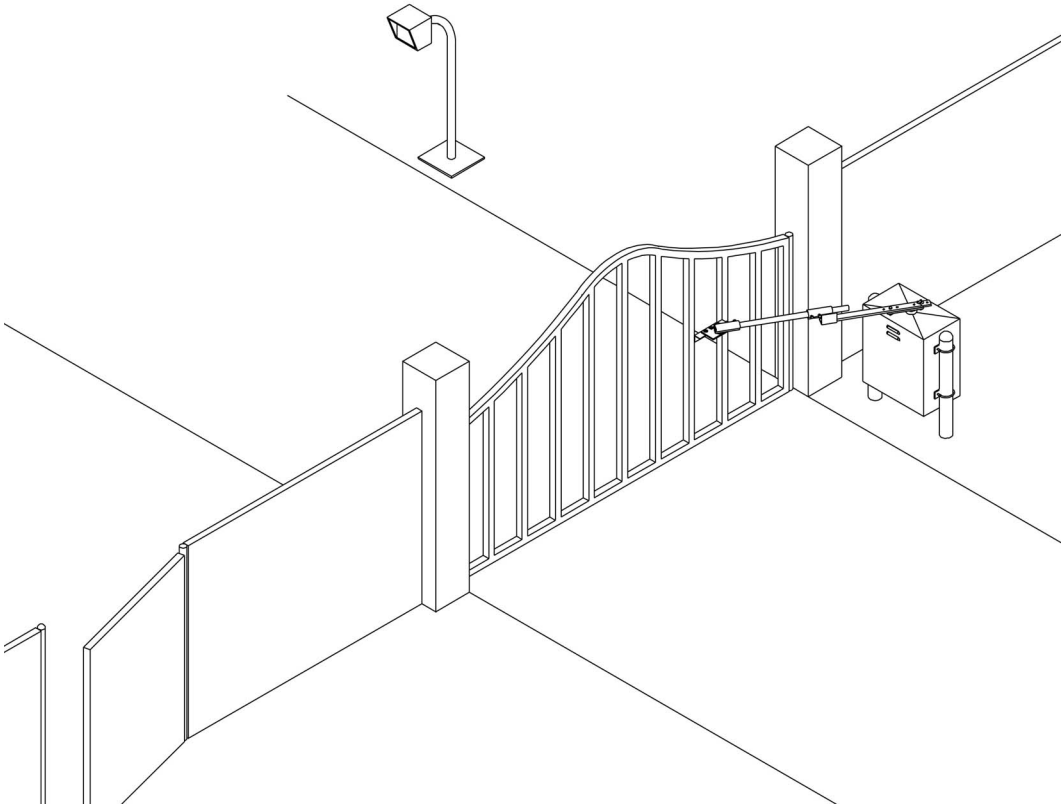
CRS • CRS-D

INSTALLATION GUIDE



OSCO®

OPERATOR SPECIALTY COMPANY, INC.

CASNOVIA, MI 49318 • U.S.A.

UL325 COMPLIANCE REQUIRES THE USE OF CONTACT EDGES OR PHOTOELECTRIC CONTROLS ON ALL AUTOMATIC OR REMOTELY-CONTROLLED GATE OPERATORS.

Aug. 2003, Rev. 15

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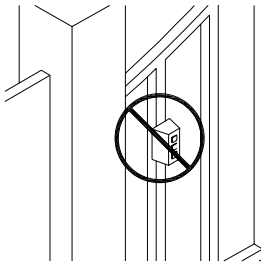
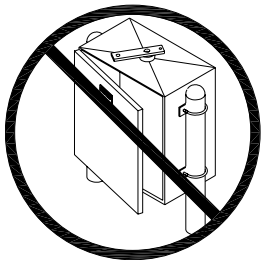
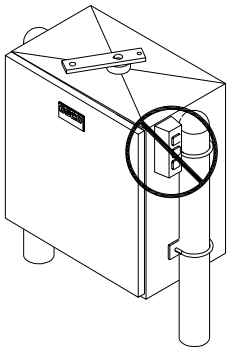


CAUTION!
DO NOT INSTALL CONTROLS ON OR NEAR THE GATE



CAUTION!
ONLY QUALIFIED SERVICE TECHNICIANS SHOULD WORK ON AN OSCO SWING GATE OPERATOR



CAUTION!
DO NOT INSTALL CONTROLS ON THE OPERATOR

GATE OPERATOR CLASSIFICATIONS

All gate operators can be divided into one of four different classifications, depending on their design and usage.

Class I Residential Vehicular Gate Operator
A vehicular gate operator intended for use in a home of one to four single family dwellings, or garage or parking area associated with these dwellings.

Class II Commercial / General Access Vehicular Gate Operator
A vehicular gate operator intended for use in a commercial location or building such as a multifamily housing unit of five or more single family units, hotel, retail store or other building servicing the general public.

Class III Industrial / Limited Access Vehicular Gate Operator
A vehicular gate operator intended for use in an industrial location or building such as a factory or loading dock area or other location not intended to service the general public.

Class IV Restricted Access Vehicular Gate Operator
A vehicular gate operator intended for use in a guarded industrial location or building such as an airport security area or other restricted access locations not servicing the general public, in which unauthorized access is prevented via supervision by security personnel.

IMPORTANT!!

Before installing the gate operator, make sure the gate's swing is free and level throughout the entire swing path. If the gate does not seem to operate properly, it may affect the operator performance or greatly shorten the life of the unit. The gate should be designed so that airflow is ample to prevent wind resistance and drag.

LIMITED TWO-YEAR WARRANTY

This electric operator is warranted for a period of two (2) years from date of sale against defects in materials or workmanship. Defective part(s) shall be repaired or replaced at no charge, at the manufacturer's option. All accessories are covered by their manufacturer's warranty.

The manufacturer will not be responsible for transportation and/or field service charges.

The above warranty is in lieu of all other warranties, expressed or implied, and shall be considered void if visible evidence implies recommended installation procedures and maintenance instructions were not followed, or if the electric operator was not sized appropriately for the particular installation.

SAFETY INFORMATION AND WARNINGS

Read the following before beginning to install OSCO swing gate operators:

1. Read the orange "Safety Instructions" brochure enclosed with the packet of information. If you do not have one, please call OSCO at 1-800-333-1717 to request one. Read and follow all instructions.
2. All electrical connections to the power supply must be made by a licensed electrician and must observe all national and local electrical codes.
3. A separate power-disconnect switch should be located near the operator so that primary power can be turned off when necessary.
4. Install the enclosed warning signs on both sides of the gate. Each sign must be plainly visible from the side of the gate on which they are mounted.
5. Never reach between, through or around the fence to operate the gate.
6. You must install all required safety equipment.

PRE-INSTALLATION INFORMATION

Before unpacking, inspect the carton for exterior damage. If you find damage, advise the delivery carrier of a potential claim. Inspect your package carefully. You can check your accessory box parts with the enclosed packing slip for your convenience. Claims for shortages will be honored for only 30 days from the date of shipment.

Before installing the operator, read this manual completely to ensure all requirements for proper installation are present. Verify that the voltage to be used matches the voltage of the operator.

The following contact or non-contact obstruction detection devices have been approved for use with OSCO swing gate operators as part of a UL325 compliant installation:

2510-264	EMX Model IRB-325 photoeye 60' with mounting hardware
2520-031	MMTC Model E3K photoeye, 28' with mounting hardware

WIRING SPECIFICATIONS

1. Select from the chart at the bottom of this page corresponding to the model, voltage and horsepower rating of your operator.
2. The distance shown on the chart is measured in feet from the operator to the power source. **DO NOT EXCEED THE MAXIMUM DISTANCE**. These calculations have been based on standard 115V and 230V supplies with a 10% drop allowable. If your supply is under the standard rating, the runs listed may be longer than what your application will handle, and you should not run wire too near the upper end of the chart for the gauge of wire you are using.
3. When large-gauge wire is used, a separate junction box (not supplied) may be needed for the operator power connection.
4. All control devices are now 24VDC, which can be run considerable distances.
5. Wire run calculations are based on the National Electrical Code, Article 430 and have been carefully determined based on motor inrush, brake solenoids, and operator requirements.
6. Connect power in accordance with local codes. **The green ground wire must be properly connected.**
7. Wire insulation must be suitable to the application.
8. Control wiring must be run in a separate conduit from power wiring. Running them together may cause interference and faulty signals in some accessories.
9. Electrical outlets are supplied in all 115VAC models for convenience with occasional use or low power consumption devices only. If you choose to run dedicated equipment from these devices, it will decrease the distance for maximum run and the charts will no longer be accurate.
10. A three-wire shielded conductor cable is required to connect master and slave operators. You must use Belden 8760 Twisted Pair Shielded Cable (or equivalent) **only** – OSCO part number 2500-1982, per foot). See page **10** for details of this connection, as well as dip switch selection. **Note: The SHIELD wire should be connected in both the master and slave operators.**

USE COPPER WIRE ONLY!

MODEL CRS

Power Wiring			
Volts & HP	**Max Distance Single**	**Dual**	**Wire Gauge**
115V	316	158	12
	502	251	10
	800	400	8
1/2	1272	636	6
HP	2022	1011	4
Volts & HP	**Max Distance Single**	**Dual**	**Wire Gauge**
230V	764	382	12
	1218	609	10
	1936	968	8
1/2	3076	1538	6
HP	4896	2448	4

MODEL CRS ACCESSORY WIRING

All Models		
Volts	**Maximum Distance (ft.)**	**Wire Gauge**
24VAC	250	14
	350*	12
24VDC	0-2000	14
*Over 350 ft. use DC power.		

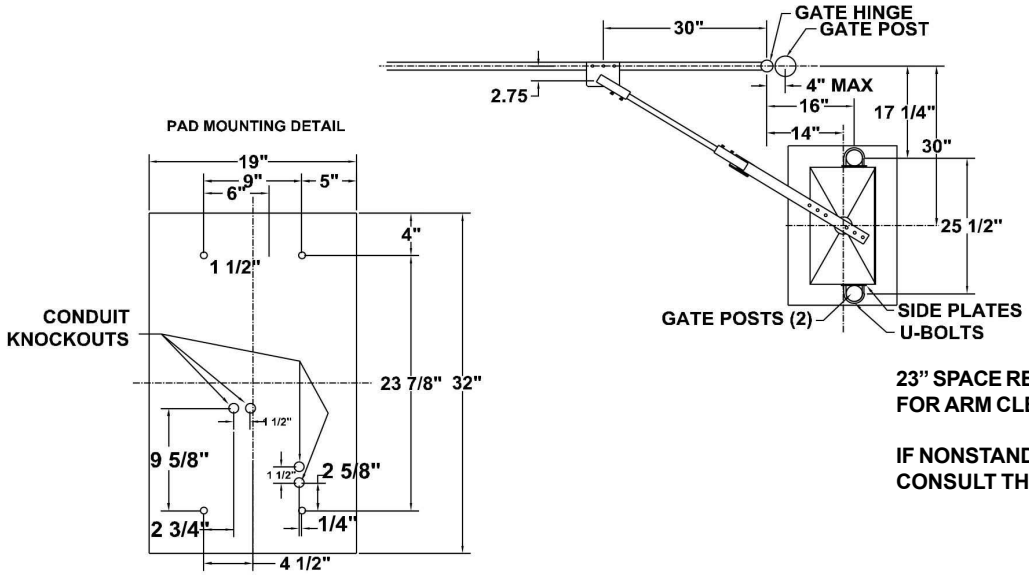
MODEL CRS-D

Power Wiring			
Volts & HP	**Max Distance Single**	**Dual**	**Wire Gauge**
115V	970	485	12
	1542	771	10
	2452	1226	8
1/2	3898	1949	6
HP	6200	3100	4

MODEL CRS-D ACCESSORY WIRING

All DC Models		
Volts	**Maximum Distance (ft.)**	**Wire Gauge**
24VDC	0-2000	14
*Over 350 ft. use DC power.		

POST AND PAD MOUNTING INSTRUCTIONS

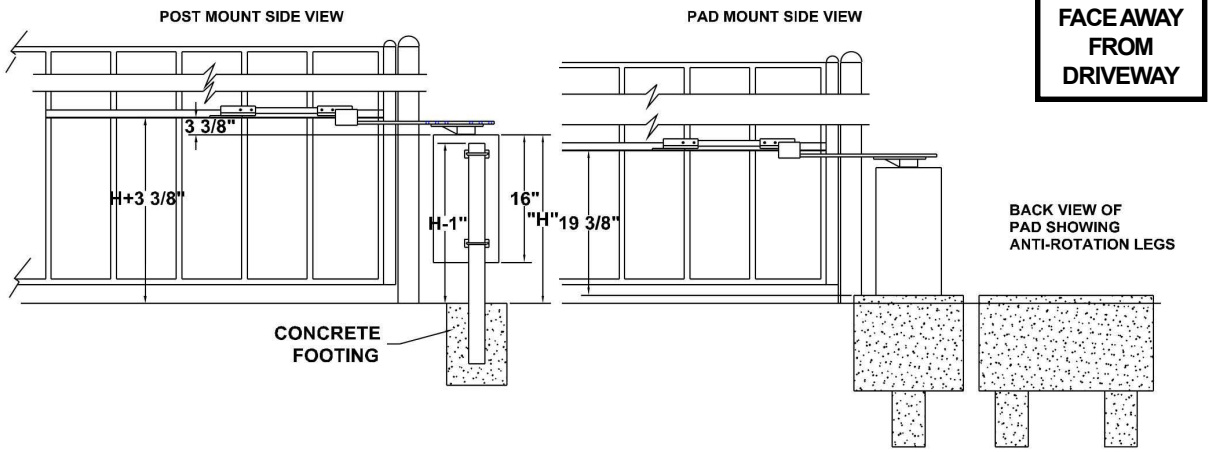


NOTE: Maximum gate opening angle is approximately 95 degrees, depending on gate width. If larger opening angle is required, non-standard positioning of the operator and modified articulating arms will be required. Contact the factory for pricing and availability.

23" SPACE REQUIRED BEHIND OPERATOR FOR ARM CLEARANCE WHILE OPENING

IF NONSTANDARD MOUNTING IS NECESSARY, CONSULT THE FACTORY

DOOR MUST FACE AWAY FROM DRIVEWAY



POST MOUNTING INSTRUCTIONS

Use two 3 - 3 1/2" diameter galvanized posts and secure with concrete footings as shown, length to be determined by local codes, frost line depth, and soil conditions.

Attach the operator with the U-bolts, side plates and hardware provided. There are eight side plates; four go on the outside of the operator, and the remaining four go on the inside. The operator should be positioned at a level to allow the arm to be installed at mid-height on the gate. Make sure the posts do not protrude above the operator cabinet.

Assemble the arm components as shown on page **7**.

A SEPARATE PEDESTRIAN GATE IS REQUIRED FOR ALL PEDESTRIAN TRAFFIC. THIS GATE MUST BE A MINIMUM DISTANCE OF 7 FEET FROM THE VEHICULAR GATE AND GATE OPERATOR

PAD MOUNTING INSTRUCTIONS

Recommended pad size is 32"x19"x18" deep minimum. Pad depth should be set according to local codes and at least as deep as frost line. If soil conditions may cause operator and pad to shift during operation, anti-rotation legs may be required. Use two 6" diameter, 10" deep legs to counteract this problem as shown. 5/8" J-bolts may be set into the concrete before it sets following the dimensions shown, or drilled after the concrete sets.

Attach pad mounting brackets to the operator with 3/8" hardware provided. Use 5/8" hardware to mount the operator to the pad.

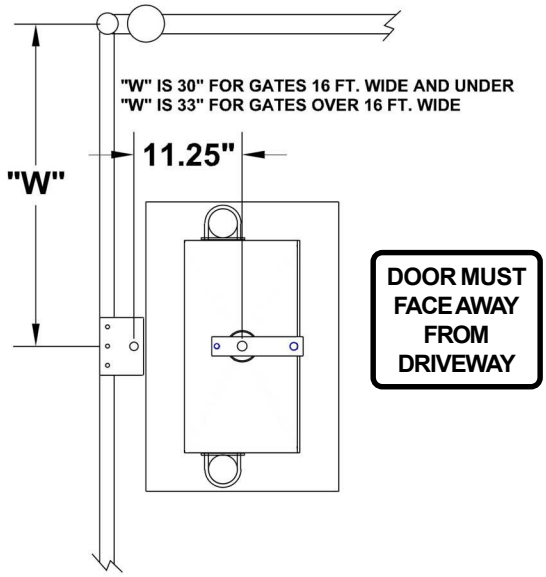
Dimensional data for conduit knockouts is also shown in the pad mount illustration. Use of flexible conduit will make it easier to line up with these knockouts.

Assemble the arm components as shown on page **7**.

STRING METHOD FOR NONSTANDARD INSTALLATION OF SWING GATE OPERATORS

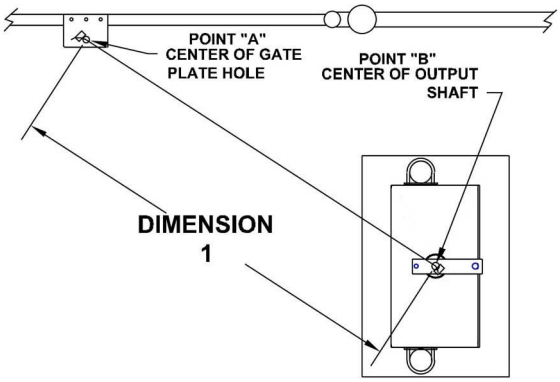
Step A: Position the Operator

1. Connect the gate plate assembly onto the gate at the recommended location for a standard installation (Dimension **"W"**).
2. Open the gate to its fully-open position.
3. Position the operator parallel to the gate. The distance from the operator output shaft to the gate plate pivot point is shown at right. The operator should be positioned the same distance from the gate hinge as the gate plate has been; ie: the **"W"** dimension.



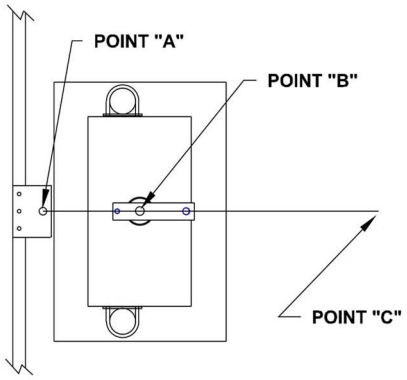
Step B: Measure the Crank Extension and Link Center to Center Distances

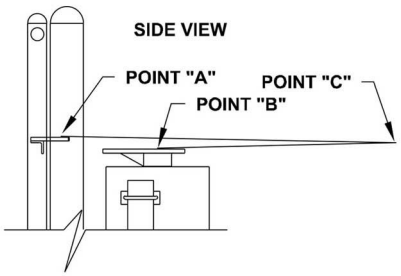
1. Close the gate.
2. Using a piece of tape, attach a string to the top of the operator output shaft, at its center. Holding the string taut and using another piece of tape, hold the other end of the string across the hole in the gate plate. This distance is Dimension **1**. Carefully measure this dimension and write it down.
3. Open the gate.
4. Pick up the string, while it is still attached at both ends, and pull it taut again while positioning it directly over the center of the operator shaft, at Point **"B**,**"** and work your way back along the string until you reach Point **"C**.**"**
5. While holding the string taut, measure the distance from Point **"B"** to Point **"C**.**"** This is the required center to center distance for the crank extension.
6. Measure the distance from Point **"A"** to Point **"C**.**"** This is the required center to center distance for the link section.
7. When added together, the distances from Point **"A"** to Point **"B"** and Point **"B"** to Point **"C"** should equal the Dimension **1** measurement.



These measurements will be needed when placing an order for special length crank extensions and links. Also note that the measurements you have just calculated are center to center only, and are not overall dimensions, which would also include other attachment hardware, such as gate arm clamps.

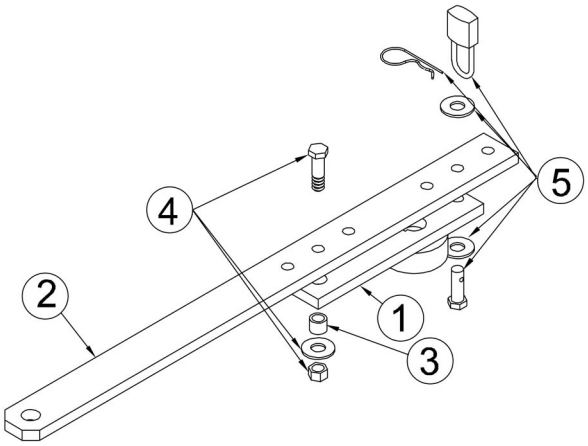
It is also possible that both open and closed limit switches may be activated at either end of gate travel due to the total gate travel required, and the shape of the limit switches and cams. This problem can be corrected by carefully bending the limit switch arm slightly and readjusting its cam.



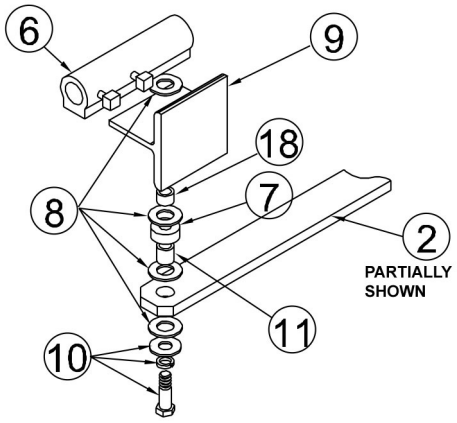


PLEASE NOTE: Your operator may look different when installed. The drawings on this page are for general reference only.

ARTICULATING-STYLE ARM ASSEMBLY INSTRUCTIONS

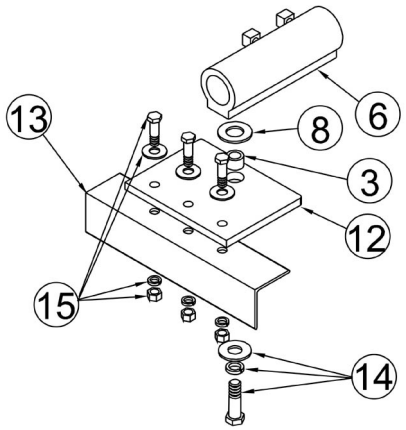


Numbered items in these drawings are for instructional reference only. For actual part numbers, go to the parts lists in the back of this booklet.

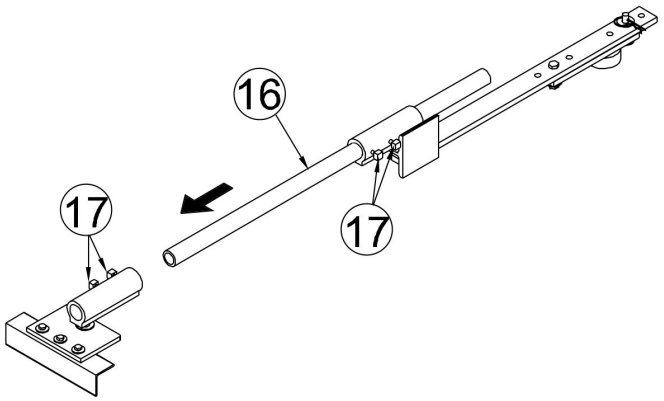


Place crank extension (2) on operator crank (1) as shown. Slide spacer (3) into crank and hold while sliding 1/2-13 x 1 3/4 hex head bolt (4) through extension and crank. Assemble with 1/2 flat washer and locknut and tighten. Slide clevis pin (5) and 1/2 flat washer through crank and extension. Slide 1/2 flat washer over end of pin and lock either disconnect pin or optional pad lock through pin.

Slide 1/2" lockwasher and flatwasher onto 1/2-13 x 2 1/2" hex head bolt. Add a nylon washer (8), then slide bolt through crank extension and hold in place. Next insert yellow-plated pivot spacer (11) into the crank extension, and rest offset spacer (7) on top of the washer. Slide the bolt, lockwasher and flat washer together (10) through this stackup of parts, adding another nylon washer (8) on top of the offset spacer, followed by the overtravel zinc-finish stop pivot spacer (18). Slide the overtravel stop (9) over its spacer, and add the last nylon washer above it. Carefully screw the bolt into the aluminum gate clamp (6) until the lockwasher has been fully compressed. The overtravel stop and crank extension should float freely when this is fully assembled, without binding.



Angle iron (not supplied) (13) should be welded to gate prior to this step. Attach gate plate (12) to angle iron using 3/8 bolts, flat washers, lock washers and hex nuts (not supplied) (15). Slide 1/2-13 x 1 1/4 bolt, 1/2 lock washer, 1/2 flat washer (14), and spacer (3) through gate plate. Place nylon washer (8) over opening in gate plate. Thread bolt into hole in gate clamp (6) and tighten carefully. **Do not overtighten!**

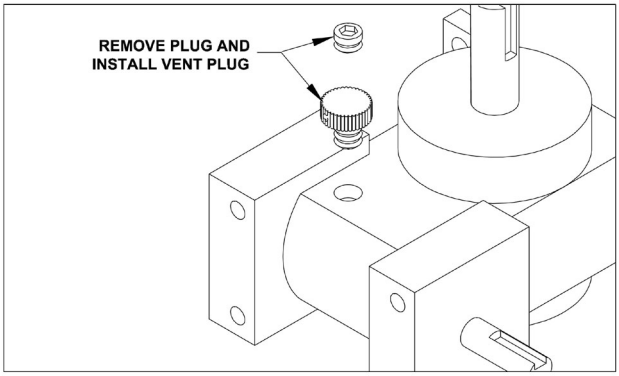


Slide pipe link (16) through arm assembly as shown. Place 5/16 square bolts in gate clamps (17) and tighten carefully. **Do not overtighten!**

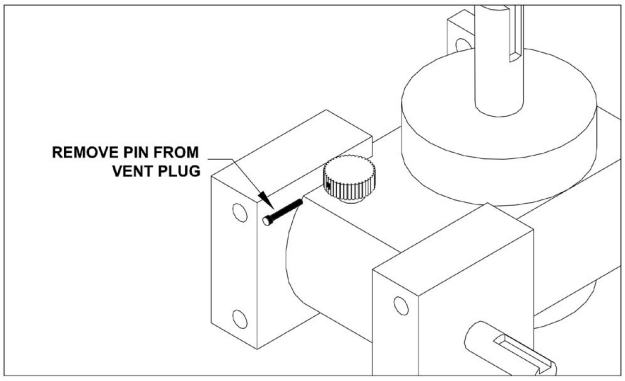
NOTE: Illustrations shown on this page are for right-hand application.
For left-hand, overtravel stop (9) should be on the opposite side from what is shown above.

VENT PLUG INSTALLATION

Gear reducers used in OSCO gate operators will have solid plugs installed prior to shipment in order to keep the oil inside from spilling out during shipping. A vent plug has been provided to replace this plug during installation. This plug will look similar to the ones shown below. Some models may have a vent plug with a breather pin. This pin should be removed after installing the operator.



OR



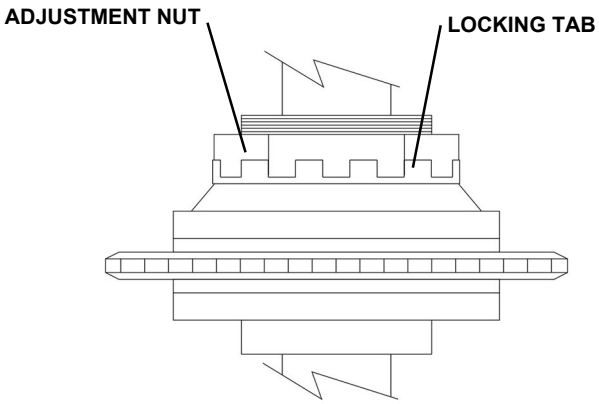
TORQUE LIMITER ADJUSTMENT

Before adjusting the torque limiter, make sure the gate is in good working condition. One person should be able to move the gate by hand. Be certain the gate moves freely and without binding throughout its travel. Torque limiters are set light at the factory. They must be adjusted during installation, preferably after limit cams have been manually set (see page **9**). Adjust the torque limiter tight enough to keep it from slipping during normal operation.

To adjust the torque limiter in models CRS and CRS-D:

1. Bend the locking tabs away from the adjustment nut.
2. *To increase the output*, turn the adustment nut clockwise one flat, or 1/6 turn, at a time until desired output is obtained.

   To reduce the output, turn the adjustment nut counterclockwise one flat, or 1/6 turn, at a time until desired output is obtained.
3. Bend the lockng tabs up to lock the adjustment nut in place.



MODEL CRS and CRS-D

ELECTRICAL CONNECTION AND ADJUSTMENTS

Power supply must be of correct voltage and phase.
Always disconnect power from operator before servicing.
Keep clear of gate during operation.

All OSCO gate operators are supplied with a power disconnect switch to turn on and off the power supply available to the operator. Incoming power should be brought into the operator and connected to the labeled pigtails in the disconnect box, following wiring specifications on page **4**. A wiring connections print can be found on the inside cover of the operator.

Proper thermal protection is supplied with the operator. The motor contains a thermal overload protector to protect from overheating the motor due to overload or high-frequency operation. This overload will reset automatically after the motor cools down.

LIMIT CAM ADJUSTMENTS

The limit cams are not preset at the factory and must be adjusted for the length and opening angle of the gate the operator is installed on. The limit switches are activated by a series of rotating limit cams which are attached to the drive shaft. The operator has also been preset in the right hand operation mode. If the installation requires left hand operation a dip switch must be flipped (see page **10**).

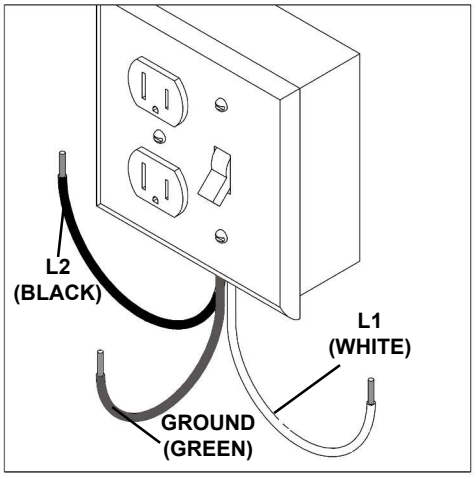
With the gate connected to the gate operator in a mid-travel position, the power disconnect switch turned **OFF**, and the torque limiter set loose enough to slip freely, manually move the gate to its fully open position.

Once the gate is in the fully open position, adjust the limit cam for open direction. Set the **LSO-1** limit cam so that it has just triggered its switch.

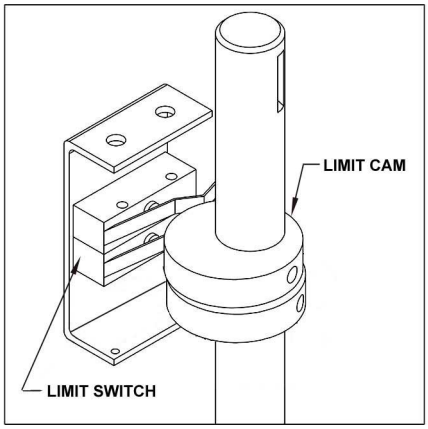
Once the open limit cam is set, repeat the above process for the close direction, **LSC-1**.

After finishing the initial limit cam adjustments, reposition the gate to approximately the center of travel. At this time, adjust the torque limiter as explained on page **8**. Turn the power disconnect switch **ON**, stand clear of any moving parts and press the **OPEN** button. Observe the gate as it runs through a complete cycle in both directions, and adjust your limits again if necessary.If the operator stops during travel, you may need to adjust the open or close current sensor adjustment or the maximum run timer (see page **12**).

POWER DISCONNECT BOX
(115VAC VERSION SHOWN)



LIMITS and CAMS
MODEL CRS and CRS-D

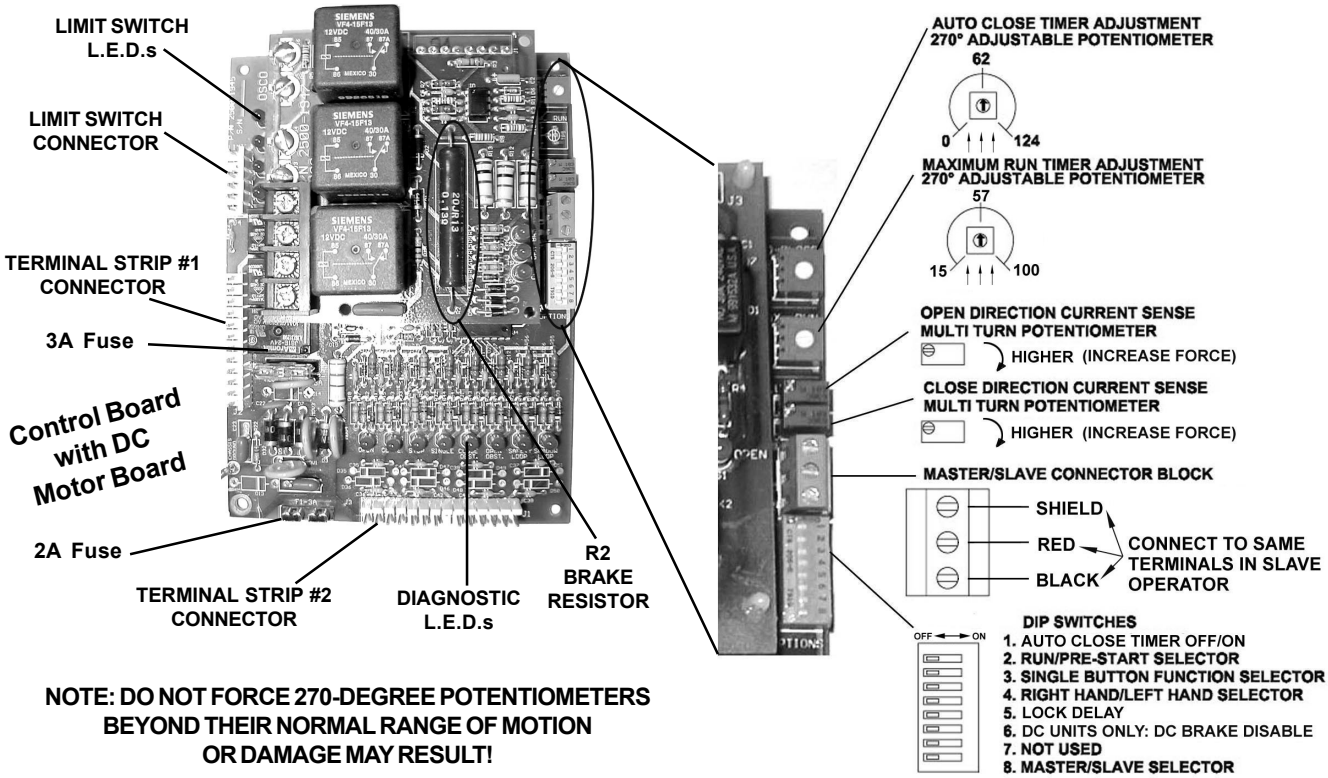


FROM TOP TO BOTTOM:

LEFT HAND	RIGHT HAND
LSC-1	LSO-1
LSO-1	LSC-1

WHENEVER HAND OF OPERATION CHANGES, BOTH LIMIT CAMS WILL NEED TO BE ADJUSTED.

CONTROL BOARD ADJUSTMENTS



NOTE: DO NOT FORCE 270-DEGREE POTENTIOMETERS BEYOND THEIR NORMAL RANGE OF MOTION OR DAMAGE MAY RESULT!

Auto Close Timer Adjustment: This 270-degree adjustable potentiometer will signal the operator to close automatically, provided no open, reversing or obstruction signals are present from the fully-open position. This timer is adjustable from 0 to 124 seconds. This feature is turned on or off using dip switch #1.

Maximum Run Timer Adjustment: This 270-degree adjustable potentiometer will signal the operator to stop running once it counts down, unless a limit switch is reached or an input is received first. Each time the motor starts, this timer will begin counting. This timer is adjustable from 15 to 100 seconds. If the timer expires, the unit locks out and the emergency alarm sounds.

Open Direction Current Sense Adjustment: This multiturn potentiometer is used to calibrate the built-in current sensing feature for detection of obstructions while running in the open direction.

Close Direction Current Sense Adjustment: This multiturn potentiometer is used to calibrate the built in current sensing feature for detection of obstructions while running in the closed direction.

Master/Slave Connection Block: This terminal block is used in conjunction with two operators to configure two gates to open and close together.

Dip Switches:

#1 This switch turns the auto close timer off/on.

#2 This switch is used in conjunction with alarms and flashing lights that may be added to the operator. When the switch is in the **ON** position, these devices will start approximately two seconds prior to the operator starting. In the **OFF** position, the devices will only work while the operator is running.

#3 This switch is used in conjunction with single-button controls and radio receivers. In the **ON** position, successive inputs will cause signals in the order of **OPEN-STOP-CLOSE-STOP**. In the **OFF** position, inputs will cause an **OPEN** signal unless the gate is fully open, in which case it will signal **CLOSE**.

#4 This switch determines right-hand vs. left-hand behavior. When looking from inside the protected area toward the gate, the side of the drive the operator is on determines its hand of operation. In the **OFF** position, the operator is set for right-hand.

#5 When turned **ON**, this switch will allow a one-second delay for solenoid locks to unlock before the motor starts.

#6 In the **ON** position, this switch will disable the inherent DC brake **in DC operators only**. In addition, the R2 brake resistor on the DC motor board must be cut from the board (refer to the picture above). In the **OFF** position, the DC brake will function.

#7 Not used at this time.

#8 This switch is used to set Master/Slave configuration. Operators which are stand-alone or master units should be set to **OFF**, while only slave units should have this switch set to **ON**.

TERMINAL CONNECTION DESCRIPTIONS

TERMINALS	FUNCTION	DESCRIPTION OF FUNCTION
24VAC 24VAC N	24VAC	Provides fused 24Volt AC power for accessories. **Note: DC models will NOT have 24Volt AC power available.**
24VDC+ 24VDC- COMM.	24VDC	Provides fused 24Volt DC power for accessories.
1 & 4	OPEN	Opens the operator. Several accessories such as button stations, keypads, transmitters and card readers can be wired to open.
3 & 4	CLOSE	Closes the operator. Use caution when wiring accessories to these terminals. **The gate must be clearly visible from the location of any accessories wired to close.**
4 & 5	SINGLE-BUTTON	Performs the single-button function which will alternate between open and close or open, stop and close - depending on dip switch #3. (See page **10** for details.)
2 & 4	STOP	Stops the operator. If no stop button is used, a jumper is required across **2&4**.
4 & 6	REVERSE	This function will cause a reversal when the gate is traveling closed and will travel back to the fully open position. Loop detectors are often wired for reverse.
4 & 50	OPEN OBSTRUCTION	This function works only while the operator is opening. Any signal to this function will cause the gate to stop, reverse a short distance, and then stop again. At this time the auto close timer is disabled, and a renewed input will be required to start the gate again. Should the gate be restarted and the signal occur again prior to reaching a limit, the gate will stop again, and this time will sound the emergency alarm and lock out.
4 & 51	CLOSE OBSTRUCTION	This function works exactly like the OPEN OBSTRUCTION, except that it will only work in the closing direction.
4 & 11	SHADOW/HOLD	This function will keep the gate in its fully open position while the signal is present. This is typically used with a loop and loop detector to keep a large swing gate open while vehicular traffic is passing through.
24VDC+ & 60	RUN/PRE-START	A 24Volt DC device such as a strobe light or alarm can be wired to these terminals. Depending on dip switch #2, these devices will either begin two seconds before the operator starts, or only while the motor is running. (See page **10** for details.)

You must follow all required safety precautions and instructions at all times. Review the safety brochure included with the operator. If any pages are missing or unreadable, contact OSCO at 1-800-333-1717 to request additional copies.

Never connect a button station within reach of the gate or on the side of the gate operator.

Do not adjust the circuit board current sensing feature too high. It should be adjusted high enough to keep the gate from falsely triggering the sensing, but no higher than necessary for the gate to operate. Do not defeat the purpose of this function!

CURRENT SENSING ADJUSTMENTS

Because gates vary in construction and may have different force requirements in the open and close directions to move, the OSCO control board has separate Multi-turn potentiometers for adjusting in both directions independently. The adjustment should be set light enough to maintain minimal force (40 lbs.) should an obstruction occur, but high enough to keep the gate moving under normal conditions without interruption.

Prior to adjusting the operator current sensing functions, make sure the gate moves freely in both directions. A badly aligned or poorly maintained gate may cause false triggering of the current sensor. Refer to page **10** when following the instructions below. A factory adjustment tool has been supplied to make these adjustments easier. This tool has been taped to the control box for your convenience.

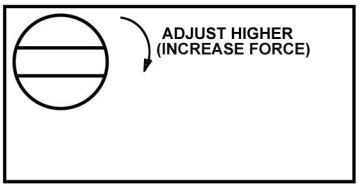
CLOSE DIRECTION CURRENT SENSE ADJUSTMENT

When the gate operator leaves the factory, it has been preset for a relatively light gate function and will require additional adjustment. Begin by starting the gate going closed. If the operator stops and reverses, turn the close direction potentiometer (see page **10**) one turn higher, press the **STOP** button, and try again. Repeat this process until the gate no longer causes false tripping of the current sensor. Note that each time the gate operator reverses, the **STOP** button must be pressed. Next, turn the close direction potentiometer lower slowly while the operator is running the gate closed until the gate operator stops and reverses again. From this point, turn the close direction potentiometer higher by 1 1/2 turns for all 115 Volt AC and 24 Volt DC operators, and by 3/4 of a turn higher for all 230 Volt AC operators.

OPEN DIRECTION CURRENT SENSE ADJUSTMENT

Repeat the same process with the open direction potentiometer while running the gate in the open direction. Once this is done, run the gate through several complete cycles and make sure the gate does not false trip in either direction.

Multi-turn Potentiometer



Remember it is important not to set the adjustment too high! Doing so will defeat the purpose of the current sensing as an obstruction detecting feature.

MAXIMUM RUN TIMER ADJUSTMENT

This adjustable potentiometer sets the maximum length of time the motor will run before shutting down. It should be configured for the time it takes to run the gate fully open or closed, plus an additional 15 seconds. See page **10** for details.

AUTO CLOSE TIMER ADJUSTMENT

This adjustable potentiometer sets the length of time which elapses before the gate operator automatically closes the gate, from the fully open position, provided no open, reversing, or obstruction signals are present. This feature can be turned on or off via dip switch selection. See page **10** for details. **Do not use the auto close timer without an appropriate reversing device installed!**

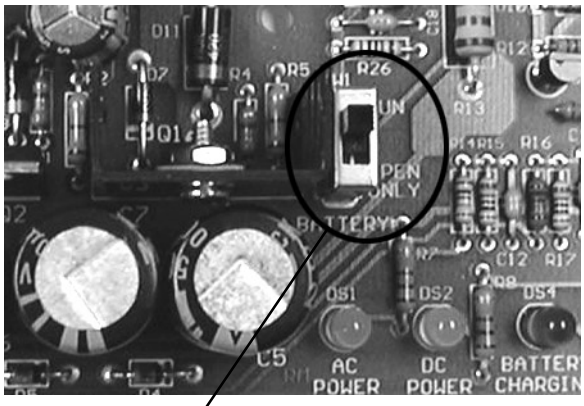
MASTER/SLAVE CONNECTION

A three-wire shielded conductor cable is required to connect master and slave operators. You must use Belden 8760 Twisted Pair Shielded Cable (or equivalent) **only** – OSCO part number 2500-1982, per foot). See page **10** for details of this connection, as well as dip switch selection. Note: The SHIELD wire should be connected in both the master and slave operators. **In addition, you must run power to both the master and slave operators.**

BATTERY BACK-UP FOR DC MODELS ONLY CHARGER BOARD CONFIGURATION

To set the voltage monitor, see the picture below. The **RUN position** will monitor the voltage of the battery only after AC voltage has been interrupted. It will allow the operator to continue to function until the batteries have dropped to 17 volts. When the batteries have reached 17 volts, the operator will open and shut down until AC power has been restored. In the **OPEN ONLY position** when AC power has been interrupted the operator will open and shut down until AC power is restored.

Note: If the charger board is set to open only, removing incoming power will cause the operator to run to full open position. Turn off power switch in operator before removing incoming power!



VOLTAGE MONITOR SHOWN ABOVE IN THE RUN POSITION

ONBOARD L.E.D. INDICATOR DESCRIPTIONS

Control Board L.E.D. Indicators:

OPEN This indicator is lit when an open signal is present. This signal can come from such devices as button stations, radio receivers, keypads and telephone entry systems.

CLOSE This indicator is lit when a closed signal is present. This signal typically comes from three-button stations.

STOP This indicator is lit when there is a break in the stop circuit. Make sure there is a stop button wired in and working properly.

SINGLE This indicator is lit when a signal from a single-button station or radio receiver is present.

CLOSE OBST This indicator is lit when a **close obstruction** signal is present. This signal can come from edges and photo eyes which have been wired to the close obstruction inputs.

OPEN OBST This indicator is lit when an **open obstruction** signal is present. This signal can come from edges and photo eyes which have been wired to the open obstruction inputs.

SAFETY LOOP This indicator is lit when a reversing signal is present. This signal is generated by a loop detector wired to the safety loop terminals.

SHADOW LOOP This indicator is lit when a shadow/hold open signal is present. This signal is generated by a loop detector wired to the shadow loop terminals.

LH	RH	
LSC-1	**LSO-1**	This indicator is lit when the open #1 limit switch is activated on a right-hand operator, or the close #1 switch on a left-hand. If this indicator is lit and the gate is not in its full open/closed position, the limit may need adjusting or the limit switch may need replacing.
LSC-2	**LSO-2**	This indicator is lit when the open #2 limit switch is activated on a right-hand operator, or the close #2 switch on a left-hand.
LSO-1	**LSC-1**	This indicator is lit when the close #1 limit switch is activated on a right-hand operator, or the open #1 on a left-hand. If this indicator is lit and the gate is not in its full open/closed position, the limit may need adjusting or the limit switch may need replacing.
LSO-2	**LSC-2**	This indicator is lit when the close #2 limit switch is activated on a right-hand operator, or the open #2 switch on a left-hand.

Motor Board L.E.D. Indicators:

NON LABELED One of these two indicators will be lit when the motor is running the gate open, and the other is lit when the motor is running the gate closed.

BRAKE REL. This indicator is lit when the brake is NOT applied.

DC Operators Only:

AC POWER Indicates AC power is supplying the unit.

DC POWER Indicates the operator is running on batteries.

BATTERY CHARGING Indicates batteries are being charged. Light goes out when batteries reach 90% of full charge.

OPEN GATE Operator is in open then lockout stage.

POWER LOCKOUT Flashes when controls/motor are in lockout mode.

IMPORTANT NOTES FOR INSTALLATION OF MASTER/SLAVE APPLICATIONS

When setting up Master/Slave gate operators, it is best to make adjustments and run each operator individually. To do this, simply:

a. Set Dip Switch #4 to proper hand of operation (right-hand or left-hand)
b. Set Dip Switch #8 as Master (off)

Run each operator making current sensing adjustments as necessary, as indicated on the Control Board Adjustments page of this installation guide. When both operators have been adjusted, turn power off, then turn on Dip Switch #8 in the operator chosen as the Slave.

The timer to close and radio/single button behavior are set in the Master operator.

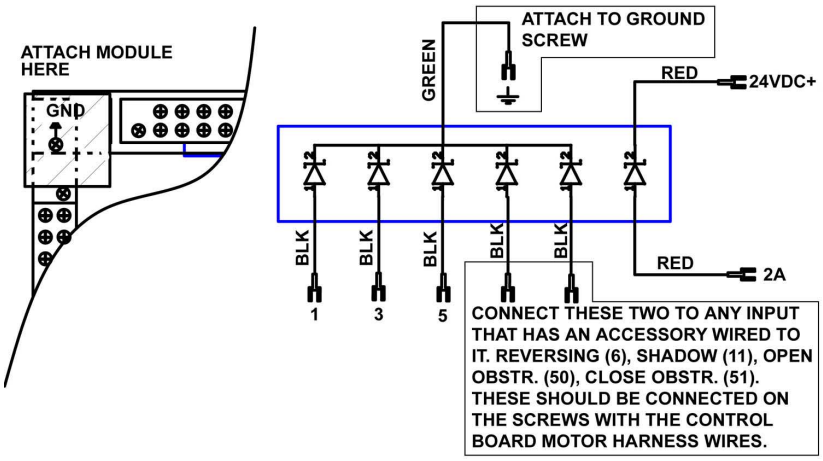
The following selections are set individually:

Current Sensing
Maximum Run Timer
One-Second Lock Release
Three-Second Pre-Start Warning
Right/Left-Hand Selections

SURGE PROTECTOR INSTRUCTIONS

The optional surge protector should be connected to any inputs that have an accessory connected to it. This includes the 3-button station, so it must be connected to 1, 2A and 3 in all cases. The green wire connected to ground, which is electrically the same as terminal 4. The red wires connect to terminals 2A and 24VDC+. This will cause the 2 amp fuse to blow if this section of the module becomes shorted. With any of the other inputs connected to the surge protector, if their protection line becomes shorted due to a surge over the rating of the module, the corresponding LED on the main board will remain lit, causing a constant signal to the controller. If this is found, please replace the entire surge protector with a new unit.

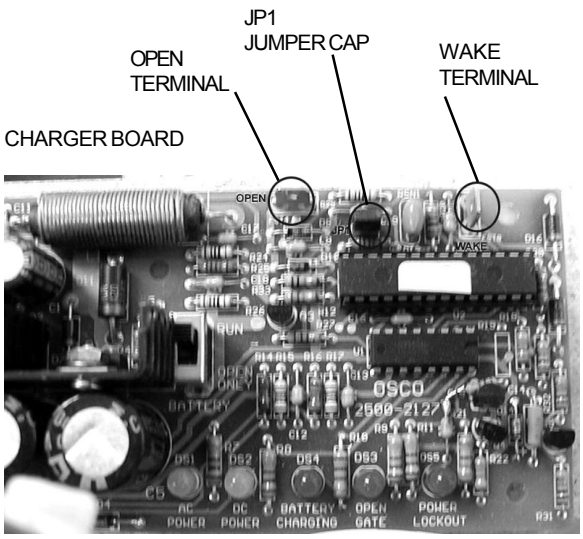
Do not simply unhook the shorted wire, as this removes the protection from the circuit that was saved by the protector in the first place!

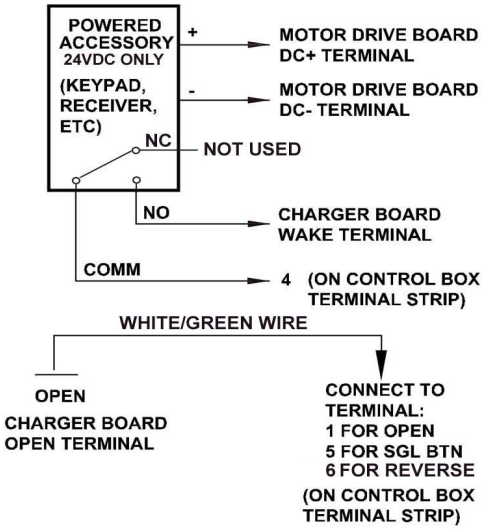


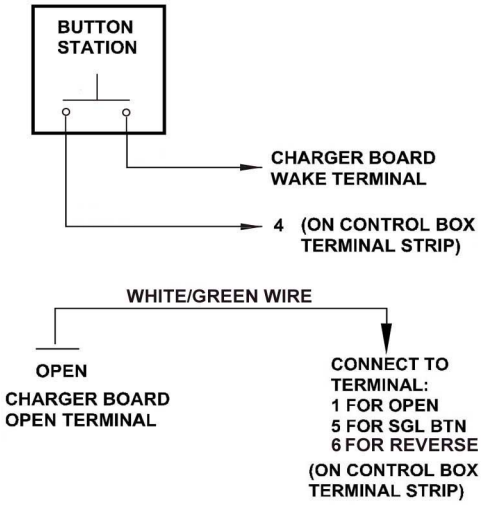
CHARGER BOARD SLEEP MODE

When primary AC power is not available, the operator will continue to operate in battery only mode if the charger board is set in its RUN mode (**see Battery Backup Charger Configuration**). Accessories wired into the operator will continue to draw power, even when the operator is not opening or closing the gate. This can dramatically reduce the amount of standby time available from the batteries.

To extend the available standby time, the charger board has a **"sleep" mode** feature which will turn off power to all controls except for any that are wired according to the schematics below. By removing the black jumper cap **JP1** located in the upper right hand corner of the charger board this feature can be enabled. After fifteen minutes of inactivity, all controls except those wired as shown below will turn off. Those wired as shown will continue to have power at all times and will upon activation generate first a "wake" signal that will power all controls back up, and then create either an open signal or single button signal, depending on how the wire jumper shown below is connected.

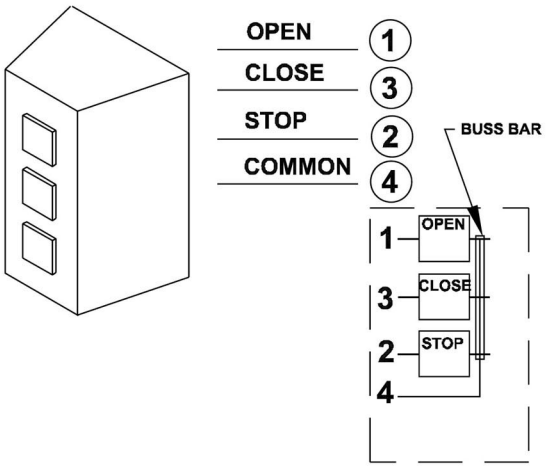




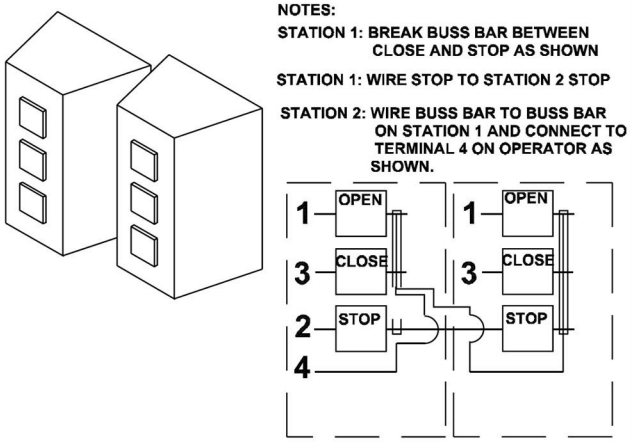


CONTROL and ACCESSORY CONNECTION ILLUSTRATIONS

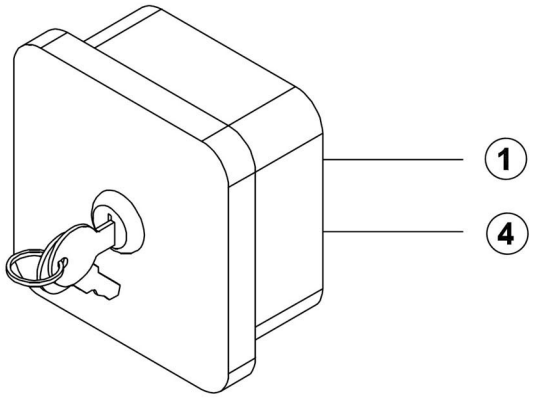
THREE BUTTON STATION



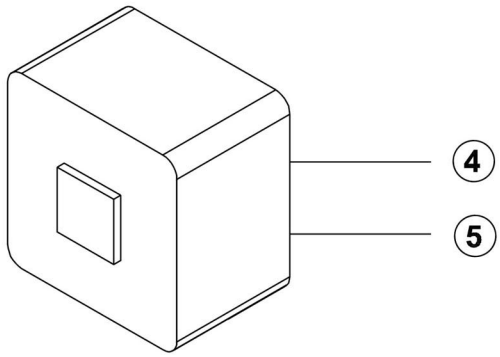
DUAL THREE BUTTON STATION



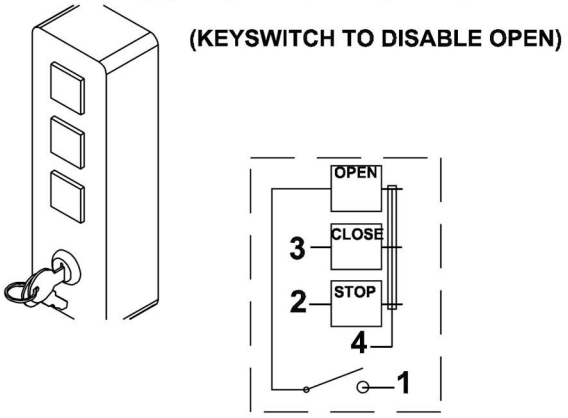
KEYSWITCH (TO OPEN)



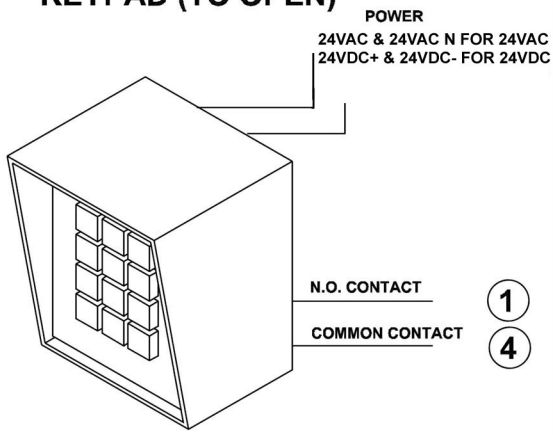
SINGLE BUTTON STATION (OPEN/CLOSE)



THREE BUTTON W/KEYSWITCH

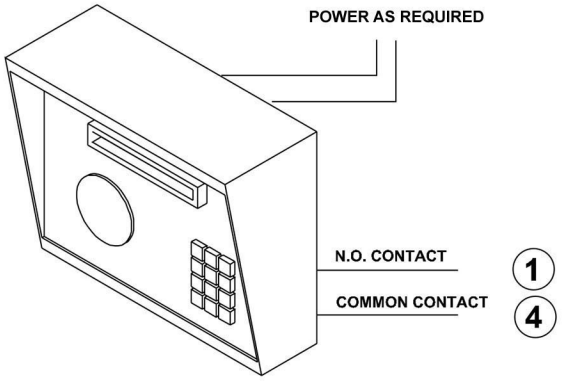


KEYPAD (TO OPEN)

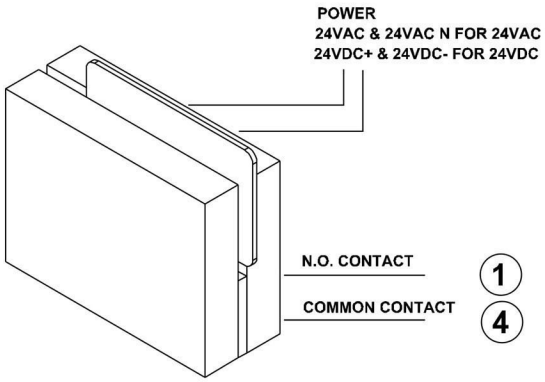


CONTROL and ACCESSORY CONNECTION ILLUSTRATIONS

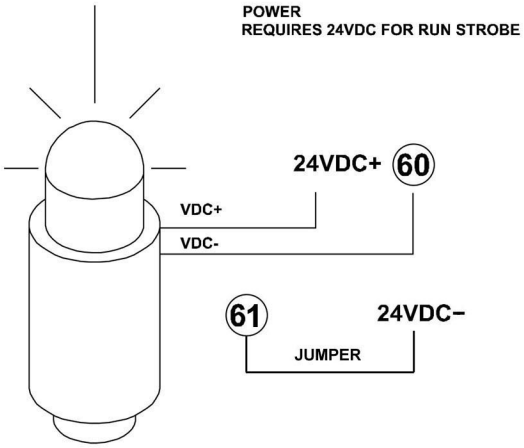
TELEPHONE ENTRY SYSTEM (TO OPEN)



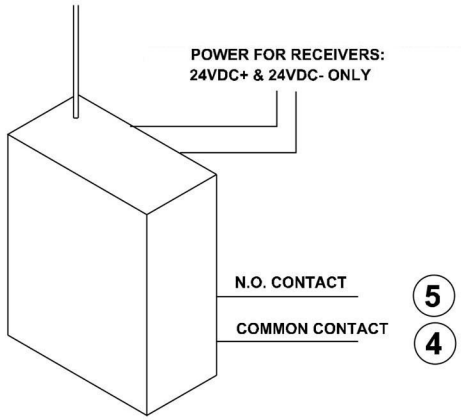
CARD READER (TO OPEN)



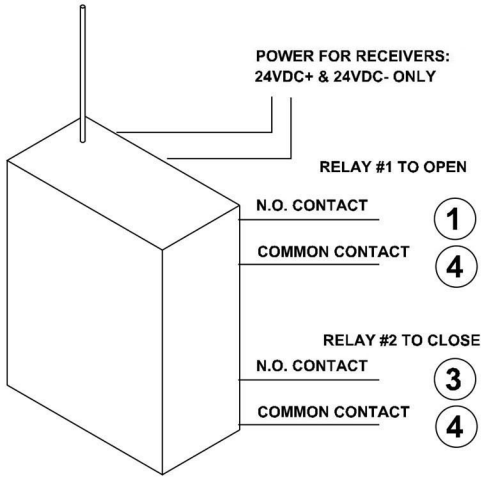
STROBE (WIRED FOR RUN)



FOUR WIRE RECEIVER (OPEN/CLOSE)

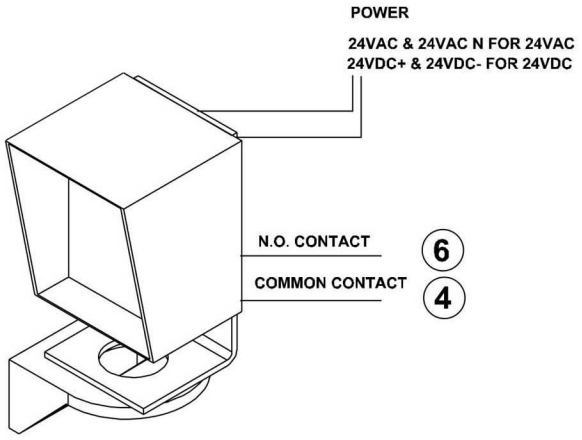


TWO CHANCEL RECEIVER (OPEN/CLOSE)

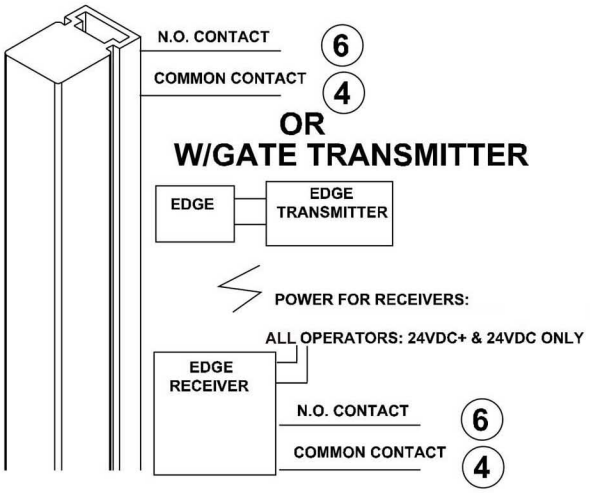


OSCO CONTROL and ACCESSORY CONNECTION ILLUSTRATIONS

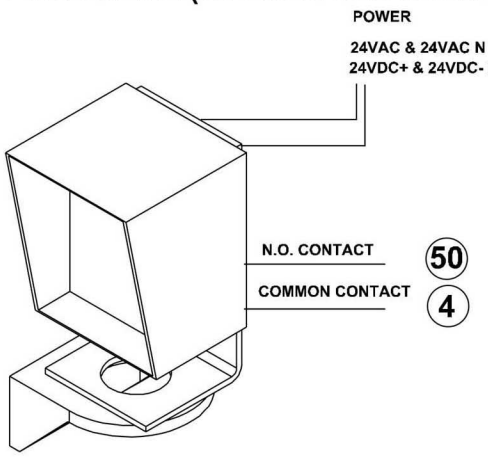
PHOTOEYE (TO REVERSE)



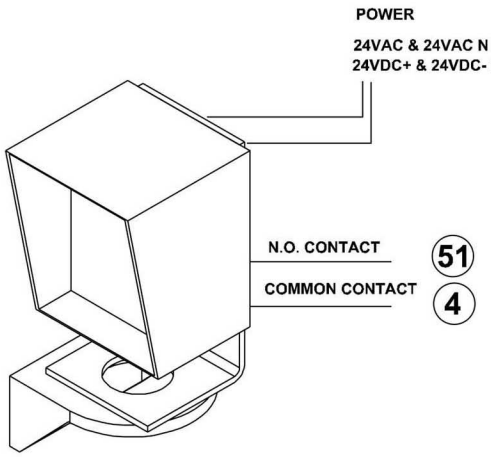
EDGE (TO REVERSE)



PHOTOEYE (OPEN OBSTRUCTION)

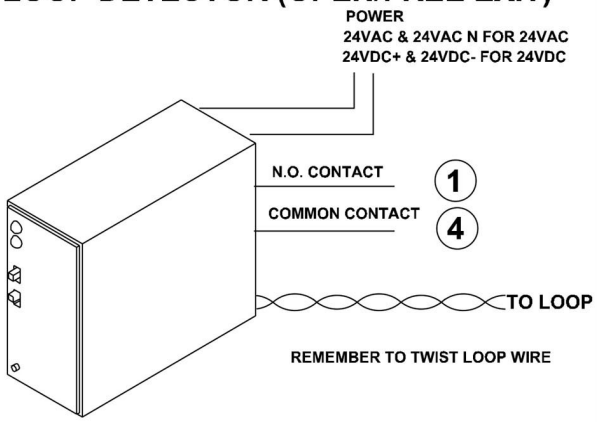


PHOTOEYE (CLOSE OBSTRUCTION)

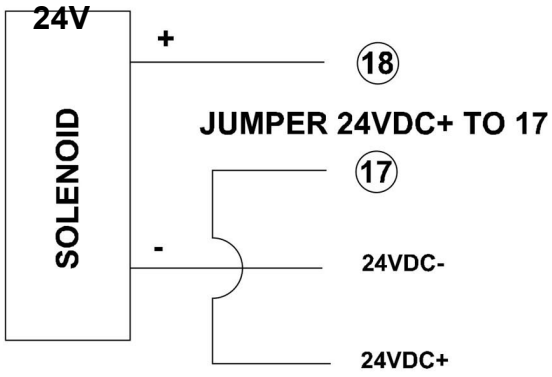


CONTROL and ACCESSORY CONNECTION ILLUSTRATIONS

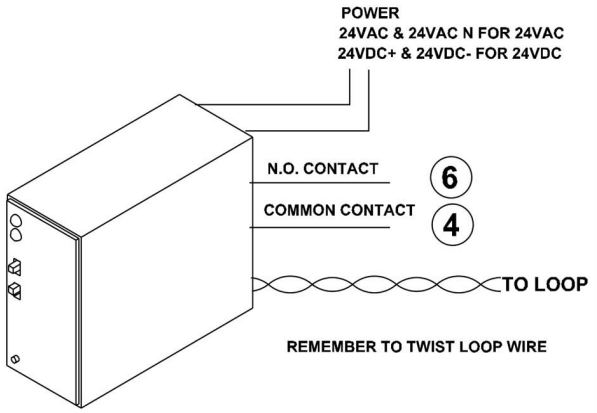
LOOP DETECTOR (OPEN/FREE EXIT)



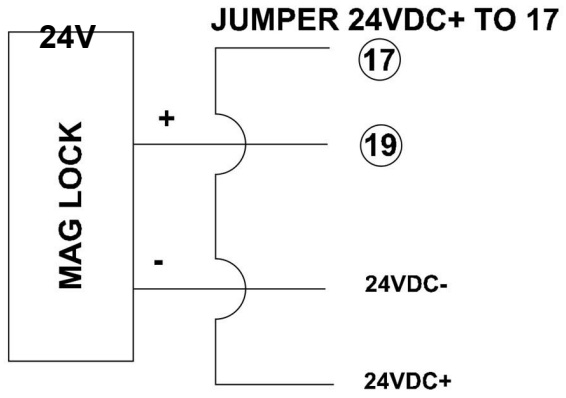
SOLENOID LOCK



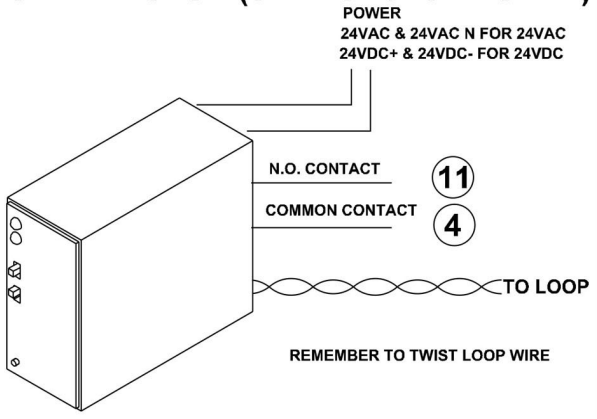
LOOP DETECTOR (TO REVERSE)



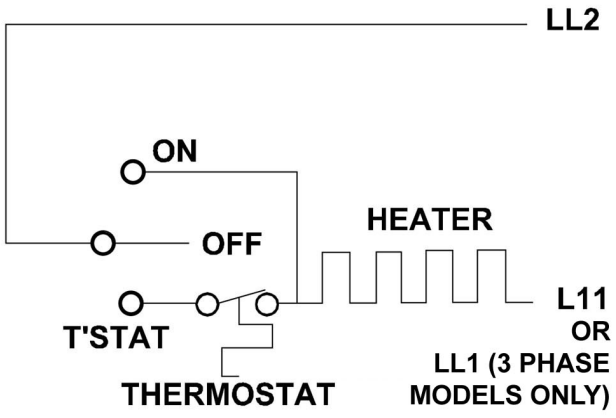
MAG LOCK



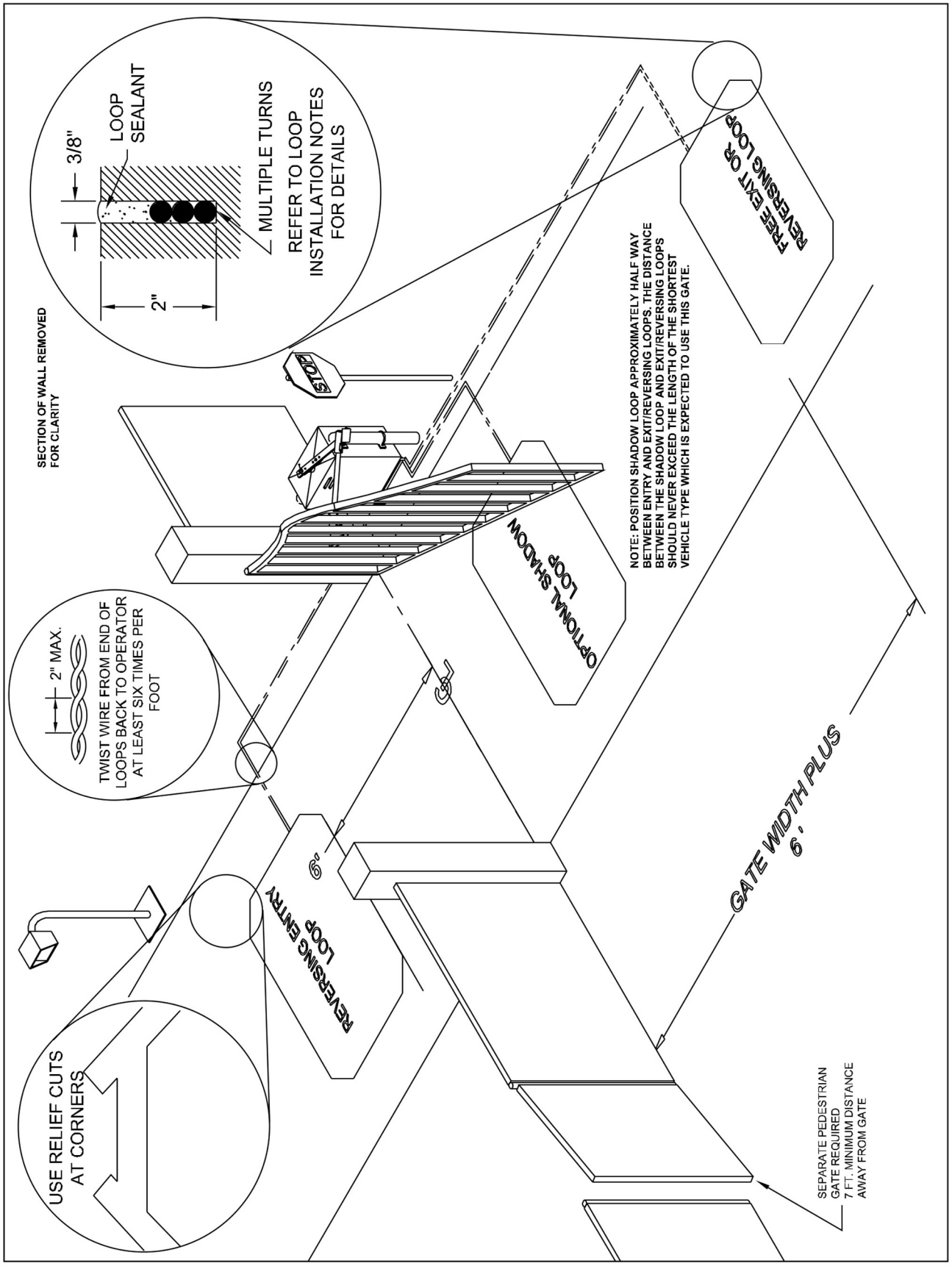
LOOP DETECTOR (SHADOW/HOLD OPEN)



HEATER ASSEMBLY AC MODELS ONLY

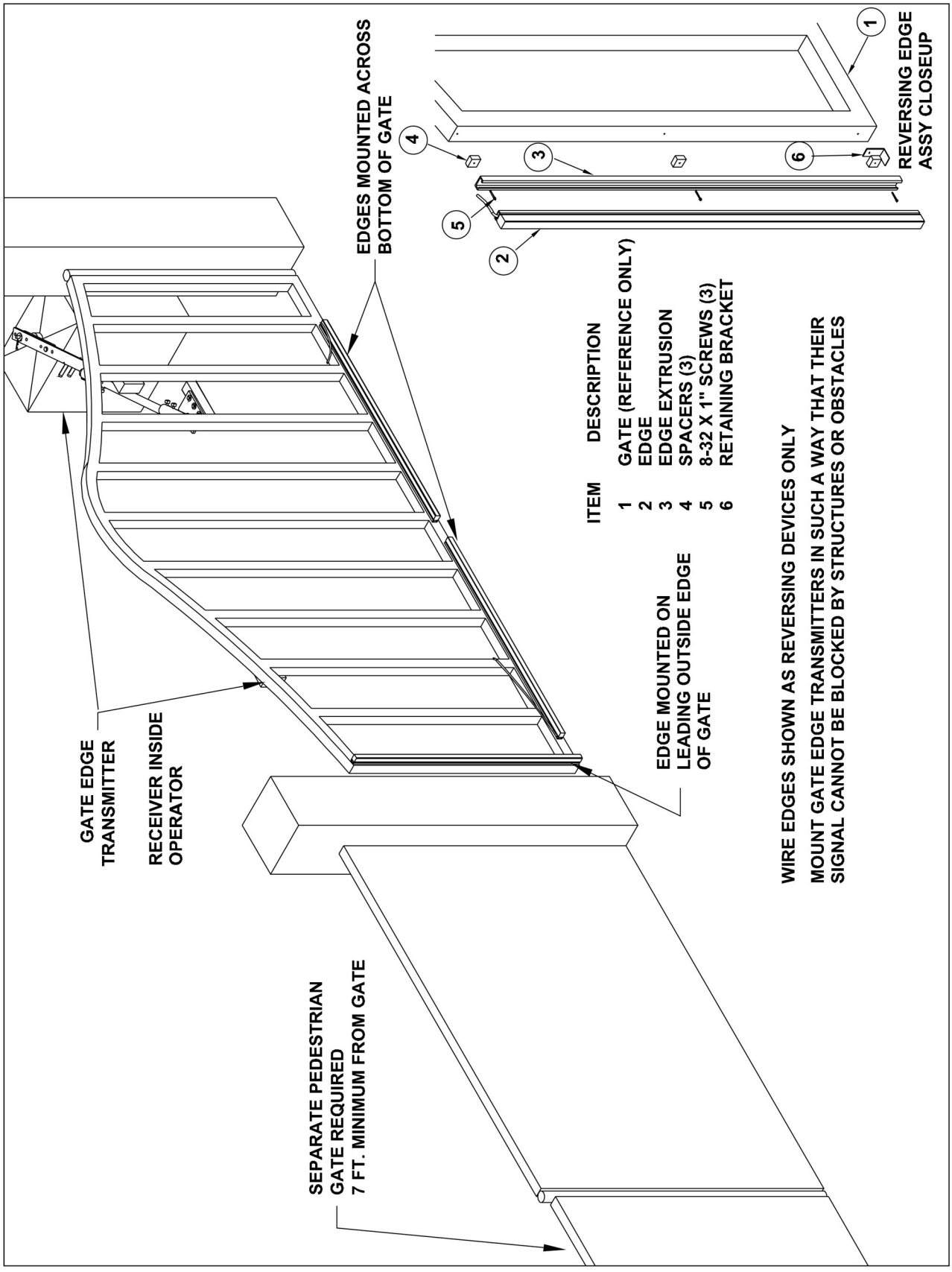


LOOP LAYOUT ILLUSTRATION



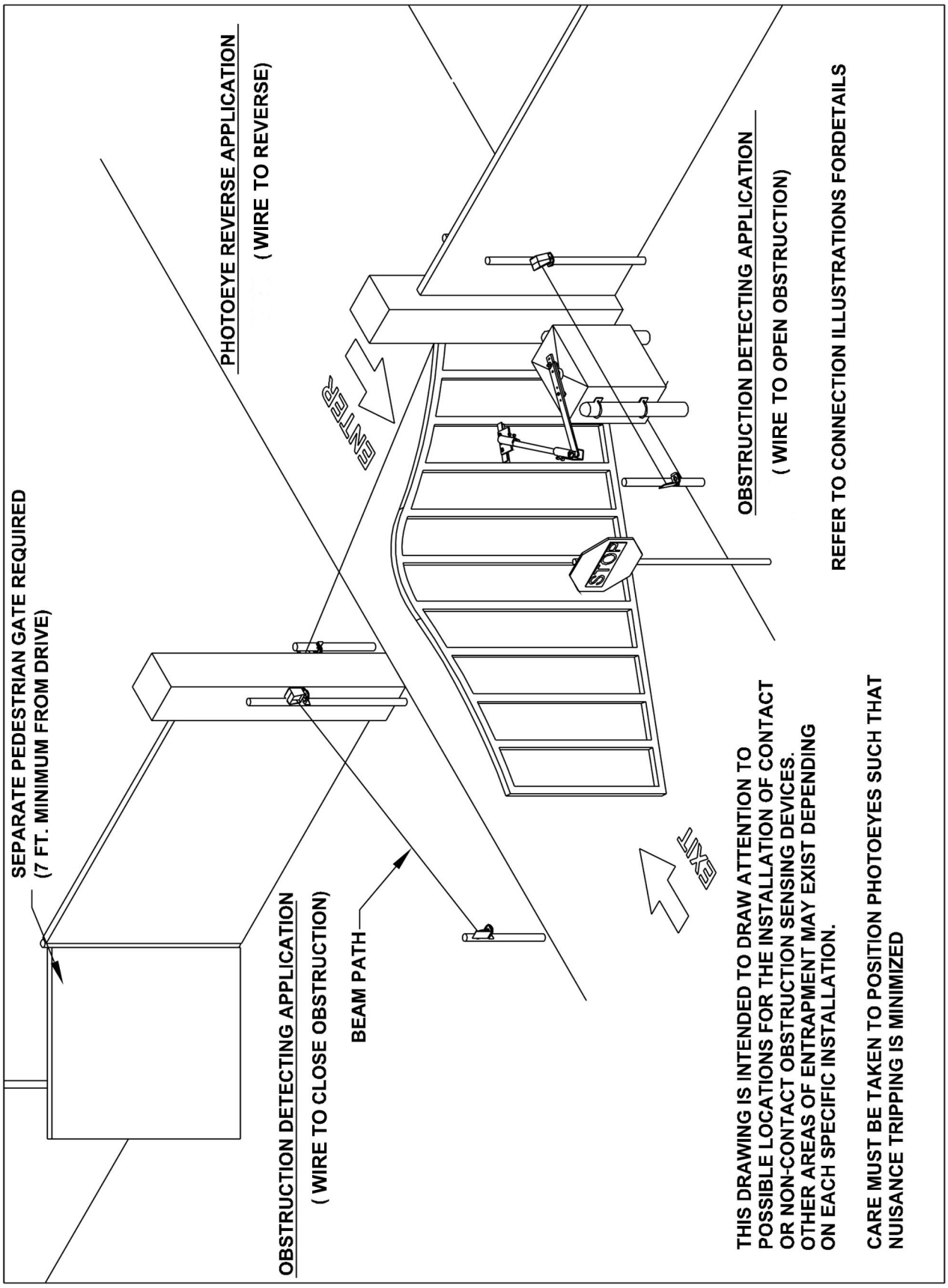
Refer to Connection Descriptions on page 11 and Loop Accessory Connections on page 19 for additional details.

EDGE LAYOUT ILLUSTRATION



Refer to Connection Descriptions on page 11 and Contact Edge Connections on page 18 for additional details.

PHOTOEYE ILLUSTRATION



Refer to Connection Descriptions on page 11 and Photoeye Accessory Connections on page 18 for additional details.

TROUBLESHOOTING

Operator fails to start:

A. If the operator has been running a large number of cycles, the motor may have gotten hot and tripped the overload. Allow the motor to cool down and the overload will reset automatically.
B. Make sure you have power at the master distribution panel and that the power has not been turned off.
C. The secondary fuse on the control board may have blown. Replace the fuse (refer to control box parts list on page **26** [CRS] and page **30** [CRS-D] for part number information).

Motor operates, but gate does not move:

A. In operators with torque limiters and friction pad clutches, check for signs of slipping. You can mark the sprocket and clutch with a yellow or white grease pen and watch for the lines to move apart if slipping is taking place. Adjust the torque limiter tighter if this is the problem.
B. Check for broken chain or worn belts.
C. Check all setscrews on pulleys and sprockets and tighten them if necessary, and check for keys which may have fallen loose from keyways.

Motor sounds like it is working harder than normal:

A. Make sure the gate is moving freely and without binding throughout its entire travel.
B. Check the drive chain for obstructions (if the operator has one).
C. If the operator has an internal brake mechanism, make sure it is releasing.

Limit switch getting out of time:

A. Check for proper tension on all limit chains to be sure there is no jumping taking place. Mark one tooth and its corresponding link and run the gate. If the marks have moved, the chain is skipping.
B. Check the setscrews in limit cams and limit sprockets for tightness. In rotary limit boxes, check the rotary limit nut for sloppiness or stripped threads. Replace if necessary.

Gate stopping part way open or closed (but no visible obstruction):

A. The control board may have received a false obstruction input triggered by current sensing set too low. Make sure the gate moves freely through its entire travel before adjusting the current sensing.
B. The maximum run timer may have counted down and expired. This can be caused by having the timer set too low, if a chain or belt is broken, or if a sprocket or pulley is slipping. When the timer expires, the gate stops and an alarm will sound.
C. An obstruction signal from an accessory wired to the obstruction input may have triggered falsely. Check the control board for lit L.E.D. indicators for any of the following inputs: safety, shadow, open obstruction, close obstruction, stop, etc. If any are lit when the operator should be running, remove all devices hooked to that function and hook them up one at a time and try to run the operator until the problem device is found. Refer to page **13** for details on the control board indicators.

Gate staying open with automatic system:

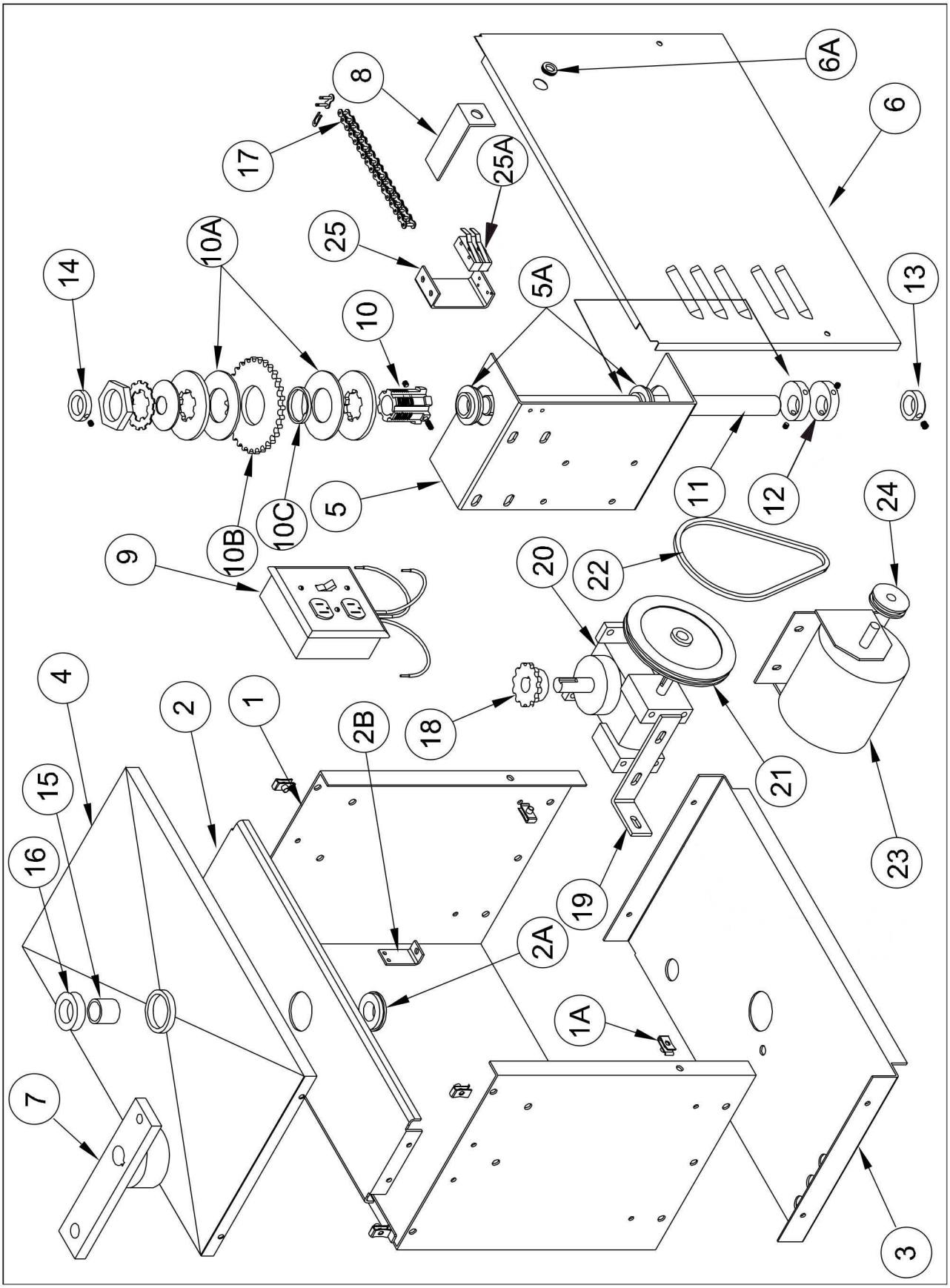
A. If there are vehicle detectors in your machine which are set up for reverse, one of your loops or loop detectors may be sending a false signal. Disconnect the wire harness and try running the operator.
B. An opening or reversing device may be stuck or malfunctioning. Try disconnecting these devices and hook them back up one at a time and try running the operator until the malfunctioning device is found.
C. Make sure the close limit switch isn't activated. If it is, the operator will think the gate is already closed.

HOW TO ORDER REPLACEMENT PARTS

Use the part numbers listed on the following pages. Contact your **local OSCO dealer** or **distributor** to order parts.

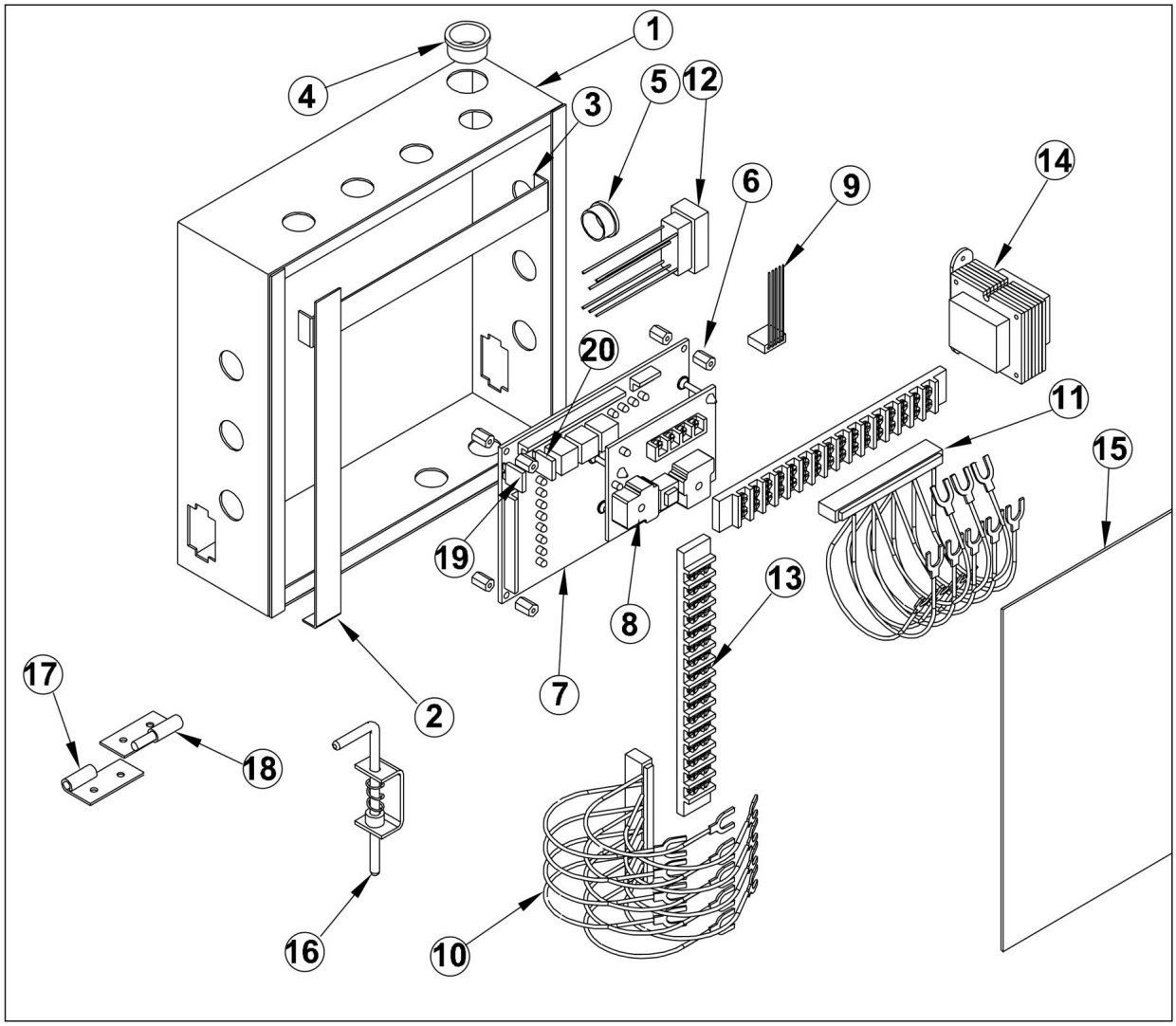
1. Supply the model number and serial number of your operator.
2. Specify the quantity of pieces needed and order by part number and name of part.
3. State whether to ship by freight, truck, parcel post, UPS or air express.
4. State whether transportation charges are to be prepaid or collect.
5. Specify name and address of person or company to whom parts are to be shipped.
6. Specify name and address of person or company to whom invoice is to be sent.

MODEL CRS MECHANICAL PARTS EXPLODED VIEW



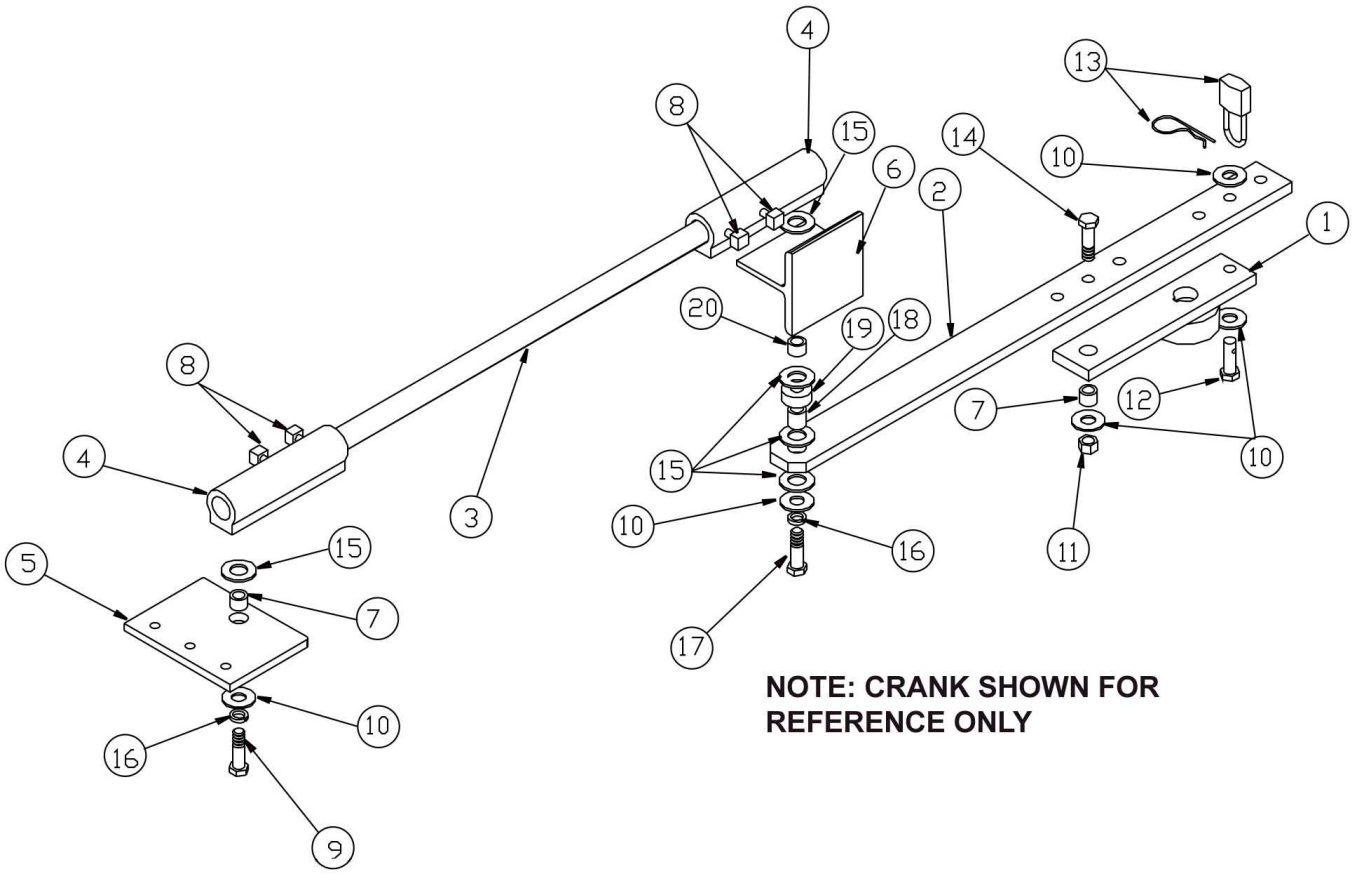
MODEL CRS MECHANICAL PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
1	2100-096-BT	Enclosure Wrap
1A	2400-343	U-Nut, 1/4-20
2	2110-604	Upper Bearing Channel with Bearing
2A	2200-001	Radial Flange Bearing, 1”
2B	2100-1809	Pull Pin Retaining Bracket
3	2100-1784	Main Frame
4	2100-1767-BT	Top Cover
5	2110-680	Motor/Reducer Bracket with Bearings
5A	2200-001	Radial Flange Bearing, 1”
6	2100-094-BT	Front Cover
6A	2300-716	Stop/Reset Button Cover
7	2100-1465-BT	Crank
8	2510-260	Stop/Reset Button and Bracket Assembly
	2100-1777	Stop/Reset Button Bracket
	2500-1495	Stop/Reset Button
9	2510-251-A	Power On/Off Disconnect Assembly with Receptacles (115VAC Models only)
	2500-1956	115VAC Duplex Receptacles only
	2500-1957	115VAC Switch only
	2510-252-A	Power On/Off Disconnect Assembly for all 230VAC Models
	2500-726	230VAC Switch only (20 Amp)
10	2200-585	Torque Limiter
	2220-025	Torque Limiter and Sprocket Assembly
10A	2200-591	Friction Disc, pair
10B	2200-446	Sprocket, 40 A 30, 2” ID
10C	2200-593	Bushings
11	2100-530	Drive Shaft, 1” x 18”
12	2100-1748	Limit Cam
13	2200-015	Shaft Collar, 1” x 9/16” LTB
14	2200-014	Shaft Collar, 1” x 3/8” LTB
15	2100-519	Output Spacer
16	2200-016	Moisture Seal
17	2400-103	#40 Roller Chain, 19 Links
	2200-006	#40 Master Link
	2400-145	#40 Half Link
18	2200-190	Sprocket, 40 B 12, 3/4” Bore
19	2100-1632-BT	Support Bracket
20	2200-819	Gear Reducer, 60:1
21	2200-473	Pulley, 6”
22	2200-052	V-Belt, 24”
23	2510-274	115V AC Motor with Harness
	2510-275	230V Single Phase AC Motor with Harness
24	2200-132	Pulley, 2”
25	2100-1960	Limit Switch Bracket
25A	2500-440	Limit Switch
	2200-872	Capacitor Clamp (not shown)
	2500-261	Capacitor for 115V CRS
	2500-552	Capacitor for 230V CRS
	2100-529	Woodruff Key
	2510-064	Three-Button Station with Lead Wires



MODEL CRS CONTROL BOX PARTS LIST

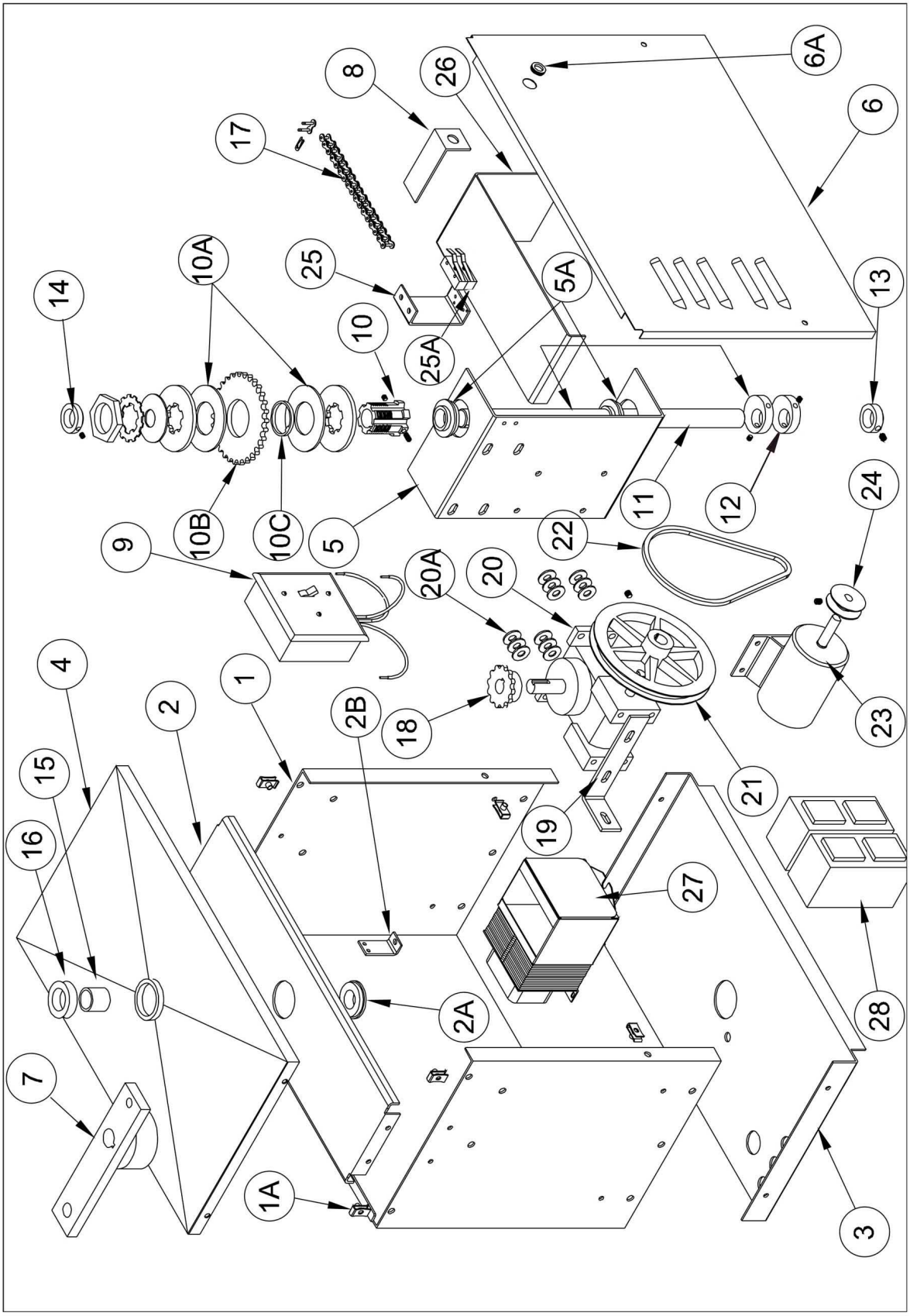
REF NO.	PART NO.	DESCRIPTION
1	2100-1778	Control Box Wrapper
2	2100-1762	Terminal Strip Bracket, Output Side
3	2100-1761	Terminal Strip Bracket, Input Side
4	2300-735	Heyco Bushing, 1.09 diameter
5	2200-122	Heyco Bushing, .87 diameter
6	2500-1948	Control Board Standoff
7	2510-268	Control Board
8	2500-1946	AC Motor Drive Board
	2510-244	Control Board with AC Motor Board
9	2510-279	Limit Switch Harness Assembly
10	2510-249	Input Wire Harness Assembly
11	2510-250	Output Wire Harness Assembly
12	2510-261	Control Box Motor Harness Assembly
13	2500-071	Terminal Strip, 16-141
14	2500-212	Transformer, 115/24VAC, 40VA
	2500-791	Transformer, 230/24VAC, 40VA
15	2300-696	Clear Control Box Cover
16	2110-701	Pull Pin Disconnect Assembly
17	2200-873	Control Box Hinge, Female (riveted to control box)
18	2200-874	Control Box Hinge, Male (riveted to main frame)
	2500-867	Alarm, 24VAC (not shown)
19	2500-1966	2 Amp Fuse for Control Board
20	2500-1975	3 Amp Fuse for Control Board
	2520-391-A	Complete Controller Assembly 115VAC (order limit harness and mounting hardware separately)
	2520-392-A	Complete Controller Assembly 230VAC (order limit harness and mounting hardware separately)



MODEL CRS GATE ARM ASSEMBLY PARTS LIST

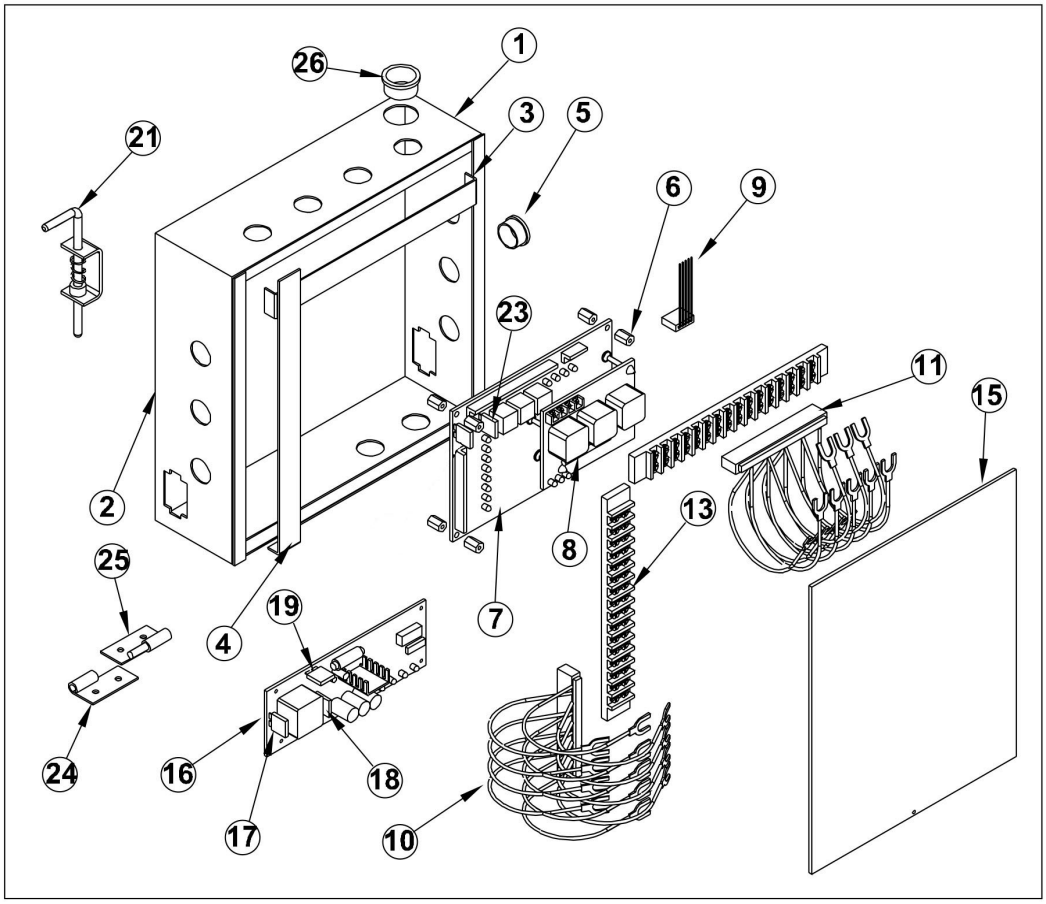
REF#	PART#	DESCRIPTION
	2120-448-BT	Complete Arm Assembly
1	2100-1465-BT	Crank
2	2100-1722-BT	Crank Extension
3	2100-302-BT	Solid Link
4	2100-1598	Gate Arm Clamp
5	2100-1733-BT	Gate Plate
6	2100-1924-BT	Overtravel Stop
7	2200-783	Spacer, 23/32" OD x 1/2" ID x 9/16" LTB
8	2400-378	Set Bolt, 5/16"-18 x 3/4"
9	2400-434	HHCS, 1/2"-13 x 1 1/4"
10	2400-376	Flat Washer, 1/2"
11	2400-418	Nylon Lock Nut, 1/2"-13
12	2100-1547	Disconnect Pin
13	2400-351	Pull Pin
	2200-034	Disconnect Lock (optional)
14	2400-380	HHCS, 1/2" - 13 x 1 3/4"
15	2300-238	Nylon Washer
16	2400-433	1/2" Lock Washer
17	2400-482	HHCS, 1/2" - 13 x 2 1/2
18	2100-1725	Spacer - yellow, 3/4" OD x 1/2" ID x 3/4" LTB
19	2100-1932-BC	Spacer - black, 1 1/4" OD x 1/2" ID, x 1/2" LTB
20	2100-1320	Spacer - zinc-silver, 3/4" OD x 1/2" ID x 1/2" LTB

MODEL CRS-D MECHANICAL PARTS EXPLODED VIEW



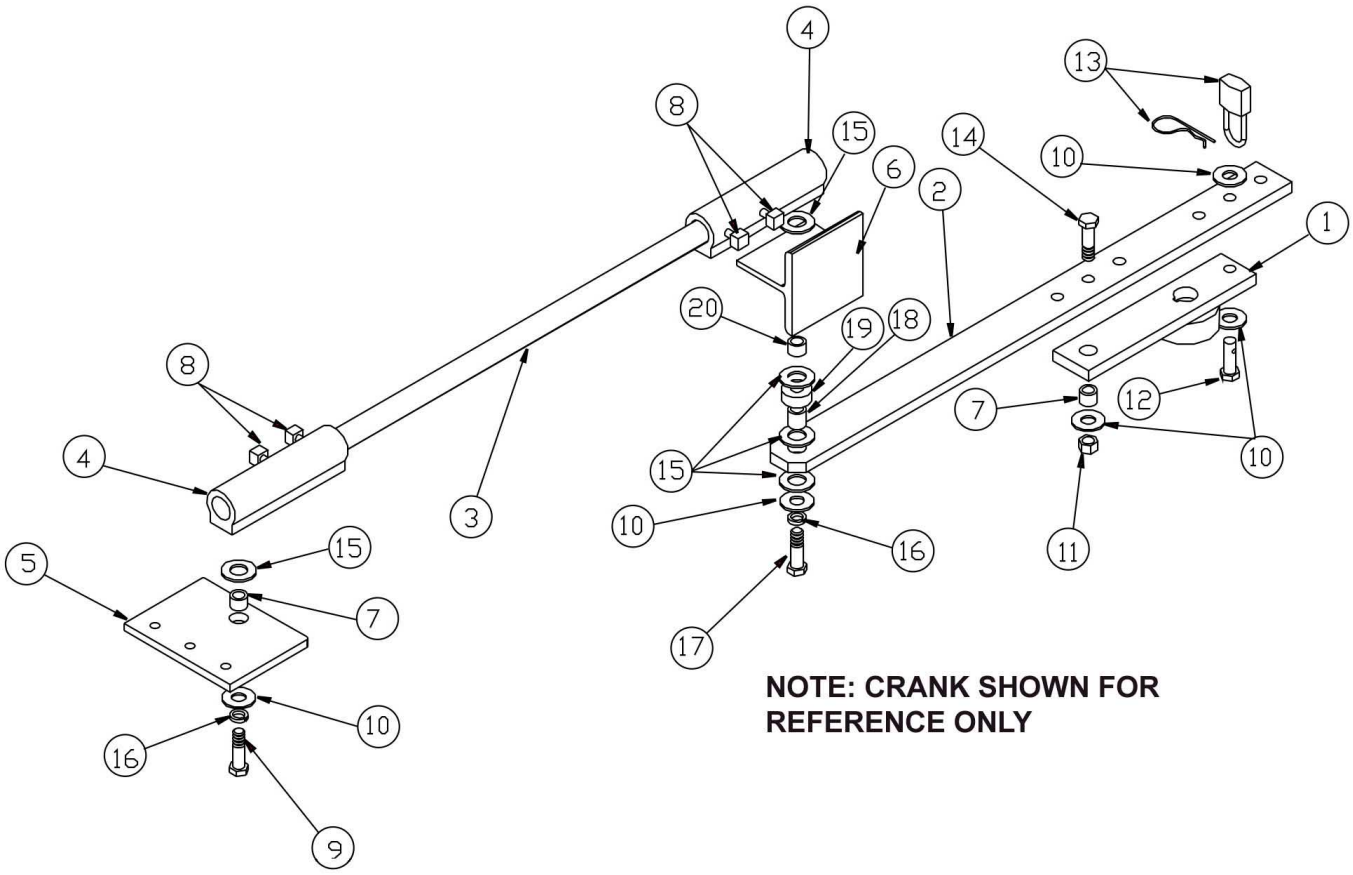
MODEL CRS-D MECHANICAL PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
1	2100-096-BT	Enclosure Wrap
1A	2400-343	U-Nut, 1/4-20
2	2110-604	Upper Bearing Channel with Bearing
2A	2200-001	Radial Flange Bearing, 1”
2B	2100-1809	Pull Pin Retaining Bracket
3	2100-1784	Main Frame
4	2100-1767-BT	Top Cover
5	2110-680	Motor/Reducer Bracket with Bearings
5A	2200-001	Radial Flange Bearing, 1”
6	2100-094-BT	Front Cover
6A	2300-716	Stop/Reset Button Cover
7	2100-1465-BT	Crank
8	2510-260	Stop/Reset Button and Bracket Assembly
	2100-1777	Stop/Reset Button Bracket
	2500-1495	Stop/Reset Button
9	2510-266	Power On/Off Switch Assembly
	2500-726	Switch only (20 Amp)
10	2200-585	Torque Limiter
10A	2200-591	Friction Disc, pair
10B	2200-281	Sprocket, 40 A 36, 2” ID
10C	2200-593	Bushing
11	2100-530	Drive Shaft, 1” x 18”
12	2100-1748	Limit Cam
13	2200-015	Shaft Collar, 1” x 9/16” LTB
14	2200-014	Shaft Collar, 1” x 3/8” LTB
15	2100-519	Output Spacer
16	2200-016	Moisture Seal
17	2200-673	#40 Roller Chain, 21 Links
	2200-006	#40 Master Link
18	2200-190	Sprocket, 40 B 12, 3/4” Bore
19	2100-1904-BT	Support Bracket
20	2200-819	Gear Reducer, 60:1
20A	2400-017	Spacer, 3/8” Flat Washers
21	2200-429	Pulley, 7”
22	2200-109	V-Belt, 27”
23	2500-1902	Motor, 1/2 HP, 24VDC
	2510-243	Brush Replacement Kit
24	2200-132	Pulley, 2”
25	2100-1960	Limit Switch Bracket
25A	2500-440	Limit Switch
26	2100-1840	Accessory Shelf
27	2510-223	Transformer Assembly
	2500-1768	Bridge Rectifier
	2500-1776	Transformer only, 115/24V, 250VA
	2500-1819	Fuse Holder
	2500-1742	6 Amp Fuse, Slo-Blo
	2100-1798	Transformer Strap (not shown)
28	2510-182	Battery Assembly
	2500-1118	Battery, 12V (2 required)
	2300-450	Velcro Tape, per foot



MODEL CRS-D CONTROL BOX PARTS LIST

REF NO.	PART NO.	DESCRIPTION
1	2100-1778	Control Box Wrapper
3	2100-1762	Terminal Strip Bracket, Output Side
4	2100-1761	Terminal Strip Bracket, Input Side
5	2200-122	Heyco Bushing, .87 diameter
6	2500-1948	Control Board Standoff
7	2510-269	Control Board DC
8	2500-1947	DC Motor Drive Board
	2510-245	Control Board with DC Motor Board
9	2510-279	Limit Switch Harness Assembly
10	2510-249	Input Wire Harness Assembly
11	2510-250	Output Wire Harness Assembly
13	2500-071	Terminal Strip, 16-141 (2)
15	2300-696	Clear Control Box Cover
16	2500-2127	DC Charger Board
17	2500-2018	Fuse, 15 Amp *(available in local hardware stores)*
18	2500-2019	Fuse, 20 Amp *(available in local hardware stores)*
19	2500-1975	Fuse, 3 Amp
21	2110-701	Pull Pin Disconnect Assembly
	2500-867	Alarm, 24VDC (not shown)
23	2500-1975	3 Amp Fuse for Control Board
24	2200-873	Control Box Hinge, Female (riveted to control box)
25	2200-874	Control Box Hinge, Male (riveted to main frame)
	2520-393-A	Complete Controller Assembly 24VDC (order limit harness and mounting brackets separately)
26	2300-735	Heyco Bushing, 1.09 diameter



MODEL CRS-D GATE ARM ASSEMBLY PARTS LIST

REF#	PART#	DESCRIPTION
	2120-448-BT	Complete Arm Assembly
1	2100-1465-BT	Crank
2	2100-1722-BT	Crank Extension
3	2100-302-BT	Solid Link
4	2100-1598	Gate Arm Clamp
5	2100-1733-BT	Gate Plate
6	2100-1924-BT	Overtravel Stop
7	2200-783	Spacer, 23/32" OD x 1/2" ID x 9/16" LTB
8	2400-378	Set Bolt, 5/16"-18 x 3/4"
9	2400-434	HHCS, 1/2"-13 x 1 1/4"
10	2400-376	Flat Washer, 1/2"
11	2400-418	Nylon Lock Nut, 1/2"-13
12	2100-1547	Disconnect Pin
13	2400-351	Pull Pin
	2200-034	Disconnect Lock (optional)
14	2400-380	HHCS, 1/2" - 13 x 1 3/4"
15	2300-238	Nylon Washer
16	2400-433	1/2" Lock Washer
17	2400-482	HHCS, 1/2" - 13 x 2 1/2
18	2100-1725	Spacer - yellow, 3/4" OD x 1/2" ID x 3/4" LTB
19	2100-1932-BC	Spacer - black, 1 1/4" OD x 1/2" ID, x 1/2" LTB
20	2100-1320	Spacer - zinc-silver, 3/4" OD x 1/2" ID x 1/2" LTB

BATTERY MAINTENANCE

The gel-cell batteries in this operator require no routine maintenance. For assured continued performance, they should be replaced every year.

If power is to be removed for one week or more, disconnect the negative wire from the batteries as this will prevent deep discharging.

Fully charge before use after storage or upon initial installation.

BRUSH REPLACEMENT

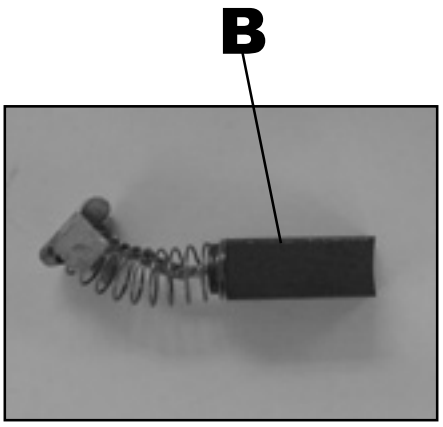
Brushes should be inspected every 100,000 cycles, (200,000 for BGU-D) or yearly, whichever comes first. The motor has two brushes, one on each side.

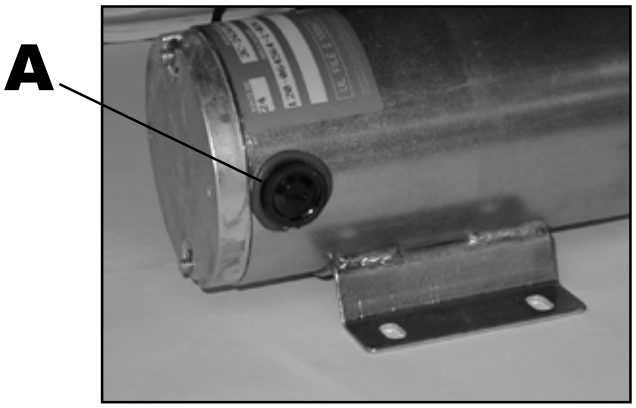
Original brushes are approximately 3/4" long and should be replaced when they are 1/4" long, or sooner. If brushes are allowed to wear beyond this point, permanent damage to the motor may result.

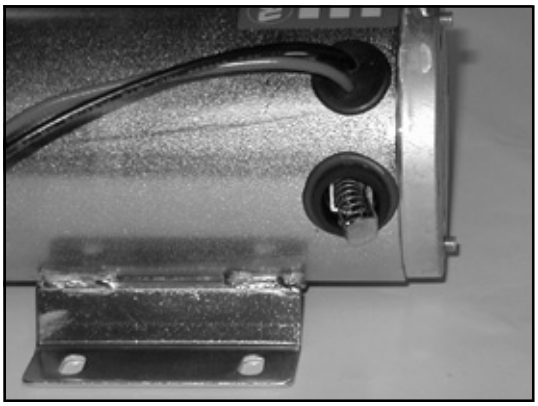
To inspect the brushes, remove retaining cap (A), with straight-blade screwdriver, and carefully pull assembly straight out. Measure remaining brush material (B).

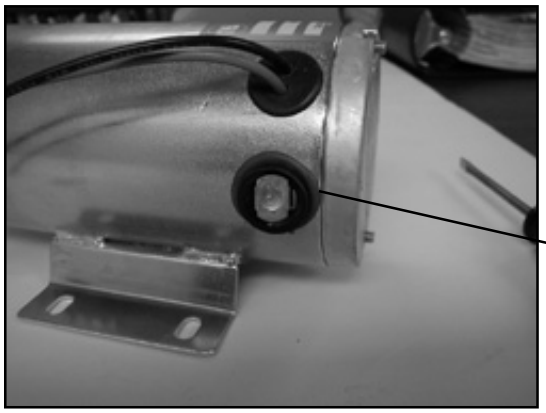
To reinstall, place brush in hold, aligning rounded indentation (C), correctly with motor shaft. Gently push in spring and align contact with oval carrier, push in with retaining cap (D). Hold in place and thread cap into brush carrier. Do not overtighten or cap will crack! Repeat for other brush.

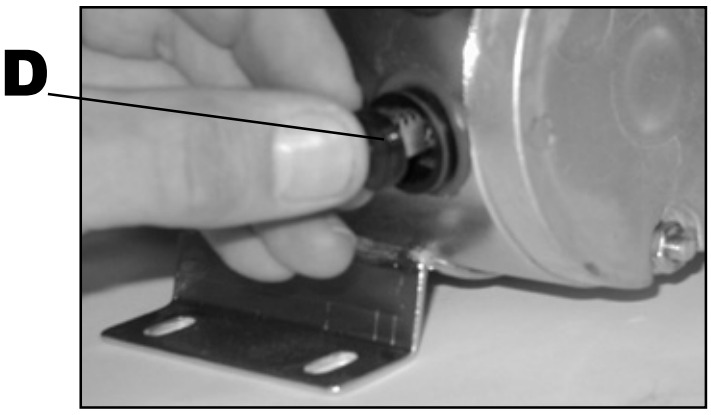
If brushes require replacement, order kit #2510-243.











Esso Imperial Oil MATERIAL SAFETY DATA SHEET

Date Prepared: June 12, 1997
Supersedes: February 02, 1996
MSDS Number: 08068

Cette fiche signaletique ast aussi disponible en francais

1. PRODUCT INFORMATION
Product Identifier: ESSO GEAR OIL GX 75W-90
Application and Use: Transmission adn gear lubricant.
Product Description: Mixture of paraffinic and naphthenic hydrocarbons (saturated and unsaturated), and additives.

REGULATORY CLASSIFICATION
WHMIS: Not a controlled product
CEPA: CANADIAN ENVIRONMENTAL PROTECTION ACT
All components of this product are either on the Domestic Substances List (DSL) or are exempt.
TDG INFORMATION (RAIL/ROAD):

Shipping Name:	Not regulated		
Class:	Not regulated	PIN Number:	Not regulated
Packing Group:	Not regulated		

Please be aware that other regulations may apply.

TELEPHONE NUMBERS		MANUFACTURER/SUPPLIER
Emergency 24 hr.	519-339-2145	IMPERIAL OIL
Technical Info.	800-268-3183	Products Division
		111 St. Clair Ave. West
		Toronto, Ontario M5W 1K3
		416-968-4111

2. REGULATED COMPONENTS
The following components are defined in accordance with subparagraph 13(a) (l) to (lv) or paragraph 14(a) of the Hazardous Products Act:

NAME	%	CAS #

Not applicable

3. TYPICAL PHYSICAL & CHEMICAL PROPERTIES
Physical State: Liquid
Specific gravity: not available
Viscosity: 15.80 cSt at 100 deg. C
Vapour Density: not available
Boiling point: 230 to 460 deg. C
Evaporation rate: <0.1 (1=n-butylacefate)
Solubility in water: negligible
Freezing/Pour Point: -42 deg. C ASTM D97
Odour Threshold: not available
Vapour Pressure: <0.1 kPa at 20 deg. C
Density: 0.89 g/cc at 15 deg. C
Appearance/odour: yellow oil; petroleum odour

4. HEALTH HAZARD INFORMATION
NATURE OF HAZARD:
INHALATION: Negligible hazard at normal temperatures (up to 38 deg. C). Elevated temperatures or mechanical action may form vapours, mists or fumes which may be irritating to the eyes, nose, throat and lungs. Avoid breathing vapours or mists.
EYE CONTACT: Slightly irritating, but will not injure eye tissue.
SKIN CONTACT: Low toxicity. Frequent or prolonged contact may irritate the skin.
INGESTION: Low toxicity.
ACUTE TOXICITY DATA: Based on animal testing data from similar materials and products, the acute toxicity of this product is expected to be:
Oral: LD50 > 5000 mg/kg (rat)
Dermal: LD50 > 3160 mg/kg (rabbit)
Inhalation: LC50 > 5000 mg/m3 (rat)
OCCUPATIONAL EXPOSURE LIMIT:
ACGIH recommends: For oil mists, 5 mg/m3. Local regulated limits may vary.

5. FIRST AID MEASURES
INHALATION: Vapour pressure of this material is low and as such inhalation under normal conditions is usually not a problem. If overexposed to oil mist, remove from further exposure. Administer artificial respiration if breathing has stopped. Keep at rest. Call for prompt medical attention.
EYE CONTACT: Flush eyes with large amounts of water until irritation subsides. If irritation persists, get medical attention.
SKIN CONTACT: Flush with large amounts of water. Use soap if available. Remove severely contaminated clothing (including shoes) and launder before reuse. If irritation persists, seek medical attention.
INGESTION: If swallowed, DO NOT induce vomiting. Keep at rest. Get prompt medical attention.

6. PREVENTIVE AND CORRECTIVE MEASURES
PERSONAL PROTECTION: The selection of personal protective equipment varies, depending upon conditions of use. In open systems where contact is likely, wear safety goggles, chemical-resistant overalls, and chemically impervious gloves. Where only incidental contact is likely, wear safety glasses with side shields. No other special precautions are necessary provided skin/eye contact is avoided. Where concentrations in air may exceed the occupational exposure limits given in Section 4 and where engineering, work practices or other means of exposure reduction are not adequate, approved respirators may be necessary to prevent overexposure by inhalation.
ENGINEERING CONTROLS: The use of local exhaust ventilation is recommended to control emissions near the source. Laboratory samples should be handled in a fumehood. Provide mechanical ventilation of confined spaces.
HANDLING, STORAGE AND SHIPPING: Keep containers closed. Handle and open containers with care. Store in a cool, well ventilated place away from incompatible materials. Do not handle or store near an open flame, sources of heat, or sources of ignition. Odorous and toxic fumes may form from the decomposition of this product if stored at temperatures in excess of 45 deg. C for extended periods of time or if heat sources in excess of 121 deg. C are used. Empty containers may contain product residue. Do not pressurize cut, heat, or weld empty containers. Do not reuse empty containers without commercial cleaning or reconditioning.
LAND SPILL: Eliminate source of ignition. Keep public away. Prevent additional discharge of material. If possible to do so without hazard. Prevent spills from entering sewers, watercourses or low areas. Contain spilled liquid with sand or earth. Recover by pumping or by using a suitable absorbent. Consult an expert of disposal or recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately. Take all additional action necessary to prevent and remedy the adverse effects of the spill.
WATER SPILL: Remove from surface by skimming or with suitable absorbants. If allowed by local authorities and environmental agencies, sinking and/or suitable dispersants may be used in unconfined waters. Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately. Take all additional action necessary to prevent and remedy the adverse effects of the spill.

7. FIRE AND EXPLOSION HAZARD
Flashpoint and method: 150 deg. C COC ASTM D92
Autoignition: 240 deg. C Flammable Limits: LEL: NA UEL: NA
GENERAL HAZARDS:
Low hazard; liquids may burn upon heating to temperatures at or above the flash point. Decomposes; flammable/toxic gases will form at elevated temperatures (thermal decomposition). Toxic gases will form upon combustion.
FIRE FIGHTING: Use water spray to cool fire exposed surfaces and to protect personnel. Shut off fuel to fire.
Use foam, dry chemical or water spray to extinguish fire. Respiratory and eye protection required for fire fighting personnel. Avoid spraying water directly into storage containers due to danger of boilover. A self-contained breathing apparatus (SCBA) should be used for all indoor fires and any significant outdoor fires. For small outdoor fires, which may easily be extinguished with a portable fire extinguisher, use of an SCBA may not be required.
HAZARDOUS COMBUSTION PRODUCTS: Smoke, carbon monoxide, carbon dioxide and traces of oxides of sulphur. Alkyl mercaptans and sulfides may also be released.

8. REACTIVITY DATA
STABILITY: This product is stable. Hazardous polymerization will not occur.
INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID: Strong oxidizing agents.
HAZARDOUS DECOMPOSITION: Fumes, smoke, carbon monoxide and sulphur oxides in case of imcomplete combustion.

9. NOTES
All components of this product are listed on the U.S. TSCA inventory.

10. PREPARATION

Date Prepared:	June 12, 1997
Prepared by:	Lubricants & Specialties
	IMPERIAL OIL
	Products Division
	111 St. Clair Avenue West
	Toronto, Ontario M5W 1K3
	800-268-3183

IMPERIAL OIL
Products Division **MSDS NO. 8068**

ESSO GEAR OIL GX EXTRA 75W-90

POWER-SONIC

MATERIAL SAFETY DATA SHEET

Product Name: Sealed Maintenance Free Lead-Acid Batteries					
DATE:	9/23/2002	ISSUED BY	ENGINEERING	TELEPHONE NO.	(619) 661-2030

HAZARDOUS COMPONENTS

COMPONENTS	WEIGHT %	TLV	LD50	LC50	LC50
			ORAL	INHALATION	CONTACT
Lead (Pb, $Pb0_2$, $PBSO_4$)	about 70%	N/A	(500) mg/kg	N/A	N/A
Sulfuric Acid	about 20%	$1mg/m^3$	(2,140) mg/kg	N/A	N/A
Fiberglass Separator	about 5%	N/A	N/A	N/A	N/A
ABS Plastic	about 5%	N/A	N/A	N/A	N/A

PHYSICAL DATA

COMPONENTS	DENSITY	MELTING POINTS	SOLLUBILITY (H_2O)	ODOR	APPEARANCE
Lead	11.34	327.4° C (Boiling)	None	None	Silver-Gray Metal
Lead Sulfate	6.2	1070° C (Boiling)	40 mg/l(15° C)	None	White Powder
Lead Dioxide	9.4	290° C (Boiling)	None	None	Brown Powder
Sulfuric Acid	about 1.3	about 114° C (Boiling)	100%	Acidic	Clear Colorless Liquid
Fiberglass Separator	N/A	N/A	Slight	Toxic	White Fibrous Glass
ABS Plastic	N/A	N/A	None	No Odor	Solid

FLAMMABILITY DATA

COMPONENTS	FLASHPOINT	EXPLOSIVE LIMIT	COMMENTS
Lead	None	None	
Sulfuric Acid	None	None	
Hydrogen		4% - 72.4%	Sealed batteries can emit hydrogen if over charged (float voltage > 2.40 VPC).
Fiberglass Separator	N/A	N/A	Toxic vapors may be released. In case of fire, wear self-contained breathing apparatus.
ABS Plastic	None	N/A	Temp. over 300° C (572° F) may release combustible gases. In case of fire: wear positive pressure self-contained breathing apparatus.

FIRST AID

SULFURIC ACID PRECAUTIONS	
Skin Contact:	Flush with water, see physician if contact area is large or if blisters form.
Eye Contact:	Call physician immediately and flush with water until physician arrives.
Ingestion:	Call physician. If patient is conscious, flush mouth with water, have patient drink milk or sodium bicarbonate solution.

REACTIVITY DATA

COMPONENT	Sulfuric Acid
STABILITY	Stable at all temperatures
COLYMERIZATION	Will not polymerize
INCOMPATIBILITY	Reactive metals, strong bases, most organic compounds
DECOMPOSITION PRODUCTS	Sulfuric dioxide, trioxide, hydrogen sulfide, hydrogen
CONDITIONS TO AVOID	Prohibit smoking, sparks, etc. from battery charging area. Avoid mixing acid with other chemicals

SPILL OR LEAK PROCEDURES

Steps to take in case of leak or spill:	If sulfuric acid is spilled from a battery, neutrilize acid with bicarbonate (baking soda), sodium carbon (soda ash), or calcium oxide (lime). Flush area with water and discard to the sewage system. Do not allow unneutralized acid into sewage system.
Waste disposal method:	Neutrilized acid may be flushed down the sewer. Spent batteries must be treated as hazardous waste and disposed of according to local, state, and federal guidelines. A copy of this MSDS must be supplied to any scrap dealer or secondary lead smelter with battery.

PROTECTION

EXPOSURE SITE	PROTECTION	COMMENTS
SKIN	Rubber gloves, Apron	Protective equipment must be worn if the battery is cracked or otherwise damaged. A respirator should be worn during reclaim operations if the TLV is exceeded.
RESPIRATORY	Respirator (for lead)	
EYES	Safety goggles, Face Shield	

ELECTRICAL SAFETY

Due to the battery's low internal resistance and high power density, high levels of short circuit current can be developed across the battery terminals. Do not rest tools or cables on the battery. Use insulated tools only. Follow all installation instructions and diagrams when installing or maintaining battery systems.

HEALTH HAZARD DATA

LEAD: The toxic effects of lead are accumulative and slow to appear. It affects the kidneys, reproductive, and central nervous systems. The symptoms of lead overexposure are anemia, vomiting, headache, stomach pain (lead colic), dizziness, loss of appetite, and muscle and joint pain. Exposure to lead from a battery most oftern occurs during lead reclaim operations through the breathing or ingestion of lead dust or fumes.

SULFURIC ACID: Sulfuric acid is a strong corrosive. Contact with acid can casue severe burns on the skin and in eyes. Ingestion of sulfuric acid will cause GI tract burns. Acid can be released if the battery case is damaged or if vents are tampered with.

FIBERGLASS SEPARATOR: Fibrour glass is an irritant of the upper repiratory tract, skin and eyes. For exposure up to 10F/CC use MSA Comfoll with type H filter. Above 10F/CC up to 50F/CC use Ultra-Twin with type H filter. This product is not considered carcinogenic by NTP or OSHA.

ALL DATA MUST BE PASSED TO ANY SCRAP DEALER OR SMELTER WHEN BATTERY IS RESOLD.

PREVENTATIVE MAINTENANCE

IMPORTANT!
- **Always disconnect power from operator before servicing.**
- **Keep clear of gate during operation.**

GENERAL:
OSCO gate operators are designed for many years of trouble-free operation and, under recommended operating conditions, will require only minimal maintenance. To ensure that your unit is ready for operation at all times--and to preclude serious damage or failure--inspect the unit systematically. Proper adjustments and lubrication should be made as recommended.

LUBRICATION:
Bearings. For models which have pillow block style bearings with greaseable fittings, lubricate at least twice a year with a lithium complex based, petroleum oil NLGI 2 rated grease. Oilite and precision sealed bearings do not require additional lubrication.

Motor. Motors have sealed ball bearings and do not require further lubrication. If bearing noise develops after several years of operation, bearings should be replaced by a motor repair company, or the motor should be replaced if necessary.

Drive Chain and Sprocket (slide gate models only). The main drive chain and sprockets should be inspected for wear, cleaned, and wiped down with a lightly oiled rag every six months.

Swing Gate Arm (swing gate models only). Check all bolts for proper tension and tighten if necessary. Make sure the arm folds overextends itself slightly against the overtravel stop to reduce the chance that the gate can be backdriven open. Adjust the close limit slightly if additional travel is required. Lightly lubricate all pivot points with a light machine oil.

Barrier Gate Arm (barrier gate models only). Check all bolts for proper tension and tighten if necessary. If the arm has been warped or damaged, replace as necessary.

ADDITIONAL SIX MONTH PREVENTATIVE MAINTENANCE:

1. For operators which utilize torque limiting clutches, check for proper tightness. If there appears to be dust from wear on the pads, inspect the pads and replace if necessary. If the clutch cannot be adjusted tightly enough to move the gate without slipping, the pads must be replaced.
2. For operators with V-belts, inspect for wear and replace as necessary. Check for proper tension and adjust if required. Check all pulley setscrews for tightness and tighten if necessary.
3. For operators with internal chain drives, inspect chain and sprockets for wear and replace if necessary. Check for proper tension and alignment, and adjust if required. Check all hub sprocket setscrews and tighten if required.
4. Check limit switches and limit actuators (cams, limit nuts, etc.) for wear and replace as required. In rotary limit switch assemblies, wipe the limit shaft clean and apply a light coating of dry lubricant.
5. For operators with magnetic brakes, check for proper adjustment. Brake disc must run free when the brake is engaged. For brake assemblies other than C-face style, the brake should be adjusted so that the solenoid plunger throw is between 3/8" to 1/2". Too much throw will damage the solenoid. **If the solenoid emits a loud buzzing sound when the motor is run, the brake must be adjusted.**
6. In operators which have a disconnect handle, inspect disconnect handle for proper function and lubricate if necessary. Use a lithium based grease on all moving parts.
7. Inspect all nuts and bolts for proper tightness and tighten as necessary.
8. Check all reversing devices for proper function. Inspect all contact edges for wear and replace if required. Check photoeyes for proper alignment and function.
9. Check current sensing for proper adjustment when finished with inspection and maintenance.
10. Inspect the installation area. Are all the warning signs intact and visible? If they are missing or need replaced, contact OSCO. Be sure there are no control stations mounted within reach of the gate. Review safety literature with the customer and advise them to remove any such stations found.

For slide and swing gate operators, you must inspect the gate for proper operation. The gate should move easily without binding through its entire travel. If the gate does bind, adjust or fix as required. Failure to keep the gate in good working condition will have adverse effects on the operator.

GATE OPERATOR INSTALLATION CHECKLIST

INSTALLER	CUSTOMER	
_____	_____	1. The gate has been checked to make sure it is level and moves freely in both directions.
_____	_____	2. Potential pinch areas have been guarded so as to be inaccessible **OR** have contact and/or non-contact obstruction sensing devices installed.
_____	_____	3. The installer has installed one or more contact or non-contact obstruction sensing devices, in compliance with UL325 requirements for this installation.
_____	_____	4. If pedestrian traffic is expected, a separate pedestrian gate has been installed, a minimum of seven feet from the gate. The customer has been informed that all pedestrian traffic must use the pedestrian gate.
_____	_____	5. Warning signs have been installed on each side of the gate in highly visible locations. The customer has been informed that these signs must remain at all times.
_____	_____	6. There are no controls installed on the gate operator, or within seven feet of the gate.
_____	_____	7. The installer has properly adjusted the obstruction sensing feature and has tested the gate to make sure that the gate stops and reverses a short distance with minimal resistance applied (40 lbs. on a swing gate at the end of the gate, 75 lbs. on a slide gate)
_____	_____	8. The installer has instructed the customer in the proper use of the gate operator and reviewed all of the operational functions, obstruction sensing devices, warning beeper and reset, etc.
_____	_____	9. The installer has instructed the customer in the proper use of the operator's manual disconnect feature. The manual disconnect must never be used while the gate is in motion. The power switch must be turned off before using the manual disconnect and disengaging the operator.
_____	_____	10. The installer has reviewed all safety instructions with the customer, and has left the safety instructions and owner's information sheets for their reference.
_____	_____	11. The installer has answered any questions the customer has regarding the operation of the gate operator and gate operator safety precautions.
_____	_____	12. The installer has explained to the customer that a regular maintenance schedule for both the gate and the gate operator is recommended.

By signing this installation checklist, I/we hereby certify that each item listed and checked above has been covered by the installer and is clearly understood by the customer.

_____ _____

Customer Signature Date

_____ _____

Installer Signature Date