GORBEL®
A CLASS ABOVE

G-Force® Vi and Vi Plus Intelligent Lifting Device

Installation, Operation & Maintenance Manual



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Please call (800) 821-0086 (US and Canada)

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Section 1 - Safety and Hoist Overview

Hoist Safe Operating Practices

General

Safe Operating Practices are the most important factor for minimizing the possibility of personal injury to the operator and those working in the area, or damage to property, equipment, or material.

Hoists and 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 hazards which cannot be protected against by mechanical means. These hazards can only be avoided by the exercise of Safe Operating Practices, care, and common sense.

Safe Operating Practices also involve a program of periodic inspection and preventative maintenance covered in Section 7 of this manual. Part of an operator's training should be an awareness of potential malfunctions/hazards requiring adjustments or repairs, and bringing these to the attention of a supervisor for corrective action.

Supervisors and managers 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 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 for Safe Operation of Hoists

The following are Do's and Don'ts for safe operation of overhead hoists. These rules can make an operator aware of dangerous practices to avoid and precautions to take for their own safety and the safety of others. Frequent examinations and periodic inspections of the equipment as well as observance of safety rules may save lives, time and money.

DON'TS - HOISTS

1. Do not allow any unqualified personnel to operate hoist.
2. Never lift or transport a load until all personnel are clear.
3. Do not transport a load over personnel.
4. Never pick up a load beyond the rated capacity appearing on the hoist. Overloading can also be caused by jerking the load, and by static overload.
5. Never carry personnel on the hook or the load.
6. Do not operate hoist if you are not physically fit.
7. Do not operate hoist to extreme limits of cable travel without first checking for proper limit switch action.
8. Avoid impact between two hoists or between hoist and end stop.
9. Do not tamper with or adjust any parts of the hoist unless authorized to do so.
10. Never use the load cable as a sling.
11. Do not divert attention from the load while operating the hoist.
12. Never leave a suspended load unattended.
13. 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.
14. Never operate a hoist that has an apparent or suspected mechanical or electrical defect.
15. Do not use load cable as a ground for welding. Never touch a live welding electrode to the load cable.
16. Do not jog controls unnecessarily. Hoists generally use high torque, high slip motors. Each sudden start causes a spike in current greater than the running current which can lead to overheating and burnout if continued to excess.
17. Do not operate the hoist if the load is not centered under the hoist.
18. Do not operate the hoist if the wire rope is twisted, kinked, or damaged.
19. Do not remove or obscure hoist labels.
20. Do not permanently activate or bypass the Operator Present Sensor.
21. Do not disassemble or reassemble components while the hoist is energized. Never "Hot-Swap" components.

DO'S - HOISTS

1. Read and follow manufacturer's instructions and installation and maintenance manuals.
2. When repairing or maintaining a hoist, use only manufacturer's recommended parts and materials.
3. Read and follow all instruction and warning information on or attached to a hoist.
4. Remove the hoist from service and thoroughly inspect and repair it if unusual performance or visual defects such as peculiar noises, jerky operations, travel in improper direction, or obviously damaged parts are noticed.
5. Follow the regular schedule of inspection in Section 7 of this manual, and maintain records for all hoists with special attention given to hooks, load cables, brakes, and limit switches.
6. Check operation of brakes for excessive drift.
7. Check for damaged hooks and load cable.

DO'S - HOISTS, CONTINUED

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 machinery, or other obstructions when raising, lowering, or transiting the load.
11. Center hoist over the load before operating.
12. Avoid swinging of load or load hook when transiting the hoist and load.
13. Be sure the load attachment is properly seated in the saddle of the hook. Balance the load correctly before lifting. 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

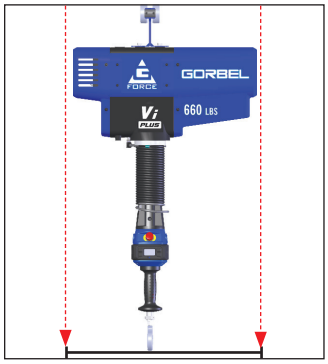
All operators should read the G-Force Installation and Operation Manual before operating the unit. Please follow the instructions contained in this manual for your safety and the optimum trouble-free operation of your G-Force.



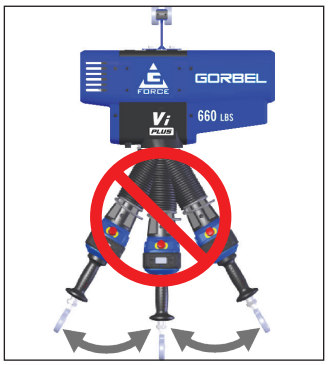
Read and follow all instructions and warning information with or attached to the G-Force®.



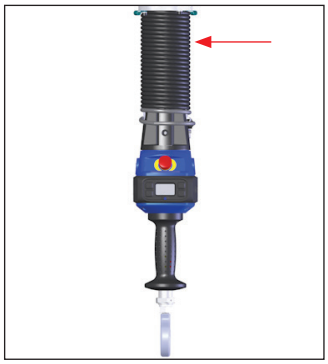
Check Wire Rope for improper seating, twisting, kinking, wear or defects before operating.



Center G-Force® over the load before lifting a load. Do not end or side load.



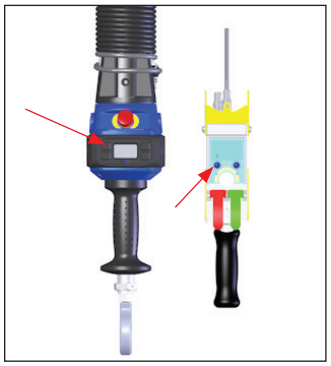
Avoid swinging of load or load hook when transiting with the G-Force®.



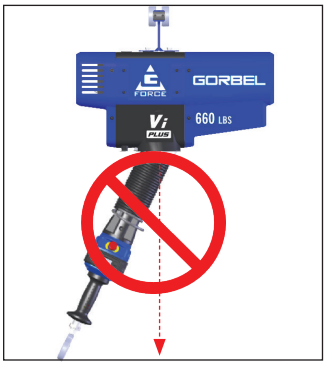
Check the coil cord for improper seating, twisting, kinking, wear or defects before operating.



The operator's hand should not leave the handle grip at any time the G-Force® is in use (excluding Float Mode).



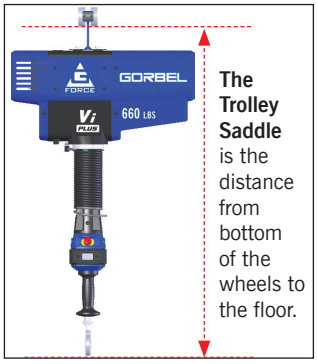
Float Mode – press the G-Force® button with only the load weight hanging from the unit. Applying additional force will cause unit to drift.



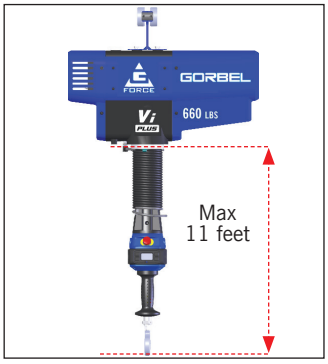
The wire rope should never be >15° out of vertical while the G-Force® is in use. The G360 must be level at all times.



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

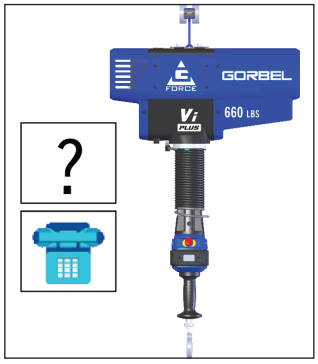


Maximum Trolley Saddle for the G-Force® with standard in-line slide handle is 14 feet.



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

For H5 duty cycle, the maximum working stroke is **8 feet**.



Questions about G-Force®? Call your local Gorbel® distributor or Gorbel® Customer Service at (800) 821-0086.

Diagram 1-1. Operational Guidelines

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** 3-4).
10. Do not mount any objects to the G-Force® Slide Handle grip (for example, 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 disassemble or reassemble components while hoist is energized (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 to the G-Force Vi and Vi Plus

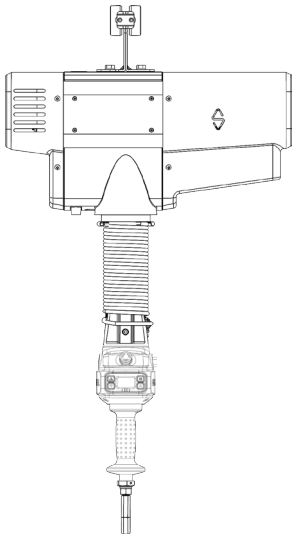
Thank you for choosing a Gorbel® G-Force® Vi/Vi Plus Intelligent Lifting Device (ILD)* to solve your material handling needs. The G-Force® is a servomotor driven, high speed, ergonomic materials handling device. The innovative design and heavy-duty construction of the G-Force® results in a superior quality 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 in this manual.

* U.S. Patent No's: 5,865,426, 6,622,990, 6,386,513, & 6,886,812, Other Patents Pending

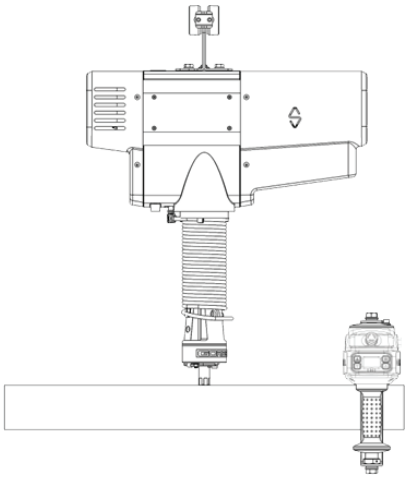
Dimensions contained in this installation manual are for reference only and may differ for your application.

WARNING
Only trained installation personnel familiar with standard fabrication practices should install the G-Force®. Gorbel is not responsible for the quality of workmanship employed in the installation of this hoist according to these instructions. For additional information Contact Gorbel, Inc., 600 Fishers Run, P.O. Box 593, Fishers, New York 14453, 1-585-924-6262.
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 only Gorbel-supplied wire rope for any G-Force® equipment. Use of wire rope other than that supplied by Gorbel will void your warranty.
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 your 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.
WARNING
Unless otherwise specifically stated, Gorbel® parts and products are designed for indoor use. Storing and/or using your items outside (even if covered), exposed to the elements, or in any method other than intended, may void all or some of the product warranty. Always store Gorbel® parts and products indoors, in a cool and dry area.
WARNING
Do not apply power to the G-Force®unit until the handle or 360 is attached to the wire rope.
⚠ WARNING ⚠
This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. For more information: www.P65warnings.ca.gov

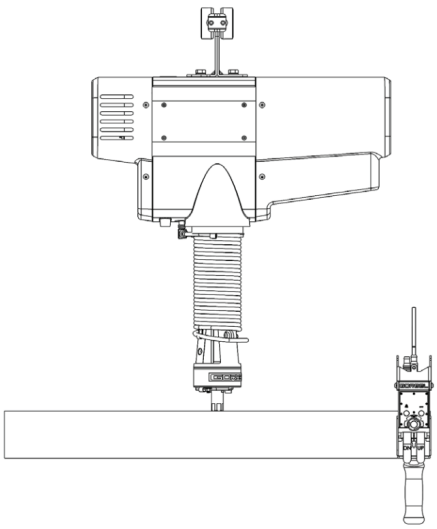
G-Force Installation Orientation



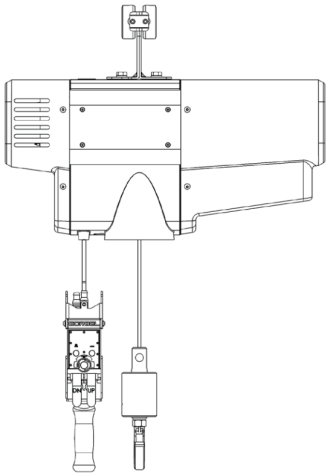
In-Line Slide Handle



Remote Mounted Slide Handle



Remote Mounted Pendant Handle



Suspended Pendant Handle

Diagram 1-2. G-Force Installation Orientation

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, 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. In Section 3, see Lift Functionality and Controls Interface Features section for additional details.

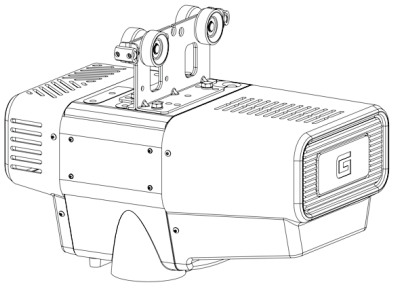


Diagram 1-3. Actuator Assembly

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 the coil cord.

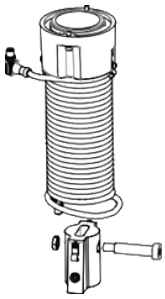


Diagram 1-4. Standard Coil Cord Assembly

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. In Section 3, see Lift Functionality and Controls Interface Features section for additional details. 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. Improper tooling integration will result in degraded performance and premature failure of the G-Force®.

   The Vi and Vi Plus G-Force® Actuators are only compatible with Vi and Vi Plus 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.**

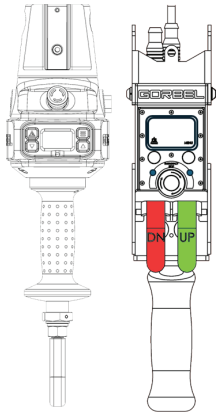


Diagram 1-5. In-Line Slide Handle* and Pendant Handle

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.

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Section 2 - Installation

Step 1 - Unpacking the G-Force

TIP!: The Packing List can be found in a plastic pocket attached to the 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 Sale 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:

- 2.5mm Allen wrench
- 3mm Allen wrench
- 5mm Allen wrench
- 6mm Allen wrench (1320 lb. only)
- 8mm Allen wrench
- 14mm wrench or hex socket
- 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 grasping the blue plastic end covers. To lift the actuator, grasp the handle slots in the trolley.

3.1. The standard G-Force® will come with the wheels pre-assembled to the Actuator Trolley **(Diagram 2-3A)**.

When a Gorbel® G-Force® is to be used on a non-Gorbel® bridge system, a universal adapter trolley is required **(Diagram 2-3B)**. **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 by rolling the actuator assembly along the full length of the bridge to ensure that the travel is smooth throughout.

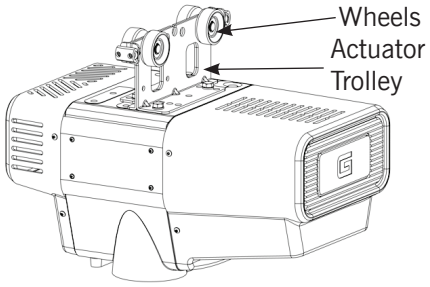


Diagram 2-3A. Standard Actuator Assembly.

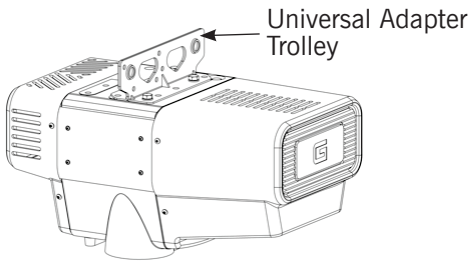


Diagram 2-3B. Standard Actuator Assembly with Universal Adapter Trolley.

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 2-4A and 2-4B**). 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).

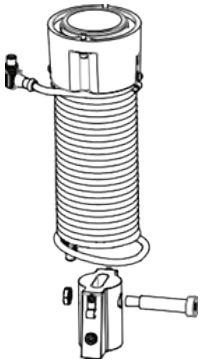


Diagram 2-4A. Standard Coil Cord Assembly

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, when coiled, 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, when coiled, 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.

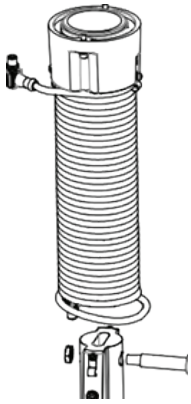


Diagram 2-4B. Double Length Coil Cord.

4.3. Use the actuator assembly hardware to fasten the coil cord assembly to the actuator as shown in **Diagram 2-4C**. 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. There should be no need for adjustment of the coil cord clamps if coil cord is aligned as shown.

4.4. Thread the coil cord connector into the actuator connector (**Diagram 2-4C**).

4.5. Ensure 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.

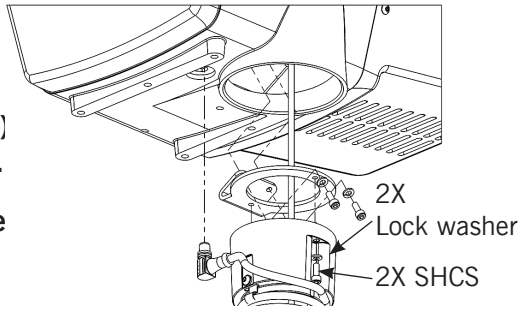


Diagram 2-4C. Coil Cord Assembly at the Actuator (Bottom view/black center not shown).

4.8. For standard **In-line Slide Handle or In-line Force Sensing Handle installation, go to Step 5A.**

For **Remote Mounted Slide Handle installation, go to Step 5B.**

For Suspended Pendant Handle installation, Step 5C.

For Remote Mounted Pendant Handle installation, go to Step 5D.

For 1320 lb. In-line Slide or Remote Mounted Handle installation, go to Step 5E.

For 1320 lb. Suspended Pendant Handle installation, go to Step 5F.

For optional 1320 Lb. Air Hose Assembly installation, go to Step 5G.

For Remote Mounted Force Sensing Handle installation, go to Step 5H.

For Remote Mounted Force Sensing Hub Handle installation, go to Step 5I.

Step 5A - In-Line Slides & 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.

5A.4. When the wire rope, coil cord footer and slide handle swivel are aligned, replace the 16mm shoulder bolt, capturing the wire rope, coil cord footer and slide handle (Diagram 2-5A1).

5A.5. Thread the coil cord connector into the slide handle connector (Diagram 2-5A1).

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 to drill a hole completely through the threads of the hook and the opposite side of the nut. Hammer the included M4x36mm spring pin into the hole until it is flush with the surface of the nut (**Diagram 2-5A2**).

5A.9. Continue to Step 6 - Electrical Power Connection.

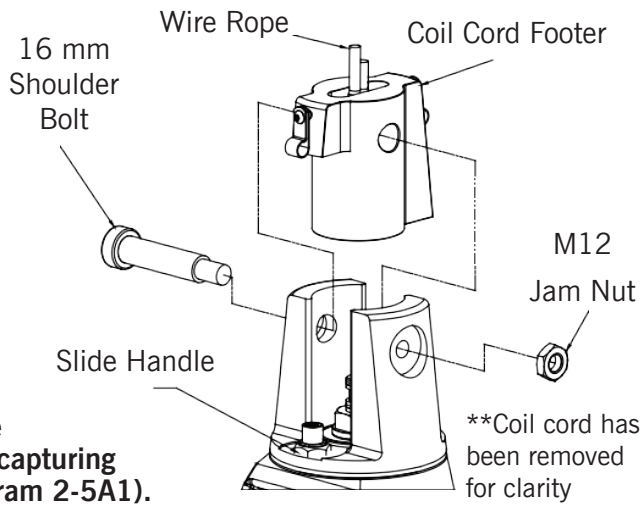


Diagram 2-5A1. Slide Handle, Shoulder Bolt and Coil Cord

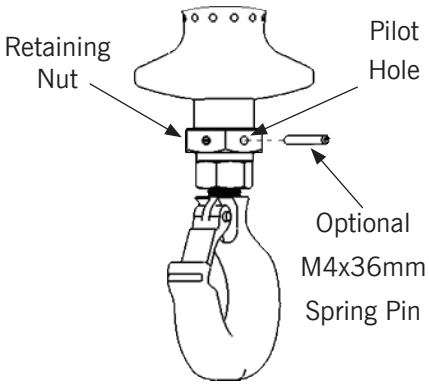


Diagram 2-5A2. Slide Handle with Optional Pin

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 2-5B1**).

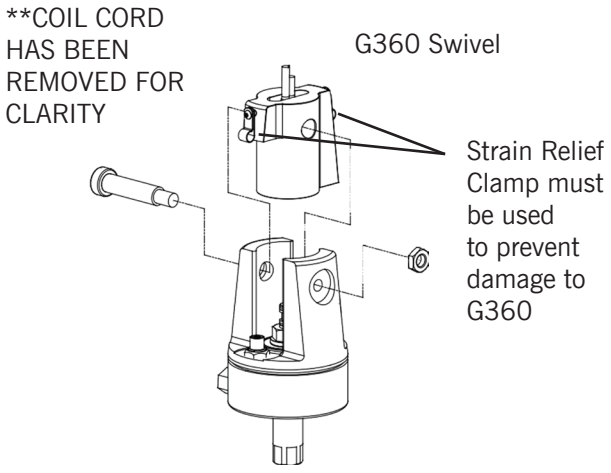


Diagram 2-5B1. G360, Shoulder Bolt and Coil Cord

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 2-5B1, previous page**).

5B.5. Thread the coil cord connector into the G360™ connector (**Diagram 2-5B1, previous page**).

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.

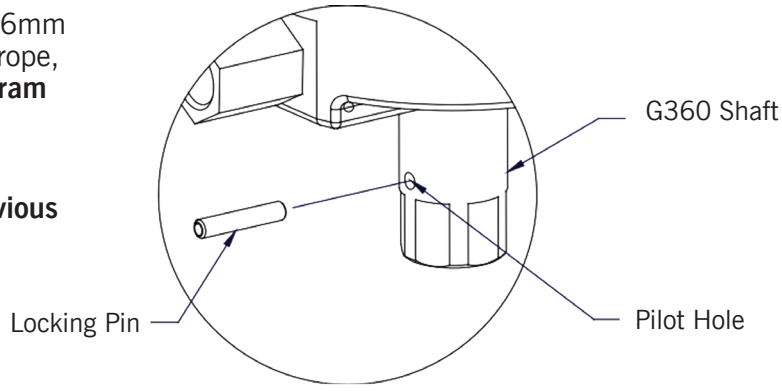


Diagram 2-5B2. Tooling Installation.

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 to lock the tooling to the G360™ (**Diagram 2-5B2**).

5B.9. Assemble the remote mounted slide handle inside the remote mount bracket using the hardware provided (**Diagram 2-5B3**). **NOTE**: This step is best completed on a workbench prior to mounting handle to tooling.

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. Ensure that the mounting arrangement does not affect the operating function of the slide handle.

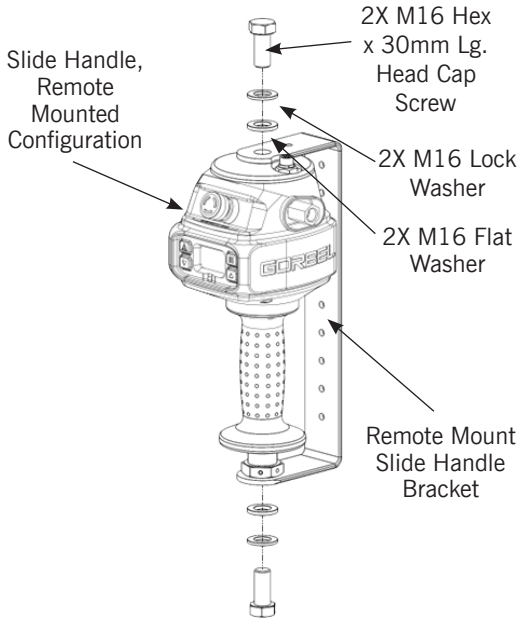


Diagram 2-5B3. Remote Mounted Slide Handle, Exploded View.

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 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 - Electrical Power Connection.

Step 5C - Suspended Pendant Handle Installation

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

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

5C.3. Thread the eye bolt into the bottom of the actuator assembly as shown (**Diagram 2-5C1**).

5C.4. Reattach the suspended pendant cable assembly to the eye bolt 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 2-5C1**).

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 2-5C2**) 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 2-5C3**).

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 - Electrical Power Connection.

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. **To clear this fault you must perform these steps 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.

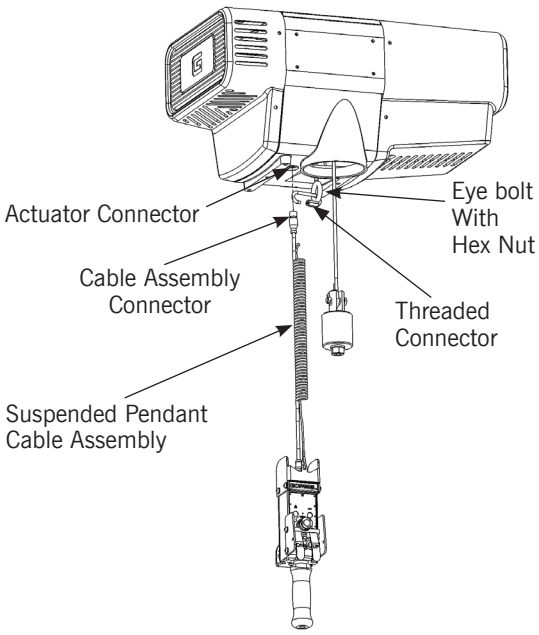


Diagram 2-5C1. Assembly of Suspended Pendant Cable Assembly to Bottom of Actuator Assembly.

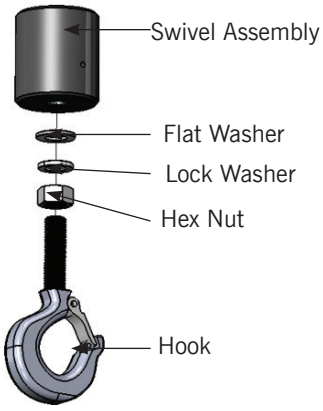


Diagram 2-5C2. Hook Installation.

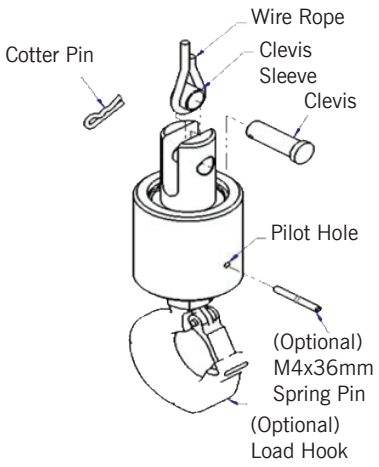


Diagram 2-5C3. Cotter Pin, Clevis, Wire Rope Swivel Assembly, and Wire Rope Thimble.

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 2-5D1**).

5D.5. Thread the coil cord connector into the G360™ connector (**Diagram 2-5D1**).

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 2-5D2**).

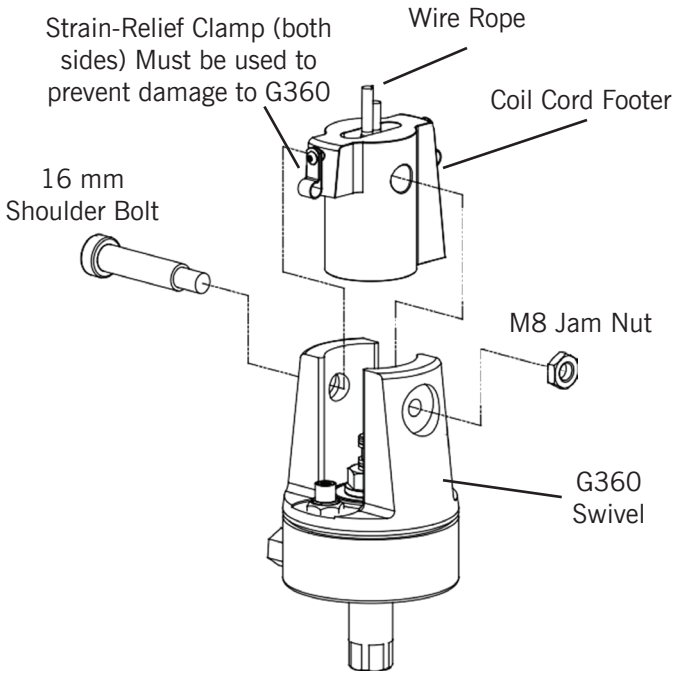


Diagram 2-5D1. G360™, Shoulder Bolt and Coil Cord.

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.

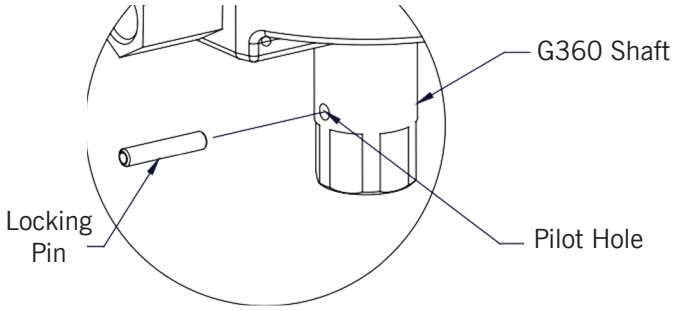


Diagram 2-5D2. Tooling Installation.

Step 5D - Remote Mounted Pendant Handle Installation, Continued

5D.9. Attach the pendant handle bracket directly to the tooling. Ensure 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 2-5D3**).

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.

5D.11. Continue to Step 6 - Electrical Power Connection.

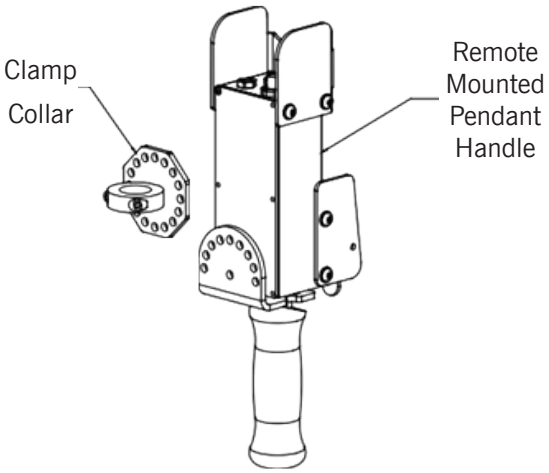


Diagram 2-5D3. Remote Mounted Pendant Handle with Collar Clamp Mounting Bracket (option)

Step 5E - 1320 Lb. Inline Slide & Remote 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 2-5E1**).

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 hex nuts, securely tighten U-bolt to the plate (**Diagram 2-5E2**).

5E.4. Attach the plate to the underside of the actuator using the supplied cap screws, lock washers, 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 wire around the pulley and slip the pulley and side spacers down between the plates (**Diagram 2-5D3 on the previous page**).

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 lock washers, attach the coil cord mounting plate to the top of the handle or G360™.

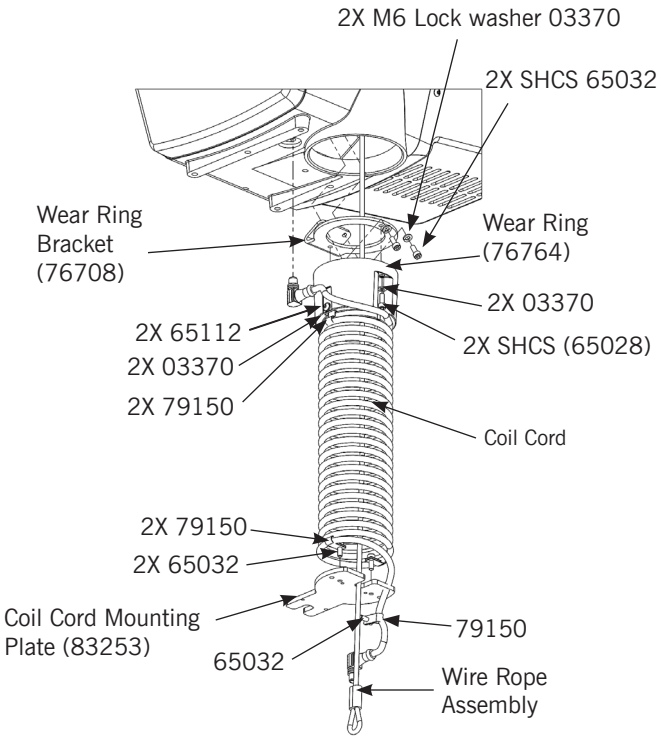


Diagram 2-5E1. Assembly of Wire Rope to 1320 lb. Actuator Assembly.

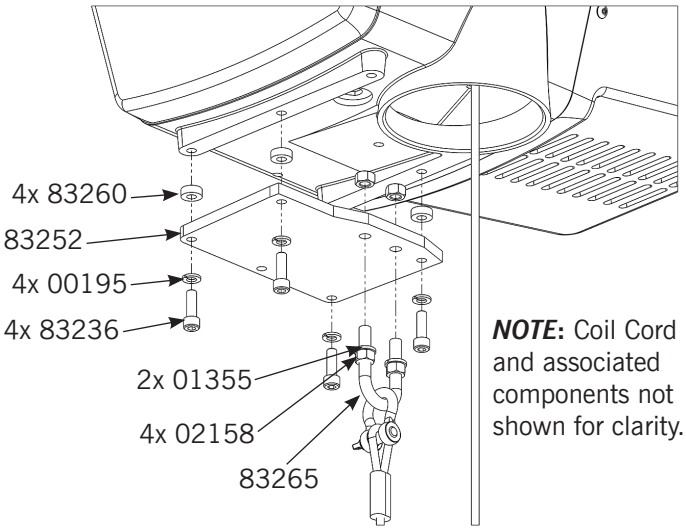


Diagram 2-5E2. Attaching U-bolt and Reinforcement Plate to Actuator Assembly.

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 - Electrical Power Connection.

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 2-5E1 on the previous page**).

5F.2. Grasp 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 hex nuts, securely tighten the U-bolt to the plate (**Diagram 2-5E2 on the previous page**).

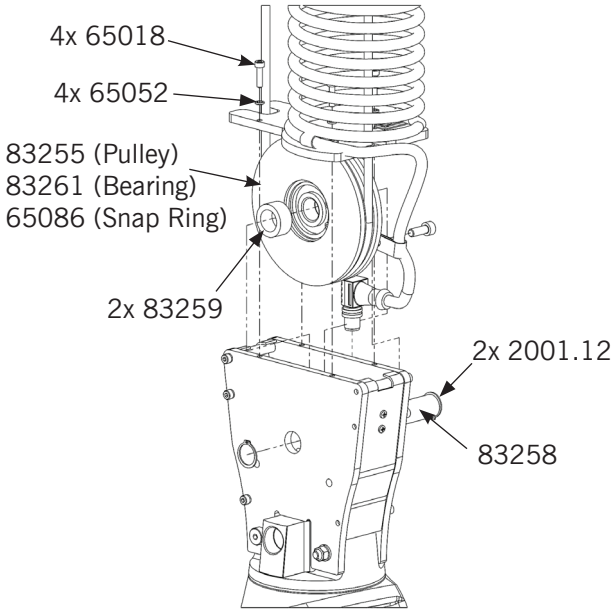


Diagram 2-5F1. Attaching Wire Rope to Pulley.

5F.3. Attach the plate to the underside of the actuator using the supplied cap screws, lock washers 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 eye bolt 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 wire rope around pulley and slip the pulley and side spacers down between the plates (**Diagram 2-5F1**).

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 lock washers, attach the coil cord mounting plate to the top of the G360™.

5F.8. Continue to Step 6 - Electrical Power Connection.

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. Refer to **Diagram 2-5G1**. Remove two screws and lock washers 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.

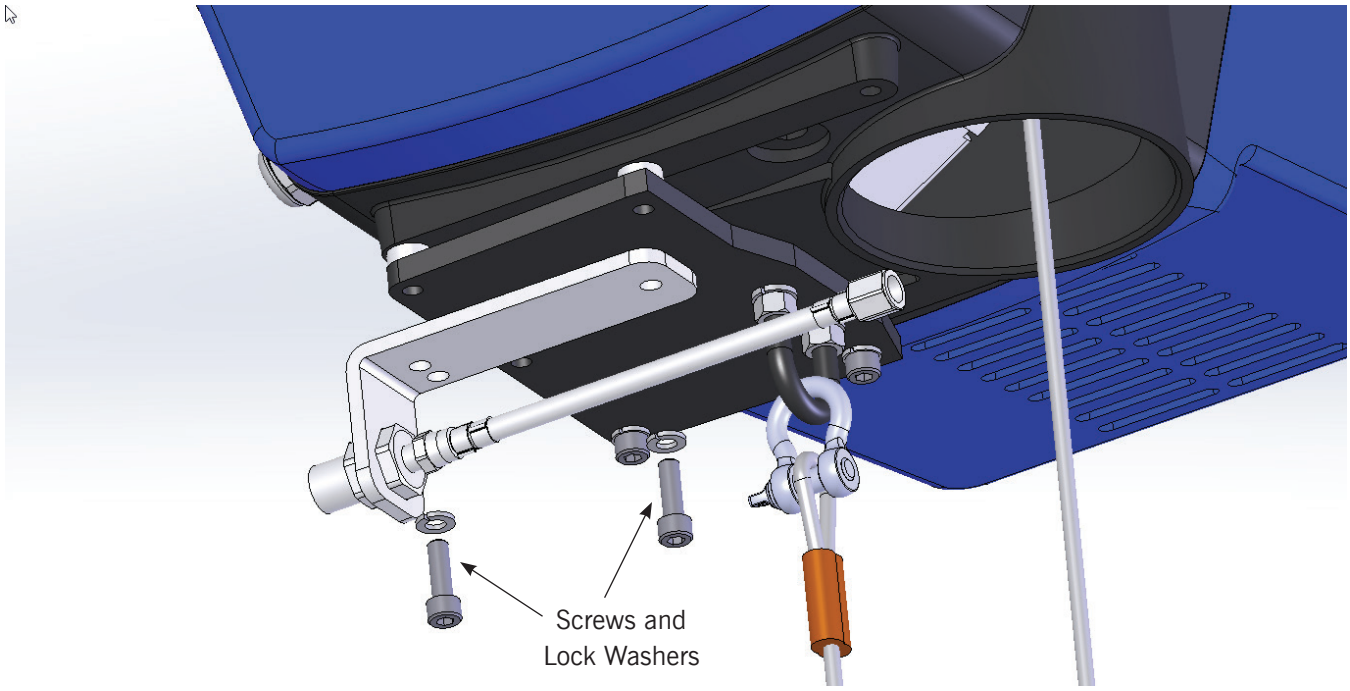


Diagram 2-5G1. Air Hose Reinforcement Plate.

Step 5H - Remote Mount Force Sensing Handle Installation

5H.1. Perform Step 5B - Remote Mounted Slide Handle Installation steps 5B-1 through 5B-8 install the 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 2-5H1**).

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 - Electrical Power Connection.

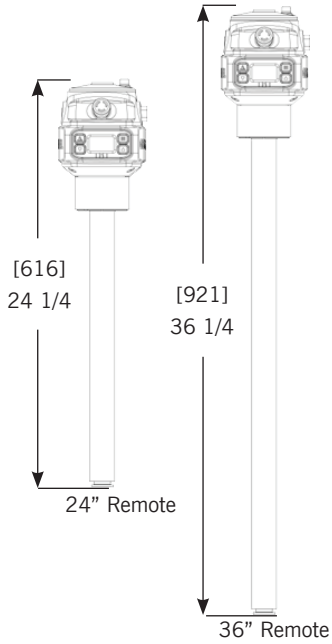


Diagram 2-5H1. Force Sensing Handle Bracket Sizes.

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: 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 2-5H3**).

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 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.

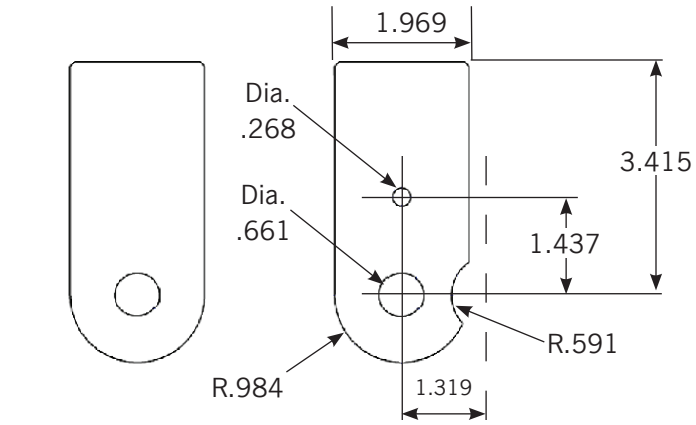


Diagram 2-5H2. Remote Handle Mounting Dimensions.

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.

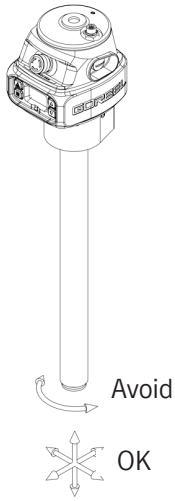


Diagram 2-5H3. Proper Use of Force Sensing Handle Grip.

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.

5H.1. Perform Step 5B - Remote Mounted Slide Handle Installation steps 5B-1 through 5B-8 install the G360™.

5I.2. Mount Hub body to tooling rigidly to resist forces exerted on it. Optional mounting plate 74136 is available. See **Diagram 2-5I1** 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 2-5I2** 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 - Electrical Power Connection.

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 2-5I3**).

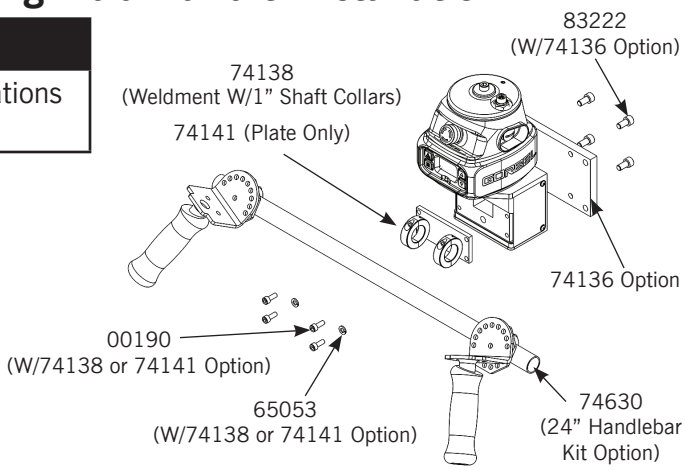
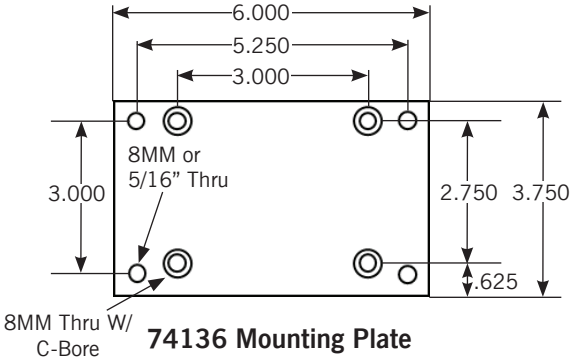
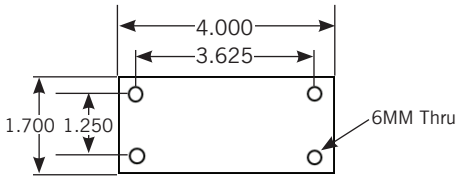


Diagram 2-5I1. Mounting Handlebar and Mounting.



74136 Mounting Plate



74141 Mounting Plate

Diagram 2-5I2. Mounting Plate Dimensions.

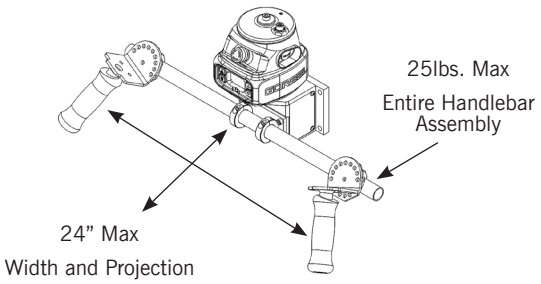


Diagram 2-5I3. Handlebar Dimensions.

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 G-Force assembly is complete

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®).

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.

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 display will indicate “**G-FORCE INITIALIZING**”.

7.4. Once the system is on-line and ready, “**Lift Ready**” will be displayed.

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 display then indicates **RUN MODE HANDLE**.

7.6. 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 display indicates **RUN MODE PENDANT**.

7.7. Test any installed end-effector tooling that may be installed.

NOTE: *See Section 3 - Lift Functionality 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.

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 - Initializing Float Mode

8.1. Float Mode may be activated by pressing the G-Force® logo button on the left-hand side of the handle (**Diagram 2-8A**). 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).

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.

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 Multi-Color Indicator will turn blue and the handle with payload should not be moving. **RUN MODE FLOAT** will be displayed.

E. Grasp the load.

F. To move the load down, put vertical pressure on the load downward, toward the floor. To move the load up, lift up on the load, toward 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.

G. Run the unit up and down several times to ensure proper operation. Float Mode should provide a smooth feel.

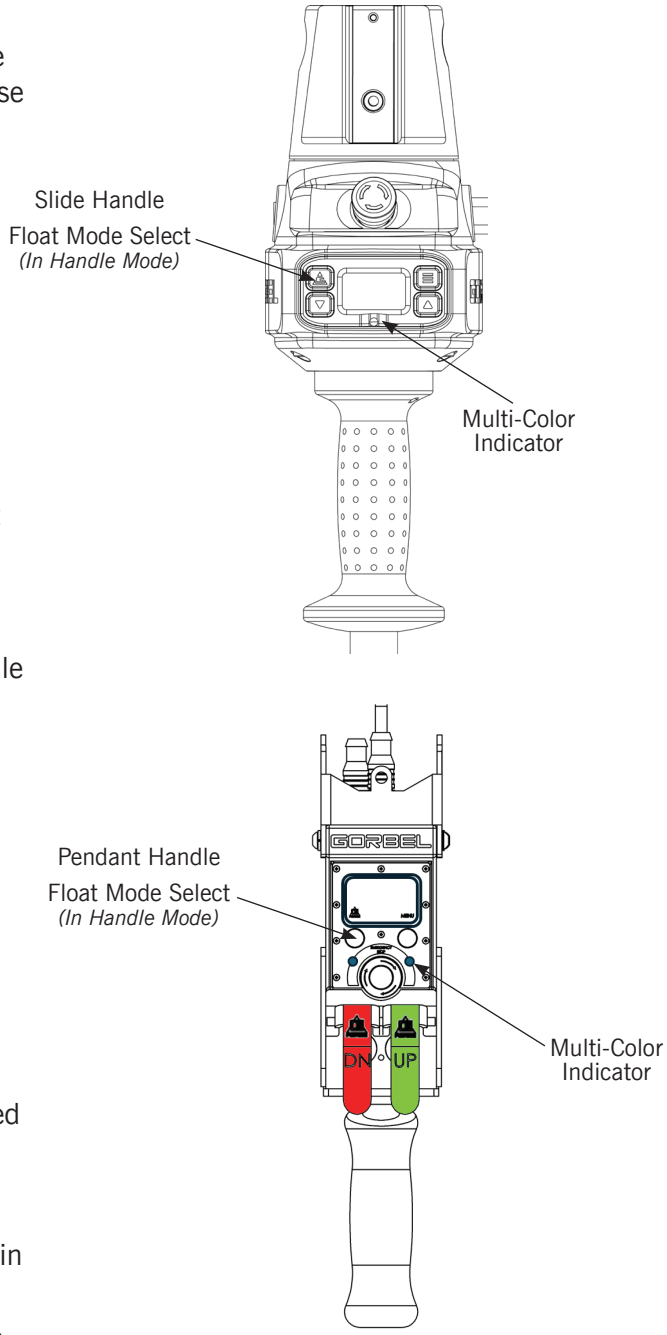


Diagram 2-8A. Entering Float Mode Slide and Pendant Handles

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

Warnings *continued on the next page...*

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 re-initiated 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 using the Smart Connect User Interface or at the handle.

9.1.1. To learn more about these two options, see Section 4A - Program Mode Overview.

9.1.2. For programming with **Smart Connect**, see Section 4B - Program Mode with Smart Connect to connect a laptop either wired or wirelessly.

9.1.3. To program through the **Slide or Pendant Handle**, see Section 4C - Program Mode - Slide or Pendant Handle for details on modifying and programming features.

9.1.4. See Section 7 - Inspection, Adjustment, Maintenance and Replacement for mechanical adjustment should the need arise due to tooling changes, wear, etc.

9.5. 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 components of the unit
- Additional questions

Please do not be limited by these items only.

9.6. Keep the 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 (Optional)

TIP!: Expansion I/O block mounting instructions only apply to Vi Plus units with an I/O Block

Refer to **Diagram 2-10** below for dimensions for the Expansion Block.

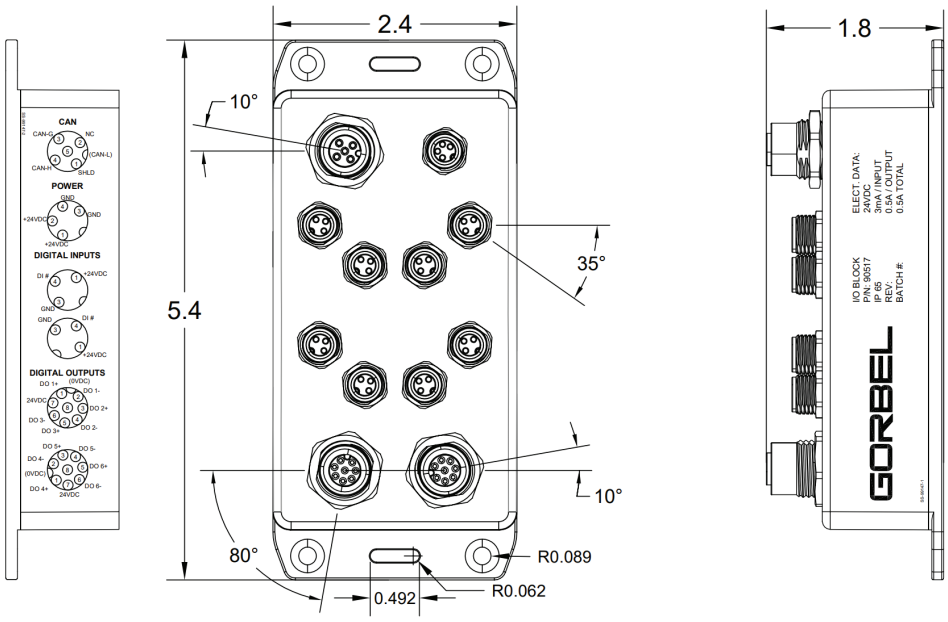


Diagram 2-10B. Expansion Block Dimensions.

Section 3 - Lift Functionality

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 3-1**). 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.

For safety, an operator present sensor (OPS) within the slide hand must be activated by the operator before the motor will activate (**Diagram 3-1**). If the operator removes their hand from the OPS line of sight, the G-Force® payload will be brought to a safe stop.

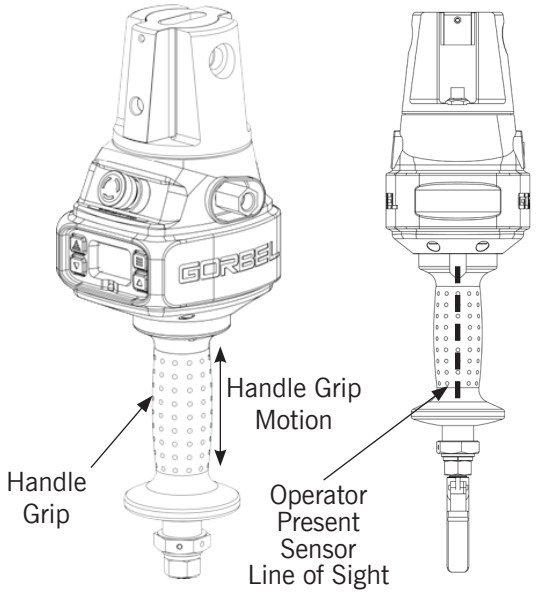


Diagram 3-1. Slide Handle - Handle Grip and Operator Present Sensor Line-of-Sight

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 3-3**). 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 3-2**). The G-Force® will operate only when the E-stop has been reset. The display will indicate 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 display will indicate LIFT READY. See Section 4C - Program Mode - Slide or Pendant Handle for information on adjusting the maximum force applied in Float Mode.

Float Mode is initiated by pressing the G-Force® logo button on the left side of the handle (**Diagram 3-2** or **3-3**). See Step 8 - Initializing Float Mode for details on Float Mode operation.

Slide and Pendant Handle Functionality

Lift Ready Mode: In this mode, the display will indicate Lift Ready. Use the Slide Handle or the Up/Down levers to raise and lower the load.

Program Mode: Entered by holding the Menu button for 3 seconds, in this mode, the operator can set speed, acceleration, service features and other variable settings. See the Section 4C - Program Mode - Slide or Pendant Handle, for complete programming functionality located at the handle.

Float Mode LED (Blue): If the G-Force is in Lift Ready Mode, and the Float Mode Select (G-Force Logo) button is pressed, the Multicolor Indicator LED (**Diagram 3-2 and 3-3**) will illuminate in blue. The display will indicate Run Mode Float.

System Fault LED (Red): The Multicolor Indicator LED flashes red when basic command and drive faults have been detected. If a fault has occurred, the system will be disabled.

Diagnostic Mode: The Diagnostic Mode is a special routine within 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 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 Diagnostic Mode.

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 when the unit is overloaded. The lift may be moved down to allow for the safe removal of the load.

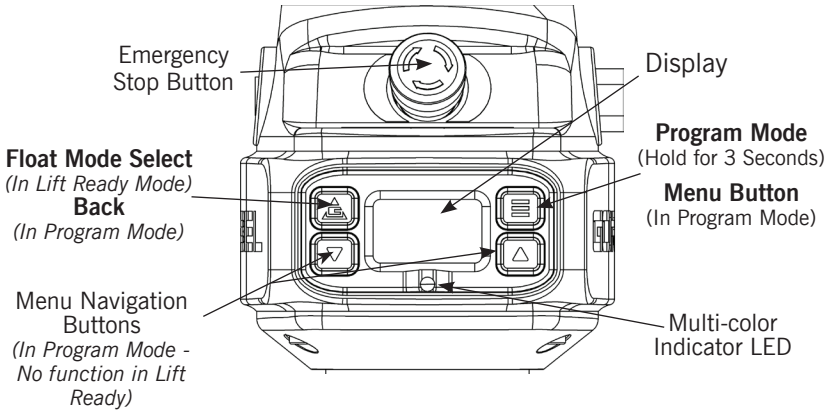


Diagram 3-2. Slide Handle Controls and Indicators.

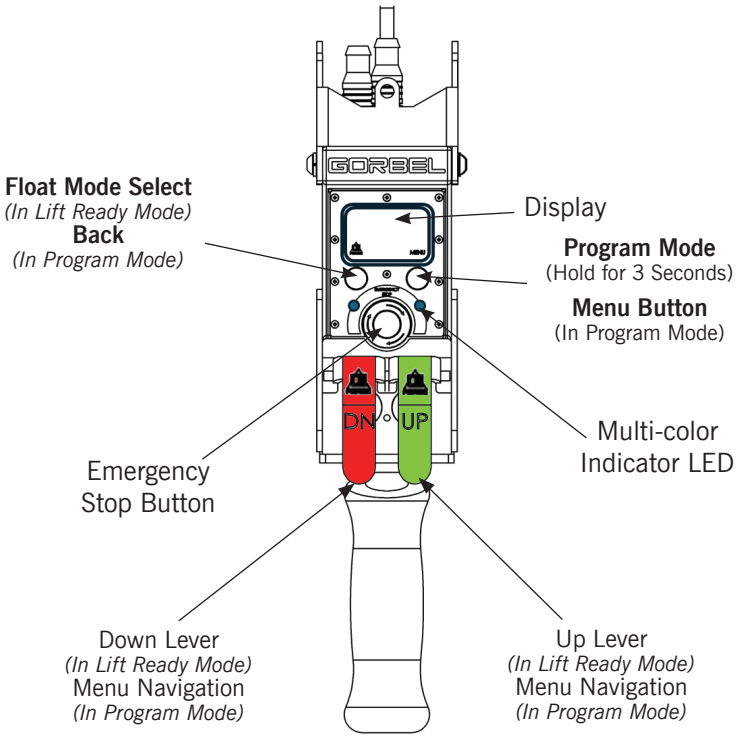


Diagram 3-3. Pendant Handle Controls and Indicators.

WARNING

In Float Mode, the live load weight cannot be increased or decreased because this will cause unwanted motion. Float Mode must be re-initiated 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.

Slide and Pendant Handle Functionality, Continued

Limit Switches

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

Slack Switch

The G-Force® is equipped with a 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.

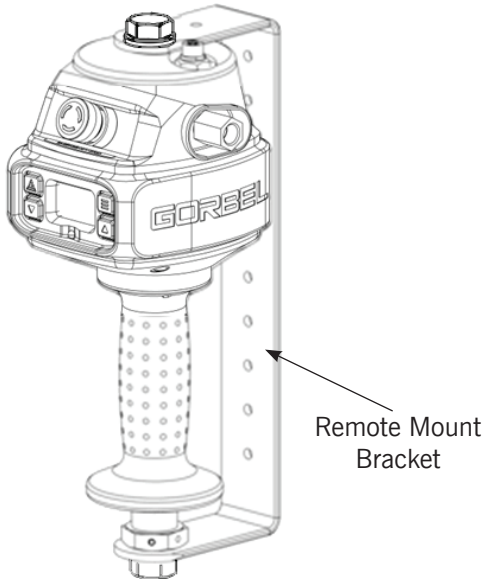


Diagram 3-4.

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 3-4**).

Controls Interface Features

Communications Connector

The Communication Connector is located as shown in **Diagram 3-5**. It is an RJ45 connector used to when implementing a wired connection from a laptop computer to the G-Force.

The connection is made to launch the Smart Connect User Interface to manage operational parameters for the Handle, Actuator and Expansion block.

For more information on the wired and wireless connection of the G-Force to the laptop, refer to Section 4B - Programming Mode with Smart Connect.

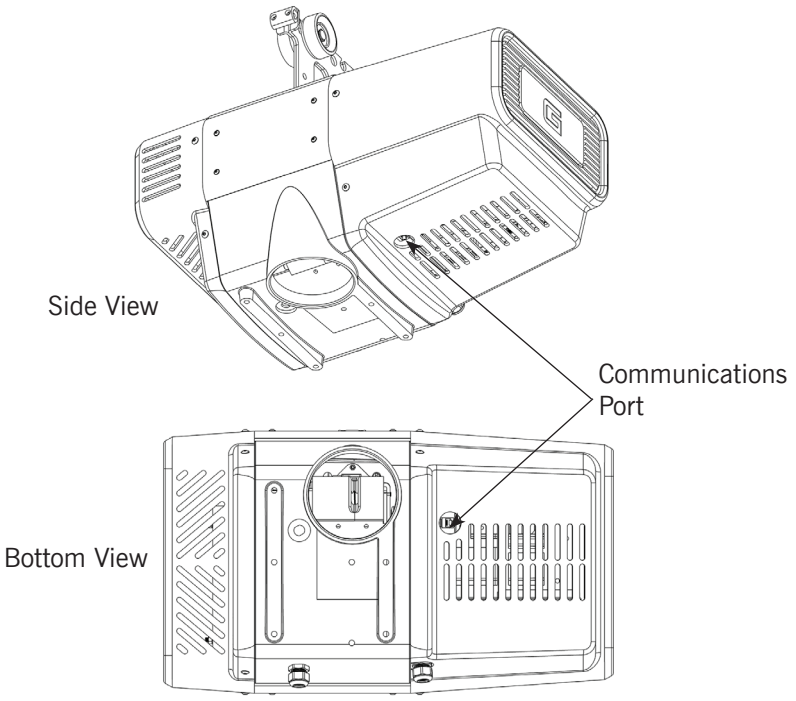


Diagram 3-5. Actuator Communications Port.

Jog Switch Push Buttons

The Jog Switch Push Buttons (**Diagram 3-6**) 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.

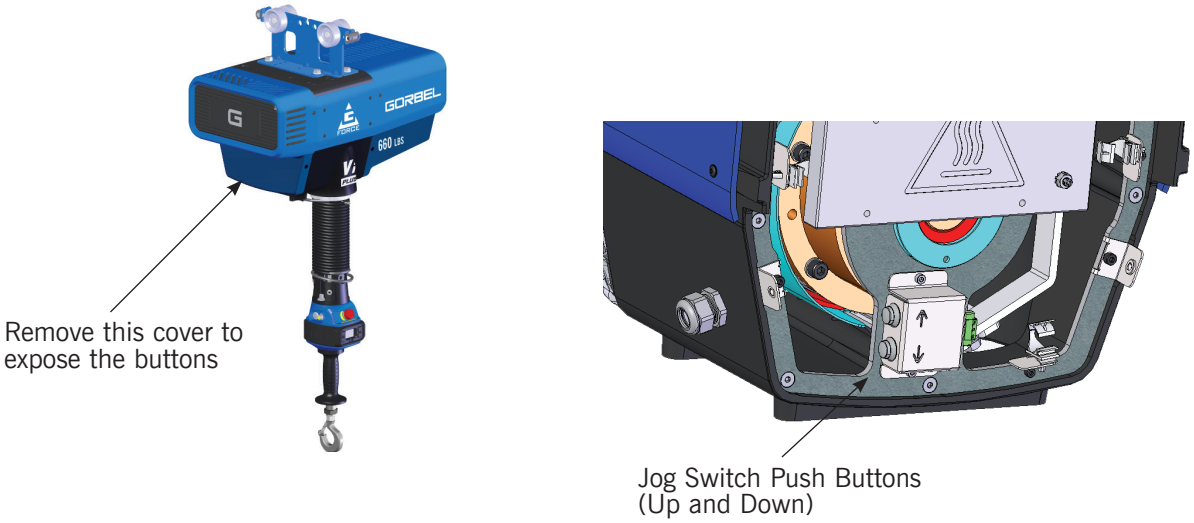


Diagram 3-6. Jog Switch Push Buttons.

DF

This section describes the procedure to setup multiple handles on the G-Force® Vi and Vi Plus products. Additional usage notes are included. The procedure applies to both Vi and Vi Plus G-Force® and Easy Arm® products.

NOTE: Dual handles can only be the inline slide and remote pendant or two inline slides or two pendants, dual handles are not applicable with force sensing handles or hubs.

WARNING
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 in the instruction.

NOTE: Before commencing this procedure, ensure that the software on the G-Force or Easy Arm is up to date. If an update is required, refer to Dual Handle Software Update to perform the update.

Procedure

1. Disconnect **BOTH** handles from the Actuator.

Handle 1:

2. Utilize the Gorbel G-Force Service Manual or Contact Gorbel After the Sales Service to access the Handle Motherboards in the Handle Housing.
3. Refer to **Diagram 3-7**. On the Handle Mother Board, go to the Block of 4 DIP Switches on the top left corner of the board. The plastic covering over the switches can either be torn or removed to access these switches.
4. Refer to **Table 3-1**. Using a precision screwdriver, toggle Switch 3 to the OFF position and ensure all other switches are in the ON position.

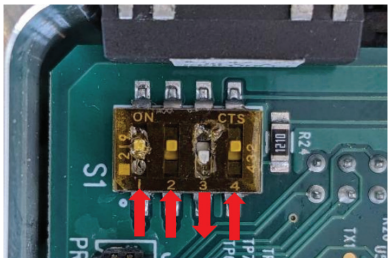


Diagram 3-7. DIP Switches on **Handle 1** Motherboard.

Switch	Handle 1
1	ON
2	ON
3	OFF
4	ON

Table 3-1. DIP Switch Settings for Handle 1.

Continued on the next page...

Handle 2:

5. Refer to **Diagram 3-8**. On the Handle Mother Board, go to the Block of 4 DIP Switches on the top left corner of the board.
6. Refer to **Table 3-2**. Using a precision screwdriver, toggle **Switches 1 and 3** to the OFF position and ensure all other switches are in the ON position.

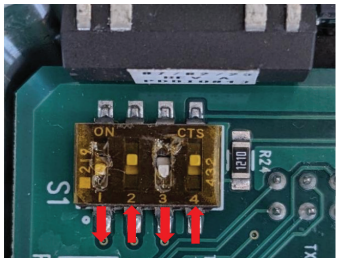


Diagram 3-8. DIP Switches on **Handle 2** Motherboard.

Switch	Handle 2
1	OFF
2	ON
3	OFF
4	ON

Table 3-2. DIP Switch Settings for **Handle 2**.

Setting up Handle Connections

1. Refer to **Diagram 3-9** (for additional detail, refer to **Diagram 4B-27**. Input/Output Cable Schematics and Pin Outs. For a dual handle setup a Splitter Cable Assembly, Gorbel P/N: 78655 is required.
2. Connect the splitter cable to the G360 M12 Connector or a cable connected to the G360.
3. Connect two handles to the two ends of the splitter cable or to cables connected to the splitter cable.

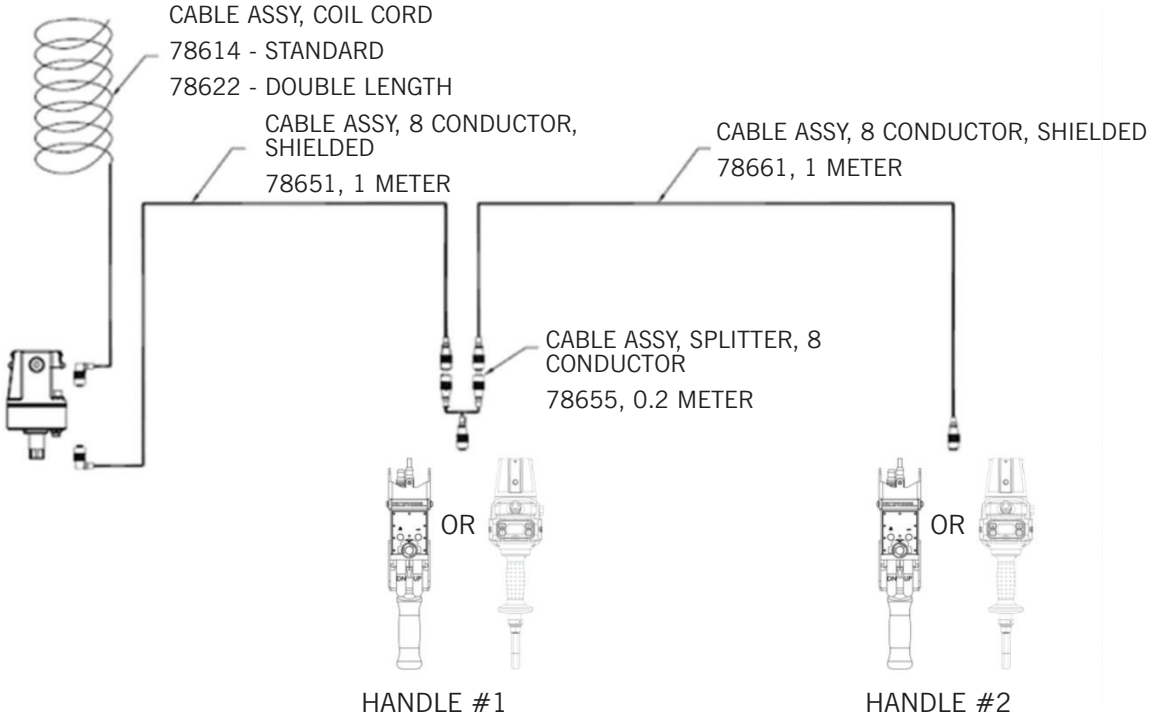


Diagram 3-9. Dual Handle Cable Assemblies and Splitter Connections.

Dual Handle Operation

These are general instructions outlining the functions of a Dual Handle G-Force.

- **Run Mode**: Only one handle can be used to control motion of the G-Force in Run Mode at a time (When one handle is being used (OPS Triggered), the other handle will not be operational (except for E-Stop).
- **Float Mode**: When one handle is put into Float Mode, the other handle also runs on Float Mode, triggering the Operator Present Sensor (OPS) on either handle will bring both handles out of Float Mode.
- **E-Stop**: When the Emergency stop on any one/two handle(s) is pressed, the G-Force will not be operational. All E-Stops must be reset for the system to be used.
- **Program Mode**: Changing any setting on one handle will be applied to the other handle as well. **NOTE**: If the adjusted setting only affects one of the handles (i.e. settings specific to handle type), that setting can still be set from either handle, but will still only affect the appropriate handle. When one handle is in program mode, both are. Actions taken in the handle menu on either handle will be reflected on both handles until one handle exits Program Mode.
- **The Dual/Single Handle Mode Switch**: This switch is found on the Factory Settings page of the Smart Connect User Interfacec only when a handle with a dip switch configuration matching a primary or secondary handle is detected by the system, or when the switch is already set to Dual Handle Mode from previous use regardless of the configurations of connected handle(s). This switch should be toggled to the corresponding setting when swapping to single or dual handle mode. After this switch is toggled, the system must be powered down while the swap between one and two handles is made.

Dual Handle Software Update

This procedure is for updating both handles.

1. After the USB Software Update is complete, access the SmartConnect User Interface and navigate to the **Factory Settings** page. Scroll down to the **Main Board State** box and observe the status box for the handle board.
2. If the handle board status displays a ***Firmware Needs Updating*** message, proceed to the next steps. If the handle board status only displays a green ***Connected*** message, the rest of this process is not necessary.
3. Power down the G-Force and disconnect both handles.
4. Open both handle housings and return all the switches in S1 in each handle to the ON position.
5. Connect only one of the two handles to the G-Force and power up the system.
6. Access the SmartConnect User Interface and navigate to the **Factory Settings** page. Scroll down to the **Main Board State** box and click the **Update Boards** button.
7. After the board updates have completed and all boards are showing a green ***Connected*** status, power down the G-Force.
8. Disconnect the first handle and then connect the remaining handle. Power up the unit and return to the SmartConnect User Interface.
9. Navigate to the **Factory Settings** page again and scroll down to **Main Board State**. The Handle Board Status will once again display a ***Firmware Needs Updating*** message. Click the **Update Boards** button in the top right corner of the **Main Board State** box.
10. After the board updates have completed and all boards are showing a green ***Connected*** status, power down the G-Force.
11. Open the housings of both handles again and return the switches in each S1 to their original Dual Handle positions then reassemble both handle housings.
12. Reconnect both handles to their corresponding connection points to the G-Force and power up the unit. Normal operation can now be resumed.

Dual Handle Setup Troubleshooting

When only one handle is connected

If only one handle of dual handle pair that has already been set up is connected to the G-Force, one of two things will happen depending on if the connected handle is set up as the primary or secondary handle.

If the handle is set up as the primary handle, the system will remain in an E-Stopped state until the system is powered down, and the secondary handle is attached. This will happen regardless of the position of the Dual/Single Handle Mode Switch in the Smart Connect User Interface, as the system treats its inability to detect the secondary handle as if it were an E-Stop request from the secondary handle for the safety of the user. The Factory Settings page of the HMI will also display an error message next to the Calibrate Handle button as shown in **Diagram 3-10**.

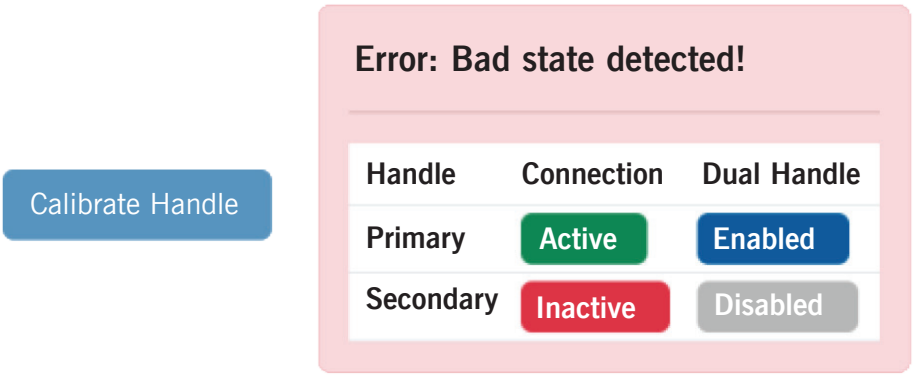


Diagram 3-10. Error Message - Primary Handle Only Connected.

If the connected handle is set up as a secondary handle, the system will fail to initialize properly, as the presence of the primary handle is required for the system to detect the secondary handle.

As such, the display on the secondary handle will be stuck showing the three bouncing loading dots. In this context the Dual/Single Handle Mode Switch will not appear in the HMI, as no handles are detected by the system. The Factory Settings page of the HMI will also display an error message next to the Calibrate Handle button as shown in **Diagram 3-11**.

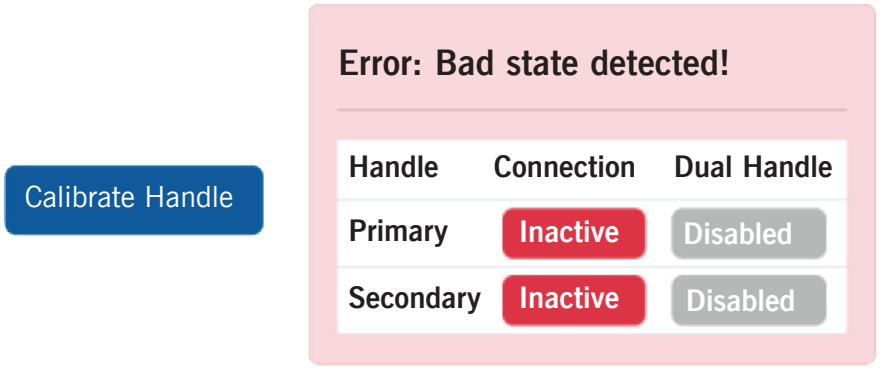


Diagram 3-11. Error Message - Secondary Handle Only Connected.

Dual Handle Setup Troubleshooting, Continued

If the DIP Switches are configured incorrectly:

If only one handle of dual handle pair that has already been set up is connected to the G-Force, one of two things will happen depending on if the connected handle is set up as the primary or secondary handle.

If the handle is set up as the primary handle, the system will remain in an E-Stopped state until the system is powered down, and the secondary handle is attached. This will happen regardless of the position of the Dual/ Single Handle Mode Switch in the Smart Connect User Interface, as the system treats its inability to detect the secondary handle as if it were an E-Stop request from the secondary handle for the safety of the user. The Factory Settings page of the Smart Connect User Interface will also display an error message next to the Calibrate Handle button as shown in **Diagram 3-10**.

On the Primary Handle:

- If the Dip Switches are configured in an arrangement that does not match the configuration for the Primary Handle, or Single Handle set up, both handles will get stuck at the three bouncing loading dots screen and be unresponsive to inputs until the system is powered down and the issue is fixed.
- If the Dip Switches in the Primary Handle match the configuration for a Single Handle set up, the Primary Handle will initialize to an Error 2-24 message which cannot be cleared until the system is powered down, and the issue is fixed.

On the Secondary Handle:

- If the Dip Switches are configured in an arrangement that does not match the configuration for the Primary Handle, Secondary Handle, or Single Handle set up, the display of the Secondary Handle will get stuck at the three bouncing loading dots and the Primary Handle Display will show a 2-24 Error until the system is powered down and the issue is fixed.
- If the Dip Switches in the Secondary Handle match the configuration for a Primary Handle, both handles will get stuck for about 30 seconds on the three bouncing loading dots screen on startup. After this time, they will both initialize and display a 2-22 Error. If this 2-22 is cleared with an E-Stop they will display a 2-24 Error. After some time has passed one of the handles will revert to the three bouncing loading dots screen until the system is powered down and the issue is fixed.
- If the Dip Switches in the Secondary Handle match the configuration for a Single Handle set up, the handles will behave similarly to the above case in which the Dip Switches in the Secondary Handle matched the configuration for a Primary Handle. The one difference being that in this context only the handle with the Switches configured as a Single Handle set up will be responsive to E-Stops.

On Both Handles:

- If Dip Switch configuration on neither handle matches that of a Primary Handle, Secondary Handle, or Single Handle set up, one of two outcomes can occur depending on the Dip Switches that are flipped. Either only one handle will initialize to a 2-24 Error while the other handle remains at the three bouncing loading dots, or both handles will get stuck at the three bouncing loading dots. In either case the handles will be unusable until the system is powered down, and the issue is fixed.

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Section 4A - Program Mode Overview

Accessing the G-FORCE Operational Parameters

The menus for customizing G-Force operational parameters are accessed in one of two ways:

- Through the **Smart Connect User Interface** on a PC or Tablet with a Chrome Browser (**Diagram 4A-1)**
- The **Handle Menus** (via the Slide or Pendant Handles) (**Diagram 4A-2)**

Programming with the Smart Connect User Interface

The Smart Connect User Interface is accessed via a Google Chrome browser that is connected to the G-Force Wifi or through a wired connection.

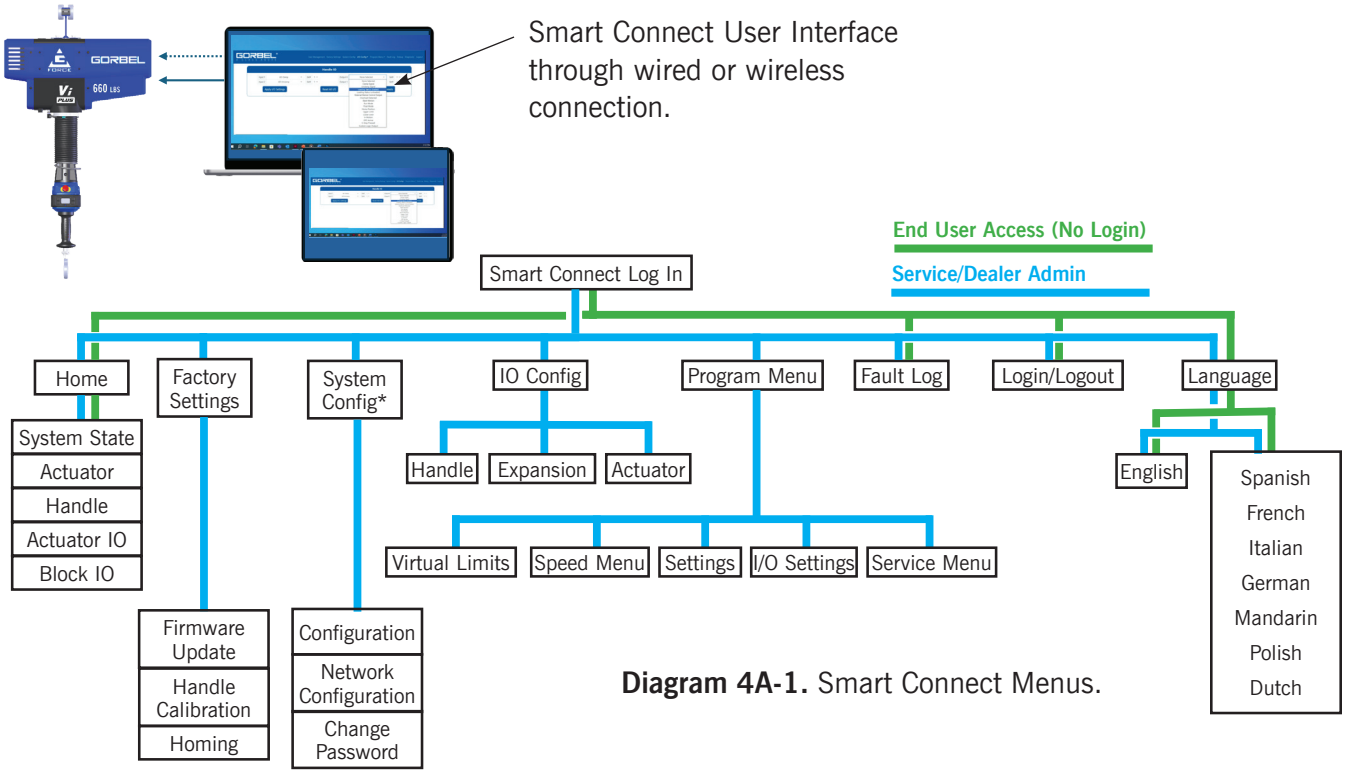


Diagram 4A-1. Smart Connect Menus.

Smart Connect Menus	Description
Home	The Home page provides read-only status of various subsystems, including the Handle, Actuator, Actuator I/O and Handle.
Factory Settings	For performing Firmware Updates at the Admin level, Handle Calibration and Homing
System Config	System Config provides a summary of information including Serial Number, Type of unit, Span if the Type is Easy Arm, and Capacity. It also provide the ability to set various network parameters.
I/O Config	Various I/O Settings for the Handle, Expansion and Actuator
Program Menu	Access to Virtual Limits, Speed Menu, AP Config, I/O Settings (Dual Float, Auto-Home and Anti-Drop) and Service Menu
Fault Log	The Fault Log will display any declared Error Codes with their Timestamp, Description and Source.
Language	The Language menu enables selection of one of six languages; English, Spanish, French, German, Italian, or Mandarin Chinese.

To program with the **Smart Connect User Interface**, go to Section 4B - Program Mode with Smart Connect.

Table 4A-1. Smart Connect User Interface Menus.

Accessing the G-FORCE Operational Parameters, Continued

Programming Using the Slide Handle or Pendant Handle

The Slide Handle and Pendant Handle both have displays that can be used to access menus for various machine settings. Whether using the Slide or Pendant Handle, pressing the Menu button for 3 seconds places the hoist in **Program Mode**, making the menus described in **Table 4A-1** available for modification.

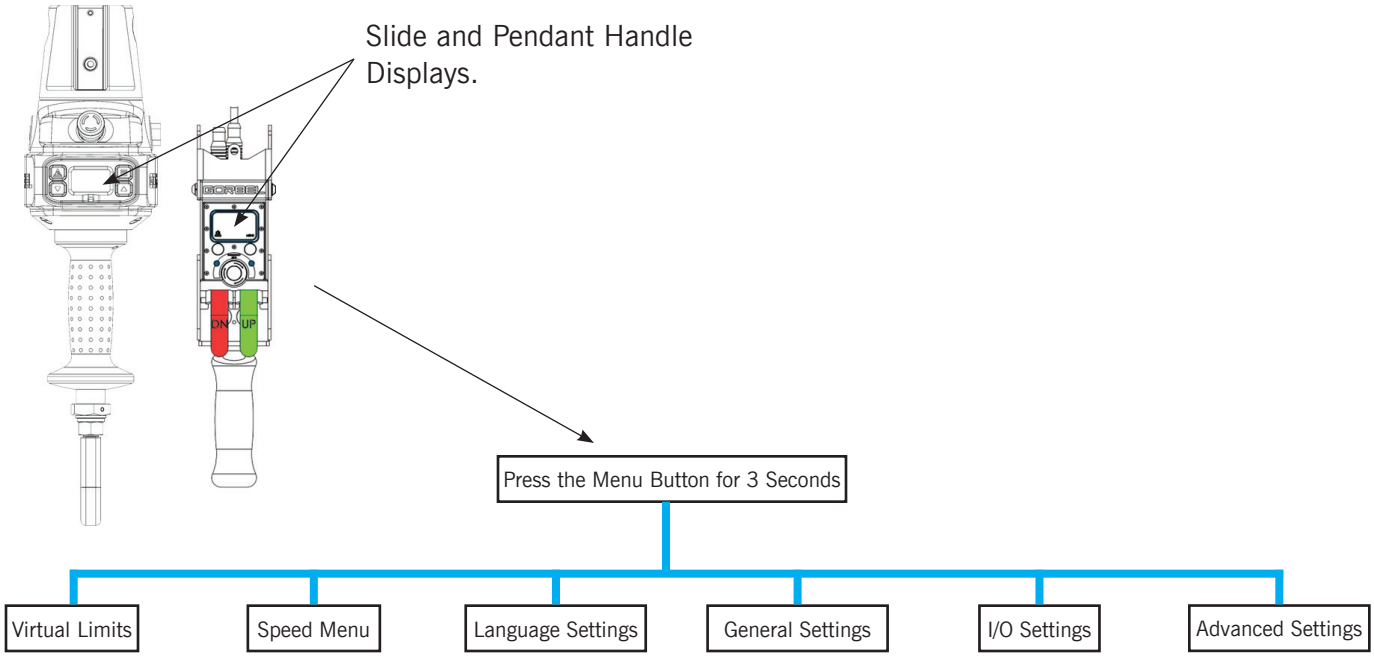


Diagram 4A-2. G-Force Menus on the Slide or Pendant Handle Displays.

Menu	Description
Virtual Limits	Set Upper and Lower Limit, Upper and Lower Slow Down and Upper Resume. Adjust Slow Down Speed and Reset Virtual Limit Settings.
Speed Menu	Configure the speed that the hook travels. **NOTE**: An unloaded hook/tool will travel faster than a loaded one.
Language Settings	Enables the selection of the language displayed on the Handle. Choices are English, Espanol, Francais, Italiano, Deutsche, and Zhongwen
General Settings	Weight Display On/Off, Zero Weight Display, Float Mode Enable/Disable, Clear Run Time, Software Version, IP Address, Settings Reset. FSH Settings (when FSH is installed)
I/O Settings	Settings for Dual Float Mode Tool, Dual Float Mode Load, Anti-Drop Tool Weight, and Set Auto Home Position.
Advanced Settings	Various settings for Float Mode Anti-Recoil, Overload Limit, and Overload Sensitivity.

Table 4A-1. Handle Menu Descriptions.

To program with the Slide or Pendant Handles, go to Section 4C - Program Mode - Slide or Pendant Handle.

Section 4B - Program Mode with Smart Connect

Accessing G-FORCE Settings with Smart Connect

The Smart Connect User Interface is available on a web browser through a wired connection, or wirelessly on a private WiFi connection that is broadcast from the G-Force.

Setting Up a Wired Connection to the G-Force - Method 1

NOTE: Some customers will not allow certain computer IP address ranges to be accessed. If access to the Smart Connect User Interface is not possible with Method 1 below, go to Setting Up a Wired Connection to the G-Force - Method 2.

WARNING
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 in the instruction.

1. Ensure the G-Force is powered on.
2. Ensure Google Chrome is installed.
3. Connect one end of an ethernet cable to the Communication Connector (**Diagram 4B-1**).
4. Connect the other end of the ethernet cable to the ethernet port on your computer.
5. Open a Chrome browser window on your PC.

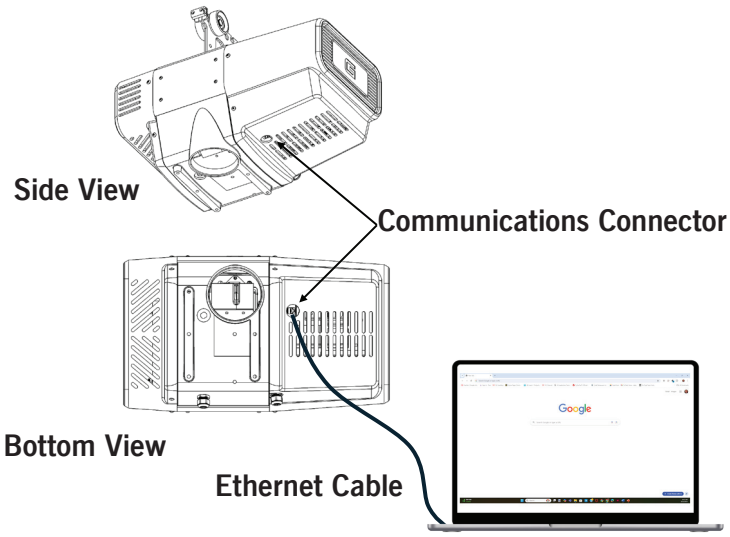


Diagram 4B-1. Actuator Communications Connector.

Setting Up a Wired Connection to the G-Force - Method 1, Continued

6. Check that your PC has Automatic (DHCP) set for obtaining an IP Address for your PC by opening **Settings** and click on **Network & Internet** (**Diagram-4B-2)**.
7. Click **Ethernet.** The screen in **Diagram-4B-3** is displayed. Ensure that IP Assignment is set to Automatic (DHCP).

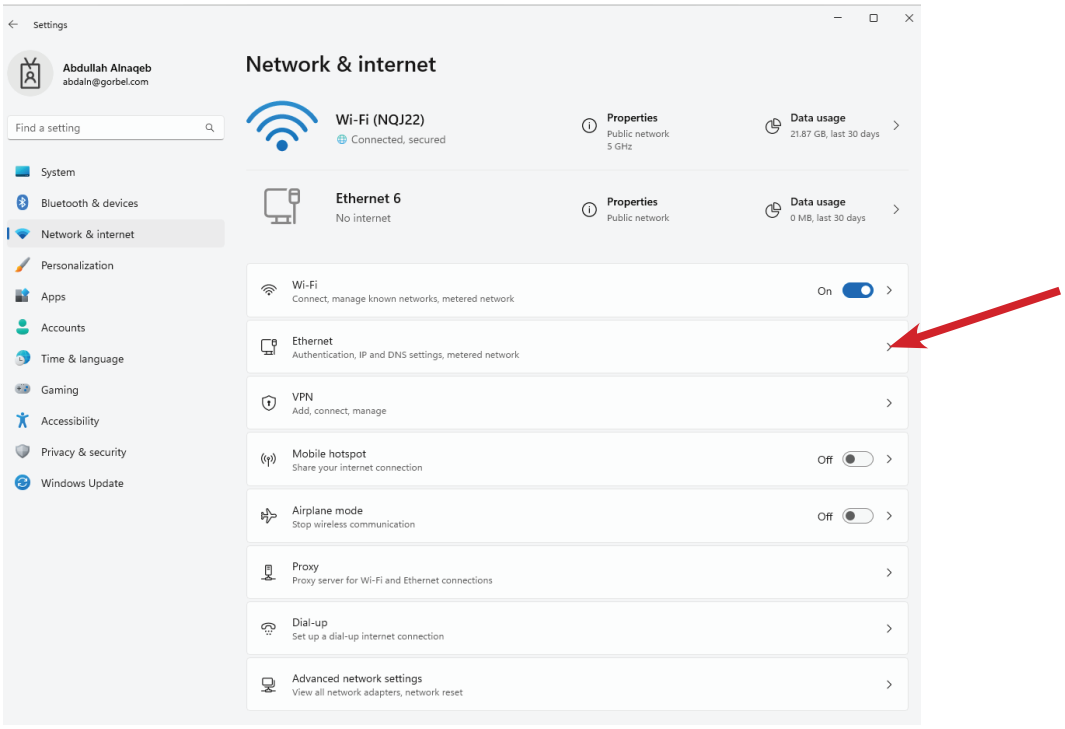


Diagram Diagram-4B-2. Network and Internet Settings>Ethernet.

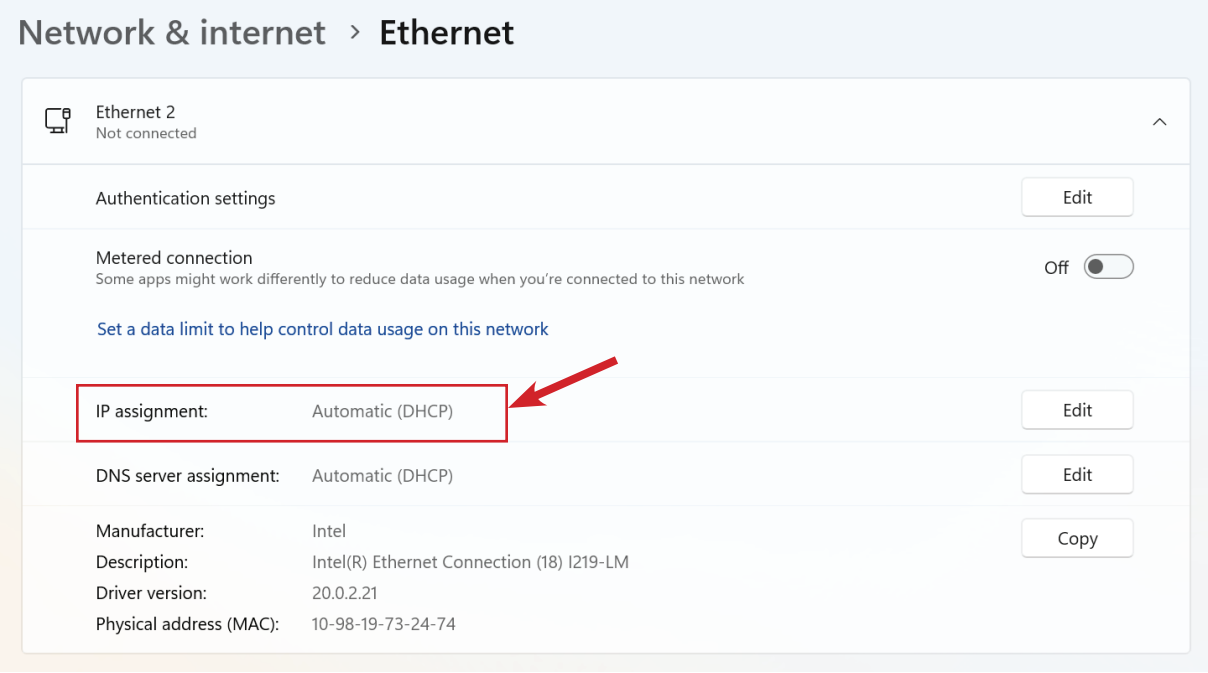


Diagram-4B-3. IP Assignment.

Accessing G-FORCE Settings with Smart Connect, Continued

Setting Up a Wired Connection to the G-Force, Method 1, Continued

8. Open the Chrome browser. In the URL bar, enter the IP Address for your unit: 192.168.4.2 (**Diagram-4B-4**).

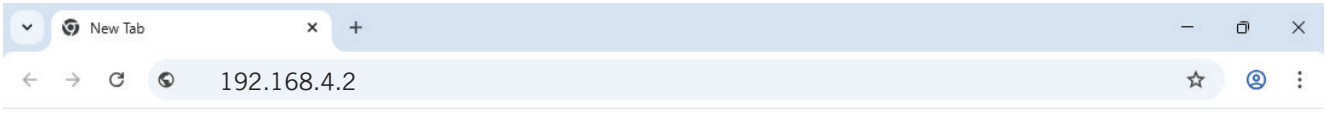


Diagram 4B-4. Wired Connection IP Address.

9. The Smart Connect Sign In screen will be displayed. Go to Signing in to the Smart Connect User Interface.

If the procedure above did not enable connection, go to **Setting Up a Wired Connection to the G-Force - Method 2**, below.

Setting Up a Wired Connection to the G-Force - Method 2

NOTE: Use this method to set up a wired connection to the Smart Connect User Interface if Method 1 on the previous pages failed.

WARNING
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 in the instruction.

1. Ensure the G-Force is powered on.
2. Ensure Google Chrome is installed.
3. Connect one end of an ethernet cable to the Communication Connector (**Diagram 4B-5**).
4. Connect the other end of the ethernet cable to the ethernet port on your computer.
5. Open a Chrome browser window on your PC.

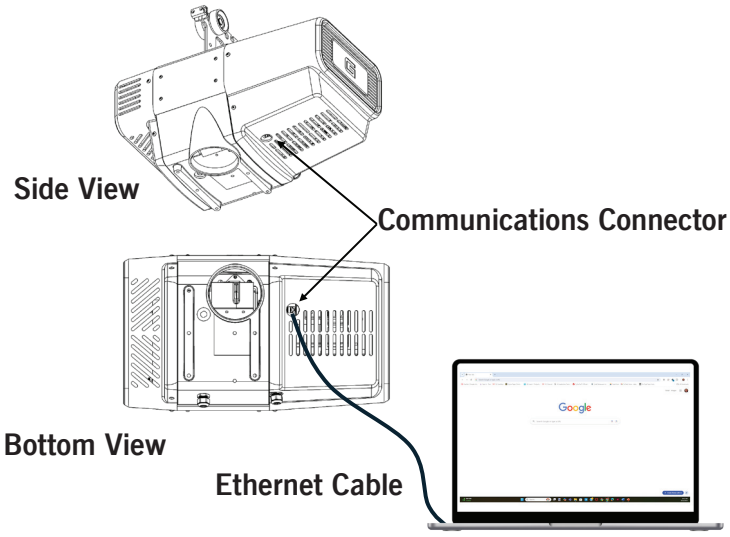


Diagram 4B-5. Actuator Communications Connector.

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Setting Up a Wired Connection to the G-Force - Method 2, Continued

Setting your PC's IP Address

6. On a Windows PC, open **Settings** and click on **Network & Internet** (**Diagram 4B-6**).

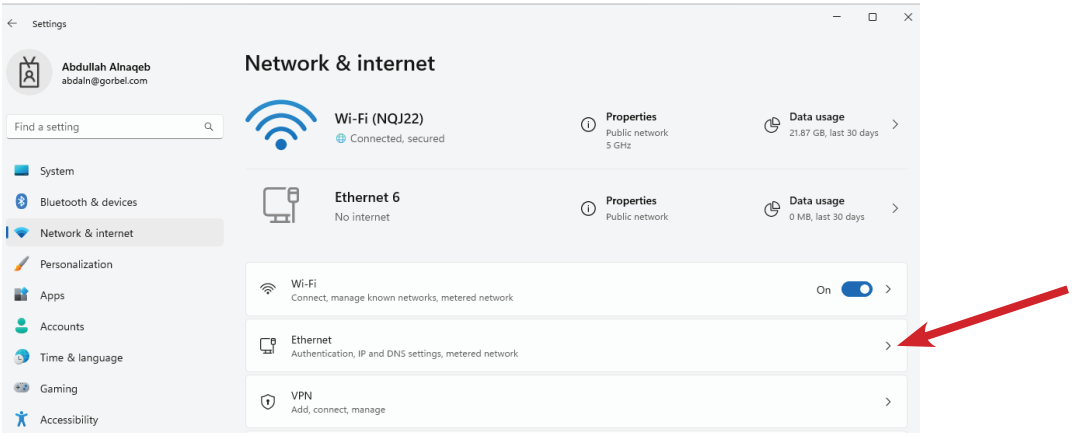


Diagram 4B-6. Network and Internet Settings>Ethernet.

7. On the **Ethernet** screen, click **Edit** for **IP Assignment**. (**Diagram 4B-7**).

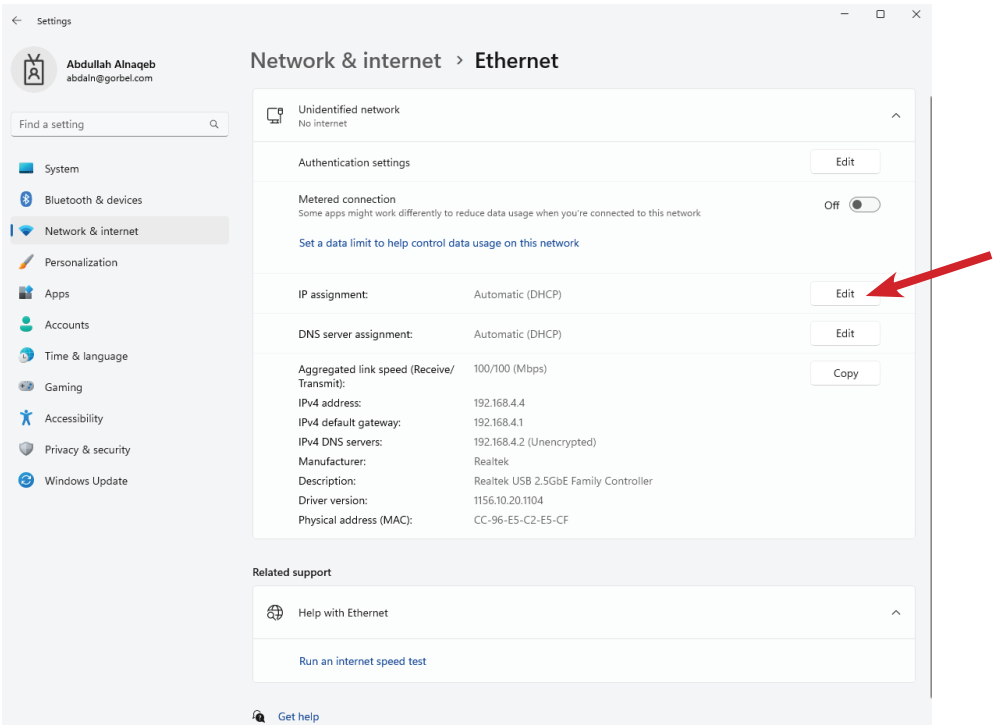


Diagram 4B-7. Ethernet Settings

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Accessing G-FORCE Settings with Smart Connect, Continued

Setting Up a Wired Connection to the G-Force - Method 2, Continued

8. On the **Edit IP settings** screen (**Diagram 4B-8**), select **Manual** on the pulldown menu. The screen in **Diagram 4B-9** will be displayed.

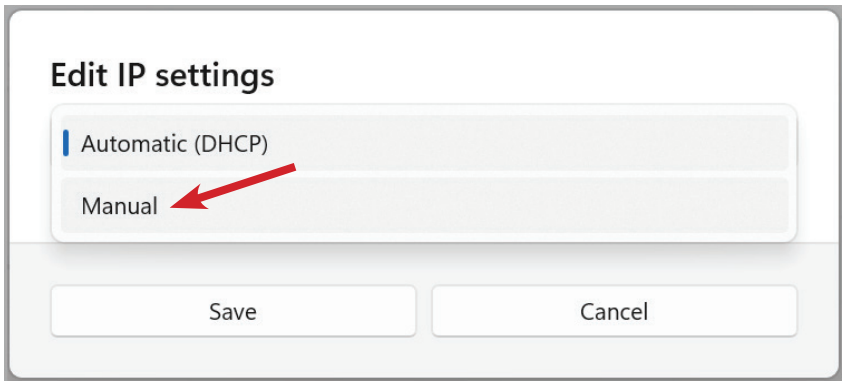


Diagram 4B-8. Edit IP Settings.

9. Toggle the **IPv4** selection to **On**. (**Diagram 4B-9**). The screen in **Diagram 4B-10** will be displayed.

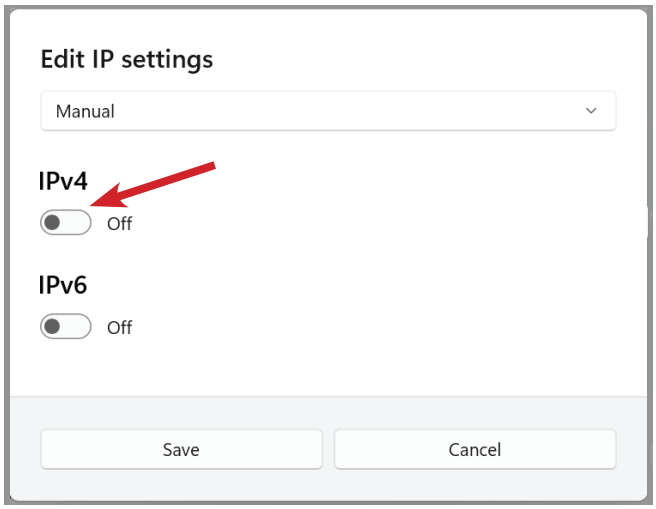


Diagram 4B-9. Edit IP Settings - Toggle IPv4 On.

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Accessing G-FORCE Settings with Smart Connect, Continued

Setting Up a Wired Connection to the G-Force - Method 2, Continued

10. Enter the values for **IP address** and **Subnet mask** as shown in **Diagram 4B-10** and click **Save**.

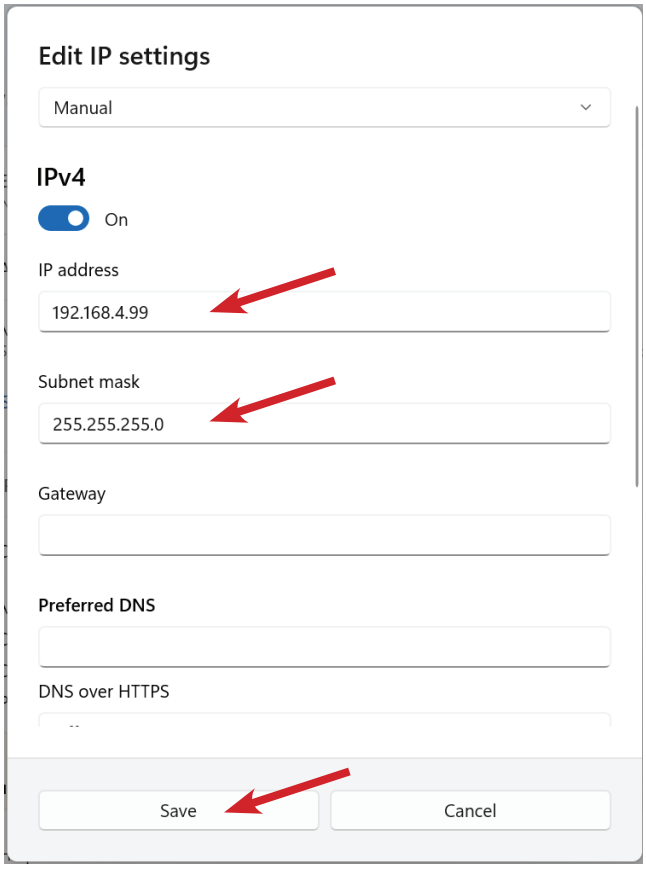


Diagram 4B-10. IP Address, Subnet Mask and Gateway.

11. Open the Chrome browser, and in the URL bar, enter the IP Address for your unit: 192.168.4.2 (**Diagram 4B-11**).



Diagram 4B-11. Wired Connection IP Address.

12. The Smart Connect Sign In screen will be displayed. Go to Signing in to the Smart Connect User Interface.
13. If neither Method 1 nor Method 2 for the Ethernet connection were successful, **call for service** at (800) 821-0086.

Accessing G-FORCE Settings with Smart Connect, Continued

Setting up a Wireless connection to the G-Force

1. Ensure the G-Force is powered on.
2. Ensure the Google Chrome browser is installed.
3. Determine the SSID for the unit being installed
   A. Observe the sticker on the bottom of the Actuator (**Diagram 4B-12, A**). It contains the Serial Number for the unit, which in this example is 719951-1-A. The Serial Number is also part of the SSID that identifies the G-Force or Easy Arm WiFi Server, and is part of the Password for the WiFi Server.
   B. On a Windows PC, select the WiFi icon on the System Tray (**Diagram 4B-12, B).**
   C. Click the icon that enables you to select a WiFi server (**Diagram 4B-12, C**).
   D. Depending on the configuration, the WiFi Server will be designated as GF for G-Force, or EA for Easy Arm (**Diagram 4B-12, D**). Select the desired WiFi Server, and click Connect.
   E. When prompted for a Password, enter the portion of the SSID shown in **Diagram 4B-12, E**. Click Next to connect to the WiFi server. **NOTE**: The end of the password may indicate Vi, or ViPlus, depending on the unit. The example shown here is a Vi Plus.
6. Open a Chrome browser window.
7. In the URL bar, enter the wireless IP Address for your unit: 192.168.4.1 (**Diagram 4B-12, F**).

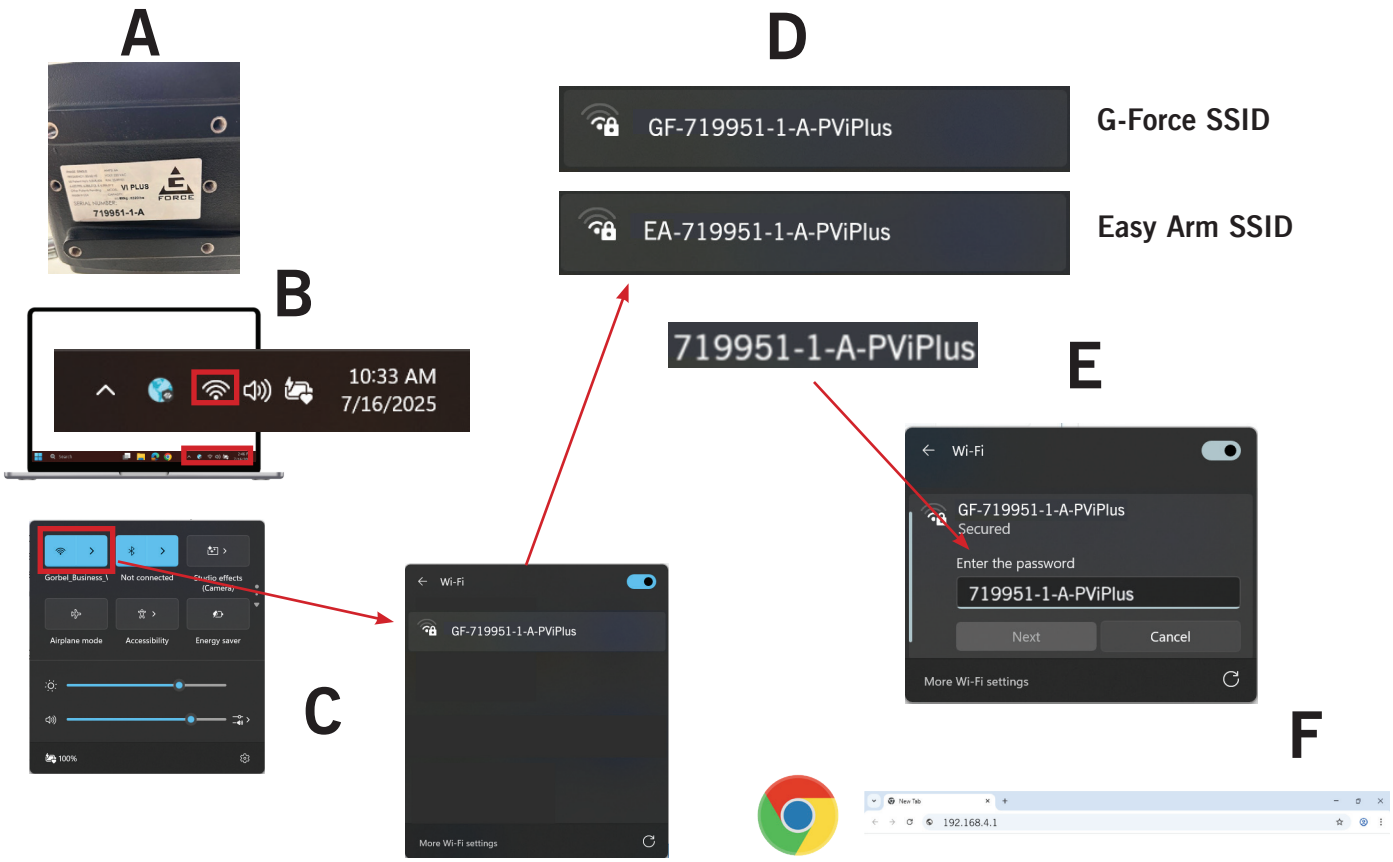


Diagram 4B-12, A-F. Wireless Connection.

8. The Smart Connect Sign In screen will be displayed. Go to Signing in to the Smart Connect User Interface.

Accessing G-FORCE Settings with Smart Connect, Continued

Signing in to the Smart Connect User Interface

NOTE: Your level of access to the operational parameters for G-Force is dependent on your role (**Diagram 4B-11**). End Users need not log in, and the path to parameters they can access are shown in **GREEN**. Service and Dealer Admins must log in to have access to the paths shown in **BLUE** in the diagram.

1. After connecting through a wired or wireless connection, the Smart Connect User Interface Sign in dialog will be displayed (**Diagram 4B-13**). The default admin user name is **user** and the password is **LiftReadyV**.



Diagram 4B-13. Smart Connect User Interface Sign In.

2. The Smart Connect User Interface Home page will be displayed (**Diagram 4B-14**). As shown in the diagram, you may find that firmware on the connected subsystems need a firmware update.



Diagram 4B-14. Smart Connect Home Page.

Continued on the next page...

Accessing G-FORCE Settings with Smart Connect, Continued

The Home Page

3. The menu selections available on the **Home** page are shown in **Diagram 4B-15** on the path shown in **PURPLE**.

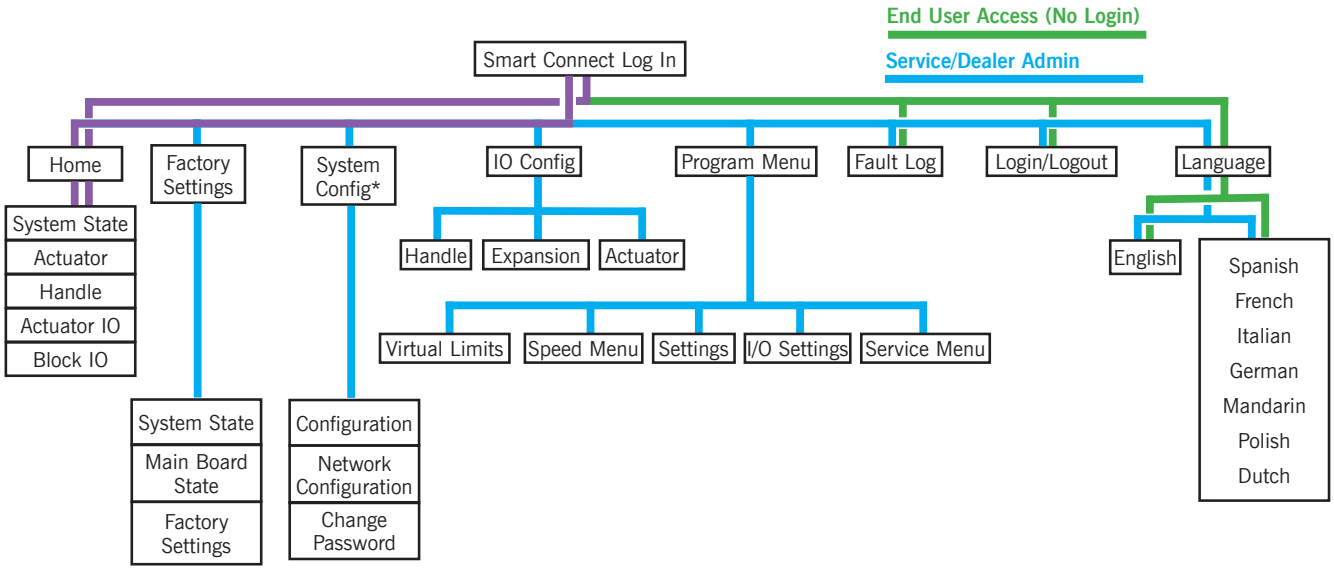


Diagram 4B-15. Smart Connect User Interface Home Page - Menus

4. Refer to **Diagram 4B-16**. If configured with Actuator I/O and Block I/O, you will find that the Home page shows them as connected. If the Actuator, Handle, Actuator I/O or Block I/O has lost connection, the **Board not connected** dialog will be displayed by the subsystem.

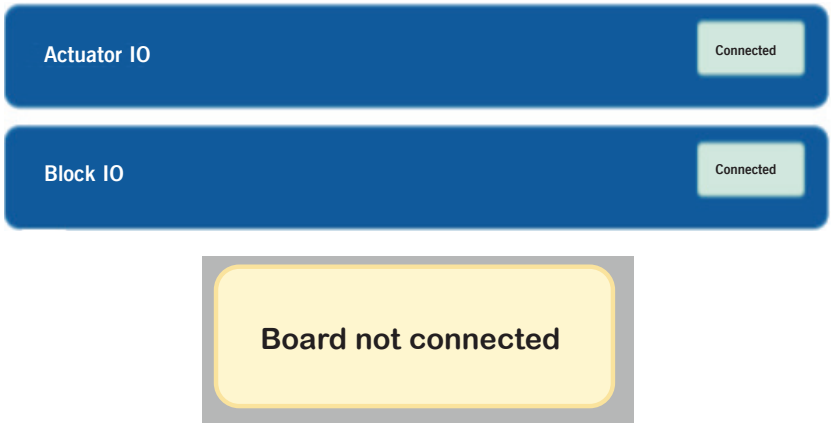


Diagram 4B-16. Home Page - Actuator I/O and Block I/O Status.

Accessing G-FORCE Settings with Smart Connect, Continued

The Home Page, Continued

5. To learn more about the Home Page settings, refer to **Table 4B-1**, below. The Home page offers a status view for each subsystem of the G-Force; the Handle, Actuator, Actuator I/O, Block State. These are read-only displays.

Display Item	Description
System State	Displays information and states for the System, including the firmware version, Drive version, Handle Type, Hoist Position, Observed Weight, Unique Identification, and whether there are Ethernet, WiFi, or USB connections active and Time Since Boot.
Handle	Displays the connection status of the Handle.
Actuator	Displays the connection status of the Actuator.
Actuator IO	Displays the connection status of the Actuator IO.
Block IO	Displays the connection status of the Block IO.

Table 4B-1. Home Page Items.

Factory Settings

The menu selections available on the **Factory Settings** display are shown in **Diagram 4B-17** in **PURPLE**. The screen is shown in **Diagrams 4B-18 (Top Section) and Diagram 4B-19 (Bottom Section).**

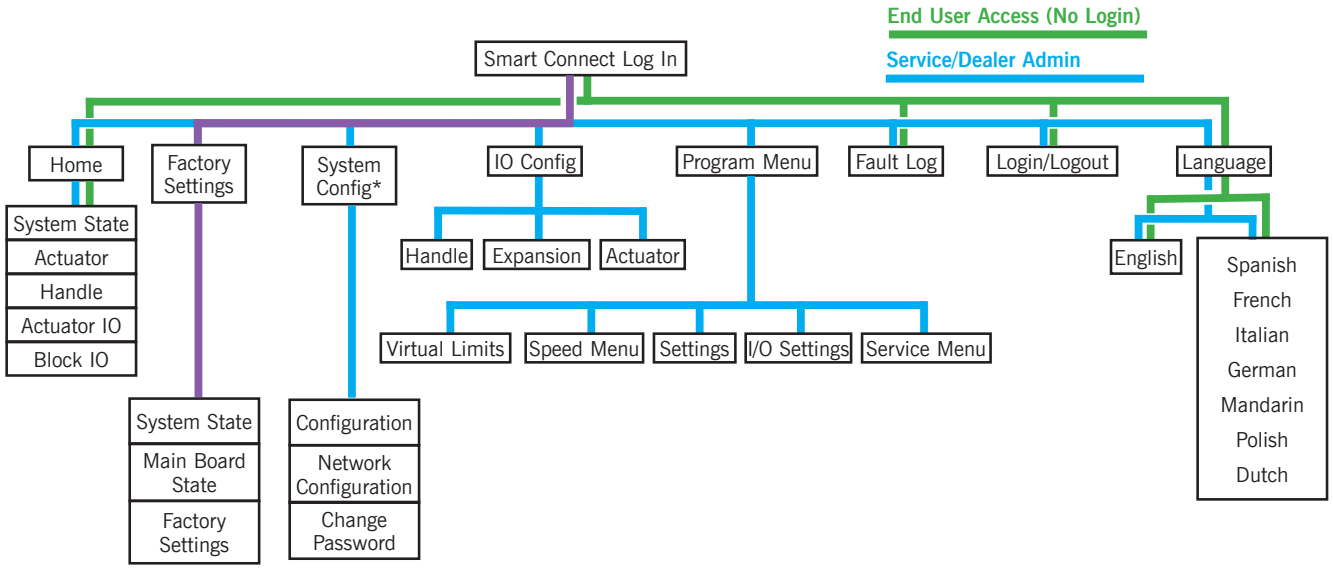


Diagram 4B-17. Factory Settings.

Accessing G-FORCE Settings with Smart Connect, Continued

Factory Settings, Continued

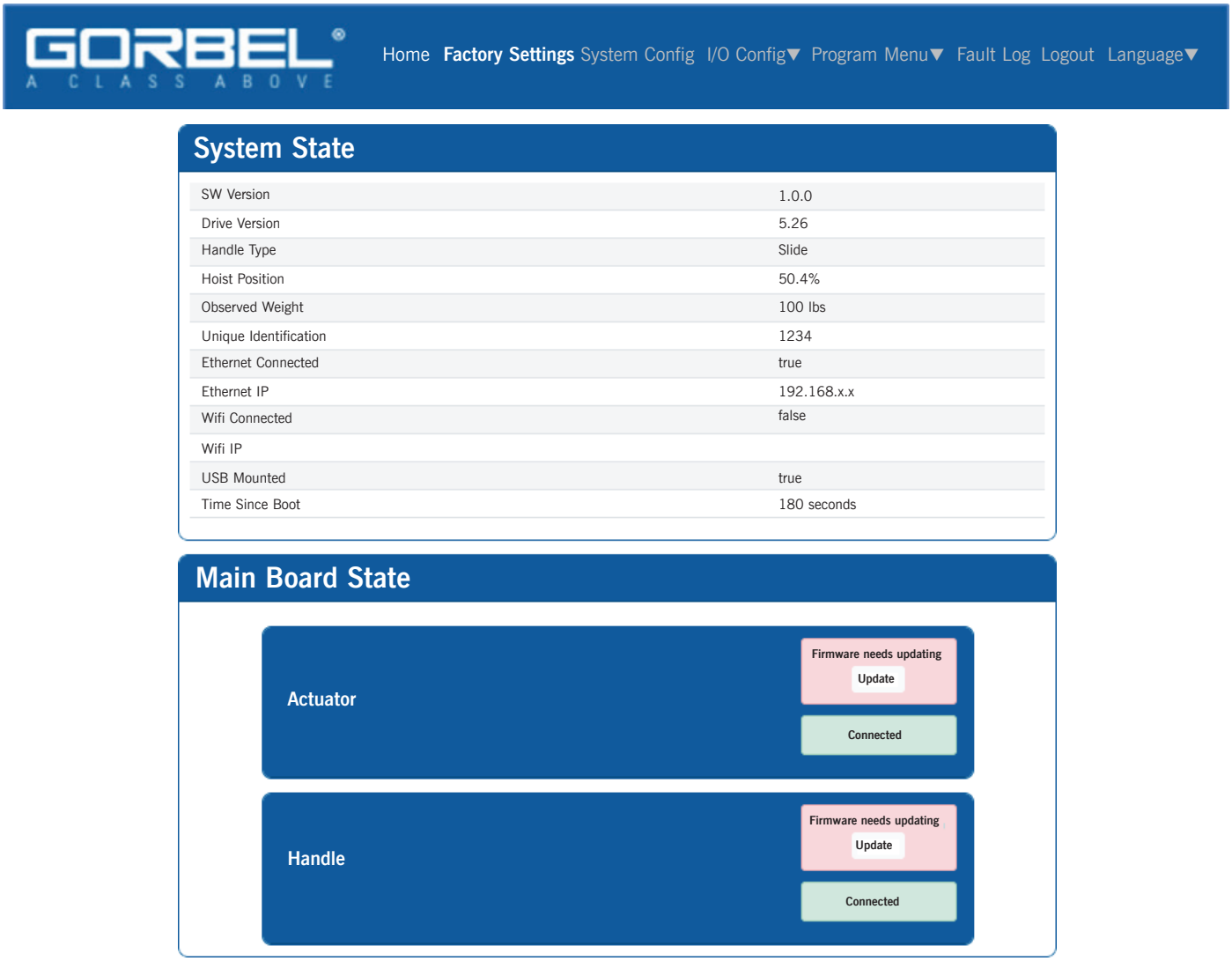


Diagram 4B-18. Smart Connect Factory Settings (**Top Section**).

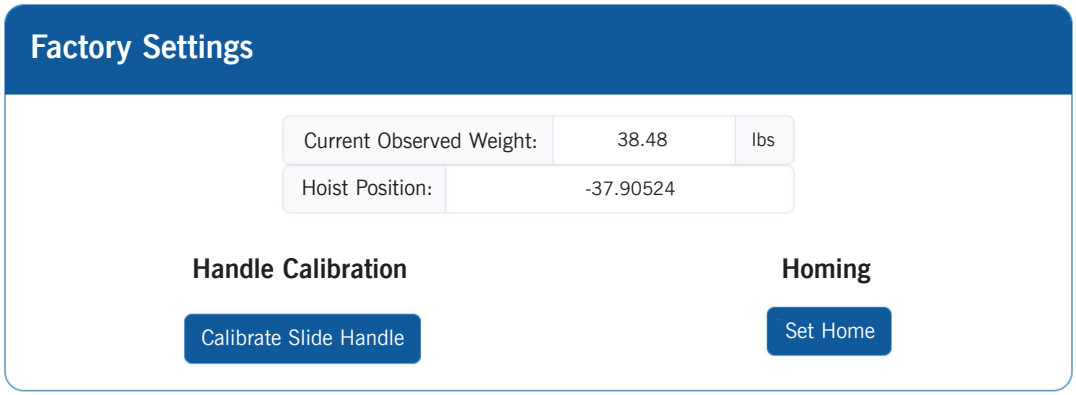


Diagram 4B-19. Smart Connect Home Page, (**Bottom Section**).

Accessing G-FORCE Settings with Smart Connect, Continued

Factory Settings, Continued

Firmware Updates for Actuator, Handle, Actuator IO and Block IO

There are firmware chips on the Handle, Actuator, Actuator IO and Block IO. The system will automatically query the firmware status for each of the areas of the G-Force to determine if a firmware upgrade is due. If, for example, it was due for the Actuator and Handle, the Home page will display the dialog shown in **Diagram 4B-20**. To update the firmware, select the **Update** button.

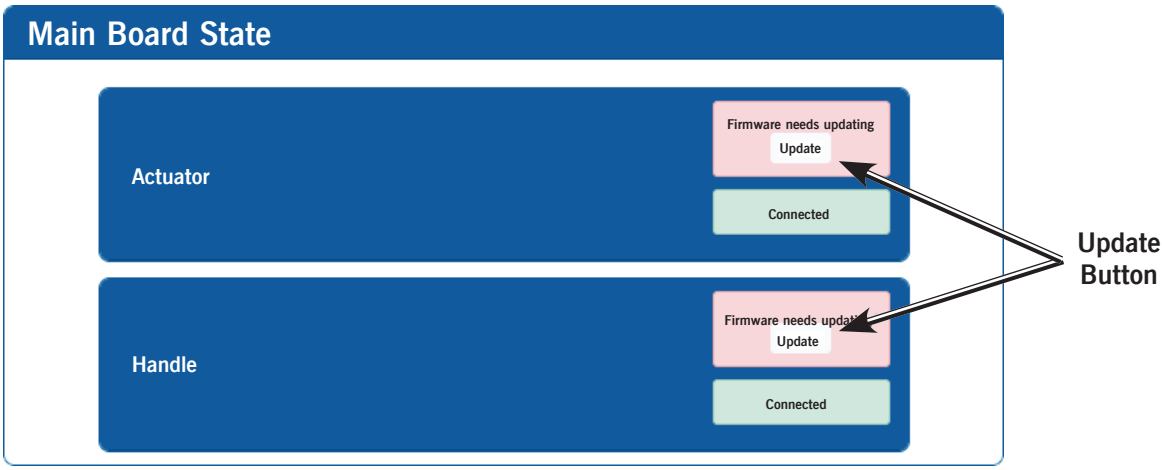


Diagram-4B-20. Main Board State - Firmware Update.

Refer back to **Diagram-4B-19** and **Table 4B-2**. The Factory Settings menu enables:

Menu	Description
Handle Calibration	Handle calibration should be performed any time a handle swap occurs on a unit, or any time a unit is experiencing a drift in motion without input or motion that is biased in one direction. See steps below.
Homing	The handle occasionally requires calibration of the homing position to ensure that the home position for the handle is the actual physical upper limit. See steps below.

Table 4B-2. Factory Settings Descriptions.

Calibrate Handle

1. If using a slide handle, ensure that the slide handle is motionless and hanging vertically from the end of the wire rope. It is crucial that the slide section of the handle remain in a neutral position throughout this stage of calibration. If using a Force Sensing Handle, ensure that no pressure is being applied to the handle during calibration.
2. Press the **Calibrate Handle** button. Over the next few seconds, the system will calibrate the current state of the handle as it's zero point, preventing the handle from drifting when the OPS is triggered.
3. After approximately 10 seconds, the calibration should complete, and a "success" message should pop up on the top-right of the page. If the pop-up message reports a failure, then the handle magnet needs to be physically adjusted.

Calibrate Home

1. With no load attached, raise the hook up to the physical upper limit.
2. Once at the upper limit, press the **Set Home** button. After the **Set Home** button is pressed, the Hoist Position should report a value very close to 0.

Accessing G-FORCE Settings with Smart Connect, Continued

System Config Settings

The location of the System Config menu is shown in **Diagram 4B-21** on the path shown in **PURPLE**.

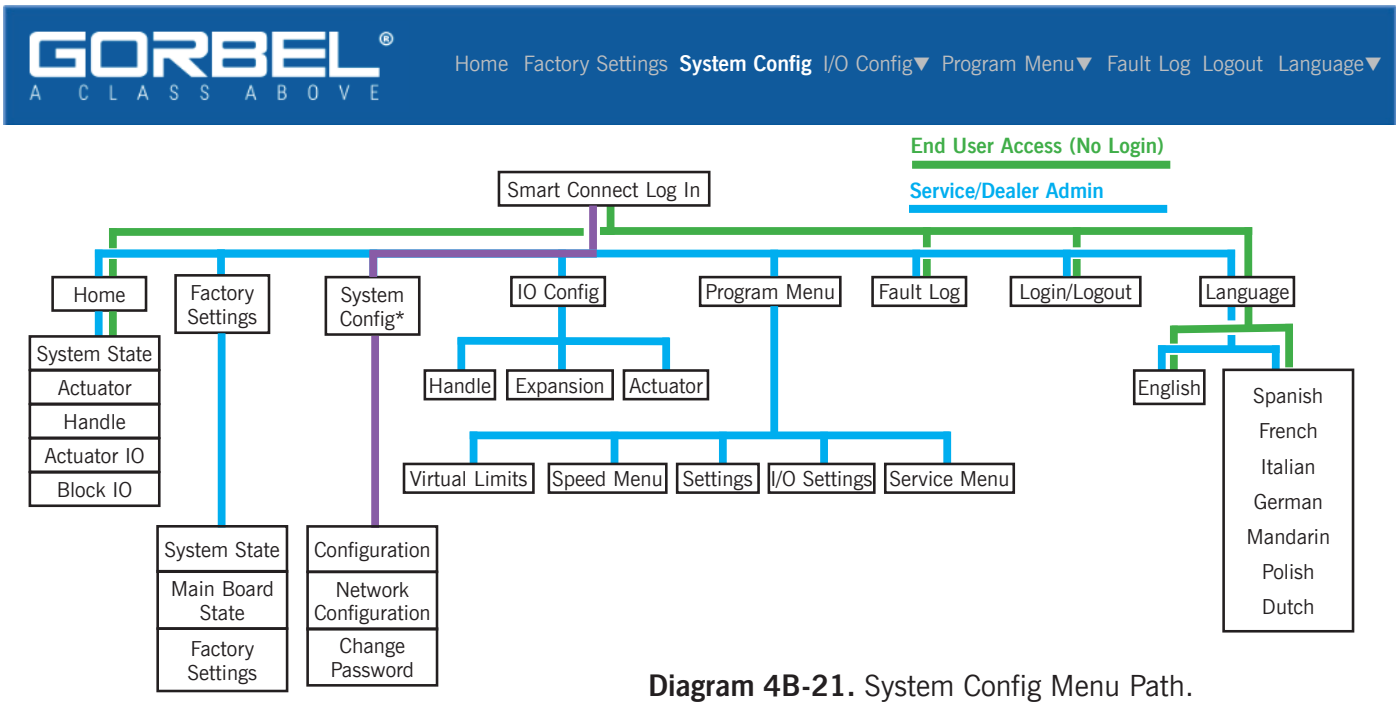


Diagram 4B-21. System Config Menu Path.

Refer to **Table 4B-3**. The System Config menu provides access to:

Menu	Description
Configuration	The contents of this menu are read-only and indicate the Serial Number, Type, Span (for Easy Arm), Capacity, and Vi Variant for the machine.
Network Configuration	This menu provides access to enable WiFi, set the SSID and Passphrase, and confirm the Passphrase, set the Transmit Power for spaces with multiple G-Force units, and the Channel for those situations also.
Change Password	A new password of at least 8 characters can be entered.

Table 4B-3. System Config Submenus.

Accessing System Config Settings

1. Connect to the G-Force through a wired or wireless connection.
2. Log in to the Smart Connect User Interface and select **System Config** from the Splash screen.
3. The menus shown in **Diagram 4B-22** will be displayed.

Continued on the next page...

Accessing G-FORCE Settings with Smart Connect, Continued

System Config Settings, Continued

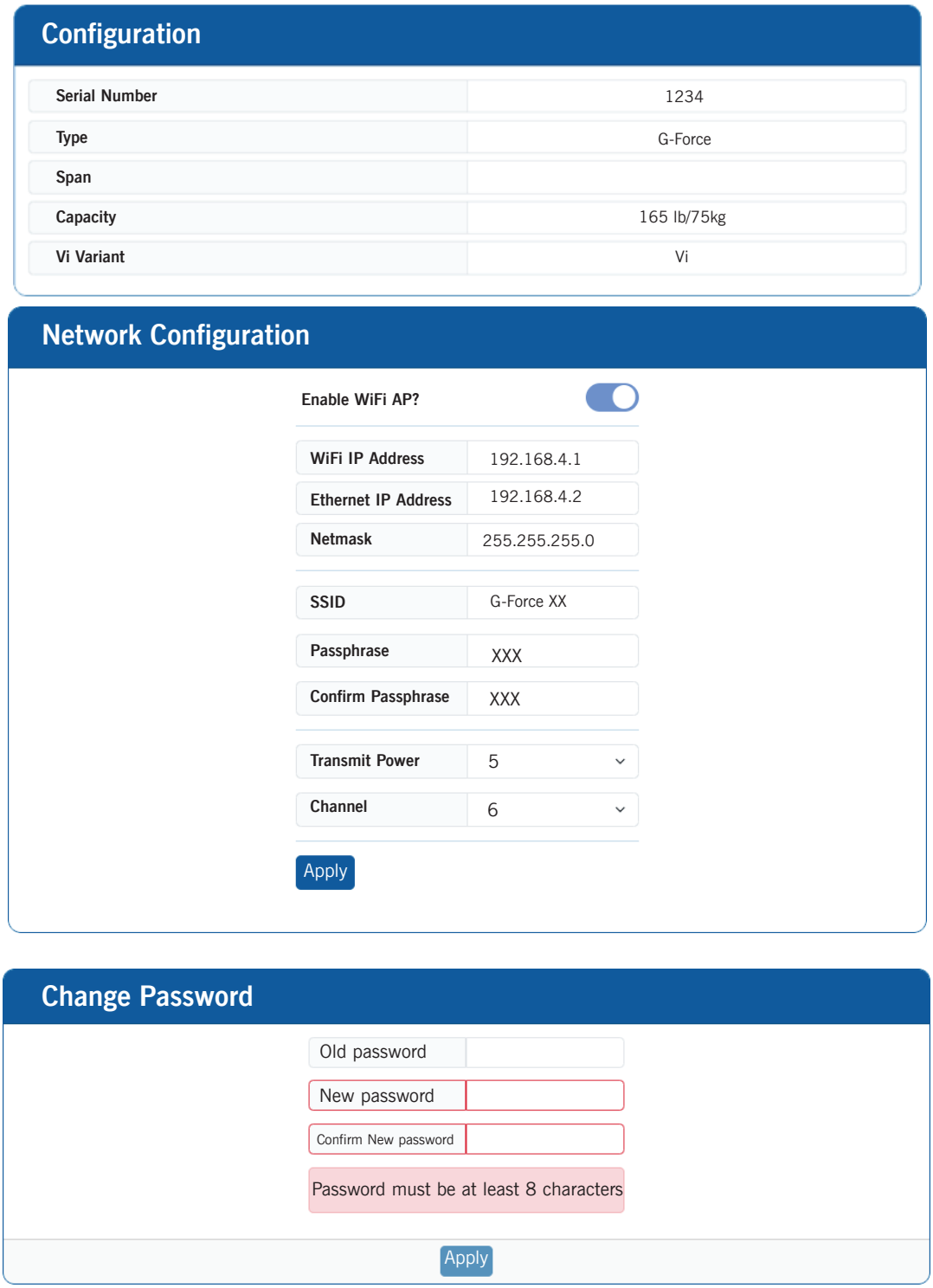


Diagram 4B-22. System Config Menus.

Continued on the next page...

System Config Settings, Continued

4. The controls available on the System Config menu include those shown in **Table 4B-4**:

Menu	Control	Description
Configuration	Serial Number	Displays the serial number of the connected Vi or Vi Plus unit.
	Type	Indicates the system type; G-Force or Easy-Arm.
	Span	If the unit is an Easy-Arm, displays the span of the system arm. For G-Force only, it remains blank.
	Capacity	Indicates the capacity.
	Vi Variant	Indicates if the unit is a Vi or Vi Plus.
Network Configuration		
	Enable WiFi AP?	Enables/Disables the WiFi application to enable wireless connection between the G-Force and a PC.
	WiFi IP Address	Sets and indicates the IP Address for the unit, for WiFi connection. Default is **192.168.4.1**. If the address is invalid, the field will be highlighted in red.
	Ethernet IP Address	Sets and indicates the IP Address for the unit, for WiFi connection. Default is **192.168.4.2**. If the address is invalid, the field will be highlighted in red.
	Netmask	Sets and indicates the subnet mask for the unit. The default is **255.255.255.0**.
	SSID	Displays the current network name for the unit Access Point. The default is user.
	Passphrase	Entry point and display for the current network password for the unit Access Point. The default is LiftReadyV.
	Confirm Passphrase	Confirms the syntax for the password entered in the Passphrase field.
	Transmit Power	When installing multiple devices in close proximity, lower Transmit Power is sometimes desireable. Displays the current transmit power for the access point.
	Channel	Like Transmit Power, the broadcast channel can enable mulitple installations. Displays the current broadcast channel for the connected device.
Change Password		
	Old password	Displays the current password
	New password	Field to enter the new password
	Confirm Password	Re-entery for the new password
	Apply	Captures the new password

Table 4B-4. System Config Control Descriptions.

Accessing G-FORCE Settings with Smart Connect, Continued

I/O Config Settings

The menu selections available on the **I/O Settings menu** are shown in **Diagram 4B-23** on the path shown in **PURPLE**.

Accessing I/O Config Settings

1. For additional information on the G-Force Input and Output Settings, refer to Introduction to Input and Output Settings. If you already understand how these settings work, proceed to **Step 2**.
2. Connect to the G-Force through a wired or wireless connection.
3. Log in to the Smart Connect User Interface and select **Program Menu>I/O Config** from the Splash screen.
4. The menu shown in **Diagram 4B-23** will be displayed.
5. Depending on the settings requiring modification, select:
   - **Handle**
   - **Expansion**
   - **Actuator**

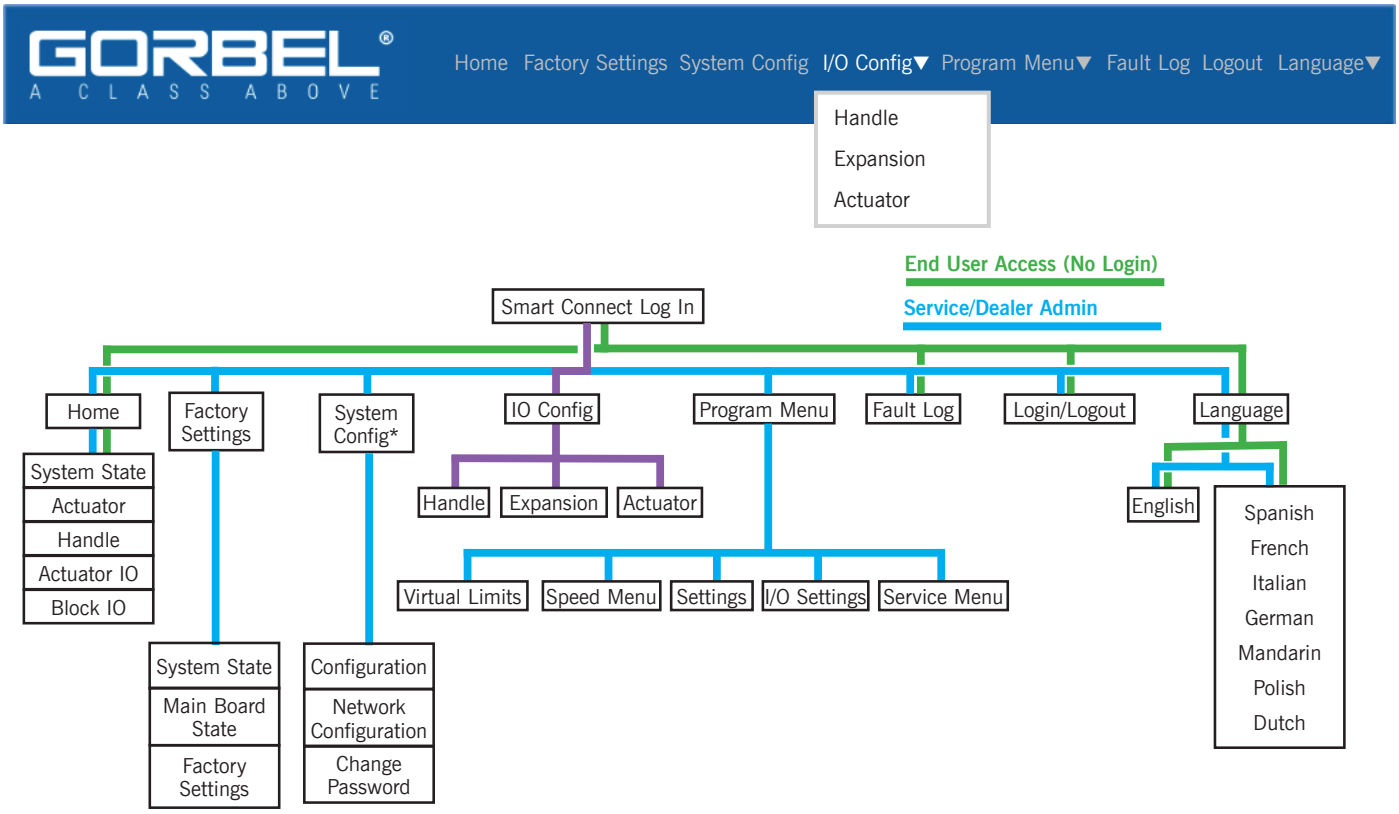


Diagram 4B-23. I/O Config Menu.

Accessing G-FORCE Settings with Smart Connect, Continued

I/O Config Settings, Continued

Introduction to Input and Output Settings

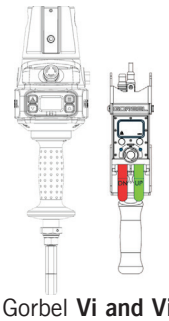
The Smart Connect User Interface provides access to Input and Output settings for the Handle, Expansion or Actuator.

NOTE: The Vi G-Force has only 2 Inputs and 2 Outputs on the Handle, and none on the Actuator. There is no Expansion block for the Vi. Only the Vi Plus provides 8 Inputs and 6 Outputs on the Actuator, and the option for an additional 8 Inputs and 6 Outputs through an Expansion Block.

There are a very large number of configurations that can be supported by the Input/Output settings for the G-Force, including not only the hardware supplied by Gorbel, but also over 20 end-effectors (or tooling) supplied by other manufacturers, and custom end-effectors created by the customer.

As shown in **Diagram 4B-24:**

- **Gorbel Slide or Pendant Handles** have **2 Inputs** and **2 Outputs**.
- **Gorbel Actuator** has **8 Inputs** and **6 Outputs**
- As necessary for the customer's configuration, an additional **Expansion I/O Block** is available that also has **8 Inputs** and **6 Outputs**.



Gorbel **Vi and Vi Plus** Slide and Pendant Handles

2 Inputs

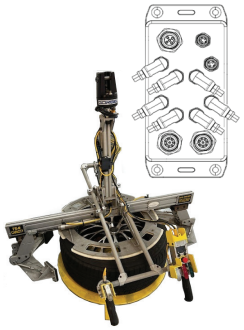
2 Outputs



Gorbel **Vi Plus** Actuator

8 Inputs

6 Outputs



Expansion Block

Gorbel **Vi Plus** Expansion Block Supporting End-Effectors/Tooling

8 Inputs

6 Outputs

Diagram 4B-24. Handle, Actuator and Expansion I/O.

Input and Output Definitions

An **Input** is a command to the Handle, Actuator or Expansion block from a button push made by an operator, or it can be actuated by some operational condition. It tells the G-Force CPU what to do.

After the Input is processed by the CPU, an **Output** is a resulting signal sent from the CPU to achieve the function. It is the "what to do" signal, routed, for example, to the end effector to tell it to clamp the load. Depending on the configuration, may have reached the end effector through the Handle, Actuator or Expansion I/O.

For example, if the Input to the CPU was AD (Anti-Drop) Clamp, the Output would be Clamp Signal, which might be routed through the Actuator I/O to a clamping tool, and because it is AD, or Anti-Drop, it would remain active until the load was safely placed.

Continued on the next page...

I/O Config Settings, Continued

Input and Output Example

Refer to **Diagram 4B-25**, which is an example of an OD Clamper end-effector used to lift and place automobile wheel and tire assemblies. The pendant handle controls the G-Force, and has two additional swithes installed to enable clamping and unclamping.

1. When clamping, the AD Clamp Input is activated and is sent through Port DI 1 on the Expansion Block to the Actuator CPU.
2. This generates a Clamp Output that is routed through the Expansion Block and to the Clamp Solenoid.
3. The Unclamp process works similarly, with the paddle sending a Clamp Input to the CPU through the DI 2 Port on the Expansion Block.
4. The Unclamp Output is produced and routed through the Expansion Block, and to the Unclamp Solenoid.

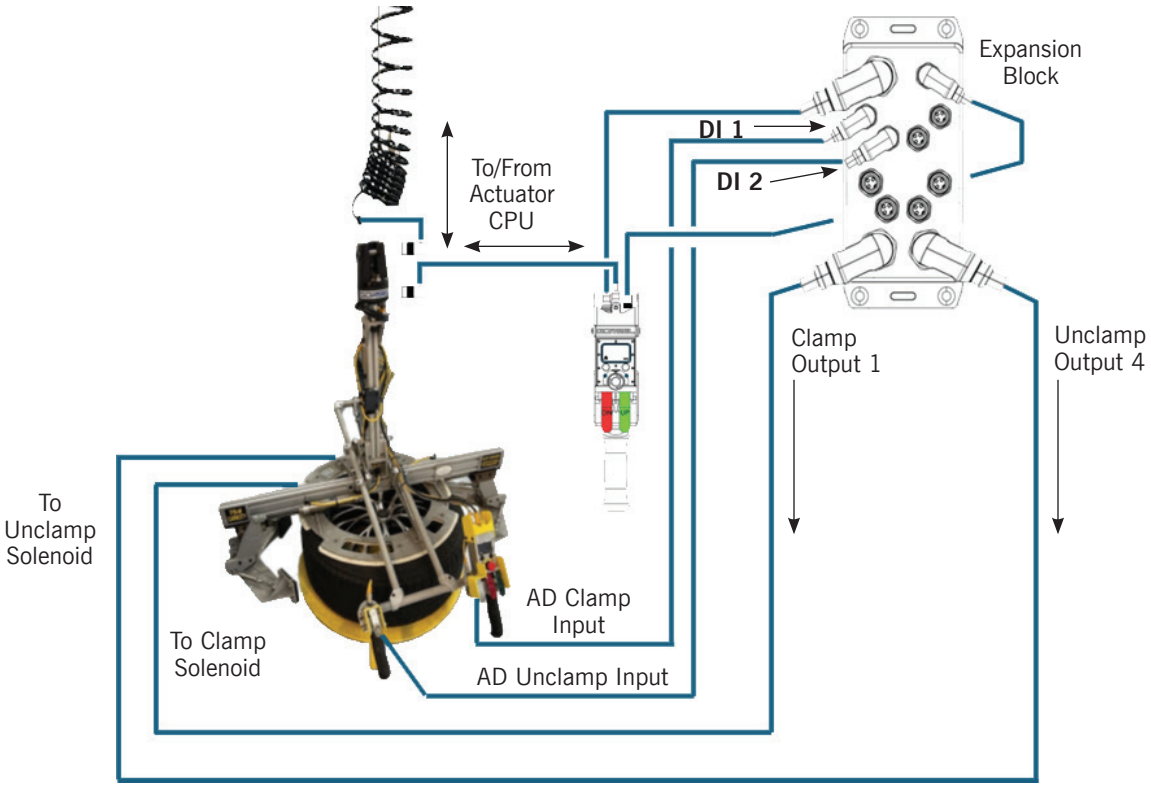


Diagram 4B-25. I/O Configuration - Clamp/Unclamp.

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I/O Config Settings, Continued

Hardware Configuration

Diagram 4B-26 below shows the physical dimensions and pin outs for the cable connectors used to provide inputs and outputs to the G-Force handles.

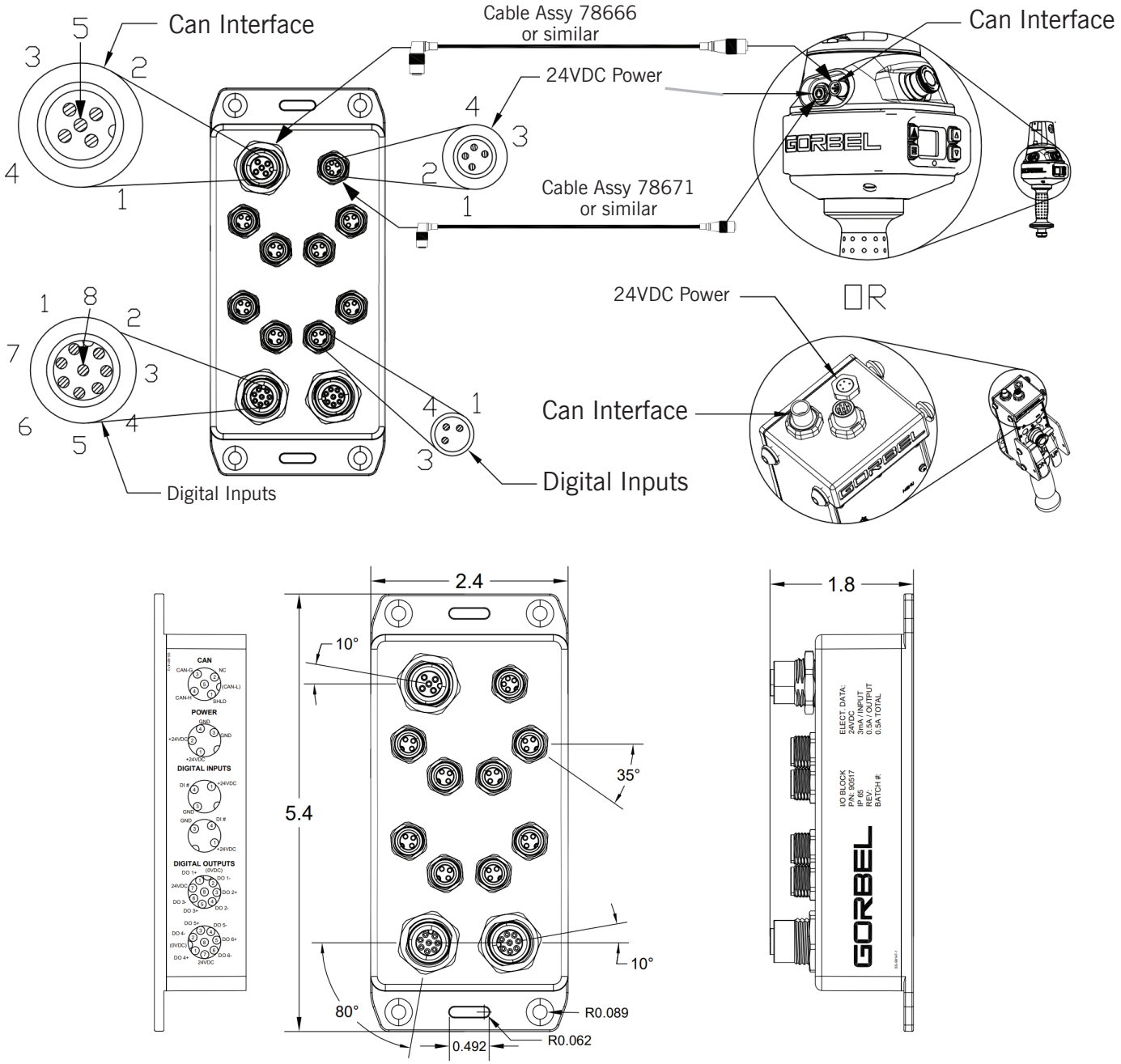


Diagram 4B-26. Handles Input/Output Block.

Schematics for Inputs and Outputs

Diagram 4B-27 through 4B-31 illustrate configuration information for the Handles and Cables, Actuator I/O pin outs, and Expansion Block pin outs.

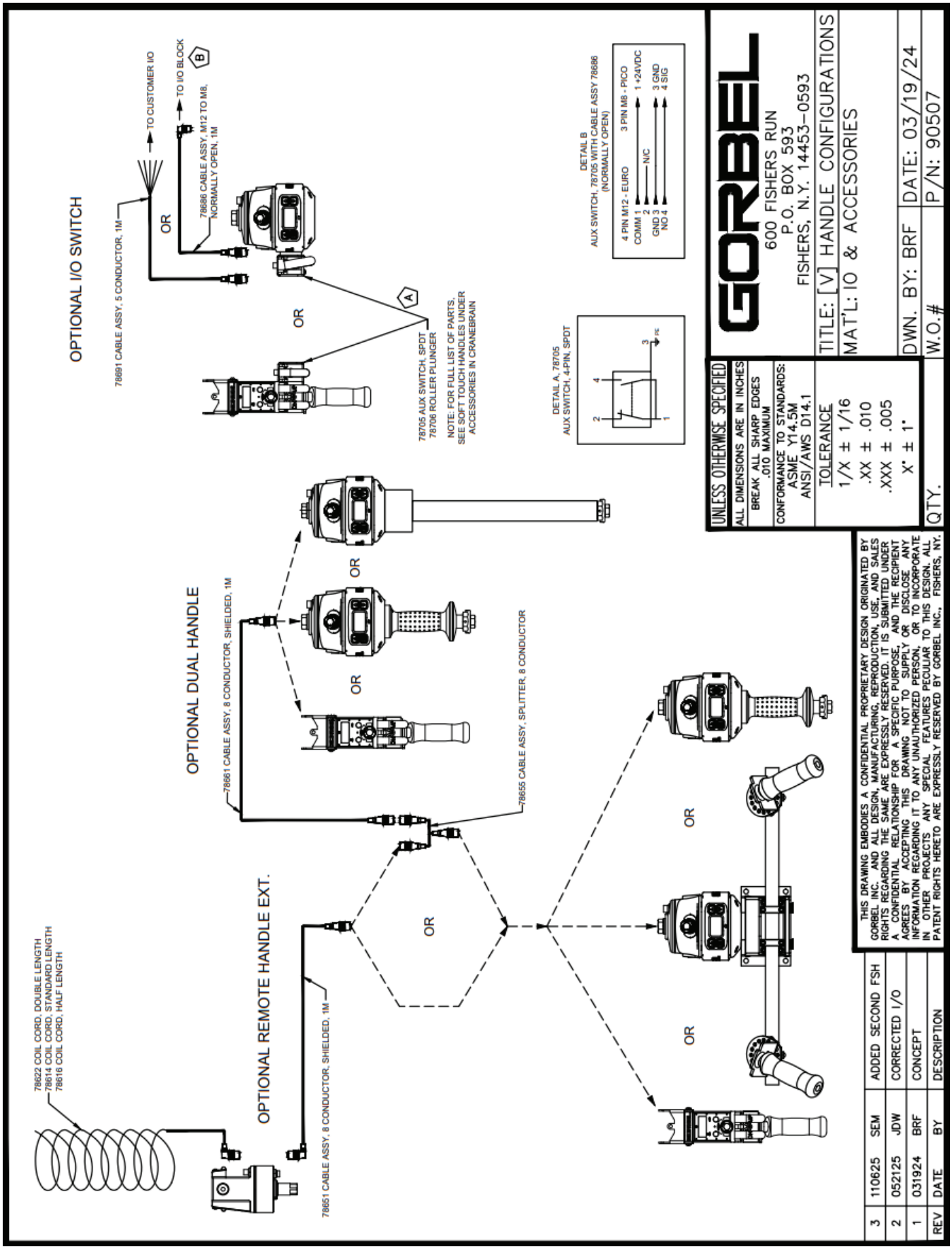


Diagram 4B-27. Input/Output Cable Schematics and Pin Outs.

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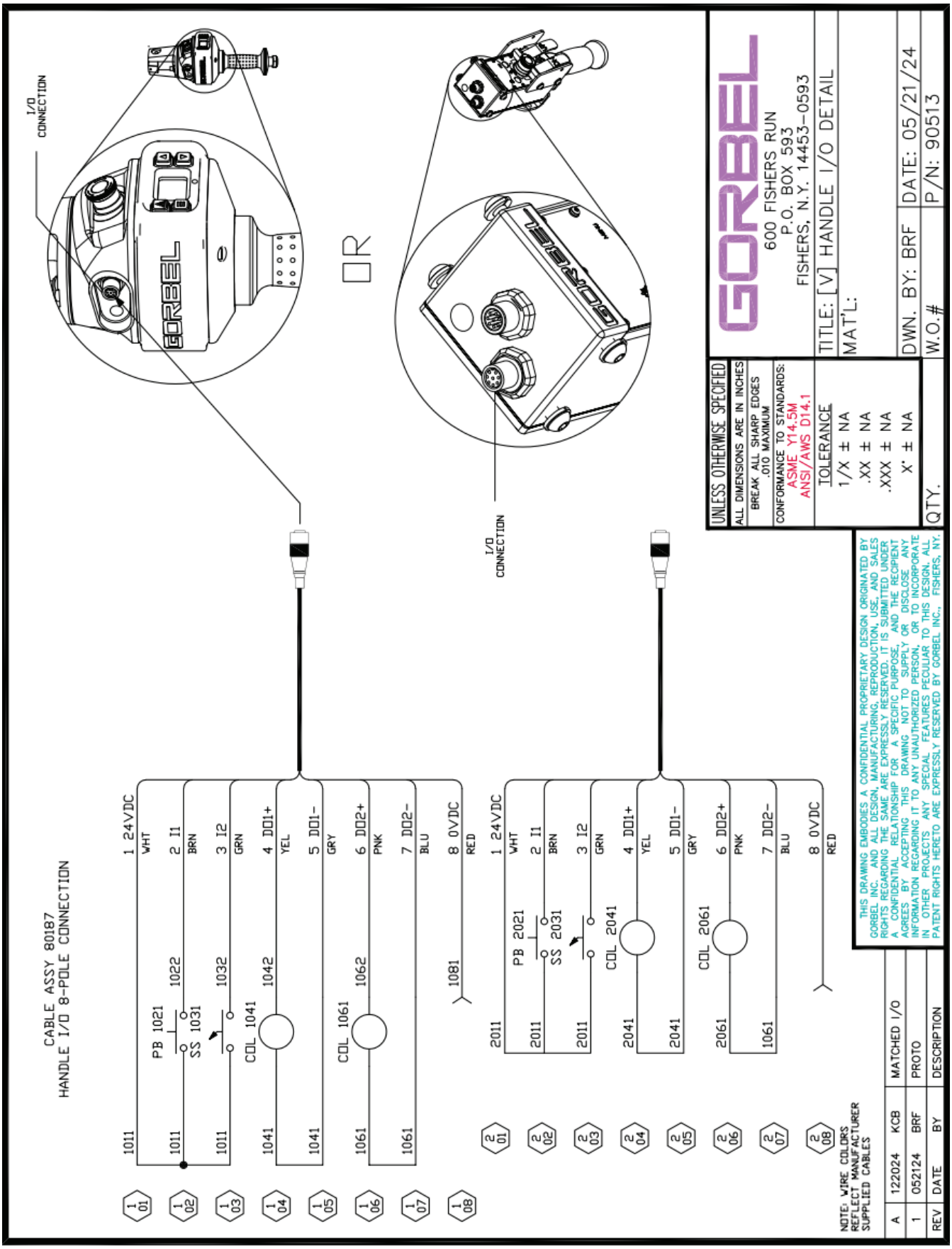


Diagram 4B-28. Iinput/Output Cable Schematics and Pin Outs.

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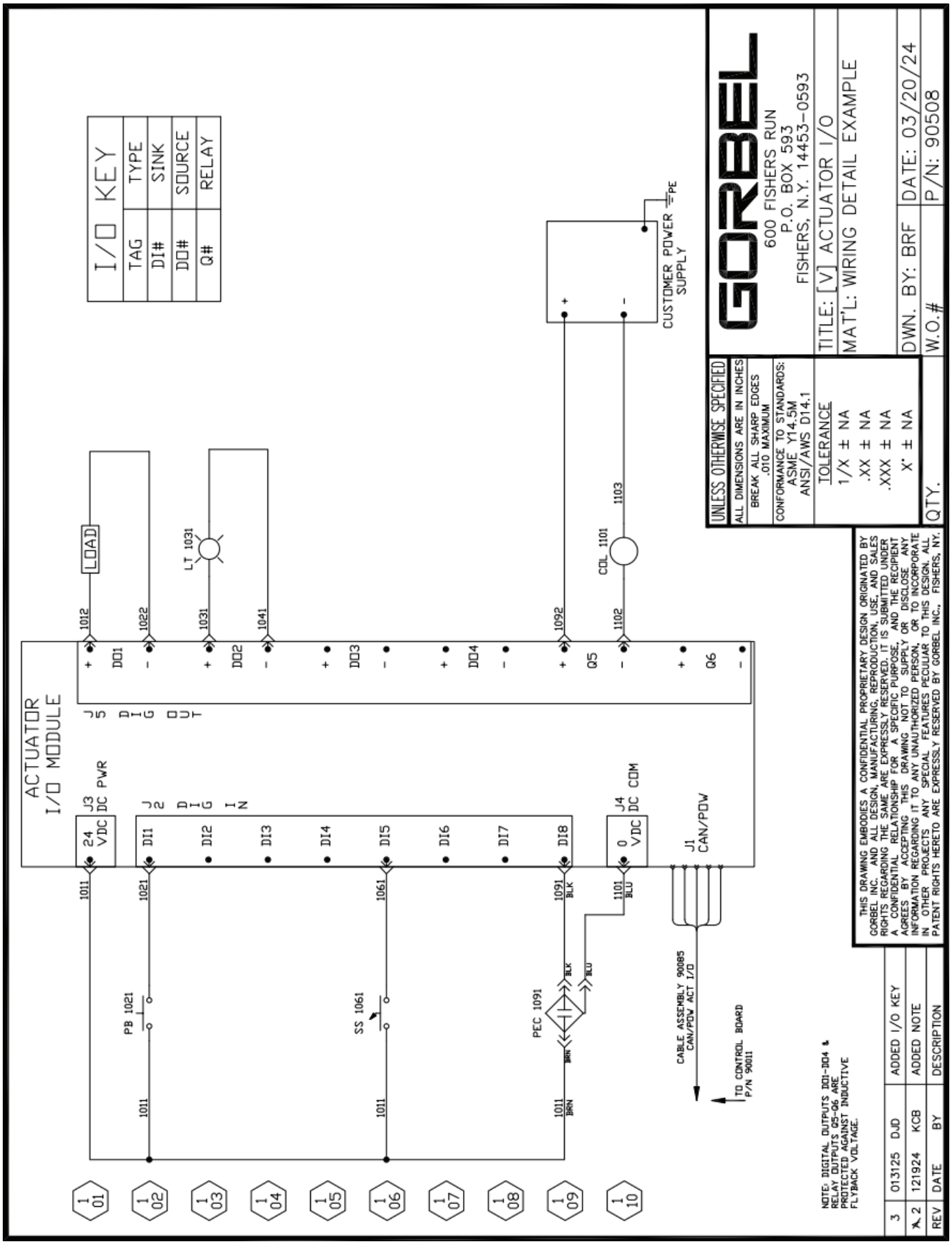


Diagram 4B-29. Actuator I/O Pin Outs.

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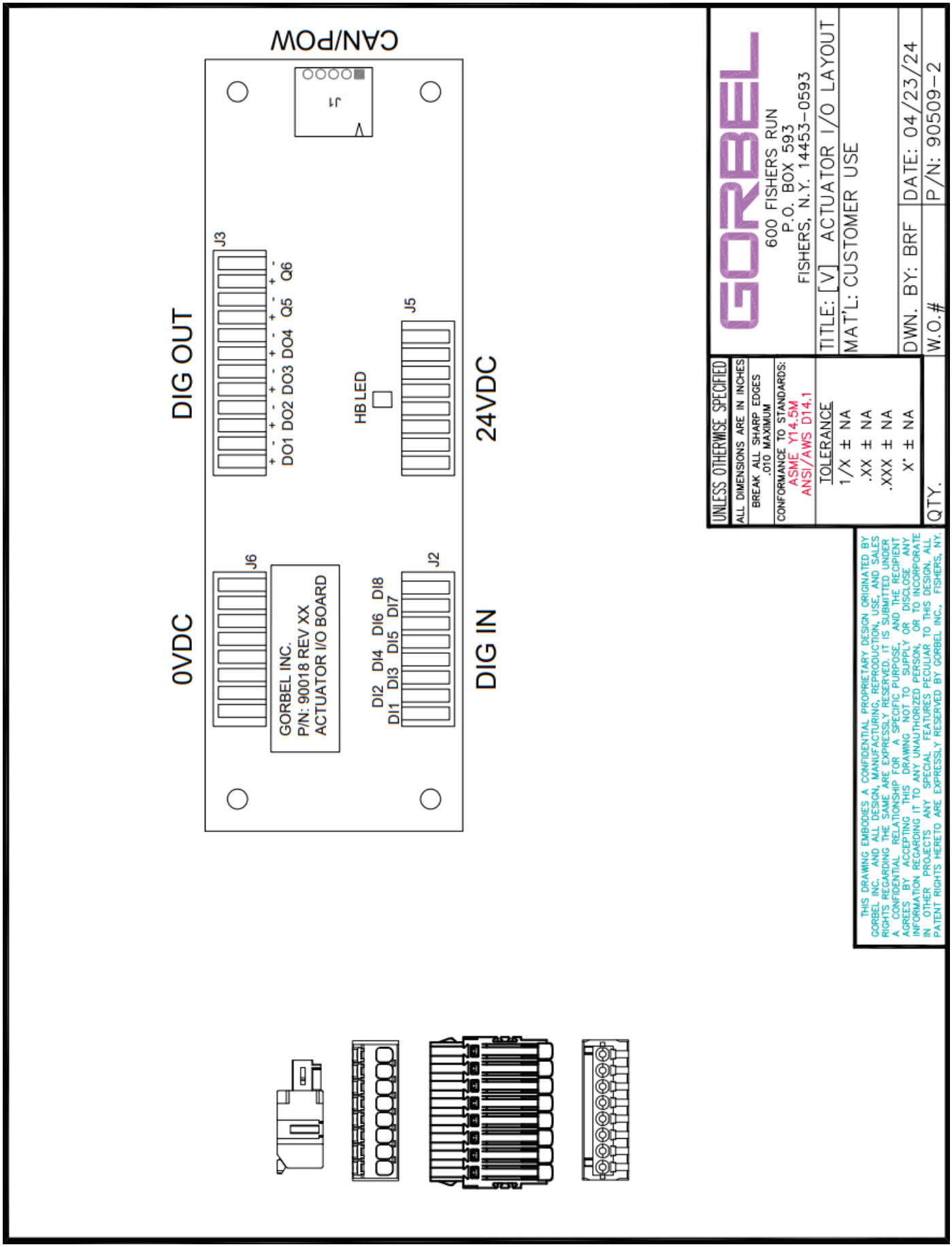


Diagram 4B-30. Actuator I/O Layout.

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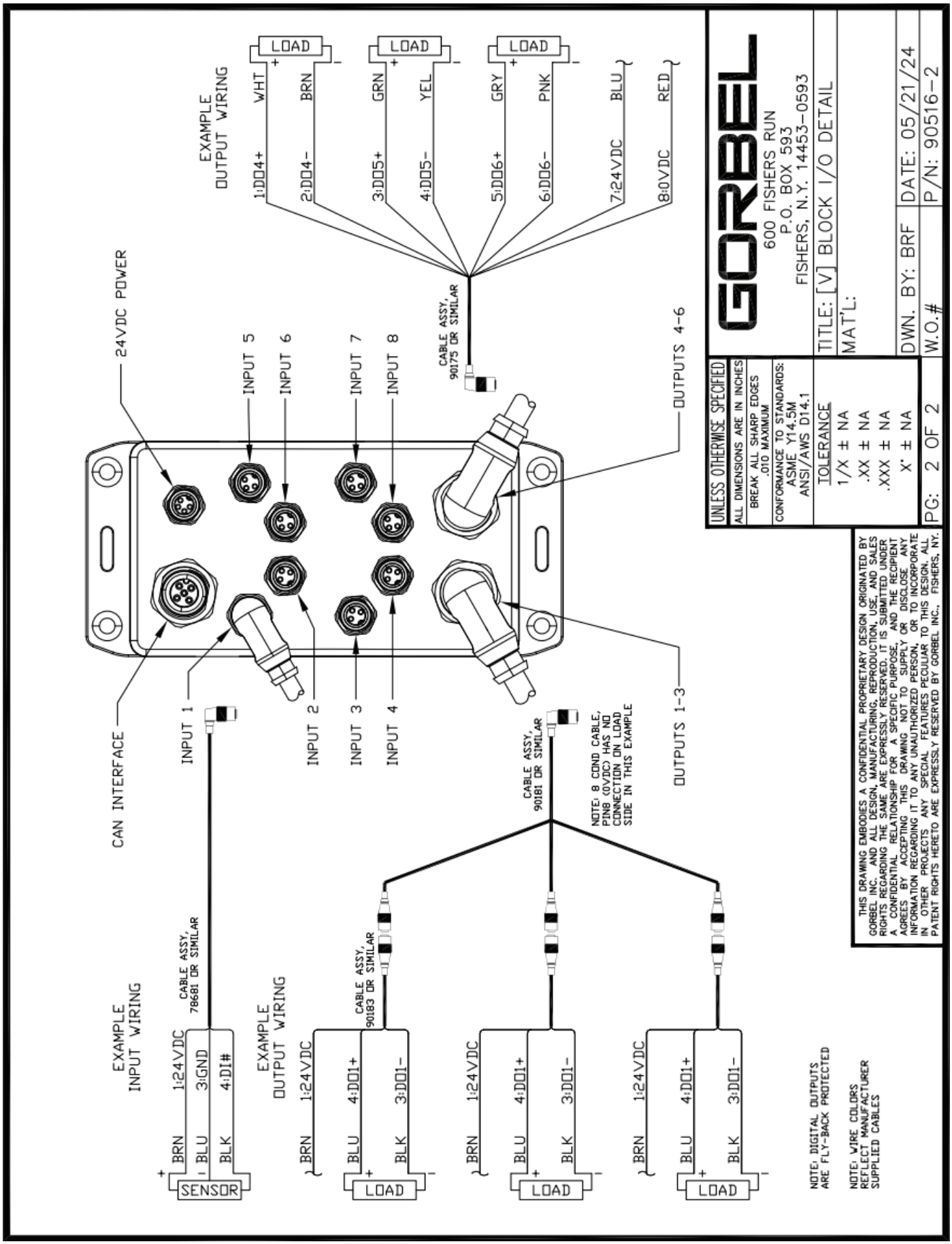


Diagram 4B-31. Expansion Block Connectors and Pin Outs.

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Accessing G-FORCE Settings with Smart Connect, Continued

Modifying the Handle I/O Configuration with I/O Config

NOTE: The Vi model of G-Force will only have the two Inputs and two Outputs on the Handle. The Vi Plus will have the additional options for the Actuator I/O and the Expansion I/O.

To access and modify the Handle I/O settings, perform the following steps:

1. Connect to the G-Force through a wired or wireless connection.
2. Log in to the Smart Connect User Interface and select **Program Menu>I/O Config>Handle** from the Splash screen. The screen in **Diagram 4B-32** will be displayed.

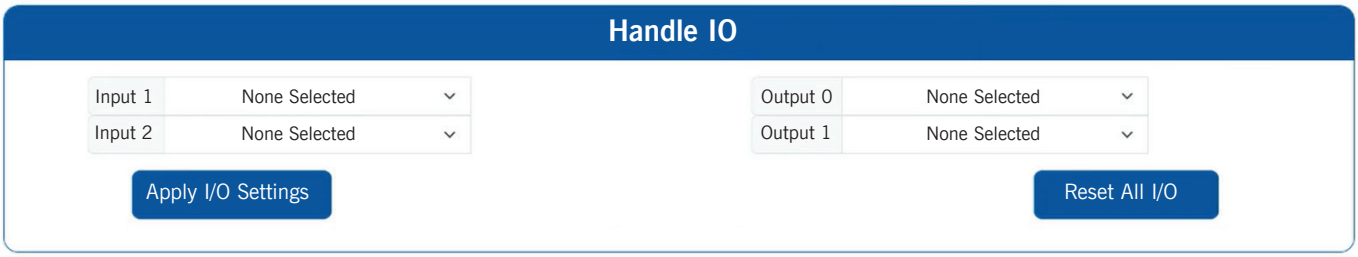


Diagram 4B-32. Handle I/O Menu.

3. The controls available on the Expansion I/O menu include those shown in **Table 4B-5**:

Control	Description
Input 1-2	Select one of the displayed input features to assign to the corresponding input slot.
Output 1-2	Select one of the displayed output features to assign to the corresponding output slot.
Apply I/O Settings	Applies settings to the Handle I/O.
Reset All I/O	Sets all inputs and outputs to “None Selected”.
Set# Dropdowns	Assigns the set number designator to the corresponding feature. This is only applicable to the External Control Input, and External Device Control Output features.

Table 4B-5. Handle I/O Controls Descriptions

To learn more about the parameters under each setting, refer to Handle, Expansion and Actuator I/O Parameters

Accessing G-FORCE Settings with Smart Connect, Continued

Modifying the Expansion I/O Configuration with I/O Config

NOTE: Only the Vi Plus model of G-Force will have the Expansion and Actuator I/O ports available.

To access and modify the Expansion I/O settings, perform the following steps:

1. Connect to the G-Force through a wired or wireless connection.
2. Log in to the Smart Connect User Interface and select **Program Menu>I/O Config>Expansion** from the Splash screen. The screen in **Diagram 4B-33** will be displayed.

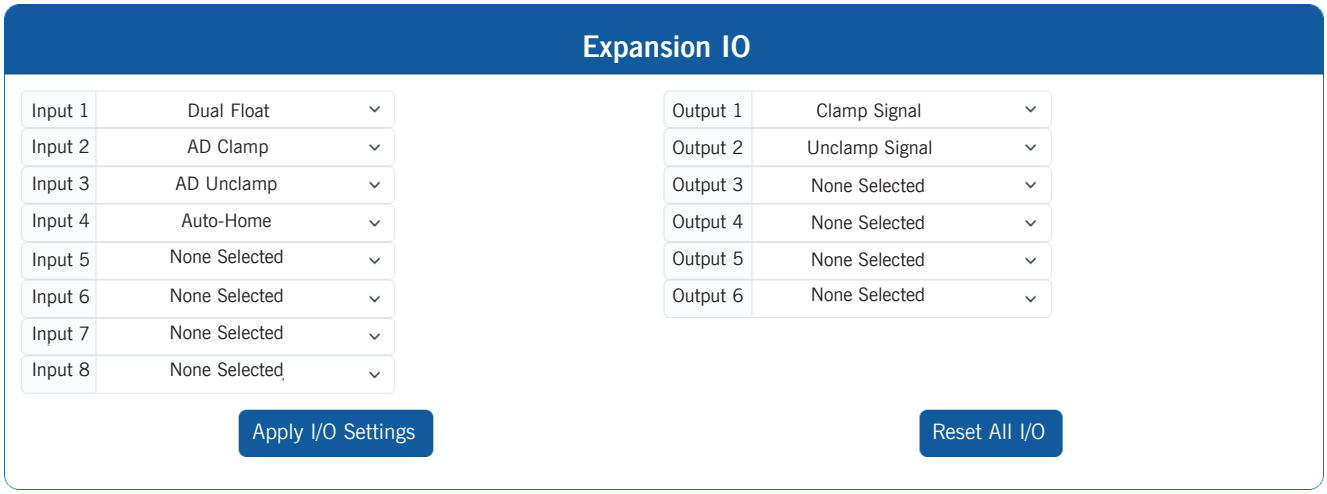


Diagram 4B-33. Expansion I/O Menu.

3. The controls available on the Expansion I/O menu include those shown in **Table 4B-6**:

Control	Description
Input 1-8	Select one of the displayed input features to assign to the corresponding input slot.
Output 1-6	Select one of the displayed output features to assign to the corresponding output slot.
Apply I/O Settings	Applies settings to the Expansion I/O.
Reset All I/O	Sets all inputs and outputs to “None Selected”.
Set# Dropdowns	Assigns the set number designator to the corresponding feature. This is only applicable the External Control Input, and External Device Control Output features.

Table 4B-6. Expansion I/O Controls Descriptions.

To learn more about the parameters under each setting, refer to Handle, Expansion and Actuator I/O Parameters.

Accessing G-FORCE Settings with Smart Connect, Continued

Modifying the Actuator I/O Configuration with I/O Config

NOTE: Only the Vi Plus model of G-Force will have the Expansion and Actuator I/O ports available.

To access and modify the Actuator I/O settings, perform the following steps:

1. Connect to the G-Force through a wired or wireless connection.
2. Log in to the Smart Connect User Interface and select **Program Menu>I/O Config>Actuator** from the Splash screen. The screen in **Diagram 4B-34** will be displayed.

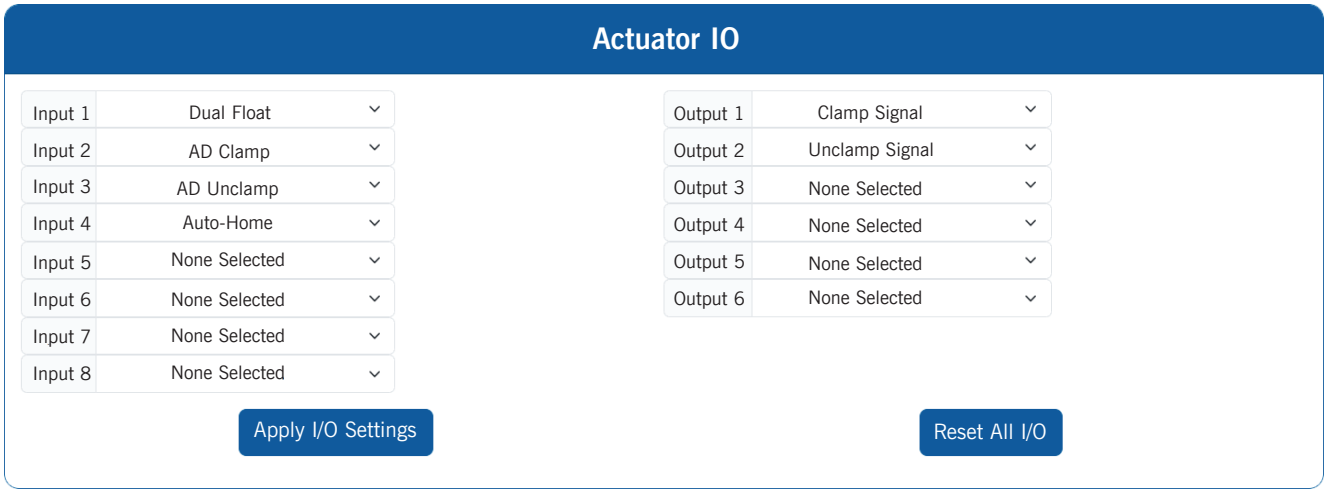


Diagram 4B-34. Actuator I/O Menu.

3. The controls available on the Actuator I/O menu include those shown in **Table 4B-5**:

Control	Description
Input 1-8	Select one of the displayed input features to assign to the corresponding input slot.
Output 1-6	Select one of the displayed output features to assign to the corresponding output slot.
Apply I/O Settings	Applies settings to the Actuator I/O.
Reset All I/O	Sets all inputs and outputs to “None Selected.”
Set# Dropdowns	Assigns the set number designator to the corresponding feature. This is only applicable the External Control Input, and External Device Control Output features.

Table 4B-7. Actuator I/O Controls Descriptions

To learn more about the parameters under each setting, refer to Handle, Expansion and Actuator I/O Parameters.

Accessing G-FORCE Settings with Smart Connect, Continued

Handle, Expansion and Actuator I/O Parameters

Diagram 4B-35 shows the Handle IO example, but the whether you select them from the Handle, Expansion or Actuator IO menus, the Input parameters you can set are described in **Table 4B-8**.

The Output parameters you can set on these submenus are described in **Table 4B-9**:



Diagram 4B-35. Input Parameters, Handle IO Example.

Input Parameter	Description	Application Options
AD (Anti-Drop) Clamp	MUST be paired with AD Unclamp and a valid configuration of the AD output(s). Anti-Drop Tool Weight MUST be set for this input to function. When toggled on and off it causes the gripper/tool linked to the Clamp Signal to grasp the load.	This parameter is part of the anti-drop feature, which makes a lifting process safer by not allowing the load to be released while in midair. When integrated, the intelligence of the G-Force or Easy Arm® inhibits the release function of a powered end-effector (e.g. a Gripper) until the load is safely set down. Use this input when individual “Clamp” and “Unclamp” input signals are used.
AD (Anti-Drop) Unclamp	MUST be paired with AD Clamp and a valid configuration of the AD output(s). Anti-Drop Tool Weight MUST be set for this input to function. When toggled on and off it causes the gripper/tool linked to the Clamp Signal to release the load when safe to do so.	Like AD Clamp, this parameter is part of the anti-drop feature. Use this input when individual “Clamp” and “Unclamp” input signals are used.
Auto-Home	When toggled it returns the hoist to its home position. Home position must be set first for this input to work.	When activated via a switch or sensor, this feature will command the G-Force® to any position in the lifting stroke defined by the end user via the user interface on a smart device or through the buttons and display on the handle. Use Auto-Home feature to move the G-Force® or Easy Arm® up and out of the way after the load has been placed or automatically set a part down with the press of a button.

Table 4B-8. Input Parameter Descriptions

Table continued on the next page...

Handle, Expansion and Actuator I/O Parameters, Continued

Input Parameter	Description	Application Options
Dual Float	When the G-Force® is in float mode, this input allows switching from one pre-programmed load weight to another. (E.g. Change from tool weight to tool + load weight)	Use this feature in machine loading applications where the unmachined part going in, is different from the machined part being taken back out.
AD Clamp/Unclamp	Toggle the 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.	This parameter is part of the anti-drop feature. Use this input when a single control input is used to toggle between “Clamp” and “Unclamp.”
Inhibit Motion	This is a maintained input, and it inhibits motion both UP and DOWN if it’s ON.	There are a wide variety of uses for this feature, such as stopping all motion when G-Force® is in a zone where any motion could damage the load or surrounding objects.
Remote Float	This is a momentary input to activate float mode.	Use this feature to add an auxiliary button to initiate float mode closer and more convenient for the operator. This is particularly helpful when end-effector handles put the operator’s hands further away from the float mode button on the control handle.
Toggle Speed	This is a maintained input, and when it’s ON it switches the speed to a pre-set one (from Program Menu>Speed Menu).	This feature is useful for slowing down the G-Force® based on an input, rather than a defined position. Use a switch, sensor, or input from other equipment’s control systems to trigger a toggle speed slow down to help make load placement easier or prevent product damage.
Inhibit Motion Up	This is a maintained input, and it inhibits motion UP if it’s ON.	Similar function and use as the “Motion Inhibit” function but will only affect the upward motion.
Inhibit Motion Down	This is a maintained input, and it inhibits motion DOWN if it’s ON.	Similar function and use as the “Motion Inhibit” function but will only affect the downward motion.
Custom Jog Up	This is a maintained input, and when it’s ON it jogs up based on the set Custom Up Jog speed set on **Program Menu>Speed Menu**.	Use this function to control the G-Force® upward motion via a discrete input. This works well when commanding motion from a PLC (Programmable Logic Controller).
Custom Jog Down	This is a maintained input, and when it’s ON it jogs down based on the set Custom Down Jog speed set on **Program Menu>Speed Menu**..	Use this function to control the G-Force® downward motion via a discrete input. This works well when commanding motion from a PLC (Programmable Logic Controller).

Table 4B-8, continued. Input Parameter Descriptions.

Table continued on the next page...

Handle, Expansion and Actuator I/O Parameters, Continued

Input Parameter	Description	Application Options
Float Mode Quit	This is a maintained input, and when it's ON it jogs down based on the set Custom Down Jog speed.	This feature is used when the application requires Float Mode to be de-activated without the potential for unintended motion, which could occur if the operator engaged the control handle to exit float mode. Using this feature with a maintained input may be used to allow the operator to perform a task without going into Auto-Float, which will be halted for as long as this input active.
Multi-Zone VL Zone 1 & 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 1&2 as an input enables Virtual Limit Set 2.	Use different sets of virtual limits, activated via a switch or sensor, that senses when the G-Force or Easy Arm® are in specific zones. Activating these inputs will switch to different elevations or a different mix of virtual limits across 4 different virtual limit sets.
Multi-Zone VL Zone 3	Multi-Zone VL 3 enables Virtual Limit Set 3.	See Column 2
Multi-Zone VL Zone 4	Multi-Zone VL 4 enables Virtual Limit Set 4.	See Column 2
External Control Input 1	When this input is on, a selected output on the Actuator/Expansion block input/output module is on and vice versa. There are two External Control Inputs that can be set **NOTE**: Set 1 must be set before Set 2.	Use this input, paired with a matched "External Control Output", to pass any signal from any input location, to any output location.
External Control Input 2	See above.	See above.

Table 4B-8, continued. Input Parameter Descriptions.

Accessing G-FORCE Settings with Smart Connect, Continued

Handle, Expansion and Actuator I/O Parameters, Continued

Diagram 4B-36 shows the Handle IO example, but the whether you select them from the Handle, Expansion or Actuator IO menus, the Output parameters you can set are described in **Table 4B-9.**



Diagram 4B-36. Output Parameters, Handle IO Example.

Output Parameter	Description	Application Options
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.	This parameter is part of the anti-drop feature, which makes a lifting process safer by not allowing the load to be released while in midair. An end effector is the gripper, or other device, that engages the load so it can be lifted. Use this output when individual “Clamp” and “Unclamp” output signals are used.
Unclamp Signal	This output is typically wired to actuate the unclamping mechanism of an end effector tooling. It turns on when AD Unclamp input is on and remains latched on when the input is released.	Like the Clamp Signal, this parameter is part of the anti-drop feature, and causes an unclamp to occur at the end-effector. Use this output when individual “Clamp” and “Unclamp” output signals are used.
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 must be used along with a legal configuration of the AD Clamp/ Unclamp Input(s).	This parameter is part of the anti-drop feature. Use this output when a single control output is used to toggle between “Clamp” and “Unclamp.”
Slack Detection	If the unit experiences slack, this output turns on.	This output can be used as a check signal for an external control system or to enable or disable end-effector control functions.

Table 4B-9, continued - Output Parameter Descriptions, Handle IO Example.

Table continued on the next page...

Handle, Expansion and Actuator I/O Parameters, Continued

Output Parameter	Description	Application Options
Run Mode	If the unit is in Run Mode, the output is on.	Use this output as a confirmation signal that the unit is in run mode. Typically used when integrating with external control systems that require redundant checks.
Float Mode	If the unit is in Float Mode, this output turns on.	Use this output as a confirmation signal the unit is in float mode. Typically used when integrating with external control systems that require redundant checks.
Upper Limit	If the unit reaches the upper limit, this output turns on.	Use this output as a confirmation signal the unit at the upper limit. Typically used when integrating with external control systems that require redundant checks.
Lower Limit	If the unit reaches the lower limit, this output turns on.	Use this output as a confirmation signal the unit at the lower limit. Typically used when integrating with external control systems that require redundant checks.
In Motion	If the unit is in motion in any mode, this output is on.	Use this output as a confirmation signal the unit is in motion (includes both run mode and float mode. Typically used when integrating with external control systems that require redundant checks.
OPS Active	If the Operator Present Sensor is active (operator presence is detected) this output turns on.	Use this output as a confirmation signal the unit's operator present function is active. Typically used when integrating with external control systems that require redundant checks.
E-Stop Pressed	If E-stop is engaged, this output turns off, otherwise it is always on.	Use this output as a confirmation signal the e-stop is pressed. Typically used when integrating with external control systems that require redundant checks.
AD Load Status	Output turns ON and stays ON when the load is at or below the anti-drop tool weight. Output turns OFF when it's above the AD tool weight.	This output is used in conjunction with Anti-Drop Inputs/Outputs but is not required for the Anti-Drop feature to work.
Fault Indicator	This output turns on when a fault is detected in the unit.	Use for fault detection.
Service Indicator	If the unit needs attention from Gorbel's Service team this output turns on.	Use to detect when service is required.
External Control Output 1	This output turns on or off when the associated External Control Input of the same set is on or off respectively. There are two External Control Outputs that can be set. **NOTE**: Set 1 MUST be set before Set 2.	Use this output, paired with A matched "External Control input", to pass any discrete signal from any input location, to any output location.
External Control Output 2	See Above.	See Above.

Table 4B-9, continued - Output Parameter Descriptions, Handle IO Example.

Accessing G-FORCE Settings with Smart Connect, Continued

The Program Menu

The menu selections available on the Program Menu are shown in **Diagram 4B-37** on the path shown in **PURPLE**.

1. Connect to the G-Force through a wired or wireless connection.
2. Log in to the Smart Connect User Interface and select **Program Menu** from the Smart Connect User Interface Splash screen. The menus in **Diagram 4B-37** will be displayed.

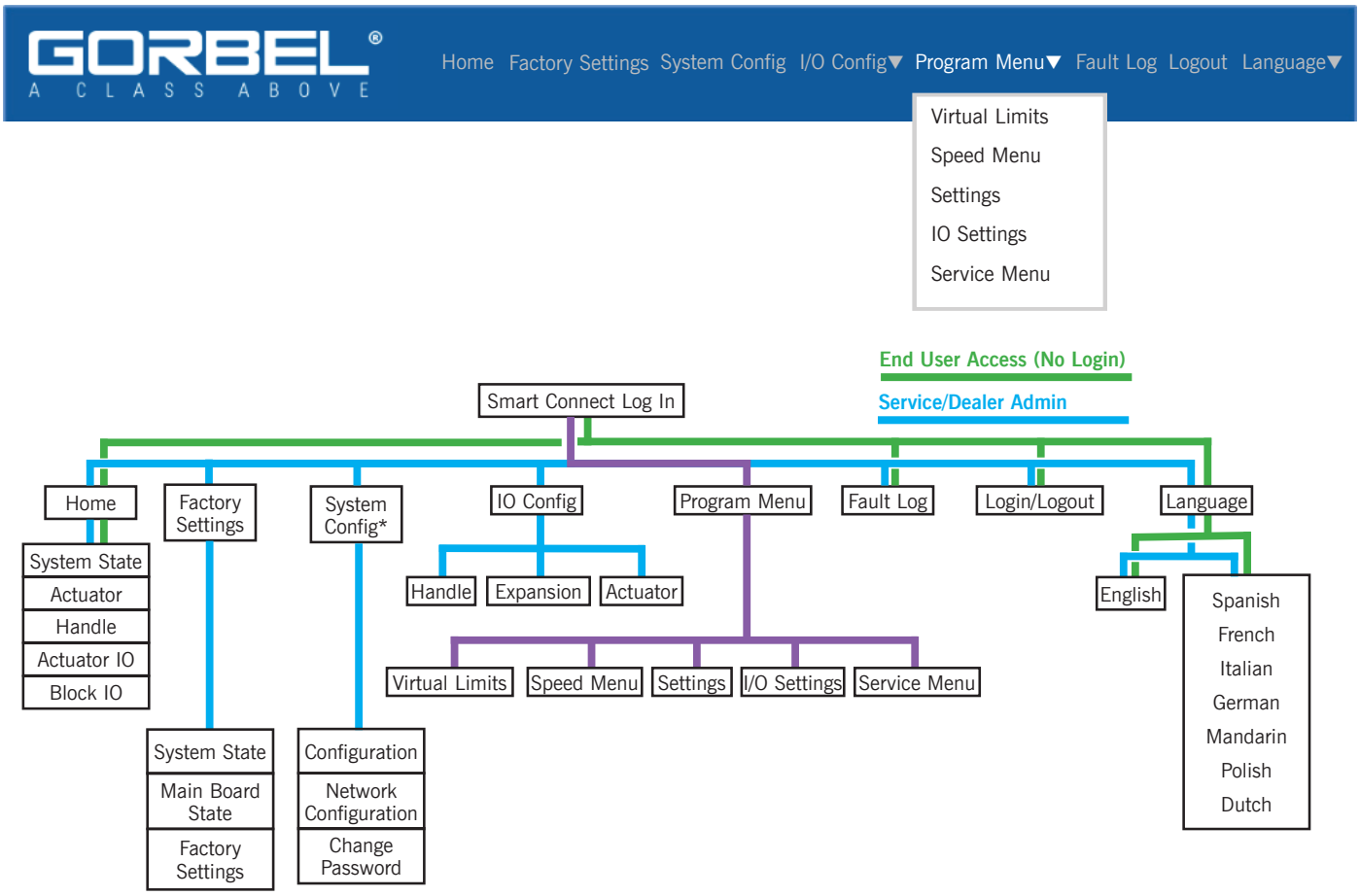


Diagram 4B-37. Program Menu and Submenus.

3. The submenus available from the Program Menu include those shown in **Table 4B-10.** Click the hyperlink to access the respective menu settings:

Submenu	Description
Virtual Limits	Various hook/load position and travel limits.
Speed Menu	Max Handle Speed and toggle and jog up and down speeds
Settings	Weight Display, Float Mode, and Overload Settings
I/O Settings	Dual Float Mode, Auto-Home and Anti-Drop Settings
Service Menu	Status indicators for I/O Sources, Hoist and Handle

Table 4B-10. Virtual Limits Parameters.

Accessing G-FORCE Settings with Smart Connect, Continued

Setting Virtual Limits on the Program Menu

The menu selections available on the Virtual Limits menu are shown in **Diagram 4B-38**.

1. Connect to the G-Force through a wired or wireless connection.
2. Log in to the Smart Connect User Interface and select **Program Menu>Virtual Limits** from the Smart Connect User Interface Splash screen. The screen in **Diagram 4B-38** will be displayed.

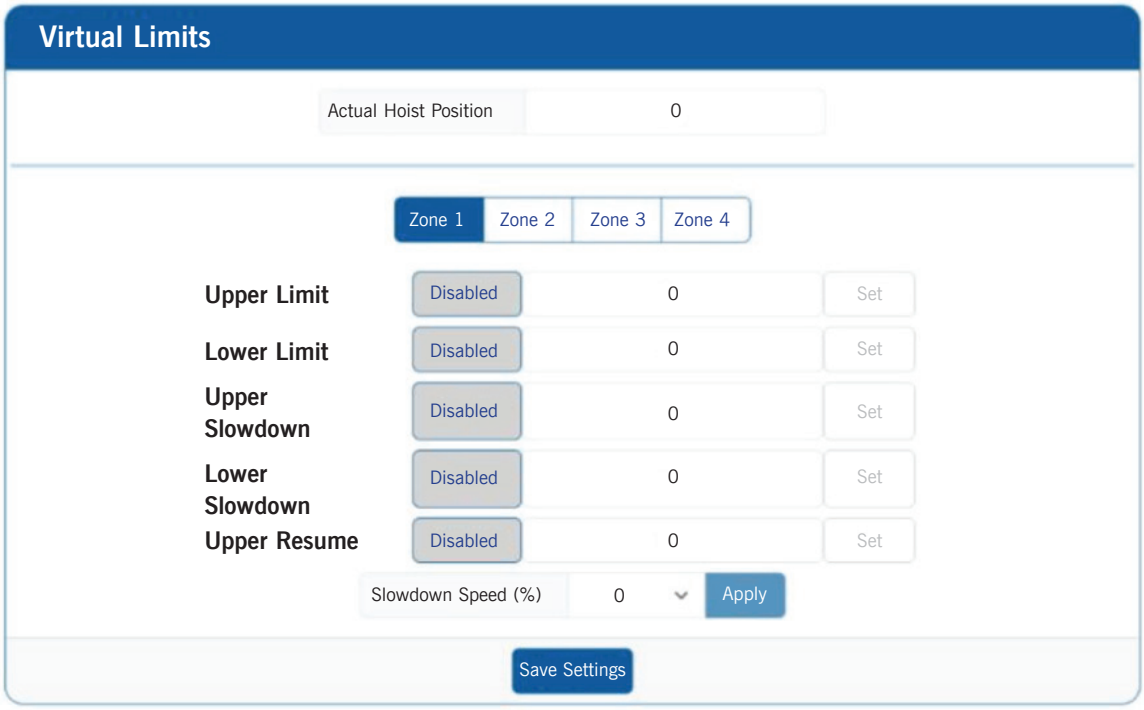


Diagram 4B-38. Virtual Limits Parameters

3. The parameters you can set on the Virtual Limits menu include those shown in **Table 4B-11**:

Parameter	Description	Application Options
Upper Limit	Sets the upper limit of travel for the hook/handle.	Used to limit unnecessary upward travel of the hoist.
Lower Limit	Sets the lower limit of travel for the hook/handle.	Used to limit unnecessary downward travel of the hoist.
Upper Slowdown	Sets the upper point at which the load slows down from max speed.	Sets an upper point in the hoist travel that slows the hoist to the speed set in Slowdown Speed %.
Lower Slowdown	Sets the lower point at which the load slows down from max speed.	Sets an lower point in the hoist travel that slows the hoist to the speed set in Slowdown Speed %.
Upper Resume	The load speed increases from the upper slowdown speed to the regular speed at this position.	Returns the hoist to Max Speed after clearing Upper Slowdown.
Slowdown Speed %	Displays the current slowdown speed, and provides a pulldown menu to select new speed as a percentage of Max Handle Speed.	NOTE: Max Handle Speed is set on the Speed Menu.

Table 4B-11. Virtual Limits Parameters Descriptions

Accessing G-FORCE Settings with Smart Connect, Continued

Setting Virtual Limits on the Program Menu, Continued

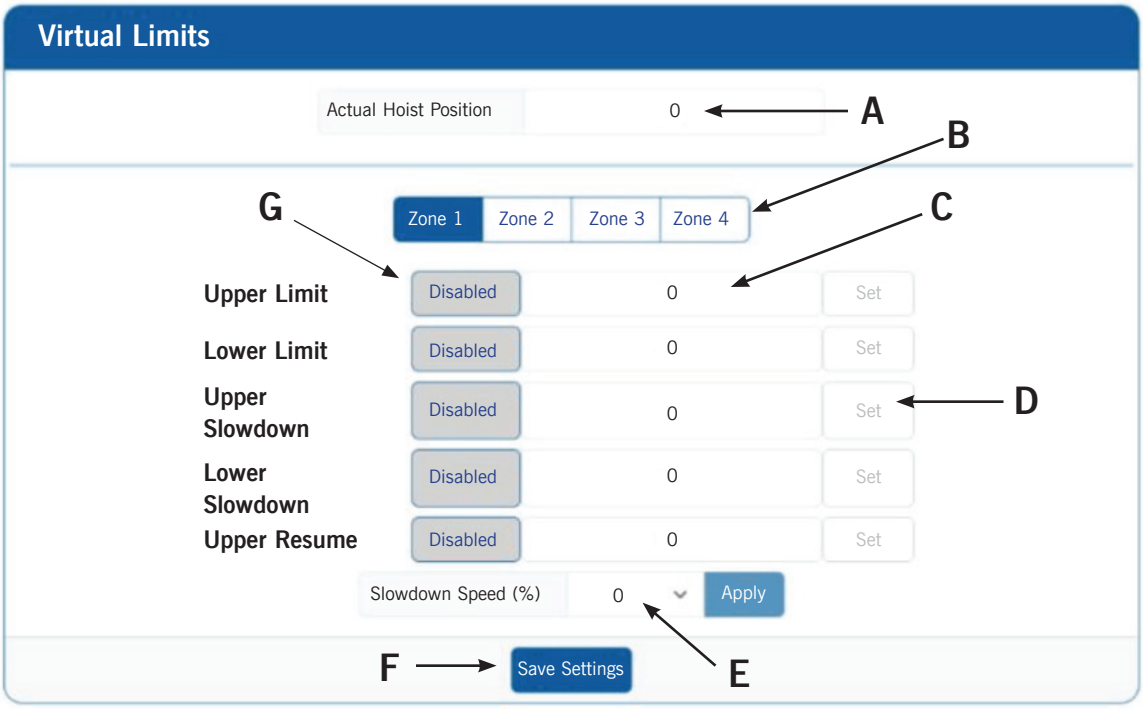


Diagram 4B-39. Smart Connect Virtual Limits Controls

The controls on the Virtual Limits menu are described in **Table 4B-12**.

	Control	Description
A.	Actual Hoist Position	Displays the numeric value of the current location of the handle/hook.
B.	Zone 1-4	Four Virtual Limit Zones are available. For each, a unique Upper Limit, Lower Limit, Upper/Lower Slowdown, Upper Resume, and Slowdown Speed can be set. The highlighted zone indicates which virtual limit zone can presently be edited. The Multi-Zone VL Zone 2, 3, 4 I/O features control which virtual limit zone is active on the unit. By default, the active zone is Zone 1.
C.	Individual Virtual Limit Value	Displays the current value of the Virtual Limit.
D.	Set Buttons	Sets the current position displayed in the Actual Hoist Position Display to be the position of the associated limit, slowdown, or resume.
E.	Slowdown Speed (%) Dropdown	Selects the speed limit of the Upper and Lower Slowdown areas by assigning the speed limit to be a percentage of the unit's maximum speed.
F.	Save Settings	When clicked, saves any modifications made to the Virtual Limits.
G.	Enable/Disable Individual Virtual Limit	When clicked, these buttons will swap the status of the associated limit, slowdown, or resume to be enabled (if currently disabled) or disabled (if currently enabled).

Table 4B-12. Virtual Limits Controls Descriptions

Accessing G-FORCE Settings with Smart Connect, Continued

Virtual Limits Examples

Overview

Below are examples of how to use Virtual Limits to most efficiently and safely use your G-Force hoist. All of the Virtual Limits shown can be used together.

Lower and Upper Limit

The following examples illustrate how Virtual Limits are used to lift and transit a load. For this simulated scenario, the Upper Limit and Lower Limit have already been set to achieve the movements shown.

Refer to **Diagram 4B-40**. In this example, a load is picked up and placed on a work surface using Lower Limit and Upper Limit to achieve consistent optimum level and speed.

A. In this step, the Lower Limit ensures that the handle is consistently lowered to the exact level needed to pick up the load.

B. In Step B, Upper Limit minimizes unneeded upward movement by lifting the load to the same level every time.

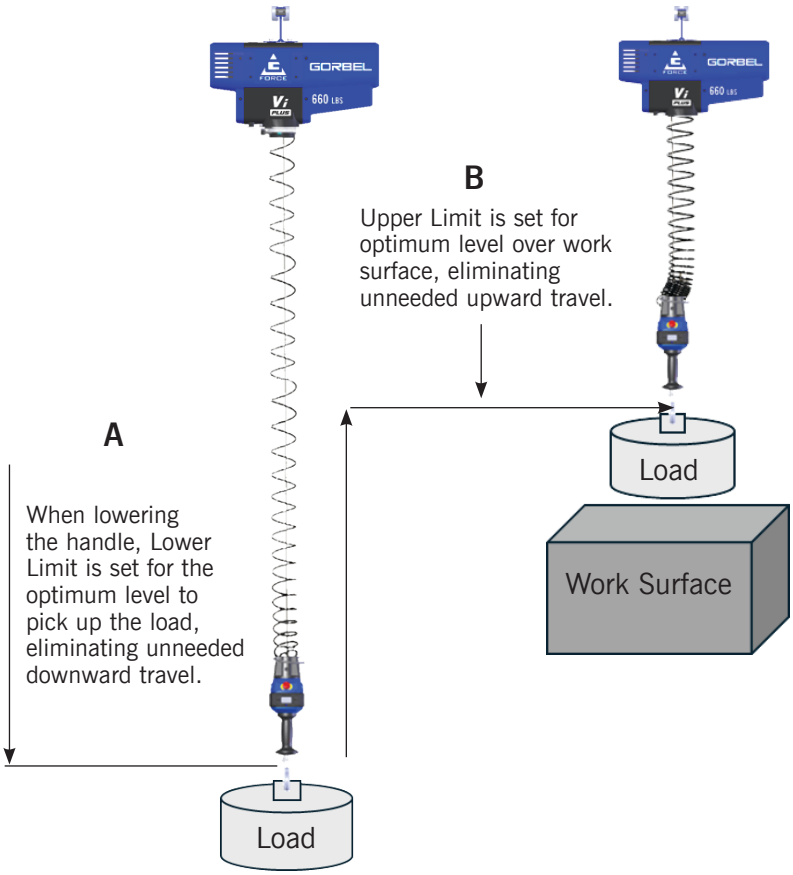


Diagram 4B-40. Upper and Lower Limit Example.

Lower Slowdown

The Lower Slowdown Virtual Limit is used to fine-tune the movement of the load, and will enable exact movement without jarring the G-Force and load with a sudden stop. **Lower Slowdown engages only when the handle is moving downward.**

NOTE: Both Lower and Upper Slowdown Virtual Limits can greatly improve accuracy while increasing the life of the hoist components and the wire rope.

Refer to **Diagram 4B-41**. In this example, Lower Slowdown has been set to the zone shown and remains in effect to the Lower Limit. The hoist is slowed to the speed set with the Slowdown Speed (%) Dropdown.

Why use Lower Slowdown?

- With an unloaded hoist, accuracy in hooking the load is increased at a slower speed.
- With a loaded hoist, accuracy in placing the load is increased, and no jarring of the load and hoist occurs.

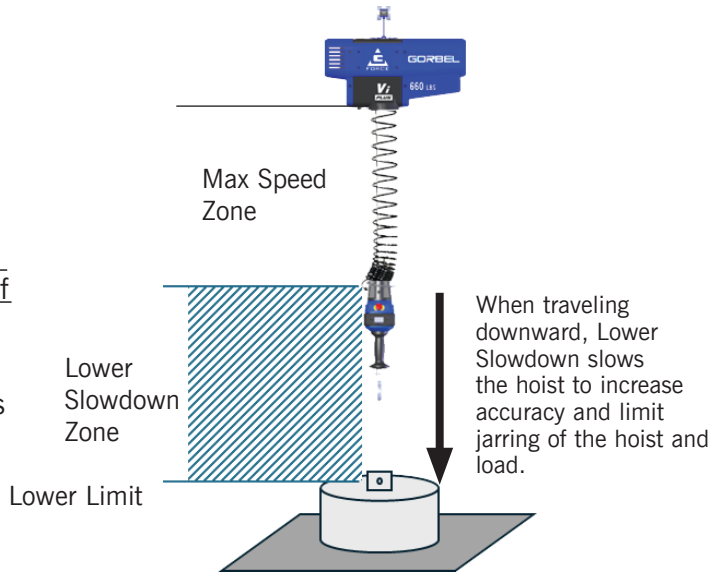


Diagram 4B-41. Lower Slowdown Example.

Examples continued on the next page...

Accessing G-FORCE Settings with Smart Connect, Continued

Virtual Limits Examples - Upper and Lower Slow Down

Upper Slowdown and Upper Resume

Like Lower Slowdown, the **Upper Slowdown** Virtual Limit is used to slow the hoist at a preset level to increase movement accuracy while eliminating sudden jarring of the hoist and wire rope. The hoist is slowed to the speed set with the Slowdown Speed (%) Dropdown. **Upper Slowdown engages only when the handle is moving upward.**

Upper Resume increases speed to Max Speed for increased efficiency.

Example 1

Refer to **Diagram 4B-42**. In this example, **Upper Slowdown** has been set to the zone shown and remains in effect until the hoist clears an obstacle, where **Upper Resume**, has been set to return the load to Max Speed.

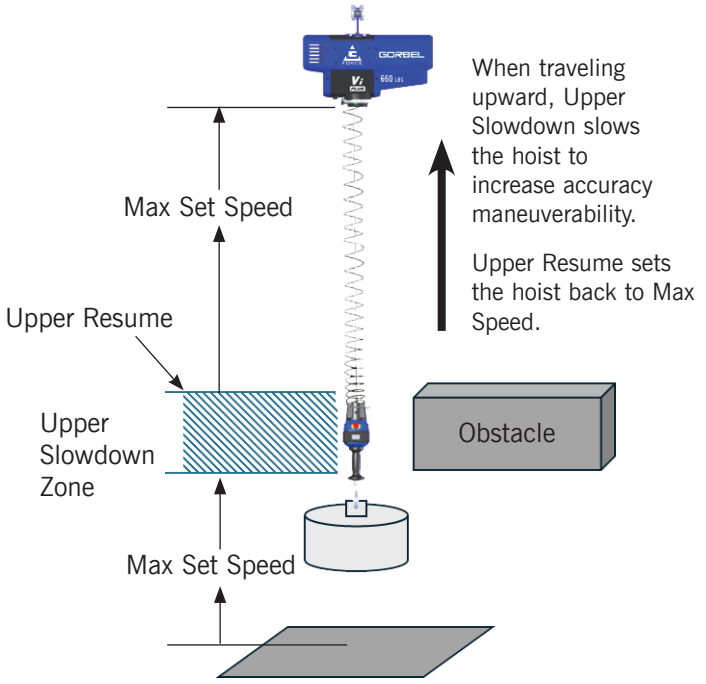


Diagram 4B-42. Upper Slowdown and Upper Resume Example 1.

Example 2

In **Diagram 4B-43**, if initiated at Max Speed, a slacked wire rope will retract at high speed and jar the hoist and the load. Setting **Upper Resume** at the position shown will ensure that the hoist engages slowly and does not jar the load or hoist.

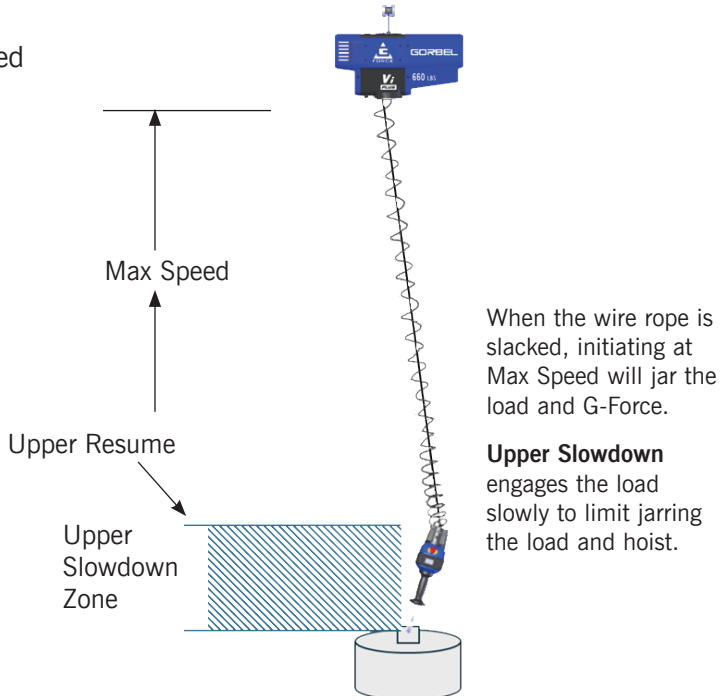


Diagram 4B-43. Upper Slowdown and Upper Resume Example 2.

Accessing G-FORCE Settings with Smart Connect, Continued

The Speed Menu

The menu selections available on the Speed menu are shown in **Diagram 4B-44**.

Modifying Speed Settings

1. Connect to the G-Force through a wired or wireless connection.
2. Log in to the Smart Connect UI and select **Program Menu>Speed Menu** from the Smart Connect Splash screen. The screen in **Diagram 4B-44** will be displayed.

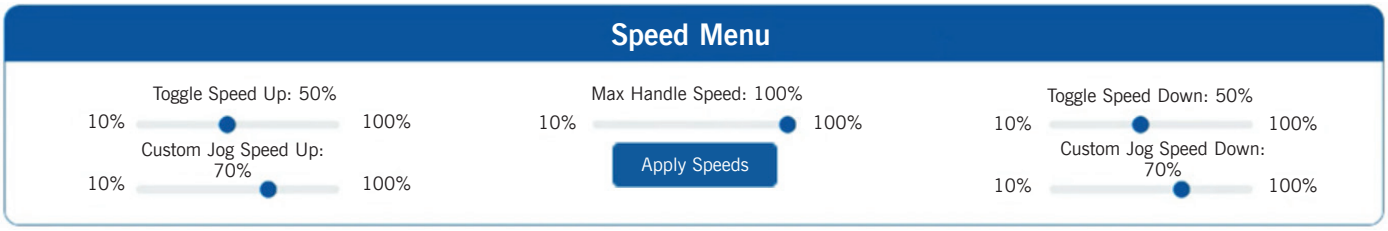


Diagram 4B-44. Smart Connect Speed Menu

3. The parameters you can set on the Speed Menu include those shown in **Table 4B-13**:

Parameter	Description
Toggle Speed Up: X% Toggle Speed Down: X%	When the respective Toggle Speed Input feature is on, the unit changes speeds to this set speed. If the input is off, it goes back to hoist speed selected.
Jog Speed Up: X% Jog Speed Up: X%	When the respective Jog Speed Input feature is on, the unit will move up/down at this speed. If the input is off, the unit will stop moving.
Max Handle Speed: X%	This slider sets the percentage from 10% to 100% of the maximum speed for the handle (dependent on the G-Force model and capacity. See **Table 4B-14**.

Table 4B-13. Speed Menu Parameter Descriptions

G-Force	Vi	VI Plus	Vi	Vi Plus	Vi	VI Plus	Vi	Vi Plus
Maximum Capacity	165 lb. (75 kg)		330 lb. (150 kg)		660 lb. (300 kg)		1320 lb. (600 kg)	
Max Unloaded Lifting Speed	195 ft/min (59 m/min)		95 ft/min (29 m/min)		45 ft/min (13.7 m/min)		25 ft/min (7.62 m/min)	
Max Loaded Lifting Speed	120 ft/min (37 m/min)		60 ft/min (18 m/min)		40 ft/min (12 m/min)		20 ft/min (6 m/min)	
Max Float Mode Lifting Speed	110 ft/min (34 m/min)		55 ft/min (17 m/min)		40 ft/min (12 m/min)		20 ft/min (6 m/min)	

Table 4B-14. Maximum Speeds for Bridge-Mounted G-Force.

Continued on the next page...

Accessing G-FORCE Settings with Smart Connect, Continued

The Settings Menu

The menu selections available on the Settings menu are shown in **Diagram 4B-45**.

1. Connect to the G-Force through a wired or wireless connection.
2. Log in to the Smart Connect User Interface and select **Program Menu>Settings** from the Smart Connect User Interface Splash screen.

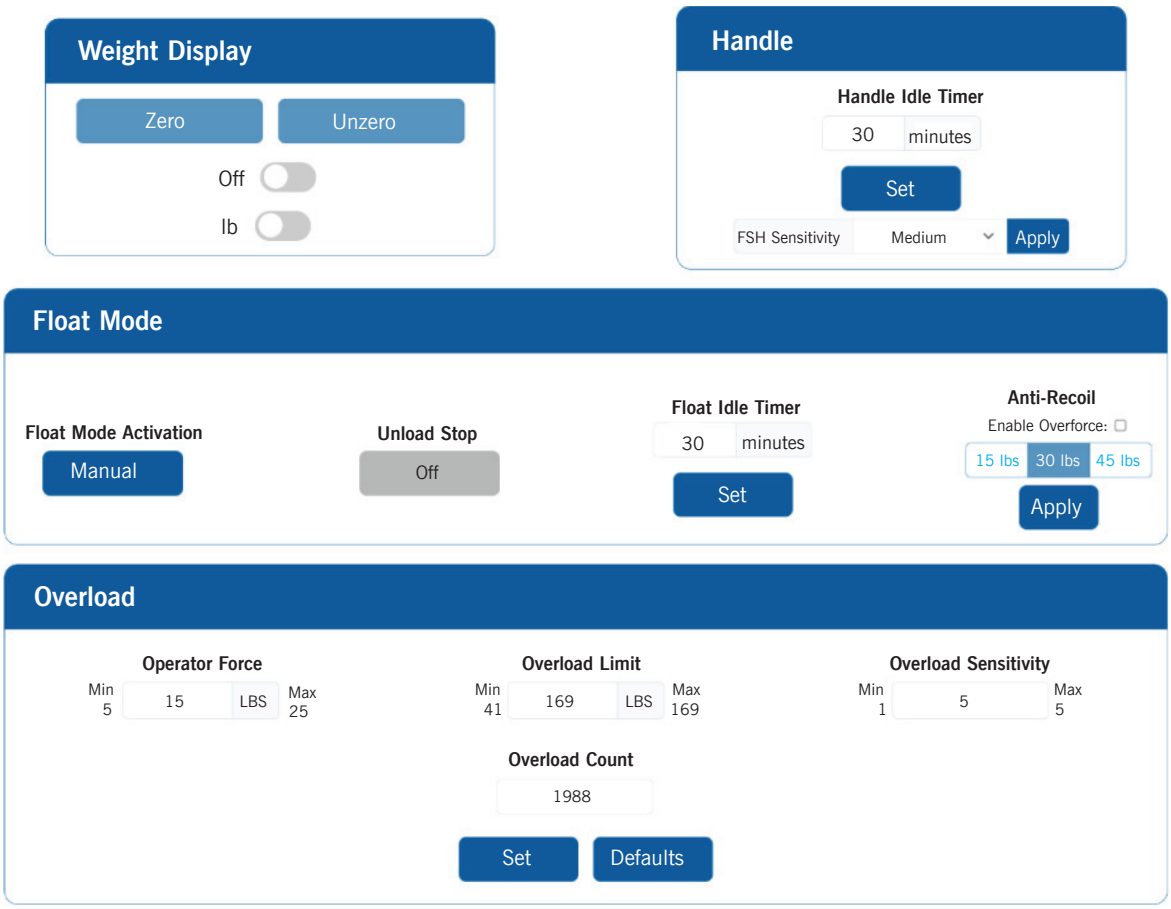


Diagram 4B-45. Smart Connect Settings Menu.

3. The parameters you can set on the Speed Menu include those shown in **Table 4B-15**:

Parameter	Description
Weight Display	
Zero/Unzero	Sets the displayed weight to zero, or to the observed weight.
Off/on	Turns the weight readout on the handle on or off.
lb/kg	Toggles the weight display between pounds and kilograms.
Handle	
Handle Idle Timer	Changes the amount of time the unit can be in handle mode before being kicked out. If the OPS is blocked on a slide handle without moving, the Idle Timer activates until it reverts to Lift Ready. The same is true of Float Mode.
FSH Sensitivity	Select among three sensitivity levels for the Force Sensing Handle (low, medium, high) which will determine how easily top speed can be reached while moving the unit with the handle. **NOTE**: FSH Sensitivity only appears when a Force Sensing Handle or Hub is connected to the G-Force.

Table 4B-15. Settings Menu Parameter Descriptions.

Accessing G-FORCE Settings with Smart Connect, Continued

The Settings Menu, Continued

Parameter	Description
Float Mode	
Float Mode Activation Auto/Manual	Turns on/off automatic float mode with the “Auto” button.
Unload Stop	Turn on/off unload stop for float mode. If unload stop is on, the unit will exit float mode when an unloaded condition is detected. This is useful for using float mode to gently set an item on the ground.
Float Idle Timer	Changes the amount of time the unit can be in float mode before being kicked out.
Anti-Recoil	Anti-Recoil is an internal algorithm that detects potentially unsafe conditions while in float mode. If one of these conditions is detected, the unit exits float mode immediately. Anti-recoil overspeed protection is always on and will exit float mode if the load reaches 90% of the maximum speed. For extra protection, the user has the option to enable overforce detection using the “Enable Overforce” checkbox and selecting one of the three overforce limits. If the anti-recoil algorithm detects a force greater than the overforce limit, float mode will exit immediately. The “Apply” button must be pressed for the new Anti-Recoil Overforce settings to be activated. The overforce limits depend on the unit capacity. For 165 and 330 lb capacity units, the selectable limits are 15, 30 and 45 lbs. For 660 and 1320 lb capacity units, the selectable limits are 30, 60 and 90 lbs.
Overload	
Operator Force	Operator Force allows a small amount of extra force to be briefly applied to the load without triggering overload. Enter the desired value of the Operator Force Limit in the value display. Then click the “Set” button to confirm the new Operator Force Limit or click the “Default” button to restore the original value. The operator force range is 5 to 15 lbs for 165 lb capacity units, and 5 to 25 lbs for all other capacities.
Overload Limit	**Loads over this value will trigger an overload warning.** Set a weight value manually by entering a number in the value display. Then assign this recorded weight as the system overload limit with the “Set” button or reset the overload limit to its default value by pressing the “Defaults” button.
Overload Sensitivity	Overload Sensitivity affects the amount of time the overload detection algorithm will allow normal motion with a load greater than the overload limit. A higher number means greater sensitivity and faster overload detection. Enter the desired sensitivity level (1-5) in the value display, then click the “Set” button to finalize the new sensitivity value or click the “Default” button to reset the sensitivity level of the overload detection system to its original value.
Overload Count	Tracks the number of times the unit has been overloaded.

Table 4B-15, continued. Settings Menu Parameter Descriptions.

Continued on the next page...

The Settings Menu, Continued

Settings Menu Examples

1. **Weight Display -** Refer to **Diagram 4B-46**.

   With **Weight Display off/on** set to on, and **lb/kg** set to lb, the handle will display the load weight in pounds whenever the handle is at **Lift Ready**. When the Handle is in **Run Mode** or **Float Mode**, the load weight is not displayed.

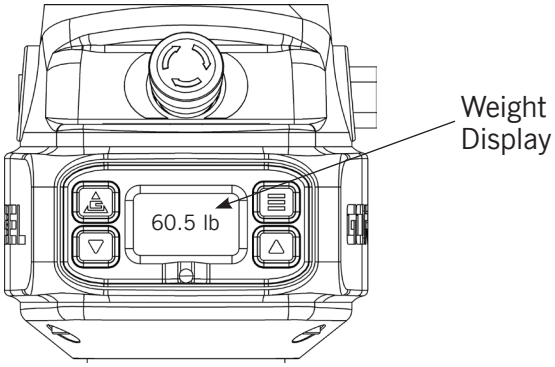


Diagram 4B-46. Weight Display.

   The **Zero/Unzero** setting is used to determine the weight of the load without the tooling. The weight displayed will include the tooling by default, so to determine the weight of the load, zero the display with only the attached tooling, and then pick a load. The displayed weight will be that of the load without the tooling.

2. **Float Mode -** Refer to **Diagram 4B-47**.

   In Float Mode, the operator does not grasp the Handle to move the load up or down. It is moved by pushing the load up or down, enabling very accurate placement.

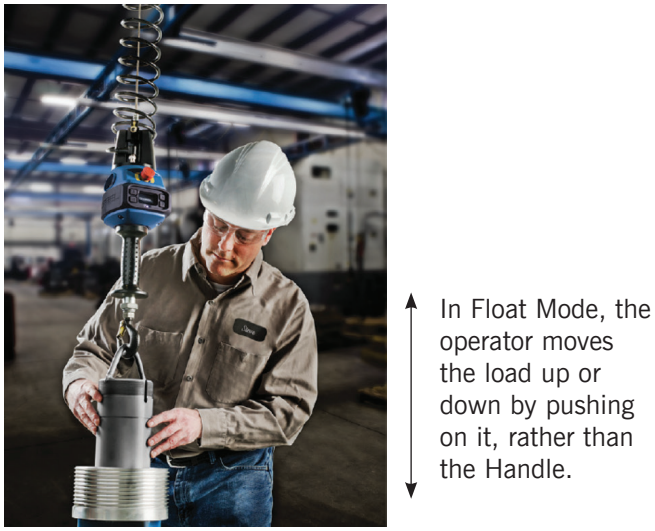


Diagram 4B-47. Float Mode.

   When the Float Mode **Auto/Manual** setting is set to **Manual**, the Handle remains in Float Mode until the Operator Present Sensor (OPS) beam is broken by grasping the Handle.

   When the Float Mode **Auto/Manual** setting is set to **Auto**, the Handle returns to Float Mode whenever the Handle is released.

Examples continued on the next page...

The Settings Menu, Continued

3. **Overload -** Capacities depend on the G-Force in use. Refer to to **Table 4B-16**.

CAUTION
For the most efficient and safe operation, always operate the G-Force within the rated capacities.

Overload Example 1

When in Float Mode, the weight on the G-Force cable consists of the actual load weight and any force placed on the load by the operator. For example, when using a G-Force with a 165 lb. (75 kg) Rated Capacity, a load that weighs 160 lbs. (72.5 kg) might also incur 10 lbs. (4.54 kg) of Operator Force that would exceed the rated capacity tolerance for the G-Force.

To operate safely and efficiently, and limit undue stress on the G-Force, you can set the **Overload Limit** to a value that is less than the combination of the G-Force Rated Capacity and the **Operator Force.**

This setting can be further modified by setting an **Overload Sensitivity** for loads that regularly approach the Overload Limit.

NOTE: The combination of all these settings cannot exceed the Rated Capacity Tolerances shown in **Table 4B-16**.

G-Force Rated Capacities	Weight Limits (Maximum and Minimum) Equation	Rated Capacity Tolerances
165 lb. (75 kg)	Maximum=Rated Capacity plus 5 lbs. (2.27 kg) Minimum=25% of Rated Capacity	41-170 lbs. (18.6-77.1 kg)
330 lb. (150 kg)	Maximum=101% of Rated Capacity plus 5 lbs. (2.27 kg) Minimum=25% of Rated Capacity	83-338 lbs. (37.64-153.3 kg)
660 lb. (300 kg)	Maximum=101% of Rated Capacity plus 5 lbs. (2.27 kg) Minimum=25% of Rated Capacity	165-672 lbs. (74.8-304.8 kg)
1320 lb. (600 kg)	Maximum=101% of Rated Capacity plus 5 lbs. (2.27 kg) Minimum=25% of Rated Capacity	330-1338 lbs. (149.68-606.9 kg)

Table 4B-16. Overload Capacities.

Overload Example 2

In some applications, lifting the load at the full lifting capacity has the potential to damage the load. For example, if the load has delicate components resistance to the lift could indicate a misalignment and binding that could bend or break the component. If the full lifting capacity is applied, the misalignment could damage the load.

The **Overload Limit** setting can be used to stop the lift when a minimum amount of weight over the load weight is sensed, to prevent damage to the load.

Accessing G-FORCE Settings with Smart Connect, Continued

The I/O Settings Menu

The menu selections available on the I/O Settings menu are shown in **Diagram 4B-48**.

1. Connect to the G-Force through a wired or wireless connection.
2. Log in to the Smart Connect User Interface and select **Program Menu>I/O Settings** from the Splash screen.

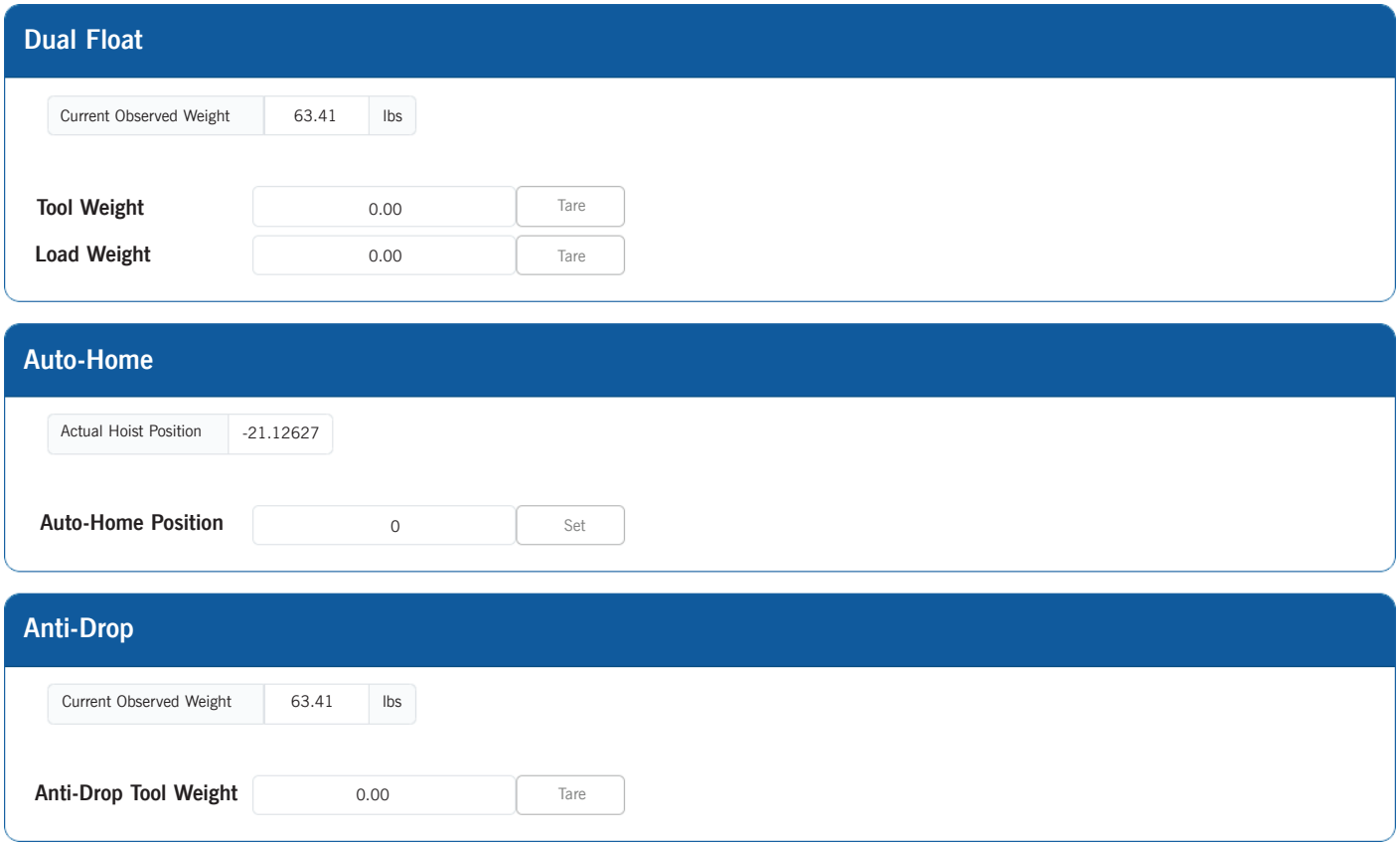


Diagram 4B-48. I/O Settings Menus.

3. The parameters you can set on the I/O Settings Menu include those shown in **Table 4B-17**:

Parameter	Description
Dual Float	Used for maintaining float mode with a load with two different weights, or for an unloaded tool and a loaded tool.
Tool Weight	Set the tool weight for Dual Float Mode to the current observed weight by pressing the “Tare” button.
Load Weight	Set the load weight for Dual Float Mode to the current observed weight by pressing the “Tare” button.
Auto Home	
Auto Home Position	Set the destination of the Auto-Home feature to the current position of the hoist by pressing the “Set” button.
Anti-Drop	
Anti-Drop Tool Weight	Set the tool weight to be referenced by the Anti-Drop safety feature equal to the current observed weight by clicking the “Tare” button.

Table 4B-17. I/O Settings Parameter Descriptions.

Accessing G-FORCE Settings with Smart Connect, Continued

The I/O Settings Menu, Continued

I/O Settings Examples

Dual Float

To use Float Mode for the unloaded tool and the loaded tool, take weight readings for both conditions.

This mode can also be used for maintaining Float Mode when lifting a component that might weigh less after processing. For example, to float an unmilled component that weighs more than the same component after milling.

Auto-Home

When toggled, the Auto-Home Input returns the hoist to its home position. Home position must be set first for this input to work. When activated via a switch or sensor, this feature will command the G-Force® to any position in the lifting stroke and is a user-defined location. Use Auto-Home feature to move the G-Force® up and out of the way after the load has been placed or automatically set a part down with the press of a button. Those are just two examples of the many possibilities of this function.

Anti-Drop

The Anti-Drop feature ensures that a loaded clamp tool does not unclamp when loaded. To do this, the G-Force needs to know the weight of the tooling so that it can determine when something that weighs more than the tooling is in the clamp.

For example, if using an OD Gripper to lift automobile tires, the weight of the tooling is determined by clicking **Tare**. When the tooling is loaded with a tire, the system can detect it because it weighs more that what the known weight of the tooling is. It will, therefore, not unclamp while the load is in the air.

Accessing G-FORCE Settings with Smart Connect, Continued

The Service Menu

The menu selections available on the Service Menu are shown in **Diagram 4B-49.**

1. Connect to the G-Force through a wired or wireless connection.
2. Log in to the Smart Connect User Interface and select **Program Menu>Service Menu**.

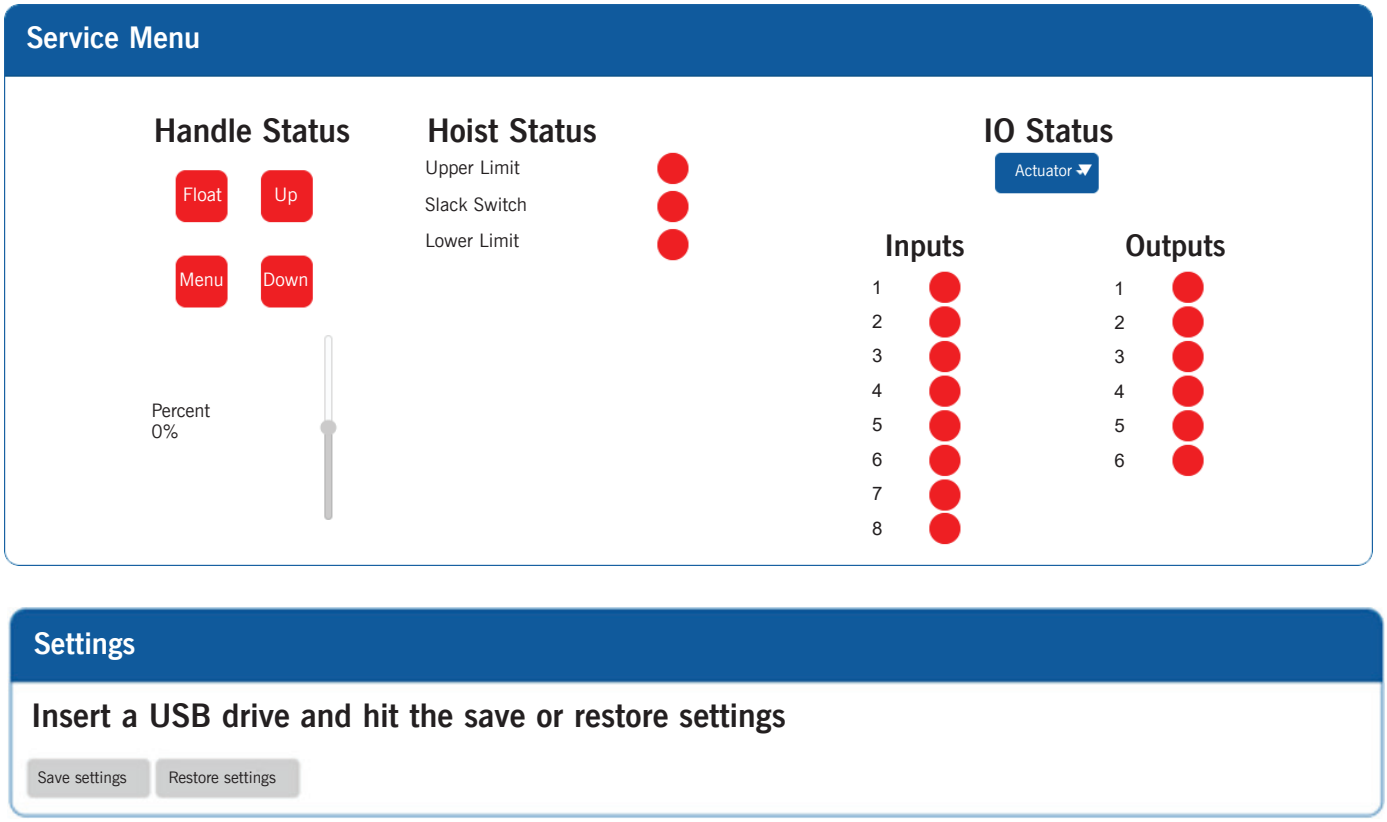


Diagram 4B-49. Service Menu.

3. The parameters you can set on the Service Menu include those shown in **Table 4B-18**:

Parameter	Description
Handle Status	The Float, Up, Menu, and Down indicators will turn **green** if the associated physical handle button is pressed. The slider below these displays the percent and analog value of the handle motion command.
Hoist Status	Displays if the hoist has hit the upper or lower mechanical limits (**not Virtual Limits**), or if the slack detection has been triggered. If any of these are true, the associated indicator will turn green.

Table 4B-18. Service Menu Parameter Descriptions.

Table continued on the next page...

Accessing G-FORCE Settings with Smart Connect, Continued

The Service Menu, Continued

Parameter	Description
IO Status	Displays the on/off status of each IO point of the selected IO Source. If any of the IO points are on, the associated indicator will turn green. Unconfigured IO points will always be displayed as off. To change the IO source, select a new source from the dropdown beneath the “IO Status” header (Actuator, Expansion or Handle).
Save and Restore Settings	Save and restore all user-selected settings to and from a USB drive.

Table 4B-18, **Continued.** Service Menu Parameter Descriptions.

Accessing G-FORCE Settings with Smart Connect, Continued

The Fault Log

The path to the Fault Log is shown in **Diagram 4B-50** in **PURPLE**.

1. Connect to the G-Force through a wired or wireless connection.
2. Log in to the Smart Connect User Interface and select **Fault Log** from the Smart Connect User Interface Splash screen.

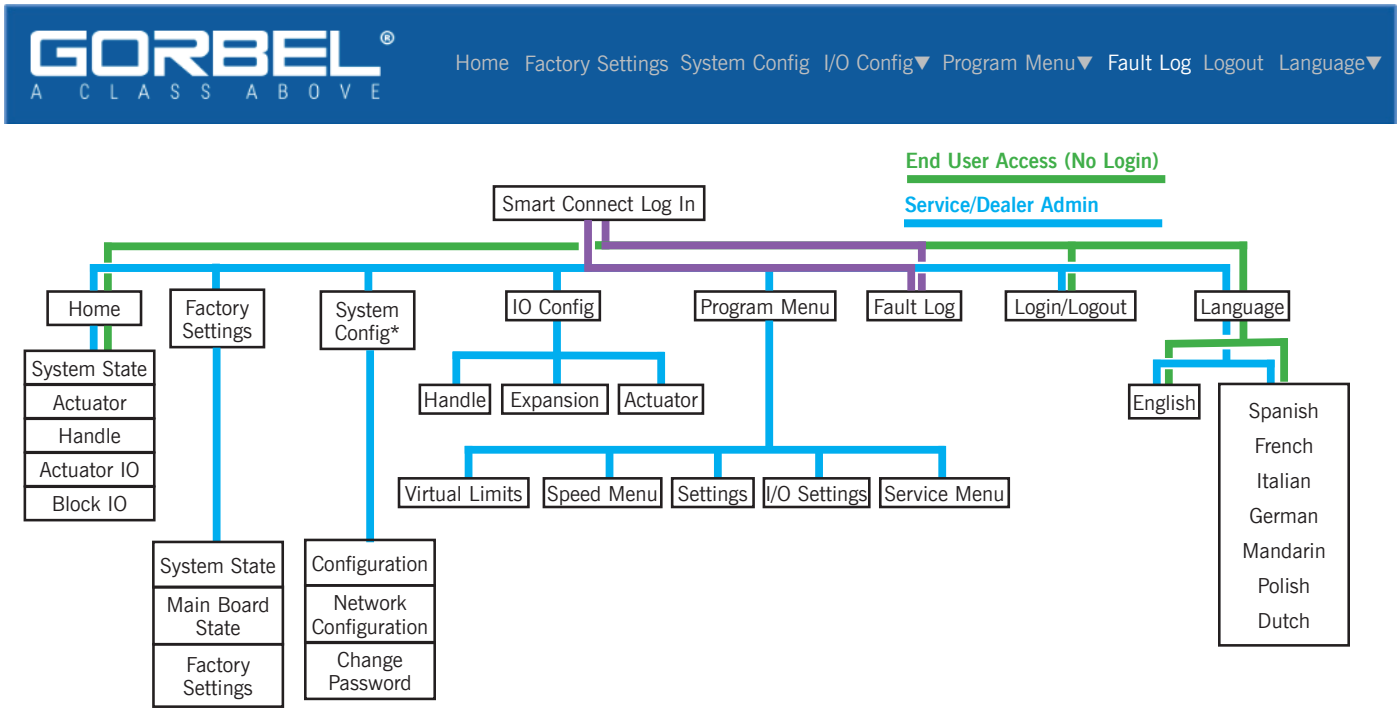


Diagram 4B-50. Fault Log Path.

3. As shown in **Diagram 4B-51**, the Fault Log will display the error code, timestamp, description, and source of the fault.

TIMESTAMP	ERROR CODE	DESCRIPTION	SOURCE
943	1-12	Command Error	Drive
752	1-6	Amp Under Voltage	Drive
1070	1-3	Current Limit	Drive
626	1-9	Motor Over Temp	Drive
1488	1-4	Short Circuit	Drive
1708	2-11	CAN Bus Off	Control Board
377	3-2	Overload	Alarm
163	2-14	Unknown Span	Control Board
2025	1-9	Motor Over Temp	Drive
795	1-16	Following Error	Drive

Diagram 4B-51. Fault Log.

Accessing G-FORCE Settings with Smart Connect, Continued

The Language Menu

The path to the Language Menu is shown in **Diagram 4B-52** in **PURPLE**.

1. Connect to the G-Force through a wired or wireless connection.
2. Log in to the Smart Connect User Interface and select **Language** from the Smart Connect User Interface Splash screen.

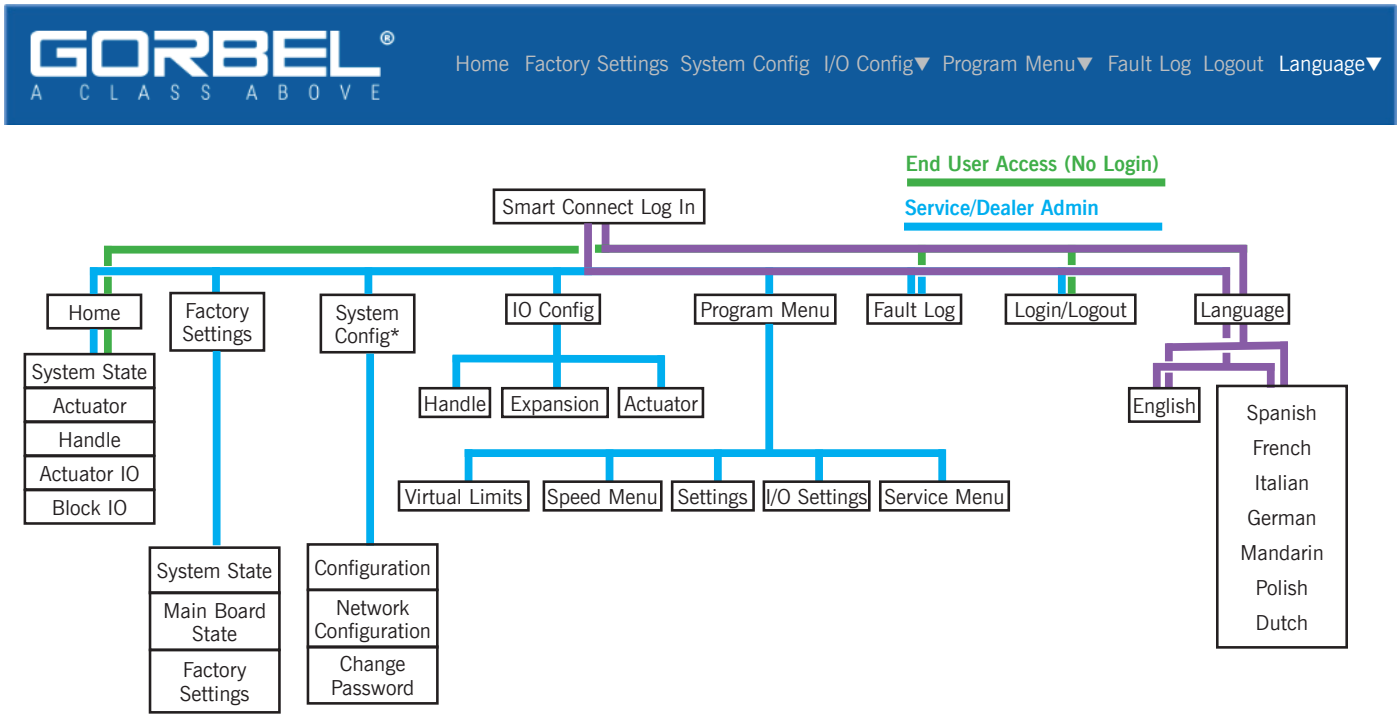


Diagram 4B-52. Language Setting Path.

3. As shown in **Diagram 4B-52**, the available languages are:
   - A. English
   - B. Spanish
   - C. French
   - D. Italian
   - E. German
   - F. Mandarin
   - G. Polish
   - H. Dutch

Section 4C - Program Mode - Slide or Pendant Handle

Accessing G-FORCE Settings Through the Handle Menus

General Navigation

NOTE: For the most efficient initial setup, we recommend that you perform all Program Mode functions to initialize your G-Force through the Smart Connect User Interface. We recommend you use the handles to access Program Mode on an as-needed basis.

To learn more about the Program Mode with the Smart Connect User Interface, see Section 4B - Program Mode with Smart Connect.

Entering Program Mode with the Slide or Pendant Handle Controls

Program Mode is initiated by following the steps below and referring to **Diagram 4C-1** (Slide Handle) or **Diagram 4C-2** (Pendant Handle) for control features.

Entering Program Mode:

1. Press and hold the MENU button for three seconds.
2. After three seconds, release the MENU button. The LED will illuminate amber and **PROGRAM MODE** will be displayed for one second. The display will then indicate **VIRTUAL LIMITS MENU.**
3. Press the MENU NAVIGATION buttons to cycle between menus. The following programmable menus will be available at this level. See Table 4C-1. Main Menu - Submenu Descriptions for additional information:
   - VIRTUAL LIMITS MENU
   - SPEED MENU
   - LANGUAGE SELECTION
   - GENERAL SETTINGS MENU
   - I/O SETTINGS MENU
   - ADVANCED SETTINGS
4. Once you have reached the menu you would like to enter, press the **Menu** button.
5. The first programmable feature in that menu will be displayed. **NOTE**: If you select **Menu** at this level you will activate the functionality to modify this item. To move to the second programmable feature, press the **Menu Navigation** (Up/Down) buttons.
7. The **Menu Navigation** buttons can be used to move from one item to the next, or to toggle between values at a level.
8. When you want to set a value or setting, select the **Menu** button. The display will indicate **Selection Confirmed** and the system returns to standard operation. The display indicates "**Lift Ready**."

NOTE: There is no timeout for Program Mode. The unit will remain in Program Mode until a setting is made, or the BACK button is pressed.

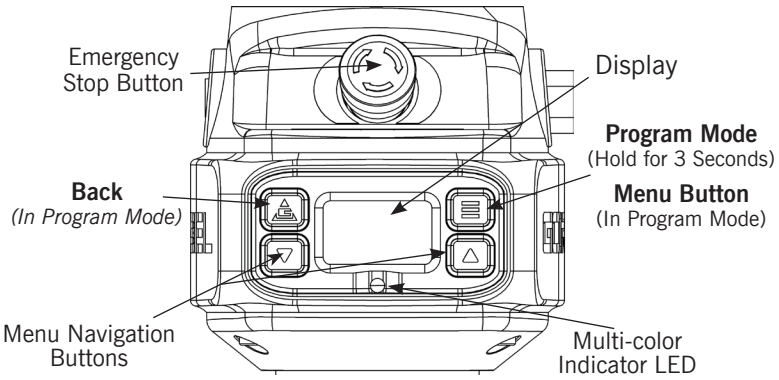


Diagram 4C-1. Slide Handle Buttons.

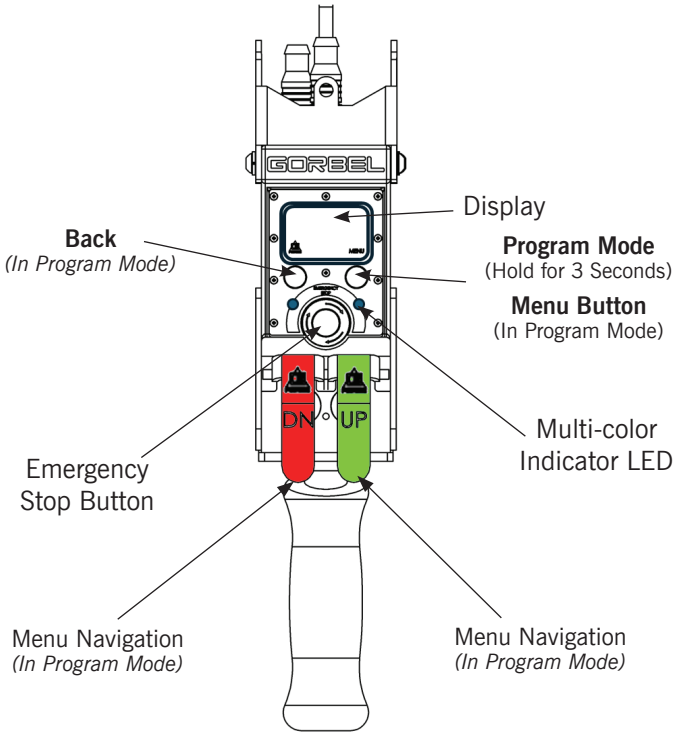


Diagram 4C-2. Pendant Handle Program Mode Controls.

Accessing G-FORCE Settings Through the Handle Menus, Continued

Lockout Feature

The Lockout feature will be enabled in a post-launch version of G-Force firmware. Until that time, no lockout of the Handles is available.

Main Menu - Slide or Pendant Handle

When entering the Program Mode through a Slide or Pendant Handle, the Main Menu (**Diagram 4C-3**) structure is available to access parameters that affect the operation of the G-FORCE unit. They are described in **Table 4C-1.**

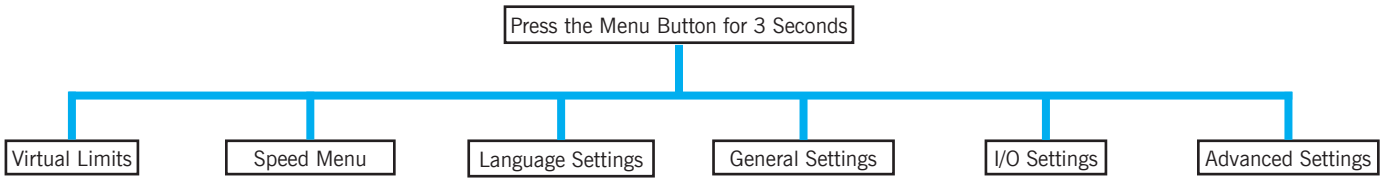


Diagram 4C-3. Slide and Pendant Handle Main Menu.

Main Menu - Submenu Descriptions

Menu	Description
Virtual Limits	Virtual Limits are used to set the Upper Limit and Lower Limit of travel, as well as the Upper and Lower Slow Down hook positions, the Upper Resume hook position, and the Adjust Slow Down Speed. Gorbel® Recommends: The minimum distance between any two virtual limits to be no less than two (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.
Speed Menu	Configure the speed that the hook travels. **NOTE**: An unloaded hook/tool will travel faster than a loaded one.
Language Selection	Enables the selection of the language displayed on the Handle. Choices are English, Espanol, Francais, Italiano, Deutsche, and Zhongwen (Mandarin Chinese).
General Settings	Various settings including FSH Settings (when not using the FSH Shortcut), Response and IP Address.
I/O Settings	Settings for Dual Float Mode Tool, Dual Float Mode Load, Anti-Drop Tool Weight, and Set Auto Home Position.
Advanced Settings	Various settings for Float Mode, Overload Limit, and Overload Sensitivity.

Table 4C-1. Main Menu - Submenu Descriptions

Setting Virtual Limits with the Slide or Pendant Handle

The menu selections available on the Virtual Limits menu are shown in **Diagram 4C-4**, and are outline in **PURPLE.** The parameters for Virtual Limits are described in **Table 4C-2.**

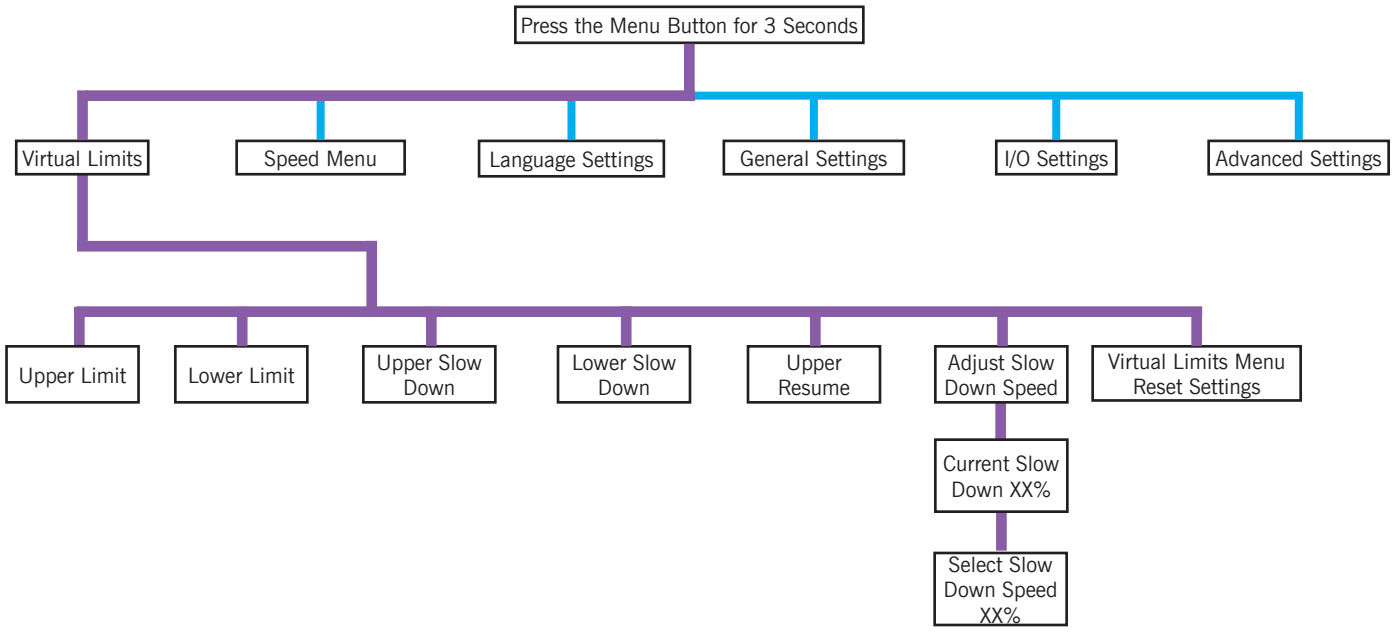


Diagram 4C-4. Virtual Limits Settings.

Parameter	Description
Upper Limit	Sets the upper travel limit for the attached tooling.
Lower Limit	Sets the lower travel limit for the attached tooling.
Upper Slow Down	Sets the point at which the load slows from max speed when moving upward.
Lower Slow Down	Sets the point at which the load slows from max speed when moving downward.
Upper Resume	The load speed increases from the Upper Slowdown speed to the max speed at this position.
Adjust Slow Down Speed	Displays the current slowdown speed, and enables toggling to select new speed as a percentage of Max Speed.
Virtual Limits Menu Reset Settings	Reset all programmed virtual limits in this menu.

Table 4C-2. Virtual Limits Parameter Descriptions.

Setting Virtual Limits with the Slide or Pendant Handle, Continued

Modifying Virtual Limits Settings

Setting the Upper Limit

1. **Position the attached tooling to the desired position**.
2. Navigate to **Virtual Limits>Set Upper Limit**.
3. Select **Menu** button to set.

Setting the Lower Limit

1. **Position the attached tooling to the desired position**.
2. Navigate to **Virtual Limits>Set Lower Limit**.
3. Select **Menu** button to set.

NOTE: Setting the upper and lower virtual limits to the same position will not allow the load to travel in either direction.

Setting Upper Slow Down

1. **Position the attached tooling to the desired position.**
2. Navigate to **Virtual Limits>Upper Slow Down**.
3. Select **Menu** button to set.

Setting Lower Slow Down

1. **Position the attached tooling to the desired position.**
2. Navigate to **Virtual Limits>Lower Slow Down**.
3. Select **Menu** button to set.

Setting Upper Resume

1. **Position the attached tooling to the desired position**.
2. Navigate to **Virtual Limits>Upper Resume**.
3. Select **Menu** button to set.

Adjusting Slow Down Speed

1. Navigate to **Virtual Limits>Adjust Slow Down Speed**.
2. The current **Slow Down Speed** will be displayed
3. Press **Menu** button or the **Down Navigation Button** to access the **Select Slow Down Speed** dialog.
4. Toggle the **Menu** button or the **Up** or **Down Menu Navigation** buttons to select the desired percentage (5-50%) of Max Speed. Select the **Menu** button to set. **NOTE**: Max Speed is set under the Speed Menu.

Resetting Virtual Limit Settings

1. Navigate to **Virtual Limits>Virtual Limit Menu Reset Settings**.
2. Select **Menu** button to reset **ALL** virtual settings to factory default.

Setting Load Speed with the Slide or Pendant Handle

The speed at which the hook travels is set on the Speed Menu shown in **Diagram 4C-5**. The navigation to these parameters is shown in **PURPLE**. They are described in **Table 4C-3**.

NOTE: An unloaded hook will travel faster than a loaded hook.

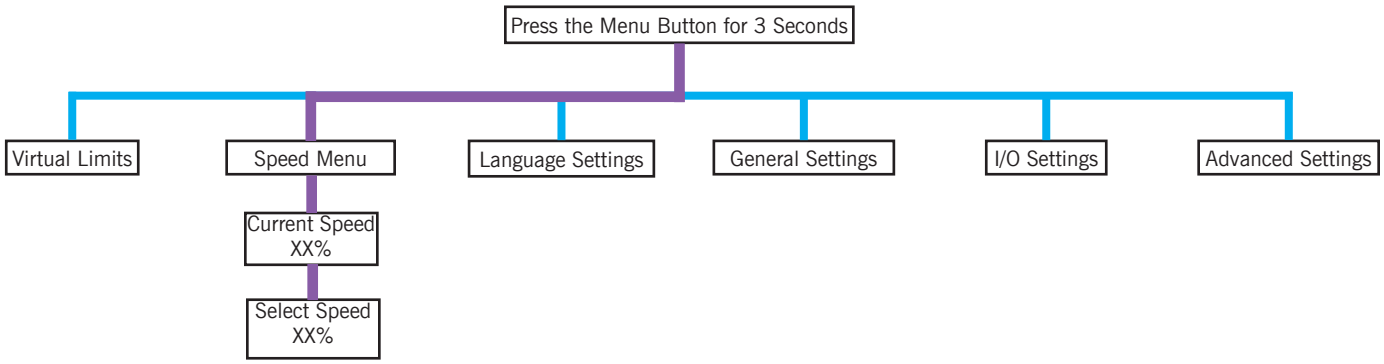


Diagram 4C-5. Speed Parameters.

Parameter	Description
Current Speed XX%	Displays current speed as a percentage of the maximum speed available in the system.
Select Speed XX%	Maximum hoist speed selection with a range of 10 – 100%.

Table 4C-3. Speed Parameter Descriptions.

Modifying Speed Menu Settings

Viewing the Current Speed

1. Navigate to **Speed Menu>Current Speed XX%**.
2. View the current speed.

Setting the Current Speed

1. Use the **Menu** button and **Menu Navigation** buttons to access **Speed Menu Select Speed XX%**.
2. Use the **Menu Navigation** buttons to select the desired percentage of maximum speed. Click on the **Menu** button to set.

Setting Languages with the Slide or Pendant Handle

The language displayed on the Slide or Pendant Handle and the Smart Connect User Interface is set using the Language Settings Menu (**Diagram 4C-6**). Navigation to the Language Settings Menu is shown below in PURPLE. They are described in **Table 4C-4**.

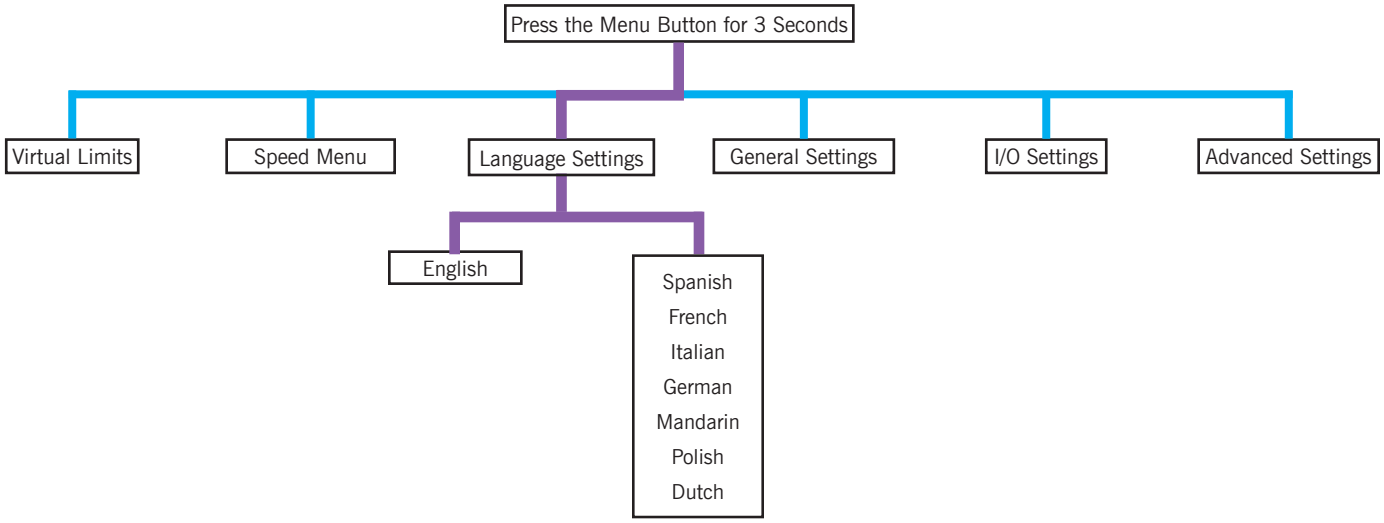


Diagram 4C-6. Language Parameters.

Parameter	Description
English	Sets the language for the Handle and the Smart Connect User Interface to English.
Spanish	Sets the language for the Handle and the Smart Connect User Interface to Spanish.
French	Sets the language for the Handle and the Smart Connect User Interface to French.
Italian	Sets the language for the Handle and the Smart Connect User Interface to Italian.
German	Sets the language for the Handle and the Smart Connect User Interface to German.
Mandarin (Zhogwen)	Sets the language for the Handle and the Smart Connect User Interface to Mandarin Chinese.
Polish	Sets the language for the Handle and the Smart Connect User Interface to Polish.
Dutch	Sets the language for the Handle and the Smart Connect User Interface to Dutch.

Table 4C-4. Language Parameter Descriptions.

Modifying Language Settings

Setting the Language for the Handle and Smart Connect User Interface dialogs

1. Navigate to **Language Settings.**
2. Toggle through the available languages with the **Menu Navigation** buttons and click on the **Menu** button to set.

General Settings for the Slide or Pendant Handle

The General Settings for the G-FORCE are used to set a multitude of parameters for the hoist, and are shown in **Diagram 4C-7**. The path to the parameters available under General Settings are shown below in PURPLE. Descriptions for the these parameters are in **Table 4C-5**.

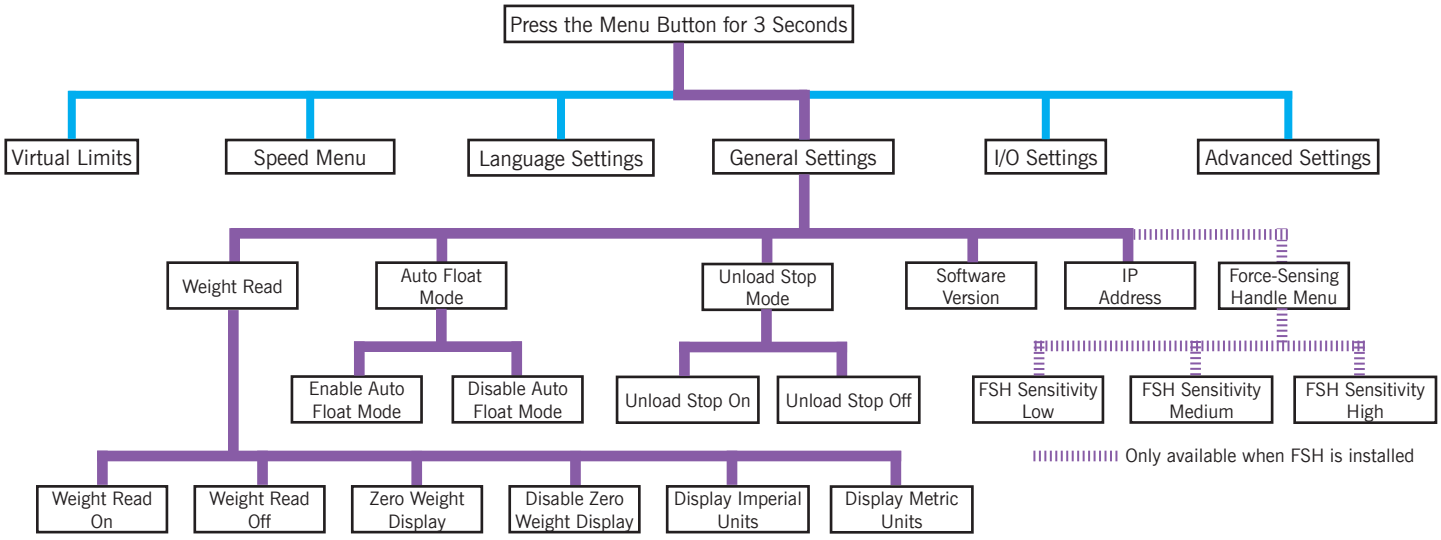


Diagram 4C-7. General Settings Parameters.

Parameter	Description
Weight Read	
Weight Read On	Turns on the weight read feature. If on, the currently observed weight will be displayed on the handle screen.
Weight Read Off	Turns off the weight read feature.
Zero Weight Display	Record and tare (zero) the current lifted weight. The currently lifted weight will display as 0 until the system is re-zeroed, un-zeroed, or power cycled.
Disable Zero Weight Display	Remove the tared weight display value. The display should now give a direct reading of the weight on the line.
Display Imperial Units	Show the weight of the load in pounds.
Display Metric Units	Show the weight of the load in kilograms.
Auto Float Mode	
Enable Auto Float Mode	Turns on Auto Float Mode
Disable Auto Float Mode	Turns off Auto Float Mode
Unload Stop	
Unload Stop On	Turns on Unload Stop Mode. When active and in Float Mode, unloading a tared load will disengage Float Mode.
Unload Stop Off	Turns off Unload Stop Mode.
Software Version	Displays the Software Version of the G-Force. **This is a read-only parameter.**
IP Address	Displays the IP Address of the CPU. When using the Handle, **this is a read-only parameter.**

Table 4C-5. General Settings Parameter Descriptions.

General Settings for the Slide or Pendant Handle, Continued

Parameter	Description
Force-Sensing Handle Menu	Open the submenu for selecting the FSH Sensitivity. The options in this sub menu will only affect performance if a force sensing handle is connected.
FSH Sensitivity Low	Sets the sensitivity of the FSH low
FSH Sensitivity Medium	Sets the sensitivity of the FSH to the default of medium
FSH Sensitivity High	Sets the sensitivity of the FSH high

Table 4C-5, continued. General Settings Parameter Descriptions.

Viewing and Modifying General Settings

Weight Display On

1. Navigate to **General Settings>Weight Read>Weight Read On**.
2. Press the **Menu** button. **NOTE**: The weight will be displayed unless the OPS is blocked.

Weight Display Off

1. Navigate to **General Settings>Weight Read>Weight Read Off**.
2. Press the **Menu** button.

Zero Weight Display

1. Navigate to **General Settings>Weight Read>Zero Weight Display**.
2. Press the **Menu** button. The currently lifted weight will display as 0 until the system is re-zeroed, un-zeroed, or power cycled.

Disable Zero Weight Display

1. Navigate to **General Settings>Weight Read>Disable Zero Weight Display**.
2. Press the **Menu** button. The display will give a direct reading of the weight on the hook.

Display Imperial Units

1. Navigate to **General Settings>Weight Read>Display Imperial Units**.
2. Press the **Menu** button. The display will show the weight in pounds.

Display Metric Units

1. Navigate to **General Settings>Weight Read>Display Metric Units**.
2. Press the **Menu** button. The display will show the weight in kilograms.

Enable Auto Float

1. Navigate to **General Settings>Auto Float Mode>Enable Auto Float Mode**.
2. Press the **Menu** button.
3. Return to **Handle Ready** mode and select the **Float Mode (G-Force logo)** button to enter **Float** mode. The handle will remain in **Float** mode until the **E-Stop** is pressed. If the OPS is blocked, the hoist will enter Handle Mode, but it will revert to Float Mode when the OPS is unblocked.

Disable Auto Float

1. Navigate to **General Settings>Auto Float Mode>Disable Auto Float Mode**.
2. Press the **Menu** button.

Continued on the next page...

General Settings for the Slide or Pendant Handle, Continued

Viewing and Modifying General Settings, Continued

Unload Stop On

1. Navigate to **General Settings>Unload Stop Mode>Unload Stop On**.
2. Press the **Menu** button.

Unload Stop Off

1. Navigate to **General Settings>Unload Stop Mode>Unload Stop Off**.
2. Press the **Menu** button.

Software Version (Read-Only)

1. Navigate to **General Settings>SW Vers** to view this read-only parameter.

IP Address (Read-Only)

1. Navigate to **General Settings>IP ADDR** to view this read-only parameter. **NOTE**:The IP Address can be modified using the Smart Connect User Interface under the Dealer Admin login and the System Config>Network Configuration settings.

I/O Settings for the Slide or Pendant Handle

The I/O Settings for the G-FORCE are used to set parameters for Dual Float Mode Tool and Load, Anti-Drop Weight, and Set Auto Home Position, and are shown in **Diagram 4C-8**. The path to the parameters available under I/O Settings are shown below in **PURPLE**. Descriptions of each are shown in **Table 4C-6**.

NOTE: These menu options are available based on the I/O selections made with the Smart Connect User Interface, and none will appear if there are no I/O points configured. See I/O Config Settings for more information.

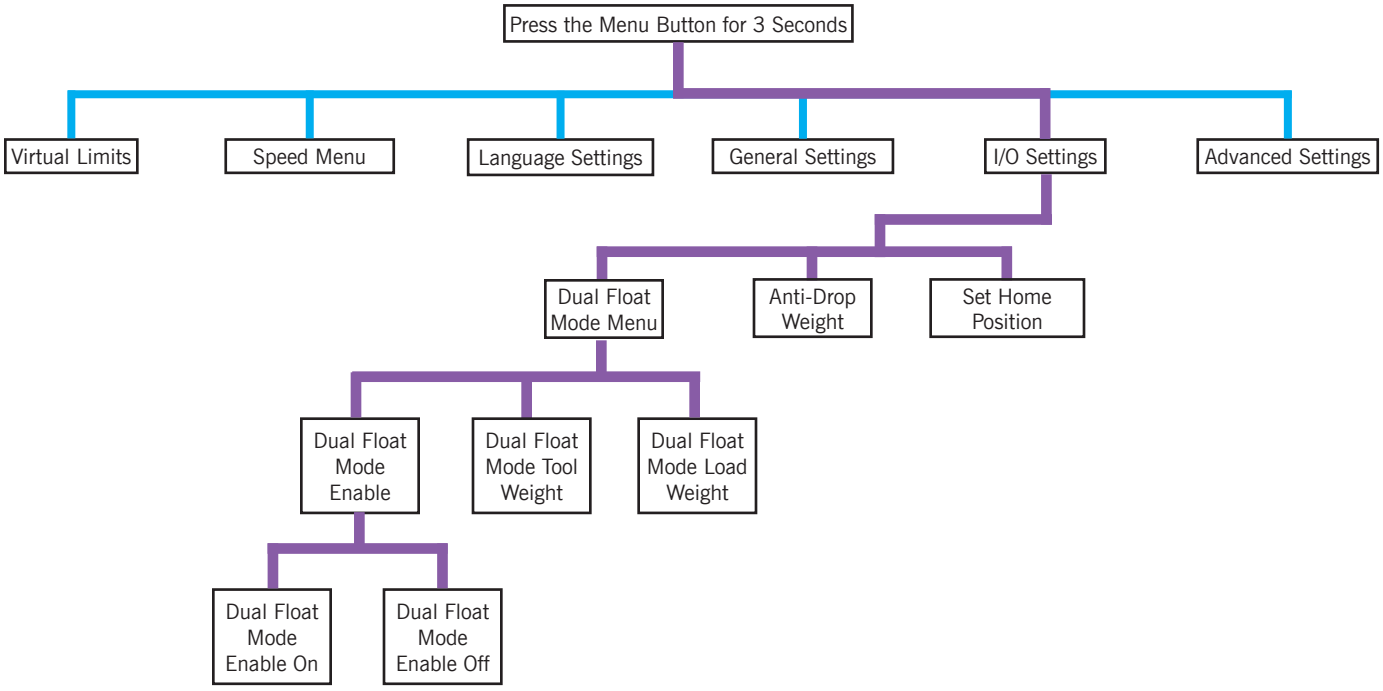


Table 4C-8. I/O Settings Parameters.

Parameter	Description
Dual Float Mode Menu	
Dual Float Mode Enable	Turns Dual Float Mode On or Off
Dual Float Mode Tool Weight	Record tooling weight for Dual Float Mode
Dual Float Mode Load Weight	Record tooling and load weights for the Dual Float Mode
Anti-Drop Weight	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®.
Set Home Position	Program the auto home tracking position (hook/load must be at desired position when setting).

Table 4C-6. I/O Settings Parameter Descriptions.

Continued on the next page...

I/O Settings for the Slide or Pendant Handle, Continued

Modifying I/O Settings

Enabling Dual Float Mode

1. Navigate to **I/O Settings>Dual Float Mode Menu>Dual Float Mode Enable**.
2. From **Dual Float Mode Enable**, select the **Menu** button.
3. Use the **Up/Down Arrows** to select **Dual Float Mode Enable On** or **Off**.
4. Press the **Menu** button to enable **Dual Float Mode** and exit Program Mode.

Setting Dual Float Mode Tool Weight

1. Unload the tooling before determining the weight.
2. Navigate to **I/O Settings>Dual Float Mode Menu>Dual Float Mode Tool Weight**.
3. Press the **Menu** button to read the weight and exit Program Mode.

Setting Dual Float Mode Load Weight

1. Load the tooling before determining the weight.
2. Navigate to **I/O Settings>Dual Float Mode Menu>Dual Float Mode Load Weight**.
3. Press the **Menu** button to read the weight and exit Program Mode.

Setting Anti-Drop Weight

1. Unload the tooling before determining the weight.
2. Navigate to **I/O Settings>Anti-Drop Weight**.
3. Press the **Menu** button to read the weight and exit Program Mode.

Setting Home Position

1. Position the hook to the desired location.
2. Navigate to **I/O Settings>Set Home Position**.
3. Press the **Menu** button to set the position and exit Program Mode.

Advanced Settings for the Slide or Pendant Handle

The Advanced Settings for the G-FORCE are used to set parameters for Float Mode Anti-Recoil, Overload Limit, and Overload Sensitivity, and are shown in **Diagram 4C-9**. The path to the parameters available under Advanced Settings are shown below in **PURPLE**. Descriptions of each are shown in **Table 4C-7**.

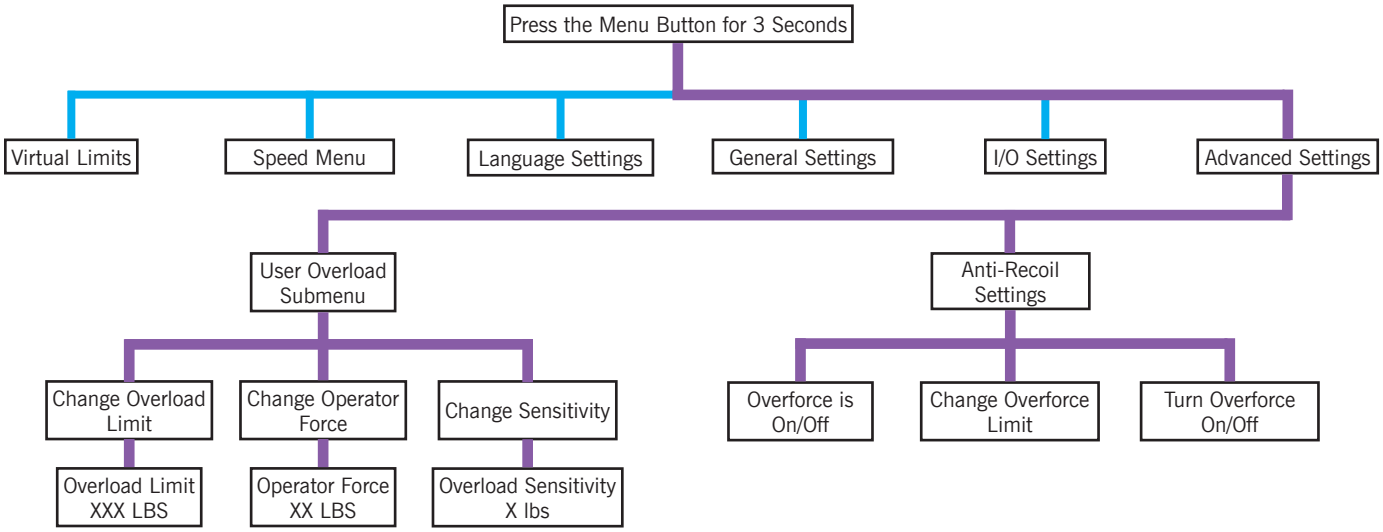


Diagram 4C-9. Advanced Settings Parameters.

Parameter	Description
User Overload Submenu	
Change Overload Limit	Set the maximum load the unit can lift, bounded by the maximum capacity. When selected, the Overload Limit XXX LBS screen is displayed to change the setting.
Change Operator Force	An operator's push and pull force is an extra loading to the system, especially when handle is mounted on the tooling. Reduces the chance of false overload detection for different user's operating force. The limit should not be set larger than necessary as it reduces detection capability. When selected, the Operator Force LBS screen is displayed to change the setting.
Change Sensitivity	Displays the current overload detection sensitivity. The sensitivity can be reduced to prevent false detection when operating a load at no greater than the Overload Limit. When selected, the Overload Sensitivity X LBS screen is displayed to change the setting.
Anti-Recoil Settings	
Overforce is On/Off	Indicates the current status of Overforce (toggles with Turn Overforce On/Off)
Change Overforce Limit	Set Anti-Recoil Over-Force Detection maximum force limit. **NOTE**: Anti-Recoil Over-Force Detection limits increased for 660 lb. units. Limits are between 30 and 90 lbs. at 5 lb. increments.
Turn Overforce On/Off	Turns on Overforce and toggles the state of Overforce On/Off.

Table 4C-7. Advanced Settings General Parameters.

Continued on the next page...

Advanced Settings for the Slide or Pendant Handle, Continued.

Modifying parameters on the User Overload Menu

Change Overload Limit

1. Navigate to **Advanced Settings>User Overload Submenu>Change Overload Limit**.
2. Press the **Menu** button to access the **Overload Limit XXX lbs** field.
3. Use the **Menu Navigation (Up/Down)** buttons to increase or decrease the value in 1 lb increments.
4. Press the **Menu** button to capture the new setting and exit Program Mode.

Change Operator Force

1. Navigate to **Advanced Settings>User Overload Submenu>Change Operator Force**.
2. Press the **Menu** button to access the **Operator Force XX lbs** field.
3. Use the **Menu Navigation (Up/Down)** buttons to increase or decrease the value in 1 lb increments.
4. Press the **Menu** button to capture the new setting and exit Program Mode.

Change Sensitivity

1. Navigate to **Advanced Settings>User Overload Submenu>Change Sensitivity**.
2. Press the **Menu** button to access the **Change Sensitivity X lbs** field.
3. Use the **Menu Navigation (Up/Down)** buttons to increase or decrease the value in 1 lb increments.
4. Press the **Menu** button to capture the new setting and exit Program Mode.

Modifying Anti-Recoil Settings

Overforce is On/Off

1. Navigate to **Advanced Settings>Anti-Recoil Settings>Overforce is On/Off**.
2. The **Overforce On/Off** field is an indicator that is modified in **Turn Overforce On/Off**.

Change Overforce Limit

1. Navigate to **Advanced Settings>Anti-Recoil Settings>Change Overforce Limit**.
2. Press the **Menu** button to access the **Current Overforce** field.
3. Use the **Menu Navigation (Up/Down)** buttons to increase or decrease the value in increments dependent on the rated capacity of the G-Force.
4. Press the **Menu** button to capture the new setting and exit Program Mode.

Turn Overforce On/Off

1. Navigate to **Advanced Settings>Anti-Recoil Settings>Turn Overforce On/Off**.
2. Press the **Menu** button to toggle the Overforce on or off.
3. Press the **Menu** button to capture the new setting and exit Program Mode. The Overforce On/Off field will now indicate the desired condition.

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Section 5 - Troubleshooting

Fault Declaration Overview

Refer to **Diagram 5-1 and 5-2**. The indications of a fault or warning message will appear on the display screen on the G-Force® handle, potentially also with the Multicolor LED on the Slide or Pendant Handle. Faults will also be declared in the Fault Log. If you have an administrator login to the Smart Connect User Interface, additional symptoms of failure may be seen in **Program Mode>Service Menu**.

This Troubleshooting section in this manual will provide procedures for failures that can be deduced from the Slide or Pendant Handle indications, the Fault Log, and the LED on the front panel of the Handles.

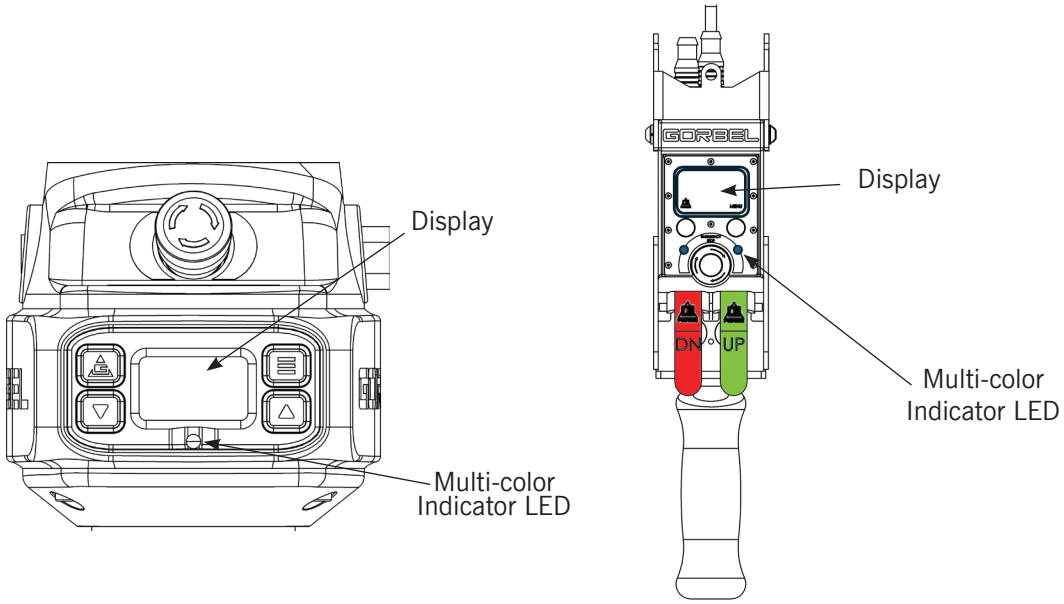


Diagram 5-1. Slide and Pendant Handle Displays and LEDs.

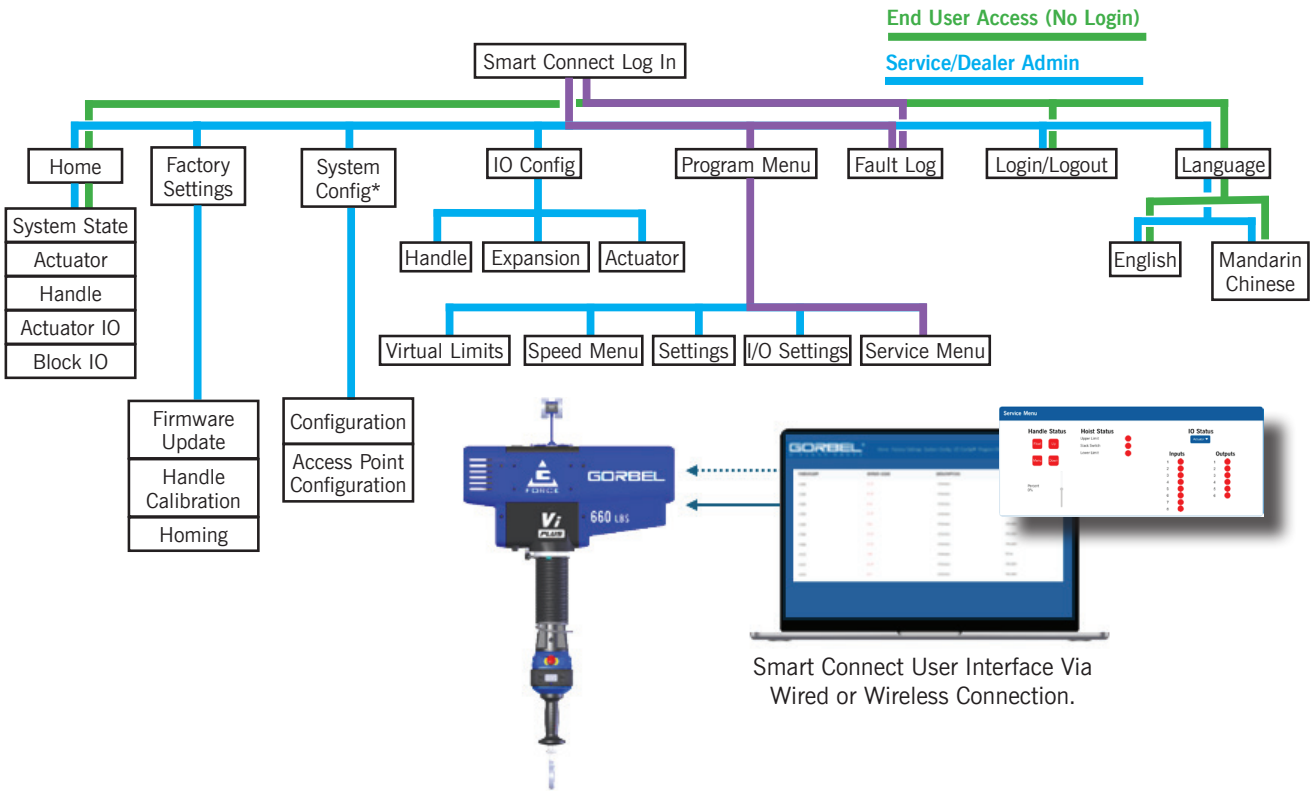


Diagram 5-2. Smart Connect User Interface Fault Log and Service Menu.

Fault Declaration Overview, Continued

Failures that result in LED indications on the Actuator circuit boards are to be managed by a Service Technician. When this occurs, 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. As necessary, check with your Gorbel® distributor or contact Gorbel® After the Sales Service (ATSS) at 800-821-0086 for assistance.

The system fault or warning message can be one of the following:

1. **Faults** - This is the MOST severe event type. This event type does latch, will prevent motor operation, and will require an Operator to correct the active issue(s) before allowing a manual reset. The Fault Message disappears from the Handle Display and no longer shows in the Active Faults List when the cause of the Fault ceases and is Manually Reset. Past Faults can be viewed in the Past Event Log.
   - After correcting the cause of the fault, a Reset operation is achieved by cycling the E-Stop Switch or Mains Power.
   - The Fault Message can be suppressed on the Handle Display by pressing any button on the handle
   - Suppressed messages re-appear in 1 minute if conditions remain unchanged. All Digital Input and Output functions are suspended during a faulted state. Diagnostics will still display the status of the Inputs but will not execute any new Output function or motor operation until the fault is cleared. **NOTE:** the Fault output activates prior to (and resets after) the fault is cleared.
2. **Alarm and Control** - This event type restricts the motion when active and displays a message to an operator via the Handle Display. The A&C Message will be present as long as the cause of the A&C is active.
   - Possible Alarm & Control actions include: Prevent Motion in a direction, Speed Reduction, inhibited I/O functions, etc.
   - Examples include Virtual Limits, and Overload features.
   - The A&C Message can be suppressed on the Handle Display by pressing any button on the handle
   - Suppressed messages re-appear in 1 minute if conditions remain unchanged.
3. **Warnings** - This event type does not latch, nor prevent motor operation, nor require manual resetting. The Warning Message disappears from the Handle Display and no longer shows in the Active Warnings List when the cause of the Warning ceases. Past Warnings can be viewed in the Past Event Log.
   - The Warning Message can be suppressed on the Handle Display by pressing any button on the handle.
   - Suppressed messages re-appear in 1 minute if conditions remain unchanged.
   - Does not impact I/O functionality
4. **Notifications** - This event type does not latch, nor prevent motor operation, nor require manual resetting. For informational purposes only.
   - Possible Notifications include: Notice: Service Due!

Recovery from any of these faults 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.**

Initial Troubleshooting

In some instances, you will be able to successfully troubleshoot the G-Force, and in some, you will have to call a technician, or Gorbel After the Sale Service (ATSS). For either situation, the best course of action is to gather a well-organized set of symptoms that will enable you or a service provider to quickly understand the problem and offer a solution.

Use Table 5-1 below to organize what you've observed, and note that in some instances the information in the this Troubleshooting section will provide the information you need to clear the problem. When these procedures do not resolve the problem, make this information available to the service team.

Failure Symptom Gathering

When gathering system failure symptoms, always be as complete as possible, and include the following in your understanding of G-Force operation:

- How did the G-Force exhibit failure?
- Did it fail in the middle of an operation?
- Were there any unusal sounds that accompanied the failure?
- Is the E-Stop disengaged? If it is engaged, reset it by turning it carefully clockwise (don't pull the E-Stop!).
- Was main power to the G-Force interrupted?
- Refer to Table 5-3. Is the Multi-color LED on the Slide or Pendant Handle lit? If yes, what is the color?
- Does the screen on the Slide or Pendant Handle display a Fault Code? If yes, refer to 5-4 to 5-6.
- Do you have wired or wireless access to the Smart Connect User Interface? If yes, record any Fault Codes observed in the Fault Log. This can be done without login.
- Can you log in as Admin on the Smart Connect User Interface? If yes, access the Program Menu and Service Menu. Refer to The Service Menu, and test the applicable functions of the G-Force, including Handle Status, Hoist Status and I/O Status.

Observed G-Force Behavior	Fault Codes or LED Indication (Refer to Table 5-3 to 5-6)	Additional Details

Table 5-1. G-Force Failure Symptom Gathering.

Continued on the next page...

Failure Modes, Fault Codes and Handle LEDs

Use the **Tables 5-2** to **5-7** to continue to gather failure symptoms. Use the information in the tables to resolve the failure. **If the listed solutions do not correct the problem, Contact you local authorized Gorbel Dealer or call for Gorbel support at (800) 821-0086.**

Failure Mode Analysis

ELECTRICAL SHOCK HAZARD!
There is a potential for **electric shock**, which can cause **serious injury or death**. These troubleshooting procedures must only be conducted by trained and qualified personnel.

Failure	Possible Solution
There is no display on the display 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 screen on the handle.	• Clear the fault condition per the instructions on the display. • 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 Table 5-3.
The unit will not raise or lower the load.	• Make sure you are in the RUN MODE. • Check the virtual limits settings and recheck. • 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.
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, for maximum speed of G-Force® Float Mode. • Check that the blue LED on the handle is illuminated. • Check to see if the display 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 display screen. • Verify the bridge capacity. Check for excessive deflection in the bridge. • Check for obvious interference with the coil cord or handle.

Table 5-2. G-Force Failure Modes.

Continued on the next page...

Failure Modes, Fault Codes and Handle LEDs, Continued

Failure Mode Analysis, Continued

Failure	Possible Solution
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.
Handle Display Stuck at Three Bouncing Loading Dots	The handle has reverted to an awaiting state due to an issue preventing normal operation. Either the system failed to complete its start-up sequence correctly (if seen immediately after a system power up), an issue with the connection between the handle and the rest of the unit has occurred, or there is a missmatch in software versions between components. Perform the following steps: 1. Using the Smart Connect User Interface, access Factory Settings. 2. Ensure that the software on all the system components is up to date. 3. If this issue happens immediately after start-up, check the cable connections to the Drive. Also check the connection of the Coil Cord (Cable As. 90059).

Table 5-2, Continued. G-Force Failure Modes.

Failure Modes, Fault Codes and Handle LEDs, Continued

LED States and Handle Display Indications

Table 5-3 provides information on the multicolored LED located on the front of the Slide Handle and the Pendant Handle. This information is to be added to any other symptoms to help determine corrective actions.

Machine State	Sub-State	LED Color	Sequence	Handle Display
Pre-Operational	Startup/Diagnostics	White	Steady	POWERED ON COMMUNICATION INITIALIZING
	Ready Mode	Yellow	Steady	LIFT READY
	Standby	No Illumination		
Run Mode	Handle	Green	Steady	RUN MODE HANDLE
	Float	Blue	Steady	RUN MODE FLOAT
	Jog Override	Green	Steady	RUN MODE JOG
	Automation Mode	Green	Steady	AUTO HOMING
Program Mode	Handle Menu	Yellow	Steady	PROGRAM MODE
	HMI Menu	Yellow	Steady	HMI MODE
Error/Alert Mode	Fault	Red	Steady	ACTUATOR ERROR #-# DRIVE ERROR #-#
	Alarm and Control	Yellow	Steady	UPPER LIMIT ANTI_RECOIL OVERFORCE TRIPPED MOTION INHIBITED
	Warning	Yellow	Steady	ACTUATOR WARNING #-#
	Notice	White	Steady	SERVICE DUE
	Emergency Stopped	Red	Steady	E-STOP ENGAGED

Table 5-3. LED States and Handle Display Indications.

Failure Modes, Fault Codes and Handle LEDs, Continued

Handle Display Indications - Drive Errors

Tables 5-4 through **5-6** provide information on any Drive Errors, Actuator Errors, and Actuator Alarms and Warnings. Use this information to continue to gather fault symptoms to troubleshoot or to provide to Gorbel After the Sale Service.

Error	Error Code	Fault Occurs When...	Fault is Corrected When...
Feedback Error	DRIVE ERROR 1-2	Over current condition detected on the output of the internal +5 VDC supply used to power the feedback, or encoder not connected or signal levels out of tolerance.	Encoder power returns to specified voltage range. Feedback signals stay within specified levels.
Over Current	DRIVE ERROR 1-3	Output current I^2T limit has been exceeded. Excessive friction in drive train, Duty rating exceeded.	G-Force is reset and re-enabled.
Short Circuit Detected	DRIVE ERROR 1-4	Output to output, output to ground, or internal PWM bridge fault.	Short circuit has been repaired.
Over Voltage	DRIVE ERROR 1-5	Drive DC Bus voltage exceeds specified voltage.	+DC bus voltage returns to specified voltage range.
Under Voltage	DRIVE ERROR 1-6	Drive DC Bus voltage falls below specified voltage. This fault can also be found in the Smart Connect UI Fault Log after a power cycle. This is only a concern if it happens during normal operation.	+DC bus voltage returns to specified voltage range.
Voltage Limit	DRIVE ERROR 1-7	Drive DC Bus voltage is fully utilized.	+DC bus voltage returns to specified voltage range.
Drive Over Temperature	DRIVE ERROR 1-8	Drive's internal temperature exceeds specified temperature.	Drive Power module temperature falls below specified temperature.
Motor Over Temperature	DRIVE ERROR 1-9	Motor over temperature switch changes state to indicate an overtemperature condition.	Temperature switch changes back to normal operating state.
Miscellaneous	DRIVE ERROR 1-10	The drive encountered a generic fault.	Listen for scraping sounds during motion. Check the Drive 24V Brake Cable (90071). Check the cable connections to the Drive. Reset and reenable the G-Force.
Command Error	DRIVE ERROR 1-12	The drive lost connection to the control board.	Ensure Drive CAN cable (90075) is connected properly.
Motor Phasing Error	DRIVE ERROR 1-13	Encoder-based phase angle does not agree with internal setting.	Encoder based phase angle is corrected.
Following Error	DRIVE ERROR 1-16	Encoder error threshold exceeded.	Check the Drive 24V Brake Cable (90071). Check the cable connections to the Drive. Reset and reenable the G-Force.
Position Wrap	DRIVE ERROR 1-17	Drive's internal position counter wrapped around.	G-Force® is reset, and re-enabled and home position is re-set.
Node Guard Error	DRIVE ERROR 1-18	Drive's CAN heartbeat connection to control board was lost.	Check the CAN bus cable (90075) connections on the control board and drive.

Table 5-4. Drive Error Indications.

Failure Modes, Fault Codes and Handle LEDs, Continued

Handle Display Indications - Actuator Errors

Error	Error Code	Description	Solution
Bad State	ACTUATOR ERROR 2-2	The control board has encountered an error and needs to stop all motion.	E-Stop cycle, then power cycle if issue remains.
Missed Tick	ACTUATOR ERROR 2-3	The control board skipped a time sensitive safety check and needs to stop all motion.	E-Stop cycle, then power cycle if issue remains.
Internal CAN Error	ACTUATOR ERROR 2-4	Communication Error. The Drive CAN Cable (90075) may have poor/no connection.	Check the CAN bus cable connections between the Control board and Drive (90075). E-Stop cycle, then power cycle if issue remains.
CAN Overflow Error	ACTUATOR ERROR 2-5	Communication Error.	Check the CAN bus cable connections on the Control board and Drive. (Cables 90059 and 90075) E-Stop cycle, then power cycle if issue remains.
CAN Watchdog Error	ACTUATOR ERROR 2-6	Communication Error.	Check the CAN bus cable connections on the Control board and Drive.(Cables 90059 and 90075) E-Stop cycle, then power cycle if issue remains.
CAN Protocol Arb. Error	ACTUATOR ERROR 2-7	Communication Error. The Drive CAN Cable (90075) may have poor/no connection.	Check the CAN bus cable connections on the Control board and Drive. (Cables 90059 and 90075) E-Stop cycle, then power cycle if issue remains.
CAN Protocol Data Error	ACTUATOR ERROR 2-8	Communication Error.	Check the CAN bus cable connections on the Control board and Drive. (Cables 90059 and 90075) E-Stop cycle, then power cycle if issue remains.
CAN Reserved Address Error	ACTUATOR ERROR 2-9	Communication Error.	Check the CAN bus cable connections on the Control board and Drive. (Cables 90059 and 90075) E-Stop cycle, then power cycle if issue remains.
CAN Passive Change Error	ACTUATOR ERROR 2-10	Communication Error. The Drive CAN Cable (90075) may have poor/no connection.	Check the CAN bus cable connections between the Control board and Drive (Cable 90075). E-Stop cycle, then power cycle if issue remains.

Table 5-5. Actuator Error Indications.

Continued on the next page...

Failure Modes, Fault Codes and Handle LEDs, Continued

Handle Display Indications - Actuator Errors, Continued

Error	Error Code	Description	Solution
CAN Bus Off	ACTUATOR ERROR 2-11	Communication Error.	Check the CAN bus cable connections on the Control board and Drive (Cable 90075) E-Stop cycle, then power cycle if issue remains.
Unknown Handle	ACTUATOR ERROR 2-12	The handle itself is not detected, or the handle type is undetected.	Ensure the coil cord (Cable 90059) is inserted all the way and screwed in on both ends. Review 90409 G-FORCE SOFTWARE FIELD UPGRADE and ensure Handle software is up to date. Power Cycle the unit.
Unknown Capacity	ACTUATOR ERROR 2-13	The rated weight capacity of the unit is not detected.	E-Stop cycle, then power cycle if issue remains.
Unknown Span	ACTUATOR ERROR 2-14	The span of the crane arm, or lack thereof, is not detected.	E-Stop cycle, then power cycle if issue remains.
Unknown Machine Type	ACTUATOR ERROR 2-15	The condition of the unit being an Easy Arm vs. standard G-Force is undetected.	E-Stop cycle, then power cycle if issue remains.
Machine Not Tuned	ACTUATOR ERROR 2-16	No motion profile is detected for the unit.	E-Stop cycle, then power cycle if issue remains.
Unexpected Drive FW Version	ACTUATOR ERROR 2-17	The drive's firmware is different than the control board software expects.	Ensure all system software is up to date. Review 90409 GFORCE SOFTWARE FIELD UPGRADE for software update instructions.
Dual Float Weight Failure	ACTUATOR ERROR 2-18	The tared dual float weights are too close together or too light.	Adjust load and tare Dual Float Load and Tool weight again
Drive Disabled in Active State	ACTUATOR ERROR 2-19	The drive was disabled while the load was moving	Check the connection of the Drive IO Cable (90061) and the Drive STO cable (90067). E-Stop cycle, then power cycle if issue remains.
Drive Brake in Active State	ACTUATOR ERROR 2-20	Drive brake is active while load is moving.	Check the connection of the Drive IO Cable (90061) and the Drive STO cable (90067) E-Stop cycle, then power cycle if issue remains.
STO Fault without EStop	ACTUATOR ERROR 2-21	Drive STO is inconsistent with E-Stop button.	Check the connection of the Drive IO Cable (90061) and the Drive STO cable (90067). When reconnecting the Drive STO Cable, a 1-10 error may occur. This is normal and should clear with an E-Stop Cycle. E-Stop cycle, then power cycle if issue remains.

Table 5-5, Continued. Actuator Error Indications.

Continued on the next page...

Failure Modes, Fault Codes and Handle LEDs, Continued

Handle Display Indications - Actuator Errors, Continued

Error	Error Code	Description	Solution
Invalid Handle Calibration	ACTUATOR ERROR 2-22	A connected handle is not calibrated or has just been attached to a new unit.	Calibrate the handle, then E-Stop cycle.
OPS Active During Initialization	ACTUATOR ERROR 2-23	The Operator Presence Sensor was activated during the Initialization phase of either startup or immediately after releasing the E-Stop. In rare circumstances this error may be caused by an issue with the Drive IO Cable.	Always wait to move the unit until the Handle display says “LIFT READY.” Release the handle’s motion inputs (Slide, Pendant Paddles, Force Sensor) then E-Stop cycle. If fault does not clear, check the connection of the Drive IO cable (90061).
Unexpected Dual Handle Setup	ACTUATOR ERROR 2-24	There is an issue with one or both handles in a dual handle setup. Or The attached handle is configured as a dual handle when it shouldn’t be.	Call After the Sale Service at (800) 821-0086. Ref. Document 90405 for Dual Handle diagnostics.

Table 5-5, Continued. Actuator Error Indications.

Failure Modes, Fault Codes and Handle LEDs, Continued

Handle Display Indications - Actuator Alarms and Warnings

Alarm/Warning	Alarm/Warning Code	Description	Motion Prevented	Solution
Overload Alarm	ALARM LIFT OVERLOAD	The system has detected a load that exceeds the rated (or derated) maximum capacity of the unit.	Upward	Reduce the weight of the load to within the rated range. If the weight of the load should be within the rated range, contact support for assistance.
Home Position Not Set	ACTUATOR ALARM 3-3	The home position of the actuator is the position in which the hardware upper limit is triggered. The control board software needs to be told where this position is.	None	E-Stop cycle and power cycle the actuator. If the warning persists, refer to **I/O Settings using the Handle Menus, or the Smart Connect User Interface** to calibrate the Home Position.
Load Cell Not Calibrated	ACTUATOR ALARM 3-4	The load cell was not calibrated.	None	Contact Gorbel ATSS
Upper Limit	UPPER LIMIT	The hook has reached the highest position to which it can travel.	Upward	Move the hook downward
Lower Limit	LOWER LIMIT	The hook has reached the lowest position to which it can travel.	Downward	Move the hook upward
Slack	SLACK DETECTED	Slack in the wire rope	Downward	Provide downward force on the hook so the wire rope is taut.
Virtual Upper Limit	UPPER LIMIT	The hook has reached the Virtual Upper Limit position.	Upward	Move the hook downward, change the Virtual Upper Limit position, or disable it.
Virtual Lower Limit	LOWER LIMIT	The hook has reached the Virtual Lower Limit position.	Downward	Move the hook upward, change the Virtual Lower Limit position, or disable it.
Virtual Limit Upper Slowdown	UPPER SLOW DOWN	The hook has reached the Virtual Upper Slow Down position.	Upward speed reduced	Move the hook through the slow down, change the Virtual Limit Upper Slow Down position, or disable it.
Virtual Limit Lower Slowdown	LOWER SLOW DOWN	The hook has reached the Virtual Lower Slow Down position.	Downward speed reduced	Move the hook through the slow down, change the Virtual Limit Lower Slow Down position, or disable it.
Inhibit Motion	MOTION INHIBITED	The Inhibit Motion Input is active.	All Motion	Check I/O Settings to see if the Inhibit Motion input is active.
Inhibit Motion Up	MOTION INHIBITED UP	The Inhibit Motion Up Input is active.	Upward	Check I/O Settings to see if the Inhibit Motion Up input is active.
Inhibit Motion Down	MOTION INHIBITED DOWN	The Inhibit Motion Down Input is active.	Downward	Check I/O Settings to see if the Inhibit Motion Down input is active.

Table 5-6. Actuator Alarms and Warnings.

Continued on the next page...

Failure Modes, Fault Codes and Handle LEDs, Continued
Handle Display Indications - Actuator Alarms and Warnings, Continued

Alarm/Warning	Alarm/Warning Code	Description	Motion Prevented	Solution
Anti-Recoil Overforce	ANTI-RECOIL OVERFORCE TRIPPED	The Actuator detected a force greater than the Anti-Recoil Overforce limit.	Float Mode Exited	Prevent large forces from being exerted on the load while in Float Mode. To modify Overforce settings, go to **Advanced Settings** (Handle Menu), or **Program Menu>Settings** (Smart Connect User Interface) to change or disable the Anti-Recoil Overforce settings.
Anti-Recoil Overspeed	ANTI-RECOIL OVERSPEED TRIPPED	The load traveled at a speed faster than the AntiRecoil Overspeed limit while in Float Mode.	Float Mode Exited	Prevent the load from traveling too fast while in Float Mode. The AntiRecoil Overspeed safety feature cannot be turned off.
Unload Stop	UNLOAD STOP TRIPPED	The actuator detected an unloaded condition while in Float Mode.	Float Mode Exited	Go to **Program Menu>Settings** (Smart Connect User Interface) to turn of the Unload Stop setting.
Dual Float Disabled while Active	DUAL FLOAT DISABLED	Dual Float Mode was disabled while the Actuator was in Float Mode.	Float Mode Exited	Do not disable the Dual Float Mode feature while the unit is in Float Mode.
Low Float Mode Tare Mass	LOW TARE	Tare mass was too low to enter Float Mode	Float Mode Exited	Increase the load to be able to enter Float Mode.
Dual Float Lag	DUAL FLOAT MODE SWITCH LAGGING	During a Dual Float mode weight switch, the load measurement did not stabilize.	Float Mode Exited	Ensure the Dual Float Tool and Load weight tares are accurate.

Table 5-6, Continued. Actuator Alarms and Warnings.

Section 6 - Technical Specifications

G-FORCE Vi Plus Actuator					
Max Capacity	**lb [kg]**	**165 [75]**	**330 [150]**	**660 [300]**	**1320 [600]**
Max Lift Speed Unloaded	**ft/min [m/min]**	195 [59]	95 [29]	45 [14]	25 [8]
Max Lift Speed Fully Loaded	**ft/min [m/min]**	120 [37]	60 [18]	40 [12]	20 [6]
Max Float Mode Lift Speed	**ft/min [m/min]**	110 [34]	55 [17]	40 [12]	20 [6]
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		Single Phase 220 VAC +/- 10%			
Max Current		6 Amps			
Duty Cycle		H5	H5	H4	H3
Available Tooling Power		24 VDV @ 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**	41-104° [5-40°]			
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 (Vi Plus Model)					
Inputs, Type		8, Sinking			
Input Current @24VDC		3ma			
Outputs, Type		4, Sourcing			
Continuous Current/Channel		0.15 amps			
Module Max Current		0.5 amps			
Outputs, Type		2, Relay			
Continuous Current/Channel		0.5 amps			
Rated Relay Voltage		24 VAC/VDC			

Table 6-1. Technical Specifications.

Continued on the next page...

Technical Specifications, Continued

G-FORCE Vi Plus Actuator	
Handle with I/O Module (Vi Plus Model)	
Inputs, Type	8, Sinking
Input Current @24VDC	3mA
Outputs, Type	6, Sourcing
Continuous Current/Channel	0.5 amps
Module Max Current	0.5 amps
Handle with Standard I/O (Vi Model)	
Inputs, Type	2, Sinking
Input Current @24VDC	60mA
Outputs, Type	2, Sourcing
Continuous Current/Channel	0.5 amps
Module Max Current	0.5 amps

Table 6-1, Continued. Technical Specifications.

Section 7 - Inspection, Adjustment, Maintenance and Replacement

Perform the procedures in this section to inspect, adjust, maintain the G-Force, and replace components found to be faulty.

WARNING

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

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 display screen.	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. Ensure 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.

Table 7-1. Inspection and Maintenance Schedule.

Recommended Tools & Spare Parts Kits

The following is a list of recommended Spare Parts Kits. You are encouraged to have spare parts on hand to limit the potential downtime if your unit becomes inoperable for any reason. To order any of these kits, please contact your authorized Gorbel® distributor.

To order kits, you will need your system's specifications, including 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* Assembly

Level Two Kit contains:

One Wire Rope Assembly One Coil Cord* Assembly One Hardware Kit

Level Three Kit contains:

One Wire Rope Assembly One Coil Cord* Assembly One Hardware Kit

One Swivel Kit**

* A pendant cable will be substituted here for systems that do not utilize Coil Cords.

** 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.

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

TOOL NAME	SIZES
Metric Allen Wrenches (T-Type, 230mm length 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 (ratcheting type), 17mm, 19mm, 24mm
Lock Ring Pliers	Small and Medium
Screwdrivers (Flat and Phillips head)	Smaller precision type
Long nose pliers	8 inch is typical

Table 7-2. Tools and Sizes.

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 7-1**).
   - 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.

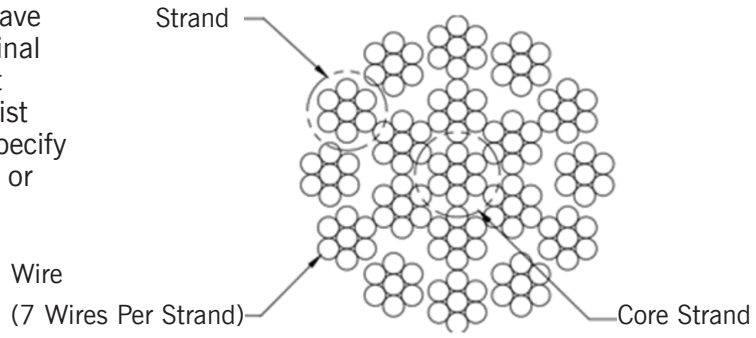


Diagram 7-1. 19x7 Preformed Wire Rope Composition

Wire Rope Replacement

Wire Rope Removal

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

1. Ensure the replacement rope is the same length and diameter (3/16" or ¼") as rope currently on the actuator.
   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.
      1. **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.
      2. **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 parts.
4. Unspool rope from drum using Jog Down button while keeping tension on wire rope with other gloved 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 on the right side (**Diagram 7-2**) This will keep the slack switch disengaged while jogging down the remainder of the rope.
6. Observe the **Lower Limit Switch** shown in **Diagram 7-3**.

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

7. Refer to **Diagram 7-3**. Using a long screwdriver or hex wrench, locate the spring-loaded upper **Socket Head Cap Screw** below the **Lower Limit Switch**. With your right hand, push the screw in until it cannot move further. Keep pressure on it (**Diagram 7-3**).
8. Using your left 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.

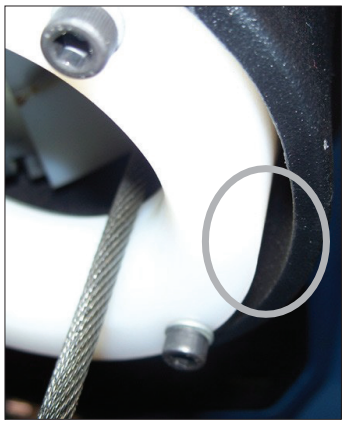


Diagram 7-2. Insert screwdriver between the white wear ring and the actuator casting where the rope exits the actuator.

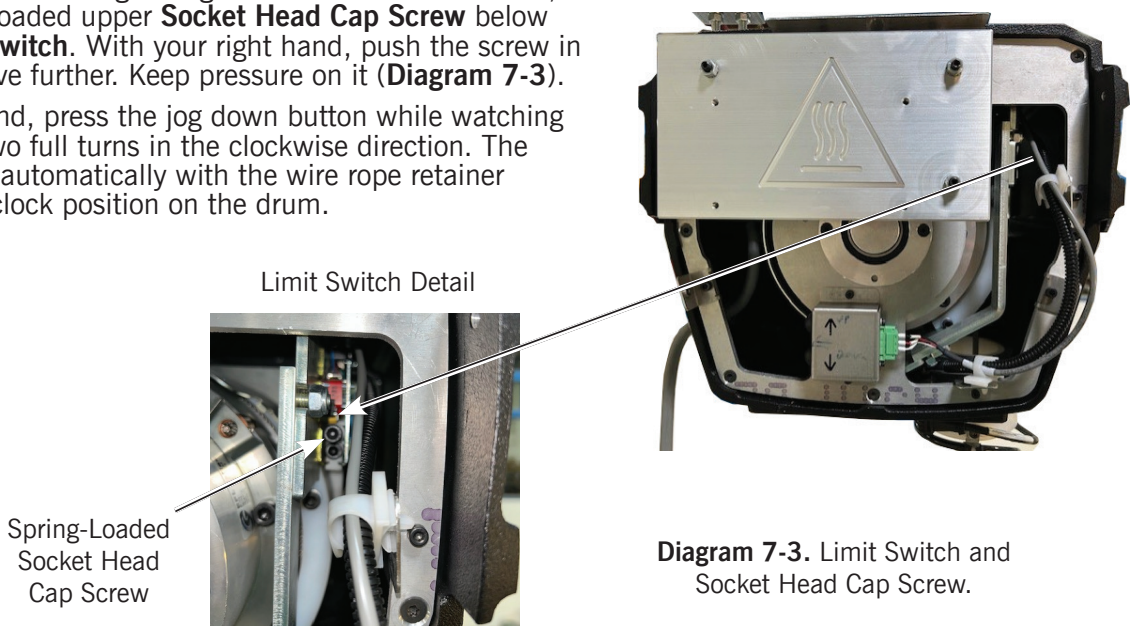


Diagram 7-3. Limit Switch and Socket Head Cap Screw.

Wire Rope Replacement, Continued

Wire Rope Removal, Continued

9. For 330 lb. (150kg) and 660 lb. (300kg) units only: Using 13mm open-end wrench, loosen, **do not remove**, the two Flange Nuts and remove Reinforcement Bracket (**Diagram 7-4**).
10. Refer to **Diagram 7-5**. Using an M5mm hex wrench, remove two **Drum Gate Cap Screws** from the **Drum Gate**. Slide the Drum Gate out toward you. Place gate and hardware in the cover.
11. Refer to **Diagram 7-5**. Using an M6mm hex wrench, remove the two **Rope Retainer Cap Screws** from the **Rope Retainer** and slide retainer off of rope end towards you. Set retainer and screws in front cover.
12. 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.

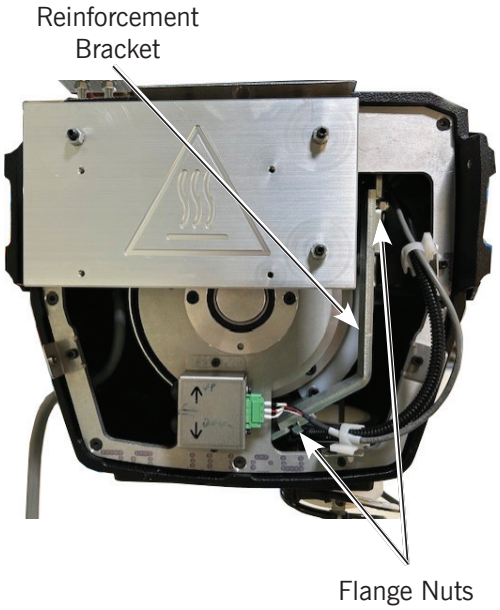


Diagram 7-4. Flange Nuts and Reinforcement Bracket.

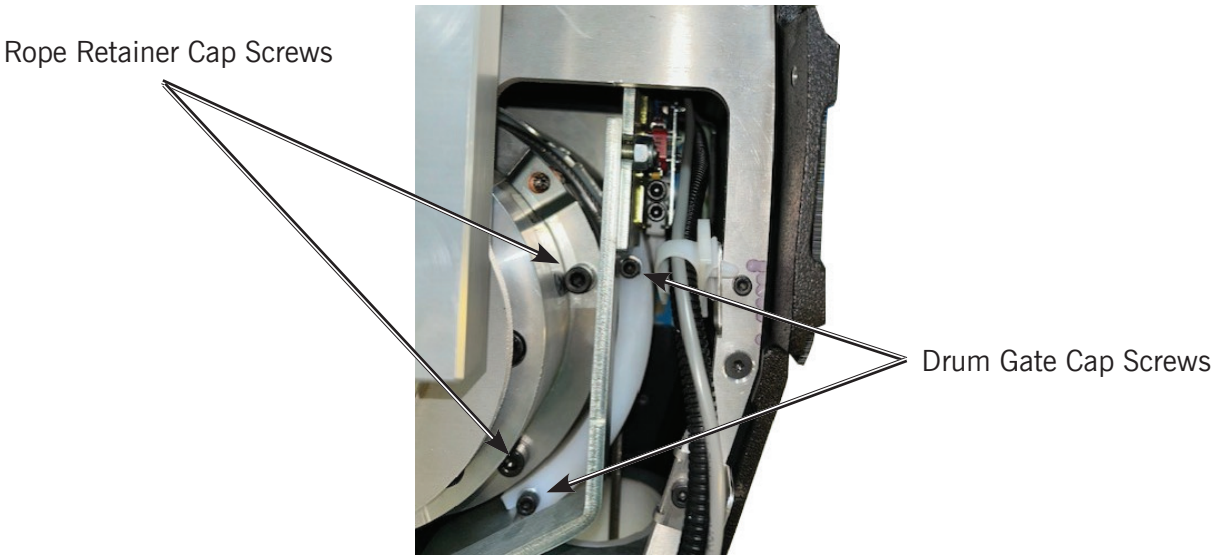


Diagram 7-5. Rope Retainer Cap Screws and Drum Gate Cap Screws

Wire Rope Replacement, 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 7-6**). while seating the end crimp into the locker with your left hand. This will involve seating the rope into the radius channel afterwards.
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 fully recess in the drum face (**Diagram 7-7**).
4. Install the rope retainer plate over the rope end and install the two M8 socket head cap screws and lock washers. Torque hardware to fully compress lock washers.
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 lock washers.
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. 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.
8. Remove screwdriver from between actuator and wear ring.
9. Install front cover onto actuator making sure all four screws are aligned with tabs before threading.
10. If using coil cord, make sure rope is inserted down through the middle of the coils.
11. Attach wire rope to handle, weighted hook, or end effector in reverse order of disassembly.
12. Reset virtual limits and/or slow down settings.

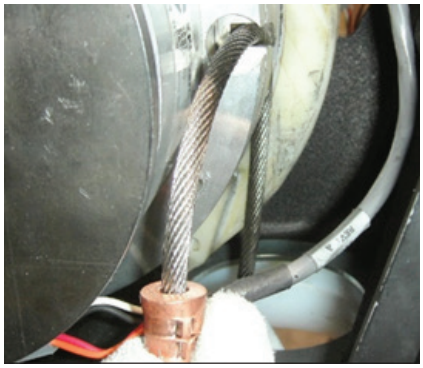


Diagram 7-6. Insert rope from actuator through opening at bottom & form loop to set in radius channel.

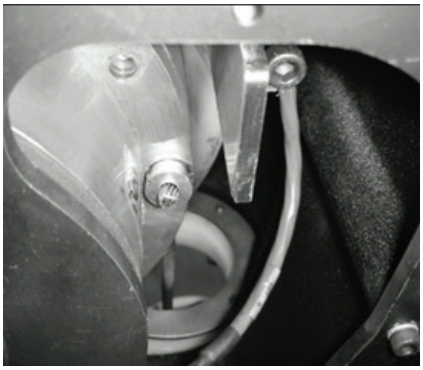


Diagram 7-7. Wire rope crimp fully seated in recess.

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 under one or more of the following conditions:

- The wire rope continues to “pay out” from actuator when end effector (handle, tooling) is being supported and down travel is commanded.
- Slack wire rope deflection exceeds 3 inches when end effector is supported.
- Tooling is added to a G360™ assembly.
- An air-line coil hose assembly is added between the end effector and actuator.
- A change from pendant handle to slide handle or vice-versa occurs.
- **Chatter or an erratic travel down operation occurs when using an unloaded G360* or weighted hook traveling downward from top of travel up limit (spring too tight).**

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

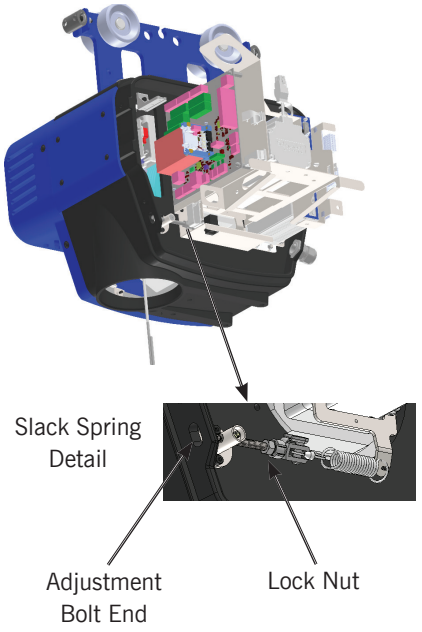


Diagram 7-8.

Slack Spring Adjustment Procedure

1. Use an M3 hex wrench to remove all screws securing the cover to actuator. Place screws in cover and set aside.
2. Locate the Slack Spring assembly (**Diagram 7-8**).
3. Using a 10mm open-end wrench, loosen the Lock Nut on bolt.
4. The Slack Spring is adjusted with a M3 Hex wrench, inserted into the Adjustment Bolt End shown in **Diagram 7-8**.
5. **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 Slack Spring tension** by turning the Adjustment Bolt **clockwise**. Test the hoist operation (full stroke up and down) between each half turn adjustment until chattering is eliminated.
6. All other conditions will require the Adjustment Bolt **counter-clockwise to increase tension in the slack spring**. Before backing it out, be sure there is enough free travel of the Adjustment Bolt.
7. Using the 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 Adjustment Bolt **counter-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 the lock nut.
8. Correct slack adjustment occurs when a deflection of the wire rope is 3-4 inches when in slack mode and rope travel stops (**Diagram 7-9**).

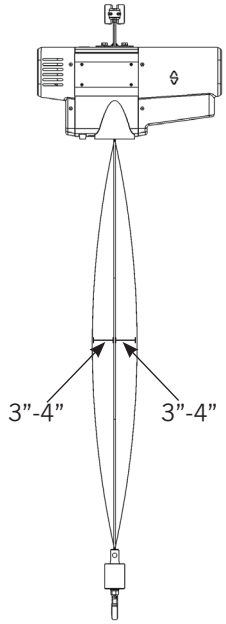


Diagram 7-9.

Load Test

Optional G-Force and Easy Arm Load Test

NOTE: Gorbel complies with OSHA 1910.179 for load testing, which states “Test loads shall not be more than 125 percent of the rated load unless otherwise recommended by the manufacturer. The test reports shall be placed on file where readily available to appointed personnel.”

Both the G-force and the Easy Arm follow the same guidelines for load testing:

1. Load the unit to 125% rated load.
2. Use the jog buttons on the actuator to lift the load off of the ground one inch.
3. Let the the load suspend for 15 seconds.
4. Engage the E-Stop and verify the brake holds the full load.
5. Move the bridge or jib its on around in full motion.
6. Disengage the E-Stop and use the jog buttons (**Diagram 7-10**) on the actuator to lower the load back to the ground.

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.

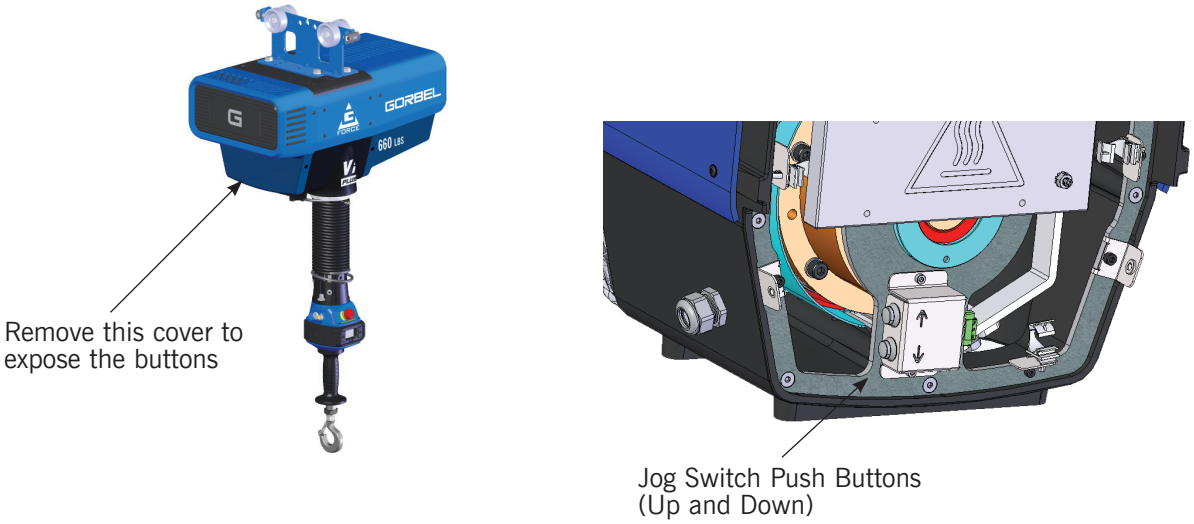


Diagram 7-10. Jog Switch Push Buttons.

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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.

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