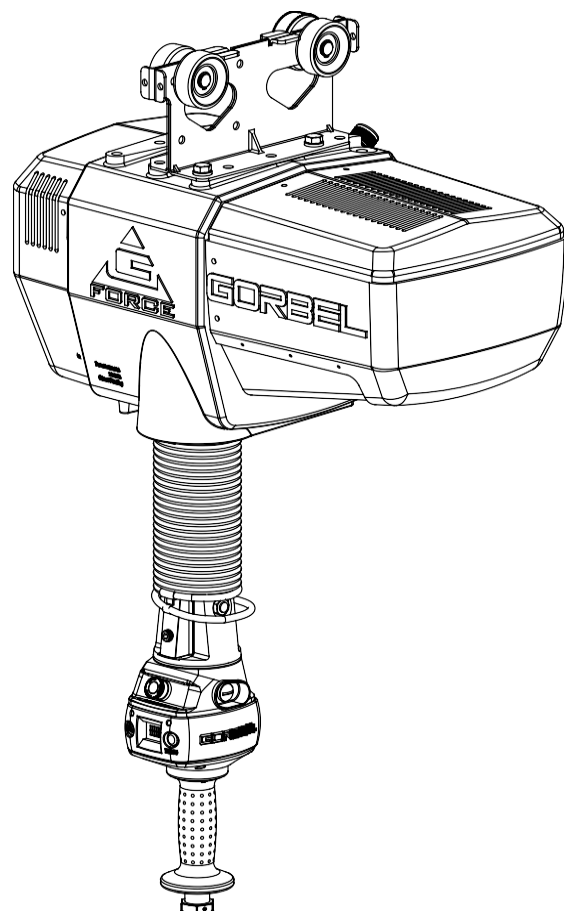**IMPORTANT!**
DO NOT DESTROY
OR DISCARD.

Installation, Operation, & Maintenance Manual

Default Settings for your G-Force® unit:
☐ *AP SSID*: G-Force AP Order Number
☐ *AP Password*: Order Number
☐ *Station SSID*: G-Force STA
☐ *Station Password*: mypassword

Refer to Appendix B for detailed instructions on connecting to your G-Force® unit.

G-Force®
Q2 and iQ2 Series

Gorbel® Customer Order No. / Serial No. _____

Gorbel® Dealer _____

_____

Date_____
　　　　　　　　　Month　　　　　　　Year

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TABLE OF CONTENTS

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 who 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 a 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 Cranes, Derricks, Hoists
- ANSI B30.2 - Overhead and Gantry Cranes
- ANSI B30.16 - Overhead Hoists

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 impact between two hoists or between hoist and end stop. Do not tamper with or adjust any parts of the hoist unless specifically authorized to do so.
8. Never use the load cable as a sling.
9. Do not divert attention from load while operating hoist.
10. Never leave a suspended load unattended.
11. 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.
12. Never operate a hoist that has an inherent or suspected mechanical or electrical defect.
13. Do not use load cable as a ground for welding. Never touch a live welding electrode to the load cable.
14. 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 current failure, or burnout, if continued to excess.
15. Do not operate hoist if load is not centered under hoist.
16. Do not operate hoist if cable is twisted, kinked, or damaged.
17. Do not remove or obscure label.
18. Do not permanently activate operator present sensor.
19. Do not dis/reassemble components while the hoist is energized, 'Hot-Swapping' of components is *strongly* discouraged.

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 hoist.
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 signals of only those persons authorized to give them.
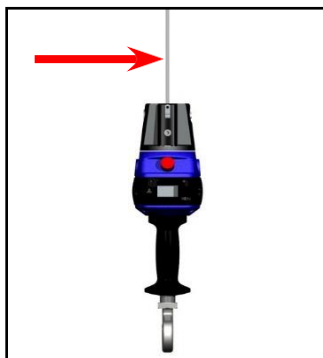
G-FORCE® OPERATIONAL GUIDELINES

All operators should read the G-Force® Installation and Operation Manual before operating the unit. Please follow the instructions contained in this manual for your safety and the optimum trouble-free operation of your G-Force®.

Read and follow all instructions and warning information on or attached to the G-Force®.

Check Wire Rope for improper seating, twisting, kinking, wear or defects before operating.
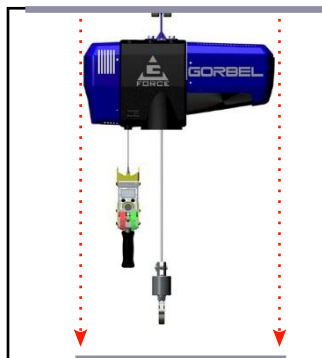
Center G-Force® over the load before lifting a load. Do not end or side load.

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

Check the coil cord for improper seating, twisting, kinking, wear or defects before operating.
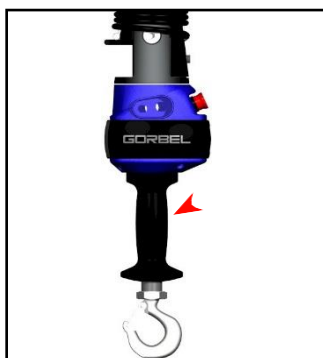
The operator's hand should not leave the handle grip at any time the G-Force® is in use (excluding Float Mode).
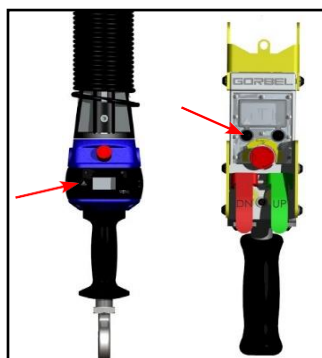
Float Mode – press the G-Force® button with only the load weight hanging from the unit. Applying additional force will cause unit to drift.
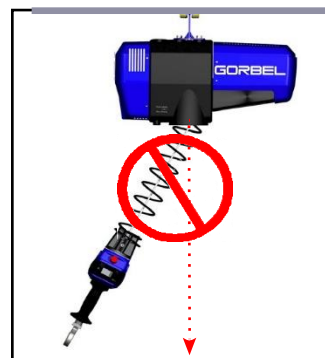
The wire rope should never be >15° out of vertical while the G-Force® is in use. The G360 must be level at all times.

Do not impact the G-Force® into end stops repeatedly or at a speed faster than a normal walking pace.

What is Trolley Saddle? The distance from bottom of wheels to floor.

Maximum Trolley Saddle or the G-Force® with standard in-line slide handle is 14'.
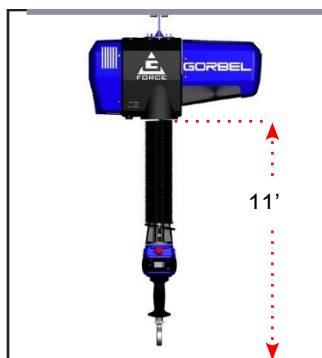
11'

The maximum available wire rope travel for the G-Force® is 11'.

For H5 duty cycle, the maximum working stroke is 8'.
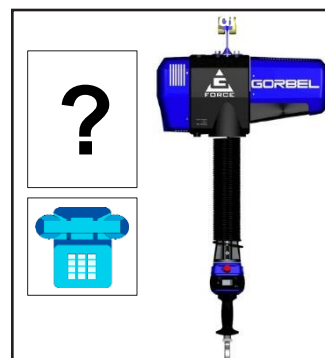
Questions about G-Force®? Call your local Gorbel® distributor or Gorbel® Customer Service at (800) 821-0086.

WARNINGS

⚠️ IMPORTANT SAFETY INSTRUCTIONS ⚠️
WARNINGS

1. All operators should read the G-Force® Installation and Operation Manual before operating the unit.
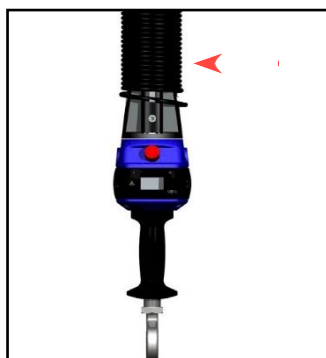2. Check wire rope for improper seating, twisting, kinking, wear, or defects before operating.
3. Center the G-Force® over the load before lifting. DO NOT end or side load the G-Force®. End or side loading will seriously reduce the life of the wire rope and lead to premature failure. The wire rope should never exceed an out of vertical angle greater than 15° under any circumstances.
4. Avoid swinging of load or load hook when traveling with the G-Force®.
5. 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.
6. Press the G-Force® logo button for Float Mode feature 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.
7. Do not repeatedly impact the 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® Inside Sales for alternative end stop options.
8. The G-Force® does not meet "wash-down" environment requirements. The G-Force® does not meet "explosion proof" requirements.
9. Ensure that the slide handle is supported properly in remote mounted handle applications by mounting the slide handle at both the top and bottom mounting points (***diagram D***, page 23).
10. Do not mount any objects to the G-Force® slide handle grip (i.e. switches). Additional objects may interfere with the travel of the sliding handle grip and affect the overall speed and functionality of the unit.
11. Do not mount any load bearing components to the blue housing of the G-Force® slide handle, pendant handle, or actuator assembly.
12. Do not dis/reassemble components while hoist is energized (i.e. *No* 'Hot-Swapping').

TOOLING INTEGRATION GUIDELINES

1. All tooling must be retained to the G360™ assembly utilizing the M16 thread and locking pin provided. The locking pin is optional on Slide Handle and Wire Rope Swivel assemblies if proper inspection and maintenance procedures are followed.
2. Do not mount anything to the G-Force® handle housing. Use supplied brackets, valves, and switches whenever possible.
3. In-line tooling must always be centered directly under the hand controller.
4. Tooling design which does not keep the tooling level; and balanced in both the loaded and unloaded condition may induce a bending force on the handle and/or collector assembly which may reduce the life and/or performance of the handle and/or collector assembly
5. Do not mount anything to the sliding portion of the G-Force® hand controller.
6. Do not alter or add conductors to the G-Force® coil cord.
7. Use only Gorbel's slide on air hose (slides over coil cord) to supply air power to end effector tooling. Gorbel cannot guarantee performance or functionality of other methods of supplying air power to end effector tooling.
8. All cables used in a remote mounted handle configuration must be properly clamped and/or strain-relieved to prevent premature failure of the G-Force® or customer tooling.

INTRODUCTION

Thank you for choosing a Gorbel® G-Force® Q2/iQ2 Intelligent Lifting Device (ILD)** to solve your material handling needs. The G-Force® is a servomotor driven, high speed, ergonomic materials handling device. The innovative design and heavy-duty construction of the G-Force® will provide a superior quality product that will offer years of long-term value. A Gorbel® G-Force® will provide many years of dependable service by following the installation and maintenance procedures described herein.

** U.S. Patent No's: 5,865,426, 6,622,990, 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.

WARNING
Only competent erection personnel familiar with standard fabrication practices should be employed to install the G-Force® 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, 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
Gorbel Inc. authorizes use of wire rope only as supplied by Gorbel for any G-Force® equipment. Use of other than Gorbel supplied wire rope shall void Gorbel's warranty of the product.
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®.
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® actuator or handles in any way. Any modification, without the written consent of Gorbel, Inc., will void warranty.
WARNING
The jog switch buttons are for system maintenance and load testing only, and should not be manipulated during normal operation of the G-Force®. Operation of the jog switch buttons during normal operation increases the risk of personal injury to the operator.

CORRECT G-FORCE® INSTALLATION ORIENTATION

In-Line Slide Handle

Remote Mounted Slide Handle
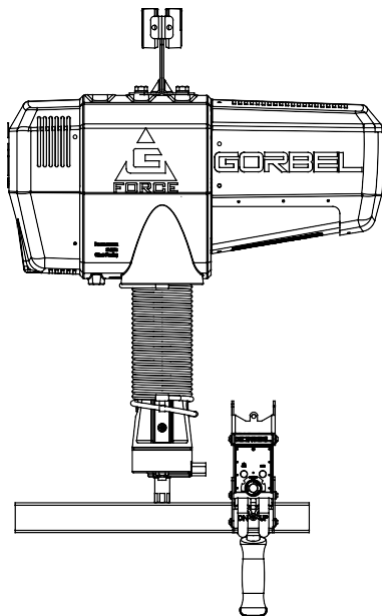
Remote Mounted Pendant Handle
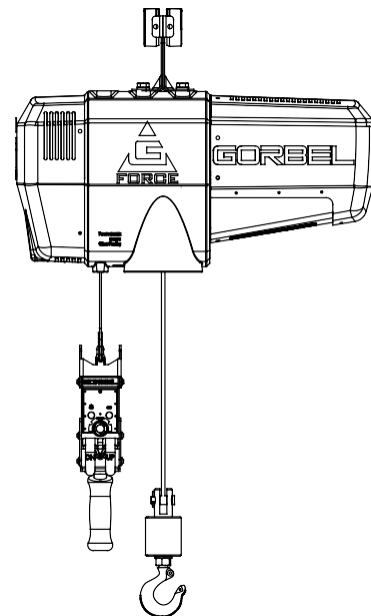
Suspended Pendant Handle

WARNING
The G-Force® was designed and fully life tested in the installation orientations shown above. Any modification to the installation orientation of the G-Force® without the written consent of Gorbel, Inc. Engineering will immediately void the warranty.
WARNING
As a normal safety precaution, check for obstructions in the crane and G-Force® travel.
WARNING
To Reduce the Risk of Electric Shock Do Not Expose to Rain, Use Indoors Only, Store Indoors Only.
WARNING
Maximum Operational Ambient Temperature 50°C (122°F).

G-FORCE® MAIN ASSEMBLY COMPONENT DESCRIPTION

➡ **TIP:** The G-Force® comes in 4 Capacities. The 2 largest capacities, 660 lbs. & 1320 lbs. (300kg & 600 kg) are identical in terms of Hardware and Software internal to the Actuator.

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

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

1) **Actuator (*diagram 1*):** The actuator assembly contains the lifting power transmission of the G-Force®. 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 section (page 25) and Controls Interface Features section (page 28) for additional details.***

Diagram 1. *Actuator Assembly*

2) **Coil Cord Assembly (*diagram 2*):** The coil cord assembly carries signals from the handle to the actuator assembly which will include lift speed, lift direction and emergency stop. Do not restrain coil cord to any foreign objects. Do not hang or strain relief additional cable or festooning from

---

WARNING
The quick disconnects on the coil cord are keyed. The connector must be aligned correctly before it threads into place.

---

3) **Handle (*diagram 3*):** The handle is the main interface between the operator and the lifting device. ***See the Lift Functionality section (page 25) and Controls Interface Features section (page 28) for additional functionality located at the handle.*** The Gorbel® slide handle can accommodate either a Gorbel® load hook or tooling (supplied by others). Tooling must meet the guidelines set forth by Gorbel, Inc (*see Tooling Integration Guidelines on page 3*). Improper tooling integration will result in degraded performance and premature failure of the G-Force®.
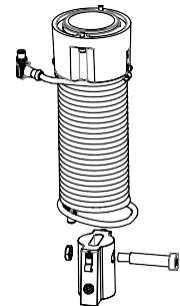
Diagram 2. *Standard Coil Cord Assembly.*

The Q2 and iQ2 G-Force® Actuators are only compatible with Q2 and iQ2 Handles and vice-versa. This hardware is _NOT_ backward compatible with prior generation units.

*Image depicts an inline Slide Handle. Certain applications may be more appropriate for use with an inline Force Sensing Handle. Contact your Gorbel® G-Force® Dealer for more information.
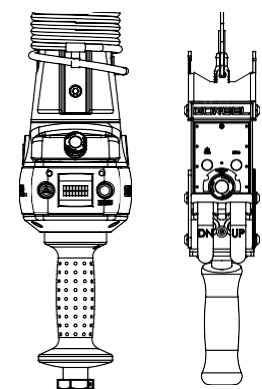
Diagram 3. *In-line Slide Handle* and Pendant Handle.*

WARNING
The unique serial number for this unit can be found on the front cover of this manual, the bottom of the actuator assembly, and the handle. Always have this serial number available during all correspondence regarding your G-Force or when ordering repair parts.
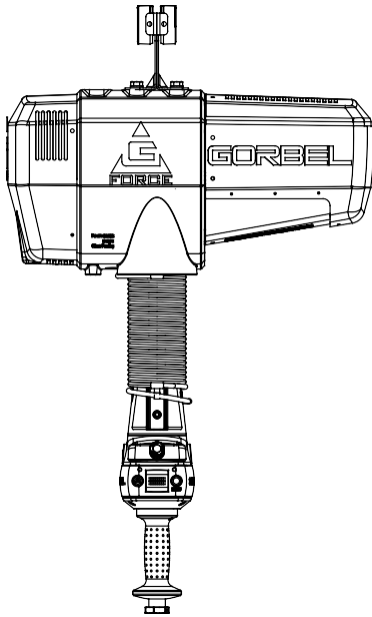
WARNING
Do not field modify the G-Force in any way. Any modification, without the written consent of Gorbel Inc, will void warranty.
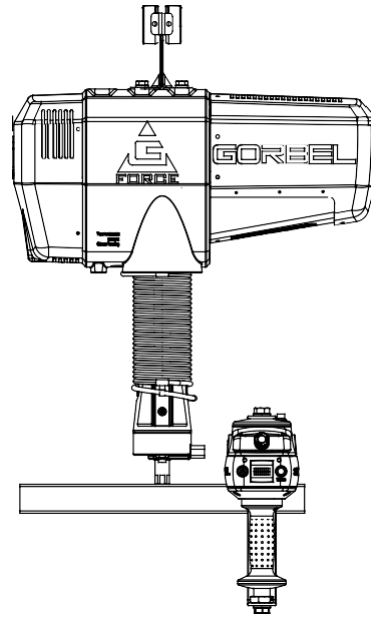
INSTALLATION
STEP 1 - UNPACKING THE G-FORCE®

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

1.1 Carefully remove all items from the box.

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® Inside Sales or After the Sales Service (ATSS) immediately at (800) 821-0086 or (585) 924-6262.

STEP 2 - PRE-ASSEMBLY / TOOLS REQUIRED

2.1 Read this entire Operator's Manual **before** beginning installation of the G-Force®.

2.2 Tools and materials (by others) typically needed to install/assemble a G-Force® are as follows:

- 5mm Allen wrench
- 8mm Allen wrench
- 2.5mm Allen wrench
- 6mm Allen wrench (1320 lb. only)
- 14mm wrench or hex socket
- 3mm Allen wrench
- 19mm hex socket
- Plastic cable tie straps
- Ladders/man lifts
- 10mm wrench
- Snap ring pliers

STEP 3 - ACTUATOR ASSEMBLY INSTALLATION

WARNING
DO NOT lift the actuator by grabbing the blue plastic end covers. To lift the actuator, grab the handle slots in the trolley.

3.1 The standard G-Force® will come with the wheels pre-assembled to the actuator trolley (*diagram 3A*).

When a Gorbel® G-Force® is to be used on a non-Gorbel® bridge system, a universal adapter trolley is required (*diagram 3B*). *Note:* The customer must provide two (2) hoist trolleys when the unit will run in a non-Gorbel® bridge system.

3.2 Ensure the power cord from the actuator is facing the festooning side of the bridge/monorail. Remove the end stop from the bridge and install the G-Force® actuator into the track. Immediately reinstall the end stop. Verify that the G-Force® trolley wheels are correct for the style and capacity track that the unit is being installed on by rolling the actuator assembly along the full length of the bridge to ensure that the travel is smooth throughout.
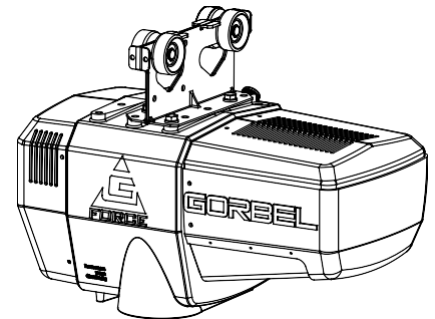
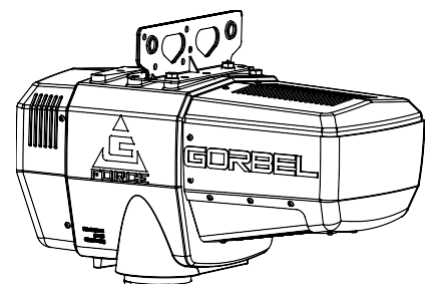

Diagram 3A. *Standard Actuator Assembly.*

Diagram 3B. *Standard Actuator Assembly with Universal Adapter Trolley.*

STEP 4 - COIL CORD INSTALLATION

➡ **TIP:** This step is best completed once the actuator has been installed into the bridge system.

Note: G-Force® units, standard in-line or remote mounted, that are ordered from the factory will be shipped with the coil cord assembled to the actuator wear ring and the coil cord footer, creating the coil cord assembly (*diagrams 4A* and *4B*). In addition, units ordered with air power will have a 1/4" ID nycoil air hose coil cord assembled onto the coil cord assembly (not shown).

Diagram 4A. *Standard Coil Cord Assembly.*

4.1   Verify the coil cord assembly is correct. There are two coil cord assemblies: standard and double length. The standard coil cord assembly is used on systems with a trolley saddle up to 14' (4.27m) and will measure approximately 8.3" (211.46mm) in length. The double length coil cord assembly is used on systems with a trolley saddle greater than 14' (4.27m) and will measure approximately 16.4" (415.93mm) in length.

4.2   Feed the wire rope from the actuator assembly through the center of the coil cord assembly.

CAUTION
The connectors on the coil cord are keyed. The connector must be aligned correctly before it threads into place.

4.3   Use the actuator assembly hardware to fasten the coil cord assembly to the actuator (*diagram 4C*). Adjust the coil cord in the clamps so that the coil cord connector is conveniently located on the proper side of the actuator assembly. *Note:* The orientation of the coil cord must be correct so that the connector is located properly (*diagram 4DC*). There should be no need for adjustment of the coil cord clamps if coil cord is aligned as shown.

Diagram 4B. *Double Length Coil Cord Assembly.*

4.4   Thread the coil cord connector into the actuator connector (*diagram 4C*).

4.5   Assure that the coils of the coil cord are centered around the wire rope when properly installed.

4.6   Use the 16mm shoulder bolt and M12 jam-nut to retain the coil cord footer to the thimble in the wire rope. *Note:* The shoulder bolt and jam-nut will be used to retain the handle or collector in the next step.

4.7   If applicable, connect air hose coil cord to supply line from the actuator assembly. The air hose coil cord is provided with two (2) ¼" NPT male swivel fittings located at both ends of the air hose.

Diagram 4C. *Coil Cord Assembly Installation at the Actuator (Bottom view/black center not shown).*

4.8   For standard in-line slide handle or in-line force sensing handle installation, go to Step 5A, page 12.
For remote mounted slide handle installation, go to Step 5B, page 12.
For suspended pendant handle installation, go to Step 5C, page 14.
For remote mounted pendant handle installation, go to Step 5D, page 15.
For 1320 lb. in-line slide or remote mounted handle installation, go to Step 5E, page 16.
For 1320 lb. suspended pendant handle installation, go to Step 5F, page 17.
For remote mounted force sensing handle installation, go to Step 5H, page 19.
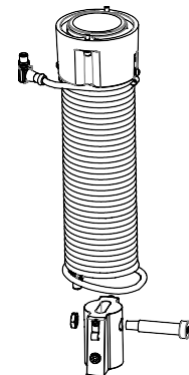For remote mounted force sensing hub handle installation, go to Step 5I, page 20.

STEP 5A - IN-LINE SLIDE & IN-LINE FORCE SENSING HANDLE INSTALLATION

5A.1 Ensure the wire rope is still fed through the center of the coil cord. Hold the slide handle just below the coil cord.

5A.2 Center the coil cord footer between the ears of the slide handle swivel. *Note:* Make sure the fin of the coil cord footer is on the opposite side of the slide handle connector.

5A.3 Remove the 16mm shoulder bolt from the coil cord footer and wire rope and allow the coil cord footer and wire rope to slide down into the slide handle swivel.

Diagram 5A1. *Slide Handle, Shoulder Bolt and Coil Cord*

5A.4 Once the wire rope, coil cord footer and slide handle swivel are aligned, replace the 16mm shoulder bolt, thereby capturing the wire rope, coil cord footer and slide handle (***diagram 5A1***).

5A.5 Thread the coil cord connector into the slide handle connector (***diagram 5A1***).

5A.6 Thread the M12 jam nut onto the 16mm shoulder bolt.

5A.7 Check that the coils of the coil cord are centered around the wire rope when properly installed.

5A.8 *Optional:* Install the hook or tooling using the retaining nut and lock washer. The included flat washer is unnecessary in this application. Use the open pilot hole on the Slide Handle Retaining Nut and a #21 drill bit
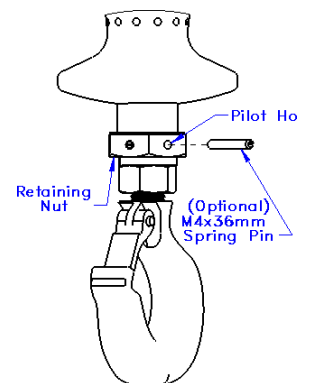
Diagram 5A2. *Slide Handle with Optional Pin.*

to drill a hole completely through the threads of the hook and the opposite side of the nut. Hammer the included M4x36mm spring into the hole until it is flush with the surface of the nut (***diagram 5A2***).

5A.9 Continue to Step 6 on page 21.

STEP 5B - REMOTE MOUNTED SLIDE HANDLE INSTALLATION

5B.1 Ensure the wire rope is still fed through the center of the coil cord. Hold the G360™ swivel just below the coil cord assembly.

5B.2 Center the coil cord footer between the ears of the G360™ swivel. *Note:* Make sure the fin of the coil cord footer is on the opposite side of the G360 connector.

5B.3 Remove the 16mm shoulder bolt from the coil cord footer and wire rope and allow the coil cord footer and wire rope to slide down into the G360 swivel.
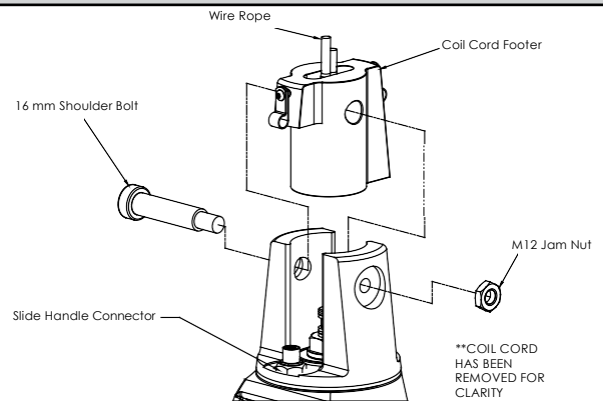

Diagram 5B1. *G360, Shoulder Bolt, and Coil Cord*

STEP 5B - REMOTE MOUNTED SLIDE HANDLE INSTALLATION (CONTINUED)

5B.4 Once the wire rope, coil cord footer and G360™ swivel are aligned, replace the 16mm shoulder bolt thereby capturing the wire rope, coil cord footer and G360™ swivel (*diagram 5B1*, page 12).

5B.5 Thread the coil cord connector into the G360™ connector (*diagram 5B1*, page 12).

5B.6 Thread M12 jam nut onto the 16mm shoulder bolt.

5B.7 Check that the coils of the coil cord are centered around the wire rope when properly installed.

5B.8 A pilot hole is provided for the locking pin. Attach tooling to G360™ utilizing M16 thread. The tool bolt/rod thread should be beyond pilot hole of shaft when fully engaged. Using a #21 drill bit, drill through the tool bolt/rod thread and out the other side of G360™ shaft. Hammer pin into place thereby locking tooling to G360™ (*diagram 5B2*).

5B.9 Assemble the remote mounted slide handle inside the remote mount bracket using the hardware provided (*diagram 5B3*). *Note:* This step is best completed on a workbench prior to mounting handle to tooling.
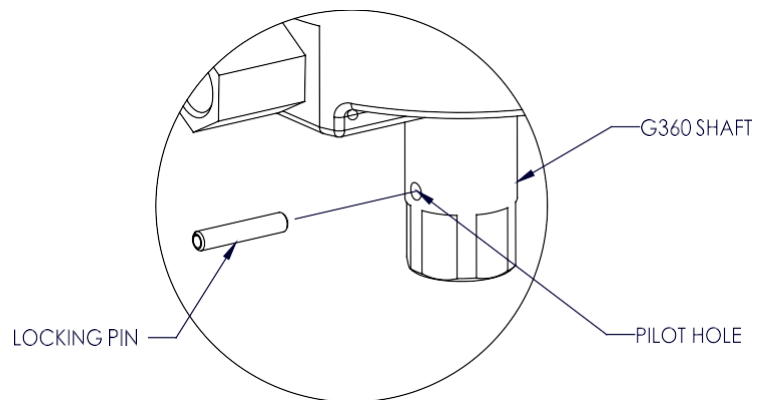
Diagram 5B2. *Tooling Installation.*
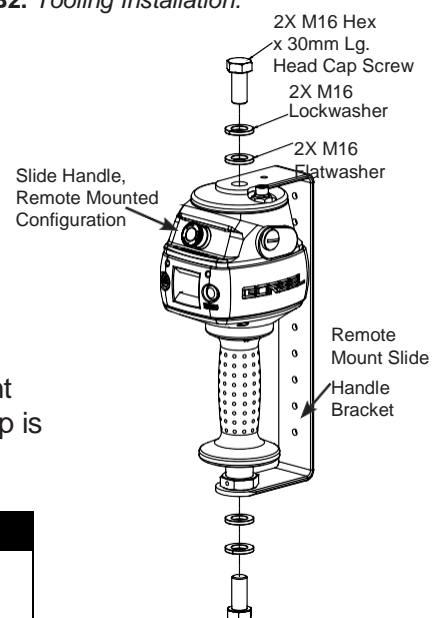
Diagram 5B3. *Remote Mounted Slide Handle, Exploded View.*

> ## WARNING
> Remote mounted G-Force® 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 poor performance and/or premature component failure.

5B.10 Attach the remote mounted handle with bracket to the tooling. Assure that the mounting arrangement does not affect the operating function of the slide handle.

5B.11 Connect the extension cable from the G360™ to the remote mounted slide handle. Securely clamp the remote mount coil cord extension cable to the tooling as needed.

> ## CAUTION
> All cables used for a remote mounted handle configuration must be properly clamped and/or strain-relieved to prevent premature failure of the G-Force or customer tooling.
> ## CAUTION
> Take care to avoid looping excess cable at locations where the loop could catch on foreign objects.

5B.12 Continue to Step 6 on page 21.

STEP 5C - SUSPENDED PENDANT HANDLE INSTALLATION

5C.1 Assure that the coils of the pendant handle coil cord are centered around the pendant handle wire rope.

5C.2 Remove the eyebolt from suspended pendant cable assembly using the threaded connector.

5C.3 Thread the eyebolt into the bottom of the actuator assembly as shown (*diagram 5C1*).

5C.4 Reattach the suspended pendant cable assembly to the eyebolt via the threaded connector.

5C.5 Adjust the suspended pendant cable assembly so that there is a service loop in the wiring cable and there is no tension in the wire cable.

5C.6 Thread the cable assembly connector into the actuator connector (*diagram 5C1*).

5C.7 Remove the cotter pin and clevis from the wire rope swivel assembly.

5C.8 *Optional:* Install the hook or tooling with the washer, lock washer and nut in the orientation shown (*diagram 5C2*) then use the pilot hole and a #21 drill bit to drill through the hook threads, a minimum of 36mm deep. Use a hammer to insert the M4x36mm spring pin into the hole until it is flush with the surface of the swivel assembly (*diagram 5C3*).

5C.9 Reinsert the clevis and cotter pin capturing the wire rope thimble in the swivel assembly (*diagram 5C3*).

5C.10 Continue to Step 6 on page 21.

Note: On suspended pendant equipped systems, the wire rope swivel assembly must be installed before AC power is applied to the system or a limit switch error will occur (501 / 11000 error codes). To clear this fault you will have to (must be done in this order):
1. Install wire rope swivel assembly or other weighted device on wire rope.
2. Disconnect AC power from the system (using the e-stop will not work).
3. Reconnect the AC power and wait approximately one minute for system to power on completely.
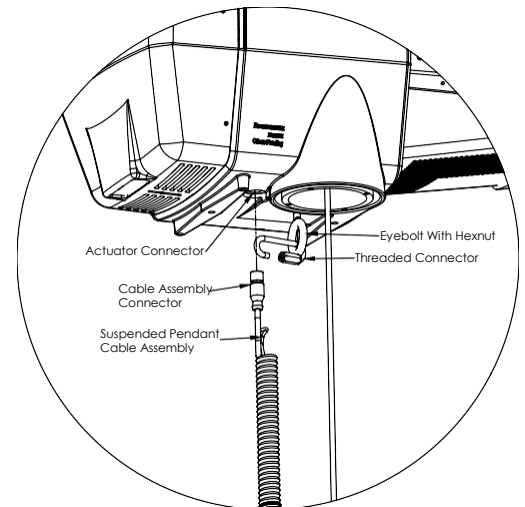
Diagram 5C1. *Assembly of Suspended Pendant Cable Assembly to Bottom of Actuator Assembly.*
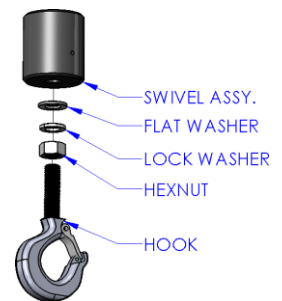
Diagram 5C2. *Hook installation.*
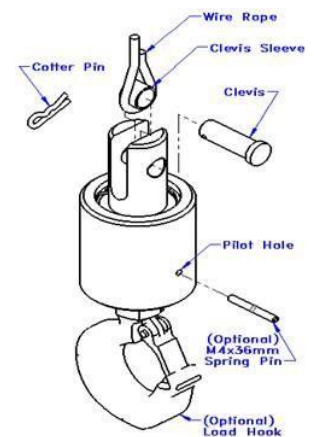
Diagram 5C3. *Cotter Pin, Clevis, Wire Rope Swivel Assembly, and Wire Rope Thimble*

STEP 5D - REMOTE MOUNTED PENDANT HANDLE INSTALLATION

5D.1 Ensure the wire rope is still fed through the center of the coil cord. Hold the G360 swivel just below the coil cord.

5D.2 Center the coil cord between the ears of the G360 swivel. Note: Make sure the fin of the coil cord footer is on the opposite side of the G360 connector.

5D.3 Remove the 16mm shoulder bolt from the coil cord footer and wire rope and allow the coil cord footer and wire rope to slide down into the G360™ swivel.
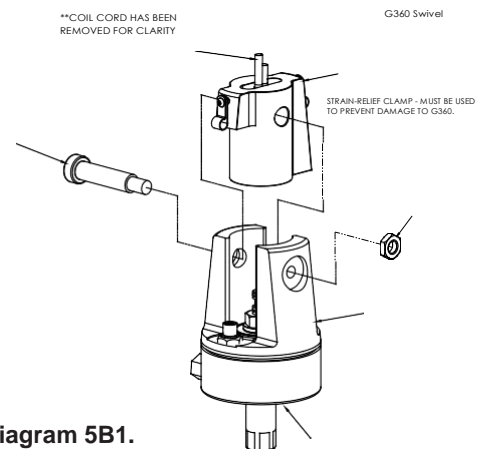
5D.4 Once the wire rope, coil cord footer and G360™ swivel are aligned, replace the 16mm shoulder bolt thereby capturing the wire rope, coil cord footer and G360™ swivel (*diagram 5D1*).

5D.5 Thread the coil cord connector into the G360™ connector (*diagram 5D1*).

5D.6 Thread the M12 jam nut onto the 16mm shoulder bolt.

5D.7 Check that the coils of the coil cord are centered around the wire rope when properly installed.

5D.8 A pilot hole is provided for the locking pin. Attach tooling to G360™ utilizing M16 thread. The tool bolt/rod thread should be beyond pilot hole of shaft when fully engaged. Using a #21 drill bit, drill through the tool bolt/rod thread and out the other side of G360 shaft. Hammer pin into place, thereby locking tooling to G360 (*diagram 5D2*).

5D.9 Attach the pendant handle bracket directly to the tooling. Assure that the mounting arrangement does not affect the operating function of the pendant handle. *Note:* If necessary, a collar clamp mounting bracket option can be used to attach the pendant handle to the tooling (*diagram 5D3*).

5D.10 Connect the extension cable from the G360™ to the remote mounted pendant handle. Securely clamp the remote mount coil cord extension cable to the tooling as needed.
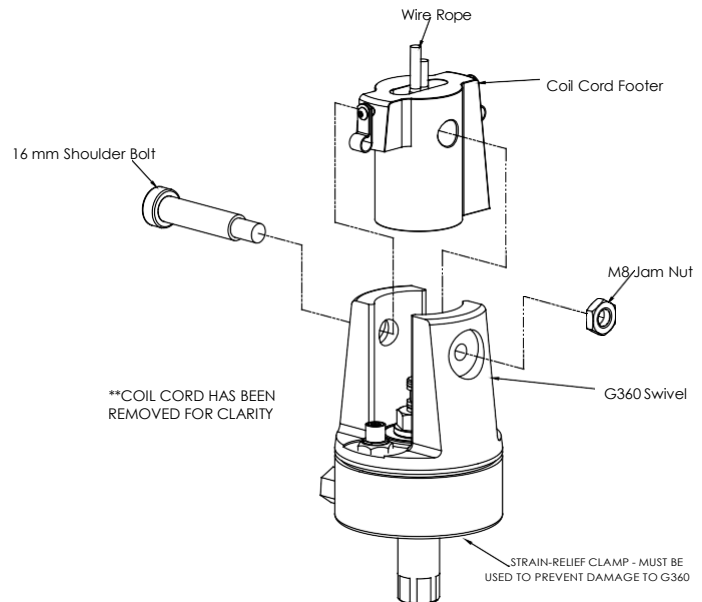
Diagram 5D1. *G360™, Shoulder Bolt and Coil Cord.*
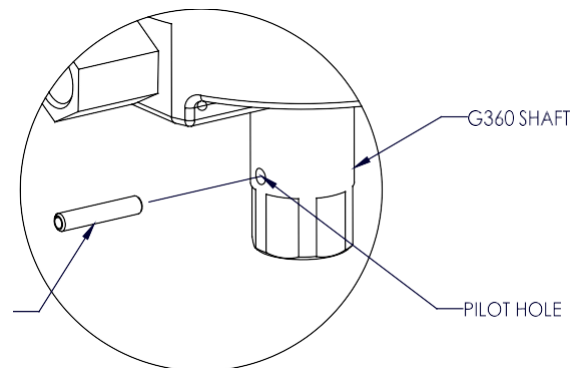
Diagram 5D2. *Tooling Installation*

CAUTION
All cables used in a remote mounted handle configuration must be properly clamped and/or strain relieved to prevent premature failure of the G-Force or customer tooling.
CAUTION
Take care to avoid looping excess cable at locations where the loop could catch on foreign objects.
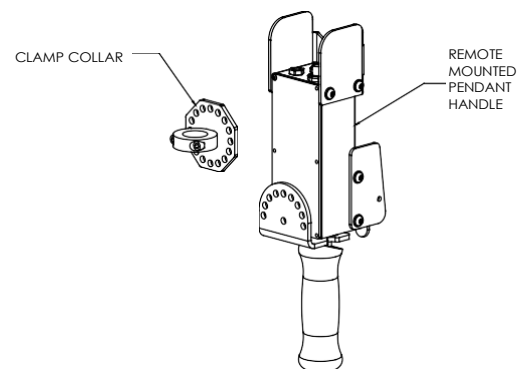
Diagram 5D3. *Remote Mounted Pendant Handle with Collar Clamp Mounting Bracket (option)*

STEP 5E - 1320 LB. INLINE SLIDE & REMOTE MOUNTED HANDLE INSTALLATION

5E.1 With the actuator hanging from the rail or other supported structure, thread the free end of the wire rope through the coil cord assembly so it hangs below the coil cord mounting plate and attach the wear ring to the wear ring bracket (inside actuator wire rope opening), using the supplied hardware (**diagram 5E1**).

5E.2 Thread the connector on coil cord into mating connector on the underside of the actuator.

5E.3 Grab the free end of the wire rope and loop it up towards the underside of the actuator, ensuring there are no twists or kinks in the rope. Feed the U-bolt through the wire rope thimble and insert the U-bolt into the appropriate holes in the reinforcement plate. Using supplied hexnuts, securely tighten U-bolt to the plate (***diagram 5E2***).

Diagram 5E1. *Assembly of Wire Rope to 1320 lb. Actuator Assembly.*

5E.4 Attach the plate to the underside of the actuator using the supplied cap screws, lockwashers, and spacers as shown and ensure hardware is now completely tightened. (If an air hose is being installed, leave hardware loose for now.)

5E.5 While holding the handle or G360™, loop the pulley through the wire rope and slip the pulley and side spacers down between the plates (***diagram 5E3***, page 17).

5E.6 Align the holes in the plates with the spacers and the bearings, insert the pulley pin, and install the snap ring on the pulley pin.

5E.7 Using the supplied cap screws and lockwashers, attach the coil cord mounting plate to the top of the handle or G360™.
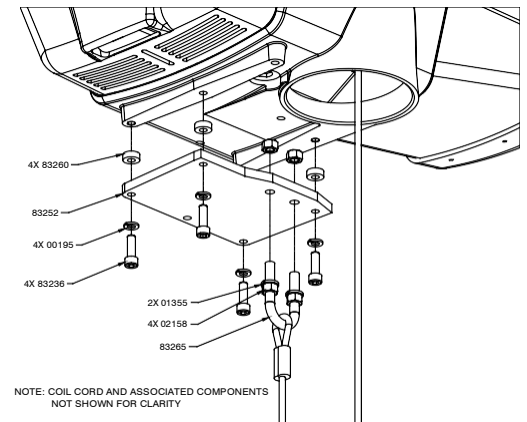
Diagram 5E2. *Attaching U-bolt and Reinforcement Plate to Actuator Assembly.*

5E.8 Attach the coil cord connector to the mating connector in the top of the handle or G360™ and use the supplied cap screw to attach the strain relief clamp to the side plate so there is a small service loop at the connector.

5E.9 Continue to Step 6 on page 21.

STEP 5F - 1320 LB. SUSPENDED PENDANT HANDLE INSTALLATION

5F.1 With the actuator hanging from the rail or other support structure, thread the free end of the wire rope through the coil cord assembly, so it hangs below the coil cord mounting plate and attach the wear ring to the wear ring bracket (inside actuator wire rope opening) using the supplied hardware (**diagram 5E1,** page 16).

5F.2 Grab the free end of the wire rope and loop it up towards the underside of the actuator, ensuring there are no twists or kinks in the rope. Feed the U-bolt through the wire rope thimble and insert the U-bolt into the appropriate holes in the reinforcement plate. Using supplied hexnuts, securely tighten the U-bolt to the plate (***diagram 5E2***, page 16).
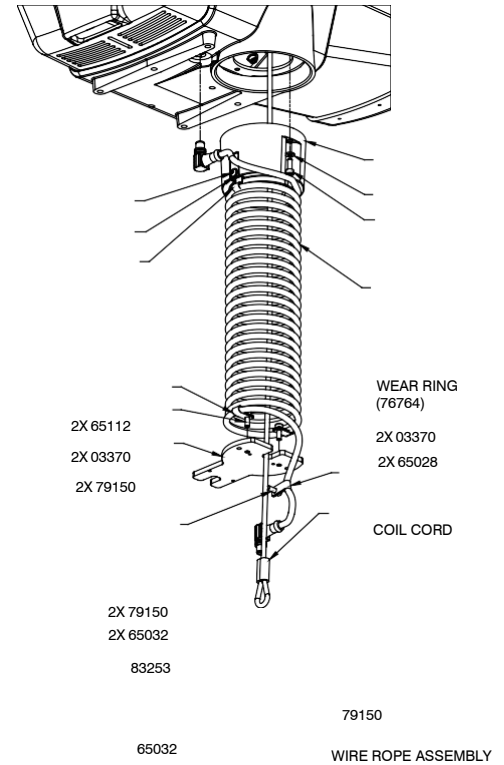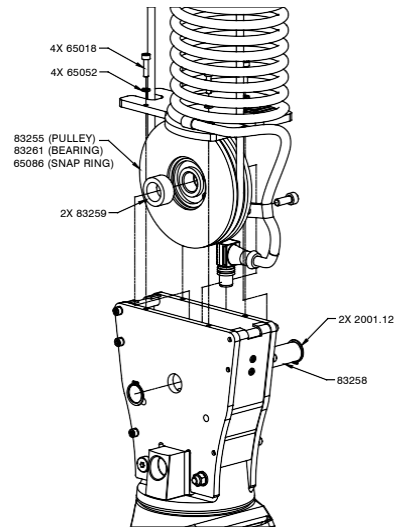
Diagram 5E3. *Attaching Wire Rope to Pulley.*

5F.3 Attach the plate to the underside of the actuator using the supplied cap screws, lockwashers and spacers as shown and ensure hardware is completely tightened. (If an air hose is being installed, leave hardware loose for now).

5F.4 Insert eyebolt at the end of the pendant cable into the threaded hole on the reinforcement plate and tighten. Thread the coil cord connector into mating connector on the underside of the actuator.

5F.5 While holding the G360™, loop the pulley through the wire rope and slip the pulley and side spacers down between the plates (***diagram 5E3***).

5F.6 Align the holes in the plates with the spacers and the bearing, insert the pulley pin, and install the snap ring on the pulley pin.

5F.7 Using the supplied cap screws and lockwashers, attach the coil cord mounting plate to the top of the G360™.

5F.8 Continue to Step 6 on page 21.

STEP 5G - 1320 LB. AIR HOSE ASSEMBLY INSTALLATION (OPTIONAL)

5G.1   The air hose assembly comes attached to the wear ring and coil cord mounting plate. Once the handle installation is complete, the air hose should be installed.

5G.2   Remove two of the screws and lockwashers holding the reinforcement plate to the underside of the actuator (leaving the spacers in place) and insert them through the air hose bracket and reattach to the underside of the actuator. Tighten all hardware.

5G.3   At the handle or G360™, insert the male swivel fitting at the end of the air hose into the female end of the elbow in the footer and tighten.

5G.4   Connect the bulkhead fitting on the underside of the actuator to shop air and check for leaks.

STEP 5H - REMOTE MOUNT FORCE SENSING SLIDE HANDLE INSTALLATION

5H.1 Follow Steps 5B.1 through 5B.7 on pages 12 and 13 to install G360™.

5H.2 Bracket must be sized to fit the handle it will be holding and rigid enough to resist the forces exerted on it (*diagram 5H1*).

5H.3 Using the included M16 hardware, fasten both ends of the handle to the bracket. Attach bracket to tooling if necessary.

5H.4 Connect cable from G360™ to handle top. Clamp the cable to tooling to prevent it from being snagged.

5H.5 Continue to Step 6 on page 21.

Note: The system cannot support two Force Sensing Handles running simultaneously on one G-Force®. If dual handles are required, one Force Sensing Handle and one traditional handle is a supported configuration.

Diagram 5H1. *Force Sensing Slide Handle bracket sizes.*

Note: Due to the nature of the Force Sensing Slide Handle, excessive twisting of the grip may be interpreted as intended motion. For best results, only push and pull the handle grip while avoiding twisting (*diagram 5H3*).

Note: To avoid damaging the handle, do not apply more than 200 lbs (90 kg) to the grip or handlebars.

Note: Remote handles must be mounted rigidly in order to function correctly. For slide handles, the mounting holes on the tooling must be aligned to avoid any binding of the handle and the bolts at each end of the handle must be tightened enough to prevent motion but not induce binding. The included rubber washers must be mounted between the handle and tooling to prevent binding. Additionally, the handle must be

Note: Do not attach anything to the grip of the Slide Force Sensing Handle as performance will be degraded.

Note: Changing the orientation of the handle (tilting) while the system is live may be interpreted as intent to move. It is recommended that the handle remains vertical at all times during use.

Note: When taring the handle, care must be taken not to apply force to the grip or handlebars as subsequently removing the force will be interpreted as intent to move.

Note: For optimal performance, re-taring the handle periodically may be necessary. The interval will depend on usage.

Diagram 5H2. *Remote handle mounting dimensions*
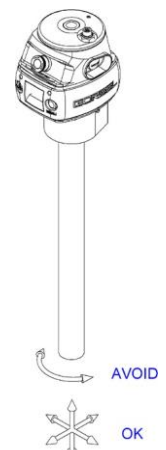
Diagram 5H3. *Proper use of Force Sensing Handle grip*

STEP 5I - REMOTE MOUNT FORCE SENSING HUB HANDLE INSTALLATION

> **WARNING**
>
> This handle is only intended for remote mount applications and must not be used for transmitting lifting loads.

5I.1   Follow Steps 5B.1 through 5B.7 on pages 12 and 13 to install G360™.

5I.2   Mount Hub body to tooling rigidly to resist forces exerted on it. Optional mounting plate 74136 is available. See *diagram 5I1* for dimensions for mounting directly to tooling.

5I.3   Attach handlebars to Hub. Handlebar kit (74630) is available or handlebars may be fabricated (by others). Optional handlebar mounting plate 74138 (with clamp collars) or 74141 (plain for modification by integrator) are available. See diagram 5I2 for dimensions for fabricating a custom solution.

5I.4   Connect cable from G360™ to handle top. Clamp the cable to tooling to prevent it from being snagged.

5I.5   Continue to Step 6 on page 21.

Note: The system cannot support two Force Sensing Handles running simultaneously on one G-Force®. If dual handles are required, one Force Sensing Handle and one traditional handle is a supported configuration.

Note: Handlebars and attachments for Remote Force Sensing Hub Handles must not exceed 25 lb (11.3 kg). For optimal performance, handlebar assemblies should be as light as possible. Handlebar weight in excess of 10 lbs. (4.5 kg) will detract from net capacity of the G-Force®.

Note: For optimal performance and to reduce the risk of damaging the handle, handlebars on Remote Force Sensing Hub Handles should not exceed 24" (0.6m) (12" or 0.3m in either direction) in width or 24" (0.6m) from the face of the handlebar mounting plate (*diagram 5I3*).
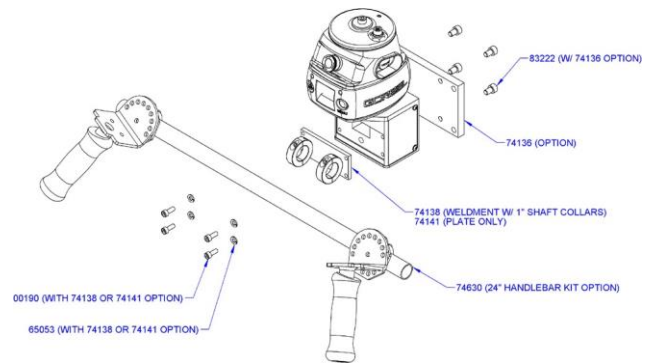
Diagram 5I1. *Mounting handlebar and mounting plate.*
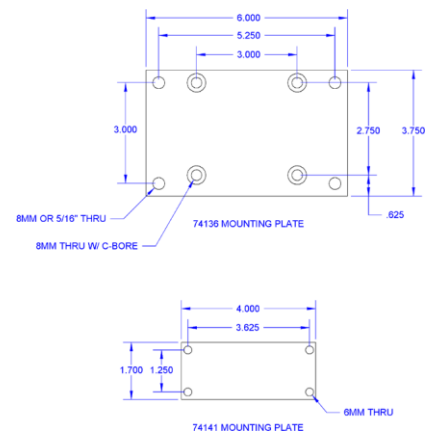
Diagram 5I2. *Mounting plate dimensions*
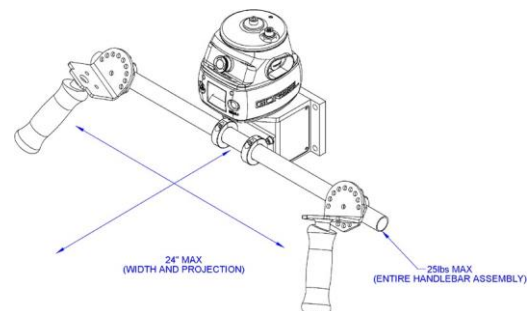
Diagram 5I3. *Handlebar dimensions.*

Note: To avoid damaging the handle, do not apply more than 200 lbs. (90 kg) to the grip or handlebars.

Note: Remote handles must be mounted rigidly in order to function correctly. For Hub handles, the back of the handle body must be securely fastened to the tooling.

Note: When taring the handle, care must be taken not to apply force to the grip or handlebars as subsequently removing the force will be interpreted as intent to move.

Note: For optimal performance, re-taring the handle periodically may be necessary. The interval will depend on usage.
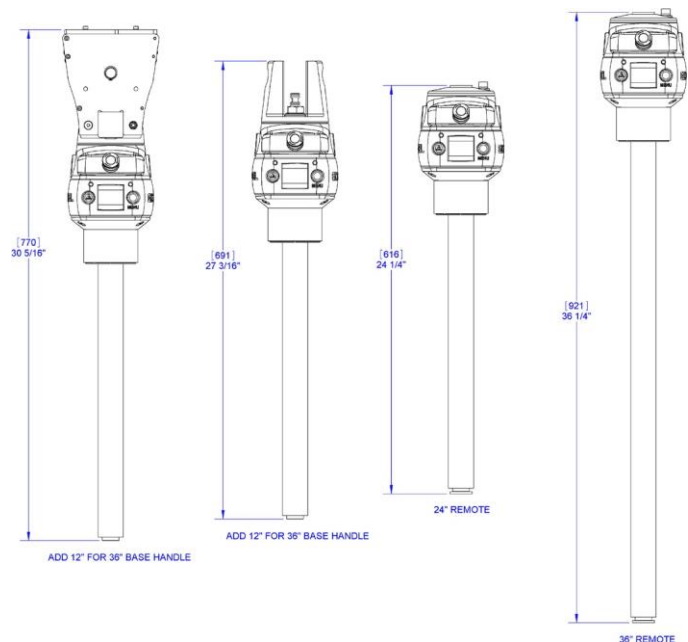
STEP 6 - ELECTRICAL POWER CONNECTION

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

STANDARD

6.1 Prior to final wiring, inspect the entire system to ensure that all connections are seated and strain relieved properly, and are without kinks or bends. Verify the following connections:
   a) Coil cord to handle or G360™ collector
   b) Coil cord to actuator assembly
   c) Extension cables (if included)

6.2 Connect a 220 VAC single-phase power source through a disconnect switch (by others) to the festooned power cabling (not provided with G-Force®).

WARNING
If your system displays drive faults 7219 and 4005 either when it powers on or when you attempt to lift or lower a load it means the AC power is too low. Even though the specification is 220 VAC +/- 10%, the power available at the system may be very close to the low end of the specification because of its proximity to the power source. The closer to the nominal 220 VAC you are supplying to the system the less likely you'll experience any problems related to the AC voltage.

6.3 After verifying the disconnect switch is turned **OFF**, follow local Electrical Codes to terminate the end of the festooned power cable at the G-Force®.

STEP 7 - INITIAL POWER-UP

7.1 Turn on the disconnect switch (by others) to apply power to the G-Force®. When power is detected, "POWER ON" is displayed on the OLED.

7.2 Disengage the emergency stop (E-STOP ENGAGED) button located on the face of the handle.

7.3 During the system power up the OLED at the handle will display "G-FORCE INITIALIZING". If you are using a Force Sensing Handle, after power is applied to the system and the unit has booted, fault 11009 will usually be displayed indicating that the handle needs to be tared. Please refer to the Programming Section,

7.4 Once the system is on-line and ready, G-FORCE READY TO LIFT will be displayed on the OLED.

7.5 • **Standard Operation - Slide Handle Configuration:** Grasp the handle grip to run the unit up and down. Do this several times to get a feel for the unit. The OLED displays RUN MODE HANDLE.
   • **Standard Operation - Pendant Handle Configuration:** Depress the up and down levers to run the unit up and down. Do this several times to get a feel for the unit. The OLED displays RUN MODE PENDANT.

   See the Lift Functionality section on page 25 for complete details on handle operation.

➡ **TIP:** The operator should always keep their hand under the operator present sensor on the slide handle while operating the unit in standard mode. If the hand is frequently moved away from the operator present sensor it will result in jerky movement from the unit.

7.6 Finally, test the operation of any special tooling that may have been integrated to the G-Force®.

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

STEP 8 - FLOAT MODE

➡ **TIP:** Gorbel® Inside Sales is available from 7am to 6pm Eastern Time Monday - Thursday and 7am to 5pm Eastern Time Friday.

8.1 Float Mode may be activated by simply pressing the G-Force® logo button on the left-hand side of the handle (*diagram 8A*). Below is a simple exercise to practice if you are not familiar with the Float feature. (This exercise assumes an in-line slide handle is being used).

G-FORCE LOGO BUTTON (FLOAT MODE)

FLOAT INDICATOR LED (BLUE)

A) Grasp the handle grip and lift an object weighing at least 20 lbs. (9 kg) to a comfortable height in front of you.

B) Let go of the handle grip.
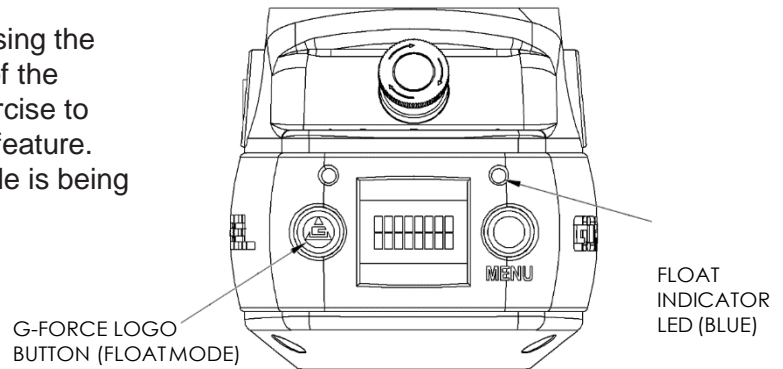
Diagram 8A. *Float Mode Button - Slide Handle.*

C) Press the G-Force® logo button on the handle. *Note:* Do not hold onto the load. Applying an upward or downward force on the handle or load while initiating Float Mode will give the unit a false reading and cause excessive drift.

D) After Float Mode is initialized, the LED light will turn blue and the handle with payload should not be moving. The OLED will display RUN MODE FLOAT.

E) Now grasp the load.

F) To move the load down, put vertical pressure on the load downward, towards the floor. To move the load up, lift up on the load, towards the ceiling. *Note:* The direction and speed of travel is now being controlled by the amount of force that the operator exerts directly onto the load. The higher the force exerted on the load, the faster the unit moves. *Note:* An over-speed detection routine checks if Float Mode reaches 90% of the maximum fully loaded lifting speed and shuts the unit down. It safely limits the maximum speed of travel in Float Mode.

CAUTION
Actuating the operator present switch while in Float Mode will cause the unit to exit Float Mode.

G) Run the unit up and down several times (at least 20 times in each direction) to assure proper operation. Float Mode should provide a smooth feel.

H) Repeat this exercise until you become comfortable with Float Mode.

WARNING
NEVER remove the load from the G-Force® while still in Float Mode. The control system 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.

WARNING
In Float Mode, the live load weight CANNOT be increased or decreased because this will cause unwanted motion. Float Mode must be reinitiated each time the weight of the live load is changed.

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.

STEP 9 - FINAL STEPS

9.1 The speed, acceleration, and other features of the G-Force® can be adjusted using the Program Menu available at the handle. ***See the Program Mode section on page 25 for complete details on modifying and programming features. See page 55 for mechanical adjustment should the need arise due to tooling changes, wear, etc.***

9.2 Please contact Gorbel® After the Sales Service department (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.

9.3 Keep Packing List, Installation & Operation Manual, Drawings, and any other inserts filed together in a safe place for future reference.

STEP 10 - EXPANSION I/O BLOCK MOUNTING INSTRUCTIONS (OPTION)
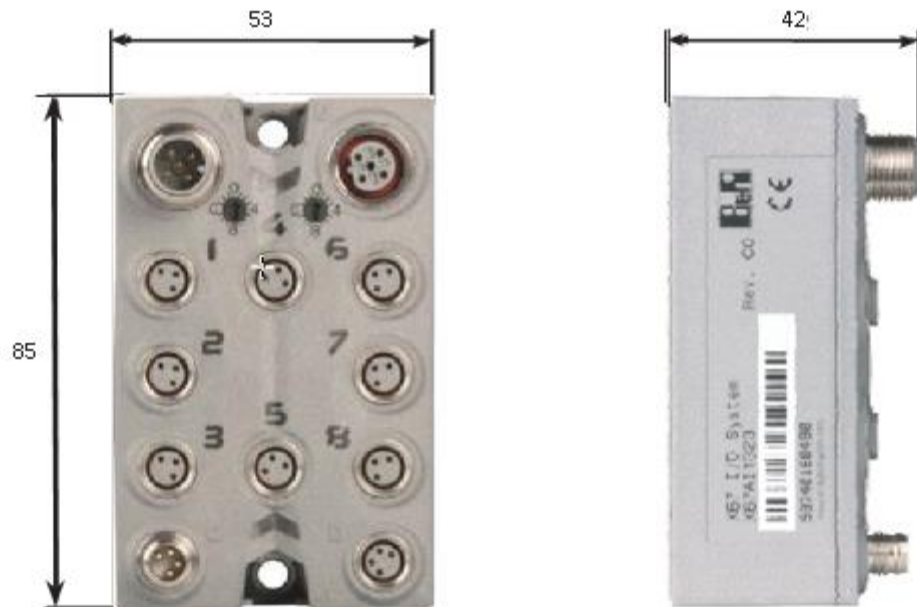
DIMENSIONS

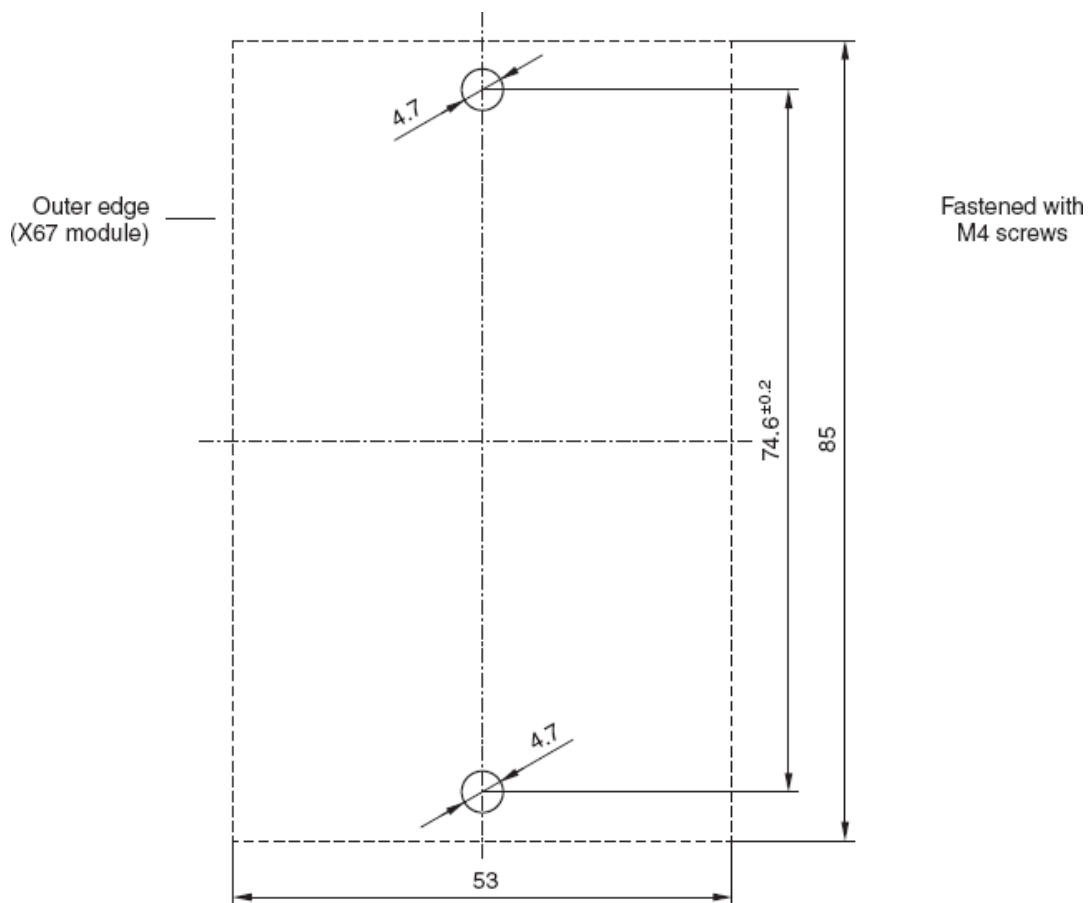**Diagram 10A.** *Expansion I/O block dimensions (millimeters).*

Diagram 10B. *Screw fastener drilling template.*

LIFT FUNCTIONALITY

Standard Operation - Slide Handle Configuration:
When the device is in the standard operational mode, the sliding grip of the handle controller commands the z-axis (vertical) direction and speed of the lift (***diagram A***). The handle grip 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 grip is displaced from the neutral position the faster the servo movement to lift or lower the load. The operator controls the slide handle location by grasping the handle grip and moving it up and down as if it were an extension of the operator's arm. The lift moves slightly slower when a load is lifted, thereby giving the operator some feel for the weight of the load.
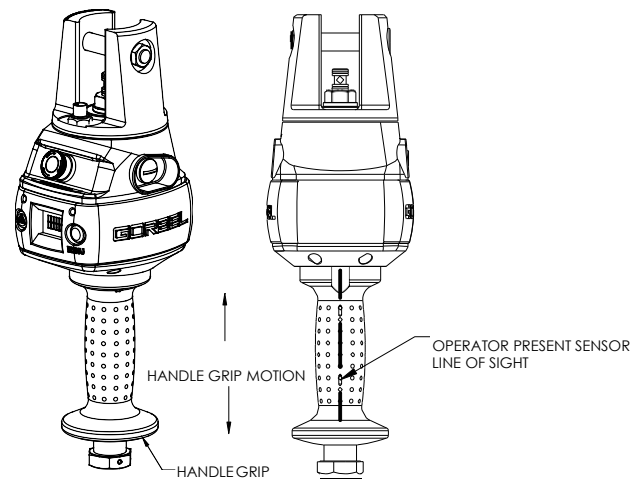

HANDLE GRIP MOTION

OPERATOR PRESENT SENSOR LINE OF SIGHT

HANDLE GRIP

Diagram A. *Slide Handle - Handle Grip and Operator Present Sensor Line of Sight*

For safety, an operator present sensor (OPS) within the slide hand must be activated by the operator before the motor will activate (diagram A). If the operator removes their hand from the OPS' line of sight, the G-Force® payload with be brought to a safe stop.

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

Standard Operation - Pendant Handle Configuration: When the device is in the standard operational mode, the up and down levers command the z-axis direction and speed of the lift (***diagram C***, page 22). The further the up or down lever is depressed, the faster the servo movement to raise or lower the load.

Standard Operation - Force Sensing Slide Handle: The grip on the handle is connected to a force sensing device so that when the user applies force up or down along the central axis of the handle this is interpreted as intent to move. Speed of the unit is proportional to the amount of force applied. Forces in lateral directions are not detected. ***Note:*** There is no traditional OPS. When the force applied to the handle exceeds a small threshold, the unit activates.

Standard Operation - Force Sensing Hub Handle: Handlebars (Gorbel® optional kit 74630, or by others) are attached to a mounting plate which in turn is connected to a force sensing device so that when the user applies a vertical force up or down, this is interpreted as intent to move. Speed of the unit is proportional to the amount of force applied. Forces in lateral directions are not detected. ***Note:*** There is no traditional OPS. When the force applied to the handle exceeds a small threshold, the unit activates.

Emergency Stop Button: When depressed, the emergency stop (E-stop) button disables the actuator. The E-stop button is located on the face of the handle (***diagram B***, page 26). The G-Force® will operate only when the E-stop has been reset. The OLED will display E-STOP ENGAGED. ***Note:*** On Force Sensing Handles, the E-stop (or E-stops if dual handles are used) should be engaged or power should be disconnected before removing the Force Sensing Handle as undesired motion may occur if the handle is removed while the system is live.

Float Mode: In this mode, the operator can simply maneuver the payload directly and cause the load to raise or lower by applying either an upward or downward force on the load. The greater the force applied, the faster the load will move. Note: There is a standard setting in the controls that safely limits the maximum speed of travel in Float Mode; this setting is not adjustable. If the limit is exceeded, the unit will return to standard operation and the LCD OLED will display LIFT READY. See ***Programming Mode*** for information on adjusting the maximum force applied in Float Mode.

Float Mode is initiated by simply pressing the G-Force® logo button on the left side of the handle (***diagram B*** or ***C***, page 26). See Step 8, page 24, for complete details on Float Mode operation.

LIFT FUNCTIONALITY (CONTINUED)

Program Mode: In this mode, the operator can control speed, acceleration, service features and other variable settings (*diagram B* or *C*). ***See the Program Mode section, page 25, for complete programming functionality located at the handle.***

Float Mode LED (Blue): The "Float Mode" enabled LED will illuminate with the G-Force logo button is pressed on the hand controller and Float Mode has been correctly initiated. This LED is located just above the G-Force® MENU button (**diagrams B and C**).

Diagram B. *Slide Handle - G-Force® Logo (Float Mode), MENU and Emergency-Stop Buttons and LEDs.*

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 system will be disabled. This LED is located just above the MENU button (*diagram B* or *C*).

Diagnostic Mode: The Diagnostic Mode is a special program within the Program Mode under the Service menu that will allow a technician to measure or monitor the state of select switches and other electronic components in the actuator and either the slide or pendant handle. It is intended to be used for troubleshooting purposes only. The user can choose single or multiple components. The E-stop must by cycled off/on to exit this particular program.

Overload: The servo controller will prevent the lift from moving upward if loaded beyond the maximum capacity of the G-Force®. The red LEDs will flash and LIFT OVERLOAD will be displayed on the OLED to indicate to the operator the unit is overloaded. The lift may be moved down to allow for the safe removal of the load.

Diagram C. *Pendant Handle - G-Force® Logo (Float Mode), MENU and Emergency-Stop Buttons and LEDs.*

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.

WARNING
In Float Mode, the live load weight cannot be increased or decreased because this will cause unwanted motion. Float Mode must be reinitiated each time the weight of the live load is changed.

WARNING
Enabling the operator present sensor while in Float Mode will cause the unit to exit Float Mode.

LIFT FUNCTIONALITY (CONTINUED)

Slack Switch: The G-Force® is equipped with a slack switch that senses tension in the wire rope and trips when the wire rope develops slack. The switch is located inside the actuator assembly. When the slack switch senses 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 Mounted 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 in-line 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 to the tooling.

Use the appropriate extension cable from the G360 swivel assembly to the remote mount handle. The handle operates exactly the same as if it were mounted in-line. The end user must supply Gorbel® with the required length of the extension cable such that it can be safely routed and clamped to the tooling.

REMOTE MOUNT BRACKET
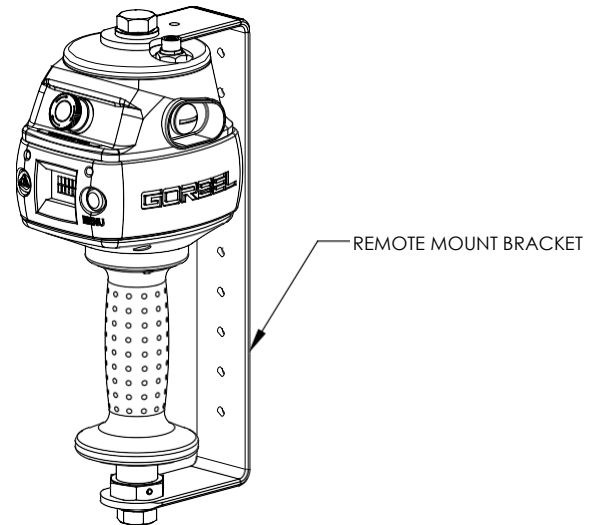
Diagram D. *Remote Mounted Slide Handle with Gorbel® Bracket.*

WARNING
The tooling must be attached to the end of the wire rope with the G360 swivel assembly (supplied by Gorbel). Failure to mount the tooling with a swivel assembly can result in premature failure of both the wire rope and the coil cord.

WARNING
All tooling must be retained to the G360 assembly utilizing the M16 thread and locking pin provided.

CAUTION
Always include the distance for bends and turns when providing the extension length.

WARNING
Ensure that the slide handle is supported properly in remote mounted handle applications by restraining the slide handle at both the top and bottom mounting points (*diagram D*)

CONTROLS INTERFACE FEATURES

The jog switch push buttons and communications connector are protected by a cover (*diagram E*). To access the jog switch push buttons and communications connector, loosen the M4 nut and slide the shield back towards the wire rope. *Note:* Do not fully unthread the M4 nut. When finished, slide the shield back into place and re-tighten the M4 nut.

Jog Switch Push Buttons: The jog switch buttons allow qualified personnel to replace the wire rope on the unit. 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 drum 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. Jog switch push buttons override all motion control from a handle or tooling.

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. Operation of the jog switch buttons during normal operation increases the risk of personal injury to the operator.
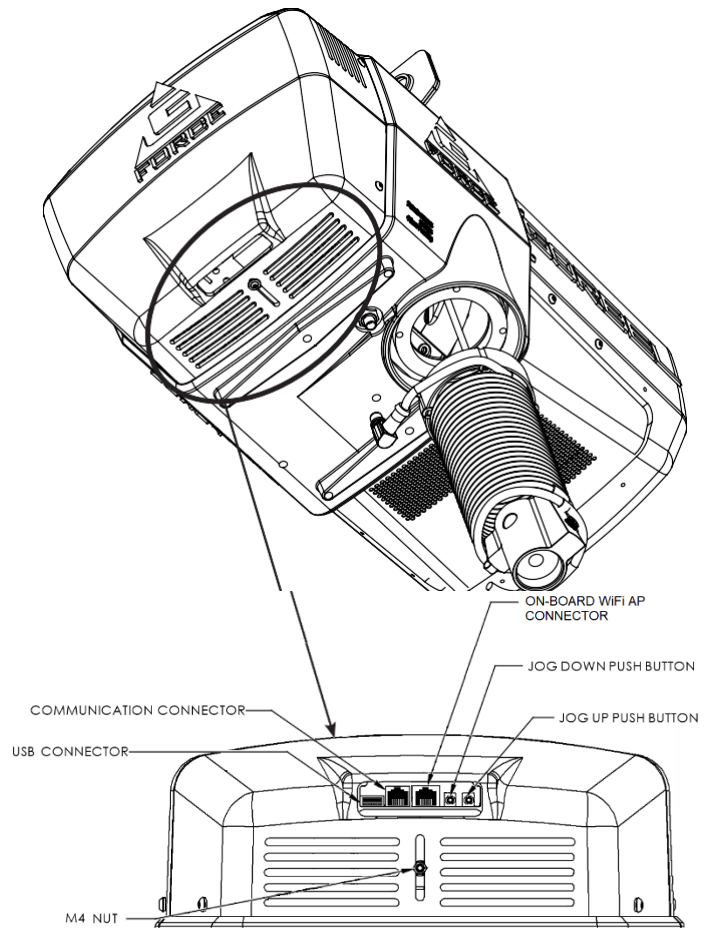
Diagram E. *Actuator - Controls Interface Display (as viewed from bottom of actuator).*

Service Mode: This operation mode is similar to the "safe mode" of a PC. In this state all handle motion control and Q2 & iQ2 custom features are disabled, all digital outputs are turned off, and only basic jog up, jog down, OLED display and safety program mode are available. It allows a minimum safe operation on a unit with a damaged handle, broken I/O electronics or other damaged peripheral control components that would make it dangerous to run the unit if the component is used. The unit is still inoperative if actuator components such as the drive, motor, or jog switches are damaged. To activate service mode, with the handle E-stop pushbutton released and the OLED screen displaying LIFT READY, press and hold both jog pushbuttons on the actuator for ten seconds. Both the blue and red LEDs flash once per second and the OLED displays SERVICE MODE when the operation mode is ready.

Communications Connector: This connector is the communications port for the G-Force®. With a standard RJ45 Ethernet cable, users may connect to the G-Force® to upload software programs or use the G-Force® VNC Viewer. When not in use, ensure the Jumper is connected between the Communications Connector and the On-board WiFi AP Connector.

On-board WiFi AP Connector: This is the port that connects the CPU of the G-Force® to the Access Point located on the Actuator's printed circuit board.

USB Connector: This port is used to upload software programs to the G-Force® via a USB flash drive.

PROGRAM MODE

Overview (Software Version R2.0)

Program Mode is used to control and adjust all of the features on the Q2 and iQ2 series G-Force®. Before entering Program Mode, review the **Program Mode Menu outline, Chart D, pages 30-35.**

Note: An alternative to using Programming Mode via the Handle is the HMI Visualization which can be accessed via a PC with a VNC Viewer installed. See Appendix 2 for more info.

Using Program Mode

Program Mode is initiated by following the steps below. Reference **diagrams B** and **C** on page 26 for button locations.

Entering Program Mode (chart A, page 31):

1. **Press and Hold** the MENU button (right-hand side of handle) for two seconds to activate Program Mode.
2. After two seconds, release the MENU button. The LED will illuminate amber and "PROGRAM MODE" will be displayed for one second.
3. Press the MENU button to toggle between menus. The OLED will display the corresponding programmable menus:
    - V-LIMITS MENU - Virtual Limits menu
    - SPEED MENU - Lift Speed adjustment
    - RESPONSE MENU - Lift Response (acceleration) adjustment
    - SETTINGS MENU - Programmable Features on both the Q2 and iQ2 units
    - ADVANCED SETTINGS - Programmable Features on iQ2 units only
    - LANGUAGE SELECTION -– Select regional language for OLED display.
4. Once you have reached the menu you would like to enter, press the G-Force® logo button.
5. The first programmable feature in that menu will be displayed. See **Chart D**, beginning on page 34 for the full list of menus and the programmable features under each menu.
6. To move to the second programmable feature, press the G-Force® MENU button again.
7. **Note:** If the MENU button is repetitively pressed in a submenu, then the selection is cleared and the last submenu option displays "RETURN BACK TO MAIN MENU" which can be selected to navigate to the program main menu.
8. Once the desired feature is selected the display shows "SELECTION CONFIRMED".
9. After the command is executed, the system returns to standard operation, and the OLED displays "G-FORCE READY TO LIFT".

PROGRAM MODE (CONTINUED)

Handle Operation

Avoid the OPS:
Make sure to keep fingers clear of the photo sensor area when in program mode. Breaking the photo sensor will drop the unit out of program mode and you will need to start over again.

Confirming a Selection:
When making changes in Program Mode, do not break the beam of the photo sensor until the new setting has been completed. The display must be allowed to flash "SELECTION CONFIRMED" before the handle is gripped.

Breaking the sensor beam before the display flashes "SELECTION CONFIRMED" will cancel the change, drop the unit out of Program Mode and you will have to start over.

G-Force® Logo Button:
Float Mode: Press and release this button to initiate Float Mode.

Program Mode: Use this button to select the desired item within the menu by pressing and releasing to advance to a submenu or confirm selection.

Menu Button:
Press and hold this button for approximately three seconds until the unit enters program mode. Once in program mode, this button is used to scroll to the desired menu. Press and release this button to advance to the next menu. If you happen to accidentally pass by a menu, it will come around again if you continue to press and release this button.

No Timeouts:
There is no Menu timeout when in Program Mode. The menus will be active long enough to confirm any selections and can be exited sooner by activating the OPS sensor.

PROGRAM MODE (CONTINUED)

The following table illustrates the different menus and corresponding selections available under each menu and sub-menu. Use the MENU button to scroll to the desired menu and the G-Force logo button to select the desired item within each menu.

Menu	Options	Sub-Menu	Sub-Menu Options	Next Sub-Menu Options
Virtual Limits Menu	Upper Limit			
	Lower Limit			
	Lower Slow Down			
	Upper Slow Down			
	Upper Resume			
	Adjust Slow Down Speed			
	VL Menu Reset Settings			
	Return back to main menu			
Speed Menu	Current Speed			
	Select Speed 10%			
	Select Speed 20%			
	Select Speed 30%			
	Select Speed 40%			
	Select Speed 50%			
	Select Speed 60%			
	Select Speed 70%			
	Select Speed 80%			
	Select Speed 90%			
	Select Speed 100%			
	Return back to main menu			
Response Menu	Current Response			
	Response Low			
	Response Medium			
	Response High			
	Return back to main menu			
Settings Menu	Zero Weight Display			
	Weight Readout On			
	Display Units			
	Float Mode Setup Sub-Menu	Float Mode Setup Sub-Menu	Enable Float Mode	
			Float Mode Anti-Recoil	At over force To over speed Turn off SS check Max Force xx LBS (changeable)
			Unload Stop On	
			Float Mode Gains Sub-Menu	
			Return to previous menu	
			Return to main menu	
	User Overload Sub-Menu	User Overload Sub-Menu	Change Limit	At OVLD LBS xxx (weight) Tare OVLD Lmt Set Limits LBS 170
			Change Operator Force	At Force LBS xxx (weight) To Force LBS 5 (Changeable)
			Change Sensitivity	At Level 4 (Changeable) *Return to previous menu* *Return to main menu*
			Default Settings	
			Return to previous menu	
			Return to main menu	
	Timer Sub-Menu	Timer Sub-Menu	Pause Timer	
			Handle Timer	
			Float Mode Timer	
			Custom Timer	
			Default Settings	
			Return to previous menu	
			Return to main menu	
	Force Sensing Handle Sub-Menu	Force Sensing Handle Sub-Menu	.—FSH-- Status	
	Settings –Reset!-			
	Return back to main menu			

Chart A. *Program Mode Process*

PROGRAM MODE (CONTINUED)

Menu	Options	Sub-Menu	Sub-Menu Options	Next Sub-Menu
Advanced Settings	Settings Menu 2			
	Reset Menu 2 Settings			
	Return back to main menu			
Language Selection	English Language			
	Spanish Language			

Chart A. *Program Mode Process*

Lockout Feature (*chart B*)

To prevent tampering in Program Mode, a Lockout Feature is available.

To Lockout Program Mode from the Handle:
1. Press both the G-Force® logo button and the MENU button simultaneously for five seconds.
2. The OLED will display LOCKOUT CHECK while both buttons are being depressed.
3. After 5 seconds, PROGRAM LOCKED will be displayed to confirm the Lockout was successful.

If Program Mode is requested after the Lockout has been enabled, the LED will illuminate amber to indicate Program Mode is not accessible and PROGRAM LOCKED will be displayed again.

To Unlock Program Mode:
1. Press both the G-Force® logo button and the MENU button simultaneously for five seconds.
2. The OLED will display UNLOCK CHECK while both buttons are being depressed.
3. After five seconds, PROGRAM UNLOCKED will be displayed to confirm the Lockout was successful.
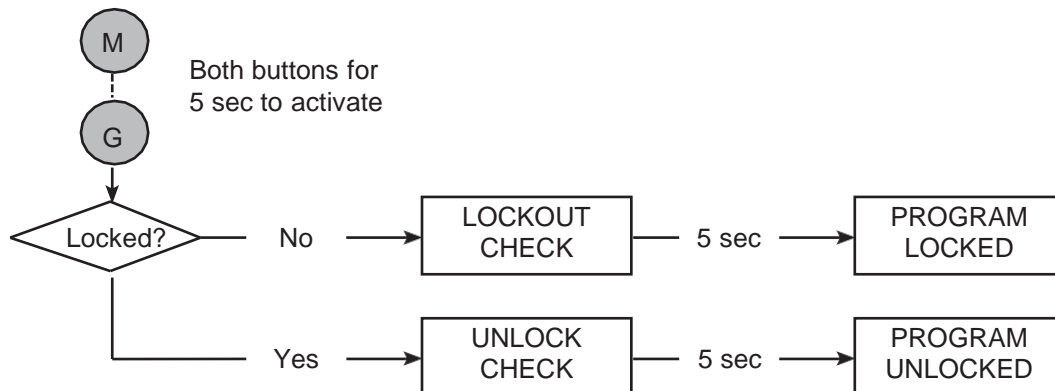
Chart C. *Lockout Feature Process.*

Disabling Handle Menu

For added system security the entire Program Mode Menu can be disabled from the password protected HMI Visualization. To do so only requires navigating to the **System Config** page and toggling the Handle Menu Enabled/Disabled button. *NOTE:* Once the Handle Menu is Disabled, it requires Re-Enabling it via the HMI and Unlocking via the Handle pushbuttons to access Program Mode via the Handle.

PROGRAM MODE (CONTINUED)

Safety Program Mode

If the G-Force® has detected a fault or is running in SERVICE MODE, only a limited set of menus are accessible.

For example, if the G-Force® records a fault, when Program Mode is activated the OLED will display LIMITED PRG MODE rather than PROGRAM MODE. Safety Program Mode can be navigated just as Program Mode would be, however the only menus available are:

- V-LIMITS MENU - Virtual Limits menu
- SPEED MENU - Lift Speed adjustment
- RESPONSE MENU - Lift Responsiveness (Acceleration) adjustment
- SERVICE MENU - Customize and manage maintenance and service features

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. Please program the Upper Slow Down Reduction point at least half an inch below the exact point of pick-up.

PROGRAM MODE (CONTINUED)

Program Mode	Menu	OLED Text	Feature Description
Virtual Limits (VL) Menu (*, **, ***)	V-LIMITS MENU[2][1] [2]	UPPER LIMIT	Keep the load at the desired position and select to set the upper limit.
		LOWER LIMIT	Keep the load at the desired position and select to set the lower limit. *Note:* Setting the upper and lower virtual limits to the same position will cause the unit to not travel in either direction.
		LOWER SLOW DN	Keep the load at the desired position and select to set the lower slowdown limit. (The load slows down from max speed once crossing this limit).
		UPPER SLOW DN	Keep the load at the desired position and select to set the upper slowdown limit. (The load slows down from max speed once crossing this limit).
		UPPER RESUME	Keep the load at the desired position and select to set the upper resume limit. (The load's speed increases from the upper slowdown speed to the regular speed here).
		ADJUST SLOW DOWN SPEED	Allows one to set the speed of slowdown for both the upper and lower slow down limits. It first displays the current slowdown speed, and by toggling, one can select speeds from 5-50-% of max speed (Multiples of 5) as set in the SPEED MENU.
		VL MENU -RESET!-	Reset all programmed virtual limits in this menu.
		RETURN TO MAIN MENU	Return back to the main selection menu Reset all programmed virtual limits in this menu.
Lift Speed Setting	SPEED MENU	SPD MENU SPD 10% ~ SPD 100%	Maximum hoist speed selection, [10 – 100%] correspond to lowest and highest speed.
		RETURN TO MAIN MENU	Return back to the main selection menu
Lift Responsiveness (Acceleration) Setting	RESPONSE MENU	RESPONSE LOW	Set the lowest handle control response corresponding to about 75% of the highest responsiveness setting.
		RESPONSE MEDIUM	Set the medium handle control response corresponding to about 85% of the highest responsiveness setting.
		RESPONSE HIGH	Set the highest handle control responsiveness setting.
		RETURN TO MAIN MENU	Return back to the main selection menu
Force Sensing Handle Settings	FAST ZERO FSH	FAST ZERO FSH	This menu provides a short cut to tare the Force Sensing Handle. Clicking the Float Mode button will perform the tare process. This menu will not be displayed unless a Force Sensing Handle is connected.
Q2 & iQ2 Custom Features	SETTING MENU	ZERO WT DISP	Record and tare out the handle weight for weight readout calculation.
		WEIGHT READ ON_ READ OFF	Toggle between enabling and displaying the load weight. Once enabled, weight is displayed two seconds into standard operation (unit idling).
		DISPLAY METRIC	Toggle the unit of the weight readout display between pounds (English) and kilograms (Metric).
		FM SETUP SUB-MENU	Access Float Mode Configuration Setup Sub-Menu.
		USR OVLD SUB-MENU	User Programmable Overload Setup Sub-Menu.
		TIMER SUB-MENU	Excessive Pause Timer Setup Sub-Menu.
		FSH HNDL SUB-MENU	[Appears only when FSH is connected] Force Sensing Handle (FSH) Setup Sub-Menu.
		SETTINGS -RESET!-	Reset all custom features in the settings menu
		RETURN TO MAIN MENU	Return back to the main selection menu

Chart D. *Program Mode Menu and Selection Settings.*

PROGRAM MODE (CONTINUED)

Program Mode	Menu	OLED Text	Feature Description
[SUB-MENU] **Float Mode (FM) Configuration Setup**	FM SETUP SUB-MENU	FM Setup Menu	Startup prompt screen when this sub-menu is accessed.
		ENABLE DISABLE FLOAT MO[3]	Enable or Disable running Float Mode related features, such as Standard Float Mode, Remote-Mount Float Mode Trigger, Dual Float Mode Weights, etc.
		FM ANTI-RECOIL	Float Mode Anti-Recoil Configuration Sub-Menu.
		UNLOAD STOP ON/ STOP OFF	Optional feature utilizing Anti-Recoil detection. When user sets a weight on a surface in Float Mode, it is terminated if Anti-Recoil detects an unloading. This can be useful for applications needing a quick Float Mode exit to an idle state to allow user to work on the part. Note: As a result of the extra detection, Float Mode is likely to terminate when the upper limit switch is hit while unit is running at a fast speed. This false detection can be avoided or reduced by running the unit at a low speed.
		FM GAINS SUB-MENU	Float Mode Gain Selection Sub-Menu (660 lb. capacity only)
		RETURN TO PREV. MENU	Clicking this takes the screen back to the Settings Menu page starting with Zero Wt Display
		RETURN TO MAIN MENU	Return back to the main selection menu
[SUB-MENU] **Float Mode Anti-Recoil Configuration Setup**	FM ANTI RECOIL	AT OVER FORCE / SPEED	Startup screen when this sub-menu is accessed. The current configured Anti-Recoil detection method is displayed (see next item for details on the detection methods).
		TO OVER FORCE/ SPEED	Toggle Anti-Recoil detection method between standard over-speed and over-force detections. Anti-Recoil protects against a dropped weight while running Float Mode causing the unit to speed upward until hitting an object or a push force equivalent to the dropped weight. Over-Speed Detection: Unit terminates Float Mode if speed exceeds maximum Float Mode speed at 90% of unit loaded speed. Over-Force Detection: Unit terminates Float Mode if user's operating force exceeds the maximum force limit or a dropped weight is detected by evaluating the force profile. Different from Over-Speed Detection, unit can run at the maximum Float Mode speed. a. Maximum force limit defaults at 35 lbs. b. A dropped weight profile assumes the operator has both hands off the weight (tooling) as the unit speeds upward. Detection ability may reduce if user attempts to stop the unit or if the tooling swings heavily. c. If the total lifted weight (e.g. tool and part) is less than the maximum force limit, Over-Speed Detection is applied.
		MX FORCE 15 ~ 45 LBS	Set Anti-Recoil Over-Force Detection maximum force limit between 15 and 45 lbs. at 5 lb. increments. Anti-Recoil Over-Force Detection limits increased for 660 lb. units. New limits are between 30 and 90 lbs. at 5 lb. increments.
		DEFAULT SETTINGS	Unit reset to the default setup according to the configured detection method. For example, unit configured with Over-Force Detection defaults to 35 lbs. maximum force limit, dropped weight profile checkup and conditional Over-Speed Detection. UNLOAD STOP option is turned off for both methods.
[SUB-MENU] **Float Mode Gains Selection (660 lb. capacity ONLY)**	FM GAINS SUB-MENU	DOES NOT APPLY	Will be displayed for non-660 lb. capacities.
		LOWEST	Lowest (least responsive / most stable) Float Mode gains.
		LOW	Second lowest Float Mode gains. (More responsive than LOWEST).
		DEFAULT (MEDIUM)	Default Float Mode gains as defined in database.
		HIGH	Highest (most responsive / least stable) Float Mode gains.

Chart D. *Program Mode Menu and Selection Settings.*

PROGRAM MODE (CONTINUED)

Program Mode	Menu	OLED Text	Feature Description
[SUB-MENU] **User Programmable Overload Setup**	USR OVLD SUB-MENU	USER SUB-MENU	Startup prompt screen when this sub-menu is accessed. Please activate weight readout while setting an overload limit, to ensure that the load cell is properly calibrated and the desired overload limit is within the acceptable range. Please see WEIGHT READ ON_ under SETTINGS MENU for additional details.
		CHANGE LIMIT	1. Displays the current overload limit 2. Tare Overload Limit 3. Set a new overload limit See *Program an Overload Limit* below for more details.
		CHANGE OPERATOR FORCE	1. Displays the current operator force 2. Set a new operator force value (Starting at 5 lbs.)
		CHANGE SENSITIVITY	Allows one to see the current sensitivity level and change it as well (Max value 5)
		DEFAULT SETTINGS	Apply factory default overload settings. Overload limit is set as the maximum limit either at the rated capacity plus 5 lbs. for G-Force® 165# and Easy Arm® 165# models, or 101% of the rated capacity plus 5 lbs. for all other models. The operating force limit is set at 15 lbs. and detection sensitivity is set to 5 (high).
		RETURN TO PREV. MENU	Clicking this takes the screen back to the Settings Menu page starting with Zero Wt Display
		RETURN TO MAIN MENU	Return back to the main selection menu
User Programmable Overload Limit. Program an Overload Limit	CHANGE OLVD LMT	AT OVLD LBS XXX	Startup prompt screen displaying the programmed overload limit. (Remember, the user Overload feature adjusts the detection sensitivity and limit parameters.) The G-Force is overloaded approximately when the load exceeds the Overload Limit + the OP FORCE (Operator Force Limit). Note: this limit is superseded by the G-Force® capacity limit.
		TARE OVLD LMT	Tare the total lifted weight as Overload Limit. When selected, unit tares the total lifted weight supported by the wire rope as the Overload Limit. (Monitored on the "WT READ ON" in the settings Menu). **Maximum limit** = Rated capacity plus 5 lbs. for G-Force® 165# and Easy Arm 165# models, or 101% of the rated capacity plus 5 lbs. for all other models. **Minimum limit** = 25% of the rated capacity. (A warning is triggered if the tare weight is outside this range)
		SET LIMIT LBS	Set Overload Limit to the selected limit. TARE OVLD LMT section lists the maximum and minimum limits for Overload Limit. Clicking the pushbutton decrements the limit from the maximum, one lb. at a time. Press the G-Force® button to confirm selection. The overload limit is now set at #### lbs.
		RETURN MENUS	1. Clicking Return to Prev. Menu takes the screen back to the Settings Menu 2. Clicking Return to Main Menu takes it back to the main selection menu.
Configure Operating Force Limit for Moving a Load in Air	CHANGE OPERATOR FORCE	AT FORCE LBS XX AT FORCE LBS	Startup prompt screen displaying the programmed Operating Force Limit. Note: An Operator's push and pull force is an extra loading to the system, especially when handle is mounted on the tooling. This sub-menu allows one to set a Force Limit to account for different user's operating force thus reducing chance of false overload detection. The limit should not be set larger than necessary as it reduces detection capability. By default, the limit is set at 15 lbs.
		TO FORCE LBS	Set Operating Force Limit to between 5 and 25 lbs. in 1 lb. increments.
		RETURN MENUS	1. Clicking Return to Prev. Menu takes the screen back to the Settings Menu 2. Clicking Return to Main Menu takes it back to the main selection menu.
Configure the sensitivity. **Config. Overload Detection Sensitivity**	CHANGE SENSITIVITY	AT LEVEL X –	Startup prompt screen displaying the programmed Detection Sensitivity. The sensitivity parameter can be reduced to prevent false detection when operating a load at no greater than the Overload Limit. However, do not reduce the sensitivity unless it is necessary due to actual usage. A reduced sensitivity increases the time to detect a legitimate overload condition that may result in damages or failure to the unit. By default, Detection Sensitivity is set at 5 (HIGH).
		TO LEVEL 1 - 5	Set Detection Sensitivity to between 5 (HIGH) and 1 (LOW) one level decrements at a time.
		RETURN MENUS	1. Clicking Return to Prev. Menu takes the screen back to the Settings Menu 2. Clicking Return to Main Menu takes it back to the main selection menu.

CHART D (continued) *Program Mode Menu and Selection Settings.*

Program Mode	Menu	LCD OLED Text	Feature Description
[SUB-MENU] **Excessive Pause Timer Setup Sub-Menu**	TIMER SUB-MENU[3]	PAUSE TIMER	Startup prompt screen when this sub-menu is accessed.
		HANDLE TIMER	Change timer setting for the slide and pendant handle run modes.
		FLOAT MODE TIMER	Change timer setting for Float Mode.
		CUSTOM TIMER	Change timer setting for custom motion such as Auto Home or other motion profile.
		DEFAULT SETTINGS	Apply default excessive pause timer settings: slide and pendant handles (45 seconds), Float Mode (60 seconds) and custom motion (20 seconds).
		RETURN MENUS	1. Clicking Return to Prev. Menu takes the screen back to the Settings Menu 2. Clicking Return to Main Menu takes it back to the main selection menu.
Change Time Setting for the Selected Run Mode	CUSTOM TIMER	AT LIMIT SEC ## MIN	Startup prompt screen displaying the current timer limit between 1 ~ 59 seconds or 1 ~ 5, 10 or 15 minutes.
		SET LIMIT SEC ## MIN M	Set a custom pause timer limit. Clicking the MENU pushbutton increments the setting from 1 to 59 seconds, followed by 1-15 minutes. Press-and-hold the pushbutton does a quick scroll-thru on these limits. Once the desired time is reached, press the GForce button to confirm the selection.
[SUB-MENU] **Force Sensing Handle Setup Sub-Menu**	FSH HNDL SUB-MENU	FSH HNDL SUB-MENU	Startup prompt screen when this sub-menu is accessed.
		ZERO FSH WEIGHT	Tare the FSH handle bar weight to zero the load cell signal.
		CHANGE 2 INLINE (REMOTE)	Change FSH style to remote if current style is inline (or inline if current style setting is remote).
		SET FRCE 2 LARGE	Change FSH Start up force to large if current setting is small (or vice versa).
		RESET FSH TARE	Reset FSH tare value to zero to un-zero the load cell signal.
		DEADBAND CENTER	FSH deadband averaging to improve sensitivity of FSH signal by centering it.
		DEFAULT SETTINGS	Apply default setting of FSH.
Advanced Features, **	ADVANCED SETTINGS	DUAL FM TOOL WT	(Float Mode feature enabled) Record tooling weight for the Dual Float Mode weights feature.
		DUAL FM LOAD WT	(Float Mode feature enabled) Record tooling and load weights for the Dual Float Mode weights feature.
		ANTIDROP TOOL WT	Tare tooling weight for anti-drop feature. The minimum difference between unloaded and loaded tool weight is 20 lbs. for G-Force® and 25 lbs. for Easy Arm®.
		MENU 2 SET HOME	Program the auto home tracking position (load must be at desired position for the limit).
		MENU 2 -RESET!-	Reset above custom features including the dual Float Mode, anti-drop, and auto home features.

Chart D. *Program Mode Menu and Selection Settings.*

* Indicates this feature is only available on iQ2 units.

** Additional details are available in the Input/Output Functionality section.

[1] Four (4) virtual limit sets are available with a standard Q2 or iQ2 unit. The Limits Sets 1 and 2 are programmable via the Handle Program Menu (set programmed is toggled with Digital Input). More virtual limit sets are possible to configure via the visualization or with custom programming.

[2] Gorbel® recommends the minimum distance between any two virtual limits to be no less than 2 inches for best performance and user experience. Please note this distance is greatly dependent on Unit Speed, Responsiveness, Capacity, and Load, individual results may vary.
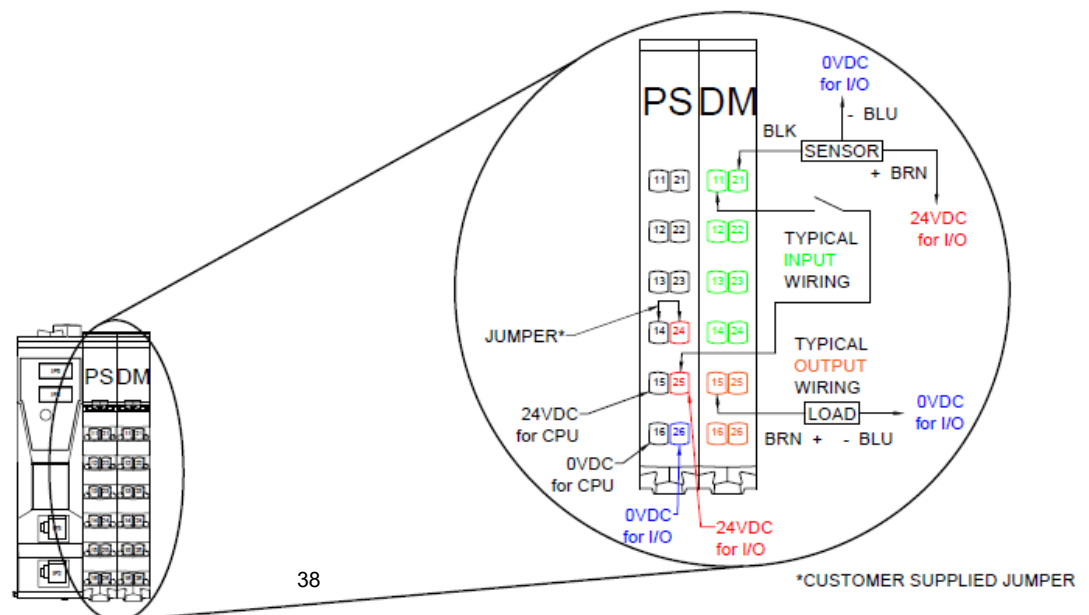
Note: Gorbel® G-Force® & EasyArm® products are capable of achieving consistent positioning to 0.5 inches.

> ➔ **Tip:** I/O Functionality may be assigned via HMI Visualization programing to meet application requirements. Review the HMI Visualization Programming Appendix for more options and details.

iQ2 Actuator Programmable Input/Output Module Functionality

I/O Point	Assigned Function	Description
1	Input - Dual virtual limit sets	When this input option is turned on, the G-Force® switches to a second independent set of virtual limits. The second set of virtual limits is programmed the same as the standard set but with this input turned on. See chart DC for instructions on setting each of these limit sets.
2...	Input – Inhibit Motion	Example user defined inputs.
	Input – Remote Float	
	Input – Toggle Speed	
3...	Input – Slowdown	
	Input – Jog Down	
...4	Input – Float Bias Up	
5	Output - External Control Output 1	This output option is controlled by the input on the optional expansion 8-point input/output block set to EXTERNAL CONTROL INPUT 1. In this example, when that input is on, output 1 on the iQ2 actuator input/ output module is on and vice versa.
6	Output - External Control Output 2	This output option is controlled by the input on the optional expansion 8-point input/output block set to EXTERNAL CONTROL INPUT 2. In this example, when that input is on, output 2 on the iQ2 actuator input/ output module is on and vice versa.
7	Output – Service Indicator	This output option turns on when service is required (based on hours of use and set at the factory) and may be used to turn on an external service indicator (supplied by others). The reset function for this output is in the Handle Settings Menu option: CLEAR RUN TIME or disable the Warning in the Service Menu of the HMI.
8	Output - Fault indicator	This output option turns on when a command fault or drive fault occurs. It does not turn on due to a command warning.

Chart E. *iQ2 Actuator Input/Output Module Example Functionality*

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5	Input - External control input 1	This input option controls the output on the actuator input/output module set to EXTERNAL CONTROL OUTPUT 1. In this example, when this input is on, output 1 on the iQ2 actuator input/output module is on and vice versa.	I/O Functionality may be assigned via visualization programming to meet application requirements.
6	Input - External Control input 2	This input option controls the output on the actuator input/output module set to EXTERNAL CONTROL OUTPUT 2. In this example, when this input is on, output 2 on the iQ2 actuator input/output module is on and vice versa.	
7	Output - Anti-drop feature (Clamp Control)	This output option is typically wired to actuate the clamping mechanism of an end effector tooling. It turns on when Input #2 (see I/O Point 2) is on and remains latched on when the input is released. It can be turned off by Input #3 (see I/O Point 3).	See I/O Point 2&3 Settings description.
8	Output - Anti-drop feature (Unclamp Control)	This output option is typically wired to actuate the unclamping mechanism of an end effector tooling. It turns on when Input #3 (see I/O Point 3) is on and the Anti-Drop algorithm determines the suspended load is at or below the set weight (ANTIDROP TOOL WT). If it is not turned on, the input can be held momentarily (do not hold on indefinitely) until the tooling is unloaded then the output is turned on. Once the output turns on, it remains latched on when the input is released. It is always turned off with Input #2 (see I/O Point 2).	

Chart F. *Expansion 8-Point Input/Output Block.*

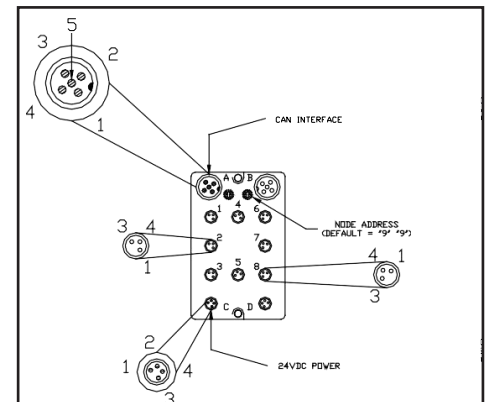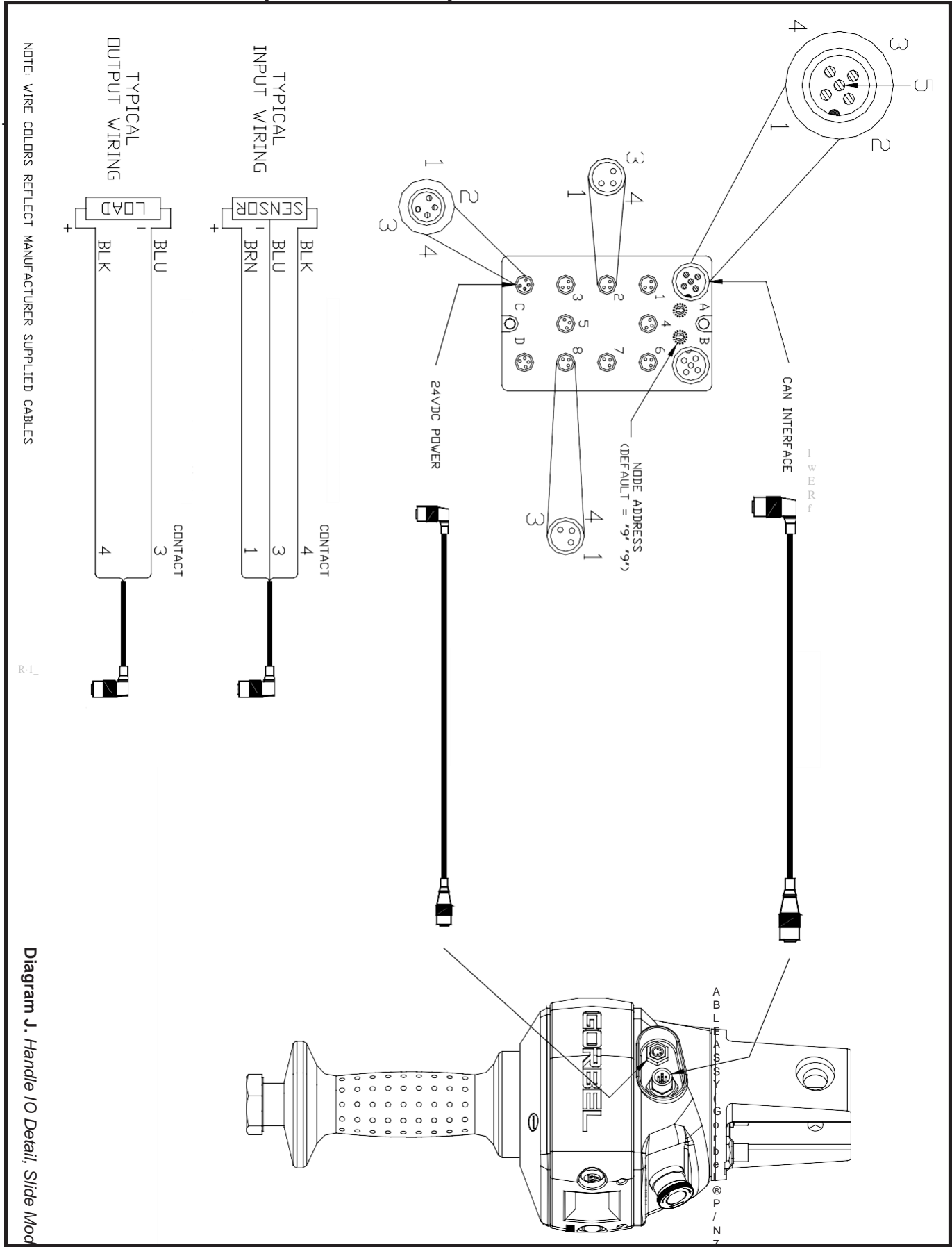* G-Force® must have Float Mode feature enabled for this feature to work.

Diagram G. *Handle Input/Output Block.*
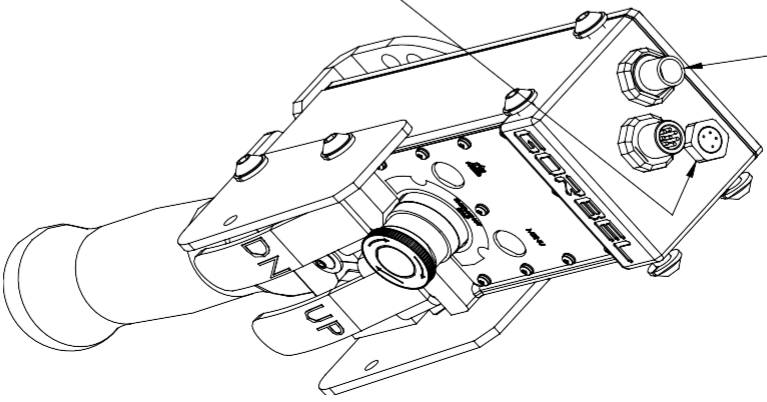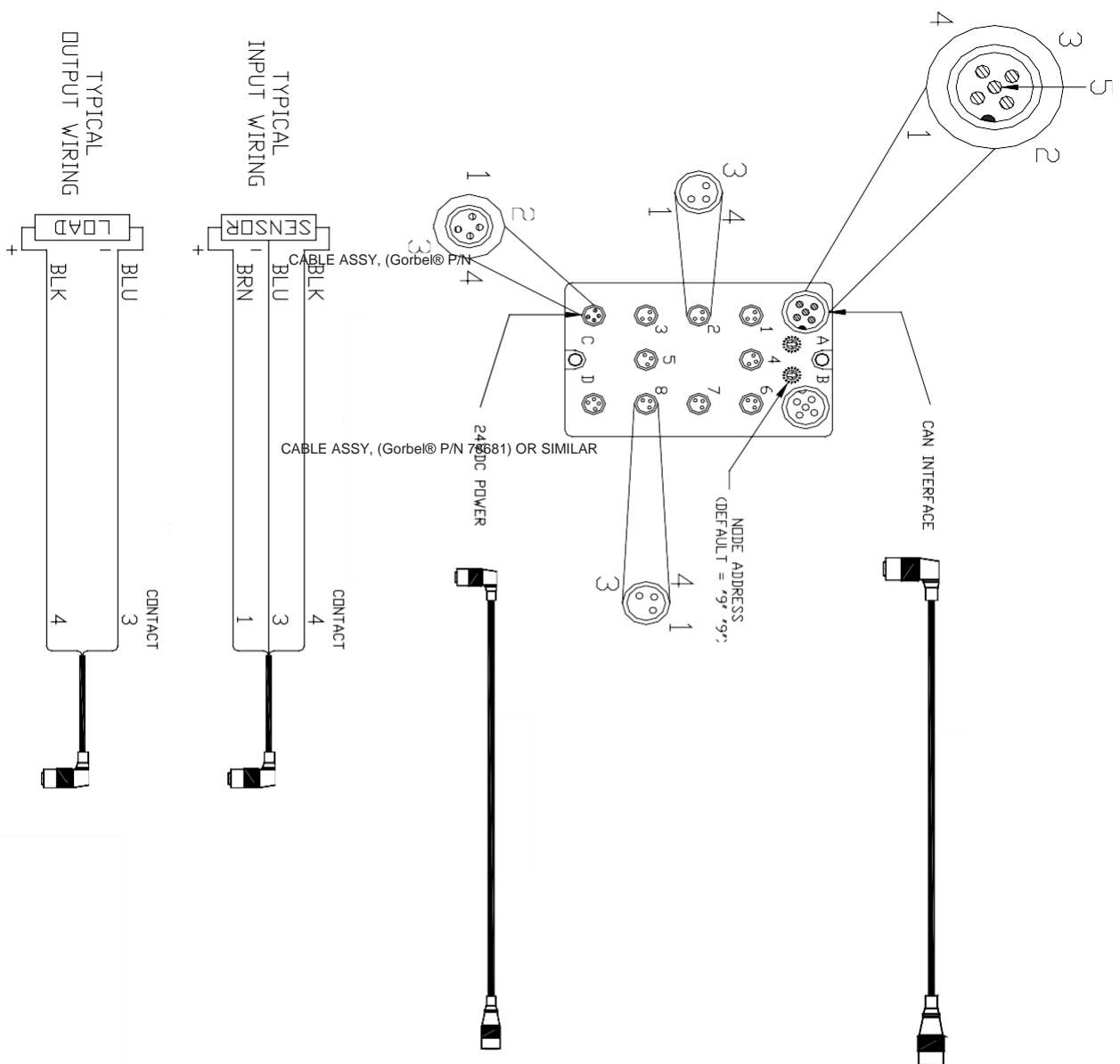
PROGRAM MODE (CONTINUED)

Diagram J. *Handle IO Detail, Slide Model.*

NOTE: WIRE COLORS REFLECT MANUFACTURER SUPPLIED CABLES

TYPICAL
OUTPUT WIRING

LOAD	
+	–
BLK	BLU
CONTACT	
4	3

TYPICAL
INPUT WIRING

SENSOR		
+		–
BRN	BLU	BLK
CONTACT		
1	3	4

24VDC POWER

NODE ADDRESS
(DEFAULT = '9','9')

CAN INTERFACE

Diagram K. *Handle IO Detail, Pendant Model.*

NOTE: WIRE COLORS REFLECT MANUFACTURER SUPPLIED CABLES

TYPICAL
OUTPUT WIRING

TYPICAL
INPUT WIRING

LOAD

SENSOR

BLU
BLK

BRN
BLU
BLK

CONTACT
3
4

CONTACT
1
3
4

CABLE ASSY, (Gorbel® P/N

CABLE ASSY, (Gorbel® P/N 78681) OR SIMILAR

24VDC POWER

NODE ADDRESS
(DEFAULT = "9" "9")

CAN INTERFACE

PENDANT HANDLE TOP GUARD NOT SHOWN

GORBEL

DN

UP

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TROUBLESHOOTING

Failure	Possible Solution
There is no display on the OLED screen on the handle.	• Verify the correct AC power to the actuator. • Check the coil cord connections at both the handle and actuator. • Check the overall condition of the coil cord. Look for broken or exposed wiring. • Verify connections to Actuator PCB are all securely connected.
There is a fault or warning message displayed on the OLED screen on the handle.	• Clear the fault condition per the instructions on the OLED. • Reset the E-stop on the handle. • Cycle the AC power. **Note:** AC power must be disconnected from the actuator by unplugging the actuator from the AC power source or disconnecting power by using a circuit breaker or similar method.
LED on the control handle is on steady or flashing.	Refer to LED chart on page 44.
The unit will not raise or lower the load.	• Make sure you are in the RUN MODE. • Check the virtual limits settings if equipped with that option. • Check that you are not in an overloaded condition. • If you are wearing dark gloves, remove them and try the sliding handle again. • Check the coil cord for secure connections at both the handle and the actuator. • Check that the sliding handle grip or pendant handle levers move smoothly. • Check for any interference between the handle and any foreign objects, work surfaces, etc.
The unit is too slow or too fast.	• Adjust the speed in PROGRAM MODE. Check for speed reduction setting in virtual limits program if that option is selected.
The unit does not accelerate at the desired rate.	• Adjust the response in PROGRAM MODE. • Make sure you are not attempting to "snatch" the load. • Check the weight of the load. If you are close to the overload limit, try lifting at a reduced speed.
Unit will not raise or lower the load to the desired height.	• Check the virtual limits settings in PROGRAM MODE. • Check for wire rope damage. • Check whether or not you have an extended wire rope with a standard length coil cord. • Check to see if the wire rope has been modified (shortened) for any reason). • Check for any interference with foreign objects, tooling, work surfaces, etc.
The actuator is extremely noisy.	• Check the condition of the wire rope. • Check for any external damage to the actuator covers.
Float Mode does not function correctly.	**Note:** Refer to Technical Specifications, page 43, for maximum speed of G-Force® Float Mode. • Check that the blue LED on the handle is illuminated. • Check to see if the OLED screen indicates you are in Float Mode. • Check that Float Mode has not timed out because the system has not been used for 60 seconds (default). • Ensure the unit is stable when Float Mode is initiated. • Check that the load data is reading accurately on the OLED screen. • Verify the bridge capacity. Check for excessive deflection in the bridge. • Check for obvious interference with the coil cord or handle.
Unit only goes in the up direction.	• Check the virtual limits settings if that option is active. • Check that the wire rope is not in a slack condition. • Check that no inhibit down motion inputs have been enabled. • Check for any obvious interference with the load or the handle. • Check that you are not at the lower limit of the system. • Check the coil cord connections at both the handle and actuator. • Check the overall condition of the coil cord. Look for broken or exposed wiring.
Unit only goes in the down direction.	• Check the virtual limits settings if that option is active. • Check that you are not at the upper limit of the system. • Check that no inhibit up motion inputs have been enabled. • Check that you are not in an overload condition. • Check for any obvious interference with the load or the handle. • Check the coil cord connections at both the handle and actuator. • Check the overall condition of the coil cord. Look for broken or exposed wiring.
E7219 / E4005 codes.	• The AC power is too low. If it approaches ~ 200VAC the system will not operate properly.
E501 / E11000 codes.	• Limit switch fault: a. Check for any mechanical binding that could engage both the upper and lower limit switches. b. Check and correct if the limit switch cable is connected to the interface board. • Check for bad electrical connection or shorted wires from the switches.

If the possible solutions do not work, refer to the optional Service Manual available

TROUBLESHOOTING (CONTINUED)

A system fault or warning message may appear on the OLED screen on the G-Force® handle along with flashing LEDs. The system fault or warning message can be one of the following:

1. **Command fault** - CPU detected condition while executing a command that results in a system shutdown. A message will displayed on the OLED screen with the Fault code.
2. **Command warning** -– CPU detected condition that will allow the system to continue to operate. A message will display on the OLED screen until the condition message is cleared in Program Mode.
   Note: The warning is cleared through Program Mode or cycling the power or E-stop if the warning condition has been resolved.
3. **ACOPOS Drive fault** -– Drive detected condition that results in a shutdown. A drive fault message will display on the OLED screen with the Drive Fault code.

The recovery from these may require the cycling off/on of the E-stop switch or AC power source.
Note: The latter must be done by disconnecting the AC power cord, using an electrical disconnect device or a circuit breaker.

It is also possible that the fault clearance may require a more specific corrective action, such as replacing the wire rope, checking certain external input/ output modules or some other service-related task. If necessary, check with your Gorbel® distributor or contact Gorbel® After the Sales Service (ATSS) at 800-821-0086 for assistance.

For specific corrective action not listed above, refer to the optional Service Manual available from Gorbel.

TROUBLESHOOTING (CONTINUED)

LED Chart: The chart below shows the status of the LED lights in different states.

Machine State	Sub-State (if applicable)	Color	OLED TEXT
E-Stop Engaged	- -	No Light	E-STOP ENGAGED
Programming Mode		Amber	PROGRAMMING MODE
PLC (Command) Fault		Flashing Red	COMMAND FAULT ERROR NUMBER: ####
Drive Fault		Flashing Red	DRIVE FAULT ERROR NUMBER: #####
Warning		Amber	WARNING ####
Service Warning		Amber	SRV WARN <###> HRS
Service Mode		Amber	SERVICE MODE
Run Mode	Overload	Red	WARNING LIFT OVERLOAD
	Overspeed	No Light	FLOAT MODE OVERSPEED
	Handle Idle Timeout	Amber	IDLE TIME EXCEEDED
	Handle Mode	Green	RUN MODE HANDLE
	Float Mode	Blue	RUN MODE FLOAT
Ready Mode	- -	No Light	G-FORCE READY TO LIFT
Startup Sequence	Before Ready Mode	No Light	SYSTEM BOOTING COMMUNICATION INITIALIZING POWERED ON
G-Force Initializing	- -	No Light	G-FORCE INITIALIZING
User is connected to the unit with user interface*		Flashing Amber	HMI USER INTERFACE IS ACTIVE

*Service level 2 or OEM level 3 user is logged in.

TECHNICAL SPECIFICATIONS

G-Force® Q2 & iQ2 Actuator		165 lb [75kg]	330 lb [150kg]	660 lb [300kg]	1320 lb [600kg]
Max Capacity	lb. [kg]	165 lb [75kg]	330 lb [150kg]	660 lb [300kg]	1320 lb [600kg]
Max Lift Speed Unloaded	ft/min [m/min]	195 fpm [59 mpm]	95 fpm [29 mpm]	45 fpm [14 mpm]	25 fpm [8 mpm]
Max Lift Speed Fully Loaded	ft/min [m/min]	120 fpm [37 mpm]	60 fpm [18 mpm]	40 fpm [12 mpm]	20 fpm [6 mpm]
Max Float Mode Lift Speed	ft/min [m/min]	110 fpm [34 mpm]	55 fpm [17 mpm]	40 fpm [12 mpm]	20 fpm [6 mpm]
Max Lift Range	ft [m]	11 [3.4]			5.5 [1.7]
Max Lift Stroke	ft [m]	8 [2.4]			5.5 [1.7]
Primary Voltage	VAC	220 +/- 10%			
Maximum Current	Amps	6			
Duty Cycle		H5	H5	H4	H3
Available Tooling Power		24VDC @ 0.5A			
Lifting Media		3/16" dia. 19x7 Preformed Stainless Steel Wire Rope		1/4" dia. 19x7 Preformed Stainless Steel Wire Rope	
Operating Temperature Range	°F [°C]	41 – 122 [5 – 50]			
Operating Humidity Range (Non-Condensing)		35 - 90%			
Environmental Rating		NEMA 5			
Weight Display Accuracy		+/- 1% Rated Capacity			
UL/CSA Certified		Yes			
CE Certified		Yes			

Actuator I/O (iQ2 Model)		
Inputs, Type		8, Sinking
Input Current @ 24 VDC		6ma
Outputs, Type		4, FET
Continuous Current/ Channel	Amps	0.5
Module Max Current	Amps	0.5

Handle with X67 I/O Module (iQ2 Model)		
Inputs, Type		8, Sinking
Input Current @ 24 VDC		4mA
Outputs, Type		8, FET
Continuous Current/ Channel	Amps	0.5
Max Current	Amps	0.5

Handle with Standard I/O (Q2 Model)		
Inputs, Type		2, Sourcing
Input Current @ 24 VDC		60mA
Outputs, Type		2, Relay
Max Switch Current	Amps	0.5
Max Available Current	Amps	0.5

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:

- distortion of the rope such as kinking, crushing, unstranding, birdcaging, main strand displacement, or core protrusion;
- general corrosion;
- broken or cut strands;
- 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:

- Points listed in previous section on **Frequent Inspection**.
- 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.

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

- Sections in contact with saddles, equalizer sheaves, or other sheaves where rope travel is limited.
- Sections of rope at or near terminal ends where corroded or broken wires may protrude.
- Sections subject to reverse bends.
- 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, contamination, and 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.

CAUTION
Rope should be maintained in a well-lubricated condition. Gorbel recommends using chain and cable penetrating oil for lubrication. Lubricant applied as part of a maintenance program shall be compatible with the original lubricant (PreLube 6). 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 judgment 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:
   - In running ropes, any visible broken wires (***diagram L***).
   - 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.
   - Wear of one-third the original diameter of outside individual wires.
   - Kinking, crushing, birdcaging, or any other damage resulting in distortion of the rope structure.
   - Evidence of heat damage from any cause.
   - Reductions from nominal diameter greater than 1/64" (.4 mm) for 1/4" (6.35 mm) diameter rope or 3/16" (4.76 mm) diameter rope.

3. Broken wire removal criteria apply 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 an end connection, the rope should be re-terminated or replaced. Re-terminating 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 connection 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.
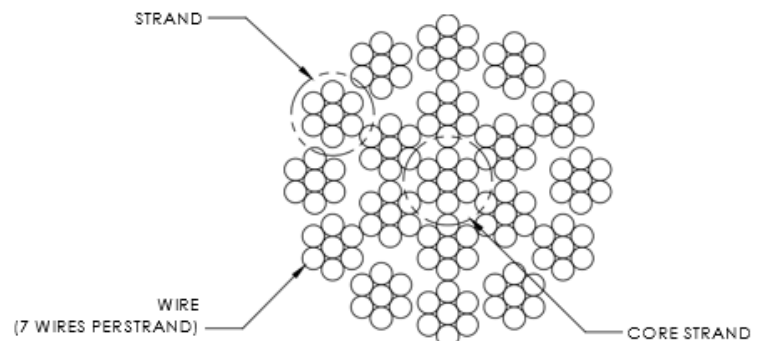

Diagram L. *19x7 Preformed Wire Rope Composition*

WIRE ROPE REPLACEMENT INSTRUCTIONS

WARNING
Wire rope replacement is to be performed by qualified maintenance personnel only.

Removal of Existing Wire Rope:
1. Make sure the replacement rope is the same length and diameter (3/16" or ¼") as rope currently on actuator unit.
   A. Ensure there is no load on handle, weighted load hook (pendant) or end effector.
   B. If using slow down setting, clear (reset) on handle or pendant handle menu screen. If using virtual limits, clear (reset) on handle or the pendant handle's menu screen.
   C. Remove end tool.
      a. Slide handle: Using a 19mm socket and ratchet, remove the nut from the handle's socket head shoulder screw, then use an M8 hex wrench and remove (unthread) socket head shoulder screw from handle. This will detach it from wire rope thimble. Set handle down on bench or table to support it and not stretch coil cord. Maintain electrical connection (via coil cord) between Handle and Actuator.
      b. Pendant handle: Remove the weighted hook or end effector from rope removing the clip and pin and set aside.

2. Using a 3mm hex wrench, completely remove the four button head screws on the G-Force® short cover.

3. Remove the short cover from actuator and set aside upward to use as a bowl to hold future parts. ***Note:*** *Be careful not to contact circuit board.*

4. Unspool rope from drum using jog down button while keeping tension on wire rope with other <u>gloved</u> hand. Continue until lower limit is engaged.

5. Insert a medium sized screwdriver between the white colored wear ring and the actuator black casting where the wire rope exits the actuator (right side). This will keep the slack switch disengaged while jogging down the remainder of the rope (***diagram M***).

6. Face the unit with circuit board on your left and wire rope on the right.

Note: The next two steps must be done at the same time.

7. Using a long screwdriver or hex wrench, reach through front of actuator and locate upper socket head cap screw head facing you underneath the lower limit switch. Fully push the screw in until it cannot move anymore (it is spring loaded). Keep pressure on it (***diagram N***).

8. Using your right hand, press the jog down button while watching the drum rotate two full turns in the clockwise direction. The drum should stop automatically with the wire rope retainer visible at the 3 o'clock position on the drum.
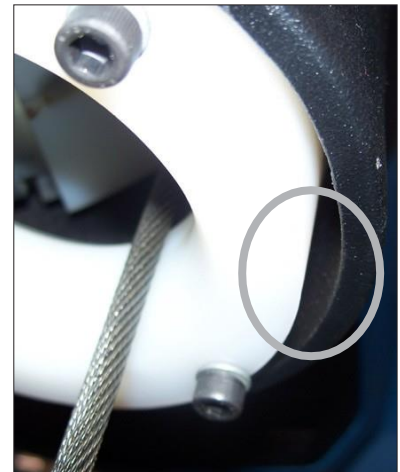

Diagram M.
Insert screwdriver between the white wear ring and the actuator casting where the rope exits the actuator
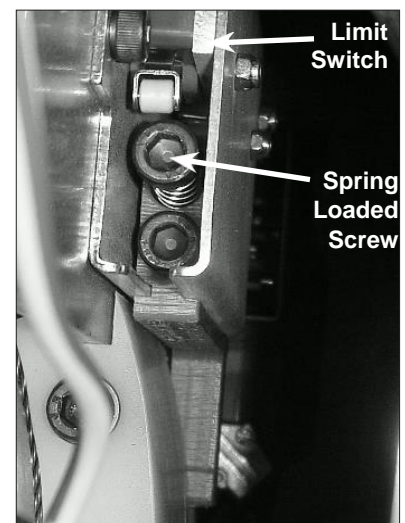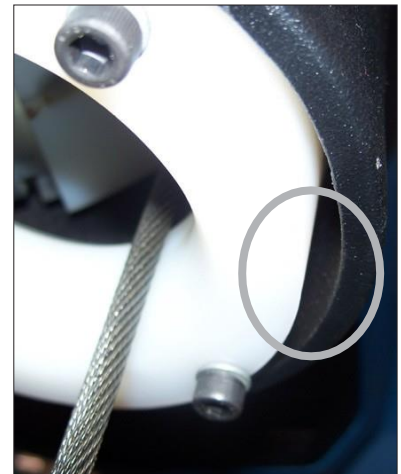

Diagram N.
Locate socket head cap screw head and fully push it in until it can not move anymore

WIRE ROPE REPLACEMENT INSTRUCTIONS (CONTINUED)

Removal of Existing Wire Rope (Continued):

9. From the limit switches is a gray colored 6 conductor lead that plugs into the circuit board. Its connected location is approximately two inches down the right side of the circuit board labeled "limits". Gently press in the locking tab and pull out the plug lead to disconnect plug from board (*diagram O*).

WARNING
Wire rope replacement is to be performed by qualified maintenance personnel only.

Wire Rope Replacement Instructions:

10. Make sure the replacement rope is same length as rope currently on actuator unit.
    A. Ensure there is no load on handle, weighted load hook (pendant) or end effector.
    B. If using slow down setting, clear (reset) on handle or pendant handle menu screen. If using virtual limits, clear (reset) on handle or the pendant handle's menu screen.
    C. Remove end tool.
       Slide handle: Using a 24mm socket and ratchet, remove the nut from the handle's socket head shoulder screw, then use an M8 hex wrench and remove (unthread) socket head shoulder screw from handle. This will detach it from wire rope thimble. Set handle down on bench or table to support it and not stretch coil cord.
    a. Pendant handle: Remove the weighted hook or end effector from rope removing the clip and pin and set aside.

11. Using a 3mm hex wrench, completely remove the four button head screws on front cover.

12. Remove front cover from actuator and set aside upward to use as a bowl to hold future parts. *Note:* Be careful not to contact circuit board.

13. Going in the down direction, unspool rope from drum using jog down button while keeping tension on wire rope with other hand wearing a glove. Continue until lower limit is engaged.

14. Insert a medium sized screwdriver between the white colored wear ring and the actuator black casting where the wire rope exits the actuator (right side). This will keep the slack switch disengaged while jogging down the remainder of the rope (*diagram M*).

Diagram M.
Insert screwdriver between the white wear ring and the actuator casting where the rope exits the actuator.

15. Face the unit with circuit board on your left and wire rope on the right.

Note: The next two steps must be done at the same time.

16. Using a long screwdriver or hex wrench, reach through front of actuator and locate upper socket head cap screw head facing you underneath the lower limit switch. Fully push the screw in until it cannot move anymore (it is spring loaded). Keep pressure on it (*diagram N, on previous page*).

17. Using your right hand, press the jog down button while watching the drum rotate two full turns in the clockwise direction. The drum should stop automatically with the wire rope retainer visible at the 3 o'clock position on the drum.

WIRE ROPE REPLACEMENT INSTRUCTIONS (CONTINUED)

Removal of Existing Wire Rope (Continued):

18. From the limit switches is a gray colored lead that plugs into the circuit board. Its connected location is approximately two inches down the right side of the circuit board labeled "limits". Gently pull out the plug lead to disconnect plug from board (*diagram O*).

19. Using 13mm open-end wrench, loosen, not remove, the two flange nuts and remove reinforcement bracket.

20. Using a 4mm hex wrench, remove four M5 socket head cap screws that fasten the swiveling circuit board bracket to the front support plate. Two screws are located on the top and two are on the bottom of bracket. Set screws in plastic front cover. Swing bracket out towards you and to the left (*diagrams P* and *Q*).

21. *For 330 lb. (150kg) and 660 lb. (300kg) units only:* Using 13mm open-end wrench, loosen, not remove, the two flange nuts and remove reinforcement bracket (*diagram Q*).

22. Using an M5mm hex wrench, remove two M6 socket head cap screws from the drum gates. Slide the unthreaded gate out towards you. Place gate and hardware in front cover (*diagram R*).

23. Using a n M6mm hex wrench, remove the two M8 socket head cap screws from the blue colored rope retainer and slide retainer off of rope end towards you. Set retainer and screws in front cover (*diagram S*).

24. Grasp wire rope with right hand where it exits actuator. Keep rope from bending while pushing rope upward to unseat the stop sleeve from the anchor channel. If this does not work, use a medium screwdriver (flat) sliding it upward between rope and drum to progressively pry rope out of anchor channel while still pushing up on rope. Remove rope from actuator through opening at bottom once unseated.
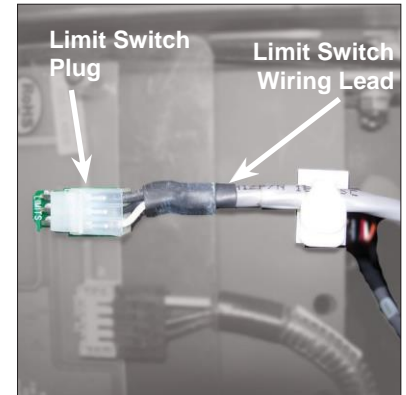
Diagram O.
Gently press tab and pull out the grey limit switch wiring lead to disconnect plug from board.
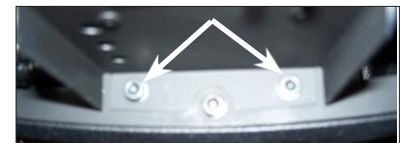
Top
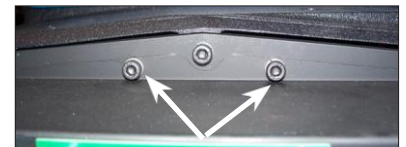
Bottom

Diagram P.
Remove (4) M5 SHCS (2 on top and 2 on bottom) that fasten the swiveling PCB bracket to the front support plate.
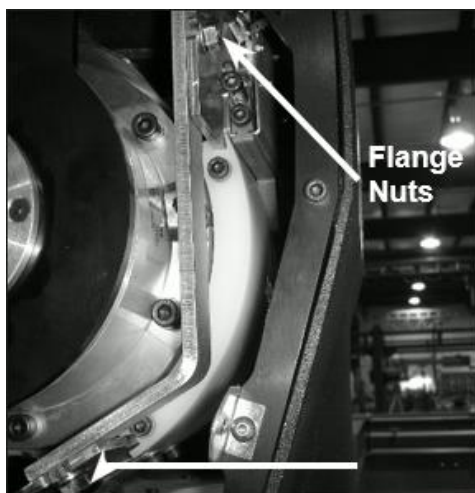
Diagram Q.
Loosen flange nuts

Diagram R.
Remove two M6 socket head cap screws from the drum gates.

Diagram S.
Remove the two M8 socket head cap screws and slide retainer off of rope end towards you.

WIRE ROPE REPLACEMENT INSTRUCTION (CONTINUED)

Installation of New Wire Rope:

1. Grasp anchor end of rope (not thimble) and make a crimp in gloved hand approximately three inches from the end (try to kink rope to make a bend radius).

2. Insert the rope into the actuator up through the wear ring using right hand. With left hand grab the free end, and bend rope to form a loop tightly enough to insert into radius channel in drum (*diagram T*). while seating the end crimp into the locker with your left hand. This will involve seating the rope into the radius channel afterwards.

Diagram T.
Insert rope from actuator through opening at bottom & form loop to set in radius channel

3. Pull down on the rope at the exit location of the actuator with right hand and hold the rope in the groove with left hand to seat the crimp into the locker fullyrecess in the drum face (*diagram U*)..

4. Install the rope retainer plate over the rope end and install the two M8 socket head cap screws and lockwashers. Torque hardware to fully compress lockwashers.

5. Ensure that rope is seated in radius channel and install rope gate back in the unit making sure the rope guide (cutout) side is inserted first and the ends are sliding on guide rails freely. Fasten the rope gate assembly together using the previously removed hardware. Torque hardware to compress lockwashers.

Diagram U.
Wire rope crimp fully seated in recess

6. *For 330 lb. (150kg) and 660 lb. (300kg) units only:* Install (slide) the reinforcement bracket studs into channels and tighten the two 13mm flange nuts.

7. Next, swing circuit board bracket closed towards plate and fasten to plate using the four previously removed socket head cap screws and lockwashers. Torque hardware to compress lockwashers.

8. Plug limit switch lead into circuit board "limits" receptacle making sure retention tab on plug is facing you.

9. Using a clean cotton cloth wrapped around rope loosely near actuator entrance, pull down on rope and press jog up button allowing rope to pass through cloth cleaning it as it is being wrapped onto the drum. Continue loading rope onto drum using jog button until three drum revolutions are completed.

10. Remove screwdriver from between actuator and wear ring.

11. Install front cover onto actuator making sure all four screws are aligned with tabs before threading.

12. If using coil cord, make sure rope is inserted down through the middle of the coils.

13. Attach wire rope to handle, weighted hook, or end effector in reverse order of disassembly.

14. Reset virtual limits and/or slow down settings.

1320 LB. WIRE ROPE REPLACEMENT INSTRUCTIONS

1. Disconnect handle or G360™ from wire rope by disconnecting coil cord and/or air hose (if applicable), removing coil cord mounting plate, and removing pulley pin.

2. Remove fasteners holding the reinforcement plate to the bottom of the actuator and nuts holding the U-bolt, freeing the end of the wire rope.

3. Follow normal wire rope change procedure.

4. Reverse steps once new wire rope is installed.

SLACK SPRING ADJUSTMENT

Slack spring adjustment is necessary if one or more of the following conditions apply:
- When wire rope continues to "pay out" from actuator when end effector (handle, tooling) is being supported and down travel is commanded.
- When slack wire rope deflection exceeds 3 inches when end effector is supported.
- When tooling is added to a G360™ assembly.
- When an air-line coil hose assembly is added between the end effector and actuator.
- When a change from pendant handle to slide handle or vice-versa occurs.
- **When chatter or erratic travel down operation occurs when using an unloaded G360[1] or weighted hook traveling downward from top of travel up limit (spring too tight).**

[1] Unloaded G360™ equipped hoist may encounter this type of operation until tooling is added.

Slack Spring Adjustment Procedure:
1. Use an M3 hex wrench to remove all screws securing the blue rear cover to actuator. Place screws in cover and set aside.

2. Locate slack spring over the motor, next to casting (*diagram V*). Spring is held in place by a motor bracket on one end and an eyebolt on the other end.

3. Using a 10mm open-end wrench, loosen the nut closest to the "eye" (inside) on bolt (*diagram W*).

4. **If chatter or erratic operation of hoist while traveling down is encountered**, the end effector or tooling on wire rope is not heavy enough to overcome the spring tension. Loosen the outside nut one half turn and test the hoist operation (full stroke up and down) between each half turn adjustment of eyebolt nut until chattering is eliminated.

5. All other conditions will require the outside nut to be adjusted by turning clockwise, tightening to increase tension in the slack spring. Before tightening this nut, be sure there is enough free travel of the eyebolt (inside nut is loose enough).

6. Using the applications' end effector (handle, unloaded end tool), travel downward resting end effector on floor. If rope continues to "pay out" from actuator beyond two seconds after reaching floor, remove hand from handle or release down button (pendant). Turn the outside nut clockwise one half turn tightening it. Test again by traveling up removing handle or tooling from floor and travel down again resting on floor. Continue adjusting and testing this until rope travel stops within two seconds of effector resting (supported) on floor and deflection of rope is 3-4 inches. Tighten inside nut clockwise until "jammed" against sheet metal while keeping eyebolt stationary.

7. Correct slack adjustment occurs when a deflection of the wire rope is 3-4 inches when in slack mode and rope travel stops (*diagram X*).
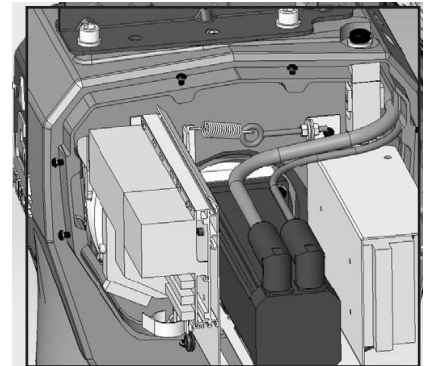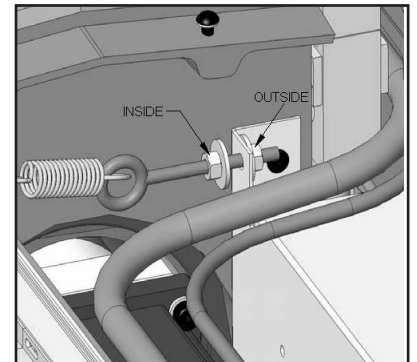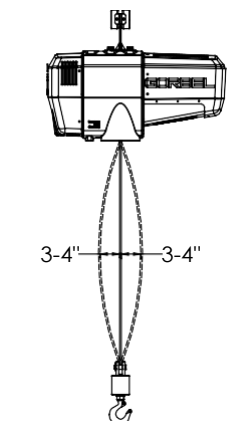

Diagram V.

Diagram W.

Diagram X.

RECOMMENDED TOOLS & SPARE PARTS KITS

Here is a list of the Spare Parts Kits we recommend. We encourage you to have spare parts on hand to limit the potential downtime if your unit becomes damaged or experiences issues for any reason. To order any of these kits, please contact your authorized Gorbel® distributor.

You will have to know your system specifications such as Serial Number, Capacity, Trolley Saddle Height, Height Under Hook and Span (if applicable to your unit).

Level One Kit contains:
One Wire Rope Assembly
One Coil Cord[a] Assembly

Level Two Kit contains:
One Wire Rope Assembly
One Coil Cord[a] Assembly
One Hardware Kit

Level Three Kit contains:
One Wire Rope Assembly
One Coil Cord[a] Assembly
One Hardware Kit
One Swivel Kit*

* If your system is equipped with a Suspended Pendant Handle you can use the Level Two Kit because you will not need the Swivel Kit.
[a] A pendant cable will be substituted here for systems that do not utilize Coil Cords.

• All kits can be used on either G-Forces or Easy Arms regardless of their capacity.

Tool Name	Sizes
Metric Allen Wrenches (T-Type, 230mm long are preferred)	2mm, 2.5mm, 3mm, 4mm, 5mm, 6mm, 8mm, 10mm
Metric Sockets (Drive sizes are typically 1/4 and 3/8 inch depending on socket size)	5.5mm, 7mm, 8mm, 10mm, 19mm
Ratchet Handles and Extensions	User preference
Metric Combination Wrenches (10mm should be ratcheting type)	10mm, 17mm, 19mm, 24mm
Lock Ring Pliers	small and medium sizes
Screwdrivers (flat and Phillips)	smaller precision type
Long Nose Pliers	8 inch is typical

# APPENDIX A: HUMAN MACHINE INTERFACE (HMI) EXPLANATION

Gorbel's G-Force® Q2 and iQ2 Intelligent Lifting Devices were designed with G-Link™ Smart Connect technology. G-Link enables units to transmit data locally or anywhere with internet access. It also allows users to set parameters remotely from a desktop, laptop, or tablet. The following pages take you through the options available to you on each screen in this Human Machine Interface (HMI).
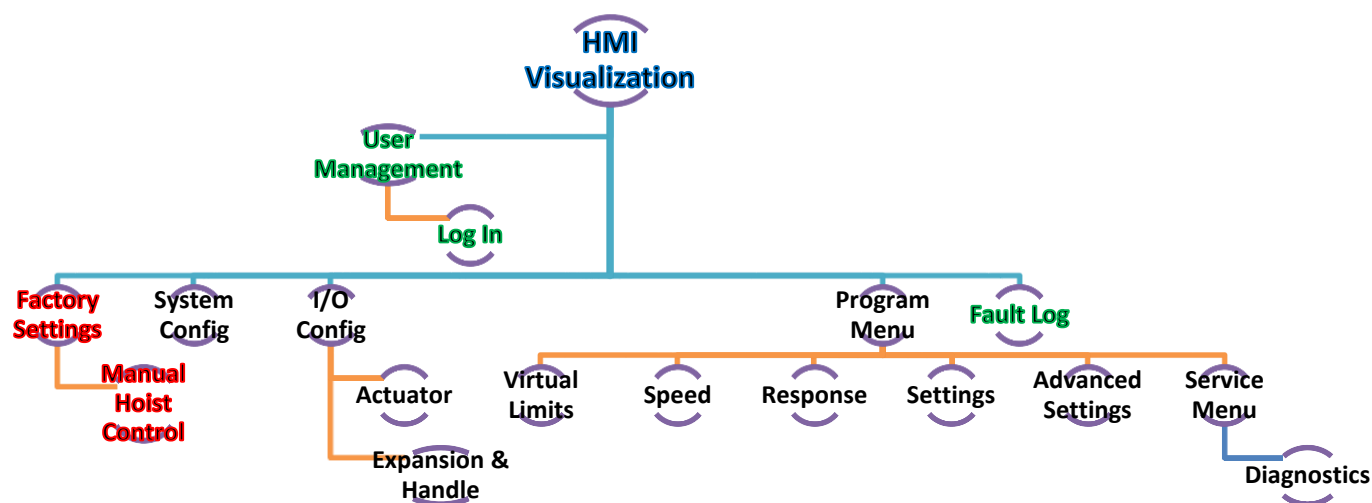
APPENDIX A: HMI EXPLANATION (continued)

Page	Sub Page	Content
User Management	--	Log In Page
Factory Settings	--	Calibrate Factory Test Manual Control Page
System Config	--	Manual Configuration Import/Export Config IP Address settings
I/O Config	Actuator	Set Actuator I/O, standard presets and clear all previous settings
	I/O & Handle	Set I/O and Handle settings, Presets and clear settings
Program Menu	Virtual Limits	Set Upper/Lower limit, Upper/Lower Slowdown, Upper Resume and Slowdown Speed
	Speed	Set Max Actuator Speed, Up/Down Toggle and Jog speed
	Response	Set Handle Response levels
	Settings	Weight Display, Idle Time out, Float Mode, Unload Stop, Anti- Recoil, Overload Limit, Operator Force, Sensitivity can be set
	Advanced Settings	Multiple FM tool and load weight, anti-drop tool weight and Auto home position
	Service Menu	Set Service warning, view system information and set operating cycles
Fault Log	--	Refresh all faults and warnings
Manual Hoist Control	--	Redirected from Factory Settings Page Manual control of the hoist

APPENDIX A: HMI EXPLANATION (continued)
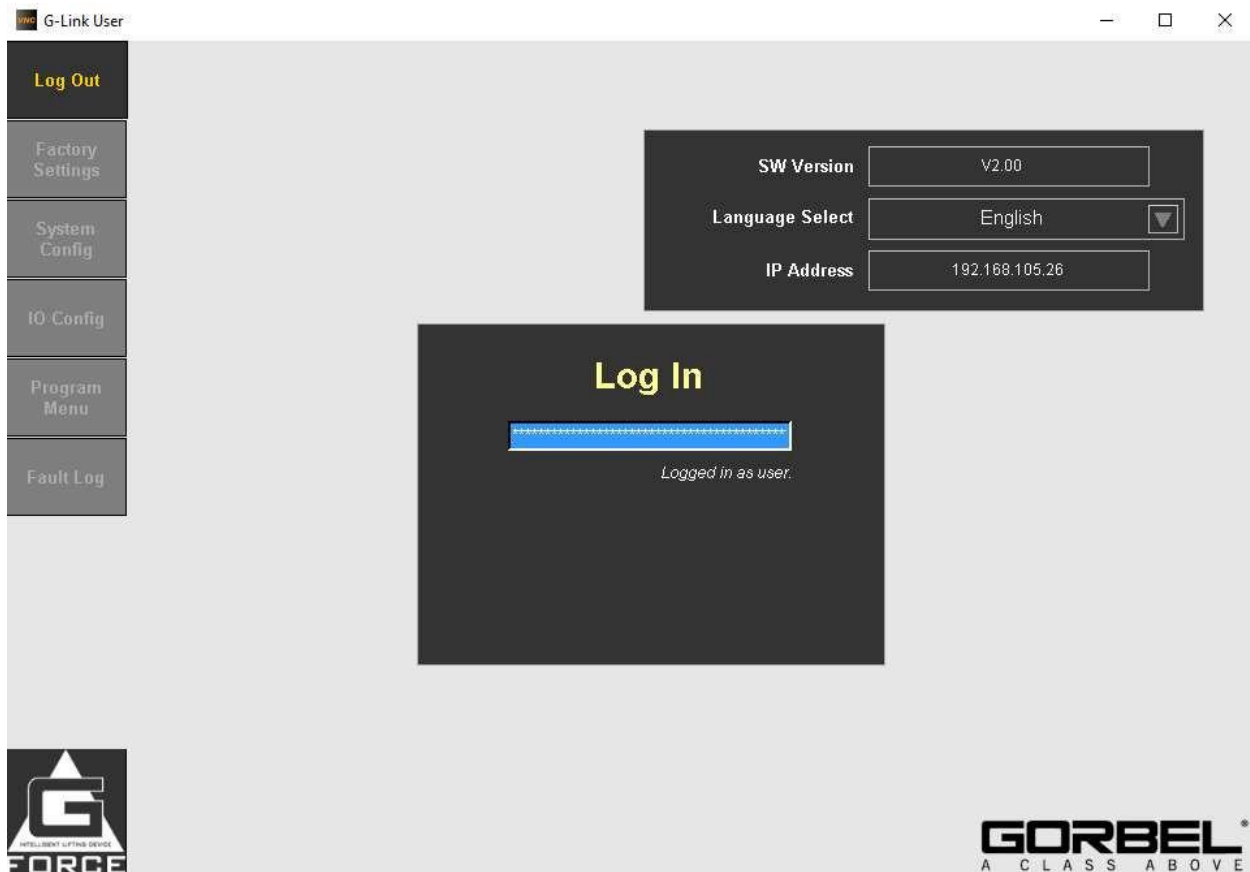
Feature	Description
Log in	If you tap on the blue box, the user is prompted to enter a password to change the access level of the HMI. By default, passcode level "1" allows access to the fault log, passcode level "2" allows access to everything except Factory settings.
SW Version	This will show the Software Version number of the PLC/Actuator software.
Language Select	This is a pulldown menu that allows the user to select the language of the HMI.
IP Address	This read-only field will show the IP Address of the PLC/Actuator.

APPENDIX A: HMI EXPLANATION (continued)

Feature	Description
Manual Configuration	
Serial Number	Manually enter the serial number of the unit
I/O Type	This automatically detects the I/O type of the unit
Type	G-Force® or Easy Arm®.
Span	If Easy Arm®, you select the span of it.
Capacity	Capacity of the unit.
Factory Default	This will reset the configuration to the factory default.
Apply Settings and Restart	This should be pressed when the configuration has been selected to ensure it was saved on the PLC.
New IP Addr.	Enter the new IP address of the G-Force®. (E.g. Factory IP Address: 192.168.105.26) Click Confirm to assign the IP address. NOTE: After clicking confirm, the VNC will disconnect, and one will need to reconnect using the newly set IP address.
Handle Menu Enabled/Disabled	Toggle to allow access to the G-Force® Handle Menus.

APPENDIX A: HMI EXPLANATION (continued)

Import/Export Configuration	
Create new	Once a manual configuration has been entered, you can select the input box (next to Create New) to type in the name of the .xml file, and then press on Create New to save a new .xml file with the configuration.
Import from Selected	Once multiple .xml files are made, scroll using the arrow buttons to choose one to import back to the PLC.
Export to Selected	To change the configuration of a .xml file, set the configuration desired from the Manual Configuration section, scroll using the arrow buttons to choose the .xml file to overwrite, and then press Export to Selected.
Delete Selected	To delete any .xml file (except factory as it cannot be deleted), scroll using the arrow buttons to choose the .xml file then press on Delete Selected.
USB/USER	This toggles the active .xml file configuration storage location. If a USB is connected to the PLC, with a pre-set configuration, pressing on USB would redirect to that configuration storage on the USB. The active storage location is indicated by the button with **Dark Text.**
Unit Select	
Unit Select	Choose the units of the HMI (between imperial and metric)

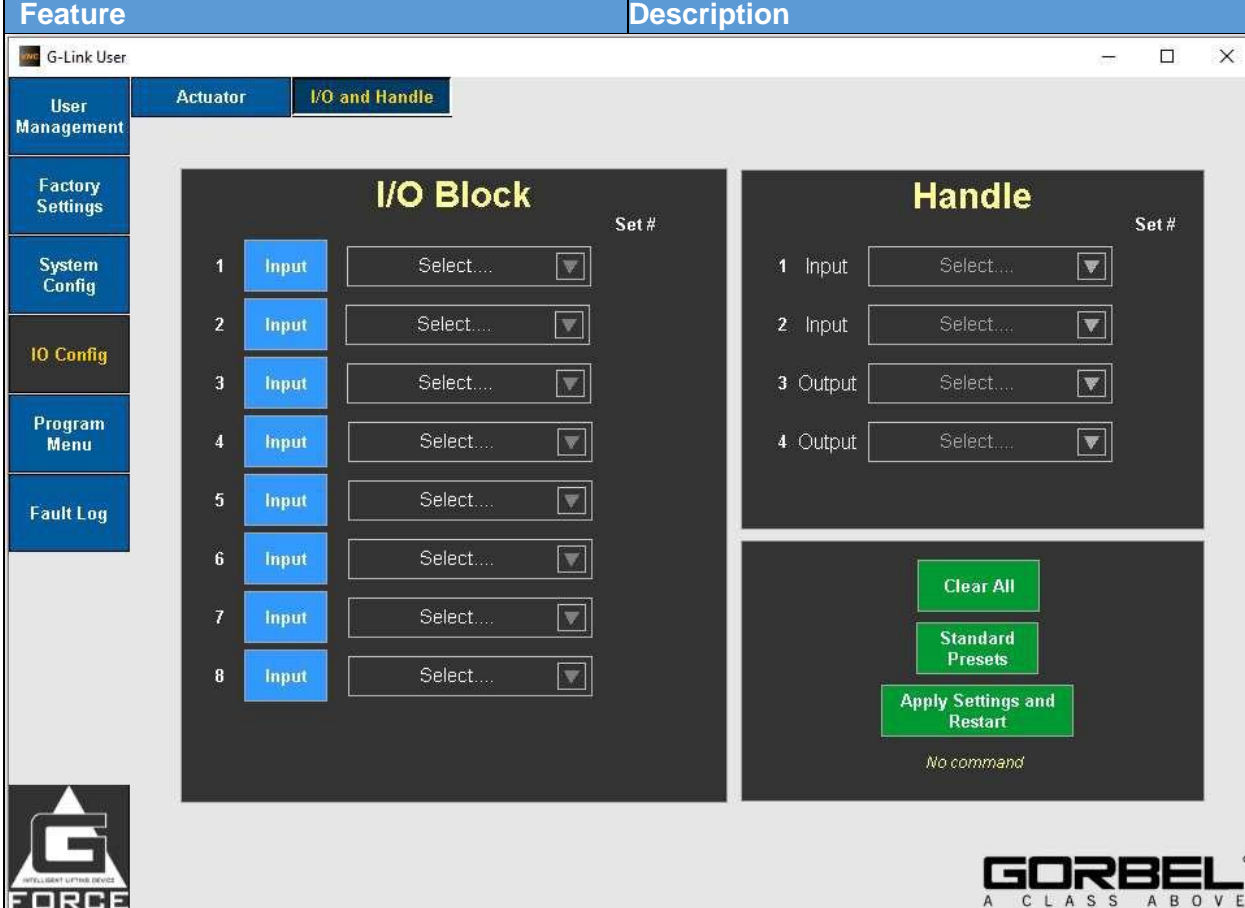# APPENDIX A: HMI EXPLANATION (continued)

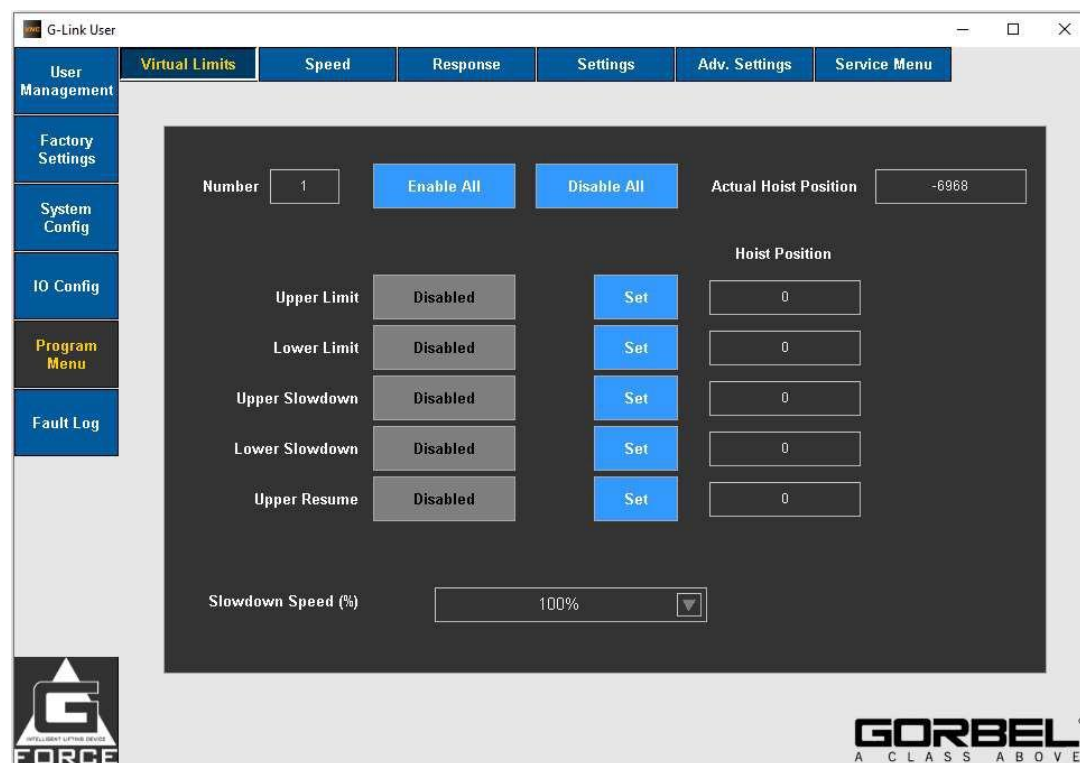| Feature	Description
Actuator I/O The Actuator I/O will come with 8 inputs and 4 outputs. iQ2 units will have Actuator I/O and/or an I/O Block. Q2 units will have Handle I/O to configure.	
Inputs	
AD Clamp	Anti-Drop Clamp input signal. This input is typically wired to a clamp request pushbutton.
AD Unclamp	This input is typically wired to an unclamp request pushbutton. When the input is on, an Output (set by user) turns on only if Anti-Drop algorithm determines the suspended load is at or below the set weight (ANTIDROP TOOL WT).
Auto-Home	When this input is toggled (momentarily turned on then off again), the G-Force® automatically travels to the set home position in the vertical travel.
Dual Float	When the G-Force® is in float mode, this input allows switching from one pre-programmed load weight to another.
IO Config Settings	
Clear All	Clears all the inputs and outputs
Standard Presets	Resets the I/O to factory defaults.
Apply Settings and Restart	This must be pressed anytime the configuration is changed for changes to take effect.

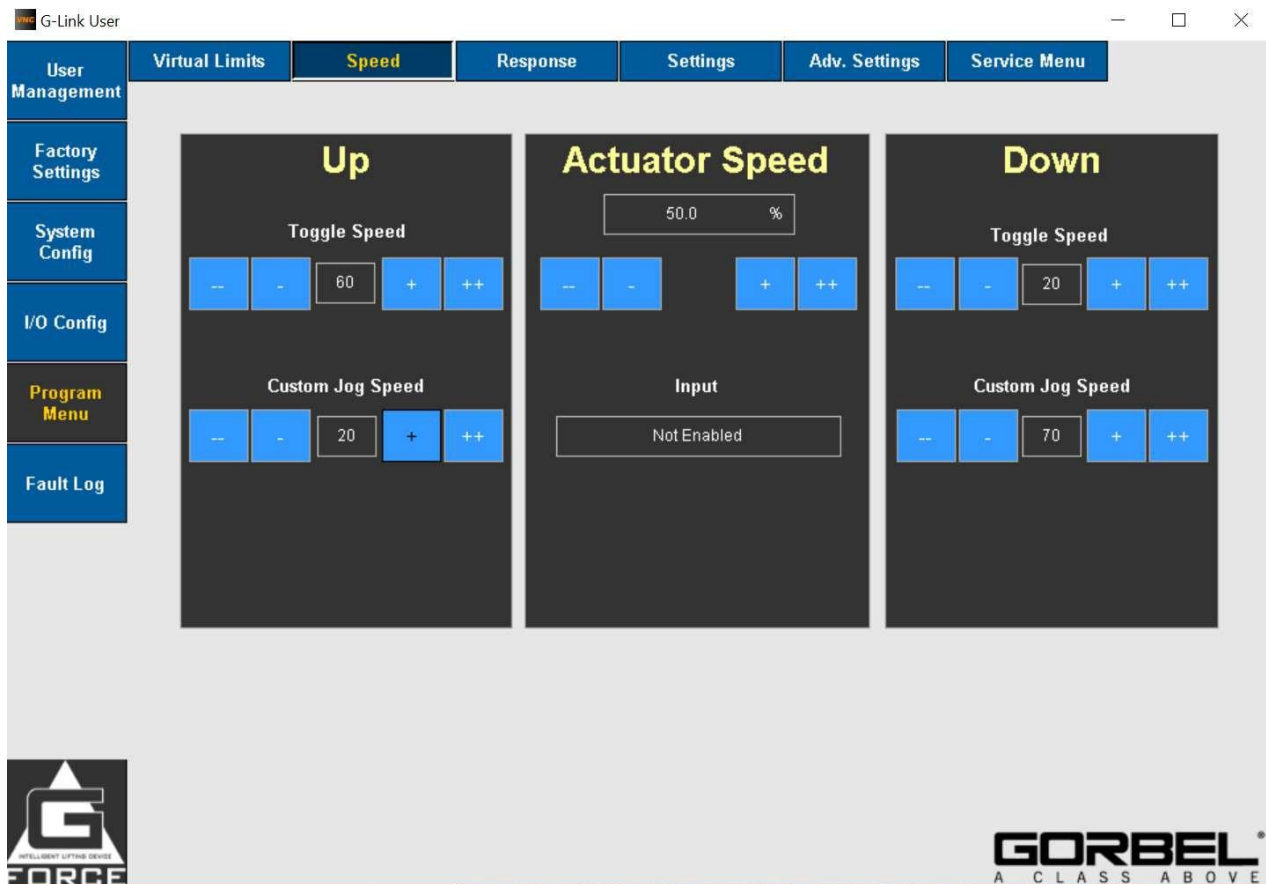|	
AD Clamp/Unclamp	When this input is off, it's a clamp signal, when it's on, it's an unclamp signal if the weight is below the set weight.
Multi-Zone VL	When this input is turned on, the G-Force® switches to a second independent set of virtual limits.
Inhibit Motion	If this input is on, it inhibits motion in both directions.
Remote Float	This is a momentary input to activate float mode.
Toggle Speed	This is a maintained input, and when it's ON it switches the speed to a pre-set one (from the program menu page)
Inhibit Motion Up	This is a maintained input, and it inhibits motion up if it's ON.
Inhibit Motion Down	This is a maintained input, and it inhibits motion down if it's ON.
Jog up	Maintained input. When this is on, the unit jogs upwards at a preset speed (from the program menu page)
Jog Down	Maintained input. When this is on, the unit jogs downwards at a preset speed (from the program menu page)
Float mode Quit	This is a momentary input to deactivate float mode.
External Control Input	When this input is on, a selected output on the PLC/Expansion block input/output module is on and vice versa.
Outputs	
Clamp Signal	This output is typically wired to actuate the clamping mechanism of an end effector tooling. It turns on when AD Clamp input is on and remains latched on when the input is released.
Unclamp signal	This output is typically wired to actuate the unclamping mechanism of an end effector tooling. It turns on when unclamp Input is on and the Anti-Drop algorithm determines the suspended load is at or below the set weight (ANTIDROP TOOL WT).
Slack Detection	If the unit experiences slack, this output turns on.
Run Mode	If the unit is in motion in any mode, this output is on.
Float Mode	If the unit is in float mode, this output turns on.
Upper Limit	If the unit reaches the upper limit, this output turns on.
Lower Limit	If the unit reaches the lower limit, this output turns on.
OPS Active	If the OPS is active, when the operator presence is detected, this output turns on.
E-stop Pressed	If E-stop is engaged, this output turns off, otherwise it is always on.
Fault Indicator	If there is a fault (error) in the unit, this output turns on.

APPENDIX A: HMI EXPLANATION (continued)

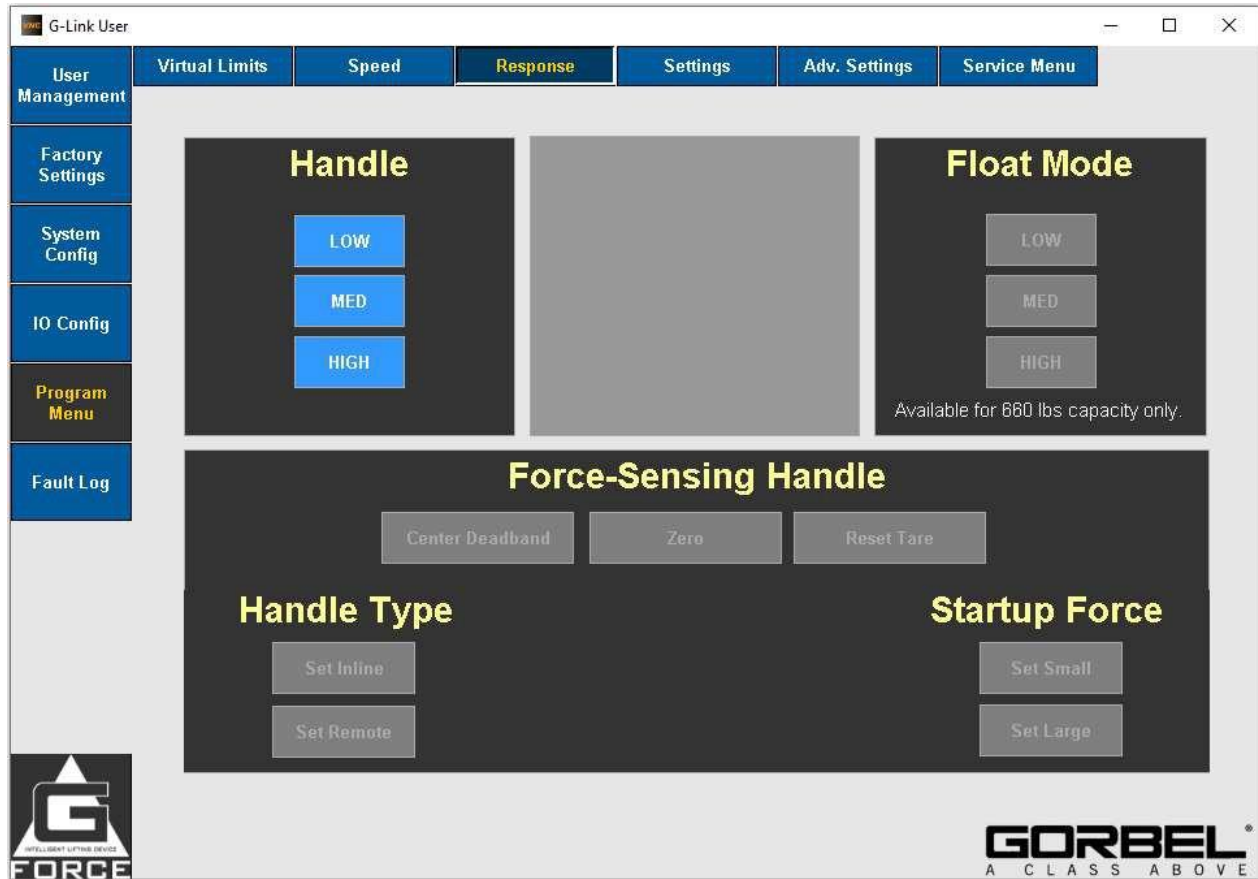| Feature	Description
Expansion Block I/O	
The Expansion Block I/O will come with 8 configurable I/O points (User can choose whether it's an input or an output). The set of input features will be identical to PLC I/O. iQ2 units will have Actuator I/O and/or an I/O Block.	
Handle I/O	
The Handle I/O will come with 2 inputs and 2 outputs. Identical features to PLC I/O. Q2 units will have Handle I/O to configure.	
Clear All	Resets the I/O to factory default.
Standard Presets	Clears all the inputs and outputs.
Apply Settings and Restart	This has to be pressed anytime the configuration is changed for changes to come into effect.

APPENDIX A: HMI EXPLANATION (continued)

Feature	Description
Virtual Limits	
The difference between setting and enabling is that 'set' saves the hoist position, while 'enable' activates the virtual limit.	
Number	This number is for choosing the set of virtual limits you're trying to set (max is 4)
Upper Limit	Program the upper virtual limit (load must be at desired position for upper limit).
Lower Limit	Program the lower virtual limit (load must be at desired position for lower limit).
Upper Slowdown	Program the upper slow down reduction point (load must be at position where slow-down begins when raising load).
Lower Slowdown	Program the upper slow down reduction point (load must be at position where slow-down begins when raising load).
Upper resume	Program the upper speed resume point (load must be at position where system will resume normal speed when raising load).
Slowdown Speed	Choose the slowdown speed for both upper and lower slowdown. (from 5% to 50% in increments of 5%)
Enable All	This is where the user can enable all the Virtual Limit features.
Disable All	This is where the user can disable all the Virtual Limit features.
Actual Hoist Position	Displays the current position corresponding of the Hoist in a counts value

APPENDIX A: HMI EXPLANATION (continued)

Feature	Description
Up	
Toggle speed	This is regarding the Toggle Speed Input selection. If that input is on, the unit changes speeds to this set speed. If the input is off, it goes back to hoist speed selected.
Custom Jog Speed	This is regarding the Jog Input selection. If that input is on, the unit changes upward jog speed to this set value.
Actuator Speed	
Set Speed	If this is selected, the max speed of the motor is restricted.
Input	Displays the location of where the Toggle Speed was configured, either on the PLC, Expansion Block, or Handle I/O
Down	
Toggle speed	This is regarding the Toggle Input selection. If that input is on, the unit changes speeds to this set speed. If the input is off, it goes back to hoist speed selected.

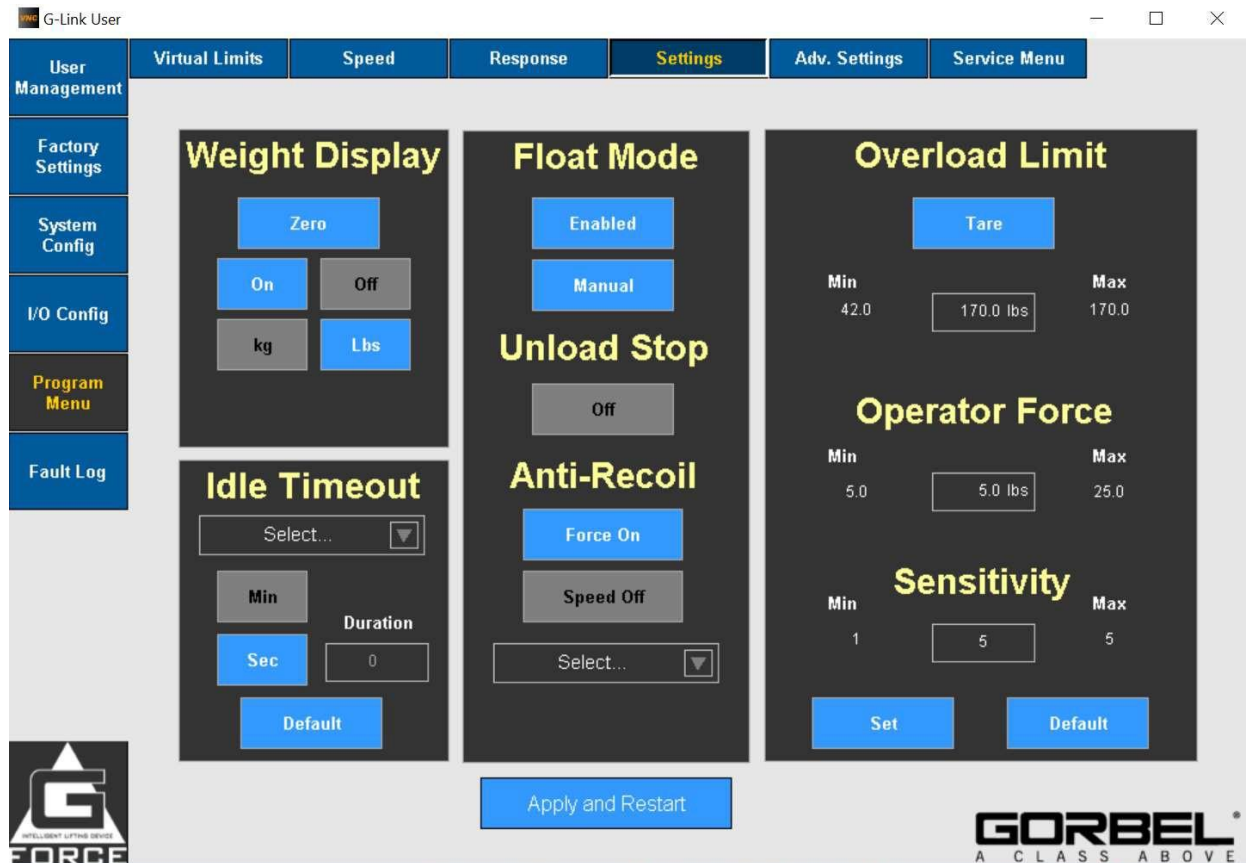# APPENDIX A: HMI EXPLANATION (continued)

Feature	Description
Handle	
Low	Set the lowest handle control response corresponding to about 75% of the highest responsiveness setting.
Med	Set the medium handle control response corresponding to about 85% of the highest responsiveness setting.
High	Set the highest handle control responsiveness setting.
Float	
Low	Lowest (least responsive / most stable) Float Mode gains.
Med	Default Float Mode gains with normal responsiveness / stability.
High	Highest (more responsive / least stable) Float Mode gains.
Force Sensing Handle	
Center Deadband	FSH deadband averaging can be used to improve sensitivity of FSH signal by centering it.

APPENDIX A: HMI EXPLANATION (continued)

Feature	Description
Handle	
Zero	Tare the FSH handle bar weight to zero the load cell signal.
Reset Tare	Reset FSH tare value from zero to un-zero the load cell signal.
Set Inline	Change FSH style to inline if current style is remote.
Set Remote	Change FSH style to remote if current style is inline.
Set Small	Change FSH Start up force to small.
Set Large	Change FSH Start up force to large.

APPENDIX A: HMI EXPLANATION (continued)

Feature	Description
Weight Display	
Zero	Zero the weight display.
On/Off	Turns the weight display ON/OFF on the OLED.
kg/Lbs.	Sets the units of the weight display, separately from the Unit Select configuration.
Idle Timeout	
Select	Choose which idle time to configure. (multiple idle times can be set concurrently between jog, float, or custom)
Min/Sec	Select the mins or secs to configure the idle time.
Default	Apply default excessive pause timer settings: slide and pendant handles (45 seconds), Float Mode (60 seconds) and custom motion (20 seconds).
Float Mode	
Enabled/Disabled	Button that indicates the current status of float mode. Click it to toggle the enable / disable.
Manual/Auto	Change between manual float mode and Auto Float mode. The way auto float works is if it detects a pre-set weight, it triggers float mode automatically.

APPENDIX A: HMI EXPLANATION (continued)

Unload Stop
Optional feature utilizing Anti-Recoil detection. When user sets a weight onto a surface in Float Mode, it is terminated if Anti-Recoil detects an unloading. This can be useful for applications needing a quick Float Mode exit to an idle state to allow user to work on the part. **Note**: As a result of the extra detection, Float Mode is likely to terminate when the upper limit switch is hit while unit is running at a fast speed. This false detection can be avoided or reduced by running the unit at a low speed or maintaining a distance from the upper limit.

Anti-Recoil	
Force On/Off	Over-Force Detection: Unit terminates Float Mode if user's operating force exceeds the maximum force limit or a dropped weight is detected by evaluating the force profile.
Speed On/Off	Over-Speed Detection: Unit terminates Float Mode if speed exceeds maximum Float Mode speed at 90% of unit loaded speed.
Select	This is to choose Force ON detection force. (15 to 45 lbs. in increments of 5 lbs.)

Overload	
Tare	Set the overload limit to the current load weight.
Overload Limit	Program an overload limit.
Operator force	Configure operating force limit for moving a load in air. Refer to I&O Manual for details.
Sensitivity	Configure overload detection sensitivity.
Set	When you make changes to either overload limit, operator force, or sensitivity, the set button must be pressed.
Default	Sets overload settings to default

APPENDIX A: HMI EXPLANATION (continued)

Feature	
Multiple FM Tool Weight	Program the feature by clicking Set at the desired value shown in the "Value" column
Multiple FM Load Weight	Program the feature by clicking Set at the desired value shown in the "Value" column
Anti-Drop Tool Weight	Program the feature by clicking Set at the desired value shown in the "Value" column
Auto Home Position	Program the feature by clicking Set at the desired value shown in the "Value" column

*Refer to I&O Manual for more feature info.

APPENDIX A: HMI EXPLANATION (continued)

Feature	Description
Operating Cycle	
Upper (Set)	Set the upper hoist position for cycles.
Lower (Set)	Set the lower hoist position for cycles.
Zero	Zero the variable (for counts, slowdown, loaded, unloaded…etc)
System Information	
Hoist Position	Current hoist position of the unit.
On time	Total time the unit was on.
Run time	Total run time (in use)
Service Warning	
User can select a duration for a service warning to pop up. (between 500, 1000, and 1500 hours)	

APPENDIX A: HMI EXPLANATION (continued)
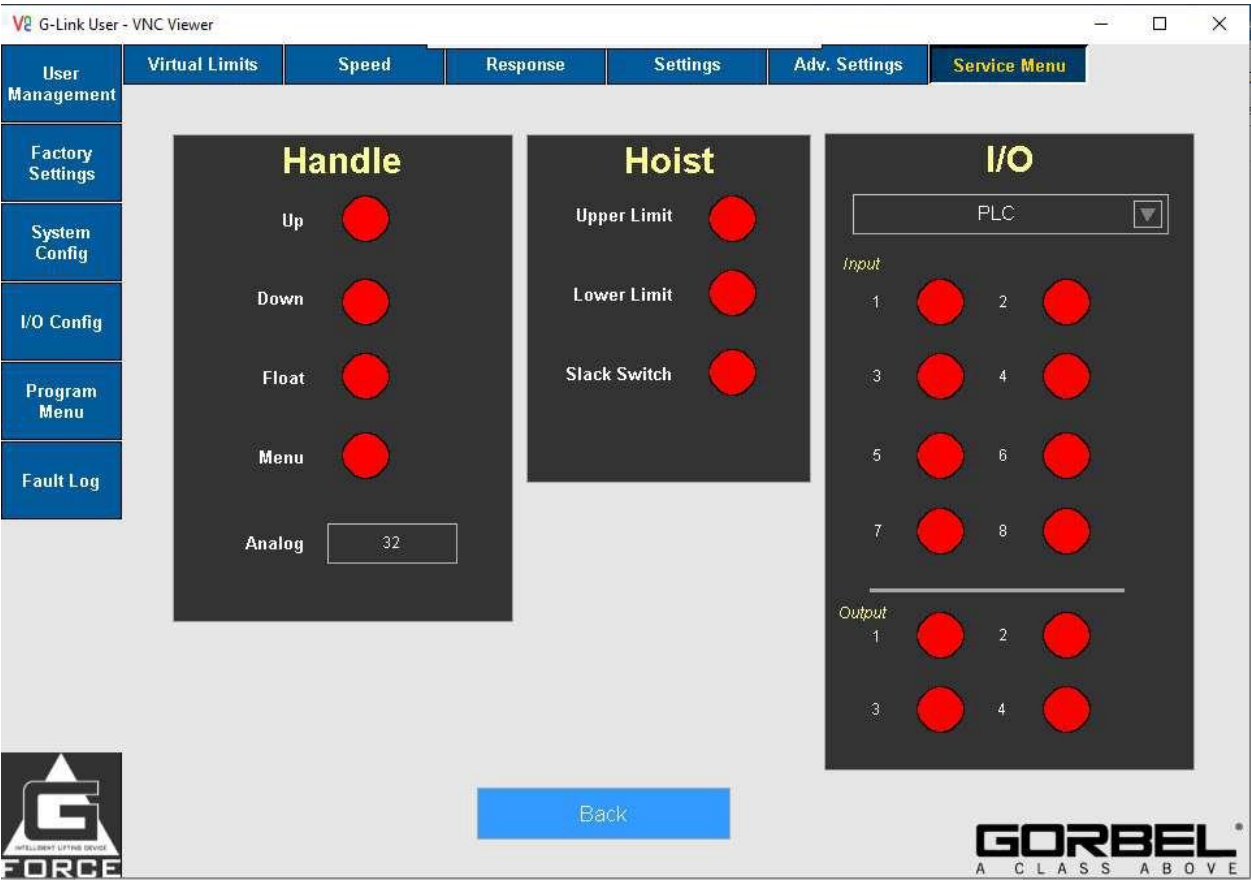
Feature	Description
Diagnostics Page	
Handle	Lights indicate when handle options are triggered, and Analog indicates the current value of the analog control signal in counts.
Hoist	Lights indicate if the Upper / Lower limit or Slack switches are triggered.
I/O	Toggle to choose between PLC / Handle / Expansion Block I/O and view the indication based on whether the input is triggered.

APPENDIX A: HMI EXPLANATION (continued)
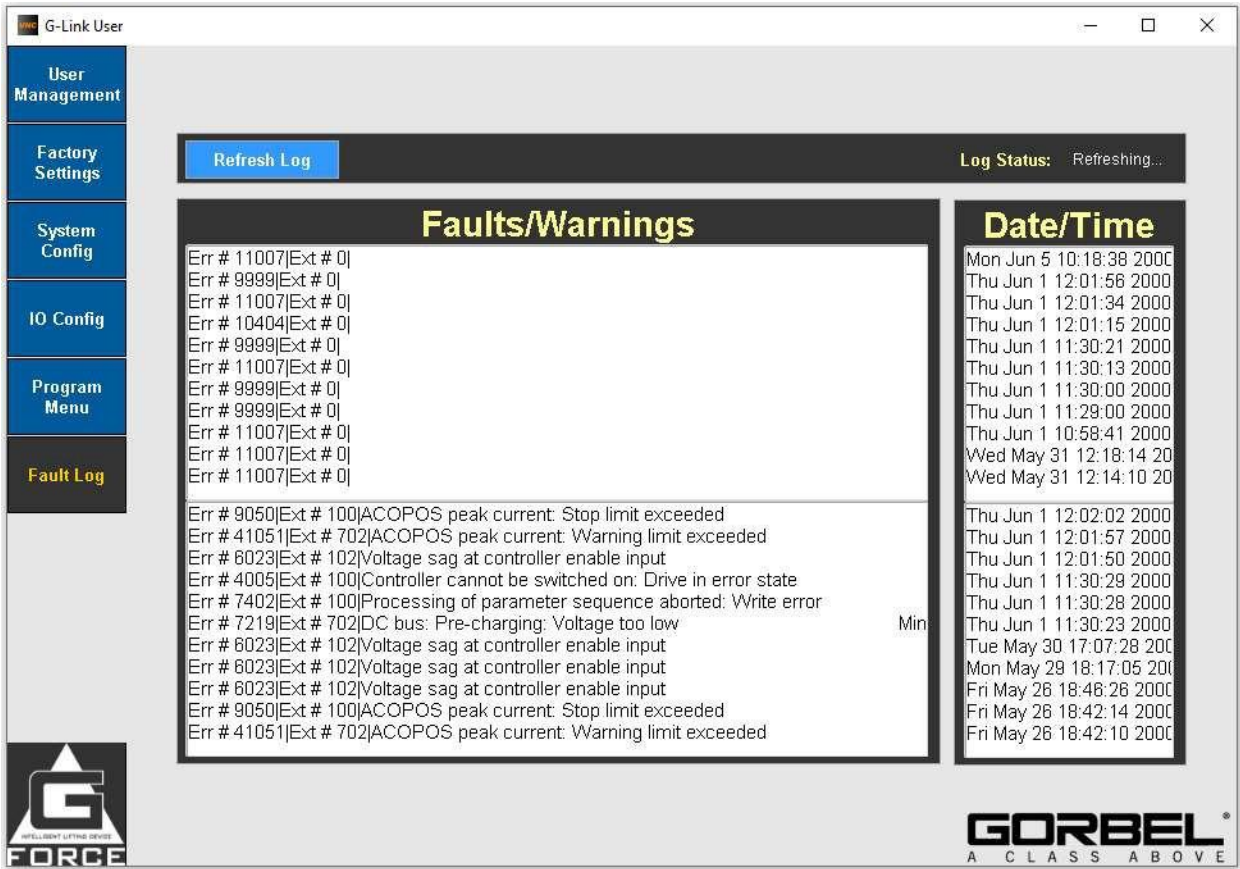
Feature	Description
Command Faults & Warnings **The upper pane shows the most recent 20 Command Faults & Warnings.**	
Drive Faults **The lower pane shows the most recent 20 Drive Faults.**	
Refresh Log	Updates the log list with any new or active errors.

APPENDIX B: WiFi Access Point Set Up Instructions

Gorbel's G-Force® Q$_2$ and iQ$_2$ Intelligent Lifting Devices were designed with G-Link™ Smart Connect technology. G-Link enables units to transmit data locally or anywhere with internet access. It also allows users to set parameters remotely from a desktop, laptop, or tablet. The following pages walk you through how to connect to your G-Force unit.

Access Point Settings:
To change one of the following details:
- SSID Access Point Name
- Access Point Password
- Transmit Power Setting (contact Gorbel)
- Transmit Channel Setting
- Mode Change from Access Point or Station

Connect via WiFi, open a browser and connect to 192.168.105.1 and login using "***Order Number***" to change any of these fields. *Your order number is on the front cover of this manual.*

Change the SSID (AP Name) or Password Instructions:
Default Settings:
- AP SSID: G-Force® AP Order Number
- AP Password: Order Number
- Station SSID: G-Force® STA
- Station Password: mypassword

You can change the password.
The new password must be:
- Minimum of 8 characters in length
- Allowed SSID characters: !$%&_-
- Allowed Password characters: !$%&_-
-

Transmit Channel Instructions:

If there are multiple G-Forces with configured APs choose a transmit channel further away from the others. E.g.: When using 3 G-Forces use 3 channels, i.e. use 1, 6 and 11 for the channels to be spread across the bandwidth. Click done to apply settings and wait 10 seconds to reboot.
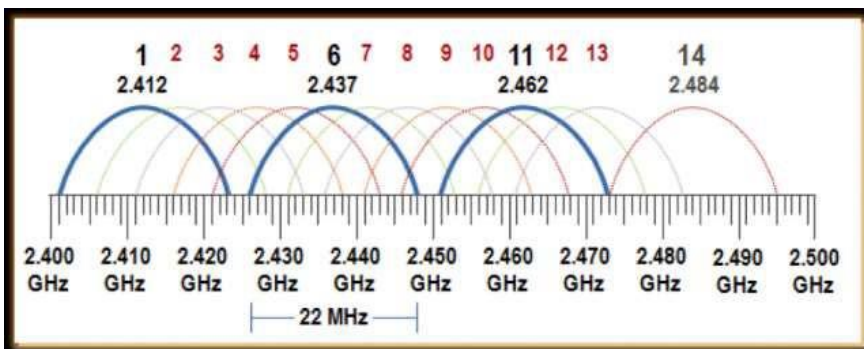
APPENDIX B: WiFi Access Point Set Up Instructions (continued)

VNC Viewer

Download the suggested VNC viewer (recommended by Gorbel®)

You can download the latest version by copying and pasting this link into your browser:

https://www.br-automation.com/en- us/downloads/software/hmi-software/vnc-

viewer/vnc-viewer-winxp-win7-win81-

win10/?noredirect=1

Install:

a) Unzip the downloaded VNC file

b) Click on the BrVncViewer in the unzipped folder (Windows Installer File Type)
    (Fig: 12) and install the application on the local windows machine.
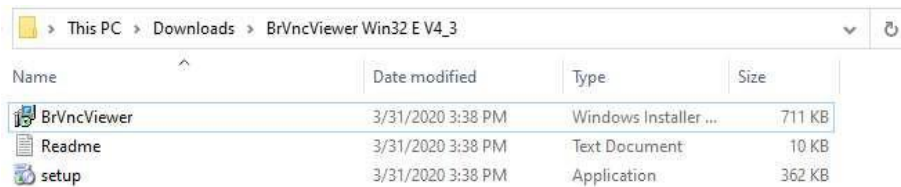
Figure 12: Unzipped/Extracted folder

c) Once successfully installed, go to Start Menu and open the "VNC Viewer" by
    either typing in the search bar and clicking on it, or opening the B&R Automation
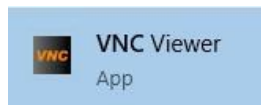   folder and clicking the application (Fig 13)

Figure 13: VNC Icon

Connect: Connect to the G-Force® AP (See Appendix 2 for instructions on the AP) at the
G-Force® IP Address

192.168.105.26 on the VNC viewer and click **Connect**.
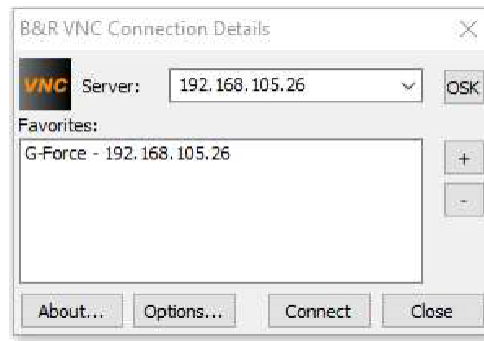
Customer AP Quick Start Guide

Find out your G-Force® SSID: Select the Internet Network Icon in the taskbar and search for the WiFi Network with the G-Force® access point name. Connect and log in.

Factory Default SSID: G-Force® AP 123456-1

(this represents your order number, which you can find on the front cover of this manual)

Factory Default Password: 123456-1

Open VNC Viewer Application:

Open a VNC viewer program on your PC.

Need a VNC Viewer Program?

Gorbel® recommends the B&R VNC Viewer

(See Appendix 2 for Instructions to set up).
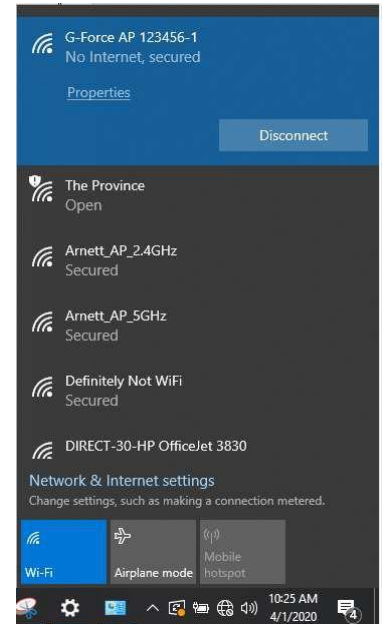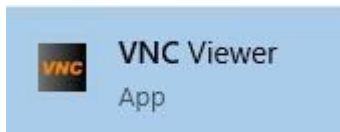
Specify G-Force® IP Address:

The VNC Viewer needs the G-Force® IP Address to connect. Enter the G-Force® IP address in the Server field and click Connect.

Factory Default IP Address: 192.168.105.26
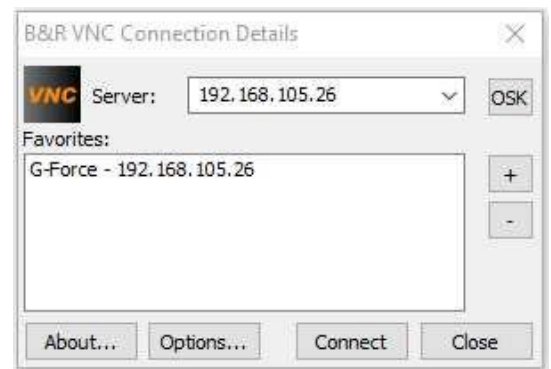
Note:

The IP Addresses of the G-Forces can be added as favorites with custom names to make it easier when working in an environment with multiple G-Forces.

Log into the G-Force®:

Click on the blue log in field and enter the passcode. Ensure that the VNC interface has loaded successfully by confirming the text "*Logged in as admin*" is present and Navigation Buttons along left side of screen are active.
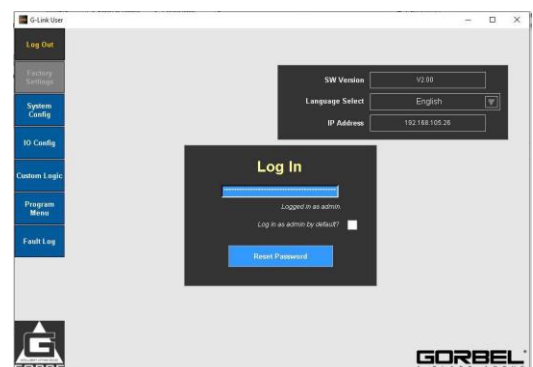
APPENDIX C: I/O Default Configuration and Description

Safety precautions before proceeding

Activities described in this procedure can cause personal harm. The minimum personal protective equipment (PPE) that must be worn at all times include safety glasses with side shields and safety shoes. Additional PPE required for specific activities will be noted within the instructions.

Tools needed:

G-Force Q2 or iQ2 device

Laptop with VNC software (suggested – Tight VNC)

WiFi capability to remotely connect to the G-Force OR Ethernet cable connected from J7 (Black) port on the G-Force to the computer

5.1   Opening IO Page

- Open the VNC viewer (Refer to Appendix B for steps to install the VNC)
- Connect to the G-Force on the VNC using the IP address 192.168.105.26 (*Ref: Fig 1*)
- Log in by selecting the blue log in field and entering the password: "2" (or, followed by the enter key on the virtual keyboard (*Ref: Fig 2*)
- Click the IO Config tab on the left pane of the Visualization to open the Input/Output Configuration page
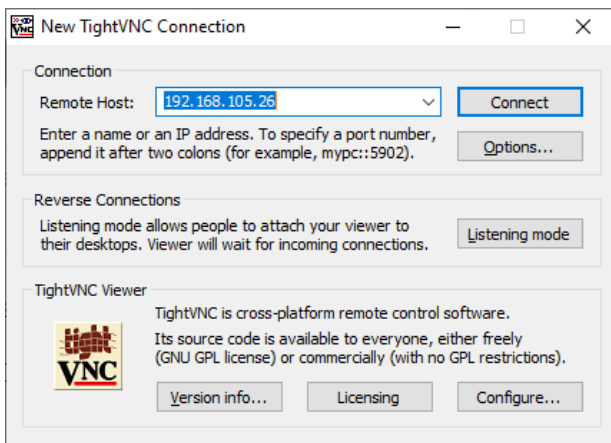
Figure 1

Figure 2

5.2   IO Types

iQ unit: Navigate to the Actuator tab on the top (If that tab is not already selected) – 8 actuator Inputs and 4 Outputs can be configured on this page (*Ref: Fig 3*)

If expansion block IO is also available, navigate to the **IO and Handle** tab on the top and then I/O Block can also be configured (*Ref: Fig 4*)

Note 1: The Expansion I/O Block can be configured as both Input and Output (Click on Input to toggle it to an output). This block contains 8 IO points, which can each be configured as an input or an output.

Note 2: If actuator IO is only present and more IO is desired, please contact Gorbel CSR.

APPENDIX C: I/O Default Configuration and Description (continued)
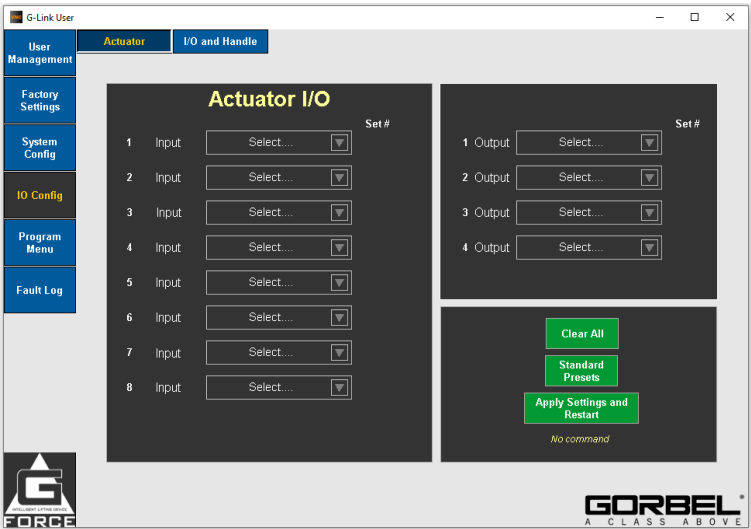
Figure 3

Q2 Unit: Navigate to the IO and handle tab on the top – Only Handle IO can be configured (*Ref: Fig 4 – Handle*) On this page, 2 inputs and 2 outputs can be configured.
NOTE: If more Inputs/Outputs are desired, please contact Gorbel CSR.

Figure 4

5.3   <u>**Understanding IO options and functionality**</u>
Any of these Inputs / Outputs can be set on the Actuator IO, Expansion IO Block or the Handle IO
NOTE: It is advised to not select the same Input / Output option at multiple points within the same IO slice or at other blocks.

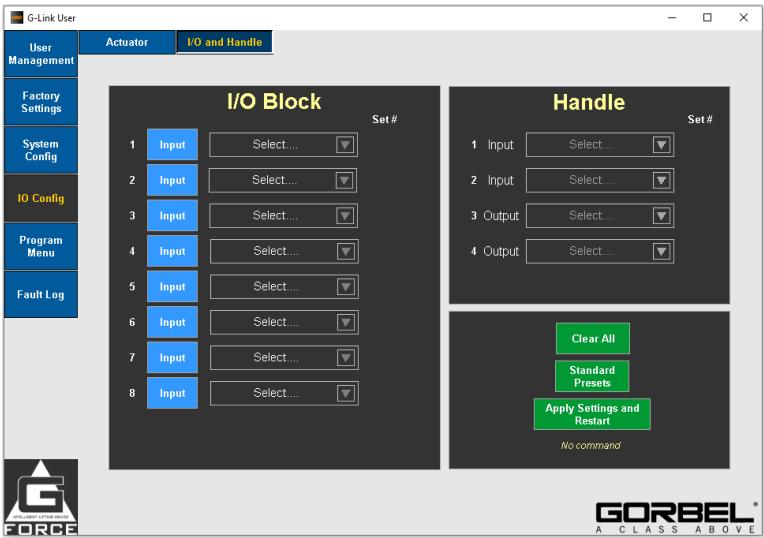| Feature	Description
INPUTS	
AD Clamp	Anti-Drop Clamp input signal. This input is typically wired to a clamp request pushbutton. Clicking this input would actuate any clamp that is linked to the output **Clamp Signal**. Ensure that an Anti-drop tool weight has to be set on the **Advanced Settings** tab on the Settings Page.
AD Unclamp	This input is typically wired to an unclamp request pushbutton. When the input is on, an Output (**Unclamp Signal**) turns on only if Anti-Drop algorithm determines if the suspended load is at or below the set weight (ANTIDROP TOOL WT). i.e If the user attempts to unclamp when lifting a weight using the tool, the G-Force / Easy Arm does not allow unclamp to be triggered, ensuring that the weight is not dropped.
AD Clamp/Unclamp	Toggle to input switch (Momentary input) to change status from Clamp to Unclamp. An output (AD Clamp/Unclamp) can be set to see the status. Unclamp signal Input does not trigger the unclamp output when lifting a weight, thereby protecting a weight from being dropped.
Setting Anti-Drop Tool weight: To use the Anti Drop Clamp and Unclamp inputs and outputs, navigate to the Advanced Settings Tab on the settings page, and click on set (When only the tool is being set). NOTE: If any I/O changes are made, the Anti-Drop Tool weight has to be set again to continue using the Clamp and Unclamp inputs/outputs.	
Auto-Home	When this input is toggled (momentarily turned on then off again), the G-Force® automatically travels to the set home position in the vertical travel.
Setting Auto-Home Position: To use the Auto-Home input, navigate to the Advanced Settings Tab on the settings page, and click on set Auto-Home position (When moved and set at the desired position). NOTE: If any I/O changes are made, the Auto-Home position has to be set again to continue using the Clamp and Unclamp inputs/outputs.	
Dual Float	When the G-Force® is in float mode, this input allows switching from one pre-programmed load weight to another. (Change from tool weight to tool + load weight)
Setting Dual Float Weight: To use the Dual Float input, navigate to the Advanced Settings Tab on the settings page, and click on set **Multiple FM tool weight** when just the tool weight – weight 1 is lifted. Then lift weight 2 (tool + load weight) and click on **Set Multiple FM load weight**. NOTE: If any I/O changes are made, ensure that the weights are set correctly.	
Inhibit Motion	This is a maintained input, and it inhibits motion both UP and DOWN if it's ON.
Inhibit Motion Up	This is a maintained input, and it inhibits motion UP if it's ON.
Inhibit Motion Down	This is a maintained input, and it inhibits motion DOWN if it's ON.
Setting Multiple Inhibit Motion Inputs: It is advised against assigning multiple Inputs to Inhibit Motions (Eg: Assigning Input 2 to Inhibit Motion and Input 3 to Inhibit Motion – In this case only the last set Input (Input 3) works). Therefore, always assign one of the three Inhibit Motion Inputs.	
Multi-Zone VL (Set 0 to 2)	When this input is turned on and a set number is selected on the I/O page, toggling the input for the corresponding set makes the G-Force® switch to that particular independent set of virtual limits. By default Virtual Limit Set 1 is active, Setting a Multi-Zone VL Set 0 as an input enables Virtual Limit Set 2. NOTE: The inputs are to be set from 0 onwards, and it is advised to not select a higher set before any previous VL sets are assigned on the I/O

Understanding VL Limits

Inputs on I/O Page			Virtual Limit Set on Settings – Virtual Limits
Multi VL Set 0	**Multi VL Set 1**	**Multi VL Set 2**	**Active Multi-VL Set**
OFF	OFF	OFF	1
ON	OFF	OFF	2
OFF	ON	OFF	3
OFF	OFF	ON	4
ON	ON	ON	Error (Only 1 VL input must be switched ON at one time)

Remote Float	This is a momentary input to activate float mode.
Toggle Speed	This is a maintained input, and when it's ON it switches the speed to a pre-set one (from the program menu page).
Setting Toggle Speed: To set toggle speed, navigate to the Speed Menu Tab on the Settings page, and click on + (to add 5%) or ++ (to add 10%) (Vice Versa for – and --) on the Toggle Up Speed and Toggle Down Speed to set the desired speed.	
Jog Up	This is a maintained input, and when it's ON it jogs up based on the set **Custom Up Jog** speed
Jog Down	This is a maintained input, and when it's ON it jogs down based on the set **Custom Down Jog** speed
Setting Custom Jog Speed: To set jog speed, navigate to the Speed Menu Tab on the Settings page, and click on + (to add 5%) or ++ (to add 10%) (Vice Versa for – and --) on the Custom Jog Up Speed and Custom Jog Down Speed to set the desired speed. If this speed is 0, turning the Jog Inputs ON would not move the hoist up/down.	
External Control Input [Set] (There are two External Control Inputs that can be set – Set 0 and Set 1) NOTE: Set 0 has to be set before Set 1	When this input is on, a selected output on the PLC/Expansion block input/output module is on and vice versa.
Float mode Quit	This is a momentary input to deactivate float mode.
OUTPUTS	
Clamp Signal	This output is typically wired to actuate the clamping mechanism of an end effector tooling. It turns on when AD Clamp input is on and remains latched on when the input is released.
UnClamp Signal	This output is typically wired to actuate the clamping mechanism of an end effector tooling. It turns on when AD UnClamp input is on and remains latched on when the input is released.
Clamp / Unclamp Signal	This output is wired to actuate the clamping mechanism of an end effector tooling. This output offers a fail-safe (It does not unclamp when lifting a load – The internal Anti-drop algorithm ensures this). It is used along with the AD Clamp/Unclamp Input
Slack Detection	If the unit experiences slack, this output turns on.
Run Mode	If the unit is in Run Mode, the output is on.
In Motion	If the unit is in motion in any mode, this output is on.
Float Mode	If the unit is in float mode, this output turns on.
Upper Limit	If the unit reaches the upper limit, this output turns on.
Lower Limit	If the unit reaches the lower limit, this output turns on.
OPS Active	If the OPS is active, when the operator presence is detected, this output turns on.
E-Stop Pressed	If E-stop is engaged, this output turns off, otherwise it is always on.
External Control Output [Set] (There are two External Control Inputs that can be set – Set 0 and Set 1) NOTE: Set 0 has to be set before Set 1	When this input is on, a selected output on the PLC/Expansion block input/output module is on and vice versa.

APPENDIX C: I/O Default Configuration and Description (continued)

Fault Indicator	If there is a fault (error) in the unit, this output turns on.
Service Indicator	If the service duration that is set is reached, the output turns ON.
Setting Service Warning: To set the Service Warning speed, navigate to the Service Menu Tab on the Settings page. Click on the drop down to choose between Disabled or a specific Duration. (Eg: When the G-Force has been used for the specified 500 hrs, it will enable to output).	
IO CONFIG SETTINGS	
Clear All	Clears all the inputs and outputs.
Standard Presets	Resets the I/O to factory default.
Apply Settings and Restart	This must be pressed anytime the configuration is changed for changes to take effect.

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, Gantry Crane, and Tether Track® products to be free from defects in material or workmanship for a period of ten years or 20,000 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 herein 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.

CE Declaration of Conformity

Hereby, Gorbel Inc., declares that this material handling equipment is in compliance with the essential requirements and other relevant provisions listed below.

EMC Directive:	**2014/30/EU**	
Emissions Testing for Industrial Environments:	EN 61000-6-4:2007+A1:2011	
ISM Radio Frequency Equipment:	EN 55011:2009+A1:2010	
Electromagnetic Compatibility	EN6100-6-2: 2005	Immunity for Industrial Environments:
	EN 61000-4-2	Electrostatic Discharge Radiated Susceptibility
	EN 61000-4-3	Radiated, Radio-Frequency Field Immunity
	EN 61000-4-4	Electrical Fast Transient/Burst Surge
	EN 61000-4-5	Surge Immunity
	EN 61000-4-6	Conducted Susceptibility
	EN 61000-4-8	Power & Frequency Immunity
Low Voltage Directive: 98/68/EEC	EN 61010	Equipment for Measurement, Control & Laboratory Use
Machinery Directive:	2014/35/EU	Equipment for Safety of Machinery
Standard:	EN 60204-1:2010	
	EN 14492-2:2006+A1:2009	Cranes – Power Driven Winches & Hoists Part 2: Power Driven Hoists

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Manufacturer's Name:	**Gorbel Inc.**
Manufacturer's Address:	600 Fishers Run Fishers, NY 14453-0593
Product:	G-Force & Easy Arm
Model:	Q2 & iQ2
Capacity	75kg, 150kg, 300kg, 600kg

Signature:

Blake Reese
Product Development Senior Electrical
Engineer Gorbel Inc.
Phone: 585-924-6262

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INSPECTION AND MAINTENANCE SCHEDULE

	GORBEL G-FORCE® INSPECTION AND MAINTENANCE SCHEDULE		
ITEM	**COMPONENT**	**MAINTENANCE**	**FREQUENCY***
1	Wire Rope	Look for any obvious external defects, damage or excessive wear. Check the lower end where it attaches to the handle, swivel assembly or tooling (by others) for signs of damage or excessive wear.	Start of Each Shift
2	Wire Rope	Expose as much of the wire rope as possible and wipe it off with a clean dry cloth. Use the jog button to pay out as much wire rope as possible.	Monthly
3	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; or severely corroded, cracked, bent, worn, or improperly applied end connections.	Periodically To be determined by qualified persons only
4	Coil Cord Assembly	Look for any obvious external defects or damage caused by the wire rope or other external causes. Make sure all coil cord clamps are in place.	Start of Each Shift
5	Slack Switch Check Adjustment	Using the handle, lower the wire rope until it goes slack. There should be no additional movement downward once it is slack. If the wire rope continues to pay out, stop immediately and perform the slack switch adjustment. Check the coil cord and air hose clamps on the wear ring to ensure the wear ring is moving freely inside the actuator opening.	Initial Install & Monthly
6	Handle	Check for smooth operation of the handle. • Slide Handle Only - Check operator present sensor for correct operation. Use a gentle puff of compressed air or a soft cloth to clean the sensor. Do not apply any pressure to the lens or do anything that may scratch it. Verify proper handle swivel functionality. • Pendant Handle Only - Check levers to make sure they function smoothly.	Start of Each Shift
7	Handle I/O Connections	Check connections at handle (if equipped). Wipe off any oil or other contamination from either handle at this time. Clean the OLED screen as well.	Monthly
8	Air Hose (if equipped)	Look for any obvious external damage or wear caused by the wire rope or other external causes. Make sure the air hose is secured properly with the correct clamps	Start of Each Shift
9	Load Hook and/or Tooling (by others)	Check that the load hook is secured properly to the handle or swivel. Make sure lock washers are compressed completely and any other associated hardware is secure.	Start of Each Shift
10	G-Force® Assembly	Conduct a visual inspection of the entire G-Force® unit.	Start of Each Shift
11	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 faulty.	Initial Install and Start of Each Shift

* 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.

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For additional service information, please consult the G-Force® Q2 and iQ2 Series Service Manual. Contact the Gorbel® After the Sales Service group to request a copy.

8/2020 Rev B