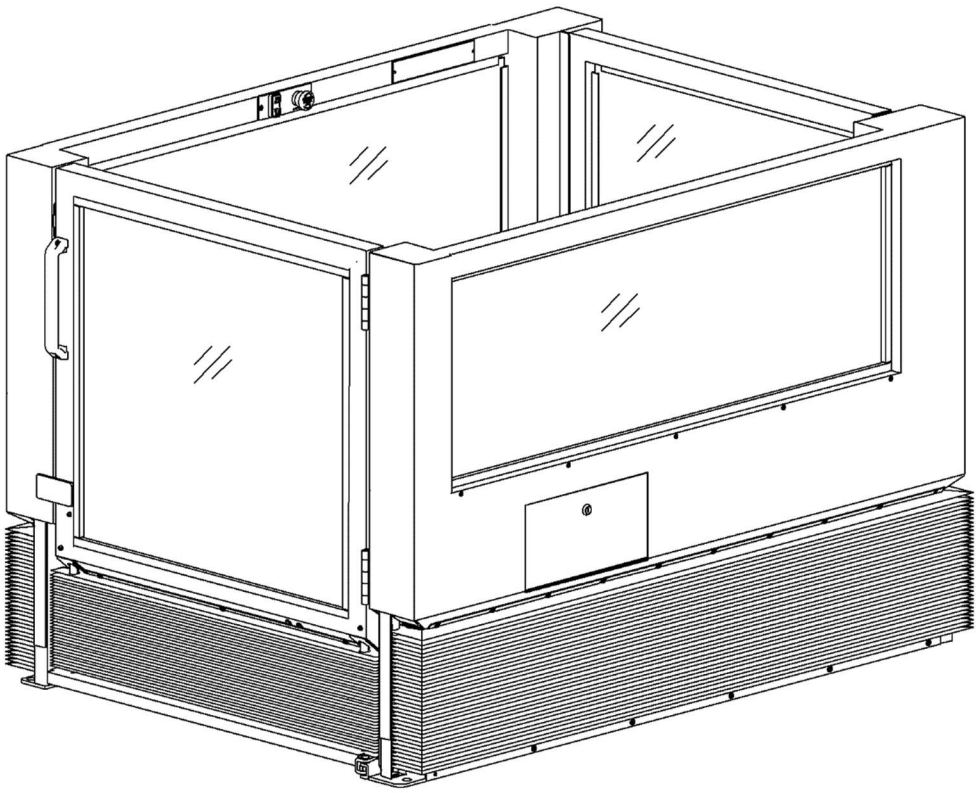
ASCENSION VIRTUOSO
WHEELCHAIR LIFT
5460F MODEL SERIES

PRODUCT MANUAL



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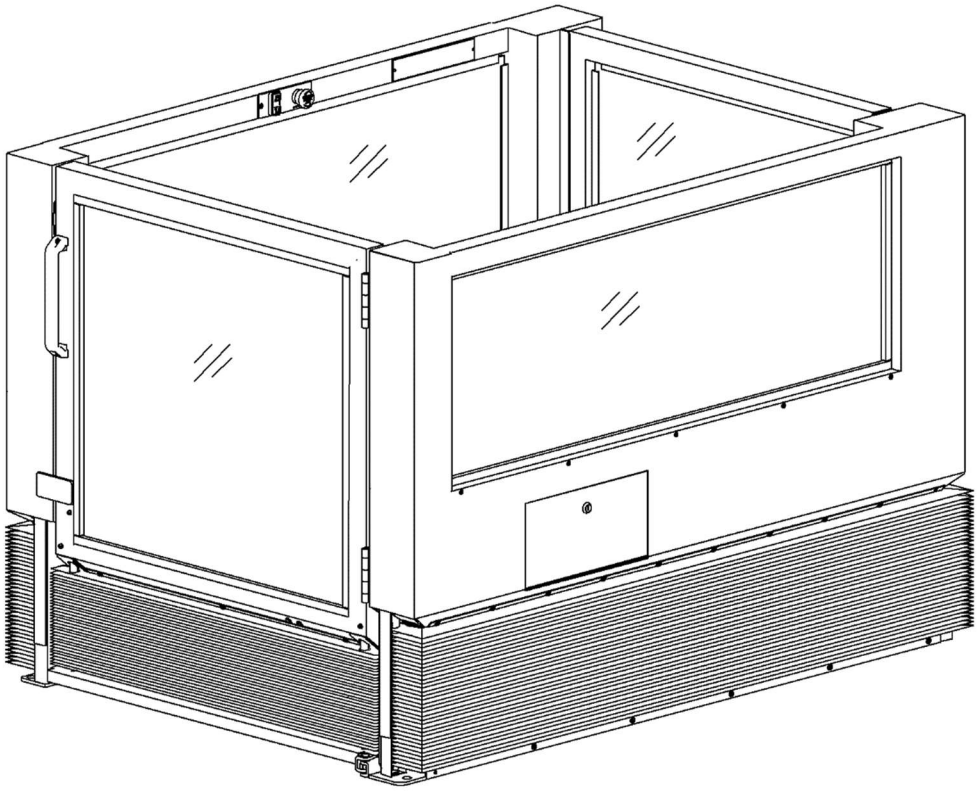

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INTRODUCTION

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.

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 lift car 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"
- OCCUPANCY: 1 person
- MAXIMUM PASSENGER LOAD: 750 pounds
- AVERAGE SPEED: 7 feet per minute
- WORKING PRESSURE: 900 psi maximum

Physical

- INTERIOR DIMENSIONS: 36" wide x 43" high x 54" long
- MATERIALS: Platform, base frame, lifting device: Mild steel
  Windows: High impact strength clear thermoplastic
- FINISH: Platform and base: Oven baked powdercoat
- ELECTRICAL: 120 VAC, 60 Hz, Single Phase, 13 Amps

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 Panel The hinged panels (four total) 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.

Front End The end of the lift where the lower platform gate is located.

Lift Car The compartment in which the passenger rides. Commonly called the "platform" in the lift industry.

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

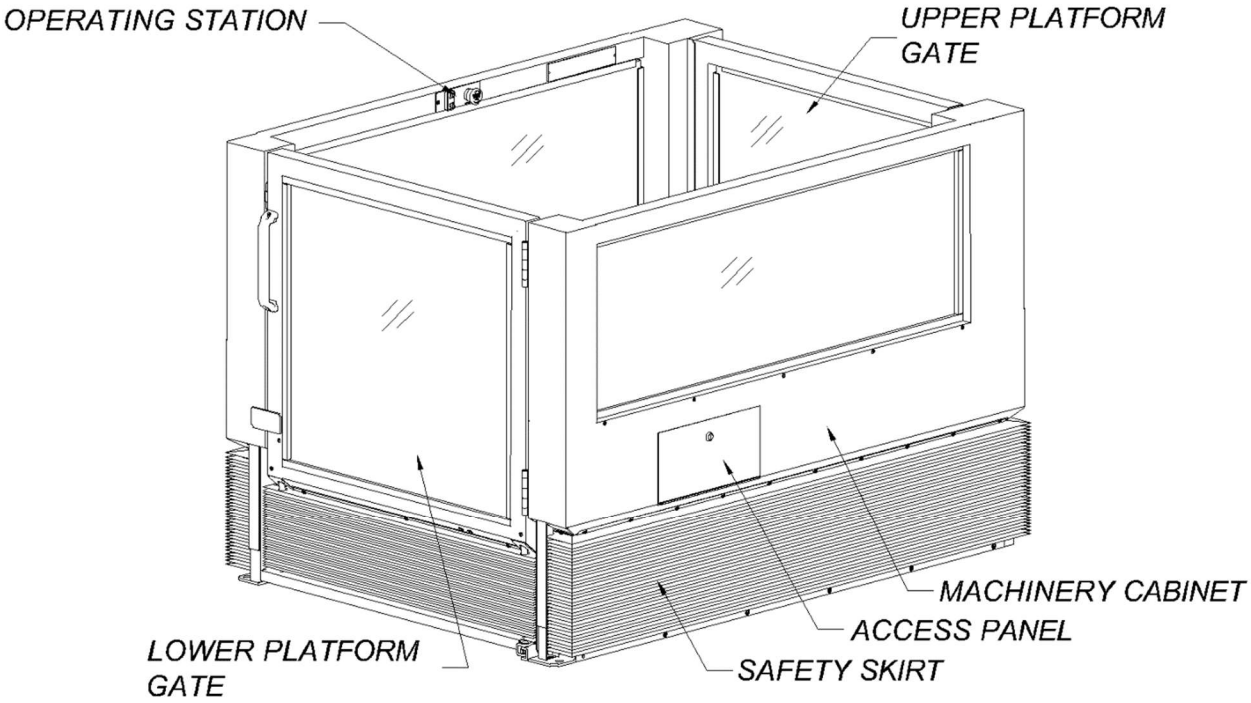
Machinery Cabinet The enclosures in which the lifting mechanism is located. There is one cabinet on each side of the lift. The contents of the machinery cabinets are accessible through the access panels.

Operating Stations The controls for raising and lowering the lift car. The operating station inside the lift car has an emergency stop switch. The operating station outside the lift car may be remotely mounted.

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

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 motion of the platform is controlled by any of the three operating switches located either in the lift car 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. 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 hand pump located in the right-hand machinery cabinet can be used to operate the platform and unlock the lower landing gate in an emergency. The hand pump may be operated from either the inner or the outer access panel.

Instructions for use:

1. Locate the 12-inch long 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.

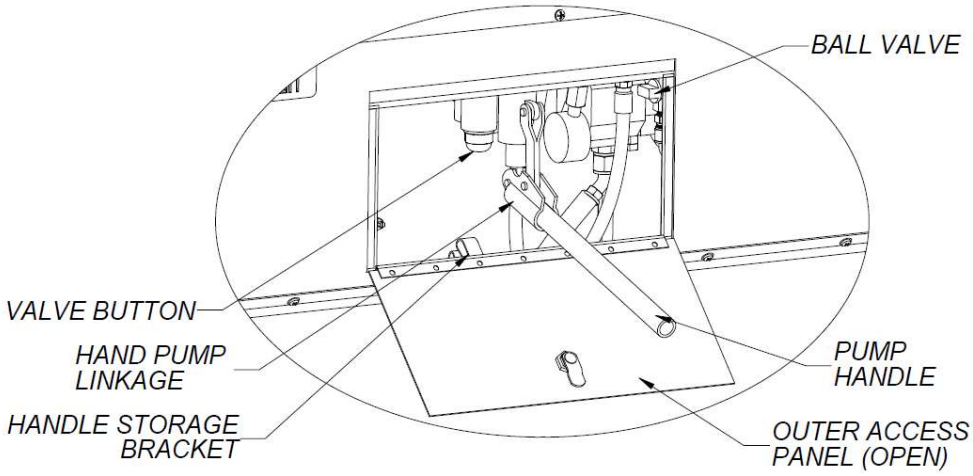


Figure 1

3. To move the lift car upward, pump the handle.
4. To move the lift car 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 pumping and contact a repair technician.***

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 (inside the right, outside access panel) 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, pull the top of the flexible sight tube out of the access panel opening, remove the bronze vent plug, and pour the hydraulic fluid slowly into the sight tube.

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.

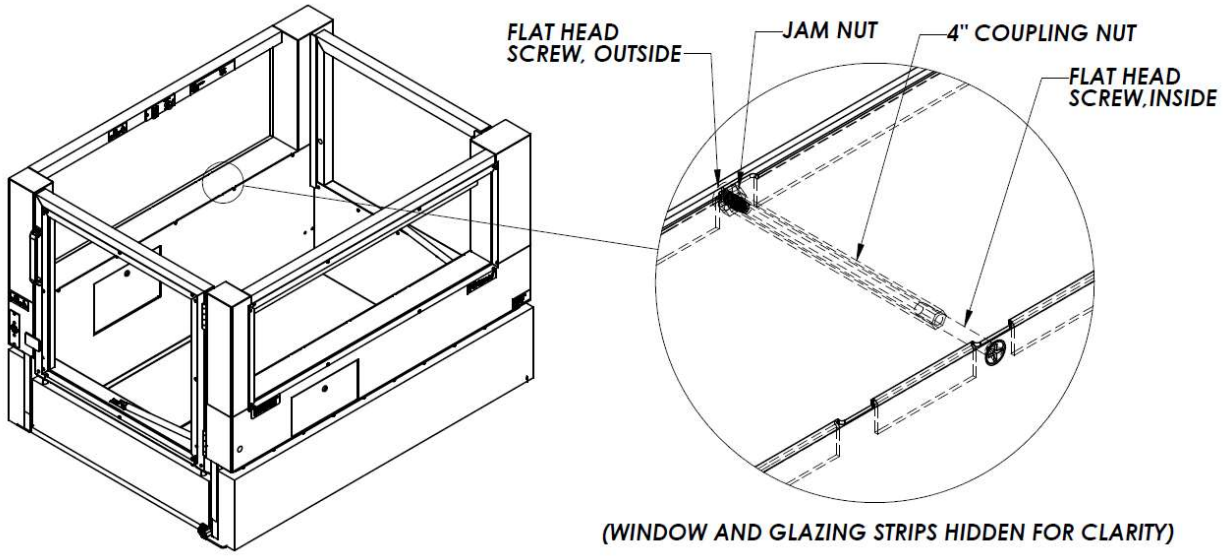
4.2 Electrically Isolating the Lift

To electrically isolate the lift, turn off the electrical disconnect feeding the lift.

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 Phillips screwdriver to loosen or remove the five (5) flat head screws located just underneath the cabinet top on the inside of the lift car. 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. 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.

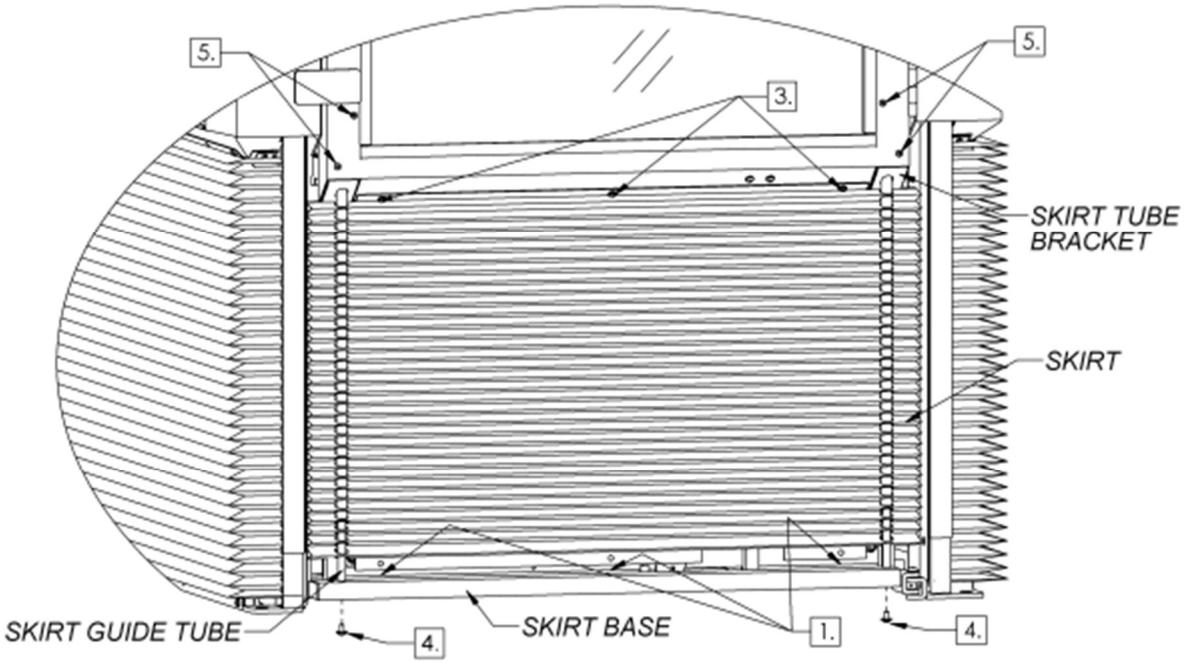


4. To reinstall the machinery cabinet top, perform the above steps in reverse order.

4.4 Retracting, Removing, and Reinstalling the Safety Skirt

The safety skirt consists of two parts: the lift car skirt, which guards the lift car 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.

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

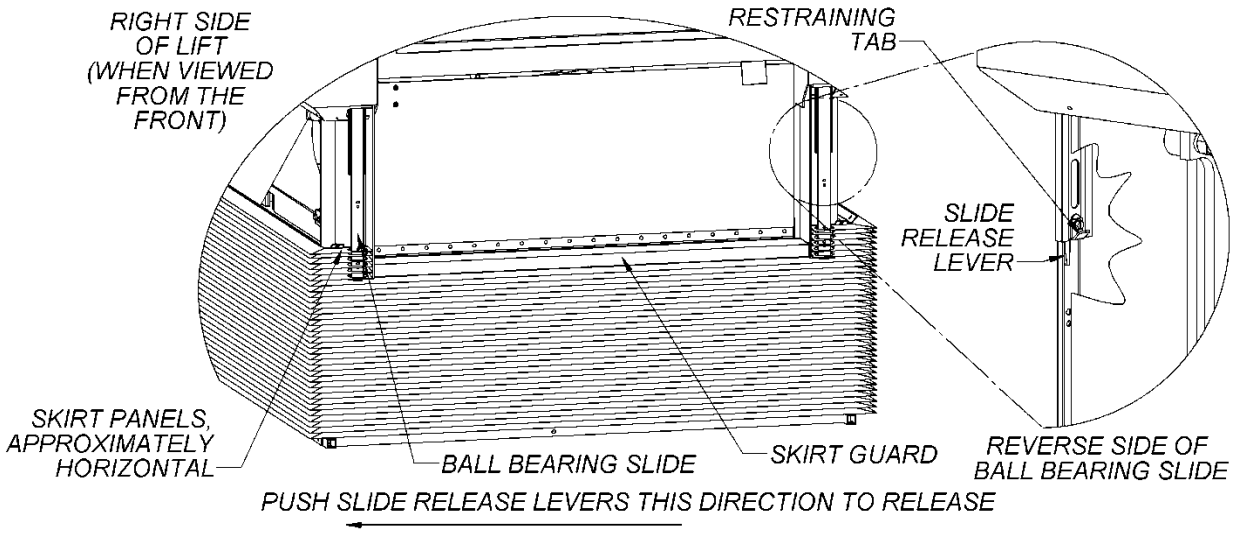
1. Use a 5/16" wrench to remove the three (3) hex head screws that secure the skirt to the skirt base. These screws are located on the top side of the skirt base.
2. Using any operating station, raise the lift car until the car floor is approximately 24" [610 mm] off the ground.

3. Use a Phillips screwdriver 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 Phillips screwdriver 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.

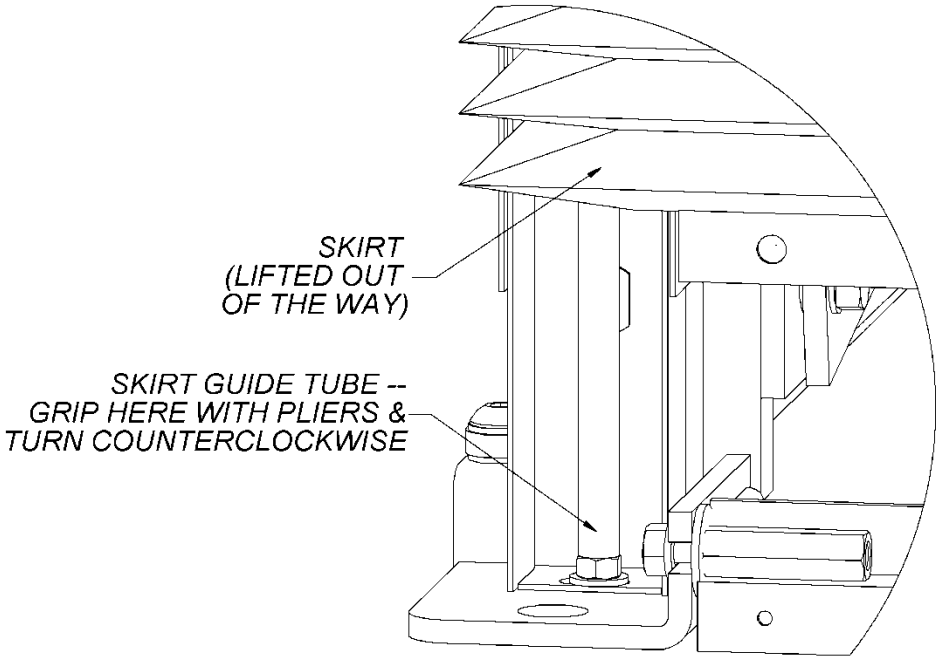
To reinstall the *gate skirt*, perform the above steps in reverse order.

To remove the *lift car skirt*, perform all of the following steps. If the skirt only needs to be retracted, performing only Steps 3 & 4 will provide access to most of the components behind the skirt.

1. If the whole skirt is to be removed, raise or lower the lift car so that the lift car floor is approximately 15" [380 mm] off the ground.
2. From inside the lift car, 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. Use a Phillips screwdriver to remove the 32 pan head screws that secure the sides of the skirt to the lift car at the top and to the lift base at the bottom.
4. Use a 5/16" combination wrench to remove the four (4) hex head screws that secure the top of the skirt to the lift car, one (1) at each corner. Remove the small skirt support brackets that are freed when these screws are removed.
5. Remove the pan head screw that secures the back of the skirt to the base.
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. Remove the (2) 5/16”-18 screws from the lift frame just above the ball bearing slides.



8. Push the ball bearing slide releases toward the right side of the lift and then pull downward on the skirt guard to separate it from the lift car.
9. 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

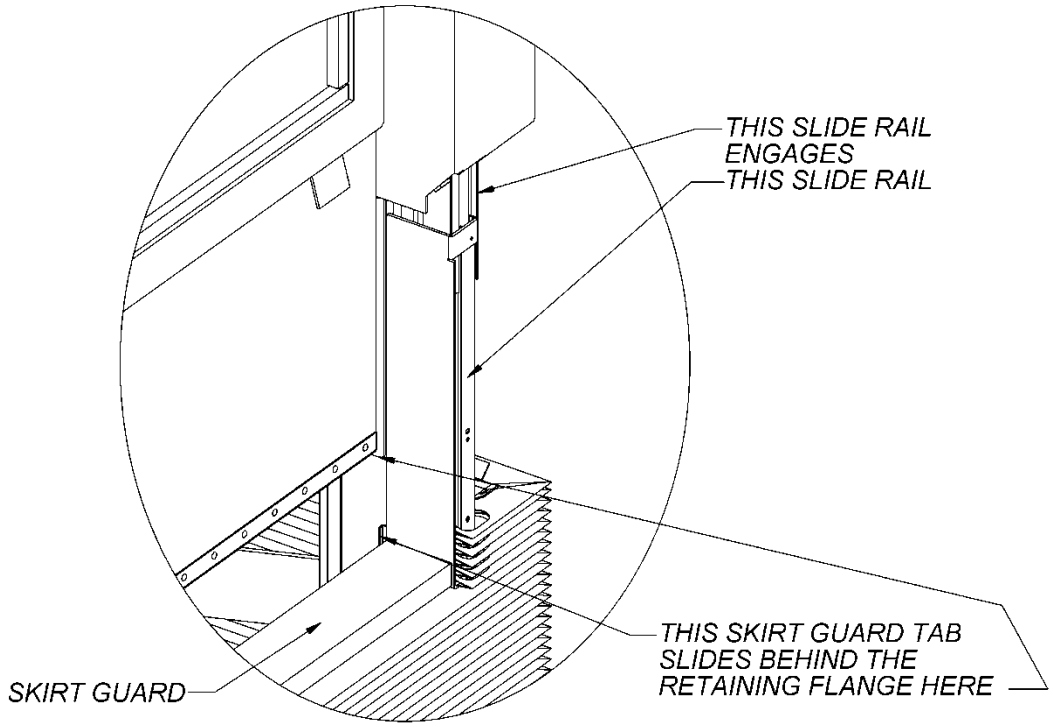
10. Retract the skirt guide tubes through the slots in the skirt. The skirt is now free of the lift. Use extreme care to support the skirt in its natural position as much as

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

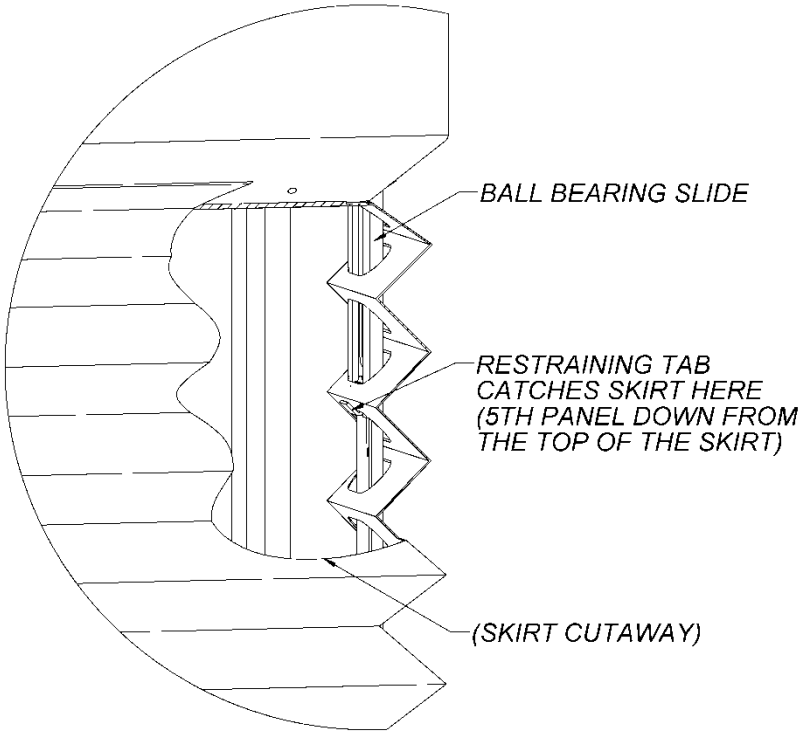
To reinstall the *lift car skirt*, perform the following steps in the order indicated. If necessary, refer to the figures in the skirt removal instructions above for identification of skirt components.

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

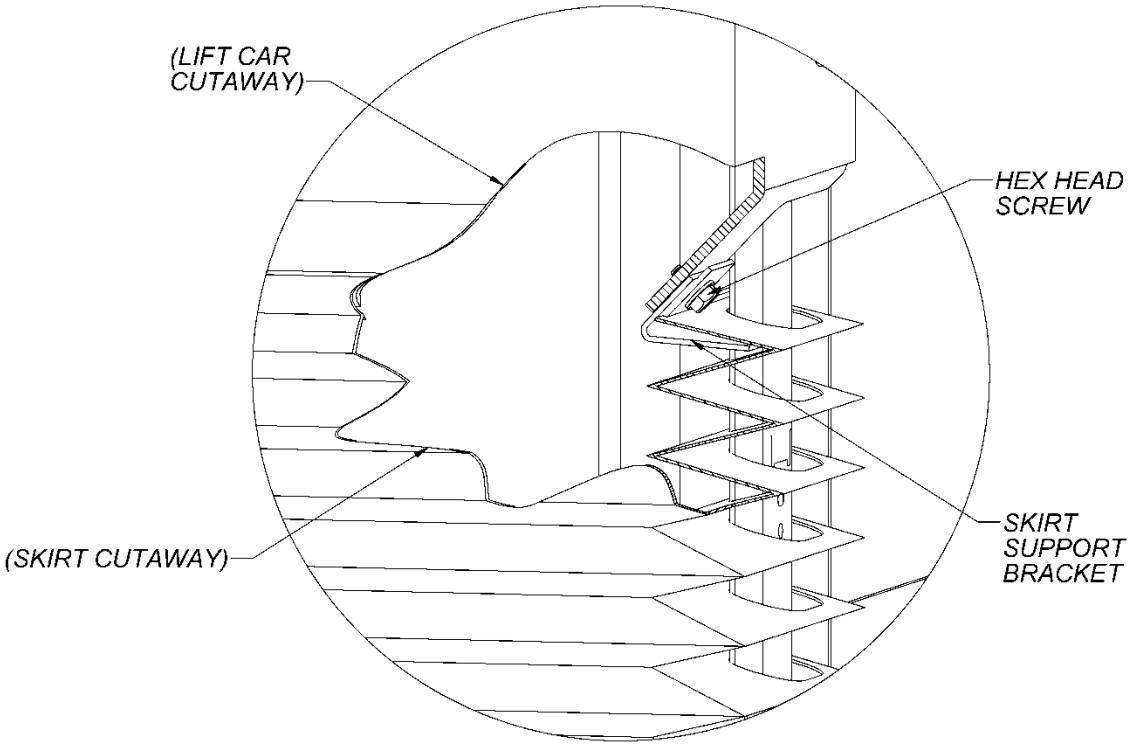
1. Raise or lower the lift car so that the lift car floor is approximately 15" off the ground.
2. Move the skirt into position around the lift car, approximately as it will be located when installed on the lift. Use extreme care to support the skirt in its natural position as much as possible while moving it. A minimum of two (2) people is recommended for moving the skirt.
3. At both front corners of the lift car, 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.
4. In the back, reinstall the skirt guard onto the lift car 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 on the lift car, so that the slide rails on the skirt guard line up with the slide rails on the lift car.
   b. Move the skirt guard upward, while making sure that the skirt guard tabs slide behind the retaining flanges on the lift car, and that the slide rails on the skirt guard lock into the slide rails on the lift car.
   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 car. 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 lift car.
   d. Reinstall the 5/16”-18 screws into the holes in the lift frame just above where the ball bearing slides enter the frame.



5. 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 5th panel down from the top of the skirt.



6. Use a Phillips screwdriver to reinstall two (2) or three (3) pan head screws on each side of the lift car to secure the top of the skirt loosely to the lift car.
7. Use a 5/16" combination wrench to reinstall the four (4) hex head screws that secure the top of the skirt to the lift car, one (1) at each corner. Be sure to install the skirt support brackets between the skirt and the lift car frame. See the figure below.

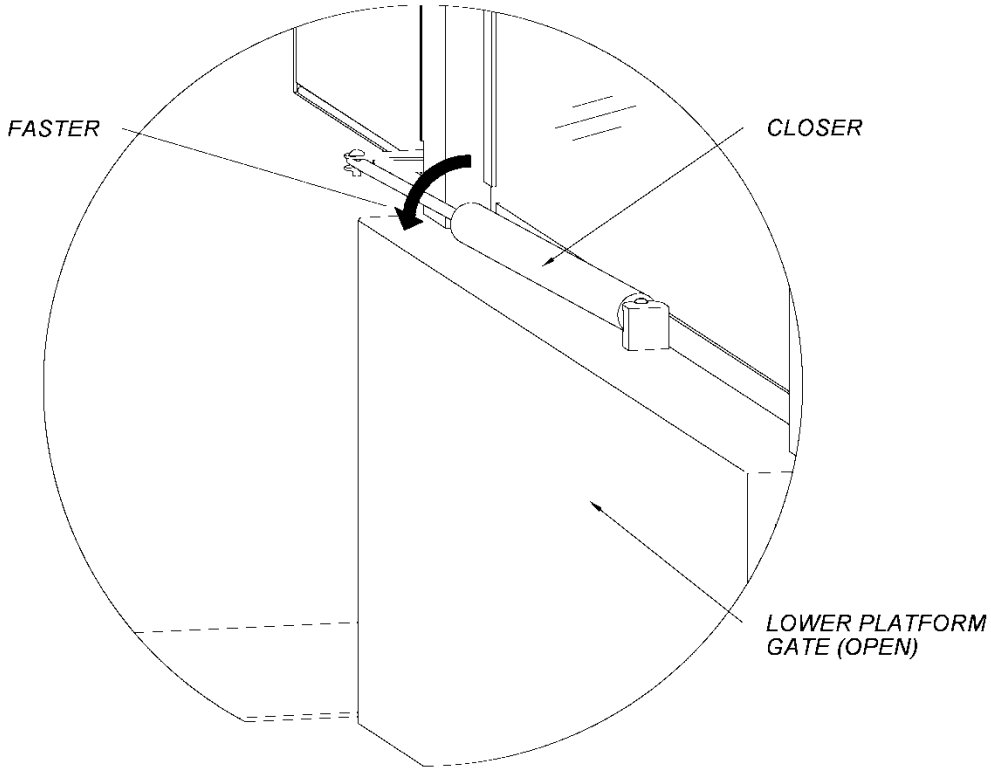


RIGHT REAR CORNER OF LIFT SHOWN

8. Use a Phillips screwdriver to reinstall the remainder of the 32 pan head screws that secure the sides of the skirt to the lift car at the top and to the lift base at the bottom.
9. Use a Phillips screwdriver to reinstall the pan head screw that secures the back of the skirt to the base.
10. Use a Phillips screwdriver to 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.

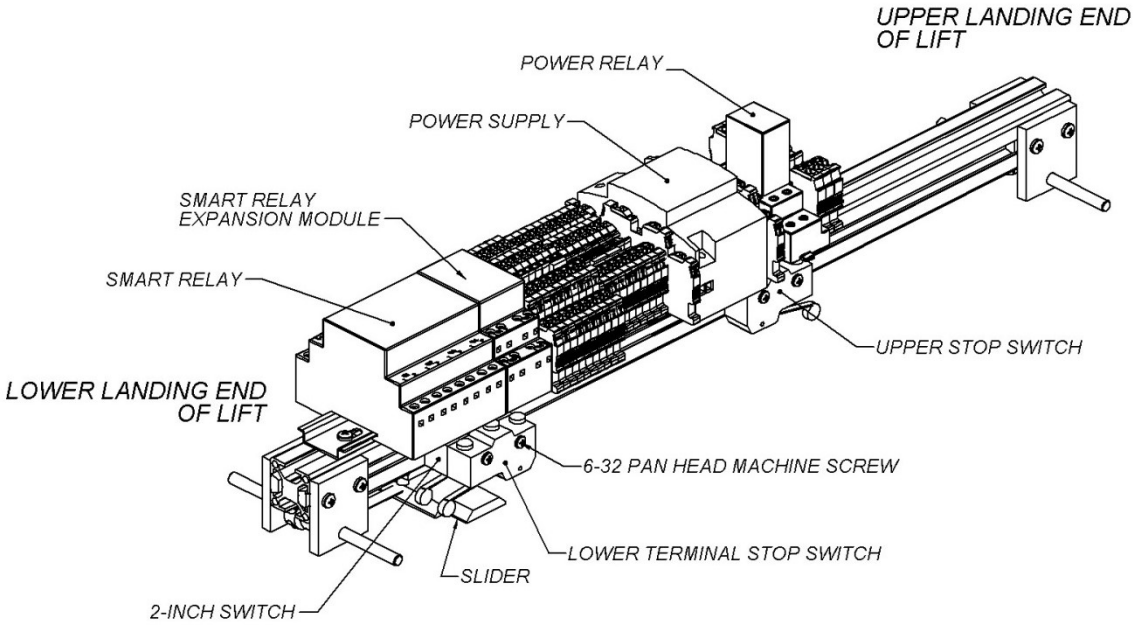


4.6 Upper Stop Mechanism

The upper stop mechanism can be accessed through the inner or outer left access panel, or through the top of the left-hand machinery cabinet. Refer to Section 4.3 in this manual for instructions on removing the top of the left-hand machinery cabinet.

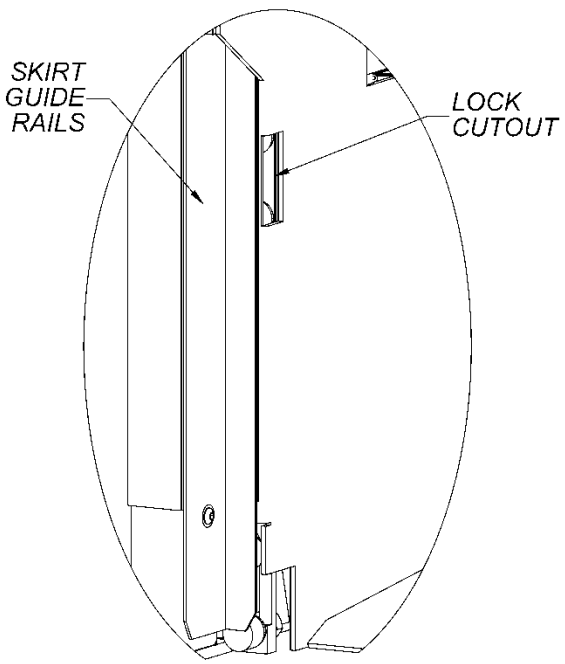
The lower terminal stop switch and two-inch switch are mounted side-by-side, with the same two screws. Both switches have wires connected to their normally open (NO) and common (COM) terminals. The lower terminal switch must be positioned so that the slider activates its roller just before the lift car arrives at the lower landing (within approximately 1/2” [13 mm]), and the two-inch switch must be positioned so that the slider activates its roller when the lift car is within 2" [50 mm] of the lower landing. In addition to shifting the position of the switches along the rail to achieve this, both switches have adjustment screws at the base of their roller levers.

The upper stop switch must be positioned so that the slider activates its roller when the lift car is at the upper landing. See the *Installation Guide* for instructions on positioning it correctly. The upper stop switch has wires connected to its normally closed (NC) and common (COM) terminals.

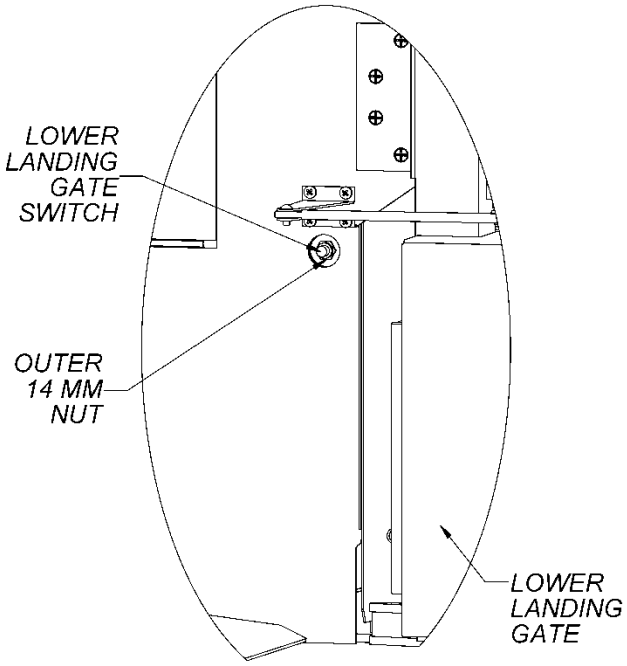


4.7 Lower Platform Gate Switch

The lower platform gate switch senses whether the lower platform gate is open or closed. The switch is located on the lift car at the hinge side of the gate, about 12" [305 mm] from the lift car 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 car 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 lift car moves off the ground. See the left-hand figure above for the location of the lock cutout.

If the lift car 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 lift car wall. (In this case, the lift car will not go higher than 2" [50 mm] off the ground.) If the lift car stops just after it begins to rise off the ground, then the switch may need to be extended further out of the lift car wall.

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

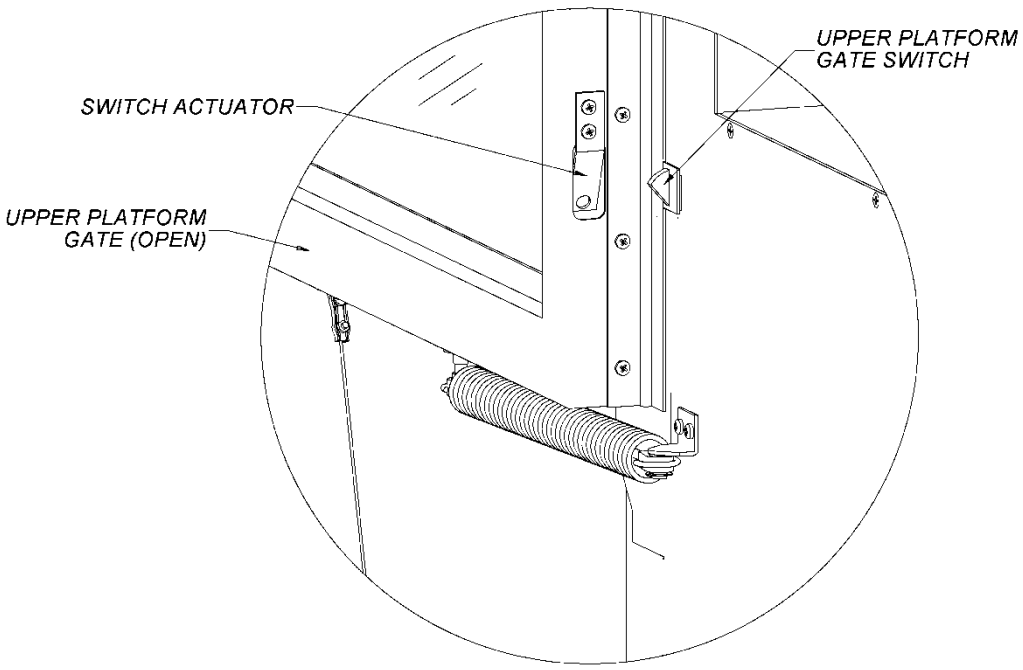
The switch is held in place by two (2) 14 mm nuts. To adjust the switch (i.e., to extend it or recess it), use a 14 mm wrench or socket to loosen the outer nut, move the inner nut as necessary, and then retighten the outer nut. To remove the switch, use a 14 mm wrench or socket to remove the outer nut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

4.8 Upper Platform Gate Switch

The upper platform gate switch senses whether the upper platform gate is open or closed. The switch is located on the lift car at the hinge side of the gate, about 12” [305 mm] from the lift car floor. Refer to the figure below. The switch is of the normally open (NO) type and can be tested with a standard multi-meter.

The upper platform gate switch is in correct adjustment if the lift car will operate only when the gate is closed. The gate is considered to be closed if the gate handle does not protrude beyond the back edge of the lift car. The switch itself cannot be adjusted; however, the switch actuator located on the gate can 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.

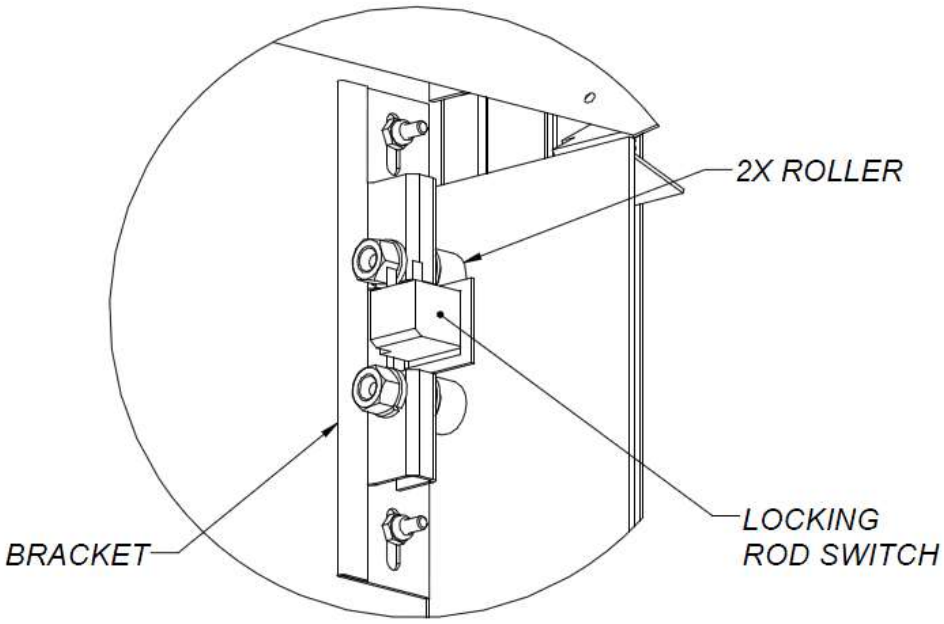
To remove the switch, remove the right-hand machinery cabinet cover (see Section 4.3). With the lift car at least 24" [610 mm] off the ground, depress the tab on the far side of the switch body and push the switch out of its mounting hole from inside the lift car wall.



4.9 Locking Rod Switch

The locking rod switch senses whether the lower platform gate has been locked by the locking rod; the locking rod must lock the gate before the lift car has moved 2" [50 mm] off the ground, or the lift car will stop. The switch is located in the front left corner of the lift car, behind the skirt. The switch is of the normally open (NO) type, and can be tested using a standard multi-meter.

To access the switch for testing or replacement, retract the upper left corner of the lift car skirt while the lift car is on the ground. See Section 4.4 for detailed instructions on retracting the skirt. To remove the switch, depress the switch tab on the lower side of the switch and pull the switch out of its cutout in the mounting bracket. Refer to the figure below for identification of components. Take care not to damage the locking rod switch while removing it.

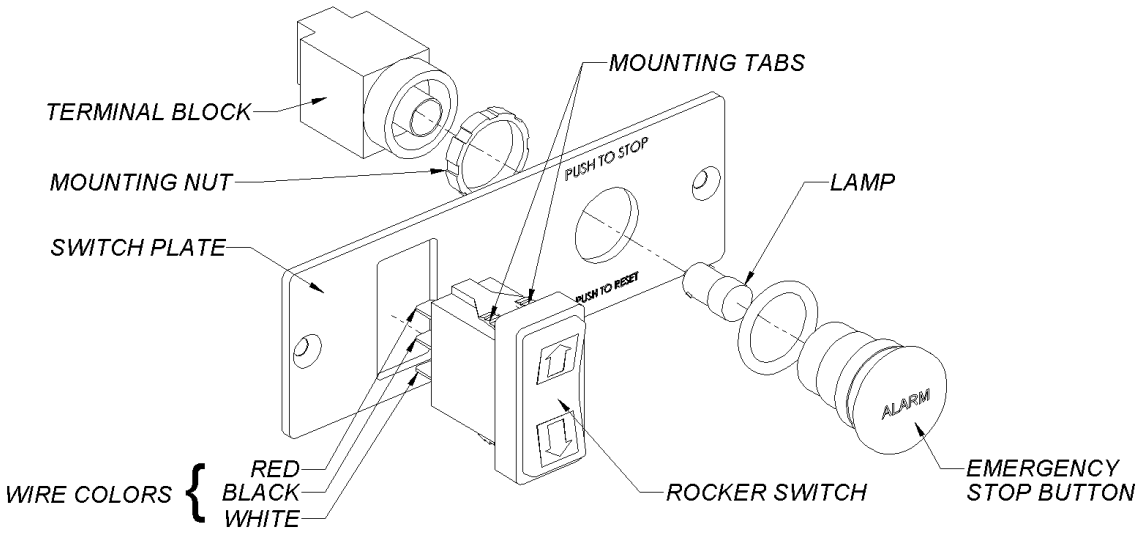


4.10 Operating Station

The operating station houses the UP/DOWN switch and the emergency stop button. To test or remove either of these switches, use a Phillips screwdriver to remove the two (2) screws that secure the switch plate to the lift car and pull the plate away from the lift car. A standard multi-meter can be used to test the switches.

To remove the rocker switch, depress the mounting tabs and push the switch out of its mounting cutout.

To remove the emergency stop button, use the release lever on the contact block to disengage the block from the back of the operator then pull it off. Remove the mounting nut to free the operator from the switch plate.

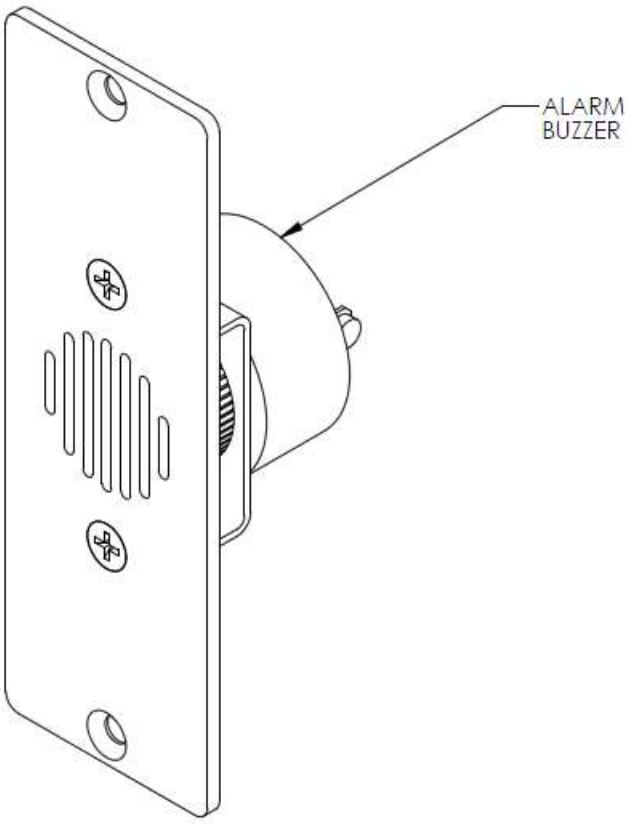


LIFT CAR OPERATING STATION SHOWN

4.11 Alarm

The lift is equipped with an audible alarm that sounds when the emergency stop button is pressed. To test, press the emergency stop button. Release 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 must be replaced. The battery is located on the control panel to the left of the power relay shown in the figure in section 4.6 (battery not shown in figure). Replace battery with style MN21, 23A/KE23A-1, or A23.

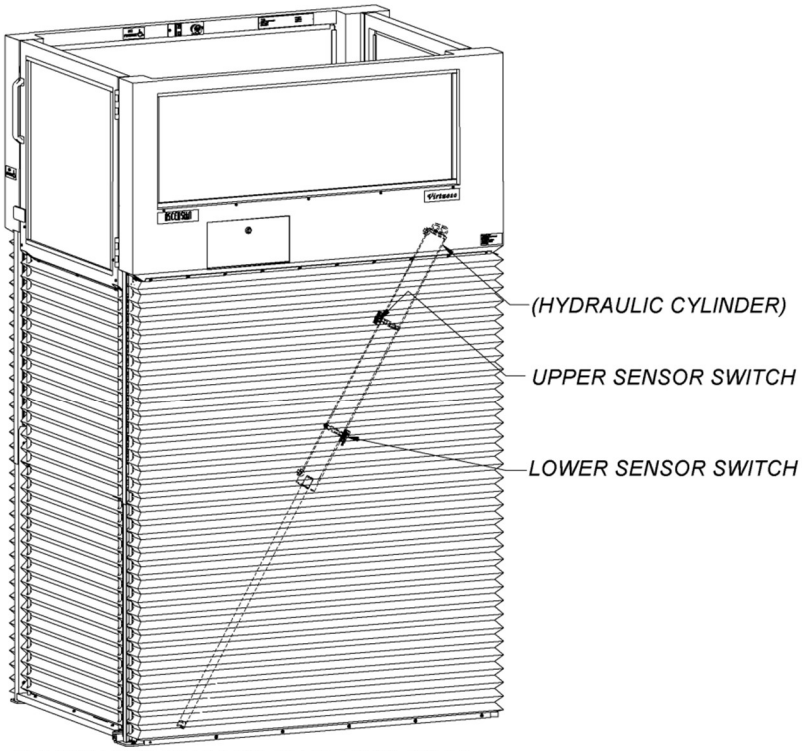


ALARM ASSEMBLY

4.12 Skirt Sensor System

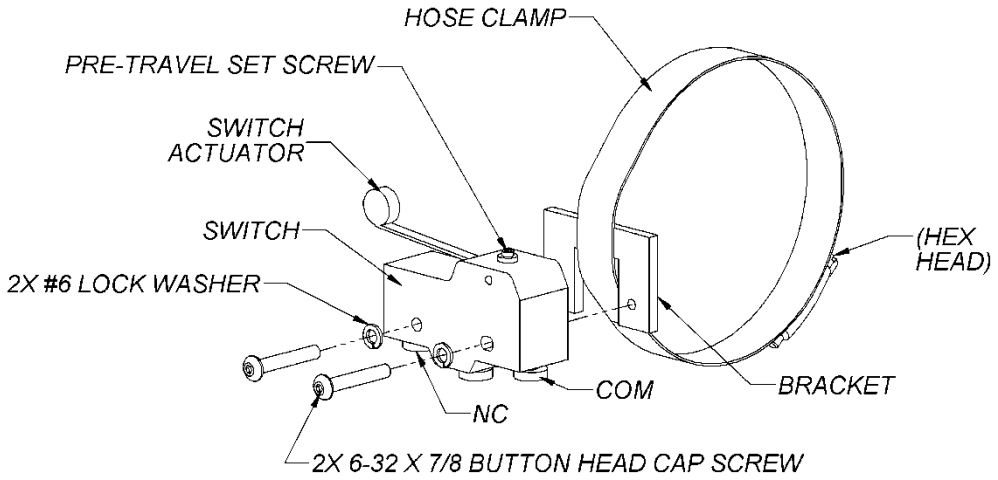
The skirt sensor system halts the motion of the lift car when an object or person pushes the safety skirt on the long sides of the lift inward more than 3" [76 mm]. One sensor assembly is located on each of the two hydraulic cylinders and consists of two extension springs that run the length of the hydraulic 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 lift car 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 lift car floor. *Be sure to turn off the lift's main disconnect at the control box and lock it in the "OFF" position before placing any body parts under the lift car floor.*
    - Open a machinery cabinet from the top as described in Section 4.3.

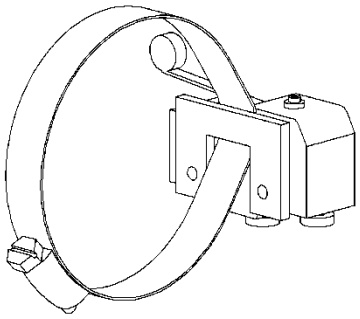


SENSOR SWITCH LOCATIONS, RIGHT SIDE

- 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 lift car 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 lift car as the lift car 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

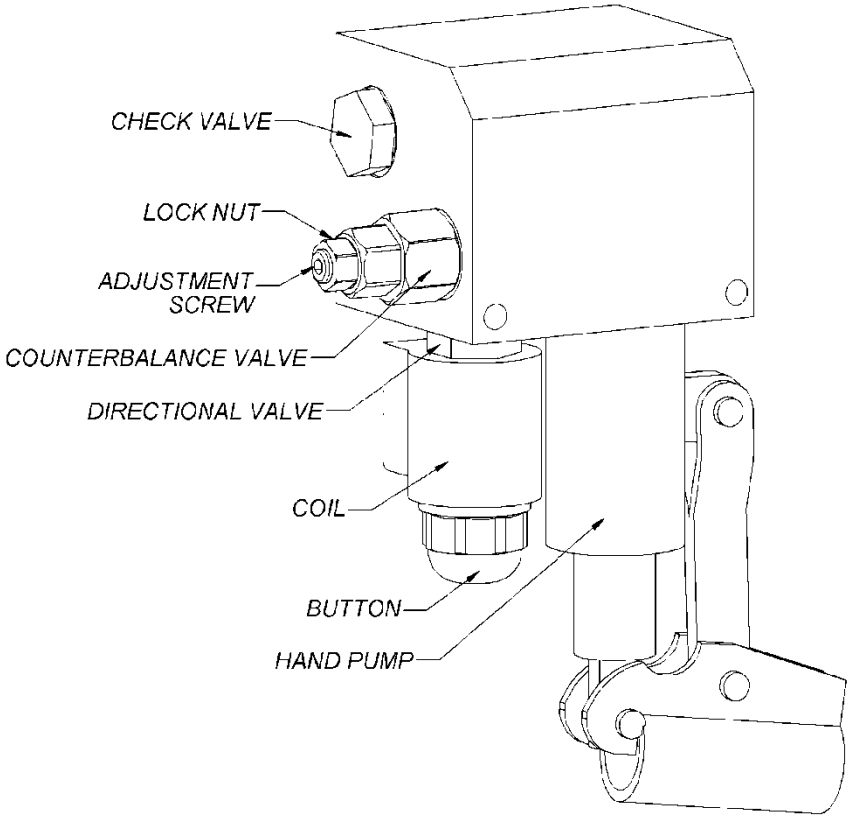
4.13 Hydraulic Valves

The hydraulic valves are located inside the right-hand machinery cabinet, and can be accessed through the outer access panel or through the top of the machinery cabinet. See Section 4.3 for instructions on opening the machinery cabinet from the top.

Refer to the following instructions for adjusting or removing any of the four components located in the manifold. It is recommended that you place paper towels below the component to be removed to catch the several ounces of hydraulic fluid that will drip from the manifold as the component is removed. Refer to the figure on the following page for component identification.

⚠ WARNING!

The lift car MUST be either at the lower landing or secured in place before the COUNTERBALANCE VALVE or CHECK VALVE is loosened or removed. Failure to do so could result in the lift car dropping and/or high pressure hydraulic oil leaks.



HYDRAULIC MANIFOLD WITH VALVES

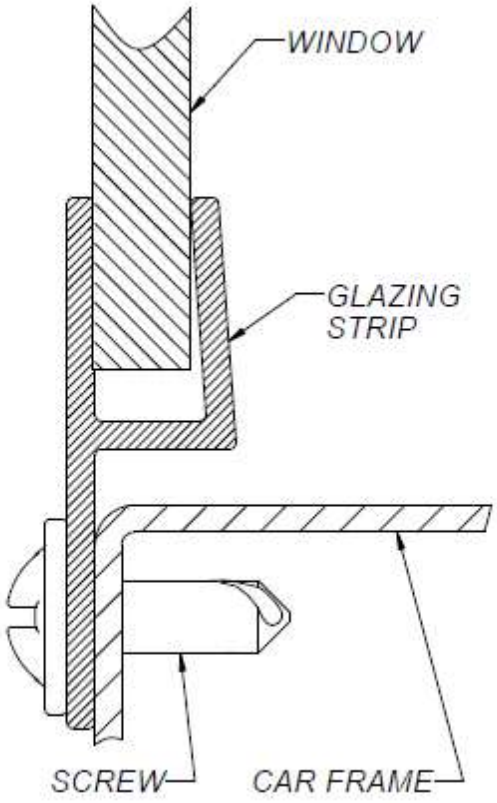
- Counterbalance Valve: If the lift car "bounces" as it descends while fully loaded, then the adjustment screw on this valve may need to be tightened. To do so, loosen the lock nut using a 1/2" wrench, turn the adjustment screw clockwise 1/4 turn using a 5/32" hex key, and then retighten the lock nut. Test and repeat as necessary until the "bouncing" has been eliminated. To remove this valve, use a 7/8" wrench. When reinstalling the counterbalance valve, torque it to 18.5-22.0 ft-lbs [13.6-16.2 N*m].
- Check Valve: 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].
- Directional Valve: This valve cannot be adjusted. This valve can be removed while the lift car is not at the lower landing provided that the counterbalance valve is working correctly. However, if the lift car starts to descend while you are turning this valve out of the manifold, immediately tighten the valve back into the manifold; the counterbalance valve is malfunctioning and must be replaced (with the lift car at the lower landing). Before removing this valve, pull the electrical harness connectors off of the coil terminals. Then remove the black button by turning it counterclockwise, and pull the coil off the valve. Finally, use a 7/8" wrench to remove the valve from the manifold. When reinstalling the directional 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 lift car is not at the lower landing provided that the counterbalance valve is working correctly. However, if the lift car 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 lift car 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].
- Main Shut-Off Valve: The main shut-off valve is a brass ball valve with a T-style handle, located at the top rear of the right outer machinery cabinet. To close the valve, turn the handle horizontal. To open, turn the handle vertical.

4.14 Windows

The windows on the lift 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.



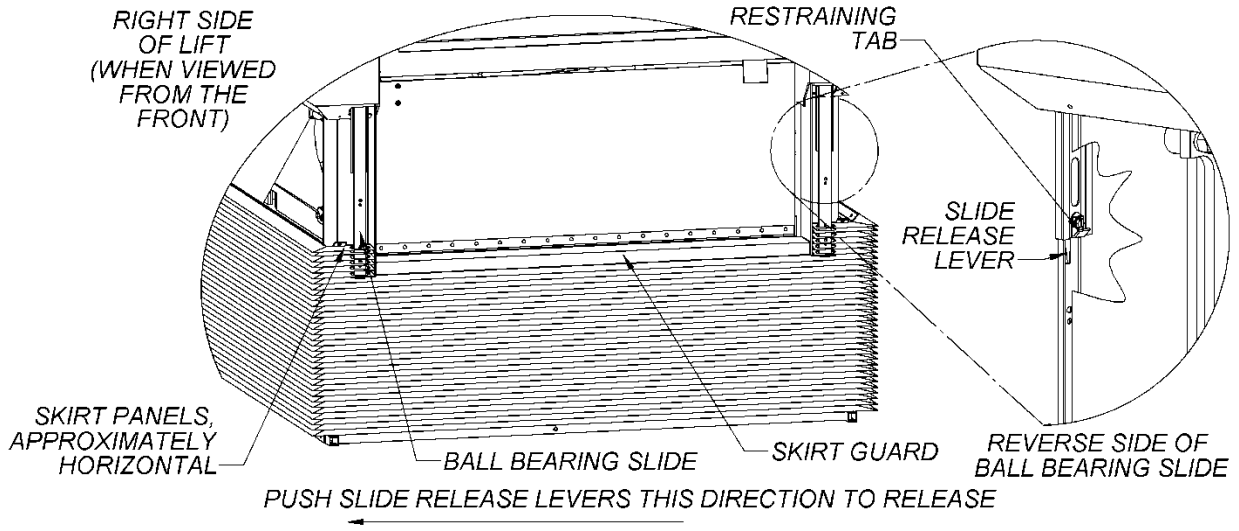
GLAZING SYSTEM CROSS SECTION

4.15 Skirt Guard

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

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

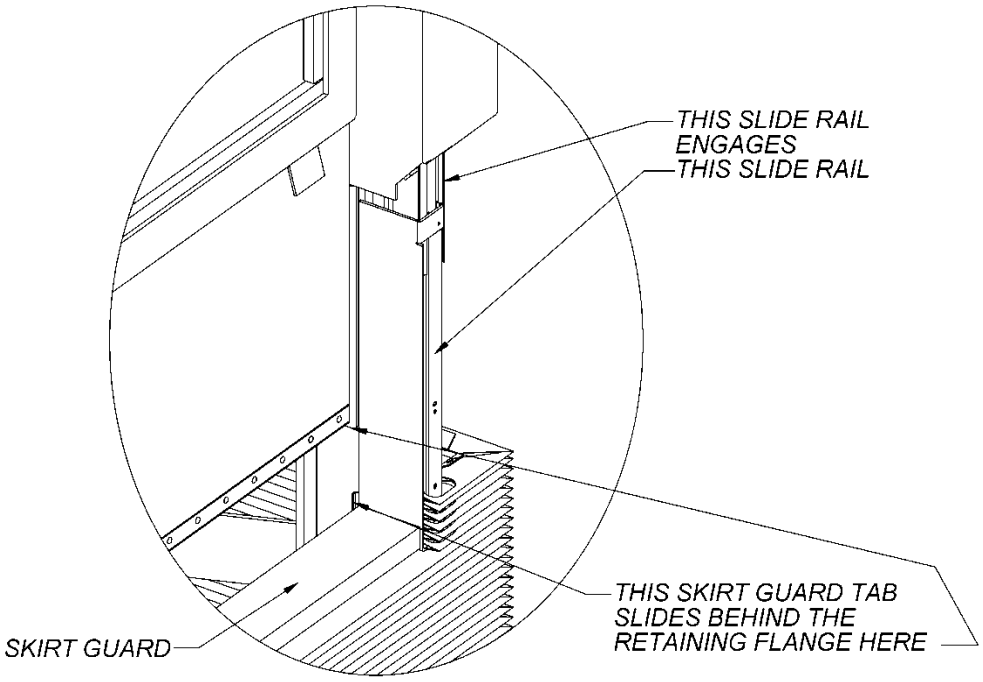
1. Move the lift car to the upper landing.
2. From inside the lift car, remove the lower portion of the upper platform gate (secured to the gate with five (5) pan head screws) and the bridge plate (secured to the skirt guard with four (4) flat head screws).
3. Detach the protective skirt from the long sides of the lift car by removing the ten (10) pan head screws on each side that secure the sides of the skirt to the lift car.
4. Use a 5/16" combination wrench to remove the two (2) hex head screws that secure the top of the skirt to the lift car 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.



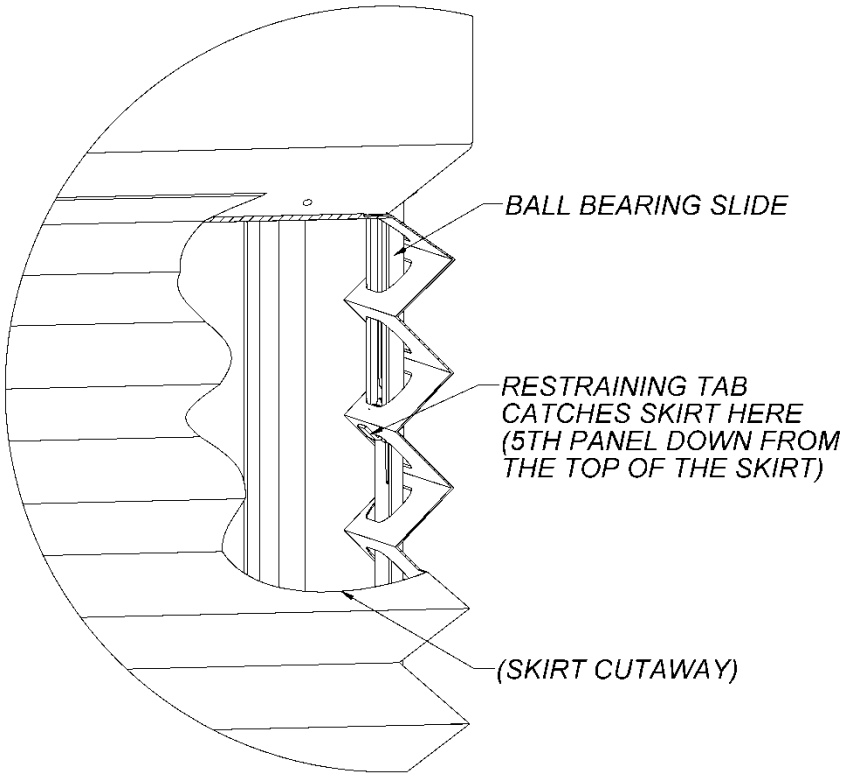
7. Push the ball bearing slide release levers as shown in the figure on the previous page and then pull downward on the skirt guard to separate it from the lift car.
8. Remove the three (3) hex head screws that secure the skirt to the skirt guard using a 5/16" wrench.
9. Use a 3/32 hex key to remove 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.

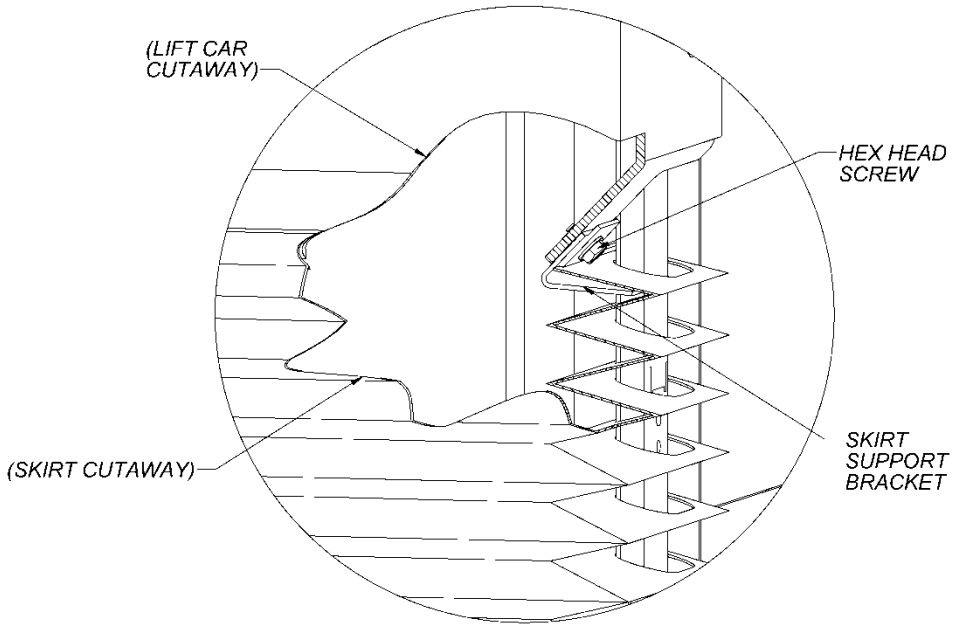
1. Thread the ball bearing slide rails through the skirt slots and the rectangular cutouts in the skirt guard and secure them in place using the two (2) 8-32 x 3/16 button head cap screws. The screws should be approximately centered in the horizontal slots in the ball bearing slide rails.
2. Use a 5/16" 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 lift car, so that the slide rails on the skirt guard line up with the slide rails on the lift car.
4. Move the skirt guard upward, while making sure that the skirt guard tabs slide behind the retaining flanges on the lift car, and that the slide rails on the skirt guard lock into the slide rails on the lift car. 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 car. If this 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 lift car.
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 5th panel down from the top of the skirt.



8. Use a Phillips screwdriver to reinstall two (2) or three (3) pan head screws on each side of the lift car to secure the top of the skirt loosely to the lift car.
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 lift car, one (1) at each corner. Be sure to install the skirt support brackets between the skirt and the lift car frame. See the figure below.



RIGHT REAR CORNER OF LIFT SHOWN

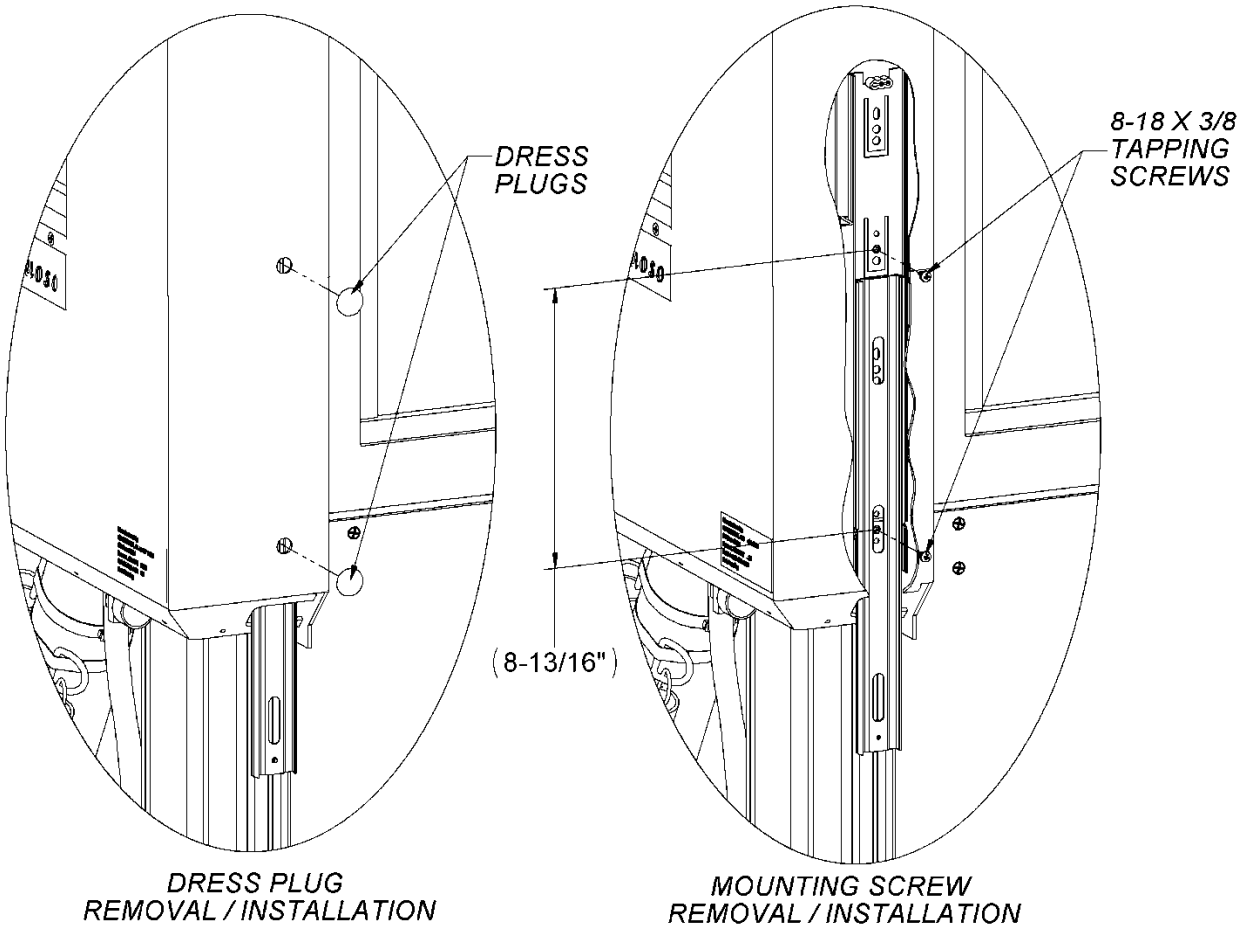
10. Use a Phillips screwdriver to reinstall the remainder of the ten (10) pan head screws that secure the sides of the skirt to the lift car.
11. Use a Phillips screwdriver to reinstall the bridge plate and the lower portion of the upper platform gate.

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

1. Complete steps 1-7 in the instructions above for removing the skirt guard from the lift car.
2. Use a blade or small standard screwdriver to pry the two (2) dress plugs out of the lift car 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 lift car 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 lift car frame so that it is clear which mounting holes are correct.

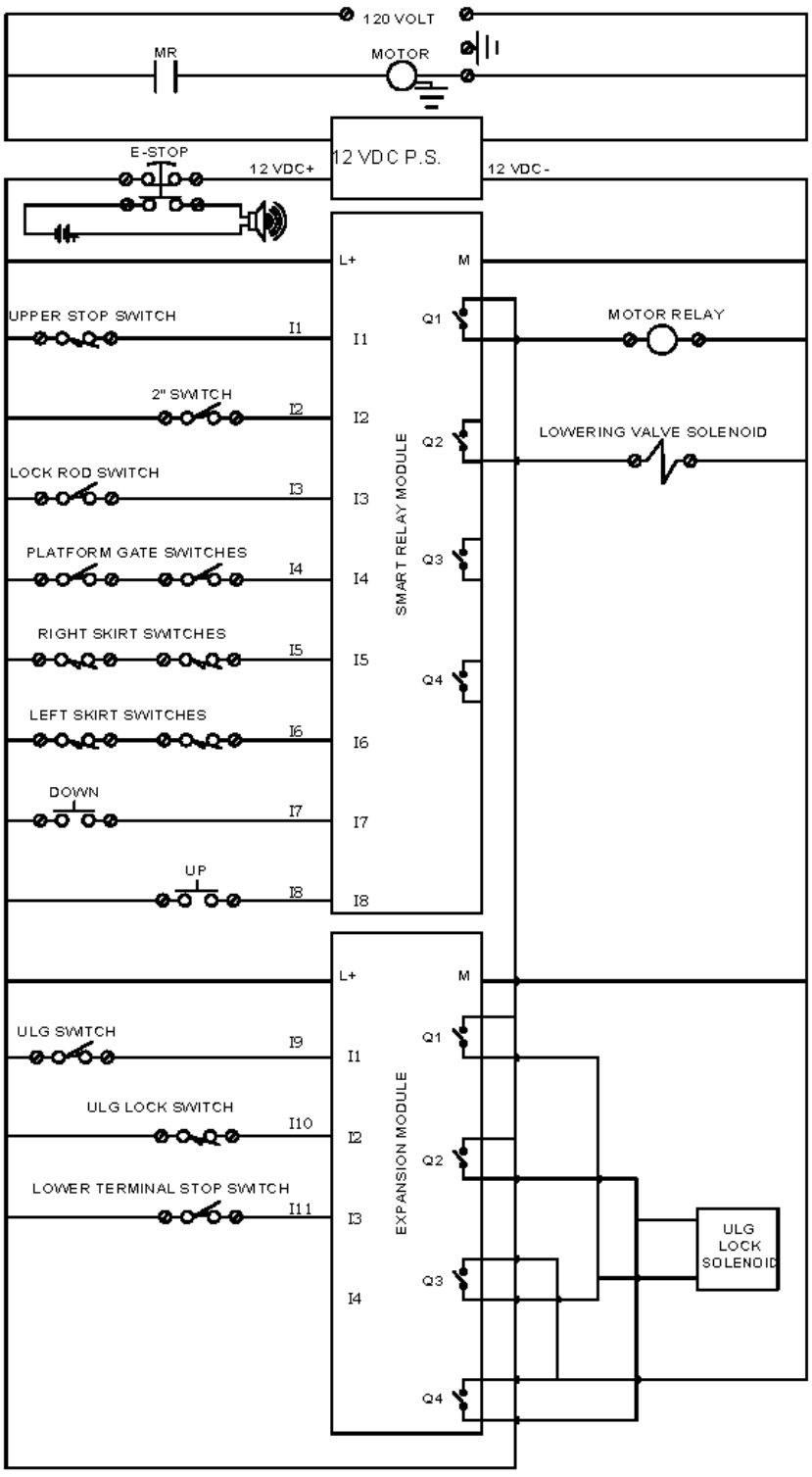


(UPPER LANDING END OF THE LIFT)

SECTION 5 Electrical Testing

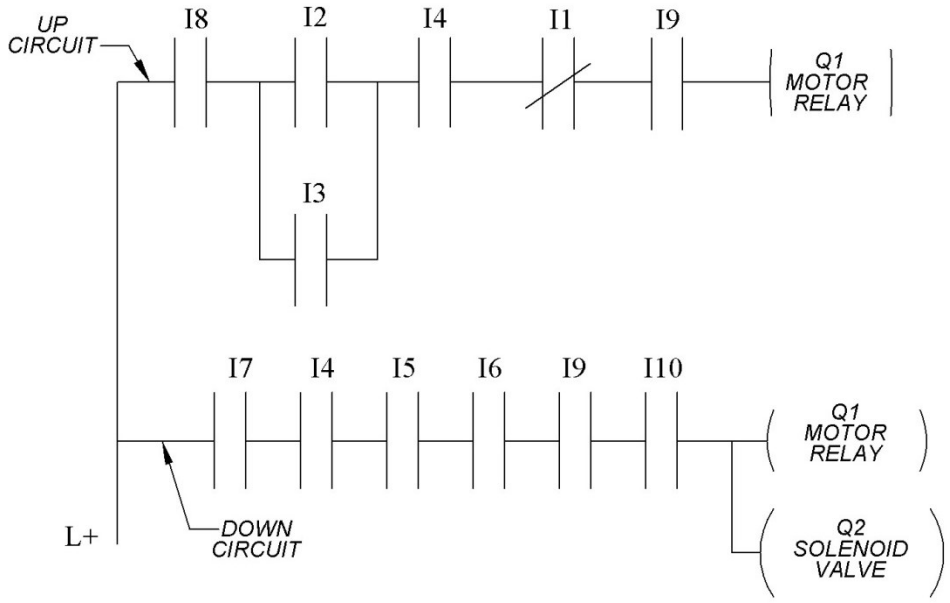
This section contains information that will enable a skilled and experienced electrician to service the lift. Logic diagrams for the lift are shown on the following pages. In addition to the schematics on the following two pages, you may need to refer to the detailed electrical schematic that was provided with the lift in order to service the lift.

> ⚠ ***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!***



Virtuoso Wiring Schematic

(Safety Under Pan option not shown. For models with Safety Under Pan, there are (16) NC switches in series with the Left Skirt switches.)



SMART RELAY LOGIC DIAGRAM

LEGEND:

Smart Relay Inputs
I1 Upper Stop Switch
I2 2-inch Switch
I3 Lower Platform Gate Interlock Switch
I4 Platform Gate Switches
I5 Left Skirt Safety Switches, and Safety Underpan Switches if equipped
I6 Right Skirt Safety Switches
I7 Down Circuit of Operating Switches
I8 Up Circuit of Operating Switches

Smart Relay Expansion Module Inputs
I9 Upper Landing Gate Switch (labeled I1 on the physical relay expansion module)
I10 Upper Landing Gate Interlock Switch (labeled I2 on the physical relay expansion module)
I11 Lower Terminal Stop Switch (not shown above, labeled I3 on the physical relay expansion module)

Notes:
1. 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 lift car to run up or down. For example, the diagram does not include the lower terminal stop switch because the lower terminal stop switch starts a timer to turn off the down circuit, but does not need to be maintained for the lift to run up or down.
2. The upper landing gate switch and upper landing gate interlock switch are bypassed if your lift installation does not include an upper landing gate.

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 in section 4.6 for identification of the major components on the control panel.

5.2 Testing the Switches

Each of the lift's switches can be tested by locating the switch, removing the switch from the lift if necessary, and checking for continuity across the contacts on the back of the switch. See the table below for information on the type of each switch and in which section of this manual to find information on accessing the switch.

Switch	Type	Section
Upper Stop Switch	SPDT, NC circuit used	4.6
Two-Inch Switch	SPDT, NO circuit used	4.6
Lower Terminal Stop Switch	SPDT, NO circuit used	4.6
Locking Rod Switch	SPST, NO	4.9
Lower Platform Gate Switch	SPDT, NO circuit used	4.7
Upper Platform Gate Switch	SPST, NO	4.8
Skirt Sensor Switch	SPDT, NC circuit used	4.12
Safety Underpan Switches, if equipped	SPST, NC	NA
Operating Switch	(Mom. On)-Off-(Mom. On)	4.10
Upper Landing Gate Switch, if equipped	SPDT, NO circuit used	NA
Upper Landing Gate Lock Switch Assembly, if equipped	SPDT, NC circuit used	NA
Emergency Stop Switch	Push-to-break	4.10
Pit Switch (California only)	Push-to-break	NA

Alternately, most of the lift's switches can be tested at the relay module, which operates on 12 VDC power. 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 continuity across the relay module's contacts as shown in the table below.

Component	Relay Module Contacts	Circuit is closed when:	Circuit is open when:
Upper Stop Switch	I1-L+	Switch is not engaged by upper stop mechanism (lift car is not at the upper landing)	Switch is engaged by upper stop mechanism (lift car is at the upper landing)
Two-Inch Switch	I2-L+	Lift car is less than 2" off the ground	Lift car is more than 2" off the
Locking Rod Switch	I3-L+	Upper locking rod is engaged (lift car is more than 2" off the ground)	Upper locking rod is disengaged (lift car is less than 2" off the ground or lower platform gate is open)
Platform Gate Switches	I4-L+	Both upper and lower platform gates are closed	One or both gates are open
Left Skirt Sensor Switches, and Safety Underpan Switches, if equipped	I5-L+	Safety skirt is relaxed, and Front and Rear underpans are relaxed	Safety skirt is pushed inward on left side of lift, and/or Front and/or Rear underpan is pushed up
Right Skirt Sensor Switches	I6-L+	Safety skirt is relaxed	Safety skirt is pushed inward on right side of lift
Operating Switch	I7-L+	Rocker is pushed down	Rocker is at rest or pushed down
	I8-L+	Rocker is pushed up	Rocker is at rest or pushed up
Upper Landing Gate Switch, if equipped	XI1-L+	Upper landing gate is closed	Upper landing gate is open
Upper Landing Gate Lock Switch Assembly, if equipped	XI2-L+	Upper landing gate is unlocked	Upper landing gate is locked
Lower Terminal Stop Switch	XI3-L+	Lift platform is less than 1/2" off the ground	Lift platform is more than 1/2" off the ground

5.3 Testing the Relay Module

The relay module (Smarty Relay) is located on the control panel. See Section 4.6.

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 logic diagram on page 38.

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 12 VDC. Refer to Section 5.4 to check it.
3. There has been a wiring harness or connector failure. See the Electrical Diagram on page 38 or the detailed electrical schematic that was included with the lift to continue troubleshooting.
4. The E-Stop is pushed in and the alarm is active. Press the E-Stop to deactivate alarm. Relay will restart in 6-8 seconds.

5.4 Testing the Power Supply

The power supply is located on the control panel. See Section 4.6. The AC power must be on to conduct the following tests.

If the green LED is illuminated, the unit is supplying 12VDC. If the LED is not illuminated, check to see that the AC supply is on. If AC power is being supplied, use a multi-meter to check for the voltage drop between a + and a – terminal on the power supply. The potential should be close to 12VDC.

To detach the power supply from the control panel, pull out on the orange tabs with a flat head screw driver. The power supply can then be removed from the DIN rail.

5.5 Testing the Power Relay

The power relay is located on the control panel. See Section 4.6.

The AC power must be on to perform the following tests.

Before testing the power relay, the following two conditions must be met:

1. The power relay must be receiving power. To verify this, check for a 120VAC† drop across the "9" and "5" contacts on the power relay if there is a black wire connected to contact "9", or across the "12" and "8" contacts on the power relay if there is a black wire connected to contact "12".
2. The relay module must be receiving power (see Section 5.3). If it is not, take the steps listed in Section 5.3 to restore power.

> ***⚠ CAUTION!***
> ***The following step may cause the lift car to rise.***

To test the power relay, connect a jumper from the "L+" contact on the relay module to the "13" contact on the power relay. If this causes the lift car to rise, then the power relay is functional. If it does not, then measure the voltage drop across the same power relay contacts indicated in step 1 above while jumping from the "L+" contact on the relay module to the "13" contact on the power relay. If the voltage drop does not go to approximately 0 VAC, then the power relay is not functioning correctly and needs to be replaced. If the voltage drop does go to approximately 0 VAC but the lift car does not move upward, then the motor or motor harness has a fault.

To replace the power relay, electrically isolate the lift according to the procedures in Section 4.2. Then, remove the “ice cube” style relay from its base. The replacement relay will only fit into the relay block in one orientation.

---

† 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.

Basic Troubleshooting Steps			
Problem	Possible Cause	Remedy	Section
Lift car will not elevate or lower when an operating switch is activated	Emergency Stop is depressed	Turn it clockwise to reset it	N/A
	Lift is not receiving power	Check building's supply line to lift	N/A
	Lower or upper gate is open	Close gate	N/A
	Lower platform gate switch is out of adjustment	Adjust the lower platform gate switch	4.7
	Upper platform gate switch is out of adjustment	Adjust the upper platform gate switch actuator	4.8
	Component failure	Electrical testing -- possible component replacement	5.2
	Upper landing gate switch is out of adjustment	Adjust the upper landing gate switch	N/A
Lift car will elevate but will not lower	Operating switch failure	Try alternate operating switch; replace switch if necessary	4.10
	Directional (solenoid) valve failure	Replace directional valve	4.13
	Relay module failure	Electrical testing -- possible component replacement	5.3
	Person or object is leaning against the safety skirt	Return the skirt to its normal (relaxed) position	N/A
	Skirt safety switch(es) is out of adjustment	Adjust the skirt sensor switch	4.12
	Upper landing gate lock is not engaged	Electrical testing – Check solenoid	N/A
	Upper landing gate lock switch failure	Electrical testing – Check switch assembly	N/A
	Safety underpan switch(es) and/or wiring is open	Electrical testing – check continuity	N/A

Basic Troubleshooting Steps			
Problem	Possible Cause	Remedy	Section
Lift car will not go more than 2" off the ground	Lower platform gate locking rod is not engaging	Adjust the upper lock rollers	N/A
	Locking rod switch failure	Test locking rod switch & replace if necessary	4.9
	Two-inch switch out of adjustment	Adjust two-inch switch	4.6
Lift car "coasts" downward over an extended period of time	Counterbalance valve malfunction	Replace counterbalance valve	4.13
Lift car does not stop automatically at the upper landing	Upper stop mechanism is not set correctly	Adjust upper stop mechanism	4.6
	Upper stop switch failure	Replace upper stop switch	4.6
Motor runs but lift car does not elevate	Hydraulic fluid level is low	Fill hydraulic fluid reservoir	N/A
	Main hydraulic shut-off closed	Open shut-off valve	4.13
	Break in hydraulic circuit	Repair break and fill hydraulic fluid reservoir	N/A
	Directional (solenoid) valve stuck open	Replace directional valve	4.13
	Lift car is overloaded	Reduce load on lift car until load is equal to or less than the rated load	N/A

Notes:

Notes:

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