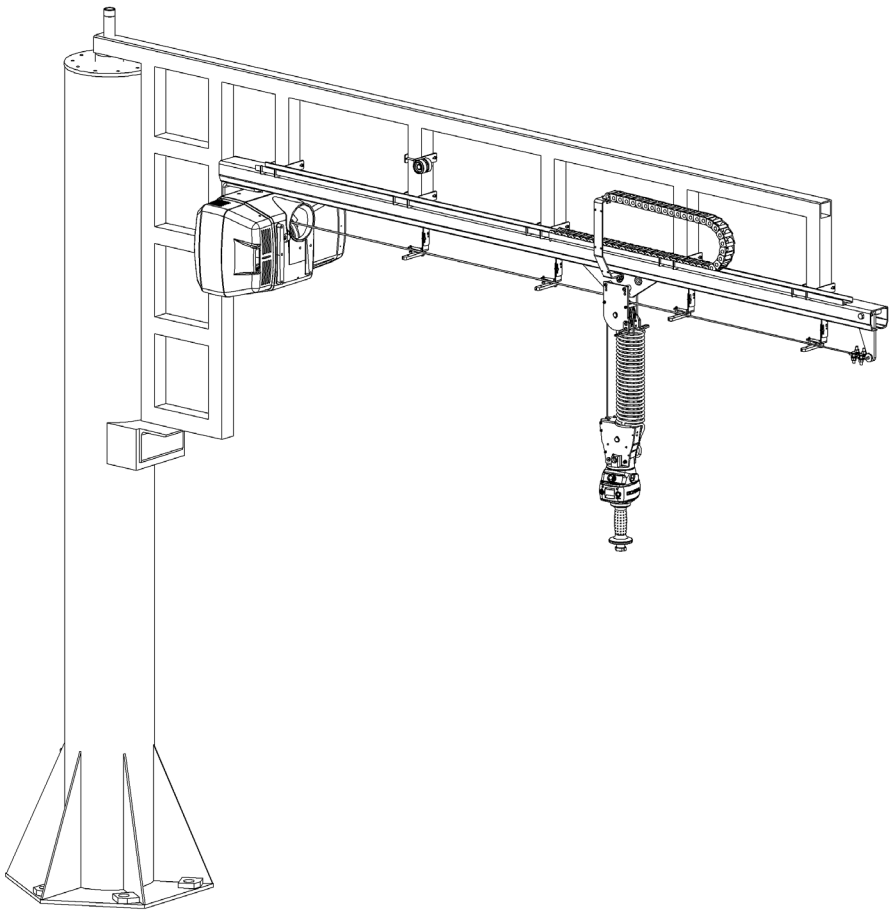
GORBEL®
A CLASS ABOVE

Installation, Operation, & Maintenance Manual



IMPORTANT!
DO NOT DESTROY

G-Force®
Intelligent Jib (G-Jib™)

Gorbel® Dealer _____

_____

Gorbel® Customer Order No. _____

Date _____
Month Year

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Questions? Concerns? Comments? Please call (800) 821-0086 (US and Canada) or (585) 924-6262 (outside US).

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SAFE HOIST OPERATING GUIDELINES

General

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

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

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

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

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

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

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

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

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

DON'TS - HOISTS

1. Never lift or transport a load until all personnel are clear and do not transport the load over personnel.
2. Do not allow any unqualified personnel to operate hoist.
3. Never pick up a load beyond the capacity rating appearing on the hoist. Overloading can be caused by jerking as well as by static overload.
4. Never carry personnel on the hook or the load.
5. Do not operate hoist if you are not physically fit.
6. Do not operate hoist to extreme limits of travel of cable without first checking for proper limit switch action.
7. Avoid sharp contact between two hoists or between hoist and end stop.
8. Do not tamper with or adjust any parts of the hoist unless specifically authorized to do so.
9. Never use the load cable as a sling.
10. Do not divert attention from load while operating hoist.
11. Never leave a suspended load unattended.
12. Do not use limit switch(es) for normal operating stop(s). These are safety devices only and should be checked on a regular basis for proper operation.
13. Never operate a hoist that has an inherent or suspected mechanical or electrical defect.
14. Do not use load cable as a ground for welding. Never touch a live welding electrode to the load cable.
15. Do not jog controls unnecessarily. Hoist motors are generally high torque, high slip types. Each start causes an inrush of current greater than the running current and leads to overheating and current failure, or burnout, if continued to excess.
16. Do not operate hoist if load is not centered under hoist.
17. Do not operate hoist if cable is twisted, kinked, or damaged.
18. Do not remove or obscure label.
19. Do not permanently activate operator present sensor.

DO'S - HOISTS

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

INTRODUCTION

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

Dimensions contained in this installation manual are for reference only and may differ for your particular application. Please refer to the enclosed General Arrangement Drawing for actual dimensions.

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

- Checking for obstructions in crane and hoist travel
- Checking that all bolts are tight and have lockwashers

WARNING

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

WARNING

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

WARNING

Consult a qualified structural engineer to determine if your support structure is adequate to support the anchor bolt force, overturning moment, or axial load of your crane.

WARNING

Crane cannot be utilized as a ground. A separate ground wire is required. For example, systems with 3-phase power require three conductors plus one ground wire.

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 method.

WARNING

Do not field modify crane in any way. Any modification without the written consent of Gorbel, Inc. will void warranty.

WARNING

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

TECHNICAL SPECIFICATIONS

Model	G-JIB™ 330#	G-JIB™ 660
Maximum Capacity (Load & Tool)	330 lbs. (150 kg)	660 lbs. (300 kg)
Crane Span	Up to 16’	Up to 16’
Crane HUB (Height Under Boom)	Up to 14’	Up to 14’
Degree of Arm Rotation	G-JIB360: 360° non-continuous without collector 360° continuous with collector G-JIB200: 200°	G-JIB360: 360° non-continuous without collector 360° continuous with collector G-JIB200: 200°
Max Lifting Speed Unloaded (feet per minute)	90 fpm	45 fpm
Max Lifting Speed Fully Loaded (feet per minute)	62.5 fpm	37.5 fpm
Max Lift Stroke (Actuator)	5.5 ft	5.5 ft
Primary Lift Voltage	220 (1 Phase) +/- 10%	220 (1 Phase) +/- 10%
Lift Amps	10 max	10 max
Lift Capacity Overload Safety	Yes	Yes
Lift LED Indicator Lights	Yes	Yes
Lift Anti-Recoil	Yes	Yes
Lift Failsafe Brake	Yes	Yes
Lift Float Mode Capable	Yes	Yes
Inertia Management	Yes	Yes
Precision Lift Capability	Yes	Yes
Lift Drive/Control System	Servo	Servo
Lift Speed Adjustment	Yes	Yes
Lift Media	Wire Rope	Wire Rope
Lift Duty Cycle	H5	H5
UL/CSA Certified	N/A	N/A
CE Certified	Optional	Optional

INSTALLATION
STEP 1 - PRE-ASSEMBLY

TIP: Packing list can be found in plastic pocket inside hardware box. General Arrangement Drawing can be found inserted in this installation manual.

1.1 Read entire manual **before** installing the crane.

1.2 Check packing list to ensure no parts have been lost prior to initiating assembly of crane.

1.3 Tools and materials typically needed to assemble crane:

- Torque wrench
- Hand tools
- Allen wrench(es) (metric)
- Ladders/man lifts
- Heavy duty drill
- Leveling tools (plumb bob, plumb fixture-pg. 10)
- Lifting device to lift heavy masts and booms
- G-JIB200 mounting bolts (Ø 5/8" Grade 5 or better)
- G-JIB360 anchor bolts (Grade 5 or better), refer to pages 7-9 for specifications
- Grout (Non-Shrink Precision Grout)

1.4 Identify crane type:

WARNING

Consult a qualified structural engineer to determine that your support structure is adequate to support the loads generated by thrust and pull (wall/column mounted) or anchor bolt force, overturning moment, or axial load (free standing) of your crane.

Wall/Column Mounted Crane (*diagram 1A*)

Refer to ***chart 1A*** to determine thrust and pull, and distance between pivot mounting assembly (bracket) centers, then proceed to Step 2, page 6.

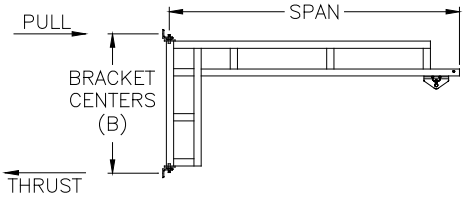


Diagram 1A. *Wall/Column Mounted Crane.*

CAPACITY	SPAN (ft)	MODEL NUMBER	TRACK SERIES	B* (in)	THRUST & PULL
330#	8'	G-JIB200-Q-330-8	500	48"	1,390 #
	10'	G-JIB200-Q-330-10	500	48"	1,784 #
	12'	G-JIB200-Q-330-12	500	60"	1.750 #
	14'	G-JIB200-Q-330-14	1000	60"	2,152 #
	16'	G-JIB200-Q-330-16	1000	60"	2,512 #
660#	8'	G-JIB200-Q-660-8	1000	48"	2,722 #
	10'	G-JIB200-Q-660-10	1000	60"	2,781 #
	12'	G-JIB200-Q-660-12	1000	60"	3,394 #
	14'	G-JIB200-Q-660-14	2000	72"	3,451 #
	16'	G-JIB200-Q-660-16	2000	72"	4,010 #

*This column provides the distance between pivot mounting assembly (bracket) centers.

Chart 1A. *Chart for determining thrust and pull, and pivot mounting (bracket) centers.*

Free Standing Crane (*diagram 1B*)

Refer to ***chart 1B***, on page 5, to determine anchor bolt load and footer width and depth, then proceed to Step 3, page 7.

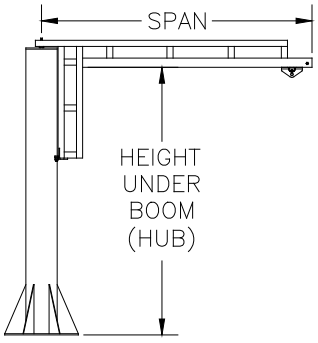


Diagram 1B. *Free Standing Crane.*

CAPACITY	HUB	SPAN	MODEL NUMBER	TRACK SERIES	FOOTER DEPTH (L)	FOOTER WIDTH (M)	MAST DIA.	ANCHOR BOLT LOAD	HUB	SPAN	MODEL NUMBER	TRACK SERIES	FOOTER DEPTH (L)	FOOTER WIDTH (M)	MAST DIA.	ANCHOR BOLT LOAD
330#	8'	8'	G-JIB360-Q-330-8-8	500	36"	48"	8-5/8"	1,071 #	12'	8'	G-JIB360-Q-330-12-8	500	36"	48"	12-3/4"	1,071 #
		10'	G-JIB360-Q-330-8-10	500	36"	48"	12-3/4"	1,417 #		10'	G-JIB360-Q-330-12-10	500	36"	48"	12-3/4"	1,417 #
		12'	G-JIB360-Q-330-8-12	500	48"	48"	12-3/4"	1,771 #		12'	G-JIB360-Q-330-12-12	500	48"	48"	12-3/4"	1,771 #
		14'	G-JIB360-Q-330-8-14	1000	48"	48"	12-3/4"	2,201 #		14'	G-JIB360-Q-330-12-14	1000	48"	48"	12-3/4"	2,201 #
		16'	G-JIB360-Q-330-8-16	1000	48"	48"	12-3/4"	2,594 #		16'	G-JIB360-Q-330-12-16	1000	48"	48"	14"	2,594 #
	10'	8'	G-JIB360-Q-330-10-8	500	36"	48"	8-5/8"	1,071 #	14'	8'	G-JIB360-Q-330-14-8	500	36"	48"	12-3/4"	1,072 #
		10'	G-JIB360-Q-330-10-10	500	36"	48"	12-3/4"	1,417 #		10'	G-JIB360-Q-330-14-10	500	36"	48"	12-3/4"	1,417 #
		12'	G-JIB360-Q-330-10-12	500	48"	48"	12-3/4"	1,771 #		12'	G-JIB360-Q-330-14-12	500	48"	48"	12-3/4"	1,772 #
		14'	G-JIB360-Q-330-10-14	1000	48"	48"	12-3/4"	2,201 #		14'	G-JIB360-Q-330-14-14	1000	48"	48"	12-3/4"	2,201 #
		16'	G-JIB360-Q-330-10-16	1000	48"	48"	12-3/4"	2,594 #		16'	G-JIB360-Q-330-14-16	1000	48"	48"	14"	2,037 #
660#	8'	8'	G-JIB360-Q-660-8-8	1000	48"	48"	12-3/4"	2,083 #	12'	8'	G-JIB360-Q-660-12-8	1000	48"	48"	12-3/4"	1,611 #
		10'	G-JIB360-Q-660-8-10	1000	48"	48"	12-3/4"	2,739 #		10'	G-JIB360-Q-660-12-10	1000	48"	48"	12-3/4"	2,142 #
		12'	G-JIB360-Q-660-8-12	1000	48"	48"	12-3/4"	3,405 #		12'	G-JIB360-Q-660-12-12	1000	48"	48"	12-3/4"	2,681 #
		14'	G-JIB360-Q-660-8-14	2000	48"	60"	14"	3,354 #		14'	G-JIB360-Q-660-12-14	2000	48"	60"	14"	3,354 #
		16'	G-JIB360-Q-660-8-16	2000	48"	60"	14"	3,953 #		16'	G-JIB360-Q-660-12-16	2000	48"	60"	16"	3,953 #
	10'	8'	G-JIB360-Q-660-10-8	1000	48"	48"	12-3/4"	2,083 #	14'	8'	G-JIB360-Q-660-14-8	1000	48"	48"	14"	2,083 #
		10'	G-JIB360-Q-660-10-10	1000	48"	48"	12-3/4"	2,739 #		10'	G-JIB360-Q-660-14-10	1000	48"	48"	14"	2,739 #
		12'	G-JIB360-Q-660-10-12	1000	48"	48"	12-3/4"	3,405 #		12'	G-JIB360-Q-660-14-12	1000	48"	48"	14"	3,405 #
		14'	G-JIB360-Q-660-10-14	2000	48"	60"	14"	3,354 #		14'	G-JIB360-Q-660-14-14	2000	48"	60"	14"	3,354 #
		16'	G-JIB360-Q-660-10-16	2000	48"	60"	14"	3,953 #		16'	G-JIB360-Q-660-14-16	2000	48"	60"	16"	3,953 #

*See pages 8 and 9 for additional information on footer requirements.

Chart 1B. *Chart for determining footer depth, footer width and anchor bolt load.*

STEP 2 - G-JIB200 (WALL/COLUMN MOUNTED) BOOM INSTALLATION

TIP: Upper and lower pivot mounting assemblies are identical on the G-JIB200.

STOP!

Do not proceed if your support structure does not meet the loading requirements determined in **Step 1.4**.

2.1 Determine position of **upper** pivot mounting assembly on support structure, and drill bolt holes. **Temporarily** bolt upper pivot mounting assembly to support structure (**do not** use lockwashers).

2.2 Determine position of **lower** pivot mounting assembly by dropping plumb bob (by others) through pivot holes (***diagram 2A***).

2.3 Drill bolt holes and bolt **lower** pivot mounting assembly to support structure. **Do not** torque bolts until boom weldment has been installed.

2.4 Remove upper pivot mounting assembly from support structure.

2.5 Clean pivot pins with clean, dry cloth. Slide bearings on pivot pins. Be sure to orient bearings correctly (diagram 2B).

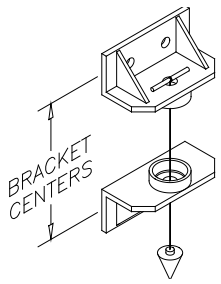


Diagram 2A. *Plumbing pivot mounting assemblies.*

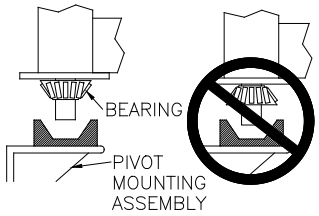


Diagram 2B. *Orienting bearing.*

STEP 2 - G-JIB200 (WALL/COLUMN MOUNTED) BOOM INSTALLATION (CONT.)

TIP: Upper and lower pivot mounting assemblies are identical on the G-JIB200.

2.6 Lift boom weldment up and insert lower pivot pin into **lower** pivot mounting assembly (***diagram 2C***).

2.7 Place **upper** pivot mounting assembly on upper pivot pin of boom weldment (***diagram 2D***). Bolt **upper** pivot mounting assembly to support structure.

2.8 At 45° intervals, check that **pivot pins** of crane are plumb. Shimming of upper and/or lower pivot mounting assembly may be required (shims included).

2.9 Once mast is plumb and shimmed, tighten all mounting bolts to manufacturer's specifications.

2.10 Carefully swing boom through entire travel to ensure boom is clear of obstructions and does not drift.

If boom drifts, support structure may be inadequate and/or pivot mounting assemblies may not be aligned (refer to **Step 2.2** for pivot mounting assembly alignment).

2.11 Proceed to **Step 5**, on page 12.

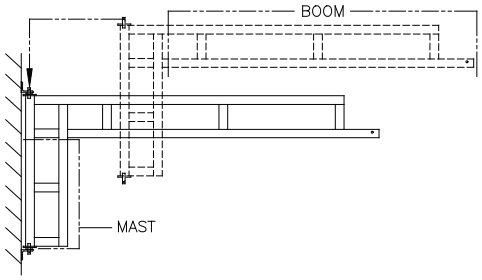


Diagram 2C. *Installing boom weldment.*

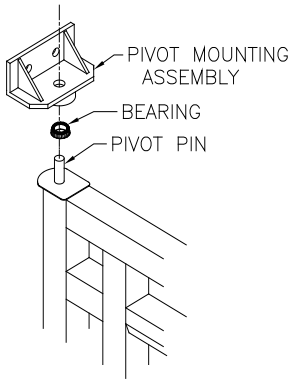


Diagram 2D. *Installing upper pivot mounting assembly.*

Note: **For G-JIB200 Installations:** Due to the fixed position of the G-Force® actuator on the jib, it is critical to ensure that it does not impact the support structure on which the jib is mounted. Ideally, the column or other structure is narrow enough to allow the jib to swing through its normal rotation. In situations where the jib is mounted on a wall or other large structure, the risk of impact on the actuator is much greater. In these cases, a standoff column is offered as an option with integrated rotation limits to keep the actuator safely away from the mounted structure. Refer to ***diagram 2E*** for more information.

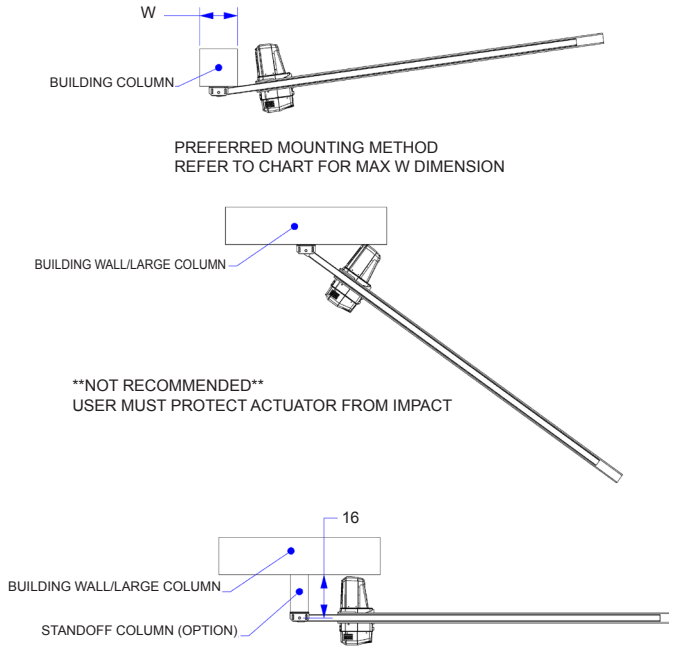


Diagram 2E. *G-Jib200 Wall Assembly.*

G-JIB200 Only			
Capacity	Span	D*	W
330# (500# Jib)	4'	10.375"	16"
	6'	10.375"	16"
	8'	13.375"	22"
	10'	13.375"	22"
	12'	16.375"	28"
	14'	16.875"	29"
	16'	16.875"	29"
660# (1000# Jib)	4'	10.375"	16"
	6'	10.375"	16"
	8'	13.375"	22"
	10'	16.375"	28"
	12'	16.375"	28"
	14'	18.875"	33"
	16'	18.875"	33"

For G-JIB200 and G-JIB360	Track length lost	Difference
Inline slide or remote handles	33.17"	---
Suspended pendant handle	42.87"	9.7"

*D = distance from bottom of actuator to bottom of handle assembly (inline slide) or G360™ (all others)
D + 9.75" = HUB lost

Chart 2A. *G-Jib™ Dimensions.*

STEP 3 - G-JIB360 (FREE STANDING) MAST INSTALLATION

TIP: Square base plates do not have triangular gussets.

STOP!

Do not proceed if your support structure does not meet the loading requirements determined in **Step 1.4**.

3.1 INSTALLING ANCHOR BOLTS

3.1.1 Square Base Plates (4-bolt pattern):

A) Anchor bolts (by others) for ***square*** baseplates must:

- be 1” in diameter.

Note: Only cranes with 1-1/4” diameter holes in the baseplate or baseplate stiffener are sized for 1” anchor bolts.

- be embedded at least 4-1/2” into floor, not to exceed 3/4 of floor depth (see ***diagram 3A***).

Note: **A minimum 6” thick reinforced concrete floor is required.**

- have minimum of two threads above nut after installation

WARNING

Diagram 3A is for **square** base plates only!

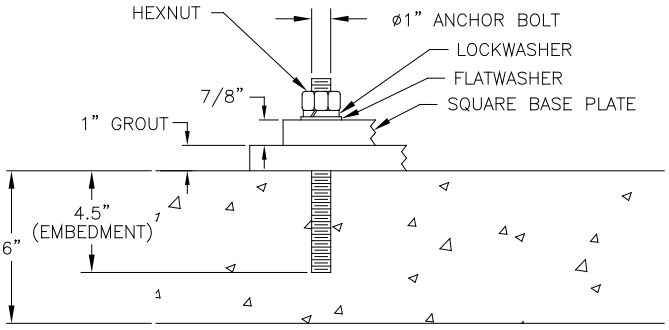


Diagram 3A. *Typical square base plate anchor bolt embedment.*

Note: G-Jib™ Intelligent Jib Crane foundation requirements are based on soil pressure of 2500# per square foot. Concrete pressure recommended for jib crane foundation is 3000# per square inch of compressive force, with no cracks or seams in a 48” square area around center of mast.

Note: Foundationless G-Jib™ Intelligent Jib Cranes should be mounted to a shallow foundation, centered on a square foot area that is free from cracks, seams and walls and mounted with chemical anchor bolts to withstand a minimum of 3470# of pull out force.

Note: Chemical (epoxy) anchor bolts are recommended because of their ability to withstand the vibrating loads caused by the hoist stopping and starting under load.

B) Drill holes in concrete floor using pre-drilled holes in base plate or ***diagram 3B*** as a guide (use drill bit size recommended by anchor bolt manufacturer).

C) Install anchor bolts (Grade 5 or better) and hardware (by others) according to manufacturer’s installation directions and requirements.

D) Proceed to **Step 3.2**, page 10, for mast installation and plumbing.

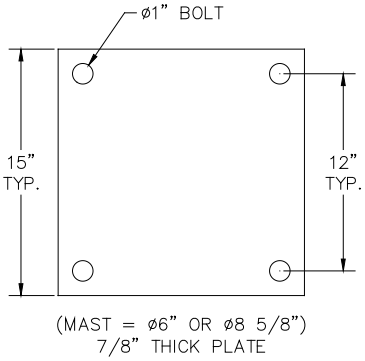


Diagram 3B. *Square base plate pattern.*

STEP 3 - G-JIB360 (FREE STANDING) MAST INSTALLATION (CONTINUED)

TIP: Anchor bolts (J bolts) typically protrude 6" above foundation before mast is installed.

STOP!

Do not proceed if your support structure does not meet the loading requirements identified in **Step 1.4**.

3.1 INSTALLING ANCHOR BOLTS (CONTINUED)

3.1.2 Hexagonal Base Plates for Poured Foundations (6 or 12 bolt pattern):

Refer to ***Chart 3A*** for Base Plate Thickness

WARNING

Consult a qualified structural engineer if you deviate from the recommended dimensions provided in this manual. Gorbel, Inc. is not responsible for any deviation from these foundation recommendations.

A) Anchor bolts (by others) for **<u>hexagonal</u>** baseplates must:

- be diameter as specified in ***diagram 3C***, ***3D*** or ***3E***.
- be embedded 3/4 of footer depth (L).
- have **minimum** of two threads above nut after installation.

B) Create steel-reinforced concrete foundation using recommendations shown in ***diagram 3F***.

Refer to ***chart 1B***, page 3, for footer depth (L) and footer width (M) in ***diagram 3F***.

Note: Jib crane foundation requirements are based on soil pressure of 2500# per square foot. Concrete pressure recommended for jib crane foundation is 3000# per square inch of compressive force.

Note: Foundation/concrete must cure seven (7) days prior to mast installation. Foundation/concrete must cure 28 days prior to using crane to full capacity.

C) Proceed to **Step 3.2**, page 10, for mast installation and plumbing.

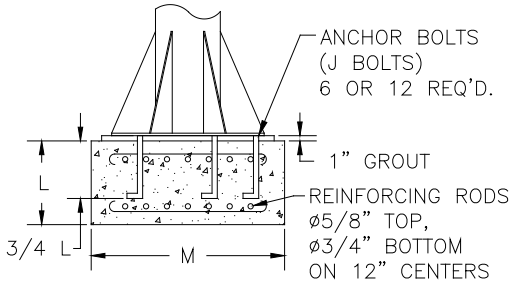


Diagram 3F. *Hexagonal base plate foundation.*

Mast Size	8-5/8	12-3/4	14	16
Base Plate Thickness	1/2"	1/2"	1/2"	1/2"

Chart 3A. *Base plate thickness.*

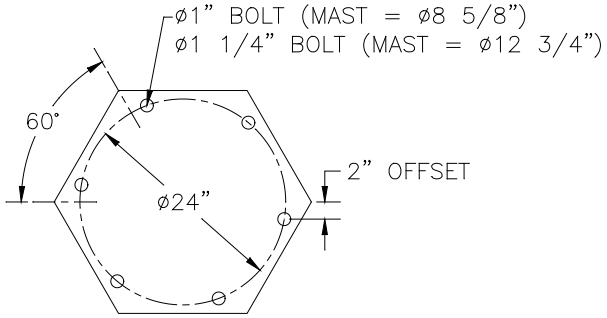


Diagram 3C. *6 bolt base bolt pattern.*

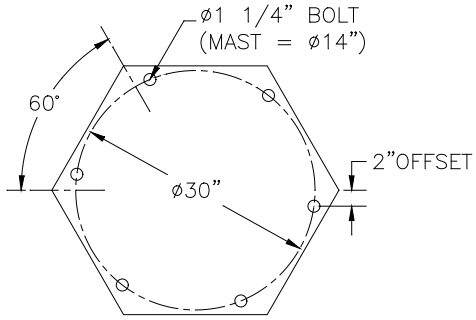


Diagram 3D. *6 bolt base bolt pattern.*

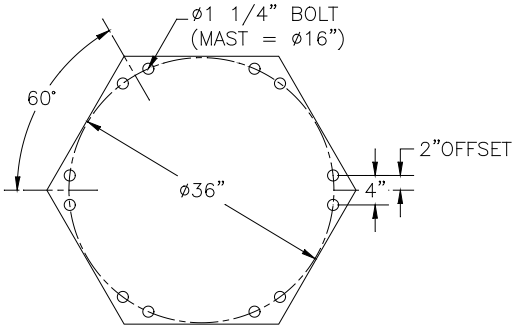


Diagram 3E. *12 bolt base bolt pattern.*

STEP 3 - G-JIB360 (FREE STANDING) MAST INSTALLATION (CONTINUED)

TIP: Anchor bolts (J bolts) typically protrude 6” above foundation before mast is installed.

3.1 INSTALLING ANCHOR BOLTS (CONTINUED)

3.1.3 Hexagonal Base Plates for Foundationless Jibs (6 bolt pattern):

For jib cranes that can be mounted on a 6” foundation that is free of cracks, seams, expansion joints, and walls (***chart 3B***).

WARNING

Consult a qualified structural engineer if you deviate from the recommended dimensions provided in this manual. Gorbel, Inc. is not responsible for any deviation from these foundation recommendations.

A) Anchor bolts (by others) for **<u>hexagonal</u>** base plates must:

- be 1” in diameter (***diagram 3G***).

Note: Jib cranes that have an NP6 designation have a special design that is different than standard G-Jib™ Intelligent Jib Cranes for poured foundations. The NP6 base plate stiffener allows for a 1” diameter anchor bolt as opposed to the standard baseplate stiffener that allows for a 1-1/4” diameter anchor bolt. If you have a standard design G-Jib™ for a poured foundation refer to Step 3.1.2. Contact Gorbel® Inside Sales if you are unsure what style (NP6 or Standard) G-Jib™ Intelligent Jib Crane you have.

- be embedded at least 4” into the floor, not to exceed 3/4 of the foundation depth.

Note: **A minimum 6” thick reinforced concrete floor is required.**

- have **minimum** of two threads above nut after installation.

Note: Jib crane foundation requirements are based on soil pressure of 2500# per square foot. Concrete pressure recommended for jib crane foundation is 3000# per square inch of compressive force.

Note: Foundationless G-Jib™ Intelligent Jib Cranes should be mounted to a shallow foundation, centered on a square foot area that is free from cracks, seams and walls mounted with chemical anchor bolts to withstand a minimum of 3470# of pull out force.

Note: Chemical (epoxy) anchor bolts are recommended because of their ability to withstand the vibrating loads caused by the hoist stopping and starting under load.

B) Drill holes in concrete floor using pre-drilled holes in base plate or ***diagram 3G*** as a guide (use drill bit size recommended by anchor bolt manufacturer).

C) Install anchor bolts (Grade 5 or better) and hardware (by others) according to manufacturer’s installation directions and requirements.

Capacity	HUB	Span	Foundation size (sq. ft.)
330#	8’	8’	5 x 5
		10’	5.5 x 5.5
		12’	5.75 x 5.75
	10’	8’	5 x 5
		10’	5.5 x 5.5
		12’	5.75 x 5.75
	12’	8’	5 x 5
		10’	5.5 x 5.5
		12’	5.75 x 5.75
	14’	8’	5 x 5
		10’	5.5 x 5.5
		12’	5.75 x 5.75
660#	8’	4’	5 x 5
		6’	5.5 x 5.5
		8’	6 x 6
	10’	4’	5 x 5
		6’	5.5 x 5.5
		8’	6 x 6
	12’	4’	5 x 5
		6’	5.5 x 5.5
		8’	6 x 6
	14’	4’	5 x 5
		6’	5.5 x 5.5
		8’	6 x 6

Chart 3B. *Distance of jib from cracks, seams, walls.*

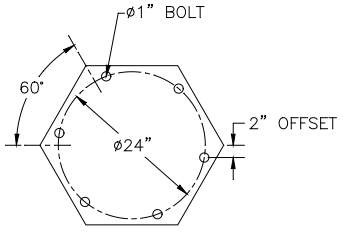


Diagram 3G. *6 bolt base bolt pattern.*

WARNING

Mast must be plumb to prevent boom from drifting.

3.2 INSTALLING AND PLUMBING MAST

A) Cover entire base plate area with one inch of non-shrink precision grout.

B) Set mast into place and make sure that the baseplate is completely seated in the grout.

C) Drop plumb line (not included) from top of mast, using fixture (not included) or equivalent (***diagram 3H***).

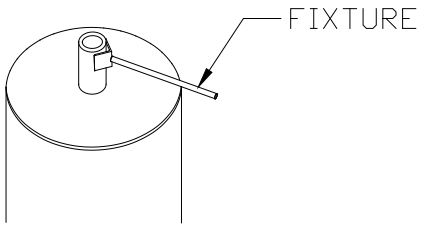


Diagram 3H. *Plumbing fixture.*

D) At point “A”, one (1”) inch below top mast plate, set plumb line a distance of three (3”) inches from surface of mast pipe (***diagram 3I***).

E) At point “B”, four (4’) feet below point “A” (approximately where rollers will contact mast pipe), distance between plumb line and face of mast should also be three (3”) inches.

F) Repeat steps D & E every 60° around the mast to ensure that the mast is plumb throughout.

Note: Be sure to fasten plumb line securely to plum fixture so that it will not move. Movement will result in an inaccurate plumb measurement.

G) Once mast is plumb ***and grout has cured***, fully tighten anchor bolt hardware.

Note: If Gorbel is the supplier of the anchor bolts, tighten to full compression of the lockwasher.

H) Verify mast is still plumb.

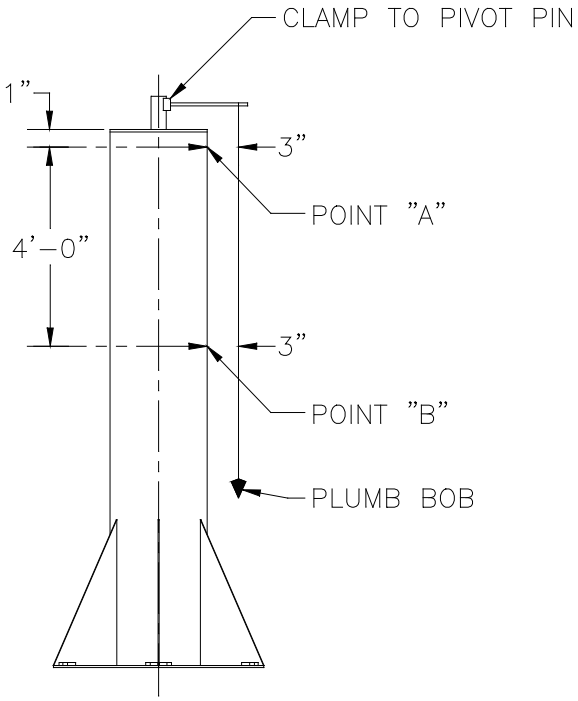
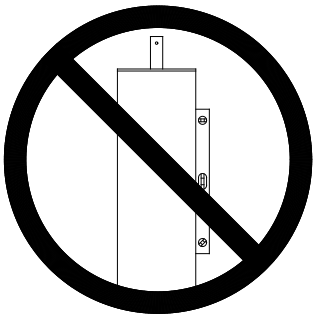


Diagram 3I. *Plumbing the mast.*

DO NOT USE A LEVEL TO PLUMB MAST.



STEP 4 - G-JIB360 (FREE STANDING) BOOM INSTALLATION

TIP: Unloaded boom will tilt slightly upward.

4.1 Install cam followers/trunnion rollers at bottom of boom assembly (***diagram 4A*** or ***4B***). Tighten nylock nuts to 50 ft.-lbs. and hexnuts until lockwashers are flat.

WARNING

If nylock nut is removed it must be replaced.

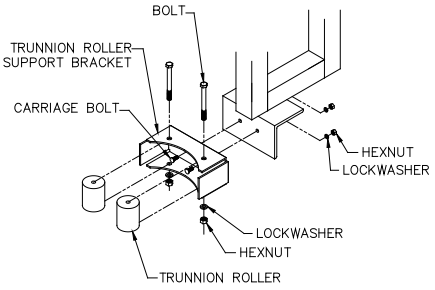


Diagram 4A. *Installing trunnion rollers.*

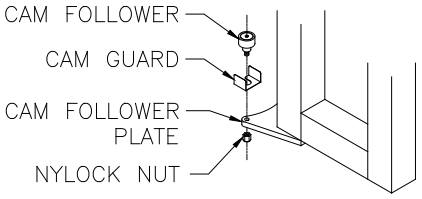


Diagram 4B. *Installing cam followers.*

4.2 Place and orient pivot bearing on mast pivot pin (***diagram 4C***).

4.3 Place boom assembly over pivot pin on mast. Insert retaining pin through pivot pin and roll O-rings onto retaining pin (***diagram 4D***).

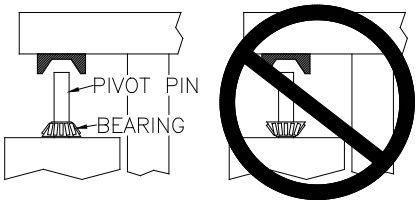


Diagram 4C. *Orienting bearing.*

WARNING

O-rings must be installed on retaining pin to ensure that retaining pin does not dislodge.

4.4 Level boom by shimming between trunnion mounting assembly and trunnion support angle (***diagram 4E***) or by evenly adjusting eccentric cam followers with an allen wrench (***diagram 4F***). Be sure boom is leveled to L/640 of span above level.

4.5 Check to make sure that both rollers have full face contact with mast pipe.

Carefully swing boom through entire travel to ensure boom is clear of obstructions and does not drift.

If boom drifts, check to make sure that cam followers/trunnion rollers are evenly adjusted and/or mast is plumb.

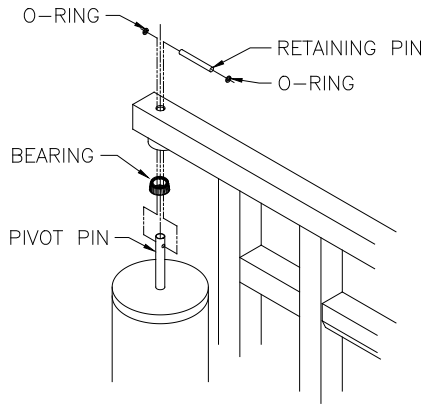


Diagram 4D. *Installing boom weldment.*

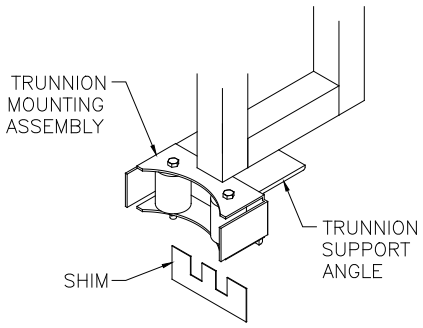


Diagram 4E. *Adjusting trunnion rollers.*

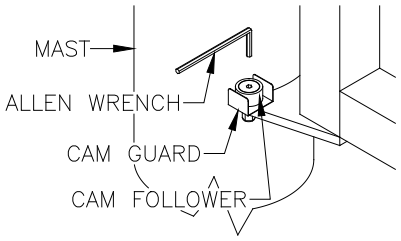


Diagram 4F. *Adjusting eccentric cam followers.*

STEP 5 - ACTUATOR INSTALLATION

5.1 The actuator (G-Force®) comes with the necessary bracketry already attached. See ***diagram 5A***. Using appropriate and safe measures, lift the actuator and insert the loosened clamp plate into the track. Slide the actuator assembly all the way into the track and tighten the three bolts, securing it to the track. Refer to ***diagram 5B***. Depending on track configuration, it may be necessary to replace the 2” bolts in the end stop with the included 1-1/2” bolts to allow maximum trolley travel. After the actuator is tightened to the track, slide the end stop into the track and position so the end of the bumper is even with the face of the actuator and tighten the nuts.

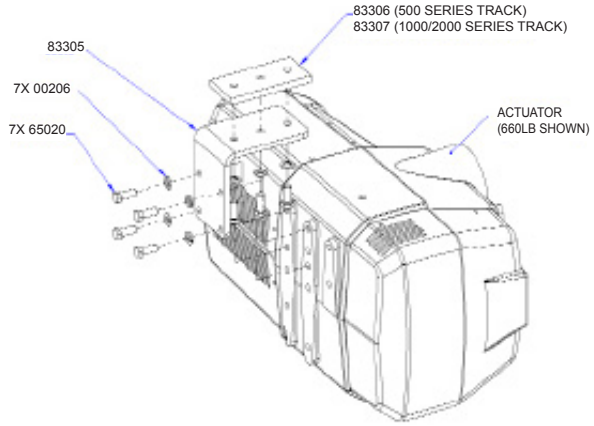


Diagram 5A. *Actuator Bracket.*

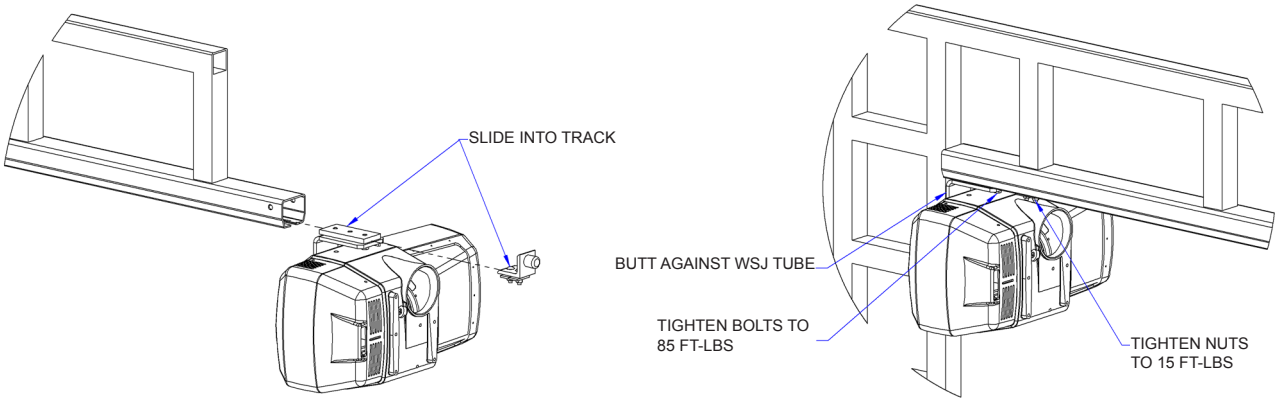


Diagram 5B. *Actuator Installation.*

STEP 6 - CABLE CARRIER TRAY INSTALLATION

6.1 Once the actuator and end stop are installed, the cable carrier and flapper assemblies can be installed. Note that the cable carrier tray brackets have two three-hole patterns; the outer holes are used on 3” uprights, the middle holes are used on 2.5” uprights, and the inner holes are used on 2” uprights. The flapper assemblies are attached using the same bolts as the carrier tray brackets (refer to ***diagram 6A***).

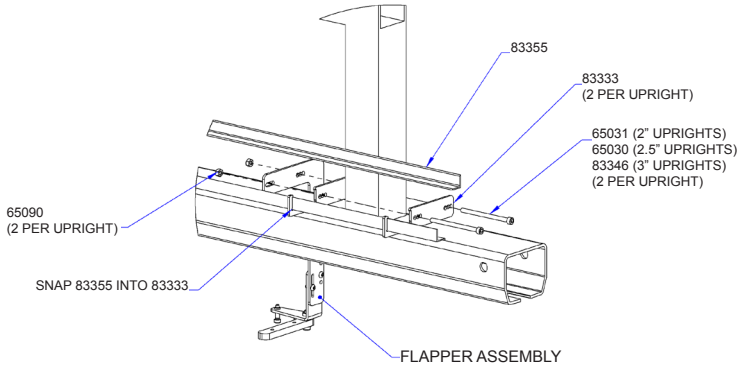


Diagram 6A. *Bracket Installation.*

6.2 The brackets need to be spaced approximately 3/8” off the track to clear the weld fillets. Ensure that the spacing is consistent on all brackets, and tighten the hardware. The flapper assemblies are included to be mounted on uprights starting at the farthest one from the actuator and leaving the one nearest to the mast empty.

6.3 Once all the brackets are firmly attached to the jib uprights, the aluminum angles can be installed. Depending on span, two or four sections of angle are included. If two sections are included, each section will have holes punched in one leg approximately halfway along the length. Ensure that each section has its leg with the holes lying horizontally and the holes are oriented closer to the actuator. If four sections are included, two sections will be punched and two will be plain. Lay the sections with the holes closer to the actuator so the legs with the holes are horizontal and the ends with the holes approximately 6” from the end are near the actuator. The plain sections lay in the brackets butting up against the holed sections. In either case, the end of the angle near the actuator should be approximately 1” closer to the mast than the first tray bracket. Once the sections are oriented correctly, snap them into the tray brackets by tilting them up so the horizontal legs engage the lower saw-tooth tabs and snap the vertical legs under the upper tabs (slip-jaw pliers may be useful here). For long spans, cable carrier support assemblies are included to be installed on the upright(s) nearest to the actuator. Referring to ***diagram 6B***, loosely clamp the assemblies to each upright approximately 6” above the track. Do not tighten until verifying that the bracket coming off the trolley with the cable carrier attached clears the wheels.

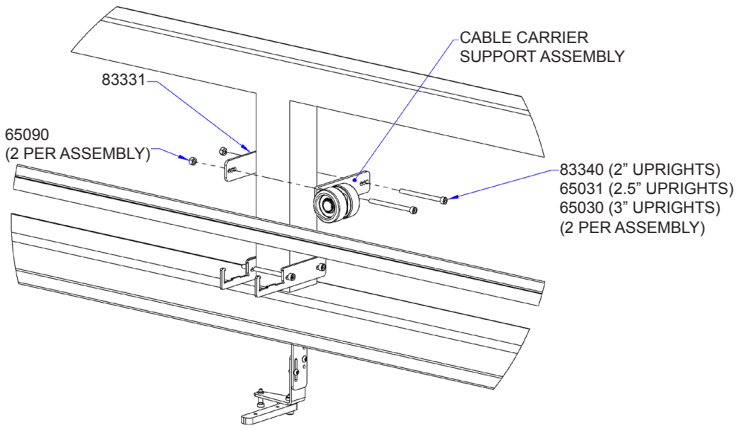


Diagram 6B. *Tray Installation.*

STEP 7 - TROLLEY INSTALLATION

7.1 Slide trolley assembly into track with the cable carrier bracket on the same side as the cable carrier tray as shown in ***diagram 7A*** (note handle may be different than shown, or may be packaged separately).

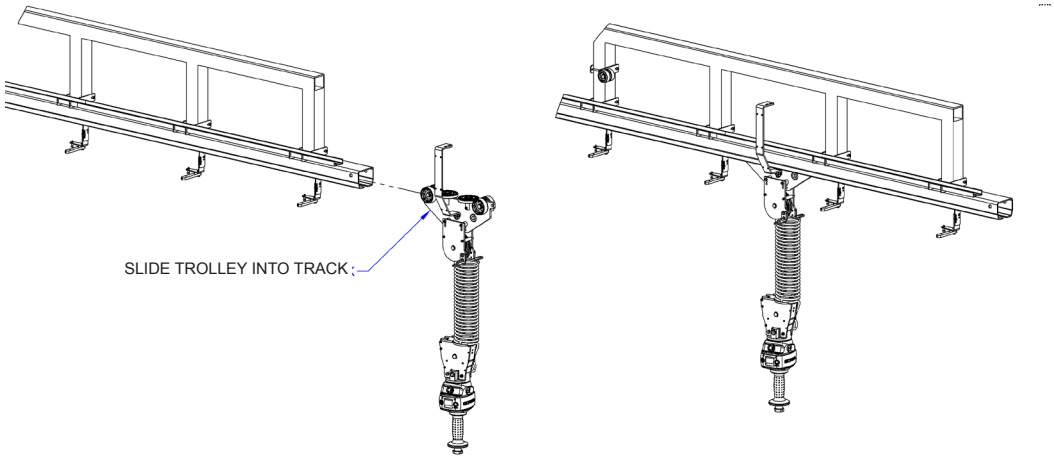


Diagram 7A. *Trolley Installation*

7.2 If you have a suspended pendant handle, leave the trolley near the end of the jib and connect the free end of the double clevis that is already attached to the suspended pendant trolley as shown in ***diagram 7B***. Slide both trolleys into the track.

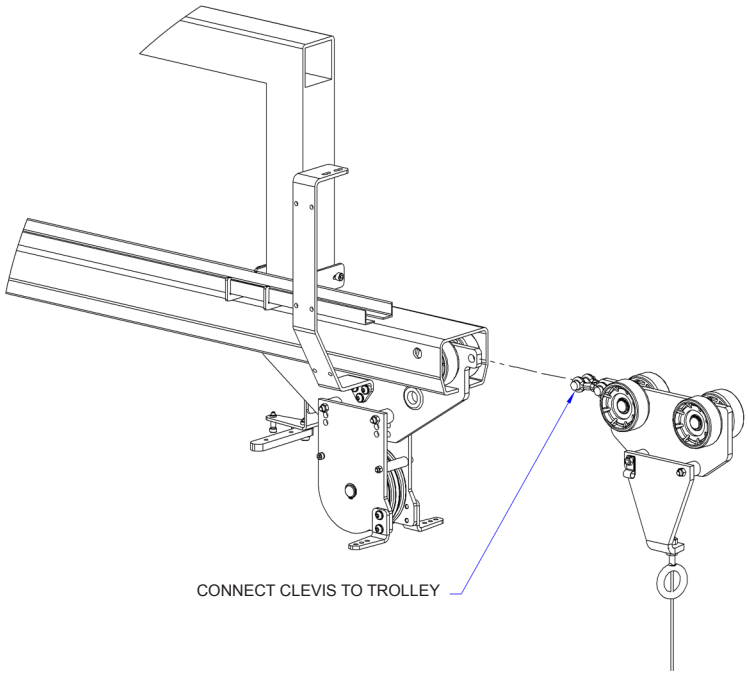


Diagram 7B. *Suspended Pendant Trolley Installation.*

STEP 7 - TROLLEY INSTALLATION (CONTINUED)

7.3 End Bracket and Wire Rope Installation

With the trolley(s) in the track, insert the end bracket where the G-Jib™ end-stop would normally go as shown in ***diagram 7C***. Remove the plastic spacers from the trolley assembly and disassemble the handle or G360™ to expose the pulley as shown in ***diagram 7D***. Being careful not to kink it, loop the wire rope from the actuator over the pulley farthest from the cable carrier bracket, down through the coil cord and/or air hose (if applicable), under the handle pulley, back over the other trolley pulley, and out to the end bracket, securing it with the end cap and SHCS. Replace the spacers from the trolley assembly and reassemble the handle pulley securing it with the end cap and SHCS by looping the free end over the thimble and loosely clamping the with the two wire rope clamps

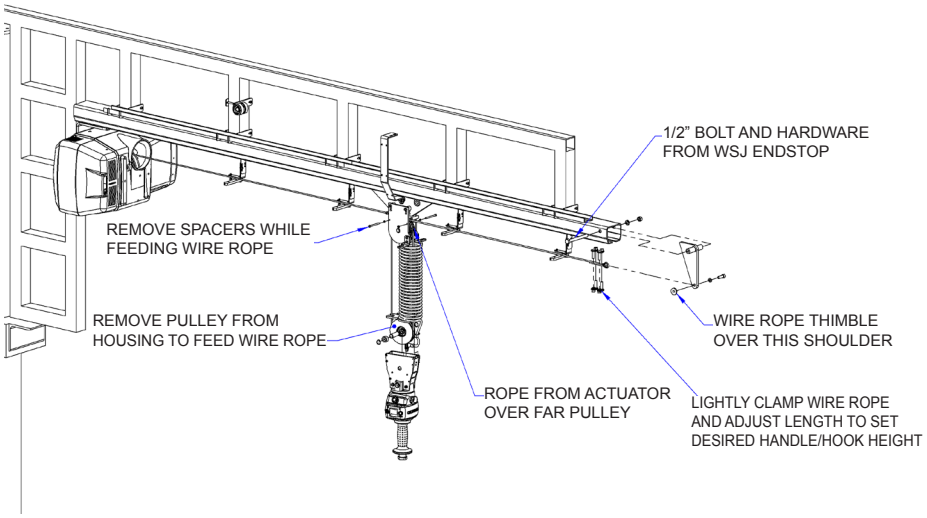


Diagram 7C. *Wire Rope Installation.*

7.4 The actuator shipped at the lower limit so adjust the length of the wire rope by sliding it out of the wire rope clamps until the handle or hook is as low as desired, taking care to account for any tooling, and tighten the clamps to the recommended spec. The excess wire rope may be cut off now or once the unit is fully functional. Once the unit is powered up, verify that the full 5.5' stroke is available, unless the HUB of the unit is low enough that max stroke is not possible, in which case the upper limit may need to be adjusted to prevent the coil cord and/or air hose from being damaged.

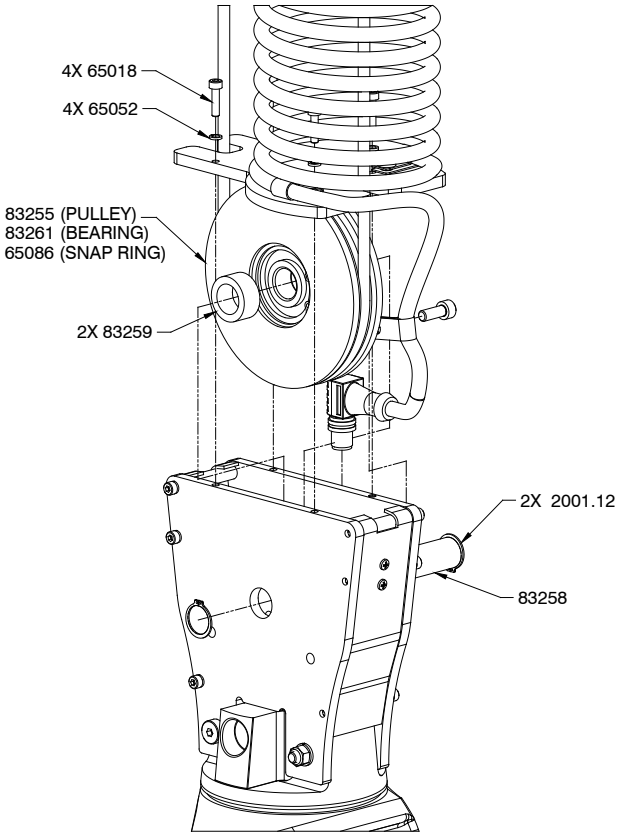


Diagram 7D. *Handle Pulley Detail.*

STEP 8A - REMOTE MOUNT FORCE SENSING SLIDE HANDLE INSTALLATION

8A.1 Bracket (by others) must be sized to fit the handle it will be holding and rigid enough to resist the forces exterted on it (***diagram 8A***).

8A.2 Using the included M16 hardware, fasten both ends of the handle to the bracket. Attach bracket to tooling if necessary.

8A.3 Connect cable from G360™ to handle top. Clamp the cable to tooling to prevent it from being snagged.

8A.4 Continue to Step 9 on page 18.

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

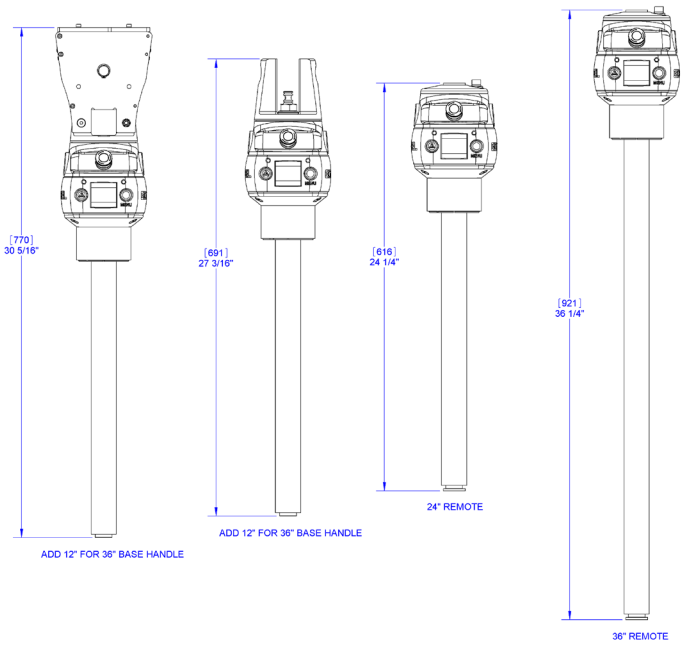


Diagram 8A. *Force Sensing Slide Handle bracket sizes.*

Note: Due to the nature of the Force Sensing Slide Handle, excessive twisting of the grip may be interpreted as intented motion. For best results, only push and pull the handle grip while avoiding twisting (***diagram 8C***).

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

Note: Remote handles must be mounted rigidly in order to function correctly. For Slide handles, the mounting holes on the tooling must be aligned to avoid any binding of the handle and the bolts at each end of the handle must be tightened enough to prevent motion but not induce bending. The included rubber washers must be mounted between the handle and tooling to prevent binding. Additionally the handle must be captured via the hole in the top cap to prevent rotation (see ***diagram 8B*** for suggested bracket dimensions). For Hub handles, the back of the handle body must be securely fastened to the tooling.

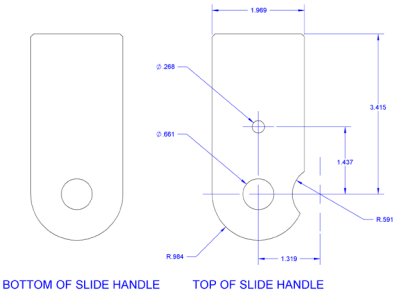


Diagram 8B. *Remote handle mounting dimensions.*

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.

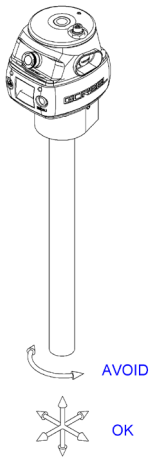


Diagram 8C. *Proper use of Force Sensing Handle grip.*

STEP 8B - REMOTE MOUNT FORCE SENSING HUB HANDLE INSTALLATION

8B.1 Mount Hub body to tooling rigidly to resist forces exerted on it. Optional mounting plate 74136 is available. See ***diagram 5D*** for dimensions for mounting directly to tooling.

8B.2 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 modication by integrator) are available. See ***diagram 5E*** for dimensions for fabricating a custom solution.

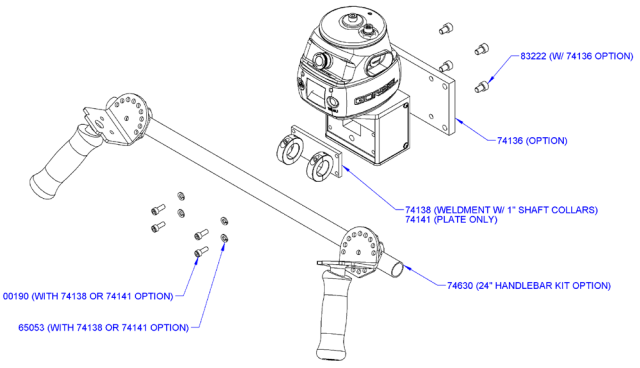


Diagram 8D. *Mounting handlebar and mounting plate.*

8B.3 Connect cable from G360™ to handle top. Clamp the cable to tooling to prevent it from being snagged.

8B.4 Continue to Step 9 on page 18.

Note: The system cannot support two Force Sensing Handles running simultaneously on one G-Jib™. 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®.

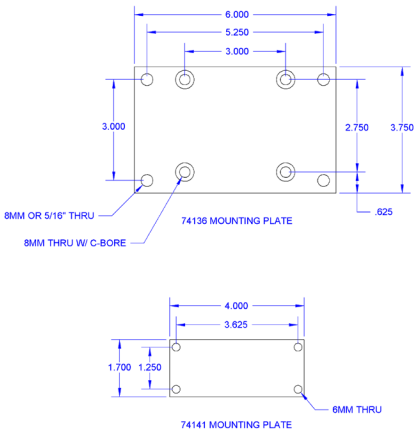


Diagram 8E. *Mounting plate dimensions.*

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 8F***).

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

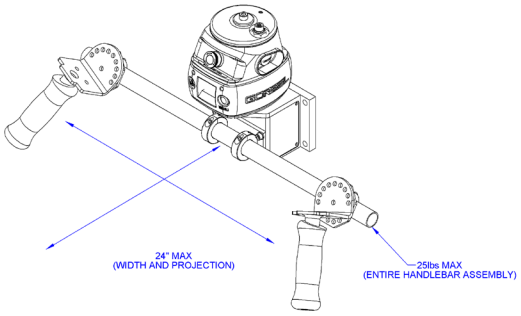


Diagram 8F. *Handlebar dimensions.*

Note: Remote handles must be mounted rigidly in order to function correctly. For Slide handles, the mounting holes on the tooling must be aligned to avoid any binding of the handle and the bolts at each end of the handle must be tightened enough to prevent motion but not induce bending. The included rubber washers must be mounted between the handle and tooling to prevent binding. Additionally, the handle must be captured via the hole in the top cap to prevent rotation (see ***diagram 8B***, page 16, for suggested bracket dimensions). 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 9 - FINAL ASSEMBLY

9.1 Cable Carrier Installation

Take the cable carrier with cable and air hose (option) and set it on the cable carrier tray installed on the jib. Make sure the male end of the cable is facing the G-Force® and the female end is looped up to meet the cable carrier bracket projecting off the trolley as shown in ***diagram 9A***. Fasten the cable carrier ends with the provided button head cap screws and tie the cable (and air hose) to the holes in the tray. Connect the female end to the coil cord or pendant cable at the trolley and tie off any remaining in a service loop on the side of the cable carrier bracket. If applicable, connect the air hose to the air coil and tie it off next to the cable, ensuring it is not kinked. Connect the free end of the air hose to shop air with the supplied barbed fitting.

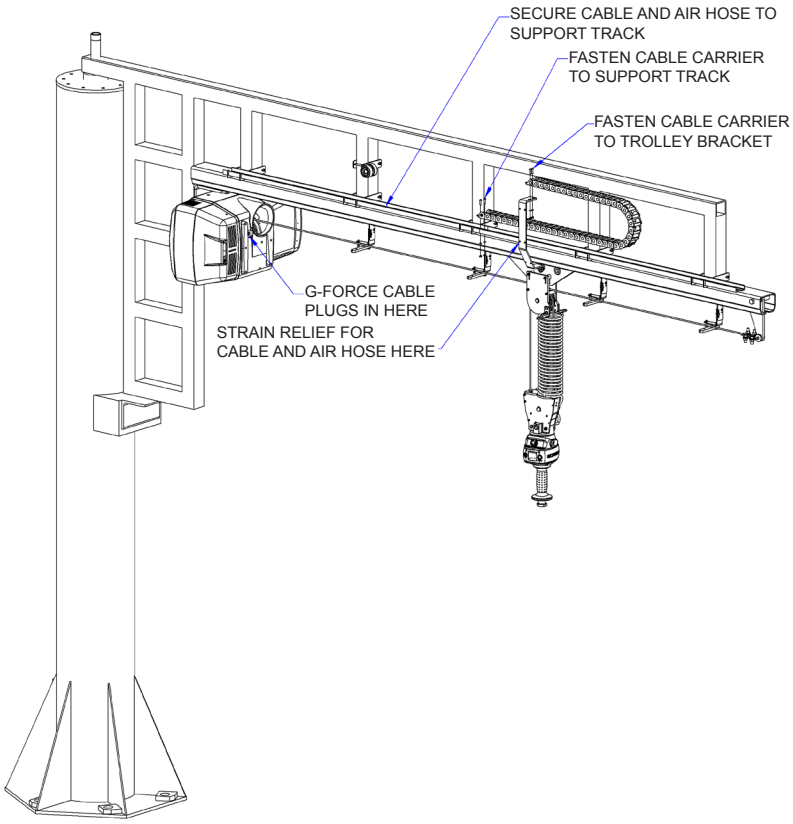


Diagram 9A. *Cable Carrier Assembly*

9.2 Initial Power-Up

A) Make sure all connections are tight and connect the G-Force® to 220vac single phase power.

B) Turn on the disconnect switch (by others) to apply power to the G-Force®. When power is detected, “POWER ON” is displayed on the LCD.

C) Disengage the emergency stop (E-stop) button located on the front face of the handle.

D) Once the system is on-line and ready, “LIFT READY” will be displayed on the LCD.

E)
- **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 LCD displays RUN MODE HANDLE.
- **Standard Operation - Pendant Handle Configuration:** Depress the up and down levers to run the unit up and down. Do this several times to get a feel for the unit. The LCD displays RUN MODE PENDANT.

Note: The LCD backlight will shut off after 10 minutes of inactivity.
See the Lift Functionality section on page 25 for complete details on handle operation.

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

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

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

STEP 10 - FLOAT MODE AND FINAL STEPS

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

10.1 Float Mode may be activated by simply pressing the G-Force® logo button on the left hand side of the handle (***diagram 10A***). 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).

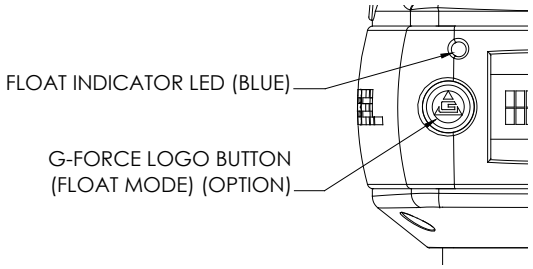


Diagram 10A. *Float Mode Button - Slide Handle.*

A) Grasp the handle grip and lift an objected 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 “blue” LED light will turn on and the handle with payload should not be moving. The LCD will display RUN MODE FLOAT.

E) Now grasp the load.

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

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

CAUTION

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

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

STEP 10 - FLOAT MODE AND FINAL STEPS (CONTINUED)

WARNING

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

WARNING

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

CAUTION

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

10.2 The speed, acceleration, and other features of the G-Force® can be adjusted using the Program Menu available at the handle. ***See the Program Mode section on page 29 for complete details on modifying and programming features.***

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

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

Please do not be limited by these items only.

10.4 Check to make sure all bolts are tight and lockwashers are compressed.

10.5 If necessary, touch up crane with paint provided.

10.6 Install yellow rubber tracdom on open end of steel track.

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

STEP 11 - EXPANSION I/O BLOCK MOUNTING INSTRUCTIONS (OPTION)

TIP: Expansion I/O block mounting instructions only apply to iQ units with an I/O block.

DIMENSIONS

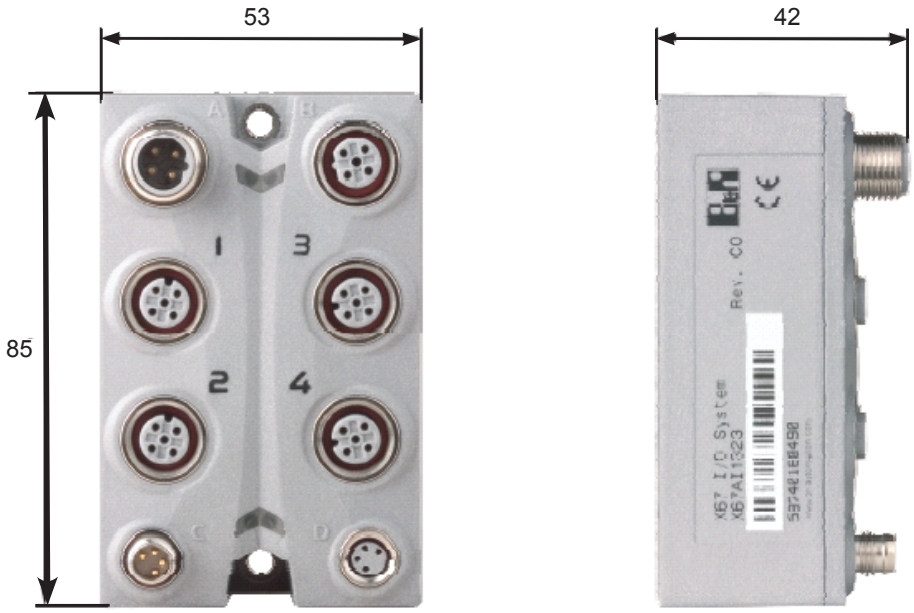


Diagram 11A. *Expansion I/O block dimensions (millimeters).*

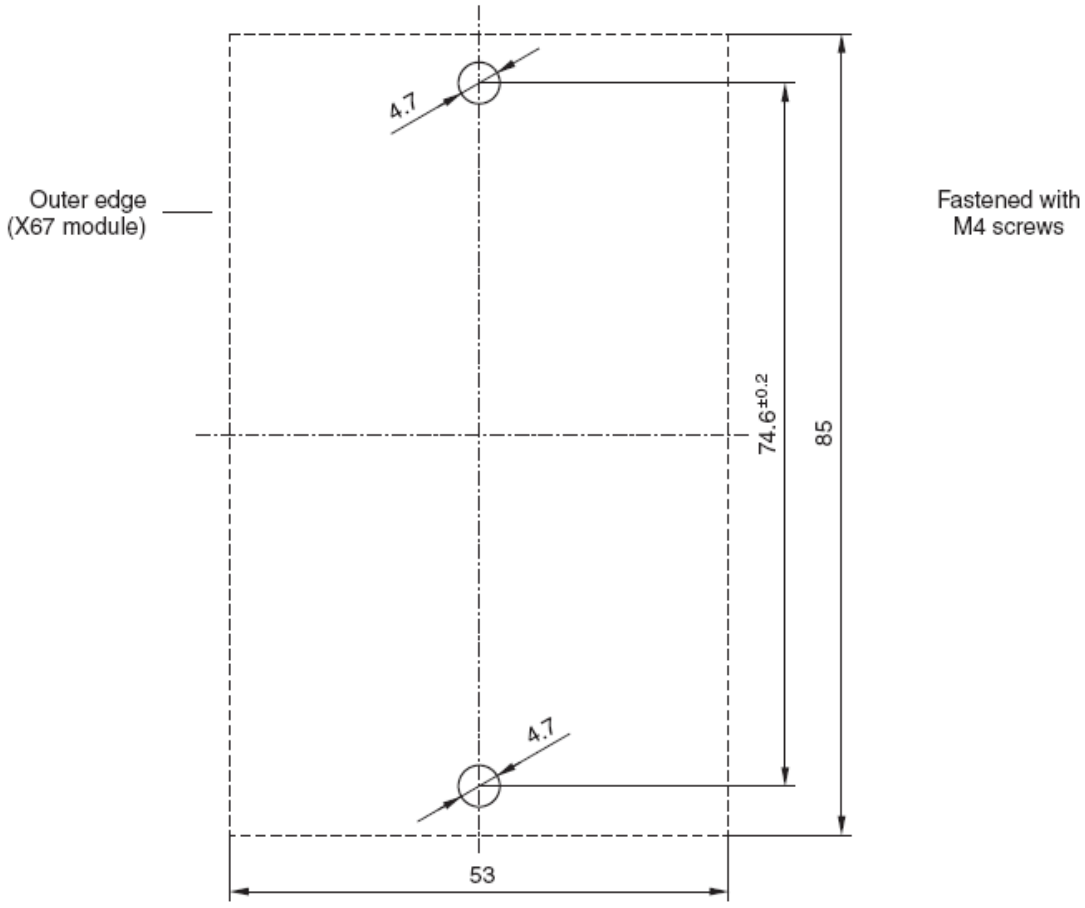


Diagram 11B. *Screw fastener drilling template.*

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ASSEMBLY DIAGRAMS

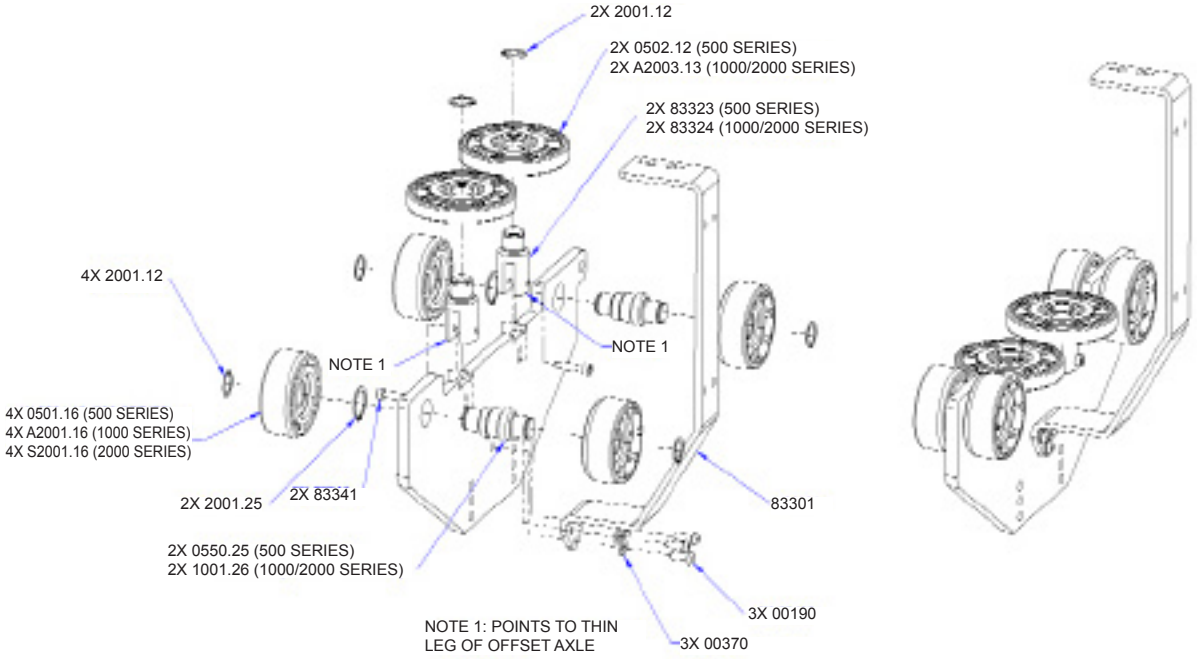


Figure 1. *Trolley Assembly.*

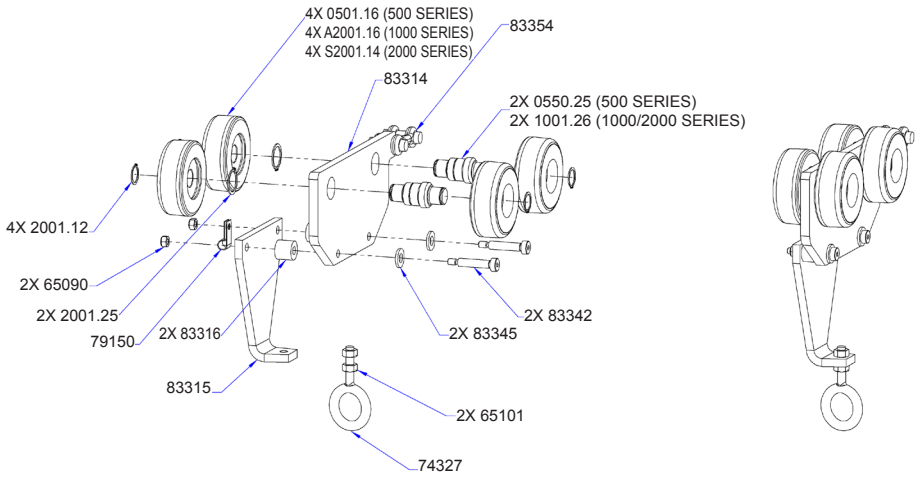


Figure 2. *Suspended Pendant Trolley Assembly.*

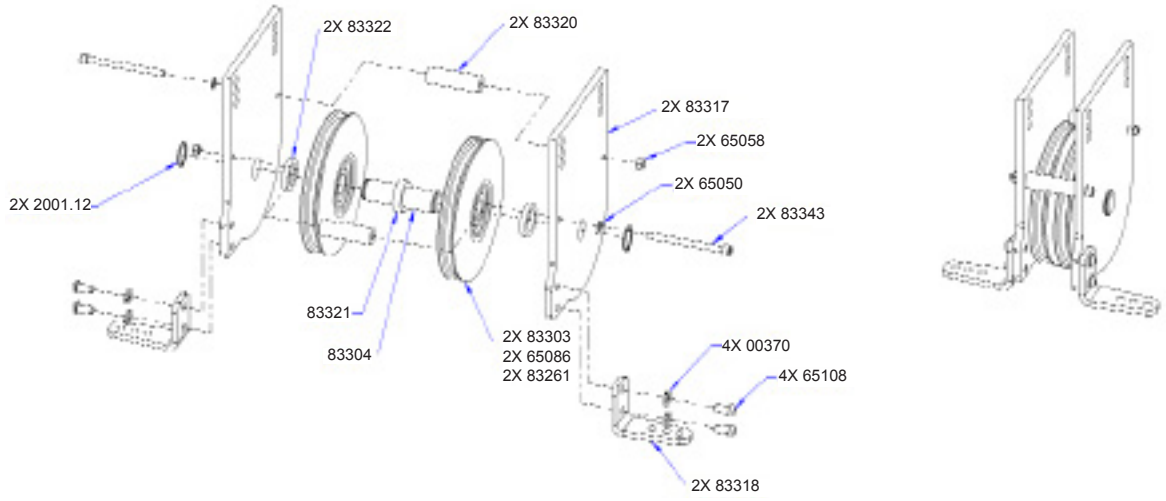


Figure 3. *Double Pulley Assembly.*

ASSEMBLY DIAGRAMS (CONTINUED)

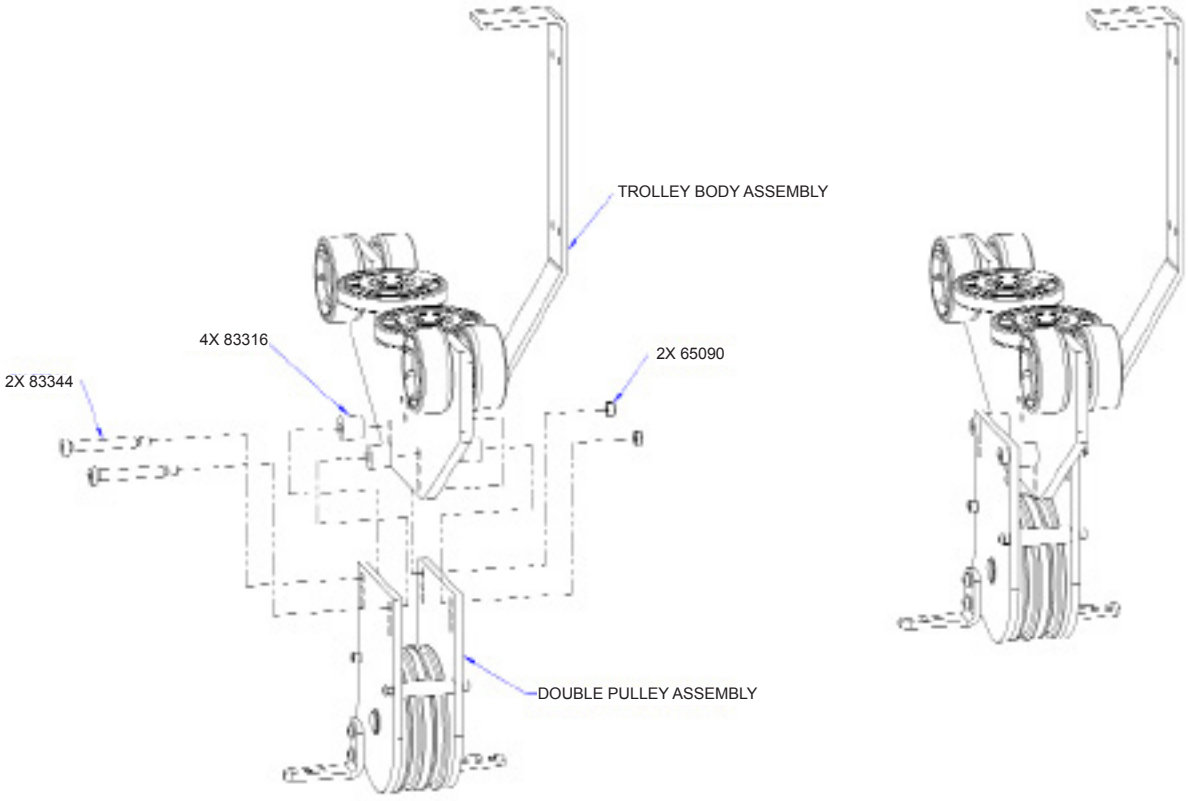


Figure 4. *Trolley-Pulley Assembly.*

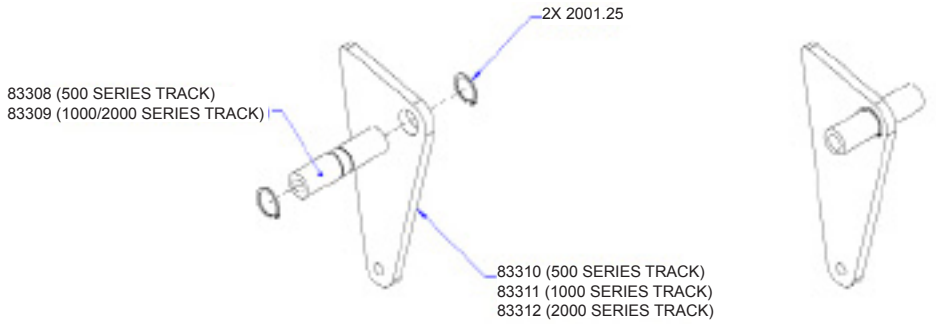


Figure 5. *End Bracket Assembly.*

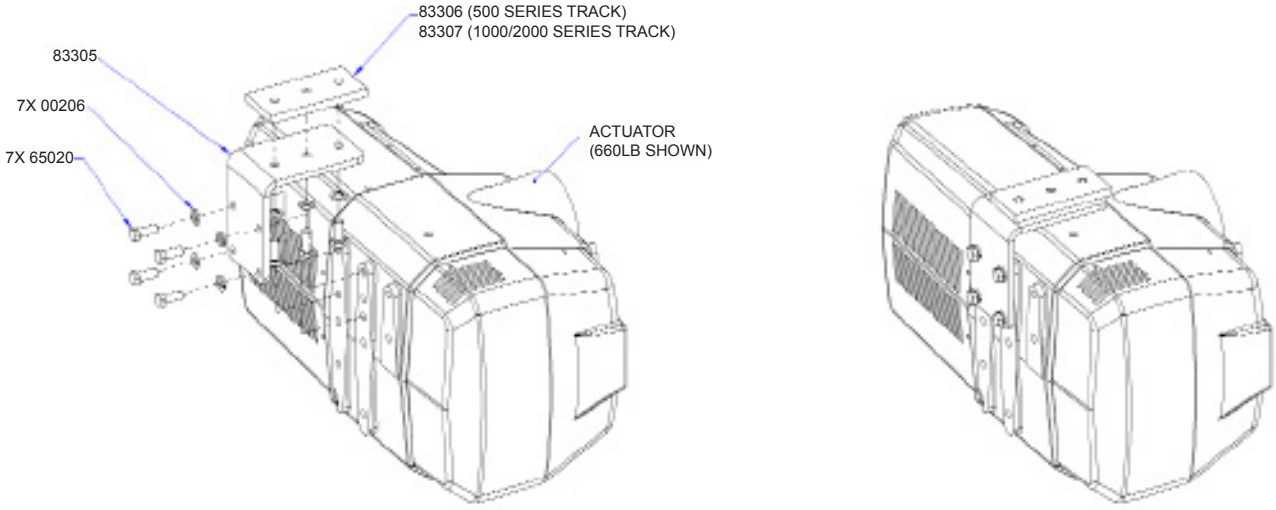


Figure 6. *Actuator Blanket Assembly.*

LIFT FUNCTIONALITY

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

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

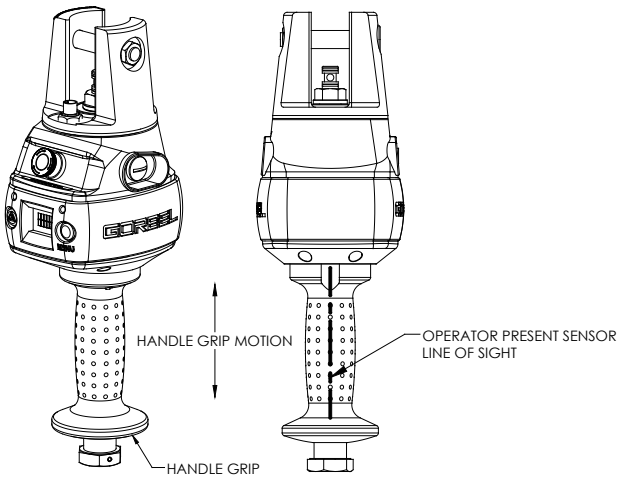


Diagram A. *Slide Handle - Handle Grip and Operator Present Sensor Line-of-Sight.*

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 C***, page 26). The further the up or down lever is depressed, the faster the servo movement to raise or lower the load.

Emergency Stop Button: When depressed, the emergency stop (E-stop) button disables the actuator. The E-stop button is located on the face of the handle (***diagram B***, page 26). The G-Force® will operate only when the E-stop has been reset. The LCD will display E-STOP ENGAGED.

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

Float Mode is initiated by simply pressing the G-Force® logo button on the left side of the handle (***diagram B*** or ***C***, page 26). See Step 10, page 19, for complete details on Float Mode operation.

Program Mode: In this mode, the operator can control speed, acceleration, service features and other variable settings (***diagram B*** or ***C***, page 26). ***See the Program Mode section, page 29, for complete programming functionality located at the handle.***

LIFT FUNCTIONALITY (CONTINUED)

Float Mode LED (Blue): If the unit is equipped with Float Mode, the “Float Mode” enabled LED will illuminate when the G-Force® logo button is pressed on the hand controller and Float Mode has been correctly initiated. This LED is located just above the G-Force® logo button (***diagram B*** or ***C***).

System Fault LED (Red): The “System Fault” LED flashes when basic faults have been detected by the control system. If a fault has occurred, the system will be disabled. This LED is located just above the MENU button (***diagram B*** or ***C***).

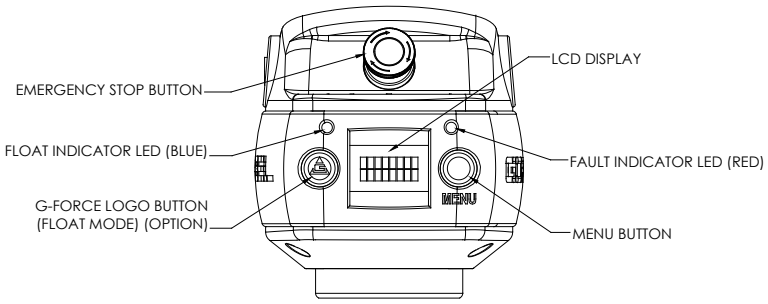


Diagram B. *Slide Handle - G-Force® Logo (Float Mode), MENU and Emergency-Stop Buttons and LEDs.*

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

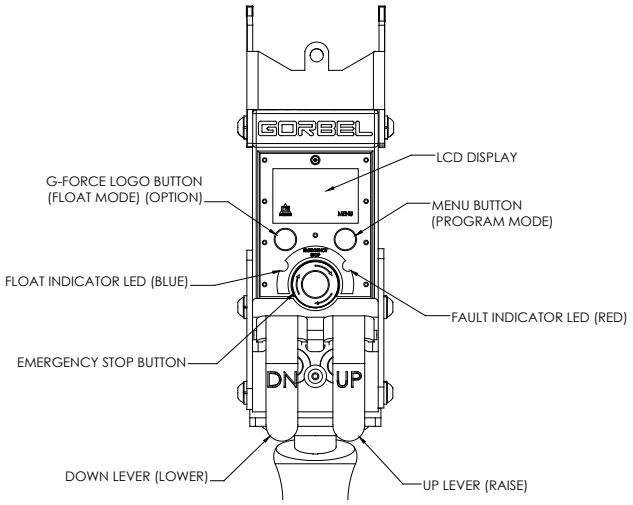


Diagram C. *Pendant Handle - G-Force® Logo (Float Mode), MENU and Emergency-Stop Buttons and LEDs.*

WARNING

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

WARNING

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

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

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.

LIFT FUNCTIONALITY (CONTINUED)

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

Remote Mounted Handle (System Option): The lifting device is capable of operating with the handle displaced from the wire rope (not in-line with the wire rope). For example, if an end user has tooling that is too large for the operator to safely reach and operate the handle in the standard in-line position, remote mounting the handle is recommended. The tooling must be mounted (and balanced) on the end of the wire rope, while the handle can be remote mounted to the tooling.

WARNING

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

WARNING

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

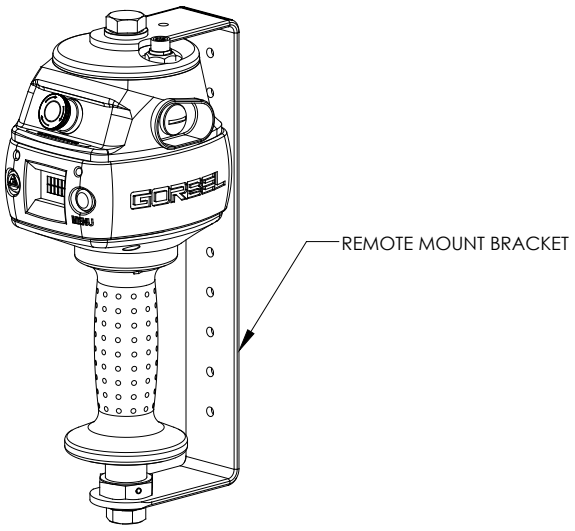


Diagram D. *Remote Mounted Slide Handle with Gorbel® Bracket.*

The remote mounted handle is linked to the coil cord via an extension cable. 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.

CAUTION

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

WARNING

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

CONTROLS INTERFACE FEATURES

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

Jog Switch Push Buttons: The jog switch buttons allow qualified personnel to replace the wire rope on the unit. To effectively operate the jog switch buttons, all electrical cables must be connected and power on. Depressing the “Up” jog switch button will enable the motor and cause the system to reel the wire rope into the actuator and onto the drum pulley. Depressing the “Down” jog switch button will enable the motor and cause the system to pay out the wire rope from the actuator and off of the main pulley. Jog switch push buttons override all motion control from a handle or tooling.

WARNING

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

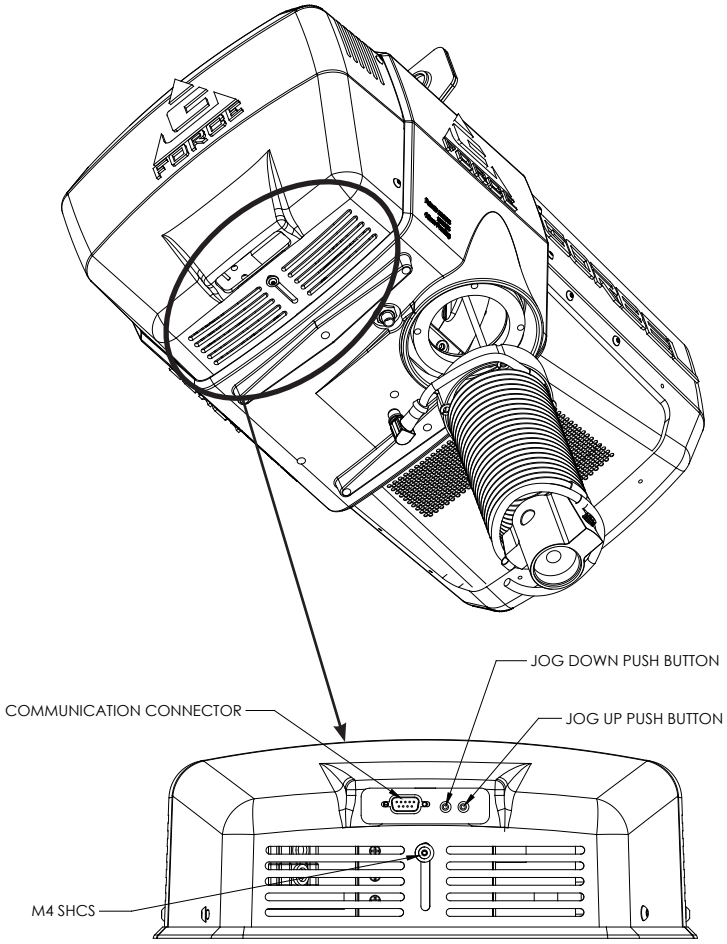


Diagram E. *Actuator - Controls Interface Display (as viewed from bottom of actuator).*

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

Communications Connector: This connector is the communications port for the G-Force®. With the program kit (option), provided by Gorbel, users may connect to the G-Force® to upload software programs or use the G-Force® Visual Basic program.

PROGRAM MODE

Overview (Software Version R1.07.1)
Program Mode is used to control and adjust all of the features on the Q and iQ series G-Force®. Before entering Program Mode review the ***Program Mode Menu outline, Chart D, pages 34-38***.

Note: Force Sensing Handles are not supported on units running software version R1.07.2 or earlier. Contact Gorbel for information on software updates.

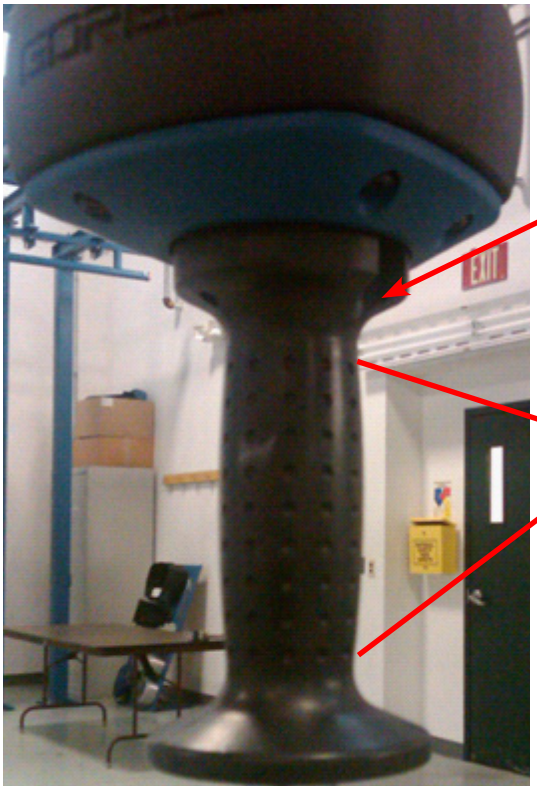
Using Program Mode
Program Mode is initiated by following the steps below. Reference ***diagrams B*** and ***C*** on page 26 for button locations.

Entering Program Mode (***chart A***, page 32):

1. Press and Hold the MENU button (right-hand side of handle) for two seconds to activate Program Mode.
2. After two seconds, release the MENU button. The red and blue LEDs will illuminate and “PROGRAM MODE” will be displayed for one second. Then the first menu will be displayed.
   - Q unit: SPEED MENU (default). ***Note:*** If the Virtual Limits Package has been ordered, the Virtual Limits Menu (V-LIMITS) will appear first.
   - iQ unit: V-LIMITS MENU
3. Press the MENU button to toggle between menus. The LCD will display the corresponding programmable menus:
   - V-LIMITS MENU - Virtual Limits menu (***option***)
   - SPEED MENU - Lift Speed adjustment
   - RESPONSE MENU - Lift Response (acceleration) adjustment
   - SETTINGS MENU - Programmable Features on both the Q and iQ units
   - SETTINGS MENU 2 - Programmable Features on iQ units only (***iQ only***)
   - LED MENU - Program the LED lights (***iQ only***)
   - SERVICE MENU - Customize and manage maintenance and service features
   - CONFIGUR MENU - Special unit features and hardware configurations
4. Once you have reached the menu you would like to enter, press the G-Force® logo button.
5. The first programmable feature in that menu will be displayed. ***Chart D***, pages 34-38, displays a full list of all the menus and programmable features under each menu.
6. To move to the second programmable feature press the G-Force® logo button again.
7. ***Note:*** If the MENU button is pressed after Step 4, the selection is cleared and the LCD displays the next program menu.
8. Once the desired feature is selected wait three seconds.
9. After displaying the feature text for three seconds, the request is executed. The LCD will flash the feature text several times to indicate the command is being executed.
10. After the command is executed, the system returns to standard operation, and the LCD displays “LIFT READY”.

PROGRAM MODE (CONTINUED)

Handle Operation



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

When making changes in program mode, do not break the beam of the photo sensor until the new setting has been completed. The display must be allowed to flash three times before the handle is gripped. Breaking the sensor beam before the display flashes three times will cancel the change and drop the unit out of program mode and you will have to start over.

When the unit is not in program mode, press and release this button to initiate float mode.

When the unit is in float mode, use this button to select the desired item within the menu by pressing and releasing to advance to the next selection

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

If you stay on a menu item selection for approximately three seconds, the display will blink three times and the change will be made. Keep advancing through the menu items quickly until you are certain of the change you want to make. Otherwise, you may accidentally make an undesired change.

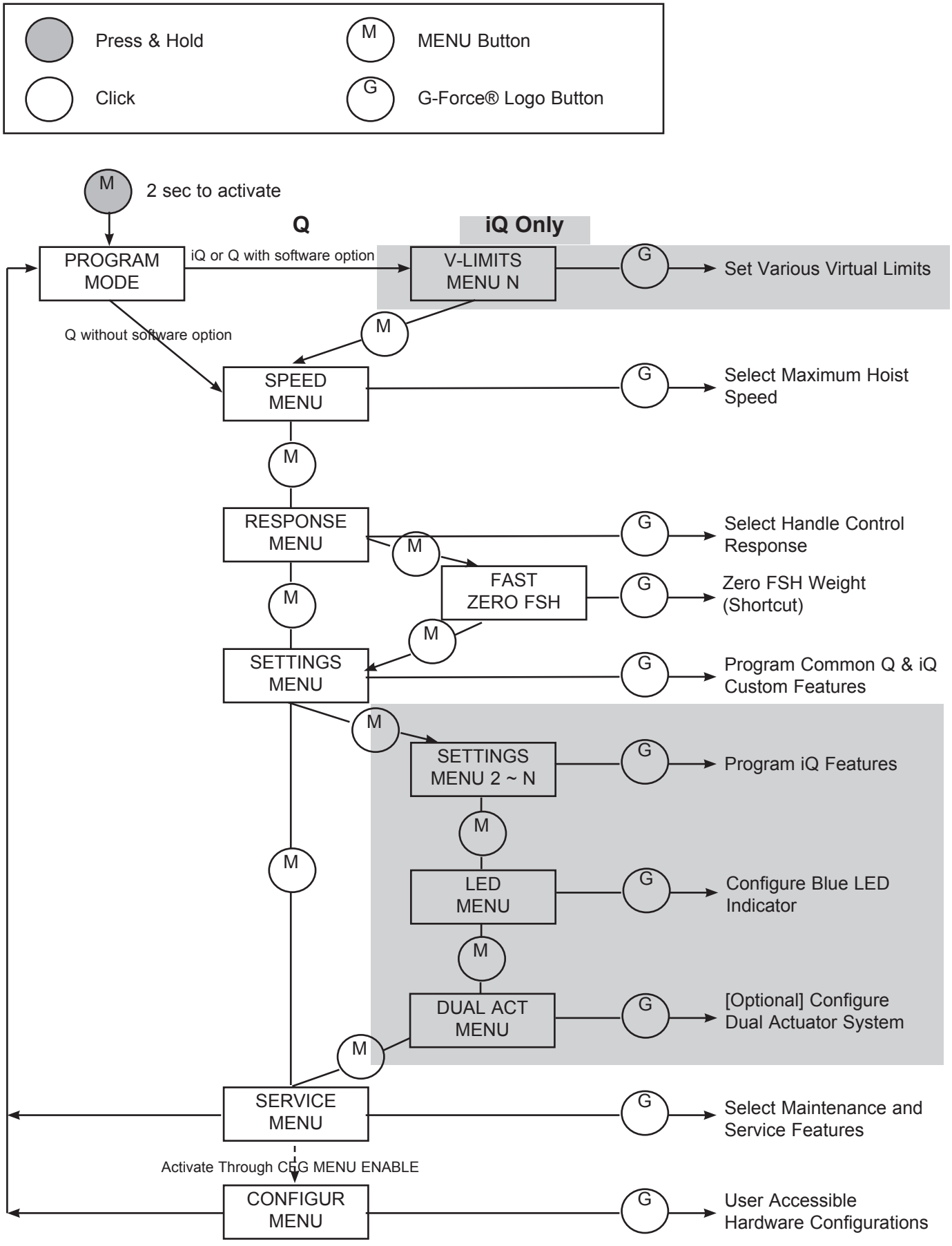


Chart A. *Program Mode Process.*

PROGRAM MODE (CONTINUED)

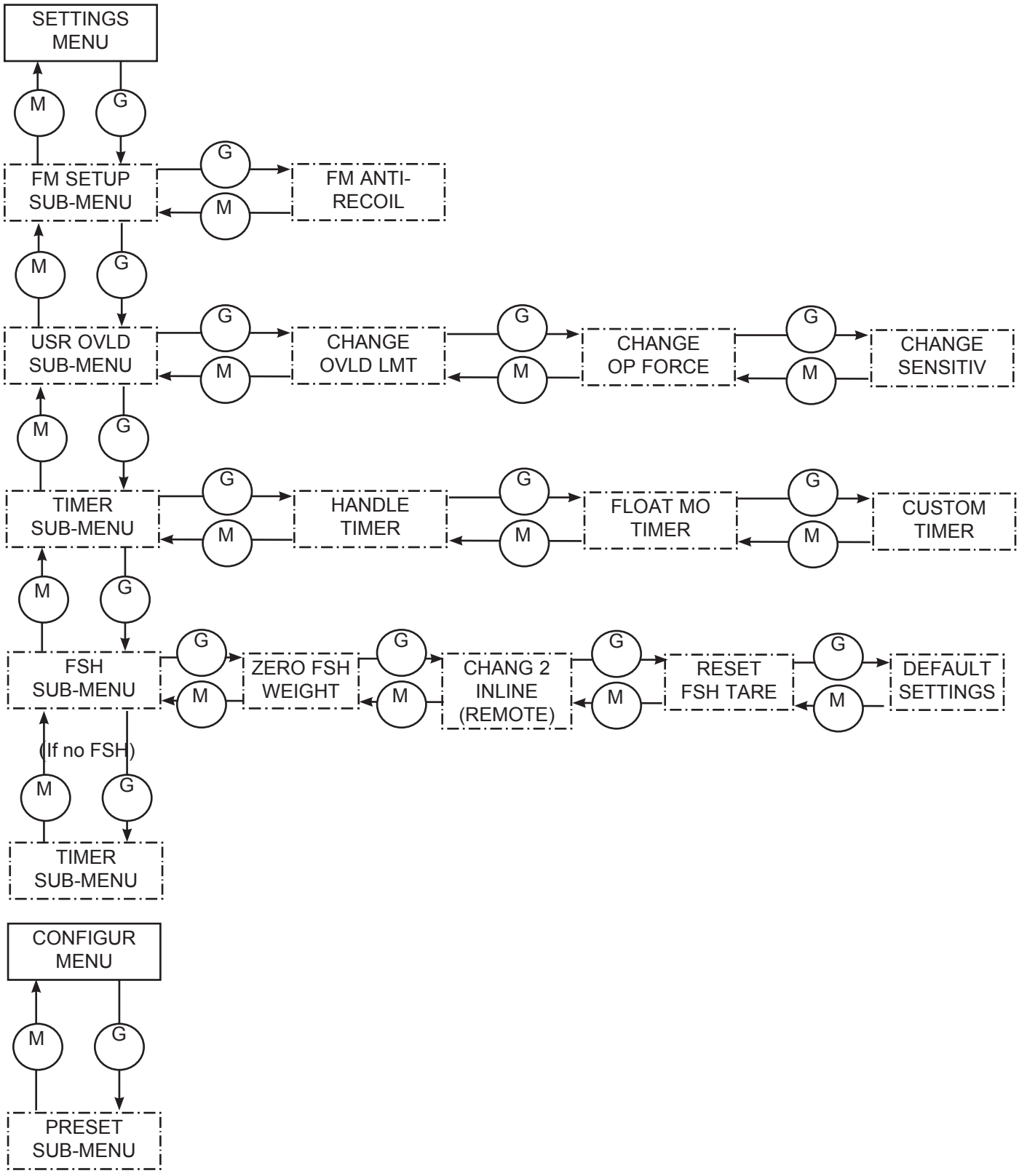


Chart B. *Program Mode Main Menu (Solid Border) and Sub-Menu (Dotted Border) Layouts.*

PROGRAM MODE (CONTINUED)

Lockout Feature (*chart C*)
To prevent tampering in Program Mode, a Lockout Feature is available.

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

If Program Mode is requested after the Lockout has been enabled, the LEDs will flash twice to indicate Program Mode is not accessible and “PROGRAM LOCKED” will be displayed again.

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

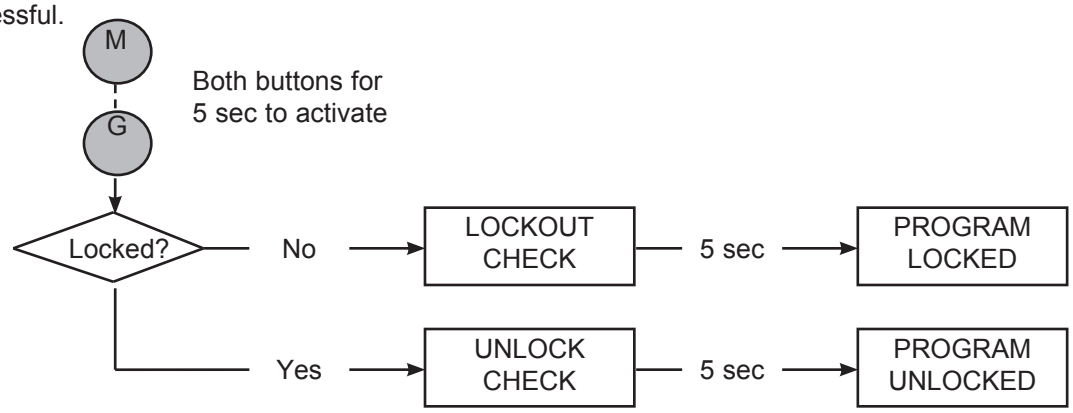


Chart C. *Lockout Feature Process.*

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

For example, if the G-Force® records a fault, when Program Mode is activated the LCD will display “LIMITED PRG MODE” rather than “PROGRAM MODE”. Safety Program Mode can be navigated just as Program Mode would be, however the only menus available are:
- V-LIMITS MENU - Virtual Limits menu (***option***)
- SPEED MENU - Lift Speed adjustment
- RESPONSE MENU - Lift Responsiveness (Acceleration) adjustment
- SERVICE MENU - Customize and manage maintenance and service features

VIRTUAL LIMITS WARNINGS

WARNINGS

If the upward speed reduction point is being used to reduce the impact of engaging the load “on the fly” (i.e. catching the load with a hook while the G-Force® is already in motion in the upward direction), care must be taken to ensure the speed reduction takes place before the load is engaged. Please program the Upper Slow Down Reduction point at least half an inch below the exact point of pick-up.

Note: Setting the upper and lower virtual limits to the same position will cause the unit to not travel in either direction.

PROGRAM MODE (CONTINUED)

Program Mode	Menu	LCD Text	Feature Description
Virtual Limits (VL) Menu*,,*** (also available for Q unit with Software Package)**	V-LIMITS MENU[1,2]	UPPER LIMIT	Program the upper virtual limit (load must be at desired position for upper limit).
		LOWER LIMIT	Program the lower virtual limit (load must be at desired position for lower limit).
		LOWER SLOW DN	Program the lower slow down reduction point (load must be at position where slow-down begins when descending).
		UPPER SLOW DN	Program the upper slow down reduction point (load must be at position where slow-down begins when raising load).
		UPPER RESUME	Program the upper speed resume point (load must be at position where system will resume normal speed when raising load).
		VL MENU -RESET!-	Reset all programmed virtual limits in this menu.
Lift Speed Setting	SPEED MENU	SPD MENU SPD 10% ~ SPD 100%	Maximum hoist speed selection, [1 ~ 10] correspond to lowest and highest speed.
Lift Responsiveness (Acceleration) Setting	RESPONSE MENU	RESPONSE LOW	Set the lowest handle control response corresponding to about 75% of the highest responsiveness setting.
		RESPONSE MEDIUM	Set the medium handle control response corresponding to about 85% of the highest responsiveness setting.
		RESPONSE HIGH	Set the highest handle control responsiveness setting.
Force Sensing Handle Settings	FAST ZERO FSH	FAST ZERO FSH	This menu provides a short cut to tare the Force Sensing Handle. Clicking the Float Mode button will perform the tare process. This menu will not be displayed unless a Force Sensing Handle is connected.
	FSH SUB MENU	ZERO FSH HNDL	Tare the handle.
		CHANGE 2 INLINE (REMOTE)	Change the handle between Inline and Remote type. This should be done when swapping one style of Force Sensing handle for another. The setting must match the handle type.
		RESET FSH	Un-tare the handle. The load cell signal will be returned to its original value. Usually command warning 11008 will display since the handle will be out of tare.
		DEFAULT SETTING	Revert to default handle setting: unit will be configured for Inline Slide Force Sensing handle.
Q & iQ Custom Features	SETTINGS MENU	ZERO WT DISP	Record and tare out the handle weight for weight readout calculation.
		WEIGHT READ ON_ READ OFF	Toggle between enabling and displaying the load weight. Once enabled, weight is displayed two seconds into standard operation (unit idling).
		DISPLAY METRIC ENGLISH	Toggle the unit of the weight readout display between pounds (English) and kilograms (Metric).
		FM SETUP SUB-MENU	Access Float Mode Configuration Setup Sub-Menu.
		USR OVLD SUB-MENU	User Programmable Overload Setup Sub-Menu.
		TIMER SUB-MENU	Excessive Pause Timer Setup Sub-Menu.
		SETTINGS -RESET!-	Reset above Custom Features, i.e. reset tarred handle weight, weight readout off, and readout display back to English unit.
[SUB-MENU] Float Mode Configuration Setup	FM SETUP SUB-MENU	FM SETTINGS	Startup prompt screen when this sub-menu is accessed.
		ENABLE DISABLE FLOAT MO[3]	Enable or Disable running Float Mode related features, such as Standard Float Mode, Remote-Mount Float Mode Trigger, Dual Float Mode Weights, etc.
		FM ANTI-RECOIL	Float Mode Anti-Recoil Configuration Sub-Menu.
		UNLOAD STOP ON STOP OFF	Optional feature utilizing Anti-Recoil detection. When user sets a weight onto a surface in Float Mode, it is terminated if Anti-Recoil detects an unloading. This can be useful for applications needing a quick Float Mode exit to an idle state to allow user to work on the part. Note: As a result of the extra detection, Float Mode is likely to terminate when the upper limit switch is hit while unit is running at a fast speed. This false detection can be avoided or reduced by running the unit at a low speed.

Chart D. *(continued on pages 35-38) Program Mode Menu and Selection Settings.*

PROGRAM MODE (CONTINUED)

Program Mode	Menu	LCD Text	Feature Description
[SUB-MENU] **Float Mode Anti-Recoil Configuration Setup**	FM ANTI-RECOIL	AT OVER FORCE SPEED	Startup screen when this sub-menu is accessed. The correct configured Anti-Recoil detection method is displayed (see next item for details on the detection methods).
		TO OVER FORCE SPEED	Toggle Anti-Recoil detection method between standard over-speed and over-force detections. Anti-Recoil protects against a dropped weight while running Float Mode causing the unit to speed upward until hitting an object or a push force equivalent to the dropped weight. Over-Speed Detection: Unit terminates Float Mode if speed exceeds maximum Float Mode speed at 90% of unit loaded speed. Over-Force Detection: Unit terminates if user's operating force exceeds the maximum force limit or a dropped weight is detected by evaluating the force profile. Different from Over-Speed Detection, unit can run at the maximum Float Mode speed. a. Maximum force limit defaults at 35 lbs. b. A dropped weight profile assumes the operator has both hands off the weight (tooling) as the unit speeds upward. Detection ability may reduced if user attempts to stop the unit or if the tooling swings heavily. c. If the total lifted weight (e.g. tool and part) is less than the maximum force limit, Over-Speed Detection is applied.
		MX FORCE 15 ~ 45 LBS	Set Anti-Recoil Over-Force Detection maximum force limit between 15 and 45 lbs.
		DEFAULT SETTINGS	Unit reset to the default setup according to the configured detection method. For example, unit configured with Over-Force Detection defaults to 35 lbs. maximum force limit, dropped weight profile checkup and conditional Over-Speed Detection. UNLOAD STOP option is turned off for both methods.
[SUB-MENU] **User Programmable Overload Setup**	USR OVLD SUB-MENU	USR OVLD SETUP	Startup prompt screen when this sub-menu is accessed. Please activate weight readout while setting an overload limit, to ensure that the load cell is properly calibrated and the desired overload limit is within the acceptable range. Please see WEIGHT READ ON_ under SETTINGS MENU for additional details.
		CHANGE OLVD LMT	Program an overload limit.
		CHANGE OP FORCE	Configure operating force limit for moving a load in air.
		CHANGE SENSITIV	Configure overload detection sensitivity.
		DEFAULT SETTINGS	Apply factory default overload settings. Overload limit is set as the maximum limit either at the rated capacity plus 5 lbs for G-Force® 165#, Easy Arm® 165# and G-Jib™ 330# models, or 101% of the rated capacity plus 5 lbs for all other models. The operating force limit is set at 15 lbs and detection sensitivity is set to 5 (high).
Program an Overload Limit	CHANGE OVLD LMT	AT OVLD LBS NNNN	Startup prompt screen displaying the programmed overload limit. User Overload feature adjusts the detection and over limit parameters proportional to programmed Overload Limit. The over limit when overload is triggered is at M% above the Overload Limit plus the Operating Force Limit (see CHANGE OP FORCE section for info). An over limit is roughly set at: G-Force®: 102% x Overload Limit + OP FORCE EasyArm®: 105% x Overload Limit + OP FORCE G-Jib™: 103% x Overload Limit + OP FORCE
		TARE OVLD LMT	Tare the total lifted weight as Overload Limit. When selected, unit tares the total lifted weight supported by the wire rope as the Overload Limit. This value can be monitored thru the weight readout feature without zeroing the reading (see SETTINGS MENU). The maximum limit is either the rated capacity plus 5 lbs for G-Force® 165#, Easy Arm 165# and G-Jib™ 330# models, or 101% of the rated capacity plus 5 lbs for all other models. The minimum limit is 25% of the rated capacity. A warning is triggered if the tare weight is outside this range. Overload limit is capped at one of these bounds.
		SET LIMIT LBS NNNN	Set Overload Limit to the selected NNNN lbs limit. TARE OVLD LMT section lists a range of the maximum and minimum limits for Overload Limit. Clicking the G-Force® Logo pushbutton decrements the limit from the maximum down to the minimum, one lb at a time. The button can be pressed and held to decrease the count at a faster rate. Once the minimum value is reached, click the pushbutton to restart from the setup screen; otherwise, the minum limit is applied after the pushbutton is released.

Chart D. *(continued from page 34 & continued on pages 36-38) Program Mode Menu and Selection Settings.*

PROGRAM MODE (CONTINUED)

Program Mode	Menu	LCD Text	Feature Description
Configure Operating Force Limit for Moving a Load in Air	CHANGE OP FORCE	AT FORCE LBS NNNN	Startup prompt screen displaying the programmed Operating Force Limit. Operator's push and pull force is an extra loading to the system, especially when handle is mounted on the tooling. This sub-menu allows one to set a Force Limit to account for different user's operating force thus reducing chance of false overload detection. The limit should not be set larger than necessary as it reduces detection capability. By default, the limit is set at 15 lbs.
		TO FORCE LBS NN	Set Operating Force Limit to between 5 and 25 lbs in 1 lb increments.
Configure Overload Detection Sensitivity	CHANGE SENSITIV	AT LEVEL 5 (HIGH) ~ 1 (LOW)	Startup prompt screen displaying the programmed Detection Sensitivity. This feature may falsely detect varying weight as overloaded, for example, on a system with unbalanced or elongated tooling that sways easily during usage, or a less rigid supporting structure that induce much vibration. The sensitivity parameter can be reduced to prevent false detection when operating a load at no greater than the Overload Limit. However, do not reduce the sensitivity unless it is necessary due to actual usage. A reduced sensitivity increases the time to detect a legitimate overload condition that may result in damages or failure to the unit. By default, Detection Sensitivity is set at 5 (HIGH).
		TO LEVEL 5 (HIGH) ~ 1 (LOW)	Set Detection Sensitivity to between 5 (HIGH) and 1 (LOW) one level decrements at a time.
[SUB-MENU] **Excessive Pause Timer Setup Sub-Menu**	TIMER SUB-MENU[3]	PAUSE TIMER	Startup prompt screen when this sub-menu is accessed.
		HANDLE TIMER	Change timer setting for the slide and pendant handle.
		FLOAT MO TIMER	Change timer setting for Float Mode.
		CUSTOM TIMER	Change timer setting for custom motion such as Auto Home or a profiled movement.
		DEFAULT SETTINGS	Apply default excessive pause timer settings: slide and pendant handle (45 seconds), Float Mode (60 seconds) and custom motion (20 seconds).
Change Time Setting for the Selected Run Mode	HANDLE FLOAT MO or CUSTOM TIMER	AT LIMIT SEC NN MIN M	Startup prompt screen displaying the current timer limit between 1 ~ 59 seconds or 1 ~ 5 minutes.
		SET LIMIT SEC NN MIN M	Set pause timer limit. Clicking the G-Force® Logo pushbutton increments the setting from 1 to 59 seconds, followed by 1 to 5 minutes. Press-and-hold the pushbutton does a quick scroll-thru on these limits.
iQ Features*,**	SETTINGS MENU 2	DUAL FM TOOL WT	(Float Mode feature enabled) Record tooling weight for the Dual Float Mode weights feature.
		DUAL FM LOAD WT	(Float Mode feature enabled) Record tooling and load weights for the Dual Float Mode weights feature.
		ANTIDROP TOOL WT	Tare tooling weight for anti-drop feature. The minimum difference between unloaded and loaded tool weight is 20 lbs. for G-Force®, 25 lbs. for Easy Arm® and 25 lbs. for G-Jib™.
		MENU 2 SET HOME	Program the auto home tracking position (load must be at desired position for the limit).
		MENU 2 -RESET!-	Reset above custom features including the dual Float Mode, anti-drop, and auto home features.
LED Config Menu*,: Programs the blue LED as an indicator)**	LED MENU	RESET LEDS	Disable any custom feature (e.g. anti-drop) from utilizing the blue LED as an indicator.
		ANTI DROP	Enables the blue LED on the control handle to act as an indicator for the anti-drop function. When this function is enabled and the anti-drop output is off (off is typically the grip/clamp state of the tooling), the blue LED will flash until the anti-drop output turns on (on is typically the release state of the tooling).
		SLACK ANTIDROP	Set Slack Anti-Drop to use the blue LED for indication identical to ANTI-DROP above. This selection is not available by default because this is a disabled built-in feature.

Chart D. *(continued from pages 34-35 & continued on pages 37-38) Program Mode Menu and Selection Settings.*

PROGRAM MODE (CONTINUED)

Program Mode	Menu	LCD Text	Feature Description
Configure Operating Force Limit for Moving a Load in Air	CHANGE OP FORCE	AT FORCE LBS NNNN	Startup prompt screen displaying the programmed Operating Force Limit. Operator's push and pull force is an extra loading to the system, especially when handle is mounted on the tooling. This sub-menu allows one to set a Force Limit to account for different user's operating force thus reducing chance of false overload detection. The limit should not be set larger than necessary as it reduces detection capability. By default, the limit is set at 15 lbs.
		TO FORCE LBS NN	Set Operating Force Limit to between 5 and 25 lbs in 1 lb increments.
Configure Overload Detection Sensitivity	CHANGE SENSITIV	AT LEVEL 5 (HIGH) ~ 1 (LOW)	Startup prompt screen displaying the programmed Detection Sensitivity. This feature may falsely detect varying weight as overloaded, for example, on a system with unbalanced or elongated tooling that sways easily during usage, or a less rigid supporting structure that induce much vibration. The sensitivity parameter can be reduced to prevent false detection when operating a load at no greater than the Overload Limit. However, do not reduce the sensitivity unless it is necessary due to actual usage. A reduced sensitivity increases the time to detect a legitimate overload condition that may result in damages or failure to the unit. By default, Detection Sensitivity is set at 5 (HIGH).
		TO LEVEL 5 (HIGH) ~ 1 (LOW)	Set Detection Sensitivity to between 5 (HIGH) and 1 (LOW) one level decrements at a time.
[SUB-MENU] **Excessive Pause Timer Setup Sub-Menu**	TIMER SUB-MENU[3]	PAUSE TIMER	Startup prompt screen when this sub-menu is accessed.
		HANDLE TIMER	Change timer setting for the slide and pendant handle.
		FLOAT MO TIMER	Change timer setting for Float Mode.
		CUSTOM TIMER	Change timer setting for custom motion such as Auto Home or a profiled movement.
		DEFAULT SETTINGS	Apply default excessive pause timer settings: slide and pendant handle (45 seconds), Float Mode (60 seconds) and custom motion (20 seconds).
Change Time Setting for the Selected Run Mode	HANDLE FLOAT MO or CUSTOM TIMER	AT LIMIT SEC NN MIN M	Startup prompt screen displaying the current timer limit between 1 ~ 59 seconds or 1 ~ 5 minutes.
		SET LIMIT SEC NN MIN M	Set pause timer limit. Clicking the G-Force® Logo pushbutton increments the setting from 1 to 59 seconds, followed by 1 to 5 minutes. Press-and-hold the pushbutton does a quick scroll-thru on these limits.
iQ Features*,**	SETTINGS MENU 2	DUAL FM TOOL WT	(Float Mode feature enabled) Record tooling weight for the Dual Float Mode weights feature.
		DUAL FM LOAD WT	(Float Mode feature enabled) Record tooling and load weights for the Dual Float Mode weights feature.
		ANTIDROP TOOL WT	Tare tooling weight for anti-drop feature. The minimum difference between unloaded and loaded tool weight is 20 lbs. for G-Force®, 25 lbs. for Easy Arm® and 25 lbs. for G-Jib™.
		MENU 2 SET HOME	Program the auto home tracking position (load must be at desired position for the limit).
		MENU 2 -RESET!-	Reset above custom features including the dual Float Mode, anti-drop, and auto home features.
LED Config Menu*,: Programs the blue LED as an indicator)**	LED MENU	RESET LEDS	Disable any custom feature (e.g. anti-drop) from utilizing the blue LED as an indicator.
		ANTI DROP	Enables the blue LED on the control handle to act as an indicator for the anti-drop function. When this function is enabled and the anti-drop output is off (off is typically the grip/clamp state of the tooling), the blue LED will flash until the anti-drop output turns on (on is typically the release state of the tooling).
		SLACK ANTIDROP	Set Slack Anti-Drop to use the blue LED for indication identical to ANTI-DROP above. This selection is not available by default because this is a disabled built-in feature.

Chart D. *(continued from pages 34-36 & continued on page 38) Program Mode Menu and Selection Settings.*

PROGRAM MODE (CONTINUED)

Program Mode	Menu	LCD Text	Feature Description
Service Menu: Maintenance and Service Features (Continued)	SERVICE MENU (Continued)	I/O BLK3 DIAGNOSE	[iQ Unit with Custom or Reconfigured Program] Third Expansion Input/Output Block Diagnostic Mode displays the status of the eight configurable inputs and outputs on the LCD screen. The inputs statuses are displayed in the first screen followed by those for the outputs. The I\O Point number of the input that measures incoming 24VDC or output that is turned on to provide 24VDC is displayed in each screen as numerical numbers, 1 ~ 8.
		SRV MENU -RESET!-	Reset all programmed features in this menu such as the upper and lower cycle limits and the service indicator time limit if the feature is available. Does not clear the run time and cycle counts.
Special Unit Features and Hardware Configurations	CONFIGUR MENU	RECORD CONFIG	Record the current unit system configuration settings such as unit type and capacity setting, factory overload settings, loadcell calibration parameters, virtual limit software package enabling flag for Q unit, burn-in status and all the custom feature setup parameters.
		ZERO LOD BIAS	Set loadcell bias signal with no weight attached to define a "zero" value (requires Float Mode option).
		CALIBRAT LOD COEF	Set loadcell signal slope coefficient with a lifted weight equal to the rated capacity of the unit below the wire rope. Any different lifting weight will result in false calibration and inaccuracy such as weight readout feature (requires Float Mode option). This step must be performed after zero load bias.
		PRESET SUB-MENU	Access predefined sets of Q/iQ feature configurations including factory default setup.
[SUB-MENU] Preset Feature Configuration List	PRESET SUB-MENU[3]	PRESET 1*	I/O Expansion I/O Block (Assignment for one I/O Anti-Drop) 1 Input - Dual Float Mode 2 Input - Anti-Drop 3 Output - Anti-Drop 4 Input - Auto Home 5 Input - External device control (combine with Actuator I/O Module point 5) 6 Input - External device control (combine with Actuator I/O Module point 6) 7 Output - mimic OPS 8 Output - mimic stack WARN: A unit equipped with a custom program would have its custom features disabled and reconfigured to the above settings.
		PRESET 2*	I/O Expansion I/O Block (Assignment for two I/O Anti-Drop) 1 Input - Dual Float Mode 2 Input - Anti-Drop (Clamp) 3 Input - Anti-Drop (Unclamp) 4 Input - Auto Home 5 Input - External device control (combine with Actuator I/O Module point 5) 6 Input - External device control (combine with Actuator I/O Module point 6) 7 Output - Anti-Drop (Clamp) 8 Output - Anti-Drop (Unclamp) WARN: A unit equipped with a custom program would have its custom features distabled and reconfigured to the above settings.
		PRESET 3*	I/O Expansion I/O Block (Two I/O Anti-Drop & System Switches Output) 1 Input - Dual Float Mode 2 Input - Anti-Drop (Clamp) 3 Input - Anti-Drop (Unclamp) 4 Input - Auto Home 5 Output - Handle Operator Present Sensor Status 6 Output - Slack or Down Travel Limit Switch Status 7 Output - Anti-Drop (Clamp) 8 Output - Anti-Drop (Unclamp) The external device control feature previously on I/O5 and 6 is disabled; therefore its corresponding outputs on Actuator I/O Module I/O points 5 and 6 are disabled as well. WARN: A unit equipped with a custom program would have its custom features disabled and reconfigured to the above settings.
		FACTORY DEFAULT	Reset feature resets back to factory default equivalent PRESET 2. A unit equipped with a custom program is reset to its default configuration with its custom features enabled.

* Indicates this feature is only available on iQ units.
** Additional details are available in the Input/Output Functionality section.
*** This menu is hidden unless the optional feature is purchased and installed.
[1] Two (2) virtual limit sets are available with a standard iQ unit. More virtual limit sets are possible with custom programming.
[2] The minimum distance between any two Virtual Limits is 1", 1/2", 1/4" and 1/8" for any 75Kg, 150Kg, 300Kg, and 600Kg actuators correspondingly, with the exception that the gap between the Upper and Lower Virtual Limits must be greater than 1". The motion control position accuracy to any Virtual Limit is as follows:
+/- 1/4" for G-Force®, Easy Arm®, G-Jib™ 150Kg; +/- 1/16" for G-Jib™ 300Kg, +/- 1/8" for G-Force® 300Kg, +/- 1/16" for G-Force® 600Kg
Note that the actual total accuracy is motion control accuracy plus any mechanical component accuracy constraints. For example, if mechanical component accuracy is +/- 1/4", the total cumulated accuracy is +/- 1/2" for G-Force® 75Kg unit.
[3] This entire section or item selection requires cycling the main 220 VAC power for the setting(s) to take effect.

Chart D. *(continued from pages 34-37) Program Mode Menu and Selection Settings.*

PROGRAM MODE (CONTINUED)

iQ Actuator Input/Output Module Functionality

I/O Point	Assigned Function	Description	Settings (see chart A for instructions on navigating and setting menu functions)
1	Input - Dual virtual limit sets	When this input is turned on, the G-Force® switches to a second independent set of virtual limits. See chart C for instructions on setting each of these limit sets.	Second set of virtual limits is done the same as the standard set but with this input on.
2	Future expansion - no default functionality assigned	Functionality may be assigned via custom programming to meet application requirements. Contact your Gorbel® dealer for more details.	
3	Future expansion - no default functionality assigned	Functionality may be assigned via custom programming to meet application requirements. Contact your Gorbel® dealer for more details.	
4	Future expansion - no default functionality assigned	Functionality may be assigned via custom programming to meet application requirements. Contact your Gorbel® dealer for more details.	
5	Output - External device control (requires optional expansion 8-point input/output block)	This output is controlled by input number 5 on the optional expansion 8-point input/output block. When that input is on, output 5 on the iQ actuator input/output module is on and vise versa.	
6	Output - External device control (requires optional expansion 8-point input/output block)	This output is controlled by input number 6 on the optional expansion 8-point input/output block. When that input is on, output 6 on the iQ actuator input/output module is on and vise versa.	
7	Output - Service indicator	This output turns on when service is required (based on hours of use and set at the factory) and may be used to turn on an external service indicator (supplied by others).	The reset function for this output is in the SERVICE MENU, items CLEAR RUN TIME or SRV WARN OFF.
8	Output - Fault indicator	This output turns on when a command fault or drive fault occurs. It does not turn on due to a command warning.	

Chart E. *iQ Actuator Input/Output Module Standard Functionality.*

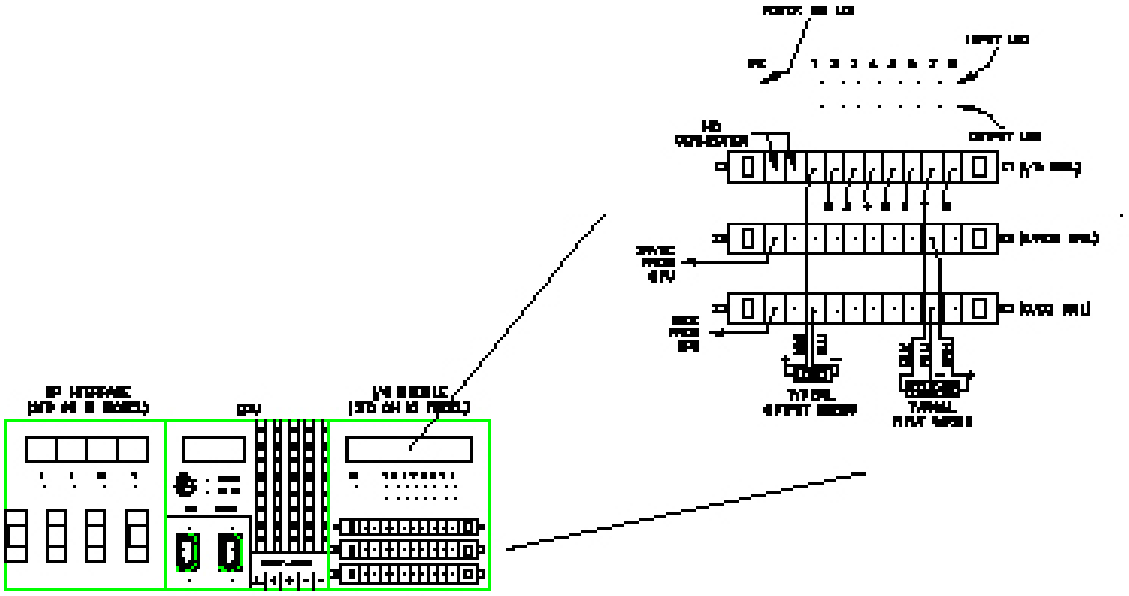


Diagram F. *Actuator CPU Input/Output Block.*

PROGRAM MODE (CONTINUED)

Expansion 8-Point Input/Output Block Functionality

I/O Point	Assigned Function	Description	Settings (see chart A for instructions on navigating and setting menu functions)
1	Input - Dual load weight Float Mode*	When the G-Force® is in float mode, this input allows switching from one pre-programmed load weight to another. These two weights must remain fixed; otherwise, some drifting can occur if the weight is different than the programmed value.	The two Float Mode load weights programmed are located in SETTINGS MENU 2 - DUAL TOOL WT and DUAL FM LOAD WT. The desired load weight must be suspended from the G-Force® when performing each setting.
2	Input - Anti-drop feature (Clamp request)*	This input is typically wired to a clamp request pushbutton. When the input is on, Output #7 (see I/O Point 7) turns on and Output #8 turns off regardless of the tooling loading state.	See I/O Point 3 Settings description.
3	Input - Anti-drop feature (Unclamp request)*	This input is typically wired to an unclamp request pushbutton. When the input is on, Output #8 (see I/O Point 8) turns on only if Anti-Drop algorithm determines the suspended load is at or below the set weight (ANTIDROP TOOL WT). If Output #8 turns on, Output #7 is turned off.	Programming to tare weight is located at SETTINGS MENU 2 - ANTIDROP TOOL WT. The empty tooling (including handle controller and other accessories) without a pickup part must be suspended solely by the wire rope when tarring. The minimum difference between unloaded and loaded tool weight is 20 lbs. for G-Force®, 25 lbs. for Easy Arm®, and 25 lbs. for G-Jib™ products.
4	Input - Auto Home	When this input is toggled (momentarily turned on then off again), the G-Force® automatically travels to the set home position in the vertical travel. Tracking stops when obstruction is detected, i.e. Q/iQ G-Force® stops at 10-25 lbs. depending on unit capacity.	The Auto Home position programming is located at SETTINGS MENU 2 - MENU 2 SET HOME. Move the G-Force® to the desired position in the vertical travel before selecting the position setting in this menu.
5	Input - External device control (used in conjunction with actuator output 5)	This input controls input 5 on the actuator input/output module. When this input is on, output 5 on the iQ actuator input/output module is on and vise versa.	
6	Input - External device control (used in conjunction with actuator output 6)	This input controls input 6 on the actuator input/output module. When this input is on, output 6 on the iQ actuator input/output module is on and vise versa.	
7	Output - Anti-drop feature (Clamp Control)*	This output is typically wired to actuate the clamping mechanism of an end effector tooling. It turns on when Input #2 (see I/O Point 2) is on and remains latched on when the input is released. It can be turned off by Input #3 (see I/O Point 3).	See I/O Point 3 Settings description.
8	Output - Anti-drop feature (Unclamp Control)*	This output is typically wired to actuate the unclamping mechanism of an end effector tooling. It turns on when Input #3 (see I/O Point 3) is on and the Anti-Drop algorithm determines the suspended load is at or below the set weight (ANTIDROP TOOL WT). If it is not turned on, the input can be held momentarily (do not hold on indefinitely) until the tooling is unloaded then the output is turned on. Once the output turns on, it remains latched on when the input is released. It is always turned off with Input #2 (see I/O Point 2).	See I/O Point 3 Settings description.

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

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

WARNING

Please be aware that software versions prior to R1.07.0 use I/O block model X67BC7321, while those with R1.07.0 and newer require the X67BC7321-1 model. The model number can be found at the left side of the block when placed in the orientation as shown in the diagram. The running software version can be checked through DISPLAY SYS INFO selection under SERVICE MENU in PROGRAM MODE.

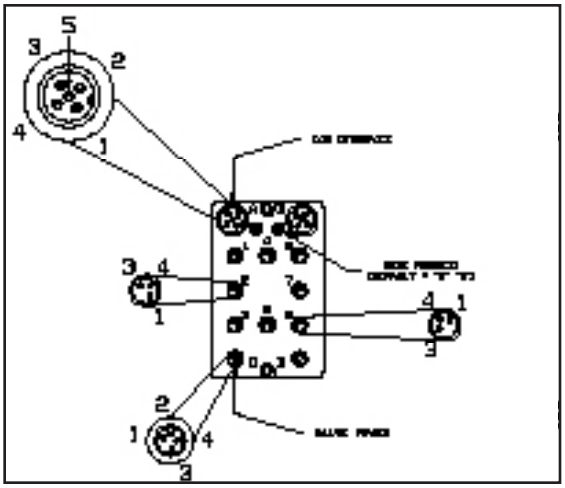


Diagram G. *Handle Input/Output Block.*

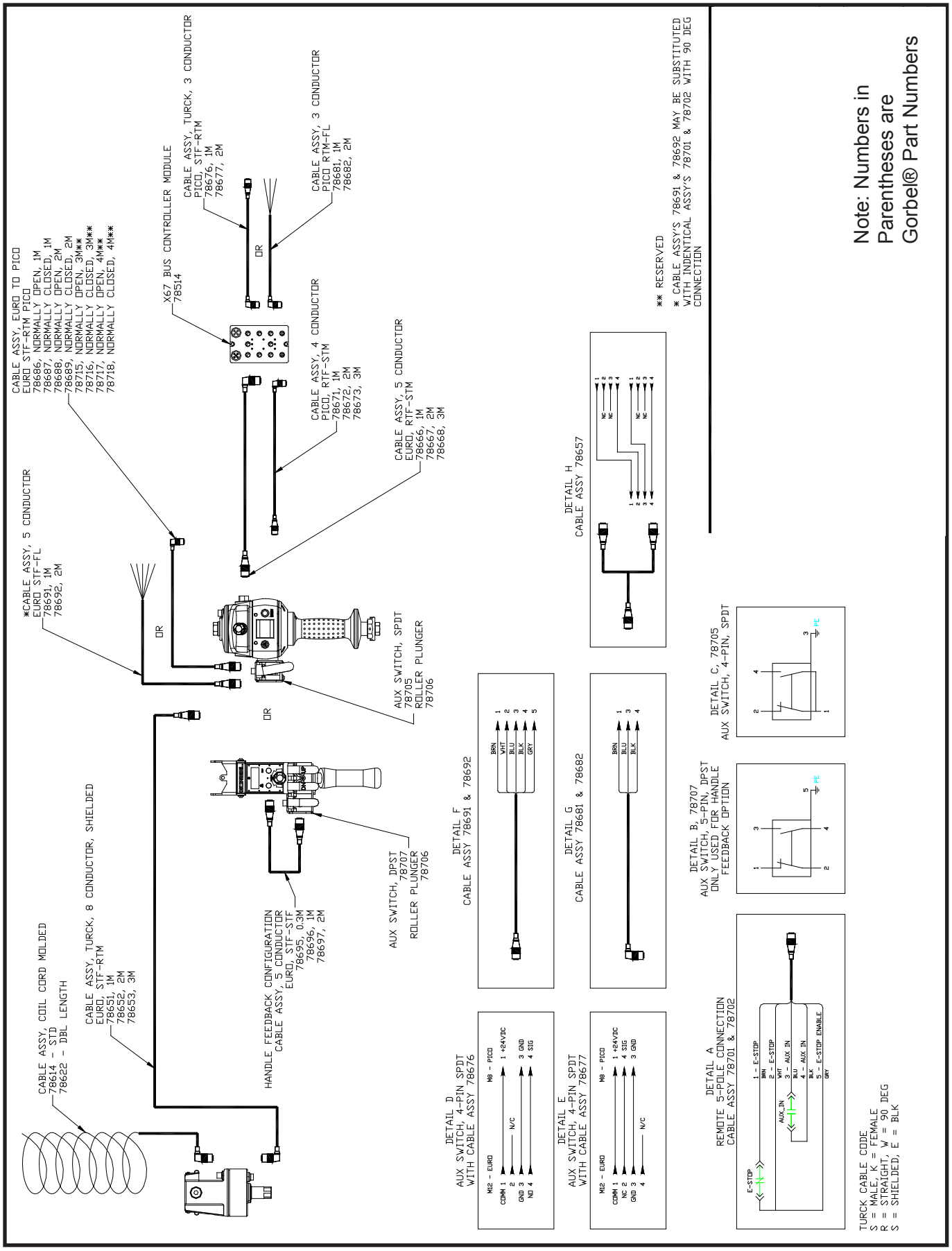


Diagram H. *Q-iQ Handle Configurations.*

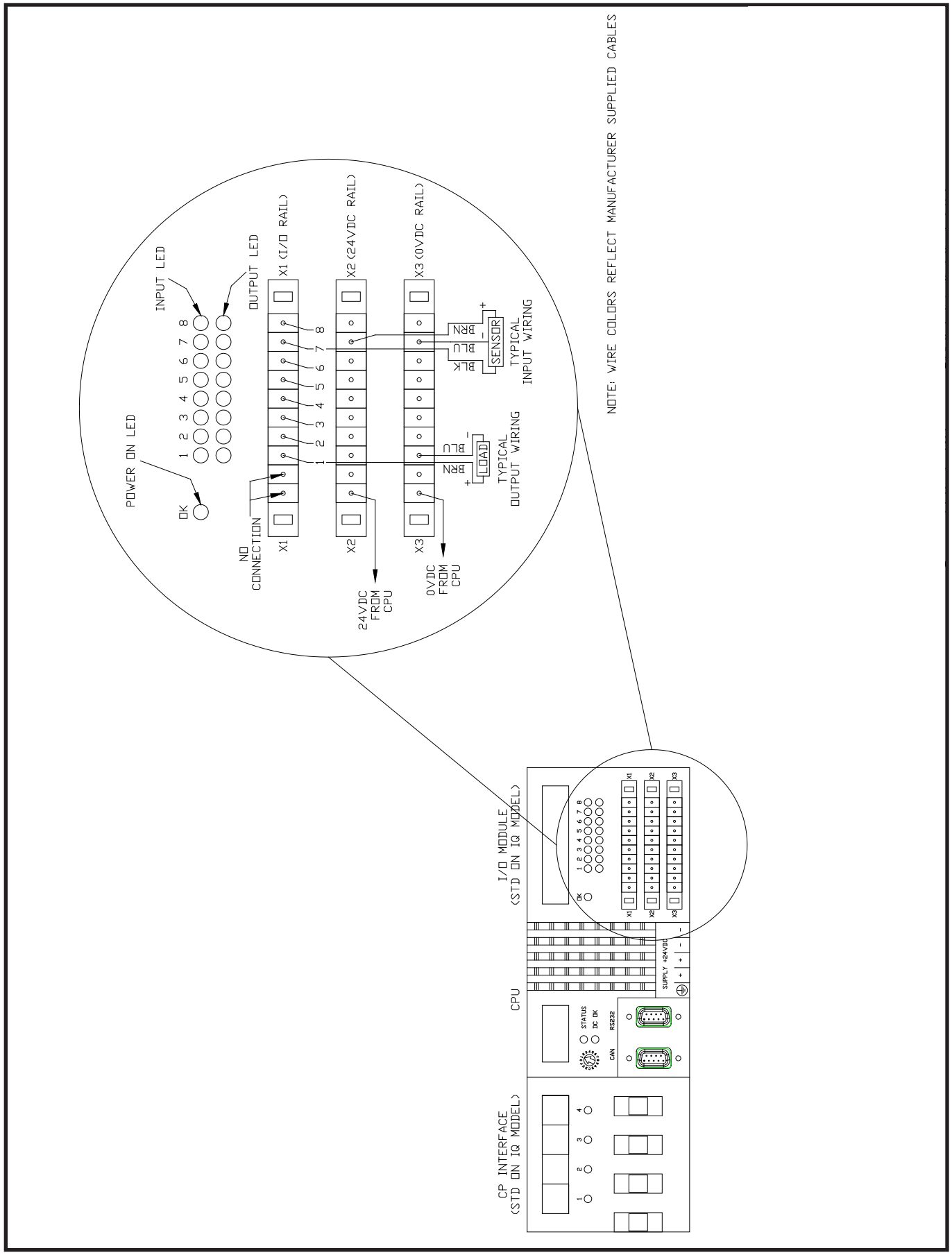


Diagram I. *Actuator IO, 474 CPU.*

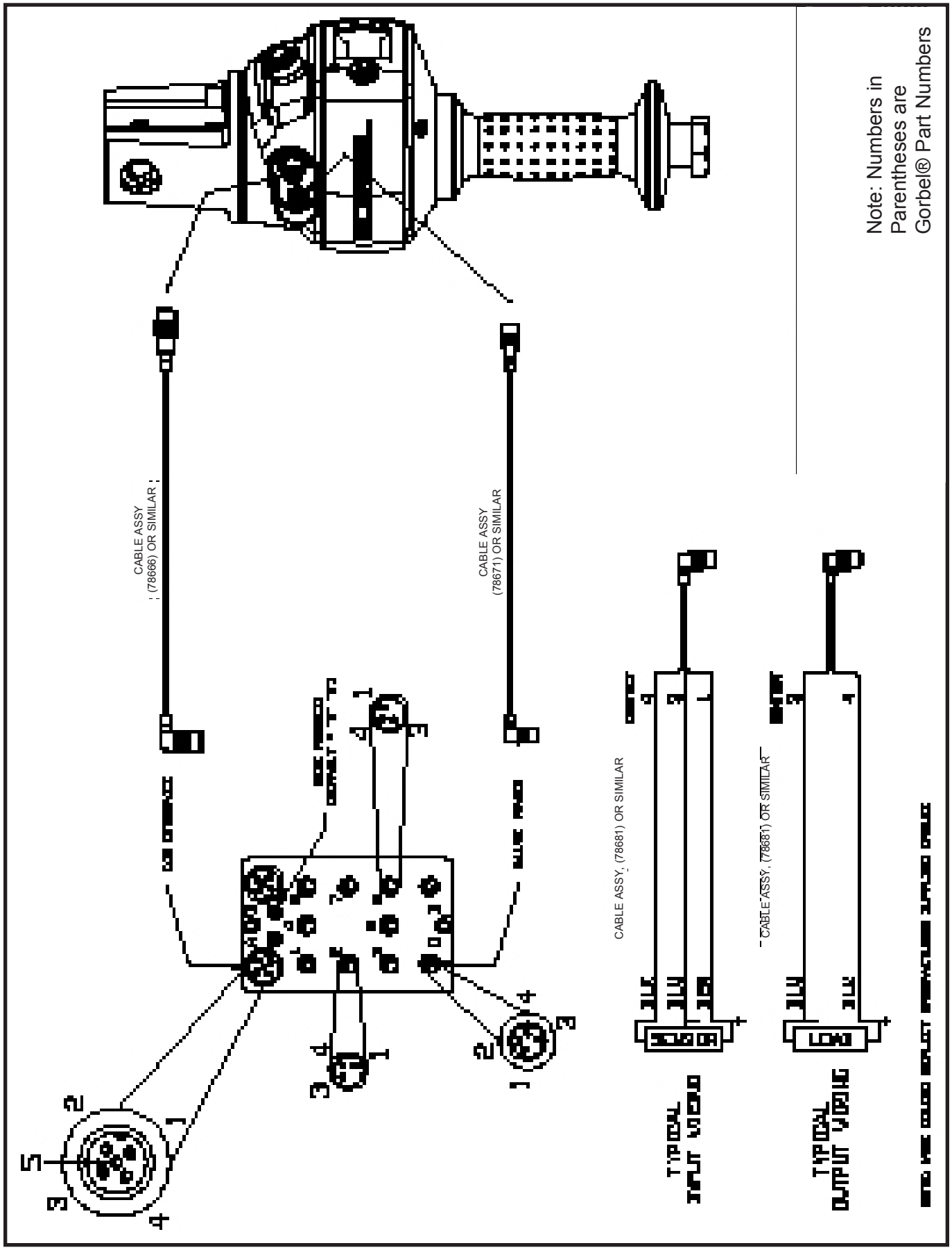


Diagram J. *Handle IO Detail, Slide Model.*

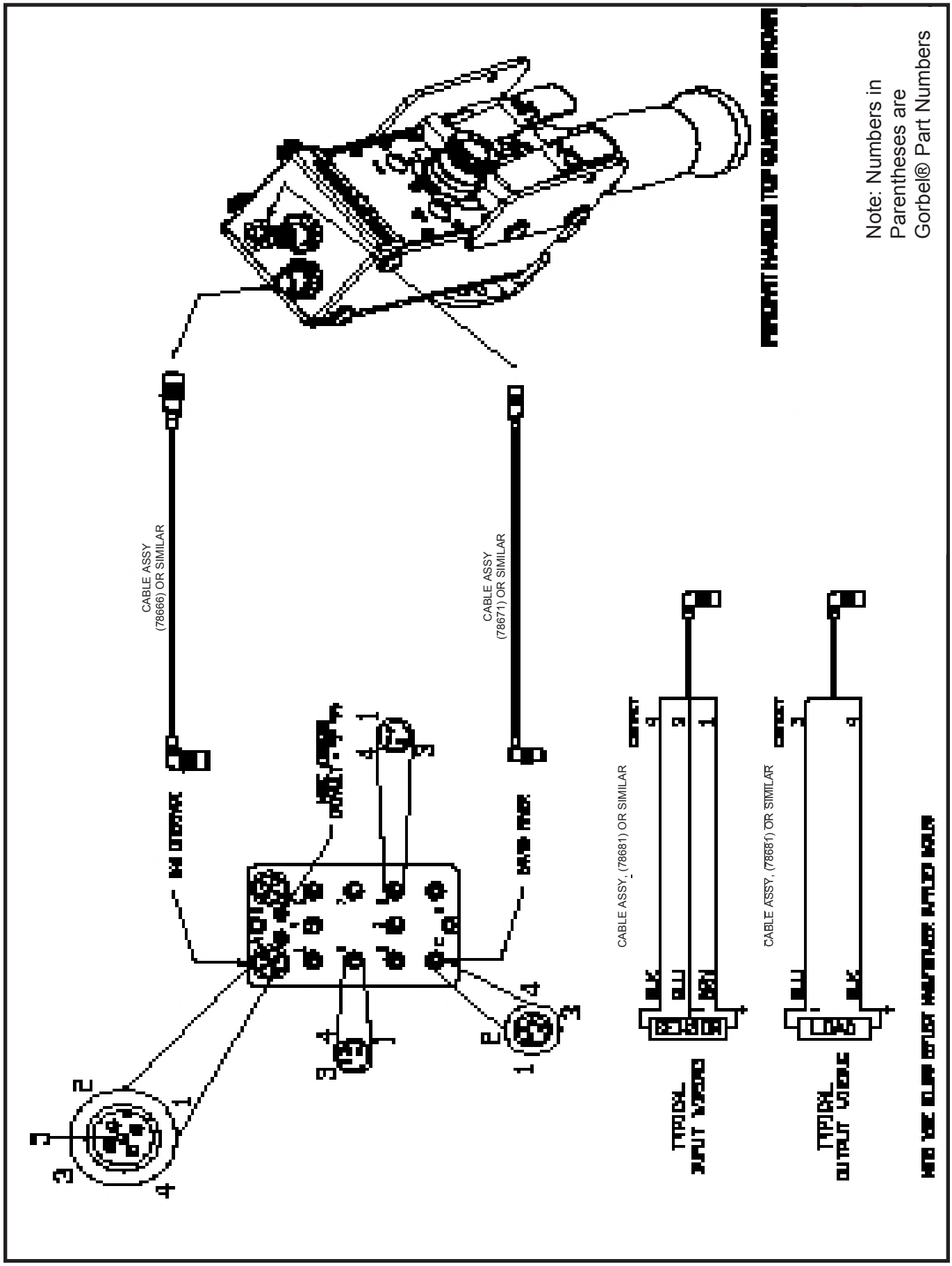


Diagram K. *Handle IO Detail, Pendant Model.*

TROUBLESHOOTING

Basic Troubleshooting

Failure	Possible Solution
There is no display on the LCD screen on the handle.	***Note:*** The LCD screen will go into screen saver mode after 10 minutes of non-use. • 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.
There is a fault or warning message displayed on the LCD screen on the handle.	• Clear the fault per the instructions on the LCD. • Reset the E-stop on the handle. • Recycle 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.
The red or blue LED, or both, on the control handle are either on or flashing.	• Refer to System Fault Diagnostics Charts on the following pages.
The unit will not raise or lower the load.	• Make sure you are in the RUN MODE. • Check the virtual limits settings if equipped with that option. • Check that you are not in an overloaded condition. • If you are wearing dark gloves, remove them and try the sliding handle again. • Check the coil cord 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 equipped with that option.
The unit does not accelerate at the desired rate.	• Adjust the response in PROGRAM MODE. • Make sure you are not attempting to “snatch” the load. • Check the weight of the load. If you are close to the overload limit, try lifting at a reduced speed.
Unit will not raise or lower the load to the desired height.	• Check the virtual limits settings in PROGRAM MODE. • Check for wire rope damage. • Check whether or not you have an extended wire rope with a standard length coil cord. • Check to see if the wire rope has been modified (shortened) for any reason). • Check for any interference with foreign objects, tooling, work surfaces, etc.
The actuator is extremely noisy.	• Check the condition of the wire rope. • Check for any external damage to the actuator covers.
Float Mode does not function correctly.	***Note:*** Refer to Technical Specifications, page 3, for maximum speed of G-Jib™ Float Mode. • Check that your system has the Float Mode option. • Check that the blue LED on the handle is illuminated. • Check to see if the LCD 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. • Ensure the unit is stable when Float Mode is initiated. • Check that the load data is reading accurately on the LCD screen. • Verify the bridge capacity. Check for excessive deflection in the bridge. • Check for obvious interference with the coil cord or handle.
Unit only goes in the up direction.	• Check the virtual limits settings if equipped with that option. • Check that the wire rope is not in a slack condition. • 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 equipped with that option. • Check that you are not at the lower limit of the system. • 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.
7219 / 4005 codes.	• The AC power is too low. If it approaches ~ 200VAC the system will not operate properly.
501 / 11000 codes.	• Limit switch fault: 1. Insure there is no weight on the hook. 2. Disconnect AC power. 3. Reapply AC power.
#### ####	• Two rows of # signs indicates poor cable connection anywhere from handle to the internal CPU. Check all external cable connections.

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

TROUBLESHOOTING (CONTINUED)

System Fault Diagnostics Chart
Under certain conditions, a system fault or warning message may appear on the LCD screen or the G-Force® handle along with either the red or blue LED flashing. The system fault or warning message can be one of the following:

1. Command fault - describes faults detected by the PLC while executing a command that results in a system shutdown with a message displayed on the LCD screen.
2. Command warning - describes a condition that will allow the system to continue to operate with a message being displayed on the LCD screen until that message is cleared using Program Mode. ***Note:*** The warning is cleared through Program Mode or cycling the power or E-stop if the warning is not repetitive.
3. ACOPOS Drive fault - describes faults detected in the drive that result in a shutdown and a drive fault message displayed on the LCD screen.

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

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

Use the following table to identify the appropriate corrective action for the specific faulted condition:

Fault Category	LCD Error # Displayed	LCD Error Message	Corrective Action
Command Faults	1 - 9, 100 - 105, 110 - 122, 300 - 310	**DOWNLOAD PROGRAM**	Cycle Power
	200, 201, 203, 204	**CHK PLC HARDWARE**	Cycle Power
	202, 205, 206	**CHK DRIV STATUS**	Cycle Power
	1600	EXTD S# NNNN	Cycle E-stop
	0 ~ 9998		Cycle Power
Command Warnings	10400, 10401, 10402, 10403, 11001	CONTACT GORBEL	Cycle Power
	10500	**REPLACE BATTERY**	Cycle Power
	11000	**RELEASE SWITCHES**	**Service is Required**
	11002	RE-PROGM OVERLOAD	Follow Overload Program Instructions
	11003	CHK HNDL HARDWARE	Cycle Power
	11008		
	11009	N/A	Re-Zero FSH
	11010	N/A	[FSH] Check Handle Cable
	11011	N/A	[FSH] Check Handle Bar Weight
	11700, 11701	**REPLACE WIREROPE**	Clear Cycle Count after wire rope replacement
	11800, 11801, 11802	**CHK HNDL ELECTRIC**	Cycle E-stop
	11803, 11804, 11805	**CHK LCD ELECTRIC**	Cycle Power
	11806, 11807, 11808	**CHK I/O MODULE**	Cycle Power
	11000 ~ 65534		Cycle E-stop
Drive Faults	5034, 7045, 7046	ENCODER ERROR	Cycle E-stop Reprogram Position
All Other Drive Faults	1 ~ 64506		Cycle E-stop or Power

If corrective action does not work, refer to the optional Service Manual available from Gorbel.

TROUBLESHOOTING (CONTINUED)

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

ID	Program State	Sub-State	Blue	Red	LCD Text Display
1	Engaged E-stop		Off	Off	Displays “E-STOP ENGAGED”. This state can also be used for troubleshooting if the E-stop is turned off intentionally.
2	Programming Mode		On	On	Overwrites fault, warning or service warning messages to allow correction of the cause of the messages. Displays “PROGRAM MODE”, various menu screens and selection items. Please see “Program Mode” section for more details.
3	Fault Mode or Drive Fault		Off	On	LCD displays if unit is in command or drive fault, followed by a fault number and a corrective message. Unit is shut down until a corrective action is taken or cycling the E-stop or main AC power.
4	Warning		Off	Fast Flash	LCD displays unit is in warning fault, followed by a fault number and a corrective message. Unit is still allowed to run but warning messages overwrite other normal running messages defined in the latter cases.
5	Service Warning		Fast Flash	Off	Displays warnings for parts replacement recommendations and those that require immediate attention, e.g. wire rope replacement or PLC low battery
6	Service Mode		Slow Flash	Slow Flash	Because SERVICE MODE is meant to run for special diagnostic purposes, it is shown before Service Warnings such as cycle count warnings. Multiple diagnostic messages are likely to be displayed here such as output a live handle connection, pushbutton states (only a special Jog Mode is running), etc.
7	Startup Process	Before Ready Mode	On	On	Displays “UNIT POWER UP”. Unit is starting up (power up) and executing necessary settings and self diagnostics.
10.a	Run Mode	Overload	Previous	Slow Flash	Indicates unit is overloaded (factory or user defined) while lifting.
10.b		Still Motion	Previous	Slow Flash	Indicates unit maintains still for an extensive time while running in a Run Mode application such as handle mode, Float Mode, etc.
10.c		Over-Speed	Previous	Slow Flash	Indicates Float Mode control exceeded the over speed limit and the unit is shutting down.
10.d		Handle Mode	Previous	Previous	Displays run mode specific message such as RUN MODE JOG, HANDLE, PENDANT or CUSTOM
		Float Mode	On	Off	Displays run mode specific messages such as “--RECORD-- --DATA--” and RUN MODE FLOAT. The first message indicates when the unit is collecting loadcell data to perform Float Mode.
11.a	Custom Feature #N	Display 1	On	Off	Displays custom feature messages for a custom motion feature (Run Mode) that also requires using LEDs for indication. More information may be found in the Custom Feature description section.
11.b		Display 2	On	On	
11.c		Display 3	Slow Flash	Off	
11.d		Display 4	Off	Slow Flash	
20	Ready Mode		Off	Off	Displays LIFT READY to indicate unit is idling and waiting for response.
20.a	Custom Feature #N	Display 1	On	Off	Displays custom feature messages for a custom feature that also requires using LEDs for indication while the unit is idling (in Ready Mode). More information may be found in the Custom Feature description section.
20.b		Display 2	On	On	
20.c		Display 3	Slow Flash	Off	
20.d		Display 4	Off	Slow Flash	

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, 12 randomly distributed broken wires in one lay or four broken wires in one strand in one lay (***diagram L***);
   - one outer wire broken at the contact point with the core of the rope, which has worked its way out of the rope structure and protrudes or loops out from the rope structure;
   - wear of one-third the original diameter of outside individual wires;
   - kinking, crushing, birdcaging, or any other damage resulting in distortion of the rope structure;
   - evidence of heat damage from any cause;
   - reductions from nominal diameter greater than 1/64” (.4 mm) for 1/4” (6.35 mm) diameter rope or 3/16” (4.76 mm) diameter rope.
3. Broken wire removal criteria applies to wire rope operating on steel sheaves and drums. However, results of internal testing have shown that rope replacement follows the same criteria regardless of sheave or drum material.
4. Attention shall be given to end connections. Upon development of two broken wires adjacent to a socketed end connection, the rope should be resocketed or replaced. Resocketing shall not be attempted if the resulting rope length will be insufficient for proper operation.
5. Replacement rope and connections shall have strength rating at least as great as the original rope and connection furnished by the hoist manufacturer. A rope manufacturer, the hoist manufacturer, or a qualified person shall specify any deviation from the original size, grade, or construction.

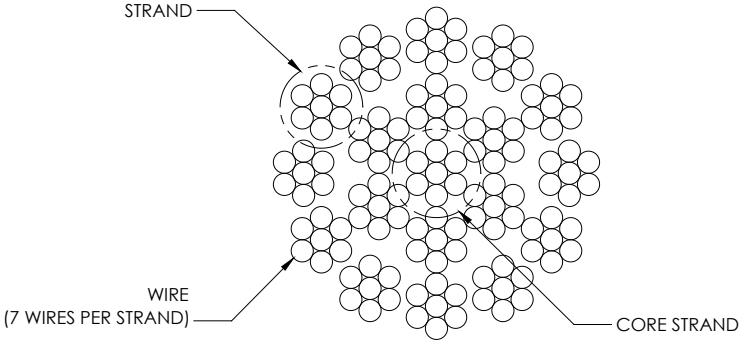


Diagram L. *19x7 Preformed Wire Rope Composition.*

WIRE ROPE REPLACEMENT INSTRUCTIONS

WARNING

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

Removal of Existing Wire Rope:

1. Make sure the replacement rope is same length as rope currently on actuator unit.
   A. Ensure there is no load on handle, weighted load hook (pendant) or end effector.
   B. If using slow down setting, clear (reset) on handle or pendant handle menu screen. If using virtual limits, clear (reset) on handle or the pendant handle's menu screen.
   C. Remove end tool. Remove handle/G360™ by reversing procedure in installation section and remove wire rope clamps at the end of the boom.
2. Using a 3mm hex wrench, completely remove the eight button head screws on front cover and back covers.
3. Remove front and back covers from actuator and set aside upward to use as a bowl to hold future parts. ***Note:*** Be careful not to contact circuit board. Using locking pliers or similar, clamp slack bracket so the spring is extended, overriding slack (***diagram M***).
4. Going in the down direction, unspool rope from drum using jog down button while keeping tension on wire rope with other hand wearing a glove. Continue until lower limit is engaged.

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

5. Using a long screwdriver or hex wrench, reach through front of actuator and locate upper socket head cap screw head facing you underneath the lower limit switch. Fully push the screw in until it cannot move anymore (it is spring loaded). Keep pressure on it (***diagrams N*** and ***O***).
6. Using your right hand, press the jog down button while watching the drum rotate two full turns in the clockwise direction. The drum should stop automatically with the wire rope retainer visible at the 3 o'clock position on the drum.

Diagram M.
Using locking pliers or similar, clamp slack bracket so the spring is extended, overriding slack.

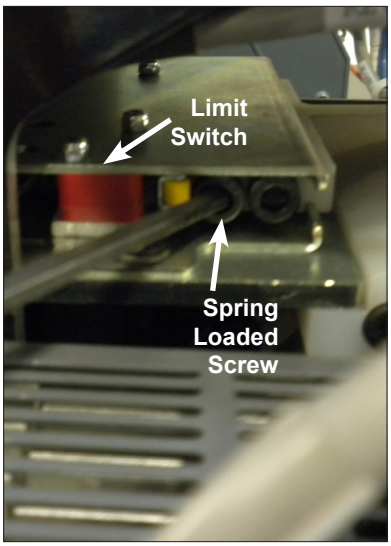


Diagram N.
Locate socket head cap screw head and fully push it in until it can not move anymore.

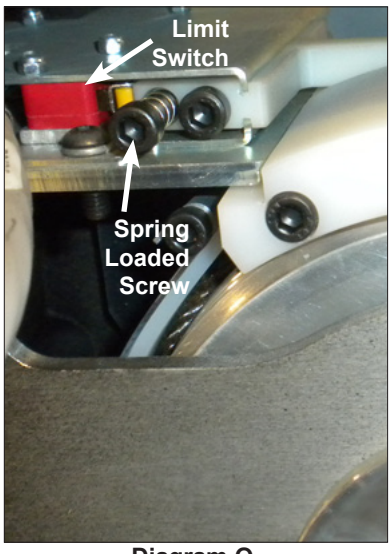


Diagram O.
Locate socket head cap screw head and fully push it in until it can not move anymore.

WIRE ROPE REPLACEMENT INSTRUCTIONS (CONTINUED)

Removal of Existing Wire Rope (Continued):

7. From the limit switches is a gray colored lead that plugs into the circuit board. Its connected location is approximately two inches down the right side of the circuit board labeled “limits”. Gently pull out the plug lead to disconnect plug from board (***diagram P***).
8. On 660# G-Jib™ Units Only: Using 13mm open-end wrench, loosen, not remove, the two flange nuts and remove reinforcement bracket.
9. Using a 4mm hex wrench, remove four M5 socket head cap screws that fasten the swiveling circuit board bracket to the front support plate. Two screws are located on the top and two are on the bottom of bracket. Set screws in plastic front cover. Swing bracket down (***diagrams Q*** and ***R***).
10. Using an M5 hex wrench, remove two M6 socket head cap screws from the drum gates. Slide the unthreaded gate out towards you. Place gate and hardware in front cover (***diagram S***).
11. Using an M3 hex wrench, remove one M5 button head cap screw from the rope retainer and loosen other M5 button head cap screw. Swing retainer out of the way (***diagram T***).
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.

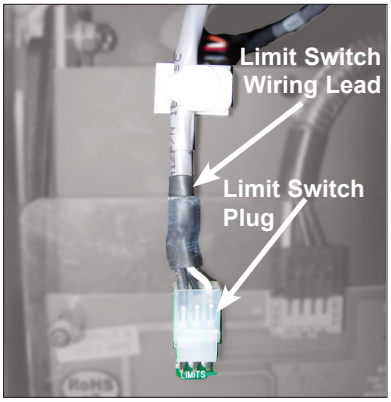
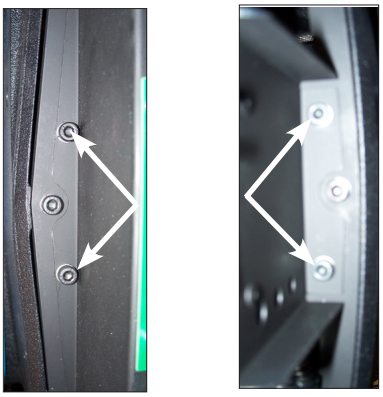


Diagram P.
Gently pull out the grey limit switch wiring lead to disconnect plug from board.

Left **Right**



Diagrams Q & R.
Remove four M5 socket head cap screws (two on top, two on bottom) that fasten the swiveling circuit board bracket to the front support plate.

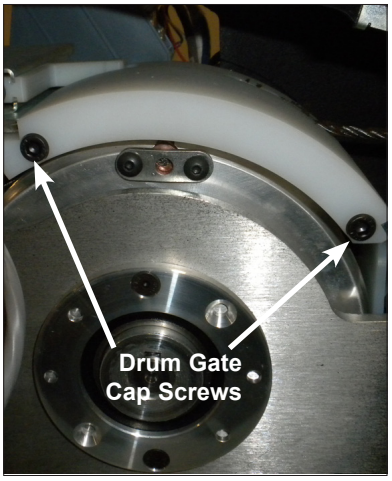


Diagram S.
Remove two M6 socket head cap screws from the drum gates.

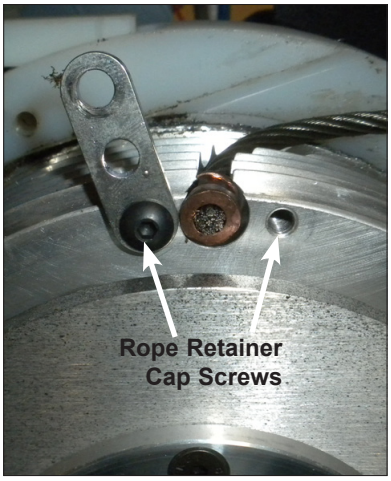


Diagram T.
Remove the M5 button head cap screw and swing retainer out of the way.

WIRE ROPE REPLACEMENT INSTRUCTION (CONTINUED)

Installation of New Wire Rope:

1. Grasp anchor end of rope (not thimble) and make a crimp in gloved hand approximately three inches from the end (try to kink rope to make a bend radius).
2. Insert the rope into the actuator up through the wear ring using right hand 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 to seat the crimp into the locker fully.
4. Install the rope retainer plate over the rope end and tighten the two socket head cap screws.
5. Ensure that rope is seated in radius channel and install rope gate back in the unit making sure the rope guide (cutout) side is inserted first and the ends are sliding on guide rails freely. Fasten the rope gate assembly together using the previously removed hardware. Torque hardware to compress lockwashers.
6. Install (slide) the reinforcement bracket studs into channels and tighten the two 13mm flange nuts on 660# G-Jib™ units only. Next, swing circuit board bracket closed towards plate and fasten to plate using the four previously removed socket head cap screws.
7. Plug limit switch lead into circuit board “limits” receptacle making sure retention tab on plug is facing you.
8. Using a clean cotton cloth wrapped around rope loosely near actuator entrance, hold 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.
9. Remove locking pliers from slack bracket.
10. Install front and rear covers onto actuator making sure all eight screws are aligned with holes before threading.
11. Attach wire rope to handle, weighted hook, or end effector in reverse order of disassembly. Clamp wire rope end and trim excess.
12. Reset virtual limits and/or slow down settings.

SLACK SPRING ADJUSTMENT

Slack spring adjustment is necessary if one or more of the following conditions apply:

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

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

Slack Spring Adjustment Procedure:

1. Use an M3 hex wrench to remove all screws securing the blue rear cover to actuator. Place screws in cover and set aside.
2. Locate slack spring over the motor, next to casting (***diagram U***). Spring is held in place by a motor bracket on one end and an eyebolt on the other end.
3. Using a 10mm open-end wrench, loosen the nut closest to the “eye” (inside) on bolt (***diagram V***).
4. **If chatter or erratic operation of hoist while traveling down is encountered**, the end effector or tooling on wire rope is not heavy enough to overcome the spring tension. Loosen the outside nut one half turn and test the hoist operation (full stroke up and down) between each half turn adjustment of eyebolt nut until chattering is eliminated.
5. All other conditions will require the outside nut to be adjusted by turning clockwise, tightening to increase tension in the slack spring. Before tightening this nut, be sure there is enough free travel of the eyebolt (inside nut loose).
6. Using the applications’ end effector (handle, unloaded end tool), travel downward resting end effector on floor. If rope continues to “pay out” from actuator beyond two seconds after reaching floor, remove hand from handle or release down button (pendant). Turn the outside nut clockwise one half turn tightening it. Test again by traveling up removing handle or tooling from floor and travel down again resting on floor. Continue adjusting and testing this until rope travel stops within two seconds of effector resting (supported) on floor and deflection of rope is 3-4 inches. Tighten inside nut clockwise until “jammed” against sheet metal while keeping eyebolt stationary.
7. Correct slack adjustment occurs when a deflection of the wire rope is 3-4 inches when in slack mode and rope travel stops.

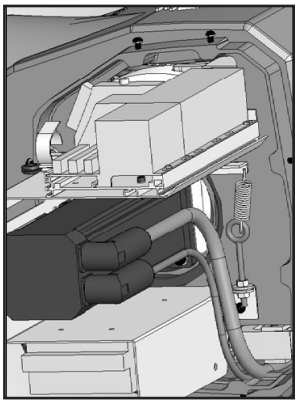


Diagram U.

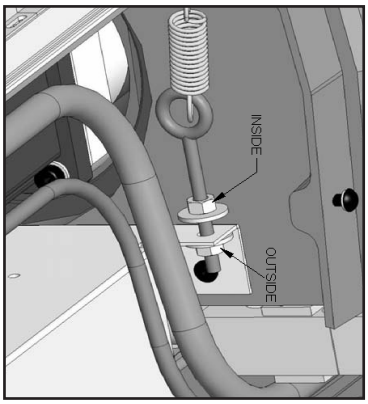


Diagram V.

CRANE OPERATOR INSTRUCTIONS

Overhead cranes and jib cranes generally handle materials over working areas where there are personnel. Therefore, it is important for the Crane Operator to be instructed in the use of the crane and to understand the severe consequences of careless operation. It is not intended that these suggestions take precedence over existing plant safety rules and regulations or OSHA regulations. However, a thorough study of the following information should provide a better understanding of safe operation and afford a greater margin of safety for people and machinery on the plant floor. It must be recognized that these are suggestions for the Crane Operator's use. It is the responsibility of the owner to make personnel aware of all federal, state and local rules and codes, and to make certain operators are properly trained.

Qualifications

Crane operation, to be safe and efficient, requires skill: the exercise of extreme care and good judgment, alertness and concentration, and rigid adherence to proven safety rules and practices as outlined in applicable and current ANSI and OSHA safety standards. In general practice, no person should be permitted to operate a crane:

- Who cannot speak the appropriate language or read and understand the printed instructions.
- Who is not of legal age to operate this type of equipment.
- Whose hearing or eyesight is impaired (unless suitably corrected with good depth perception).
- Who may be suffering from heart or other ailments which might interfere with the operator's safe performance.
- Unless the operator has carefully read and studied this operation manual.
- Unless the operator has been properly instructed.
- Unless the operator has demonstrated his instructions through practical operation.
- Unless the operator is familiar with hitching equipment and safe hitching equipment practices.

Handling the Jib Boom Motion

Before using the boom of the jib crane, the operator should be sure the hook is high enough to clear any obstruction. Before a load is handled by the crane, the jib boom should be brought into position so that it is directly over the load. Start the jib boom slowly and bring it up to speed gradually. Approaching the place where it is desired to stop the jib, reduce the boom speed.

Handling the Trolley Motion

Before a load is handled, the hoist should be positioned directly over the load that is to be handled. When the slack is taken out of the slings, if the hoist is not directly over the load, bring it directly over the load before hoisting is continued. Failure to center the hoist over the load may cause the load to swing upon lifting. Always start the trolley motion slowly and reduce the trolley speed gradually.

Handling the Hoist Motion

Refer to the lifting (hoist) equipment's operating instructions.

GENERAL SUGGESTIONS

Know Your Crane

Crane operators should be familiar with the principal parts of a crane and have a thorough knowledge of crane control functions and movements. The crane operator should be required to know the location and proper operation of the main conductor disconnecting means for all power to the attachments on the crane.

Responsibility

Each crane operator should be held directly responsible for the safe operation of the crane. Whenever there is any doubt as to SAFETY, the crane operator should stop the crane and refuse to handle loads until: (1) safety has been assured or (2) the operator has been ordered to proceed by the supervisor, who then assumes all responsibility for the SAFETY of the lift.

Do not permit **ANYONE** to ride on the hook or a load.

Inspection

Test the crane movement and any attachments on the crane at the beginning of each shift. Whenever the operator finds anything wrong or apparently wrong, the problem should be reported immediately to the proper supervisor and appropriate corrective action taken.

Operating Suggestions

One measure of a good crane operator is the smoothness of the crane operation. The good crane operator should know and follow these proven suggestions for safe, efficient crane handling.

1. The crane should be moved smoothly and gradually to avoid abrupt, jerky movements of the load. Slack must be removed from the sling and hoisting ropes before the load is lifted.
2. Center the crane over the load before starting the hoist to avoid swinging the load as the lift is started. Loads should not be swung by the crane to reach areas not under the crane.
3. Crane-hoisting ropes should be kept vertical. Cranes shall not be used for side pulls.
4. Be sure everyone in the immediate area is clear of the load and aware that a load is being moved.
5. Do not make lifts beyond the rated load capacity of the crane, sling chains, rope slings, etc.
6. Make certain that before moving the load, load slings, load chains, or other lifting devices are fully seated in the saddle of the hook with the hook latch closed (if equipped with hook latch).
7. Check to be sure that the load and/or bottom block is lifted high enough to clear all obstructions when moving boom or trolley.
8. At no time should a load be left suspended from the crane unless the operator has the push button with the power on, and under this condition keep the load as close as possible to the floor to minimize the possibility of an injury if the load should drop. When the crane is holding a load, the crane operator should remain at the push button.
9. Do not lift loads with sling hooks hanging loose. If all sling hooks are not needed, they should be properly stored, or use a different sling.
10. All slings or cables should be removed from the crane hooks when not in use (dangling cables or hooks hung in sling rings can inadvertently snag other objects when the crane is moving).
11. Operators shall not carry loads and/or empty bottom blocks over personnel. Particular additional caution should be practiced when using magnet or vacuum devices. Loads, or parts of loads, held magnetically could drop. Failure of power to magnets or vacuum devices can result in dropping the load. Extra precaution should be exercised when handling molten metal in the proximity of personnel.
12. Whenever the operator leaves the crane the following procedure should be followed:
    - Raise all hooks to an intermediate position.
    - Spot the crane at an approved designated location.
    - Place all controls in the "off" position.
    - Open the main switch to the "off" position.
    - Make visual check before leaving the crane.
13. In case of emergency or during inspection, repairing, cleaning or lubrication, a warning sign or signal should be displayed and the main switch should be locked in the "off" position. This should be done whether the work is being done by the crane operator or by others.
14. Contact with rotation stops or trolley end stops shall be made with extreme caution. The operator should do so with particular care for the safety of persons below the crane, and only after making certain that any persons on the other cranes are aware of what is being done.
15. ANY SAFETY FEATURES AND MECHANISMS BUILT-IN OR OTHERWISE PROVIDED WITH THE CRANE BY GORBEL ARE REQUIRED FOR THE SAFE OPERATION OF THE CRANE. DO NOT, UNDER ANY CIRCUMSTANCES, REMOVE OR OTHERWISE IMPAIR OR DISABLE THE PROPER FUNCTIONING OF ANY CRANE SAFETY MECHANISMS OR FEATURES BUILT-IN OR OTHERWISE PROVIDED BY GORBEL FOR SAFE OPERATION OF THE CRANE. ANY REMOVAL, IMPAIRMENT OR DISABLING OF ANY SUCH SAFETY MECHANISMS OR FEATURES OR OTHER USE OR OPERATION OF THE CRANE WITHOUT THE COMPLETE AND PROPER FUNCTIONING OF ANY SUCH SAFETY MECHANISMS OR FEATURES AUTOMATICALLY AND IMMEDIATELY VOIDS ANY AND ALL EXPRESS AND IMPLIED WARRANTIES OF ANY KIND OR NATURE.

LIMITED WARRANTY

It is agreed that the equipment purchased hereunder is subject to the following LIMITED warranty and no other. Gorbel Incorporated ("Gorbel") warrants the manual push-pull Work Station Cranes, Jib Crane, and Gantry Crane products to be free from defects in material or workmanship for a period of 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 her in agreed to be paid has been fully paid in cash.

Claims and Damages:

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

Cancellations:

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

Returns:

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

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

Changes and Alterations:

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

Third Party Action:

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

OSHA Responsibilities:

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

Equal Employment Opportunity:

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

INSPECTION AND MAINTENANCE SCHEDULE

GORBEL® G-JIB™ INSPECTION AND MAINTENANCE SCHEDULE			
ITEM	**COMPONENT**	**MAINTENANCE**	**FREQUENCY***
1	Wire Rope	Check for distortion of the rope such as kinking, crushing, unstranding, birdcaging, main strand displacement or core protrusion, general corrosion, broken or cut strands, and number, distribution, and type of visible broken wires.	Start of Each Shift
2	Wire Rope	Maintenance listed in (1) as well as reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires; severely corroded or broken wires at end connections; or severely corroded, cracked, bent, worn, or improperly applied end connections.	Periodically (to be determined by qualified persons only)
3	Pulleys	Inspect all pulleys for excessive wear. Replace pulleys immediately if excessive wear or damage is present.	Every 5 Weeks
4	Limit Switches	Verify the upper and lower limit switches are operating properly. Verify that the slack switch is operating properly. Replace switches immediately if they are damaged.	Every 5 Weeks
5	Coil Cord Assembly	Check to make sure there is no excessive wearing of the coil cable sleeving caused by the wire rope. Check for excessive bends or pinching. Check that mating contactor is secured to the hand controller properly.	Start of Each Shift
6	Handle	Check for smooth operation of sliding handle. Check “operator present sensor” for correct operation.	Start of Each Shift
7	Arm Rotation	Verify that the jib is functioning correctly.	Start of Each Shift
8	G-Jib™ Assembly	Conduct a visual inspection of the entire G-Jib™ unit.	Start of Each Shift

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

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

For service information, please consult the G-Force® Q and iQ Series Service Manual available from Gorbel or go to http://www.gorbel.com/support/gfserviceregistration.aspx to register your G-Force® and sign up for our Platinum Service Package.

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