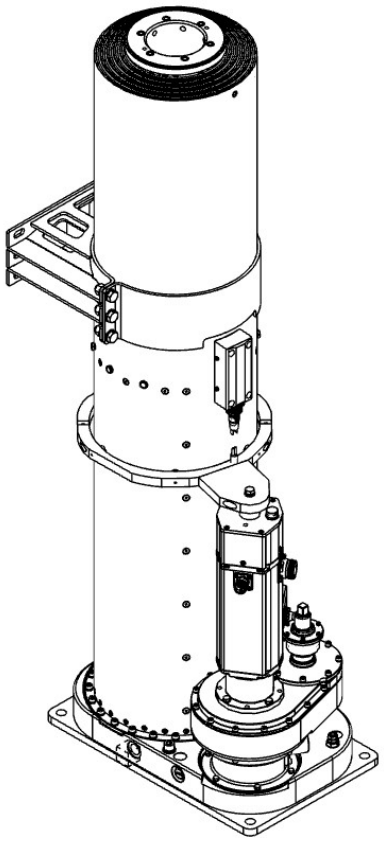
WILL-BURT

STILETTO® AL HEAVY DUTY

Stiletto AL HD Operating Instructions



(4-Meter Stiletto AL HD P/N: 7121110001 Shown)

The Will-Burt Company
401 Collins Blvd
Orrville, OH 44667, USA

Phone: +1 330 684 4000
E-Mail: info@willburt.com
Website: www.willburt.com

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Original Instructions

CE UKCA

Authorized Representative:
Will-Burt Germany GmbH & Co. KG
Fischergasse 25
D-91344 Waischenfeld, Germany

INNOVATION ELEVATED®

Warranty

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

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

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

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

Contents

Document History

Table 0-1 Document History

Document Revision	Date	Change Details	Changes Backward Compatible with Previous Manual Version
TP-7121110000-00	Oct. 2024	Initial Release	--
TP-7121110000-01	Dec. 2024	Updated Troubleshooting tables, graphics in Installation, payload mounting info, and electrical installation info.	Yes
TP-7121110000-02	Sept. 2025	Updated Technical Data info, Installation Dimensions info, and Mast System Drawings.	Yes

1 Safety Summary

This section describes safety instructions for the Stiletto AL HD that personnel must understand and apply throughout all product activities such as transportation, handling, installation, operation, maintenance, storage, disposal and troubleshooting. Read and understand this entire document, and contact The Will-Burt Company with any questions, before performing any procedure outlined in this document. Keep this document during the entire duration of use of the device. Pass this document along to trained and qualified end users.

1.1 Signal Word Definitions

The following signal words and definitions are used to indicate hazardous situations:

⚠ DANGER

DANGER indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury or equipment damage. It is also used to alert against unsafe practices.

1.2 Safety Instructions

⚠ DANGER

Electrocution Hazard! Contact with high voltage will result in death or serious injury. Observe general safety precautions for handling equipment using high voltage. Do not locate or operate mast near electrical lines, cables or other unwanted sources of electricity. Allow sufficient clearance on all sides of mast to allow for side sway. Do not operate mast during an electrical storm. Be certain electrical cables are undamaged and properly terminated. Do not touch live wires. Follow OSHA or other national safety regulations when working near energized power lines. Personnel working with or near high voltages should be familiar with methods of resuscitation.

⚠ DANGER

Disconnect Power for Service! Always disconnect all power sources following proper lock-out tag-out procedures before performing service, repair or test operations. Remove the tethered hand held control where applicable for added protection during maintenance.

⚠ DANGER

Mast Tip Over Hazard! Mast tip over could result in death or serious injury. Before operation, be certain mounting structure is capable of resisting forces generated from all loading and

environmental conditions, including, but not limited to, mast size and weight, payload and cable size and weight, payload sail area, wind speed, guy line arrangement, support bracket or roof line location, and base plate assembly. Do not operate in wind speed conditions exceeding the maximum rated wind speed. Do not operate on slopes exceeding the maximum deployment angle. Do not install a payload that exceeds the maximum payload lifting capacity of mast. Do not install a payload with the center of gravity offset from mast centerline exceeding the maximum allowed offset. Stand clear of mast and mast payload during operation. Be certain mast is level and secure before and during installation, operation, and maintenance.

⚠ DANGER

Falling Objects from Mast Hazard! Wear a protective hard hat when working on mast or situated near mast operating area while mast is extending, retracting or deployed in any position above the nested position. Improperly secured payload or mast components, ice formations, etc. could be dislodged from mast and fall. Be sure the payload is properly installed and secured.

⚠ DANGER

Relocation/Driving Hazard! Do not relocate the system during operation or while mast is extended to any height above the nested position or powered up. Do not move vehicle until mast has been securely nested and isolated from power. Power-up and operate mast only if the vehicle is stationary and securely parked with the parking brake properly applied. Do not put mast in service or operate without the vehicle interlock warning circuit or magnetic warning kit installed to provide confirmation mast is nested prior to moving the vehicle. Contact The Will-Burt Company Engineering team for special on-the-move situations for military only use on specialized products.

⚠ DANGER

Burst Hazard! For pneumatically operated masts, do not operate without the over-pressure safety valve installed. Keep personnel clear of safety valve exhaust direction. Do not exceed the maximum rated pressure of mast. If the mast air pressure is not fully discharged prior to removing air hoses, a rapid release of air pressure will occur requiring hearing and eye protection.

⚠ WARNING

Payload Lifting Hazard - Intended Use! The mast is intended to lift a specific payload for lighting, surveillance or communication use only. Any other use without written consent is prohibited and could cause death or serious injury. Do not use mast to lift personnel. Do not exceed specified payload capacity. Large payload wind sail areas can reduce payload capacity. Consult The Will-Burt Company Engineering team.

⚠ WARNING

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

⚠ WARNING

Read Operating Instructions! Read and observe the operating instructions. Non-observance of the instructions, operation which is not in accordance with use as prescribed in the instructions, wrong installation or incorrect handling can seriously affect the safety of operators and machinery. Adhere to the safety instructions when carrying out any activity relating to the Stiletto AL HD.

⚠ WARNING

Trained Personnel Only! This product is intended for use by trained professionals only. It is not intended for general use by the public or untrained personnel. Handling, installation, operation and maintenance to be performed by trained and authorized personnel only. Only a properly trained and qualified certified electrician should perform electric installations and service.

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ CAUTION

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

⚠ CAUTION

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

⚠ CAUTION

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

⚠ CAUTION

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

⚠ CAUTION

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

⚠ CAUTION

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

⚠ CAUTION

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

Electrocution Hazard! Mast tubes are aluminum construction and are highly conductive to electrical current. Follow applicable safety regulations when working near energized power lines. Do not deploy the mast if power lines are less than 50 ft. (15 m) from the center of the deployment site.

⚠ WARNING

Relocation Hazard! The payload must be supported or removed prior to driving the vehicle to prevent damage to the mast and payload. Remove any payload tie down or locking features before operating the mast. Do not move the mast while it is being raised or lowered.

⚠ WARNING

Safety Instruction – Payload Mounting! The payload shall be bolted to the mast using all six of the provided mounting holes using proper thread locking techniques such as lock washers and locking compound.

⚠ WARNING

Safety Instruction – Kinetic Energy! This mast has an automatic failsafe brake. No manual intervention is required during manual operation. In the unlikely event of brake failure the mast can back-drive. Potentially destructive kinetic energy may be created.

⚠ WARNING

Mounting Structure Hazard! Before installation, ensure the mounting structure is capable of resisting forces generated from all loading and environmental conditions, including, but not limited to, mast system size and weight, payload size and weight, vehicle dynamic loads, sail size, wind speed, ice loading, support bracket or roof line location and base plate assembly. The

lower structure at the base plate shall be sized to support all vertical loads from the mast and payload. The support bracket is not intended to carry vertical loads. The support bracket mounting structure and the base plate mounting structure shall be tied to the same vehicle structure/frame (i.e. do not mount the support bracket to vehicle body and the base plate to the vehicle chassis frame. This would put the vehicle suspension system between the mounting points).

⚠ WARNING

Tip Over Hazard! Before operating, the base section shall be within:

- 10° of vertical for models at or below 10M extended height
- 5° of vertical for models above 10M extended height

⚠ CAUTION

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

⚠ CAUTION

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

⚠ CAUTION

Equipment Damage – Cable Routing! Cabling or Nycoil should be routed such that it cannot become trapped or pinched between the mast collars during retraction.

⚠ CAUTION

Safety Instruction - Guy Lines! For masts using guy lines, do not overtighten guy lines or tension them unevenly.

⚠ CAUTION

Safety Instruction - Polarity! Reversing polarity of the source incoming DC power will damage components.

⚠ CAUTION

Equipment Damage! Do not substitute any grease for the Will-Burt drive screw lubricant. This is a super-premium aerospace grade product and is required for specified performance and life.

⚠ CAUTION

Equipment Damage – Overriding Sensor and Faults! Only use OVERRIDE Switch for emergency operation of mast. When the OVERRIDE Switch is engaged, all sensors and faults generated by the controls of the mast are ignored. Power to the Motor will continue as long as the OVERRIDE Switch is held, even at the extreme high and low ends of travel. The limit switches typically used to prevent the mast from over-travelling at the extreme ends of travel will not function normally. Use extreme caution when using the OVERRIDE Switch at the fully extended and fully nested areas of mast deployment. Holding the UP/DOWN Switch beyond the limits of travel may result in equipment damage.

⚠ CAUTION

Equipment Damage – Manual Operation! When manually extending or retracting the mast, do not drive past the normal extended or nested stops. Do not apply in excess of 50 lb.-ft. (68 N-m)

when using the Crank Handle Assembly. The normal protections are being bypassed and equipment damage could occur. Use caution to avoid strain when operating the hand crank.

Note: When not in use, store the Crank Handle Assembly in an accessible area in close proximity to the mast.

⚠ CAUTION

Voltage and Current! Verify that a power source capable of delivering the specified Mast System voltage and current has been properly connected to the Control Box. Damage to the Control Box may occur if voltage drops below 18 volts during operation of the mast. Verify the power supply has been connected with the right polarity before initializing the mast system.

⚠ CAUTION

Tangled and Damaged Cables! Ensure cables have adequate clearance from the Mast System so that the cables are not pinched between the collars or speared by the trigger posts as the mast is retracted.

⚠ CAUTION

Equipment Damage – Cutting! Wear gloves when installing the electrical ground strap, and handling icebreakers to avoid possible injury.

⚠ CAUTION

Disconnect Power! Power must be disconnected before connecting or disconnecting any Mast System connector. For example, power must be disconnected when connecting or disconnecting J1, J2, J3, J4 and J5 on the Control Box. Do not disconnect the power cable from J1 on the Control Box or from the power source while the mast is in motion (extending or retracting). This could result in damage to the Control Box.

⚠ CAUTION

Equipment Damage – Control Box! Do not open the Control Box. The Control Box is vacuum-sealed at the factory. Opening the Control Box could cause equipment damage and will void the warranty.

⚠ CAUTION

Equipment Damage – Qualified Personnel! All persons installing and maintaining this equipment should be suitably qualified and work to local, regional, and national standards and codes of practice.

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

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

1.3 Symbols Used on Product Labels

The following symbols are displayed on the product. The symbol meanings are as follows:

This symbol indicates an electrocution hazard or hazardous voltage hazard. There is voltage present inside mast and control box. Do not operate mast near electrical lines or during electrical storms. Contact with high voltage will result in death or serious injury.

This symbol indicates a pinch point hazard. Keep fingers and hands clear of moving parts.

This symbol indicates a tip-over hazard. The mast must be properly supported during transport, handling, installation, maintenance, operation and decommissioning. System tip-over could result in death or serious injury.

This symbol indicates a general warning. In this unit, this symbol indicates a frozen water hazard. Water must be permitted to exit mast to avoid ice damage to mast.

This symbol is used to remind users to read and understand the operator's manual before operating the mast system. Failure to follow operating instructions could result in death or serious injury. Read and understand operating instructions before handling, installing, operating, or maintaining the mast system.

This symbol indicates a hard hat is required when working under the mast operating area. Failure to wear a hard hat could result in death or serious injury.

This symbol indicates an electrical ground connection point.

This symbol is used to indicate the center of gravity (COG) of a fully nested mast in a horizontal transport position.

2 Specification Compliance

2.1 CE Declaration of Conformity

Refer to the Product page at www.willburt.com for the latest Declaration of Conformity.

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3 Introduction

Thank you for selecting The Will-Burt Company for your critical payload elevation needs. These operating instructions describe transporting, handling, installing, operating, maintaining, storing, and troubleshooting procedures for the Stiletto AL HD mast system. These procedures assume the use of standard mast systems. Procedures and characteristics for mast systems customized to meet customer-specific needs may vary.

These operating instructions are intended for professionals who are qualified by their appropriate training and experience to perform the procedures. Review this document in its entirety. Contact The Will-Burt Company with any questions before performing any procedure outlined in this manual.

The views depicted in this manual are provided for clarification and are subject to change without notice. Views are not to scale.

This manual is for the following Stiletto masts:

- Stiletto AL HD Masts

This manual is not for the following Stiletto masts:

- Stiletto Masts
- Stiletto AL Masts
- Stiletto HD Masts

See www.willburt.com for information on these and other The Will-Burt Company products.

The Stiletto AL HD mast models are available with many options installed by The Will-Burt Company.

A typical Stiletto AL HD mast system consists of:

- A telescoping mast with a 28 VDC Drive Assembly and a Support Bracket Assembly
- Control Box
- Optional Accessories

3.1 Intended Use

The Stiletto AL HD mast system is intended for use by professionals in the defense/fire/rescue/first responder/security/towing/broadcast/cellular industries to provide elevated and directional emergency scene lighting and surveillance or communication capabilities. It is not intended for use by non-professionals. Do not use the mast to lift personnel. The Stiletto AL HD mast system is intended to be installed on defense/fire/rescue/towing/first responder/broadcast/cellular vehicles with the vehicle interconnect safety circuit installed and operational.

The Stiletto AL HD mast system is intended to be used only when the vehicle is stationary and the vehicle parking brake is properly applied. Do not supply input supply voltage or operate the mast system when the vehicle is in motion. The mast shall remain in the powered-down, nested position during vehicle motion. Contact The Will-Burt Company with any questions on the intended use or available training programs for installation and operation.

3.2 Definition of Terms

Throughout this manual, the following terms are used:

- **Mast:** refers to the mechanical telescoping mast
- **Mast System:** refers to the entire Stiletto AL HD mast system (telescoping mast, Control System, and additional accessories)
- **Payload:** refers to the object or equipment being raised by the mast to an operational height

See Section 9.4 for an Extended Glossary of Terms used within this manual. The Extended Glossary of Terms includes:

- General Terms and Abbreviations (Section 9.4.1)
- Mounting Position Terms (Section 9.4.2)

3.3 Finishes

The Will-Burt Company offers a variety of finishes designed to prolong the life of the mast and reduce maintenance. The drive assembly cover, support bracket, and base tube will be painted the appropriate colors. The collars are black anodized regardless of the finish; painted collars are not currently available. Typically, the top and intermediate tubes will not be painted but will have a black anodized finish, however, paint finishes for these tubes are available. Contact The Will-Burt Company for details. CARC finish is available for the drive assembly cover and base tube, but not the intermediate and top tubes.

Note: If a paint other than a black anodized finish is used on the intermediate and top tubes, the wearing on the painted intermediate and top tubes will not be covered under the warranty. This is because flat paints show more wear and are less suitable for intermediate and top tubes as compared to the black anodized finish.

For information on available mast finishes, see www.willburt.com.

3.4 Mast Component Descriptions

Telescoping Mast: The mast is the structure used to raise the payload to an operational height. It consists of concentric tube sections that extend and retract mechanically. The exterior surfaces of the tubes are anodized and sealed for long life. The environmental seals at the top of each tube limit water and dust ingress.

Each tube has one rectangular key along the tube length. This key aligns with the keyway in the next smaller adjacent tube and is used to establish azimuth (rotational) integrity.

The mast is designed to drain water through a ½-14 NPT threaded port at the base of the mast and does not require a drain plate.

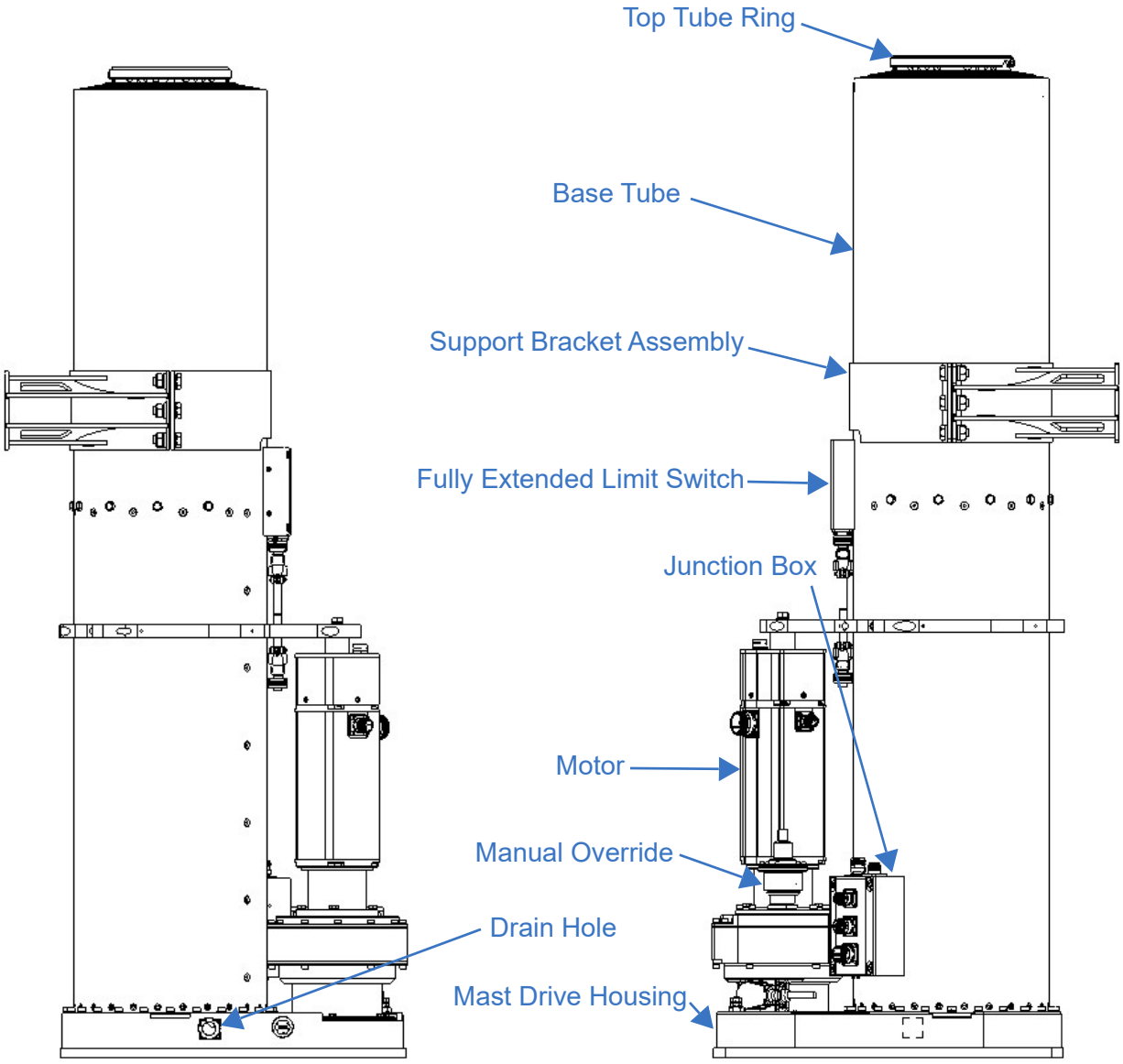

Figure 3-1 Mast (4-Meter P/N: 7121110001 Shown)

Drive Assembly: The drive assembly extends and retracts the mast tubes. It includes a ball screw, motor and mast drive housing.

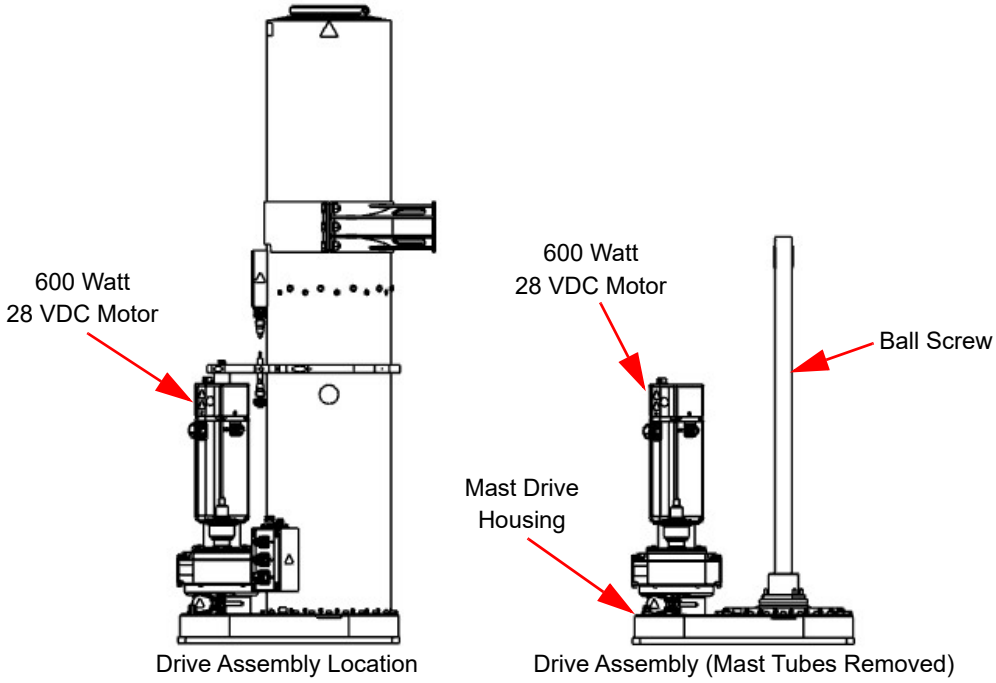

Figure 3-2 Drive Assembly (Not to Scale)

Ball Screw: The mast is driven by a steel, mechanical ball screw. Each moving tube (all except the base tube) has a bearing that allows the tube to extend and retract. The ball screw extends and retracts the tubes all at the same time as it rotates, meaning that all tubes extend at the same time, not sequentially. The ball screw is located in the center of the mast and responds to either input from the Control Box or by using the manual cranking mechanism (with all power disconnected).

Motor: The motor is used, in powered operation, to rotate the ball screw. When power is removed from the motor, the spring-loaded brake is applied. The brake is always on when power is removed from the system in order to prevent the mast from back driving.

The Mast Drive Housing: The mast drive housing contains the gear drive system. Contents can be accessed for maintenance and repair through the cover plate. Only appropriately trained repair and service personnel permitted.

Top Tube Ring: The top tube ring is attached to the top tube. It has a Payload Interface to attach the customer payload or payload adapter. The standard Payload Interface for a Ø150 mm top tube is shown in Figure 3-3. Contact The Will-Burt Company for alternative options.

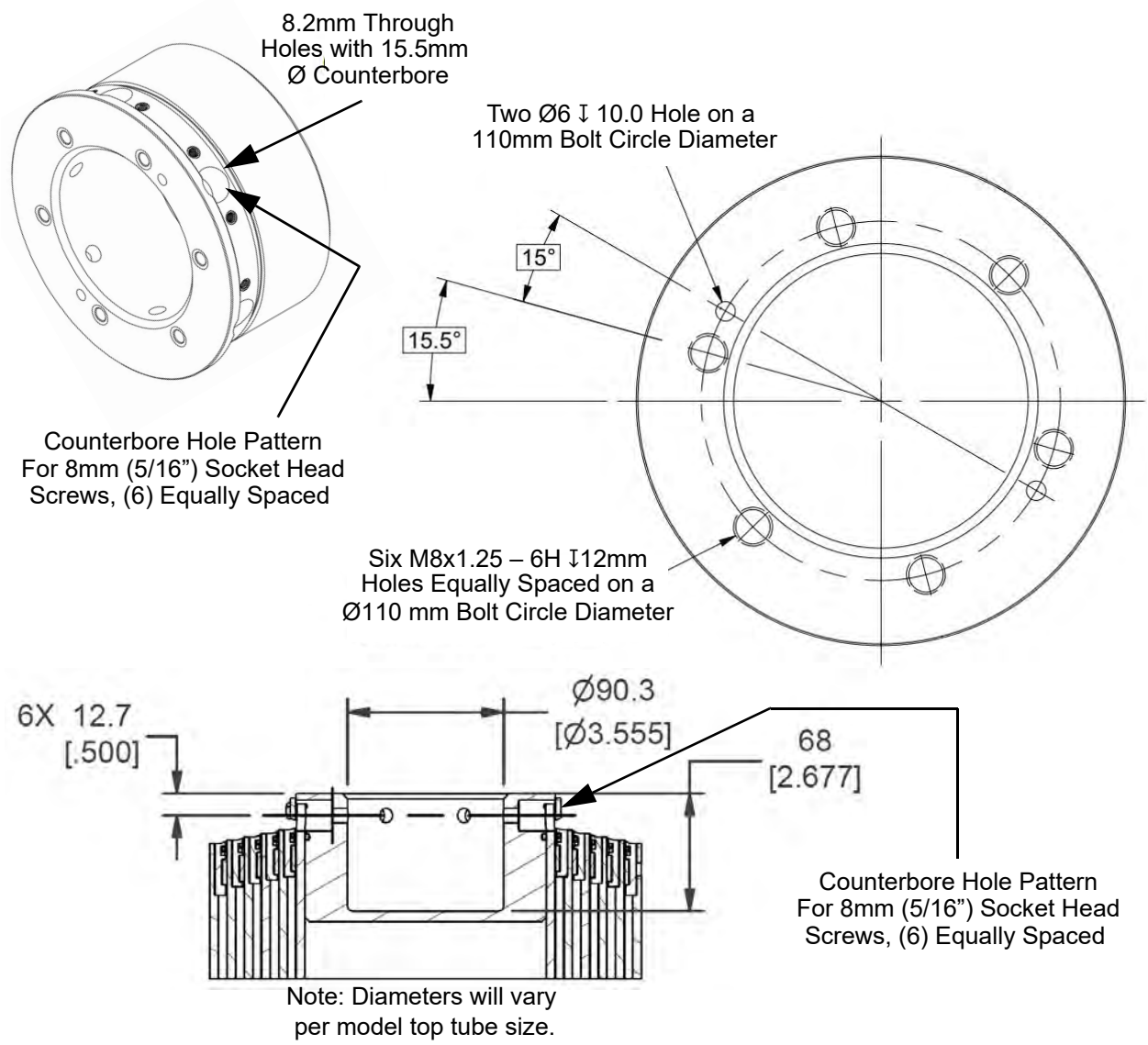

Figure 3-3 Top Tube Ring (Top Tube Ring P/N: 5889202 Shown)

Support Bracket Assembly: The support bracket assembly secures the mast to the support structure. Along with the mounting holes in the base of the mast, it is an essential part of mounting the mast system. Hardware to secure the support bracket assembly to the mast ships with the mast system. Hardware to secure the support bracket assembly to the support structure varies based on the customer-specific mounting application and is customer-provided.

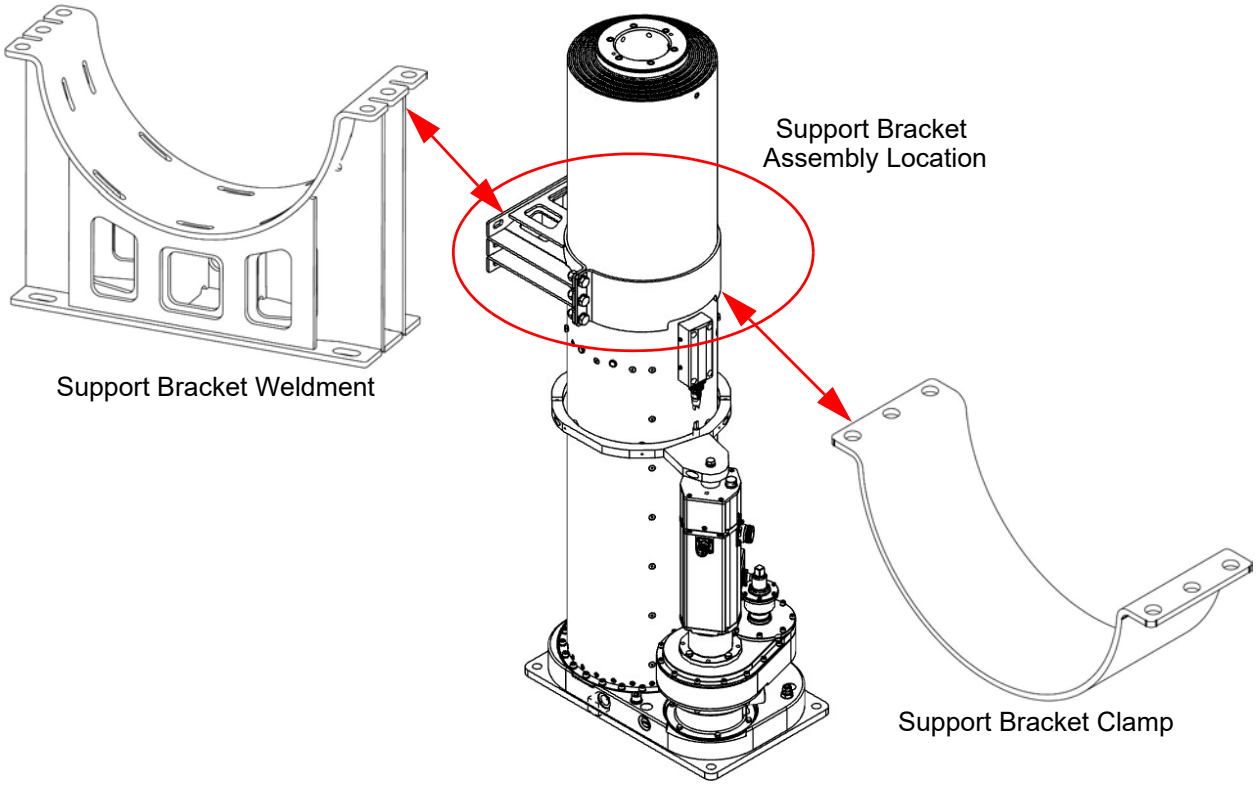

Figure 3-4 Support Bracket Assembly (Not to Scale)

Fully Extended Limit Switch: The fully extended limit switch is used to detect when the mast is fully extended.

Fully Nested Limit Switch: The fully nested limit switch is used to detect when the mast is fully nested.

Motor Cable: The motor cable provides power to the motor. The connectors and cables are environmentally sealed to prevent dust, sand, or moisture intrusion. There is a 6-pin military screw-type connector on each end of the motor and brake cable for ease of installation and to prevent environmental intrusion.

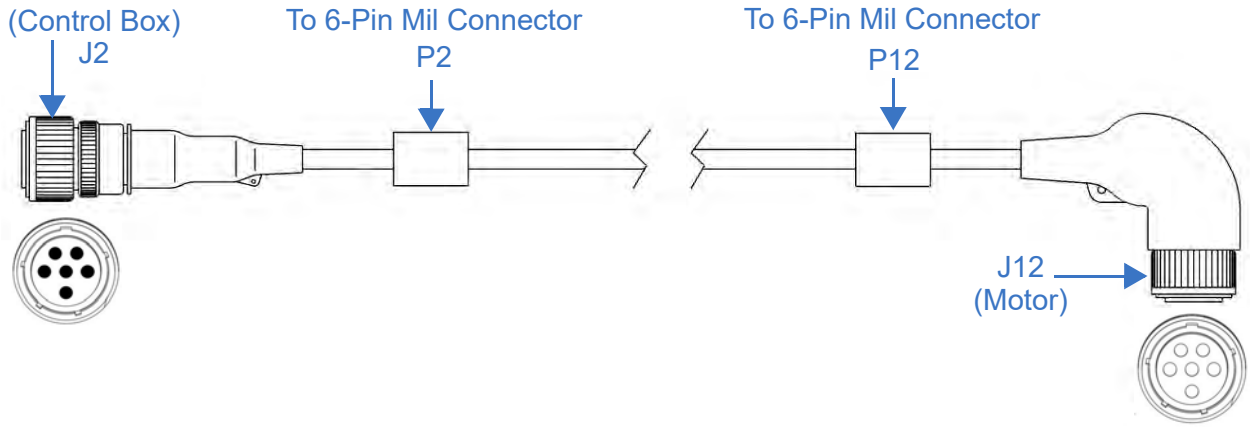

Figure 3-5 Motor Cable

The Mast Data Cable: The mast data cable transfers signals to the mast. The connectors and cables are environmentally sealed to prevent dust, sand, or moisture intrusion. The mast data cable has 10-pin military screw-type connectors on each end for ease of installation and to prevent environmental intrusion.

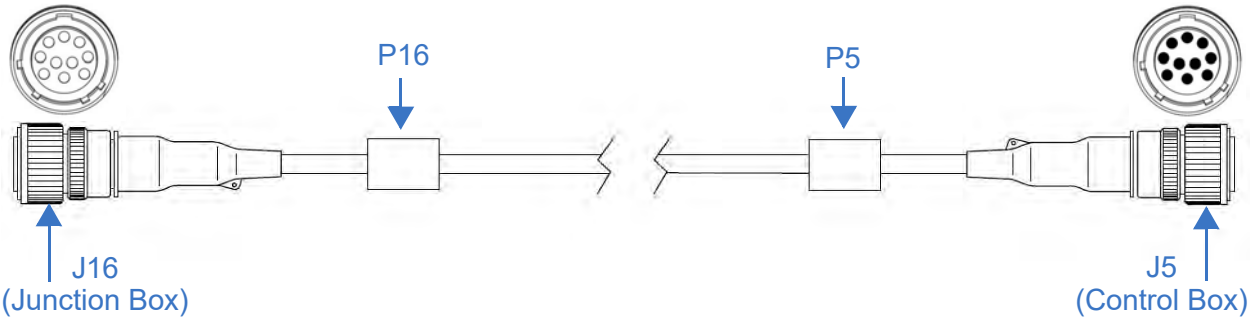

Figure 3-6 Mast Data Cable

Fully Extended Limit Switch Cable: The fully extended limit switch cable (Figure 3-7) transfers signals between the fully extended limit switch and the mast drive housing (J7).

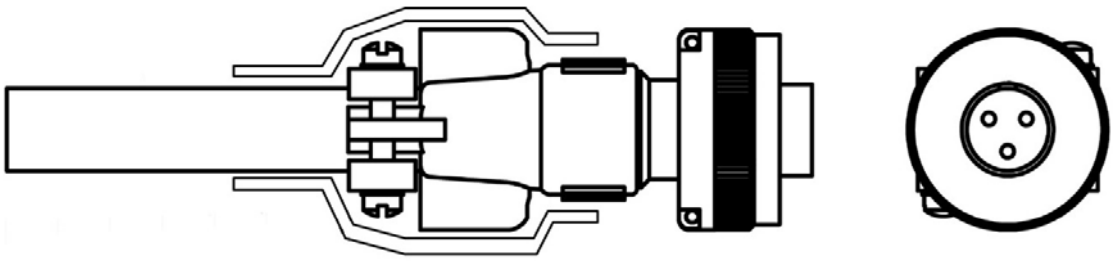

Figure 3-7 Fully Extended Limit Switch Cable

EMI Filter (Optional): The EMI Filter includes a shielded cable (multiple lengths available) to the Control Box J1 connector. It mates with customer supplied shielded cable to power supply and customer control. It is required for Military EMC/EMI compliance (not required for CE compliance). It is ordered separately from the mast assembly.

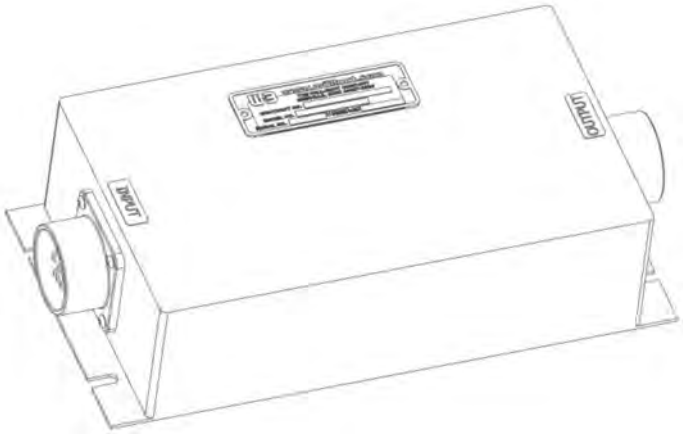

Figure 3-8 EMI Filter (Optional)

Power Cable Connector: The power cable connector is a MS3106E24-11S Connector that connects the customer-supplied power cable to the Control Box at J1 (or on the optional EMI Filter input side as required). It ships with the mast system.

Figure 3-9 Power Cable Connector

Identification Plate: Information pertaining to the mast can be found on the identification plates. The identification plates are located on the mast drive housing and the Control Box. The information on the identification plates is the same.

Figure 3-10 Identification Plate (P/N: 6025601 Shown)

Crank Handle Assembly: The crank handle assembly can be used to manually crank the motor to extend and retract the mast. When manually cranking the motor, it is necessary to remove all power from the mast system.

Figure 3-11 Crank Handle Assembly

Label Kit: The label kit is used to identify potential hazards and connection points within the mast system. These labels come installed on the mast system. Additionally, the label kit includes a ground straps and hardware used to ground the mast system and Control Box. Contact The Will-Burt Company for information pertaining to alternate language label kits.

3.5 System Controllers

3.5.1 Control Box

This section describes the standard Control Box. Additional options are available. Contact The Will-Burt Company for additional information.

Stiletto AL HD masts are designed to work with Control Boxes operating version 1.0 or later software. These Control Boxes will indicate if the connected mast is a Stiletto AL HD. Only operate the mast with version 1.0 or later software.

The standard Control Box (Figure 3-12):

- Combines customer input, power input, sensor input, and power output to allow the customer to extend and retract the mast without running past sensor or software limits.
- The normally-engaged brake on the motor also engages to lock the mast and prevent back driving when the mast is not moving (powered or unpowered).
- Can be factory-set to show the intermediate extension height in metric or US customary units.
- Is wired to allow for an optional Hand-Held Remote Control or PC Interface.
- Has some self-diagnosis capability (errors and warnings).
- Is housed in an aluminum NEMA 4X box.
- Is vacuum-sealed at the factory. Opening the Control Box will void the warranty.

Figure 3-12 Control Box

The Control Box works with input from the:

- “Nested Limit Switch” which:
  - Assists the mast from being over-nested
  - Installed in the mast
  - Is a reed switch mounted outside the base tube that detects a permanent magnet attached to the bottom of the largest moving tube
- “Fully Extended Limit Switch” which:
  - Prevents the mast from being overextended
  - Is integrated in the mast
  - Is a reed switch mounted outside the base tube that detects a permanent magnet attached to the bottom of the largest moving tube
- “Encoder”:
  - Interprets data as an extension distance to generate the intermediate extension height

Components of the Control Box (Figure 3-13) include:

- E-Stop Button
- Display
- UP/DOWN Switch with Waterproof Boot
- OVERRIDE Switch with Waterproof Boot
- Bulkhead Connectors (J1, J2, J3, J4 and J5)
- Printed Circuit Board (Not shown)

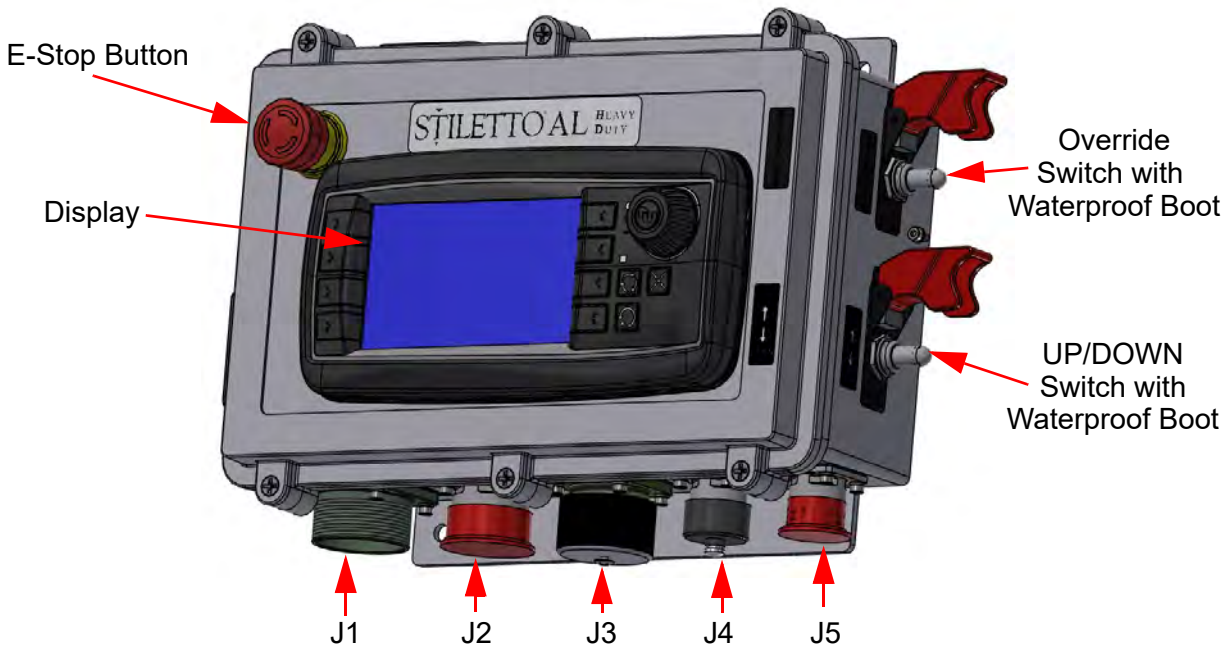

Figure 3-13 Control Box Components

Display

The Display controls mast functions and provides full system control.

Error Codes

In the event of any unexpected switch feedback, communication errors, or amp draws on the mast, the display will show the associated error message. See Troubleshooting (Section 10).

UP/DOWN Switch

The UP/DOWN Switch is:

- Used to extend and retract the mast
- Located on the side of the Control Box
- Protected by a switch guard and waterproof boot
- A SPDT (Mom-Off-Mom) toggle switch

OVERRIDE Switch

The OVERRIDE Switch is:

- Used with the UP/DOWN Switch to ignore any errors returned by the Control Box in order to retract the mast
- Located on the side of the Control Box
- Protected be a switch guard and waterproof boot
- A SPST (Off-Mom) toggle switch

Bulkhead Connectors

The Control Box contains the following military screw-type connectors:

- J1 which is a 9-pin connector for customer power and handshake lines
- J2 which is a 6-pin connector for motor cable
- J3 which is an 8-pin connector for optional components such as the Hand-Held Remote Control or D-TEC. It is also used to update the CAN bus controls
- J4 which is an 8-pin connector for the PC Interface for either RS-485 or CAN bus J1939 integration. It is also used to update the display software
- J5 which is a 10-pin connector for mast data cable

3.5.2 PC Interface

The mast system ships standard with SCRAM (Stiletto Control Remote Access Management) software enabled. If desired, this allows the operator to control the mast system through a PC or proprietary control system. SCRAM provides the same functionality as the Control Box, plus additional functions and information not directly accessible through the standard hardware interface.

Functions include controls to:

- Extend the mast
- Retract the mast
- Nest the mast
- Stop the mast
- Move the mast to a specific desired height
- Input the Mast Offset Height
- Monitor mast parameters and limit switch inputs in real-time

In addition to the SCRAM software, The Will-Burt Company also offers the PC Interface Application Notes which allow a customer to create their own GUI that will communicate with the Control Box to operate the Mast System. This is particularly useful when integrating the Mast System into a proprietary control system. When using the Application Notes, the customer must write their own software using the commands provided in the Application Notes.

When using a PC or proprietary control system to operate the Mast System, it will be necessary to connect the PC or proprietary control system to J4 on the Control Box. The standard protocol for J4 is RS-485. To connect from the Control Box to the PC or proprietary control system, The Will-Burt Company offers various lengths of RS-485 to RS-232 Communications Cables and RS-485 to USB Communications Cables.

For more information about SCRAM, PC Interface Application Notes, or cables used to connect the mast system and PC or proprietary control system, contact your Will-Burt sales representative.

3.5.3 Hand-Held Remote Control

The optional Hand-Held Remote Control (HHRC):

- Contains an SPDT (Mom-Off-Mom) toggle switch (UP/DOWN) protected by a switch guard and waterproof boot to extend and retract the mast
- Uses three LED lights to backlight text to indicate the status of the system as follows:
  - “EXTENDED” to indicate the mast is fully extended
  - “PARTIAL” to indicate the mast is partially extended
  - “NESTED” to indicate the mast is fully nested
- Includes a cable with a MS3106 8-pin screw-type connector that attaches to the front of the Control Box at bulkhead J3. Multiple cable lengths are available
- Is enclosed in a NEMA 4X box
- Does not have an alphanumeric display to show intermediate extension readouts

Figure 3-14 Hand-Held Remote Control

The optional HHRC comes in multiple configurations including:

- Black HHRC with 20 ft. Cable
- White HHRC with 20 ft. Cable
- Black HHRC with 50 ft. Cable
- Turkish HHRC with 20 ft. Cable

For additional information on the HHRC, see www.willburt.com.

3.5.4 Accessory Options (Sold Separately)

This section describes accessory options available for the mast system.

3.5.4.1 D-TEC®

The D-TEC® Safety System (Figure 3-15) is a safety device which:

- Mounts at the highest point of the mast/payload configuration
- Provides overhead power line field detection
- Provides above-the-mast illumination

The D-TEC® system automatically stops mast extension when an electric field above the sensing threshold is detected providing added protection for the operator and equipment from overhead power line hazards. This unit is intended as a safety tool, and in no way is a substitute for common sense and caution.

Figure 3-15 D-TEC (P/N: 5354901 Shown)

The D-TEC Features:

- Two 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.
- An LED Look-Up Light and an Ambient Light Sensor to ensure the Look-Up Light only illuminates when it is dark.
- The D-TEC communicates over an RS-485 link with the Control Box which acts as the communications master. This means the Control Box initiates all communication. The D-TEC only allows or disallows the operator to extend the mast and does not provide direct power to the mast. Both the D-TEC and the Control Box perform self-diagnostic routines each time the Mast System is powered up.

Specifications for the D-TEC are listed in Table 3-1.

Table 3-1 D-TEC Specifications

Functional Characteristics	Operational Parameters
Detection	Simultaneous AC Voltage (Electric Field) and Electromagnetic and Electrostatic (Magnetic Field) Detection
Minimum Voltage Detection	2.3 Kilovolts/Meter at 0° (Reduced with angle)
Look-Up Light	LED
Input Voltage	11 to 33 VDC
Power Requirements	12 VDC 10 Amps or 24 VDC 5 Amps
Operating Temperature Range	-40°C to 71°C (-40°F to 160°F)
Duty Cycle	100%

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

3.5.4.2 Additional Accessory Options

Table 3-2 describes a number of additional accessory options available for the mast system.

Table 3-2 Additional Accessory Options

Accessory		Description
Lift Brackets (P/N: 4674901)		Used to aid in lifting and transporting the mast vertically during installation. Includes (4) SCR CAP M8-1.25x16.0 SC HD SSTL.
Input Power Cable Pigtails		Connects customer power to the Mast System. Mast Systems ship standard with a Power Cable Connector that the customer wires according to the specific mounting application needs and then attaches to J1 on the Control Box or the EMI filter input. The optional Input Power Cable Pigtails have a Power Cable Connector with pre-wired flying leads of predetermined lengths to simplify the process.
	P/N: 4674701	Unshielded 5 Meter
	P/N: 4674702	Unshielded 8 Meter
	P/N: 4784001	Shielded 5 Meter

Table 3-2 Additional Accessory Options (Continued)

Accessory	Description
PositionIt™	Remotely pans and tilts a payload.
P/N: 5061001	PI-150 with a payload capacity of 150 lb.-ft. (202 N-m).
P/N: 5191201	PI-75 with a payload capacity of 75 lb.-ft. (101 N-m).
P/N: 5467801	PI-35 with a payload capacity of 35 lb.-ft. (47.4 N-m).
Roof Seal Kit (P/N: 4794602)	Used with internal mounting applications (i.e. mounting inside an enclosure of vehicle.
Nycoil® Cable Conduit	Manages payload cables. The Nycoil Cable Conduit length should be two times the difference between the mast extended and nested heights. To go around the mast, a minimum of 1 ¼ inch (31.8 mm) cable ID with a 21.5 inch (546 mm) coil OD is required. Smaller sizes are available if the Nycoil Cable Conduit is offset.
Power Supply Kits	
110 VAC Power Supply Kit (P/N: 4655201)	Converts 110 VAC input to 24 VDC output.
220 VAC Power Supply Kit (P/N: 4655202)	Converts 220 VAC input to 24 VDC output.
Shelf Bracket (P/N: 46748xx)	Used to position and support a mast. A variety of colors, and Polane and CARC finishes are available.

For more information on these and other additional accessory options, or customized solutions to customer-specific scenarios, see www.willburt.com.

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4 Technical Data

Stiletto AL HD Models	4-Meter	6-Meter	8.54-Meter	10-Meter	12-Meter
Extended Height (ft / m) (±0.236 inches) (±6 mm)	13.16 / 4	19.6 / 6	28 / 8.54	32.8 / 10	39.3 / 12
Nested Height (ft / m) (±0.236 inches) (±6 mm)	4.2 / 1.28	5.18 / 1.58	6.54 / 2	7.33 / 2.28	8.43 / 2.58
Rated Payload Capacity (lb / kg) (center of gravity within 300 mm of mast centerline)	600 / 272.16				
Approximate Mast Weight (lb / kg) (Without the Support Bracket Assembly, Control Box, Accessories, Hand Crank Assembly, and Cables)	314 / 142.4	348 / 157.9	399 / 181	450 / 204.1	472 / 214.1
Mast Footprint (in / mm)	17.56 x 11.22 / 446 x 284				
Control Box Footprint (in / mm)	12.23 x 8.0 / 311 x 203				
Mast Type	Electro-Mechanical				
Drive System	SSTL Ball Screw				
Emergency Operation	Manual Hand-Crank				
Emergency Operation: Approximate Mast Travel per Manual Rotation (in / mm)	0.094 in / 2.4 mm				
Emergency Operation: Approximate Torque to Turn Crank	3.5 in.-lb. / 0.4 Nm				
Collar Type	Internal Collars				
Number of Tubes	6				
Tube Outside Diameter Range (in / mm) (Base tube to top tube)	9.84 to 5.9 / 250 to 150				
Tube Material	Aluminum				
Height Readout	Meters or US Customary (Defaults to meters.)				
Operating Voltage Range	20-32 VDC				
Optimal Voltage (MIL-STD-1275)	28 VDC				
Steady State Current Draw (Maximum Operating Conditions)	45 Amps				
Inrush Current (Maximum Operating Conditions)	60 Amps				
Deployment Wind Speed (mph/km/h)	40 max / 64 max				
*Survival Wind Speed (mph / km/h)	130 / 209	115 / 185	95 / 153	80 / 129	62 / 100
Rotational Accuracy (Twist)	±0.7°				

Approximate Extension Time (Powered, 28 VDC)	< 45 seconds	< 65 seconds	< 90 seconds	< 105 seconds	< 130 seconds
Approximate Retraction Time (Powered, 28 VDC)	< 45 seconds	< 65 seconds	< 90 seconds	< 105 seconds	< 130 seconds
Maximum Altitude Above Sea Level (ft / m)	15,000 feet / 4572 m				
System Operating Temperature	-40 to 140 °F / -40 to 60 °C				
System Storage Temperature	-60 to 160 °F / -51 to 71 °C				
Maximum Deployment Angle	±10° (17.6% Grade)				±5° (8.8% Grade)
Auto Deploy and Auto Stow®	Yes				
D-TEC Option Available	Yes				
Guying	Optional				
Typical Payload Sail Area (ft² / m²)	17 / 1.58	12 / 1.11	11 / 1.02	11 / 1.02	8 / 0.74
Airborn Noise Emissions Per EN ISO 3744:2010	Compliant				

Note:
- Dimensions and specifications are provided for reference only and are not intended for vehicle design purposes.
- Specifications may be subject to change without notice.
- Maximum payload weight will impact other performance specifications. Consult The Will-Burt Company for additional information.
- Maximum Tilt from Vertical assumes the rated payload.
- All survival wind load payloads assume a payload center of pressure position 1 meter above the top of the mast and payload drag coefficient (Cd) of 1.5.

Consult factory for larger sail areas, as the payload and wind capacities may be reduced.

Table 4-1 Equipment Weights (Approximate)

Equipment	Approximate Weight (lb. / kg)
Control Box (no cables)	7 / 3.2
Mast Motor Cable (3 m)	2 / 0.9
Mast Sensor Cable (3 m)	1 / 0.45
Support Bracket with Hardware	19 / 8.6
Hand Crank Assembly	1 / 0.45
HHRC (19 ft Cable)	3 / 1.4

5 Installation

This section describes the physical and electrical installation of the Stiletto AL HD and provides the general procedures that must be followed to ensure a successful installation. Be sure to read and understand the entire installation procedure and the Safety Summary (Section 1) before beginning installation.

The exact installation procedures may vary based on the configuration of the mast system being used and the installation environment.

These instructions assume that the mounting hole locations are not pre-drilled and that the mast system components will be used as templates to drill these holes during installation. Alternatively, the mounting hole locations could be found and pre-drilled using the installation dimensions (Section 5.4). When pre-drilling the mounting holes, use care to ensure the mounting holes properly align.

5.1 Mounting Location Requirements

The following factors must be included when selecting an appropriate mounting location:

- The mounting structure must have sufficient room to mount the system. Ensure the installation site does not interfere with the cables or crowd them into the mast.
- The mounting structure must be level in all directions, solid, and capable of holding the forces required by the bolts. Check the strength and rigidity of the mounting structure where the system is to be attached. Reinforce as necessary. The support bracket and base support structure shall be mounted to a common frame (i.e. not separated by vehicle suspension elements).
- The area underneath the mast must be free of obstructions to allow for accessibility to the fasteners.
- When installing in a vehicle, ensure the vehicle is stationary and on a level surface.
- Do not obstruct the drain hole (Figure 5-1) for rainwater and condensation at the base of the mast. Keep any personnel or sensitive equipment away from the drain hole direction.

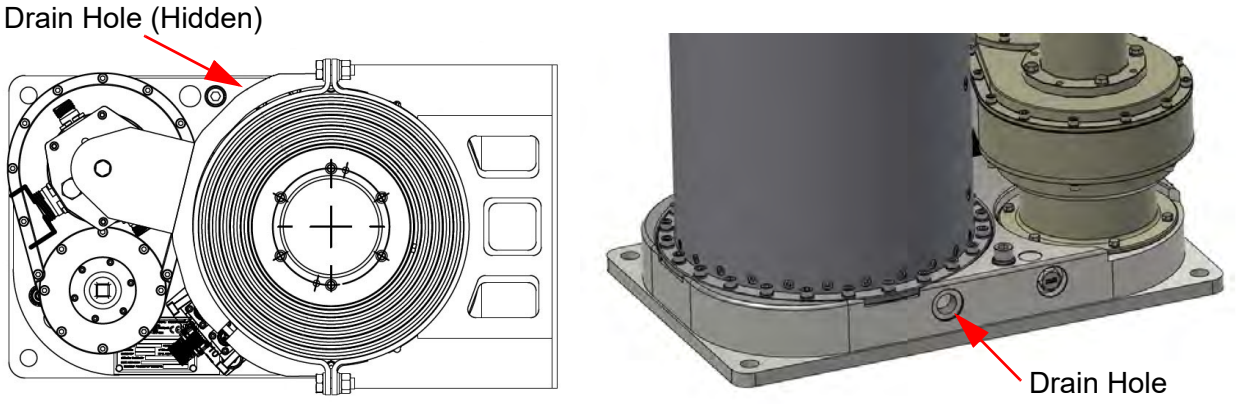


Figure 5-1 Drain Hole Location

- Cables will eventually need routed between components of the system as follows:
  - Customer power to the Control Box
  - The three meter motor cable and the three meter mast data cable will need routed between the Control Box and mast junction box
  - Additional cables may need routed for optional components

5.2 Recommended Installation Tools

Table 5-1 lists recommended tools and materials for installation.

Table 5-1 Recommended Installation Tools & Materials

Tools and Materials		
Safety Glasses	Safety Gloves	Safety Shoes
Hard Hat or Helmet	Hearing Protection	Nitrile or Vinyl Gloves
Wrenches	Level	Measuring Tape
Torque Wrench	Drill	Rubber Mallet
Sling	Appropriate Hardware (Section 5.3)	Washers or Spacers (For Shimming)
Hoist	Anti-Seize	Loctite® Blue 242/243 or Equivalent
Rags (Clean and Dry)		

Note:

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

5.3 Installation Hardware

Table 5-2 describes hardware that may be used during installation. Depending on the specific installation application, all hardware may not be used.

Table 5-2 Installation Hardware

Hardware*	Supplied By	Notes
Support Bracket Assembly (Together)		
(6) 10.5x20.0x2.2 18-8 SSTL Flat Washer	The Will-Burt Company	Ships with mast system.
M10-1.5x30.0 SSTL Bolts	The Will-Burt Company	Ships with mast system.
M10x18.10x2.05 18-8 SSTL Lock Washers	The Will-Burt Company	Ships with mast system.
M10-1.50 18-8 SSTL Nuts	The Will-Burt Company	Ships with mast system.
Support Bracket Assembly (To the Support Structure)		
(6) M10 (⅜ Inch) Sets of Stainless Steel Hardware	Customer	The bolts should be sized to length to allow for the thickness of the Support Bracket Assembly, support structure, any shims, and all mounting hardware (e.g. flat washers, lock washers, and nuts).
Base of Mast System (To the Mounting Surface)		
(4) M12 (½ Inch) (Minimum) Sets of Stainless Steel Hardware	Customer	The bolts should be sized to length to allow for the thickness of the base of the mast, mounting surface, any shims, and all mounting hardware (e.g. flat washers, lock washers, and nuts). Use heavy-duty, extra-thick (MS 15795-819) stainless steel flat washers.
Control Box (To the Support Structure)		
(6) M6 (¼ Inch) Sets of Stainless Steel Hardware	Customer	The bolts should be sized to length to allow for the thickness of the Control Box, mounting surface, any shims, and all mounting hardware (e.g. flat washers, lock washers, and nuts).
Optional EMI Filter (To the Support Structure)		
(4) M4 (#8) Sets of Stainless Steel Hardware	Customer	

Table 5-2 Installation Hardware

Hardware*	Supplied By	Notes
Ground Straps		
10-32 UNF-2B Hardware	The Will-Burt Company	Ships with mast system.
Payload (To the Mast System)		
(6) M8 Sets of Hardware	Customer	The standard Payload Attachment Interface comes with (6) M8x1.25 – 6H ↧12 mm holes. When using stainless steel hardware, use an anti-seize to prevent galling.

* Unless otherwise indicated, the mounting hardware must include proper means to resist vibration loosening such as thread-locking compound and locking hardware. Torque all hardware as appropriate for its size and grade. Torque values in these instructions assume the use of The Will-Burt Company provided hardware. Depending on the specific installation application, all hardware may not be used. Additional hardware may be required for additional accessories, or customer-specific applications.

5.4 Installation Dimensions

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

5.4.1 Mast Installation Dimensions

Model	A		B		C		D		E	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
4-Meter	517.5	20.37	213.5	8.41	152.4	6	304.8	12	789.3	31.08
6-Meter	517.5	20.37	213.5	8.41	152.4	6	304.8	12	1126.7	44.4
8.54-Meter	517.5	20.37	213.5	8.41	152.4	6	304.8	12	1543.9	60.8
10-Meter	517.5	20.37	213.5	8.41	152.4	6	304.8	12	1543.7	60.8
12-Meter	517.5	20.37	213.5	8.41	152.4	6	304.8	12	2126.8	83.7

	F		G		J*		K		L (Nested)**	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
4-Meter	500.5	19.7	567.6	22.3	785.7	30.9	1251.5	49.3	1280	50.4
6-Meter	626	24.6	567.6	22.3	1120	44.1	1551.4	61.1	1580	62.2
8.54-Meter	812.7	32	567.6	22.3	1535	60.4	1971	77.6	2000	78.7
10-Meter	926.1	36.5	567.6	22.3	1540.1	60.6	2248.4	88.5	2277.4	89.7
12-Meter	1080.3	42.5	567.6	22.3	2120	83.5	2551	100.4	2580	101.6

	L (Extended)**		M		N		P		S	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
4-Meter	4013.6	158	446	17.56	285	11.22	409.2	16.11	247.4	9.74
6-Meter	6000.4	236.2	446	17.56	285	11.22	409.2	16.11	247.4	9.74
8.54-Meter	8540	336.2	446	17.56	285	11.22	409.2	16.11	247.4	9.74
10-Meter	10000	393.7	446	17.56	285	11.22	409.2	16.11	247.4	9.74
12-Meter	12000	472.4	446	17.56	285	11.22	409.2	16.11	247.4	9.74

* Minimum
** ±6 mm (±0.236 inches)
*** ±6 mm (±0.236 inches)

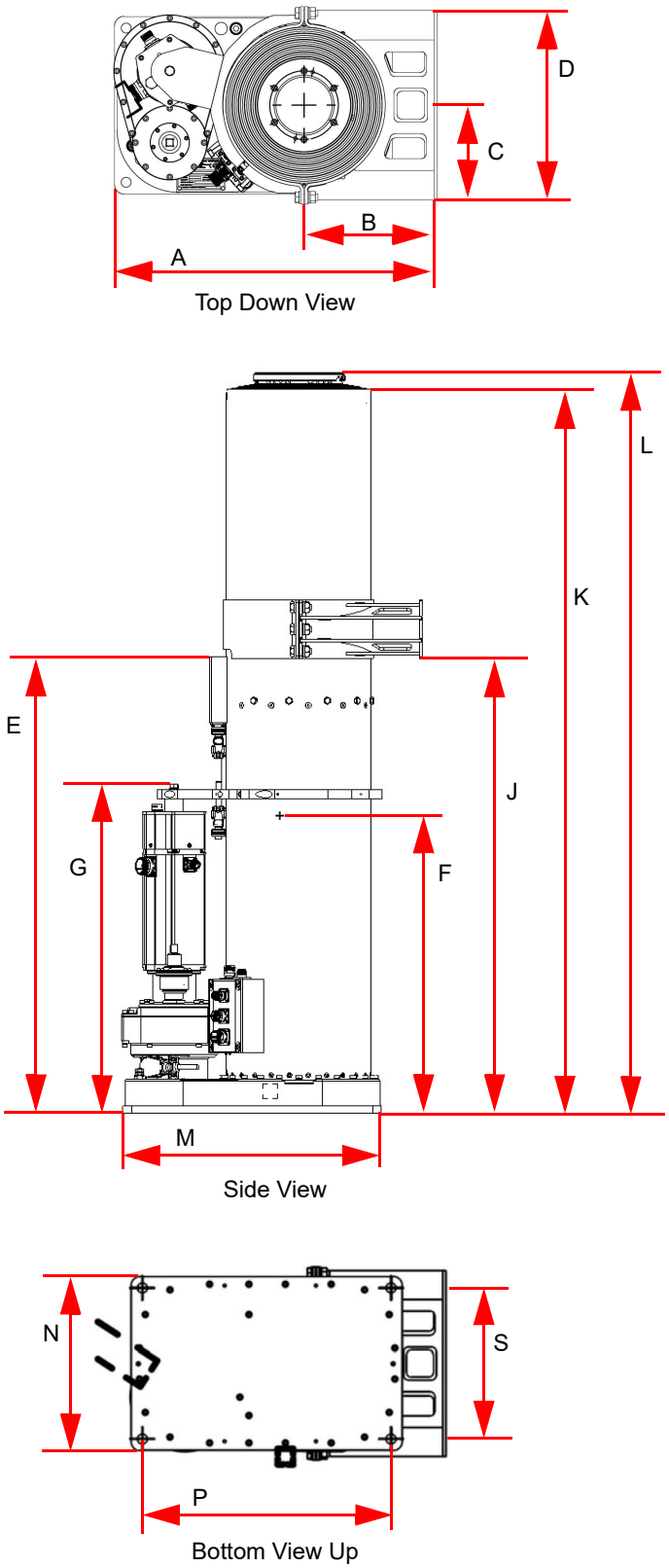


Figure 5-2 Mast Installation Dimensions (Not to Scale)

5.4.2 Support Bracket Assembly Dimensions

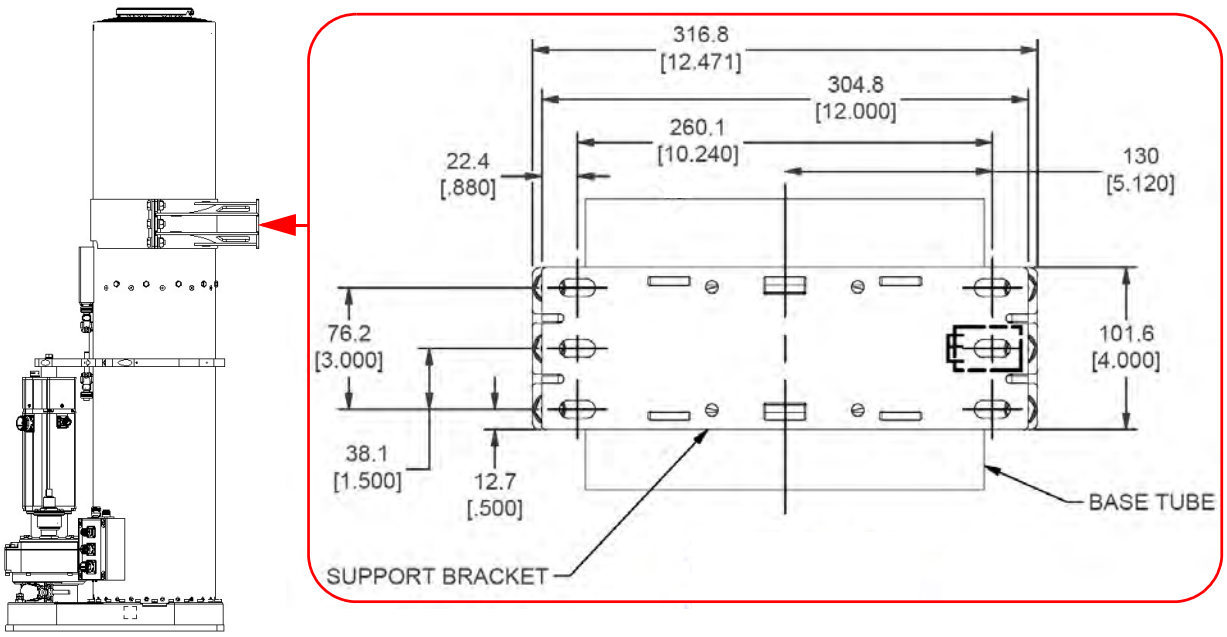


Figure 5-3 Support Bracket Assembly Bolt Hole Pattern

5.4.3 Control Box Dimensions

Control Box Dimensions are shown on next page (Figure 5-4).

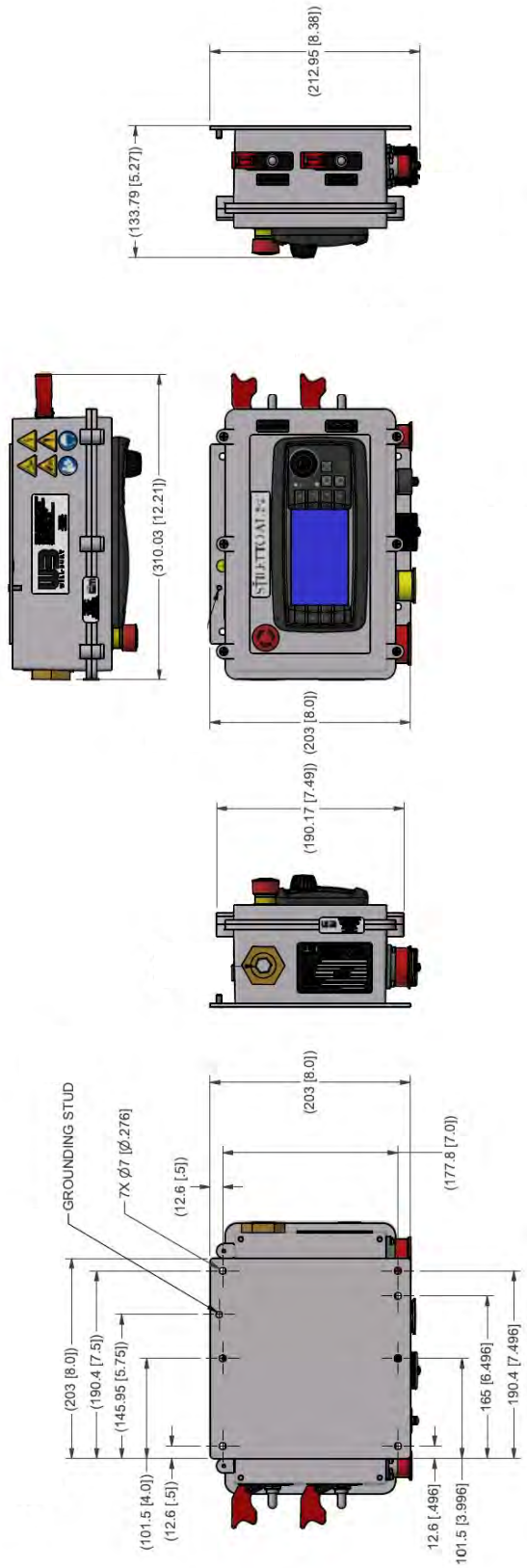
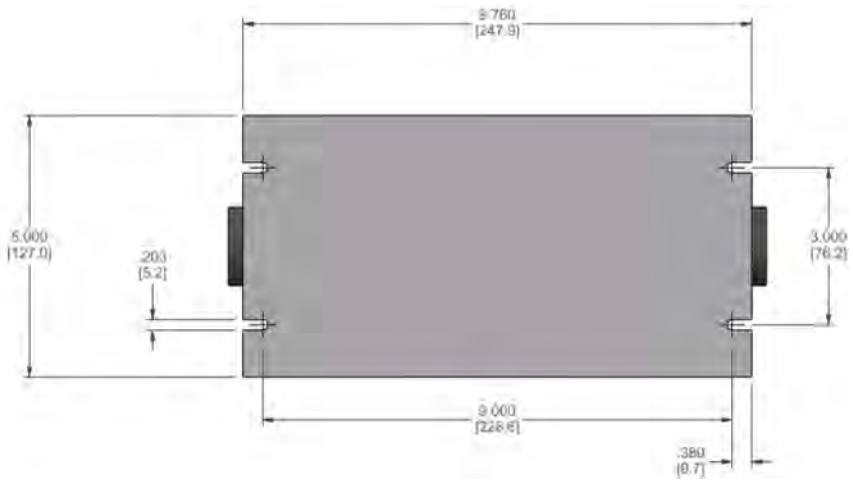


Figure 5-4 Control Box Installation Dimensions (Measurements in Inches)

5.4.4 EMI Filter Dimensions (Optional Equipment)

Inch [mm]



5.5 Power Supply Requirements

This mast requires a 28VDC power supply that meets the characteristics set forth by MIL-STD-1275. If the application or installation does not allow for such a power supply, storage batteries can be used.

The mast system has a steady state current draw up to 45 amps between 20 and 33 VDC including with heavy side loads, or when worn or dirty. Further, the motor could theoretically briefly (milliseconds) see as much as 60 amps of inrush current. Any impedance in the power supply or leads will reduce this figure and could prevent the mast from operating.

Table 5-3 lists the specifications for the auto-resetting circuit breaker in the system.

Table 5-3 Circuit Breaker Specifications

Functional Characteristic	Specification*
Breaker Current Rating	25
Approximate Open Time 1.8 Seconds at 600% Rated Current	150
Approximate Open Time 2.3 Seconds at 500% Rated Current	125
Approximate Open Time 4.3 Seconds at 400% Rated Current	100
Approximate Open Time 8.8 Seconds at 300% Rated Current	75
Approximate Open Time 18.2 Seconds at 200% Rated Current	50
Must Carry 100% Rated Current for Minimum 1 Hour	25

Contact The Will-Burt Company with any questions.

5.6 Unpacking & Handling

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

Unpack and handle the items as follows:

1. Carefully open the shipping crate.

2. Carefully remove all loose components.

3. Ensure all components are included and that the required tools are readily available.

4. Inspect for any shipping damage. If damage has occurred, notify the carrier.

5. Remove the top half of the wooden saddles that secure the mast in place (Figure 5-5).

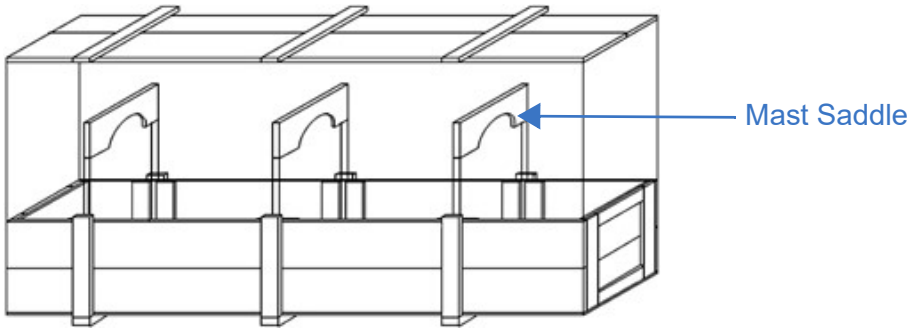


Figure 5-5 Shipping Crate

6. Outfit the mast with a sling and hoist capable of supporting the mast weight. The sling must support the mast from at least two points. Attach the sling at the center of gravity label so that horizontal balance and control can be maintained while positioning the mast. Use care not to damage or crush the fully extended limit switch or fully extended limit switch cable while transporting the mast.

   Note: The Will-Burt Company also offers the optional Lift Bracket to aid in lifting and transporting the mast vertically during installation.

7. Slowly lift the mast until just free of the mast saddles.

8. If necessary, lower the mast and adjust the sling as necessary to balance the mast.

9. Ensuring the sling does not catch on anything, lift the mast without any sharp or jerking motions until it is free of the shipping crate.

10. Slowly move the mast to the desired mounting location. The hoist operator should be able to view the mast at all times to ensure the mast does not collide with any obstructions.

11. Slowly lower the mast until the mast is on the mounting surface and the weight of the mast has settled. Stop lowering the mast once the mast weight has settled.

12. Ensure the mast is temporarily secured to prevent it from tipping over during the installation process.

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

5.6.0.1 Secure the Support Bracket Assembly

To secure the support bracket assembly:

1. Carefully move the mast into position in the mounting location. Be certain to orient the mast so the operator has a clear view of the hazard labels.

2. Ensure the mast is level in all directions. If necessary, shims may be added to correct the alignment of the mast. It is necessary to check the mast in two places 90° apart when leveling.

3. Determine the desired location for the support bracket assembly. Refer to Section 5.4 for the minimum height of the support bracket assembly on the mast.

4. Secure the support bracket assembly around the base tube with the hardware included. Shim as necessary to avoid overtightening the support bracket assembly on the base tube. This will damage the mast. The mounting hardware must include proper means to resist vibration loosening such as thread-locking compound or locking hardware.

5. Torque to 245-290 in.-lb. (28-33 Nm).

6. Use the Support Bracket as a template to drill holes in the desired support structure. Ensure the Mast System is level in all directions during drilling.

7. Loosely secure the support bracket to the support structure with six ⅜ inch (M10) sets of customer-provided stainless steel hardware. Do not torque the hardware at this point. This will be done later in these procedures. The mounting hardware must include a proper means to resist vibration loosening such as thread-locking compound and/or locking hardware.

5.6.0.2 Secure the Base of the Mast

To secure the base of the mast:

1. Use the base of the mast as a template to drill holes through the mounting surface.

2. Loosely secure the mast system to the mounting surface with four ½ inch (M12) sets of customer-provided stainless steel hardware. Use heavy-duty, extra-thick (MS 15795-819) stainless steel flat washers. Do not torque the hardware at this point. This will be done later in these procedures. The mounting hardware must include a proper means to resist vibration loosening such as thread-locking compound and/or locking hardware.

5.6.0.3 Finalize Physical Installation of the Mast

With the mast loosely secured at the support bracket assembly and at the base of the mast:

1. Ensure the mast is level in all directions. If necessary, shims may be added to correct the alignment of the mast. It is necessary to check the mast in two places 90° apart when leveling.

2. Torque all hardware as appropriate for its size and grade to secure the mast in place against the support structure and mounting surface. Ensure the mast remains level as it is torqued. Recommended torque values for stainless steel fasteners are as follows:

   M10: 245-290 in.-lb. (28-33 Nm)

   3/8-16:190-240 in.-lb. (21-27 Nm)

   ½-13 & ½-20: 450-530 in.-lb. (51-60 Nm)

   M12: 355-425 in.-lb. (40-48 Nm)

   Use manufacturer’s specified torque values for other fastener materials/grades.

3. Attach one end of the ground strap to the mast at any of the ground stud locations. The M5 ground stud provided can be moved to any of the ground stud locations as needed. The Ground Stud locations are designated with the electrical ground label (Figure 5-6). Torque to 24-31 in.-lb. (2.7-3.5 N-m).

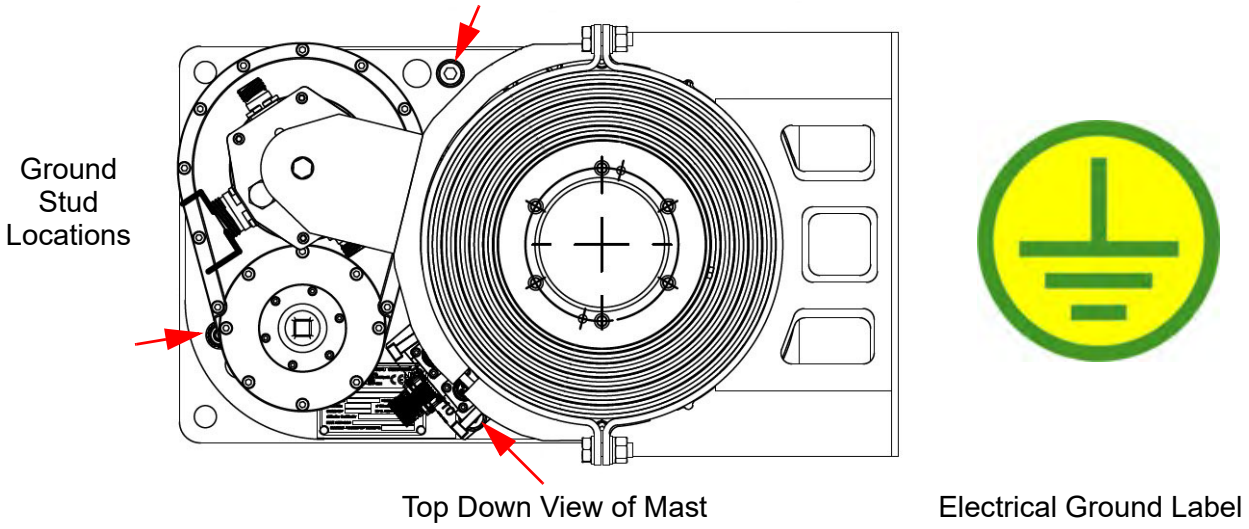


Figure 5-6 Ground Stud Locations

4. Attach the other end of the ground strap to a known earth ground such as the chassis of the vehicle. Torque to 24-31 in.-lb. (2.7-3.5 N-m).

5.6.0.4 Secure the Control Box

The Control Box may be installed outside or inside an enclosure such as the cab of a vehicle.

To install the Control Box:

1. Use the Control Box as a template, drill six M6 (¼ inch) clearance holes into the mounting structure.

   Note: The Control Box has seven mounting holes. It is only necessary to use six of the mounting holes to secure the Control Box.

2. Attach the Control Box using six M6 (¼ inch) stainless steel fasteners. Torque all hardware as appropriate for its material and size. The mounting hardware must include proper means to resist vibration loosening such as thread-locking compound or locking hardware. The recommended torque for stainless steel M6 fasteners is 60-72 in-lb. (7-8 N-m).

3. Use 10-32 UNF-2B hardware and a Ground Strap to ground the Control Box from the designated ground location (Figure 5-7) to the chassis of the vehicle or a known earth ground. The ground location on the Control Box is designated with the electrical ground label. Torque the ground strap hardware to 24-31 in.-lb. (2.7-3.5 N-m).

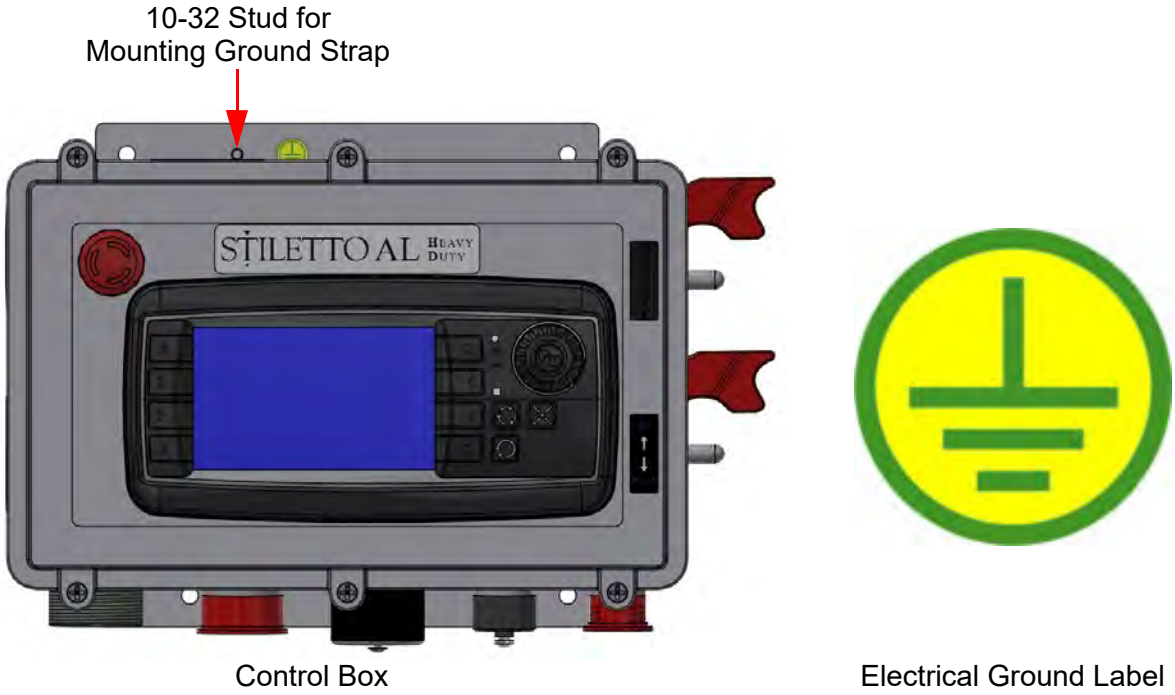


Figure 5-7 Control Box Ground Location

5.6.0.5 Electrically Install the Mast System

Power must be disconnected before connecting or disconnecting any system connector. For example, power must be disconnected when connecting or disconnecting J1, J2, J3, J4 and J5 on the Control Box.

To electrically install the Mast System:

1. Refer to Figure 5-8 for an overview of the system wiring (optional EMI filter shown).

   Note: When using an optional EMI filter, customer power will connect through the Power Cable Connector (P/N: 213075) at point “A” below. The EMI filter cable will install between point “B” below and J1 on the Control Box.

   When NOT using the optional EMI filter, customer power will connect through the Power Cable Connector (P/N: 213075) directly at J1 on the Control Box.

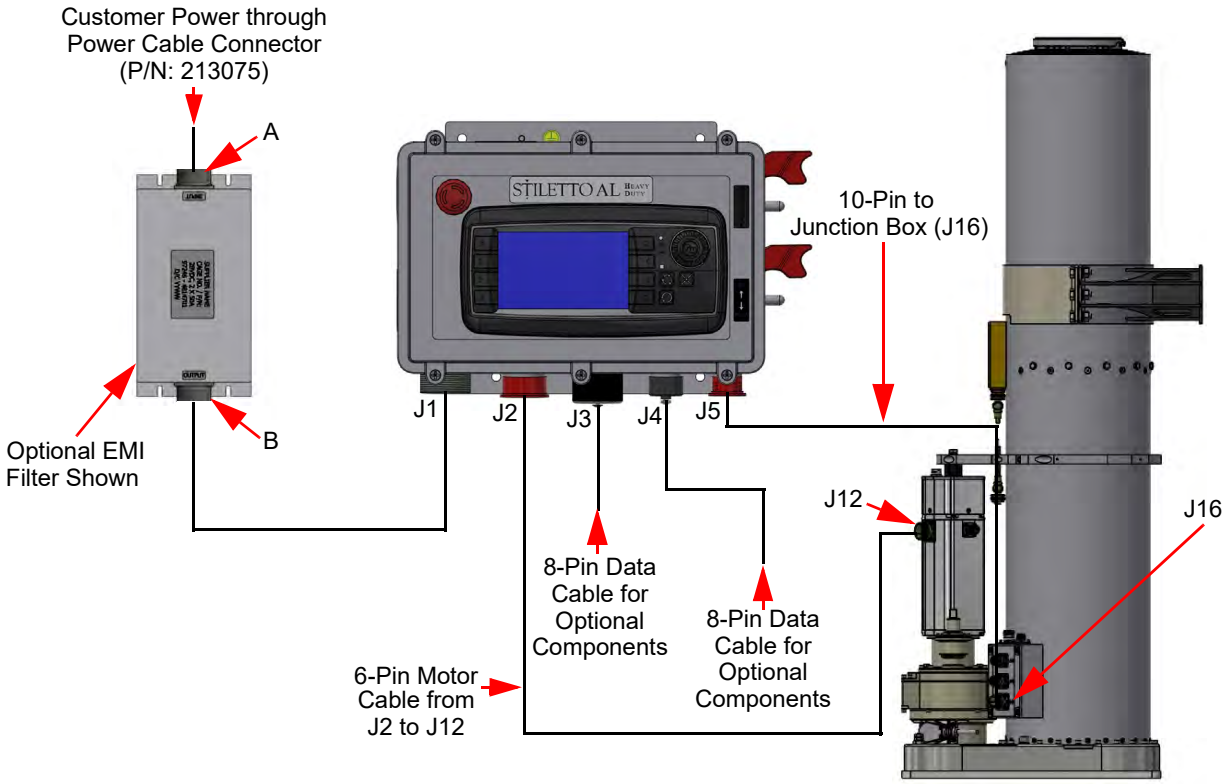


Figure 5-8 Stiletto AL HD Wiring (Not to Scale)

2. Plug the 10-pin mast data cable into bulkhead connector J5 on the Control Box and bulkhead connector J16 at the base of the mast junction box. Screw both connectors in place so that the cable is secure.

3. Plug the 6-pin motor cable into bulkhead connector J2 on the Control Box and bulkhead connector J12 on the motor. Screw both connectors in place so that the cable is secure.

4. Depending on the Mast System configuration, a cable may be used with optional components including the Hand-Held Remote or D-TEC.

   If used, plug in the 8-pin data cable to bulkhead connector J3. Screw the connector in place so that the cable is secure.

   If not used, ensure the dust cap to J3 is installed and secure.

5. Depending on the Mast System configuration, a data cable may be used with the PC Interface using RS-485 or J1939.

   If used, plug in the 8-pin data cable to bulkhead connector J4. Screw the connector in place so that the cable is secure.

   If not used, ensure the dust cap to J4 is installed and secure.

6. The Fully Extended Limit Switch Cable will ship installed. Ensure the 3-pin Fully Extended Limit Switch Cable is securely in place between the Fully Extended Limit Switch and bulkhead connector J7 at the base of the mast.

Refer to WD-59305 in Appendix (Section 11) for more electrical information.

5.6.0.6 Connect Power to the Mast System

Power and the handshake lines enter the Control Box through bulkhead connector J1. The Will-Burt Company supplies a 9-pin Power Cable Connector (Section 3.4) to connect to J1. If the optional EMI filter is required, the connector plugs into the input side of the filter and the cable supplied with the filter connects from the filter output side to the Control Box J1. The customer is responsible for integrating 10-gauge (6 mm^2) power lines (with optional ground) and any handshake lines into the Power Cable Connector. With cable runs longer than 7.5 meters (25 feet), a lower gauge wire will be needed.

The enable input circuit (hatch switch) on J1 Pins A and B require a closed circuit to enable mast operation. If no switch is installed to provide a closed circuit, a jumper is required to connect J1 Pins A and B.

The Will-Burt Company also offers optional Input Power Cable Pigtails (Table 3-2) which have a Power Cable Connector with pre-wired flying leads of predetermined lengths to simplify the wiring process.

The mast does not have a master power switch. If a master power switch is desired, the customer must provide it with the source power. It is recommended to provide appropriate circuit protection if using master power switch.

To connect customer power to the mast system:

1. Wire the Power Cable Connector and Emergency Stop Switch according to (Figure 5-9).

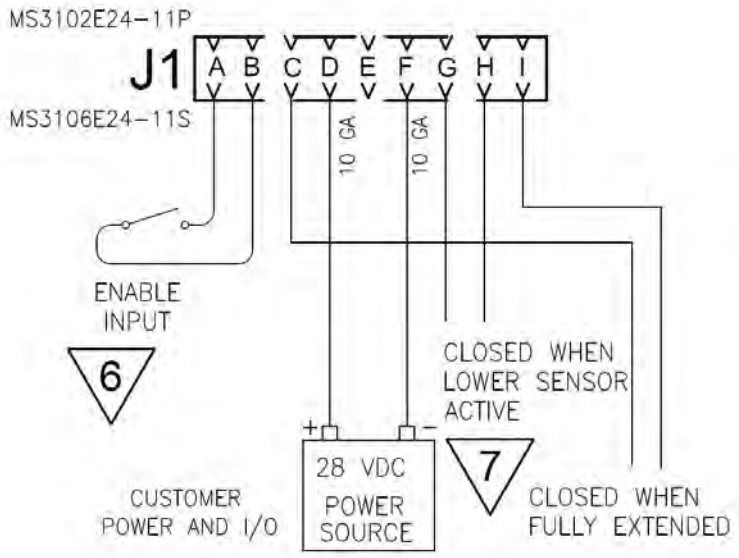


Figure 5-9 Power Cable Connector Wiring

2. Plug customer power into J1 on the Control Box. Screw the connector in place so that the cable is secure.

5.7 Adjusting Mast Parameters

The following sections define and explain procedures to adjust the following mast parameters:

- Set Above Ground Level Offset (Section 5.7.2)
- Set Preset Heights (Section 5.7.3)
- Adjust Screen Brightness (Section 5.7.4)
- Change Units (Section 5.7.5)

For more information, see www.willburt.com or contact The Will-Burt Company.

5.7.1 Enter Settings Screen

1. To adjust the mast system, go to the Settings Screen (Figure 5-11). To go to the Settings Screen, select the gear icon on the bottom left of the screen (Figure 5-10).

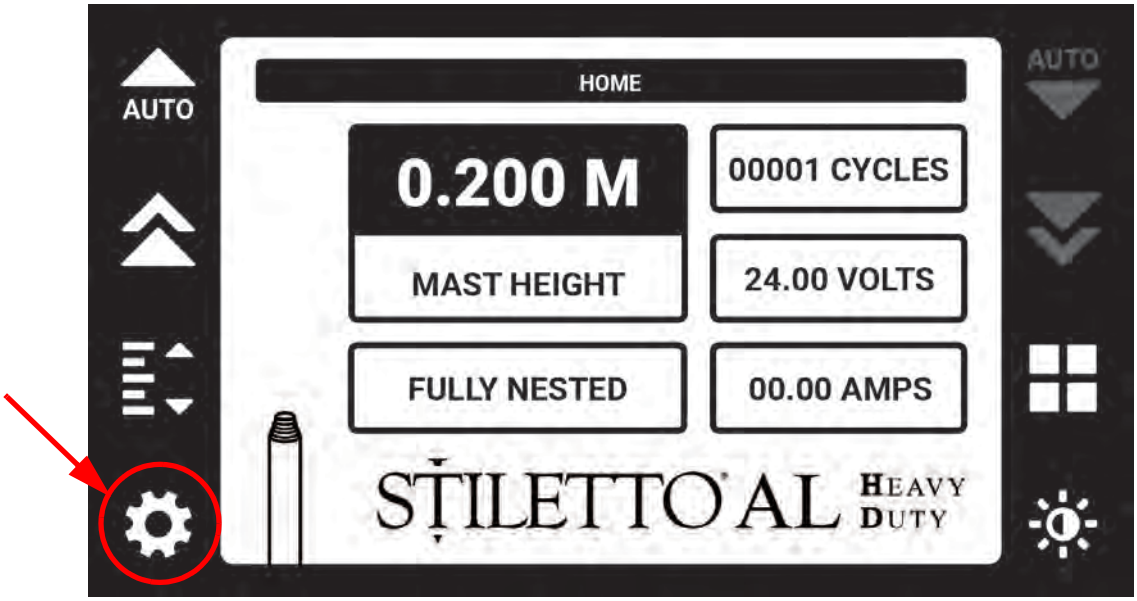


Figure 5-10 Select Settings Button

Below is the Settings Screen (Figure 5-11). Use the arrows or the scroll wheel to scroll through the setting options. The selected setting option will be highlighted blue.

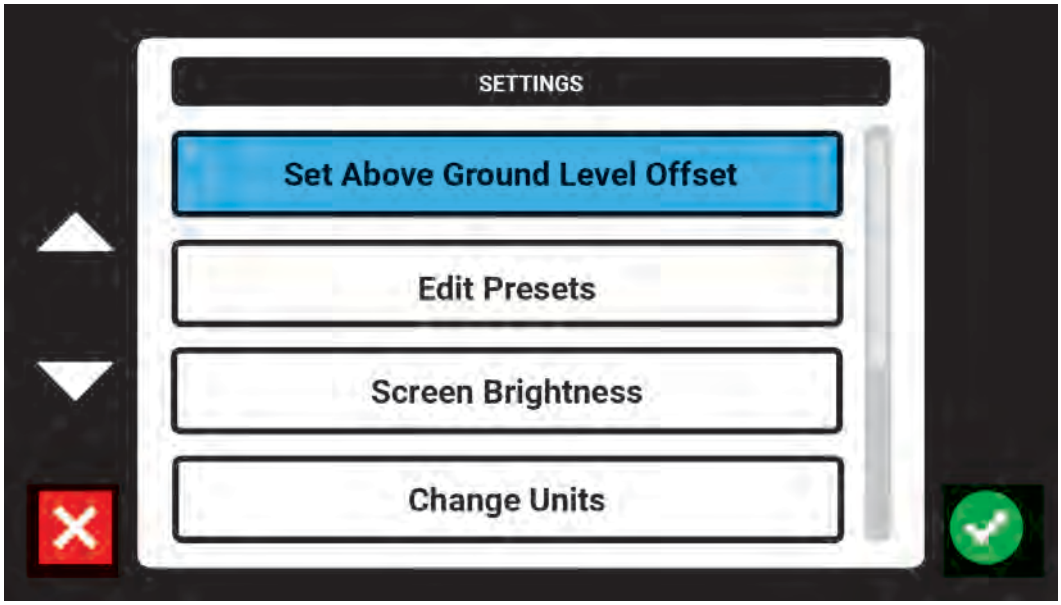


Figure 5-11 Settings Screen

5.7.2 Set Above Ground Level Offset

The mast system can be programmed to offset the above ground level height. This feature can be used if the mast is on a vehicle/platform or in other situations where the mast above ground level. For example, if a mast is 4 feet / 1.22 m off the ground on a vehicle, the mast can be programmed to include that 4 feet / 1.22 m in the total height of the mast.

The extension height shown on the Control Box display is measured from the top of the mast.

To set the above ground level offset:

1. Go to the Settings Screen (Section 5.7.1). Scroll through the setting options and select “Above Ground Level Offset”. A screen will pop up stating that the Preset Heights will be cleared and will need to be reprogrammed. After reading and understanding the notice, press the green check mark to continue. Below is the Above Ground Level Offset Screen (Figure 5-12).

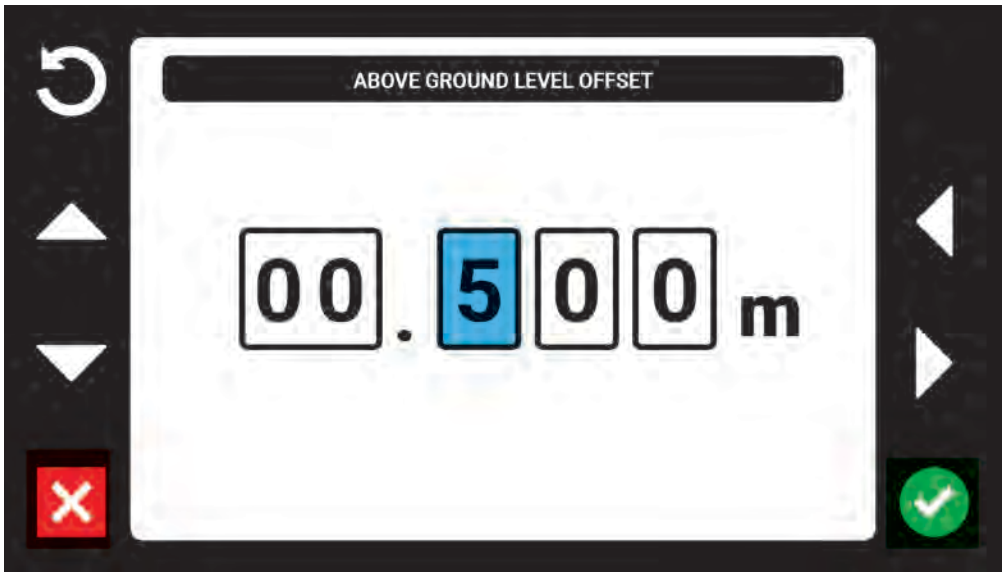


Figure 5-12 Above Ground Level Offset Screen

2. Use the arrows or the scroll wheel to change the numbers to the desired height. The parameter being adjusted will be highlighted blue. Press the green check mark button once input is complete. A confirmation screen will pop up asking the user to confirm the above ground level offset height. Press the green check mark button to confirm.

Note: When an above ground level offset is programmed, the height readout on the display will indicate “AGL”.

5.7.3 Set Preset Heights

The preset height feature allows the mast to automatically extend or retract to a height pre-programmed by the user. Four different preset heights can be programmed. The preset heights can be programmed or re-programmed during any time.

To program preset heights:

1. Go to the Settings Screen (Section 5.7.1). Scroll through the setting options and select “Edit Presets”. Below is the Edit Presets Screen (Figure 5-13):

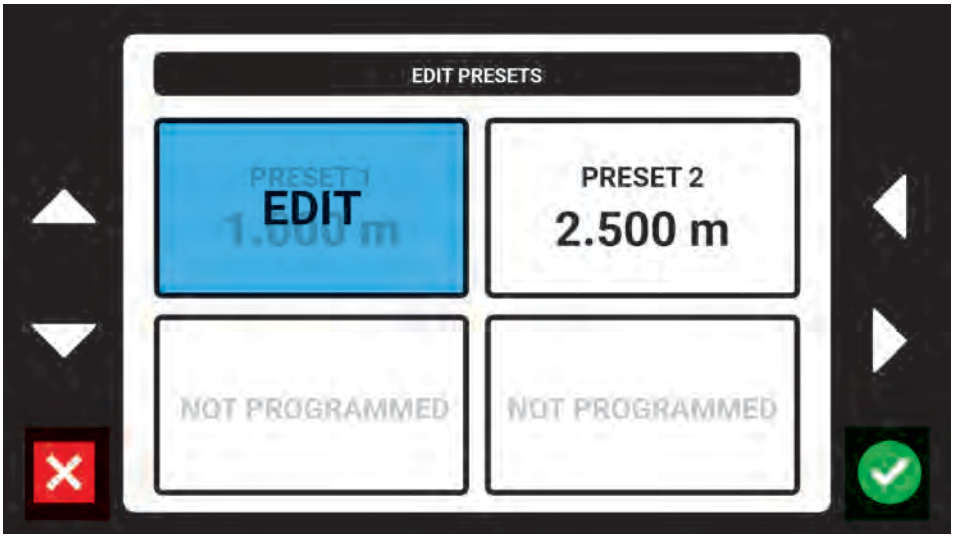


Figure 5-13 Edit Presets Screen

2. To select a preset to edit, use the arrows or the scroll wheel to go to desired preset. Once selected, press the green check mark button to get to that preset’s Programming Screen (Figure 5-14).

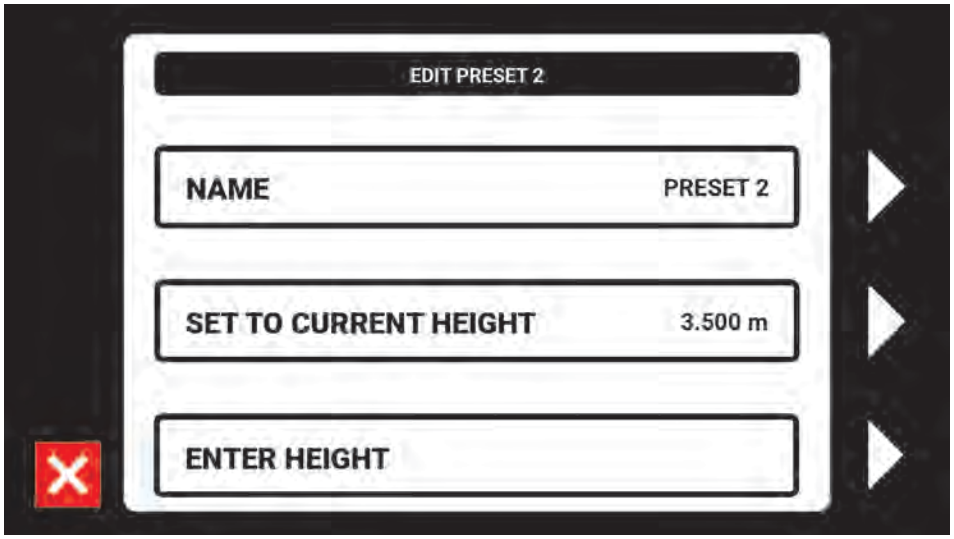


Figure 5-14 Preset Programming Screen (Preset 2 Shown)

To make the current height of the mast the preset height: Press the arrow button by preset parameter that says “SET TO CURRENT HEIGHT”. Press the green check mark button to confirm.

To enter the height of the preset: Press the arrow button by preset parameter that says “ENTER HEIGHT”. Below is the Enter Preset Height Screen (Figure 5-15).

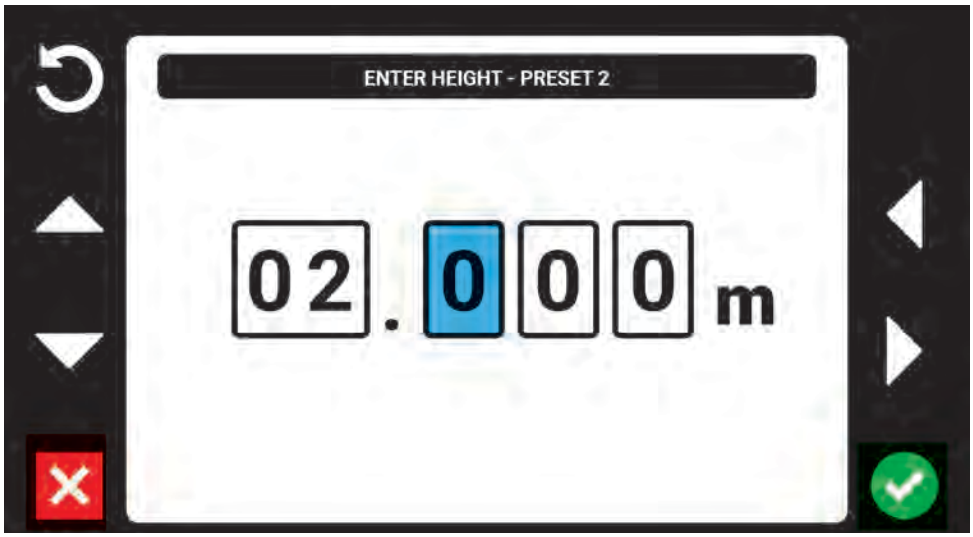


Figure 5-15 Enter Preset Height (Preset 2 Shown)

Use the arrows or the scroll wheel to change the numbers to the desired height. The parameter being adjusted will be highlighted blue. Press the green check mark button once completed. A confirmation screen will pop up asking the user to confirm the height change. Press the green check mark button to confirm.

5.7.4 Adjust Screen Brightness

To change the screen brightness of the Control Box display screen:

1. Go to the Settings Screen (Section 5.7.1). Scroll through the setting options and select “Screen Brightness”. Below is the Brightness Screen (Figure 5-16).

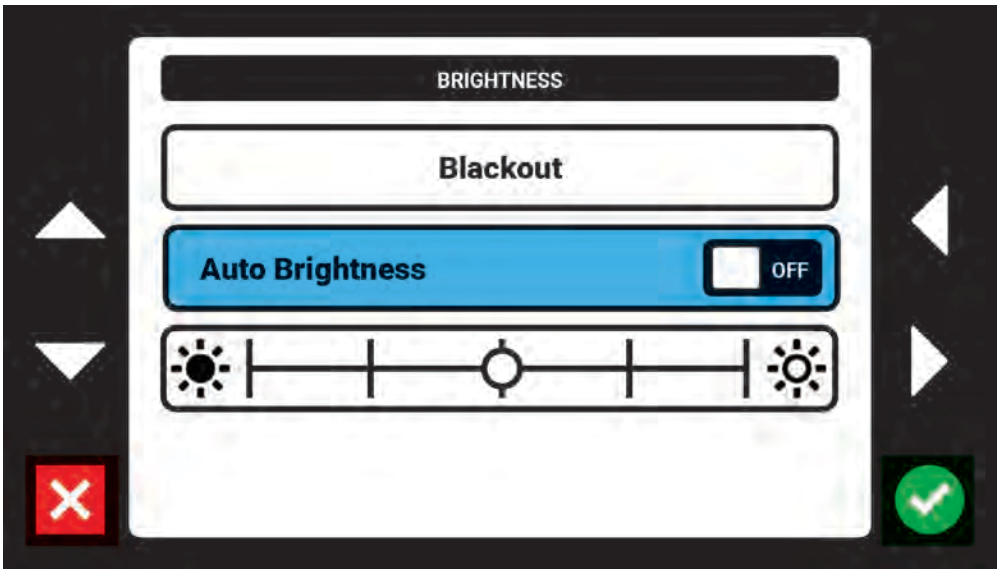


Figure 5-16 Brightness Screen

Blackout: The blackout option will turn the whole screen black. This feature can also be accessed from the home page (Figure 5-17). To disable Blackout mode, press any button.

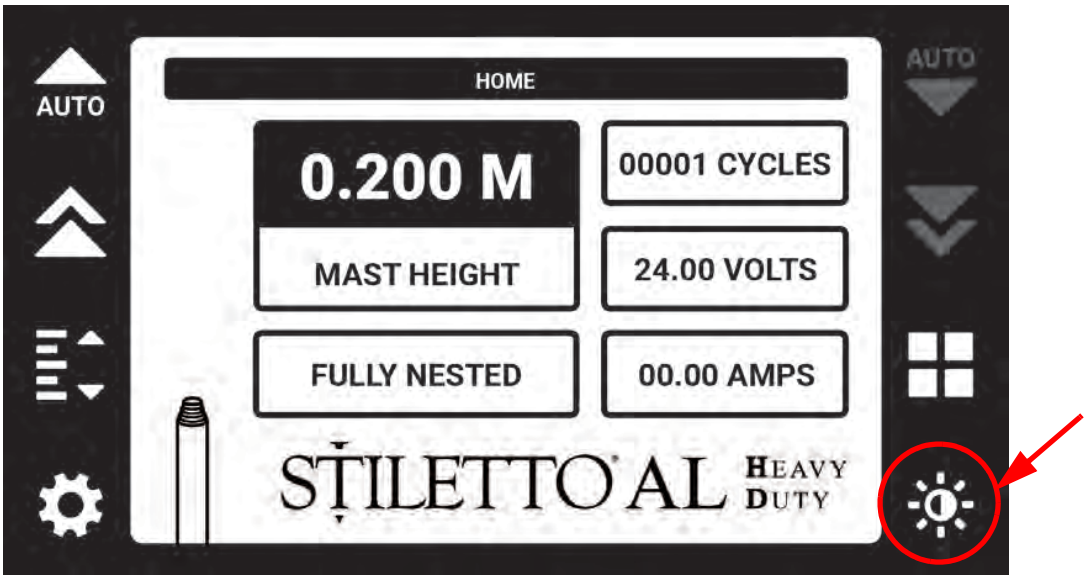


Figure 5-17 Blackout Button on Home Screen

Auto Brightness: The Auto Brightness option will allow the Control Box display's sensor to automatically select the brightness of the screen.

Brightness Scale: The brightness scale allows the user to select the brightness of the display manually.

Note: When the Auto Brightness option is turned on, the brightness scale disappears (Figure 5-18).

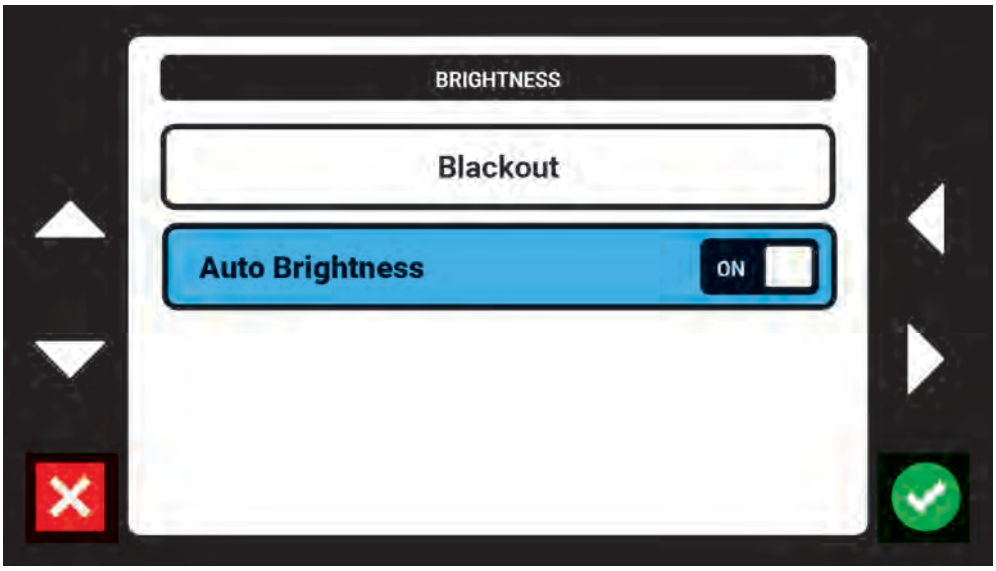


Figure 5-18 Auto Brightness Turned On

2. Use the Up/Down arrows or the scroll wheel to select the desired brightness option.

   If turning the Auto Brightness on or off, use the Left/Right arrows or the scroll wheel to toggle between the options.

   If using the brightness scale, use the Left/Right arrows or the scroll wheel to adjust the display as needed.

   To activate selected option, press the green check mark button.

   To exit Brightness Screen, press the red "X" button.

5.7.5 Change Units Between Imperial and Metric

To change the units of the mast system between Imperial or Metric:

1. Go to the Settings Screen (Section 5.7.1). Scroll through the setting options and select “Change Units”. Below is the Change Units Screen (Figure 5-19).

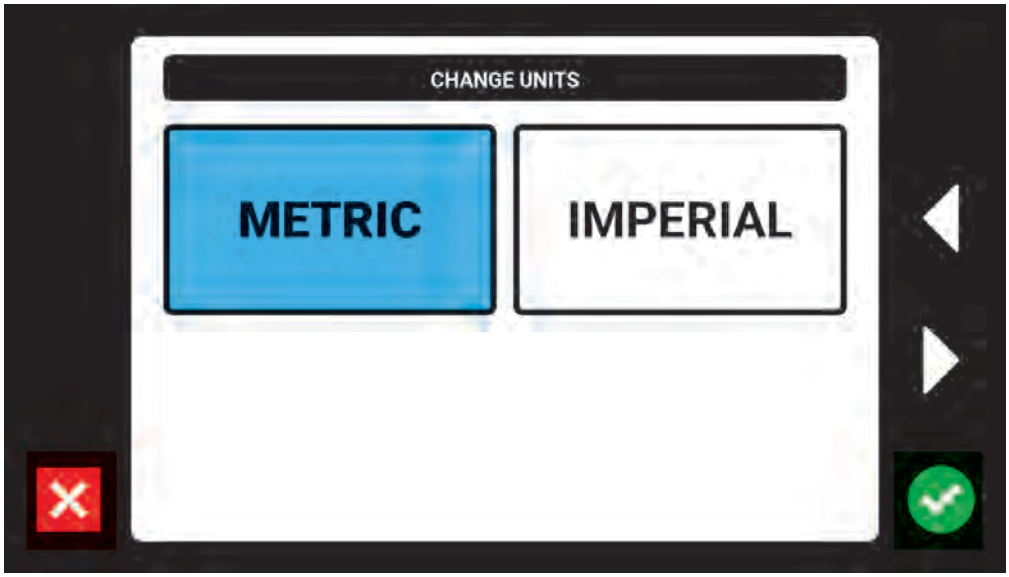


Figure 5-19 Change Units Screen

2. Use the arrows or the scroll wheel to choose the desired units. Press the green check mark button once completed.

5.8 Additional Accessory Installation

Depending on the configuration of the mast system, optional components selected, or the installation environment, additional accessories such as PC Interface or positioners may need to be installed. Install any additional accessories as appropriate.

General installation procedures to keep in mind when installing optional accessories include:

- Use connector J3 on the Control Box to connect the following optional components:
  - D-TEC
  - Hand-Held Remote Control (HHRC)
- Use connector J4 on the Control Box to connect the following optional component:
  - PC Interface
  - CAN bus J1939 Interface

Contact The Will-Burt Company with any questions before performing any installation procedures.

5.9 Installing Hand-Held Remote Control (HHRC)

This section provides information to install the HHRC.

Note: Do not connect or disconnect the HHRC cable when power is on.

To install the HHRC, plug the HHRC cable into the Control Box J3 connector (Section 5.6.0.5).

5.10 Wiring Vehicle Interlock on Sensor

The Stiletto AL HD masts are designed to allow for integration into vehicle safety circuitry to eliminate the possibility of driving with the mast extended. Usage shall be used to comply with various safety standards such as NFPA-1901. Possible Vehicle Interlock systems include a customer-supplied flashing warning lamp in the cab, or wiring into the parking brake or transmission circuit. The customer is responsible for determining which system works best for the specific application. The installer shall ensure that voltage is only supplied to the mast system when the vehicle is stationary.

Vehicle safety circuitry interfaces with the mast system through a dedicated reed switch located in a junction box on the mast base. This sensor and associated customer provided wiring are completely independent from the mast control system. The nested interlock circuit should be wired directly to pins G and H of J1.

The Control Box contains a printed circuit board.

The printed circuit board has three pairs of handshakes contacts as follows:

- An enable input (For a hatch switch, vehicle stationary or other precondition contact closure located between pins A and B on J1)
    - An open circuit will inhibit extension (must include a jumper if no precondition circuit is used)
    - A closed circuit is required between these pins to enable mast operation
- A fully extended output (Located between pins C and I of J1)
- A fully nested output (Located between pins G and H of J1)

The rated output of the handshake contacts is one ampere at 28 VDC. The contacts change state when the mast is fully extended or nested. These shall be used as customer interlocks or indicators (visual or audible). For more information on electrical installation of the mast system, see Section 5.6.0.4.

5.11 Test the Installation

Review the Operation (Section 6) and Safety Summary (Section 1) and observe all safety precautions and procedures before testing the installation. If any part of the testing fails, check the Control Box.

To test the installation, proceed as follows:

1. Review the Pre-Operation Check (Section 6.1).
2. Prepare the mast system for operation.
3. Extend the mast.
4. Lower the mast.

5.12 Install Payload

The exact installation procedures for payload will vary based on the customer-specific payload and any adapter being used. For optimal performance, center the payload as best as possible. If the payload will be offset a significant amount, contact The Will-Burt Company. Contact The Will-Burt Company with any questions before performing any installation procedures.

In general, to install the payload:

1. Ensure power is removed from the mast system while installing the payload to eliminate the possibility of inadvertent mast extension.

2. Confirm the top tube ring is installed on the top tube. If using the radial payload mounting holes, loosen the top tube ring and orient the cutout as needed as bolts are inserted.

Figure 5-20 Orient Cutout as Needed as Bolts Are Inserted

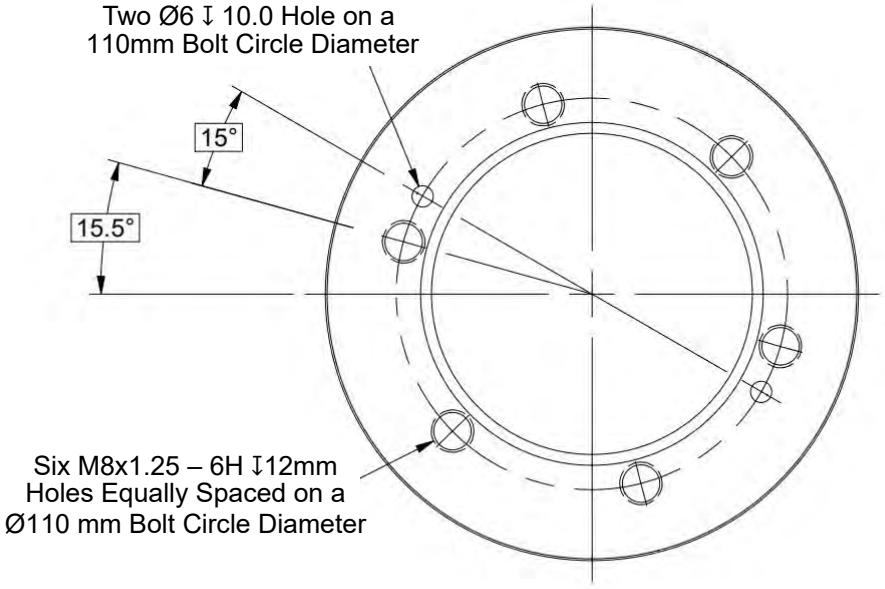
3. Carefully move the payload into position.

4. Properly secure the payload to the mast with customer-provided M8 high strength hardware. Choose the appropriate length of screw in order to allow maximum thread engagement with the threaded inserts. The standard Payload Interface has six M8x1.25 – 6H ↧12mm holes (Figure 5-21). If required, the Ø6 ↧ 10.0 hole may be used for orientation. The mounting hardware must include proper means to resist vibration loosening such as thread-locking compound and/or locking hardware. Torque all hardware as appropriate for its size and grade.

   The six Ø8.2 through holes on the side of the payload mount can be used for additional M8 bolts, quick release pins or a tether for additional payload security. These holes are oriented 30° from the bolt pattern on the top of the payload mount and are at a height of 0.5 inches below the top payload mount surface. Please contact The Will-Burt Company's Engineering team to determine if your application requires these precautions.

   Note: The Payload Interface has stainless steel inserts. When using stainless steel hardware, use an anti-seize to prevent galling. Use vibration locking methods that do not rely on thread locking compound when using anti-seize

5. Tighten the top tube ring bolt. Use medium strength Loctite®. Tighten to 25-45 in-lb. (4-5 Nm).



Holes Equally Spaced on a Ø110 mm Bolt Circle Diameter

Figure 5-21 Mounting Hole Pattern (4-M P/N: 7121110001 Shown)

Contact the factory for alternatives to the depicted interface.

6 Operation

This section describes the operation of the system. Be sure to read and understand the entire operation procedure and the Safety Summary (Section 1) before beginning operation.

6.1 Pre-Operation Check

Before operating the system:

- All operators read and understand the entire operation procedure.
- Visually inspect the mast system for damage. If damage is apparent, do not use the mast system and have it serviced prior to use.
- The mast system is properly installed and undamaged.
- Check for and remove any objects which might obstruct motion of the mast, cause binding or hinder mast function.
- Ensure the payload is properly installed. The payload should be bolted to the mast using the six M8x1.25 threaded holes in the top of the top tube ring with high strength bolts and the appropriate thread locker. The six 8.2mm through holes on the side can be used for additional bolts, quick release pins or a tether for additional payload security. Please contact The Will-Burt Company's Engineering team to determine if your application requires these precautions.
- All cables are undamaged, not tangled, properly terminated (if applicable) and are free to pay out as the mast extends.
- Any transit tie-downs on the payload have been removed.
- The area is free of power lines or other overhead obstructions. The mast system location should be no closer than a horizontal distance equal to the extended height of the mast away from power lines.
- When using a vehicle, that the vehicle is not moving and is on level terrain. The mast can be operated on terrain having a slope up to 10° for the 4-Meter mast system.
- The mast system area is free of personnel.
- The operator has full view of the mast system during use.

6.2 Operation Equipment

Table 6-1 lists recommended equipment for operation.

Table 6-1 Recommended Installation Tools & Materials

Tools and Materials		
Safety Glasses	Safety Gloves	Safety Shoes
Hard Hat or Helmet	Hearing Protection	Nitrile or Vinyl Gloves
Crank Handle Assembly (For manual operation only.)		
* Depending on the local, regional and national standards and codes of practice, and the environment, additional personal protective equipment may be necessary.		

6.3 Control Functions

The mast system can be operated with the:

- Control Box (Powered Operation)
- Control Box Display (Powered Operation)
- PC Interface (Powered Operation)
- Crank Handle Assembly (Manual Operation).

6.4 Control Box Operation

This section describes operation of the mast system using the Control Box.

If an emergency stop is required at any time, release the UP/DOWN Switch or press the emergency stop button. This will cause the mast to stop extending or retracting.

6.4.1 Prepare the System for Powered Operation

To prepare the mast system for powered operation:

- Ensure the mast system is stationary on level, stable ground.
- Ensure enable input is closed (Section 5.6.0.6).
- Perform the Pre-Operation Check (Section 6.1).
- If necessary, secure the payload to the mast (Section 5.12).
- If necessary, reset the emergency stop.
- If necessary, turn on the optional (customer supplied) master power switch to supply power to the mast system.

The mast system is now operational.

6.4.2 Extend the Mast with UP/DOWN Switch

To extend the mast with the UP/DOWN Switch:

1. Push back the switch guard covering the UP/DOWN Switch.

2. Hold the UP/DOWN Switch in the up position (Figure 6-1). As long as the UP/DOWN Switch is held in the up position, the mast will extend and the display will show the appropriate intermediate extension height. Be sure to stay clear of the collars during operation as they create a pinch point hazard.

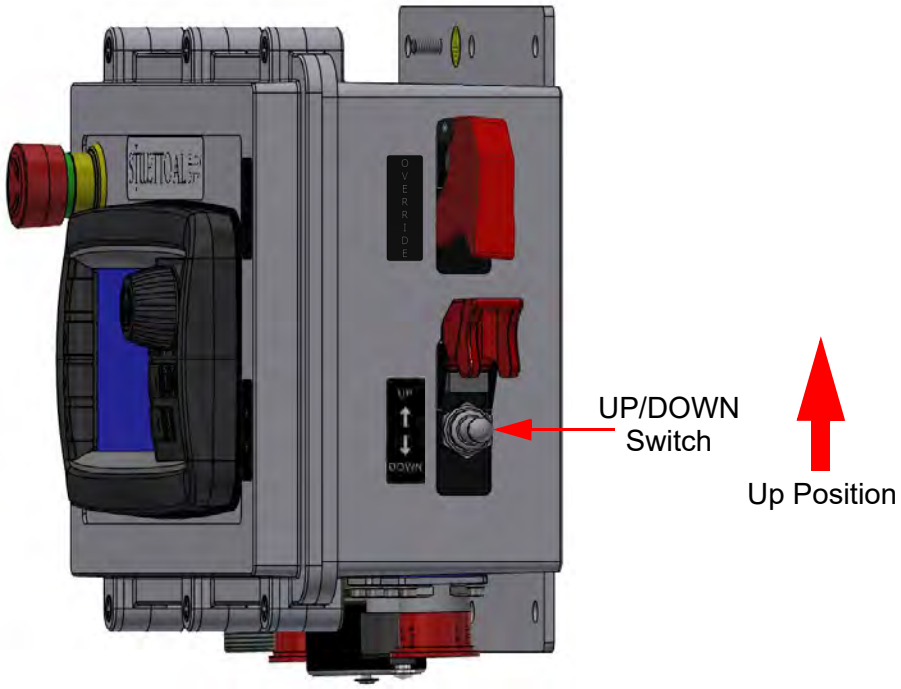


Figure 6-1 UP/DOWN Switch Up Position

3. Release the UP/DOWN Switch when the desired height is reached.

   If the UP/DOWN Switch is released before the maximum extension is reached, the mast will quickly stop and the display will show the current extension.

   If the UP/DOWN Switch is held long enough, the mast will automatically stop when the maximum height is reached and the display will show “FULLY EXTENDED” along with the full extension height.

4. Push the switch guard back into position to protect the UP/DOWN Switch.

6.4.3 Retract the Mast with UP/DOWN Switch

To retract the mast with the UP/DOWN Switch:

1. Push back the switch guard covering the UP/DOWN Switch.

2. Hold the UP/DOWN Switch in the down position (Figure 6-2). As long as the UP/DOWN Switch is held in the down position, the mast will retract and the display will show the appropriate intermediate extension height. Be sure to stay clear of the collars during operation as they create a pinch point hazard.

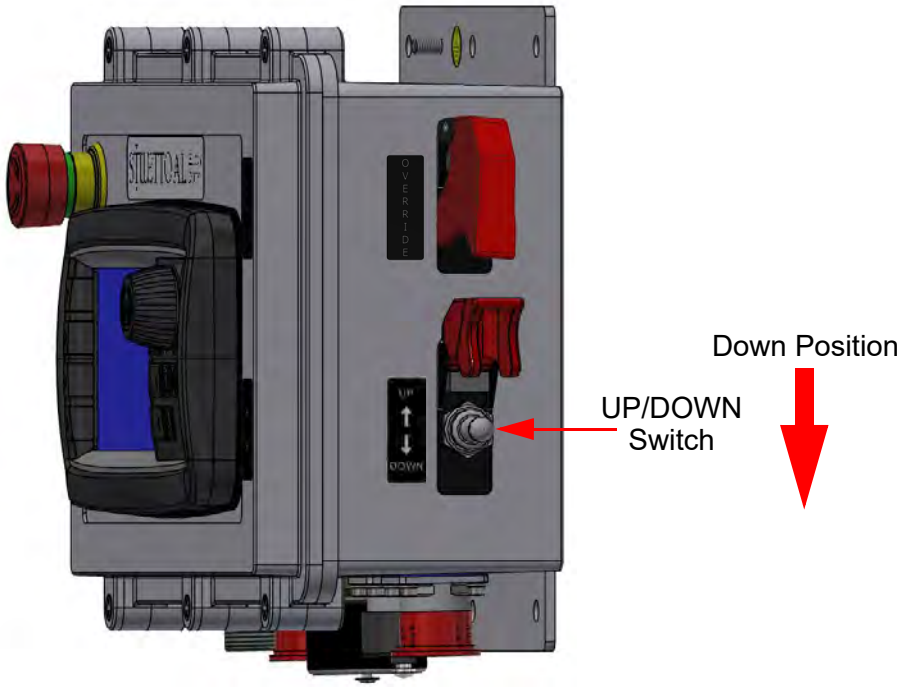


Figure 6-2 UP/DOWN Switch Down Position

3. Release the UP/DOWN Switch when the desired height is reached.

   If the UP/DOWN Switch is released before the Nested position is reached, the mast will quickly stop and the display will show the current extension.

   If the UP/DOWN Switch is held long enough, the mast will automatically stop when the nested height is reached and the display will show “FULLY NESTED” along with the nested height.

4. Push the switch guard back into position to protect the UP/DOWN Switch.

6.4.4 Retract the Mast with OVERRIDE Switch (Emergency Operation)

The OVERRIDE Switch is used with the UP/DOWN Switch or the “Mast Down” button to ignore any errors returned by the Control Box in order to retract the mast. Use the OVERRIDE Switch only for emergency operation of the mast.

6.4.4.1 Retract the Mast Using the UP/DOWN Switch and the OVERRIDE Switch

Note: Use extreme caution when using the OVERRIDE Switch at the fully nested area of mast deployment. Holding the UP/DOWN Switch beyond the limits of travel may result in equipment damage.

1. Push back the switch guards covering the OVERRIDE Switch and the UP/DOWN Switch.

2. Hold the OVERRIDE Switch in the engage position and the hold the UP/DOWN Switch in the down position (Figure 6-3). As long as both switches are held, the mast will retract and the display will show the Override Active Screen (Figure 6-4). Be sure to stay clear of the collars during operation as they create a pinch point hazard.

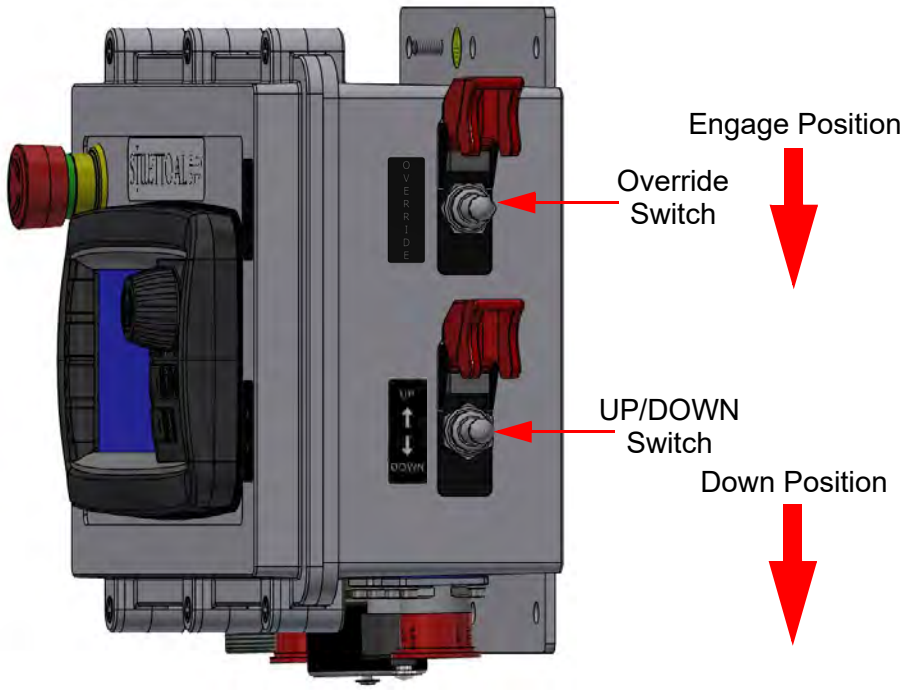


Figure 6-3 OVERRIDE Switch Engage Position and UP/DOWN Switch Down Position

3. Release the UP/DOWN Switch and OVERRIDE Switch when the desired height is reached.

4. Push both switch guards back into position to protect the UP/DOWN and OVERRIDE Switches.

6.4.4.2 Retract the Mast Using the “Mast Down” button and the OVERRIDE Switch

Note: Use extreme caution when using the OVERRIDE Switch at the fully nested area of mast deployment. Holding the UP/DOWN Switch beyond the limits of travel may result in equipment damage.

1. Push back the switch guard covering the OVERRIDE Switch.

2. Hold the OVERRIDE Switch in the engage position and press and hold the “Mast Down” button. As long as both the OVERRIDE switch and the “Mast Down” button are held, the mast will retract and the display will show the Override Active Screen (Figure 6-4). Be sure to stay clear of the collars during operation as they create a pinch point hazard.

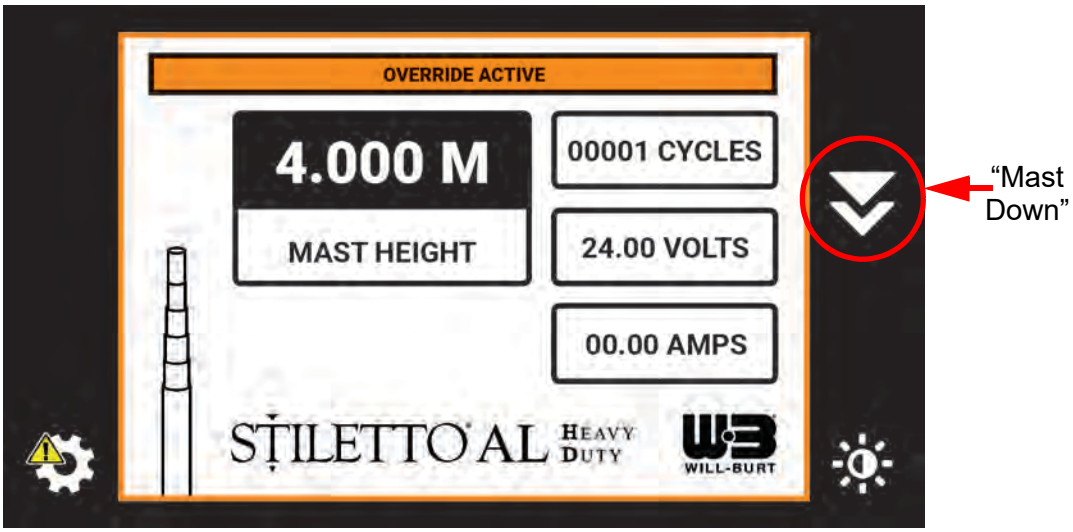


Figure 6-4 Override Active Screen

3. Release the “Mast Down” button and OVERRIDE Switch when the desired height is reached.

4. Push the switch guard back into position to protect the OVERRIDE Switch.

6.5 Control Box Display Operation

This section explains how to use the Control Box Display.

Using the Control Box display (Figure 6-5), the operator can perform an emergency stop and can access all functions of the mast.

Figure 6-5 Control Box Display Functions

6.5.1 Scroll Wheel

To use the scroll wheel (Figure 6-5):

- **To navigate through lists:** Turn the scroll wheel to scroll through the list options. To select a list option, press the center of the scroll wheel down.
- **To input specific variables (like numbers and letters):** Press the center down to select a variable to input. Turn the scroll wheel to reach the desired number or letter. Press the center of the scroll wheel down to input that number or letter.

  Note: After inputing the desired numbers or letters, the user must press the green check mark button to fully enter the name or number into the system.

6.5.2 Emergency Stop (E-Stop)

If an emergency stop (E-Stop) (Figure 6-5) is required at any time, press the “E-Stop” button. This will halt motion and disable all operation. When the E-Stop is used, an orange notification appear informing the operator that the mast has been stopped (Figure 6-6).

Figure 6-6 Emergency Stop Screen

Do not reset the E-Stop until the cause of the event is corrected. Turn the red E-Stop button if needed. Once the issue is resolved, select “RESOLVE”. Follow the instructions on the following screen (Figure 6-7):

Figure 6-7 Emergency Stop Resolve Screen

To get back to regular mast operation, press the green check mark button.

6.5.3 Prepare the System for Powered Operation

To prepare the mast system for powered operation:

- Ensure the mast system is stationary on level, stable ground.
- Ensure enable input is closed (Section 5.6.0.6).
- Perform the Pre-Operation Check (Section 6.1).
- If necessary, secure the payload to the mast (Section 5.12).
- If necessary, reset the emergency stop.
- If necessary, turn on the optional (customer supplied) master power switch to supply power to the mast system

The mast system is now operational.

6.5.3.1 Conflicting Commands

Conflicting commands is when different commands on different controllers are given to the mast system at the same time. For example, if the HHRC UP/DOWN switch was activated at the same time the Control Box UP/DOWN switch was activated, the mast system is receiving conflicting commands.

If there are conflicting commands given to the mast system, the mast system will stop and a warning screen will appear while problem persists. Once the conflicting commands stops, the warning will auto-clear and normal mast operation will resume.

6.5.4 Extending the Mast

The mast can be extended by using:

- Auto Up® Feature
- “Mast Up” Button
- “Deploy To” Feature
- Presets Feature

All of the methods of extension can be accessed from the Home Screen (Figure 6-8).

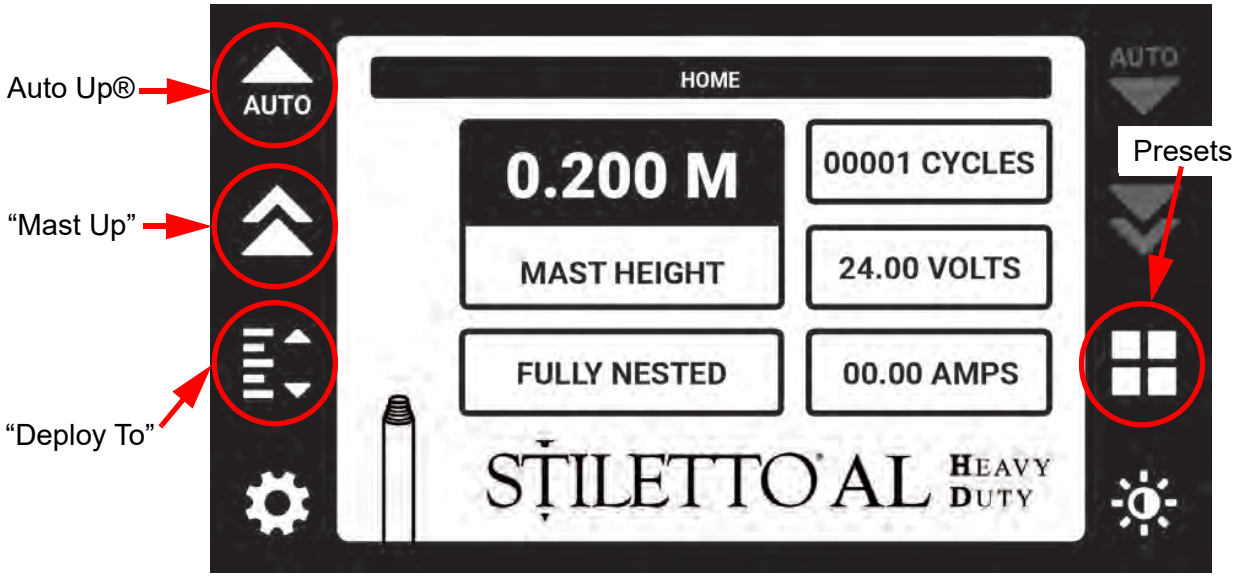


Figure 6-8 Home Screen - Mast is Fully Nested

If a command is available for use, the icon will be colored white. If a command is not available, the icon will be colored dark gray. For example, in Figure 6-8, the mast is fully nested, so the Auto Stow® and the "Mast Down" button are unavailable since the mast cannot be further lowered.

Once a command is activated, the command's icon will turn blue.

If the extension method is automated (Auto Up® feature, "Deploy To" feature, and Presets feature), an Automated Motion Warning Screen will appear asking the user to check for obstructions before operating the mast (Figure 6-9). After ensuring the operation area is clear, press the green check mark button.

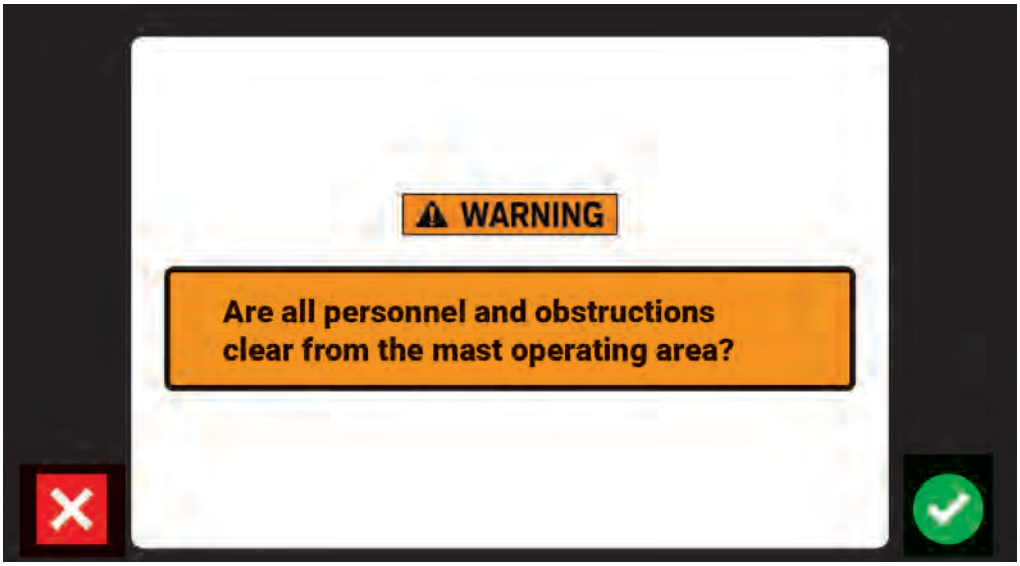


Figure 6-9 Automated Motion Warning Screen

Any of the auto sequences can be aborted by pushing the normal stop button or any of the buttons or switches on the controller, HHRC, Control Box, or Control Box display at any point during the auto sequence. If the auto sequence is aborted, the mast will stop and wait for input from the controller, HHRC, Control Box, or Control Box display.

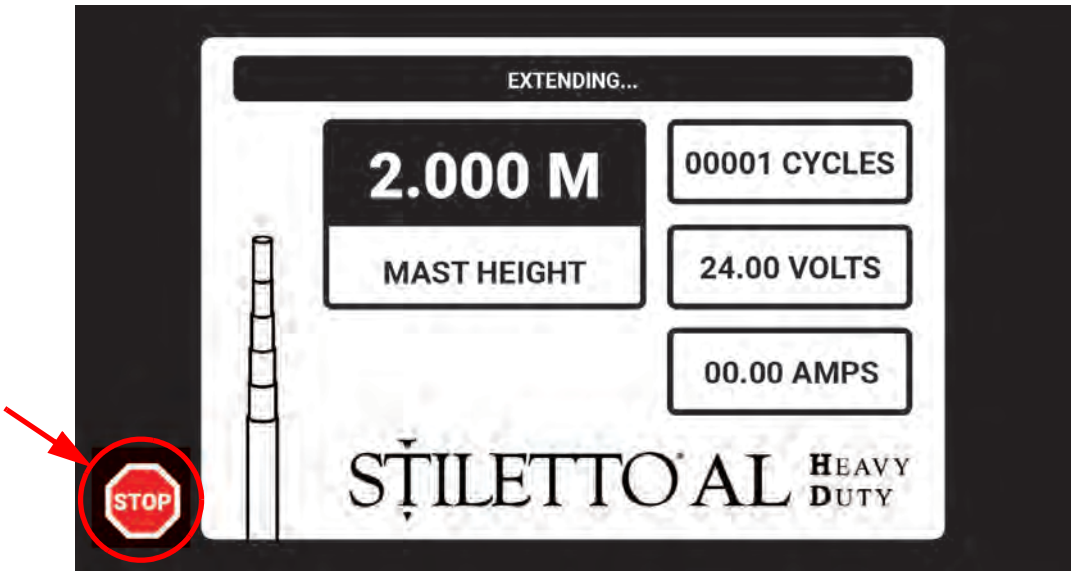


Figure 6-10 Press Any Button or Switch to Stop Motion

6.5.4.1 Using the Auto Up® Feature

1. To fully extend the mast, press the Auto Up® button (Figure 6-8).

2. An Automated Motion Warning Screen will appear asking the user to check for obstructions before operating the mast (Figure 6-9). After ensuring the operation area is clear, press the green check mark button. The mast will now fully extend.

6.5.4.2 Using the “Mast Up” Button

1. To extend the mast, press and hold the “Mast Up” button (Figure 6-8) 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. If the “Mast Up” button is not released, the mast will reach its fully extended height.

6.5.4.3 Using the “Deploy To” Feature

1. To extend the mast, press the “Deploy To” button (Figure 6-8). The Deploy To - Enter Height Screen will appear (Figure 6-11).

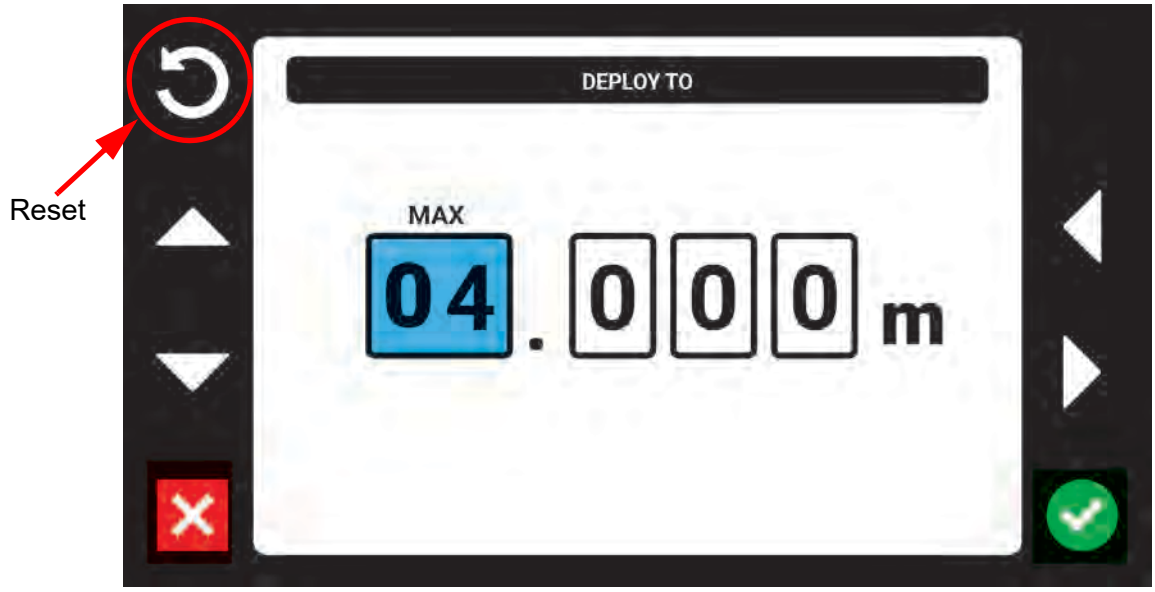


Figure 6-11 Deploy To - Enter Height Screen

2. Use the arrows or the scroll wheel to enter the desired height. The parameter being adjusted will be highlighted blue. The Reset icon at the top left of the screen will reset all numbers to minimum height. Press the green check mark button once the desired input is entered.

3. An Automated Motion Warning Screen will appear asking the user to check for obstructions before operating the mast (Figure 6-9). After ensuring the operation area is clear, press the green check mark button. If the mast is lower than the “Deploy To” height, the mast will now extend to the entered height.

6.5.4.4 Using the Presets Feature

See Section 5.7.3 for the procedure to set Preset heights.

1. To extend the mast, press the Presets button (Figure 6-8). The Select Preset Screen will appear (Figure 6-12).

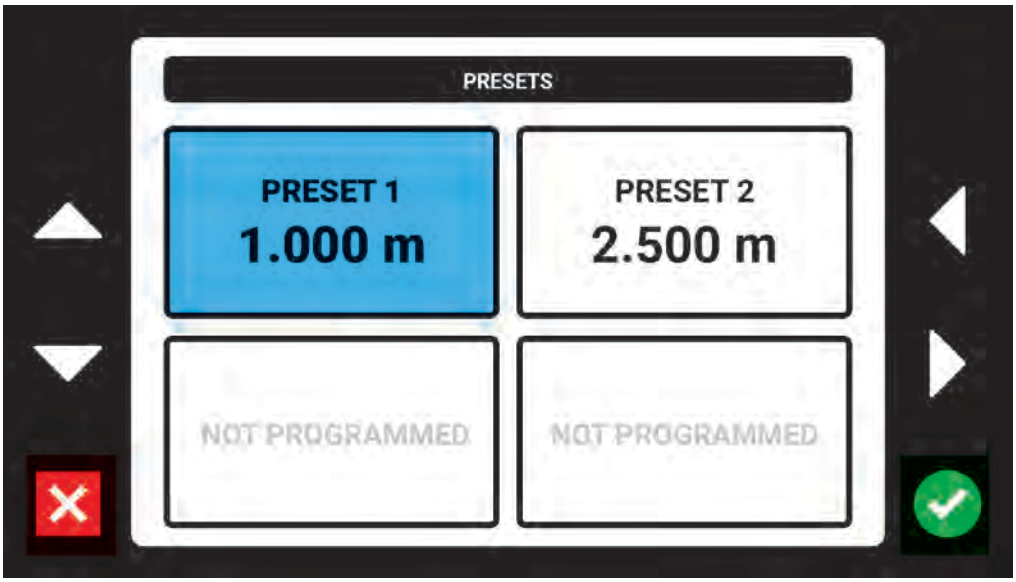


Figure 6-12 Select Preset Screen

2. Using the arrows or the scroll wheel, select the desired Preset height then press the green check mark button.

3. An Automated Motion Warning Screen will appear asking the user to check for obstructions before operating the mast (Figure 6-9). After ensuring the operation area is clear, press the green check mark button. If the mast is lower than the Preset height, the mast will now extend to the chosen preset height.

6.5.5 Lowering the Mast

The mast can be stowed by using:

- Auto Stow®
- “Mast Down” Button
- “Deploy To” Feature
- Presets Feature

All of the above methods of retraction can be accessed from the Home Screen (Figure 6-13).

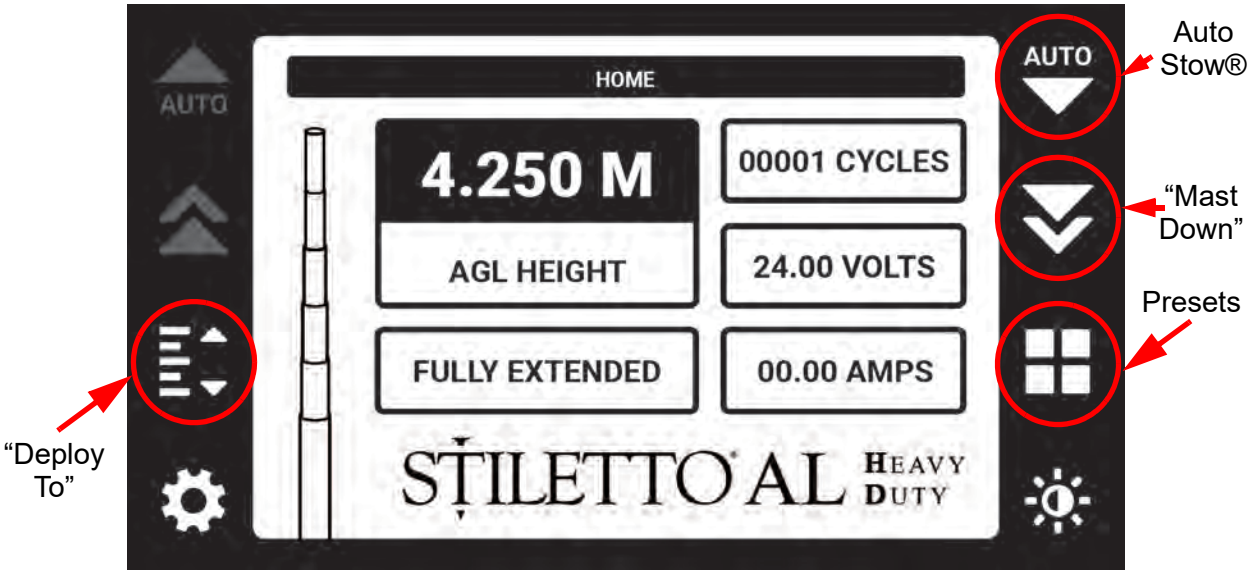


Figure 6-13 Home Screen - Mast is Fully Extended

If the retraction method is automated (Auto Stow® feature, “Deploy To” feature, and Presets feature), an Automated Motion Warning Screen will appear asking the user to check for obstructions before operating the mast (Figure 6-14). After ensuring the operation area is clear, press the green check mark button.

Figure 6-14 Automated Motion Warning Screen

Any of the auto sequences can be aborted by pushing the normal stop button or any of the buttons or switches on the controller, Control Box, or Control Box display at any point during the auto sequence. If the auto sequence is aborted, the mast will stop and wait for input from the controller, HHRC, Control Box, or Control Box display.

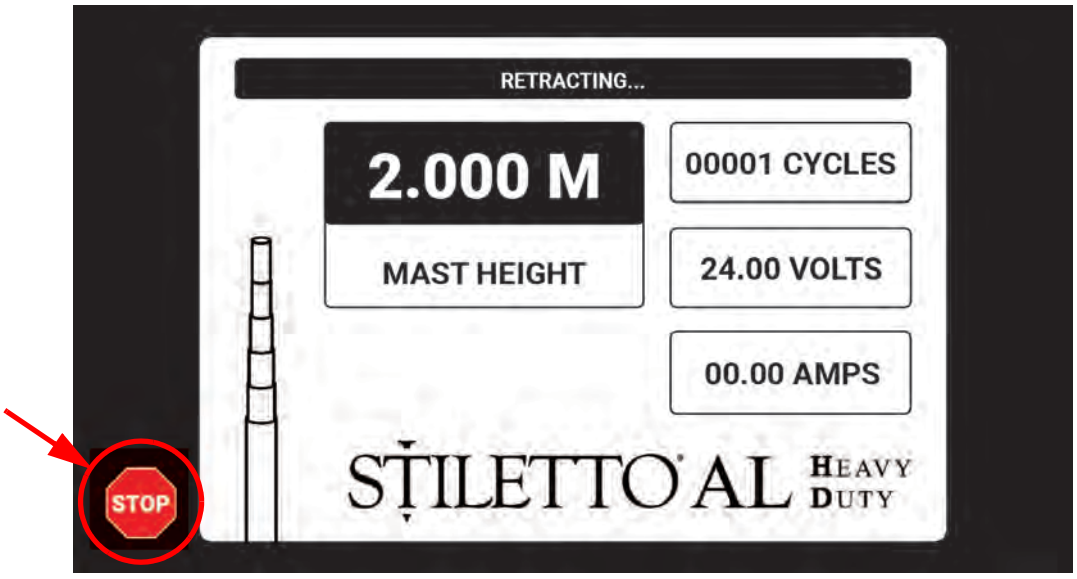


Figure 6-15 Stop Button, Though Pressing Any Button or Switch Will Stop Motion

6.5.5.1 Using the Auto Stow® Feature

1. To fully stow the mast, press the Auto Stow® button (Figure 6-13).

2. An Automated Motion Warning Screen will appear asking the user to check for obstructions before operating the mast (Figure 6-14). After ensuring the operation area is clear, press the green check mark button. The mast will now fully retract.

6.5.5.2 Using the “Mast Down” Button

1. To retract the mast, press and hold the “Mast Down” button (Figure 6-13) until the mast reaches the desired height. Pushing the “Mast Down” button will cause the mast to lower until the “Mast Down” button is released. If the “Mast Down” button is not released, the mast will fully stow.

6.5.5.3 Using the “Deploy To” Feature

1. To retract the mast, press the “Deploy To” button (Figure 6-13). The Deploy To - Enter Height Screen will appear (Figure 6-16).

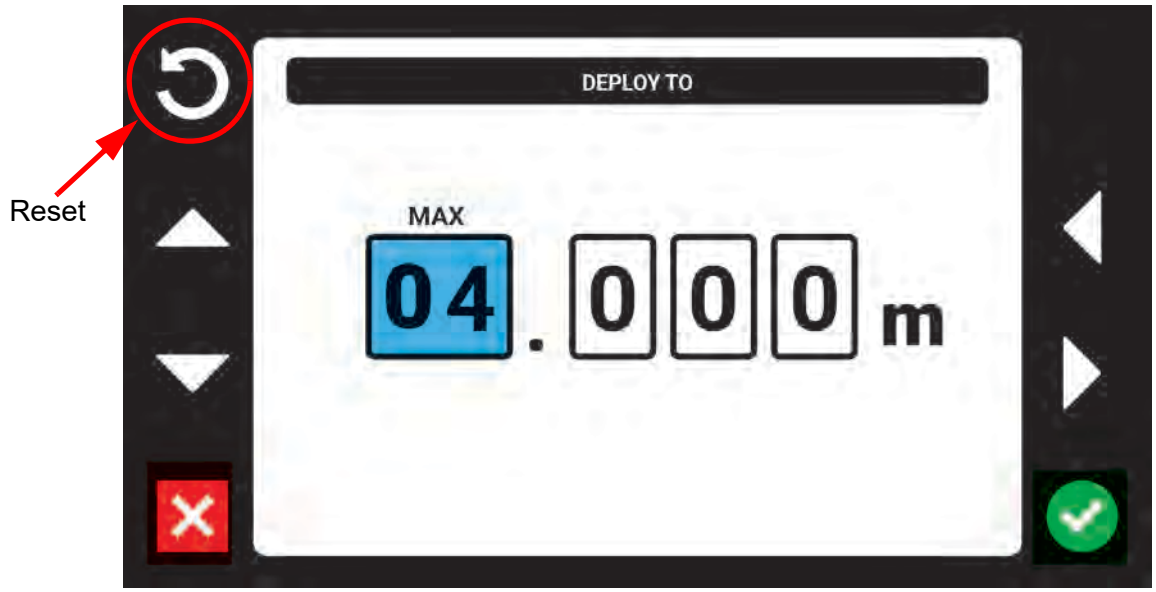


Figure 6-16 Deploy To - Enter Height Screen

2. Use the arrows or the scroll wheel to enter the desired height. The parameter being adjusted will be highlighted blue. The Reset icon at the top left of the screen will reset all numbers to minimum height. Press the green check mark button once input is complete.

3. An Automated Motion Warning Screen will appear asking the user to check for obstructions before operating the mast (Figure 6-14). After ensuring the operation area is clear, press the green check mark button. If the mast is higher than the “Deploy To” height, the mast will now retract to the entered height.

6.5.5.4 Using the Presets Feature

See Section 5.7.3 for the procedure to set Preset heights.

1. To retract the mast, press the Presets button (Figure 6-13). The Select Preset Screen will appear (Figure 6-17).

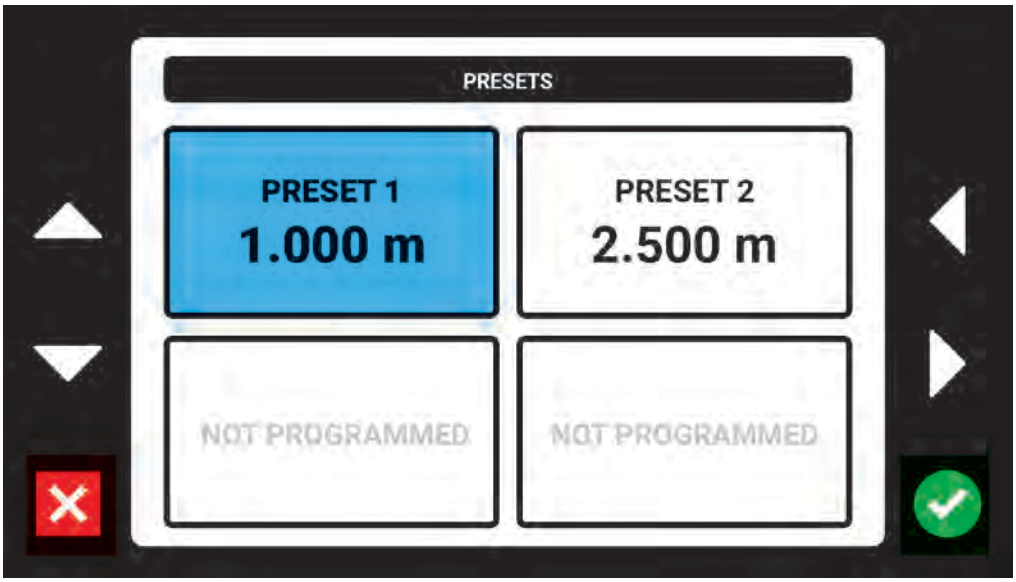


Figure 6-17 Select Preset Screen

2. Using the arrows or the scroll wheel, select the desired Preset height then press the green check mark button.

3. An Automated Motion Warning Screen will appear asking the user to check for obstructions before operating the mast (Figure 6-14). After ensuring the operation area is clear, press the green check mark button. If the mast is higher than the Preset height, the mast will now retract to the chosen preset height.

6.5.6 Blackout Screen

The blackout mode option will turn the whole screen black. This feature can also be accessed from the home page (Figure 6-18) and also when adjusting screen brightness (Section 5.7.4).

To activate Blackout mode, press the sun shaped button.

To disable Blackout mode, press any button.

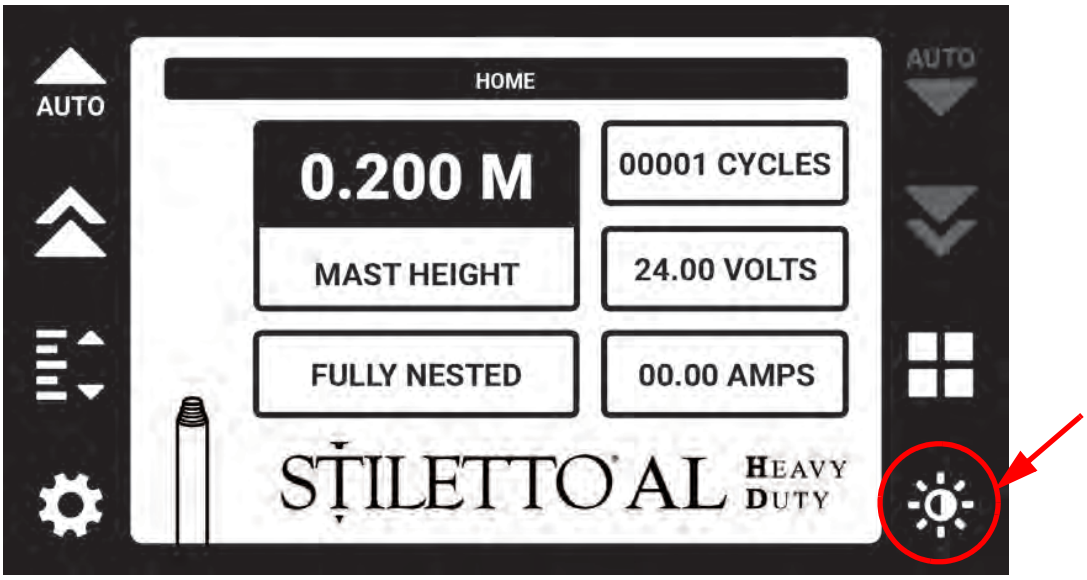


Figure 6-18 Blackout Button on Home Screen

6.6 PC Interface Operation

For information on operation using the PC Interface, contact The Will-Burt Company.

6.7 Crank Handle Operation (Emergency Operation Without Power)

This section describes operation of the mast system using the crank handle assembly.

Use manual operation for emergency situations only. The normal limit switches and software limits are not in effect during manual operation. There are mechanical hard stops just beyond both the upper and lower limit switch locations that will stop the mast safety, however it is good practice to stop the mast at the normal positions.

To extend or retract the mast manually:

1. Ensure power is removed from the mast system. Do not access the manual override until power has been removed from the mast system.

2. Retrieve the crank handle assembly from its storage location

3. Locate the manual override on the motor (Figure 6-19).

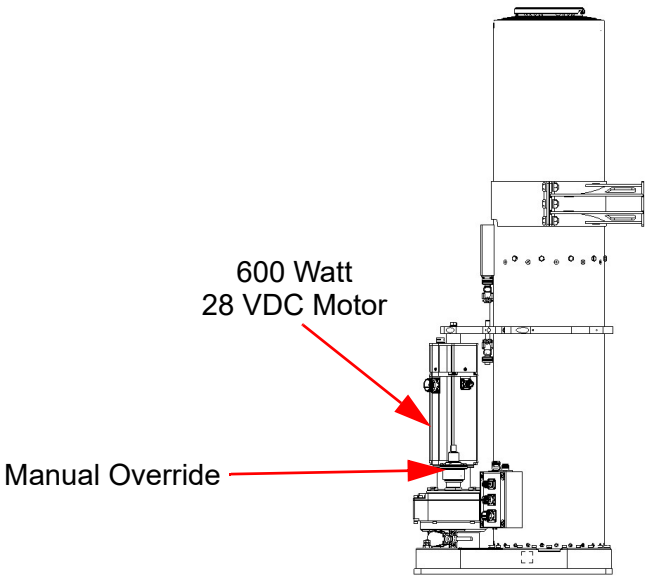


Figure 6-19 Manual Override

4. Place the crank handle assembly onto the manual override. Press down on the manual override ride with the crank handle assembly so the manual override lowers. When the manual override is lowered, the lock is disengaged and the mast can be operated.

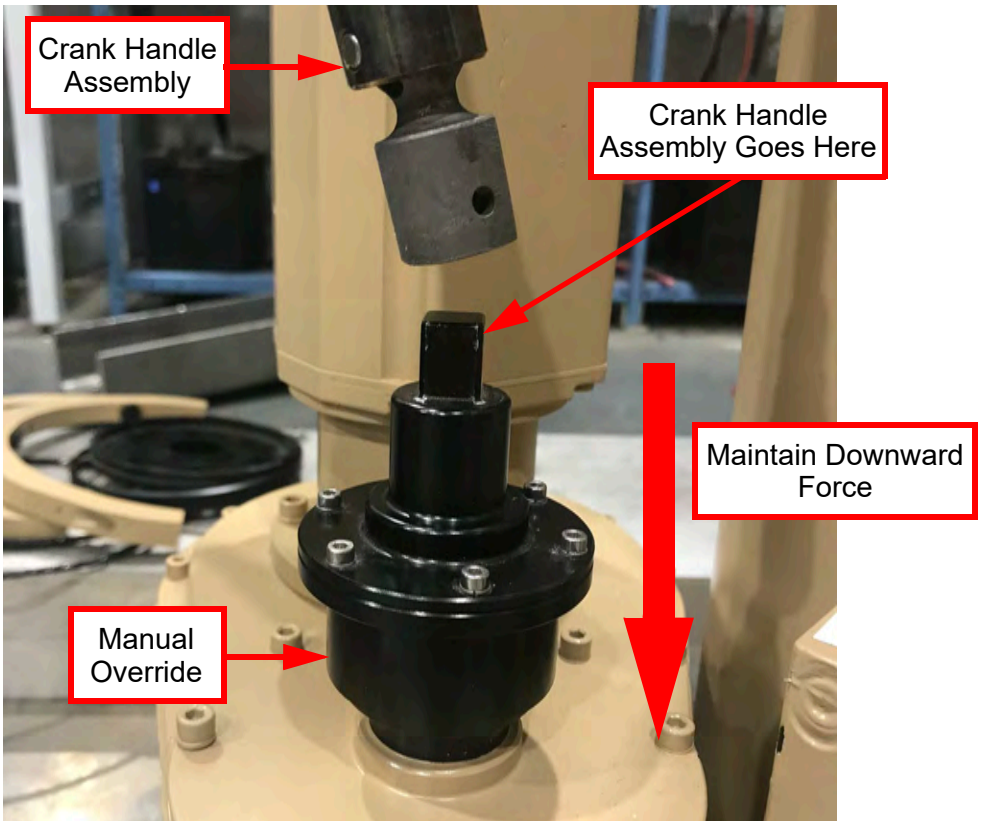


Figure 6-20 Place Crank Handle Assembly onto Manual Override

5. **To extend the mast:** Turn the crank handle assembly counterclockwise while maintaining downward force. If the downward force is removed, the manual override will rise and lock the mast.

   To retract the mast: Turn the crank handle assembly clockwise while maintaining downward force. If the downward force is removed, the manual override will rise and lock the mast.

   Note: Be sure to stay clear of moving parts during operation as they create a pinch point hazard.

6. When the mast has reached the desired height, remove the downward force. Slightly turn the crank handle assembly until the override housing locks into place (approximately 1/4 turn). Remove the crank handle assembly. If the lock remains stuck (lowered), operating the mast normally (not manually) will correct the issue. However, operating the mast normally will create a brief metal contact noise.

   Note: The mast will hit a hard stop just below the nested position. If the hard stop is reached, raise the mast above the hard stop by at least 1 mm.

7. Store the crank handle assembly in an accessible area in close proximity to the mast.

7 Transportation

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

7.1 General Transportation

To prepare the mast system for transportation:

1. Ensure the mast is fully nested. Do not transport the mast system with the mast and payload extended. Always visually confirm the mast is fully retracted before moving the mast. Please contact The Will-Burt Company's Engineering team for special circumstances for transportation without the mast nested for military use only.

2. The vehicle interlock circuit should confirm the mast is nested and disconnect power to the unit before moving the vehicle.

3. If used, ensure the optional (customer supplied) master power switch is off to eliminate the possibility of inadvertent mast extension.

4. Ensure the payload is removed, supported, or otherwise isolated from the top tube to prevent damage to the mast and payload.

5. Consult The Will-Burt Company's Engineering team for applications where the payload is not removed or supported.

6. If necessary, secure any additional components in the mast system.

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

7.2 Shipping

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

When shipping:

1. As necessary, remove the payload.

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

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

4. Secure the mast system in the shipping crate:

    a. Carefully position the mast in the crate.

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

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

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

    e. Secure the lid on the shipping crate.

8 Maintenance and Adjustments

This section describes the routine maintenance and adjustment procedures required to keep the system operational. Be sure to read and understand the entire operation procedure and the Safety Summary (Section 1) before beginning any maintenance or adjustment procedure.

This section describes the systematic care, inspection, and servicing of equipment to keep it in good condition and to prevent breakdowns. If the mast system does not perform as required, see Section 10. If anything looks wrong and cannot be diagnosed and/or fixed, the mast system should be taken to the next higher level maintenance facility. The Will-Burt Company recommends creating and maintaining a maintenance log for each mast system.

8.1 Pre-Maintenance Check

Before performing maintenance procedures, ensure:

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

8.2 Maintenance Equipment

Table 8-1 lists recommended equipment for maintenance.

Table 8-1 Recommended Maintenance Tools & Materials

Tools and Materials		
Safety Glasses	Safety Gloves	Safety Shoes
Hard Hat or Helmet	Hearing Protection	Nitrile or Vinyl Gloves
Wrenches	Wire Brush	Paint Brushes
Torque Wrench	Screwdrivers	Sling
Hoist	Touchup Paint	Denatured Alcohol or Other Solvent
Rags (Clean and Dry)	Non-Abrasive Cleaners (Soap and Water)	

Note:

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

8.3 System Info Screen and Contact Us Screen

If information about the mast and the software is needed, the user can see that information by using the System Info Screen (Figure 8-1). This screen says the serial number, the software version, etc.

If you need to contact The Will-Burt Company, go to the Contact Us Screen (Figure 8-2).

To access the System Info Screen: Go to the Settings Screen (Section 5.7.1). Scroll through the setting options and select “System Info”. Once done viewing the System Info Screen, press the green check mark button to exit.

Figure 8-1 System Info Screen

To access the Contact Us Screen: Go to the Settings Screen (Section 5.7.1). Scroll through the setting options and select “Contact Us”. Once done viewing the Contact Us Screen, press the green check mark button to exit.

Figure 8-2 Contact Us Screen

8.4 Power Isolating Procedure

Disconnect power to the mast system and any devices mounted to the mast with lock out tag out procedures as appropriate before performing mast maintenance. The J1 connector on the Control Box can be removed to isolate power to the mast and Control Box. Be sure source power is removed before removing the J1 connector.

To isolate power to the mast system:

1. Operate the mast to the desired position for the maintenance procedure.

2. Disconnect all power sources using lock-out tag-out procedures. It is recommended that the vehicle ignition keys be held by the maintenance engineer as an additional precaution to prohibit unexpected power up.

8.5 Spare Parts

To order spare or replacement parts, always refer to the mast model number and serial number. The model number, serial number, and additional information is located on the mast Identification Plate (Figure 3-10). To order spare parts, contact The Will-Burt Company.

8.6 Periodic Inspections

This section describes the systematic care and inspection of equipment to keep it in safe operating condition and to prevent breakdowns. If the system does not perform as required, see Section 10 for troubleshooting. If anything looks wrong and cannot be diagnosed and/or fixed, contact The Will-Burt Company. Table 8-2 provides a schedule of periodic inspections and procedures required to keep the mast system in safe operating condition.

Table 8-2 Periodic Inspections

Frequency	Inspection	Action
As Needed; In salt water or sandy environments, clean the mast every 3 months.	**Keep Clean** – Inspect to ensure the mast system is kept clean and free from foreign material. Dirt, grease, oil, sand and debris may cover up a serious problem.	Clean as you work and as needed. Use denatured alcohol on all metal surfaces. Use water when cleaning rubber or plastic material. Use soap and water when cleaning the exterior surfaces of the mast tubes. Use a soft, non-abrasive cloth to wipe clean the bezel on the Control Box display.
During Operation	**Damage** – Inspect for damage before use. During extension and retraction of the mast, inspect the outer surfaces for damage.	If damage is apparent, do not use the mast, and have it serviced prior to use.
During Operation	**Binding** – During extension and retraction of the mast, observe mast operation for evidence of binding.	Remove any foreign material or obstructions as necessary.
Weekly	**Damage** – Inspect all visible surfaces for damage.	If damage is apparent, do not use the mast system and have it serviced before use.
Weekly	**Finish** – Inspect the condition of the mast finish. Look for bare metal, rust, and corrosion	Remove any rust or corrosion with a wire brush. Touch up any bare metal with touchup paint.
Weekly	**Fasteners** – Inspect external fasteners. Look for loose, missing, bent, or broken fasteners. Look for chipped paint, bare metal, or rust around the bolt heads. Pay particular attention to the fastener securing the Mast System to the mounting surface, the mast to the Drive Assembly, the Motor to the Drive Assembly, and the payload to the mast.	Replace any missing or damage hardware. If any hardware is found loose, re-tighten. If loose fasteners joining major components cannot be tightened, do not use the Mast System and have it serviced before use.

Table 8-2 Periodic Inspections (Continued)

Frequency	Inspection	Action
Weekly	**Mast Cables** – Inspect Mast System cables. Look for cracked, frayed, or broken insulation; bare wires; loose or broken connectors. Ensure the cables and bulkhead connectors are clean, the pins undamaged, and the threads in good condition.	Replace cables as required. Tighten loose connections. If the bulkhead connectors are unable to mate with the corresponding cable, do not use the Mast System and have it serviced before use
Weekly	**Payload Cables** – Inspect any cables going up to the payload for signs of pinching between the collars or spearing by the trigger posts.	Replace cables as required.
Weekly	**Cycle Counter** – Check to ensure Cycle Counter is operating properly by noting that during initial cycle of the mast the cycle counter increases by one.	
Every 6 Months (3 months in salt water environment)	If the mast remains idle for long periods of time, operate the mast to full extension at least once every six months (3 months in salt water environment).	Exercise mast.
5,000 Cycles (or 7 Years)	**Overhaul** – Return for complete factory overhaul and rebuild.	

8.7 Mast Damage

If damage to the mast occurs, do not use the mast system and have it serviced before use. Servicing the mast system may require removal of the mast system. If the mast system is installed on a vehicle, consult the vehicle manual for specific installation details.

In general, remove the mast system as follows:

1. Disconnect power from the mast system.
2. Disconnect the power cable from J1 on the Control Box.
3. Disconnect motor cable from J2 on the Control Box and J12 on the mast.
4. Disconnect the mast data cable from J5 on the Control Box and J16 on the mast.
5. Disconnect any cables from J3 and J4 on the Control Box.
6. Remove the support bracket assembly.
7. Remove the mounting hardware from the base of the mast.

8.8 Long-Term Storage

This section describes the best practice for long-term storage (longer than one month) of the Mast System.

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

- Mast is fully nested
- Payload is removed
- Mast System is clean. Dirt, grease, oil, and debris only serves to collect additional dirt during storage.
- Use denatured alcohol on all metal surfaces. Use water when cleaning rubber or plastic material. Use soap and water when cleaning the exterior surfaces of the mast tubes. Use a soft, non-abrasive cloth to wipe clean the bezel on the Control Box display.
- Inspect the condition of the mast finish. Look for bare metal, rust, and corrosion.
- Inspect external fasteners. Look for loose, missing, bent, or broken fasteners. Look for chipped paint, bare metal, or rust around the bolt heads. Pay particular attention to the fastener securing the Mast System to the mounting surface, the mast to the Drive Assembly, the Motor to the Drive Assembly, and the payload to the mast.
- Inspect Mast System cables. Look for cracked, frayed, or broken insulation; bare wires; loose or broken connectors. Ensure the cables and bulkhead connectors are clean, the pins undamaged, and the threads in good condition.

Once the Mast System has been inspected and repaired, it should be stored:

- In a clean and dry indoor environment
- Out of direct sunlight
- In the shipping crate. If necessary, replacement shipping crates may be ordered.
- Between 0°C to 32°C (32°F to 90°F)

If the mast system is stored for a period of time greater than five years, the mast is to be inspected by a factory-trained technician before operation.

8.9 System Disposal

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

9 Reference Information

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

9.1 Nycoil® (Optional)

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

Figure 9-1 Nycoil® Conduit

Nycoil® conduit comes in a variety of sizes. Depending on the system being used, some restrictions on the size of the Nycoil® may occur. The standard sizes are:

- 1/2 inch inside diameter of the conduit with the outside diameter of the coil being 8 inches
- 3/4 inch inside diameter of the conduit with the outside diameter of the coil being 13 inches

Consult engineering on specific applications for other Nycoil® sizes.

Note: Nycoil® is a registered trademark of the Nycoil company.

9.2 Drawings

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

9.3 Guying

Stiletto AL HD masts are not typically guyed, however light guying is possible and can help with deflection. Only one level of guying is recommended.

In general, to guy the mast:

1. Prepare the mast system for operation (Section 6.1).

2. Secure the payload to the mast.

3. Attach the guy lines to the mast ensuring the guy lines do not interfere with any payload cables or intermediate payloads.

4. Prior to extending the mast, The Will-Burt Company recommends laying out any guy lines so they do not become tangled during extension (Figure 9-2).

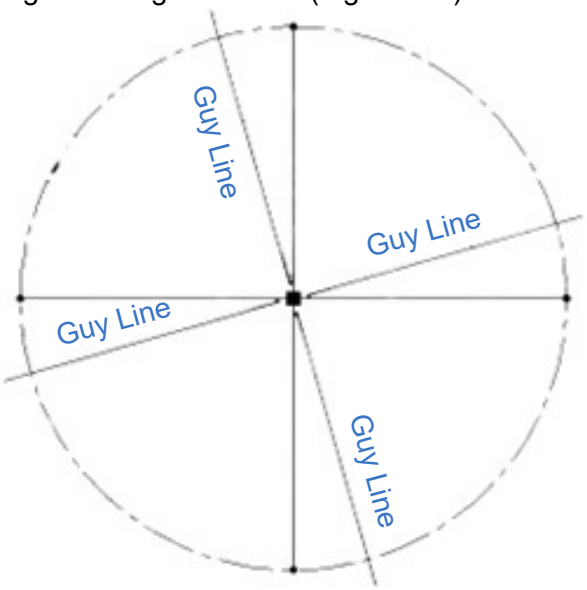


Figure 9-2 Lay Out Guy Lines

5. Extend the mast (Section 6).

6. Properly secure and tension the guy lines immediately after raising the mast. The installer shall verify the guy anchor point strength is adequate to support the guy line forces. All guy lines should be equally tensioned. Beginning at two locations opposite each other, gradually tension each guy line. Vertical alignment of the mast is accomplished by observing the mast perpendicularly to the two guy lines being tensioned to ensure the mast is standing straight and is not bending too far towards one side. Adjust the appropriate guy line as necessary to keep the mast plumb vertically. Check periodically.

9.4 Extended Glossary of Terms

This section defines terms used within this manual as follows:

9.4.1 General Terms and Abbreviations

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

- **Amp:** stands for ampere which is a unit of electric current.
- **Base Tube:** refers to the tube with the largest diameter. When the mast is fully extended, this is the tube closest to the mounting surface.
- **CD:** stands for coefficient of drag.
- **Collars:** attaches to the top of each tube except the top tube.
- **EMC:** stands for electromagnetic compatibility.
- **EMI:** stands for electromagnetic interference.
- **Extended:** refers to the partial- or full-raised position of the mast that the mast mechanically goes to from the nested position. In the extended position, some or all the tubes have risen.
- **ID:** stands for Inside Diameter or the diameter to the inside edge of a circle.
- **in.-lb.:** stands for inch-pounds, which is a unit of torque equal to the force in pounds multiplied by the distance in inches to the pivot point.
- **Intermediate Tubes:** refers to the tubes between the base tube and the top tube.
- **lb.-ft.:** stands for pounds-feet, which is a unit of torque equal to the force in pounds multiplied by the distance in feet to the pivot point.
- **Mast:** refers to the mechanical telescoping mast.
- **Mast System:** refers to the entire Stiletto AL HD mast system (telescoping mast, Control System, and additional accessories).
- **MOSFET:** stands for metal-oxide semiconductor field-effect transistor.
- **NEMA 4X:** refers to watertight enclosures as defined by the National Electrical Manufacturers Association.
- **Nested:** refers to the position of the mast were no tubes have risen. The mast remains retracted. This position is sometimes referred to as “stowed”.
- **NPT:** stands for “American National Standard Pipe Thread” or “National Pipe Thread” for short; a United States standard for thread specifications on pipes and fittings. NPT threads are tapered.
- **N-m:** standards for Newton Meters, which is a unit of torque equal to the force of one newton applied perpendicularly to a moment arm which is one meter long.
- **OD:** stands for Outside Diameter or the diameter to the outside edge of a circle.
- **Payload:** refers to the object or equipment being raised by the mast to an operational height.
- **P/N:** stands for Part Number. These are The Will-Burt Company part numbers for various components in the mast system.

- **Top Tube:** refers to the tube with the smallest diameter. When the mast is fully extended, this is the tube furthest from the mounting surface.
- **Ø:** stands for diameter.

9.4.2 Mounting Position Terms

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

- **Mounting Structure:** the overall structure where the mast system is mounted.
- **Mounting Surface:** the surface to which the base of the mast is secured.
- **Support Structure:** the vertical surface to which the support bracket assembly is secured.

10 Troubleshooting

This section describes system troubleshooting information. Please contact The Will-Burt Company if these guides do not solve the issue. Be sure to read and understand the entire operation procedure and the Safety Summary (Section 1) before beginning any maintenance or troubleshooting procedure.

10.1 Error Screens

When something is not working correctly, the Control Box display will show an error screen. These screens are either an orange warning screen or a yellow caution screen. At the top of the error notice box, it will either say “WARNING” or “CAUTION”. The reason for the error is written underneath.

10.1.1 Warnings

When a warning occurs, the mast is completely disabled and will not move until the issue is fixed. Below is an example of a warning (Figure 10-1).

Figure 10-1 Example of a Warning Screen

If you need to access the home screen for any reason, press the red “X” button to dismiss the warning screen. Below is the home screen with a warning notice (Figure 10-2).

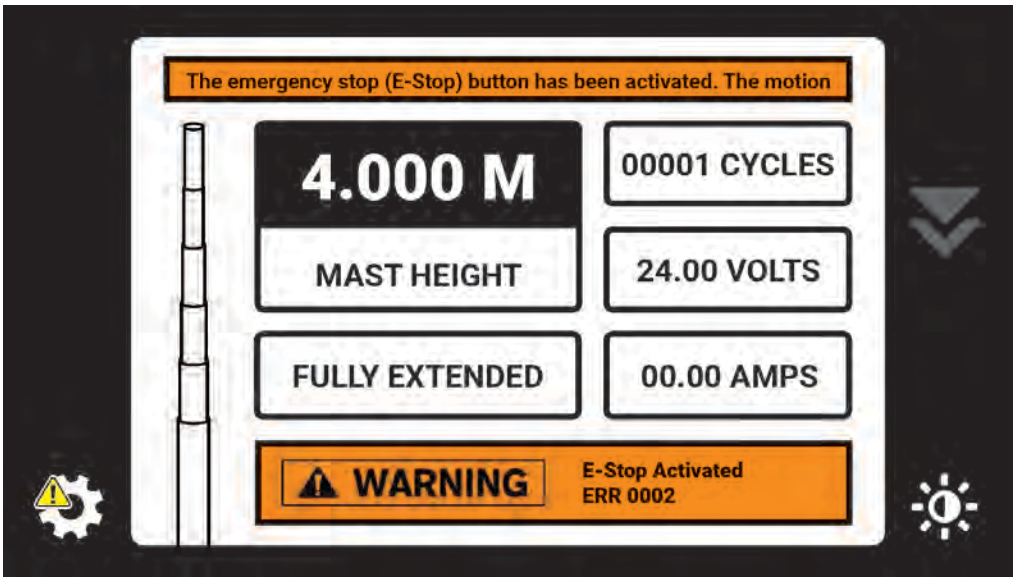


Figure 10-2 Home Screen with Warning Notice

To get back to the warning screen, press the Settings button in the bottom left of the screen. Scroll to where the warning alert is and press the green check mark button (Figure 10-3).

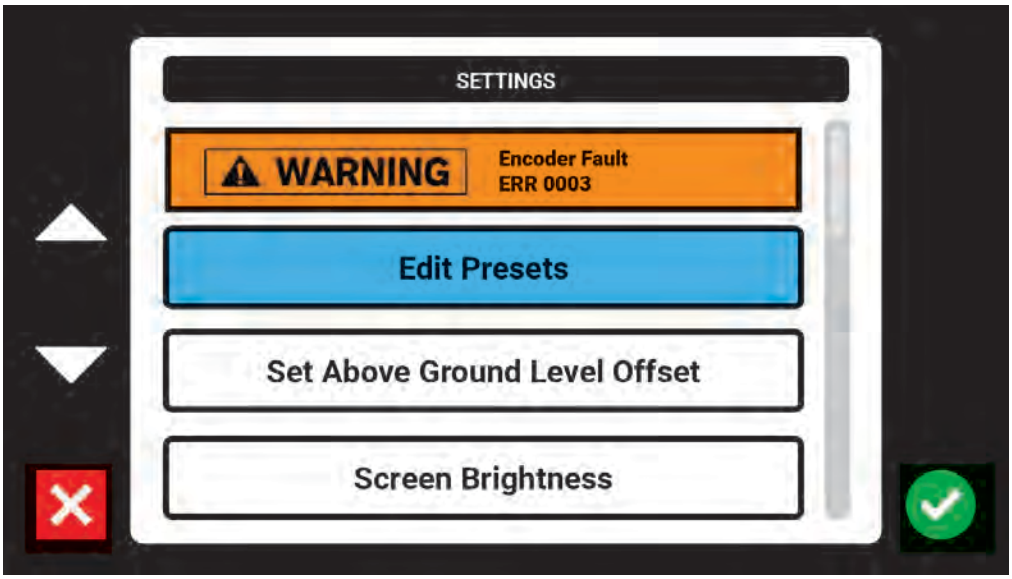


Figure 10-3 Warning Alert in Settings List

This will open up the original warning window. Select “RESOLVE” to see possible causes of the warning. Address the possible causes and press the green check mark button to see if the warning has been corrected. If the warning persists, contact The Will-Burt Company.

10.1.2 Cautions

When a caution screen occurs, the mast can still be used and moved, but the operator should still fix the issue. Below is an example of a caution (Figure 10-4).

Figure 10-4 Example of a Caution Screen

If you need to access the home screen, press the red “X” button to dismiss the caution screen. Below is the home screen with a caution notice (Figure 10-5).

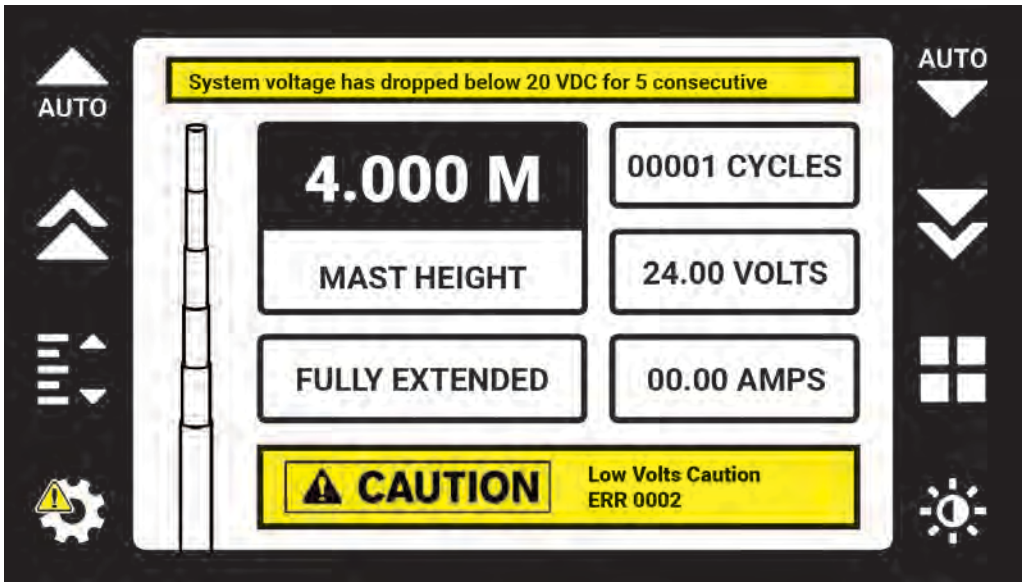


Figure 10-5 Home Screen with Caution Notice

To get back to the caution screen, press the Settings button in the bottom left of the screen. Scroll to where the caution alert is and press the green check mark button (Figure 10-6).

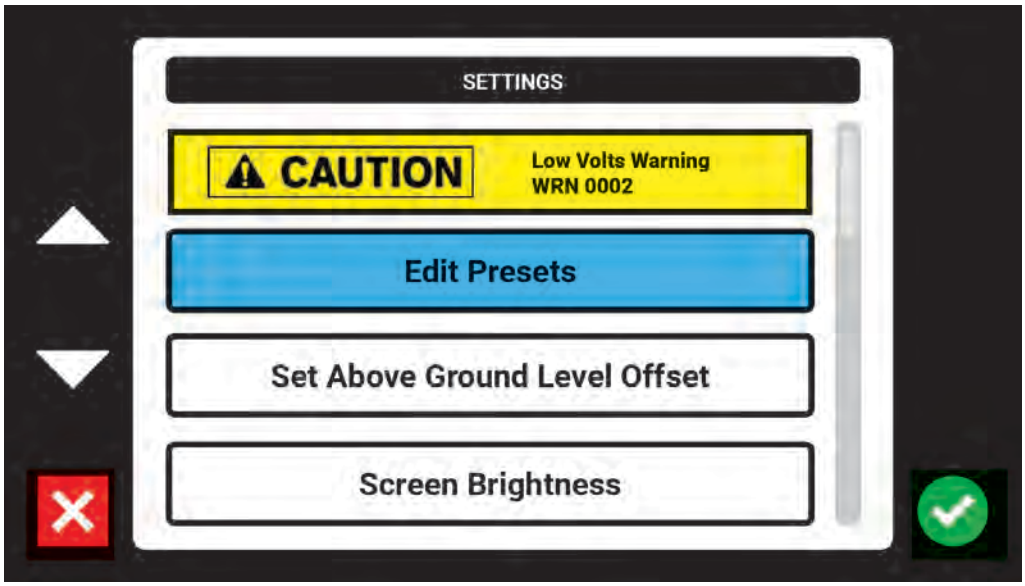


Figure 10-6 Caution Alert in Settings List

Select “RESOLVE” to see possible causes of the caution. Below is an example of a Caution Resolve screen (Figure 10-7).

Figure 10-7 Example of Caution Possible Causes

Address the possible causes and press the green check mark button to see if the caution has been corrected. If the caution persists, contact The Will-Burt Company.

10.2 Troubleshooting Electrical

This section includes a list of caution and warning notices and their potential causes. Caution notices do not stop motion or use, but let you know of potential issues. Warning codes point out problems and usually inhibit operation to prevent potential damage. These notices are shown on the control box display.

For additional information, please contact The Will-Burt Company.

10.2.1 Caution Conditions

Table 10-1 shows probable caution conditions. Where multiple probable causes can explain a caution condition, they are listed in order of probability from highest to lowest. It should be noted that some “cautions” are more aptly called “states” and do not necessarily indicate improper operation.

Table 10-1 Caution Codes

Caution Code	Trigger Condition	System Response	Latch Until	Possible Causes
0001	System voltage has dropped below 20 VDC for 5 consecutive seconds. (Remaining above 18 VDC).	**Low Volts Caution (Caution 0001):** Allow all mast normal functions.	• System voltage reaches 21 VDC for 5 consecutive seconds.	• Excessive battery drain without sufficient charge current/ time • High motor current due to mast resistance or large payload
0002	If mast reaches the nested point and stops without detecting the Lower Limit Switch.	**Lower Limit Switch Not Active (Caution 0002):** Allow all mast normal functions.	• Lower Limit Switch active in proper nesting location - or - • 5 OVERRIDE Switch activations within 3 seconds or Screen Clear	• Switch requires adjustment or recalibration • Switch failed and requires replacement

Table 10-1 Caution Codes

Caution Code	Trigger Condition	System Response	Latch Until	Possible Causes
0003	Motor internal Utilization rate has risen above 90%.	**Motor Utilization Rate above 90% Caution (Caution 0003):** Allow all mast normal functions.	• Motor Utilization rate has decreased to 80%.	• Mast has been overused. If utilization rate reaches 100%, current will be limited and mast performance will be lowered.

10.2.2 Warning Conditions

Table 10-2 shows probable warning conditions. Where multiple probable causes can explain a warning condition, they are listed in order of probability from highest to lowest. It should be noted that some “warnings” are more aptly called “states” and do not necessarily indicate improper operation.

Table 10-2 Warning Codes

Warning Code	Trigger Condition	System Response	Latch Until	Possible Causes
00000001	System Enable (J1-A, J1-B) not active when Motion requested	**System Not Enabled (Warning 00000001)** Disable all normal output functions.	• System enable (J1-A, J1-B) is active - or - • 5 OVERRIDE Switch activations within 3 seconds or Screen Clear	• Enable circuit (J1-A, J1-B) has not been set when motion was requested.
00000002	E-Stop on control box has been pressed	**E-Stop Pressed (Warning 00000002)** Disable all normal output functions.	• Twist E-Stop to neutral/reset position	• E-Stop has been pressed/ activated on the control box • E-Stop has been damaged and requires replacement

Table 10-2 Warning Codes

Warning Code	Trigger Condition	System Response	Latch Until	Possible Causes
00000004	Local Up Switch active for over 200 [seconds]	**Local Up Switch Stuck Warning (Warning 00000004)** Ignore the Local Up input. OVERRIDE command allows down motion that stops motion automatically at encoder nested limit.	• Local Up Switch is no longer active - or - • System power is cycled and trigger conditions cleared	• Switch is being held on • Switch is damaged • Water ingress may be activating switch input • Cable or connection failure
00000006	Remote Up Switch active for over 200 [seconds]	**Remote Up Switch Stuck Warning (Warning 00000006)** Ignore the Local Up input. OVERRIDE command allows down motion that stops motion automatically at encoder nested limit.	• Remote Up Switch is no longer active - or - • System power is cycled and trigger conditions cleared	• Switch is being held on • Switch is damaged • Water ingress may be activating switch input • Cable or connection failure
00000010	Local Down Switch active for over 200 [seconds]	**Local Down Switch Stuck Warning (Warning 00000010)** Ignore the Local Down input, except when the OVERRIDE command is active to allow override down that stops motion automatically at encoder nested limit.	• Local Down Switch is no longer active - or - • System power is cycled and trigger conditions cleared	• Switch is being held on • Switch is damaged • Water ingress may be activating switch input • Cable or connection failure

Table 10-2 Warning Codes

Warning Code	Trigger Condition	System Response	Latch Until	Possible Causes
00000020	Remote Down Switch active for over 200 [seconds]	**Remote Down Switch Stuck Warning (Warning 00000020)** Ignore the Remote Down Switch, except when the OVERRIDE command is active to allow override down that stops motion automatically at encoder nested limit.	• Remote Down Switch is no longer active - or - • System power is cycled and trigger conditions cleared	• Switch is being held on • Switch is damaged • Water ingress may be activating switch input • Cable or connection failure
00000040	Encoder height data changes not detected or CAN bus communica-tion stops during mast positioning motion	**Encoder Warning (Warning 00000040)** Disable the Motor Outputs. Allow down motion if OVERRIDE command activated until the lower Reed switch activates then disable motor outputs (cannot be overridden). **NOTICE:** Mast control element for nested/extended stops not functioning. Risk if already below Reed switch activation point.	• Valid encoder signal detected • 5 OVERRIDE Switch activations within 3 seconds or Screen Clear • System power is cycled and trigger conditions cleared	• Encoder requires adjustment or recalibration • Encoder failed and requires replacement • Encoder wiring damaged and requires repairs or replacement

Table 10-2 Warning Codes

Warning Code	Trigger Condition	System Response	Latch Until	Possible Causes
00000080	Upper Reed Switch activated (changed state)	**Mast Over-Travel Warning (Warning 00000080)** Turn off all motor outputs. OVERRIDE command can allow down motion only.	• Upper Reed Switch is no longer active - or - • System power is cycled and trigger conditions cleared	• Encoder signal inaccurate results in over-travel • Encoder setup improperly • Encoder cable issue
00000100	OVERRIDE Switch has been active for over 200 [seconds]	**OVERRIDE Switch Stuck Warning (Warning 00000100)** Ignore OVERRIDE command input. Note: This warning cannot be overridden.	• OVERRIDE Switch is no longer active - or - • System power is cycled and trigger conditions cleared	• Switch is being held on • Switch is damaged • Water ingress may be activating switch input
00000200	Error occurred in setup SDO configuration message	**SDO Configuration Warning (Warning 00000200)** Disable the Motor Outputs. Allow down motion if OVERRIDE command activated until the lower Reed switch activates then disable motor outputs (cannot be overridden). **NOTICE:** Some of the setup messages may not have been sent properly. System may not operate properly until successful configuration given.	• 5 OVERRIDE Switch activations within 3 seconds or Screen Clear - or - • System Power is cycled and trigger conditions cleared	• Sensor cable from mast to control box (P5 <–> P16) cable issue • Loose or disconnected cable on the system

Table 10-2 Warning Codes

Warning Code	Trigger Condition	System Response	Latch Until	Possible Causes
00000800	Encoder CAN bus node is not transmitting status or is in wrong operating mode	**Encoder CAN bus Warning (Warning 00000800)** Disable the Motor Outputs. Allow down motion if OVERRIDE command activated until the lower Reed switch activates then disable motor outputs (cannot be overridden). **NOTICE:** Mast height readout may be incorrect and mast may not operate correctly.	• 5 OVERRIDE Switch activations within 3 seconds or Screen Clear - or - • System Power is cycled and trigger conditions cleared	• Cable from encoder to junction box not connected (P6 <–> P9) • Encoder LED not solid green • CAN bus network error detected on the system
00001000	Motor CAN bus node is not transmitting status or is in wrong operating mode	**Motor CAN bus Warning (Warning 00001000)** Disable the Motor Outputs. Allow down motion if OVERRIDE command activated until the lower Reed Switch activates then disable motor outputs (cannot be overridden). **NOTICE:** If motor CAN bus not working properly, mast may not operate correctly if override used.	• 5 OVERRIDE Switch activations within 3 seconds or Screen Clear - or - • System power is cycled and trigger conditions cleared	• Cable from motor to junction box not connected (P13 <-> P14) • CAN bus network error detected on the system

Table 10-2 Warning Codes

Warning Code	Trigger Condition	System Response	Latch Until	Possible Causes
00002000	Mast zero not set correctly	**Mast Zero Not Set (Warning 00002000)** Disable the Motor Outputs. Allow down motion if OVERRIDE command activated until the lower Reed Switch activates then disable motor outputs (cannot be overridden). **NOTICE:** Mast has not been scaled properly and height readout may not be accurate.	• Mast needs to have a proper zero-point set	• New Encoder has been added to the system that has not been properly setup • Contact The Will-Burt Company for steps to rescale system
00004000	Up and Down Limit Switches are active at the same time (not physically possible)	**Conflicting Up/ Down Limit Switch Warning (Warning 00004000):** Disable the Motor Outputs unless the Override Switch is also active. (Only allow down motion with OVERRIDE).	• One or both Switches is(are) no longer active - or - • System power is cycled and trigger conditions cleared	• Switch(es) require adjustment or recalibration • Switch(es) failed and require replacement(s) • Cable or connection failure

Table 10-2 Warning Codes

Warning Code	Trigger Condition	System Response	Latch Until	Possible Causes
00008000	Both Up and Down commands detected simulta-neously (Local and Remote commands conflict).	**Conflicting Mast Up/Mast Down Commands Warning (Warning 00008000):** Disable the Motor Outputs unless the Override Switch is also active. (Only allow down motion with OVERRIDE).	• One or both of the conflicting command inputs is(are) no longer active - or - • System power is cycled and trigger conditions cleared	• One or both Switch(es) are being held on • One or more Switch(es) are damaged • Water ingress may be activating switch input(s) • Cable or connection failure
00010000	Lower Limit Switch activated while mast height reading higher than normal nesting value	**Lower Limit Active (Warning 00010000):** Disable all normal output functions. If the OVERRIDE command is activated while this warning is active, re-enable mast retracting.	• Rescale system - or - • 5 OVERRIDE Switch activations within 3 seconds or Screen Clear - or - • System power is cycled and trigger conditions cleared	• Switch requires adjustment or recalibration • Switch failed and requires replacement • Encoder not scaled correctly (Contact The Will-Burt Company for steps to rescale system)

Table 10-2 Warning Codes

Warning Code	Trigger Condition	System Response	Latch Until	Possible Causes
00020000	System voltage drops below 17 VDC for 5 consecutive seconds.	**Excessive Low Volts Warning (Warning 00020000):** Disable all normal output functions. If the OVERRIDE command is activated while this warning is active, re-enable mast down outputs. **CAUTION:** Avoid unnecessary attempts to operate the mast at excessive low voltage levels to prevent system damage. **NOTICE:** Even though outputs are enabled, the mast may not be able to move due to the low system voltage.	• System is above 18 Volts and no Up/ Down inputs are active - or - • System power is cycled and is above 18 Volts	• Excessive battery drain without sufficient charge current/ time • Excessive Motor current due to mast resistance, excessive payload, or drive chain binding • Insufficient power supply • Too long/ undersized power supply line (mains)
00040000	Motor fault detected.	**Motor Faulted Warning (Warning 00040000):** Disable all normal output functions. If the OVERRIDE command is activated while this warning is active, re-enable mast down outputs.	• 5 OVERRIDE Switch activations within 3 seconds or Screen Clear - or - • System power is cycled and trigger conditions cleared	• Motor has detected an internal error condition • Lookup motor error code in motor manual

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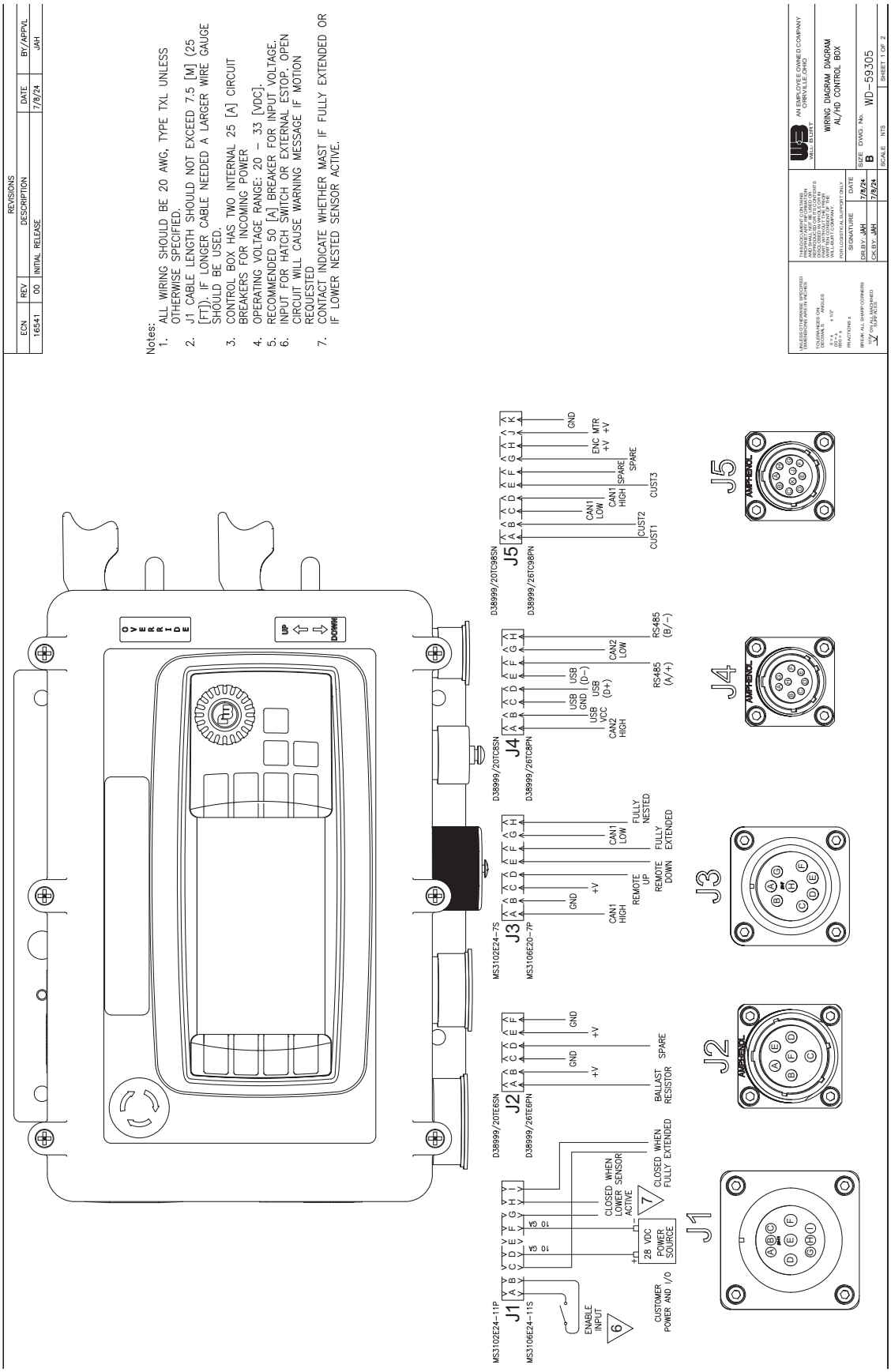
11 Appendix

11.1 System Wiring Diagrams

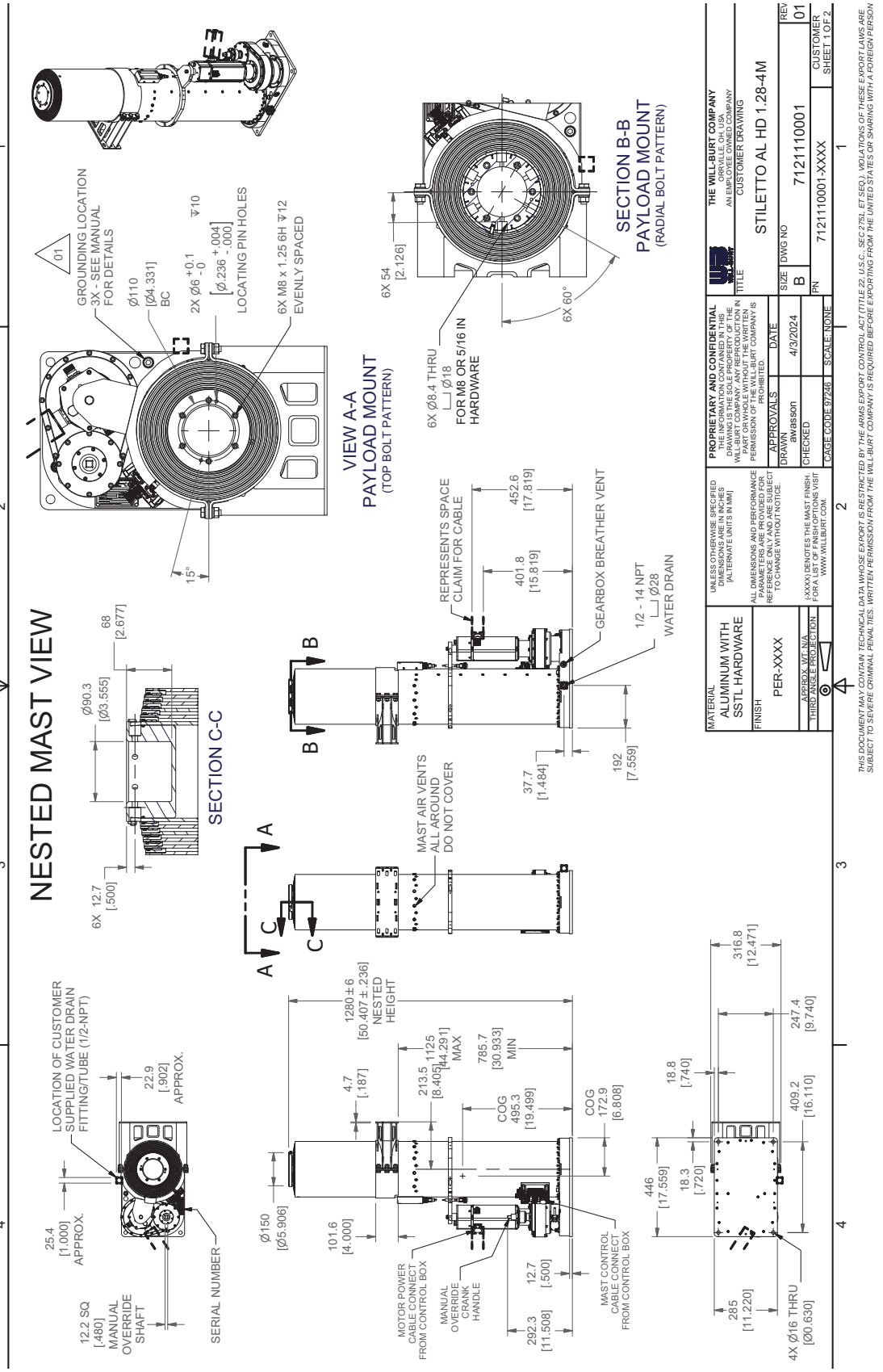
The system wiring diagrams are as follows:


REVISIONS
ECN | REV | DESCRIPTION | DATE | BY/APPVL
16541 | 00 | INITIAL RELEASE | 7/8/24 | JAH
Notes:
1. ALL WIRING SHOULD BE 20 AWG, TYPE TXL UNLESS OTHERWISE SPECIFIED.
2. J1 CABLE LENGTH SHOULD NOT EXCEED 7.5 [M] (25 [FT]). IF LONGER CABLE NEEDED A LARGER WIRE GAUGE SHOULD BE USED.
3. CONTROL BOX HAS TWO INTERNAL 25 [A] CIRCUIT BREAKERS FOR INCOMING POWER
4. OPERATING VOLTAGE RANGE: 20 – 33 [VDC].
5. RECOMMENDED 50 [A] BREAKER FOR INPUT VOLTAGE.
6. INPUT FOR HATCH SWITCH OR EXTERNAL ESTOP. OPEN CIRCUIT WILL CAUSE WARNING MESSAGE IF MOTION REQUESTED
7. CONTACT INDICATE WHETHER MAST IF FULLY EXTENDED OR IF LOWER NESTED SENSOR ACTIVE.
OVERRIDE
UP
DOWN
J1
J2
J3
J4
J5
AMPSEAL
CUSTOMER POWER AND I/O
ENABLE INPUT
28 VDC POWER SOURCE
CLOSED WHEN LOWER SENSOR ACTIVE
CLOSED WHEN FULLY EXTENDED
BALLAST RESISTOR
SPARE
REMOTE UP
REMOTE DOWN
FULLY EXTENDED
FULLY NESTED
CAN1 HIGH
CAN1 LOW
USB VCC
USB GND
USB (D+)
USB (D-)
CAN2 HIGH
CAN2 LOW
RS485 (A/+)
RS485 (B/-)
CUST1
CUST2
CUST3
ENC MTR +V
WILL-BURT
WIRING DIAGRAM, DIAGRAM AL/HD CONTROL BOX
SIZE B
DWG. No. WD-59305
SCALE NTS
SHEET 1 OF 2

11.2 Mast System Drawings

The mast system drawings are as follows:

11.2.1 4-Meter



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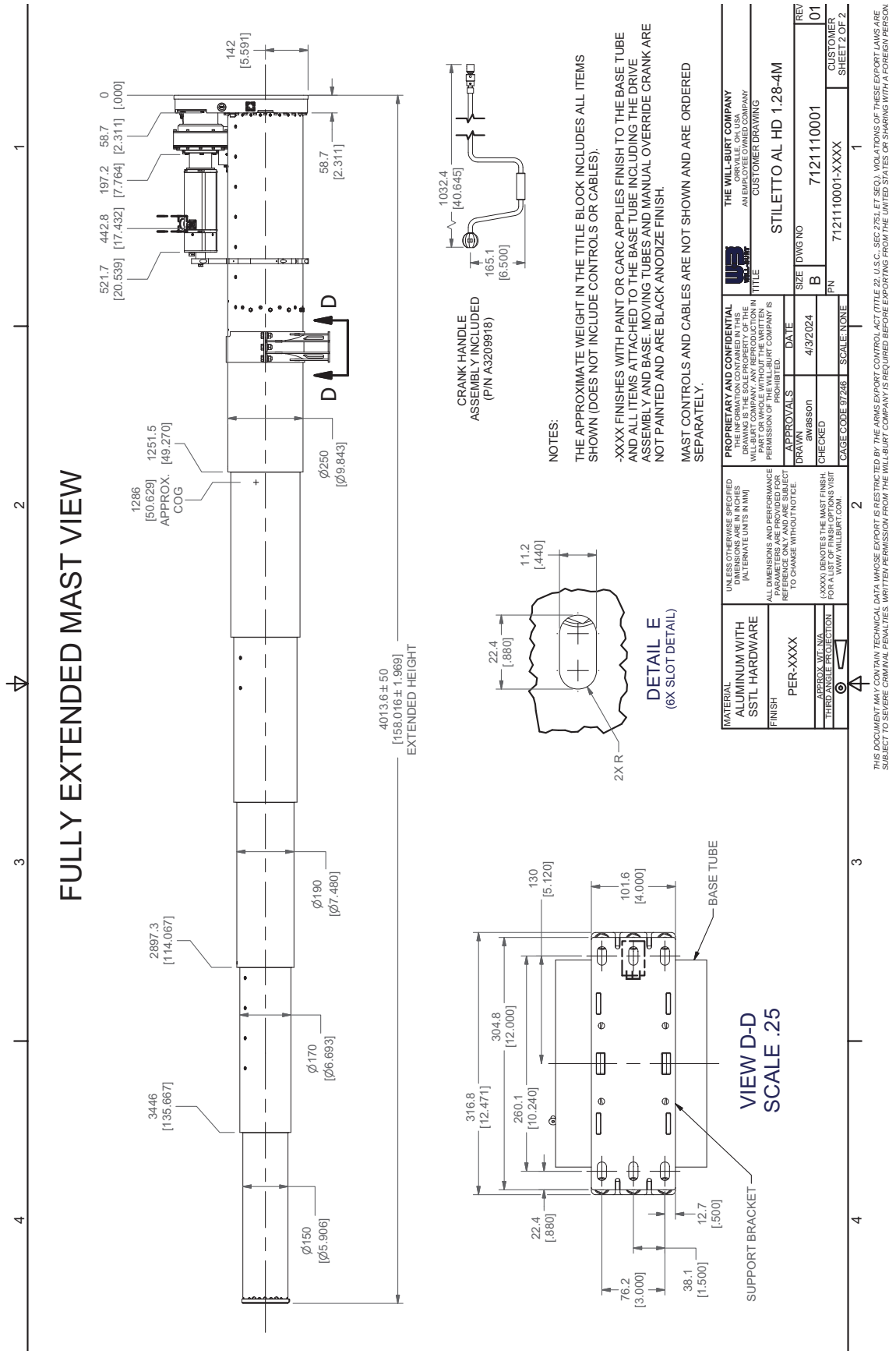
FULLY EXTENDED MAST VIEW
142 [5.591]
0 [.000]
58.7 [2.311]
197.2 [7.764]
442.8 [17.432]
521.7 [20.539]
58.7 [2.311]
1251.5 [49.270]
1286 [50.629] APPROX. COG
Ø250 [Ø9.843]
Ø190 [Ø7.480]
2897.3 [114.067]
Ø170 [Ø6.693]
3446 [135.667]
Ø150 [Ø5.906]
4013.6 ± 50 [158.016 ± 1.969] EXTENDED HEIGHT
D
D
1032.4 [40.645]
165.1 [6.500]
CRANK HANDLE ASSEMBLY INCLUDED (P/N A3209918)
NOTES:
THE APPROXIMATE WEIGHT IN THE TITLE BLOCK INCLUDES ALL ITEMS SHOWN (DOES NOT INCLUDE CONTROLS OR CABLES).
-XXXX FINISHES WITH PAINT OR CARC APPLIES FINISH TO THE BASE TUBE AND ALL ITEMS ATTACHED TO THE BASE TUBE INCLUDING THE DRIVE ASSEMBLY AND BASE. MOVING TUBES AND MANUAL OVERRIDE CRANK ARE NOT PAINTED AND ARE BLACK ANODIZE FINISH.
MAST CONTROLS AND CABLES ARE NOT SHOWN AND ARE ORDERED SEPARATELY.
11.2 [.440]
22.4 [.880]
2X R
DETAIL E
(6X SLOT DETAIL)
130 [5.120]
101.6 [4.000]
BASE TUBE
316.8 [12.471]
304.8 [12.000]
260.1 [10.240]
22.4 [.880]
12.7 [.500]
76.2 [3.000]
38.1 [1.500]
SUPPORT BRACKET
VIEW D-D
SCALE .25
MATERIAL
ALUMINUM WITH SSTL HARDWARE
FINISH
PER-XXXX
APPROX. WT: N/A
THIRD ANGLE PROJECTION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES [ALTERNATE UNITS IN MM]
ALL DIMENSIONS AND PERFORMANCE PARAMETERS ARE PROVIDED FOR REFERENCE ONLY AND ARE SUBJECT TO CHANGE WITHOUT NOTICE.
(-XXXX) DENOTES THE MAST FINISH. FOR A LIST OF FINISH OPTIONS VISIT WWW.WILLBURT.COM.
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APPROVALS
DATE
DRAWN awasson 4/3/2024
CHECKED
CAGE CODE 97246
SCALE: NONE
THE WILL-BURT COMPANY
ORRVILLE, OH, USA
AN EMPLOYEE OWNED COMPANY
CUSTOMER DRAWING
TITLE
STILETTO AL HD 1.28-4M
SIZE B
DWG NO 7121110001
REV 01
PN 7121110001-XXXX
CUSTOMER
SHEET 2 OF 2
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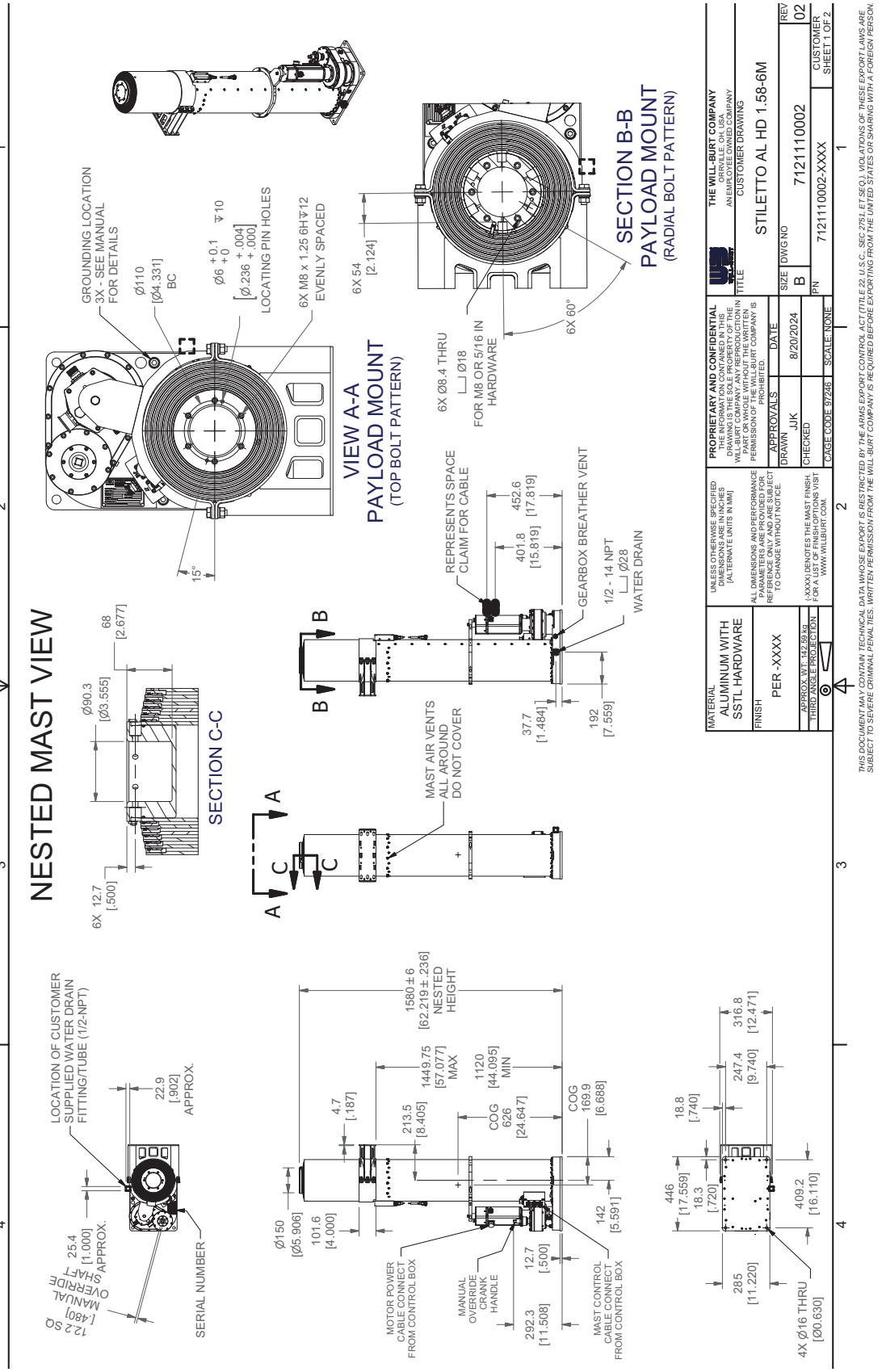
11.2.2 6-Meter


NESTED MAST VIEW
SECTION C-C
VIEW A-A
PAYLOAD MOUNT
(TOP BOLT PATTERN)
SECTION B-B
PAYLOAD MOUNT
(RADIAL BOLT PATTERN)
GROUNDING LOCATION
3X - SEE MANUAL
FOR DETAILS
LOCATING PIN HOLES
6X M8 x 1.25 6H↧12
EVENLY SPACED
6X 8.4 THRU
⌴ Ø18
FOR M8 OR 5/16 IN
HARDWARE
6X 60°
REPRESENTS SPACE
CLAIM FOR CABLE
GEARBOX BREATHER VENT
1/2 - 14 NPT
⌴ Ø28
WATER DRAIN
MAST AIR VENTS
ALL AROUND
DO NOT COVER
LOCATION OF CUSTOMER
SUPPLIED WATER DRAIN
FITTING/TUBE (1/2-NPT)
SERIAL NUMBER
MOTOR POWER
CABLE CONNECT
FROM CONTROL BOX
MANUAL
OVERRIDE
CRANK
HANDLE
MAST CONTROL
CABLE CONNECT
FROM CONTROL BOX
1580 ± 6
[62.219 ± .236]
NESTED
HEIGHT
4X Ø16 THRU
[Ø0.630]
MATERIAL
ALUMINUM WITH
SSTL HARDWARE
FINISH
PER -XXXX
THIRD ANGLE PROJECTION
PROPRIETARY AND CONFIDENTIAL
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DRAWING IS THE SOLE PROPERTY OF THE
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PART OR AS A WHOLE WITHOUT THE WRITTEN
PERMISSION OF THE WILL-BURT COMPANY IS
PROHIBITED.
APPROVALS
DRAWN JJK 8/20/2024
CHECKED
CAGE CODE 97248
SCALE: NONE
THE WILL-BURT COMPANY
ORRVILLE, OHIO, USA
AN EMPLOYEE OWNED COMPANY
CUSTOMER DRAWING
STILETTO AL HD 1.58-6M
SIZE B
DWG NO 7121110002
REV 02
PN 7121110002-XXXX
CUSTOMER
SHEET 1 OF 2
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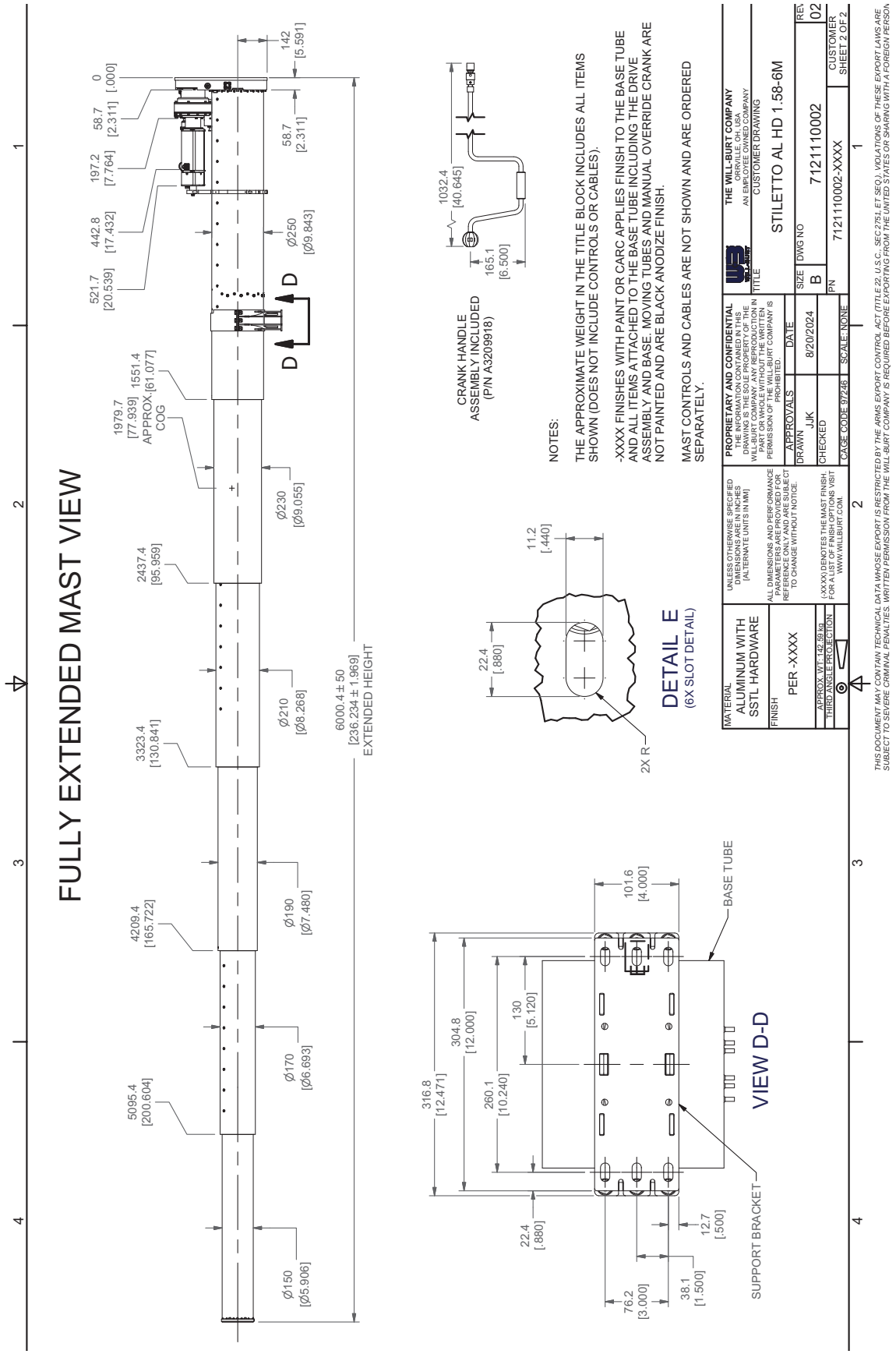
FULLY EXTENDED MAST VIEW
0 [.000]
58.7 [2.311]
197.2 [7.764]
442.8 [17.432]
521.7 [20.539]
142 [5.591]
58.7 [2.311]
Ø250 [Ø9.843]
1979.7 [77.939]
APPROX. COG
1551.4 [61.077]
Ø230 [Ø9.055]
2437.4 [95.959]
Ø210 [Ø8.268]
3323.4 [130.841]
6000.4 ± 50 [236.234 ± 1.969] EXTENDED HEIGHT
Ø190 [Ø7.480]
4209.4 [165.722]
Ø170 [Ø6.693]
5095.4 [200.604]
Ø150 [Ø5.906]
D
D
CRANK HANDLE ASSEMBLY INCLUDED (P/N A3209918)
1032.4 [40.645]
165.1 [6.500]
Ø8.34
NOTES:
THE APPROXIMATE WEIGHT IN THE TITLE BLOCK INCLUDES ALL ITEMS SHOWN (DOES NOT INCLUDE CONTROLS OR CABLES).
-XXXX FINISHES WITH PAINT OR CARC APPLIES FINISH TO THE BASE TUBE AND ALL ITEMS ATTACHED TO THE BASE TUBE INCLUDING THE DRIVE ASSEMBLY AND BASE. MOVING TUBES AND MANUAL OVERRIDE CRANK ARE NOT PAINTED AND ARE BLACK ANODIZE FINISH.
MAST CONTROLS AND CABLES ARE NOT SHOWN AND ARE ORDERED SEPARATELY.
11.2 [.440]
22.4 [.880]
2X R
DETAIL E
(6X SLOT DETAIL)
316.8 [12.471]
304.8 [12.000]
260.1 [10.240]
130 [5.120]
101.6 [4.000]
BASE TUBE
22.4 [.880]
76.2 [3.000]
38.1 [1.500]
12.7 [.500]
SUPPORT BRACKET
VIEW D-D
MATERIAL
ALUMINUM WITH SSTL HARDWARE
FINISH
PER -XXXX
APPROX. WT: 142.59 kg
THIRD ANGLE PROJECTION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES [ALTERNATE UNITS IN MM]
ALL DIMENSIONS AND PERFORMANCE PARAMETERS ARE PROVIDED FOR REFERENCE ONLY AND ARE SUBJECT TO CHANGE WITHOUT NOTICE.
(-XXXX) DENOTES THE MAST FINISH. FOR A LIST OF FINISH OPTIONS VISIT WWW.WILLBURT.COM.
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APPROVALS
DRAWN JJK 8/20/2024
CHECKED
CAGE CODE 97246
THE WILL-BURT COMPANY
ORRVILLE, OH, USA
AN EMPLOYEE OWNED COMPANY
CUSTOMER DRAWING
TITLE
STILETTO AL HD 1.58-6M
SIZE B
DWG NO 7121110002
REV 02
PN 7121110002-XXXX
SCALE: NONE
CUSTOMER
SHEET 2 OF 2
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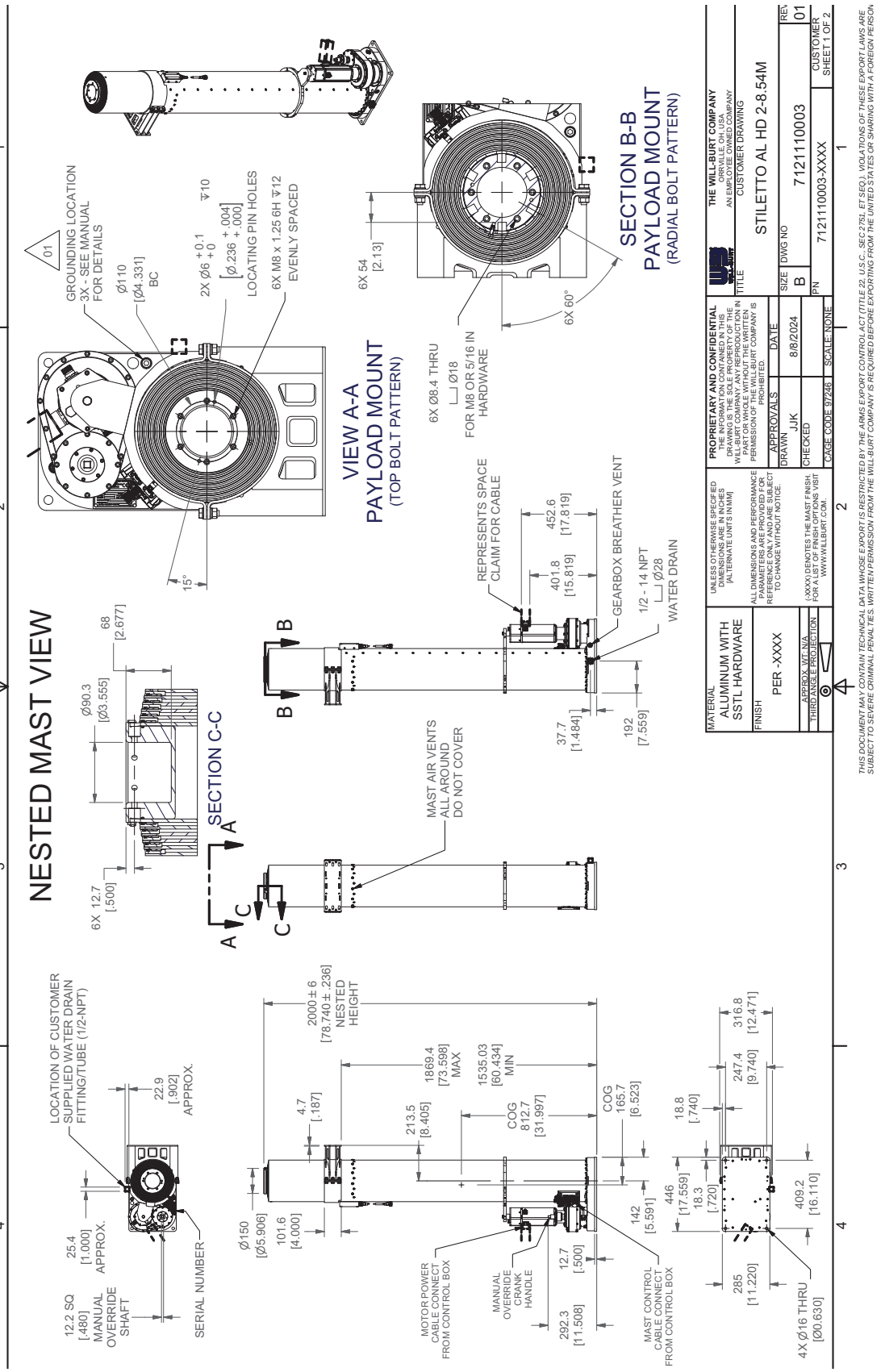
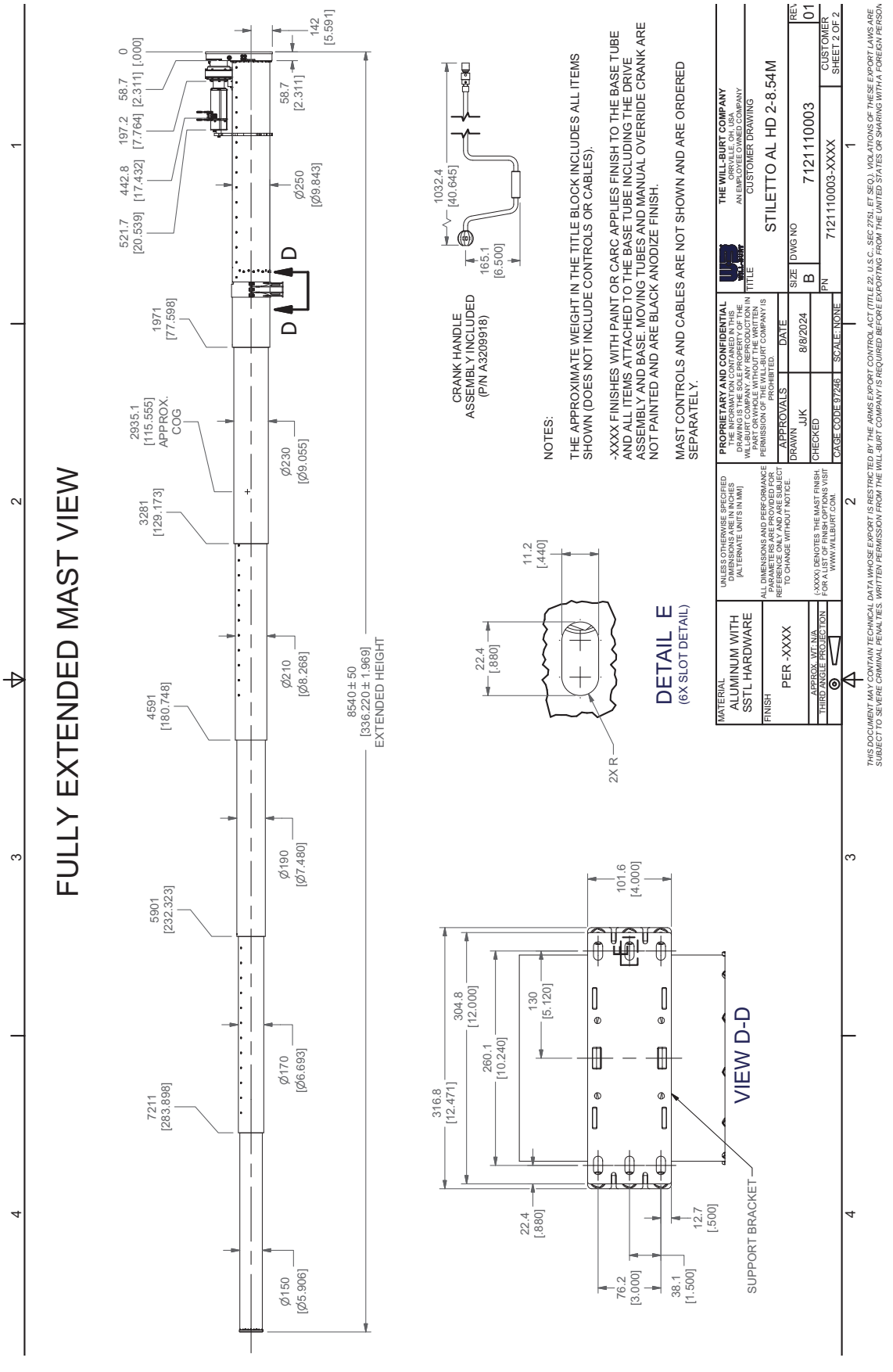
11.2.3 8.54-Meter




FULLY EXTENDED MAST VIEW
8540 ± 50
[336.220 ± 1.969]
EXTENDED HEIGHT
7211
[283.898]
5901
[232.323]
4591
[180.748]
3281
[129.173]
2935.1
[115.555]
APPROX.
COG
1971
[77.598]
521.7
[20.539]
442.8
[17.432]
197.2
[7.764]
58.7
[2.311]
0
[.000]
142
[5.591]
58.7
[2.311]
Ø250
[Ø9.843]
Ø230
[Ø9.055]
Ø210
[Ø8.268]
Ø190
[Ø7.480]
Ø170
[Ø6.693]
Ø150
[Ø5.906]
D
D
CRANK HANDLE
ASSEMBLY INCLUDED
(P/N A3209918)
1032.4
[40.645]
165.1
[6.500]
NOTES:
THE APPROXIMATE WEIGHT IN THE TITLE BLOCK INCLUDES ALL ITEMS SHOWN (DOES NOT INCLUDE CONTROLS OR CABLES).
-XXXX FINISHES WITH PAINT OR CARC APPLIES FINISH TO THE BASE TUBE AND ALL ITEMS ATTACHED TO THE BASE TUBE INCLUDING THE DRIVE ASSEMBLY AND BASE. MOVING TUBES AND MANUAL OVERRIDE CRANK ARE NOT PAINTED AND ARE BLACK ANODIZE FINISH.
MAST CONTROLS AND CABLES ARE NOT SHOWN AND ARE ORDERED SEPARATELY.
DETAIL E
(6X SLOT DETAIL)
11.2
[.440]
22.4
[.880]
2X R
VIEW D-D
316.8
[12.471]
304.8
[12.000]
260.1
[10.240]
130
[5.120]
101.6
[4.000]
22.4
[.880]
12.7
[.500]
38.1
[1.500]
76.2
[3.000]
SUPPORT BRACKET
MATERIAL
ALUMINUM WITH
SSTL HARDWARE
FINISH
PER -XXXX
APPROX. WT: N/A
THIRD ANGLE PROJECTION
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
[ALTERNATE UNITS IN MM]
ALL DIMENSIONS AND PERFORMANCE PARAMETERS ARE PROVIDED FOR REFERENCE ONLY AND ARE SUBJECT TO CHANGE WITHOUT NOTICE.
(-XXXX) DENOTES THE MAST FINISH.
FOR A LIST OF FINISH OPTIONS VISIT
WWW.WILLBURT.COM.
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APPROVALS
DRAWN JJK 8/8/2024
CHECKED
CAGE CODE 97246
SCALE: NONE
THE WILL-BURT COMPANY
ORRVILLE, OH, USA
AN EMPLOYEE OWNED COMPANY
CUSTOMER DRAWING
TITLE
STILETTO AL HD 2-8.54M
SIZE B
DWG NO 7121110003
REV 01
PN 7121110003-XXXX
CUSTOMER
SHEET 2 OF 2
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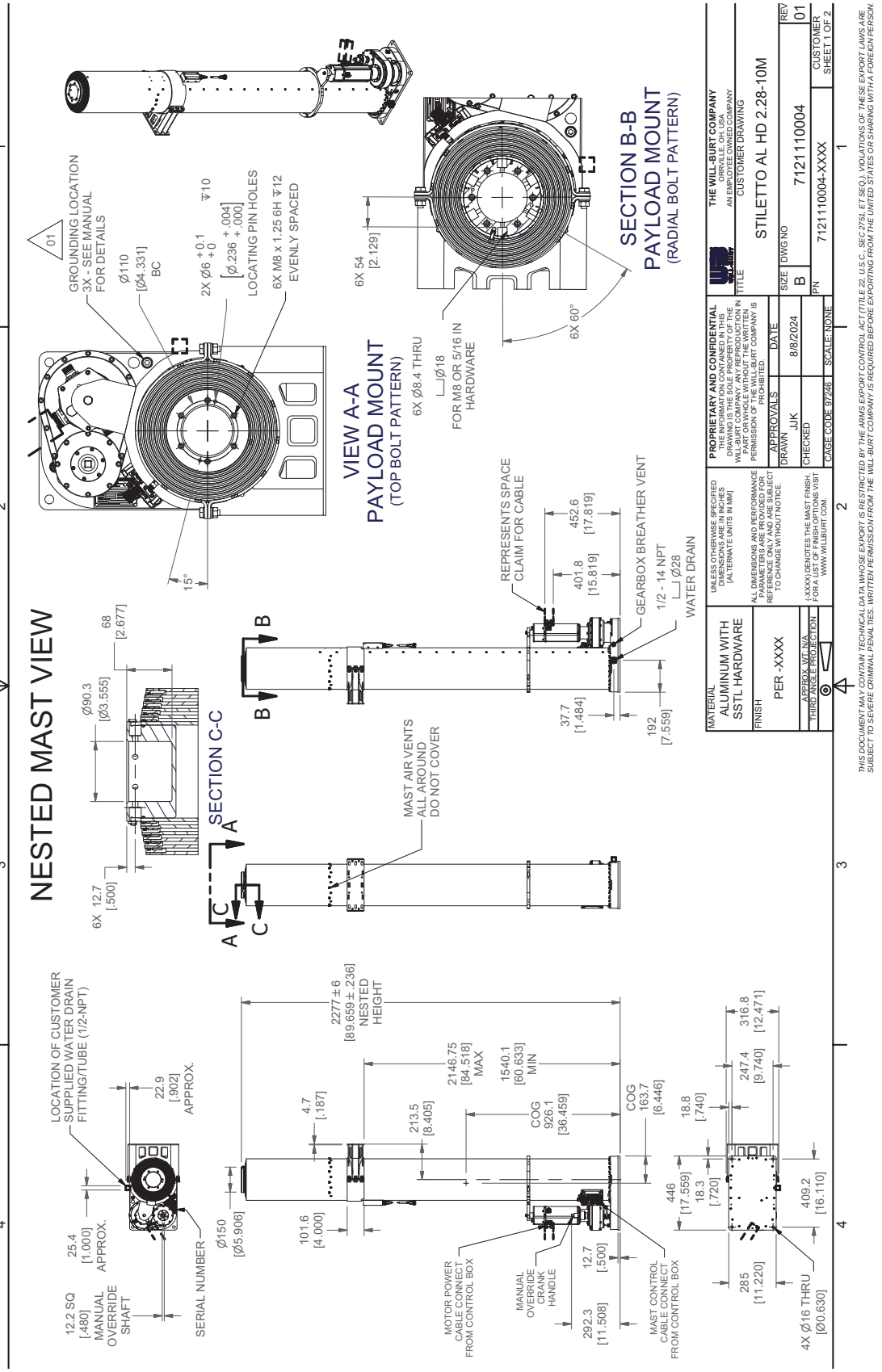
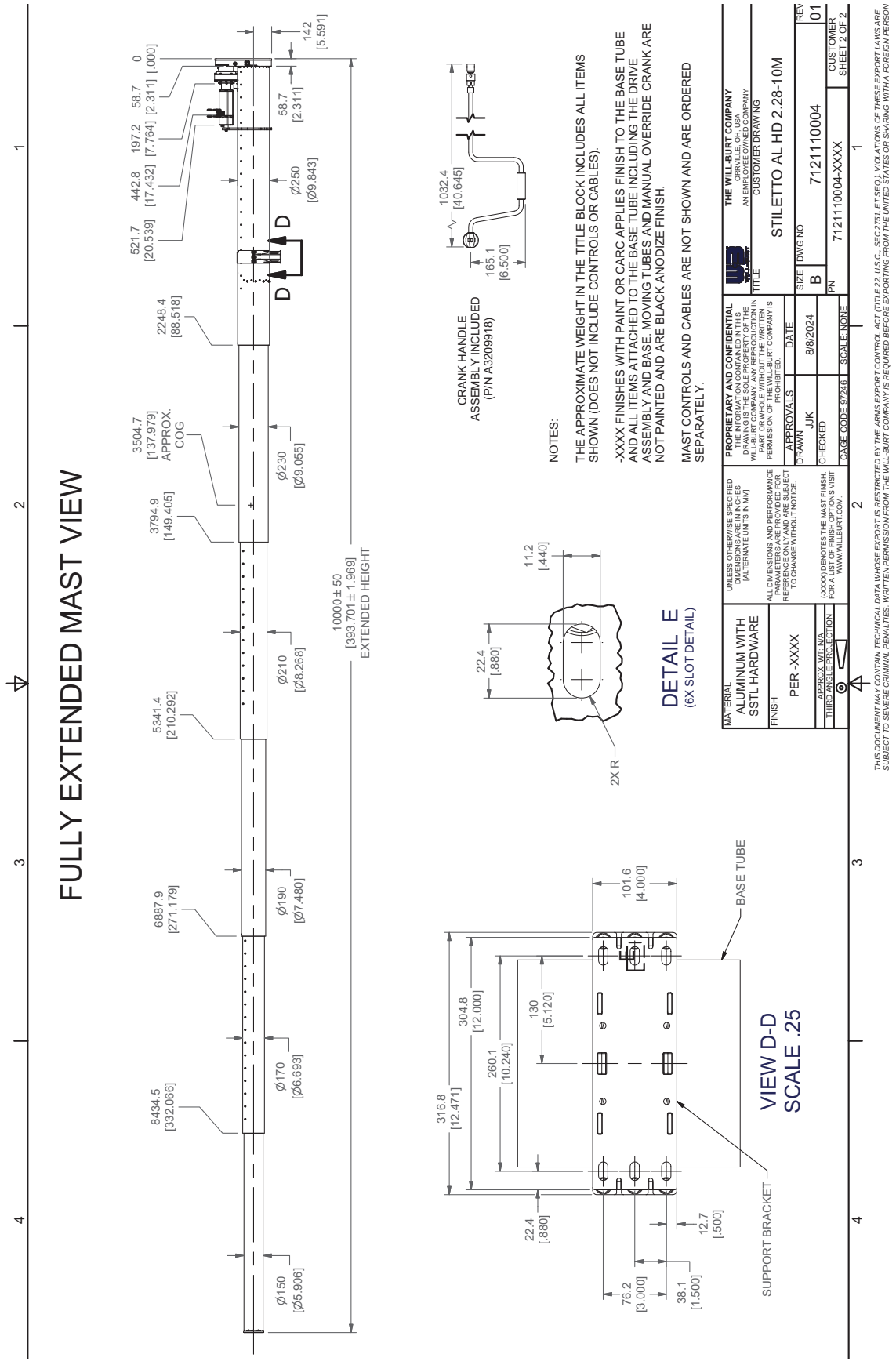
11.2.4 10-Meter




FULLY EXTENDED MAST VIEW
521.7 [20.539]
442.8 [17.432]
197.2 [7.764]
58.7 [2.311]
0 [.000]
142 [5.591]
58.7 [2.311]
Ø250 [Ø9.843]
2248.4 [88.518]
3504.7 [137.979] APPROX. COG
Ø230 [Ø9.055]
3794.9 [149.405]
5341.4 [210.292]
Ø210 [Ø8.268]
6887.9 [271.179]
Ø190 [Ø7.480]
Ø170 [Ø6.693]
8434.5 [332.066]
Ø150 [Ø5.906]
10000 ± 50 [393.701 ± 1.969] EXTENDED HEIGHT
D
D
1032.4 [40.645]
165.1 [6.500]
CRANK HANDLE ASSEMBLY INCLUDED (P/N A3209918)
NOTES:
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MAST CONTROLS AND CABLES ARE NOT SHOWN AND ARE ORDERED SEPARATELY.
11.2 [.440]
22.4 [.880]
2X R
DETAIL E
(6X SLOT DETAIL)
316.8 [12.471]
304.8 [12.000]
260.1 [10.240]
130 [5.120]
101.6 [4.000]
BASE TUBE
22.4 [.880]
76.2 [3.000]
38.1 [1.500]
12.7 [.500]
SUPPORT BRACKET
VIEW D-D
SCALE .25
MATERIAL
ALUMINUM WITH SSTL HARDWARE
FINISH
PER -XXXX
APPROX. WT: N/A
THIRD ANGLE PROJECTION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES [ALTERNATE UNITS IN MM]
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APPROVALS
DATE
DRAWN JK 8/8/2024
CHECKED
CAGE CODE 97246
SCALE: NONE
THE WILL-BURT COMPANY
ORRVILLE, OH, USA
AN EMPLOYEE OWNED COMPANY
CUSTOMER DRAWING
TITLE
STILETTO AL HD 2.28-10M
SIZE B
DWG NO 7121110004
REV 01
PN 7121110004-XXXX
CUSTOMER
SHEET 2 OF 2
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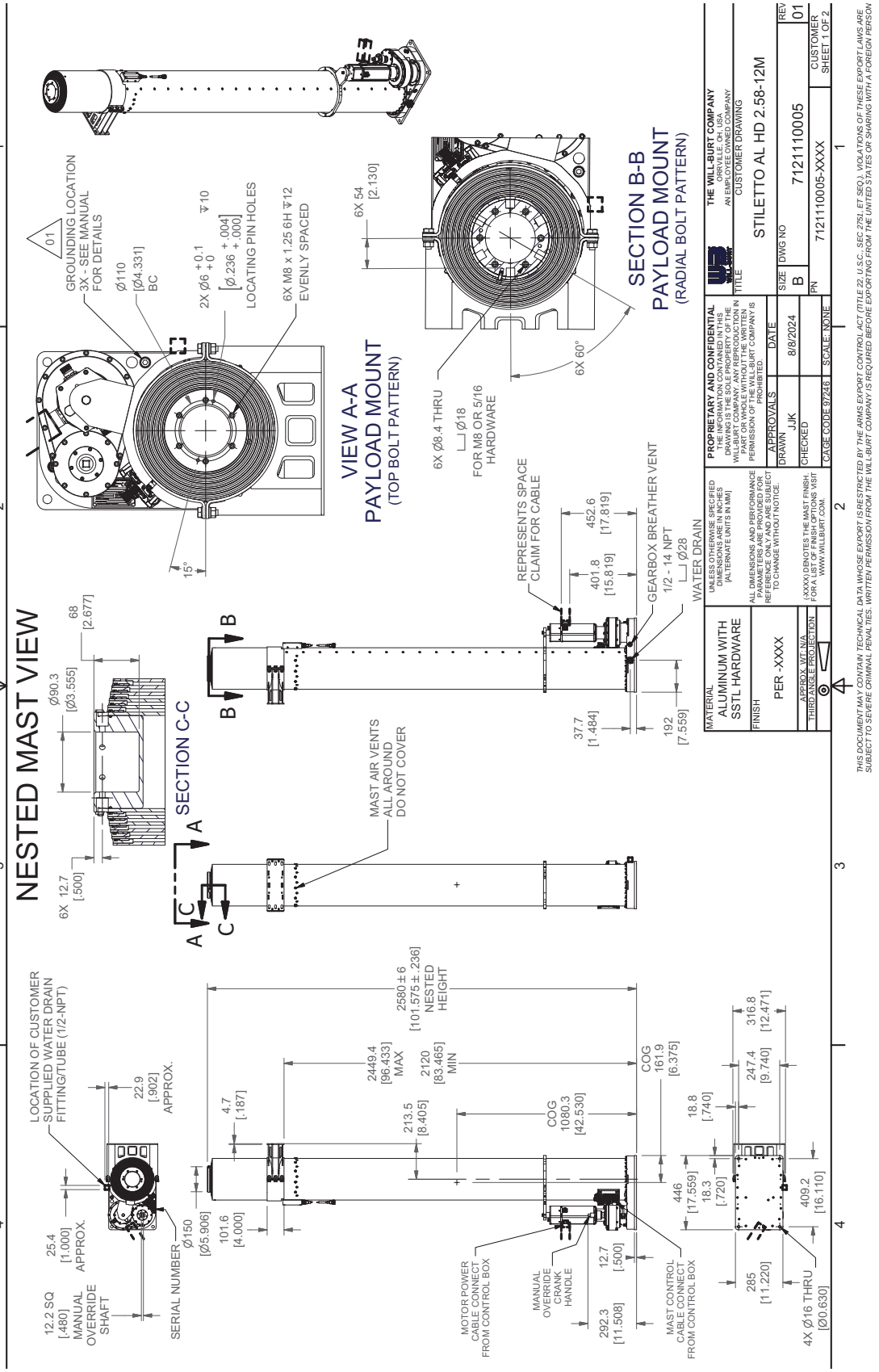
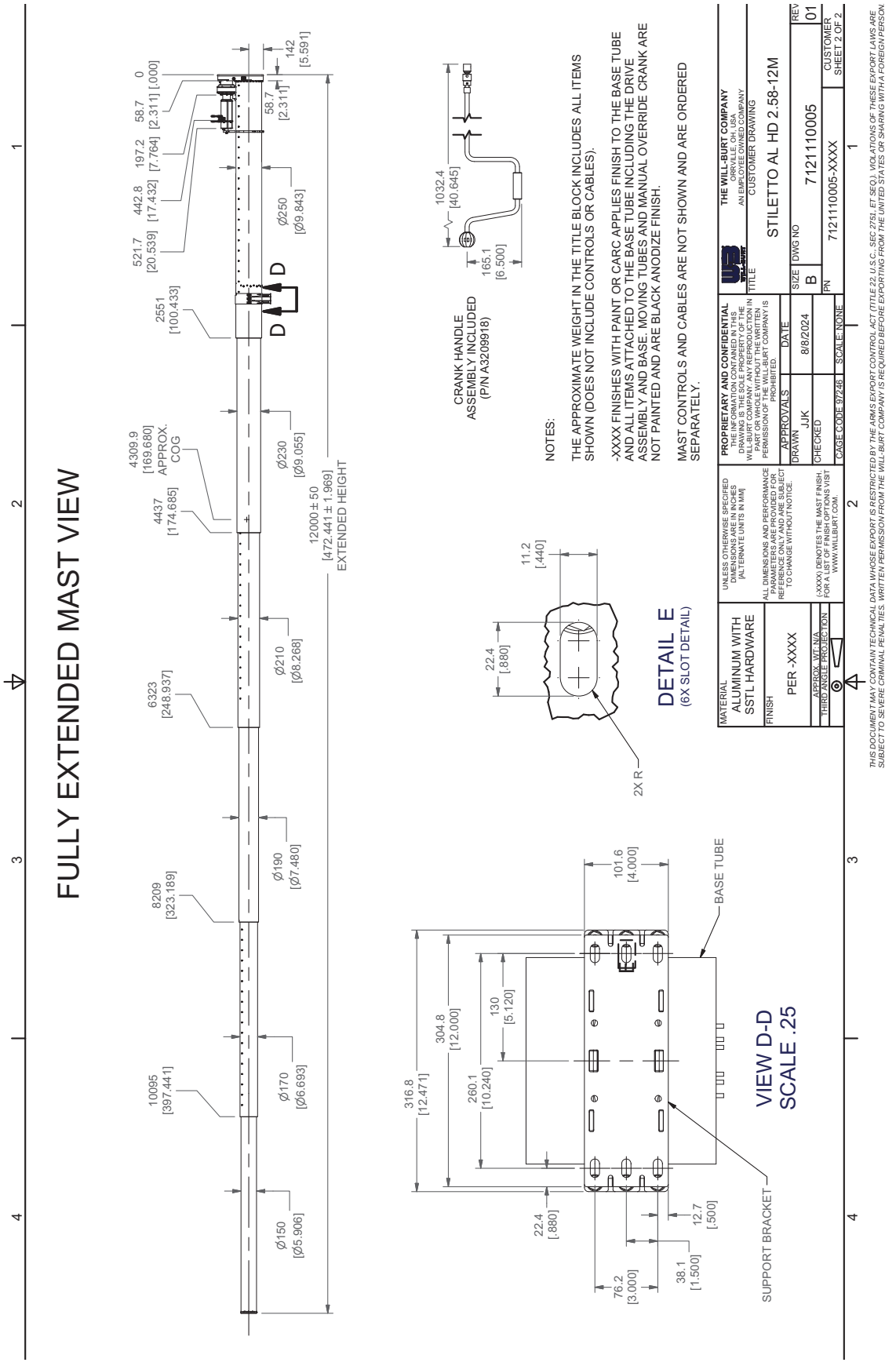
11.2.5 12-Meter




FULLY EXTENDED MAST VIEW
12000 ± 50
[472.441 ± 1.969]
EXTENDED HEIGHT
4309.9
[169.680]
APPROX.
COG
4437
[174.685]
10095
[397.441]
8209
[323.189]
6323
[248.937]
2551
[100.433]
521.7
[20.539]
442.8
[17.432]
197.2
[7.764]
58.7
[2.311]
0
[.000]
142
[5.591]
Ø250
[Ø9.843]
Ø230
[Ø9.055]
Ø210
[Ø8.268]
Ø190
[Ø7.480]
Ø170
[Ø6.693]
Ø150
[Ø5.906]
D
D
CRANK HANDLE
ASSEMBLY INCLUDED
(P/N A3209918)
1032.4
[40.645]
165.1
[6.500]
NOTES:
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MAST CONTROLS AND CABLES ARE NOT SHOWN AND ARE ORDERED SEPARATELY.
11.2
[.440]
22.4
[.880]
2X R
DETAIL E
(6X SLOT DETAIL)
316.8
[12.471]
304.8
[12.000]
260.1
[10.240]
130
[5.120]
101.6
[4.000]
BASE TUBE
22.4
[.880]
12.7
[.500]
38.1
[1.500]
76.2
[3.000]
SUPPORT BRACKET
VIEW D-D
SCALE .25
MATERIAL
ALUMINUM WITH
SSTL HARDWARE
FINISH
PER -XXXX
APPROX. WT: N/A
THIRD ANGLE PROJECTION
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
[ALTERNATE UNITS IN MM]
ALL DIMENSIONS AND PERFORMANCE
PARAMETERS ARE PROVIDED FOR
REFERENCE ONLY AND ARE SUBJECT
TO CHANGE WITHOUT NOTICE.
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FOR A LIST OF FINISHES, GO TO
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PROHIBITED.
APPROVALS
DRAWN JJK 8/8/2024
CHECKED
CAGE CODE 97246
SCALE: NONE
THE WILL-BURT COMPANY
ORRVILLE, OH, USA
AN EMPLOYEE OWNED COMPANY
CUSTOMER DRAWING
TITLE
STILETTO AL HD 2.58-12M
SIZE B
DWG NO 7121110005
REV 01
PN 7121110005-XXXX
CUSTOMER
SHEET 2 OF 2
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