



VERTICAL EXPRESS

# LD-16 Door Operator



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# 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 that all manufacturing wire connections are tight on relays, contactors, fuse blocks, resistors, and terminals on cards and DIN rail terminals. 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 *Employee Safety and Accident Prevention Program Manual* and 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.

### 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. Refer to the *Elevator Employees' Safety and Accident Prevention Program Manual* for the required procedure.

## Electrical Safety

(continued)

- Test Equipment Safety** Always refer to manufacturers' instruction book for proper test equipment operation and adjustments.
- Megger or 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 Employees' Safety and Accident Prevention Program Manual* and the *Elevator Industry Field Employees' Safety Handbook* for mechanical equipment safety information on installation and service.

## 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.

## Asbestos Compliance

Elevator personnel will no longer drill or modify any doors with asbestos containing materials (ACM) or possible asbestos containing materials (PACM). All elevator doors manufactured or installed 1980 and earlier will be treated as having ACM/PACM.

Doors with ACM/PACM should be replaced rather than modified. If replacement is not feasible, abatement modifications shall be done by a licensed asbestos abatement company. The mechanics will safely stage the equipment for the abatement team, or remove the doors and seal them with plastic for delivery or pick up by the asbestos abatement company.

Doors manufactured or installed 1980 and earlier may be modified by employees if a test is conducted by a licensed asbestos company prior to work showing zero evidence of ACM/PACM.

All employees that risk exposure to asbestos will complete the safety department approved asbestos awareness training. All employees will stop any work that could expose them to ACM/PACM, and immediately contact their supervisor and their safety manager.

# 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.



Refer to the *Replacement Parts Catalog* to order extra static bags and shipping cartons for each card.

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

## Revision Change Bars

Each revised page included in this manual will have a vertical line (change bar) to the left of the text that has been added or changed. The example at the left of this paragraph shows the size and position of the revision change bar.

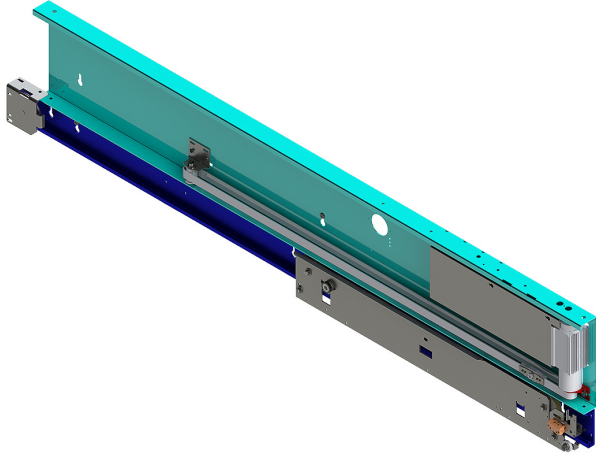


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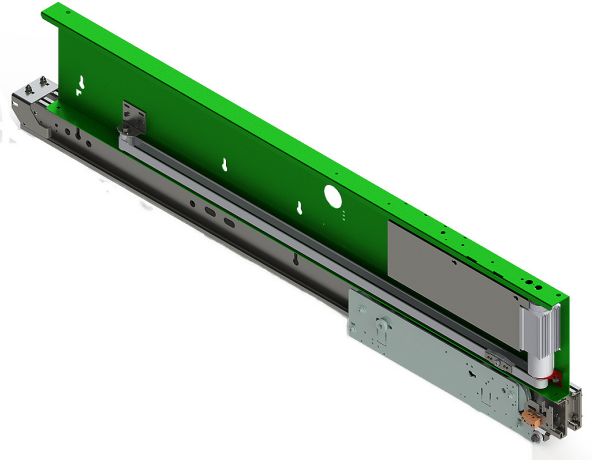
# Overview

## Integral Cab Header

Single-Speed Side-Opening Doors Assembly (3002BG)



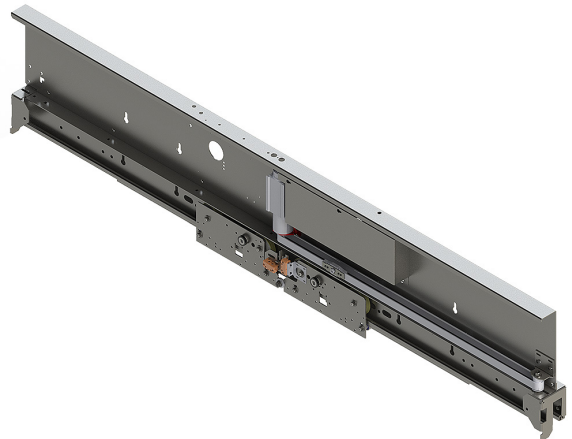
Two-Speed Side-Opening Doors Assembly (3002BH)



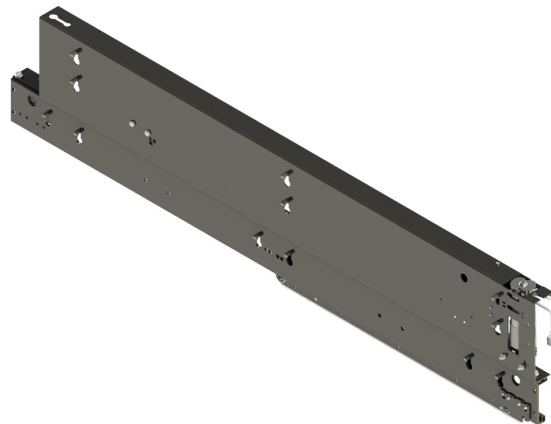
Single-Speed Center-Opening Doors Assembly (3002BF)



Two-Speed Center-Opening Doors Assembly (3002BJ)



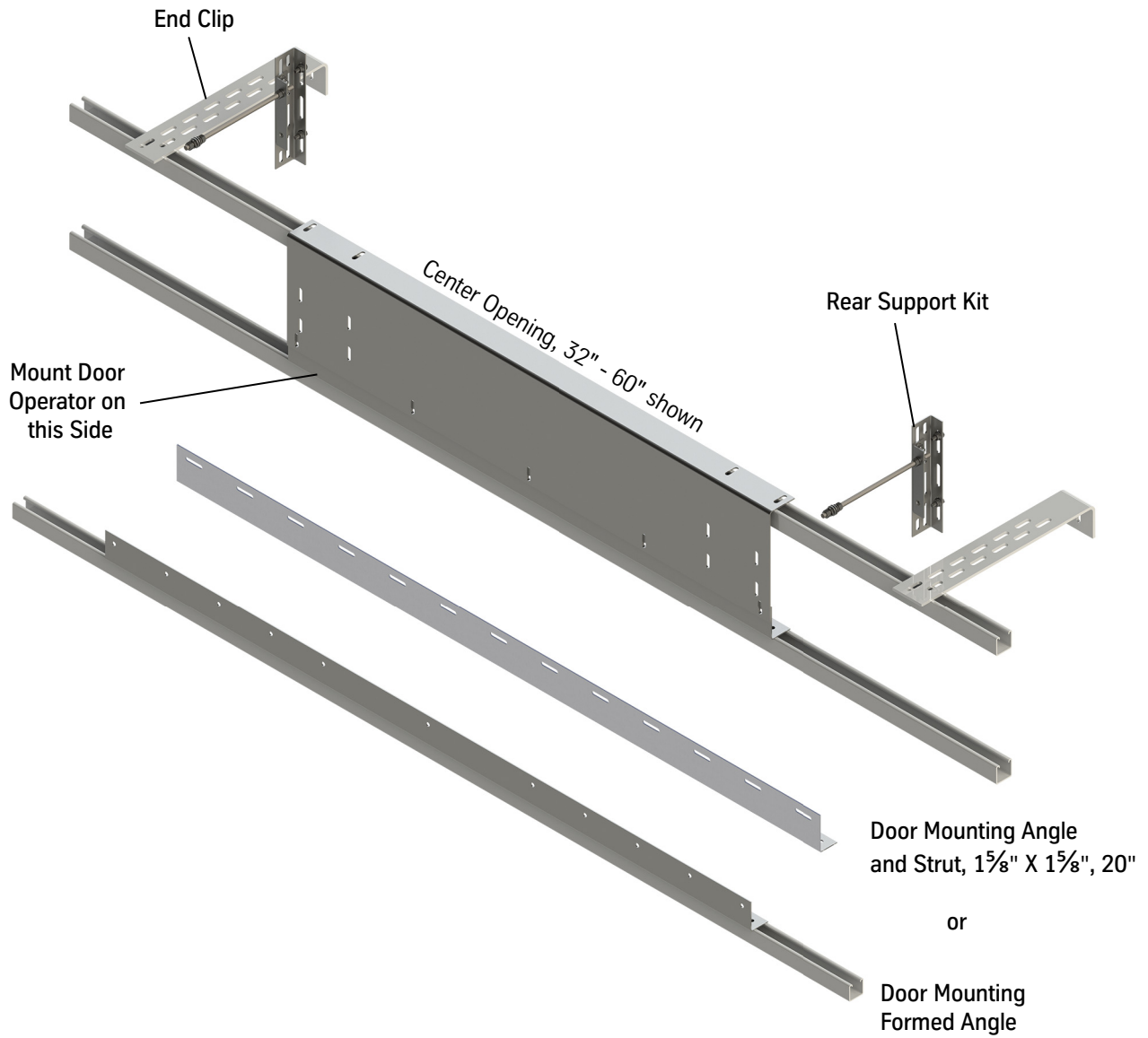
Cimarron Assembly (3002BN)



Overview  
(continued)

Existing Cab Header

See Universal MOD Kit (200CJD) Installation on page 33.



To obtain clearance with existing equipment, use the proper door angle for the job installation.

# Performance Specifications

	MIDI+	SUPRA
	All NI, SS, CO, and 2SPD. with elevator speed $\leq 200$ fpm. and elevator travel $\leq 100$ feet.	<ul style="list-style-type: none"> <li>All NI with elevator travel <math>&gt; 100</math> feet or elevator speed <math>&gt; 200</math> fpm.</li> <li>All 2SCO.</li> <li>All MOD operators with tracks and hangers.</li> </ul>
Motor Characteristics	Three-phase Permanent Magnet Synchronous Motor	
Drive	V3F-Converter (vector control)	
Average power consumption	92W	170W
Maximum momentary power consumption	475W	900W
Power supply	Universal 115-230V $\pm 20\%$ 50/60Hz	
Protection class	IP20	
Storage temperature	$-45^{\circ}$ to $70^{\circ}$ C	
Operating ambient temperature	$-20^{\circ}$ to $50^{\circ}$ C	
Humidity range	98% maximum $40^{\circ}$ C	
Regulations and codes	ASME A17.1/CSA B44, EN81	
Electromagnetic compatibility	Immunity and emission protection EN12015/16	
Maximum movable masses	600 lbs. (270 kg)	1322 lbs. (600 kg)
Estimated lifetime	More than 3 million cycles	More than 5 million cycles
Safety device for cab egress	Car door interlock	
Door operator noise level* *sound levels in a stopped car	Average 55 dBA Maximum 60 dBA	Average 50 dBA Maximum 55 dBA
Maximum door speed capability* *actual top door speed for a specific installation may be different depending on door mass or door travel.	2.16 ft/sec	2.96 ft/sec
Reopening device* *on modernization installations: door reversal could be greater if the door edge bypasses the door control board and is connected to the elevator controller.	Safety light edge with door reversal capability less than $2^{1/2}$ "	

# Motor Specifications

	Unit of Measure	MIDI PMSM	SUPRA PMSM
Motor Type		57BL74	M763
Operation Mode		S1	S1
Insulation Class		B	B
Protection Degree		IP40	IP40 (IP54 opt.)
Storage Temperature	°C	-45 to +70	-45 to +70
Operating Temperature	°C	-20 to +65	-25 to +55
Humidity	%RH	93% @ 40° C	98% @ 40° C
Noise Level	dBA	50 avg./55 max.	45 avg./50 max.
Door Cycles, Lifetime		7,000,000	10,000,000
Hours, Lifetime	Hours	12,000	20,000
NR Pole		4	4
Rated Voltage	V	36	42
Rated Speed	rpm	4000	3300
Rated Torque	Nm	0.22	0.41
Nominal Current	A	3.45	4
Rated Output Power	W	92	142
Efficiency	%	-	84.5
Overload (I <sub>max</sub> /I <sub>rated</sub> )		5	7
DC-Link Voltage	V	18 to 42	18 to 75
Rotor Inertia	gcm <sup>2</sup>	119	760
Max. Cogging Force	Ncm	< 85, 9	< 85, 9
Cogging Torque (Motor Only)	Ncm	< 4, 5	< 4, 5
Gear Rate		8.2	6.43
Tooth Belt Diameter	mm	38.2	38.2
Tooth Belt Tension	N	800	1,100
Duty	Starts/Hour	250	250
Top Speed	ft/sec	1.96	2.96



# Required Tools and Materials

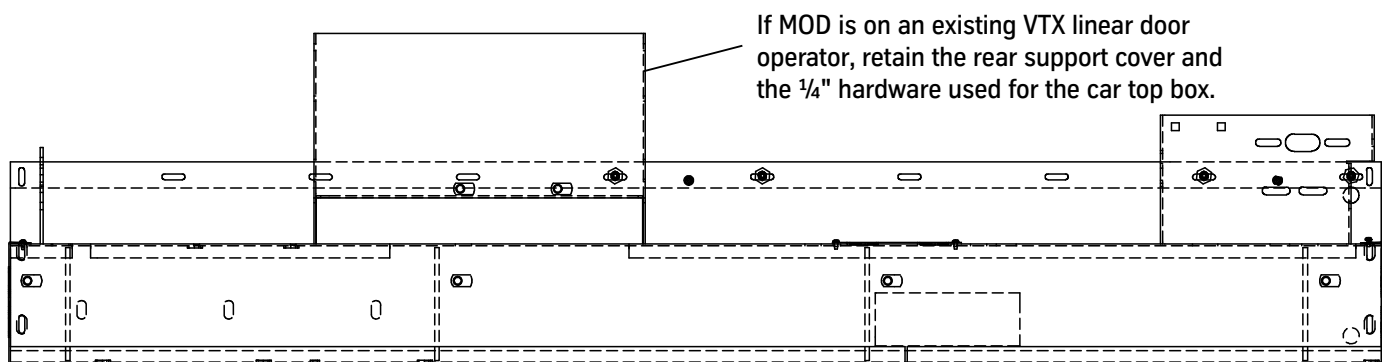
- Ratchet wrenches: 13 mm, 17 mm,  $\frac{1}{16}$ " ,  $\frac{3}{4}$ "
- $\frac{3}{8}$ " ratchet & extension
- Sockets: 13 mm, 14 mm, 15 mm,  $\frac{1}{64}$ " ,  $\frac{3}{4}$ "
- T-handle (Allen keys): 4 mm, 5 mm, 6 mm,  $\frac{3}{16}$ "
- $\frac{3}{8}$ " socketed-head Allen key
- Flat & Phillips screwdrivers
- Torpedo or tool box level
- Tape measure or folding ruler
- Door pressure gauge
- $\frac{1}{4}$ " cordless impact with 12" extension
- Sawsall with metal cutting blades (MOD applications)
- Pallet jack
- Hand trucks
- Tin snips
- Pry bar
- Claw hammer
- Tri square
- Small plumb bob
- Large channel locks
- $\frac{5}{16}$ " nut driver for impact
- $\frac{3}{8}$ " impact gun adapter
- Wire strippers
- Scribe
- Electrical tape
- Small straight slot screwdriver (plug wiring)
- Runbug
- Grinder
- Hack saw

# Single-Speed Side-Opening Doors

## Integral Cab Header Installation

Other Installation Configurations		Starts on
Single-Speed Center-Opening Doors Integral Cab Header		page 26
Two-Speed Side-Opening Doors Integral Cab Header		page 19
Existing Cab	Not Integral Cab Header	Universal MOD Kit (200CJD)
		Separate Header Installation

1. Ensure that the car will run on Runbug Operation.
2. Remove the doors and the related door components and keep these items if they will be reused. Keep all removed components until the elevator is running. See Figure 1.



- Header shown is for a VTX linear operator, 42" opening width.
- Headers for HD and other widths will be different.

Figure 1 - Header Modifications

3. Remove the existing door operator wiring harness and the Car Top Station (CTS).
4. Remove all door operator parts and components that may interfere with new equipment.
5. Remove part of the header (for clearance of the mounting angles) so that it is even with the top of the header. See Figure 2 on page 13.
6. Use the included hardware to install the mounting angles. See Figure 3 on page 13 for Dimension C.

Single-Speed Side-Opening Doors Integral Cab Header Installation

(continued)

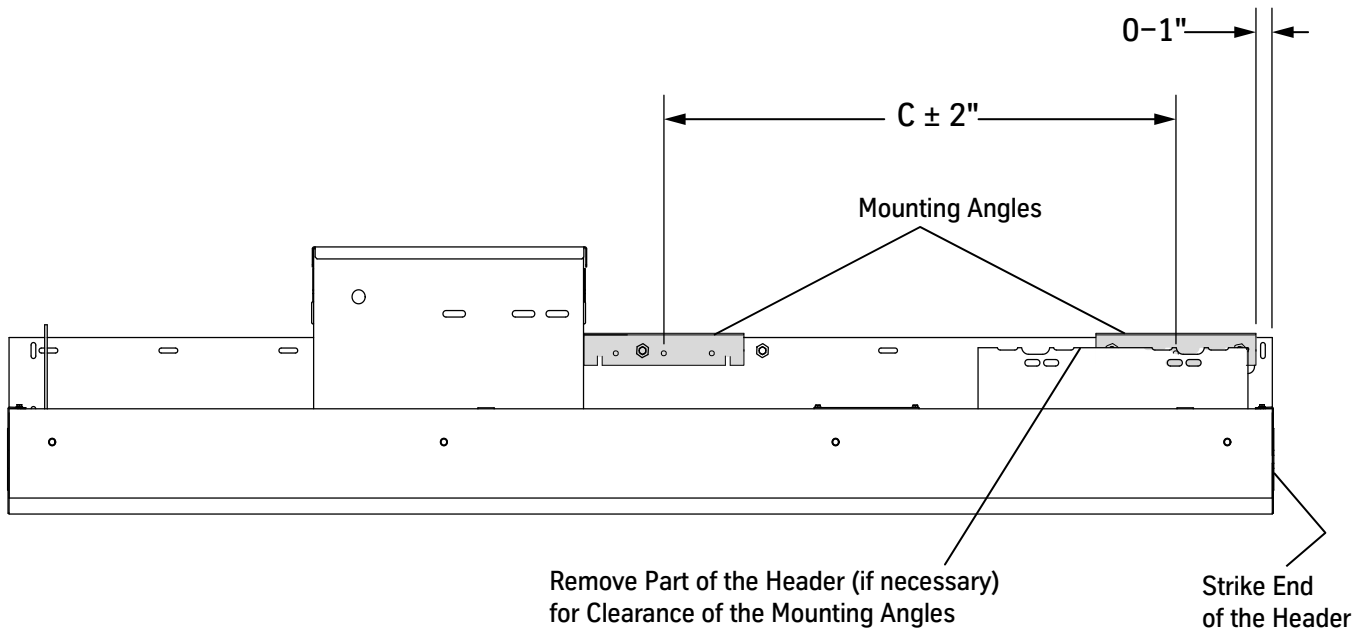
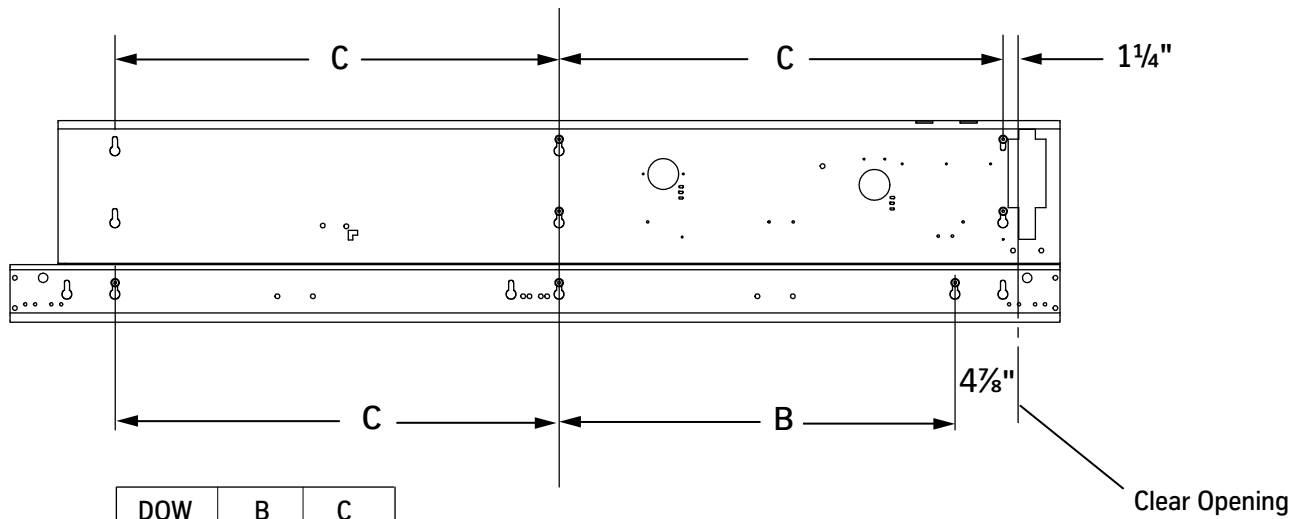


Figure 2 - Modify Header and Install Mounting Angles



DOW	B	C
32	23	27
34	25	29
36	27	31
38	29	33
40	31	35
42	33	37
44	35	39
46	37	41
48	39	43
Dimension C = ±2" (all dim. in inches)		

Primary location for keyslots used to brace the door operator back to the cab start at 1¼" from the clear opening, and spaced at Dimension C inches. See Chart for Dimension C.  
(right-hand shown; left-hand opposite)

Figure 3 - Relationship of Keyslots and Door Operator Machine to Clear Opening

## Single-Speed Side-Opening Doors Integral Cab Header Installation

(continued)

7. Use the existing door track holes to align the adapter angle. See Figure 4 below and Figure 5 on page 15.
8. Use included hardware to attach the adapter angle to the header, but do not tighten; leave hardware loose to allow adapter alignment with track keyslots.
  - a. Use low profile bolts at the following locations:  
When looking from the strike end of the side opening,
    - Small Hole/Slot = Right-Hand Openings
    - No Hole/Slot = Left-Hand Openings
  - b. Use push nuts to help position the low profile bolts.

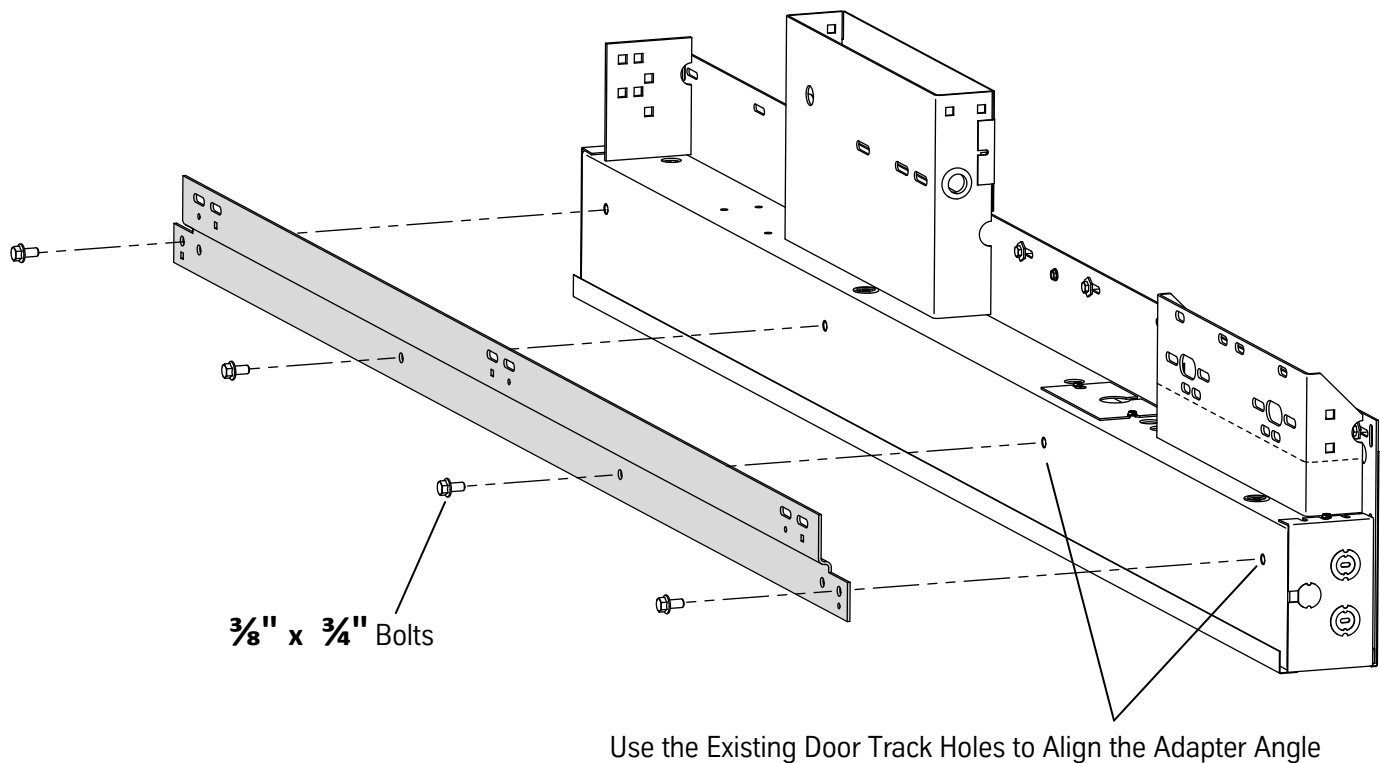
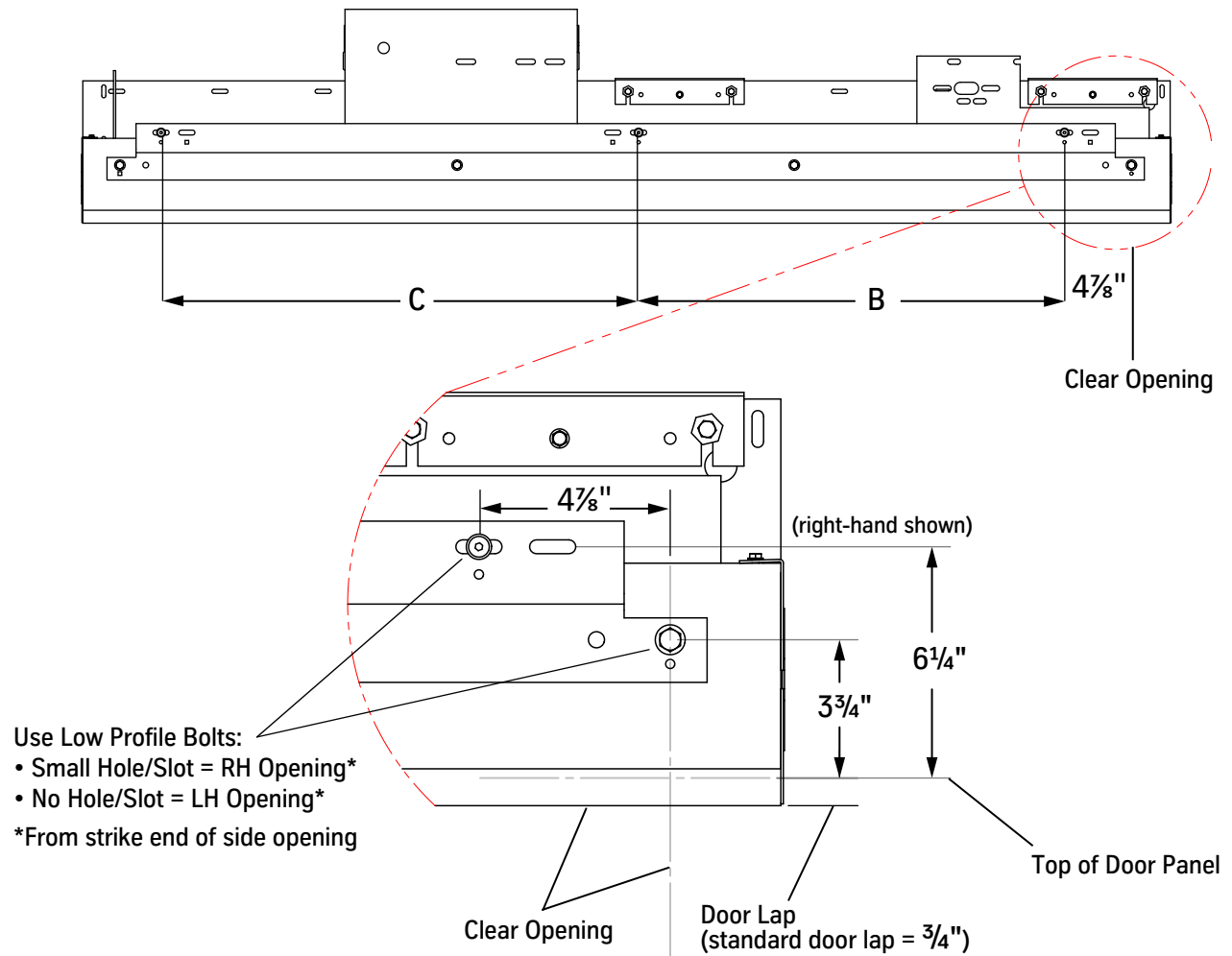


Figure 4 - Adapter Angle Installation (1 of 2)

### Single-Speed Side-Opening Doors Integral Cab Header Installation

(continued)



Use Push Nuts To Position Low Profile Bolts

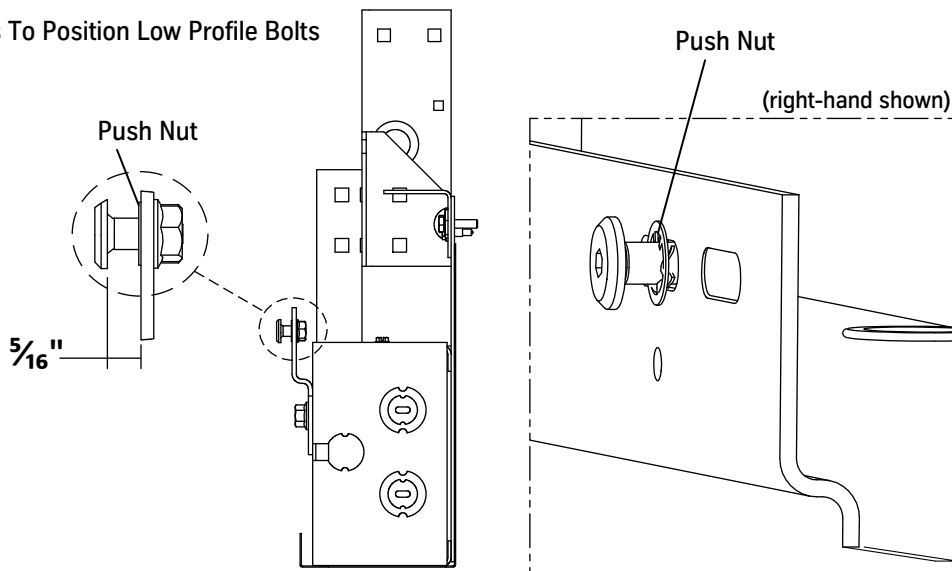


Figure 5 - Adapter Angle Installation (2 of 2)

## Single-Speed Side-Opening Doors Integral Cab Header Installation

(continued)

9. Route the door operator harness to the Car Operating Panel (COP). See the Maintenance on page 88 and the Generic Wiring Diagrams on page A-17.



- Do not install the plugs on the operator door card or on the COP.
- Before moving the car, replace the door card cover.

10. Install the door operator to the adapter angle. See Figure 6 below and Figure 7 on page 17.
  - a. Align the door track bolts with the keyslots in the track, and attach the door operator to the adapter.
  - b. Verify that the door operator is level.
  - c. Verify that there is  $5\frac{1}{4}$ " between the clear opening and the B dimension.
  - d. Use a  $\frac{3}{16}$ " Allen wrench to tighten down the bolts.
11. Install the door operator mounting angles.
12. Add bolts to brace the cab to the door operator back.
13. Check for plumb.
14. Verify that the track to sill is parallel.

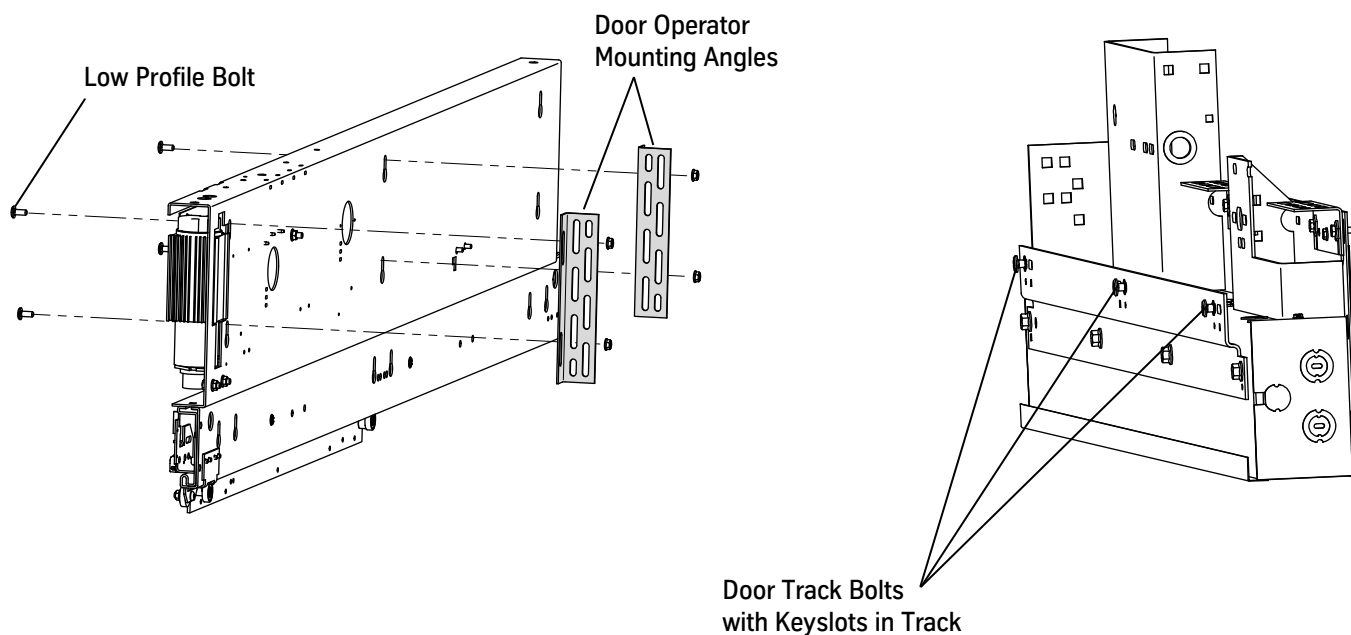


Figure 6 - Door Operator Machine Installation (1 of 2)

### Single-Speed Side-Opening Doors Integral Cab Header Installation (continued)

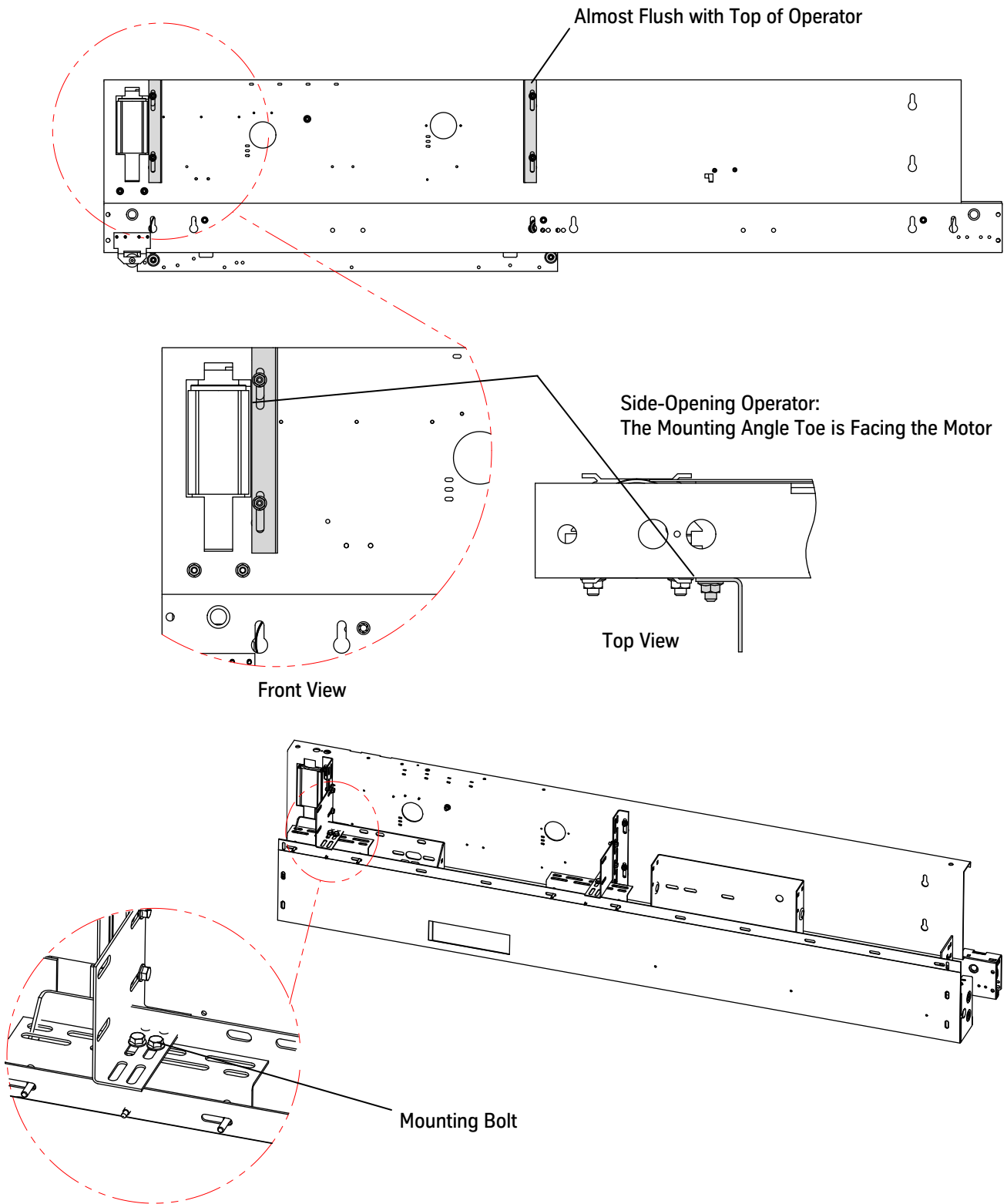


Figure 7 - Door Operator Machine Installation (2 of 2)

## Single-Speed Side-Opening Doors Integral Cab Header Installation

(continued)

15. Use a 4 mm Allen wrench to remove the door controller cover, and remove the rubber grommet from the operator box.
16. Install the junction box to the door operator. See Figure 8.
17. Route the wiring harness through the 1<sup>1</sup>/<sub>2</sub>" flex conduit, and then install the 1<sup>1</sup>/<sub>2</sub>" flex and straight connectors.
18. Install the wiring harnesses through the flex conduit; insert the OPERF or OPERR plug into the COP harness end.
19. Install the CTS to the top of the junction box. See Figure 8.
20. Before routing, cable tie the CTS wiring.
21. Proceed to New/Existing Car Door Panel Installation on page 49.

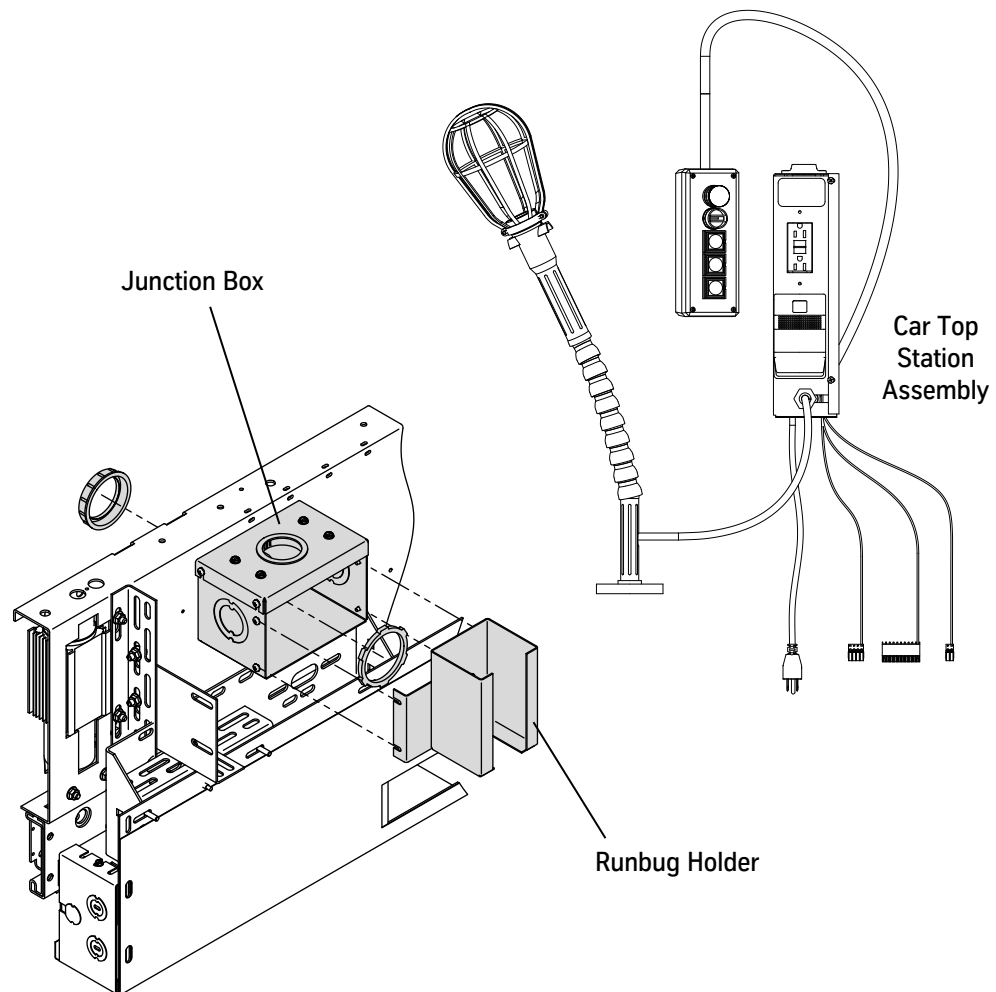


Figure 8 - Car Top Station Installation

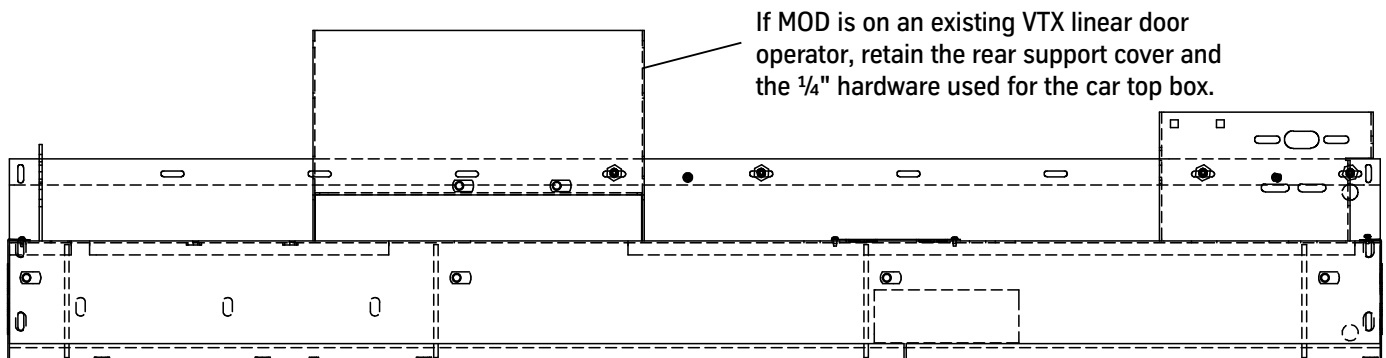


# Two-Speed Side-Opening Doors

## Integral Cab Header Installation

Other Installation Configurations			Starts on
Single-Speed Side-Opening Doors Integral Cab Header			page 12
Single-Speed Center-Opening Doors Integral Cab Header			page 26
Existing Cab	Not Integral Cab Header	Universal MOD Kit (200CJD)	page 33
		Separate Header Installation	page 40

1. Ensure that the car will run on Runbug Operation.
2. Remove the doors and the related door components and keep these items if they will be reused. Keep all removed components until the elevator is running. See Figure 9.



- Header shown is for a VTX linear operator, 42" opening width.
- Headers for HD and other widths will be different.

Figure 9 - Header Modifications

3. Remove existing door operator wiring harness and Car Top Station (CTS).
4. Remove all door operator parts and components that may interfere with new equipment.
5. Remove part of the header (for clearance with mounting angles) so that it is even with the top of the header. See Figure 10 on page 20.
6. Use the included hardware to install the mounting angles. See Figure 11 on page 20 for Dimension C.

Two-Speed Side-Opening Doors Integral Cab Header Installation

(continued)

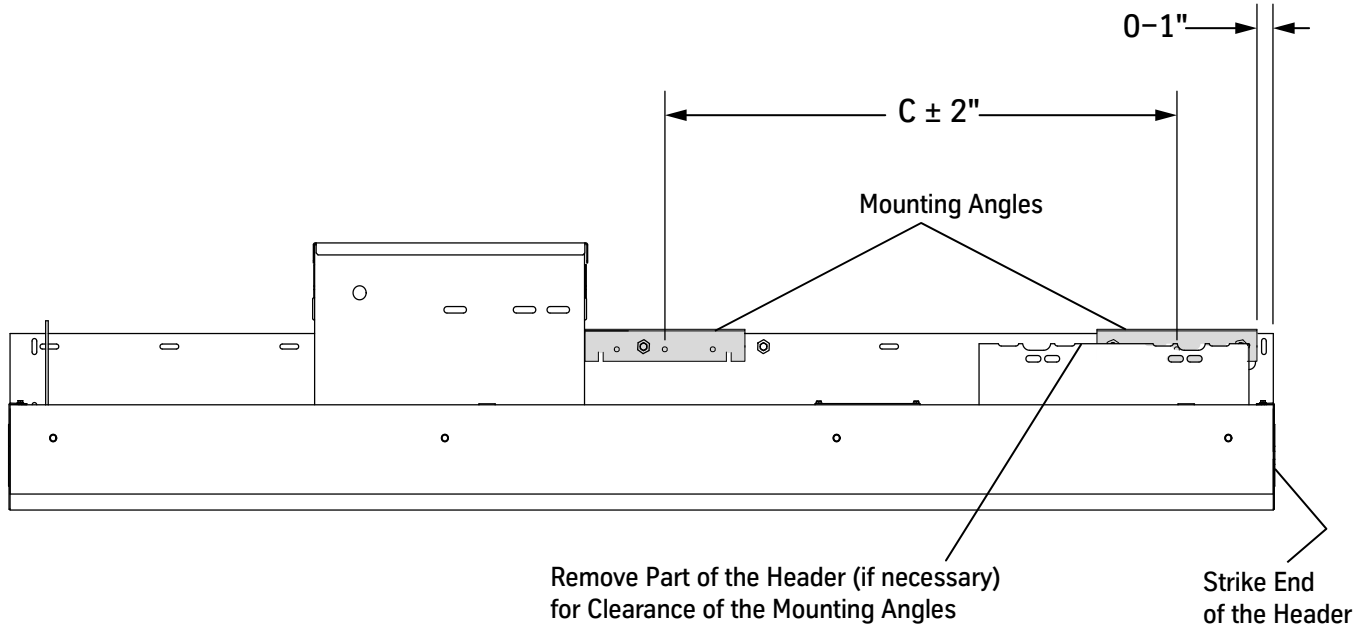
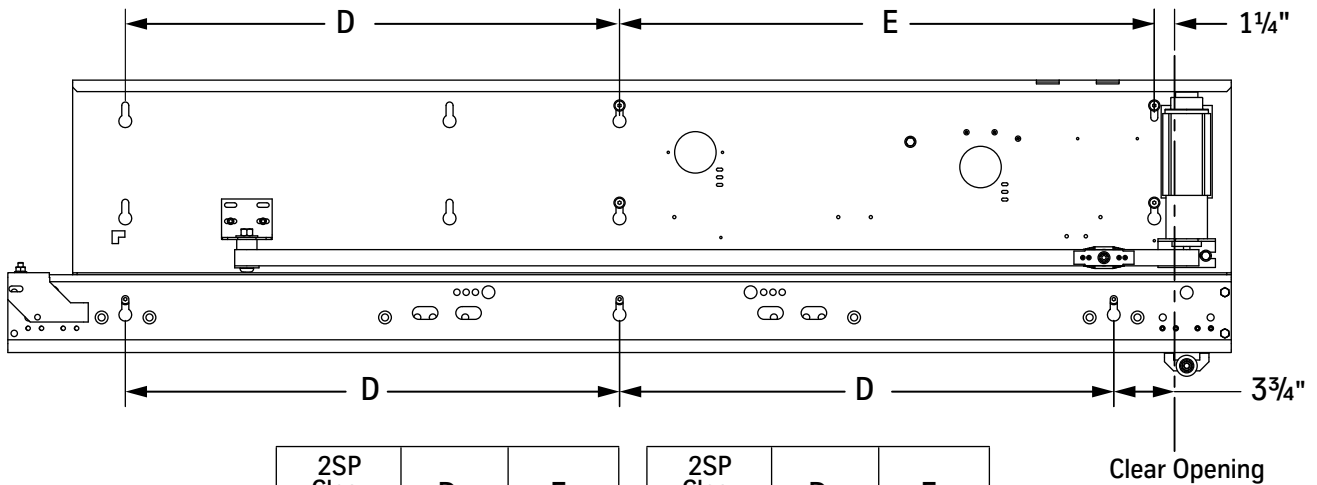


Figure 10 - Modify Header and Install Mounting Angles



2SP Clear Opening	D	E	2SP Clear Opening	D	E
36	24	21½	54	37½	35
38	25½	23	56	39	36½
40	27	24½	58	40½	38
42	28½	26	60	42	39½
44	30	27½	62	43½	41
46	31½	29	64	45	42½
48	33	30½	66	46½	44
50	34½	32	68	48	45½
52	36	33½	70	49½	47
			72	51	48½
(all dim. in inches)					

Figure 11 - Relationship of Keyslots and Door Operator Machine to Clear Opening

## Two-Speed Side-Opening Doors Integral Cab Header Installation

(continued)

7. Use the existing door track holes to align the adapter angle. See Figure 12 below and Figure 13 on page 22.
8. Use included hardware to attach the adapter angle to the header, but do not tighten; leave hardware loose to allow adapter alignment with track keyslots.
  - a. Use low profile bolts at the following locations:
 

When looking from the strike end of the side opening,

    - Small Hole/Slot = Right-Hand Openings
    - No Hole/Slot = Left-Hand Openings
  - b. Use push nuts to help position the low profile bolts.

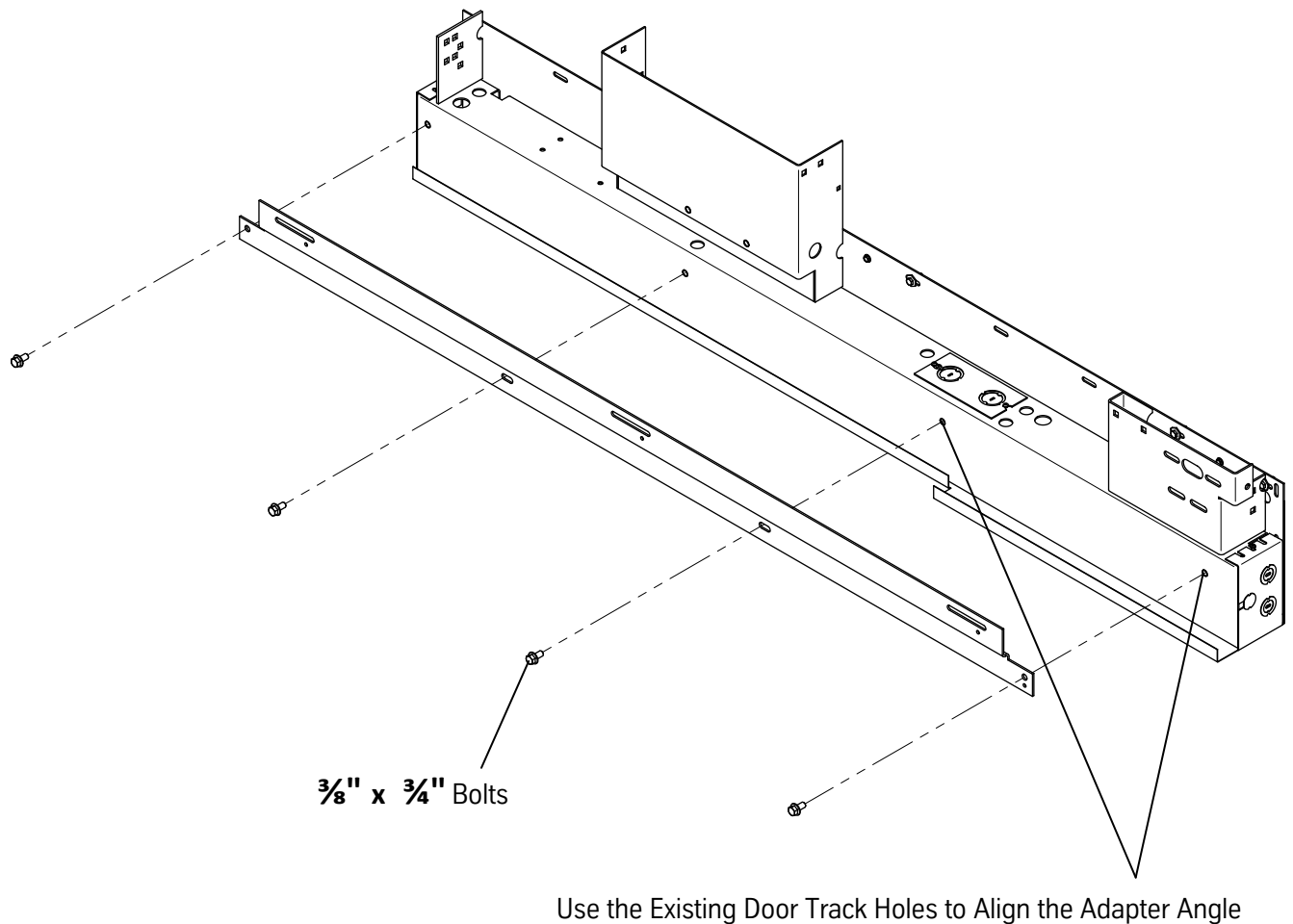


Figure 12 - Adapter Angle Installation (1 of 2)

### Two-Speed Side-Opening Doors Integral Cab Header Installation (continued)

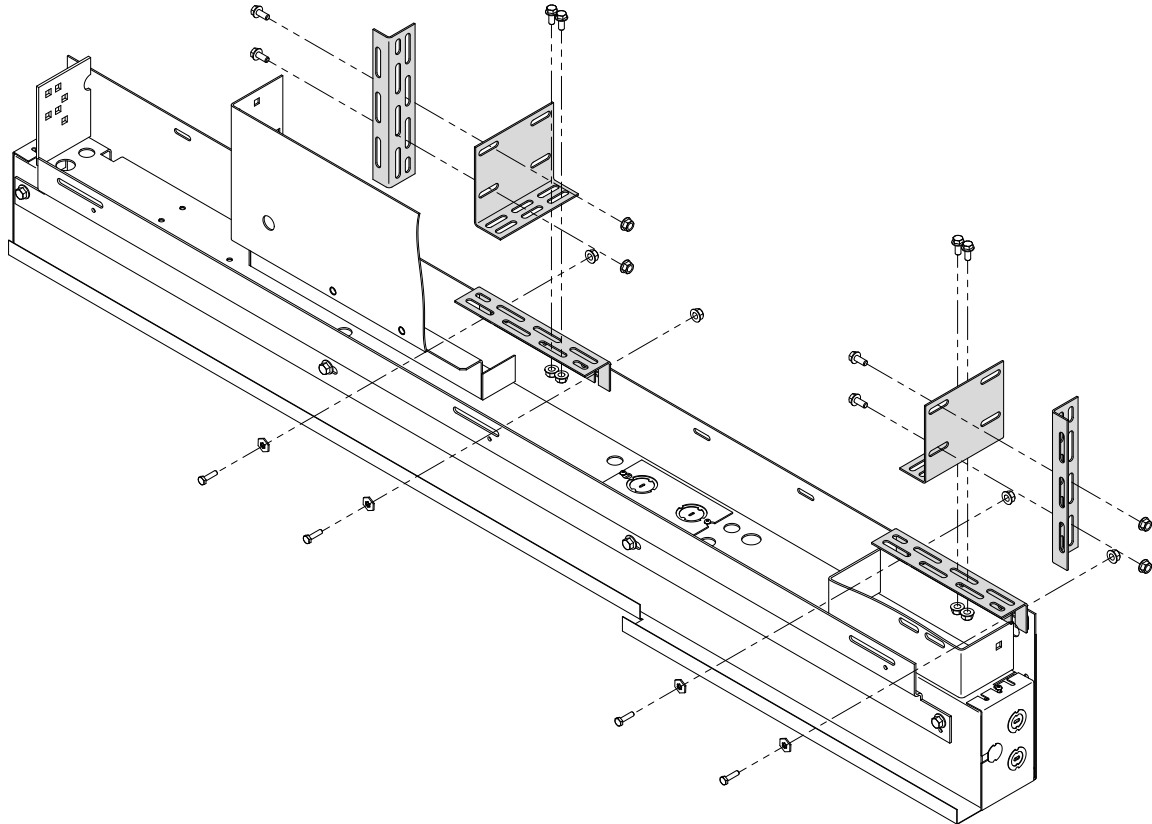


Figure 13 - Adapter Angle Installation (2 of 2)

## Two-Speed Side-Opening Doors Integral Cab Header Installation

(continued)

9. Route the door operator harness to the Car Operating Panel (COP). See the Maintenance on page 88 and the Generic Wiring Diagrams on page A-17.
  - Do not install the plugs on the operator door card or on the COP.
  - Before moving the car, replace the door card cover.
10. Install the door operator to the adapter angle. See Figure 14 below and Figure 15 on page 24.
  - a. Align the door track bolts with the keyslots in the track, and attach the door operator to the adapter.
  - b. Verify that the door operator is level.
  - c. Verify that there is  $5\frac{1}{4}$ " between the clear opening and the B dimension.
  - d. Use a  $\frac{3}{16}$ " Allen wrench to tighten down the bolts.
11. Install the door operator mounting angles.
12. Add bolts to brace the cab to the door operator back.
13. Check for plumb.
14. Verify that the track to sill is parallel.

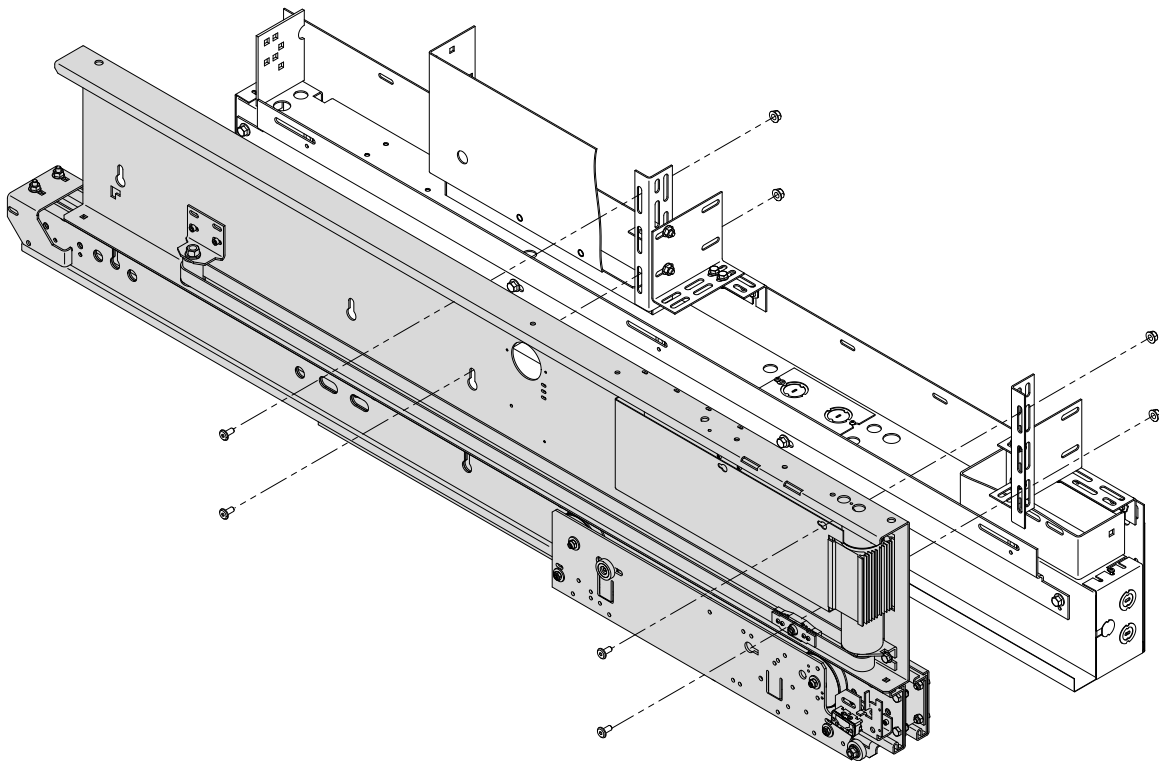


Figure 14 - Door Operator Machine Installation (1 of 2)

## Two-Speed Side-Opening Doors Integral Cab Header Installation (continued)

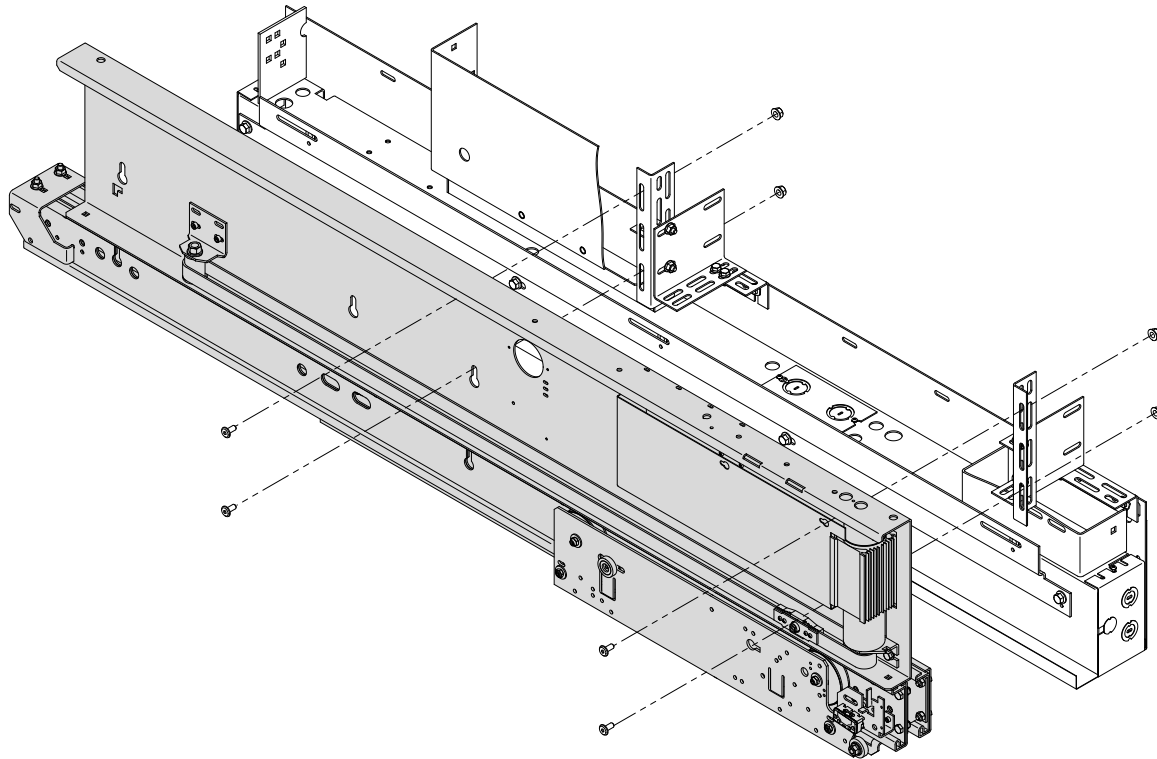


Figure 15 - Door Operator Machine Installation (2 of 2)

## Two-Speed Side-Opening Doors Integral Cab Header Installation

(continued)

15. Use a 4 mm Allen wrench to remove the door controller cover, and remove the rubber grommet from the operator box.
16. Install the junction box to the door operator. See Figure 16.
17. Route the wiring harness through the 1 $\frac{1}{2}$ " flex conduit, and then install the 1 $\frac{1}{2}$ " flex and straight connectors.
18. Install the wiring harnesses through the flex conduit; insert the OPERF or OPERR plug into the COP harness end.
19. Install the CTS to the top of the junction box. See Figure 16.
20. Before routing, cable tie the CTS wiring.
21. Proceed to New/Existing Car Door Panel Installation on page 49.

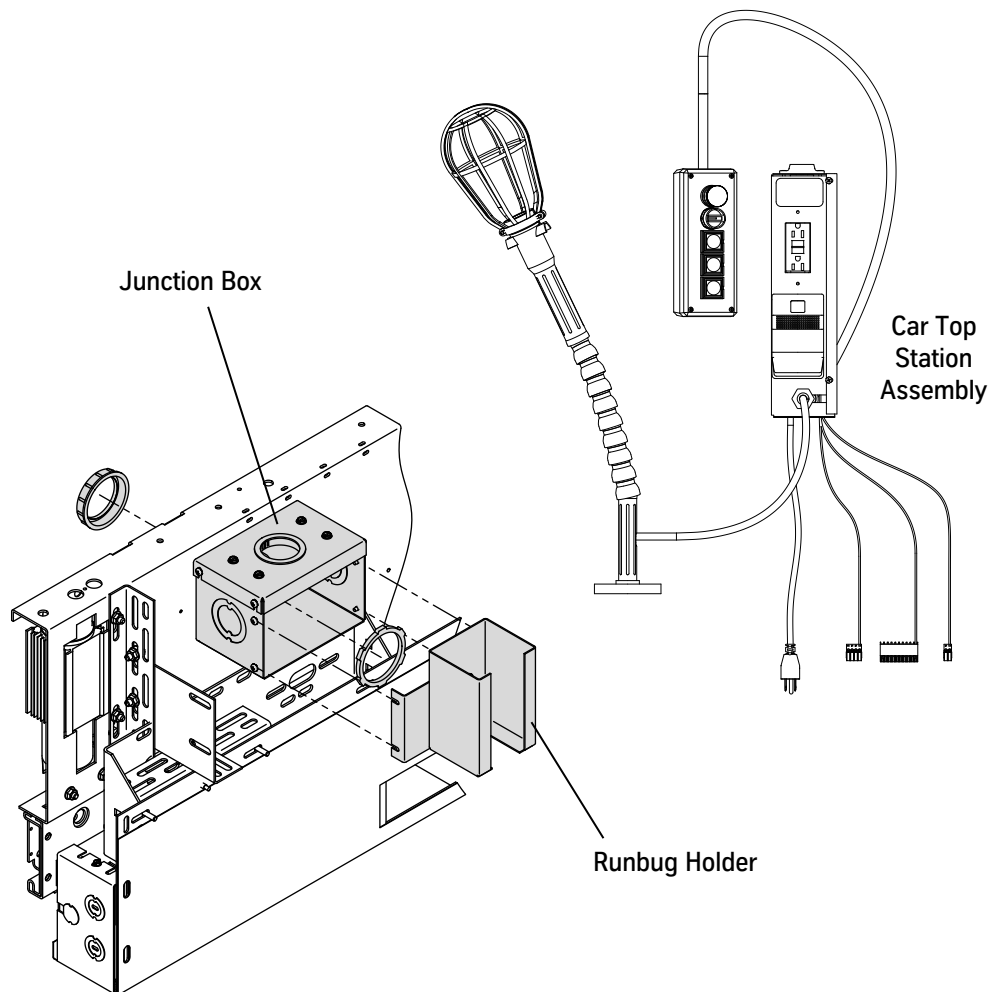


Figure 16 - Car Top Station Installation

# Single-Speed Center-Opening Doors

## Integral Cab Header Installation

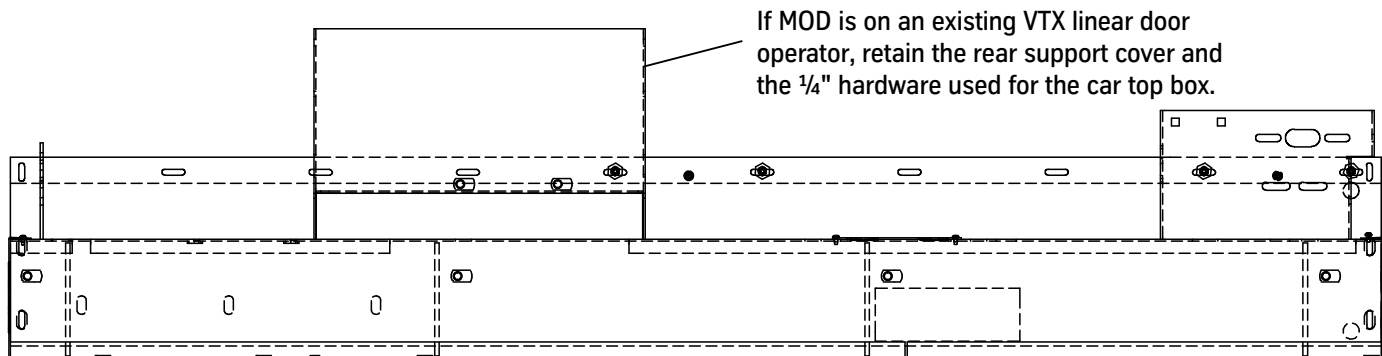
Other Installation Configurations			Starts on
Single-Speed Side-Opening Doors Integral Cab Header			page 12
Two-Speed Side-Opening Doors Integral Cab Header			page 19
Existing Cab	Not Integral Cab Header	Universal MOD Kit (200CJD)	page 33
		Separate Header Installation	page 40

1. Ensure that the car will run on Runbug Operation.



To later locate the center of the door opening, make a reference mark on the header where the car doors meet.

2. Remove the doors and the related door components and keep these items if they will be reused. Keep all removed components until the elevator is running. See Figure 17.



- Header shown is for a VTX linear operator, 42" opening width.
- Headers for HD and other widths will be different.

Figure 17 - Header Modifications

3. Remove the existing door operator wiring harness and the Car Top Station (CTS).
4. Strip the header of all door operator parts and components that may interfere with new equipment.
5. Remove part of the header, where necessary, for clearance with mounting angles located 21" from the center. See Figure 18 on page 27.
6. Use the included hardware to install the mounting angles. See Figure 19 on page 27.



### Single-Speed Center-Opening Doors Integral Cab Header Installation

(continued)

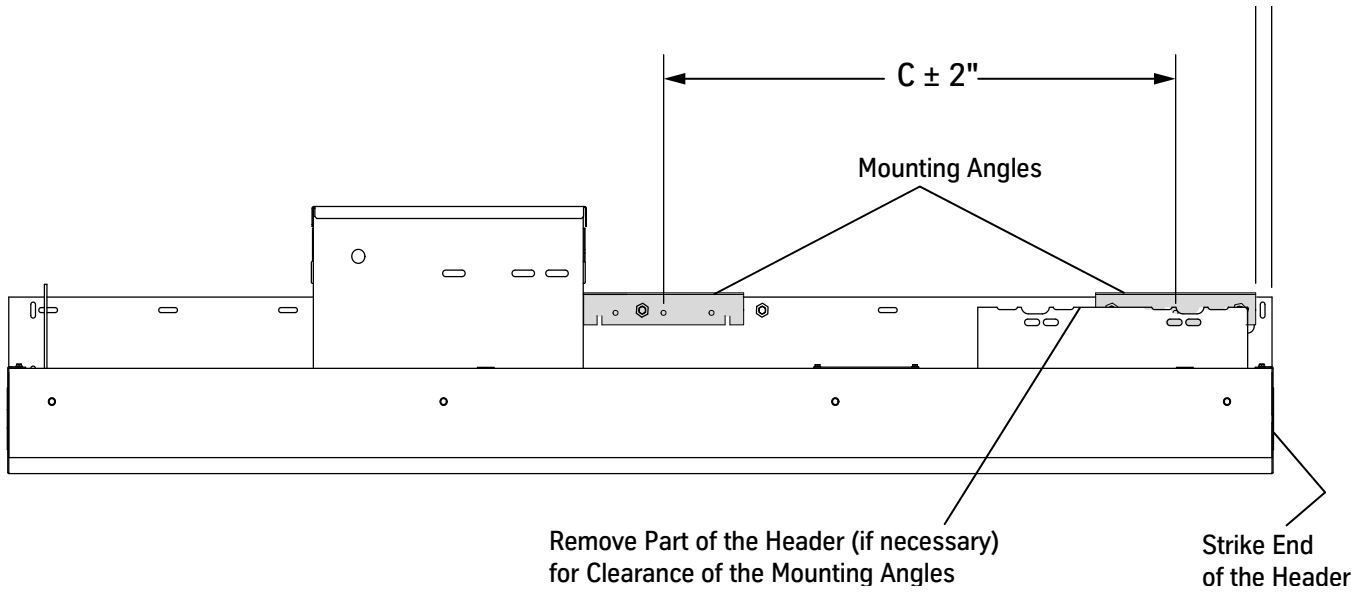
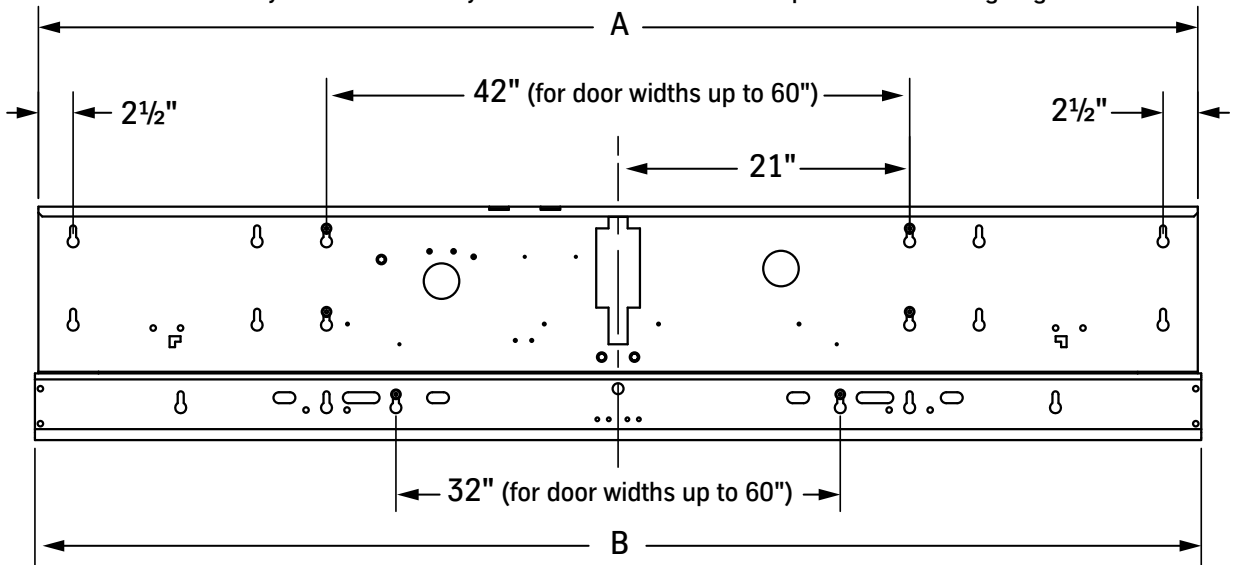


Figure 18 - Modify Header and Install Mounting Angles

Keyslots shown at 42\"/>



Clear Opening	B	A		Clear Opening	B	A
32	64	63½	All dimensions in inches	46	92	91½
34	68	67½		48	96	95½
36	72	71½		50	100	99½
38	76	75½		52	104	103½
40	80	79½		54	108	107½
42	84	83½		56	112	111½
44	88	87½		58	116	115½
				60	120	119½

Figure 19 - Relationship of Keyslots and Door Operator Machine to Clear Opening

### Single-Speed Center-Opening Doors Integral Cab Header Installation

(continued)

7. Use included hardware to attach the adapter angle to the header, but do not tighten; leave hardware loose to allow adapter alignment with track keyslots. See Figure 20.

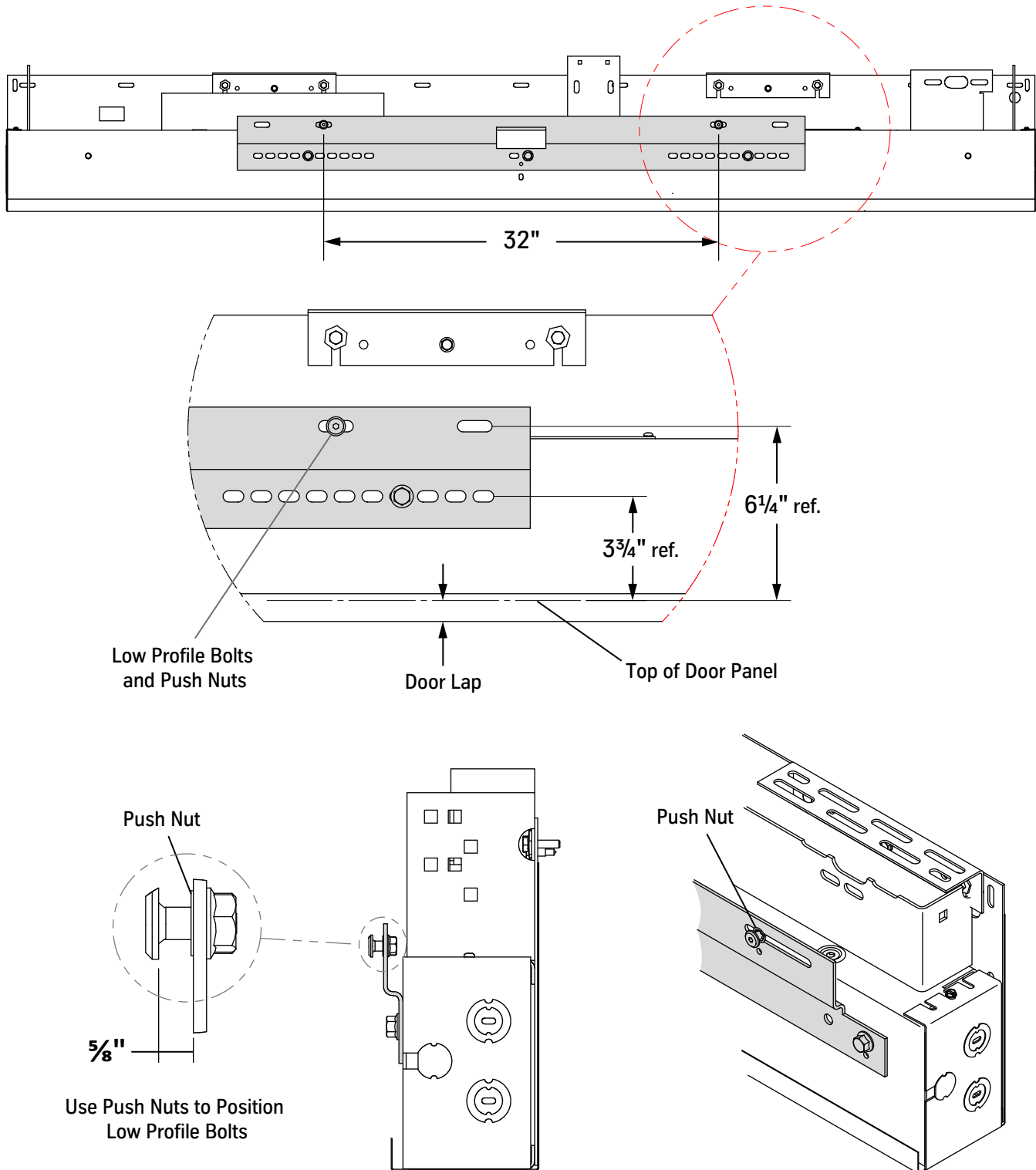


Figure 20 - Adapter Angles Installation Detail

## Single-Speed Center-Opening Doors Integral Cab Header Installation

(continued)

8. Route the door operator harness to the Car Operating Panel (COP). See the Maintenance on page 88 and the Generic Wiring Diagrams on page A-17.



- Do not install the plugs on the operator door card or on the COP.
- Before moving the car, replace the door card cover.

9. Install the door operator to the adapter angle. See Figure 21 below and Figure 22 on page 30.
  - a. Align the door track bolts with the keyslots in the track, and attach the door operator to the adapter.
  - b. Verify that the door operator is level.
  - c. Verify that there is 21"  $\pm$ 2" from the center of the door opening.
  - d. Use a  $\frac{3}{16}$ " Allen wrench to tighten down the bolts.
10. Install the door operator mounting angles.
11. Add bolts to brace the cab to the door operator back.
12. Check for plumb.
13. Verify that the track to sill is parallel.

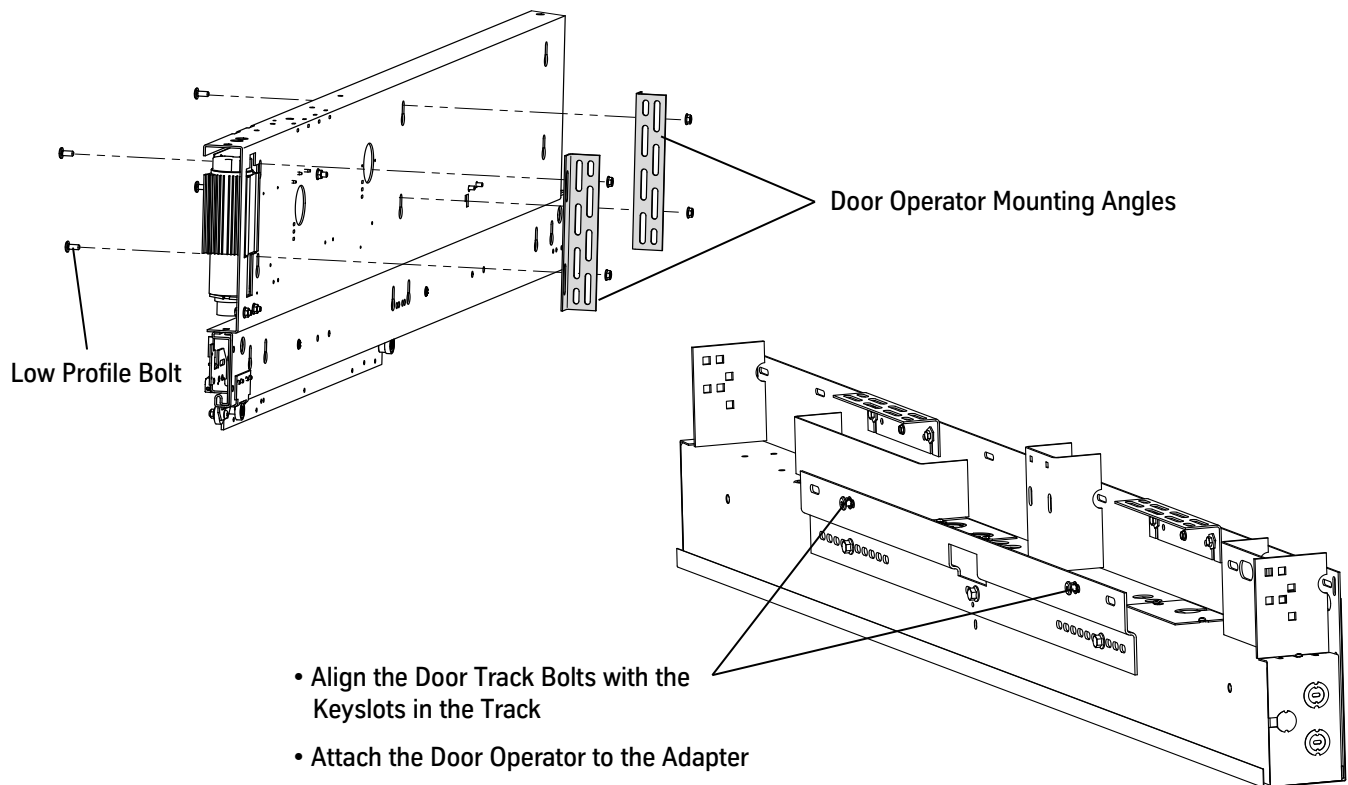
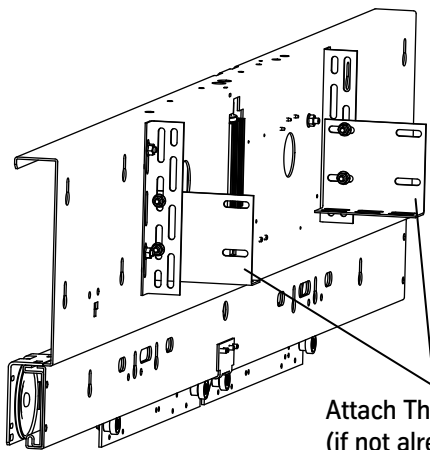
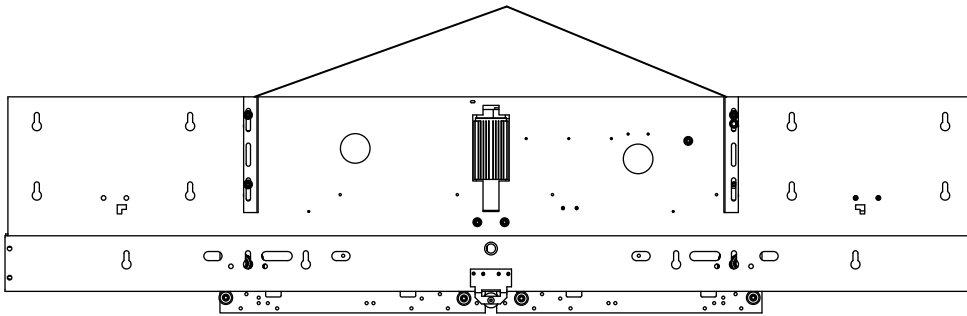


Figure 21 - Door Operator Machine Installation (1 of 2)

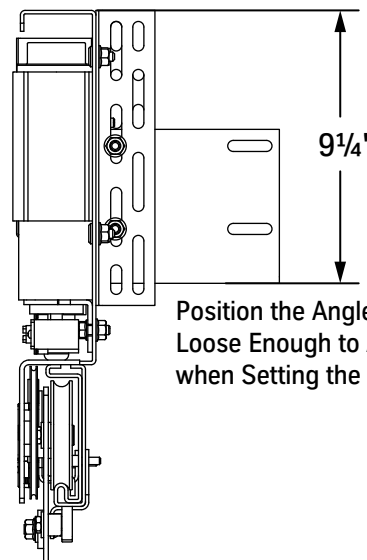
### Single-Speed Center-Opening Doors Integral Cab Header Installation

(continued)

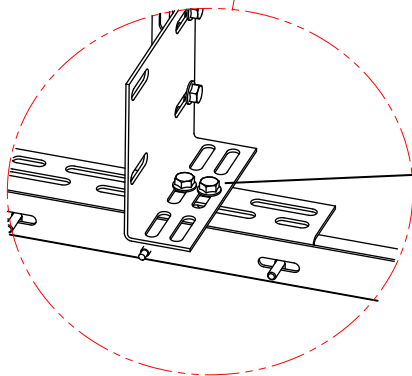
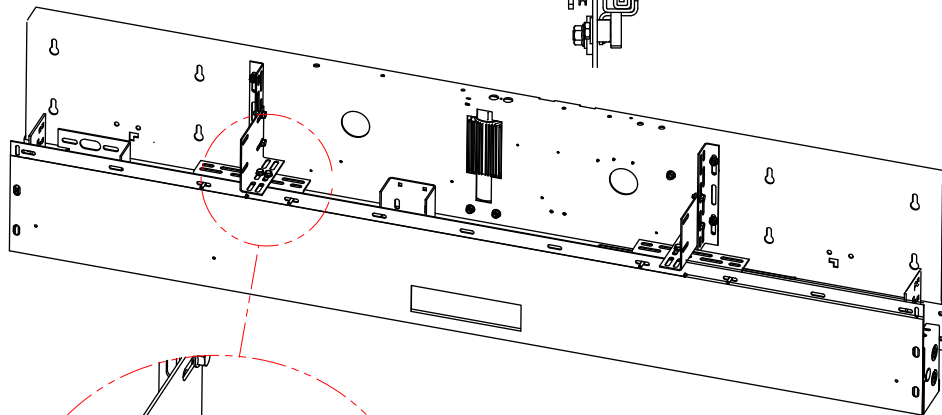
Angles are Almost Flush with Top of Door Operator



Attach These Angles  
(if not already on header)



Position the Angle with the Bolt  
Loose Enough to Adjust the Height  
when Setting the Operator in Place.



Add Mounting Bolts to Brace the  
Cab to the Door Operator Back

Figure 22 - Door Operator Machine Installation (2 of 2)

## Single-Speed Center-Opening Doors Integral Cab Header Installation

(continued)

14. Use a 4 mm Allen wrench to remove the door controller cover, and remove the rubber grommet from the operator box.
15. Install the junction box to the door operator. See Figure 23.
16. Route the wiring harness through the 1<sup>1</sup>/<sub>2</sub>" flex conduit, and then install the 1<sup>1</sup>/<sub>2</sub>" flex and straight connectors.
17. Install the wiring harnesses through the flex conduit; insert the OPERF or OPERR plug into the COP harness end.
18. Install the CTS to the top of the junction box. See Figure 23.
19. Before routing, cable tie the CTS wiring.
20. Proceed to New/Existing Car Door Panel Installation on page 49.

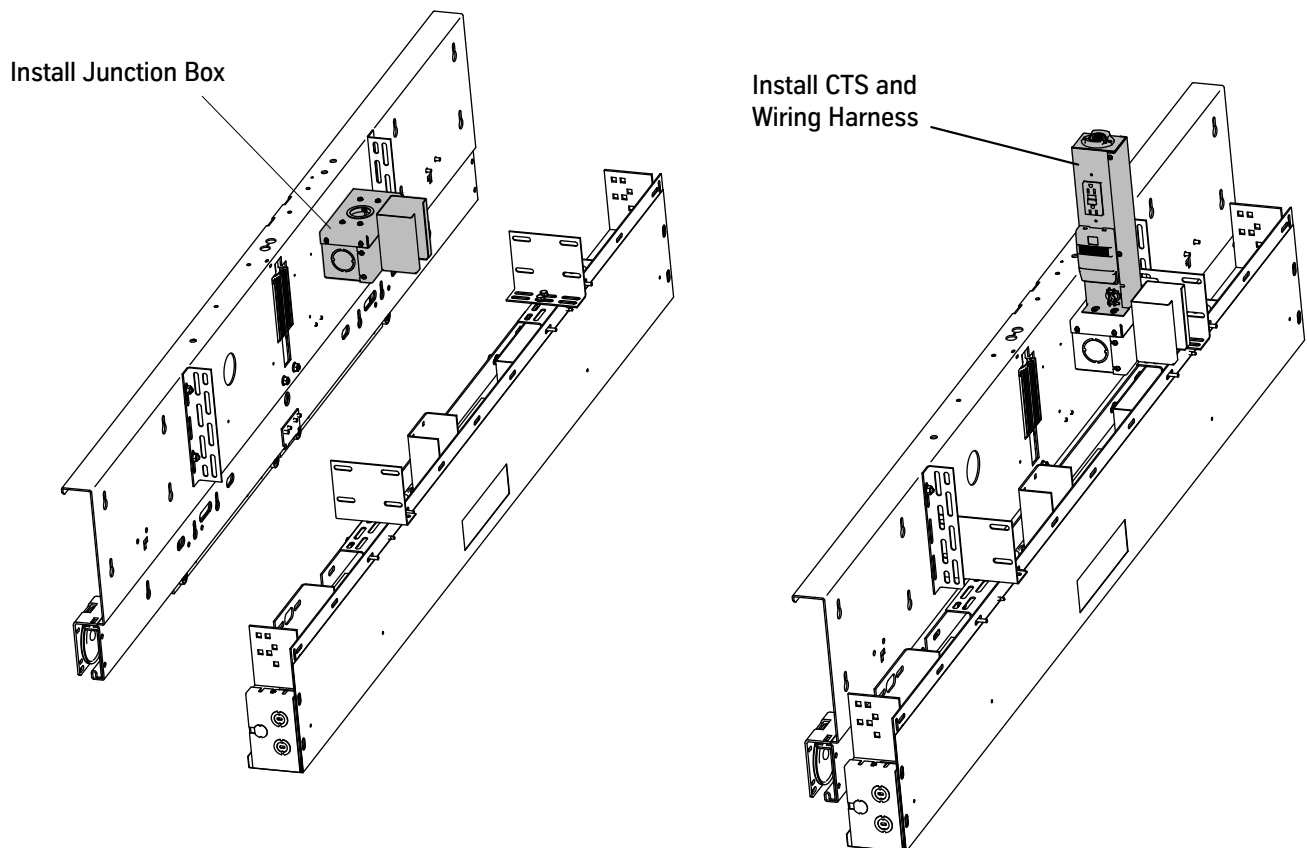


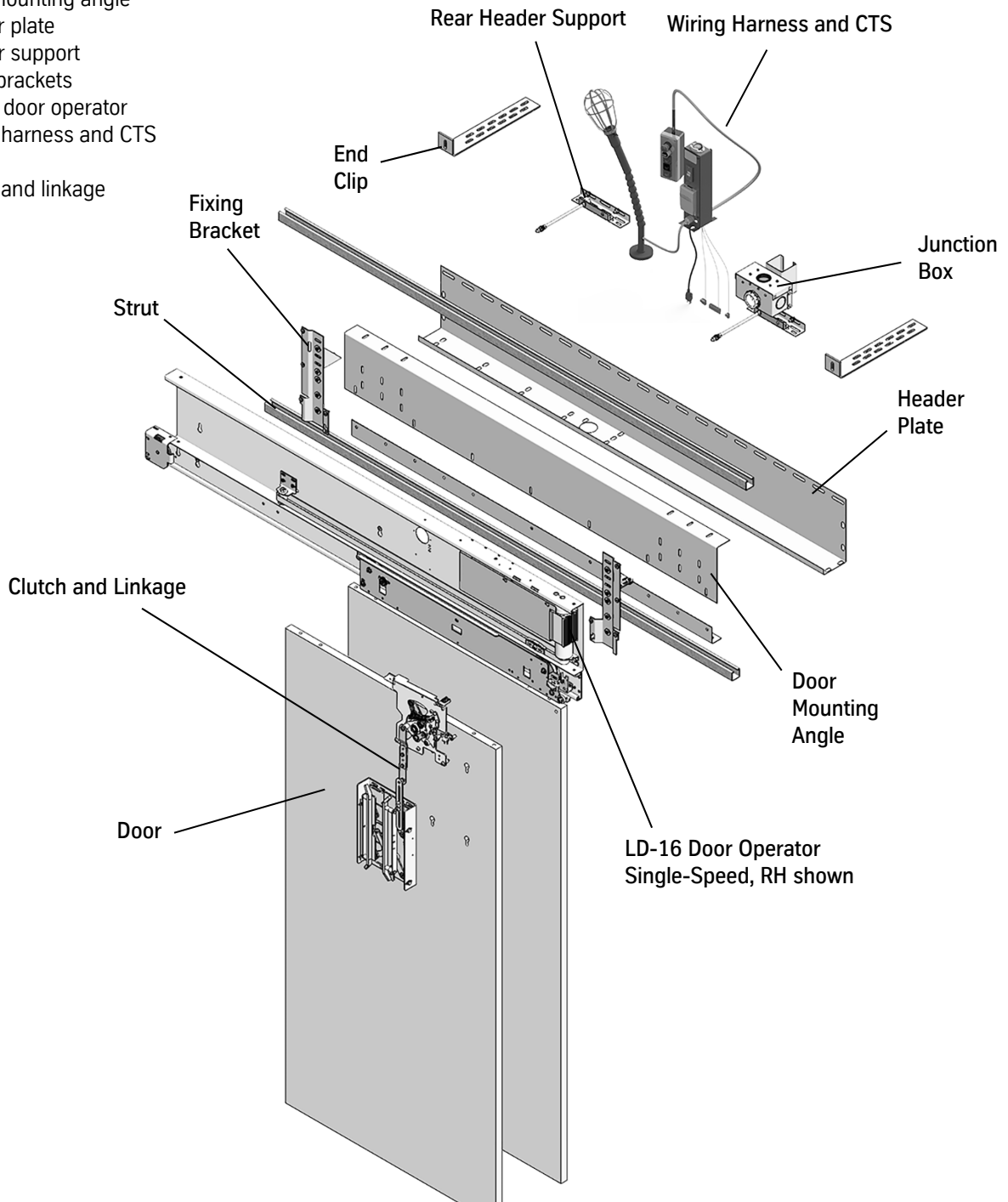
Figure 23 - Car Top Station Installation

# Existing Cab Header Installation

## Overview

### Installation Steps

1. Remove existing door operator
2. Install bottom strut
3. Install door mounting angle
4. Install header plate
5. Install header support
6. Install fixing brackets
7. Install LD-16 door operator
8. Install wiring harness and CTS
9. Install doors
10. Install clutch and linkage



## Existing Cab Header Installation

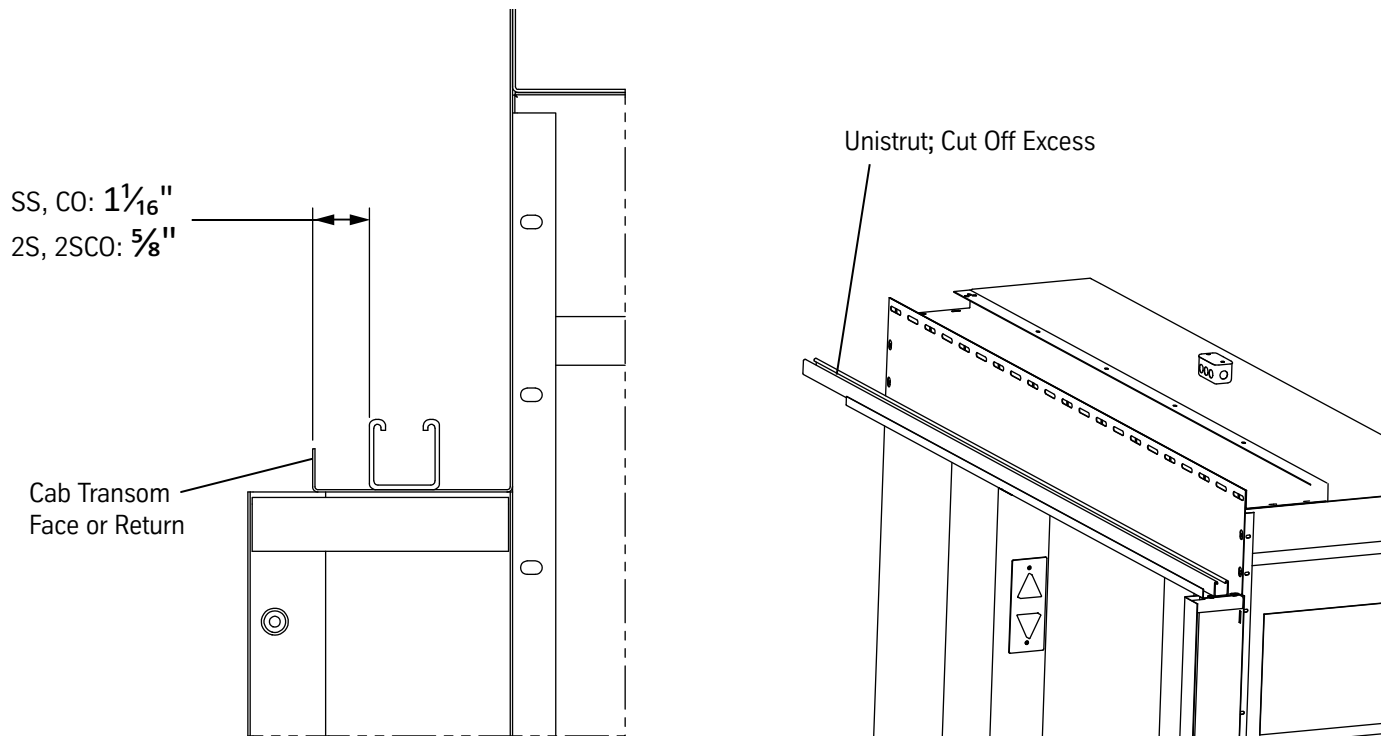
(continued)

### Universal MOD Kit (200CJD)

1. Remove any doors or equipment that may interfere with the LD-16 Door Operator.
2. Install the strut. See Figure 24.

**IMPORTANT!**

- The strut may require notching depending on job conditions. This applies to all parts in the Universal MOD Kit.
- The dimensions shown in the following drawings are reference points and apply to VTX or Dover equipment ONLY.
  - a. Place the strut above the cab transom face or the return per the applicable dimensions:
    - Single-Speed and Center-Opening:  $1\frac{1}{16}$ "
    - Two-Speed and Two-Speed Center-Opening:  $\frac{5}{8}$ "
  - b. Cut off the excess material.



Dimensions shown are reference points and apply to VTX or Dover equipment ONLY.

Figure 24 - Strut Installation

## Universal MOD Kit

(continued)

3. Use the included hardware to install the door operator mounting angles to the strut. See Figure 25 on page 34.
  - Single-Speed and Center-Opening:  $1\frac{1}{16}$ " (to have  $\frac{5}{16}$ " door panel to cab running clearance).
  - Two-Speed and Two-Speed Center-Opening:  $\frac{5}{8}$ "
4. Use the included hardware to install the door operator header to the mounting angle. See Figure 25 on page 34.



For side-opening: align one end of the header plate with the clear opening.

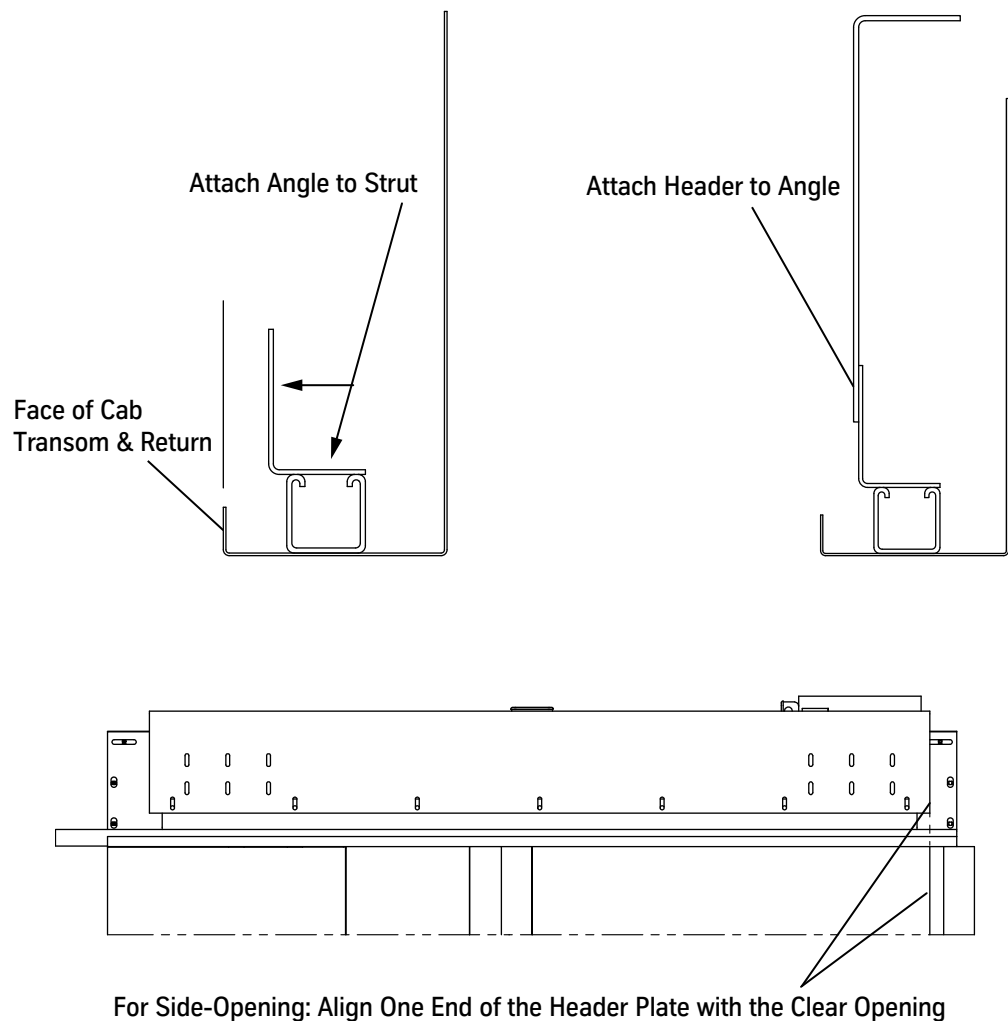


Figure 25 - Mounting Angles and Header Installation



Universal MOD Kit

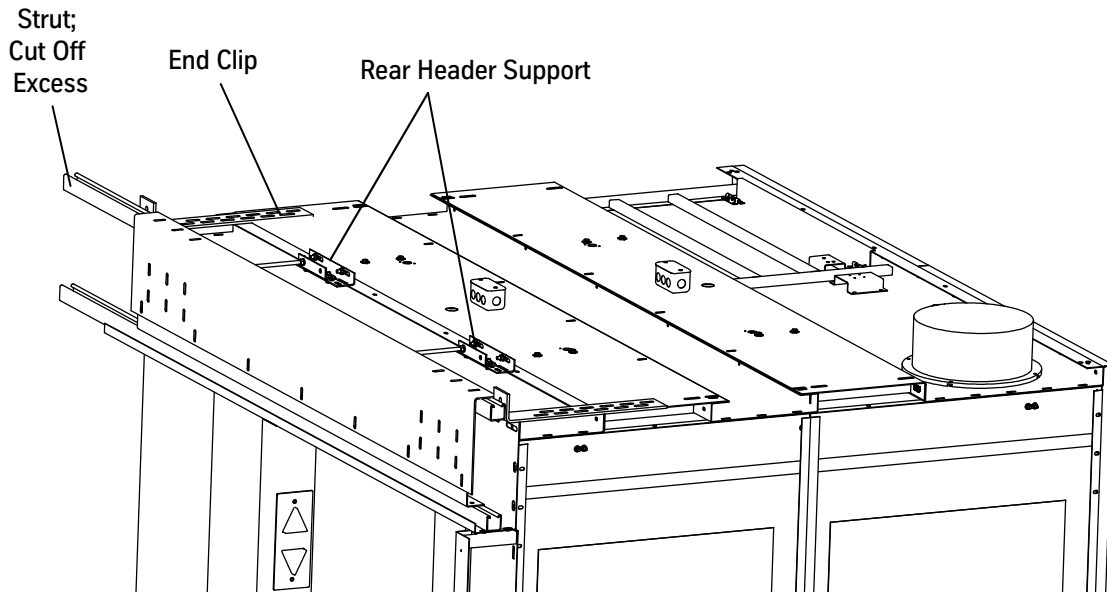
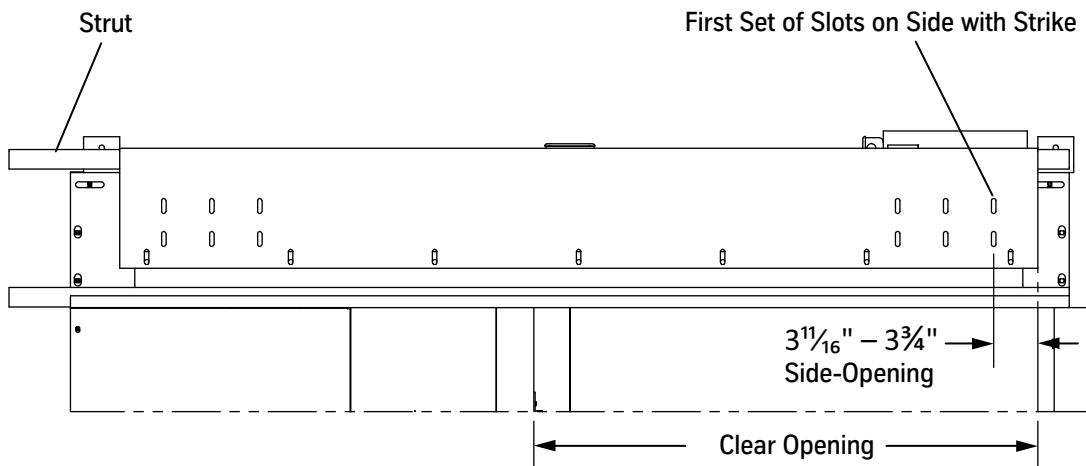
(continued)

5. Install the header support. See Figure 26.
  - a. Place the strut under the top angle of the header, and cut off the excess.
  - b. Align the end clip with the strut at the first set of slots on the strike side.



Side opening distance =  $3\frac{11}{16}'' - 3\frac{3}{4}''$

- c. Use the included hardware to attach the end clips to each end of the strut.
- d. Install the rear header support brackets.



Dimensions shown are reference points and apply to VTX or Dover equipment ONLY.

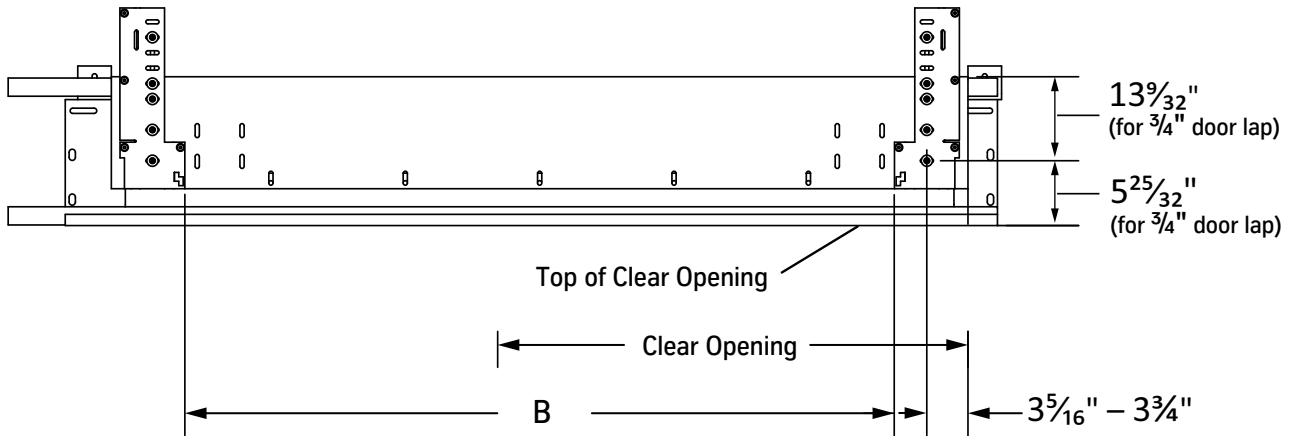
Figure 26 - Header Support Installation

Universal MOD Kit

(continued)

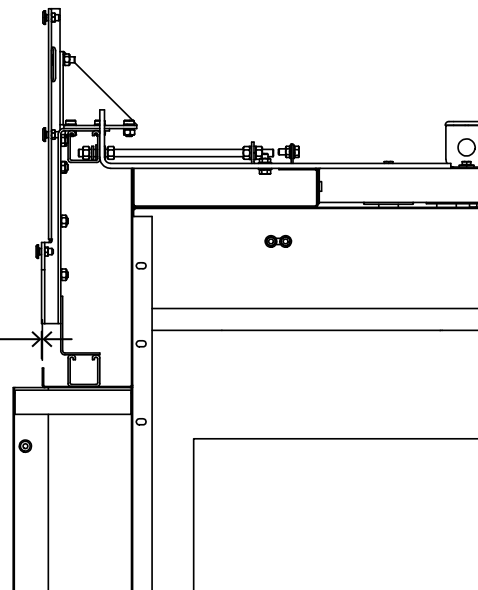
6. Install the fixing brackets per the applicable door operator.

- Single-Speed: Figure 27.
- Two-Speed: Figure 28 on page 37.
- Center-Opening: Figure 29 on page 38.



SS Clear Opening	Dim. B
32	$32\frac{3}{8}$
34	$47\frac{3}{8}$
36	$51\frac{3}{8}$
38	$55\frac{3}{8}$
40	$59\frac{3}{8}$
42	$63\frac{3}{8}$
44	$67\frac{3}{8}$
46	$71\frac{3}{8}$
48	$75\frac{3}{8}$
(all dim. in inches)	

Install fixing brackets  $\frac{1}{4}$ " in front of cab transom to give  $\frac{5}{16}$ " slow door running clearance (approx.)

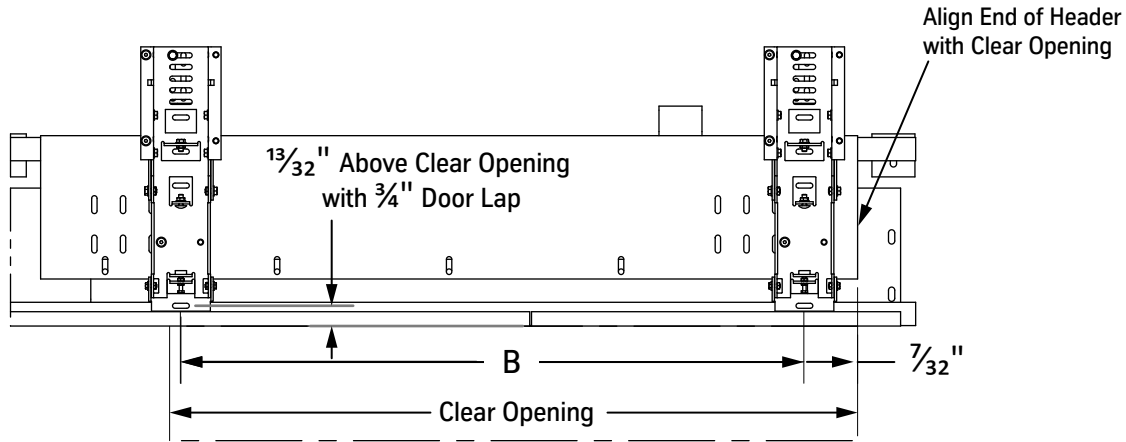


Dimensions shown are reference points and apply to VTX or Dover equipment ONLY.

Figure 27 - Single-Speed Fixing Brackets

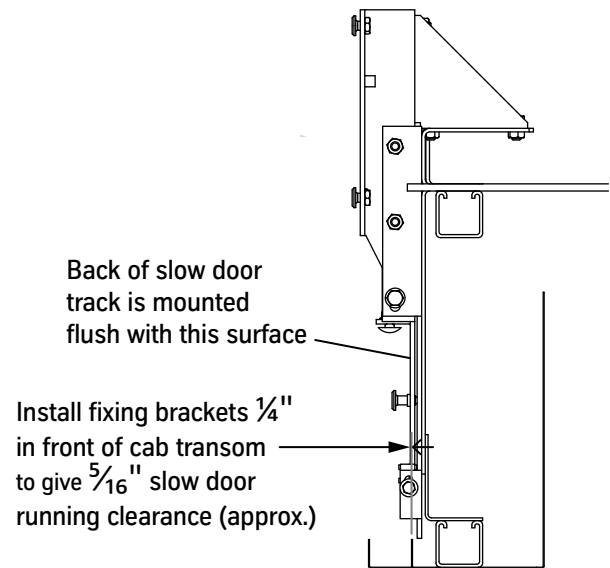
Universal MOD Kit

(continued)



2SP Clear Opening	B	2SP Clear Opening	B
36	31½	54	49½
38	33½	56	51½
40	35½	58	53½
42	37½	60	55½
44	39½	62	57½
46	41½	64	59½
48	43½	66	61½
50	45½	68	63½
52	47½	70	65½
		72	65½

(all dim. in inches)

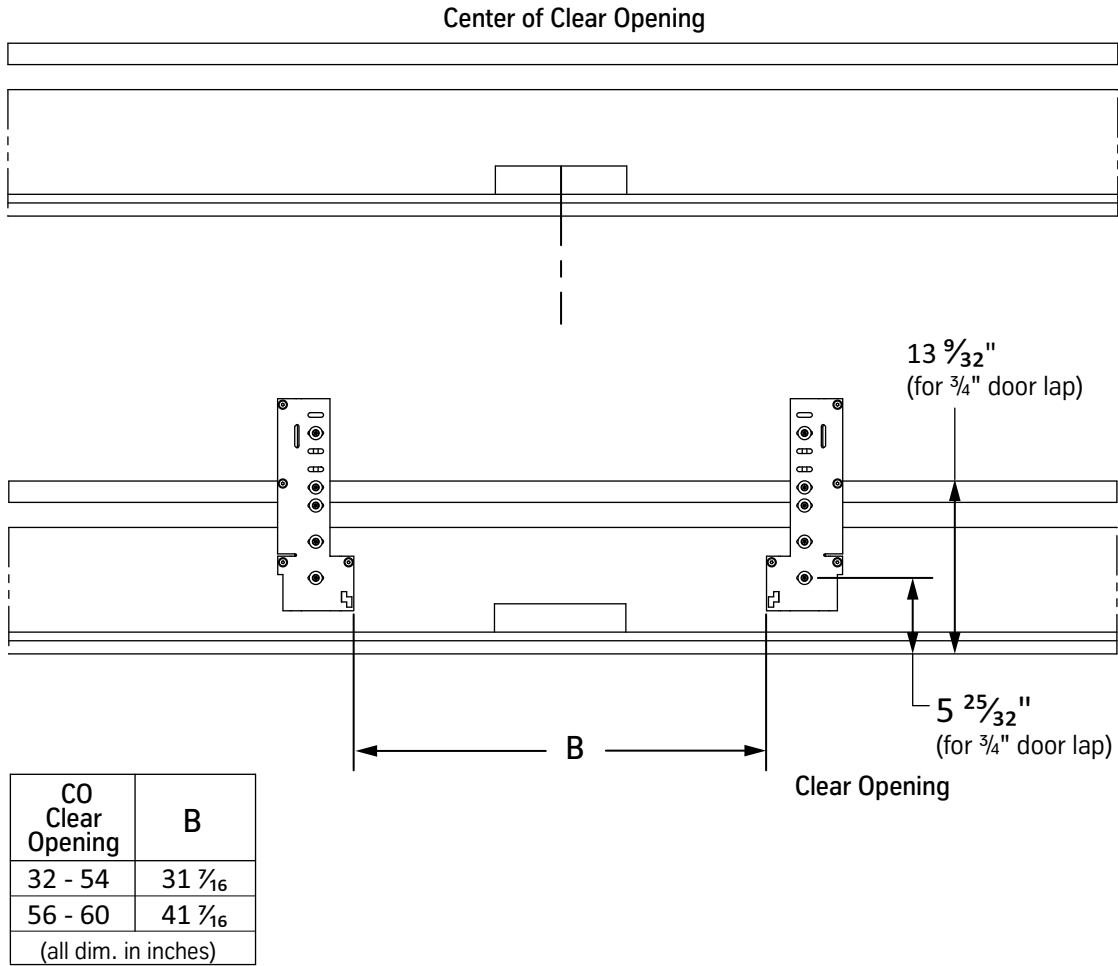


Dimensions shown are reference points and apply to VTX or Dover equipment ONLY.

Figure 28 - Two-Speed Fixing Brackets

Universal MOD Kit

(continued)



Dimensions shown are reference points and apply to VTX or Dover equipment ONLY.

Figure 29 - Center-Opening Fixing Brackets

## Universal MOD Kit

(continued)

7. Install the door operator. See Figure 30.
8. Install the junction box to the door operator.
9. Install the CTS and the wiring harness to the COP.
10. Proceed to New/Existing Car Door Panel Installation on page 49.

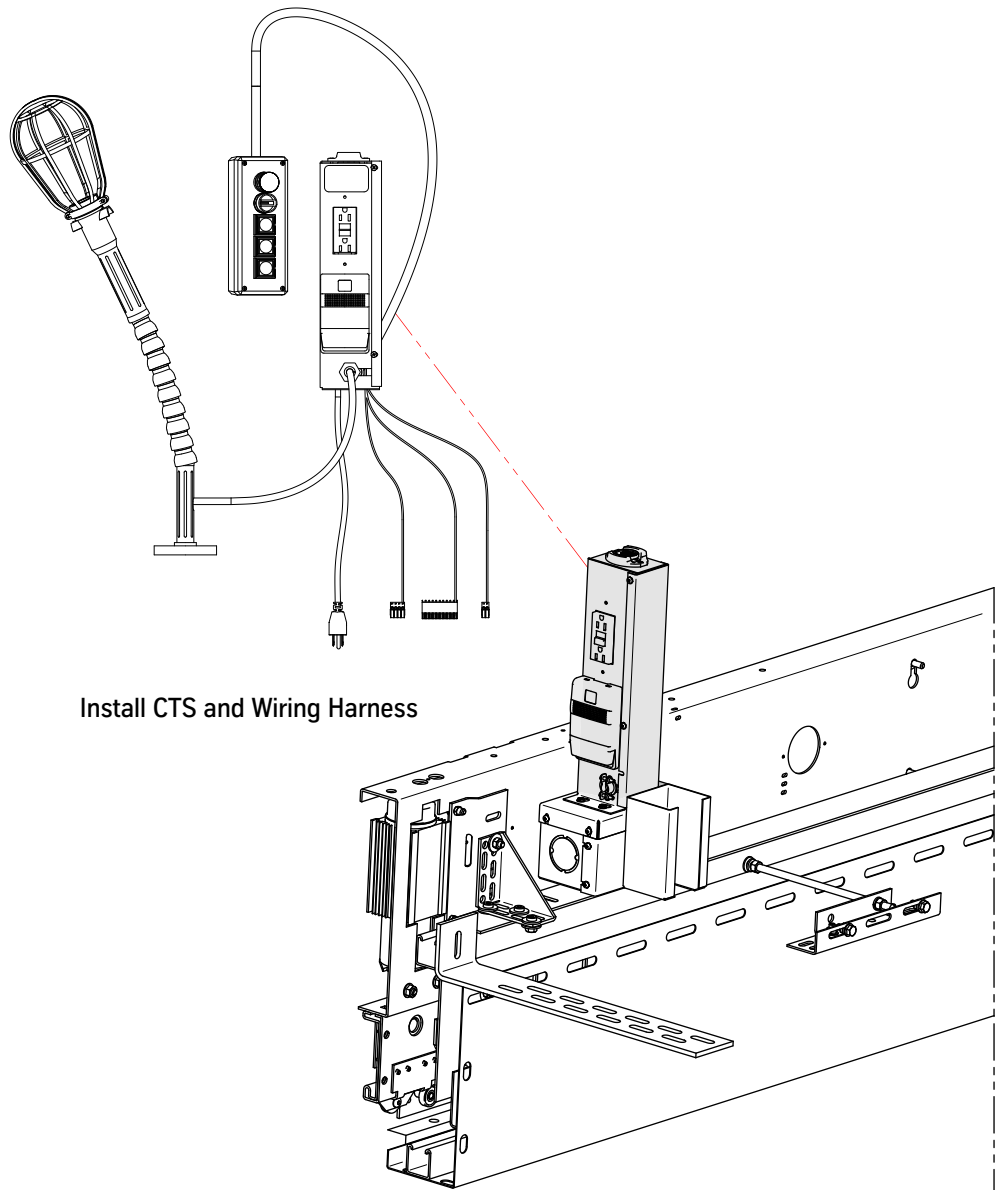


Figure 30 - Door Operator, CTS, and Wiring Harness Installation

# Separate Header Installation

1. Remove the following components—Do Not Remove the Header Angle. See Figure 31.
  - Door operator
  - Tracks
  - Hangers

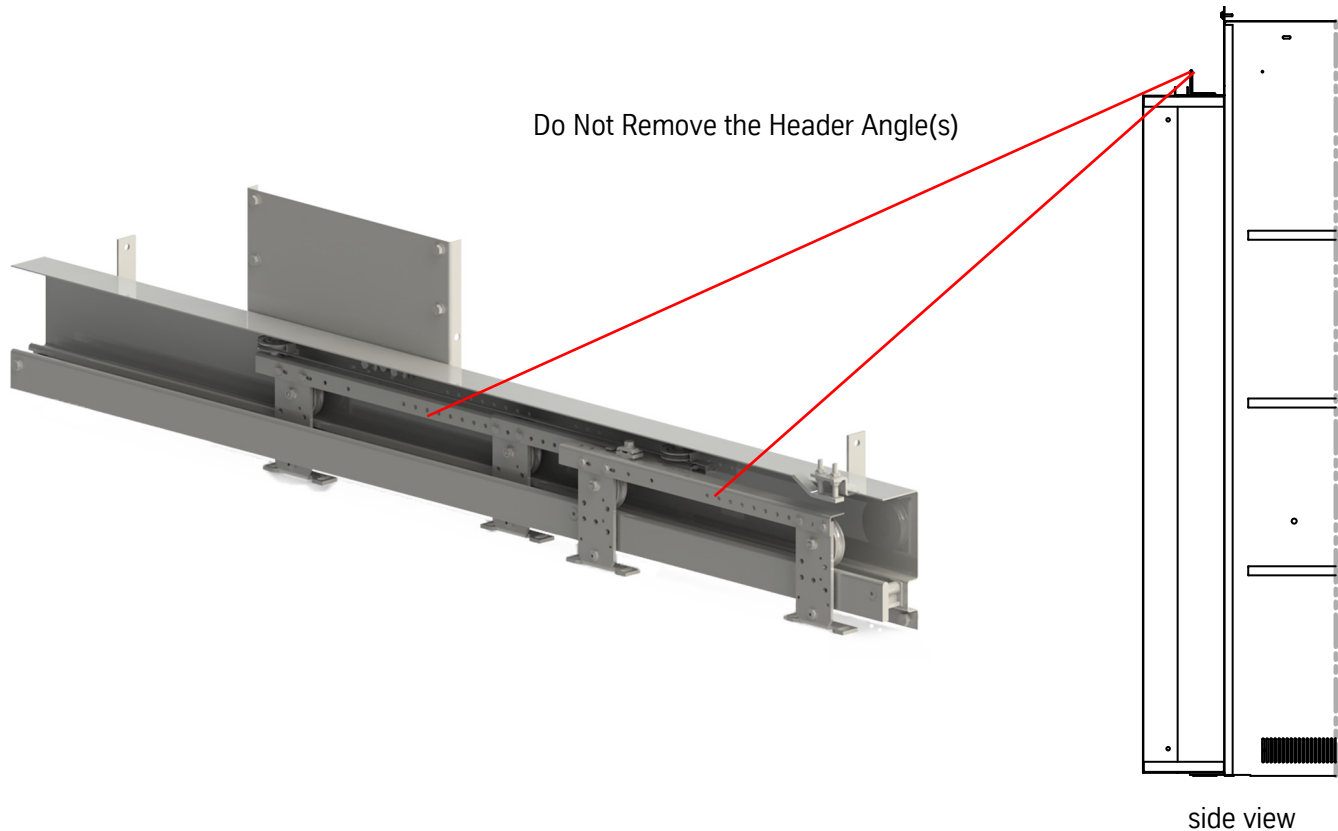
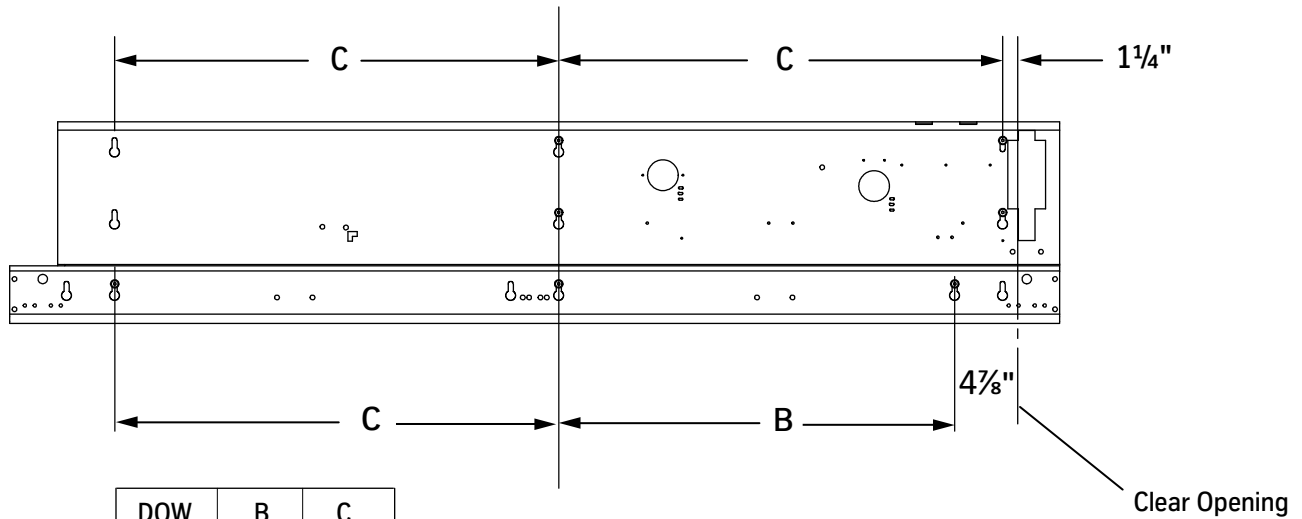


Figure 31 - Remove Door Operator and Equipment—Do Not Remove the Header Angle(s)

2. Install the door operator mounting per the applicable application.
  - Single-Speed: Figure 32 on page 41.
  - Center-Opening: Figure 33 on page 42.
  - Two-Speed: Figure 34 on page 43.

### Separate Header Installation

(continued)



DOW	B	C
32	23	27
34	25	29
36	27	31
38	29	33
40	31	35
42	33	37
44	35	39
46	37	41
48	39	43
Dimension C = ±2" (all dim. in inches)		

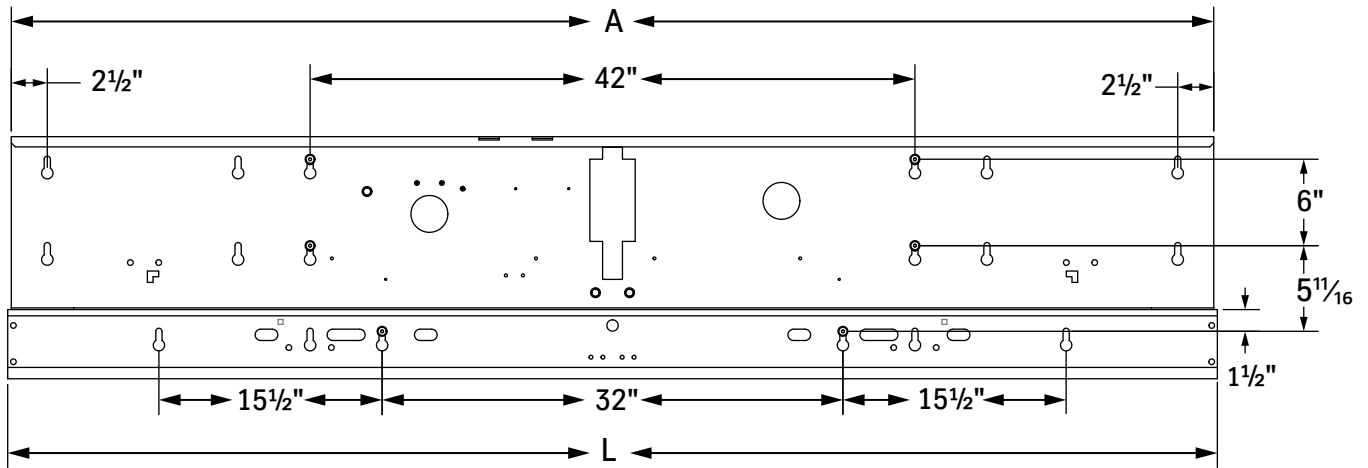
Primary location for keyslots used to brace the door operator back to the cab start at 1¼" from the clear opening, and spaced at Dimension C inches. See Chart for Dimension C.  
(right-hand shown; left-hand opposite)

Dimensions shown are reference points and apply to VTX or Dover equipment ONLY.

Figure 32 - Single-Speed Door Operator Mounting

Separate Header Installation

(continued)



Clear Opening C	L	A
32	64	63 <sup>1</sup> / <sub>2</sub>
34	68	67 <sup>1</sup> / <sub>2</sub>
36	72	71 <sup>1</sup> / <sub>2</sub>
38	76	75 <sup>1</sup> / <sub>2</sub>
40	80	79 <sup>1</sup> / <sub>2</sub>
42	84	83 <sup>1</sup> / <sub>2</sub>
44	88	87 <sup>1</sup> / <sub>2</sub>
46	92	91 <sup>1</sup> / <sub>2</sub>
48	96	95 <sup>1</sup> / <sub>2</sub>
50	100	99 <sup>1</sup> / <sub>2</sub>
52	104	103 <sup>1</sup> / <sub>2</sub>
54	108	107 <sup>1</sup> / <sub>2</sub>
56	112	111 <sup>1</sup> / <sub>2</sub>
58	116	115 <sup>1</sup> / <sub>2</sub>
60	120	119 <sup>1</sup> / <sub>2</sub>
(all dim. in inches)		

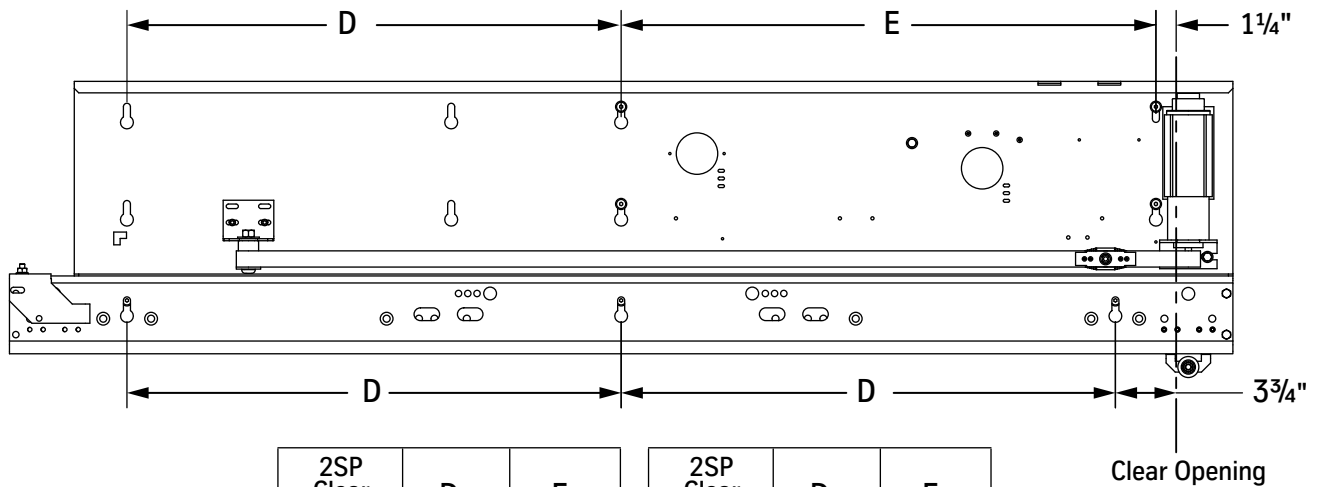
Dimensions shown are reference points and apply to VTX or Dover equipment ONLY.

Figure 33 - Center-Opening Door Operator Mounting



### Separate Header Installation

(continued)



2SP Clear Opening	D	E	2SP Clear Opening	D	E
36	24	21½	54	37½	35
38	25½	23	56	39	36½
40	27	24½	58	40½	38
42	28½	26	60	42	39½
44	30	27½	62	43½	41
46	31½	29	64	45	42½
48	33	30½	66	46½	44
50	34½	32	68	48	45½
52	36	33½	70	49½	47
			72	51	48½
(all dim. in inches)					

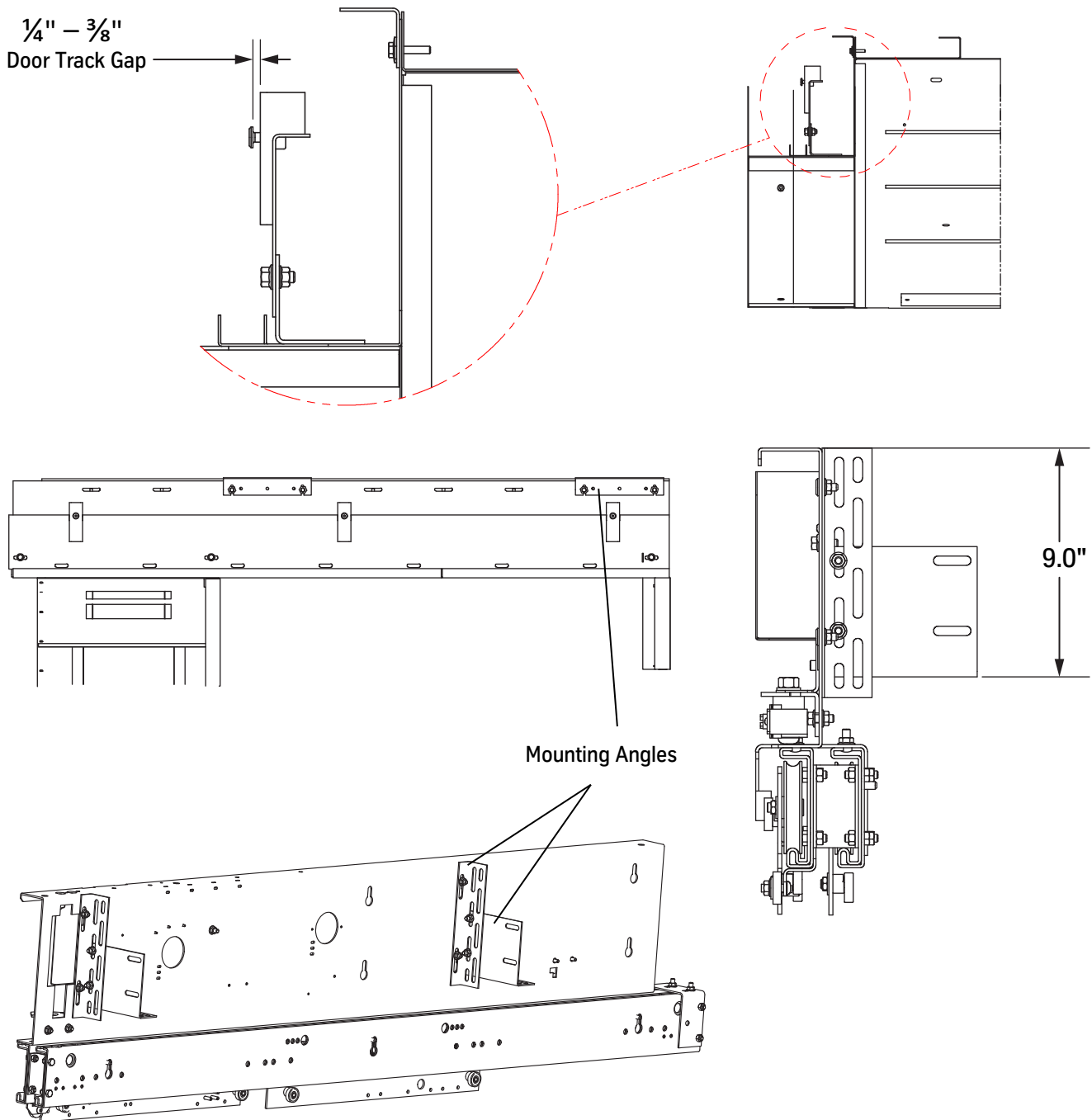
Dimensions shown are reference points and apply to VTX or Dover equipment ONLY.

Figure 34 - Two-Speed Door Operator Mounting

3. Install the door track leaving a gap of  $\frac{1}{4}$ " –  $\frac{3}{8}$ " or more. See Figure 35 on page 44.
4. Install the door operator mounting angles. Use the included hardware to attach the mounting angles, but do not tighten; leave hardware loose to allow for adjustment when setting the door operator in place.
5. Install the door operator. Figure 36 on page 45.
  - a. Align the door operator with the door track and the mounting angles.
  - b. Verify that the door operator is level with the face of the door track.
  - c. Tighten all hardware.

### Separate Header Installation

(continued)



Dimensions shown are reference points and apply to VTX or Dover equipment ONLY.

Figure 35 - Door Track and Mounting Angles Installation

### Separate Header Installation (continued)

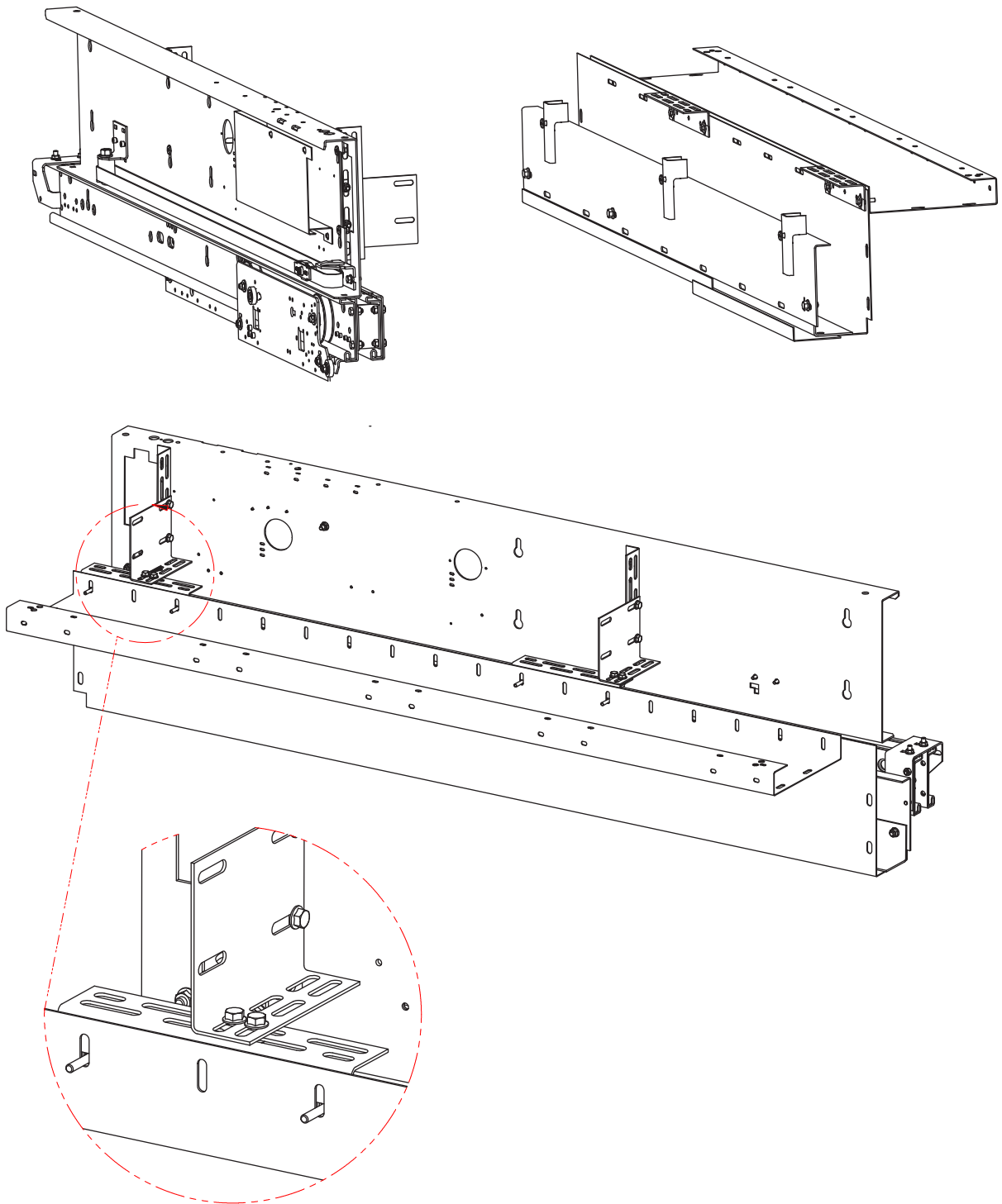


Figure 36 - Door Operator Installation

## Separate Header Installation

(continued)

6. Install the junction box. See Figure 37.

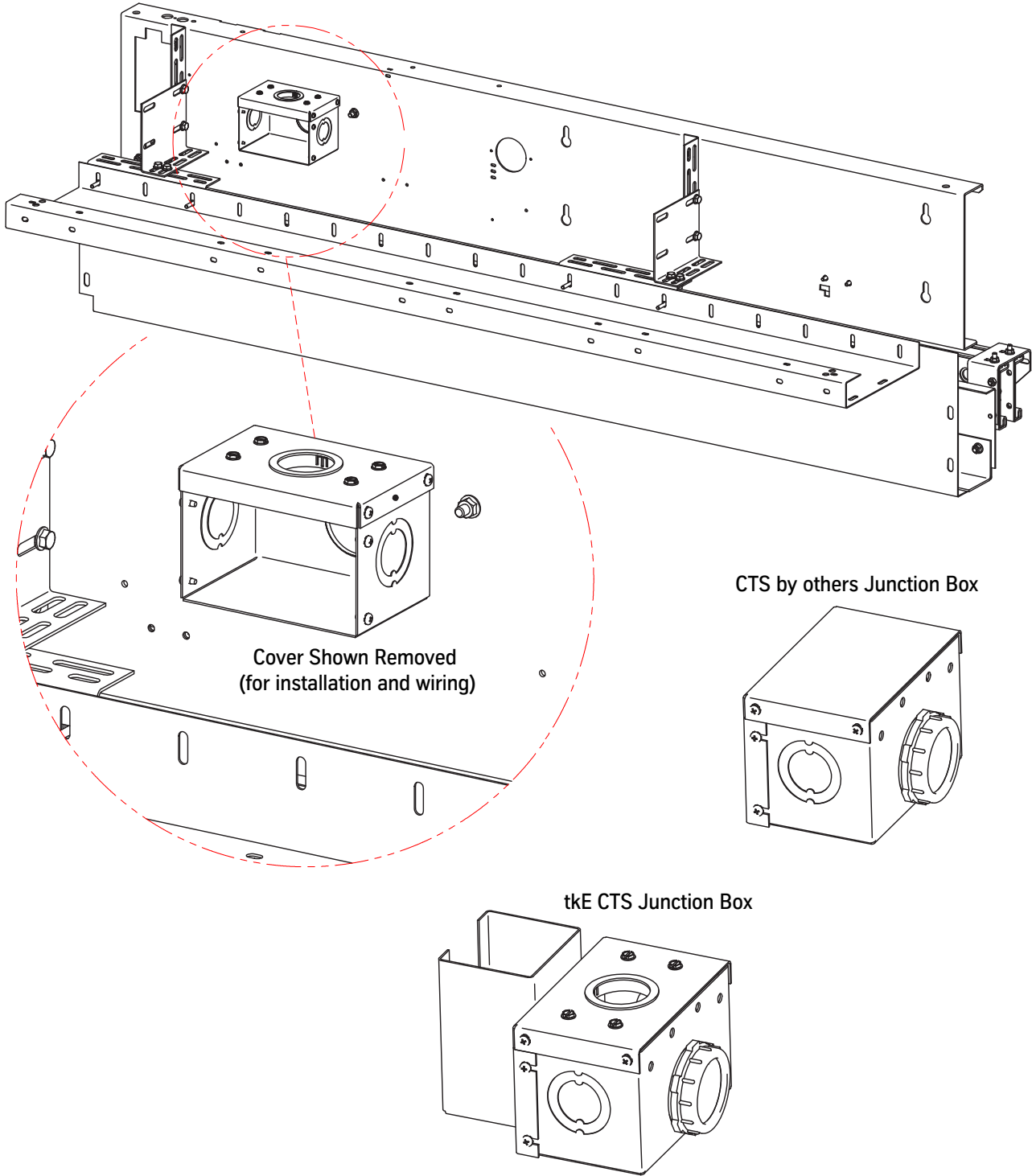


Figure 37 - Junction Box Installation

## Separate Header Installation

(continued)

7. Install the CTS to the top of the junction box. See Figure 38.
8. Route the wiring harness from the junction box to the COP.
9. Install the junction box cover.

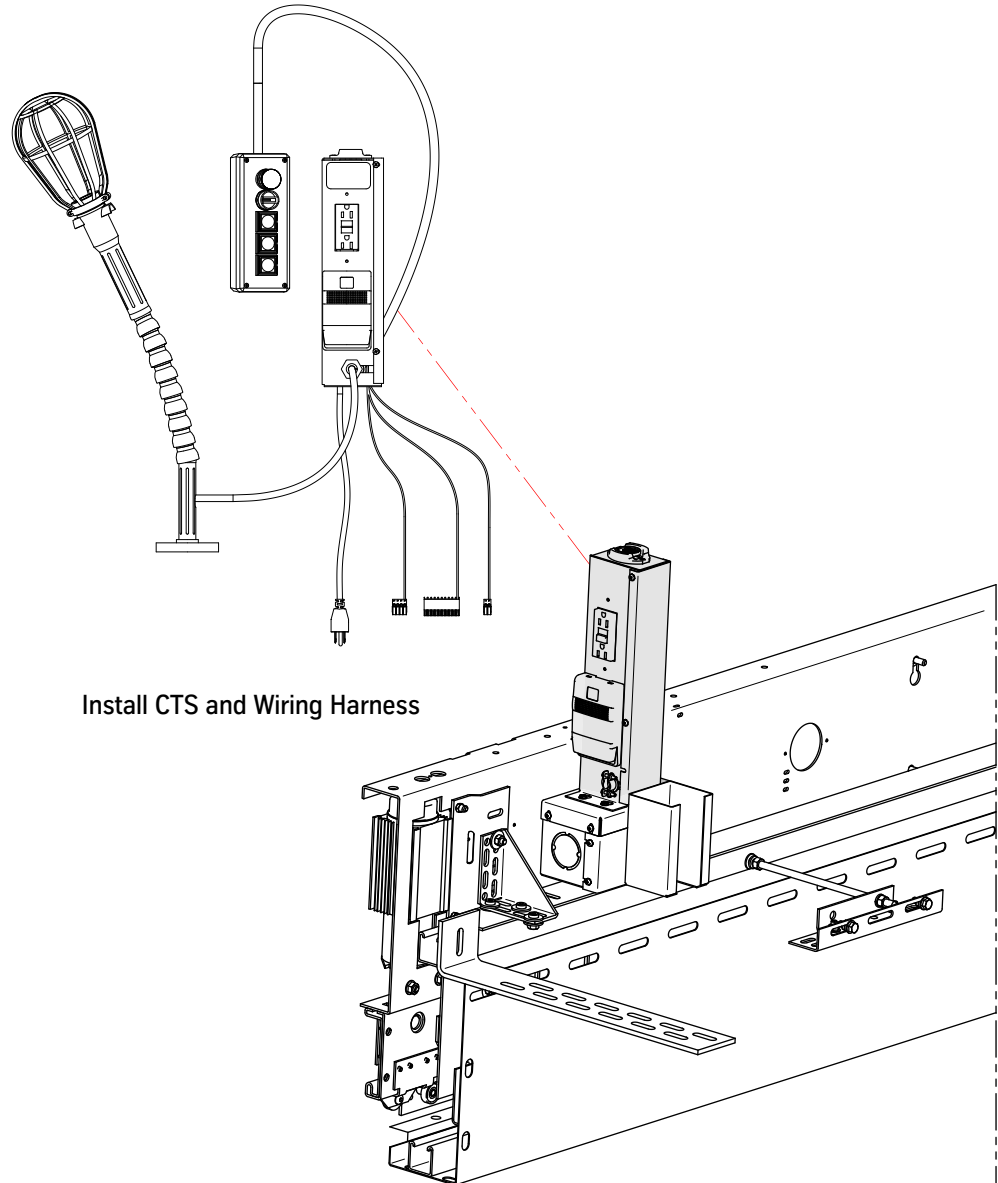
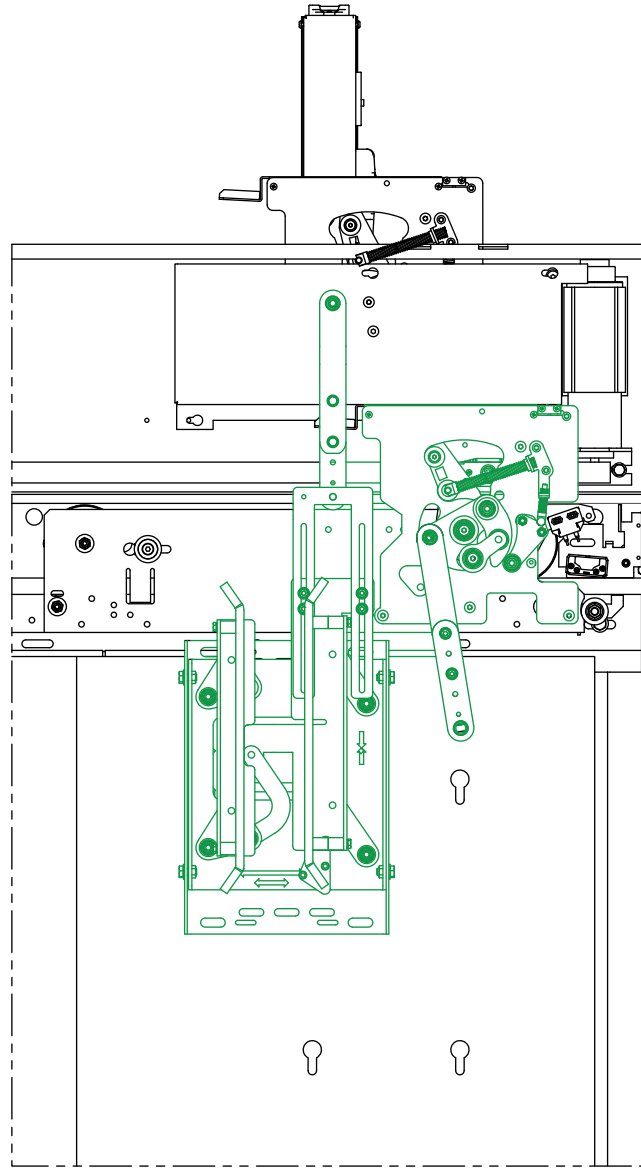


Figure 38 - CTS and Wiring Harness Installation

## Separate Header Installation

(continued)

10. Install the clutch. See Figure 39.



(clutch shown in green)

Figure 39 - Clutch Installation

# New/Existing Car Door Panel Installation

1. Remove the existing door hangers.
2. Assemble the door panel and angle, and align the angle to be parallel to the door. See Figure 40 below and Figure 41 on page 50.
3. Set the door panel with the angle into the door opening on top of the  $\frac{1}{4}$ " spacers on the sill.
4. Use included hardware to install the door interface angle to the top of the existing car door.
5. Shim (as necessary) to ensure that the interface angle is plumb to the car door.
6. Install the car door on the two eccentrics, and align the adapter slots with the holes in the hanger.
7. Install and hand-tighten the four 8 mm bolts.

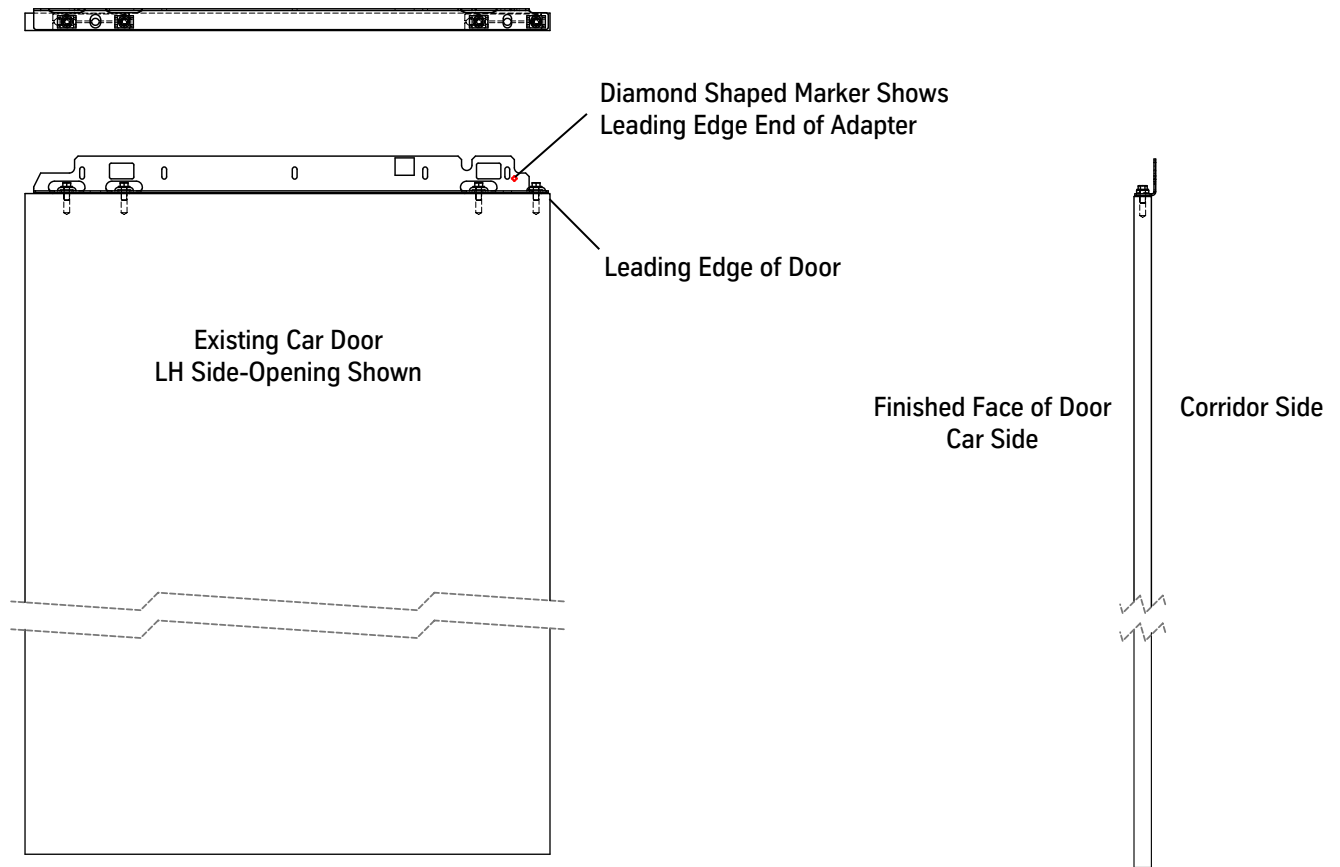


Figure 40 - Assemble and Align Door Panel and Angle (1 of 2)

### New/Existing Car Door Panel Installation

(continued)

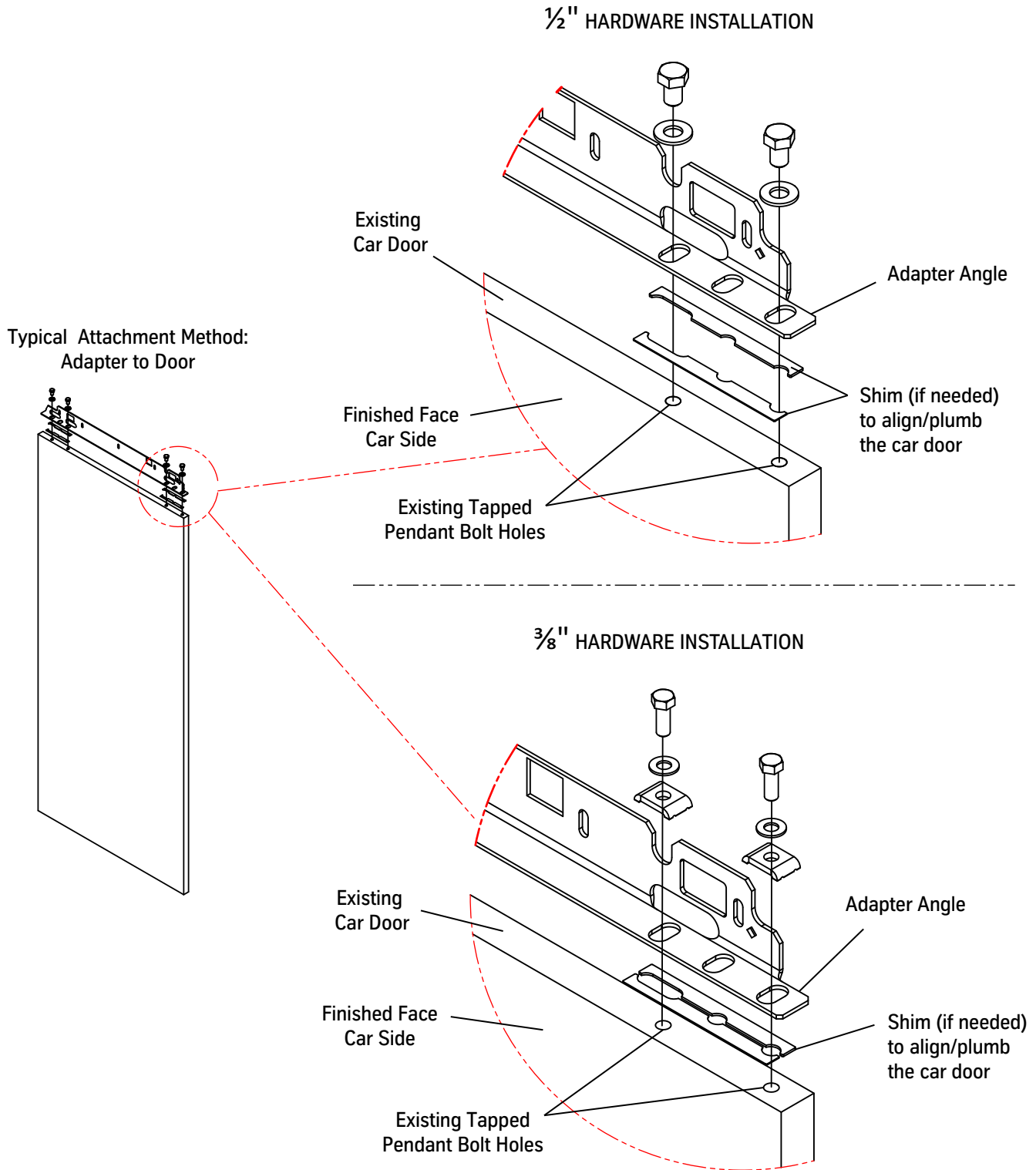


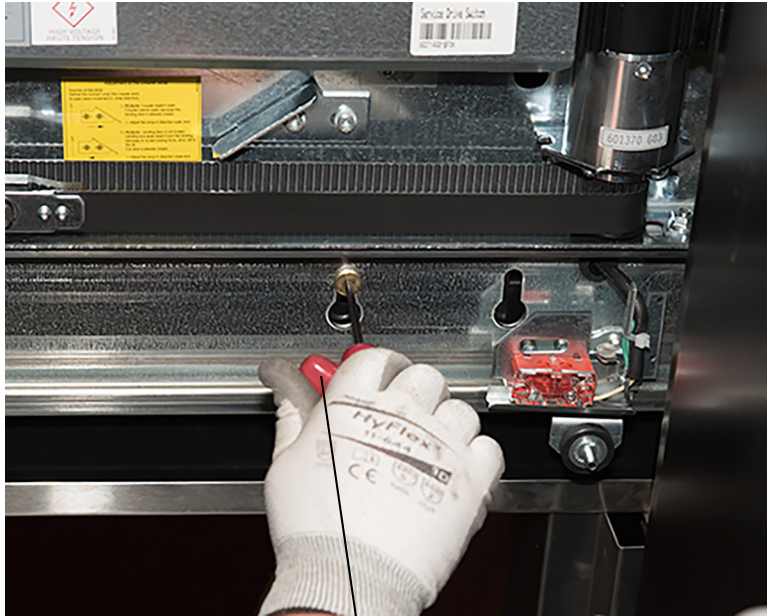
Figure 41 - Assemble and Align Door Panel and Angle (2 of 2)



## New/Existing Car Door Panel Installation

(continued)

8. Use a 6 mm T-handle Allen wrench to rotate the eccentrics and align the car door panel with the return. See Figure 42.
9. Verify that there is  $\frac{1}{4}$ " clearance from the door to the top of the sill.



T-handle Wrench

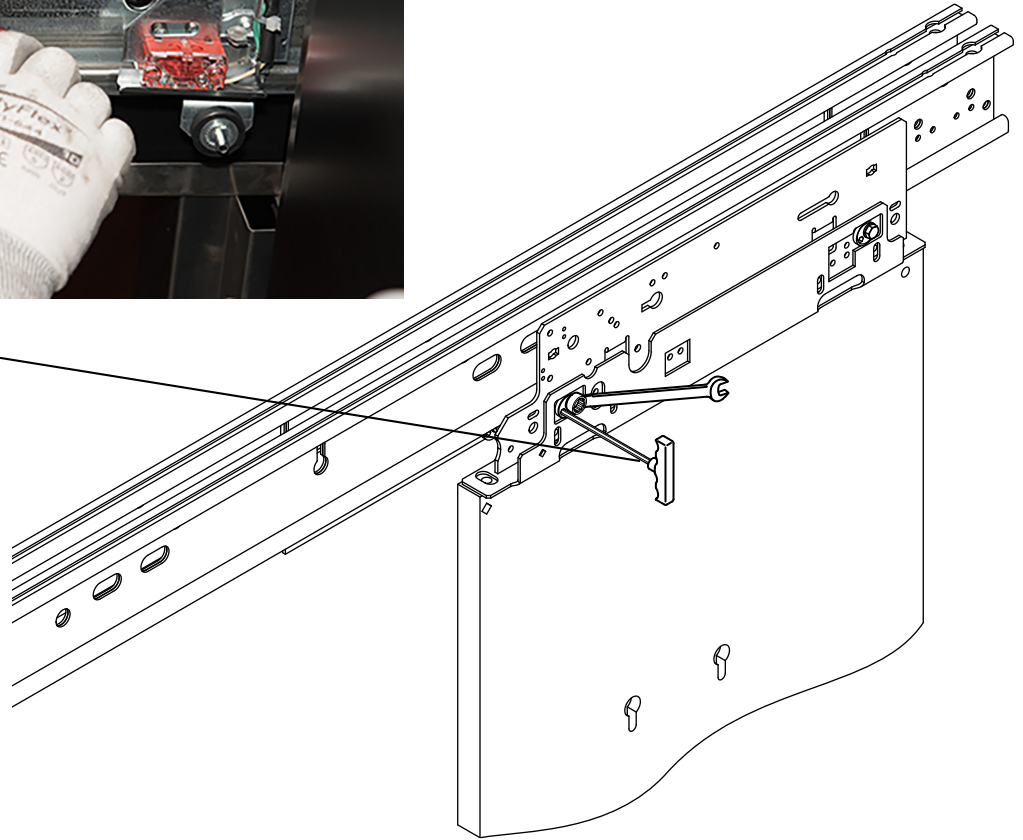


Figure 42 - Car Door Installation

## Car Door Panel Adjustment

1. Move the door hanger(s) to the fully closed position against the LD-16 bumper. See Figure 43.



For center-opening doors: secure the door hanger(s) with a cable tie for easier adjustment.

2. Adjust the doors until the upper and lower leading edge of the door panel makes contact with either the LD-16 bumper or the opposite door panel on center-opening doors.
3. Verify that the door-to-sill clearance is between  $\frac{3}{16}$ " and  $\frac{5}{16}$ ".

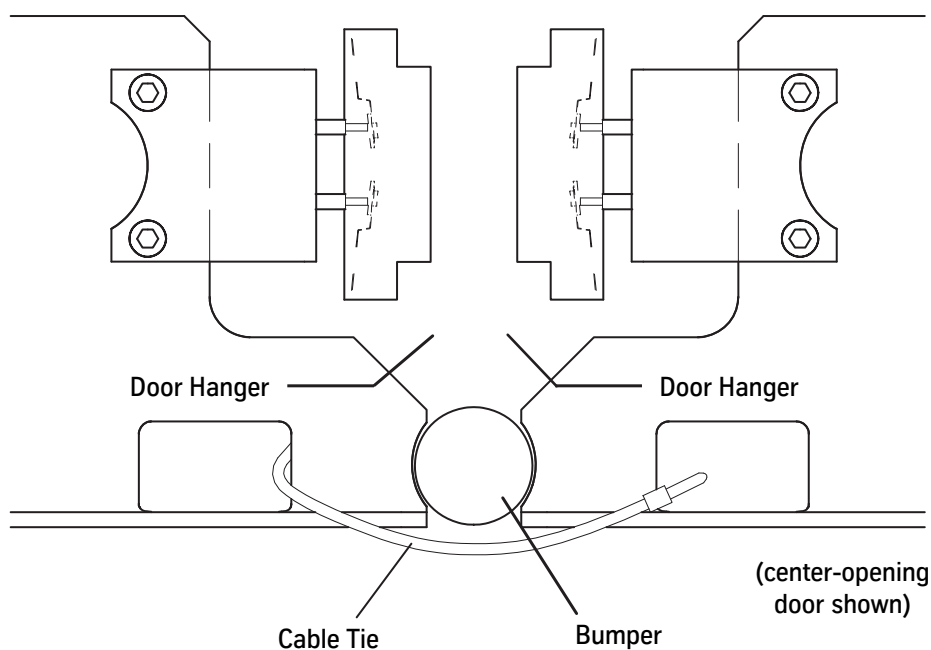


Figure 43 - Door Hanger Fully Closed Position Against Bumper

4. Use a 13 mm wrench to tighten the eccentric bolt; then tighten the mounting bolts. See Figure 44 on page 53.
5. Set a  $\frac{1}{4}$ " –  $\frac{3}{8}$ " required gap (per code) between the transom, the returns, and the door panel.
  - a. Loosen the  $\frac{1}{2}$ " bolts that attach the interface angle to the top of the car door.
  - b. Tighten the  $\frac{1}{2}$ " hardware.
6. Install the gibs.
7. Verify that the car door travels freely along the entire path of travel and also maintains a  $\frac{1}{4}$ " –  $\frac{3}{8}$ " gap during travel.

## Car Door Panel Adjustment

(continued)

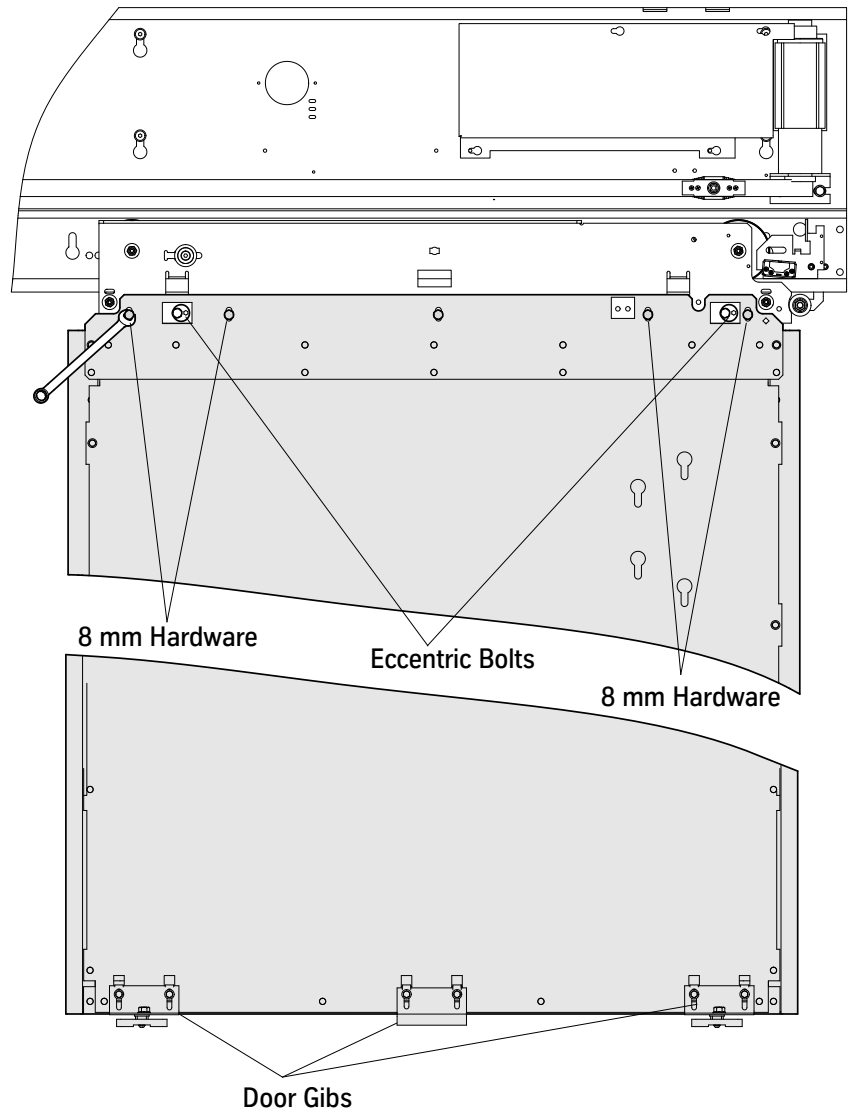


Figure 44 - Tighten Mounting Bolts

## Set Eccentrics on the Car Door Hanger

1. Verify that the gap between the upthrust roller and the rail is  $\frac{1}{64}$ ".
2. If the upthrust roller needs adjustment, loosen the nut and use the Allen wrench to turn the roller shaft.

# Clutch Installation and Adjustment

1. Verify that the clutch with spacer configuration matches the hoistway equipment. See Clutch Assemblies on page A-1 (Appendix).
2. Remove and discard 4 shipping nuts from the clutch actuator/restrictor assembly. See Figure 45.
3. Use the included hardware to mount the clutch actuator assembly to the hanger plate.
4. Check all clutch bolts and fasteners for tightness (may be loose from shipping).
5. Use 2 Allen screws to connect the clutch assembly to the drive belt.

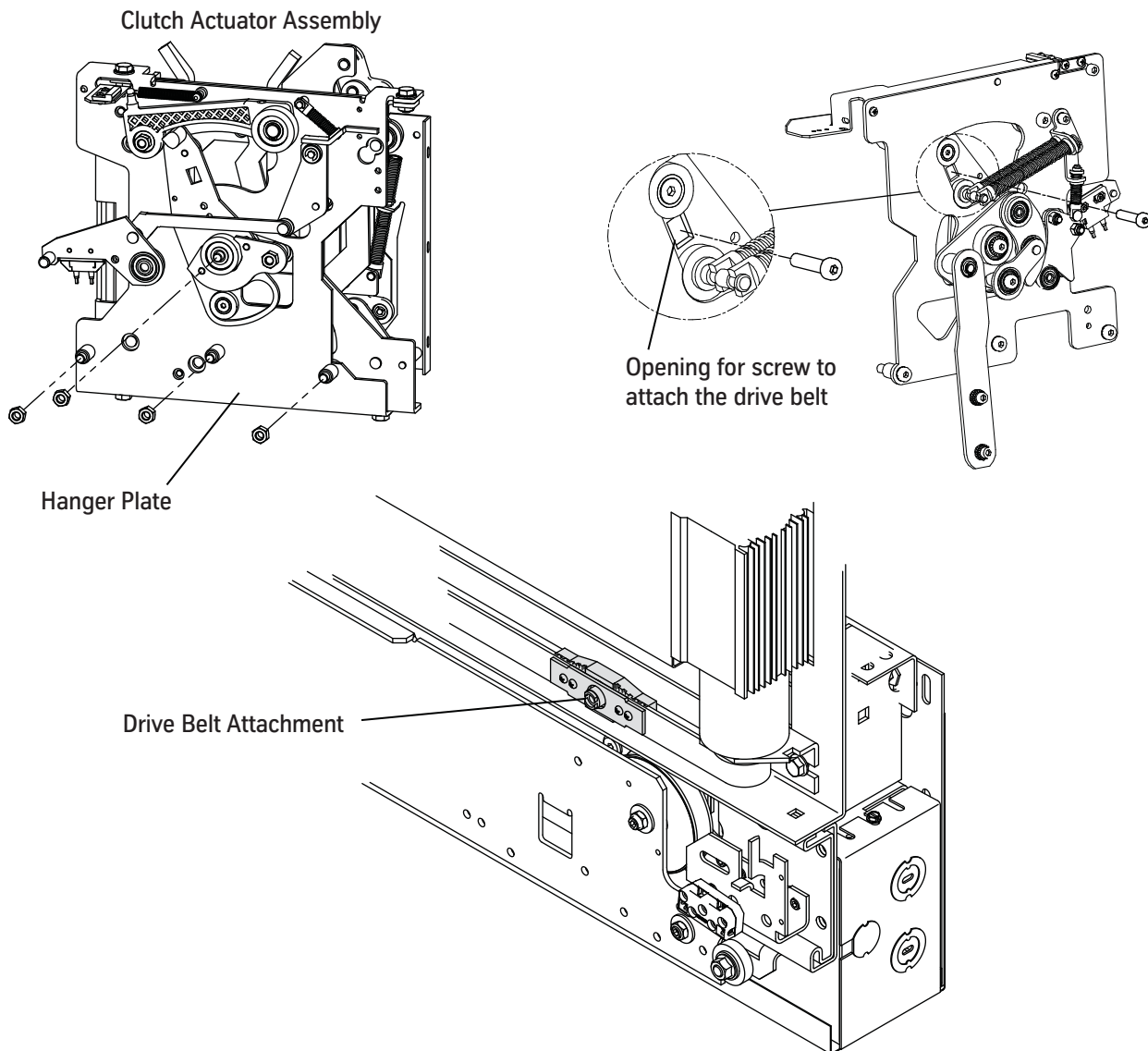


Figure 45 - Clutch Actuator Assembly Installation

## Clutch Installation and Adjustment

(continued)

6. Move the car to the tightest hatch pickup roller to car sill clearance location.
7. Mark the level edge of the closed door stationary pickup roller location onto the car sill.
8. Close the car door and transfer the roller location mark from the car sill to the car door.
9. Install cage nuts in the car door keyslots. If existing keyslots do not exist, scribe the elevation of rollers above the sill; use the clutch baseplate as a drilling template.
10. Use the supplied metric bolts to attach the clutch assembly. See Figure 46.



Clutch location = the hatch door rollers are centered vertically in the clutch with the car at floor level.

11. Verify that the running clearance is between  $\frac{1}{4}$ " and  $\frac{5}{16}$ " with the hatch sill at the tightest landing in the hoistway and adjust as required.
12. Check the alignment and adjust as required.

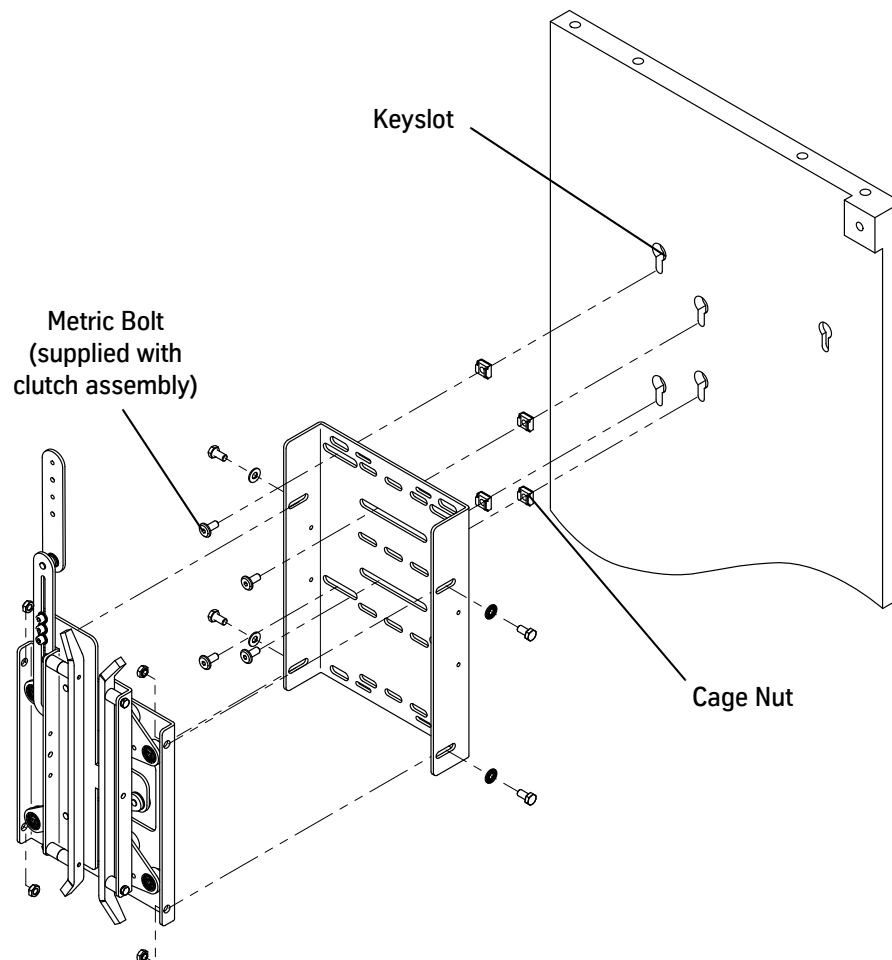


Figure 46 - Clutch Installation

## Clutch Installation and Adjustment

(continued)

13. Use the enclosed hardware screws to connect the door linkages.
14. Adjust clutch and clutch actuator linkage. See Figure 47 below and Figure 48 on page 57.
  - a. Place a spacer between the vanes. Use one of the following methods to determine the spacer width:
    - Distance of the squeezed pickup rollers
    - Actual rollers
    - Interlock rollers width =  $1\frac{5}{8}$ "
  - b. Use a 5 mm hex key to adjust the linkage length until the lock hook is in the fully lifted position, and tighten the linkage screws. To extend the lengths of the push rod (if needed) use the linkage extensions.

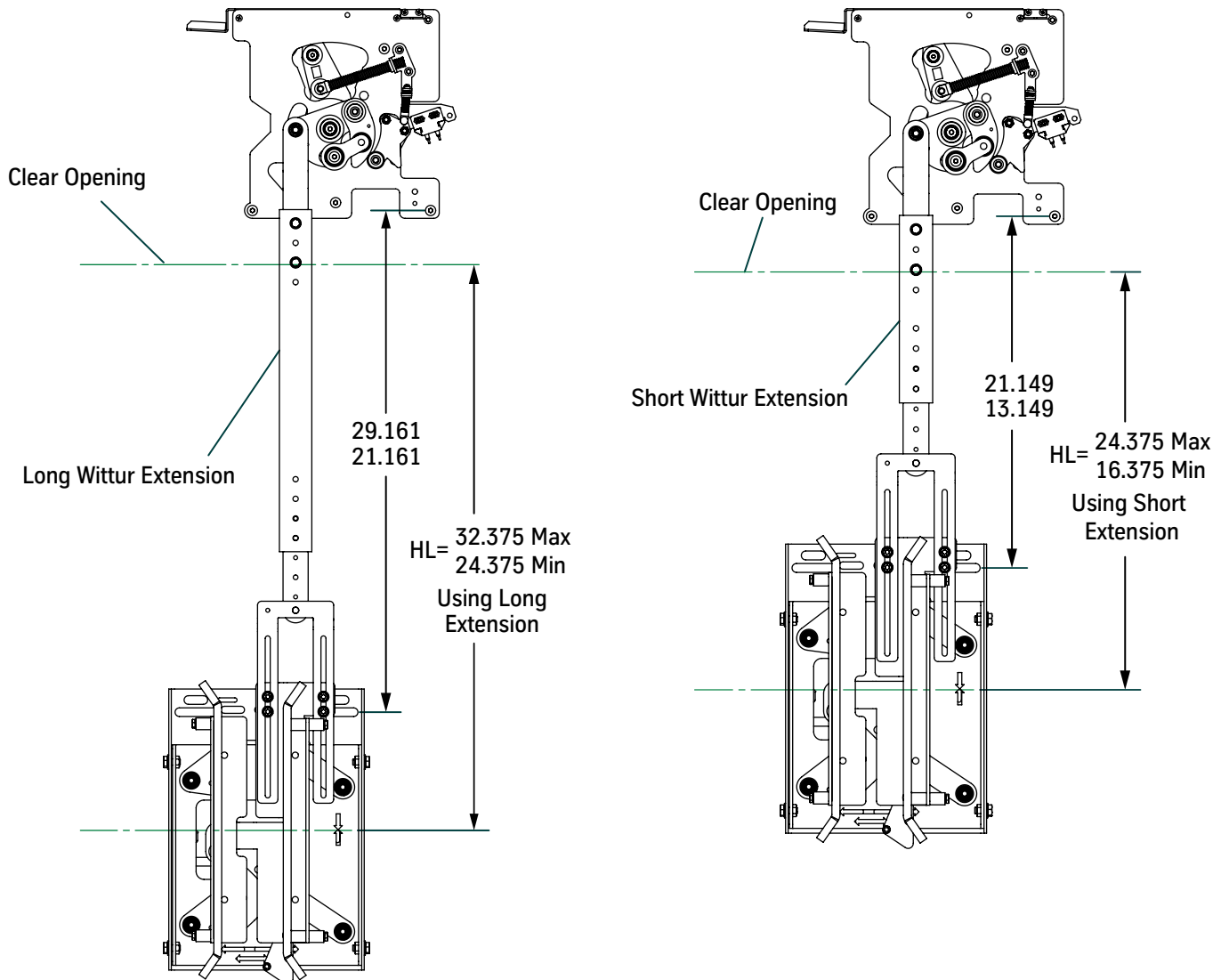


Figure 47 - Adjust Clutch and Linkage - Short and Long Wittur Extensions

### Clutch Installation and Adjustment (continued)

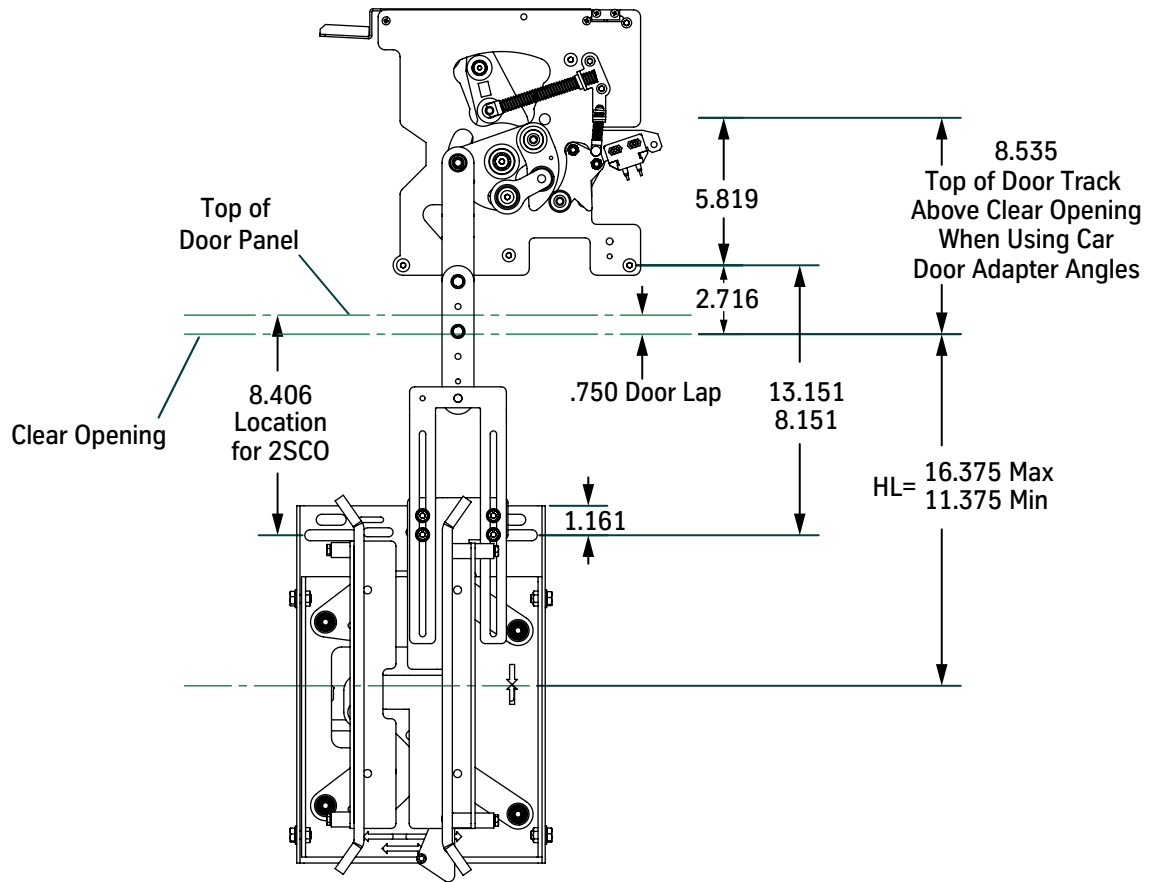


Figure 48 - Adjust Clutch and Linkage - Two-Speed Center-Opening

## Adjust Door Contacts and Door Lock Contact (Relating Cable Adjustment)

- Center-Opening Doors
1. Verify that the distance from the bumpers to the pendants is equal for both pendants. If the distance is not equal:
    - a. Loosen the set screw on the rope guide (relating cable rope guide).
    - b. Move the car door hanger until the distance is equal for both pendants.
    - c. Tighten the set screws on the rope guide.
- All Other Doors
2. When the door lock pins are just touching the door contacts, verify that the measurement between the door hanger and the bumper is  $\frac{1}{8}$ ". See Figure 49. If the measurement is not  $\frac{1}{8}$ ":
    - a. Loosen the screws.
    - b. Move the bracket(s).
    - c. Verify that the measurement is  $\frac{1}{8}$ ".

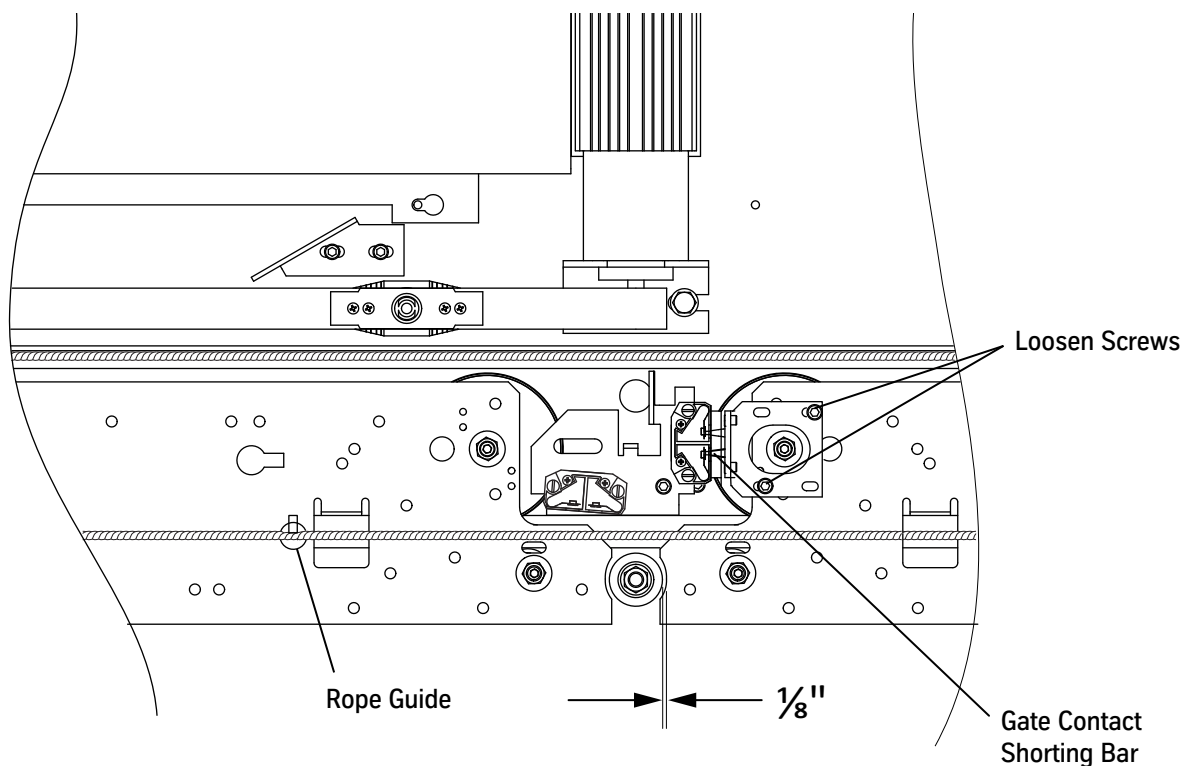


Figure 49 - Adjust Door Contacts/Door Lock Contact (Center-Opening Shown)



## Adjust Car Door Interlock/Restrictor

The horizontal location of the car door interlock/restrictor ramp determines when the restrictor latch starts to open as the car door reaches a fully closed position. See Figure 50.

### Troubleshooting

Problem	Reason	Solution
Car door interlock/restrictor does not open.	Hoistway door is already closed.	Move the car door interlock/restrictor ramp in the Door Open direction.
Hoistway door is not locked and the car door is closed.	Hoistway door latch does not lock because of closing force, wind, or dirt in the sill.	Move the car door interlock/restrictor ramp in the Door Close direction.

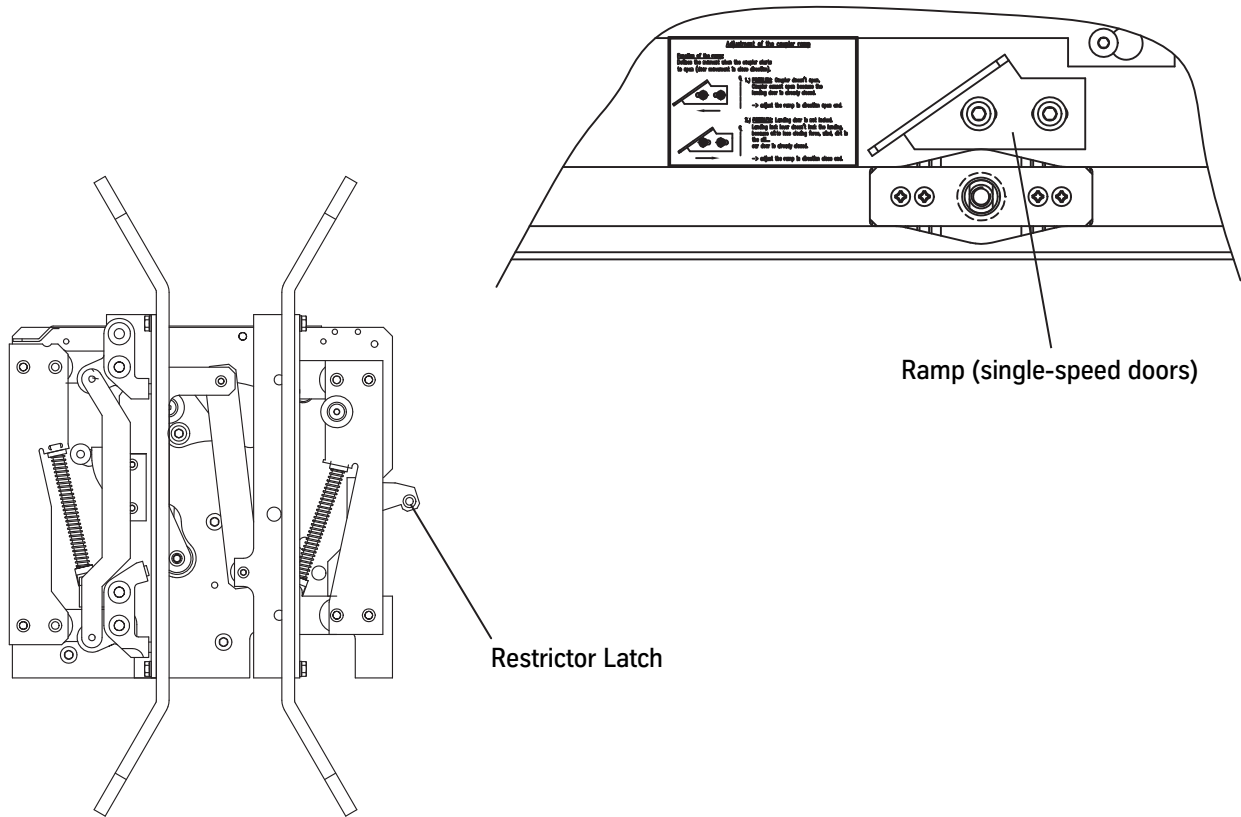


Figure 50 - Adjust Car Door Interlock/Restrictor

## Verify Running Clearances

**IMPORTANT!**

- To move the doors open under power when not floor level, manually open the clutch to operate the restrictor. See Block LD-16 Clutch Open (next section).
- To retract the clutch with the doors all the way closed, move the screw towards the Door Close direction.

Verify that there is a  $\frac{3}{8}$ " running clearance for the following areas. See Figure 51.

1. Clutch to sill - use the four bolts (see below) for adjustment.
2. Stationary pickup roller to rear clutch cam - after one pickup roller is adjusted, transfer the roller position to the top of the LD-16 header and use this position to set the pickup rollers at all other entrances.

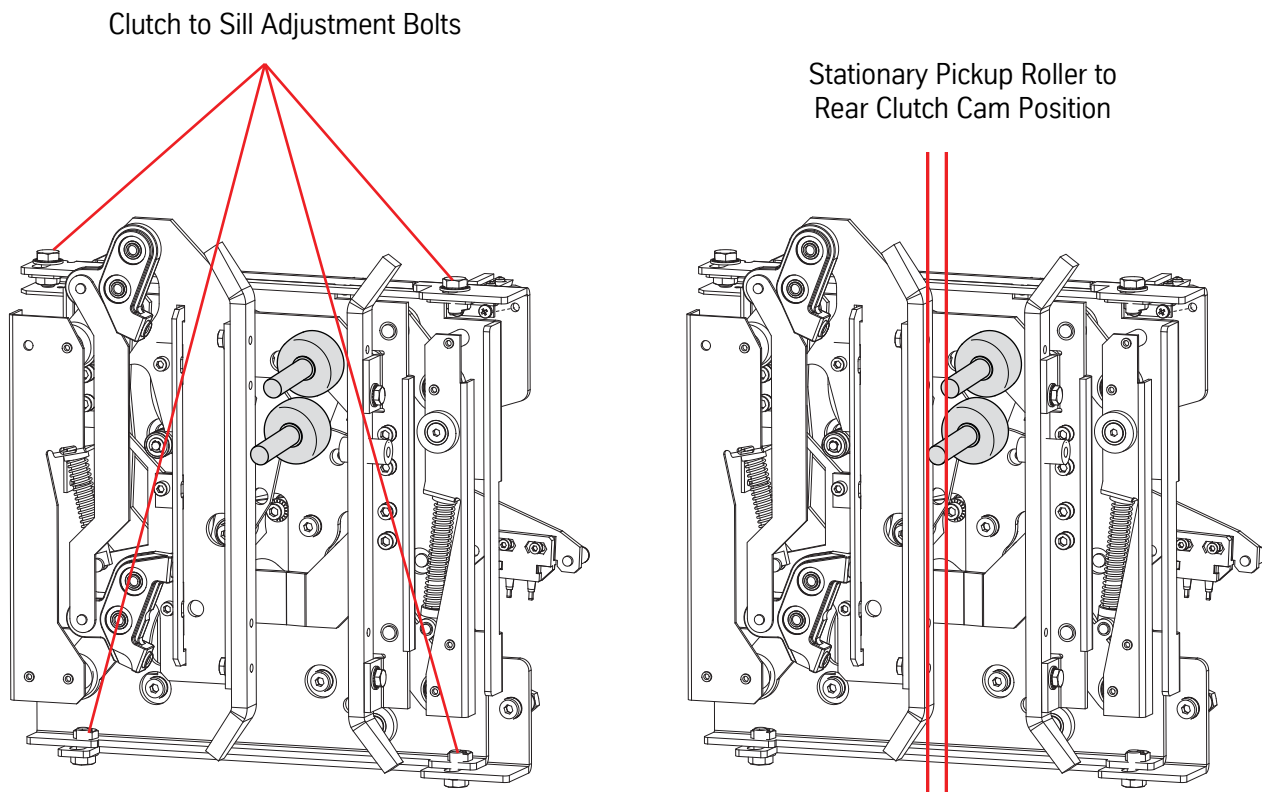


Figure 51 - Verify Running Clearances

## Block LD-16 Clutch Open

If it is necessary to move the car with no power to the door operator, block the LD-16 clutch open.



**Failure to provide proper clutch-roller clearance will cause roller or clutch damage. Failure to block the clutch open when running the car with the LD-16 powered OFF will cause roller or clutch damage.**

1. Remove the screw from the parking position on the clutch. See Figure 52.
2. Open the clutch vanes, and install the screw in the lock position hole.
3. Run the car on Inspection Operation, and check the running clearance between the clutch and the hatch door rollers at each floor. Adjust the hatch door rollers (or clutch) as required.
4. After checking the running clearance, remove the screw from the lock position hole and reinstall it in the parking position hole.

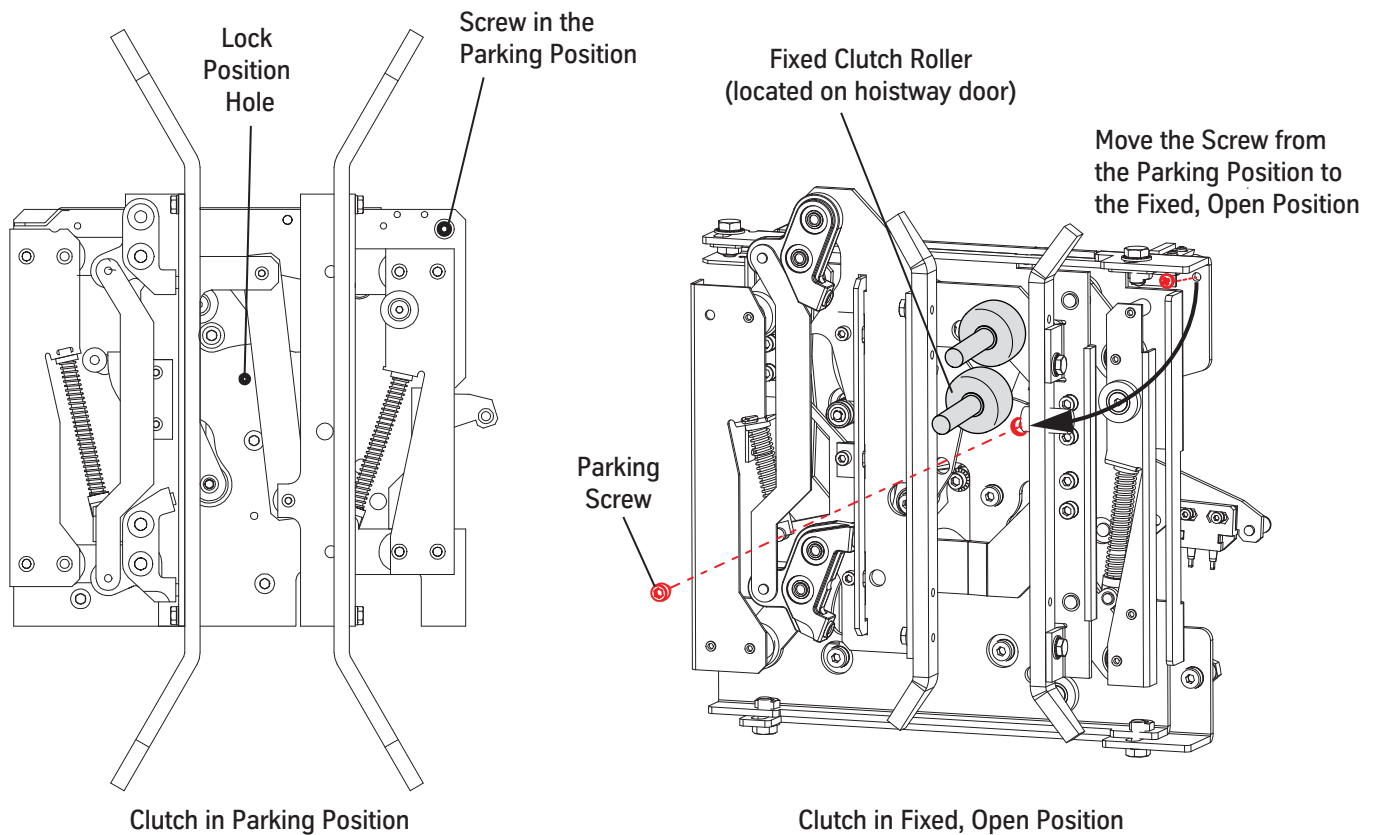


Figure 52 - Block LD-16 Clutch Open

## Install Electronic Edge



- The minimum distance between the receiver and transmitter of the electronic edge is a critical dimension. See the electronic edge included instructions for installation and minimum distance dimensions.
  - Drilling locations for the electronic edge mounting need to be a minimum of  $1^{13}/_{16}$ " from the leading edge of the door.
  - Begin measurement from the metal leading edge; do not include astragal.
  - If the drilling location is closer to the leading edge than  $1^{13}/_{16}$ " the drilling will be difficult, since the doors in this area have  $1/3$ " thick embedded structural steel.
1. Install the electronic edge per the instructions packaged with the electronic edge.
  2. Route cables—avoid tight bends and sharp edges—from the electronic edge to the ends of the door track, and secure with cable ties. See Figure 53 on page 63.
  3. Use clips to secure the electronic edge cables to the doors.
  4. Route the electronic edge cables up to the top of the door operator C-channel, and secure with cable ties.
  5. Route the electronic edge cables to the Door Operator Control Board located behind the cover.
  6. Plug in the cable from the receiver to X15 on the Door Operator Control Board.
  7. Plug in the cable from the transmitter to X16 on the Door Operator Control Board.

### Install Electronic Edge (continued)

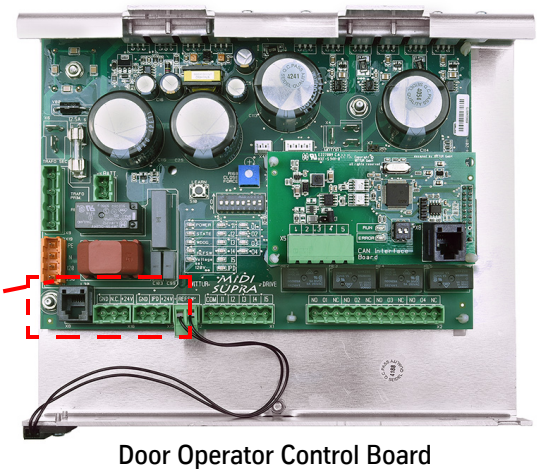
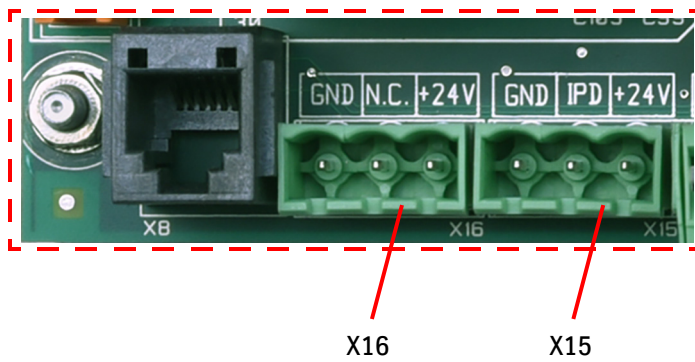
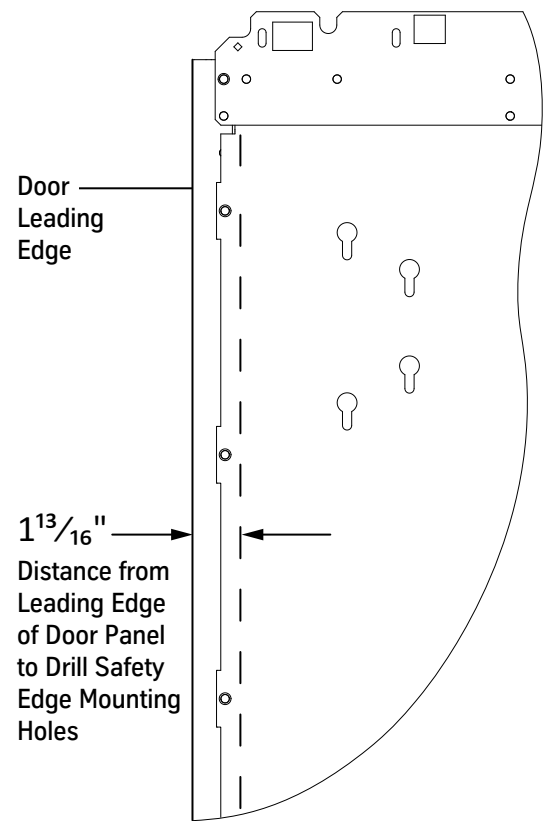
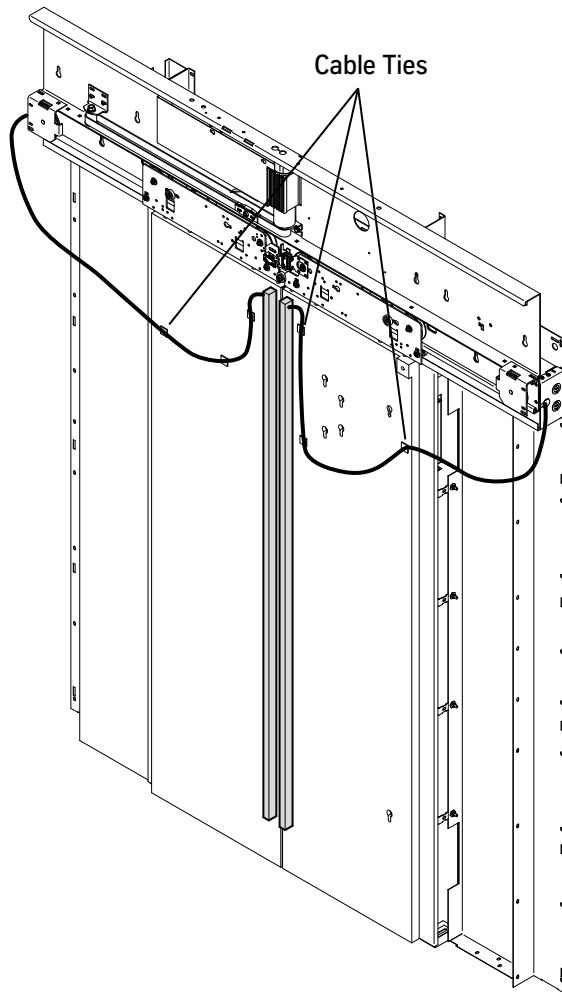


Figure 53 - Install Electronic Edge

# Electronic Setup & Adjustment

## Wiring

See also:

Job wiring diagrams

Generic wiring diagrams starting on page A-17 (Appendix).

1. Verify that the doors are mechanically adjusted for smooth movement with no binding or interference.
2. Remove the cover from the Door Operator Control Board. See Figure 54.
  - a. If required, move the car doors partially open.
  - b. Loosen 4 screws, slide the cover over and off of the screws, and set the cover aside. The Door Operator Control Board should not have power at this point.

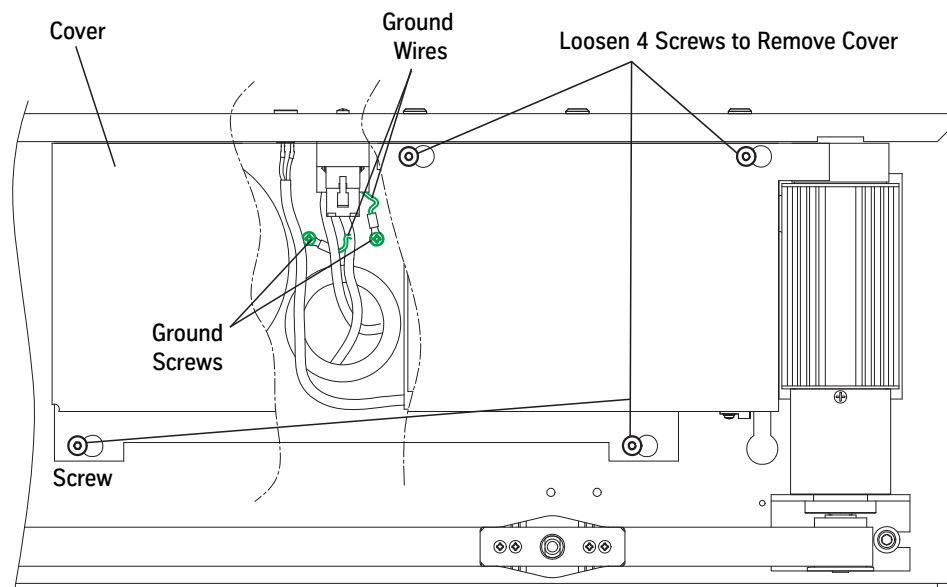
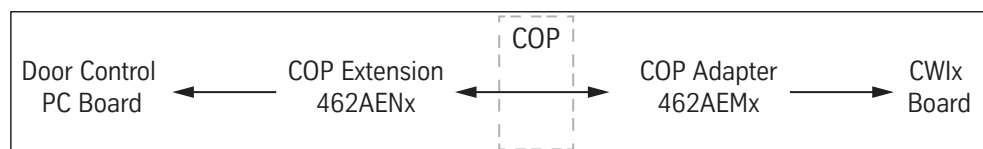


Figure 54 - Remove Cover and Attach Ground Wires

3. Attach the previously installed door operator harness and the plugs in the COP to the Door Operator Control Board. See Figure 55 on page 65.

If non-VTX system, remove the COP plugs from the 462AEMx harness and wire the harness directly to the COP terminals.

### Harness Installation Overview



The 120VAC female plug receptacle powers the GFCI receptacle in the CTS

See also:

- Harness Assembly diagrams start on page A-9.
- Serial Communications - Legacy Control Systems on page 77.
- Discrete Controller Interface on page 80.



**Wiring**

(continued)

4. Attach the following wires to the ground screws.
  - a. Ring lug ground wire from X19.
  - b. Ring lug ground wire in the harness from the COP.

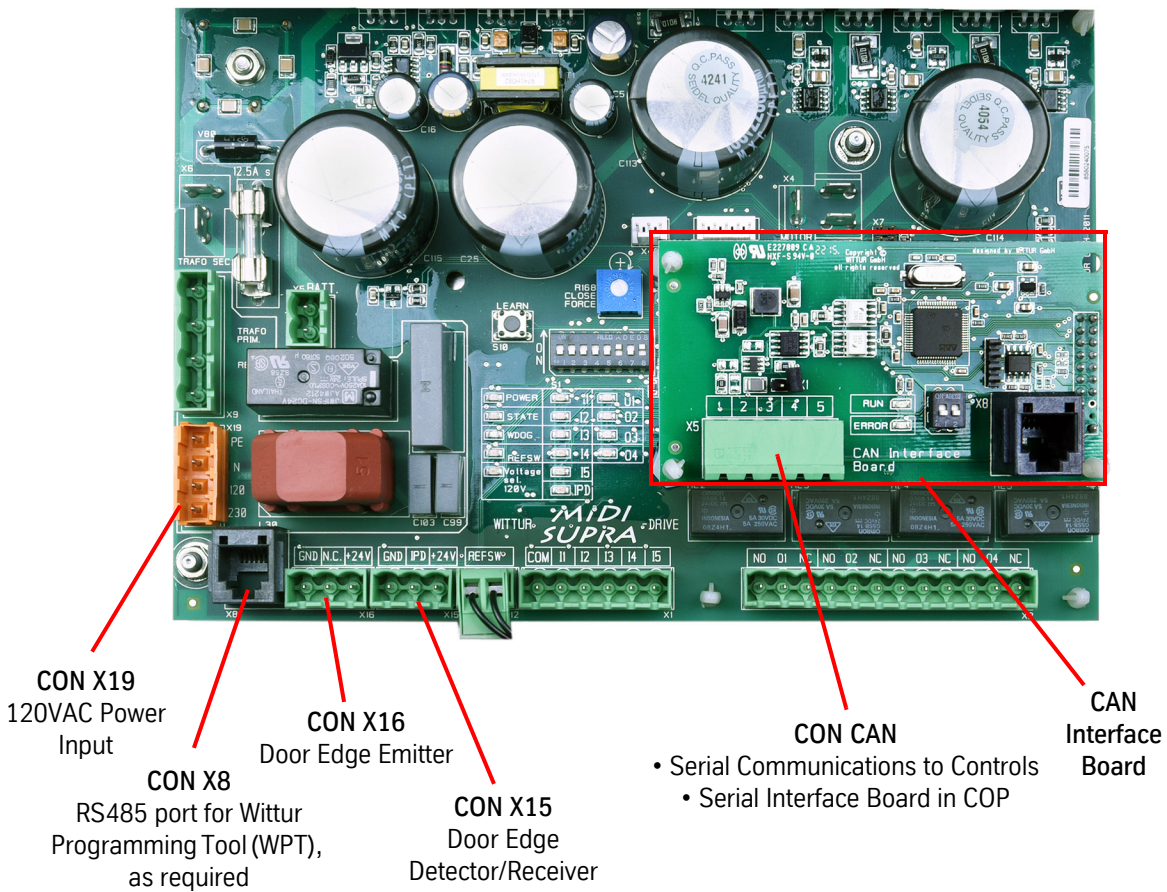
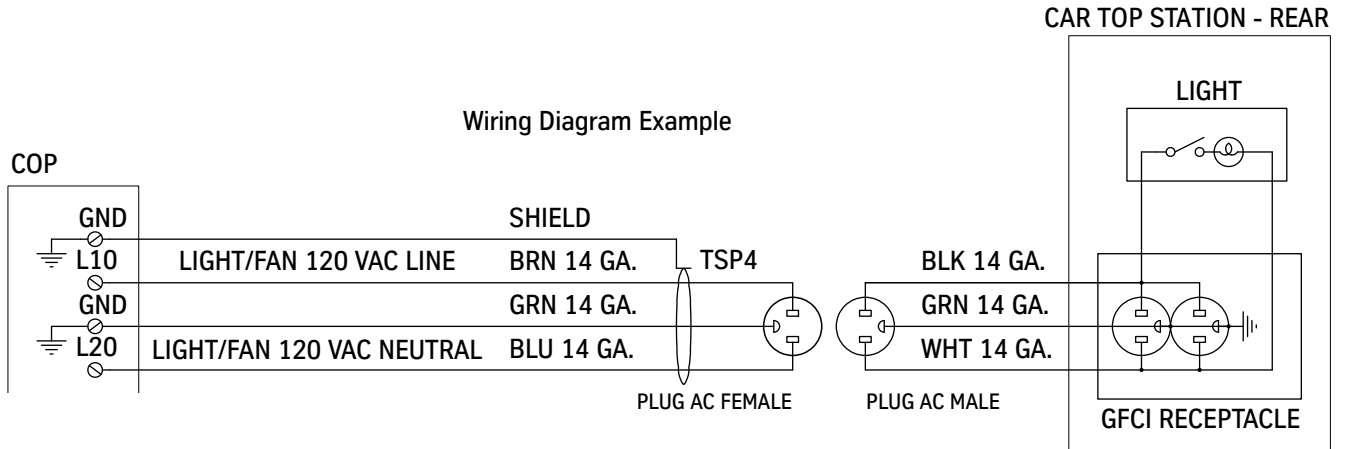


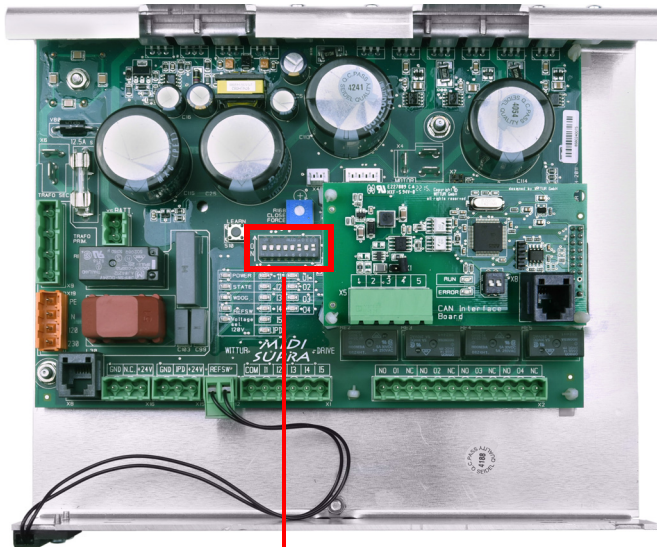
Figure 55 - Wiring Diagram Example and Harness Connections

## DIP Switch Settings

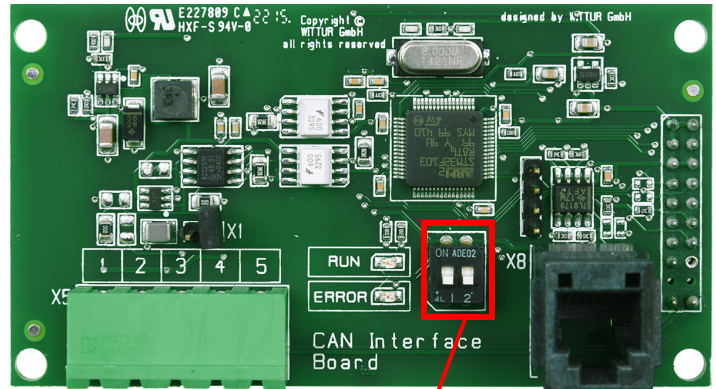


Disconnect power from door operator when changing DIP Switch settings.

Verify the DIP Switch settings. See Figure 56 and Table 1.



Door Operator Control Board



CAN Interface Board

DIP Switch 1: Front = OFF, Rear = ON

DIP Switch 2: OFF

**Serial Communications**

DIP Switch 2 & 8 = ON

All Others = OFF

**Discrete Interface**

DIP Switch 2 = ON

DIP Switch 1, 3, 4, 7 = OFF

DIP Switch 5 & 6 = Desired Speed Pattern - See Table 1.

Figure 56 - DIP Switch Default Settings

Switch No.	ON	OFF		
S1/1*	Test Drive Button Operation (Buttons active) Performs same function as TEST/RUN switch	Normal Operation (Command Inputs Active)		
S1/2	Automatic Reopen on Obstruction or IPD (Reopen O3 switched as long as Reopen in progress)	No Automatic Reopen (Only Reopen O3 is switched)		
S1/3	Electric Shoe Operation, Command Input Always I1 (Swing Door Mode) (*)	Normal Operation (Command Inputs Active)		
S1/4	Reduced Motor Torque Used	Maximal Possible Motor Torque Used		
S1/7	Open Force Limitation Active	No Open Force Limitation		
S1/8	Automatic End-Keeping	Hold Open/Closed Only on Active Open/Close Command		
Desired Speed Pattern - Discrete Interface Only				
Switch No.	Min.	Speed Pattern Selection		Max.
	1	2	3	4
S1/5	OFF	ON	OFF	ON
S1/6	OFF	OFF	ON	ON

Table 1 - Door Operator Control Board DIP Switch Definitions



## Learn Door Travel



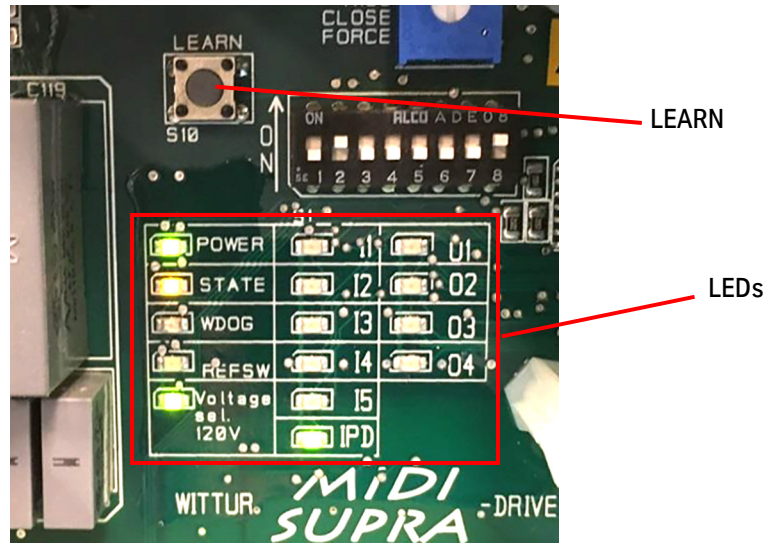
Before performing a Learn Door Travel Procedure, install a tie wrap to keep the CDI picked and eliminate the risk of getting fingers pinched.

1. Place the elevator on Inspection Operation, and manually close the doors.
2. Power up the door operator, and verify the following LEDs. See Figure 57 on page 68.
  - a. POWER, VOLTAGE SEL 120VAC, and REFSW are illuminated.
  - b. WDOG is not illuminated.
3. Press **LEARN** until STATE LED starts flashing (about 10 seconds), and then release it. STATE LED should remain illuminated; if it remains in the flashing mode, there is an error and setup cannot proceed.
4. Rotate the TEST/RUN switch to the TEST position. See Figure 57 on page 68.
  - a. To allow the doors to start opening when the car is not at floor level, manually lift the clutch open to activate the car door interlock/restrictor, and open powered movement will begin.
  - b. Press and hold **DOOR CLOSE** until O2 and REFSW LEDs illuminate—the door will start powered motion to learn the direction and the closed limit. If the doors move open, continue to press **DOOR CLOSE** until O2 and REFSW LEDs illuminate.
  - c. Press and hold **DOOR OPEN** until the door is fully open on its hard stop—this is a slow speed run. The O1 LED should illuminate.
  - d. Repeat step b and step c until STATE LED is not illuminated.
    - The doors have learned the hardware parameters. Door direction, opening width, and clutch width are retained until manually reset or re-learned.
    - A soft learn (used for fine-tuning the belt position) must happen after every power cycle. In this case, the door will not move itself to learn, but will learn while moving.
5. Rotate the TEST/RUN switch to the RUN position. The door system is now capable of Automatic Operation, and learned parameters are automatically saved.



### Learn Door Travel

(continued)



Door Operator Control Board

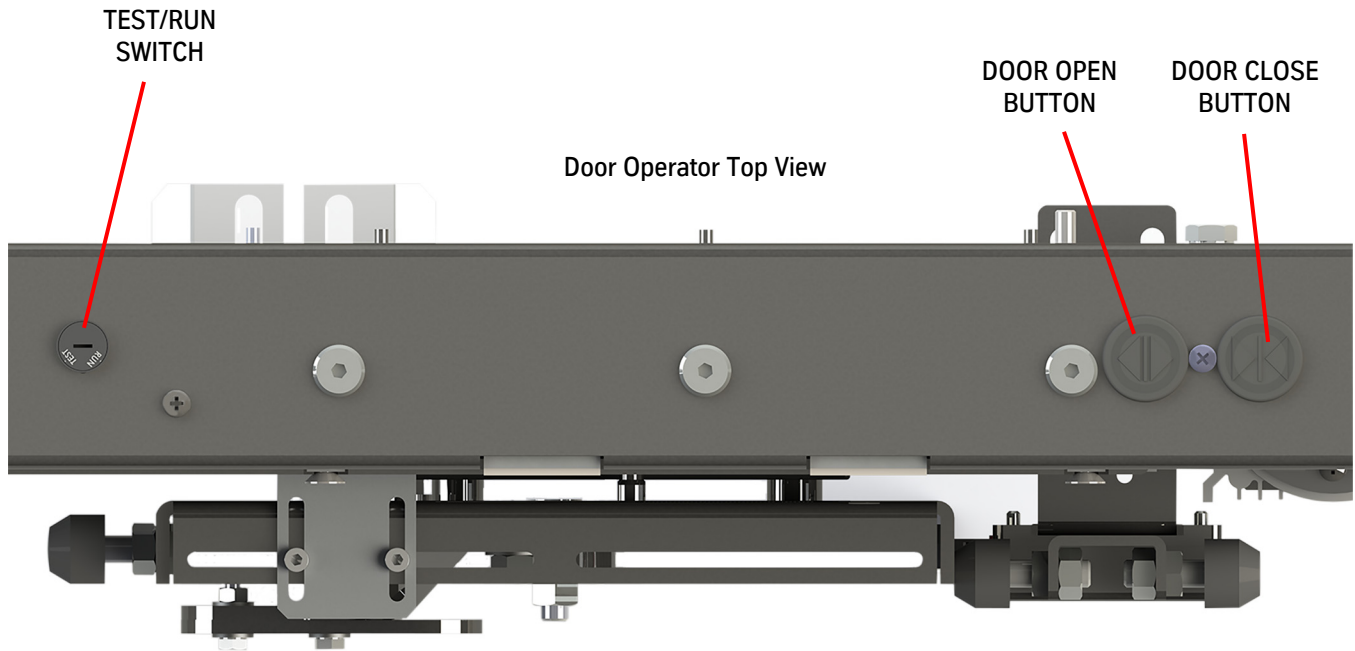


Figure 57 - LEDs and Test Buttons for Learn Door Travel

## Speed Pattern Adjustment via IMS - Legacy TAC Systems Only

**IMPORTANT!**

This procedure requires IMS version 2.7.9 or later.

The Speed Pattern 4 Adjustments are listed in the IMS Door Smart FAST Adjustment Menu. See Figure 58.

To use Speed Pattern 4, the controller must have the SDP Parameter set equal to Speed Pattern 4 (SDP = 4). If not, door performance will be reduced (S-Curve Derating) per the settings in Table 2.

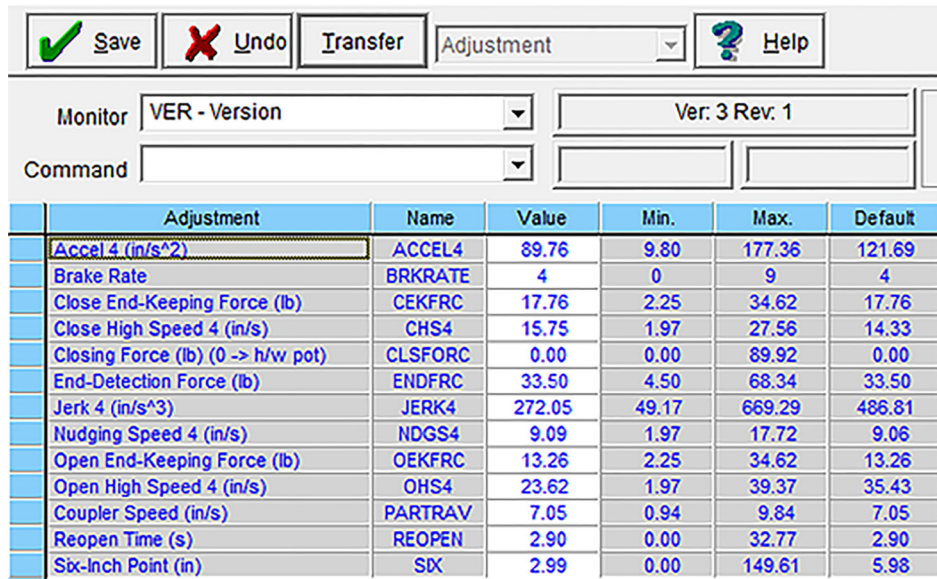


Figure 58 - IMS Door Smart FAST, Speed Pattern 4

MIDI+ Drive					
Pattern	Open High Speed	Close High Speed	Nudging Speed	Acceleration	Max. Door Mass @ defaults
4	100% per IMS value				330lbs
3	83%	77%	77%	75%	440lbs
2	66%	61%	61%	50%	550lbs
1	50%	50%	50%	33%	660lbs
SUPRA Drive					
Pattern	Open High Speed	Close High Speed	Nudging Speed	Acceleration	Max. Door Mass @ defaults
4	100% per IMS value				330lbs
3	77%	77%	77%	60%	550lbs
2	55%	61%	61%	37%	880lbs
1	33%	50%	50%	25%	1323lbs

Table 2 - S-Curve Derating

## Speed Pattern Adjustment via IMS

(continued)

1. Adjust the door speed profile.
  - a. Use OPEN and CLOSE in the COP to cycle the doors and observe the changes.  
*or*
  - b. Rotate the TEST/RUN switch to the TEST position, and use the test buttons to cycle the doors.



With the controller on Inspection Operation and while in TEST mode, the door operator will ignore CAN commands from the control system and the door edge inputs.

2. Begin with Speed Pattern 4 at default settings, and observe door operation. See Figure 59 below and Table 3 on page 71.
  - If satisfactory, only the closing force potentiometer and nudging speeds need adjustment.
  - If lower performance is required, set the SDP Parameter in the TAC Control System to 3, 2, or 1 as required.
  - If a custom speed pattern is desired, individual settings may be changed. It is suggested that only the Open or Closing High Speed settings be adjusted as required, as the system will compensate for these changes to provide a smooth door cycle.

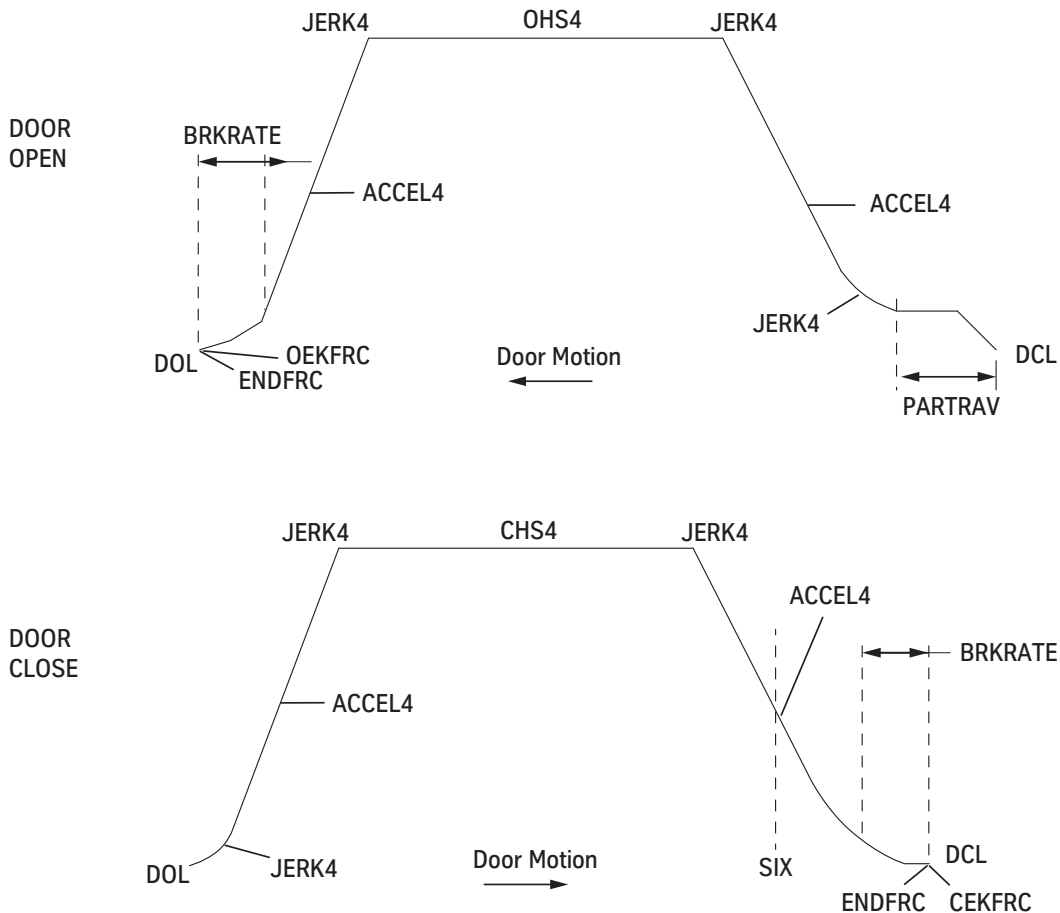


Figure 59 - Speed Pattern S-Curve

## Speed Pattern Adjustment via IMS

(continued)

Mnemonic	Unit	Definition	Notes
ACCEL4	inches per sec. <sup>2</sup>	Acceleration to and from High Speed	The higher this value, the less time it takes to reach high speed, or slow from high speed to a stop, and more motor current is used.
BRKRATE	—	Open or Close Limit Approach Jerk (rate of change of acceleration)	Near the end of travel on a door cycle, the system reduces the speed to approach the limit (how quickly the system performs the jerk to final stop). The higher this setting, the quicker the final stop occurs (closer to the limit). At 0, the creep starts further out from the limit (maximum), and at 9 it is the closest to the limit (minimum).
CEKFRC	lbs.	Closed End-Keeping Force	When the doors are closed, this sets the force used to keep them closed. The higher this is, the more force is used.
CHS4	inches per sec.	Close High Speed	The top speed for closing; higher number means higher speed (will be limited by ASME Code for kinetic energy based on door mass).
CLSFORC	lbs.	Closing Force	The torque limit used to comply with ASME on closing force, set to zero. Not used. Leave at 0.
CLTIM	sec.	Communication Loss End-Keeping Timeout	Sets the delay before end-keeping is turned off if the door system loses communication with the control system (prevents excessive time of power applied to the motor if a communication loss). Set to zero to disable.
ENDFRC	lbs.	End Detection Force	Sets pounds of force level that indicates a door limit is reached. The higher this value, the more pounds of force will be required to sense travel limit.
JERK4	inches per sec. <sup>3</sup>	Acceleration Rate of Change	Sets the rate of S-Curve acceleration rate change. The lower this value, the more aggressive/sharp the corners of the S-Curve become (less rounding, more rough operation).
NDGS4	inches per sec.	Nudging Speed	Top closing speed when on nudging; the higher this value the faster the doors run while on nudging.
OEKFRC	lbs.	Open End-Keeping Force	When the doors are open, this sets the force used to keep them open. The higher this value, the more force is used.
OHS4	inches per sec.	Open High Speed	The top speed for opening; a higher value means higher speed.
PARTRAV	inches per sec.	Clutch Speed	The speed dictated when the doors are in the hoistway door pickup roller area near the closed limit when opening or closing. Higher values mean a higher maximum speed when the doors are moving while the clutch picks or drops the rollers.
REOPEN	sec.	Reopen Time	Sets the door standing time for an Automatic Reopen before another attempt to close.
SIX	inches	Door Six Inches from Closed Point	Sets the DCL6 activation point used for pre-torque application and DC motor field activation (among other things) on TAC Control Systems.

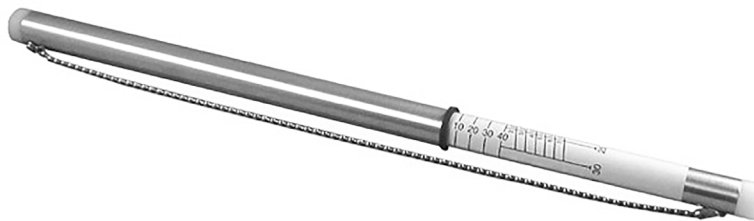
Table 3 - IMS Speed Adjustment Descriptions

## Speed Pattern Adjustment via IMS

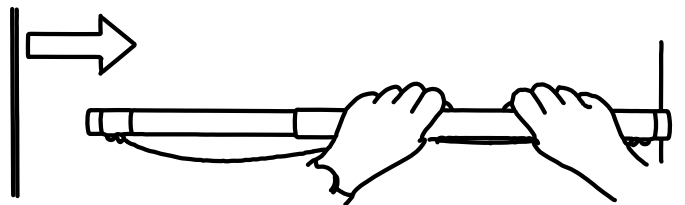
(continued)

### Closing Force Adjustment - 30 lbs. Maximum

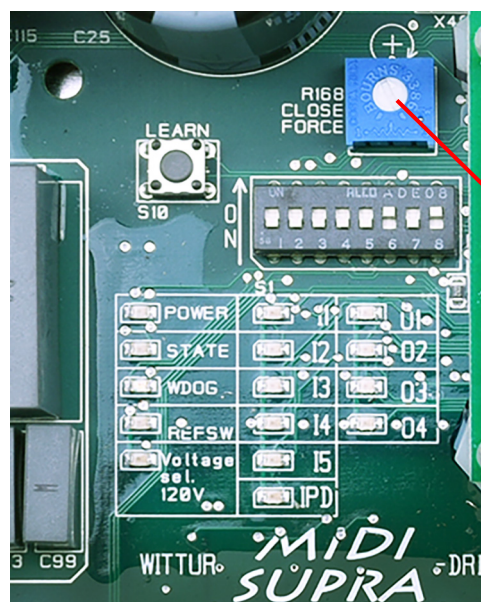
1. Place the car at floor level on Inspection Operation.
2. Rotate the TEST/RUN switch to the TEST position.
3. Use the kinetic force gauge (part no. 9869657) to measure the closing force, and press DOOR CLOSE to close the doors. Do not apply closing force for more than 10 seconds at a time. See Figure 60.
  - If required, reduce the closing force by turning the CLOSE FORCE Potentiometer counterclockwise; remeasure and repeat until the closing force is within limits.
  - To control kinetic energy, reduce door closing top speed to within code requirements.
4. Rotate the TEST/RUN switch to the RUN position.



Kinetic Force Gauge  
Part No. 9869657



Safe Use of  
Kinetic Force Gauge



CLOSE FORCE  
Potentiometer

Figure 60 - Closing Force Gauge

# Diagnostics

## Fault Codes

32bit CPUa IMS Fault Code Front/Rear	WPT Tool Mnemonic	Description
3402/3702	PS	Parameter set error
3403/3703	EE	EEPROM writing or reading fault
3404/3704	OC	Overcurrent
3405/3705	RS	Faulty reference switch
3406/3706	IE	Internal software fault
3407/3707	AP	Fault by position counter, door width > 3.5m
3408/3708	TS	Faulty temperature sensor
3409/3709	NE	Encoder not connected
3410/3710	CF	Closing force potentiometer defect
3411/3711	ME	Fault by motor or encoder
3412/3712	SS	Standstill fault, door is blocked
3413/3713	TH	Temperature of the electronic or motor too high
3414/3714	FE	Set during manual change of coupler movement parameter
3415/3715	ES	Fault by encoder, signals out of limits
3416/3716	PI	Position input (ABSPOS) Invalid
3418/3718	BE	Electrical error during rotor angle detection, no current is flowing (motor not connected)
3419/3719	BM	Mechanical error during rotor angle detection; door stalled wrong rotation direction; press <b>LEARN</b> .
3450/3750	--	Software timing error --- only IE is set
3451/3751	--	Wrong interrupt warning --- only IE is set
3452/3752	--	Stack size error --- only new software start-up
3453/3753	--	SCI send error --- only ICE
3454/3754	--	Software-watchdog failed --- only new software start-up
3455/3755	--	Flash cannot be read
3456/3756	--	Flash checksum wrong
3457/3757	--	Illegal state-machine state
3458/3758	--	EEPROM protection error
3459/3759	--	RAM protection error
3464/3764	--	Learn bits protection error
3465/3765	--	mfu.flag.dc_mode bit protection error
3466/3766	--	Learn bits protection error
3480/3780	--	Unknown reset source detected
3481/3781	--	Illegal address reset detected
3482/3782	--	Watchdog reset detected
3483/3783	--	Closing over-speed detected
3490/3790	--	Current offset measurement failed



## IMS Monitor Variables (requires IMS version 2.7.9 or later)

Variable	Definition	Application
BELTPS	Drive belt position from DCL - in inches in real time.	Door position in real time when the doors cannot be viewed.
CLSFORC	Closing Force potentiometer - results in pounds. This is the observed closing force limit based on the current torque limit potentiometer setting.	Check the door torque gauge when used in door closing torque adjustment.
CPLWID	Coupler (clutch) width - in inches when closed (hatch rollers picked for an Open cycle) as learned during the "hard learn" process.	Shows the distance when opening or closing that the belt travels in the DCL area without moving the door panels.
CYCNT	Hard count of door cycles made by the door operator since first power up, updates in real time when the doors reach fully closed.	Predictive maintenance planning.
DCBUS	Live readout of the board DC bus voltage (voltage supply used to generate the AC current in the motor).	Monitor in real time during cycling to see power supply stability or for certain door system faults.
DRDIST	The cumulative distance traveled by the door panels since first cycle/power up - in kilometers (kilometers x .62 = miles).	Predictive maintenance planning.
ENERGY	The cumulative energy used by the door operator since first cycle/power up - in kilowatt hours (kWhr).	Energy control.
IQMEAS	Real time door force feedback in pounds (converted from the Iq axis of motor stator current feedback). This is a dynamic variable when the door is in motion, and stabilizes when the door stalls or when a travel limit is reached.	Check the door torque gauge when used in door closing torque adjustment.
IQREF	Real time door force dictation in pounds (converted from the Iq axis of motor stator current dictation which results from speed loop error). This is a dynamic variable when the door is in motion, and stabilizes when the door stalls, when a travel limit is reached, or when the door speed is close to constant.	Judge door control performance or to note mechanical issues that may be interfering with smooth door motion.
MASS	Door system mass in pounds, as derived from averages of motor current over time (the door controller observed this door mass).	Judge mechanical installation conditions. If the door panel masses are physically known, this variable should be close to that figure. If the door system is free to move (if 15% higher or more), the door system is trying to overcome a mechanical restraint.
OPTIM	Cumulative door system ON time in hours (how long the system has been electrically powered).	Predictive maintenance planning.
POWER	Real time display of electrical power being consumed by the door system, in watts (746watts = 1HP).	Energy control.
SPDNUM	Real time display of the speed pattern currently in use as directed by the control system (SDP on serial TAC systems), or board DIP switches & inputs (discrete).	Verification of which speed pattern is used at any time/floor.
SVCTMP	Real time display of the motor's temperature as reported by the motor's thermocouple.	Energy control, predictive maintenance planning, fault diagnosis, control issue resolution.
SVIPERC	Percentage by which the motor current limit is reduced to allow the door to function despite danger of overheating (invoked when overheating thresholds are being approached).	Fault diagnosis, control issue resolution.
SVMTMP	Real time display of the motor encoder's temperature as reported by the encoder's thermocouple.	
VER	Software version of the Door Operator Control Board.	
VMEAS	Real time display of belt velocity feedback in inches per second (door speed feedback).	
VREF	Real time display of belt velocity dictation in inches per second (door speed dictation).	



## Troubleshooting Guide

Problem	Possible Causes or Solutions
The Door Does Not Move At All	<p>Blinking STATE LED = Fault; the fault codes can be read by either IMS or WPT.</p> <p>STATE LED            (# blinks) Fault Type</p> <p>(1) Motor or Encoder Fault            (3) Internal Board Fault            (4) Abnormal Operation            (5) Learn Error</p> <ol style="list-style-type: none"> <li>1. Check that the power is ON. The POWER LED must illuminate if X19 is connected and the circuit breaker in the elevator control panel is ON.</li> <li>2. Check WD LED. If continuous illuminate/blink, switch OFF/ON or replace the electronic unit.</li> <li>3. Verify that the motor and encoder wires (plug X4 and X10) are correctly connected and that the motor is not overheated.</li> <li>4. Verify that the control panel is sending an Open or Close Command.               <ul style="list-style-type: none"> <li>• Discrete interface system: I1-I2/X1, LED I1, I2</li> <li>• Serial system: see Serial Communication for Legacy Control Systems on page 77.</li> </ul> </li> <li>5. Verify that the friction is not too high when the door is manually moved. If the STATE LED flashes, use IMS or the WPT to read the faults; switch OFF/ON.</li> <li>6. Verify the DIP Switch settings.</li> </ol>
The Door Does Not Reopen	<ol style="list-style-type: none"> <li>1. When Automatic Reopen is selected (DIP switch S1/2 is ON), an Automatic Reopen process is executed by the IPD input (safety edge input) or by the Close Force Limiter.</li> <li>2. Check the following reopen devices:               <ul style="list-style-type: none"> <li>• Curtain of Light: not defected or dirty.</li> <li>• Close Force Limiter: friction is not too high.</li> </ul> </li> </ol>
Faults Cause Reset or Switch Off	<p>Blinking STATE LED = Fault; the fault codes can be read by either IMS or WPT.</p> <p>STATE LED            (# blinks) Fault Type</p> <p>(1) Motor or encoder short circuit - open wires and/or missing signals.            (3) Overcurrent, e.g., power stage or motor short circuit.            (3) Internal electronic fault.            (4) Door mechanically blocked.            (5) Mechanical end not found (<math>\geq 3.5m</math>).            OFF - Undervoltage; the supply voltage is measured and if too low, power stage switches OFF.</p>
Faults Decrease Door Performance	<p>Blinking STATE LED = Fault; the fault codes can be read by either IMS or WPT.</p> <p>STATE LED            (# blinks) Fault Type</p> <p>(4) Motor and/or power stage temperature too high, and the software reduces the motor power. If the temperature exceeds a higher limit, the power stage is shut down for cooling.            (5) Faulty reference switch.            OFF - Low voltage supply, low line voltage.</p>
<b>Discrete Only</b>	
The Door Does Not Open	<ol style="list-style-type: none"> <li>1. Verify that the Open Command LED I1 illuminates when an Open Command is present - I1/X1 connected to COM.</li> <li>2. Verify that the Close Command LED I2 does not illuminate - I2/X1 not connected to COM. A Close Command overrides an Open Command.</li> <li>3. Verify that the car and landing door locks are not jammed.</li> <li>4. Verify the DIP Switch settings.</li> </ol>
The Door Does Not Close	<ol style="list-style-type: none"> <li>1. Verify the Close Command LED I2 illuminates when the input I2/X1 is switched on COM.</li> <li>2. The close force may be too low, or friction may be too high. Turn the CLOSE FORCE Potentiometer slightly clockwise to increase closing force, but observe maximum-allowed force.</li> </ol>
The Door Partially Opens or Closes	<p>Verify that the Open and Close signal times (LEDs I1, I2) from the elevator controller are long enough. The door moves only as long as the Open/Close Command is set.</p>

## Door Operator Control Board DIP Switch Definitions

Sw. No.	ON	OFF
S1/1*	Test Drive Button Operation (Buttons active)	Normal Operation (Command Inputs Active)
	Performs the same function as the TEST/RUN switch located on top of the door operator.	
S1/2	Automatic Reopen on Obstruction or IPD (Reopen O3 is switched as long as Reopen is in progress)	No Automatic Reopen (Only Reopen O3 is switched)
S1/3	Electric Shoe Operation, Command Input Always I1 (Swing Door Mode) (*)	Normal Operation (Command Inputs Active)
S1/4	Reduced Motor Torque Used	Maximal Possible Motor Torque Used
S1/5	Speed Adjustment, Binary Coded (Only used on discrete interfaces)	
S1/6		
S1/7	Open Force Limitation Active	No Open Force Limitation
S1/8	Automatic End-Keeping	Hold Open/Closed Only on Active Open/Close Command

## Door Operator Control Board LEDs

LED	Application	Description - when illuminated
I1	Discrete Input Status	Discrete input I1 is active - Open command (connected to COM)
I2		Discrete input I2 is active - Close command (connected to COM)
I3		Discrete input I3 is active - Nudging command (connected to COM)
I4		Discrete input I4 is active - Inspection command (connected to COM)
I5		Discrete input I5 is active - Alt speed profile command (connected to COM)
IPD	Input - Passenger Detection	Light curtain signal is active - Doors are obstructed
O1	Discrete Output Status	Discrete output O1 is active - Door Open Limit - relay is ON and serial bit sent
O2		Discrete output O2 is active - Door Close Limit- relay is ON and serial bit sent
O3		Discrete output O3 is active - Reopening - relay is ON
O4		Discrete output O4 is active - SIX Inch Limit- relay is ON and serial bit sent
POWER	Board Power Supply	Board power supply is ON
WDOG	Microprocessor Function	Board microprocessor is not executing software - locked up
REFSW	Closed Limit Area	Car door is in the REFSW area - closed limit area, REFSW is active
Voltage Sel 120VAC	120VAC Supply Selected	120VAC power input is selected and active
STATE	—	OFF = Normal Operation
	—	Constant ON = Learn Mode and Start Up
	Error/Status See Troubleshooting Guide on page 75	Flashing: 1X = Motor or encoder fault 3X = Internal board fault 4X = Abnormal operation 5X = Learn error

# Serial Communication for Legacy Control Systems

## Serial Interface Board Setup

- See also:
- Serial Interface Board LED Definitions on page 78.
  - Serial Interface Board Troubleshooting Guide on page 78.
  - Serial Communications Troubleshooting Guide on page 79.

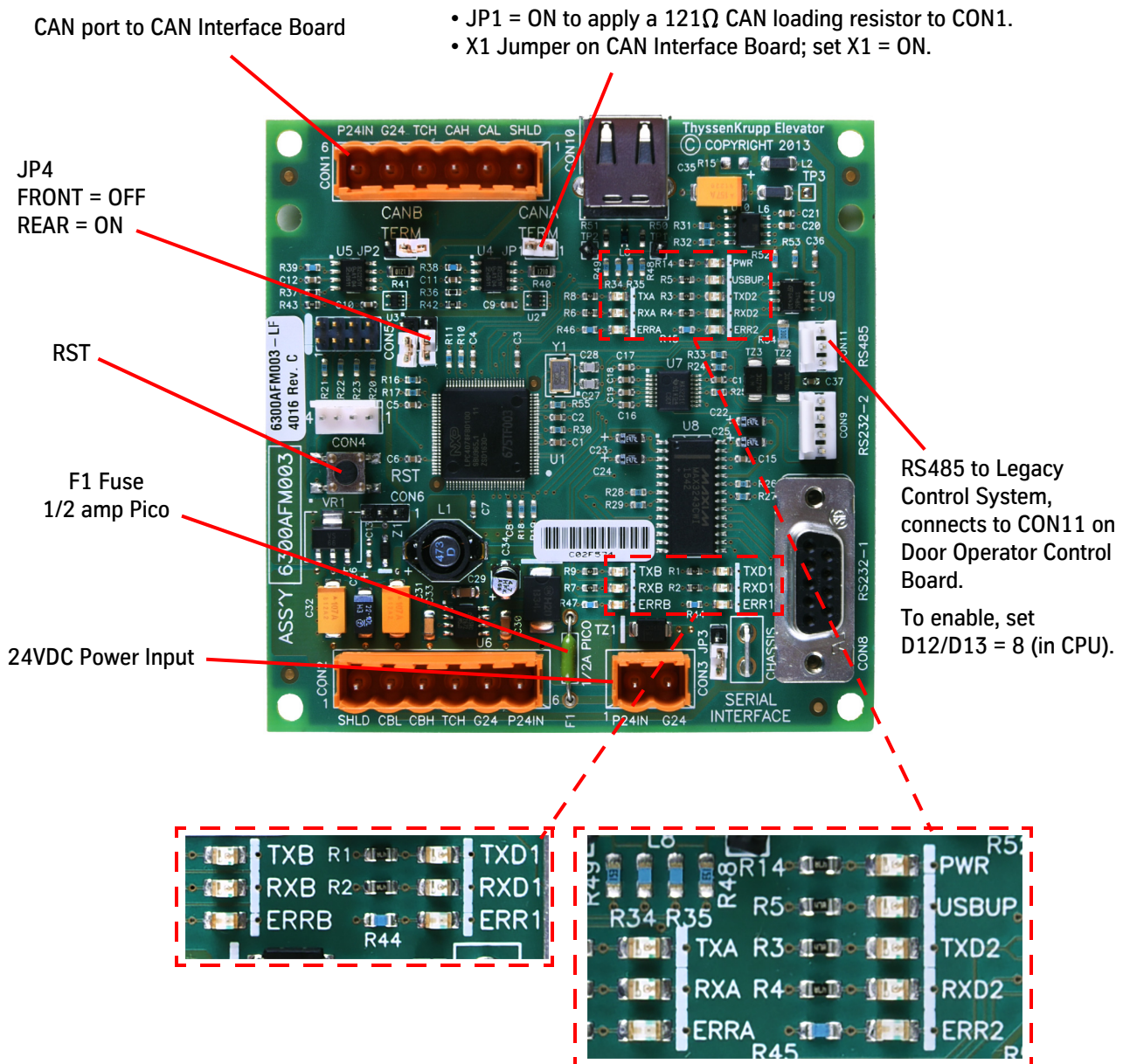


Figure 61 - Serial Interface Board (6300AFM)

## Serial Interface Board LED Definitions

LED	Color	Use	Status	Definition
PWR	Green	24VDC Power Input	ON	<ul style="list-style-type: none"> <li>+24VDC correct at CON3.</li> <li>F1 fuse is functional.</li> <li>All low voltage power supplies are functional.</li> </ul>
TXA	Green	CAN Packet Transmit	Blinking	CAN communications transmitted from CON1 to CAN Interface Board.
RXA	Green	CAN Packet Receipt	Blinking	CAN communications received at CON1 from CAN Interface Board.
ERRA	Red	CAN Packet Errors	Blinking or ON	Serial Interface Board detecting CAN packet errors.
TXD2	Green	RS485 Packet Transmit	Blinking	RS485 communications transmit from CON11 to VTX control system CPU.
RXD2	Green	RS485 Packet Receipt	Blinking	RS485 communication received at CON11 from VTX control system CPU.
ERR2	Red	RS485 Packet Errors	Blinking or ON	Serial Interface Board detecting RS485 packet errors.

## Serial Interface Board Troubleshooting Guide

Problem	Possible Causes or Solutions
RX_ or TX_ LEDs are not blinking.	<ol style="list-style-type: none"> <li>Press RST on the Serial Interface Board, and all LEDs illuminate for 1 second - LEDs are good and the microprocessor board is functional. If not, verify the following:               <ol style="list-style-type: none"> <li>+24VDC power input problems.</li> <li>F1 Fuse (1/2 amp Pico).</li> <li>Board replacement.</li> </ol> </li> </ol> <p>The RX_LEDs will not blink if communication is not established, or if wiring is not correct. The TX_LEDs may blink at first, even with faulty wiring, as the board attempts to establish communication.</p>
Serial Interface Board stops trying to communicate on one of the channels (CAN or RS485) because the other channel cannot be established.	<ul style="list-style-type: none"> <li>If the CAN bus to the door operator does not function for 10 seconds or longer, the board will stop trying to communicate to the VTX CPU on the RS485 channel to signal to the VTX CPU that door communications are offline, and the TXD2 LED will stop blinking.</li> <li>If the RS485 bus to VTX CPU does not function for 10 seconds or longer, the board will stop trying to communicate to the LD-16 door board on the CAN channel to signal to the LD-16 door board that door communication to the controller CPU is offline, and the TXA LED will stop blinking.</li> </ul> <p>Verify the following:</p> <ul style="list-style-type: none"> <li>LEDs per the Serial Interface Board - LED Definitions (see above).</li> <li>Both TX_LEDs are blinking.</li> <li>No ERR_LEDs are blinking or ON.</li> </ul> <p>TIP: Use the IMS Smart FAST to query the LD-16 door board for the RS485 and CAN channels. If the IMS Smart FAST fills in the adjustment menu with values, communication is established. The IMS Door I/O &amp; Faults Screen (in Door Diagnostics) will show ONLINE status = ON.</p>



## Serial Communications Troubleshooting Guide

Door Communications Faults in the Host CPU/CPUa, or Door Serial Communications Not Working Correctly	
Verify the following applicable items.	
CAN Systems	Jumper X1 on the CAN Interface Board is not installed. (inserts a termination resistor – not used in this mode).
	Door Adjustments D12 and D13 = 7.
	462AEN/462AEM harness connections between the CWI <sub>x</sub> (in the COP) and the CAN Interface Board are correct.
	Wires are properly inserted in OPERF plug and OPERR plug.
TAC32 CAN Systems	Car CAN channel is fully functional; the DCN Command shows the CWI <sub>x</sub> _node online.
RS485 Systems	462AEM harness connections between CWI <sub>x</sub> (in the COP) and Serial Interface Board are correct.
	462AEN harness connections between CAN Interface Board and Serial Interface Board correct.
	Wires are properly inserted in the OPERF plug and the OPERR plug.
RS485 Systems with Serial Interface Board in the COP	Door Adjustments D12 and D13 = 8.
	Jumper X1 on the CAN Interface Board = ON. JP1 on the Serial Interface Board (in the COP) = ON.
	Door communication travel cable wires are not damaged and correctly connected at both ends.
CAN Interface Board	DIP Switch S1-2 = OFF (for 50K baud).
Door Operator Control Board	RS485 Systems JP4 on Serial Interface Board. Front = OFF Rear = ON
	CAN Interface Board DIP Switch S1-1. Front = OFF Rear = ON



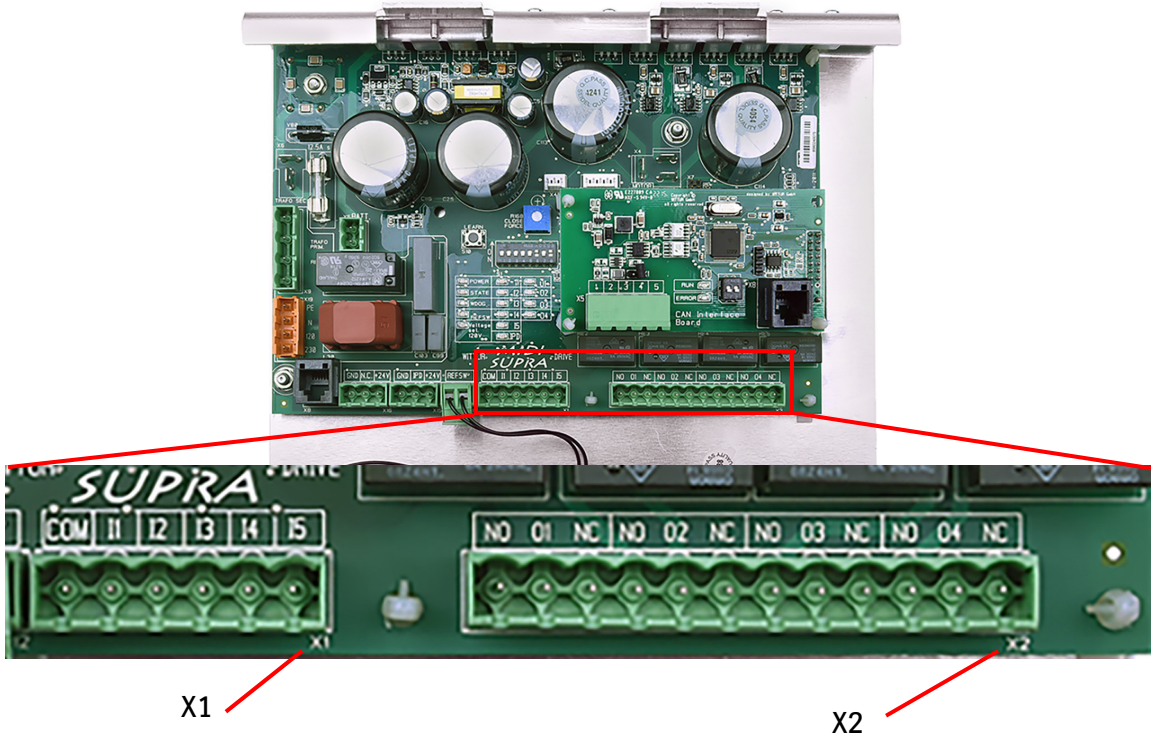
# Discrete Controller Interface for non-TAC Systems

## Discrete Controller Interface Setup

- See also:
- I/O Signal Definitions on page 81.
  - I/O Wiring Diagram on page 82.



If a CAN board is present, remove it to use the discrete interface ports.



- INPUTS enter the board here.
- Do not wire any controller power supply to any pin.
- Circuits designed for low current.
- Suggested relays = <100mA.

COM = Common  
 I1 = OPEN  
 I2 = CLOSE  
 I3 = NUDGING  
 I4 = INSPECTION  
 I5 = ALT SPEED

- OUTPUTS exit the board here.
- Relay output contacts are rated at 5A, 30VDC or 5A, 250VAC.

NO = Normally Open  
 O1 = Door Open Limit  
 NC = Normally Closed  
 O2 = Door Close Limit  
 O3 = Reopening  
 O4 = SIX

Figure 62 - Discrete Controller Interface

## Discrete Controller Interface

(continued)

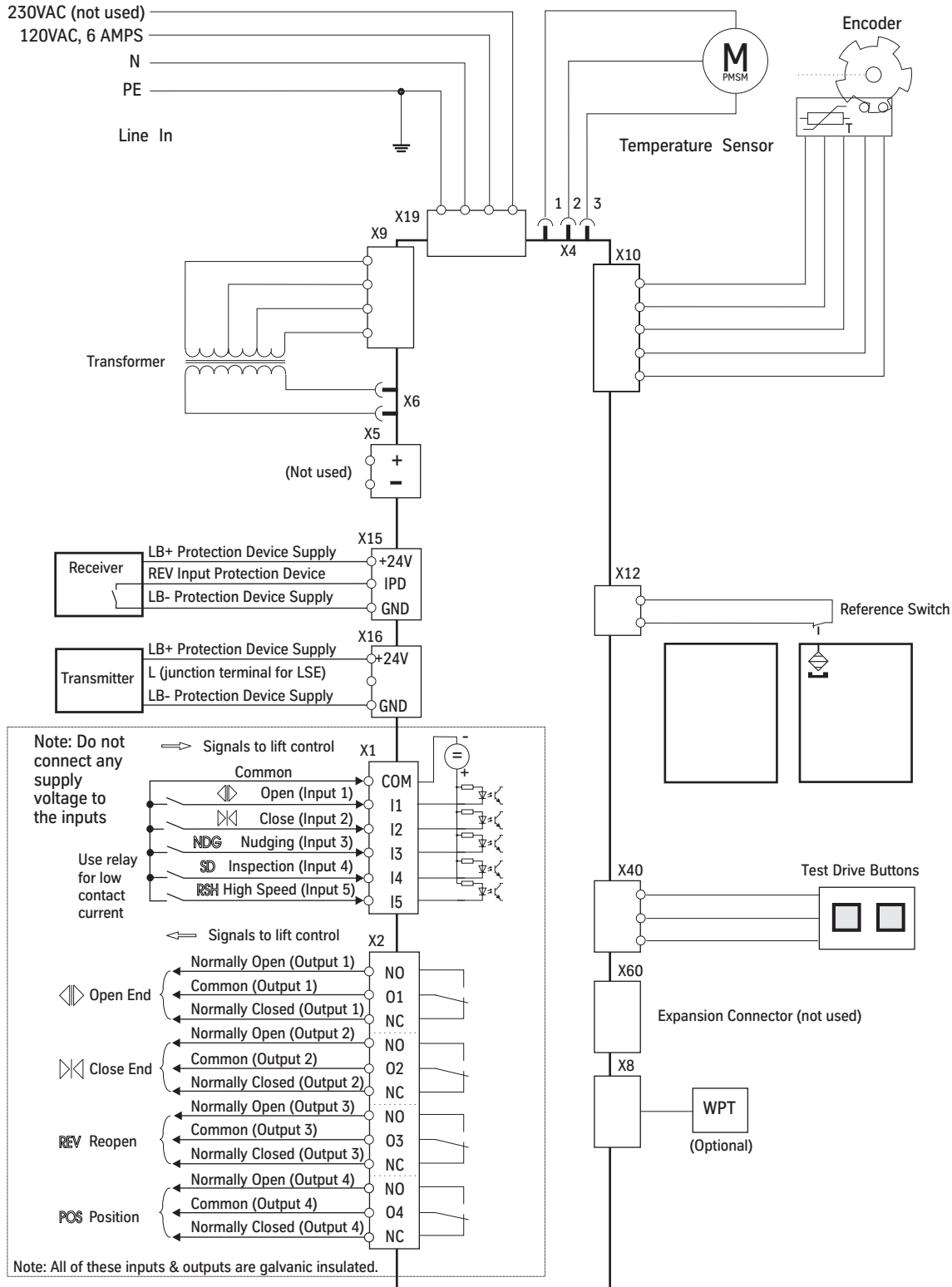
### I/O Signal Definitions

LED	Name	Definition
<b>INPUTS</b>		
11	OPEN Command	Drives the door in the open direction until the open position is reached. Input must be maintained all the way to the mechanical open stop. Automatic End-Keeping - DIP Switch 8 = ON, the door card and motor torque keeps doors open without this command being active; use if the control system does not maintain the Open Command input when DOL is reached.
12	CLOSE Command	Drives the door in the closed direction until the closed position is reached. Input must be maintained all the way to the mechanical close stop. Automatic End-Keeping - DIP Switch 8 = ON, the door card and motor torque keeps doors closed without this command being active; use if the control system does not maintain the Close Command input when DOL is reached.
13	NUDGING Command	Activates the nudging door slow speed for the Close cycle. Input must be maintained all the way to the mechanical close stop. Smoke-sensitive devices (photo cell/light curtain--IPD input) & closing force reopen ignored.
14	INSPECTION Command	Deactivates all inputs at the X1 plug and activates the door operator test drive buttons (same function as DIP Switch 1). The X2 outputs still functional when input is active.
15	ALT SPEED Command	Selects a higher Open or Close speed profile when active and used with an Open or Close Command input (same function as DIP Switch 6). DIP Switches 5 & 6 = OFF, speed pattern 1 in effect input will select pattern 3. DIP Switch 5 = ON & 6 = OFF, speed pattern 2 in effect input will select pattern 4. DIP Switch 6 = ON, no change.
<b>OUTPUTS</b>		
01	Door Open Limit	Activates when the car door panels reach the fully open position and stays active until the panels move off of this position.
02	Door Closed Limit	Activates when the car door panels reach the fully closed position and stays active until the panels move off of this position.
03	Reopening	Activates whenever an Automatic Reopen is performed or when a Reopen request is coming into the door card from the light curtain or closing force limiter. Typically, the light curtain is connected to the door's X15/X16 plugs and DIP Switch 2 = ON (allows the door card to perform Automatic Reopen upon obstruction or IPD input).
04	SIX	Activates when the car door panels reach a preset position in their travel, typically 6" from the closed point. If the door panels are between the closed limit and this adjustable point, this output will be active. Adjust this position point with either of the following methods: <ul style="list-style-type: none"> <li>• IMS = SIX Parameter (serial control systems)</li> <li>• WPT = Position Out Adjustment.</li> </ul>

# Discrete Controller Interface

(continued)

## I/O Wiring Diagram





# Calculate Minimum Door Closing Times

1. Use Table 4 on page 84 through Table 7 on page 87 to determine the weight of the car doors and the weight of the hoistway doors.
2. Add the weight of the car doors and the weight of the hoistway doors, and enter this number as the typical door weight on the Total Door System Weight (580AWP001) label. See Figure 63.
  - a. If hoistway doors are heavier at one or more floors, determine the weight of these doors.
  - b. Add the weight of the car doors to the weight of the heavier hoistway doors, and enter the heavy door weight on the Total Door System Weight (580AWP001) label.

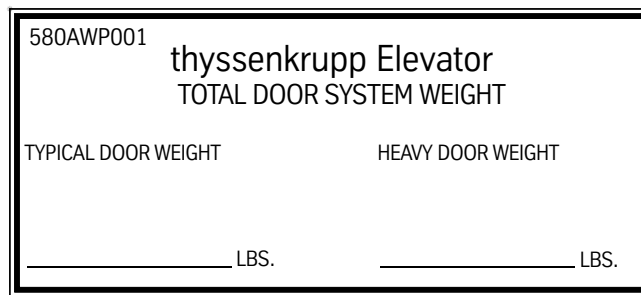


Figure 63 - Total Door System Weight (580AWP001) Label

3. Install the Total Door System Weight (580AWP001) label next to the Minimum Door Closing Times Chart. See Figure 64.

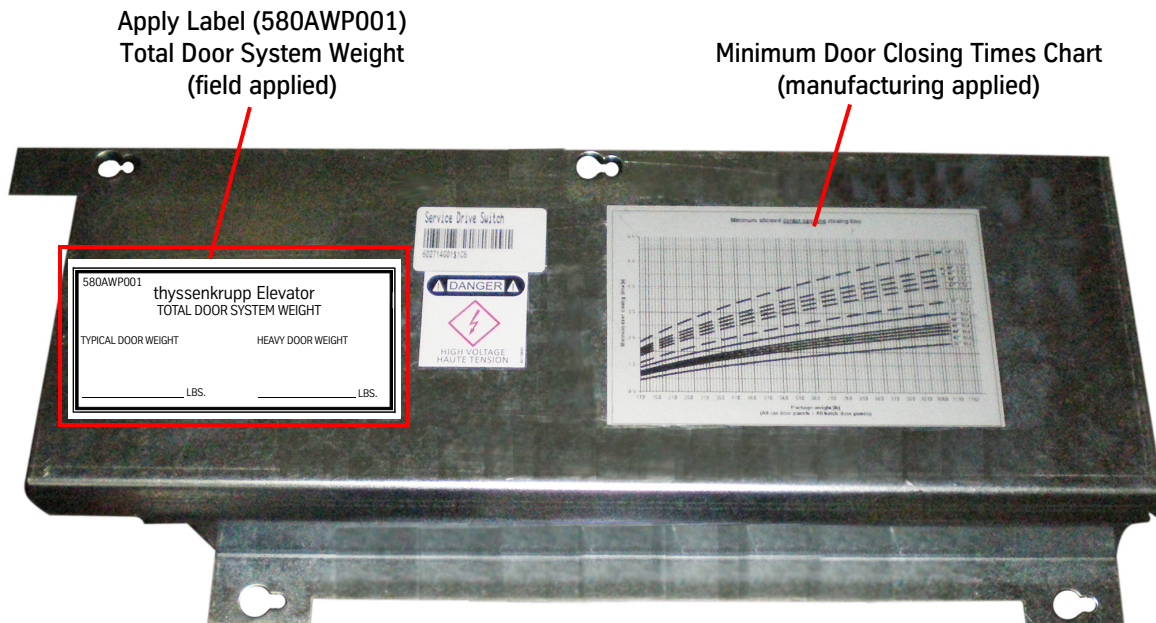


Figure 64 - Door System Labels

### Calculate Minimum Door Closing Times

(continued)



- Door weights include allowance for door hangers, clutch, crank, etc.
- The IMS Monitor variable, MASS, can be used to determine the total door weight for the label.

CAR OR HOISTWAY DOOR WEIGHT  
**SINGLE SPEED SIDE OPENING**      Weight Density, M721 = 7.600

DOOR OPENING HEIGHT	120	208	221	234	247	260	273	285	298	311
	118	205	218	230	243	255	268	281	293	306
	116	202	214	226	239	251	264	276	288	301
	114	198	210	222	235	247	259	271	283	296
	112	195	207	219	231	243	255	267	279	291
	110	191	203	215	227	238	250	262	274	285
	108	188	199	211	222	234	246	257	269	280
	106	184	196	207	218	230	241	252	264	275
	104	181	192	203	214	226	237	248	259	270
	102	178	188	199	210	221	232	243	254	265
	100	174	185	196	206	217	228	238	249	260
	98	171	181	192	202	213	223	234	244	255
	96	167	178	188	198	208	219	229	239	250
	94	164	174	184	194	204	214	224	234	244
	92	160	170	180	190	200	210	220	229	239
	90	157	167	176	186	196	205	215	225	234
	88	154	163	172	182	191	201	210	220	229
	86	150	159	169	178	187	196	206	215	224
	<b>84</b>	147	156	<b>165</b>	174	183	<b>192</b>	201	210	<b>219</b>
	82	143	152	161	170	178	187	196	205	214
	80	140	148	157	166	174	183	191	200	209
		32	34	<b>36</b>	38	40	<b>42</b>	44	46	<b>48</b>
		DOOR OPENING WIDTH								

Table 4 - Single-Speed Side-Opening Door Weights

### Calculate Minimum Door Closing Times

(continued)



- Door weights include allowance for door hangers, clutch, crank, etc.
- The IMS Monitor variable, MASS, can be used to determine the total door weight for the label.

CAR OR HOISTWAY DOOR WEIGHT

**CENTER OPENING**

WEIGHT DENSITY, M721 = 8.500

DOOR OPENING HEIGHT	120	233	247	262	276	290	305	319	333	348	362	377	391	405	420	434
	118	229	243	257	272	286	300	314	328	342	356	370	384	399	413	427
	116	225	239	253	267	281	295	309	323	336	350	364	378	392	406	420
	114	222	235	249	262	276	290	303	317	331	344	358	372	385	399	412
	112	218	231	245	258	271	285	298	312	325	338	352	365	379	392	405
	110	214	227	240	253	267	280	293	306	319	332	346	359	372	385	398
	108	210	223	236	249	262	275	288	301	313	326	339	352	365	378	391
	106	206	219	232	244	257	270	282	295	308	320	333	346	359	371	384
	104	202	215	227	240	252	265	277	290	302	314	327	339	352	364	377
	102	199	211	223	235	247	260	272	284	296	309	321	333	345	357	370
	100	195	207	219	231	243	255	267	279	291	303	315	327	339	350	362
	98	191	203	214	226	238	250	261	273	285	297	308	320	332	344	355
	96	187	199	210	222	233	245	256	268	279	291	302	314	325	337	348
	94	183	194	206	217	228	240	251	262	273	285	296	307	318	330	341
	92	179	190	201	212	224	235	246	257	268	279	290	301	312	323	334
	90	176	186	197	208	219	230	240	251	262	273	284	294	305	316	327
88	172	182	193	203	214	225	235	246	256	267	277	288	298	309	320	
86	168	178	189	199	209	220	230	240	250	261	271	281	292	302	312	
<b>84</b>	164	174	184	194	204	<b>214</b>	225	235	<b>245</b>	255	265	275	285	295	305	
82	160	170	180	190	200	209	219	229	239	249	259	269	278	288	298	
80	156	166	176	185	195	204	214	224	233	243	253	262	272	281	291	
		32	34	36	38	40	<b>42</b>	44	46	<b>48</b>	50	52	54	56	58	60

Table 5 - Center-Opening Door Weights

Calculate Minimum Door Closing Times

(continued)



- Door weights include allowance for door hangers, clutch, crank, etc.
- The IMS Monitor variable, MASS, can be used to determine the total door weight for the label.

CAR OR HOISTWAY DOOR WEIGHT  
TWO SPEED SIDE OPENING

Weight Density, M721 = 7.900

120	243	257	270	283	297	310	323	337	350	363	377	390	403	417	430	443	457	470	483
118	239	252	266	279	292	305	318	331	344	357	370	384	397	410	423	436	449	462	475
116	235	248	261	274	287	300	313	326	338	351	364	377	390	403	416	429	442	454	467
114	231	244	257	269	282	295	307	320	333	345	358	371	383	396	409	421	434	447	459
112	227	240	252	265	277	290	302	314	327	339	352	364	377	389	402	414	427	439	451
110	223	236	248	260	272	284	297	309	321	333	346	358	370	382	395	407	419	431	443
108	219	231	243	255	267	279	291	303	315	327	339	351	363	375	387	399	411	424	436
106	215	227	239	251	262	274	286	298	310	321	333	345	357	369	380	392	404	416	428
104	211	223	234	246	258	269	281	292	304	315	327	339	350	362	373	385	396	408	420
102	207	219	230	241	253	264	275	287	298	309	321	332	344	355	366	378	389	400	412
100	203	214	226	237	248	259	270	281	292	303	315	326	337	348	359	370	381	393	404
98	199	210	221	232	243	254	265	276	287	297	308	319	330	341	352	363	374	385	396
96	195	206	217	227	238	249	259	270	281	292	302	313	324	334	345	356	366	377	388
94	191	202	212	223	233	244	254	265	275	286	296	306	317	327	338	348	359	369	380
92	187	197	208	218	228	239	249	259	269	280	290	300	310	321	331	341	351	362	372
90	183	193	203	213	223	233	243	253	264	274	284	294	304	314	324	334	344	354	364
88	179	189	199	209	218	228	238	248	258	268	277	287	297	307	317	327	336	346	356
86	175	185	194	204	214	223	233	242	252	262	271	281	290	300	310	319	329	338	348
<b>84</b>	171	181	190	199	209	218	<b>227</b>	237	246	<b>256</b>	265	274	284	293	303	312	321	331	340
82	167	176	186	195	204	213	222	231	240	250	259	268	277	286	295	305	314	323	332
80	163	172	181	190	199	208	217	226	235	244	253	262	271	279	288	297	306	315	324
	36	38	40	42	44	46	<b>48</b>	50	52	<b>54</b>	56	58	60	62	64	66	68	70	72

DOOR OPENING WIDTH

↑  
DOOR OPENING HEIGHT

Table 6 - Two-Speed Side-Opening Door Weights

### Calculate Minimum Door Closing Times

(continued)



- Door weights include allowance for door hangers, clutch, crank, etc.
- The IMS Monitor variable, MASS, can be used to determine the total door weight for the label.

CAR OR HOISTWAY DOOR WEIGHT

Weight Density, M721 = 7.900

#### TWO SPEED CENTER OPENING

120	403	417	430	443	457	470	483	497	510	523	537	550	563	577	590	603	617	630	643
118	397	410	423	436	449	462	475	488	502	515	528	541	554	567	580	593	606	620	633
116	390	403	416	429	442	454	467	480	493	506	519	532	545	558	570	583	596	609	622
114	383	396	409	421	434	447	459	472	485	497	510	523	535	548	561	573	586	599	611
112	377	389	402	414	427	439	451	464	476	489	501	514	526	539	551	564	576	588	601
110	370	382	395	407	419	431	443	456	468	480	492	505	517	529	541	554	566	578	590
108	363	375	387	399	411	424	436	448	460	472	484	496	508	520	532	544	556	568	580
106	357	369	380	392	404	416	428	439	451	463	475	487	498	510	522	534	546	557	569
104	350	362	373	385	396	408	420	431	443	454	466	477	489	501	512	524	535	547	559
102	344	355	366	378	389	400	412	423	434	446	457	468	480	491	503	514	525	537	548
100	337	348	359	370	381	393	404	415	426	437	448	459	471	482	493	504	515	526	537
98	330	341	352	363	374	385	396	407	418	429	439	450	461	472	483	494	505	516	527
96	324	334	345	356	366	377	388	398	409	420	431	441	452	463	473	484	495	505	516
94	317	327	338	348	359	369	380	390	401	411	422	432	443	453	464	474	485	495	506
92	310	321	331	341	351	362	372	382	392	403	413	423	433	444	454	464	474	485	495
90	304	314	324	334	344	354	364	374	384	394	404	414	424	434	444	454	464	474	484
88	297	307	317	327	336	346	356	366	376	385	395	405	415	425	435	444	454	464	474
86	290	300	310	319	329	338	348	358	367	377	386	396	406	415	425	434	444	454	463
84	284	293	303	312	321	331	340	349	359	368	378	387	396	406	415	425	434	443	453
82	277	286	295	305	314	323	332	341	350	360	369	378	387	396	405	415	424	433	442
80	271	279	288	297	306	315	324	333	342	351	360	369	378	387	396	405	414	423	431
	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96

↑  
DOOR  
OPENING  
HEIGHT

DOOR OPENING WIDTH

Table 7 - Two-Speed Center-Opening Door Weights

# Maintenance

## Replace the Door Operator Control Board



Replacement Door Operator Control Boards are mounted in an aluminum box; the reference sensor is included.

1. Remove the car from service, and then remove the door operator power.
2. Remove all door board plugs.
3. Remove 3 Allen bolts from the top of the door board box, and then slide the aluminum box down and out of the door operator.
4. Set the new door board DIP switches and jumpers to match the replaced unit.
5. Attach the new door board box onto the door operator hanger, and then install the 3 Allen bolts at the top to attach the unit to the door operator—do not omit any spacers that may be present.
6. Verify the location and the alignment of the reference switch. The reference switch (located on the door box) must align with the clutch actuator magnet.

Correct alignment: When the door panels are fully closed and on the rubber stop buffer, the ends of the door panel line up vertically with no more than  $\frac{1}{8}$ " vertical separation. See Figure 65.

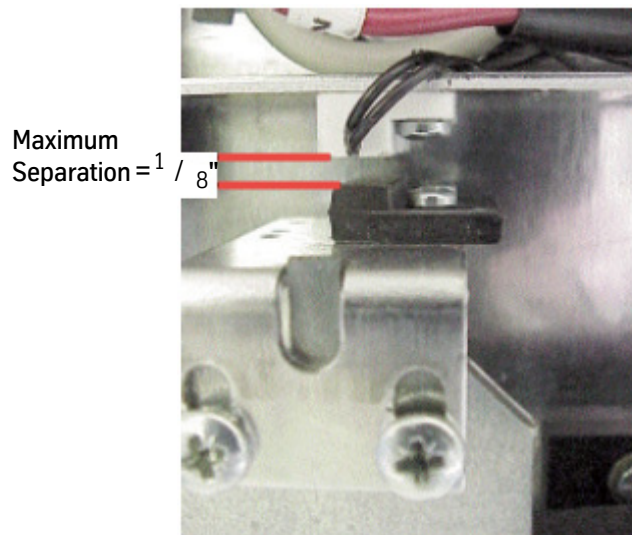


Figure 65 - Correct Alignment of Reference Switch

7. Verify the following:
  - a. The doors are fully closed on their rubber buffer stop.
  - b. The control system is on Inspection Service.

## Replace the Door Operator Control Board

(continued)

8. Power up the door board, and verify the POWER, WDOG, and REPSW LEDs illuminate.
9. Perform a new door scan. See Learn Door Travel on page 67.
10. Verify door speeds and door operation.
  - a. Operate the doors either on Automatic Operation, or use the test buttons on top of the door operator.
  - b. Adjust the speed or operation (as needed). See Speed Pattern Adjustment via IMS - Legacy TAC Systems Only on page 69.
11. Adjust the kinetic and closing force of the new door board. See Closing Force Adjustment - 30 lbs. Maximum on page 72.
12. Return the car to service.

## Replace the Drive Belt

1. Remove the drive belt screws. See Figure 66.
2. Release the old belt from the bracket.
3. Shorten the new belt to match the length of the old belt.
4. Install the new belt. Loosen the screws of the diverting pulley, and use a screwdriver to tighten the belt.

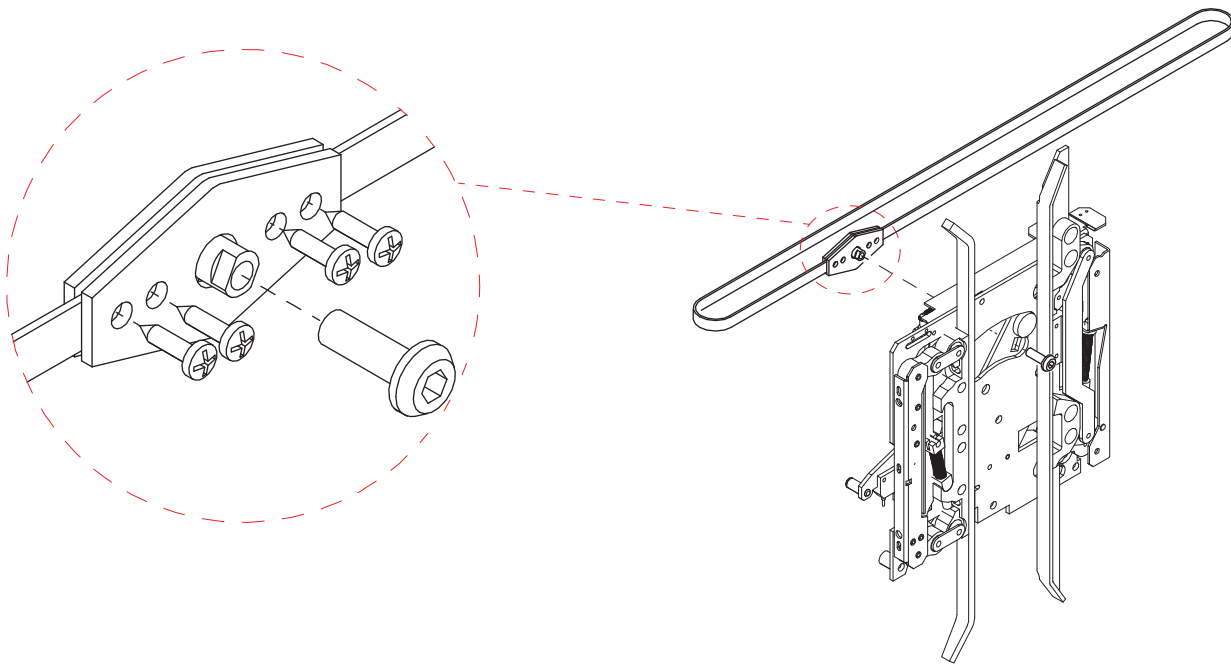


Figure 66 - Replace the Drive Belt

# Replacement Parts

ITEM	PART NO.	DESCRIPTION
1	9732100	Hanger Roller, D94 x 19 mm with Bushing
2	9732202	Counter Roller, D30 x 9 mm with Shaft
3	9732305	Buffer Cup
4	9731714	Buffer
5	9731313	Door Contact
6	9731416	Door Contact Bridge
7	9731910	Synchronization Rope, L= 5010
8	9732019	Synchronization Rope, L=1750 mm
9	9732317	Coupler Contact Bridge
10	9732718	Rope Diverting Pulley, Left
11	9733012	Rope Diverting Pulley, Right
12	9747977	Rubber Puffer
13	9732240	Fixing Screw (for clutch), M8 x 20 mm
14	9733310	Belt, L=3000 mm, SS <=42"; SS-C/O, <=48"
15	9731325	Belt, L=3900 mm, All Others >46"
16	9731428	Belt Diverting Pulley
17	9731726	Belt Diverting Pulley, Left
18	9731829	Door Drive Control Box - Standard
19	9731921	Door Drive Control Box with CAN Interface
20	9732123	Motor Unit Midi, C/O, LH
21	9732226	Motor Unit Midi, C/O, RH
22	9732329	Motor Unit Supra, C/O, LH
23	9733127	Motor Unit Supra, C/O, RH
24	9733220	Motor Unit, Double Coupler Main, LH
25	9731349	Transformer (Universal Trafo)
26	9731337	Magnet Switch, L=220 mm
27	9731430	Magnet
28	9731933	Belt Fixing Clamp
29	9732238	Belt Fixing Clamp, Main Belt
30	9732330	Belt Fixing Clamp, Second Belt
31	9733139	Service Switch, Electrical Box
32	9736918	Wittur Programming Tool (WPT), see next page.



## Replacement Parts

(continued)

### Wittur Programming Tool (WPT)

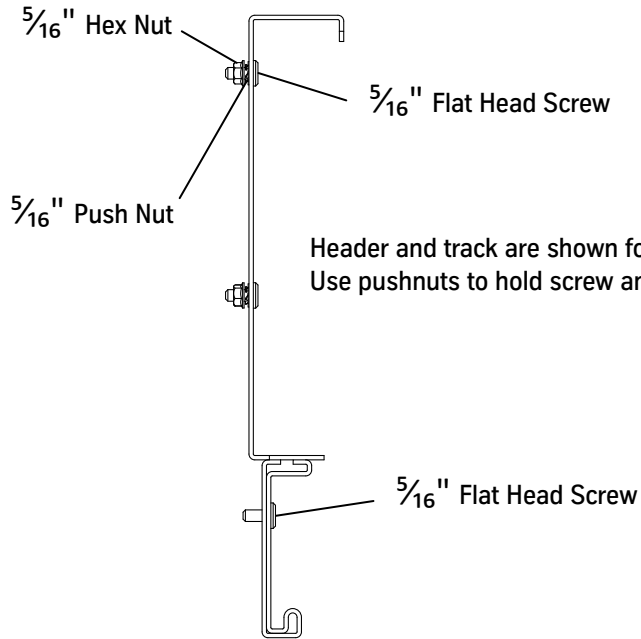
Part No. 9736918



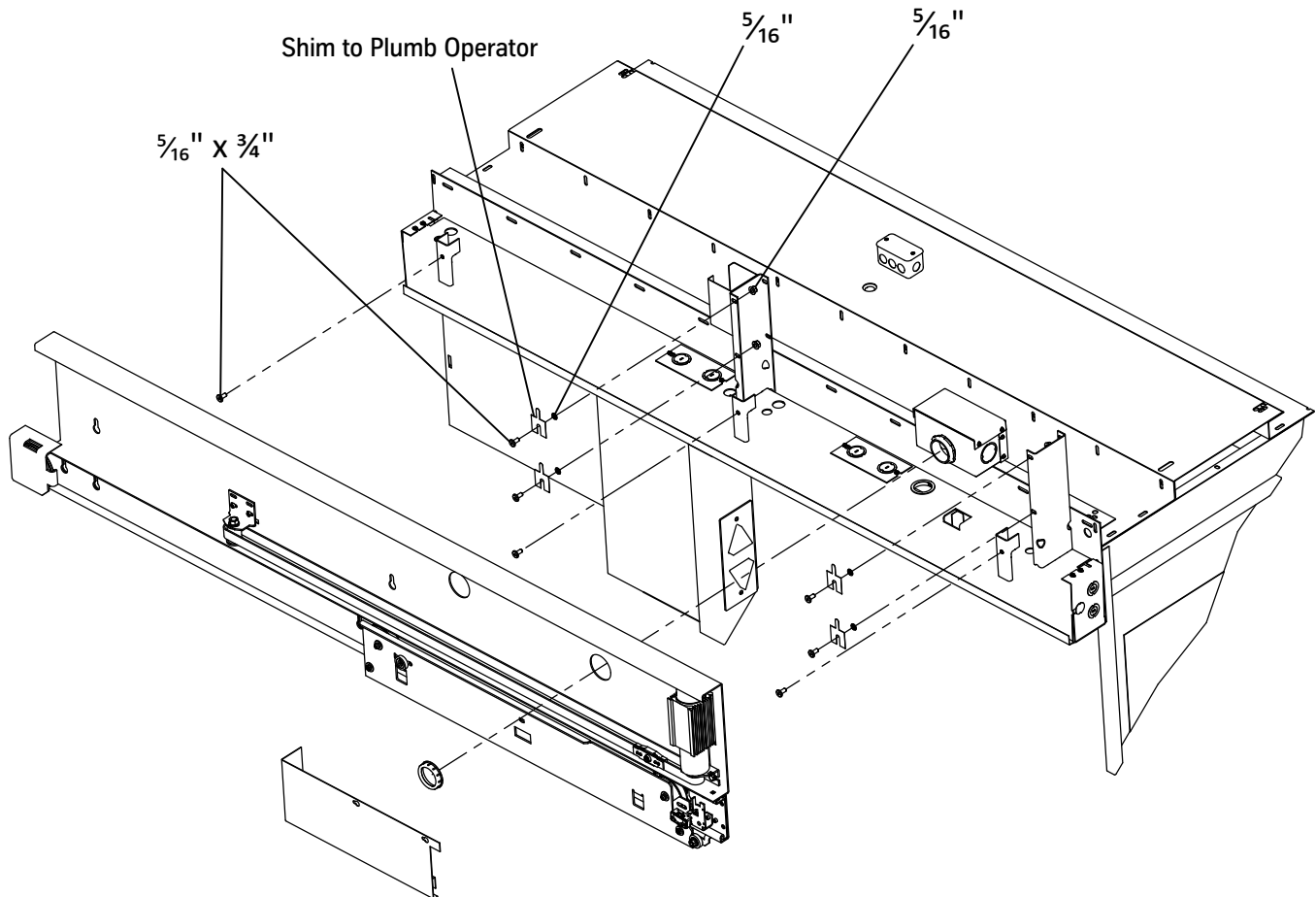
## Replacement Parts

(continued)

### Door Operator Bolt Kit (200CHN001)



Header and track are shown for installation detail only.  
Use pushnuts to hold screw and nut in position to set operator in place.



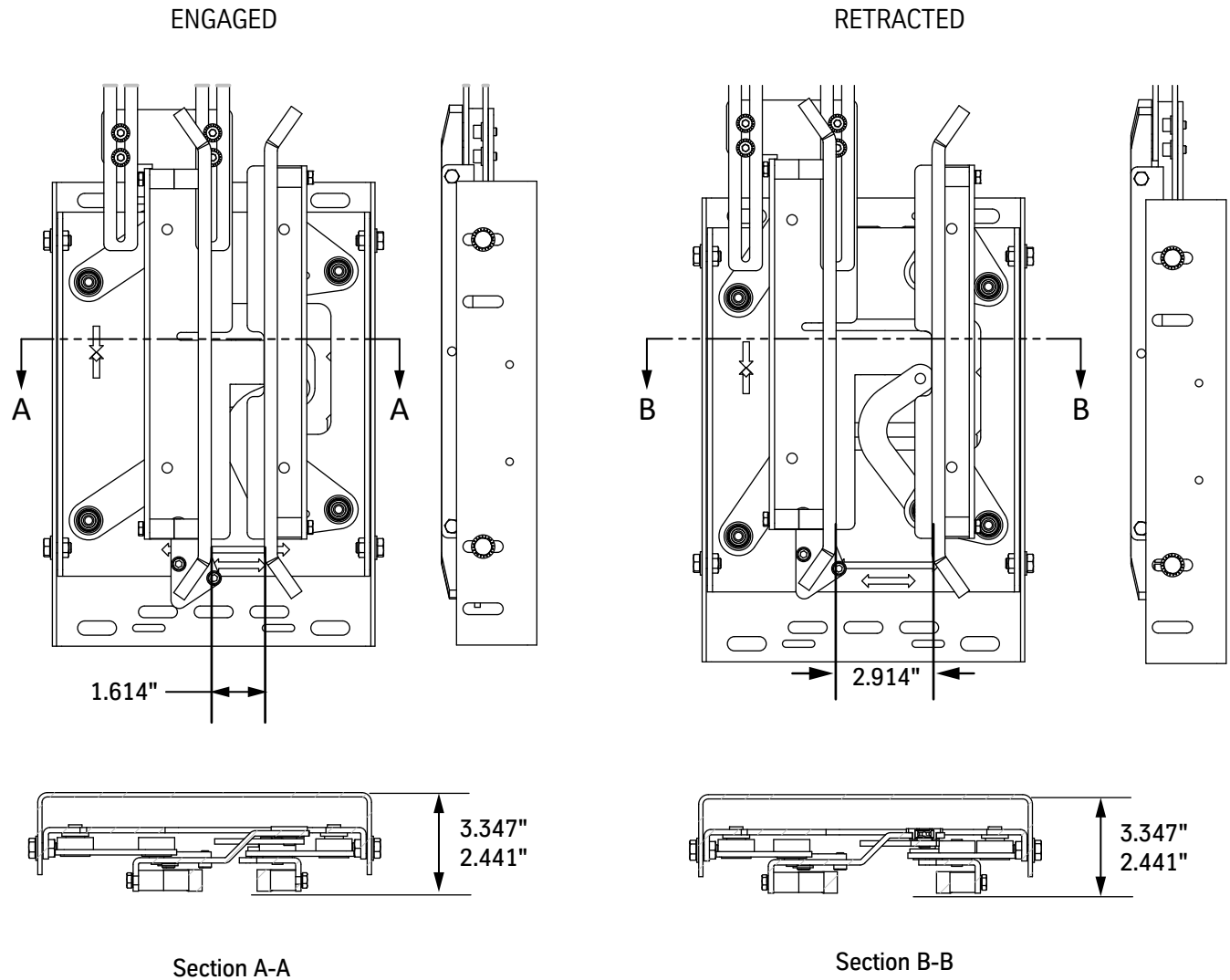


# APPENDIX

# Clutch Assemblies

## Dover/tkE Interlock Rollers (364AG\_)

See also: Clutch Operating Space on page A-8



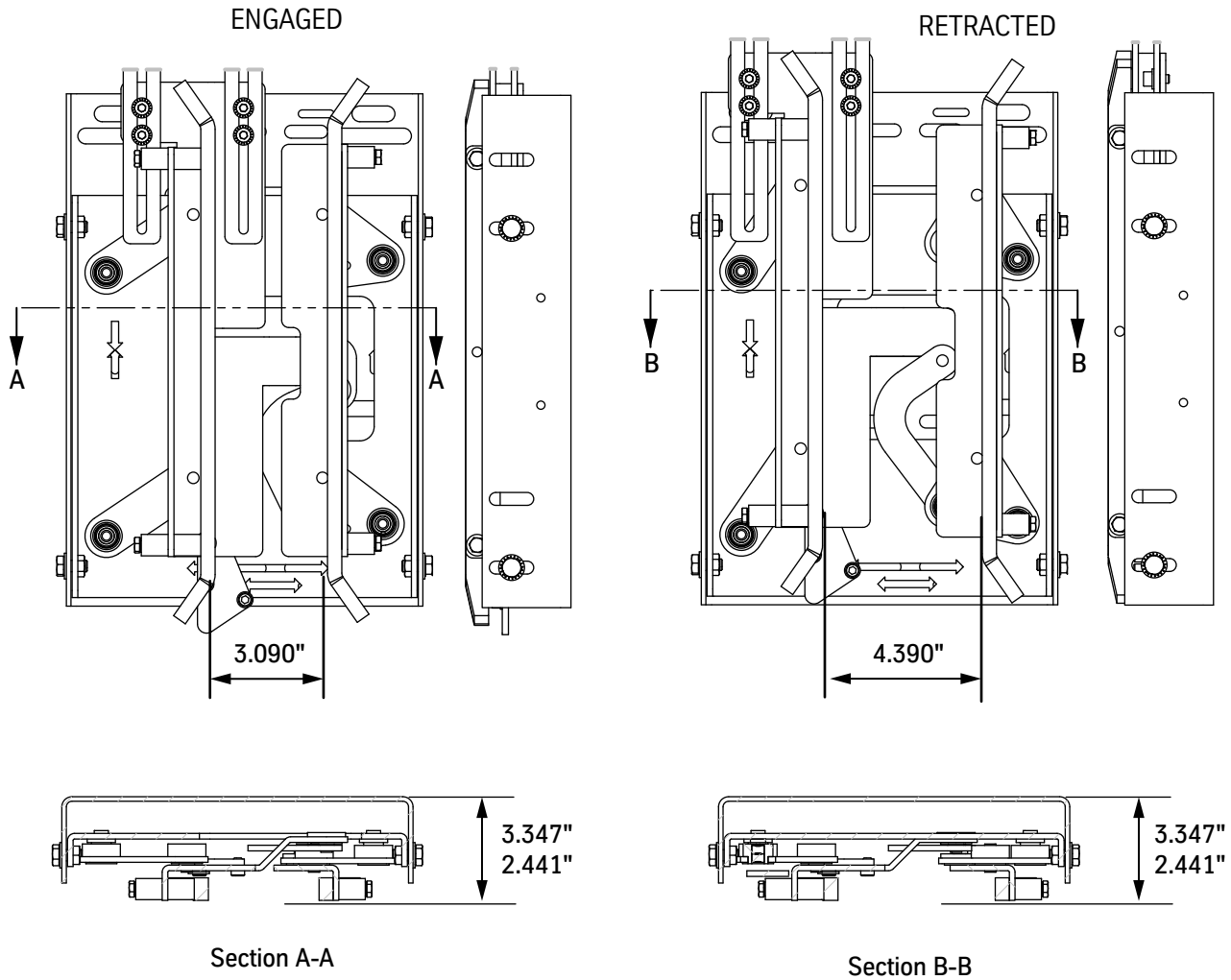
- Clutches shown with spacers are configured for Dover/tkE Interlock Rollers.
- tkE LH shown, RH opposite.

Clutch Assemblies

(continued)

GAL Interlock Rollers (364AG\_)

See also: Clutch Operating Space on page A-8



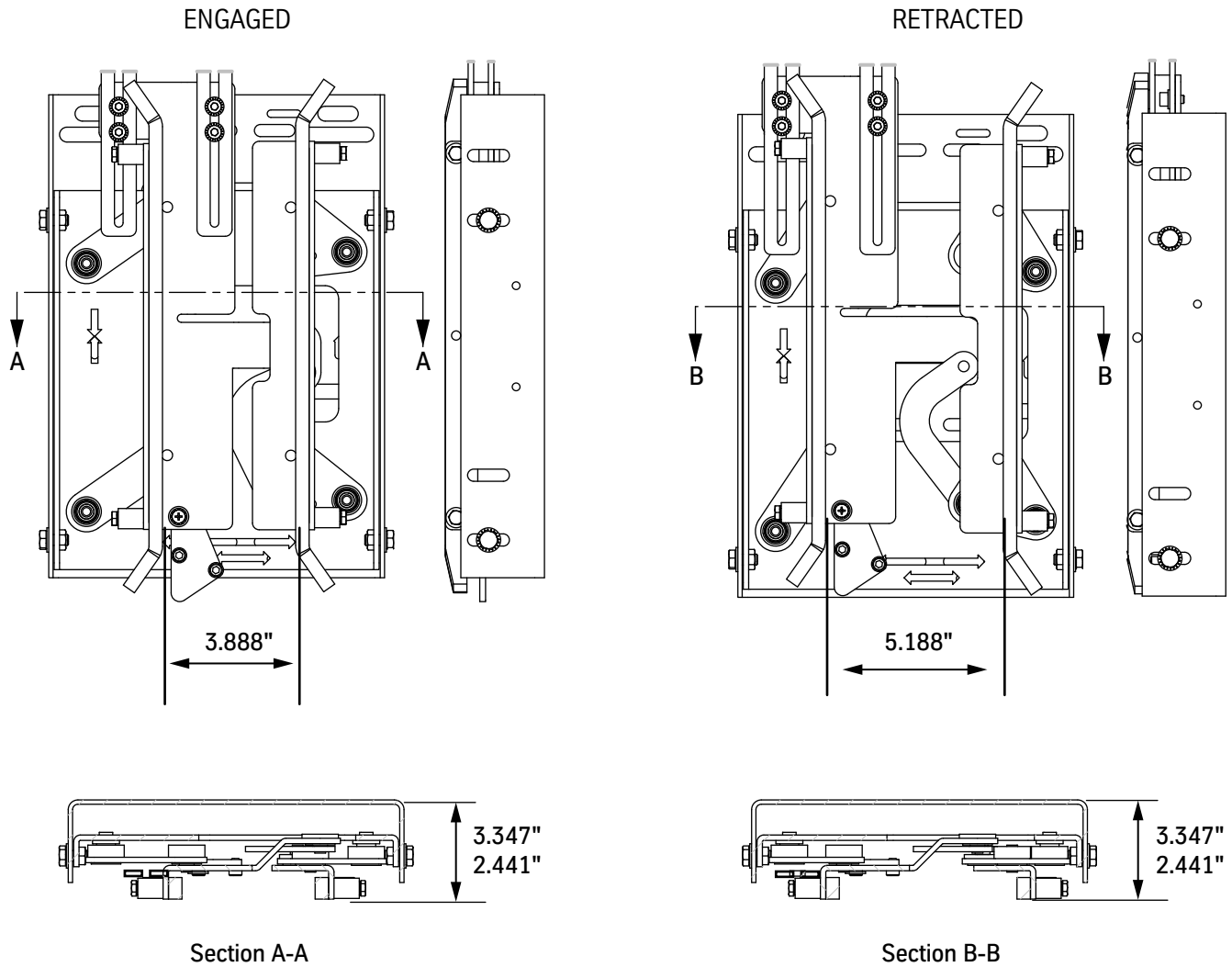
- Clutches shown with spacers are configured for GAL Interlock Rollers.
- tkE LH shown, RH opposite.

### Clutch Assemblies

(continued)

### MAC Interlock Rollers (364AG\_)

See also: Clutch Operating Space on page A-8

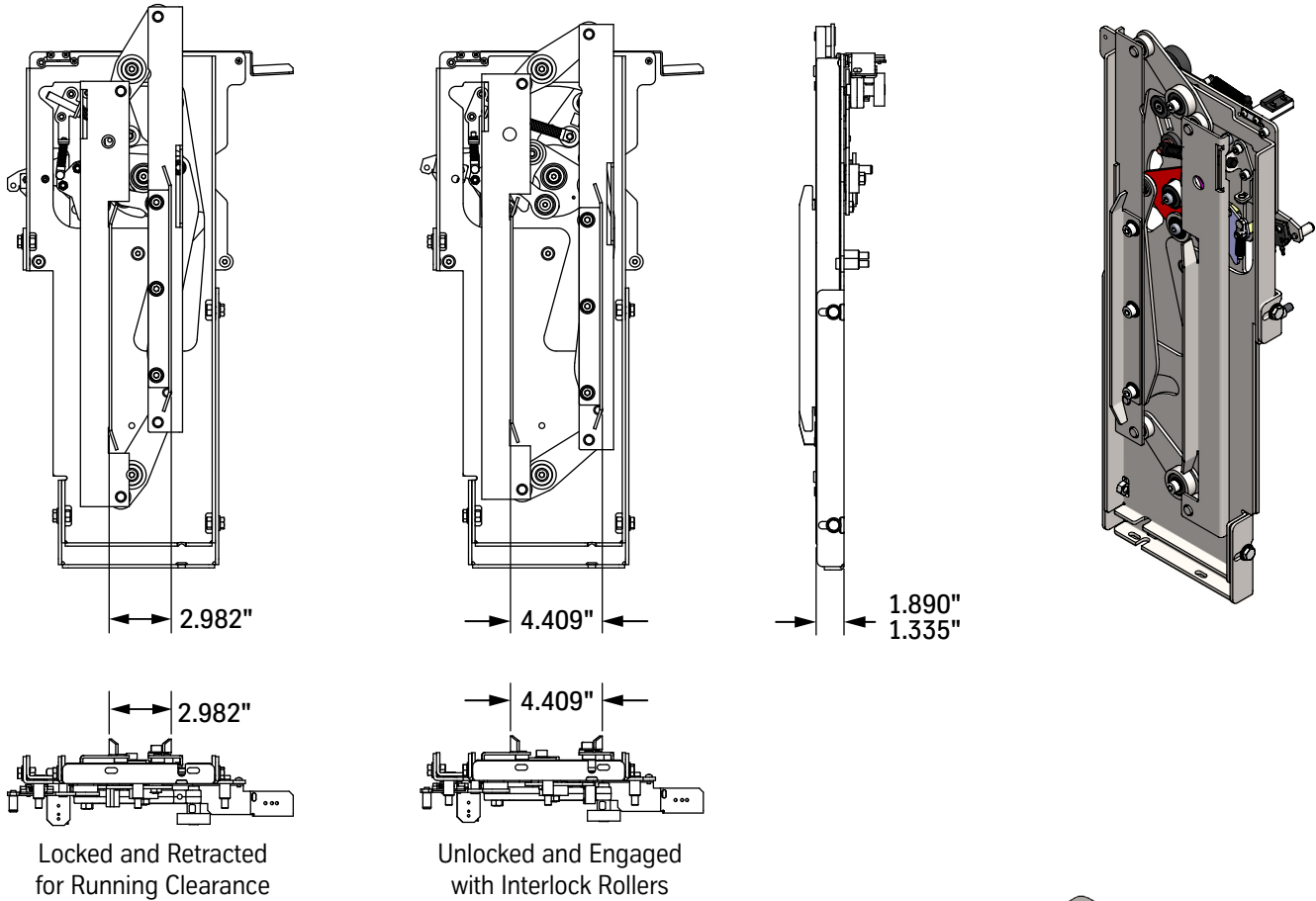


- Clutches shown with spacers are configured for MAC Interlock Rollers.
- tKE LH shown, RH opposite.

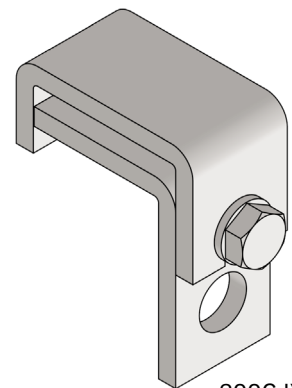
Clutch Assemblies

(continued)

Otis 6940 Interlock (364AJ\_) 1 of 2



- Clutch shown must be used with Otis Landing Lock Kit, part no. 200CJX001 → 1 Lock Kit per Otis 6940 Interlock.
- When using this clutch with side opening doors, locate the door operator so that the center line of the door closed stop aligns with the strike side of the clear opening.
- Dimensions to interlock rollers on this page are for reference only.
- tKE LH shown, RH opposite.



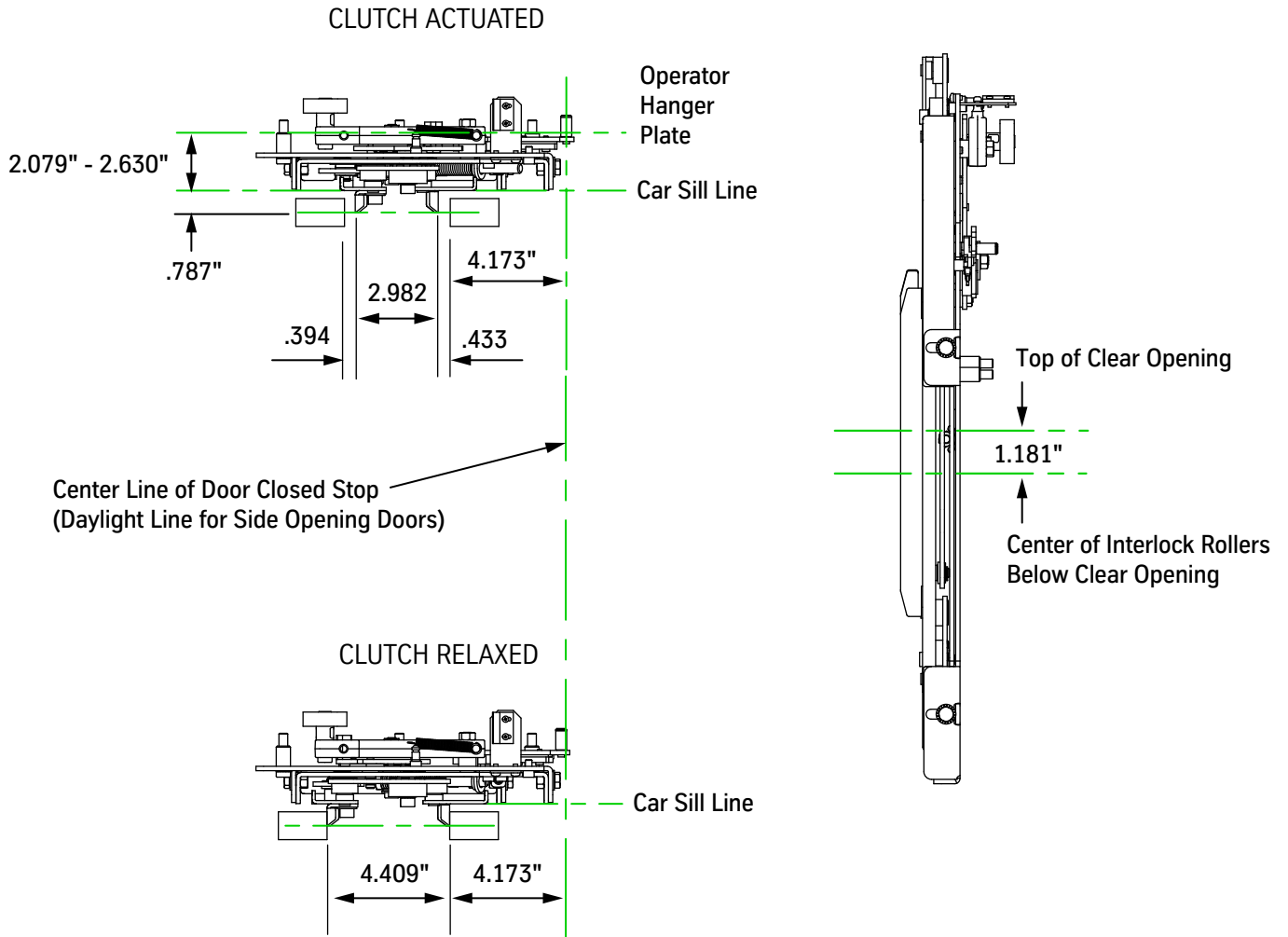
200CJX001



Clutch Assemblies

(continued)

Otis 6940 Interlock (364AJ\_) 2 of 2

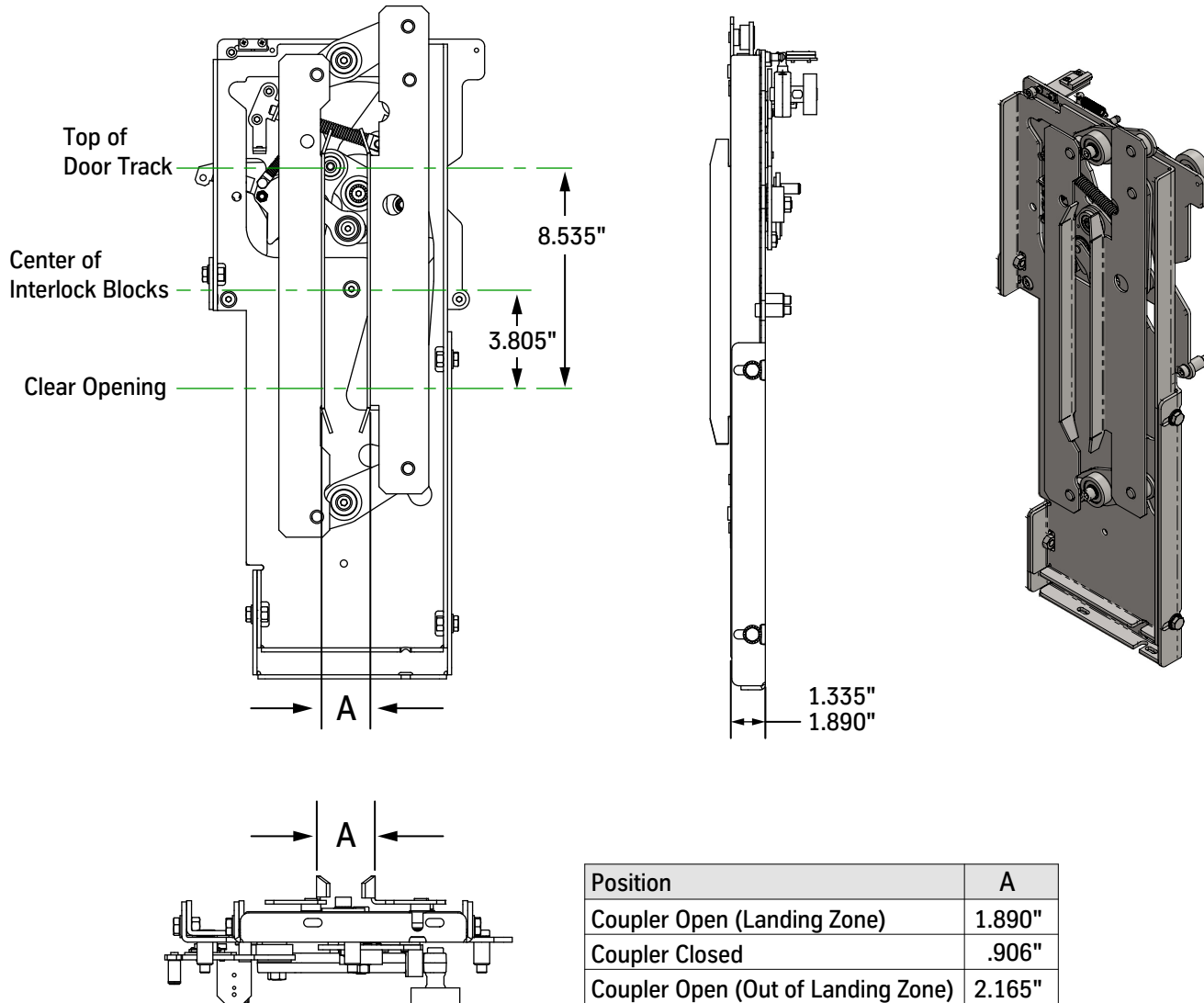


- When using this clutch with side opening doors, locate the door operator so that the center line of the door closed stop aligns with the strike side of the clear opening.
- Dimensions to interlock rollers on this page are for reference only.
- tkE LH shown, RH opposite.

Clutch Assemblies

(continued)

Westinghouse Interlocks Model E5A (364AK\_) 1 of 2

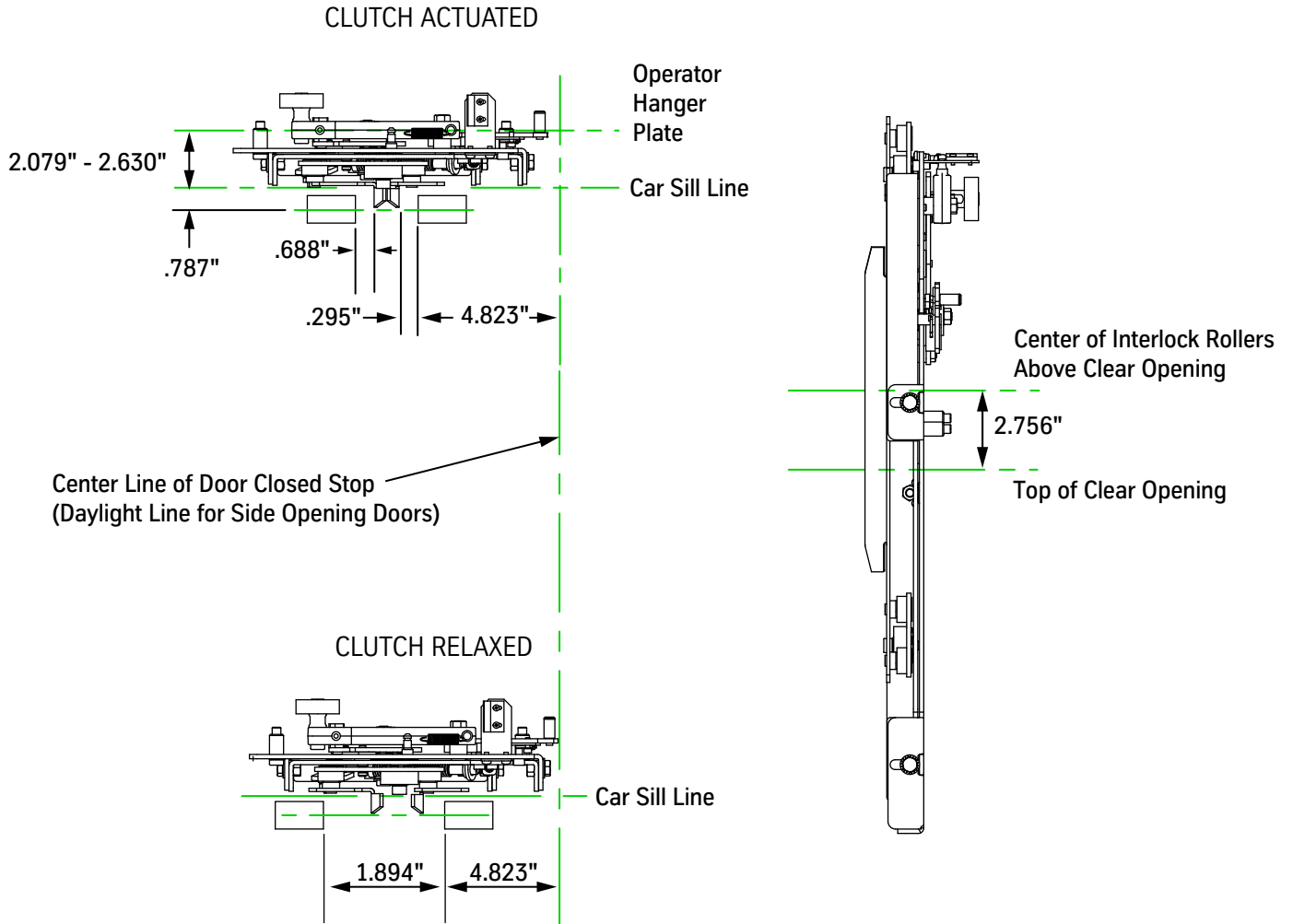


- When using this clutch with side opening doors, locate the door operator so that the center line of the door closed stop aligns with the strike side of the clear opening.
- Dimensions to interlock rollers on this page are for reference only.
- tKE LH shown, RH opposite.

Clutch Assemblies

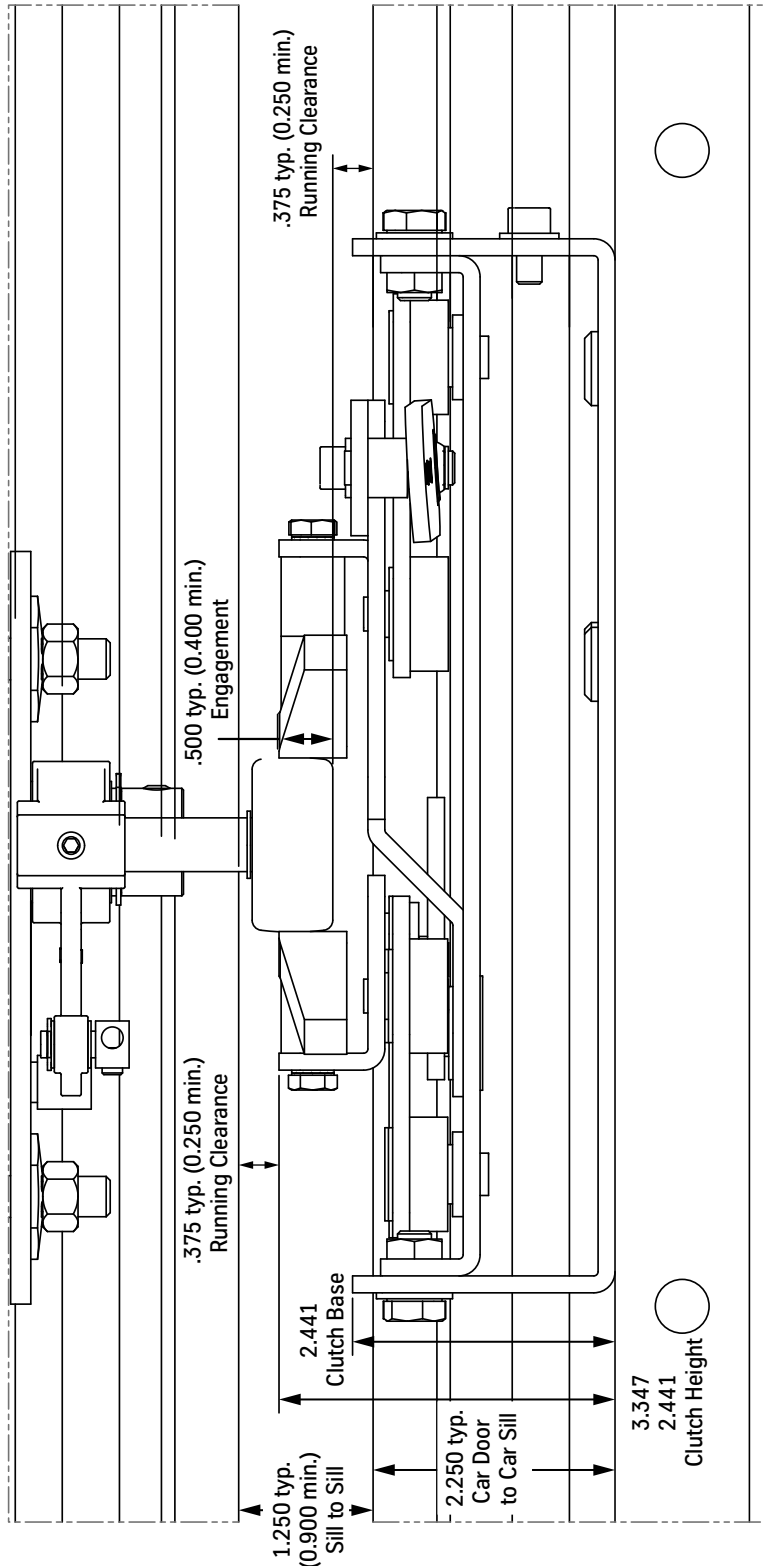
(continued)

Westinghouse Interlocks Model E5A (364AK\_) 2 of 2



- When using this clutch with side opening doors, locate the door operator so that the center line of the door closed stop aligns with the strike side of the clear opening.
- Dimensions to interlock rollers on this page are for reference only.
- tkE LH shown, RH opposite.

# Clutch Operating Space

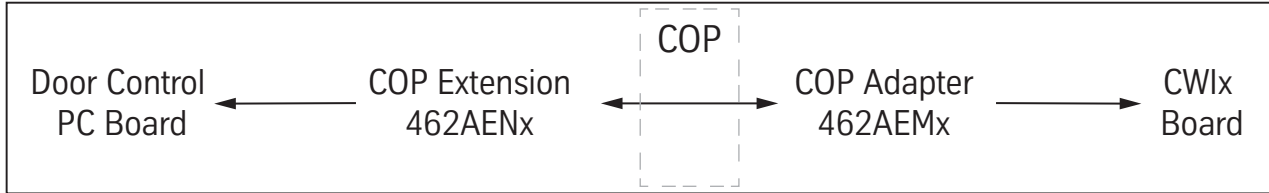


364AG Shown

Sill To Sill	Required Space Car Door To Car Sill	
	For .375 Running Clearance	For .250 Running Clearance
1.250	1.566	1.441
1.000	1.816	1.691
0.900	1.916	1.791

# Harness Assembly Diagrams

## Harness Assemblies Installation Overview



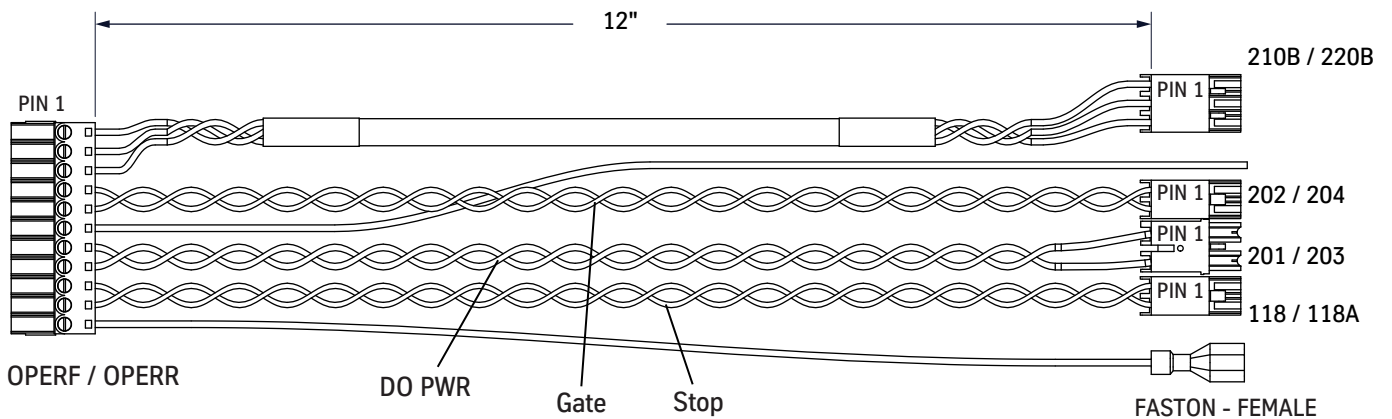
The 120VAC female plug receptacle powers the GFCI receptacle in the CTS



COP Extension, 462AEN\_ starts on page A-15.

## COP Adapter, 462AEM\_

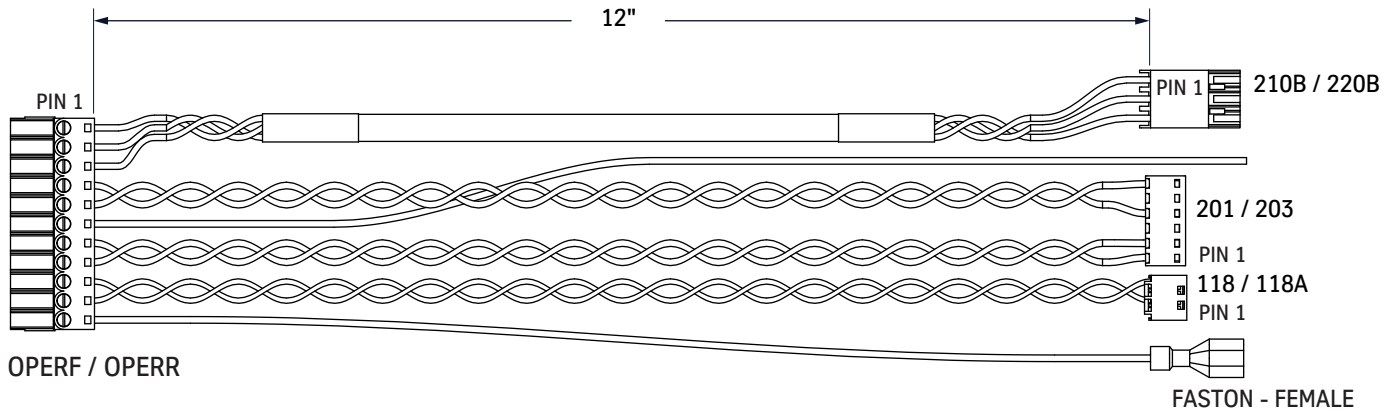
Type: Door Operator  
 Use: TAC32T  
 Front: 462AEM001  
 Rear: 462AEM002



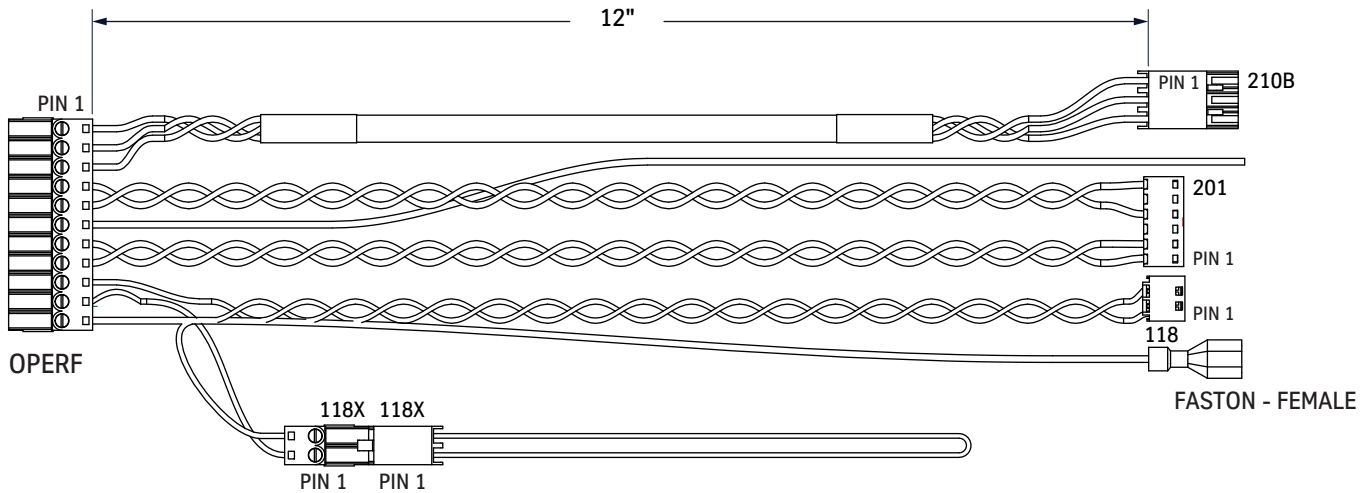
Harness Assembly Diagrams - COP Adapter, 462AEM\_

(continued)

Type: Door Operator  
 Use: TAC32H  
 Front: 462AEM004  
 Rear: 462AEM005

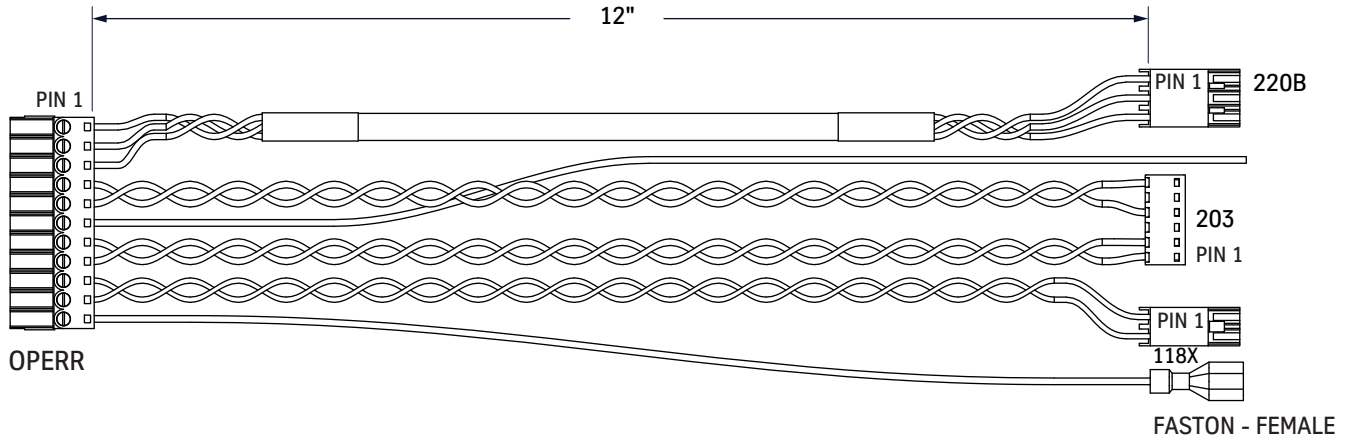


Type: Door Operator  
 Use: Futura T, TAC50-04  
 Front: 462AEM006

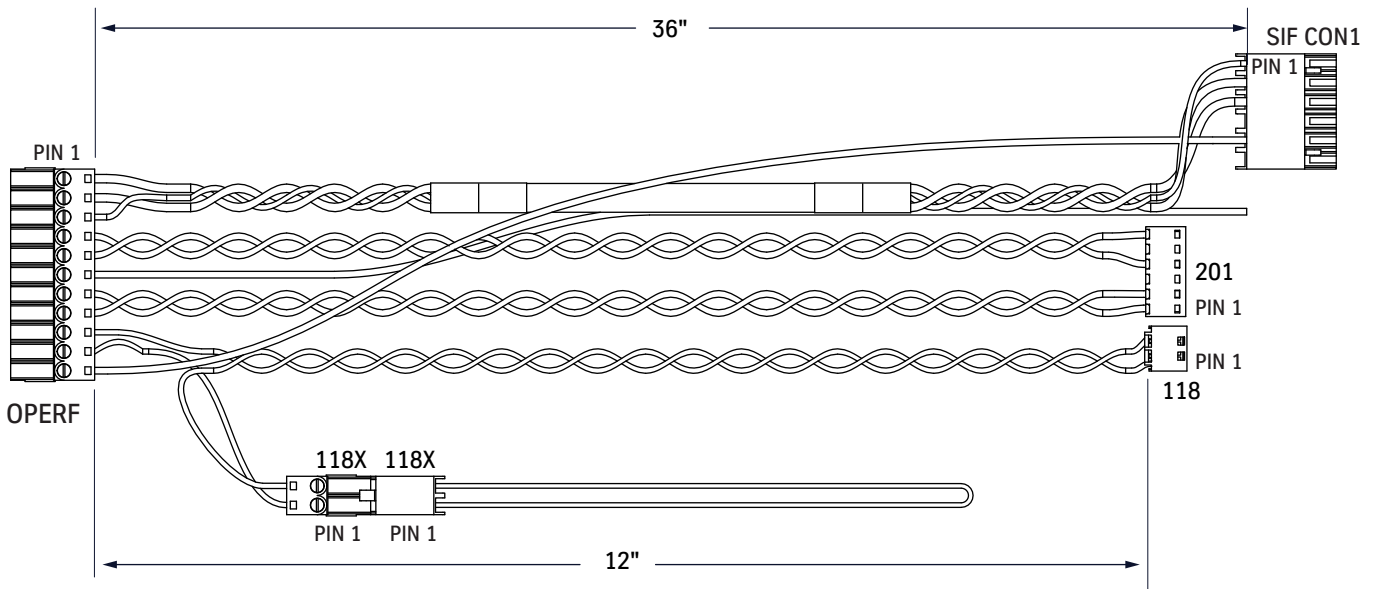


### Harness Assembly Diagrams - COP Adapter, 462AEM\_ (continued)

Type: Door Operator  
Use: Futura T, TAC50-04  
Rear: 462AEM007

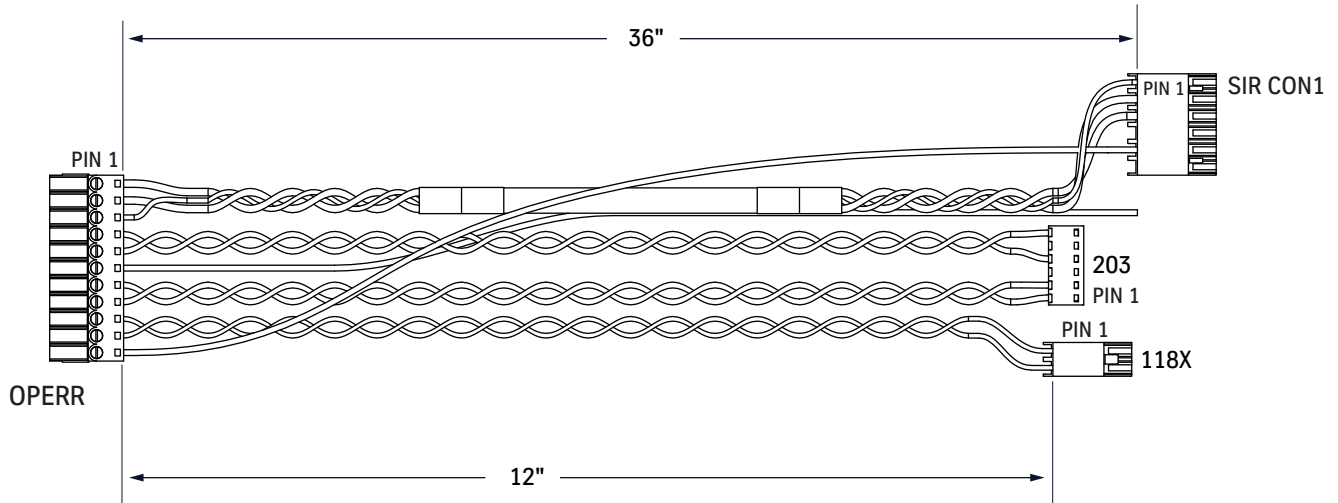


Type: Door Operator  
Use: TAC22, ICON, TAC20-03, TAC20, TAC50-03  
Front: 462AEM008

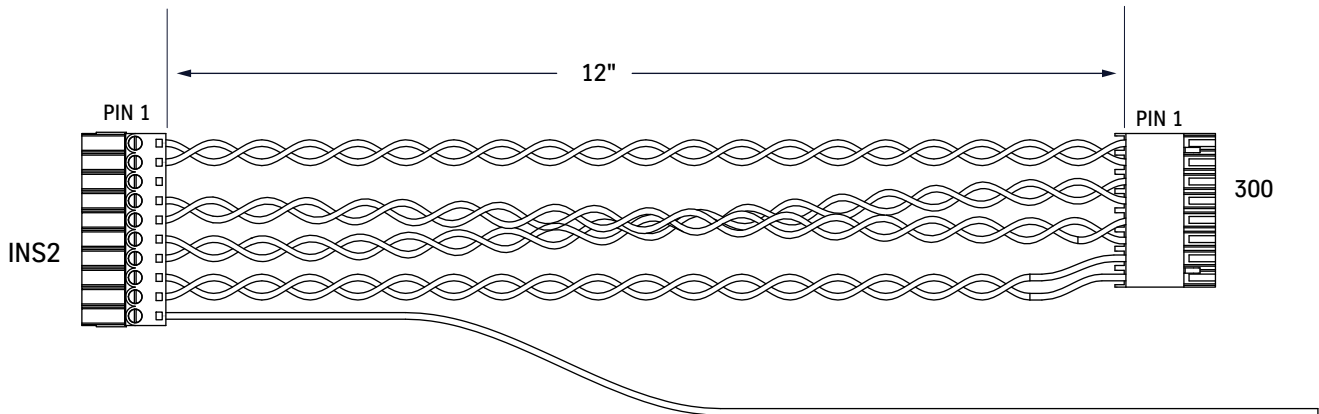


### Harness Assembly Diagrams - COP Adapter, 462AEM\_ (continued)

Type: Door Operator  
Use: TAC22, ICON, TAC20-03, TAC20, TAC50-03  
Rear: 462AEM009



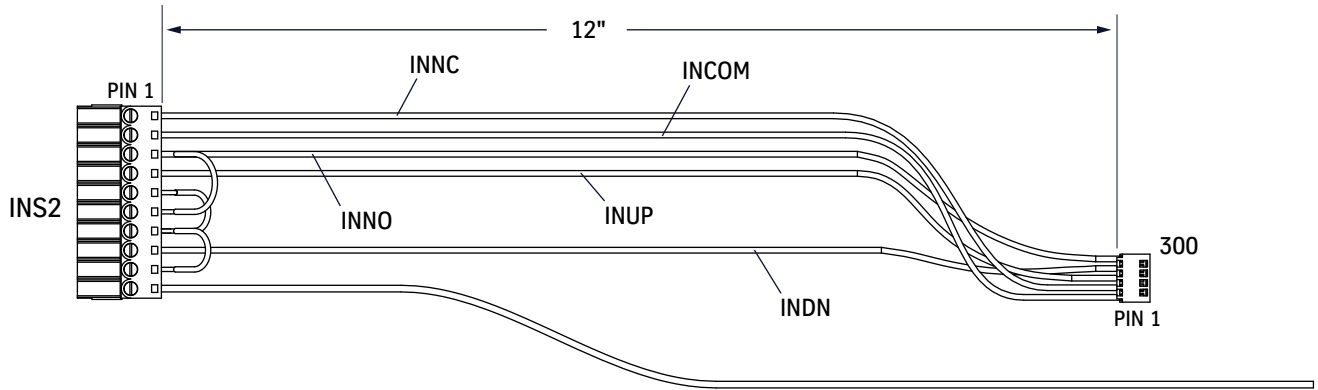
Type: Inspection  
Use: TAC32T  
Front: 462AEM010



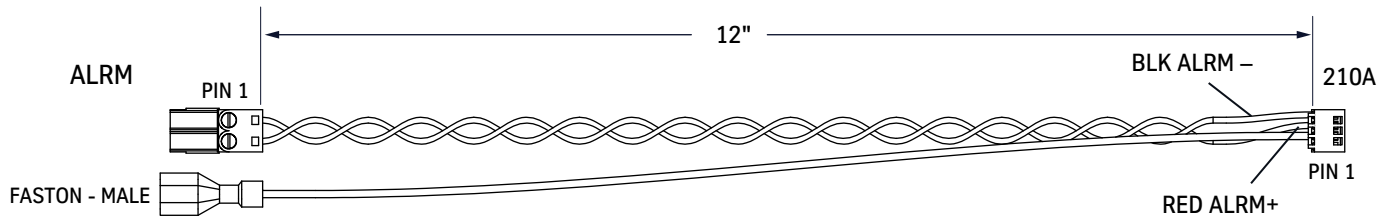


### Harness Assembly Diagrams - COP Adapter, 462AEM\_ (continued)

Type: Inspection  
Use: TAC32H, FUTURA T, TAC50-04, TAC22, ICON, TAC20-03, TAC20, TAC50-03  
Front: 462AEM011



Type: Alarm  
Use: TAC32T, TAC32H, FUTURA T, TAC50-04  
Front: 462AEM012



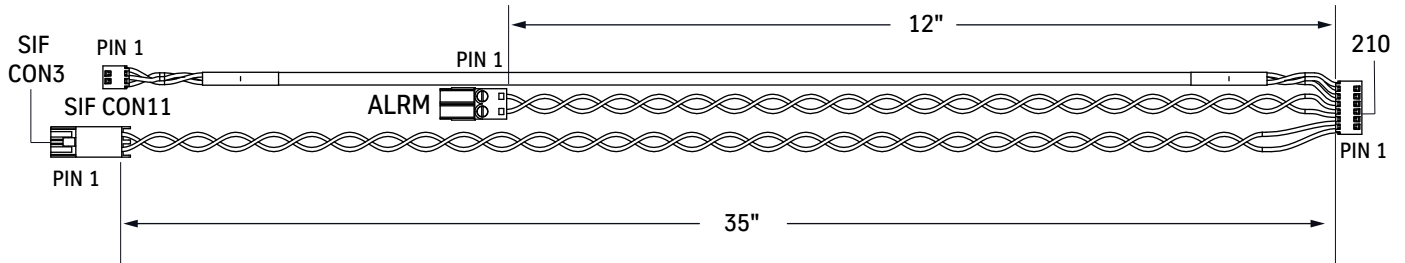
**Harness Assembly Diagrams - COP Adapter, 462AEM\_**

(continued)

Type: Alarm, 485

Use: TAC22, ICON, TAC20-03, TAC20, TAC50-03

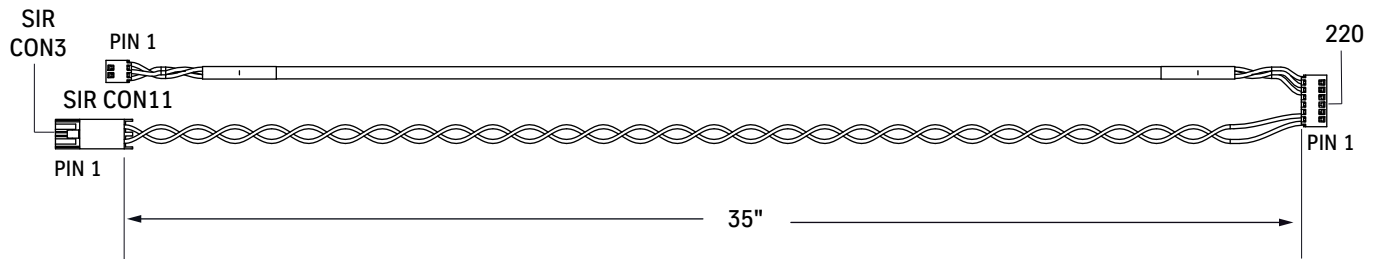
Front: 462AEM0013



Type: Alarm, 485

Use: TAC22, ICON, TAC20-03, TAC20, TAC50-03

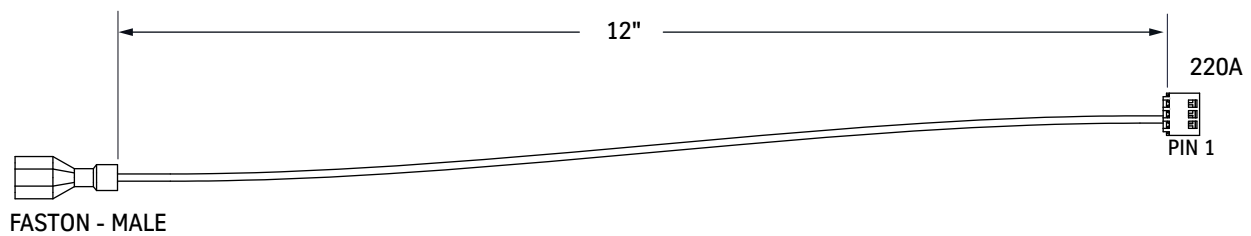
Rear: 462AEM0014



Type: Door Operator Ground

Use: TAC32T, TAC32H, FUTURA T, TAC50-04

Rear: 462AEM016



### Harness Assembly Diagrams

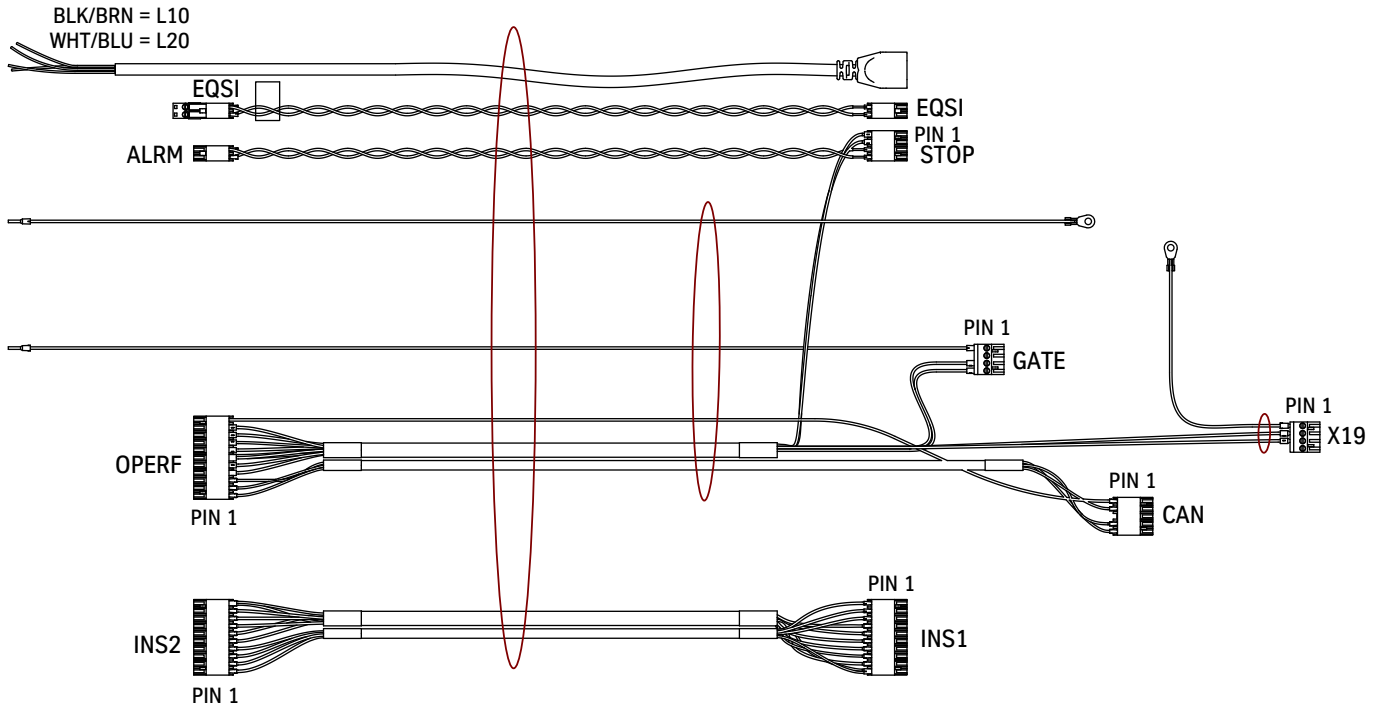
(continued)

## COP Extension, 462AEN\_

Type: COP

Use: Front with Inspection Station

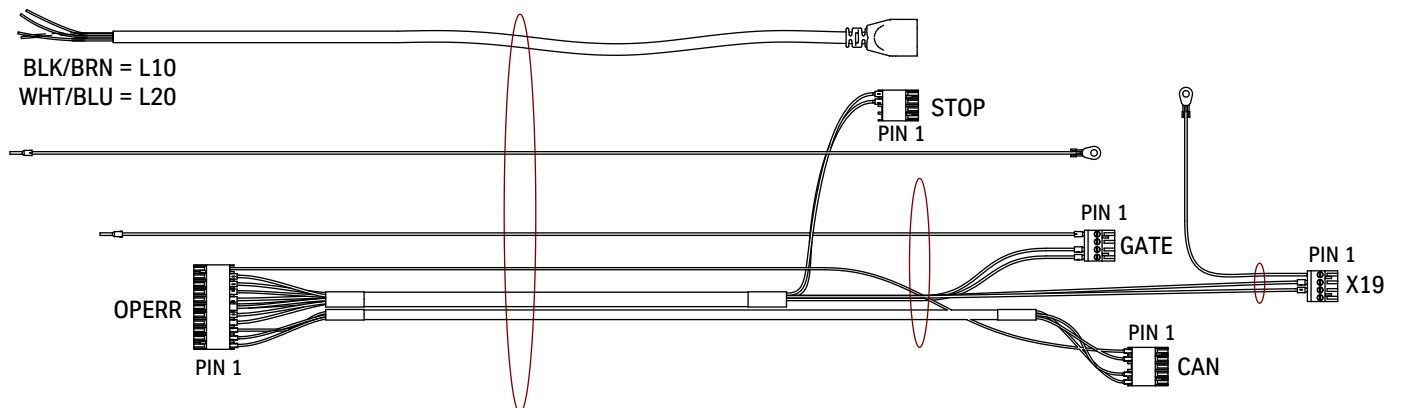
Print No: 462AEN001



Type: COP/CTB

Use: Rear, No Inspection Station

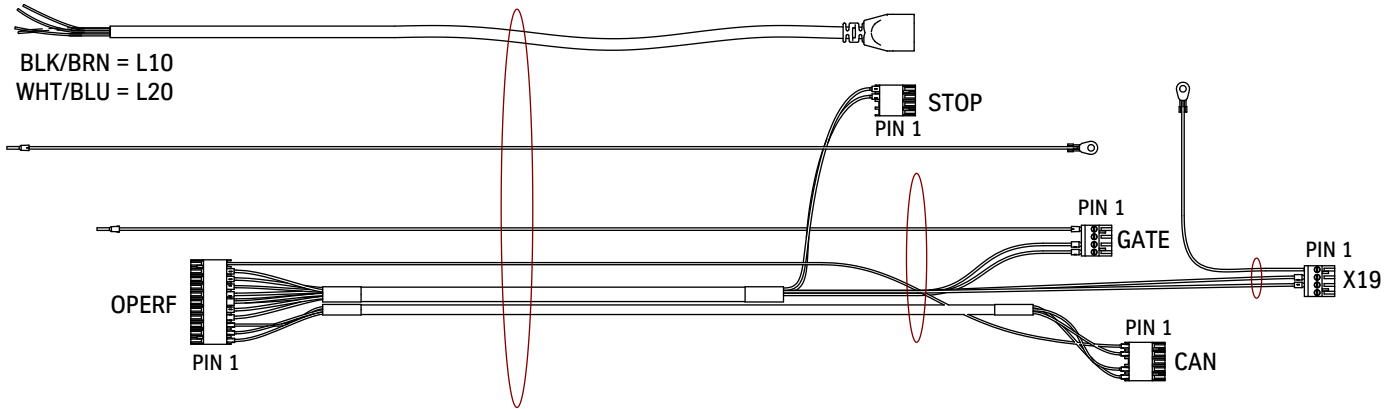
Print No: 462AEN002



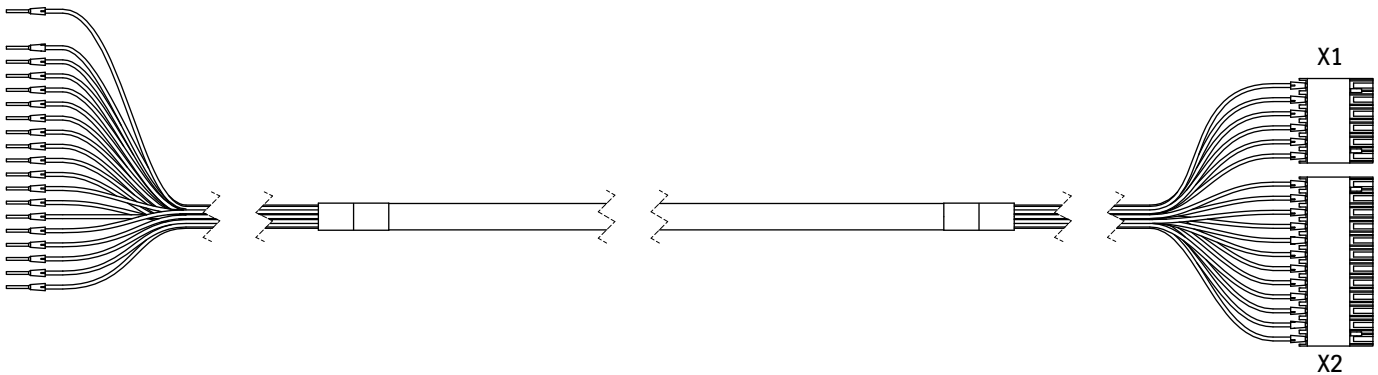
**COP Extension, 462AEN\_**

(continued)

Type: CTB  
 Use: Front, No Inspection Station  
 Print No: 462AEN004

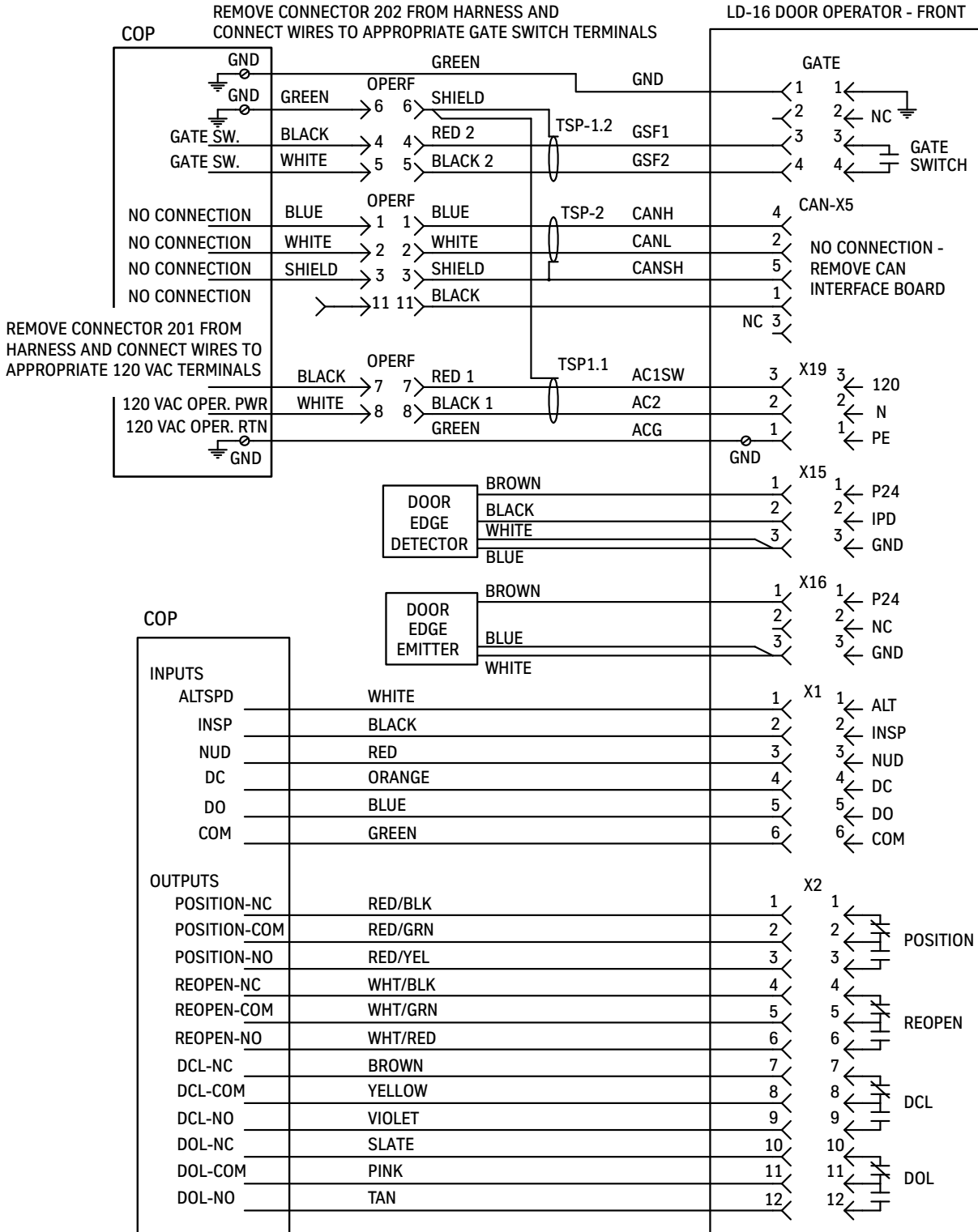


Type: Discrete  
 Use: Add On  
 Print No: Front, 462AEN005  
 Print No: Rear, 462AEN006

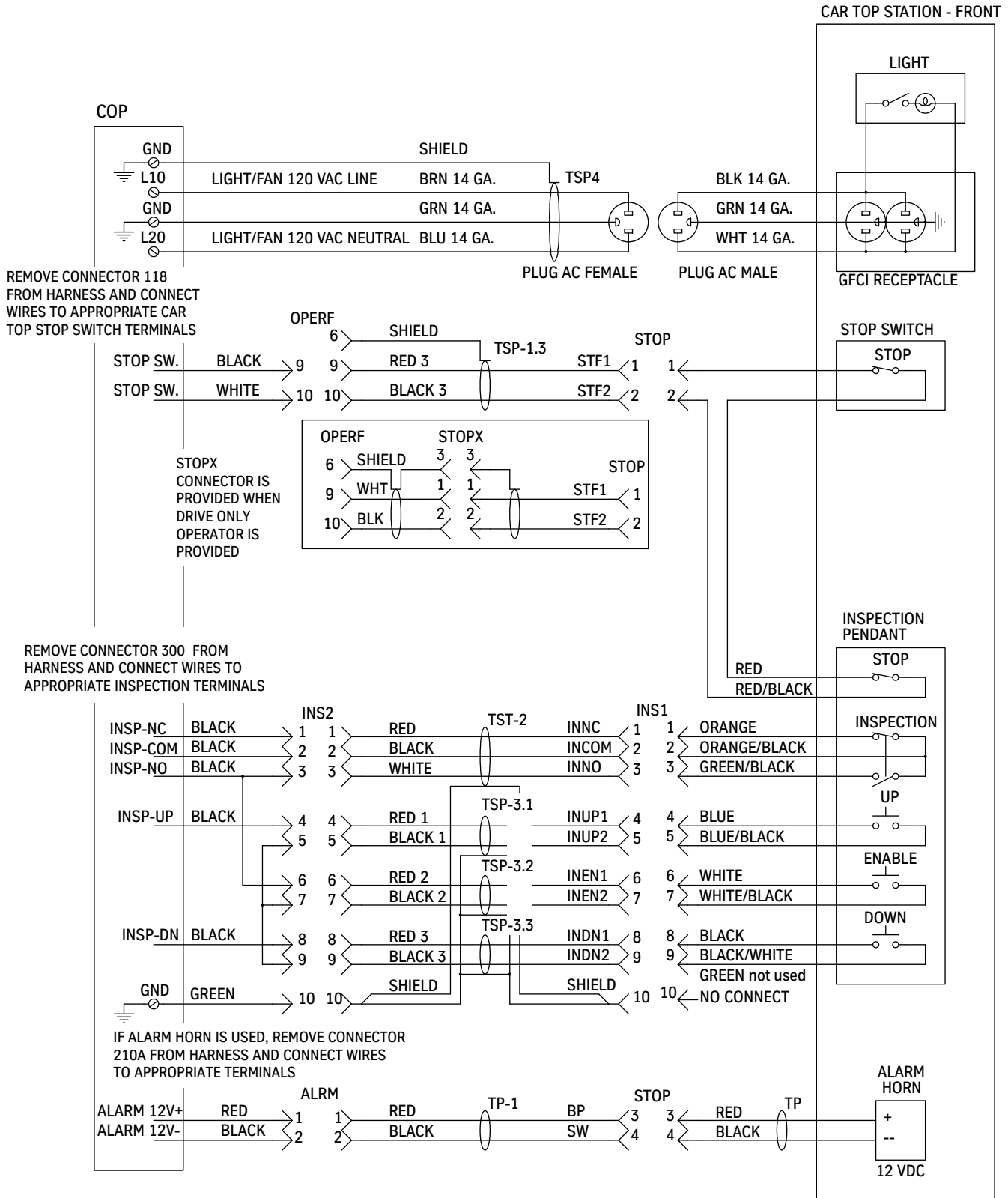


# Generic Wiring Diagrams

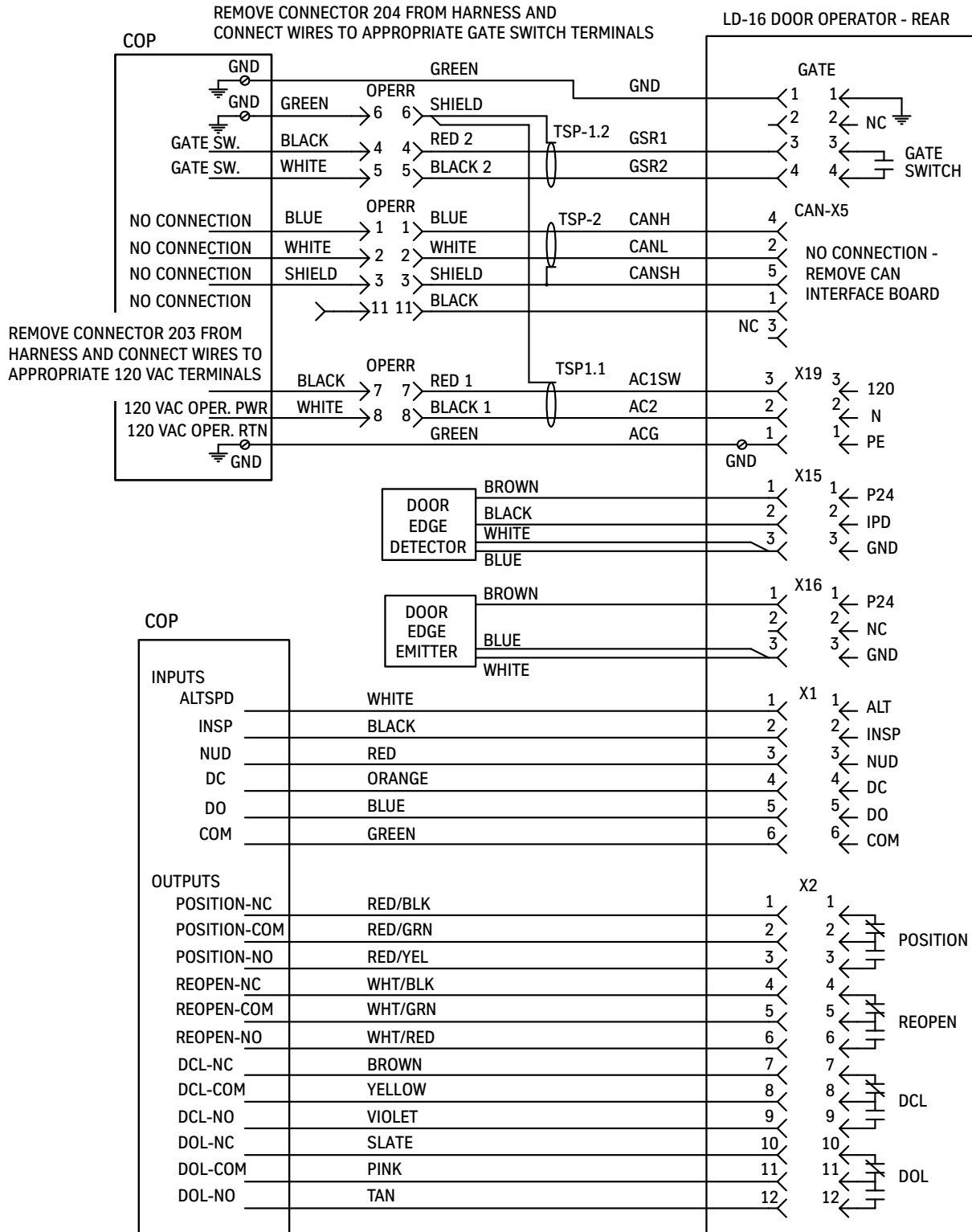
## DISCRETE CONTROLLER - FRONT (1 of 2)



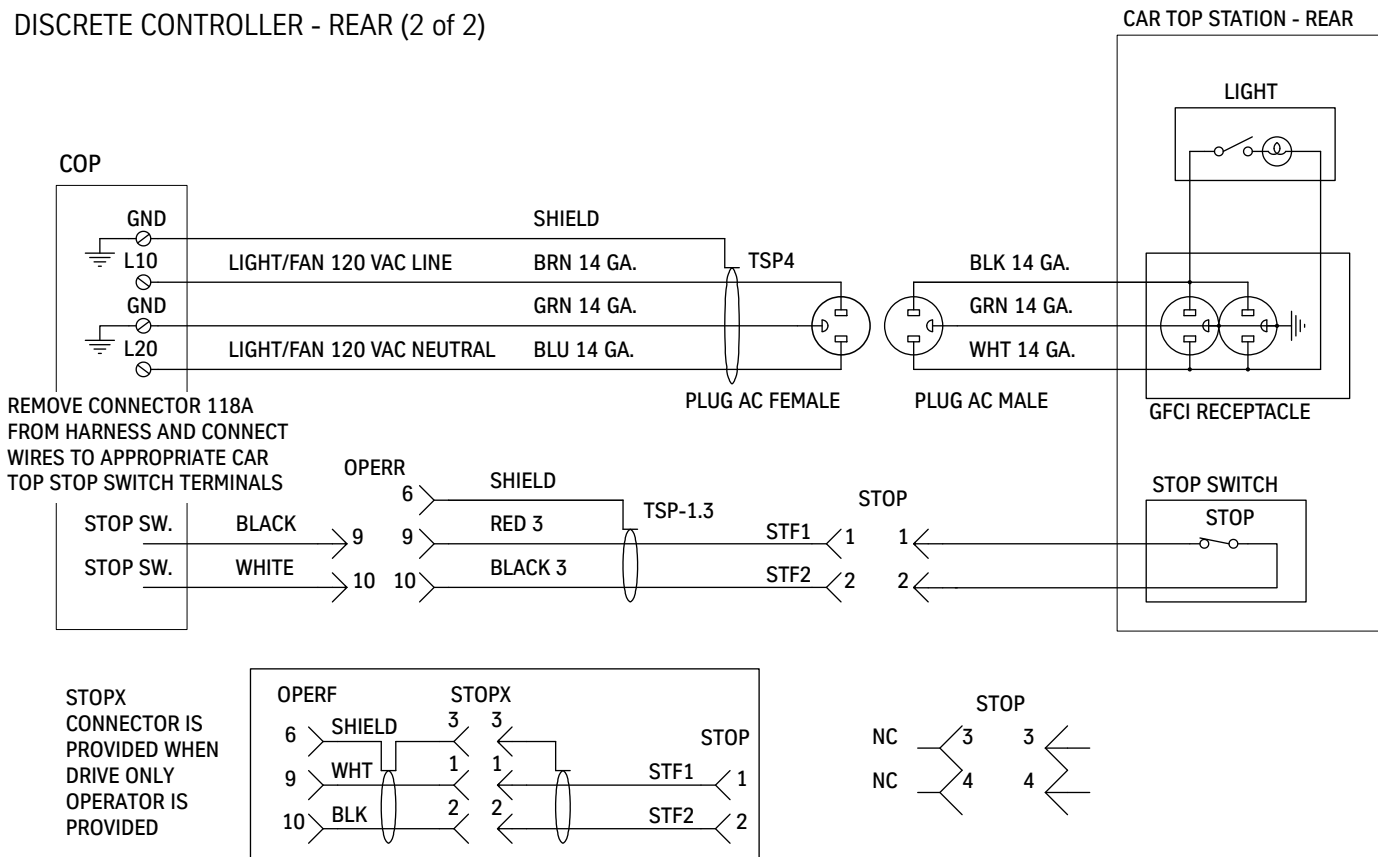
DISCRETE CONTROLLER - FRONT (2 of 2)



DISCRETE CONTROLLER - REAR (1 of 2)



DISCRETE CONTROLLER - REAR (2 of 2)









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