

# **Linear**<sup>®</sup>

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# **INSTALLATION AND OWNER'S MANUAL MO-S SERIES**

## **MO-S SERIES SOLID STATE COMMERCIAL VEHICULAR DOOR**



As of date of manufacture,  
meets all ANSI/UL 325  
Safety Requirements for  
Vehicular door operators


Serial #:
Date Installed:
Your Dealer:

***READ THIS MANUAL  
CAREFULLY BEFORE  
INSTALLATION OR USE  
SAVE THESE INSTRUCTIONS***


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**READ THESE STATEMENTS CAREFULLY AND FOLLOW THE INSTRUCTIONS CLOSELY.**

The Warning and Caution boxes throughout this manual are there to protect you and your equipment. Pay close attention to these boxes as you follow the manual.


<b>WARNING</b>
Indicates a MECHANICAL hazard of INJURY OR DEATH. Gives instructions to avoid the hazard.


<b>CAUTION</b>
Indicates a MECHANICAL hazard of DAMAGE to your opener or equipment. Gives instructions to avoid the hazard.


<b>WARNING</b>
Indicates an ELECTRICAL hazard of INJURY OR DEATH. Gives instructions to avoid the hazard.


<b>CAUTION</b>
Indicates an ELECTRICAL hazard of DAMAGE to your opener or equipment. Gives instructions to avoid the hazard.

The purpose of this booklet is to provide assembly, installation and operation information concerning the MO-S Series Commercial Vehicular Garage Door Openers and related Accessory Products.

## NOTICE

**IT IS IMPORTANT THAT THIS INSTRUCTION MANUAL BE READ AND UNDERSTOOD COMPLETELY BEFORE INSTALLATION OR OPERATION IS ATTEMPTED. IT IS INTENDED THAT THE INSTALLATION OF THIS UNIT WILL BE DONE ONLY BY PERSONS TRAINED AND QUALIFIED IN THE INSTALLATION, ADJUSTMENT AND SERVICE OF COMMERCIAL OVERHEAD DOORS AND DOOR OPENERS AND BY QUALIFIED ELECTRICIANS.**

## NOTICE

**THE IMPORTANT SAFEGUARDS AND INSTRUCTIONS IN THIS MANUAL CANNOT COVER ALL POSSIBLE CONDITIONS AND SITUATIONS WHICH MAY OCCUR DURING ITS USE. IT MUST BE UNDERSTOOD THAT COMMON SENSE AND CAUTION MUST BE EXERCISED BY THE PERSON(S) INSTALLING, MAINTAINING AND OPERATING THE EQUIPMENT DESCRIBED HEREIN. DO NOT USE THIS EQUIPMENT FOR ANY OTHER THAN ITS INTENDED PURPOSE - OPERATING OVERHEAD COMMERCIAL VEHICULAR GARAGE DOORS.**

## STANDARD FEATURES:

**Solid State Controls:** The openers employ solid state technology with advanced standard features to provide for a complete commercial door operating system.

**Switch Selectable Operating Modes:** Six distinct base operation modes can be selected by resetting the switches on the motor control board: a standard Open, Close, Stop (B2, momentary button push); three constant pressure modes (C2, D1, and E2); two Timer to Close modes (T and TS). See page 17 for complete description of the modes.

**Switch Selectable Characteristic Modes:** Five different operating characteristics can be activated and/or modified through the switches on the motor control board: Delay On Reverse, Close Limit Delay, Mid Stop Travel, Timer to Close, Maximum Run Timer.

**Limit Switches:** Driven limit switches, easily adjusted over a wide range. The motor may be removed without affecting the limit switch adjustments

**Manual Release:** Permits manual operation of the door in the event of a power failure.

**Control Circuit:** Standard three button open, close and stop. 5 Volts DC.

## Connections For Auxiliary Entrapment Protection

**Devices:** For the ultimate in protection, terminals are provided to connect a Linear Corp. Photo-Beam System that consists of an emitter, Part No. 217792 and detector, Part No. 217800. This device when connected is a monitored photo-beam system. Additional connection terminals for a Normally Open and Normally Closed reversing devices such as a reversing door edge or a three wire photo-beam are provided.

**Momentary Contact To Close:** Standard operating mode. Requires a photo-beam as described above or one of the Miller Edge family of Door Edge devices as described on this page to be properly installed on the door and connected to the operator. See Page 13 for the entrapment protection installation guide.

## MODEL MO-S OPENER APPLICATIONS:

MO-S openers are intended for commercial and industrial use to raise or lower rolling steel or sectional overhead doors by chain coupling to the door shaft. MO-S openers are suitable where all or part of the door remains in a vertical position when fully open such as doors with at least 18 inches of lift clearance or full vertical lift doors. MO-S openers may also be used with roll up service doors and grills when specified on order from factory.

An MO-S opener **DOES NOT LOCK THE DOOR IN ITS CLOSED POSITION.** However, because the cross-header shaft is prevented by the opener from turning, the torsion springs provide no assistance in lifting the door should an attempt be made to raise it manually.

MO-S openers are used in the following applications:

- **Continuous Duty, Medium and Heavy Duty Cycle Commercial installations.**
- **Indoor Use Only**
- **Doors with a maximum area of 560 square feet (2 HP) - maximum area slightly higher for lighter doors - consult factory**
- To operate in Momentary Contact To Close mode and comply with the UL325 Entrapment Protection requirements effective Aug. 29, 2010, the door system must include one of the following (a, b, or c):
  - (a) Linear Corp. Photo-Beam System that consists of an emitter, Part No. 217792 and detector, Part No. 217800 for doors as described above up to 30 FT wide. See Page 12.
  - (b) Any Miller Edge ME, MT/MU, and CPT family of edges, with suffix T2, must be connected to the SM-102 Edge Module, Recognized by UL as per UL325 2010 on 08-29-2010 for door as described above. See Page 12.
  - (c) A Vitector Fraba OSE 2-wire Photosystem as Recognized by UL as per UL325 2010 on 08-29-2010 for door as described above. See Page 12.
- The manufacturer of this operator strongly recommends installation of one of the entrapment protection device above and states that one is - **REQUIRED where the 3-button station is out of sight of the door, or any other automatic, remote or manual control is used to activate the door.**

## OPTIONAL FEATURES:

**Digital Radio Controls:** Open, Close and Stop operation. Radio units are available to control up to 27 doors from one transmitter.

**Keyless Entry System:** Connection terminals provided for hard wired keyless entry system. Optional radio receiver will allow operation of a wireless keyless system.

**⚠ WARNING**

**ELECTRIC DOOR OPENERS ARE DESIGNED FOR DOORS IN GOOD WORKING CONDITION, PROPERLY COUNTERBALANCED AND PROPERLY ADJUSTED IN ACCORDANCE WITH THE DOOR MANUFACTURER'S INSTALLATION INSTRUCTIONS.**

Before starting the installation of the opener, the door must be in good working condition and properly counterbalanced. Inspect the door and door guides for loose or missing hardware. Test the door manually for balance and ease of operation. Lubricate door hinges and rollers. If necessary, employ a qualified technician to adjust the springs for proper counterbalance of the door.

Stops should be installed at the top end of each track to prevent the possibility of the door rollers moving beyond the ends of the track.

If the cross header shaft is made from hollow tubing rather than solid rod, it is recommended that it be plugged with a short length of solid bar for a more secure installation of the shaft sprocket or flange coupler. Before removing the opener powerhead from the shipping carton,

inspect the nameplate on the cover of the operator control box to verify that it is the correct model for the intended application and that the voltage and phase are in accordance with electrical power provided at the job site.

**Warning: Rope off the area to keep personnel and vehicles clear of the door and floor space in the vicinity of the opener during the installation.**

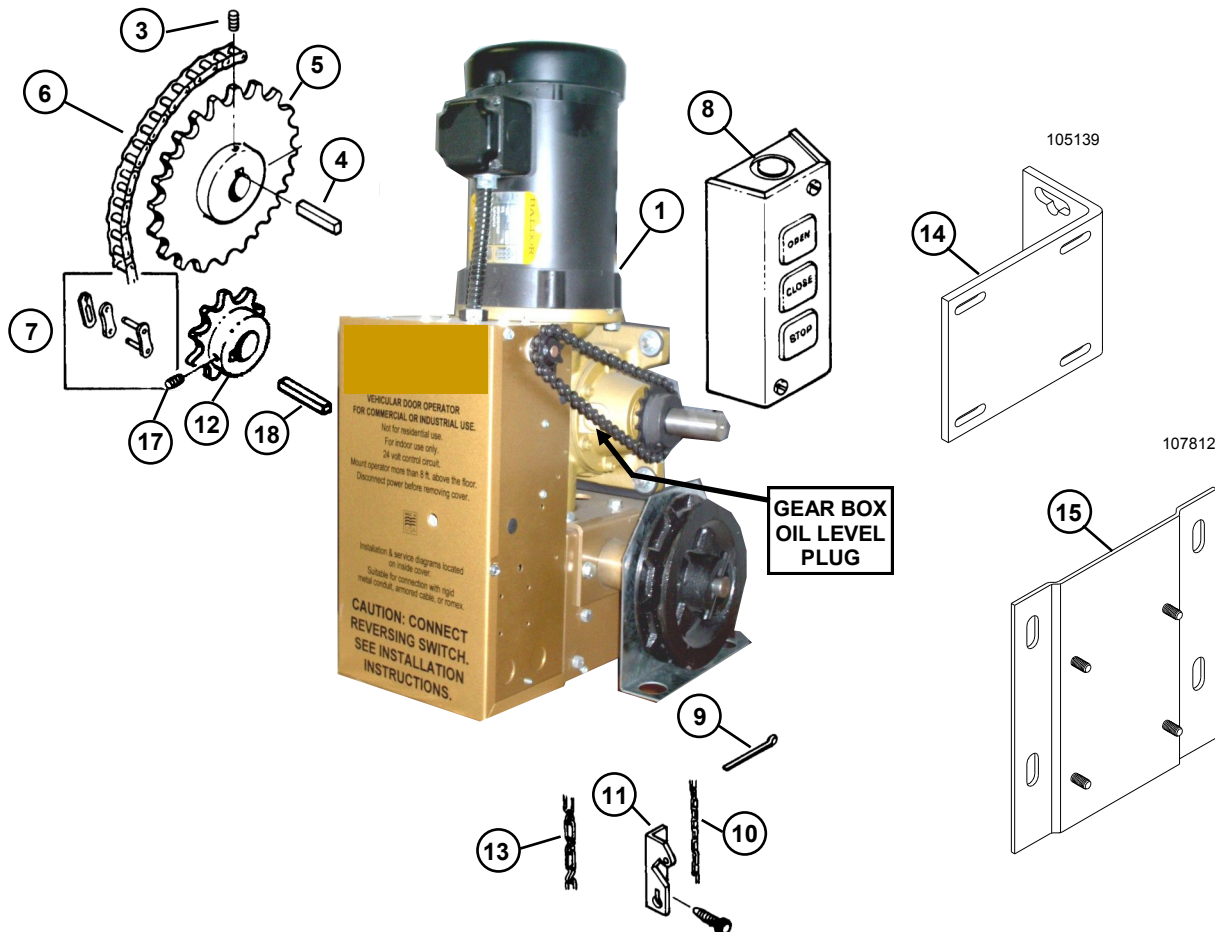
**⚠ WARNING**

**SPRINGS ARE SUBJECT TO VERY HIGH FORCES AT ALL TIMES AND ADJUSTMENTS MUST BE MADE ONLY BY A QUALIFIED PROFESSIONAL DOOR INSTALLER.**

**⚠ WARNING**

**REMOVE OR DISABLE ANY LOCKING DEVICES FROM DOOR AND REMOVE ALL ROPES**

**FIGURE 1 - COMPONENT IDENTIFICATION**



# IMPORTANT INSTALLATION INSTRUCTIONS! 5



**WARNING**

**TO REDUCE THE RISK OF SEVERE INJURY OR DEATH:**

## READ AND FOLLOW ALL INSTALLATION INSTRUCTIONS!

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• Install only on a properly operating and balanced garage door. A door that is operating improperly could cause severe injury. Have qualified service personnel make repairs to cables, spring assemblies and other hardware before installing the opener.</li> <li>• Remove all pull ropes and remove, or make inoperative, all locks (unless mechanically and/or electrically interlocked to the power unit) that are connected to the garage door before installing the opener.</li> <li>• Lightweight doors (fiberglass, aluminum etc.) must be reinforced to avoid door damage. Check the door manufacturer's instruction manual for a bracing procedure or the availability of a Reinforcement Kit.</li> <li>• Model MO-S is a Commercial Vehicular Door Operator and as such IS NOT recommended for pedestrian traffic. In installations where it is known that pedestrians will be nearby ensure a pedestrian door is available for entrance and exit to the building. In addition YOU MUST install an auxiliary entrapment protection device (reversing door edge or photoelectric beam device).</li> <li>• Connect an auxiliary entrapment protection device (reversing edge or photoelectric device across the door opening). A device of this type is <b>STRONGLY ADVISED FOR ALL</b> commercial operator installations. An auxiliary entrapment protection device is <b>REQUIRED</b> when the three button control station is out of sight of the door or any other automatic or manual control is used.</li> </ul> | <ul style="list-style-type: none"> <li>• Install the door operator at least 8 feet or more above the floor if the operator has exposed moving parts.</li> <li>• Do not connect the opener to the source of power until instructed to do so.</li> <li>• Locate the control station:               <ul style="list-style-type: none"> <li>a) within sight of the door,</li> <li>b) at a minimum height of five feet above the floor so small children cannot reach it,</li> <li>c) away from all moving parts of the door, and</li> <li>d) far enough away from the door, or positioned such that the user is prevented from coming in contact with the door while operating the controls.</li> </ul> </li> <li>• Do not overtighten the clutch adjustment to compensate for a poorly working door.</li> <li>• Install the Entrapment Warning Placard next to the control station in a prominent location.</li> <li>• All warning signs and placards must be installed so they are visible in the area of the door.</li> <li>• After installing the opener, all safety features must be tested for proper operation (see page 19).</li> <li>• For products having a manual release, instruct the end user on the operation of the manual release.</li> </ul> |
|--|--|

**TABLE 1 - COMPONENT IDENTIFICATION LISTING**

Item #	Part Number	Description	Qty.		Item #	Part Number	Description	Qty.	
1	Per Model	Opener Power Head	1		10	009149	Sash Chain	12 FT	
3	006119	Set Screw, 5/16-18 x 1, Sqr Head	2		11	105193	Wall Disconnect Bracket	1	
4	Per Model	Steel Square Key	1		12	Per Model	Drive Sprocket	1	
5	Per Model	Driven Sprocket on Door Shaft	1		13	100315	Hand Chain, Precut @ 26 FT	1	
6	Per Model	Drive Chain	1		14	105139	Mounting Bracket		Optional
7	Per Model	Master Link	1		15	107812	Wall Mounting Plate w/Studs		Optional
8	005031	3 Button Station	1		17	006119	Set Screw, 5/16-18 x 1, Sqr Head	2	
9	105531	Cotter Pin	1		18	100413	Key, 1/4 x 1/4 x 1	1	

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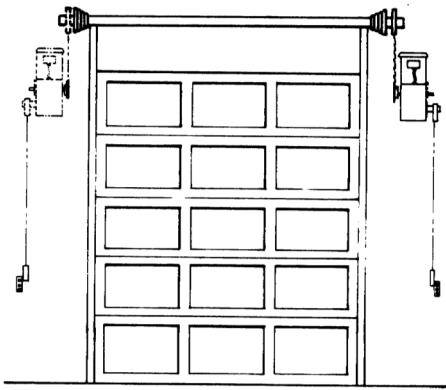
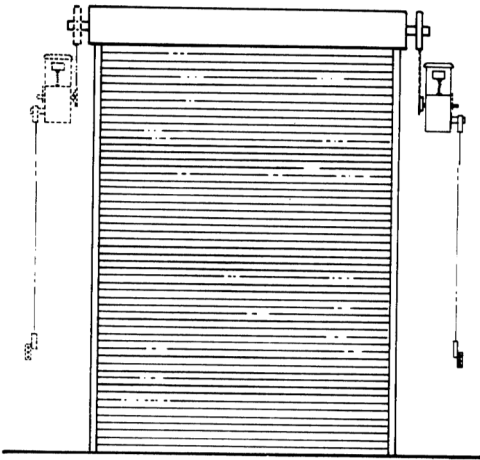
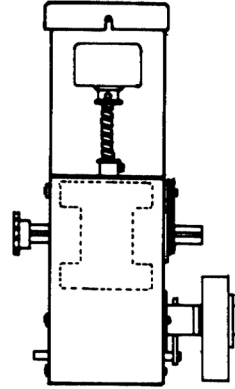


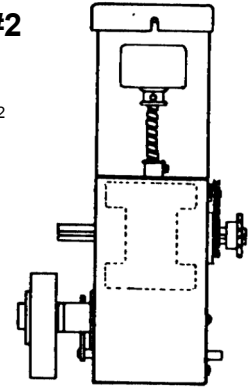
Figure 2

#1

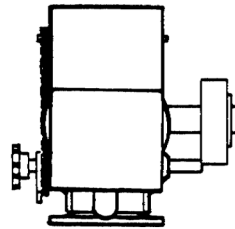


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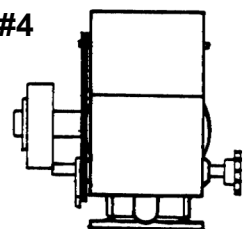
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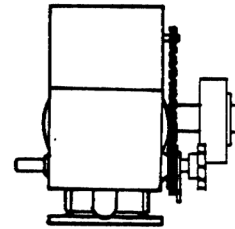
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#5



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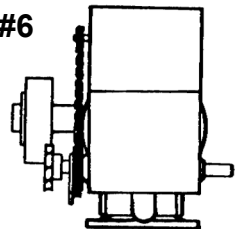
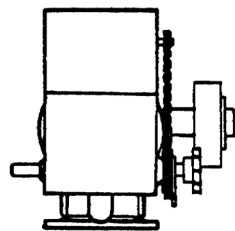


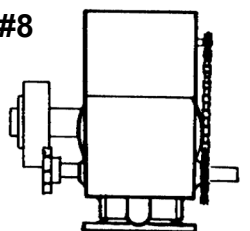
Figure 3

- #1 Wall Mount, Right Hand
- #2 Wall Mount, Left Hand
- #3 Bracket (Shelf) Mount, Right Hand
- #4 Bracket (Shelf) Mount, Left Hand
- #5 Bracket (Shelf) Mount, Front of Hood,
- #6 Bracket (Shelf) Mount, Front of Hood, Left
- #7 Bracket (Shelf) Mount, Above Hood, Right
- #8 Bracket (Shelf) Mount, Above Hood, Left
- #9 Bracket (Vertical) Mount, Right Hand
- #10 Bracket (Vertical) Mount, Left Hand

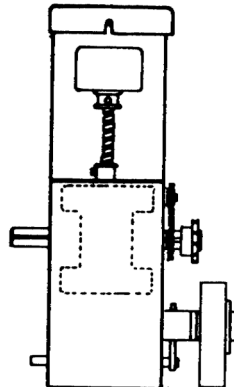
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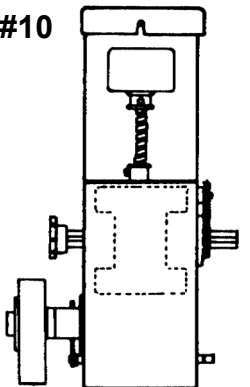
#8



#9



#10





**SPRINGS, PULLEYS, CABLES AND MOUNTING HARDWARE USED TO BALANCE YOUR GARAGE DOOR ARE UNDER EXTREME TENSION AT ALL TIMES AND CAN CAUSE SEVERE INJURY OR DEATH IF DISTURBED. DO NOT ATTEMPT ADJUSTMENT.**

## MOUNTING THE OPENER

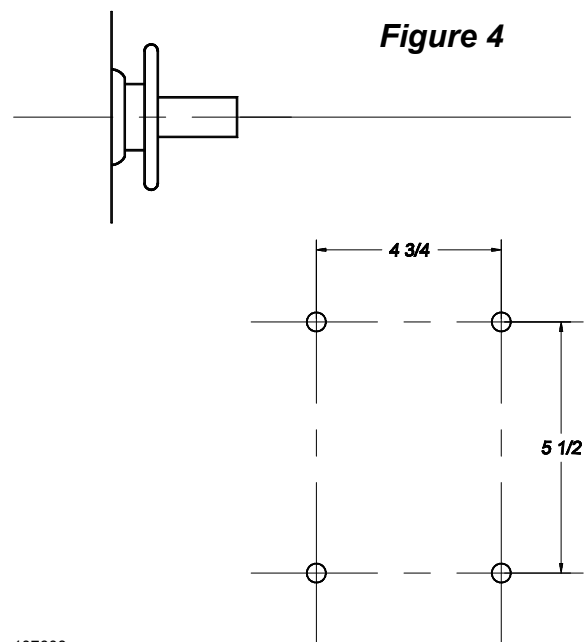
**WHEN PREPARING THE MOUNTING SURFACE ENSURE THE OPENER WILL BE RIGID AND SECURE WHEN INSTALLED, THE MOUNTING SURFACE WILL PROVIDE A LEVEL BASE, AND THE OPENER'S DRIVE SHAFT WILL BE PARALLEL WITH THE DOOR SHAFT. FAILURE TO MEET THESE CONDITIONS WILL RESULT IN AN OVERALL UNSAFE DOOR OPERATION AND PREMATURE FAILURE OF THE DOOR AND DOOR OPENER.**

1. **Figure 2**, page 6 illustrate several positions suitable for mounting the opener; right hand or left hand wall mount or horizontal (shelf) mount to the torsion shaft. For sectional doors, the opener must be wall mounted. For rolling steel doors the opener may be wall mounted or hood mounted by using an optional hood mounting bracket, [14]. A wall mounting plate [15] is also available from the factory (see **Figure 1**). The mounting plate/bracket provides for chain tension adjustment as well as aiding installation.

**NOTE:** THE OPENER DRIVE SPROCKET MAY BE INSTALLED ON EITHER SIDE OF THE GEAR REDUCER. SELECTION DEPENDS ON WHICH SIDE OF THE DOOR THE OPENER IS MOUNTED ON.

2. Determine which side of the door the opener will be located on. Fasten the sprockets [5] and [12] and the keys [4] on the chosen side of the torsion shaft of the door and on the corresponding end of the output shaft of the opener. Tighten the set screws enough to prevent the sprockets from sliding off the shaft. If the door shaft lacks a keyway you will need to drill and pin the sprocket in accordance with Step 6 (tightening the set screws is sufficient for this step). The sprockets should be kept as close as possible to the bearings. Fasten the wall mounting plate or the mounting bracket (as applicable and if available) to the opener gear box flange. Temporarily suspend the opener in its mounting position and such that the distance between the door shaft and the opener's output shaft is between 12" and 15". See **Figure 5** for wall mount and **Figure 6** for hood mount illustration. The distance between the shafts may be greater if the mounting conditions prohibit installation as suggested.
3. Connect the two drive sprockets [5 and 12] with the drive chain [6] and connecting link [7], shortening the chain to the proper length if necessary. To shorten the chain use a chain tool or drive out the appropriate rivets with a punch.

4. With the chain tight and straight and the opener's output shaft parallel with the door's torsion shaft, trace the mounting slots (holes) on the mounting surface then lower the opener to the floor. The opener's gear box mounting hole pattern is shown in **Figure 4**.
5. The opener should be installed using 1/2" bolts through the wall. If the building's construction will not allow the usage of through bolts then use lag bolts and shields (or the equivalent type fasteners). Mount the opener, slipping the drive chain on before bolting the opener to the mounting surface but do not completely tighten the bolts at this time.
6. Re-align the door shaft and opener drive shaft sprockets and connecting drive chain. Secure the sprockets in place with their set screws. If no keyway exists in the door shaft, drill a 5/16" through the door sprocket and door shaft with the sprocket in its aligned position. Insert the 5/16" roller pin [2] through the sprocket and shaft to secure the sprocket in place. See **Figure 7**.
7. Adjust the drive chain tension such that there is no more than 1/4" slack when the chain is depressed between the sprockets. See **Figure 8**. The preferred mounting is with the motor end up and the opener below the door shaft. This results in better clearance for the hand chain and disconnect chain.
8. Attach sash chain, item 10, with cotter pin, item 9. See **Figure 9**, next page.



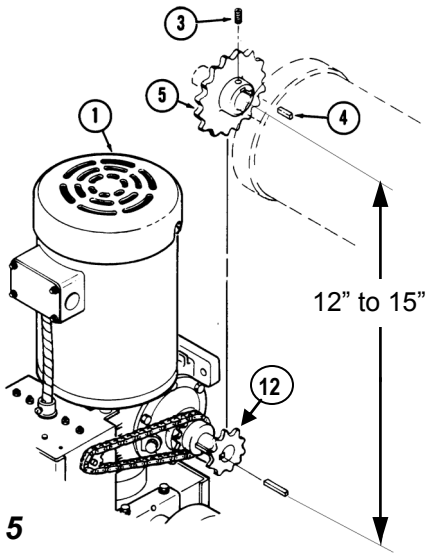


Figure 5

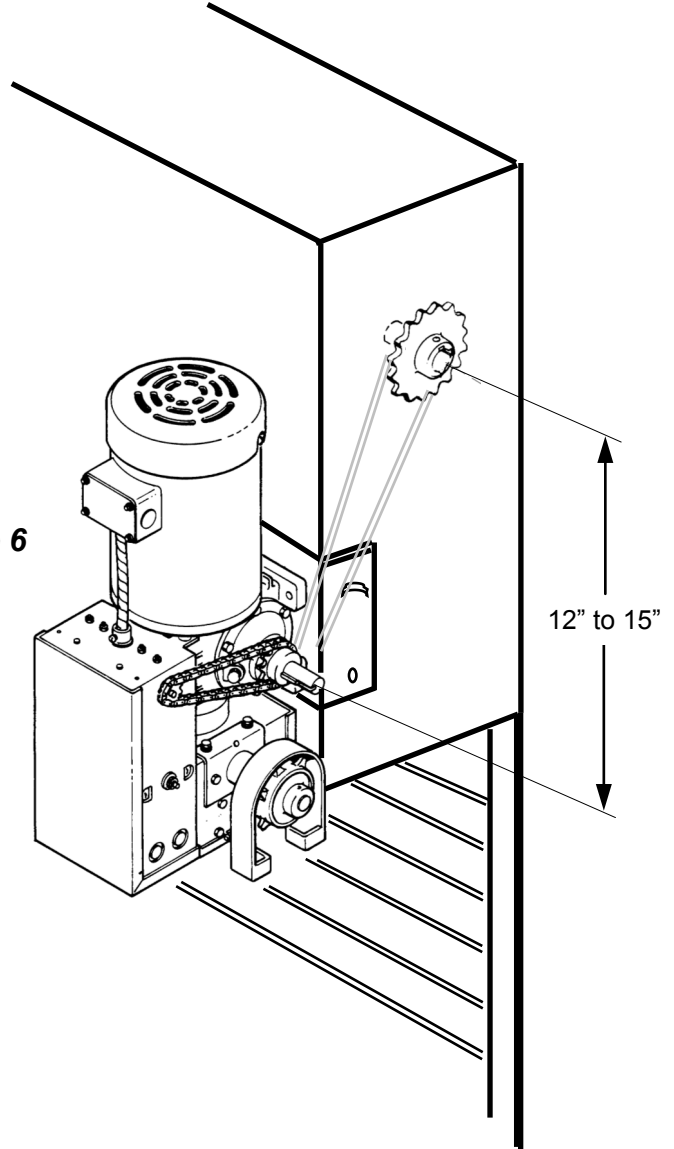


Figure 6

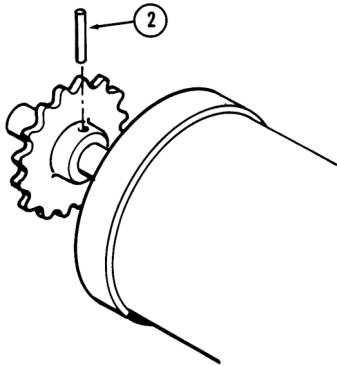


Figure 7

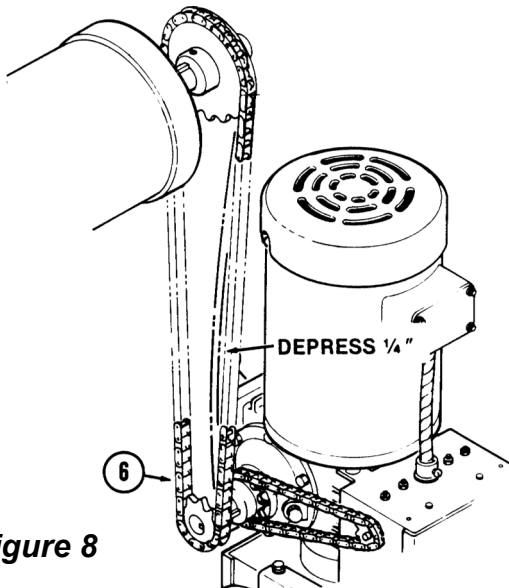


Figure 8

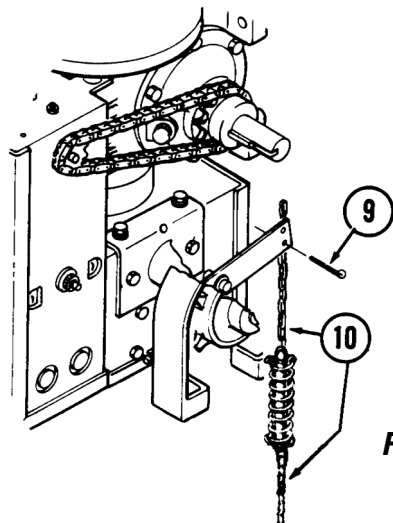


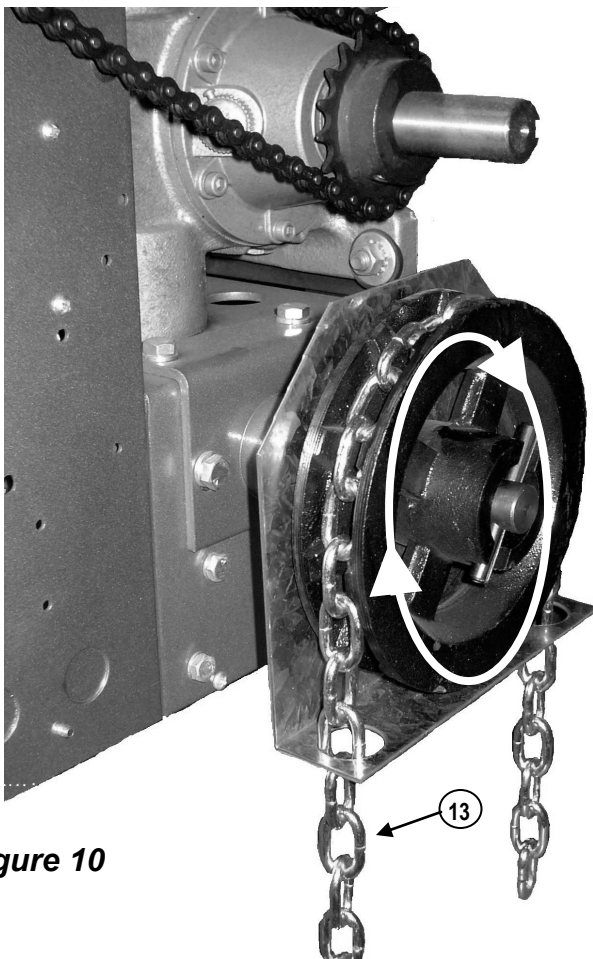
Figure 9



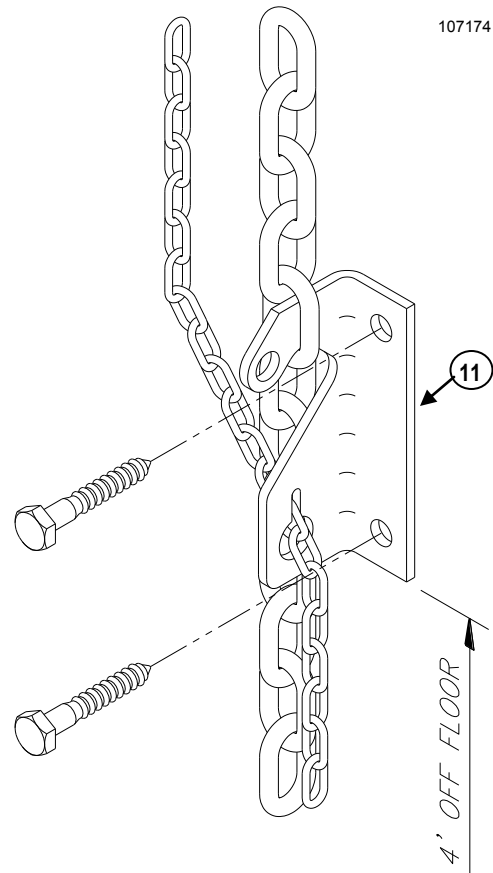
## CHAIN HOIST INSTALLATION

1. Refer to **Figure 10** to install the chain hoist. Pass the hand chain, item 13 over the chain pocket wheel and through the chain guide holes on the opener clutch shaft (opposite end from the large pulley). Fasten the ends of the chain together (to make one continuous loop) by opening and re-closing one link using two pairs of pliers. If the chain is too long, shorten it to the desired length by removing links.
2. After attaching sash chain, Item 10, with tension spring, (See **Figure 9**), pull the sash chain to engage the hand chain. This will actuate the interlock switch and disengage the solenoid brake.
3. Use lag screws to attach the disconnect bracket, item 11, vertically in line with the sash chain about four feet off the floor. See **Figure 11**.

**BEFORE PROCEEDING WITH THE OPENER INSTALLATION AND SETTINGS, MAKE A FINAL CHECK FOR TIGHTNESS OF ALL MOUNTING HARDWARE AND SET SCREWS.**



**Figure 10**



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**Figure 11**



## WARNING

**TO AVOID RISK OF ENTRAPMENT AND POSSIBLE DAMAGE TO THE DOOR AND OPERATOR THE LIMITS MUST BE ADJUSTED BEFORE APPLYING POWER TO THE OPERATOR.**

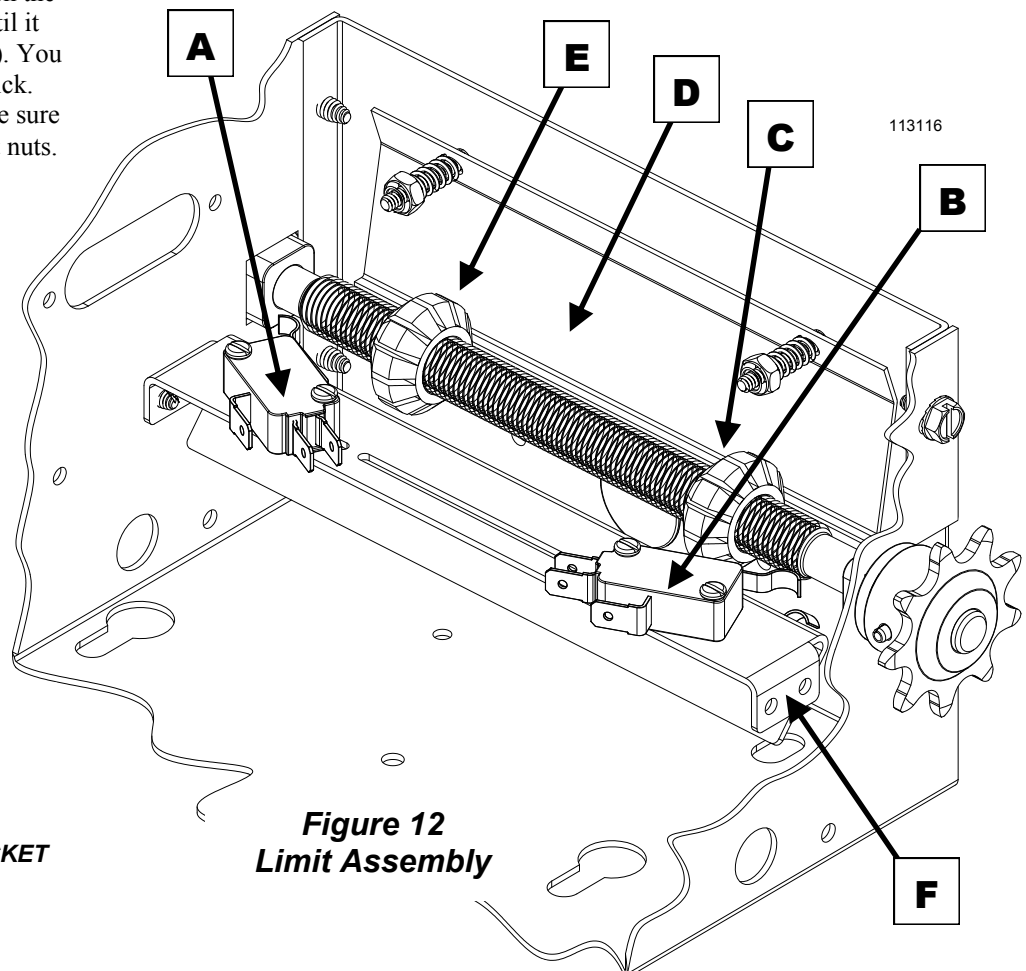
### SETTING THE LIMIT SWITCHES

- 1) With the cover open on the electrical enclosure, reference Figure 12 below. There are two (2) switches (A and B) mounted to the 'V' bracket (F). The switches are activated by the two limit nuts (C and E) on the threaded shaft which move laterally along the shaft as the operator opens and closes the door. When a limit nut nears the end of the shaft it activates a switch, that send a message back to the motor control board to stop the door.
- 2) Depress the Limit Nut Retention Plate (D) so it disengages from the slots in the limit nuts and move the Limit nuts to the center of the threaded shaft.
- 3) Using the built-in hoist, manually raise the door to a nearly open position.
- 4) Depress the limit nut retaining plate (D) so it disengages from the slots in the limit nuts. Turn the OPEN limit nut (E) on the shaft until it engages the Open Limit Switch (A). You will need to listen for an audible click. Release the retaining bracket and be sure that it engages in slots of both limit nuts.

5) Manually lower the door to a position approximately 4 inches shy of the fully closed position and repeat Step #3 with the Close Limit nut (C) and the Close Limit switch (B). The actual Close Limit position is a timed function whereas the door continues to run for a certain period of time after the Close Limit switch is activated. This amount of time (Close Limit Delay) is factory set to 0.32 seconds and will provide reversing cutout of approximately 4 inches from the floor for a door traveling at 12 inches per seconds. If the door fails to reverse when an object at least four inches high is placed in its path (see Testing, page 21) it may be necessary to adjust the Close Limit Delay time, see procedure on page 18.

6) Manually move the door to a half open position. With the door in a mid position there will be time to stop the door if something or someone were in the door path when initially starting the door.

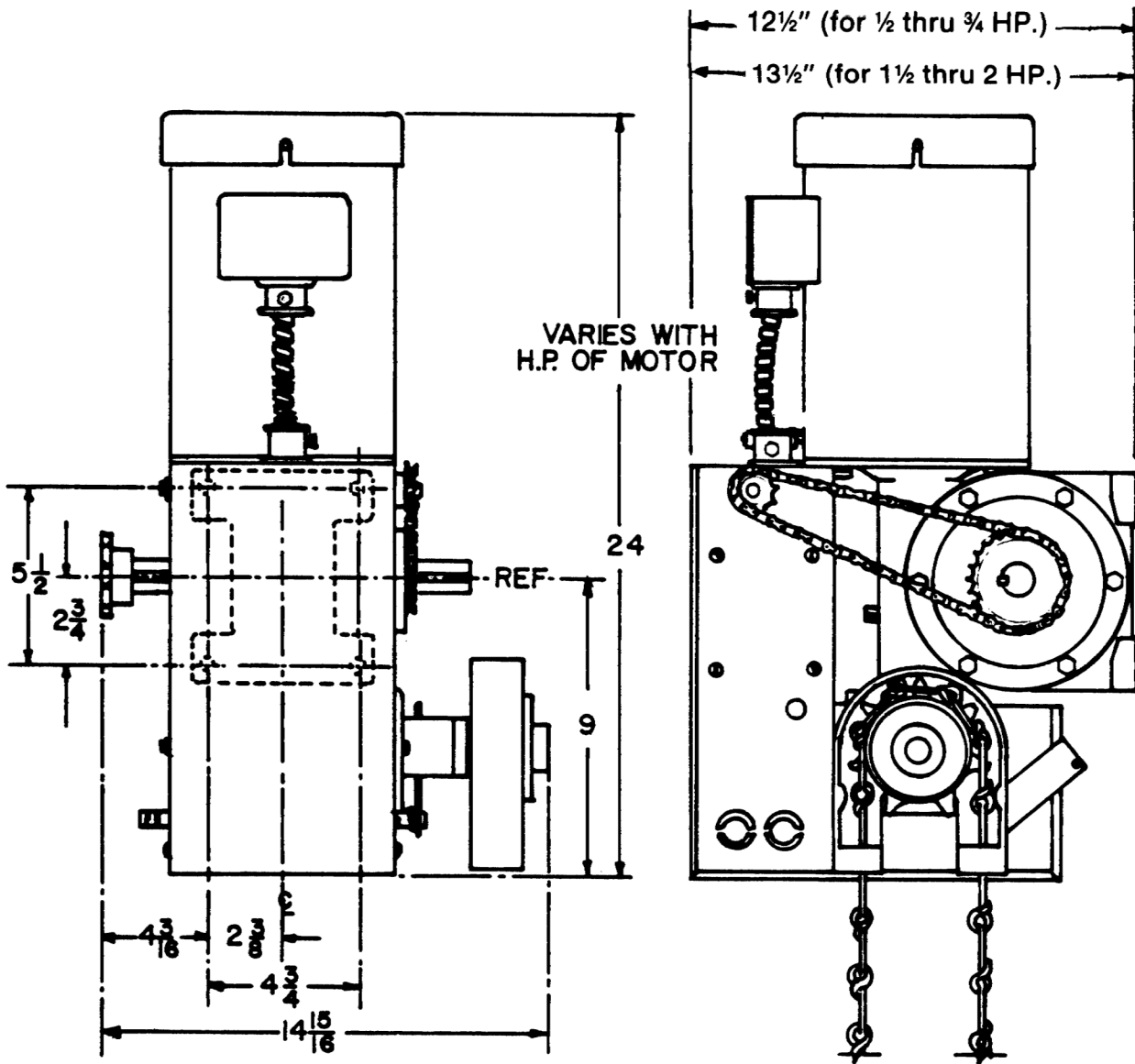
7) A final limit adjustment may be necessary after the connection of the power supply in order to ensure the door stops at the proper Open and Close positions. If desired, a fine adjustment can be done as part of the final adjustment by loosening the screws holding the Limit Switches to the V bracket and moving the switch within the slots on the bracket.



**Figure 12**  
**Limit Assembly**

- A - OPEN LIMIT SWITCH
- B - CLOSE LIMIT SWITCH
- C - CLOSE LIMIT NUT
- D - LIMIT NUT RETAINING BRACKET
- E - OPEN LIMIT NUT
- F - "V" BRACKET

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**WARNING**

**TO PREVENT THE RISK OF PERSONAL INJURY OR DEATH :**

- **DISCONNECT POWER AT THE FUSE BOX BEFORE PROCEEDING.**
- **ELECTRICAL CONNECTIONS MUST BE MADE BY A QUALIFIED INDIVIDUAL.**
- **OBSERVE LOCAL ELECTRICAL CODES WHEN WIRING THE OPENER.**

**WARNING:** The MO-S openers have been designed and constructed for use with voltages from 115 Volts AC to 480 Volts AC, in single or three phase. Check the opener nameplate label on the control box cover for the proper voltage and phase. The application of an improper input voltage or phase will result in catastrophic failure to the internal electrical components.

**Observe local electrical codes when wiring the opener.**

When hard wiring, observe state and local electrical codes. A wiring diagram is attached to the inside of the control box cover. Connect the appropriate voltage and phase power leads to the appropriate terminals as per the wiring diagram and connect a ground wire to the grounding screw. On three phase units, incorrect phasing of the power supply will cause the motor to rotate in the wrong direction (open when CLOSE button is pushed and vice versa). To correct this, interchange any two of the incoming three phase conductors.

The wiring diagram attached inside the cover of the control box details all of the field wiring terminal connections for the opener. Always connect the wires to the push-button controls and auxiliary devices exactly as shown.

Warning: Control voltage of the opener is 5 volts DC, Class 2. Do not run the power leads and control circuit wiring in the same electrical conduit.

**WARNING**

**TO PREVENT THE RISK OF PERSONAL INJURY AND/OR DAMAGE TO DOOR OR PROPERTY, ONLY OPERATE DOOR CONTROL WHEN DOOR IS IN CLEAR VIEW. IF CONTROL STATION CANNOT BE LOCATED WHERE THE DOOR IS VISIBLE OR IF ANY OTHER DEVICE IS USED TO CONTROL THE DOOR AN AUXILIARY ENTRAPMENT DEVICE (DOOR EDGE OR PHOTOELECTRIC) *MUST BE CONNECTED.***

**WARNING**

**RISK OF ENTRAPMENT THAT MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH. DISCONNECT POWER TO THE OPENER BEFORE AND DURING INSTALLATION OF AN ACCESSORY REVERSING DOOR EDGE OR PHOTOELECTRIC DEVICE. DO NOT RECONNECT POWER TO OPENER UNTIL INSTRUCTED TO DO SO. ENSURE DOORWAY IS CLEAR BEFORE STARTING TESTING OF UNIT.**

Note: The MO-S Series model operators are pre-wired for entrapment protection devices. To operate in Momentary Contact To Close mode and comply with the UL325 Entrapment Protection requirements effective Aug. 29, 2010, an approved external entrapment device as described on Page 3 must be installed and connected to the operator. Refer to Page 13 and the manufacturer's instructions to install and connect one of the approved door edge devices. One or more contact sensors shall be located at the bottom edge of a vertically moving door. Refer to the instructions on Page 13 for the Linear photoelectric system installation and wiring.

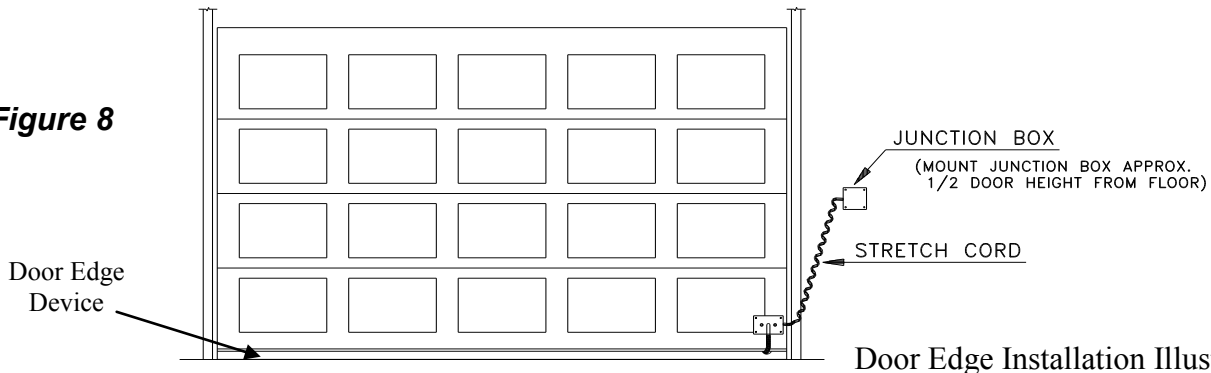
If the external entrapment protection device is connected, the selector switches are set properly (Page 17) and the device detects an obstruction or becomes inactive, an opening door continues to open and a closing door stops, pauses and starts open. While in this mode, if a problem is detected while the operator is stopped, a close will require constant activation of the control Close button. If an entrapment protection device as described above is attached and is properly working for 1 second, it will be ***auto detected and the monitored function will be turned on.*** Once the monitoring function is active, it will remain active even if the power is removed and the entrapment protection device is disconnected and power is restored. While in this mode, if a problem is detected while the operator is stopped, a close will require constant activation .

Operators which have an operational entrapment protection device as described above may have one or more additional means of control which should be wired in accordance with the diagram supplied in the opener and also illustrated on Pages 22 & 23. To add a second three button station, refer to Figure 16.

Number 22 gauge wire or heavier must be used for wiring the control stations and auxiliary control devices to the opener. Smaller gauge wire may cause operational problems, especially when multiple push-button stations are used or **during summer months.**

**Note:** See the door edge manufacturer's installation instructions for the complete installation procedure. See Figure 9 for connecting the edge to the operator. See Page 17 for proper setting of the selector switches. These switches must be properly set and an approved photoelectric device or approved door edge device connected to the operator to obtain B2 Mode of Operation, Momentary Contact to Close.

Figure 8



## Install the Safety Beam

**WARNING**  
Persons, particularly children, could be killed by a closing garage door without a properly installed and adjusted safety beam optical obstacle sensing system.

► **NOTE:** The safety beam's infrared light beam must not be obstructed by the door, or by any part of the door hardware. Use wooden spacers between the beam brackets and wall if necessary to create proper clearance.

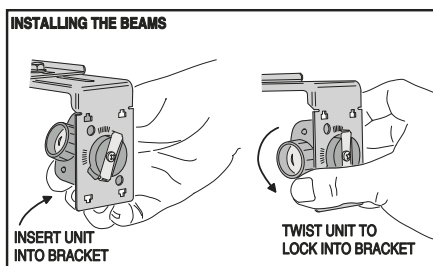
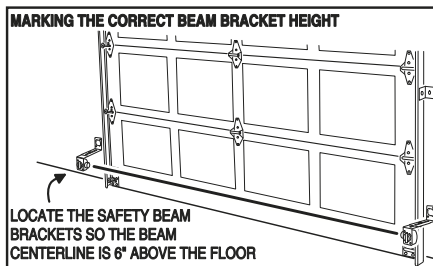
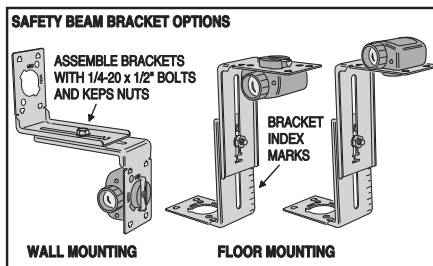
1 Assemble the two safety beam brackets from the four L-shaped brackets using two 1/4-20 x 3/4" bolts and 1/4-20 keps nuts (one nut & bolt for each bracket).

**WARNING**  
To protect small children, do not install the safety beam higher or lower than instructed.

2 Position the assembled brackets on each side of the door so the center line of the safety beam lenses will be 6" above the floor. Use the index marks on the brackets to make the bracket assemblies equal lengths. Mark the locations for the bracket mounting screws (the brackets can be wall or floor mounted).

► **NOTE:** The safety beam receiver (the unit with two indicators) should be located on the "shady" side of the door to prevent sunlight from shining directly into the receiver's lens.

3 Drill two 3/16" pilot holes for lag screws at marks. Mount the brackets with two 1/4" x 1-1/4" lag screws and tighten with a 7/16" socket (or use proper concrete fasteners if floor mounting).



4 Insert the sender and receiver into the bracket holes so the lenses of the units will face each other. Twist the units until the spring clips lock into a detent mark on the brackets. To protect the units from being bumped after installation, it is recommended to mount the sender and receiver inside the brackets as shown.

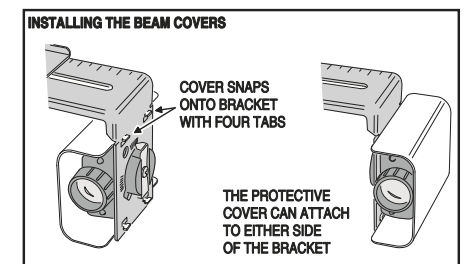
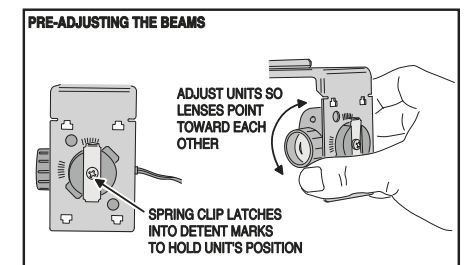
5 Install the two safety beam protective covers over the beam units to protect them from damage.

► **IMPORTANT:** Be careful to route the safety beam wiring away from any moving parts of the door or operator.

6 For non-prewired installations, route the wires from the sender and receiver, up the wall above the door hardware, then over to the center of the door, then along the top of the rail (or ceiling), and back to the operator head. Cut the wires about 6" longer than needed to reach the operator terminals. Strip back 1/2" of insulation from the ends of the wires.

7 For non-prewired installations, secure all the wires to the wall and ceiling with insulated staples (not supplied). Staples must straddle both wires to prevent shorts.

8 At the operator, twist one wire from each pair together, then twist the other wire from each pair together.



9. See Figure 9 for connecting the photoelectric device to the operator. See Page 17 for proper setting of the selector switches. These switches must be properly set and an approved photoelectric device or approved door edge device connected to the operator to obtain B2 Mode of Operation, Momentary Contact to Close.

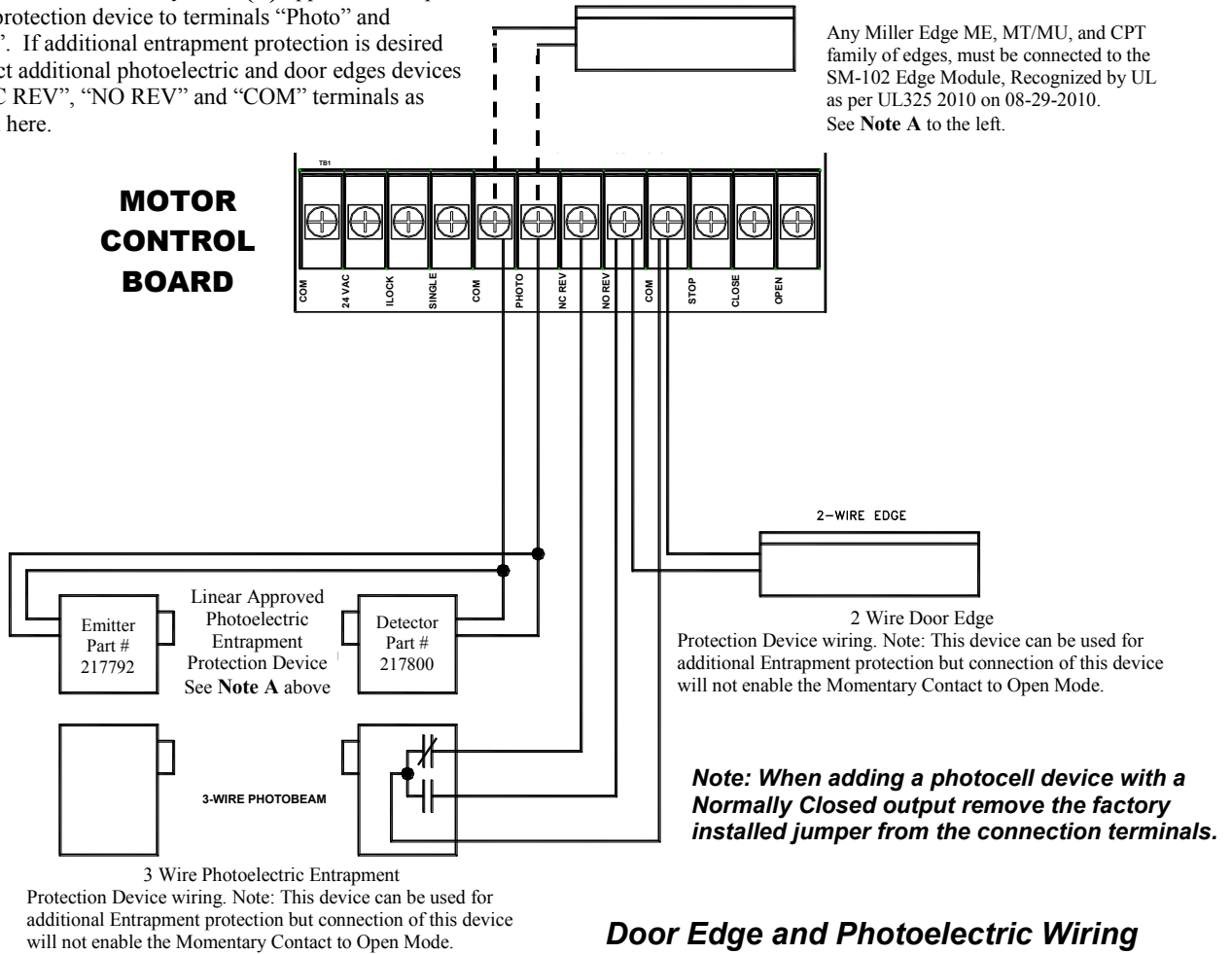
**CAUTION**  
TO AVOID DAMAGE TO DOOR AND OPERATOR ENSURE ALL DOOR LOCKS ARE DISABLED.  
USE AN INTERLOCK SWITCH IF A LOCK IS REQUIRED TO RETAIN FUNCTIONALTY.

**ENTRAPMENT PROTECTION DEVICES WIRING INSTRUCTIONS**

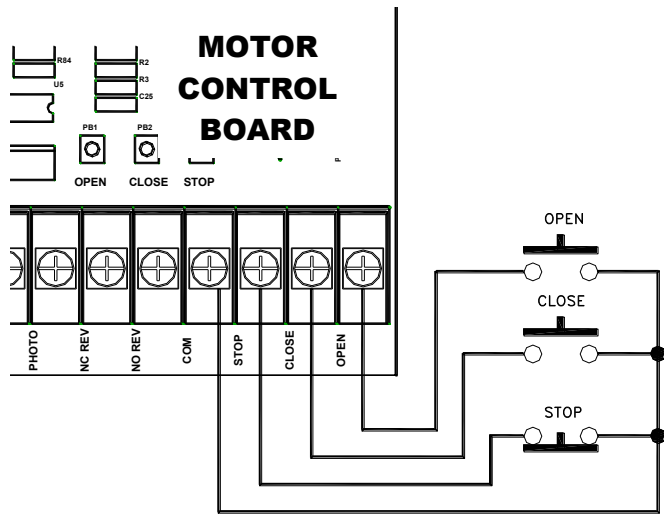
**Note A:** Connect only **one (1)** approved entrapment protection device to terminals “Photo” and “Com”. If additional entrapment protection is desired connect additional photoelectric and door edges devices to “NC REV”, “NO REV” and “COM” terminals as shown here.

Any Miller Edge ME, MT/MU, and CPT family of edges, must be connected to the SM-102 Edge Module, Recognized by UL as per UL325 2010 on 08-29-2010. See **Note A** to the left.

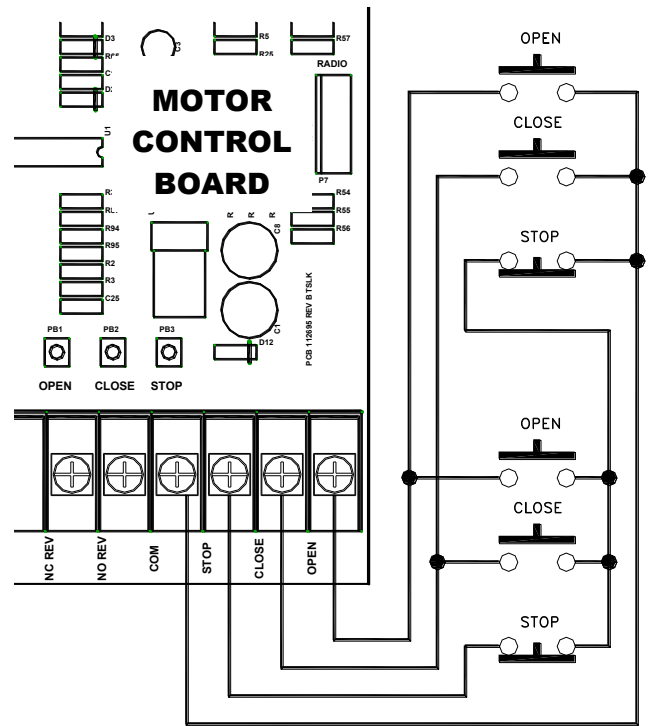
Figure 9



After properly connecting an approved Entrapment Protection Device (see above and Page 3) to the operator, see Page 17 for setting of the selector switches. These switches must be properly set and an approved photoelectric device or approved door edge device connected to the operator to obtain B2 Mode of Operation, Momentary Contact to Close.



Single 3 Button Station Figure 15



Multiple 3 Button Station Figure 16

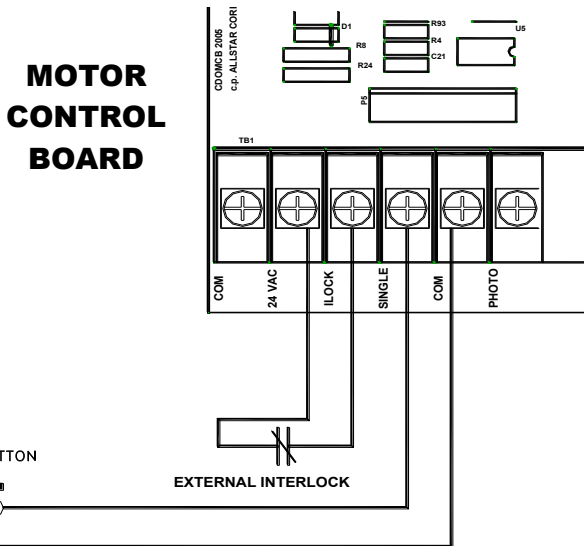


Figure 17

Single Button and External Interlock Wiring

**Note:** When adding an External Interlock remove the factory installed jumper from the connection terminals.

## TURNING ON THE POWER TO THE OPERATOR

**NOTE:** It is now necessary to turn on the power in order to change the Operating Mode (if applicable), program any changes desired to the operator's other settings, check for proper performance of all the operator's features to include the brake (if applicable) and clutch (adjusting settings if necessary); and to finalize any adjustments to the limit settings. Before doing so, ensure that all mounting hardware are installed and properly tightened, that all electrical connections are per local code requirements, and that proper wiring practices have been followed. Also, double-check that all ropes have been removed from the door and that the doorway is clear.

**IMPORTANT SAFETY INSTRUCTIONS FOR OWNER****WARNING****TO REDUCE THE RISK OF SEVERE INJURY OR DEATH:****READ AND FOLLOW ALL INSTRUCTIONS!**

- Understand all of the operating features of your door control system at the time of its installation. Your installing dealer will demonstrate them for you.
- NEVER let children operate or play with door controls. Keep the Remote Control (where provided) away from children.
- Personnel should keep away from a door in motion and keep the moving door in sight until the door is completely closed or opened. **NO ONE SHOULD CROSS THE PATH OF A MOVING DOOR.**
- TEST THE DOOR OPENER'S SAFETY FEATURES AT LEAST ONCE A MONTH. After adjusting either the force setting or the limit of travel, ALWAYS RETEST the Operator's safety features. Failure to ADJUST THE OPERATOR PROPERLY may cause SEVERE INJURY OR DEATH.
- DO NOT over adjust the force setting to compensate for a poorly working door.
- If possible, USE THE MANUAL RELEASE only when the door is closed. Use caution when using this release when the door is open. WEAK OR BROKEN SPRINGS MAY ALLOW THE DOOR TO CLOSE RAPIDLY, CAUSING SEVERE INJURY OR DEATH.
- KEEP THE GARAGE DOOR PROPERLY BALANCED. See the door manufacturer's owner's manual. An improperly balanced door COULD CAUSE SEVERE INJURY OR DEATH. Have a TRAINED DOOR SYSTEMS TECHNICIAN MAKE REPAIRS TO CABLES, SPRING ASSEMBLIES AND OTHER HARDWARE.
- Inspect and maintain your door system as described in this manual.
- SAVE THESE INSTRUCTIONS

**WARNING**

**AVOID ELECTROCUTION:  
DO NOT ROUTE LOW VOLTAGE WIRES IN  
SAME CONDUIT AS HIGH VOLTAGE  
WIRES. FOLLOW ALL LOCAL  
ELECTRICAL CODES OR THE NATIONAL  
ELECTRICAL CODE.**

**WARNING**

**FAILURE TO TEST REVERSING  
SYSTEM COULD RESULT IN DEATH  
OR SERIOUS INJURY. TEST THIS  
SYSTEM ONCE A MONTH.**



**SETTING THE SWITCH SELECTABLE OPERATING MODES**

**Changing the Switch Selectable Operation Modes**

The following modes are selected by setting the on-board dip switches, Figure 18 at right shows where the switches are located on the operator control board. For each Operational Mode, the switches are set to either ON or OFF according to the table at right below. For all the modes, if an approved entrapment protection (EP) reversing device as described on page 3 of this manual is attached to the input labeled “Photo”, it will function as noted. Once an approved EP device is recognized by the control board it is monitored for correct operation. If the device becomes inactive then the mode will default to constant pressure activation for close regardless of the dip switch setting. In order for any of the Momentary Contact to Close operation modes (B2, TS, T) to become active an approved Entrapment Protection (EP) Reversing device (see Page 3) must be properly installed and connected to the operator. The switches must be set to **one** of the six Operational Mode combinations for the operator to function. In order for the NO (Normally Open) Reverse or NC (Normally Close) Reverse inputs to function, you must first install an operational approved Entrapment Protection (EP) Reversing Device.

**Settable Switches Location**

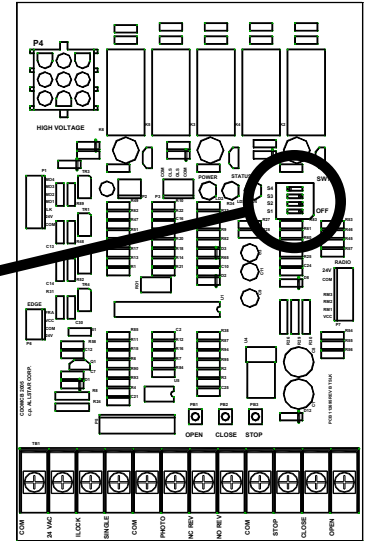
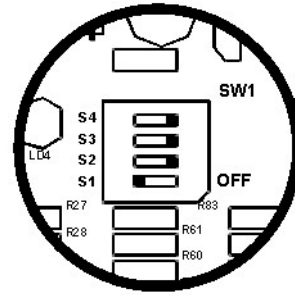


Figure 18

**MOTOR CONTROL BOARD**

Operating Mode	Switch 1	Switch 2	Switch 3	Switch 4
B2 Operation	ON	OFF	OFF	OFF
C2 Operation	OFF	OFF	OFF	OFF
D1 Operation	OFF	ON	OFF	OFF
E2 Operation	ON	ON	OFF	OFF
TS Operation	OFF	OFF	ON	OFF
T Operation	ON	OFF	ON	OFF

**B2 Operation (Factory Default)**

- Open Button:* Momentary activation; open override of closing door.
- Close Button:* Momentary activation.
- Stop Button:* Momentary activation; stops open, close or reverse action.
- Single Button:* Momentary activation to open; open override of closing door, closes door from mid-stop or open limit.
- EP Reverse (Photo Input):* Momentary activation will reverse a closing door, reverse to full open (ignores mid-stop) unless stopped by stop pushbutton input.
- Mid-Stop:* Activation stops an opening door; momentary contact of open button at mid stop will restart door to full open position; if door is moving open, constant pressure on open button will bypass mid-stop.
- Auto Close Timer:* N/A.

**C2 Operation**

- Open Button:* Momentary activation; open override of closing door.
- Close Button:* Constant activation, door will stop when button is released.
- Stop Button:* Momentary activation; stops open, close or reverse action.
- Single Button:* Momentary activation to open; open override of closing door.
- EP Reverse (Photo Input):* Momentary activation will reverse a closing door, reverse to full open (ignores mid-stop) unless stopped by stop pushbutton input.
- Mid-Stop:* Activation stops an opening door; momentary contact of open button at mid stop will restart door to full open position; if door is moving open, constant pressure on open button will bypass mid-stop.
- Auto Close Timer:* N/A.

**D1 Operation**

- Open Button:* Constant activation; open override of closing door.
- Close Button:* Constant activation, door will stop when button is released.
- Stop Button:* Momentary activation; stops open, close or reverse action (not required).
- Single Button:* N/A.
- EP Reverse (Photo Input):* Momentary activation will stop a closing door.
- Mid-Stop:* Activation stops an opening door; after the door stops at the mid stop, constant contact of open button at mid stop will restart door to full open position.
- Auto Close Timer:* N/A.

**E2 Operation (roll-back)**

- Open Button:* Momentary activation; open override of closing door.
- Close Button:* Constant activation, door will reverse to full open (ignores mid-stop) when button is released.
- Stop Button:* Momentary activation; stops open, close or reverse action.
- Single Button:* N/A.
- EP Reverse (Photo Input):* Momentary activation to reverse a closing door, reverse to full open (ignores mid-stop) unless stopped by stop pushbutton input.

*Mid-Stop:* Activation stops an opening door; momentary contact of open button at mid stop will restart door to full open position; if door is moving open, constant pressure on open button will bypass mid-stop.

*Auto Close Timer:* N/A

### **TS Operation**

*Open Button:* Momentary activation; open override of closing door.

*Close Button:* Momentary activation.

*Stop Button:* Momentary activation; stops open, close or reverse action.

*Single Button:* Momentary activation to open; open override of closing door, closes door from mid-stop or open limit.

*EP Reverse (Photo Input):* Momentary activation will reverse a closing door, reverse to full open (ignores mid-stop) unless stopped by stop pushbutton input.

*Mid-Stop:* Activation stops an opening door; momentary contact of open button at mid stop will restart door to full open position; if door is moving open, constant pressure on open button will bypass mid-stop.

*Auto Close Timer:* Closes door from mid-stop or open limit after pre-set time. Stop will deactivate the auto close timer. Open will reactivate the auto close timer or reset the auto close timer when the door is at the mid-stop or open limit. Single button will reset the auto close timer from the mid-stop or open limit. Reverse will reactivate the auto close timer or reset the auto close timer when the door is at the mid-stop or open limit.

### **T Operation, Dip-Switch Setting**

*Open Button:* Momentary activation; open override of closing door.

*Close Button:* Momentary activation.

*Stop Button:* Momentary activation; stops open, close or reverse action.

*Single Button:* Momentary activation to open; open override of closing door, closes door from mid-stop or open limit.

*EP Reverse (Photo Input):* Momentary activation will reverse a closing door, reverse to full open (ignores mid-stop) unless stopped by stop pushbutton input.

*Mid-Stop:* Activation stops an opening door; momentary contact of open button at mid stop will restart door to full open position; if door is moving open, constant pressure on open button will bypass mid-stop.

*Auto Close Timer:* Closes door from mid-stop or open limit after pre-set time. Stop will deactivate the auto close timer. Open will reactivate the auto close timer or reset the auto close timer when the door is at the open limit. Single button will reset the auto close timer from the mid-stop or open limit. Reverse deactivates the auto close timer if the door is closing. Reverse will reset the auto close timer at the mid-stop or open limit if the auto close timer has not been previously deactivated.

## SETUP MODES

### **Setup Modes**

Various operating characteristics can be modified via the setup modes. The operator is moved to the close limit position and the on-board dip switches (see Figure 18, page 17) are **TEMPORARILY** set according to the table at right to enter a Setup Mode. The on board OPEN and STOP buttons are used to modify the characteristic. Once set, the values are stored in non-volatile memory.

These values are set to factory defaults that should be satisfactory for many applications. **ALL VALUES AS DESCRIBED HERE CAN BE RESET TO THE FACTORY DEFAULTS AS FOLLOWS:**

Remove 24 VAC power from the control board.

Press and hold the on-board stop button.

Re-apply 24 VAC while holding the on-board stop button.

After completing the procedure to modify the operating characteristic the switches must be returned to the originally set Operating Mode setting (see section previous).

### **Delay on Reverse Setup**

To help prevent stress on the door components, this feature allows for a delay time between the door stopping and reversing when a command to reverse is received as the door is closing. The factory default time is 0.75 seconds; the minimum time is 0.4 seconds; the maximum time is 2 seconds.

After moving the door to the close position and **temporarily** setting the switches to the appropriate settings in the table, pressing STOP will reset the time to the minimum setting. Every time OPEN is pressed, 200 mS is added to the time (up to the maximum).

Setup Mode	Switch 1	Switch 2	Switch 3	Switch 4
Delay on Reverse	ON	ON	ON	ON
Close Limit Delay	OFF	ON	ON	ON
Mid-Stop Limit	ON	OFF	ON	ON
Auto Close Timer	OFF	OFF	ON	ON
Maximum Run Time	OFF	ON	OFF	ON

Changing the dip-switch setting to any other setting will save the new time. Return the dip switches to the originally set Operating Mode setting (see section previous).

### **Close Limit Delay Setup**

To provide for irregularities in the floor, this feature allows for the door to continue to travel down after the Reverse Cutout Limit is activated. The factory default time is 0.32 seconds; the minimum time is 0.12 seconds; the maximum time is 0.66 seconds.

After moving the door to the close position and **temporarily** setting the switches to the appropriate settings in the table, pressing STOP will reset the time to the minimum setting. Every time OPEN is pressed, 0.02 seconds are added to the time (up to the maximum).

Changing the dip-switch setting to any other setting will save the new time. Return the dip switches to the originally set Operating Mode setting (see section previous).

**Mid-Stop Limit Setup**

This feature provides a timing function to stop a door as it is traveling open at a Mid Stop position instead of the full open position. The door can then be moved to the full open position if desired by pressing the Open button. A single button input when the door is at the mid stop position will cause the door to begin moving in the close direction. The factory default is not set; the minimum run time to mid-stop limit is 6 seconds. After moving the door to the close position and *temporarily* setting the switches to the appropriate settings in the table, pressing STOP will remove the mid-stop limit setting. Pressing OPEN will start the door open. When the door reaches the desired mid-stop position, press STOP. Changing the dip-switch setting to any other setting will save the mid-stop limit position. Return the dip switches to the originally set Operating Mode setting (see section previous). *Note: The door must move a sufficient distance to fully disengage the Reverse Cutout Limit nut from the Reverse Cutout Limit switch to set the mid-stop limit.*

**Auto Close Timer Setup**

This feature allows for a modification of the amount of time between the door reaching either the Mid Stop or the Full Open position and automatically starting in the close direction. The Auto Close feature is only active when the operator is set to the T or TS Operating Mode (see section previous). The factory

default is 30 seconds; the minimum time is 5 seconds; the maximum time is 5 minutes.

After moving the door to the close position and *temporarily* setting the switches to the appropriate settings in the table, pressing STOP will clear and turn off the auto close timer. Every time OPEN is pressed, 5 seconds is added to the time. Changing the dip-switch settings to any other settings will save the new time. Return the dip switches to the originally set Operating Mode setting (see section previous).

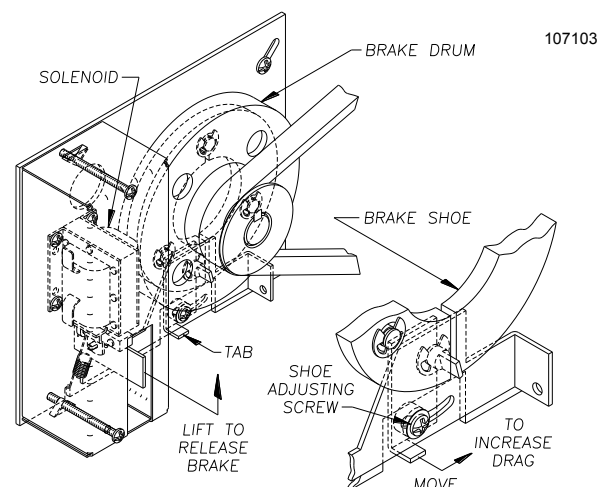
**Maximum Run Time Setup**

This feature provides for a maximum amount of time the motor will be energized after an input is recognized. The factory default time is 30 seconds; the maximum time is 60 seconds. After moving the door to the close position and *temporarily* setting the switches to the appropriate settings in the table, pressing STOP will reset the time to the factory default setting. Pressing OPEN will start the door open. The run time will be recorded when the door reaches the open limit. To prevent nuisance problems, 0.75 seconds are added to this time. Pressing stop before the door reaches the open limit will stop the door and reset the time to the factory default. Changing the dip-switch setting to any other setting will save the new time. Return the dip switches to the originally set Operating Mode setting (see section previous).

## BRAKE ADJUSTMENT

The solenoid operated brake may require occasional adjustment. Adjustment is necessary if door tends to drift downward after reaching the open limit. Follow the instructions below and use **Figure 19** as a guide.

- (1) Loosen shoe adjusting screw and bottom bracket arm of solenoid.
- (2) Move tab until drum has a slight drag.
- (3) Reverse drag slightly from tab and tighten shoe adjustment screw.



**Figure 19**

## Aligning the Infrared Safety Beam

The safety beam has two components, a sender and a receiver. The sender produces a narrow infrared beam that travels across the bottom of the door opening to the infrared receiver. If an object blocks the infrared beam while the door is closing, the door will stop, then reverse and fully open.

As a safety feature, the operator will inhibit close commands if the door is open and the infrared safety beam is blocked or out of alignment. In this case, the door can be forced closed by pressing and holding the wall station's CLOSE pushbutton (be sure the door area is in clear view).

### ! WARNING !

**STAY CLEAR OF THE DOOR DURING THESE TESTS!**

### Safety Beam Test

- 1 Check that the operator has power. The green lights on the sender and receiver should be lit.
- 2 If the receiver's green light is on, but the red light is off, the receiver has power but is not detecting the infrared beam from the sender. The red light might flash when the beam is partially detected. This can be caused by mis-alignment or something blocking the beam. Adjust the safety beam sender and receiver while watching the receiver's red light (stay out of the beam while aligning it). When the red light stays on, the beam is aligned.

**SAFETY BEAM INDICATOR TABLE**

GREEN ON	POWER ON
GREEN OFF	POWER OFF
RED ON	BEAM OK - NO BLOCKAGE
RED OFF	BEAM BLOCKED OR MIS-ALIGNED
RED FLASHING	BEAM ALIGNED POORLY

- **NOTE:** If the receiver's red light remains off, check for: 1) Dirt on the receiver's lens, 2) Sunlight shining into the receiver's lens, 3) A short in the safety beam wiring (from staples or at the operator terminals).

- 3 If the door is closed, press the wall station's OPEN button to fully open the door.
- 4 Push the wall station's CLOSE button. While the door is moving to the close position, CAREFULLY block the safety beam. **THE DOOR MUST STOP, THEN REVERSE TO THE OPEN POSITION.**
- 5 Place an object in the path of the safety beam. Check that constant pressure is required on the wall station's CLOSE button to cause the door to move toward the close position. Release the pushbutton before the operator stops; check that the door returns to the up position.

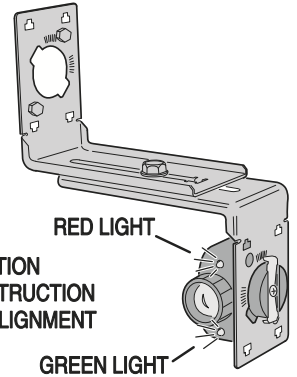
### ! WARNING !

**Serious injury or death from a closing garage door may result because of failure to test and adjust the safety reverse system. Repeat this test monthly and adjust as needed.**

### SAFETY BEAM INDICATORS

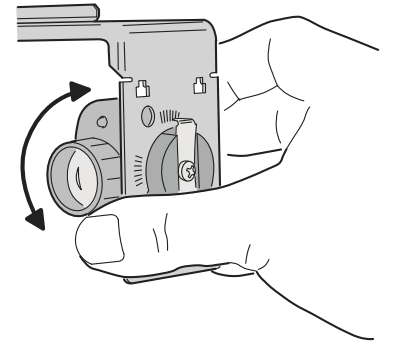
**GREEN LIGHT**  
ON = POWER ON  
OFF = POWER OFF

**RED LIGHT**  
ON = BEAM ALIGNED, NO OBSTRUCTION  
OFF = BEAM NOT ALIGNED, OR OBSTRUCTION  
BLINKING = BEAM NEEDS BETTER ALIGNMENT

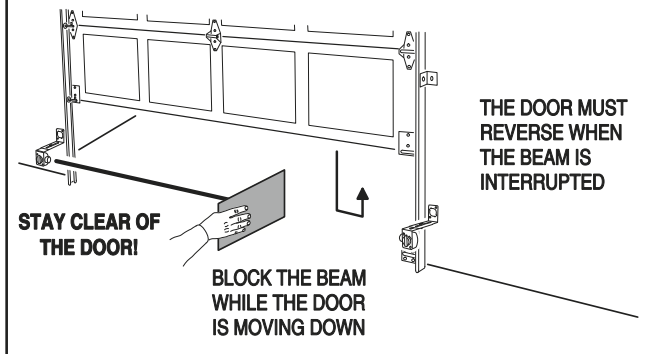


### ADJUSTING THE BEAM

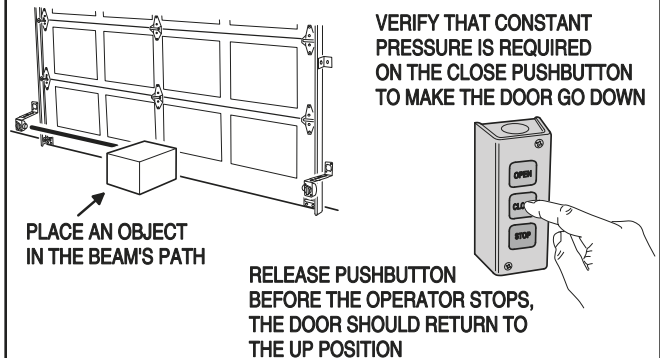
ADJUST THE SENDER AND RECEIVER UNTIL THE RED INDICATOR LIGHTS SOLID



### CHECKING FOR REVERSAL



### CHECKING FORCED CLOSURE FEATURE



## TESTING

Following installation, the opener **MUST** be tested and respond correctly to all controls as specified on the wiring diagram. **KEEP** personnel and equipment clear of the area beneath the door when performing the tests. When testing the 3-button wall station, first observe that each button operates the door in the direction indicated and that the STOP button performs that function. With the door stopped at its full open position, the OPEN button should be inoperative. This should be verified and, likewise, the CLOSE button should be inoperative with the door fully closed.

Certain opener control circuits use only a single button or a two button control station and may be designed to function differently than the more common three-button circuit described above. Test the controls in accordance with the description of operation as indicated on pages 17 and 18.

Observe the door when traveling in each direction for smoothness of operation. Test the setting of the clutch by restraining the door by hand. The clutch should slip. Re-check the limit settings. The door should close tightly at the floor without excessive impact. Likewise, it should fully clear the door opening without the carrier striking the stops on the rail.

MO-S openers are equipped with a reversing circuit and to allow for Momentary Close Contact operation an approved entrapment protection device as described on Page 3 needs to be properly installed and connected to the operator. To test it for proper reversal, place an object beneath the leading edge of the door. The door should instantly reverse when it comes into contact with the object provided the height of the object exceeds the cut out point built into the close limit switch (approximately four inches).

### CAUTION

**DO NOT STAND UNDER DOOR  
TO TEST REVERSING EDGE  
USE A CORRUGATED BOX  
OR OTHER SIMILAR OBJECT**

If the opener is equipped with other means of control, such as additional 3 button stations or radio controls, each of these should be tested separately for proper operation.

To test the manual disconnect first move the door to the fully closed position. Then disconnect the power to the opener. Manual door operation mode should engage when the release chain is pulled. The door can then be manually opened or closed by physically moving the door or using the hoist chain. If it is difficult to engage and/or the jackshaft to doorshaft chain appears to be under compression, reset the CLOSE limit slightly to reduce the door travel in the close direction.



### WARNING

**ALWAYS DISCONNECT POWER TO  
THE OPENER BEFORE SERVICING,  
CONNECTING ACCESSORY DEVICES  
OR MAKING ADJUSTMENTS.**

## MAINTENANCE

Normally, very little maintenance is required. A monthly visual inspection must be made for loose or missing hardware and for excessive slack in the V-Belt and jackshaft chain. The brake is adjusted at the factory and will need periodic adjustment for wear. When adjustment becomes necessary see **Figure 19** on page 19 for the adjustment procedure.

Test the reversing edge circuit or components (where applicable) at least once a month by permitting the door to contact an obstruction while closing.

Periodic inspection of gear box oil level should be made by removing oil level plug. If oil level is below this plug, add Esso Gear Oil XP90 or Mobilelube "C" SAE 140 or equivalent to bring to proper level.

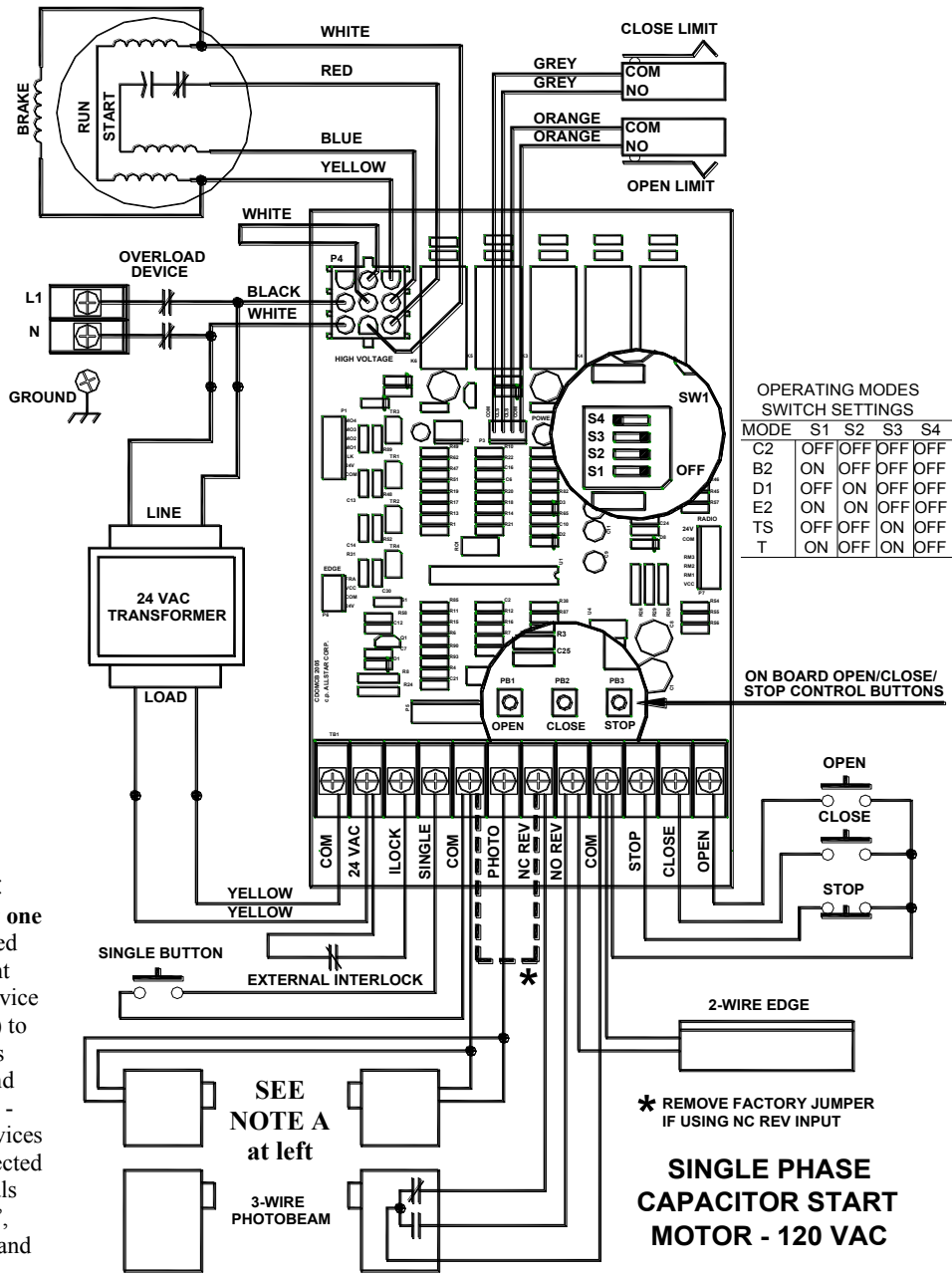
Lubrication of the opener is not required. It is important, for trouble free service from the opener, that the door be kept free

### CAUTION

**DO NOT STAND UNDER DOOR TO  
TEST REVERSING  
FEATURE - USE A CORRUGATED  
BOX OR OTHER SIMILAR OBJECT**

from binding, properly counter balanced and periodically lubricated. **An annual inspection of the door by a qualified overhead door professional is recommended.**

**Warning: Repairs and adjustments to the door and opener should be performed only by someone qualified to service commercial overhead doors and openers.**



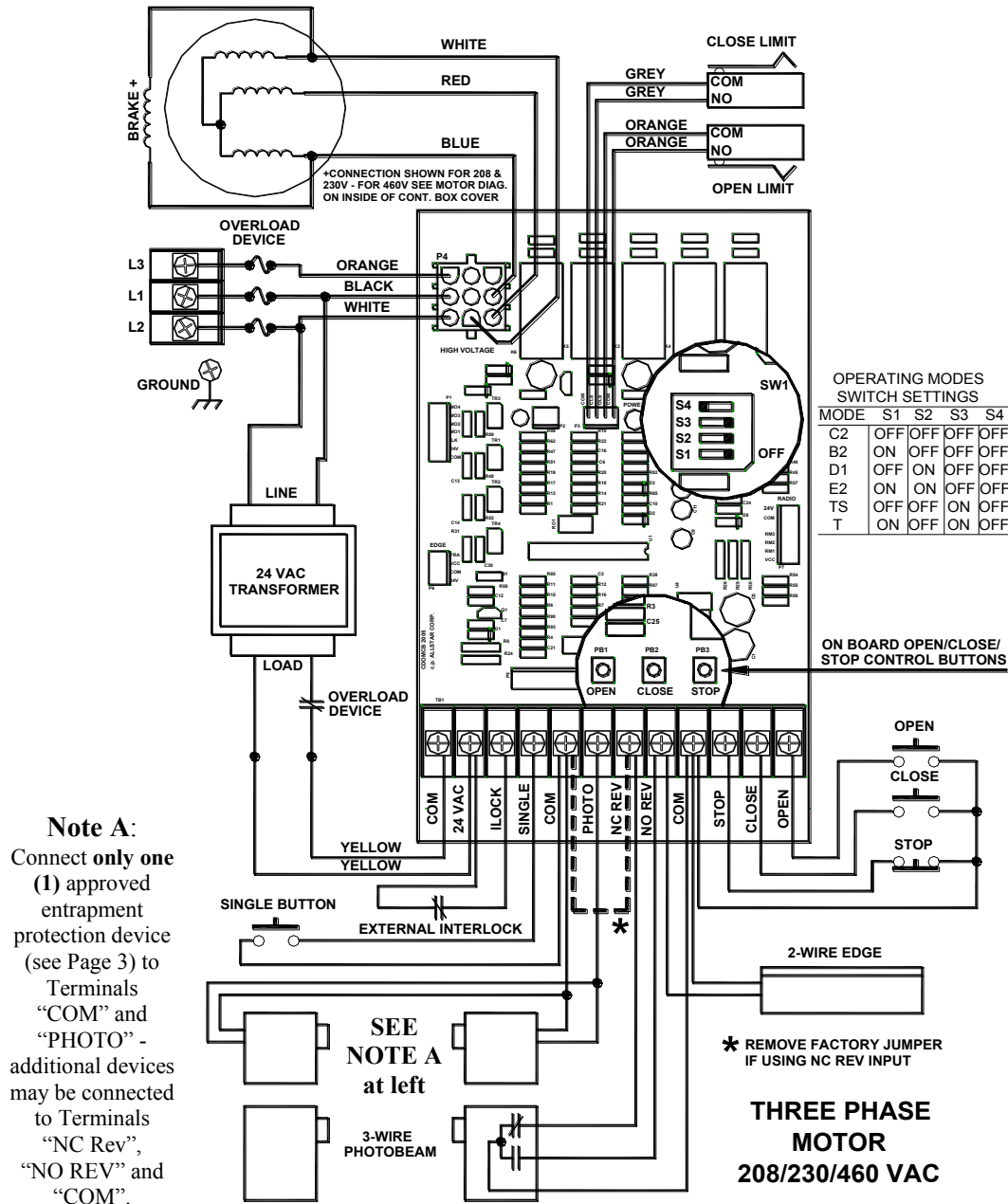
**Note A:**  
Connect **only one (1)** approved entrapment protection device (see Page 3) to Terminals "COM" and "PHOTO" - additional devices may be connected to Terminals "NC Rev", "NO REV" and "COM".

\* REMOVE FACTORY JUMPER IF USING NC REV INPUT

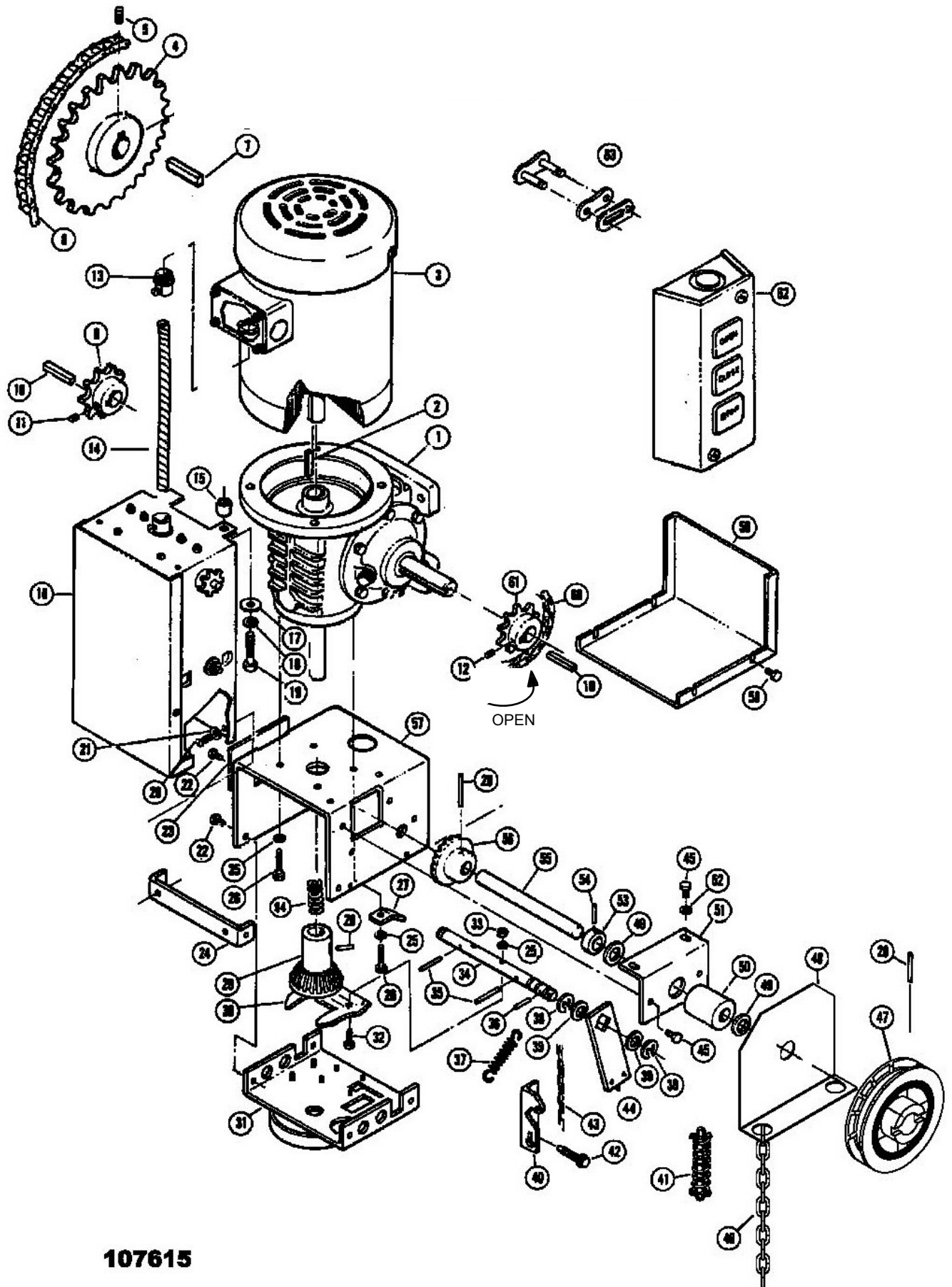
**SINGLE PHASE CAPACITOR START MOTOR - 120 VAC**

MOTOR WIRING CHART		CDO OPERATORS WITH CDO-MCB MOTOR CONTROL SYSTEM	
<p><b>A.O. SMITH</b> SINGLE VOLTAGE - 115 VAC, 1P MOTOR</p> <p>TO REVERSE MOTOR, SWITCH LEADS 1 &amp; 3</p>	<p><b>A.O. SMITH - DUAL VOLTAGE MOTOR</b> WIRED FOR 115 VAC, 1P</p> <p>Wire Nut Connection TO REVERSE MOTOR, SWITCH LEADS 3/4 &amp; 2/1</p>	<p><b>A.O. SMITH - DUAL VOLTAGE MOTOR</b> WIRED FOR 208/230 VAC, 1P</p> <p>Wire Nut Connection TO REVERSE MOTOR, SWITCH LEADS L1 &amp; L2</p>	<p><b>BALDOR</b> DUAL VOLTAGE MOTOR - 115V 1P</p> <p>TO REVERSE MOTOR DIRECTION, SWITCH INCOMING LEADS TO TERMINALS 5 AND 8.</p>
<p><b>208/230 VOLTS, 3 PHASE</b> DUAL VOLTAGE MOTOR</p> <p>TO REVERSE MOTOR DIRECTION, SWITCH ANY TWO INCOMING LEADS.</p>	<p><b>460 VOLTS, 3 PHASE</b> DUAL VOLTAGE MOTOR</p> <p>TO REVERSE MOTOR DIRECTION, SWITCH ANY TWO INCOMING LEADS.</p>	<p><b>575 VOLTS, 3 PHASE</b> SINGLE VOLTAGE MOTOR</p> <p>TO REVERSE MOTOR DIRECTION, SWITCH ANY TWO INCOMING LEADS.</p>	<p><b>BALDOR</b> DUAL VOLTAGE MOTOR - 230V 1P</p> <p>TO REVERSE MOTOR DIRECTION, SWITCH INCOMING LEADS TO TERMINALS 5 AND 8.</p>





MOTOR WIRING CHART		CDO OPERATORS WITH CDO-MCB MOTOR CONTROL SYSTEM	
<p><b>A.O. SMITH</b> SINGLE VOLTAGE - 115 VAC, 1P MOTOR</p> <p>TO REVERSE MOTOR, SWITCH LEADS 1 &amp; 3</p>	<p><b>A.O. SMITH - DUAL VOLTAGE MOTOR</b> WIRED FOR 115 VAC, 1P</p> <p>Wire Nut Connection TO REVERSE MOTOR, SWITCH LEADS 3/4 &amp; 2/1</p>	<p><b>A.O. SMITH - DUAL VOLTAGE MOTOR</b> WIRED FOR 208/230 VAC, 1P</p> <p>Wire Nut Connection TO REVERSE MOTOR, SWITCH LEADS L1 &amp; L2</p>	<p><b>BALDOR</b> DUAL VOLTAGE MOTOR - 115V 1P</p> <p>TO REVERSE MOTOR DIRECTION, SWITCH INCOMING LEADS TO TERMINALS 5 AND 8.</p>
<p><b>208/230 VOLTS, 3 PHASE</b> DUAL VOLTAGE MOTOR</p> <p>TO REVERSE MOTOR DIRECTION, SWITCH ANY TWO INCOMING LEADS.</p>	<p><b>460 VOLTS, 3 PHASE</b> DUAL VOLTAGE MOTOR</p> <p>TO REVERSE MOTOR DIRECTION, SWITCH ANY TWO INCOMING LEADS.</p>	<p><b>575 VOLTS, 3 PHASE</b> SINGLE VOLTAGE MOTOR</p> <p>TO REVERSE MOTOR DIRECTION, SWITCH ANY TWO INCOMING LEADS.</p>	<p><b>BALDOR</b> DUAL VOLTAGE MOTOR - 230V 1P</p> <p>TO REVERSE MOTOR DIRECTION, SWITCH INCOMING LEADS TO TERMINALS 5 AND 8.</p>



107615



# PARTS LISTING

	Part #	Description	Qty
1	105462	Gear Reducer, 40:1 (1/2 through 1 HP)	1
	105458	Gear Reducer, 40:1 (1-1/2 through 2 HP)	
2	105817	Key, 3/16" x 3/16" x 1-1/8"	1
3	105359	Motor, 1/2 HP, 115/230V, Single Phase	1
	105362	Motor, 3/4 HP, 115/230V, Single Phase	
	105365	Motor, 1 HP, 115/230V, Single Phase	
	105367	Motor, 1-1/2 HP, 115/230V, Single Phase	
	105370	Motor, 1/2 HP, 208-230/460V, 3 Phase	
	105371	Motor, 3/4 HP, 208-230/460V, 3 Phase	
	105372	Motor, 1 HP, 208-230/460V, 3 Phase	
	105373	Motor, 1-1/2 HP, 208-230/460V, 3 Phase	
	106260	Motor, 2 HP, 208-230/460V, 3 Phase	
4	105274	Sprocket, 50B40	1
	105281	Sprocket 50B60	
	105292	Sprocket, 60B60 (1-1/2 and 2 HP)	
	105270	Sprocket, 50B24, (Sectional Door Only)	
5	006119	Set Screw, 5/16-18 x 1, Square Head	2
7	100413	Key, Steel, 1/4 x 1/4 x 1 (As Applicable)	1
7	105562	Key, Steel, 3/8 x 3/8 x 1-1/12 (As Applicable)	
	105560	Key, Steel, 1/4 x 1/4 x 1-1/2 (As Applicable)	
8	105349	Chain, #50, 6 Ft. Long	1
	105353	Chain, #60, 6 Ft. Long	
9	105268	Sprocket, 50B12	1
	105285	Sprocket, 60B12 (1-1/2 and 2 HP Only)	
10	100413	Key, Steel, 1/4 x 1/4 x 1	2
11	006119	Set Screw, 5/16 - 18 x 1, Square Head	2
12	105433	Sleeve, Insulating	2
13	105412	Connector, Conduit, Box	1
	005068	Connector, Conduit, Non-Metallic	
14	100626	Conduit, Non-Metallic, 3/8 Inch	
15	105226	Bearing, Spacer	2
16		Box, Electrical (Specify VAC, phase, HP)	1
17	105520	Washer, Flat, 3/8 x 3/4 x 3/32	4
18	006051	Washer, Lock, 3/8 Split	4
19	006026	Screw, Machine, 3/8-16 x 1-1/2	4
20	006060	Screw, Machine, 1/4-20 x 3/8	2
21	010062	Washer, flat, 1/4 x 9/16 x 3/32	2
22	105571	Screw, Machine Hex, 1/4-20 x 1/2	4
23	105188	Plate, Cover	1
24	105189	Bracket, Electrical Box Mounting	1
25	006050	Washer, Lock Split 1/4	6
26	010046	Screw, Machine, 1/4-20 x 3/4	4

	Part	Description	Qty
27	105153	Bracket, Spring Return, Gear Yoke	4
28	105541	Roll Pin, 1/4 x 1-1/2	1
29	106122	Gear, Bevel Engaging	3
30	105151	Yoke, Bevel Gear	1
31	106126	Brake Assy, CMPLT, 115V, 1 phase	1
	106127	Brake Assy, CMPLT, 230V, 3 phase	1
32	006059	Screw, Machine, 1/4-20 x 1	2
33	006035	Nut, Hex, 1/4-20	2
34	105199	Shaft, Control	1
35	105532	Pin, Roll, 1/8 x 1-1/2	2
36	105537	Pin, Roll, 3/16 x 3/4	2
37	105304	Spring, Yoke	1
38	105548	Snap Ring, 1/2	2
39	105521	Spacer, 1/2 x 1 x 3/32	2
40	105193	Bracket, Floor Level	1
41	105305	Spring, Disconnect	1
42	102636	Lag Hex Bolt, 5/16 x 2	2
43	105323	Chain, Sash, #8A-12 Ft. Long	1
44	105150	Arm, Manual Engagement	1
45	006033	Screw, Machine, 5/16-18 x 1/2	4
46	100315	Chain, Hand, Precut to 26 FT	1
47	100184	Pocket Wheel with Bearing	1
48	100183	Chain Guide with Bearing	1
49	105216	Bushing, 3/4 ID, 1 OD, 3/4 L	2
50	106928	Post, 1/2 Inch Hex x 2-7/16L	1
51	105154	Plate, Mounting Hoist Shaft	1
52	006052	Washer, Split Lock	2
53	105443	Collar, 3/4 ID	1
54	105538	Pin, Roll, 3/16 x 1	1
55	105198	Shaft, Control Hoist	1
56	105820	Gear, Bevel Engaging	1
57	105152	Frame, BK/Hoist Mtg.	1
58	105574	Screw, Pan, 8-32 x 1/4	4
59	105155	Cover, Brake/Hoist Assy	1
60	105334	Chain, #48, 43 Pitch, 22"	1
	105335	Chain, #48, 45 Pitch, 1-1/2 & 2 HP	
61	105266	Sprocket, Limit Switch	1
62	005031	Control Station, 3 button	1
63	009224	Master Link, #48 Chain Limit Switch	1
	105351	Master Link, #50 Chain	
	105354	Master Link, #60 Chain, 1-1/2 & 2 HP	
64	105303	Compression Spring	1
65	106927	Bracket w/Bearing Assy	1

## SPECIFICATIONS

MODEL : MO \_ \_ \_ \_ S      HP : \_\_\_\_\_

VOLTS : \_\_\_\_\_      PHASE : \_\_\_\_\_

- \* UL AND CANADIAN UL LISTED
- \* HIGH STARTING TORQUE, CONTINUOUS DUTY MOTOR
- \* GEAR IN OIL BATH PRIMARY REDUCTION
- \* #50 CHAIN FINAL DRIVE STANDARD
- \* KEYED EXTERNAL SPROCKETS
- \* MOTOR OVERLOAD PROTECTION
- \* CLASS 2 (24 VOLT) CONTROL CIRCUIT
- \* SOLENOID BRAKE
- \* SOLID STATE MOTOR CONTROL CIRCUITRY WITH  
ADVANCED OPERATIONAL FEATURES STANDARD
- \* THREE BUTTON CONTROL: OPEN, CLOSE, STOP
- \* WIRED TO ACCEPT REVERSING EDGE INPUT
- \* HEAVY GAUGE, POWDER-COATED STEEL FRAME AND  
POWDER COATED CONTROL BOX
- \* INTEGRAL MANUAL CHAIN HOIST WITH FLOOR LEVEL  
ENGAGEMENT AND DISCONNECT.
- \* FULLY ADJUSTABLE, INTERNAL, SHAFT DRIVEN LIMITS

## LINEAR LIMITED WARRANTY

This Linear product is warranted against defects in material and workmanship for 2 years. This warranty extends only to wholesale customers who buy direct from Linear or through Linear's normal distribution channels. Linear does not warrant this product to consumers. Consumers should inquire from their selling dealer as to the nature of the dealer's warranty, if any. There are no obligations or liabilities on the part of Linear LLC for consequential damages arising out of or in connection with use or performance of this product or other indirect damages with respect to loss of property, revenue, or profit, or cost of removal, installation, or reinstallation. All implied warranties, including implied warranties for merchantability and implied warranties for fitness, are valid only until the warranty expires. This Linear LLC Warranty is in lieu of all other warranties express or implied.

All products returned for warranty service require a Return Product Authorization Number (RPA#).  
Contact Linear Technical Services at 1-800-421-1587 for an RPA# and other important details.