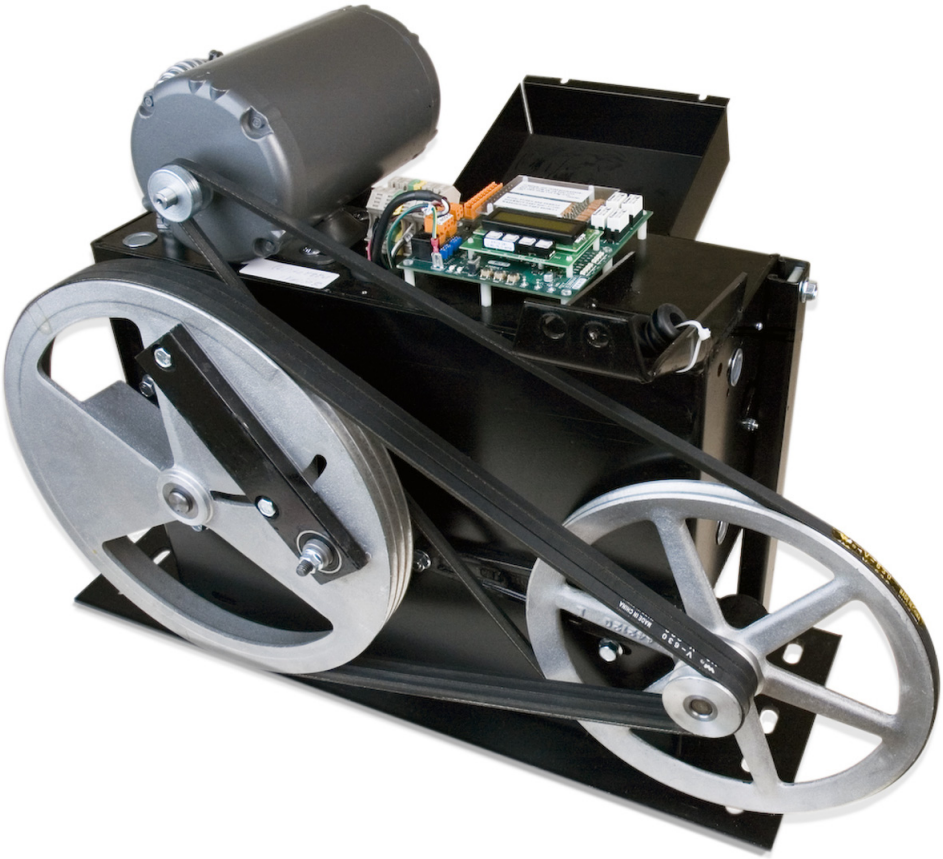
VERTICAL EXPRESS

HD-LM Door Operator



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Warning

The following procedures are intended for the use of qualified and authorized personnel only. In the interest of your personal safety and the safety of others, do NOT attempt any procedure that you are not qualified and authorized to perform.

The procedures in this manual must be accomplished in accordance with the applicable rules of the latest edition of the National Electrical Code; the latest edition of ASME A17.1; and any governing local codes.

Every attempt has been made to ensure that this manual is as accurate and up-to-date as possible. However, Vertical Express assumes no liability for consequences resulting from any error or omission.

Safety Precautions

IMPORTANT! **Read this page before any work is performed on elevator equipment. The procedures contained in this manual are intended for the use of qualified elevator personnel. In the interest of your personal safety and the safety of others, do not attempt any procedure that you are not qualified to perform.**

All procedures must be accomplished in accordance with the applicable rules in the latest edition of the National Electrical Code, the latest edition of ASME A17.1, and any governing local codes.

Terms in This Manual

CAUTION **CAUTION statements identify conditions that may result in damage to the equipment or other property if improper procedures are followed.**

WARNING **WARNING statements identify conditions that may result in personal injury if improper procedures are followed.**

General Safety

CAUTION **Before applying power to the controller, check all relays, contactors, fuse blocks, resistors, terminals on cards, and DIN rail terminals to ensure that the wiring connections installed by manufacturing are tight, because connections loosened during shipment may cause damage or intermittent operation.**

Other specific warnings and cautions are found where applicable and do not appear in this summary. See the *Elevator Industry Field Employees' Safety Handbook* for electrical equipment safety information on installation and service.

Electrical Safety

All wiring must be in accordance with the National Electrical Code and be consistent with all state and local codes.

Use the Proper Fuse

To avoid fire hazards, use only a fuse of the correct type, voltage, and current rating. See the job specific drawings sheet (Power Supplies) for fusing information.

Electric shocks can cause personal injury or loss of life. Circuit breakers, switches, and fuses may not disconnect all power to the equipment. Always refer to the wiring diagrams. Whether the AC supply is grounded or not, high voltage will be present at many points.

Electrical Safety
(continued)

Printed Circuit Cards

Printed circuit boards may be damaged if removed or installed in the circuit while applying power. Before installation and/or removing printed circuit boards, secure all power.

Always store and ship printed circuit cards in separate static bags.

Mainline Disconnect

Unless otherwise directed, always Turn OFF, Lock, and Tag out the mainline disconnect to remove power from elevator equipment. Before proceeding, confirm that the equipment is de-energized with a volt meter.

Test Equipment Safety

Always refer to manufacturers' instruction book for proper test equipment operation and adjustments.

Buzzer-type continuity testers can damage electronic components. Connection of devices such as voltmeters on certain low level analog circuits may degrade electronic system performance. Always use a voltmeter with a minimum impedance of 1M Ohm/Volt. A digital voltmeter is recommended.

When Power Is On

To avoid personal injury, do not touch exposed electrical connections or components while power is ON.

Mechanical Safety

See the *Elevator Industry Field Employees' Safety Handbook* for mechanical equipment safety information on installation and service.

Static Protection Guidelines

IMPORTANT! **Read this page before working with electronic circuit boards.**

Elevator control systems use a number of electronic cards to control various functions of the elevator. These cards have components that are extremely sensitive to static electricity and are susceptible to damage by static discharge.

Immediate and long-term operation of an electronic-based system depends upon the proper handling and shipping of its cards. For this reason, manufacturing bases warranty decisions on the guidelines below.

Handling

- Cards shipped from manufacturing in separate static bags must remain in the bags until time for installation.
- Anti-static protection devices, such as wrist straps with ground wire, are required when handling circuit boards.
- Cards must not be placed on any surface without adequate static protection.
- Only handle circuit cards by their edges, and only after discharging personal static electricity to a grounding source. Do NOT touch the components or traces on the circuit card.
- Extra care must be taken when handling individual, discrete components such as EPROMS (which do not have circuit card traces and components for suppression).

Shipping

- Complete the included board discrepancy sheet.
- Any card returned to manufacturing must be packaged in a static bag designed for the card.
- Any card returned to manufacturing must be packaged in a shipping carton designed for the card.
- “Peanuts” and styrofoam are unacceptable packing materials.

Failure to adhere to the above guidelines will VOID the card warranty!

Arrival of Equipment

Receiving

Upon arrival of the equipment, inspect it for damage. Promptly report all visible damage to the carrier. All shipping damage claims must be filed with the carrier.

Storing

During storage in a warehouse or on the elevator job site, precautions should be taken to protect the equipment from dust, dirt, moisture, and temperature extremes.

Access and Egress Procedures

The Access and Egress Procedures that are used entering the hoistway determine whether or not power is needed to perform the required task(s). If not, Turn OFF, Lock, and Tag out the mainline disconnect.

WARNING

DO NOT stand on the car top emergency access cover, it may not be able to hold total body weight.

Car Top Safety

Safety precautions when accessing/egressing car tops:

- Prior to opening the hoistway door, ensure that the correct hoistway has been selected and that the car is at the proper floor (to avoid a fall hazard).

NOTE

Access car tops from the top terminal landing whenever possible.

- Never access a hoistway, unless a reliable method of controlling the car has been determined.
- Locate the emergency stop switch.
- Before accessing the car top, place the stop switch in the STOP position, and confirm the proper operation.
- Locate a safe refuge area.
- Always maintain control of the hoistways doors during access/egress.
- Fall protection is to be used when a fall hazard exists. The only exception to this is when routine maintenance is being performed on top of complete, operational elevator cars, Do Not use fall protection where there is a greater risk of entanglement.
- When opening hoistway doors from the car top, do so slowly, so that no one steps in from the landing thinking a car has arrived.
- Observe overhead clearances.
- Use extra care when working on car tops that are curved, domed, or located in unenclosed hoistways.
- When egressing the hoistway/car top, ensure that the stop switch is in the STOP position, and that the inspection switch is on Inspection Operation.

WARNING

DO NOT turn these switches to Automatic Operation until the hoistway door interlock is open – and remains open – and the hoistway is empty.

Access and Egress Procedures
(continued)

Pit Safety

Before entering a pit, ensure that every employee is aware of the hazards. Some common hazards are:

- Recognized refuge space
- Inadequate lighting
- Improper access
- Tripping hazards
- Improper use of pit ladders
- Moisture/water/fluid
- Moving equipment

Before entering a pit, take appropriate steps to minimize the following hazards and any others that are identified:

- Locate the position and counterweights of the car being accessed, as well as any other cars/counterweights in the vicinity.
- Obtain control of the car.
- Identify a refuge space.
- If movement of the elevator is not needed to complete the work being performed, Turn OFF, Lock, and Tag out procedures are required.
- If notified by the building owner or representative that the pit and/or hoistway has been classified as a Permit Required Confined Space (this notification could be verbal or the pit/hoistway may be labeled), contact the appropriate person for authorization. In either case, DO NOT enter the pit/hoistway until you receive authorization.

Safety precautions when working in pits:

- Before entering the pit, test and verify the door lock circuit and stop switch circuit.
- Ensure that all portable lights and tools are connected through a ground fault (GFCI).
- Take care to protect all lighting from damage.
- DO NOT work in a pit with standing water.
- Before climbing, always examine shoes for fluid/grease.
- Use both hands when working with ladders and when accessing/egressing the pit.
- Be aware of moving equipment (e.g., pump, motors, belts, and sheaves), and ensure that clothing and hands can't get caught in them.
- Avoid smoking, or the use of open flames in the pit.

Mechanical Installation

Single-Drive Arm Door Operation

Single-Speed/Two-Speed/Center-Opening Doors

Dual-Drive Arm Installation begins on page 18.

1. Remove the door operator from the shipping carton and crate. Locate and store the bag of parts.
2. To remove the cover from the rear of the operator, loosen the two top screws and the two lower rear screws.
3. Inspect the wiring. Verify all connections are secure.
4. Loosen the bolts holding the mechanical stops. See Figure 1.

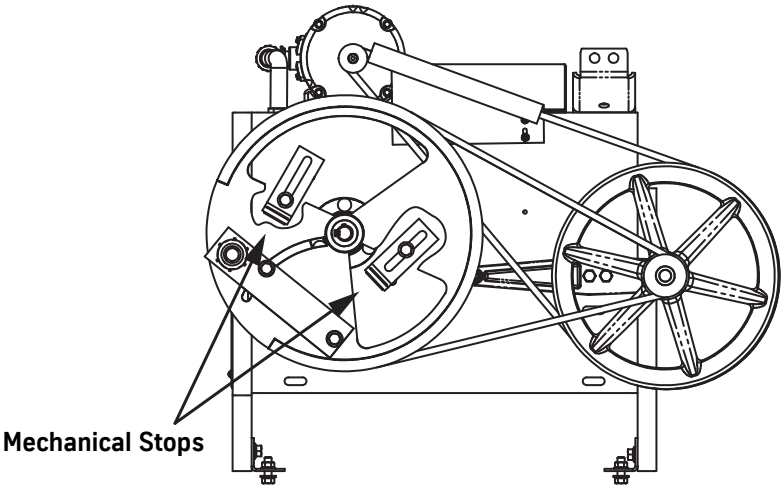


Figure 1 - Drive Sheave Mechanical Stops

Measure V Belt Tension

Three V Belts

These are located between the drive sheave and the small sheave on the jack sheave.

1. Place a V belt tension gauge in the center of the belt span between the drive sheave and the small sheave on the jack sheave.
2. Measure for an acceptable belt deflection (tension) of 0.020–0.024 at 7.5–8.5 pounds of deflection. If the amount of deflection is not within this range:
   a. Loosen the three bolts on the idler arm and the lock nut on the adjustment screw. See Figure 2 on page 10.
   b. Turn the adjustment screw to attain the correct measurement.
   c. When the V belts are correctly tensioned, securely tighten the idler arm bolts and the lock nut on the adjustment screw.

Measure V Belt Tension

(continued)

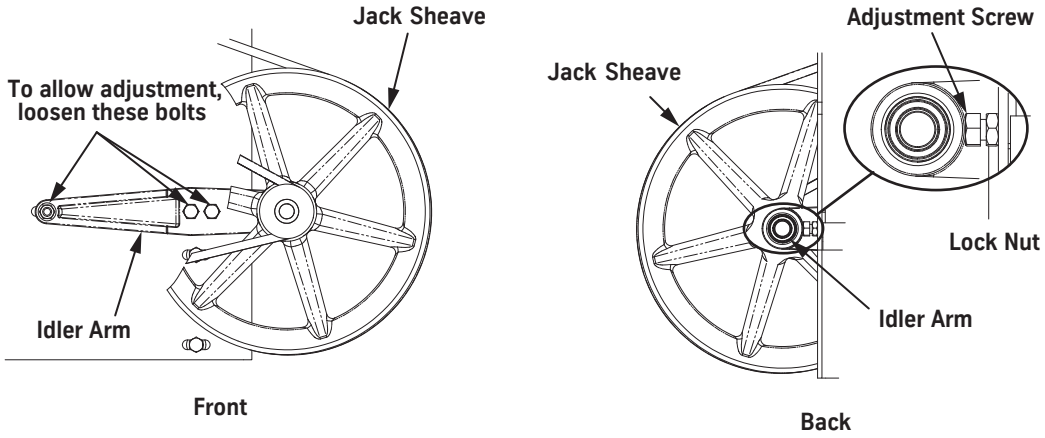


Figure 2 - V Belt Adjustment

Single V Belt

These are located between the motor sheave and jack shaft sheave.

1. Place a V belt tension gauge in the center of the belt span between the jack sheave and the motor sheave.

2. Measure for an acceptable belt deflection (tension) of 0.020–0.024 at 7.5–8.5 pounds of deflection.

NOTE While changing the motor position to attain the proper belt tension, the alignment of the motor sheave and the jack sheave must be maintained to avoid excessive belt wear.

If the amount of deflection is not within this range:

a. Loosen the bolts securing the motor to the door operator cabinet.

b. Reposition the motor to achieve an acceptable belt tension between the belt on the motor and the jack sheave.

c. Maintain the alignment between the sheaves and belt, and tighten the bolts securing the motor to the door operator cabinet.

3. After 24 hours of initial operation, adjust the belt deflection (tension) to 0.020–0.024 at 5.5–7.5 pounds of deflection.

Door Operator Installation

Door Operator Base (Header by Others)

1. Position the car to allow access to the car top during the installation process.
2. Turn OFF, Lock, and Tag out the mainline disconnect.
3. Use the supplied drilling template as a reference to mount the door operator base on the car top. See Figure 3 on page 12.
4. Lift the door operator to the car top.
5. Remove the rear support clips from the door operator's rear support struts. Retain the unistrut nut and one screw, and discard the rest.
6. Match four slots in the door operator frame to four holes in the door operator base, and install a hex head screw, a flat washer, a lock washer, and a hex nut in each of the four openings.
7. Use the unistrut nut and one screw to loosely attach the rear support struts to the clips on the door operator base.
8. Tilt the door operator backward or forward to plumb the face of the drive wheel, and then tighten the hardware on each rear support.
9. Attach the drive arm to the right-hand hole of the drive arm support (as viewed from the front of the operator).
10. Check the drive arm for plumb, and then attach the connecting arm to the elevator door.

NOTE Use no more than three $^{3}/_{8}$" flat washers for spacing.

11. Place the doors in the fully open position.
12. Loosen the hardware holding the door operator base to the car top, and move the door operator until the drive arm is as straight as possible.
13. Tighten the hardware holding the door operator base to the car top.

Door Operator Installation
(continued)

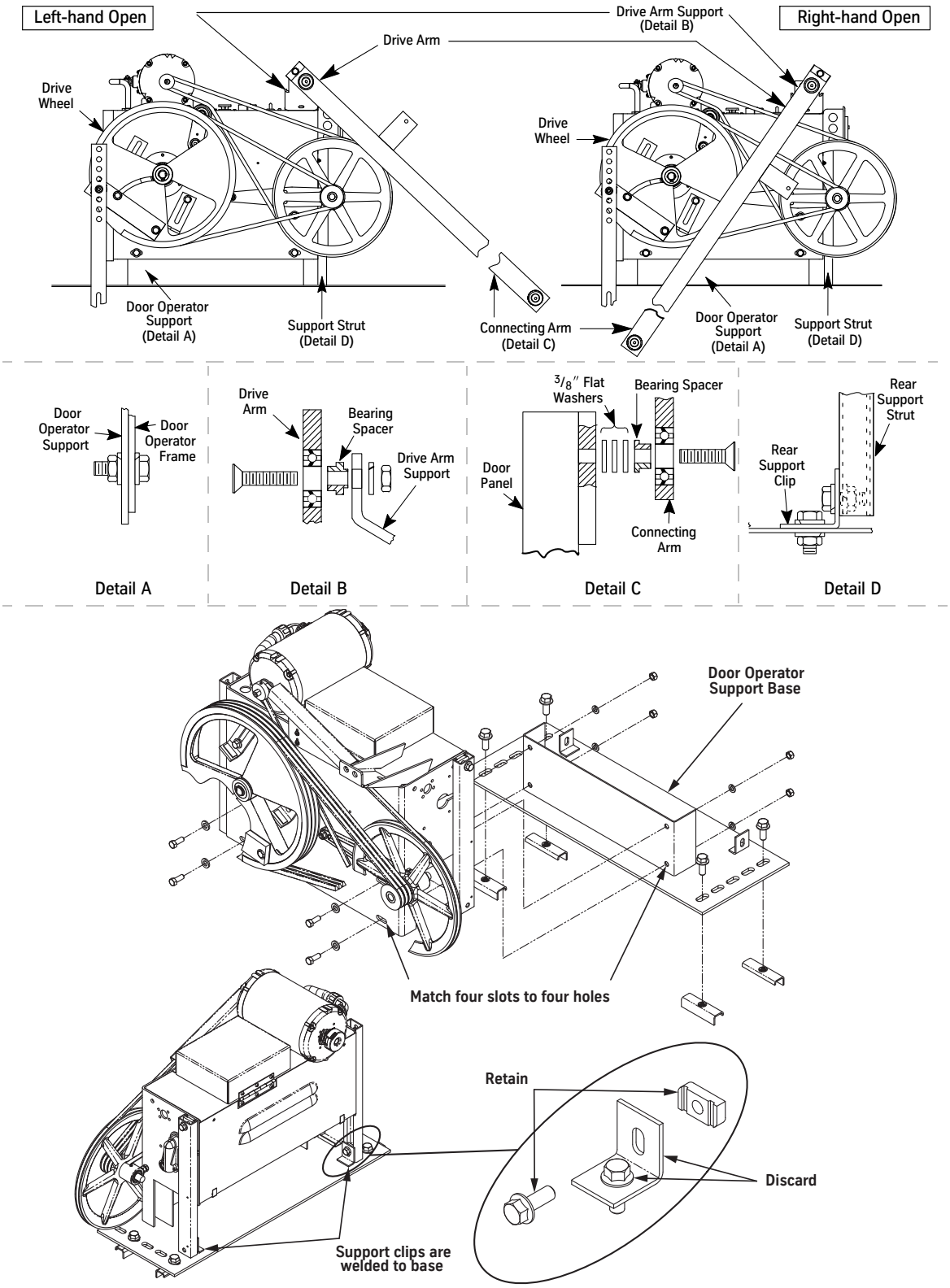


Figure 3 - Door Operator Mounted on the Door Operator Base

Door Operator Installation
(continued)

Door Operator Rear Foot (TKE Header)

See Figure 4 on page 14 for all steps in this procedure.

1. Remove the two screws (located just behind the door operator support) holding the car top to the header and one screw from each side of the support for a total of four screws.
2. Align the door operator rear foot mount to the approximate center of the door operator support, and install and hand tighten the screws removed in step 1.
3. Mount the door operator on the door operator support.
4. Remove the flange screw and flange nut from the bottom side of both support clips.
5. On the left side of the operator (opposite the door motor), remove the support clip and place it on the outside of the strut with the hole turned down.
6. Insert the flange screw through the slot and the hole in the support strut, then into the clamp nut, and hand tighten.
7. On each end of the operator, loosen the two retaining screws that hold the support struts in place.
8. On the right side of the operator, loosen both the front and back struts.
9. Adjust the support strut so that the support clips sit flat on the rear foot mount. Snugly tighten the two retaining screws.
10. Adjust the rear foot mount until the two support clips align with the slots in the rear foot mount.

Adjust the door operator on the door operator support if further adjustment is needed.

11. Install the remaining fasteners from step 4 into the support clips.
12. Tighten all fasteners holding the support clips to the support struts and the rear foot mount.
13. Tighten the screws holding the rear foot mount to the car top and header.
14. Plumb the door operator, and tighten the strut retaining screws.
15. Verify that all fasteners are secure.

Door Operator Installation
(continued)

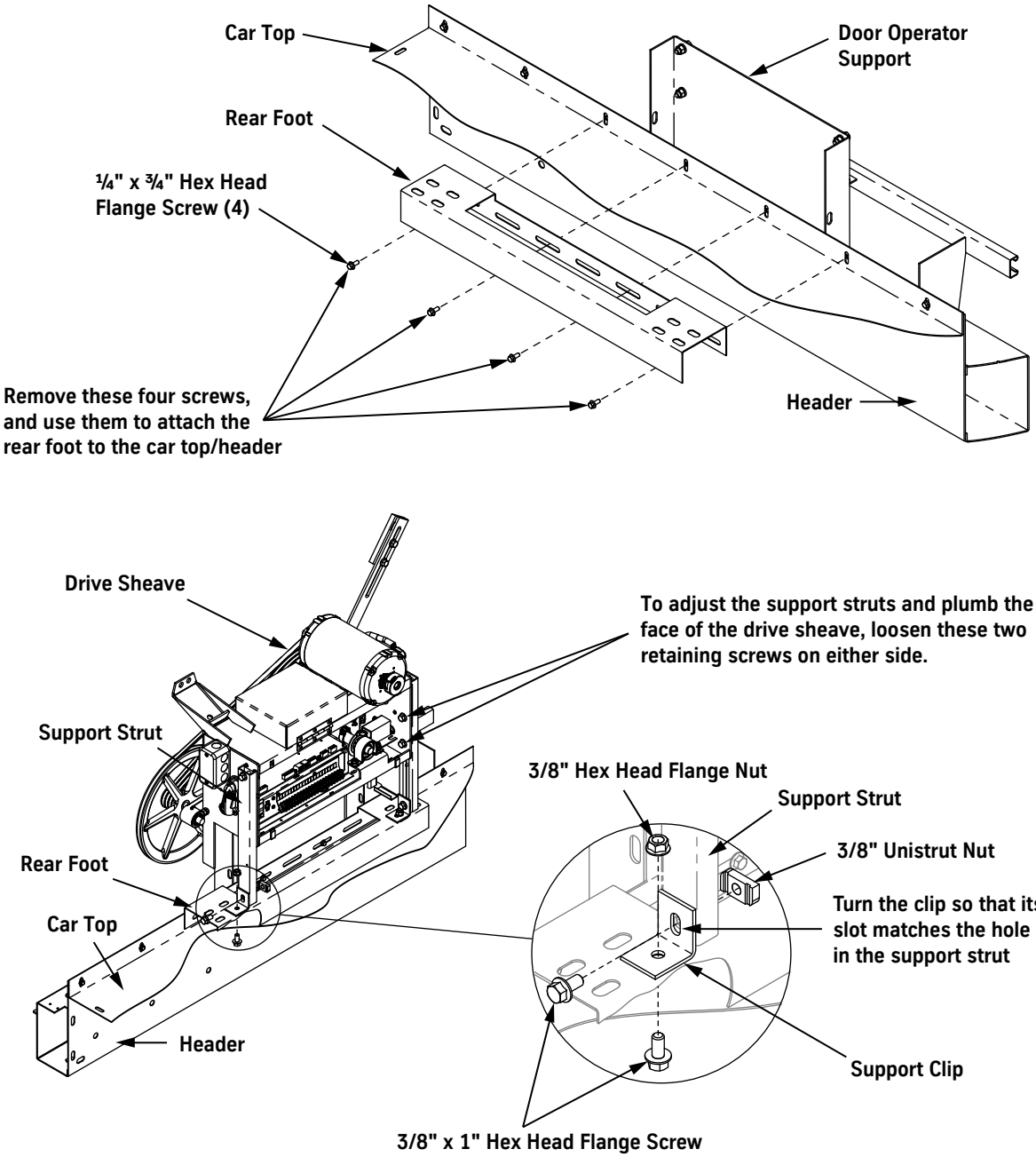


Figure 4 - Door Operator Mounted on the Rear Foot Mounting

Set the Stroke

See Figure 5 for all steps in this procedure.

- Fully Open Door Position - The point where the doors are flush with or slightly recessed behind the return column.
- Fully Closed Door Position - The point where the leading edge of the door contacts the door jamb or, in the case of center-opening doors, the point where the two leading edges of the doors contact.

1. Place the doors in the fully open position.
2. Measure the distance from point **B** to point **C,** and record this measurement as Door Open (DO).
3. Place the doors in the fully closed position.
4. Measure the distance from point **B** to point **C,** and record this measurement as Door Closed (DC).
5. Use the following formula to calculate the stroke:

$$\text{STROKE} = \frac{\text{DO - DC}}{2} + {}^{1}/_{8}"$$

6. Loosen the two cap screws in the adjustable arm.
7. Move the adjustable arm in the circular slot of the drive wheel so that the distance from point **A** to point **B** is equal to the calculated stroke length.
8. Tighten the two cap screws in the adjustable arm.

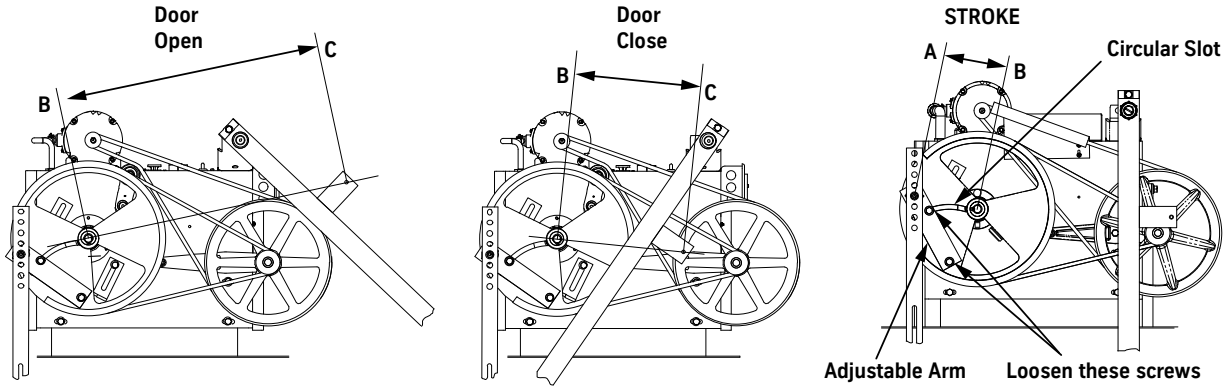


Figure 5 - Calculate the Door Operator Stroke

Adjust the Drive Arms

See Figure 6 on page 17 for all steps in this procedure.

1. Place the doors in the fully open position.
2. Slide the pivot arm to the end of the slot in the intermediate arm so that the hole in the bearing is exposed.
3. Use a $^{3}/_{8}$" flathead socket cap screw to attach the pivot arm to the intermediate arm through the bearing and a bearing spacer.
4. Verify the following:
   - The spacer plate is between the two arms.
   - The bearing spacer is installed.
   - The doors are in the fully open position.
5. With the doors in the fully open position, rotate the drive wheel until **A**, **B**, and **C** are in a straight line.
6. Tighten the two cap screws attaching the pivot arm to the intermediate arm.
7. Use a pencil to trace a line along both sides of the adjustable arm on the drive wheel. This will be the reference mark in the event that the stroke requires further adjustment.
8. Move the doors to the fully closed position.

If the doors will not fully close, loosen the two cap screws in the drive wheel adjustable arm, and move the arm toward the outside of the drive wheel in small increments of $^{1}/_{8}$" until the doors close.

9. Measure the distance from the top of the intermediate arm to the center of the drive wheel. The correct distance for this measurement is $^{1}/_{2}$"–$1^{1}/_{2}$". If the measurement is:
   - Correct: Securely tighten the cap screws in the adjustable arm and the cap screws connecting the intermediate arm to the pivot arm.
   - Less than $^{1}/_{2}$": Loosen the two cap screws in the adjustable arm. Reposition the arm toward the outside of the drive wheel, and tighten the two cap screws.
   - More than $1^{1}/_{2}$": Loosen the two cap screws in the adjustable arm. Reposition toward the center of the drive wheel, and tighten the two cap screws.
10. Verify the doors can be opened from the inside per local code. The smaller this diameter, the more difficult it will be to manually pull the elevator doors open.
    a. Move the doors to the fully open position, and check the alignment of the connecting arm and points **A**, **B**, and **C**.
    b. Move the doors to the fully closed position, and measure the distance from the top of the intermediate arm to the center of the drive wheel.
    c. If these measurements are incorrect, repeat the adjustment of the arm until the correct operation and measurement is obtained.
11. After the stroke is adjusted, verify the two cap screws in the adjustable arm and the two cap screws holding the pivot arm to the intermediate arm are securely tightened.

Adjust the Drive Arms
(continued)

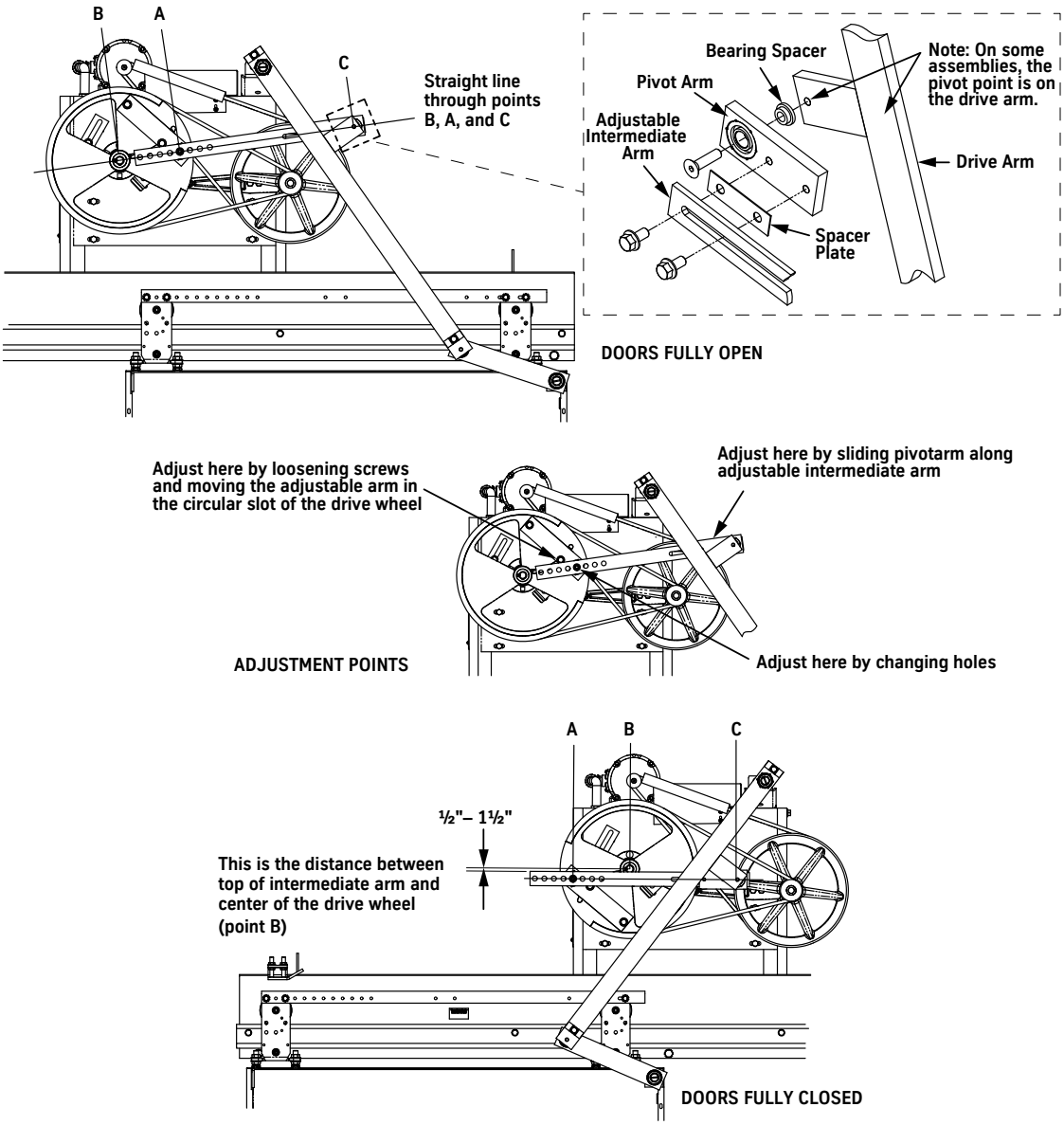


Figure 6 - Adjust the Drive Arms

Set the Mechanical Stops

1. Move the doors to the fully open position.
2. Position the open mechanical stop $^{1}/_{8}$" from the inside surface of the drive wheel, and tighten the bolt securely.
3. Move the doors to the fully closed position.
4. Position the closed mechanical stop $^{1}/_{8}$" from the inside surface of the drive wheel, and tighten the bolt securely.

Dual-Drive Arm Door Operation

Center-Opening Doors Only

1. Remove the door operator from the shipping carton and crate. Locate and store the bag of parts.
2. To remove the cover from the rear of the operator, loosen the two top screws and the two lower rear screws.
3. Inspect the wiring. Verify all connections are secure.
4. Loosen the bolts holding the mechanical stops. See Figure 7.

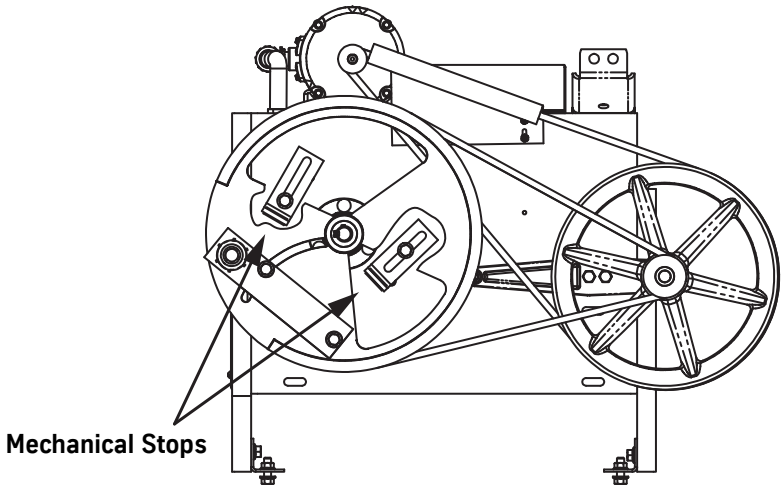


Figure 7 - Drive Sheave Mechanical Stops

Measure V Belt Tension

Three V Belts These are located between the drive sheave and the small sheave on the jack sheave.

1. Place a V belt tension gauge in the center of the belt span between the drive sheave and the small sheave on the jack sheave.
2. Measure for an acceptable belt deflection (tension) of 0.020–0.024 at 7.5–8.5 pounds of deflection.

   If the amount of deflection is not within this range:

   a. Loosen the three bolts on the idler arm and the lock nut on the adjustment screw. See Figure 8 on page 19.
   b. Turn the adjustment screw to attain the correct measurement.
   c. When the V belts are correctly tensioned, securely tighten the idler arm bolts and the lock nut on the adjustment screw.

Measure V Belt Tension
(continued)

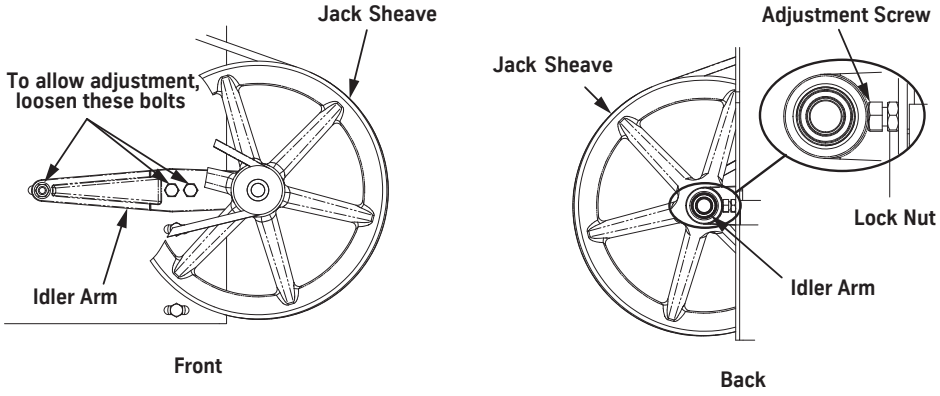


Figure 8 - V Belt Adjustment

Single V Belt These are located between the motor sheave and jack shaft sheave.

1. Place a V belt tension gauge in the center of the belt span between the jack sheave and the motor sheave.
2. Measure for an acceptable belt deflection (tension) of 0.020–0.024 at 7.5–8.5 pounds of deflection.

   If the amount of deflection is not within this range:

   a. Loosen the bolts securing the motor to the door operator cabinet.
   b. Reposition the motor to achieve an acceptable belt tension between the belt on the motor and the jack sheave.
   c. Maintain the alignment between the sheaves and belt, and tighten the bolts securing the motor to the door operator cabinet.

NOTE While changing the motor position to attain the proper belt tension, the alignment of the motor sheave and the jack sheave must be maintained to avoid excessive belt wear.

3. After 24 hours of initial operation, adjust the belt deflection (tension) to 0.020–0.024 at 5.5–7.5 pounds of deflection.

Door Operator Installation

Door Operator Base (Header by Others)

1. Position the car to allow access to the car top during the installation process.
2. Turn OFF, Lock, and Tag out the mainline disconnect.
3. Use the supplied drilling template as a reference to mount the door operator base on the car top. See Figure 9 on page 20.
4. Lift the door operator to the car top.
5. Remove the rear support clips from the door operator's rear support struts. Retain the unistrut nut and one screw, and discard the rest.

Door Operator Installation
(continued)

6. Match four slots in the door operator frame to four holes in the door operator base, and install a hex head screw, a flat washer, a lock washer, and a hex nut in each of the four openings.

7. Use the unistrut nut and one screw to loosely attach the rear support struts to the clips on the door operator base.

8. Tilt the door operator backward or forward to plumb the face of the drive wheel, and then tighten the hardware on each rear support.

9. Loosen the hardware holding the door operator base to the car top, and adjust the door operator and base so that the centerline of the drive shaft is aligned with the centerline of the door opening.

10. Place the doors in the fully closed position.

11. Adjust dimensions **M**, **N**, and **P** as needed. See Figure 10 on page 21.

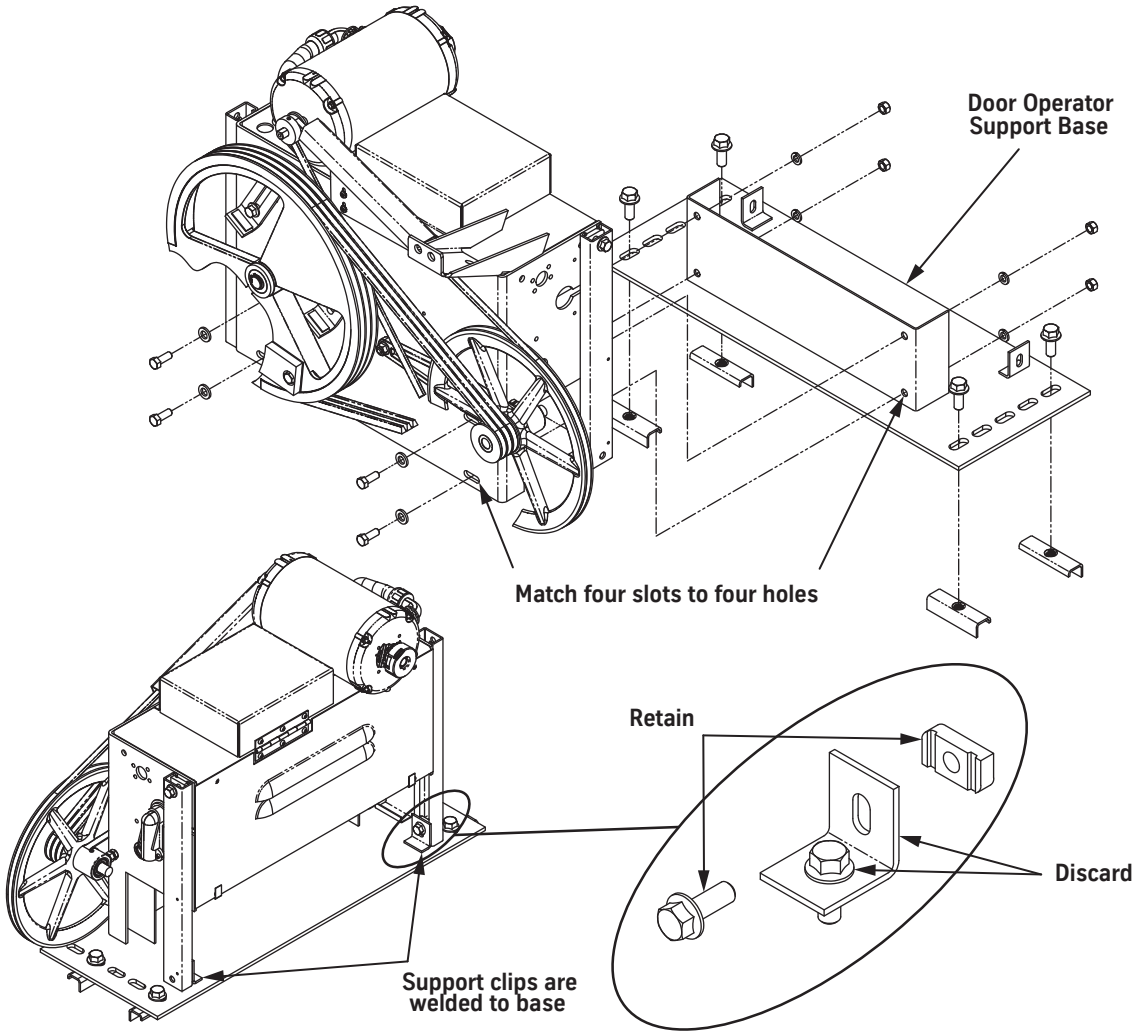
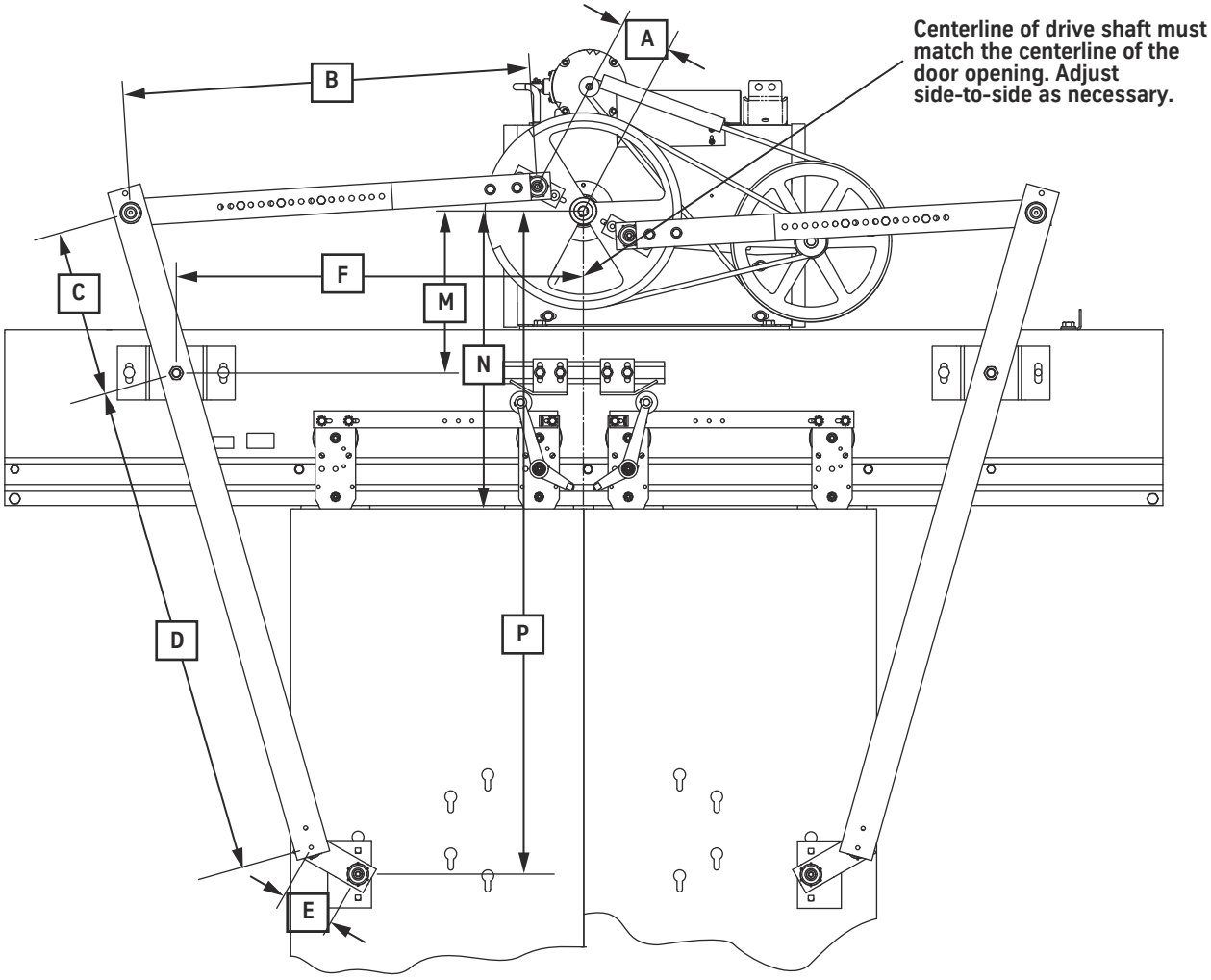


Figure 9 - Door Operator Mounted on the Door Operator Base

Door Operator Installation
(continued)



Note: Corresponding dimensions on each side are equal.

Door Opening	Cab Height	Set at Manufacturing						Field Adjusted		
		A	B	C	D	E	F	M	N	P
7′ 0″ x 42″	8′ 0″	3.875	30.250	12.375	41.250	4.0	30.250	12.0	23.0	52.750
7′ 6″ x 42″	8′ 6″	3.875	30.250	12.375	41.250	4.0	30.250	12.0	23.0	52.750
8′ 0″ x 42″	10′ 6″	3.875	30.250	15.0	50.0	4.0	30.250	14.625	35.0	64.750
8′ 0″ x 42″	10′ 8″	3.875	30.250	16.875	56.250	4.0	30.250	16.625	43.0	72.750
8′ 0″ x 48″	9′ 6″	4.250	31.750	13.875	46.250	4.0	31.750	13.375	29.0	58.750
8′ 0″ x 48″	9′ 8″	4.250	31.750	14.250	47.50	4.0	31.750	13.750	31.0	60.750
9′ 0″ x 48″	10′ 0″	4.250	31.750	12.750	42.50	4.0	31.750	12.250	23.0	53.750
9′ 0″ x 48″	10′ 2″	4.250	31.750	13.50	45.0	4.0	31.750	13.0	25.0	56.750
NOTE: For combinations of door sizes and cab heights not shown, please see job specific drilling templates.										

Figure 10 - Dual-Drive Arm Setup Dimensions

Door Operator Installation
(continued)

Door Operator Rear Foot (TKE Header)

See Figure 11 on page 23 for all steps in this procedure.

1. Remove the two screws (located just behind the door operator support) holding the car top to the header and one screw from each side of the support for a total of four screws.

2. Align the door operator rear foot mount to the approximate center of the door operator support, and install and hand tighten the screws removed in step 1.

3. Mount the door operator on the door operator support.

4. Remove the flange screw and flange nut from the bottom side of both support clips.

5. On the left side of the operator (opposite the door motor), remove the support clip and place it on the outside of the strut with the hole turned down.

6. Insert the flange screw through the slot and the hole in the support strut, then into the clamp nut, and hand tighten.

7. On each end of the operator, loosen the two retaining screws that hold the support struts in place.

8. On the right side of the operator, loosen both the front and back struts.

9. Adjust the support strut so that the support clips sit flat on the rear foot mount. Snugly tighten the two retaining screws.

10. Adjust the rear foot mount until the two support clips align with the slots in the rear foot mount.

Further adjustments can be made by adjusting the door operator on the door operator support.

11. Install the remaining fasteners from step 4 into the support clips.

12. Tighten all fasteners holding the support clips to the support struts and the rear foot mount.

13. Tighten the screws holding the rear foot mount to the car top and header.

14. Plumb the door operator, and tighten the strut retaining screws.

15. Verify all fasteners are secure.

Door Operator Installation
(continued)

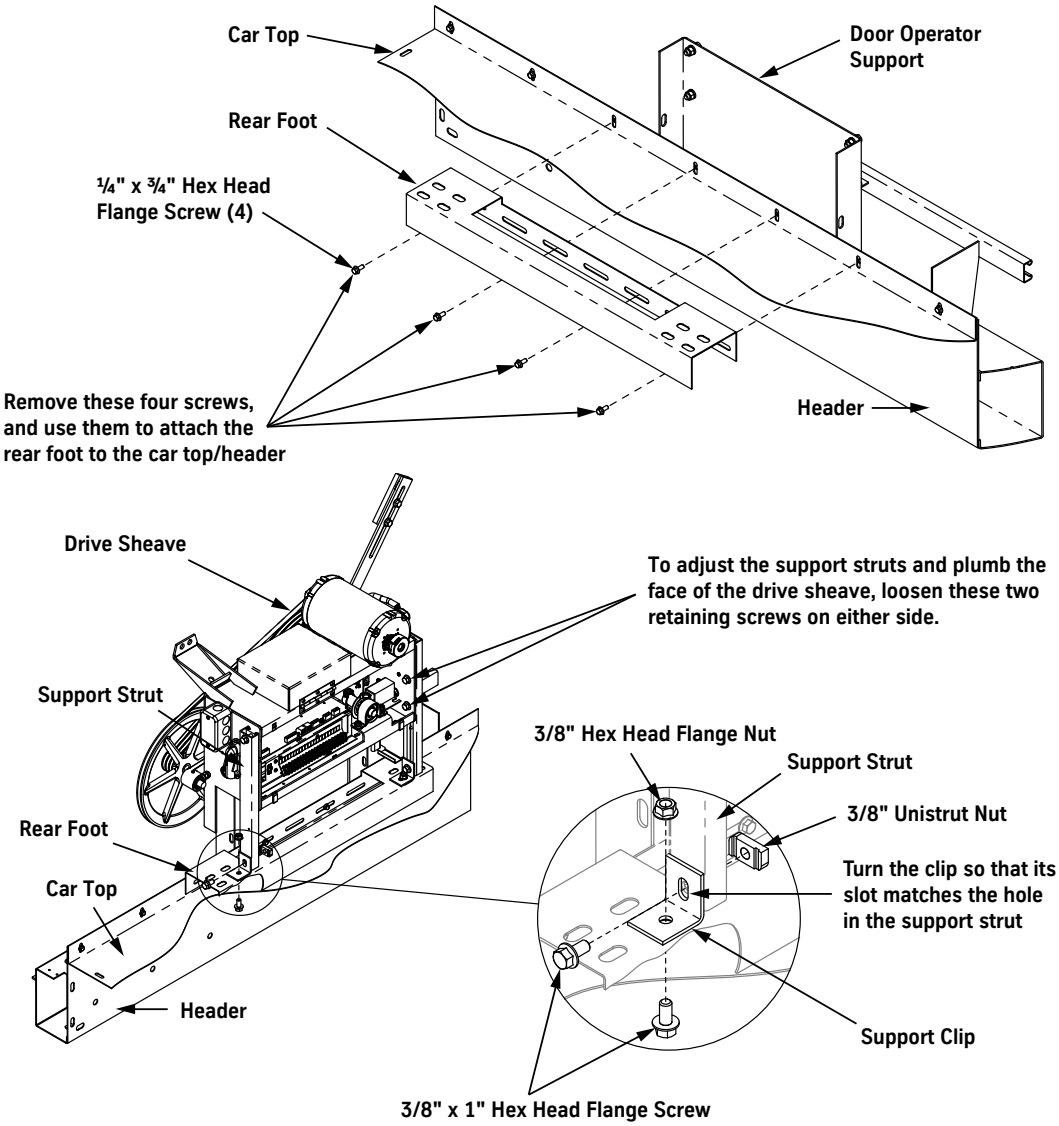


Figure 11 - Door Operator Mounted on the Rear Foot Mounting

Connect the Drive Arms

See Figure 12 on page 24 for all steps in this procedure.

1. Attach the drive arm assembly to the pivot bearing on the car header.
2. Position the connecting arm to point away from the door operator, and attach the door tap plate to the door panel.
3. Attach the adjustable arm to the drive wheel bar, and connect the adjustable arm to the drive arm.
4. Check the drive arm for plumb. If necessary, space the drive arm from the car header with $^{5}/_{8}$" flat washers.
5. Repeat steps 1 through 4 on other side.

Door Operator Installation
(continued)

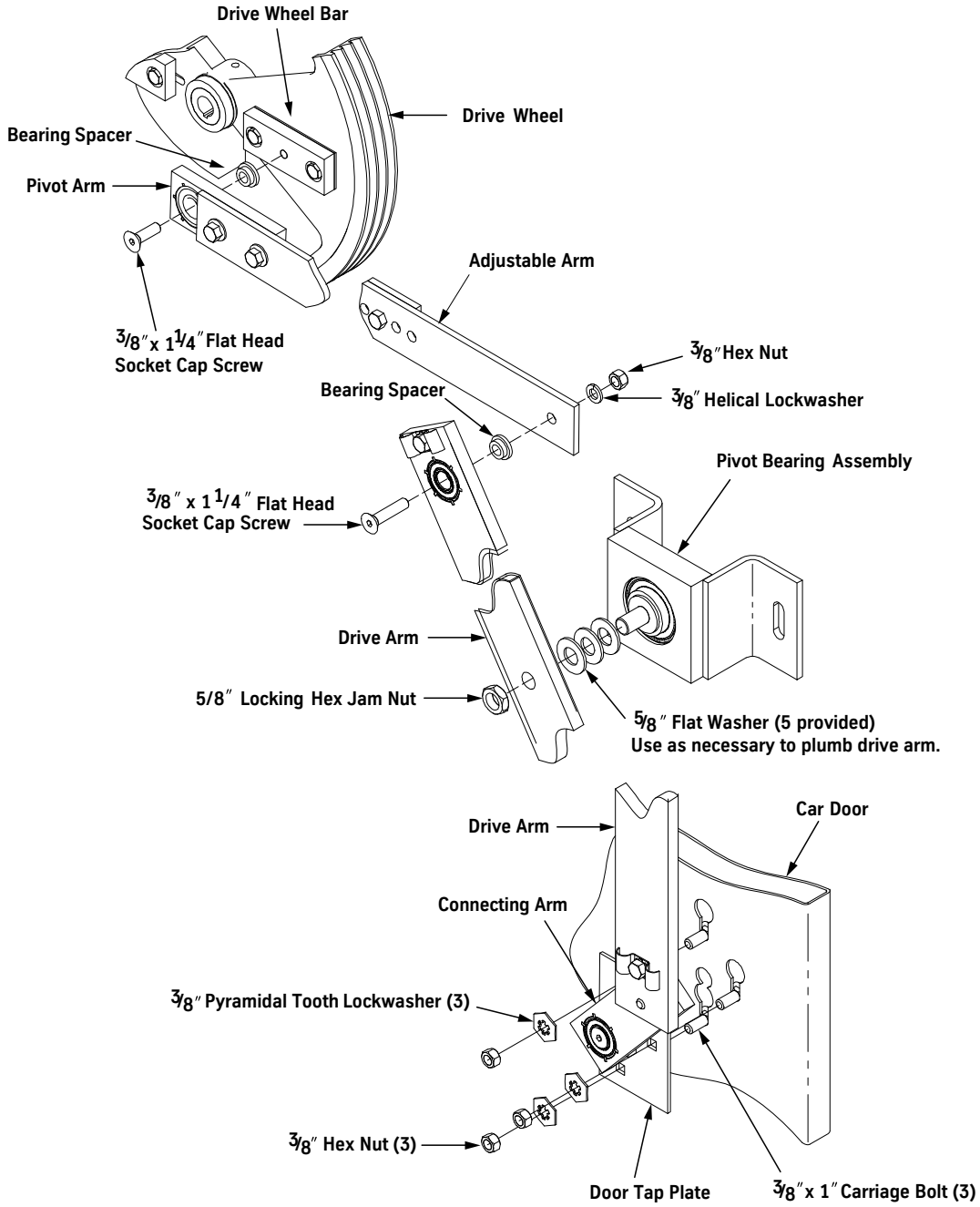


Figure 12 - Connect the Dual-Drive Arms

Set the Mechanical Stops

1. Move the doors to the fully open position.
2. Position the open mechanical stop $^{1}/_{8}$" from the inside surface of the drive wheel, and tighten the bolt securely.
3. Move the doors to the fully closed position.
4. Position the closed mechanical stop $^{1}/_{8}$" from the inside surface of the drive wheel, and tighten the bolt securely.

Electrical Installation

Discrete Configuration

1. Locate the toggle switch inside the door operator, and place it in the OFF position.
2. Bring wiring from the elevator controller to the door operator. This provides the connection points for the HD-LM door operator power and the car gate switch connections for the elevator controller. See the job wiring diagrams, Table 1, and Table 2.

Signal Name	Signal Description
AC1	115VAC Line Input (5 amps)
AC2	AC Neutral
GND	Ground
GS1	DRA from Gate Switch
GS2	DRB from Gate Switch

Table 1 - Door Operator Power Input & Car Gate to Controller Connections

Remote UIT_I/O Card	Signal Name	Signal Description
CON 5-1	DOL-O	Door Open Limit Output
CON 5-2	DCL-O	Door Close Limit Output
CON 5-3	DL6-O	Door Close 6 Inches Point Output
CON 5-4	DRL-O	Door Reversal Limit Point Output
CON 5-5	OD	Open Door Command Input
CON 5-6	CD	Close Door Command Input
CON 5-7	NDG	Nudging Command Input
CON 5-8	HDI	Heavy Duty Command Input
CON 5-9	Input Common	OD, CD, NDG, and HDI, Input Common
CON 5-10	Output Common	DOL, DCL, DL6, and DRL Output Common

Table 2 - CON 5 on the Remote UIT_I/O Card

Electronic Setup and Adjustment

WARNING **To prevent automatic movement of the door while adjusting limit switches, place the elevator on Inspection Operation and disconnect Connector 5 from the Remote UIT_I/O Card.**

1. Turn OFF, Lock, and Tag out the mainline disconnect.
2. Route the door operator harness to the swing return, and connect the harness connectors to the appropriate connectors on the car wiring interface card.
3. If required, connect the safety edge cables to the safety edge box.

NOTE On jobs with both front and rear doors, adjust front and rear door operators separately.

4. Verify that the VBUS and WD LEDs on the door card are illuminated.

NOTE If the LEDs are not illuminated, see Troubleshooting on page 50.

Limit Setting

1. Turn OFF, Lock, and Tag out the mainline disconnect.
2. Physically move the door to the fully closed position, noting which direction the cam shaft rotates. See Figure 13.
3. Loosen the DCL and DOL cams, and rotate them until the magnets face the door card.
4. Loosen the door card mounting bracket screws.
5. Slide the door card and bracket toward or away from the DCL and DOL cams until there is $^{1}/_{8}$" between the card and the cams. The card MUST be square with the DCL and DOL cams.
6. Tighten the door card mounting bracket screws.
7. Slide the DCL and DOL cams to align the center of their magnets with the center of their respective magnetic sensors at the edge of the door card.

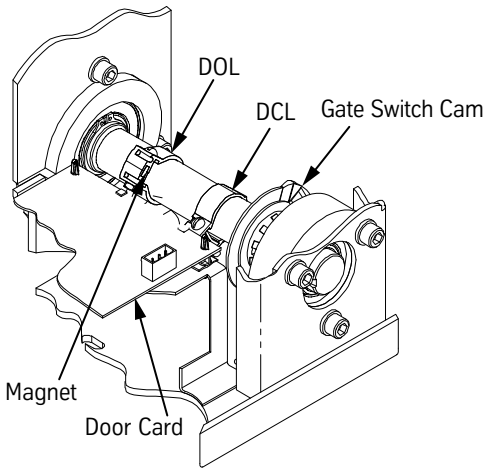


Figure 13 - Door Operator Cams

Limit Setting
(continued)

8. Turn ON the mainline disconnect.
9. Verify that the VBUS and WD LEDs on the door card are illuminated.

NOTE If LEDs are not illuminated, see Troubleshooting on page 50.

10. Rotate the DCL cam in the same direction that the cam shaft rotated in step 3 until the DCL LED is illuminated. Tighten the set screw.
11. Move the door to the fully open position, noting which direction the cam shaft rotates.
12. Rotate the DOL cam in the same direction the cam shaft rotated in the previous step until the DOL LED is illuminated. Tighten the set screw.
13. Verify that the configuration jumpers on the door card are installed per Table 3. See Figure 14 and Figure 15 on page 28 for jumper locations.

Jumper	Jumper Setting/Position	Description
JP1	ON 1-2 (default)	*Default setting for normal operation.
	ON 2-3	*This setting is for In Circuit Emulation or Programming.
JP2	ON 1-2 (default)	*Ties CAN termination resistor decoupling capacitor to ground.
	ON 2-3	*Ties CAN termination resistor decoupling capacitor to chassis ground.
JP3	ON 1-2 (default)	*Allows CAN shield to be connected to ground through capacitor.
	ON 2-3	*Allows CAN shield to be connected directly to ground.
JP4	ON 1-2 (default)	*Allows CAN shield to be connected to ground through capacitor.
	ON 2-3	*Allows CAN shield to be connected directly to ground.
* Do not change these values.		
CAUTION	**All JP5 jumpers must be all ON for 24–48VDC or all OFF for 115VAC or damage to the card could occur.**	
JP5 A-H	ON	Input signals configured for 24-48VDC.
	OFF	Input signals configured for 115VAC.
JP6	ON	Selects other CAN devices.
	OFF (default)	Selects door operator card CAN device (TAC50–04).
JP8	ON	Configures Remote UIT_I/O Card for use with TAC CAN or RS485 controllers (no I/O).
	OFF (default)	Configures Remote UIT_I/O Card for use with stand alone discrete I/O.
JP9	ON	Remote UIT_I/O Card will communicate with rear door operator.
	OFF (default)	Remote UIT_I/O Card will communicate with front door operator.

Table 3 - Remote UIT_I/O Card Configuration Jumpers

Limit Setting
(continued)

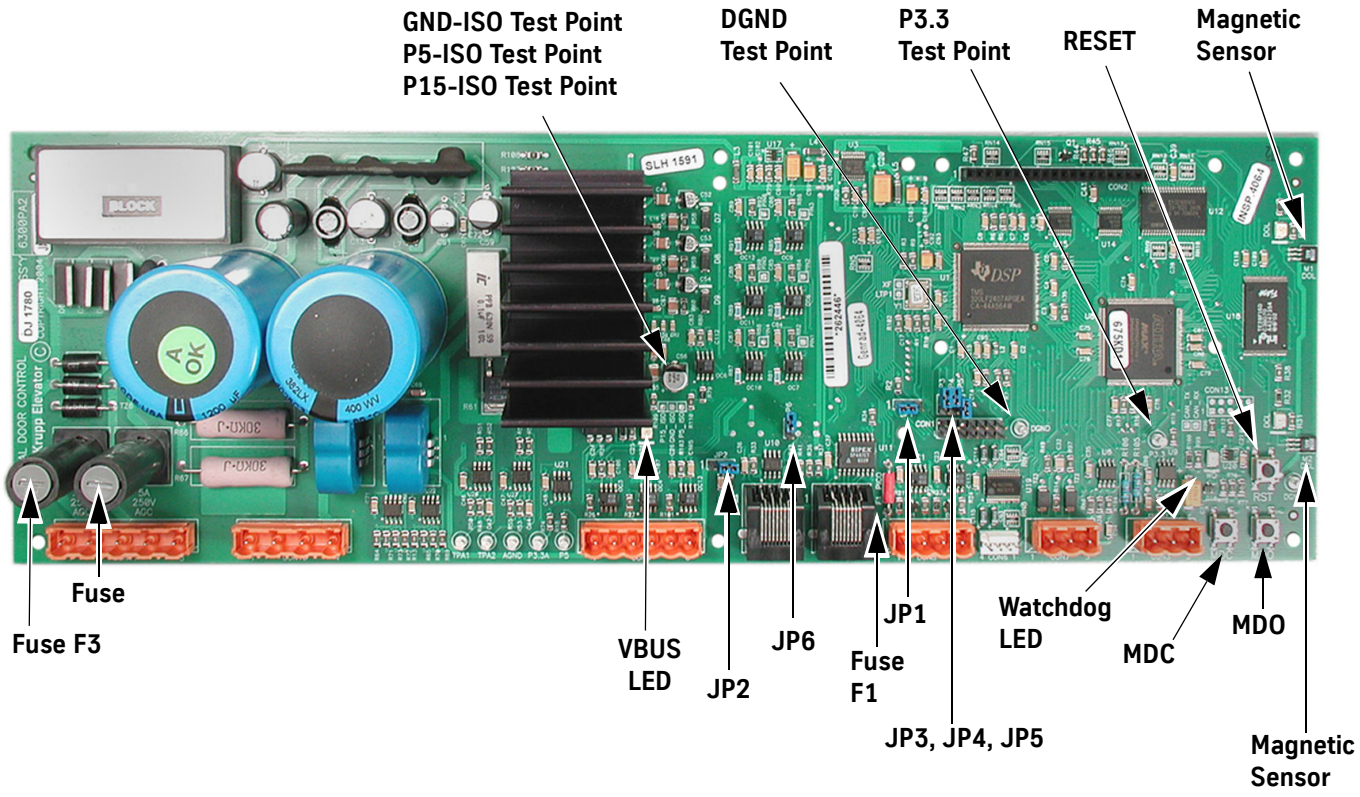


Figure 14 - 6300PA7 Door Operator Card

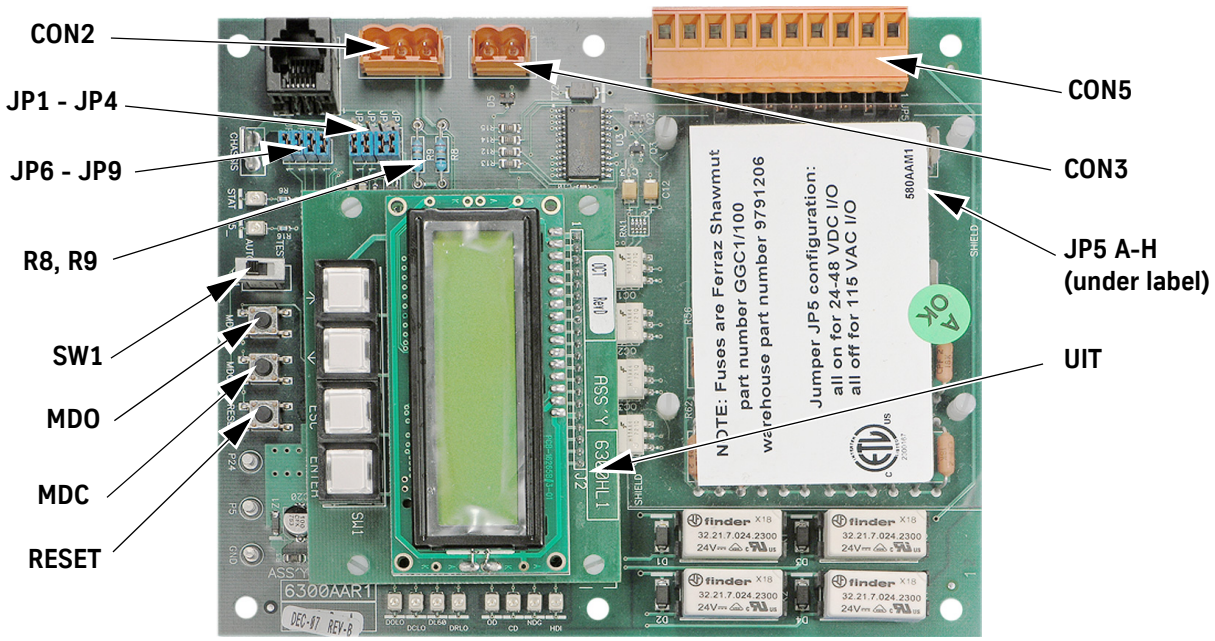


Figure 15 - 6300AAR Remote UIT_I/O Card

Direction Check

Verify the location of the doors.

- If the doors are fully closed (DCL illuminated), press **MDO** on the Remote UIT_IO Card and the doors should move in the Open direction.
  - If the doors did not move, press **MDC**.
  - If the doors moved in the Open direction, the LHO value must be changed.

Auto Null

When performing an Auto Null, the doors must be at rest.

1. Begin with the doors fully closed.
2. Use the UIT to scroll to MAIN>DOOR>CMD>AUTONULL.
3. Press **ENTER**, and the UIT displays **Nulling ADC offsets**. When complete, the UIT displays **Null complete.**
4. Scroll to Save>Flash>Config to save the Auto Null values.

Door Scan

1. Place the elevator on Inspection Operation.
2. Verify that the door is fully closed or fully open.
3. On the UIT, scroll to MAIN>PROFILE1>CMD>LEARN TRAVEL.
4. Press **ENTER,** and the UIT displays:
   Travel = (some number)
   Ent to Re-Learn
5. Press **ENTER,** and the UIT displays:
   Travel = 0.000
   Move Doors Now
6. Press **MDO** until the DOL LED is illuminated, and the UIT displays:
   Travel = (learned value)
   Save to Flash
7. Save the door scan to FLASH.
   a. Scroll to MAIN>SYSTEM>CMD>SAVETOFLASH, press **ENTER**, and UIT displays:
      ENT to save
      ESC to exit
   b. Press **ENTER**, and the UIT displays **Adj's have been saved to FLASH.**

Profile Adjustments

The doors should perform well with default settings. However, if changes to the performance are required, see Diagnostics on page 35.

1. Place the elevator at the appropriate landing of the profile that is to be adjusted.

2. Use the UIT to scroll to MAIN>CONTROL>CMD>CYCLE MODE, and press **ENTER** to place the door in Cycle mode.

NOTE Some adjustments cannot be changed with the door in motion. If the Cycle mode does not have a delay, make adjustment changes only when the door is at rest on either limit.

3. Scroll to MAIN>CONTROL>ADJ>CDT to adjust the delay time at each limit. Some delay at the door close limit is necessary to allow other adjustments to be changed.

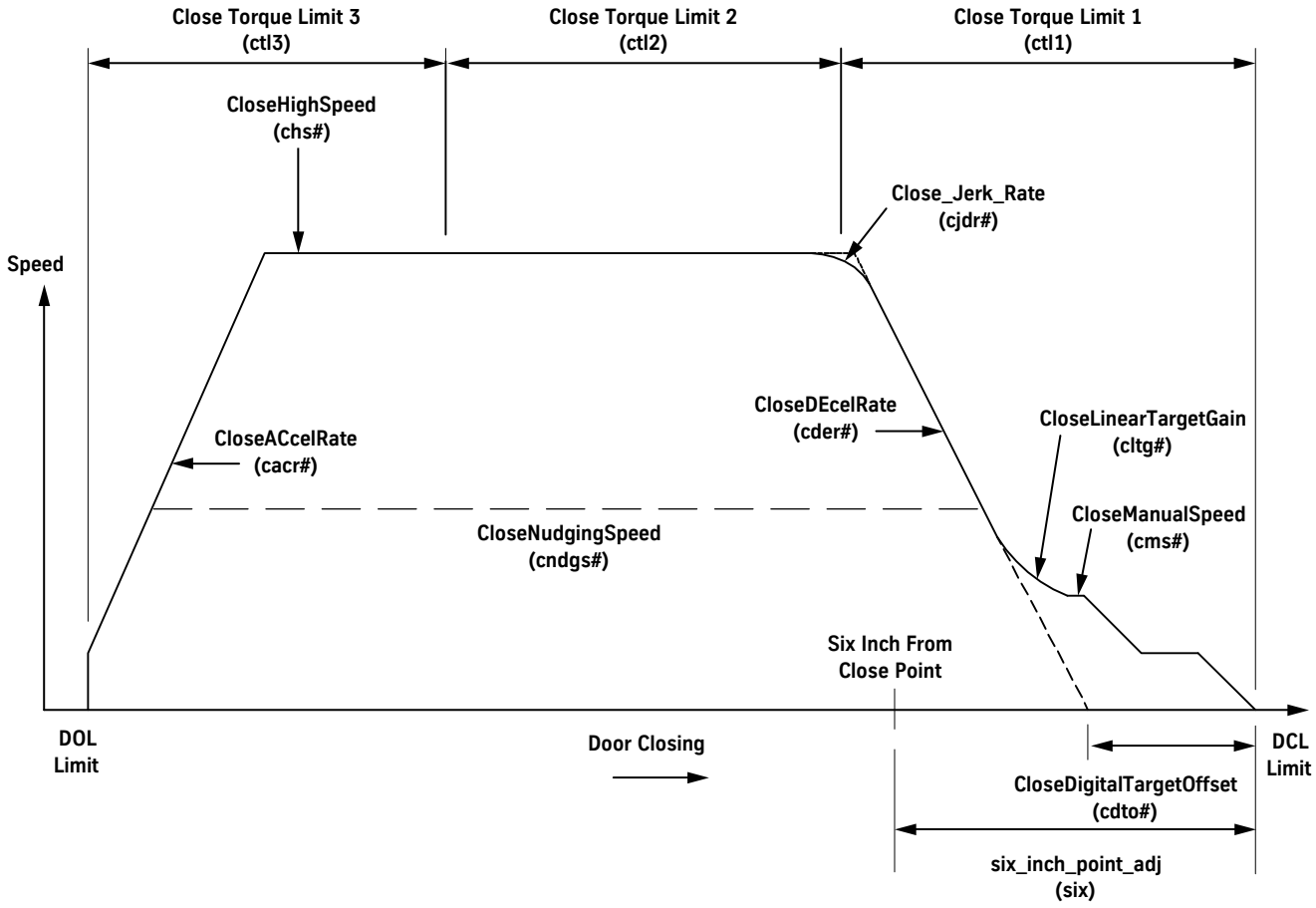
CAUTION **To avoid mechanical damage to the doors when increasing open and close high speed, do NOT make drastic changes.**

4. On the UIT, scroll to MAIN>PROFILE#>ADJ, and make the necessary Door Open and Door Close adjustments. See Figure 16 on page 31 and Figure 17 on page 32.

5. Save any adjustment changes to FLASH.

IMPORTANT! **Save changes to FLASH when the door is on DCL, or the changes may not be accepted.**

Profile Adjustments
(continued)



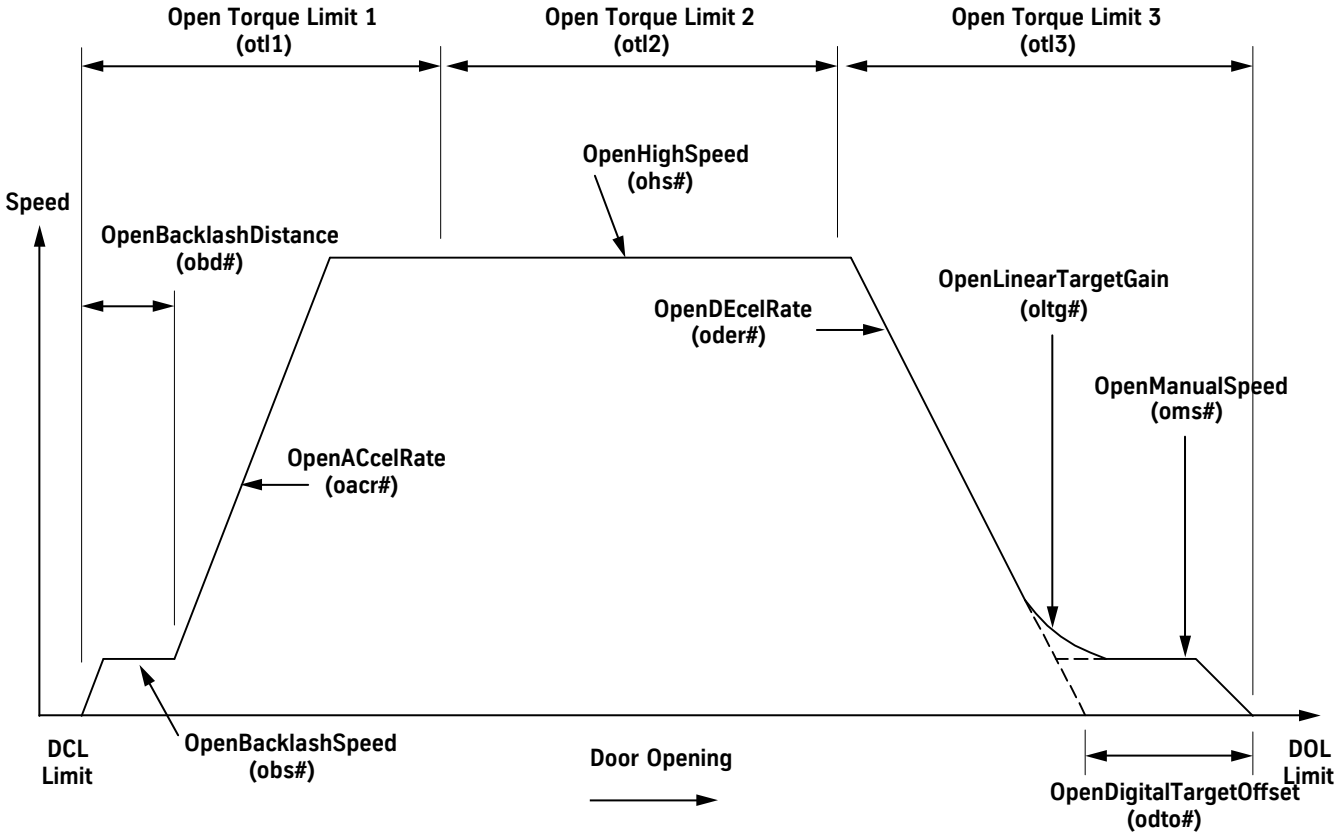
Profile#	Adjustment
oacr#	OpenACcelRate
obs#	OpenBacklashSpeed
obd#	OpenBacklashDistance
ohs#	OpenHighSpeed
oder#	OpenDEcelRate
oms#	OpenManualSpeed
oltg#	OpenLinearTargetGain
odto#	OpenDigitalTargetOffset

Door Adjustment	
otl1	Open Torque Limit 1
otl2	Open Torque Limit 2
otl3	Open Torque Limit 3

Note: # = Profile Number

Figure 16 - Door Closing Profile

Profile Adjustments
(continued)



Profile#	Adjustment
oacr#	OpenACcelRate
obs#	OpenBacklashSpeed
obd#	OpenBacklashDistance
ohs#	OpenHighSpeed
oder#	OpenDEcelRate
oms#	OpenManualSpeed
oltg#	OpenLinearTargetGain
odto#	OpenDigitalTargetOffset

Door Adjustment	
otl1	Open Torque Limit 1
otl2	Open Torque Limit 2
otl3	Open Torque Limit 3

Note: # = Profile Number

Figure 17 - Door Opening Profile

Closing Force

1. Use the UIT to scroll to MAIN>DOOR>ADJ>STALL, and note the value so that it can be reset later.
2. Press **ENTER**, scroll to 0 (zero), and press **ENTER** again. This sets STALL=0.
3. Use a force gauge to measure the closing force. See Figure 18.

- The closing force should be less than 30 lbf. in the middle 1/3 of travel.
- If the closing force is too high: Scroll to MAIN>DOOR>ADJ>CTL2, reduce the value, re-measure and repeat until the closing force is within limits.

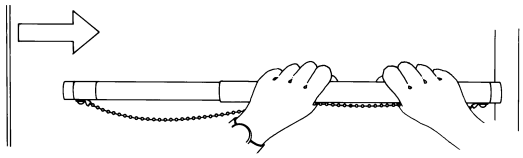


Figure 18 - Safe Use of the Door Gauge

4. Scroll to MAIN>DOOR>ADJ>STALL, and set STALL back to its original value.
5. Save the values to FLASH.
6. Scroll to MAIN>SYSTEM>CMD>SAVETOFLASH, press **ENTER**, and the UIT displays:
   ENT to save
   ESC to exit
7. Press **ENTER**, and the UIT displays **Adj's have been saved to FLASH.**

Closing Kinetic Energy

1. Place the elevator on Inspection Operation at the landing where the test will be performed.
2. Use the UIT to scroll to MAIN>DOOR>MON>DOOR_trav, and record the value.
3. Use either **MDC** or **MDO** to move the doors to one of the following positions:
   - Center-opening doors: 1" from fully open
   - Single-speed doors: 2" from fully open
4. Scroll to MAIN>DOOR>MON>DOOR_pos, and record the value.
5. Subtract the DOOR_pos value from the DOOR_trav value.
6. Scroll to MAIN>DOOR>MON>ADJ>SWM1, and enter the value from the previous step.
7. Use either **MDC** or **MDO** to move the doors to one of the following positions:
   - Center-opening doors: 1" from fully closed
   - Single-speed doors: 2" from the face of the strike column
8. Scroll to MAIN>DOOR>MON>DOOR_pos, and record the value.
9. Scroll to MAIN>DOOR>MON>ADJ>SWM2, and enter the value from the previous step.
10. Determine the minimum allowable closing time from the door operator nameplate.

Closing Kinetic Energy
(continued)

11. Place the elevator on Automatic Operation.
12. Scroll to MAIN>DOOR>CMD>STOPWATCH, and press **ENTER**.
13. Select the close time, press **ENTER**, and the UIT displays **POS Mark 1 n.nnn** (value from SWM1).
14. Press **ENTER**, and the UIT displays **POS Mark 2 n.nnn** (value from SWM2).
15. Press **DOOR OPEN**, and when door is fully open, press **ENTER** and the UIT displays **Stopwatch armed**.
16. When the door closes, the UIT displays the closing time. If the closing time is less than the minimum allowable closing time specified, reduce the value of the Close High Speed (CHS#) adjustment and repeat until the closing time is greater than or equal to the minimum.
17. Save any adjustment changes to FLASH.

Set the Gate Switch

1. Position the door $1^1/_2$" from fully closed.
2. Rotate the disk in the Close direction until the shorting bar just touches the two leaf contacts. See Figure 19.
3. Locate a tab on the locking ring that lines up with a notch in the contact disk.
4. Rotate the drive wheel until the door is fully closed, and verify that the shorting bar has not run past the leaf contacts.
5. Open and close the door to verify that the gate switch shorting bar enters the leaf contacts at $1^1/_2$" from fully closed.
6. Verify that the shorting bar remains between the leaf contacts in the fully closed position and that the gate switch leaf contacts do not rub on the thin portion of the plastic disk during normal operation.
7. Recheck all bolts, cap screws, cam hex screws, and belt tensions for proper tightness.

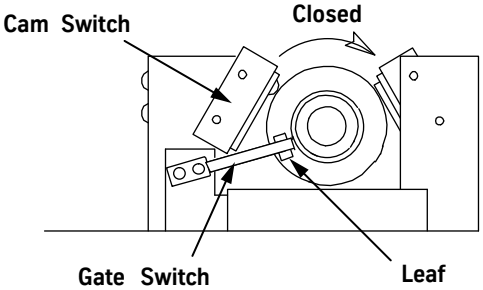
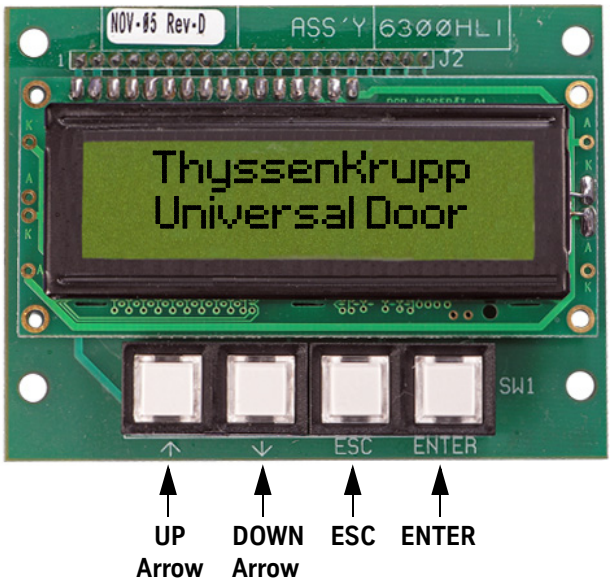


Figure 19 - Gate Switch

Diagnostics

User Interface Tool (UIT)



UP or DOWN Arrow - Scrolls through menus, adjustments, and displays.

ESC - Exits the current level of a menu, adjustment, or display.

ENTER - Selects a menu, adjustment, or display.

Overview of Adjustments, Parameters, and Commands

- All adjustments must be made when the doors are idle.
- Before the card is reset or powered-down, save any adjustment changes to FLASH.
- When the adjustment is a speed value:

  » Increase the value = The door runs at a faster speed.

  » Decrease the value = The door runs at a slower speed.

- When the adjustment is an acceleration or deceleration rate value:

  » Increase the value = The door accelerates or decelerates faster.

  » Decrease the value = The door accelerates or decelerates slower.

- When the adjustment is a distance or point value:

  » Increase the value = The distance or point is further from either the Door Open Limit (DOL) or Door Close Limit (DCL), depending on whether door is opening or closing.

  » Decrease the value = The distance or point is closer to either the Door Open Limit (DOL) or Door Close Limit (DCL), depending on whether door is opening or closing.

- Door position is stored at 0 on DCL and at Travel (TRV) on DOL.
- Speeds are (+) in the opening direction, and (–) in the closing direction.

UIT Menu Tree

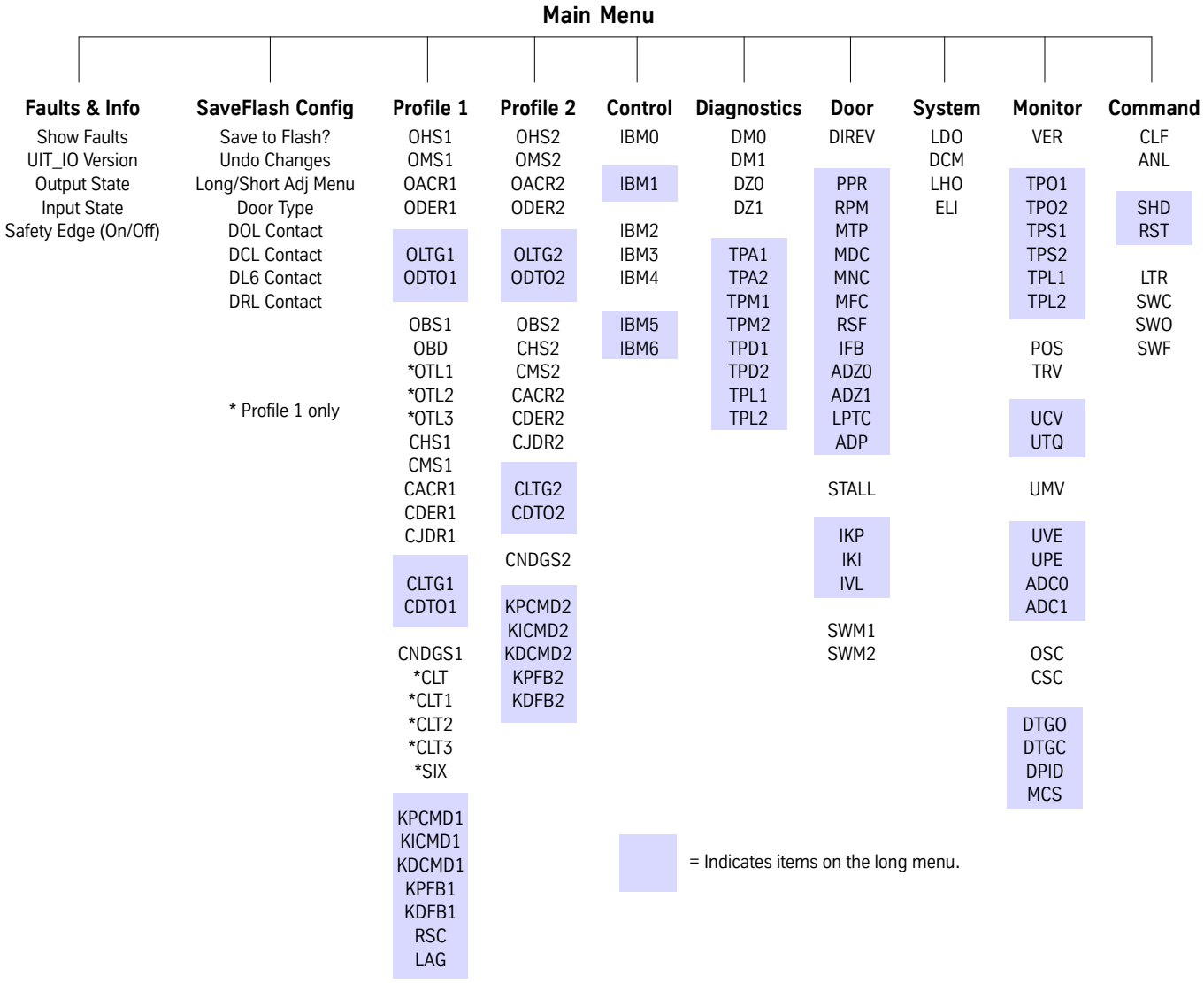


Figure 20 - UIT Menu Tree

Adjustments

Control Adjustments

Name	Adjustment	Definition
CDT	Cycle Delay Time	The time the door control delays at each limit when doors are on continuous cycle mode.
DBM0	De-Bounce Bit Mask 0	The signals can have additional de-bouncing - set the corresponding bit.
DBM1	De-Bounce Bit Mask 1	The signals can have additional de-bouncing - set the corresponding bit.
DBM4	De-Bounce Bit Mask 4	The signals can have additional de-bouncing - set the corresponding bit.
DBM5	De-Bounce Bit Mask 5	The signals can have additional de-bouncing - set the corresponding bit.
IBM0	Invert Bit Mask 0	The signals can be inverted - set the corresponding bit.
IBM1	Invert Bit Mask 1	The signals can be inverted - set the corresponding bit.
IBM4	Invert Bit Mask 4	The signals can be inverted - set the corresponding bit.
IBM5	Invert Bit Mask 5	The signals can be inverted - set the corresponding bit.
IIM	Input Invert Mask	This is the input invert mask for the I/O Expansion.
OIM	Output Invert Mask	This is the output invert mask for the I/O Expansion.

Diagnostic Adjustments

- These values are for diagnostic purposes and cannot be changed using the UIT.
- The test points have a range of 0V minimum—+3V maximum.
- The test point outputs are based on Equation 1 and Equation 2.
  Equation 1= TP1out = ((TP1in * TPM1) / TPD1) * 0.73mV + 1.5V
  Equation 2 = TP2out = ((TP2in * TPM2) / TPD2) * 0.73mV + 1.5V

Adjustment	Minimum	Default	Maximum	Definition
DM0	0	2048	4095	DAC 0 Multiplier.
DM1	0	2048	4095	DAC 1 Multiplier.
DZ0	-1228	0	1228	DAC 0 Offset.
DZ1	-1228	0	1228	DAC 1 Offset.
HEX	–	0	–	Values in Hex.
TPA1	0	2048	32767	Test Point 1 Address.
TPA2	0	2048	32767	Test Point 2 Address.
TPD1	0	0	32767	Test Point 1 Divider.
TPD2	0	0	32767	Test Point 2 Divider.
TPL1	–	0	–	Test Point 1 Length.
TPL2	–	0	–	Test Point 2 Length.
TPM1	1	1	32767	Test Point 1 Multiplier.
TPM2	1	1	32767	Test Point 2 Multiplier.

Door Adjustments

Adjustment	Minimum	Default	Maximum	Definition
ADP*	1	1	DPL	Active Door Profile.
ADZ0*	-8192	0	8192	A/D Digital Zero 0.
ADZ1*	-8192	0	8192	A/D Digital Zero 1.
CLT	0	10	25	Closing Torque.
CTL1	0	20	100	Close Torque Limit 1.
CTL2	0	20	100	Close Torque Limit 2.
CTL3	0	40	100	Close Torque Limit 3.
DIREV	0	100	500	Smooth Turnaround.
IFB*	0	0	1	Invert Feedback - Do Not Change.
IKI*	0	807	6400	Current Loop Integral Gain - Do Not Change.
IKP*	0	1.25	8.0	Current Loop Proportional Gain - Do Not Change.
IVL*	10	95	100	Current Loop Voltage Limit - Do Not Change.
LPTC*	0	.015	.050	Low Pass Time Constant.
MDC*	MNC	6.79	6.8	Maximum Drive Current.
MFC*	0	1.0	MNC	Motor Field Current.
MNC*	MFC	1.4	MDC	Motor Nameplate Current - Do Not Change.
MTP*	2.0	6.0	8.0	Motor Poles - Do Not Change.
OTL1	0	50	100	Open Torque Limit 1.
OTL2	0	45	100	Open Torque Limit 2.
OTL3	0	20	100	Open Torque Limit 3.
PPR*	64	500	2048	Encoder Resolution.
RPM*	500	1150	2048	Motor RPM.
RSF*	.10	3.1	6.0	Rated Slip Frequency - Do Not Change.
SIX	0	1.0	15.9	Six Inch Point.
STALL	0	50	300	Stall Velocity.
SWM1	0	0	32.767	Stop Watch Mark 1.
SWM2				Stop Watch Mark 2.
*System Adjustment MAL must equal 1 for the availability of the adjustment.				

Profile Adjustments

- # = profile number.
- Each profile has adjustments for both Open and Close; the profile adjustments have the same minimum, default, and maximum values.
- Each value may be adjusted for a different purpose.
- Adjustment values can relate to one another only within same door operation profile.

Adjustment	Minimum	Default	Maximum	Definition
CACR#	0	1200	3600	Close Acceleration Rate.
CDER#	0	900	1919	Close Deceleration Rate.
CDTO#	-2.0	0	2.0	Close Digital Target Offset.
CHS#	Close manual speed adjustment value.	300	Rated RPM of motor in RPM adjustment.	Close High Speed.
CJDR#	0	3100	8192	Close Jerk Rate.
CLTG#	60	120	3000	Close Linear Target Gain.
CMS#	0	40	Close high speed adjustment value.	Close Manual Speed.
CNDGS#	0	125	Close high speed adjustment value.	Nudge Close Speed.
KDCMD#	0	0	327.67	Speed Control Derivative Gain - Do Not Change.
KDFB#	0	0	327.67	Speed Feedback Derivative Gain - Do Not Change.
KICMD#	0	22.2	3276.7	Speed Control Integral Gain - Do Not Change.
KPCMD#	0	0	327.67	Speed Command Proportional Gain - Do Not Change.
KPFB#	0	3.33	327.67	Speed Feedback Proportional Gain - Do Not Change.
LAG	0	0.150	0.250	Profile Lag Compensation - Do Not Change.
OACR#	0	1200	3600	Open Acceleration Rate.
OBD	0	1.0	10	Open Backlash Distance.
OBS#	0	60	Open high speed adjustment value.	Open Backlash Speed.
ODER#	0	1200	3839	Open Deceleration Rate.
ODTO#	-2.0	0	2.0	Open Digital Target Offset.
OHS#	Open manual speed adjustment value.	400	Rated RPM of motor in RPM adjustment.	Open High Speed.

Adjustment	Minimum	Default	Maximum	Definition
OLTG#	60	150	3000	Open Linear Target Gain.
OMS#	0	40	Open high speed adjustment value.	Open Manual Speed.
RSC	0	0	2000	Re-open Slip Compensation - Do Not Change.

System Adjustments

These adjustments will not take effect until the new value is saved to FLASH and the door operator card is reset.

Adjustment	Minimum	Default	Maximum	Definition
DCI	–	0	–	Discrete Controller Interface.
DCM	–	1	–	DC Motor Control Selection.
DOI	–	0	–	Discrete Operator Interface.
DPL	1	5	5	Door Profile Limit.
DRM	1	4	50	Multiple for Slow Clock - Do Not Change.
ELI	–	0	–	Electronic Limit Interface.
FSP	250	1000	2500	Sample Frequency - Do Not Change.
LDO	–	0	–	Linear Door Operator.
LHO	–	1	–	Left Hand Operation.
MAL	–	0	–	Menu Access Level.
UPM	1	2	50	Multiple for Medium Clock - Do Not

Parameters

CAN Parameters

These values are viewable only to aid in manufacturing-level diagnostics. Not for field use.

Name	Command	Definition
CEC	Transmit and Receive Error Counters	Displays value of transmit and receive error counters.
ESR	Error Status Register	Displays value of error status register.
GSR	Global Status Register	Displays value of global status register.
MDER	Mailbox Direction/Enable Register	Displays value of mailbox direction/enable register.
RCR	Receive Control Register	Displays short test point 1 input variable.
TCR	Transmission Control Register	Displays value of transmission control register.

System Parameters

Name	Command	Definition
VER	Software Version/Revision	Displays the version/revision of door operator software.

Control Parameters

These values are viewable only to aid in diagnostic purposes.

Motion Control State Number (MCS) - Indicates the current motion state of the of the doors; this number changes with the specific operation of the doors.

Motion Control State Number	Description
4	Direction Reversal
8	Stop Door
9	Hold Closed
10	Nudge Close
11	Manual Open
12	Manual Close
13	Open Door
14	Close Door

Door Parameters

Name	Command	Definition
ADC0	Analog to Digital Converter 0	Displays the value of analog to digital converter number 0.
ADC1	Analog to Digital Converter 1	Displays the value of analog to digital converter number 1.
CSC	Close Slip Compensation	This value is automatically set - Do Not Change.
DPID	Profile ID	Displays current profile.
DTGC	Distance To Go Close	Calculated value based on travel and close slip compensation.
DTGO	Distance To Go Open	Calculated value based on travel and open slip compensation.
OSC	Open Slip Compensation	This value is automatically set - Do Not Change.
POS	Door Position	This parameter displays position of door in motor revolutions.
TRV	Door Travel	This is the travel value learned when a door scan is performed.
UCV	UPID Command Velocity	Displays the dictated or commanded velocity.
UMV	UPID Motor Velocity	Displays the dictated or commanded motor velocity.
UPE	UPID Position Error	Displays the difference between calculated position and actual position.
UTQ	UPID Torque	Displays the dictated or commanded torque.
UVE	UPID Velocity Error	Displays the difference between dictated or commanded velocity and actual velocity.

Fault Codes

2000 Series Fault Code = Front Door Operator

3000 Series Fault Code = Rear Door Operator

Fault Code	Description
2036 / 3036	IGBT FAULT
2050 / 3050	ENCODER FAULT
2051 / 3051	XS BELT SLIP FLT
2053 / 3053	MOTOR WIRE WRONG
2054 / 3054	REV ENCODER FLT
2055 / 3055	TRAVEL FAULT
2056 / 3056	OPEN OS FAULT
2057 / 3057	CLOSE OS FAULT
2058 / 3058	CL RUNAWAY FAULT
2059 / 3059	BUS POWER FAULT
2060 / 3060	OP RUNAWAY FAULT
2061 / 3061	OP OV DRIVE FAULT
2062 / 3062	CL OV DRIVE FAULT
2063 / 3063	IFBK FAULT
2064 / 3064	I SERIAL COM FAULT
2065 / 3065	I SCALE FAULT
2066 / 3066	DOL DCL FAULT
2067 / 3067	DOL FAILURE
2068 / 3068	DCL FAILURE
2069 / 3069	MAX TORQUE FAULT

Technical Information

Record Flight Time

This procedure requires two people, one in the elevator and one on top of the elevator.

1. Place the elevator on Inspection Operation at the landing where the test will be performed.
2. Use the UIT to scroll to MAIN>DOOR>ADJ>SWM1, and enter **0** (zero).
3. Scroll to MAIN>DOOR>MON>DOOR_trav, and record the value.
4. Use **MDC** or **MDO** to move the doors to 3/4 fully open position.
5. Scroll to MAIN>DOOR>MON>DOOR_pos, and record the value.
6. Subtract the POS value from the TRV value, and enter this value in door adjustment SWM2.
7. Place the elevator on Automatic Operation. The doors will close.
8. Scroll to MAIN>DOOR>CMD>STOPWATCH, and press **ENTER**.
9. Choose the flight time, press **ENTER**, and the UIT displays **POS Mark 1 n.nnn** (value from SWM1).
10. Press **ENTER**, and the UIT displays **POS Mark 2 n.nnn** (value from SWM2).
11. Press and hold **Door Open** (to open the doors), and enter a car call for the next landing.
12. Release **Door Open**. The doors will close, and the elevator will run to the selected car call. When the elevator makes its run and the doors open, the flight time is displayed.

SWM1 and SWM2 values are retained without saving until the door operator power is cycled or the door card is reset.

Jumper Settings

If the card is not communicating with IMS, verify that the jumpers are set as shown in Table 4. If not, power-down the card, set the jumper(s) to the proper setting, and power-up the card.

Jumper	Jumper Setting/Position	Description
JP1	Jumper on 1 and 2	Selects the DSP to run as a microcontroller. Manufacturing use only.
	Jumper on 2 and 3	Selects the DSP to run as a microprocessor. Manufacturing use only.
JP2	Jumper on 1 and 2	Provides +5VDC programming voltage for DSP core FLASH. Manufacturing use only.
	Jumper on 2 and 3	Removes +5VDC programming voltage to DSP core FLASH. Manufacturing use only.
JP3	ON	*Selects Zmodem Mode for uploading new software. Field Selectable.
	OFF	*Selects Normal Mode for running. Field Selectable.
JP4	ON	*Selects Rear Door Mode for receiving rear door commands. Field Selectable.
	OFF	*Selects Front door mode for receiving front door commands. Field Selectable.
JP5	ON	*Selects RS485 communication link mode. Field Selectable. (Door Parameters D12 & D13=8).
	OFF	*Selects CAN communication link mode. Field Selectable. (Door Parameters D12 & D13=7 or 9).
JP6	ON	*Selects 100K baud for CAN communication link. Field Selectable. (Door Parameters D12 & D13 = 9).
	OFF (Default)	*Selects 50K baud for CAN communication link. (JP6 OFF for TAC 50-03 & TAC 50-04) Field Selectable. (Door Parameters D12 & D13=7).
*Reset must be pressed for changes to take effect.		

Table 4 - Jumper Settings

Upload Generic Software

Upload FLASH Program Software

If the FLASH code becomes corrupted, it can be reinstalled.

1. Turn OFF, Lock, and Tag out the mainline disconnect.
2. Install a UIT on CON2.
3. Use a serial cable with a 4-pin connector adapter to connect a laptop with the HyperTerminal software to the UDC Card at CON6.
4. Click **Start**.
5. Select Programs>Accessories>HyperTerminal. The Connection Description window opens.
6. Type in a name, such as "FLASH COMM", select an icon, and then click **OK**. The Connect To window opens.
7. Select the arrow beside Connect Using:, then select COM1 (or the port that will be used) from the list, and click **OK**. The COM1 Properties window opens.
8. Type in the following properties:
   - Bits per second: 38400
   - Data bits: 8
   - Parity: None
   - Stop bits: 1
   - Flow Control: Hardware
9. Click **OK**. This session will be activated.
10. Select File>Save.
11. Select File>Properties. The Properties dialog box opens.
12. Select Settings. Verify the following:
    - The function, arrow, and ctrl keys act as terminal keys
    - The backspace key sends: Ctrl+H
    - Emulation: Auto detect
    - Telnet terminal ID: ANSI
    - Back scroll buffer lines: 500

Upload FLASH Program Software
(continued)

13. Click **ASCII Setup**, and verify the following:
    - Line delay: 0 milliseconds
    - Character delay: 0 milliseconds
    - **Wrap lines that exceed terminal width** is the only item checked.
14. Click **OK** on both dialog boxes.
15. Select the Transfer drop-down menu, then select Send File.
16. Use the Browse command to find the correct file, click the filename, and then click **Open**.
17. Install jumper JP3, and press **Reset** (located on the door card).
18. Turn ON the mainline disconnect.

NOTE The UIT displays the status message **ZMODEM READY**. If this message is not shown, replace the door card.

19. To start the software upload, click **Send** in the HyperTerminal screen.
20. When the upload is complete, the UIT displays:

    ThyssenKrupp
    Universal Door

21. Remove jumper JP3, press **Reset**, and the UIT displays:

    ThyssenKrupp
    Universal Door

22. Turn OFF, Lock, and Tag out the mainline disconnect.
23. Remove the cable from CON6.

Determine the Software Version/Revision

1. Begin with the doors fully closed.
2. Scroll to MAIN>SYSTEM>MON>SW_v_r, and press **ENTER**.

NOTE The UIT will display the software version and revision. The first two digits are the version, and the second two digits are the revision.

3. Press **ESC** until the main menu displays.

Cycle Mode

When the Cycle Command (CYC) is activated, the doors continuously cycle. The delay at the DOL and the DCL is controlled by the Cycle Delay Time (CDT) adjustment.

Activate the Cycle Command

1. Scroll to MAIN>CONTROL>CMD>Cycle Mode, press **ENTER**, and the UIT displays:
   ENT to ENABLE
   CYCLE Mode
2. Press **ENTER**, and the doors will start cycling.The UIT displays:
   Control/Cmd
   Cycle Mode

Deactivate the Cycle Command

1. Scroll to MAIN>CONTROL>CMD>Cycle Mode, press **ENTER**, and the UIT displays:
   ENT to ENABLE
   CYCLE Mode
2. Press **ENTER**, and the doors will stop cycling. The UIT displays:
   Control/Cmd
   Cycle Mode

Restart the IGBT Power Module

If an overcurrent circuit condition causes the power module to send a shutdown signal to the DSP, the power module may be reset; however, the power module can only be reset after the fault condition has been cleared.

1. Scroll to MAIN>DOOR>CMD>IGBT ERR Rst, press **ENTER**, and the UIT displays:
   ENT to Proceed
   ESC to Exit
2. To reset the power module, press **ENTER**, and the UIT displays **PWM Reenabled.**
3. Press **ESC** until the main menu displays.

Shutdown the IGBT Power Module

This command prevents any motor operation including the Manual Door Open (MDO) and Manual Door Close (MDO) functions.

1. Scroll to MAIN>DOOR>CMD>Shutdown, and press **ENTER**.

NOTE The UIT display will not change, and the power module has now been shutdown.

2. Press **ESC** until the main menu displays.

Restore Factory Defaults

Each HD-LM Door Operator is shipped with certain parameters and adjustments modified to match the job condition; however, the defaults remain the same for all units.

CAUTION **The supplied configuration of the door operator uses adjustment and parameter values that are different from the default values shown in the Diagnostics section. Using the Factory Defaults Command (FDF) could result in a maladjusted or non-functioning door operator.**

1. Begin with the doors fully closed.
2. Scroll to MAIN>SYSTEM>CMD>FACTORY DEFAULTS, press **ENTER**, and UIT displays:

   ENT to Restore
   ESC to Exit

3. Press **ENTER**, and the UIT displays:

   Values Restored

NOTE All adjustments, parameters and commands are now set to the manufacturing defaults.

4. Press **ESC** until the main menu displays.

Troubleshooting

Power-Up Verification

1. Turn OFF, Lock, and Tag out the mainline disconnect.
2. Unplug the connectors from the door card.
3. Turn ON the mainline disconnect.
4. Measure AC voltage on the door operator terminal strip across AC1S and AC2. The voltages should match the voltages in Table 5. If the voltage measured is zero (0), verify the following:
   - The power switch in the door control box is ON.
   - The connections in the swing return are functional.
   - The power is ON at the elevator controller.
   - The fuses in the elevator controller are functional.
   - The connections in elevator controller are functional.
5. Measure the AC voltage across AC1S and ACG.
   a. If the voltage is in range of 0–80VAC, measure AC2 to ACG.
   b. If AC2 to ACG is in range of 103–126VAC, AC1S and AC2 have been reversed; reverse AC1S and AC2.
6. With the system still powered-up, measure the DC voltages on the door operator terminal strip across P24 and G24. The voltages should match the voltages in Table 5. If the voltage measured is zero (0), verify the following:
   - The P24 switch in the swing return is ON.
   - The connections in the swing return are functional.
   - The power is ON at the elevator controller.
   - The fuses in the elevator controller are functional.
   - The connections in the elevator controller are functional.

Voltage	Meter Setting	Positive Meter Probe	Negative Meter Probe	Voltage Measured
AC1S	Volts AC	AC1S terminal 6	AC2 terminal 5	103 - 126VAC
AC1S	Volts AC	AC1S terminal 6	ACG terminal 4	103 - 126VAC
AC2	Volts AC	AC2 terminal 5	ACG terminal 4	0VAC
P24	Volts DC	P24 terminal 17	G24 terminal 20	22 - 26VDC

Table 5 - Voltage Settings

LED Verification

1. Turn OFF, Lock, and Tag out the mainline disconnect.
2. Reconnect the connectors on the door card (located inside the door operator).
3. Verify the doors are in the fully closed position.
4. Turn ON the mainline disconnect.
5. Verify that the VBUS and WD LEDs are illuminated. See Figure 21 on page 52.

NOTE If the VBUS or the WD LED is not illuminated, see Troubleshooting Guide on page 54.

6. Verify that the door is still in the fully closed position and that the DCL LED is illuminated. If the LED does not illuminate, see Troubleshooting Guide on page 54.
7. Turn OFF the toggle switch (located in the door operator).
8. Manually move the doors to the fully open position.
9. Turn ON the toggle switch.
10. With the door in the fully open position, verify that the DOL LED is illuminated. If the LED does not illuminate, see Troubleshooting Guide on page 54.

Power Supplies Check

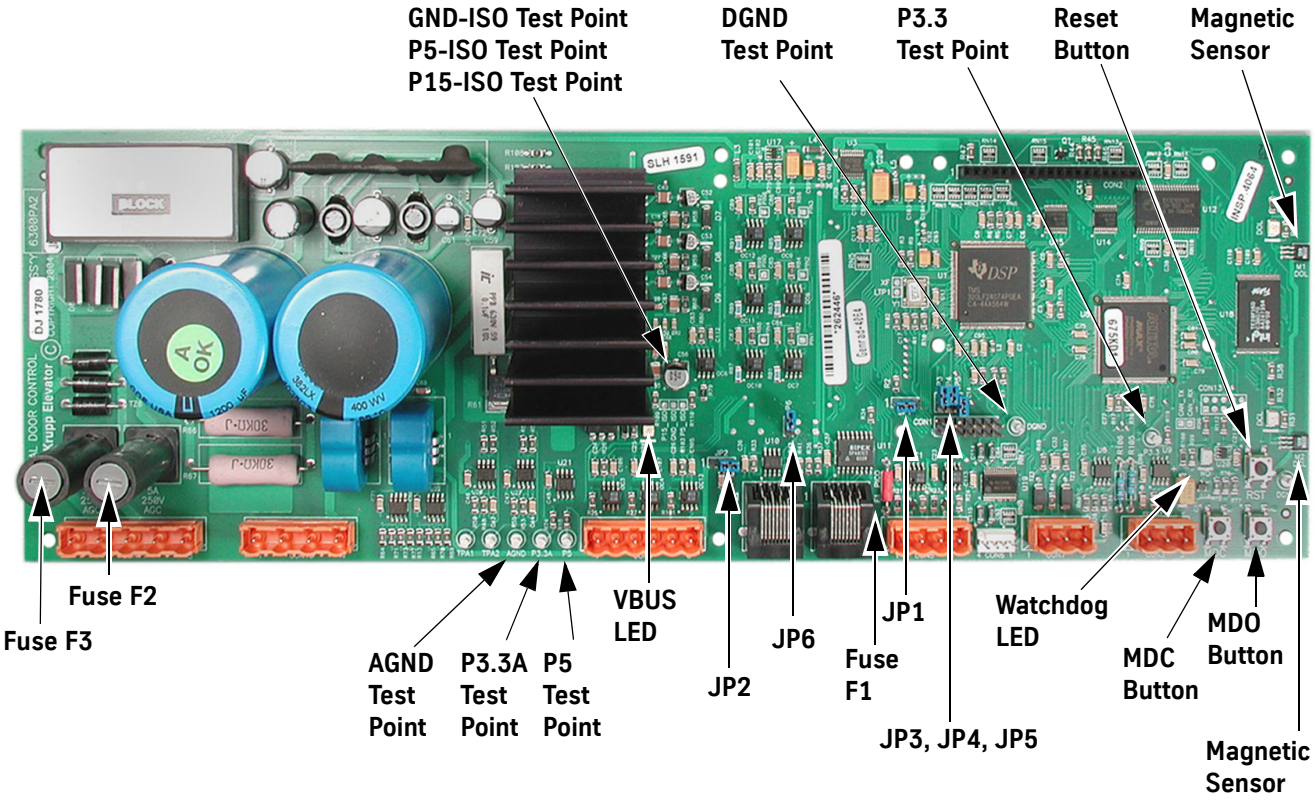
WARNING **When checking door card power supplies, take great care to avoid electrical shock and/or damage to the door card.**

1. Turn the door card ON, and measure the voltages at the specified points on the door card. The voltage for each measurement should be in the range noted. See Figure 21 on page 52.

NOTE VBUS is the power supply for the motor. The voltage for this power rail is generated from the incoming 115VAC, which is rectified and filtered to produce the DC power supply. A VBUS indicator LED is provided on the card.

2. The VBUS LED will indicate whether this power supply is functional.
   a. If the VBUS LED is not illuminated, see Troubleshooting Guide on page 54.
   b. If 115VAC is available at CON11 pins 1 and 2, and the VBUS LED is not illuminated, replace the door operator card.

Power Supplies Check
(continued)



Power Supply	Measurement Locations	Acceptable Voltage Range (VDC)
P5	P5 Test Point to DGND Test Point	4.875–5.125
P3.3	P3.3 Test Point to DGND Test Point	3.2–3.37
P3.3A	P3.3A Test Point to AGND Test Point	3.2–3.4
P5_ISO	P5_ISO Test Point to GND_ISO Test Point	4.5–5.5
P15_ISO	P15_ISO Test Point to GND_ISO Test Point	14.625–15.375

Figure 21 - Door Card Power Supply Check

Check the Encoder

Perform this check to verify that the encoder signals are working properly.

1. Before conducting this test, verify that fuse F1 on the door card is functional.
2. Use a digital multimeter to measure the voltage across fuse F1.
   - If the voltage reads higher than 1.5 volts, replace the fuse.
   - If the voltage reads below 1.5 volts, the fuse is functional.

NOTE The best way to check the encoder signals is with an oscilloscope. If an oscilloscope is not available, use the digital multimeter method.

Oscilloscope Method

Required tool: An oscilloscope with two working channels.

1. Set the vertical channel to 5V/div.
2. Set the horizontal channel to 1uS/div.
3. Connect the ground leads for both channels to the GND test point.
4. Connect the channel A probe to CON8-2 (PHA).
5. Connect the channel B probe to CON8-3 (PHB).
6. Slowly rotate the door motor by hand.

NOTE
- PHA and PHB should be 90 degrees out-of-phase, and toggle between 0–1 and 4.5–5 volts.
- If both signals toggle as they should, then the encoder is working. The door card may need replacing.

Digital Multimeter Method

Required tool: A digital multimeter set to measure DC volts.

1. Connect the negative lead to the GND test point and positive lead to CON8-2 (PHA).
2. Slowly rotate the door motor by hand.

NOTE The digital multimeter display should toggle between less than 1 volt and greater than 4 volts.

3. Connect the negative lead to the GND test point and positive lead to CON8-3 (PHB).
4. Slowly rotate the door motor by hand.

NOTE
- The digital multimeter display should toggle between less than 1 volt and greater than 4 volts.
- If both PHA and PHB toggle as they should, then the encoder is working. The door card may need replacing.

Troubleshooting Guide

For assistance, please call 1-866-HELP-TKE.

<table>
<tr><th>Problem</th><th>Possible Causes or Solutions</th></tr>
<tr><td>Doors Run the Opposite Direction When First Powered Up</td><td>1. Change the hand of the operator by changing the LHO adjustment.
2. To verify that the problem was corrected, press MDO to verify that the doors move in the Open direction.
3. To verify that the doors move in the Close direction, press MDC.
4. Save this adjustment change to FLASH.</td></tr>
<tr><td>Door Motor Vibrates When Trying to Move the Door</td><td>1. Verify that the proper motor type is selected in the DCM adjustment.
2. Verify that the motor leads are connected per the Motor Connections Chart below.
The motor and encoder connections must match what is shown in the charts below. If any of these connections are not correct, unstable operation will result.
CAUTION Do not change motor or encoder connections to change door direction. To change door direction, use the LHO Adjustment.
3. Verify that the encoder is connected per the Encoder Connections Chart.
4. Verify 5VDC to encoder connector.
a. Use a digital multimeter to measure the voltage from CON 8-1 to CON 8-4.
b. Place the red probe on CON 8-1 and the black probe on CON 8-4.
• If the voltage reads less than 4.5 volts, check the fuse.
• If the voltage reads above 4.5 volts, check the encoder signals.
5. Verify that the encoder power fuse F1 on the door card is functional.
6. Verify that the encoder works.

Motor Connections
<table><tr><th>Connector-Pin</th><th>VFD Cable Wire No.</th><th>AC Motor Leads</th><th>DC Motor Leads</th></tr><tr><td>CON 10-2</td><td>1</td><td>1</td><td>No Connect</td></tr><tr><td>CON 10-4</td><td>2</td><td>2</td><td>Red</td></tr><tr><td>CON 10-3</td><td>3</td><td>3</td><td>Black</td></tr><tr><td>GND Screw</td><td>Green</td><td>Green</td><td>No Connect</td></tr></table>
Encoder Connection
<table><tr><th>Connector-Pin</th><th>Wire Color</th><th>Signal</th></tr><tr><td>CON 8-1</td><td>Red</td><td>P5</td></tr><tr><td>CON 8-2</td><td>White</td><td>PHA</td></tr><tr><td>CON 8-3</td><td>Green</td><td>PHB</td></tr><tr><td>CON 8-4</td><td>Black</td><td>GND</td></tr></table></td></tr>
</table>

Problem (Continued)	Possible Causes or Solutions
Doors Will Not Open to Fully Open Position	1. Verify DOL limit is adjusted properly and the DOL LED illuminates when the magnet is aligned with the hall-effect sensor. 2. Verify the mechanical stop is set properly and is not interfering with the Open Cycle. 3. Verify the drive arms are set up and aligned properly.
Doors Will Not Close to Fully Closed Position	1. Verify that the DCL limit is adjusted properly and that the DCL LED illuminates when the magnet is aligned with the hall-effect sensor. 2. Verify the mechanical stop is set properly and is not interfering with the Close Cycle. 3. Verify that the drive arms are setup and aligned properly.
VBUS LED Will Not Light	1. Verify that the power switch in the operator is in the ON position. 2. Check for 115VAC across pins 1 and 2 of CON 11. 3. Check fuse F2 on the door card; replace if necessary. 4. Verify the wires for power (those going to CON 11) are securely fastened and in the correct place.
WD LED Will Not Light	1. Verify power switch in operator (located on the PC card shelf) is in the ON position. 2. Check fuse F3 on the door card; replace if necessary. 3. Verify the wires for power (those going to CON11) are securely fastened and in the correct place.
DCL or DOL LED Will Not Light	The DCL or DOL LEDs will not illuminate unless the magnet cam is aligned with the hall- effect sensor on the end of the card. 1. Verify proper alignment of the magnetic limit cam with the hall-effect sensor. If not aligned properly, adjust the magnetic limit cam on the door operator cam shaft. 2. Verify that the DCI, ELI, and LDO adjustments are all set to 0 (zero). 3. Verify that the power switch in the operator is in the ON position. 4. Check fuse F3 on the door card; replace if necessary. 5. Verify that the wires for power (those going to CON11) are securely fastened and in the correct place.
Doors Will Not Reverse on Safety Edge Activation	1. Verify that the wires for safety edge signal are securely fastened and in the correct connector. The safety edge signal wire goes to CON 9-5 on the UDC. 2. Verify that the SE signal return wire (G24) is connected to CON 9-6. 3. Verify the UDC Card signal. a. Use a digital multimeter to place black probe on CON 9-6 and red probe on CON 9-5. b. Activate the safety edge, and verify that the digital multimeter reads less than 2 volts.
MDO Starts to Open Doors, But Doors Reclose	Verify that the elevator is on Inspection Operation. The MDO is overridden by a Close Door Command from the elevator controller.
MDC Starts to Close Doors, But Doors Reopen	Verify that the elevator is on Inspection Operation. The MDC is overridden by an Open Door Command from the elevator controller or by an active SE signal.
Doors Will Not Set Up	1. Verify that the motor moves the door in the correct direction when **MDC** or **MDO** are pushed. 2. Verify that the encoder is connected properly. 3. Verify 5VDC to the encoder connector. 4. Use a digital multimeter to measure the voltage from CON8-1 to CON8-4. Place the red probe on CON8-1, and the black probe on CON8-4. • If the voltage reads less than 4.5 volts, check the fuse. • If the voltage reads above 4.5 volts, check the encoder signals. 5. Verify that the encoder power fuse F1 on the door card is functional. 6. Verify that the encoder works.

Problem (Continued)	Possible Causes or Solutions
Doors Will Not Close After Opening, or Doors Open Without Command and Will Not Close	1. Verify that the SE signal is not active. 2. Use a digital multimeter to place the black probe on CON 9-6 and the red probe on CON 9-5. 3. Activate the safety edge, and verify that the digital multimeter reads less than 2 volts. If the voltage at the CON9 is greater than 2 volts, then the wiring in the safety edge enclosure will have to be changed so that the signal goes low when an obstruction is in the doorway.
Doors Will Not Move When MDO or MDC Is Pushed	1. Verify that there are no mechanical restrictions or binds. 2. Verify that the IGBT has not been shutdown due to a fault. Check faults and follow the instructions for the particular faults that are listed. If the fault listed is the IGBT_FAULT, reset the IGBT power module. 3. If MDO does not work: a. Verify that the elevator is on Inspection Operation. The MDO is overridden by a Close Door Command from the elevator controller. b. Verify that the DOL limit is not active. If it is active, the doors will not open. If on the DOL limit, move the doors off of the open limit, and verify that MDO does cause the doors to open. 4. Verify that the elevator is on Inspection Operation. The MDC is overridden by an Open Door Command from the elevator controller or by an active SE signal. 5. If MDC does not work, verify that the DCL limit is inactive. If it is active, the doors will not close. If on the DCL limit, move the doors off of the close limit, and verify that MDC does cause the doors to open. 6. Verify that VBUS LED is illuminated. 7. Verify that WD LED is illuminated. 8. Power-down the card, remove the connector to the motor, and power-up the card. 9. Connect a voltmeter to the motor output pins; be very careful not to short the pins together. 10. Press **MDO** or **MDC**, and verify there is voltage on the motor output pins. a. If voltage is present, check motor wiring. If wiring is good, motor may be bad. b. If no voltage is present, verify that the correct door operator profile is loaded for the type of door and motor being used. If the correct door operator profile is loaded and the IGBT is not faulted out, the card may be damaged.

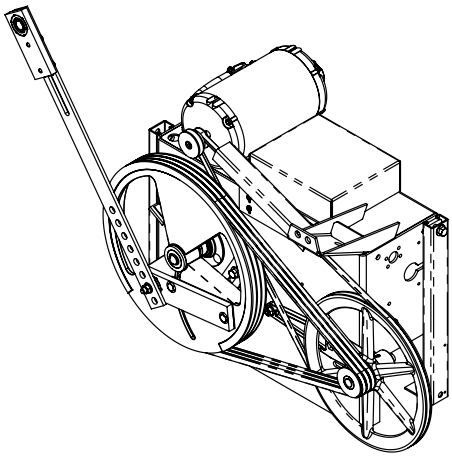
Maintenance

1. Verify that the motor mounting bolts are tight.
2. Remove the brush covers (where applicable), blow out the brush holders, check the brushes for wear, and reinstall the covers.
3. Inspect the operator belts for the following:
   a. Cracks or glazing
   b. Even wear on both sides of the belt
   c. Belts are not bottomed out in the grooves
   d. Proper tension (belt slippage).

   The following guidelines apply when testing, adjusting, or replacing belts:

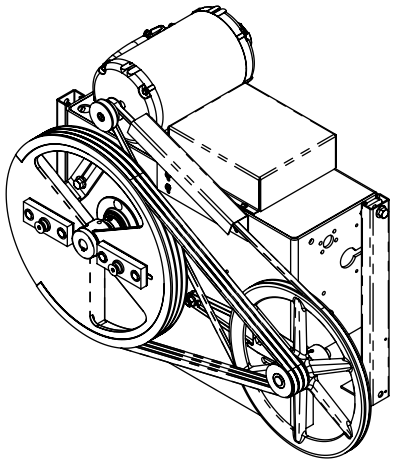
   - Ideal tension is the lowest tension at which the belt will not slip at peak load.
   - All belts in the set should be tested for equal tension by pushing each belt down at the midpoint between the pulleys (typical deflection is $^{3}/_{8}$" with 10 lbf. applied).
   - If belts require tensioning, check the sheave alignment with a straight edge.
   - If belts are replaced on multi-groove sheaves, change the belts as a matched set.
4. Verify that all of the linkage bolts are tight.
5. Remove the door operator cover, rotate the door operator by hand, and check the operation of the DOL and DCL sensors.
6. Check the operation of the gate switch, and verify that it is adjusted per code.
7. Use a burnishing tool/clean rough paper to clean gate switch contacts (if needed).
8. Replace the door operator cover.
9. Check for excessive bearing wear.

Replacement Parts



3001AX1, 3001AX2, 3001AX5

Single Arm, SS/2S/CO

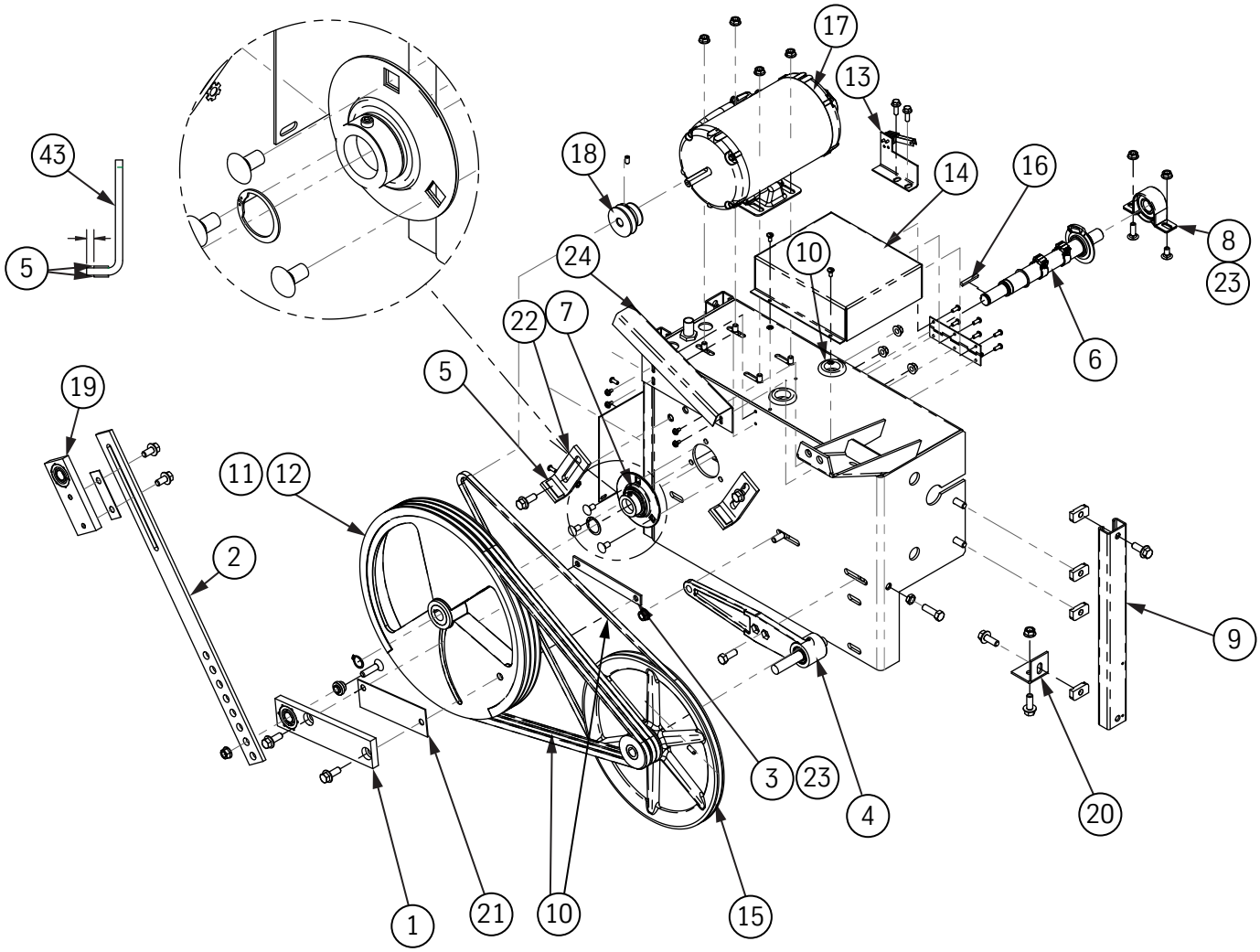


3001AX3, 3001AX4

Dual Arm, CO

Single Arm Assembly SS, 2S, CO	Sub-Assemblies	Description
3001AX1	3002AY1	Electrical Assembly, Standard Frame
	2011AF1	Mechanical Assembly, 1/2 HP
3001AX2	3002AY2	Electrical Assembly, Heavy Duty Frame
	2011AF2	Mechanical Assembly, 1/2 HP
3001AX5	3002AY5	Electrical Assembly, Standard Frame
	2011AF1	Mechanical Assembly, 1/2 HP
	177AM1	Alarm, Audible Signal, 12V
Dual Arm Assembly CO Only	**Sub-Assemblies**	**Description**
3001AX3	3002AY3	Electrical Assembly, Standard Frame
	2011AF3	Mechanical Assembly, 1/2 HP
3001AX4	3002AY4	Electrical Assembly, Heavy Duty Frame
	2011AF4	Mechanical Assembly, 1/2 HP
Other Parts	**Print Number**	**Description**
	378AW1	Fan Assembly, Dual-Drive Arm
	462KL1	Harness Assembly, AC Motor
	462PY1	Harness Assembly, Internal
	960DT	Wiring Diagrams

Replacement Parts
(continued)



2011AF1 - Mechanical Assembly, 1/2 HP shown

Replacement Parts
(continued)

ITEM	PART NO.	PRINT NO.	DESCRIPTION
1	9723997	123992	Adjustable Arm Assembly
2		103268	Adjustable Arm (Intermediate)
3		124050	Bar, Tap, Adjustable Arm, Door Operator
4	9838820	63882	Idler Arm Assembly, Adjustable
5		40148	Dumper, Closing Vane, Clutch
6		141708	Cam, Shaft Assembly HD85
7	9711715	101171	Bearing, Main Door Operator
8	9711739	101172	Bearing, Rear Door Operator
9		800BP1	Door Operator Support Strut
10	9749470	77920	V Belt, 3V630
11		750CV1	Drive Sheave
12		894AM1	Drive Sheave
13		141700	Gate Switch Assembly
14		320LL1	Top Cover
15	9876686	67668	Jack Sheave Machining V Groove
16		44312	Door Operator Key
17	9739593	591BJ1	Motor Assembly, DO Closed Loop 115V, 1/2hp
18	9734624	120969	Sheave, Motor
19	9723985	123990	Pivot Arm Assembly
20		102109	Rear Support Clip
21		123988	Shim, Door Operator Machine
22	9814656	14653	Door Operator Stop
23		142CN1	Bearing, Rear Door Operator, Cast
24		451LF1	Belt Guard

The following items not illustrated:

25		286AH15	Flex Connector, Straight, .500 Dia.
26		200AMM1	Bolt Kit Dual-Drive Arm Door Operator
27		165ANB1	Motor Tensioning Assembly Plate
28		112HC1	Drive Wheel Bar
29		112HE1	Bar, Tap, Drive Wheel
30		760BM1	Shim, Drive Wheel

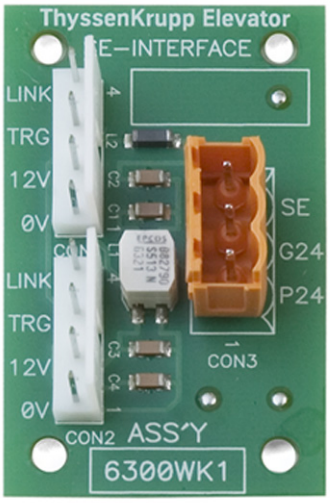
Replacement Parts
(continued)

31	9803889	6300PA7	UDC Board
32		378AW1	Fan Assembly Dual-Drive Arm Door Operator
33	9782722	672BW1	Power Supply, 24VDC, 50W
34	9736254	177AM1	Audible Signal Alarm, 12V
35		6300AEN1	PCB Assembly, SE Interface No Filter
36		286AV5	Flex Conduit, .500 Dia. X 7.500
37		142CM1	Bearing, Main Door Operator, Cast

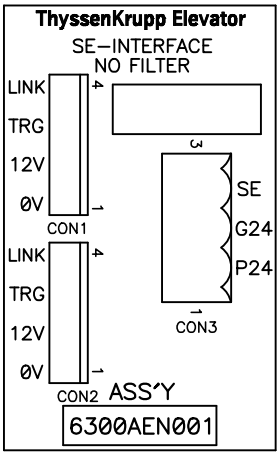
3200AY1 Electrical Assembly Replacement Parts

ITEM	PART NO.	PRINT NO.	DESCRIPTION
1		2011AF1	Door Operator Mechanical Assembly, 1/2 hp
		2011AF2	Door Operator Mechanical Assembly, 1/2 hp
		2011AF3	Door Operator Mechanical Assembly, 1/2 hp
		2011AF3	Door Operator Mechanical Assembly, 1/2 hp
2		196ADY1	P.C. Board Shelf
3	9803889	6300PA7	UDC Board
4		320HJ2	Gate Switch Cover
5		580KN1	Toggle Switch ON/OFF Marker
6	9870936	661BA4	Conn Term Plug/M 90° 5.08mm 1x4
7		378AW1	Fan Assembly Dual-Drive Arm Door Operator
8		672BW1	Power Supply, 24VDC, 50W
9	9736254	177AM1	Audible Signal Alarm, 12V
10		287AL1	Conduit Steel Box
11	9853662	834AF1	Terminal Block Rail, End Section
		834DE1	Terminal Block Rail, 180° 10mm beige single level
		834DF1	Terminal Block Rail, 180° 10mm green/yellow
12		684AD19	Din Rail
13		6300AEN001	PCB Assembly, SE Interface no filter

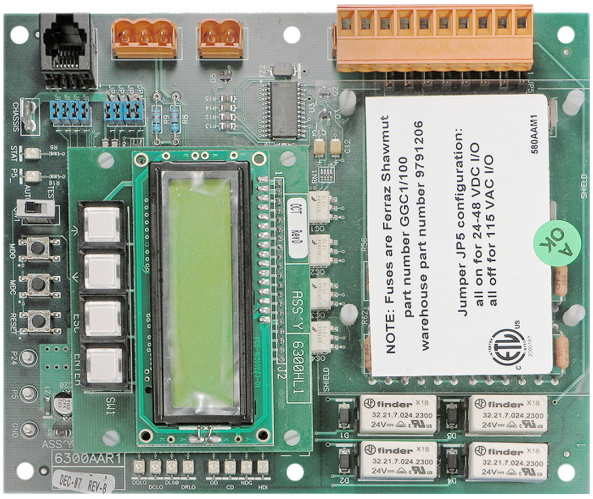
Replacement Cards and Connectors



6300WK1 - SE Interface

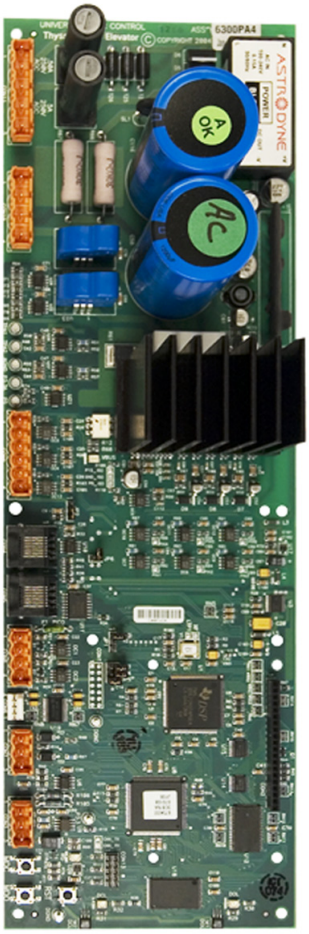


6300AEN1 - SE Interface, No Filter



6300AAR1 - Remote UIT_I/O
6300HL1 - User Interface Tool

6300PA7 - Universal Door Control (UDC)



Connector Plugs

Part No.	Print No.	Location	Connector	Image
9725638	661BA3	Door Card	CON 3	
9725638	661BA3	UIT_I/O	CON 2	
9870936	661BA4	Door Card	CON 8	
9854698	661BB4	Door Card	CON 10	
9854542	661BB5	Door Card	CON 11	
9726541	661BA6	Door Card	CON 9	
9853431	661BA2	UIT_I/O	CON 3	

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