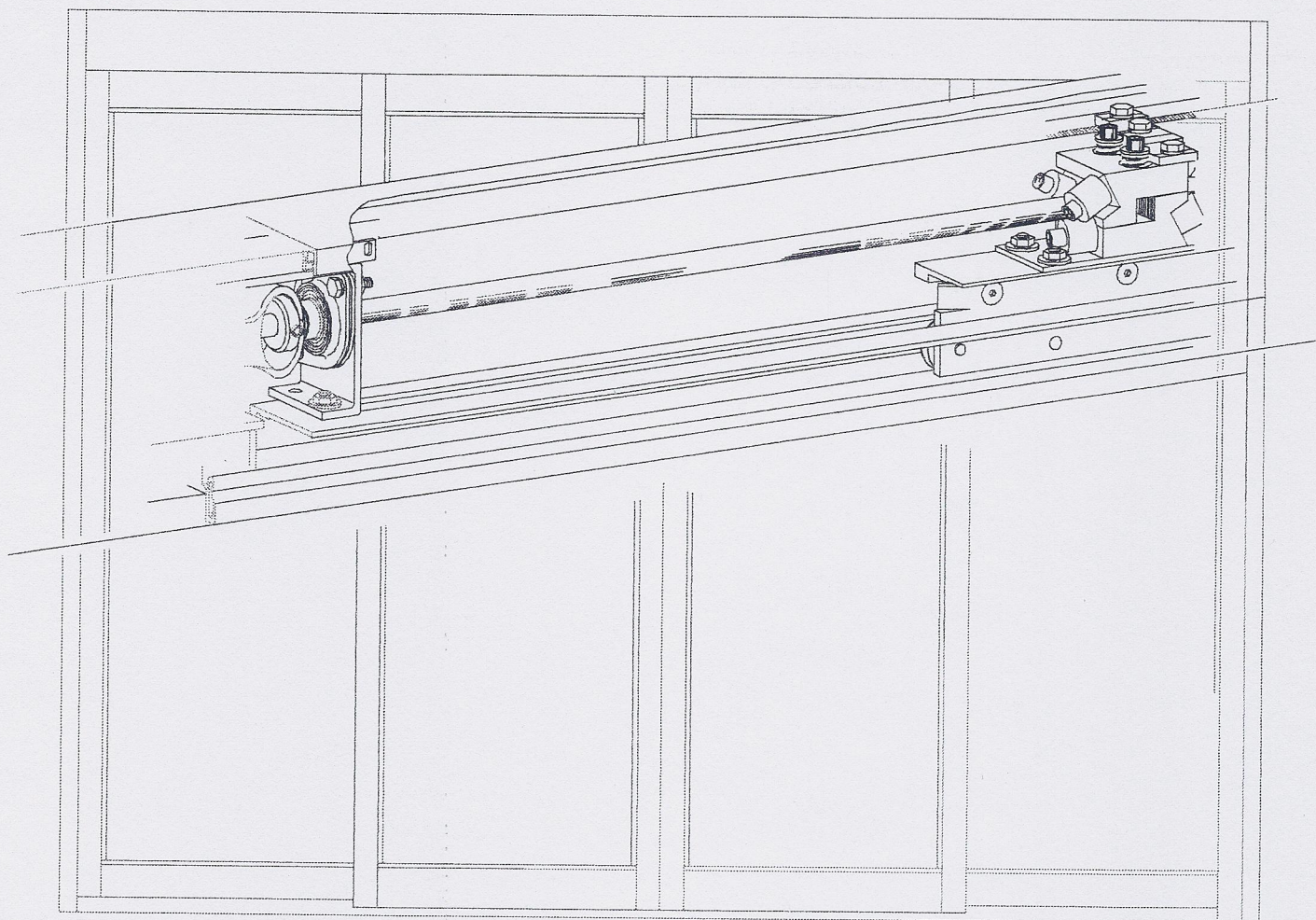
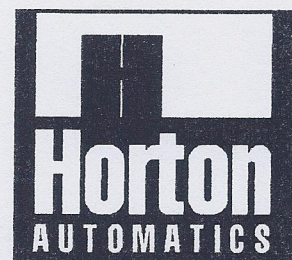


# Series 2000 Linear Drive Electric Slide Door Operator Installation Instructions



1.068d

G200, AUG2000





# CONTENTS

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# SERIES 2000 ELECTRIC SLIDING DOOR INSTALLATION INSTRUCTIONS

## 1. INSTRUCTIONS TO INSTALLER

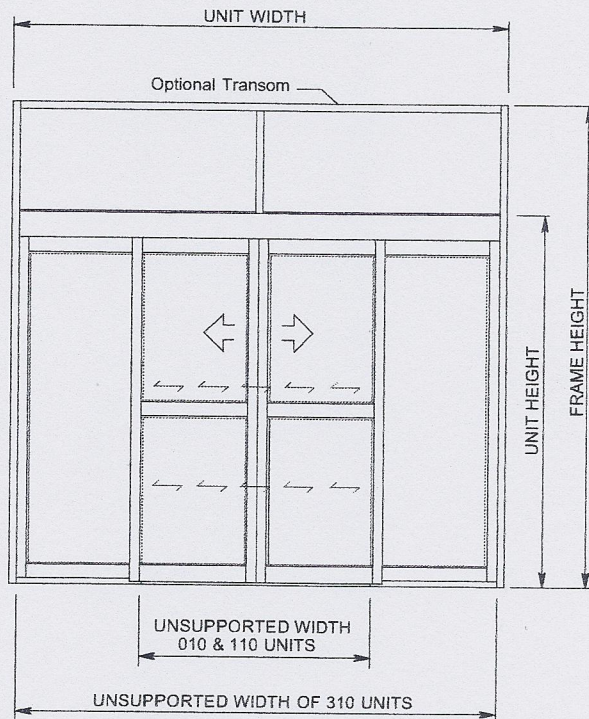
- This door is to be installed by a trained and experienced installer with knowledge of local codes and ANSI A156.10 standards for power operated doors.
- To ensure safe and proper operation, the door must be installed and adjusted to conform to Horton Automatics recommendations, all code requirements and ANSI A156.10.
- If there are any questions about these instructions, call Horton Automatics Technical Assistance.

## INFORMATION TO BE PROVIDED BY THE DISTRIBUTOR TO THE OWNER

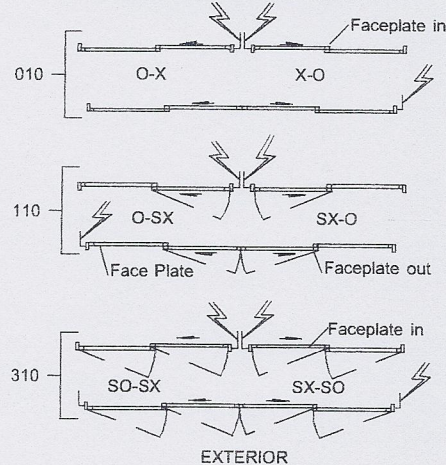
- After installation instruct the owner on the safe operation of the door.
- Present the Owners Manual M300 and explain how to perform the daily safety check.
- Location of power on / off switch.
- Necessary warnings not covered in these general instructions.
- Date equipment shipped from Horton Automatics.
- Date equipment placed in service.
- Horton Automatics' invoice number for warranty reference.
- Equipment type.
- Accessories included.
- Phone number to call regarding problems or request for service.
- **Give caution** to owner: if a potentially hazardous situation is suspected, the door should be taken out of automatic service until a professional inspection is made and the problem is corrected.

## 2. GENERAL REQUIREMENTS

- Power: 120 VAC, 60Hz, 15 Amp service (in conduit) to the "J" box inside the header of each unit.
- Non North American voltages can be 240 VAC, if so be sure the operator has a 240VAC power supply.
- Power may be brought in through the top of the jamb on perimeter mount units or in through the back of surface mount units.
- For remote switch locations, routing of low voltage class II wiring (in conduit) to the operator controls will be required.
- Remote switch locations should be predetermined and wired before installation begins.
- Opening size should be 1/4" taller and 1/2" wider than the unit / frame.
- The opening must be plumb and level, including the threshold area.
- Door panels may be glazed before or after installation.



### POWER INPUT LOCATIONS



### LOAD LIMITS & SIZES OF UNSUPPORTED TRANSOMS

Unsupported Width	Allowable Transom Weight
up to 8'	600 Lb.*
up to 10'	250 Lb.
up to 12'	100 Lb.

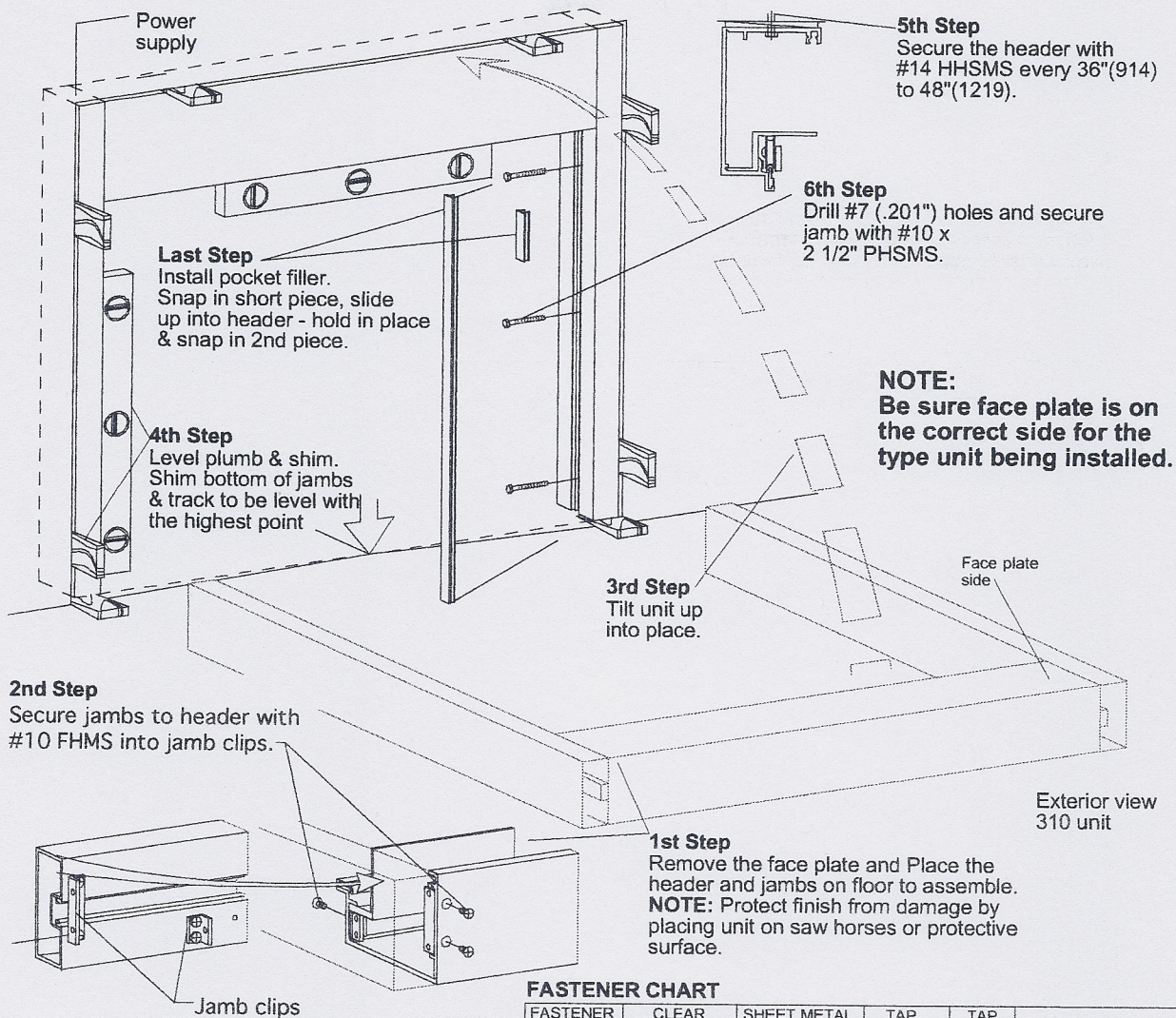
Supporting dead weight on headers longer than 12' is not recommended.

\*For loads greater than 250 lb. 1/4" screws instead of #10 screws should be used secure the header to the jamb.



### 3. INSTALLING FRAME

Take care that the frame is not racked. Wood shingles will be needed to shim the unit. All the fasteners shown below are provided with each unit. If these are inappropriate, alternate fasteners are shown in the fastener chart. Route power supply wiring and low voltage wiring.

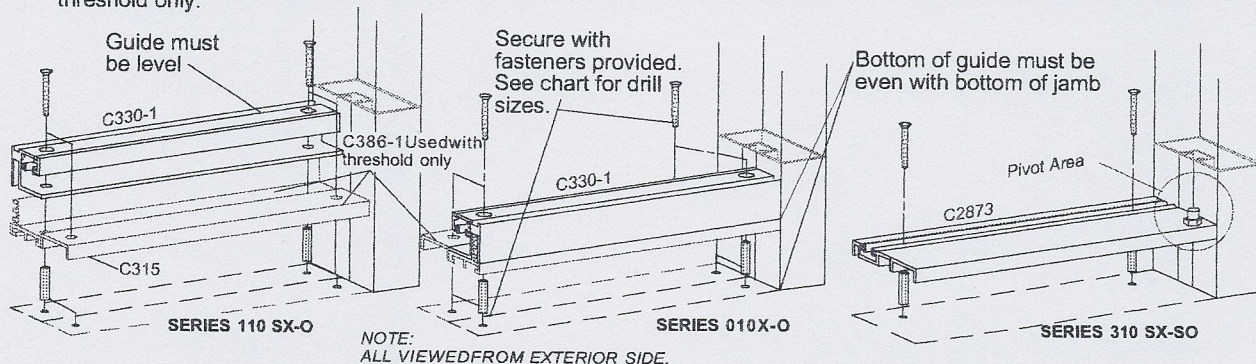


**FASTENER CHART**

FASTENER SIZE / TYPE	CLEAR DRILL / C'SINK	SHEET METAL DRILL HOLE	TAP DRILL	TAP SIZE	MASONRY
#6 SMS & #6-32 MS	#25(.149) & #6 c'sink	#31(.120)	#36(.106)	#6-32	
#10 SMS & #10-24 MS	#7(.201) & #10 c'sink	#21(.159)	#25(.149)	#10-24	Drill 1/4"(.25) & use C1423 green anchor
#14 SMS & #1/4-20 MS	#7(.257) & #14 c'sink	3/16(.187)	#7(.149)	1/4-20	Drill 5/16"(.312) & use C1424 blue anchor

### 4. INSTALLING FLOOR GUIDES

Bottom guides will vary with the unit type. The 3 basic types are shown below. The C315 / C386-1 filler is used with threshold only.





## 5. INSTALLING SIDE PANELS

G200.3

2 types of side panels are shown "O" fixed and "SO" swing panel. If panels are to be glazed before installation see section 7.

Panels come assembled and prewired from the factory, unless side panels are extra large.

### TYPE 010 OR 110 "O" PANEL

#### 1st Step

Position the "O" panel, as shown, in the C330-1 bottom guide about 1" from the jamb to clear security stud.

#### 2nd Step

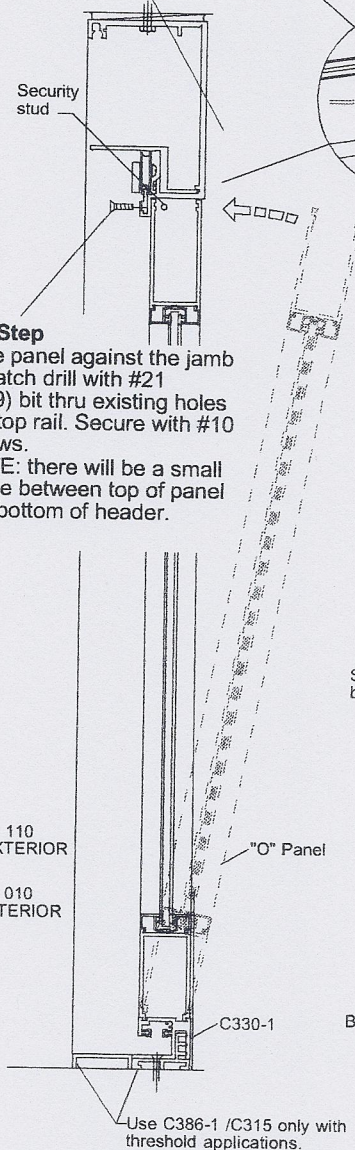
Connect safety wiring harness from door panel to harness in header. Place wire in notch and feed into door panel as unit is tilted into place.

#### 3rd Step

Slide panel against the jamb & match drill with #21 (.159) bit thru existing holes into top rail. Secure with #10 screws.

NOTE: there will be a small space between top of panel and bottom of header.

110  
EXTERIOR  
010  
INTERIOR



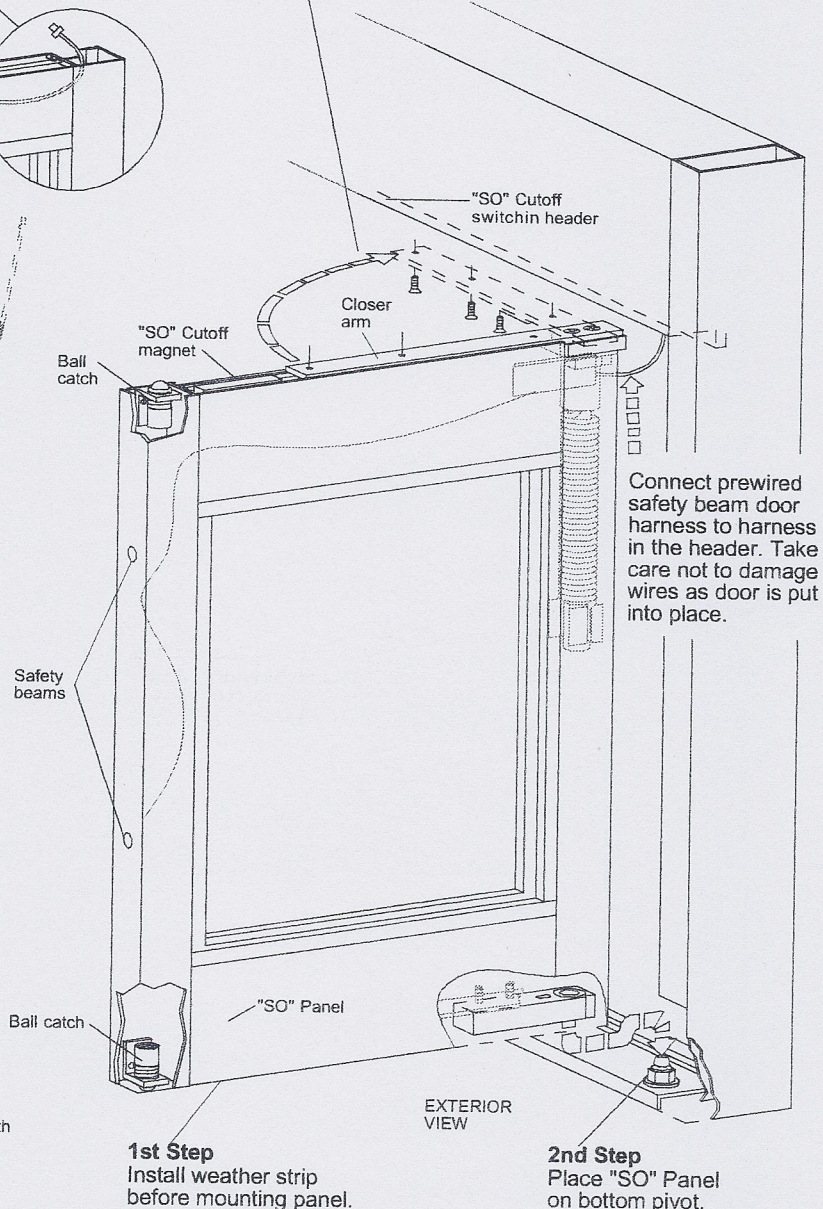
### TYPE 310 OR 410 "SO" PANEL

#### 2nd Step

Place "SO" panel in open position & rotate closer arm under header. Secure "SO" closer with #10 screws.

#### CAUTION:

Closer arm is spring loaded. Take precautions to avoid injury.



#### 1st Step

Install weather strip before mounting panel.

#### 2nd Step

Place "SO" Panel on bottom pivot.



## 6. INSTALLING SLIDE PANELS

G200.4

3 types of slide panels are shown 010, 110 & 310. If panels are to be glazed before installation see section 7.

Height  
adjustment

**2nd Step**  
Connect the hanger to  
the wheel carriage.  
Adjust height as required

### NOTE:

Always loosen height adjustment screw before installing or removing carriage bolts. Height adjustment screws should not be used to raise or lower the door - only to hold it in place.

Install threshold after all panels are in place.

### TYPE 010 "X" PANEL

**1st Step**  
Remove end cap.  
Slide bottom guide into track.  
The panel may need to be angled  
to start pins into the guide.

**2nd Step**  
Connect the breakout to  
the wheel carriage.  
Adjust height as required

### TYPE 110 "SX" PANEL

**1st Step**  
Remove end cap.  
Slide bottom guide into track.  
The panel may need to be  
angled to start pins into the  
guide.

**2nd Step**  
Connect the breakout to  
the wheel carriage.  
Adjust height as required

Adjust interlocks to  
line up vertical rails.

Set flush with  
back of rail.

### TYPE 310 "SX" PANEL

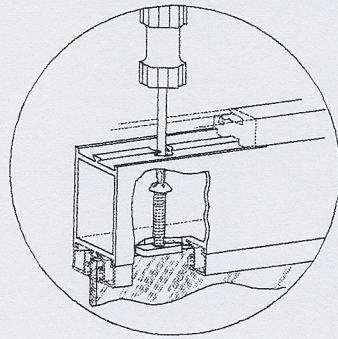
**1st Step**  
Place guide pin in the track.  
The door panel may need to  
be angled to start.

UNITS ARE VIEWED FROM THE EXTERIOR SIDE



## 7. TYPICAL GLAZING AND SQUARING (SX-SO single slide shown)

Door panels may be glazed laying down flat or installed in the frame. The latter method is referred to below.

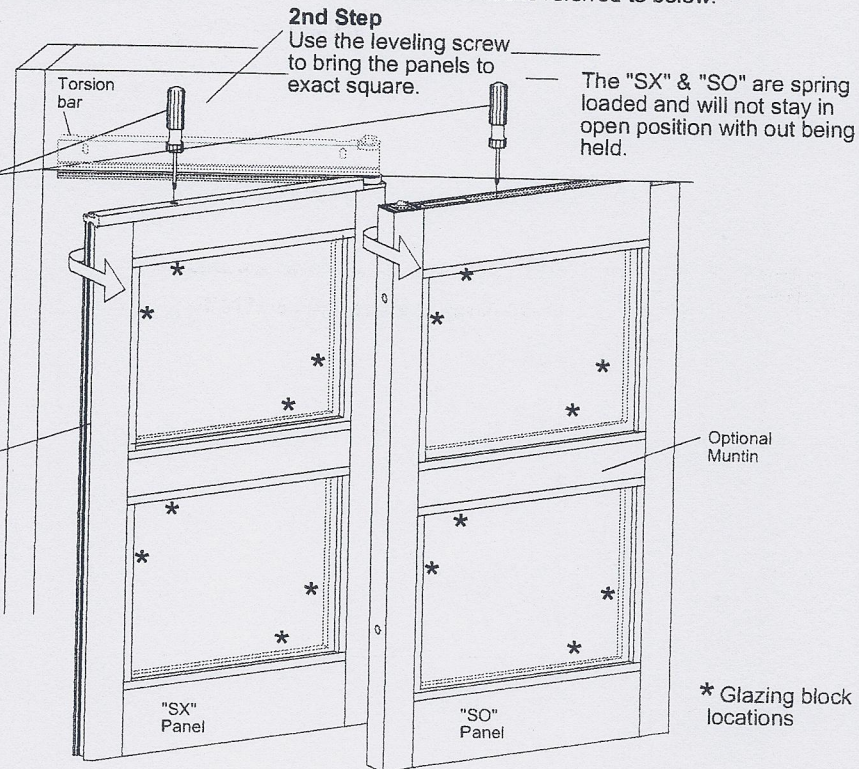


### 1st Step

Always glaze the "SX" panel with the torsion bar in the broken-out position.

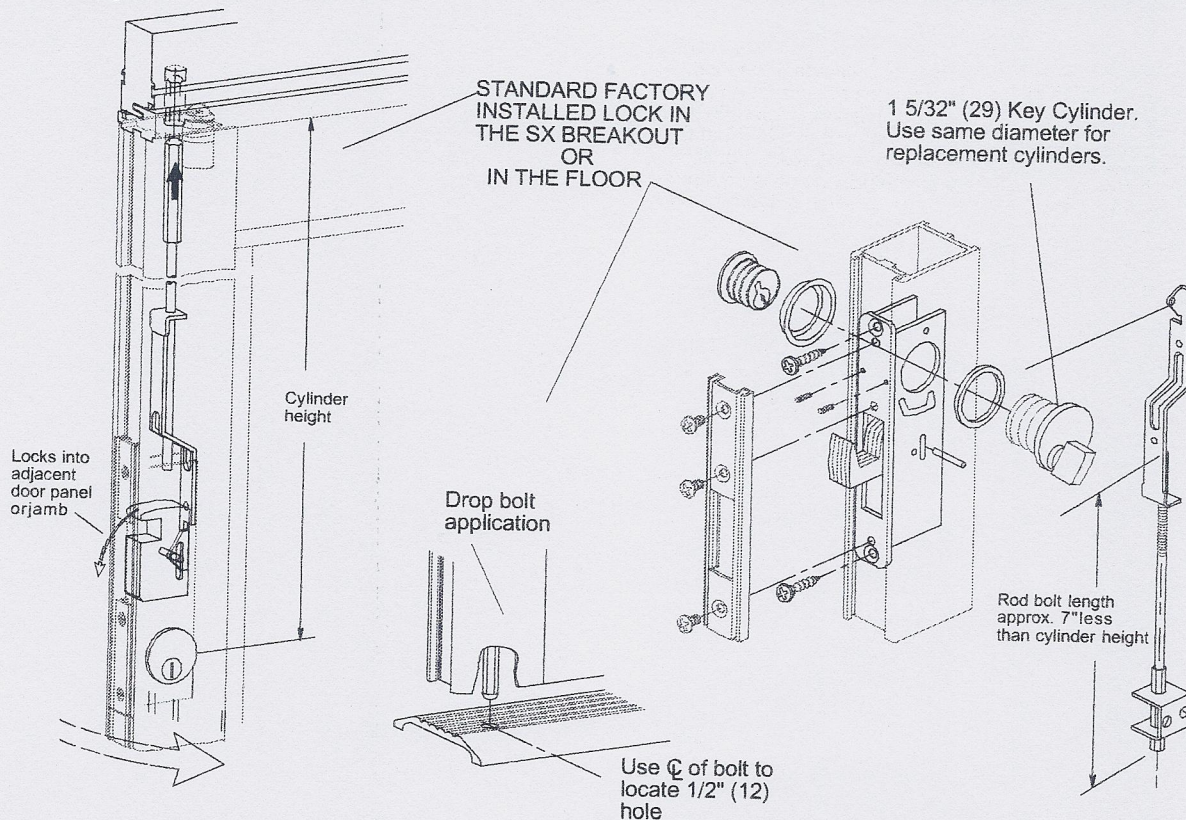
### NOTE:

Do not remove glazing blocks from door panels or **glass breakage will occur** when the leveling screw is adjusted.



## 8. STANDARD LOCKING

A lock cylinder is included with door. UL requires that the inside of the lock be equipped with a thumbturn. Local codes may vary.





## 9. AUTOMATIC LOCKING (OPTIONAL)

The Fail Safe and Fail Secure Autolocks will only inhibit the slide action of the door not the "swing" or breakout action. See section 8 for standard locking. Autolocks are installed at the factory. Retrofit units will be supplied with instructions.

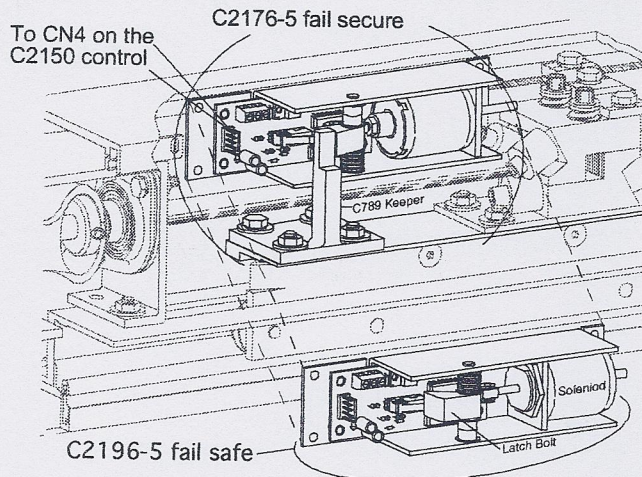
### GENERAL AUTOLOCK OPERATION

- Open signal is received by control (C2150)
- Unlock signal is sent to Autolock
- Solenoid retracts lockbolt
- Door opens and closes
- Solenoid extends the lockbolt when door is fully closed and the keeper is in locked position
- Door (slide motion only) is locked

### LINEAR DRIVE AUTOLOCK

**C2176-5 Fail secure** (if power fails the door will remain locked)

**C2176-5 Fail safe** (if power fails the door will unlock)



## 10. ACTIVATING DEVICES

- Activating switches must be located where door operation may be observed by the person actuating it.
- ANSI standard requires a motion detector be placed on each side of the door and be active while the door is open (except the last 6" 150mm of closing). The detector pattern may be reduced to 24" (610) on the control side for one-way traffic.
- Mount sensors on the door header or above at a height of 7ft (2134) to 8ft (2438) from the floor. Sensitivity and detection area may not meet ANSI standards if detector is placed higher.
- Walk test the pattern from various angles and speeds.
- Adjust the sensitivity and pattern of the motion sensor as per ANSI A156.10 See drawing below for pattern and location.

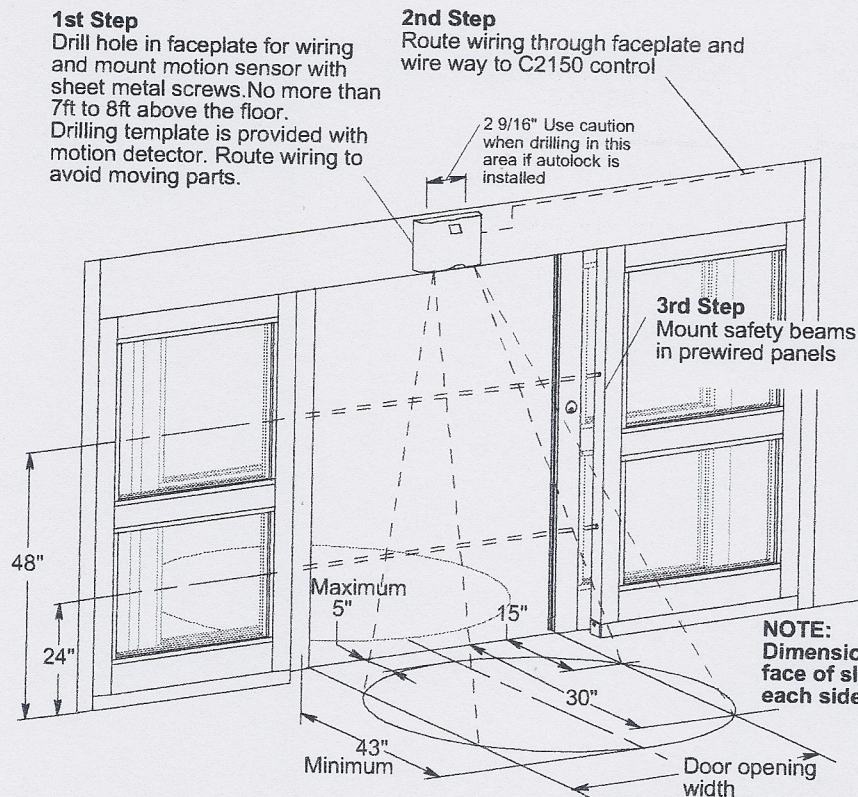
See instructions supplied with the sensor.

**NOTE: Never decrease the sensitivity or pattern so it will not detect slow moving traffic.**

- The motion detector time delay should be set to a minimum of two seconds cumulative with C2150 control before the door begins to close. Three seconds or more is recommended by Horton Automatics.

## 11. SAFETY BEAMS

Horton Automatics' sliding doors are sold with dual safety beams as standard equipment. The doors are factory prepped and wired.



**NOTE:**  
If APEX is installed only one beam is required at 24" to 26".  
If MOTION DETECTOR is installed two beams are required at 24" at 48"

**NOTE:**  
Dimensions taken from face of sliding door each side.



## 12. SAFETY CONSIDERATIONS

To comply with Underwriters' Laboratories Safety Requirements (UL 325), ANSI A156.10 and pedestrian safety, horizontal sliding doors must be adjusted within the following requirements and guidelines.

### CLOSING SPEED

- At no time should the door close faster than 1ft per second or close completely in less than 3 seconds for door panels weighing up to and including 160 lbs 73kg.

### CLOSING FORCE

- The force required to stop the door should not exceed 30 foot pounds (133N).

### REVERSING

- The reversing circuit of the C2150 must be adjusted to reverse when a maximum force of 28 foot pounds (38N) is exerted to prevent the door from closing.

### TIME DELAY

- The time before closing should never be less than 2 seconds. 3 seconds or more (after activating zone is clear) is recommended by Horton Automatics.

For set-up and trouble-shooting

**SEE HORTON PUBLICATION H202 FIELD QUICK START INSTRUCTIONS.**

**NOTE: After adjustments are completed be sure the faceplate is secured with screws into the support brackets.**

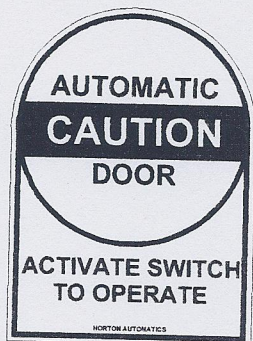
### THRESHOLD PROTECTION

- All sliding doors should be installed with a minimum of two presence detectors in the threshold area. Horton Automatics sliding doors are supplied with dual safety beams.
- Motion detectors must be set up as per section 10 on previous page.

## 13. DECAL APPLICATION

### C7280

Place on entry side of slide panels on doors using pushbutton entry. To meet knowing act ANSI standard.



### C1630-2

For 2-way traffic place one on each sliding panel. For 1-way traffic use C1631-3 (sent with unit)



### C1631-3

For 1-way traffic place the side shown toward control side of door.



### C1690-1

Daily safety check. Place near on / off switch at eye level.

### C1634

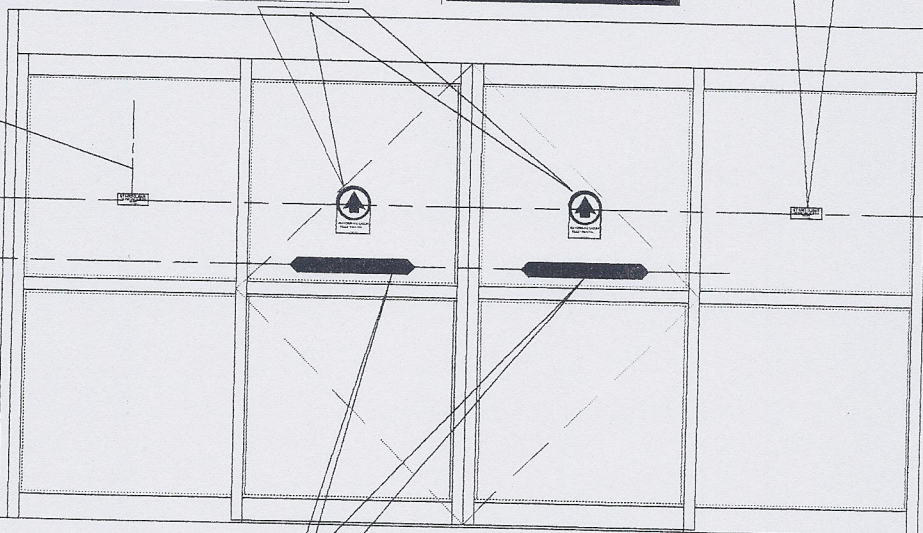
Place on sidelites. (sent with unit)



Locate decals on the center line of each panel at elevation shown.

58"(1473)  
± 5"(127)

48"(1219)



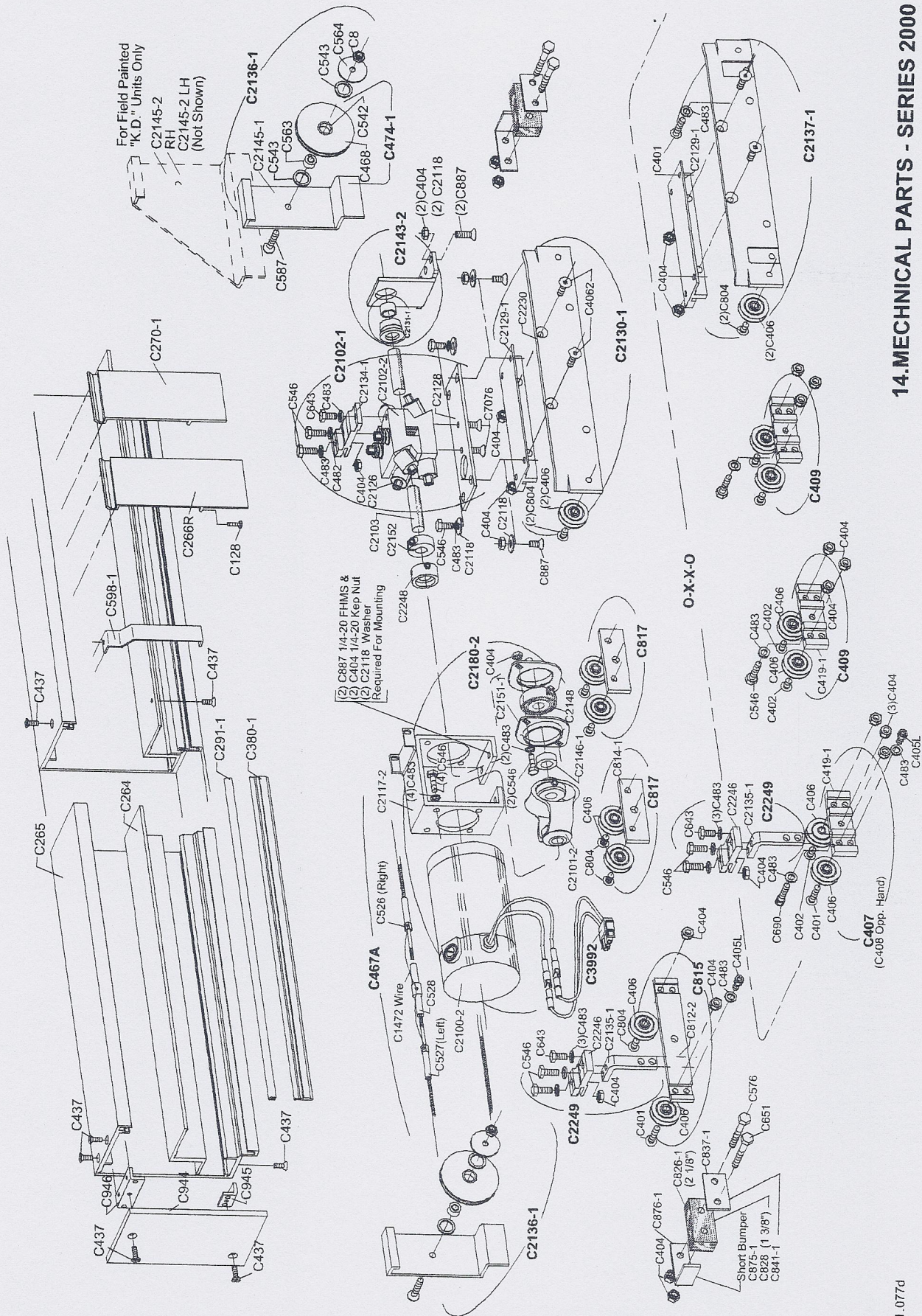
### C1682

Place on exit side of breakout panels. (sent with unit)

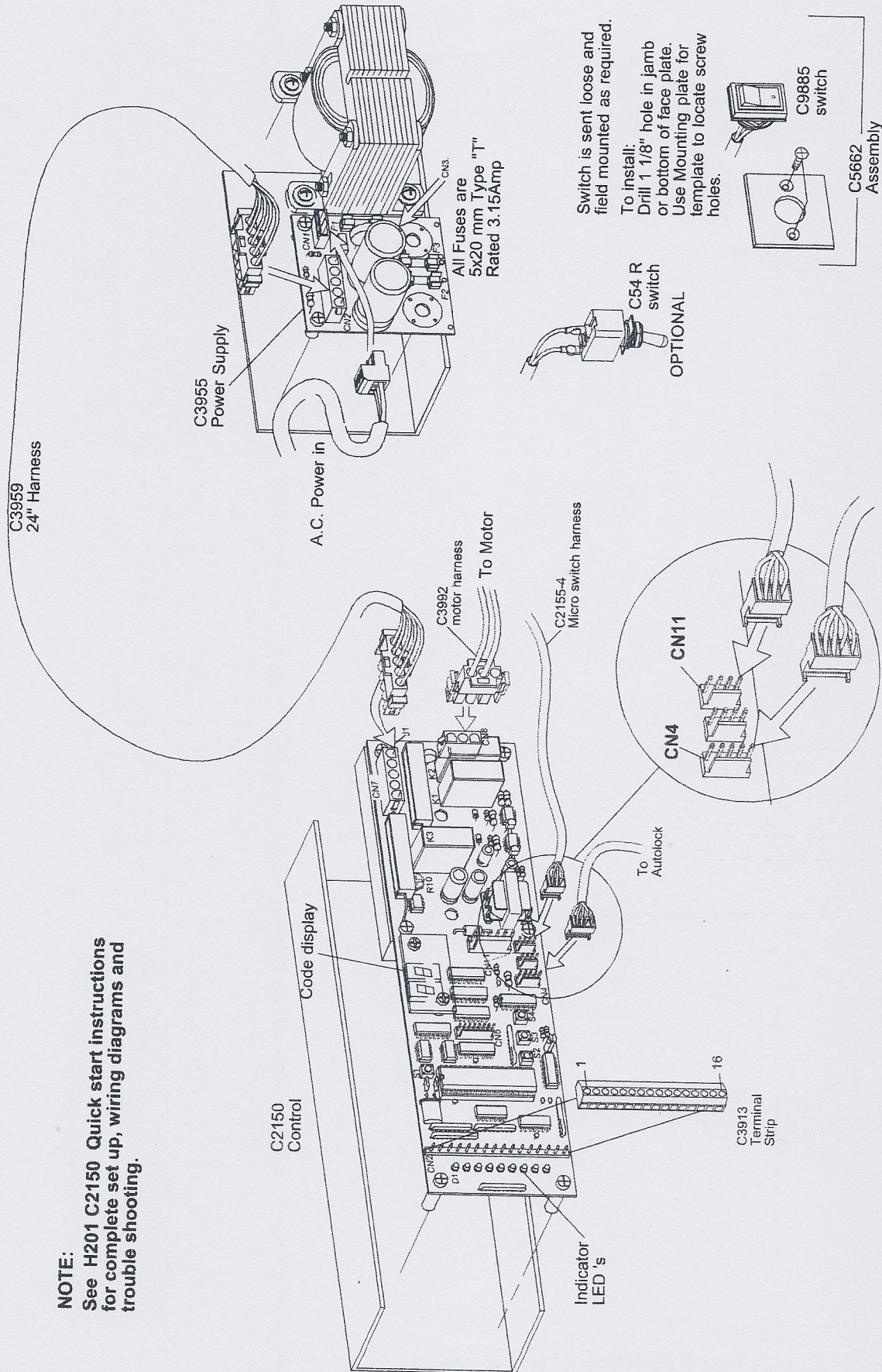
**IN EMERGENCY PUSH TO OPEN**



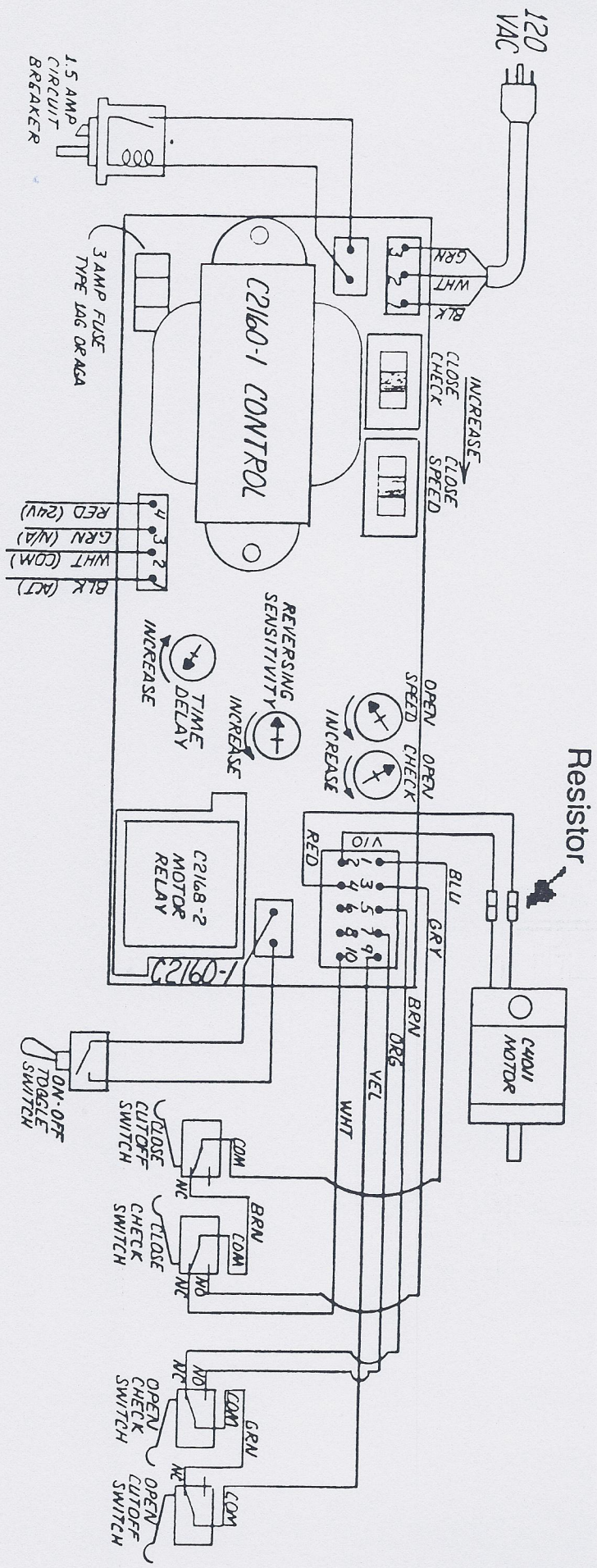
## 14. MECHANICAL PARTS - SERIES 2000













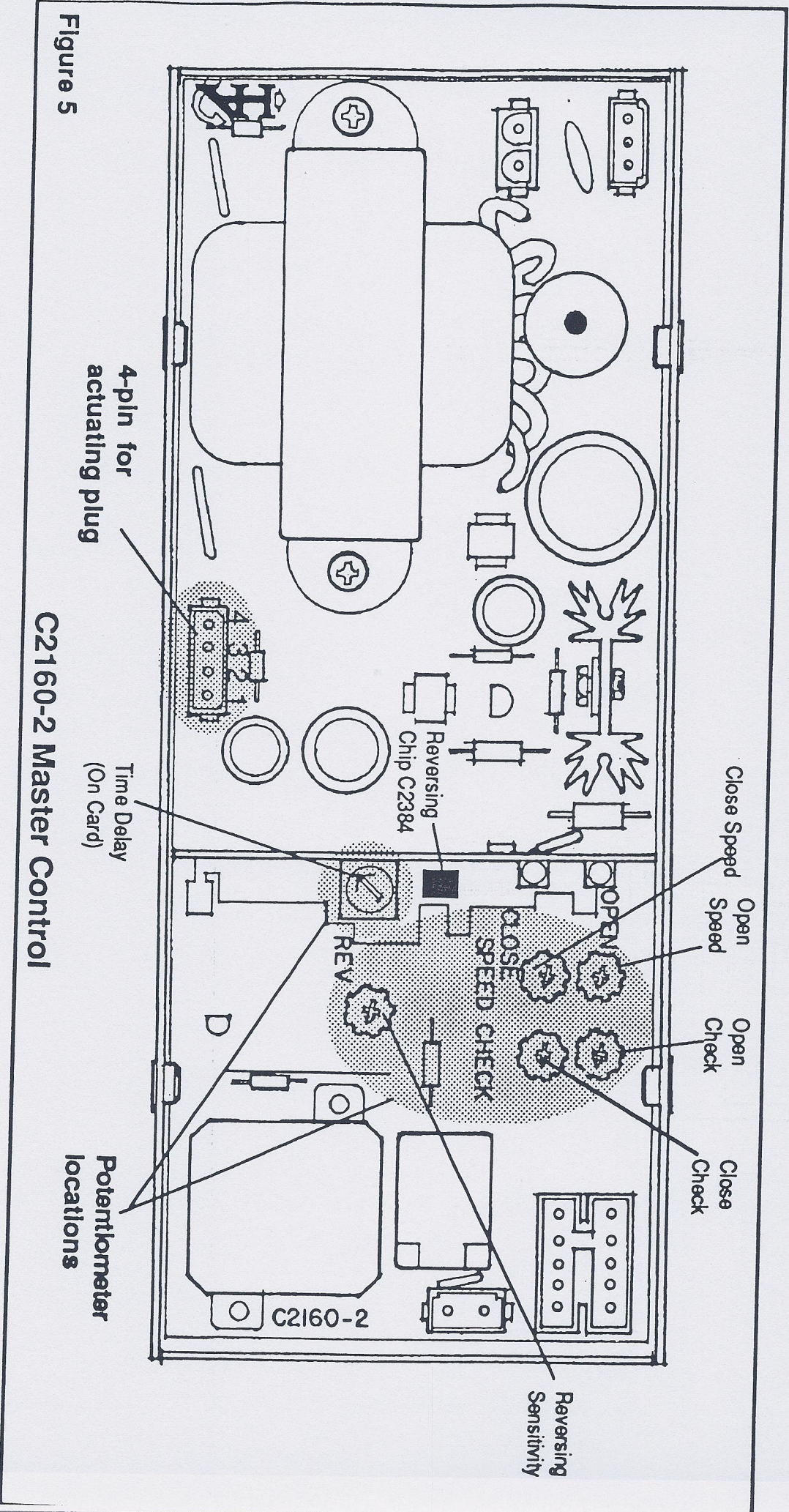
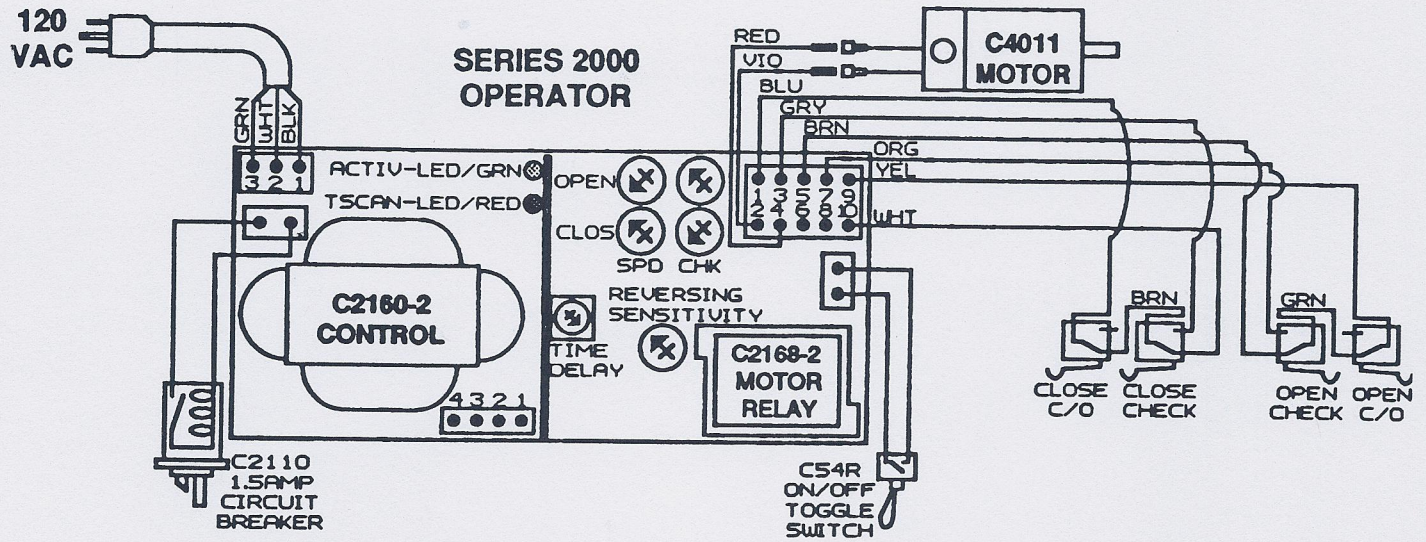


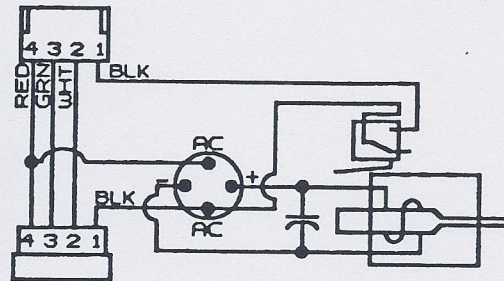
Figure 5

C2160-2 Master Control

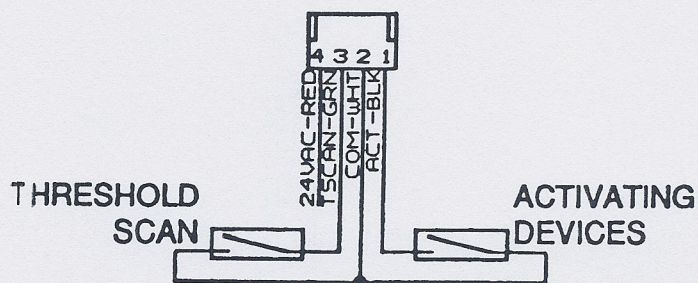
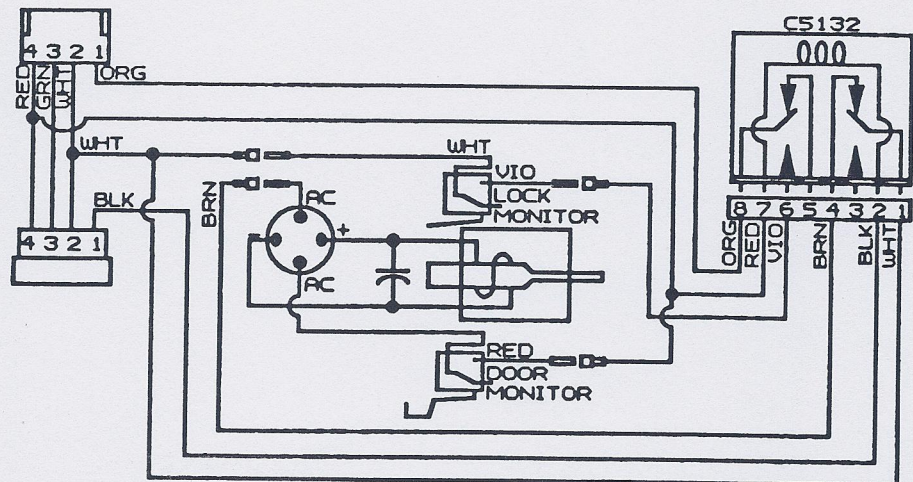




**C2176-2  
FAIL-SECURE  
AUTOLOCK**



**ALTERNATE  
C2196-2  
FAIL-SAFE  
AUTOLOCK**







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Product equipment depicted in the various figure drawings are approximate and for illustration purposes only. Consult manufacturer for detail product specifications. Horton Automatics reserves the right to improve the product and change its specifications without notice.



# Series 2000 Automatic Sliding Door

## Service Manual for doors manufactured since 1991





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# **Series 2000 Automatic Sliding Door Service Manual**

**Doors Manufactured Since 1991**

Safe and reliable performance are important factors of Horton Automatics products. For the product to perform safely and properly, it must be serviced by a qualified technician – experienced, trained and knowledgeable of related safety requirements and of Horton Automatics products.

Horton Automatics offers extensive training to its distributors to ensure our products are installed and serviced by authorized technicians, in a professional, efficient manner.

Only authorized parts should be used as replacements. Horton Automatics designs and builds products to provide low cost of ownership. To ensure this low ownership cost, the distributor must offer a rebuilding program in addition to selling new parts when required.

This service manual addresses most of the common items that can cause a door to malfunction.

In addition to this service manual, the following associated material must also be studied:

- Installation Instructions G200

- Service Training Tape (VHS)

- Periodic Service Bulletins

- H1010 Training Manual for Automatic doors.

- H1020 Manual for using voltmeter to test Horton Automatics products.

- H200 Series 2000 Operator Service Manual 1975-1994

## **Tools Required to Service Equipment:**

- Standard Hand Tools—screw drivers, wrenches, pliers, etc.

- V.O.M Meter

- Spring Scale

- Service Technician's Pushbutton Tester

After the service technician has completed repairs, the entire sliding door system should be inspected for compliance with ANSI A156.10 standard for power operated doors.



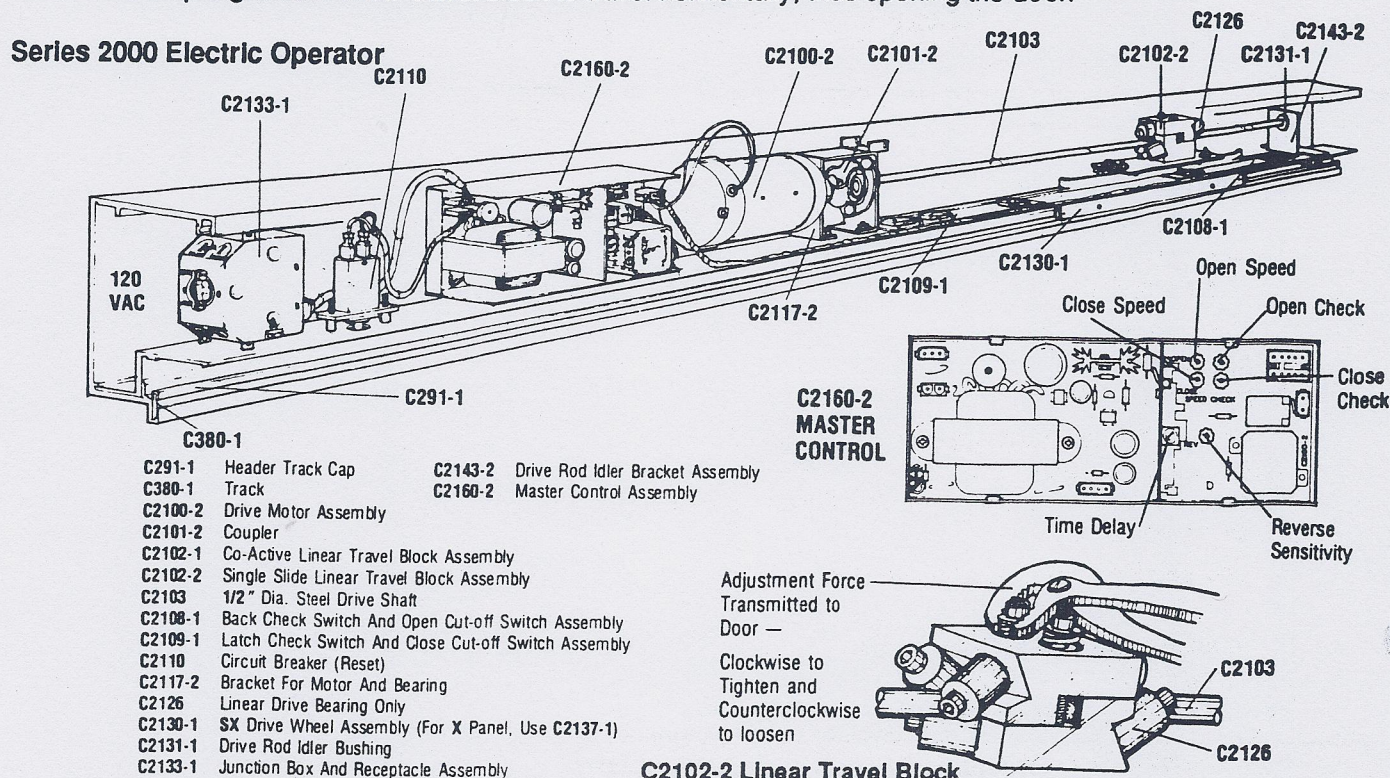


## I. Series 2000 Electric Operator

### 1. How it Works

Three main modules compose the Series 2000 operator – a DC high performance permanent magnet motor, a C2160-2 master control and a linear travel block.

The solid state C2160-2 master control provides the electrical circuitry necessary to open and close the door. When the actuating switch (mat, motion detector etc.,) signals the master control switch to open the door the motor is started. The motor turns the threadless shaft (spanning the full length of the door's travel) which in turn drives the spring loaded linear travel block to travel horizontally, thus opening the door.



The linear travel block system consists of two parts: a threadless drive-shaft and a linear travel block. The block is comprised of two sections and contains six freewheeling rollers, three at each end, that are angled relative to the long axis of the drive-shaft and spring-loaded against it. As the shaft turns, the rollers describe a helical path along the shaft and move the block forward or backward depending on the direction of rotation.

The speed at which the block travels along the drive-shaft is governed by motor RPM rotation of shaft.

The amount of thrust developed depends on the force exerted on the drive-shaft by the angled rollers. This force is governed by the adjustable springs that compress the two halves of the block together.

Overload protection is completely automatic. When a resisting force opposing the linear travel block equals or exceeds the preset maximum thrust rating of the unit, the rollers simply continue to turn but produce no forward motion, slipping in place instead. This "free wheeling" effect causes no damage whatsoever to components, shaft, motor - or most importantly of all, pedestrians using the door. The closing force is limited to 30 lbs. to stop when properly maintained and adjusted to Horton Automatics recommendations.

Operators manufactured after 1-83 include a reversing circuit in the operator's master control that will reverse the door during closing when a force of approximately 15 lbs. is exerted to prevent the door from closing. Series 2000 operators manufactured prior to 1-83 can be updated with the reversing control.

A series of switches are installed on the operator in the line of door travel. As the door reaches a selected position, one of the switches signals the box to change motor speeds and the door slows down to a controlled stop. At full open position, it contacts a limit switch that cuts off the motor. (Note: Some units manufactured after 1992 are microprocessor based with an encoder – not limit switches.)

The door remains open as long as the actuating switch is occupied. After the adjustable time delay expires the motor reverses its direction of rotation and the travel block closes the door. The same limit switch arrangement as described in opening takes place. If the door is recycled, it will instantly reopen. Shock is removed from the recycle by the correct amount of tension on the linear travel block springs.



## 2. General Information

### Series 2000 Operator

Horton Automatics has been manufacturing the Series 2000 sliding door operator since 1975. It is a member of the electromechanical slide door operator family. The Series 2000 is one of the easiest operators to service. Operator failure can usually be isolated in one of two areas – Mechanical or Electrical. Mechanical failure will usually be something such as a broken coupling or a defective bearing in the linear travel block. Mechanical failure can usually be found with a visual inspection of the equipment or by listening for an unusual noise. This service manual does not go into great detail to explain mechanical repairs because in most cases they are obvious or covered by service bulletins. Electrical problems are a little more complex. Therefore, the majority of this manual is devoted to electrical repairs.

The Series 2000 Operator was designed so the majority of the electronic components are included in the C2160-2 master control. Only a few of the electrical components are outside the master control – limit switches, the motor and wiring. The service technician can service the door by simply replacing the master control. Then the defective master control can be returned to the shop for repairs by someone experienced in working with electronic components or returned to Horton Automatics for repair.

To determine which section of the operator system is causing the problem, do the following:

- a. Analyze what the door is **not** doing, i.e., won't open, won't close, won't operate in either direction, etc. If the operator is functioning, merely listening to or observing the operator as it moves through its cycle may help you diagnose the problem.
- b. If the operator is not functioning, check to be sure the unit has electrical power.
- c. Whenever a door is held open in the energized position, the actuating or safety device is probably the cause of trouble.

### C2160-2 Master Control

A majority of C2160-2 master control problems can be repaired by the authorized distributor and the control will not have to be returned to Horton Automatics for repair. This is the most economical approach to correcting the problem. The recommended job site repair is to exchange the master control. Several things can cause master control problems. If one specific door continues to have master control problems, the following information will be of help.

- a. **High degrees of line voltage fluctuation.** The unit requires a constant voltage of between 110 and 125 VAC. Inquire if other electrical items in the building have had problems. This may give you a hint that the incoming electricity is causing problems.
- b. **C-2102 travel block adjusted too tight.** This tends to put an electrical strain on the system, particularly during recycle of heavy doors.
- c. **Internal wiring and connection to limit switches must be tight and conducting properly.**  
For repairs to be made at the distributor's shop, it is best to have a test rack constructed that will at least simulate the cycles in the operator underload.

Installation Instructions G-200 and ANSI A156.10 1991 are important components of these repair instructions. The service technician should be familiar with the requirements of ANSI. In the event the door being repaired does not measure up to those requirements, he should so note this on his work ticket and call it to the attention of the owner.





## II. Trouble Shooting Information

The following service hints should be followed to troubleshoot the Series 2000 electric sliding door operator. It is important to note that the operator includes both a full open cutoff and full close cutoff switch. The motor should be cut off in both positions and not be allowed to operate in a stalled position.

**Be cautious! High voltage is present in the operator and limit switches, and it is possible that the door could start operating at any time.**

**When changing components, always disconnect power.**

**If any of the following statements apply to your problem, proceed to appropriate tests (#1, #2, or #3).**

### A. Door closes, but won't open.

*Proceed to #1. Opening*

### B. Door opens (is hung open) but won't close. *Proceed to #2. Closing*

### C. Door won't open or close.

1. Check incoming power at outlet box in header.
2. Check circuit breaker
3. Check 24 VAC between #2 and #4 of the 4-pin activating plug. If it is bad, replace C2160-2 Master Control.

#### #1. Opening

##### a. Failure to start opening

- 1) Lack of 120 VAC voltage to the operator.

Be sure the C2110 circuit breaker and the C54R ON-OFF toggle switch are in the on position. Incoming electrical voltage can be checked at the receptacle installed in the header. See C2133-1 Electrical Receptacle Figure 2.

- 2) Check for defective 1.5 amps circuit breaker. Use your OHMS meter to test. With the breaker button depressed, it should read a closed circuit. Replace if defective.

- 3) If the circuit breaker tests good, check the toggle switch (ON-OFF), SO or SX cutoff switches if supplied. These should show a closed circuit when activated.

- 4) Failure in the actuating circuit.

If there is operating power, insert a push button test switch

(Figure 3) into the plug socket in the C2160-2 and depress the switch or use a jumper. The green LED should illuminate. If the door now functions, look for loss of electrical contact in the 4-pin plug actuating circuit (Figure 5), mats, motion detector, etc. or wiring to the switch. If the door does not work with this test, exchange the C2160-2 master control. If the door still does not work, proceed with the following tests.

- 5) If the door works in the closing cycle but not the opening, check for a defective opening cutoff switch or possibly the arm is bent improperly.

- 6) Check for physical bind in the door. Do this by manually operating the door with power off.

- 7) If the motor runs but the door does not move, the C-2102 travel block (Figure 4) may not have sufficient tension. See page 9 for Final Operating Adjustments.

- 8) Check for a defective motor. If voltage 20-100 VDC is applied to the motor and it will not attempt to rotate, motor is defective.

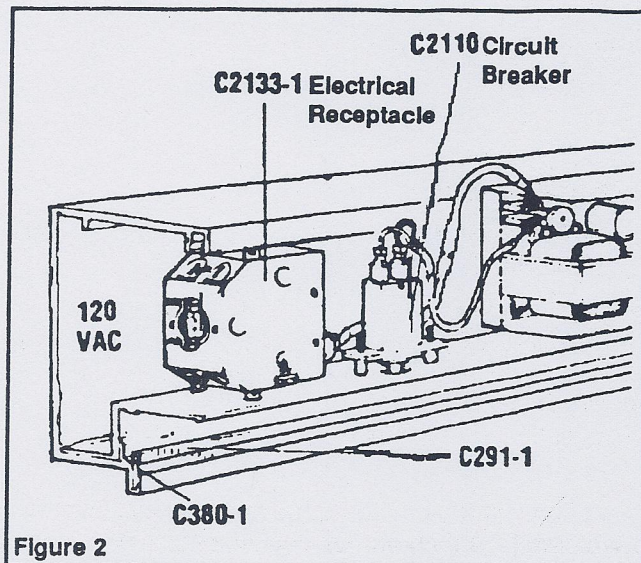


Figure 2

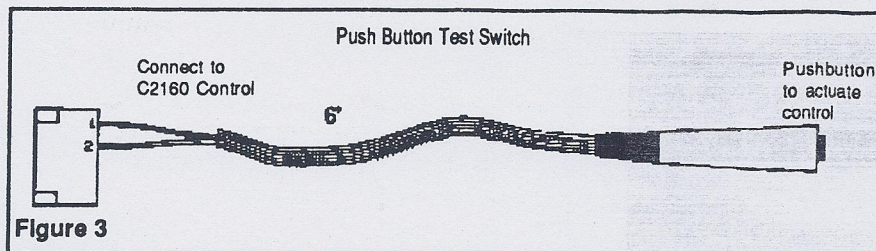


Figure 3

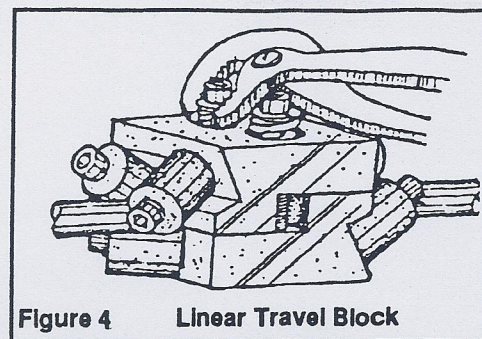


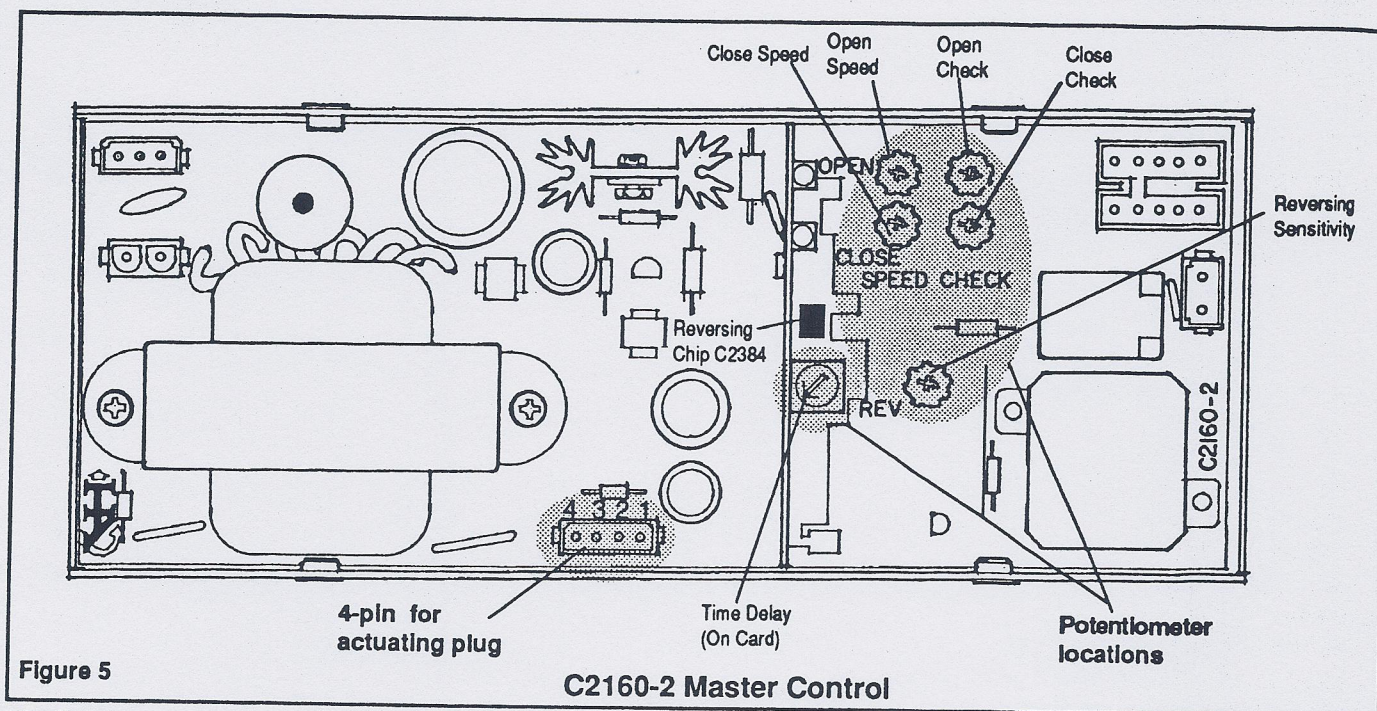
Figure 4

Linear Travel Block



## b. Opening too fast or too slow

1. Adjust at Potentiometer locations (Figure 5) on C2160-2 master control. Check limit switches and connecting harness. It is preferable to check switch with VOM.
2. If the door opens under full speed without slowing down then trips the circuit breaker, the master control is defective.



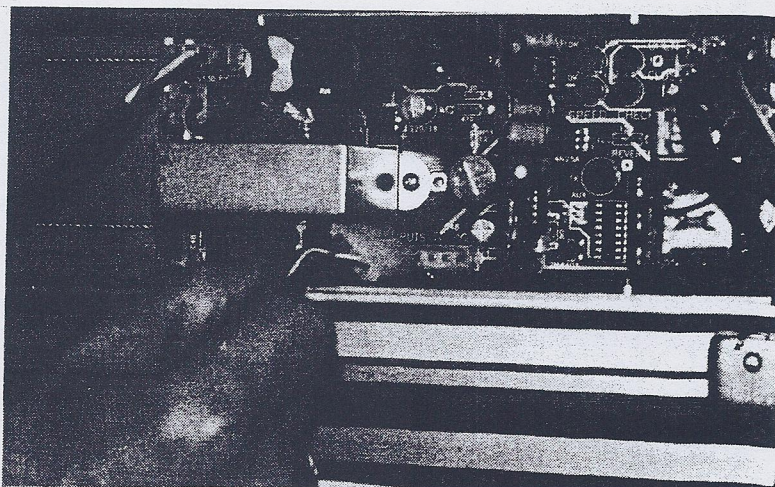
## #2. Closing

It is important that the closing speed and closing force be adjusted in accordance with the instructions in Final Operating Adjustments on page 9 and Safety Consideration on page 10.

### a. Failure to start closing If either the green LED or the red LED Is Illuminated

The reverse operation must take place for the door to close as when it opened with the exception that the actuating and safety signal must be removed.

1. Check voltage.
2. The most common cause of a door failing to start closing is the failure of or a short in the 4-pin plug actuating switch (*mat, motion detector, safety beam etc.*). Unplug the 4-pin plug at the C2160-2 master control; any LED that is illuminated should now be off. (See Figure 6) If the actuating device is the problem, the door should close after the time delay expires.
3. Be sure the closing cutoff switch has not prematurely cut off the operator.
4. Replace C2160-2 master control.
5. Check for physical bind.
6. If the motor runs and the rod turns, the problem could be in the tension set on the C2102 travel block. Adjust tension in accordance with Final Operating Adjustments on page 9. **This is an important safety adjustment.**



**Figure 6**

## b. Closing too fast or slow

1. Adjust at Potentiometers (Figure 5) on C2160-2 master control.
2. Check limit switch for proper operation.

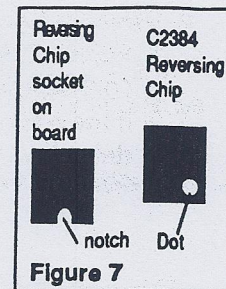




### #3. Reversing

The door should reverse when stalled. If it does not, adjust the Potentiometers (Figure 8), but if it still does not reverse, replace the C2384 reversing chip; it plugs in. **Be sure to match notch or dot on chip with notch on C2160-2 board.** (See Figure 7) Check closing force with reverser off; the clutch should be set to generate from 25-28 lbs. closing force. If the linear travel block is too loose, the reverser will not react properly.

*There are of course other items that can cause unsatisfactory door operation. If the previous tests did not correct the situation, you will have to rely on your deductive thinking and visual inspection to correct the problem.*



### III. In-depth Analysis/Repair

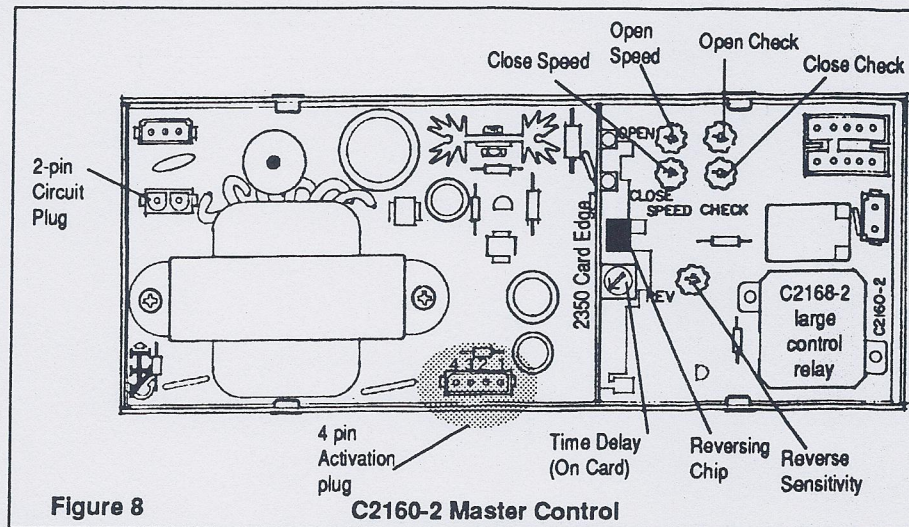
Also consult H1020 instruction manual "How To Use Voltmeter".

The C2160-2 contains two separate circuits, a high voltage (120V) system to power the DC motor, and a low voltage (24V) control circuit.

Troubleshooting the C2160-2 master control is divided into two stages – one for the 24V circuit and the second for the high voltage power circuit. The following procedure is suggested.

**Extreme caution should be observed when testing for high voltage (120V) and an electrical shock is always possible and can be dangerous.** Before repairs begin,

study the electrical drawings (Page 15) to familiarize yourself with the wiring layout.



#### 1. Low Voltage Test, Including Check of External Activation Device

Activate the circuit of the C2160-2 by shorting between pins 1 & 2 of the 4-pin plug (Figure 8) or by connecting the Service Technician's pushbutton tester. If the green LED illuminates or the door moves, more than likely the low voltage system is functional and the low voltage test can be skipped and the problem can be assumed to be in the power circuit.

##### a. Test Activating Switch

If the door does not move when the circuit is activated, remove the 4-pin plug (Figure 8) and using a small wire jumper, short between the terminals 1 and 2 on the left side of the C2160-2 or insert the Service Man's Friend tester. If the door begins operating, the problem is in the activating switch circuit. (Mats, motion detector, control wire, etc.)

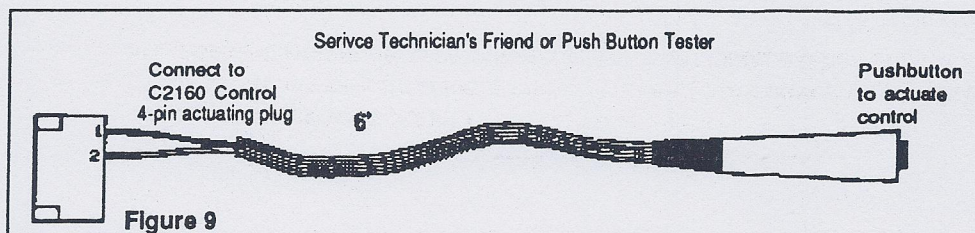
This tester will connect directly to any C2160-2 slide door master control, any C7160-3, C4160, or C4160-1 swing door control, or any C8160-3 window control.

Use this handy device to:

1. Adjust open speed.
2. Adjust close speed.
3. Adjust time delay and reversing sensitivity.

4. Eliminate existing

activating devices in order to determine if they are the cause of malfunction or improper operation.



##### b. Test 24 VAC Circuit Inside C2160-2 Master Control

If no door action is observed, listen closely for a relay "click" when the actuating signal is removed. If the "click" is heard, adjust the time delay (Figure 8) counter clockwise to minimum and when the jumper is inserted a "click" should be heard, another "click" should occur when the jumper is removed. If this "click" is not heard, visual inspection (no contact movement, burnt contact, etc.) can determine whether the large control relay C2168-2 (Figure 8) is defective. This relay plugs in so it is easy to inspect or replace.



### c. Check Internal 24 VAC

- 1) Check the 24 VAC circuit by measuring the voltage between pin 2 and 4 of the 4-pin plug (Figure 10, B).

A reading of 18-22 VAC should be obtained. If less than 18 volts is observed, turn off the circuit breaker, unplug the 4-pin activating plug, wait 10 seconds for the posistors in the control to cool down. Turn circuit breaker back on and retest for voltage at pins 2 and 4 of the 4-pin plug. If 18-22 volts is now present, there is probably a short circuit on pin 4 of the activate circuit. (wire or activating device)

If no voltage is observed between pins 2 and 4 of the 4-pin plug, and the high voltage checks O.K. the C2160-2 is defective and should be replaced. If a reading of 18-22 VAC is observed in this step, but door still will not operate proceed to test toggle circuit.

### d. Check toggle circuit

Remove two pin toggle plug and listen for click on motor cut-off relay. If click is heard, toggle circuit is probably functioning. If no click is heard or to be certain toggle circuit is O.K. Place a jumper from pin one in the toggle plug on the C2160-2 control to pin 2 of the same plug. Motor cut off relay should definitely click now and if problem is in the toggle circuit door will now begin to work. If it does, there is an open circuit in the toggle switch, SO or Sx cutoff or the associated wiring. These

switches should show a closed circuit when the toggle switch is on and the SO/SX panels are in place.

## 2. High Voltage Test

- a. With voltmeter in AC voltage range, check incoming power in the outlet box and if power is present there, check at pins 1 and 2 of the 3-pin incoming power plug on the C2160-2 control.
- b. If power is present at pins 1 and 2 of the 3-pin incoming power plug on the C2160-2 master control, disconnect the circuit breaker from the 2-pin plug (Figure 10) marked BRKR on control board. Put meter in OHMS range and check breaker and breaker lace for continuity.

### c. Test Limit Switches for Continuity (C2160-2 Is 24 VAC)

Turn off the circuit breaker and push the door open, then turn the breaker back on. If the door does not close or does not latch check, check the latch check switch and the close cutoff for a bent switch arm, defective switch or faulty wire contact.

Note: C2160-2 master controls made after October 1991 include a time cutoff feature that cuts off the operation after 15 seconds. After this time delay, the operator will not drive shut if pushed open manually as earlier models would do.

### d. Test Control Potentiometers

If the fault is not found in test III #1, a on PAGE 6, the problem is probably one of the control Potentiometers (Figure 10, C) causing the erratic action, i.e., closing speed Potentiometer, latch check Potentiometer. Actuate the door and check the opening action in the same manner.

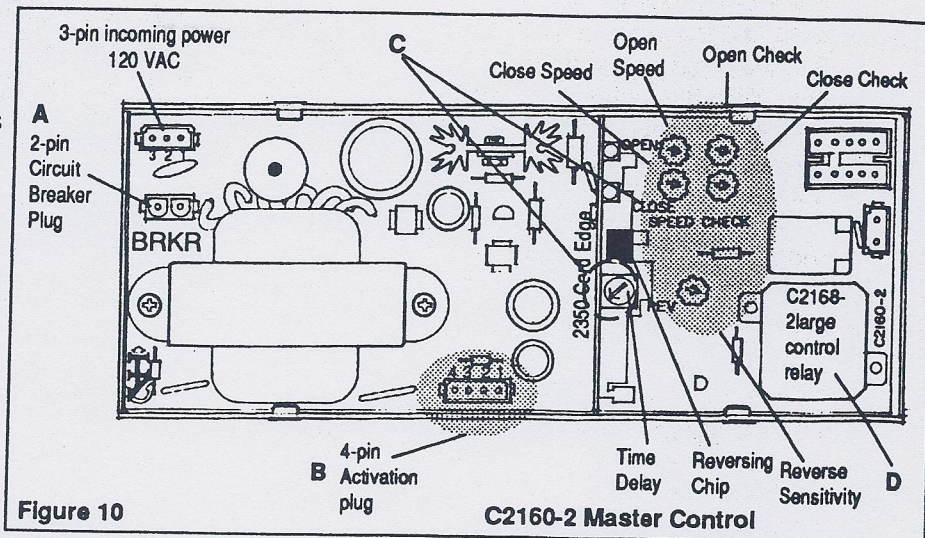


Figure 10

C2160-2 Master Control

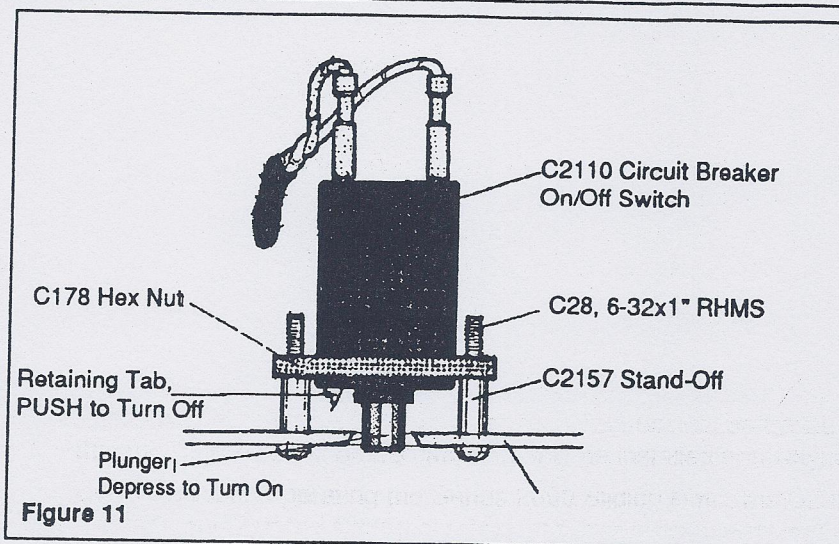


Figure 11





**e. Check to rule out a Short In C2160-2 master control**

Place one probe to the box case and the other probe to pin 3 of the 3-pin high voltage plug. With the meter on OHMS RXI, a short circuit should be shown. Pins 1 and 2 should show an open circuit to pin 3. If pin 1 or 2 has a short to pin 3, the C2160-2 Master Control should be replaced. (Figure 12)

**f. Test Large Control Relay**

If everything appears to be functioning normally, but the door operates erratically or not at all, examine the contacts on the large control relay (motor) (Figure 12, D) for excessive contact wear or carbon buildup. It is a plug-in and can easily be replaced.

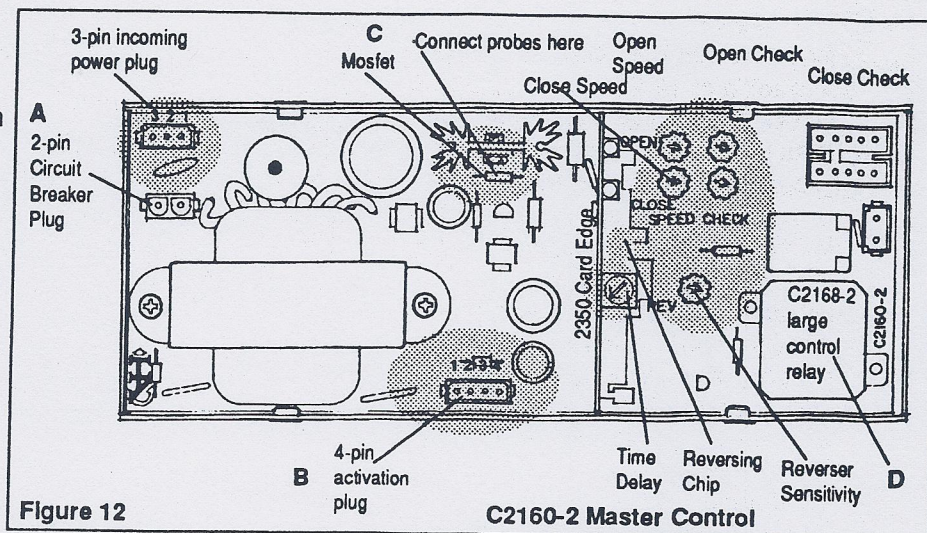


Figure 12

C2160-2 Master Control

**3. C2160-2 Master Control Information**

- a. A power Mosfet provides motor control. The best method for determining if this part of the control is defective is to note if the door slams open or closed under full power and trips the circuit breaker. To test, do the following:

With power off, set the OHM meter to 200 OHM and apply test probes (Figure 12, C). If no recording, it is good.

**General Information:** To prevent the C2356 8-pin card edge connector from being damaged in shipment, the C2360 circuit board card is removed from the card edge connector before shipment.

If the control is shipped individually, the C2360 circuit board card will be removed when the control is being boxed.

The C2360 circuit board card is wrapped separately, but it is in the same box with the control.

When a control is shipped installed in the header, the circuit board card is removed after the header has been tested and just before the cover is installed. The C2360 is wrapped and placed inside the header.

The installer should be sure to install the C2360 circuit board card before starting the operator. It should be noted that the C2360 circuit board card can only be installed one way so it is difficult to put it in incorrectly.

**Caution:** When operating the Series 2000 Sliding Door, the C2360 circuit board **must** be plugged into the C2160-2 Master Control. If the C2360 circuit board card is not plugged in, the door will drive open or closed at full speed with absolutely no control over closing speed.

Late in 1991 a motor cutoff timer was added to the C2160-2 master control. If there is a physical bind in the door or if the open or close cutoff switch is not being tripped, this timer can prevent failure of the control and/or motor due to continued attempts to drive the door in the open or close direction.

If the door is opened manually (slide), it will not close on its own until after an activation signal has been presented. Once an activation signal has been given, the doors will then go full cycle and close.



## IV. Final Operating Adjustments

### 1. Before Turning Unit On

- Operate door manually to be sure there are no restrictions.
- Be sure each switch; close cut-off, close check, open check and open cut-off are operating properly. Listen for the clicks. Open cut-off should trip approximately 1/2 inch before door strikes open bumper. Close cut off should be adjusted to trip just slightly before full closed.  
The 'SX' and/or 'SO' panels equipped with cut-off switches must be connected in the toggle switch circuit that engages the motor to the control.

### 2. Turn On Unit

Depress plunger on circuit breaker and then turn on the toggle switch that engages the motor to the control.  
(Figure 13)

- Activate door.** Units have been tested at the factory but are not factory set to perform to specific job requirements, field adjustments may be necessary. The proper adjustment procedures are indicated in #3 below and potentiometers are labeled on the C2160-2 master control. It is important to note that the potentiometers on the C2160-2 master control adjust clockwise to increase speed, counterclockwise to decrease speed.

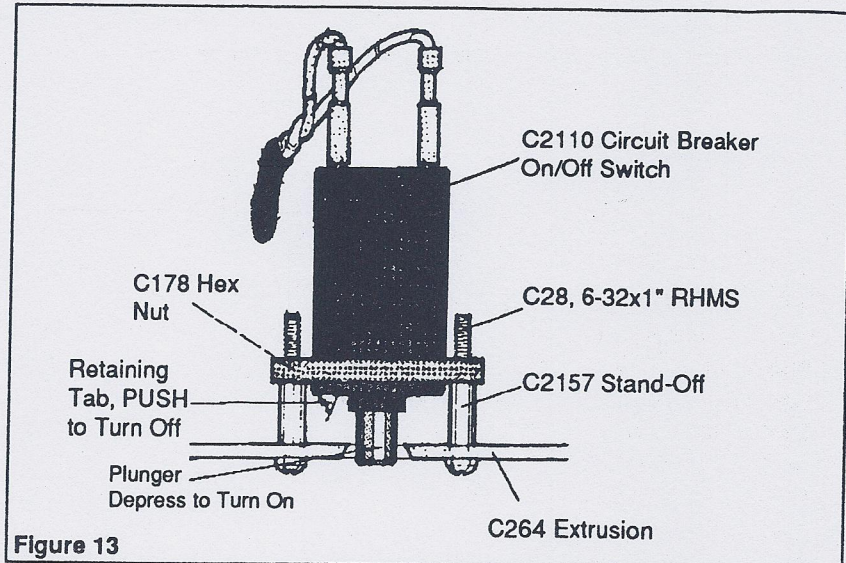


Figure 13

- With the reverser sensitivity is turned all the way down (fully counterclockwise), the force required to prevent door from closing should be adjusted to 28 pounds and not exceed 30 pounds. This should be checked at several points in the closing cycle by stopping the door and attaching a spring scale. The scale reading should be 28 pounds and not exceed 30 pounds. If it does, the closing force must be reduced by adjusting the screws on the top of the linear travel block C2102. (Figure 14)

*Caution: Adjusting closing force to less than recommended force can affect the reverser sensitivity.*

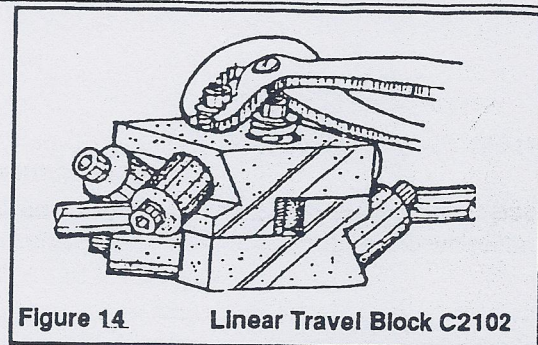


Figure 14 Linear Travel Block C2102

### 3. Adjustment Notes

- Before installation of the C2160-2 master control in a Series 2000 Electric Sliding door, it is important that all potentiometers (Figure 15) be adjusted to the lowest setting by turning them counterclockwise.
- Felts in the linear travel block should be lubricated with 10W-30 motor oil to leave a thin layer of oil on the drive rod.
- Adjust the open speed, open check speed and open cut-off switch to ensure the door consistently moves to a full open position.
- Door closing speed should be adjusted to no more than one foot per second or never faster than 3 seconds; i.e., a 60" biparting net door opening cannot close faster than 3.0 seconds 2" from full open to 2" from full closed.

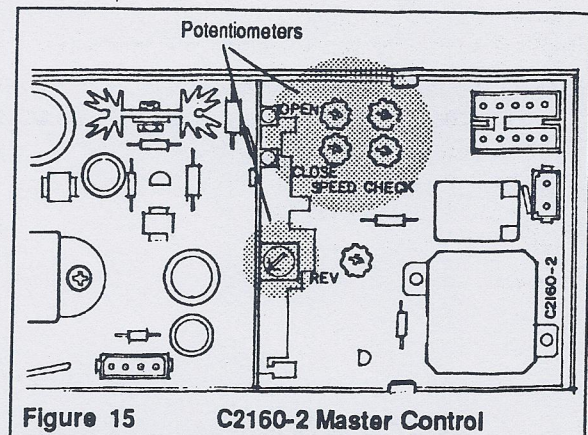


Figure 15 C2160-2 Master Control





e. Be sure the linear travel block is adjusted to 28 pounds and no more than 30 pounds of closing force. Recheck closing speed after closing force is adjusted. (Figure 16)

f. Set reverse sensitivity:

1. Adjust sensitivity fully counterclockwise (Figure 17).
2. Set "close speed" and "close check" to desired settings.
3. Stop door in its closing cycle before it reaches the close check switch.
4. Slowly adjust sensitivity clockwise until door reopens.

Note: Any readjustment of close speed and/or close check requires readjustment of reversing sensitivity.

For safe operation, door must be adjusted in accordance with ANSI Standard A156.10 and Underwriters Laboratories Standard UL 325.

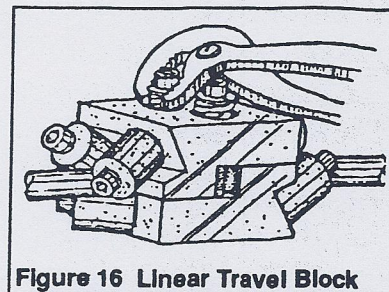


Figure 16 Linear Travel Block

## V. Safety Considerations

Horizontal sliding doors must be adjusted within the following requirements to comply with Underwriters Laboratories Safety Requirements (UL 325) and ANSI A156.10-1991. The doors should meet the following guidelines.

1. **Closing speed should be set as slow as conditions will allow.** At no time should the door close faster than 1 foot per second or close completely in less than three seconds. Setting the door for a slow closing speed is essential for pedestrian safety as it reduces the kinetic energy (momentum) of the moving panel and also provides reaction time for the pedestrian to respond to the moving panel.
2. **Closing force should be set as low as possible for existing conditions.** At no time should it ever exceed 30 lbs to stop the door.
3. **Time delay before closing should never be less than 2 seconds.** A three (3) second or longer setting is strongly recommended by Horton Automatics when motion detector actuation is used and can require 5-10 seconds if remote mounted push switches are used.
4. **The reversing circuit of the C2160-2 must be adjusted to reverse when a maximum of 15 lbs. is exerted to prevent the door from closing.**
5. **Horton Automatics recommends installing a sliding door package with a minimum of two presence detectors in the threshold.** This can be accomplished with either a C1304 system with two safety beams or a system with one beam and a Threshold Scan.
6. **Motion Detector Patterns must be set as large as the net slide opening.** The pattern should always be capable of detecting within 5" of the door face. The detector must be capable of detecting slow traffic and the time delay set for a minimum of three (3) seconds total.

*Do not sacrifice the detector pattern size because of cross traffic nuisance trips.* Suggest alternate methods such as a barrier or perhaps more identifiable areas such as a mat. If routine traffic approaches the door at an acute angle, some type of "artificial barrier" should be placed to cause the traffic to enter the detector pattern perpendicular to the door. However, the "artificial barrier" should not inhibit the emergency egress breakout.

### 7. Decal Application (Per ANSI Specifications)

A set of green decals with arrows on both sides and words "AUTOMATIC DOOR" are included with each shipment and should be installed. They are to be applied to each sliding door panel with the arrows pointing up, on a centerline of 58" plus or minus 5". If one-way traffic is desired, use a decal with a black arrow on one side and DO NOT ENTER on the other side. If older doors are being serviced and they do not have Horton Automatics' current decals, update them with the new decals. See page 16.

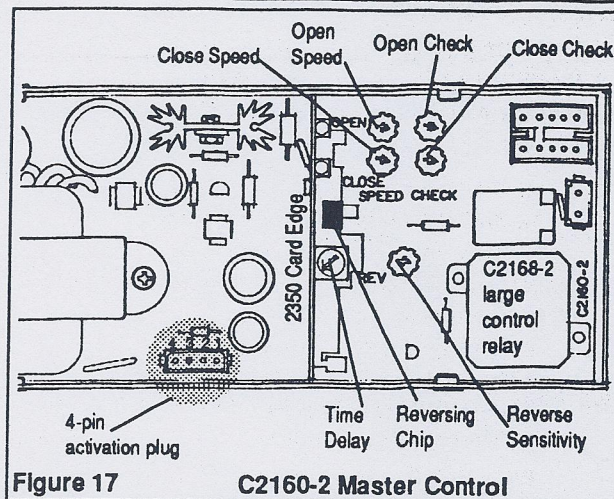


Figure 17

C2160-2 Master Control



## VI. Other Service Related Items For Sliding Doors

### 1. Alignment of the Operator Assembly

- Be sure the **C2100-2** motor is parallel to door— stand under the header, look up at motor, and check to see if it is parallel with the edge of header.
- Loosen the mounting bolts of the **C2117-2** motor mount bracket, *if so equipped*.
- Loosen the front two 1/4"-20 flat head bolts and starwasher nuts that attach the **C2102-1** linear travel block to the **C2130-1** wheel carriage. Loosen the back two 1/4"-20 hex head bolts that attach the linear travel block to the wheel carriage, this will allow the block to shift positions.
- Slowly and fully open the door allowing the linear travel block to align itself with the end rod bearing assembly. With the door fully open, tighten the front two flat head bolts and starwasher nuts that attach the linear travel block to the wheel carriage and tighten the back two hex head bolts that attach the linear travel block to the wheel carriage. Doing this positions the linear travel block in the center of travel of the end rod bearing assembly.
- At the motor end with the door fully open, loosen the **C2151-1** flange bearing. Slowly and completely close the door. Tighten the flange bearing, this step aligns the motor bearing assembly with travel block assembly. Tighten the **C2117-2** *if so equipped*.
- Loosen the mounting bolts of the **C2143-2** secondary shaft holder (*if so equipped*) and open the door to the full open position. Tighten the mounting bolts but be careful not to allow the shaft holder to change position.

### 2. Test For Bad Motor

With OHM meter set at 200 OHM, attach meter probe to the motor leads, slowly rotate motor shaft by hand a few degrees then stop and read meter scale. You can feel the stops as you turn. Continue to rotate motor shaft for a full 360 degrees. A consistent meter reading between 10-15 OHMS indicates a good motor; wide meter fluctuation indicates the motor is bad. Horton Automatics provides motors with replaceable brushes. This may be all that is required. When replacing brushes be sure to blow out old carbon buildup.

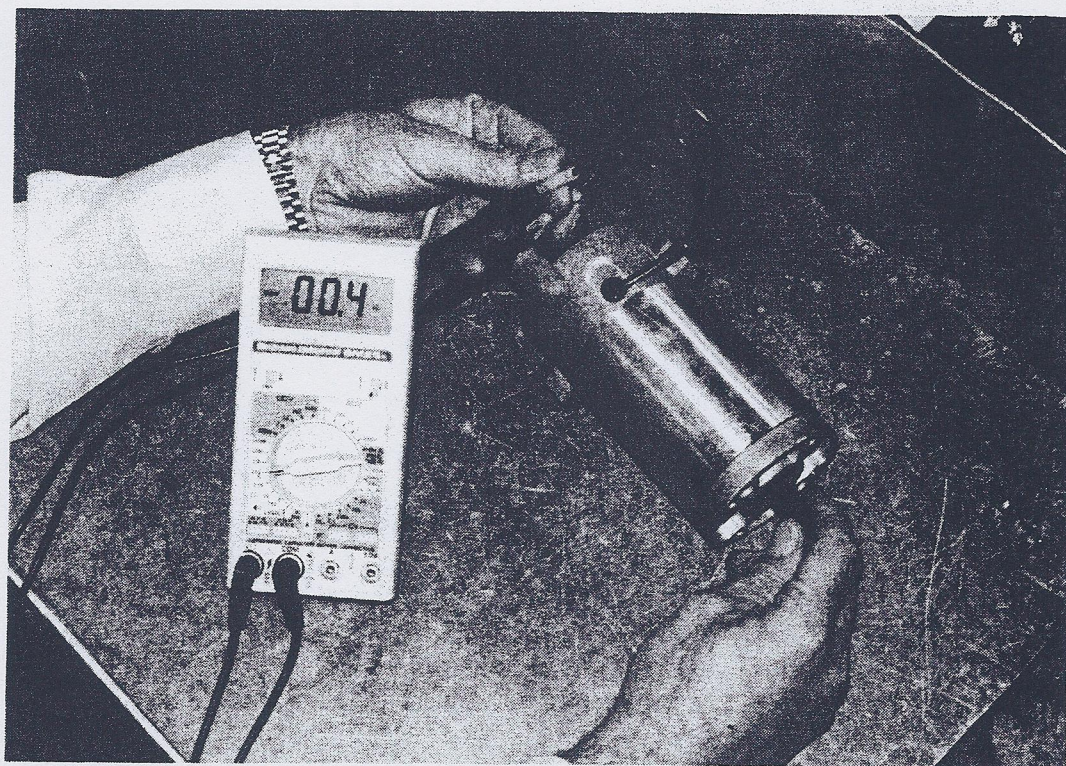


Figure 18

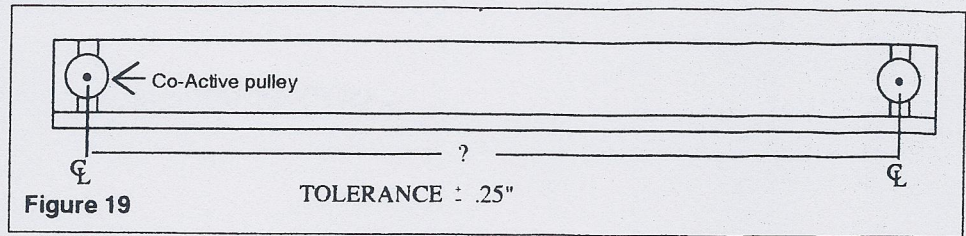




### 3. Replacement C467A Co-Active Cable for Biparting Doors

For the correct size replacement cable, you must give the exact centerline to centerline dimension of the two co-active pulley axles.

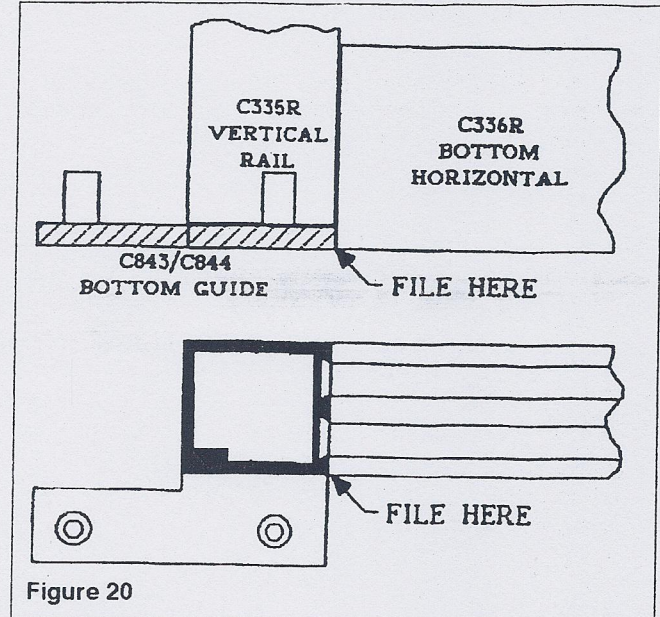
(Figure 19) No other dimension is acceptable.



### 4. Service Tip on Sliding Door Guides - Series 110 Bottom Guide

Due to manufacturing tolerances, occasionally the C843-1 or C844-1 Bottom Guide will hit the edge of the C336 Horizontal Rail prematurely and consequently will not rotate to a position parallel to the door panel.

If this happens, it will cause the guide to run tight in the C330-1 Bottom Guide Track. A solution is to file the edge of the horizontal rail enough to allow the guide to rotate past parallel. Then slide the Bottom Guide Track into the bottom guide to ensure it will rotate past parallel. (Figure 20)



### 5. Service to SX Assembly

See instruction G600

### 6. Automatic Locking

#### a. How it Works

##### 1. Locking for Sliding Door Operation

To lock the sliding door operation, the C2176-2 fail secure and C2196-2 fail safe automatic sliding door lock for the Series 2000 electric operator are installed in the header.

When the C2176-2 Autolock is used, the activating switch sends a signal to the lock solenoid. The lock solenoid retracts the latch that trips a limit switch. The limit switch completes the activating circuit from activating device to the C2160-2 master control to open the door. The solenoid continues to be energized until the signal is removed and lets the door close. When the lock solenoid releases, a spring in the latch bolt extends the bolt. When the door keeper attached to the sliding door passes the latch bolt at about 1/2 inch from fully closed, the spring-loaded bolt retracts and returns to its normal extended position when the keeper passes to the other side. The door is now secured in the closed position.

As long as power remains to the operator, automatic unlocking is possible. However, the lock is designed to remain locked in the cases of power failure. Should codes require the door to be opened in cases of power failure, SX swing/slide doors should be used or if desired, the autolock can be supplied to unlock on loss of power. Specify C2196-2 for Series 2000 Electric Operator. See page 14 *Adjustment to Automatic Lock*.

#### b. The following should be considered to assure security is not violated.

1. **Secure Area** – A switch is installed inside the room to signal the operator to open. Any type momentary contact switch, a mat or a simple push-button, will work. If the door includes a reversing nosing or safety horizontal photoelectric light, specify a cutoff feature to cut these off shortly before the lock engages. This keeps unwanted persons from pushing an object into the reopening device and opening the door. Mats laid directly in front of the door present a security problem if the mat adjacent to the door is not cut off when the door is closed and locked. If mats are to be used, you should consider a small mat immediately in front of the door that is cut off when the door is closed but active when the door is open (serves as a hold open). A second mat would be located in front of the hold open mat to serve as the actuating mat.

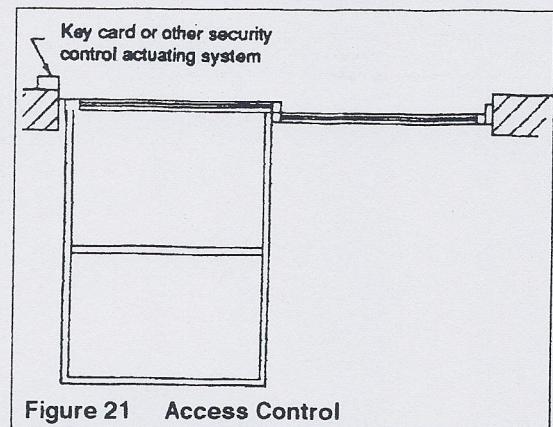


Figure 21 Access Control



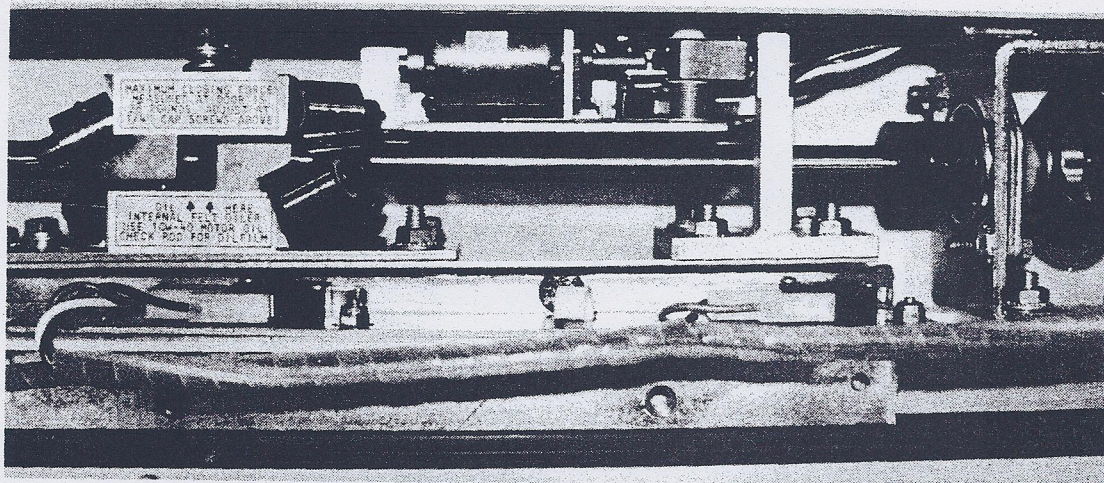
### c. Locks - Options

Numerous options are offered for locking to meet job requirements. Depending on the degree of security desired, additional locking, other than the automatic locking of the slide operation, may be required.

#### 1. Automatic Sliding Door Lock C2176-2

*The C2176-2 only locks the slide function of the door.*

The Life Safety Code may require the sliding door have an emergency breakout feature (SX). If the door is equipped with an emergency breakout feature, the swingout panel is not locked unless some type of lock for the swingout function is specified. Some security from entry is provided without locking the breakout panel. The SX panel is usually held closed by a ball-catch latch that releases when approximately 45 pounds is applied at the interior lock stile of the door. It is difficult to grip the panel from the exterior and open the door, but the door can be opened with a hook device. If the owner feels the ball-catch latch is adequate security, no additional lock will be required. Horton Automatics' self-closing device on the swing/slide panel recloses the panel if it is accidentally knocked open while someone is exiting.



View looking at automatic lock in Electric Sliding Door Header

Linear travel block must be adjusted to 28 pounds maximum closing force

Door keeper is attached to sliding door wheel carriage. Latch bolt locks keeper in closed position

#### 2. Swing/Slide Panic Door Lock C659

An Adams Rite Series 1870 cylinder operated bolt locks the swingout (SX) operation of the sliding panel into the top carrier frame. The bolt is extended during normal door operation to prevent swinging the door open for entry. A C463 Thumb Turn installed on the inside of the door unlocks the extended bolt and allows emergency egress by pushing out on the panel. (Figure 22)

Note: Alternate Jackson 1085P concealed vertical rod paddle panic exit device C938 is available. Push paddle operation on active side releases steel bolt and unlocks door for emergency egress. (Figure 23)

Check local codes to see if this method of unlocking – in case of emergency – is acceptable for the location of the door.

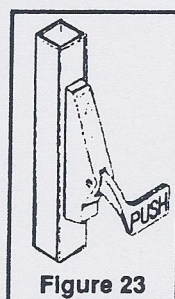
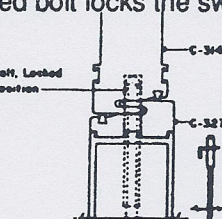


Figure 23



C-659 Lock swing out operation Thumb turn inside for emergency opening

Maximum security night or weekend cylinder lock

Figure 22

#### 3. Maximum Security Non-Automatic Locking

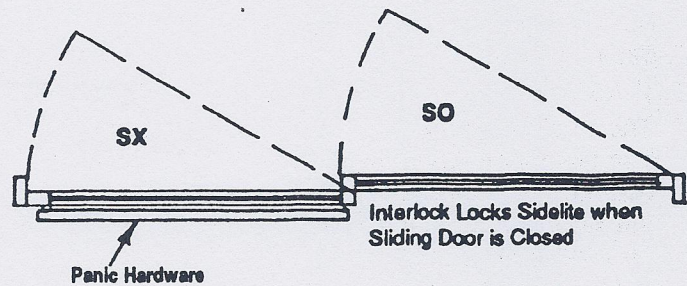
Should manual lockup during non-operational times be required, a second key operated cylinder with a C454 lock to lock the door to the jamb can be installed.





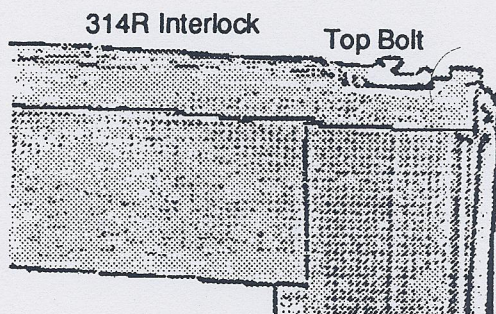
#### 4. Panic Hardware On Swing/Slide Door

If the location requires panic hardware, a Type 310 SO-SX unit is required with an Adams Rite 8600 concealed vertical rod device. The concealed vertical rod device is installed in the sliding panel and it locks swing operation only. The sidelite is equipped with a hook lock that interlocks to the sliding door when the sliding door is in the closed position.

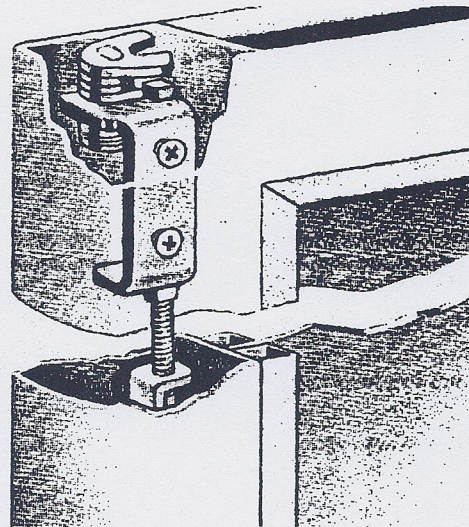


#### d. Adjustments to Automatic Lock

1. Cutoff operator, remove face plates and slide door closed.
2. Set C789 lock keeper with 1/8" clearance between it and C778 lock bolt on automatic lock.



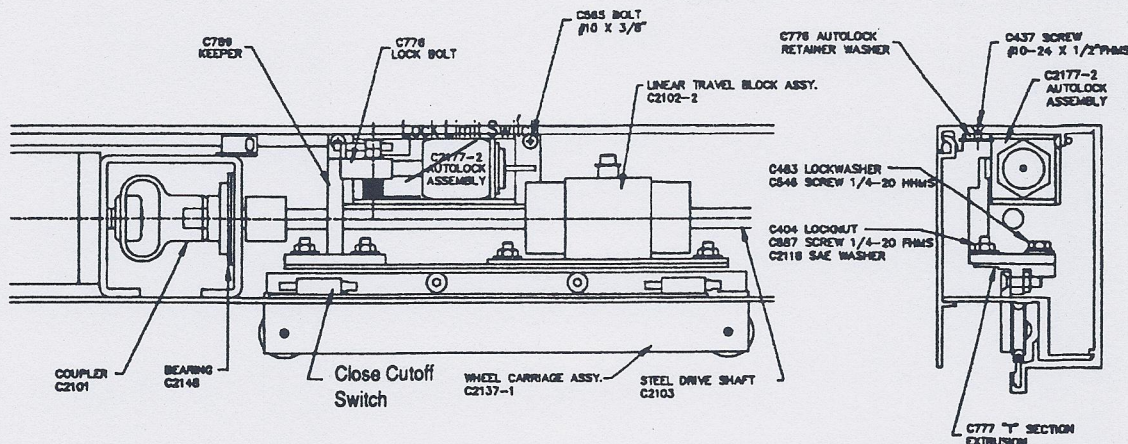
327R  
Bottom  
Interlock



No bottom latching is used, so slide operation can continue with the swing operation locked.

3. Set close cut-off switch so it cuts off operator 1/4" before door is fully closed. **Note: Operators with controls manufactured before 11/91 require 1/4" margin between close cut-off switch and lock keeper. This margin prevents anyone from manually sliding the door off the close cut-off switch and causing the reverser circuit to actuate door. (Set the reverser adjustment when the door is in the closing cycle, before the latch check switch is tripped by wheel carriage/cam.)**

C2160-2 Master Controls manufactured after 11-91 include a timer in the control that cuts off the closing circuit after 15 seconds. If the sliding door is opened manually, it will not drive closed.



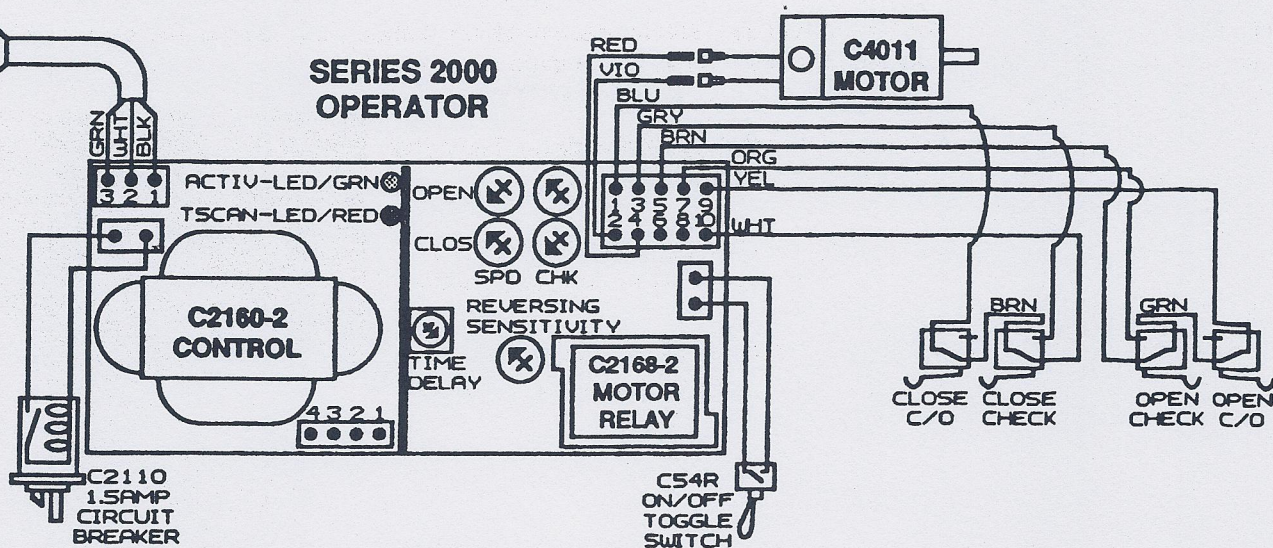
#### e. Trouble shooting Locks

If you have a jammed lock:

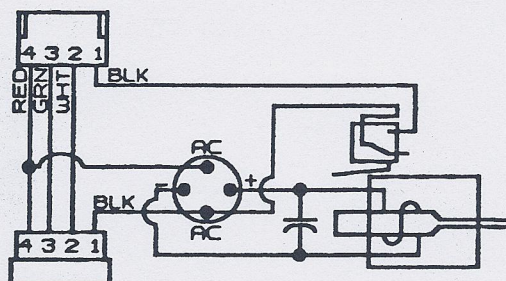
1. Check limit switch in lock assembly; make sure it does not trip until the lock solenoid is fully engaged.
2. Check that the C789 lock keeper is 1/8" from the C778 lock bolt. Positioning it firmly against the lock bolt can cause a physical bind.

**Service Tip:** If the circuit breaker has tripped and the face plate screws are not accessible because the doors are closed and the automatic lock is locked, gently pry the face plate away from the header. Using a long skinny screw-driver, you should now be able to depress the circuit breaker.

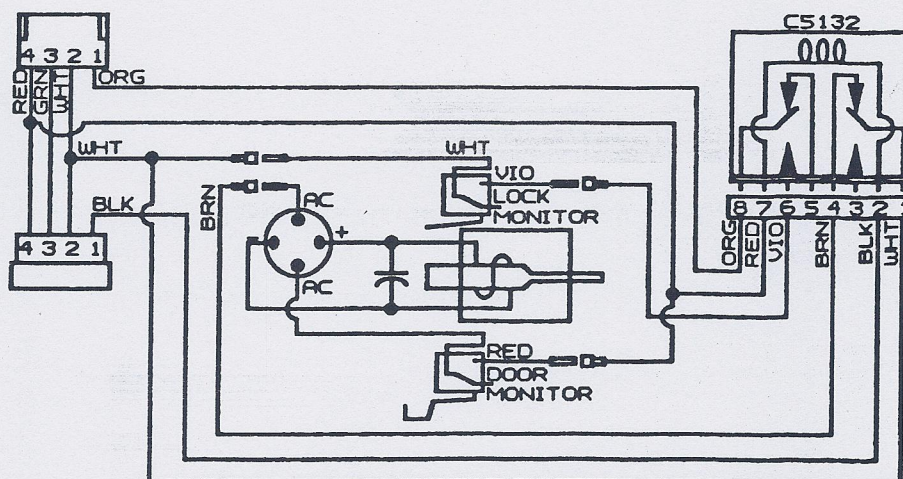




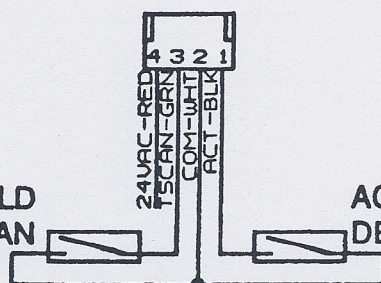
**C2176-2  
FAIL-SECURE  
AUTOLOCK**



**ALTERNATE  
C2196-2  
FAIL-SAFE  
AUTOLOCK**



**THRESHOLD  
SCAN**



**ACTIVATING  
DEVICES**





## VII. Decal Placement Instructions for Sliding Doors

Proper marking plays an important part in user safety. Each installation should include the following markings on the automatic doors. Be sure to explain the ANSI A156.10 standard requirement.

### Daily Safety Check (Decal)

Each slide door package includes a **Daily Safety Check** decal. The decal is applied to the door and has daily safety check instructions for the owner.

One decal per automatic unit is supplied in the Installation Instructions envelope and should be applied, by the installer, as close to each operator on/off switch as possible.

ENCLOSED IN THE INSTALLATION INSTRUCTIONS ENVELOPE IS AN OWNERS MANUAL THAT SHOULD BE REVIEWED WITH AND GIVEN TO THE OWNER UPON COMPLETION OF EACH JOB. THIS IS A VERY IMPORTANT PART OF PRODUCT LIABILITY PREVENTION AND SHOULD NOT BE IGNORED.



Daily Safety Check Decal Placement

## Decal Placement Instructions for Sliding Doors

Based on ANSI/BHMA A156.10-1991 Standards for Power Operated Pedestrian Doors

