VMag, LLC

High Velocity Magnetic
Gate Operators

c UL us
LISTED
UL325

Linear Induction Slide Gate Operator

VM1220 / VM1420

INSTALLATION AND OPERATION MANUAL

NOTE: Operators shipped after November 2021 will require a 0.027” prox sensor gap.

1224

CONTENTS

DESCRIPTION

The Vmag is an industrial slide gate operator utilizing linear induction technology as the drive force. Linear induction motor operation can be best described as taking a typical electric motor, cutting it open and laying it flat. This produces a linear force verses a rotary force. Linear induction is used to power trams, accelerate atomic particles and launch Naval aircraft from aircraft carriers.

The standard Vmag drive component consists of two electromagnetic linear induction motors mounted on aluminum reaction fins which are attached to the slide gate. The standard configuration is designed for industrial slide gates up to thirty feet in overall length (twenty foot opening). Additional reaction fins and motors may be required to accommodate longer and or heavy slide gates.

There are no moving parts such as chains, belts, cable, gears or hydraulic pinch wheels in the drive component essentially eliminating the need for grease or hydraulic fluid which can permeate the ground from leaking hoses and fittings. The advantages of Vmag technology are previously unavailable speed, reliability and virtually no maintenance.

The Vmag is designed for and must only be used in Class III & IV installations. Although the Vmag can be programmed to achieve high speeds, consideration should be given to safety and gate construction. Some installations may benefit from the higher speeds to maintain high security levels and traffic flow efficiency. To conform to UL325 the addition of two different entrapment protection devices such as an edge switch and photo beam is required. The installer will recommend the appropriate protection devices based on the installation.

The Vmag Is ETL listed to UL325.

A certified VMAG installer and certified electrician is required for proper installation. Vmag operators are designed for permanent wiring. All conduit and connectors should be supplied & installed by a certified electrician. All local & national codes should be adhered to.

UL 325 divides gate operators into four classes. Vmag operators should only be used for **CLASS III & IV** usage.

CLASS I **RESIDENTIAL VEHICULAR GATE OPERATOR**

A vehicular gate operator (or system) intended for use in a home of one-to four single family dwelling, or a garage or parking area associated therewith.

CLASS II **COMMERCIAL / GENERAL ACCESS VEHICULAR GATE OPERATOR**

A vehicular gate operator (or system) intended for use in a commercial location or building such as a multi-family housing unit (five or more single family units), hotel, garages, retail store, or other building servicing the general public.

CLASS III **INDUSTRIAL / LIMITED ACCESS VEHICULAR GATE OPERATOR**

A vehicular gate operator (or system) intended for use in an industrial location or building such as a factory or loading dock area or other locations not intended to service the general public.

CLASS IV **RESTRICTED ACCESS VEHICULAR GATE OPERATOR**

A vehicular gate operator (or system) intended for the use in a guarded industrial area or building such as an airport security area or other restricted access locations not serving the general public, in which unauthorized access is prevented via supervision by security personnel.

PRE-INSTALLATION CHECK LIST

- Has the proper Vmag operator been selected?
  (maximum speed & performance depends on gate installation and supply voltage).
- Is the installer factory certified by Vmag?
- Is the gate level? Must not roll on own either direction if operator is disconnected.
- Is the existing gate including hardware in good condition?
- Minimum specifications for Gate Posts must be 4" OD schedule 40, or 4" square $^{1}/_{4}$" wall, to minimize vibration.
- Is 208-240 VAC single/three phase (VM1220) or 440-480 VAC single/three phase (VM1420) power readily accessible?
  POWER MUST BE STABLE AND MAINTAIN SPECIFIED VOLTAGE.
- Has a certified electrician been contacted for electrical hookup?
- Do you have assurance from the electrician that proper grounding practices will be used?
- Have local building & fire codes been reviewed for compliance?
- Are there existing vehicle and entrapment protection devices installed or in the plans as per U.L. 325?
- Does the gate manufacturer adhere to ASTM F-2200?
- Is there clearance for the Vmag? (see page 9)
- If the operator is not functioning properly is there an alternative vehicular entrance or exit for access until operator is back on line?
- If continued operation during power outages is required a backup generator should be installed to provide uninterrupted power for gate operation and access control.
- Will the personnel using this entrance and/or exit be aware of the increased speed?
- Can the controller enclosure be installed within ten feet from the motor assembly?
- If you have any questions concerning the compatibility of installation please contact Vmag at 210-495-3000.

INTENDED INSTALLATION OF A GATE OPERATOR

A) Install the gate operator only when:

1) The operator is appropriate for the construction of the gate and the usage Class of the gate,
2) All openings of a horizontal slide gate are guarded or screened from the bottom of the gate to a minimum of 6 feet (1.83 m) above the ground to prevent a 2-1/4 inch (57.2 mm) diameter sphere from passing through the openings anywhere in the gate, and in that portion of the adjacent fence that the gate covers in the open position,
3) All exposed pinch points are eliminated or guarded, and
4) Guarding is supplied for exposed rollers.
5) The operator instructions shall list the maximum number of open and close entrapment devices capable of being connected to the operator.

B) **The operator is intended for installation only on gates used for vehicles. Pedestrians must be supplied with a separate access opening.** The pedestrian access opening shall be designed to promote pedestrian usage. Locate the gate such that persons will not come in contact with the vehicular gate during the entire path of travel of the vehicular gate.

C) The gate must be installed in a location so that enough clearance is supplied between the gate and adjacent structures when opening and closing to reduce the risk of entrapment. Swinging gates shall not open into public access areas.

D) The gate must be properly installed and work freely in both directions prior to the installation of the gate operator.

E) For gate operators utilizing Type D protection

1) The gate operator controls must be placed so that the user has full view of the gate area when the gate is moving,
2) The placard as required by 58.1.6 shall be placed adjacent to the controls,
3) An automatic closing device (such as a timer, loop sensor, or similar device) shall not be employed, and
4) No other activation device shall be connected.

F) Permanently controls intended for user activation must be located at least six feet (6') away from any moving part of the gate and where the user is prevented from reaching over, under, around or through the gate to operate the controls. Outdoor or easily accessible controls shall have a security feature to prevent unauthorized use.

Exception: Emergency access controls only accessible by authorized personnel (e.g. fire, police, EMS) may be placed at any location in the line-of-site of the gate.

G) The Stop and/or Reset button must be located in the line-of-sight of the gate. Activation of the reset control shall not cause the operator to start.

H) A minimum of two (2) WARNING SIGNS shall be installed, one on each side of the gate where easily visible.

I) For gate operators utilizing a non-contact sensor in accordance with 31.1.1:

1) See instructions on the placement of non-contact sensors for each Type of application,
2) Care shall be exercised to reduce the risk of nuisance tripping, such as when a vehicle , trips the sensor while the gate is still moving, and
3) One or more non-contact sensors shall be located where the risk of entrapment or obstruction exists, such as the perimeter reachable by a moving gate or barrier.

J) For gate operators utilizing a contact sensor in accordance with 31.1.1:

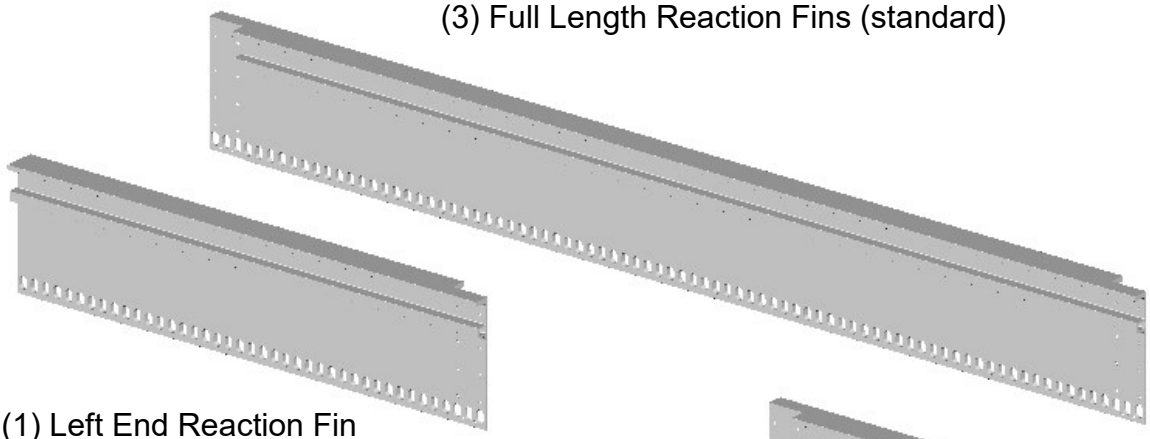
1) One or more contact sensors shall be located where the risk of entrapment or obstruction exists, such as at the leading edge, trailing edge, and post mounted both inside and outside of a vehicular horizontal slide gate.
2) One or more contact sensors shall be located at the bottom edge of a vehicular vertical lift gate.
3) One or more contact sensors shall be located at the pinch point of a vehicular vertical pivot gate.
4) A wireless device such as one that transmits radio frequency (RF) signals to the gate operator for entrapment protection functions shall be located where the transmission of the signals are not obstructed or impeded by building structures, natural landscaping or similar obstruction. A wireless device shall function under the intended end-use conditions.

COMPONENT IDENTIFICATION

Controller

Motor Assembly

(3) Full Length Reaction Fins (standard)



(1) Left End Reaction Fin

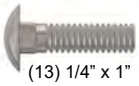
(1) Right End Reaction Fin

Vstops - left & right

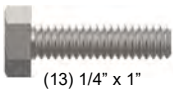
HARDWARE KIT

(42) 10-32 x 3/8"
Counter Sunk Screw

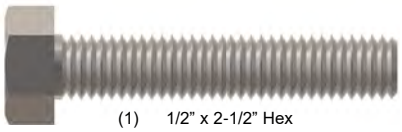
(16) 10-24 x 1/2"
Motor End Cap Screws
stainless



(13) 1/4" x 1"
Carriage Bolt



(13) 1/4" x 1"
Hex Bolt
stainless



(1) 1/2" x 2-1/2" Hex
Bolt stainless

(13) 1/4" Nuts

(2) 1/2" Nuts
stainless

(13) 1/4" Nut Inserts
For 1/8th inch material

(13) 1/4" Nut Inserts
For 1/4 inch material

(25) 1/4" Lock Washers

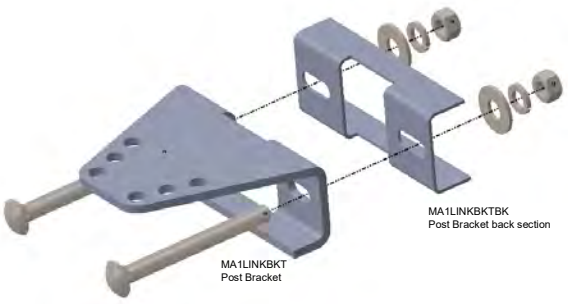
(13) 1/4" Flat Washers

(2) 1/2" Shim Washers stainless

(6) RF1HB
Hanger Bracket

(1) MH1LINK
Linkage Assy

Manual



Post Bracket Assy with
Hardware

Motor End Caps (2 sets)

(2) WARNING Signs
One for each side of gate

RECOMMENDED TOOLS FOR INSTALLATION

INSTALLATION TOOLS

Standard installation tools and test equipment for gate operator installation.

Additional tools:

- 0.027” 12” feeler gauge
- 25/64” Drill bit for threaded inserts
- 5/16” Drill bit for reaction fin carriage bolts

P1 programmer for Vmag operators

Loctite Blue thread locker (or equivalent)

(two) Quick-Grip Bar Clamp 12” (Home Depot or Lowes)
Select the standard clamps not the heavy duty model.

Rivet Nut Inserter
(Variety available on Amazon.
Order 2 additional 1/4-20 mandrels for the inserter selected)

Additional Materials and Installation Required

- A controller stand must be fabricated and set in concrete.
- Only approved (UL listed) electrical connections are to be installed from electrical supply to the controller by a certified electrician. If the wiring of the operator is located so that it may be in proximity to combustible material or may be subject to mechanical damage, it shall be in armored cable, rigid metal conduit, electrical metallic tubing, metal race-way, or otherwise acceptably protected as per UL325.
- Access control and entrapment protection equipment should be planned and installed as required per UL325.

Wiring for the Vmag operator will be simplified by procuring the following:

(2) 1/2” flex and approved connectors from controller to lock assembly
(2) 1/2” flex and approved connectors from controller to each motor
(2) 3/4” to 1/2” reducer (allows for 1/2” flex to connect to a 3/4” LB connection elbow on each motor assembly)

Motor power……	RED	12 AWG[1]	Stranded
“ “ ……	WHITE	12 AWG[1]	
“ “ ……	BLUE	12 AWG[1]	
Motor Grounds……..	GREEN	14 AWG	
Lock Assembly Ground…..	GREEN	16 AWG	
Lock Solenoid……..….	BLACK	16 AWG	
Motor Thermal Switch…...	YELLOW	18 AWG	

8 foot ground rod, #6 copper ground wire and ground clamp

1. The controller should be installed within 10 feet of the motors. Contact Vmag if further distance is required.

Vmag Installation Considerations

Correct installation of the Vmag is required for proper operation. A certified Vmag installer will be able to review any existing or new installation plans to determine Vmag compatibility.

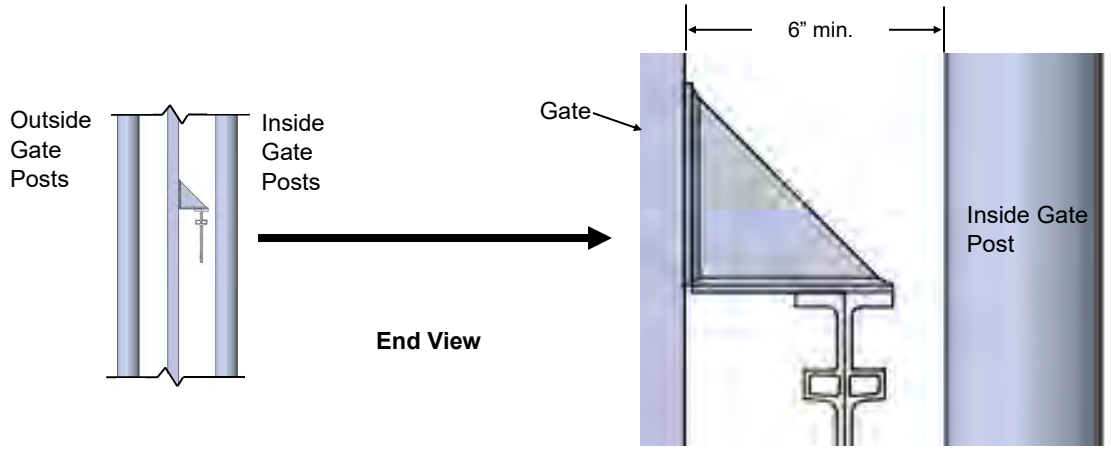
Determining Number of Reaction Fins

The Vmag may be adapted to various types of slide gates. This manual will illustrate installation using a typical aluminum frame slide gate. Each reaction fin section is approximately 79" (6.58 ft.) long. Add 72" (6 ft.) minimum to the gate opening to determine the number of reaction fin sections required.

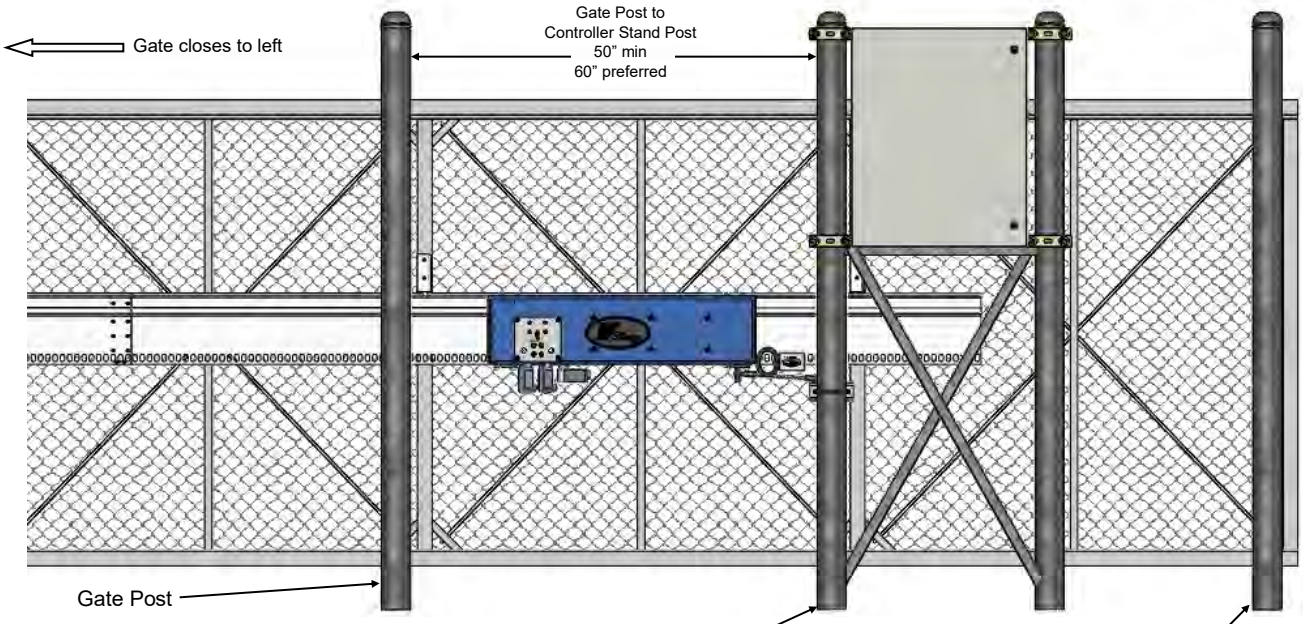
(Opening Distance (ft.) + 6) / 6.58 = # of reaction fins required (*round up*)

Example: Gate opening = 24' (24+6) / 6.58 = 4.56 sections round up to 5 sections required

Clearance Requirements
For dual track gates or gate posts that are on the inside (secured side)



End View



Inside View

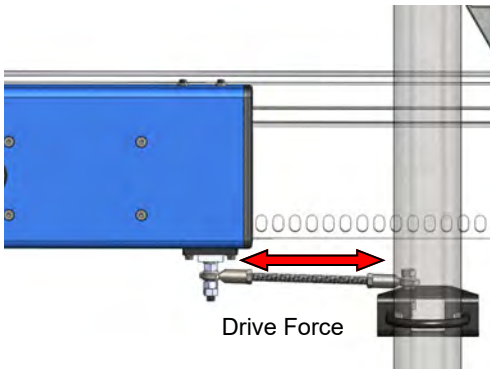
Controller Enclosure Installation

Controller enclosure must not be mounted on posts supporting the gate due to vibration from gate operation. Gate Posts must be 4" OD Schedule 40, or square 1/4" wall thickness, installed according to gate manufacturer.

A fabricated stand is required for proper installation.

The rigidity of the post that the motor assemblies are connected to is extremely important for proper operation of the VMag.

If there is notable vibration with the motors and/or control cabinet, additional bracing will be required.



Recommended Controller Stand

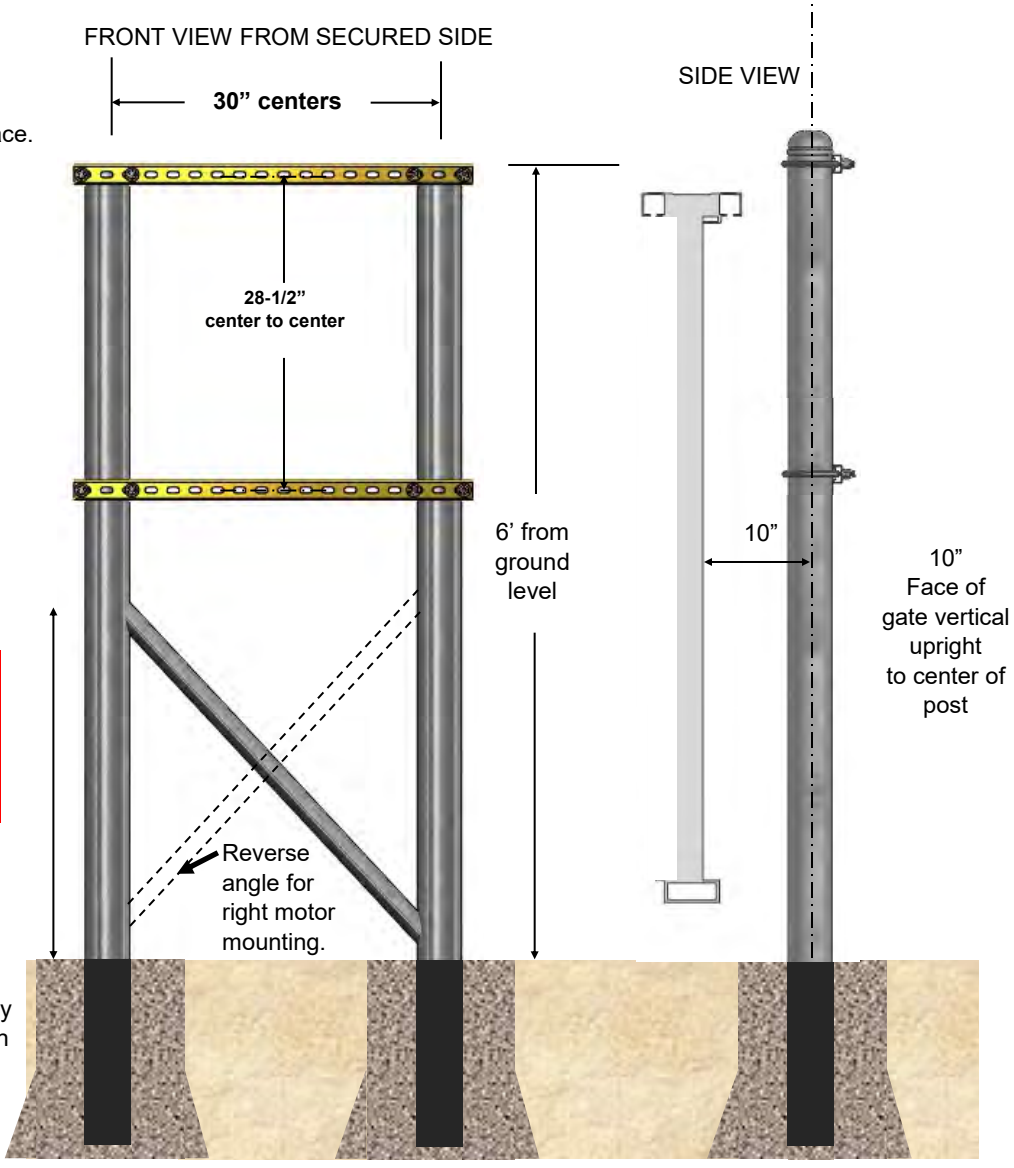
Qty Materials

(2) 4" OD schedule 40 posts, or square 1/4" wall thickness posts. Length determined by gate manufacturer and hole depth.

(2) 1-$^{5}/_{8}$" x 36" Unistrut

(4) $^{3}/_{8}$" x 4" U-Bolts

(1) 2" round/square tube for diagonal brace.



Diagonal MUST be welded for warranty to be in effect.

Diagonal shown is for left motor mounting.

Proper controller stand foundation will be site soil dependent and is the responsibility of the installer to ensure proper hole depth and diameter.

The controller stand & gate posts must be ridged.

GROUNDING

High Importance

Proper electrical grounding is essential for all Vmag gate operator installations. Low resistance grounding improves lighting dissipation and minimizes radio frequency interference (RFI) that can affect sensitive electronic components. The grounding technique below is minimal but suitable for many locations.
Other techniques, however, may be required depending on geographic conditions including soil composition, frequency of lighting or other radio frequency emissions in the area.

A local licensed electrical contractor should be able to recommend and install the proper grounding equipment for the specific geographical location. Ground resistance is measured with a 'Ground Resistance Tester' which must be used by an electrician or technician experienced in the operation of the tester.

Ideal ground resistance is 5Ωs or less.

Ground resistance must not exceed 10Ωs.

NO GROUND ….NO WARRANTY

DO NOT USE EXISTING GROUND ROD UNLESS TESTED.

DO NOT INSTALL GROUND ROD THROUGH OR IN CONCRETE!

DO NOT USE CONDUIT AS A GROUND CONDUCTOR!

DO NOT CONNECT GROUND WIRE TO THE CONTROLLER POST!

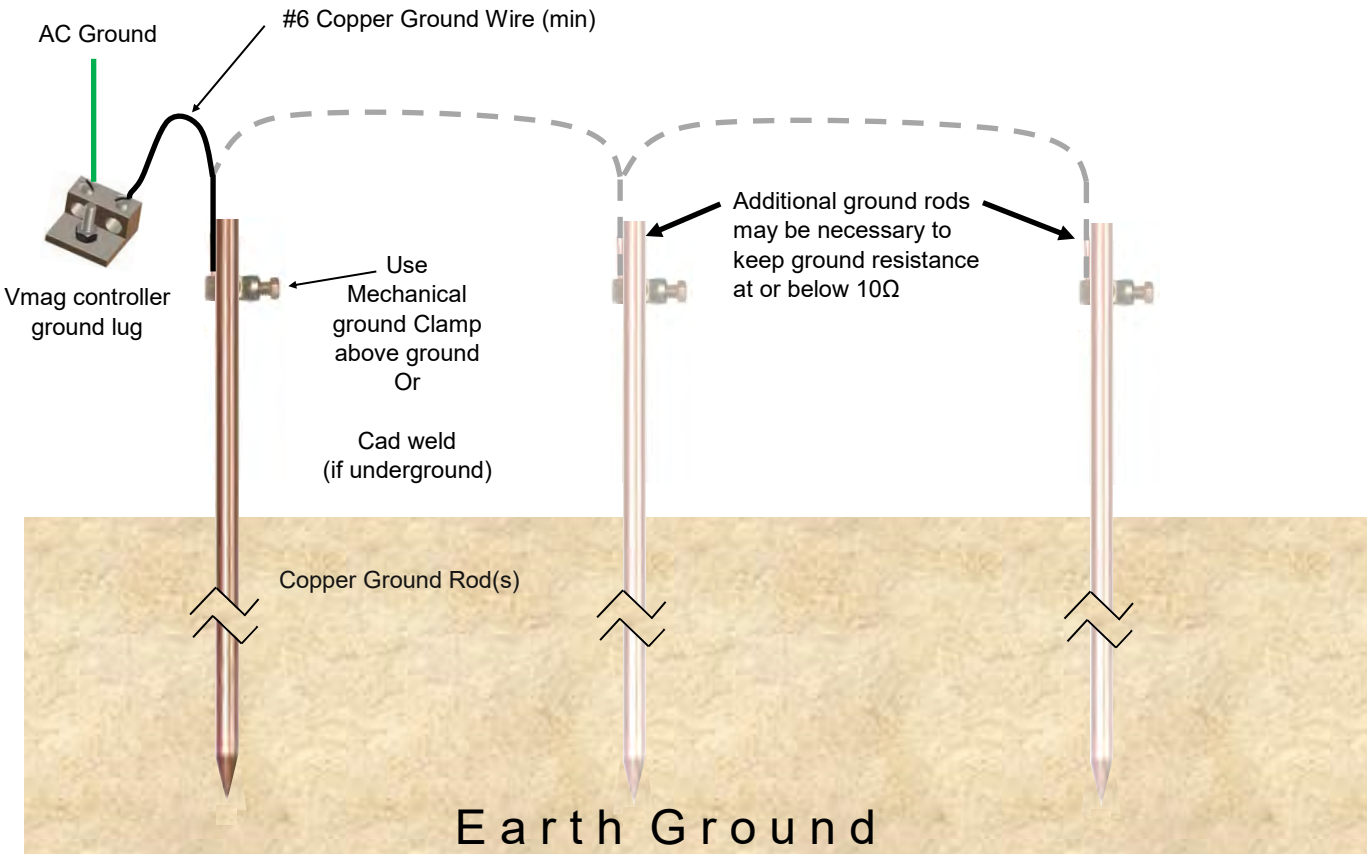
DO install a new ground rod & wire if resistance is >10Ωs.

DO install the ground rod as close to the controller as possible.

DO check that both connections are securely tightened.

DO terminate the ground wire at the controller ground lug.

DO Periodically test ground resistance.

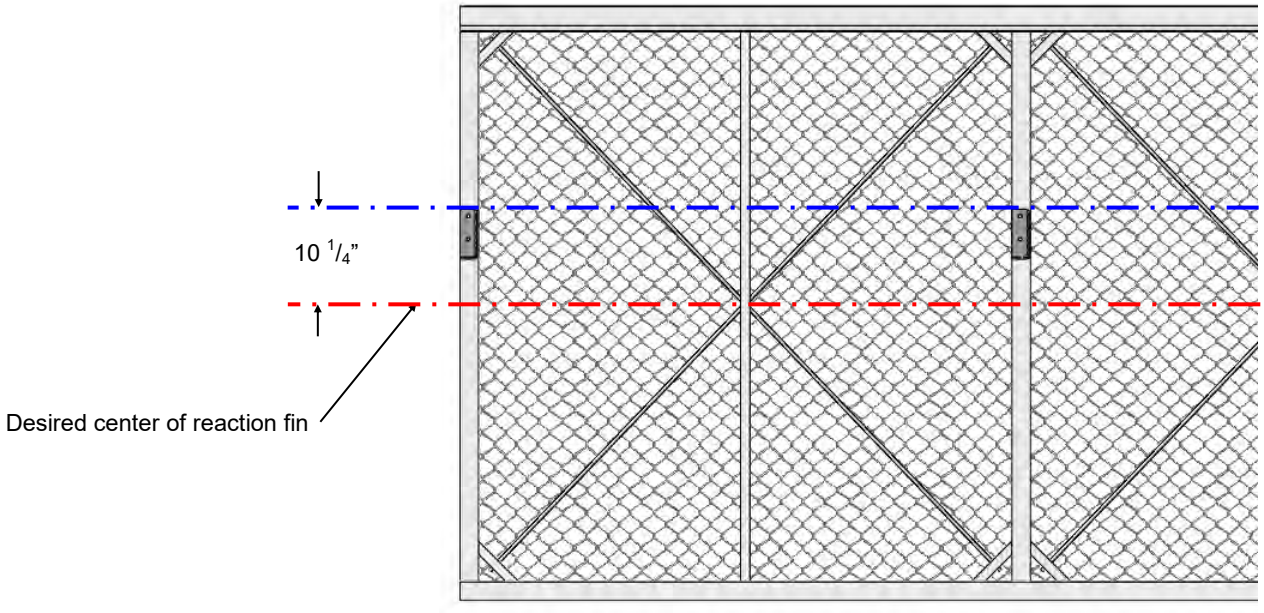


Hanger Bracket Installation for Square Frame Gates

Step 1.

The following instructions are intended for gates constructed with square or rectangular tubing. **For pipe gates see page 13 for instructions on adapter fabrication.**

Determine the height preference for the reaction fins. The reaction fins should be installed no higher than the center of the gate. Higher positions will require increased bracing for the motor linkage assembly. The top of the hanger brackets should be 10 $^{1}/_{4}$" above the desired center of the reaction fins.

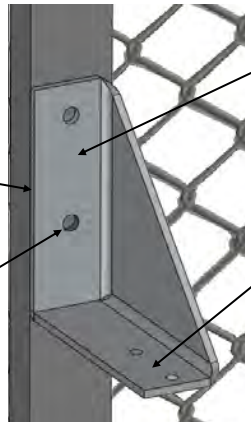


Step 2.

Starting at the closing end, attach a hanger bracket on every other vertical member of the gate using supplied nut inserts or equivalent. Measurements should be made from the top horizontal member of the gate. Hangers are spaced approximately 6 feet apart depending on the gate construction. Some gates will use two different sizes of vertical members which will be alternated down the frame. Use the larger members for mounting the hanger brackets. Note the hole spacing on the hanger brackets. The side with wider hole spacing should be attached to the gate vertical member.

Position hanger bracket to the gate vertical member.

Square the back side of the hanger bracket to the gate vertical member.

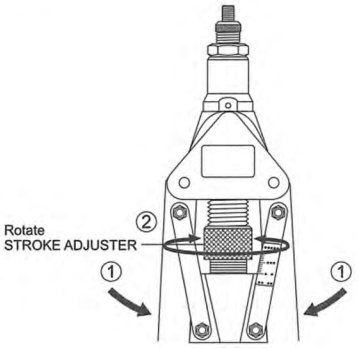


Marson Thread Setter Stroke Adjustment

[WARNING]

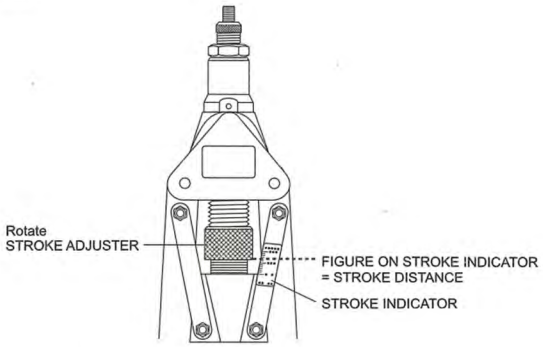
- **The proper Stroke Distance is decided as per the WORKPIECE Thickness and the Grip Range of RIVET NUT. Each RIVET NUT has its own Grip Range, the Maximum Grip and Minimum Grip.**
- **The WORKPIECE Thickness must be WITHIN the Grip Range of RIVET NUT or BETWEEN the Maximum Grip and Minimum Grip of RIVET NUT for safe and firm fastening.**
- **If the Maximum Grip of RIVET NUT is SMALLER than the WORKPIECE Thickness, this TOOL and RIVET NUT Threads might be damaged.**
- **If the Minimum Grip of RIVET NUT is LARGER than the WORKPIECE Thickness, this RIVET NUT can not be gripped firmly in the WORKPIECE.**
- **Adjusting TOO LONG Stroke Distance might damage this TOOL and RIVET NUT Threads, while TOO SHORT Stroke Distance can not fasten RIVET NUT firmly in the WORKPIECE.**

1



Close 2 HANDLES completely①, rotate STROKE ADJUSTER② to adjust the proper Stroke Distance in 2 popular ways.

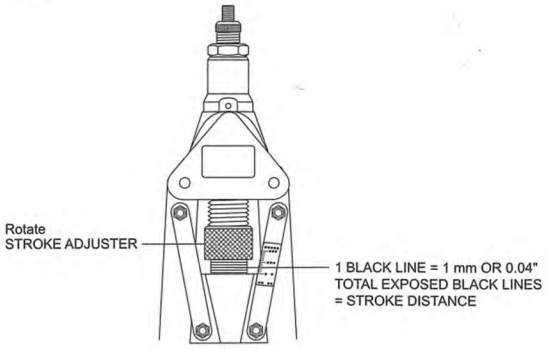
2



First Way: Rotate STROKE ADJUSTER to find out the Figure on the STROKE INDICATOR parallel with the Bottom Edge of the STROKE ADJUSTER:

Figure on STROKE INDICATOR = Stroke Distance

3

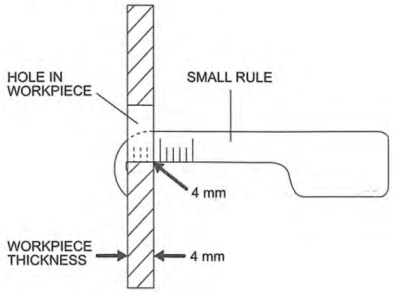


Second Way: Rotate STROKE ADJUSTER to find out the Total Exposed Black Lines of the STROKE INDUCATING LINES:

1 Black Line = 1 mm or 0.04" Stroke Distance

Total Exposed Black Lines = Stroke Distance

NOTE



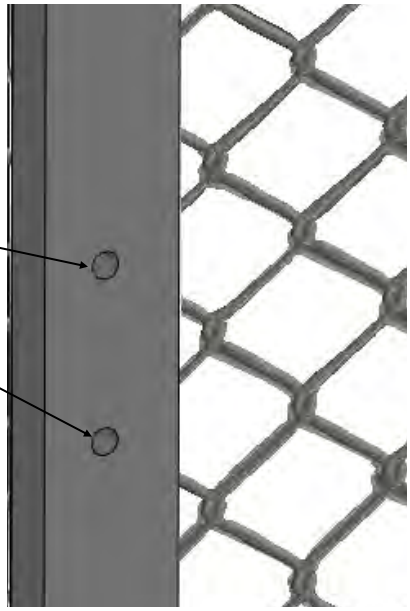
NOTE: The SMALL RULE is specially designed to measure the WORKPIECE Thickness.

Step 3.

Determine thickness of material.

Nut inserts are provided for 1/8th" and 1/4" material.

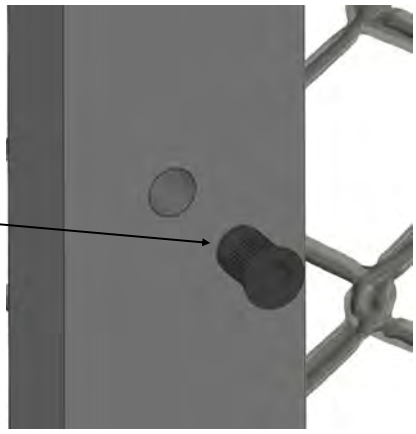
Drill two 25/64" holes through the front of the vertical member.



Step 4.

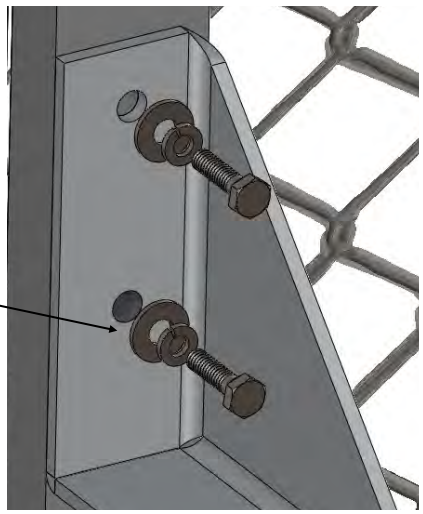
Set the thread setter for the proper stroke (see pg.13)

Install threaded inserts using the thread setter tool.



Fasten Hanger bracket to gate using 1/4" grade 8 hex bolts, lock washers and flat washers.

Torque bolts to 11 foot-pounds

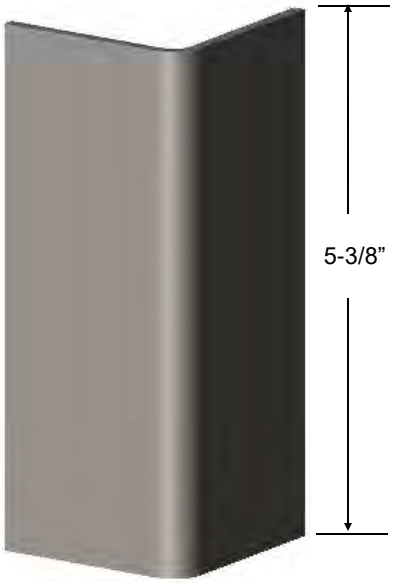


Hanger Bracket Installation for Pipe Gates

If the gate is constructed with round tubing a hanger bracket adapter will have to be pre-fabricated. Welding and additional hardware will be required for proper installation. 1/4” hardware will be required to secure the hanger bracket thru the adapter and gate vertical member.

Pre-fabricate Hanger adapter brackets using 2 $^{1}/_{2}$” x 2 $^{1}/_{2}$ - $^{1}/_{8}$” wall thickness angle iron in 5-3/8” lengths for each hanger bracket.

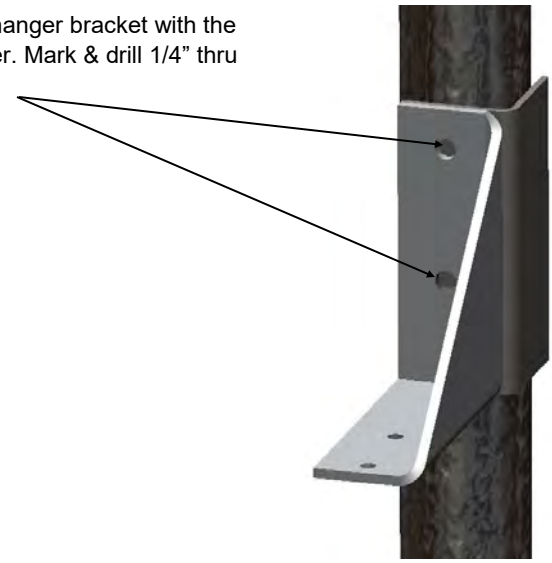
Corrosion protection should be considered for intended site environment.



Align adapter bracket for proper height and orientation to gate. (see page 13)

Tack weld in place.

Align hanger bracket with the adapter. Mark & drill 1/4” thru holes.



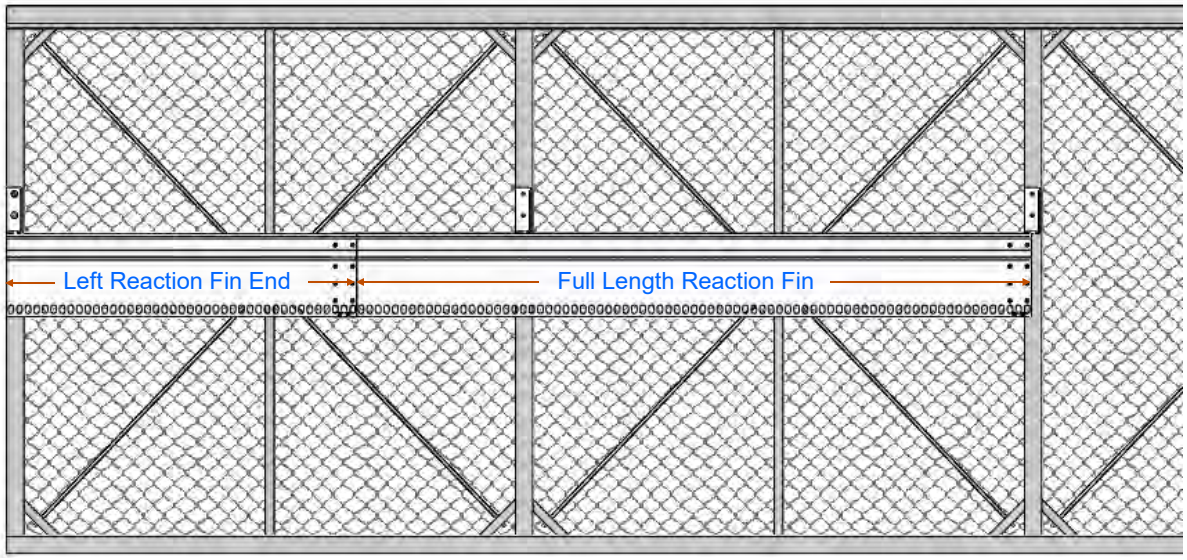
Install hanger bracket using 1/4” hex bolts, lock washers & washers.

Re-check alignment prior to permanent weld.

Reaction Fin Installation

Step1.

The standard reaction fin assembly consists of two end sections (short) and three full length sections. The reaction fin installation should always be started at the close end of the gate. The example below illustrates the beginning of the reaction fin install on a gate that closes to the left. Assemble the reaction fin end to a full length reaction fin as describe in Step 2.



Step 2.

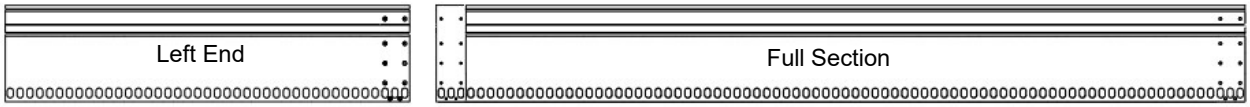
Assemble the reaction fin sections using (10) 10-32 x 3/8" stainless steel flat head screws. Loctite thread locker blue or equivalent must be applied on each screw to prevent galling and vibration back out. Securely tighten the screws.

Do not screw fins together without using thread locker!

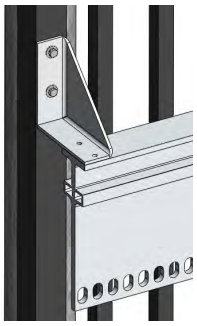
The following instructions are shown for a **left** closing gate *(from the secured side).*

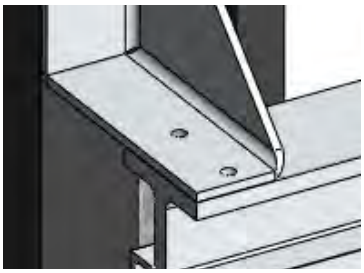
Step 3.

Assemble the left end to a full section.



Starting at the left end of the gate, align the front and side edge of the hanger bracket flush with the top end of the fin.





Clamp both hanger brackets to the reaction fin with vice grips.

Step 4.

Make sure the front edge of each bracket is flush with the top edge of the fin.

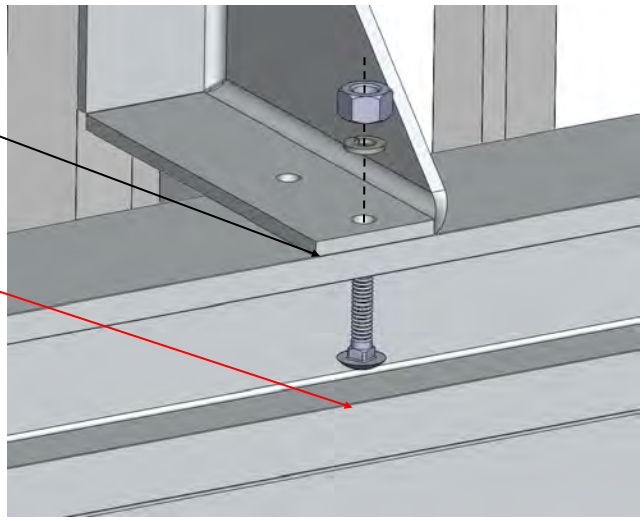
Drill through both of the hanger bracket mounting holes and the top of the reaction fin with a 5/16” drill bit. Do not allow drill bit to contact the wheel surface of reaction fin (both sides) as hole goes through the top of reaction fin.

Insert a 1/4” carriage bolt from the bottom and secure with a 1/4” lock washer and nut.

Check that the square neck of the bolt is pulled up into the reaction fin.

Manually open and close the gate to ensure clearance.

Install the remaining reaction fins.



MOTOR ASSEMBLY INSTALLTION

The motors are shipped assembled. If the motor mating brackets are configured correctly for the installation, two persons *(motor assembly weighs approximately 120lbs)* should be able to slide the complete assembly onto the reaction fins.

Step 1.

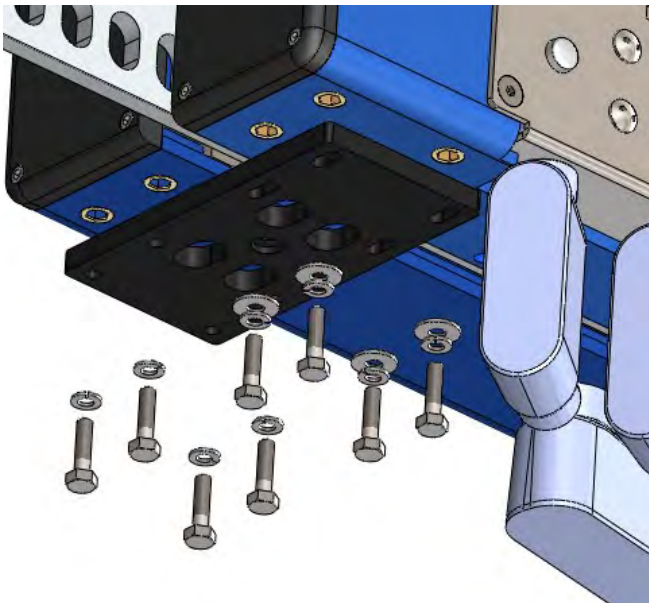
Note that one of the motor mating brackets will have a 1/2” bolt installed. This bracket will be installed on the side of the motor assembly that will be attached to the controller stand.

Step 5.

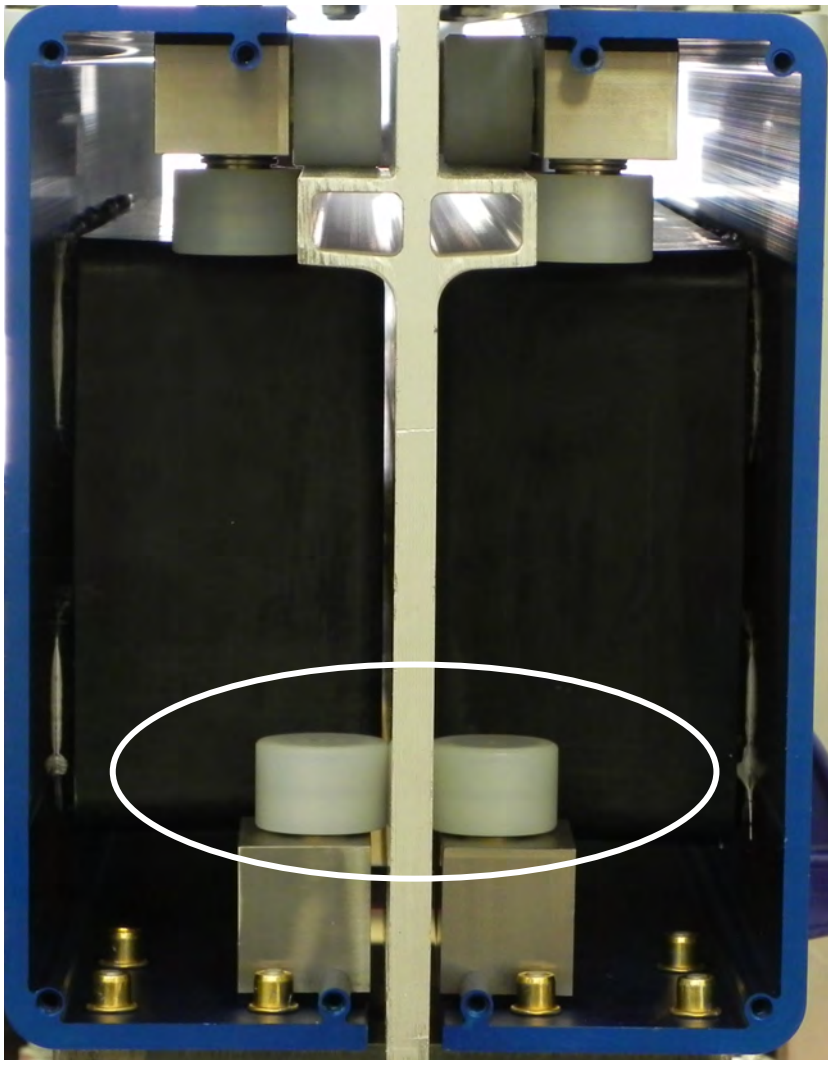
If the motor mating brackets need to be swapped, first secure the motor assembly at the top and bottom with two bar clamps.

Step 6.

Remove the 8 1/4” bolts, lock washers and flat washers on each bracket. Swap brackets and reassemble. The oval slot holes should be toward the front. Tighten the rear 4 bolts on each side only. Do not tighten the front bolts yet.



High Importance



Step 7.

Adjust motor mating brackets to ensure the four **bottom** cam rollers contact the sides of the reaction fin.

Bottom cam rollers should touch the fin but not too difficult to turn by hand.

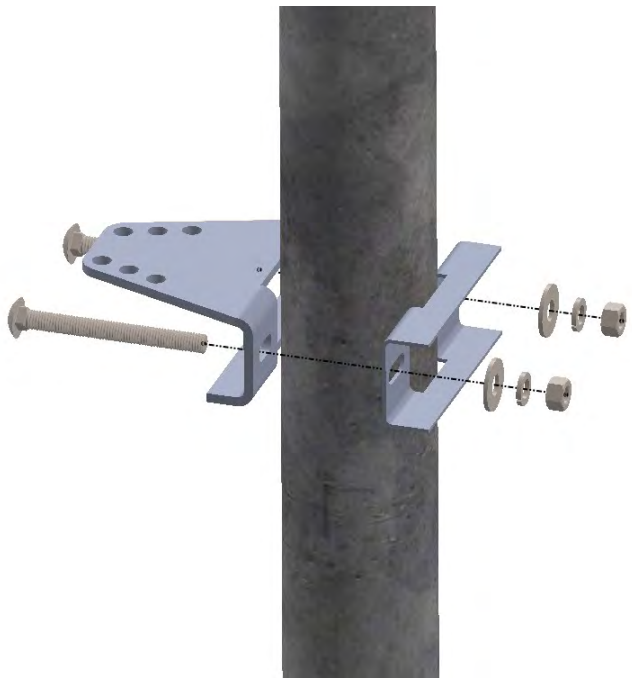
Tighten the four front bolts on each side and recheck cam roller tension. Re-adjust if necessary.

Torque all bolts to 8 foot pounds.

Post Bracket & Linkage Assembly Installation

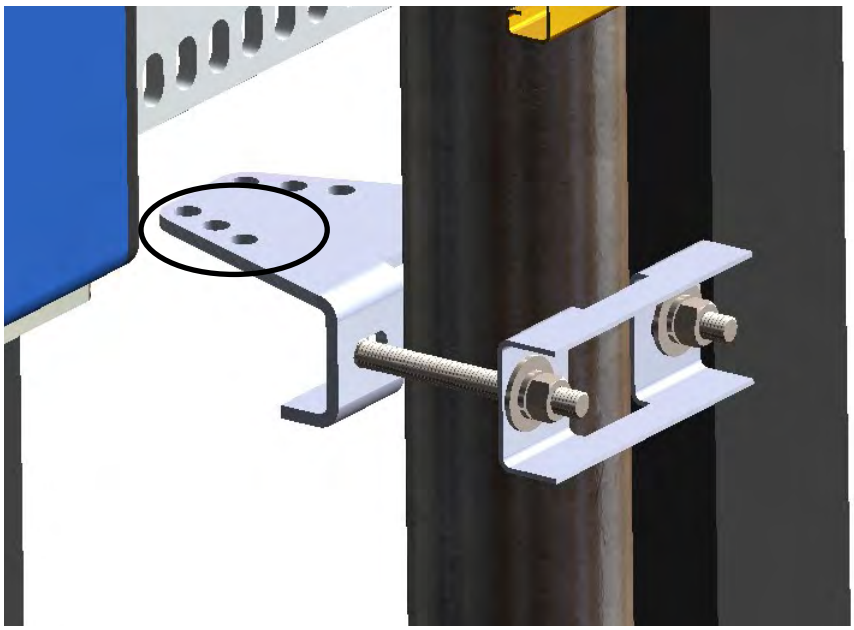
Step 1.

Install the post bracket assembly as shown using 1/2” carriage bolts, washers, lock washers & nuts. Do not tighten at this time. This will allow some positioning for the following steps.



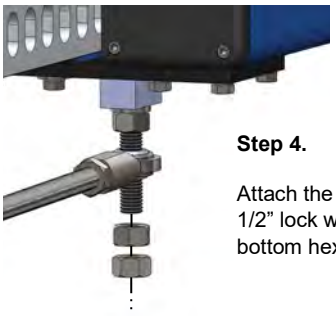
Step 2.

Determine which mounting hole in the post bracket will align the best directly under the reaction fin. Select one of the three holes closest to the motor assembly.



Step 3.

Attach the linkage assembly as shown. Securely tighten the hex nuts using the bottom nut as a jam nut.

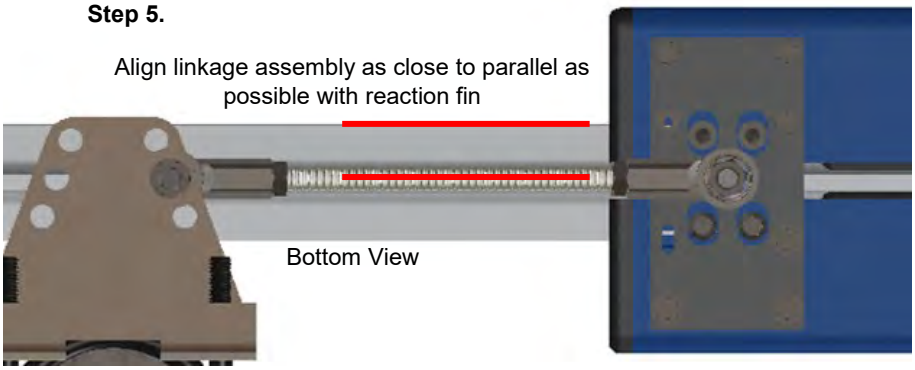


Step 4.

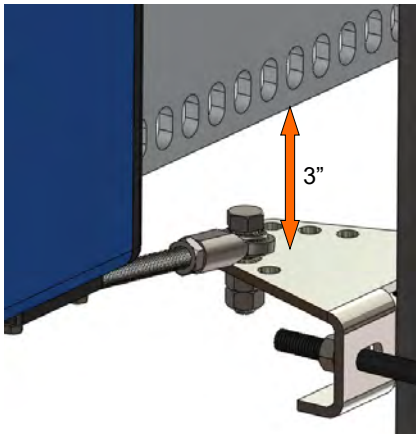
Attach the opposite end of the linkage assembly to the motor bracket with the 1/2” lock washer, 1/2” two 1/2” nuts. Securely tighten the top hex nut using the bottom hex nut as a jam nut.

Step 5.

Align linkage assembly as close to parallel as possible with reaction fin



Bottom View

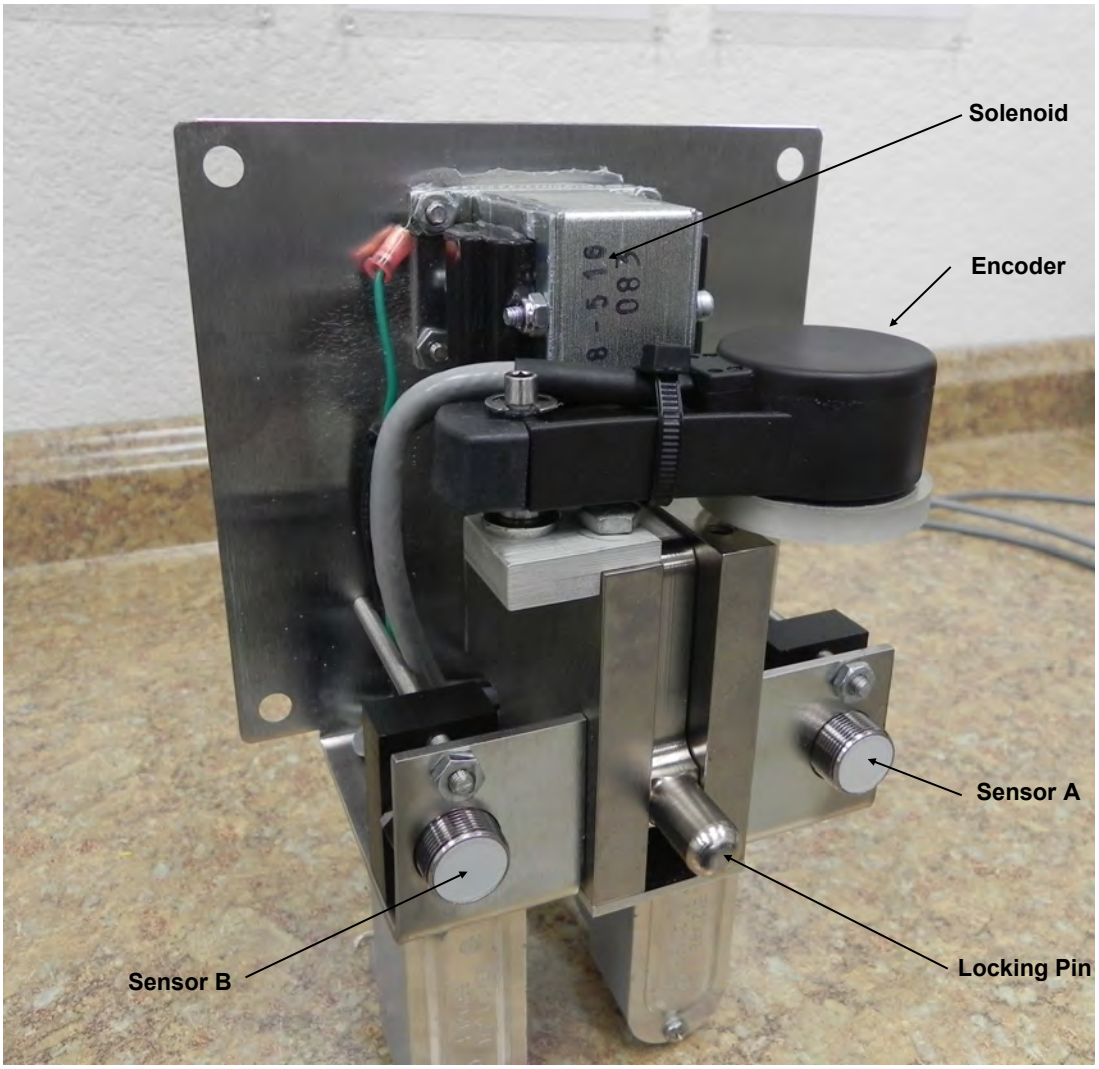


Step 6.

Adjust the top of the post bracket 3” from the bottom of the reaction fin.

Securely tighten .

Lock Assembly Installation



The Lock Assembly consists of :

Encoder - Sends feedback to the inverter for speed and direction of gate travel. Spring loaded.

Sensor A & B - Reads the holes in the reaction fin to determine gate position.

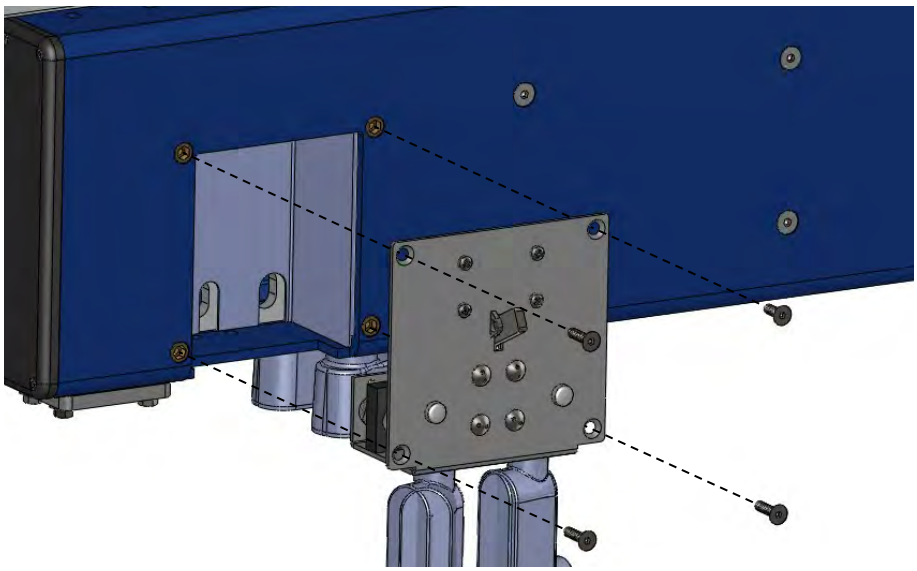
Lock Solenoid - Retracts the locking pin when activated.

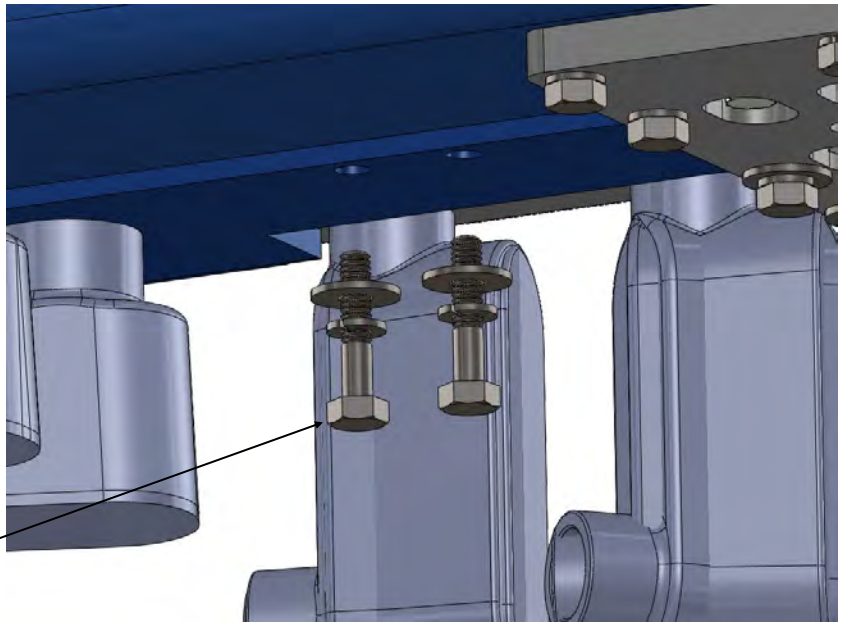
Locking Pin - Retracted with solenoid, gravity engaged.

Remove the four 1/4” flathead screws from the front of the motor housing and the two 1/4” from the bottom of the lock assembly.

Install the lock assembly using the four 1/4” flathead screws.

The screws have been coated with anti-seize to prevent galling.



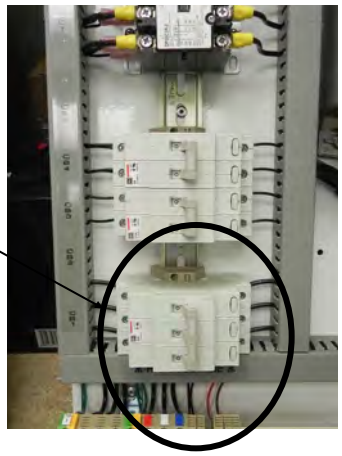


Secure the bottom of the lock assembly using two 1/4” x 1” hex bolts, 1/4” flat washers & lock washers

Sensor Adjustment

The two proximity sensors are set at the factory to 0.027” from the reaction fin but should be rechecked once motor are installed.

Adjustment procedure:



Turn off CB1 power to the operator.

Manually move gate halfway open.

Lift caps off of adjustment screws.

Insert 0.027” feeler gauge* between sensor A and the reaction fin.

Rotate clockwise to increase sensor gap.

Rotate counter clockwise to reduce sensor gap.

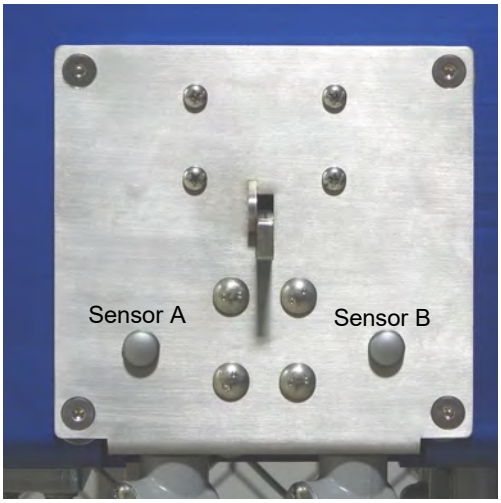
Set the A proximity sensor at 0.027”

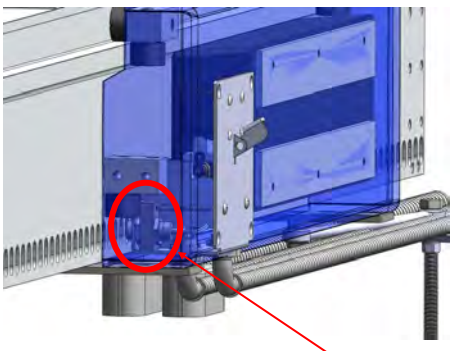
Repeat for sensor B

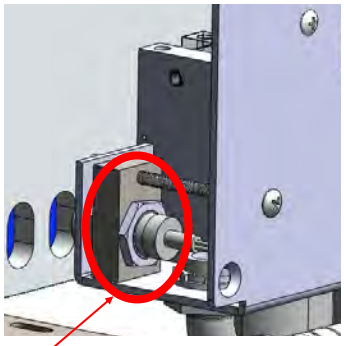
Replace caps, restore power and test.

On the third cycle check the PROX JITTER on the programmer. The value should be 500 $^{+}/_{-}$ 2

Longer gates may require checking the sensor gap at two to three different points along the gate travel. These adjustments may have to be averaged throughout the length of travel.

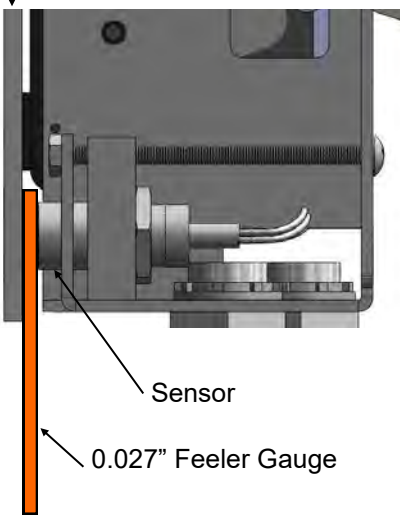






Sensor A

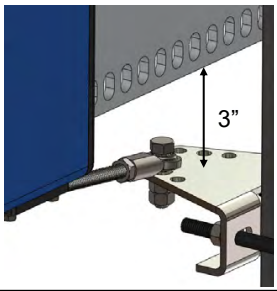
Reaction Fin



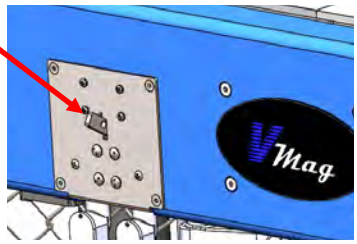
VSTOP Installation

TURN OFF POWER

The top of the post bracket should be 3” from the bottom of the reaction fin



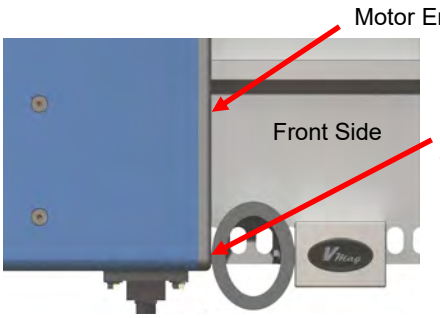
Hold down the lock release handle and slide a #2 Phillips screwdriver thru the handle lock hole.



Position the gate to the desired close position and install the Vstop.

Standing from the secured side if the gate closes to the left, start with the right Vstop.

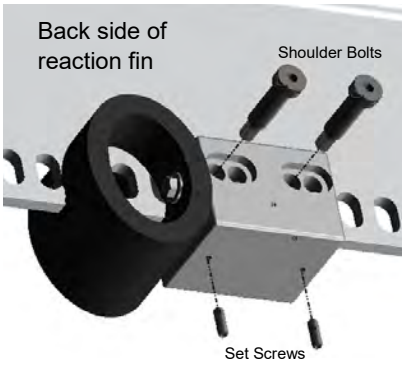
If the gate closes to the right start with the left Vstop. Install the two shoulder bolts from the back side.



Install the appropriate Vstop at a position where the bumper is making contact with the motor housings (or as close as possible). The Vmag logo should be visible from the secured side.

With the bumper touching the motor end caps, release the lock handle. **If the lock pin drops freely into one of the reaction fin holes and can be retracted with no binding, snug up the two bottom set screws ands continue with the other stop.**

If the lock pin drops between holes, or the lock pin drops into a hole but binding can be felt when releasing the stop block will need to shift left or right 1/2”. To make this adjustment refer to the procedure below.



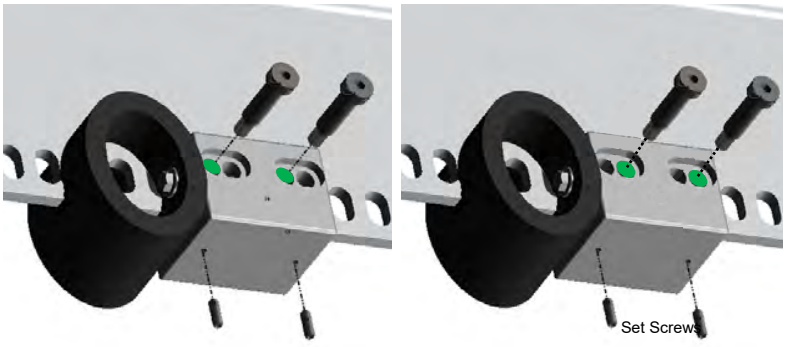
Test the operator. If the lock pin wedges on the open or close position move the shoulder bolts to the other two holes. You will have to move the Vstop one direction or the other 1/2” to line up the second set of holes.

Loosen both set screws on the bottom.

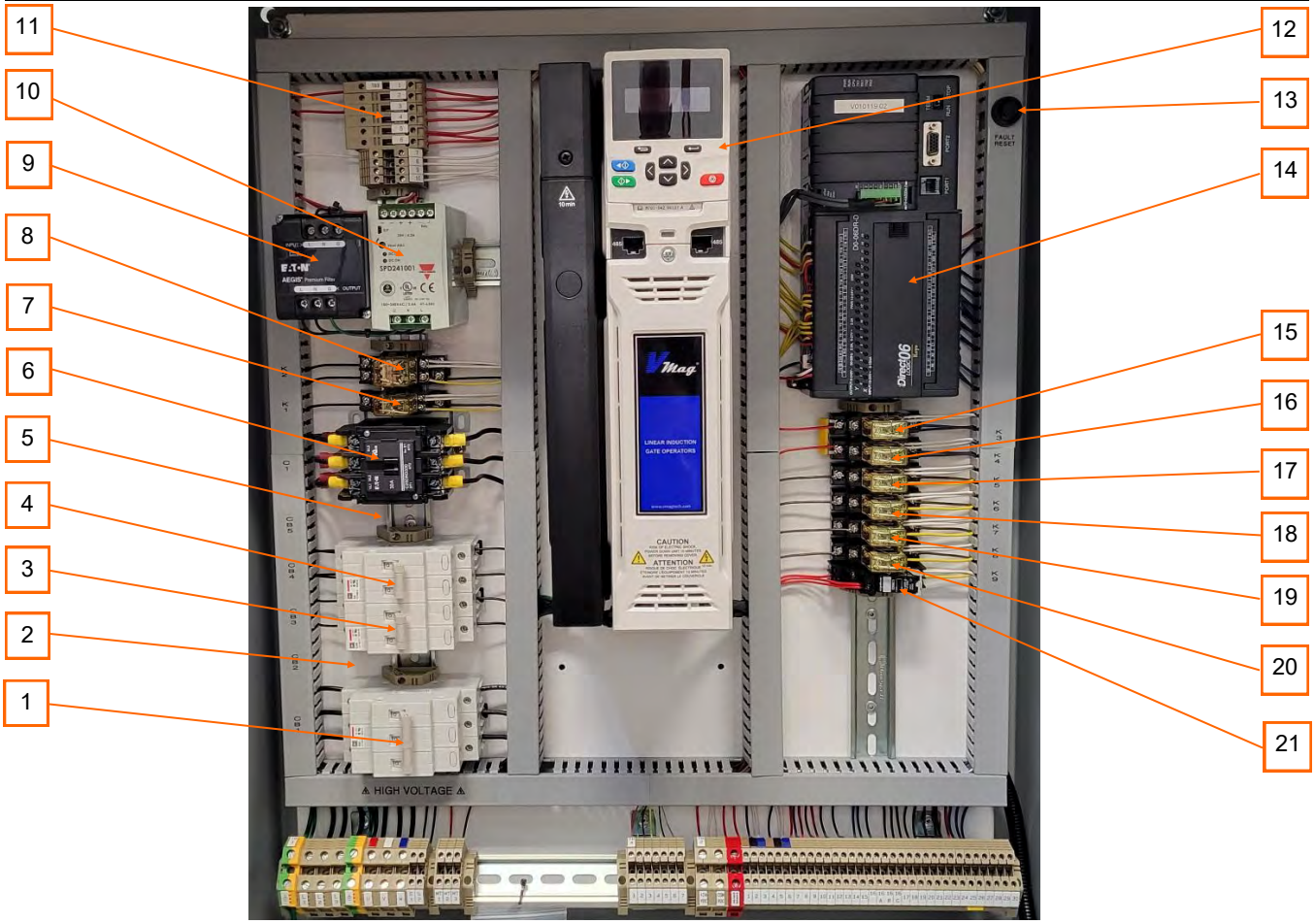
While keeping the Vstop in place, remove the shoulder bolts one at a time and seat them into the adjacent holes.

Slide the Vstop 1/2” left or right until one of the shoulder bolts goes through a reaction fin hole.

Repeat for the second bolt then tighten both shoulder bolts and set screws.



Control Panel Parts Identification



1. **CB1 35A VAC Main Circuit Breaker**
2. **CB2 2A Circuit Breaker** - for VM14xx external transformer (not shown)
3. **CB3 2A Circuit Breaker** - for Lock Solenoid
4. **CB4 5A Circuit Breaker** - for 24 VDC Supply
5. **CB5 2A Circuit Breaker -** for heater option (not shown)
6. **C1 Contactor**
7. **K1 SPDT Relay** - Contactor control
8. **K2 DPDT Relay -** Lock Solenoid control
9. **AC Line Filter**
10. **24 VDC Power Supply**
11. **24 VDC Fuses**
12. **Inverter Drive**
13. **RESET Push Button**
14. **Programmable Logic Controller** (PLC)
15. **K3 SPDT Relay -** Motor Over Temp
16. **K4 SPDT Relay -** Inverter Current Threshold
17. **K5 SPDT Relay -** OPEN STATUS
18. **K6 SPDT Relay -** CLOSE STATUS
19. **K7 SPDT Relay -** FAULT
20. **K8 SPDT Relay -** Siren Activate
21. **K9 Solid State Relay -** Entrapment Power Relay

All Fuses 2A FB
GMA2 or equiv.

TB3 FUSES

-1 TB2 Proximity Switches
-2 PLC Power
-3 PLC Jumpered Power
-4 TB2 24VDC Accessories
-5 Internal control wiring power
-6 TB2 Secondary Power
Motor Overtemp
STOP Input

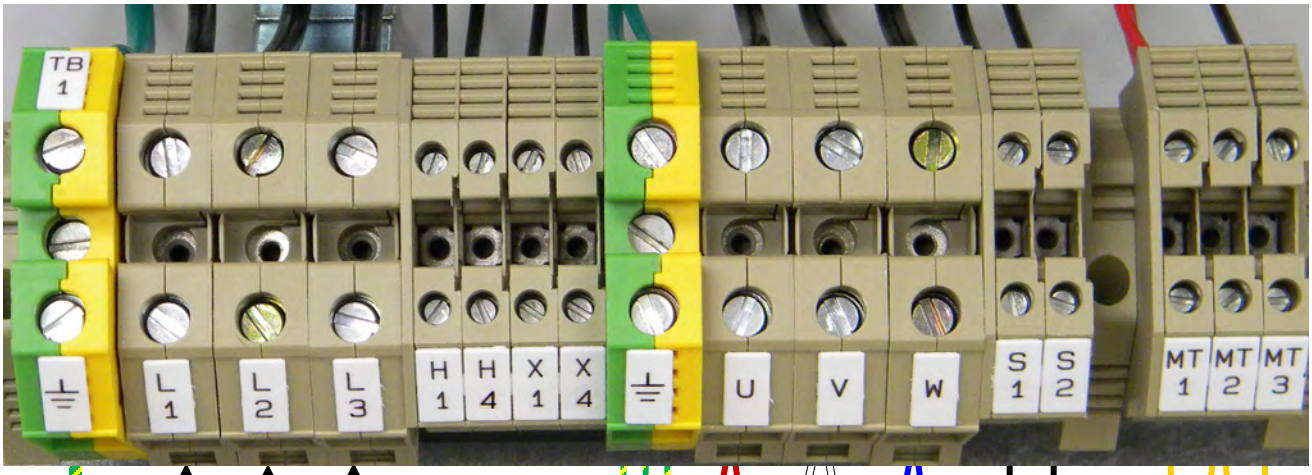
High Voltage Connections VM1220 & VM1420

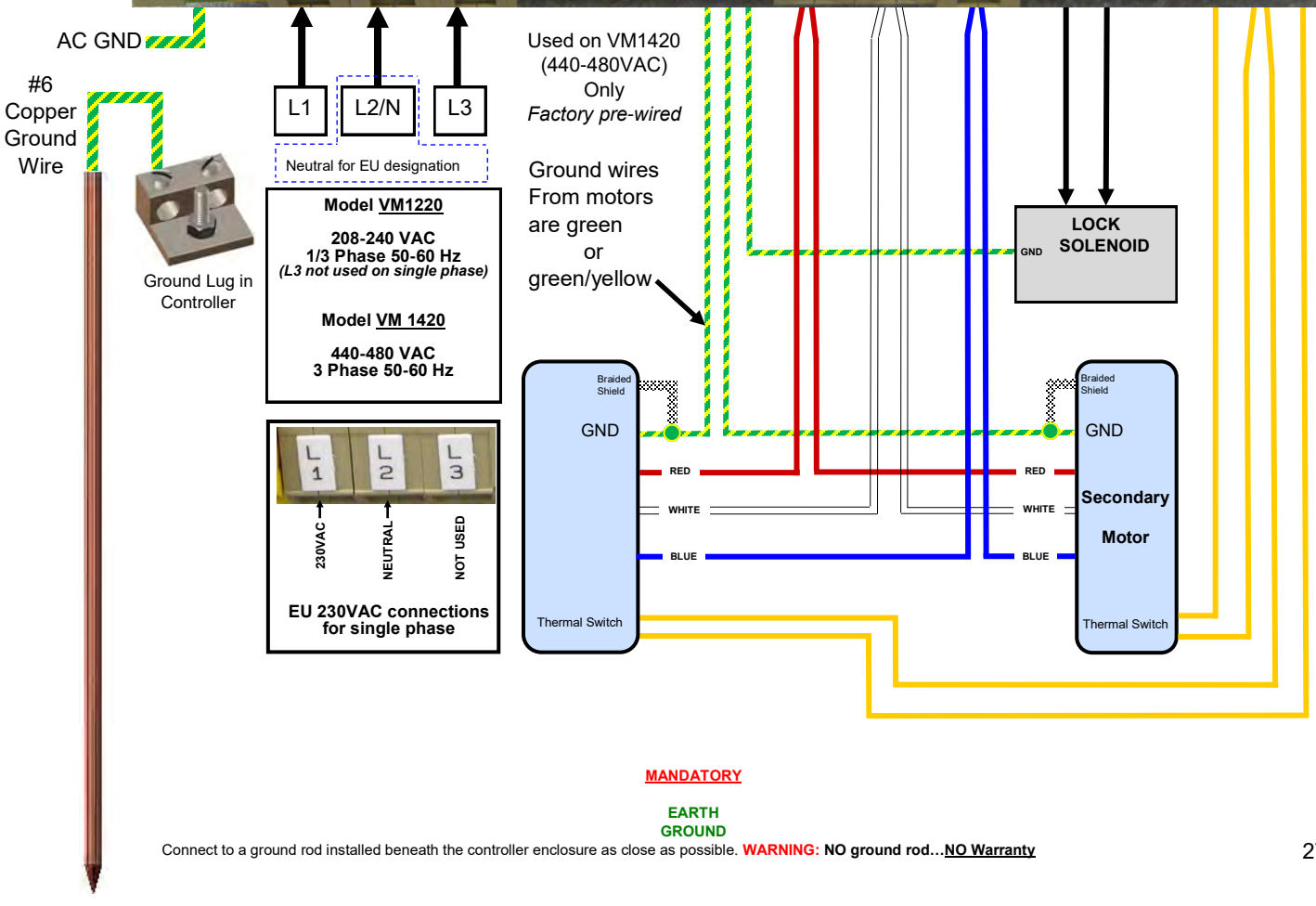
The VM1220 & VM1420 is designed for permanent wiring. Conduit and connectors should be supplied & installed by a certified electrician. All local & national codes should be adhered to.

Motor power……	RED	12 AWG[1]	Stranded
" " ……	WHITE	12 AWG[1]	
" " ……	BLUE	12 AWG[1]	
Motor Grounds……..	GREEN	14 AWG	
Lock Assembly Ground…..	GREEN	16 AWG	
Lock Solenoid……..….	BLACK	16 AWG	
Motor Thermal Switch…...	YELLOW	18 AWG	

1. The controller should be installed within 10 feet of the motors. Contact Vmag if further distance is required.

IMPORTANT: The control cabinet should be connected to a ground rod installed as close to the control cabinet as possible





MANDATORY

EARTH GROUND

Connect to a ground rod installed beneath the controller enclosure as close as possible. **WARNING: NO ground rod…NO Warranty**

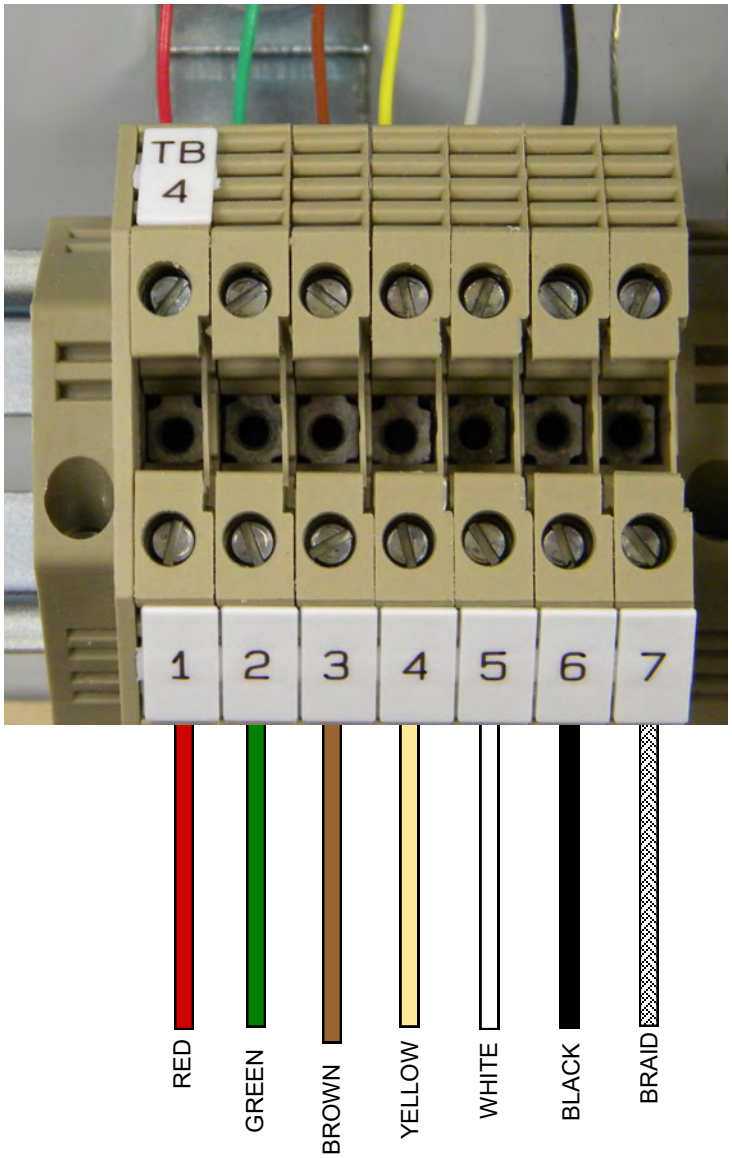
Encoder Connections

High Importance

If the wires are incorrectly connected, the operator will not be able to control the speed of the gate.

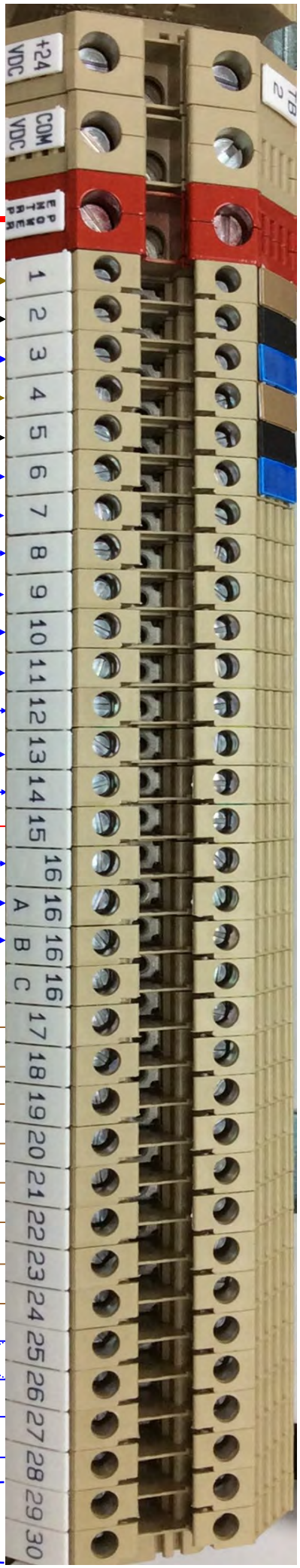
Make sure the colors match!

Do not cut the encoder cable!



ENCODER

TB 2 Low Voltage Connections



24 VDC Auxiliary Power (2 amps max)

Auxiliary Power Common

24VDC Power for Entrapment Devices and across drive photo beam

Do not cut the sensor cables!

Sensor A

BROWN
BLACK
BLUE

Sensor B

BROWN
BLACK
BLUE

Not recommended for normal use → **Operate** Input

Free Exit Loop

Safety Loop

Shadow Loop

Per UL325 requirements, Loop detectors must have a UL 508 listing and installed in accordance with the manufacturers instructions.	OPENS GATE	REVERSES GATE	TIMES OUT & CLOSES GATE
FREE EXIT TB2-10	✓	✓	✓
SAFETY TB2-12	X	✓	✓
SHADOW TB2-14	X	X	✓

All three devices to be powered from **ENTRP POWER** and are monitored once per cycle to verify proper operation.
PLC lights X22, X20, & X17 need to be **ON** in a powered up unobstructed state.
When **ENTRP POWER** is turned **OFF** these inputs must de-activate.

UL 325 Edge Detector Type B2 Contact Device — COM, N/C

UL 325 Photo Beam Type B1 Non-Contact Device — COM, N/C

Photo Beam (across drive) vehicular only
NOT FOR ENTRAPMENT PROTECTION USE
Works as a vehicular **SAFETY** input — COM, N/C

+24 VDC
X22
X20
X17

No connection

All outputs are normally open dry relay contact closures rated for 10 A.

OPEN STATUS

CLOSED STATUS

FAULT STATUS (normally closed)

SIREN WARNING PRESTART

THREE BUTTON STATION INPUTS

* Remove jumper on 25 & 26 for three button station option.

If a three button station is not used, 25 & 26 must be jumpered.

STOP N.C. *

OPEN N.O.

CLOSE N.O.

Optional **EMERGENCY CLOSE** input

Low Voltage Input & Output Description TB2

1 **Sensor A** (brown) +24VDC

2 **Sensor A** (black) proximity sensor A output

3 **Sensor A** (blue) DC common

4 **Sensor B** (brown) +24VDC

5 **Sensor B** (black) proximity sensor B output

6 **Sensor B** (blue) DC common

7 +24VDC

8 **OPERATE** - Toggles between OPEN - STOP - CLOSE Normally used with car hand transmitters and receiver

9 +24VDC

10 **FREE EXIT** - N/O When activated opens gate - holds gate open - stops and opens gate if closing

11 +24VDC

12 **SAFETY** - N/O When activated will stop and open gate if closing - holds gate open - does not open gate if gate is stopped.

13 +24VDC

14 **SHADOW** - N/O When activated will hold gate open. Once the gate starts to close, the SHADOW input will not stop and re-open the gate. Can be used to prevent tailgating

15 +24VDC

Entrapment devices should be connected at these inputs to meet the UL325 standard. After two consecutive inputs in the same cycle the operator will go into a hard shutdown condition that can only be reset with the internal FAULT reset push button. These inputs are tested once per cycle for proper device operation.

16 **EDGE** - N/C UL325 Type B2 monitored contact device.

16A **PHOTO BEAM** - N/C UL325 Type B1 monitored non-contact device.

16B **PHOTO BEAM** - N/C Activated when beam broken. Works the same as SAFETY INPUT but is still monitored once per cycle. For across road vehicular traffic only. Cannot be used to meet UL325 Type B1 Non-contact device.

16C not used

17 **OPEN STATUS**
18 **OPEN STATUS**
N/O Dry contact relay output - contacts closed when gate is within the OPEN limit distance.

19 **CLOSED STATUS**
20 **CLOSED STATUS**
N/O Dry contact relay output - contacts closed when gate is within the CLOSE limit distance.

21 **FAULT STATUS**
22 **FAULT STATUS**
N/O Dry contact relay output - contacts closed when a FAULT condition exists. Must be reset with the FAULT RESET push button inside the controller.

23 **SIREN WARNING**
24 **SIREN WARNING**
N/O Dry contact relay output - contacts closed when siren is installed and activated

25 +24VDC

26 **STOP** (NC)
27 **OPEN** (NO)
28 **CLOSE** (NO)
Three button station inputs. Jumper between 25 & 26 must be removed for proper operation. Leave jumper in for two button station.
AUTO CLOSE is disabled when the OPEN button is used.

29 **EMERGENCY CLOSE**
30 **EMERGENCY CLOSE**
Optional

ENTRAPMENT DEVICES REQUIRED FOR UL 325

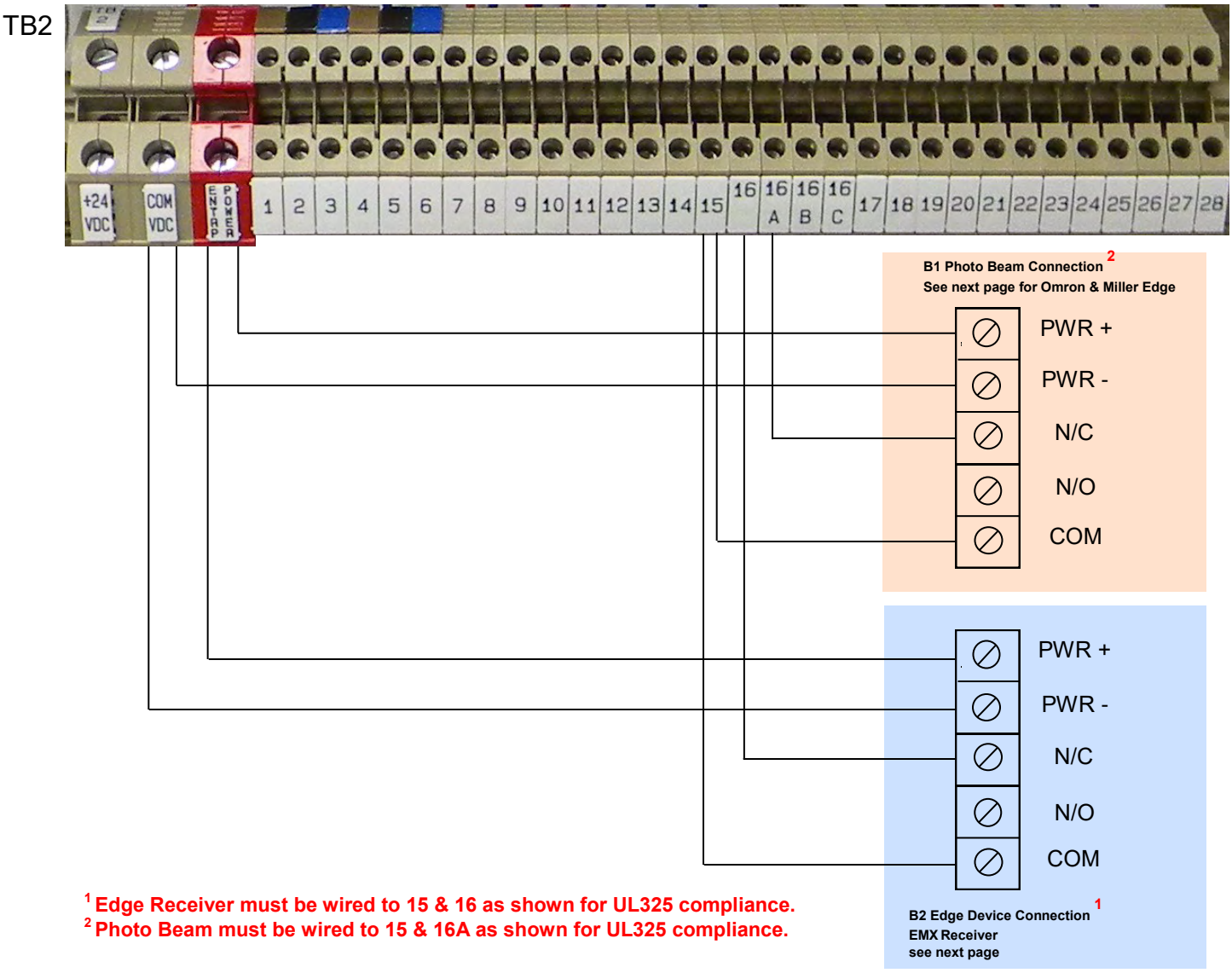
Effective January 12th, 2016 UL325 requires that every entrapment device be monitored for proper operation once every cycle. Vmag has adopted the **Normally Closed** monitoring method which requires that the entrapment devices used must have the output relay energized in the non-detect mode for proper testing. In the event a device is determined to be mal-functioning the operator will shut down and sound an alarm for five minutes. This fault condition can only be cleared by two activations of the **FAULT RESET** push button inside of the controller.

Vmag operators have provisions for one **Type B1** device (photo beam) & one **Type B2** device (edge switch) to comply with UL325.

The following entrapment devices have been tested for use with Vmag gate operators.

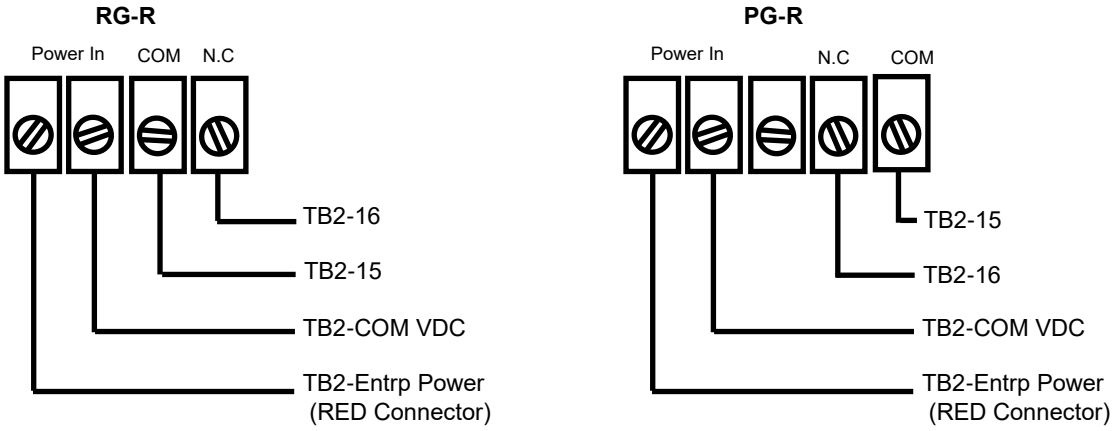
Gate Edge Devices: EMX WEL-200 Transmitter & Receiver used with Miller Edge 10 k edge switches

Photo Beam Devices: Omron - E3K-R10K4-NR (see next page)
Miller Edge - PG-K-R50 through beam
Miller Edge - RG-K-R reflective beam

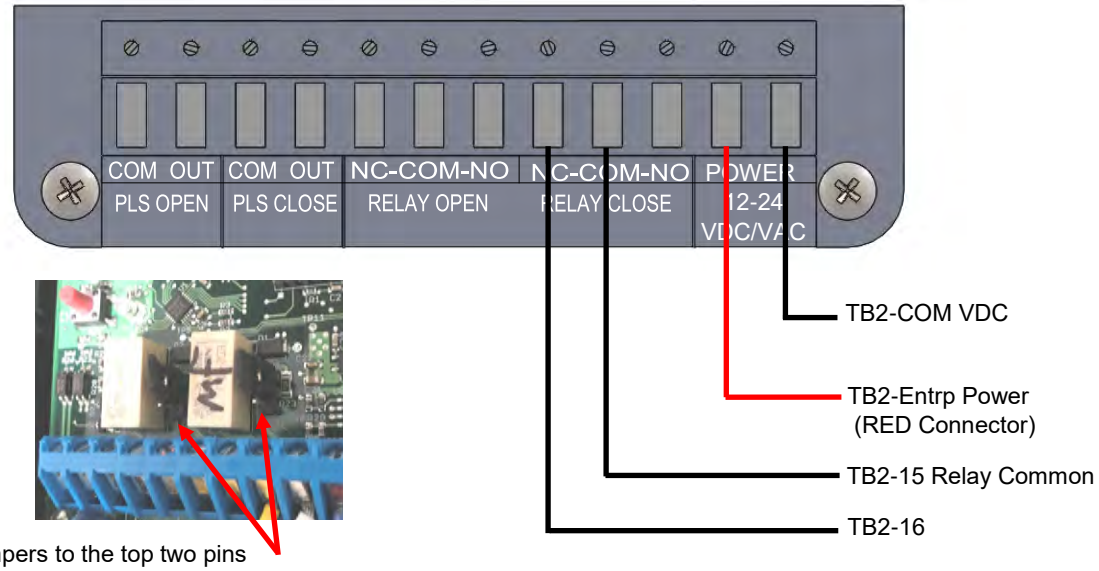


[1] **Edge Receiver must be wired to 15 & 16 as shown for UL325 compliance.**
[2] **Photo Beam must be wired to 15 & 16A as shown for UL325 compliance.**

Miller Edge ReflectiGuard RG-R and PrimeGuard PG-R



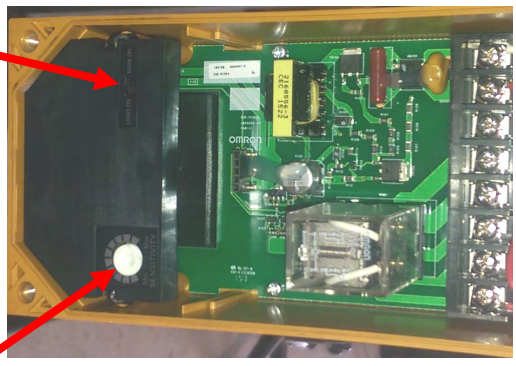
EMX WEL-200 Wireless Edge Link



Move 10K jumpers to the top two pins

OMRON E3K-R10K4-NR

Set switch to
LIGHT ON



Make sure
SENSITIVITY
Is not set too low

PWR → TB2-ENTRP PWR
PWR → TB2-COMM VDC

Remove resistor if installed

NC1 → TB2-16A

C1 → TB2-15

Make sure all personnel are clear of the gate travel.

WARNING: All entrapment protection devices should be installed and operational prior to operating the gate. When activating operator for the first time after installation, assure all personnel are clear of gate and be prepared to turn off CB1 if the gate is in the learn mode & the gate moves at excessive speed. Re-check the encoder & wiring before next start up.

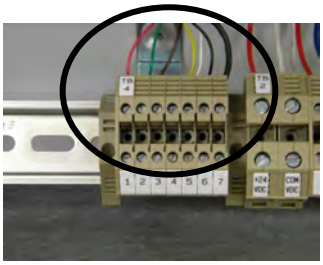
When the operator is first powered or whenever a power loss is restored, the first activation (card swipe, key code etc.) opens the gate in a learn mode. The learn mode moves the gate at one foot per second to find the physical limits at each end. After one complete cycle the operator will run at the programmed speed but slow down approximately 50 inches from each stop.

During the second and subsequent cycles the operator will fine tune the open and close slow down points. The operator is now fully functional.

All safety and access devices should be tested monthly for proper operation.

Re-check encoder wiring. Wire colors must match or operator will not have speed control.

Check motor ground connections, controller grounds and proper sensor adjustment before first operational tests.



Confirm that the three position switch on the PLC is in the **TERM** (center) position.

I f DC power is good but the inverter does not come on, turn the PLC switch down to **RUN** then back to **TERM** (center position).

Turn all circuit breakers on to power operator.

The inverter will display:

Ready
.000 A

If the inverter does not power up reset the PLC as shown above

The first activation after a reset starts the gate in a learn mode. The Vmag only learns traveling from the open stop to the close stop. To save time, manually position the gate about two feet from the OPEN position before activation.

Using the programmer press the "OPEN" button.

The lock pin will release and the gate will move to the open stop at a slow speed.

Once the gate stops and the inverter indicates 'Ready' press the "CLOSE" button.

The gate is now in the learn mode and will move the gate at a slow speed to the close stop.

Once the gate stops and the inverter indicates 'Ready' open the gate again.

During this second cycle the gate will move at the preset speed in both directions but slow down about 50" from the end and continue to the limit.

The gate will now run normal.

Check the "**Prox Jitter**" in the **SYSTEM DIAGNOSTICS** of the programmer and verify the prox jitter is 500 $^{+}/_{-}$ 2

Test all access control and safety devices.

TROUBLESHOOTING

Operator does not work

Reset the operator by turning off CB1 for ten seconds and back on ***(Keep Alive must be turned off if used).***

Check PLC lights to verify proper conditions.

When opening or closing gate, there is a buzzing noise and hesitation before the gate starts to move.

This is an indication that the locking pin is binding. Move the Vstop 1/2" in either directions and re-try. If problem still exists the gate is probably not level or is in a bind at the closed or open position. A built in un-wedging feature will sense the binding and attempt to "jog" the gate until the locking pin is free.

Operator does not complete the learn cycle.

Recheck proximity sensors for proper gap. Check proximity sensor connections going to TB2-1 thru 6.
CHECK ALL GROUND CONNECTIONS.
Turn power off to the controller, release the locking pin and manually roll the gate to detect any possible binding. Inspect the gate and reaction fins for damage. The Vmag may not work properly on excessive inclines.

Excessive vibration at motors when operating.

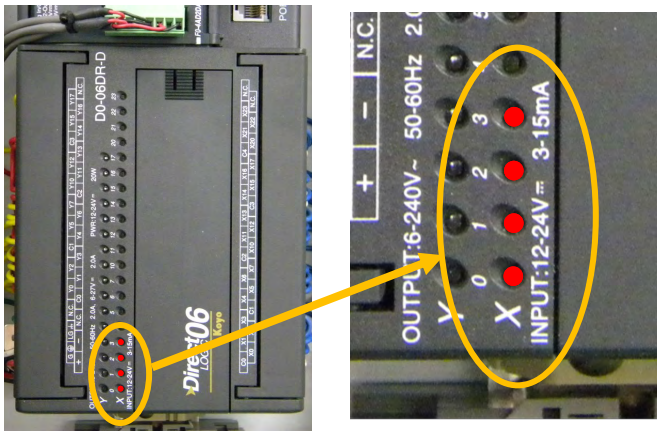
Make sure that all nuts used in the linkage assembly are tight. The mounting post for the motor linkage assembly must be rigid. Add diagonal cross bracing to correct this issue.

Gate opened but will not close.

If the PLC lights on **X7** (free exit input) or **X10** (safety input) the gate will not close. Check loop detectors and/or photo beams for proper operation.

Gate operates erratically or does not stop properly at open or close limits.

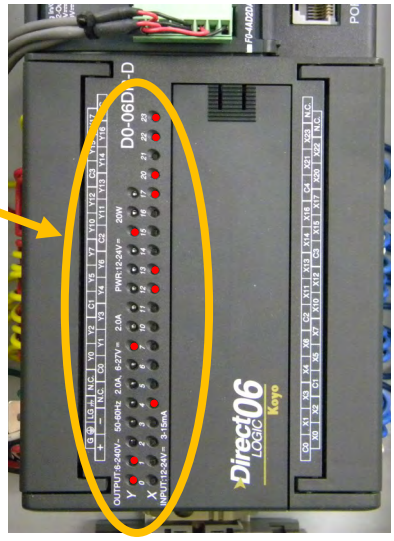
This is usually a sensor alignment problem.
Re-calibrate operator. While in calibration mode observe **X0, X1, X2,** & **X3** on the PLC. If these lights do not flash in a **sequential pattern** or one or more drop out or stay on, the proximity sensors need to be readjusted.



The PLC uses red LEDs to indicate an active signal. This can be helpful troubleshooting loop detectors, edge switches, etc. RED = ON

Y0, Y1, Y7, Y15

X4, X12, X13, X17, X20, X22, X23 } normally ON



PLC LED Indications

Y0	Contactor Control	normally ON
Y1	Inverter Enable	normally ON
Y4	Solenoid Lock Retract	On during operation
Y5	Open Status	On when open
Y6	Close Status	On when closed
Y7	Fault Status	Off indicates a fault*
Y15	Entrapment Control	Used for UL325 test
Y17	Prestart Warning	On at prestart

*When first applying power to the operator or after a power disruption the FAULT STATUS LED Y7 will not be illuminated until the operator has completed the Learn mode.

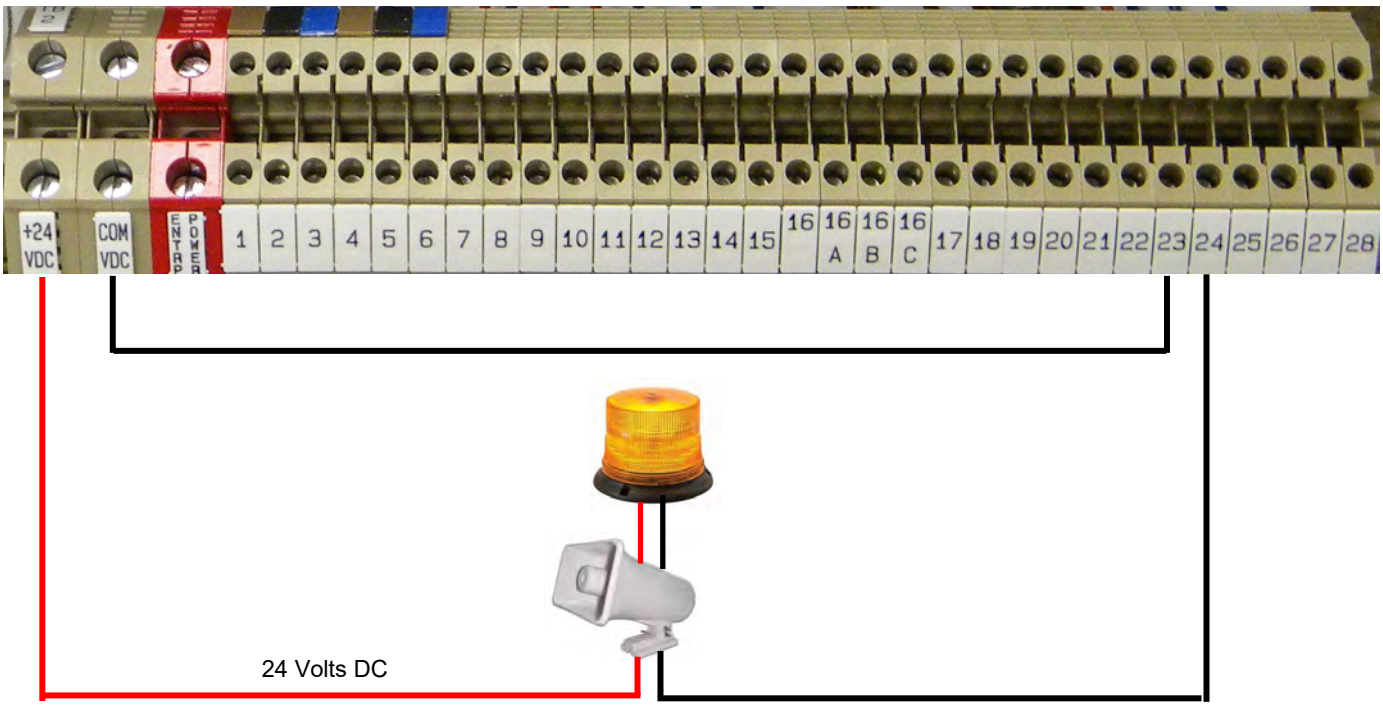
X0	Proximity Switch A	LEDs will turn off and on depending upon the position of the gate.
X1	Proximity Switch B	
X2	Proximity Switch A	
X3	Proximity Switch B	
X4	Inverter Drive Healthy	normally ON
X6	OPERATE	momentarily ON when activated
X7	FREE EXIT LOOP	On while exit loop activated
X10	SAFETY LOOP	On while safety loop activated
X11	SHADOW LOOP	On while shadow loop activated
X12	Motor Thermal Switch	normally ON
X13	STOP Push Button	momentarily OFF when activated
X14	OPEN Push Button	momentarily ON when activated
X15	CLOSE Push Button	momentarily ON when activated
X17	Non UL Photo Beam N/C	momentarily OFF when activated
X20	UL Photo Beam N/C	momentarily OFF when activated
X21	FAULT RESET	momentarily ON when activated
X22	UL Edge Switch N/C	momentarily OFF when activated
X23	Power Good	normally ON

If further troubleshooting is required contact Vmag Customer Service @ 210 495-3000

SIREN CONNECTION

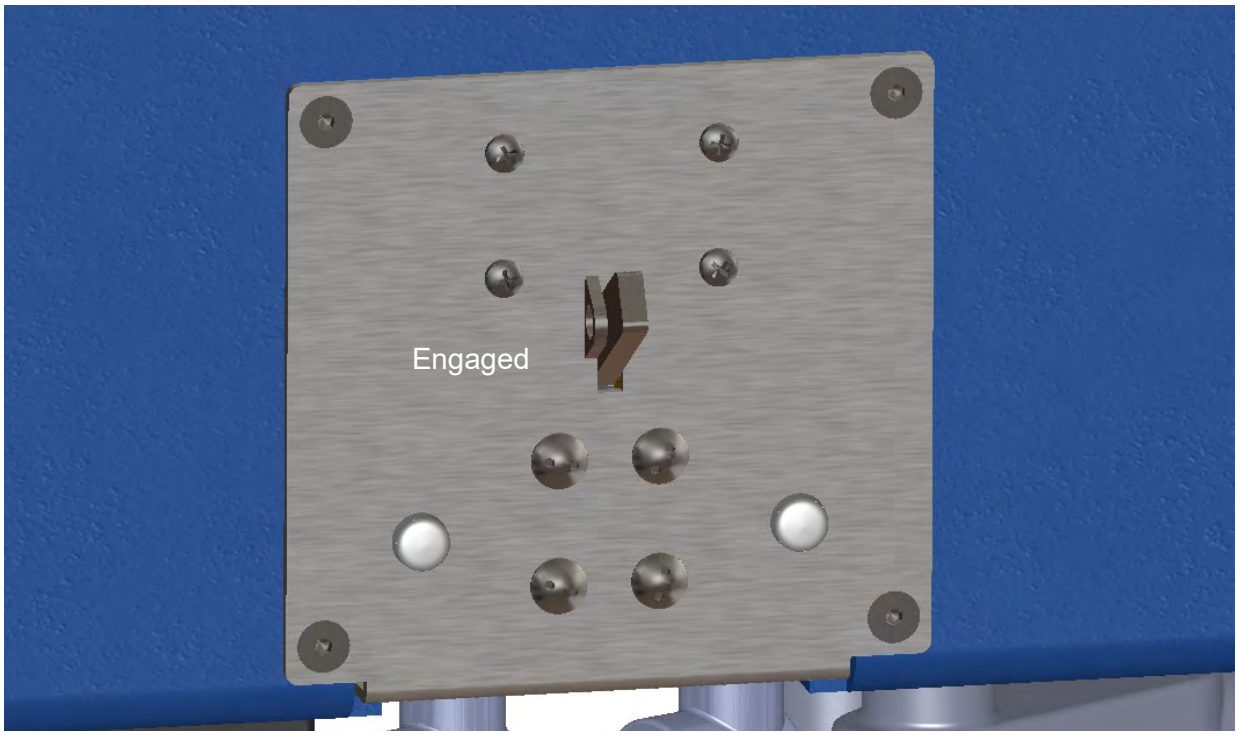
The SIREN OUTPUT / LED Strobe consists of a normally open dry relay contact. The 24 VDC auxiliary power source may be used.

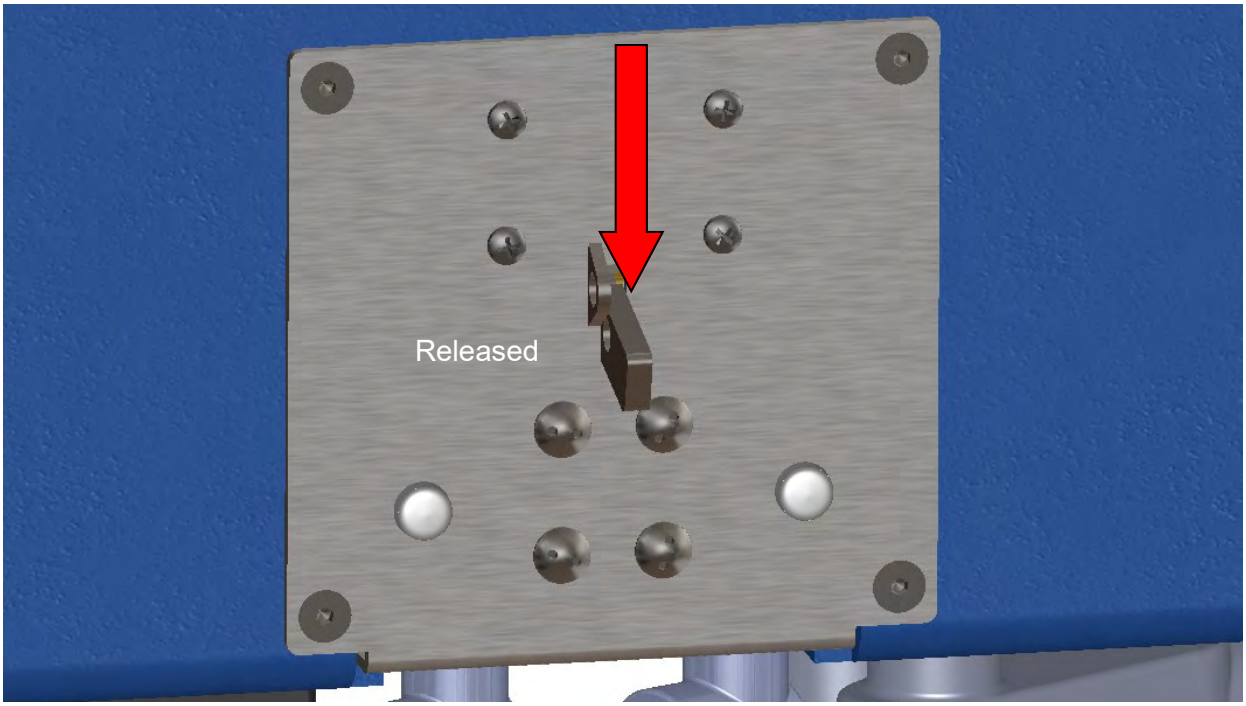
This output is fused limiting the current to under 2 amps. If 2 amps or more is required to power auxiliary devices a supplement power supply will be required.



MANUAL RELEASE OPERATION

To manually operate gate, turn power off to the operator, unlock the quick release *(if locked)* and hold down while manually pulling gate open.





Maintenance Schedule for Vmag Gate Operators

Maintenance is primarily checking gate and operator hardware for integrity.

6 month check (first check should be performed within first three months of operation).

Gate

⇒ Inspect and manually roll gate to verify unrestricted and smooth travel.

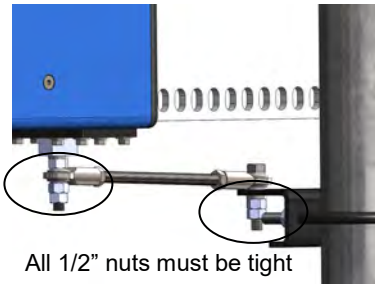
⇒ Inspect gate rollers (overhead trucks, cantilever rollers or V track hardware) for abnormal wear.

Vmag Operator

⇒ Check the fault code table page in the programmer for fault patterns that should be addressed.

⇒ Verify that the "JITTER" (diagnostics) is 500 +/- 2.

⇒ Check linkage assembly & post bracket hardware to ensure proper alignment & rigidity.

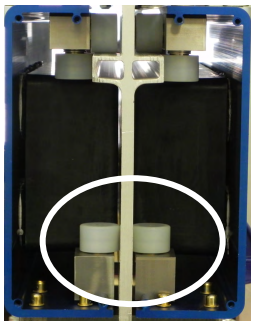


All 1/2" nuts must be tight

⇒ Remove motor assembly end caps to inspect cam rollers for excessive wear & proper reaction fin contact.

⇒ Check that the **bottom** 4 cam rollers contact the sides of the reaction fin. Cam rollers should touch the fin but not too difficult to turn by hand.

⇒ If adjustment is required, refer to page 19 for the proper adjustment procedure and recheck proximity sensor gap.



⇒ Test all vehicular and safety devices for proper operation. All safety devices should conform to UL325.

⇒ Inspect reaction fin holes and file down flush any protrusions found.

⇒ Visually inspect reaction fin assembly screws for integrity. Re-apply thread locker e.g. "Loctite" to any reaction fin screws that may have come loose.

⇒ Check & tighten reaction fin hanger bracket bolts.

⇒ Ensure that the green light is illuminated on the surge filter. If not, unit needs to be replaced.

⇒ Check Lock Assembly for freedom of operation. Lock plunger should fall freely when solenoid is de-energized. Lock assembly parts may be cleaned using electrical contact cleaner or brake cleaner that will dry without collecting dust and dirt. Do not use WD40 or any other type of lubrication.

⇒ "Keep Alive Option" batteries should be replaced once every two years.

⇒ Replace PLC clock battery every 5 years.

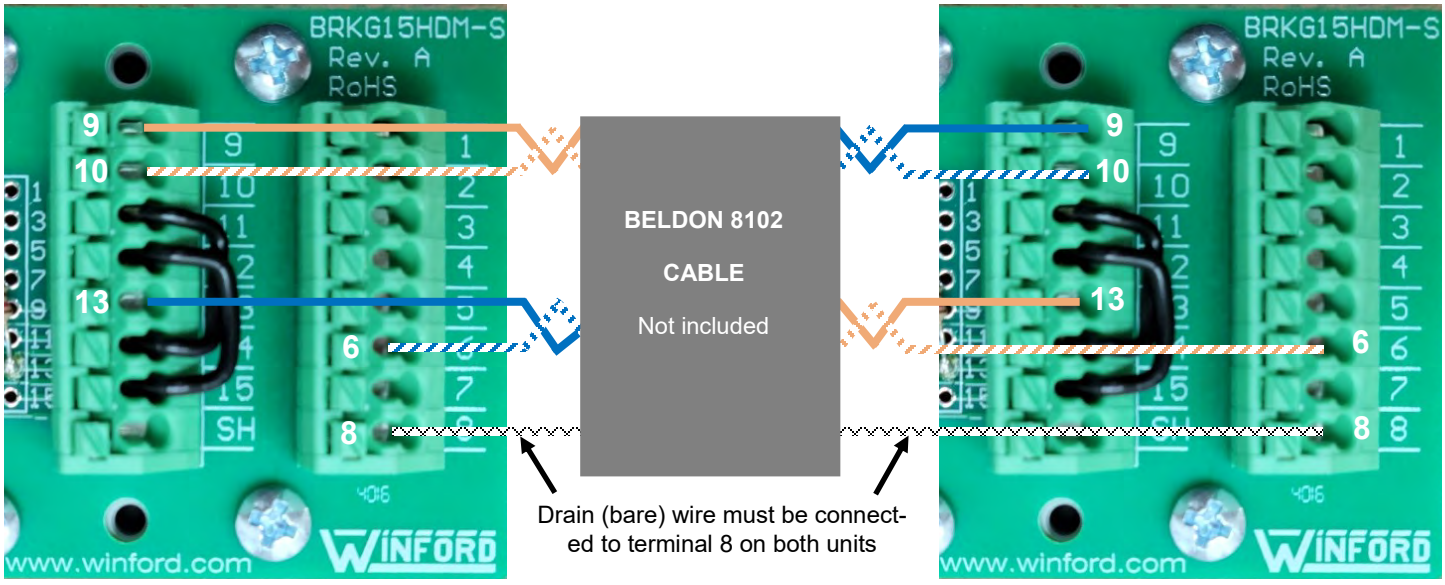
V DUAL

The Dual Kit consists of (2) interface modules and (2) internal cables.

Both gates are connected together using **Beldon 8102 or equivalent to be supplied by the installer**.

The cable should be run in buried conduit from controller to controller. This cable is a low capacitance communications cable and should only be substituted *(if necessary)* with cable that has equivalent capacitance specifications.

PRIMARY Interface Module	SECONDARY Interface Module
9 ORANGE	6 ORANGE/WHITE
10 ORANGE/WHITE	13 ORANGE
8 SHIELD WIRE	8 SHIELD WIRE
13 BLUE	10 BLUE/WHITE
6 BLUE/WHITE	9 BLUE



Note: ORANGE & ORANGE /WHITE and BLUE & BLUE/WHITE must be a twisted pair. If in doubt ohm out pairs or use a tone sniffer.

Connect the included data cable from the PLC to the interface module on both operators.

Using the programmer go to SYSTEM

Set the master side to **DUAL/MASTER** & the slave side to **DUAL/SLAVE** with the programmer

- **The AUTO CLOSE timer must be ENABLED on both gates. The MASTER (primary) determines the close time.**
- **Use FREE EXIT TB2 –9 & -10 to test dual operation.**
- **The programmer will operate only the gate it is connected to.**

A latch time of 1 second minimum is required to active

SPECIFICATIONS

Operator

UL Listings: **VM 1420 & VM 1220** UL325, UL991 and CAN/CSA C22.2#247

Required Electrical Supply

Volts: **VM 1220** 208-240 VAC 50/60 Hz, 1* or 3 phase, minimum 20 amps ** If used in conjunction with V UPS, minimum 30 Amp service required. See V UPS specifications*

VM 1420 440-480 VAC 50/60 Hz, 3 phase, minimum 30 amps *(single phase not recommended)*

Controller Enclosure

Listings: UL 508 Types 3R, 4, and 12

CSA Type 3R, 4, and 12

Complies with: NEMA Type 3R, IEC 60529, IP66

Dimensions: 30" W x 24" H x 12" D

Material: 14 gauge steel, ANSI-61 gray powder coat inside and outside

(Optional 316 marine grade stainless steel)

Reaction Fins

Material: 6061-T6 Aluminum

Weight.: 37.55 lbs. ea. *(approx. 5.3 lbs. per foot)*

Length: 6.83 ft. *(82")* Overall

Height: 9.78"

Motor Housings / Assembly

Material: 6061-T6 Aluminum

Weight: Motor assembly 130 lbs.

Length: 37"

Height: 10"

Width: 7-$^1/_2$"

Finish: Blue Anodize - MIL-A-8625, Type II / III, Class 2

Motors

Type: Linear Induction with internal thermal protection

Winding Insulation: Class H 180^{0}C *(355^{0}F)*

Class F 155^{0}C *(310^{0}F)*

LIMITED FIVE-YEAR WARRANTY

Vmag gate operators are warranted against defects for a period of 60 months from the date of purchase, providing installation procedures as per this manual are followed. This warranty is in lieu of all other warranties expressed or implied (some states do not allow limitations on how long an implied warranty lasts, so this limitation may not apply to you) and shall be considered void if damage was due to improper installation or use, improper or lack of grounding, connection to improper power source, or if damage was caused by fire, flood, or lightning. The manufacturer will not be responsible for any labor charges incurred in the removal or replacement of defective parts.

In case of failure due to defective material or workmanship during the warranty period, the defective part will be repaired or replaced at the manufacturer's option at no charge if returned freight prepaid. New or factory rebuilt replacements may be used. Replacement parts are warranted for the remaining portion of the original warranty period.

Lighting or electrical power surges may cause damage beyond repair and are not covered in this warranty.

Following pages must be removed and given to end user

IMPORTANT SAFETY INSTRUCTIONS

WARNING - To reduce the risk of severe injury or death:

1. READ AND FOLLOW ALL INSTRUCTIONS.
2. Never let children operate or play with gate controls. Keep any remote control away from children.
3. Always keep people and objects away from gate.

   NO ONE SHOULD CROSS THE PATH OF A MOVING GATE.
4. Test the gate operator monthly. The gate MUST reverse on contact with a rigid object or stop when an object activates the non-contact sensors. After adjusting the force or the limit of travel, retest the gate operator. Failure to adjust and retest the gate operator properly can increase the risk of injury or death.

1. Use the manual release only when the gate is not moving.
2. KEEP GATES PROPERLY MAINTAINED. Read the owner's manual. Have a qualified service person make repairs to gate hardware.

7. The entrance is for vehicles only. Pedestrians must use a separate entrance.

8. SAVE THESE INSTRUCTIONS.

Installer to tear out this page and give to the customer.

CONSIGNES DE SÉCURITÉ IMPORTANTES

AVERTISSEMENT - Pour réduire le risque de blessure ou de mort:

1. **LIRE ET SUIVRE TOUTES LES INSTRUCTIONS.**

2. **Ne laissez jamais les enfants utiliser ou jouer avec les commandes de porte. Gardez une télécommande hors de portée des enfants.**

3. **Toujours maintenir les personnes et les objets loin de la porte. PERSONNE NE DOIT TRA VERSER LE PAR COURS D'UN PORTE EN MOUVEMENT.**

4. **Testez l'opérateur de porte mensuel. La porte DOIT remonter au contact d'un objet rigide ou arrêt quand un objet active les capteurs sans contact. Après réglage de la force ou de la limite de Voyage, retester l'opérateur de porte. Un mauvais réglage et retester l'opé rateur de porte correctement peut augmenter le risque de blessure ou de mort.**

5. **Utilisez le déverrouillage d'urgence lorsque la porte ne se déplace pas.**

6. **GARDER GATES BIEN ENTRETENU. Lire le propriétaire de manuel.**
   Demandez à un technicien qualifié d'effectuer les réparations à porte matériel.

7. **L'entrée est seulement pour les véhicules. Les piétons doivent utiliser un entrée séparée.**

8 CONSERVER CES INSTRUCTIONS.

Installer pour arracher cette page et de donner au client.