



SafeRack GX RetractAlok SAS Gangway



OWNER'S MANUAL

SafeRack GX RetractAlok Self-Adjusting Stair (SAS) Gangway

THIS PRODUCT AND/OR IT'S COMPONENTS MAY BE COVERED BY ONE OR MORE PATENTS. SEE WWW.SAFERACK.COM/PATENTS



219 Safety Avenue / Andrews, SC 29510 / Ph 866 761 7225 / Fx 803 774 7233

Table of Contents

Notes and Specifications	Page 4
Introduction.....	Page 5
Components.....	Page 6
Pre-Assembly Information.....	Page 7
Standard Mounting Templates.....	Page 8
Standard Mounting Instructions.....	Page 9
Optional Mounting Guide - Small Angle Clip.....	Page 11
Side Mounting.....	Page 12
Optional Mounting Guide - Universal Angle Clip.....	Page 13
Channel Mounting.....	Page 14
Wide Flange Mounting.....	Page 15
Optional Mounting - Underslung Mounting.....	Page 16
Optional Cage Mounting Instructions.....	Page 18
Optional Cage Instructions.....	Page 19
110 V Enclosure Box Mounting.....	Page 20
110 V Wiring Diagram.....	Page 21
220 V Wiring Diagram.....	Page 22
Solar Panel Wiring Diagram.....	Page 23
Pneumatic Circuit Diagram.....	Page 24
GX 120VAC/Solar/Charger Setup.....	Page 25
Operational Instructions Lower Gangway.....	Page 26
Operational Instructions Raise Gangway.....	Page 28
Operational Hazards/Warnings.....	Page 30
Trouble Shooting Guide.....	Page 31
Important Before Operating.....	Page 32
Maintenance.....	Page 33
Tightening/Torque Guide.....	Page 34
Hydraulic Fitting Guidelines.....	Page 35
Replacement Parts.....	Page 36
Pinch Points / Moving Parts.....	Page 37
Safety Data Sheets.....	Page 38

GX RETRACTALOK SAS GANGWAY



Thank you for purchasing a SafeRack GX Retractable SAS Gangway.

Your new SafeRack gangway has been manufactured using the latest technologies, along with only the highest quality materials to ensure dependable service for years to come.

SafeRack's GX Retractable SAS gangways are more ergonomic and last longer. Tested in the most critical applications, these gangways outperform all others. In addition to multiple lengths, the SAS gangway is available in 24", 36", 48", 60" and 72" widths. Adding fall protection cages is easy and are available in various sizes.

Please take care, to follow all guidelines and installation instructions to ensure your stair unit performs as designed.

For further questions or concerns, please contact Customer Support at 866.761.7225

Thanks again for choosing SafeRack!

GX RETRACTALOK SAS GANGWAY

IMPORTANT NOTES AND SPECIFICATIONS



Read carefully and understand all instructions before starting installation. Adhere to all instructions in manual. **FAILURE TO FOLLOW ALL INSTRUCTIONS MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH.**



DANGER! Electrical hazard; Unit is conductive.

Equipment should not be altered or modified from its original design without consultation with the manufacturer.

Equipment which is damaged or becomes damaged during use, handling, or shipping should be set aside and not used.

Unit is designed for a total load capacity of 500 lbs., handrails designed for 200 lbs., midrails designed for 100 lbs.

Available working range of 45° above horizontal to 40° below horizontal.



WARNING! This product can expose you to chemicals including cadmium, which is known to the State of California to cause cancer, and/or birth defect or other reproductive harm. For more information go to www.P65warnings.ca.gov

GX RETRACTALOK SAS GANGWAY



INTRODUCTION:

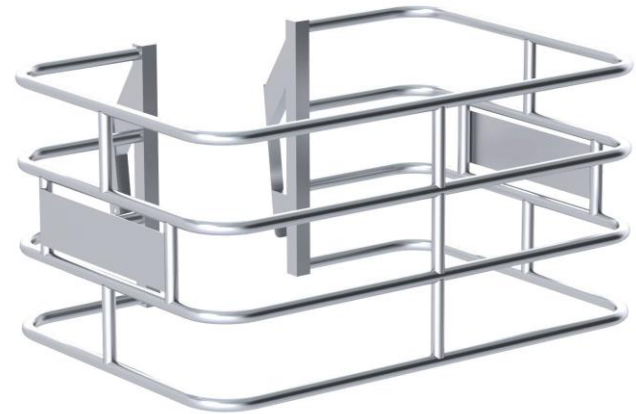
With repetitive strain injuries topping the list of liabilities reported by employers across the globe, SixAxis has rolled out an innovative new solution to mitigate the need for manual lifting while loading or unloading. The GX Gangway uses Retractable power-assist technology so operators can lift and lower the gangway with the push of a foot pedal and the simple pull of a rope. A primary and secondary auto-lock feature prevents operator error while loading and ensures safety in any position. The GX is the next generation in SafeRack's gangway technology, improving productivity and throughput while enhancing safety for workers in the loading industry

- **Powered Lift & lower system**
 - Improved ergonomics eliminate back strain for healthier employees and a safer workplace.
- **Positive locking system**
 - Protects drivers and operators by automatically locking in any position.
- **Plug and Play**
 - Factory Installed, pre-set and calibrated for fast and easy installation.
- **Multiple Power Options**
 - Retractable can be powered by pneumatic, electric, and solar options.

COMPONENTS



GX RETRACTALOK SAS
GANGWAY



OPTIONAL CAGE



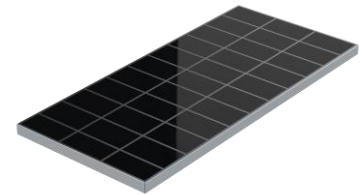
CONTAINER OF
HARDWARE



ELECTRICAL BOX FOR
110V / SOLAR POWER



ELECTRICAL BOX
FOR 240V



OPTIONAL SOLAR
PANEL

PRE-ASSEMBLY



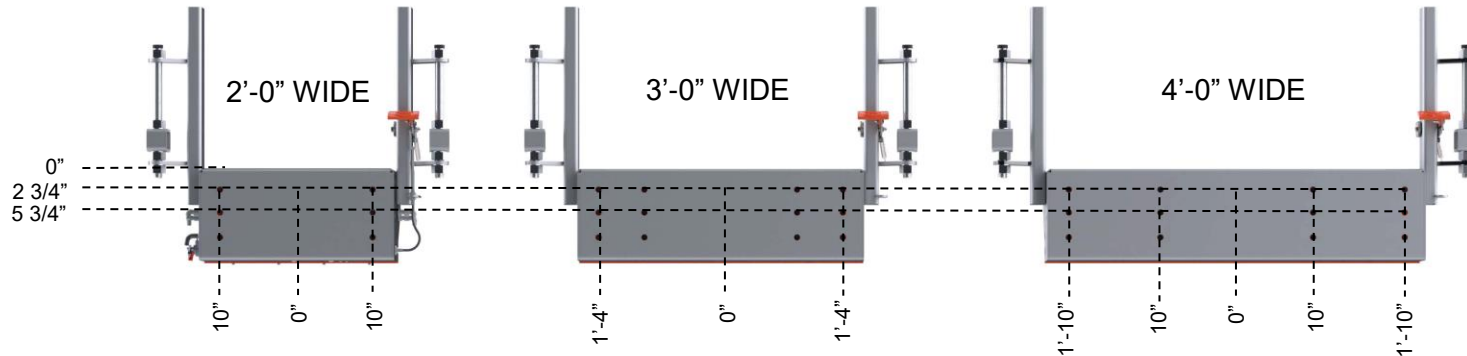
CONTAINER OF
HARDWARE



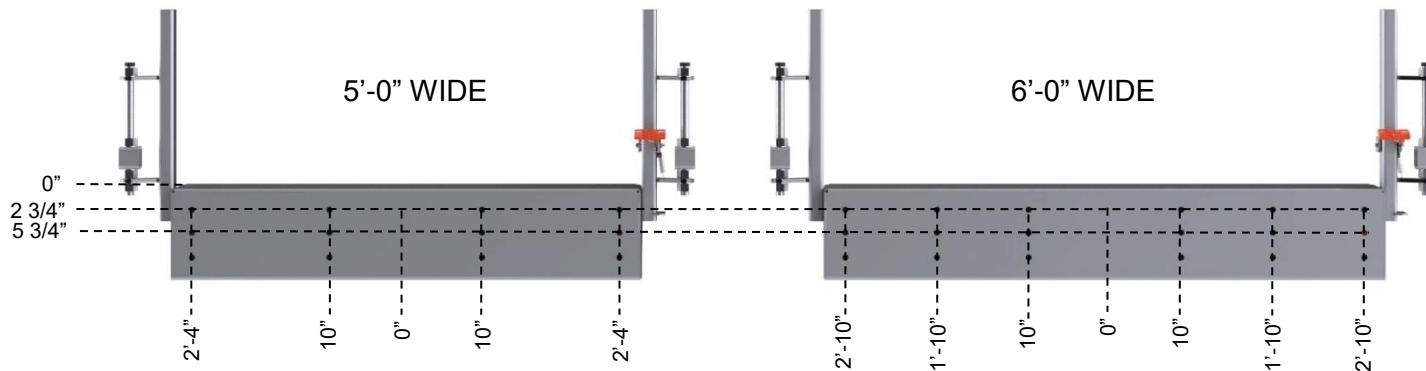
All hardware needed for assembly is located in a 5 gallon bucket shipped with the gangway. Inside you will find all hardware boxed and marked as to its proper location. It is recommended that a forklift, hoist, crane or other suitable lifting device be used for proper and safe assembly.

Please take a moment to inspect your new gangway. Please look for shipping damage or any loose banding which might indicate a missing part. Please check packing list against your unit to ensure all parts have arrived without damage.

STANDARD MOUNTING TEMPLATES



ALL MOUNTING HOLES
13/16" DIA. FOR 3/4" A325 BOLTS

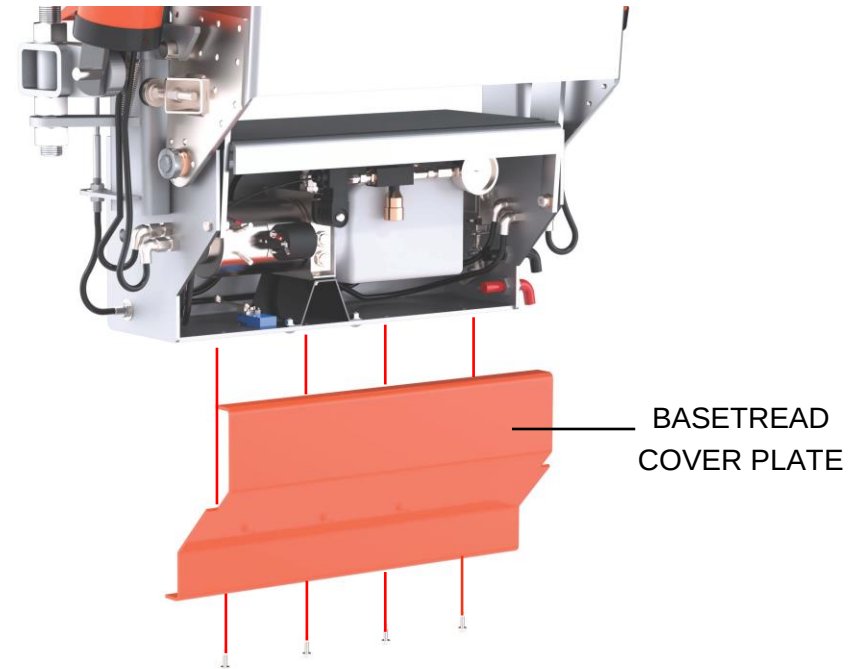


All bolt holes should be used when mounting gangway and backing plates should be used at each set of bolt holes.



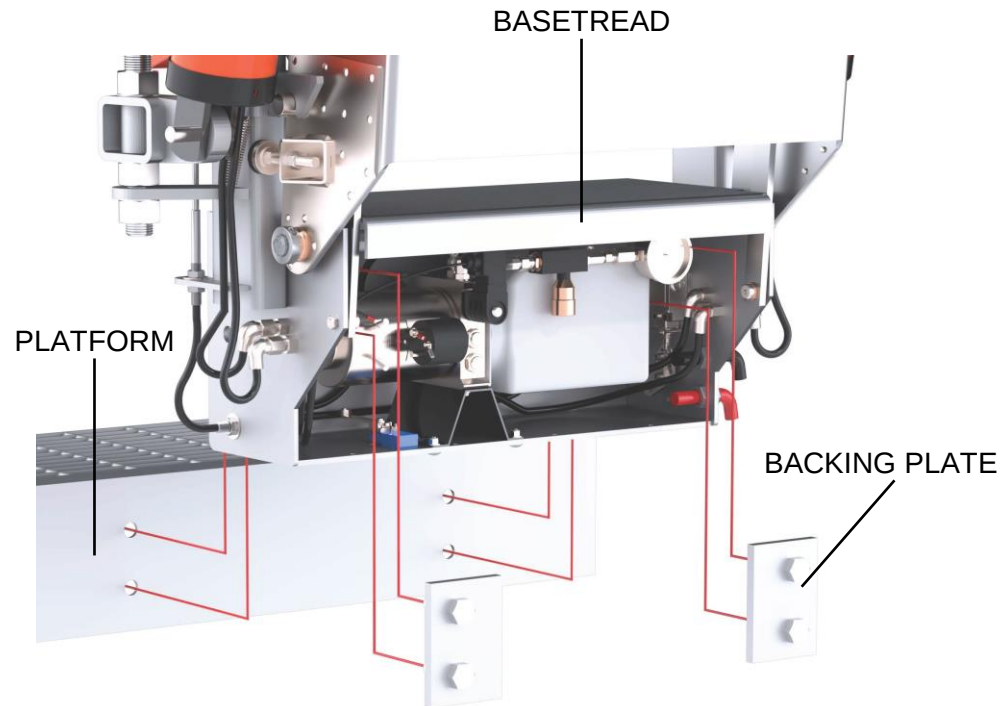
WARNING! Top of gangway basetread should be flush with top of platform walk surface. **FAILURE TO DO SO CAN CREATE TRIPPING HAZARD.**

STANDARD MOUNTING INSTRUCTIONS



1. Pre-drill 13/16" diameter holes into existing platform using template shown on previous page. (SafeRack platforms will be pre-drilled.)
2. Remove basetread cover plate as shown to gain access to gangway mounting holes.

STANDARD MOUNTING INSTRUCTIONS

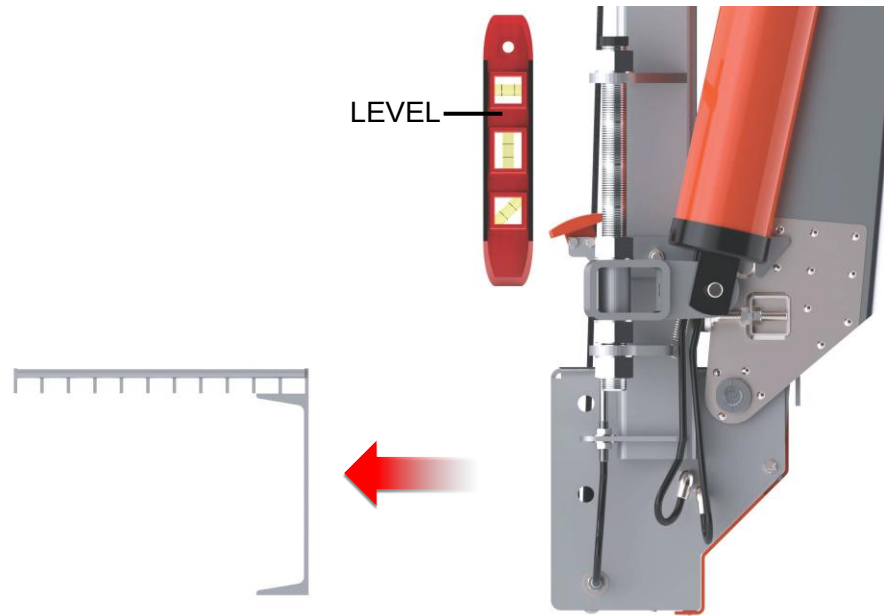


1. Lift gangway into place using correctly positioned lifting straps (as shown) and forklift, hoist, crane, or other suitable lifting device.
2. Loosely bolt gangway into place using bolts, nuts, washers, and backing plate (as shown). Backing plate goes inside basetread flush against back wall of basetread aligned with top and middle holes.
3. Verify gangway is plumb, square, and walk surface is level with the platform walk surface.
4. Tighten and torque all bolts. Use tightening/torque guide provided in this manual.



WARNING! Take care not to damage power unit or move any hoses during these steps.

OPTIONAL MOUNTING GUIDE USING SMALL ANGLE CLIP



FRONT MOUNT



GANGWAY UPRIGHT MUST BE
PLUMB AND LEVEL AND
BASE/READ TOP MUST BE
FLUSH WITH WALK SURFACE

PLATFORMS WITH GRATING ON TOP

- 8" CHANNEL 1 1/4" GRATING
- 8" CHANNEL 1 1/2" GRATING
- 10" CHANNEL 1 1/4" GRATING
- 12" CHANNEL 1 1/4" GRATING
- 12" CHANNEL 1 1/2" GRATING

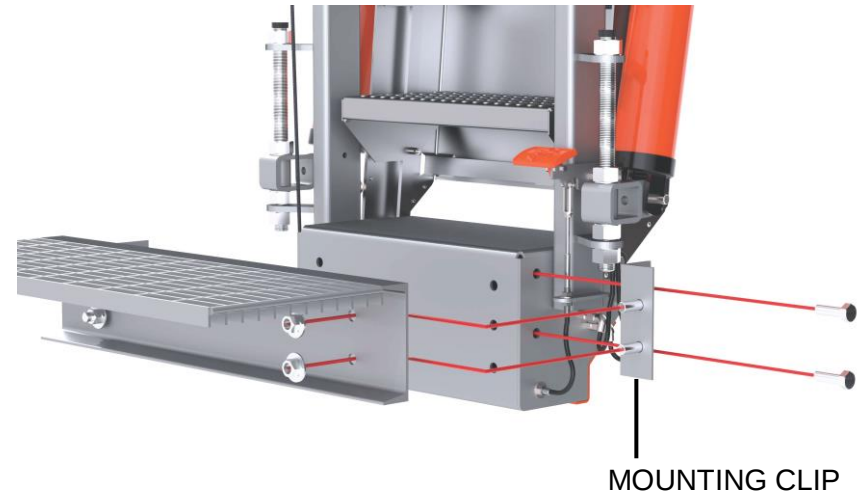
PLATFORMS WITH RECESSED GRATING

- 8" CHANNEL
- 10" CHANNEL
- 12" CHANNEL
- 15" CHANNEL

OPTIONAL MOUNTING CLIP SIDE MOUNTING MOUNTING



GANGWAY UPRIGHT MUST BE PLUMB AND LEVEL AND BASEREAD TOP MUST BE FLUSH WITH WALK SURFACE

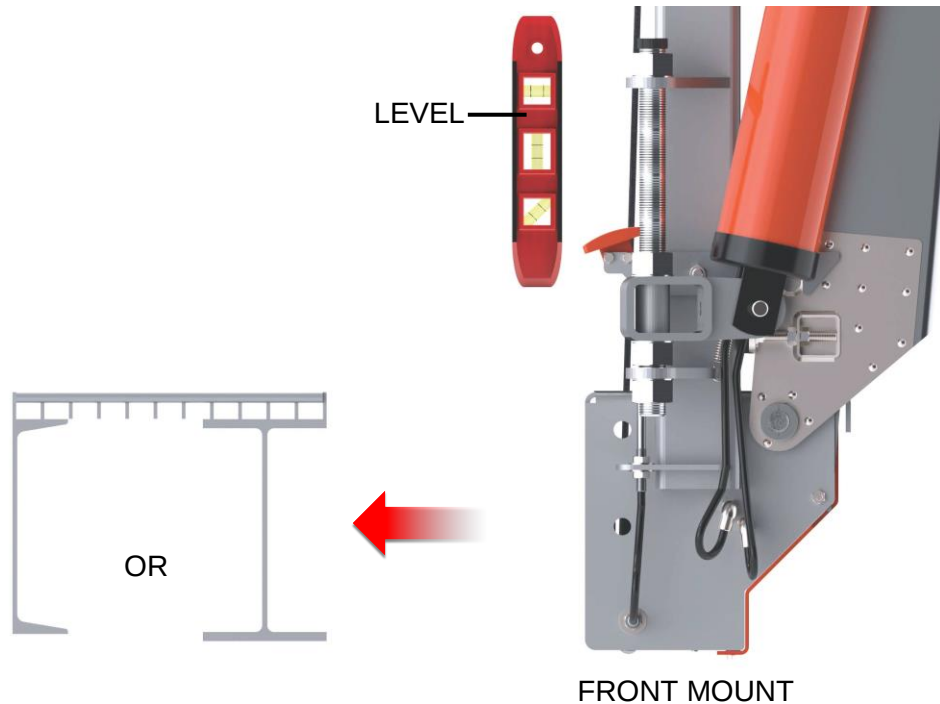


1. Pre-drill 13/16" diameter holes into existing platform using mounting clips provided or refer to erection drawings (if applicable) for mounting pattern. (SafeRack platforms will be pre-drilled.)
2. Lift gangway into place using correctly positioned lifting straps (as shown on sheet 8) and forklift, hoist, crane, or other suitable lifting device.
3. Loosely bolt gangway into place using bolts, nuts, washers and backing plate (as shown).
4. Verify gangway is plumb and square, then gangway walk surface should be level with the platform walk surface.
5. Tighten and torque all bolts. Use tightening/torque guide provided in this manual.



WARNING! Top of gangway basetread should be flush with top of platform walk surface. **FAILURE TO DO SO CAN CREATE TRIPPING HAZARD.** (NOT APPLICABLE ON RAISED MOUNTING).

OPTIONAL MOUNTING GUIDE USING UNIVERSAL ANGLE CLIP



GANGWAY UPRIGHT MUST BE PLUMB AND LEVEL AND BASETREAD TOP MUST BE FLUSH WITH WALK SURFACE

PLATFORMS WITH GRATING ON TOP

PLATFORMS WITH RECESSED GRATING

- | | | |
|--|---|---|
| <ul style="list-style-type: none"> • 8" CHANNEL 1 1/4" GRATING • 8" CHANNEL 1 1/2" GRATING • 10" CHANNEL 1 1/4" GRATING • 12" CHANNEL 1" GRATING • 12" CHANNEL 1 1/4" GRATING | <ul style="list-style-type: none"> • 8" BEAM 1 1/4" GRATING • 8" BEAM 1 1/2" GRATING • 10" BEAM 1 1/4" GRATING • 10" BEAM 1 1/2" GRATING (UP TO AND INCLUDING W10x30) | <ul style="list-style-type: none"> • 12" BEAM 1 1/4" GRATING • 12" BEAM 1 1/2" GRATING (UP TO AND INCLUDING W12x35) |
|--|---|---|

- 10" CHANNEL
- 12" CHANNEL
- 15" CHANNEL
- 10" BEAM
- 12" BEAM

UNIVERSAL MOUNTING CLIP CHANNEL MOUNTING



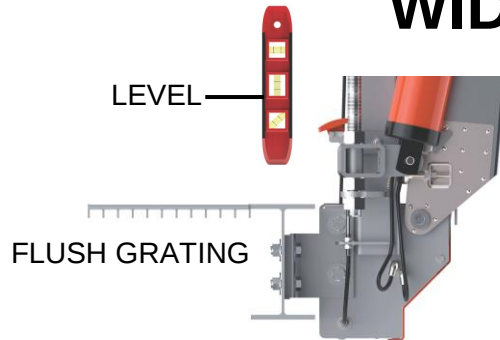
GANGWAY UPRIGHT MUST BE
PLUMB AND LEVEL AND
BASETREAD TOP MUST BE
FLUSH WITH WALK SURFACE

1. Pre-drill 13/16" diameter holes into existing platform using mounting clips provided or refer to erection drawings (if applicable) for mounting pattern. (SafeRack platforms will be pre-drilled.)
2. Mount angle clips to gangway as shown using 3/4" x 2 1/4" bolts, nuts and washers.
3. Verify gangway is plumb and square.
4. Gangway walk surface should be level with the platform walk surface.
5. Use 3/4" bolts, nuts and washers to connect gangway to platform. Use mounting plate between mounting clip and platform channel as needed for spacer (not shown).
6. Tighten and torque all bolts. Use tightening/torque guide provided in this manual.



WARNING! Top of gangway basetread should be flush with top of platform walk surface. **FAILURE TO DO SO CAN CREATE TRIPPING HAZARD.**

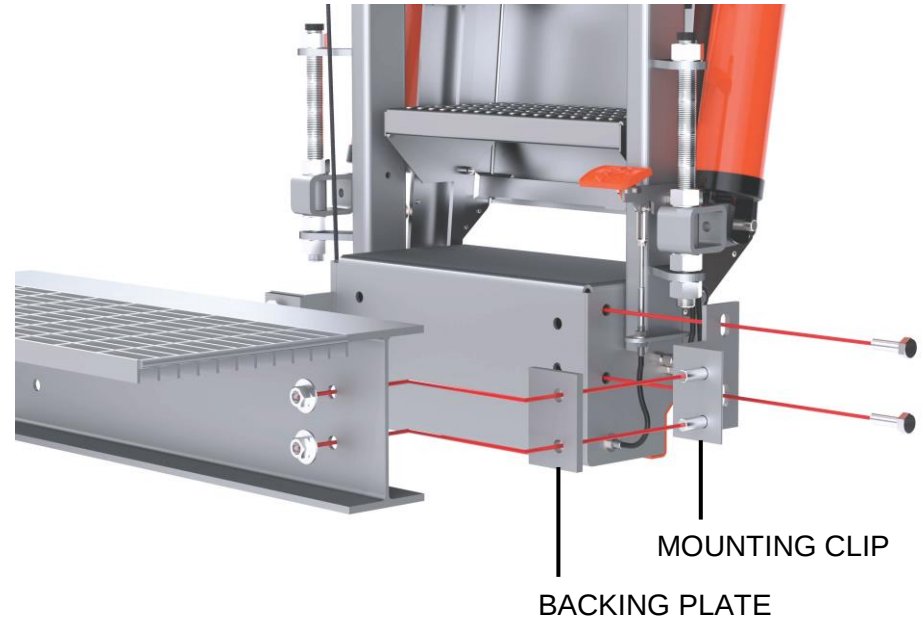
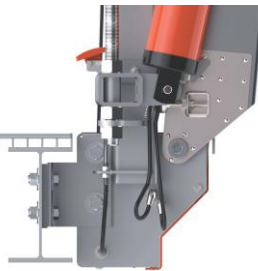
UNIVERSAL MOUNTING CLIP WIDE FLANGE MOUNTING



GRATING ON TOP



GANGWAY UPRIGHT MUST BE
PLUMB AND LEVEL AND
BASETREAD TOP MUST BE
FLUSH WITH WALK SURFACE

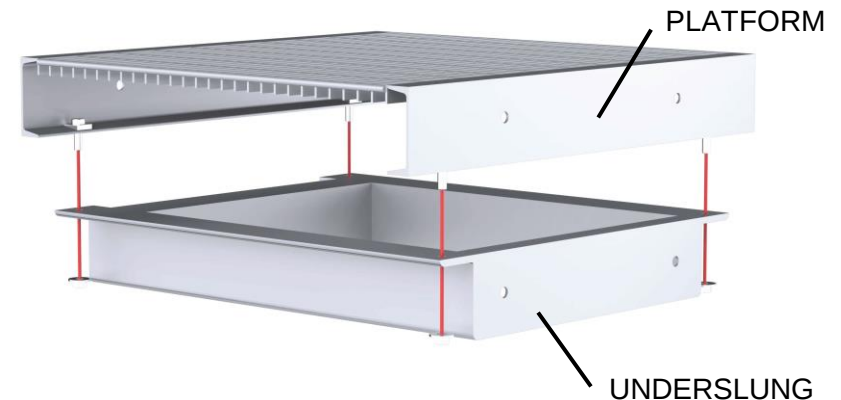
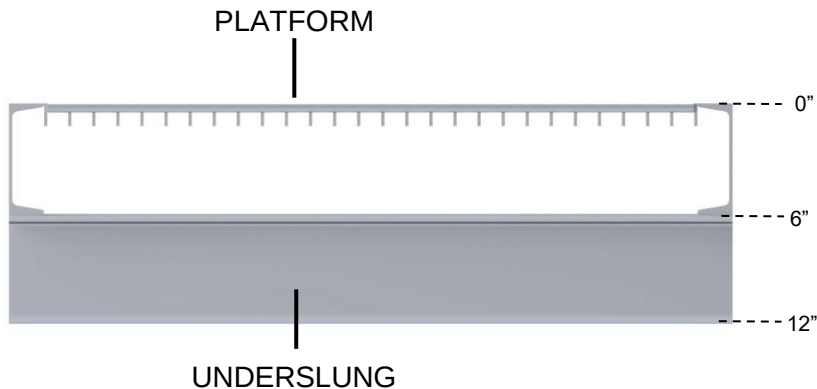


1. Pre-drill 13/16" diameter holes into existing platform using mounting clips provided or refer to erection drawings (if applicable) for mounting pattern. (SafeRack platforms will be pre-drilled.)
2. Mount angle clips to gangway as shown using $\frac{3}{4}$ " x 2 $\frac{1}{4}$ bolts, nuts and washers.
3. Verify gangway is plumb and square.
4. Gangway walk surface should be level with the platform walk surface.
5. Use $\frac{3}{4}$ " bolts, nuts and washers to connect gangway to platform. Use mounting plate between mounting clip and platform beam as needed for spacer (as shown).
6. Tighten and torque all bolts. Use tightening/torque guide provided in this manual.



WARNING! Top of gangway basetread should be flush with top of platform walk surface. **FAILURE TO DO SO CAN CREATE TRIPPING HAZARD.**

OPTIONAL MOUNT FOR UNDERSLUNG MOUNTING

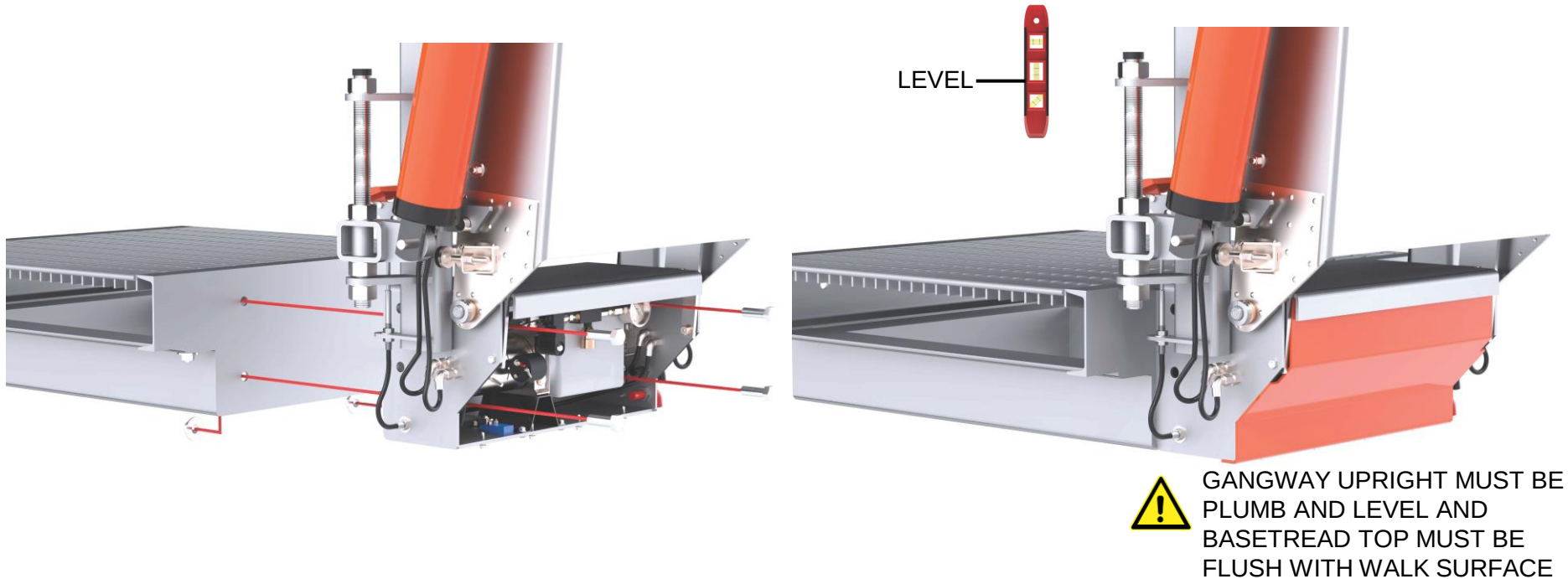


NOTE: Platform and underslung shown may differ from actual. Refer to erection drawings for specific hole size, spacing and bolt sizes.

1. Pre-drill 11/16" diameter holes into bottom flanges of existing platform using the underslung mount provided. Lift underslung mount in place under the platform using forklift, hoist, crane, or other suitable lifting device.
2. Loosely bolt mount into place using (4) 5/8" x 2" bolts, nuts, flat and bevel washers.
3. Verify mount is plumb and square..
4. Tighten and torque all bolts. Use tightening/torque guide provided in this manual.

(CONTINUED ON NEXT PAGE)

OPTIONAL MOUNT FOR UNDERSLUNG MOUNTING

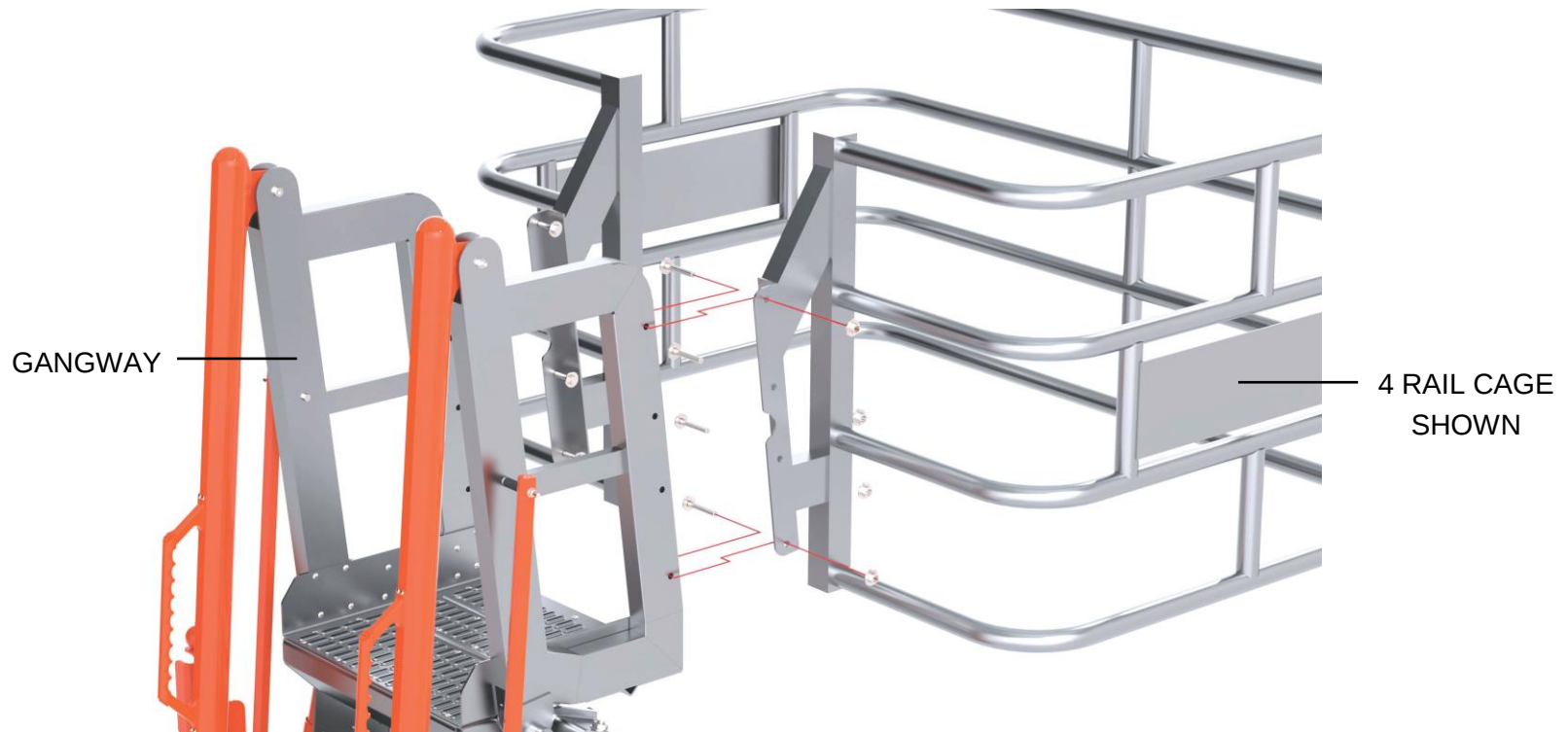


5. Lift gangway in place using correctly positioned lifting straps and forklift, hoist, crane, or other suitable lifting device.
6. Loosely bolt gangway into place using remaining (4) 3/4" x 2 1/4" bolts, nuts, flat and bevel washers.
NOTE: In system shown, base tread middle row of mounting holes not used.
7. Verify gangway is plumb and square. The gangway walk surface should be level with the platform walk surface.
8. Tighten and torque all bolts. Use tightening/torque guide provided in this manual.



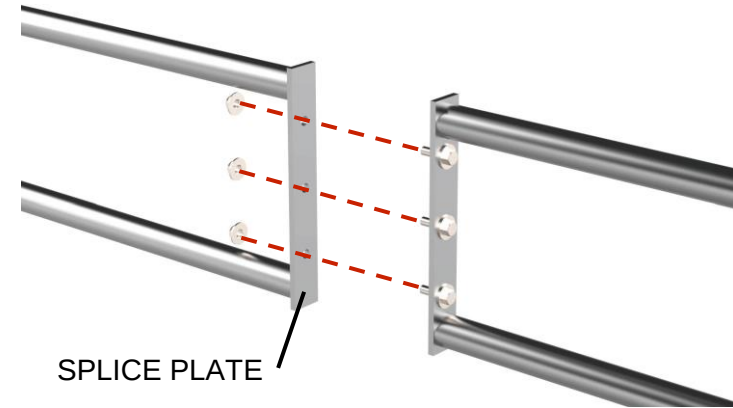
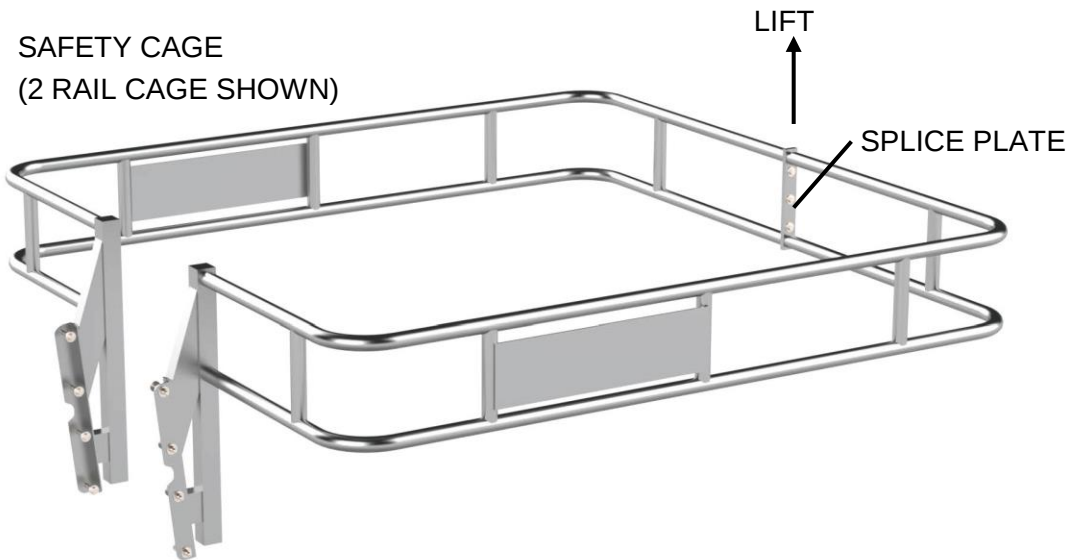
WARNING! Top of gangway basetread should be flush with top of platform walk surface. **FAILURE TO DO SO CAN CREATE TRIPPING HAZARD.**

OPTIONAL - CAGE MOUNTING INSTRUCTIONS



1. Lift cage up to gangway.
2. Align holes in cage bracket with holes in gangway upright.
3. Use supplied s/s bolts w/ nuts and washers to attach cage as shown. Use anti-seize to help prevent s/s hardware from galling.
4. If cage appears to sag, loosen bolts, lift cage up from the front outside edge "off-level" and then retighten bolts.

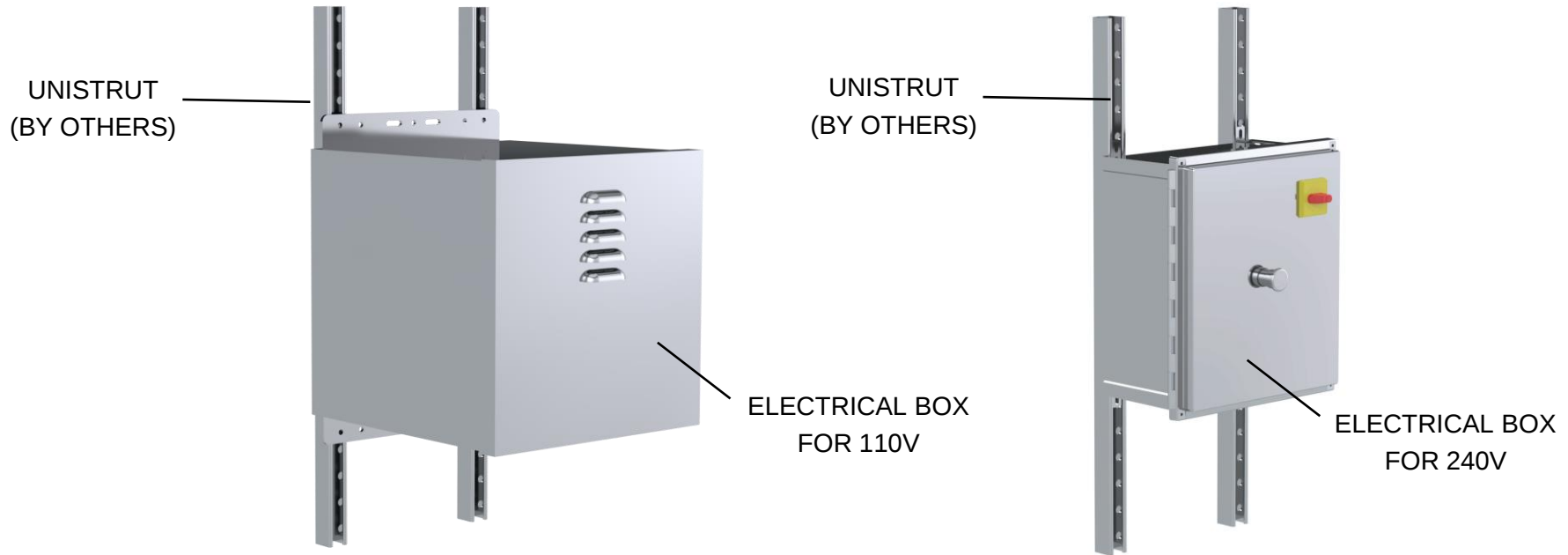
OPTIONAL – CAGE INSTRUCTIONS



Some larger cages are spliced (as shown) and will need to be pre-assembled before attaching to gangway.

1. Align holes in cage splice plate located on the front of the cage.
2. Use supplied s/s bolts w/ nuts and washers to assemble cage. Be sure to tighten bolts during assembly.
3. Follow steps on previous page to mount cage to gangway.

110V/240V ENCLOSURE BOX MOUNTING



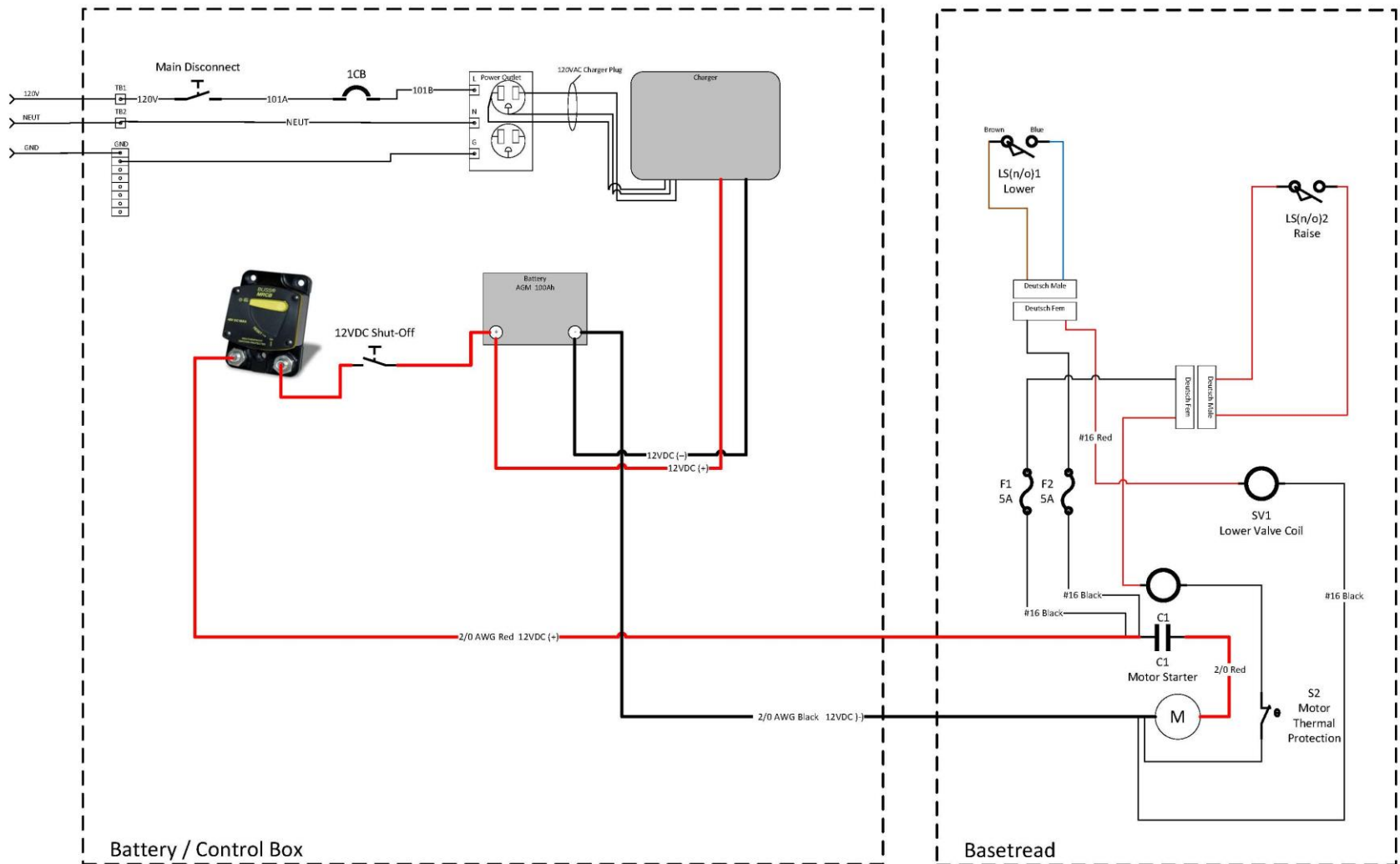
Locate and mount control box at desired location and height on platform.

Box should be mounted convenient to gangway access and where visible to all moving parts of the system.

Note: System comes with maximum 10 feet of cable.

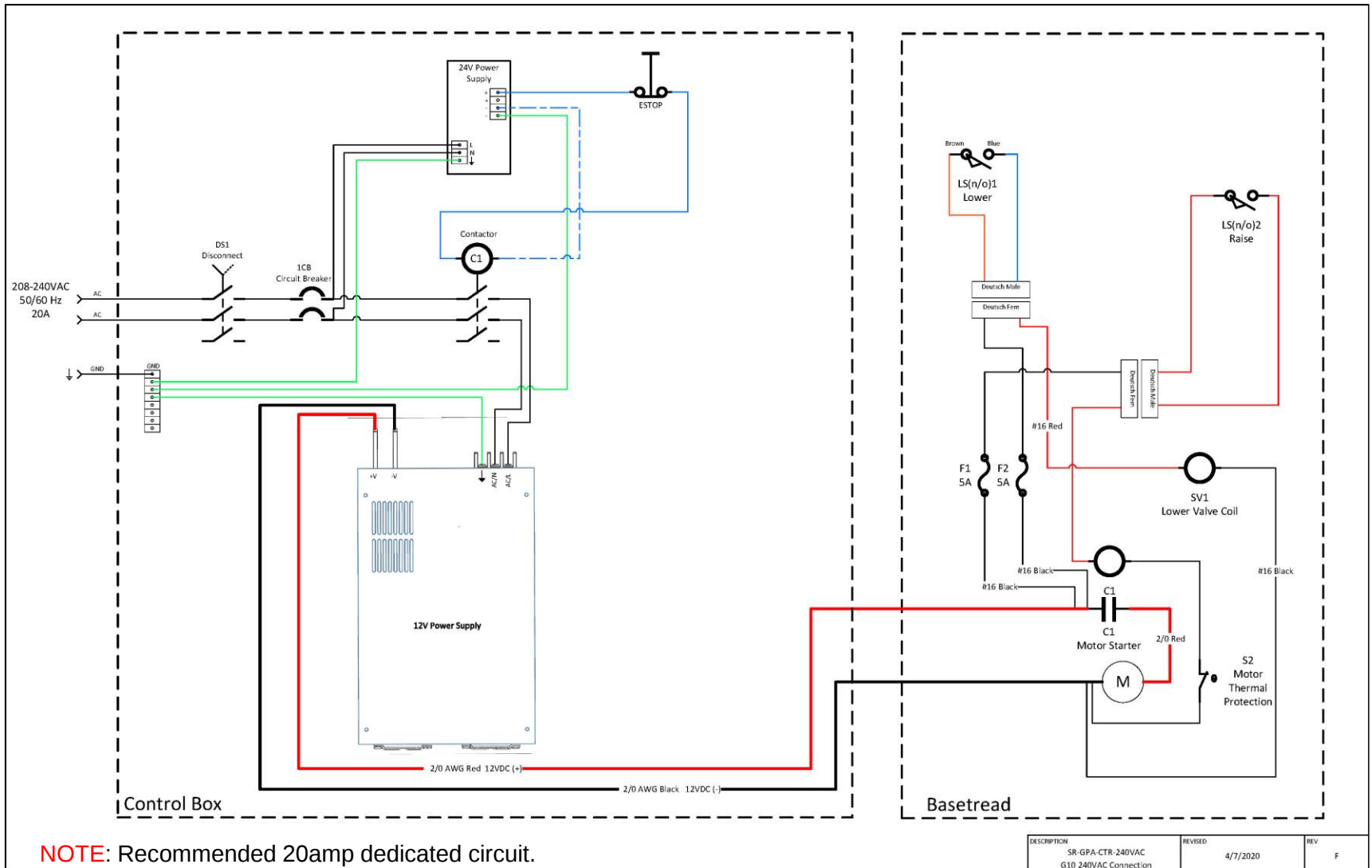
When mounting control box, use Unistrut or similar material for mounting box to structural member for a secure mount.

110 V WIRING DIAGRAM

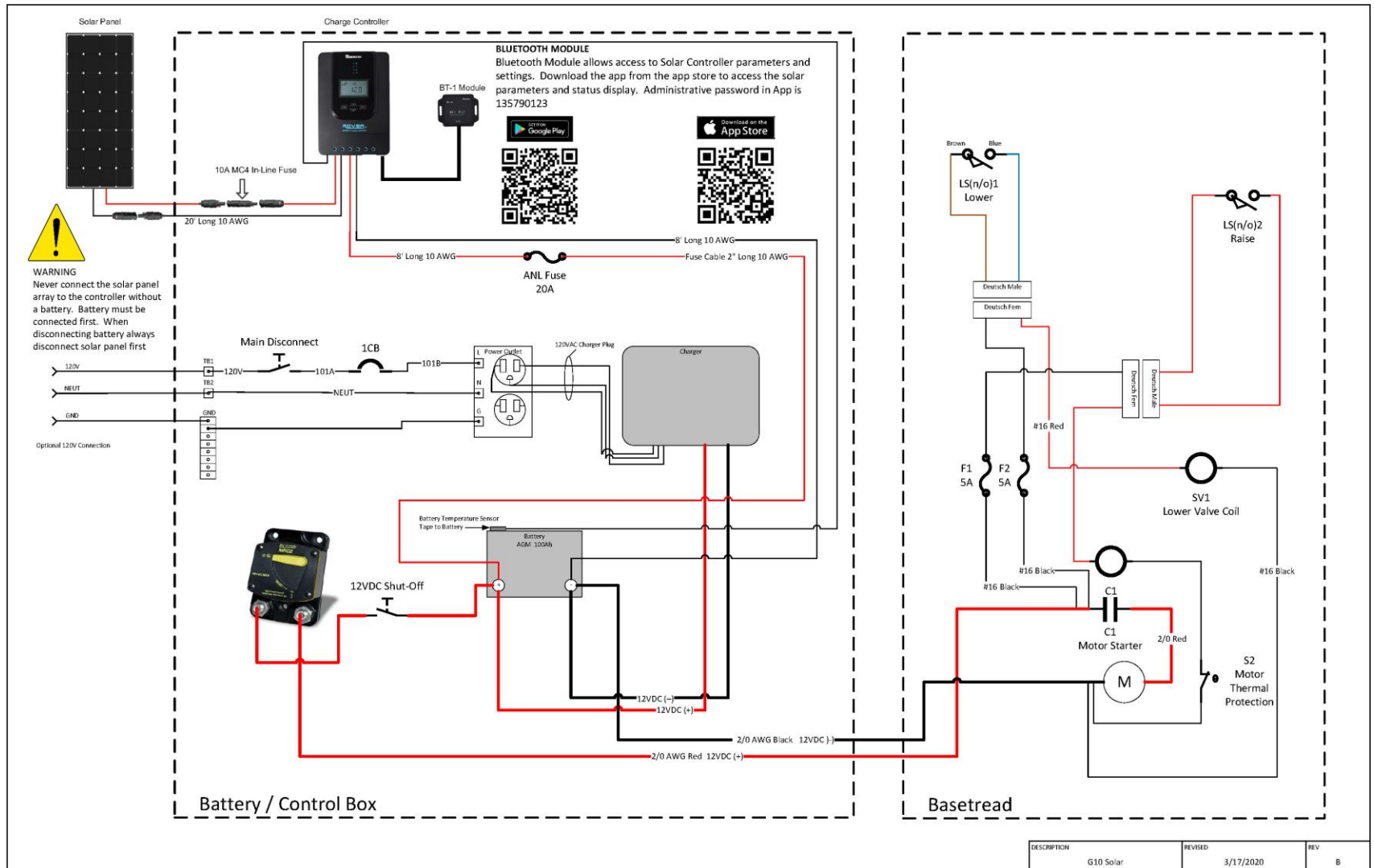


NOTE: Recommended 10amp dedicated circuit.

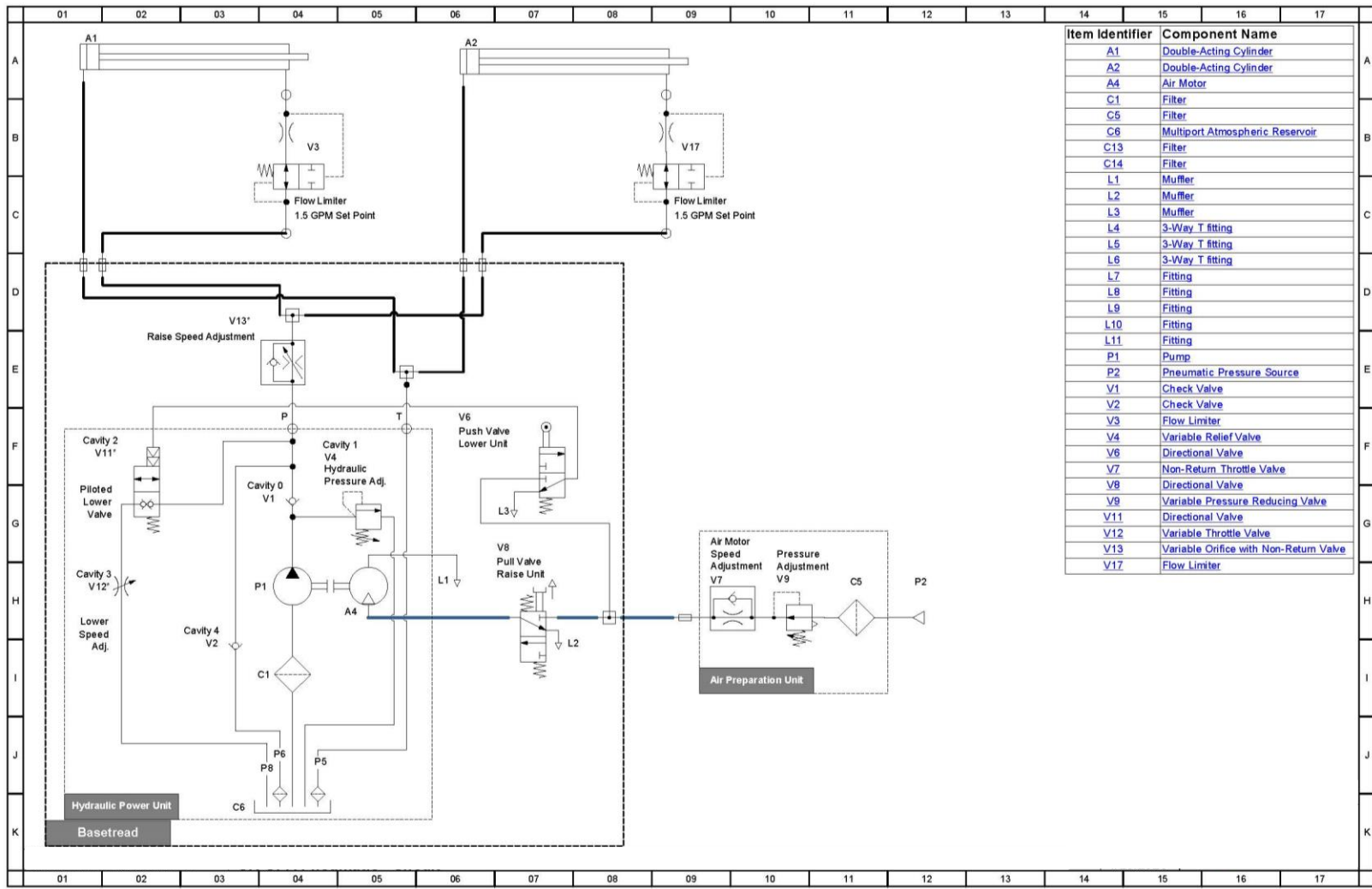
240 V WIRING DIAGRAM



SOLAR PANEL WIRING DIAGRAM



PNEUMATIC CIRCUIT DIAGRAM



NOTE: System requires 80psi, 25 SCFM for air supply. The air supply must be clean / dry air only.

GX 120VAC/SOLAR/CHARGER SETUP



Configuring the battery type.

When connecting a battery to the system for the first time or replacing a battery on the system, it is necessary to select the charging mode on the charger for the appropriate battery type. GX systems use AGM batteries. To select this, follow the instructions below.

1. Connect the battery to the charging leads and system connections.
2. Power up the System.
3. Once powered up the system will show the 12V battery selected. This is for wet cell batteries and we need to change it to AGM batteries that are used in GX.
4. To change this setting Press the MODE button one time.
5. The battery selection indicator will change to 12V AGM.
6. At this point you have completed the setup. The 12V AGM setting will be retained unless the battery is disconnected. If the battery is disconnected, you will need to verify the mode is set to 12V AFM when powering back up.

Understanding Charge LEDs

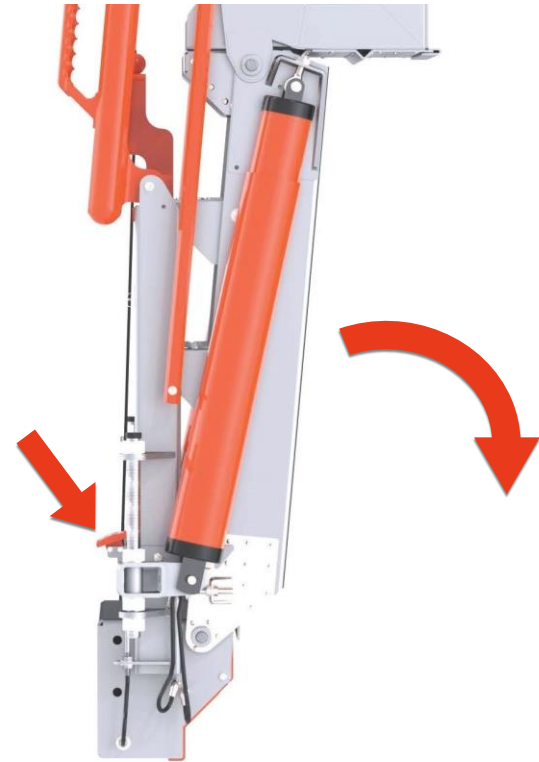
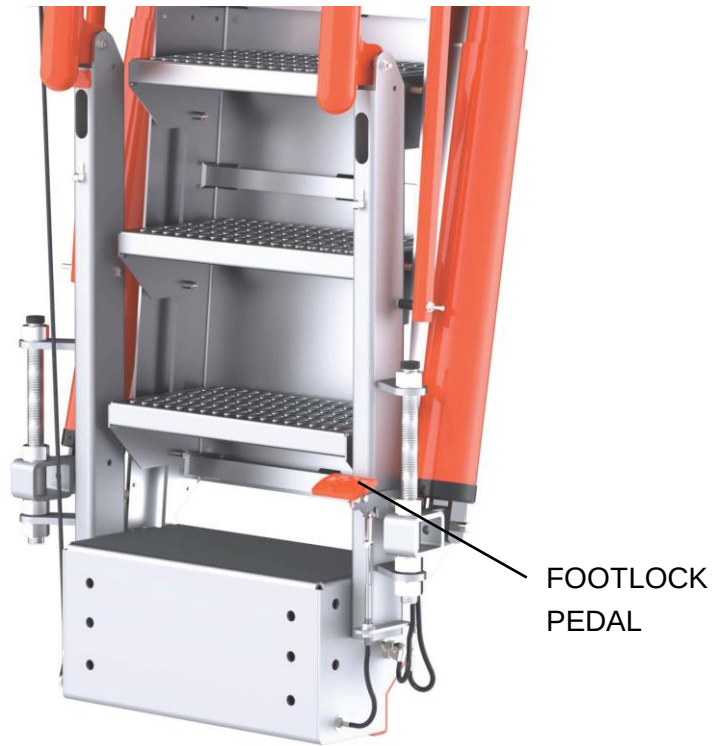
The charge LEDs on the charger give a visual indication of the battery charge level.

25% CHARGED.	50% CHARGED.	75% CHARGED.	100% CHARGED	MAINTENANCE.
Pulsing Red 25% - The battery is less than 25% charged.	Pulsing Red 50% - The battery is less than 50% charged.	Pulsing Orange - The battery is less than 75% charged.	Pulsing Green - Bulk Charge complete, optimizing battery for extended life.	Slow Pulsing Green - After the battery is fully charged, the charger will continue to provide ongoing maintenance and optimization until disconnected.

Diagnostic LEDs

HIGH VOLTAGE.	BAD BATTERY.	REVERSE POLARITY.	STANDBY MODE.
The battery voltage is too high for the selected charge mode. Check the battery and charge mode.	There is a possible battery short or the battery will not hold a charge. Have the battery checked by a professional.	Charger is connected to the battery in reverse. Reverse the connections.	The charger is in standby mode or the battery voltage is too low for the charger to detect.

OPERATING INSTRUCTIONS - LOWER GANGWAY



1. Check area around gangway to ensure that objects and equipment are clear of articulating path of gangway.
2. Verify safety chains are fully released (fully slack) before operation gangway.
3. Depress footlock pedal located on the right side of the base tread to actuate gangway.
4. Keep footlock pedal depressed until desired gangway position is achieved.



WARNING! Keep hands away from pinch points or moving parts during operation (see sheet 24 for pinch points).

OPERATING INSTRUCTIONS - LOWER GANGWAY



5. Pull safety chains through basetread uprights and lock into keyhole tabs.
6. Ensure safety chains on both sides of gangway are secure before using.

Note: Chain can be twisted at each link to ensure a tight, even connection at each keyhole tab.

OPERATING INSTRUCTIONS - RAISE GANGWAY



1. Check area around gangway to ensure that objects and equipment are clear of articulating path of gangway.
2. Pull up on pull rope located on the left side of the basetread to actuate gangway.
3. Keep rope pulled until gangway reaches desired position or until gangway stops at the stored position.



WARNING! Keep hands away from pinch points or moving parts during operation (see sheet 24 for pinch points).

OPERATING INSTRUCTIONS - RAISE GANGWAY



4. Locking mechanism (on right side of basetread) will engage when gangway reaches stored position.
5. Verify that footlock is fully engaged before leaving gangway.
6. When stored, pull safety chains through basetread uprights and lock into keyhole tabs.

OPERATIONAL HAZARDS

WARNINGS

BEFORE USING CONTROLS:

- Verify that the chain stops on both sides of the gangway are fully released.

BEFORE WALKING ON UNIT:

- Verify that the chain stops on both sides of the gangway are set.

UNIT MUST BE SUPPORTED:

- Unit must be supported on the vehicle or by the chain stops.
- Do not use the cage as a means of supporting the gangway. This can damage and/or break the cage.

WHEN LOWERING AND/OR RAISING UNIT:

- Keep hands away from moving parts.
- Do not hold on to gangway while in motion.
- Do not ride gangway while in motion.
- Keep personnel and/or equipment clear of traveling area while unit is in motion.
- If unit is not working properly, stop immediately. Continued use could damage the gangway.

TROUBLE SHOOTING GUIDE - A

1. FOOTLOCK NOT ENGAGING.
 - A. Refer to troubleshooting guide B – E.
 - B. Check for obstructions.
 - C. Check for gangway damage.
2. GANGWAY LEANING AWAY FROM PLATFORM.
 - A. Check for obstructions.
 - B. Bolts loose on mounting bracket/basetread mount.
 - C. Check for gangway damage.
3. SAFETY CAGE LEANING AND/OR SAGGING.
 - A. Check for obstructions.
 - B. Bolts loose where connected to gangway.
 - C. Cage bent or broken.
 - D. Check for gangway damage.
 - E. Bolts loose on mounting bracket/basetread mount.
4. SAFETY CHAINS WON'T ENGAGE
 - A. Check for obstructions.
 - B. Verify chains have not been replaced with ones that do not match original chain size/length.
5. HYDRAULIC SYSTEM FAILURE

In the event of a hydraulic system failure when gangway is in a lowered position and needs to be raised. Place winch in a secure position above unit and connect to (gwy at...???), engage the safety chains, remove the pins on the end of the cylinders, then raise the gangway with the winch until the foot lock is engaged. (FIG 1)

Pull the safety chains until they are in fully locked position on the uprights and gangway is secure in place and will not lower. (FIG 2)

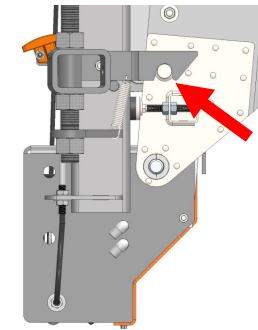


FIG 1



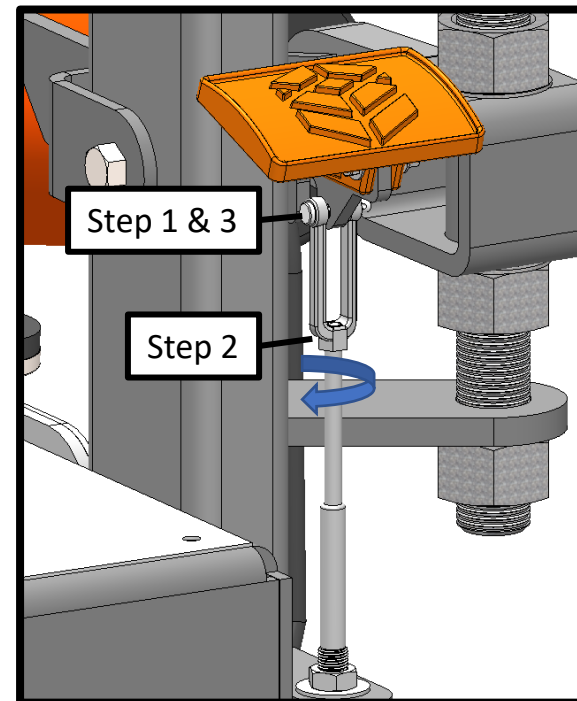
FIG 2

TROUBLE SHOOTING GUIDE - B

If GX is lowering without pressing down on foot lock...

- Step 1: Remove pin from clevis at top of cable
- Step 2: Turn clevis counterclockwise 2-3 rotations to effectively shorten the pin-to-pin length of foot lock.
- Step 3: Reinstall pin and verify operation.
- Step 4 (if needed): Repeat Steps 1-3 until gangway lowers only when foot lock is pressed

If this does not correct the issue, the same procedure should be employed at the other end of the push/pull cable inside of the basetread.

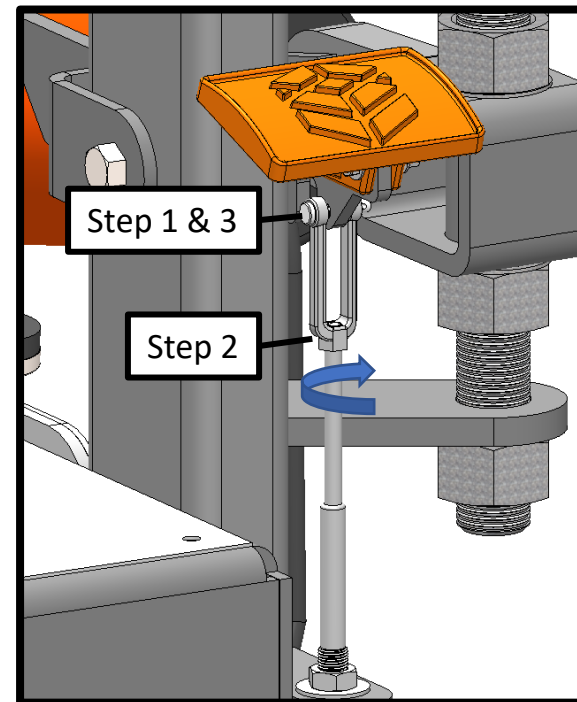


TROUBLE SHOOTING GUIDE - C

If GX does not lower when pressing down on foot lock...

- Step 1: Remove pin from clevis at top of cable
- Step 2: Turn clevis clockwise 2-3 rotations to effectively lengthen the pin-to-pin length of foot lock.
- Step 3: Reinstall pin and verify operation.
- Step 4 (if needed): Repeat Steps 1-3 until gangway lowers when foot lock is pressed

If this does not correct the issue, the same procedure should be employed at the other end of the push/pull cable inside of the basetread.

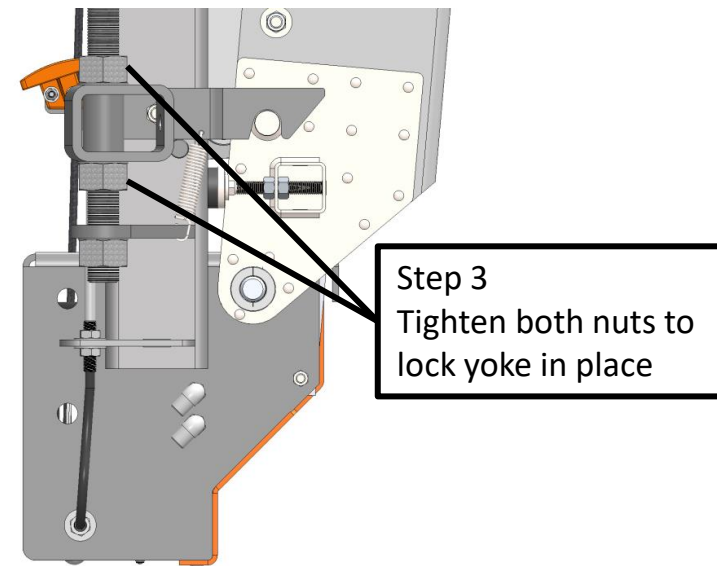
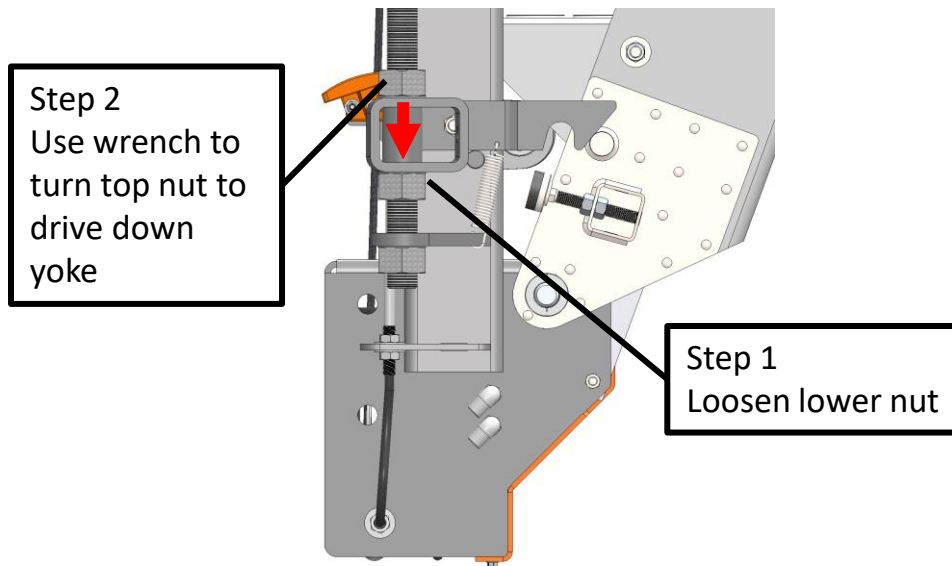


TROUBLE SHOOTING GUIDE - D

If GX is not storing with foot lock engaged...

If cylinders are bottoming out before the lug can catch the foot lock, lower the bottom cylinder yoke.

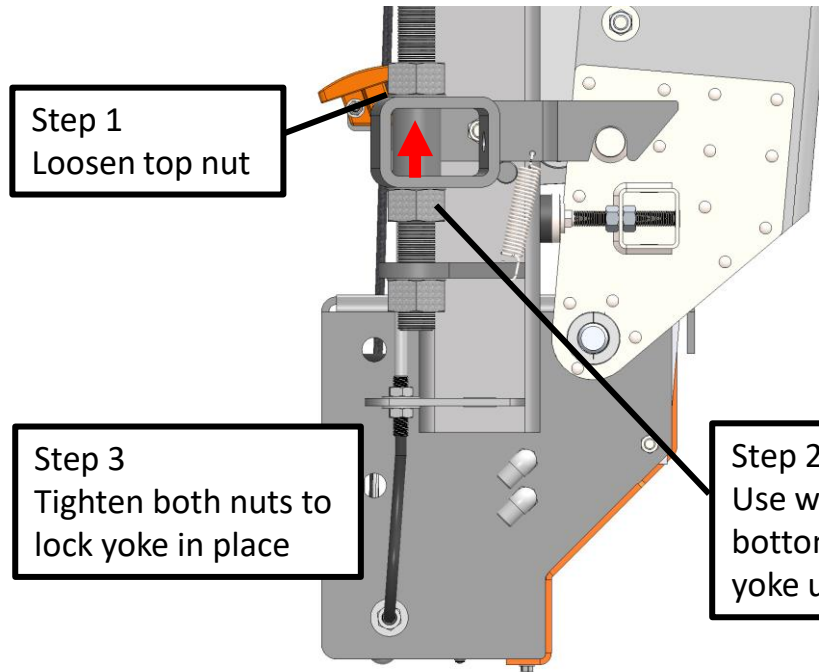
As you lower the yoke, the U body will rise, and the lug will get closer to capture by the foot lock. Image below shows proper adjustment.



Note: Adjust the nut $\frac{1}{4}$ turn at a time, its important to keep the yokes roughly at the same elevation

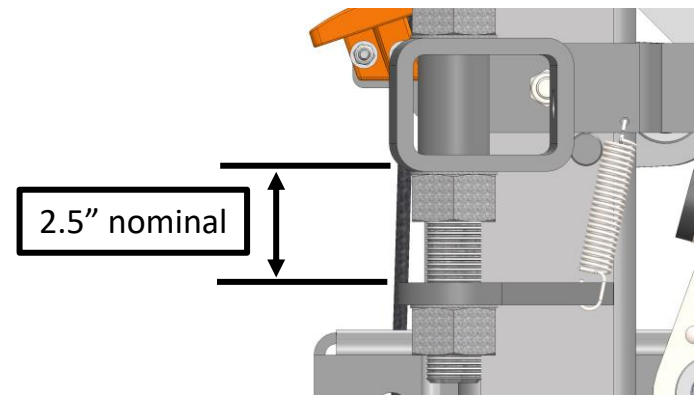
TROUBLE SHOOTING GUIDE - E

If GX is storing before cylinders fully retract...



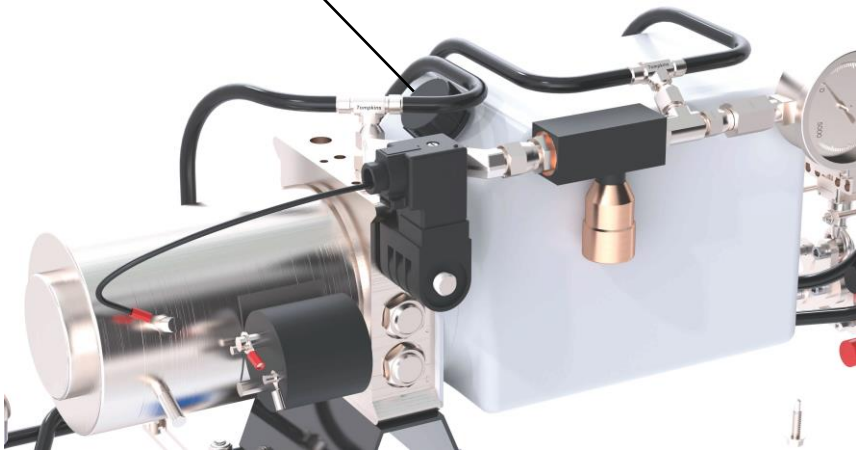
Note: Adjust the nut $\frac{1}{4}$ turn at a time, its important to keep the yokes roughly at the same elevation

- If cylinders are not fully retracting before the lug can catch the foot lock, raise the bottom cylinder yoke.
- The indicator that the cylinders are not fully retracted include:
 - Basetread uprights flexing away from each other
 - Deformation at top cylinder attachment bracket
- Cylinders should fully retract with the lug centered in the foot lock.
- Set height of spring yoke to 2.5" before beginning adjustment procedure shown to the left

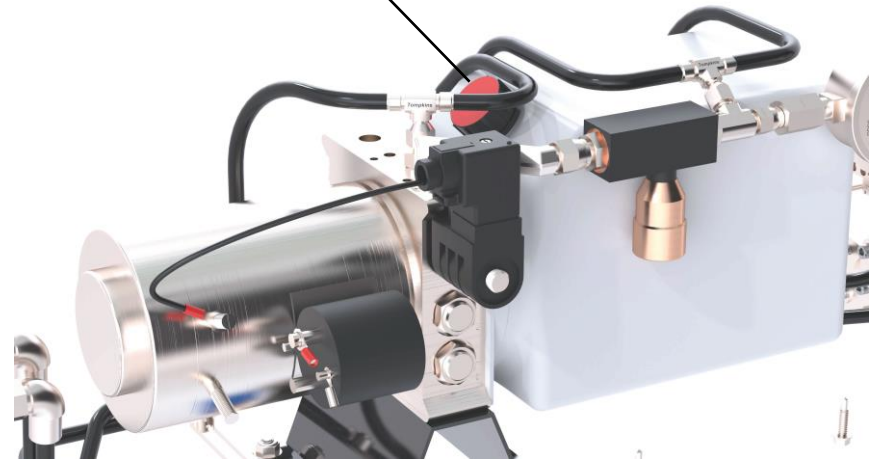


IMPORTANT BEFORE OPERATING

NON-VENTED
CAP



VENTED
CAP



1. Unit ships with non-vented cap.
2. Non-vented cap must be removed and replaced with vented cap.

Note: Vented cap has red end to cap.

MAINTENANCE

MONTHLY:

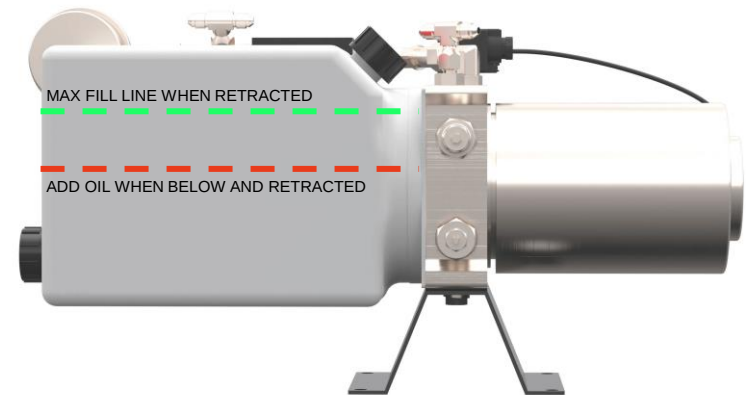
1. Check all bolted connections to ensure that they are properly tightened.
Note: Stainless steel hardware should only be hand tightened to prevent binding.
2. Inspect gangway for damage that may have occurred while in use, that may affect operation.
3. Check all power wires/hoses going into gangway to ensure good connections.

BIANNUAL:

1. Lubricate all pivot points with a multi-purpose white lithium grease.
2. Inspect chain and shackle connections to insure there are no damage and/or missing pins.
3. Flush and replace hydraulic fluid. Reservoir should require approximately (3) quarts of Bio-Ultimax 1000 hydraulic fluid ISO 46.

NOTE:

If gangway is used extremely frequently (excess of 100 cycles per day), check hydraulic fluid color and viscosity monthly. If hydraulic fluid becomes discolored, flush and replace.



TIGHTENING/TORQUING BOLT GUIDE

TURN-OF-NUT METHOD:

- Bolts shall be installed in all holes of the connections and brought to a snug-tight condition. Snug tight is defined as the tightness that exist when the plies if the joint are in firm contact. This may be attained by a few impacts of an impact wrench or the full effort of a an using an ordinary spud wrench. Following this initial operation, all bolts in the connection shall be tightened further by the applicable amount of rotation specified in the table below. During the tightening operation, there shall be no rotation of the part not turned by the wrench.
- Nut rotation is relative to bolt regardless of the element (nut or bolt) being turned. For bolts installed by 1/2 turn or less, the tolerance should be +/- 30 degrees; for bolts installed by 2/3 turn and more, the tolerance should be +/- 45 degrees.
- Applicable only to joints in which all material within the grip is steel.
- Beveled washers not used.
- NOTE: Information from AISC Steel Manual, Section A14 – ASO bolt Specification.

BOLT LENGTH	DISPOSITION OF OUTER FACE OF BOLTED PARTS		
	BOTH FACES NORMAL TO BOLT AXIS	ONE FACE NORMAL TO BOLT AXIS AND OTHER SLOPED NOT MORE THAN 1:20	BOTH FACES SLOPED NOT MORE THAN 1:20 FROM NORMAL TO THE BOLT AXIS
NOT MORE THAN 4 DIAMETERS	1/3 TURN	1/2 TURN	2/3 TURN
MORE THAN 4 DIAMETERS BUT NOT MORE THAN 8 DIAMETERS	1/2 TURN	2/3 TURN	5/6 TURN
MORE THAN 8 DIAMETERS BUT NOT MORE THAN 12 DIAMETERS	2/3 TURN	5/6 TURN	1 TURN

HYDRAULIC FITTING TIGHTENING GUIDELINES

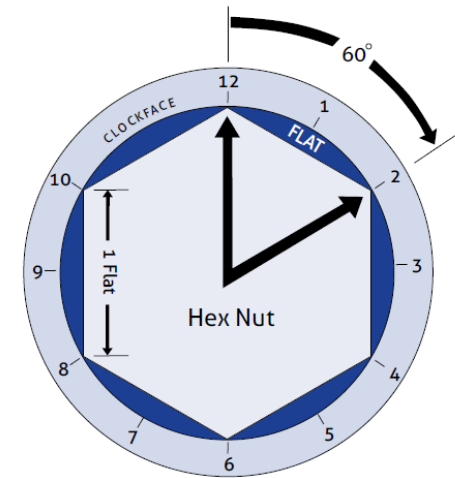
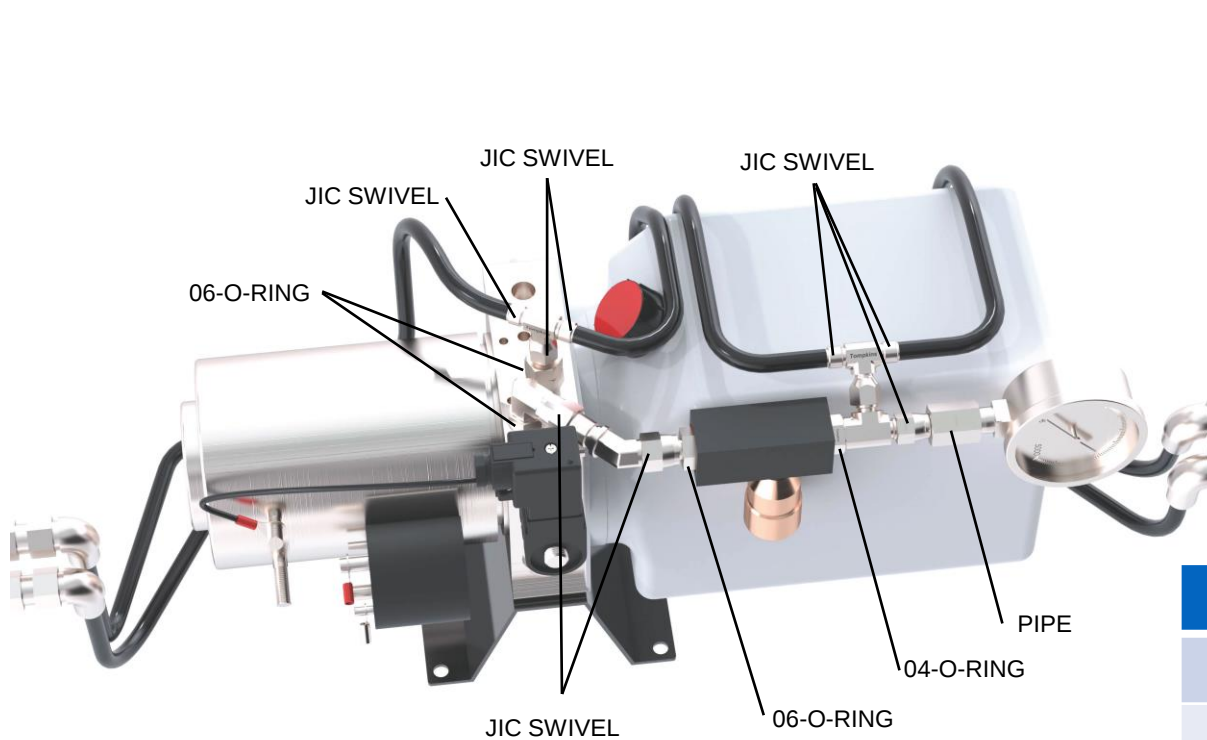
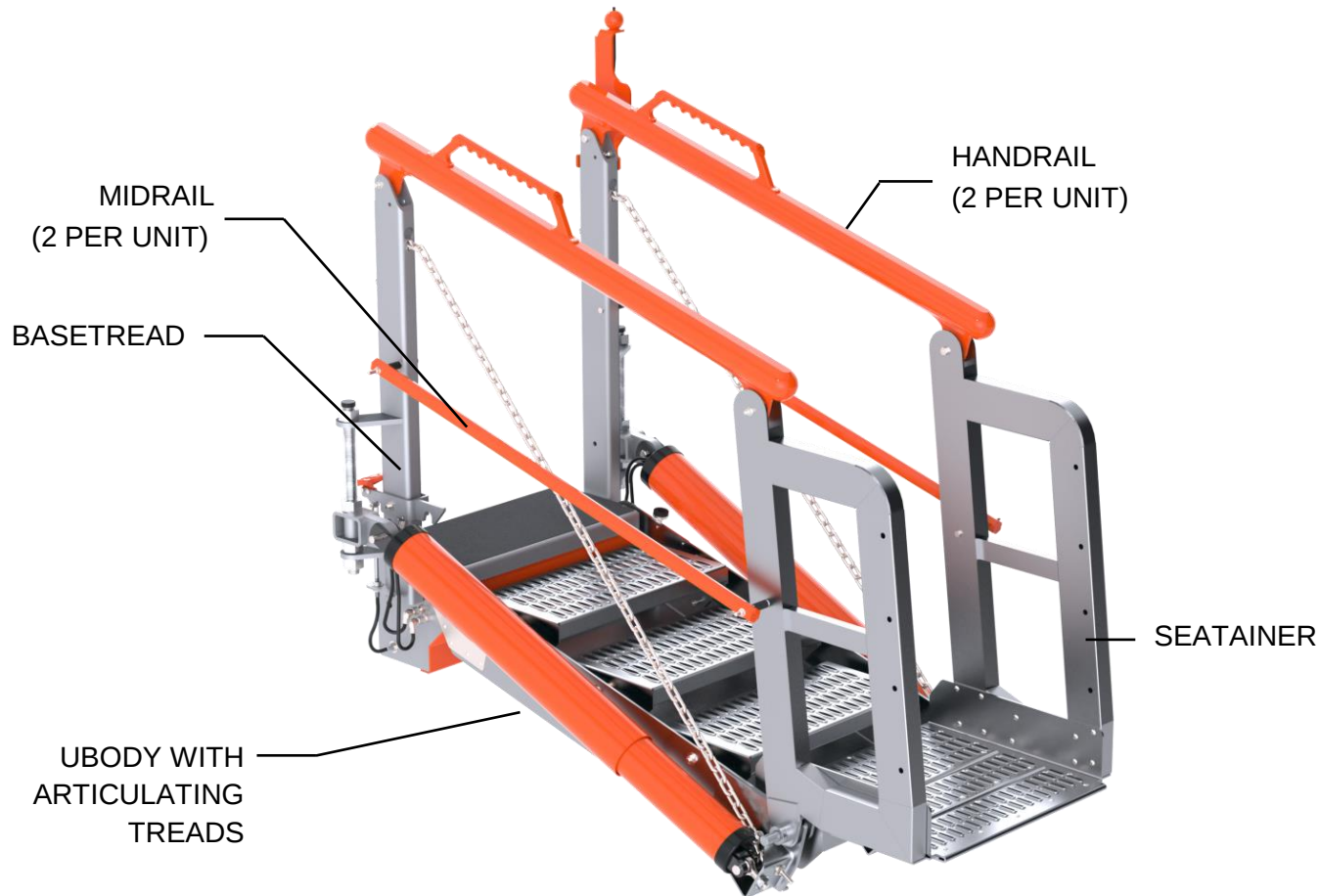


Figure 1: FFWR Diagram

Identifier	Torque
JIC SWIVEL	¼ - ½ FFWR
PIPE	2 – 3 FFWR
04 O-RING	13 ft-lbs +25% -0%
06 O-RING	22 ft-lbs +25% -0%

Hydraulic fittings should be tightened via the Flats From Wrench Resistance (FFWR) method. This method is based on the hexagon or hex nut of the fitting. The hex nut is divided into angles of rotation of a circle or 360 deg. One hex nut side is a Flat and makes up 1/6 of the circle or 60 deg. Hence, to turn one flat is equal to 60 deg of rotation. For example, we can think of a hex nut like a clock face. One flat equals 2 hours or 60 deg, see Figure 1.

REPLACEMENT PARTS



ELECTRICAL BOX FOR
110V / SOLAR POWER



ELECTRICAL BOX
FOR 240V

ALL REPLACEMENT PARTS REQUIRE MODEL NUMBER AND SERIAL NUMBER FROM UNIT.

PINCH POINT / MOVING PARTS



WARNING! Keep hands away from pinch points or moving parts during operation.

SAFETY DATA SHEET

Issue Date: 15 May 2015

Revision date: 15 May 2015

Version 1

1. - IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product identifier

Product Name: Bio-Ultimax 1000 Hydraulic Fluids ISO 46

Other means of identification

Product code: 81011, 81013, 81014, 81016, 81017

CAS NO: Mixture

Synonyms: None

Recommended use of the chemical and restrictions on use

Recommended Use: Biobased Hydraulic Oil, (Biodegradable), Compliant, EPA-VGP-EAL

Details of the supplier of the safety data sheet

Supplier and Manufacture

Renewable Lubricants, Inc.

476 Griggy RD NE, P.O. Box 474

Hartville, Oh 44632

Phone: (330) 877-9982

Fax: (330) 877-2266

www.renewablelube.com, www.renewablelubricants.com

Emergency telephone number

Emergency Telephone (CHEMTREC) 1-800-424-9300. Outside the U.S. (703) 527-3887

SECTION 2 – HAZARDS IDENTIFICATION

This material is not hazardous according to regulatory guidelines (see SDS Section 15).

Other hazard information:

HAZARD NOT OTHERWISE CLASSIFIED (HNOC): None as defined under 29 CFR 1900.1200.

PHYSICAL / CHEMICAL HAZARDS

No significant hazards.

HEALTH HAZARDS

This material has no known hazards when used as directed.

ENVIRONMENTAL HAZARDS

No significant hazards.

NFPA Hazard ID: Health: 0 Flammability: 1 Reactivity: 0

HMIS Hazard ID: Health: 0 Flammability: 1 Reactivity: 0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

Material Name: Bio-Ultimax 1000 Hydraulic Fluids ISO 46, Page 1 of 6
Issue Date: 15 May 2015

SECTION 3 - COMPOSITION/INFORMATION on INGREDIENTS

No Hazardous Substance(s) or Complex Substance(s) required for disclosure. As per paragraph (i) of 29 CFR 1910.1200, formulation is considered a trade secret and specific chemical identity and exact percentage (concentration) of composition may have been withheld. Specific chemical identity and exact percentage composition will be provided to health professionals, employees, or designated representatives in accordance with applicable provisions of paragraph (i).

SECTION 4 - FIRST AID MEASURES

Eye contact: Flush eye with water for 15 minutes. If symptoms persist, call a physician.

Skin contact: Wash off immediately with soap and plenty of water. Remove and wash contaminated clothing before re-use. If skin irritation persists, call a physician.

Inhalation: Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. If symptoms persist, call a physician.

Ingestion: Do not induce vomiting. If conscious, drink plenty of water. Obtain medical attention.

Most important symptoms and effects, both acute and delayed

Symptoms: No information available.

Indication of any immediate medical attention and special treatment needed

Notes to physician: Treat symptomatically

SECTION 5 - FIRE-FIGHTING MEASURES

Suitable extinguishing media: Use dry chemical, CO₂, water spray or "alcohol" foam.

Unsuitable extinguishing media: Do not use a solid water stream as it may scatter and spread fire.

Fire Fighting Instructions: Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Use water spray to cool fire exposed surfaces and to protect personnel.

Hazardous Combustion Products: Incomplete combustion products, Smoke, Fume, Oxides of carbon.

Specific hazards arising from the chemical: In the event of fire, cool tanks and protect personnel with water spray.
FLASH POINT (COC) 243°C (469°F)

Explosion data:

Sensitivity to Mechanical Impact	None.
Sensitivity to Static Discharge	None.

Special protective equipment for firefighters:

Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions: Use personal protective equipment. Keep unnecessary personnel away.

Environmental precautions

Environmental precautions: Prevent product from entering drains. Do not contaminate surface water. Check on local, national and international regulatory information to determine any reporting requirements for spills.

Methods and material for containment and cleaning up

Methods for containment: Prevent further leakage or spillage if safe to do so, confine spill immediately with booms.

Methods for cleaning up: Absorb spill with inert material (e.g. dry sand or earth). Where necessary collect using absorbent media, or skimming surface with suitable absorbent, then transfer material in approved containers.

Material Name: Bio-Ultimax 1000 Hydraulic Fluids ISO 46, Page 2 of 6
Issue Date: 15 May 2015

SECTION 7 - HANDLING AND STORAGE

Precautions for safe handling

Handling: Handle in accordance with good industrial hygiene and safety practice. Keep containers closed when not in use. Wash thoroughly after handling.

Conditions for safe storage, including any incompatibilities

Storage Conditions: Keep containers tightly closed and store in a cool well-ventilated place free of contaminants. Empty containers may retain product properties. Follow all MSDS / Label warnings after container is emptied. No special storage precautions required.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

Components	ACGIH TLV	OSHA (TWA mg/m ³):	IDLH
Oil Mist	5 mg/m ³	5 mg/m ³	

Appropriate engineering controls

Engineering measures to reduce exposure: Use only in area provided with appropriate exhaust ventilation.

Individual protection measures, such as personal protective equipment

Respiratory protection: No personal respiratory protective equipment normally required. In case of insufficient ventilation wear suitable respiratory equipment.

Hand protection: Nitrile rubber Neoprene gloves

Eye protection: Safety glasses

Skin and body protection: Impervious clothing

General Hygiene Considerations: Avoid contact with skin, eyes and clothing

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Typical information on basic physical and chemical properties

Specific Gravity (H₂O = 1): 88 @ 15.6°C

Flash Point (COC): 243°C (469°F)

Kinematic viscosity: 43.8 cSt @ 40°C

Pour Point: -40°C (-40°F)

Explosive properties: Material does not have explosive properties.

Oxidizing properties: See Section 2, No significant hazards.

Volatile Organic Compound (VOC): Components contain No VOC according to CARB

Physical state Liquid

Appearance Oil

Odor Mild

Color Light yellow liquid

Odor threshold Not Determined

Melting point/freezing point: Not Determined

Boiling point /boiling range: Not Determined

Flammability (solid, gas): Not Determined

Flammability Limit in Air Not Determined

Evaporation rate: (n-Butyl Acetate=1) Approx. <1

Percent Volatile: Not Determined

Boiling Point: Not Determined

Vapor Density (Air = 1): <1

Vapor pressure: Not Determined

Solubility in Water: Insoluble

Upper flammability limit: Not Determined

Lower flammability limit: Not Determined

Partition coefficient: Not Determined

Autoignition temperature: Not Determined

Decomposition temperature: Not Determined

Other information

The above data are typical values and do not constitute a specification.

Material Name Bio-Ultimax 1000 Hydraulic Fluids ISO 46, Page 3 of 6
Issue Date: 15 May 2015

SECTION 10 - STABILITY AND REACTIVITY

Reactivity

Not applicable

Chemical stability

Stability: Stable under normal conditions

Possibility of Hazardous Reactions

Possibility of Hazardous Reactions: None under normal processing

Hazardous polymerization: Hazardous polymerization does not occur

Conditions to avoid

Conditions to avoid: No special storage conditions required

Hazardous Decomposition Products

Hazardous Decomposition Products: None under normal processing

Incompatible materials

Incompatible materials: Oxidizing agents

SECTION 11 - TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Product Information Product does not present an acute toxicity hazard based on known or supplied information

Eye contact Contact with eyes may cause irritation. May cause mild, short-lasting discomfort to eyes based on assessment of the components.

Skin contact Acute Toxicity: Minimally Toxic, based on assessment of the components. Substance does not generally irritate and is only mildly irritating to the skin with prolonged exposure.

Inhalation Acute Toxicity: Minimally Toxic, based on assessment of the components.
Irritation: Negligible hazard at ambient/normal handling temperatures.

Ingestion Acute Toxicity: Minimally Toxic, based on assessment of the components and structurally similar materials.

Aspiration Not expected to be an aspiration hazard, based on physical and chemical properties of the material.

Respiratory Sensitization Not expected to be a respiratory sensitizer, based on assessment of the components and structurally similar materials.

Germ Cell Mutagenicity Not expected to be a germ cell mutagen, based on assessment of the components and structurally similar materials.

Carcinogenicity Not expected to cause cancer, based on assessment of the components and structurally similar materials. This product does not contain any carcinogens or potential carcinogens as listed by OSHA, IARC or NTP.

Reproductive Toxicity Not expected to be a reproductive toxicant, based on assessment of the components.

Lactation Not expected to cause harm to breast-fed children.

Specific Target Organ Toxicity (STOT) Single Exposure: Not expected to cause organ damage from a single exposure.
Repeated Exposure: Not expected to cause organ damage from prolonged or repeated exposure.

OTHER INFORMATION

Product Information: Product does not present an acute toxicity hazard based on known or supplied information. Not expected to cause significant health effects under conditions of normal use, based on laboratory studies with the same or similar materials. Not mutagenic or genotoxic. Not sensitizing in test animals and humans.

Material Name Bio-Ultimax 1000 Hydraulic Fluids ISO 46, Page 4 of 6
Issue Date: 15 May 2015

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicity: No known hazards to the aquatic environment

Biodegradation: Based on previous biodegradability studies, the product provides Ultimate Biodegradation Pw1 >60% within 28 days in ASTM D-5864 Aerobic Aquatic Biodegradation of Lubricants.

Aquatic/Ecotoxicity: OECD 201, 202, and 203: Based on previous studies, LC50/EC50 is greater than 3,000 ppm (3000 mg/L).

Bioaccumulation: No Potential to Bioconcentrate

Soil Mobility: Not Established

Persistence and degradability: Readily biodegradable >60% within 28 days

Water Mobility: The product is insoluble and floats on water. **WGK:** 1

SECTION 13 - DISPOSAL INFORMATION

Waste treatment methods

Disposal of waste: Disposal should be in accordance with applicable regional, national and local laws and regulations.

Contaminated packaging: Do not reuse container.

SECTION 14 - TRANSPORTATION INFORMATION

UN number	ADR/RID Not regulated.
ICAO Not regulated.	IMDG Not regulated.
UN proper shipping name	ADR/RID Not regulated.
ICAO Not regulated.	IMDG Not regulated. Marine Pollutant: NO
Transport hazard class(es)	ADR/RID Not regulated.
ICAO Not regulated.	IMDG Not regulated.
Packing group	ADR/RID Not regulated.
AIR	IATA Not regulated.
LAND	TDG Not regulated.
LAND	DOT Not regulated.

SECTION 15 - REGULATORY INFORMATION

International Inventories

TSCA: Listed in TSCA

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

Global Chemical Inventories:

USA	All components of this material are on the US TSCA Inventory or are exempt.
EU	All components are in compliance with the EC Seventh amendment Directive 92 /32/EEC.
Japan	All components are in compliance with the Chemical Substances Control Law of Japan.
Australia	All components are in compliance with chemical notification requirements in Australia.
Canada	All components are in compliance with the Canadian Environmental Protection Act and are Canadian DSL/NDSL.
Switzerland	All components are in compliance with the Environmentally Hazardous Substances Ordinance in Switzerland.
China	All components of this product are listed on the Inventory of Existing Chemical Substances in China
Korea	All components are in compliance in Korea.
Philippines	All components are in compliance with the Philippines Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990 (R.A. 6969).
TSCA:	All ingredients in this product are listed or exempt from listing on the TSCA Chemical inventory.
CEPA:	All ingredients in this product are listed or exempt from listing on the Canadian DSL/NDSL.
Proposition 65:	This product contains no chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Material Name Bio-Ultimax 1000 Hydraulic Fluids ISO 46, Page 5 of 6
Issue Date: 15 May 2015

Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

SARA 311/312 Hazard Categories

Acute Health Hazard	No
Chronic Health Hazard	No
Fire Hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42).

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material.

State Regulations (RTK)

California Proposition 65

This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

This product does not contain any known chemical substance on the SARA Extremely Hazardous Substances list.

U.S. EPA Label Information

EPA Pesticide Registration Number Not applicable

SECTION 16 - OTHER INFORMATION

Read and follow all label directions and precautions before using the product.

NFPA:

Health: 0
Flammability: 1
Instability 0

HMIS health rating:

Health: 0
Flammability: 1
Physical hazards 0
The customer is responsible for determining the PPE code for this material.

Guide to Abbreviations:

ACGIH = American Conference of Governmental Industrial Hygienists; CARB = California Air Resource Board, CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

Revision:

Date	Revised Section
15 May 2015	new

The information presented herein has been compiled from sources considered to be dependable and is accurate to the best of Renewable Lubricants, Inc. knowledge; however, Renewable Lubricants, Inc. makes no warranty whatsoever, expressed or implied, of MERCHANTABILITY OF FITNESS FOR THE PARTICULAR PURPOSE, regarding the accuracy of such data or the results to be obtained from the use thereof. Renewable Lubricants Inc. assumes no responsibility for injury to recipient or to third persons or for any damage to any property and recipient assumes all such risks.

Material Name Bio-Ultimax 1000 Hydraulic Fluids ISO 46, Page 6 of 6
Issue Date: 15 May 2015