mast. When transporting, it is the responsibility of the operator to properly secure the payload for vehicle travel.

The mast can be stowed by using:

- Auto Stow®
- Mast Down
- Emergency Stow With Power
- Emergency Stow Without Power
The best method is to stow the mast with the Auto Stow® feature. It does not require the operator to stop the mast exactly in the saddle. The mast can be auto-stowed from any position including 90°, partially extended, or fully extended.

On NFPA systems, all power is removed after the mast is stowed. To operate the mast again on NFPA systems, the red “Start/Stop” button must be turned. The green “NFPA Start” button must then be pushed. This is a safety feature that prevents the mast from being inadvertently raised.

On Standard systems, power is still applied to the system after the mast is stowed and it is not required to turn the “Start/Stop” button to operate the mast again. Since power is still applied, care must be taken to ensure the controller buttons are not accidently hit.

3.9.1 Using the Auto Stow® Feature

To use the Auto Stow® feature:

1. Press the “Mast Down” button twice quickly in successive depressions (two depressions within ½ second). The mast will lower to 90° (if not already there) and stow the mast. This automatic sequence can be aborted by pushing any of the buttons on the controller at any point during the Auto Stow®. If a button is pressed, the mast will not stow by itself, and will await further operator input.
2. On an NFPA system, wait until all controller LEDs turn off. Any lit LEDS indicate that the mast is not stowed.
3. Visually inspect that the mast is properly stowed. Ensure that the payload will not bounce as the vehicle drives down the road.
4. Store any controllers so they will not be damaged during transportation.

3.9.2 Using the Mast Down Button

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

To stow the mast using the “Mast Down” button:

1. Press the “Mast Down” button until the mast stops and the “Mast Down” LED is turned off. The mast will lower to 90° (if not already there), then to the home position, and then stow the mast. Once stowed, the Mast Stowed Safety Interlock Contact signals it is safe to move the vehicle.
2. On an NFPA system, wait until all controller LEDs turn off. Any lit LEDS indicate that the mast is not stowed.
3. Visually inspect that the mast is properly stowed. Ensure that the payload will not bounce as the vehicle drives down the road.
4. Store any controllers so they will not be damaged during transportation.
3.9.3 Emergency Stow with Power

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

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

Pressing the emergency stow button causes the system to generate an “ERR 1,20” error. Errors cause the mast to automatically exhaust all air from the mast, which lowers the mast to 90°.

Once the mast has lowered to 90°, pressing and holding S4 will drive the actuator to stow the mast. The mast will continue to lower and drive in the saddle until S4 is released.

**CAUTION**

**Equipment Damage – Emergency Stow Button!** When using the emergency stop button, it is totally up to the operator to ensure safe operation throughout the emergency stow attempt. The actuator will lower the mast without regard to any faults, switches, or system interlocks. Normal operation switches are disabled and the mast can be overdriven causing damage to the system.

To stow the mast using the emergency stow button:

1. Remove the left side cover (the side with the look-up light) if not already removed.
2. Tap S4 on the Base Board. Do not hold down S4; just press, then immediately release S4 once. This will cause the controller to show an “ERR 1,20”. The error will cause all air to exhaust from the mast.
3. Wait until all air has exhausted from the mast. The mast should now be retracted and in the 90° position.
4. Ensure that there are no obstructions in the path of the mast.
5. While observing the mast, press and hold S4 on the Base Board.
6. Immediately release the S4 button as soon as the mast is in the saddle.
7. Visually check that the mast is properly stowed.

3.9.4 Emergency Stow without Power

If power is lost or an unrecoverable error occurs, the mast will automatically exhaust all air and lower to 90°. However, the mast will not return to its fully stowed, horizontal position. Since there is no power to run the actuator, the emergency stow button cannot be used and the mast must be stowed manually.

**WARNING**

**Safety Instruction!** Ensure all power has been disconnected from the system prior to manually lowering the mast. Death or serious injury could result if proper precautions are not performed.
To manually stow:

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

2. Adjust the pan and tilt, if necessary, to place the payload in the stow position. Ensure that the payload will not make contact with the saddle or mounting surface when the mast stows.

3. Remove the cover to access the actuator.

4. Remove the 6 mm hex head bolt on the end of the actuator cover (Figure 3-1).

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

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

7. Replace the right side base cover.
Section 4 Maintenance and Adjustments

This section describes maintenance procedures required to keep the system operational. Use care to follow all precautions while performing these procedures.

4.1 Pre-Maintenance Check

Before performing maintenance procedures, ensure:

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

  ▶️ WARNING

Safety Instruction – Power! Ensure all power has been disconnected prior to performing maintenance.

▶️ WARNING

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

▶️ WARNING

Fire Hazard! 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. Cleaning solvent is flammable and can be explosive, resulting in death or serious injury.

▶️ WARNING

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

▶️ WARNING

Pressurized Vessel! A pneumatic telescoping mast is a pressurized vessel. Caution must be exercised to stay clear when the mast is being extended. Do not lean directly over the mast. Proper eye protection should be worn when working on the mast.

▶️ CAUTION

Equipment Damage – Contaminants! Do not lubricate the exterior of the mast. This will cause the lubricant to attract dust and contaminants from the air.
4.2 Maintenance Tools

Table 2-1 lists recommended tools and materials for maintenance.

Table 4-1  Tools and Materials Recommended for Maintenance

<table>
<thead>
<tr>
<th>Tools and Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Glasses</td>
</tr>
<tr>
<td>Safety Gloves</td>
</tr>
<tr>
<td>Safety Shoes</td>
</tr>
<tr>
<td>Hard Hat or Helmet</td>
</tr>
<tr>
<td>Hearing Protection</td>
</tr>
<tr>
<td>Rags (Clean and dry)</td>
</tr>
<tr>
<td>Non-Abrasive Cleanser</td>
</tr>
</tbody>
</table>

Note: Depending on the national and local standards and codes of practice, and the environment, additional personal protective equipment may be necessary.

4.3 Cleaning the System

Will-Burt pneumatic telescoping masts come from the factory pre-lubricated and require no scheduled maintenance under normal operating conditions. In extremely harsh environmental conditions, maintenance of the mast might be required.

Signs that cleaning and lubrication are needed can be:

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

To clean the base, while at 90°, wipe down the base using a soft cloth or sponge, and a mild solution of soapy water.

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

1. For models 4.5, 6.0, and 7.5, reduce the regulator (Figure 4-1) setting such that it pressurizes the mast to between 5 and 10 PSIG. Pull up on the regulator cap and rotate counterclockwise. Push cap down to lock into place.

2. While at the 90° position, have one person press the “Mast Up” button to slowly pressurize the mast just enough to extend the desired mast section. A second person may have to hold down the larger mast section collars to ensure the desired tube extends. Release “Mast Up” button as soon as the desired mast section is fully exposed.

3. Wipe down the desired mast section using a non-abrasive cleanser or solvent such as lacquer thinner. Do not allow the cleaning fluid or solvent to run down inside the collar.

4. Repeat steps two and three for the next larger mast section.

5. Inject approximately ½ oz. of TMD Mast Lubricant or lightweight machine oil into the weep hole (drain) of each exposed mast section. The weep holes are located approximately 10” below the collar on each tube except the top tube.

6. Using the “Mast Down” button, lower the mast to 90°.

7. Wait several minutes to allow the lubricant to settle and spread around the wear ring and seal at the bottom of each mast section.

8. Using the “Mast Up” button, extend the mast one section at a time. For each section wipe off any excess lubricant which flows out the weep holes.
4.4 Functional Test

To test the functionality of the system, perform the following tests.

4.4.1 Emergency Circuit Test

To test the emergency circuit, power up the system and operate the system, and then press the “Start/Stop” button at the following stages and check if the system is stopped and de-energized:

- Mast Up (Actuator active – mast going from 0° to 90°)
- Mast Up (Up valve active – actual telescoping mast raising in height)
- Mast Down (Down valve active – telescopic mast lowering in height)
- Mast Down (Actuator active – mast going from 90° to 0°)

4.4.2 Brake Function Test (Standard Only)

To test the brake function in Standard (or non-NFPA) systems, check the following:

1. If the vehicle brake signal is off, the system should not operate.
2. If the vehicle brake is on, the system should be able to operate.
3. During operation, if the vehicle brake signal goes off, the system should shut down and:
   - Stow automatically (units in Standard [non-NFPA] mode)
   - Exhaust air (units in NFPA mode)

4.5 Adjusting the 90° and Mast Stowed Switches

Before delivery of a new system, all switches are properly set and tested and normally no switch adjustment is necessary. However, if a switch needs adjusted, for example if the actuator was replaced, follow the steps outlined in this section to make the adjustment.

4.5.1 Diagnostic LEDs

Table 4-2 charts the colors of the relevant diagnostic LEDs for the various mast positions. An example of the diagnostic LEDs showing the mast in the stowed position is shown in Figure 4-2. These diagnostic LEDs can be used to help determine if an adjustment is necessary, for example if D7 / D8 shows Yellow when the mast is supposed to be stowed. They are also useful in assisting to determine when the switches have been properly adjusted.
Table 4-2 Mast Positions Shown by Diagnostic LEDs

<table>
<thead>
<tr>
<th></th>
<th>D7 / D8</th>
<th>D10 / D11</th>
<th>D13 / D14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mast Stowed</td>
<td>Green</td>
<td>Green</td>
<td>Green</td>
</tr>
<tr>
<td>Mast Between 0° and 90°</td>
<td>Yellow</td>
<td>Green</td>
<td>Green</td>
</tr>
<tr>
<td>Mast at 90°</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Green</td>
</tr>
<tr>
<td>Mast Extended</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Yellow</td>
</tr>
</tbody>
</table>

4.5.2 Adjusting the 90° Switch

The 90° Switch (Figure 4-3 and Figure 4-4) senses when the mast is at 90° by checking the position of the actuator. When the mast is being raised from the stowed position and the 90° Switch is sensed, power to the actuator is removed thus allowing the mast to remain at 90°. The mast will not extend if the mast is not at 90°.

To adjust the 90° Switch:

1. Make certain that the base is level.
2. Remove the base cover to access the switches and Base Board.
3. Loosen the locknuts to adjust the switch.
4. Raise the mast to 90° by holding the “Mast Up” button until the mast is at 90°. Do not use the Auto-up feature to raise the mast to 90°.
5. Check that the mast is at 90° by using a level, ensuring that the mast is square to the sheet metal side plate on the base. A value range of 89.5 to 90.5° is acceptable.
6. Adjust the 90° Switch until it senses the actuator. This will be indicated by the diagnostic LEDs on the Base Board (Figure 4-2).

7. Secure the switch in position using the locknuts.

8. Raise and lower the mast several times, checking that the mast is plumb each time, and adjust the switch if necessary.

9. Replace the cover.
4.5.3 Adjusting the Mast Stowed Switch

The Mast Stowed (near 0°) Switch (Figure 4-3 and Figure 4-4) senses that the mast is in the saddle upon power up, and when the mast is nearing the saddle during stowing. The circuit then looks for a pre-determined current rise (for a maximum of 0.5 seconds) to indicate a solid nesting before shutting off.

To adjust the Mast Stowed Switch:

1. Make certain that the base is level.
2. Remove the base cover to access the switches and Base Board.
3. Raise the mast to gain access to the Mast Stowed Switch.
4. Loosen the locknuts to adjust the switch.
5. Lower the mast to the stowed position by holding the “Mast Down” button until the mast is stowed. Immediately release the “Mast Down” button when the mast is stowed. If you drive the mast too far into the saddle, you may receive a “1,04” error. Do not use the Auto Stow® feature to stow the mast.
6. Check that the mast is properly stowed. This will be indicated by the diagnostic LEDs on the Base Board. As the mast comes down D11 and D13 will be green, and D7 will be yellow. Once stowed, D7 will also turn green (Figure 4-2).
7. Raise the mast to gain access to the Mast Stowed Switch.
8. Secure the switch in position by using the locknuts.
9. Raise and lower the mast several times, checking that the mast stows each time, and adjust the switch if necessary.
10. Replace the cover.

4.6 Adjusting the Magnetic Down Switch

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

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

1. Loosen the band-clamp that holds the Magnetic Down Switch and lower the clamp to the bottom of the mast.
2. While observing the Base Board diagnostic “Mast Down” LED, slowly move the band-clamp up until the “Mast Down” LED turns green.
Inflexion Plus

3. To test:
   a. Initiate the mast.
   b. Press the “Mast Down” button on the controller until the mast stows. If the mast does not stow, repeat steps one and two several more times or until the mast stows.

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

5. If the mast still will not stow, hold a magnet up to the Banded Magnetic Switch. Press the “Mast Down” button and ensure that the mast begins to stow:

6. If the mast stows, repeat the switch adjustment steps above until the switch senses the magnet.

7. If the mast does not stow, check the wiring to the Base Board for loose or disconnected wires. See the wiring diagrams for the system. If the wiring is intact, replace the magnetic switch.
Section 5 Reference Information

This section contains reference information for the system.

5.1 D-TEC II Sensor

The D-TEC II Sensor is an optional accessory. Refer to the Will-Burt D-TEC II Safety System Manual before installing the D-TEC II.

5.1.1 D-TEC II Functionality

An optional D-TEC II Sensor provides additional limited protection against raising the mast into power lines or physical obstructions. As soon as the mast begins raising, the control begins initiating the D-TEC II Sensor and self-tests it until it either passes, or the mast reaches 90°. Assuming that it passes, the operator is then permitted to extend the mast. If the mast senses an obstruction or a power line, the mast will stop extending even though the operator continues to push the "Mast Up" button. In each of these two cases, there will be a message displayed on the alphanumeric display of the Remote Control(s). If the operator believes the sensed condition to be false, they may clear it in either of two ways: momentarily initiating an Auto Stow® function, or lowering the mast to the bottom of the 90° position. This will clear the alarm and allow the operator another chance to raise the mast to its full extension. The following messages may be displayed on the Remote Control(s).

Table 5-1  D-TEC II Error Codes

<table>
<thead>
<tr>
<th>Message</th>
<th>Meaning</th>
<th>Root Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-TEC Testing</td>
<td>The D-TEC II Sensor is performing a self-test.</td>
<td>The D-TEC II has repeatedly been trying to pass the self-test while moving to the RCP active position. Normally, it will pass one of these attempts and no message will be displayed. If not, once there it tries one more time to pass and this message will displayed during the self-test.</td>
</tr>
<tr>
<td>Power Line E-Field</td>
<td>The D-TEC II has sensed voltage from a power line.</td>
<td>A power line may be in close proximity. If so, move the vehicle to a location away from the power line, and then redeploy the system.</td>
</tr>
<tr>
<td>Power Line H-Field</td>
<td>The D-TEC II has sensed current from a power line.</td>
<td>A power line may be in close proximity. If so, move the vehicle to a location away from the power line, and then redeploy the system.</td>
</tr>
<tr>
<td>D-TEC Obstruction</td>
<td>The D-TEC II has sensed some type of physical obstruction.</td>
<td>A physical obstruction may be in close proximity. If so, move the vehicle to a location away from the obstruction, and then redeploy the system. Certain high frequency sounds (e.g. air from pneumatic tools) or fluorescent lights may also interfere.</td>
</tr>
<tr>
<td>D-TEC OSHA Limit</td>
<td>The D-TEC II has sensed voltage from a very high power line.</td>
<td>A power line may be in close proximity. If so, move the vehicle to a location away from the power line, and then redeploy the system.</td>
</tr>
</tbody>
</table>

5.1.2 D-TEC II Sensor Faults

The D-TEC II Sensor is not serviceable, so most issues will end with returning the sensor to Will-Burt for repair. See Troubleshooting for a list of related error codes.
MATERIAL SAFETY DATA SHEET (MSDS)
The Will-Burt Company  Orrville, Ohio  330-682-7015

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION
Etna Products Inc.  
16824 Park Circle Drive  
Chagrin Falls, Ohio 44022

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

Product Name: Masterdraw B685 B  
Product Number: 000626
Issue Date: 02/03/2014  
Supersedes Date: 09/22/2009

Will-Burt Product Name: Mast Lubrication  
Will-Burt Part Number: 900600

SECTION 2: HAZARDS IDENTIFICATION
EMERGENCY OVERVIEW
Appearance / odor:  Transparent Blue liquid with a petroleum oil odor
WARNING:  May cause slight to mild irritation of the skin, eyes and mucus membranes with repeated exposure.
Fire:  Will burn in a fire.
Likely Routes of Exposure:  Skin contact, Eye contact, Inhalation
Skin:  Prolonged or repeated exposure may cause irritation or oil acne
Eyes:  Contact with the eyes may cause temporary irritation
Inhalation:  Vapors generated at high temperatures or oil mist may cause mild irritation of the mucus membranes.
Ingestion:  Considered no more than slightly toxic if swallowed.
Medical Conditions Aggravated by Exposure: Pre-existing skin and respiratory disorders.
This product does not contain any SARA 313 reportable compounds
This product does not contain any carcinogens as defined by OSHA, NTP and IARC at greater than 0.1%
Hazardous Materials Identification System Rating (HMIS®)  110 C

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS
The table below will only list hazardous ingredients. If the table below is blank none are present.

<table>
<thead>
<tr>
<th>Component</th>
<th>Chemical Abstracts Number (CAS)</th>
<th>% by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SECTION 4: FIRST AID MEASURES
Skin Contact:  Remove contaminated clothing and wash with soap and water. If irritation occurs get medical attention.
Eye Contact:  Flush with water for 15 minutes. If irritation occurs get medical attention.
Inhalation:  Remove victim to fresh air and provide oxygen if breathing is difficult. Get medical attention.
Ingestion:  Do not induce vomiting. Get medical attention.

SECTION 5: FIRE FIGHTING MEASURES
Use water, fog, foam, dry chemical or CO2. Do not use a direct stream of water. Product may float and can be reignited on the surface of the water.
Unusual Fire and Explosive Hazards: None
Products of Combustion: Highly dependent on combustion conditions. Mixture of air borne solids, liquid and gases evolve upon decomposition by heat or combustion. CO2 and other organic compounds may be formed during combustion.
Protection of Firefighters: Cool fire exposed surfaces. Do not enter fire space without proper protective equipment including full fire fighting turnout gear and a NIOSH approved self-contained breathing apparatus.

SECTION 6: ACCIDENTAL RELEASES
Personal Precautions: Use personal protection recommended in Section 8 and by the HMIS Rating.
Environmental Precautions: Recover free product. Prevent product from entering sewers or waterways by digging or impounding. Advise authorities if product enters waterways or extensive land areas.
Methods of Containment: Use sand, earth or other suitable absorbent to the spill.
Methods of Clean-up: Remove free and absorbed material from the spill area. Dispose of recovered material and residue in compliance with all federal, state and local regulations.

SECTION 7: HANDLING AND STORAGE
Handling: Keep containers away from heat, open flame or strong oxidants. Use personal protection recommended in Section 6 and by the HMIS Rating.
Storage: Store inside away from heat, open flame and strong oxidants. Keep containers closed when not in use.

SECTION 8: EXPOSURE CONTROL / PERSONAL PROTECTION
Occupational Exposure Guidelines
OSHA PEL / TWA:  5 mg / M3
OSHA PEL / Ceiling: N/E
ACGIH TLV / TWA:  5 mg / M3
ACGIH TLV / STEL:  10 mg / M3
Based on:  oil mist
Engineering Controls: Provide local exhaust ventilation to prevent exceeding recommended exposure limits. Controls are required only to capture vapor, mist, or fumes.

Eye and Face Protection: Use safety glasses or goggles to prevent eye contact.

Skin Protection: Use chemically resistant gloves to avoid prolonged skin contact. Use chemically resistant apron as necessary.

Respiratory Protection: As needed to prevent over exposure to mist or fumes. Use NIOSH approved chemical mist and organic vapor respirator.

General Hygiene Considerations: Wash thoroughly after handling. Wash with soap and water prior to using toilet facilities, eating, drinking or smoking.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES
Boiling Point: > 500 F
Specific Gravity @ 15.6 °C: .87
Vapor Pressure: Unknown
% Volatile / % VOC: Unknown
Vapor Density (Air = 1): Unknown
Evaporation Rate (N-BA = 1): > 1
Solubility in Water: Nil
pH: Not available
Reactivity in Water: Nil
Appearance: Transparent Blue liquid
Odor: Petroleum odor
Flashpoint: > 300 F
Flammable Limits (in air % by Volume): Upper: Unknown Lower: Unknown
Auto Ignition: Unknown

SECTION 10: STABILITY AND REACTIVITY
Stability: Stable
Conditions to Avoid: Strong oxidants, heat, sparks and open flames
Hazardous Polymerization: Will not occur
Incompatibility: Strong oxidants
Decomposition Products: Mixture of air borne solids, liquid and gases evolve upon decomposition by heat or combustion.

SECTION 11: TOXICOLOGY INFORMATION
ACUTE EFFECTS
Oral LD₅₀: Not established
Dermal LD₅₀: Not established
Inhalation LD₅₀: Not established
CHRONIC EFFECTS
None

SECTION 12: ECOLOGICAL INFORMATION
Not available

SECTION 13: DISPOSAL INFORMATION
The material is non hazardous, dispose of material in compliance with all federal, state and local regulations.

SECTION 14: TRANSPORTATION INFORMATION
Proper shipping Description: None
Consider the product to be non-hazardous. No special labeling is required by the Department of Transportation.

SECTION 15: REGULATORY INFORMATION
Global Inventories

<table>
<thead>
<tr>
<th>TSCA: United States</th>
<th>The ingredients of this product are included</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSL: Canada</td>
<td>The ingredients of this product are included</td>
</tr>
<tr>
<td>EINECS: European Union</td>
<td>The ingredients of this product are included</td>
</tr>
</tbody>
</table>

SARA 313 Information:

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS #</th>
<th>% by weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#HMIS: Canadian Workplace Hazardous Material Information System:

SECTION 16: OTHER INFORMATION
Prepared by: The Will-Burt Company Technical Department
The information contained herein is based on the data available to us and is believed to be correct. The Will-Burt Company does not warrant or guarantee their accuracy or reliability and The Will-Burt Company shall not be liable for any loss or damage arising out of the use thereof. The information and recommendations are offered for the user’s consideration and examination and it is the user’s responsibility to satisfy oneself as to the suitability and completeness of this information for their own particular use.
Section 6 Troubleshooting

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

6.1 Troubleshooting Electrical

This section includes a list of warning and error codes and their potential causes. Warning codes do not halt the situation, but let you know of potential issues. Error codes point out problems and usually inhibit operation to prevent potential damage. These codes are shown on the status light on the Base Board. For example, an error of 3,07 would be shown on the status light as three flashes, pause, seven flashes. Additionally, if the controller for your system has a display, errors and warnings will typically be shown there. For more extensive information, see the Night Scan Product Troubleshooting Guide.

Table 6-1 Base Codes

<table>
<thead>
<tr>
<th>Message</th>
<th>Meaning</th>
<th>Root Issue</th>
<th>Potential Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRN 1,04</td>
<td>Look-Up light is burned out.</td>
<td>The control circuit is not sensing the look-up light current.</td>
<td>Look-up light is burned out or disconnected somehow.</td>
</tr>
<tr>
<td>WRN 1,05</td>
<td>Well cover switches indicate closed when they should be open. This stops all vertical movement of the mast to prevent damage to the mast, covers, or load.</td>
<td>Well cover switches indicate closed when they should be open.</td>
<td>Wiring error, or defective switch.</td>
</tr>
<tr>
<td>WRN 1,06</td>
<td>RCP Stow (Vertical, upper mag switch) – Sensor State Error.</td>
<td>Switch outputs are valid (opposite), but switch shows wrong polarity for nested state.</td>
<td>Defective mag switch, defective base board.</td>
</tr>
<tr>
<td>WRN 1,07</td>
<td>At power up, the lower mag switch is indicating &quot;up&quot; (yellow) when it should be &quot;down&quot; (green). If you ignore the warning and continue, the mast will go up, but will shut down after a few seconds with an ERR 1,14.</td>
<td>The lower mag switch needs to be adjusted. D13 should be green when it &quot;sees&quot; the magnet</td>
<td>Wiring error, defective mag switch.</td>
</tr>
<tr>
<td></td>
<td>(Vertical Only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,01</td>
<td>Mast Down (mag switch) - Sensor State Error.</td>
<td>This is only checked at power up, if stowed. Sensor outputs are O.K., but it is indicating that the mast is extended (not down).</td>
<td>1. The magnetic sensor is not being energized or is defective.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Mag switch out of position.</td>
</tr>
<tr>
<td>1,02</td>
<td>Mast Stowed (near 0°) – Sensor Output Error</td>
<td>Sensor outputs are bad.</td>
<td>Defective sensor, defective board</td>
</tr>
<tr>
<td>1,03</td>
<td>Mast Stowed (near 0°) – Sensor State Error.</td>
<td>Sensor outputs are O.K., but sensor shows wrong polarity for nested state. The board remembers where it was (0° or 90°) when it was shut off, and this time it powered up, it's sensing the opposite condition.</td>
<td>Base board was changed or software was updated with the mast at 90°.</td>
</tr>
</tbody>
</table>
| 1,04 | Excessive amp draw during actuator decline | Current sensor indicating it has exceeded:  
(12v systems) 10A for 100ms  
(24v systems) 6.0 amps AND less than 10 amps for (100 msec) | If mast stops at ~70° and issues error, replace Base Board.  
Current sense circuit has failed.  
If error occurs during nesting, check LED D7 “MAST STOWED (near 0°)”. Once the sensor “sees” the magnet, it allows 0.5 sec to see the (nesting) current rise. If the circuit does not see the sensor, it does not look for nesting current to shut down. It will keep driving into the saddle and then issue a 1,04. Re-adjust Near 0° sensor.  
Bad actuator – AC component in current wave shape due to internal mechanical problem. Replace actuator. |
| 1,05 | Well Open (Vertical with well cover) - Switch Output Error | Sensor outputs are bad. | Defective switch or wiring error. Refer to System Wiring Diagram. |
| 1,06 | Well Open (vertical with well cover) - Switch State Error. | Switch outputs are O.K., but show wrong polarity for closed state. | Well cover open or wiring error. System is expecting the well cover to be closed at power-up. |
| 1,07 | Microprocessor Error | No successful poll / response communication for 250ms. | |
| 1,08 | Internal firmware detected error. | Internal state machine logic has detected an invalid state transition. Firmware logic error. | |
| 1,09 | Initiate Pushbutton input error. | Init input has remained active for 5 seconds. Input is stuck, or has been hot-wired. | 1. Unit is in NFPA mode and connected to a Non-NFPA J-box. (Note: if the unit is in Non-NFPA mode and connected to an NFPA junction box, the unit will look normal (UP led on HHRC on), but will not respond to the HHRC. The software is expecting to see the init signal always on. No error message is generated).  
2. Wiring short in the control cable or defective switch/wiring in the junction box. |
| 1,10 | Memory Error | Memory Error | |
| 1,11 | Actuator current has unexpectedly stopped | During decline, the Base board senses actuator current. After the “Near 0°” sensor is detected, it is expecting to see the current level rise before it stops. This error indicates the sensed current has stopped before nesting. | If it occurs near the nested position:  
Actuator has reached its internal stop before nesting completed, most likely saddle too low or saddle not secured causing sideways movement when nesting. |
<table>
<thead>
<tr>
<th>Page</th>
<th>Sensor Type</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,12</td>
<td>Sensor Output Error</td>
<td>Roof-mount - Actuator at 90° magnetic sensor Vertical - Upper magnetic sensor switch</td>
<td>Sensor outputs are bad. Wiring error, faulty sensor (Vertical only) mag switch positioning. Note: Sensor is only active as mast tube magnet goes by. Software watches for direction of travel and sensor activation to determine if mast is “up” or “down”.</td>
</tr>
<tr>
<td>1,13</td>
<td>RCP STOWED magnetic sensor – Sensor Output Error</td>
<td>(Upper magnetic sensor on Vertical)</td>
<td>Sensor outputs are bad. Wiring problem, defective magnetic sensor.</td>
</tr>
<tr>
<td>1,14</td>
<td>Mast Down (lower magnetic sensor)</td>
<td>1. Sensor Output Error 2. Sensor State Error</td>
<td>1. Sensor outputs bad. They have not been opposite for &gt;250ms. or 2. Mast was told to go up, and the sensor indicates it did not move after 8 seconds (v7.2), or 15 seconds (v7.3). 3. Sensor is not seeing magnet when mast is fully retracted. 1. There may be a wiring problem, or a defective magnetic sensor. or 2. Defective magnetic sensor, air supply inadequate, or external magnet affecting sensor. 3. Sensor not seeing magnet - sensor needs to be re-aligned.</td>
</tr>
<tr>
<td>1,15</td>
<td>At 90° (Actuator) - Sensor State Error</td>
<td>Checked at power up after stowing. Sensor outputs are O.K., but sensor shows wrong polarity for nested state.</td>
<td>Board was changed or updated while the mast was at 90°.</td>
</tr>
<tr>
<td>1,17</td>
<td>Well Closed (Vertical with well cover) - Switch Output Error.</td>
<td>Sensor outputs are bad.</td>
<td>D7 Green = Closed D8 Yellow = Not Closed</td>
</tr>
<tr>
<td>1,18</td>
<td>Well Closed (Vertical with well cover) – Sensor State Error</td>
<td>Switch outputs are O.K., but show wrong polarity for Well Closed.</td>
<td>Switch wiring, defective switch, board.</td>
</tr>
<tr>
<td>1,19</td>
<td>Both Near 0° and 90° - Sensor State Error</td>
<td>Both the Nested LS and the 90° LS have been detected active at the same time. This is an invalid condition, and indicates a problem with one or both sensors.</td>
<td>Both sensors indicate proximity, one may be bad.</td>
</tr>
<tr>
<td>1,20</td>
<td>Forced Stow has been activated</td>
<td>This fault is set when the Forced Stow switch is activated to assure the system is not in normal operation during the forced stow operation.</td>
<td>Forced Stow button has been activated</td>
</tr>
<tr>
<td>Message</td>
<td>Meaning</td>
<td>Root Issue</td>
<td>Potential Cause</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>WRN 2,04</td>
<td>Single-tilt - Tilt Stuck</td>
<td>Checked only when moving out of a limit position. The software indicates the state of the (left) tilt photosensor has not changed even though the motor has been told to move for more than 1/2 second.</td>
<td>Something is preventing movement of left tilt mechanism, the motor is defective, or the RCP board is defective.</td>
</tr>
<tr>
<td>WRN 2,05</td>
<td>Right Tilt Stuck</td>
<td>Checked only when moving out of a limit position. The software indicates the state of the right tilt photosensor has not changed even though the motor has been told to move for more than 1/2 second.</td>
<td>Something is preventing movement of right tilt mechanism, the motor is defective, or the RCP board is defective.</td>
</tr>
<tr>
<td>WRN 2,06</td>
<td>Pan Stuck</td>
<td>Checked only when moving out of a limit position. The software indicates the state of the pan photosensor has not changed even though the motor has been told to move for more than 1/2 second.</td>
<td>Something is preventing movement of pan mechanism, the motor is defective, or the RCP board is defective.</td>
</tr>
<tr>
<td>2,01</td>
<td>Pan Limit Overlap</td>
<td>The software indicates both pan photosensors are blocked simultaneously.</td>
<td>Foreign material in one of the photosensors or faulty photosensor.</td>
</tr>
<tr>
<td>2,03</td>
<td>TILT pot stuck</td>
<td>No movement detected in expected direction for 2.0 seconds</td>
<td>Soft stops are not set, something is preventing the sense voltage (pot) movement, the motor is defective, the sense voltage is going the wrong way (miswire), or the P/T drive board is defective.</td>
</tr>
<tr>
<td>2,04</td>
<td>PAN pot stuck</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,07</td>
<td>Communication Timeout</td>
<td>The RCP or P-T Drive board has not sent out communications recently.</td>
<td>Bad board or connection in communications link.</td>
</tr>
<tr>
<td>2,08</td>
<td>Microprocessor error</td>
<td>The RCP board has sent an invalid message.</td>
<td>Indicates a software problem.</td>
</tr>
<tr>
<td>2,09</td>
<td>(RCP Only) (Left) Tilt Up wrap around</td>
<td>The software indicates the same photosensor was made before the opposite limit photosensor was made to stop rotation. This indicates wrap around.</td>
<td>1. The flag that interrupts the light may need to be adjusted to go deeper into the photocell.</td>
</tr>
<tr>
<td>2,10</td>
<td>(RCP Only) (Left) Tilt Down wrap around</td>
<td>The software indicates the same photosensor was made before the opposite limit photosensor was made to stop rotation. This indicates wrap around.</td>
<td>2. The limit photosensor is defective</td>
</tr>
<tr>
<td>2,09</td>
<td>(Positioner Only) Pan Pot Failure</td>
<td>The Positioner software indicates the pot feedback voltage is out of acceptable operating range.</td>
<td>Defective pot, incorrect wiring, bad connection, defective P-T board.</td>
</tr>
<tr>
<td>2,10</td>
<td>(Positioner Only) Tilt Pot Failure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,11</td>
<td>2,11 Right Tilt Up wrap around</td>
<td>The software indicates the same photosensor was made before the opposite limit photosensor was made to stop rotation. This indicates wrap around.</td>
<td>1. The flag that interrupts the light may need to be adjusted to go deeper into the photocell.</td>
</tr>
<tr>
<td>2,12</td>
<td>2,12 Right Tilt Down wrap around</td>
<td>The software indicates the same photosensor was made before the opposite limit photosensor was made to stop rotation. This indicates wrap around.</td>
<td>2. The limit photosensor is defective</td>
</tr>
<tr>
<td>Message</td>
<td>Meaning</td>
<td>Root Issue</td>
<td>Potential Cause</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>2,13</td>
<td>2,13 Pan Right wrap around</td>
<td>The software indicates the same photosensor was made before the opposite limit photosensor was made to stop rotation. This indicates wrap around.</td>
<td>The limit photosensor is defective.</td>
</tr>
<tr>
<td>2,14</td>
<td>2,14 Pan Left wrap around</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,15</td>
<td>Left Tilt Limit Overlap</td>
<td>The software indicates both tilt photosensors appear to be blocked simultaneously.</td>
<td>Foreign material in one of the photosensors or faulty photosensor.</td>
</tr>
<tr>
<td>2,16</td>
<td>Right Tilt Limit Overlap</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6-3  **HHRC Codes**

<table>
<thead>
<tr>
<th>Message</th>
<th>Meaning</th>
<th>Root Issue</th>
<th>Potential Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRN 3,02</td>
<td>Dual HHRC simultaneous inputs</td>
<td>Two HHRCs are sending commands simultaneously.</td>
<td>Two HHRCs are sending commands simultaneously.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If commands are not conflicting, they will be allowed (Base Board decides).</td>
<td>Two HHRCs are sending commands simultaneously.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If commands are conflicting, no action/movement will be allowed by the Base Board.</td>
<td>Two HHRCs are sending commands simultaneously.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Warning appears regardless of conflicting or not conflicting to alert operators that someone else is trying to operate the unit simultaneously.</td>
<td>Two HHRCs are sending commands simultaneously.</td>
</tr>
<tr>
<td>3,07</td>
<td>Unrecoverable Communication Error</td>
<td>The display board in the HHRC or PMRC has power, but the Base Board is not communicating with it. It may be caused by the HHRC, Base Board, RCP Board, or any other device that is using the RS-485 communication lines in the system.</td>
<td>Defective HHRC or defective base board. Bad or improper connection in communications link, or HHRC is not properly powered. Check continuity of the data lines from the DC power cable connector to the HHRC connector. Refer to System schematic. Also check that the shield in the junction box has a good electrical connection to the electronics common at one end or the other, but not both.</td>
</tr>
<tr>
<td>3,08</td>
<td>Microprocessor Error</td>
<td>Internal firmware detected error.</td>
<td>Replace HHRC or HHRC Display pcb.</td>
</tr>
<tr>
<td>3,09</td>
<td>RF module Error</td>
<td>Wireless Transmitter/Receiver did not properly initialize.</td>
<td>Return HHRC to factory for repair.</td>
</tr>
<tr>
<td>Message</td>
<td>Meaning</td>
<td>Root Issue</td>
<td>Potential Cause</td>
</tr>
<tr>
<td>---------</td>
<td>----------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>5,01</td>
<td>Lamp Fault</td>
<td>The D-Tec has sensed a fault in the LED lamp circuit.</td>
<td>This check is made when the mast thinks it has just arrived at 90°. The D-Tec Sensor measures the current through the look-up LED's to see if it is within a certain range. If it is not, the fault occurs.</td>
</tr>
<tr>
<td>5,03</td>
<td>SPI Fault</td>
<td>A communications bus internal to the D-Tec II sensor has failed during self-test.</td>
<td>Defective Sensor</td>
</tr>
<tr>
<td>5,07</td>
<td>Unrecoverable Communication Error</td>
<td>No successful communication for 250ms.</td>
<td>Check connection (data lines, ground) for continuity.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>This error may also be displayed on systems without a D-Tec if the Base Board is missing the 4710801 DIP Switch Shunt Board.</td>
</tr>
<tr>
<td>5,09</td>
<td>E-Field Fault</td>
<td>E-Field portion of the D-Tec II failed its self-test.</td>
<td>Defective sensor</td>
</tr>
<tr>
<td>5,10</td>
<td>H-Field 1 Fault</td>
<td>One axis of the Magnetic Field portion of the D-Tec II failed its self-test.</td>
<td>Defective sensor</td>
</tr>
<tr>
<td>5,11</td>
<td>H-Field 2 Fault</td>
<td>One axis of the Magnetic Field portion of the D-Tec II failed its self-test.</td>
<td>Defective sensor</td>
</tr>
<tr>
<td>5,12</td>
<td>H-Field 3 Fault</td>
<td>One axis of the Magnetic Field portion of the D-Tec II failed its self-test.</td>
<td>Defective sensor</td>
</tr>
<tr>
<td>5,15</td>
<td>Ultrasonic Fault</td>
<td>The ultrasonic portion of the D-Tec II failed its self-test.</td>
<td>Check for ultrasonic physical sensor or deflector damage.</td>
</tr>
<tr>
<td>5,16</td>
<td>Supply Voltage Fault</td>
<td>The power supply section of the D-Tec II sensor is outside proper operational limits.</td>
<td>Check power connections, voltage level and induced noise on power source.</td>
</tr>
</tbody>
</table>
### 6.2 Troubleshooting Mechanical Symptoms

This section describes mechanical troubleshooting of your system. Table 6-5 lists some problems that may be observed, but may not generate an error or warning code on the controller.

#### Table 6-5 Mechanical Symptoms and Troubleshooting Sequence

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Root Issue</th>
<th>Troubleshooting Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mast sticking during extension or retraction.</td>
<td>Mast is dirty and/or requires lubrication.</td>
<td>1) Clean and lubricate mast. 2) If condition continues, mast requires overhaul.</td>
</tr>
<tr>
<td>Mast leaks down when extended.</td>
<td>Air leak in mast or valve/compressor assembly.</td>
<td>Use a soapy water solution to pinpoint the leak. If the mast is leaking, it will require new seals. If the valve or compressor assembly is leaking at a fitting, remove the fitting, clean and reinstall using thread tape or sealant. Replace a faulty valve or compressor.</td>
</tr>
<tr>
<td>Erratic or noisy when raising to 90°.</td>
<td>Bent or worn actuator or pivot shaft.</td>
<td>Replace damaged component.</td>
</tr>
<tr>
<td>RCP continually pans or tilts.</td>
<td>Bent flag in RCP.</td>
<td>1) Remove RCP cover straighten or replace flag. 2) Make sure wiring is not wound tight. Reset home position.</td>
</tr>
<tr>
<td>Pan or tilt motor will not respond with no errors displayed on remote control(s).</td>
<td>Broken or loose motor wire lead or faulty motor.</td>
<td>1) Reconnect wire lead. 2) Replace motor.</td>
</tr>
<tr>
<td>Mast fails to fully nest in saddle and disconnects power.</td>
<td>Binding of actuator, software fault or control erroneously sensed an increase in current.</td>
<td>1) Check that Base Board has software version 2.6 or later. Contact Will-Burt if update is required. 2) See the Night Scan Product Troubleshooting Guide for software fault codes. 3) Check actuator for binding. Replace actuator if binding.</td>
</tr>
<tr>
<td>Mast will not begin to lower from 90° position.</td>
<td>Mast tube sections do not fully collapse.</td>
<td>1) Extend and retract mast. 2) Check tube sections for damage. 3) Internal coil cord may be binding, contact Will-Burt.</td>
</tr>
<tr>
<td>Mast will not begin to lower from 90° position.</td>
<td>Magnetic switch band-clamped to mast is not made.</td>
<td>1) Magnetic switch is may be out of adjustment. Loosen clamp and slide switch up and down the mast until contact is established. 2) Check wiring. 3) Replace defective magnetic switch.</td>
</tr>
</tbody>
</table>
(This page is intentionally left blank.)
Section 7 Appendix
This section contains the appendixes for the system.

7.1 Installing the PMRC
There are several types of controllers available for your system. This section will describe how to install the PMRC. See the drawings at the end of this manual for additional information on installing the controller including information on physical dimensions, and the placement of the mounting holes.

7.1.1 Attaching the PMRC
To attach the PMRC:

1. Find a convenient, dry location to mount the PMRC.
2. At the desired location, cut the panel to the dimensions of the PMRC (Figure 7-1).

3. Provide four #10 round head screws.
4. Place the PMRC through the panel cutout.
5. From the front of the PMRC, fasten the PMRC to the base with the #10 screws.

![PMRC Dimensions]

Figure 7-1 PMRC Dimensions
7.1.2 Wiring the Base Board
See Section 2 of this manual for information on how to wire the Base Board.

7.1.3 Wiring the PMRC
One end of the Control Cable must be wired to a provided plug which connects to the back of the PMRC.

To wire the PMRC plug:

1. See the electrical drawings at the end of this manual.
2. Ensure power is disconnected from the system.
3. Connect the wires from the Control Cable to the supplied PMRC plug.
4. Plug the cable into the back of the PMRC.
7.2 Installing a Wired HHRC with J-Box

To electrically connect a wired HHRC with a J-Box, follow the instructions in Section 2 for Wiring the Base Board, and use the following schematic (Figure 7-2).

Figure 7-2  Alternate Wiring Using J-Boxes
Section 8 Drawings
This section contains the drawings for the system.
NightScan Products, Roof-Mount with 4311701 Universal Control Base Wiring

Drawing: WD-46276

Sheet: 2 of 2
SINGLE REMOTE WITH EMERGENCY STOP

WHEN WIRING TWO ACCESS POINTS FOR USE WITH ONE HHRC:
PARALLEL CONNECT TO J4 AS FOR A SINGLE CONTROLLER.

JUMPER FROM J-7 REQUIRED FOR STANDARD (NON-NFPA) OPERATION.

CONNECT SHIELD GROUNDS TO J4-2.

TB4 ON BASE BOARD

NOTES
1. "MAST ACTIVE" CONTACTS (J4-B) USE SW2-1 ON BASE BOARD TO SELECT OPEN OR CLOSED WHEN "MAST ACTIVE.
2. SW2-1 OPEN = CONTACTS OPEN WHEN "MAST ACTIVE, SW2-1 CLOSED = CONTACTS CLOSED WHEN "MAST ACTIVE.
3. MINIMUM CONDUCTOR, 1820 SWG AVAILABLE.
4. REMOTE INPUTS IF REPLACED BY PARKING BRAKE INTERLOCK, J4-5 TO J4-7 CLOSED WHEN BRAKE "OFF." THIS FUNCTION AVAILABLE IN STANDARD MODE ONLY.
5. CONNECT CABLE: ALL WIRES 20 AWG, EXCEPT RED AND BLACK (J4-1 AND 2).
6. OPTIONAL DISABLED INPUT, CUSTOMER SUPPLIED CONTACTS, MUST HAVE CONTINUITY TO FUNCTION.
7. 18 GA. MIN. FOR 1 BOX POWER, SEPARATE POWER TO BASE BOARD TB4 REQUIRED.
8. TERMINAL: 20-16AWG, 2.5mm

(2) REMOTES WITH EMERGENCY STOP
POWERLITE DUAL-TILT HHRC ONLY, NOT AVAILABLE FOR CHEF SINGLE-TILT.

JUMPER FROM J-7 REQUIRED FOR STANDARD (NON-NFPA) OPERATION.

CONNECT SHIELD GROUNDS TO J4-2.

TB4 ON BASE BOARD
Night Scan Universal Control
Roof-Mount, NFPA or Standard, HHRC with Emergency Stop

Drawing: WD-72312