

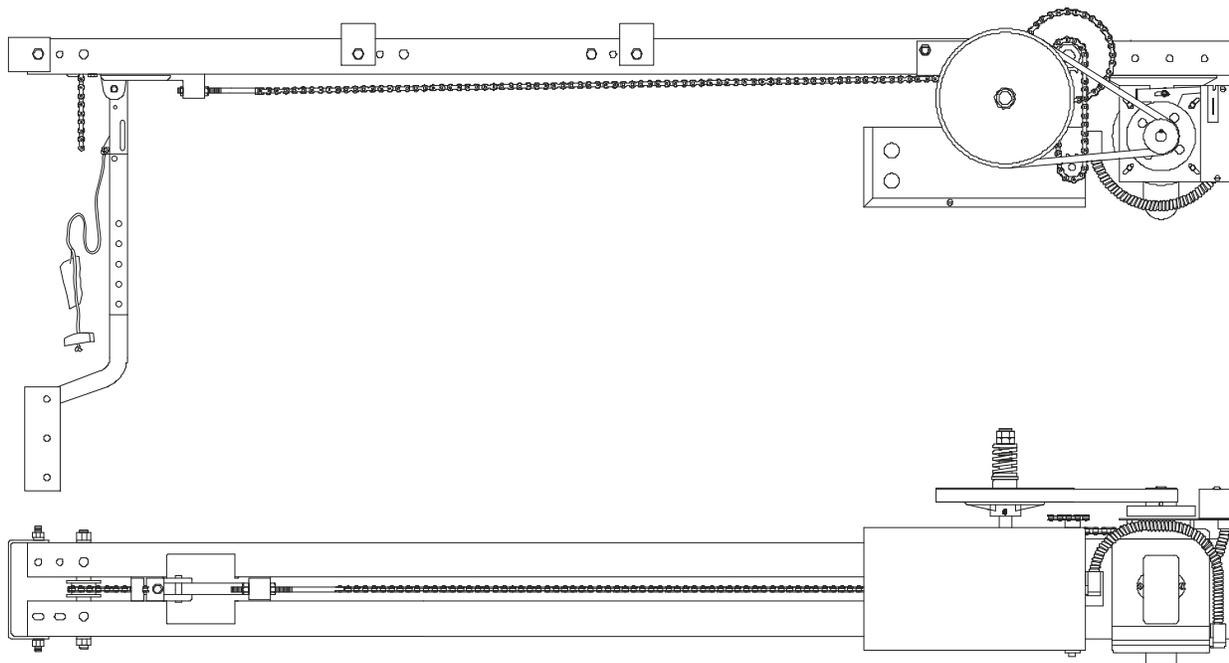
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INSTALLATION AND OWNER'S MANUAL

T

**MODEL T-S SERIES DRAWBAR
COMMERCIAL VEHICULAR DOOR
OPERATORS with SOLID STATE
CONTROLS**



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.


WARNING
Indicates a MECHANICAL hazard of INJURY OR DEATH. Gives instructions to avoid the hazard.


CAUTION
Indicates a MECHANICAL hazard of DAMAGE to your operator or equipment. Gives instructions to avoid the hazard.


WARNING
Indicates an ELECTRICAL hazard of INJURY OR DEATH. Gives instructions to avoid the hazard.


CAUTION
Indicates an ELECTRICAL hazard of DAMAGE to your operator or equipment. Gives instructions to avoid the hazard.

The purpose of this booklet is to provide assembly, installation and operation information concerning the T-S Series Solid State Commercial Vehicular Garage Door Operators 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 OPERATORS 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 15 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 11 for the entrapment protection installation guide.

T-S SERIES OPERATOR APPLICATIONS:

Drawbar operators are for commercial and industrial use on sectional overhead doors which use horizontal track with normal radius. A draw bar operator is not suitable for doors with high lift exceeding 24 inches or vertical lift doors. The installation requires a minimum clearance of 5 inches above the high arc of the door (the highest point reached by the door at any part of its travel). The back-room required for the opener is the door height plus 54 inches. When properly installed a drawbar operator effectively locks the door in the closed position.

The T-S Series drawbar operators are used in the following applications:

-Continuous Duty, Medium Cycle Commercial installations only

-Indoor Use Only

-Up to 22 foot high doors with a maximum area of 480 square feet for 3/4 HP, 280 square feet for 1/2 HP and 200 square feet for 1/3 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 11.

(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 11.

(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 11.

- The manufacturer of this operator strongly recommends installation of one of the entrapment protection device above and states that one is **REQUIRED** where any 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 or wireless keyless entry system.

Brake: Optional on 1/3 & 1/2HP, Standard on 3/4HP. Can be added in the field.

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 operator, the door must be in good working condition and properly counterbalanced. Inspect the door and track for loose or missing hardware. Test the door manually for balance and ease of operation. Lubricate door hinges and rollers. If necessary, adjust the springs for proper counterbalance of the door.

Before removing the operator 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.

The rails and drawbar chain/hardware package are shipped separately from the powerhead. **Warning: Rope off the area to keep personnel and vehicles clear of the door and floor space in the vicinity of the operator during the installation.**

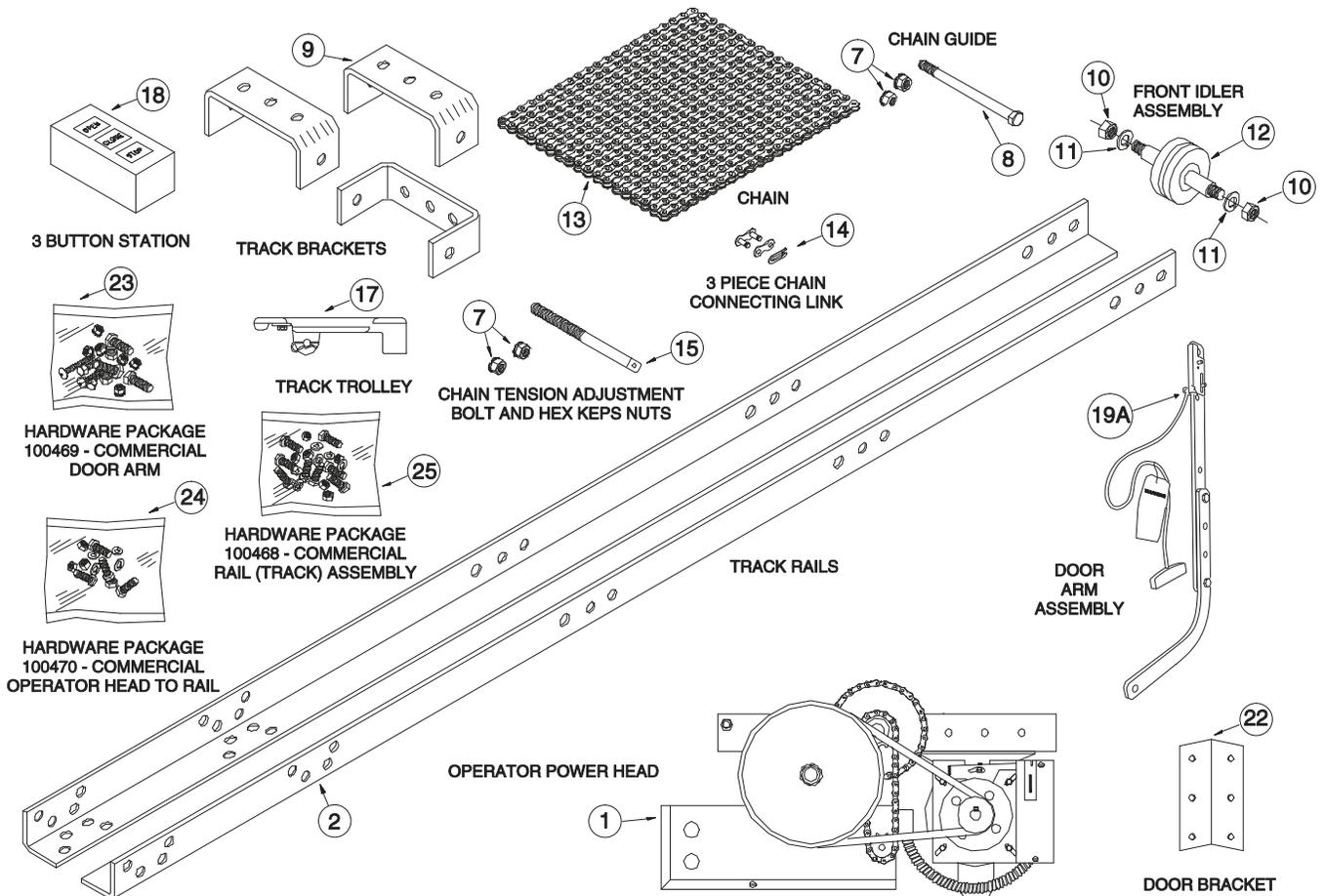
WARNING

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!

- 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.
- 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.
- 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. See Page 9.
- Model T-S Series 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).
- Connect an auxiliary entrapment protection device (reversing edge or photoelectric device across the door opening). A device of this type is **STRONGLY ADVISED FOR ALL** commercial operator installations. An auxiliary entrapment protection device is **REQUIRED** when the three

- button control station is out of sight of the door or any other automatic or manual control is used.
- Install the door operator at least 8 feet or more above the floor if the operator has exposed moving parts.
- Do not connect the opener to the source of power until instructed to do so.
- Locate the control station:
 - a) within sight of the door,
 - b) at a minimum height of five feet above the floor so small children cannot reach it,
 - c) away from all moving parts of the door, and
 - 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.
- Do not overtighten the clutch adjustment to compensate for a poorly working door.
- Install the Entrapment Warning Placard next to the control station in a prominent location.
- All warning signs and placards must be installed so they are visible in the area of the door.
- After installing the opener, all safety features must be tested for proper operation (see page 20).
- For products having a manual release, instruct the end user on the operation of the manual release.

TABLE 1 - COMPONENT IDENTIFICATION LISTING

ITEM #	PART#	DESCRIPTION	QUAN.	ITEM #	PART#	DESCRIPTION	QUAN
1		Operator Power Head	1	18	E031	3 Button Station	1
2		Track Rails	2	19A	2110-845	Door Arm Assembly	1
7	F031	3/8-16 Keps Hex Nut	6	22	100108	Door Bracket	1
8	101315	3/8 - 16 X 6-1/2 Hex Head Blot	1	23	100469	Hardware Pkg Com. Door Arm	1
9	107049	Track Bracket	AR	26		3/8 - 16 X 2-1/2 Carriage Bolt	2
10	F034	1/2 - 15 Hex Nut	2	16		3/8 - 16 X 1 Hex Head Bolt	1
11	F049	1/2 Split Lockwasher	2	27		3/8 Nylon Insert Locknut	1
12	106265	Front Idler Assembly	1	28		5/16 - 18 X 1-1/4 Hex Head Bolt	4
13		Chain For Track Rail	1	29		5/16 - 18 Keps Hex Nuts	4
14		3 Piece Chain Connecting Link	1	25	100468	Hardware Pkg Com. Track Assy	1
15	F084	Chain Tension Adjustment Bolt	1	4		3/8 - 16 Hex Nut	AR
16	F031	3/8 - 16 Keps Hex Nut	2	5		3/8 Split Lockwasher	AR
17	100512	Track Trolley	1	6		3/8 - 16 X 1-1/2 Hex Head Bolt	AR

— AR - As Required

6 RAIL/CHAIN ASSEMBLY INSTRUCTIONS

RAIL/CHAIN ASSEMBLY

Refer to Figure 1 parts illustrations. The part names and item numbers are referenced identically to the part names and numbers in the assembly procedures that follow. Before starting assembly of the operator track check for the proper length. The tracks supplied may be longer than required for the door height. The tracks should be three (3) feet longer than the door height. If the tracks supplied with the operator are longer than the door height plus three (3) feet it will be necessary to trim the rails in two foot increments from the power head mounting end as shown in Figure 2.

CAUTION: WHEN NECESSARY TO CUT THE TRACK ENSURE THE ENDS ARE LINED UP AS IN FIGURE 2.

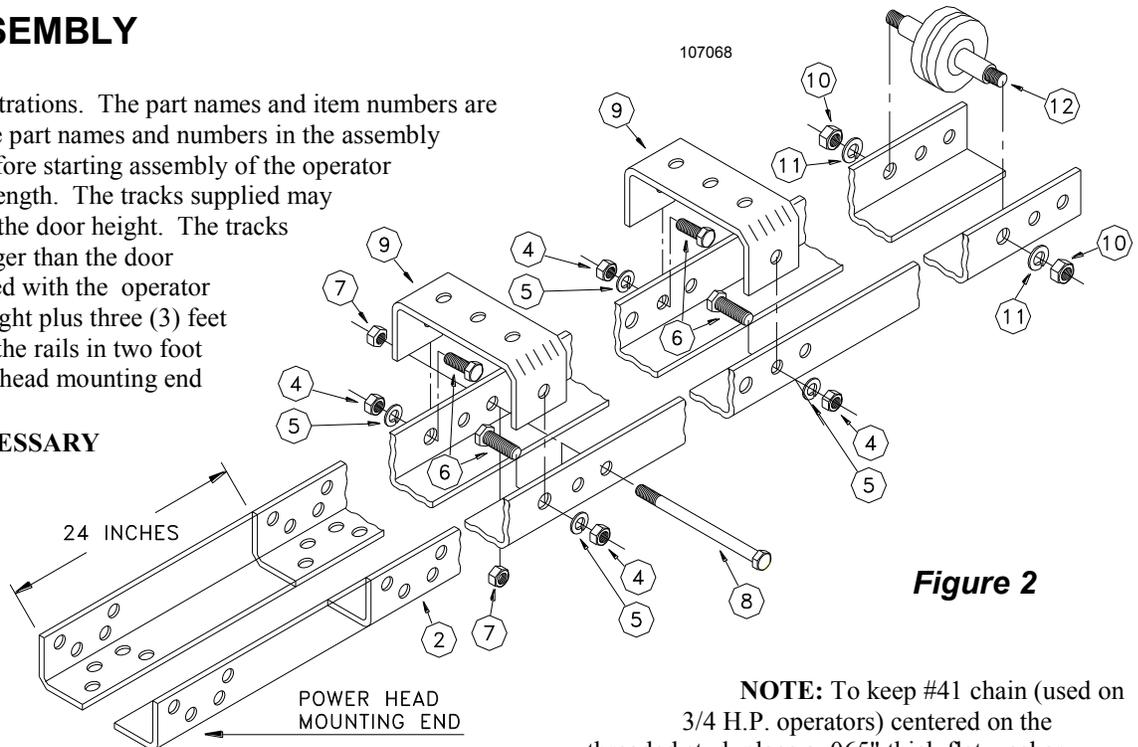


Figure 2

1) Assemble the operator track by assembling the items as shown in Figure 2.

2) After the track is assembled, position track assembly onto the operator power head and attach with four 3/8"-16 x 1" bolts, lock washers and nuts (supplied in a separate hardware package #100470).

3) Referring to Figure 1, 2 and 3 (below), slide the trolley onto the track with the chain take up bolt lug (C) toward the power head. Thread one 3/8-16 keps nut (attached star washer) onto the Chain take up bolt with the keps part (attached star washer) away from the chain attachment end. Insert the chain take up bolt threaded end through the lug hole on the trolley (C) just far enough to start a second 3/8-16 keps nut. Attach one end of the chain to the opposite end of the threaded stud using a 3-piece chain link (provided). See Figure 3.

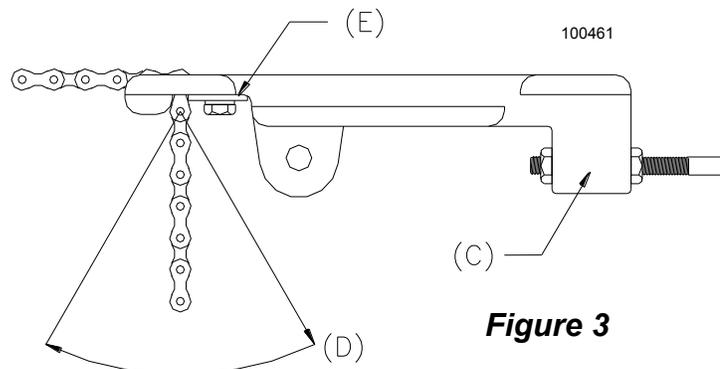


Figure 3

NOTE: To keep #41 chain (used on 3/4 H.P. operators) centered on the threaded stud, place a .065" thick flat washer (provided) on each side of the flat, as indicated by the arrows in Figure 4, when installing the connecting link. 1/3 and 1/2 horsepower operators use the narrower #65 chain and the use of the spacers is not required.

Install chain around drive sprocket at operator head then around idler at front end of rail and thread through opening at front end of carrier. If the rail is equipped with a chain guide-spacer near its center (12 foot rail or longer only) pass the chain over it in one direction and under it in the other direction to separate the two lengths of chain. Apply initial tension by pushing forward on the carrier while pulling chain tight through opening in the carrier in the direction of D. When maximum tension has been applied by this means, swing chain forward and insert retaining plate, E, in place. Insert 1/4-20 x 5/8 hex head machine screw through retaining plate, E, and tighten plate in place. Make final adjustment of chain tension to remove excess sag by adjusting nuts on threaded rod at chain lug, C.

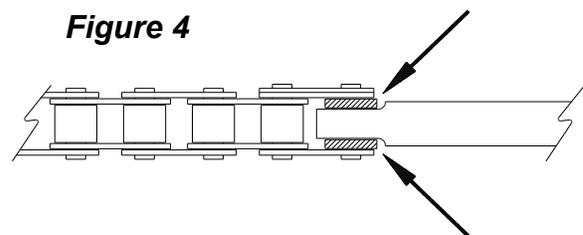


Figure 4



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 FUNCTIONALITY.

- 1) Locate the center of the door and mark a line on the wall directly above the door. Extend this line approximately 20" up the wall. See Figure 5.

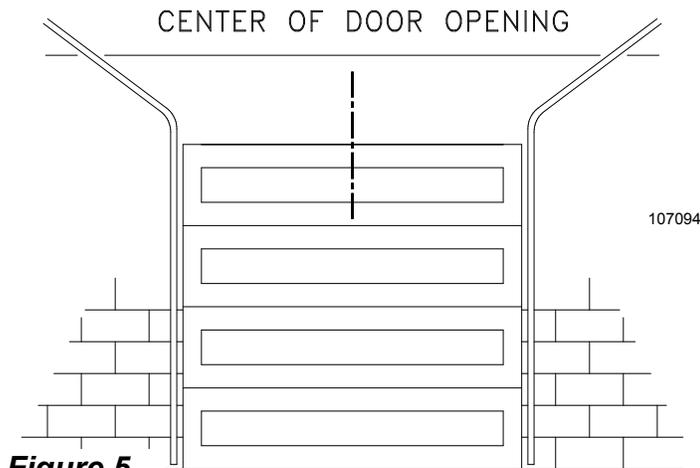


Figure 5

- 2) Slowly raise the garage door and observe the action of the top section. When the top section reaches the highest point (high arc), use a level and project a line from this point to the center of the door. See Figure 6.

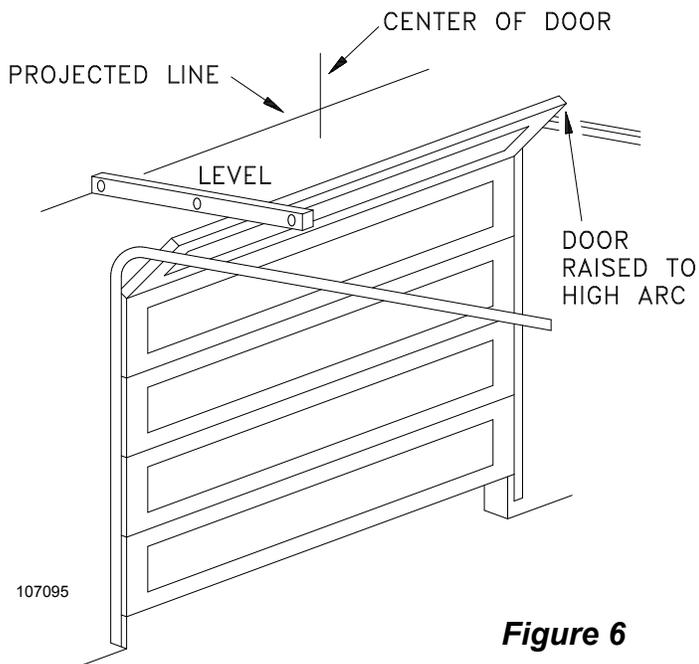


Figure 6



CAUTION

A MINIMUM OF TWO PERSONS ARE REQUIRED FOR OPERATOR INSTALLATION. ENSURE A SAFE RIGID WORKING PLATFORM IS AVAILABLE.

- 3) Using the projected lines for location, mount a suitable wood block or angle iron, depending on the structure of the building, to the wall above the door opening as shown in Figure 7. Ensure the block or angle iron used will provide a sound and secure mounting pad for the operator rail front mounting bracket, see **CAUTION** warning below.

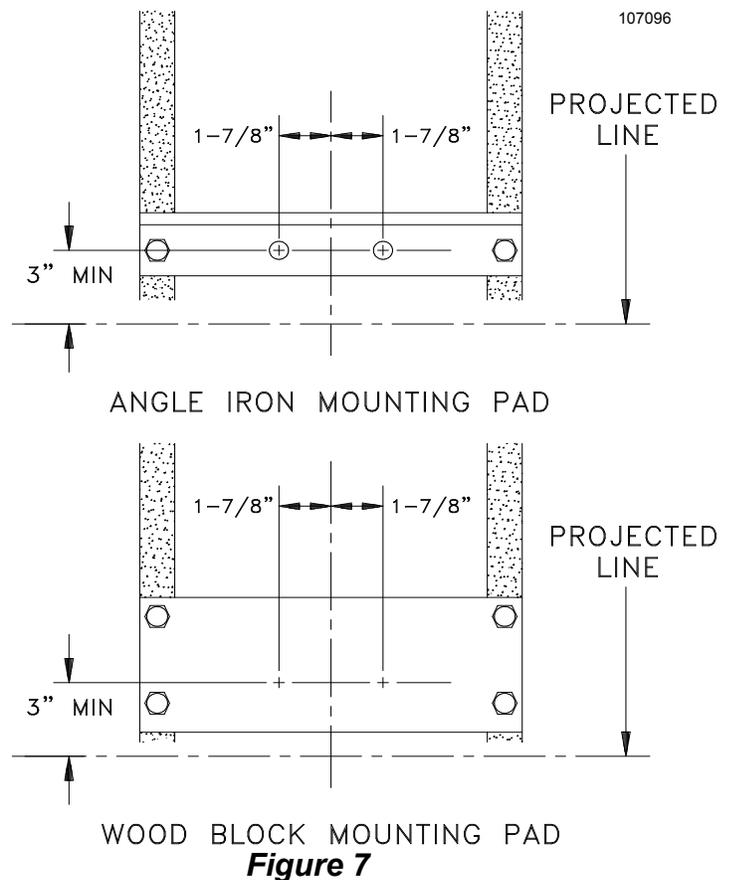


Figure 7



CAUTION

THE FRONT MOUNTING SURFACE FOR THE OPERATOR MUST BE SOUND AND SECURE. IF NECESSARY PROVIDE REINFORCEMENT IN THIS AREA BEFORE MOUNTING THE OPERATOR RAIL FRONT MOUNTING BRACKET.

4) Mount the front mounting bracket (Item 9) to the mounting pad as shown in Figure 8. The location of the door's torsion shaft may prevent you from placing the mounting pad in the location shown. Mount the pad as close as possible to three (3) inches above the door's high arc point.

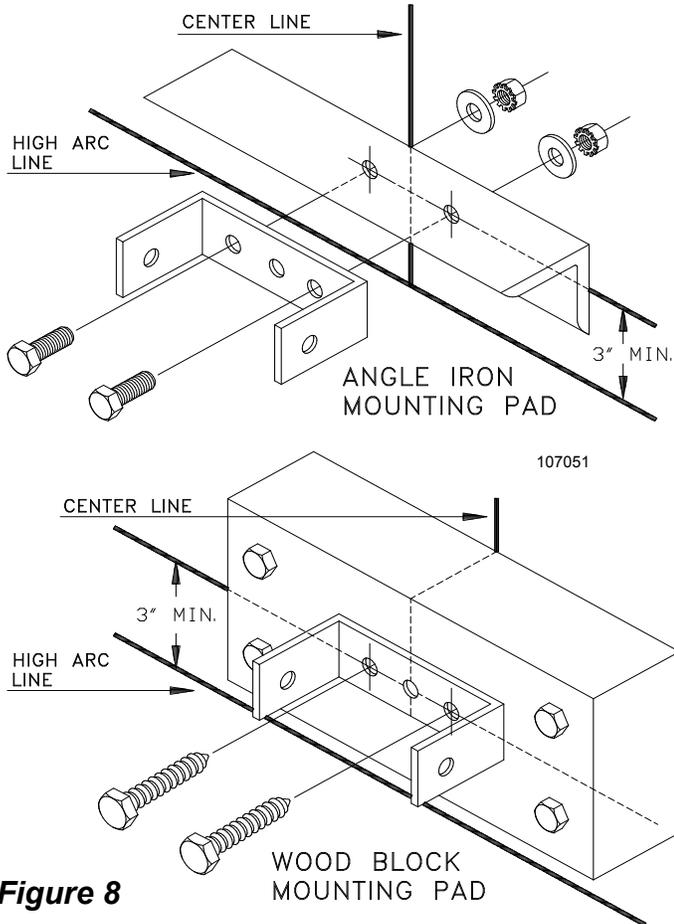


Figure 8

5) With the door in the down position, loosely attach the rail support to the mounting bracket using two (2) bolts, lockwashers and nuts (Items 4, 5, 6). See Figure 9.

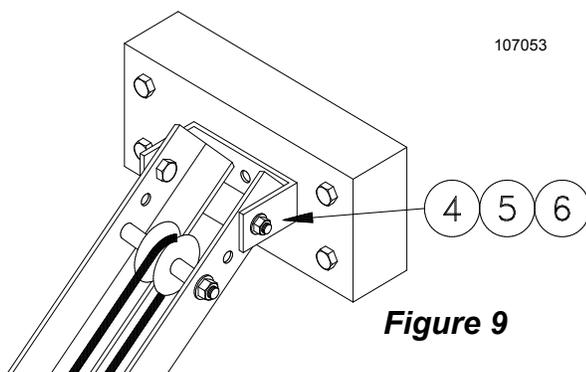


Figure 9

6) Swing the operator to a horizontal position above the door guide rails (high enough to raise the door) and temporarily secure by suspending from the ceiling with a suitable rope or chain or support from the floor to the operator. Now open the garage door slowly, being careful not to dislodge the temporary support. Lower the operator until it is level. Make sure the operator is aligned with the center of the door and the bottom of the rail is at least 2" above the high arc of the door. See Figure 10.

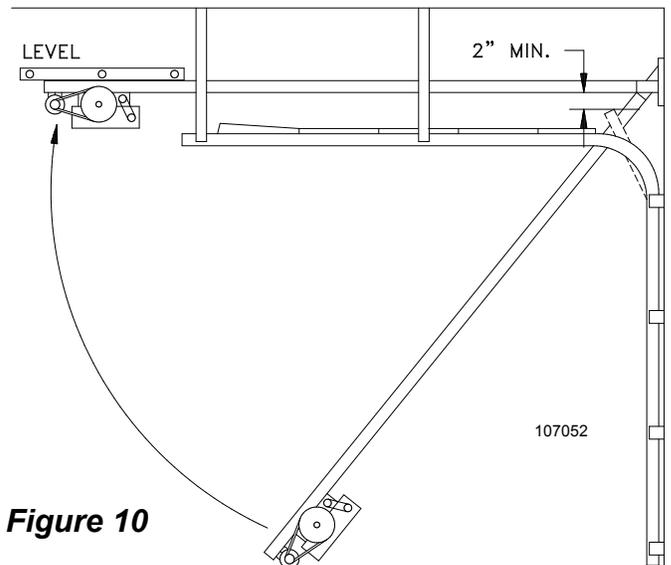
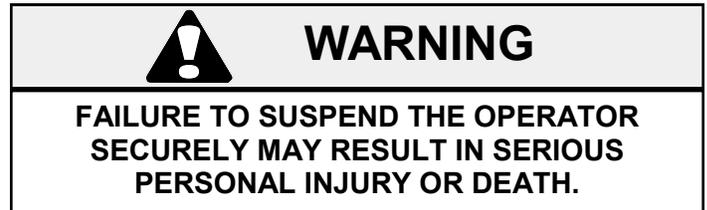


Figure 10

7) Tighten securely the two (2) bolts, nuts and washers that were loosely attached in Step 5. See Figure 11.

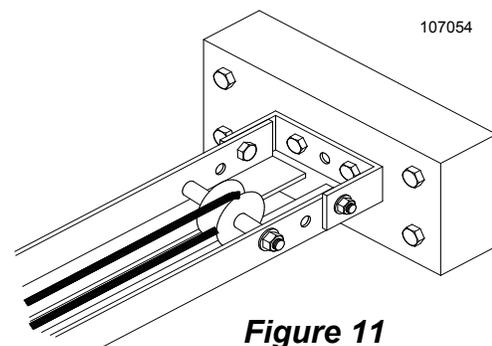


Figure 11

WARNING

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.

8) Figure 12 details a typical method of hanging the operator from the ceiling. Each installation will vary due to the difference in building structures; but in all installations side braces should be used to further strengthen the installation. If the operator track (rail) is longer than 15 feet a mid support is recommended.

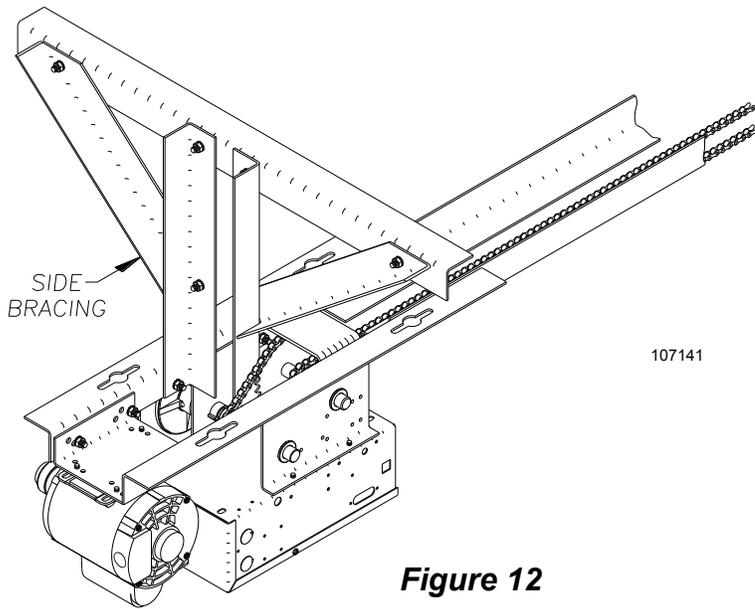


Figure 12

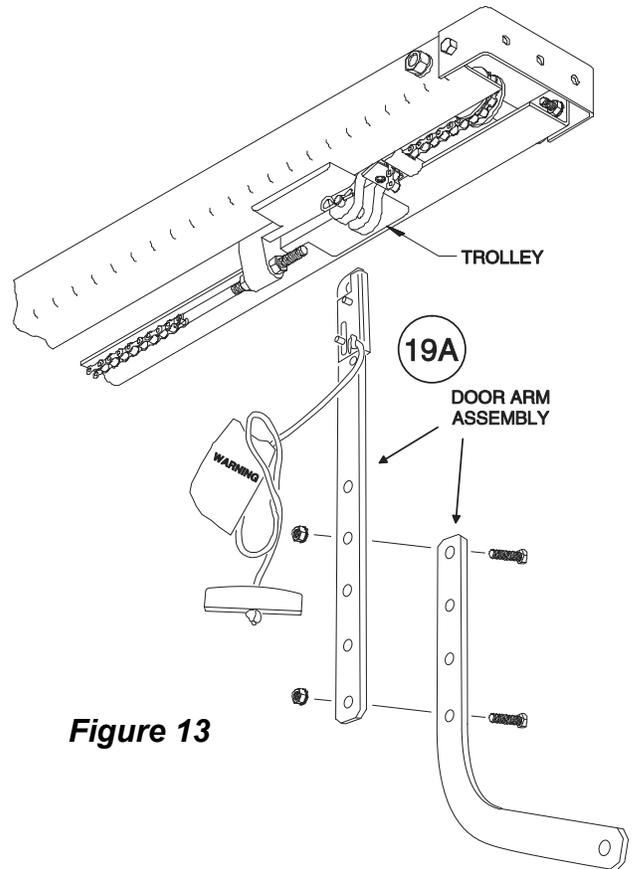


Figure 13

9) Fully close the door and move the trolley to within 2 inches of the idler sprocket. Using Figure 13 as a guide, connect the release arm (Item 19A) to the trolley. Connect the door curved arm to the door release arm with two 5/16 inch bolts and keps nuts.

10) Refer to Figure 14. Attach the door bracket (Item 22) to the curved arm using a 3/8 bolt and locknut (Items 16 & 27). Tighten the bolt until snug then back off 1/4 to 1/2 turns so as to allow the arm to pivot on the bolt freely. Position the door bracket to the scribed center line on the door. Use suitable hardware to attach the door bracket to the door.

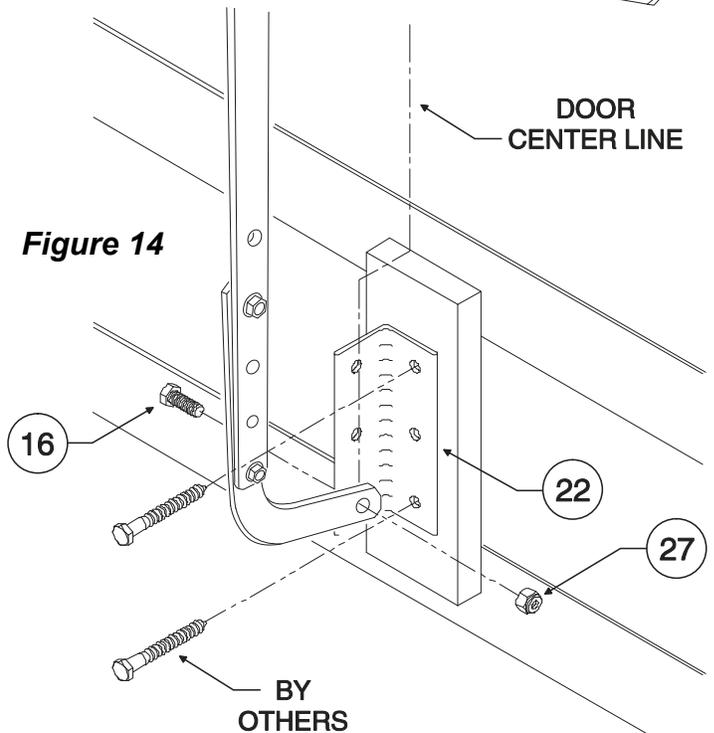


Figure 14

IMPORTANT

TO AVOID DAMAGE TO THE DOOR TOP SECTION REINFORCE THE CENTER STILE WITH A VERTICAL BRACE. ADDITIONAL BRACING/REINFORCEMENT MAY BE REQUIRED WHEN THE DOOR IS CONTROLLED BY AN AUTOMATIC DOOR OPERATOR; CONSULT THE DOOR MANUFACTURER FOR INSTRUCTIONS.

NOTE

BEFORE PROCEEDING RECHECK ALL BOLTS, NUTS AND LAG SCREWS AND ENSURE THEY ARE TIGHT.


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 OPERATOR.**


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.

WARNING: T-S Series operators have been designed and constructed for use with AC Voltages from 115 to 460 VAC, single and three phase. Check the operator 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 operator.

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.

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

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

located at the bottom edge of a vertically moving door. Refer to the instructions on Page 11 for the Linear photoelectric system installation and wiring.

If the external entrapment protection device is connected, the selector switches are set properly (Page 15) 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 are equipped with a reversing edge circuit may have one or more additional means of control which should be wired in accordance with the diagram supplied in the operator and also illustrated in Figures 18 & 20. To add a second three button station, refer to Figure 19.

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

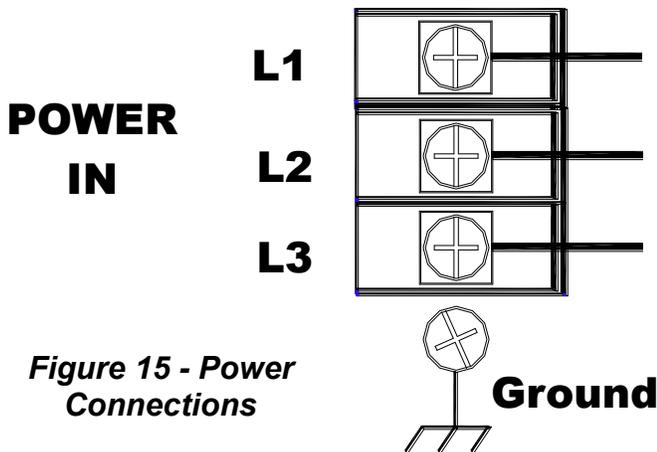


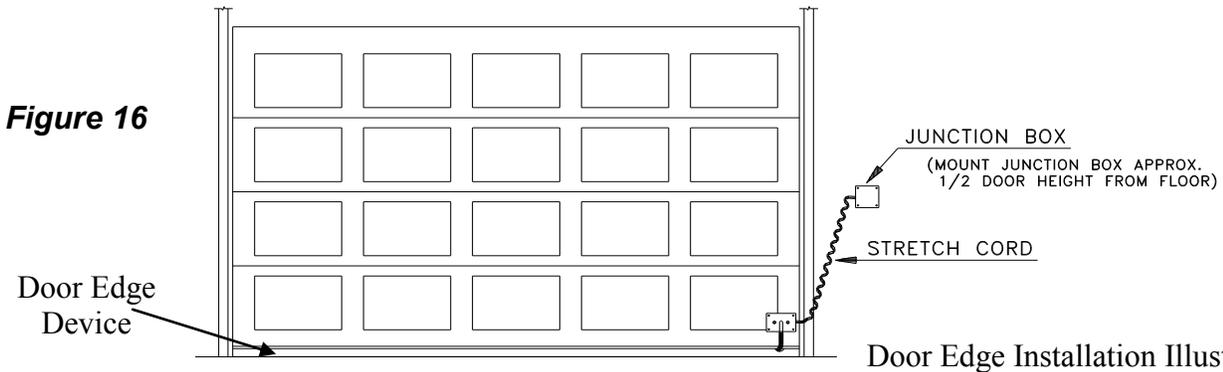
Figure 15 - Power Connections

Note: T-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 Figure 16 and the manufacturer's instructions to install and connect one of the approved door edge devices. One or more contact sensors shall be


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.

Note: See the door edge manufacturer's installation instructions for the complete installation procedure. See Figure 17 for connecting the edge to the operator. See Page 15 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.



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.

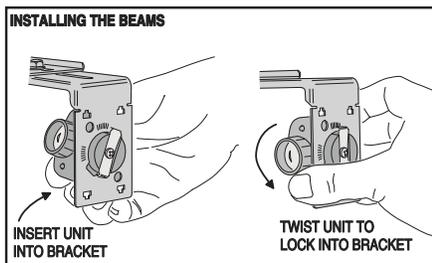
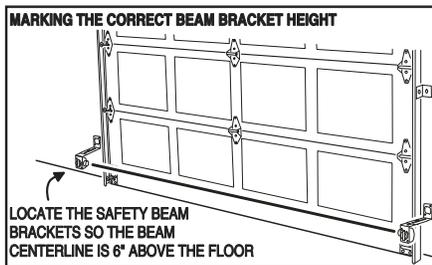
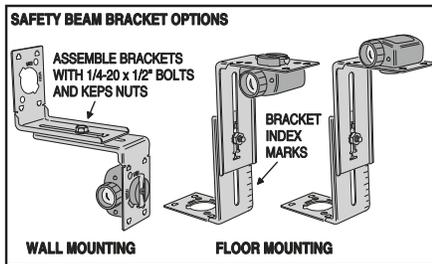
1 Assemble the two safety beam brackets from the four L-shaped brackets using two 1/4-20 x 3/4" bolts and 1/4-20 keps nuts (one nut & bolt for each bracket).

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.

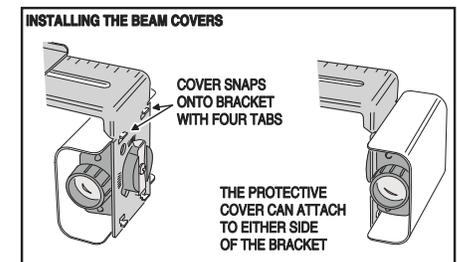
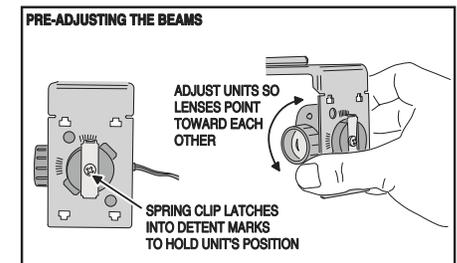
5 Install the two safety beam protective covers over the beam units to protect them from damage.

► **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 17 for connecting the photoelectric device to the operator. See Page 15 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.

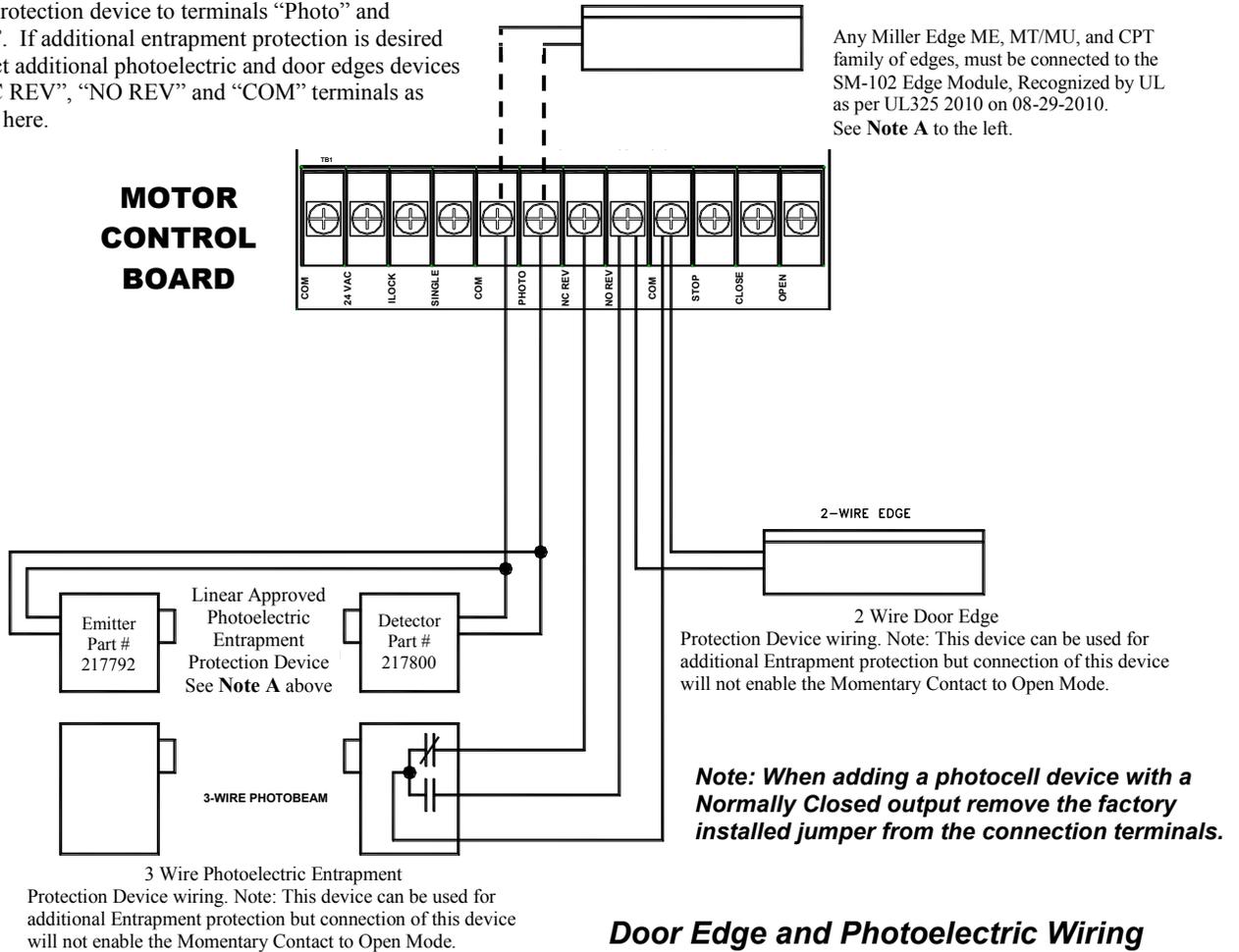
CAUTION
TO AVOID DAMAGE TO DOOR AND OPERATOR ENSURE ALL DOOR LOCKS ARE DISABLED.
USE AN INTERLOCK SWITCH IF A LOCK IS REQUIRED TO RETAIN FUNCTIONALTY.

ENTRAPMENT PROTECTION DEVICES WIRING INSTRUCTIONS

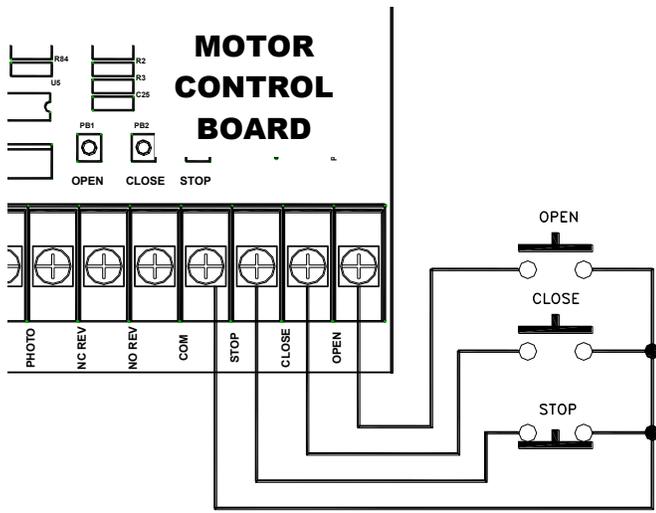
Note A: Connect only **one (1)** approved entrapment protection device to terminals “Photo” and “Com”. If additional entrapment protection is desired connect additional photoelectric and door edges devices to “NC REV”, “NO REV” and “COM” terminals as shown here.

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.

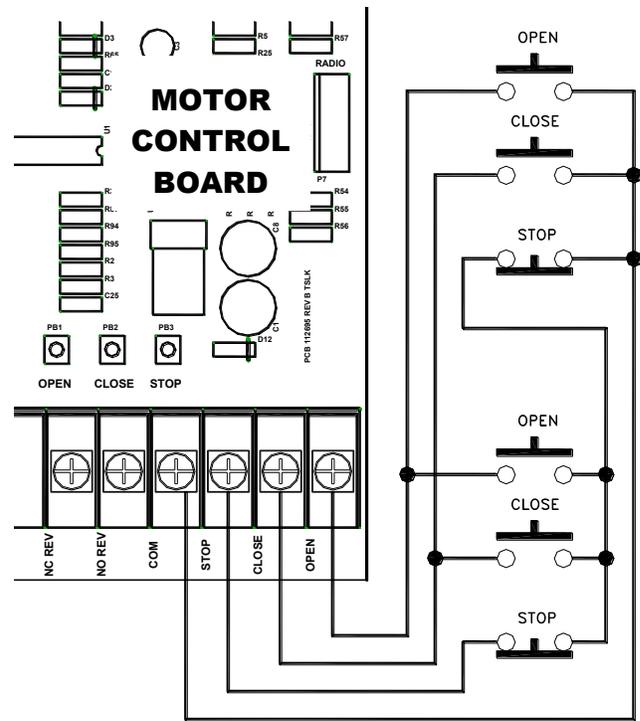
Figure 17



After properly connecting an approved Entrapment Protection Device (see above and Page 3) to the operator, see Page 15 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 18



Multiple 3 Button Station Figure 19

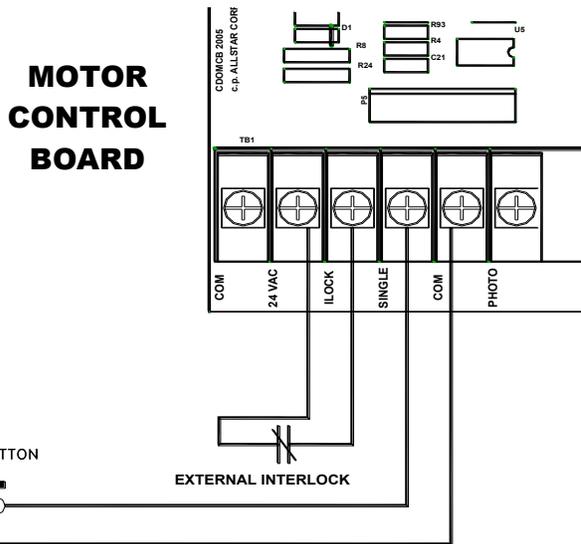


Figure 20
Single Button and External Interlock Wiring

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 set and 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 21 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

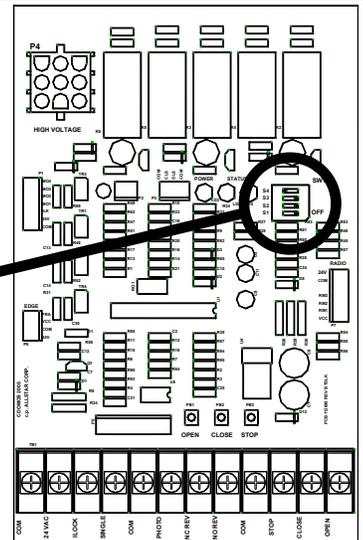
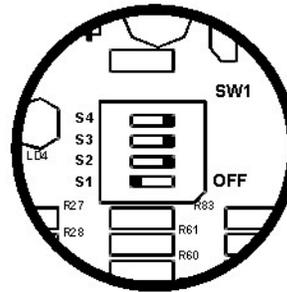


Figure 21

MOTOR CONTROL BOARD

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.

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

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 21, page 15) 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 - Brake is optional on some models.

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 Figure 22.

- (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.

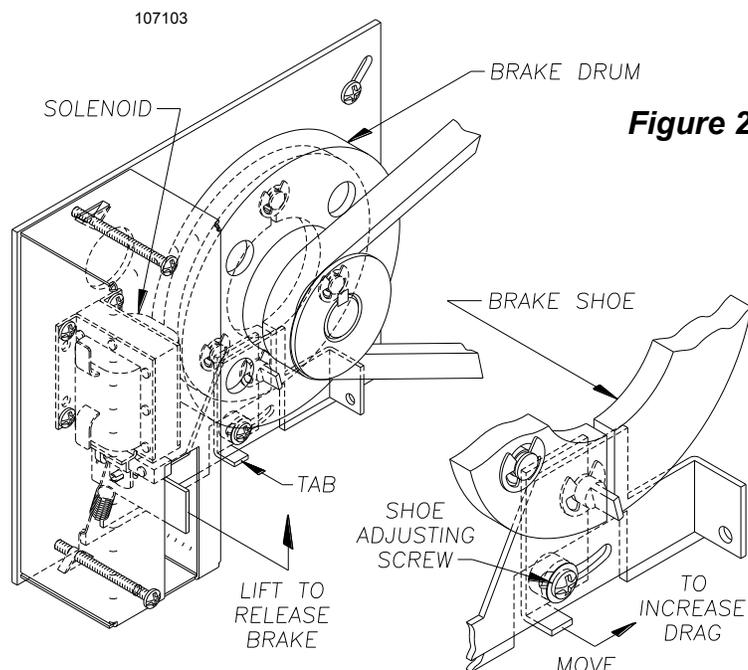


Figure 22

CLUTCH ADJUSTMENT

**WARNING**

RISK OF ENTRAPMENT THAT MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH. DISCONNECT POWER TO THE OPENER BEFORE SERVICING OR MAKING ADJUSTMENTS. ENSURE DOORWAY IS CLEAR BEFORE STARTING TESTING OF THE OPERATOR.

The clutch serves to protect the door, the electric operator and other equipment from undue stress or damage caused by starting forces and/or an obstruction to the door. It should be set no tighter than is necessary to smoothly and consistently move the door throughout its full range of travel. When properly set, it will slip freely if the door should encounter an obstruction, and it should be possible to stop the travel of the door by hand.

WARNING: Before adjustment remove power to the operator.

To adjust the clutch, loosen the jamb nut, and turn the adjusting nut, as shown at right. Make adjustments in 1/4 turn increments. Always re-tighten the jamb nut before running the operator to prevent clutch from changing its setting.

CAUTION

NEVER COMPRESS CLUTCH SPRING BEYOND POINT LIMITED BY THE DESIGN OF THE OPERATOR OR REPLACE IT WITH A HEAVIER SPRING

Due to changing conditions of the door and normal wear, it may be necessary to occasionally readjust the clutch to obtain dependable operation.

WARNING: BEFORE DOING SO BE CERTAIN THAT THE DOOR IS IN GOOD WORKING CONDITION, PROPERLY COUNTERBALANCED AND THAT THE CLUTCH IS NOT SLIPPING BECAUSE OF LOOSE OR MISSING HARDWARE, BINDING IN THE TRACK, RUBBING AGAINST THE DOOR STOPS OR DEFECTIVE OR MISADJUSTED SPRINGS. ANY SERVICE REQUIRED TO THE DOOR, DOOR SPRINGS OR DOOR OPERATOR MUST BE PREFORMED BY A QUALIFIED PROFESSIONAL DOOR INSTALLER.

The fiber disk will wear during normal operation and should be replaced when it becomes difficult or impossible to sufficiently tighten the clutch to obtain smooth operation of the door when it is in good working condition. To replace the fiber disk, first loosen the motor mounting bolts and remove the V-belt then the clutch adjusting nuts, spring and clutch pulley. Check condition of V-belt before reassembly and replace if required. After reassembly, adjust clutch as described above.

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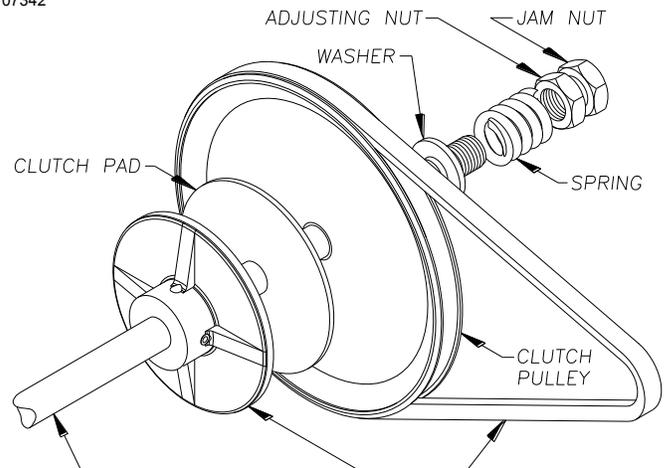


Figure 23

**WARNING**

IMPROPER ADJUSTMENT OF CLUTCH SETTING COULD CAUSE ENTRAPMENT, INJURY OR DEATH.

SET CLUTCH ADJUSTMENT FOR JUST ENOUGH FORCE TO OPERATE THE DOOR RELIABLY, BUT NO STRONGER. Contact a service professional to correct any binding, sticking or other door problems. DO NOT OVER-ADJUST CLUTCH SETTING TO COMPENSATE FOR A POORLY WORKING DOOR.



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 24 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. Follow step 2 or 2a depending on how the door and trolley are currently orientated.

2) For original installation setting, the door and operator trolley should be positioned just shy (approximately 4 inches) of the fully closed position. If this is the case, depress the Limit Nut Retention Plate (D) so it disengages from the slots in the limit nuts and move the Close Limit Nut (E) on the shaft until it engages the Close Limit Switch (A), see Step 5 for an explanation of the Close Limit function. You will need to listen for an audible click. Depress the Limit Nut Retention Plate (D) so it disengages from the slots in the limit nuts and move the Open Limit Nut (C) to the center of the threaded shaft. Release the retaining bracket and be sure that it engages in slots of both limit nuts.

2a) If the door and operator trolley are at some other position other than fully closed, depress the Limit Nut Retention Plate (D) so it disengages from the slots in the limit nuts and move the both the Limit nuts to the center of the threaded shaft. Release the retaining bracket and be sure that it engages in slots of both limit nuts.

3) With all due care use the built-in three button station on the motor control board or the wall mounted three button station to raise the door to the fully open position. You will need to remember to use the STOP button to stop the door at the Fully 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 (C) on the shaft until it engages the Open Limit Switch (B). 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) With all due care use the built-in three button station on the motor control board or the wall mounted three button station to lower the door just shy (approximately 4 inches) of the fully closed position and repeat Step #4 with the Close Limit nut (E) and the Close Limit switch (A). 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 19) it may be necessary to adjust the Close Limit Delay time, see procedure on page 15.

6) Move the door to the fully open position then the fully closed positions and observe the stopping position. Reset the Limit Nut(s) per above instructions if desired.

7) A fine adjustment can be done by loosening the screws holding the Limit Switches to the V bracket and moving the switch within the slots on the bracket.

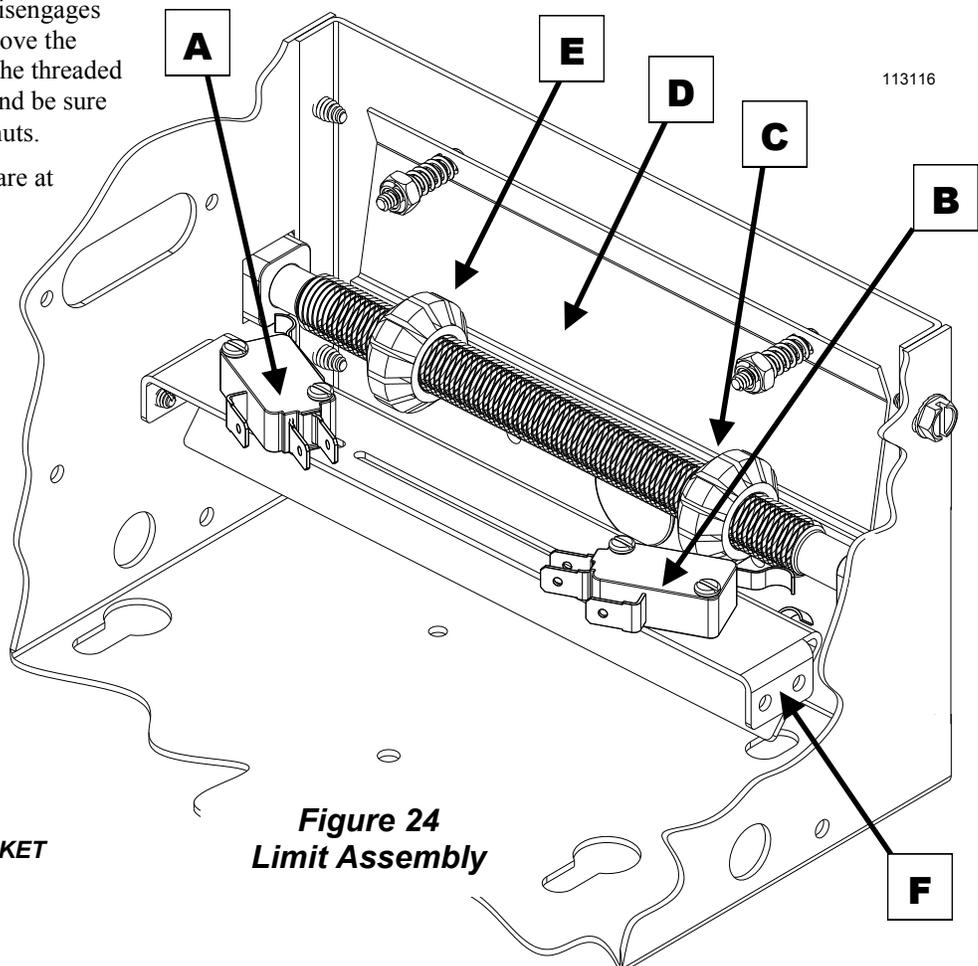


Figure 24
Limit Assembly

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

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.

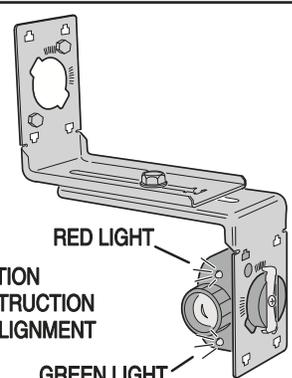
SAFETY BEAM INDICATOR TABLE	
GREEN ON	POWER ON
GREEN OFF	POWER OFF
RED ON	BEAM OK - NO BLOCKAGE
RED OFF	BEAM BLOCKED OR MIS-ALIGNED
RED FLASHING	BEAM ALIGNED POORLY

➤ **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.

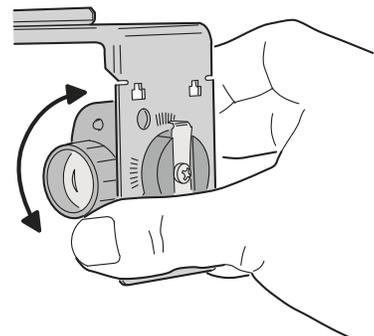
SAFETY BEAM INDICATORS



GREEN LIGHT
ON = POWER ON
OFF = POWER OFF

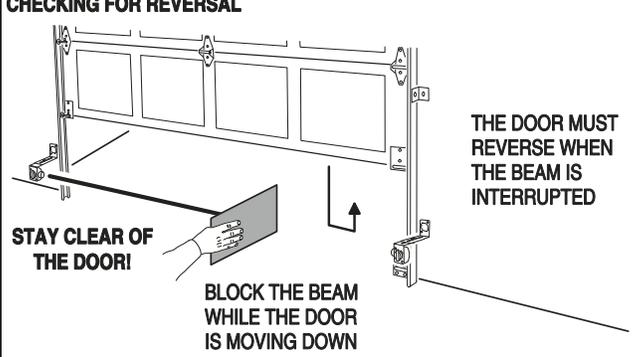
RED LIGHT
ON = BEAM ALIGNED, NO OBSTRUCTION
OFF = BEAM NOT ALIGNED, OR OBSTRUCTION
BLINKING = BEAM NEEDS BETTER ALIGNMENT

ADJUSTING THE BEAM



ADJUST THE SENDER AND RECEIVER UNTIL THE RED INDICATOR LIGHTS SOLID

CHECKING FOR REVERSAL

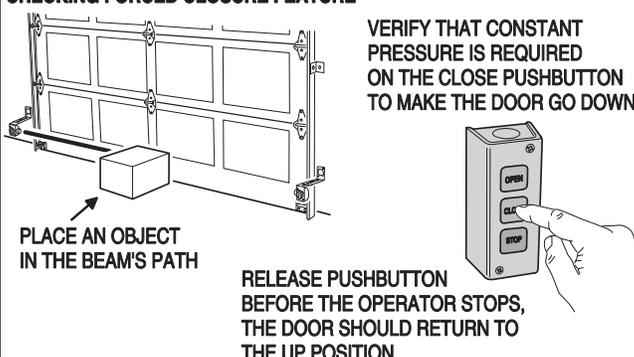


STAY CLEAR OF THE DOOR!

BLOCK THE BEAM WHILE THE DOOR IS MOVING DOWN

THE DOOR MUST REVERSE WHEN THE BEAM IS INTERRUPTED

CHECKING FORCED CLOSURE FEATURE



PLACE AN OBJECT IN THE BEAM'S PATH

VERIFY THAT CONSTANT PRESSURE IS REQUIRED ON THE CLOSE PUSHBUTTON TO MAKE THE DOOR GO DOWN

RELEASE PUSHBUTTON BEFORE THE OPERATOR STOPS, THE DOOR SHOULD RETURN TO THE UP POSITION

Following installation, the operator **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 operator 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 the wiring diagram and on page 15, Operating Modes.

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.

The T series operators are equipped with a reversing edge circuit and to conform with code, need to be connected to a pneumatic or foam door edge or photoelectric device. To test an edge for proper reversal, place an object beneath the leading edge of the door. To test a photoelectric device for proper reversal, start the door down and obstruct the beam. 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 (approx. four (4) inches).

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

If the operator 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.

Test the manual disconnect with the door in the fully closed position. The door arm should freely fall away from the carrier when the release chain is pulled. If it is difficult to release and the door arm appears to be under excessive compression, reset the CLOSE limit slightly to reduce the travel of the carrier in the close direction.

	WARNING
ALWAYS DISCONNECT POWER TO THE OPERATOR BEFORE SERVICING, CONNECTING ACCESSORY DEVICES OR MAKING ADJUSTMENTS.	

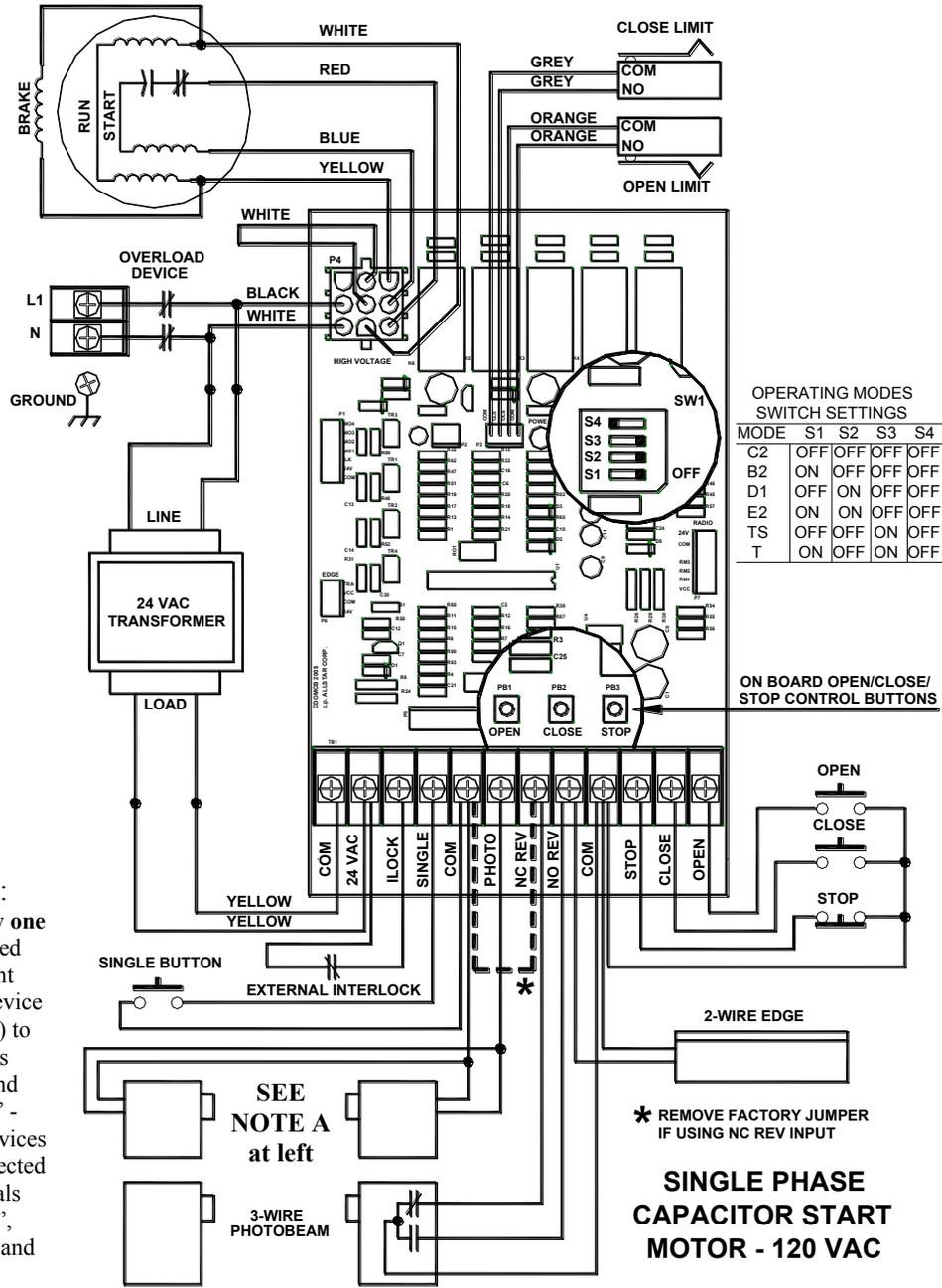
MAINTENANCE

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 drawbar chain. The clutch must be tested periodically and adjustments made if necessary (see page 18). The brake (where applicable) is adjusted at the factory and will need periodic adjustment for wear. When adjustment becomes necessary see **Figure 22** on page 17 for the adjustment procedure.

Test the reversing edge circuit at least once a month by permitting the door to contact an obstruction while closing. To test a pneumatic or foam door edge for proper reversal, place an object beneath the leading edge of the door. To test a photoelectric device for proper reversal, start the door down and obstruct the beam. 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 (approx. four (4) inches).

Lubrication of the operator is not required. It is important, for trouble free service from the operator, that the door be kept free from binding, properly counter balanced and periodically lubricated. **An annual inspection of the door by a qualified overhead door professional is recommended.**

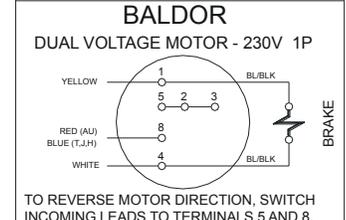
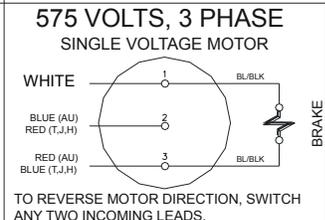
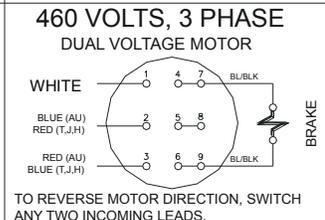
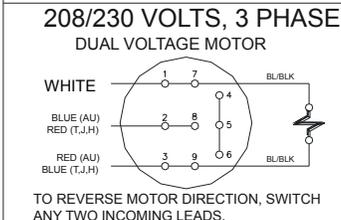
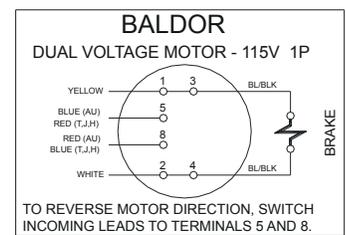
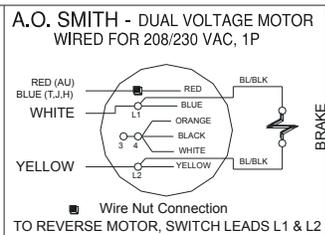
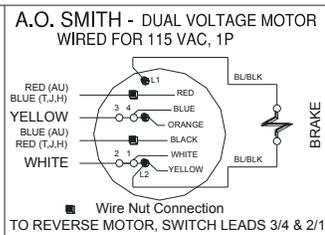
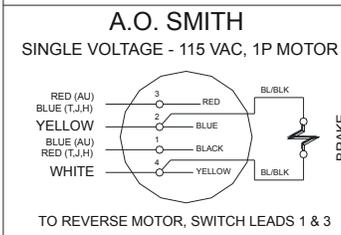
Warning: Repairs and adjustments to the door and operator should be performed only by someone qualified to service commercial overhead doors and operators.

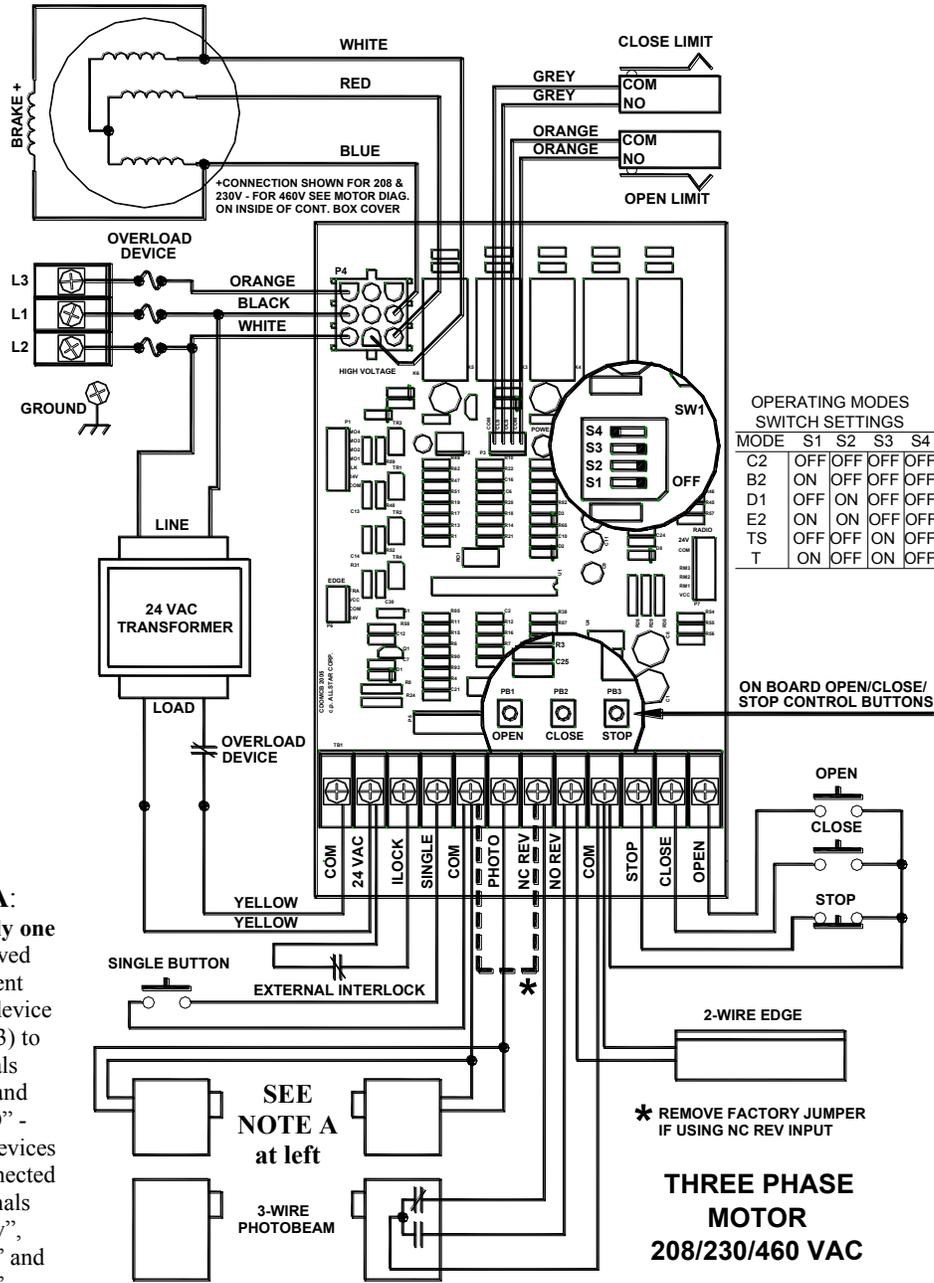


Note A:
Connect **only one (1)** approved entrapment protection device (see Page 3) to Terminals "COM" and "PHOTO" - additional devices may be connected to Terminals "NC Rev", "NO REV" and "COM".

MOTOR WIRING CHART

CDO OPERATORS WITH CDO-MCB MOTOR CONTROL SYSTEM





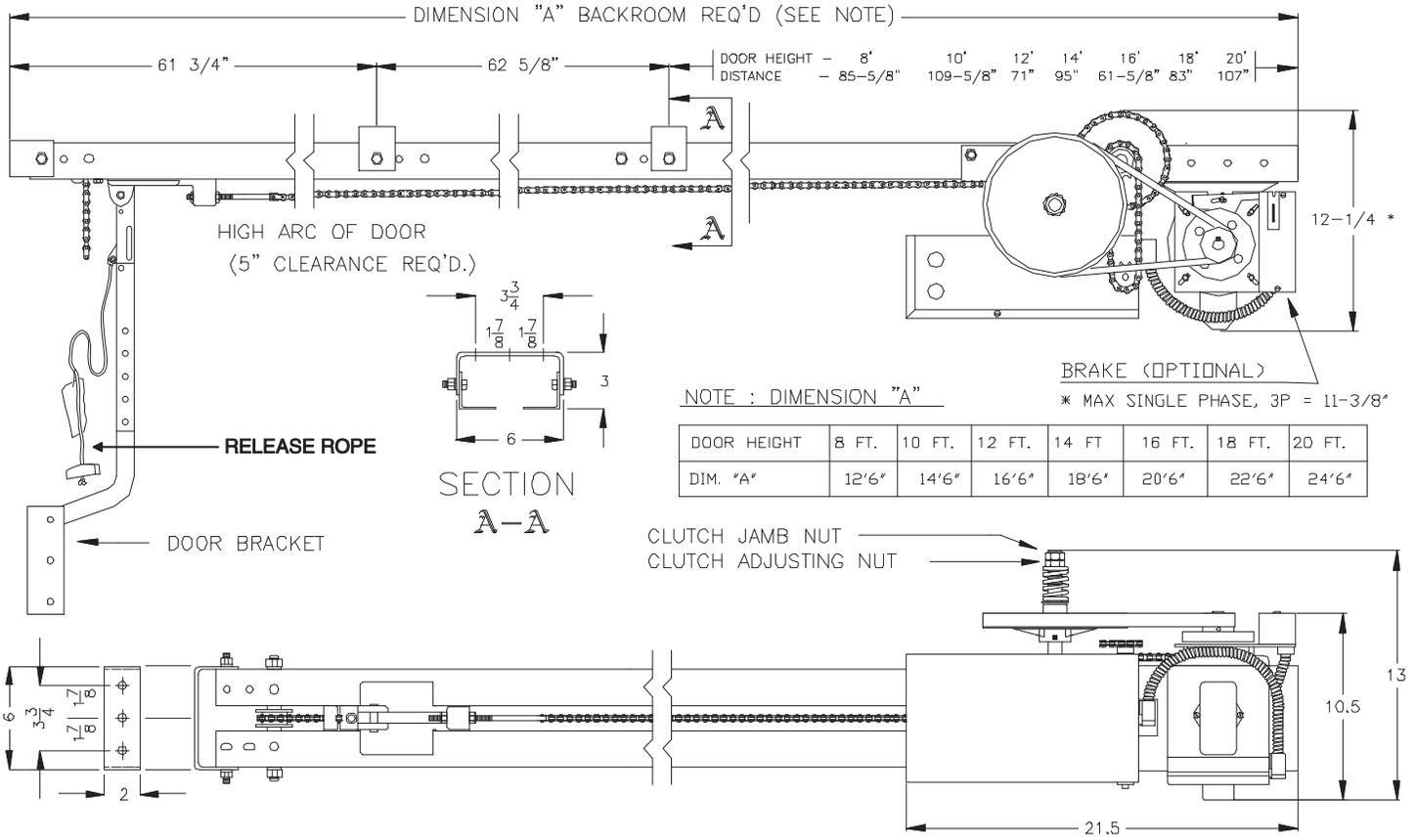
Note A:
Connect **only one (1)** approved entrapment protection device (see Page 3) to Terminals "COM" and "PHOTO" - additional devices may be connected to Terminals "NC Rev", "NO REV" and "COM".

MOTOR WIRING CHART

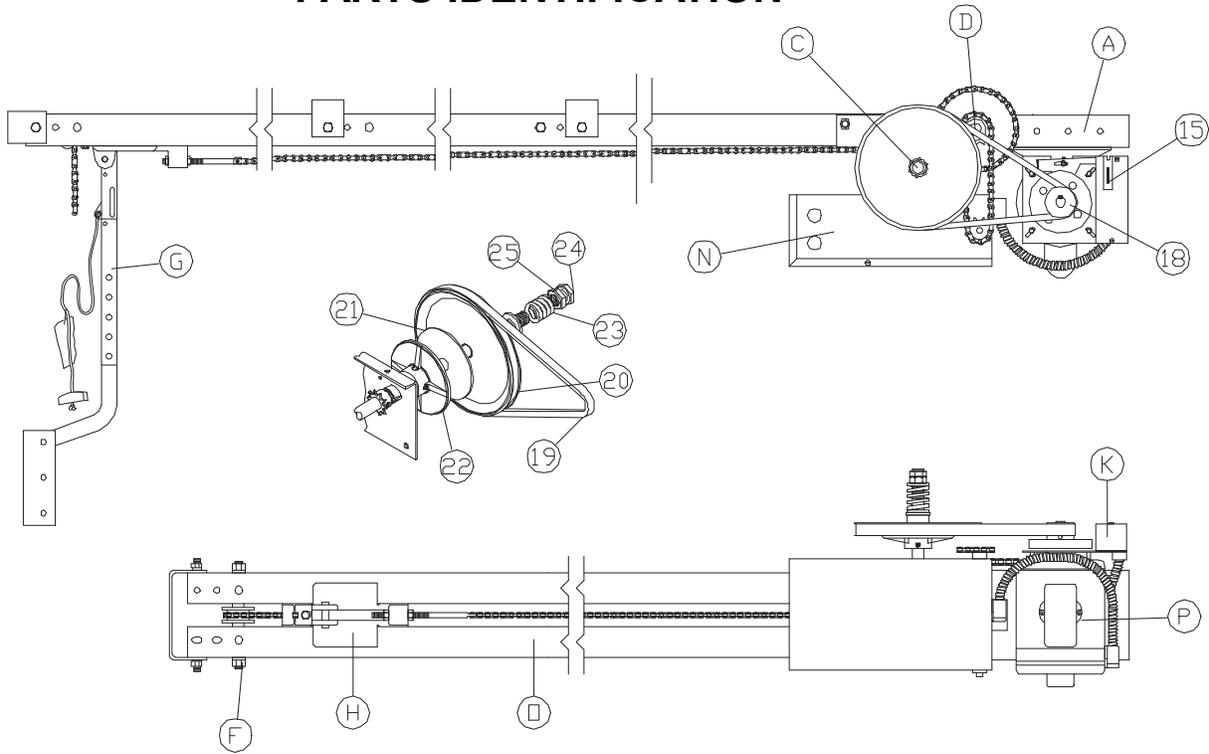
CDO OPERATORS WITH CDO-MCB MOTOR CONTROL SYSTEM

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

FIGURE 24 - OPERATOR DIMENSIONS



NOTES



Ref	Part #	Description
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Assemblies

A	105745	Frame Assembly, T with Shafts (1/3 & 1/2 HP)
	105746	Frame Assembly, T with Shafts (3/4 HP)
C	106358	Clutch Shaft Assembly, T
D	105748	Drive Shaft Assembly, T (1/3 & 1/2 HP)
	105749	Drive Shaft Assembly, T (3/4 HP)
F	106265	Front Idler Assembly
G	2110-845	Door Arm Assembly
H	100512	Trolley Assembly
		Brake standard on 3/4 HP, optional on 1/3 & 1/2 HP
K	106267	Brake Assembly, T, 115 VAC
	106268	Brake Assembly, T, 230 VAC (also used on 460 VAC)
N	Call	Control Box Assembly
O	Call	Track and Chain Packages

Motors

P	100465	Motor, 1/3 HP, 48 Frame, ODP, 115 VAC, 1 Phase
	100466	Motor, 1/2 HP, 48 Frame, ODP, 115 VAC, 1 Phase
	005156	Motor, 1/3 HP, 56 Frame, ODP, 115/230 VAC, 1 Phase
	005026	Motor, 1/2 HP, 56 Frame, ODP, 115/230 VAC, 1 Phase
	005027	Motor, 3/4 HP, 56 Frame, ODP, 115/230 VAC, 1 Phase
	005183	Motor, 1/3 HP, 56 Frame, ODP, 230/460 VAC, 3 Phase
	005184	Motor, 1/2 HP, 56 Frame, ODP, 230/460 VAC, 3 Phase
	005038	Motor, 3/4 HP, 56 Frame, ODP, 230/460 VAC, 3 Phase

Ref	Part #	Description
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Parts

4	008071	Flange Bearing, 3/4" ID
5	105549	Snap Ring, 3/4"
7	105265	Sprocket, 41B12, 3/4" Bore (1/3 & 1/2 HP)
8	105250	Sprocket, 41B12, 3/4" Bore (3/4 HP)
9	100134	Sprocket, 41B10, 3/4" Bore
10	105256	Sprocket, 41B32, 3/4" Bore
11	101506	Motor Pulley, 5L
12	009244	Limit Chain, #65, 18" with Master Link
13	105318	Primary Chain, #41, 20" with Master Link
15	105385	Brake Solenoid, 115 VAC
	105386	Brake Solenoid, 230 VAC (also used on 460 VAC)
17	110042	Brake Shoe
18	105934	Brake Drum with 5L Pulley, 5/8" Bore
19	009088	V Belt, 5L350
20	105750	Clutch Pulley with Bushing, 5L
21	009028	Clutch Fiber Disk
22	100133	Clutch Plate
23	105308	Clutch Spring
24	100636	Clutch Lock Nut
25	107517	Clutch Adjusting Nut

SPECIFICATIONS

MODEL : T____S HP:_____

VOLTS : _____ PHASE : _____

- * UL AND CANADIAN UL LISTED
- * HIGH STARTING TORQUE, CONTINUOUS DUTY MOTOR
- * MOTOR OVERLOAD PROTECTION
- * CLASS 2 (24 VOLT) CONTROL CIRCUIT
- * SOLENOID BRAKE (STANDARD ON 3/4 HP, OPTIONAL ON 1/3 HP AND 1/2 HP)
- * 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
- * ALL SPROCKETS AND PULLEYS PINNED OR KEYED, SOLID STEEL DRIVE SHAFTS
- * FULLY ADJUSTABLE FRICTION CLUTCH
- * HEAVY DUTY FLANGE BEARINGS ON OUTPUT SHAFT
- * MANUAL DOOR 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.