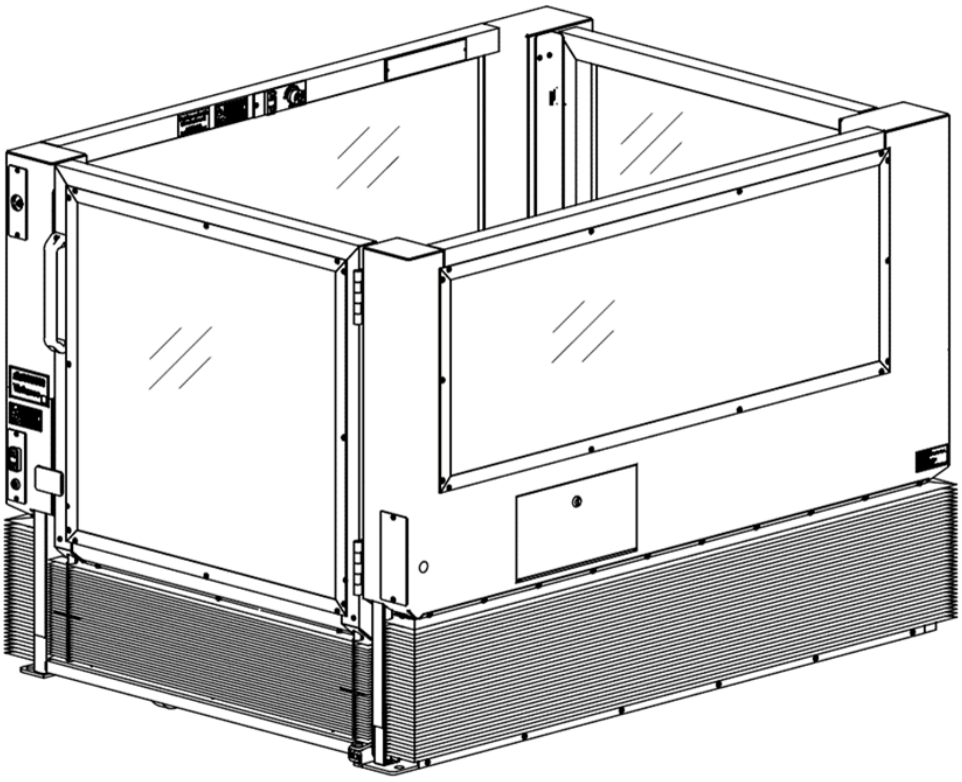
ASCENSION VIRTUOSO
WHEELCHAIR LIFT
5460F MODEL SERIES

PRODUCT MANUAL

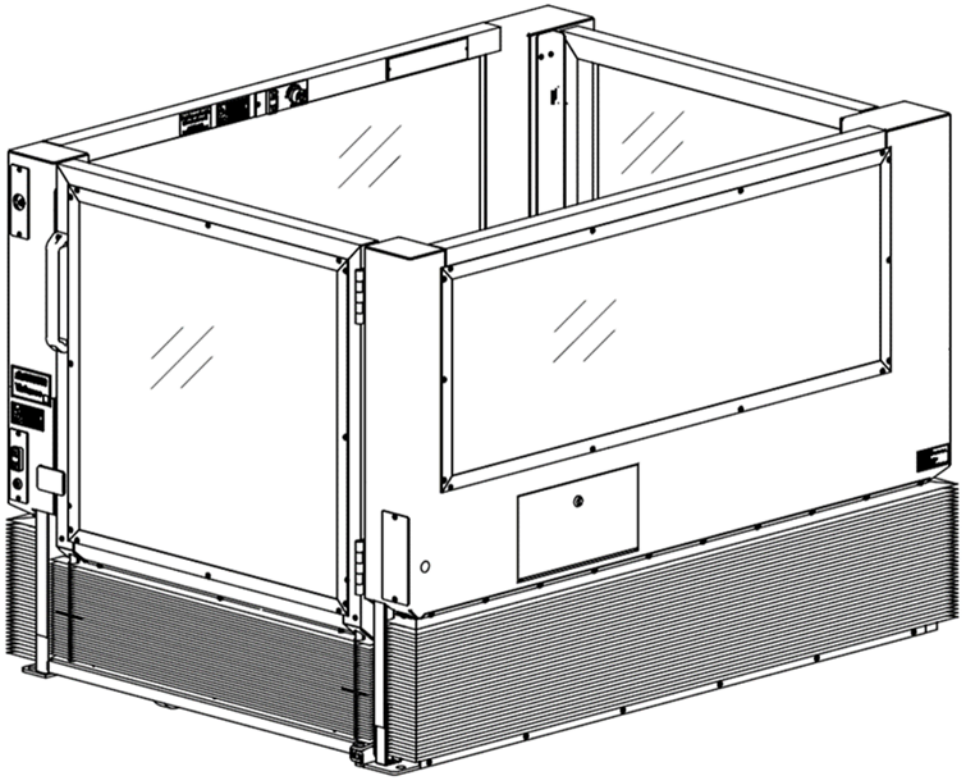


Patented – see www.ascension-lift.com/patents

ascension®

ASCENSION VIRTUOSO
WHEELCHAIR LIFT
5460F MODEL SERIES

PRODUCT MANUAL



ascension®

http://ascension-lift.com
1-800-459-0400

TABLE OF CONTENTS

INTRODUCTION

About this Manual

This manual is divided into six sections.

Section 1 contains reference information about the lift, including specifications and definitions of terms that are used throughout the rest of the manual.

Section 2 covers standard operation of the lift.

Section 3 describes routine maintenance to be performed on the lift.

Section 4 covers mechanical repair. This includes component replacement, as well as detailed procedures to disassemble, test, and reassemble major components.

Section 5 covers electrical testing.

Section 6 is a troubleshooting guide. It provides information for locating and correcting any problems with the lift.

Additional Information

Refer to the *Installation Guide* for instructions on installing the lift. Refer to the detailed electrical schematic that was included with the lift to perform additional electrical troubleshooting beyond what is covered in this manual.

Various helpful videos may be found on the Ascension website:
https://www.ascension-lift.com/lift-setup/

Getting Help

If you have a question or problem with the lift, please try to find the solution in this manual. In particular, be sure to review the troubleshooting guide in Section 4. If you are not able to resolve the problem, please contact Ascension as indicated below, making sure that you have the serial number of your lift ready. The serial number can be found on the data plate located inside the platform on the upper left rail. Also, it is recommended that you contact Ascension while in the immediate vicinity of your lift, as this will reduce the time required to properly diagnose the problem.

Contacting Ascension

Ascension's business hours are 8 a.m. to 5 p.m. Mountain Standard Time, Monday through Friday.

Telephone:	800-459-0400	Mailing Address:	Ascension
Fax:	520-881-4983		Customer Service
Email:	sales@ascension-lift.com		PO Box 40020
Website:	ascension-lift.com		Tucson, AZ 85717-0020

SECTION 1 General

1.1 Product Information

Operational

- VERTICAL TRAVEL DISTANCE: 12" to 60" [305 to 1525 mm]
- OCCUPANCY: 1 person
- MAXIMUM PASSENGER LOAD: 750 pounds [340 kg]
- AVERAGE SPEED: 7 feet per minute [35 mm/s]
- WORKING PRESSURE: 900 psi maximum

Physical

- INTERIOR DIMENSIONS: 36" wide x 43" high x 54" long
- WEIGHT: 1025 pounds [465 kg]
- MATERIALS: Platform, base frame, lifting device: Mild steel
  Windows: High impact strength clear thermoplastic
- FINISH: Platform and base: Oven baked powder coat
- ELECTRICAL: 120† VAC, 60 Hz, Single Phase, 13 Amps

† Electrical ratings may differ on lifts outside the USA. Check lift data plate for electrical ratings.

1.2 Terminology

To effectively use this manual, you need to be familiar with the following terms. Refer to the figure on the following page for identification of components. Not all components are shown in the figure.

Access Panels The four hinged panels that provide access to the machinery cabinets.

Back End The upper landing end of the lift.

Base The steel frame that rests on the floor and supports the operating mechanism.

Control Panel The electrical panel for the lift which contains the power supply, control system relay, and the main power relay. The control panel is located inside the left-hand machinery cabinet.

Front End The lower landing end of the lift.

Lower Platform Gate The gate that serves the lower landing (ground level).

Machinery Cabinets The enclosures in which the lifting and control mechanisms are located. There is one cabinet on each side of the lift. The contents of the machinery cabinets are accessible through the access panels.

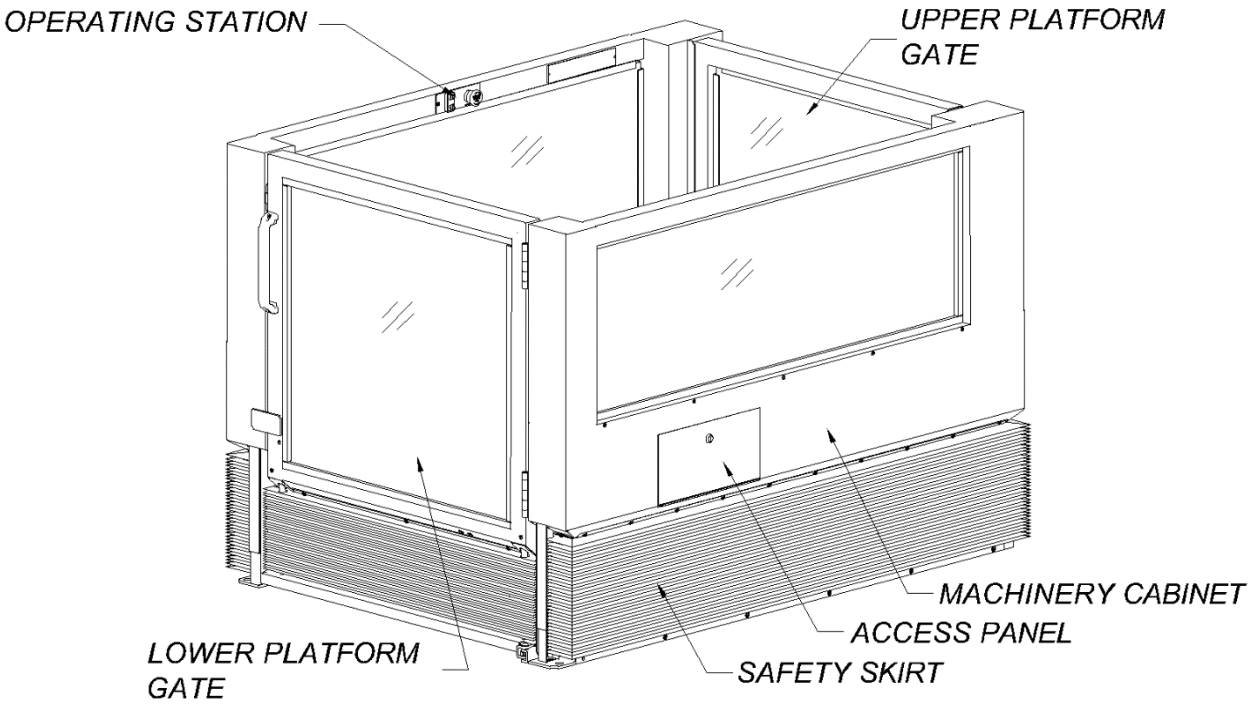
Operating Stations The controls for raising and lowering the platform. There are three total, each with an up/down rocker switch. The operating station inside the platform also has an emergency stop switch.

Platform / Lift Car The compartment in which the passenger rides.

Safety Skirt The accordion-style cover which completely encloses the underside of the platform.

Upper Landing The stage, platform, or riser that the lift serves.

Upper Platform Gate The gate that serves the upper landing, or stage. The lift may also have an upper landing gate mounted to the upper landing sill that opens in tandem with the upper platform gate.


OPERATING STATION
UPPER PLATFORM GATE
MACHINERY CABINET
ACCESS PANEL
SAFETY SKIRT
LOWER PLATFORM GATE

1.3 Description of System

Two hydraulic cylinders raise and lower the platform. When the "up" circuit is energized, an electric motor operates a hydraulic pump which provides pressurized hydraulic fluid to the cylinders, causing the cylinder rods to extend and raise the platform. When the "down" circuit is energized, a hydraulic valve is shifted so that the fluid flows in the opposite direction through the hydraulic circuit and the platform is lowered.

A gate at each end of the lift permits passengers to enter and leave the platform. The lower platform gate will open only when the platform is at the lower landing. The upper platform gate can be fully opened only when the platform is at the upper landing. Both gates are self-closing.

The height limit switch is located in the left-hand machinery cabinet. This switch halts the movement of the platform when it reaches the upper landing.

The motion of the platform is controlled by any of the three operating switches located either on the platform or remotely mounted. These are constant-pressure type switches, so that when a switch is released the platform stops. It takes approximately 45 seconds for the platform to move through its full range of 60 inches [1525 mm]. These switches are interlocked so that while one switch is activated, pressing another switch in the opposite direction will not cause the lift to stop; the original action will continue.

The electrical control panel is located inside the left-hand machinery cabinet. This panel includes the power supply, control system relay, and main power relay.

The unit is equipped with a hand pump that can be used to raise or lower the platform in an emergency, when power is not available. The hand pump is located in the right-hand machinery cabinet.

SECTION 2 Operation

2.1 Standard Operation

- Move the platform with any one of the three operating switches. The operating switches must be held with constant pressure until the platform stops at the upper or lower landing. Releasing a switch will immediately stop the platform.
- Both gates must be closed for the lift to operate.
- The lower platform gate can be opened only when the platform is at the lower landing. The gate interlock is automatic.
- The upper platform gate can be opened only when the platform is at the upper landing. The edge of the upper landing prevents the gate from opening otherwise.
- Push the emergency stop button located inside the platform to stop the platform and prevent all operation. Reset the button to restore operation.

2.2 Manual Operation

The hydraulic hand pump can be used to move the platform and/or unlock the lower platform gate when facility power is unavailable. It may be operated from either the inner or the outer access panel of the right-hand machinery cabinet. Note that it is normal for the platform to raise unevenly when using the hand pump and that the platform being out of level by a couple of inches will not damage the lift.

Hand Pump Instructions:

1. Locate the hand pump handle stored just inside the outer access panel on the right-hand machinery cabinet and remove it from its bracket.
2. Swivel the pump linkage outward and then insert the hand pump handle into it.

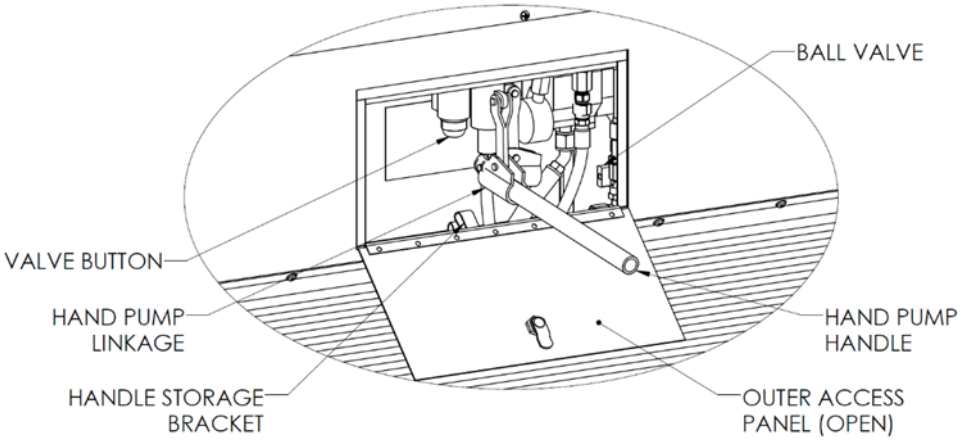


Figure 1

3. To move the platform upward, pump the handle.
4. To move the platform downward, pump the handle while depressing the black valve button located beside the hand pump.
5. To unlock the lower landing gate at the lower landing level, turn the ball valve (shut-off valve for main cylinders) handle 90 degrees and repeat step 4. Return valve to initial position to resume normal operation.

⚠WARNING!
Only use the handle provided with the pump. If this handle does not provide enough leverage to move the platform, stop and contact Ascension.

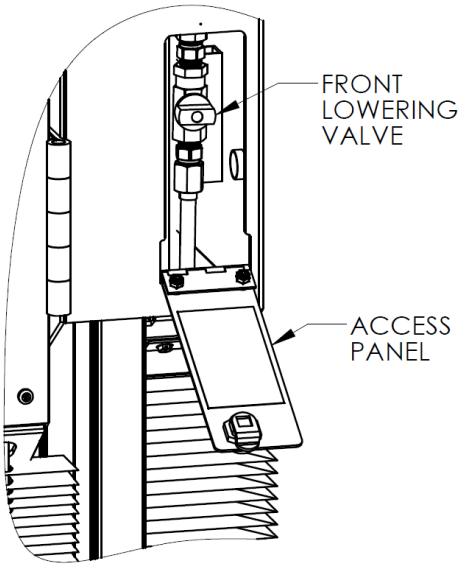
Alternatively, the front lowering valve can be used to manually lower the platform.

Front Lowering Valve Instructions:

1. Locate the front lowering valve located behind a small access panel at the front right corner of the lift.

> ***⚠WARNING!***
> ***Stay clear of the platform when it is moving to avoid any pinching and/or crushing hazards as manual operation bypasses all electrical safety switches.***

2. Turn the T-style handle from the “OFF” position (perpendicular to valve) to the “ON” position (parallel to valve) to begin lowering the platform. For a faster descent, open the valve fully. For a slower descent, open the valve part way.
3. Once the platform is fully lowered, return the handle to the “OFF” position.
4. To unlock the lower platform gate, use the hand pump.



SECTION 3 Routine Maintenance

The owning facility is responsible for the proper maintenance of the lift. The following checks must be performed every six months:

1. Verify the operation of the lift per Section 2.
2. Verify that the platform will not operate with either gate open.
3. Verify that the emergency stop switch halts the movement of the platform.
4. Verify that the lower platform gate interlock engages before the platform has moved more than 2" from the lower landing.
5. Verify that pushing inward on the safety skirt on the long sides of the lift halts the downward movement of the platform.
6. Verify that all of the screws securing the safety skirt to the platform frame are present and tight.
7. Inspect the safety skirt for any visible damage.
8. Verify that the hydraulic fluid in the reservoir (behind right-side access panels) is between the minimum and maximum levels when the platform is at the lower landing. If you need to add hydraulic fluid to the lift, use an ISO 32 grade hydraulic oil such as Texaco Rando HD32 or 76 Unax AW32 filtered to 10 microns for lifts installed indoors. For outdoor lifts use a low-temperature oil such as Amsoil AWF oil. In order to add fluid to the reservoir, first remove the machinery cabinet cover per Section 4.3.

SECTION 4 Mechanical Disassembly and Repair

4.1 Important Preliminary Information

The repairs in this section are to be performed by a skilled technician who has experience in working on electro-mechanical systems. Furthermore, the technician should be well-versed in standard industrial safety practices and procedures. In the United States of America, electrical safety procedures are established in OSHA's *Lockout/Tagout – Hazardous Energy Sources Standard* (29 CFR 1920.147).

Familiarity with the setup and operation of the lift is required to effectively perform the repairs listed in this section.

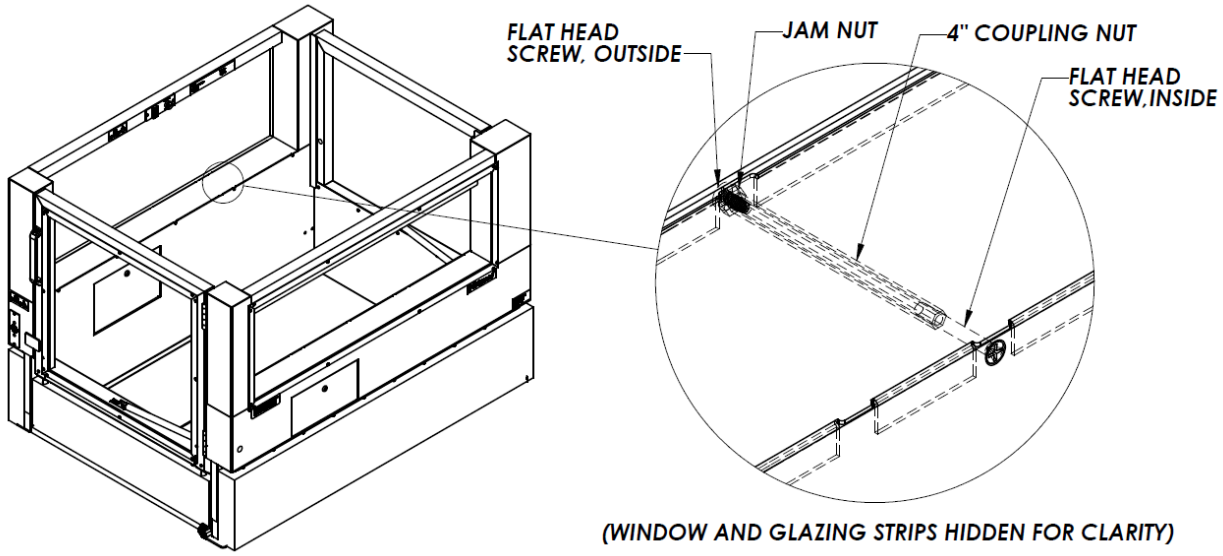
4.2 Electrically Isolating the Lift

To electrically isolate the lift, turn off the electrical disconnect feeding the lift. Secure it with a lockout hasp and/or padlock.

4.3 Opening the Machinery Cabinets from the Top

For some of the repairs described in this manual, it is necessary to gain access to a machinery cabinet from the top. The top of either machinery cabinet can be removed by performing the following steps:

1. Use a T25 Torx tamper-resistant driver to loosen or remove the five (5) flat head screws located just underneath the cabinet top on the inside of the platform. These screws thread into coupling nuts attached to the other side of the machinery cabinet, and function to compress the cabinet lid between the sides.
2. Use a flathead screwdriver, inserted above where each screw is located, to pry the panel up and/or open the interior access panel and push up on the cabinet lid to free the inside edge. Once the inside edge "pops" out, the lid can be removed by sliding it outward and upward.
3. For the purposes of servicing, the long coupling nuts may be unthreaded and removed. Removal of the jam nuts and outside screws is not recommended, as these cannot be reassembled without removing the lift's window from outside the lift.

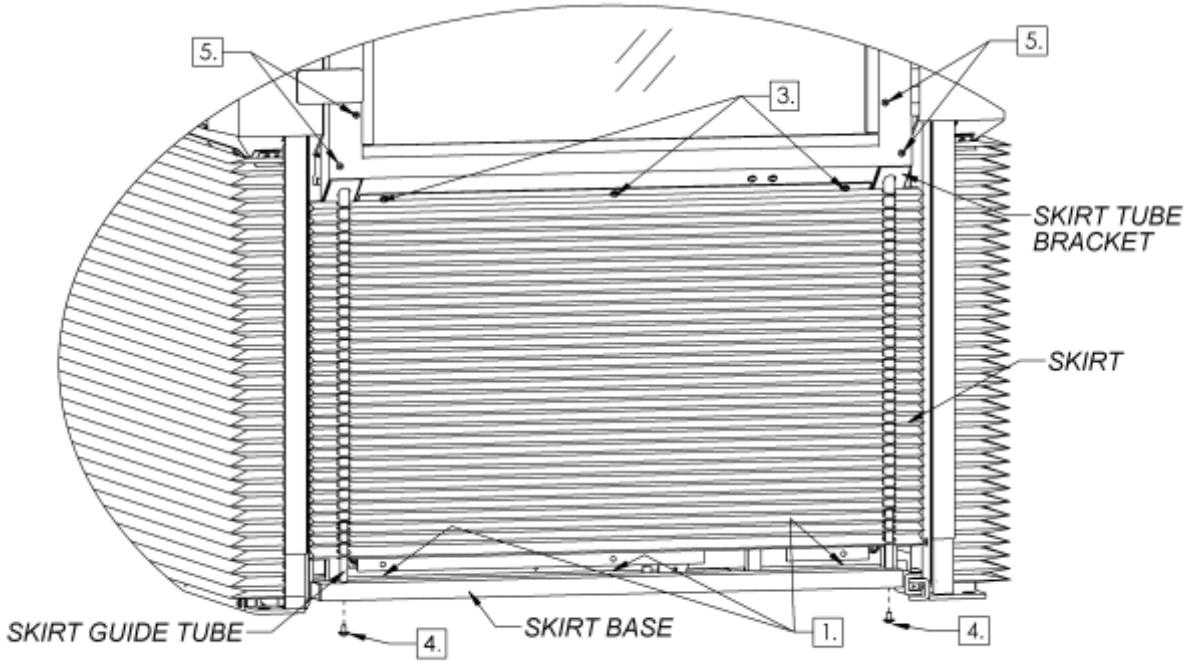


4. To reinstall the machinery cabinet top, perform the above steps in reverse order.

4.4 Retracting, Removing, and Reinstalling the Safety Skirt

The safety skirt consists of two parts: the platform skirt, which guards the platform on three sides; and the gate skirt, which guards the area under the lower platform gate. For some of the repairs described in this manual, it is necessary to gain access to components normally hidden behind the skirt. In most cases, only a small portion of the skirt may need to be retracted; however, sometimes it may be necessary to remove the whole skirt.

Gate Skirt: To remove the *gate skirt*, perform all of the following steps. If the skirt only needs to be retracted, performing only Step 3 will provide access to many of the components behind the skirt. Refer to the figure below for the location of the fasteners referenced in each step.



SKIRT SHOWN RETRACTED FROM THE SKIRT BASE

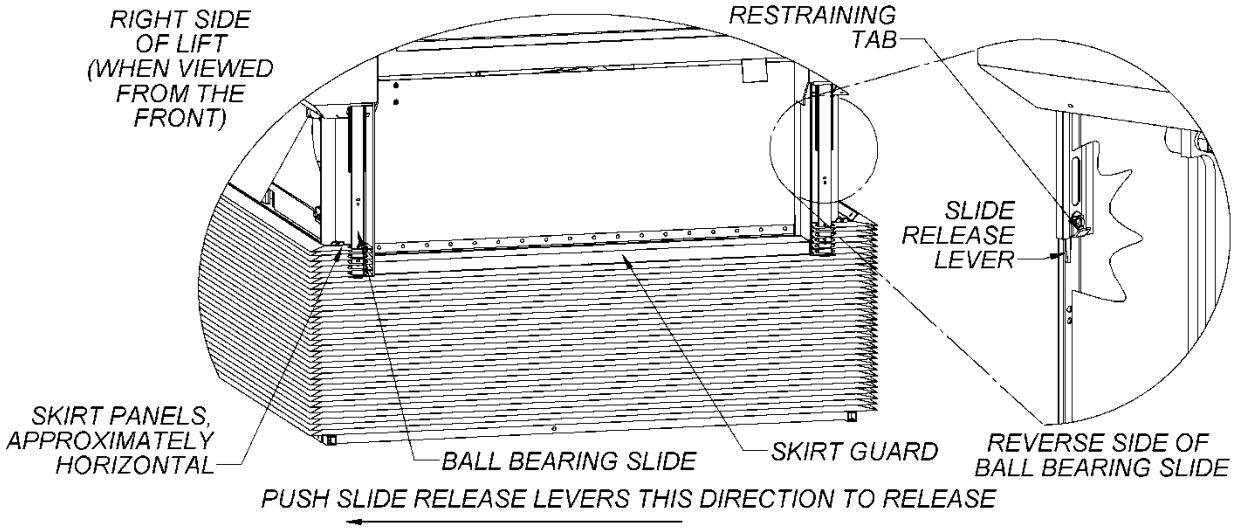
1. Use a 5/16" wrench to remove the three (3) hex head screws that secure the skirt to the skirt base. These screws are located on the top side of the skirt base.
2. Using any operating station, raise the platform until the platform floor is approximately 24" [610 mm] off the ground.

3. Use a T25 Torx tamper-resistant driver to remove the three (3) screws that secure the skirt to the lower platform gate.
4. Use a 5/32" hex key to remove the two (2) button head cap screws and washers that secure the skirt guide tubes to the skirt base. Hold the skirt guide tubes stationary with pliers if necessary while removing the screws.
5. Use a T25 Torx tamper-resistant driver to remove the four (4) screws (two (2) on each side) that secure the skirt guide tube brackets to the lower platform gate and pull the brackets downward, out of the gate. The skirt can now be removed from the gate.

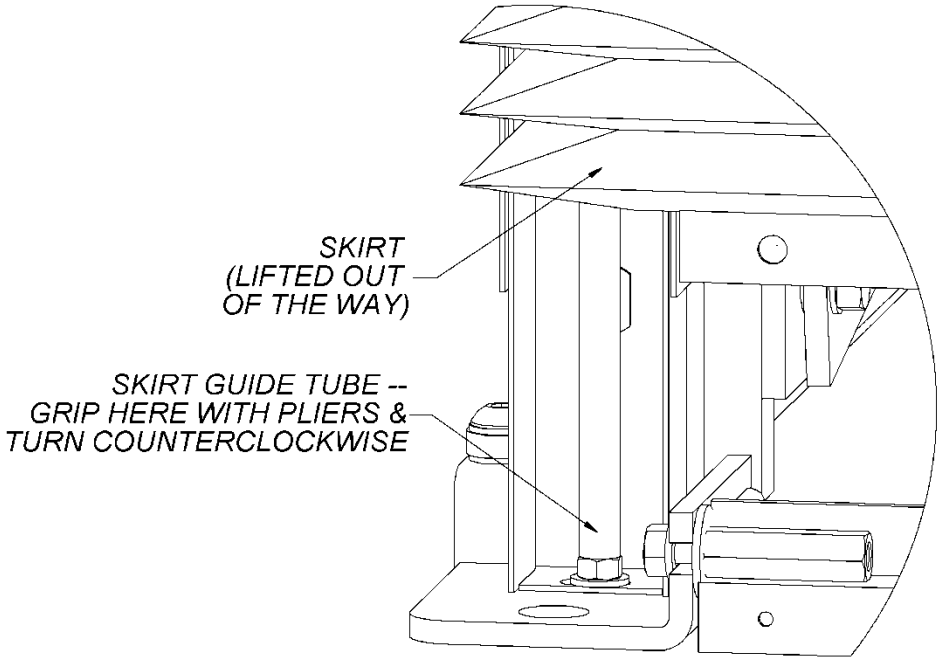
To reinstall the *gate skirt*, perform the above steps in reverse order.

Platform Skirt: To remove the *platform skirt*, perform the following steps. Also see Virtuoso Compression Video from the Ascension website which includes skirt removal. Performing steps 3 & 4 will provide access behind the skirt without fully removing it.

1. From inside the platform, remove the lower portion of the upper platform gate (secured to the gate with five (5) pan head screws) and the bridge plate (secured to the skirt guard with four (4) flat head screws).
2. With the platform about 15" [380 mm] off the ground, remove the (32) T25 Torx tamper-resistant head screws that secure the sides of the skirt to the platform at the top and to the lift base at the bottom.
3. Use a 5/16" combination wrench to remove the four (4) hex head screws that secure the top of the skirt to the platform, one (1) at each corner. Remove the small skirt support brackets that are freed when these screws are removed.
4. Remove the T25 Torx tamper-resistant head screw that secures the back of the skirt to the base.
5. Remove the (2) 5/16”-18 screws from the lift frame just above the ball bearing slides.
6. In the back, retract the skirt around the ball bearing slides as shown in the figure at the top of the following page. You will need to hold each skirt panel approximately horizontal to move it past the restraining tab.



7. Push the ball bearing slide release levers toward the right side of the lift and then pull downward on the skirt guard to separate it from the platform.
8. At the front of the skirt, use pliers or a similar tool to turn the skirt guide tubes counterclockwise until they release from the studs in the base. You will need to lift the corners of the skirt to gain access to the skirt guide tubes.



FRONT RIGHT CORNER OF THE LIFT SHOWN

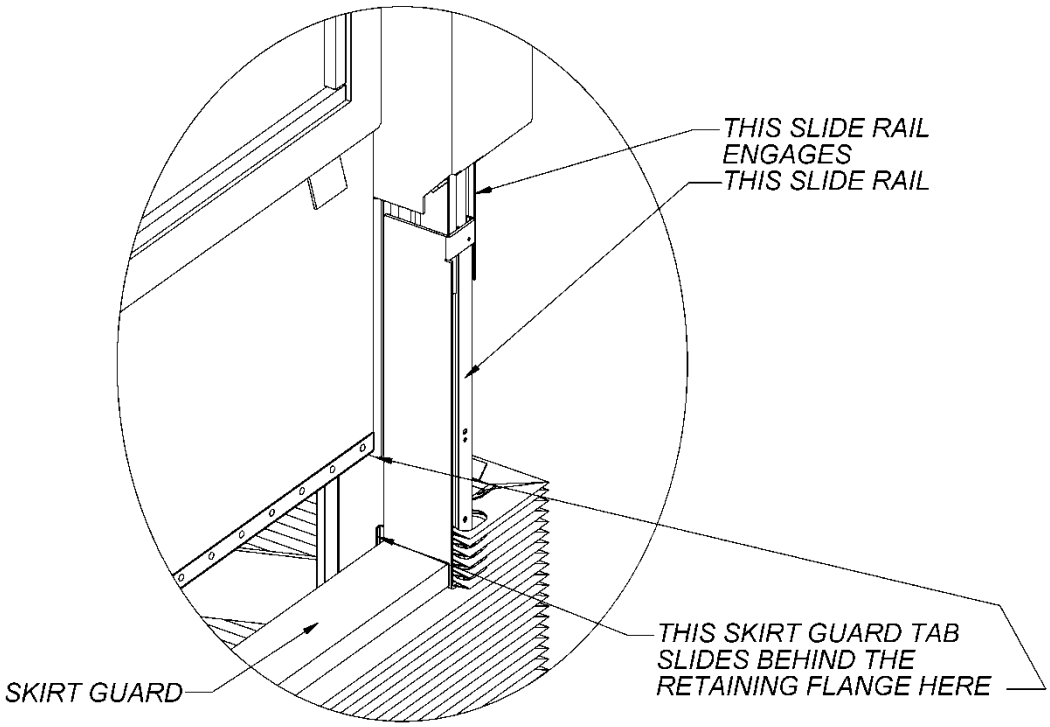
9. Retract the skirt guide tubes through the slots in the skirt. The skirt is now free of the lift. Use extreme care to support the skirt in its natural position as much as

possible while moving it. A minimum of two (2) people is recommended for moving the skirt.

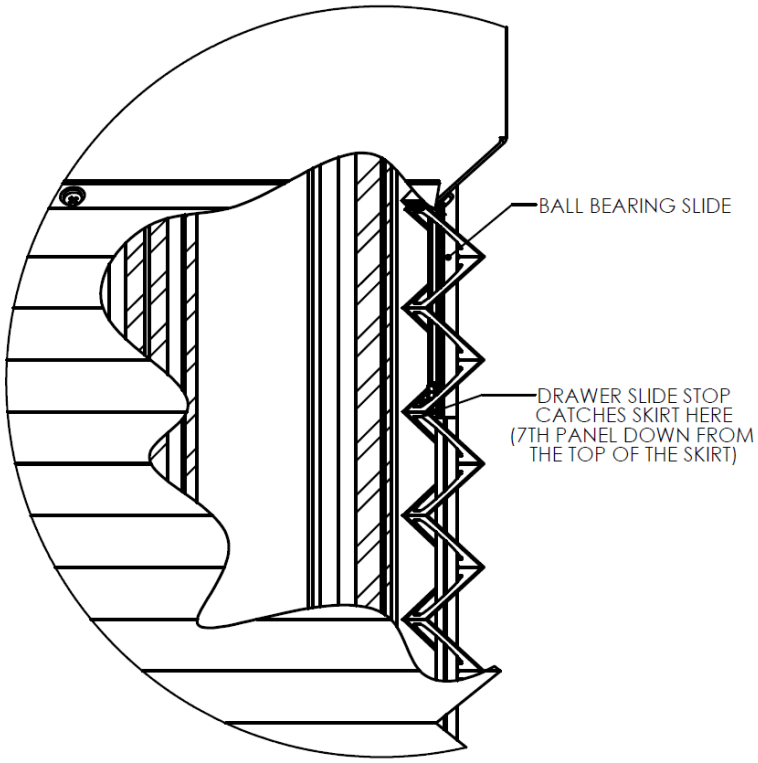
To reinstall the *platform skirt*, perform the following steps. Also see Virtuoso Compression Video from the Ascension website which includes skirt reinstallation. If necessary, refer to the figures in the skirt removal instructions above for identification of skirt components.

> **⚠ *CAUTION!***
> ***In the following step, stay clear of the platform when it is moving to avoid any pinching and/or crushing hazards.***

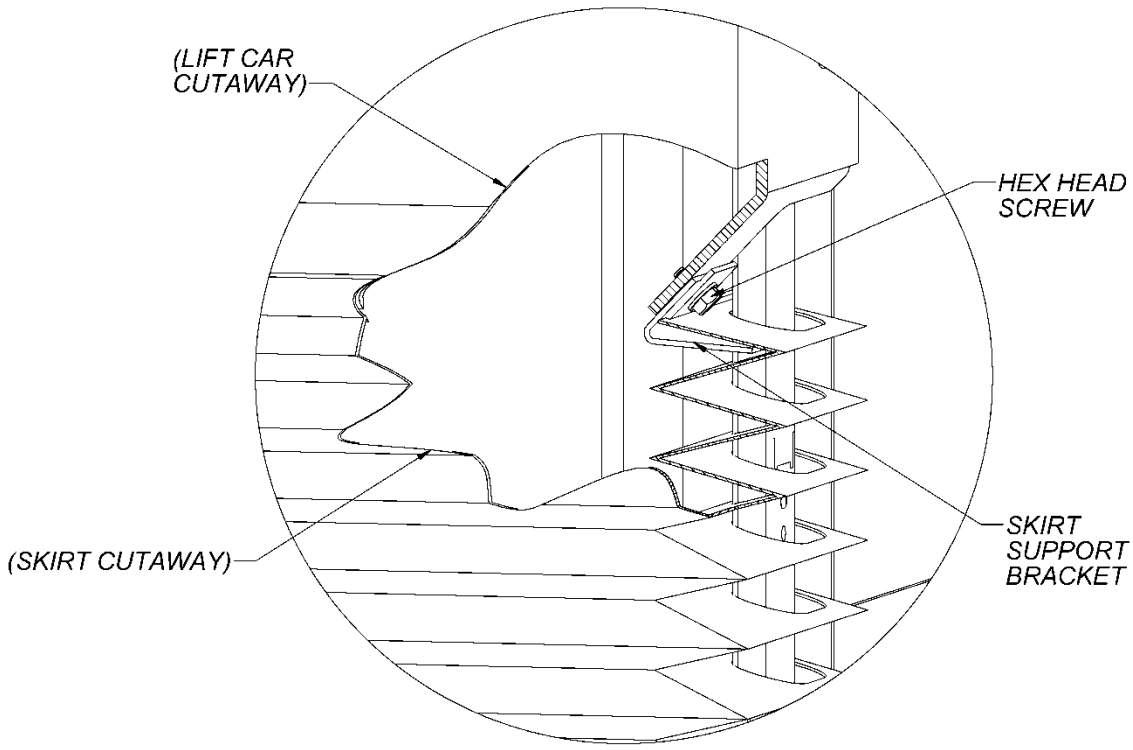
1. With the platform about 15" [380 mm] off the ground, move the skirt into position around the platform, roughly where it will be located when installed on the lift. Use extreme care to support the skirt in its natural position as much as possible while moving it. A minimum of two (2) people is recommended for moving the skirt.
2. At both front corners of the platform, lift the skirt guide tubes upward, move the skirt into place, and insert the guide tubes through the slots in the skirt. Then turn the guide tubes clockwise onto the base studs, using pliers to tighten them.
3. In the back, reinstall the skirt guard onto the lift by performing the following steps. Refer to the figure at the top of the following page as necessary.
   a. Position the skirt guard underneath the ball bearing slide rails at the back of the lift, aligning the skirt guard slide rails with the platform slide rails.
   b. Move the skirt guard upward, while making sure that the skirt guard tabs slide behind the retaining flanges on the platform, and that the slide rails on the skirt guard lock into the slide rails on the platform.
   c. You will feel and hear a "click" when the ball bearing slide rails engage each other, and the skirt guard will be held in place. If the skirt guard was installed correctly, the guard cannot be pulled away from the lift. If this is not the case, use the release levers to release the skirt guard and then reinstall it, taking care to slide the skirt guard tabs behind the retaining flanges on the platform.
   d. Reinstall the 5/16”-18 screws into the holes in the lift frame just above where the ball bearing slides enter the frame.



4. Lift the skirt upward on both sides of the skirt guard until the skirt slips past the restraining tabs on the ball bearing slides as shown in the figure below. The restraining tab must catch the skirt on the 7th panel down from the top of the skirt.



5. Reinstall two (2) or three (3) T25 Torx tamper-resistant head screws on each side of the platform to secure the top of the skirt loosely to the platform.
6. Use a 5/16" combination wrench to reinstall the four (4) hex head screws that secure the top of the skirt to the platform, one (1) at each corner. Be sure to install the skirt support brackets between the skirt and the platform frame. See the figure below.

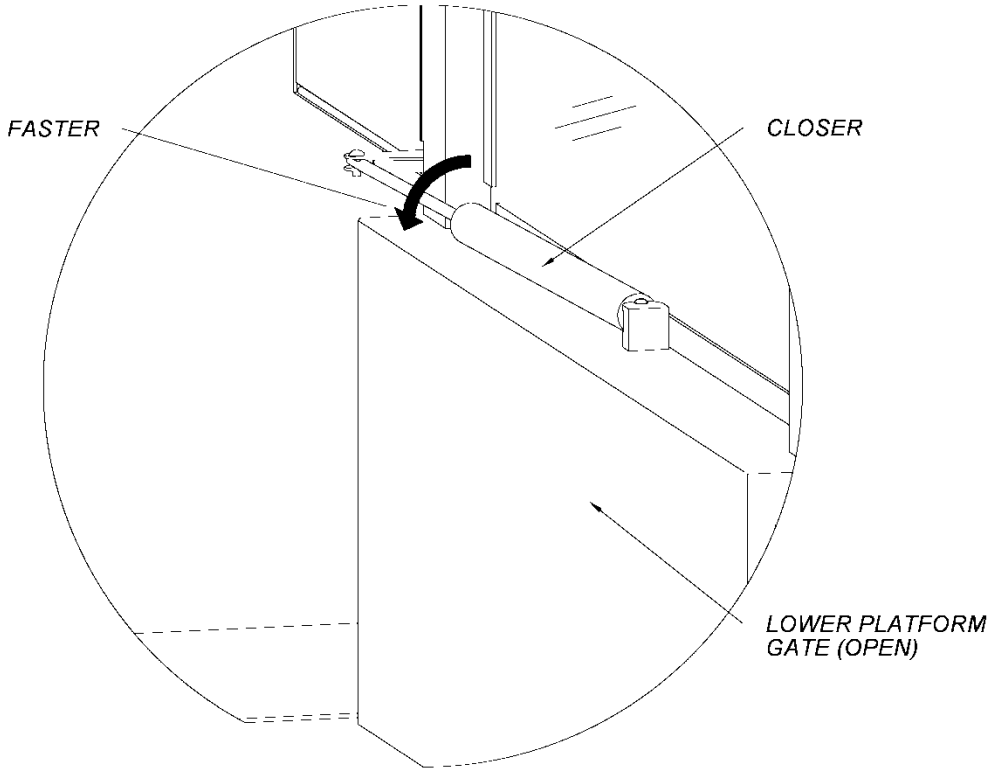


RIGHT REAR CORNER OF LIFT SHOWN

7. Reinstall the remainder of the (32) T25 Torx tamper-resistant head screws that secure the sides of the skirt to the platform at the top and to the lift base at the bottom.
8. Reinstall the T25 Torx tamper-resistant head screw that secures the back of the skirt to the base.
9. Reinstall the bridge plate and the lower portion of the upper platform gate.

4.5 Platform Gate Closers

To make a platform gate close faster, turn the gate closer counterclockwise, 1/2 rotation at a time. To make a platform gate close slower, turn the gate closer clockwise, 1/2 rotation at a time. See the figure below.



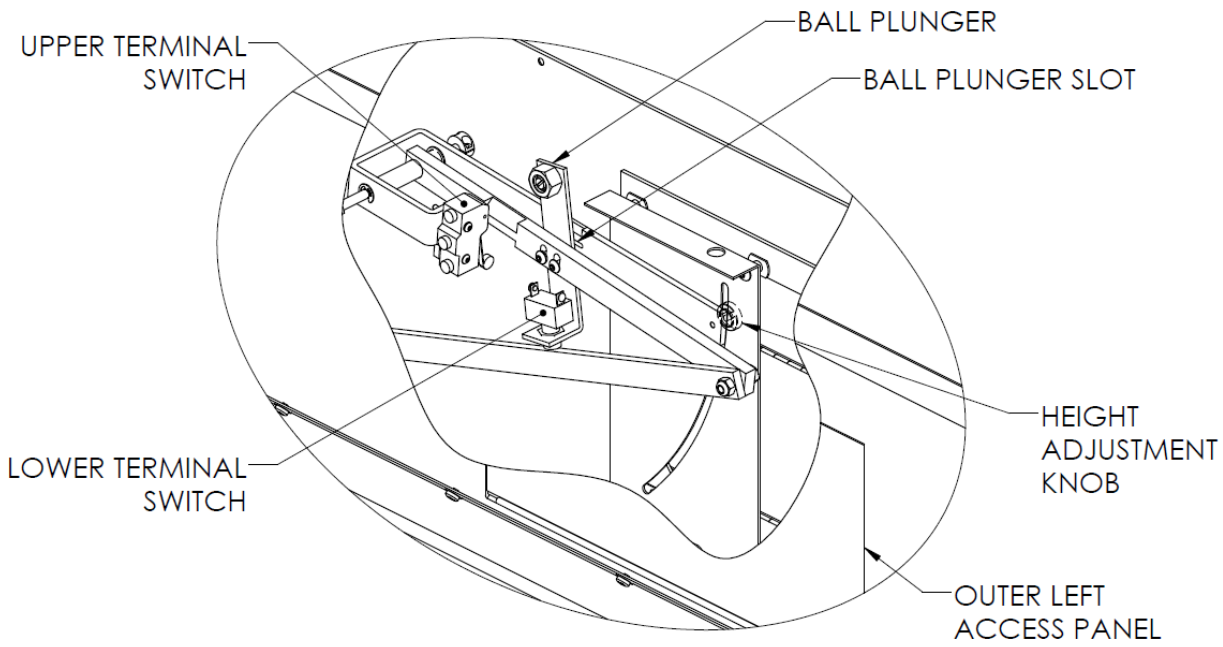
4.6 Upper and Lower Terminal Switches

The upper stop mechanism serves a few different functions, but gets its name since its main purpose is to stop the platform at the upper landing. The upper stop mechanism is located in the left-hand machinery cabinet and contains the upper terminal switch, the ball plunger, and the lower terminal switch. For instructions on adjusting the platform stop height, see the *Installation Guide*.

Upper Terminal Switch: The normally closed (NC) contacts are used on this switch. Whenever the switch is actuated (contacts opened), the lift will not run up. The roller arm on the switch is actuated by the actuator ramp on the adjacent linkage. The assembly is factory-set such that the upper terminal switch actuates at the same time as when the ball plunger “clicks” into the ball plunger slot (see next section). To finely adjust the actuation point of the switch, use a 1/16” hex key to adjust the set screw at the roller arm base.

Ball Plunger: The ball plunger’s only purpose is to “click” into the ball plunger slot right as upper terminal switch actuates in order to simplify positioning the upper terminal switch and setting the platform stop height. After the stop height is set, it has no bearing on operation. When the two are perfectly synched, the height that the platform automatically stops at during normal use will exactly match the platform height from when the stop height was set via the height adjustment knob and ball plunger. When not synced, the platform will stop above or below the intended stop location set per the setup procedure. The ball plunger force (the strength of the “click”) may be adjusted by screwing the threaded plunger assembly in or out and locking it in place with the nut. The ball plunger position (relative to the actuation point of the upper terminal switch) may be adjusted by adjusting the position of the bracket it is mounted to. However, please note that adjusting this bracket simultaneously adjusts the position of both the ball plunger and the lower terminal switch (see next section).

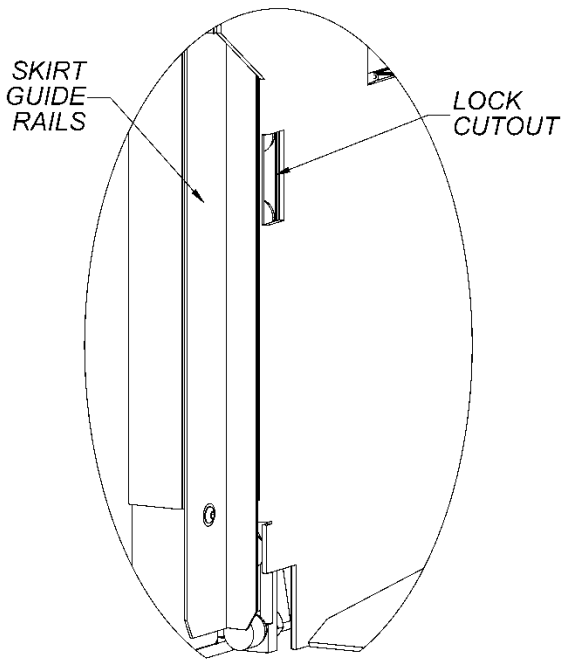
Lower Terminal Switch: When this normally open (NO) switch is actuated, it allows the motor to fully engage/disengage the lower platform gate lock, functioning as a bypass to the locking rod switch (Section 4.9). Accordingly, the lower terminal switch is factory-set to be actuated when the platform is within 2" of the lower landing. As the platform cannot go any lower than floor level, this switch does not stop the motor at the lower landing and instead runs it for few seconds in order to unlock the lower gate and relevel the platform. This switch is actuated by the adjacent linkage (see image below). The switch position may be adjusted relative to its mounting bracket. The mounting bracket position may be adjusted as well, though bracket adjustments will simultaneously adjust both the ball plunger and the lower terminal switch positions. To check the switch setting, open the lower platform gate and, while manually actuating the lower platform gate switch (Section 4.7), run the lift up and ensure that it stops automatically within 2".



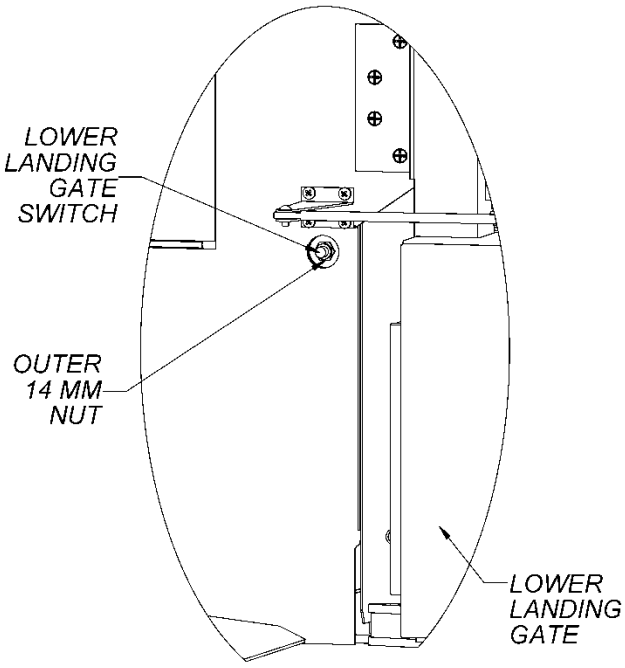
(MECHANISM SHOWN WITH PLATFORM AT LOWER LANDING)
(WIRING HARNESSES NOT SHOWN)

4.7 Lower Platform Gate Switch

The lower platform gate switch senses whether the lower platform gate is open or closed. The switch is located on the platform at the hinge side of the gate, about 12" [305 mm] from the floor. Refer to the right-hand figure below. The switch has wires connected to its normally open (NO) and common (COM) terminals.



FRONT LEFT CORNER, LOWER LANDING GATE OPEN



FRONT RIGHT CORNER, LOWER LANDING GATE OPEN

The gate switch is in correct adjustment if the lift will operate only when the gate is closed. The gate is considered to be closed if the upper locking rod in the gate engages in the lock cutout as the platform moves off the ground. See the left-hand figure above for the location of the lock cutout.

If the platform can be raised off the ground with the gate open far enough for the locking rod to fall outside of the lock cutout, then the switch probably needs to be recessed further into the platform wall. (In this case, the platform will not go higher than 2" [50 mm] off the ground.) If the platform stops just after it begins to rise off the ground, then the switch may need to be extended further out of the platform wall.

You will need to access the back of the switch in order to adjust, test, or replace it. To do so, retract the upper front corner of the platform skirt away from the platform. If necessary, see Section 4.4 for instructions on retracting the skirt.

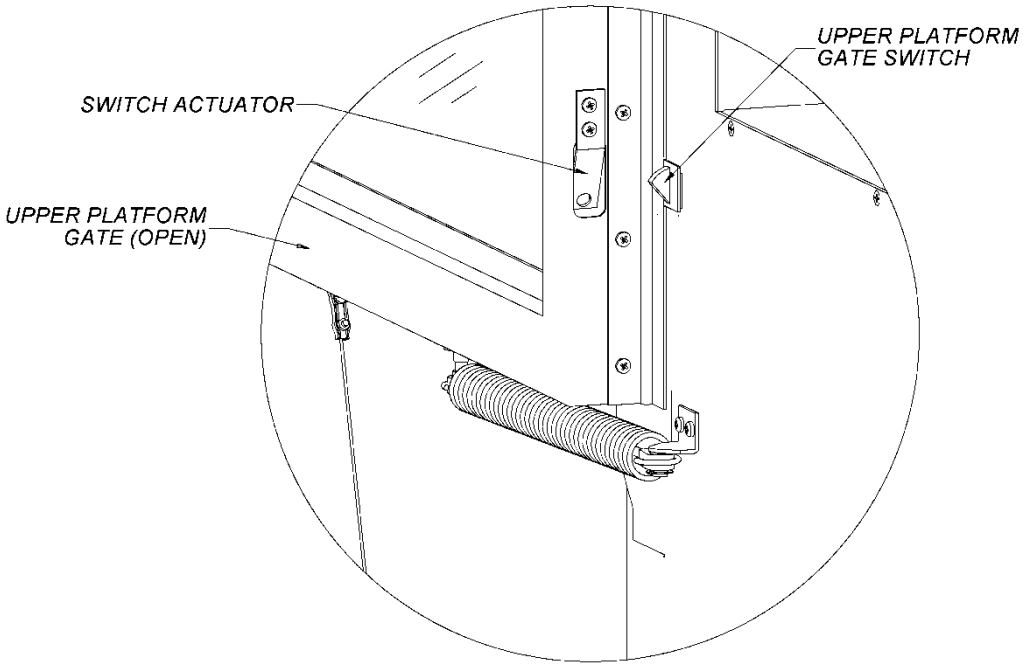
The switch is held in place by two (2) 14 mm nuts. To adjust the switch (i.e., to extend it or recess it), use a 14 mm wrench or socket to loosen the outer nut, move the inner nut as necessary, and then retighten the outer nut. To remove the switch, use a 14 mm wrench or socket to remove the outer nut and then pull the switch out of its mounting hole.

4.8 Upper Platform Gate Switches

The upper platform gate switches sense whether the upper platform gate is open or closed. The first switch is a refrigerator-style switch located on the hinge-side of the gate. The second switch is a magnetic switch located in the stop plate on the strike-side of the gate. Both switches are of the normally open (NO) type.

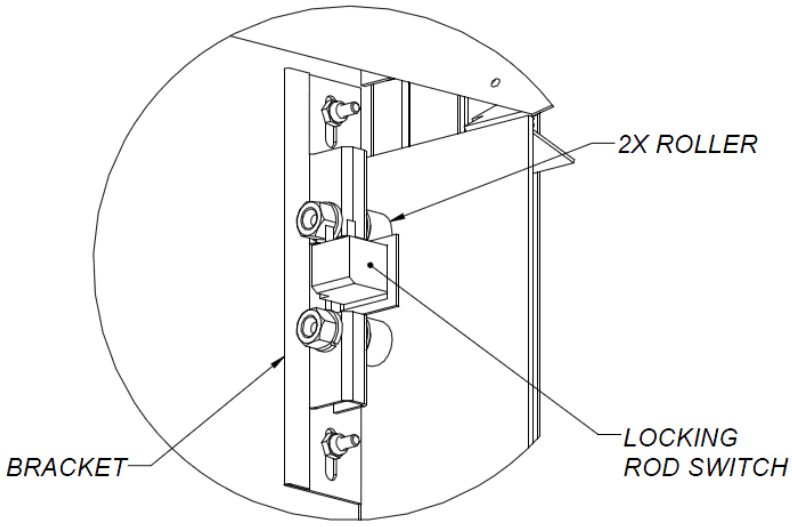
The lift should not be able to operate unless the upper platform gate is closed (the handle does not protrude beyond the back edge of the lift). The switches are not adjustable, but the actuator for the refrigerator-style switch may be adjusted. To adjust the switch actuator, insert a screwdriver or similar tool into the hole in the actuator and then carefully bend it in or out.

To remove the refrigerator-style switch, remove the right-hand machinery cabinet cover (see Section 4.3). With the platform at least 24" [610 mm] off the ground, depress the tab on the far side of the switch body and push the switch out of its mounting hole from inside the platform wall.



4.9 Locking Rods and Locking Rod Switch

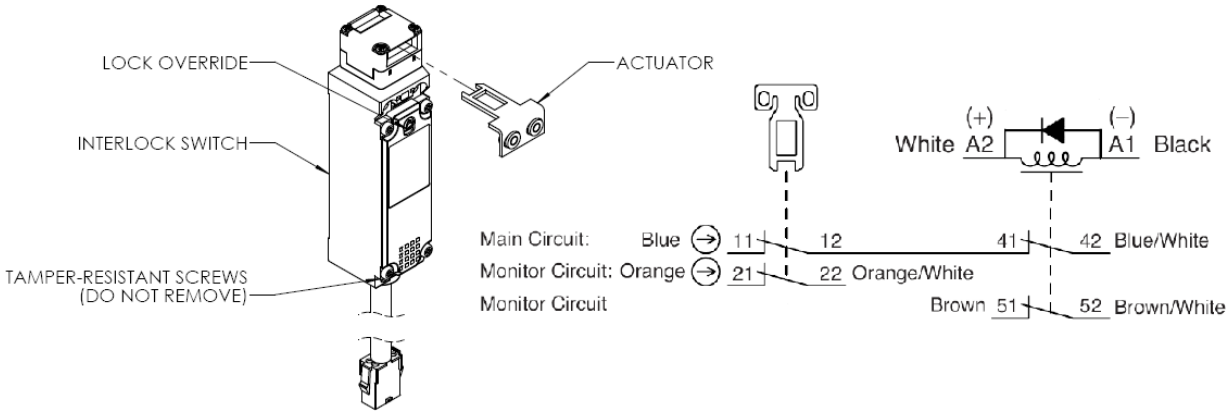
The two hydraulically driven locking rods (interlock) extend from the lower platform gate into the platform sides to physically lock the gate during travel. The locking rod switch senses if the top locking rod has successfully engaged and locked the gate. Before the platform has moved 2" [50 mm] off the ground, the platform will stop if the locking rod has not successfully engaged (see Lower Terminal Switch from Section 4.6). The switch is located in the front strike-side corner of the platform, behind the skirt (see Section 4.4 for detailed instructions on retracting the skirt). The switch is of the normally open (NO) type.



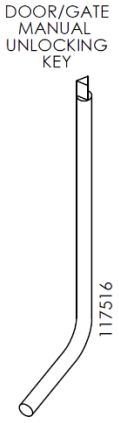
The locking rods are hydraulically driven, so either the motor or the hand pump must be used to move them. The lift is plumbed such that the locking rods must extend before the platform can begin to raise and will only retract after the platform has reached the ground. Accordingly, the motor will run for a few seconds after reaching the lower landing to retract the locking rods. To manually unlock the lower platform gate after reaching the lower landing, use the hand pump to pump down. It is recommended to first turn off the main shut-off valve (section 4.15) as this will make the process easier. Turning off the main shut-off valve also allows the hand pump to be used to retract the locking rods even when the platform is raised. *Electrically isolate the lift (section 4.2) before placing any body parts under the platform floor.*

4.10 Upper Landing Gate Interlock

For lifts equipped with the optional upper landing gate (5460FG models), the upper landing gate is equipped with a safety interlock switch that mechanically latches the gate whenever the platform leaves the landing and electrically monitors whether the gate is open, shut and unlocked, or locked shut. The switch actuator mounts onto a plate on the swing side of the gate. When the gate closes, the actuator is inserted into the head of the switch mounted in the gate post. If an operating switch is pressed while the actuator is inserted, the switch releases the locking pin to latch the gate. It remains locked until the platform returns to that landing. When the gate is open, the solenoid releases the lock pin so that it may immediately spring into its locking position when the actuator is re-inserted. When the gate closes, it stays locked for a half second to prevent it from bouncing open.



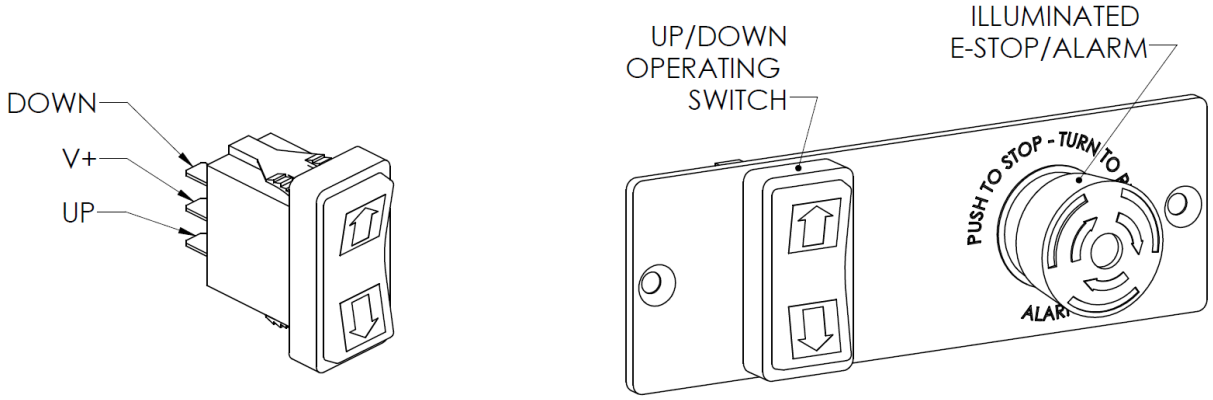
Some maintenance and repairs require manually unlocking the upper landing gate. While mechanically overridden, the interlock cannot lock and the lift will not operate until the override is returned to the default position. To mechanically override the interlock, insert the manual unlocking key (or a 2.5mm hex key) into the hole below the lock actuator entry and fit it into the triangular recess in the interlock switch. Gently turn the key a 1/4 turn counterclockwise to override. Gently turn back a 1/4 turn clockwise to return the interlock to the default position.



4.11 Operating Station

Operating stations are the controls for raising and lowering the platform. There is an operating station for the lower landing, the platform, and the upper landing. The operating station inside the platform has an emergency stop switch. The emergency stop switch immediately stops the lift until it is manually reset.

To gain access to any of the up/down operating switches or the emergency stop switch, remove the screws fastening the mounting plate.



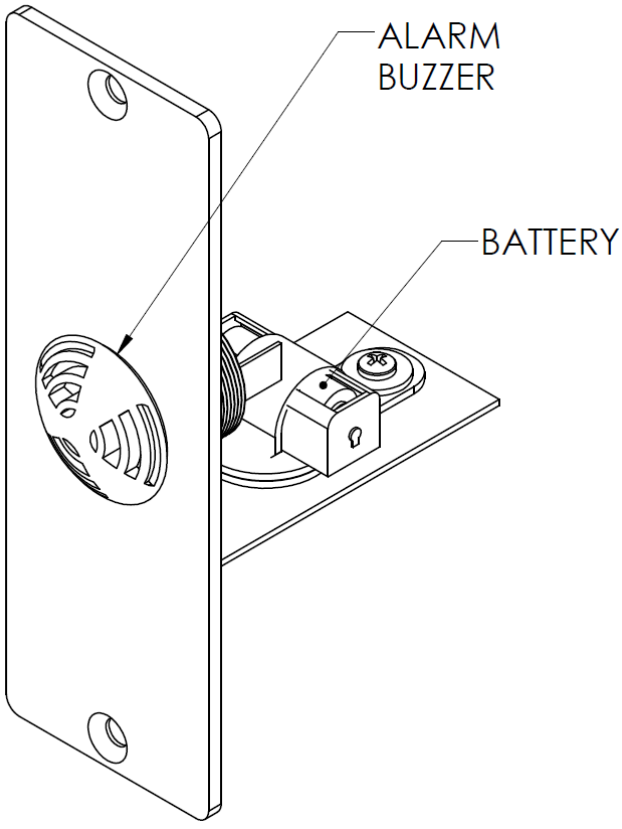
4.12 ON/OFF Switch

The ON/OFF switch is used to enable/disable the lift. When “OFF”, this switch will cut all power to the lift control system, preventing the lift from operating. This switch is located on the outer electrical panel (see Section 5.1) behind the access panels in the left-hand machinery cabinet.

4.13 Alarm

The lift is equipped with a battery-powered audible alarm that sounds when the emergency stop button is pressed. To test, press the emergency stop button. Reset the emergency stop button to turn off the alarm.

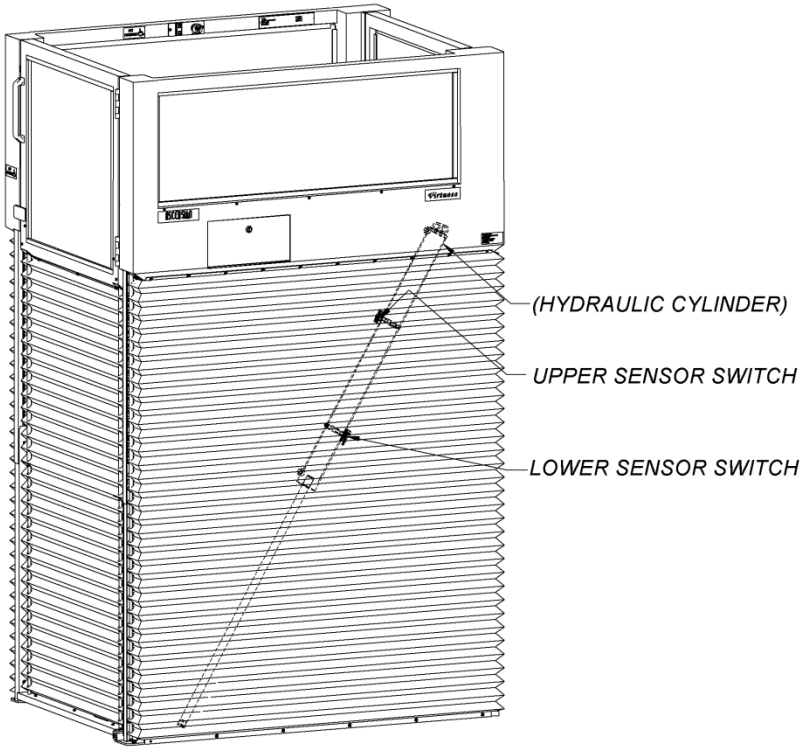
If the alarm does not sound when the emergency stop button is pressed, the alarm battery may need to be replaced. The battery is located just behind the alarm buzzer, which is mounted at the top left corner of the lower landing end of the lift. Remove the alarm assembly from the front of the lift to access the battery for replacement. Replace battery with style MN21, 23A/KE23A-1, or A23.



4.14 Skirt Sensor System

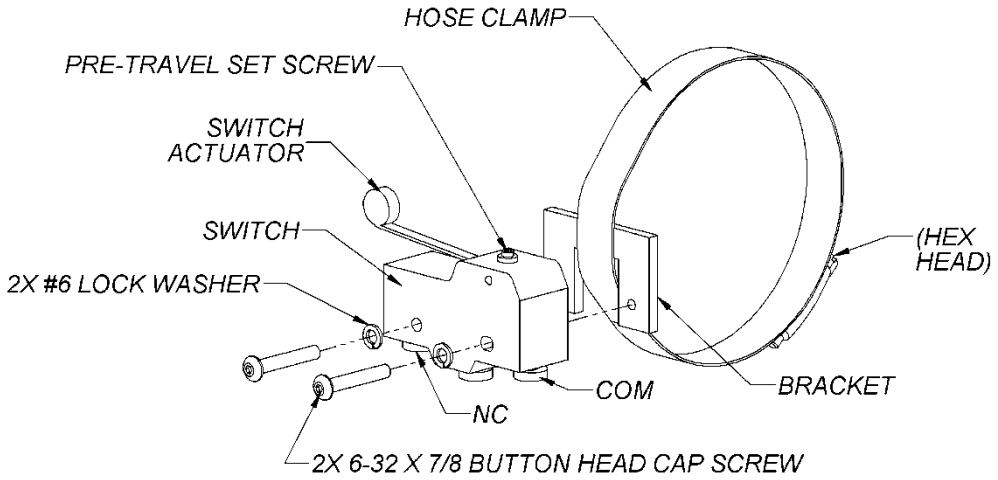
The skirt sensor system halts the motion of the platform when an object or person pushes the safety skirt on the long sides of the lift inward more than 3" [76 mm]. One sensor assembly is located on each of the two hydraulic cylinders and consists of two extension springs that run the length of the hydraulic cylinder and two sensor switches that are actuated by the movement of the springs.

- See the figure below for the locations of the sensor switches. To gain access to the sensor switches, you can:
    - Retract the safety skirt as described in Section 4.4.
    - Move the platform away from the lower landing with the lower platform gate open (while overriding the locking rod switch and lower platform gate switch) until the sensor switches can be accessed from underneath the platform floor. *Electrically isolate the lift (section 4.2) before placing any body parts under the platform floor.*
    - Open a machinery cabinet from the top as described in Section 4.3.

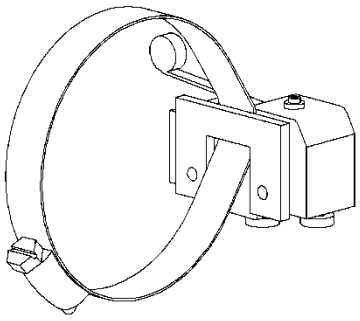


SENSOR SWITCH LOCATIONS, RIGHT SIDE

- To shift the position of a sensor switch, loosen the hose clamp that holds it in place, shift the clamp, and then retighten it.
- To remove a switch:
    - Mark the location of the hose clamp on the hydraulic cylinder so it can be put back in the same place.
    - Remove the wires from the switch terminals.
    - Remove the hose clamp and pull the assembly free from the hydraulic cylinder.
    - Remove the two (2) 6-32 x 7/8 button head cap screws that secure the switch to the bracket and hose clamp.
- To install a switch:
    - Refer to the figure on the following page for the orientation of the switch and bracket to the hose clamp. Note that the assemblies on the right and left side are mirror images of each other.
    - Be careful not to over tighten the two (2) 6-32 x 7/8 button head cap screws that secure the switch to the bracket and hose clamp, as this could crack the switch case.
    - The pre-travel on the switch should be minimized such that the switch audibly "clicks" (its contacts close) just as the switch actuator is starting to be depressed. If necessary, adjust the pre-travel on the switch actuator by turning the small set screw at the base of the actuator with a 1/16" hex key.
    - When the switch assembly is installed correctly on the hydraulic cylinder, it will halt the movement of the platform when the skirt is pushed inward more than 3" [76 mm]. This generally requires that the switch actuator be positioned about .060-.090" [1.5-2.25 mm] from the extension spring that actuates it.
    - The hex head on the hose clamp should be oriented such that it does not impede the movement of either extension spring and does not contact the sidewall of the platform as the platform descends.
    - The wiring harness should be connected to the normally closed (NC) and common (COM) terminals of the switch.



RIGHT SIDE SWITCH ASSEMBLY



LEFT SIDE SWITCH ASSEMBLY

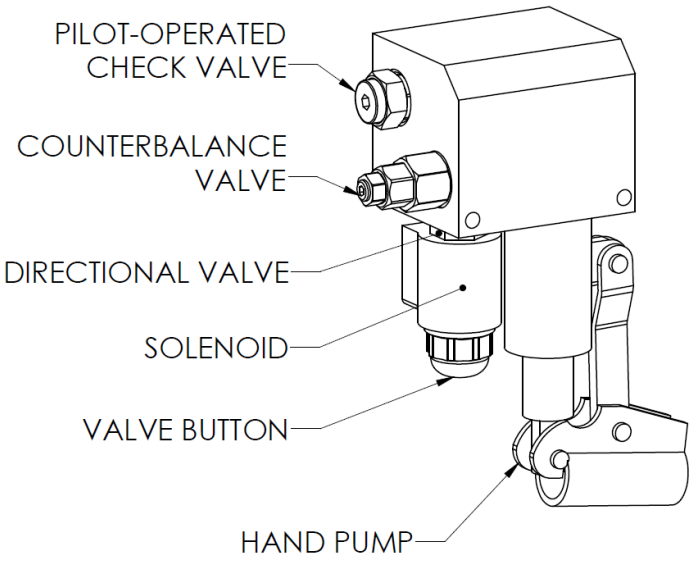
4.15 Hydraulic Valves

The various hydraulic valves are located inside the right-hand machinery cabinet behind the access panels. For additional access, the top of the machinery cabinet may be removed (see Section 4.3).

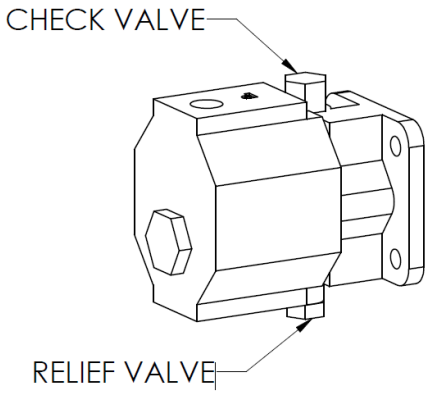
Refer to the following instructions for adjusting or removing any of the hydraulic valves. It is recommended to place paper towels below the component to be removed to catch the several ounces of hydraulic fluid that will drip as the component is removed. Refer to the following figures for component identification.

> ***⚠ WARNING!***
> ***The platform MUST be either at the lower landing or secured in place before the COUNTERBALANCE VALVE or PILOT-OPERATED CHECK VALVE is loosened or removed. Failure to do so could result in the platform dropping and/or high-pressure hydraulic oil leaks.***

HYDRAULIC MANIFOLD ASSEMBLY



HYDRAULIC PUMP



Pilot-Operated Check Valve: This valve keeps the lift base raised when the lift is on its casters (during installation). This valve cannot be adjusted. Use a 7/8" wrench to remove the valve from the manifold. When reinstalling the valve, torque it to 25-30 ft-lbs [19-22 N*m].

Counterbalance Valve: This valve keeps the platform raised when the motor is not running. If the platform "bounces" as it descends while fully loaded, then the adjustment screw on this valve may need to be tightened clockwise a 1/4 turn at a time until the “bouncing” has been eliminated. To remove this valve, use a 7/8" wrench. When reinstalling the valve, torque it to 18.5-22.0 ft-lbs [13.6-16.2 N*m].

Directional Valve: This valve directs the hydraulic fluid flow to run the lift up or down. This valve is normally operated by the solenoid, but can be manually overridden with the valve button. The default (un-powered/un-overridden) position is for flow that causes the platform to go up. This valve cannot be adjusted. If necessary, this valve can be removed with the platform raised. However, retighten immediately should the platform start to descend during removal, which indicates a faulty counterbalance valve. To remove the valve, first disconnect the solenoid wires, then turn the black button clockwise to remove it and the solenoid. Use a 7/8" wrench to remove the valve from the manifold. When reinstalling the valve, torque it to 18.5-22.0 ft-lbs [13.6-16.2 N*m].

Hand Pump: The hand pump cannot be adjusted. The hand pump can be removed while the platform is not at the lower landing provided that the counterbalance valve is working correctly. However, if the platform starts to descend while you are turning the pump out of the manifold, immediately tighten it back into the manifold; the counterbalance valve is malfunctioning and must be replaced (with the platform at the lower landing). Use a 1-1/4" wrench to remove the hand pump from the manifold. When reinstalling the hand pump, torque it to 25-30 ft-lbs [19-22 N*m].

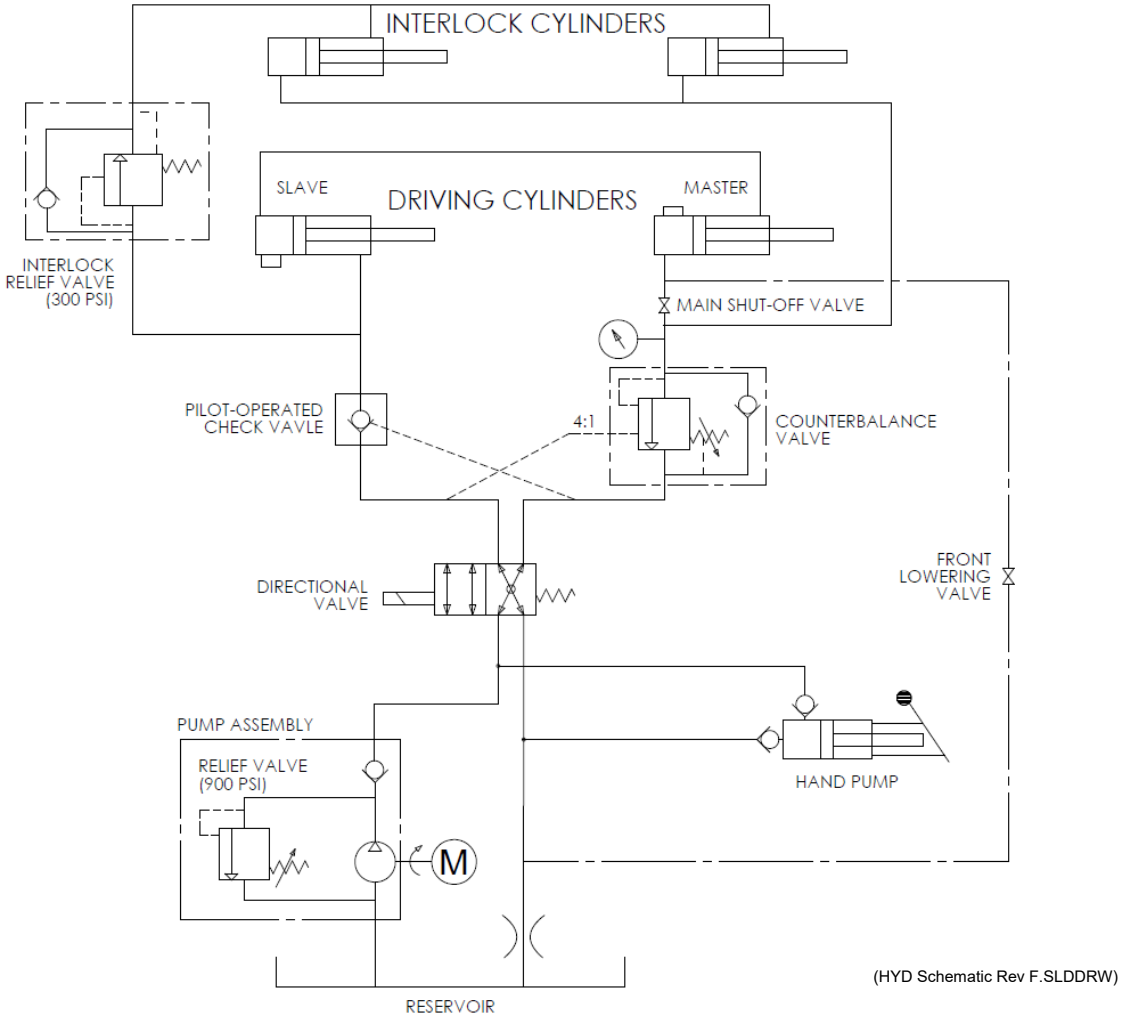
Pump Check Valve: This valve functions as a backup to the counterbalance valve to keep the platform raised when the motor is not running. This valve cannot be adjusted.

Relief Valve: This valve sets the maximum pressure that can be developed in the hydraulic system. This is factory-set to 900 psi. To adjust, remove the cap and tighten the screw to increase relief pressure, or loosen the screw to decrease relief pressure.

Main Shut-Off Valve: This valve is a brass ball valve with a T-style handle located beneath the hydraulic pump. When closed, it blocks fluid flow to the cylinders and only allows flow to the locking rods. Turn handle horizontal to close or vertical to open.

Front Lowering Valve: This valve is a brass ball valve with a T-style handle located behind a small access panel at the front right corner of the lift. This valve is used to manually lower the platform. See Section 2.2 for instructions on its use.

Interlock Relief Valve (for Locking Rods): This in-line valve is housed within a long, hexagonal casing. It is located behind the right-hand access panels for lifts with a left-handed lower platform gate and at the back, bottom left corner of the platform for lifts with a right-handed lower platform gate. When lowering the platform, the purpose of this valve is to block flow that would retract the locking rods until the platform has reached the ground, at which point enough pressure can be developed to open this relief valve and begin retracting the locking rods. This valve cannot be adjusted.



HYDRAULIC DIAGRAM

4.16 Driving Cylinders

The two double-acting driving cylinders are responsible for physically raising and lowering the platform. The cylinders are in series with the first being the “master” cylinder (right side of lift) and the second being the “slave” (left side of lift). The cylinders include bypass ports that allow hydraulic fluid to pass through them when fully retracted to resynchronize the two cylinders with each other such that the platform raises level each cycle. If the platform does not raise level with the motor (the platform will not raise level with the hand pump), the starting extension point (maximum retraction) of each cylinder may be finely adjusted via the cylinder stop screw located directly beneath where each cylinder rod attaches to the lift base. The cylinder stop screws are factory-set and should not normally need to be adjusted in the field.

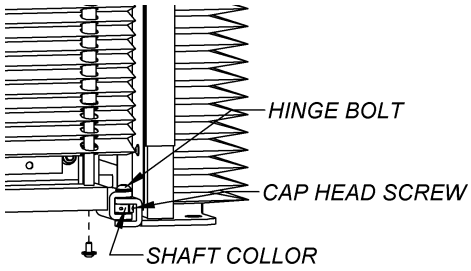
4.17 Interlock Cylinders

The two hydraulic interlock cylinders physically extend and retract the locking rods (Section 4.9). The cylinders are mounted behind the lower platform gate skirt, one at the bottom and the other higher up. Two hydraulic hoses are routed into the gate on the hinge-side to serve these cylinders.

To remove and replace the interlock cylinders, perform all of the following steps. *ALWAYS make sure that the lift platform is at the lower landing before detaching any hydraulic hoses. Otherwise, there will be hydraulic pressure in the system*.

1. To replace the cylinders, first remove the gate skirt as instructed in Section 4.4.
2. Position the platform with the floor approximately 10” [254 mm] off the ground with the lower platform gate open. The lift may be raised with the gate open by manually actuating both the locking rod switch (Section 4.9) and the lower platform gate switch (Section 4.7), or by using the hand pump.

3. Remove the lower hinge bolt that secures the skirt base to the lift base: Loosen the cap head screw in the shaft collar using a 7/64 hex key, and then turn the hinge bolt out with a 7/32 hex key while using a standard screwdriver blade to keep the shaft collar from rotating.



4. Use a 1/2" wrench or socket to remove the three (3) bolts that secure the top of the scissor locking mechanism to the gate. Note the position of the bolts in the slots so that the mechanism may be reinstalled in the same position later.
5. Remove the scissor locking mechanism from the gate, pulling the hinge side out first until the locking rod can be pulled through the gate cutout. The easiest way to do this is, with the lower platform gate almost fully closed, to lift up the skirt base until the scissors are collapsed, and then pull the base out toward you. DO NOT disconnect the hydraulic hoses at this time.
6. Lower the lift platform all the way to the lower landing, taking care not to crush or damage the interlock mechanism. Keep running down until the locking rods are retracted.
7. Use two 9/16” wrenches to disconnect the hydraulic hoses from the cylinder(s): use one wrench to turn the hose fitting and the other wrench to keep the hose from twisting. You may get some hydraulic fluid leakage from the hoses when you disconnect them.
8. Use a 5/32” hex wrench to remove the bracket that holds the cylinder to the mechanism, and disconnect the cylinder clevis from the locking rod.
9. Install the replacement cylinder(s) using the same tools that were used for removing the old one(s) and reconnect all hoses.
10. After confirming that all hose connections are tight, position the platform with the floor approximately 10” [254 mm] off the ground, and then re-install the locking mechanism into the gate using the three (3) removed bolts.

11. Loosely secure the skirt base to the base frame, raising the platform further if necessary.
12. Lower the platform to the lower landing and close the front gate. Cycle the lift vertically 4-5 times so that the locking mechanism fills with oil. Verify that the lock remains closed while the lifting platform descends, performing additional cycles until it does, if necessary.
13. Verify that the gate is hanging at the correct height, not angled too far up or down. If the gate is hanging down (sagging), loosen the three (3) bolts that hold the scissor mechanism to the gate and shift the mechanism toward the hinge side of the gate before re-tightening the bolts. You can shift the position of the mechanism by wedging a standard screwdriver between the end of the top mechanism member and the side of the gate's kick panel, and then using the screwdriver as a lever. If the gate is hanging to far up, move the mechanism to the toward the latch side of the gate instead.
14. Reinstall the gate skirt as instructed in Section 4.4 and re-secure the skirt base tightly to the base frame.
15. Cycle the lift platform up and down several times with the lower platform gate closed to confirm correct operation.

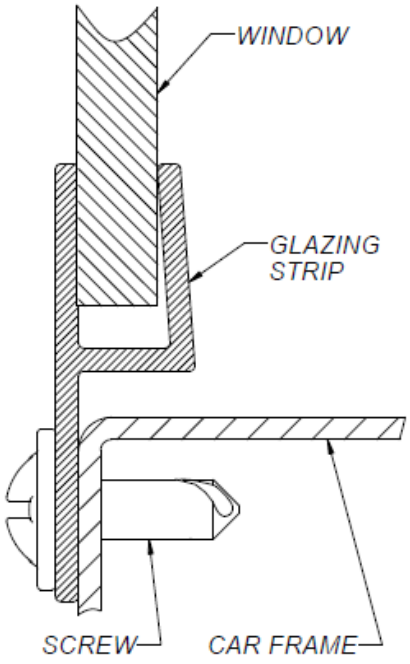
4.18 Windows

All standard windows are made of high impact strength acrylic sheet. The windows are pinched in the channel of a glazing strip which is attached to the lift frame with screws. See the figure below.

To remove a window, remove each of the screws attaching the four glazing strips to the lift's exterior. The window and strips can then be removed as a single unit.

To reinstall a window, position the window assembly in its original installation orientation and reinstall screws. Note that in some locations there may be a gap between the bottom of the glazing strip channel and the lift frame to allow clearance for the fillet welds at the corners of the frame; this is normal.

Clean windows using a soft antistatic cloth and water mixed with a mild, non-abrasive detergent. Scuffs and scratches may be removed with plastic polish (Ex: Novus #2 or #3 plastic polish).



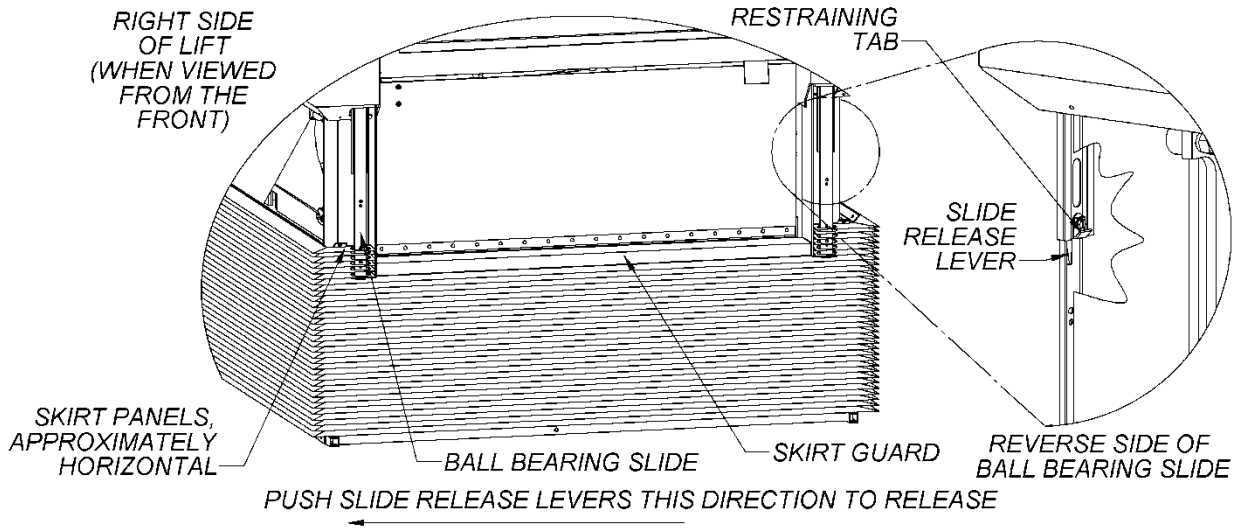
GLAZING SYSTEM CROSS SECTION

4.19 Skirt Guard

The skirt guard is located on the upper landing side of the platform, below the gate. The skirt guard blocks the upper platform gate from opening while the lift is fully lowered, but slides out of the way as the platform moves away from the lower landing.

To detach the skirt guard from the lift and safety skirt, perform the following steps:

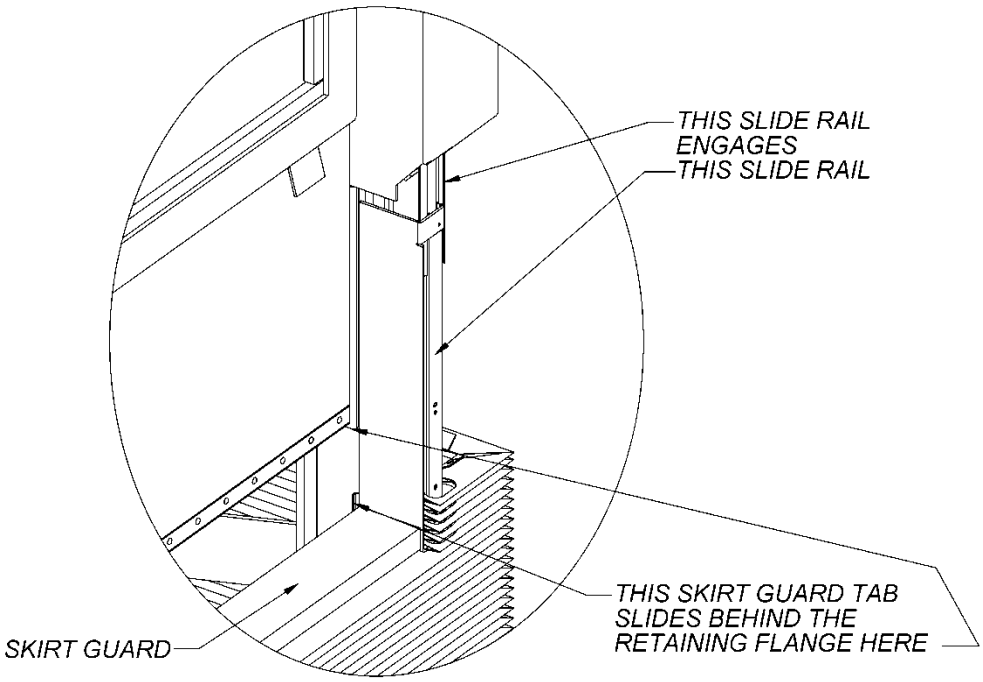
1. Move the platform to the upper landing.
2. From inside the platform, remove the lower portion of the upper platform gate (secured to the gate with five (5) pan head screws) and the bridge plate (secured to the skirt guard with four (4) flat head screws).
3. Detach the top of the protective skirt from the long sides of the platform by removing the ten (10) T25 Torx tamper-resistant head screws that secure each side.
4. Use a 5/16" combination wrench to remove the two (2) hex head screws that secure the top of the skirt to the platform on the upper landing side, one (1) at each corner. Remove the small skirt support brackets that are freed when these screws are removed.
5. Remove the (2) 5/16”-18 screws from the lift frame just above the ball bearing slides.
6. Retract the skirt around the ball bearing slides as shown in the figure below. You will need to hold each skirt panel approximately horizontal to move it past the restraining tab.



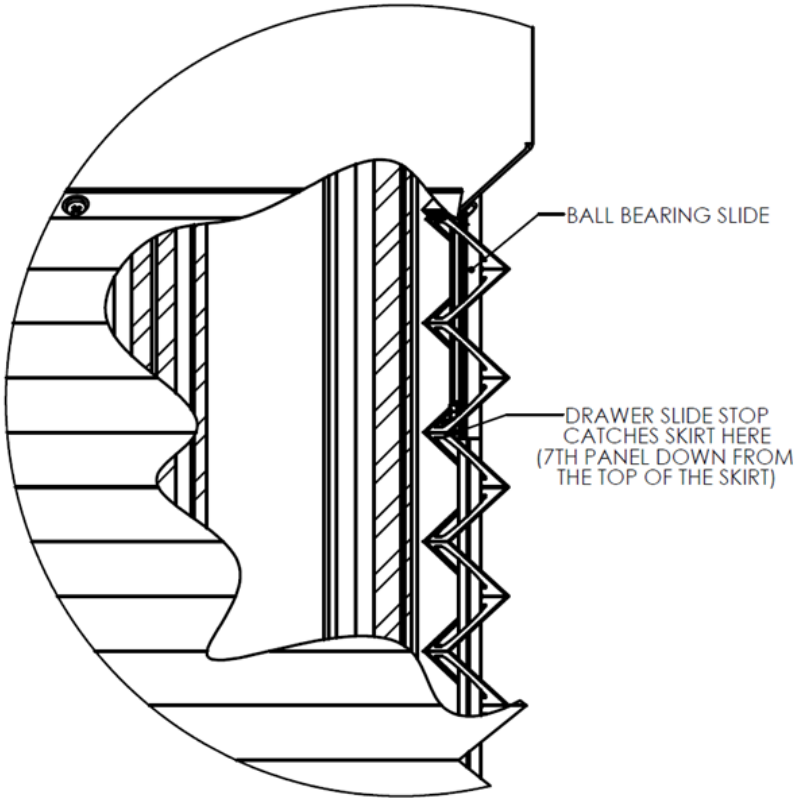
7. Push the ball bearing slide release levers as shown in the figure on the previous page and then pull downward on the skirt guard to separate it from the platform.
8. Remove the three (3) hex head screws that secure the skirt to the skirt guard using a 5/16" wrench.
9. Use a 3/32 hex key to remove the two (2) 8-32 x 3/16 button head cap screws that secure the ball bearing slide rails to the skirt guard. The guard can now be freed from the safety skirt.

To reinstall the skirt guard, perform the following steps. If necessary, refer to the figures in the skirt guard instructions above for identification of components.

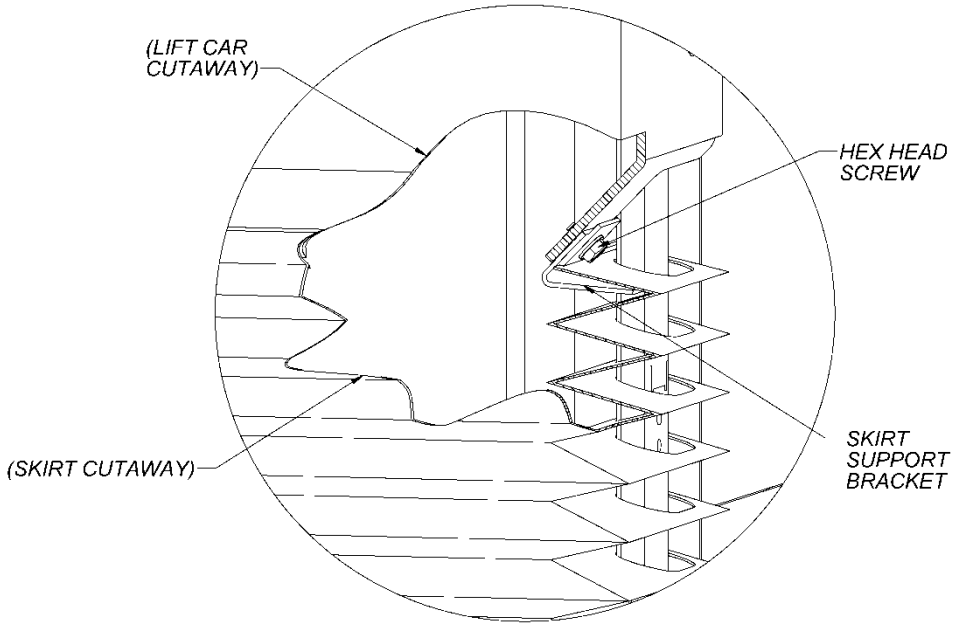
1. Thread the ball bearing slide rails through the skirt slots and the rectangular cutouts in the skirt guard and secure them in place using the two (2) 8-32 x 3/16 button head cap screws. The screws should be approximately centered in the horizontal slots in the ball bearing slide rails.
2. Use a 5/16" wrench to secure the skirt to the skirt guard with the (3) hex head screws removed in Step 6 above.
3. Position the skirt guard underneath the ball bearing slide rails on the platform, so that the slide rails on the skirt guard line up with the slide rails on the platform.
4. Move the skirt guard upward, while making sure the skirt guard tabs slide behind the retaining flanges on the platform, and that the slide rails on the skirt guard lock into the slide rails on the platform. See the figure at the top of the following page.
5. You will feel and hear a "click" when the ball bearing slides engage each other, and the skirt guard will be held in place. If the skirt guard was installed correctly, the guard cannot be pulled away from the lift. If this is not the case, use the release levers to release the skirt guard, and then reinstall it, taking care to slide the skirt guard tabs behind the retaining flanges on the platform.
6. Reinstall the 5/16”-18 screws into the holes in the lift frame just above where the ball bearing slides enter the frame.



7. Lift the skirt upward on both sides of the skirt guard until the skirt slips past the restraining tabs on the ball bearing slides as shown in the figure below. The restraining tab must catch the skirt on the 7th panel down from the top of the skirt.



8. Reinstall two (2) or three (3) T25 Torx tamper-resistant head screws on each side of the platform to secure the top of the skirt loosely to the platform.
9. Use a 5/16" combination wrench to reinstall the two (2) hex head screws that secure the skirt and skirt support brackets to the platform, one (1) at each corner. Be sure to install the skirt support brackets between the skirt and the platform frame. See the figure below.



RIGHT REAR CORNER OF LIFT SHOWN

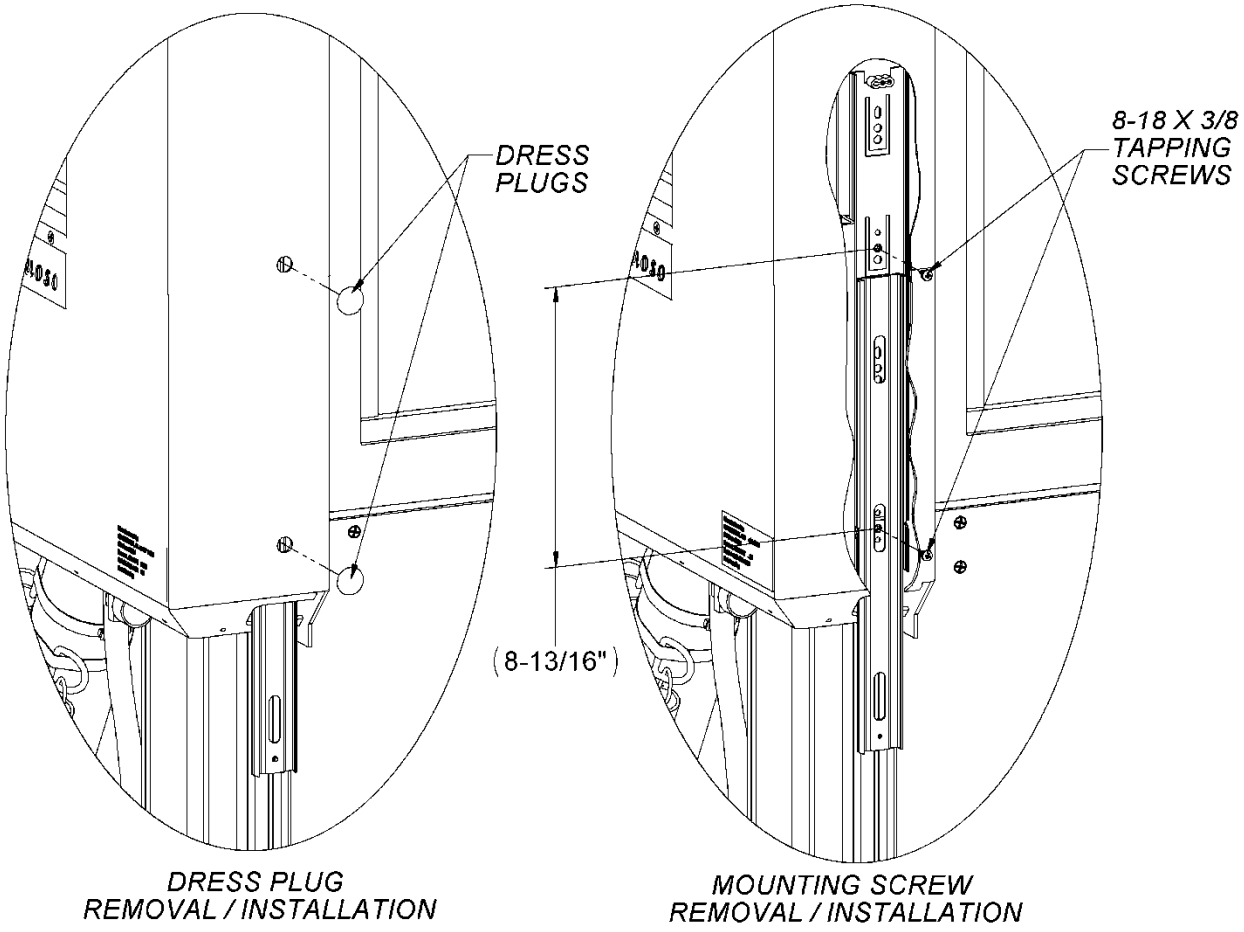
10. Reinstall the remainder of the ten (10) T25 Torx tamper-resistant head screws that secure the sides of the skirt to the platform.
11. Reinstall the bridge plate and the lower portion of the upper platform gate.

To remove the portion of a ball bearing slide that is mounted to the platform:

1. Complete steps 1-7 in the instructions above for removing the skirt guard from the platform.
2. Use a blade or small standard screwdriver to pry the two (2) dress plugs out of the platform frame in the corner in which you are removing the ball bearing slide. See the figure on the following page.

3. Use a Phillips screwdriver to remove the two (2) 8-18 x 3/8 self-tapping pan head screws that are now accessible. You may need to shift the position of the movable portion of the ball bearing slide to expose the screws. Be sure to catch the screws as they are removed.

To install a ball bearing slide into the platform frame, reverse the above instructions. Be sure to install the two (2) 8-18 x 3/8 self-tapping pan head screws through the ball bearing slide holes indicated in the figure below. It is recommended that you mark the correct holes with a marker on the ball bearing slide before attempting to install the slide inside the platform frame so that it is clear which mounting holes are correct.

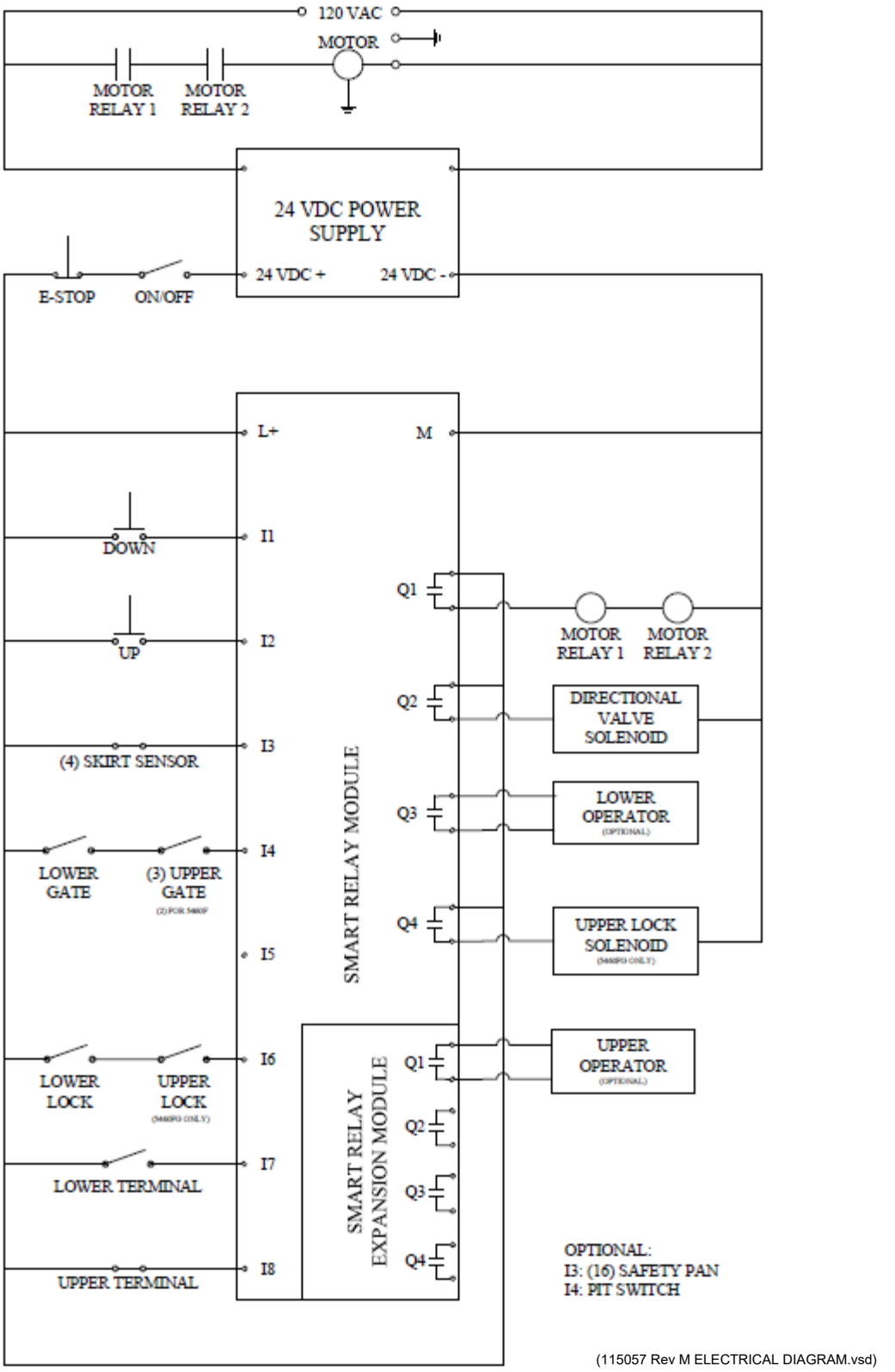


(UPPER LANDING END OF THE LIFT)

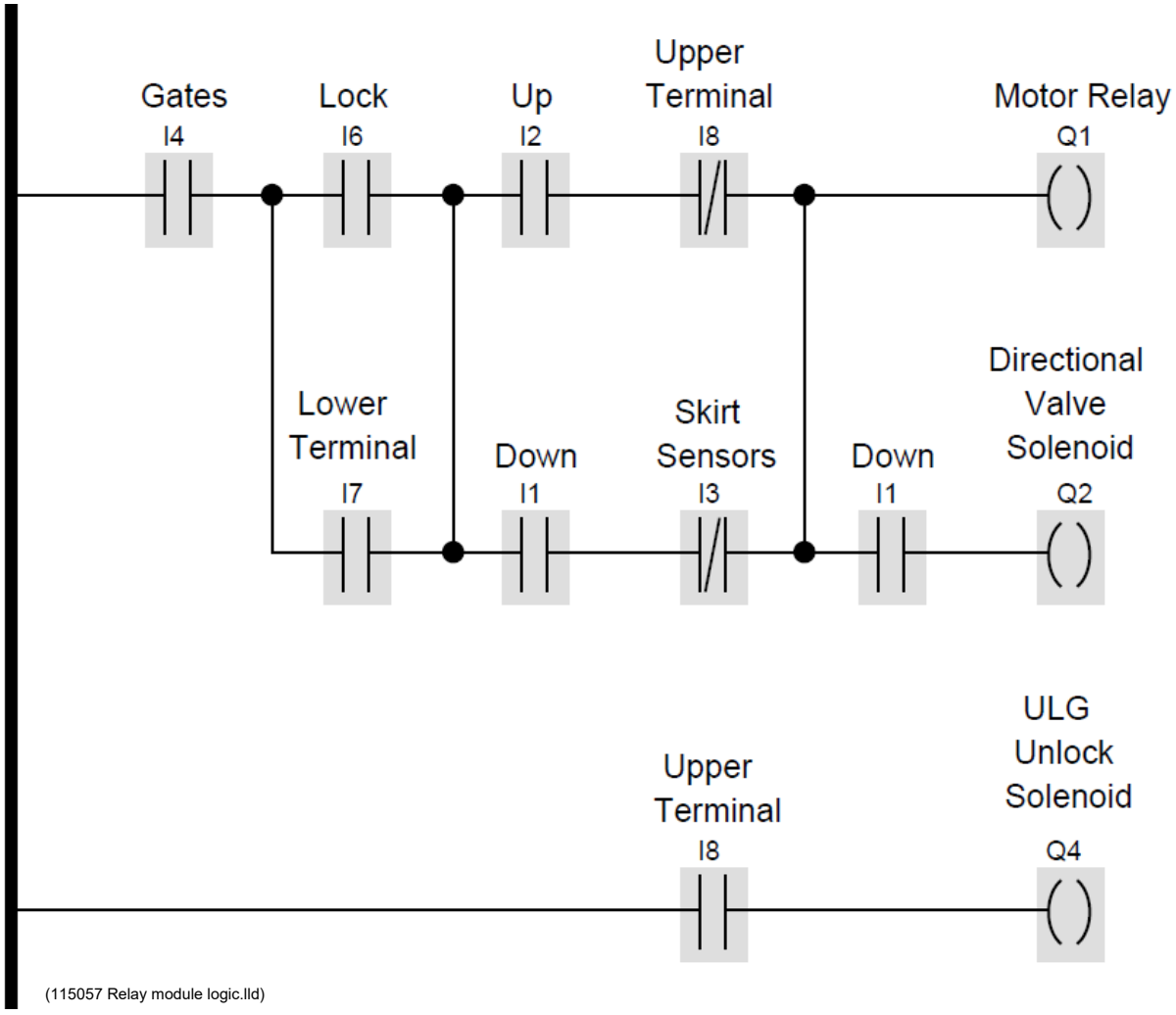
SECTION 5 Electrical Testing

This section contains information that will enable a skilled and experienced electrician to service the lift. The electrical and logic diagrams for the lift is shown on the following pages.

> ***⚠ CAUTION!***
> ***When working on any part of the electrical system, industrial electrical safety practices should be rigorously adhered to, including:***
>
> - ***Danger Tags: While repairs are underway, a danger tag must be attached to the disconnect to advise personnel that the lift is being serviced.***
> - ***Two-man rule: As a minimum, two (2) people should be present while repairs and tests are being performed.***
> - ***Do not leave the lift unattended while the electrical system components are exposed unless the disconnect has been locked in the "OFF" position.***
> - ***Be cognizant as to the electrical status of the lift (i.e., whether it is powered or not). When in doubt as to whether a circuit or component is powered, test it first!***



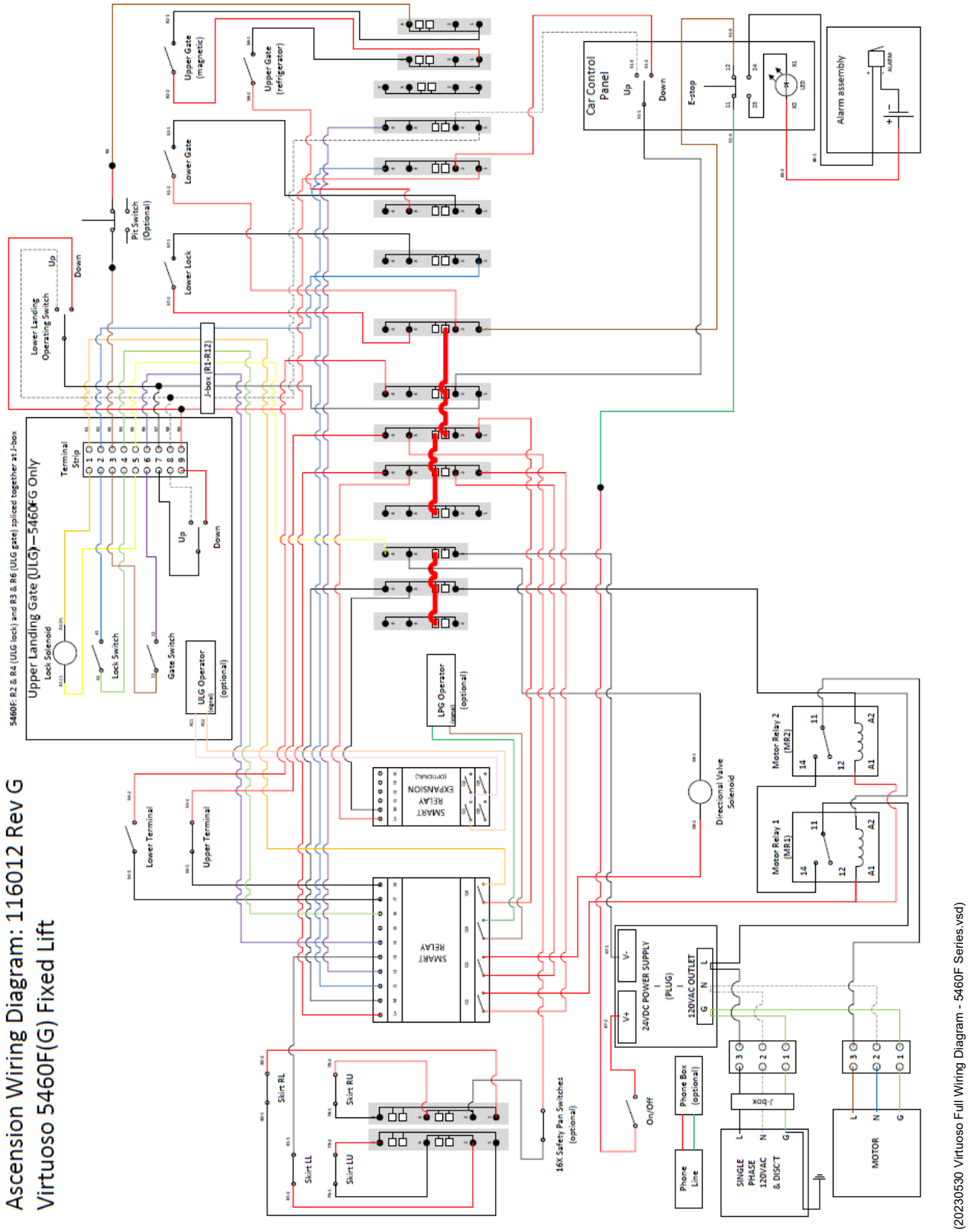
SIMPLIFIED ELECTRICAL DIAGRAM



SMART RELAY MODULE LOGIC

Notes:

The logic diagram above does not include any of the timers or more complicated components of the logic circuit. Rather, it only shows the contacts that must be maintained for the platform to run up or down. To use the logic diagram, start at the left and work towards the right. If there is a continuous path to a given endpoint (Ex: Q1), then the smart relay will activate that given endpoint/component.



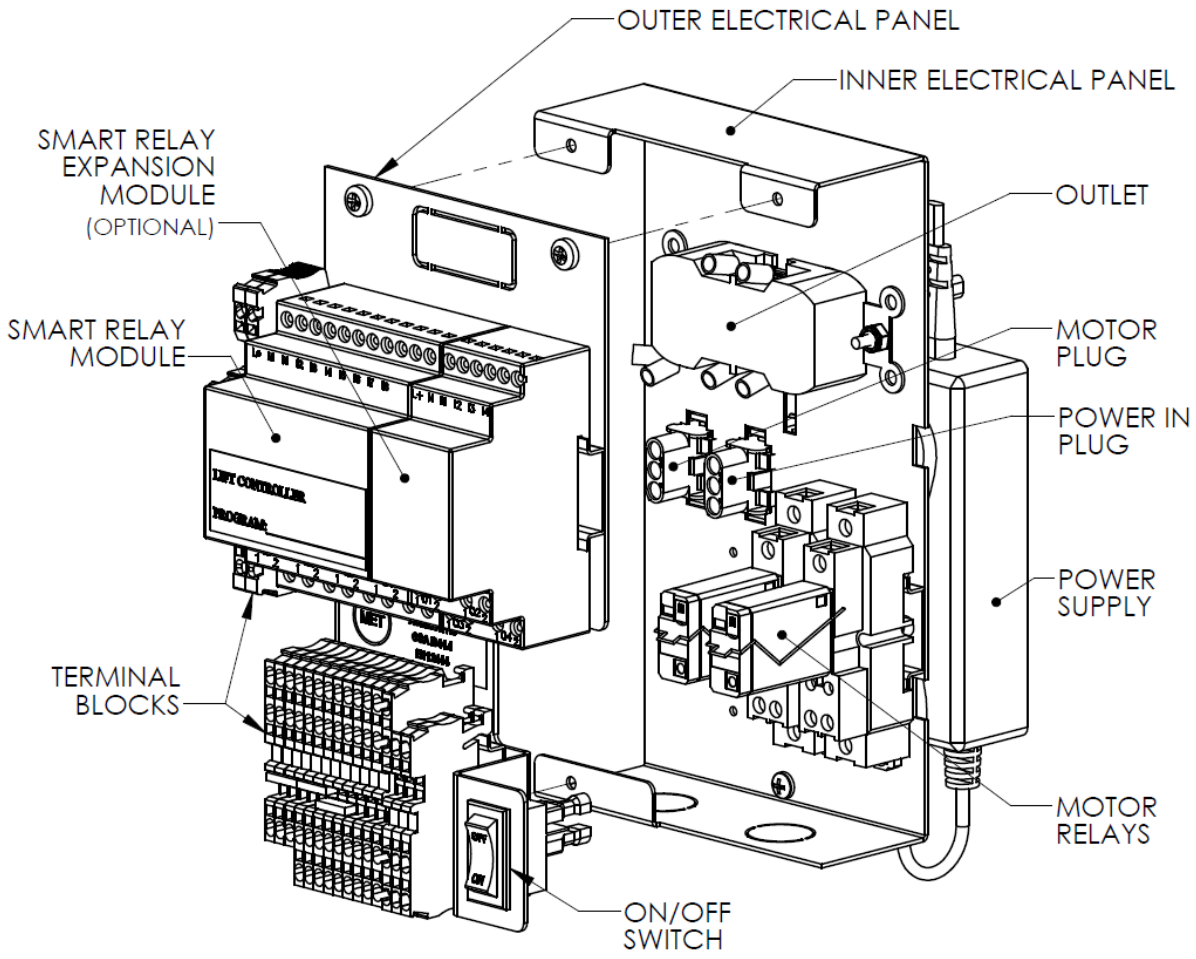
FULL ELECTRICAL DIAGRAM

(Contact Ascension for electronic color copy of 5460F full electrical diagram).

5.1 Control Panel

The electrical panel can be accessed through both access panels in the left-hand machinery cabinet. If additional access space is needed, the top of the left-hand machinery cabinet can be removed (refer to Section 4.3 for instructions).

Refer to the figure below for identification of the major components on the electrical panel.



ELECTRICAL PANEL & MAJOR COMPONENTS
WIRING HARNESSES AND CONNECTORS NOT SHOWN

5.2 Testing the Switches

When troubleshooting the electrical system, it is recommended to begin by testing at the Smart Relay Module to determine the present state of each individual safety circuit. The control system operates on 24 VDC. Before performing any checks at the relay module, verify that the module itself is receiving power (refer to Section 5.3). If the module is receiving power, then the function of the lift's switches can be verified by testing for 24 VDC between ground (M) and each of the smart relay inputs (I1 – I8) continuity across the relay module's contacts as shown in the following table.

Circuit Components	Relay Module Contacts	Circuit is closed (meter reads 24VDC) when:	Circuit is open (meter reads ~0VDC) when:
Operating Switch (Down)	I1-M	“DOWN” is pressed	“DOWN” is not pressed
Operating Switch (Up)	I2-M	“UP” is pressed	“UP” is not pressed
Skirt switches (4x)	I3-M	Skirt hangs freely; not pushed in	Object pushing in on skirt
Gate Switches	I4-M	Gates are closed	Either gate is open
Lock Switch(s)	I6-M	Gates are locked	Either gate is unlocked
Lower Terminal Switch	I7-M	Platform is less than ~2" [50 mm] off the ground	Platform is more than ~2" [50 mm] off the ground
Upper Stop Switch	I8-M	Switch is not engaged by upper stop mechanism (platform is not at the upper landing)	Switch is engaged by upper stop mechanism platform is at the upper landing)

Once a given safety circuit has been identified as the problem, the switches and wire connections in that circuit may be tested. Individual switches may be tested for continuity across the switch contacts. Note that the lift should be disconnected from power when testing for continuity. See the table below for information on the type and corresponding manual section for each switch.

Switch	Type	Section
Lower Terminal Switch	SPST, NO	4.6
Upper Terminal Switch	SPDT, NC circuit used	4.6
Lower Platform Gate Switch	SPDT, NO circuit used	4.7
Upper Platform Gate Switch (2x)	SPST, NO	4.8
Locking Rod Switch	SPST, NO	4.9
Upper Landing Gate & Lock Switches	SPST, NO	4.10
Emergency Stop Switch	Push-to-break	4.11
Up/down Operating Switch	(Mom. On)-Off-(Mom. On)	4.11
ON/OFF Switch	On-Off	4.12
Skirt Sensor (4x)	4x SPDT, NC circuit used	4.14
Safety Underpan Switches (16x) (optional)	SPST, NC	NA
Pit Switch (California only)	Push-to-break	NA

5.3 Testing the Relay Module

The relay module (Smarty Relay) is located on the electrical panel. See Section 5.1.

A green light on the relay module indicates that it is receiving power and is ready for use. Note that the relay module requires 6-8 seconds to initialize after it receives power, during which time the relay light is red. Always give the module time to initialize before performing any testing on it.

To test the function of the relay module, refer to the smart relay module logic diagram at the beginning of SECTION 5.

If the relay module is not receiving power, check for and correct the following conditions as necessary:

1. AC supply to the lift has been shut off.
2. The power supply is not supplying 24 VDC. Refer to Section 5.4 to check it.
3. There has been a wiring harness or connector failure. See the Electrical Diagrams at the beginning of SECTION 5 to continue troubleshooting, or contact Ascension.
4. The E-Stop is pushed in and the alarm is active. Reset the E-Stop.
5. The ON/OFF switch is “OFF”. Turn the switch “ON”.

5.4 Testing the Power Supply

The power supply converts the 120 VAC† input power from the facility to 24 VDC which is used to power the entire lift control system. The power supply is located behind the inner electrical panel. See Section 5.1. The AC power must be on to conduct the following tests..

To confirm that the power supply is receiving power, verify that the green light on the power supply is illuminated; this may be viewed by removing the lower landing operating station plate. Otherwise, confirm that the internal power outlet that the power supply is plugged into is outputting 120 VAC†.

To confirm that the power supply is outputting power, disconnect the power supply output at the circular connector behind the inner electrical panel and test for a 24 VDC drop between the exposed metal on the inside and outside of the cylindrical male connector. If the power supply is receiving 120 VAC† but is not outputting 24 VDC, then the power supply must be replaced.

† Electrical ratings may differ on lifts outside the USA. Check lift data plate for electrical ratings.

5.5 Testing the Power Relays

The power relays connect/disconnect 120 VAC† power to the motor to cause the lift to run/stop. When 24 VDC is applied to the input-side of the relays, the output-side relay contacts close and supply power to the motor. See Section 5.1 for identification of the power relays. The lift must be plugged in and turned on to perform the following tests.

Checking for AC Supply Power

While the motor is not running, 120 VAC† should be present across Power Relay 1 terminal '11' and Power Relay 2 terminal '11'. If not, check the upstream AC power connections. Alternatively, confirm power by manually overriding the power relays.

Manually Overriding the Power Relays

CAUTION: The following test may cause the lift to move.

To manually override the power relays, push the small override buttons on the front of both relays simultaneously. Normally, will cause the motor to run and the lift to move.

Releasing either override button should cause the lift to stop. If releasing the override button on either relay does not cause the lift to stop, that relay must be replaced.

Replacing the Power Relays

To replace a power relay, first electrically isolate the lift according to the procedures in Section 4.2. Next, push the metal hold-down clip down off the top of the relay and pull the relay out of its socket. Insert the new relay into the socket and pull the hold-down clip back onto the top of the relay to secure it.

† Electrical ratings may differ on lifts outside the USA. Check lift data plate for electrical ratings.

SECTION 6 Troubleshooting

The table below presents the necessary information to perform basic troubleshooting on the lift. The numbers in the Section column refer to sections within this manual.

Problem	Possible Cause	Remedy	Section
Platform will not raise or lower	Electrical disconnect is off	Turn on disconnect	N/A
	Emergency Stop is depressed	Turn clockwise to reset	4.11
	Lift is turned off	Turn the lift on	4.12
	Lift is not receiving power	Check building's supply line to lift	N/A
	One or both gates are open	Close both gates	N/A
	Lower platform gate switch is out of adjustment	Adjust the lower platform gate switch	4.7
	Upper platform gate switches are out of adjustment	Adjust the upper platform gate switches	4.8
	Upper landing gate switches are out of adjustment	Adjust the upper landing gate switches	4.10
	Component failure	Electrical testing -- possible component replacement	5.2
Platform will raise but will not lower	Person or object is leaning against the safety skirt	Return the skirt to its normal (relaxed) position	4.14
	Operating switch failure	Try alternate operating switch; replace switch if necessary	4.11
	Directional valve failure	Replace directional valve	4.15
	Relay module failure	Electrical testing -- possible component replacement	5.3
Platform will not go more than 2" [50 mm] off the ground	Lower platform gate locking rod is not engaging	Adjust the upper lock rollers	4.9
	Locking rod switch failure	Test locking rod switch & replace if necessary	4.9
	Lower terminal switch out of adjustment	Adjust lower terminal switch	4.6
Platform "coasts" downward over an extended period of time	Counterbalance valve malfunction	Replace counterbalance valve	4.15

Problem	Possible Cause	Remedy	Section
Platform does not stop automatically at the upper landing	Upper height knob is not set correctly	Set the upper height knob properly per the *Installation Manual*	N/A
	Upper stop switch failure	Replace upper stop switch	4.6
	Upper stop mechanism is out of adjustment	Adjust upper stop mechanism	4.6
Motor runs but platform does not raise	Hydraulic fluid level is low	Fill hydraulic fluid reservoir	N/A
	Main hydraulic shut-off closed	Open shut-off valve	4.15
	Break in hydraulic circuit	Repair break and fill hydraulic fluid reservoir	N/A
	Directional valve stuck open	Replace directional valve	4.15
	Platform is overloaded	Reduce load on platform until load is equal to or less than the rated load	N/A

Notes:

ascension®

WHEELCHAIR LIFTS

A DIVISION OF AGM

Printed in the U.S.A.

115057 REV M