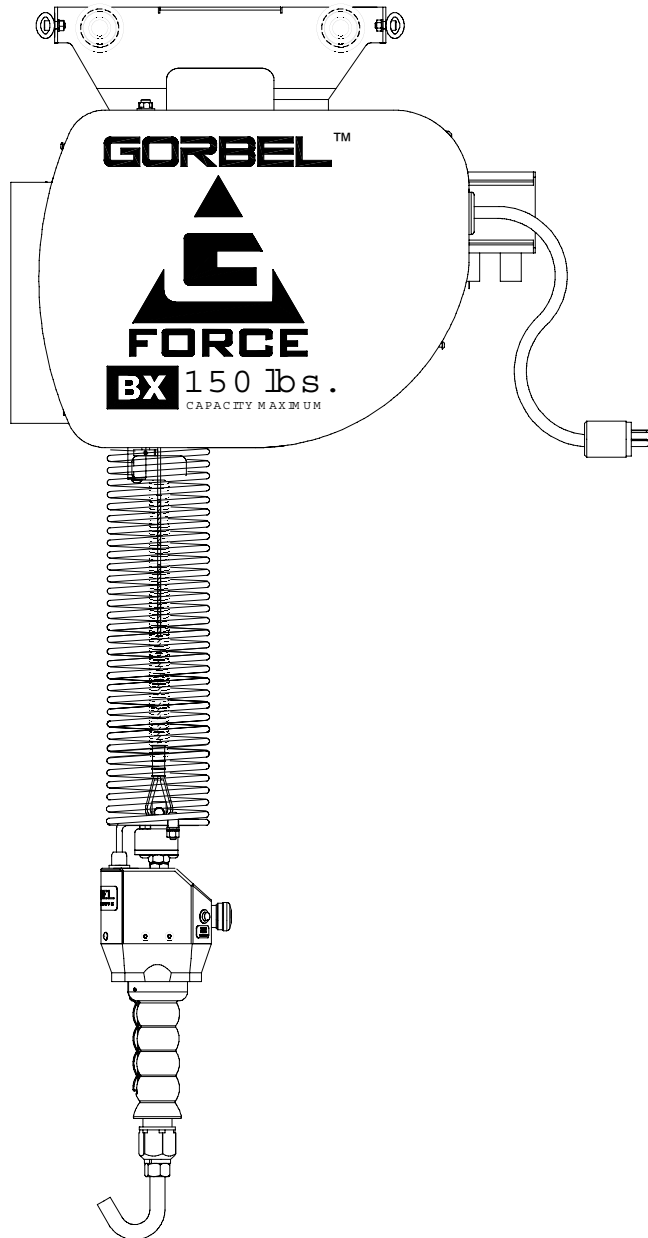


GORBEL®
A C L A S S A B O V E

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Installation, Operation, & Maintenance Manual

U.S. PATENT NO'S:
5,865,426, 6,386,513,
& 6,886,812
OTHER PATENTS
PENDING



150/300/380 lbs. BX Series

Gorbel® Dealer: _____

Serial Number: _____

Gorbel® Customer Order No.: _____

Date: _____

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SAFE HOIST OPERATING GUIDELINES

General

There is no one single factor that is more important for minimizing the possibility of personal injury to the operator and those working in the area, or damage to property, equipment, or material, than being familiar with the equipment and using Safe Operating Practices.

Hoists/trolleys are designed for lifting and transporting of material only. Under no circumstances, either during initial installation or in any other use, should the hoist be used for lifting or transporting personnel.

No operator should be permitted to use the equipment that is not familiar with its operation, is not physically or mentally fit, or has not been schooled in safe operating practices. The misuse of hoists can lead to certain hazards which cannot be protected against by mechanical means; hazards which can only be avoided by the exercise of intelligence, care, and common sense.

Safe Operating Practices also involve a program of periodic inspection and preventative maintenance (covered in separate section). Part of the operator's training should be an awareness of potential malfunctions/hazards requiring adjustments or repairs, and bringing these to the attention of supervision for corrective action.

Supervision and management also have an important role to play in any safety program by ensuring that a maintenance schedule is adhered to, and that the equipment provided for the operators is suitable for the job intended without violation of one or more of the rules covering safe operating practices and good common sense.

The Safe Operating Practices shown are taken in part from the following publications:

- American National Standard Institute (ANSI)
- Safety Standards for Crane, Derricks, Hoists
- ANSI B30.2 - Overhead and Gantry Cranes
- ANSI B30.16 - Overhead Hoist

Do's and Don'ts (Safe Operation of Hoists)

The following are Do's and Don'ts for safe operation of overhead hoists. A few minutes spent reading these rules can make an operator aware of dangerous practices to avoid and precautions to take for his own safety and the safety of others. Frequent examinations and periodic inspections of the equipment as well as a conscientious observance of safety rules may save lives as well as time and money.

DON'TS - HOISTS

1. Never lift or transport a load until all personnel are clear and do not transport the load over personnel.
2. Do not allow any unqualified personnel to operate hoist.
3. Never pick up a load beyond the capacity rating appearing on the hoist. Overloading can be caused by jerking as well as by static overload.
4. Never carry personnel on the hook or the load.
5. Do not operate hoist if you are not physically fit.

6. Do not operate hoist to extreme limits of travel of cable without first checking for proper limit switch action.
7. Avoid sharp contact between two hoists or between hoist and end stops.
8. Do not tamper with or adjust any parts of the hoist unless specifically authorized to do so.
9. Never use the load cable as a sling.
10. Do not divert attention from load while operating hoist.
11. Never leave a suspended load unattended.
12. Do not use limit switch(es) for normal operating stop(s). These are safety devices only and should be checked on a regular basis for proper operation.
13. Never operate a hoist that has an inherent or suspected mechanical or electrical defect.
14. Do not use load cable as ground for welding. Never touch a live welding electrode to the load cable.
15. Do not jog controls unnecessarily. Hoist motors are generally high torque, high slip types. Each start causes an inrush of current greater than the running current and leads to overheating and heat failure, or burnout, if continued to excess.
16. Do not operate hoist if load is not centered under hoist.
17. Do not operate hoist if cable is twisted, kinked or damaged.
18. Do not remove or obscure label.
19. Do not permanently activate dead man's switch.

DO'S - HOISTS

1. Read and follow manufacturer's instruction, installation, and maintenance manuals. When repairing or maintaining a hoist, use only manufacturer's recommended parts and materials.
2. Read and follow all instruction and warning information on or attached to a hoist.
3. Remove the hoist from service and thoroughly inspect and repair, as necessary, if unusual performance or visual defects (such as peculiar noise, jerky operations, travel in improper direction, or obviously damaged parts) are noticed.
4. Establish a regular schedule of inspection and maintain records for all hoists with special attention given to hooks, load cables, brakes, and limit switches.
5. Check operation of brakes for excessive drift.
6. Never lift loads over people, etc.
7. Check for damaged hooks and load cable.
8. Keep load cable clean and well maintained.
9. Check the load cable for improper seating, twisting, kinking, wear, or other defects before operating the hoists.
10. Make sure a load clears neighboring stockpiles, machinery, or other obstructions when raising, lowering, or traveling the load.
11. Center hoist over load before operating.
12. Avoid swinging of load or load hook when traveling the hoist.
13. Be sure the load attachment is properly seated in the saddle of the hook. Balance load properly before handling. Avoid hook tip loading.
14. Pull in a straight line, so that neither hoist body nor load cable are angled around an object.
15. Take up slack slowly.
16. Know the hand signals for hoisting, cross travel, and crane travel if working with cab-operated hoists or cranes. Operators should accept the signals of only those persons authorized to give them.

WARNING

Check Wire Rope for improper seating, twisting, kinking, wear or defects before operating.

WARNING

Center BX G-Force® over the load before lifting. DO NOT end or side load the BX G-Force®. End or side loading will seriously reduce the life of the Wire Rope and lead to premature failure. The Wire Rope should never exceed an out of vertical angle greater than 20°, under any circumstances.

WARNING

Avoid swinging of load or load hook when traveling with the BX G-Force®.

WARNING

Check the Coil Cord for improper seating, twisting, kinking, wear or defects before operating. Any of the described conditions will seriously reduce the life of the Coil Cord and lead to premature failure.

WARNING

Press Float Mode (option) button with only the load weight hanging from the unit. Additional external forces applied to the load during initiation of Float Mode will result in the load drifting.

WARNING

Do not repeatedly impact the BX G-Force® into the end stops. This condition will seriously reduce the life of the Controls and could lead to premature failures. If the unit impacts the end stop more than 10 times in a single shift, contact Gorbel® Customer Service for alternative end stop options.

WARNING

The BX G-Force® ILD does not meet “Wash-down” environment requirements. The BX G-Force® ILD does not meet “Explosion Proof” requirements.

WARNING

Ensure that the Load Cell is properly mounted in Remote Mount Handle applications with Float Mode (reference Figure I4, page 68).

WARNING

Ensure that the Handle is supported properly in Remote Mount Handle applications by attaching tooling at both the Top and Bottom mounting points (reference Figures H1, I3 & I4, on pages 64, 67, & 68).

WARNING

Do not mount any objects to the sliding portion of the G-Force® Handle (i.e. switches). Additional objects may interfere with the travel of the sliding Handle, and affect the overall speed and functionality of the unit.

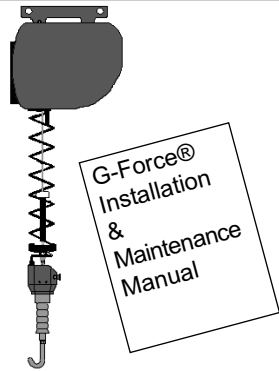
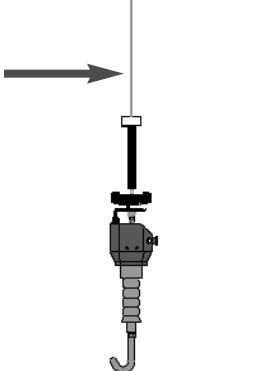
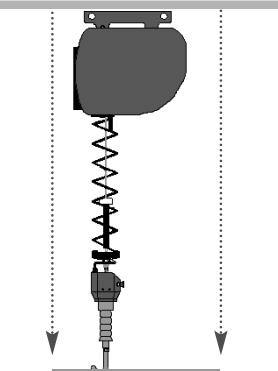
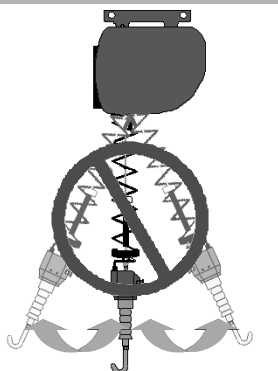
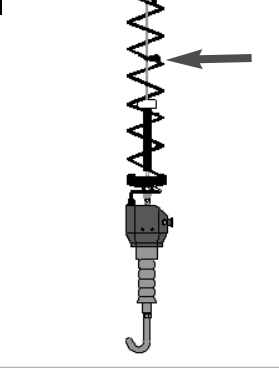
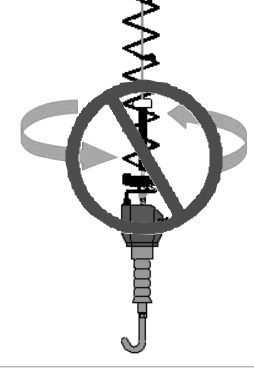
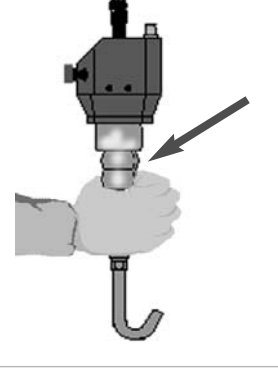
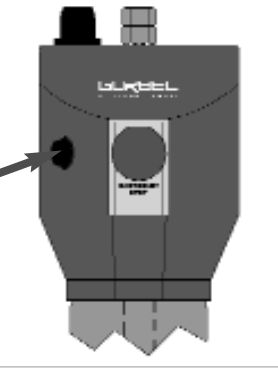
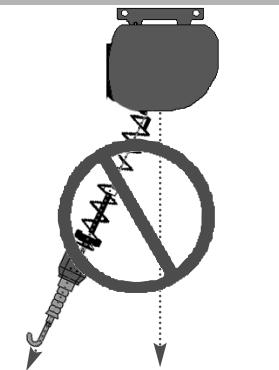
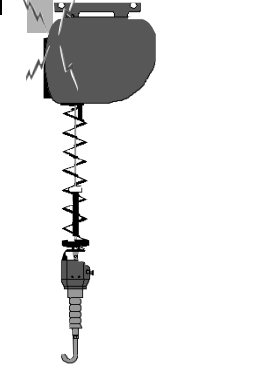
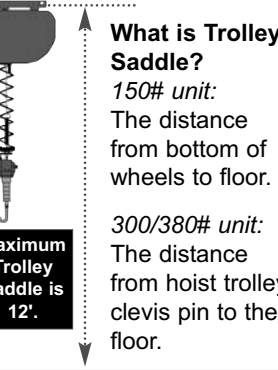
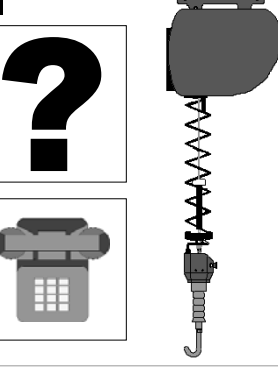
WARNING

Do not mount any load bearing components to the Blue Poly-carbonate housings of the G-Force® Handle or Actuator assembly.



G-Force® Operational Guidelines

All operators should read the G-Force® Instruction, Installation and Maintenance Manuals before operating the unit. Please follow the instructions contained in these manuals for your safety and for optimum trouble-free operation of your G-Force®. When repairing or maintaining a G-Force®, use only Gorbel® recommended parts and materials.

<p>1</p>  <p>Read & follow all instruction & warning information on or attached to the G-Force®.</p>	<p>2</p>  <p>Check Wire Rope for improper seating, twisting, kinking, wear or defects before operating.</p>	<p>3</p>  <p>Center G-Force® over the load before lifting a load. Do not end or side load.</p>	<p>4</p>  <p>Avoid swinging of load or load hook when traveling with the G-Force®.</p>
<p>5</p>  <p>Check the coil cord for improper seating, twisting, kinking, wear or defects before operating.</p>	<p>6</p>  <p>Do not over-twist coil cable assembly (>360°). Damage and/or failure could occur.</p>	<p>7</p>  <p>The Operator Present switch should be depressed the entire time the G-Force® is in use.</p>	<p>8</p>  <p>Press Float Mode Button with only the load weight hanging from unit. Applying other force will cause unit to drift.</p>
<p>9</p>  <p>The wire rope should never be more than 20° out of vertical while the G-Force® is in use.</p>	<p>10</p>  <p>Do not bang the G-Force® into end stops repeatedly or at a speed faster than a normal walking pace.</p>	<p>11</p>  <p>What is Trolley Saddle? 150# unit: The distance from bottom of wheels to floor. 300/380# unit: The distance from hoist trolley clevis pin to the floor. Maximum Trolley Saddle is 12'.</p> <p>Maximum Trolley Saddle for the G-Force® is 12'. See drawing for Trolley Saddle definitions by unit size.</p>	<p>12</p>  <p>Questions about G-Force®? Call Gorbel® Customer Service at (800) 821-0086 or your local Gorbel® distributor.</p>

INTRODUCTION

Thank you for choosing a Gorbel® G-Force® BX Intelligent Lifting Device (ILD)** to solve your material handling needs. The innovative design and heavy-duty construction of the G-Force® BX ILD will provide a superior quality product that will offer years of long-term value. A Gorbel® G-Force® BX ILD will provide many years of dependable service by following the installation and maintenance procedures described herein.

** U.S. PATENT NO'S: 5,865,426, 6,386,513, & 6,886,812, OTHER PATENTS PENDING

Dimensions contained in this installation manual are for reference only and may differ for your particular application.

Normal safety precautions: These include, but are not limited to:

- Checking for obstructions in crane and hoist travel.

WARNING

Only competent erection personnel familiar with standard fabrication practices should be employed to install the G-Force® ILD because of the necessity of properly interpreting these instructions. Gorbel is not responsible for the quality of workmanship employed in the installation of this hoist according to these instructions. Contact Gorbel, Inc., at 600 Fishers Run, P.O. Box 593, Fishers, New York 14453, 1-585-924-6262, for additional information, if necessary.

WARNING

Equipment described herein is not designed for, and should not be used for, lifting, supporting or transporting humans. Failure to comply with any one of the limitations noted herein can result in serious bodily injury and/or property damage. Check Federal, State and Local regulations for any additional requirements.

WARNING

Prior to installation, consult a qualified structural engineer to determine if your support structure is adequate to support the loadings created during normal operation of the G-Force® ILD.

WARNING

Reference American Institute of Steel Construction (AISC) Manual of Steel Construction (9th edition), Part 5, Specification for Structural Joints using ASTM A325 or A490 Bolts (section 8.d.2) for proper procedure to follow when using any torque tightening methods.

WARNING

Do not field modify the G-Force® BX ILD in any way. Any modification without the written consent of Gorbel, Inc., will void warranty.

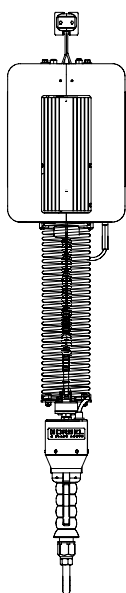
WARNING

The unique serial number for this unit can be found on the front cover of this manual and on the ID nameplate sticker attached to the back bottom of the G-Force® ILD Actuator assembly cover. Always have this serial number available during all correspondence regarding your G-Force® BX, ILD, or when ordering repair parts.

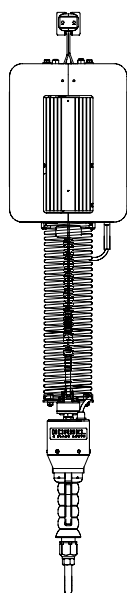
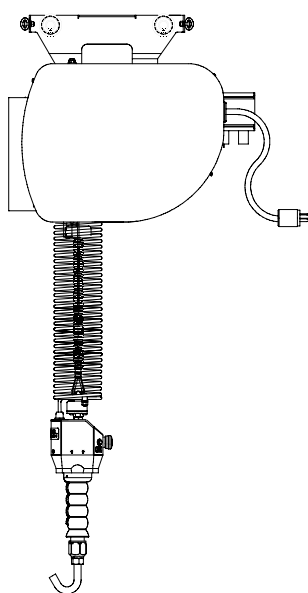
WARNING

The Jog Switch buttons are for system maintenance and load testing use only, and should not be manipulated during normal operation of the G-Force® BX ILD. Operation of the Jog Switch buttons during normal operation increases the risk of personal injury to the operator.

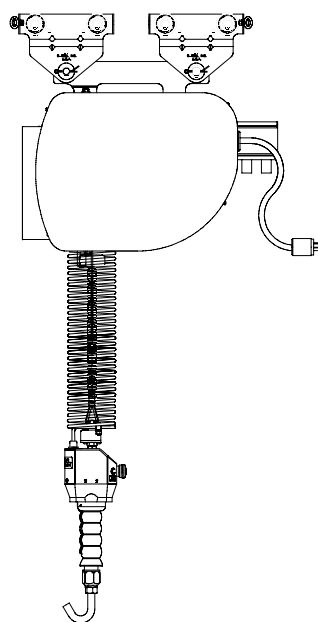
CORRECT G-FORCE® INSTALLATION ORIENTATION



150# BX G-Force®



300/380# BX G-Force®



WARNING

The BX G-Force® was designed and fully life tested in the installation orientation shown above. Any modification to the installation orientation of the BX G-Force® without the written consent from Gorbel, Inc. Engineering will immediately void the warranty. Please contact the factory if a modification to the installation orientation shown above is desired.

G-FORCE® BX ILD MAIN ASSEMBLY COMPONENT DESCRIPTION

Standard Assembly: The G-Force® BX ILD consists of three (3) main assemblies and they are as follows:

- 1) **Actuator:** The Actuator assembly contains the main lifting power transmission of the G-Force® BX ILD. The drive assembly of the Actuator consists of the ServoMotor with failsafe brake, Gearbox, Main Drum Pulley, and Controls. The Actuator assembly also contains the Upper and Lower Limit Switches. **See the Lift Functionality and Controls Interface Feature sections for additional details.**
- 2) **Coil Cord:** The Coil Cord assembly carries the signals from the Handle back to the Controls in the Actuator assembly. The Coil Cord carries signals back to the Controls for lift speed, lift direction, E-Stop, and Float Mode (if equipped). Caution must be taken to not over-rotate the Handle, as serious damage can occur when the Coil Cord binds up around the wire rope.
- 3) **Handle:** The Handle is the main interface between the operator and the lifting device. The Handle comes standard equipped with a lifting hook. The supplied lifting hook can be removed and replaced with customer tooling. Tooling must meet the guidelines set forth by Gorbel, Inc. Improper tooling integration will result in degraded performance and may lead to premature failure of the G-Force® BX ILD. **See the Lift Functionality and Controls Interface Feature sections for additional functionality located at the Handle.**

LIFT FUNCTIONALITY

Standard Operation: The Gorbel® G-Force® BX ILD is a servomotor driven, high speed, ergonomic materials handling device. When the device is in the standard operational mode, the sliding handle of the hand controller commands the z-axis direction and speed of the lift (**reference Diagram A**). The handle has a center neutral position and can slide up and down to provide up and down speed commands to the control system. The further the handle is displaced from the neutral position, the faster the servo movement to lift or lower the load. The operator lifts or lowers the load by grasping the handle and moving it up or down as if it were an extension of the operator's arm. The lift moves slightly slower when a heavy load is lifted, thereby giving the operator some feel for the weight of the load and thus reducing inertial forces. When depressed, the operator present switch in the handle activates the servomotor (**reference Diagram A**). Depressing the operator present switch also releases an electrically operated mechanical failsafe holding brake in the motor.

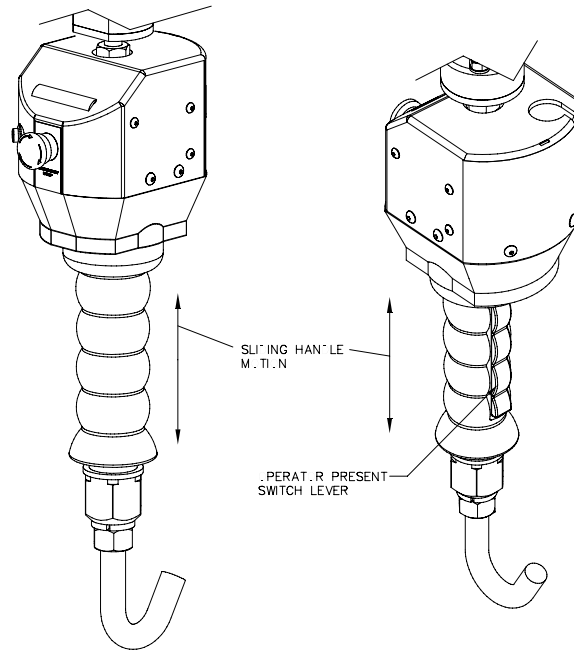


Diagram A. Sliding Handle - Operator Present Switch Lever.

Float Mode (System Option): This mode is initiated by simply pressing the Float Mode Enable button on the hand controller. In this mode, the operator can simply handle the load directly with either one or two hands and cause the load to raise or lower by applying either an upward or downward force on the load. This mode overrides the need to depress the operator present switch. The greater the force applied, the faster the load will move. There is a standard setting in the controls that safely limits the maximum speed of travel in Float Mode. Actuating the operator present switch while in Float Mode will cause the unit to exit float. While in Float Mode, the load cannot be increased or decreased because this may cause unwanted motion. Float Mode must be reinitiated each time the weight of the live load is changed. The Float Mode enable button is located on the face of the handle (**reference Diagram B**).

Emergency Stop Button: When depressed, the Emergency Stop (E-Stop) button cuts off all power to the Controls, and sets the mechanical fail-safe brake. The E-Stop button is located on the face of the handle (**reference Diagram B**). The G-Force® can't operate until the E-Stop has been reset.

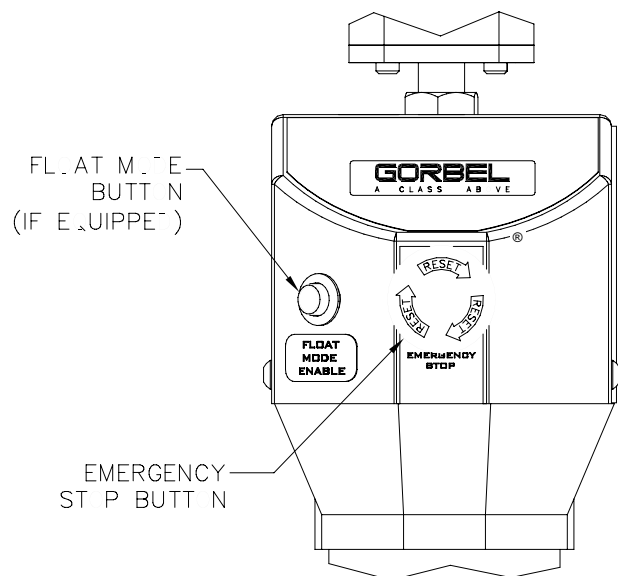


Diagram B. E-Stop and Float Mode (optional) Buttons.

Overload: The servo controller will prevent the lift from moving upward if loaded beyond the maximum capacity of the G-Force® BX ILD. When an overload condition is sensed, the Overload indicator is illuminated and the lift is prevented from moving upward. The lift may be moved down to allow for the safe removal of the load. Releasing and reactivating the operator present switch resets the overload condition.

Limit Switches: The G-Force® is equipped with both mechanical Upper and Lower Limit switches, located in the Actuator assembly. When the Upper Limit switch is triggered, the upward motion of the lift stops quickly at a controlled deceleration rate. The controlled deceleration rate guarantees the load cannot come off the hook. When the Upper Limit is triggered, the lift will move down but not up. The lower limit is set so that a minimum of two (2) full wraps of wire rope remain on the drum pulley at all times. When the Lower Limit switch is triggered, the downward motion of the lift stops quickly at a controlled deceleration rate. When the Lower Limit is triggered, the lift will only move up and not down.

Slack Switch: The G-Force® is equipped with a pair of Slack Switches that sense tension in the wire rope and trips when the wire rope develops slack. The switches are located inside the Actuator assembly. When the Slack Switches sense slack in the wire rope, downward movement of the lift is stopped to minimize the amount of wire rope unwound from the drum pulley. When slack in the wire rope is sensed, the lift will only move up but not down.

Remote Mount Handle (System Option): The lifting device is capable of operating with the handle displaced from the wire rope (not in-line with the wire rope). For example, if an end user has tooling that is too large for the operator to safely reach and operate the handle in the standard position, remote mounting the handle is recommended. The tooling must be mounted (and balanced) on the end of the wire rope, while the handle can be remote mounted. The tooling **must** be attached to the end of the wire rope with a swivel assembly (supplied by Gorbel, Inc.). Failure to mount the tooling with a swivel assembly can result in premature failure of both the wire rope and the coil cord. The remote mounted handle is linked to the coil cord via extension cables and connectors. The handle operates exactly the same as if it were mounted in-line. If the device is equipped for Float Mode, a load cell assembly is provided that must also be mounted between the tooling and the end of the wire rope. The handle is linked to the load cell via an extension cable and connectors. ****The end user must supply Gorbel, Inc., with the required length of the extension cables such that they can be safely routed and clamped to the tooling. Always include the distance for bends and turns when providing the extension length.**

CONTROLS INTERFACE FEATURES

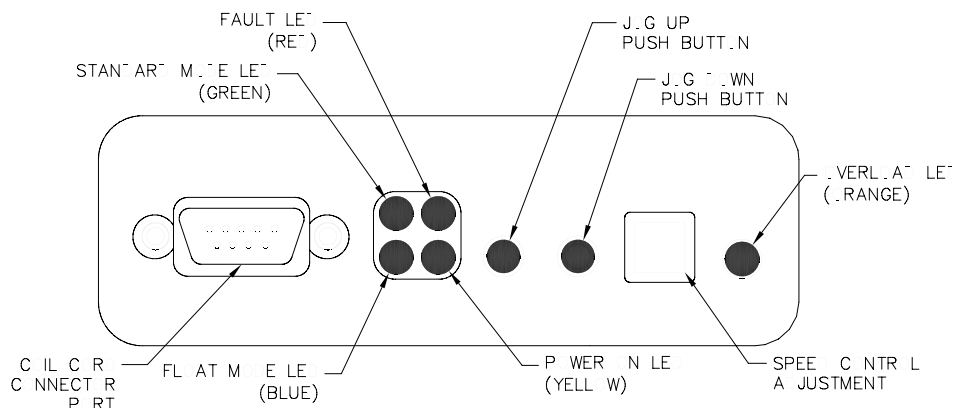


Diagram C. Controls Interface Display.

1. **Jog Switch Push Buttons:** The Jog Switch Buttons allow qualified personnel to replace the wire rope (load cable) on the system. To effectively operate the Jog Switch Buttons, all electrical cables must be connected and power on. Depressing the "Up" jog switch button will enable the motor and cause the system to reel the wire rope into the actuator and onto the main pulley. Depressing the "Down" jog switch button will enable the motor and cause the system to pay out the wire rope from the actuator and off of the main pulley. The handle and operator present switch are not to be operated during use of the Jog Switch Buttons.

WARNING

The Jog Switch buttons are for system maintenance and load testing use only, and should not be manipulated during normal operation of the G-Force® BX ILD. Operation of the Jog Switch buttons during normal operation increases the risk of personal injury to the operator.

2. **Speed Control Adjustment:** The 10 position Speed Control adjustment switch allows the operator to adjust the speed of the lifting device with a small flathead screwdriver.
3. **Power Up Diagnostic Mode:** When the “E-stop” button is released and power is applied to the lift, the servo motor controller goes into a power up diagnostic mode test. The following are the sections of the diagnostic mode test:
 - a) **LED Indicator Test:** The purpose of this test is to verify the five (5) indicator LEDs are functional. When the E-stop button is released, the yellow “Power On” LED comes on immediately indicating the internal 24 volt power is operational. After the servo controller completes a series of self-tests, it turns on the four (4) remaining LEDs for two (2) seconds to simply verify functionality.
 - b) **Switch Test:** After completion of the indicator test, a system switch test is started. The purpose of this test is to display the state of the “Slack” switches and “Upper and Lower Limit” switches. During the switch test, the Green “Standard Mode” LED will remain on if the “Upper Limit” switch is triggered (up limit state) and the Blue “Float Mode” LED will remain on if the “Slack” switches are triggered (wire rope slack). Once the operator present switch or jog switch is activated, the servo motor controller exits the power up diagnostic mode and goes into normal operation.

Note: The Yellow Power On indicator will remain on during the power up diagnostic mode test.

4. **Power On LED (Yellow):** The “Power On” LED illuminates when the required 220 VAC, single-phase power has been correctly applied to the system and the E-Stop button has been released.
5. **Standard Mode LED (Green):** The “Standard Mode” LED illuminates when all system initialization is complete and the operator present switch is depressed, thus activating the standard mode of operation.
6. **Capacity Overload LED (Orange):** The “Capacity Overload” LED illuminates when a load or impact load greater than the capacity of the hoist has been detected by the system. When this LED illuminates, the controller will allow the operator to lower the load, but it will inhibit the operator from raising the load prior to “resetting” the system. To clear the overload fault and “reset” the system, release the switch for approximately 1 to 2 seconds. Once the LED turns off, the system can again be operated.
7. **Float Mode LED (Blue):** If the unit is equipped with Float Mode (system option), the “Float Mode” enabled LED will illuminate when the Float Mode button is pressed on the hand controller and Float Mode has been initiated.
8. **System Fault LED (Red):** The “System Fault” LED flashes when basic faults have been detected by the control system. If a fault has occurred, the “Standard Mode” or “Float Mode” (if equipped) LEDs will turn off.

TECHNICAL SPECIFICATIONS

BX Series	150 lbs.	300 lbs.	380 lbs.
Maximum Capacity (Load & Tool)	150 lbs.	300 lbs.	380 lbs.
Max Lifting Speed Unloaded (feet per minute)	240 fpm	120 fpm	86 fpm
Max Lifting Speed Fully Loaded (feet per minute)	200 fpm	100 fpm	71 fpm
Max Float Mode (Option) Lifting Speed (feet per minute)	117 fpm	88 fpm	63 fpm
Max Lift Stroke	7 ft	7 ft	7 ft
Primary Lift Voltage	220 VAC (1 Phase) +/- 10%	220 VAC (1 Phase) +/- 10%	220 VAC (1 Phase) +/- 10%
Amps	5	5	5
Capacity Overload Safety	Yes	Yes	Yes
LED Indicator Lights	Yes	Yes	Yes
Anti-Recoil	Yes	Yes	Yes
Failsafe Brake	Yes	Yes	Yes
Float Mode Capable	Yes (Option)	Yes (Option)	Yes (Option)
Inertia Management	Yes	Yes	Yes
Precision Lift Capability	Yes	Yes	Yes
Drive/Control System	Servo	Servo	Servo
Speed Adjustment	Yes	Yes	Yes
Jogging Capability	Yes	Yes	Yes
Media	Wire Rope	Wire Rope	Wire Rope
Duty Cycle	H5	H5	H5

INSTALLATION

STEP 1 - UNPACKING THE G-FORCE® BX ILD

► **TIP:** Packing list can be found in plastic pocket attached to shipping box.

1.1 Carefully remove all items from the box.

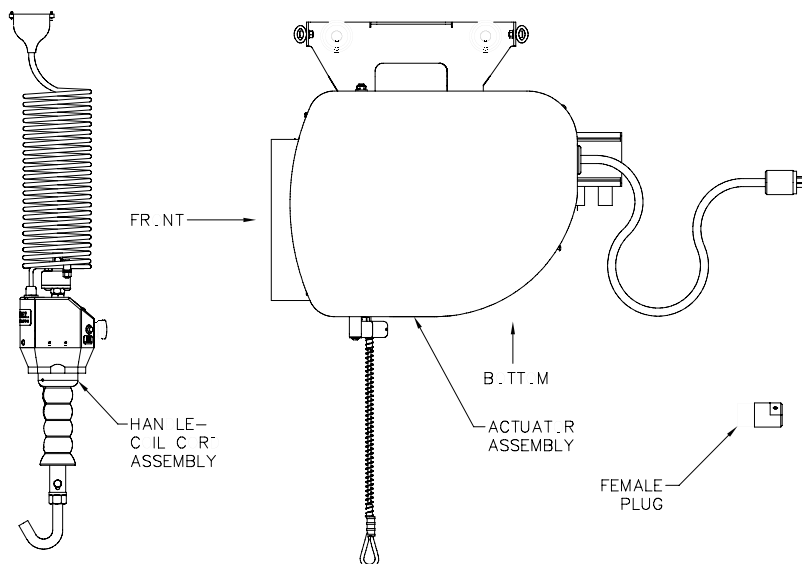


Diagram 1A. 150# BX series shipped components.

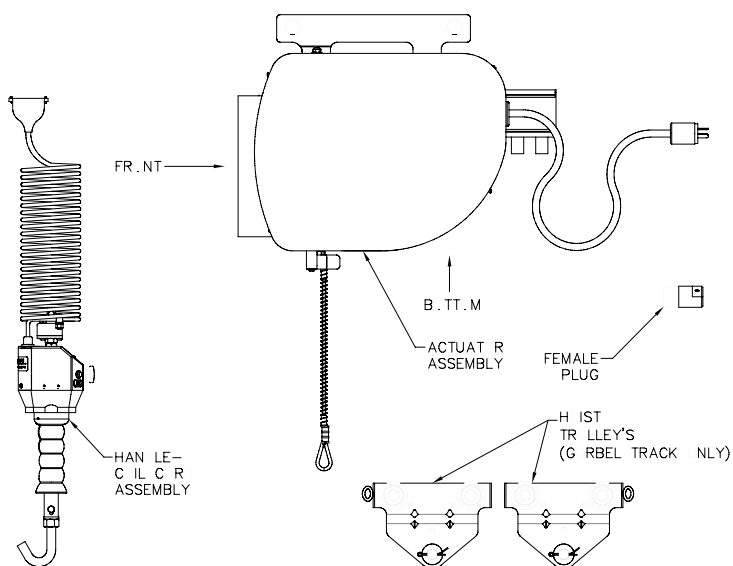


Diagram 1B. 300/380# BX series shipped components.

1.2 Verify that all components listed on the packing slip are included.

1.3 If any items are missing or were damaged during shipping, please contact Gorbel® Customer Service immediately.

STEP 2 - PRE-ASSEMBLY

2.1 Read entire installation manual **before** beginning installation of the G-Force® BX ILD.

2.2 Tools and materials typically needed to install/assemble a G-Force® BX ILD are as follows:

- Hand tools
- Plastic cable tie straps
- Ladders/man lifts

2.3 Prior to installing the G-Force® BX ILD, it is a good idea to familiarize yourself with the main components.

- Reference the following layout drawings:
 - **Figure I1**, page 65 - 150# BX Standard Inline Component Layout
 - **Figure I2**, page 66 - 300/380# BX Standard Inline Component Layout
 - **Figure I3**, page 67 - Standard Remote Mount Component Layout
 - **Figure I4**, page 68 - Float Mode Remote Mount Component Layout

STEP 3 - HANDLE-COIL CORD INSTALLATION (STANDARD INLINE)

➡ **TIP:** This step is best completed on a workbench, prior to installation of the Actuator into the bridge system.

Note: For Standard Remote Mounted Handle-Coil Cord Installation, go to Step 3A, page 13.
For Float Mode Remote Mounted Handle-Coil Cord Installation, go to Step 3B, page 14.

3.1 Remove the Cotter and Clevis Pin from the Handle swivel assembly.

3.2 Feed the wire rope from the Actuator assembly through the center of the Coil Cord. Slide the looped end of the wire rope assembly into the yoke of the Handle swivel assembly (**reference Diagram 3A**).

3.3 Re-insert the Clevis and Cotter Pin capturing the wire rope assembly in the Handle swivel assembly (**reference Diagram 3A**).

3.4 Remove the Coil Cord mounting clamps from the bottom side of the Actuator assembly (**reference Diagram 3B**, page 13).

3.5 Assemble the Coil Cord to the clamps by capturing the cord in the opening in the clamp (**reference Diagram 3B**, page 13).

3.6 Re-assemble the Coil Cord mounting clamps to the bottom side of the Actuator assembly (**reference Diagram 3B**, page 13).

3.7 Adjust the Coil Cord in the clamps so that the Coil Cord Connector is conveniently located on the proper side of the Actuator assembly (**reference Diagram 3B**, page 13).

3.8 Connect the Coil Cord Connector to the plug on the Control's Interface located on the bottom side of the Actuator assembly (**reference Diagram 3B**, page 13).

3.9 Assure that the coils of the Coil Cord are centered around the wire rope when properly installed. When the proper alignment of the Coil Cord has been achieved, finish clamping the hardware to fix the Coil Cord in place (**reference Diagram 3B**, page 13).

Continue to Step 4 on Page 15.

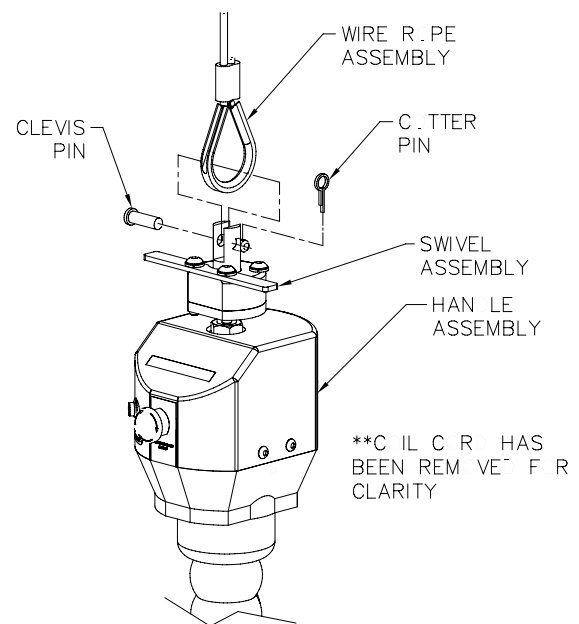


Diagram 3A. Handle to Wire Rope assembly.

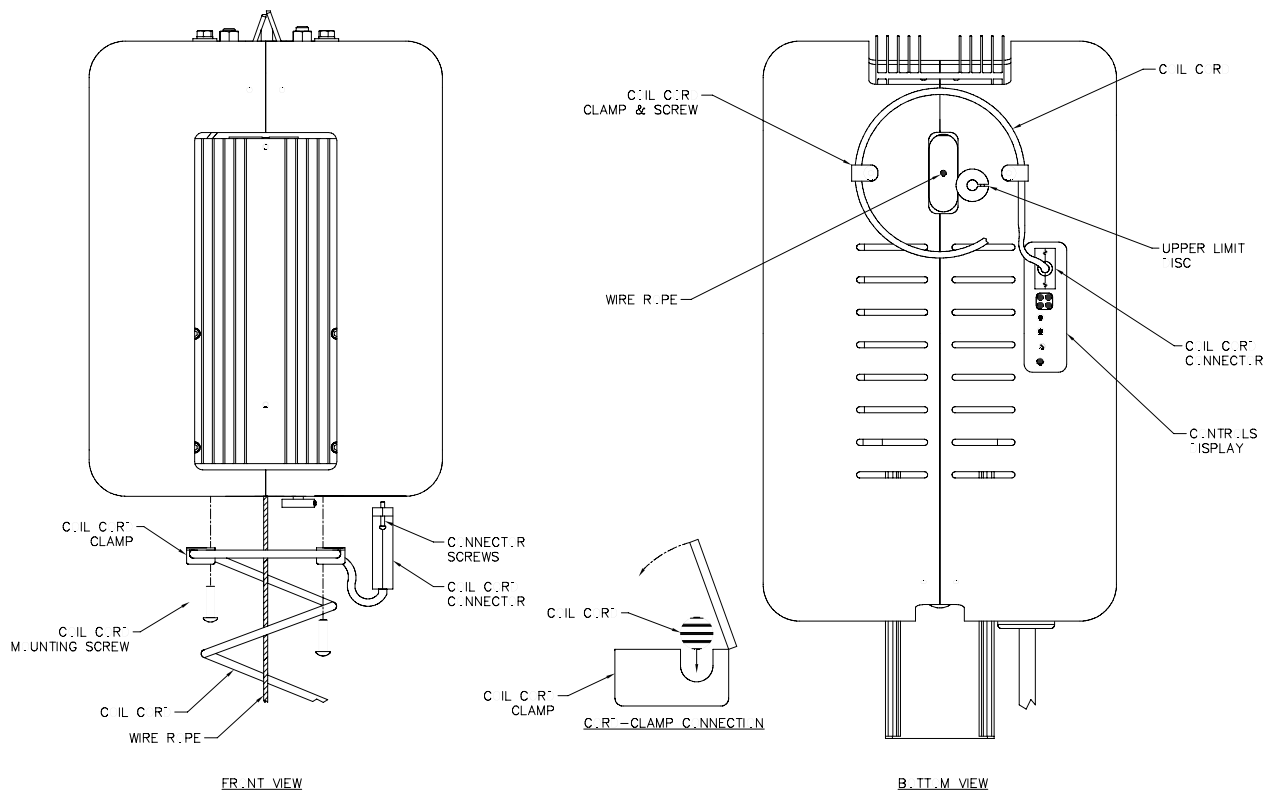


Diagram 3B. *Coil Cord to Actuator assembly.*

STEP 3A - HANDLE-COIL CORD INSTALLATION (STANDARD REMOTE MOUNTED)

➡ **TIP:** This step is best completed on a workbench, prior to installation of the Actuator into the bridge system.

- 3A.1** Attach the wire rope Swivel assembly directly to the end tooling (*reference Figure I3*, page 67).
- 3A.2** Remove the Cotter and Clevis Pin from the Swivel assembly.
- 3A.3** Feed the wire rope from the Actuator assembly through the center of the Remote Mount Coil Cord. Slide the looped end of the wire rope assembly into the yoke of the Swivel assembly (*reference Diagram 3A*, page 12). The Handle in *Diagram 3A*, page 12, will be replaced by the customer end tooling.
- 3A.4** Re-insert the Clevis and Cotter Pin capturing the wire rope assembly in the Swivel assembly (*reference Diagram 3A*, page 12). The Handle in *Diagram 3A*, page 12, will be replaced by the customer end tooling.
- 3A.5** Remove the Coil Cord mounting clamps from the bottom side of the Actuator assembly (*reference Diagram 3B*).
- 3A.6** Assemble the Remote Mount Coil Cord to the clamps by capturing the cord in the opening in the clamp (*reference Diagram 3B*).
- 3A.7** Re-assemble the Remote Mount Coil Cord to the clamps to the bottom side of the Actuator assembly (*reference Diagram 3B*).
- 3A.8** Adjust the Remote Mount Coil Cord in the clamps so that the Coil Cord Connector is conveniently located on the proper side of the Actuator assembly (*reference Diagram 3B*).
- 3A.9** Connect the Coil Cord Connector to the plug on the Control's Interface located on the bottom side of the Actuator assembly (*reference Diagram 3B*).

- 3A.10** Assure that the coils of the Remote Mount Coil Cord are centered around the wire rope when properly installed. When the proper alignment of the Remote Mount Coil Cord has been achieved, finish clamping the hardware to fix the Remote Mount Coil Cord in place (**reference Diagram 3B**, page 13).
- 3A.11** Attach the Standard Remote Mount Handle to the Tooling, being sure to mount at both the top and bottom of the Remote Mount Handle assembly (**reference Figure 13**, page 67). Assure that the mounting arrangement does not effect the operating function of the Handle.

<p style="text-align: center;">WARNING</p> <p>Remote Mount G-Force® BX Handles must be mounted at both the top and bottom of the Handle assembly. Failure to mount the Remote Mounted Handle at top and bottom can result in undesirable performance and/or premature component failure.</p>
--

- 3A.12** Connect the Remote Mount Coil Cord Extension cable from the Remote Mount Handle to the Remote Mount Coil Cord. Securely clamp the Remote Mount Coil Cord Extension cable to the tooling as needed (**reference Figure 13**, page 67).

Continue to Step 4 on page 15.

STEP 3B - HANDLE-COIL CORD INSTALLATION (FLOAT MODE REMOTE MOUNTED)

<p>➡ TIP: This step is best completed on a workbench, prior to installation of the Actuator into the bridge system.</p>
--

- 3B.1** Attach the Load Cell - Swivel assembly directly to the end tooling (**reference Figure 14**, page 68).
- 3B.2** Remove the Cotter and Clevis Pin from the Swivel assembly.
- 3B.3** Feed the wire rope from the Actuator assembly through the center of the Remote Mount Coil Cord. Slide the looped end of the wire rope assembly into the yoke of the Swivel assembly (**reference Diagram 3A**, page 12). The Handle in **Diagram 3A**, page 12, will be replaced by the customer end tooling.
- 3B.4** Re-insert the Clevis and Cotter Pin capturing the wire rope assembly in the Swivel assembly (**reference Diagram 3A**, page 12). The Handle in **Diagram 3A**, page 12, will be replaced by the customer end tooling.
- 3B.5** Remove the Coil Cord mounting clamps from the bottom side of the Actuator assembly (**reference Diagram 3B**, page 13).
- 3B.6** Assemble the Remote Mount Coil Cord to the clamps by capturing the cord in the opening in the clamp (**reference Diagram 3B**, page 13).
- 3B.7** Re-assemble the Remote Mount Coil Cord mounting clamps to the bottom side of the Actuator assembly (**reference Diagram 3B**, page 13).
- 3B.8** Adjust the Remote Mount Coil Cord in the clamps so that the Coil Cord Connector is conveniently located on the proper side of the Actuator assembly (**reference Diagram 3B**, page 13).
- 3B.9** Connect the Coil Cord Connector to the plug on the Control's Interface located on the bottom side of the Actuator assembly (**reference Diagram 3B**, page 13).
- 3B.10** Assure that the coils of the Remote Mount Coil Cord are centered around the wire rope when properly installed. When the proper alignment of the Remote Mount Coil Cord has been achieved, finish clamping the hardware to fix the Remote Mount Coil Cord in place (**reference Diagram 3B**, page 13).
- 3B.11** Attach the Standard Remote Mount Handle to the Tooling, being sure to mount at both the top and bottom of the Remote Mount Handle assembly (**reference Figure 14**, page 68). Assure that the mounting arrangement does not affect the operating function of the Handle.

WARNING

Remote Mount G-Force® BX Handles must be mounted at both the top and bottom of the Handle assembly. Failure to mount the Remote Mounted Handle at top and bottom can result in undesirable performance and/or premature component failure.

- 3B.12** Connect the Remote Mount Coil Cord Extension cable from the Remote Mount Handle to the Remote Mount Coil Cord. Connect the Float Mode Extension cable from the Remote Mount Handle to the Remote Mounted Load Cell assembly. Securely clamp the Remote Mount Coil Cord Extension and Float Mode Extension cable to the tooling as needed (**reference Figure 14**, page 68).

STEP 4 - INSTALLING THE ACTUATOR ASSEMBLY

- 4.1** Verify that the G-Force® BX ILD trolley wheels are correct for the style and capacity track that the unit is being installed on. **Note:** Standard 150# G-Force® BX ILDs come with the wheels pre-assembled to the Actuator Trolley. Standard 300 and 380# G-Force® BX ILDs are supplied with an assembled Actuator Adapter Trolley and two (2) properly sized Hoist Trolleys when being installed in a Gorbel® Bridge system. The customer must provide two (2) Hoist Trolleys when the unit will run in a non-Gorbel® Bridge system. 150# G-Force® BX ILDs can also be supplied with an Actuator Adapter Trolley, similar to that of the 300 and 380# units.

- 4.2 300 and 380# G-Force® BX ILD:** Assemble the Hoist Trolleys to the Actuator Adapter Trolley. Remove the Clevis Pin and flat washers from the Hoist Trolleys. Slide the Trolley legs over the Adapter Trolley and align the holes. Re-assemble the Clevis Pin and washers to the Hoist Trolleys (**reference Diagram 4A**).

- 4.3** Remove the end stop from the Bridge and install the G-Force® Actuator into the track. Immediately re-install the end stops. Roll the Actuator assembly along the full length of the Bridge to assure that the travel is smooth throughout.

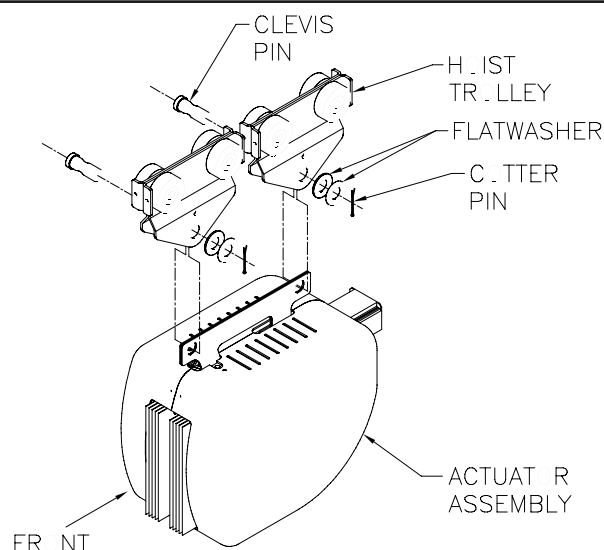


Diagram 4A. 300/380# BX Actuator-Hoist Trolley Assembly.

STEP 5 - ELECTRICAL POWER CONNECTION

➡ **TIP:** Do not connect to main power until all assembly is complete.

STANDARD:

- 5.1** Prior to final wiring, inspect the entire system to assure that all connections are seated properly and are without kinks or bends. Verify the following connections:
- a) Coil Cord to Handle
 - b) Coil Cord to Actuator Assembly

WARNING

To operate servo drives, it is necessary that certain parts are carrying voltages over 42 VDC. A life-threatening electrical shock could occur if you touch these parts. This could result in death, severe injury or material damage. After switching off the servo drive, wait until the DC bus discharge time of at least 5 minutes has passed. The Run LED going out does not indicate that voltage is not present on the device.

- 5.2** Connect a 220 VAC single-phase power source through a Disconnect Switch (by others) to the festooned power cabling (not provided with G-Force® BX ILD).

WARNING

Source power to the BX G-Force® unit is to measure 220 VAC (1 Phase) +/- 10%. Minimum Voltage = 198 VAC. Maximum Voltage Must NOT Exceed 242 VAC. Voltages greater than 242 VAC will result in premature Control System failure.

- 5.3** Wire the Female Turnlock Power Plug (provided) to the end of the festooned power cable.

- 5.4 After verifying the Disconnect Switch is turned **OFF**, connect the newly installed receptacle to the Male Plug at the G-Force® BX ILD.

STEP 6 - AIR CONNECTION (OPTION)

➡ **TIP:** G-Force® BX ILD units (Standard Inline or Remote Mounted) that are ordered with Air power, have a 3/8" ID Nycoil air hose integrated into the full length of the Coil Cord. The Coil Cord is provided with two (2) Male fittings located at both ends of the air hose. Gorbel also provides both mating Female fittings for 3/8" ID air hose.

- 6.1 Assemble one of the Female fittings (provided) to the end of the input air hose (not provided).
- 6.2 Assemble the other Female fitting (provided) to the end of the tooling airline (not provided).
- 6.3 Connect both fittings to the respective ends of the Nycoil air hose in the Coil Cord.
- 6.4 Release the valve supplying air to the G-Force® BX ILD. Inspect and assure that all connections are properly made and there are no air leaks.

STEP 7 - INITIAL POWER-UP

➡ **TIP:** Do not depress the operator present switch on the Handle during start-up. Depressing the Handle during the start-up process will result in a drive fault.

- 7.1 Turn on the Disconnect Switch (by others) to apply power to the G-Force® BX ILD.
- 7.2 Disengage the Emergency Stop (E-stop) button located on the front face of the handle.
- 7.3 The system will complete the "Power Up Diagnostic Test" described in the "Controls Interface Features" section of this manual on pages 6 & 7.
- 7.4 When the "Power Up Diagnostic Test" has been successfully completed, the unit is ready for operation.
- 7.5 Standard Operation: Depress the operator present switch on the Handle and run the unit up and down several times (at least 20 times in each direction) to assure that there is no mechanical binding in the lift system or electrical connection issues.

➡ **TIP:** The operator should always keep the operator present switch depressed while operating the unit in Standard Mode. Frequent pressing and releasing of the operator present switch (which is common for first time users) will result in jerky movement, and is not recommended.

- 7.6 Float Mode (if equipped): Lift up a load greater than 20 lbs. Settle the Load and depress the "Float Mode Enabled" button. ***Do not hold onto the part while initiating Float Mode.*** This will give the unit a false reading and cause excessive drift. Grasping the load, run the unit up and down several times (at least 20 times in each direction) to assure proper operation. Float Mode should provide a nice smooth feel.
- 7.7 Finally, test the operation of any special tooling that may have been integrated to the G-Force® BX ILD.

WARNING

Gorbel, Inc., does not provide integrated tooling for the G-Force® BX ILD. All tooling related questions should be directed to the tooling manufacturer or supplier.

STEP 8 - ADJUSTING LIFT SPEED

- 8.1 Take note of the speed of the unit as it is raised and lowered during Step 7. The speed of the G-Force® BX ILD can be adjusted using the 10 position Speed Selector switch located at the Controls Interface back at the bottom face of the Actuator assembly.

- 8.2 Using a small flat-head screwdriver, the position of the switch can be turned to any of the positions that are numbered from 0 to 9. If a slower speed is desired, position the switch to a smaller number (towards 0). If a faster speed is desired, position the switch to a larger number (towards 9).

STEP 9 - FLOAT MODE (OPTION)

- 9.1 Lift and steady the load.

- 9.2 Without applying any external forces to the load, press the Float Mode Button for one (1) second. When done correctly, the “Blue” LED light will turn on (the “Yellow” LED will remain on as well).

WARNING

If external forces are applied to the load while Float Mode is being initiated, the G-Force® will calculate a baseline weight that is higher or lower than the actual weight being lifted. When the external force is removed, the load will begin to drift in the opposite direction of the load that was applied.

- 9.3 The direction and speed of travel is now being controlled by the amount of force that the operator exerts directly onto the load. To move the load down, put vertical pressure on the load in down direction. To move the load up, lift up on the load in the vertical up direction. The higher the force exerted on the load, the faster the unit moves.

WARNING

NEVER remove the load from the G-Force® while still in Float Mode. The drive will interpret the removal of the load as operator intent to lift the load. Therefore, the Handle will begin to drift up. The speed of the Handle drift directly correlates to the weight that was removed from the unit. The heavier the weight, the faster the Handle will travel.

STEP 10 - FINAL STEPS

➡ **TIP:** Gorbels® Customer Service is available from 7am to 7pm Eastern Time Monday - Thursday and 7am to 5pm Eastern Time Friday.

- 10.1 Please contact the Gorbels® factory (585-924-6262) if any of the following occur. **DO NOT ATTEMPT TO REPAIR UNIT YOURSELF.**

- **Excessive noise**
- **Unexpected operation**
- **Change in performance**
- **Damage or excessive wear to unit components**
- **Questions about the unit arise**

Please do not be limited by these items only.

- 10.2 Keep Packing List, Installation Manual, Drawings, and any other inserts filed together in a safe place.

DRIVE FAULT TROUBLESHOOTING CHART

The G-Force® ILD has extensive diagnostic capability. The “Red” System Fault LED flashes when basic faults have been detected by the control system. If a fault has occurred, the Standard Mode Operating or Float Mode LEDs will go off.

The red System Fault LED flashes a simple code when a fault has occurred. The sequence of flashes indicates the type of fault. The sequence consists of a number of short flashes followed by a long pause. The number of short flashes is the key to determining the fault code. For example, three (3) short flashes followed by a long pause indicates fault code #3. The sequence continually repeats until the fault is reset. The Fault Codes are listed in the chart on the next page.

Fault Code	Failure	Possible Causes
2	DC Bus Under Voltage	<ol style="list-style-type: none"> 1. Low AC line in. 2. Transformer feeding AC in on the MLD is undersized for the load.
3	DC Bus Over Voltage	<ol style="list-style-type: none"> 1. High AC line in. 2. Regen circuit is not operating correctly. 3. Regen resistor not connected correctly or has failed.
4	IGBT Fault	<ol style="list-style-type: none"> 1. Too much weight being lifted by the unit (applies if weight limit set greater than 185 pounds on a 150 pound unit). 2. Loss of an internal power supply voltage. 3. PWM logic error. 4. Over current detected through IGBT.
5	IGBT Over Temperature	<ol style="list-style-type: none"> 1. IGBT is greater than 85 degrees C.
6	Over Current	<ol style="list-style-type: none"> 1. Over current detected through the current sensor. 2. Too much weight being lifted by the unit (applies if weight limit set greater than 185 pounds on a 150 pound unit). 3. Wire Rope is bound. 4. The motor is wired incorrectly. 5. IGBT failure (applies if code will not reset with the cycling of power).
7	Motor Over Temperature	<ol style="list-style-type: none"> 1. Motor has exceeded its upper temperature limit.
8	Safety Relay Failure	<ol style="list-style-type: none"> 1. Relay timing closing the motor brake and opening the motor windings does not meet specified timing requirements.
9	Unknown Source Reset	<ol style="list-style-type: none"> 1. CPU was reset, but not by power down or via the JTAG programming port.
10	Missing Clock Caused Reset	<ol style="list-style-type: none"> 1. 16 Mhz clock stopped.
11	Watchdog Timer Caused Reset	<ol style="list-style-type: none"> 1. The CPU has stopped running code feeding watchdog timer.
12	XTAL Oscillator Startup Error	<ol style="list-style-type: none"> 1. The external 16 Mhz oscillator did not start.
13	Unexpected Hardware Configuration	<ol style="list-style-type: none"> 1. Mode switch does not match jumper or software configuration. 2. Handle pulled in during power up. 3. Power interruption during operation.

Note: If any of the above listed problems persist, contact Gorbel® Customer Service.

WIRE ROPE INSPECTION

1) Frequent Inspection

The operator or other designated person should visually inspect all ropes at the start of each shift. These visual observations should be concerned with discovering gross damage, such as listed below, which may be an immediate hazard:

- (a) distortion of the rope such as kinking, crushing, unstranding, birdcaging, main strand displacement, or core protrusion;
- (b) general corrosion;
- (c) broken or cut strands;
- (d) number, distribution, and type of visible broken wires. [See next section on rope replacement]

When such damage is discovered, the rope shall either be removed from service or given an inspection as detailed in the next section.

2) Periodic Inspection

The inspection frequency shall be determined by a qualified person and shall be based on such factors as expected rope life as determined by experience on the particular installation or similar installations; severity of environment; percentage of capacity lifts; frequency rates of operation; and exposure to shock loads. Inspections need not be at equal calendar intervals and should be more frequent as the rope approaches the end of its useful life.

A designated person shall perform periodic inspections. This inspection shall cover the entire length of rope. The individual outer wires in the strands of the rope shall be visible to this person during the inspection. Any deterioration resulting in appreciable loss of original strength, such as described below, shall be noted, and determination shall be made as to whether further use of the rope would constitute a hazard:

- (a) points listed in previous section on frequent inspection;
- (b) reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires;
- (c) severely corroded or broken wires at end connections;
- (d) severely corroded, cracked, bent, worn, or improperly applied end connections.

Special care should be taken when inspection sections of rapid deterioration, such as the following:

- (a) sections in contact with saddles, equalizer sheaves, or other sheaves where rope travel is limited;
- (b) sections of rope at or near terminal ends where corroded or broken wires may protrude;
- (c) sections subject to reverse bends;
- (d) sections of ropes that are normally hidden during visual inspection, such as parts passing over sheaves.

WIRE ROPE MAINTENANCE

- 1) Rope should be stored to prevent damage or deterioration.
- 2) Rope shall be unreeled or uncoiled in a manner to avoid kinking of or inducing a twist in the rope.
- 3) Before cutting rope, means shall be used to prevent unlaying of the strands.
- 4) During installation, care should be observed to avoid dragging of the rope in dirt or around objects that will scrape, nick, crush, or induce sharp bends.

- 5) Rope should be maintained in a well-lubricated condition. Gorbelt recommends using Chain and Cable Penetrating oil for lubrication. Lubricant applied as part of a maintenance program shall be compatible with the original lubricant. Lubricant applied shall be of the type that does not hinder visual inspection. Immediately after inspection, lubricant shall be applied before rope is returned to service. Those sections of rope that are located over sheaves or otherwise hidden during inspection and maintenance procedures require special attention when lubricating rope. The object of rope lubrication is to reduce internal friction and to prevent corrosion.

WIRE ROPE REPLACEMENT CRITERIA

- 1) No precise rules can be given for determination of the exact time for rope replacement, since many factors are involved. Once a rope reaches any one of the specified removal criteria, it may be allowed to operate to the end of the work shift, based on the judgement of a qualified person. The rope shall be replaced after that work shift, at the end of the day, or at the latest time prior to the equipment being used by the next work shift.
- 2) Removal criteria for the rope replacement shall be as follows:
 - (a) in running ropes, 12 randomly distributed broken wires in one lay or four broken wires in one strand in one lay (**reference Diagram E below**);
 - (b) one outer wire broken at the contact point with the core of the rope, which has worked its way out of the rope structure and protrudes or loops out from the rope structure;
 - (c) wear of one-third the original diameter of outside individual wires;
 - (d) kinking, crushing, birdcaging, or any other damage resulting in distortion of the rope structure;
 - (e) evidence of heat damage from any cause;
 - (f) reductions from nominal diameter greater than those shown below:

<u>Rope Diameter</u>	<u>Maximum Allowable Reduction From Nominal Diameter</u>
Up to 5/16 in. (8 mm)	1/64 in. (0.4 mm)

- 3) Broken wire removal criteria applies to wire ropes operating on steel sheaves and drums. However, results of internal testing have shown that rope replacement follows the same criteria regardless of sheave or drum material.
- 4) Attention shall be given to end connections. Upon development of two broken wires adjacent to a socketed end connection, the rope should be resocketed or replaced. Resocketing shall not be attempted if the resulting rope length will be insufficient for proper operation.
- 5) Replacement rope and connections shall have strength rating at least as great as the original rope and connections furnished by the hoist manufacturer. A rope manufacturer, the hoist manufacturer, or a qualified person shall specify any deviation from the original size, grade, or construction.

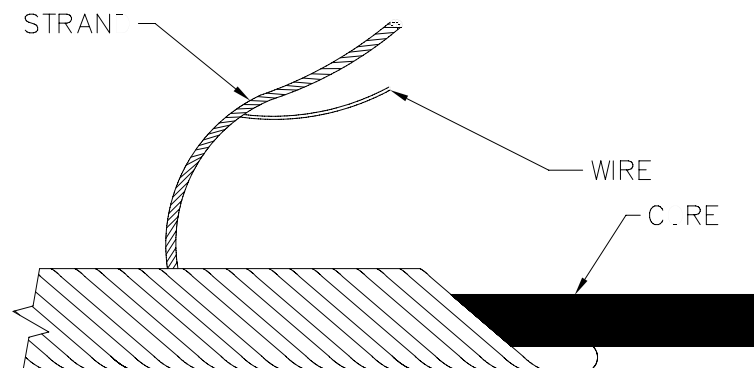


Diagram E. Wire Rope Composition Diagram.

WIRE ROPE REPLACEMENT INSTRUCTIONS

➡ **TIP:** Wire rope replacement is to be performed by qualified maintenance personnel only.

Note: All referenced drawings below are for a 150# unit. The procedure remains the same regardless of capacity.

- 1) Depress the Emergency Stop (E-Stop) button on the Handle. Disconnect power from the unit.
- 2) Remove the Covers from the Actuator assembly.
 - a) First, remove the Controls side Cover (Item #2, **Figure A13**, page 31) from the Actuator assembly. To remove this Cover you must first unscrew and remove the Coil Cord Plug from the Controls Interface. Remove the Coil Cord mounting Clamp (Item #11, **Figure A13**, page 31). Remove the three (3) mounting screws (Item #10, **Figure A13**, page 31) from the Controls side Cover only. Finally, remove the Cover mounting bolt (Item #7, **Figure A13**, page 31) at the Actuator Frame. Slide the Cover off of the Actuator assembly.
 - b) Remove the remaining side Cover (Item #3, **Figure A13**, page 31) from the Actuator assembly. Remove the Coil Cord mounting Clamp (Item #11, **Figure A13**, page 31). Remove the Upper Limit Switch Disc (Item #5, **Figure A13**, page 31). Finally, remove the Cover mounting bolt (Item #7, **Figure A13**, page 31) at the Actuator Frame. Slide the Cover off of the Actuator.
- 3) Remove three (3) of the Heatsink mounting bolts (Item #8, **Figure A9**, page 29), leaving the lower left bolt in place. Loosen, but do not remove, the lower left mounting bolt and rotate the Heatsink down towards the floor. This will support the Heatsink while wire rope replacement is being performed.
- 4) Remove the Nylon Drum Cover (Item #2, **Figure A8**, page 28) from the Actuator. Remove the six (6) mounting bolts and lockwashers (Item #s: 3 & 4, **Figure A8**, page 28) and slide the Drum Cover off of the Main Drum Pulley.
- 5) Re-attach the Coil Cord Plug to the Controls Interface and Power to the unit.
- 6) Release the Emergency Stop (E-Stop) button on the Handle. At the Controls Interface, jog the unit down until the remaining Wire Rope has been payed off of the Main Drum Pulley.
- 7) Depress the Emergency Stop (E-Stop) button on the Handle and disconnect Power to the unit.
- 8) Detach the Wire Rope from the Handle. Remove the cotter and clevis pins from the Handle Swivel assembly. Pull the damaged Wire Rope out of the Swivel assembly.
- 9) Set the Handle down on a secure base while Wire Rope replacement is taking place.
- 10) Remove the Upper Limit Donut (Item #10, **Figure A6**, page 27) from the broken wire rope assembly.
- 11) Remove the Wire Rope termination cover (Item #3, **Figure A6**, page 27) by removing the mounting bolts (Item #14, **Figure A6**, page 27) from the Main Drum Pulley.
- 12) Remove the terminated end of the Wire Rope from the Main Drum Pulley. Do so by simply lifting the terminated end out of the groove in the Drum Pulley. Pull the damaged wire rope completely out of the Actuator assembly.
- 13) Unless otherwise instructed, discard the damaged wire rope.
- 14) Remove the one (1) Extension Spring (Item #5, **Figure A5**, page 26) from the Heatsink side of the Actuator Frame by unscrewing the shoulder mounting bolt (Item #9, **Figure A7**, page 28) attached to the Idler Guide Plate (Item #3, **Figure A7**, page 28).
- 15) Remove the two (2) Snap Rings (Item #8, **Figure A7**, page 28) from the Idler Pulley Shafts (Item #4, **Figure A7**, page 28) and remove the Idler Pulley Guide Plate (Item #3, **Figure A7**, page 28).
- 16) Unscrew the **TOP** Idler Pulley Shaft (Item #4, **Figure A7**, page 28) only, using a 5/16" open-end wrench.

- 17) Feed the new wire rope assembly, Stop Sleeve terminated end first, through the following path:
- Through the Nylon Insert (Item #2, **Figure A1**, page 24) at the bottom of the Actuator Frame.
 - Over the top of the Idler Pulley going counter-clockwise.
 - Clockwise around the Main Drum Pulley (Item #2, **Figure A6**, page 27). Terminate the wire rope into the side groove and opening located at the front side of the Main Drum Pulley.
 - Wind the wire rope on the Main Drum Pulley until the wire rope is properly seated into all of the grooves up to and including the one that the Pulley Guide Block (Item #1, **Figure A4**, page 25) is located in.

WARNING

ALL slack must be removed from the wire rope and the wire rope must exit the Drum in the groove that contains the Pulley Guide Block in order to function correctly.

- Reconfirm that the wire rope exits the drum in the same groove that contains the Pulley Guide Block, and that all slack has been removed from the wire rope.
 - Replace the wire rope termination cover (Item #3, **Figure A6**, page 27) on the Main Drum Pulley.
- 18) Screw the top Idler Pulley Shaft (Item #4, **Figure A7**, page 28) back into the Threaded Hole Guide Plate (Item #2, **Figure A7**, page 28) located on the backside of the Actuator Frame assembly. Tighten using a 5/16" open-ended wrench.
- 19) Re-assemble the Idler Guide Plate (Item #3, **Figure A7**, page 28) to the Idler Pulley Shafts (Item #4, **Figure A7**, page 28) and replace the two (2) Snap Rings (Item #8, **Figure A7**, page 28).
- 20) Re-assemble the Extension Spring (Item #5, **Figure A5**, page 26) to the Idler Guide Plate (Item #3, **Figure A7**, page 28), by securing the Shoulder bolt (Item #9, **Figure A7**, page 28) in place.
- 21) Attach the Upper Limit Donut (Item #10, **Figure A6**, page 27) from Step 10 to the new wire rope assembly.
- 22) Re-attach the Handle to the new wire rope assembly.
- 23) Plug the Coil Cord Connector into the Controls Interface and reconnect power to the unit.
- 24) Release the Emergency Stop button on the Handle and grasp the operator present switch. Run the unit up and down several times to assure proper operation.
- 25) Depress the Emergency Stop button on the Handle and disconnect the power.
- 26) Assemble the Nylon Drum Cover (Item #2, **Figure A8**, page 28) over the Main Drum Pulley.
- 27) Properly re-assemble the Heatsink (Item #2, **Figure A9**, page 29) to the Actuator Frame.
- 28) Replace the Covers on the Actuator assembly.
- Re-assemble the side Cover (Item #3, **Figure A13**, page 31) to the Actuator assembly. Slide the Cover onto the Actuator assembly. Re-assemble the Cover mounting bolt (Item #7, **Figure A13**, page 31) at the Actuator Frame. Re-assemble the Upper Limit Switch Disc (Item #5, **Figure A13**, page 31). Re-assemble the Coil Cord mounting Clamp (Item #11, **Figure A13**, page 31).
 - Now, re-assemble the Controls side Cover (Item #2, **Figure A13**, page 31) to the Actuator assembly. Slide the Cover onto the Actuator assembly. Slide the Power Cord Grommet into the slotted opening at the back face of the Cover. Re-assemble the Cover mounting bolt (Item #7, **Figure A13**, page 31) at the Actuator Frame. Re-assemble the Coil Cord mounting Clamp (Item #11, **Figure A13**, page 31). Re-assemble the three (3) mounting screws (Item #10, **Figure A13**, page 31) to the Controls side Cover. Re-assemble the Coil Cord Plug to the Controls Interface.

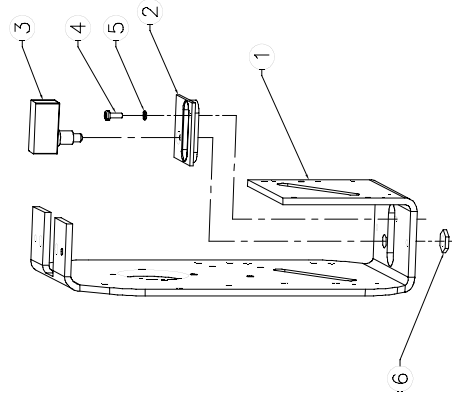
29) Reconnect power to the unit.

30) Release the Emergency Stop button on the Handle and grasp the operator present switch. Run the unit up and down several times to assure proper operation.

31) Continue normal operation.

APPENDIX A - 150# BX ACTUATOR ASSEMBLY DRAWINGS

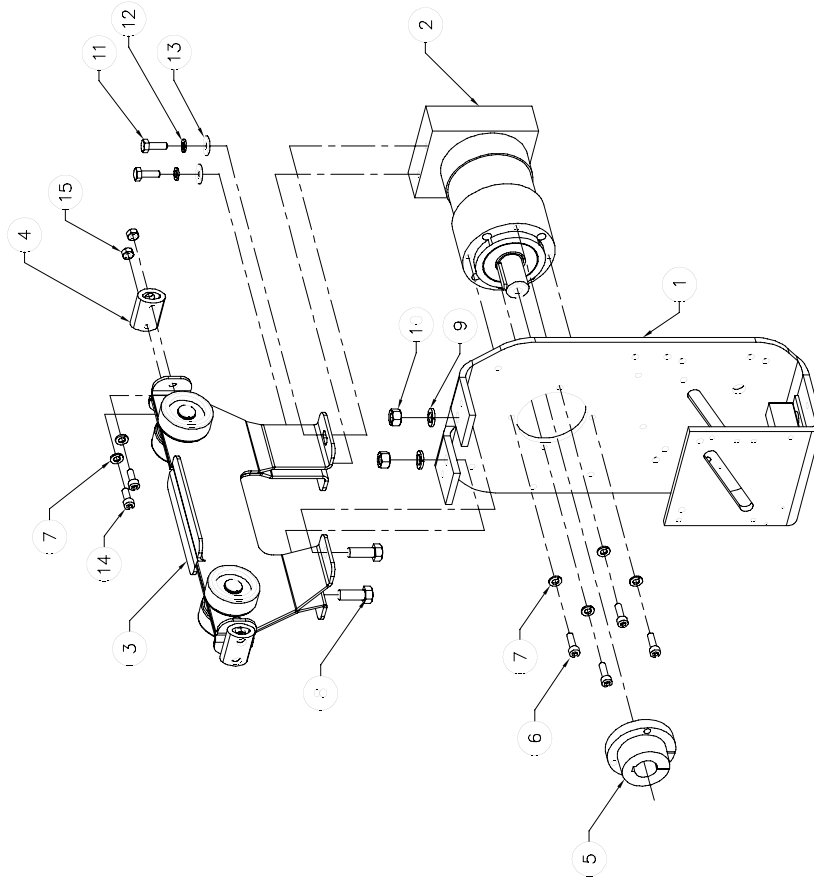
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#	QTY	P/N	DESCRIPTION
1	1	7733	ACTUATOR FRAME, 15# BX, WRMS
2	1	7734	LIMIT SWITCH, LARGE PLUNGER TYPE
3	1	7735	PHMS, #11-32 X 1/2\" LG, SL TITE, ZNPL
4	1	7736	LIMIT SWITCH, SMALL PLUNGER TYPE
5	1	7737	LIMIT SWITCH, MOUNTING NUT (SUPPLY W/ SWITCH)
6	1	7738	LIMIT SWITCH, MOUNTING NUT (SUPPLY W/ SWITCH)

15# BX ACTUATOR ASSEMBLY

FIGURE A1.



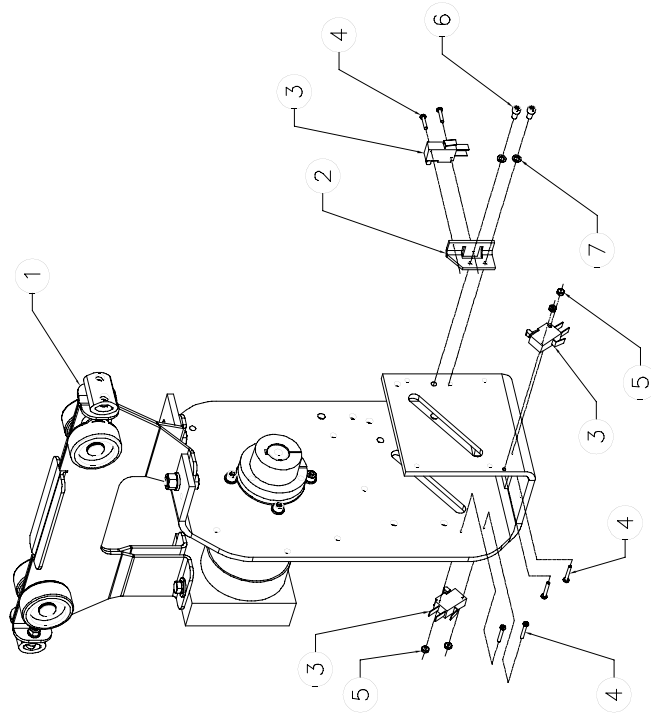
#	QTY	P/N	DESCRIPTION
1	1	7733	ACTUATOR FRAME, 15# BX, WRMS
2	1	7734	LIMIT SWITCH, LARGE PLUNGER TYPE
3	1	7735	PHMS, #11-32 X 1/2\" LG, SL TITE, ZNPL
4	1	7736	LIMIT SWITCH, SMALL PLUNGER TYPE
5	1	7737	LIMIT SWITCH, MOUNTING NUT (SUPPLY W/ SWITCH)
6	1	7738	LIMIT SWITCH, MOUNTING NUT (SUPPLY W/ SWITCH)

15# BX ACTUATOR ASSEMBLY

FIGURE A2.

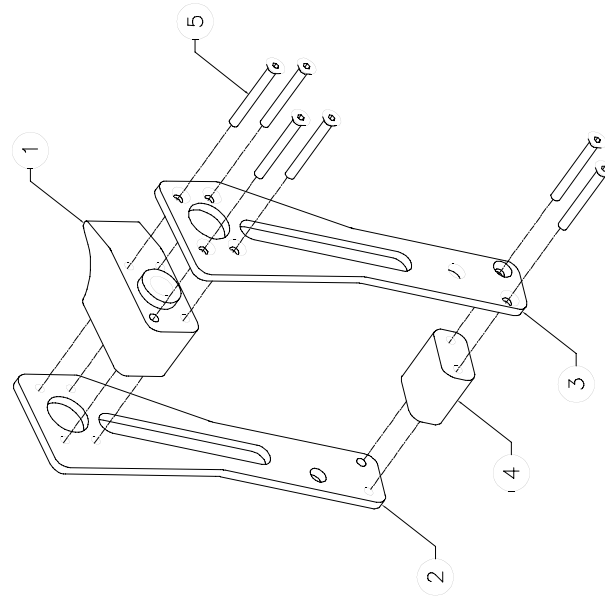
Figure A1 (bottom) & Figure A2 (top). 150# BX Actuator Assembly.

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#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	77551	LOWER LIMIT SWITCH BRACKET
3	3	77554	LIMIT SWITCH, ROLLER ARM ACTUATOR, FIRM C
4	6	77523	SLRH, #4-4 X 3/4" LG, ZNPL
5	4	77524	HEXNUT, #4-4, ZNPL
6	2	77535	SHCS, #1-24 X 3/4" LG
7	2	77549	LOCKWASHER, #1, ZNPL

150# BX ACTUATOR ASSEMBLY FIGURE A3.

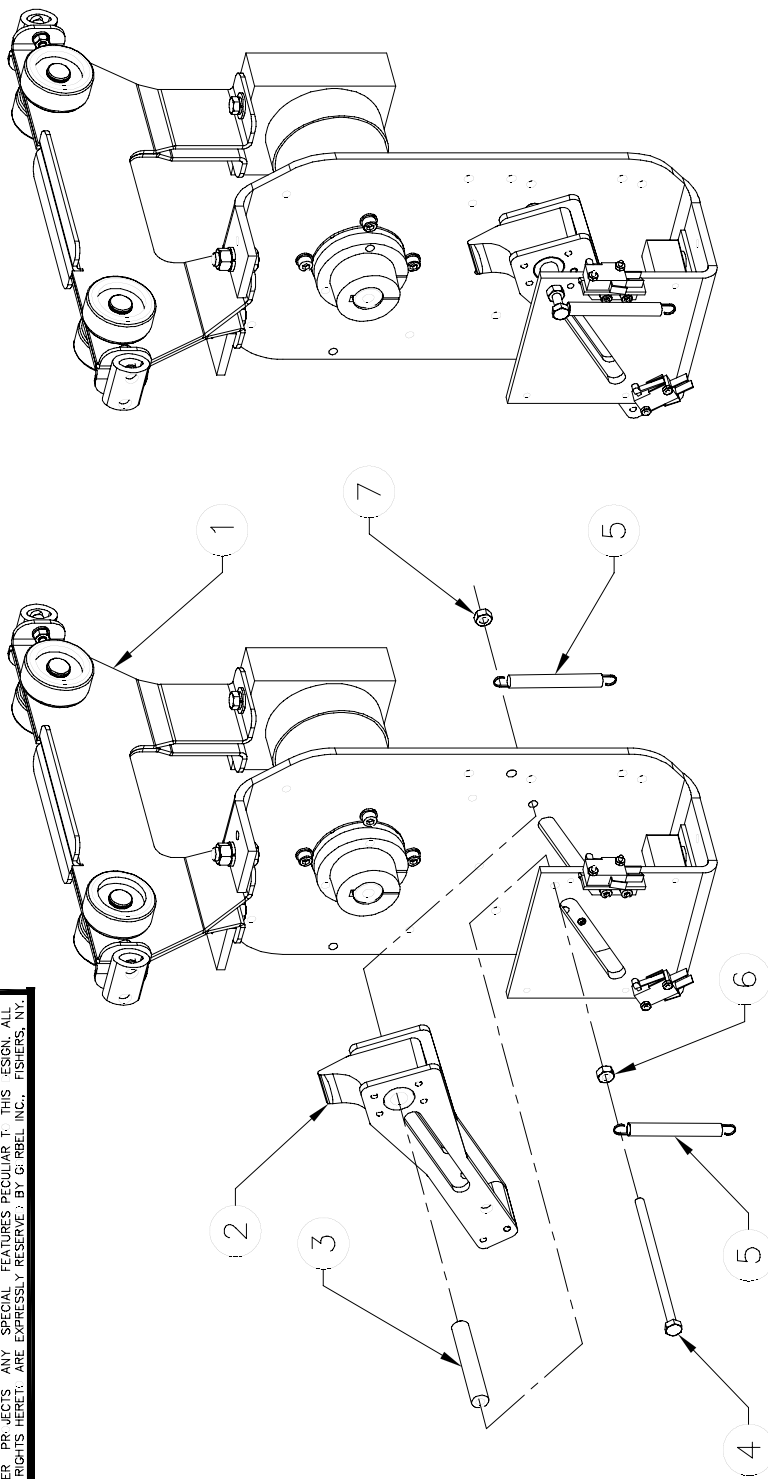


#	QTY	P/N	DESCRIPTION
1	1	73599	GUIDE BLOCK
2	1	77553	GUIDE PLATE, TAPPE, HLES
3	1	77554	GUIDE PLATE, C-INTERSUNK HLES
4	1	77555	SPACER BLOCK
5	6	77533	PHCS, #1-32 X 1-3/4" LG

150# BX ACTUATOR ASSEMBLY FIGURE A4.

Figure A3 (bottom) & Figure A4 (top). 150# BX Actuator Assembly.

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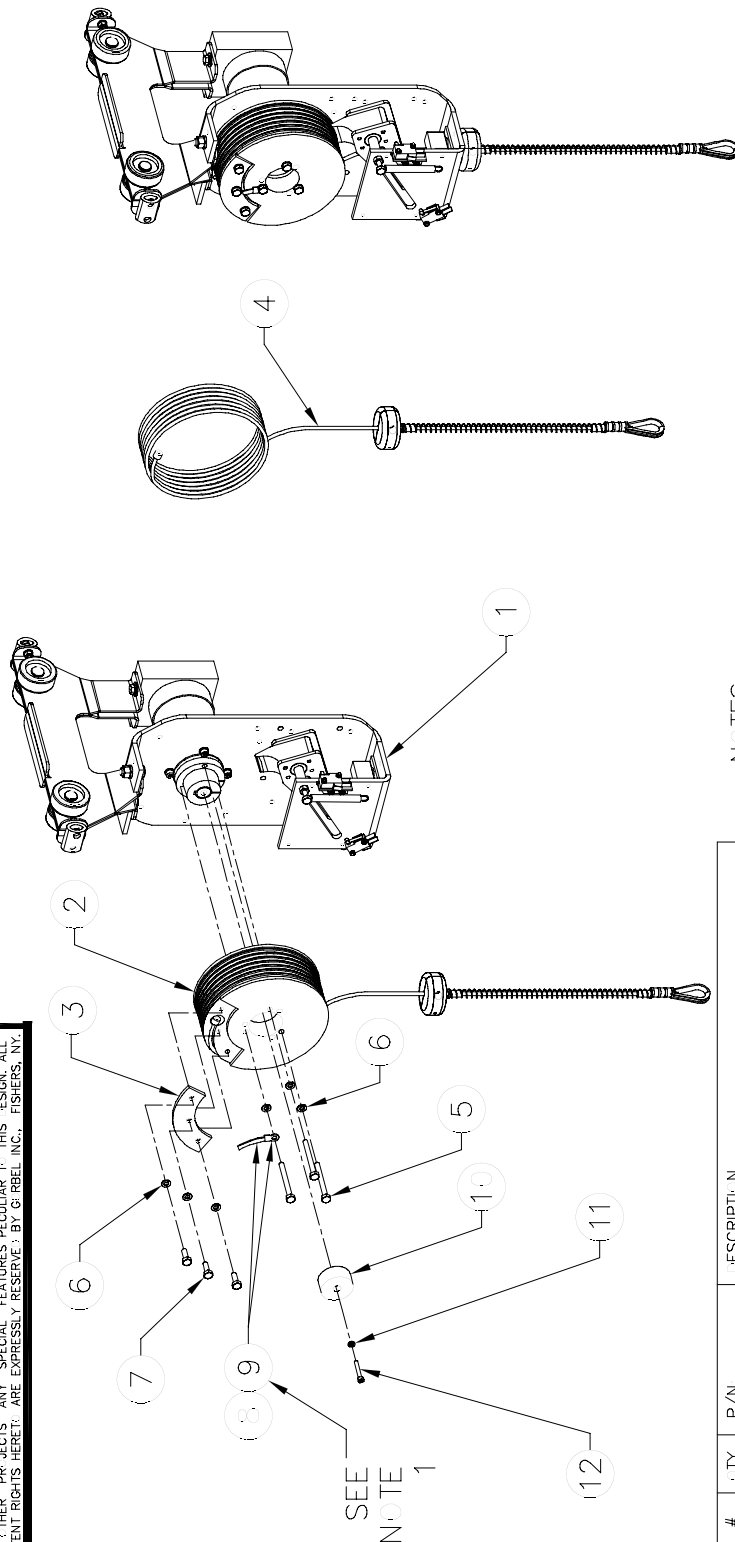


#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	REF ONLY	PULLEY GUIDE MECHANISM
3	1	2916	LIMIT SWITCH SPACER SHAFT
4	1	633	HHCS, 1/4"-2" X 5" LG, GR 5, ZNPL
5	2	7752	EXTENSION SPRING, 3/16" X 1-1/2" LG
6	1	1221	HEXNUT, 1/4"-2", ZNPL
7	1	1177	NYLON LOCK NUT, 1/4"-2", ZNPL

150# BX ACTUATOR ASSEMBLY FIGURE A5.

Figure A5. 150# BX Actuator Assembly.

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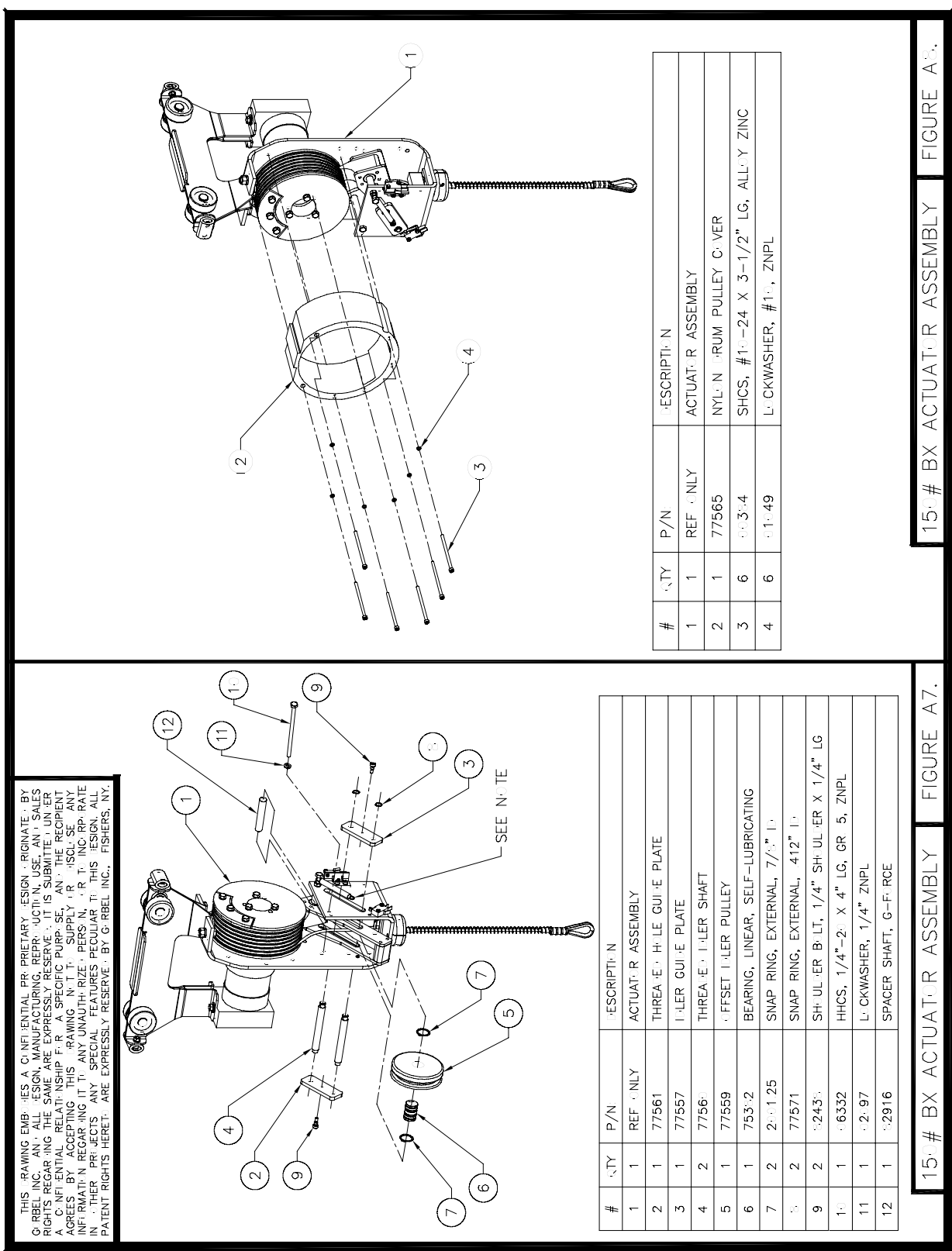
NOTES

- 1) TERMINATE THE BRAIDED GROUND CABLE TO THE BOLT SHOWN. TIN BRAIDED STRAP IS TO LAY OVER THE WIRE ROPE ENTRANCE GROOVE PRIOR TO WIRE ROPE ASSEMBLY.

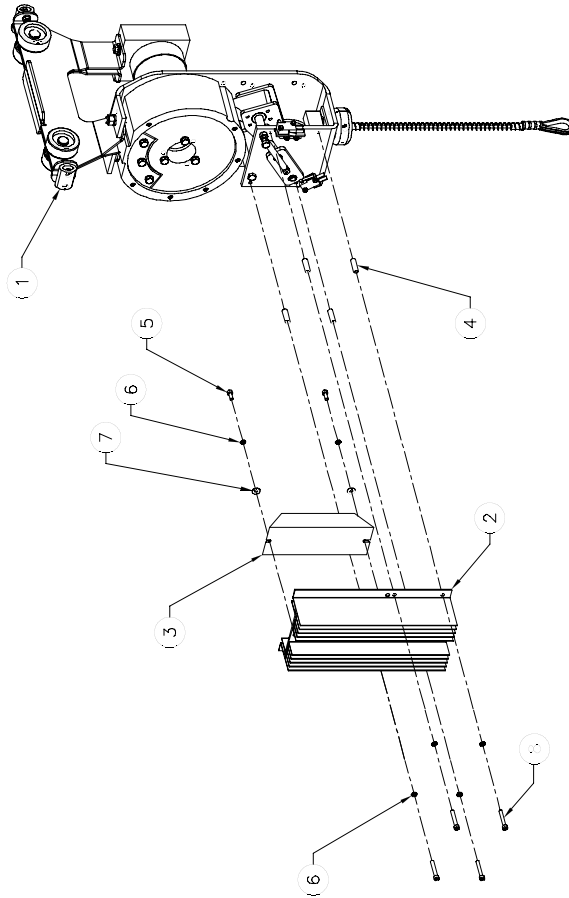
#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	773-1	DRUM PULLEY, 3/16" DIAMETER WIRE ROPE
3	1	773-1**	TERMINATION COVER, (SUPPLIED WITH DRUM)
4	1	773-15	WIRE ROPE ASSEMBLY, 3/16"
5	3	6329	HHCS, 1/4"-20 X 2-1/2" LG GR 5, ZNPL
6	6	62-97	LOCKWASHER, 1/4", ZNPL
7	3	6214	HHCS, 1/4"-20 X 3/4" LG, GR 5, ZNPL
8	1	77964	TERMINAL RING, 1/4" STU, 14-15 AWG
9	3	77966	TINNE COPPER FLAT BRAIDING, 3/16" WIRE
10	1	7753	15 LB BUSHING RETAINER
11	1	66195	LOCKWASHER, M10, ZNPL
12	1	662-9	SHCS, M10 X 1.25 MM PITCH X 30 MM LG

150# BX ACTUATOR ASSEMBLY FIGURE A6.

Figure A6. 150# BX Actuator Assembly.

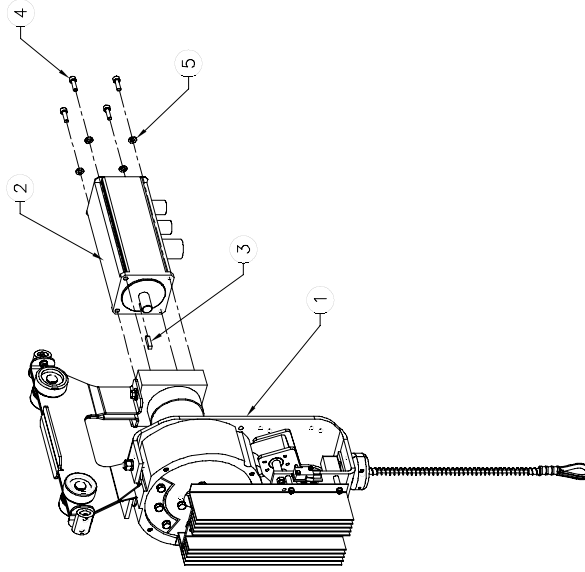


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#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	753-3	HEATSINK, ACTUATOR
3	1	771-6	REGEN RESISTOR, 3 OHM
4	4	77562	HEATSINK SPACER, 1" LG
5	2	77373	SHCS, #1-24 X 1/2" LG
6	6	77149	LOCKWASHER, #1, ZNPL
7	2	77175	FLATWASHER, #1, ZNPL
8	4	77376	SHCS, #1-24 X 1-3/4" LG, SS

150# BX ACTUATOR ASSEMBLY FIGURE A9.



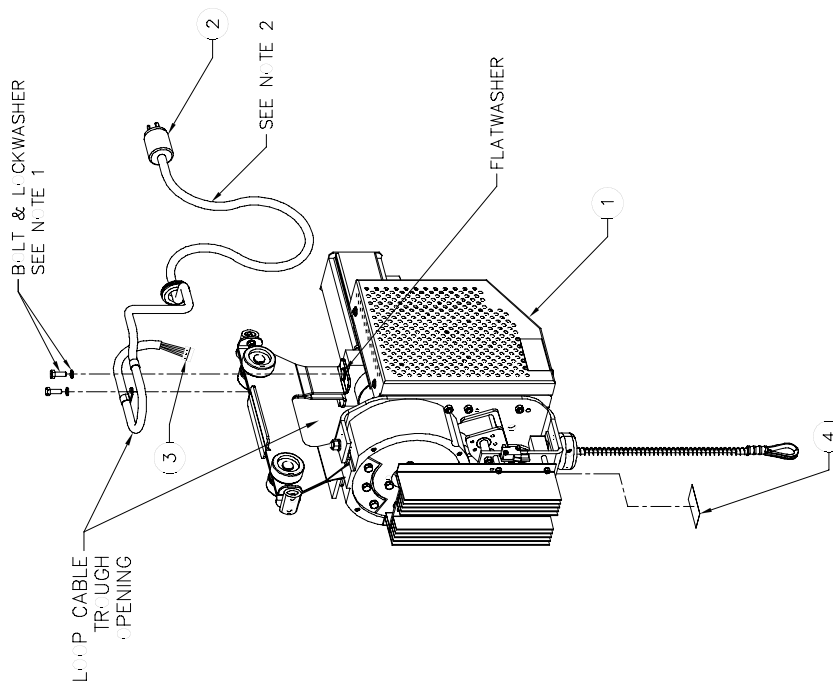
#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	77635	MOTOR, SERV W/ BRAKE, BX SERIES, W C NN
3	1	77621	KEYSTOCK, 5MM DIA, X 777" LG, ZNPL
4	4	77176	SHCS, M6 X 2-MM LG
5	4	77337	LOCKWASHER, M6, ZNPL

150# BX ACTUATOR ASSEMBLY FIGURE A10.

Figure A9 (bottom) & Figure A10 (top). 150# BX Actuator Assembly.

#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY, 15" #, BX
2	1	7219	CONTROLS ASSEMBLY, ML-114
3	3	753-4	WASHER, VIBRATION DAMPING, 1/4" ID
4	3	777	WASHER, VIBRATION DAMPING, 1/4" ID

150# BX ACTUATOR ASSEMBLY



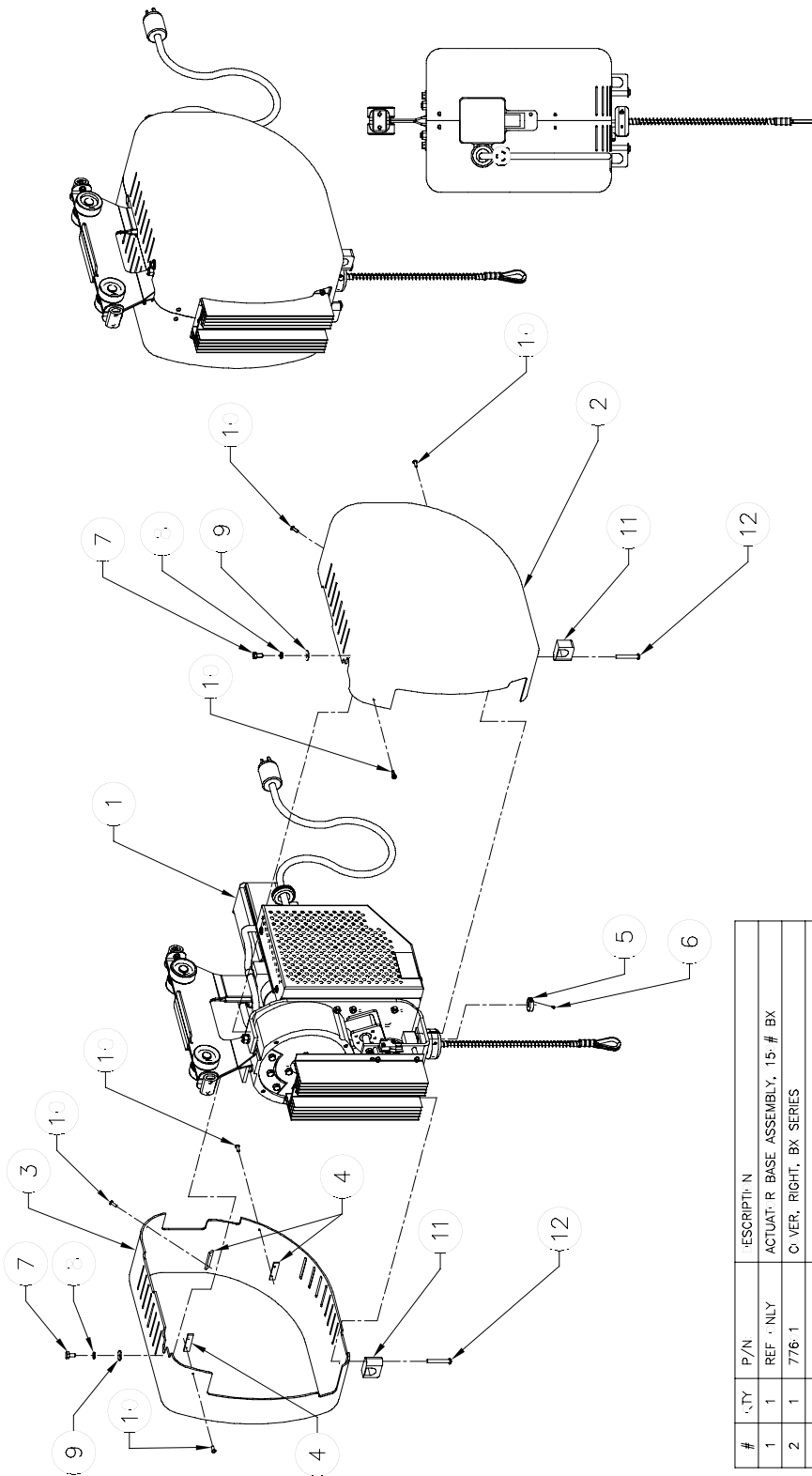
NOTES

- 1) REMOVE THE HARWARE NUTS AT A TIME. RE-ASSEMBLE THE HARWARE THROUGH THE RUBBER CUSHION STEEL LIP STRAPS (AS SHOWN).
- 2) ROUTE CABLE AS SHOWN.

#	ITY	P/N	ESCRPT: N
1	1	REF · NLY	ACTUAT · R ASSEMBLY
2	1	71155	P · WER C · R · ASSEMBLY, G · F · RCE
3	1	7796*	C · NNECT · R, MALE, 5MM, 3 Pl S
4	1	776*	ACTUAT · R TAC · MOTES STAYED

150 # BX ACTUATOR ASSEMBLY

4/04-Rev. S



STANDARD/FLAT MOUNTING UNITS

#	QTY	P/N	DESCRIPTION
11	2	75379	CLAMP, VIBRATION DAMPING, 5/16" LG
12	2	11163	BHCS, 1/4"-20 X 1" LG

STANDARD/FLAT MOUNTING UNITS WITH AIR

#	QTY	P/N	DESCRIPTION
11	2	75379	CLAMP, VIBRATION DAMPING, 3/4" LG
12	2	11164	BHCS, 1/4"-20 X 1-3/4" LG

#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR BASE ASSEMBLY, 150# BX
2	1	776.1	C-VER, RIGHT, BX SERIES
3	1	776.2	C-VER, LEFT, BX SERIES
4	3	71.47	H- USING CONNECTOR STRIP
5	1	7539	LIMIT SWITCH -ISC
6	1	1117	SHCS, #4-48 X 3/4" LG
7	2	11671	HHCS, 1/4"-20 X 1/2" LG
8	2	1297	LICWASHER, 1/4", ZNPL
9	4	1122	FLATWASHER, 1/4", USS, ZNPL
10	6	1211	BHCS, #10-32 X 1/2" LG, ZNPL

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150# BX ACTUATOR ASSEMBLY

FIGURE A13.

Figure A13. 150# BX Actuator Assembly.

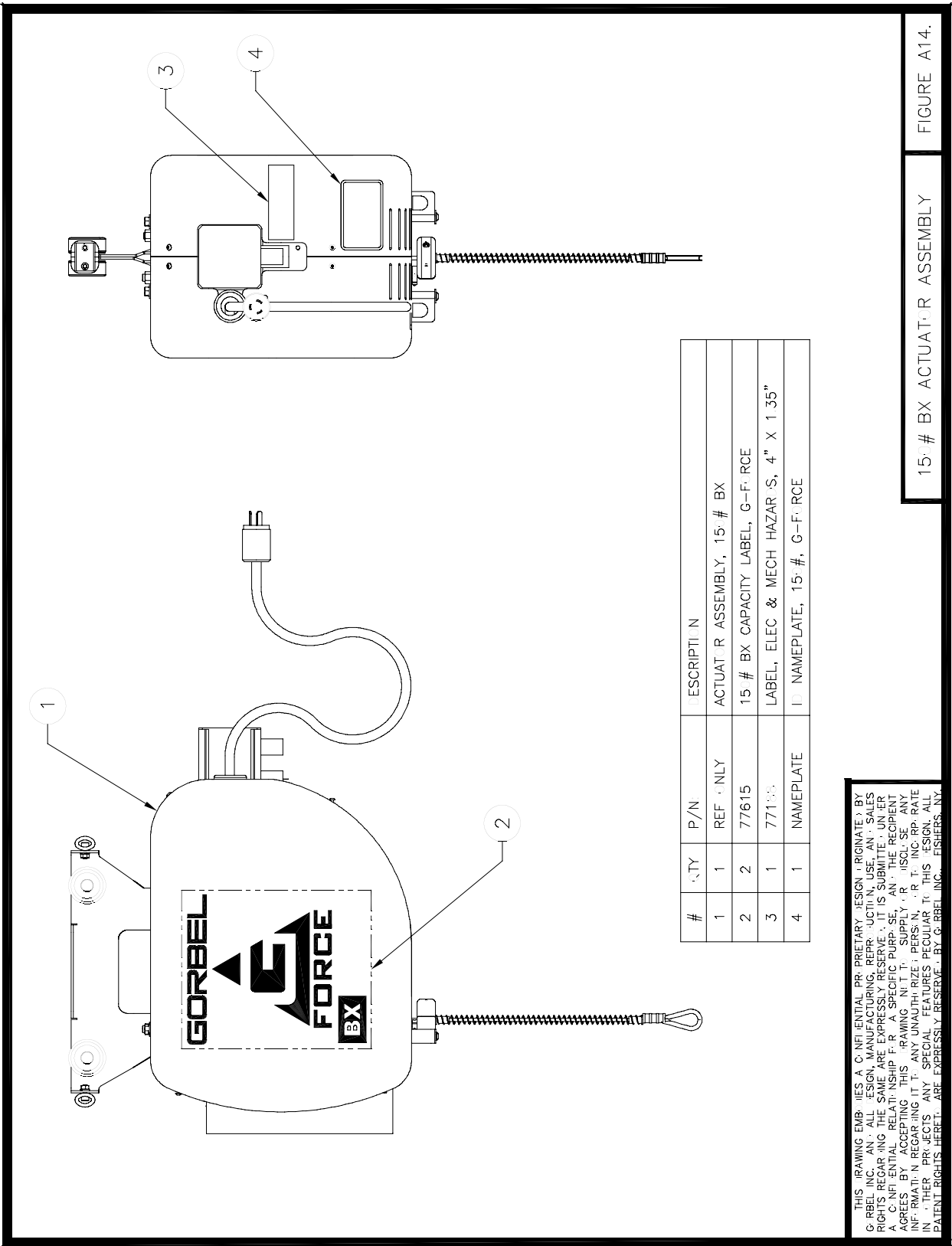
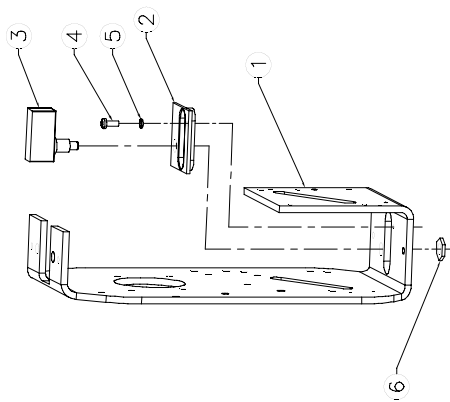


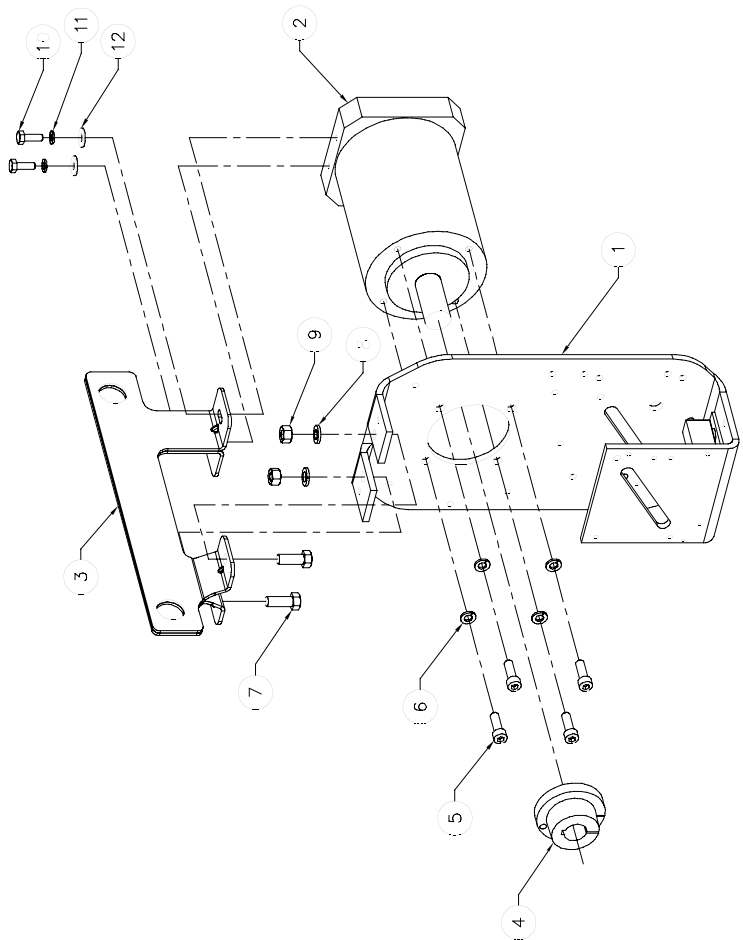
Figure A14. 150# BX Actuator Assembly.

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#	QTY	P/N	DESCRIPTION
1	1	775-3	ACTUATOR FRAME, 3/4\"
2	1	775-3	LIMIT SWITCH, LARGE PLUNGER TYPE
3	1	75354	PHMS, #1-32 X 1/2\"
4	1	1-155	LCKWASHER, #11, ZNPL
5	1	1-149	LCKWASHER, #11, ZNPL
6	1	75354**	LIMIT SWITCH MOUNTING NUT (SUPPLY W/ SWITCH)

300/380# BX ACTUATOR ASSEMBLY FIGURE B1.

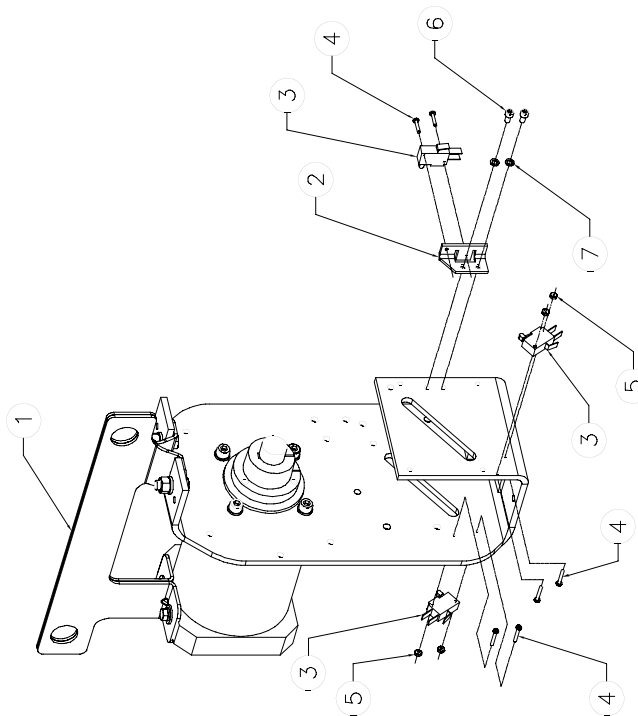


#	QTY	P/N	DESCRIPTION	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY	REF ONLY	ACTUATOR ASSEMBLY
2	1	777-4	GEARBOX, PLANETARY, 7:1 RATIO, W/ KEY	777-4	GEARBOX, PLANETARY, 7:1 RATIO, W/ KEY
3	1	775-4	ADAPTER TRILLEY, 3/4\"	775-4	ADAPTER TRILLEY, 3/4\"
4	1	775-3	LOCK BUSHING	775-3	LOCK BUSHING
5	4	194	SHCS, M10 X 25MM LG	194	SHCS, M10 X 25MM LG
6	4	195	LCKWASHER, M10, ZNPL	195	LCKWASHER, M10, ZNPL
7	2	1356	HKCS, 3/4\"-16 X 1\" LG, GR 5, ZNPL	1356	HKCS, 3/4\"-16 X 1\" LG, GR 5, ZNPL
8	2	1355	LCKWASHER, 3/4\" ZNPL	1355	LCKWASHER, 3/4\" ZNPL
9	2	215	HEXNUT, 3/4\"-16, ZNPL	215	HEXNUT, 3/4\"-16, ZNPL
10	2	214	HKCS, 1/4\"-20 X 3/4\" LG, GR 5, ZNPL	214	HKCS, 1/4\"-20 X 3/4\" LG, GR 5, ZNPL
11	2	297	LCKWASHER, 1/4\" ZNPL	297	LCKWASHER, 1/4\" ZNPL
12	2	122	FLATWASHER, 1/4\" USS, ZNPL	122	FLATWASHER, 1/4\" USS, ZNPL

300/380# BX ACTUATOR ASSEMBLY FIGURE B2.

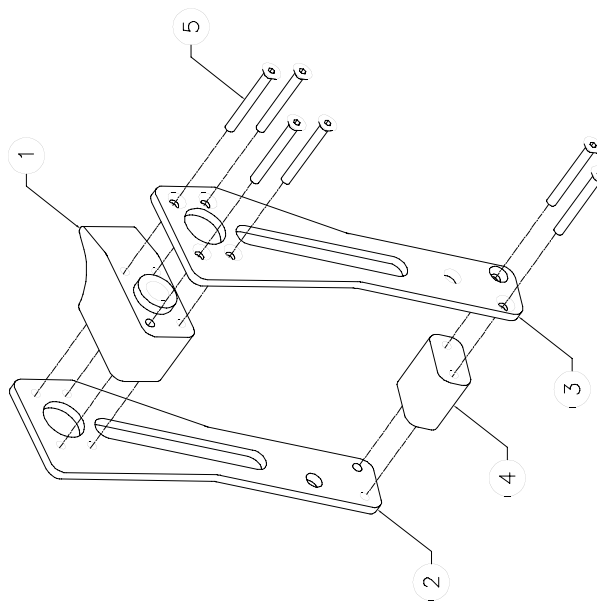
Figure B1 (bottom) & Figure B2 (top). 300/380# BX Actuator Assembly.

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#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	77553	LOWER LIMIT SWITCH BRACKET
3	3	77554	LIMIT SWITCH, ROLLER ARM ACTUATOR, FORM C
4	6	77523	SLRH, #4-40 X 3/4" LG, ZNPL
5	4	77524	HEXNUT, #4-40, ZNPL
6	2	77535	SHCS, #11-24 X 3/16" LG
7	2	77549	LOCKWASHER, #11, ZNPL

300/380# BX ACTUATOR ASSEMBLY FIGURE B3.

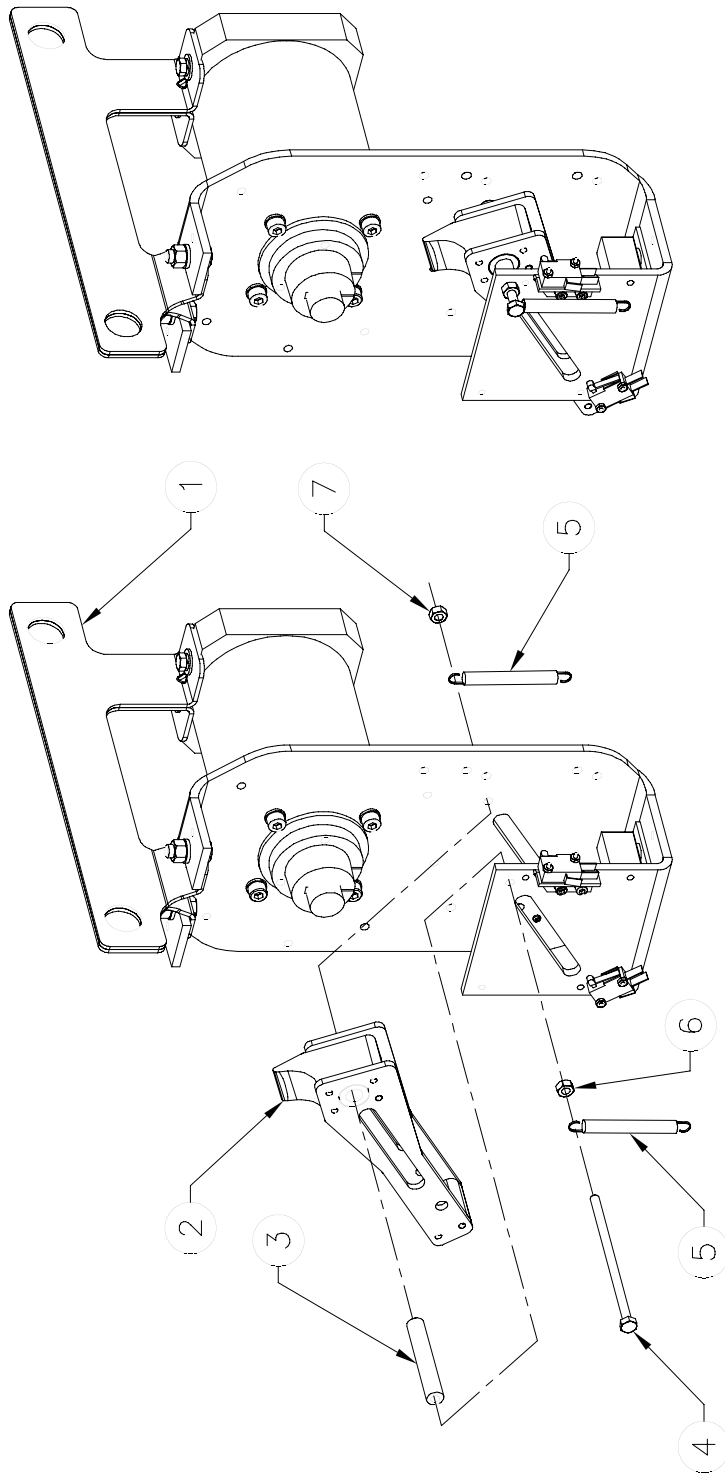


#	QTY	P/N	DESCRIPTION
1	1	77599	GUIDE BLOCK
2	1	77553	GUIDE PLATE, TAPPE, HLES
3	1	77554	GUIDE PLATE, COUNTERSUNK HLES
4	1	77555	SPACER BLOCK
5	6	77533	SHCS, #11-32 X 1-3/4" LG

300/380# BX ACTUATOR ASSEMBLY FIGURE B4.

Figure B3 (bottom) & Figure B4 (top). 300/380# BX Actuator Assembly.

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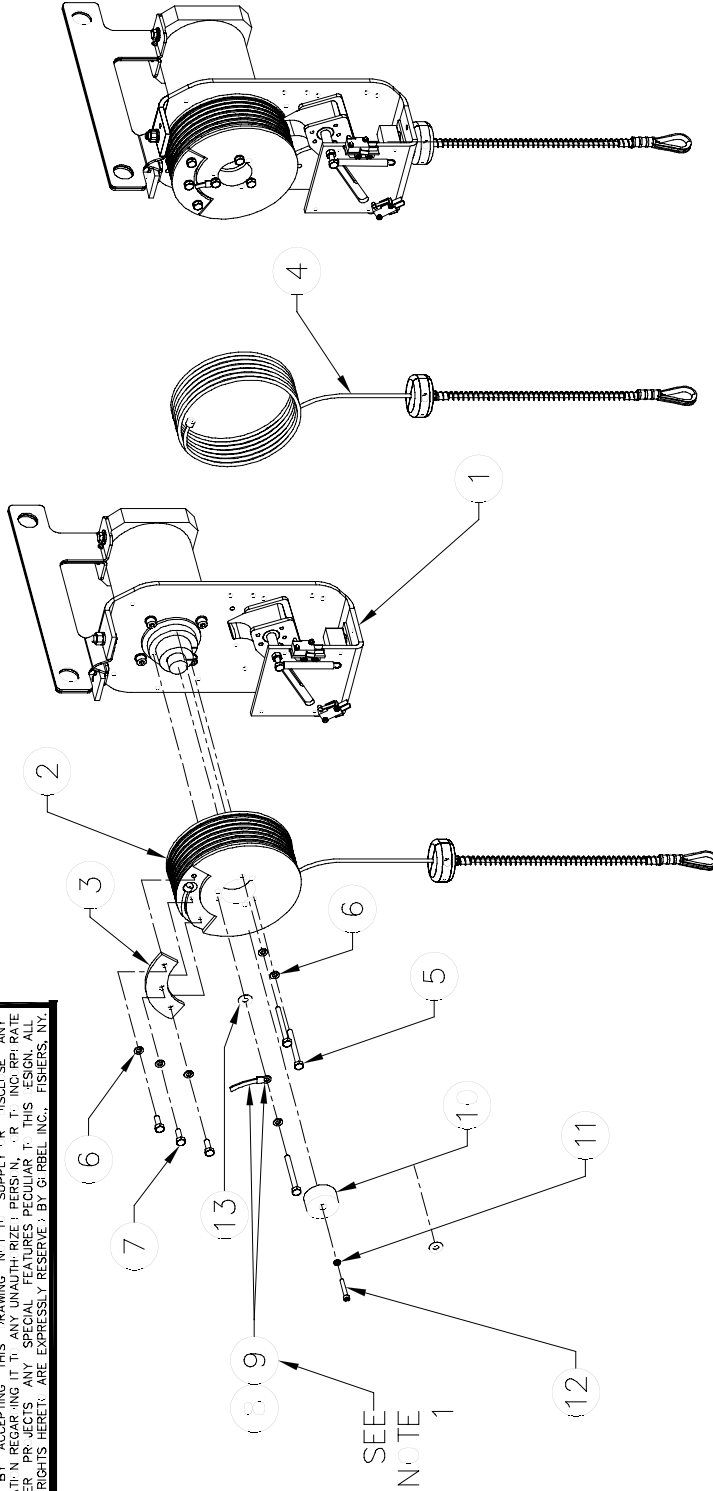


#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	REF ONLY	PULLEY GUIDE MECHANISM
3	1	2916	LIMIT SWITCH SPACER SHAFT
4	1	633	HHCS, 1/4"-2" X 5" LG, GR 5, ZNPL
5	2	77572	EXTENSION SPRING, 3/4" X 1-1/2" LG
6	1	1221	HEX NUT, 1/4"-2", ZNPL
7	1	1177	NYLON NUT, 1/4"-2", ZNPL

300/380# BX ACTUATOR ASSEMBLY FIGURE B5.

Figure B5. 300/380# BX Actuator Assembly.

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NOTES

- 1) TERMINATE THE BRAIDED GROUND CABLE TO THE BOLT SHOWN. TIN BRAIDED STRAP IS TO LAY OVER THE WIRE ROPE ENTRANCE GROOVE PRIOR TO WIRE ROPE ASSEMBLY.

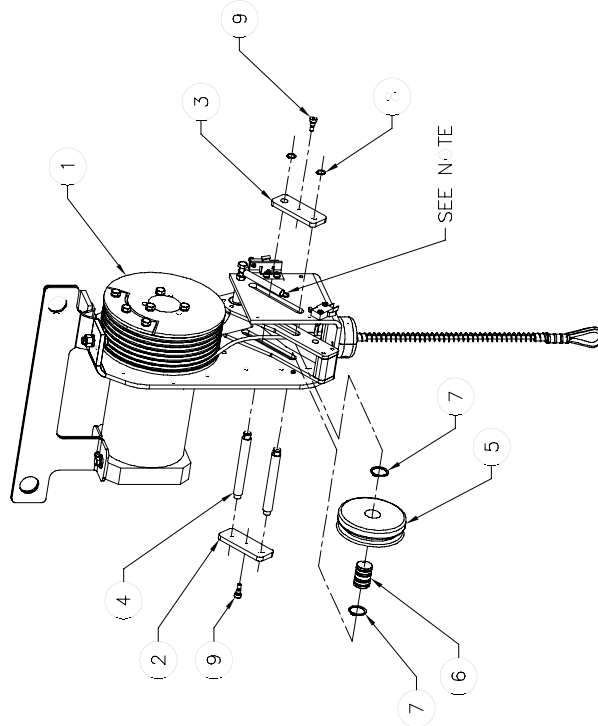
#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	773-1	DRUM PULLEY, 3/16" DIAMETER WIRE ROPE
3	1	773-1**	TERMINATING COVER, (SUPPLIED WITH DRUM)
4	1	77315	WIRE ROPE ASSEMBLY, 3/16"
5	3	6329	HHCS, 1/4"-2" X 2-1/2" LG GR 5, ZNPL
6	6	6297	LOCKWASHER, 1/4", ZNPL
7	3	6214	HHCS, 1/4"-2" X 3/4" LG, GR 5, ZNPL
8	1	77964	TERMINAL RING, 1/4" STU, 14-15 AWG
9	3	77966	TINNED COPPER FLAT BRAIDING, 3/16" WIDE
10	1	77531	3/16" LB BUSHING RETAINER
11	1	6214	LOCKWASHER, M10, ZNPL
12	1	6214	SHCS, M10 X 1.5 MM PITCH X 3.0 MM LG
13	1	6122	1/4" FLAT WASHER, ZNPL

300/380# BX ACTUATOR ASSEMBLY FIGURE B6.

Figure B6. 300/380# BX Actuator Assembly.

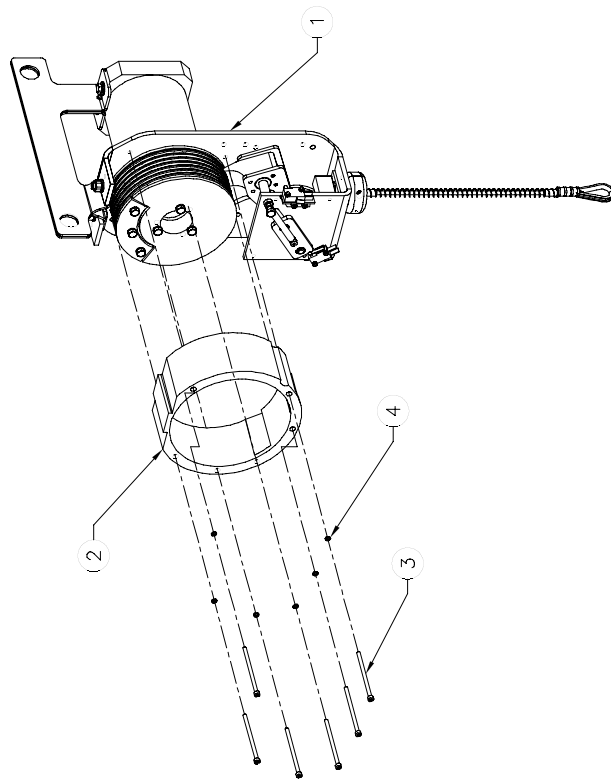
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NOTE: CONNECT LINE ENDS OF EXTENSION SPRINGS (2) TO THE SHULDER BOLTS DURING INSTALLATION.



#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	77561	THRUST PLATE
3	1	77557	THRUST PLATE
4	2	7756	THRUST PLATE
5	1	77559	THRUST PLATE
6	1	753-2	BEARING, LINEAR, SELF-LUBRICATING
7	2	2-1125	SNAP RING, EXTERNAL, 7/16" ID
8	2	77571	SNAP RING, EXTERNAL, .412" ID
9	2	1243	SHULDER BOLT, 1/4" SHULDER X 1/4" LG

300/380# BX ACTUATOR ASSEMBLY FIGURE B7.

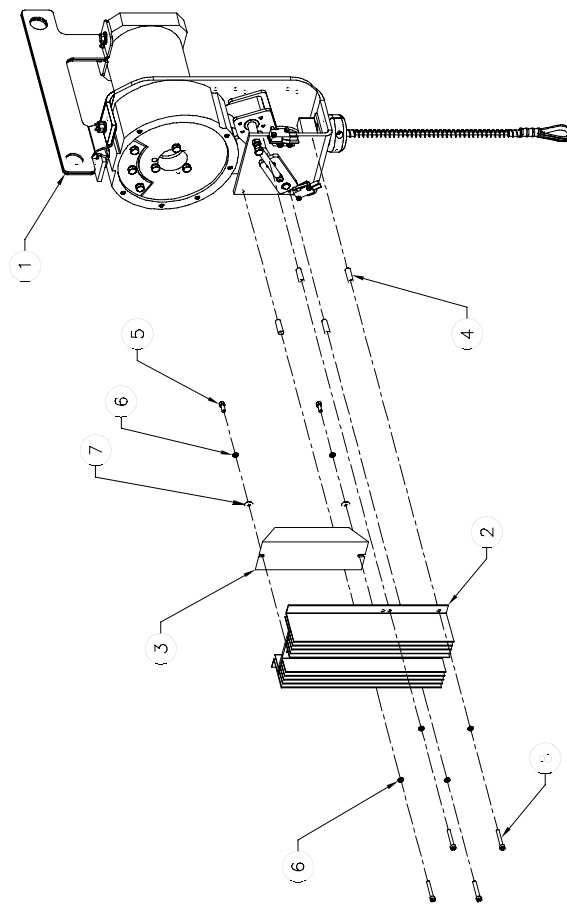


#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	77565	THRUST PLATE
3	6	13-4	SHCS, #10-24 X 3-1/2" LG, ALL-Y ZINC
4	6	11-49	LOCKWASHER, #10, ZNPL

300/380# BX ACTUATOR ASSEMBLY FIGURE B8.

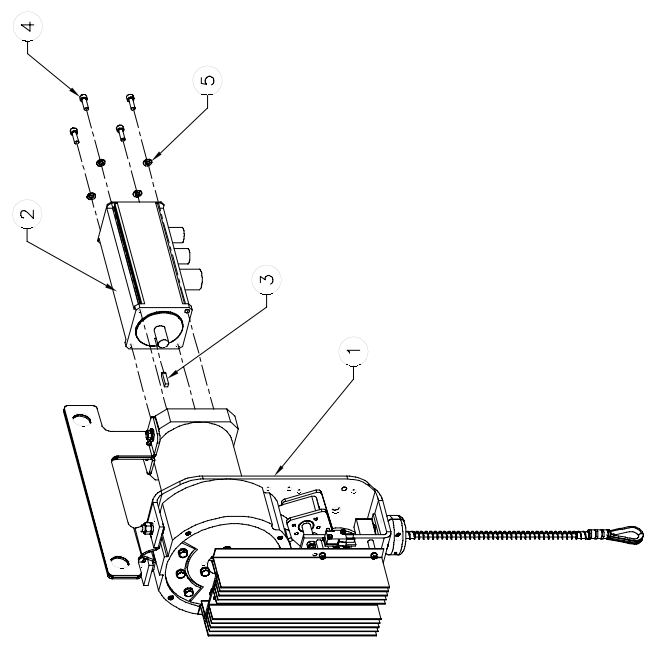
Figure B7 (bottom) & Figure B8 (top). 300/380# BX Actuator Assembly.

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#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	753-3	HEATSINK, ACTUATOR
3	1	771-6	REGEN RESISTOR, 3" HM
4	4	77562	HEATSINK SPACER, 1" LG
5	2	373	SHCS, #1-24 X 1/2" LG
6	6	1-49	LOCKWASHER, #1, ZNPL
7	2	175	FLATWASHER, #1, ZNPL
8	4	3-6	SHCS, #1-24 X 1-3/4" LG, SS

300/380# BX ACTUATOR ASSEMBLY FIGURE B9.

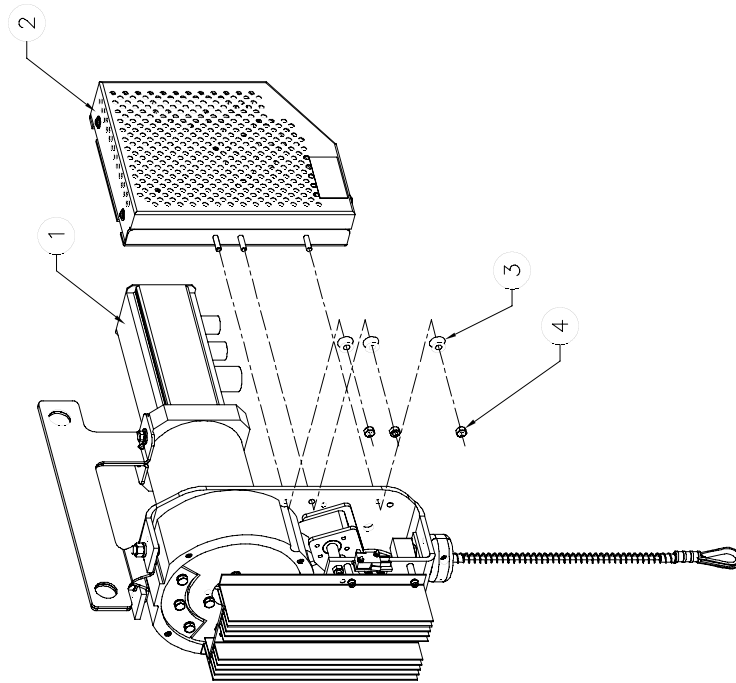


#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	77635	SERV MOTOR W/ BRAKE, BX SERIES, W/ DINN
3	1	77621	KEYSTOCK, 5MM DIA, X 1.777" LG, ZNPL
4	4	1-1-6	SHCS, M6 X 2 MM LG
5	4	337	LOCKWASHER, M6, ZNPL

300/380# BX ACTUATOR ASSEMBLY FIGURE B10.

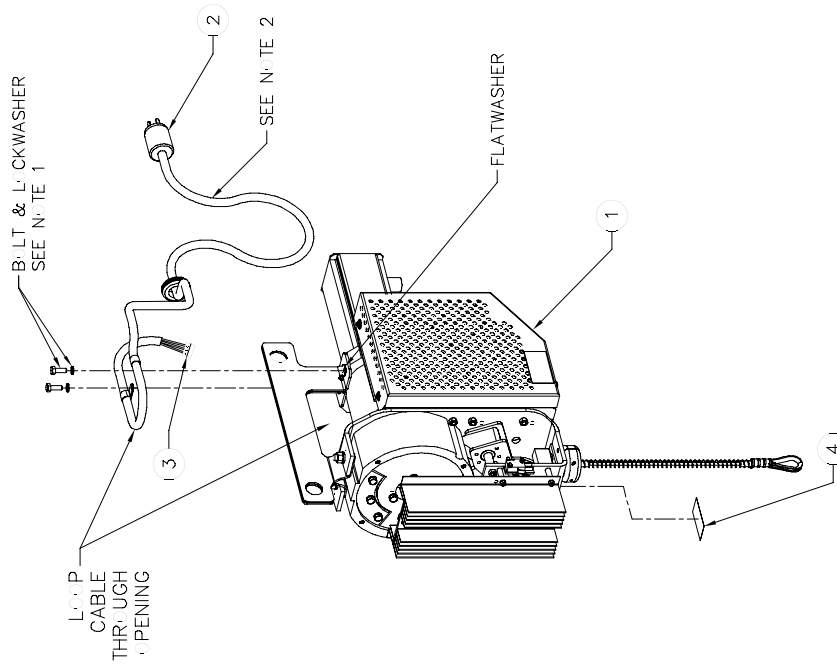
Figure B9 (bottom) & Figure B10 (top). 300/380# BX Actuator Assembly.

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#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY, 300# BX
2	1	7219	CONNECTOR ASSEMBLY, ML-114
3	3	7534	WASHER, VIBRATING, 1/4"
4	3	1177	NYLON NUT, 1/4"-20, ZNPL

300/380# BX ACTUATOR ASSEMBLY FIGURE B11.



- NOTES
- 1) REMOVE THE HARDWARE ONE STEP AT A TIME. RE-ASSEMBLE THE HARDWARE THROUGH THE RUBBER CUSHION STEEL LOOP STRAPS (AS SHOWN).
 - 2) ROUTE CABLE AS SHOWN.

#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	71155	POWER CONNECTOR ASSEMBLY, G-F-RCE
3	1	7796	CONNECTOR, MALE, 5MM, 3 P.S
4	1	7760	ACTUATOR TAG MATRICE STICKER

300/380# BX ACTUATOR ASSEMBLY FIGURE B12.

Figure B11 (bottom) & Figure B12 (top). 300/380# BX Actuator Assembly.

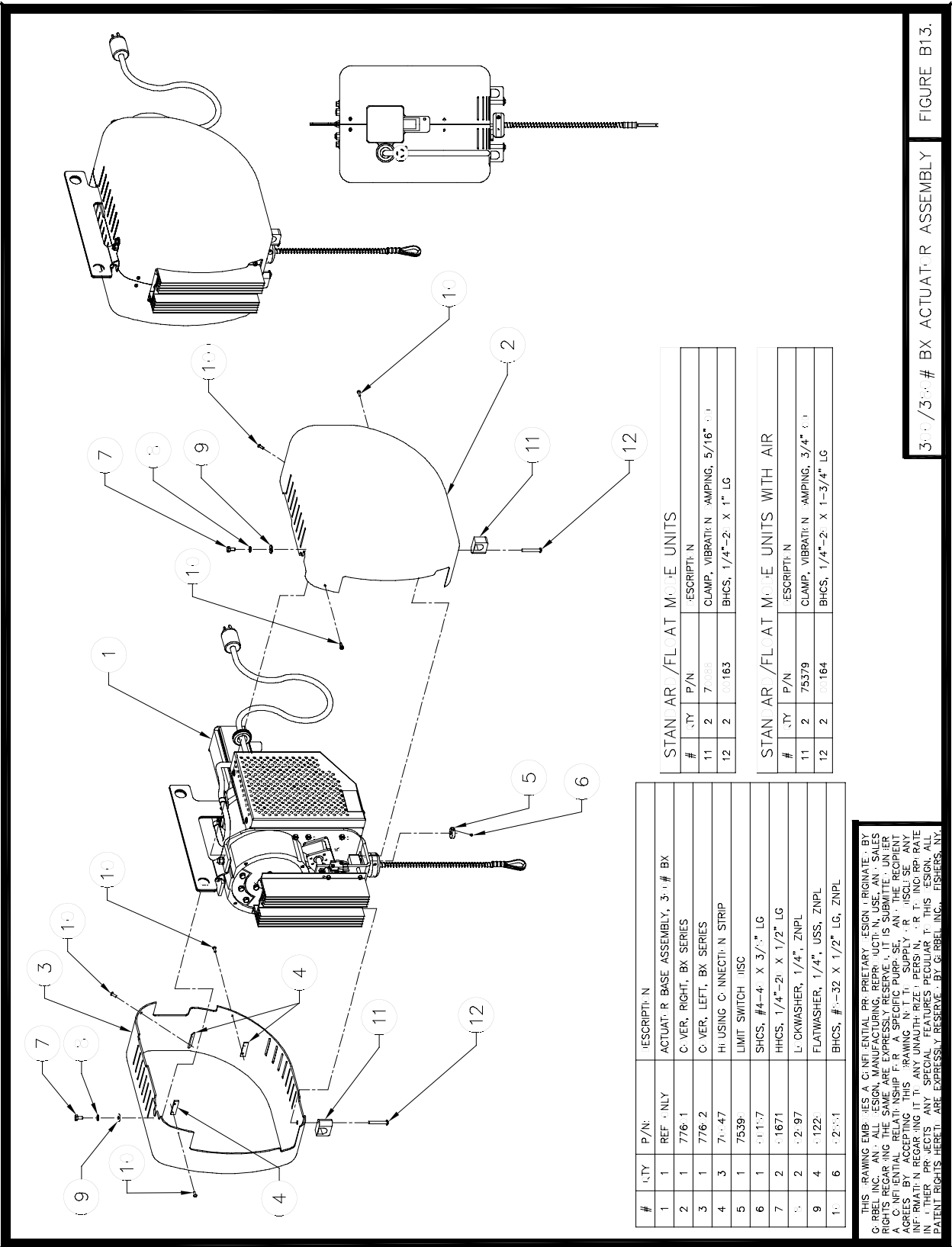
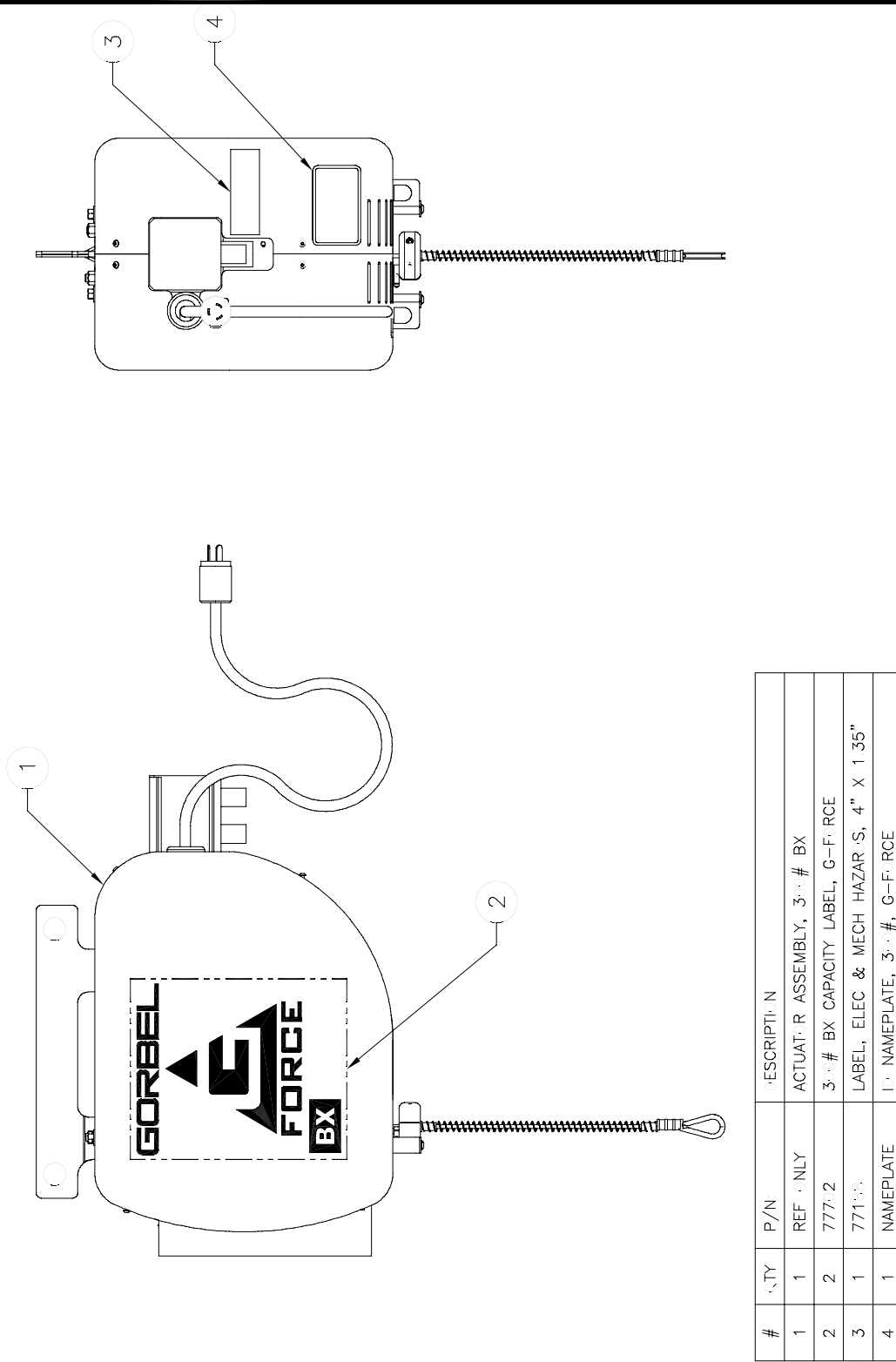


Figure B13. 300/380# BX Actuator Assembly.



#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY, 300# BX
2	2	777-2	300# BX CAPACITY LABEL, G-F RCE
3	1	771-1	LABEL, ELEC & MECH HAZARD, 4" X 1.35"
4	1	NAMEPLATE	NAMEPLATE, 300#, G-F RCE

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300/380# BX ACTUATOR ASSEMBLY FIGURE B14.

APPENDIX C - BX STANDARD HANDLE ASSEMBLY DRAWINGS

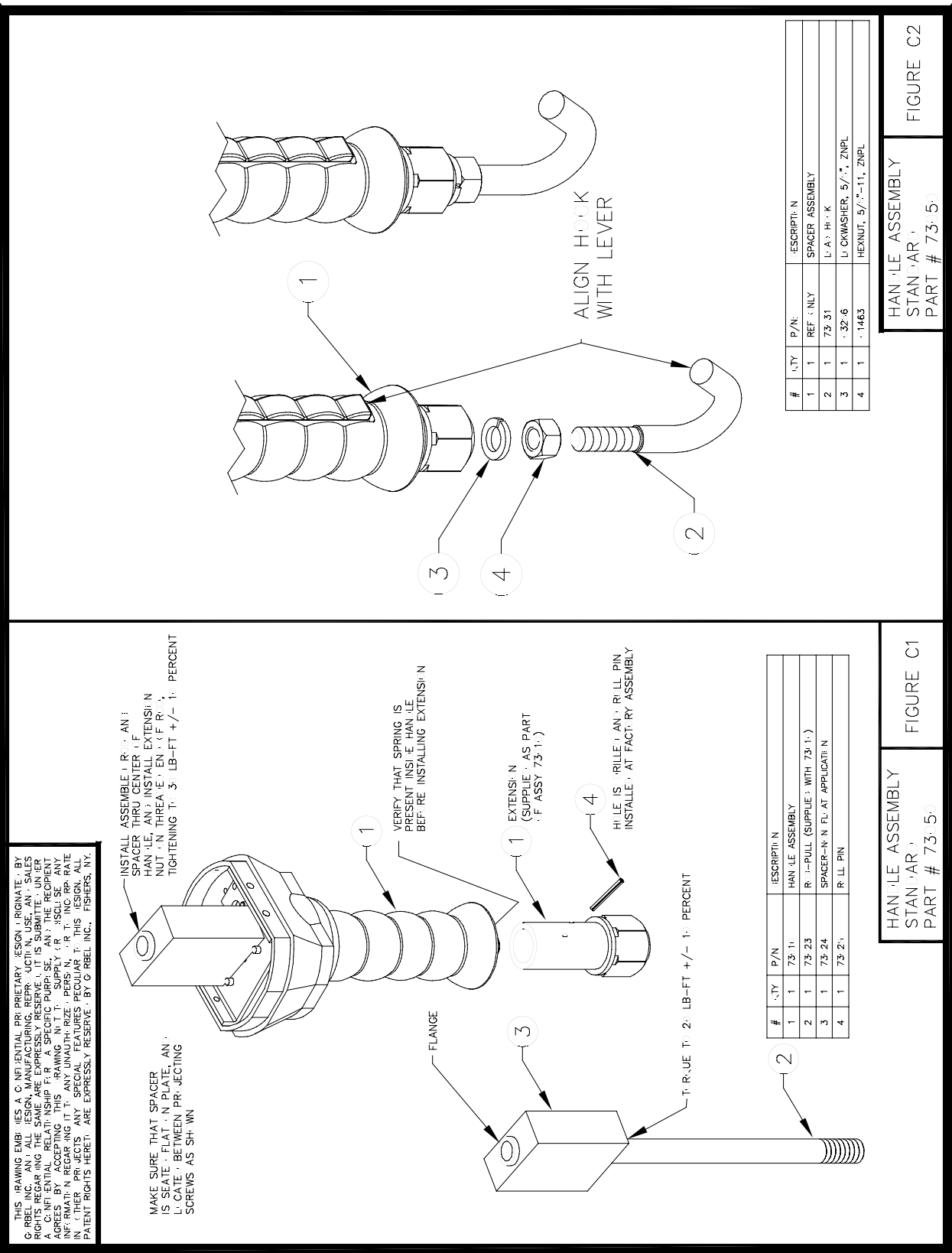
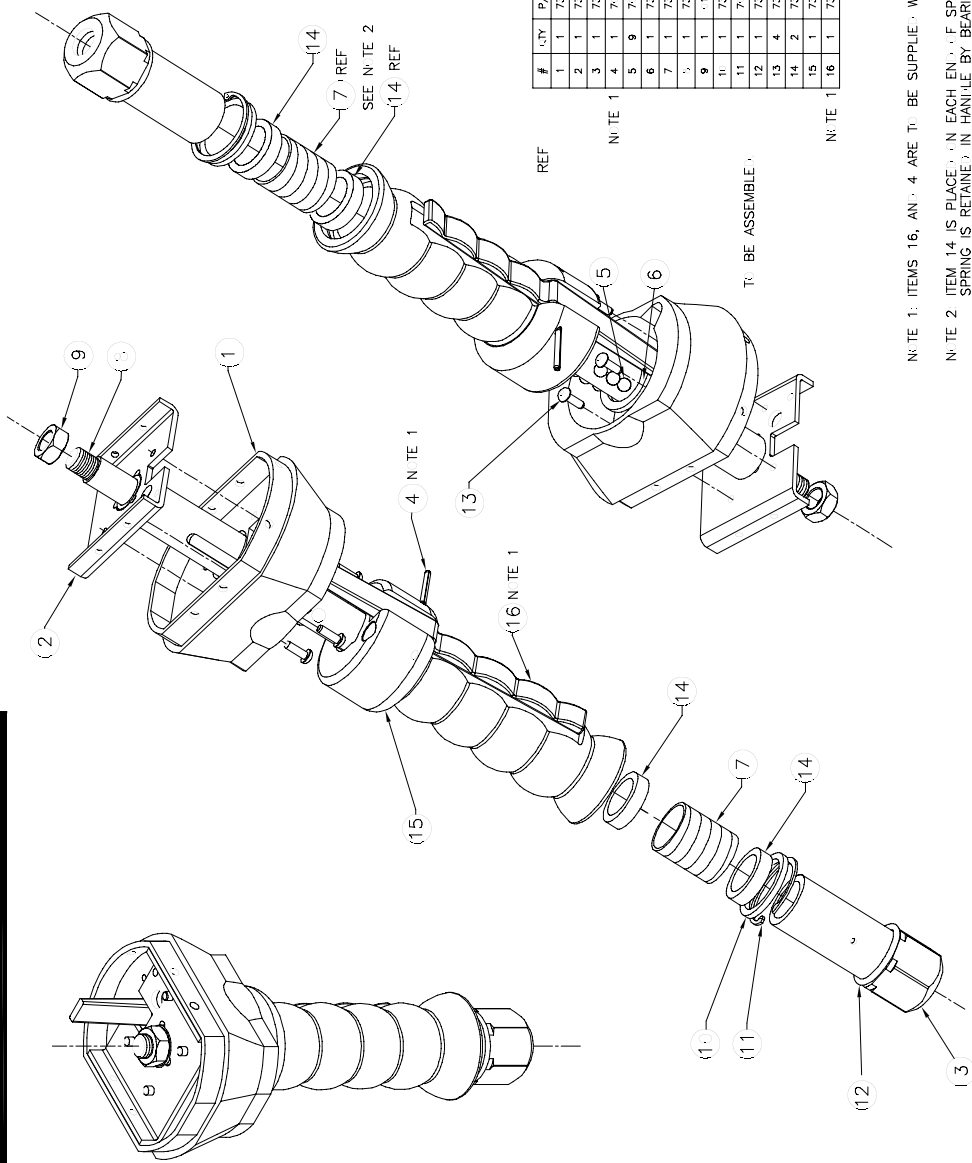


Figure C1 (bottom) & Figure C2 (top). Standard Handle Assembly.

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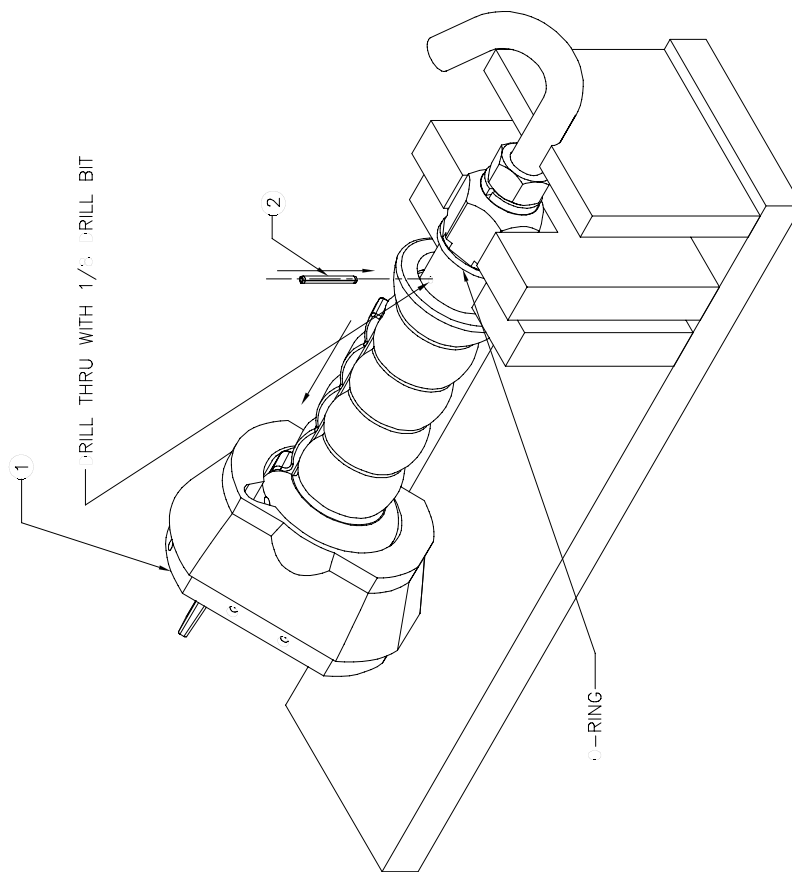
#	QTY	P/N	DESCRIPTION
1	1	73-17	BASE
2	1	73-2	TOP PLATE ASSEMBLY
3	1	73-15	EXTENSION
4	1	7-25	RI-LL PIN
5	9	7-93	BEARING BALL 25-14
6	1	73-16	BUFFER
7	1	73-19	HANDLE SPRING
9	1	1985	1/2-20 JAM NUT-ZN PLATE
11	1	7-94	WASHER-NUT N
12	1	73-29	RETAINING RING
13	4	73-32	1-32 X .5 BUSH
14	2	73-33	BEARING
15	1	73-34	HANDLE
16	1	73-35	LEVER

NOTE 1: ITEMS 16, AND 4 ARE TO BE SUPPLIED WITH ASSEMBLY 73-1, BUT ARE NOT
 NOTE 2: ITEM 14 IS PLACED IN EACH END OF SPRING (ITEM 7)
 SPRING IS RETAINED IN HANDLE BY BEARING (14) AND ITEM 1

G-FORCE HANDLE BASE FIGURE C3

Figure C3. Standard Handle Assembly.

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ASSEMBLY PROCEDURE

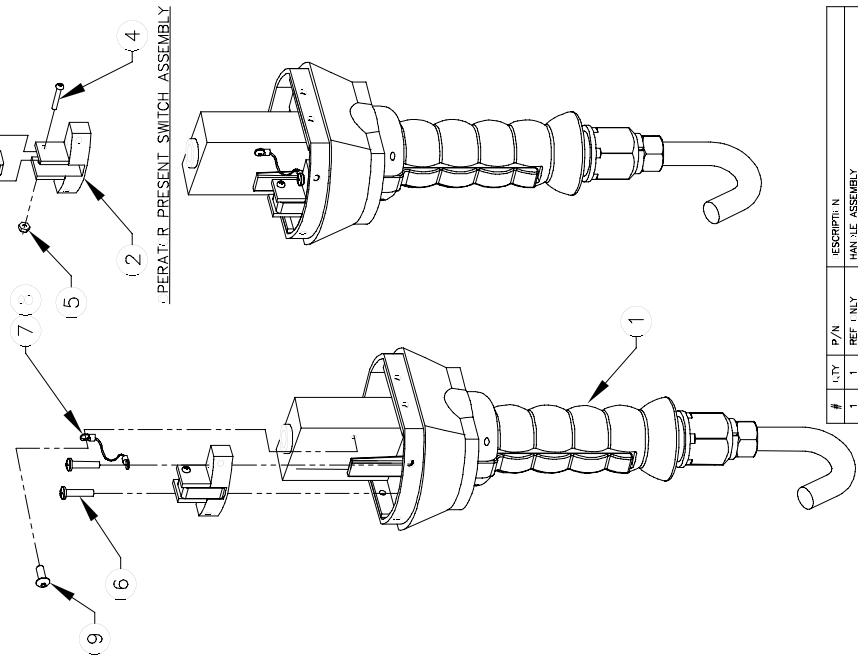
1. PUSH HANDLE OF ASSEMBLY FULLY INTO BASE, EXPANDING PILET HOLE IN THE SIDE OF EXTENSION.
2. PLACE IN FIXTURE, WITH HOLE UP.
3. DRILL COMPLETELY THRU EXTENSION AND REMOVE ANY CHIPS, AND BURRS FROM BOTH ENDS OF HOLE.
4. PRESS OR DRIVE ROLL PIN THRU EXTENSION, MAKING SURE THAT BOTH ENDS ARE FLUSH TO SLIGHTLY BELOW FLUSH, AND THAT THERE ARE NO BURRS.
5. OPERATE HANDLE SEVERAL TIMES THRU FULL TRAVEL RANGE TO ENSURE THAT NO BINDING CAN BE DETECTED.

#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	HANDLE- ASSEMBLY
2	1	73-21	ROLL PIN

HANDLE PIN OPERATION FIGURE C4

Figure C4. Standard Handle Assembly.

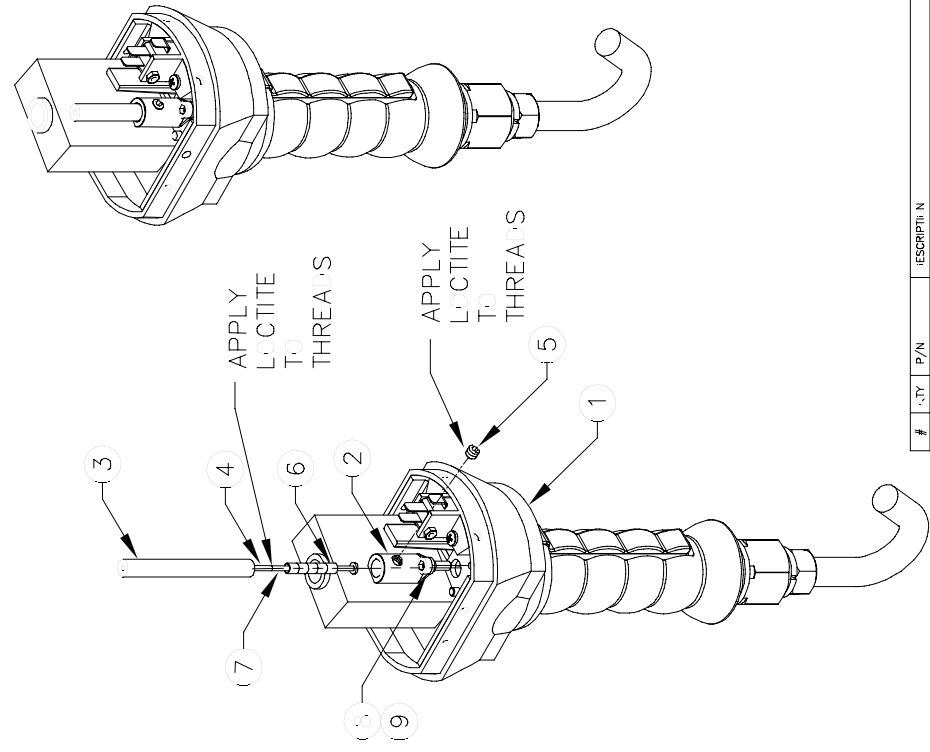
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#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	HANDLE ASSEMBLY
2	1	77-11	OPERATOR PRESENT SWITCH INSERT
3	1	77-14	LIMIT SWITCH ROLLER ARM ACT. FR. M.C.
4	1	77-23	SLIP, #4-6 X 3/4" LG. ZNPL
5	1	77-24	HEX NUT, #4-4, ZNPL
6	2	77-26	PHILS. #1 X 3/4" LG. STAINLESS
7	3	77-53	1/4" KLIP WIRE, 24 AWG. GRN/YEL
8	2	77-56	RING TERMINAL #1-24-26 AWG
9	1	77-171	PHILS #1-32 X 3/4" LG. SUTITE, ZNPL

HANDLE ASSEMBLY
STANDARD
PART # 73-50

FIGURE C5



#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	HANDLE ASSEMBLY
2	1	77-20	LV.T. +/- 1/2" STRIKE, 5 WIRE
3	1	77-99	LV.T. C. RE-SUPPLY W/LV.T.
4	1	77-99	SET-SCREW, 1/4"-2 X 1/4" LG. ALLOY STEEL
5	1	73-36	SPRING-LV.T.
6	1	73-76	EXTENSION-LV.T. Q. RE
7	1	73-75	1-32 X 3/4" SHCS
8	1	73-53	#1-171
9	1	73-49	WASHER

HANDLE ASSEMBLY
STANDARD
PART # 73-50

FIGURE C6

Figure C5 (bottom) & Figure C6 (top). Standard Handle Assembly.

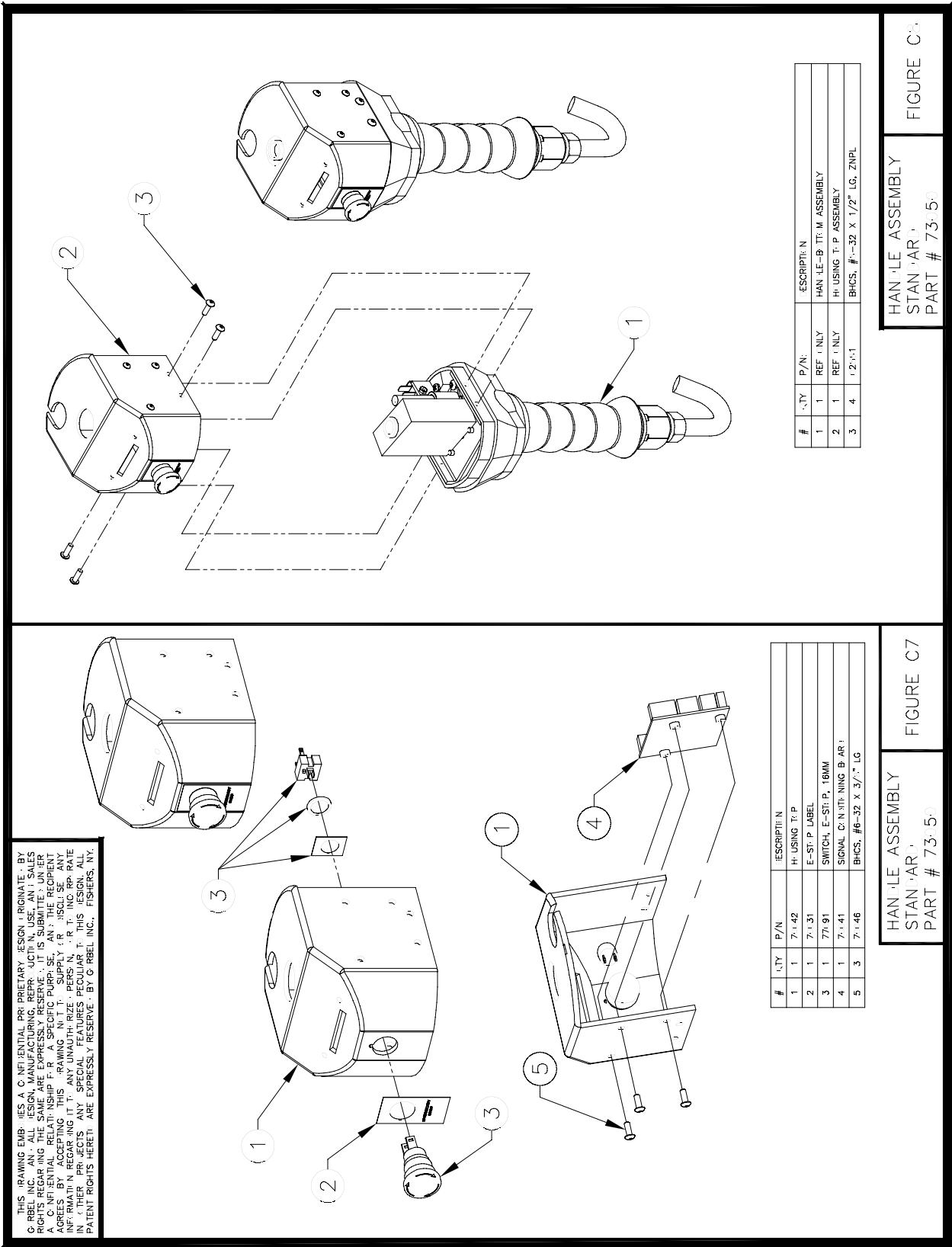
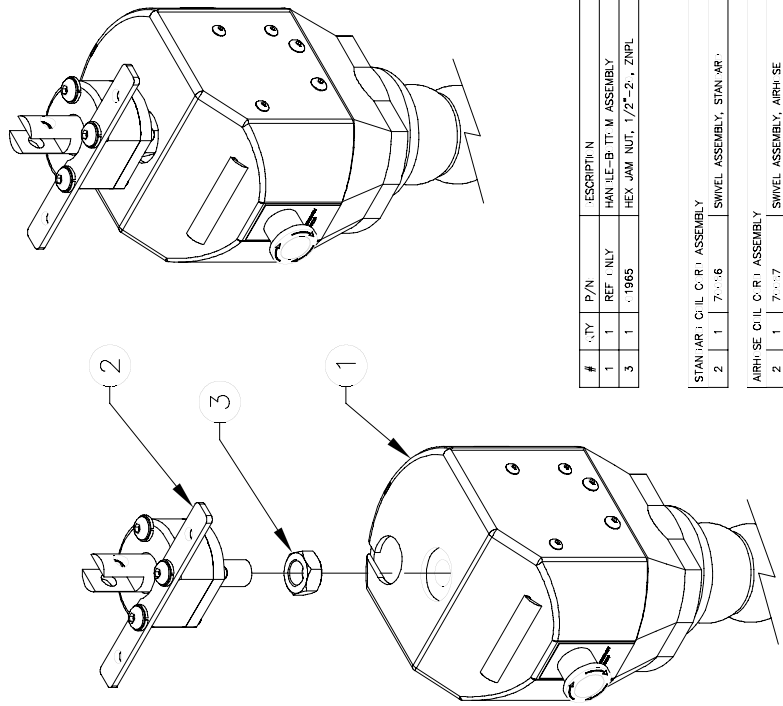


Figure C7 (bottom) & Figure C8 (top). Standard Handle Assembly.

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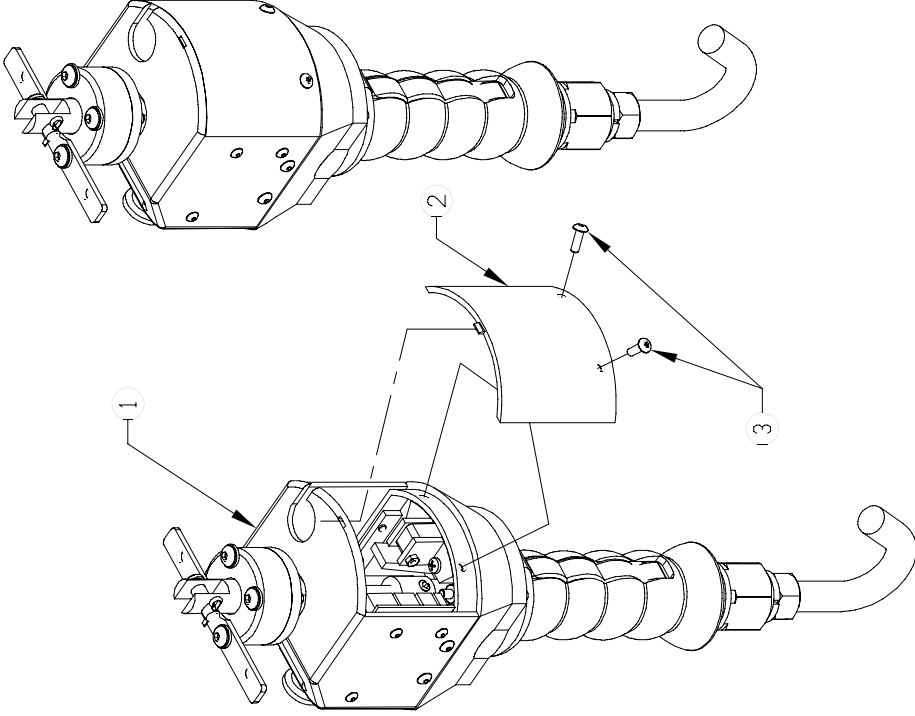
#	QTY	P/N	DESCRIPTION
1	1	REF. ONLY	HANDLE-BOTTOM ASSEMBLY
3	1	1965	HEX JAW NUT, 1/2"-2, ZNPL

#	QTY	P/N	DESCRIPTION
2	1	7-1-6	SWIVEL ASSEMBLY, STANDARD

#	QTY	P/N	DESCRIPTION
2	1	7-1-7	SWIVEL ASSEMBLY, AIRHSE

HANDLE ASSEMBLY
STANDARD,
PART # 73-50

FIGURE C9



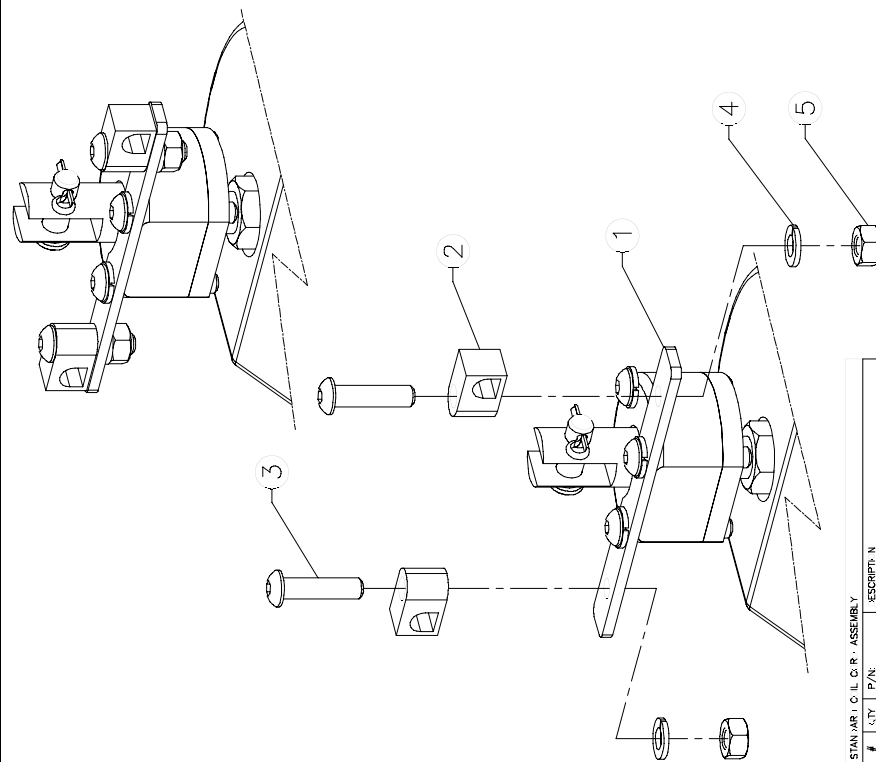
#	QTY	P/N	DESCRIPTION
1	1	REF. ONLY	HANDLE ASSEMBLY
2	1	7-1-1	HOUSING FRONT
3	2	7-2-1	BHCS, #1-32 X 1/2" LG, ZNPL

HANDLE ASSEMBLY
STANDARD,
PART # 73-50

FIGURE C10

#	TYPE	P/N:	DESCRIPTION
1	1	REF - ONLY	HANDLE ASSEMBLY
2	1	7-163	CLEVIS PIN (**C) MES WITH C-TTER PIN**)
3	1	7-163	C-TTER PIN (**C) MES WITH CLEVIS PIN**)

HANDLE ASSEMBLY
STANDARD
PART # 73.5



#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	HAN L/E ASSEMBLY
2	2	7-1111	CLAMP, VBRATI N AMPING, 5/16" X 1
3	2	1-163	BUCS, 1/4"-2. X 1" LG
4	2	1-2197	L'CKWASHER, 1/4", ZNPL
5	2	1-1291	HEXNUT 1/4"-2. ZNPL

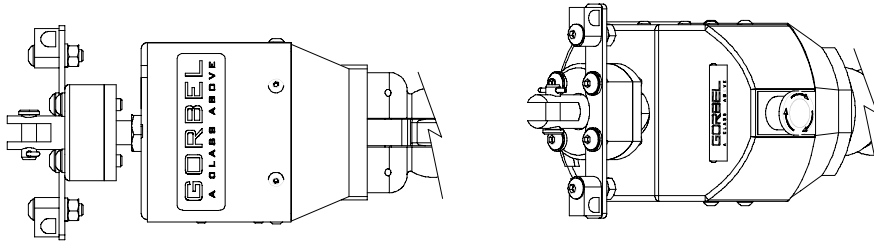
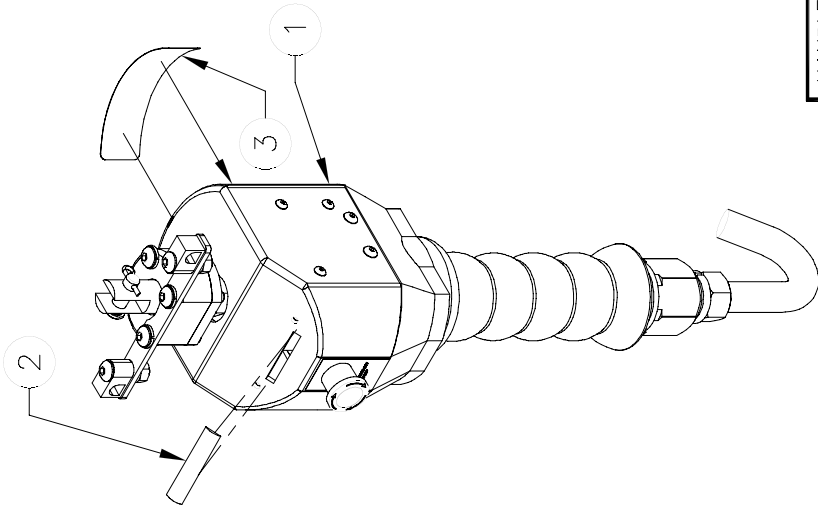
#	QTY	P/N:	DESCRIPTION
1	1	REF ONLY	HAN LE ASSEMBLY
2	2	75579	CLAMP, VIBRATI N, AMPING, 3/4" X 1/2"
3	2	1-164	BUCS, 1/4"-2, X 1-3/4" LG
4	2	12197	L'CKWASHER, 1/4", ZNPL
5	2	12021	KEYHOLE, 1/4"-2, ZNPL

FIGURE C12

HANDLE ASSEMBLY
STANDARD
PART # 73.5

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#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	HANDLE ASSEMBLY
2	1	7-1-4	BOX - ME LABEL
3	1	7-1-32	FRONT GORBEL LABEL



HANDLE ASSEMBLY
STANDARD
PART # 73-50

FIGURE C13

Figure C13. Standard Handle Assembly.

APPENDIX D - BX FLOAT MODE HANDLE ASSEMBLY DRAWINGS

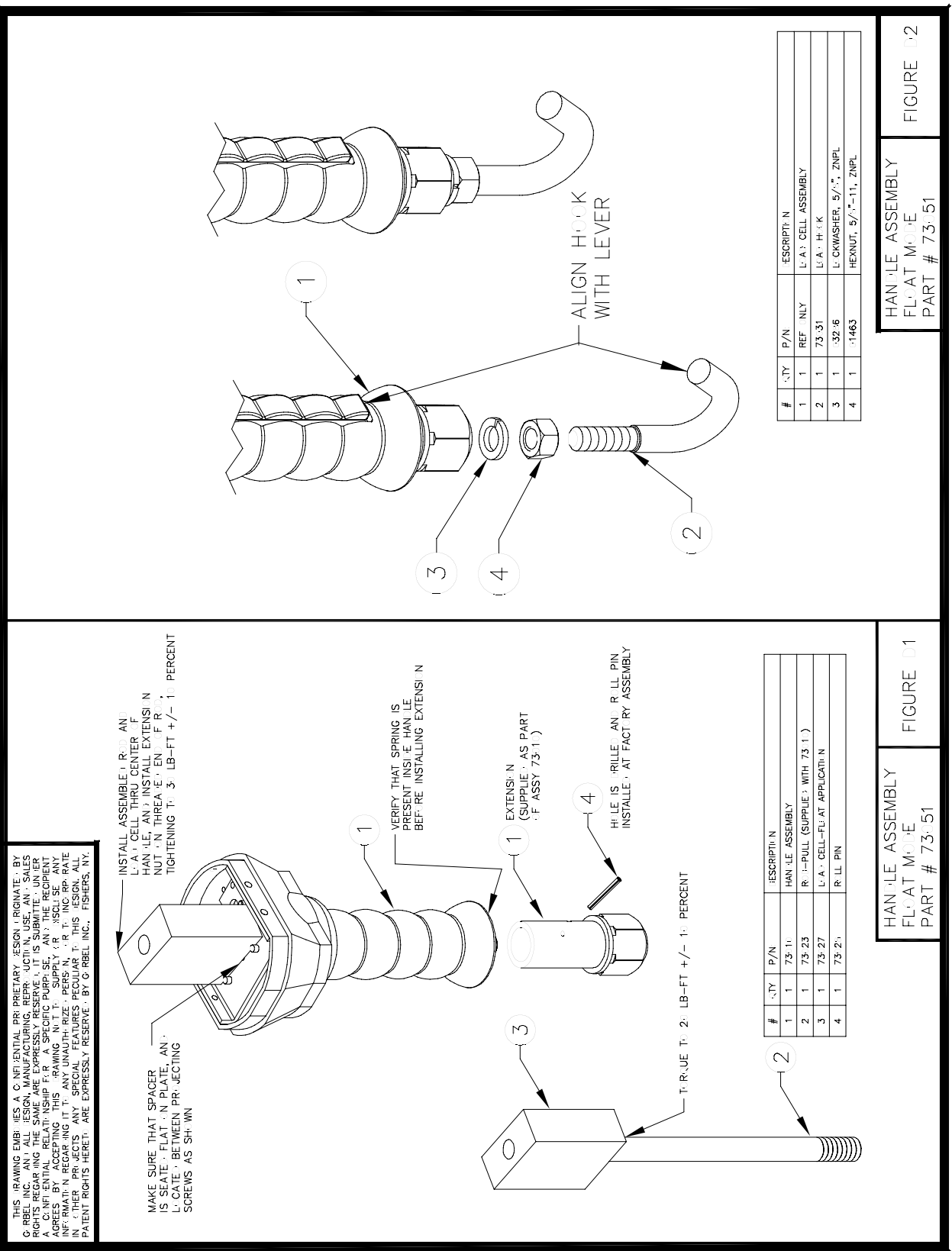
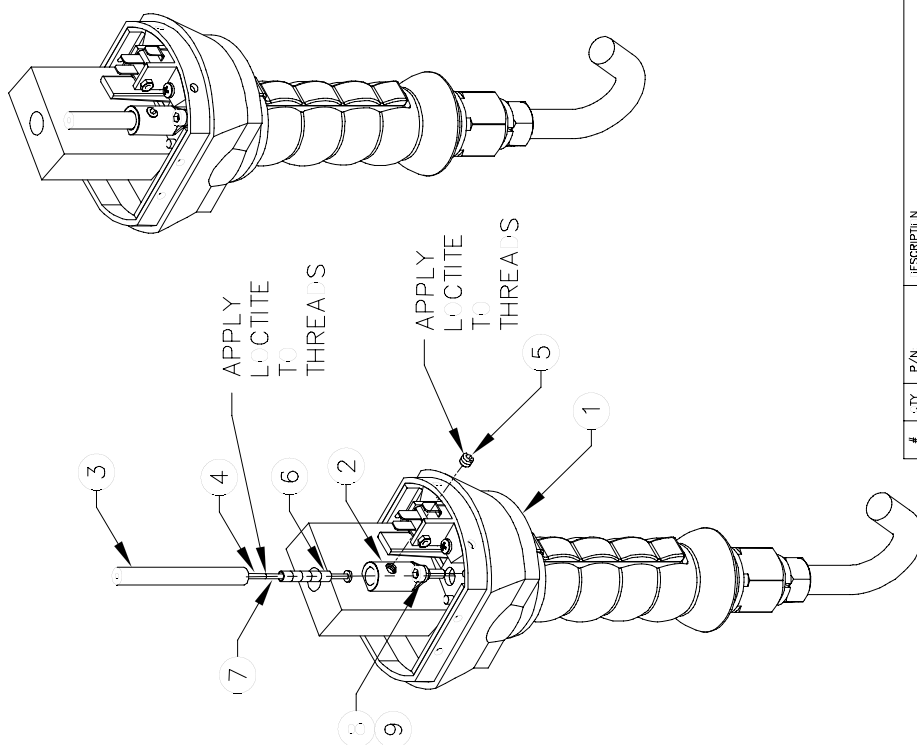


Figure D1 (bottom) & Figure D2 (top). Float Mode Handle Assembly.

#	QTY	P/N	DESCRIPTION
1	1	REF. ONLY	HAN LEE ASSEMBLY
2	1	7-1-11	16 PIN PRESENT SWITCH INSERT
3	1	775-4	LIMIT SWITCH, ROLLER ARM ACT, FR M C
4	1	7-23	LIMIT SWITCH, ROLLER ARM ACT, FR M C
5	1	7-24	SLRMT, #4-4, 3/4" LG, ZNPL
6	1	7-26	HEXNUT, #4-4, ZNPL
7	3	775-53	PHPS, #1/8 X 3/4" LG, STAINLESS
8	1	771-136	HW CTR WIRE, 24 AWG, GRN/YEL
9	1	771-174	DRIVE TERMINAL, #24-26 AWG
10	1	771-174	DRIVE TERMINAL, #24-26 AWG

HANDLE ASSEMBLY
FLOAT MODE
PART # 73-51

FIGURE 03

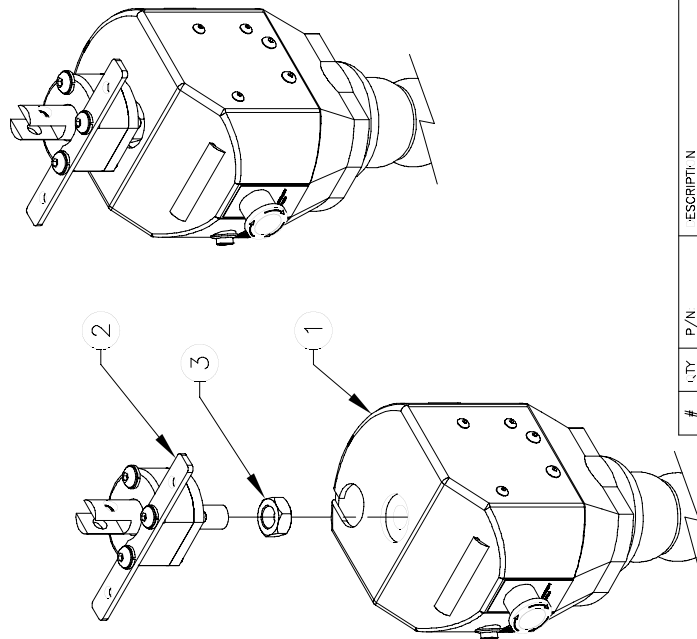


QTY	P/N	DESCRIPTION
1	REF. INLY	HAN LE ASSEMBLY
2	1	LV T B:SS
1	2	LV T B:SS
3	1	LV T. +/- 1/2" STRIKE, 5 WIRE
4	1	LV T C:RE-SUPPLY, 1/4" LG.
5	1	7-36
6	1	73-26
7	1	73-25
8	1	73-3
9	1	73-3
10	1	73-3
11	1	73-3
12	1	73-3
13	1	73-3
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97	1	73-3
98	1	73-3
99	1	73-3
100	1	73-3

HAN · LE ASSEMBLY
 FL · AT MO · E
 PART # 73 · 51

FIGURE D · 4

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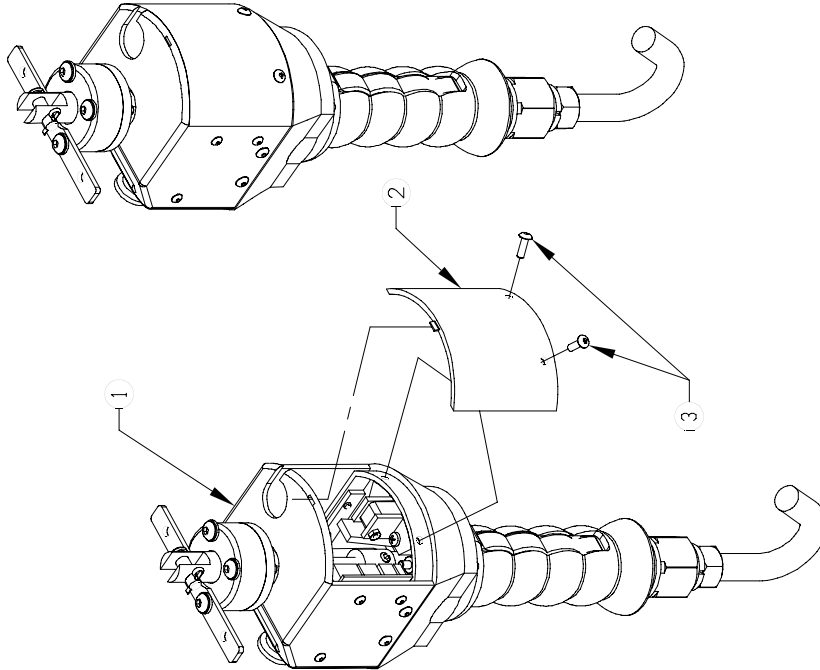
#	QTY	P/N	DESCRIPTION
1	1	REF: NLY	BY-FLAT MODE BASE ASSEMBLY
3	1	1965	HEX JAM NUT, 1/2"-20, ZNPL

#	QTY	P/N	DESCRIPTION
2	1	7-1-6	SWIVEL ASSEMBLY, STAN-AR

#	QTY	P/N	DESCRIPTION
2	1	7-1-7	SWIVEL ASSEMBLY, AIRH-SE

HANDLE ASSEMBLY
FLOAT MODE
PART # 73-51

FIGURE D7



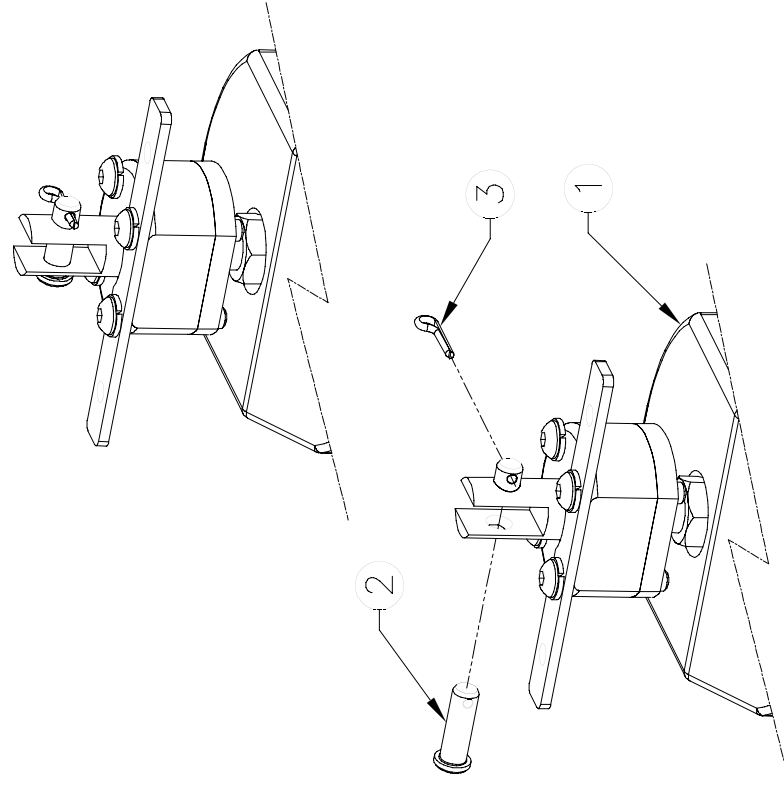
#	QTY	P/N	DESCRIPTION
1	1	REF: NLY	HANDLE ASSEMBLY
2	1	7-1-1	HUSING FRONT
3	2	7-2-1	BHCS, #10-32 X 1/2" LG, ZNPL

HANDLE ASSEMBLY
FLOAT MODE
PART # 73-51

FIGURE D8

Figure D7 (bottom) & Figure D8 (top). Float Mode Handle Assembly.

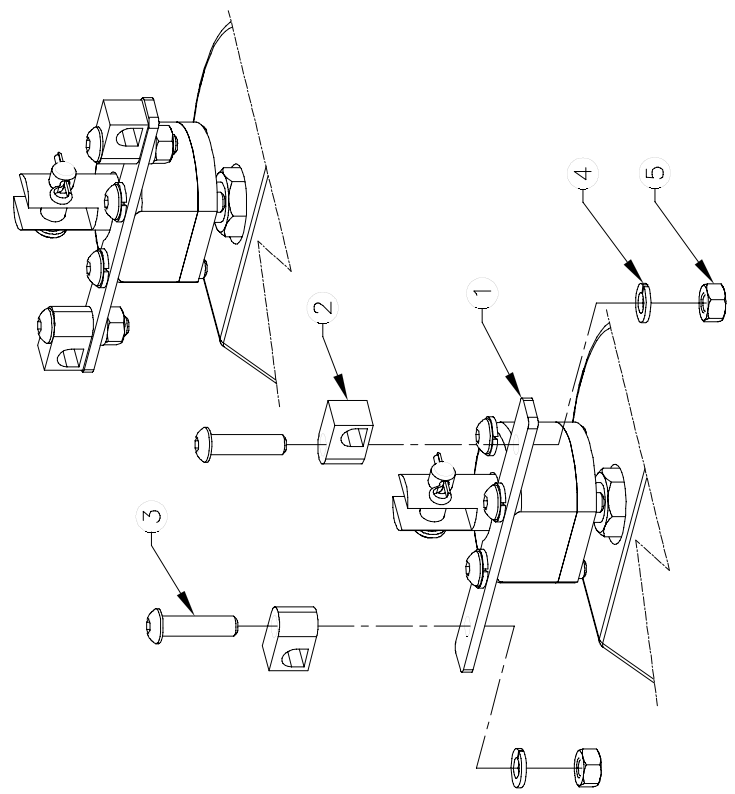
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#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	HANDLE ASSEMBLY
2	1	7-63	CLEVIS PIN (**C MES WITH C-TIE PIN**)
3	1	7-63	C-TIE PIN (**C MES WITH CLEVIS PIN**)

HANDLE ASSEMBLY
FLOAT MODE
PART # 73-51

FIGURE D9



#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	HANDLE ASSEMBLY
2	2	7-163	CLAMP, VIBRATION DAMPING, 5/16"
3	2	7-163	BHCS, 1/4"-2" X 1" LG
4	2	7-297	LOCKWASHER, 1/4", ZNPL
5	2	7-1221	HEXNUT, 1/4"-2", ZNPL

#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	HANDLE ASSEMBLY
2	2	75379	CLAMP, VIBRATION DAMPING, 3/4"
3	2	7-164	BHCS, 1/4"-2" X 1-3/4" LG
4	2	7-297	LOCKWASHER, 1/4", ZNPL
5	2	7-1221	HEXNUT, 1/4"-2", ZNPL

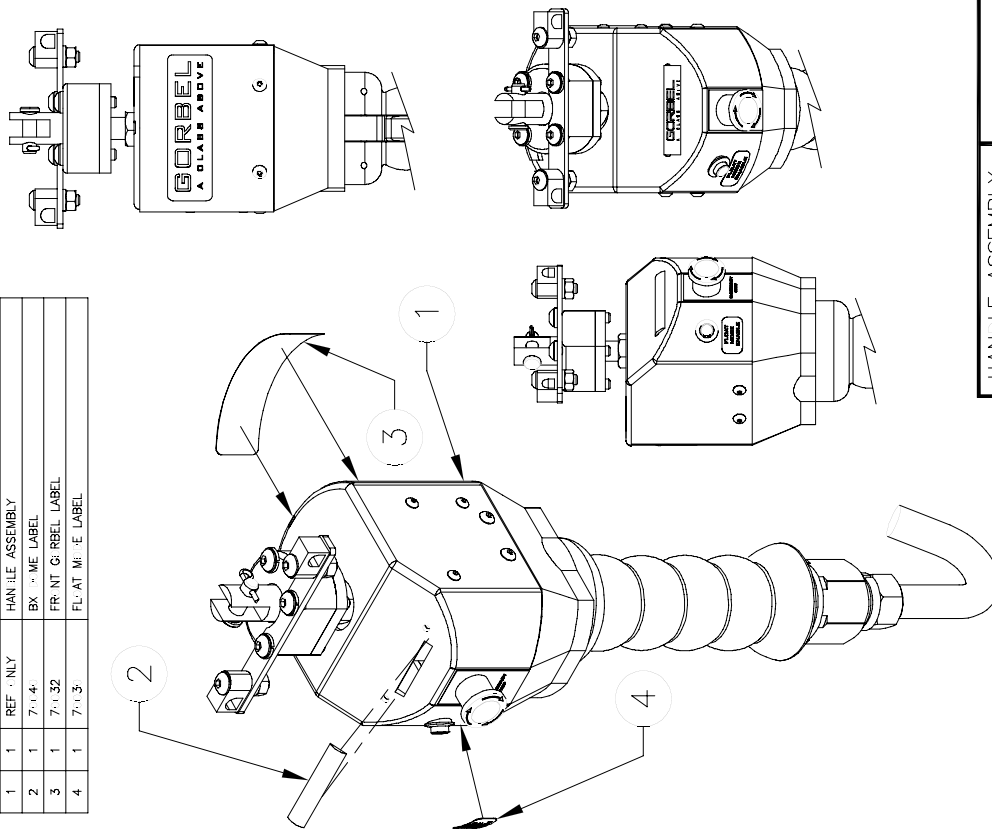
HANDLE ASSEMBLY
FLOAT MODE
PART # 73-51

FIGURE D10

Figure D9 (bottom) & Figure D10 (top). Float Mode Handle Assembly.

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#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	HANDLE ASSEMBLY
2	1	7-1-4	BX - ME LABEL
3	1	7-1-32	FRONT GORBEL LABEL
4	1	7-1-3	FLAT MODE LABEL



HANDLE ASSEMBLY
FLAT MODE
PART # 73-51

FIGURE D11

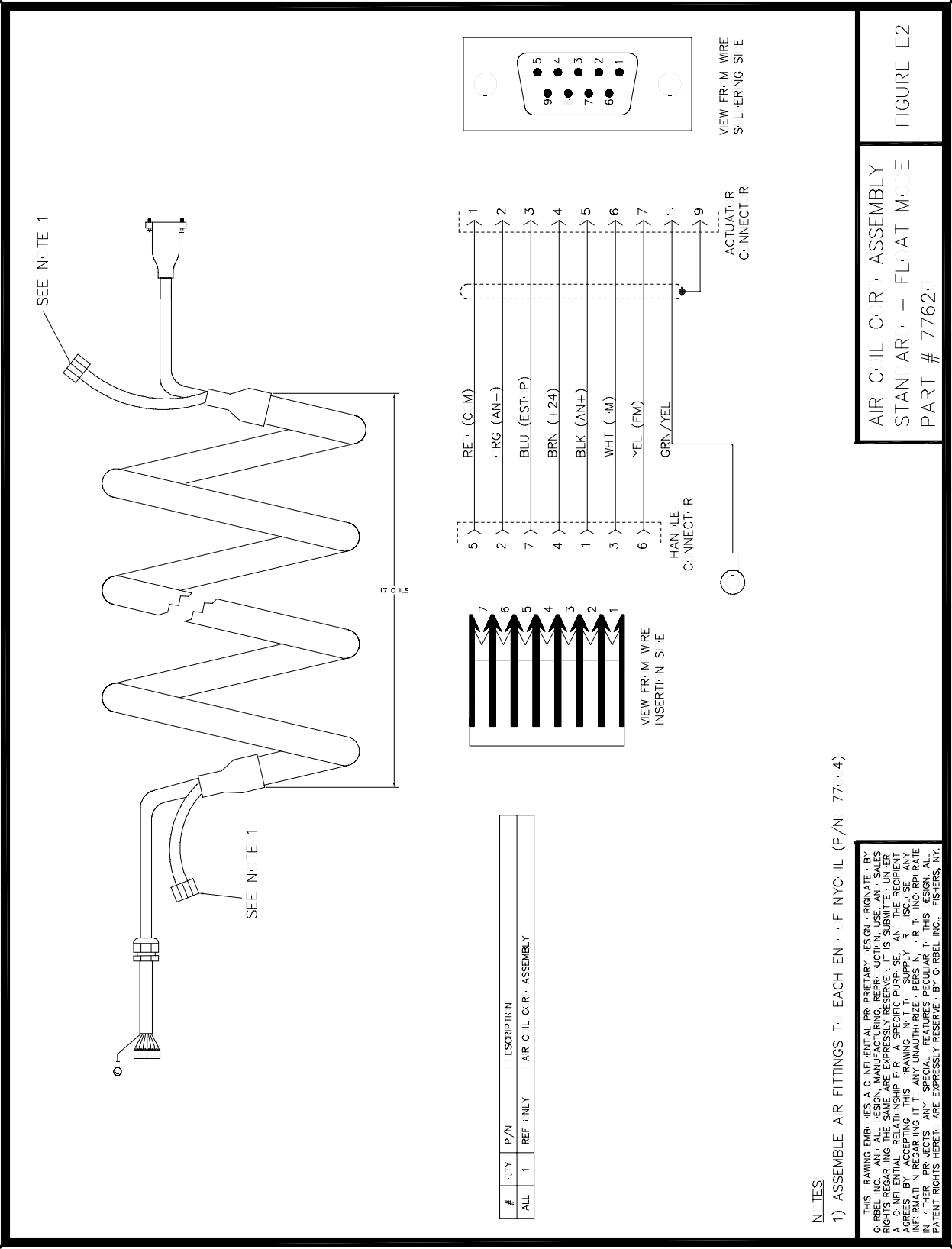
Figure D11. Float Mode Handle Assembly.

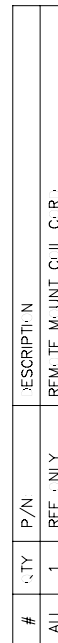
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Figure E2. Air Coil Cord Assembly Standard - Float Mode.



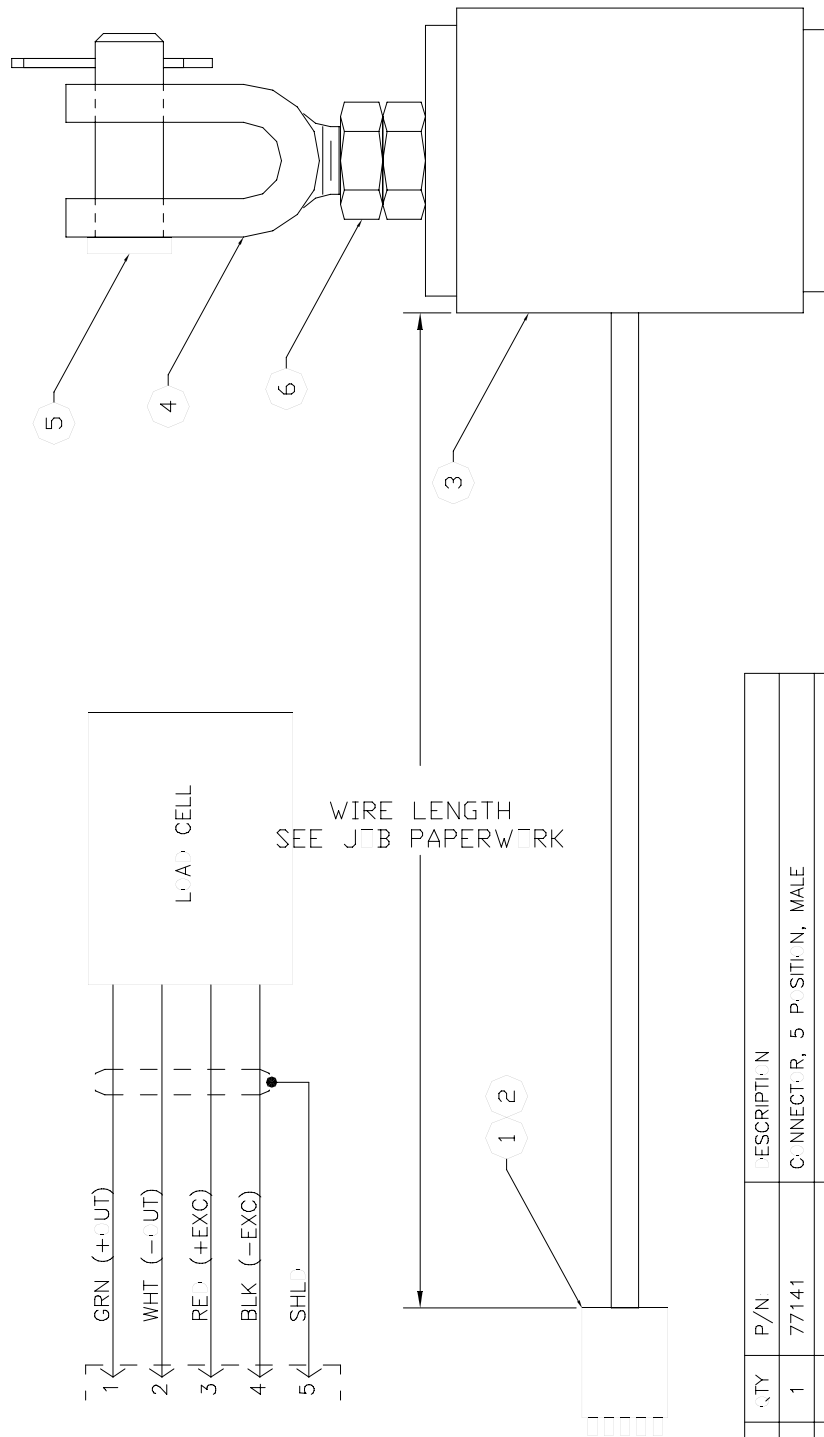




AIR REMOTE MOUNT COIL CORD
STANDARD - FLOAT MODE
PART # 77665

APPENDIX F - CONTROLS SCHEMATIC DRAWINGS

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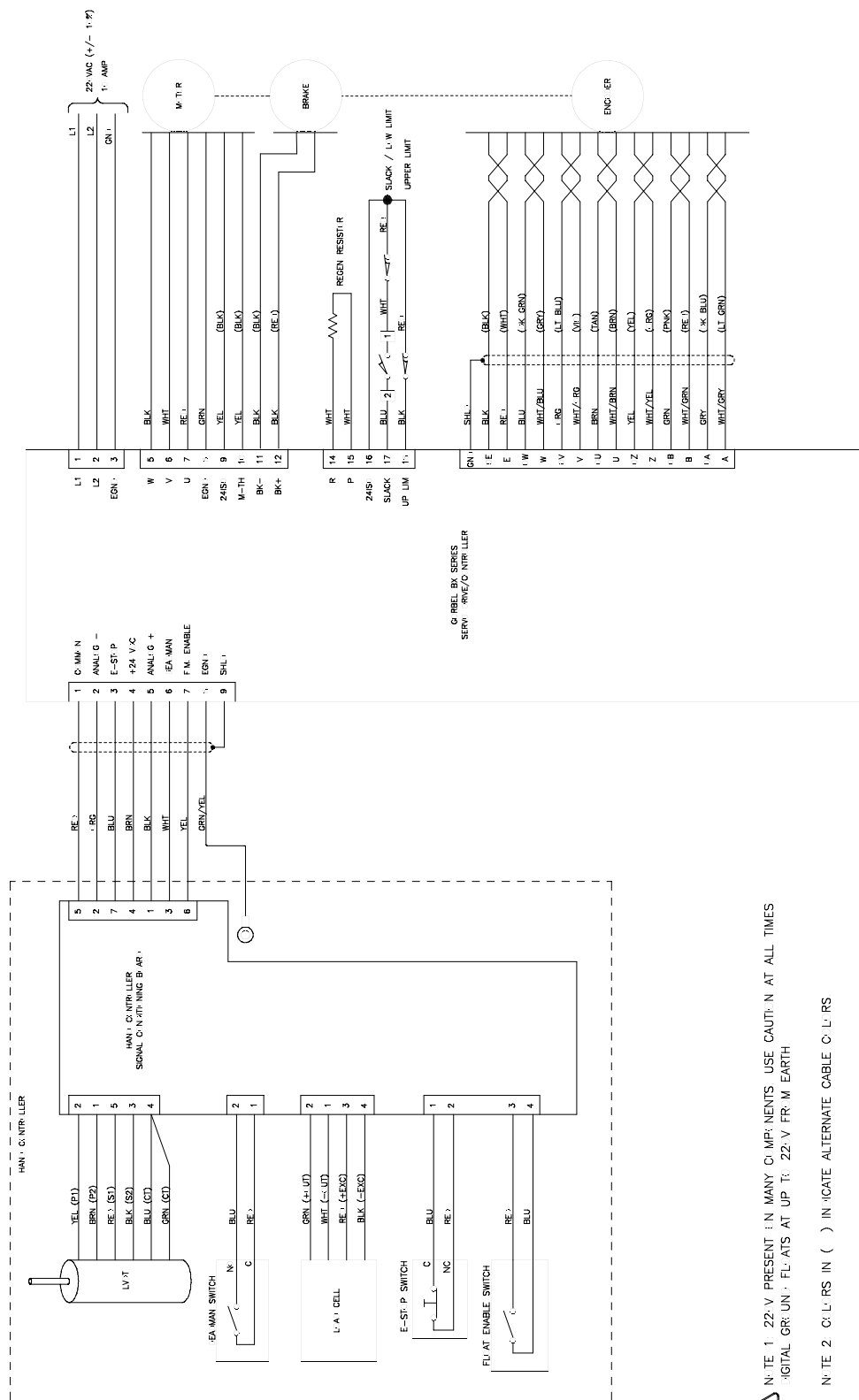


#	QTY	P/N	DESCRIPTION
1	1	77141	CONNECTOR, 5 POSITION, MALE
2	1	77142	CONNECTOR, 5 POSITION
3	1	73-27	LOAD CELL, 45 LBS CAPACITY, S TYPE
4	1	774-5	KEY CONNECTOR, 1/2"-20 SHANK THREAD
5	1	774-3	CLEVIS-CATERPILLAR PIN, 1/2" DIAMETER
6	2	1965	HEX NUT, JAM, 1/2"-20, ZNPL

REMOTE MOUNT
LOAD CELL ASSEMBLY
PART # 77144

FIGURE F1

Figure F1. Remote Load Cell Assembly.



NOTE 1: 22-V PRESENT IN MANY COMBINATIONS. USE CAUTION AT ALL TIMES.
DIGITAL GROUND: FLATS AT UP TO 22-V FROM EARTH

NOTE 2: CABLES IN () INDICATE ALTERNATE CABLE COLORS

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FIGURE F2
BX CONTROLS SCHEMATIC
STANDARD - FLAT MODEL

APPENDIX G - OVERALL G-FORCE® REFERENCE DIMENSIONS

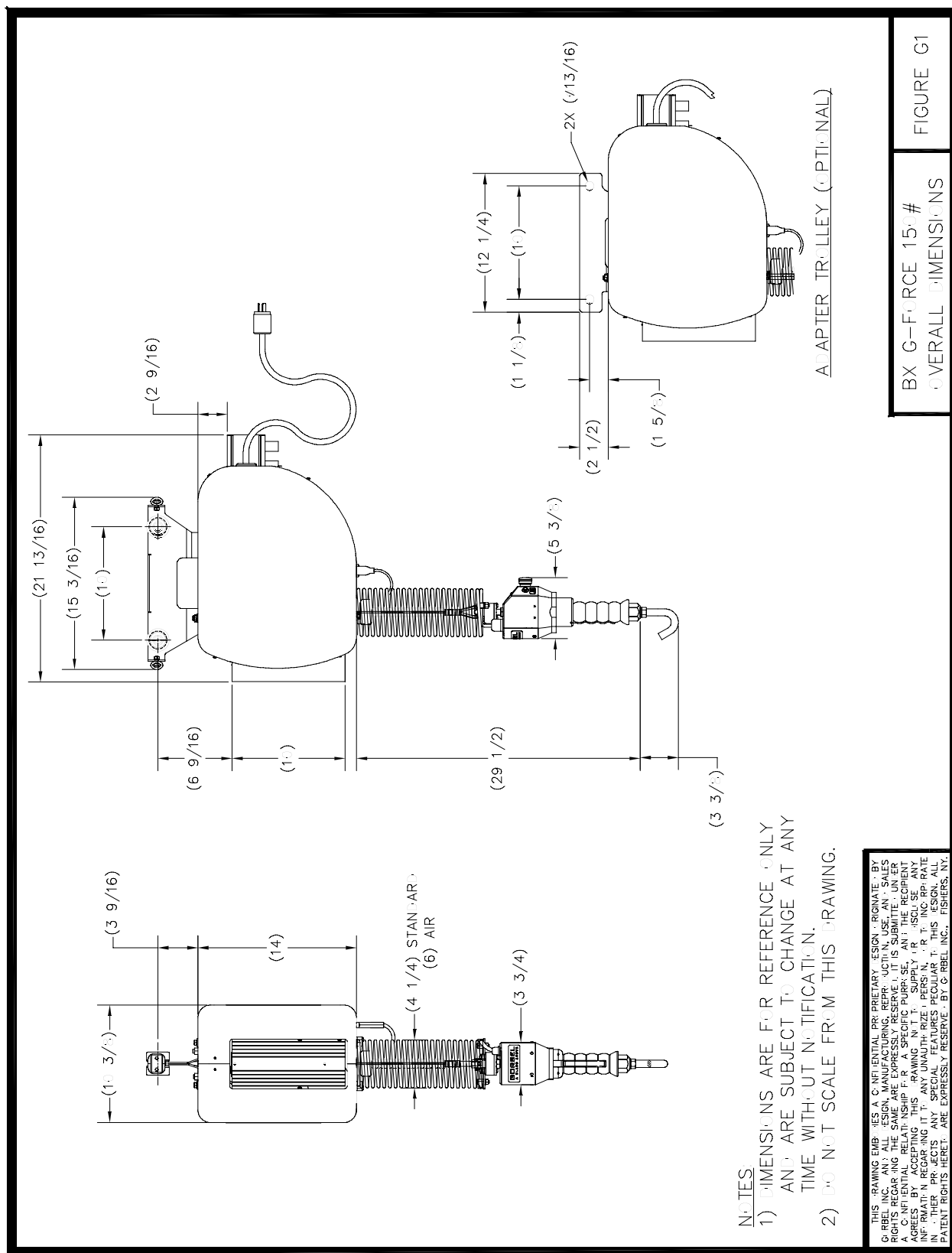
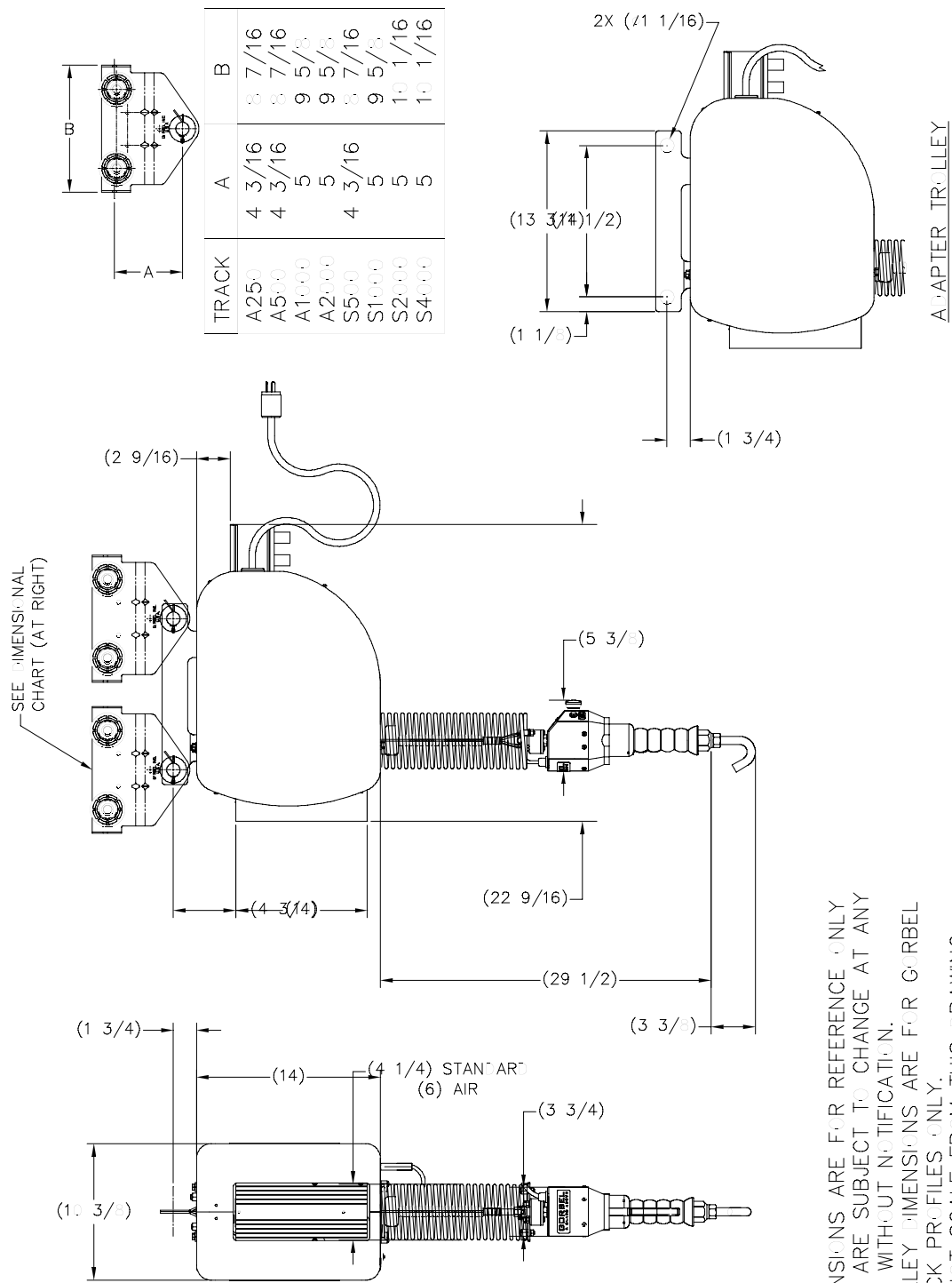


Figure G1. BX G-Force® 150# Overall Dimensions.



- NOTES:
- 1) DIMENSIONS ARE FOR REFERENCE ONLY AND ARE SUBJECT TO CHANGE AT ANY TIME WITHOUT NOTIFICATION.
 - 2) TRAILLEY DIMENSIONS ARE FOR GORBEL TRACK FILES ONLY.
 - 3) DO NOT SCALE FROM THIS DRAWING.

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BX G-Force 300/380#
OVERALL DIMENSIONS

FIGURE G2

Figure G2. BX G-Force® 300/380# Overall Dimensions.

APPENDIX H - BX G-FORCE® HANDLE REFERENCE DIMENSIONS

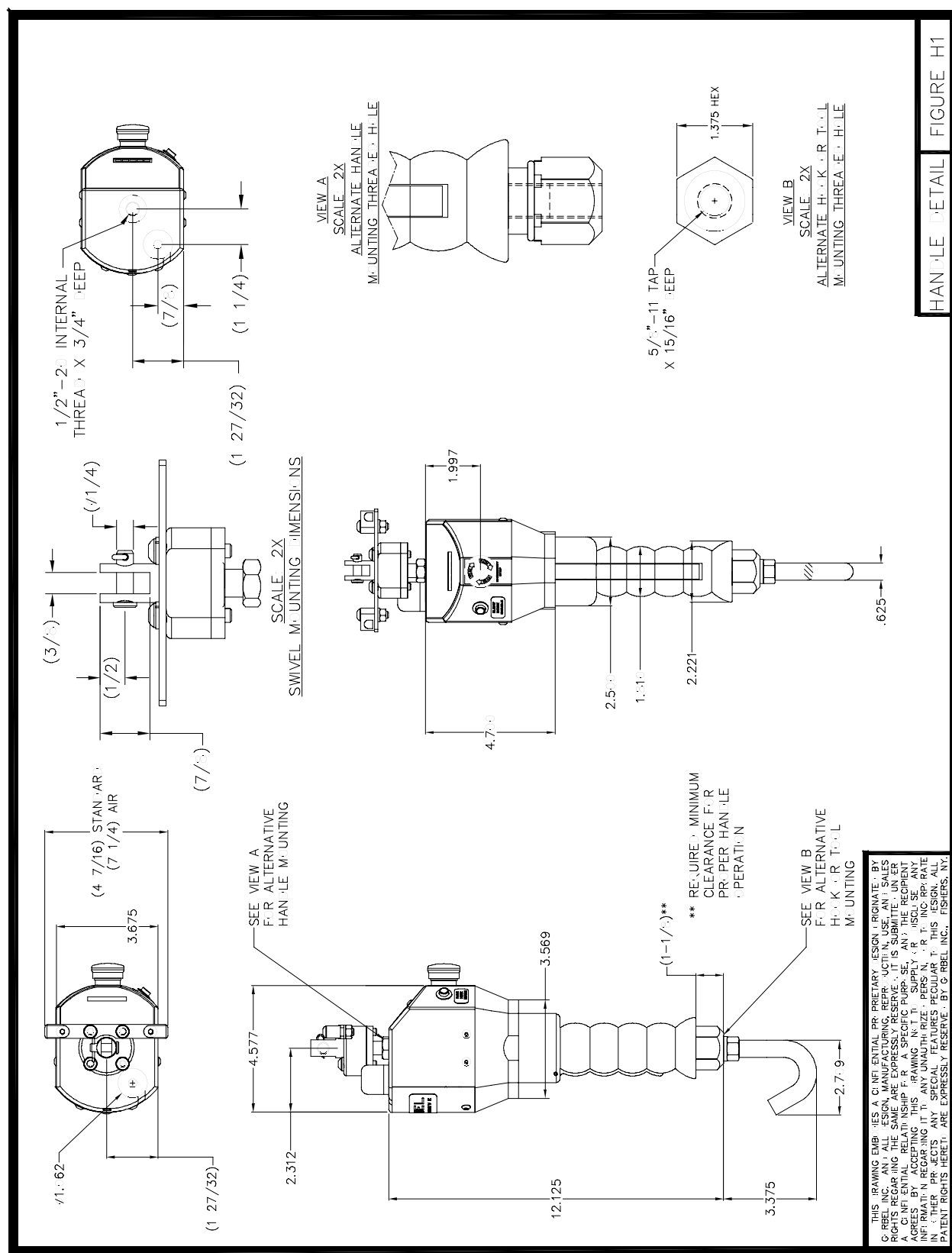
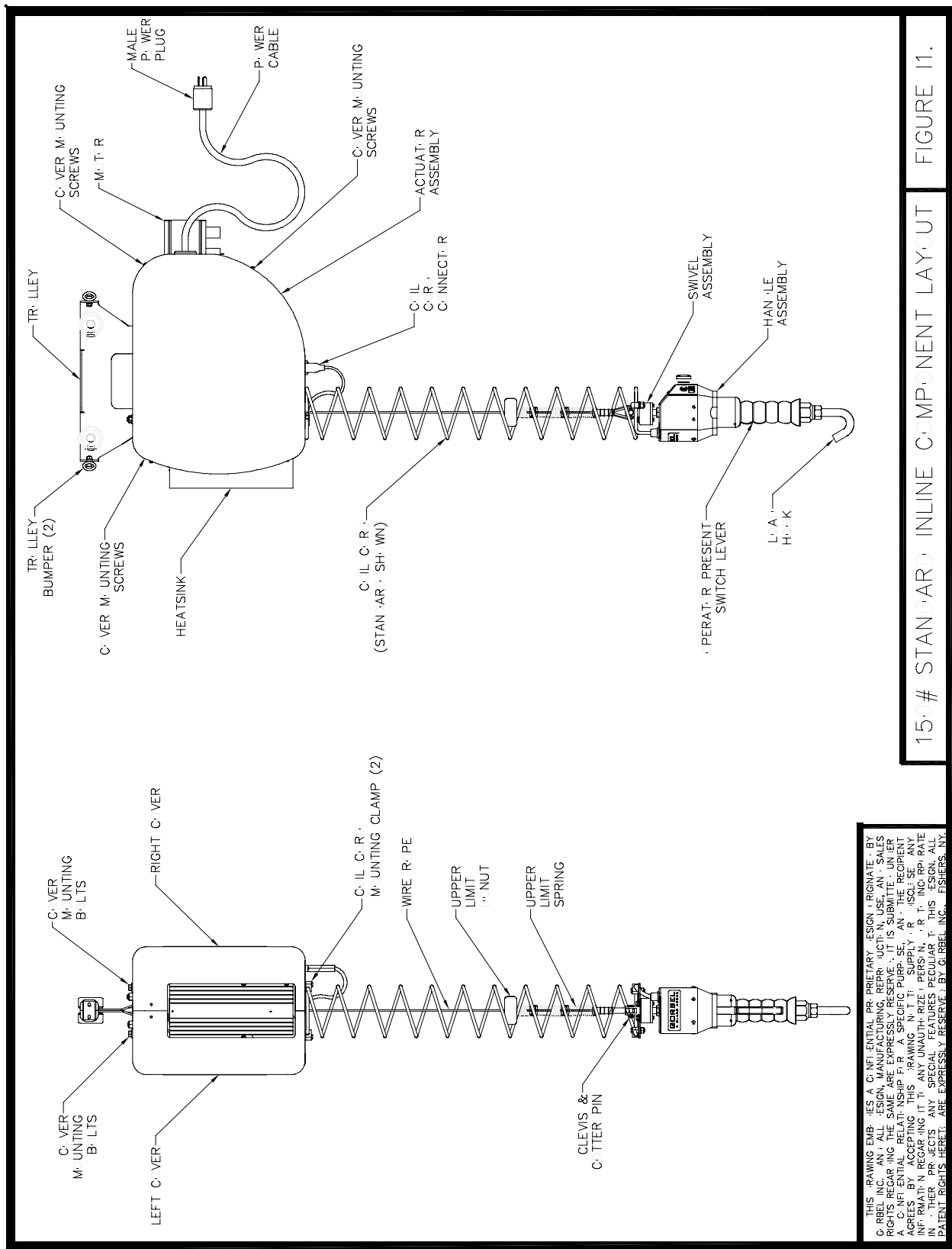


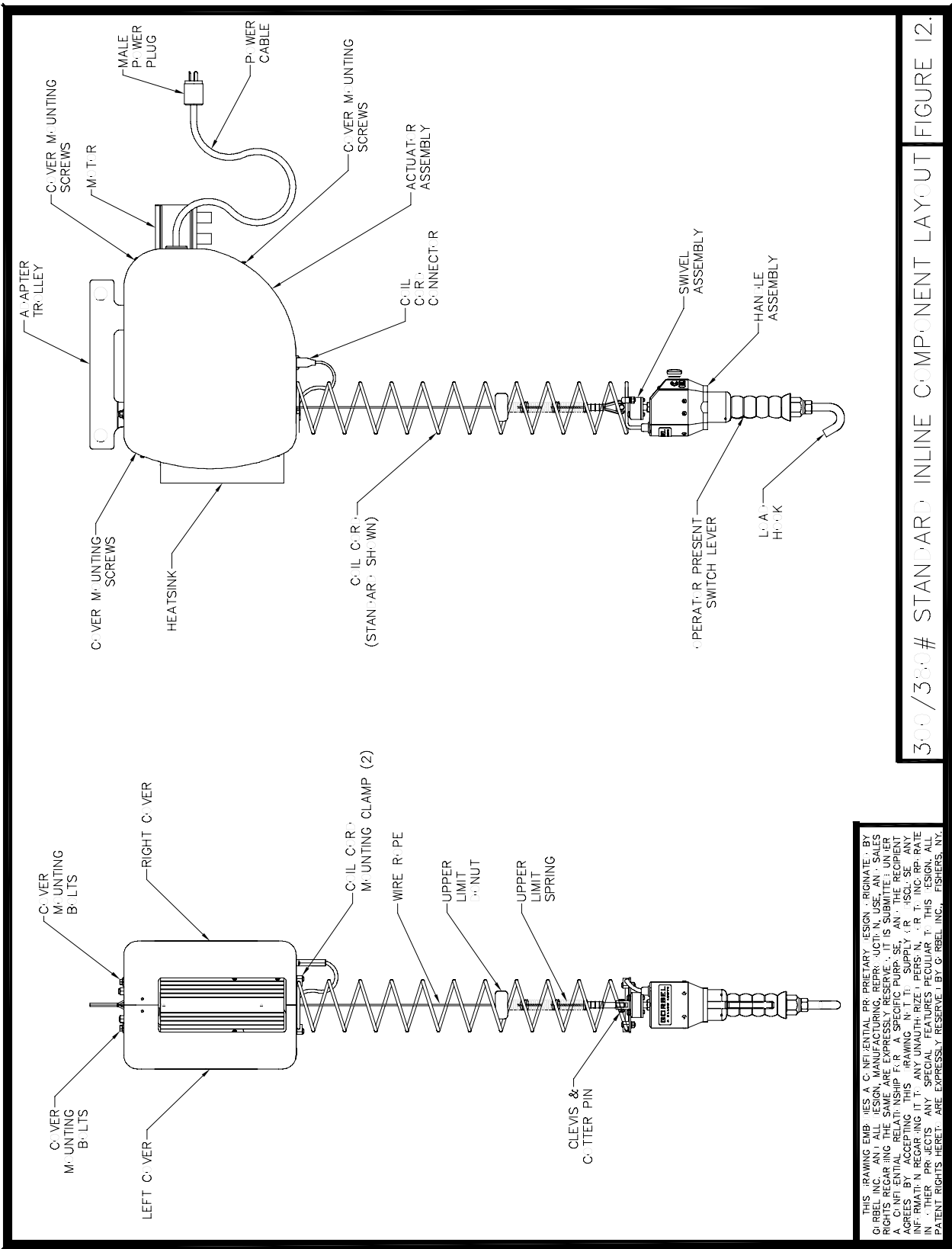
Figure H1. BX G-Force® Handle Detail Dimensions.

APPENDIX I - COMPONENT LAYOUT DRAWINGS



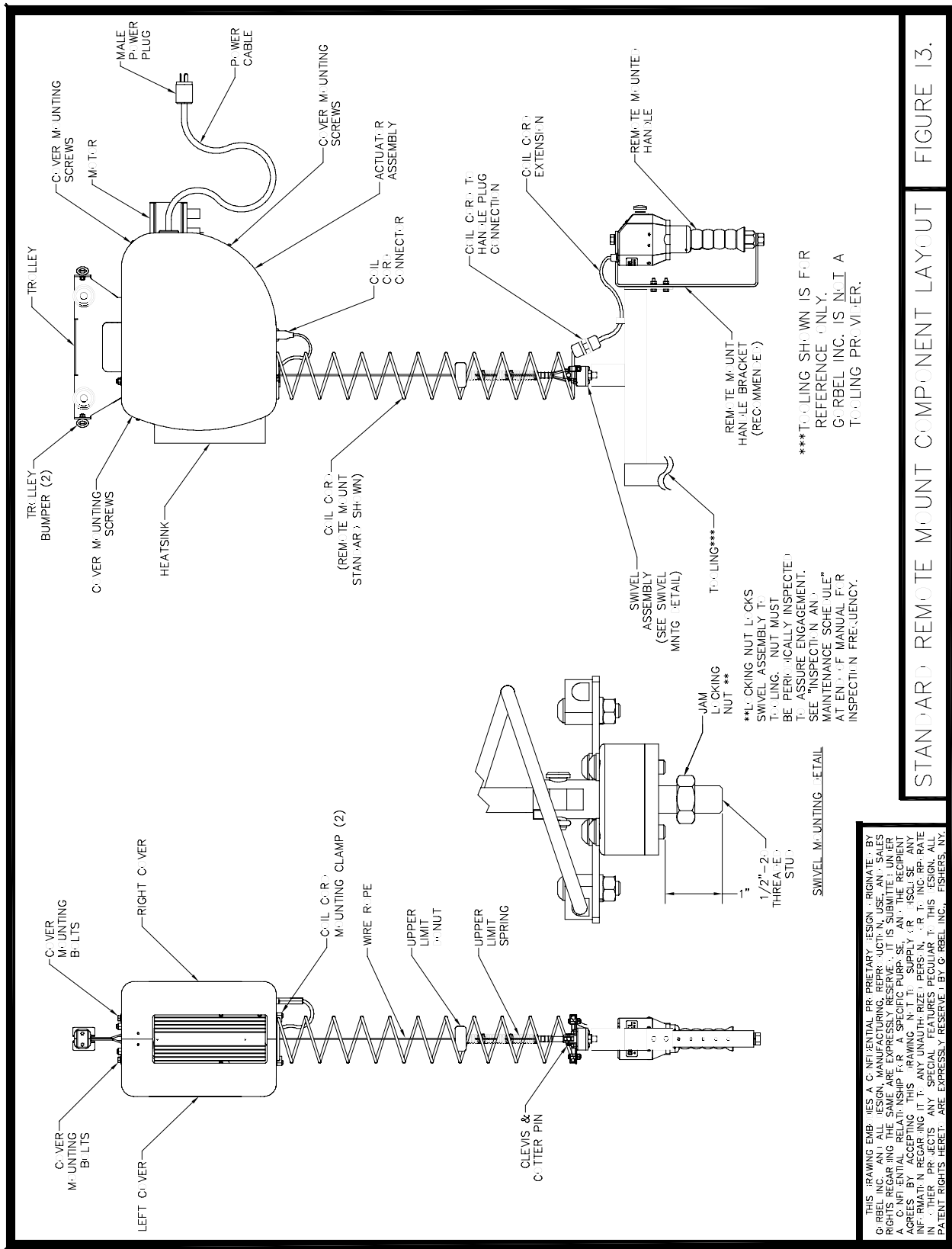
150# STANDARD INLINE COMPONENT LAYOUT FIGURE 11.

Figure 11. 150# Standard Inline Component Layout.



300/380# STANDARD INLINE COMPONENT LAYOUT FIGURE I2.

Figure I2. 300/380# Standard Inline Component Layout.



STANDARD REMOTE MOUNT COMPONENT LAYOUT

FIGURE 13.

Figure 13. Standard Remote Mount Component Layout.

RECOMMENDED SPARE PARTS LIST

<u>Item #</u>	<u>Part #</u>	<u>Description</u>	<u>Qty</u>
1	73050.ASM	Handle-Coil Cord Assembly, Inline, 150, 300, & 380#, Standard	1
2	73051.ASM	Handle-Coil Cord Assembly, Inline, 150, 300, & 380#, Float Mode	1
3	73650.ASM	Handle-Coil Cord Assembly with Air, Inline, 150, 300, & 380#, Standard	1
4	73651.ASM	Handle-Coil Cord Assembly with Air, Inline, 150, 300, & 380#, Float Mode	1
5	73050	Handle (only), 150, 300, & 380#, Standard, Inline, Must specify Air option	1
6	73051	Handle (only), 150, 300, & 380#, Float Mode, Inline, Must specify Air option	1
7	73146	Handle (only), 150, 300, & 380#, Remote Mount, Standard, Must specify remote mount length	1
8	73148	Handle (only), 150, 300, & 380#, Remote Mount, Float Mode, Must specify remote mount length	1
9	77610	Coil Cord (only), 150, 300, & 380#, Standard & Float Mode	1
10	77620	Coil Cord (only) with Air, 150, 300, & 380#, Standard & Float Mode	1
11	77157	Coil Cord, Remote Mount, 150, 300, & 380#, Standard & Float Mode	1
12	77665	Coil Cord, Remote Mount with Air, 150, 300, & 380#, Standard & Float Mode	1
13	77315	Wire Rope Replacement Assembly, 150,300, & 380#	1
14	73099	Idler Pulley Guide Block, 150, 300, & 380#	1
15	75354	Upper Limit Switch, 150, 300, & 380#	1
16	77084	Lower Limit/Slack Switch, 150, 300, & 380#	3
17	77559	Offset Idler Pulley, 150, 300, & 380#	1
18	72190	Controls Assembly, MLD-114	1
19	78010	BX G-Force® Universal Miscellaneous Hardware Kit	1

Contact Gorbel® Customer Service for Spare Parts pricing and availability.

LIMITED WARRANTY

It is agreed that the equipment purchased hereunder is subject to the following LIMITED warranty and no other. Gorbel Incorporated ("Gorbel") warrants the manual push-pull Work Station Cranes, Jib Crane, and Gantry Crane products to be free from defects in material or workmanship for a period of five years or 10,000 hours use from date of shipment. Gorbel warrants the Motorized Work Station Cranes and Jib Crane products to be free from defects in material or workmanship for a period of two years or 4,000 hours use from the date of shipment. Gorbel warrants the G-Force® and Easy Arm™ products to be free from defects in material or workmanship for a period of one year or 2,000 hours use from the date of shipment. This warranty does not cover Gantry Crane wheels. This warranty shall not cover failure or defective operation caused by operation in excess of recommended capacities, misuses, negligence or accident, and alteration or repair not authorized by Gorbel. No system shall be field modified after manufacture without the written authorization of Gorbel, Inc. Any field modification made to the system without the written authorization of Gorbel, Inc. shall void Gorbel's warranty obligation. OTHER THAN AS SET FORTH HEREIN, NO OTHER EXPRESS WARRANTIES, AND NO IMPLIED WARRANTIES, ORAL OR WRITTEN, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE MADE BY GORBEL WITH RESPECT TO ITS PRODUCTS AND ALL SUCH WARRANTIES ARE HEREBY SPECIFICALLY DISCLAIMED. GORBEL SHALL NOT BE LIABLE UNDER ANY CIRCUMSTANCES FOR ANY INCIDENTAL, SPECIAL AND/OR CONSEQUENTIAL DAMAGES WHATSOEVER, WHETHER OR NOT FORESEEABLE, INCLUDING BUT NOT LIMITED TO DAMAGES FOR LOST PROFITS AND ALL SUCH INCIDENTAL, SPECIAL AND/OR CONSEQUENTIAL DAMAGES ARE HEREBY ALSO SPECIFICALLY DISCLAIMED. Gorbel's obligation and Purchaser's or end user's sole remedy under this warranty is limited to the replacement or repair of Gorbel's products at the factory, or at the discretion of Gorbel, at a location designated by Gorbel. Purchaser or end user shall be solely responsible for all freight and transportation costs incurred in connection with any warranty work provided by Gorbel hereunder. Gorbel will not be liable for any loss, injury or damage to persons or property, nor for damages of any kind resulting from failure or defective operation of any materials or equipment furnished hereunder. Components and accessories not manufactured by Gorbel are not included in this warranty. Purchaser's or end user's remedy for components and accessories not manufactured by Gorbel is limited to and determined by the terms and conditions of the warranty provided by the respective manufacturers of such components and accessories.

A) DISCLAIMER OF IMPLIED WARRANTY OF MERCHANTABILITY

Gorbel and Purchaser agree that the implied warranty of merchantability is excluded from this transaction and shall not apply to the goods involved in this transaction.

B) DISCLAIMER OF IMPLIED WARRANTY OF FITNESS FOR PARTICULAR PURPOSE

Gorbel and Purchaser agree that the implied warranty of fitness for particular purpose is excluded from this transaction and shall not apply to the goods involved in this transaction.

C) DISCLAIMER OF EXPRESS WARRANTY

Gorbel's agents, or dealer's agents, or distributor's agents may have made oral statements about the machinery and equipment described in this transaction. Such statements do not constitute warranties, and Purchaser agrees not to rely on such statements. Purchaser also agrees that such statements are not part of this transaction.

D) DISCLAIMER OF SPECIAL, INCIDENTAL AND CONSEQUENTIAL DAMAGES

Gorbel and Purchaser agree that any claim made by Purchaser which is inconsistent with Gorbel's obligations and the warranty remedies provided with Gorbel's products, and in particular, special, incidental and consequential damages, are expressly excluded.

E) DEALER OR DISTRIBUTOR NOT AN AGENT

Gorbel and Purchaser agree that Purchaser has been put on notice that dealer or distributor is not Gorbel's agent in any respect for any reason. Gorbel and Purchaser also agree that Purchaser has been put on notice that dealer or distributor is not authorized to incur any obligations or to make any representations or warranties on Gorbel's behalf other than those specifically set forth in Gorbel's warranty provided in connection with its product.

F) MERGER

This warranty agreement constitutes a final and complete written expression of all the terms and conditions of this warranty and is a complete and exclusive statement of those terms.

G) PAINTING

Every crane (excluding components) receives a quality paint job before leaving the factory. Unfortunately, no paint will protect against the abuses received during the transportation process via common carrier. We have included at least one (1) twelve ounce spray can for touchup with each crane ordered (unless special paint was specified). If additional paint is required, contact a Gorbel® Customer Service Representative at 1-800-821-0086 or 1-585-924-6262.

Title and Ownership:

Title to the machinery and equipment described in the foregoing proposal shall remain with Gorbel and shall not pass to the Purchaser until the full amount hereof is agreed to be paid has been fully paid in cash.

Claims and Damages:

Unless expressly stated in writing, goods and equipment shall be at Purchaser's risk on and after Seller's delivery in good shipping order to the Carrier. Gorbel shall in no event be held responsible for materials furnished or work performed by any person other than it or its authorized representative or agent.

Cancellations:

If it becomes necessary for the purchaser to cancel this order wholly or in part, he shall at once so advise Gorbel in writing. Upon receipt of such written notice all work will stop immediately. If the order entails only stock items, a flat restocking charge of 15% of the purchase price will become due and payable by Purchaser to Gorbel. Items purchased specifically for the canceled order shall be charged for in accordance with the cancellation charges of our supplier plus 15% for handling in our factory. The cost of material and/or labor expended in general fabrication for the order shall be charged for on the basis of total costs to Gorbel up to the time of cancellation plus 15%.

Returns:

No equipment, materials or parts may be returned to Gorbel without express permission in writing to do so.

Extra Charge Delay: If Purchaser delays or interrupts progress of Seller's performance, or causes changes to be made, Purchaser agrees to reimburse Gorbel for expense, if any, incident to such delay.

Changes and Alterations:

Gorbel reserves the right to make changes in the details of construction of the equipment, as in its judgment, will be in the interest of the Purchaser; will make any changes in or additions to the equipment which may be agreed upon in writing by the Purchaser; and Gorbel is not obligated to make such changes in products previously sold any customer.

Third Party Action:

Should Gorbel have to resort to third party action to collect any amount due after thirty (30) days from date of invoice, the Purchaser agrees to pay collection costs, reasonable attorney's fees, court costs and legal interest.

OSHA Responsibilities:

Gorbel agrees to fully cooperate with Purchaser in the design, manufacture or procurement of safety features or devices that comply with OSHA regulations. In the event additional equipment or labor shall be furnished by Gorbel, it will be at prices and standard rates then in effect, or as may be mutually agreed upon at the time of the additional installation.

Equal Employment Opportunity:

Gorbel agrees to take affirmative action to ensure equal employment opportunity for all job applicants and employees without regard to race, color, age, religion, sex, national origin, handicap, veteran, or marital status. Gorbel agrees to maintain non-segregated work facilities and comply with rules and regulations of the Secretary of Labor or as otherwise provided by law or Executive Order.

INSPECTION AND MAINTENANCE SCHEDULE

G-FORCE® BX ILD INSPECTION AND MAINTENANCE SCHEDULE			
ITEM	COMPONENT	MAINTENANCE	FREQUENCY*
1	Wire Rope	Check for distortion of the rope such as kinking, crushing, unstranding, birdcaging, main strand displacement, or core protrusion. General corrosion, broken or cut strands, and number, distribution, and type of visible broken wires	Start of each Shift
2	Wire Rope	Maintenance listed in (1), as well as reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires. Severely corroded or broken wires at end connections. Severely corroded, cracked, bent, worn, or improperly applied end connections.	Periodically (to be determined by qualified persons only)
3	Coil Cord Assembly	Check to make sure there is no excessive wearing of the coil cable sleeving caused by the wire rope. Check for excessive bends or pinching. Check that Mating Connector is secured to the Actuator properly. Assure the Strain Relief at the Handle is properly tightened.	Start of each Shift
4	Handle	Check for smooth operation of sliding handle. Check "Operator Present Switch" for correct operation. Verify proper handle Swivel functionality.	Start of each Shift
5	G-Force® Assembly	Conduct a visual inspection of the entire BX G-Force® unit.	Start of each Shift
6	Pulleys	Inspect the Slack-Idler Pulley for excessive wear. Replace Pulleys immediately if excessive wear or damage is present.	Every 90 Days
7	Limit Switches	Verify that the Upper and Lower Limit Switches are operating properly. Verify that the Slack Switch is operating properly. Replace Switches immediately if they are damaged.	Every 90 Days
8	Slack Switch Sliding Mechanism	Verify that the Slack Switch Sliding Mechanism is functioning properly. Replace Slack Switch Sliding Mechanism if not operating correctly.	Every 90 Days
9	Wheels	Check for cracks, pits, and/or grooves. All of these increase pull forces. If any of these conditions exist, wheels should be replaced.	Every 2000 Hours or Yearly
10	Handle	Perform general cleaning of the Handle, being sure to remove all debris and foreign substances that may exist. Specifically, take care to remove all debris and foreign substances from the back side of the OPS Lever.	Periodically based on Application (to be determined by qualified persons only)
11	Hardware	Perform routine inspection of all hardware connections, verifying that all lockwashers are compressed and nuts tightened to manufacturer's specifications. Be sure to verify the jam nuts located between the swivel assembly and handle/tooling are properly torqued.	Every 90 Days

* Federal, state and local codes may require inspection and maintenance checks more often. Please check the federal, state and local code manuals in your area.

WARNING

Any changes in rotating effort or unusual noises must be immediately identified and corrected.

WARNING

DO NOT TWIST COIL CABLE ASSEMBLY. OVER TWISTING OF HANDLE WILL CAUSE SHORTING IN COIL CABLE ASSEMBLY, THEREFORE CAUSING PREMATURE UNIT FAILURE. KEEP ROTATION OF HANDLE TO LESS THAN 360 DEGREES.

GORBEL®

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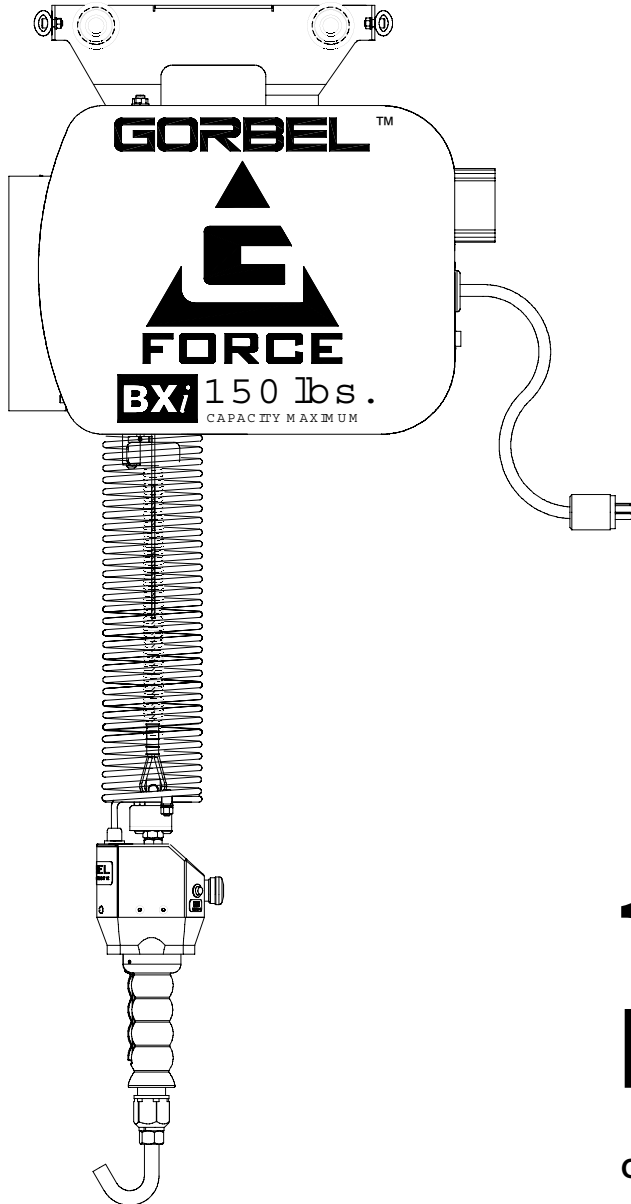
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Installation, Operation, & Maintenance Manual



U.S. PATENT NO'S:
5,865,426, 6,386,513,
& 6,886,812
OTHER PATENTS
PENDING



150/300/380 lbs. BXi Series

Gorbel® Dealer: _____

Serial Number: _____

Gorbel® Customer Order No.: _____

Date: _____

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SAFE HOIST OPERATING GUIDELINES

General

There is no one single factor that is more important for minimizing the possibility of personal injury to the operator and those working in the area, or damage to property, equipment, or material, than being familiar with the equipment and using Safe Operating Practices.

Hoists/trolleys are designed for lifting and transporting of material only. Under no circumstances, either during initial installation or in any other use, should the hoist be used for lifting or transporting personnel.

No operator should be permitted to use the equipment that is not familiar with its operation, is not physically or mentally fit, or has not been schooled in safe operating practices. The misuse of hoists can lead to certain hazards which cannot be protected against by mechanical means; hazards which can only be avoided by the exercise of intelligence, care, and common sense.

Safe Operating Practices also involve a program of periodic inspection and preventative maintenance (covered in separate section). Part of the operator's training should be an awareness of potential malfunctions/hazards requiring adjustments or repairs, and bringing these to the attention of supervision for corrective action.

Supervision and management also have an important role to play in any safety program by ensuring that a maintenance schedule is adhered to, and that the equipment provided for the operators is suitable for the job intended without violation of one or more of the rules covering safe operating practices and good common sense.

The Safe Operating Practices shown are taken in part from the following publications:

- American National Standard Institute (ANSI)
- Safety Standards for Crane, Derricks, Hoists
- ANSI B30.2 - Overhead and Gantry Cranes
- ANSI B30.16 - Overhead Hoist

Do's and Don'ts (Safe Operation of Hoists)

The following are Do's and Don'ts for safe operation of overhead hoists. A few minutes spent reading these rules can make an operator aware of dangerous practices to avoid and precautions to take for his own safety and the safety of others. Frequent examinations and periodic inspections of the equipment as well as a conscientious observance of safety rules may save lives as well as time and money.

DON'TS - HOISTS

1. Never lift or transport a load until all personnel are clear and do not transport the load over personnel.
2. Do not allow any unqualified personnel to operate hoist.
3. Never pick up a load beyond the capacity rating appearing on the hoist. Overloading can be caused by jerking as well as by static overload.
4. Never carry personnel on the hook or the load.
5. Do not operate hoist if you are not physically fit.

6. Do not operate hoist to extreme limits of travel of cable without first checking for proper limit switch action.
7. Avoid sharp contact between two hoists or between hoist and end stops.
8. Do not tamper with or adjust any parts of the hoist unless specifically authorized to do so.
9. Never use the load cable as a sling.
10. Do not divert attention from load while operating hoist.
11. Never leave a suspended load unattended.
12. Do not use limit switch(es) for normal operating stop(s). These are safety devices only and should be checked on a regular basis for proper operation.
13. Never operate a hoist that has an inherent or suspected mechanical or electrical defect.
14. Do not use load cable as a ground for welding. Never touch a live welding electrode to the load cable.
15. Do not jog controls unnecessarily. Hoist motors are generally high torque, high slip types. Each start causes an inrush of current greater than the running current and leads to overheating and heat failure, or burnout, if continued to excess.
16. Do not operate hoist if load is not centered under hoist.
17. Do not operate hoist if cable is twisted, kinked, or damaged.
18. Do not remove or obscure label.
19. Do not permanently activate dead man's switch.

DO'S - HOISTS

1. Read and follow manufacturer's instruction, installation, and maintenance manuals. When repairing or maintaining a hoist, use only manufacturer's recommended parts and materials.
2. Read and follow all instruction and warning information on or attached to a hoist.
3. Remove the hoist from service and thoroughly inspect and repair, as necessary, if unusual performance or visual defects (such as peculiar noise, jerky operations, travel in improper direction, or obviously damaged parts) are noticed.
4. Establish a regular schedule of inspection and maintain records for all hoists with special attention given to hooks, load cables, brakes, and limit switches.
5. Check operation of brakes for excessive drift.
6. Never lift loads over people, etc.
7. Check for damaged hooks and load cable.
8. Keep load cable clean and well maintained.
9. Check the load cable for improper seating, twisting, kinking, wear, or other defects before operating the hoists.
10. Make sure a load clears neighboring stockpiles, machinery, or other obstructions when raising, lowering, or traveling the load.
11. Center hoist over the load before operating.
12. Avoid swinging of load or load hook when traveling the hoist.
13. Be sure the load attachment is properly seated in the saddle of the hook. Balance load properly before handling. Avoid hook tip loading.
14. Pull in a straight line, so that neither hoist body nor load cable are angled around an object.
15. Take up slack slowly.
16. Know the hand signals for hoisting, cross travel, and crane travel if working with cab-operated hoists or cranes. Operators should accept the signals of only those persons authorized to give them.

WARNING

Check Wire Rope for improper seating, twisting, kinking, wear, or defects before operating.

WARNING

Center BXi G-Force® over the load before lifting. DO NOT end or side load the BXi G-Force®. End or side loading will seriously reduce the life of the Wire Rope and lead to premature failure. The Wire Rope should never exceed an out of vertical angle greater than 20°, under any circumstances.

WARNING

Avoid swinging of load or load hook when traveling with the BXi G-Force®.

WARNING

Check the Coil Cord for improper seating, twisting, kinking, wear or defects before operating. Any of the described conditions will seriously reduce the life of the Coil Cord and lead to premature failure.

WARNING

Press Float Mode (option) button with only the load weight hanging from the unit. Additional external forces applied to the load during initiation of Float Mode will result in the load drifting.

WARNING

Do not repeatedly impact the BXi G-Force® into the end stops. This condition will seriously reduce the life of the Controls and could lead to premature failures. If the unit impacts the end stop more than 10 times in a single shift, contact Gorbel® Customer Service for alternative end stop options.

WARNING

The BXi G-Force® ILD does not meet “Wash-down” environment requirements. The BXi G-Force® ILD does not meet “Explosion Proof” requirements.

WARNING

Ensure that the Load Cell is properly mounted in Remote Mount Handle applications with Float Mode (reference Figure I4, page 72).

WARNING

Ensure that the Handle is supported properly in Remote Mount Handle applications by attaching to tooling at both the Top and Bottom mounting points (reference Figures H1, I3 & I4, on pages 68, 71 & 72).

WARNING

Do not mount any objects to the sliding portion of the G-Force® Handle (i.e. switches). Additional objects may interfere with the travel of the sliding Handle and affect the overall speed and functionality of the unit.

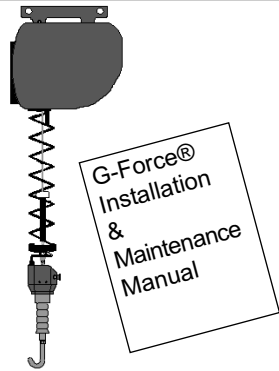
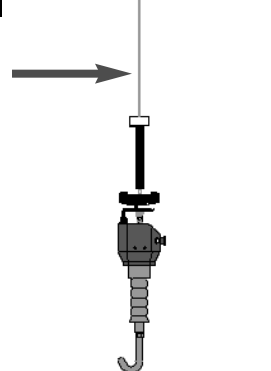
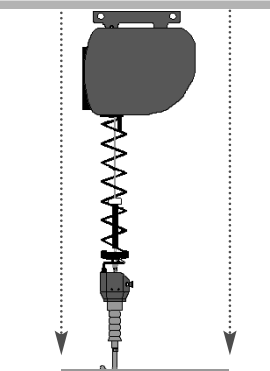
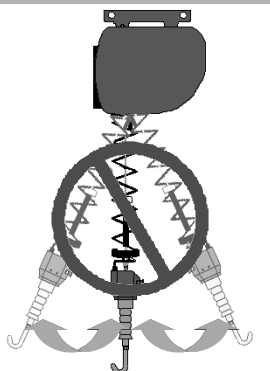
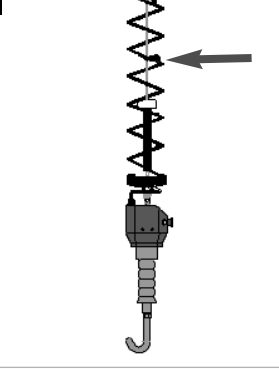
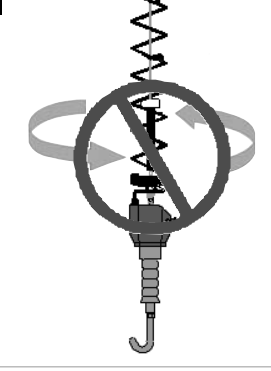
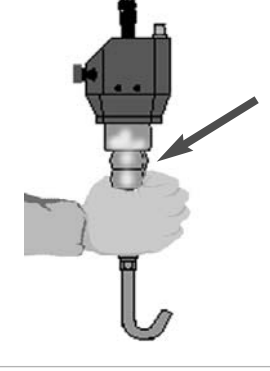
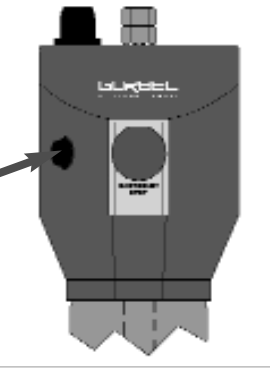
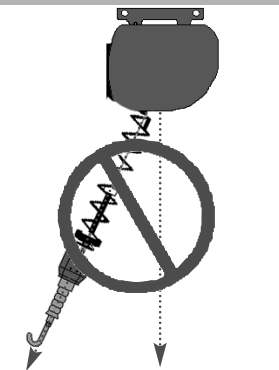
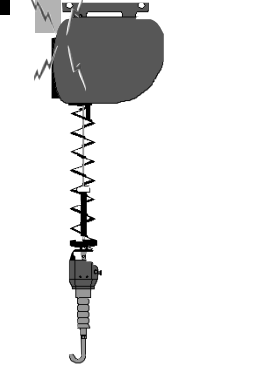
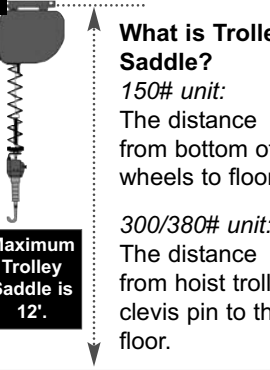
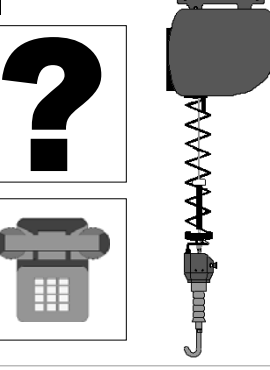
WARNING

Do not mount any load bearing components to the Blue Poly-carbonate housings of the G-Force® Handle or Actuator assembly.



G-Force® Operational Guidelines

All operators should read the G-Force® Instruction, Installation and Maintenance Manuals before operating the unit. Please follow the instructions contained in these manuals for your safety and for optimum trouble-free operation of your G-Force®. When repairing or maintaining a G-Force®, use only Gorbel® recommended parts and materials.

<p>1</p>  <p>G-Force® Installation & Maintenance Manual</p> <p>Read & follow all instruction & warning information on or attached to the G-Force®.</p>	<p>2</p>  <p>Check Wire Rope for improper seating, twisting, kinking, wear or defects before operating.</p>	<p>3</p>  <p>Center G-Force® over the load before lifting a load. Do not end or side load.</p>	<p>4</p>  <p>Avoid swinging of load or load hook when traveling with the G-Force®.</p>
<p>5</p>  <p>Check the coil cord for improper seating, twisting, kinking, wear or defects before operating.</p>	<p>6</p>  <p>Do not over-twist coil cable assembly (>360°). Damage and/or failure could occur.</p>	<p>7</p>  <p>The Operator Present switch should be depressed the entire time the G-Force® is in use.</p>	<p>8</p>  <p>Press Float Mode Button with only the load weight hanging from unit. Applying other force will cause unit to drift.</p>
<p>9</p>  <p>The wire rope should never be more than 20° out of vertical while the G-Force® is in use.</p>	<p>10</p>  <p>Do not bang the G-Force® into end stops repeatedly or at a speed faster than a normal walking pace.</p>	<p>11</p>  <p>What is Trolley Saddle? 150# unit: The distance from bottom of wheels to floor. 300/380# unit: The distance from hoist trolley clevis pin to the floor. Maximum Trolley Saddle is 12'.</p> <p>Maximum Trolley Saddle for the G-Force® is 12'. See drawing for Trolley Saddle definitions by unit size.</p>	<p>12</p>  <p>Questions about G-Force®? Call Gorbel® Customer Service at (800) 821-0086 or your local Gorbel® distributor.</p>

INTRODUCTION

Thank you for choosing a Gorbel® G-Force® BXi Intelligent Lifting Device (ILD)** to solve your material handling needs. The innovative design and heavy-duty construction of the G-Force® BXi ILD will provide a superior quality product that will offer years of long term value. A Gorbel® G-Force® BXi ILD will provide many years of dependable service by following the installation and maintenance procedures described herein.

** U.S. PATENT NO'S: 5,865,426, 6,386,513, & 6,886,812, OTHER PATENTS PENDING

Dimensions contained in this installation manual are for reference only and may differ for your particular application.

Normal safety precautions: These included, but are not limited to:

- Checking for obstructions in crane and hoist travel.

WARNING

Only competent erection personnel familiar with standard fabrication practices should be employed to install the G-Force® ILD because of the necessity of properly interpreting these instructions. Gorbel is not responsible for the quality of workmanship employed in the installation of this hoist according to these instructions. Contact Gorbel, Inc., at 600 Fishers Run, P.O. Box 593, Fishers, New York 14453, 1-585-924-6262, for additional information, if necessary.

WARNING

Equipment described herein is not designed for, and should not be used for, lifting, supporting, or transporting humans. Failure to comply with any one of the limitations noted herein can result in serious bodily injury and/or property damage. Check Federal, State and Local regulations for any additional requirements.

WARNING

Prior to installation, consult a qualified structural engineer to determine if your support structure is adequate to support the loadings created during normal operation of the G-Force® ILD.

WARNING

Reference American Institute of Steel Construction (AISC) Manual of Steel Construction (9th edition), Part 5, Specification for Structural Joints using ASTM A325 or A490 Bolts (section 8.d.2) for proper procedure to follow when using any torque tightening methods.

WARNING

Do not field modify the G-Force® BXi ILD in any way. Any modification, without the written consent of Gorbel, Inc., will void warranty.

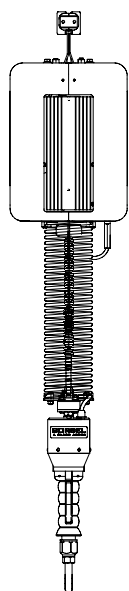
WARNING

The unique serial number for this unit can be found on the front cover of this manual or on the ID nameplate sticker attached to the back bottom of the G-Force® ILD Actuator assembly cover. Always have this serial number available during all correspondence regarding your G-Force® BXi ILD, or when ordering repair parts.

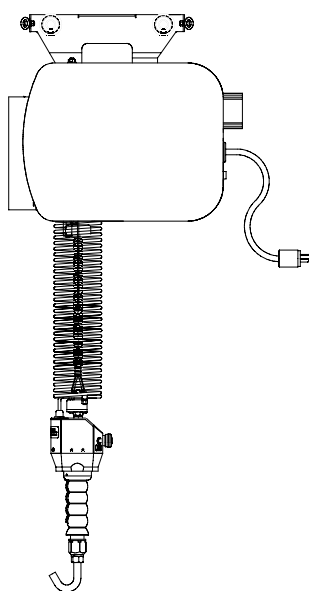
WARNING

The Jog Switch buttons are for system maintenance and load testing use only, and should not be manipulated during normal operation of the G-Force® BXi ILD. Operation of the Jog Switch buttons during normal operation increases the risk of personal injury to the operator.

CORRECT G-FORCE® INSTALLATION ORIENTATION



150# BXi G-Force®



300/380# BXi G-Force®

WARNING

The BXi G-Force® was designed and fully life tested in the installation orientation shown above. Any modification to the installation orientation of the BXi G-Force® without the written consent from Gorbels, Inc. Engineering will immediately void the warranty. Please contact the factory if a modification to the installation orientation shown above is desired.

G-FORCE® BXi ILD MAIN ASSEMBLY COMPONENT DESCRIPTION

Standard Assembly: The G-Force® BXi ILD consists of three (3) main assemblies and they are as follows:

- 1) **Actuator:** The Actuator assembly contains the main lifting power transmission of the G-Force® BXi ILD. The drive assembly of the Actuator consists of the ServoMotor with failsafe brake, Gearbox, Main Drum Pulley, and Controls. The Actuator assembly also contains the Upper and Lower Limit Switches. **See the Lift Functionality and Controls Interface Feature sections for additional details.**
- 2) **Coil Cord:** The Coil Cord assembly carries the signals from the Handle back to the Controls in the Actuator assembly. The Coil Cord carries signals back to the Controls for lift speed, lift direction, E-Stop, and Float Mode (if equipped). Caution must be taken to not over-rotate the Handle, as serious damage can occur when the Coil Cord binds up around the wire rope.
- 3) **Handle:** The Handle is the main interface between the operator and the lifting device. The Handle comes standard equipped with a lifting hook. The supplied lifting hook can be removed and replaced with customer tooling. Tooling must meet the guidelines set forth by Gorbels, Inc. Improper tooling integration will result in degraded performance and premature failure of the G-Force® BXi ILD. **See the Lift Functionality and Controls Interface Feature sections for additional functionality located at the Handle.**

LIFT FUNCTIONALITY

Standard Operation: The Gorbel® G-Force® Bxi ILD is a servomotor driven, high speed, ergonomic materials handling device. When the device is in the standard operational mode, the sliding handle of the hand controller commands the z-axis direction and speed of the lift (**reference Diagram A**). The handle has a center neutral position and can slide up and down to provide up and down speed commands to the control system. The further the handle is displaced from the neutral position the faster the servo movement to lift or lower the load. The operator lifts or lowers the load by grasping the handle and moving it up or down as if it were an extension of the operator's arm. The lift moves slightly slower when a heavy load is lifted, thereby giving the operator some feel for the weight of the load and thus reducing inertial forces. When depressed, the operator present switch in the handle activates the servomotor (**reference Diagram A**). Depressing the operator present switch also releases an electrically operated mechanical failsafe holding brake in the motor.

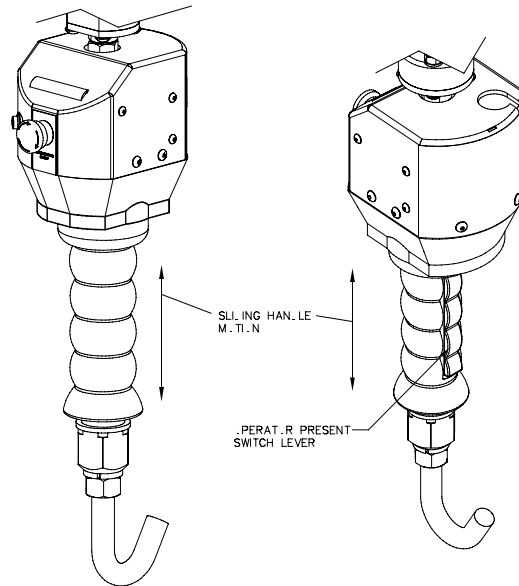


Diagram A. Sliding Handle - Operator Present Switch Lever.

Float Mode (System Option): This mode is initiated by simply pressing the Float Mode Enable button on the hand controller. In this mode, the operator can simply handle the load directly with either one or two hands and cause the load to raise or lower by applying either an upward or downward force on the load. This mode overrides the need to depress the operator present switch. The greater the force applied, the faster the load will move. There is a standard setting in the controls that safely limits the maximum speed of travel in Float Mode. Actuating the operator present switch while in Float Mode will cause the unit to exit float. While in Float Mode, the load cannot be increased or decreased because this may cause unwanted motion. Float Mode must be reinitiated each time the weight of the live load is changed. The Float Mode enable button is located on the face of the handle (**reference Diagram B**).

Virtual Limits and Speed Reduction Points: Five different settings can be used to limit or reduce the speed and/or vertical lift of a Bxi model G-Force®. These settings are referred to as Virtual Limits and Speed Reduction Points. Following is a description of each of these five settings.

The **UPPER LIMIT** acts as a software-controlled limit switch, preventing the handle from traveling above the defined point.

The **LOWER LIMIT** acts as a software-controlled limit switch, preventing the handle from traveling below the defined point.

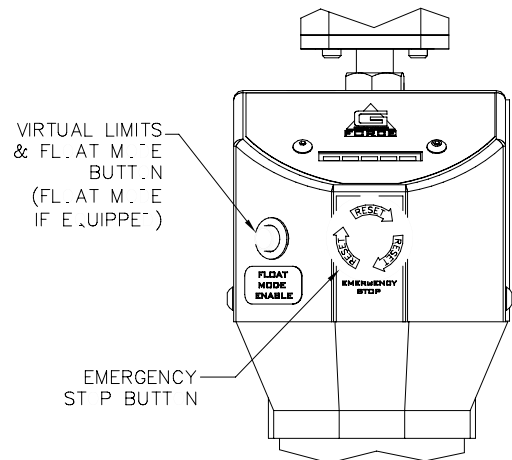


Diagram B. E-Stop, Virtual Limit, and Float Mode (optional) Buttons.

Three different settings are included for Speed Reduction.

The **UPWARD SPEED REDUCTION POINT** reduces the speed of the G-Force® to a speed that is 25% of the maximum speed the G-Force® is set to. The G-Force® will travel at the reduced speed above the point which the Upward Speed Reduction Point is set.

WARNING

If the Upward Speed Reduction Point is being used to reduce the impact of engaging the load “on the fly” (i.e. catching the load with a hook while the G-Force® is already in motion in the upward direction), care must be taken to ensure the speed reduction takes place before the load is engaged. Depending on the upward speed of the G-Force®, it may take several inches of travel for the unit to fully decelerate to the reduced speed.

The **UPWARD RESUME SPEED POINT** is used in conjunction with the Upward Speed Reduction Point to create a defined zone within which the G-Force® will travel in the upward direction at the reduced speed. When an Upward Speed Reduction Point is set, the Upward Resume Speed Point will allow the G-Force® to continue traveling at normal speed above the point which the Upward Resume Point is set.

WARNING

A minimum of up to two inches must be allowed between the **UPWARD SPEED REDUCTION POINT** and the **UPWARD RESUME SPEED POINT** in order for the G-Force® to fully decelerate before resuming full speed.

The **DOWNWARD SPEED REDUCTION POINT** reduces the speed of the G-Force® to a speed that is 25% of the maximum speed the G-Force® is set to. The G-Force® will travel at the reduced speed below the point which the Downward Speed Reduction Point is set.

WARNING

If the Downward Speed Reduction Point is being used to reduce the impact of setting down the load, care must be taken to ensure the speed reduction takes place before the load impacts the surface it is being set down on. Depending on the downward speed of the G-Force®, it may take several inches of travel for the unit to fully decelerate to the reduced speed.

Emergency Stop Button: When depressed, the Emergency Stop (E-Stop) button cuts off all power to the Controls, and sets the mechanical fail-safe brake. The E-Stop button is located on the face of the handle (*reference Diagram B*, page 7). The G-Force® can't operate until the E-Stop has been reset.

Overload: The servo controller will prevent the lift from moving upward if loaded beyond the maximum capacity of the G-Force® BXi ILD. When an overload condition is sensed the Overload indicator is illuminated and the lift is prevented from moving upward. The lift may be moved down to allow for the safe removal of the load. Releasing and reactivating the operator present switch resets the overload condition.

Limit Switches: The G-Force® is equipped with both mechanical Upper and Lower Limit switches, located in the Actuator assembly. When the Upper Limit switch is triggered, the upward motion of the lift stops quickly at a controlled deceleration rate. The controlled deceleration rate guarantees the load cannot come off the hook. When the Upper Limit is triggered the lift will move down but not up. The lower limit is set so that a minimum of two full wraps of wire rope remain on the drum pulley at all times. When the Lower Limit switch is triggered, the downward motion of the lift stops quickly at a controlled deceleration rate. When the Lower Limit is triggered, the lift will only move up and not down.

Slack Switch: The G-Force® is equipped with a pair of Slack Switches that sense tension in the wire rope and trips when the wire rope develops slack. The switches are located inside the Actuator assembly. When the Slack Switches sense slack in the wire rope, downward movement of the lift is stopped to minimize the amount of wire rope unwound from the drum pulley. When slack in the wire rope is sensed, the lift will only move up but not down.

Remote Mount Handle (System Option): The lifting device is capable of operating with the handle displaced from the wire rope (not in-line with the wire rope). For example, if an end user has tooling that is too large for the operator to safely reach and operate the handle in the standard position, remote mounting the handle is recommended. The tooling must be mounted (and balanced) on the end of the wire rope, while the handle can be remote mounted. The tooling **must** be attached to the end of the wire rope with a swivel assembly (supplied by Gorbel, Inc.). Failure to mount the tooling with a swivel assembly can result in premature failure of both the wire rope and the coil cord. The remote mounted handle is linked to the coil cord via extension cables and connectors. The handle operates exactly the same as if it were mounted in-line. If the device is equipped for Float Mode, a load cell assembly is provided that must also be mounted between the tooling and the end of the wire rope. The handle is linked to the load cell via an extension cable and connectors. **The end user must supply Gorbel with the required length of the extension cables such that they can be safely routed and clamped to the tooling. Always include the distance for bends and turns, when providing the extension length.

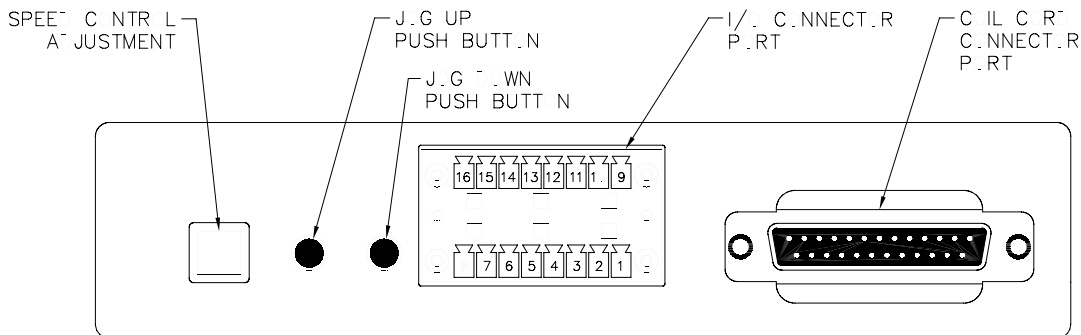


Diagram C. Controls Interface Display.

CONTROLS INTERFACE FEATURES

1. **Jog Switch Push Buttons:** The Jog Switch Buttons allow qualified personnel to replace the wire rope (load cable) on the system. To effectively operate the Jog Switch Buttons, all electrical cables must be connected and power on. Depressing the “Up” jog switch button will enable the motor and cause the system to reel the wire rope into the actuator and onto the main pulley. Depressing the “Down” jog switch button will enable the motor and cause the system to pay out the wire rope from the actuator and off of the main pulley. The handle and operator present switch are not to be operated during use of the Jog Switch Buttons.

WARNING

The Jog Switch buttons are for system maintenance and load testing use only, and should not be manipulated during normal operation of the G-Force® BXi ILD. Operation of the Jog Switch buttons during normal operation increases the risk of personal injury to the operator.

2. **Speed Control Adjustment:** The 10 position Speed Control adjustment switch allows the operator to adjust the speed of the lifting device with a small flathead screwdriver.
3. **Power Up Diagnostic Mode:** When the “E-stop” button is released and power is applied to the lift, the servo motor controller goes into a power up diagnostic mode test. The following are the sections to the diagnostic mode test:

- a) **LED Indicator Test:** The purpose of this test is to verify the five (5) indicator LEDs are functional. When the E-stop button is released, the yellow “Power On” LED comes on immediately, indicating the internal 24 volt power is operational. After the servo controller completes a series of self-tests, it turns on the four (4) remaining LEDs for two (2) seconds to simply verify functionality.

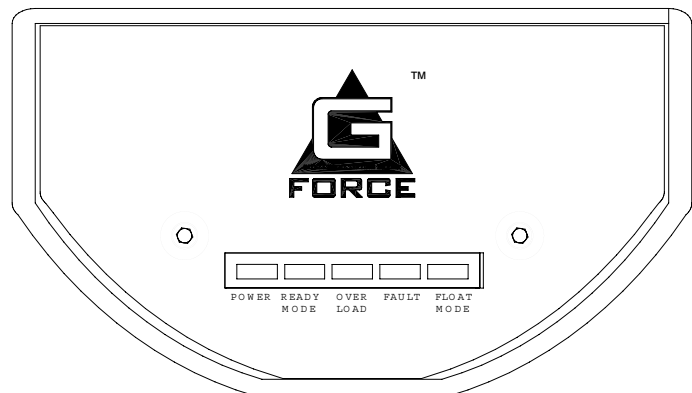


Diagram D. BXi Handle LED Display.

- b) **Switch Test:** After completion of the indicator test, a system switch test is started. The purpose of this test is to display the state of the “Slack” switches and “Upper and Lower Limit” switches. During the switch test, the orange “Overload” LED will flash if the “Upper Limit” switch is triggered (up limit state) and the red “System Fault” LED will flash if the “Slack” switches are triggered (wire rope slack). Once the operator present switch or jog switch is activated the servo motor controller exits the power up diagnostic mode and goes into normal operation.

NOTE: The yellow Power On indicator will remain on during the power up diagnostic mode test.

4. **Power On LED (Yellow):** The “Power On” LED illuminates when the required 220VAC, single-phase power has been correctly applied to the system, and the E-Stop button has been released.
5. **Standard Mode LED (Green):** The “Standard Mode” LED illuminates when all system initialization is complete and the operator present switch is depressed, thus activating the standard mode of operation.
6. **Capacity Overload LED (Orange):** The “Capacity Overload” LED illuminates when a load or impact greater than the capacity of the hoist has been detected by the system. When this LED illuminates, the controller will allow the operator to lower the load, but it will inhibit the operator from raising the load prior to “resetting” the system. To clear the overload fault and “reset” the system, released the switch for approximately 1 to 2 seconds. Once the LED turns off, the system can again be operated.
7. **Float Mode LED (Blue):** If the unit is equipped with Float Mode (system option), the “Float Mode” enabled LED will illuminate when the Float Mode button is pressed on the hand controller and Float Mode has been initiated.
8. **System Fault LED (Red):** The “System Fault” LED flashes when basic faults have been detected by the control system. If a fault has occurred, the “Standard Mode” or “Float Mode” (if equipped) LED’s will turn off.

TECHNICAL SPECIFICATIONS

BX Series	150 lbs.	300 lbs.	380 lbs.
Maximum Capacity (Load & Tool)	150 lbs.	300 lbs.	380 lbs.
Max Lifting Speed Unloaded (feet per minute)	275 fpm	138 fpm	98 fpm
Max Lifting Speed Fully Loaded (feet per minute)	200 fpm	100 fpm	71 fpm
Max Float Mode (Option) Lifting Speed (feet per minute)	131 fpm	88 fpm	63 fpm
Max Lift Stroke	7 ft	7 ft	7 ft
Primary Lift Voltage	220 VAC (1 Phase) + 20%, - 20%	220 VAC (1 Phase) + 20%, - 20%	220 VAC (1 Phase) + 20%, - 20%
Amps	5	5	5
Capacity Overload Safety	Yes	Yes	Yes
LED Indicator Lights	Yes	Yes	Yes
Anti-Recoil	Yes	Yes	Yes
Failsafe Brake	Yes	Yes	Yes
Float Mode Capable	Yes (Option)	Yes (Option)	Yes (Option)
Inertia Management	Yes	Yes	Yes
Precision Lift Capability	Yes	Yes	Yes
Drive/Control System	Servo	Servo	Servo
Speed Adjustment	Yes	Yes	Yes
Jogging Capability	Yes	Yes	Yes
Media	Wire Rope	Wire Rope	Wire Rope
Duty Cycle	H5	H5	H5
Virtual Limits (Upper Limit, Power Limit, Speed Reduction)	Yes	Yes	Yes
Weight Readout / Output	Yes (Option)	Yes (Option)	Yes (Option)
Cycle Counting	Yes (Option)	Yes (Option)	Yes (Option)
Capacity Overload Threshold Adjustability	Yes (Option)	Yes (Option)	Yes (Option)
User Accessible Inputs / Outputs	(4) 24VDC Inputs (4) Relay Outputs (1) E-Stop Relay Output	(4) 24VDC Inputs (4) Relay Outputs (1) E-Stop Relay Output	(4) 24VDC Inputs (4) Relay Outputs (1) E-Stop Relay Output
DeviceNet Data Output	Yes (Option)	Yes (Option)	Yes (Option)
Power Available for Tooling	24 VDC, 0.5 Amps	24 VDC, 0.5 Amps	24 VDC, 0.5 Amps

INSTALLATION

STEP 1 - UNPACKING THE G-FORCE® BXI ILD

➡ **TIP:** Packing list can be found in plastic pocket attached to shipping box.

1.1 Carefully remove all items from the box.

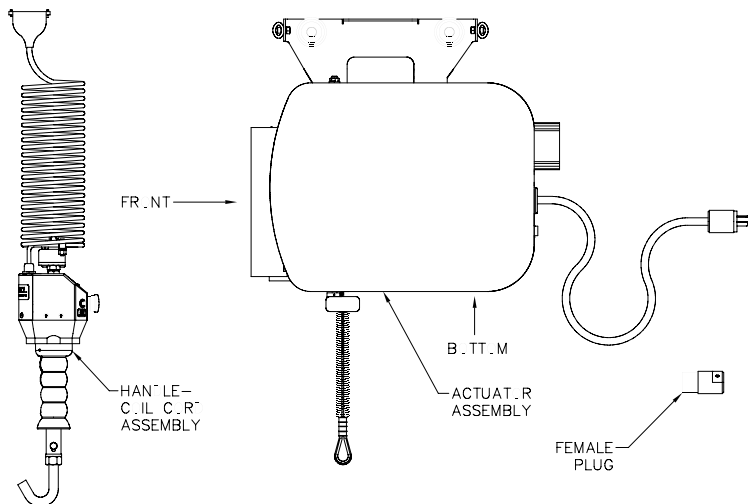


Diagram 1A. 150# BXi series shipped components.

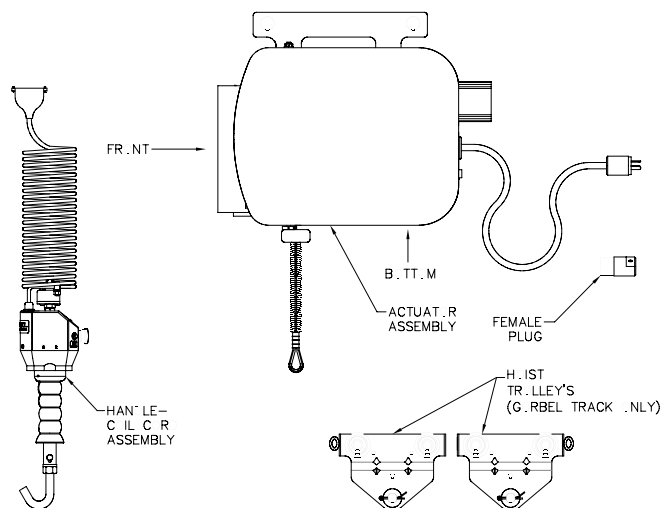


Diagram 1B. 300/380# BXi series shipped components.

1.2 Verify that all components listed on the packing slip are included.

1.3 If any items are missing or were damaged during shipping, please contact Gorbel® Customer Service immediately.

STEP 2 - PRE-ASSEMBLY

- 2.1 Read entire installation manual **before** beginning installation of the G-Force® BXi ILD.
- 2.2 Tools and materials typically needed to install/assemble a G-Force® BXi ILD are as follows:
- Hand tools
 - Plastic cable tie straps
 - Ladders/man lifts
- 2.3 Prior to installing the G-Force® BXi ILD, it is a good idea to familiarize yourself with the main components.
- Reference the following layout drawings:
 - **Figure I1**, page 69 - 150# BXi Standard Inline Component Layout
 - **Figure I2**, page 70 - 300/380# BXi Standard Inline Component Layout
 - **Figure I3**, page 71 - Standard Remote Mount Component Layout
 - **Figure I4**, page 72 - Float Mode Remote Mount Component Layout

STEP 3 - HANDLE-COIL CORD INSTALLATION (STANDARD INLINE)

➡ **TIP:** This step is best completed on a workbench, prior to installation of the Actuator into the bridge system.

Note: For Standard Remote Mounted Handle-Coil Cord Installation, go to Step 3A, page 14.
For Float Mode Remote Mounted Handle-Coil Cord Installation, go to Step 3B, page 15.

- 3.1 Remove the Cotter and Clevis Pin from the Handle swivel assembly.
- 3.2 Feed the wire rope from the Actuator assembly through the center of the Coil Cord. Slide the looped end of the wire rope assembly into the yoke of the Handle swivel assembly (**reference Diagram 3A**).
- 3.3 Re-insert the Clevis and Cotter Pin capturing the wire rope assembly in the Handle swivel assembly (**reference Diagram 3A**).
- 3.4 Remove the Coil Cord mounting clamps from the bottom side of the Actuator assembly (**reference Diagram 3B**, page 14).
- 3.5 Assemble the Coil Cord to the clamps by capturing the cord in the opening in the clamp (**reference Diagram 3B**, page 14).
- 3.6 Re-assemble the Coil Cord mounting clamps to the bottom side of the Actuator assembly (**reference Diagram 3B**, page 14).
- 3.7 Adjust the Coil Cord in the clamps so that the Coil Cord Connector is conveniently located on the proper side of the Actuator assembly (**reference Diagram 3B**, page 14).
- 3.8 Connect the Coil Cord Connector to the plug on the Control's Interface located on the bottom side of the Actuator assembly (**reference Diagram 3B**, page 14).
- 3.9 Assure that the coils of the Coil Cord are centered around the wire rope when properly installed. When the proper alignment of the Coil Cord has been achieved finish clamping the hardware to fix the Coil Cord in place (**reference Diagram 3B**, page 14).

Continue to Step 4 on Page 16.

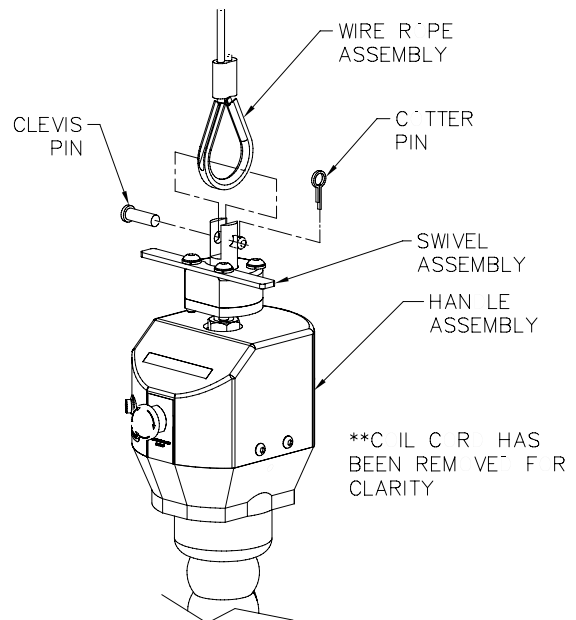


Diagram 3A. Handle to Wire Rope assembly.

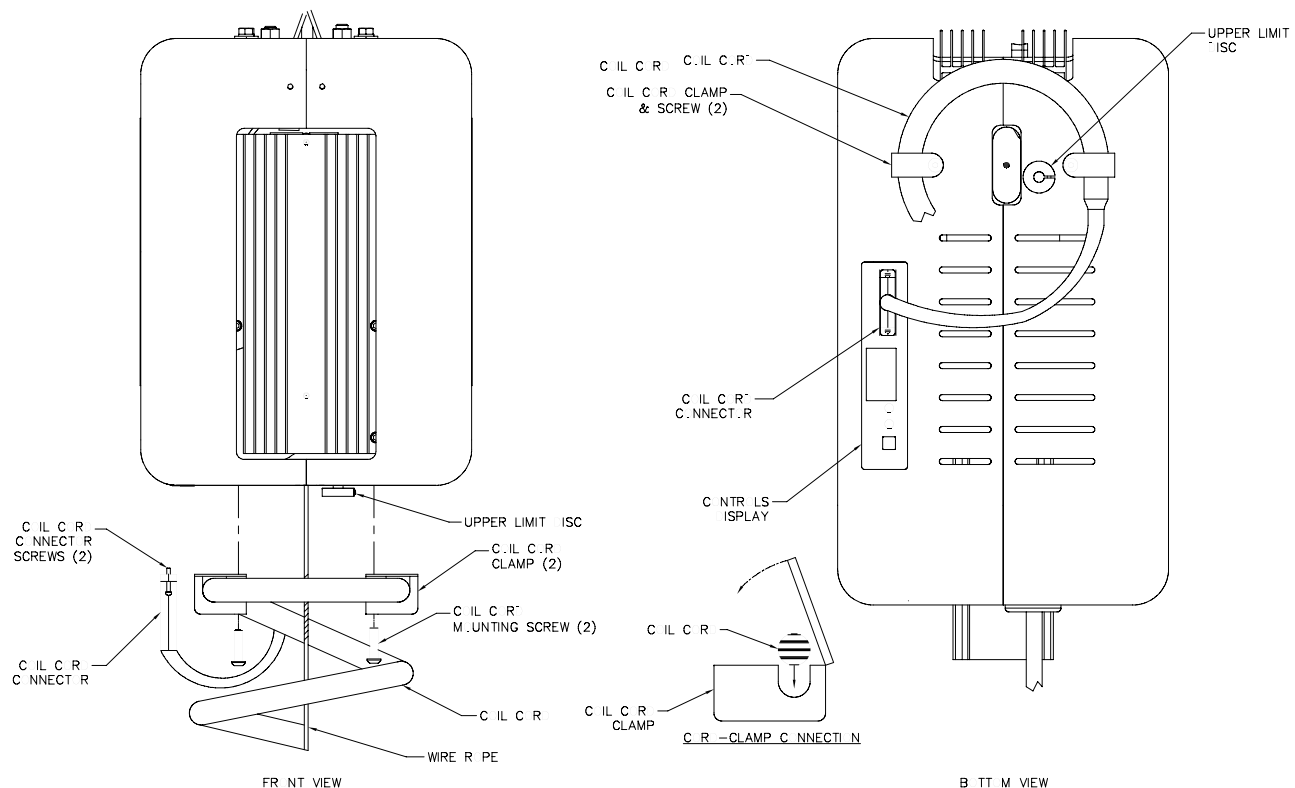


Diagram 3B. *Coil Cord to Actuator assembly.*

STEP 3A - HANDLE-COIL CORD INSTALLATION (STANDARD REMOTE MOUNTED)

➡ **TIP:** This step is best completed on a workbench, prior to installation of the Actuator into the bridge system.

- 3A.1** Attach the wire rope Swivel assembly directly to the end tooling (*reference Figure I3*, page 71).
- 3A.2** Remove the Cotter and Clevis Pin from the Swivel assembly.
- 3A.3** Feed the wire rope from the Actuator assembly through the center of the Remote Mount Coil Cord. Slide the looped end of the wire rope assembly into the yoke of the Swivel assembly (*reference Diagram 3A*, page 13). The Handle in *Diagram 3A*, page 13, will be replaced by the customer end tooling.
- 3A.4** Re-insert the Clevis and Cotter Pin capturing the wire rope assembly in the Swivel assembly (*reference Diagram 3A*, page 13). The Handle in *Diagram 3A*, page 13, will be replaced by the customer end tooling.
- 3A.5** Remove the Coil Cord mounting clamps from the bottom side of the Actuator assembly (*reference Diagram 3B*).
- 3A.6** Assemble the Remote Mount Coil Cord to the clamps by capturing the cord in the opening in the clamp (*reference Diagram 3B*).
- 3A.7** Re-assemble the Remote Mount Coil Cord mounting clamps to the bottom side of the Actuator assembly (*reference Diagram 3B*).
- 3A.8** Adjust the Remote Mount Coil Cord in the clamps so that the Coil Cord Connector is conveniently located on the proper side of the Actuator assembly (*reference Diagram 3B*).
- 3A.9** Connect the Coil Cord Connector to the plug on the Control's Interface located on the bottom side of the Actuator assembly (*reference Diagram 3B*).

- 3A.10** Assure that the coils of the Remote Mount Coil Cord are centered around the wire rope when properly installed. When the proper alignment of the Remote Mount Coil Cord has been achieved, finish clamping the hardware to fix the Remote Mount Coil Cord in place (**reference Diagram 3B**, page 14).
- 3A.11** Attach the Standard Remote Mount Handle to the Tooling, being sure to mount at both the top and bottom of the Remote Mount Handle assembly (**reference Figure I3**, page 71). Assure that the mounting arrangement does not effect the operating function of the Handle.

WARNING

Remote Mount G-Force® BXi Handles must be mounted at both the top and bottom of the Handle assembly. Failure to mount the Remote Mount Handle at top and bottom can result in undesirable performance and/or premature component failure.

- 3A.12** Connect the Remote Mount Coil Cord Extension cable from the Remote Mount Handle to the Remote Mount Coil Cord. Securely clamp the Remote Mount Coil Cord Extension cable to the tooling as needed (**reference Figure I3**, page 71).

Continue to Step 4 on page 16.

STEP 3B - HANDLE-COIL CORD INSTALLATION (FLOAT MODE REMOTE MOUNTED)

➡ **TIP:** This step is best completed on a workbench, prior to installation of the Actuator into the bridge system.

- 3B.1** Attach the Load Cell - Swivel assembly directly to the end tooling (**reference Figure I4**, page 72).
- 3B.2** Remove the Cotter and Clevis Pin from the Swivel assembly.
- 3B.3** Feed the wire rope from the Actuator assembly through the center of the Remote Mount Coil Cord. Slide the looped end of the wire rope assembly into the yoke of the Swivel assembly (**reference Diagram 3A**, page 13). The Handle in **Diagram 3A**, page 13, will be replaced by the customer end tooling.
- 3B.4** Re-insert the Clevis and Cotter Pin capturing the wire rope assembly in the Swivel assembly (**reference Diagram 3A**, page 13). The Handle in **Diagram 3A**, page 13, will be replaced by the customer end tooling.
- 3B.5** Remove the Coil Cord mounting clamps from the bottom side of the Actuator assembly (**reference Diagram 3B**, page 14).
- 3B.6** Assemble the Remote Mount Coil Cord to the clamps by capturing the cord in the opening in the clamp (**reference Diagram 3B**, page 14).
- 3B.7** Re-assemble the Remote Mount Coil Cord mounting clamps to the bottom side of the Actuator assembly (**reference Diagram 3B**, page 14).
- 3B.8** Adjust the Remote Mount Coil Cord in the clamps so that the Coil Cord Connector is conveniently located on the proper side of the Actuator assembly (**reference Diagram 3B**, page 14).
- 3B.9** Connect the Coil Cord Connector to the plug on the Control's Interface located on the bottom side of the Actuator assembly (**reference Diagram 3B**, page 14).
- 3B.10** Assure that the coils of the Remote Mount Coil Cord are centered around the wire rope when properly installed. When the proper alignment of the Remote Mount Coil Cord has been achieved finish clamping the hardware to fix the Remote Mount Coil Cord in place (**reference Diagram 3B**, page 14).
- 3B.11** Attach the Standard Remote Mount Handle to the Tooling, being sure to mount at both the top and bottom of the Remote Mount Handle assembly (**Figure I4**, page 72). Assure that the mounting arrangement does not affect the operating function of the Handle.

WARNING

Remote Mount G-Force® BXi Handles must be mounted at both the top and bottom of the Handle assembly. Failure to mount the Remote Mount Handle at top and bottom can result in undesirable performance and/or premature component failure.

- 3B.12** Connect the Remote Mount Coil Cord Extension cable from the Remote Mount Handle to the Remote Mount Coil Cord. Connect the Float Mode Extension cable from the Remote Mount Handle to the Remote Mounted Load Cell assembly. Securely clamp the Remote Mount Coil Cord Extension and Float Mode Extension cables to the tooling as needed (*reference Figure 14*, page 72).

STEP 4 - INSTALLING THE ACTUATOR ASSEMBLY

- 4.1** Verify that the G-Force® BXi ILD trolley wheels are correct for the style and capacity track that the unit is being installed on. **Note:** Standard 150# G-Force® BXi ILDs come with the wheels pre-assembled to the Actuator Trolley. Standard 300 and 380# G-Force® BXi ILDs are supplied with an assembled Actuator Adapter Trolley and two (2) properly sized Hoist Trolleys when being installed in a Gorbel® Bridge system. The customer must provide two (2) Hoist Trolleys when the unit will run in a non-Gorbel® Bridge system. 150# G-Force® BXi ILDs can also be supplied with an Actuator Adapter Trolley, similar to that of the 300 and 380# units.

- 4.2 300 and 380# G-Force® BXi ILD:** Assemble the Hoist Trolleys to the Actuator Adapter Trolley. Remove the Clevis Pin and flat washers from the Hoist Trolleys. Slide the Trolley legs over the Adapter Trolley and align the holes. Re-assemble the Clevis Pin and washers to the Hoist Trolleys (*reference Diagram 4A*).

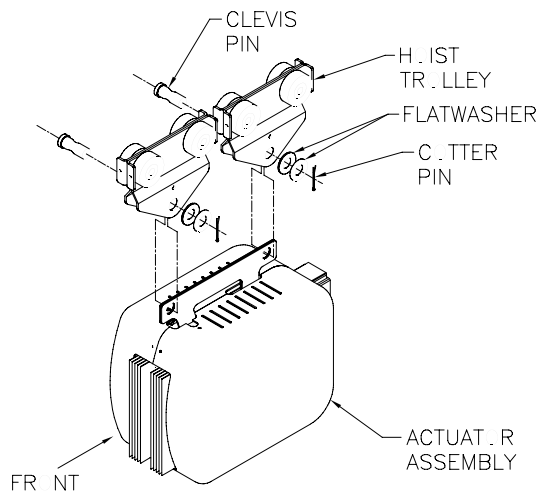


Diagram 4A. 300/380# BXi Actuator-Hoist Trolley Assembly.

- 4.3** Remove the end stop from the Bridge and install the G-Force® Actuator into the track. Immediately re-install the end stops. Roll the Actuator assembly along the full length of the Bridge to assure that the travel is smooth throughout.

STEP 5 - ELECTRICAL POWER CONNECTION

➡ **TIP:** Do not connect to main power until all assembly is complete.

STANDARD

- 5.1** Prior to final wiring, inspect the entire system to assure that all connections are seated properly and are without kinks or bends. Verify the following connections:
- a) Coil Cord to Handle
 - b) Coil Cord to Actuator Assembly
- 5.2** Connect a 220 VAC single-phase power source through a Disconnect Switch (by others) to the festooned power cabling (not provided with G-Force® BXi ILD).

WARNING

Source power to the BXi G-Force® unit is to measure 220 VAC (1 Phase) +/- 20%. Minimum Voltage = 176 VAC. Maximum Voltage Must NOT Exceed 264 VAC. Voltages greater than 264 VAC will result in premature Controls failure.

- 5.3** Wire the Female Turnlock Power Plug (provided) to the end of the festooned power cable.

- 5.4 After verifying the Disconnect Switch is turned **OFF**, connect the newly installed receptacle to the Male Plug at the G-Force® BXi ILD.

STEP 6 - AIR CONNECTION (OPTION)

➡ **TIP:** G-Force® BXi ILD units (Standard Inline or Remote Mounted) that are ordered with Air power have a 3/8" ID Nycoil air hose integrated into the full length of the Coil Cord. The Coil Cord is provided with two (2) Male fittings located at both ends of the air hose. Gorbel also provides both mating Female fittings for 3/8" ID air hose.

- 6.1 Assemble one of the Female fittings (provided) to the end of the input air hose (not provided).
- 6.2 Assemble the other Female fitting (provided) to the end of the tooling airline (not provided).
- 6.3 Connect both fittings to the respective ends of the Nycoil air hose in the Coil Cord.
- 6.4 Release the valve supplying air to the G-Force® BXi ILD. Inspect and assure that all connections are properly made, and there are no air leaks.

STEP 7 - INITIAL POWER-UP

➡ **TIP:** Do not depress the operator present switch on the Handle during startup.

- 7.1 Turn on the Disconnect Switch (by others) to apply power to the G-Force® BXi ILD.
- 7.2 Disengage the Emergency Stop (E-stop) button located on the front face of the handle.
- 7.3 The system will complete the "Power Up Diagnostic Test" described in the "Controls Interface Features" section of this manual on pages 9 & 10.
- 7.4 When the "Power Up Diagnostic Test" has been successfully completed the unit is ready for operation.
- 7.5 Standard Operation: Depress the operator present switch on the Handle and run the unit up and down several times (at least 20 times in each direction) to assure that there is no mechanical binding in the lift system or electrical connection issues.
- ➡ **TIP:** The operator should always keep the operator present switch depressed while operating the unit in Standard Mode. Frequent pressing and releasing of the operator present switch (which is common for first time users) will result in jerky movement, and is not recommended.
- 7.6 Float Mode (if equipped): Lift up a load greater than 20 lbs. Settle the Load and depress the "Float Mode Enabled" button. ***Do not hold onto the part while initiating Float Mode.*** This will give the unit a false reading and cause excessive drift. Grasping the load, run the unit up and down several times (at least 20 times in each direction) to assure proper operation. Float Mode should provide a nice smooth feel.
- 7.7 Finally test the operation of any special tooling that may have been integrated to the G-Force® BXi ILD.

WARNING

Gorbel, Inc., does not provide integrated tooling for the G-Force® BXi ILD. All tooling related questions should be directed to the tooling manufacturer or supplier.

STEP 8 - ADJUSTING LIFT SPEED

- 8.1 Take note of the speed of the unit as it is raised and lowered during Step 7. The speed of the G-Force® BXi ILD can be adjusted using the 10 position Speed Selector switch located at the Controls Interface back at the bottom face of the Actuator assembly.

- 8.2 Using a small flat-head screwdriver, the position of the switch can be turned to any of the positions that are numbered from 0 to 9. If a slower speed is desired, position the switch to a smaller number (towards 0). If a faster speed is desired, position the switch to a larger number (towards 9).

STEP 9 - SETTING VIRTUAL LIMITS AND SPEED REDUCTION POINTS

- 9.1 Move the handle to the point at which you would like to define a Virtual Limit or Speed Reduction Point.

WARNING

Ensure the G-Force® is in standby mode **WITHOUT** the Operator Present Switch engaged and Float Mode must be off.

- 9.2 Press and hold the Float Mode Enable button for 2 seconds, or until all of the LEDs on the handle are illuminated. This sets the G-Force® to Program Mode.
- 9.3 Release the Float Mode Enable button. You are now in Program Mode (assuming the LEDs are still illuminated).
- 9.4 Press and release the Float Mode Enable button the number of times that correspond to the point you want to set (see table below).
- 9.5 Once the selected point is set, the LEDs will turn off and the G-Force® is ready for operation.

NOTE: Program Mode must be entered before defining each point.

Number of Button Presses	Function
1	Sets the UPPER LIMIT
2	Sets the LOWER LIMIT
3	Sets the DOWNWARD SPEED REDUCTION POINT
4	Clears all Virtual Limits and Speed Reduction Points
5	Sets the UPWARD SPEED REDUCTION POINT
6	Sets the UPWARD SPEED RESUME POINT

STEP 10 - FLOAT MODE (OPTION)

- 10.1 Lift and steady the load.
- 10.2 Without applying any external forces to the load, press the Float Mode Button for one (1) second. When done correctly the “Blue” LED light will turn on (the “Yellow” LED will remain on as well).

WARNING

If external forces are applied to the load while Float Mode is being initiated, the G-Force® will calculate a baseline weight that is higher or lower than the actual weight being lifted. When the external force is removed, the load will begin to drift in the opposite direction of the load that was applied.

- 10.3 The direction and speed of travel is now being controlled by the amount of force that the operator exerts directly onto the load. To move the load down, put vertical pressure on the load in down direction. To move the load up, lift up on the load in the vertical up direction. The higher the force exerted on the load, the faster the unit moves.

WARNING

NEVER remove the load from the G-Force® while still in Float Mode. The drive will interpret the removal of the load as operator intent to lift the load. Therefore, the Handle will begin to drift up. The speed of the Handle drift directly correlates to the weight that was removed from the unit. The heavier the weight, the faster the Handle will travel.

STEP 11 - FINAL STEPS

➔ **TIP:** Gorbel® Customer Service is available from 7am to 7pm Eastern Time Monday - Thursday and 7am to 5pm Eastern Time Friday.

11.1 Please contact the Gorbel® factory (585-924-6262) if any of the following occur. **DO NOT ATTEMPT TO REPAIR UNIT YOURSELF.**

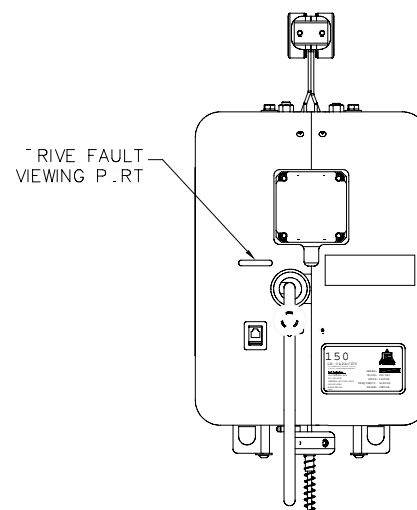
- Excessive noise
- Unexpected operation
- Change in performance
- Damage or excessive wear to unit components
- Questions about the unit arise

Please do not be limited by these items only.

11.2 Keep Packing List, Installation Manual, Drawings, and any other inserts filed together in a safe place.

DRIVE FAULT TROUBLESHOOTING CHART

A fault occurs when there is a flashing “Red” LED on the Handle after the diagnostic check is completed. Two short flashes, followed by a long pause indicates that a Drive Fault has occurred. The Servo Drive in the BXi G-Force® ILD is equipped with a Drive Status LED Display. This is a 5-Digit seven-segment display, which indicates the current status of the driver. A fault on the drive would be represented by AL-## which indicates an alarm with an associated two digit number. These Alarm Codes are listed in the charts on the next couple of pages. The Alarm Codes can be viewed from outside the G-Force® by looking through the Drive Fault Viewing Port located on the backside of the Actuator Assembly (as shown to the right). Three short “Red” flashes followed by a long pause indicates a “Following Error”. This specific error can occur when the applied motor parameters are not well tuned, and result in the large following error. All standard G-Force® units are setup with properly tuned motor settings for standard handles. Therefore, following errors are more likely to occur with custom G-Force® units or one with specialized tooling. Please contact Gorbel for further information.



ALARM CODE	DESCRIPTION	RECOVERY STEPS
AL-01 Internal Power Module Error	Driver has detected the following: <ul style="list-style-type: none"> • Overcurrent • Overheat • Gate voltage drop 	<ol style="list-style-type: none"> 1. Verify the ambient temperature is not over 55° C. 2. Contact Gorbel® Customer Service if problem persists, as the servo drive may need to be replaced.
AL-02 Overvoltage	DC power bus exceeds 420 VDC.	<ol style="list-style-type: none"> 1. Verify the power supply is within 176 VAC to 264 VAC. 2. Contact Gorbel® Customer Service if problem persists, as the servo drive may need to be replaced.
AL-03 Undervoltage	DC power bus below 200 VDC.	<ol style="list-style-type: none"> 1. Verify the power supply is within 176 VAC to 264 VAC. 2. Contact Gorbel® Customer Service if problem persists, as the servo drive may need to be replaced.
AL-06 Resolver Open	Resolver feedback signal drops below 0.34 VAC.	<ol style="list-style-type: none"> 1. Verify that the resolver connection between the motor and drive is not damaged or disconnected. 2. Contact Gorbel® Customer Service if problem persists, as the servo drive may need to be replaced.
AL-07 Power Stage Error	Main control unit identifies a fault in the power stage of the driver.	<ol style="list-style-type: none"> 1. Contact Gorbel® Customer Service if problem persists, as the servo drive may need to be replaced.

ALARM CODE	DESCRIPTION	RECOVERY STEPS
AL-09 Regen Resistor Over Temperature	Excessive regen energy being dissipated by the internal or external regeneration resistor.	<ol style="list-style-type: none"> 1. Verify the power supply is within 176 VAC to 264 VAC. 2. Verify the handled load is within the limits of the hoist. 3. Contact Gorbel® Customer Service if problem persists, as the servo drive may need to be replaced.
AL-12 Watchdog Timer	Internal CPU clock has stopped.	<ol style="list-style-type: none"> 1. Contact Gorbel® Customer Service if problem persists, as the servo drive may need to be replaced.
AL-14 Brake Alarm	Sequencing of the static or dynamic brake is faulty.	<ol style="list-style-type: none"> 1. Verify all connections (ribbon cables) between the servo drive and the interface board on the side of the control module. 2. Contact Gorbel® Customer Service if problem persists, as the servo drive may need to be replaced.
AL-15 Excessive Current	Motor current exceeds the rating by 120%.	<ol style="list-style-type: none"> 1. Verify the hoist mechanics are not jammed and are working properly. 2. Contact Gorbel® Customer Service if problem persists, as the servo drive may need to be replaced.
AL-16 Speed Amp Saturated	Internal speed loop is saturated and maximum torque is applied for more than 3 seconds.	<ol style="list-style-type: none"> 1. Verify the hoist mechanics are not jammed and are working properly. 2. Contact Gorbel® Customer Service if problem persists, as the servo drive may need to be replaced.
AL-17 Motor Overload	Calculated motor temperature exceeds rating 110%.	<ol style="list-style-type: none"> 1. Verify the hoist mechanics are not jammed and are working properly. 2. Verify the handled load is within the limits of the hoist. 3. Contact Gorbel® Customer Service if problem persists, as the servo drive may need to be replaced.
AL-18 Driver Overload	Motor current exceeds intermittent rating of driver. The driver rating is specified as follows:	<ol style="list-style-type: none"> 1. Verify the hoist mechanics are not jammed and are working properly. 2. Verify the handled load is within the limits of the hoist. 3. Contact Gorbel® Customer Service if problem persists, as the servo drive may need to be replaced.
AL-19 Resolver Error	Resolver feedback error.	<ol style="list-style-type: none"> 1. Verify that the resolver connection between the motor and drive is not damaged or disconnected. 2. Contact Gorbel® Customer Service if problem persists, as the servo drive may need to be replaced.
AL-20 Overspeed	Motor speed exceeds maximum rating by 120%.	<ol style="list-style-type: none"> 1. Verify that the resolver connection between the motor and drive is not damaged or disconnected. 2. Contact Gorbel® Customer Service if problem persists, as the servo drive may need to be replaced.
AL-21 Deviation Counter Overflow	Motor is unable to follow the commanded profile. Deviation counter exceed +/- 2 ²¹ .	<ol style="list-style-type: none"> 1. Verify the hoist mechanics are not jammed and are working properly. 2. Verify the handled load is within the limits of the hoist. 3. Contact Gorbel® Customer Service if problem persists, as the servo drive may need to be replaced.
AL-26 Parameter Setting Error	Motor code is not set or is set improperly.	<ol style="list-style-type: none"> 1. Contact Gorbel® Customer Service if problem persists, as the servo drive may need to be replaced.

ALARM CODE	DESCRIPTION	RECOVERY STEPS
AL-32 Absolute Home Position Not Set	Absolute Home Position has not been established. Also set with AL-6, 19, 22, 23.	1. Contact Gorbel® Customer Service if problem persists, as the servo drive may need to be replaced.
AL-33 Absolute Home Position Setting Error	Absolute Home setting procedure is not correctly completed. Also set with AL-6, 19, 22, 23, 27.	1. Contact Gorbel® Customer Service if problem persists, as the servo drive may need to be replaced.
AL-36 Battery Missing	Battery has been disconnected when the power was OFF.	1. Contact Gorbel® Customer Service if problem persists, as the servo drive may need to be replaced.
AL-44 Battery Low	Absolute battery voltage has fallen below 2.8 V.	1. Contact Gorbel® Customer Service if problem persists, as the servo drive may need to be replaced.

WIRE ROPE INSPECTION

1) Frequent Inspection

The operator or other designated person should visually inspect all ropes at the start of each shift. These visual observations should be concerned with discovering gross damage, such as listed below, which may be an immediate hazard:

- (a) distortion of the rope such as kinking, crushing, unstranding, birdcaging, main strand displacement, or core protrusion;
- (b) general corrosion;
- (c) broken or cut strands;
- (d) number, distribution, and type of visible broken wires. [See next section on rope replacement]

When such damage is discovered, the rope shall either be removed from service or given an inspection as detailed in the next section.

2) Periodic Inspection

The inspection frequency shall be determined by a qualified person and shall be based on such factors as expected rope life as determined by experience on the particular installation or similar installations; severity of environment; percentage of capacity lifts; frequency rates of operation; and exposure to shock loads. Inspections need not be at equal calendar intervals and should be more frequent as the rope approaches the end of its useful life.

A designated person shall perform periodic inspections. This inspection shall cover the entire length of rope. The individual outer wires in the strands of the rope shall be visible to this person during the inspection. Any deterioration resulting in appreciable loss of original strength, such as described below, shall be noted, and determination shall be made as to whether further use of the rope would constitute a hazard:

- (a) points listed in previous section on frequent inspection;
- (b) reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires;
- (c) severely corroded or broken wires at end connections;
- (d) severely corroded, cracked, bent, worn, or improperly applied end connections.

Special care should be taken when inspecting sections of rapid deterioration, such as the following:

- (a) sections in contact with saddles, equalizer sheaves, or other sheaves where rope travel is limited;
- (b) sections of rope at or near terminal ends where corroded or broken wires may protrude;
- (c) sections subject to reverse bends;
- (d) sections of ropes that are normally hidden during visual inspection, such as parts passing over sheaves.

WIRE ROPE MAINTENANCE

- 1) Rope should be stored to prevent damage or deterioration.
- 2) Rope shall be unreeled or uncoiled in a manner to avoid kinking of or inducing a twist in the rope.
- 3) Before cutting rope, means shall be used to prevent unlaying of the strands.
- 4) During installation, care should be observed to avoid dragging of the rope in dirt or around objects that will scrape, nick, crush, or induce sharp bends.

- 5) Rope should be maintained in a well-lubricated condition. Gorbelt recommends using Chain and Cable Penetrating oil for lubrication. Lubricant applied as part of a maintenance program shall be compatible with the original lubricant. Lubricant applied shall be of the type that does not hinder visual inspection. Immediately after inspection, lubricant shall be applied before rope is returned to service. Those sections of rope that are located over sheaves or otherwise hidden during inspection and maintenance procedures require special attention when lubricating ropes. The object of rope lubrication is to reduce internal friction and to prevent corrosion.

WIRE ROPE REPLACEMENT CRITERIA

- 1) No precise rules can be given for determination of the exact time for rope replacement, since many factors are involved. Once a rope reaches any one of the specified removal criteria, it may be allowed to operate to the end of the work shift, based on the judgement of a qualified person. The rope shall be replaced after that work shift, at the end of the day, or at the latest time prior to the equipment being used by the next work shift.
- 2) Removal criteria for the rope replacement shall be as follows:
 - (a) in running ropes, 12 randomly distributed broken wires in one lay or four broken wires in one strand in one lay (**reference Diagram E**, below);
 - (b) one outer wire broken at the contact point with the core of the rope, which has worked its way out of the rope structure and protrudes or loops out from the rope structure;
 - (c) wear of one-third the original diameter of outside individual wires;
 - (d) kinking, crushing, birdcaging, or any other damage resulting in distortion of the rope structure;
 - (e) evidence of heat damage from any cause;
 - (f) reductions from nominal diameter greater than those shown below:

<u>Rope Diameter</u>	<u>Maximum Allowable Reduction From Nominal Diameter</u>
Up to 5/16 in. (8 mm)	1/64 in. (0.4 mm)

- 3) Broken wire removal criteria applies to wire rope operating on steel sheaves and drums. However, results of internal testing have shown that rope replacement follows the same criteria regardless of sheave or drum material.
- 4) Attention shall be given to end connections. Upon development of two broken wires adjacent to a socketed end connection, the rope should be resocketed or replaced. Resocketing shall not be attempted if the resulting rope length will be insufficient for proper operation.
- 5) Replacement rope and connections shall have strength rating at least as great as the original rope and connections furnished by the hoist manufacturer. A rope manufacturer, the hoist manufacturer, or a qualified person shall specify any deviation from the original size, grade, or construction.

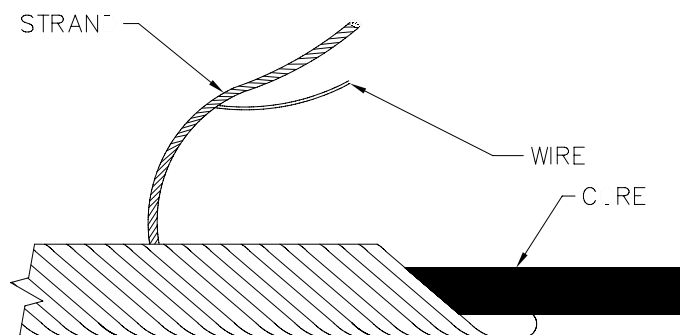


Diagram E. Wire Rope Composition Diagram.

WIRE ROPE REPLACEMENT INSTRUCTIONS

➡ **TIP:** Wire rope replacement is to be performed by qualified maintenance personnel only.

Note: All reference drawings below are for 150# unit. The procedure remains the same regardless of capacity.

- 1) Depress the Emergency Stop (E-Stop) button on the Handle. Disconnect power from the unit.
- 2) Remove the Covers from the Actuator assembly.
 - a) First, remove the Controls side Cover (Item #3, **Figure A13**, page 34) from the Actuator assembly. To remove this Cover you must first unscrew and remove the Coil Cord Plug from the Controls Interface. Remove the Coil Cord mounting Clamp (Item #10, **Figure A13**, page 34). Remove the three (3) mounting screws (Item #15, **Figure A13**, page 34) from the Controls side Cover only. Finally, remove the Cover mounting bolt (Item #11, **Figure A13**, page 34) at the Actuator Frame. Slide the Cover off of the Actuator assembly.
 - b) Remove the Power Cord side Cover (Item #2, **Figure A13**, page 34) from the Actuator assembly. Slide the Power Cord Grommet out of the slot in the Cover. Remove the Coil Cord mounting Clamp (Item #10, **Figure A13**, page 34). Remove the Upper Limit Switch Disc (Item #8, **Figure A13**, page 34). Finally, remove the Cover mounting bolt (Item #11, **Figure A13**, page 34) at the Actuator Frame. Slide the Cover off of the Actuator.
- 3) Remove three (3) of the Heatsink mounting bolts (Item #8, **Figure A9**, page 32), leaving the lower left bolt in place. Loosen, but do not remove, the lower left mounting bolt and rotate the Heatsink down towards the floor. This will support the Heatsink while wire rope replacement is being performed.
- 4) Remove the Nylon Drum Cover (Item #2, **Figure A8**, page 31) from the Actuator. Remove the six (6) mounting bolts and lockwashers (Item #'s: 3 & 4, **Figure A8**, page 31), and slide the Drum Cover off of the Main Drum Pulley.
- 5) Re-attach the Coil Cord Plug to the Controls Interface, and Power to the unit.
- 6) Release the Emergency Stop (E-Stop) button on the Handle. At the Controls Interface, jog the unit down until the remaining Wire Rope has been payed off of the Main Drum Pulley.
- 7) Depress the Emergency Stop (E-Stop) button on the Handle and disconnect Power to the unit.
- 8) Detach the Wire Rope from the Handle. Remove the cotter and clevis pins from the Handle Swivel assembly. Pull the damaged Wire Rope out of the Swivel assembly.
- 9) Set the Handle down on a secure base while Wire Rope replacement is taking place.
- 10) Remove the Upper Limit Donut (Item #10, **Figure A6**, page 30) from the broken wire rope assembly.
- 11) Remove the Wire Rope termination cover (Item #3, **Figure A6**, page 30) by removing the mounting bolts (Item #14, **Figure A6**, page 30) from the Main Drum Pulley.
- 12) Remove the terminated end of the Wire Rope from the Main Drum Pulley. Do so by simply lifting the terminated end out of the groove in the Drum Pulley. Pull the damaged wire rope completely out of the Actuator assembly.
- 13) Unless otherwise instructed, discard the damaged wire rope.
- 14) Remove the one (1) Extension Spring (Item #5, **Figure A5**, page 29) from the Heatsink side of the Actuator Frame, by unscrewing the shoulder mounting bolt (Item #9, **Figure A7**, page 31) attached to the Idler Guide Plate (Item #3, **Figure A7**, page 31).
- 15) Remove the two (2) Snap Rings (Item #8, **Figure A7**, page 31) from the Idler Pulley Shafts (Item #4, **Figure A7**, page 31) and remove the Idler Pulley Guide Plate (Item #3, **Figure A7**, page 31).

16) Unscrew the **TOP** Idler Pulley Shaft (Item #4, **Figure A7**, page 31) only, using a 5/16" open-end wrench.

17) Feed the new wire rope assembly, Stop Sleeve terminated end first, through the following path:

- a) Through the Nylon Insert (Item #2, **Figure A1**, page 27) at the bottom of the Actuator Frame.
- b) Over the top of the Idler Pulley going counter-clockwise.
- c) Clockwise around the Main Drum Pulley (Item #2, **Figure A6**, page 30). Terminate the wire rope into the side groove and opening located at the front side of the Main Drum Pulley.
- d) Wind the wire rope on the Main Drum Pulley, until the wire rope is properly seated into all of the grooves up to and including the one that the Pulley Guide Block (Item #1, **Figure A4**, page 28) is located in.

WARNING

ALL slack must be removed from the wire rope and the wire rope must exit the Drum in the groove that contains the Pulley Guide Block in order to function correctly.

- e) Reconfirm that the wire rope exits the drum in the same groove that contains the Pulley Guide Block, and that all slack has been removed from the wire rope.
- f) Replace the wire rope termination cover (Item #3, **Figure A6**, page 30) on the Main Drum Pulley.

18) Screw the top Idler Pulley Shaft (Item #4, **Figure A7**, page 31) back into the Threaded Hole Guide Plate (Item #2, **Figure A7**, page 31) located on the backside of the Actuator Frame assembly. Tighten using a 5/16" open-ended wrench.

19) Re-assemble the Idler Guide Plate (Item #3, **Figure A7**, page 31) to the Idler Pulley Shafts (Item #4, **Figure A7**, page 31), and replace the two (2) Snap Rings (Item #8, **Figure A7**, page 31).

20) Re-assemble the Extension Spring (Item #5, **Figure A5**, page 29) to the Idler Guide Plate (Item #3, **Figure A7**, page 31), by securing the Shoulder bolt (Item #9, **Figure A7**, page 31) in place.

21) Attach the Upper Limit Donut (Item #10, **Figure A6**, page 30) from Step 10, to the new wire rope assembly.

22) Re-attach the Handle to the new wire rope assembly.

23) Plug the Coil Cord Connector into the Controls Interface, and reconnect power to the unit.

24) Release the Emergency Stop button on the Handle, and grasp the operator present switch. Run the unit up and down several times to assure proper operation.

25) After operation is verified, you must reset the Software Lower Limit. This Software Lower Limit is independent of the Virtual Lower Limit described earlier and can not be turned off. Complete the following steps:

- a) Run the Handle down until the hard lower limit switch is activated. At this point there must be AT LEAST two (2) complete wraps of wire rope on the Main Drum Pulley.
- b) Press and hold the "Virtual Limit-Float Mode" button until all of the LEDs are illuminated.
- c) Release the button. If all LEDs remain illuminated, then you are now in "Program Mode". If all LEDs are not illuminated, then repeat Step 25b.
- d) Press and release the "Virtual Limit-Float Mode" button ten (10) times. If set correctly, all of the LEDs except the "Yellow" Power-On LED should turn off.

WARNING

If the Software Lower Limit is not reset during wire rope replacement, problems such as no downward motion or possible wire rope failures may occur.

26) Depress the Emergency Stop button on the Handle and disconnect the power.

27) Assemble the Nylon Drum Cover (Item #2, **Figure A8**, page 31) over the Main Drum Pulley.

28) Properly re-assemble the Heatsink (Item #2, **Figure A9**, page 32) to the Actuator Frame.

29) Replace the Covers on the Actuator assembly.

- a) Re-assemble the Power Cord side Cover (Item #2, **Figure A13**, page 34) to the Actuator assembly. Slide the Cover onto the Actuator assembly. Re-assemble the Cover mounting bolt (Item #11, **Figure A13**, page 34) at the Actuator Frame. Re-assemble the Upper Limit Switch Disc (Item #8, **Figure A13**, page 34). Re-assemble the Coil Cord mounting Clamp (Item #10, **Figure A13**, page 34). Slide the Power Cord Grommet back into the slot in the Cover.
- b) Now, re-assemble the Controls side Cover (Item #3, **Figure A13**, page 34) to the Actuator assembly. Slide the Cover onto the Actuator assembly. Re-assemble the Cover mounting bolt (Item #11, **Figure A13**, page 34) at the Actuator Frame. Re-assemble the Coil Cord mounting Clamp (Item #10, **Figure A13**, page 34). Re-assemble the three (3) mounting screws (Item #15, **Figure A13**, page 34) to the Controls side Cover. Re-assemble the Coil Cord Plug to the Controls Interface.

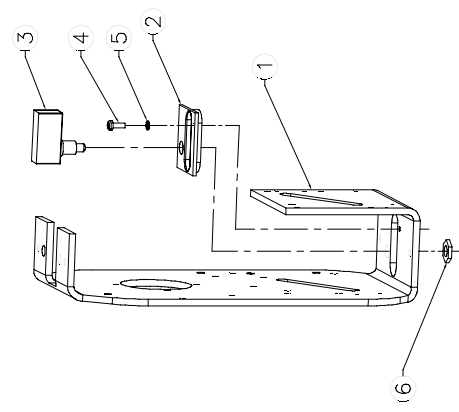
30) Reconnect power to the unit.

31) Release the Emergency Stop button on the Handle, and grasp the operator present switch. Run the unit up and down several times to assure proper operation.

32) Continue normal operation.

APPENDIX A - 150# BXI ACTUATOR ASSEMBLY DRAWINGS

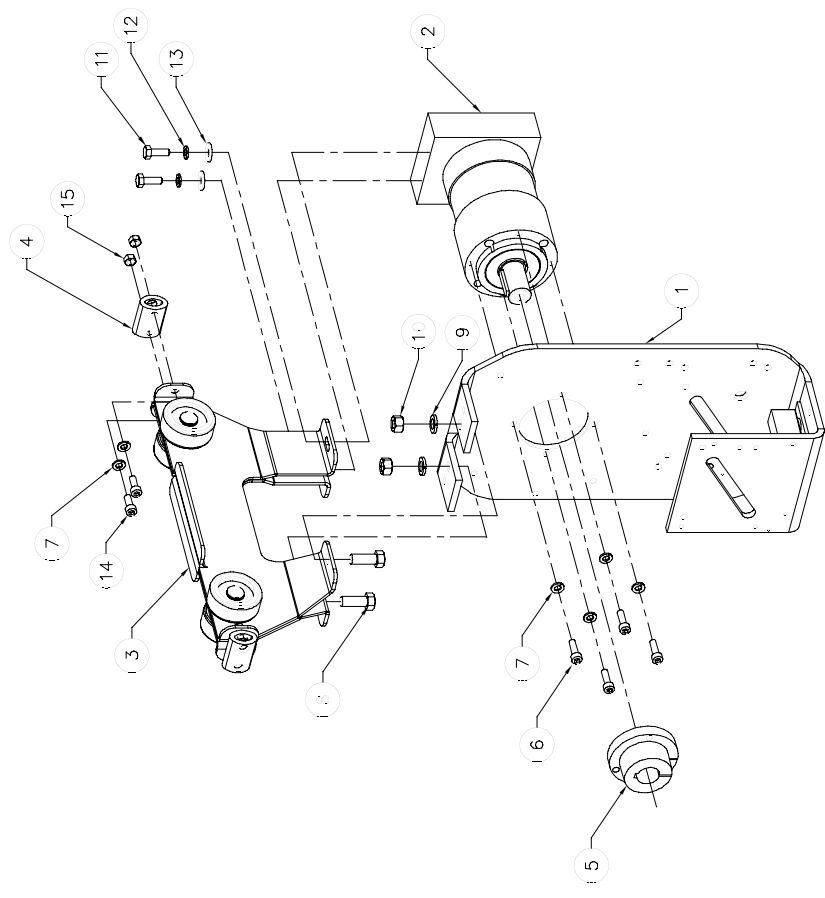
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#	QTY	P/N	DESCRIPTION
1	1	715	ACTUATOR FRAME, 15#
2	1	713.3	NYLON INSERT, INTEGRATE ACTUATOR FRAME
3	1	7354	LIMIT SWITCH, LARGE PLUNGER TYPE
4	1	1155	PHMS, #1-32 X 1/2" LG, SLTITE, ZNPL
5	1	1149	L CWASHER, #11, ZNPL
6	1	7354**	LIMIT SWITCH MOUNTING NUT (SUPPLY W/ SWITCH)

15- # BXi ACTUATOR ASSEMBLY

FIGURE A1.



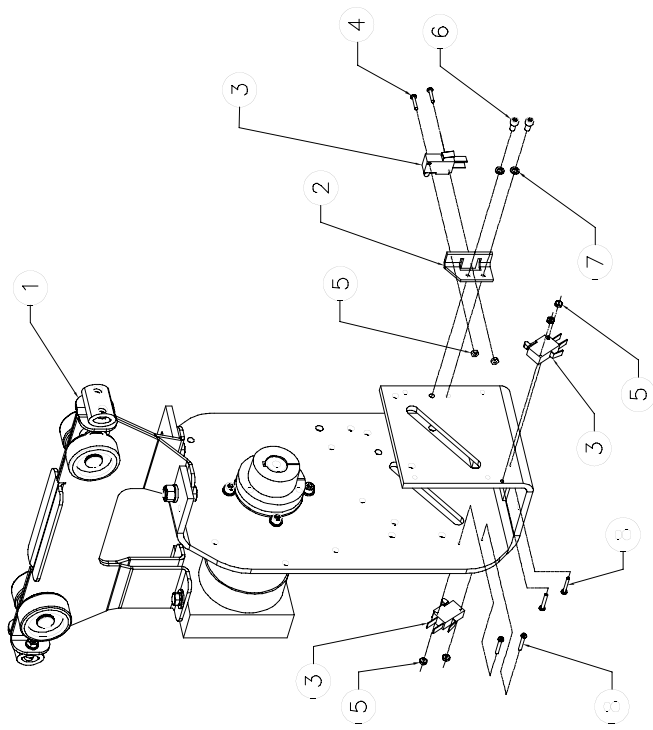
#	QTY	P/N	DESCRIPTION	#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY, 15#	9	2	1355	L CWASHER, 3/16", ZNPL
2	1	777.4	GEARBOX, PLANETARY, 25:1 RATIO, W/ KEY	10	2	215	HEX NUT, 3/16"-16, ZNPL
3	1	7533	ACTUATOR TRAILER ASSEMBLY, 15#	11	2	214	HHCS, 1/4"-20 X 3/4" LG, GR 5, ZNPL
4	2	732	BUMPER, G-10 FIBER TRAILER	12	2	297	L CWASHER, 1/4", ZNPL
5	1	7532	BUSHING, 1/2 SH-22MM BORE	13	2	122	FLATWASHER, 1/4", USS, ZNPL
6	4	116	SHCS, M6 X 2 MM LG	14	4	19	SHCS, M6 X 16MM PITCH
7	3	1337	L CWASHER, M6, ZNPL	15	4	1764	HEX NUT, M6 X 1.1 MM PITCH, ZNPL
8	2	1356	HHCS, 3/16"-16 X 1" LG, GR 5, ZNPL				

15- # BXi ACTUATOR ASSEMBLY

FIGURE A2.

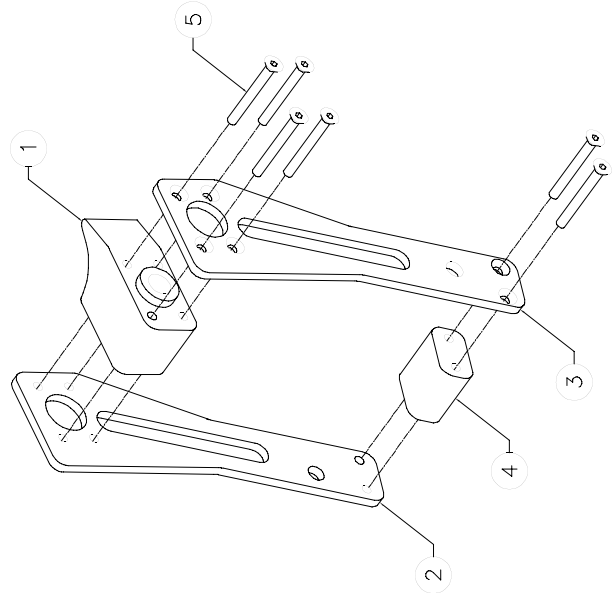
Figure A1 (bottom) & Figure A2 (top). 150# BXi Actuator Assembly.

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#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	77551	LIMIT SWITCH BRACKET
3	3	77114	LIMIT SWITCH, ROLLER ARM ACTUATOR, FORM C
4	2	77123	SLRH, #4-40 X 3/4" LG, ZNPL
5	6	2992	NYLON NUT, #4-40, ZNPL
6	2	3135	SHCS, #1-24 X 3/8" LG
7	2	3149	LOCKWASHER, #1-24, ZNPL
8	4	31149	SLPH, #4-40 X 7/8" LG, ZNPL

150# BXi ACTUATOR ASSEMBLY FIGURE A3.

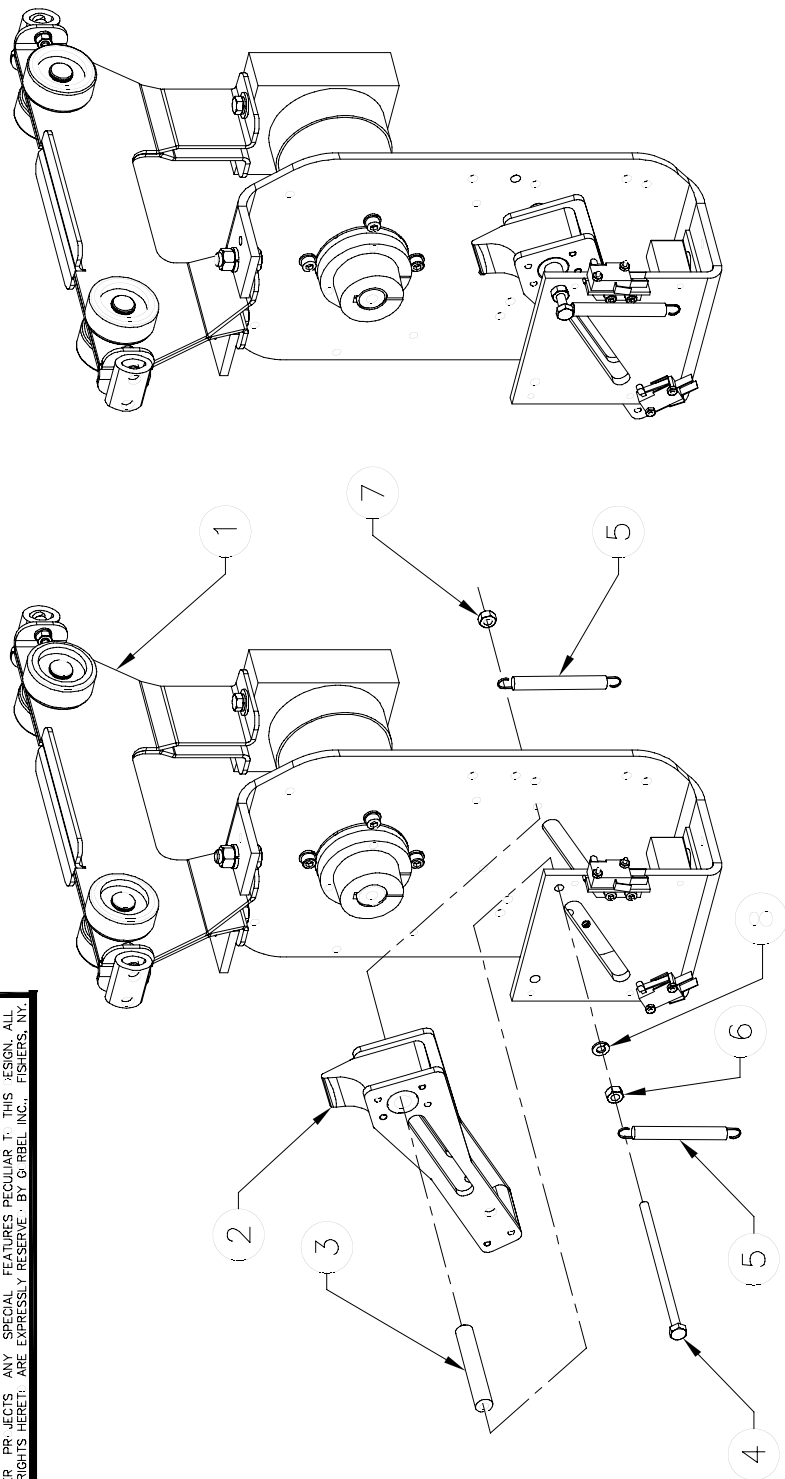


#	QTY	P/N	DESCRIPTION
1	1	73199	GUIDE BLOCK
2	1	77553	GUIDE PLATE, TAPPEL HLES
3	1	77554	GUIDE PLATE, COUNTERSUNK HLES
4	1	77555	SPACER BLOCK
5	6	31323	PHCS, #1-32 X 1-3/4" LG

150# BXi ACTUATOR ASSEMBLY FIGURE A4.

Figure A3 (bottom) & Figure A4 (top). 150# BXi Actuator Assembly.

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#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	REF ONLY	PULLEY GUIDE MECHANISM
3	1	2916	LIMIT SWITCH SPACER SHAFT
4	1	633	HHCS, 1/4"-2" X 5" LG, GR 5, ZNPL
5	2	77572	EXTENSION SPRING, 3/16" X 1-1/2" LG
6	1	1221	HEX NUT, 1/4"-2", ZNPL
7	1	1177	NYLOCK NUT, 1/4"-2", ZNPL
8	1	1297	LOCKWASHER, 1/4", ZNPL

150# BXi ACTUATOR ASSEMBLY FIGURE A5.

Figure A5. 150# BXi Actuator Assembly.

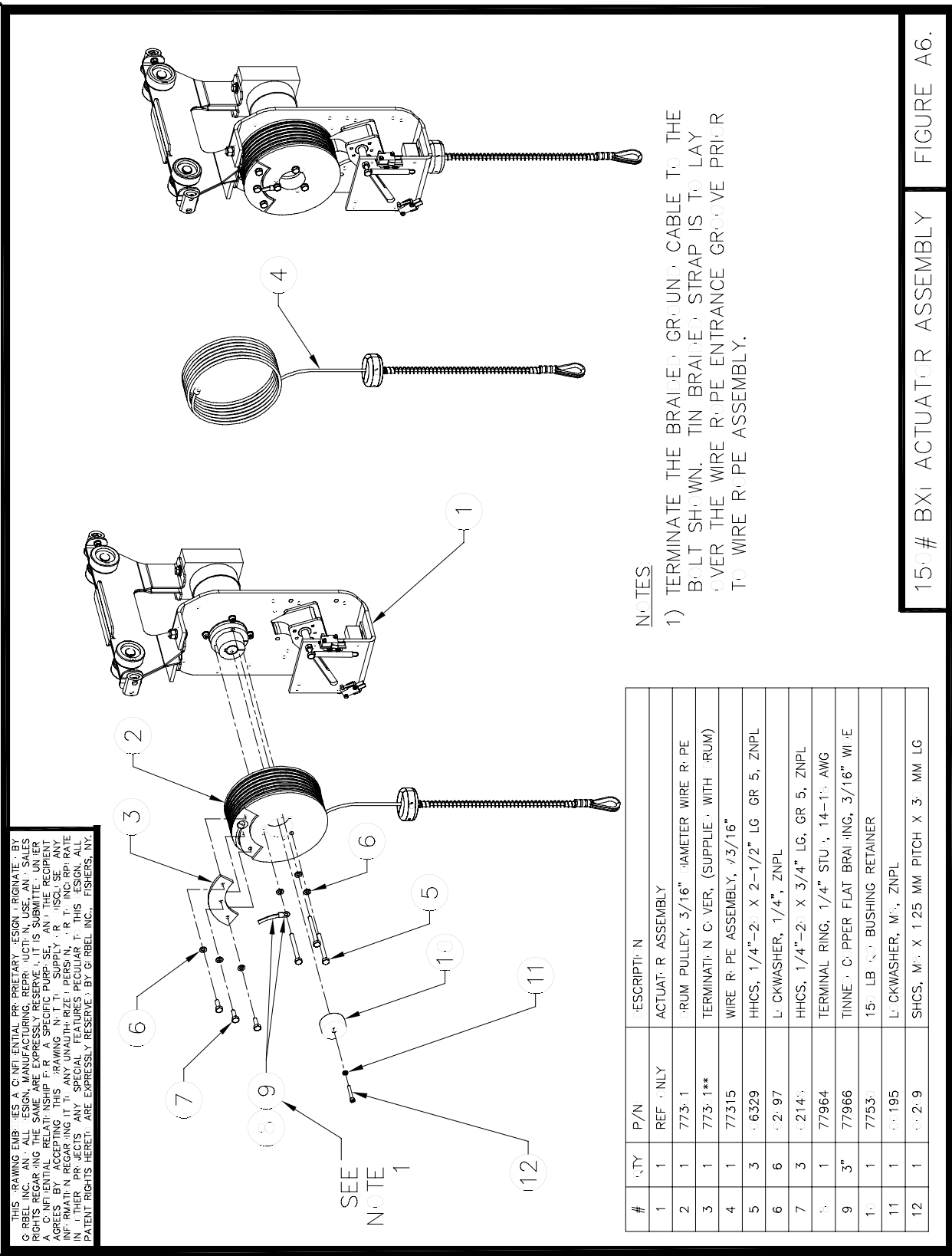
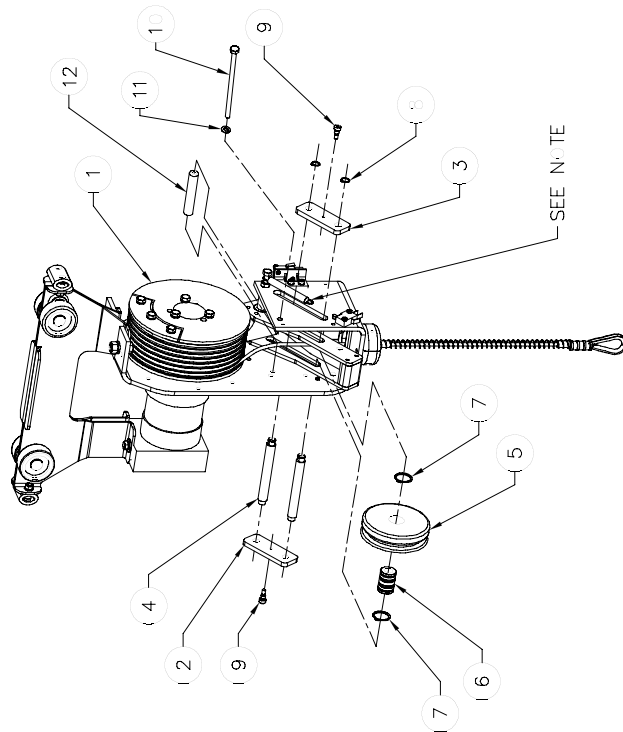


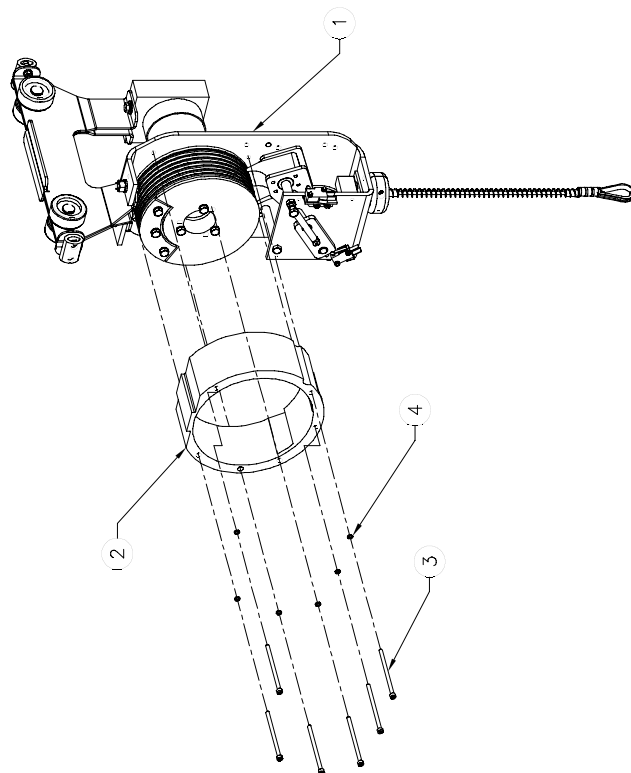
Figure A6. 150# BXi Actuator Assembly.

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#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	77561	THREADED HELD GUIDE PLATE
3	1	77557	HELPER GUIDE PLATE
4	2	7756	THREADED HELPER SHAFT
5	1	77559	OFFSET HELPER PULLEY
6	1	753-2	BEARING, LINEAR, SELF-LUBRICATING
7	2	2-1125	SNAP RING, EXTERNAL, 7/16" ID
8	2	77571	SNAP RING, EXTERNAL, 412" ID
9	2	1243	SHOULDER BOLT, 1/4" SHOULDER X 1/4" LG
10	1	16332	HHCS, 1/4"-20 X 4" LG, GR 5, ZNPL
11	1	1297	LOCKWASHER, 1/4" ZNPL
12	1	12916	SPACER SHAFT, G-FRICE

150# BXi ACTUATOR ASSEMBLY FIGURE A7.



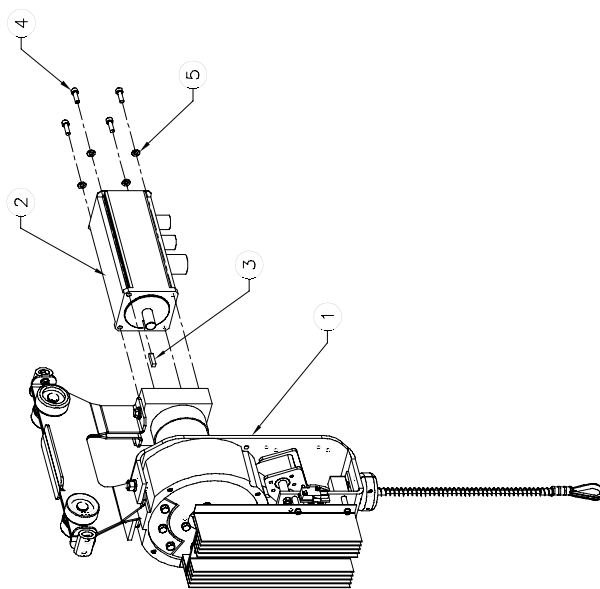
#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	77565	NYLON RUM PULLEY COVER
3	6	11314	SHCS, #10-24 X 3-1/2" LG, ALL-Y ZINC
4	6	11149	LOCKWASHER, #10, ZNPL

150# BXi ACTUATOR ASSEMBLY FIGURE A8.

Figure A7 (bottom) & Figure A8 (top). 150# BXi Actuator Assembly.

A technical drawing of a mechanical assembly, likely a pump or motor. The drawing includes several numbered callouts: 1 points to a small component on the left; 2 points to a rectangular block on the right; 3 points to a rectangular block below 2; 4 points to a long, thin component extending from the top right; 5 points to a small component on the left side of the main body; 6 points to a small component on the right side of the main body; 7 points to a small component on the left side of the main body; 8 points to a small component on the right side of the main body; 9 points to a small component on the right side of the main body; and 10 points to a small component on the right side of the main body.

#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	753-3	HEATSINK, ACTUATOR
3	1	771-6	REGEN RESISTOR, 300HM
4	4	77562	HEATSINK SPACER, 1" LG
5	2	373	SHCS, #10-24 X 1/2" LG
6	6	149	LOCKWASHER, #10, ZNPL
7	2	175	FLATWASHER, #10, ZNPL
8	4	36	SHCS, #10-24 X 1-3/4" LG, SS
9	4	175	FLATWASHER #10, ZNPL

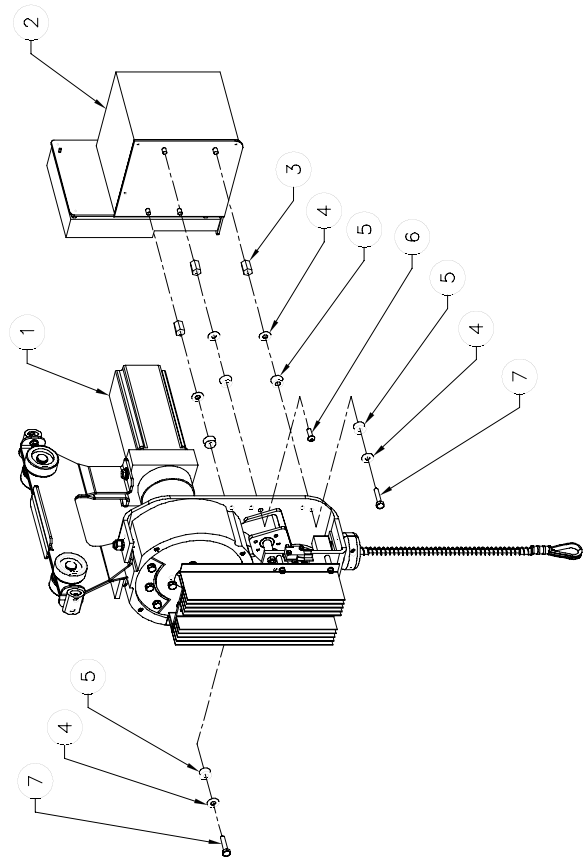


#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	75350	MTR, SERV- W/ BRAKE, BX SERIES, W/ NN
3	1	77621	KEYST-CK, 5MM S-X, X 777" LG, ZNPL
4	4	11-16	SHCS, M6 X 2 MM LG
5	4	1-337	1-CKWASHER, M6, ZNPL

15.0 # BX1 ACTUATOR ASSEMBLY

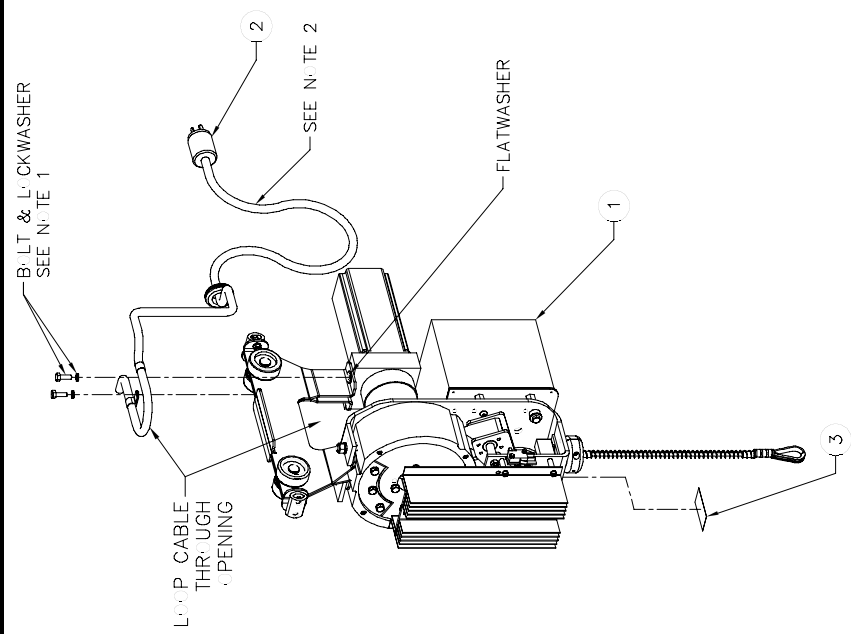
150# Bxi ACTUATOR ASSEMBLY	FIGURE A9.
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#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	71165	CENTRAL ASSEMBLY, G-F-RCE, GEN 4
3	3	75333	STANDARD, HEX THREADED, 1/4"-2
4	5	1220	FLATWASHER, 1/4", USS, ZNPL
5	5	75334	WASHER, VIBRATING, 1/4" ID
6	1	197	BHCS, 1/4"-20 X 3/4" LG
7	2	227	HHCS, 1/4"-20 X 1-1/4" LG, GR 5, ZNPL

15# BXi ACTUATOR ASSEMBLY FIGURE A11.



- NOTES
- 1) REMOVE THE HARDWARE NEEDED AT A TIME. RE-ASSEMBLE THE HARDWARE THROUGH THE RUBBER CUSHIONING STRAPS AS SHOWN.
 - 2) ROUTE CABLE AS SHOWN.

#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	71155	POWER COIL ASSEMBLY, G-F-RCE
3	1	77600	ACTUATOR TAG MATRICE STICKER

15# BXi ACTUATOR ASSEMBLY FIGURE A12.

Figure A11 (bottom) & Figure A12 (top). 150# BXi Actuator Assembly.

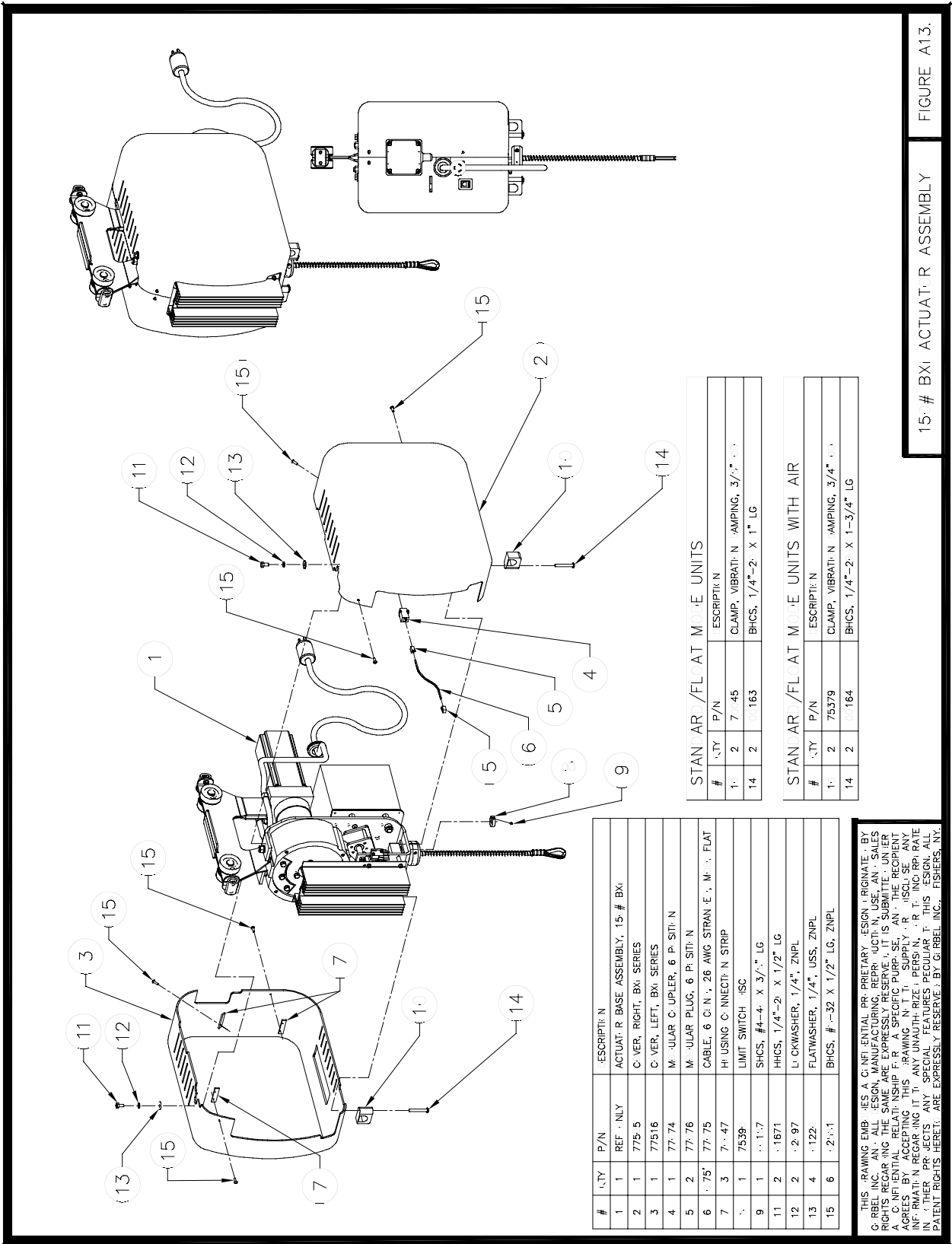
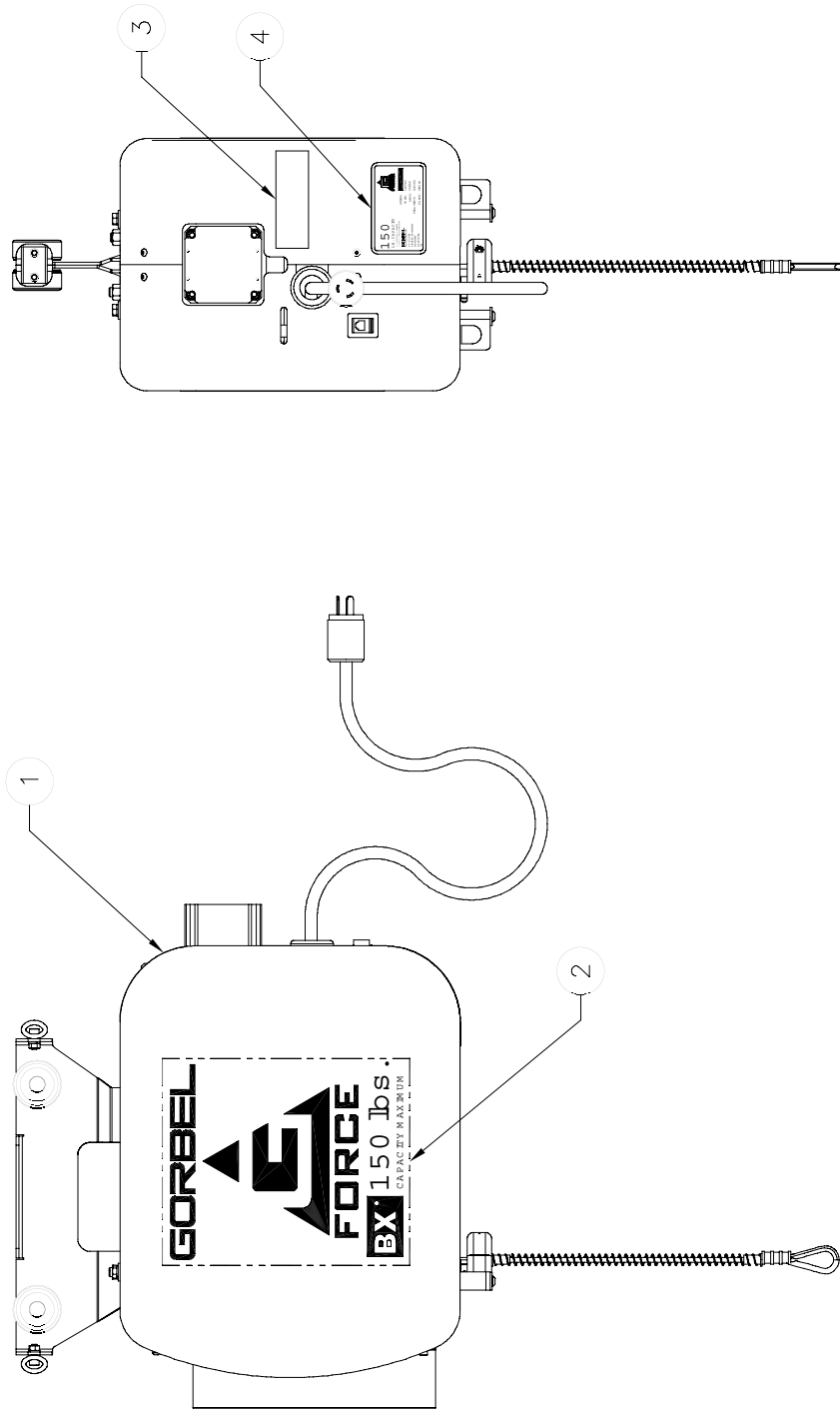


Figure A13. 150# Bxi Actuator Assembly.



#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY, 15# BXi
2	2	77101	15# BXi CAPACITY LABEL, G-F RCE
3	1	77103	LABEL, ELEC & MECH HAZARD S, 4" X 1.35"
4	1	NAMEPLATE	15# NAMEPLATE, 15# G-F RCE

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15# BXi ACTUATOR ASSEMBLY

FIGURE A14.

Figure A14. 150# BXi Actuator Assembly.

APPENDIX B - 300/380# BXI ACTUATOR ASSEMBLY DRAWINGS

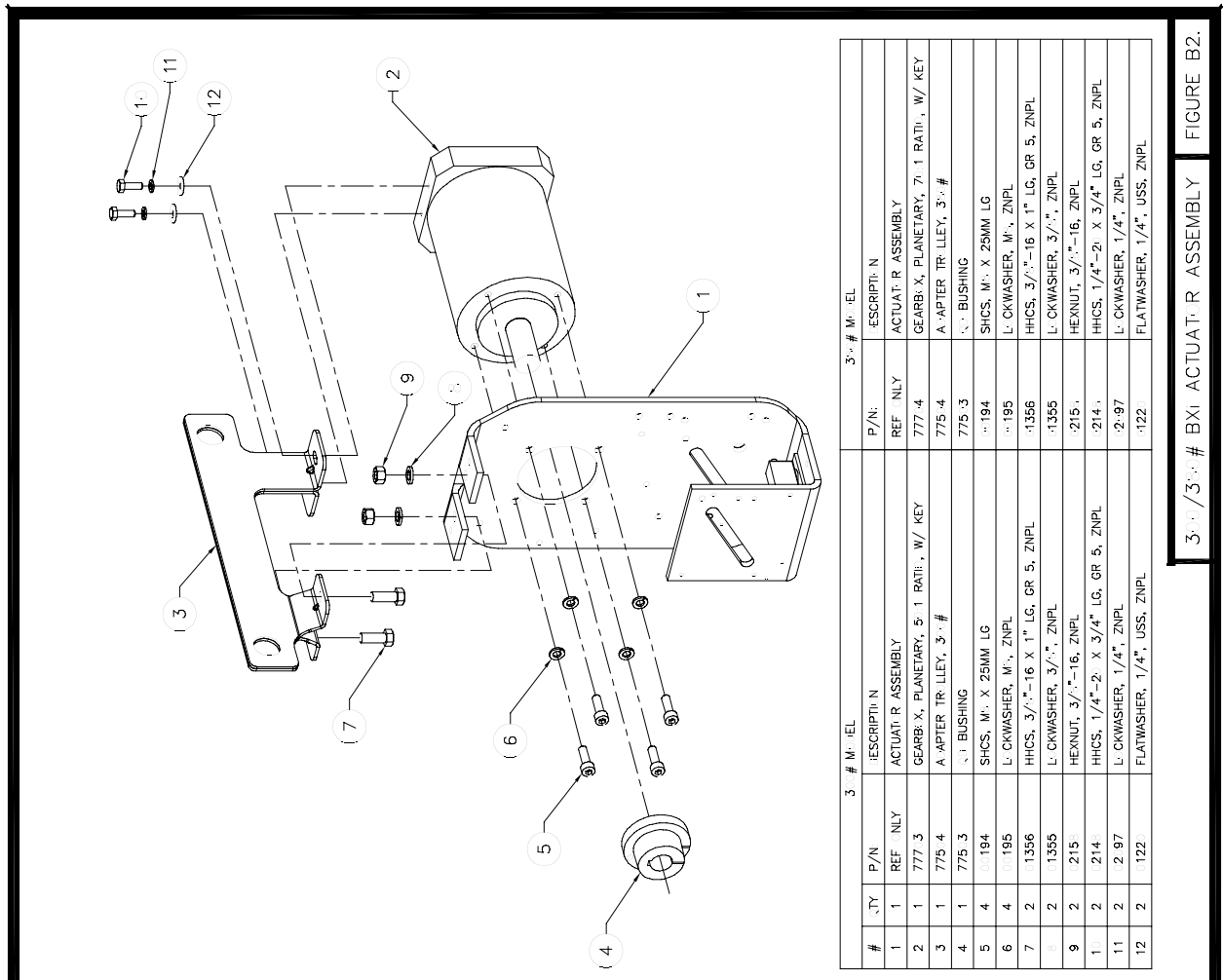
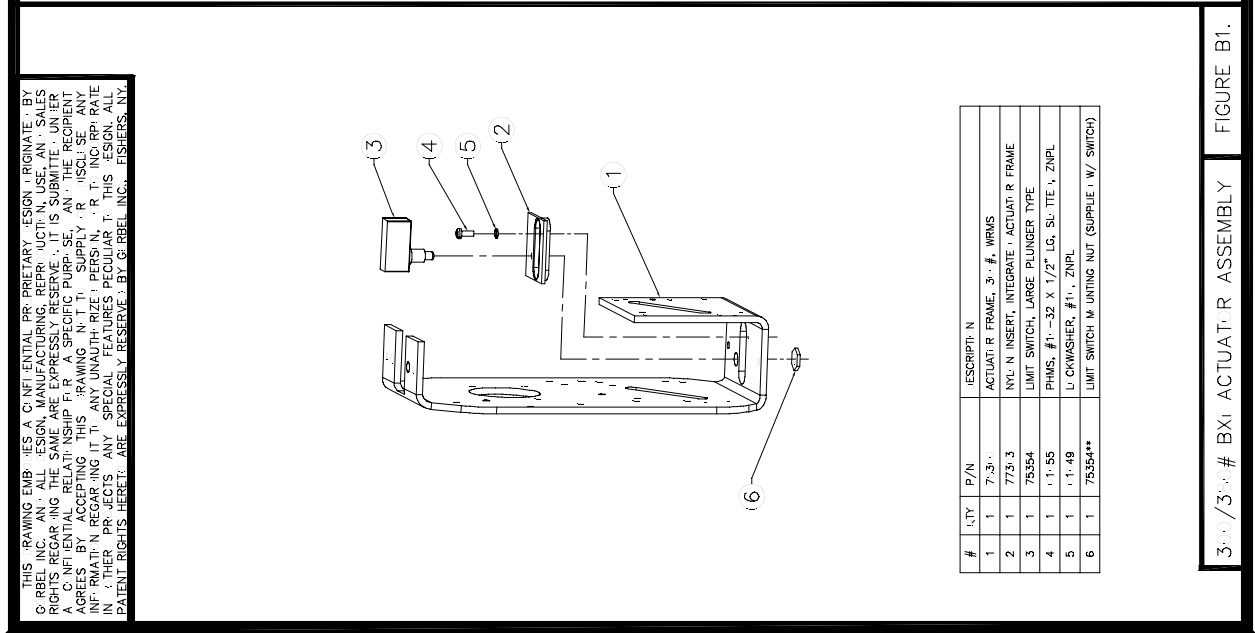
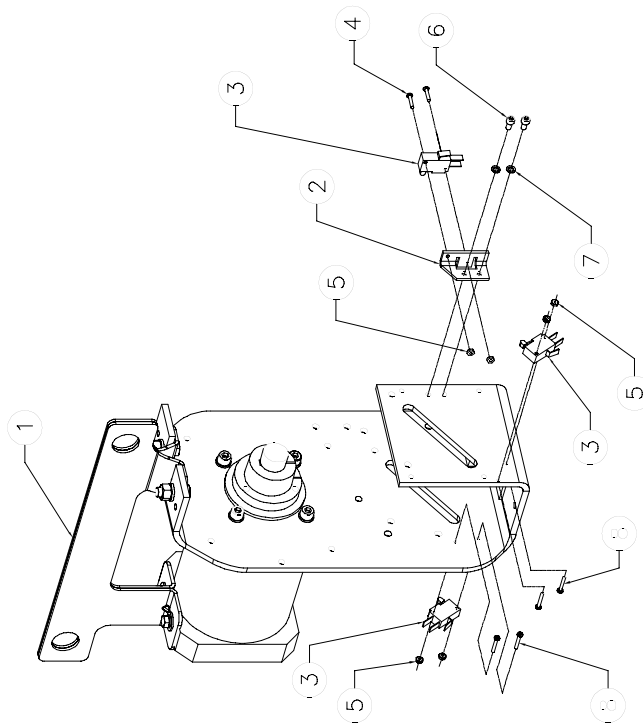


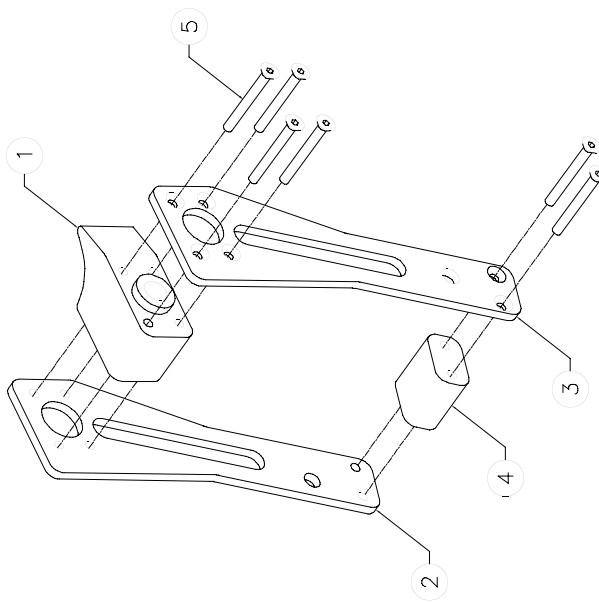
Figure B1 (bottom) & Figure B2 (top). 300/380# BXI Actuator Assembly.

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#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	77551	LOWER LIMIT SWITCH BRACKET
3	3	77554	LIMIT SWITCH, ROLLER ARM ACTUATOR, FORM C
4	2	77523	SLRH, #4-40 X 3/4" LG, ZNPL
5	6	2992	NYLON NUT, #4-40, ZNPL
6	2	2935	SHIMS, #1-24 X 3/8" LG
7	2	2949	LOCKWASHER, #1, ZNPL
8	4	2949	SLPH, #4-40 X 7/8" LG, ZNPL

300/380# BXi Actuator Assembly FIGURE B3.

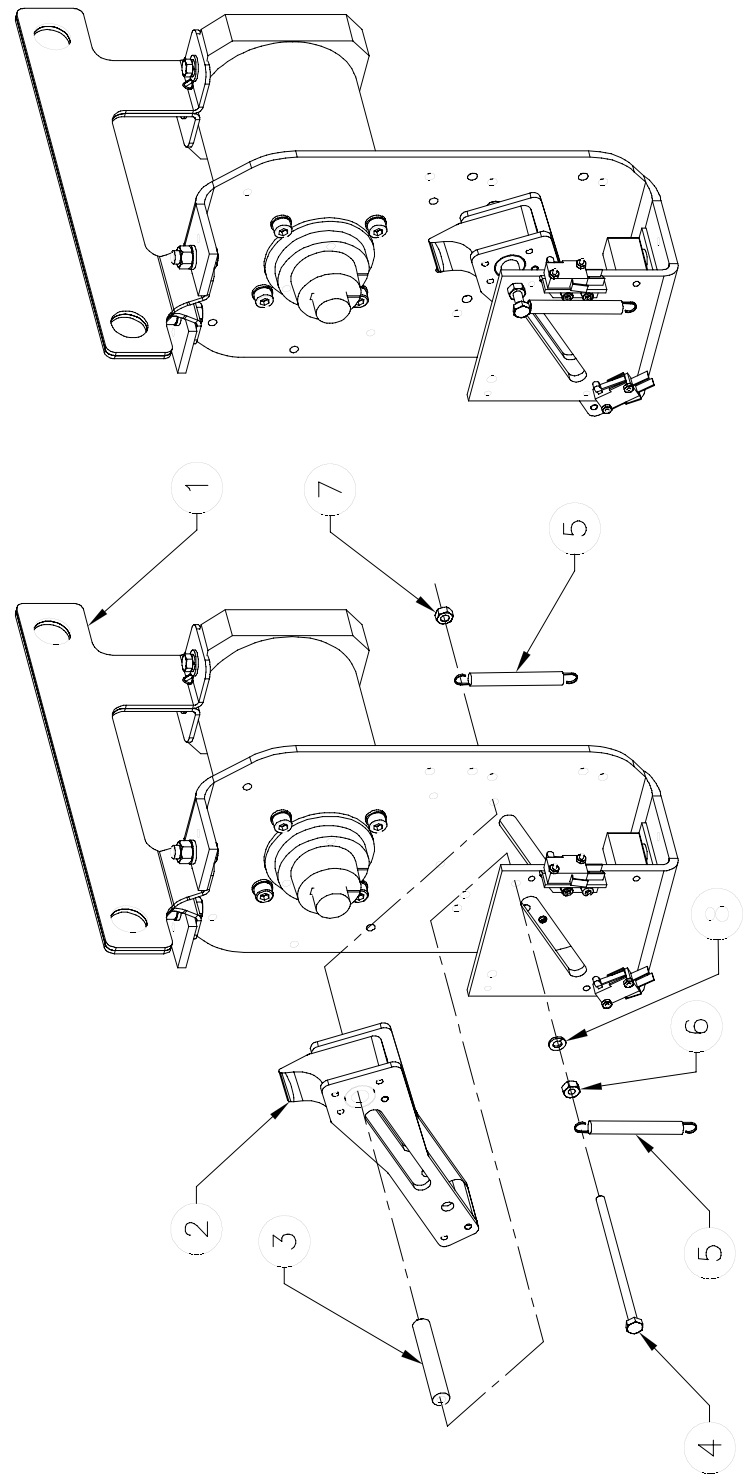


#	QTY	P/N	DESCRIPTION
1	1	73099	GUIDE BLOCK
2	1	77553	GUIDE PLATE, TAPPED HOLES
3	1	77554	GUIDE PLATE, COUNTERSUNK HOLES
4	1	77555	SPACER BLOCK
5	6	2933	FHCS, #1-32 X 1-3/4" LG

300/380# BXi Actuator Assembly FIGURE B4.

Figure B3 (bottom) & Figure B4 (top). 300/380# BXi Actuator Assembly.

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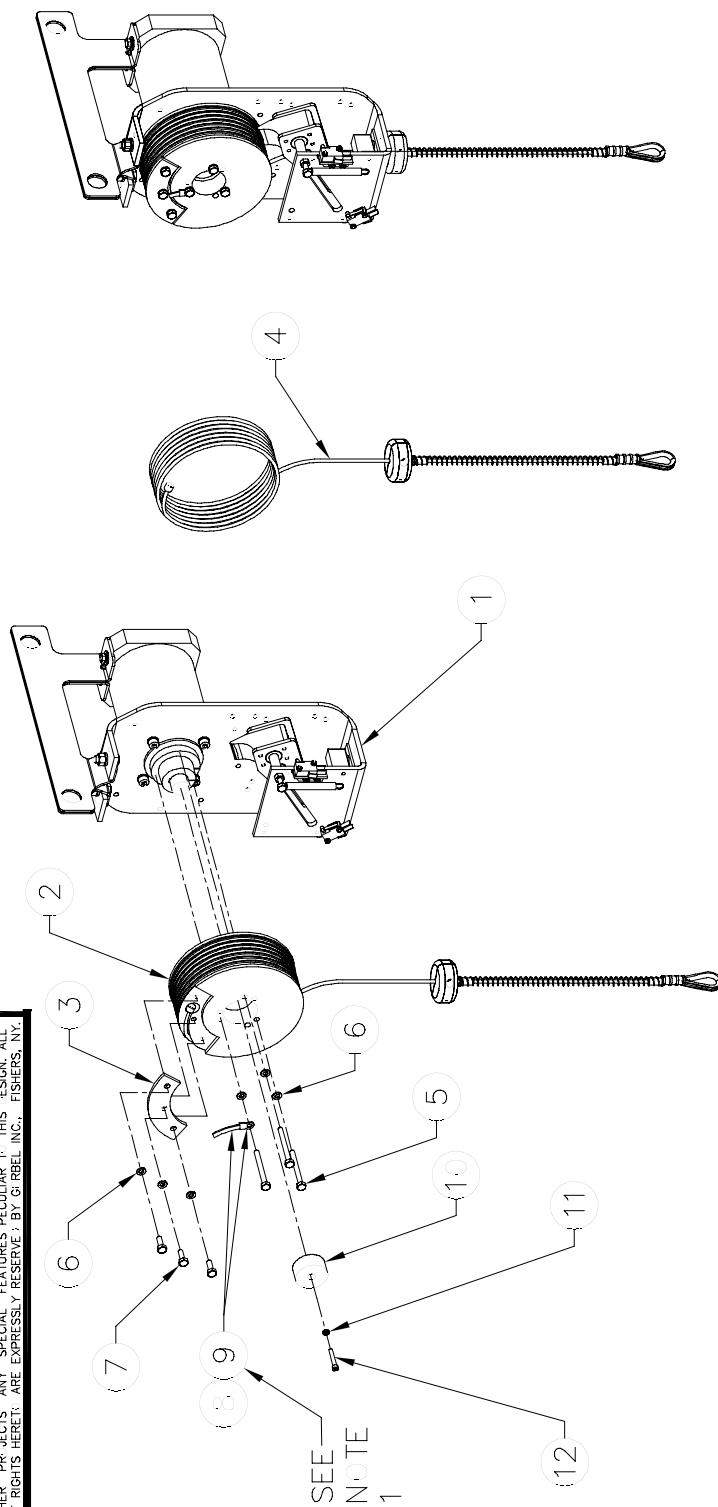


#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	REF ONLY	PULLEY GUIDE MECHANISM
3	1	2916	LIMIT SWITCH SPACER SHAFT
4	1	633	HHCS, 1/4"-2" X 5" LG, GR 5, ZNPL
5	2	77572	EXTENSION SPRING, 3/16" X 1-1/2" LG
6	1	1221	HEX NUT, 1/4"-2", ZNPL
7	1	1177	NYLOCK NUT, 1/4"-2", ZNPL
8	1	1297	LOCKWASHER, 1/4", ZNPL

300/380# Bxi ACTUATOR ASSEMBLY FIGURE B5.

Figure B5. 300/380# Bxi Actuator Assembly.

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NOTES

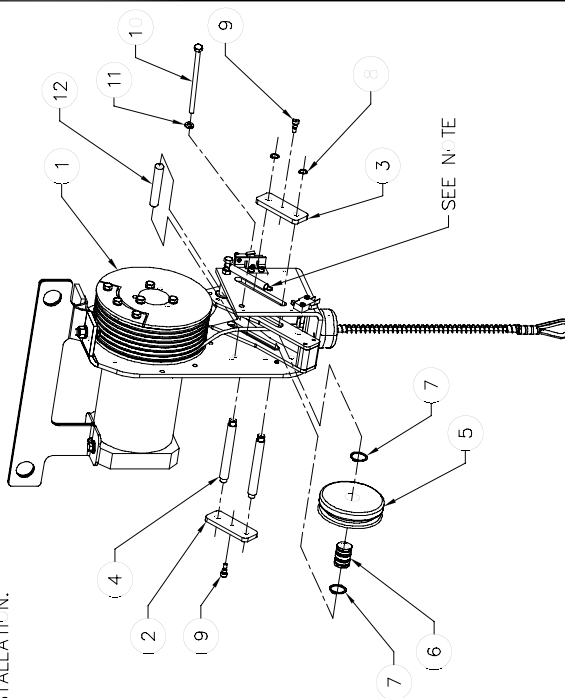
- 1) TERMINATE THE BRAIDED GROUND CABLE TO THE BOLT SHOWN. THE BRAIDED STRAP IS TO LAY OVER THE WIRE ROPE ENTRANCE GROOVE PRIOR TO WIRE ROPE ASSEMBLY.

#	QTY	P/N	DESCRIPTION
1	1		ACTUATOR ASSEMBLY
2	1	773-1	DRUM PULLEY, 3/16" DIAMETER WIRE ROPE
3	1	773-1**	TERMINATION COVER, (SUPPLIED WITH DRUM)
4	1	77315	WIRE ROPE ASSEMBLY, 1/3/16"
5	3	6329	HHCS, 1/4"-2" X 2-1/2" LG GR 5, ZNPL
6	6	6297	LOCKWASHER, 1/4", ZNPL
7	3	6214	HHCS, 1/4"-2" X 3/4" LG, GR 5, ZNPL
8	1	77964	TERMINAL RING, 1/4" STU, 14-11 AWG
9	3	77966	TINNED COPPER FLAT BRAIDING, 3/16" WIDE
10	1	77531	300 LB BUSHING RETAINER
11	1	6224	LOCKWASHER, M10, ZNPL
12	1	6221	SHCS, M10 X 1.5 MM PITCH X 3.5 MM LG

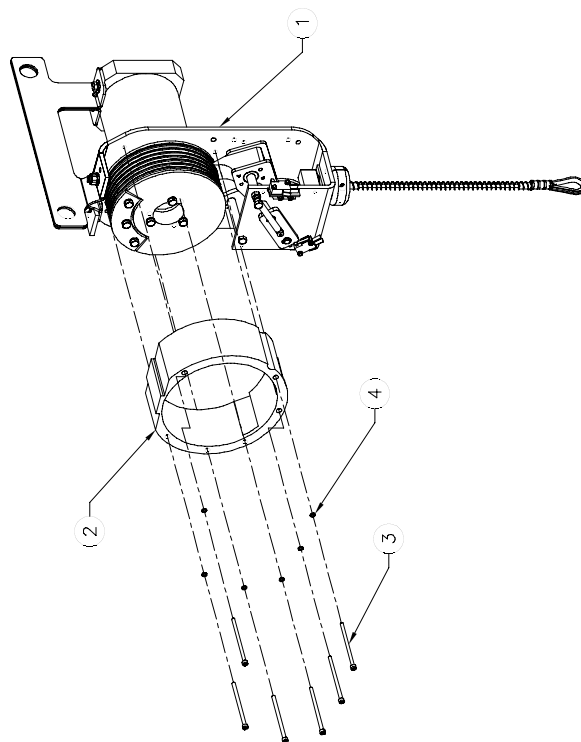
300/380# Bxi ACTUATOR ASSEMBLY FIGURE B6.

Figure B6. 300/380# Bxi Actuator Assembly.

NOTE CONNECT LOOSE END OF EXTENSION SPRINGS (2) TO THE SHOULDER BOLTS DURING INSTALLATION.



#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	77561	THREADED HOLE GUIDE PLATE
3	1	77557	ROLLER GUIDE PLATE
4	2	77556	THREADED ROLLER SHAFT
5	1	77559	OFFSET ROLLER PULLEY
6	1	75312	BEARING, LINEAR, SELF-LUBRICATING
7	2	201125	SNAP RING, EXTERNAL, 7/16" ID
8	2	77571	SNAP RING, EXTERNAL, .412" ID
9	2	12435	SHOULDER BOLT, 1/4" SHOULDER X 1/4" LG
10	1	16332	HHCS, 1/4"-2" X 4" LG, GR 5, ZNPL
11	1	1297	LOCKWASHER, 1/4" ZNPL
12	1	12916	SPACER SHAFT, G-F, RCF



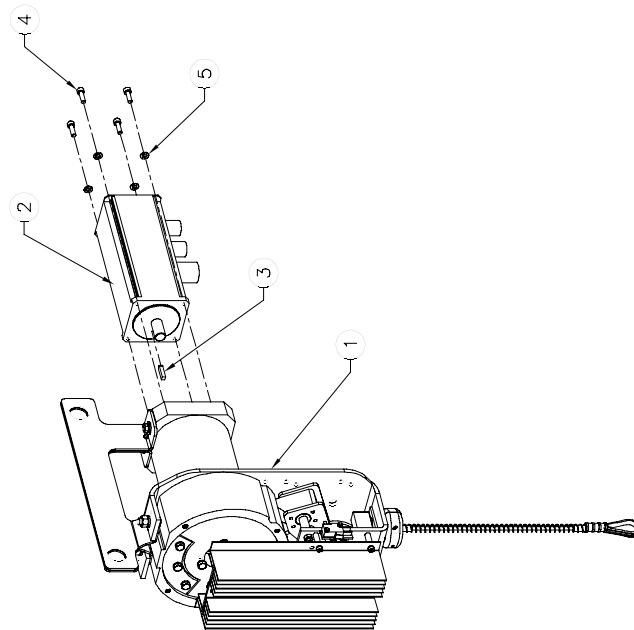
#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	77565	NYLON RUM PULLEY C.VER
3	6	3134	SHCS, #11-24 X 3-1/2" LG, ALL Y ZINC
4	6	31149	LOCKWASHER, #11, ZNPL

300/300# BXi ACTUATOR ASSEMBLY

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A technical drawing of a mechanical device, possibly a pump or a valve actuator. The drawing includes a main body with a circular flange (1) and a handle (2). A long, thin rod (3) extends from the handle, passing through a series of components (4, 5, 6, 7, 8, 9, 10) which appear to be seals or guides. The rod is shown in a perspective view, with dashed lines indicating its path. The components are labeled with circled numbers: 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10.

#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	753-3	HEATSINK, ACTUATOR
3	1	771-6	REGEN RESISTOR, 30 OHM
4	4	77562	HEATSINK SPACER, 1" LG
5	2	63373	SHCS, #10-24 X 1/2" LG
6	6	61149	LICKWASHER, #10, ZNPL
7	2	66175	FLATWASHER, #10, ZNPL
8	4	63366	SHCS, #10-24 X 1-3/4" LG, SS
9	4	66175	FLATWASHER #10, ZNPL



#	TY	P/N	DESCRIPTION
1	1	75350	ACTUATOR ASSEMBLY
2	1	75350	SERV. MOTOR W/ BRAKE, BX. SERIES, W/ C. NN
3	1	77621	KEYST. CK. 5MM S. X 1 7/77 LG. ZNPL
4	4	1 16	SHCS, M6 X 2-MM LG
5	4	1 337	1. CHWASHER, M6 7/20

300/300 # BXI ACTUATOR ASSEMBLY	300/300 # BXI ACTUATOR ASSEMBLY	FIGURE B10.
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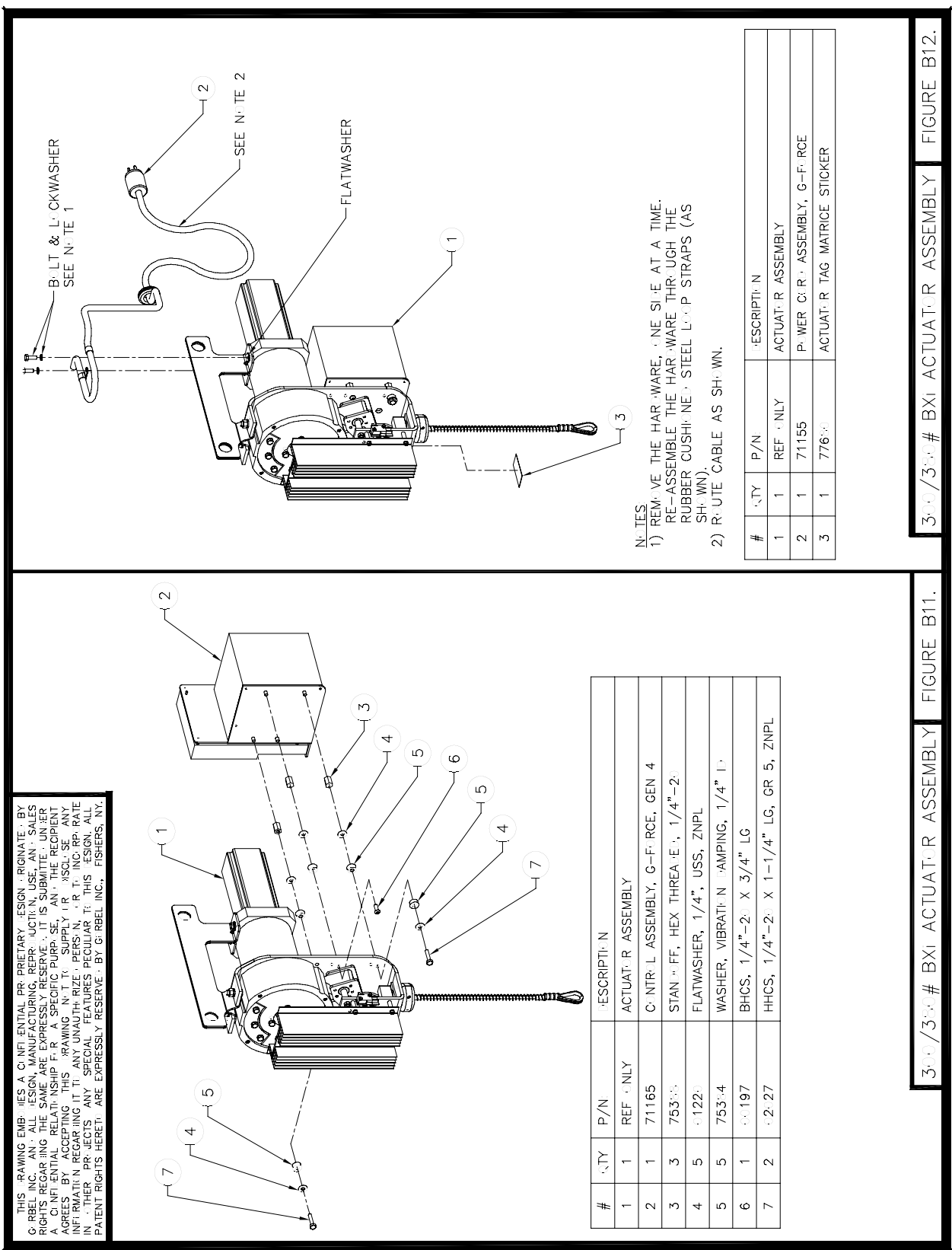
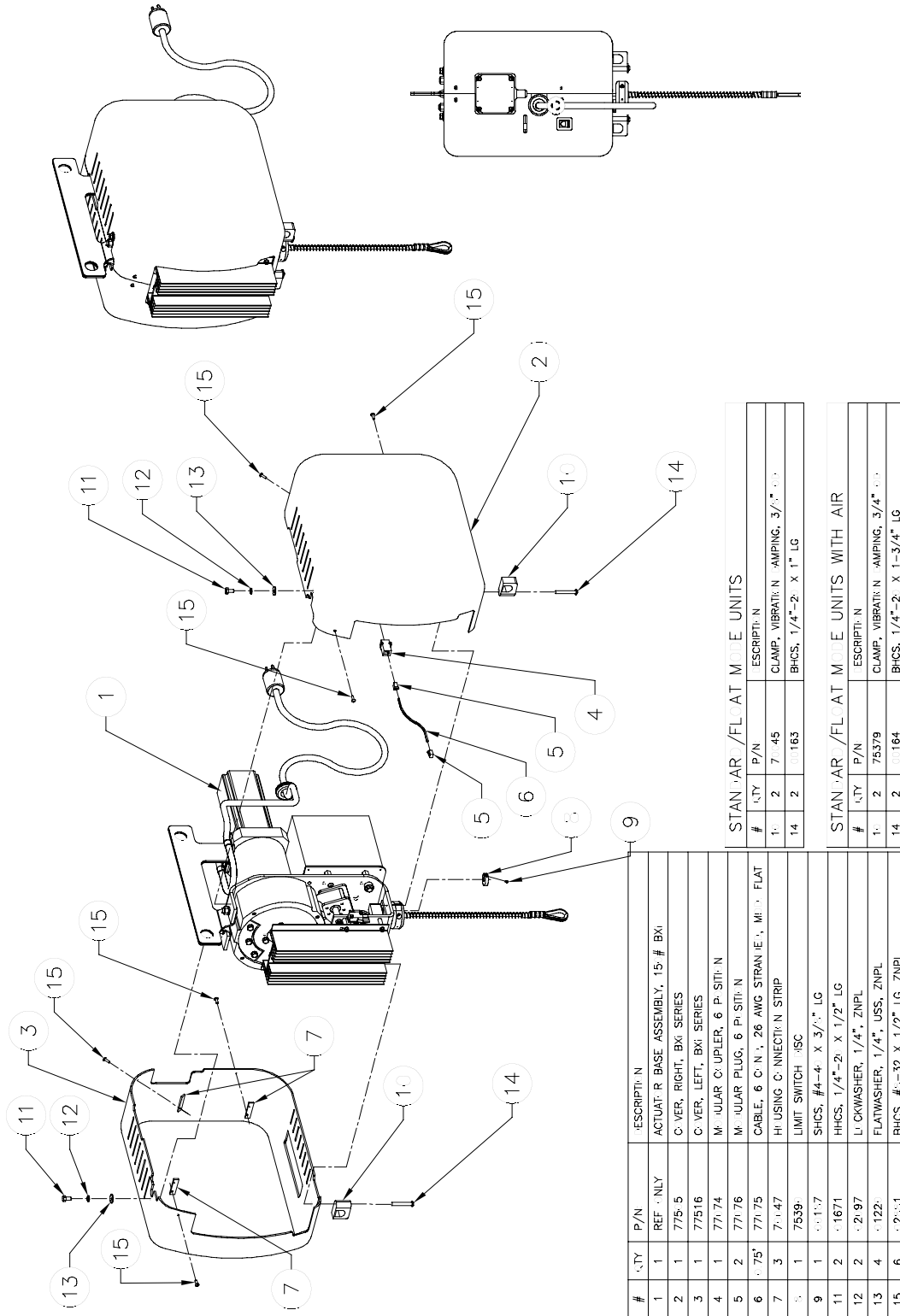


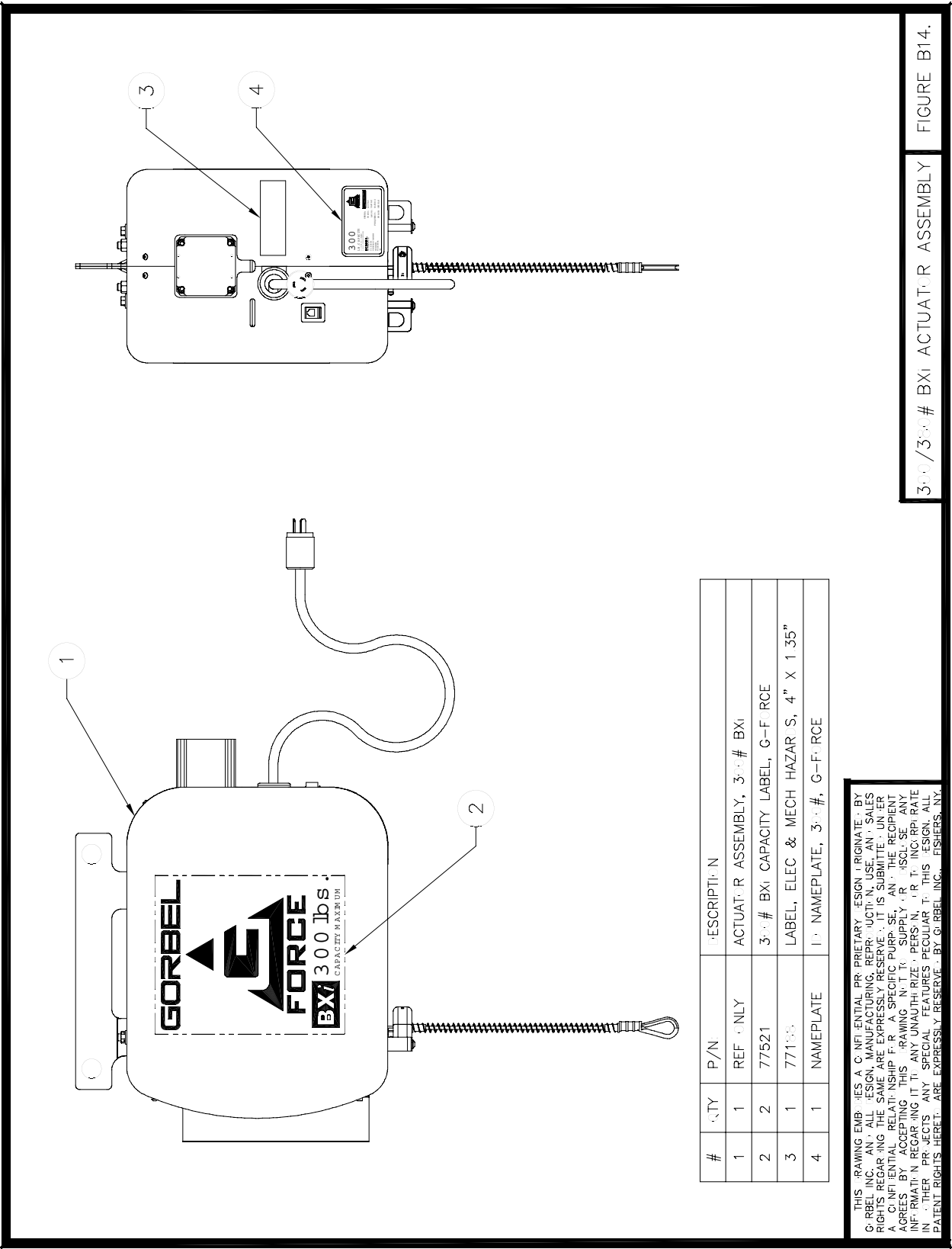
Figure B11 (bottom) & Figure B12 (top). 300/380# Bxi Actuator Assembly.



#		P/N		DESCRIPTION	
1	1	775-5	1	ACTUATOR BASE ASSEMBLY, 15 # BXi	
2	1	775-6	1	COVER, RIGHT, BXi SERIES	
3	1	775-16	1	COVER, LEFT, BXi SERIES	
4	1	771-74	1	MODULAR CABLE, 6 P. STRIP	
5	2	771-76	1	MODULAR PLUG, 6 P. STRIP	
6	75	771-75	1	CABLE, 6 C.N., 26 AWG STRANDED, MIL. FLAT	
7	3	771-47	1	HIUSING CONNECTION STRIP	
8	1	7539	1	LIMIT SWITCH	
9	1	17	1	SHCS, #4-40 X 3/4" LG	
10	2	1671	1	HHCS, 1/4"-20 X 1/2" LG	
11	2	297	1	LOCKWASHER, 1/4", ZNPL	
12	2	122	1	FLATWASHER, 1/4", USS, ZNPL	
13	4	122	1	FLATWASHER, 1/4", USS, ZNPL	
14	2	164	1	HHCS, #4-40 X 1/2" LG, ZNPL	
15	6	251	1	HHCS, #4-40 X 1/2" LG, ZNPL	

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300/380# BXi Actuator Assembly FIGURE B13.



300/380# BXi Actuator Assembly FIGURE B14.

APPENDIX C - BXI STANDARD HANDLE ASSEMBLY DRAWINGS

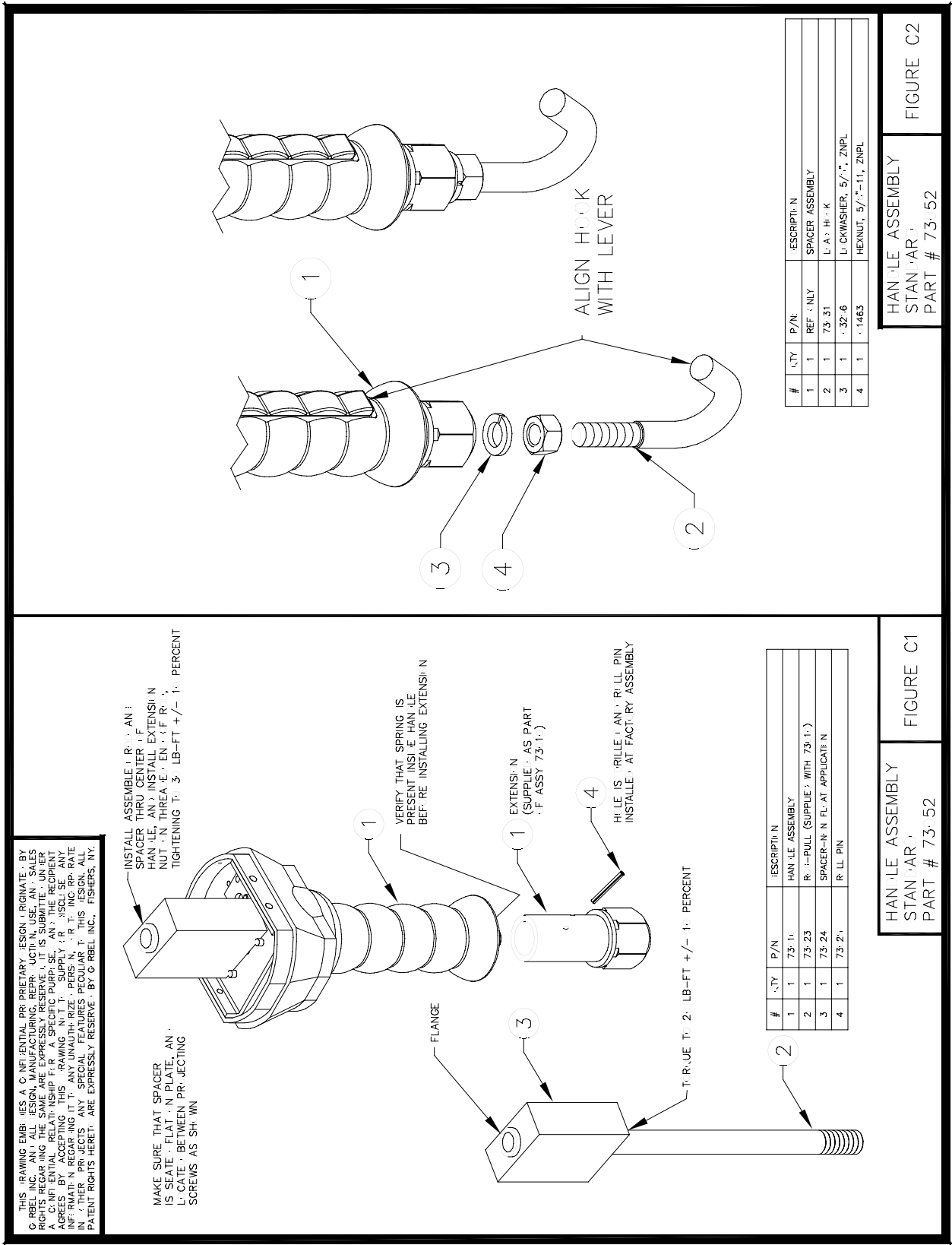
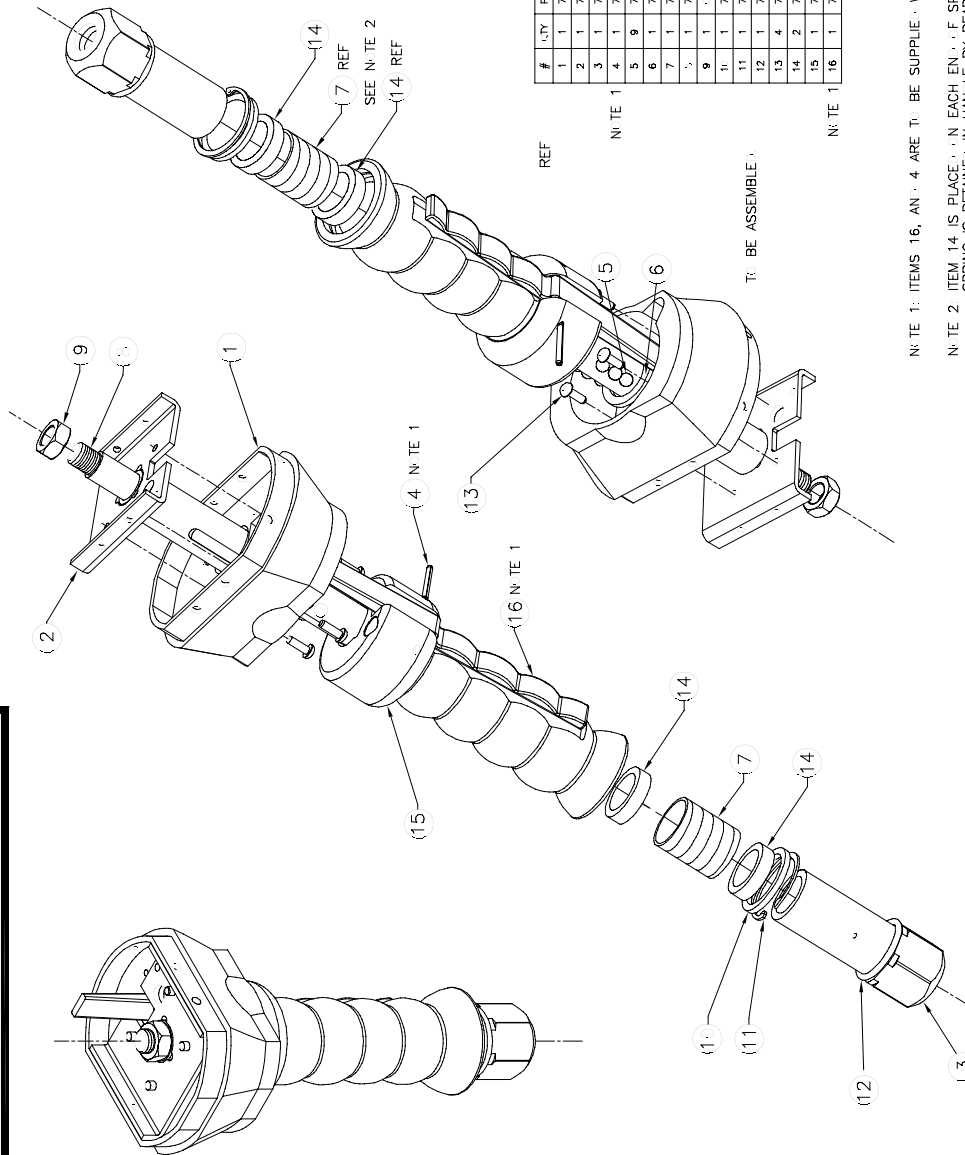


Figure C1 (bottom) & Figure C2 (top). Standard Handle Assembly.

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#	QTY	P/N	DESCRIPTION
1	1	73-17	BASE
2	1	73-20	TOP PLATE ASSEMBLY
3	1	73-15	EXTENDER
4	1	7-25	ROLL PIN
5	9	7-93	BEARING BALL 25-14
6	1	73-16	BUFFER
7	1	73-19	HAND SPRING
8	1	73-23	ROLL PIN
9	1	1985	1/2-20 UNF NUT-ZN PLATE
10	1	73-14	WASHER-NYLON
11	1	7-84	RETAINING RING
12	1	73-29	SHIM
13	4	73-32	1-32 X .5 BUSHING
14	2	73-33	BEARING
15	1	73-34	HAND SPRING
16	1	73-35	LEVER

NOTE 1: ITEMS 16, AND 4 ARE TO BE SUPPLIED WITH ASSEMBLY 73-17, BUT ARE NOT

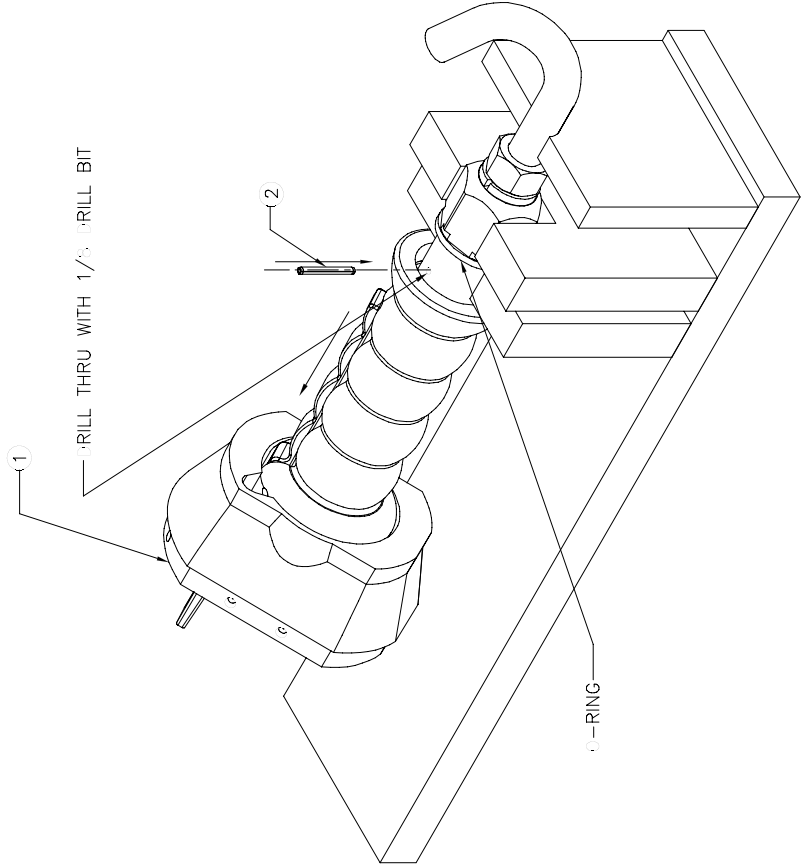
NOTE 2: ITEM 14 IS PLACED IN EACH END OF SPRING (ITEM 7) SPRING IS RETAINED IN HANDLE BY BEARING (14) AND ITEM 1.

G-FORCE HANDLE BASE

FIGURE C3

Figure C3. Standard Handle Assembly.

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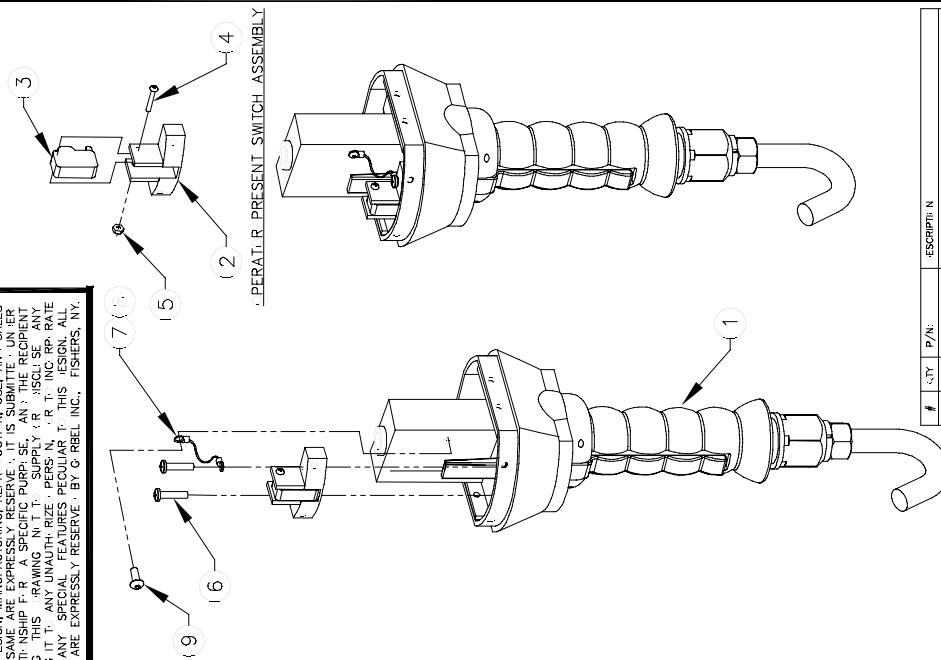
ASSEMBLY PROCEDURE

1. PUSH HANDLE OF ASSEMBLY FULLY INTO BASE, EXPOSING PILOT HOLE IN ONE SIDE OF EXTENSION
2. PLACE IN FIXTURE, WITH HOLE UP
3. DRILL COMPLETELY THRU EXTENSION AND REMOVE ANY CHIPS, AND BURRS FROM BOTH ENDS OF HOLE
4. PRESS DRIVE ROLL PIN THRU EXTENSION, MAKING SURE THAT BOTH ENDS ARE FLUSH TO SLIGHTLY BELOW FLUSH, AND THAT THERE ARE NO BURRS
5. OPERATE HANDLE SEVERAL TIMES THRU FULL TRAVEL RANGE TO ENSURE THAT NO BINDING CAN BE DETECTED

#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	HANDLE- ASSEMBLY
2	1	73-25	ROLL PIN

HANDLE PIN OPERATION FIGURE C4

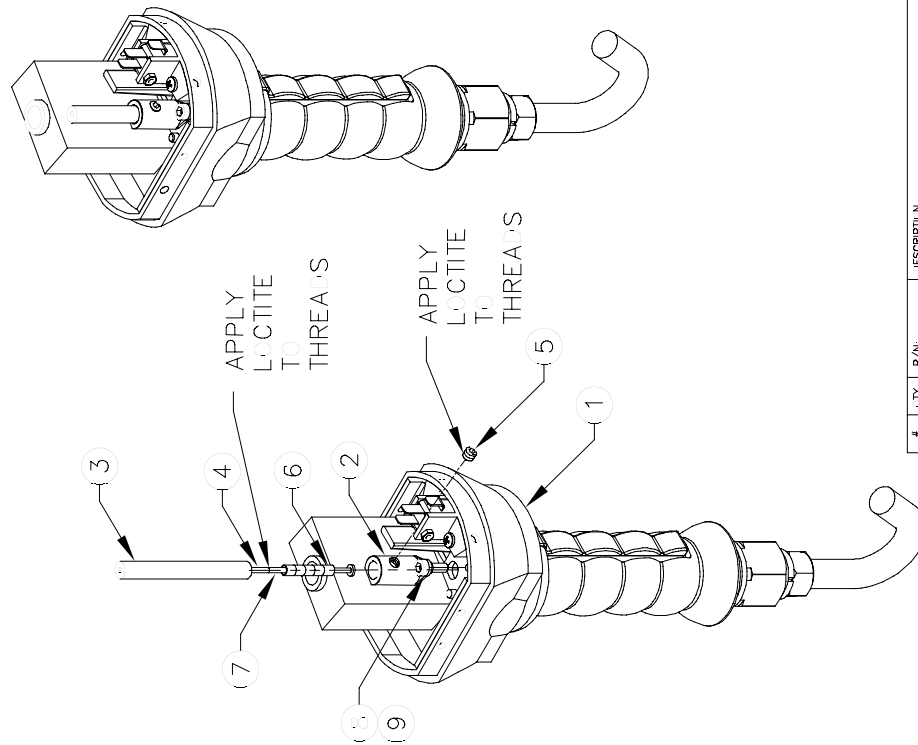
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#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	HANDLE ASSEMBLY
2	1	77-11	OPERATOR PRESENT SWITCH INSERT
3	1	77-14	LIMIT SWITCH ROLLER ARM ACT. FR. M.C.
4	1	77-23	SLIP, #4-6 X 3/4" LG, ZNPL
5	1	77-24	HEX NUT, #4-4, ZNPL
6	2	77-26	PHOS. #1 X 3/4" LG, STAINLESS
7	3	77-53	H.C. KUP WIRE, 24 AWG, GRN/YEL
8	2	77-56	RING TERMINAL, #1, 24-26 AWG
9	1	77-171	PHOS #1-32 X 3/4" LG, SUTITE, ZNPL

HANDLE ASSEMBLY
STANDARD
PART # 73-52

FIGURE C5



#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	HANDLE ASSEMBLY
2	1	77-22	LV.T. +/- 1/2" STR. KE. 5 WIRE
3	1	77-99	LV.T. C. RE-SUPPLY 1 W/LV.T
4	1	77-99	SET-SCREW, 1/4"-2" X 1/4" LG, ALL Y STEEL
5	1	77-36	SPRING-LV.T
6	1	73-26	EXTENSION-LV.T O RE
7	1	73-25	1-32 X 3/4" SHCS
8	1	77-49	#1-171 O WASHER

HANDLE ASSEMBLY
STANDARD
PART # 73-52

FIGURE C6

Figure C5 (bottom) & Figure C6 (top). Standard Handle Assembly.

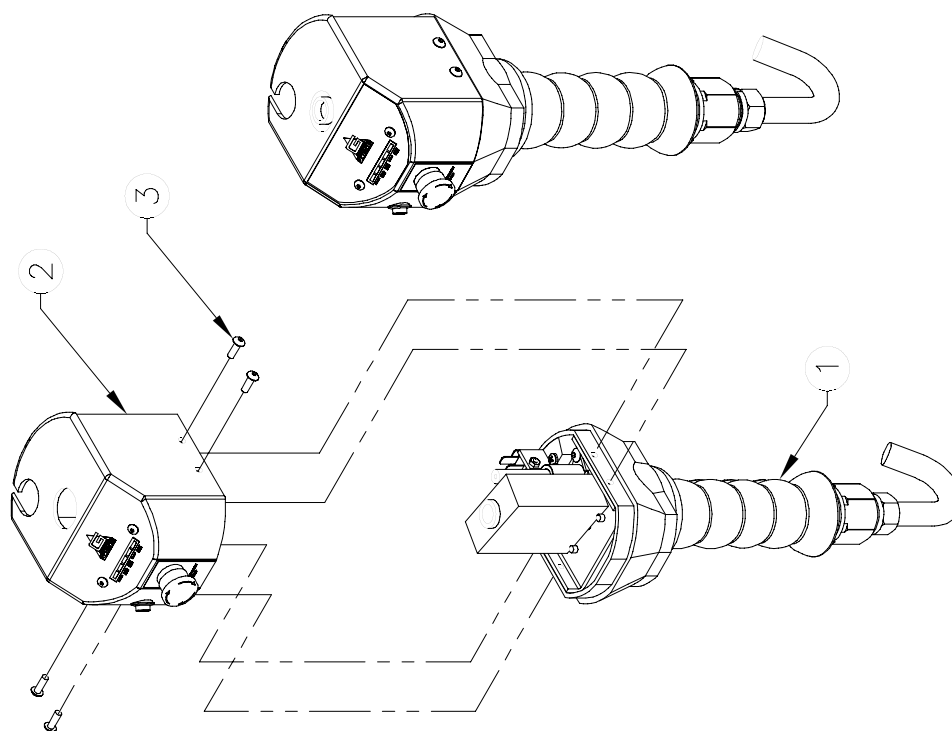
This diagram shows the exploded view of a portable electronic device, likely a handheld GPS or surveying instrument. The components are numbered as follows:

- 1**: The main body of the device, which is a rectangular box with a screen on the front and a control panel on the side.
- 2**: A small, rectangular display screen or keypad component.
- 3**: A small, rectangular component, possibly a battery or a sensor module.
- 4**: A small, rectangular component, possibly a battery or a sensor module.
- 5**: A small, rectangular component, possibly a battery or a sensor module.
- 6**: A small, rectangular component, possibly a battery or a sensor module.

The diagram illustrates the assembly of the device, showing how the various components fit together. The main body (1) is shown with a screen (2) and a control panel (3) attached. A small component (4) is shown attached to the side of the main body. A small component (5) is shown attached to the top of the main body. A small component (6) is shown attached to the bottom of the main body.

#	TY	P/N	DESCRIPTION
1	1	7-1-42	H ₂ USING T: P
2	1	7-1-29	LE: B
3	1	771-7	LE: B AR: PCB, 5 O: L R
4	1	7-1-31	E-ST: P LABEL
5	1	771-91	SWITCH, E-ST: P, 16MM
6	2	7-1-45	BUFC, 46, 30, 2, 6, 1, 1 C

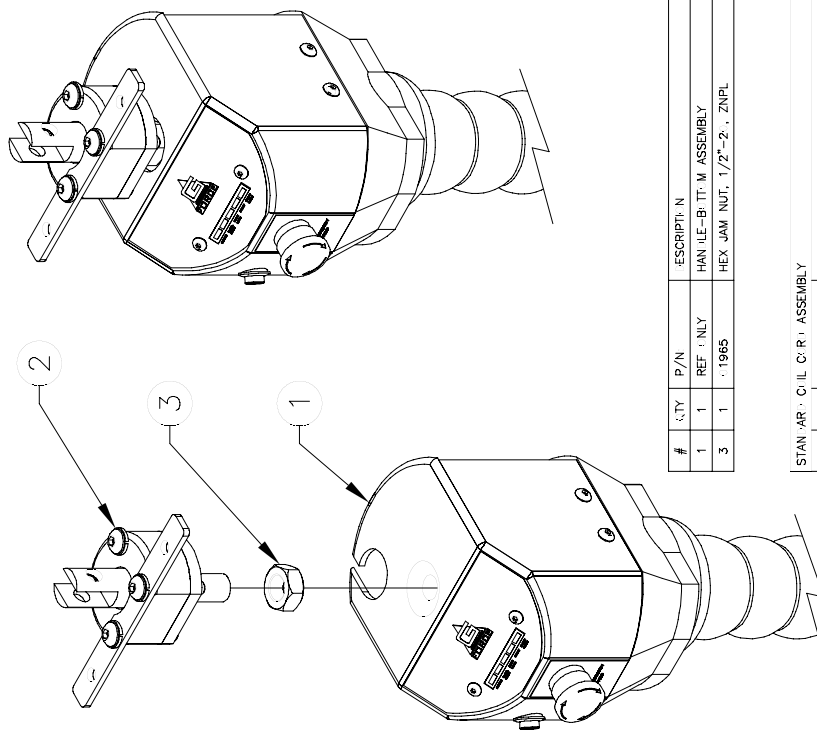
HANDLE ASSEMBLY
STANDARD
PART # 73.52



#	QTY	P/N	DESCRIPTION
1	1	REF . NLY	HAN 'LE-B' TT- M ASSEMBLY
2	1	REF . NLY	H- USING T- P ASSEMBLY
3	4	REF . NLY	BELTS #1-37 X 1/2" I.C. 7NPI

HANDLE ASSEMBLY
STANDARD
PART # 73052

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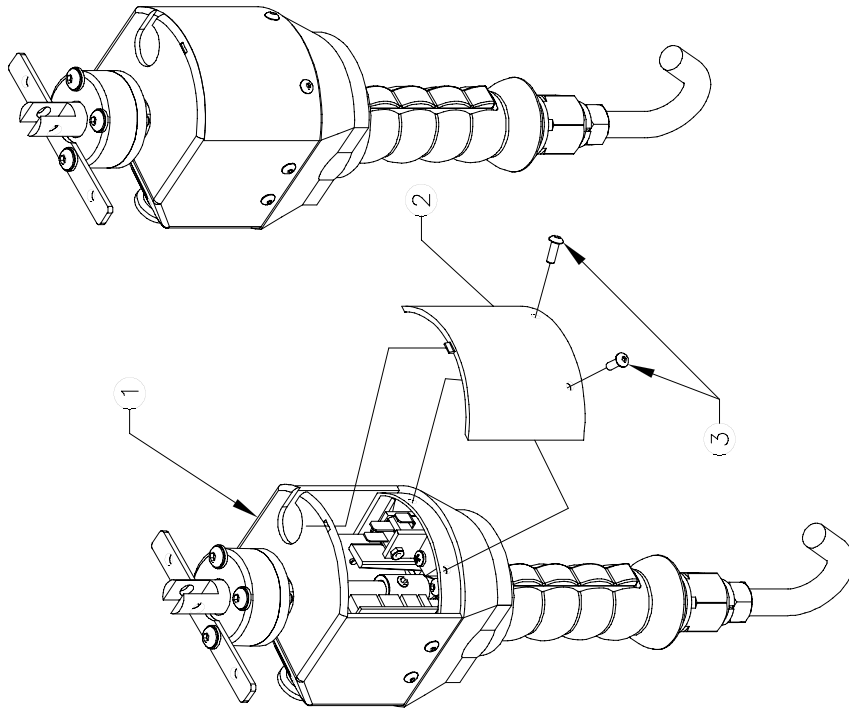
#	QTY	P/N	DESCRIPTION
1	1	REF: NLY	HANDLE-BOTTOM ASSEMBLY
3	1	1965	HEX JAM NUT, 1/2"-2, ZNPL

STANDARD HANDLE ASSEMBLY			
2	1	7116	SWIVEL ASSEMBLY, STANDARD

AIRHSE HANDLE ASSEMBLY			
2	1	7117	SWIVEL ASSEMBLY, AIRHSE

HANDLE ASSEMBLY
STANDARD
PART # 73-52

FIGURE C9



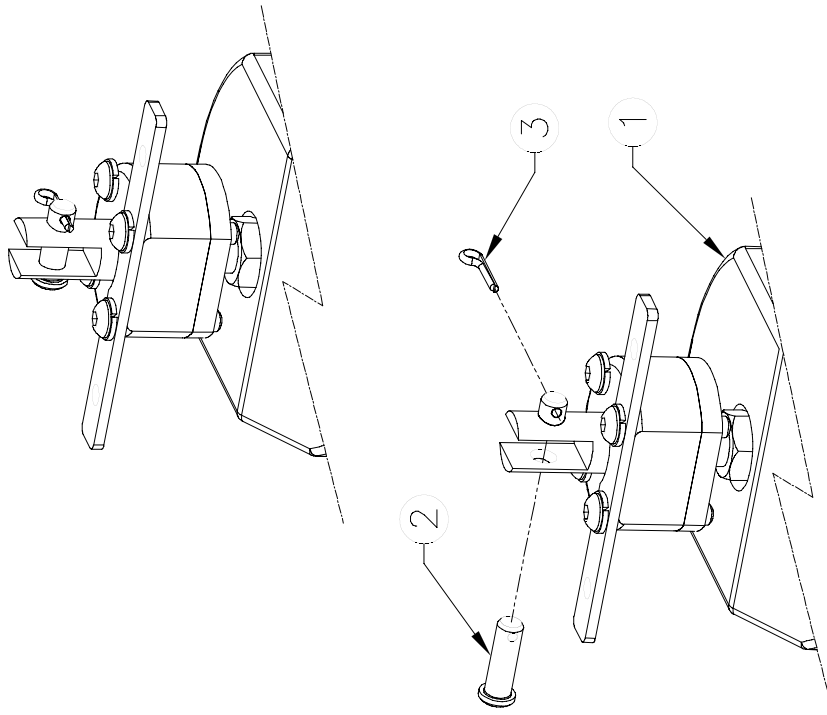
#	QTY	P/N	DESCRIPTION
1	1	REF: NLY	HANDLE ASSEMBLY
2	1	7111	HUSING FR-NT
3	2	7111	BHCS, #1-32 X 1/2" LG, ZNPL

HANDLE ASSEMBLY
STANDARD
PART # 73-52

FIGURE C10

Figure C9 (bottom) & Figure C10 (top). Standard Handle Assembly.

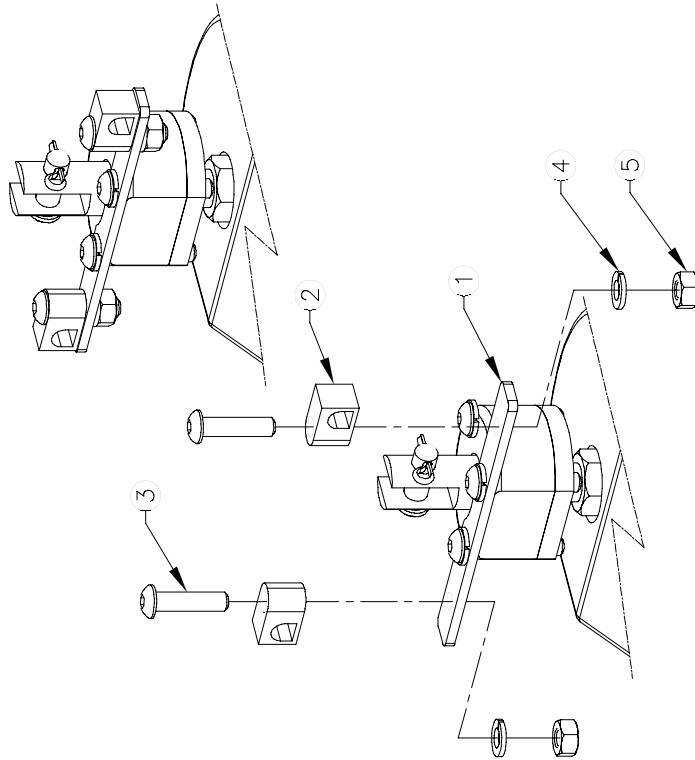
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#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	HANDLE ASSEMBLY
2	1	7-63	CLEVIS PIN (**C MES WITH CLEVIS PIN**)
3	1	7-63	CLEVIS PIN (**C MES WITH CLEVIS PIN**)

HANDLE ASSEMBLY
STANDARD
PART # 73.52

FIGURE C11



#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	HANDLE ASSEMBLY
2	2	7-163	CLAMP, VIBRATION DAMPING, 5/16"
3	2	1-163	BKCS, 1/4"-2" X 1" LG
4	2	1-2-97	LOCKWASHER, 1/4", ZNPL
5	2	1-1221	HEXNUT, 1/4"-2", ZNPL

#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	HANDLE ASSEMBLY
2	2	7-379	CLAMP, VIBRATION DAMPING, 3/4"
3	2	1-164	BKCS, 1/4"-2" X 1-3/4" LG
4	2	1-2-97	LOCKWASHER, 1/4", ZNPL
5	2	1-1221	HEXNUT, 1/4"-2", ZNPL

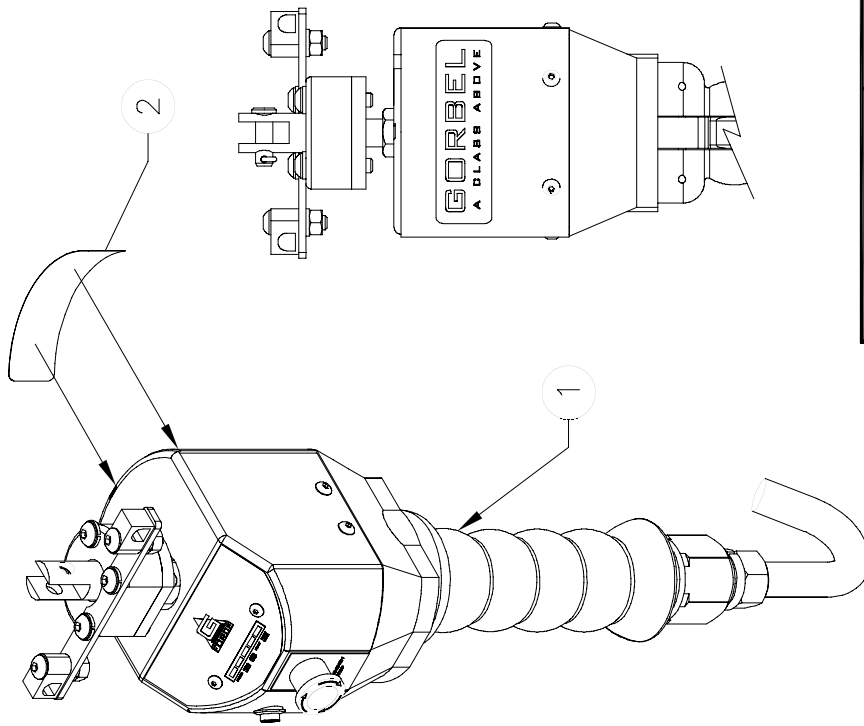
HANDLE ASSEMBLY
STANDARD
PART # 73.52

FIGURE C12

Figure C11 (bottom) & Figure C12 (top). Standard Handle Assembly.

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#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	HANDLE ASSEMBLY
2	1	71132	FRONT GORBEL LABEL

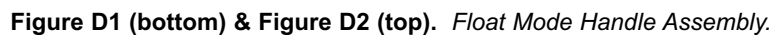


HANDLE ASSEMBLY
STANDARD
PART # 73152

FIGURE C13

Figure C13. Standard Handle Assembly.

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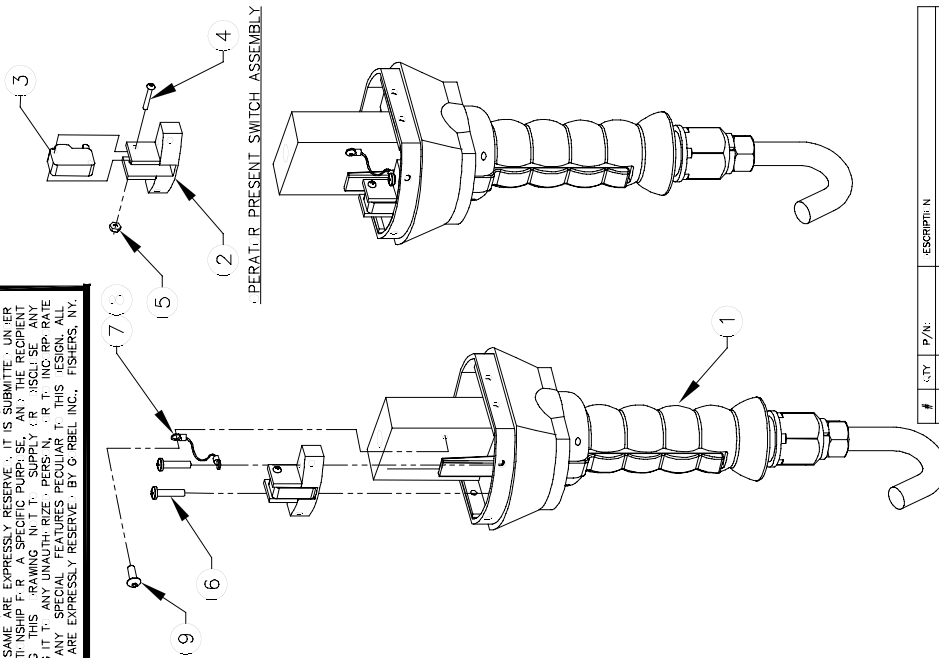
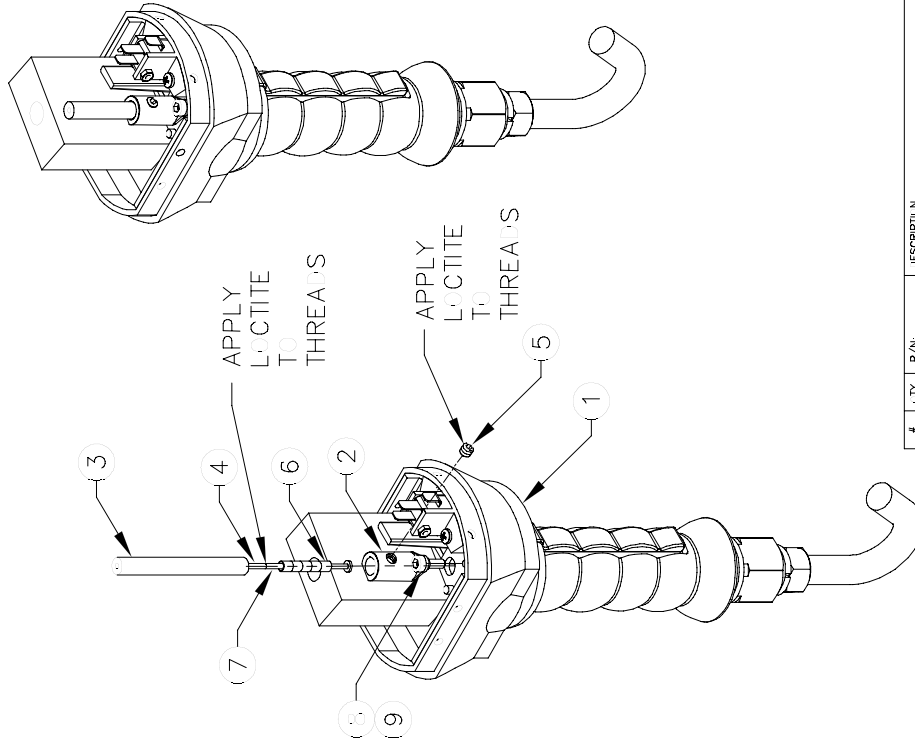


FIGURE D3
HANDLE ASSEMBLY
FLOAT MODE
PART # 73-53

#	QTY	P/N	DESCRIPTION
1	1	73-11	HANDLE ASSEMBLY
2	1	73-12	HANDLE CAP
3	1	73-13	HANDLE CAP INSERT
4	1	73-14	HANDLE CAP INSERT
5	1	73-15	HANDLE CAP INSERT
6	2	73-16	HANDLE CAP INSERT
7	3	73-17	HANDLE CAP INSERT
8	2	73-18	HANDLE CAP INSERT
9	1	73-19	HANDLE CAP INSERT

FIGURE D3
HANDLE ASSEMBLY
FLOAT MODE
PART # 73-53



APPLY
LOCTITE
TO
THREADS

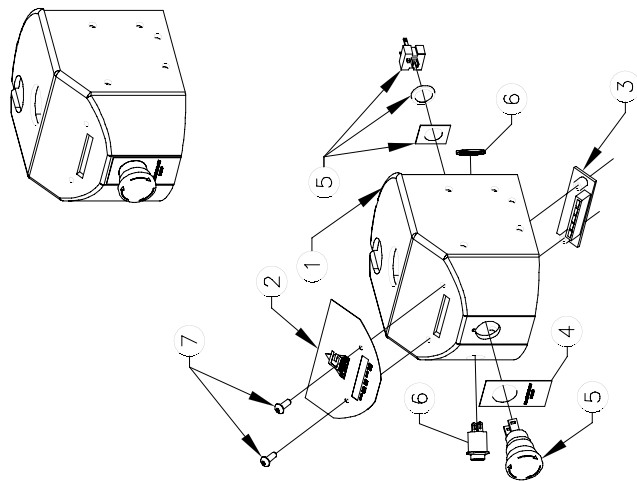
APPLY
LOCTITE
TO
THREADS

#	QTY	P/N	DESCRIPTION
1	1	73-20	HANDLE ASSEMBLY
2	1	73-21	HANDLE CAP
3	1	73-22	HANDLE CAP INSERT
4	1	73-23	HANDLE CAP INSERT
5	1	73-24	HANDLE CAP INSERT
6	1	73-25	HANDLE CAP INSERT
7	1	73-26	HANDLE CAP INSERT
8	1	73-27	HANDLE CAP INSERT
9	1	73-28	HANDLE CAP INSERT

FIGURE D4
HANDLE ASSEMBLY
FLOAT MODE
PART # 73-53

Figure D3 (bottom) & Figure D4 (top). Float Mode Handle Assembly.

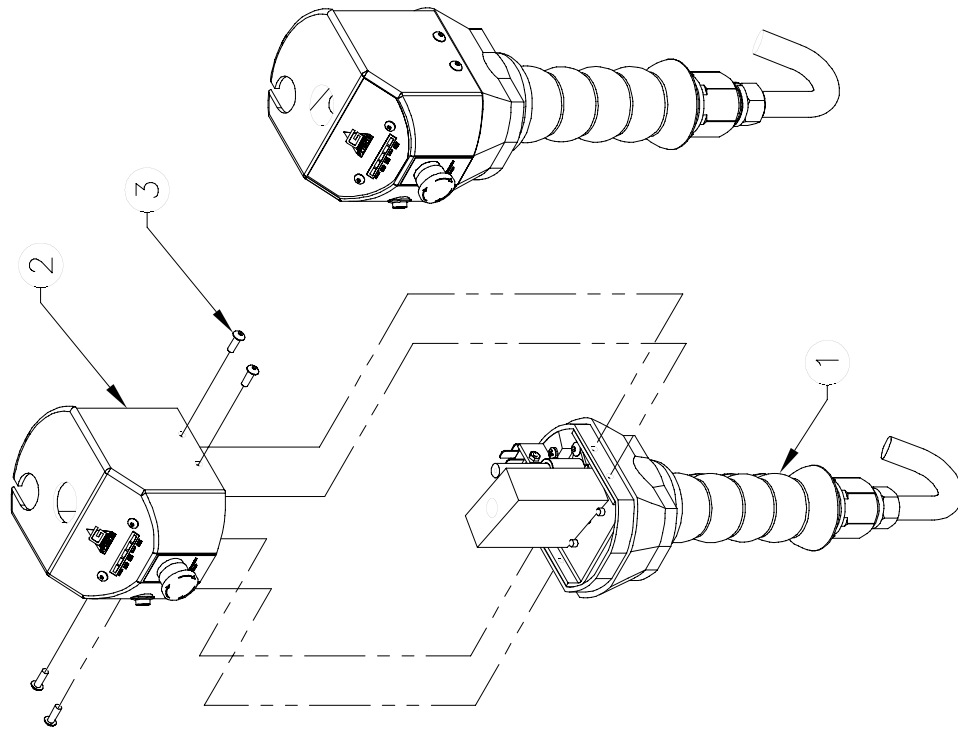
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#	QTY	P/N	DESCRIPTION
1	1	71-42	H- USING T.P
2	1	71-29	LE - LABEL
3	1	771-7	LE - BAR, PCB, 5 O L R
4	1	71-31	E-ST: P LABEL
5	1	771-91	SWITCH, E-ST: P, 16MM
6	1	76-12	SWITCH, PUSHBUTT: N
7	2	71-46	BHCS, #6-32 X 3/4" LG

HANDLE ASSEMBLY
FLOAT MODE
PART # 73-53

FIGURE D5



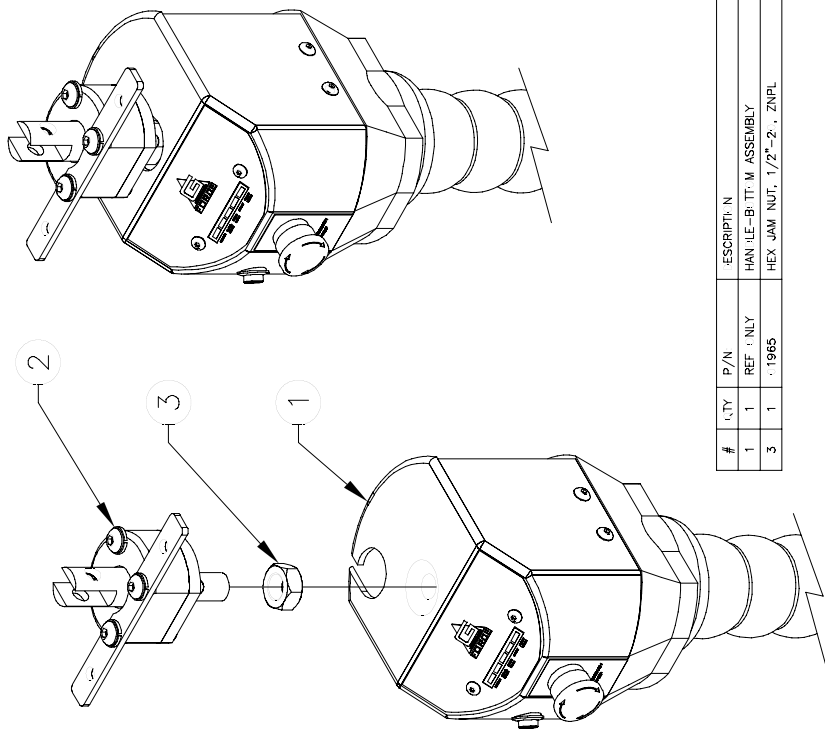
#	QTY	P/N	DESCRIPTION
1	1	REF - NLY	HAN -LE-B-TT: M ASSEMBLY
2	1	REF - NLY	H- USING T.P ASSEMBLY
3	4	72-11	BHCS, #6-32 X 1/2" LG, ZNPL

HANDLE ASSEMBLY
FLOAT MODE
PART # 73-53

FIGURE D6

Figure D5 (bottom) & Figure D6 (top). Float Mode Handle Assembly.

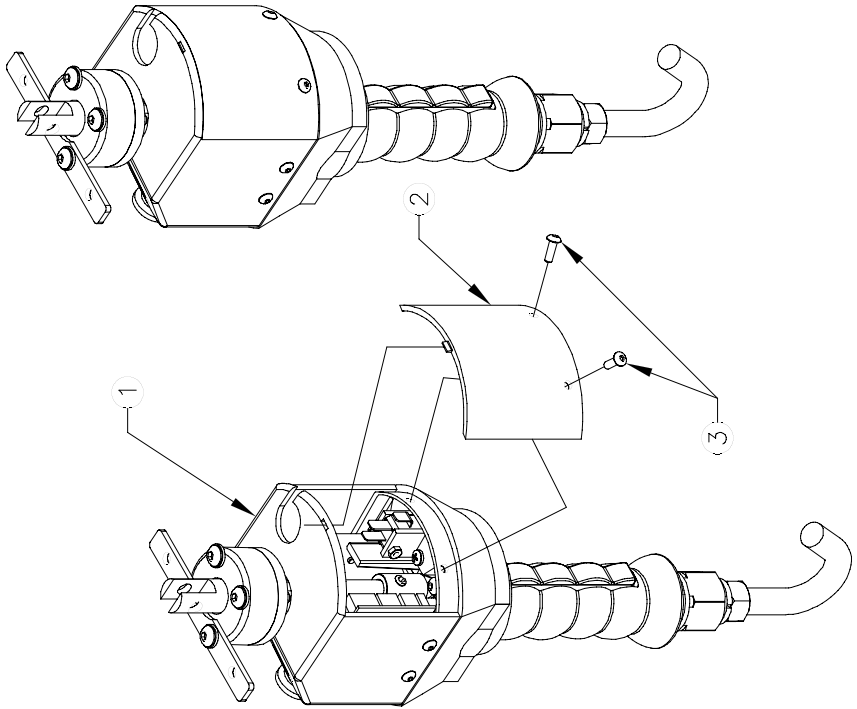
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#	QTY	P/N	DESCRIPTION
1	1	REF: NLY	HANDLE-BOTTOM ASSEMBLY
3	1	1965	HEX JAM NUT, 1/2"-2, ZNPL

STANDARD CIL CIL ASSEMBLY			
2	1	7116	SWIVEL ASSEMBLY, STANDARD
AIRHSE CIL CIL ASSEMBLY			
2	1	7117	SWIVEL ASSEMBLY, AIRHSE

FIGURE D7
HANDLE ASSEMBLY
FLOAT MODE
PART # 73-53

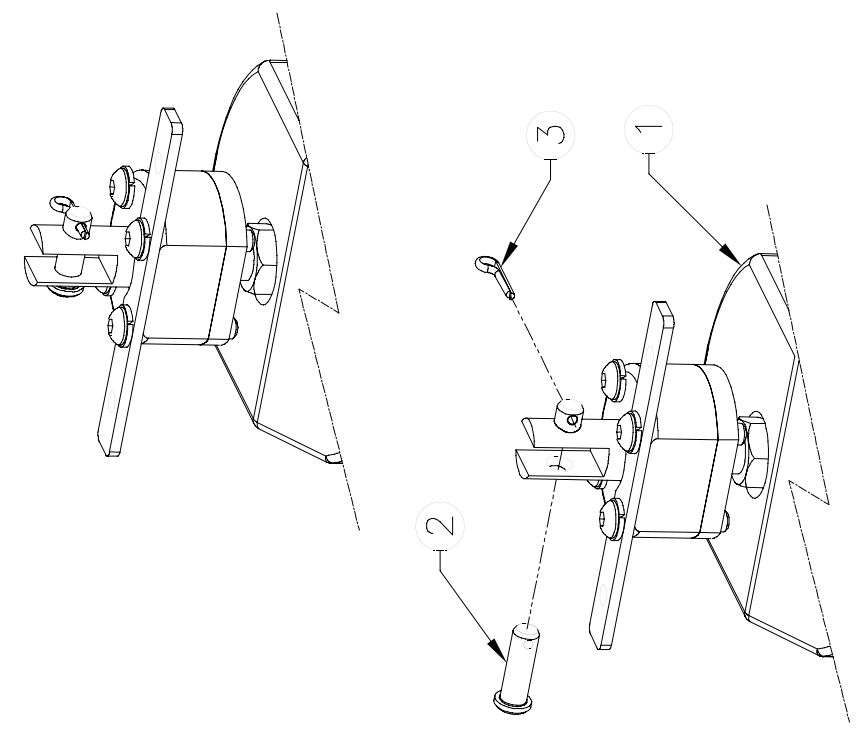


#	QTY	P/N	DESCRIPTION
1	1	REF: NLY	HANDLE ASSEMBLY
2	1	7111	WASHER, 1/2"-2, ZNPL
3	2	7211	BHCS, #32 X 1/2" LG, ZNPL

FIGURE D8
HANDLE ASSEMBLY
FLOAT MODE
PART # 73-53

Figure D7 (bottom) & Figure D8 (top). Float Mode Handle Assembly.

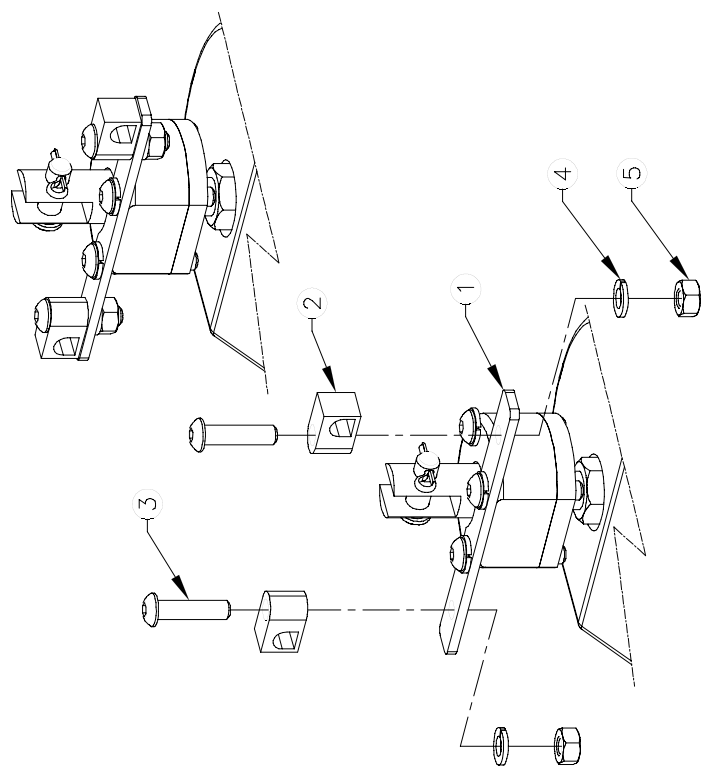
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#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	HANDLE ASSEMBLY
2	1	7-163	CLEVIS PIN (**C-MES WITH C-TITER PIN**)
3	1	7-163	C-TITER PIN (**C-MES WITH CLEVIS PIN**)

HANDLE ASSEMBLY
FLOAT MODE
PART # 73-53

FIGURE D9



#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	HANDLE ASSEMBLY
2	2	7-163	CLAMP, VIBRATION DAMPING, 5/16" LG
3	2	7-163	BHCS, 1/4"-20 X 1" LG
4	2	7-297	LOCKWASHER, 1/4", ZNPL
5	2	7-1221	HEX NUT, 1/4"-20, ZNPL

#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	HANDLE ASSEMBLY
2	2	7-297	CLAMP, VIBRATION DAMPING, 3/4" LG
3	2	7-164	BHCS, 1/4"-20 X 1-3/4" LG
4	2	7-297	LOCKWASHER, 1/4", ZNPL
5	2	7-1221	HEX NUT, 1/4"-20, ZNPL

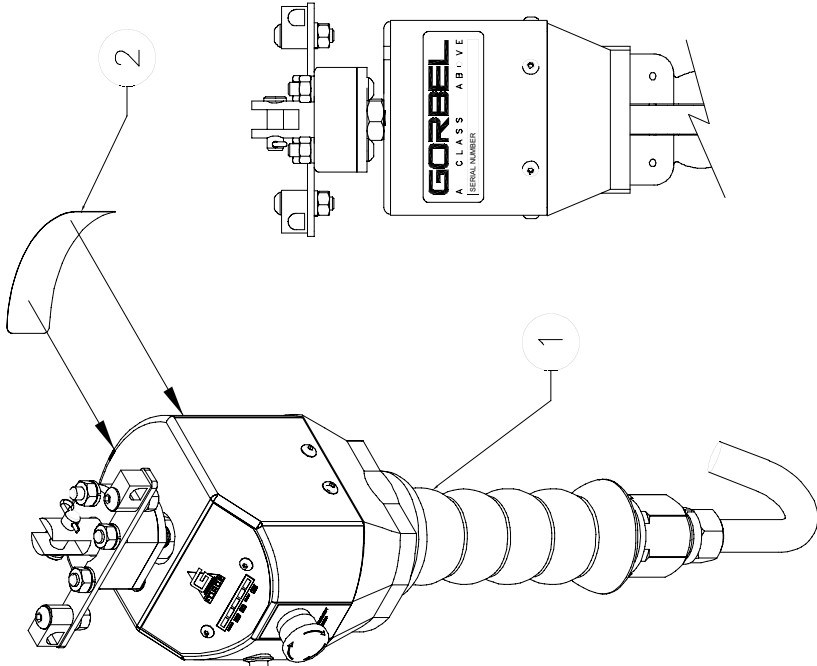
HANDLE ASSEMBLY
FLOAT MODE
PART # 73-53

FIGURE D10

Figure D9 (bottom) & Figure D10 (top). Float Mode Handle Assembly.

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#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	HANDLE ASSEMBLY
2	1	7-132	FRONT GORBEL LABEL



HANDLE ASSEMBLY
FLOAT MODE
PART # 7-132

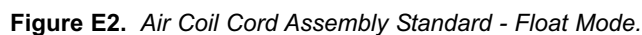
FIGURE D11

Figure D11. Float Mode Handle Assembly.

GORBEL®



4/04-Rev. S



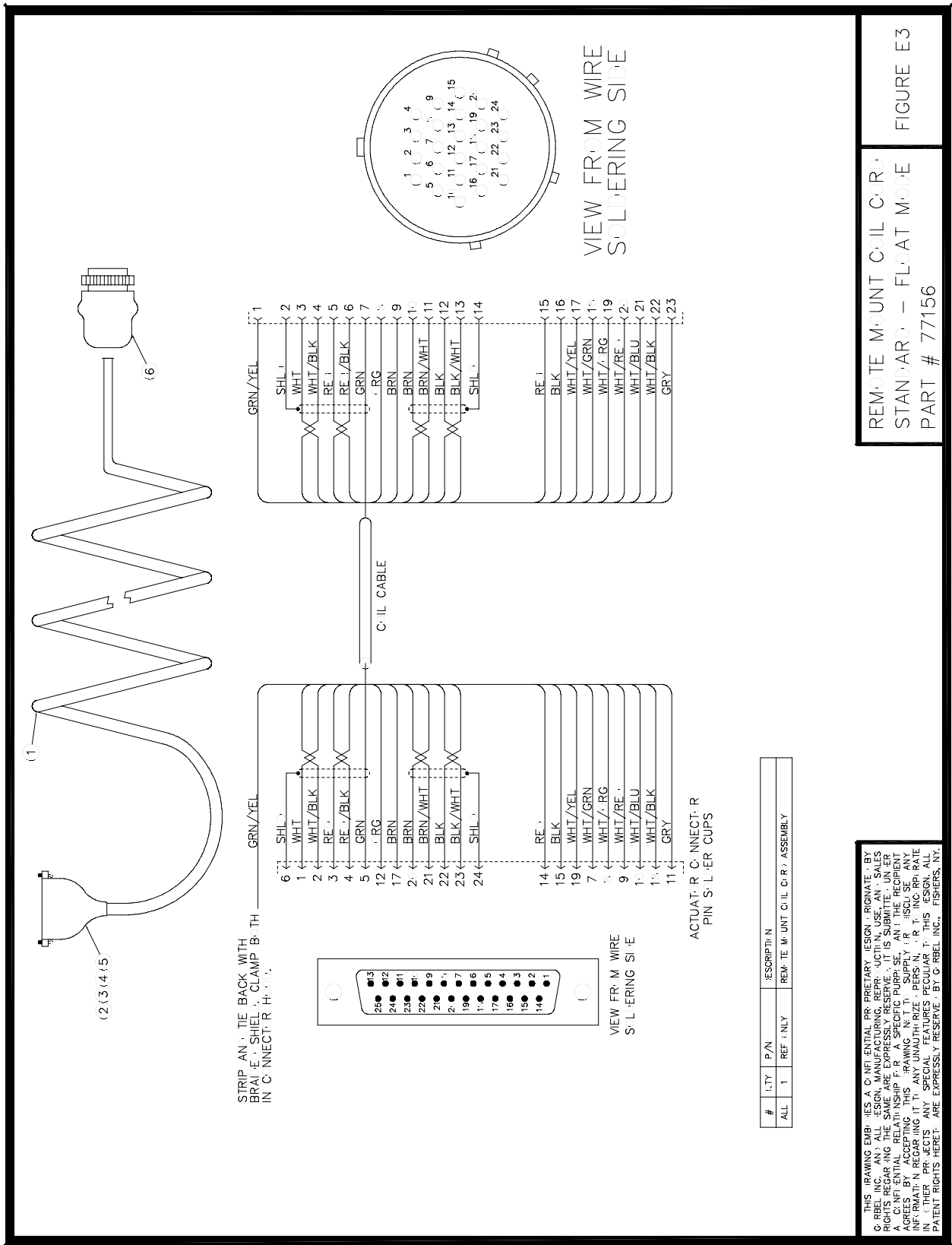
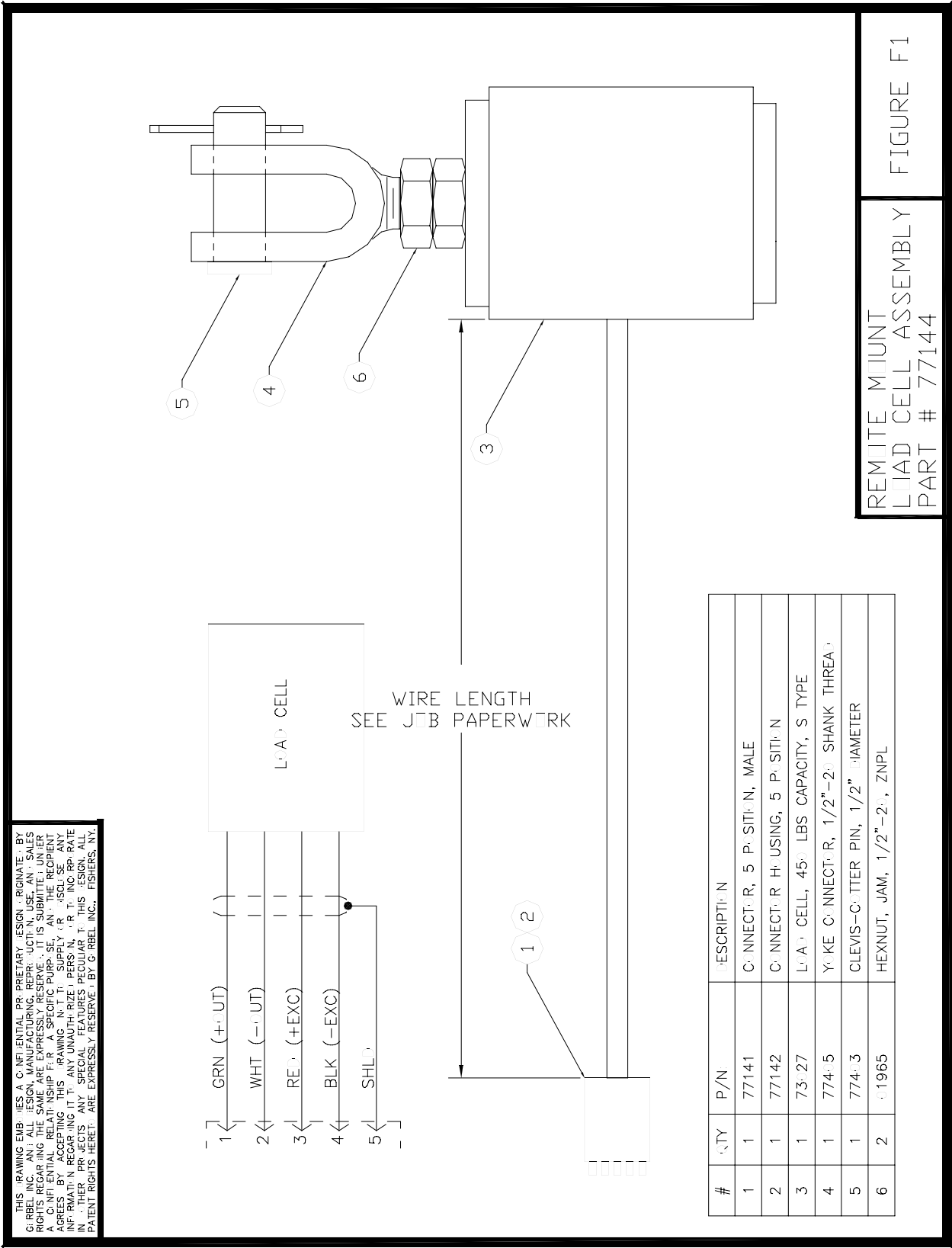


Figure E3. Remote Mount Coil Cord Standard - Float Mode.

APPENDIX F - CONTROLS SCHEMATIC DRAWINGS



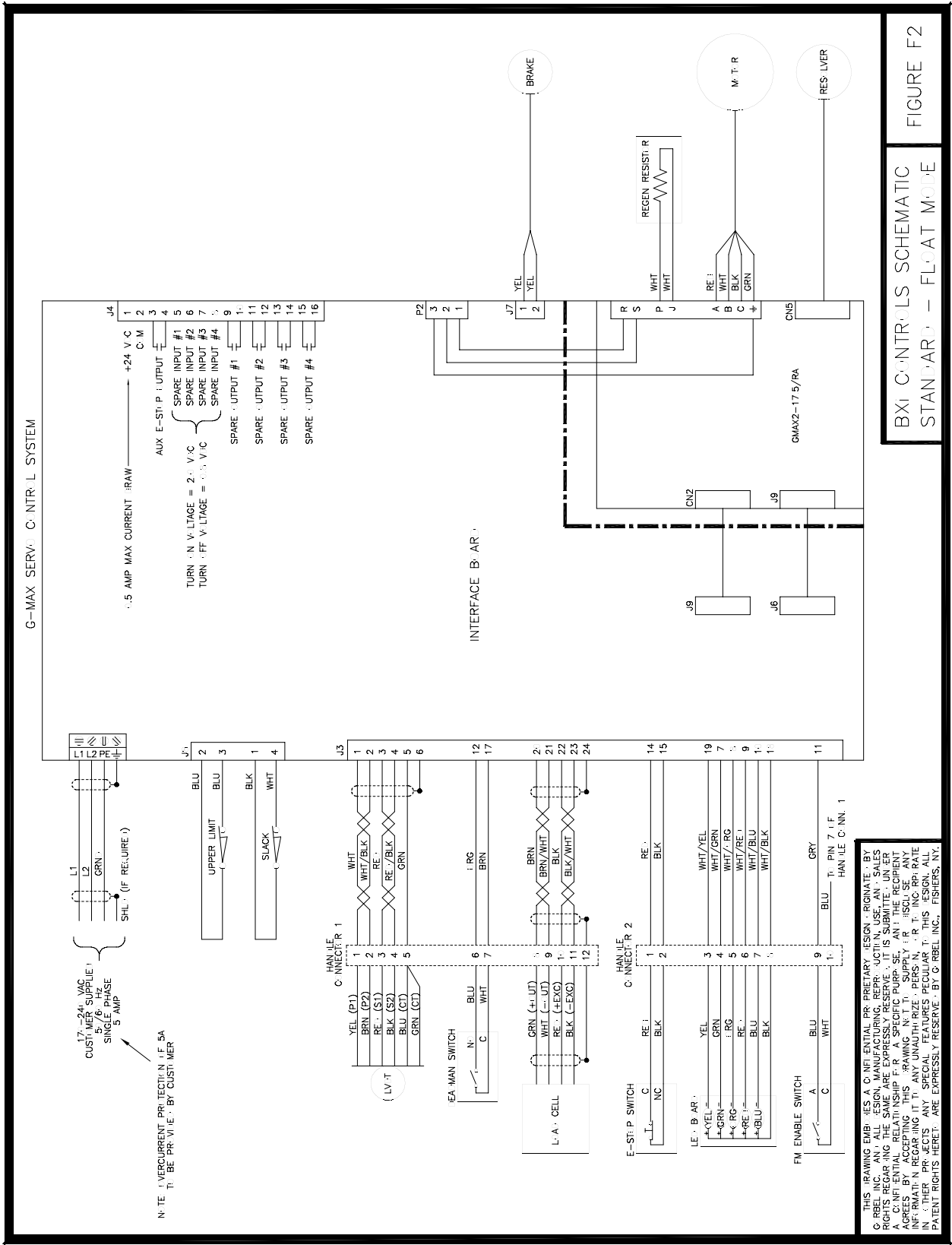


Figure F2. Controls Schematic.

APPENDIX G - OVERALL G-FORCE® REFERENCE DIMENSIONS

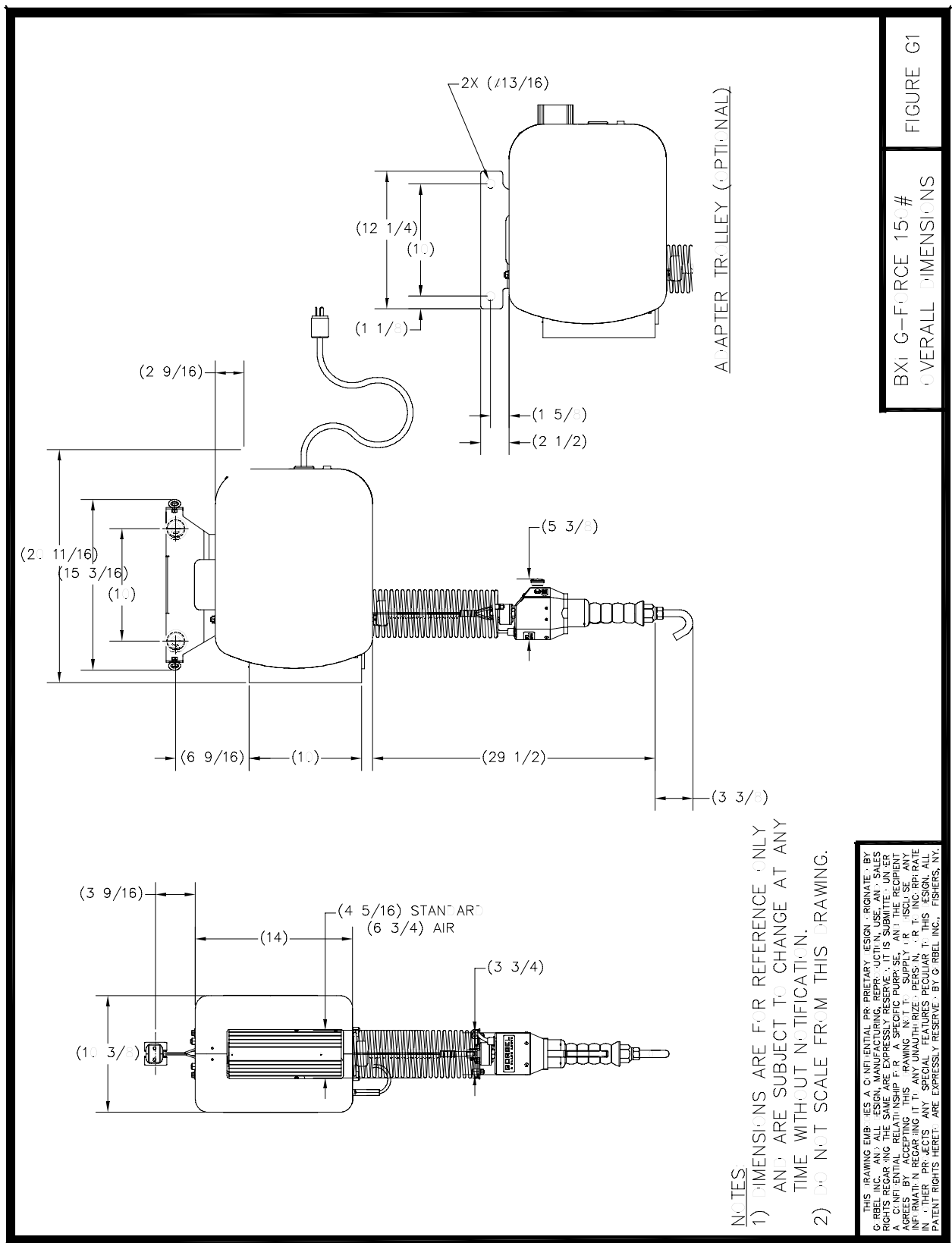


Figure G1. BXi G-Force® 150# Overall Dimensions.

4/04-Rev. S



APPENDIX I - COMPONENT LAYOUT DRAWINGS

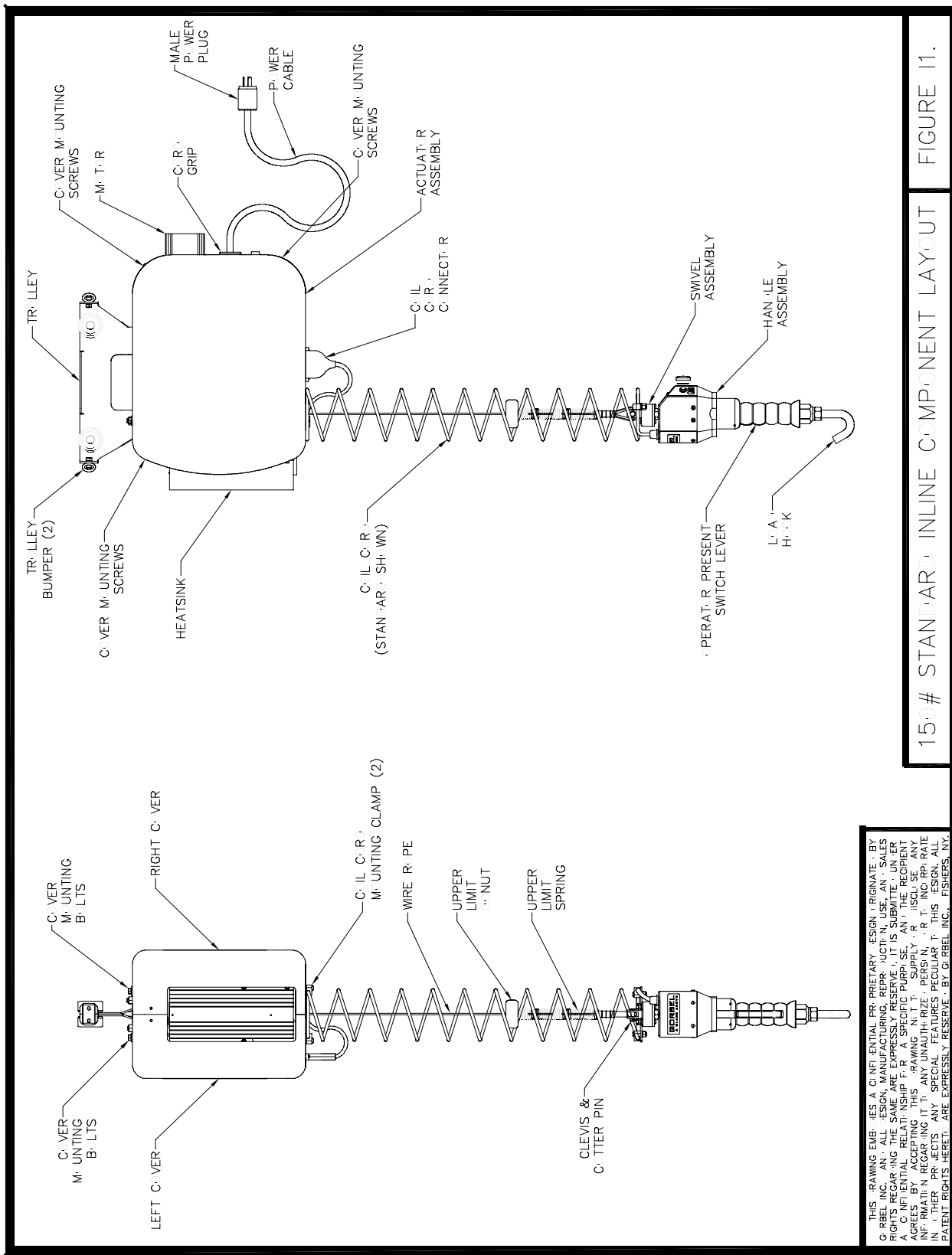


Figure 11. 150# Standard Inline Component Layout.

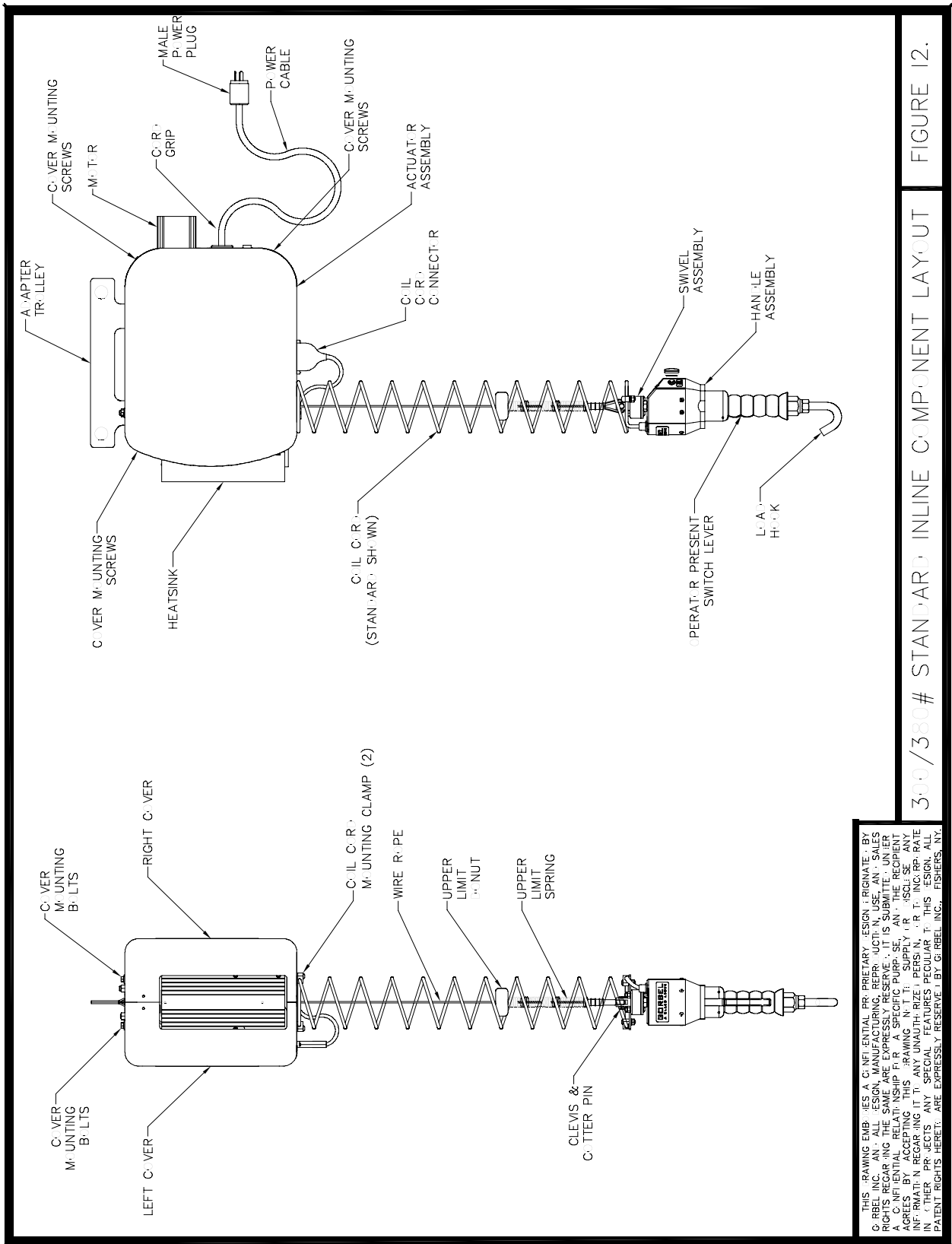
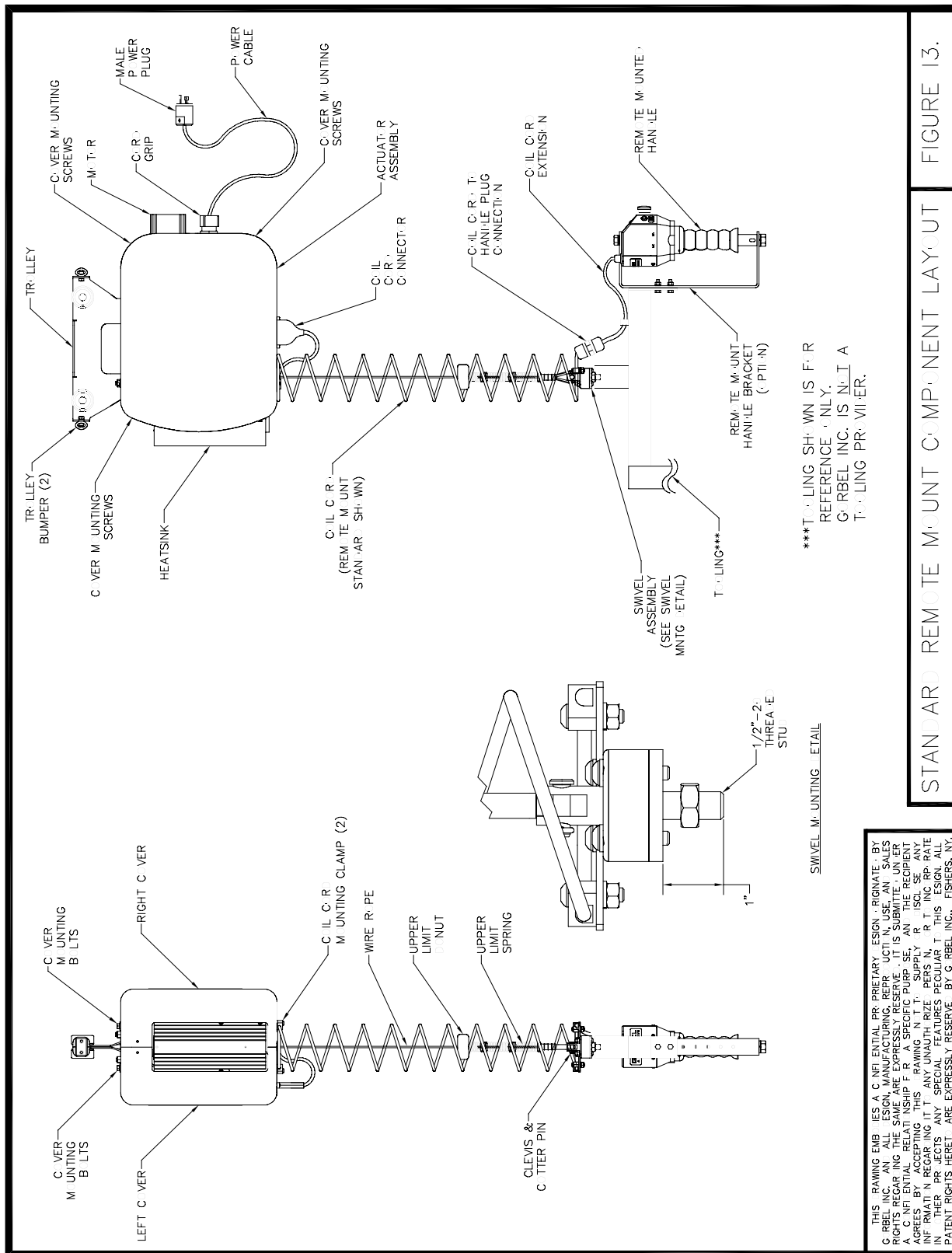


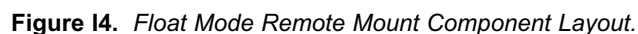
Figure I2. 300/380# Standard Inline Component Layout.



STANDARD REMOTE MOUNT COMPONENT LAYOUT

FIGURE I3.

Figure I3. Standard Remote Mount Component Layout.



RECOMMENDED SPARE PARTS LIST

<u>Item #</u>	<u>Part #</u>	<u>Description</u>	<u>Qty</u>
1	73052.ASM	Handle-Coil Cord Assembly, Inline, 150, 300, & 380#, Standard	1
2	73053.ASM	Handle-Coil Cord Assembly, Inline, 150, 300, & 380#, Float Mode	1
3	73652.ASM	Handle-Coil Cord Assembly with Air, Inline, 150, 300, & 380#, Standard	1
4	73653.ASM	Handle-Coil Cord Assembly with Air, Inline, 150, 300, & 380#, Float Mode	1
5	73052	Handle (only), 150, 300, & 380#, Standard, Inline, Must specify Air option	1
6	73053	Handle (only), 150, 300, & 380#, Float Mode, Inline, Must specify Air option	1
7	73145	Handle (only), 150, 300, & 380#, Remote Mount, Standard, Must specify remote mount length	1
8	73147	Handle (only), 150, 300, & 380#, Remote Mount, Float Mode, Must specify remote mount length	1
9	77206	Coil Cord (only), 150, 300, & 380#, Standard & Float Mode	1
10	77640	Coil Cord (only) with Air, 150, 300, & 380#, Standard & Float Mode	1
11	77156	Coil Cord, Remote Mount, 150, 300, & 380#, Standard & Float Mode	1
12	77660	Coil Cord, Remote Mount with Air, 150, 300, & 380#, Standard & Float Mode	1
13	77315	Wire Rope Replacement Assembly, 150, 300, & 380#	1
14	73099	Idler Pulley Guide Block, 150, 300, & 380#	1
15	75354	Upper Limit Switch, 150, 300, & 380#	1
16	77084	Lower Limit/Slack Switch, 150, 300, & 380#	3
17	77559	Offset Idler Pulley, 150, 300, & 380#	1
18	77104	Control System, G-Force®, Gen 4	1
19	78020	BXi G-Force® Universal Miscellaneous Hardware Kit	1

Contact Gorbel® Customer Service for Spare Parts pricing and availability.

LIMITED WARRANTY

It is agreed that the equipment purchased hereunder is subject to the following LIMITED warranty and no other. Gorbel Incorporated ("Gorbel") warrants the manual push-pull Work Station Cranes, Jib Crane, and Gantry Crane products to be free from defects in material or workmanship for a period of five years or 10,000 hours use from date of shipment. Gorbel warrants the Motorized Work Station Cranes and Jib Crane products to be free from defects in material or workmanship for a period of two years or 4,000 hours use from the date of shipment. Gorbel warrants the G-Force® and Easy Arm™ products to be free from defects in material or workmanship for a period of one year or 2,000 hours use from the date of shipment. This warranty does not cover Gantry Crane wheels. This warranty shall not cover failure or defective operation caused by operation in excess of recommended capacities, misuses, negligence or accident, and alteration or repair not authorized by Gorbel. No system shall be field modified after manufacture without the written authorization of Gorbel, Inc. Any field modification made to the system without the written authorization of Gorbel, Inc. shall void Gorbel's warranty obligation. OTHER THAN AS SET FORTH HEREIN, NO OTHER EXPRESS WARRANTIES, AND NO IMPLIED WARRANTIES, ORAL OR WRITTEN, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE MADE BY GORBEL WITH RESPECT TO ITS PRODUCTS AND ALL SUCH WARRANTIES ARE HEREBY SPECIFICALLY DISCLAIMED. GORBEL SHALL NOT BE LIABLE UNDER ANY CIRCUMSTANCES FOR ANY INCIDENTAL, SPECIAL AND/OR CONSEQUENTIAL DAMAGES WHATSOEVER, WHETHER OR NOT FORESEEABLE, INCLUDING BUT NOT LIMITED TO DAMAGES FOR LOST PROFITS AND ALL SUCH INCIDENTAL, SPECIAL AND/OR CONSEQUENTIAL DAMAGES ARE HEREBY ALSO SPECIFICALLY DISCLAIMED. Gorbel's obligation and Purchaser's or end user's sole remedy under this warranty is limited to the replacement or repair of Gorbel's products at the factory, or at the discretion of Gorbel, at a location designated by Gorbel. Purchaser or end user shall be solely responsible for all freight and transportation costs incurred in connection with any warranty work provided by Gorbel hereunder. Gorbel will not be liable for any loss, injury or damage to persons or property, nor for damages of any kind resulting from failure or defective operation of any materials or equipment furnished hereunder. Components and accessories not manufactured by Gorbel are not included in this warranty. Purchaser's or end user's remedy for components and accessories not manufactured by Gorbel is limited to and determined by the terms and conditions of the warranty provided by the respective manufacturers of such components and accessories.

A) DISCLAIMER OF IMPLIED WARRANTY OF MERCHANTABILITY

Gorbel and Purchaser agree that the implied warranty of merchantability is excluded from this transaction and shall not apply to the goods involved in this transaction.

B) DISCLAIMER OF IMPLIED WARRANTY OF FITNESS FOR PARTICULAR PURPOSE

Gorbel and Purchaser agree that the implied warranty of fitness for particular purpose is excluded from this transaction and shall not apply to the goods involved in this transaction.

C) DISCLAIMER OF EXPRESS WARRANTY

Gorbel's agents, or dealer's agents, or distributor's agents may have made oral statements about the machinery and equipment described in this transaction. Such statements do not constitute warranties, and Purchaser agrees not to rely on such statements. Purchaser also agrees that such statements are not part of this transaction.

D) DISCLAIMER OF SPECIAL, INCIDENTAL AND CONSEQUENTIAL DAMAGES

Gorbel and Purchaser agree that any claim made by Purchaser which is inconsistent with Gorbel's obligations and the warranty remedies provided with Gorbel's products, and in particular, special, incidental and consequential damages, are expressly excluded.

E) DEALER OR DISTRIBUTOR NOT AN AGENT

Gorbel and Purchaser agree that Purchaser has been put on notice that dealer or distributor is not Gorbel's agent in any respect for any reason. Gorbel and Purchaser also agree that Purchaser has been put on notice that dealer or distributor is not authorized to incur any obligations or to make any representations or warranties on Gorbel's behalf other than those specifically set forth in Gorbel's warranty provided in connection with its product.

F) MERGER

This warranty agreement constitutes a final and complete written expression of all the terms and conditions of this warranty and is a complete and exclusive statement of those terms.

G) PAINTING

Every crane (excluding components) receives a quality paint job before leaving the factory. Unfortunately, no paint will protect against the abuses received during the transportation process via common carrier. We have included at least one (1) twelve ounce spray can for touchup with each crane ordered (unless special paint was specified). If additional paint is required, contact a Gorbel® Customer Service Representative at 1-800-821-0086 or 1-585-924-6262.

Title and Ownership:

Title to the machinery and equipment described in the foregoing proposal shall remain with Gorbel and shall not pass to the Purchaser until the full amount hereof is agreed to be paid has been fully paid in cash.

Claims and Damages:

Unless expressly stated in writing, goods and equipment shall be at Purchaser's risk on and after Seller's delivery in good shipping order to the Carrier. Gorbel shall in no event be held responsible for materials furnished or work performed by any person other than it or its authorized representative or agent.

Cancellations:

If it becomes necessary for the purchaser to cancel this order wholly or in part, he shall at once so advise Gorbel in writing. Upon receipt of such written notice all work will stop immediately. If the order entails only stock items, a flat restocking charge of 15% of the purchase price will become due and payable by Purchaser to Gorbel. Items purchased specifically for the canceled order shall be charged for in accordance with the cancellation charges of our supplier plus 15% for handling in our factory. The cost of material and/or labor expended in general fabrication for the order shall be charged for on the basis of total costs to Gorbel up to the time of cancellation plus 15%.

Returns:

No equipment, materials or parts may be returned to Gorbel without express permission in writing to do so.

Extra Charge Delay: If Purchaser delays or interrupts progress of Seller's performance, or causes changes to be made, Purchaser agrees to reimburse Gorbel for expense, if any, incident to such delay.

Changes and Alterations:

Gorbel reserves the right to make changes in the details of construction of the equipment, as in its judgment, will be in the interest of the Purchaser; will make any changes in or additions to the equipment which may be agreed upon in writing by the Purchaser; and Gorbel is not obligated to make such changes in products previously sold any customer.

Third Party Action:

Should Gorbel have to resort to third party action to collect any amount due after thirty (30) days from date of invoice, the Purchaser agrees to pay collection costs, reasonable attorney's fees, court costs and legal interest.

OSHA Responsibilities:

Gorbel agrees to fully cooperate with Purchaser in the design, manufacture or procurement of safety features or devices that comply with OSHA regulations. In the event additional equipment or labor shall be furnished by Gorbel, it will be at prices and standard rates then in effect, or as may be mutually agreed upon at the time of the additional installation.

Equal Employment Opportunity:

Gorbel agrees to take affirmative action to ensure equal employment opportunity for all job applicants and employees without regard to race, color, age, religion, sex, national origin, handicap, veteran, or marital status. Gorbel agrees to maintain non-segregated work facilities and comply with rules and regulations of the Secretary of Labor or as otherwise provided by law or Executive Order.

INSPECTION AND MAINTENANCE SCHEDULE

G-FORCE® BXI ILD INSPECTION AND MAINTENANCE SCHEDULE			
ITEM	COMPONENT	MAINTENANCE	FREQUENCY*
1	Wire Rope	Check for distortion of the rope such as kinking, crushing, unstranding, birdcaging, main strand displacement, or core protrusion. General Corrosion, broken or cut strands, and number, distribution, and type of visible broken wires.	Start of each Shift
2	Wire Rope	Maintenance listed in (1), as well as reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires. Severely corroded or broken wires at end connections. Severely corroded, cracked, bent, worn, or improperly applied end connections.	Periodically (to be determined by qualified persons only)
3	Coil Cord Assembly	Check to make sure there is no excessive wearing of the coil cable sleeving caused by the wire rope. Check for excessive bends or pinching. Check that Mating Connector is secured to the Actuator properly. Assure the Strain Relief at the Handle is properly tightened.	Start of each Shift
4	Handle	Check for smooth operation of sliding handle. Check "Operator Present Switch" for correct operation. Verify proper handle Swivel functionality.	Start of each Shift
5	G-Force® Assembly	Conduct a visual inspection of the entire BXi G-Force® unit.	Start of each Shift
6	Pulleys	Inspect the Slack-Idler Pulley for excessive wear. Replace Pulleys immediately if excessive wear or damage is present.	Every 90 Days
7	Limit Switches	Verify that the Upper and Lower Limit Switches are operating properly. Verify that the Slack Switch is operating properly. Replace Switches immediately if they are damaged.	Every 90 Days
8	Slack Switch Sliding Mechanism	Verify that the Slack Switch Sliding Mechanism is functioning properly. Replace Slack Switch sliding Mechanism if not operating correctly.	Every 90 Days
9	Wheels	Check for cracks, pits, and/or grooves. All of these increase pull forces. If any of these conditions exist, wheels should be replaced.	Every 2000 Hours or Yearly
10	Handle	Perform general cleaning of the Handle, being sure to remove all debris and foreign substances that may exist. Specifically, take care to remove all debris and foreign substances from the back side of the OPS Lever.	Periodically based on Application (to be determined by qualified persons only)
11	Hardware	Perform routine inspection of all hardware connections, verifying that all lockwashers are compressed and nuts tightened to manufacturer's specifications. Be sure to verify the jam nuts located between the swivel assembly and handle/tooling are properly torqued.	Every 90 Days

* Federal, state and local codes may require inspection and maintenance checks more often. Please check the federal, state and local code manuals in your area.

WARNING

Any changes in rotating effort or unusual noises must be immediately identified and corrected.

WARNING

DO NOT TWIST COIL CABLE ASSEMBLY. OVER TWISTING OF THE HANDLE WILL CAUSE SHORTING IN COIL CABLE ASSEMBLY, THEREFORE CAUSING PREMATURE UNIT FAILURE. KEEP ROTATIONS OF HANDLE TO LESS THAN 360 DEGREES.

GORBEL®

600 Fishers Run, P.O. Box 593
Fishers, NY 14453-0593

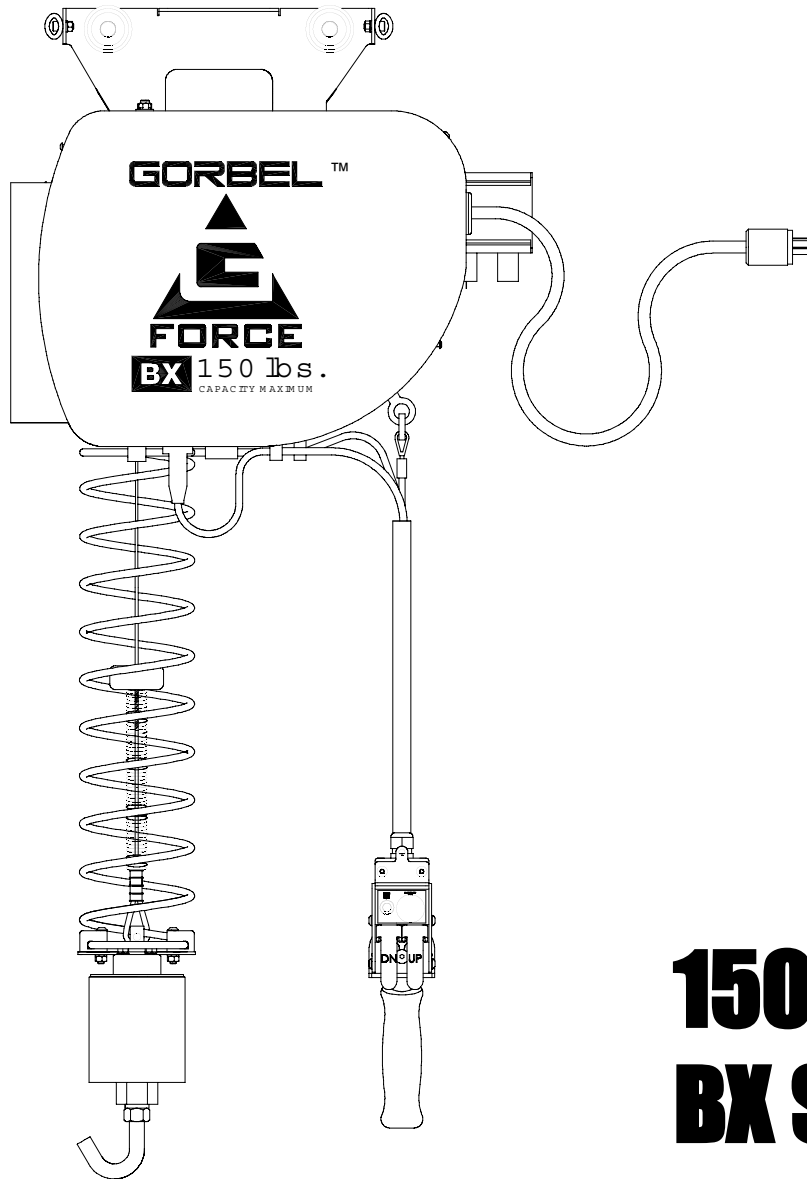
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Installation, Operation, & Maintenance Manual



U.S. PATENT NO'S:
5,865,426, &
6,386,513,
OTHER PATENTS
PENDING



150/300/380 lbs. BX Series With Pendant Handle

Gorbel® Dealer: _____

Serial Number: _____

Gorbel® Customer Order No.: _____

Date: _____

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SAFE HOIST OPERATING GUIDELINES

General

There is no one single factor that is more important for minimizing the possibility of personal injury to the operator and those working in the area, or damage to property, equipment, or material, than being familiar with the equipment and using Safe Operating Practices.

Hoists/trolleys are designed for lifting and transporting of material only. Under no circumstances, either during initial installation or in any other use, should the hoist be used for lifting or transporting personnel.

No operator should be permitted to use the equipment that is not familiar with its operation, is not physically or mentally fit, or has not been schooled in safe operating practices. The misuse of hoists can lead to certain hazards which cannot be protected against by mechanical means; hazards which can only be avoided by the exercise of intelligence, care, and common sense.

Safe Operating Practices also involve a program of periodic inspection and preventative maintenance (covered in separate section). Part of the operator's training should be an awareness of potential malfunctions/hazards requiring adjustments or repairs, and bringing these to the attention of supervision for corrective action.

Supervision and management also have an important role to play in any safety program by ensuring that a maintenance schedule is adhered to, and that the equipment provided for the operators is suitable for the job intended without violation of one or more of the rules covering safe operating practices and good common sense.

The Safe Operating Practices shown are taken in part from the following publications:

- American National Standard Institute (ANSI)
- Safety Standards for Crane, Derricks, Hoists
- ANSI B30.2 - Overhead and Gantry Cranes
- ANSI B30.16 - Overhead Hoist

Do's and Don'ts (Safe Operation of Hoists)

The following are Do's and Don'ts for safe operation of overhead hoists. A few minutes spent reading these rules can make an operator aware of dangerous practices to avoid and precautions to take for his own safety and the safety of others. Frequent examinations and periodic inspections of the equipment as well as a conscientious observance of safety rules may save lives as well as time and money.

DON'TS - HOISTS

1. Never lift or transport a load until all personnel are clear and do not transport the load over personnel.
2. Do not allow any unqualified personnel to operate hoist.
3. Never pick up a load beyond the capacity rating appearing on the hoist. Overloading can be caused by jerking as well as by static overload.
4. Never carry personnel on the hook or the load.
5. Do not operate hoist if you are not physically fit.

6. Do not operate hoist to extreme limits of travel of cable without first checking for proper limit switch action.
7. Avoid sharp contact between two hoists or between hoist and end stops.
8. Do not tamper with or adjust any parts of the hoist unless specifically authorized to do so.
9. Never use the load cable as a sling.
10. Do not divert attention from load while operating hoist.
11. Never leave a suspended load unattended.
12. Do not use limit switch(es) for normal operating stop(s). These are safety devices only and should be checked on a regular basis for proper operation.
13. Never operate a hoist that has an inherent or suspected mechanical or electrical defect.
14. Do not use load cable as ground for welding. Never touch a live welding electrode to the load cable.
15. Do not jog controls unnecessarily. Hoist motors are generally high torque, high slip types. Each start causes an inrush of current greater than the running current and leads to overheating and heat failure, or burnout, if continued to excess.
16. Do not operate hoist if load is not centered under hoist.
17. Do not operate hoist if cable is twisted, kinked or damaged.
18. Do not remove or obscure label.
19. Do not permanently activate dead man's switch.

DO'S - HOISTS

1. Read and follow manufacturer's instruction, installation, and maintenance manuals. When repairing or maintaining a hoist, use only manufacturer's recommended parts and materials.
2. Read and follow all instruction and warning information on or attached to a hoist.
3. Remove the hoist from service and thoroughly inspect and repair, as necessary, if unusual performance or visual defects (such as peculiar noise, jerky operations, travel in improper direction, or obviously damaged parts) are noticed.
4. Establish a regular schedule of inspection and maintain records for all hoists with special attention given to hooks, load cables, brakes, and limit switches.
5. Check operation of brakes for excessive drift.
6. Never lift loads over people, etc.
7. Check for damaged hooks and load cable.
8. Keep load cable clean and well maintained.
9. Check the load cable for improper seating, twisting, kinking, wear, or other defects before operating the hoists.
10. Make sure a load clears neighboring stockpiles, machinery, or other obstructions when raising, lowering, or traveling the load.
11. Center hoist over load before operating.
12. Avoid swinging of load or load hook when traveling the hoist.
13. Be sure the load attachment is properly seated in the saddle of the hook. Balance load properly before handling. Avoid hook tip loading.
14. Pull in a straight line, so that neither hoist body nor load cable are angled around an object.
15. Take up slack slowly.
16. Know the hand signals for hoisting, cross travel, and crane travel if working with cab-operated hoists or cranes. Operators should accept the signals of only those persons authorized to give them.

WARNING

Check Wire Rope for improper seating, twisting, kinking, wear or defects before operating.

WARNING

Center BX G-Force® over the load before lifting. DO NOT end or side load the BX G-Force®. End or side loading will seriously reduce the life of the Wire Rope and lead to premature failure. The Wire Rope should never exceed an out of vertical angle greater than 20°, under any circumstances.

WARNING

Avoid swinging of load or load hook when traveling with the BX G-Force®.

WARNING

Check the Coil Cord for improper seating, twisting, kinking, wear or defects before operating. Any of the described conditions will seriously reduce the life of the Coil Cord and lead to premature failure.

WARNING

Press Float Mode (option) button with only the load weight hanging from the unit. Additional external forces applied to the load during initiation of Float Mode will result in the load drifting.

WARNING

Do not repeatedly impact the BX G-Force® into the end stops. This condition will seriously reduce the life of the Controls and could lead to premature failures. If the unit impacts the end stop more than 10 times in a single shift, contact Gorbel® Customer Service for alternative end stop options.

WARNING

The BX G-Force® ILD does not meet “Wash-down” environment requirements. The BX G-Force® ILD does not meet “Explosion Proof” requirements.

WARNING

Ensure that the Load Cell is properly mounted in Remote Mount Handle applications with Float Mode (reference *Figure I6*, page 63).

WARNING

Ensure that the Handle is supported properly in Remote Mount Handle applications by attaching tooling at both the Top and Bottom mounting points (reference *Figures H1, I5 & I6*, on pages 57, 62, & 63).

WARNING

Do not mount any objects to the sliding portion of the G-Force® Handle (i.e. switches). Additional objects may interfere with the travel of the sliding Handle, and affect the overall speed and functionality of the unit.

WARNING

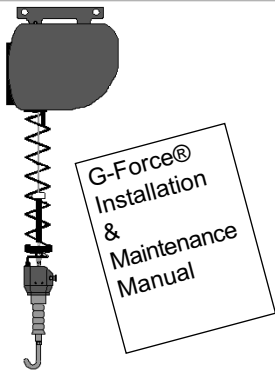
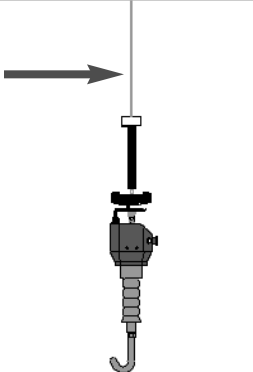
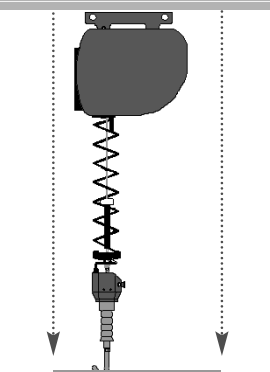
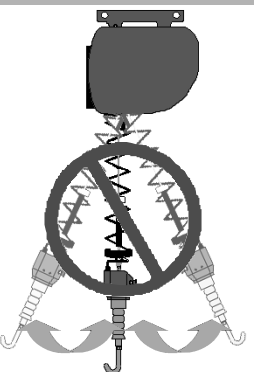
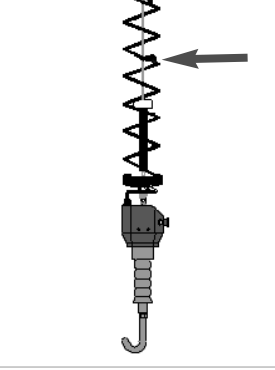
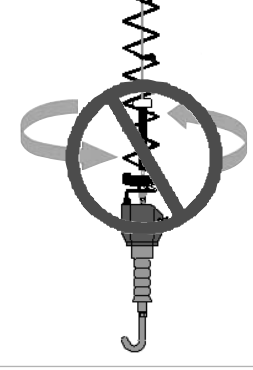
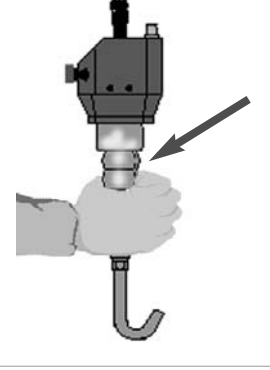
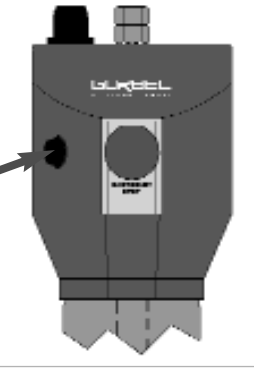
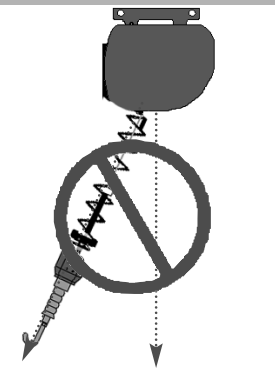
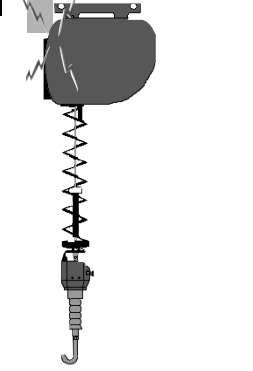
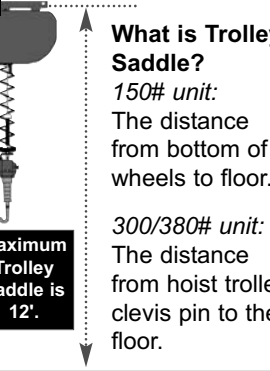
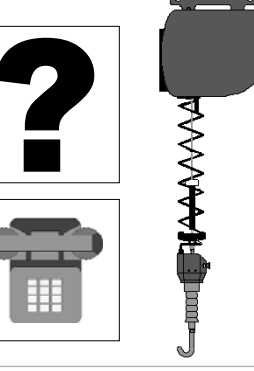
Do not mount any load bearing components to the Blue Poly-carbonate housings of the G-Force® Handle or Actuator assembly.



G-Force® Operational Guidelines

All operators should read the G-Force® Instruction, Installation and Maintenance Manuals before operating the unit. Please follow the instructions contained in these manuals for your safety and for optimum trouble-free operation of your G-Force®. When repairing or maintaining a G-Force®, use only Gorbels® recommended parts and materials.

Note: G-Force® shown with Gorbels® Sliding Handle, not Pendant Handle.

<p>1</p>  <p>Read & follow all instruction & warning information on or attached to the G-Force®.</p>	<p>2</p>  <p>Check Wire Rope for improper seating, twisting, kinking, wear or defects before operating.</p>	<p>3</p>  <p>Center G-Force® over the load before lifting a load. Do not end or side load.</p>	<p>4</p>  <p>Avoid swinging of load or load hook when traveling with the G-Force®.</p>
<p>5</p>  <p>Check the coil cord for improper seating, twisting, kinking, wear or defects before operating.</p>	<p>6</p>  <p>Do not over-twist coil cable assembly (>360°). Damage and/or failure could occur.</p>	<p>7</p>  <p>The Operator Present switch should be depressed the entire time the G-Force® is in use.</p>	<p>8</p>  <p>Press Float Mode Button with only the load weight hanging from unit. Applying other force will cause unit to drift.</p>
<p>9</p>  <p>The wire rope should never be more than 20° out of vertical while the G-Force® is in use.</p>	<p>10</p>  <p>Do not bang the G-Force® into end stops repeatedly or at a speed faster than a normal walking pace.</p>	<p>11</p>  <p>What is Trolley Saddle? 150# unit: The distance from bottom of wheels to floor. 300/380# unit: The distance from hoist trolley clevis pin to the floor. Maximum Trolley Saddle is 12'.</p> <p>Maximum Trolley Saddle for the G-Force® is 12'. See drawing for Trolley Saddle definitions by unit size.</p>	<p>12</p>  <p>Questions about G-Force®? Call Gorbels® Customer Service at (800) 821-0086 or your local Gorbels® distributor.</p>

INTRODUCTION

Thank you for choosing a Gorbels® G-Force® BX Intelligent Lifting Device (ILD)** to solve your material handling needs. The innovative design and heavy-duty construction of the G-Force® BX ILD will provide a superior quality product that will offer years of long-term value. A Gorbels® G-Force® BX ILD will provide many years of dependable service by following the installation and maintenance procedures described herein.

** U.S. PATENT NO'S: 5,865,426, & 6,386,513 OTHER PATENTS PENDING

Dimensions contained in this installation manual are for reference only and may differ for your particular application.

Normal safety precautions: These include, but are not limited to:

- Checking for obstructions in crane and hoist travel.

WARNING

Only competent erection personnel familiar with standard fabrication practices should be employed to install the G-Force® ILD because of the necessity of properly interpreting these instructions. Gorbels is not responsible for the quality of workmanship employed in the installation of this hoist according to these instructions. Contact Gorbels, Inc., at 600 Fishers Run, P.O. Box 593, Fishers, New York 14453, 1-585-924-6262, for additional information, if necessary.

WARNING

Equipment described herein is not designed for, and should not be used for, lifting, supporting or transporting humans. Failure to comply with any one of the limitations noted herein can result in serious bodily injury and/or property damage. Check Federal, State and Local regulations for any additional requirements.

WARNING

Prior to installation, consult a qualified structural engineer to determine if your support structure is adequate to support the loadings created during normal operation of the G-Force® ILD.

WARNING

Reference American Institute of Steel Construction (AISC) Manual of Steel Construction (9th edition), Part 5, Specification for Structural Joints using ASTM A325 or A490 Bolts (section 8.d.2) for proper procedure to follow when using any torque tightening methods.

WARNING

Do not field modify the G-Force® BX ILD in any way. Any modification without the written consent of Gorbels, Inc., will void warranty.

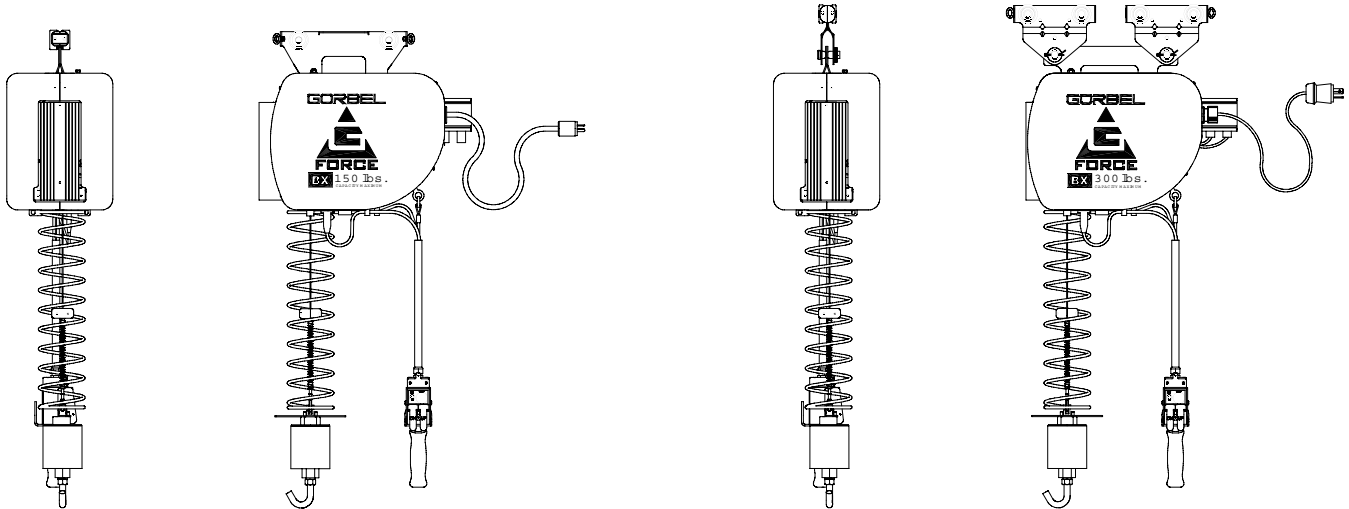
WARNING

The unique serial number for this unit can be found on the front cover of this manual and on the ID nameplate sticker attached to the back bottom of the G-Force® ILD Actuator assembly cover. Always have this serial number available during all correspondence regarding your G-Force® BX, ILD, or when ordering repair parts.

WARNING

The Jog Switch buttons are for system maintenance and load testing use only, and should not be manipulated during normal operation of the G-Force® BX ILD. Operation of the Jog Switch buttons during normal operation increases the risk of personal injury to the operator.

CORRECT G-FORCE® INSTALLATION ORIENTATION



150# BX G-Force® with Pendant

300/380# BX G-Force® with Pendant

WARNING

The BX G-Force® was designed and fully life tested in the installation orientation shown above. Any modification to the installation orientation of the BX G-Force® without the written consent from Gorbels, Inc. Engineering will immediately void the warranty. Please contact the factory if a modification to the installation orientation shown above is desired.

G-FORCE® BX ILD MAIN ASSEMBLY COMPONENT DESCRIPTION

Standard Assembly: The G-Force® BX ILD consists of three (3) main assemblies and they are as follows:

- 1) **Actuator:** The Actuator assembly contains the main lifting power transmission of the G-Force® BX ILD. The drive assembly of the Actuator consists of the ServoMotor with failsafe brake, Gearbox, Main Drum Pulley, and Controls. The Actuator assembly also contains the Upper and Lower Limit Switches. **See the Lift Functionality and Controls Interface Feature sections for additional details.**
- 2) **Coil Cord and Wiring Harness Assembly:** The Coil Cord assembly carries the signals from the Handle back to the Controls in the Actuator assembly. The Coil Cord carries signals back to the Controls for lift speed, lift direction, E-Stop, and Float Mode (if equipped).
- 3) **Handle:** The Handle is the main interface between the operator and the lifting device. Tooling must meet the guidelines set forth by Gorbels, Inc. Improper tooling integration will result in degraded performance and may lead to premature failure of the G-Force® BX ILD. **See the Lift Functionality and Controls Interface Feature sections for additional functionality located at the Handle.**

LIFT FUNCTIONALITY

Standard Operation: The Gorbel® G-Force® BX ILD is a servomotor driven, high speed, material handling device. When the device is in the standard operational mode, the up and down levers command the z-axis direction and speed of the lift (**reference Diagram A**). The mechanical brake is activated when neither of the up or down levers is depressed and will deactivate when one of the levers is depressed. The more the up or down lever are depressed, the faster the servo movement to raise or lower the load.

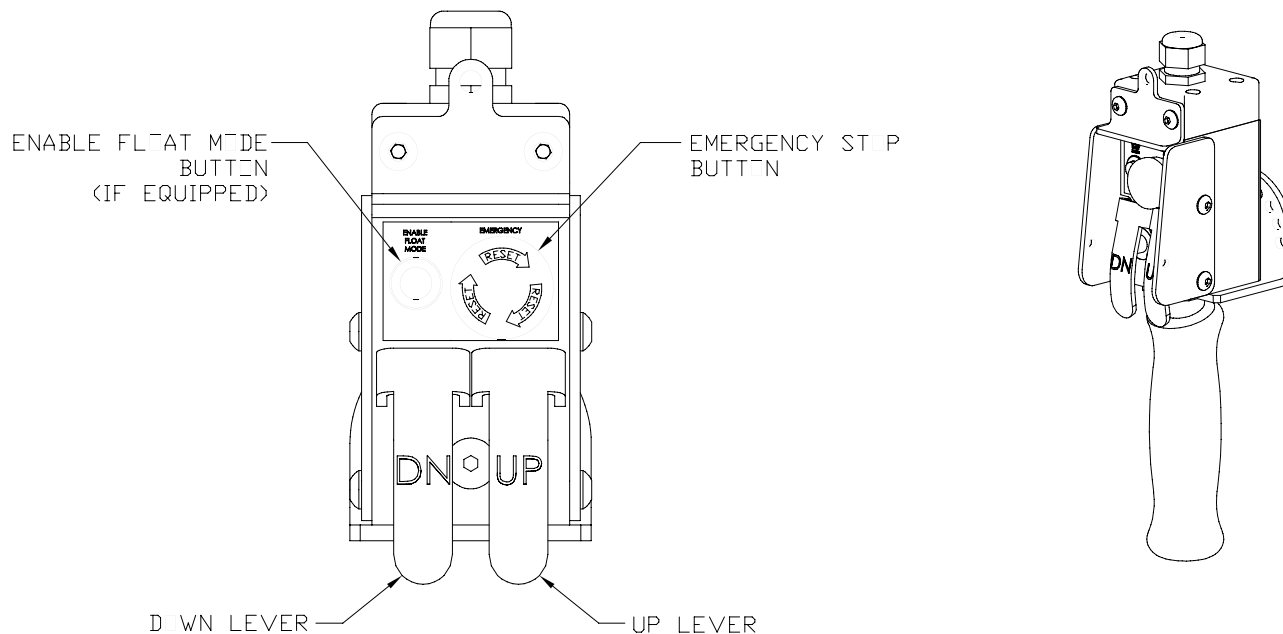


Diagram A. Pendant Handle - E-stop Button, Enable Float Mode Button, Up and Down Levers.

Float Mode (System Option): This mode is initiated by simply depressing the Enable Float Mode button on the face of the pendant (**reference Diagram A**). In this mode, the operator can simply handle the load directly with either an upward or downward force applied to the load. The greater the force applied, the faster the load will move. There is a standard setting in the controls that safely limits the maximum speed of travel in float mode. Depressing one of the up or down levers while in Float Mode will cause the unit to exit Float Mode. While in Float Mode, the load cannot be increased or decreased because this may cause unwanted motion on the unit. Float Mode must be reinitiated each time the weight of the live load is changed.

WARNING

When using a pendant handle with the unit in float mode, depressing the up or down lever will move the load as well as cancel float mode. DO NOT HOLD LEVER DOWN unless rapid motion is desired. Cancel float mode with a quick, light press on either lever.

Emergency Stop Button: When depressed, the Emergency Stop (E-Stop) button cuts off all power to the Controls, and sets the mechanical brake. The E-Stop button is located on the face of the pendant handle (**reference Diagram A**). The G-Force® cannot operate until the E-Stop has been reset.

Overload: The servo controller will prevent the lift from moving upward if loaded beyond the maximum capacity of the G-Force® BX ILD. When an overload condition is sensed, the Overload indicator is illuminated and the lift is prevented from moving upward. The lift may be moved down to allow for the safe removal of the load. Cycle the power off and on to reset.

Limit Switches: The G-Force® is equipped with both mechanical Upper and Lower Limit switches, located in the Actuator assembly. When the Upper Limit switch is triggered, the upward motion of the lift stops quickly at a controlled deceleration rate. The controlled deceleration rate guarantees the load cannot come off the hook. When the Upper Limit is triggered, the lift will move down but not up. The lower limit is set so that a minimum of two (2) full wraps of wire rope remain on the drum pulley at all times. When the Lower Limit switch is triggered, the downward motion of the lift stops quickly at a controlled deceleration rate. When the Lower Limit is triggered, the lift will only move up and not down.

Slack Switch: The G-Force® is equipped with a pair of Slack Switches that sense tension in the wire rope and trips when the wire rope develops slack. The switches are located inside the Actuator assembly. When the Slack Switches sense slack in the wire rope, downward movement of the lift is stopped to minimize the amount of wire rope unwound from the drum pulley. When slack in the wire rope is sensed, the lift will only move up but not down.

Remote Mount Handle (System Option): The lifting device is capable of operating with the handle displaced from the wire rope. For example, if an end user has tooling that is too large for the operator to safely reach and operate the handle in the standard position, remote mounting the handle is recommended. The tooling must be mounted (and balanced) on the end of the wire rope, while the handle can be remote mounted. The tooling **must** be attached to the end of the wire rope with a swivel assembly (supplied by Gorbel, Inc.). Failure to mount the tooling with a swivel assembly can result in premature failure of both the wire rope and the coil cord. The remote mounted handle is linked to the coil cord via extension cables and connectors. If the device is equipped for Float Mode, a load cell assembly is provided that must also be mounted between the tooling and the end of the wire rope. The handle is linked to the load cell via an extension cable and connectors. ****The end user must supply Gorbel, Inc., with the required length of the extension cables such that they can be safely routed and clamped to the tooling. Always include the distance for bends and turns when providing the extension length.**

CONTROLS INTERFACE FEATURES

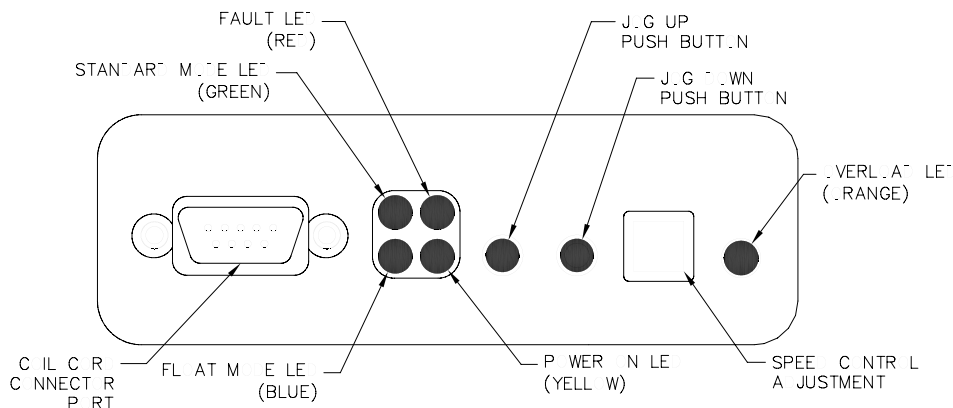


Diagram B. Controls Interface Display.

1. **Jog Switch Push Buttons:** The Jog Switch Buttons allow qualified personnel to replace the wire rope (load cable) on the system. To effectively operate the Jog Switch Buttons, all electrical cables must be connected and power on. Depressing the "Up" jog switch button will enable the motor and cause the system to reel the wire rope into the actuator and onto the main pulley. Depressing the "Down" jog switch button will enable the motor and cause the system to pay out the wire rope from the actuator and off of the main pulley.

WARNING

The Jog Switch buttons are for system maintenance and load testing use only, and should not be manipulated during normal operation of the G-Force® BX ILD. Operation of the Jog Switch buttons during normal operation increases the risk of personal injury to the operator.

2. **Speed Control Adjustment:** The 10 position Speed Control adjustment switch allows the operator to adjust the speed of the lifting device with a small flathead screwdriver.
3. **Power Up Diagnostic Mode:** When the “E-stop” button is released and power is applied to the lift, the servo motor controller goes into a power up diagnostic mode test. The following are the sections of the diagnostic mode test:
 - a) **LED Indicator Test:** The purpose of this test is to verify the five (5) indicator LEDs are functional. When the E-stop button is released, the yellow “Power On” LED comes on immediately indicating the internal 24 volt power is operational. After the servo controller completes a series of self-tests, it turns on the four (4) remaining LEDs for two (2) seconds to simply verify functionality.
 - b) **Switch Test:** After completion of the indicator test, a system switch test is started. The purpose of this test is to display the state of the “Slack” switches and “Upper and Lower Limit” switches. During the switch test, the Green “Standard Mode” LED will remain on if the “Upper Limit” switch is triggered (up limit state) and the Blue “Float Mode” LED will remain on if the “Slack” switches are triggered (wire rope slack). Once the operator present switch or jog switch is activated, the servo motor controller exits the power up diagnostic mode and goes into normal operation.

Note: The Yellow Power On indicator will remain on during the power up diagnostic mode test.

4. **Power On LED (Yellow):** The “Power On” LED illuminates when the required 220 VAC, single-phase power has been correctly applied to the system and the E-Stop button has been released.
5. **Standard Mode LED (Green):** The “Standard Mode” LED illuminates when all system initialization is complete, thus activating the standard mode of operation.
6. **Capacity Overload LED (Orange):** The “Capacity Overload” LED illuminates when a load or impact load greater than the capacity of the hoist has been detected by the system. When this LED illuminates, the controller will allow the operator to lower the load, but it will inhibit the operator from raising the load prior to “resetting” the system. To clear the overload fault and “reset” the system, cycle the power off and on using the emergency stop button.
7. **Float Mode LED (Blue):** If the unit is equipped with Float Mode (system option), the “Float Mode” enabled LED will illuminate when the Float Mode button is pressed on the hand controller and Float Mode has been initiated.
8. **System Fault LED (Red):** The “System Fault” LED flashes when basic faults have been detected by the control system. If a fault has occurred, the “Standard Mode” or “Float Mode” (if equipped) LEDs will turn off.

TECHNICAL SPECIFICATIONS

BX Series	150 lbs.	300 lbs.	380 lbs.
Maximum Capacity (Load & Tool)	150 lbs.	300 lbs.	380 lbs.
Max Lifting Speed Unloaded (feet per minute)	275 fpm	138 fpm	98 fpm
Max Lifting Speed Fully Loaded (feet per minute)	200 fpm	100 fpm	71 fpm
Max Float Mode (Option) Lifting Speed (feet per minute)	131 fpm	88 fpm	63 fpm
Max Lift Stroke	7 ft	7 ft	7 ft
Primary Lift Voltage	220 VAC (1 Phase) +/- 10%	220 VAC (1 Phase) +/- 10%	220 VAC (1 Phase) +/- 10%
Amps	5	5	5
Capacity Overload Safety	Yes	Yes	Yes
LED Indicator Lights	Yes	Yes	Yes
Anti-Recoil	Yes	Yes	Yes
Failsafe Brake	Yes	Yes	Yes
Float Mode Capable	Yes (Option)	Yes (Option)	Yes (Option)
Inertia Management	Yes	Yes	Yes
Precision Lift Capability	Yes	Yes	Yes
Drive/Control System	Servo	Servo	Servo
Speed Adjustment	Yes	Yes	Yes
Jogging Capability	Yes	Yes	Yes
Media	Wire Rope	Wire Rope	Wire Rope
Duty Cycle	H5	H5	H5

INSTALLATION

STEP 1 - UNPACKING THE G-FORCE® BX ILD

➡ **TIP:** Packing list can be found in plastic pocket attached to shipping box.

1.1 Carefully remove all items from the box.

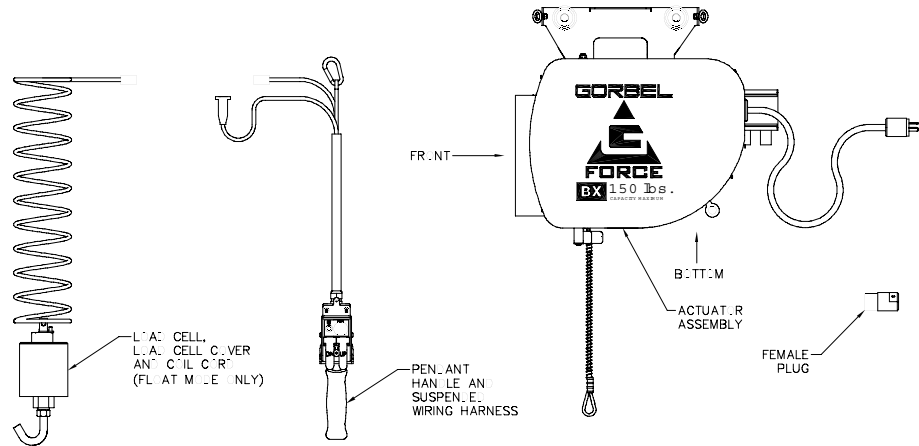


Diagram 1A. 150# BX series with suspended pendant - shipped components.

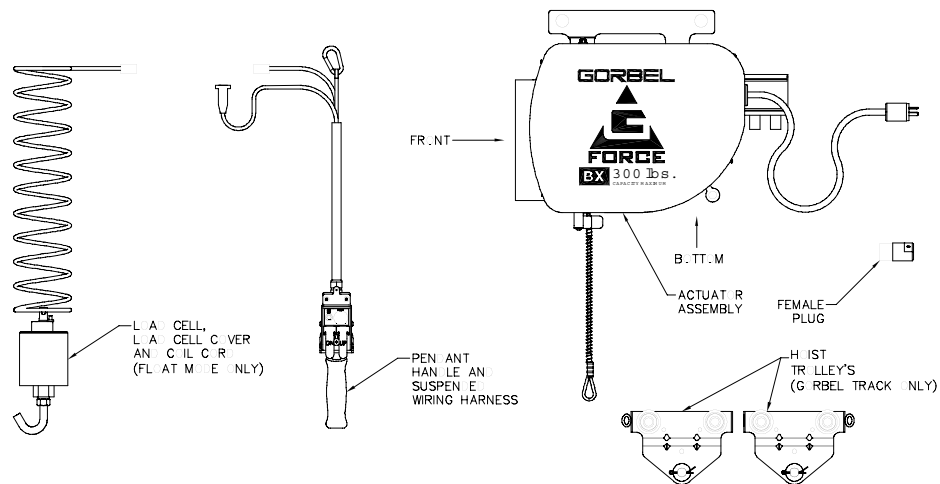


Diagram 1B. 300/380# BX series with suspended pendant - shipped components.

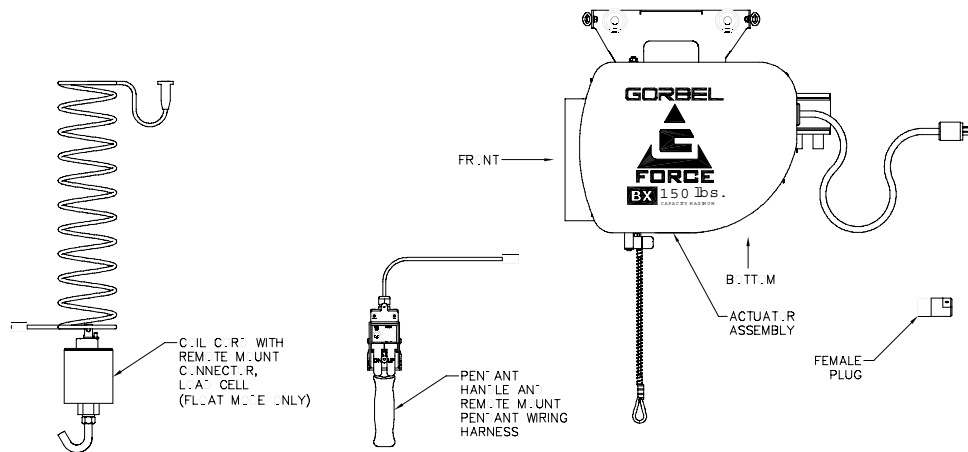


Diagram 1C. 150# BX series with remote mount pendant - shipped components.

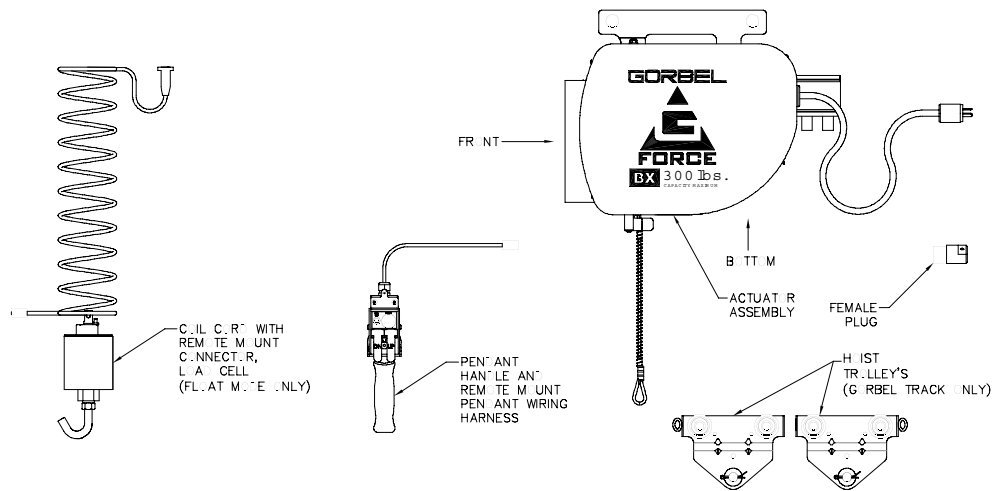


Diagram 1D. 300/380# BX series with remote mount pendant - shipped components.

- 1.2 Verify that all components listed on the packing slip are included.
- 1.3 If any items are missing or were damaged during shipping, please contact Gorbel® Customer Service immediately.

STEP 2 - PRE-ASSEMBLY

- 2.1 Read entire installation manual **before** beginning installation of the G-Force® BX ILD.
- 2.2 Tools and materials typically needed to install/assemble a G-Force® BX ILD are as follows:
 - Hand tools
 - Plastic cable tie straps
 - Ladders/man lifts
- 2.3 Prior to installing the G-Force® BX ILD, it is a good idea to familiarize yourself with the main components.
 - Reference the following layout drawings:
 - **Figure I1**, page 58 - 150# BX Suspended Pendant with Float Mode Component Layout
 - **Figure I2**, page 59 - 150# BX Suspended Pendant without Float Mode Component Layout
 - **Figure I3**, page 60 - 300/380# BX Suspended Pendant with Float Mode Component Layout
 - **Figure I4**, page 61 - 300/380# BX Suspended Pendant without Float Mode Component Layout
 - **Figure I5**, page 62 - Remote Mount Pendant without Float Mode Component Layout
 - **Figure I6**, page 63 - Remote Mount Pendant with Float Mode Component Layout

STEP 3 - INSTALLING THE ACTUATOR ASSEMBLY

- 3.1 Verify that the G-Force® BX ILD trolley wheels are correct for the style and capacity that the unit is being installed on. **Note:** Standard 150# G-Force® BX ILDs come with the wheels pre-assembled to the Actuator Trolley. Standard 300 and 380# G-Force® BX ILDs are supplied with an assembled Actuator Adapter Trolley and two (2) properly sized Hoist Trolleys when being installed in a Gorbel® Bridge system. The customer must provide two (2) Hoist Trolleys when the unit will run in a non-Gorbel® Bridge system. 150# G-Force® BX ILDs can also be supplied with an Actuator Adapter Trolley, similar to that of the 300 and 380# units.
- 3.2 **300 and 380# G-Force® BX ILD:** Assemble the Hoist Trolleys to the Actuator Adapter Trolley. Remove the Clevis Pin and flat washers from the Hoist Trolleys. Slide the Trolley legs over the Adapter Trolley and align the holes. Re-assemble the Clevis Pin and washers to the Hoist Trolleys (**reference Diagram 3A**).
- 3.3 Remove the end stop from the Bridge and install the G-Force® Actuator into the track. Immediately re-install the end stops. Roll the Actuator Assembly along the full length of the Bridge to assure that the travel is smooth throughout.

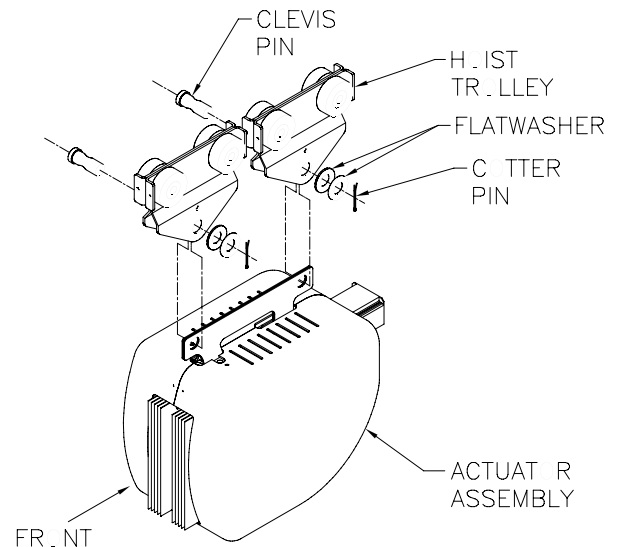


Diagram 3A. 300/380# BX Actuator-Hoist Trolley Assembly.

STEP 4 - SUSPENDED PENDANT WITHOUT FLOAT MODE INSTALLATION

Note: For Suspended Pendant with Float Mode Installation, go to Step 4A.

For Remote Mount Pendant Installation, with or without Float Mode, go to Step 4B.

- 4.1 Attach the threaded connector on the suspended pendant to the eye hook on the actuator assembly (**reference Diagram 4A**).
- 4.2 Connect the large rectangular connector on the suspended pendant wiring harness to the plug on the control's interface located on the bottom side of the actuator assembly (**reference Diagram 4A**).
- 4.3 Remove the cable clamp, spacer and bolt from the bottom of the actuator assembly (**reference Diagram 4A**).

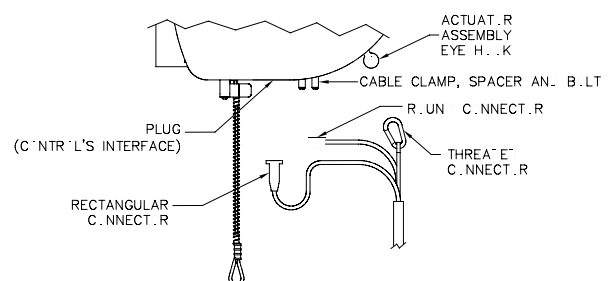


Diagram 4A. Connect Suspended Pendant to Actuator Assembly

- 4.4 Capture the cord of the suspended pendant wiring harness in the cable clamp, insert the bolt through the cable clamp and spacer, and attach the bolt to the bottom side of the actuator assembly.
- 4.5 Adjust the cord of the wiring harness so that there is a service loop in the wiring harness and there is no tension in the cord.

STEP 4A - SUSPENDED PENDANT WITH FLOAT MODE INSTALLATION

- 4A.1 Attach the threaded connector on the suspended pendant to the eye hook on the actuator assembly (**reference Diagram 4A**, page 13).
- 4A.2 Connect the large rectangular connector on the suspended pendant wiring harness to the plug on the control's interface located on the bottom side of the actuator assembly (**reference Diagram 4A**, page 13).
- 4A.3 Remove the cable clamps, spacers and bolts from the bottom of the actuator assembly (**reference Diagram 4A**, page 13).
- 4A.4 Capture the cord of the suspended pendant wiring harness (with large rectangular connector) in the cable clamp, insert the bolt through the cable clamp and spacer, and attach the bolt to the bottom side of the actuator assembly.
- 4A.5 Adjust the cord of the wiring harness so that there is a service loop in the wiring harness and there is no tension in the cord.
- 4A.6 Remove the cotter pin and clevis pin from the swivel assembly on the coil cord and load cell assembly (**reference Diagram 4B**).
- 4A.7 Feed the wire rope from the actuator assembly through the center of the coil cord. Slide the looped end of the wire rope assembly into the yoke of the swivel assembly (**reference Diagram 4B**).

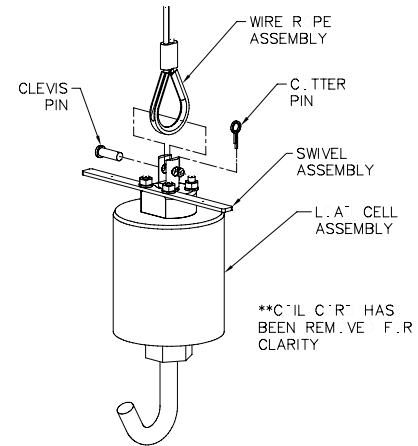


Diagram 4B. Handle to Wire Rope Assembly.

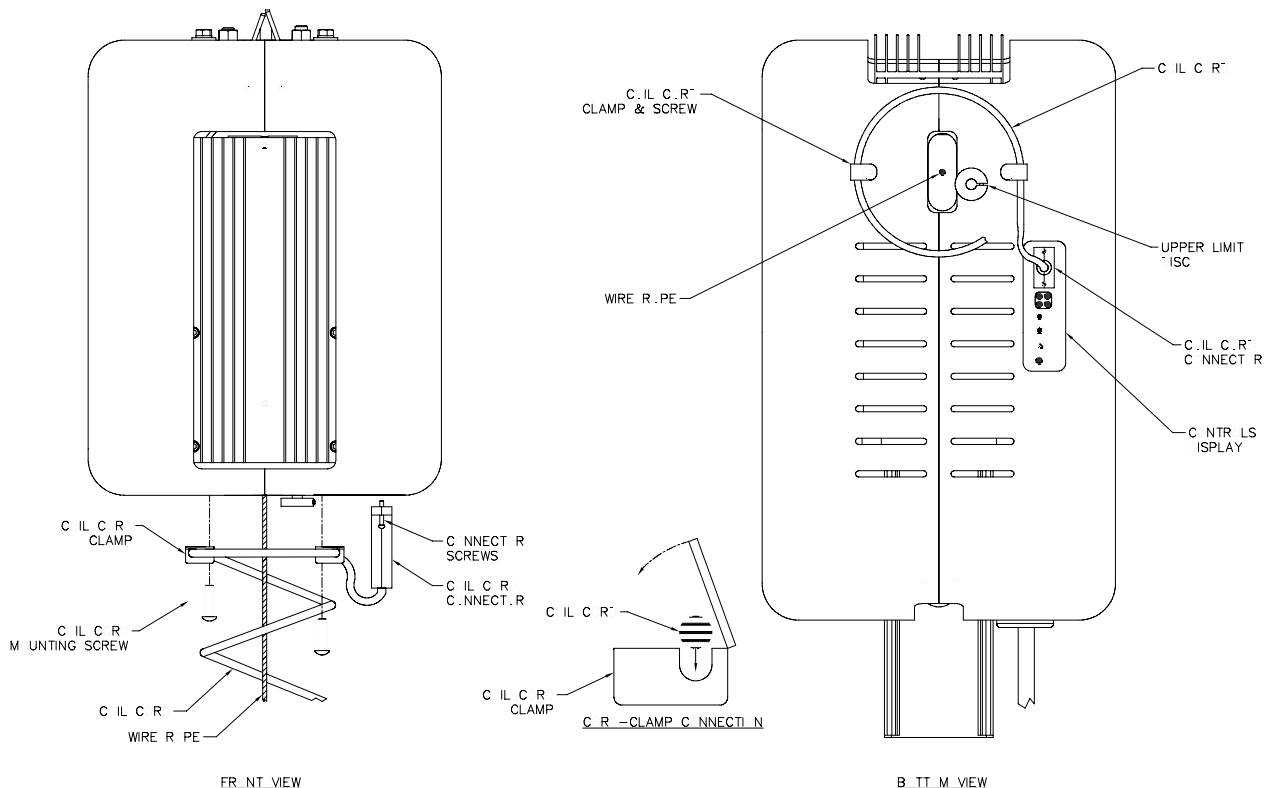


Diagram 4C. Coil Cord to Actuator assembly.

- 4A.8** Re-insert the clevis and cotter pin capturing the wire rope assembly in the swivel assembly (**reference Diagram 4B**, page 14).
- 4A.9** Assemble the coil cord to the cable clamps by capturing the cord in the opening in the clamp (**reference Diagram 4C**, page 14)
- 4A.10** Re-assemble the coil cord mounting clamps to the bottom side of the actuator assembly (**reference Diagram 4C**, page 14).
- 4A.11** Connect the round connector on the coil cord assembly to the round connector on the suspended wiring harness.
- 4A.12** Capture the cord of the suspended pendant wiring harness (with round connector) in the cable clamp, insert the bolt through the cable clamp and spacer, and attach the bolt to the bottom side of the actuator assembly.
- 4A.13** Adjust the cord of the suspended pendant wiring harness (with round connector) so that there is a service loop in the wiring harness and there is no tension in the cord.
- 4A.14** Assure that the coils of the coil cord are centered around the wire rope when properly installed.

STEP 4B - REMOTE MOUNT HANDLE INSTALLATION

(For Float Mode and Non-Float Mode Units)

- 4B.1** Attach the wire rope swivel assembly directly to the end tooling.
- 4B.2** Remove the cotter pin and clevis pin from the swivel assembly (**reference Diagram 4B**, page 14).
- 4B.3** Feed the wire rope from the actuator assembly through the center of the remote mount coil cord. Slide the looped end of the wire rope assembly into the yoke of the swivel assembly (**reference Diagram 4B**, page 14).
- 4B.4** Re-insert the clevis and cotter pin, capturing the wire rope assembly in the swivel assembly (**reference Diagram 4B**, page 14).
- 4B.5** Remove the cable clamps from the bottom of the actuator assembly.
- 4B.6** Assemble the remote mount coil cord to the cable clamps by capturing the cord in the opening in the clamp (**reference Diagram 4C**, page 14).
- 4B.7** Re-assemble the coil cord mounting clamps to the bottom side of the actuator assembly (**reference Diagram 4C**, page 14).
- 4B.8** Connect the large rectangular connector on the coil cord to the plug on the controls interface located on the bottom side of the actuator assembly.
- 4B.9** Assure that the coils of the coil cord are centered around the wire rope when properly installed.
- 4B.10** Attach the clamp collar bracket to the tooling or attach the pendant handle bracket directly to the tooling.
- 4B.11** Connect the large round connector on the remote mount pendant wiring harness to the large round connector on the remote mount coil cord. Securely clamp the remote mount pendant wiring harness to the tooling as needed.
- 4B.12** If the unit is equipped with float mode, connect the small round connector on the remote mount pendant wiring harness to the small round connector on the remote mount coil cord.

STEP 5 - ELECTRICAL POWER CONNECTION

➡ **TIP:** Do not connect to main power until all assembly is complete.

STANDARD

- 5.1 Prior to final wiring, inspect the entire system to assure that all connections are seated properly and are without kinks or bends.
- 5.2 Connect a 220 VAC single-phase power source through a Disconnect Switch (by others) to the festooned power cabling (not provided with G-Force® BX ILD).

WARNING

Source power to the BX G-Force® unit is to measure 220 VAC (1 Phase) +/- 10%. Minimum Voltage = 198 VAC. Maximum Voltage Must NOT Exceed 242 VAC. Voltages greater than 242 VAC will result in premature Control System failure.

- 5.3 Wire the Female Turnlok Power Plug (provided) to the end of the festooned power cable.
- 5.4 After verifying the Disconnect Switch is turned **OFF**, connect the newly installed receptacle to the Male Plug at the G-Force® BX ILD.

STEP 6 - AIR CONNECTION (OPTION)

➡ **TIP:** G-Force® BX ILD units (Standard Inline or Remote Mounted) that are ordered with Air power, have a 3/8" ID Nycoil air hose integrated into the full length of the Coil Cord. The Coil Cord is provided with two (2) Male fittings located at both ends of the air hose. Gorbel also provides both mating Female fittings for 3/8" ID air hose.

- 6.1 Assemble one of the Female fittings (provided) to the end of the input air hose (not provided).
- 6.2 Assemble the other Female fitting (provided) to the end of the tooling airline (not provided).
- 6.3 Connect both fittings to the respective ends of the Nycoil air hose in the Coil Cord.
- 6.4 Release the valve supplying air to the G-Force® BX ILD. Inspect and assure that all connections are properly made and there are no air leaks.

STEP 7 - INITIAL POWER-UP

- 7.1 Turn on the Disconnect Switch (by others) to apply power to the G-Force® BX ILD.
- 7.2 Disengage the Emergency Stop (E-stop) button located on the front face of the handle.
- 7.3 The system will complete the "Power Up Diagnostic Test" described in the "Controls Interface Features" section of this manual on pages 6 & 7.
- 7.4 When the "Power Up Diagnostic Test" has been successfully completed, the unit is ready for operation.
- 7.5 Standard Operation: Depress the up and down levers on the handle and run the unit up and down several times (at least 20 times in each direction) to assure that there is no mechanical binding in the lift system or electrical connection issues.
- 7.6 Float Mode (if equipped): Lift up a load greater than 20 lbs. Settle the Load and depress the "Float Mode Enabled" button ***Do not hold onto the part while initiating Float Mode.*** This will give the unit a false reading and cause excessive drift. Grasping the load, run the unit up and down several times (at least 20 times in each direction) to assure proper operation. Float Mode should provide a nice smooth feel.
- 7.7 Finally, test the operation of any special tooling that may have been integrated to the G-Force® BX ILD.

WARNING

Gorbel, Inc., does not provide integrated tooling for the G-Force® BX ILD. All tooling related questions should be directed to the tooling manufacturer or supplier.

STEP 8 - ADJUSTING LIFT SPEED

- 8.1 Take note of the speed of the unit as it is raised and lowered during Step 7. The speed of the G-Force® BX ILD can be adjusted using the 10 position Speed Selector switch located at the Controls Interface back at the bottom face of the actuator assembly.
- 8.2 Using a small flat-head screwdriver, the position of the switch can be turned to any of the positions that are numbered from 0 to 9. If a slower speed is desired, position the switch to a smaller number (towards 0). If a faster speed is desired, position the switch to a larger number (towards 9).

STEP 9 - FLOAT MODE (OPTION)

- 9.1 Lift and steady the load.
- 9.2 Without applying any external forces to the load, press the Float Mode Button for one (1) second. When done correctly, the “Blue” LED light will turn on (the “Yellow” LED will remain on as well).

WARNING

If external forces are applied to the load while Float Mode is being initiated, the G-Force® will calculate a baseline weight that is higher or lower than the actual weight being lifted. When the external force is removed, the load will begin to drift in the opposite direction of the load that was applied.

- 9.3 The direction and speed of travel is now being controlled by the amount of force that the operator exerts directly onto the load. To move the load down, put vertical pressure on the load in down direction. To move the load up, lift up on the load in the vertical up direction. The higher the force exerted on the load, the faster the unit moves.

WARNING

NEVER remove the load from the G-Force® while still in Float Mode. The drive will interpret the removal of the load as operator intent to lift the load. Therefore, the unit will begin to drift up. The speed of the unit drift directly correlates to the weight that was removed from the unit. The heavier the weight, the faster the unit will travel.

STEP 10 - FINAL STEPS

➡ **TIP:** Gorbel® Customer Service is available from 7am to 7pm Eastern Time Monday - Thursday and 7am to 5pm Eastern Time Friday.

- 10.1 Please contact the Gorbel® factory (585-924-6262) if any of the following occur. **DO NOT ATTEMPT TO REPAIR UNIT YOURSELF.**
 - Excessive noise
 - Unexpected operation
 - Change in performance
 - Damage or excessive wear to unit components
 - Questions about the unit arisePlease do not be limited by these items only.
- 10.2 Keep Packing List, Installation Manual, Drawings, and any other inserts filed together in a safe place.

DRIVE FAULT TROUBLESHOOTING CHART

The G-Force® ILD has extensive diagnostic capability. The “Red” System Fault LED flashes when basic faults have been detected by the control system. If a fault has occurred, the Standard Mode Operating or Float Mode LEDs will go off.

The red System Fault LED flashes a simple code when a fault has occurred. The sequence of flashes indicates the type of fault. The sequence consists of a number of short flashes followed by a long pause. The number of short flashes is the key to determining the fault code. For example, three (3) short flashes followed by a long pause indicates fault code #3. The sequence continually repeats until the fault is reset. The Fault Codes are listed in the chart below.

Fault Code	Failure	Possible Causes
2	DC Bus Under Voltage	<ol style="list-style-type: none"> 1. Low AC line in. 2. Transformer feeding AC in on the MLD is undersized for the load.
3	DC Bus Over Voltage	<ol style="list-style-type: none"> 1. High AC line in. 2. Regen circuit is not operating correctly. 3. Regen resistor not connected correctly or has failed.
4	IGBT Fault	<ol style="list-style-type: none"> 1. Too much weight being lifted by the unit (applies if weight limit set greater than 185 pounds on a 150 pound unit). 2. Loss of an internal power supply voltage. 3. PWM logic error. 4. Over current detected through IGBT.
5	IGBT Over Temperature	<ol style="list-style-type: none"> 1. IGBT is greater than 85 degrees C.
6	Over Current	<ol style="list-style-type: none"> 1. Over current detected through the current sensor. 2. Too much weight being lifted by the unit (applies if weight limit set greater than 185 pounds on a 150 pound unit). 3. Wire Rope is bound. 4. The motor is wired incorrectly. 5. IGBT failure (applies if code will not reset with the cycling of power).
7	Motor Over Temperature	<ol style="list-style-type: none"> 1. Motor has exceeded its upper temperature limit.
8	Safety Relay Failure	<ol style="list-style-type: none"> 1. Relay timing closing the motor brake and opening the motor windings does not meet specified timing requirements.
9	Unknown Source Reset	<ol style="list-style-type: none"> 1. CPU was reset, but not by power down or via the JTAG programming port.
10	Missing Clock Caused Reset	<ol style="list-style-type: none"> 1. 16 Mhz clock stopped.
11	Watchdog Timer Caused Reset	<ol style="list-style-type: none"> 1. The CPU has stopped running code feeding watchdog timer.
12	XTAL Oscillator Startup Error	<ol style="list-style-type: none"> 1. The external 16 Mhz oscillator did not start.
13	Unexpected Hardware Configuration	<ol style="list-style-type: none"> 1. Mode switch does not match jumper or software configuration. 2. Power interruption during operation.

Note: If any of the above listed problems persist, contact Gorbel® Customer Service.

WIRE ROPE INSPECTION

1) Frequent Inspection

The operator or other designated person should visually inspect all ropes at the start of each shift. These visual observations should be concerned with discovering gross damage, such as listed below, which may be an immediate hazard:

- (a) distortion of the rope such as kinking, crushing, unstranding, birdcaging, main strand displacement, or core protrusion;
- (b) general corrosion;
- (c) broken or cut strands;
- (d) number, distribution, and type of visible broken wires. [See next section on rope replacement]

When such damage is discovered, the rope shall either be removed from service or given an inspection as detailed in the next section.

2) Periodic Inspection

The inspection frequency shall be determined by a qualified person and shall be based on such factors as expected rope life as determined by experience on the particular installation or similar installations; severity of environment; percentage of capacity lifts; frequency rates of operation; and exposure to shock loads. Inspections need not be at equal calendar intervals and should be more frequent as the rope approaches the end of its useful life.

A designated person shall perform periodic inspections. This inspection shall cover the entire length of rope. The individual outer wires in the strands of the rope shall be visible to this person during the inspection. Any deterioration resulting in appreciable loss of original strength, such as described below, shall be noted, and determination shall be made as to whether further use of the rope would constitute a hazard:

- (a) points listed in previous section on frequent inspection;
- (b) reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires;
- (c) severely corroded or broken wires at end connections;
- (d) severely corroded, cracked, bent, worn, or improperly applied end connections.

Special care should be taken when inspection sections of rapid deterioration, such as the following:

- (a) sections in contact with saddles, equalizer sheaves, or other sheaves where rope travel is limited;
- (b) sections of rope at or near terminal ends where corroded or broken wires may protrude;
- (c) sections subject to reverse bends;
- (d) sections of ropes that are normally hidden during visual inspection, such as parts passing over sheaves.

WIRE ROPE MAINTENANCE

- 1) Rope should be stored to prevent damage or deterioration.
- 2) Rope shall be unreeled or uncoiled in a manner to avoid kinking of or inducing a twist in the rope.
- 3) Before cutting rope, means shall be used to prevent unlaying of the strands.
- 4) During installation, care should be observed to avoid dragging of the rope in dirt or around objects that will scrape, nick, crush, or induce sharp bends.

- 5) Rope should be maintained in a well-lubricated condition. Gorbelt recommends using Chain and Cable Penetrating oil for lubrication. Lubricant applied as part of a maintenance program shall be compatible with the original lubricant. Lubricant applied shall be of the type that does not hinder visual inspection. Immediately after inspection, lubricant shall be applied before rope is returned to service. Those sections of rope that are located over sheaves or otherwise hidden during inspection and maintenance procedures require special attention when lubricating rope. The object of rope lubrication is to reduce internal friction and to prevent corrosion.

WIRE ROPE REPLACEMENT CRITERIA

- 1) No precise rules can be given for determination of the exact time for rope replacement, since many factors are involved. Once a rope reaches any one of the specified removal criteria, it may be allowed to operate to the end of the work shift, based on the judgement of a qualified person. The rope shall be replaced after that work shift, at the end of the day, or at the latest time prior to the equipment being used by the next work shift.
- 2) Removal criteria for the rope replacement shall be as follows:
 - (a) in running ropes, 12 randomly distributed broken wires in one lay or four broken wires in one strand in one lay (**reference Diagram E below**);
 - (b) one outer wire broken at the contact point with the core of the rope, which has worked its way out of the rope structure and protrudes or loops out from the rope structure;
 - (c) wear of one-third the original diameter of outside individual wires;
 - (d) kinking, crushing, birdcaging, or any other damage resulting in distortion of the rope structure;
 - (e) evidence of heat damage from any cause;
 - (f) reductions from nominal diameter greater than those shown below:

<u>Rope Diameter</u>	<u>Maximum Allowable Reduction From Nominal Diameter</u>
Up to 5/16 in. (8 mm)	1/64 in. (0.4 mm)

- 3) Broken wire removal criteria applies to wire ropes operating on steel sheaves and drums. However, results of internal testing have shown that rope replacement follows the same criteria regardless of sheave or drum material.
- 4) Attention shall be given to end connections. Upon development of two broken wires adjacent to a socketed end connection, the rope should be resocketed or replaced. Resocketing shall not be attempted if the resulting rope length will be insufficient for proper operation.
- 5) Replacement rope and connections shall have strength rating at least as great as the original rope and connections furnished by the hoist manufacturer. A rope manufacturer, the hoist manufacturer, or a qualified person shall specify any deviation from the original size, grade, or construction.

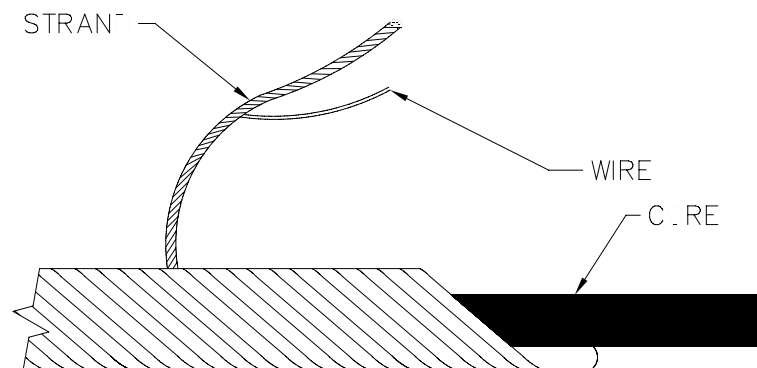


Diagram E. Wire Rope Composition Diagram.

WIRE ROPE REPLACEMENT INSTRUCTIONS

➡ **TIP:** Wire rope replacement is to be performed by qualified maintenance personnel only.

Note: All referenced drawings below are for a 150# unit. The procedure remains the same regardless of capacity.

- 1) Depress the Emergency Stop (E-Stop) button on the Handle. Disconnect power from the unit.
- 2) Remove the Covers from the Actuator assembly.
 - a) First, remove the Controls side Cover (Item #2, **Figure A14**, page 32) from the Actuator assembly. To remove this Cover you must first unscrew and remove the Coil Cord Plug from the Controls Interface. Remove the Coil Cord mounting Clamp (Item #11, **Figure A14**, page 32). Remove the three (3) mounting screws (Item #10, **Figure A14**, page 32) from the Controls side Cover only. Finally, remove the Cover mounting bolt (Item #7, **Figure A14**, page 32) at the Actuator Frame. Slide the Cover off of the Actuator assembly.
 - b) Remove the remaining side Cover (Item #3, **Figure A14**, page 32) from the Actuator assembly. Remove the Coil Cord mounting Clamp (Item #11, **Figure A14**, page 32). Remove the Upper Limit Switch Disc (Item #5, **Figure A14**, page 32). Finally, remove the Cover mounting bolt (Item #7, **Figure A14**, page 32) at the Actuator Frame. Slide the Cover off of the Actuator.
- 3) Remove three (3) of the Heatsink mounting bolts (Item #8, **Figure A9**, page 29), leaving the lower left bolt in place. Loosen, but do not remove, the lower left mounting bolt and rotate the Heatsink down towards the floor. This will support the Heatsink while wire rope replacement is being performed.
- 4) Remove the Nylon Drum Cover (Item #2, **Figure A8**, page 28) from the Actuator. Remove the six (6) mounting bolts and lockwashers (Item #s: 3 & 4, **Figure A8**, page 28) and slide the Drum Cover off of the Main Drum Pulley.
- 5) Re-attach the large rectangular plug to the Controls Interface and Power to the unit.
- 6) Release the Emergency Stop (E-Stop) button on the Handle. At the Controls Interface, jog the unit down until the remaining Wire Rope has been payed off of the Main Drum Pulley.
- 7) Depress the Emergency Stop (E-Stop) button on the Handle and disconnect Power to the unit.
- 8) Remove the cotter and clevis pins from the Swivel assembly. Pull the damaged Wire Rope out of the Swivel assembly.
- 9) Remove the Upper Limit Donut from the broken wire rope assembly.
- 10) Remove the Wire Rope termination cover (Item #3, **Figure A6**, page 27) by removing the mounting bolts (Item #7, **Figure A6**, page 27) from the Main Drum Pulley.
- 11) Remove the terminated end of the Wire Rope from the Main Drum Pulley. Do so by simply lifting the terminated end out of the groove in the Drum Pulley. Pull the damaged wire rope completely out of the Actuator assembly.
- 12) Unless otherwise instructed, discard the damaged wire rope.
- 13) Remove the one (1) Extension Spring (Item #5, **Figure A5**, page 26) from the Heatsink side of the Actuator Frame by unscrewing the shoulder mounting bolt (Item #9, **Figure A7**, page 28) attached to the Idler Guide Plate (Item #3, **Figure A7**, page 28).
- 14) Remove the two (2) Snap Rings (Item #8, **Figure A7**, page 28) from the Idler Pulley Shafts (Item #4, **Figure A7**, page 28) and remove the Idler Pulley Guide Plate (Item #3, **Figure A7**, page 28).
- 15) Unscrew the **TOP** Idler Pulley Shaft (Item #4, **Figure A7**, page 28) only, using a 5/16" open-end wrench.

- 16) Feed the new wire rope assembly, Stop Sleeve terminated end first, through the following path:
- Through the Nylon Insert (Item #2, **Figure A1**, page 24) at the bottom of the Actuator Frame.
 - Over the top of the Idler Pulley going counter-clockwise.
 - Clockwise around the Main Drum Pulley (Item #2, **Figure A6**, page 27). Terminate the wire rope into the side groove and opening located at the front side of the Main Drum Pulley.
 - Wind the wire rope on the Main Drum Pulley until the wire rope is properly seated into all of the grooves up to and including the one that the Pulley Guide Block (Item #1, **Figure A4**, page 25) is located in.

WARNING

ALL slack must be removed from the wire rope and the wire rope must exit the Drum in the groove that contains the Pulley Guide Block in order to function correctly.

- Reconfirm that the wire rope exits the drum in the same groove that contains the Pulley Guide Block, and that all slack has been removed from the wire rope.
 - Replace the wire rope termination cover (Item #3, **Figure A6**, page 27) on the Main Drum Pulley.
- 17) Screw the top Idler Pulley Shaft (Item #4, **Figure A7**, page 28) back into the Threaded Hole Guide Plate (Item #2, **Figure A7**, page 28) located on the backside of the Actuator Frame assembly. Tighten using a 5/16" open-ended wrench.
- 18) Re-assemble the Idler Guide Plate (Item #3, **Figure A7**, page 28) to the Idler Pulley Shafts (Item #4, **Figure A7**, page 28) and replace the two (2) Snap Rings (Item #8, **Figure A7**, page 28).
- 19) Re-assemble the Extension Spring (Item #5, **Figure A5**, page 26) to the Idler Guide Plate (Item #3, **Figure A7**, page 28), by securing the Shoulder bolt (Item #9, **Figure A7**, page 28) in place.
- 20) Attach the Upper Limit Donut from Step 10 to the new wire rope assembly.
- 21) Re-attach the Swivel assembly to the new wire rope assembly.
- 22) Plug the Coil Cord Connector into the Controls Interface and reconnect power to the unit.
- 23) Release the Emergency Stop button on the Handle. Run the unit up and down several times to assure proper operation.
- 24) Depress the Emergency Stop button on the Handle and disconnect the power.
- 25) Assemble the Nylon Drum Cover (Item #2, **Figure A8**, page 28) over the Main Drum Pulley.
- 26) Properly re-assemble the Heatsink (Item #2, **Figure A9**, page 29) to the Actuator Frame.
- 27) Replace the Covers on the Actuator assembly.
- Re-assemble the side Cover (Item #3, **Figure A14**, page 32) to the Actuator assembly. Slide the Cover onto the Actuator assembly. Re-assemble the Cover mounting bolt (Item #7, **Figure A14**, page 32) at the Actuator Frame. Re-assemble the Upper Limit Switch Disc (Item #5, **Figure A14**, page 32). Re-assemble the Coil Cord mounting Clamp (Item #11, **Figure A14**, page 32).
 - Now, re-assemble the Controls side Cover (Item #2, **Figure A14**, page 32) to the Actuator assembly. Slide the Cover onto the Actuator assembly. Slide the Power Cord Grommet into the slotted opening at the back face of the Cover. Re-assemble the Cover mounting bolt (Item #7, **Figure A14**, page 32) at the Actuator Frame. Re-assemble the Coil Cord mounting Clamp (Item #11, **Figure A14**, page 32). Re-assemble the three (3) mounting screws (Item #10, **Figure A14**, page 32) to the Controls side Cover. Re-assemble the Coil Cord Plug to the Controls Interface.

- 29) Reconnect power to the unit.
- 30) Release the Emergency Stop button on the Handle. Run the unit up and down several times to assure proper operation.
- 31) Continue normal operation.

APPENDIX A - 150# BX ACTUATOR ASSEMBLY DRAWINGS

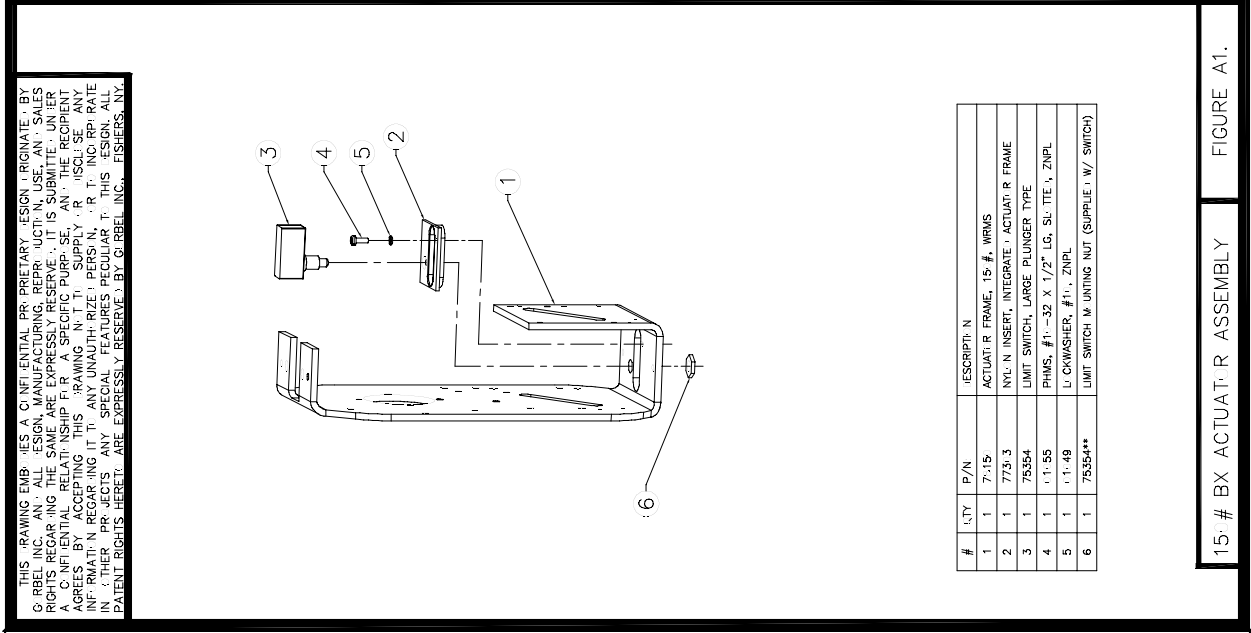
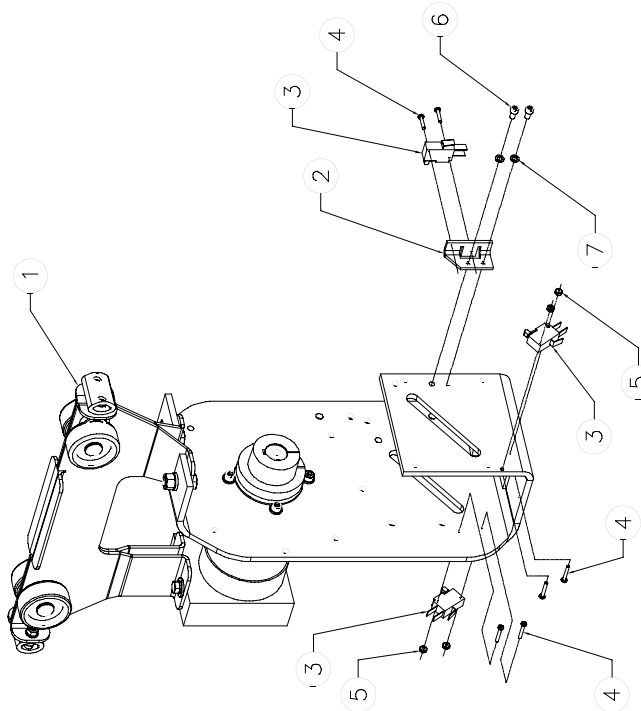


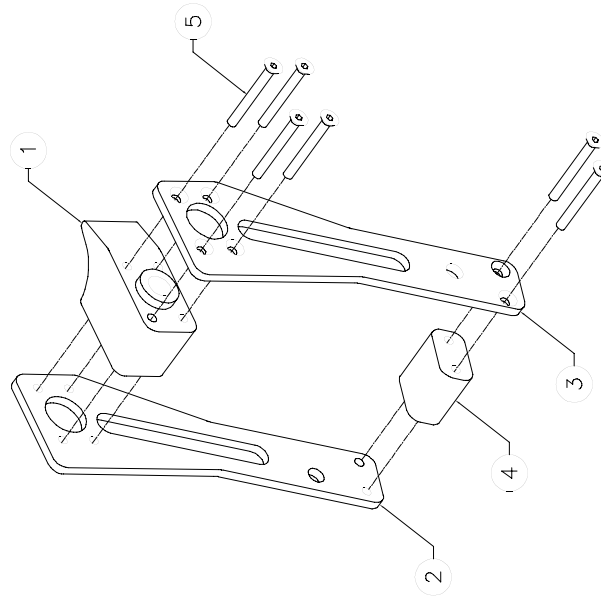
Figure A1 (bottom) & Figure A2 (top). 150# BX Actuator Assembly.

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#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	77551	LIMIT SWITCH BRACKET
3	3	77554	LIMIT SWITCH, ROLLER ARM ACTUATOR, FIRM C
4	6	77523	SLRH, #4-4 X 3/4" LG, ZNPL
5	4	77524	HEXNUT, #4-4, ZNPL
6	2	77535	SHCS, #1-24 X 3/4" LG
7	2	77549	LOCKWASHER, #1, ZNPL

150# BX ACTUATOR ASSEMBLY FIGURE A3.

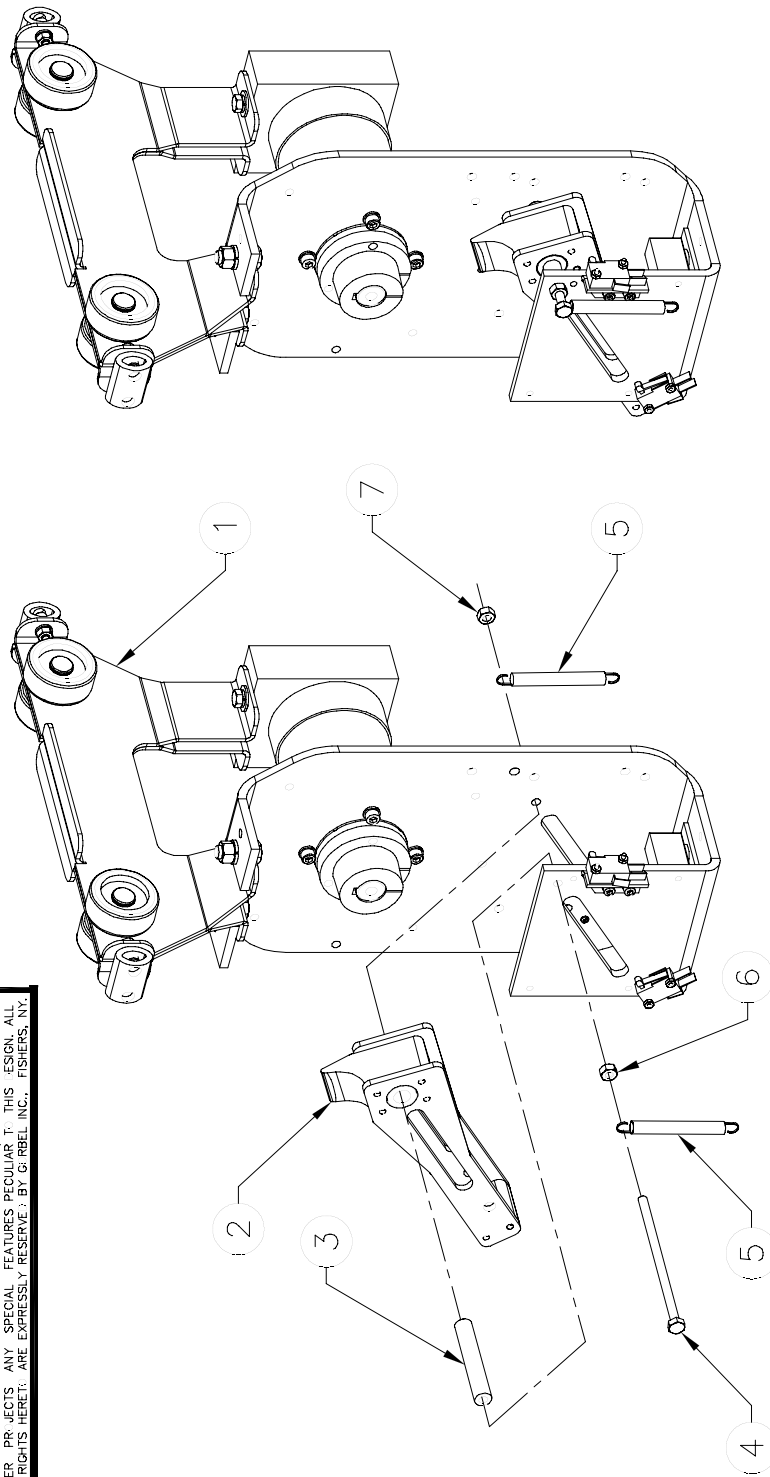


#	QTY	P/N	DESCRIPTION
1	1	7399	GULF BUCK
2	1	77553	GULF PLATE, TAPPE HLES
3	1	77554	GULF PLATE, COUNTERSUNK HLES
4	1	77555	SPACER BUCK
5	6	77533	SHCS, #1-32 X 1-3/4" LG

150# BX ACTUATOR ASSEMBLY FIGURE A4.

Figure A3 (bottom) & Figure A4 (top). 150# BX Actuator Assembly.

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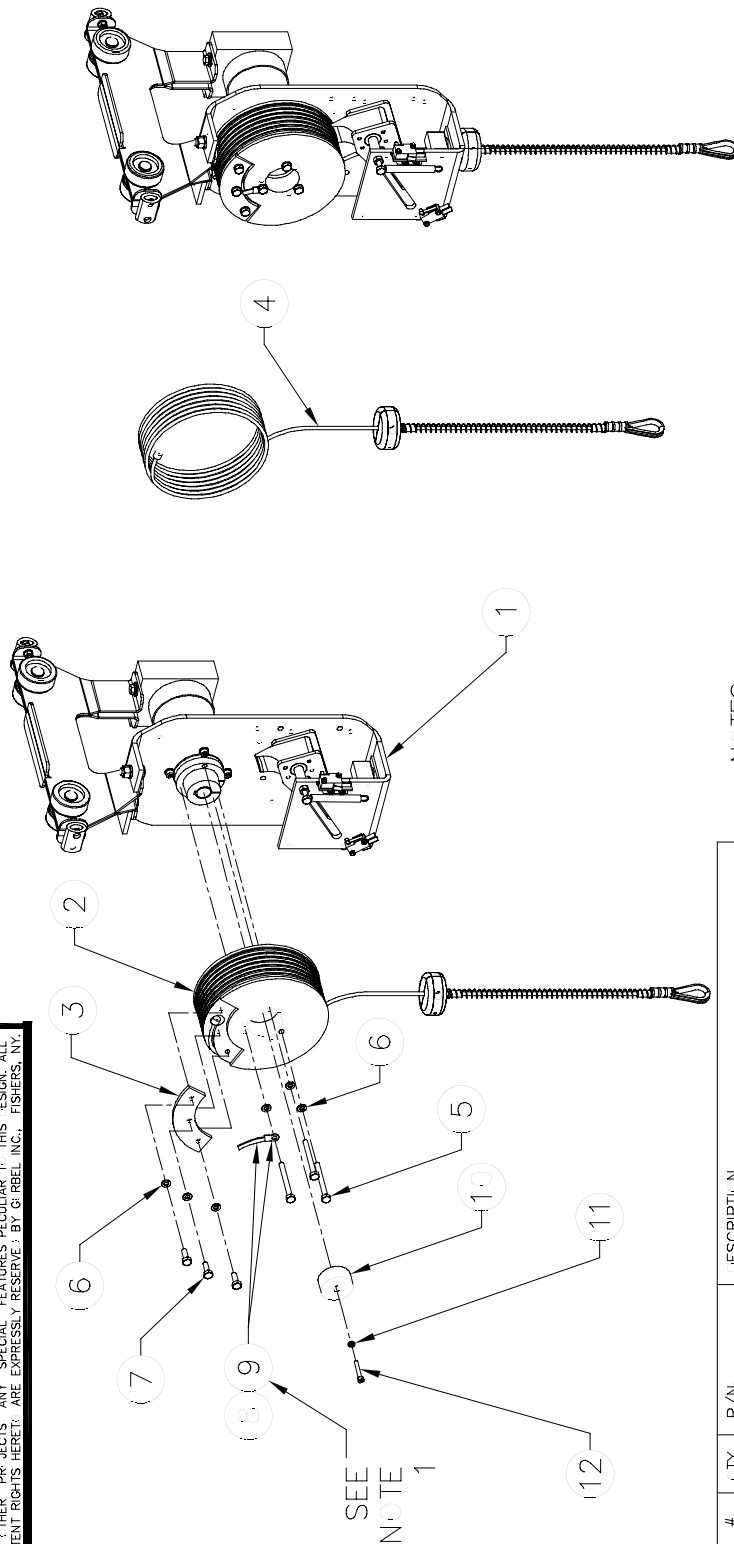


#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	REF ONLY	PULLEY GUIDE MECHANISM
3	1	02916	LIMIT SWITCH SPACER SHAFT
4	1	06330	HHCS, 1/4"-2" X 5" LG, GR 5, ZNPL
5	2	77572	EXTENSION SPRING, 3/16" DIA X 1-1/2" LG
6	1	01221	HEX NUT, 1/4"-2", ZNPL
7	1	00177	NYLOCK NUT, 1/4"-2", ZNPL

150# BX ACTUATOR ASSEMBLY FIGURE A5.

Figure A5. 150# BX Actuator Assembly.

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NOTES

- 1) TERMINATE THE BRAIDED GROUND CABLE TO THE BOLT SHOWN. THE BRAIDED STRAP IS TO LAY OVER THE WIRE ROPE ENTRANCE GROOVE PRIOR TO WIRE ROPE ASSEMBLY.

#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	773-1	DRUM PULLEY, 3/16" DIAMETER WIRE ROPE
3	1	773-1**	TERMINATION COVER, (SUPPLIED WITH DRUM)
4	1	77315	WIRE ROPE ASSEMBLY, 3/16"
5	3	6329	HHCS, 1/4"-20 X 2-1/2" LG GR 5, ZNPL
6	6	2-97	LOCKWASHER, 1/4", ZNPL
7	3	2145	HHCS, 1/4"-20 X 3/4" LG, GR 5, ZNPL
8	1	77964	TERMINAL RING, 1/4" STU, 14-11 AWG
9	3	77966	TINNED COPPER FLAT BRAIDING, 3/16" WIDE
10	1	77530	15- LB BUSHING RETAINER
11	1	2-195	LOCKWASHER, M10, ZNPL
12	1	2-2-9	SHCS, M10 X 1.25 MM PITCH X 30 MM LG

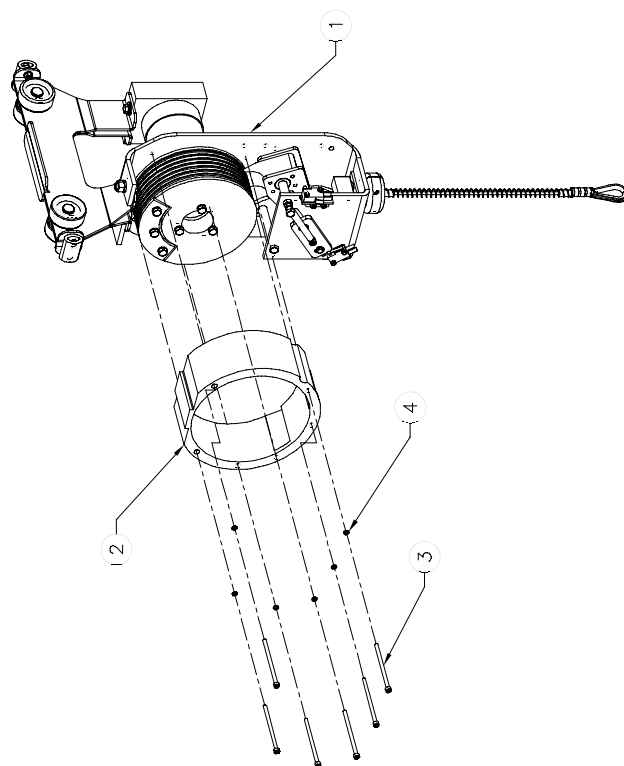
150# BX ACTUATOR ASSEMBLY FIGURE A6.

Figure A6. 150# BX Actuator Assembly.

Diagram illustrating the exploded view of a mechanical assembly, showing various components labeled with numbers 1 through 12. The components include a main housing (1), a central shaft (2), a pulley (3), a spring (4), a bracket (5), a nut (6), a washer (7), a pin (8), a screw (9), a bolt (10), a nut (11), and a washer (12). A label 'SEE NOTE' points to the central shaft area.

#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	77561	THREADED HELICAL GUIDE PLATE
3	1	77557	INNER GUIDE PLATE
4	2	77566	THREADED INNER SHAFT
5	1	77559	OFFSET INNER PULLEY
6	1	75312	BEARING, LINEAR, SELF-LUBRICATING
7	2	21125	SNAP RING, EXTERNAL, 7/8" ID
8	2	77571	SNAP RING, EXTERNAL, .412" ID
9	2	12431	SHOULDER BOLT, 1/4" SHULDER X 1/4" LG
10	1	6332	HHCS, 1/4"-2" X .4" LG, GR 5, ZNPL
11	1	1297	LOCKWASHER, 1/4" ZNPL
12	1	12916	SPACER SHAFT, G-FRICE

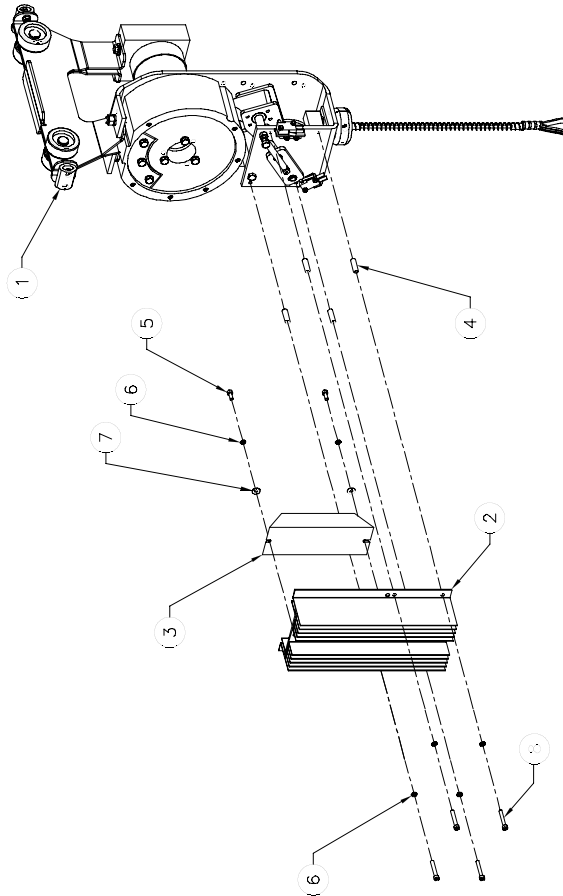
FIGURE A7.



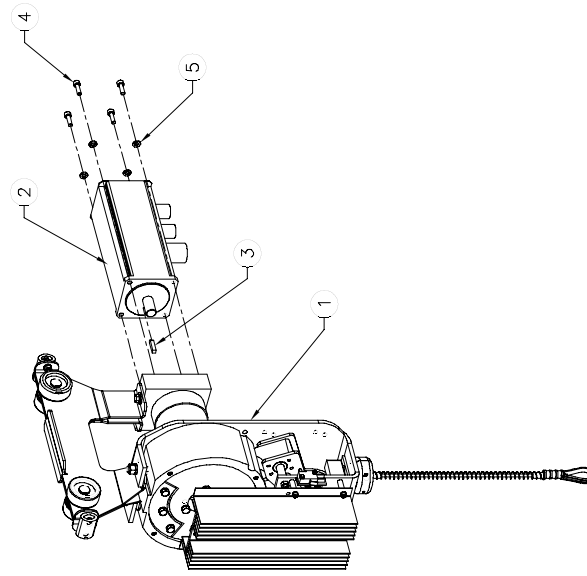
#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	77565	NYLON RUM PULLEY COVER
3	6	334	SHCS, #10-24 X 3-1/2" LG, ALL-Y ZINC
4	6	1149	LOCKWASHER, #10, ZNPL

FIGURE A8.

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#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	753-3	HEATSINK, ACTUATOR
3	1	771-6	REGEN RESISTOR, 3" HM
4	4	77562	HEATSINK SPACER, 1" LG
5	2	373	SHCS, #1-24 X 1/2" LG
6	6	1-49	FLATWASHER, #1-1, ZNPL
7	2	175	SHCS, #1-24 X 1-3/4" LG, SS



#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	77635	MOTOR, SERV W/ BRAKE, BX SERIES, W COIL
3	1	77621	KEYSTONE, 5MM SL, X 777" LG, ZNPL
4	4	1-1-6	SHCS, M6 X 2 MM LG
5	4	1-337	FLATWASHER, M6, ZNPL

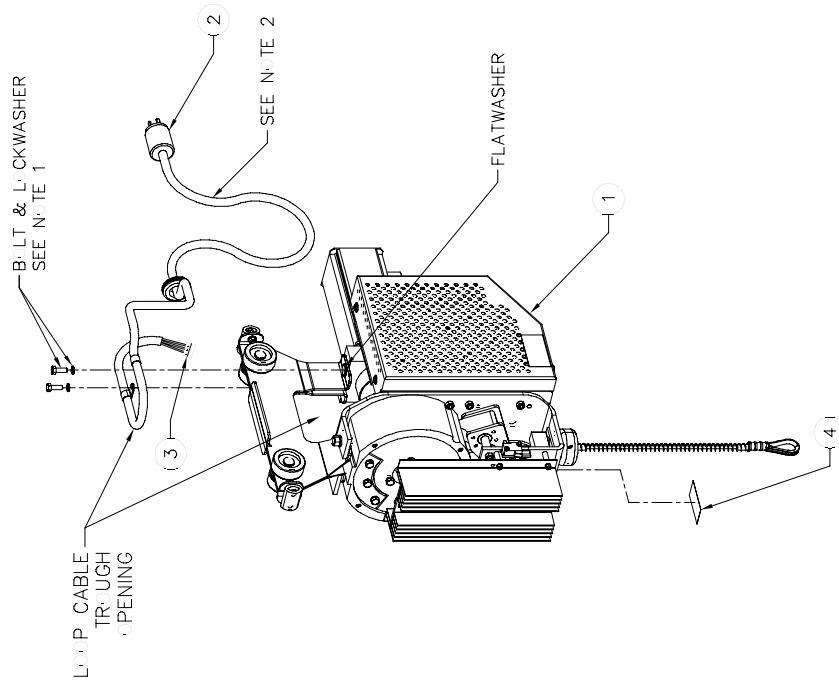
150# BX ACTUATOR ASSEMBLY FIGURE A9.

150# BX ACTUATOR ASSEMBLY FIGURE A10.

Figure A9 (bottom) & Figure A10 (top). 150# BX Actuator Assembly.

This diagram illustrates the assembly of the motor unit. It shows the motor (1) with its mounting bracket (3) and fan (2). The fan is shown being attached to the motor. The mounting bracket (3) is shown being attached to the motor (1) using screws (4). The fan (2) is shown being attached to the motor (1) using screws (4).

#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY, 15" #, BX
2	1	7219	CONTROLS ASSEMBLY, ML-114
3	3	753-4	WASHER, VIBRATION DAMPING, 1/4" ID
4	3	777	NYLOCK NUT, 1/4"-20, ZNPL

 γ 

NOTES

- 1) REMOVE THE HARWARE NUTSIE AT A TIME. RE-ASSEMBLE THE HARWARE THROUGH THE RUBBER CUSHION. STEEL LAMP STRAPS (AS SHOWN).
- 2) ROUTE CABLE AS SHOWN.

#	QTY	P/N	DESCRIPTION
1	1	REF . NLY	ACTUATOR ASSEMBLY
2	1	71155	POWER CIR : ASSEMBLY, G-F, RCE
3	1	77960	CINNECT-R, MALE, 5MM, 3 PL S
4	1	77670	ACTUATOR TAC MATRICE, STICKER

FIGURE A12.

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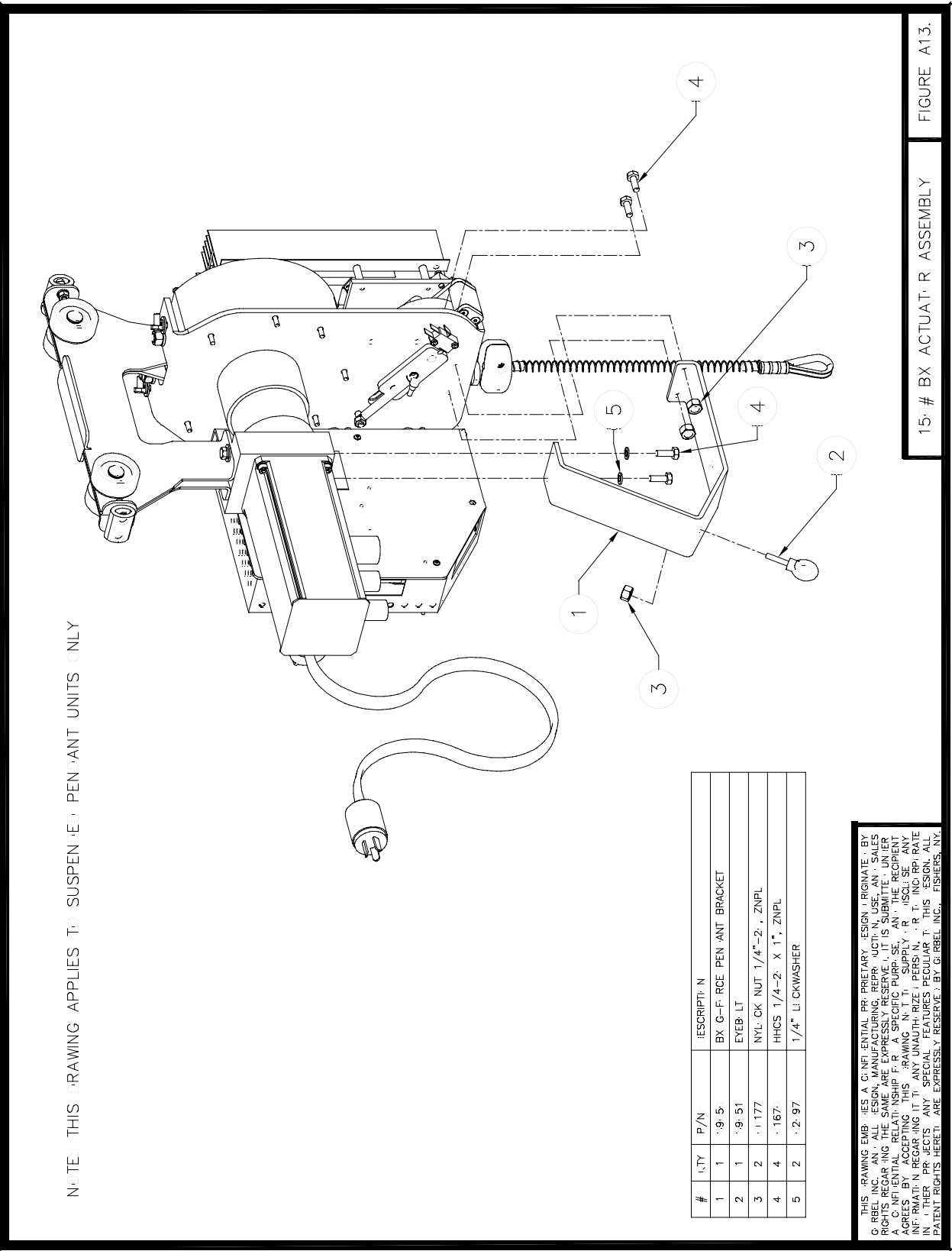
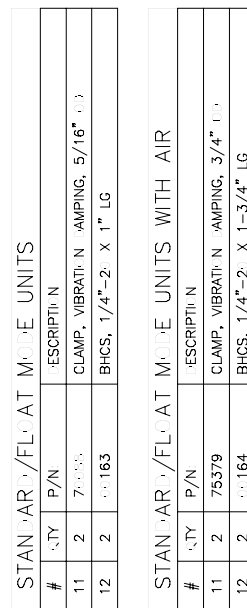


Figure A13. 150# BX Actuator Assembly.



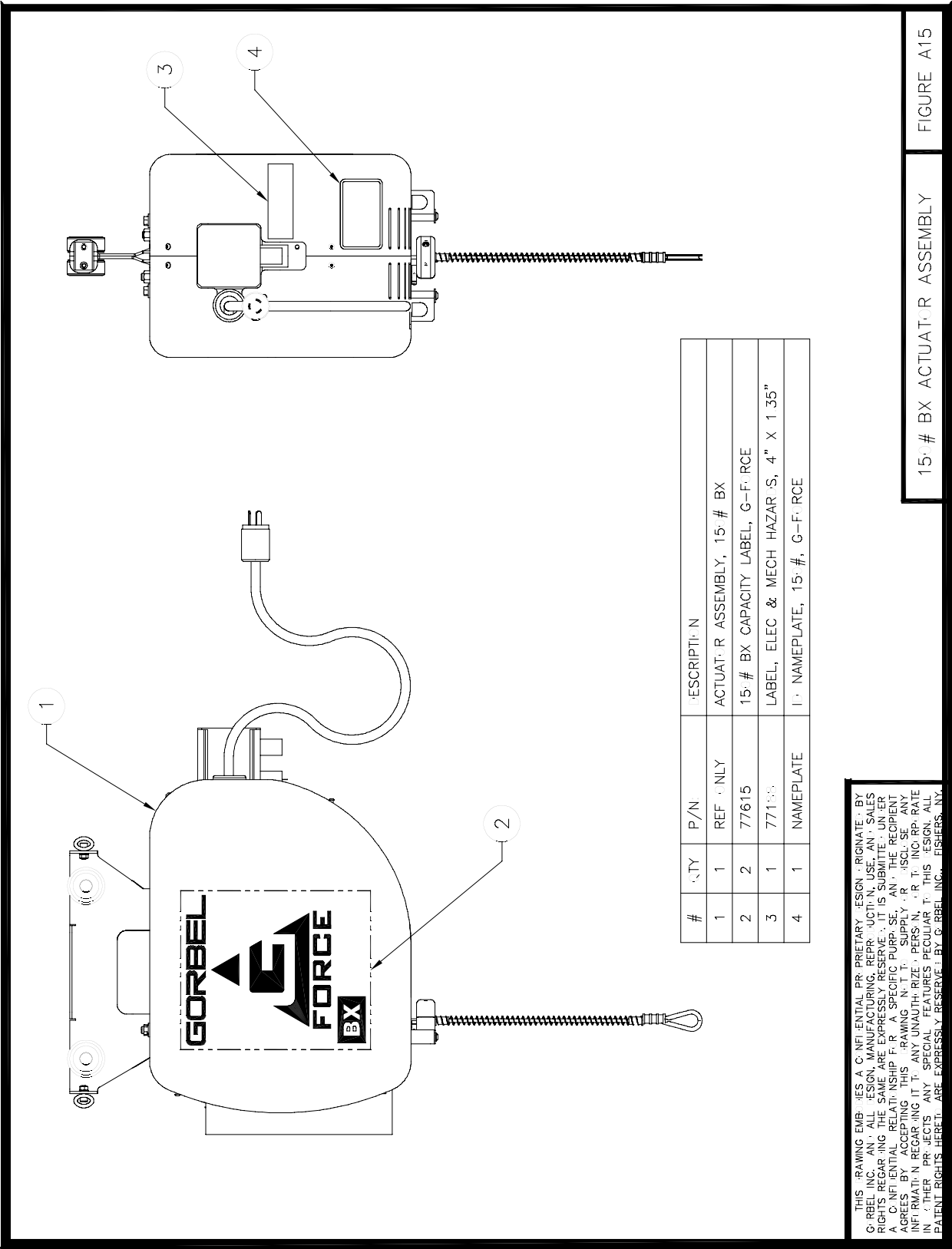
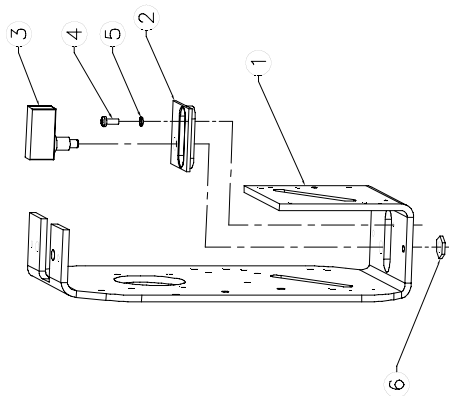


FIGURE A15

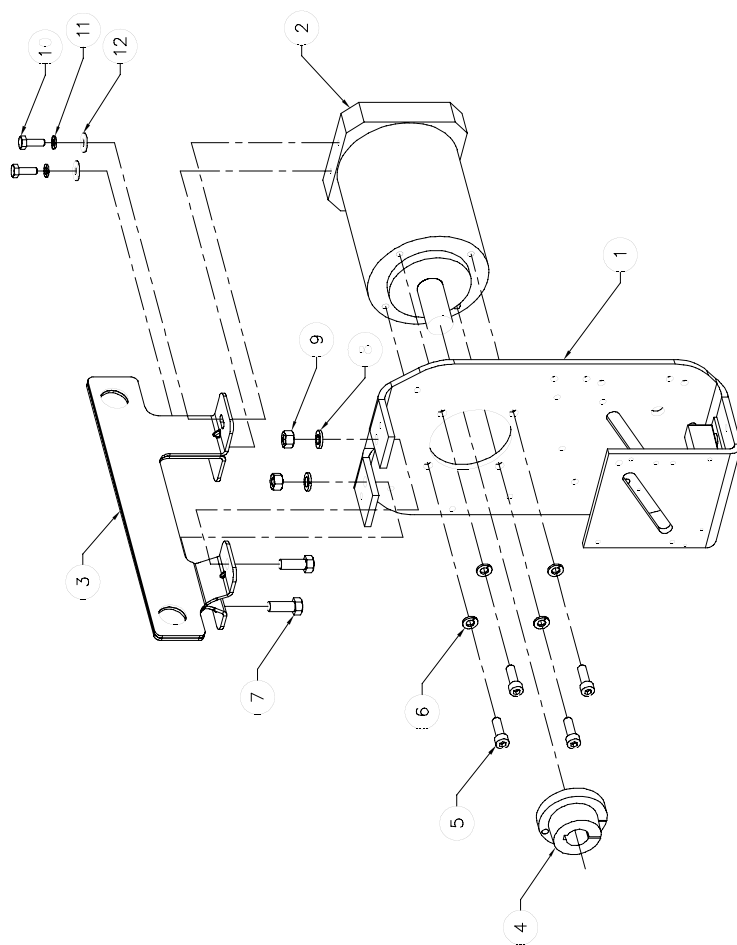
150# BX ACTUATOR ASSEMBLY

Figure A15. 150# BX Actuator Assembly.

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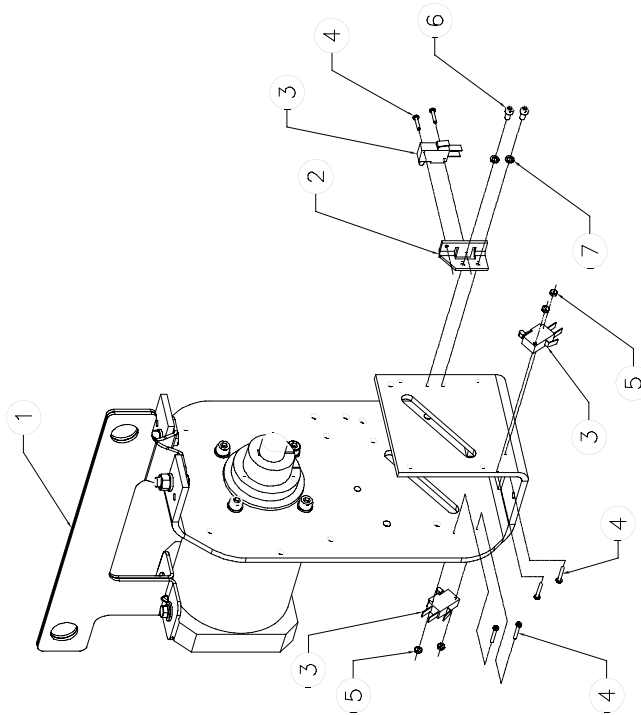


300/300 BX ACTUATOR ASSEMBLY

300/300# BX ACTUATOR ASSEMBLY
FIGURE B2.

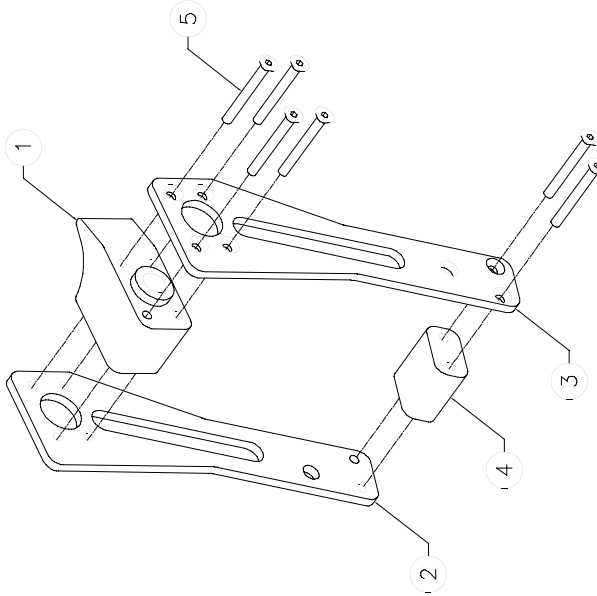
34

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#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	77553	LIMIT SWITCH, ROLLER ARM ACTUATOR, FIRM C
3	3	77554	LIMIT SWITCH, ROLLER ARM ACTUATOR, FIRM C
4	6	77523	SLRH, #4-4 x 3/4 LG, ZNPL
5	4	77524	HEXNUT, #4-4, ZNPL
6	2	77535	SHCS, #1-24 x 3/8 LG
7	2	77549	LOCKWASHER, #1, ZNPL

300/380# BX ACTUATOR ASSEMBLY FIGURE B3.

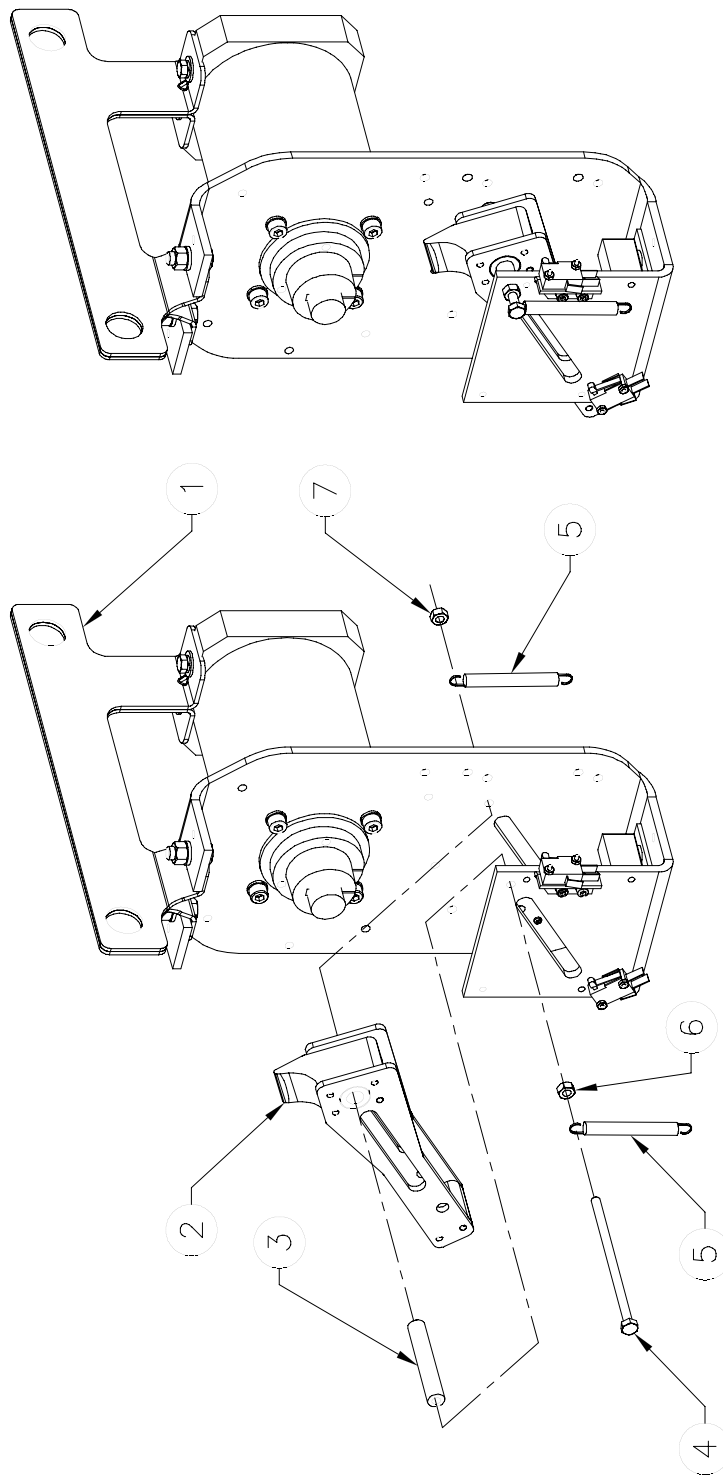


#	QTY	P/N	DESCRIPTION
1	1	73199	QUIET BLOCK
2	1	77553	QUIET PLATE, TAPPEL HLES
3	1	77554	QUIET PLATE, C-UNTERSUNK HLES
4	1	77555	SPACER BLOCK
5	6	77533	PHCS, #1-32 x 1-3/4 LG

300/380# BX ACTUATOR ASSEMBLY FIGURE B4.

Figure B3 (bottom) & Figure B4 (top). 300/380# BX Actuator Assembly.

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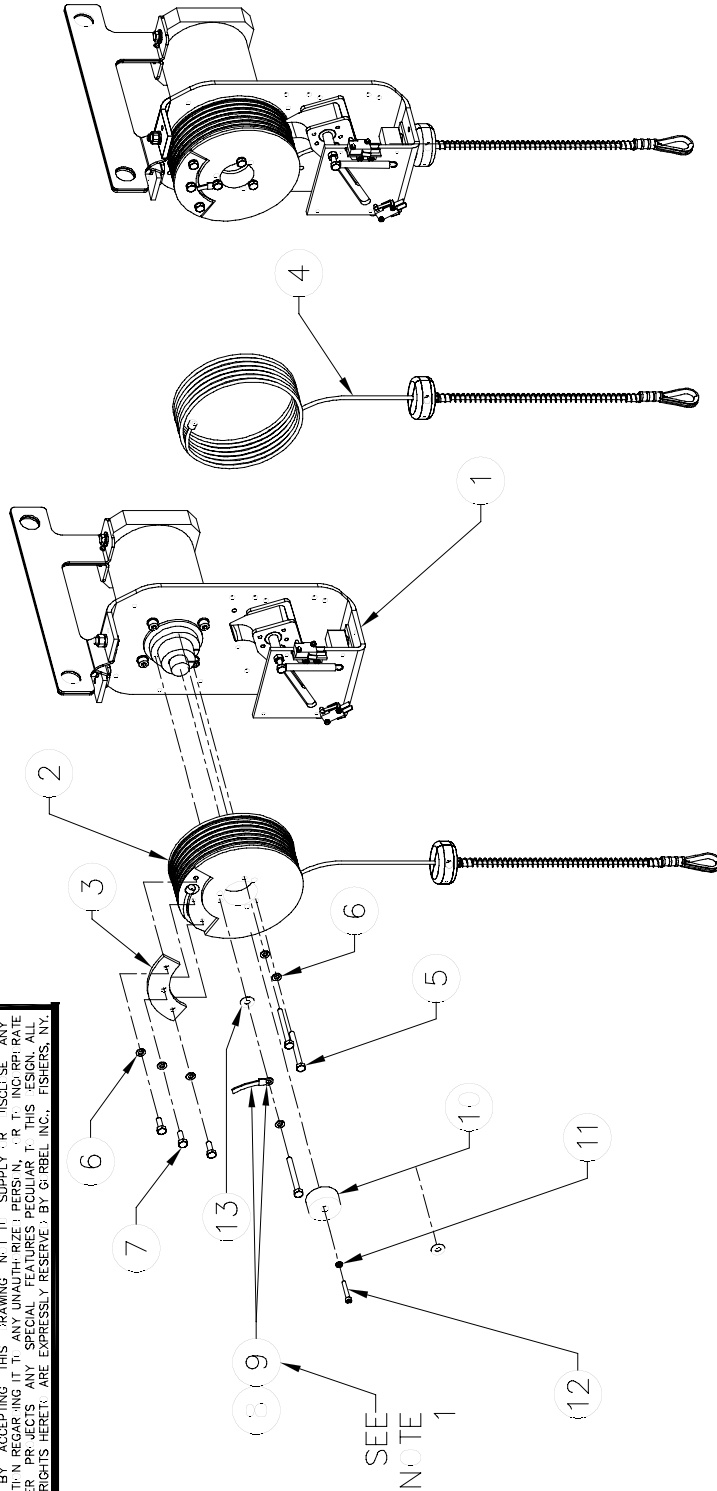


#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	REF ONLY	PULLEY GUIDE MECHANISM
3	1	2916	LIMIT SWITCH SPACER SHAFT
4	1	633	HHCS, 1/4"-2" X 5" LG, GR 5, ZNPL
5	2	77572	EXTENSION SPRING, 3/16" X 1-1/2" LG
6	1	1221	HEX NUT, 1/4"-2", ZNPL
7	1	1177	NYLOCK NUT, 1/4"-2", ZNPL

300/380# BX ACTUATOR ASSEMBLY FIGURE B5.

Figure B5. 300/380# BX Actuator Assembly.

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NOTES

- 1) TERMINATE THE BRAIDED GRUNP CABLE TO THE BOLT SHOWN. THE BRAIDED STRAP IS TO LAY OVER THE WIRE ROPE ENTRANCE GROOVE PRIOR TO WIRE ROPE ASSEMBLY.

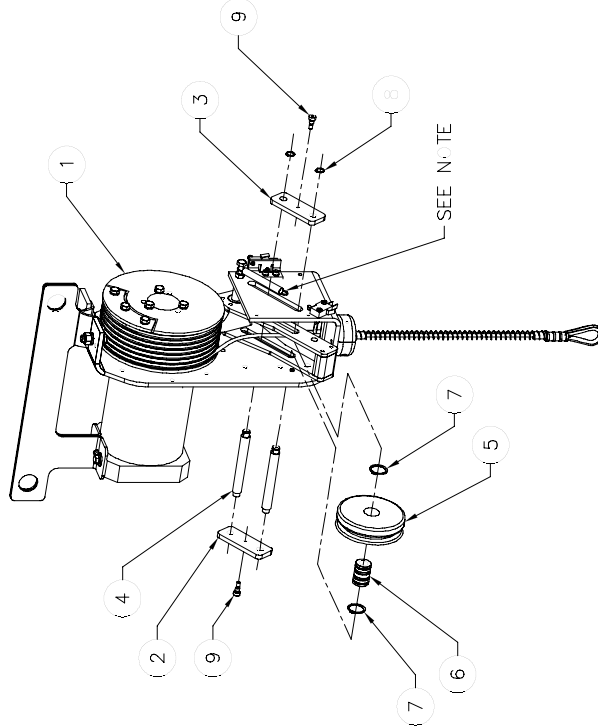
#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	773-1	DRUM PULLEY, 3/16" DIAMETER WIRE ROPE
3	1	773-1**	TERMINATION COVER, (SUPPLIED WITH DRUM)
4	1	77315	WIRE ROPE ASSEMBLY, 3/16"
5	3	6329	HHCS, 1/4"-2" X 2-1/2" LG GR 5, ZNPL
6	6	6297	LOCKWASHER, 1/4", ZNPL
7	3	6214	HHCS, 1/4"-2" X 3/4" LG, GR 5, ZNPL
8	1	77964	TERMINAL RING, 1/4" STU, 14-11 AWG
9	3	77966	TINNED COPPER FLAT BRAIDING, 3/16" WIRE
10	1	77531	3/16" LB BUSHING RETAINER
11	1	6214	LOCKWASHER, M10, ZNPL
12	1	6210	SHCS, M10 X 1.5 MM PITCH X 3.5 MM LG
13	1	6122	1/4" FLAT WASHER, ZNPL

300/380# BX ACTUATOR ASSEMBLY FIGURE B6.

Figure B6. 300/380# BX Actuator Assembly.

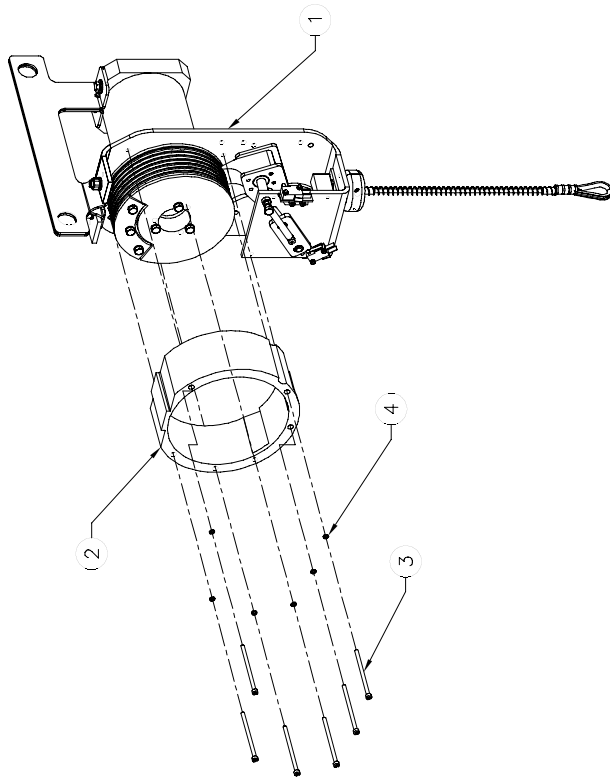
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NOTE: CONNECT LINE ENDS OF EXTENSION SPRINGS (2) TO THE SHULDER BOLTS DURING INSTALLATION.



#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	77561	THREADED HOLE GUIDE PLATE
3	1	77557	ROLLER GUIDE PLATE
4	2	77556	THREADED ROLLER SHAFT
5	1	77559	OFFSET ROLLER PULLEY
6	1	753-2	BEARING, LINEAR, SELF-LUBRICATING
7	2	2-1125	SNAP RING, EXTERNAL, 7/16" ID
8	2	77571	SNAP RING, EXTERNAL, 412" ID
9	2	243	SHULDER BOLT, 1/4" SHULDER X 1/4" LG

300/380# BX ACTUATOR ASSEMBLY FIGURE B7.

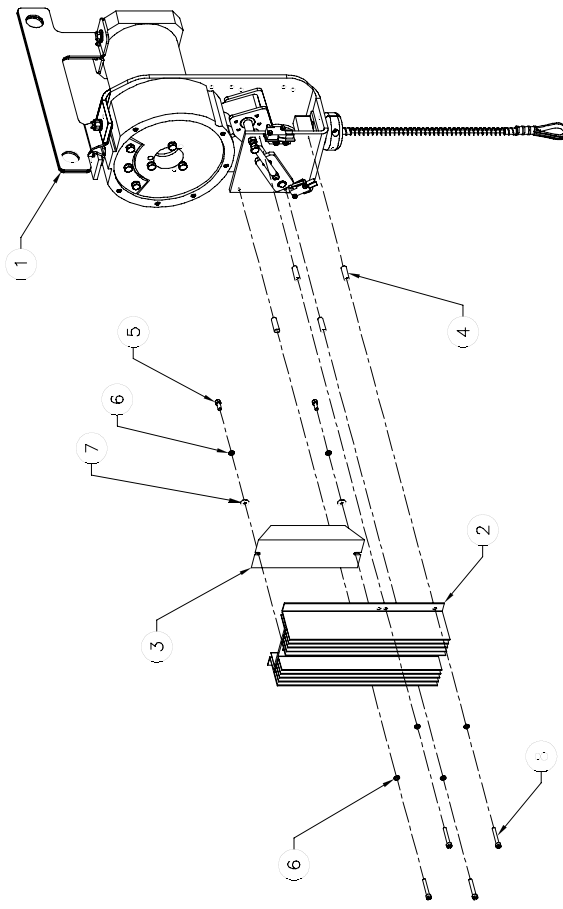


#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	77565	NYLON RUM PULLEY COVER
3	6	3-4	SHCS, #1-24 X 3-1/2" LG, ALL Y ZINC
4	6	1-49	LOCKWASHER, #1-1, ZNPL

300/380# BX ACTUATOR ASSEMBLY FIGURE B8.

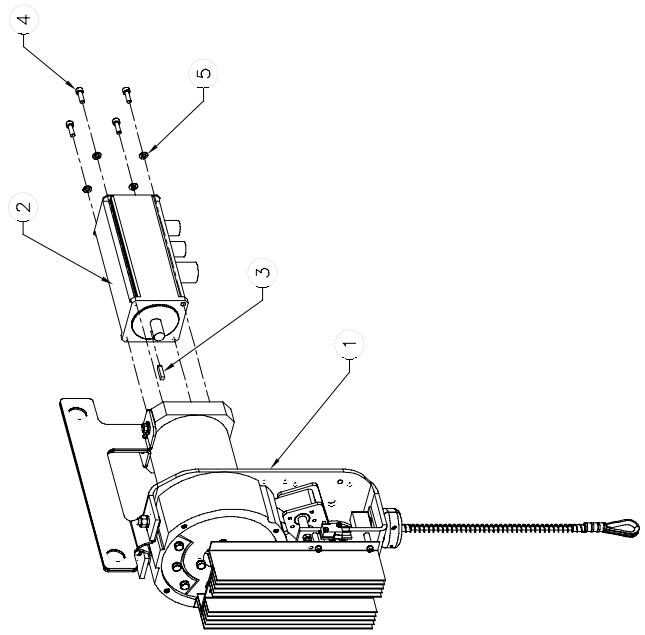
Figure B7 (bottom) & Figure B8 (top). 300/380# BX Actuator Assembly.

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#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	753-3	HEATSINK, ACTUATOR
3	1	771-6	REGEN RESISTOR, 3" HM
4	4	77562	HEATSINK SPACER, 1" LG
5	2	77373	SHCS, #10-24 X 1/2" LG
6	6	77149	LOCKWASHER, #10, ZNPL
7	2	77175	FLATWASHER, #10, ZNPL
8	4	77376	SHCS, #10-24 X 1-3/4" LG, SS

300/380# BX ACTUATOR ASSEMBLY FIGURE B9



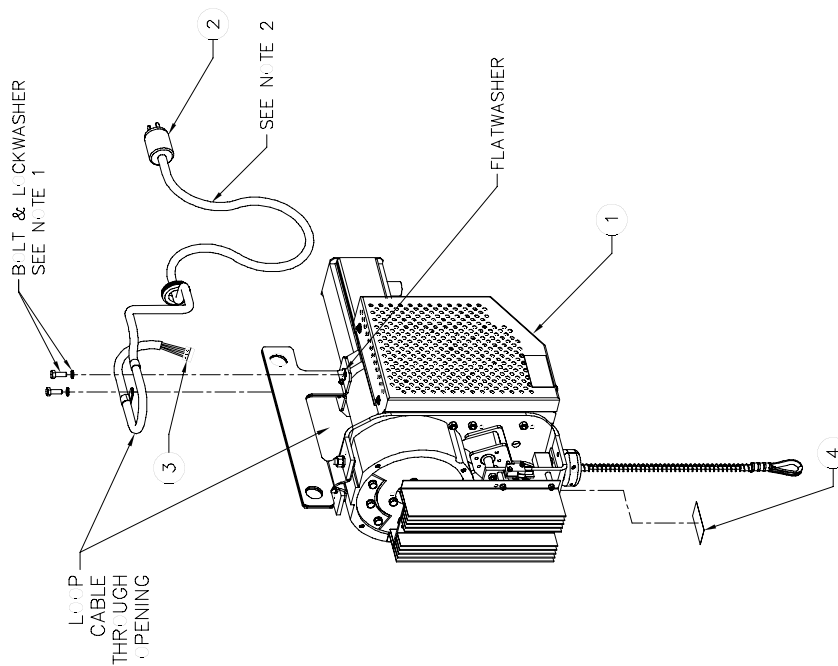
#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	77635	SERVO MOTOR W/ BRAKE, BX SERIES, W/ DIN
3	1	77621	KEYSLOT, 5MM DIA, X 1/4" LG, ZNPL
4	4	77176	SHCS, M6 X 2 MM LG
5	4	77337	LOCKWASHER, M6, ZNPL

300/380# BX ACTUATOR ASSEMBLY FIGURE B10

Figure B9 (bottom) & Figure B10 (top). 300/380# BX Actuator Assembly.

#	QTY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY, 3" #, BX
2	1	7219-0	CONTROLS ASSEMBLY, ML-114
3	3	753-4	WASHER, VIBRATION DAMPING, 1/4" ID
4	3	753-177	NYLOCK NUT, 1/4"-20, ZNPL

300/300# BX ACTUATOR ASSEMBLY



UNITES

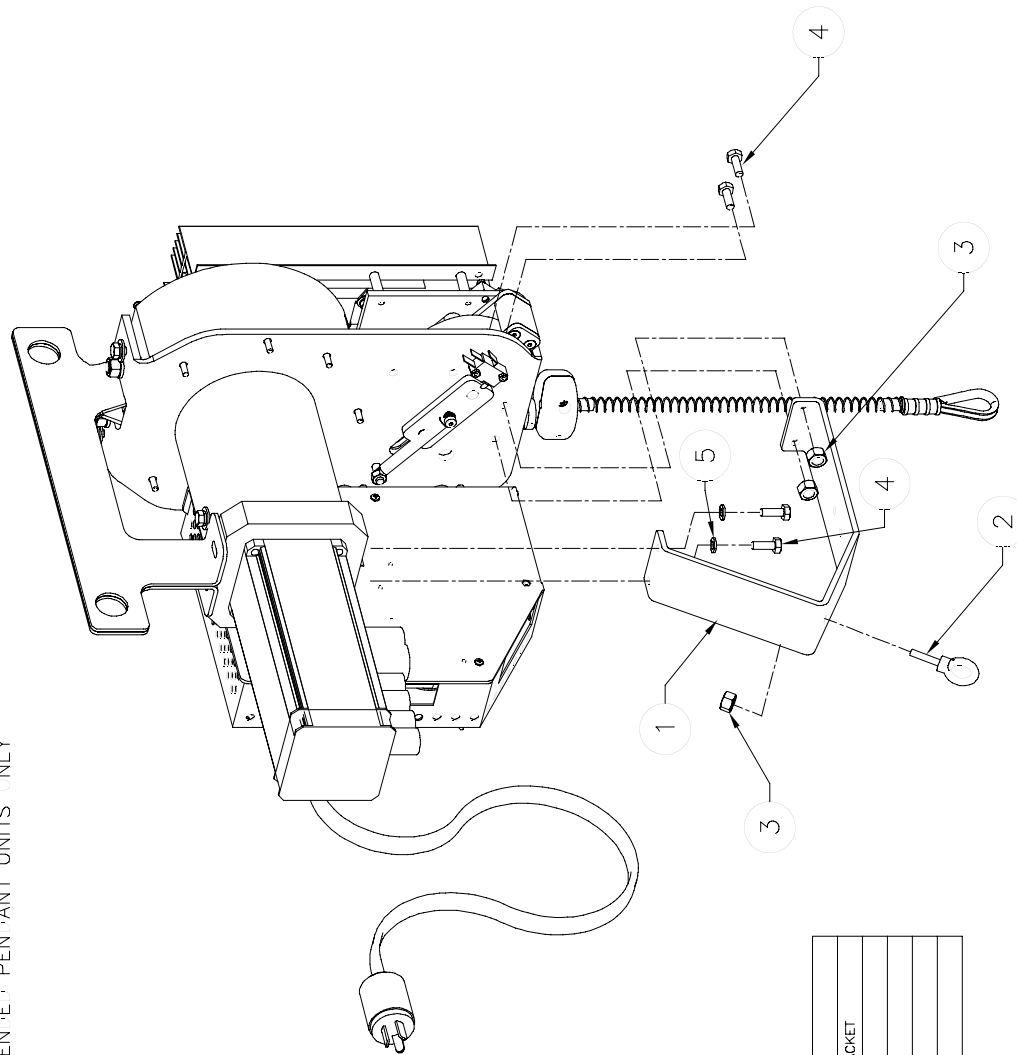
1) REM: VE THE HAR 'WARE' NE SI'E AT A TIME. RE-ASSEMBLE THE HAR 'WARE' THRU' THE RUBBER CUSHI'NE. STEEL L'V P STRAPS (AS SH' WN).

2) R: UTE CABLE AS SH' WN.

#	TY	P/N	DESCRIPTION
1	1	REF ONLY	ACTUATOR ASSEMBLY
2	1	71155	PISTON ROD ASSEMBLY, G-F RCE
3	1	7796	CONNECTOR, MALE, 5MM, 3 P. S
4	1	776	ACTUATOR TAG MATRIX STICKER

300/300# BX ACTUATOR ASSEMBLY

NOTE: THIS DRAWING APPLIES TO SUSPENSION UNITS ONLY



#	QTY	P/N	DESCRIPTION
1	1	09-60	BX G-FRONT PENDANT 3" BRACKET
2	1	09-51	EYEBOLT
3	3	11-177	NYLON LOCK NUT 1/4"-20, ZNPL
4	4	11-167	HEX NUT 1/4"-20 X 1", ZNPL
5	2	12-97	1/4" LOCK WASHER

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15-# BX ACTUATOR ASSEMBLY

FIGURE A13.

Figure B13. 300/380# BX Actuator Assembly.

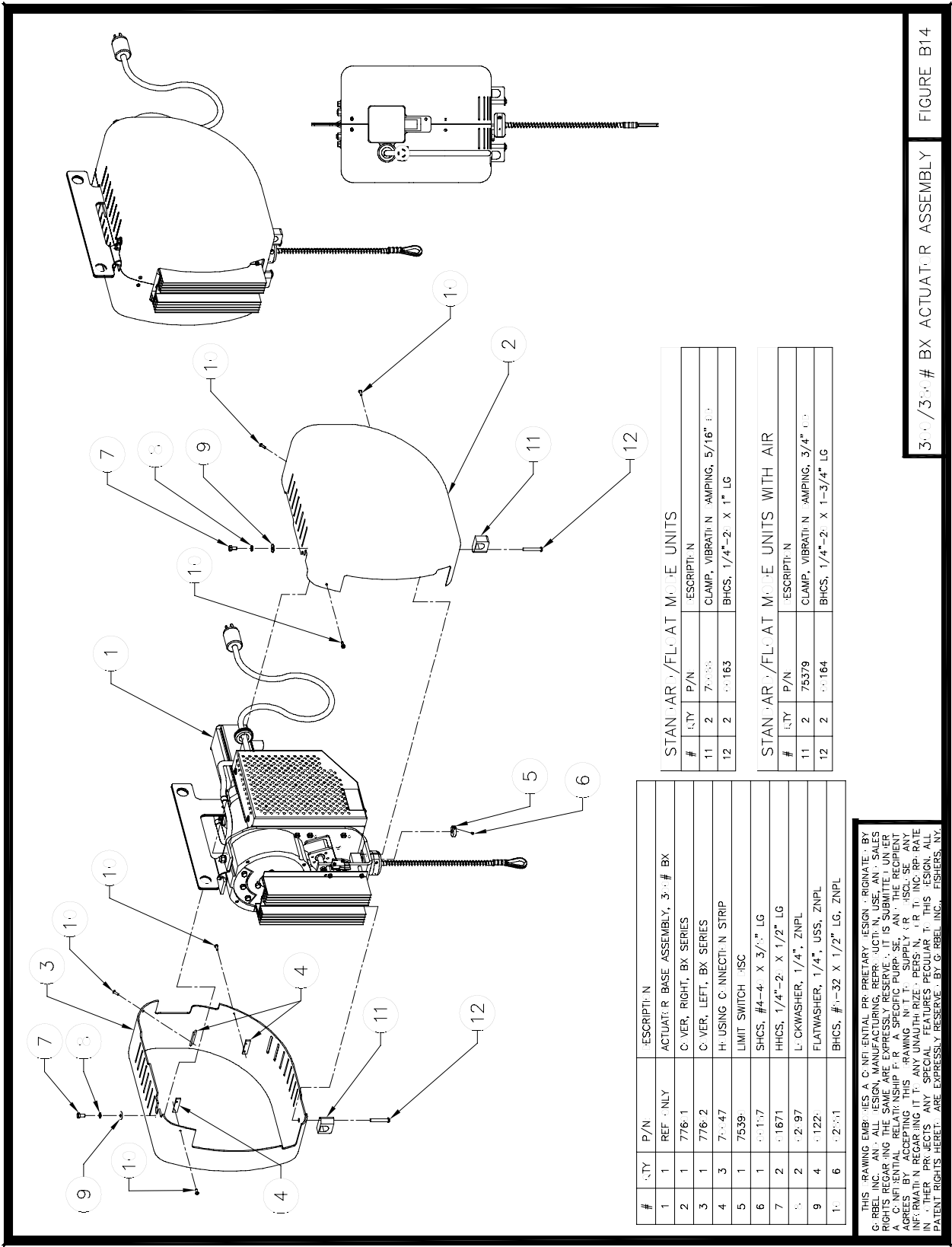


Figure B14. 300/380# BX Actuator Assembly.

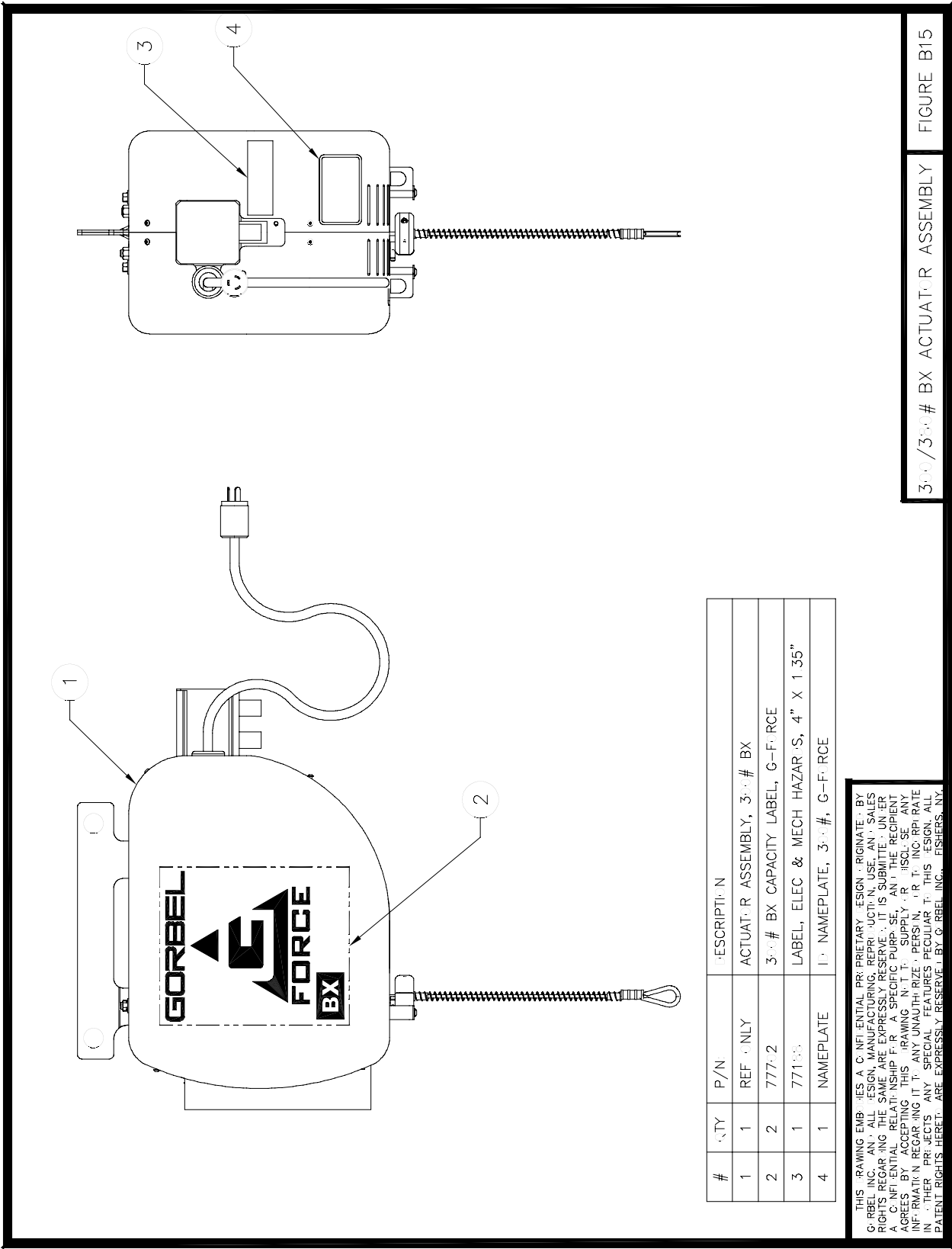


Figure B15. 300/380# BX Actuator Assembly.

APPENDIX C - PENDANT HANDLE ASSEMBLY

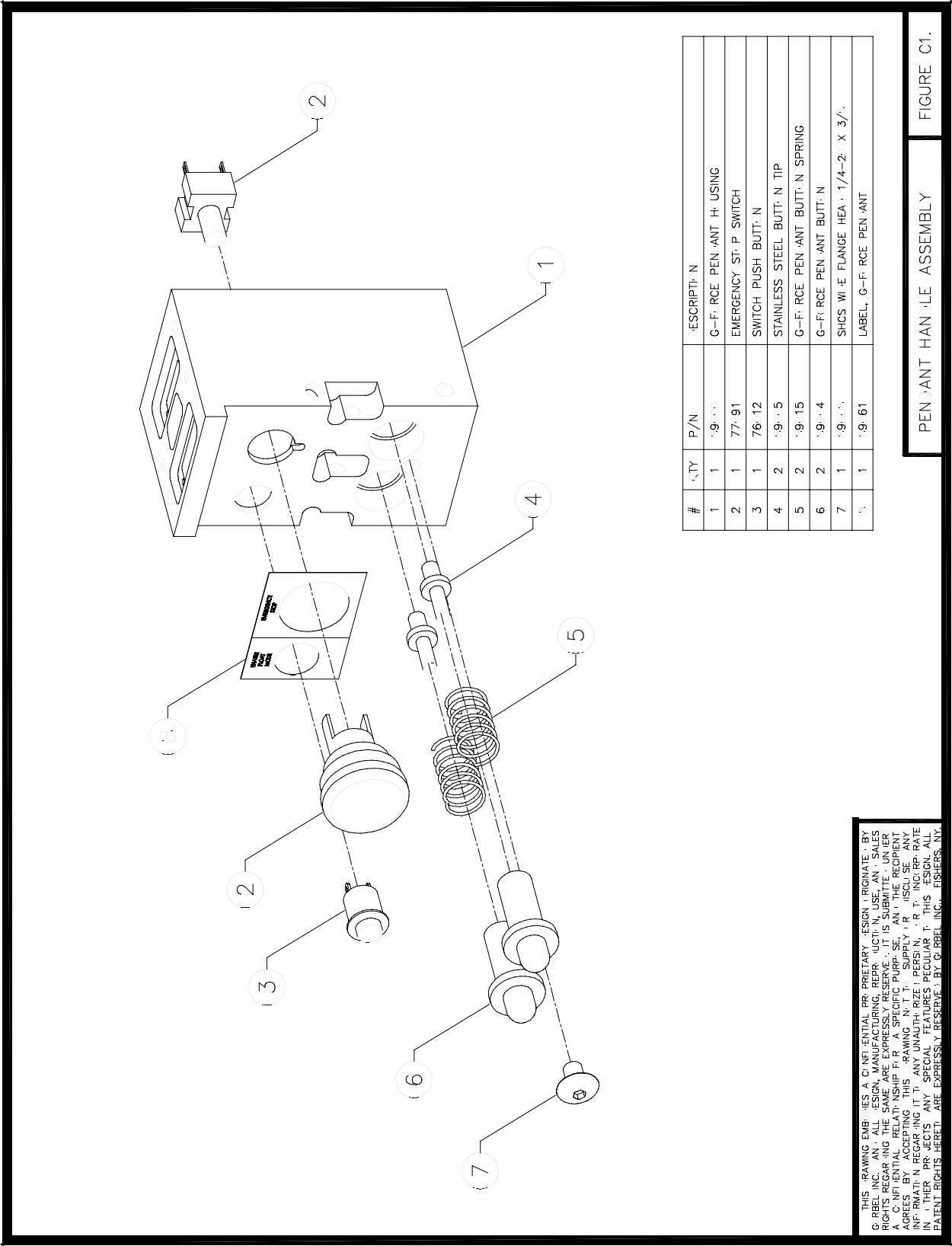


Figure C1. Pendant Handle Assembly.

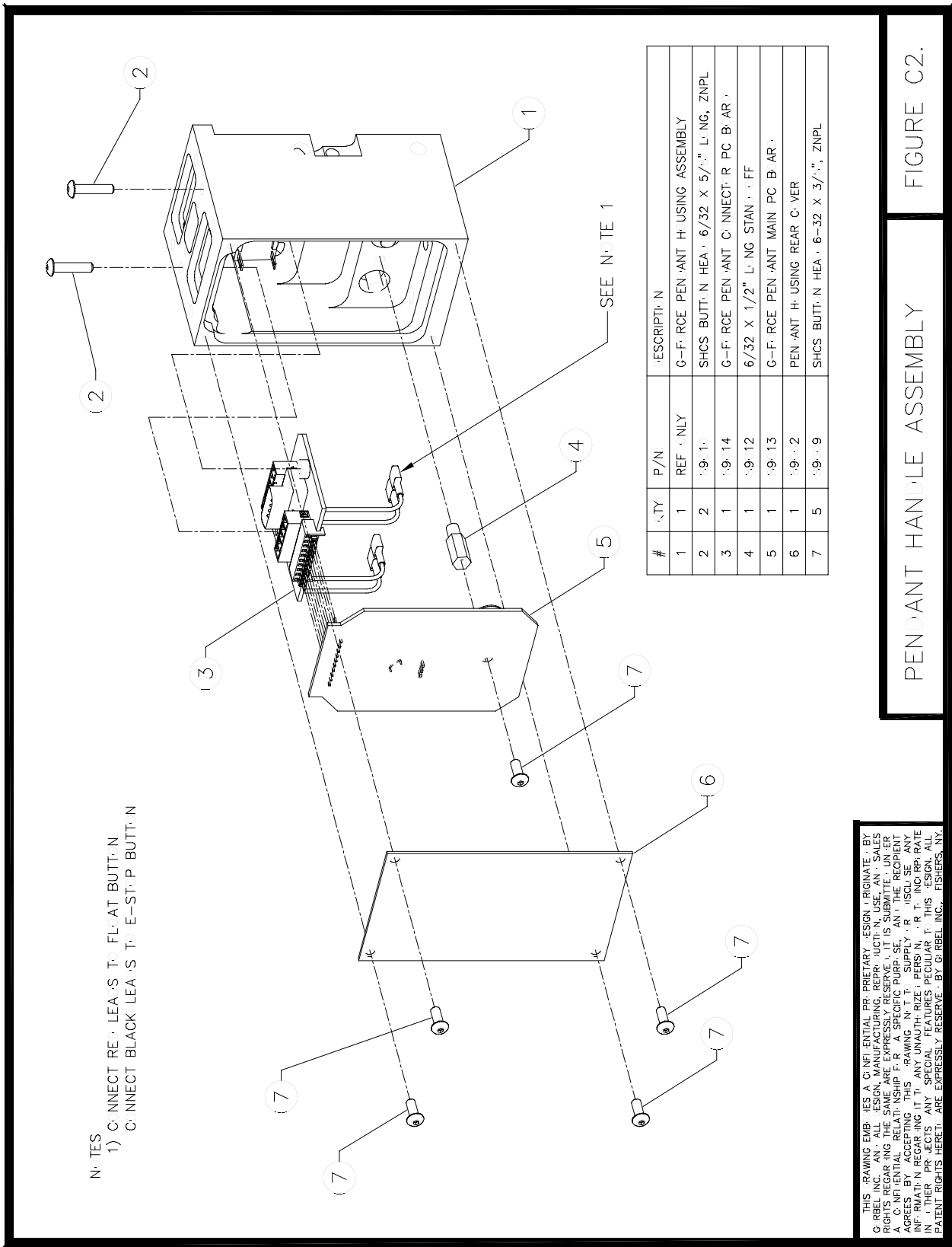
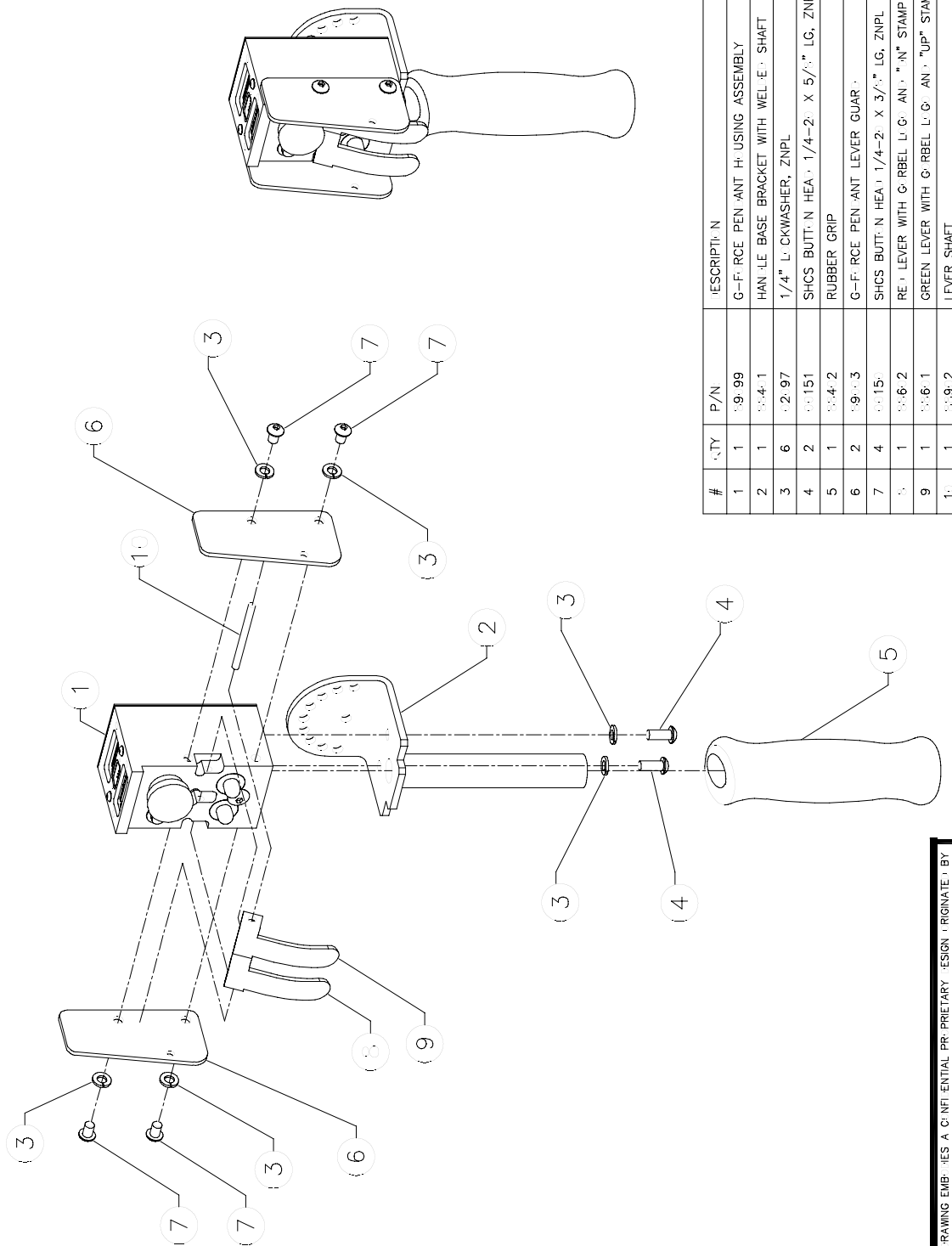


Figure C2. Pendant Handle Assembly.

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PENDANT HANDLE ASSEMBLY

FIGURE C2.



#	QTY	P/N	DESCRIPTION
1	1	19-99	G-F-RCE PEN ANT H- USING ASSEMBLY
2	1	19-4-1	HANDLE BASE BRACKET WITH WEL-E SHAFT
3	6	12-97	1/4" LOCKWASHER, ZNPL
4	2	19-151	SHCS BUTT-N HEA 1/4-2" X 5/16" LG, ZNPL
5	1	19-4-2	RUBBER GRIP
6	2	19-13	G-F-RCE PEN ANT LEVER GUAR
7	4	19-15	SHCS BUTT-N HEA 1/4-2" X 3/16" LG, ZNPL
8	1	19-6-2	RE-1 LEVER WITH G-RBEL LG AN-"N" STAMP
9	1	19-6-1	GREEN LEVER WITH G-RBEL LG AN-"UP" STAMP
10	1	19-9-2	LEVER SHAFT

PEN ANT HANDLE ASSEMBLY

FIGURE C3.

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Figure C3. Pendant Handle Assembly.

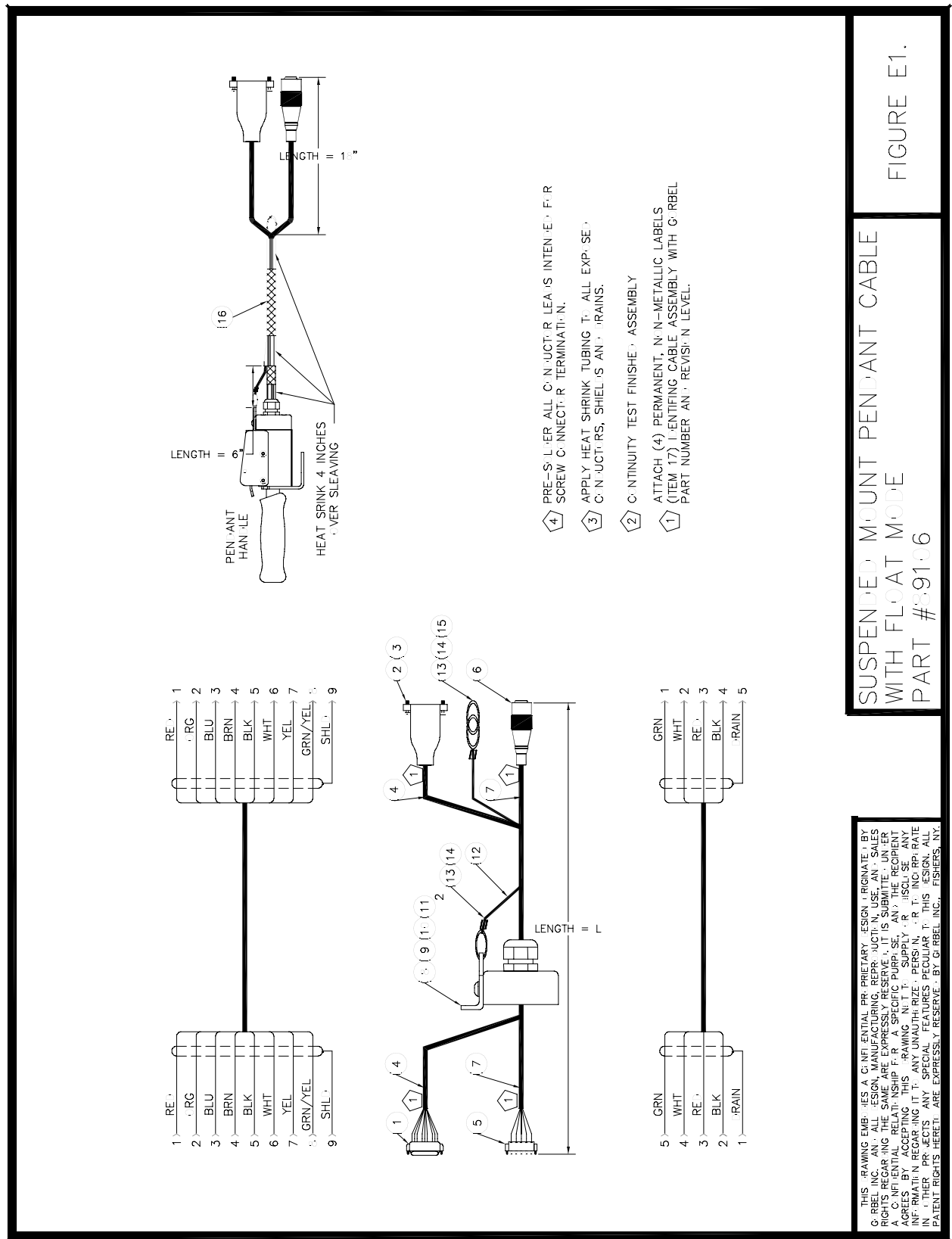
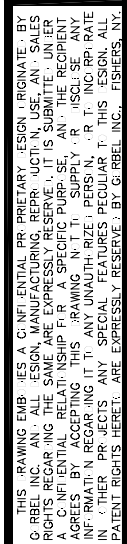


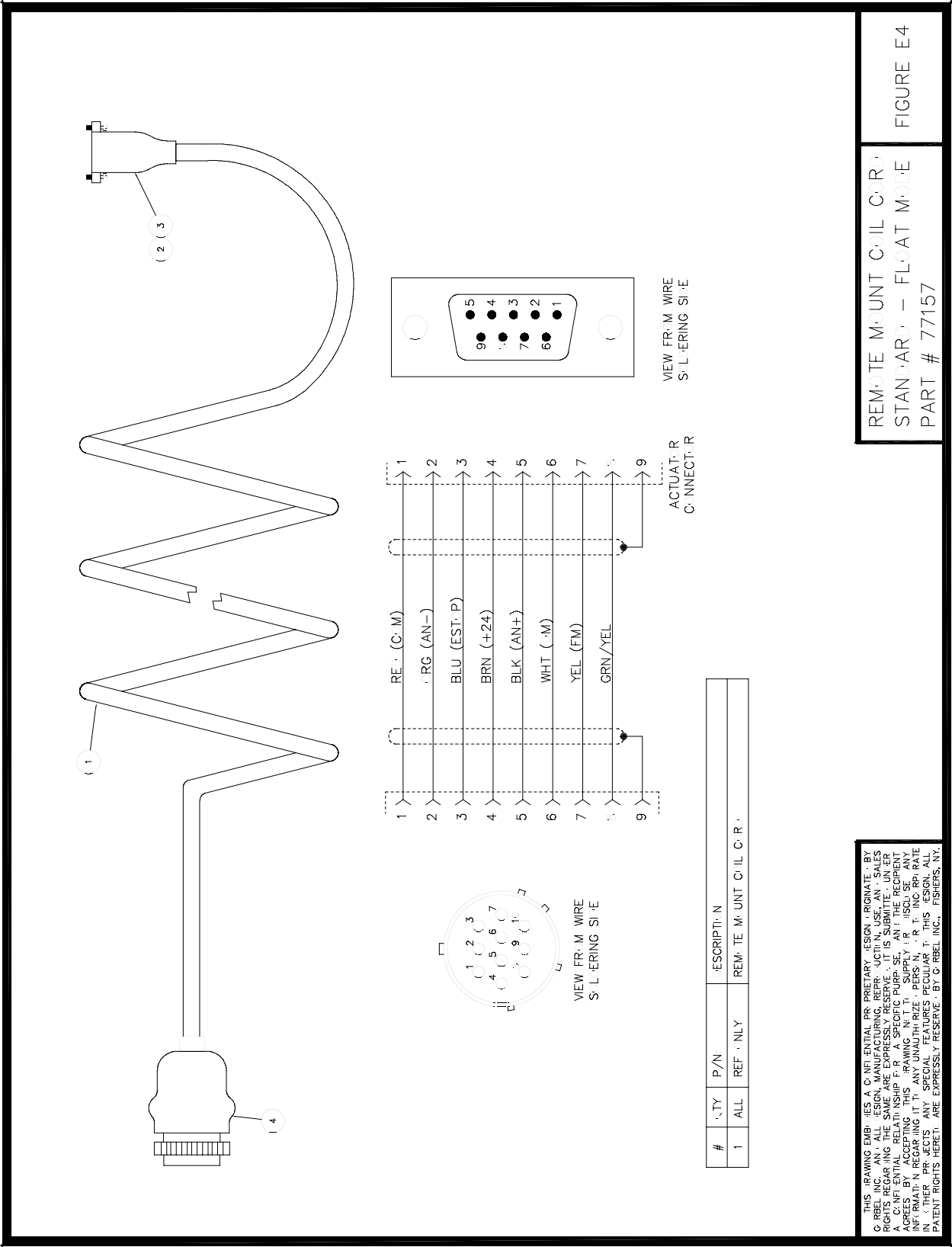
FIGURE E1.

SUSPENDED MOUNT PENDANT CABLE
WITH FLOAT MODE
PART # 9106

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SUSPENDED MOUNT PENDANT CABLE
WITH UT FLAT MODE
PART # 91.5

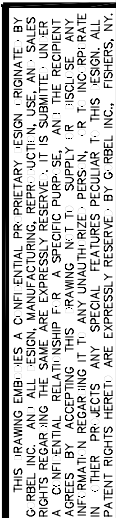


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REMOTE MOUNT COIL CORD
STANDARD - FLOAT MODE
PART # 77157

FIGURE E4

Figure E4. Remote Mount Coil Cord Standard - Float Mode.



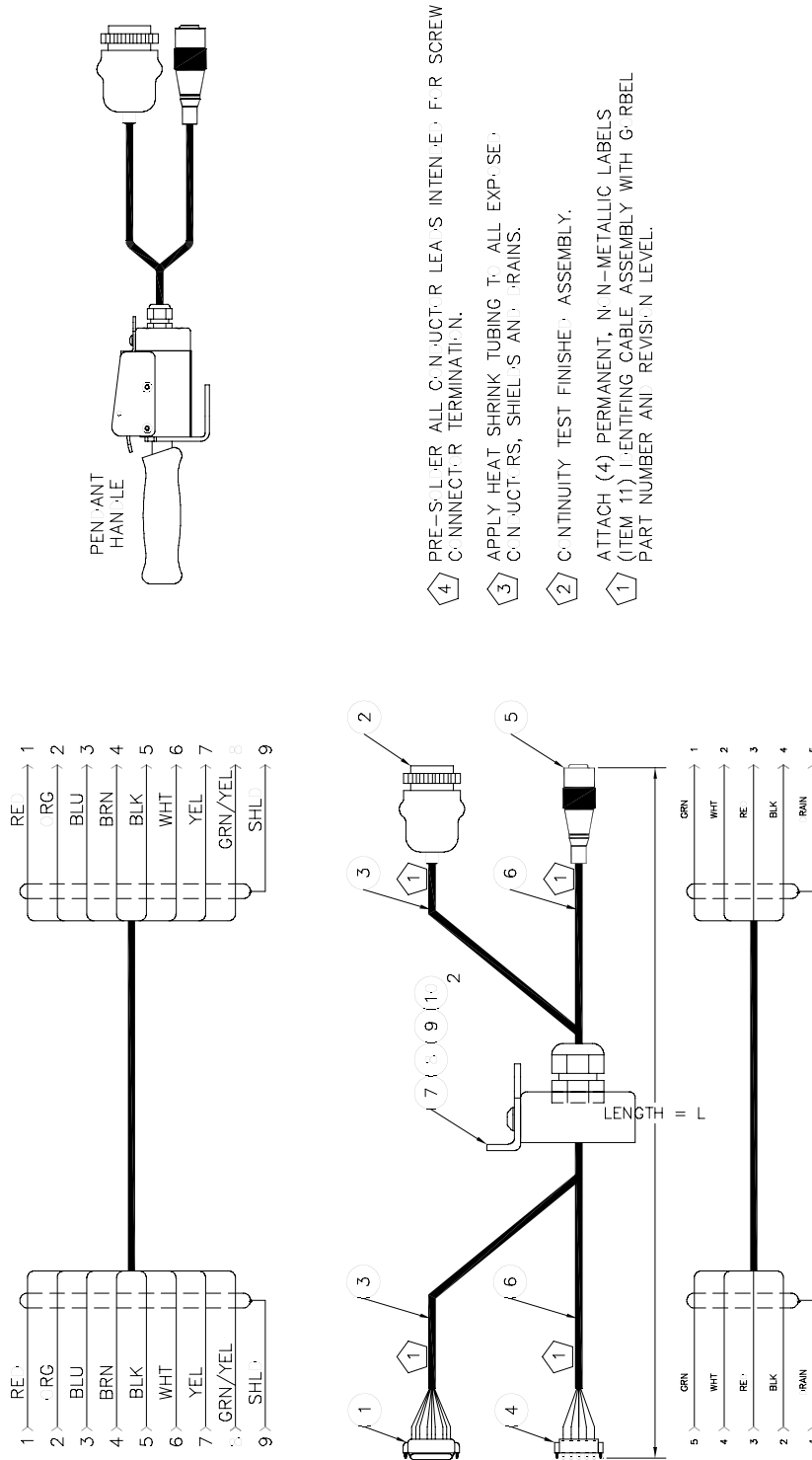


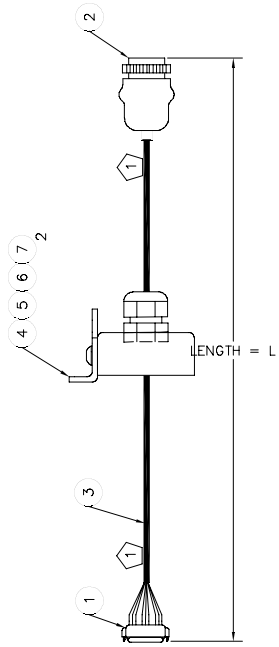
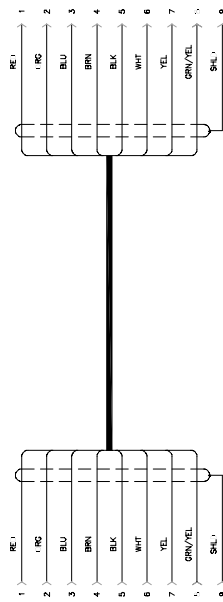
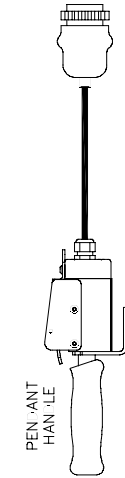
Figure E6. Remote Mount Pendant with Float Mode.

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REMOTE MOUNT PENDANT
WITH FLOAT MODE
PART #89108

FIGURE E6.

ITEM	G-RBEL P/N	DESCRIPTION	QTY
1	7295	C-CONNECTOR, 1/2" SUB, SOCKET, 9-PIN, SOLDER	1
2	77153	C-CONNECTOR, CIRCULAR, PIN, 1/2" P.S., SOLDER	1
3	77154	CABLE, 24 AWG, 1/2" C.N., SHIELD	FT
4	753	STRAIN RELIEF, TYPE SL-13, THREE, PG13, GRY	1
5	79-1	C-VER, G-F-RCE PENDANT C-CONNECTOR	1
6	79-16	G-F-RCE PENDANT TYP GAUR	1
7	7715	SHCS 1/4-20 x 3/4", ZNPL	2
8	---	LABEL	2



- 3 APPLY HEAT SHRINK TUBING TO ALL EXPOSED CONDUCTORS, SHIELDS AND BRAIDS.
- 2 CONTINUITY TEST FINISHED ASSEMBLY
- 1 ATTACH (2) PERMANENT, NON-METALLIC LABELS (ITEM 8) IDENTIFYING CABLE ASSEMBLY WITH G-RBEL PART NUMBER AND REVISION LEVEL.

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REMOTE MOUNT PENDANT WITHOUT FLOAT MODE

FIGURE E7.

Figure E7. Remote Mount Pendant without Float Mode.

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Figure F1. *BX Controls Schematic Standard - Float Mode.*

NOTE 1: 22·V PRESENT IN MANY COMPONENTS. USE CAUTION AT ALL TIMES.
DIGITAL CIRCUITS AT UP TO 22·V FROM EARTH.

NOTE 2. COLORS IN () INDICATE ALTERNATE CABLE COLORS

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APPENDIX G - OVERALL G-FORCE® REFERENCE DIMENSIONS

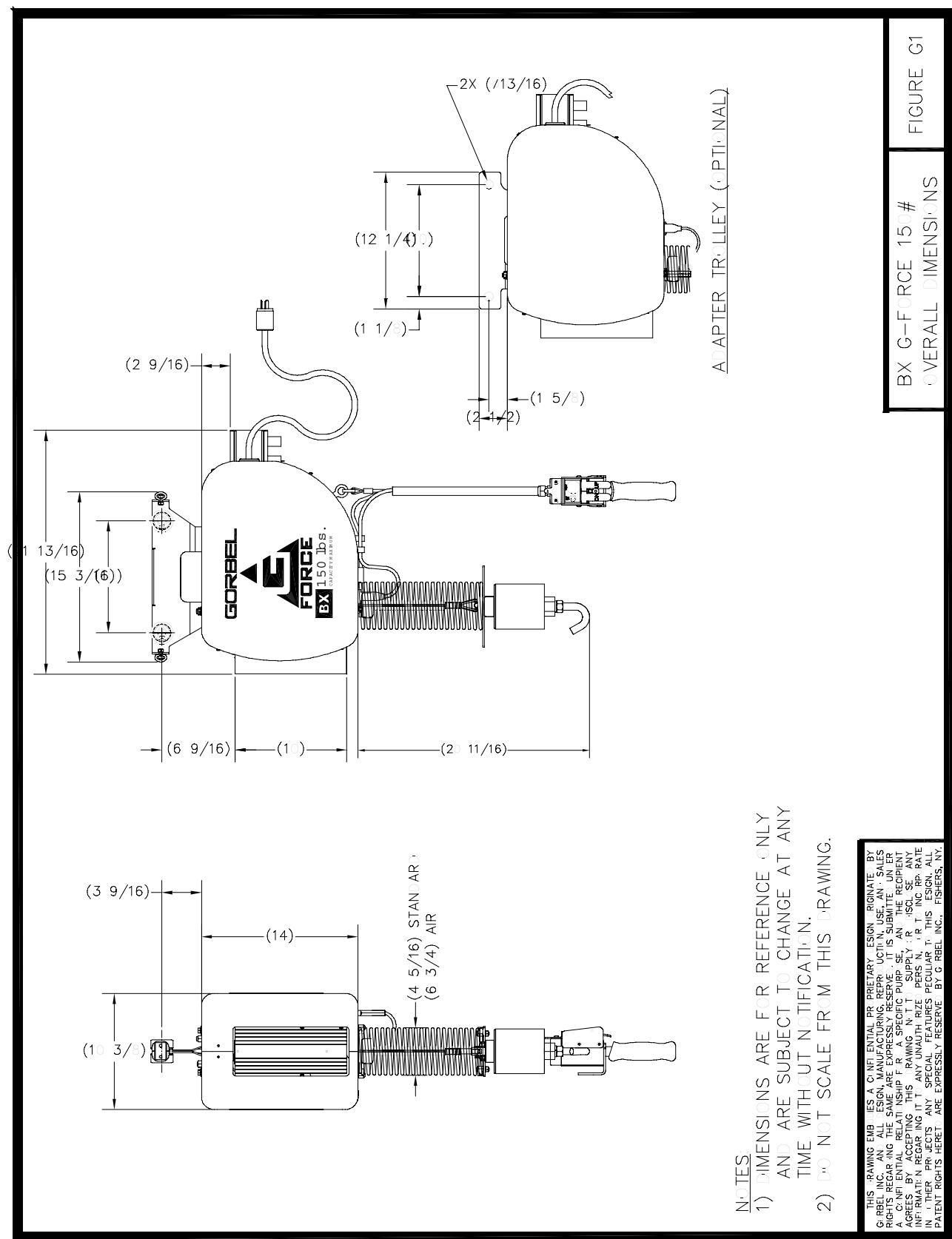
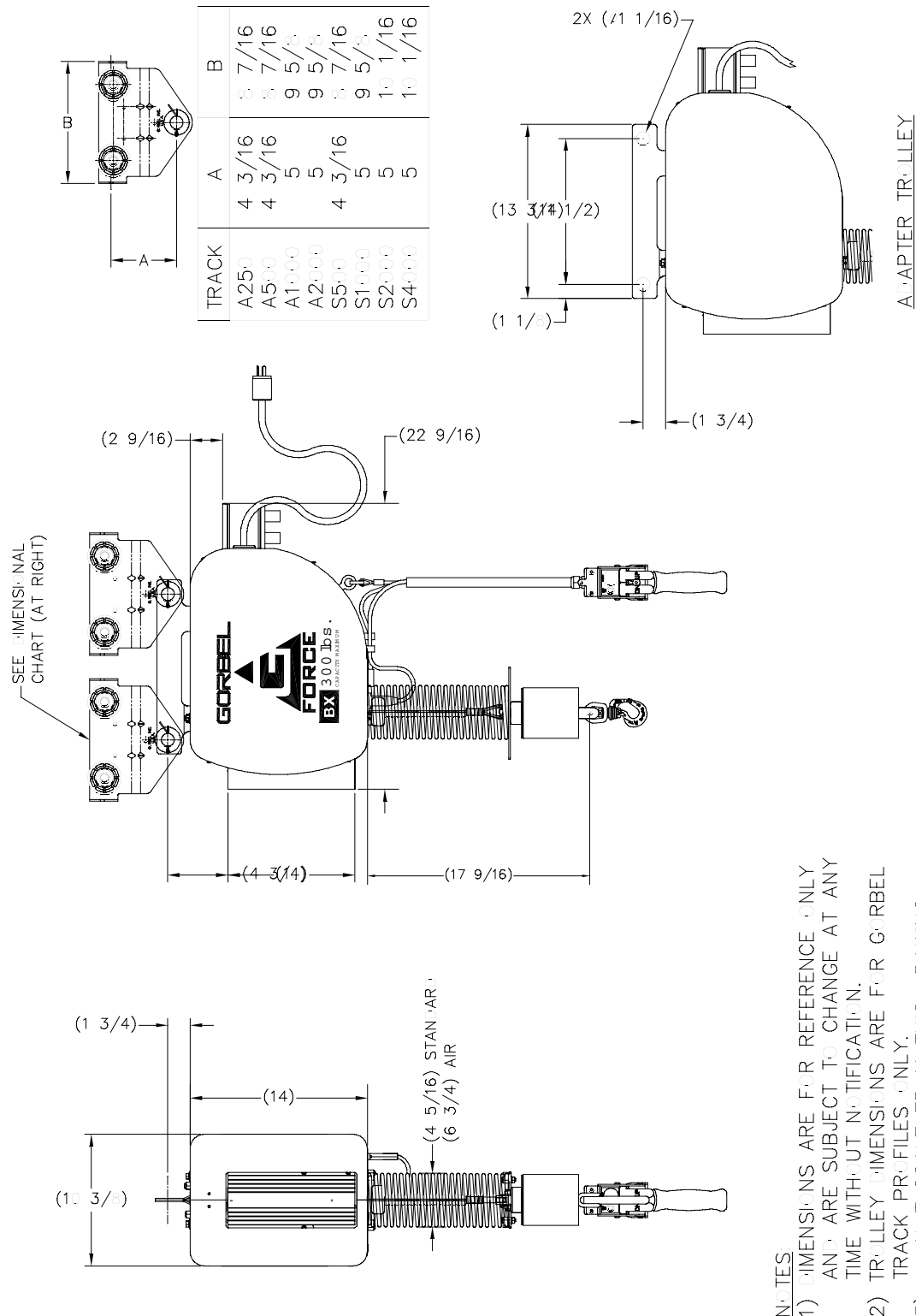


Figure G1. BX G-Force® 150# with Suspended Pendant Overall Dimensions.



- NOTES:**
- 1) DIMENSIONS ARE FOR REFERENCE ONLY. ANY ARE SUBJECT TO CHANGE AT ANY TIME WITHOUT NOTIFICATION.
 - 2) TRAILLEY DIMENSIONS ARE FOR GORBEL TRACK PROFILES ONLY.
 - 3) DO NOT SCALE FROM THIS DRAWING.

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BX G-Force 300/380#
OVERALL DIMENSIONS
FIGURE G2

Figure G2. BX G-Force® 300/380# with Suspended Pendant Overall Dimensions.

10/04-Rev. K



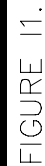


Figure I1. 150# Suspended Pendant with Float Mode Component Layout.

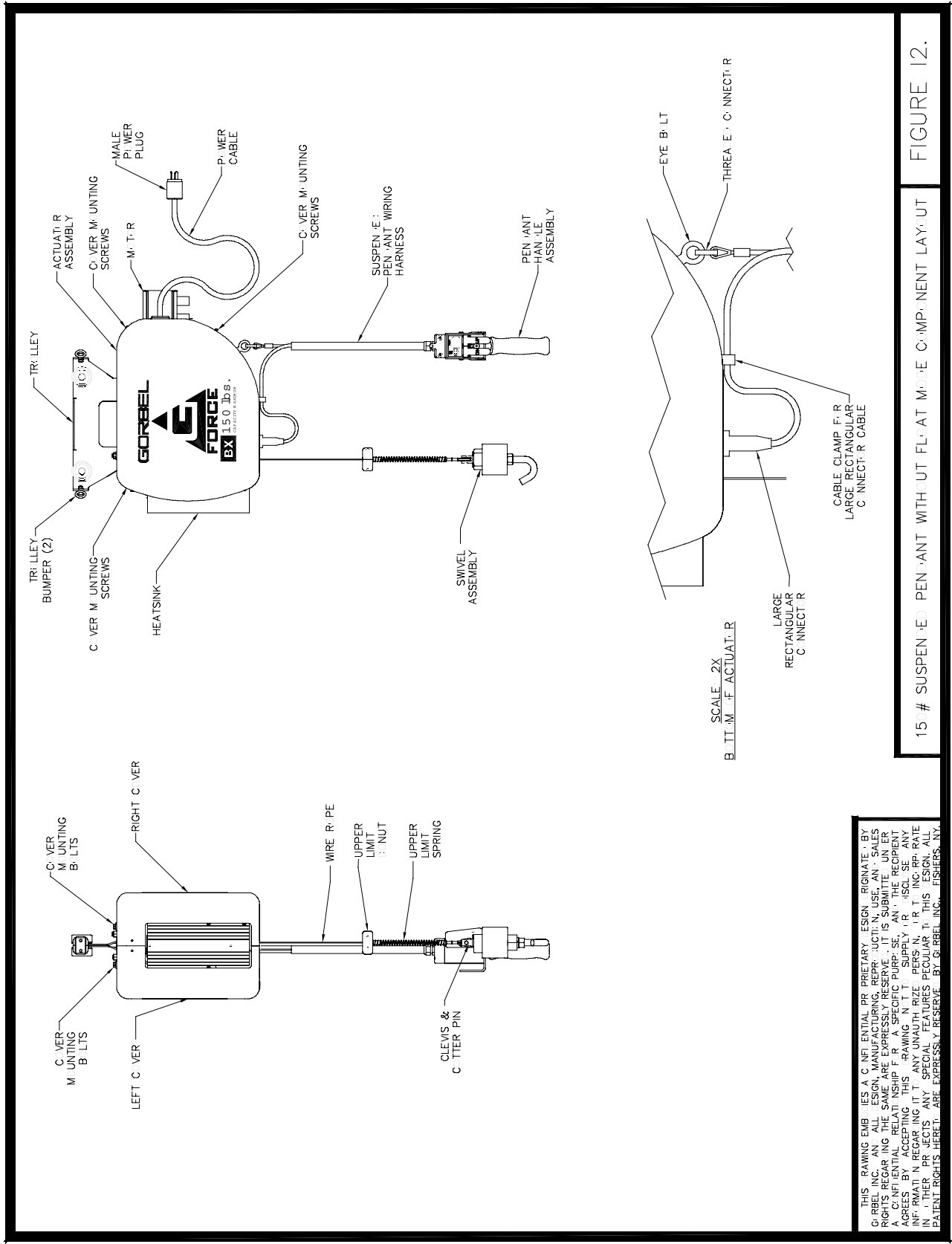


Figure I2. 150# Suspended Pendant without Float Mode Component Layout.

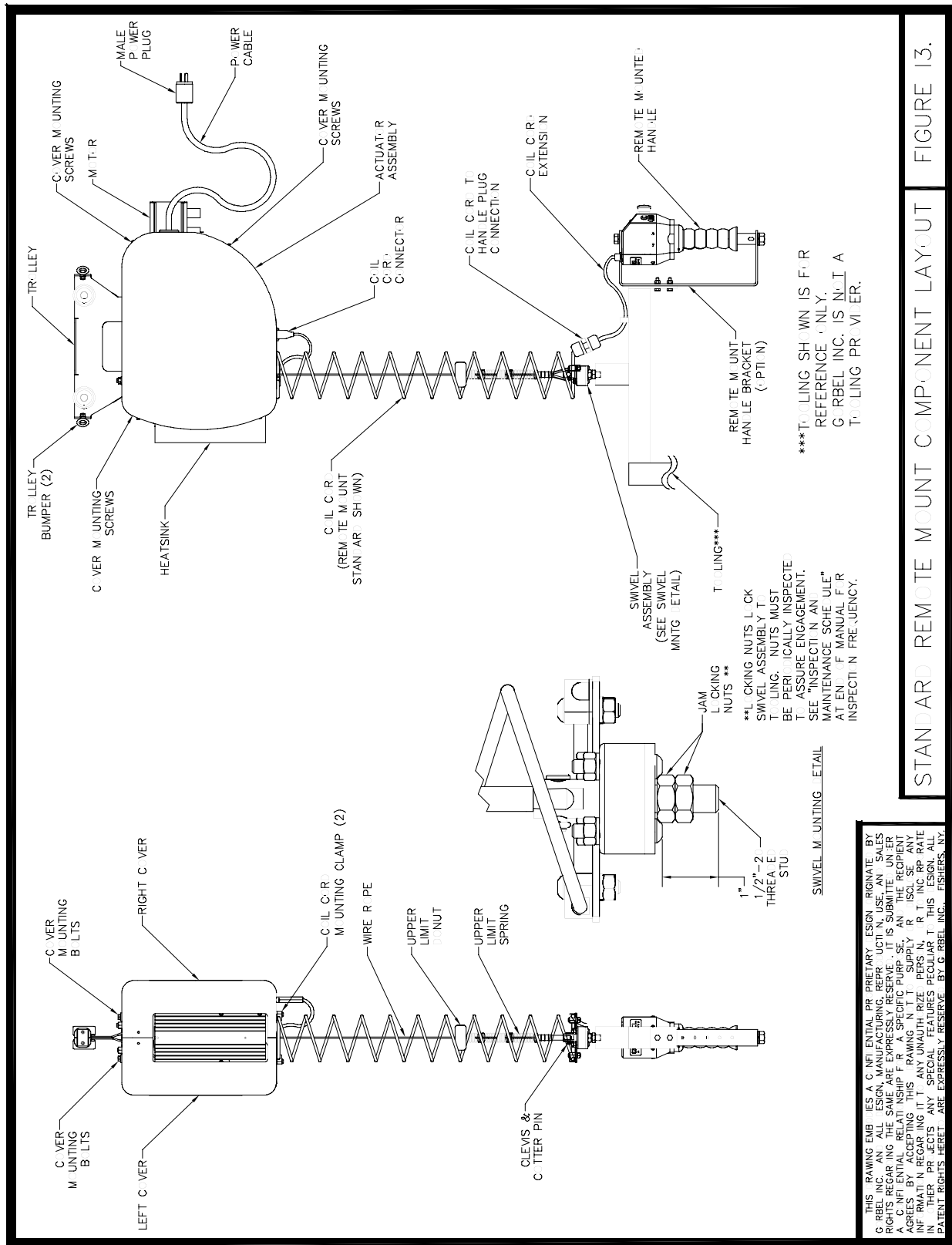


Figure 13. 300/380# Suspended Pendant with Float Mode Component Layout.

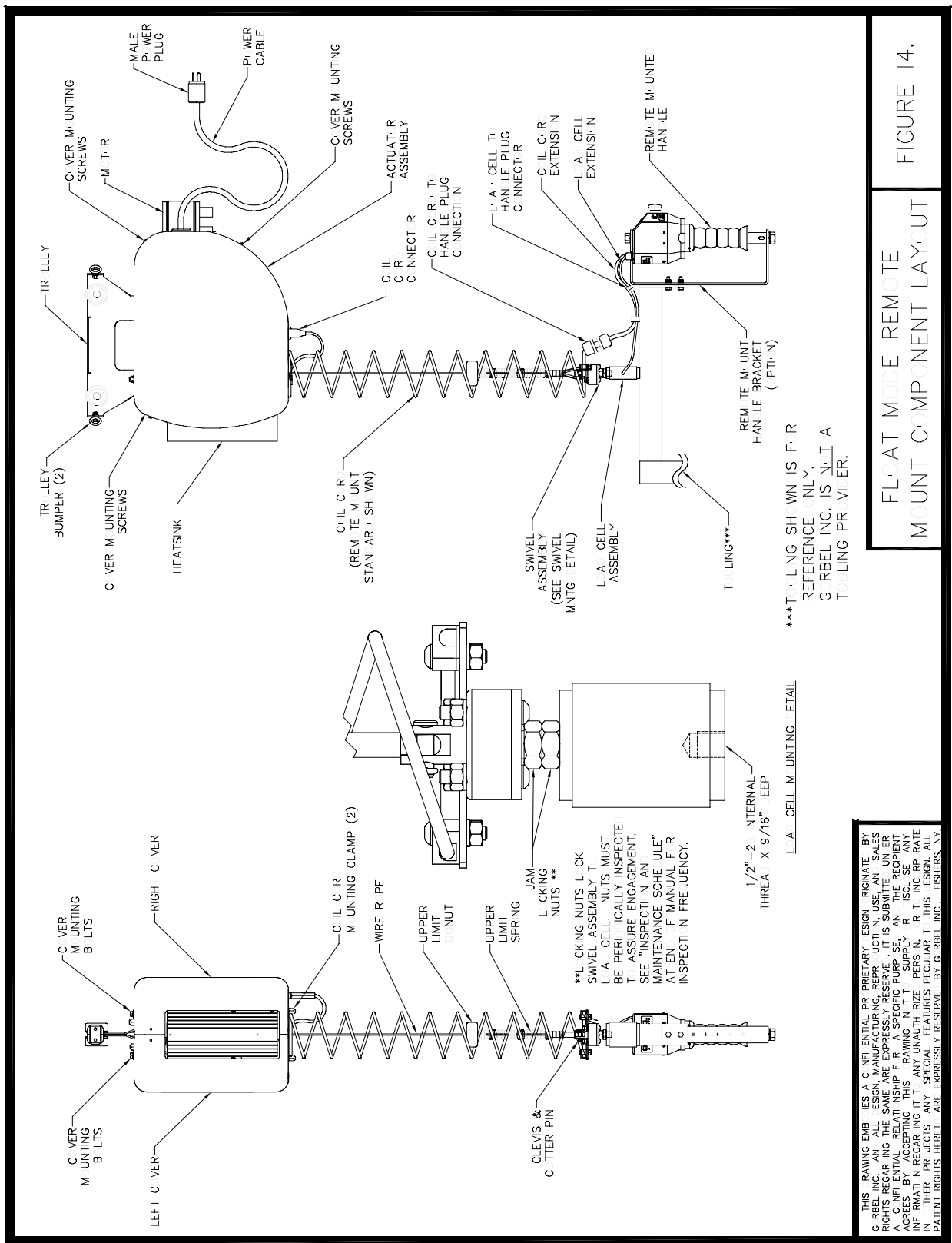


Figure 14. 300/380# Suspended Pendant without Float Mode Component Layout.

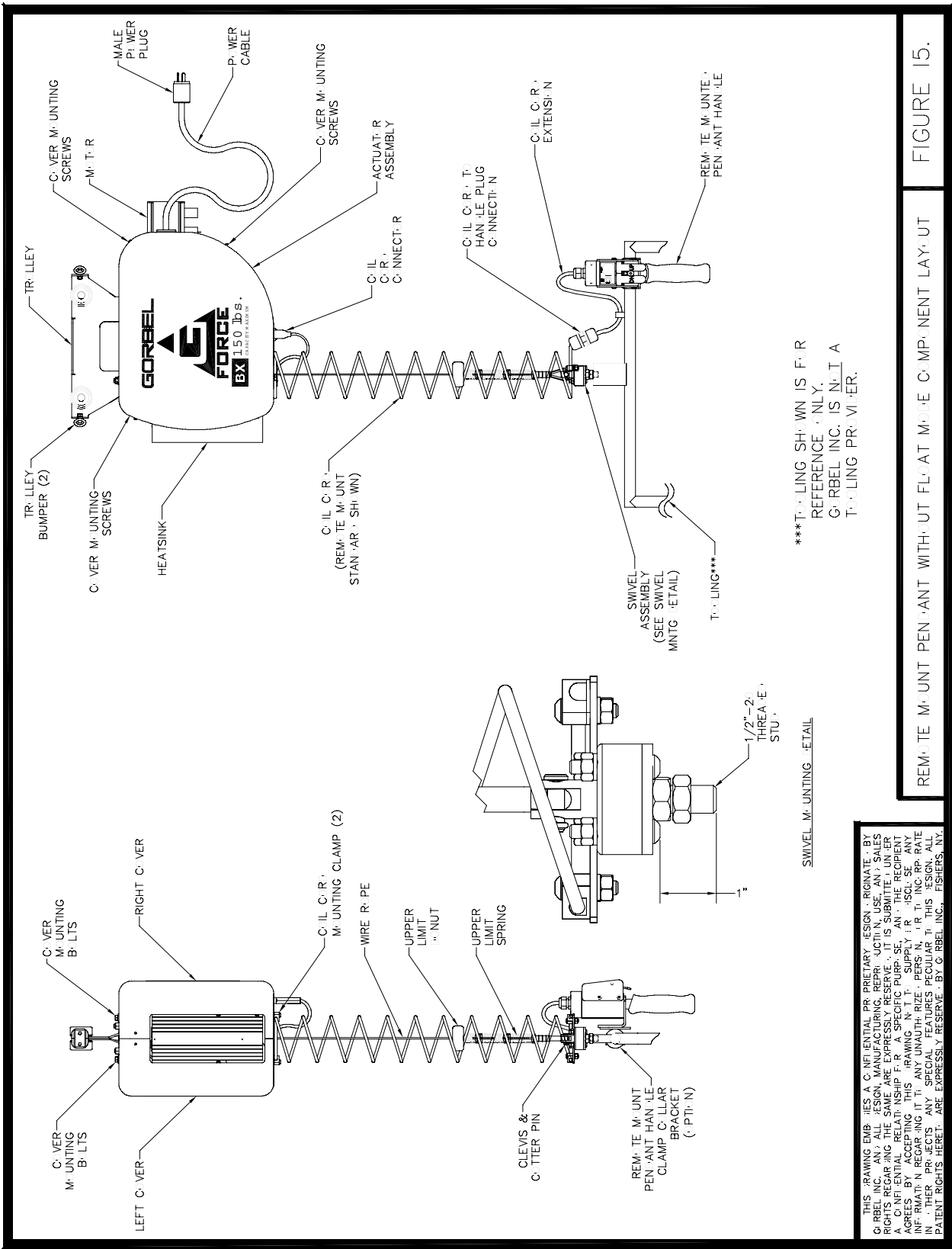


FIGURE I5.

REMOTE MOUNT PENDANT WITHOUT Float Mode Component Layout

Figure I5. Remote Mount Pendant without Float Mode Component Layout.

RECOMMENDED SPARE PARTS LIST

<u>Item #</u>	<u>Part #</u>	<u>Description</u>	<u>Qty</u>
1	77157	Coil Cord, Remote Mount, 150, 300, & 380#, Standard & Float Mode	1
2	77665	Coil Cord, Remote Mount with Air, 150, 300, & 380#, Standard & Float Mode	1
3	77315	Wire Rope Replacement Assembly, 150, 300, & 380#	1
4	73099	Idler Pulley Guide Block, 150, 300, & 380#	1
5	75354	Upper Limit Switch, 150, 300, & 380#	1
6	77084	Lower Limit/Slack Switch, 150, 300, & 380#	3
7	77559	Offset Idler Pulley, 150, 300, & 380#	1
8	72190	Controls Assembly, MLD-114	1
9	78010	BX G-Force® Universal Miscellaneous Hardware Kit	1

Contact Gorbel® Customer Service for Spare Parts pricing and availability.

LIMITED WARRANTY

It is agreed that the equipment purchased hereunder is subject to the following LIMITED warranty and no other. Gorbel Incorporated ("Gorbel") warrants the manual push-pull Work Station Cranes, Jib Crane, and Gantry Crane products to be free from defects in material or workmanship for a period of five years or 10,000 hours use from date of shipment. Gorbel warrants the Motorized Work Station Cranes and Jib Crane products to be free from defects in material or workmanship for a period of two years or 4,000 hours use from the date of shipment. Gorbel warrants the G-Force® and Easy Arm™ products to be free from defects in material or workmanship for a period of one year or 2,000 hours use from the date of shipment. This warranty does not cover Gantry Crane wheels. This warranty shall not cover failure or defective operation caused by operation in excess of recommended capacities, misuses, negligence or accident, and alteration or repair not authorized by Gorbel. No system shall be field modified after manufacture without the written authorization of Gorbel, Inc. Any field modification made to the system without the written authorization of Gorbel, Inc. shall void Gorbel's warranty obligation. OTHER THAN AS SET FORTH HEREIN, NO OTHER EXPRESS WARRANTIES, AND NO IMPLIED WARRANTIES, ORAL OR WRITTEN, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE MADE BY GORBEL WITH RESPECT TO ITS PRODUCTS AND ALL SUCH WARRANTIES ARE HEREBY SPECIFICALLY DISCLAIMED. GORBEL SHALL NOT BE LIABLE UNDER ANY CIRCUMSTANCES FOR ANY INCIDENTAL, SPECIAL AND/OR CONSEQUENTIAL DAMAGES WHATSOEVER, WHETHER OR NOT FORESEEABLE, INCLUDING BUT NOT LIMITED TO DAMAGES FOR LOST PROFITS AND ALL SUCH INCIDENTAL, SPECIAL AND/OR CONSEQUENTIAL DAMAGES ARE HEREBY ALSO SPECIFICALLY DISCLAIMED. Gorbel's obligation and Purchaser's or end user's sole remedy under this warranty is limited to the replacement or repair of Gorbel's products at the factory, or at the discretion of Gorbel, at a location designated by Gorbel. Purchaser or end user shall be solely responsible for all freight and transportation costs incurred in connection with any warranty work provided by Gorbel hereunder. Gorbel will not be liable for any loss, injury or damage to persons or property, nor for damages of any kind resulting from failure or defective operation of any materials or equipment furnished hereunder. Components and accessories not manufactured by Gorbel are not included in this warranty. Purchaser's or end user's remedy for components and accessories not manufactured by Gorbel is limited to and determined by the terms and conditions of the warranty provided by the respective manufacturers of such components and accessories.

A) DISCLAIMER OF IMPLIED WARRANTY OF MERCHANTABILITY

Gorbel and Purchaser agree that the implied warranty of merchantability is excluded from this transaction and shall not apply to the goods involved in this transaction.

B) DISCLAIMER OF IMPLIED WARRANTY OF FITNESS FOR PARTICULAR PURPOSE

Gorbel and Purchaser agree that the implied warranty of fitness for particular purpose is excluded from this transaction and shall not apply to the goods involved in this transaction.

C) DISCLAIMER OF EXPRESS WARRANTY

Gorbel's agents, or dealer's agents, or distributor's agents may have made oral statements about the machinery and equipment described in this transaction. Such statements do not constitute warranties, and Purchaser agrees not to rely on such statements. Purchaser also agrees that such statements are not part of this transaction.

D) DISCLAIMER OF SPECIAL, INCIDENTAL AND CONSEQUENTIAL DAMAGES

Gorbel and Purchaser agree that any claim made by Purchaser which is inconsistent with Gorbel's obligations and the warranty remedies provided with Gorbel's products, and in particular, special, incidental and consequential damages, are expressly excluded.

E) DEALER OR DISTRIBUTOR NOT AN AGENT

Gorbel and Purchaser agree that Purchaser has been put on notice that dealer or distributor is not Gorbel's agent in any respect for any reason. Gorbel and Purchaser also agree that Purchaser has been put on notice that dealer or distributor is not authorized to incur any obligations or to make any representations or warranties on Gorbel's behalf other than those specifically set forth in Gorbel's warranty provided in connection with its product.

F) MERGER

This warranty agreement constitutes a final and complete written expression of all the terms and conditions of this warranty and is a complete and exclusive statement of those terms.

G) PAINTING

Every crane (excluding components) receives a quality paint job before leaving the factory. Unfortunately, no paint will protect against the abuses received during the transportation process via common carrier. We have included at least one (1) twelve ounce spray can for touchup with each crane ordered (unless special paint was specified). If additional paint is required, contact a Gorbel® Customer Service Representative at 1-800-821-0086 or 1-585-924-6262.

Title and Ownership:

Title to the machinery and equipment described in the foregoing proposal shall remain with Gorbel and shall not pass to the Purchaser until the full amount hereof is agreed to be paid has been fully paid in cash.

Claims and Damages:

Unless expressly stated in writing, goods and equipment shall be at Purchaser's risk on and after Seller's delivery in good shipping order to the Carrier. Gorbel shall in no event be held responsible for materials furnished or work performed by any person other than it or its authorized representative or agent.

Cancellations:

If it becomes necessary for the purchaser to cancel this order wholly or in part, he shall at once so advise Gorbel in writing. Upon receipt of such written notice all work will stop immediately. If the order entails only stock items, a flat restocking charge of 15% of the purchase price will become due and payable by Purchaser to Gorbel. Items purchased specifically for the canceled order shall be charged for in accordance with the cancellation charges of our supplier plus 15% for handling in our factory. The cost of material and/or labor expended in general fabrication for the order shall be charged for on the basis of total costs to Gorbel up to the time of cancellation plus 15%.

Returns:

No equipment, materials or parts may be returned to Gorbel without express permission in writing to do so.

Extra Charge Delay: If Purchaser delays or interrupts progress of Seller's performance, or causes changes to be made, Purchaser agrees to reimburse Gorbel for expense, if any, incident to such delay.

Changes and Alterations:

Gorbel reserves the right to make changes in the details of construction of the equipment, as in its judgment, will be in the interest of the Purchaser; will make any changes in or additions to the equipment which may be agreed upon in writing by the Purchaser; and Gorbel is not obligated to make such changes in products previously sold any customer.

Third Party Action:

Should Gorbel have to resort to third party action to collect any amount due after thirty (30) days from date of invoice, the Purchaser agrees to pay collection costs, reasonable attorney's fees, court costs and legal interest.

OSHA Responsibilities:

Gorbel agrees to fully cooperate with Purchaser in the design, manufacture or procurement of safety features or devices that comply with OSHA regulations. In the event additional equipment or labor shall be furnished by Gorbel, it will be at prices and standard rates then in effect, or as may be mutually agreed upon at the time of the additional installation.

Equal Employment Opportunity:

Gorbel agrees to take affirmative action to ensure equal employment opportunity for all job applicants and employees without regard to race, color, age, religion, sex, national origin, handicap, veteran, or marital status. Gorbel agrees to maintain non-segregated work facilities and comply with rules and regulations of the Secretary of Labor or as otherwise provided by law or Executive Order.

INSPECTION AND MAINTENANCE SCHEDULE

G-FORCE® BX ILD INSPECTION AND MAINTENANCE SCHEDULE			
ITEM	COMPONENT	MAINTENANCE	FREQUENCY*
1	Wire Rope	Check for distortion of the rope such as kinking, crushing, unstranding, birdcaging, main strand displacement, or core protrusion. General corrosion, broken or cut strands, and number, distribution, and type of visible broken wires	Start of each Shift
2	Wire Rope	Maintenance listed in (1), as well as reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires. Severely corroded or broken wires at end connections. Severely corroded, cracked, bent, worn, or improperly applied end connections.	Periodically (to be determined by qualified persons only)
3	Coil Cord Assembly	Check to make sure there is no excessive wearing of the coil cable sleeving caused by the wire rope. Check for excessive bends or pinching. Check that Mating Connector is secured to the Actuator properly. Assure the Strain Relief at the Handle is properly tightened.	Start of each Shift
4	Pendant Handle	Check for smooth operation of levers.	Start of each Shift
5	G-Force® Assembly	Conduct a visual inspection of the entire BX G-Force® unit.	Start of each Shift
6	Pulleys	Inspect the Slack-Idler Pulley for excessive wear. Replace Pulleys immediately if excessive wear or damage is present.	Every 90 Days
7	Limit Switches	Verify that the Upper and Lower Limit Switches are operating properly. Verify that the Slack Switch is operating properly. Replace Switches immediately if they are damaged.	Every 90 Days
8	Slack Switch Sliding Mechanism	Verify that the Slack Switch Sliding Mechanism is functioning properly. Replace Slack Switch Sliding Mechanism if not operating correctly.	Every 90 Days
9	Wheels	Check for cracks, pits, and/or grooves. All of these increase pull forces. If any of these conditions exist, wheels should be replaced.	Every 2000 Hours or Yearly
10	Pendant Handle	Perform general cleaning of the Pendant Handle, being sure to remove all debris and foreign substances that may exist.	Periodically based on Application (to be determined by qualified persons only)
11	Hardware	Perform routing inspection of all hardware connections, verifying that all lockwashers are compressed and nuts tightened to manufacturer's specifications. Be sure to verify the jam nuts located between the swivel assembly and handle/tooling are properly torqued.	Every 90 Days

* Federal, state and local codes may require inspection and maintenance checks more often. Please check the federal, state and local code manuals in your area.

WARNING

Any changes in rotating effort or unusual noises must be immediately identified and corrected.

WARNING

DO NOT TWIST COIL CABLE ASSEMBLY. OVER TWISTING OF HANDLE WILL CAUSE SHORTING IN COIL CABLE ASSEMBLY, THEREFORE CAUSING PREMATURE UNIT FAILURE. KEEP ROTATION OF HANDLE TO LESS THAN 360 DEGREES.

GORBEL®

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G-Force® Preventative Maintenance Bulletin

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IMPORTANT! DO NOT DISCARD

This document contains important preventive maintenance procedures that could help eliminate potential service issues and prolong the life of your G-Force® unit.

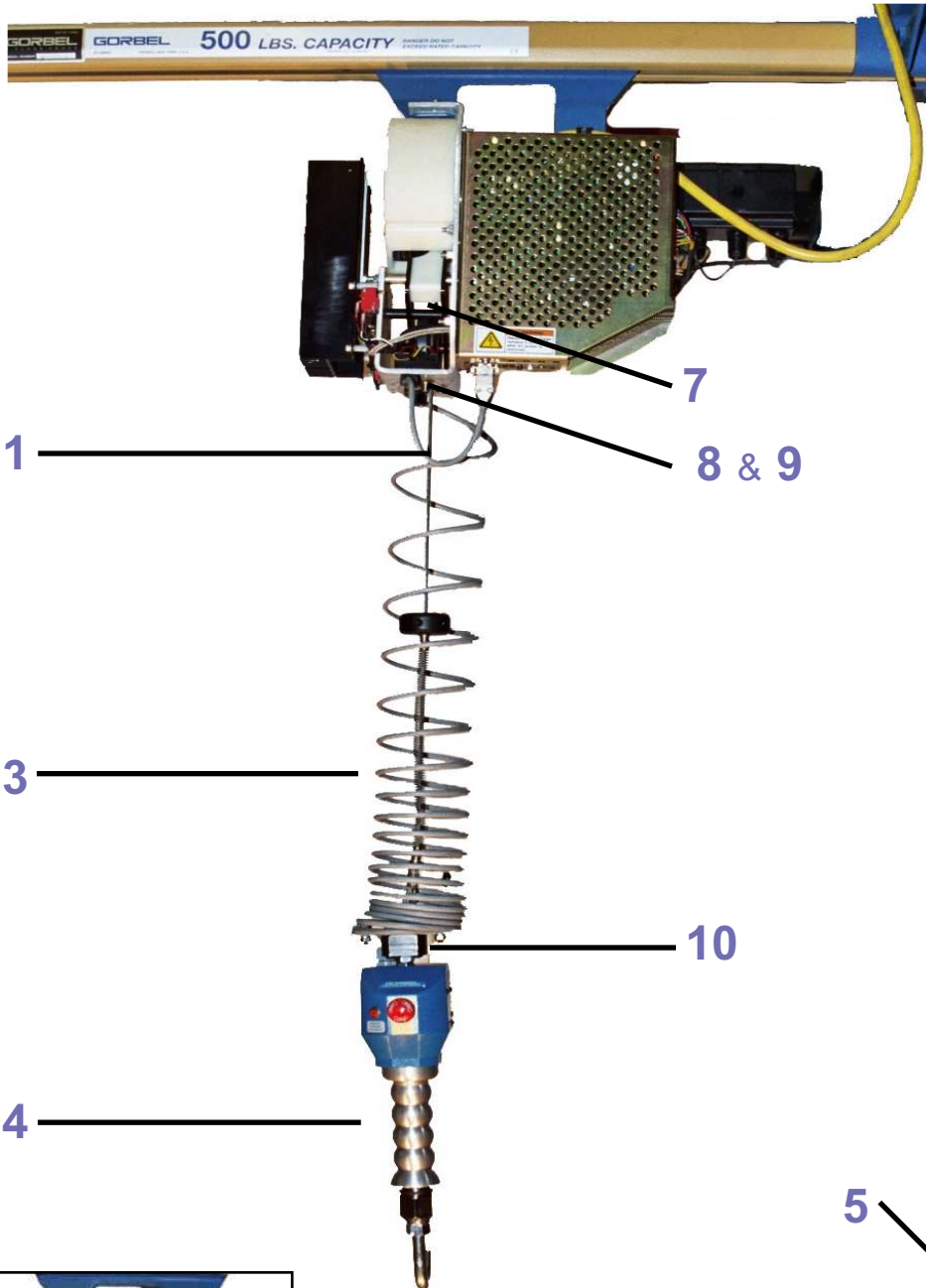
Please familiarize your G-Force® operators and maintenance staff with the procedures detailed in this bulletin.

THE SMARTER WAY TO LIFT

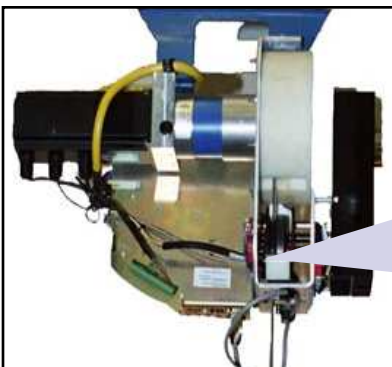




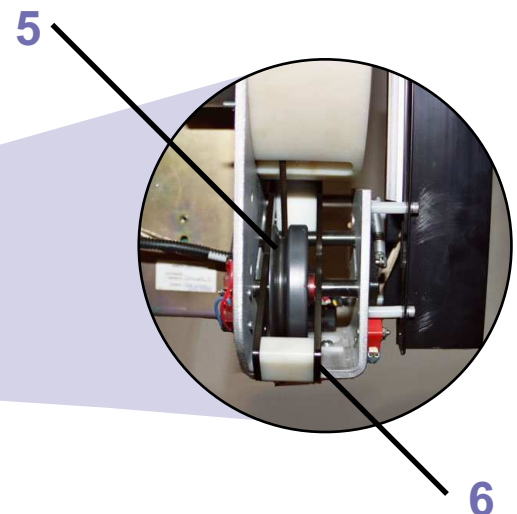
G-Force™ BX & BXi models



Note: Enlarged photo is BX 150 model with actuator covers removed.



Reverse Angle



90-Day Maintenance Check

Item 5: Idler Pulley

- Inspect the Slack Idler Pulley for excessive wear or obvious damage.
- Replace the Slack Idler Pulley if excessively worn or damaged.

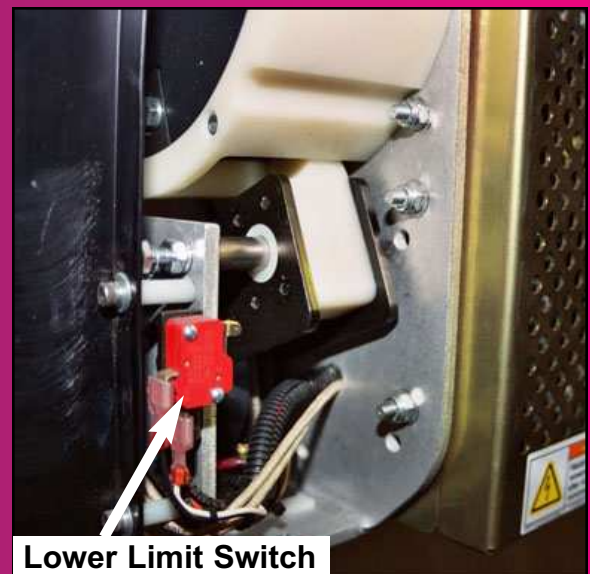
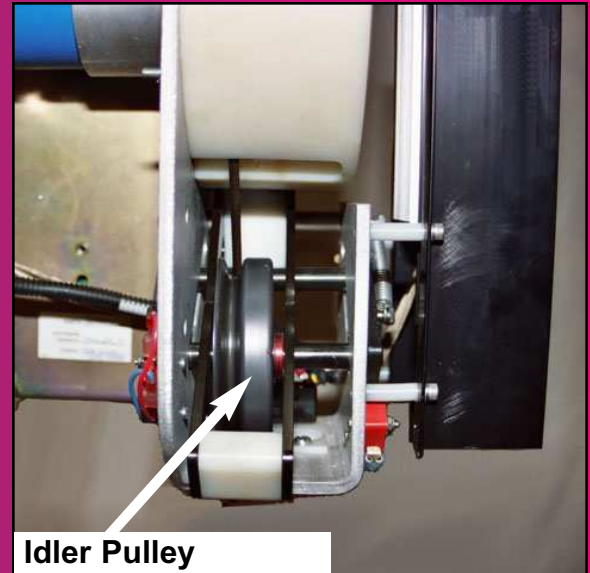
Item 6: Upper Limit Switch*

- Verify that the Upper Limit Switch actuates and deactuates freely.
- Check that the Upper Limit Switch Disk is installed properly.
- Verify that the Wire Rope Upper Limit Donut contacts the Upper Limit Switch Disk when the Handle is raised to it's uppermost position.

Item 7: Lower Limit Switch*

- Verify that the Lower Limit Switch actuates and deactuates freely.
- Check that the Lower Limit Switch is actuated when the Pulley Guide Mechanism moves towards the end of it's travel.

** Note: This is a dynamic test that must be performed with the Actuator Covers removed, Coil Cord and Handle electrically connected to the Actuator and AC power applied to the system. Use the jog buttons to initiate movement in both directions.*

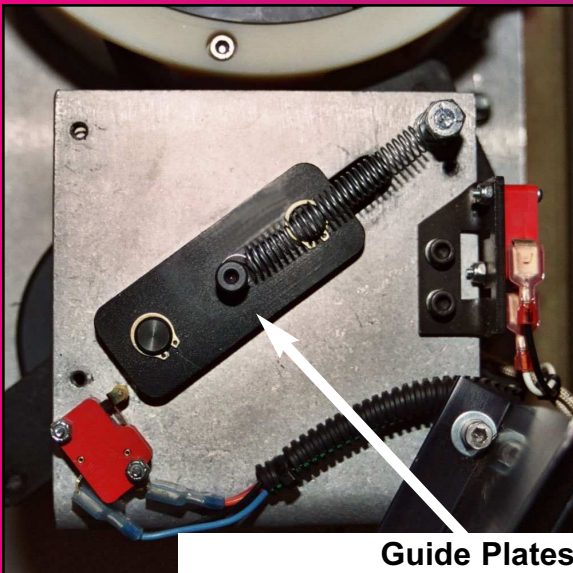


90-Day Maintenance Check



Item 8: Slack System*

- Verify that the Pulley Guide Mechanism moves freely from side to side as the Wire Rope Drum Pulley rotates in each direction.



Item 9: Slack System*

- Verify that the Guide Plates move freely along the Actuator frame and actuate the Slack Switches when the Pulley Guide Mechanism is at its lowest position.



Item 10: Hardware - Swivel Nuts

- Perform a routine inspection of all the system hardware connections, verifying that all lockwashers are compressed and nuts tightened to manufacturer's specifications.
- Be sure to verify the jam nuts located between the Swivel Assembly and Handle or Tooling are properly torqued.

** Note: This is a dynamic test that must be performed with the Actuator Covers removed, Coil Cord and Handle electrically connected to the Actuator and AC power applied to the system. Use the jog buttons to initiate movement in both directions.*

Maintenance Check - Start of Every Shift

Item 1: Wire Rope

Check for signs of:

- Kinking
- Crushing
- Unstranding
- Birdcaging
- Corrosion
- Broken or cut strands
- Any other obvious defects along any section of wire rope.

Item 2: Coil Cord

Check for:

- Excessive wear caused by the Wire Rope rubbing against the Coil Cord.
- Excessive bends or pinching or other obvious damage.
- Electrical connection secure at the Actuator.
- Coil Cord is secured at the Actuator end with the proper size clamps.

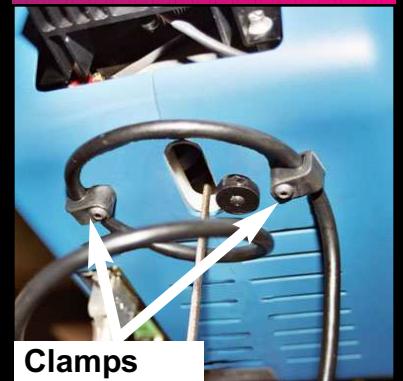
Item 3: Coil Cord

Check for:

- Excessive bends, pinching or other obvious damage
- Electrical connection is secure at the handle.
- Coil Cord is secured to the Coil Cord Support Bar at the lower end of the Coil Cord.

Item 4 Handle Assembly

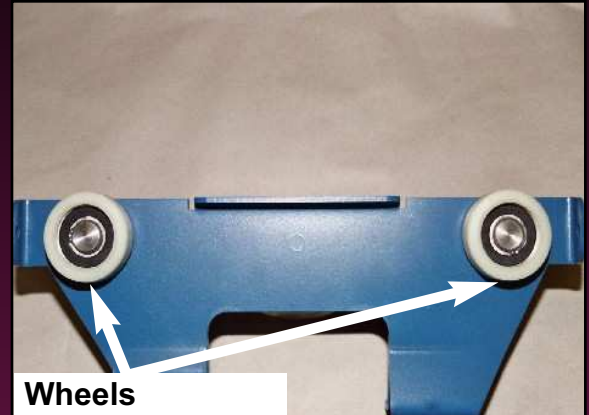
- Check for the smooth operation of sliding portion of the Sliding Handle.
- Check the Operator Present Switch Lever for free movement.
- Check that the Swivel functions freely without any restrictions.
- Check for the smooth operation of the levers of Pendant Handle.



Maintenance Check - Every 2000 Hours/Annually

Item 11: Wheels

- Check for cracks, pits and / or grooves. All of these increase pull forces.
- If any of the above conditions exist, wheels should be replaced.



Item 12: System

- Perform a routine inspection of all the supporting system hardware connections, verifying that all lockwashers are compressed and nuts tightened to manufacturer's specifications.

Spare part kits are available for all Gorbel Intelligent Lifting Devices. Contact your Gorbel distributor for pricing and availability.



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