

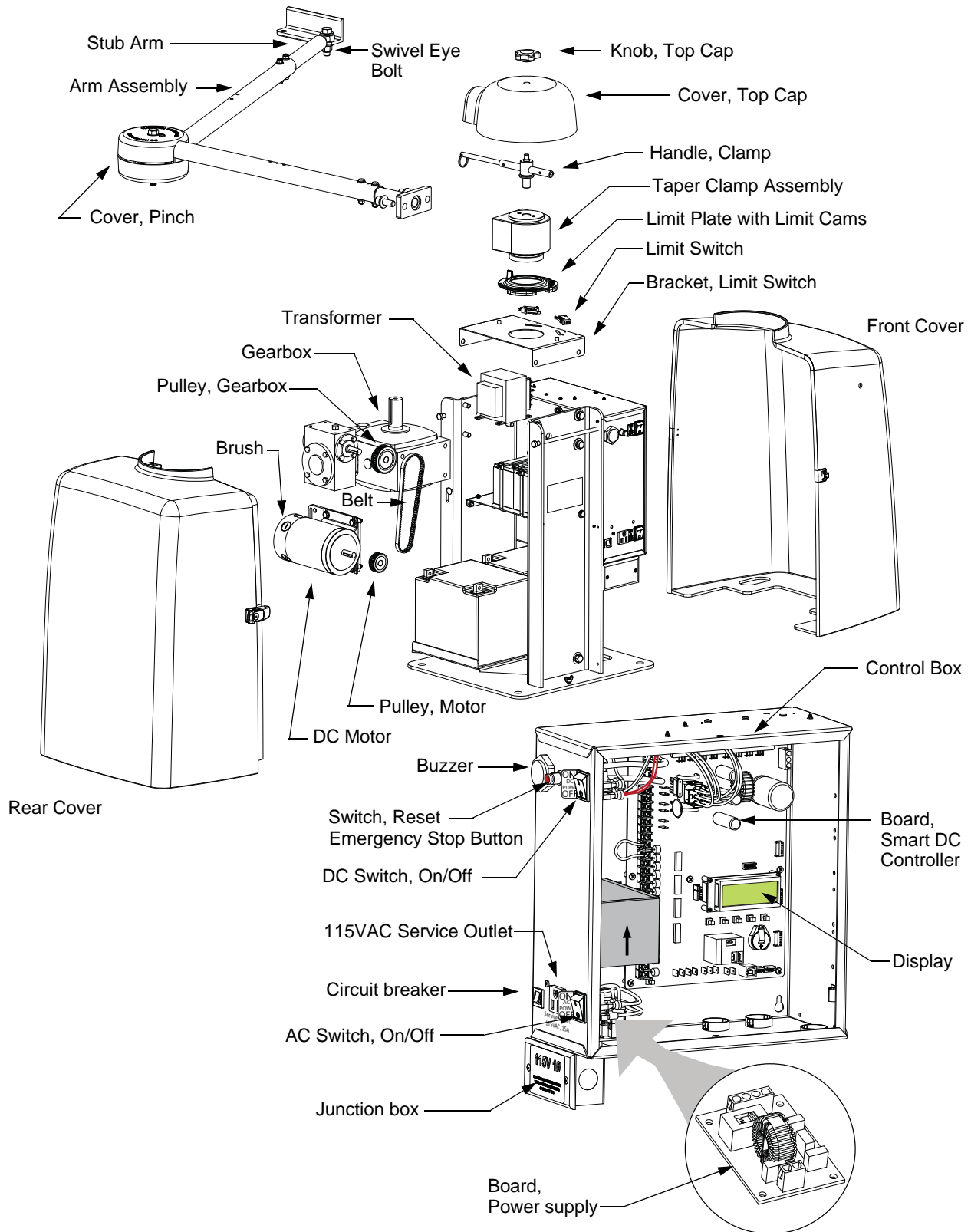
HySecurity

SwingSmart DC 20 Gate Operator SwingSmart DCS 20 Gate Operator Installation and Maintenance Manual

D0149 - Revision C
Installation and Maintenance Manual
(19 October 2010)

HySecurity
Corporate Headquarters
6623 S 228th Street
Kent, WA 98032

SWINGSMART COMPONENTS



Note: Refer to Parts & Limited Warranty for the SwingSmart parts list.

PRODUCT & WARRANTY REGISTRATION

Enter the following information to register your HySecurity product. Please write legibly.

Today's Date: _____

NOTE: To extend the operator warranty beyond 1 year, you must return this registration within 60 days of purchase. Refer to the *Limited Warranty*.

Installer Information

First/Last Name: _____

Company Name: _____

Address: _____

City: _____ State/Province: _____

Country: _____ Postal Code: _____

Daytime Phone: _____ Fax: _____

E-mail: _____

Product Information

Model name/number: _____

Serial number: _____

Purchase Date: _____

Purchase Price: _____

Distributor's name: _____

Distributor's City: _____

Country: _____

Installation Date: _____

End-user Information

First/Last Name: _____

Company/Association: _____

Address: _____

City: _____ State/Province: _____

Country: _____ Postal Code: _____

Daytime Phone: _____ Fax: _____

E-mail: _____

Who is completing this form?

- ☐ Installer ☐ End User ☐ Distributor
☐ Maintenance Personnel ☐ Other _____

Additional Comments

Did you visit the HySecurity website before purchasing your product?

- ☐ Yes ☐ No

How did you hear about HySecurity gate operators? (Check all that apply.)

- ☐ Advertisement ☐ Exhibition ☐ Distributor
☐ Business associate ☐ Other (please specify): _____

What factor(s) most influenced your purchase? (Check all that apply.)

- ☐ Performance ☐ Price ☐ Power
☐ Reliability ☐ Brand ☐ Prior Experience
☐ Recommendation ☐ Warranty ☐ Product Weight

Fax or Mail this completed form to:

HySecurity, Inc
6623 South 228th Street
Kent, WA 98032

Fax: 888-321-9946
Email: info@hysecurity.com

HySecurity provides product installation, maintenance and troubleshooting training. View opportunities online at the HySecurity website: www.hysecurity.com/support. For Technical Support, call 800-321-9947.

HySecurity does not share this warranty registration information with third parties unless the requested services, transactions, or legal requirements necessitate it.

SwingSmart Components

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Introducing SwingSmart DC

Thank you for purchasing our premium SwingSmart DC™ 20 swing gate operator. At HySecurity® Gate, Inc., we pride ourselves on quality and a number of unparalleled user benefits:

Robust - An especially strong twin channel steel chassis and adjustable taper clutch greatly improves the ability for SwingSmart to resist damage from vehicle hits on the gate. The components on the Smart DC Controller are protected by opto-isolators which shield them from power surges and lightning strikes.

Power - A variable speed control board supplies a powerful, continuous 24V DC motor which drives a 600:1 gearbox providing variable speeds. The electronics, motor and gear box are rated to operate in very broad temperatures that range from -13°F to 158°F (-25°C to 70°C). SwingSmart DC is rated for gates up to 20 feet long and 1,300 pounds.

Finesse - A variable rate of gate acceleration and deceleration, dependent upon gate weight and length, assures very smooth handling.

Adaptable - The design incorporates left and right gate arms to assure aesthetic functionality. An articulating arm is an available option which also provides adaptability to a variety of site situations.

UPS backup and Solar ready - Two 12V, 8 amp hour (Ah) batteries will provide a fully functional gate operator (up to 300 gate cycles) when AC power is unavailable. Four user-selectable UPS modes are available. 12VDC and 24VDC are available to power access controls. The unit's design also incorporates space for optional 50Ah batteries to support solar applications or usage during extended power outages.

INTELLIGENT FEATURES: SMART DC CONTROLLER™

Automatic adjustment and synchronization of bi-parting gates - The Smart DC Controller automatically adjusts the gate speed to synchronize the left and right gates so that they reach the open and close positions at the same time. Independent leaf delay adjustment for bi-parting gates is selectable in ½ second increments.

Menus and User relays - The Smart DC Controller has 48 menu items to allow installer configuration of gate function and two user relays, which can be configured for 22 different functions.

Independent adjustment for open and close gate speeds - An easy-to-use menu on the Smart DC Controller allows the installer to vary the open and close speed settings in a range between 10 and 15 seconds.

Intelligent Inherent Entrapment Sensor (IES) - Any impediment to gate travel is sensed by the system, stopping gate movement per UL 325 Safety Standards. The intelligent system monitors gate power then adapts the IES to trip at an adjustable threshold above normal power.

Improved Liquid Crystal Display (LCD) - A 32-character LCD provides increased readability for programming and troubleshooting.

USB communications port - A direct connect provides accessibility to download system diagnostics and upload system configurations using the Smart Touch Analyze and Retrieve Tool (START) software.

START software and diagnostics - With START software loaded on a laptop computer, you have an invaluable management tool for all HySecurity operators. To download this free software, visit the HySecurity website at www.hysecurity.com.

TECHNICAL SUPPORT

For technical support, call your installer or authorized HySecurity distributor. Obtain the serial number of your operator before calling. Refer to *SwingSmart Components* on the front page. For the name of a distributor near to your locale, call HySecurity at 800-321-9947.

For information about HySecurity training for installers, maintenance personnel and end-users, refer to the company website at www.hysecurity.com or call 800-321-9947.

INSTALLER'S CHECK LIST

The following list provides a high level overview of the tasks involved in installing the SwingSmart DC gate operator. Take a moment to review the list and check off the items as you complete the install.

- ☐ Site Prep - concrete pad location/dimensions/distance from gate, conduits and vehicle detector loops properly installed, gate bracket and linkage arm mounting considerations.
- ☐ Make sure gate installation complies with ASTM F2200 Specification for Automated Vehicular Gate Construction and UL325 Safety Standards. Install supplied WARNING signs on both sides of the gate.
- ☐ Check for compliance with local codes, site conditions, and NEC standards.
- ☐ Install operator on concrete pad using four ½ - 13 x 3.5inch long concrete wedge anchors.
- ☐ Temporarily attach gate bracket and linkage arm(s).
- ☐ Adjust open and close limit switches through manual operation of the gate.
- ☐ Complete gate arm installation (weld or drill and bolt).
- ☐ Hand-tighten the taper clamp to obtain a tight clutch setting.
- ☐ Install the earth ground and AC wiring connections for AC power.
- ☐ Connect battery wire to switch.
- ☐ Complete Initial Setup Menu programming.
- ☐ Review the connections on the Smart DC Controller.
- ☐ Install Master/Slave operator connections, if the site is a bi-parting gate system.
- ☐ Attach accessory devices.
- ☐ Configure the User and Installer Menu options. Program applicable settings dependent on accessory devices installed.
- ☐ Set the Close Timer (in the User Menu), if necessary.
- ☐ Check the Smart DC Controller software version. If needed, upload the latest version from www.hysecurity.com. See *Smart Touch Analyze and Retrieve Tool (S.T.A.R.T.)*.
- ☐ Remove the vent plug from the gear box.
- ☐ Give a copy of the operator instructions to the end user. Show the end user how to:
 - Remove the operator covers. Turn the power off and on.
 - Turn the DC power switch off, which disengages the motor.
 - Loosen the taper clamp and manually push the gate(s) open & close.

Note: *Remember to re-tighten the taper clamp before turning the DC power switch back on and replacing the covers.*

 - Test the red Emergency Stop Button located on the side of the control box. It can be accessed through a hole in the cover. See illustration on page S-8.
- ☐ Take photographs of the completed installation site and save them in your business files.

Safety Requirements

Automatic gate operators provide user convenience and security. However, because these machines can produce high levels of force, it is imperative that gate operator system designers, installers and end users be aware of potential hazards associated with improperly designed, installed, or maintained systems. The gate operator is only one component of the total gate operating system. It is the joint responsibility of the architect, site designer, purchaser, installer and end user to verify that the total system is appropriately configured for its intended use. Additionally, certain municipalities have established licensing, codes or regulations that regulate automated gate system design and installation. Consult local government agencies for up-to-date rules and regulations prior to gate system design or installation.

IMPORTANT SAFETY INSTRUCTIONS



A moving gate can cause serious injury or death. Start the gate operator only when the gate's travel path is clear.

Hazards, associated with automatic gates, can be reduced with proper site design, installation, and use. Installers, maintenance crews, and owners/users must read and follow the *Important Safety Instructions* in this manual and review all the literature that accompanies the product. It is important that only qualified installer's handle the installation of the SwingSmart gate operator. A "qualified" installer has one of the following:

- A minimum of three years experience installing similar equipment.
- Proof of attending a HySecurity Technical Training seminar within the past three years.
- Significant manufacturer endorsements of technical aptitude in gate operator installation and operation.

Underwriter Laboratories (UL) and the American Society for Testing and Materials (ASTM) are responsible for current safety standards and regulations regarding gate operators and automated gates. To pass UL certification, all aspects of gate installation must comply with the appropriate safety standards. For the most up-to-date, ASTM F2200 Gate and Fence Standards, refer to www.astm.org. For UL 325 Safety Standard, refer to www.ul.com.

Safety Standards - Installer's Responsibility

- Study the entire contents of this manual prior to installing, operating, or maintaining the SwingSmart gate operator. Taking extra time to align the gate operator and verify a fully functional installation will reduce maintenance, guarantee longest system life, and ensure customer satisfaction.
- Verify the gate operator usage class for the site. Refer to *Identifying Gate Operator Category and Usage Class* for gate classifications. Install SwingSmart only when the gate operator class is correct for the site, size, and type of gate.
- Install an automatic operator only on gates that comply with ASTM F2200 Gate and Fence Standards. Screen or enclose openings in the gate per UL 325 Safety Standards.

- Before attaching the operator to the gate, move the gate in both directions. Make sure it is level and moves freely. A gate that swings easily reduces strain on operator components. Gravity should play no part in the opening or closing of the gate.
 - Make sure there is a separate walk-through entrance nearby. Make certain a clear pedestrian path is designated and signs direct pedestrians to the walk-through gate. The automated gate entry is for vehicle use only. No one should cross the path of a moving gate.
 - Install the gate operator on the secure (non-public) side of the gate. Note that swing gates cannot open into public areas. Locate controls (OPEN, STOP, CLOSE) where a user will have a clear view of the gate.
 - Mount access control devices beyond reach of the gate. The control devices that operate the gate must be:
 - Located in a clear line of sight to the gate.
 - Mounted beyond 6 feet of the gate to prevent users from touching or accessing the gate while operating the controls. People attempting to access the controls by reaching through or around the gate can be seriously injured or killed by the moving gate.
 - Incorporate a security feature to prevent unauthorized use.
 - The gate operator must be properly grounded and the incoming power voltage must match the voltage label on the junction box.
 - Install enough external entrapment protection sensors so that pedestrians are protected from entrapment in both directions of the gate travel and all hazard areas and possible pinch points are fully protected. Review the information found in *Secondary Entrapment Protection Sensors*.
 - Install the supplied WARNING signs on the inside and outside of the gate so they are clearly visible from both sides of the gate. Installing the signs is a requirement for UL 325 compliance.
 - Locate controls (Open, Close, Stop/Reset) where a user will have a clear view of the gate. Refer to the *Emergency Stop Button*. Connect radio and other remote access (non-resetting controls) to the REMOTE OPEN terminal.
 - Connect radio and other remote access (non-resetting controls) to the RADIO OPTIONS terminals.
 - Open and close the gate to confirm that it was properly installed and to ensure reduced risk of entrapment. Verify the clearance between the gate and adjacent structures per UL 325 Safety Standards. Have a qualified technician test the gate monthly.
 - When you complete the installation, show the end user how to:
 - Remove the operator covers and turn the power off and on.
 - Turn the DC power switch off, which disengages the motor.
 - Loosen the taper clamp and manually push the gate(s) open & close.
- Note:** *Remember to re-tighten the taper clamp before turning the DC power switch back on and replacing the covers.*
- Test the red Emergency Stop Button located on the side of the control box. It can be accessed through a hole in the cover.

— NOTE

Gate operator instructions must be given to the owner per UL 325 Safety Standards.

Safety Standards - Owner/User Responsibility

WARNING

A moving gate can cause serious injury or death. Automatic gate operators move gates with high force. Make sure gates and gate operators are installed to reduce the risks of entrapment. Verify your gate and gate operator comply with UL 325 Safety Standards and ASTM F2200 Gate and Fence Standards. Ask for a copy of the gate operator's product literature and review it. You are responsible for educating all gate system users about proper use of the automated gate system. Failure to adjust and test the gate operator on a regularly maintained schedule can increase the risk of injury or death.

- Automatic gates are for vehicular use only; provide and maintain walkways and signs to direct pedestrians to a separate walk-through entrance.
- An automatic gate can start at any time without warning; always keep people away from the gate area.
- Never let children operate or play with gate controls. Keep all remote controls, especially radio transmitters, away from children. Do not allow children to play on or around the gate or gate operators.
- Learn how to turn the power on and off. Learn how to manually release the gate.

CAUTION

Before attempting a manual release, make sure the gate is not moving.

- WARNING signs supplied with the gate operator must remain installed and clearly visible on both sides of the gate. The signs are required to maintain UL 325 compliance.
- Never disable the Warn Before Operate buzzer and NEVER disconnect or cut its wires. The buzzer provides an alert that the gate is about to move and it must be functional in the event of entrapment regardless of UL 325 gate usage class. Disabling the warning buzzer may increase the risk or extent of injury if entrapment occurs.
- Test the gate operator monthly. Specifically, test the primary Inherent Entrapment Sensor (IES) and secondary entrapment protection sensors. The gate must reverse its direction of travel upon contact with a rigid object and/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 test the gate operator on a regularly maintained schedule can increase the risk of injury or death.
- Have a professional gate installer routinely test the entire gate operator and entrapment protection sensors. Have a qualified service person make repairs to gate hardware to keep the gate running smoothly.

Hazardous Materials and Proper Disposal

SwingSmart uses sealed, state-of-the-art Absorbed Glass Mat (AGM) batteries and highly recommends replacing used batteries with new AGM-type batteries.



The batteries used with the SwingSmart gate operator contain materials that are considered hazardous to the environment. Proper disposal of the battery is required by federal law. Refer to federal guidelines found in *Hazardous Waste Regulations*.

To reduce the risk of fire or injury to persons:

- Observe the polarity between the batteries and charging circuit.
- Never mix battery sizes, types, or brands. HySecurity strongly recommends that only sealed AGM style batteries be used.
- Exercise care in handling batteries. Be aware that the metal found in rings, bracelets, and keys can conduct electricity, short the batteries, and cause potential injury.
- Do not open or mutilate the batteries. Battery cells contain corrosive materials which may cause burns and other injuries. The material within batteries is toxic.
- Always dispose of batteries properly. Do NOT place batteries in fire. The battery cells may explode. Follow federal guidelines for proper disposal of hazardous waste.
- Replace batteries according to the instructions found in *DC Battery Replacement*.

SECONDARY ENTRAPMENT PROTECTION SENSORS

SwingSmart is equipped with a primary, Type A, inherent entrapment sensor (IES). UL 325 Safety Standard compliance requires installation of secondary entrapment protection sensors, the number of which, depends on the entrapment hazards that exist at each particular installation.

To comply with UL 325, the following external sensors may be used:

- Contact sensors, such as edge sensors
- Non-contact sensors, such as photoelectric eyes

The site designer or installer can choose either photoelectric eyes or edge sensors or use these devices in combination. Whatever devices are used, protection in both the opening and closing directions of gate travel must be provided.

The UL 325 Safety Standard for automatic swinging gates specifically requires that edge sensors or photoelectric eyes or a combination of both devices be installed to protect against pedestrian entrapment in BOTH directions of the gate travel and where an entrapment hazard exists.

PHOTOELECTRIC EYES: One or more photoelectric eyes shall be located where the risk of entrapment or obstruction exists, such as the perimeter reachable by a moving gate.



A photoelectric eye or contact sensor is also required to protect against possible entrapment if the gate opens to a position less than 16 inches (40.6cm) from any object, such as a post or wall.

EDGE SENSORS: One or more edge sensors shall be located on the inner and outer leading edge of a swing gate where the risk of entrapment or obstruction exists. If the bottom edge of the swing gate is situated more than 6-inches (152 mm) above ground level at any point in its arc of travel, one or more contact sensors must be located on the bottom edge, as well.

SENSOR SECURITY: A hard-wired sensor shall be located and its wiring arranged so that communication between the sensor and gate is not subjected to mechanical damage.

SENSOR FUNCTION and COMMUNICATION: A sensor that transmits its signal to the gate operator must be located so its signal is not impeded by building structures or other obstructions. All sensors must be installed so that they function as intended for the end-use conditions.

UL 325 LISTING: The edge sensors and photo electric eyes must be tested and labeled as “Recognized Components” under UL 325 in order to be deemed acceptable for use in a gate operator. Study the *Important Safety Instructions* and consider your specific installation to determine where the greatest entrapment risks exist. Locate edge sensors and/or photoelectric sensors accordingly.

Be certain that a sufficient number of sensors are used so that pedestrians are protected from entrapment in both directions of the gate travel and all hazard areas are fully protected. Refer to the UL website at www.ul.com for the most up-to-date list of gate operator safety standards (UL 325). Refer to www.astm.org for a complete list of ASTM F2200 Gate and Fence Standards.

Identifying Gate Operator Category and Usage Class

The SwingSmart operator, according to UL 325 Safety Standards, falls in the Swing Gate and Vertical Barrier Arm category for gate operators. It's usage class is determined by the area that the vehicular gate services.

Four different vehicular usage classes are defined by UL 325:

Class I



Class I: Intended for use in a location of one to four single family dwellings or a parking area associated with one to four single family dwellings.

Class II



Class II: Intended for use in a commercial location or building such as a multi-family housing units (five or more single family units) hotels, garages, retail stores or other buildings servicing the general public.

Class III



Class III: Intended for use in an industrial location or building such as factories or loading docks or other locations not intended to service the general public.

Class IV



Class IV: Intended for use in guarded industrial locations or buildings such as an airport security area or other restricted access location, not servicing the general public, in which access is monitored by security personnel or via closed circuitry.

Choosing Secondary Entrapment Protection

The site designer or installer must determine which secondary entrapment sensor devices will be installed with the SwingSmart operator to meet UL compliance. The type of entrapment sensor device systems are described below. For a complete listing of the requirements, see UL 325 Safety Standards.

— NOTE —

SwingSmart is equipped with a primary, Type A, inherent entrapment sensor (IES) that complies with UL 325. Any impediment to gate travel causes the gate to stop and reverse.

Usage Class	Primary Type Device	Secondary Type Device
Class I, II, III	A	B1, B2, C, or D
Class IV	A	B1, B2, C, D, or E

To comply with UL 325, refer to the chart and take the following steps:

1. Select the Usage Class according to the gate's locale and purpose.
2. The required UL 325 primary Type A sensor is an integral part of the SwingSmart system.
3. Based on the gate's usage class, choose Secondary Type Devices: B1, B2, C, D, or E.
 - To comply using B1 - install non-contact sensors (photoelectric sensor or the equivalent).
 - To comply using B2 - install contact sensors (edge sensor device or the equivalent).
 - To comply using a Type D device requires a CONSTANT HOLD push-button station. This CONSTANT HOLD push-button station must be the only device that opens and closes the gate. It can only be used where the gate and push button station will be monitored by personnel 24 hours a day in full view of the gate area. An automatic closing device (such as a timer, loop sensor, or similar device) must not be employed. A Warning placard stating, "WARNING - Moving Gate has the Potential of Inflicting Injury or Death - Do Not Start the Gate Unless the Path is Clear" must be placed adjacent to the gate operator controls.

CAUTION

While compliance is possible with Type C, which is a low force limiting clutch, the SwingSmart operator develops more gate actuation force than is permitted under the UL 325 Safety Standards and, therefore, its clutch cannot be considered an entrapment protection device.

Similar compliance issues exist with a Type E device (audio warn before operate alarm). A Type E device is permitted as a means of secondary entrapment protection by UL 325 in Class IV applications, but it is not recommended by HySecurity because a buzzer warns, but cannot protect against possible entrapment. HySecurity highly recommends, even for Class IV use, that secondary entrapment protection (edge or photo-eye sensor) devices be installed to detect possible entrapment.

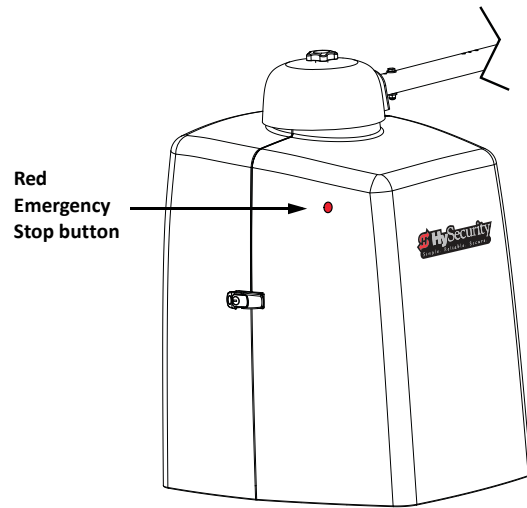
EMERGENCY STOP BUTTON

An emergency stop button that is accessible from the outside of the operator is a requirement for compliance with UL325 Safety Standards. The red emergency stop button on the SwingSmart operator is located inside a hole cutout on the cover.

Pressing the emergency stop button while the gate is opening or closing disables the automatic close timer and stops gate travel. The gate travel remains stopped until the operator receives any open or close signal.

Make sure all users of the gate know where the emergency stop button is located.

A screwdriver or hex key can be used to press lightly on the switch to activate it.



EMERGENCY RELEASE

Make sure to teach all users how to turn off electric power and how to move the gate manually. SwingSmart allows a gate to be pushed manually when the taper clamp is loosened. It is recommended that you turn off DC power which disengages the motor allowing you to easily move the gate.

When you turn DC power off, the following occurs:

- The motor disengages which keeps it from running should any relay or open/close leaf functions be set.
- The GATE NO LOAD (FAULT 4) may appear on the display.

To manually open the gate(s), take the following steps:

1. Remove the covers and turn off.
2. Extend the taper handle and loosen the clamp by turning the handle counter-clockwise. Refer to Figure 1-16 on page 1-15.
3. Swing the gate(s) open or close.

To return SwingSmart to automatic operation, take the following steps:

1. Make sure the gate(s) is not moving.
2. Tighten the taper clamp until no slippage occurs when you simulate a gate strike. Refer to *Setting the Taper Clamp* on page 1-15.
3. Flip the DC power switch ON.
4. Clear any faults by pressing STOP or RESET.

SAFETY NOTICES

The following four levels of safety notices are used where applicable within this manual; each notice contains information specific to the situation.



Indicates death or serious injury **will** occur if the hazardous situation is not avoided.



Indicates death or serious injury **could** occur if the hazardous situation is not avoided.



Indicates mild or moderate injury **could** occur if the hazardous situation is not avoided.



Indicates damage to equipment **is probable** if the hazardous situation is not avoided.

COMMON INDUSTRIAL SYMBOLS

The following international safety symbols may appear on the product or in its literature. The symbols are used to alert you to potential personal injury hazards. Obey all safety messages that follow these symbols to avoid possible injury or death.



Attention
- Take Note -



- Danger -
Keep Away



Entrapment
Zone



Possible
Pinch Point

Installation

Chapter 1

SITE OVERVIEW & PLANNING

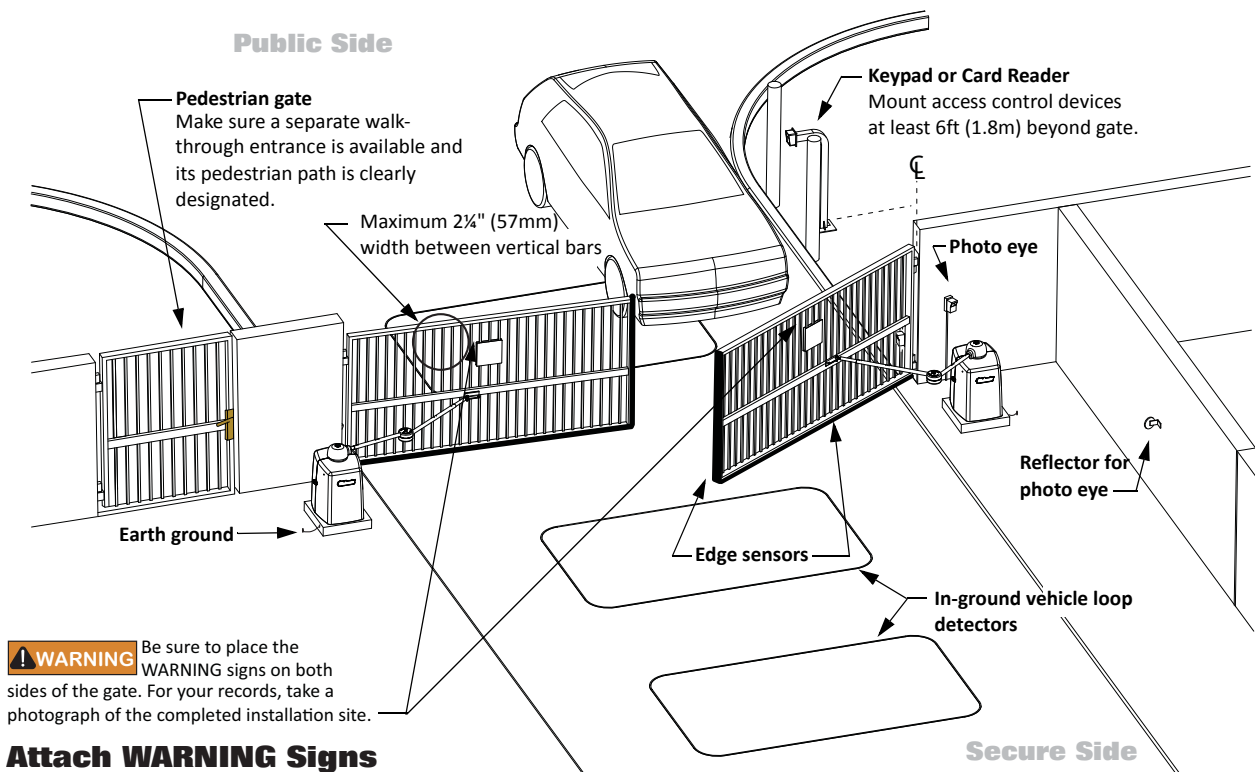


Figure 1-1.

SwingSmart DC 20

Duty cycle: continuous
 Power, single phase: Switch selectable
 115 volts, 3 amps, 50/60 Hertz
 230 volts, 1.5 amps, 50/60 Hertz
 Motor: 1/2 hp
 DC Batteries: Two 8Ah (50Ah optional)
 Gate time to open/close:
 Approximately 10 to 15 seconds
 Variable speed, open/close separately
 Gate weight: 1,300lbs @ 12ft leaf (590kg @ 4m leaf)

SwingSmart DCS 20 Solar

Duty cycle: continuous
 Solar-powered
 24VDC, 100 cycles/day requires two 10 WATT panels and a minimum of 5 solar hours/day.
 Motor: 1/2 hp
 DC Batteries: Two 8Ah (50Ah optional)
 Gate time to open/close:
 Approximately 10 to 15 seconds
 Variable speed, open/close separately
 Gate weight: 1,300lbs @ 12ft leaf (590kg @ 4m leaf)

Note: For more specifications, refer to the last page in this manual.

PAD CONDITION

Pouring the Concrete

1. Follow the local building codes to identify the frost line and determine the required depth of the concrete pad. HySecurity recommends a minimum 16-inch (40.6cm) depth with a minimum 2-inch (51cm) extension above ground level. Refer to Figure 1-2 and Figure 1-3.
2. Before pouring the pad, consider conduit placement so it fits within the confines of the cutout in the SwingSmart base plate as shown in Figure 1-3. Run separate conduits for:
 - high voltage wiring (115-230V supply power) including equipment ground
 - low voltage wiring (12V and 24V accessory power) including:
 - vehicle loop control wiring
 - master/slave connections
 - earth ground (NEC/NFPA)

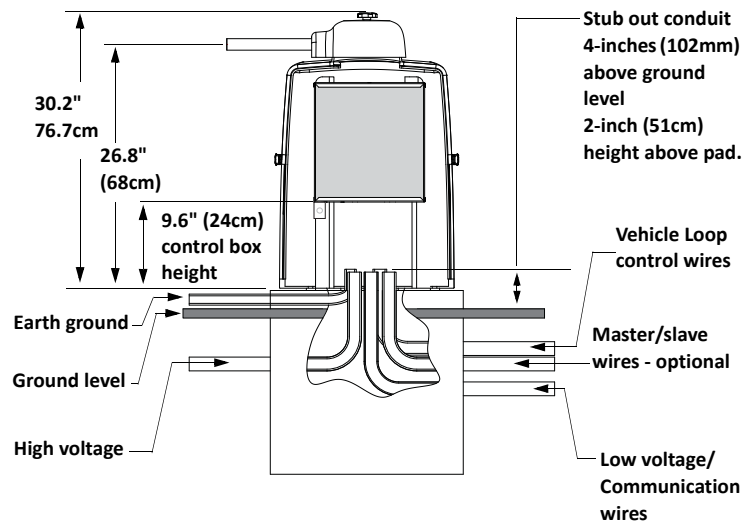


Figure 1-2.

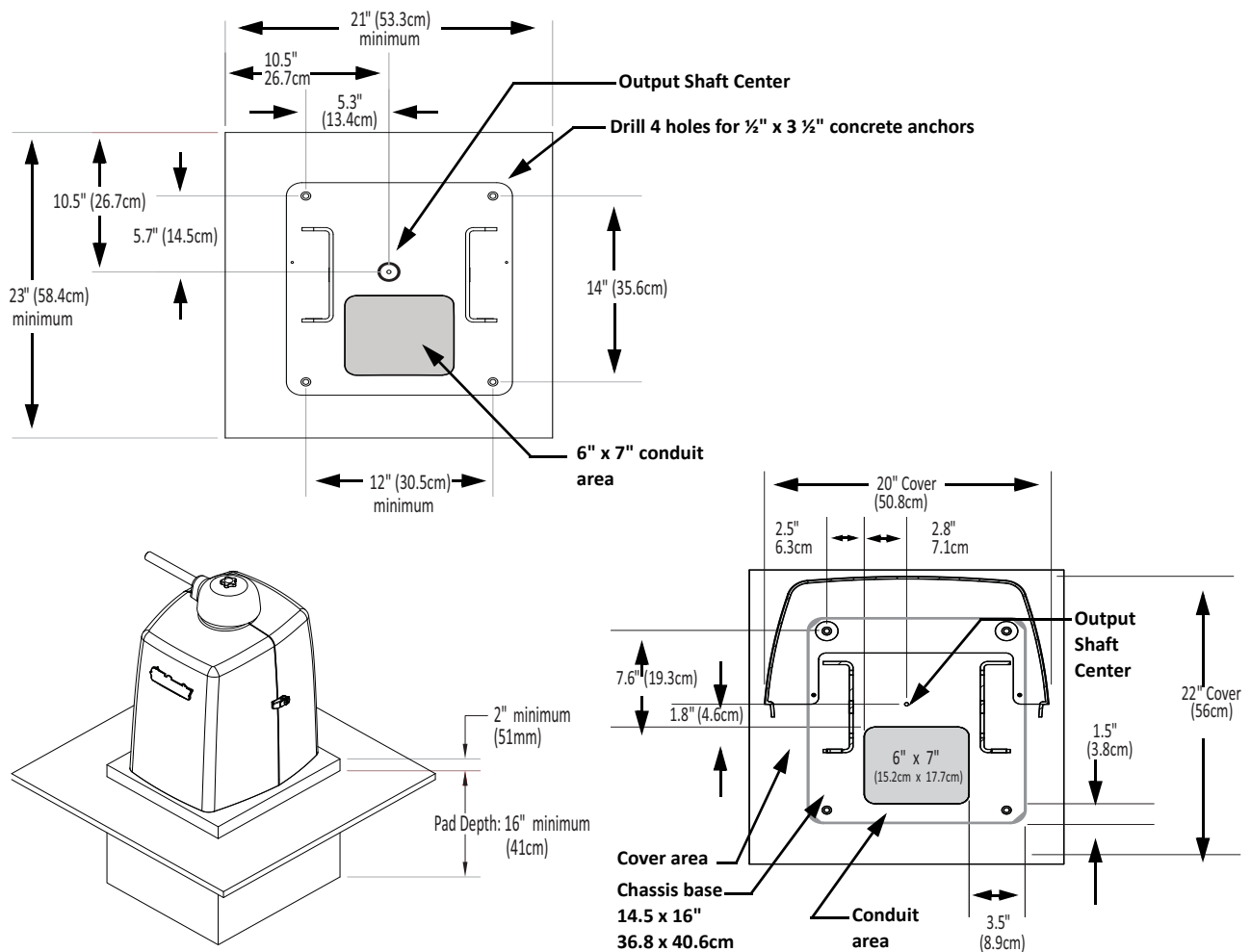


Figure 1-3.

NOTE

SwingSmart provides a 6 x 7-inch (15.2 x 17.7cm) cutout in its chassis base for conduit. Refer to Figure 1-3. The design also provides a 9.6-inch (24.4cm) height between the control box and chassis base for pulling and placement of wires.

3. Extend conduit height 2-inches (51mm) above the pad (4-inches/102mm above ground level). Make sure the concrete forms are square with the gate and the pad is level. Refer to Figure 1-3 for minimum pad dimensions.

CAUTION

Be sure to restrict conduit to the 6 x 7-inch (15.2 x 17.7cm) cutout in the chassis base if you plan to use the extended battery backup kit. The area designed for the optional dual 50Ah batteries may be obstructed if conduit is routed elsewhere. Refer to *Installing the Extended Battery Backup Kit*.

Using an Existing Pad

In many applications, SwingSmart may be a replacement operator for an existing gate system. Make sure the pad is level and inspect the pad for:

- Compliance with local building codes.
- Appropriate distance from the gate. Refer to Figure 1-3.
- Appropriate dimensions for SwingSmart installation.
- Durability.

To use an existing pad, take the following steps:

1. Remove any existing equipment from the pad.
2. Measure the pad to ensure it is sized properly for SwingSmart.
3. Mark the center shaft location.
4. Follow the steps in *Mounting the Operator*.

CAUTION

Consider positioning the operator so existing conduit exits through the cutout in the SwingSmart base plate. Cutting small holes in the base plate for pre-existing conduit is permissible, but not recommended because it can impair the strength of the chassis and void the Limited Warranty.

UNPACKING THE OPERATOR

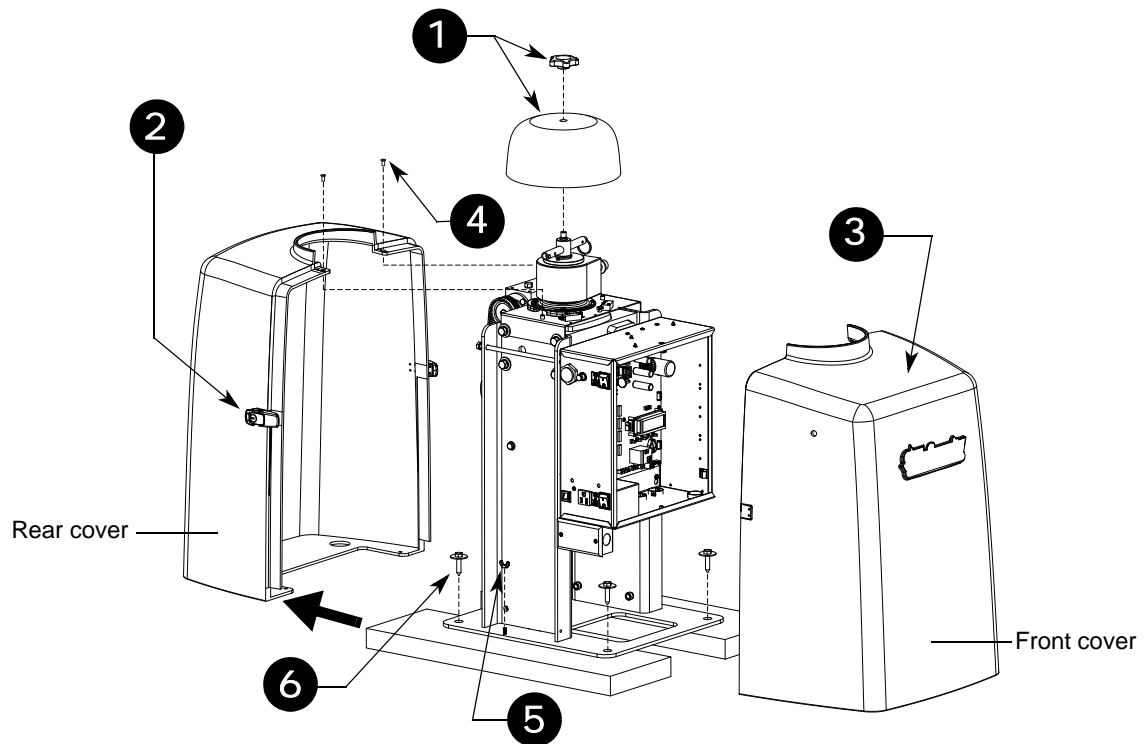


Figure 1-4.

Prepare the gate operator for installation. See Figure 1-4.

1. Remove the top cap by unscrewing the knob.
2. Unfasten the side cover latches.
3. Remove the front cover.
4. Use a Phillips-head screwdriver to remove the two screws that secure the top of the rear cover. Set the screws aside.
5. Remove the two wing nuts that secure the rear cover to the base plate and set the rear cover aside. Set the wing nuts aside.

— NOTE —

Do not lose the Phillips-head screws or wing nuts as they are used to secure the rear cover when the installation is complete.

6. Remove the four lag bolts and separate the operator from the shipping boards.

MOUNTING THE OPERATOR

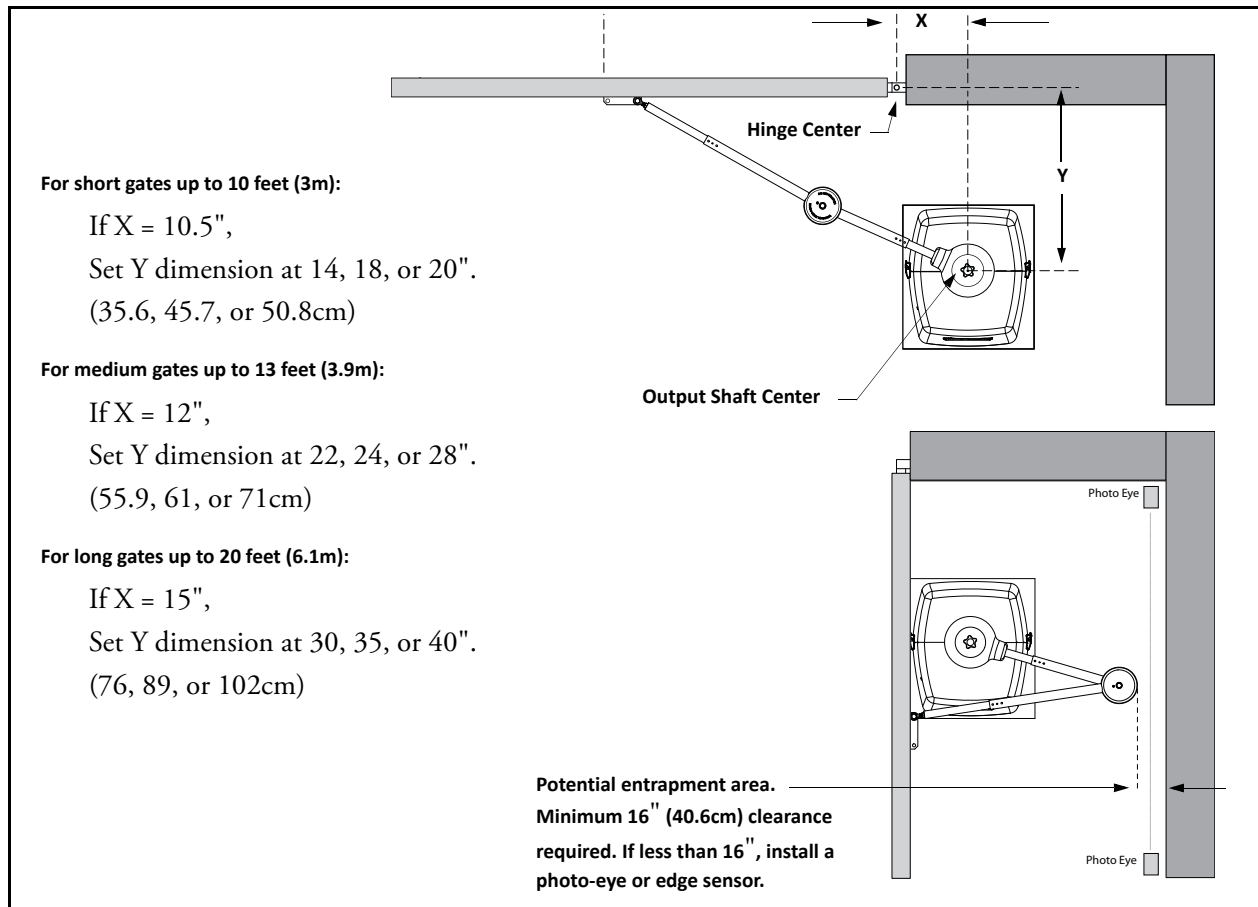


Figure 1-5.

Install the operator, by taking the following steps:

1. Assess any limitations in the surrounding area such as curbs, walls, or bushes.
2. Before placing the operator on the pad, measure and mark the output shaft center on the concrete pad by selecting the X and Y dimensions. Refer to Figure 1-3 and Figure 1-5.
3. Set the operator base on the concrete pad and use it as a template. Position the operator base so the center mark on the pad aligns with the small hole in the base plate. Mark the fastener and conduit cutouts. Remove the operator from the concrete pad and drill the holes for the concrete anchors.
4. Mount the operator with four $\frac{1}{2} \times 3\frac{1}{2}$ -inch concrete anchors as shown in Figure 1-6.

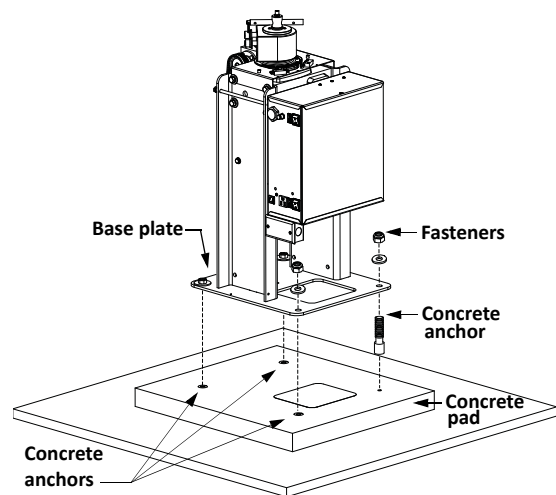


Figure 1-6.

GATE BRACKET AND LINKAGE ARMS

Installing the Gate Bracket

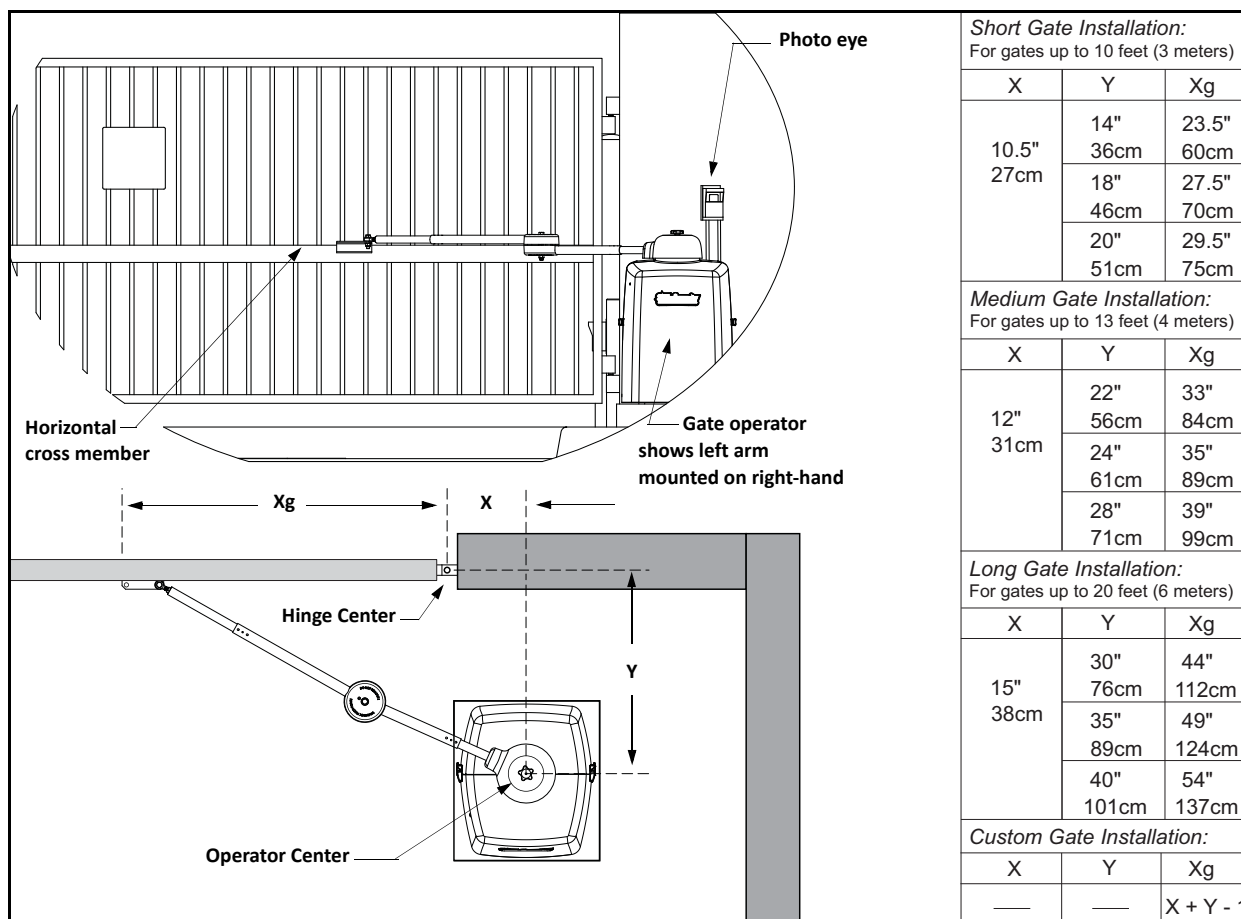


Figure 1-7.

1. Secure the gate to prevent movement.

CAUTION

If vertical bars make up the gate design, be sure to install a horizontal cross member to provide the necessary support to the gate arm. Do not mount the bracket to a small number of vertical pickets. Pickets will bend in the event of a gate strike.

2. Determine the proper position of the gate bracket. Use the chart for reference.
Hint: Determine if you have a short, medium, or long gate. If the X and Y dimensions in the chart are the same as your install, set the gate bracket at the Xg dimension. If your install does not fit to the chart specs, use the Custom Gate Installation formula to determine the proper gate bracket placement.
3. Measure and position the gate bracket so it is level with the arm on the operator. Clamp the gate bracket to the horizontal cross member.

Attaching the Stub Arms

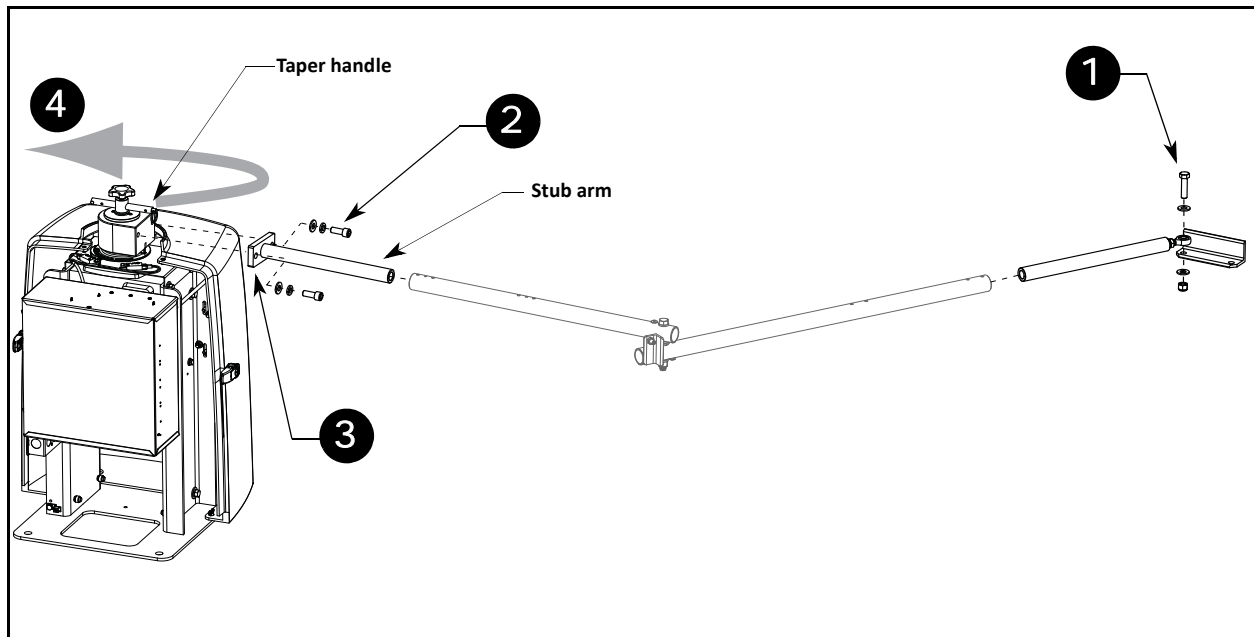


Figure 1-8.

1. Attach the swivel eye bolt to the gate bracket using the fasteners provided.
2. Remove the fasteners from the taper clamp assembly.
3. Align the stub arm and secure it to the taper clamp assembly using the fasteners removed in step 2.
4. Pull the taper handle to lengthen it. Adjust the handle so the ball detent fits into its cutout and secures the handle length. Turn the handle counterclockwise to loosen the taper clamp. Figure 1-8.

— NOTE —

Do not retighten the taper clamp. It needs to remain loose for manual gate adjustments.

Installing the Linkage Arms

— NOTE —

SwingSmart operators ship with a standard left-hand linkage arm. The left-hand linkage arm can be used on a right-hand operator (and vice versa) by flipping the arm. This causes the gate attachment point to be approximately 2-inches (51cm) higher which means the gate bracket needs to be positioned accordingly. For aesthetics and ease of installation, order a left-hand and right-hand arm for bi-parting systems.

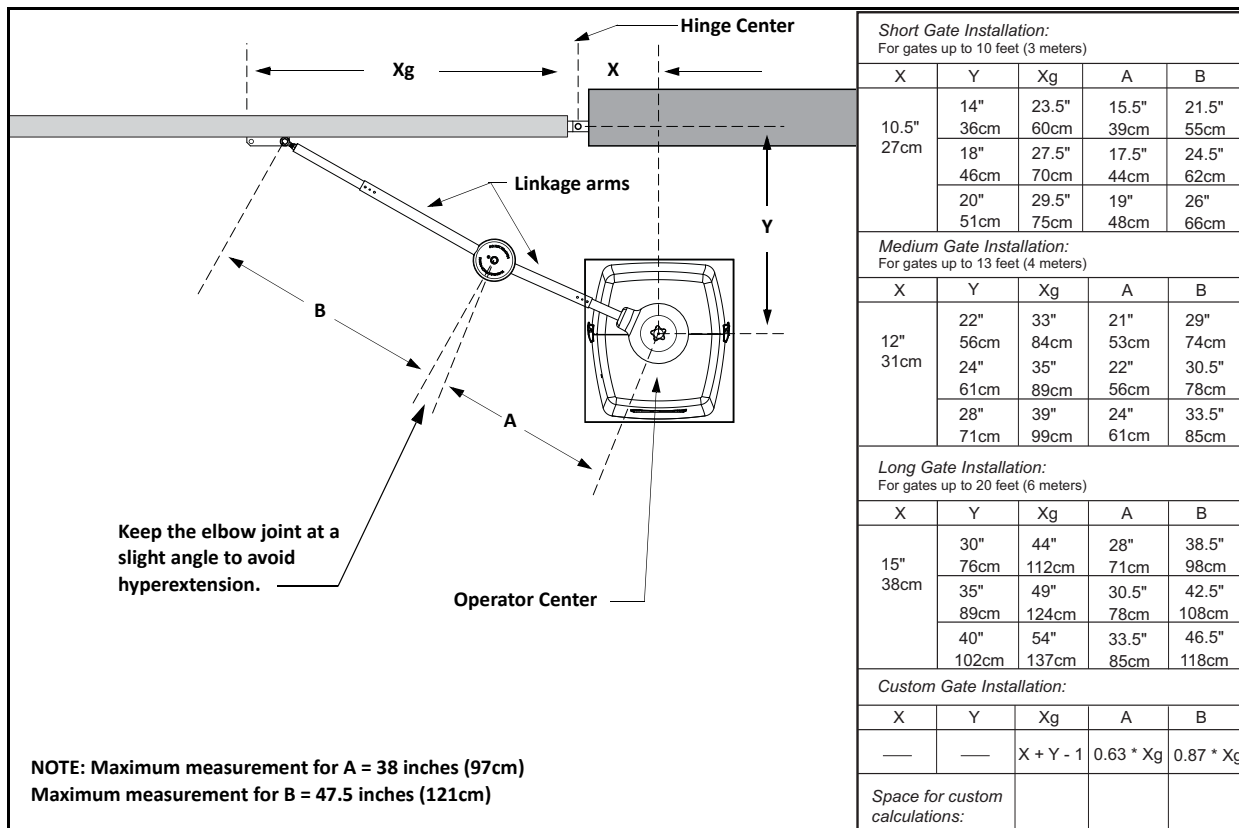


Figure 1-9.

- Slide the linkage tubes on the appropriate stub arms and use the tapped holes for adjustment purposes. Tighten the hex-head bolts to hold the arms in place. Refer to Figure 1-10.
- Verify the A and B dimensions on the arm linkage tubes. For short gate applications, the linkage arms must be cut to achieve the required lengths. See Figure 1-9. If your operator position does not fit the chart specs, use the Custom Gate Installation formula to determine the proper length.

Operator Placement & Gate Arm Geometry for 100° through 130° opening					
° of Swing	X	Y	Xg	A	B
100°	20"	24"	36"	24"	36"
	51cm	61cm	91cm	61cm	91cm
110°	26"	24"	39"	28"	40.5"
	66cm	61cm	99cm	71cm	103cm
120°	32"	20"	41"	31.5"	44"
	81cm	51cm	104cm	80cm	112cm
130°	38"	18"	44"	36"	47.5"
	97cm	46cm	112cm	91cm	121cm
NOTE: Maximum A = 38" (97cm) Maximum B = 47.5" (121cm)					

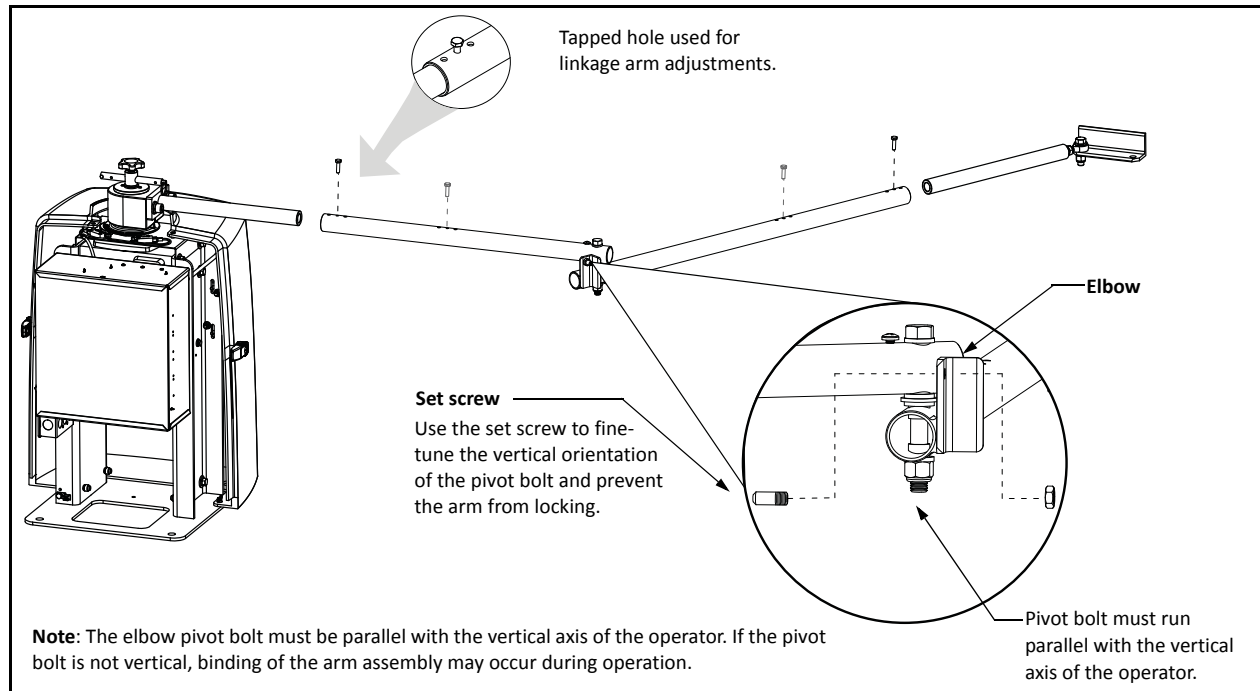


Figure 1-10.

— NOTE —

The linkage tubes used for the arm can be drilled and bolted or welded together. Do the finishing work AFTER the arm and gate adjustments are complete. See *Completing Gate Arm Installation*.

3. To verify appropriate arm length, manually push the gate to the full open and close positions. Maximum security is obtained when the elbow on the linkage arms is slightly bent with the gate closed and at an approximate 90° angle with the gate in the open position. See Figure 1-11. Refer to NOTE on page 1-11.
4. During the open and close process:
 - Verify all pivot joints rotate smoothly without binding. At the full open position, linkage arms must not scissor or bind.
 - Make sure the longer arm (B) does not collide with the top cap cover.
 - See Figure 1-10 and make adjustments to arm lengths by:
 - loosening the set screws
 - telescoping the arms
 - retightening the set screws

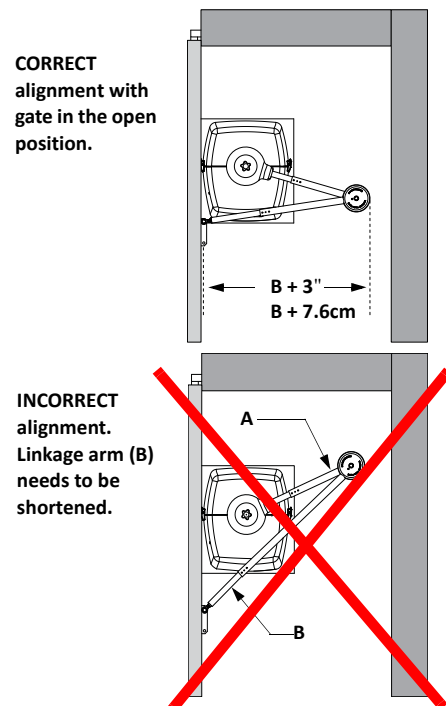


Figure 1-11.

Adjusting the Limit Switches

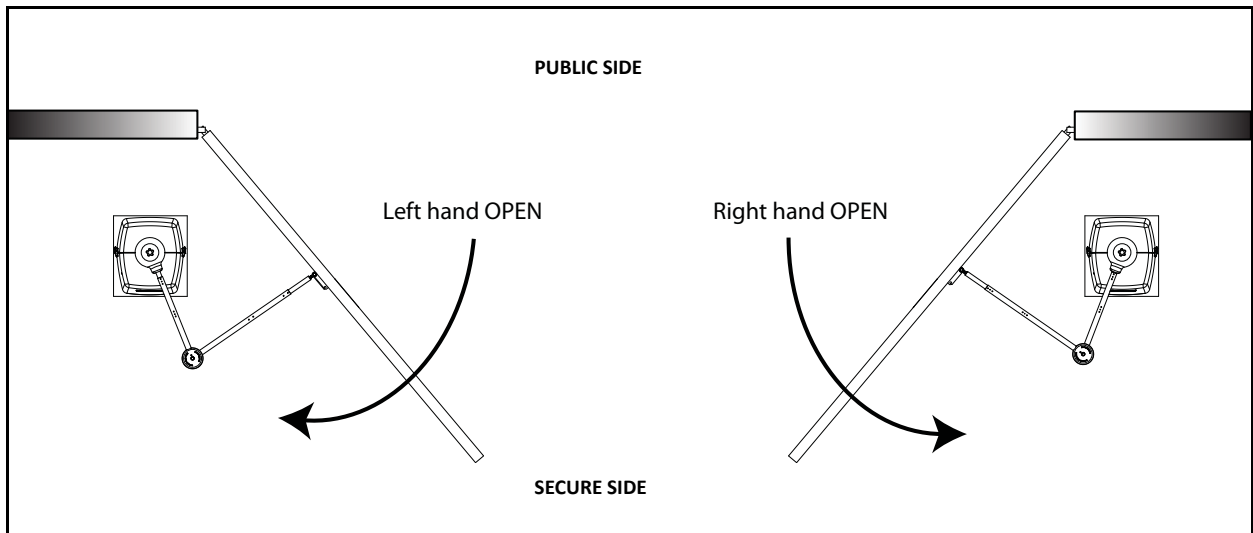


Figure 1-12.

1. Determine whether the gate operator is a right-hand operator or left-hand operator. See Figure 1-12. Stand on the secure side of the gate. If the gate opens to the right, it is a right-hand operator.

— NOTE —

For a right-hand operator, the OPEN switch is the left limit switch as shown in Figure 1-13. The opposite occurs in a left-hand operator; the OPEN switch becomes the right limit switch.

2. To adjust the limit cams, use a Phillips-head screwdriver and loosen the fastener that secures each limit cam to the limit plate.
3. Manually, open and close the gate. Move the limit cams so they trip the appropriate limit switch at the full OPEN and full CLOSE positions.
4. Secure the limit cams by retightening the two Phillips-head screws.

A fin on the limit plate fits into the taper clamp. This feature ensures the limits always track the gate arm position even if the gate is struck and the taper clamp slips.

Note: When reassembling the taper clamp, make sure the limit plate fin is seated into the slot on the taper clamp.

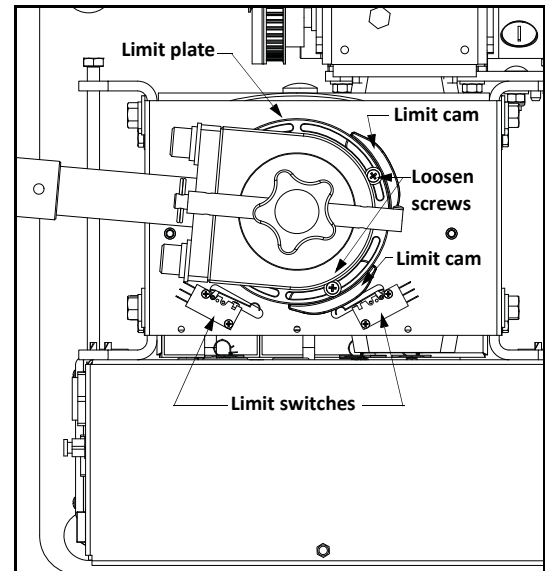


Figure 1-13.

Completing Gate Arm Installation

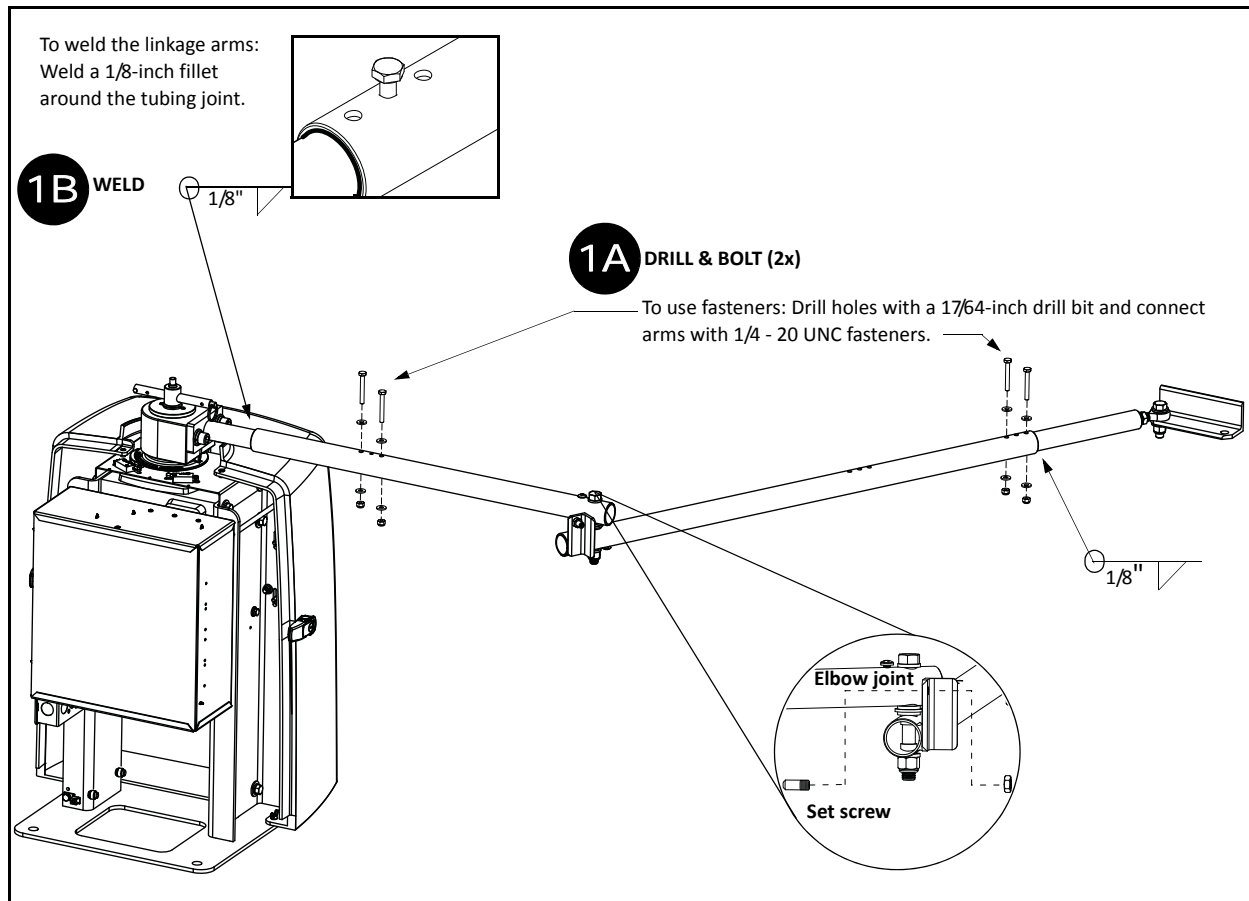


Figure 1-14.

1. To determine whether you should drill & bolt or weld the linkage arms, you should take into consideration site planning and future impact to gate arm installation. Check whether fire bans exist at your site. Fire bans do not permit outdoor welding.
2. Paint exposed areas to prevent rusting.

CAUTION

For sites where incident of gate strikes are high, HySecurity recommends setting the elbow with a slight offset at the full close position. Use the supplied set screw to prevent the arm from locking. The intent of the offset is that, upon gate strike, the elbow will bend and the taper clamp will slip, minimizing damage to the gearbox and operator. Be aware if the elbow is set straight and a gate strike does occur, the full force of the impact will be transferred through the linkage arms and into the gearbox causing possible damage to the gearbox and operator.

- 1A** DRILL & BOLT: If you plan to use fasteners, drill holes through the linkage arms. Refer to Figure 1-14.
- 1B** WELD: If you plan to weld the linkage arms, weld a 1/8-inch fillet around the tubing joint. Only weld at sites where outdoor welding is permitted.

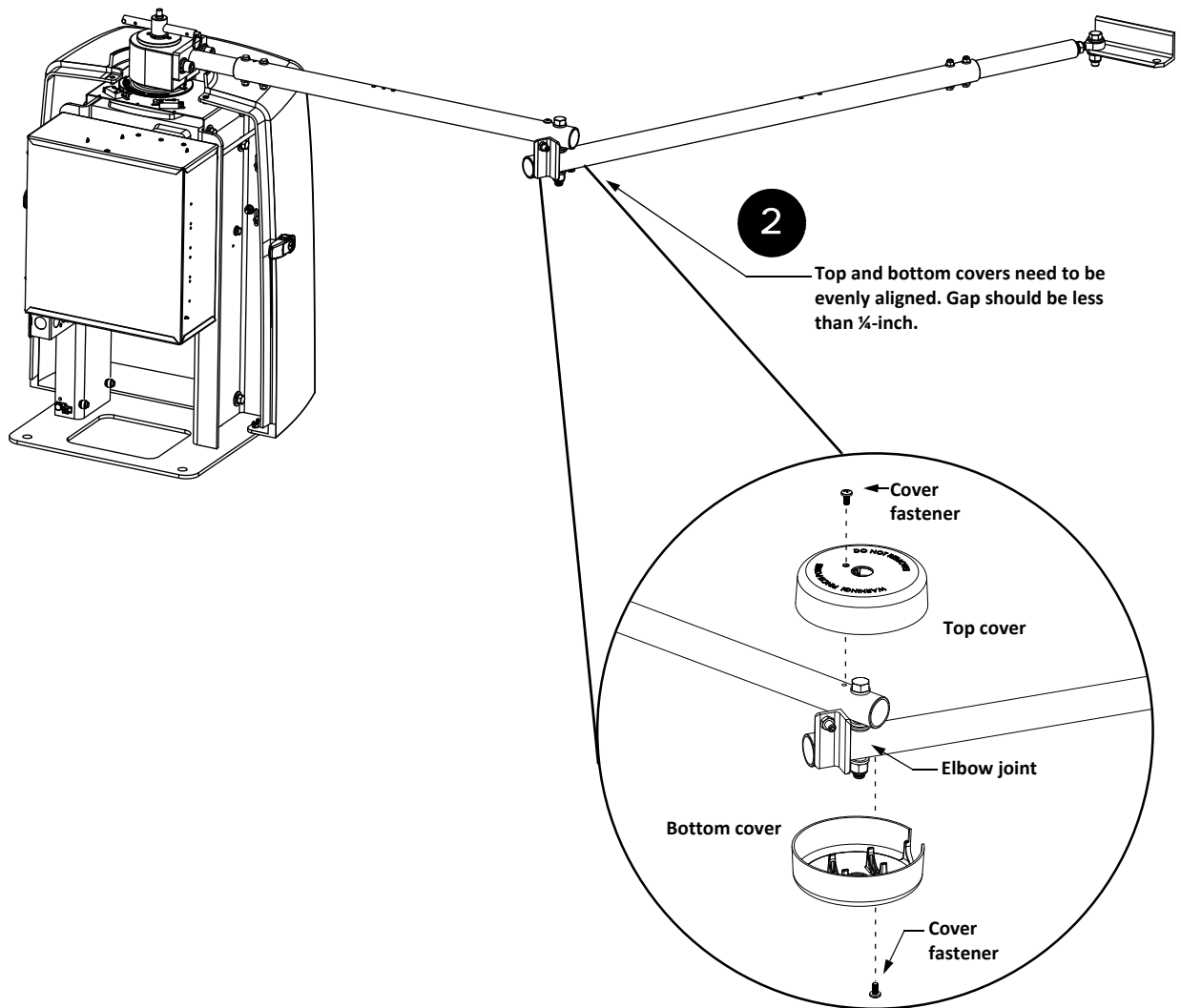


Figure 1-15.

— NOTE —

The two elbow joint cover fasteners are shipped with the covers.

3. Place the covers over the elbow joint.
4. Align the mounting holes and cutouts in the covers with the gate arms.
5. Make sure the gap between the top and bottom covers is evenly aligned. See Figure 1-15.
6. Insert the two fasteners and secure the covers.

⚠ CAUTION

It is critical that you install the elbow joint covers to comply with UL325 Safety Standards. The elbow joint is considered a pinch point and serious injury may occur if the covers are not secured properly to the gate arms.

Articulating Arm Option

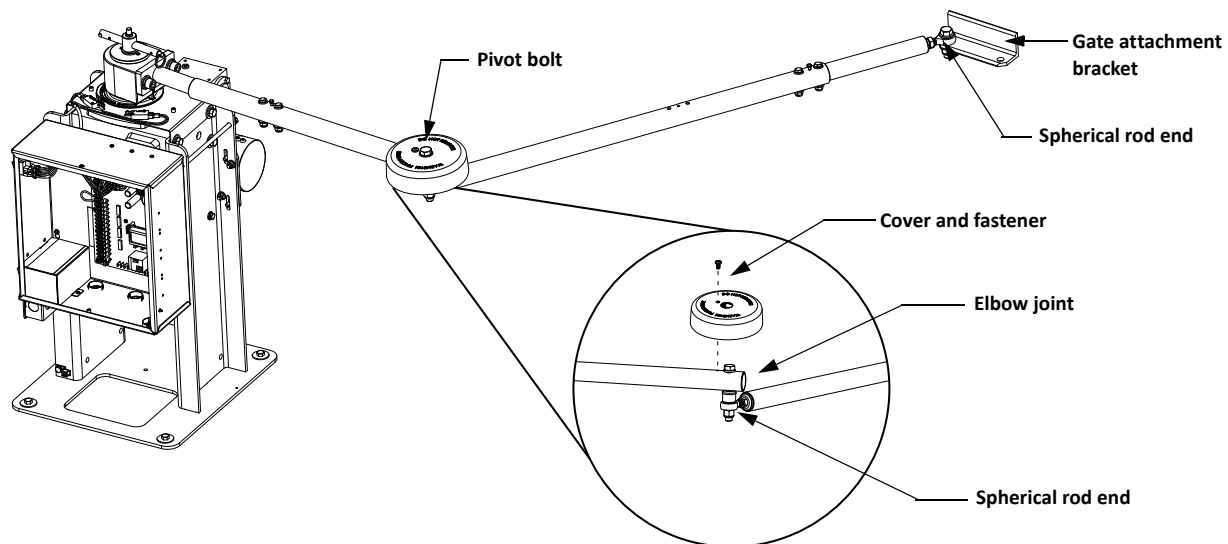
The articulating arm assembly uses a spherical rod end at the elbow and at the bracket mount. Situations where you might use this option include:

- The operator pad or gate is not level. The spherical rod ends on the articulating arm forgive minor discrepancies where the hardware may not be perfectly plumb.
- The gate arm is not horizontal.

By ordering the articulating arm assembly for use in these situations, the binding stress between the operator and gate hardware is reduced.

NOTE

Although some sites necessitate fastening a gate arm to the gate at an angle, HySecurity does not recommend it. The preferred method is an installation where the gate arm remains horizontal throughout gate travel.



When installing an articulating arm assembly, be sure to take into account the following guidelines:

- A gate must be neutrally balanced. To comply with ASTM F2200 General Requirements, a gate must be designed, constructed and installed in such a way that its movement is not initiated by gravity when the gate operator is disconnected or loses power.
- The over-extension stop on the standard HySecurity gate arm does not exist on the articulating arm. To avoid hyperextension, mount the arm so a slight bend at the elbow joint is maintained in the gate closed position. This slight bend may prevent damage to the operator during a gate strike because it allows the elbow to bend properly and permits the taper clutch to slip thereby reducing the impact to the operator.
- Due to the flexibility in the elbow joint, only one pinch protection cover is used.

CAUTION

If the gate arm is mounted at a slight angle, test the operation of the gate several times. Be sure to check for clearance issues. If possible pinch points exist, make sure to adjust the gate arm and eliminate any clearance issues or pinch points.

Setting the Taper Clamp

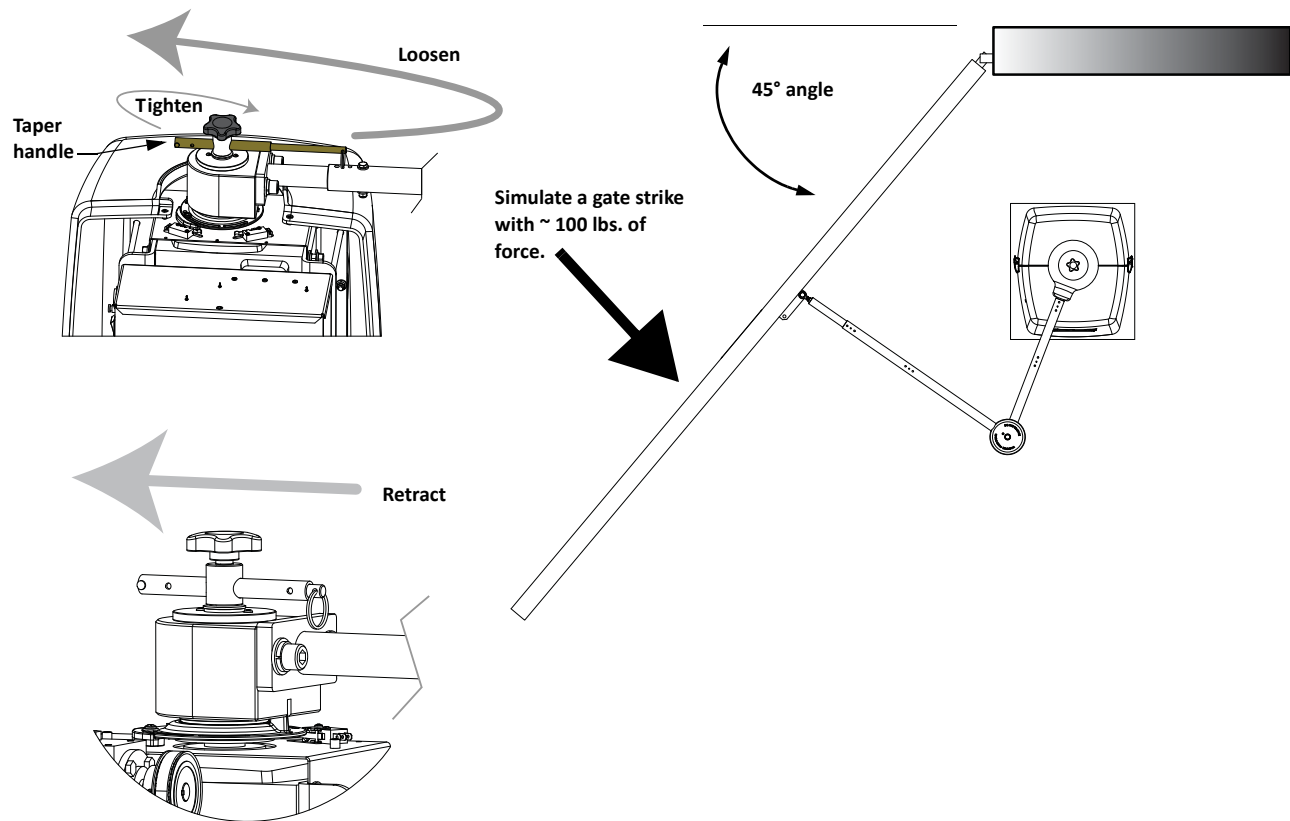


Figure 1-16.

— NOTE —

Setting the taper clamp with the gate closed impedes traffic flow. If vehicles need to pass through the gate area, delay setting the taper clamp until after the operator has been configured to run. Refer to Chapter 3, *Configuring the Setup Menu*.

The taper clamp is made of two pieces: a cone-shaped hub fits into a taper clamp assembly. The more you turn the taper handle clockwise the harder it becomes to slip the clutch.

1. To loosen and release the taper clamp, extend the taper handle and turn the handle counterclockwise. See Figure 1-16.
2. Manually, swing the gate half way between the open and closed position (approximate 45° angle).
3. To tighten the assembly, turn the taper clamp handle clockwise in 1/8-inch (3.2mm) increments. A large amount of torque is not required in order to obtain a tight clutch setting.
4. Push the gate end with approximately 100 pounds of force to simulate a gate strike. If the taper clamp slips, use the taper handle to further tighten the assembly.
5. Continue to adjust the taper clamp until no slippage occurs.
6. Retract and center the taper clamp handle.

Removing the Vent Plug

To complete the installation, be sure to remove the small red vent plug found on top of the gear box.

CAUTION

Remove the red vent plug prior to leaving the installation site. Removing the red vent plug improves breathability which increases shaft seal life.

1. Use a long flat blade screwdriver with a small tip and slide it beneath the chassis (limit plate cover) to hook the top of the red plug.
2. Leverage the tip and slide the red plug out of the vent cap. Refer to Figure 1-17.

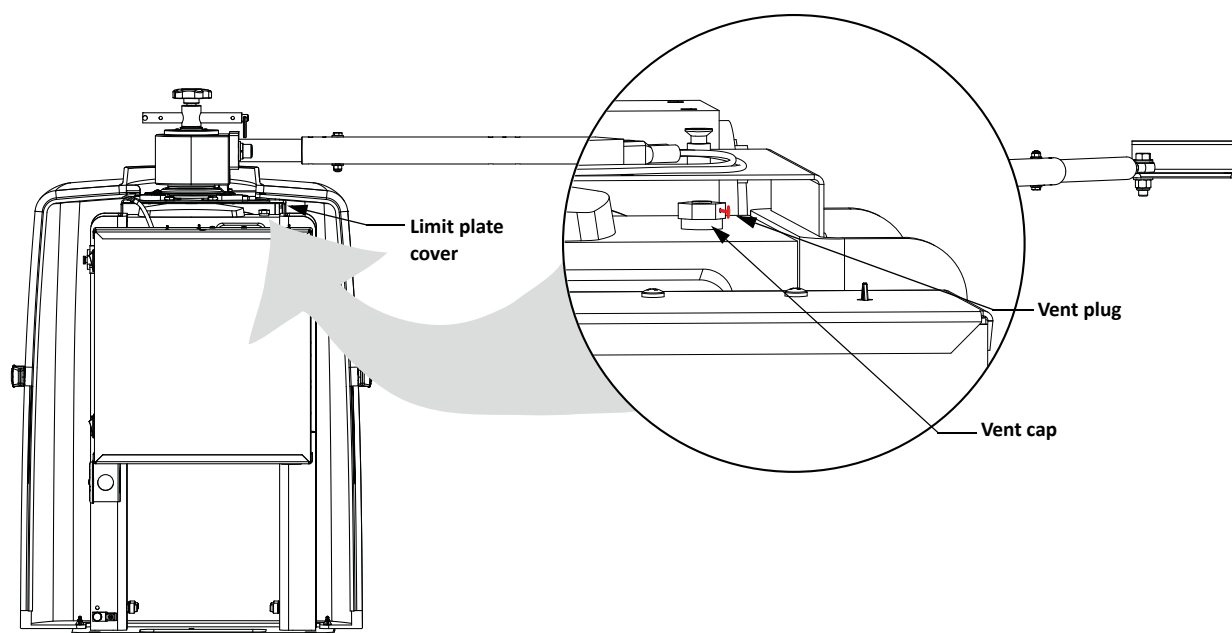


Figure 1-17.

Power

Chapter 2

INSTALLING THE EARTH GROUND

An earth ground refers to the grounding rod and accompanying equipment ground which need to be installed to safeguard against potential electrical shock and damage to personnel and equipment.

! DANGER

The potential for lightning discharge exists with all gates, fences and gate operators. National Electric Code (NEC) requires a separate earth ground in addition to the required equipment ground.

HySecurity recommends grounding the operator with a separate earth ground connected to a ground rod to assure proper operation and shield it against electromagnetism and other electrical signals that may cause erratic operation with or damage to the Smart DC Controller.

— NOTE —

If you do not ground the operator with a separate earth ground rod, you risk voiding the Limited Warranty.

For earth grounding requirements, refer to the National Fire Protection Association (NFPA) 780 - *Standard for the Installation of Lightning Protection Systems*. Highlights of the standard include.

- The ground rod is a solid copper rod: minimum requirements: 5/8" (16mm) diameter and 10 feet (3m) in length.
- The ground rod is driven into the earth (refer to local codes for proper depth requirements).
- The ground rod is electrically bonded to the chassis with a single length of un-spliced 6AWG copper wire less than 3 feet (91cm) long.
- Local jurisdictions may impose additional requirements above the NEC and NFPA 780. Consult the local codes and regulations regarding requirements in your area.

Take the following steps to comply with NEC and NFPA 780 standards:

1. Install a grounding rod per local building codes. See Figure 2-1.
2. Attach a large earth ground wire (6AWG) from the grounding rod to the lug nut on the base of the chassis.
 - *New site:* Run the 6AWG wire through the concrete base and into the cutout on the chassis base.
 - *Existing site:* Run the 6AWG wire beneath the rear cover. Make sure the covers align and side latches lock properly.

Properly grounding the gate operator is critical to gate operator performance and the life of its electrical components. Use sufficient wire size during installation. Refer to *Wiring 115VAC Power* or *Wiring 230VAC Power*.

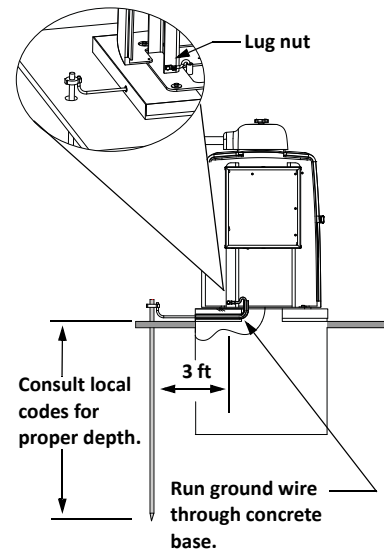


Figure 2-1.

WIRING AC POWER

! DANGER

Turn off AC power at the source (circuit breaker panel) before accessing the wires in the SwingSmart junction box. Follow facility Lock Out/Tag Out procedures. Make sure both the DC and AC power switches, on the side of the SwingSmart control box are in the off position. See Figure 2-2.

! CAUTION

Wiring of gate operators must conform to the NEC standards and comply with all local codes. If you plan to connect to 230VAC power, read the WARNING in Figure 2-2. The voltage selector switch on the AC Power board must be moved to the 230V position or damage to the operator will occur and void the Limited Warranty.

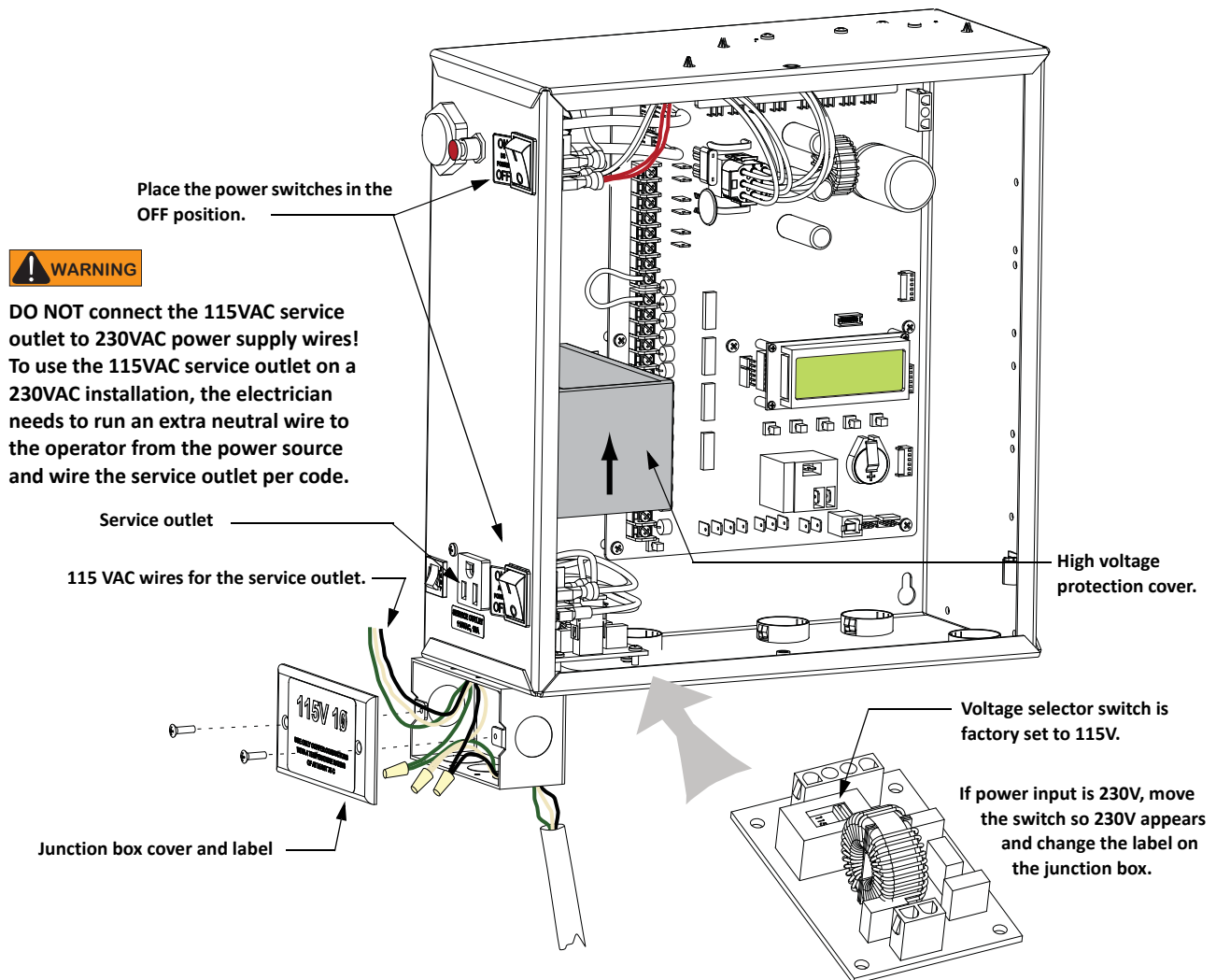


Figure 2-2.

Wiring 115VAC Power

For standard 115VAC power connection:

- Verify AC power supply wires and low voltage (12V & 24V accessory power wires) run through two separate conduits. The higher voltage from the AC power supply may cause interference and anomalies in SwingSmart operation if the high and low voltage wires are routed through the same conduit.
- Current draw is 3 Amps on a dedicated circuit (15A dedicated circuit is recommended).
- Make sure proper wiring is being used. The following table shows the maximum allowable wire run from the power source to the operator for various wire sizes.

Table 2-1. Wire Gauge versus Run

AC Power	14 gauge wire	12 gauge wire	10 gauge wire
One operator 115V	730 ft (223 m)	1200 ft (366 m)	1900 ft (579 m)
Two operators 115V	460 ft (140 m)	750 ft (228 m)	1160 ft (354 m)

Note: Table 2-1 assumes a dedicated circuit with an accessory power load up to 2A. Additional loads require that the wire size be increased or the distance of the run be decreased.

To connect to 115VAC power, take the following steps:

1. Make sure the AC power is turned off at its source and the DC and AC power switches on the operator are in the off position.
2. Access the input power wires and service outlet wires by removing the two Phillips-head screws that secure the high voltage junction box cover. See Figure 2-2.

— NOTE —

The service outlet wires are solid copper and are labeled and bound together to keep them separate from the AC power switch wires.

3. Wire nut or crimp bond the power supply wires to the black and white lead wires coming from the AC power switch (no label).
4. Wire nut or crimp bond the equipment ground wire to the green ground wire in the junction box.
5. To activate the 115VAC service outlet, include the black and white outlet lead wires and the green ground wire in the connections made above.
6. Neatly organize all wire connections and replace the high voltage junction box cover. Secure it with the two Phillips-head screws.

Wiring 230VAC Power



All SwingSmart operators are shipped from the factory as 115VAC units. When connecting to 230VAC power, the voltage selector switch on the AC power board must be moved to the 230V position or damage to the operator will occur and void the Limited Warranty.

- Verify AC power supply wires and low voltage (12V & 24V accessory power wires) run through two separate conduits as discussed in *Wiring 115VAC Power*.
- Current draw is 1.5 Amps on a dedicated circuit (15A dedicated circuit is recommended).
- Make sure proper wiring is being used. The following table provides the size wire for distance (in feet) from the power source to the operator:

CONNECTING DC POWER

To connect the DC power:

1. Turn off the DC and AC power switches.
2. Slide the plastic cover off the control box.
3. Attach the red spade connector to the battery terminal on the DC power switch. See Figure 2-4.

Note: For extended battery backup installation, refer to the *Installing the Extended Battery Backup Kit instructions*.

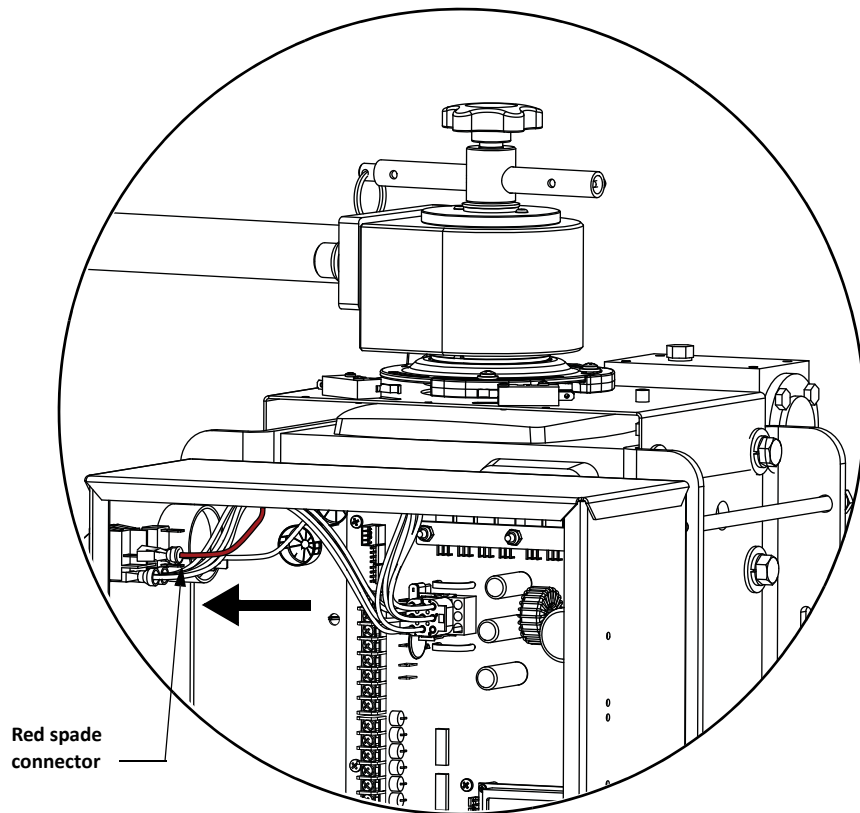


Figure 2-4.

USING A SOLAR POWERED OPERATOR

HySecurity offers a solar version of the SwingSmart operator: SwingSmart DCS20. The solar model has different internal wiring and includes software programmed for solar use. The Smart DC Controller has a built-in charger which allows a 24V solar panel (or two 12V panels) a direct connection to the SwingSmart operator with no additional electronic devices required.

— NOTE —

Solar panels are NOT included in the purchase of the SwingSmart DCS 20 Solar operator. Also, adapting a standard SwingSmart DC operator to a solar application is not recommended. For ease of installation and proper functionality, be sure to order a SwingSmart DCS 20 for a solar-powered site.

To plan a solar-powered site, read through this entire section. Keep in mind that the SwingSmart DCS 20 operator does not have the following components:

- Transformer
- AC power supply board
- AC service outlet
- Various wiring adaptations that are standard in a SwingSmart DC 20 operator

Design Requirements & Considerations

Two standard 8Ah batteries are supplied with SwingSmart DCS 20 and nominally support up to 100 cycles per day based on the following:

- Battery storage capacity based on 5 solar hours per day. See Figure 2-7.
- 20WATT solar panel system (minimum requirement). See Figure 2-5.
- A gate weight of 750lbs (340kg) and gate length of 12ft (3.7m)
- Connection to two HY-5A and one multi-code radio receiver. Note that if connected properly, photo eyes are not considered in the power load because the Smart DC Controller only powers the photo eyes when the motor engages. Refer to *Installing Photoelectric Sensors For Secondary Entrapment Protection Only*.

— NOTE —

The available 50Ah battery option supports more peripheral connections because of its higher storage capacity. A higher energy storage capacity provides a higher sustained current draw. If the solar operator will be opening and closing more often at night or in low solar hour conditions, consider using the 50Ah option and two 20WATT panels (for a total capacity of 40 WATTS).

The design of the solar-powered site is important in maintaining the highest gate cycle capacity and extending the life of the batteries. The construction of a solar-powered gate and its cycle capacity is significantly affected by the following:

- Energy demand of the peripheral devices. The more energy efficient the device the less power draw occurs to the batteries.
- Solar hours at the site. “Solar hours” relate to the amount of energy delivered by the sun and absorbed by the solar panels. It is NOT the same as the number of daylight hours available at the site. See Figure 2-8.
- Design considerations must use calculations that are figured for the darkest months of the year (typically December/January). Higher wattage panels may be required.
- Impediments to the sun’s rays reaching the solar panels. Elements such as, shade, improper alignment, or dirty panels will reduce the amount of power available.

— NOTE —

Solar panels must not be shaded (not even partially) or the output power will be significantly reduced. Panels must be kept clean as small areas of sunlight blockage cause a large reduction in output power. Alignment is also critical because the rated wattage output is based on the solar panels being mounted perpendicular to the angle of the sun’s rays midday on winter solstice (December 21st).

- Extreme temperatures affect battery life. Keep the batteries away from temperatures above 90°F (32°C). See *Important Considerations for DC-powered Operators*.
- Good gate hardware and smooth, unobstructed gate travel lowers the operator’s power draw and serves to extend battery life.

— NOTE —

Any solar systems that are designed close to the minimum margins will stress and shorten the battery life and risk unreliable operation, especially in periods of inclement weather.

Connecting the SwingSmart DCS 20 to Solar Power Panels

1. Use 14 gauge wire or larger to connect the solar panel(s) within 100ft (30.5m) of the operator. Check NEC and local regulations if other distances apply.
2. Use one 24VDC solar panel or two 12VDC solar panels in series with a total capacity of at least 20W. Mount them according to the manufacturer's installation instructions.
3. Make sure both DC power switches on the SwingSmart control box are in the OFF position, and then remove the two Phillips head screws that secure the 24VDC cover to the junction box.
4. Wire nut or crimp bond the solar panel wires to the black and red input wires. See Figure 2-5.
5. Wire nut or crimp bond the equipment ground wire to the green ground wire in the junction box.

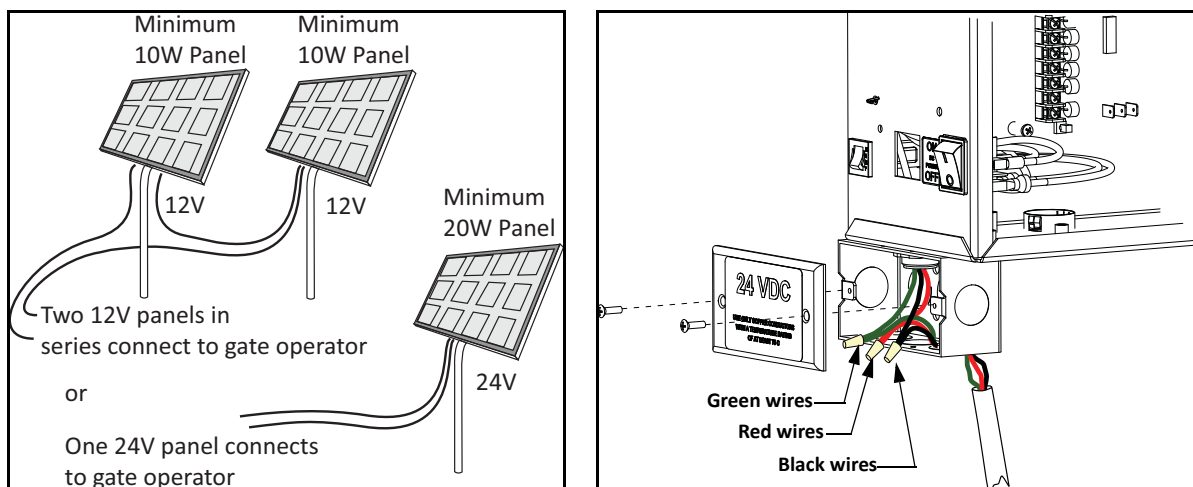


Figure 2-5. Solar Panels and Wiring Connections

— NOTE —

For extended battery backup installation instructions, refer to *Installing the Extended Battery Backup Kit*.

6. Slide the plastic cover off the control box and attach the red spade connector to the battery terminal on the upper DC power switch. See Figure 2-6.
7. Turn both DC power switches ON and program the Smart DC Controller. See *Configuring the Setup Menu*.

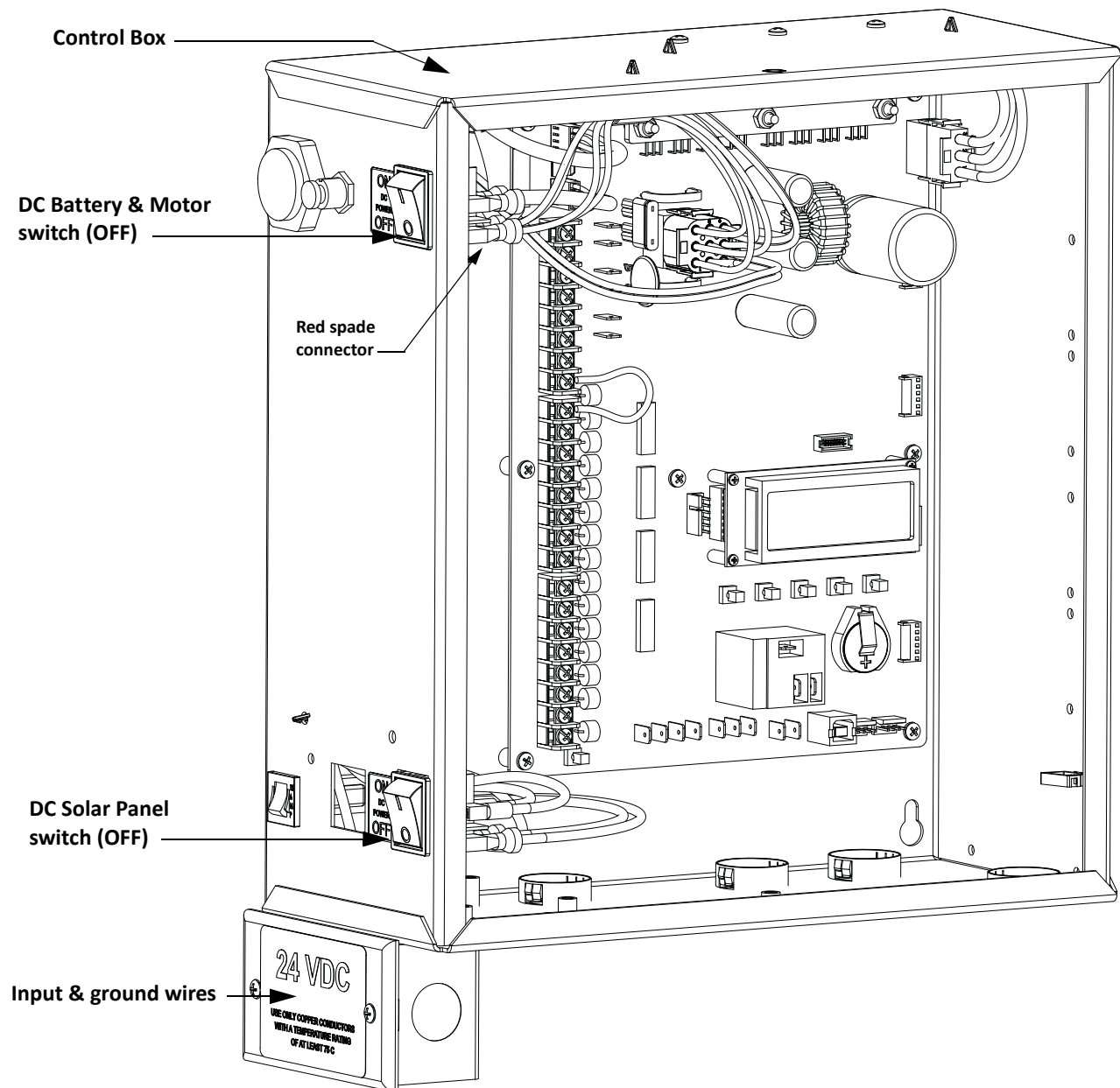
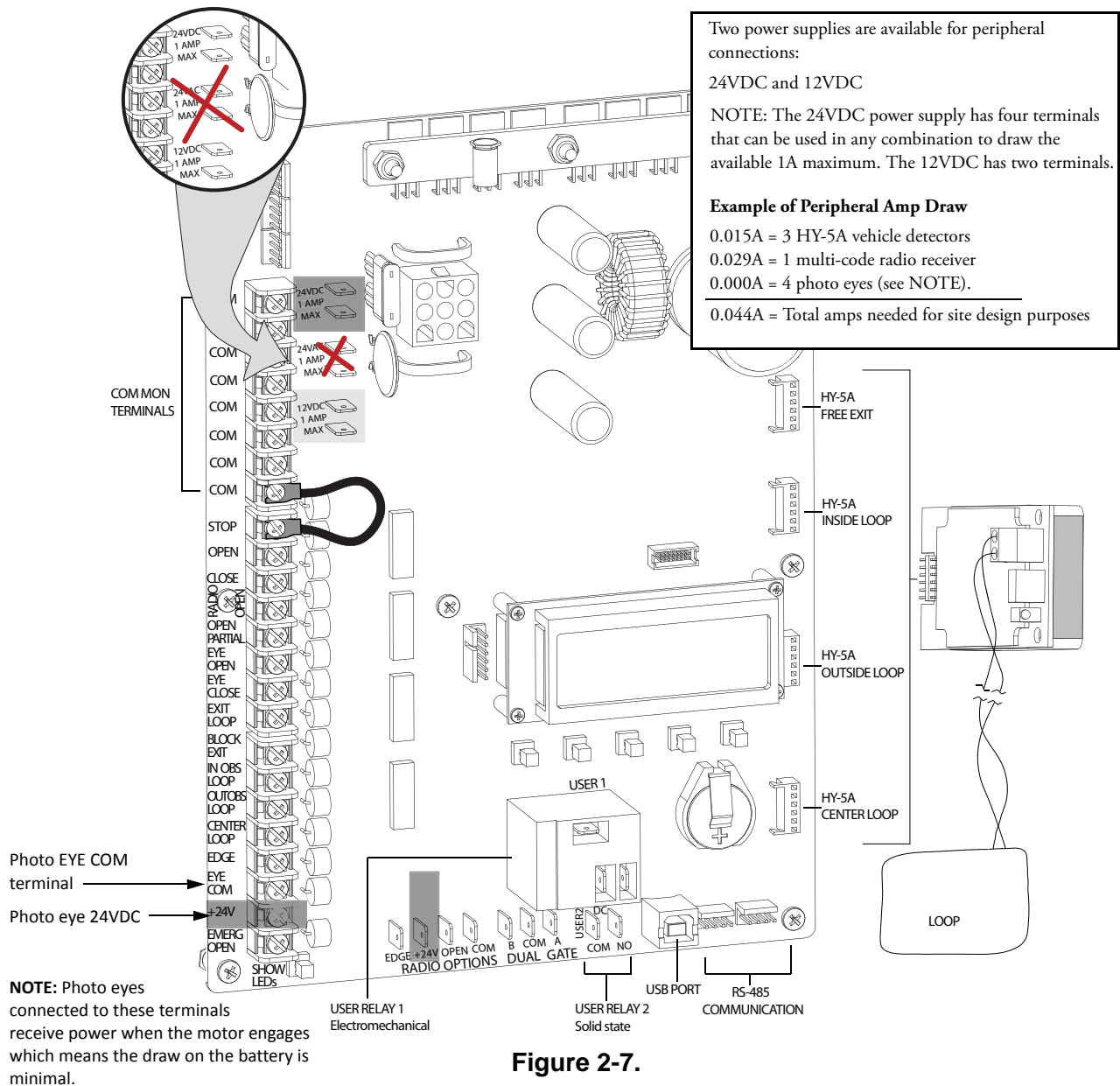


Figure 2-6. SwingSmart DCS 20 Control Box

Connecting Peripherals to Solar Operators

CAUTION

The 24VAC power supply shown in Figure 2-7 is not to be used for peripheral connections because the 24VAC terminals are directly connected to the solar panel inputs. Any peripherals attached to the 24VAC terminals could be severely damaged due to varying voltage levels.



To connect any peripheral devices to a solar operator, use the 24VDC or 12VDC terminals. Because a solar operator gets its energy from the sun and stores the energy produced by the solar panels in batteries that are constantly discharging, it is important to use peripheral devices that draw and consume as little power as possible.

For example, the Smart DC Controller has specific connections for photo eyes. When you attach photo eyes for entrapment protection, you have the option to wire the photo eyes to the EYE COM and +24VDC. When wired to these connections, the photo eyes only draw power when the motor engages, thereby extending battery life. The same can be said for HY-5A vehicle detectors which draw a minimal 0.005A per detector; compared to box detectors which usually draw, at minimum, 0.009A. For more information on photo eyes, refer to the section titled *Installing Photoelectric Sensors For Secondary Entrapment Protection Only*. To review information about vehicle detectors, refer to *Installing Vehicle Detectors and Loops*.

Understanding Gate Activity based on Solar Zones

Use the solar maps to determine the number of solar hours per day that can be reasonably expected in a particular zone. The number of solar hours per day affects the amount of gate travel powered by the SwingSmart solar operator.

— NOTE —

Remember, the sun is the only source of energy. If you need to increase the number of gate cycles per day, additional solar panels may be required. Also, the greater the battery capacity, the longer the operator can cycle the gate on cloudy days without the recharge provided by the solar panels. Sites requiring more cycles per day or those sites located in less sunny climates, need larger capacity batteries. HySecurity offers a 50Ah battery option which provides six times the storage capacity of the standard 8Ah batteries.

Map Legend

Solar hrs/day	Gate cycles/day using 8Ah batteries
5.0	100 (20W panel)
4.5	60 (20W panel)
4.0	48 (20W panel)
3.5	34 (20W panel)
3.0	20 (20W panel)
2.5	6 (20W panel)

The chart is based on a 20 Watt (24VDC) solar panel system with SwingSmart powering a 12 foot (3.6m), 750lbs (340kg) gate with the following peripherals attached:

- One low current multi-code radio receiver
- Two HY-5A vehicle detectors

The number of amps that the peripherals draw coupled with the cycles of operation occurring throughout the *night* determines the battery capacity required.

The number of amps that the peripherals draw coupled with the cycles of operation during the *day*, determines the solar panel size needed.

NOTE: HySecurity provides a 50Ah battery option for sites where more peripherals may be attached or inclement weather is an issue. For sites of this nature, consider a 40W system. A 40W system increases the capacity shown in the chart above.

Four Week Average, December 7 - January 4

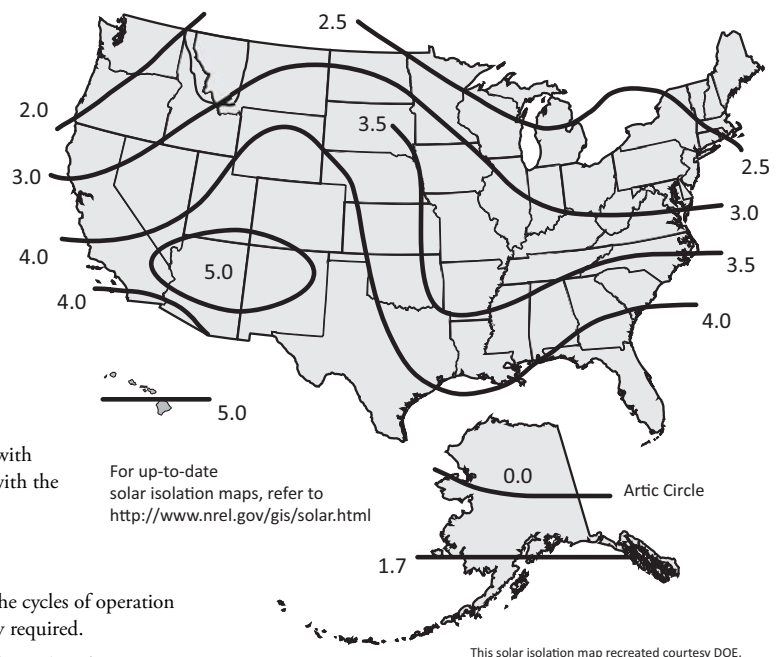


Figure 2-8.

IMPORTANT CONSIDERATIONS FOR DC-POWERED OPERATORS

- Since the operator is intended to run on batteries, control of the load is important. Gates that move easily and do not bind will drain less energy from the battery, preserving capacity for more cycles during a power failure.
- Be certain to observe polarity when connecting the batteries or adding accessories. Reversed polarity may result in a non-functional operator or damage to a component. Red (+) is positive and black (-) is negative. If shorted, the batteries will generate a very high current. The batteries are connected in a series circuit: Join the positive (+) terminal from one battery to the negative (-) terminal of the next battery.
- Batteries have a finite life and age more quickly when exposed to temperatures above 80°F (27°C). Battery temperatures above 104°F (40°C) are damaging and significantly shorten battery life.
- As the batteries age, they will progressively lose their capacity to store energy. If the total amount of back up capacity is critical, plan to replace the batteries after two years of use especially in hot climates. Properly discard used batteries. Refer to *Hazardous Materials and Proper Disposal*.

WARNING

Batteries contain sulfuric acid. Acid in your eyes, on your skin, or on your clothing can cause injury and severe burns. If batteries are dropped or damaged dispose of them properly.

- Batteries are rated to perform to capacity at certain temperatures. Variations in temperature affect performance of the batteries. An example of amp hour performance is shown in Table 2-3. HySecurity mounts the battery pack near the transformer to provide residual heat around the batteries which guards against amp hour loss in colder climates.

Table 2-3.
Amp Hour - Example of Battery Performance

Temperature	Capacity
77°F (25°C)	100
32°F (0°C)	80
-22°F (-27°C)	50

- HySecurity uses a permanently sealed AGM-type battery which last much longer than wet cell batteries and needs no maintenance over its life span. Batteries are protected from over discharge by a low voltage sensing circuit. The charger circuit regulates to allow high charger output when the battery is partially discharged. The charger circuit automatically reduces the output to near zero as the batteries become fully charged.

NOTE

The SwingSmart operator stores all User and Installer Menu settings in non-volatile memory (EEPROM). Configurations are saved if a power loss occurs and reinstated once power is restored.

Installing the Extended Battery Backup Kit

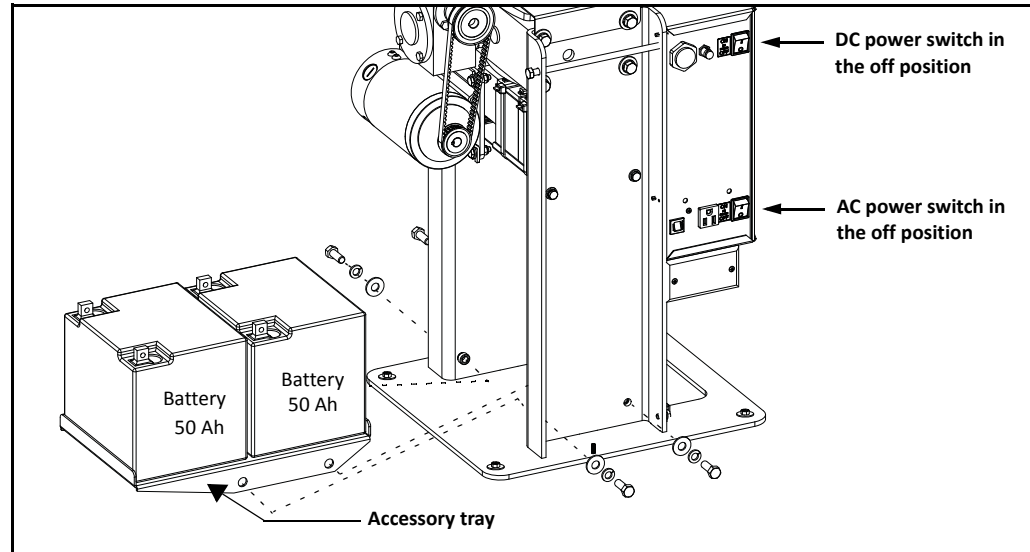


Figure 2-9.

HySecurity offers extended DC power back up option with two 50Ah batteries. Contact HySecurity parts department to order extended battery backup kit (P/N MX001810).

To install the extended battery backup kit:

1. Turn off the DC and AC power switches.
2. Unlock side latches to remove the SwingSmart front cover. Remove the two Phillips-head screws and the two wing nuts that secure the rear cover. Set the covers aside.
3. Cut the two black zip ties which secure the 8Ah batteries to the tray.
4. To access the 8Ah batteries and disconnect its wires, remove the two screws closest to the motor and loosen the other two screws that secure the support tray as shown in Figure 2-10.
5. Carefully rotate the support tray to access the battery wires. Lift the 8Ah batteries from the support tray. Disconnect the black and blue wires and set the 8Ah batteries aside.
6. Return the support tray to it's original position and secure it properly.

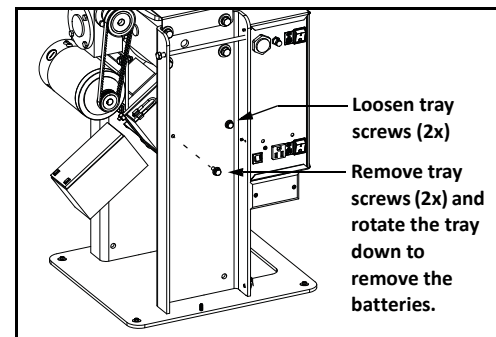


Figure 2-10.

! DANGER

Make sure both the left and right 8Ah DC battery wires are disconnected. Remove the batteries from the unit and properly store or discard them. Refer to *Hazardous Materials and Proper Disposal*. Never mix battery sizes, types, or brands. HySecurity strongly recommends that only sealed AGM style batteries be used.

7. Place the 50Ah battery tray between the chassis posts and secure it using the four fasteners provided in the kit. See Figure 2-11.
8. Situate the two 50Ah batteries on the tray.
9. Attach the blue wire from the red terminal on one 50Ah battery to the black terminal on other 50Ah battery.
10. Run the 8Ah wire harness through hole in the 8Ah battery support tray.
11. Using the wires attached in the 50Ah battery kit, attach the red wire to the red positive terminal on the 50Ah battery. Connect its opposite end to the red lead exiting the support tray. Connect the black wire to the black negative terminal on the 50Ah battery. Connect its opposite end to the black lead exiting the support tray.
12. Access the Installer Menu on the Smart DC Controller.
13. Change the Battery Setting (BT) in the Installer Menu to a number 1 (Extended). Follow the steps in the menu tree shown here.

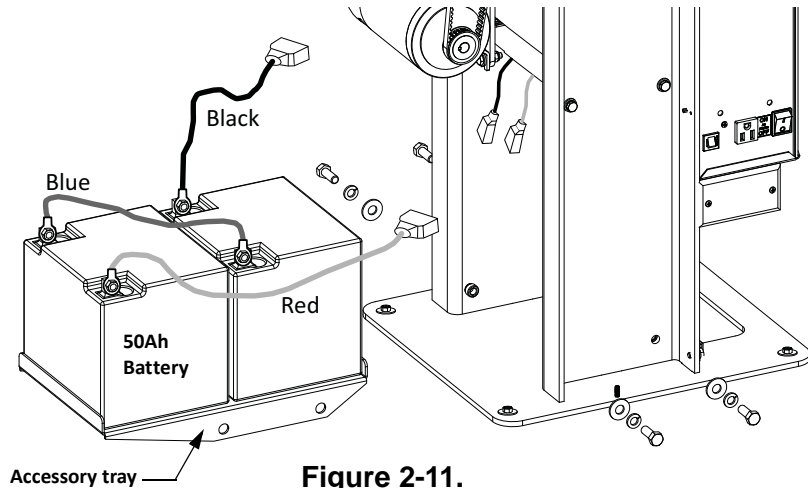


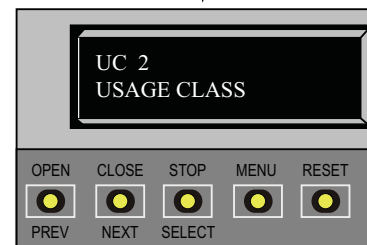
Figure 2-11.



1. Start at a gate status display.



2. Access the User Menu, by pressing MENU twice.



3. Access the Installer Menu, by simultaneously pressing OPEN and RESET. Release the buttons.



4. Use NEXT to navigate to the menu display. Change the setting using the SELECT and NEXT buttons.

Display and Menu Options

Chapter 3

This section of the manual provides information about the display and menu options. It includes how to:

- Turn both AC and DC power switches on.
- Configure the Setup Menu
- Review how to use the Smart DC Controller Buttons in Menu Mode
- Review Run Mode and Gate Status Displays
- Access and Configure User Menu Options
 - Adjust the Close Timer
 - Set the Time and Date
 - Set the AC Power Loss Gate Function
 - Adjust the Display Contrast
- Access and Configure Installer Menu Options
 - Set the Open and Close Gate Speed
 - Adjust IES Sensitivity
 - Enable Fire Department Access
 - Reinstate Factory Defaults

It describes what you will see on the display and explains the functionality of the buttons. User and Installer Menu charts provide information about peripheral connections and the corresponding menu items that need to be configured.

INITIAL SETUP

Once you've completed the installation of the SwingSmart operator and attached the wired accessories, you're ready to program the operator. Two different approaches exist:

- Connect a laptop computer to the USB or serial (RS-232) port and upload the gate settings and set the operator menu configurations via the START software.

— NOTE —

Use a laptop computer at your place of business to conveniently download the free START software from www.hysecurity.com before heading out into the field. A START User Guide is also available online.

- Manually navigate through the User and Installer Menus using the buttons located on the Smart DC Controller. The instructions for performing this second option are provided in this section.

Turning Both Power Switches On

One AC and one DC rocker power switch are located on the outside edge of the control box. Refer to Figure 3-1.

1. Turn both power switches ON. An audible beep occurs and a red light pulsates next to the OPEN button on the Smart DC Controller which indicates the system is functioning.

Note: *If AC power is lost, the rate of flashing slows down. Other indicator lights are described below.*

2. The software version briefly appears on the LCD display and the display settles on one of the following modes:
 - Gate status - indicates the operator is in Run Mode. Refer to *Run Mode*.
 - Usage class - indicates that the Setup Menu, which consists of four sequential displays, needs to be programmed. Refer to *Configuring the Setup Menu*.
 - Error message - indicates a problem exists with the operator which needs to be resolved before the operator can function properly. Refer to *Smart DC Controller Troubleshooting*.

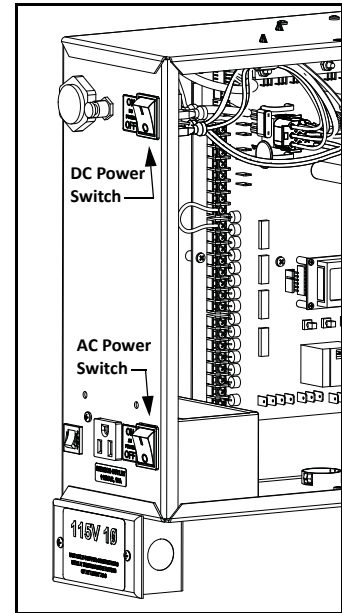


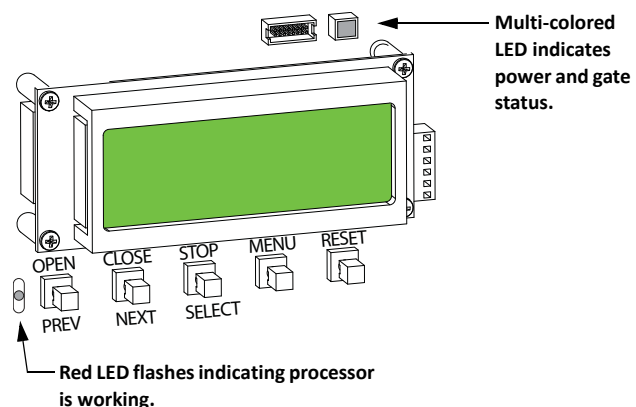
Figure 3-1.

— NOTE —

The Smart DC Controller can be powered when either switch is turned on. However, the operator is a DC-powered unit and runs on its batteries. If the DC power switch is off, the operator will not function (even though the AC power switch is on). When the operator is connected to AC power and the unit is turned on, the charge level of the battery is being monitored and maintained. On a solar-powered operator, the AC power switch connects and disconnects the DC power from the solar panels.

The flashing red indicator light next to the OPEN button on the Smart DC Controller is considered the heart beat of the system. It indicates that the electronics board is receiving power. When AC power is lost, the rate of flashing slows down. Another indicator light, above the display, is multi-colored and corresponds to the action that the operator is performing:

- Green - the operator is stopped.
- Flashing yellow - the operator is running.
- Red - the operator has experienced an error.
- Not lit - AC power is lost. Pressing the SHOW LEDs button indicates which inputs, if any, are active. Refer to Figure 4-2 for the SHOW LEDs location on the board.



Using the Smart DC Controller Buttons In Menu Mode

The buttons on the Smart DC Controller let you navigate, change, or clear the information in the display menus. Refer to Figure 3-2.

The buttons with text above and below are variable function keys (VFK). Use these buttons to enter or change operational data and navigate through the User and Installer Menus. The singular use of a variable function key is dependent on operator mode. Three different modes exist:

- Run Mode - gate is operational awaiting commands. Refer to *Using the Smart DC Controller Buttons In RUN Mode*.
- Menu Mode - motor disengages and operator commands are ignored. Data entry, menu navigation, and menu selection can be accomplished via the Controller buttons or through a START software connection using the USB port.
- Fault Mode - errors, faults or alerts appear on the display. Some errors or faults can be reset with the STOP button while more serious faults require the RESET button or cycling power, and then pressing RESET. Faults indicate a need for diagnosis and resolution. Refer to *Smart DC Controller Troubleshooting*.

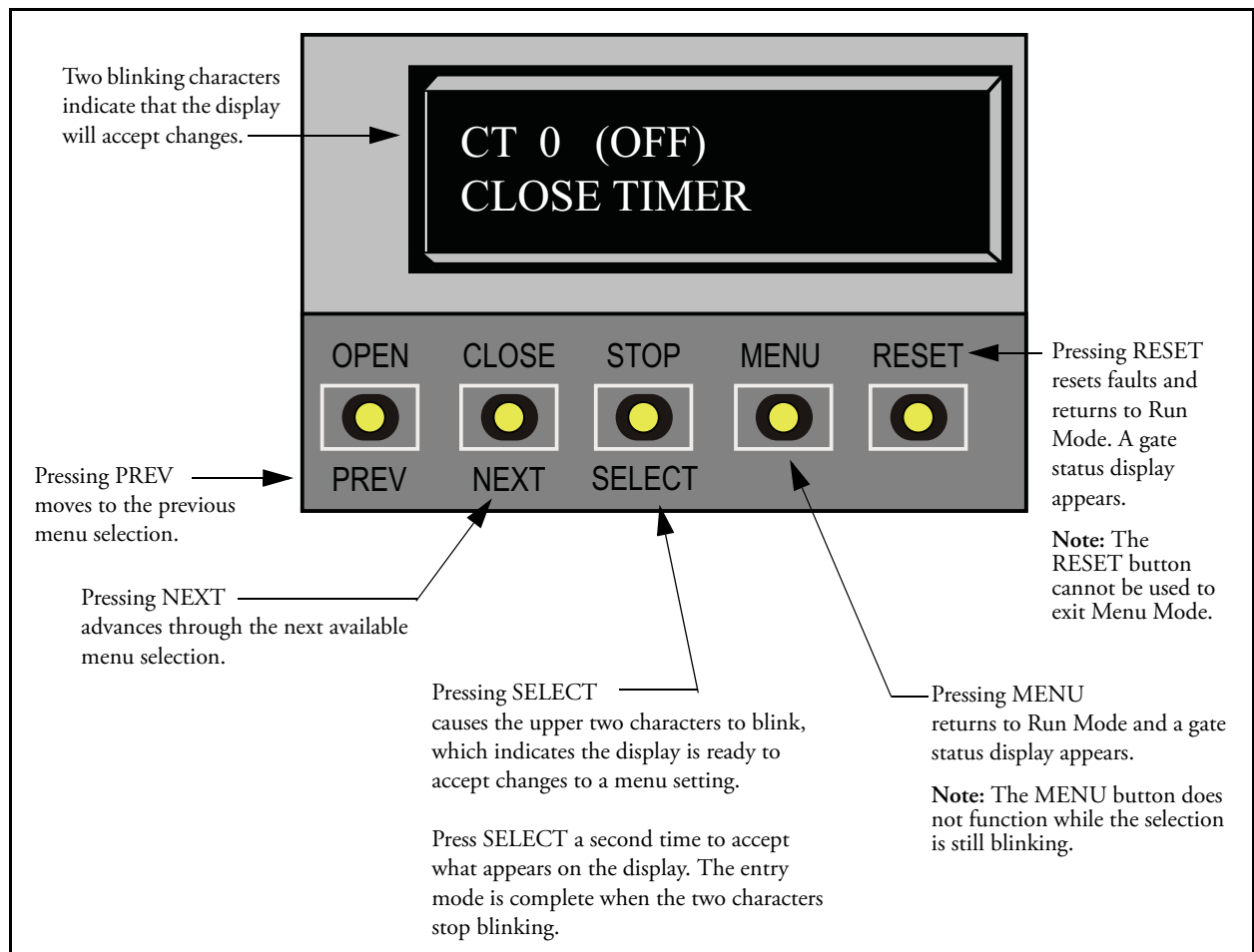


Figure 3-2. Function of the Smart DC Controller Buttons in Menu Mode

Configuring the Setup Menu

The USAGE CLASS display appears the first time power is supplied. See Figure 3-3.

Note: If a gate status display appears, the Setup Menu has already been configured. Refer to *Understanding Gate Status Displays*.

Four sequential displays present information which must be configured before SwingSmart will function. Once the configuration is complete, the information is retained even when a power loss occurs.

Note: Programming the Setup Menu is usually a one-time occurrence unless factory defaults are reinstated through the Installer Menu. Refer to *Reinstating Factory Defaults*.

To navigate within the Setup Menu, use the SELECT, NEXT, and PREV buttons. All menu options cycle, so you eventually return to the first menu option by continually pressing the NEXT or PREV key.

From the USAGE CLASS display, take the following steps:

1. Press SELECT.
The two top characters blink.
2. Press NEXT.
Continue to press NEXT to view all the selections.
3. When the desired selection appears, press SELECT.
The blinking characters become static.
4. Press NEXT.
Advance to the next menu display.
5. Continue to configure each menu display that appears.

An audible beep occurs as the gate status display appears when the initial setup is complete. The operator enters Run Mode.

Note: Complete the gate installation. If you haven't already done so, refer to *Setting the Taper Clamp* in Chapter 1.

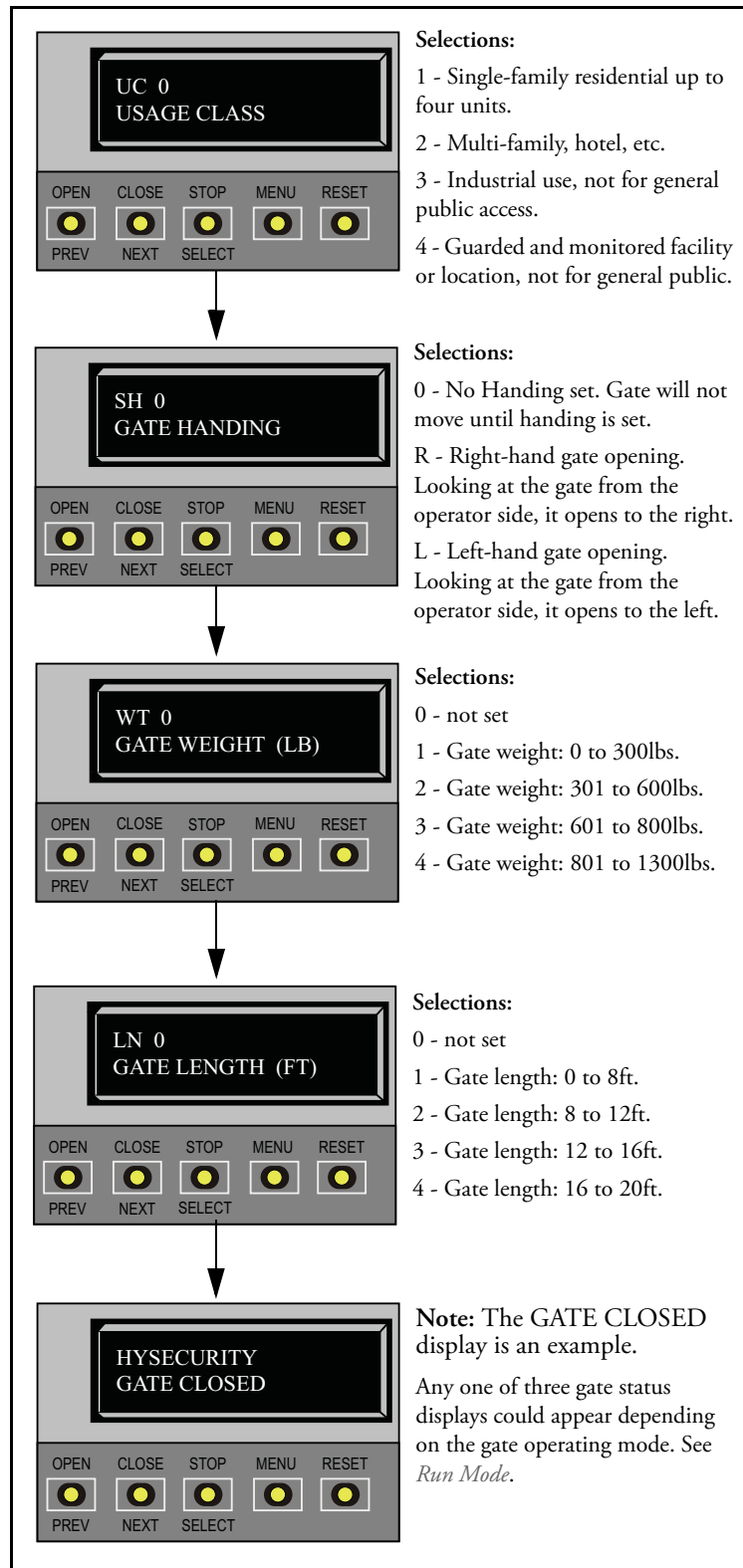
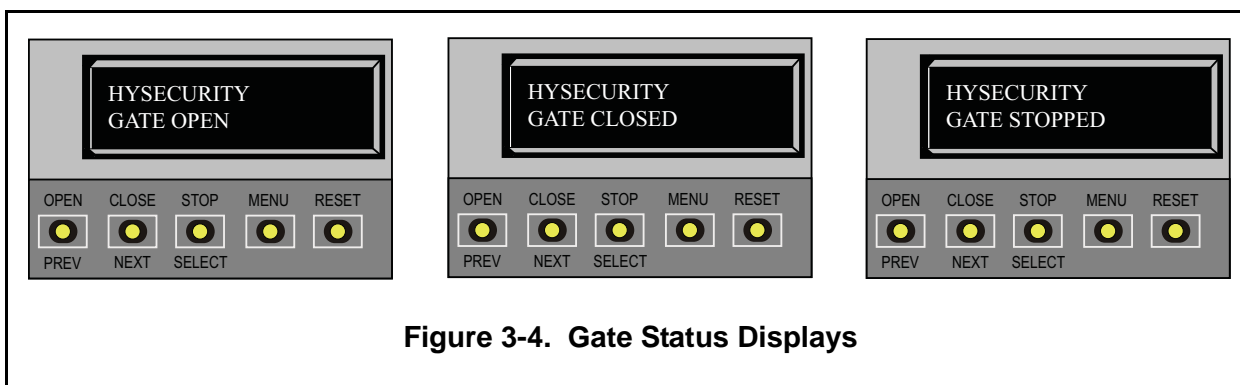


Figure 3-3. Setup Menu

RUN MODE

Gate status displays appear when the operator is ready and waiting for a gate operation command. When the menu display is flashing “GATE OPENING” or “GATE CLOSING” a command has been received and the operator is responding appropriately. The command may come from a variety of sources: a card reader, push-button remote, or recognition of a vehicle passing over a loop detector. In all cases, the operator “runs” the motor when it receives a gate operation command.

Understanding Gate Status Displays



Three gate status displays are shown in Figure 3-4. Each indicates the position or status of the gate. When accessing the User or Installer menus, you must begin at one of these gate status displays.

— NOTE

To access the User or Installer menus, the motor cannot be engaged and the gate cannot be moving.

Using the Smart DC Controller Buttons In RUN Mode

The Run Mode buttons are distinguished by the fact that their name appears above each button. The buttons with text above and below are variable function keys (VFK) and function differently depending on the mode of the operator. Three different modes exist:

- Run Mode - gate is operational awaiting commands.
- Menu Mode - motor disengages and operator commands are ignored. Menu navigation and menu selection can be accomplished using the Smart DC Controller buttons or through a START software connection via the USB port. Refer to *Using the Smart DC Controller Buttons In Menu Mode*.
- Fault Mode - errors, faults or alerts appear on the display. Some errors or faults can be reset with the STOP button while more serious faults require the RESET button or cycling power, and then pressing RESET. Faults indicate a need for diagnosis and resolution. Refer to *Smart DC Controller Troubleshooting*.

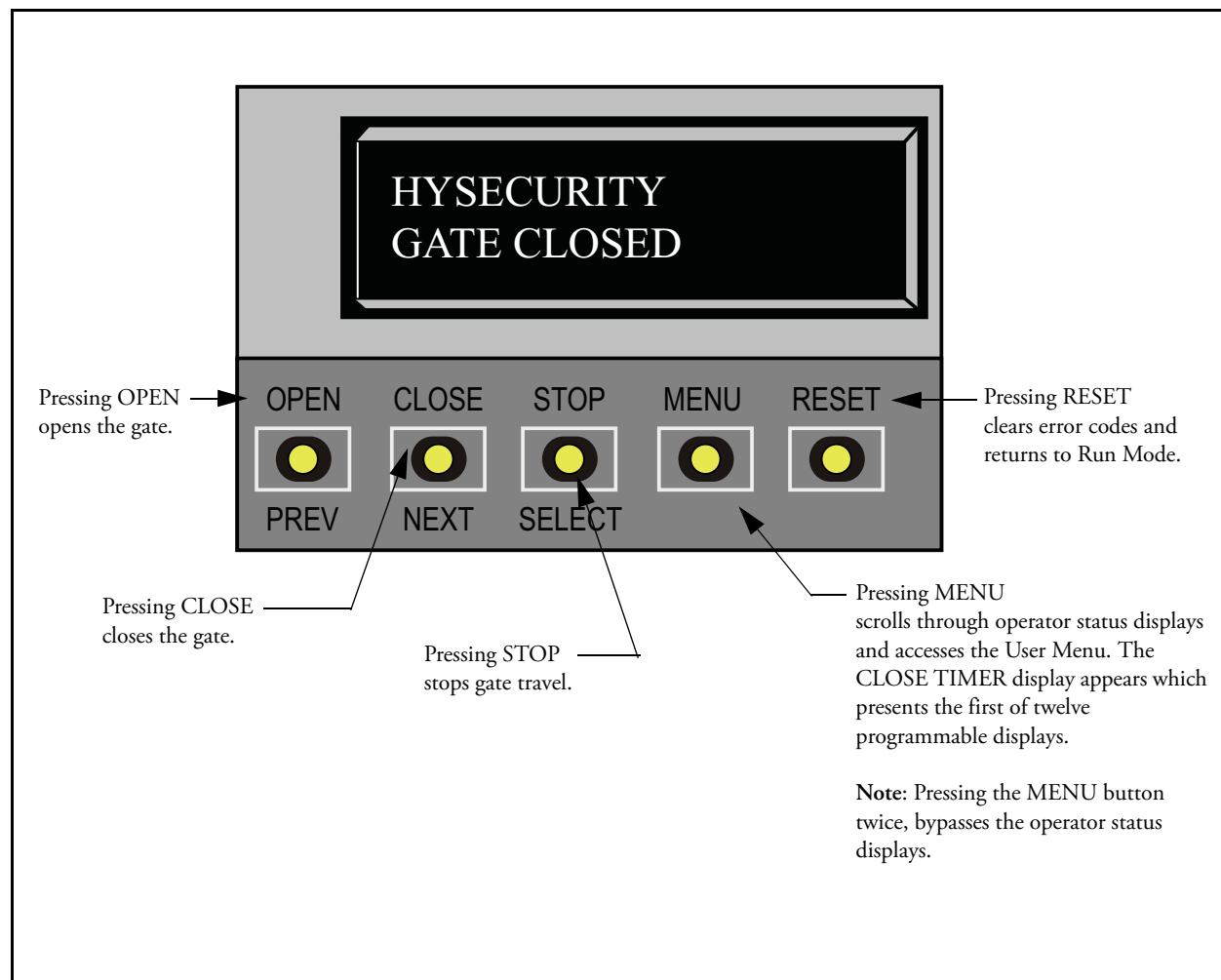


Figure 3-5. Function of Smart DC Controller Buttons in Run Mode

Viewing Operator Status Displays

Eight operator status displays appear in two second intervals and show pertinent information which provides a quick overview of the operator's status or configurations. Refer to Figure 3-6.

— NOTE —

Items shown inside the brackets < > are variables that may change depending on operator configurations. The examples shown in Figure 3-6 may appear differently on your operator.

	Variables	Description
SOFTWARE VERSION H5.##	The software version and revision number are hard-coded in the Smart DC Controller.	Displays the software version which is useful as a maintenance tool and required when calling Technical Support.
DUAL GATE <MASTER>	MASTER or SLAVE (This display only appears when the operator is used in bi-parting gate systems.)	Indicates, in a dual gate setting, whether the operator is set to Master or Slave. The setting is assigned in the Installer Menu.
OT <12>D SWINGSMART DC20	1, 2, 3, 4, 5, 6, 7 and 11, 12, 13, 14	Indicates the software configuration number which is preset at the factory and cannot be changed.
<LEFT> HAND	LEFT or RIGHT	Designates which way a gate opens viewed from the operator. If it swings to the left, it is a left-hand gate. Gate handing is established in the initial Setup Menu.
UC <2> USAGE CLASS	1, 2, 3, or 4	Displays the operator's Usage Class designation per UL 325 standards. Refer to <i>Identifying Gate Operator Category and Usage Class</i> .
BT <0> STANDARD BATTERY	0, 1, or 2 0 = 8Ah 1 = 50Ah (Extended) 2 = 110Ah (Maximum)	Confirms the operator's battery type which is assigned through the Installer Menu.
D <32>.0 VDC BATTERY VOLTAGE	Number varies depending on the voltage that the charger is providing.	Displays the actual voltage that the batteries are delivering to the Smart DC Controller.
CC<002600> CYCLE COUNT	Number varies depending on open and close cycles. One cycle equals a full open and close sequence.	Displays the number of cycles the gate operator has incurred. Similar to an odometer, it resets to zero after 999,999 cycles.

Figure 3-6. Operator Status Displays

User Menu

The User Menu consists of twelve functions which can be modified using the Smart DC Controller buttons. Refer to *Using the Smart DC Controller Buttons In Menu Mode*.

To access the User Menu, take the following steps:

1. At a gate status display, press the MENU button. Eight operator status displays scroll past and the CLOSE TIMER display appears.

Note: *To access the User Menu, the operator must be in Run Mode. The motor cannot be engaged and the gate cannot be moving.*

2. To bypass the operator status displays and access the User Menu, press the MENU button twice. The CLOSE TIMER display appears.



In the pages that follow, a detailed view of the more commonly used menus is provided:

- Adjusting the Close Timer
- Setting the Time & Date
- Setting the AC Power Loss Gate Function
- Adjusting the Display Contrast

Table 3-1 on page 3-13 describes the User Menus, supplies the factory defaults, and references the hard-wire connections.

For information on how the menu buttons function, review *Using the Smart DC Controller Buttons In Menu Mode*.

Adjusting the Close Timer

The close timer assigns how many seconds will pass before the operator initiates closure of a fully opened gate after all open commands and reversing sensor inputs have ceased. Every gate operator needs to have the close timer set to a specific number of seconds unless a hard-wired closing device is connected to the unit such as a push-button station.

To adjust the time (1 to 99 seconds) it takes before the operator initiates gate closure, take the following steps:

1. At a gate status display, press the MENU button twice.
This accesses the User Menu and the CLOSE TIMER display appears.
2. Use the SELECT and NEXT or PREV buttons to navigate and change the number on the display.

Note: *Keep the close time at zero if gate personnel operate the gate or the owner plans to use a remote control.*

3. To exit the User Menu, press the MENU button.
The gate status appears in the display indicating you have returned to Run Mode.



Setting the Time and Date

A feature of the Smart DC Controller is its 24-hour, 365 day clock. Make sure it is set to the appropriate time zone. An accurate time and date allows the diagnostic log to date stamp operational data which indicates when Alerts, Faults and Errors occur. The log helps in troubleshooting and can be viewed via a laptop connected to the USB or RS232 port. For more information, refer to *Smart DC Controller Troubleshooting*.

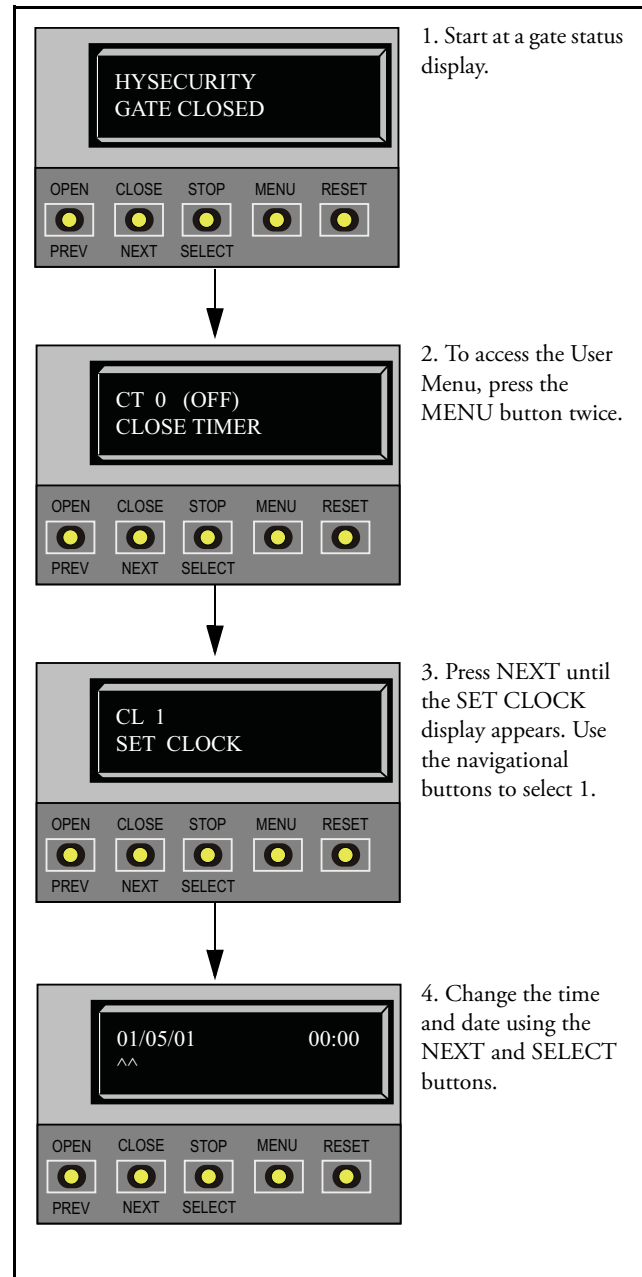
To set or adjust the time or date, take the following steps:

1. At a gate status display, press the MENU button twice. This accesses the User Menu and the CLOSE TIMER display appears.
2. Press NEXT or PREV until the SET CLOCK display appears.
3. Press SELECT. CL blinks.
4. Press NEXT or PREV to change the number to 1.
5. Press SELECT to accept the display.
6. The date and time display appears. Use the SELECT and NEXT buttons in the same manner as before to adjust the date and time.

Note: A date or time field must be blinking before it can be changed.

7. To accept what appears on the date and time display, press SELECT.
8. To exit the User Menu, press the MENU button. A gate status appears in the display indicating you have returned to Run Mode.

Note: A lithium coin battery supports the clock so the date and time is retained even when the main power is turned off. Replace the battery about every five years with a DL 2025, DL 2032 or CR 2025 or CR 2032 battery. Refer to *Clock Battery Replacement*.



Setting AC Power Loss Gate Function

The setting in the AC LOSS display determines what action the operator performs during an AC power loss. The settings help reduce drain on the battery. You can choose between four settings depending on customer preferences.

— NOTE —

DC Solar Powered units can only be set for AP0 or AP1.

AP 0 AC LOSS
UPS FAIL OPEN

Normal gate functions continue until the system detects a battery voltage drop below 21V. DEAD BATTERY appears on the display and the gate automatically opens. Any push-button CLOSE command will close the gate and any open command will re-open the gate. If the battery continues to diminish and the system detects 18V or less, the system initiates an automatic open cycle. Any new open or close command is ignored and the LCD appears blank. The system remains in this disabled state until reset or the battery recovers to 24V.

AP 1 AC LOSS
UPS FAIL CLOSE

Normal gate functions continue until the system detects a battery voltage drop below 21V. DEAD BATTERY appears on the display and the gate automatically closes. The gate can be opened by a special sequence of a STOP input followed by an OPEN push-button or directly opened with the Fire Department Open command. Any push-button CLOSE command will close the gate. If the battery continues to diminish and the system detects 18V or less, the system initiates an automatic open cycle. Any new open or close command is ignored and the LCD appears blank. The system remains in this disabled state until reset or the battery recovers to 24V.

AP 2 AC LOSS
AUTO OPEN

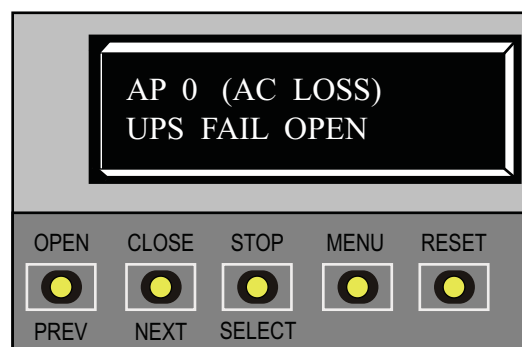
The operator automatically opens the gate five seconds after it detects an AC power loss. The gate remains open until AC power is restored. Any push-button CLOSE command will close the gate and any open command will open the gate. When the battery voltage drops below 21V or less, the system initiates an automatic open cycle. The gate will remain open until the battery recovers to 24V.

AP 3 AC LOSS
NO CLOSE TIMER

The operator initially does nothing after it detects AC power loss until it receives an open command. Once an open command is received, the operator opens and remains in that state. Any push-button CLOSE command will close the gate and any open command will open the gate. When the battery voltage drops below 21V or less, the system initiates an automatic open cycle. The gate will remain open until the battery recovers to 24V.

To designate what you want the operator to do during an AC power loss, take the following steps:

1. At a gate status display, press the MENU button twice. This accesses the User Menu and the CLOSE TIMER display appears.
2. Press NEXT until the AC LOSS display appears.
3. Use the SELECT and NEXT buttons to navigate and change the number on the display. Review *Using the Smart DC Controller Buttons In Menu Mode*.
4. To exit the User Menu, press the MENU button. A gate status appears in the display indicating you have returned to Run Mode.



Adjusting the Display Contrast

The display contrast can be adjusted from 1 to 9 to increase visibility and ease of use. It is set at the factory to level 5. The text becomes darker as you go up the scale.

To adjust the contrast (1 to 9), take the following steps:

1. At a gate status display, press the MENU button twice. This accesses the User Menu and the CLOSE TIMER display appears.
2. Press NEXT until the LCD CONTRAST display appears.
3. Use the SELECT and NEXT buttons to navigate and change the number on the display.
4. To exit the User Menu, press the MENU button. A gate status appears in the display indicating you have returned to Run Mode.



Table 3-1. Smart DC Controller - User Menu Functions






Ref. No. *	User Menu	Setting Options (Bold = Factory Settings)	Menu Tasks and Explanations	Associated DC Controller Connections
	Display			
1		0 = Timer disabled 1 second to 99 seconds	Assign how many seconds before the open gate initiates closure. Keep the setting at 0 if a hard-wired, push-button control device is being used. Note: The CLOSE TIMER display does not appear when the HOLD TO CLOSE is set to 1.	Not applicable (N/A)
2		0 = off 1 = on	Set to 0 produces a gate closure when a momentary signal is transmitted. Set to 1 if a constant hold to close signal, such as a push button control, is being used. A setting of 1 also deactivates the automatic close timer and causes its menu to disappear. You must set HC to 1 to comply with UL 325 Type D protection. Refer to Table Notes.	COM STOP OPEN CLOSE
3		0 = off 1 = on	Similar to HOLD TO CLOSE, but configures the Open push button for a constant-hold function. 0 = Momentary open signal 1 = Constant hold open push button required. You must set HO to 1 to comply with UL 325 Type D protection. Refer to Table Notes	COM OPEN
4		0 = UPS FAIL OPEN 1 = UPS FAIL CLOSE 2 = AUTO OPEN 3 = NO CLOSE TIMER	The setting designates what action the gate performs during an AC power loss. Refer to <i>Setting AC Power Loss Procedures</i>	Dependent on setting.
5		0 = off 1 = on	Configures radio input for open only (0) or at setting 1 adds the capability for radio input to close the gate when it is fully open.	COM RADIO OPEN

Table 3-1. Smart DC Controller - User Menu Functions




Ref. No. *	User Menu	Setting Options (Bold = Factory Settings)	Menu Tasks and Explanations	Associated DC Controller Connections
	Display			
6		0 = off 1 = on 2 = on	<p>Controls the warn-before-operate buzzer and can be configured three ways:</p> <p>Set to 1: Buzzer beeps for 3 seconds before gate motion begins and continues through entire gate travel.</p> <p>Set to 2: Buzzer beeps for 3 seconds before gate motion begins and continues for 2 seconds of gate travel.</p> <p>Set to 0: Buzzer is disabled. Set at 0 the buzzer will still beep when alerts, faults, errors, or entrapment are detected.</p> <p>WARNING: Do NOT cut the wires to the buzzer or unplug it as the operator will not be in compliance with UL 325. Failure to comply may result in serious injury or death.</p>	(N/A)
7		0 = off 1 = on	<p>Intended for highly secure facilities.</p> <p>Set to 1, the operator sounds the 3-second “warn before operate” buzzer alarm, and then initiates a closure if the gate is forced open and the closed limit switch disengages. The motor restarts to secure the gate. If the gate does not fully close within 4 seconds, the motor turns off and the alert buzzer sounds for 30 seconds. The display shows ALERT 1 - FORCED OPEN.</p>	(N/A)
8		0 = off 1 = on	<p>Set to 1, the operator sounds the 3-second “warn before operate” buzzer alarm and initiates an open command if the gate is forced, or drifts, off the open limit switch. The motor starts to reopen the gate. The motor runs for a maximum of 4 seconds and, if the gate is not fully open at the end of this period, the buzzer sounds for 10 seconds. The display shows ALERT 2 - DRIFT CLOSED</p>	(N/A)

Table 3-1. Smart DC Controller - User Menu Functions

Ref. No. *	User Menu	Setting Options (Bold = Factory Settings)	Menu Tasks and Explanations	Associated DC Controller Connections
	Display			
9		0 = off 1 = on	When set to 1, the operator serves as an aide in photo-eye transmitter/receiver alignment. The buzzer chirps once when the emitter and receiver are not aligned. When the emitter and receiver are aligned, the buzzer chirps twice. If they go out of alignment again, the buzzer will chirp once. The Alignment Mode is reset with a close-limit input or reset input.	EYE OPEN EYE CLOSE EYE COM
10		0 = Display 1 = Set Clock	The Smart DC Controller is equipped with a 24 hour 365 day clock; thus events of significance are logged and stamped with the time and date. This feature is useful to read historical operation data, which can be accessed with a computer via the USB or RS232 port. To set or adjust the hour, minute, day or month, see <i>Setting the Time and Date</i> .	(N/A)
11		5 0 through 9	Under some extreme high or low temperature conditions, it may be necessary to adjust the contrast of the LCD display. The display is adjustable from 0-9 with a factory default setting of 5.	(N/A)
12		0 = off (standard) 1 = on (detailed)	Set this item to 1 to record all gate operator open and close events, in addition to the normal alert, fault and error logs. This parameter automatically resets to the default 0 (off) after 24 hours, which is useful when experiencing intermittent problems. Set to 0, the DC Controller logs pertinent gate operator events such as faults, errors, or menu manipulation.	USB or RS232 cable and laptop computer with HySecurity's free START software is required to read the log file.
Table Notes: The following conditions apply to the indicated reference-numbered menu selections: 2 & 3 For gate operators using Type D entrapment protection, an automatic closing device (such as a timer, loop sensor, or similar device) shall not be employed. For additional information, refer to <i>Choosing Secondary Entrapment Protection</i> .				

INSTALLER MENU

The Installer Menu consists of several functions which can be modified using the Smart DC Controller buttons or configured through the use of a laptop computer and the START software available from the HySecurity website.

The Installer Menu options provide more advanced configurations for the SwingSmart operator. Access to the Installer Menu is through the User Menu. The navigational buttons are the same in both menu modes. To review how to use the navigational buttons on the Smart DC Controller, refer to *Using the Smart DC Controller Buttons In Menu Mode*.

— NOTE —

To access the User or Installer menus, the operator must be in Run Mode with a gate status showing on the display. The motor cannot be engaged and the gate cannot be moving.

To access the Installer Menu, take the following steps:

Note: Four menu items, *Usage Class*, *Gate Handing*, *Gate Weight*, and *Gate Length* must be configured before the operator will function. Refer to *Configuring the Setup Menu*.

In the pages that follow, a detailed view of the more commonly used menus is provided.

- Adjusting the Open Speed
- Adjusting the Close Speed
- Adjusting the IES Sensitivity
- Enabling the Fire Department Override
- Reinstating Factory Defaults

Table 3-2 on page 3-22 describes the Installer Menus, supplies the factory defaults, and references the hard-wire connections.

For information on how the menu buttons function, review *Using the Smart DC Controller Buttons In Menu Mode*.

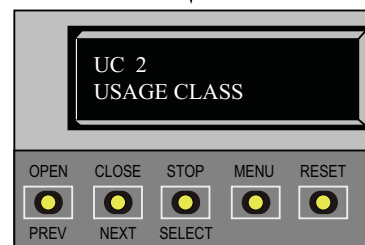


1. Start at a gate status display. To bypass the Operator Status Displays, press the MENU button twice.



The CLOSE TIMER display appears indicating you have accessed the User Menu.

2. To access the Installer Menu, simultaneously, press OPEN and RESET.



Release the buttons and the Usage Class display appears indicating entrance to the Installer Menu. The USAGE CLASS display is the first item in the Installer Menu.

Adjusting the Gate Speed

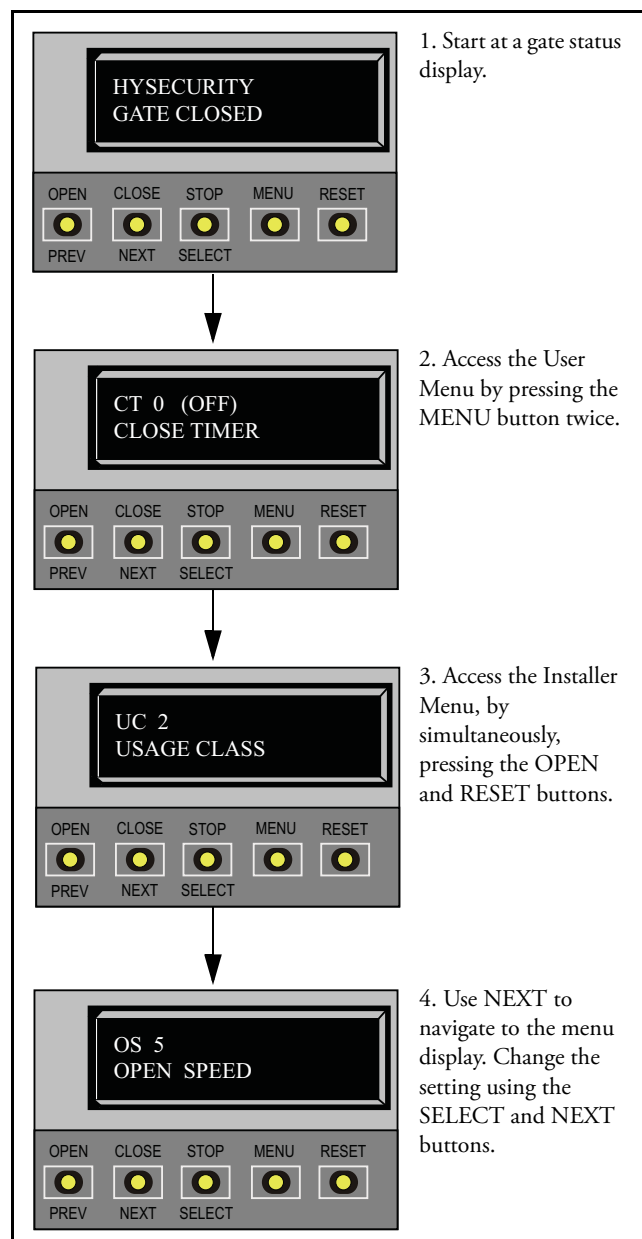
The gate speed designates how quickly the gate opens and closes. The available range from 1 to 10 varies the speed of the motor and the gate speed increases as you go up the number scale. The adjustable speed range is approximately 15 seconds to 10 seconds.

— NOTE —

Two displays, one for OPEN SPEED the other for CLOSE SPEED, exist in the Smart DC Controller. The steps involved in changing the open speed are shown below. The steps to set the close speed are the same, you just need to access at the CLOSE SPEED display. The factory defaults for both are set to a level 5, a mid-range setting.

To adjust the gate speed (1 to 10), take the following steps:

1. At a gate status display, press the MENU button twice. This accesses the User Menu and the CLOSE TIMER display appears.
2. Simultaneously, press the OPEN and RESET buttons to enter the Installer Menu. Release the buttons and the USAGE CLASS display appears. It is the first item in the Installer Menu.
3. Press NEXT until the OPEN SPEED (or CLOSE SPEED) display appears. The factory default setting is 5.
A speed setting of 1 slows the gate travel speed to open or close in approximately 15 seconds.
A speed setting of 10 increases gate travel and opens or closes in approximately 10 seconds.
4. Use the SELECT and NEXT buttons to navigate and change the speed setting on the display.
5. To exit the Installer Menu, press the MENU button. The gate status appears in the display indicating you have returned to Run Mode.



Adjusting the IES Sensitivity

SwingSmart uses a primary Type-A inherent entrapment sensor (IES) per UL325 Safety Standards. A solid immovable object blocking the gate will trip the IES and cause the operator to stop and reverse (for two seconds) and enter safe mode.

The adaptive IES software monitors the average running motor current while the gate is in motion and reverses the gate when the current exceeds an automatically self-adapting average.

The IES display, accessed through the Installer Menu, allows you to input a number between 0 and 9. The settings (0 through 6) allow an increasingly higher threshold (amount of headroom) above the average current draw before tripping. For IES settings 7 through 9, the current limit is a fixed relatively high value before the IES will be tripped. The factory setting is 2, which is adequate for most sites.



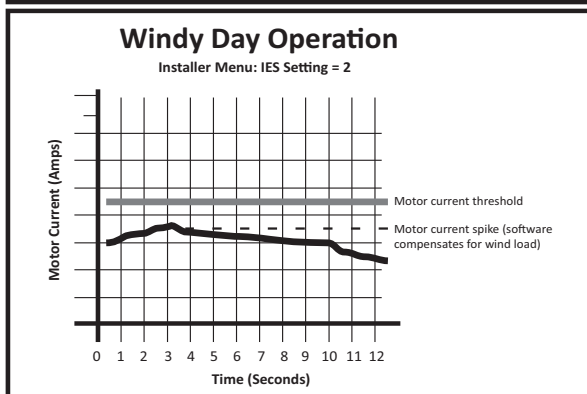
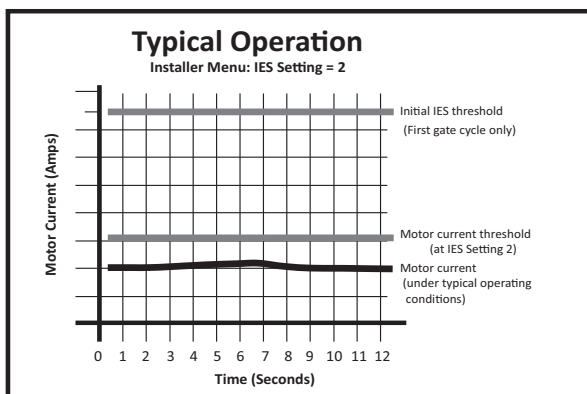
CAUTION

Avoid setting the IES sensitivity to a fixed level (7 - 9 setting). The high motor current required for the IES to trip could cause severe injury or death to people caught in the moving gate.

For IES settings (0 through 6), the motor current is continually being measured and the IES threshold automatically set to trip at the average current plus the additional “headroom” provided by the IES setting selected.

To prevent false IES trips, the software boosts the IES current threshold for one gate cycle after an IES event, then returns to the normal sensitivity threshold.

Over time, a gate may sag or a hinge begin to fail or other site issues, such as wind loading can occur. As the gate hardware ages and becomes stiffer, the SwingSmart motor current increases. A failing hinge or other gate condition which causes excessive drag may create the need to use a higher IES setting level. The higher settings should only be used on a TEMPORARY basis until the gate sag or bad hinge is repaired so the gate swings smoothly with minimum resistance.



NOTE: When wind load increases, IES software adapts and changes the threshold allowance. The IES threshold automatically increases by 50% when the temperature drops below 32°F.

— NOTE —

When changing the IES setting, consider the site design and vehicular gate traffic. It is recommended that you use the most sensitive setting while still allowing for reliable gate operation.

Examples of conditions which affect IES sensitivity include:

Gate design - A higher IES setting might be required if the gate environment is prone to high winds. If you have gate panels that are open and present little wind resistance, the deviation from the average current will be relatively small and you can use a more sensitive (lower) IES setting. For large, heavy gates in windy environments or a fairly solid gate, large variations in motor current may occur. In these types of scenarios, you may want to use a higher (less sensitive) IES setting.

Gate condition - Over time, a gate may sag or a hinge begin to fail. Gate hinges will deteriorate more rapidly near salty sea air. For these issues, you may want to use a higher (less sensitive) IES setting until repairs are made.

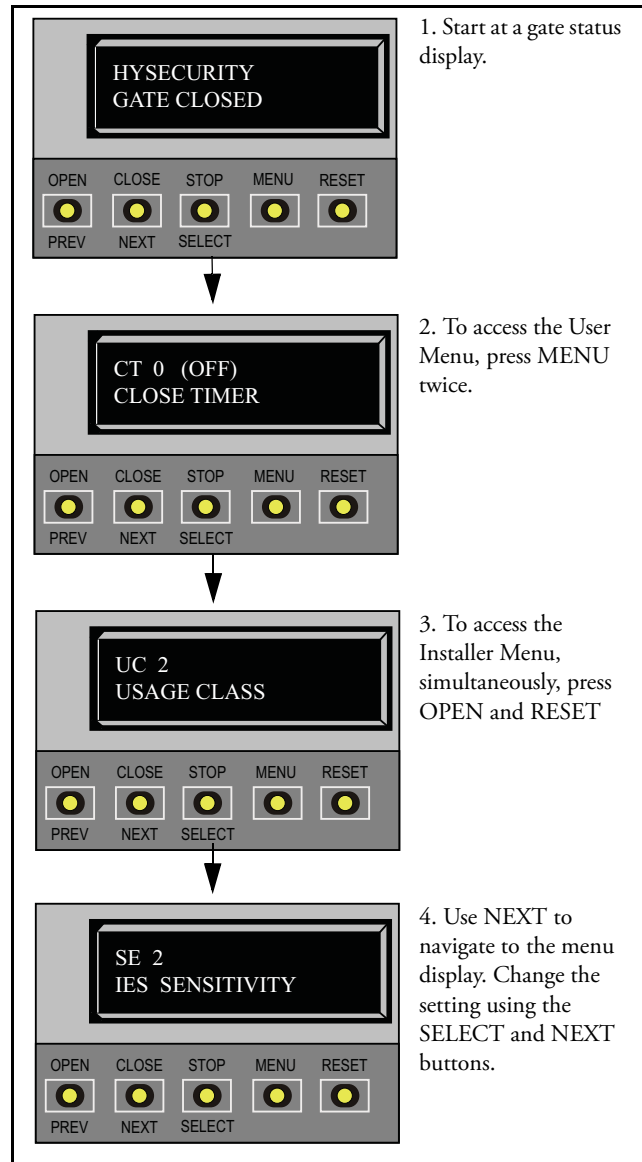
Note: *If gate hardware is an issue, upgrade the gate hardware to reduce resistance and increase the longevity of the gate and gate operator.*

To adjust the IES sensitivity, take the following steps:

1. At a gate status display, press the MENU button twice. This accesses the User Menu and the CLOSE TIMER display appears.
2. Simultaneously, press the OPEN and RESET buttons to enter the Installer Menu. Release the buttons and the USAGE CLASS display appears. It is the first item in the Installer Menu.
3. Press NEXT until the IES SENSITIVITY display appears. The factory default setting is 2.

CAUTION

Avoid setting the IES sensitivity to a fixed level (7 - 9 setting). The high motor current required for the IES to trip could cause severe injury or death to people caught in the moving gate



4. Use the SELECT and NEXT buttons to navigate and change the number on the display.
5. To exit the Installer Menu, press the MENU button. The gate status appears in the display indicating you have returned to Run Mode.

If errors occur due to IES issues, SAFE MODE or ENTRAPMENT MODE will appear on the display. For more information about troubleshooting, refer to Table 6-1 in the “Reference” section.

Reinstating Factory Defaults

Twelve menu configurations are available in the User Menu. Another 32 items in the Installer Menu let you customize the operator depending on the number of attached accessories and your customer's needs.

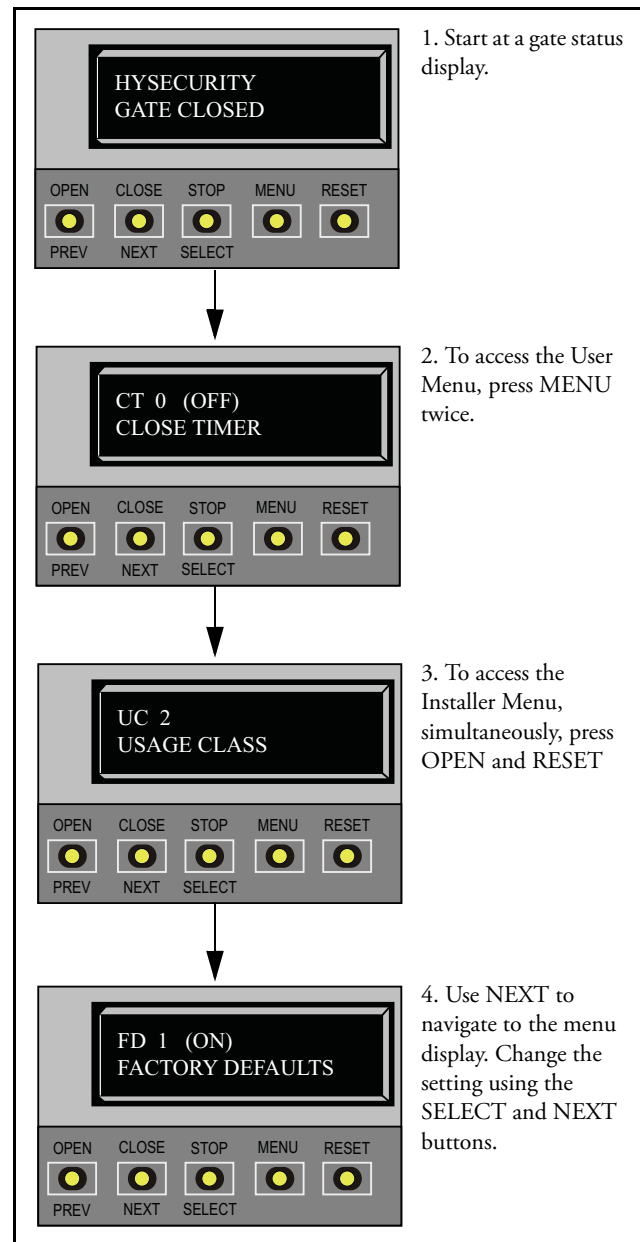
CAUTION

Reinstating factory default clears ALL menu display settings stored in the operator and returns them to factory defaults. It is recommended that you save the menu settings before reinstating factory defaults. You can write the settings in a notebook or, if you have a laptop computer, you can use HySecurity's START software and download the menu settings as part of the diagnostic log.

To reinstate factory defaults, take the following steps:

1. At a gate status display, press the MENU button twice. This accesses the User Menu and the CLOSE TIMER display appears.
2. Simultaneously, press the OPEN and RESET buttons to enter the Installer Menu. Release the buttons and the USAGE CLASS display appears. It is the first item in the Installer Menu.
3. Press NEXT until the FACTORY DEFAULTS display appears. The factory default setting is 0.
4. Use the SELECT and NEXT buttons to navigate and change the number on the display to 1.

Note: When you press SELECT to accept FD 1, the factory settings are reinstated immediately and the menu display returns to the initial Setup Menu. The gate operator will not run until all four sequential menu parameters are entered: Usage Class, Gate Handing, Gate Weight, and Gate Length. Refer to *Configuring the Setup Menu*.



Enabling the Fire Department Override

Many counties and cities require a Fire Department override system for gate operators. The fire department's alert system is a separate unit that must be connected to the SwingSmart DC Controller. The FIRE DEPARTMENT OPEN option must be properly configured through the Installer Menu before the operator will recognize the alert system.

To enable the Fire Department Override, take the following steps:

1. Connect the contact NO from the alert system or key switch to the following Smart DC Controller terminals:
EMERG OPEN
+24V
2. Configure the Installer Menu.
At a gate status display, press the MENU button twice. This accesses the User Menu and the CLOSE TIMER display appears.
3. Simultaneously, press the OPEN and RESET buttons to enter the Installer Menu.
Release the buttons and the USAGE CLASS display appears. It is the first item in the Installer Menu.
4. Press NEXT until the FIRE DEPARTMENT OPEN display appears. The factory default setting is 0.
5. Use the NEXT button to change the number on the display to 1 and then press SELECT.
6. To exit the Installer Menu, press the MENU button. The gate status appears in the display indicating you have returned to Run Mode.

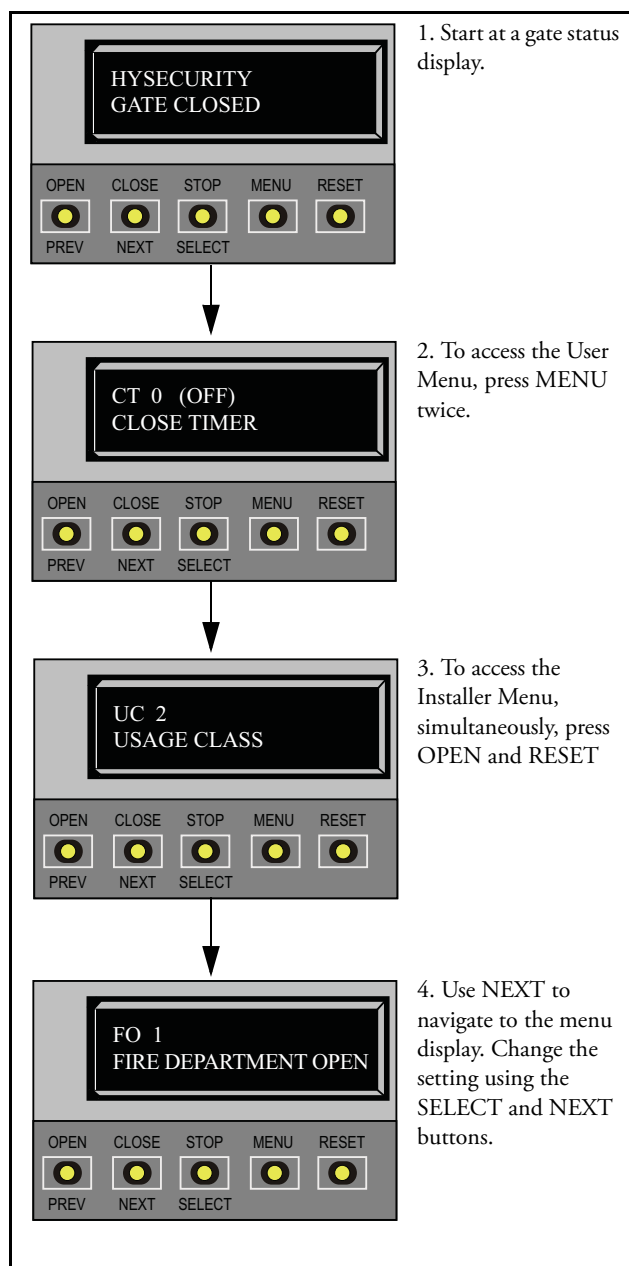
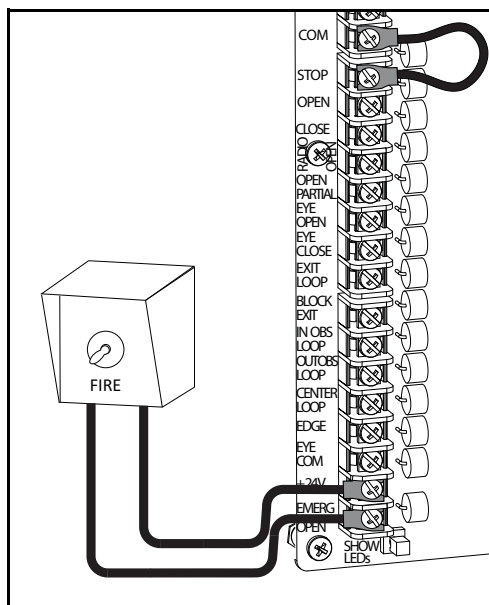


Table 3-2. Smart DC Controller - Installer Menu Functions






Ref. No. #	Installer Menu		Setting Options (Bold = Factory Settings)	Tasks and Explanations	Associated DC Controller Connections
	Display				
1			0 = Gate disabled 1 = Residential 1 to 4 units 2 = Comm./public access 3 = Light industrial 4 = Industrial secure	Assign the operator's Usage Class designation per UL 325 standards. See <i>Identifying Gate Operator Category and Usage Class</i> . The installer must designate a usage class before the operator will function. See <i>Configuring the Setup Menu</i> .	Not applicable (N/A)
2			0 = Gate disabled R = Right hand L = Left hand	The handing determines which way the gate opens as you view it from the operator side. See <i>Adjusting the Limit Switches</i> . The installer must designate a left or right handing before the operator will function. See <i>Configuring the Setup Menu</i> .	(N/A)
3			0 = Gate disabled 1 = 0 to 300lbs. 2 = 301 to 600lbs. 3 = 601 to 800lbs. 4 = 800 to 1300lbs.	Select the gate's weight range in pounds. The installer must designate the gate's weight before the operator will function. See <i>Configuring the Setup Menu</i> . Designating the correct gate weight allows the operator to determine the appropriate acceleration and deceleration rates.	(N/A)
4			0 = Gate disabled 1 = 0 to 8 feet 2 = 8 to 12 feet 3 = 12 to 16 feet 4 = 16 to 20 feet	Select the gate's length in feet. The installer must designate the gate's length before the operator will function. See <i>Configuring the Setup Menu</i> . Designating the correct gate length allows the operator to determine the appropriate acceleration and deceleration rates.	(N/A)
5			5 1 through 10 1 = slowest speed 10 = fastest speed	Designate how quickly the gate opens. The range 1 through 10 varies the speed of the motor and the gate opening speed increases as you go up the number scale. A setting of 1 slows the gate travel to approximately 15 seconds. A setting of 10 speeds up gate travel to approximately 10 seconds. See <i>Adjusting the Gate Speed</i> .	(N/A)

Table 3-2. Smart DC Controller - Installer Menu Functions (Continued)

Ref. No. #	Installer Menu		Setting Options (Bold = Factory Settings)	Tasks and Explanations	Associated DC Controller Connections
	Display				
6	<div>CS 5 CLOSE SPEED</div>		5 1 through 10 1 = slowest speed 10 = fastest speed	Designate how quickly the gate closes. The range 1 through 10 varies the speed of the motor and the gate closing speed increases as you go up the number scale. A setting of 1 slows the gate travel to approximately 15 seconds. A setting of 10 speeds up gate travel to approximately 10 seconds. See <i>Adjusting the Gate Speed</i> .	(N/A)
7	<div>FD 0 (OFF) FACTORY DEFAULTS</div>		0 = user settings 1 = reload factory settings	Globally restores all menu settings back to new operator status. Select setting 1 to return the operator to factory defaults. Note: If factory defaults are restored, the UL usage class, handling, gate weight and length and any other modified menu settings will need to be configured again.	(N/A)
8	<div>DG 0 (OFF) DUAL GATE</div>		0 = solo operator 1 = Slave unit 2 = Master unit	Configures the gate operator as a Master or as a Slave in a dual-gate installation. When you assign one unit as the Master, you must configure the other as Slave through the Installer Menu. See <i>Master and Slave Menu Setup</i> .	3-wire shielded cable to DUAL GATE input terminals on both operators. Pair wires: A - A, COM - COM, and B - B
9	<div>CH 0 (AC) CHARGER TYPE</div>		0 = AC powered charger 1 = solar powered charger	Assigns charger type. Note: If a solar-powered unit is ordered and delivered factory-ready, this menu will not appear. The battery type for a solar-charger is set to 50Ah even though your operator may have 8Ah batteries installed.	(N/A)
10	<div>BT 0 (STANDARD) BATTERY TYPE</div>		0 = standard (8Ah) 1 = extended (50Ah) 2 = maximum (110Ah)	Assign the battery type used by the operator. Note: Smaller batteries are charged with less current to avoid overheating and larger batteries are charged with more current to supply a more rapid charge.	Extended (50Ah) batteries require wire extensions and an accessory tray. Maximum (110Ah) batteries require separate housing and wiring.

Table 3-2. Smart DC Controller - Installer Menu Functions (Continued)

Ref. No. *	Installer Menu		Setting Options (Bold = Factory Settings)	Tasks and Explanations	Associated DC Controller Connections
	Display				
11	<div>FO 0 (OFF) FIRE DEPT OPEN</div>		0 = disabled 1 = enabled	Provides the Fire Department Open input. When set to 1, the open signal received by the operator overrides all photoelectric eyes and edge sensors and opens the gate. Pressing the RESET button (or the OPEN push button) is required before the gate can be closed.	+24V DC EMERG OPEN
12	<div>SE 2 IES SENSITIVITY</div>		1 = maximum sensitivity 2 = moderate sensitivity 9 = least sensitivity	Adjusts the sensitivity of the internal inherent entrapment sensor (IES). Available settings are 1 to 9 with 9 being the least sensitive. HySecurity strongly recommends that you avoid setting the IES sensitivity higher than 6. Note: Adjust taper clamp for security and gate impact purposes prior to changing IES sensitivity.	See Note.
13	<div>SS 0 (OFF) IES STOP ONLY</div>		0 = stop, reverse for 2s 1 = stop only	In a Usage Class 4 environment, the operator can be set to stop the gate and not reverse gate travel after and IES trip. Note: This menu option only appears when the Usage Class is set to 4.	(N/A)
14	<div>LC 0 (0.0 SECS) LEAF DELAY CLOSE</div>		0 = none 1 through 20 For example: 1 = ½ second 4 = 2 seconds 20 = 10 seconds	Delays gate closure. This menu option appears if the gate operator is designated as a Master or a Slave. Available settings are 1 to 20. Each increment adds ½ second, to a maximum of 10 seconds time delay, before the operator activates when commanded to close.	DUAL GATE inputs on both operators
15	<div>LO 0 (0.0 SECS) LEAF DELAY OPEN</div>		0 = none 1 through 20 For example: 1 = ½ second 4 = 2 seconds 20 = 10 seconds	Delays gate opening. This menu appears if the gate operator is set up as a Master or a Slave. Available settings are 1 to 20. Each increment adds ½ second (with a maximum of 10 seconds) time delay following a command to open before the operator activates.	DUAL GATE inputs on both operators

Table 3-2. Smart DC Controller - Installer Menu Functions (Continued)






Ref. No. *	Installer Menu		Setting Options (Bold = Factory Settings)	Tasks and Explanations	Associated DC Controller Connections
	Display				
16			0 = 30 Seconds max run, 1 = 300 Seconds max run	Assigns a motor run time of 30 or 300 seconds. If the gate opening or closure takes longer than 30 seconds, you'll need to set the run timer to 1.	(N/A)
17			0 = Close eye stops only 1 = 2s reverse to open	The default setting is non-reversal if the close photo eye is triggered. A setting of 1 causes the gate to reverse and travel open for two seconds if triggered while closing.	EYE OPEN EYE COM
18			0 = Open eye stops only 1 = 2s reverse to close	The default setting is non-reversal if the open photo eye is triggered. A setting of 1 causes the gate to reverse travel and close for two seconds if triggered while opening.	EYE CLOSE EYE COM
19			0 = Edge reverses full open 1 = 2s reversal only	The default setting is a full-open reversal if the gate edge is triggered while closing. The optional setting of 1 causes the gate to reverse for 2 seconds if triggered while closing.	EDGE COM
20			0 = IES reverses full open 1 = 2 second reversal only	The default setting is a 2-second duration reversal if the inherent sensor is triggered. The optional setting of 0 will cause the gate to reopen fully if triggered while closing.	N/A

Table 3-2. Smart DC Controller - Installer Menu Functions (Continued)

Ref. No. *	Installer Menu	Setting Options (Bold = Factory Settings)	Tasks and Explanations	Associated DC Controller Connections
	Display			
21	<div>PC 0 NO CONTACT PHOTO EYE OUTPUT</div>	0 = Normal Open PE output 1 = Normal Closed (supervised)	The default setting is photo eyes with Normally Open outputs. The optional setting 1 requires a Normally Closed (NC) output which requires that both a photo EYE OPEN and a photo EYE CLOSE are connected. If set for NC, the connection is also supervised and any open or short circuit fault will generate a FAULT 2 alert which requires a STOP button reset to re-enable any function if triggered.	Photo eye connections: EYE OPEN EYE CLOSE EYE COM +24V
22	<div>GC 0 NO CONTACT GATE EDGE OUTPUT</div>	0 = Normally Open Edge 1 = Normally Closed	The default setting is edge sensor with Normally Open (NO) output. The optional setting of 1 requires an (NC) output.	EDGE COM
23	<div>DT 0 FREE EXIT DISABLE FUNCTION</div>	0 = Disable Free Exit 1 = Disable Close Timer	Configures the BLOCK EXIT input to disable either the Free Exit Detector function or, alternately, the Timer To Close function. The default setting disables the free exit detector. Note: The free exit is disabled when the gate is at its closed limit. If the closed limit is not tripped, the free exit continues to work normally.	BLOCK EXIT COM
24	<div>OR 1 REVERSE OUTSIDE OBS LOOP</div>	0 = Pause closing only 1 = Enable reversing to open	The default is for full reversal when the Outside Obstruction Loop is triggered. A setting of 0 causes the gate to only pause when triggered. Gate closure begins as soon as the loop is clear again.	OUTSIDE OBS LOOP COM
25	<div>IR 1 REVERSE INSIDE OBS LOOP</div>	0 = Pause closing only 1 = Enable reversing to open	The default is for full reversal when the Inside Obstruction Loop is triggered. A setting of 0 causes the gate to only pause when triggered. Closure begins as soon as the loop is clear again.	INSIDE OBS LOOP COM

Table 3-2. Smart DC Controller - Installer Menu Functions (Continued)



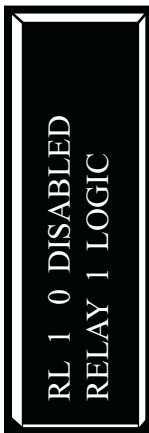
Ref. No. *	Installer Menu	Setting Options (Bold = Factory Settings)	Tasks and Explanations	Associated DC Controller Connections
	Display			
26		0 = Hold open only 1 = Hold close and hold open	<p>Configures the function of the Center Loop (Shadow Loop) when triggered:</p> <p>Setting 1 - holds the gate from starting open and from starting closed. This setting prevents opening and closing of the gate when the Center Loop is tripped if the gate is on either (opened or closed) limit switches.</p> <p>Setting 0 - holds the gate from starting closed. This setting prevent closing when on the open limit switch.</p>	CENTER LOOP COM
27		1 = Standard 2 = Quick close	<p>Configures for faster closure. This selection determines whether the close timer begins to count after vehicles have departed the detector loops or whether the close timer will count down while the loops are occupied. The gate can only close when all loop detectors are not triggered.</p> <p>The default setting causes the Close Timer to start when the Center Loop is clear. A setting of 2 causes the Close Timer to start when the open limit switch trips.</p>	HY-5A
27		0 = Disabled 1 to 24 available	<p>Configures the function of the user 1 output relay, which is a large relay. It has the capacity to switch both AC and DC and can be used for high voltage and/or high current loads. Connect devices directly to the top of the relay: COM plus NO and NC contacts.</p> <p>Additionally, there are 24 optional logic function choices, which are described in detail in <i>Setting the User Relay Function in the Installer Menu</i></p>	User 1 Relay

Table 3-2. Smart DC Controller - Installer Menu Functions (Continued)

Ref. No. #	Installer Menu	Setting Options (Bold = Factory Settings)	Tasks and Explanations	Associated DC Controller Connections
	Display			
28	<div>RL 2 1 CLOSE LIMIT RELAY 2 LOGIC</div>	0 = Disabled 1 = default 1 to 24 available	Configures the function of the user 2 output relay, which is an electronic relay with the capacity for switching a DC load only. The User 2 Relay is limited to 48 Volts DC and 4 Amps maximum load. Connect a device directly to the two spade terminals at the bottom of the control board, next to the label USER 2. There are 24 optional logic function choices, which are described in detail in <i>Setting the User Relay Function in the Installer Menu</i>	User 2 Relay
29	<div>TL 2 (45 SECS) OPEN TIME ALERT</div>	0 = 0 seconds 1 = 15 seconds 2 = 45 seconds 3 = 75 seconds 4 = 105 seconds 5 = 135 seconds	Adjusts the time delay before activating a user relay function. Maximum time setting is 135 seconds. See <i>Setting the User Relay Function in the Installer Menu</i> Note: This menu appears only when a user relay is set to Function No. 8.	User relays
30	<div>LT 3 (75 SECS) LOITERING ALERT</div>	0 = 0 sec. 1 = 15 seconds 2 = 45 seconds 3 = 75 seconds 4 = 105 seconds 5 = 135 seconds	This function monitors activation of the Outside Obstruction Loop when there is no activation of the gate. When the adjustable period of time is exceeded, User Relay No. 13 triggers and reports loitering in the diagnostics log. Adjust the time delay before activating the user relay function. Maximum time setting is 135 seconds. See <i>Setting the User Relay Function in the Installer Menu</i> Note: This menu appears only when a user relay is set to Function No. 13.	User relays
31	<div>SA 0 (OFF) STC ADDRESS</div>	0 = No network 1 to 99 = Network “drop” address	Sets the system address for network communication: 0 = no network communication 1-99 sets individual polling addresses.	RS-485

Table 3-2. Smart DC Controller - Installer Menu Functions (Continued)

Ref. No. *	Installer Menu		Setting Options (Bold = Factory Settings)	Tasks and Explanations	Associated DC Controller Connections
	Display				
32	<div>ELD 0 (RUN MODE) EXIT LOOP SET</div>		0 = Run mode 1 = Show frequency 2 = Show call level 0-7 3 = Set Frequency	Controls the HY-5A Free Exit detector.	HY-5A
33	<div>ILD 0 (RUN MODE) IN OBS LOOP SET</div>		0 = Run mode 1 = Show frequency 2 = Show call level 0-7 3 = Set Frequency	Controls the HY-5A Inside Obstruction Loop detector.	HY-5A
34	<div>OLD 0 (RUN MODE) OUT OBS LOOP SET</div>		0 = Run mode 1 = Show frequency 2 = Show call level 0-7 3 = Set Frequency	Controls the HY-5A Outside Obstruction Loop detector.	HY-5A
35	<div>CLD 0 (RUN MODE) CENTER LOOP SET</div>		0 = Run mode 1 = Show frequency 2 = Show call level 0-7 3 = Set frequency	Controls the HY-5A Center Loop (Shadow) detector.	HY-5A

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Smart DC Controller

Chapter 4

This section provides information about the Smart DC Controller board; its inputs for peripheral connections and its monitoring capabilities. This section explains how to:

1. Review the connections on the Smart DC Controller
2. Perform a Preliminary Test of the components
3. Connect Vehicle Detectors
4. Connect Accessory Devices
 - Entrapment Sensor Connections
 - Access Controls
 - Manual Push-button Station
 - User Relays

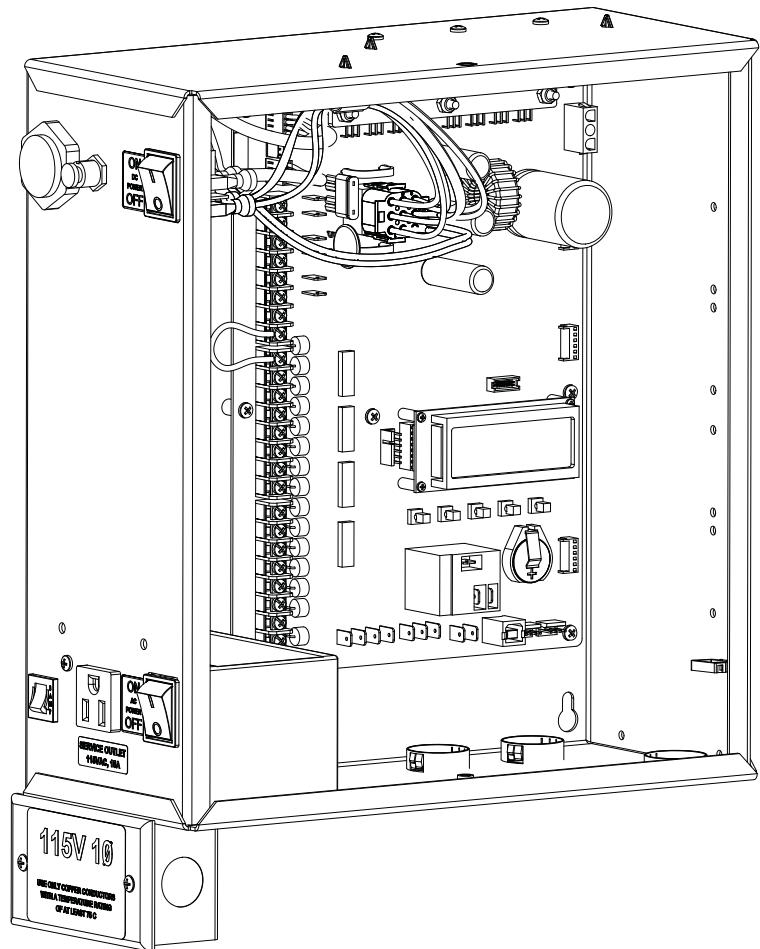


Figure 4-1. Smart DC Controller and Control Box

OVERVIEW OF THE SMART DC CONTROLLER

The Smart DC Controller uses LED's to indicate active inputs when AC power is present. For operators that use only DC power, you can push a button to show the active inputs. This button is at the bottom left corner near the EMERG OPEN input.

On a new operator no active inputs should appear until external accessories and wiring are attached. If any inputs are active before connecting external wiring, refer to *Smart DC Controller Troubleshooting*.

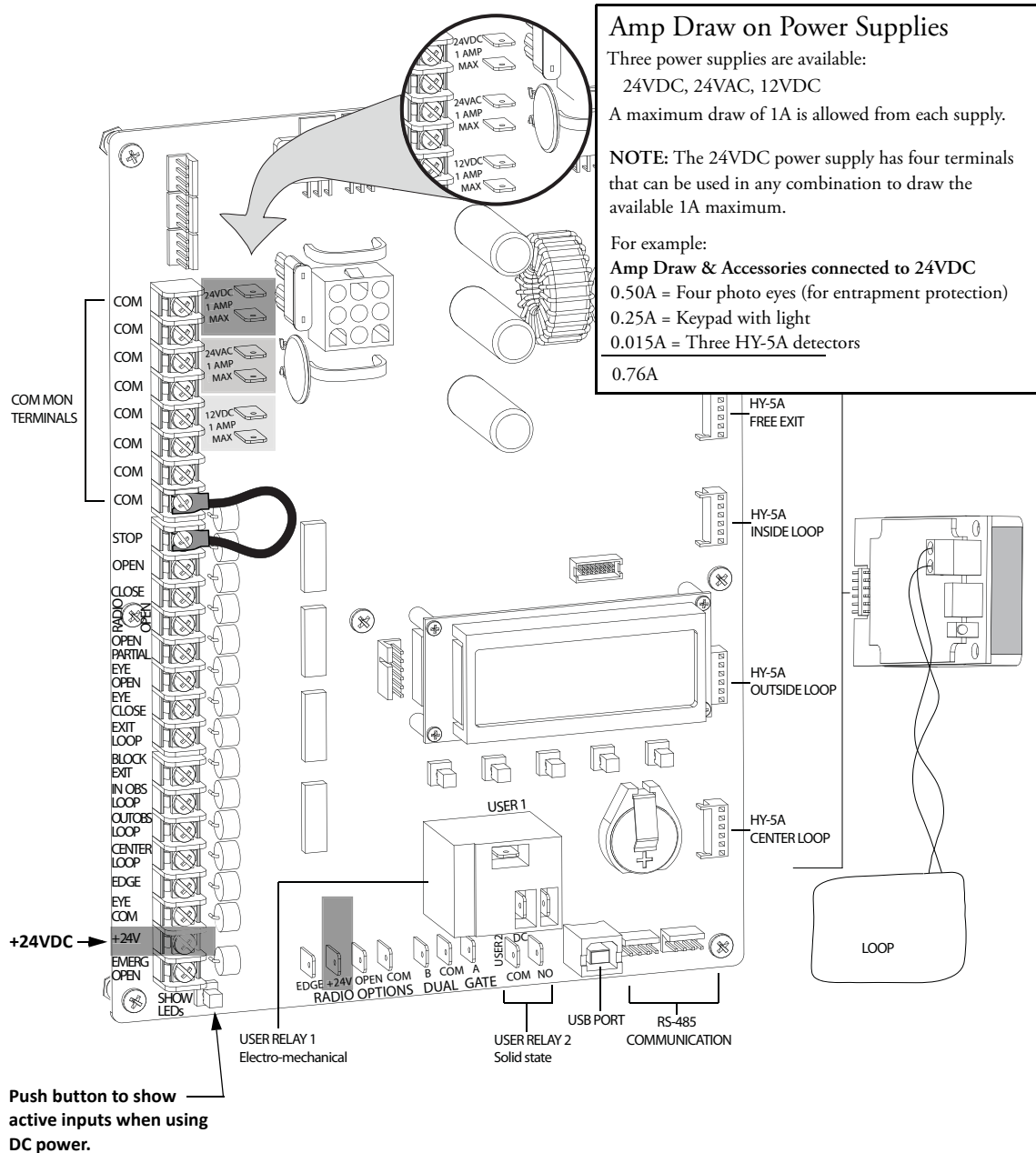


Figure 4-2. Smart DC Controller Board

Preliminary Testing

All the control device inputs listed in Table 4-1 are shown as a single input. The second wire is connected to a Common Terminal Bus (1 - 8) on the Smart DC Controller board.

The Fire Department Open input is an exception and requires a +24 Volt input as well as activation in the Installer Menu. For convenience a +24V terminal is located next to the EMERG OPEN terminal. Refer to Figure 4-2.

Table 4-1. Smart DC Controller Board Inputs

Terminal No.	Input Name	Use
1- 8	Common Terminal	All user inputs are energized when connected to common except Emergency Open.
9	Stop * push button	Normally Closed (N.C.). input. Jumper to Common if not being used.
10	Open * push Button	Normally Open (N.O.) input. Not for radio or remote access controls.
11	Close push button	N.O. input. Connection for a close push-button.
12	Remote Open and Radio Control	N.O. input. For radio / remote open device - Program to also Close using Smart Touch Installer Menu.
13	Partial Open	Not used in swing gate operators.
14	Photo Eye Open direction	N.O. input. Connection for Photo Eye Open direction. Can be changed to a supervised Normally Closed (N.C.) contact through the Installer Menu.
15	Photo Eye Close direction	N.O. input. Connection for Photo Eye Close direction. Can be changed to a supervised Normally Closed (N.C.) contact through the Installer Menu.
16	Free Exit Vehicle Detector	N.O. input. Connection for free exit vehicle detector.
17	Block Free Exit vehicle detector or Close Timer	N.O. input. Free Exit is only disabled if Close Limit Switch is tripped. If the gate is partially opened, the Free Exit detector will trigger the gate to open fully. The input can be converted in the Installer Menu to alternately disable the Close Timer.
18	Inside Obstruction Vehicle Detector	N.O. input. Inside reversing loop.
19	Outside Obstruction Vehicle Detector	N.O. input. Outside reversing loop.
20	Center Loop (Shadow) Vehicle Detector	N.O. input. Shadow function used for Swing gates only.
21	Edge Sensor	N.O. input. One input works for both directions of travel. It can be changed to N.C. contact through the Installer Menu.
22	Photo Eye Common	When the Photo Eye Open and Photo Eye Closed common wires are connected to this terminal, the photo eyes energize only when the motor runs. Use these terminals to preserve battery power.
23	+24V DC	Convenient 24VDC power for photo eyes or the Emergency Open input.
24	Emergency Open (Fire Dept.Open) **	N.O. input. The Emergency Open must be enabled via the Installer Menu. It is energized by connecting to the +24V terminal above it. The EMERG OPEN overrides photo eye & edge sensor commands.

*Do not connect an external control to the STOP or OPEN inputs unless the controls are located in clear view of the entire gate area. Use the RADIO OPEN input or RADIO OPTIONS spade connections for all out-of-sight controls, such as a telephone entry or radio operated controls.

**The Fire Department Open control must be keyed or guarded so that it can only be used by authorized personnel.

Vehicle Detector Installation Options

The Smart DC Controller provides a feature-rich interface to four different vehicle detector inputs.

— NOTE —

Standard box type 11 pin (24 Volt DC or 24 Volt AC) vehicle detectors may be connected in the traditional manner as described in *Installing Standard 11-Pin Box Type Vehicle Detectors*.

HySecurity's custom HY-5A mini-detector module (Figure 4-3) plugs directly into the Smart DC Controller Board making field installation much faster plus providing a large performance benefit. The detector communicates with the Smart DC Controller microprocessor to achieve the following benefits over common box type detectors:

- Loop frequency is automatically set and monitored by the Smart DC Controller
- Very low power draw, which is important for maximum UPS capability during a power failure and for solar applications.
- Cross-talk between multiple loops is impossible.
- Best operating frequency for each loop is automatically selected.
- Loop frequency and call strength can be reported on the Smart DC Controller display.
- Loop malfunctions are reported and stored by the Smart DC Controller.
- Most detector or loop faults that can occur are reported and presented on the Smart DC Controller display.

It is not mandatory to use two separate detectors for inner and outer obstruction detection, however the benefits of using this additional detector are great. Several new features are possible, such as second vehicle tailgating detection, loitering alert, and selectable non-reversing options.

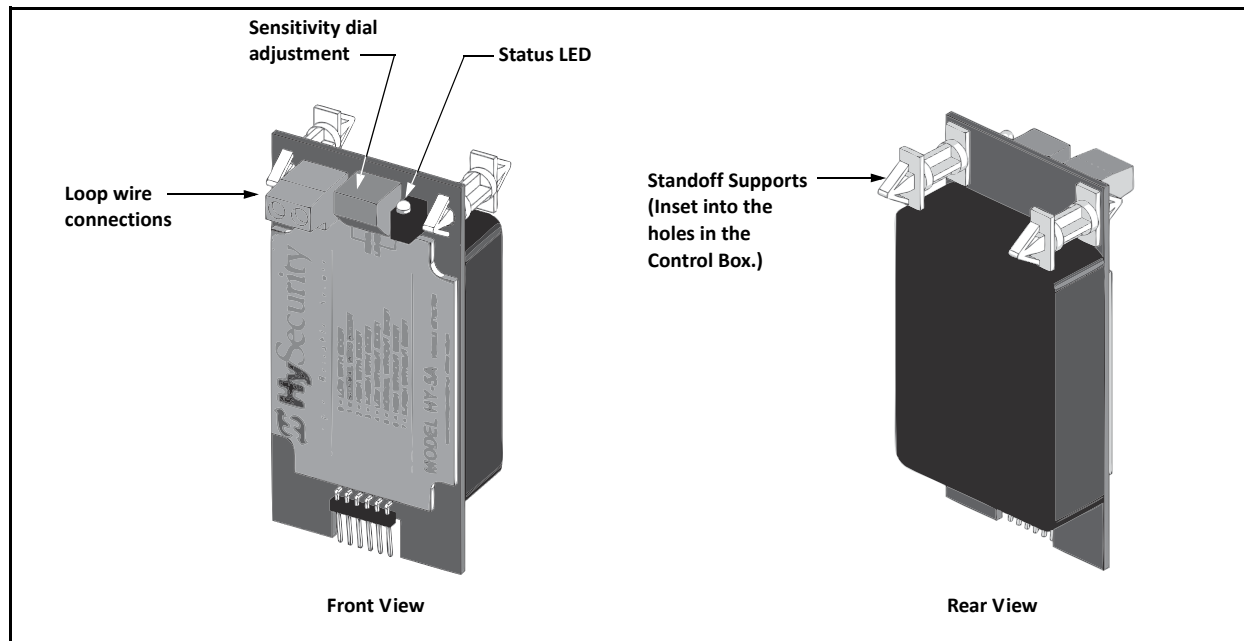


Figure 4-3. HY-5A Vehicle Detector Module

There are four vehicle detector inputs available on the Smart DC Controller as well as via the direct plug in modules. The vehicle detector input functions are as follows:

- Free Exit Loop Detector - This opens a fully closed gate.
- Outside Obstruction Loop Detector (Out Obs Loop) - This is for the outside reversing loop
- Inside Obstruction Loop Detector (In Obs Loop) - This is for the inside reversing loop
- Center Loop Detector - This is also known as a Shadow Loop and is used for swing gates only to prevent a gate from starting open or closed when a vehicle is in the path of the gate.

— **NOTE** —

Use of any combination of HY-5A detectors and box detectors is acceptable. On occasion, multiple obstruction detectors may be mandatory. For example, an area greater than 200 square feet (61 square meters) of loop cannot be connected to any one detector because the sensitivity becomes inadequate.

CONNECTING HY-5A VEHICLE DETECTORS

Install the HY-5A Vehicle Detector modules, one at a time, according to the following procedure:

1. Turn off both AC and DC power switches.
2. Insert the locking end of the two white plastic standoffs into the mounting holes on the detector.
3. Plug the detector into the appropriate socket along the right edge of the Smart DC Controller board. *Be careful to align the six detector pins into the socket correctly* (the screws for tightening the terminals should face toward the board), and then snap the standoffs into the holes in the control box.
4. Route the loop wires through the holes provided in the control box and connect the loop leads to the two terminals on the HY-5A detector. Tighten the terminal screws securely.
5. To enable the detector, turn on power. The detector will immediately tune if it is connected to loops. Make sure no cars or other metal objects are over the loops.
6. Repeat Steps 1 through 5 for each HY-5A detector.
7. If the detector module is unplugged after it is enabled, a communications alert (ALERT 10) will be triggered; if the fault continues an error message, ERROR 3 "Detector Failed" is displayed.

— **NOTE** —

If there is any detector fault, the gate operator functions as if the detector is triggered.

Pressing the RESET button:

- Clears any errors
 - Tunes the detectors on connected loops
 - Un-installs any detectors that have been removed
8. The Smart DC Controller automatically governs frequency selection for all HY-5A detector modules. This simplifies installation and guarantees that there is no cross-talk between multiple loops. The frequency can also be manually selected; if this is required, refer to the Table 3-2 "Smart DC Controller - Installer Menu Functions" on page 3-22.

9. Sensitivity is the only adjustment available on the detector itself. Generally, sensitivity does not need to be increased unless the loop is large or there are multiple loops connected to one detector.

— **NOTE** —

Do not exceed more than 200 square feet (61 square meters) of loop area to one detector.

If required, adjust the sensitivity using the rotary switch which has the following eight settings:

- 0 = Low with boost (See NOTE.)
- 1 = Normal with boost (See NOTE.)
- 2 = Medium with boost (See NOTE.)
- 3 = High with boost (See NOTE.)
- 4 = Low without boost
- 5 = Normal without boost
- 6 = Medium without boost
- 7 = High without boost

— **NOTE** —

A boost feature is applied for settings 0 through 3. Boost increases the sensitivity during a call and is useful for maintaining continuous detection if the signal becomes weak (such as with tractor-trailer trucks). Sensitivity settings 4 through 7 are the same as 0 through 3, but without the boost feature.

10. Vehicle detector functions are configurable through the Installer Menu as described in Table 4-2.

Table 4-2. Vehicle Detector - Configurable Functions

Display	Meaning	Installer Menu Setting Options
		(Bold - Default)
OR 1	Outside Obstruction loop detector function	0 = Pause closing only 1 = Enable reversing to open
IR 1	Inside Obstruction loop detector function	0 = Pause closing only 1 = Enable reversing to open
HD 1	Center Loop detector function	0 = Hold open only 1 = Hold open and Hold closed
DL 1	Vehicle detector logic	1 = Standard (Close Timer does not begin counting until all loops have cleared) 2 = Quick close (Close Timer can count to zero, even while loops are active, so the gate will close as soon as the loops are clear)

11. The outside and inside Obstruction Loop Detectors are factory configured to fully re-open the gate as a default setting. In the Installer Menu, each detector can individually be set so that when the gate is closing there is only a pause if triggered. To change the setting, go to the menu OR or IR item and set to 0.

INSTALLING STANDARD 11-PIN BOX TYPE VEHICLE DETECTORS

If standard 11-pin box type vehicle detectors are to be used, perform the following procedure.

1. If there is sufficient space, install the sockets in the control box; if not, then install them in a separate external housing. Figure 4-4 is for general reference only.

— NOTE

Carefully consider your peripheral connections. Any peripheral device required for safe gate operation should be attached 24VDC in case of an AC power outage. Additionally, box detectors with relays require five times more power than HY-5A detectors, therefore UPS battery life will be extended if using HY-5A detectors.

2. Connect 24 Volt power to the detector. Connect Pin No. 1 to a 24VAC or 24VDC terminal and Pin No. 2 to common.
3. Connect output Pin No. 6 to the Common Bus and output Pin No. 5 to one of the four detector terminal inputs (depending upon the detector function required) on the Smart DC Controller.
4. If multiple detectors are used, route the power wires and common wire from socket to socket (daisy-chaining) rather than individually running each wire to the same location. See Figure 4-4. The only wires that are separate are the output wire to the Smart DC Controller and the detector loop input wires.

— NOTE

Always keep the detector loop wires well twisted at all places beyond the area of the loop. The lead in portion sealed in a saw cut does not need to be twisted so long as the wires are encapsulated in loop sealant and cannot move. Refer to *Installing Vehicle Detectors and Loops*.

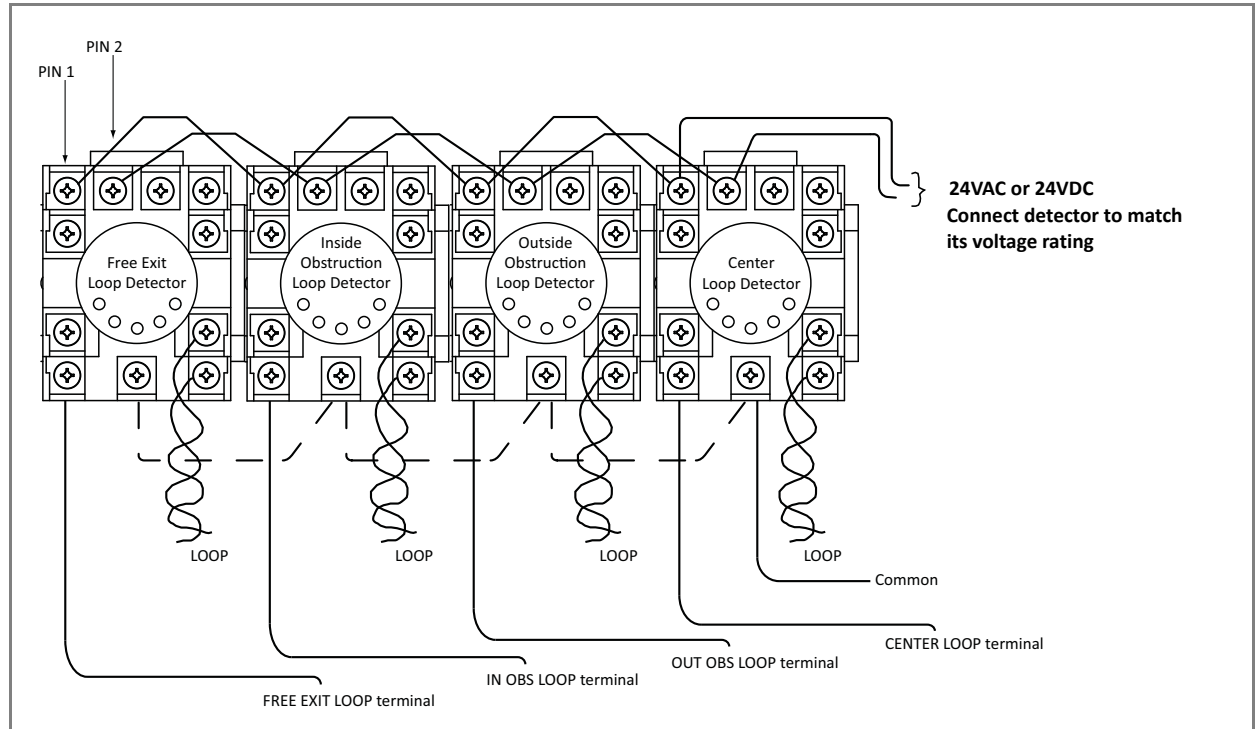


Figure 4-4. Standard 11-Pin Box Type Vehicle Detector

VEHICLE DETECTOR CONFIGURATION AND QUICK CLOSE MODE SELECTION

The Standard Quick Close modes are selectable in the Installer Menu. Refer to Table 3-2 on page 3-22.

The two selectable modes are described as follows:

Mode 1 (Default)

An input from either the Free Exit, Outside Obstruction Loop, Inside Obstruction Loop or the Center Loop will hold the gate open, reset the close timer, and block all close inputs.

Mode 2

Same function as Mode 1, except the close timer can count to zero even with the Free Exit, Outside Obstruction Loop, Inside Obstruction Loop or the Center Loop detector inputs active. If the close timer has counted to zero, the gate will close when all detector inputs are clear.

CONNECTING ACCESSORY DEVICES

All accessories require a minimum of two connections on the Smart DC Controller.:

- a device input
- a Common Bus Terminal (COM)

Devices, such as gate edge sensors and photoelectric beams, must be installed to protect against entrapment. These secondary entrapment protection devices are required so the gate installation is in compliance with UL 325 Safety Standards. Figure 4-5 illustrates how to connect different sensor devices to the Smart DC Controller.

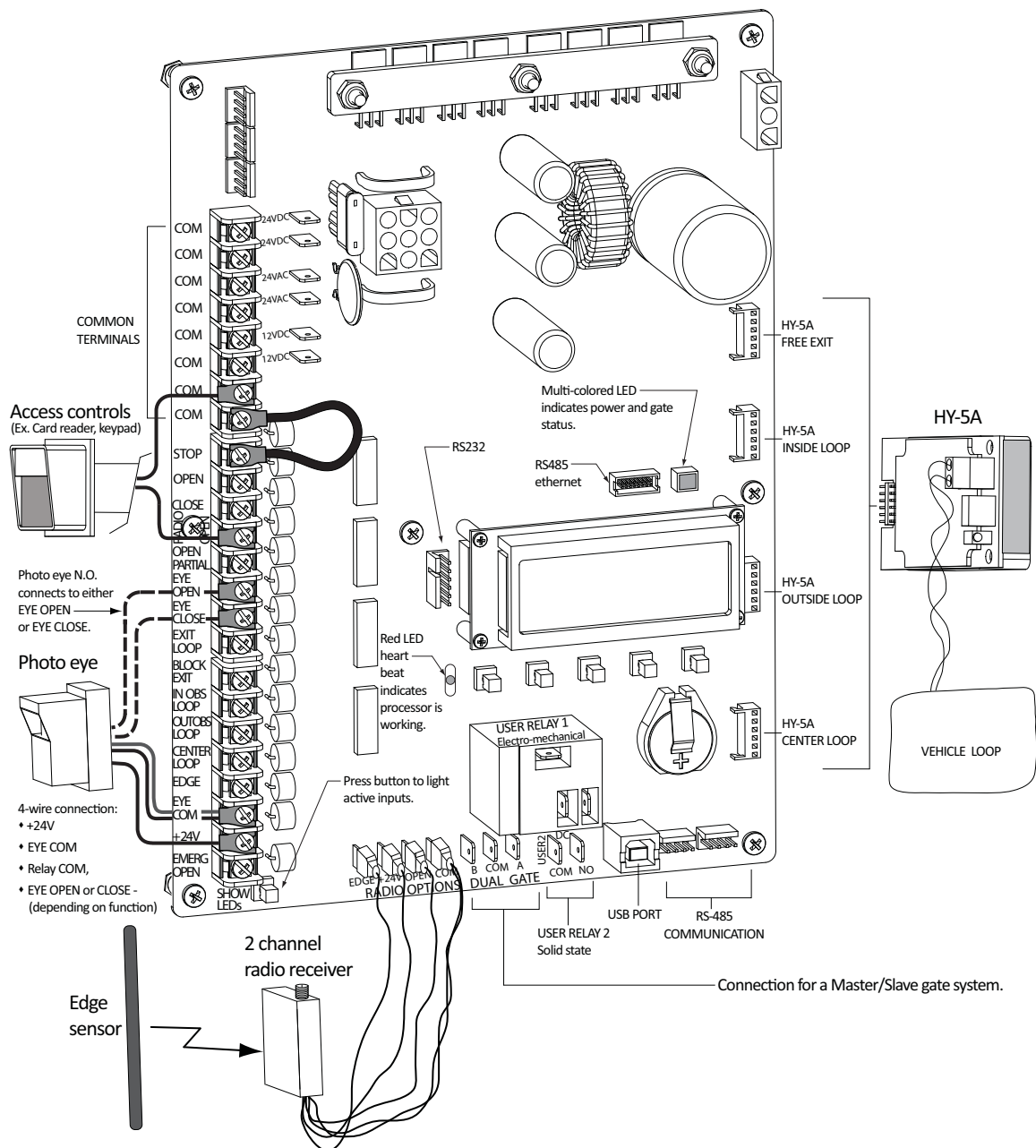


Figure 4-5. Entrapment Sensors & Accessory Connections

Manual Push-button Station

A manual push-button station controls the gate operator and opens, stops, and closes the gate. It is most often used by a guard in a 24-hour guard station. An example of the push-button station connections on SwingSmart is shown in Figure 4-6.

CAUTION

Make sure the manual push-button station is within site of the gate, a distance (six foot, 1.8m minimum) away from the gate's moving parts, and out of reach of children.

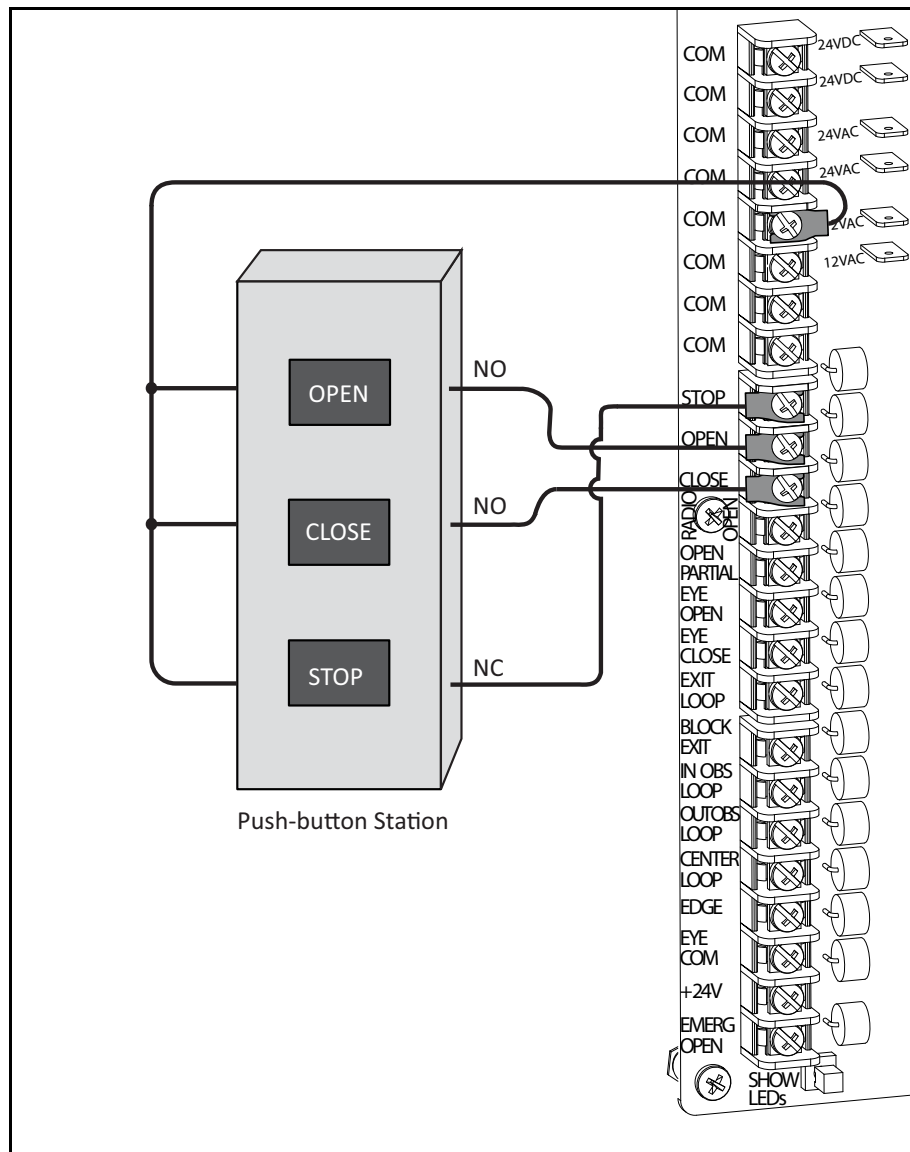


Figure 4-6. Manual Push-button Station Connection

User Relays - Programming Procedure

The Smart DC Controller is able to interface with many types of external devices through the use of two user-programmable output relays. All of the user relay functions identified and described in Table 4-3 are accessible in the Installer Menu.

— NOTE —

The User Relays will operate normally to less than 18VDC. The USER 2 RELAY is rated for DC only up to 48V and does not have an N.C. (normally closed) connection.

Use the Smart DC Controller buttons to program the user relays according to the following steps:

1. Select the relay you wish to use.
2. Enter the appropriate function using the associated number listed in the table.

Table 4-3. User-Programmable User Relays - Function Options

No.	Name	Description
1	Close limit output	Creates an interlock signal to another operator's interlock input, or simply to indicate that the gate is secure. The relay is released when the fully-closed limit switch is tripped. The relay is energized when the fully-closed limit is released. (Any open command energizes the relay.)
2	Close limit pulse output	Used in a sequenced system to command a second machine to close. Generates a brief pulsed output that occurs when the close limit is triggered.
3	Open limit output	Indicates a full-open position. This output becomes active when an open-limit is triggered and releases when the open-limit is released.
4	Open limit pulse output	Trips a sequenced barrier arm gate operator to open. Generates a brief pulsed-output when the open-limit is triggered. An additional pulse is also generated with any new open command even when the gate is already fully-opened.
5	Warn before/during operate output	Controls an external warning device. This output operates at the same time as the internal warn before operate buzzer.
6	Gate Lock output	Controls external solenoid locks or magnetic locks. In both directions of travel, this output is activated about 7/10 ^{ths} of a second before the operator starts moving the gate and remains active while moving as well as for a few seconds after stopping.
7	Gate forced open output	Activated if the gate is forced off the closed limit switch and operator is not able to restore the gate to full closed within four seconds. This alarm resets itself in 30 seconds. Note: FA - FORCE OPEN ALERT must be set to 1 in the User Menu.
8	Gate open too long output	Activates when the gate is open longer than a user-selected period of time. Adjustable from 0 delay to 135 seconds delay in 15-second time increments. Note: TL - OPEN TIME ALERT adjustments can be made in the Installer Menu.
9	Safety Mode Alert output	Activated when system is in the Safety Mode or the Entrapment Mode. Safety Mode occurs upon an impact with an obstruction. Entrapment Mode means the gate is stopped and occurs if the internal inherent sensor triggers while the system is in the Safety Mode.
10	Entrapment Mode Alert output	Activated only when system is in the Entrapment Mode.
11	Unauthorized Vehicle Entry output	Activated when a second vehicle enters from the outside without a valid input from an access control device. This output releases when an access control input signals open or the gate reaches the close limit position.
12	Outside Obstruction Vehicle Detector output	Interlocks an entry device to prevent pedestrian use. This output is active whenever the Outside Obstruction Loop Detector is tripped.

Table 4-3. User-Programmable User Relays - Function Options (Continued)

No.	Name	Description
13	Loitering Alert	Indicates a vehicle or loitering on the Outside Obstruction Loop. Adjustable from 0 delay to 135 seconds delay in 15-second time intervals. Note: LT - LOITERING ALERT adjustments can be made in the Installer Menu.
14	Gate nearing full travel output	Activated when the gate is three feet from full travel in both the open and close directions. This output is used to reduce the sensitivity of a proximity sensor near the ends of gate travel.
15	Gate Failure output	Activated to report occurrence of a problem. Indicates the system is in an Error Mode, Fault Mode or Entrapment Mode. If active, the gate is disabled.
16	Motor Running output	Active when the motor is running and the gate is in motion.
17	AC Power Failure output	This relay is normally energized and drops with loss of AC power.
18	DC Power Failure output	Activated when the battery power is very low, but the output ceases when the battery is dead. The relay is triggered when the battery is less than 20 Volts.
19	Flasher Relay	Controls flashing lights that pulse once per second. The relay is constantly activating except when the open limit switch is triggered.
20	Free Exit Loop Vehicle Detector output	Active whenever the Exit Loop is tripped.
21	Inside Obstruction Vehicle Detector output	Activated when the Inside Obstruction Vehicle Detector is tripped.
22	Reset/Shadow Loop Detector output	Activated when the Center (Shadow) loop detector is tripped.
23	External Latching Gate Lock Output	Not functional in the SwingSmart operator.
24	Gate at Partial Open Position	Not functional in the SwingSmart operator.

Bi-parting Gate Systems

Chapter 5

The steps involved with installing a bi-parting gate system are explained in this section and include:

- Power Requirements
- Master/Slave Wiring Connections
- Master/Slave Menu Setup

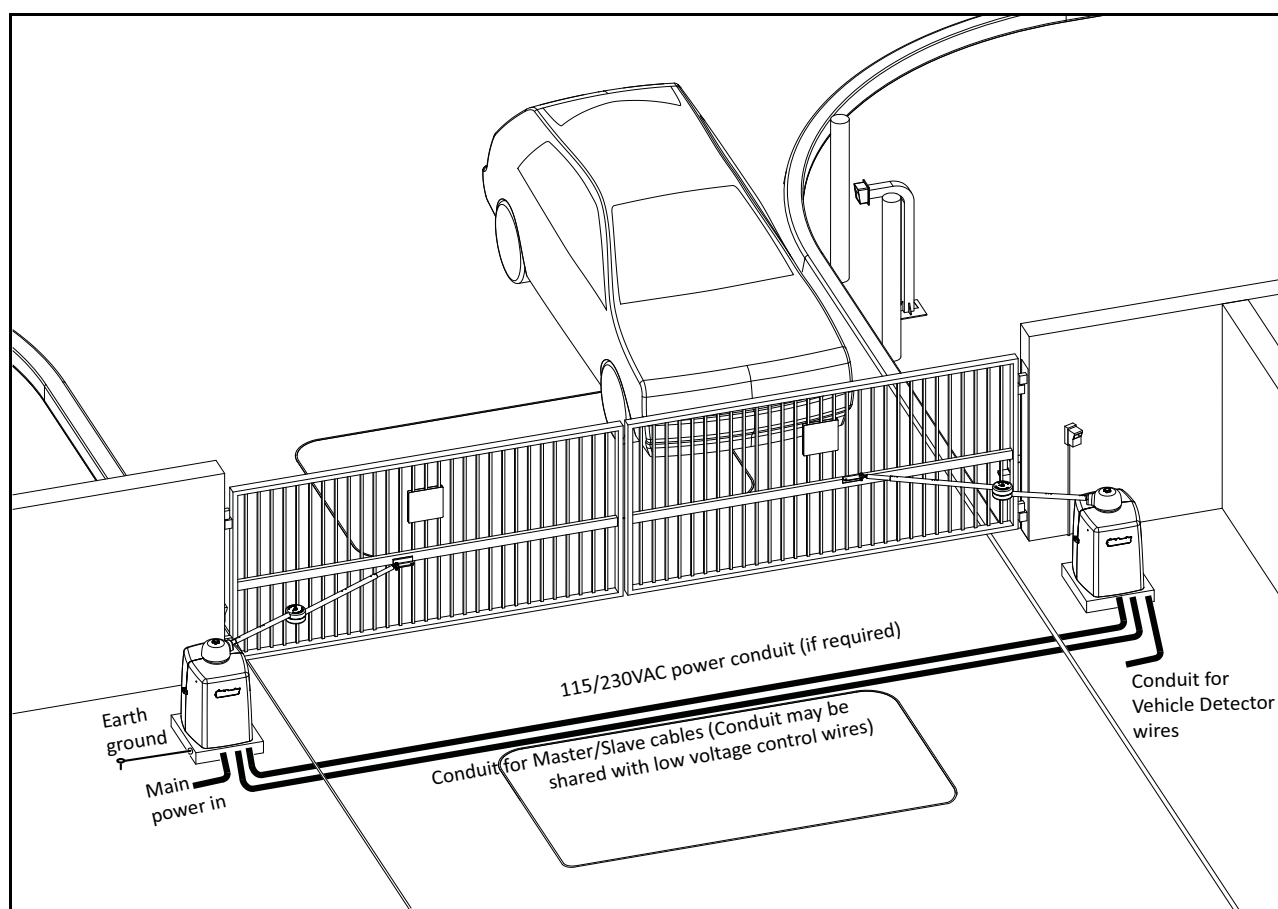


Figure 5-1.

CONNECTING A MASTER SLAVE PAIR

When installing a dual-operator system, the following must be adhered to:

- An electrical conduit for interconnecting wires must span between the two operators. The master-slave communication wires and any low voltage control wires must be installed in a conduit that is separate from the high voltage power wires. See Figure 5-2.
- Complete the installation of both operators as separate machines and verify that their basic functions are correct as solo operators before interconnecting them.
- External control inputs, vehicle detectors and entrapment protection sensors may be connected to either gate operator without regard to preference.
- Both operators can be connected to the same 20A circuit breaker in the main panel. The wire size affects operator performance. Use the following chart as a guideline to size wire for the given distance from the power source to BOTH operators.

Table 5-1. Wire Length Chart

AC Power - Dual Operators	14 gauge wire	12 gauge wire	10 gauge wire
115V	305 ft (95 meters)	500 ft (150 meters)	775 ft (240 meters)
230V	1220 ft (370 meters)	1950 ft (590 meters)	3100 ft (940 meters)

MASTER AND SLAVE WIRING CONNECTIONS

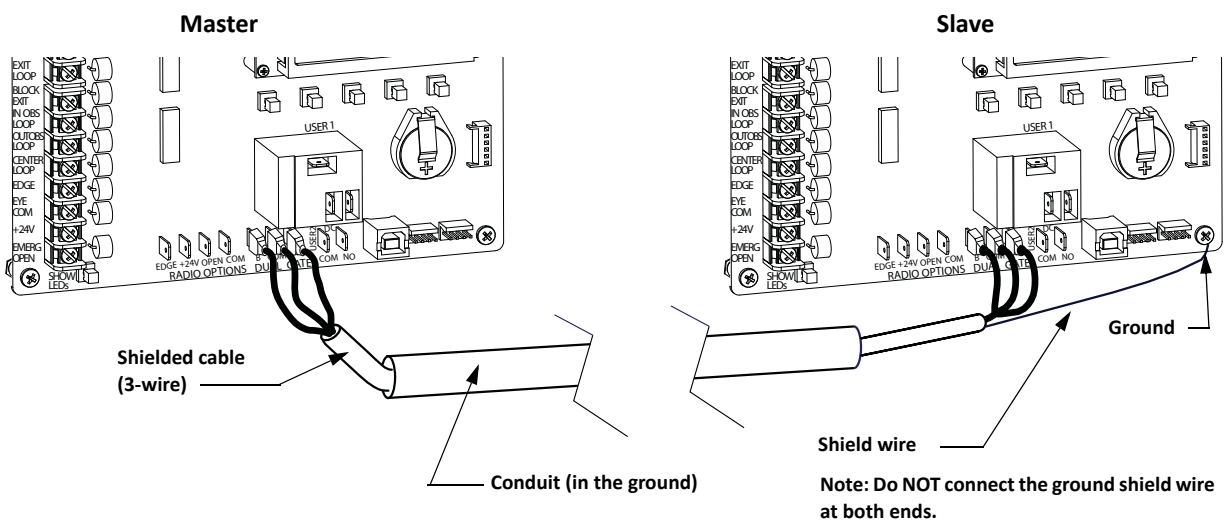


Figure 5-2.

1. As shown in Figure 5-2, connect a shielded communications cable to the DUAL GATE inputs in each unit. The inputs are located near the base of the Smart DC Controller. Be sure to connect the wires in pairs to the same terminal ports (A-A, B-B, and COM to COM) on both units. See *Master Slave Connections on SDC Boards* Table 5-2.

Table 5-2. Master Slave Connections on SDC Boards

Slave	Master
A	A
COM	COM
B	B
Shield wire to Ground*	* Only ground to one unit. Do NOT attach the shield wire to both units.

2. Attach a ring terminal to the shield wire and connect it to the Smart DC Controller's convenient ground screw. Refer to Figure 5-2.

— NOTE —

Connect the ground shield wire to only one operator, not both.

MASTER AND SLAVE MENU SETUP

Determine which unit will be set up as the Master. The other unit will be set up as the Slave. It doesn't matter which unit is which, but you must identify the Master and Slave operators by taking the following steps:

Start by configuring the MASTER unit.

1. At a gate status display, press the MENU button twice. This accesses the User Menu and the CLOSE TIMER display appears.
2. Simultaneously, press the OPEN and RESET buttons to enter the Installer Menu. Release the buttons and the USAGE CLASS display appears which is the first item in the Installer Menu.
3. Press NEXT until the DUAL GATE display appears. The factory default setting is 0.
4. Use the SELECT and NEXT buttons to navigate and change the setting to 2 MASTER.
5. To exit the Installer Menu, press the MENU button. A gate status appears in the display indicating you have returned to Run Mode.

Note: For proper operation, you must set the other gate operator as SLAVE.

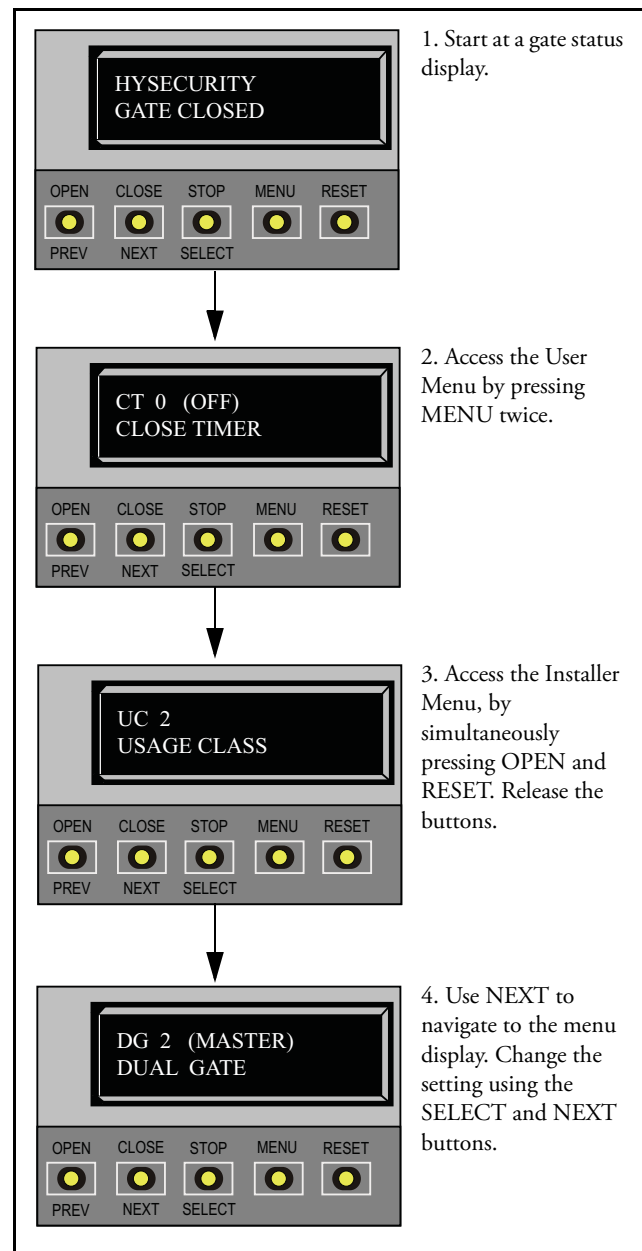
6. Move to the other SwingSmart operator.
7. Using the buttons on the Smart DC Controller, access the DUAL GATE display through the Installer Menu.
8. Perform the same steps, 1 through 5, but address the operator as SLAVE, setting 1.

When the SwingSmart operator has been designated as the master and the other as slave, the dual-gate operators will be in constant communication, most often, in a peer-to-peer relationship. For example,

- Any control input that is attached to the slave unit will be recognized by the master once the Installer Menu is properly configured in both units.
- A diagnostics log is maintained in each unit, but both units run and store the errors codes and diagnostics pertinent to each other.
- The master unit controls the close timer even if the timer is set in the slave unit. If a close timer is set in both units, the master unit overrides the slave setting.

— NOTE —

If the dual-gate communication stops for whatever reason, (communication wire severed or the power switch is turned off in one unit), both operators cease to function and an ERR4 (Master/Slave Communication Error) appears in the display.



Reference

Chapter 6

This section of the manual provides information which may be useful when installing SwingSmart operators. It includes how to:

- Connect a Radio Receiver for Remote Open
- Install a Gate Locking Mechanism
- Install a Solar-powered Operator (See NOTE.)
- Install Vehicle Detectors and Loops
- Install Photoelectric Sensors
- Install Gate Edge Sensors
- Troubleshoot error codes, faults, and hardware issues
- Diagnose vehicle detector and loop faults
- Review General Maintenance procedures

CONNECTING A RADIO RECEIVER FOR REMOTE OPEN

Take the following steps to mount a commercial style 24VDC radio receiver (external antenna type):

1. Install the receiver in the channel of the chassis on either side of the electrical box.
2. Knock out the closest hole in the bottom of the electrical box and route the wires to the area marked RADIO OPTIONS. Only three wire connections are needed because the common wire and one radio output wire are connected together. Figure 6-1 shows additional wires from a two channel receiver.
3. Make sure to observe polarity and crimp together the black radio common wire and one of the radio output wires using a ¼-inch spade connector.
4. Fasten the two crimped wires to the COM terminal.
5. Connect the red wire to the +24V spade and connect the other radio output contact wire to the spade marked OPEN.

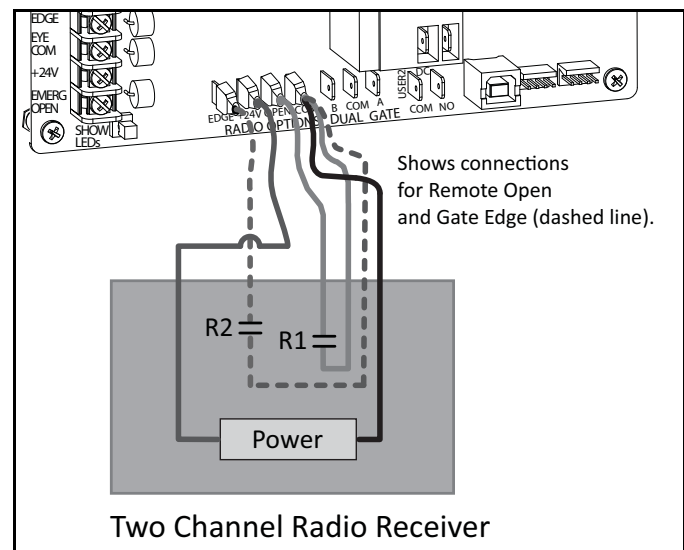


Figure 6-1.

Note: *This terminal is the same as the input terminal labeled RADIO OPEN along the left edge of the Smart DC Controller.*

6. Mount an external antenna onto the top of a fixed fence post near the operator.
7. Connect the antenna into the socket on the radio receiver.
8. Set the “DIP” switches in the receiver to match the same code used in the transmitter.

— NOTE —

If an edge sensor transmitter is also used to reverse the gate, be certain to use a two channel commercial receiver. The edge and hand held transmitters must have their codes set to match the receiver or they will not function.

INSTALLING A MAGLOCK OR SOLENOID LOCK

To provide additional gate security, a maglock or a solenoid lock can be used and connected to the Smart DC Controller. The Smart DC Controller releases the gate prior to initiating gate movement. Before installing the lock, be sure to:

- Determine the electrical power requirements of your lock (maglock or solenoid lock). Electronic board and peripheral connections differ between high voltage and lower voltage gate operators.
- Determine the current required. The 24VDC, 24VAC, or 12VDC terminals supply up to 1 ampere. If the peripherals attached to the terminals need more than 1 amp, a separate power supply is required.

Installing a Lock for 12VDC or 24VDC Systems

To install a lock for 12VDC or 24VDC systems, take the following steps:

1. Connect a wire between COM on USER 1 RELAY and a COM terminal on the electronics board. See Figure 6-2.
2. Connect the power lead from the lock to the appropriate power spade (+24VDC or +12VDC)

3. Connect the common wire from the lock to NC on USER 1 RELAY.

Note: Connect to NO on USER 1 RELAY if installing a Solenoid lock.

4. Set the User Relay function in the Installer Menu to RL1 - 6. Refer to *Setting the User Relay Function in the Installer Menu*.

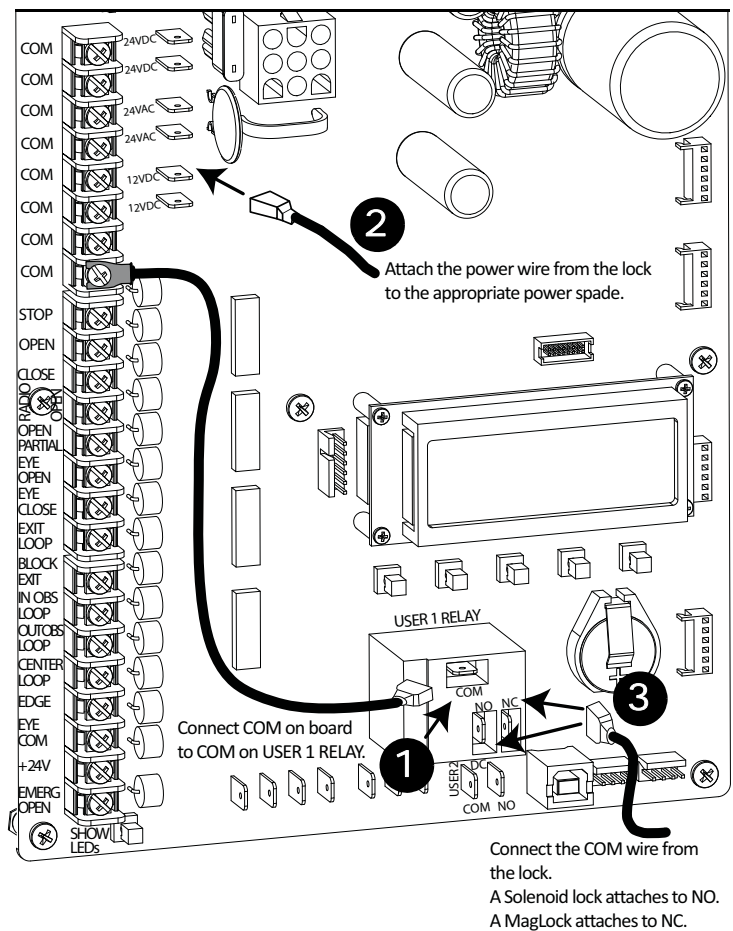


Figure 6-2.

Installing a Lock on 24VAC Systems

To install a lock for 24VAC systems, take the following steps:

1. Connect a wire from COM on USER 1 RELAY and one 24VAC power spade. See Figure 6-3
2. Connect a power lead from the lock to the remaining 24 VAC power spade.
3. Connect the remaining power lead from the lock to the NC terminal on USER 1 RELAY.

Note: Connect to NO on USER 1 RELAY if installing a Solenoid lock.

4. Set the User Relay function in the Installer Menu to RL1 - 6. Refer to *Setting the User Relay Function in the Installer Menu*.

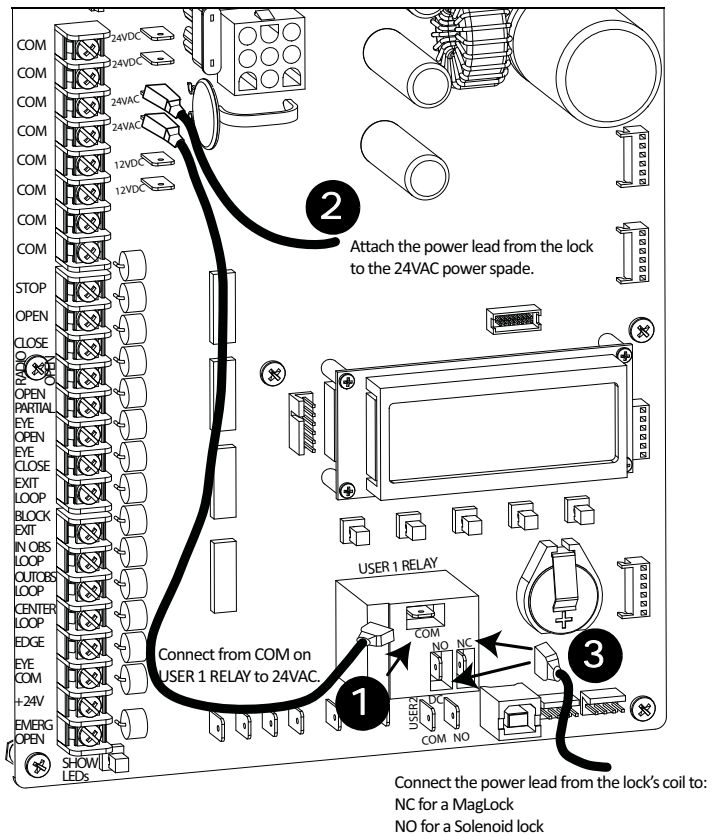


Figure 6-3.

Installing a Lock for High Voltage Systems

To install a lock on higher voltage systems (115V or 230V), take the following steps:

1. Connect one lead of the power supply to one lead of the lock's coil. See Figure 6-4.
2. Connect the other lead of the lock's coil to NO on USER 1 RELAY.

Note: Connect to NC on USER 1 RELAY if installing a maglock.

3. Connect the COM on USER 1 RELAY to the second lead wire in the power supply (115V or 230V).

4. Set the User Relay function in the Installer Menu to RL1 - 6. Refer to *Setting the User Relay Function in the Installer Menu*.

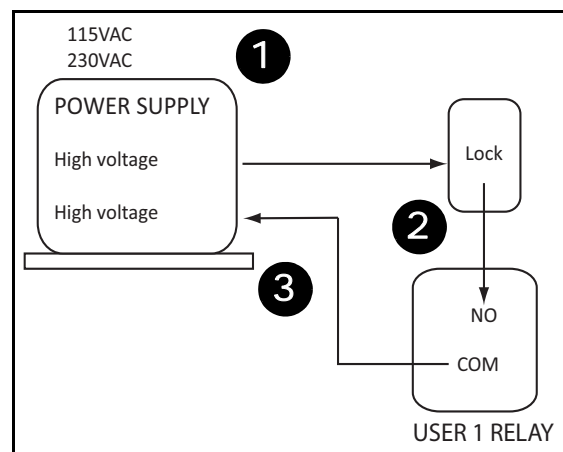
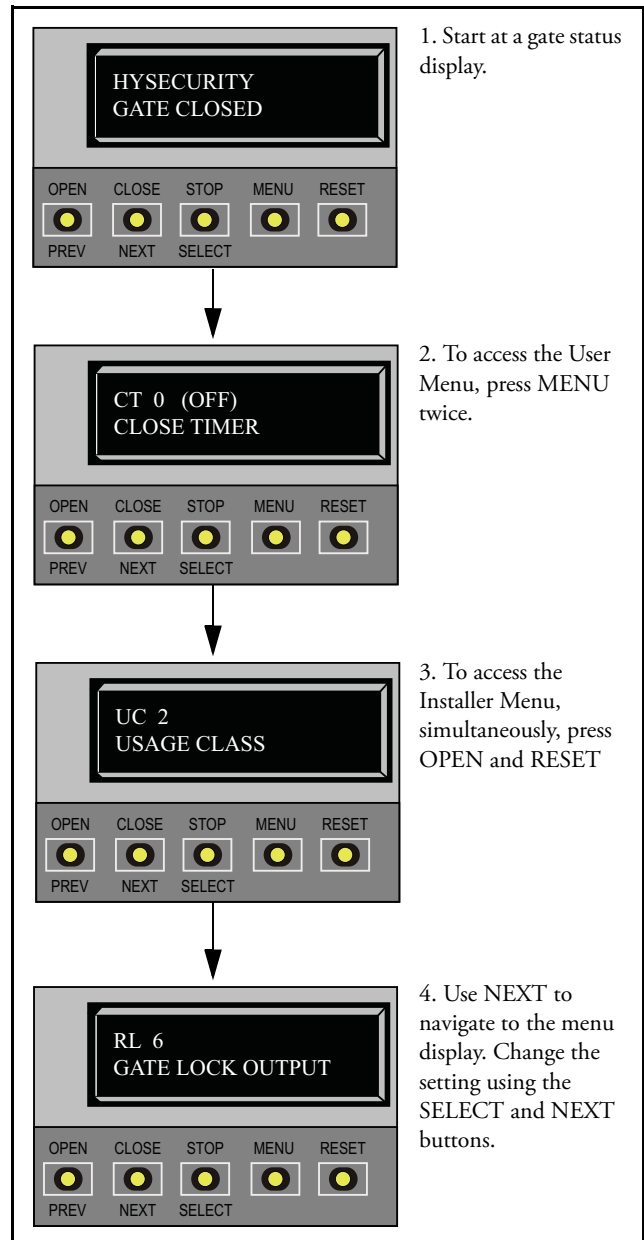


Figure 6-4.

Setting the User Relay Function in the Installer Menu

5. Enter the Installer Menu and set the User 1 Relay to Function 6 - GATE LOCK OUTPUT.



INSTALLING VEHICLE DETECTORS AND LOOPS

A vehicle detector passes a small current flow through the “loop” which then becomes an inductive coil. When a vehicle passes over the loop, the detector senses the resultant drop in the inductance, and actuates the detector output.

Loop Configurations:

Configurations differ depending on the application. In parking applications, a loop may be as small as 4 x 6 foot (122 x 183cm). In traffic applications employing one of our sliding gate operators, or swing gate operators, the smallest loop should not be less than 6 x 6 foot (183 x 183cm) in order to detect high bed vehicles.

Rules to Follow for Security Gate Applications:

The side of the loop closest to the gate must be located at least 4 ft (122cm) from the line of travel.

1. The shortest side of the loop should be between 6 and 8 feet (1.8 x 2.4m) in length. The longest side of the loop should be between 6 and 20 feet (1.8 x 6.1m) in length. For applications that need to span a wide area, use several smaller loops. Do not connect more than 200 square feet (18.6sq. m) of loop area to a single detector.
2. In applications with multiple loops, keep each loop at least 6 feet (1.8m) apart. This avoids “cross talk”. It is possible to have loops closer together by selecting different frequencies. An advantage of using HySecurity model HY-5A detectors is that problematic “cross talk” is not possible.
3. For greater sensitivity and less chance of false calls caused by the motion of the gate, it is better to use multiple smaller loops, connected in a series circuit, to one detector instead of a single large loop.
4. To avoid interference, keep loops at least 2-inches (5cm) above any reinforcing steel. Do not route loop wires with, or in close proximity to, any other conductors, including other loop leads, unless shielded lead-in cable is used. Never route high voltage circuits in PVC conduit near a loop.
5. Loop and lead-in wire should be one continuous piece. Avoid splices, if possible. If a splice is necessary for any reason, “pot” the splice in epoxy or use heat shrink to ensure that the quality of the splice covering is the same as the original wire jacket.
6. Use only 14, 16, or 18 gauge stranded wire with a direct burial jacket. Cross linked polyethylene insulation types, such as, XLPE or XHHW, will last much longer and are less prone to damage during installation than conventional insulation types. Preformed loops can be used before road surfacing or under pavers.
7. Twist loose tails of lead-in wires tightly, approximately ten times per foot. See Figure 6-5.
8. Follow this guide for the correct number of turns in the loop;
 12 to 20 sq. ft = 5 turns 20 to 60 sq. ft. = 4 turns 60 to 240 sq. ft. = 3 turns
 3.7 to 6.1sq. m = 5 turns, 6.1 to 18.3sq. m = 4 turns, 18.3 to 73.1sq. m = 3 turns

Twist lead-in at least 10 turns per foot



Like This



Not Like This

Twist Like This



Figure 6-5.

9. This guide is written from a design perspective, but installation workmanship practices are equally important to insure proper operation and long loop life. The best way to insure a quality installation is to employ a professional installer experienced with detector loops. A few important practices are:
- The slot in the surface of the road should be cut $\frac{1}{4}$ -inch wide x $1\frac{1}{2}$ -inch deep (6.3 x 38.1mm).
 - The corners of the cut must be at an angle or core drilled to relieve stress on the wires.
 - After the wire is installed, the slot must be completely backfilled with a non-hardening sealer. If the loop wires are able to move in the slot after the sealer has set, the detector may give false calls.

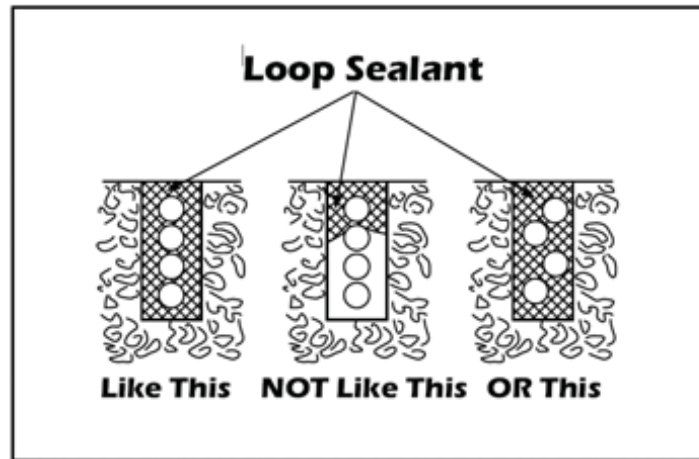


Figure 6-6.

Detector Logic

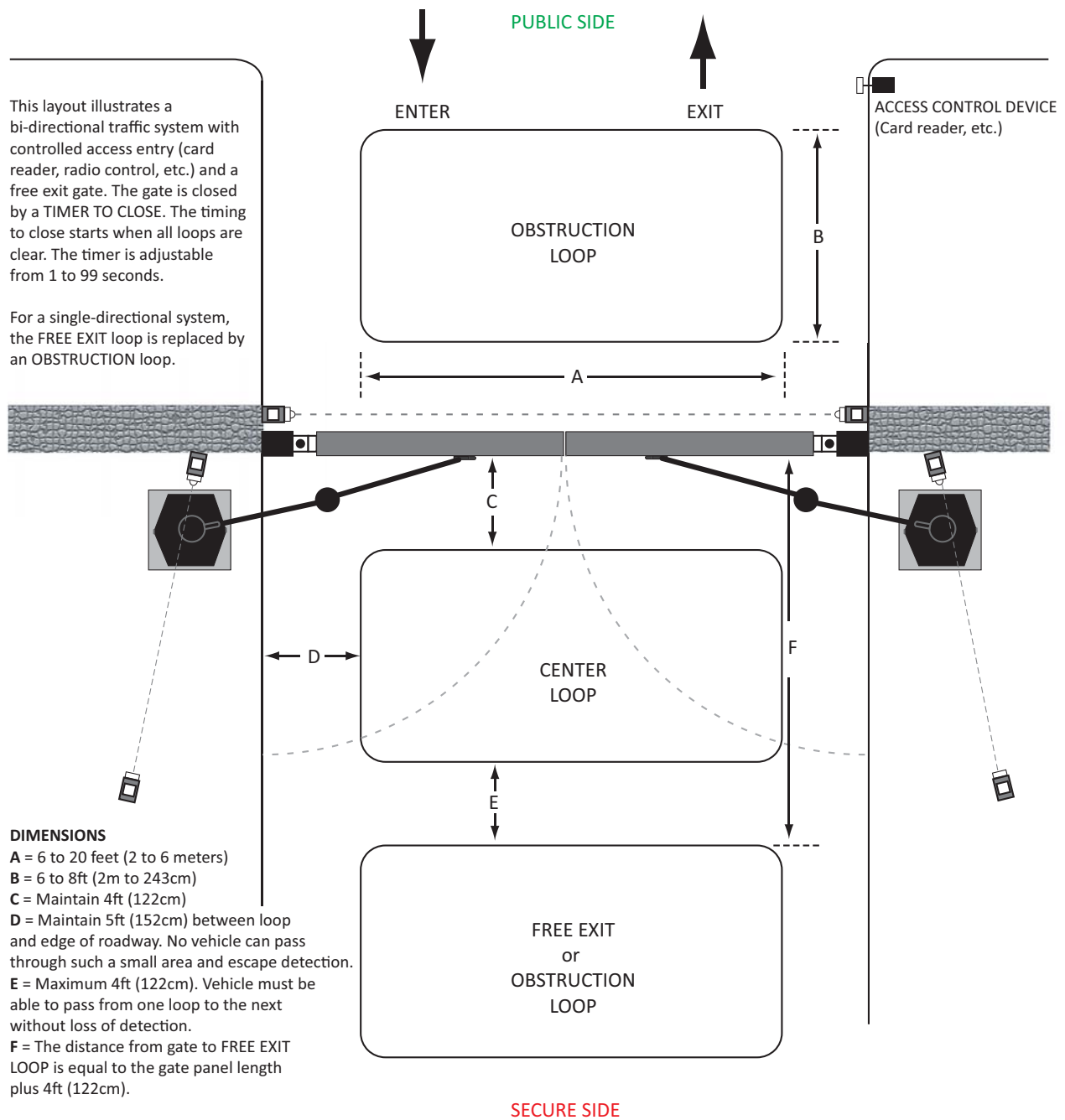
HySecurity recommends that vehicle detectors be used for free open and obstruction sensing logic only. Because of their slower speeds, closing logic is a poor choice for security gate systems. Since there are several ways that the gate may be left standing open and because there is a loss of safety, our circuit has not been designed to accommodate “detect to close” logic.

Loop Diagnostics

The following tests cannot guarantee a functioning loop, but failure of either test means that the loop is definitely suspect, even though it may still be functioning at the time.

1. Test the resistance of the loop and lead-in wire. It should not exceed 4 Ohms.
2. Test the resistance between the loop and earth ground with a 500V Megohm meter. It should be 100 Megohms or more. Loops may function at 10 Megohms or less but will not be reliable (e.g. when the ground is wet from rainfall). Low resistance indicates broken or moisture saturated insulation. This is common if inappropriate wire insulation has been used.

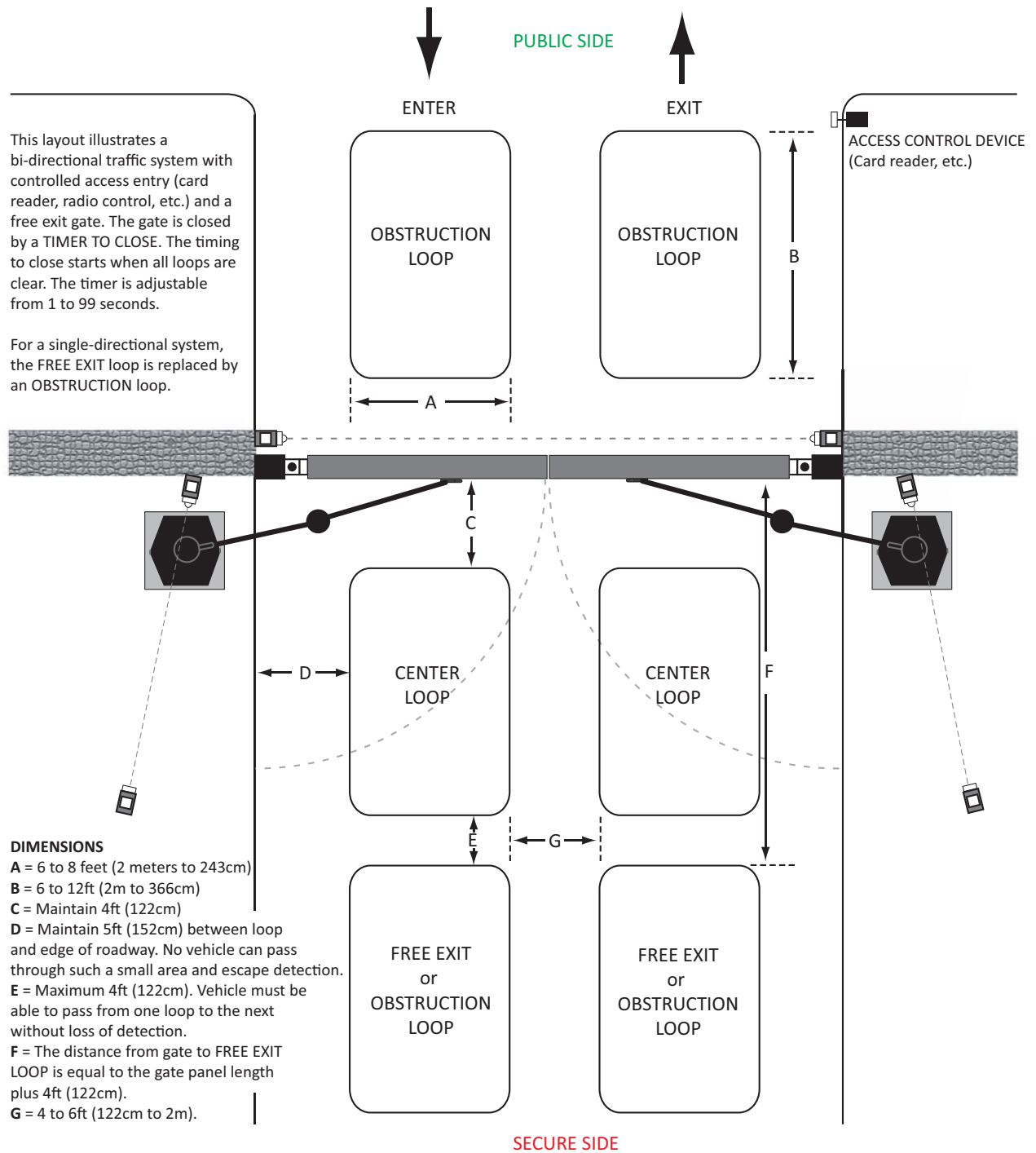
Schematics for Swing Gate Loop Layout are shown in Figure 6-7 and Figure 6-8.



Vehicle Detectors and Loop Layout for Openings less than 28 feet*

* NOTE: A minimum of three (3) detectors are required for this type of gate.

Figure 6-7.



Vehicle Detectors and Loop Layout for Openings greater than 28 feet*

* NOTE: A minimum of three (3) detectors are required for this type of gate.

Figure 6-8.

INSTALLING PHOTOELECTRIC SENSORS FOR SECONDARY ENTRAPMENT PROTECTION ONLY

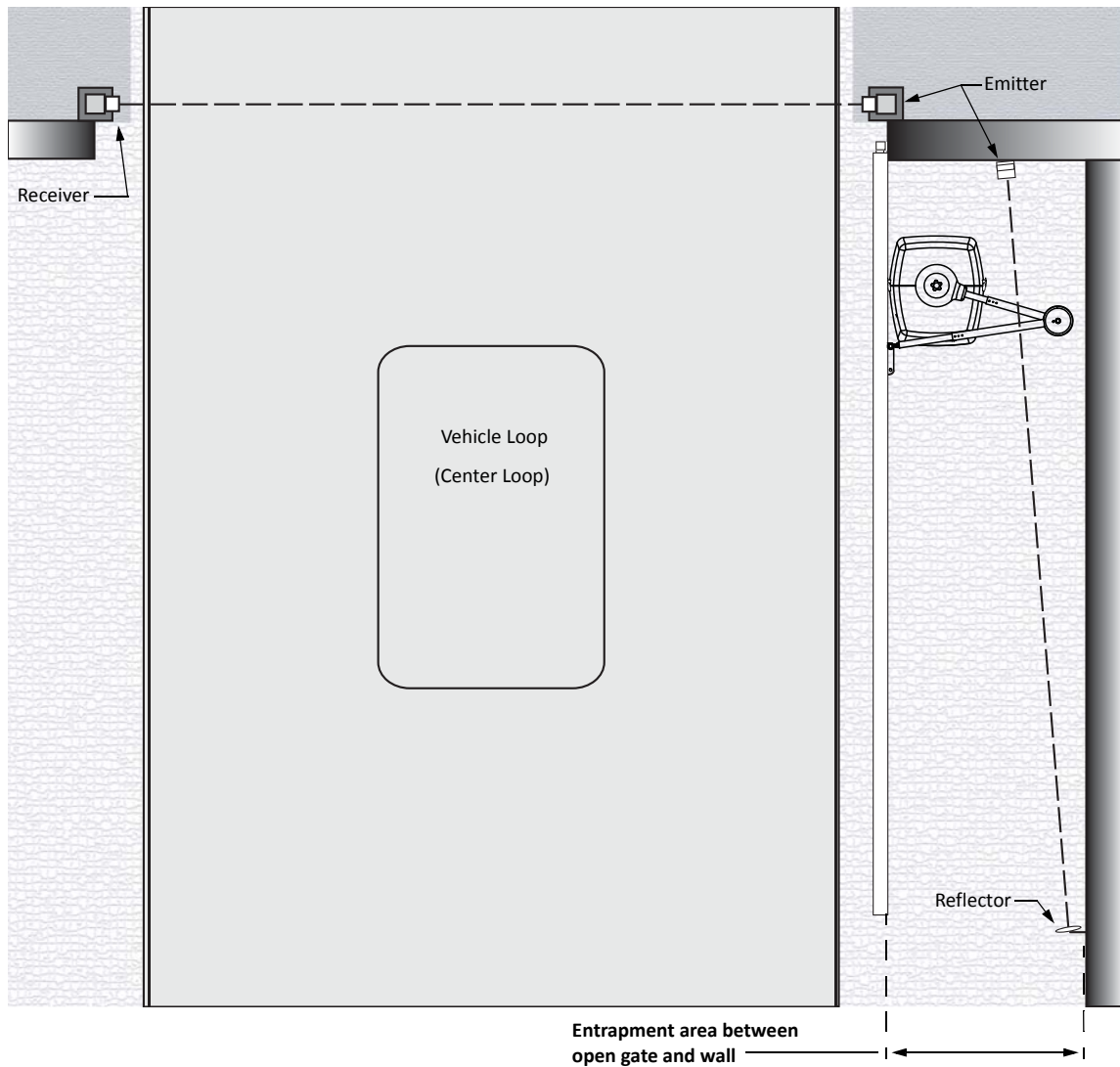


Figure 6-9.

Refer to Figure 6-9 to help plan the most appropriate placement for the photo eyes being installed as secondary entrapment protection devices. If no other secondary external entrapment protection devices (like edge sensors) are installed, then at least two photoelectric sensors are required to guard the gate in each direction of travel. If the photo eyes are tripped, the operator will temporarily stop the gate.

Consult a photoelectric sensor manual for wiring details. Make all electrical connections to Smart DC Controller as shown in Figure 6-10.

OPERATION NOTES:

- A photo eye trip does not reverse gate.
- The Smart DC Controller software is factory set to stop upon photo eye trip.
- Software is configurable to stop and reverse two seconds upon photo eye trip.
- If the photo eye is cleared within five seconds, the gate will proceed in the direction of travel.

There are two common types of photoelectric sensors, thru-beam and retro-reflective, and each has its advantages.

- A thru-beam sensor is generally more powerful and able to function reliably with dirty optics and in poor weather.
- A retro-reflective sensor does not require the installation and extra wiring of a separate emitter and receiver as is required in a thru-beam system, but retro-reflective eyes are generally more problematic in poor weather. Avoid using retro-reflective devices across outdoor distances greater than 24 feet (7.3m) because of performance and reliability issues.

Mount thru-beam type photo eyes approximately 15" to 30" (38cm to 76cm) above the ground and as close to the gate as possible. A minimum of two photo eyes are required, one photo eye to guard the open direction and the other for the close direction of travel, unless gate edges for entrapment protection are installed. Mount the emitters and the receivers just beyond the travel of the gate in both the full open and full closed positions of travel. The installation locations described above are intended for pedestrian detection. If photo eyes are to be used for vehicular detection, install a low elevation photo eye for cars and another photo eye at a height of about 55" (140cm) to detect semi-trucks.

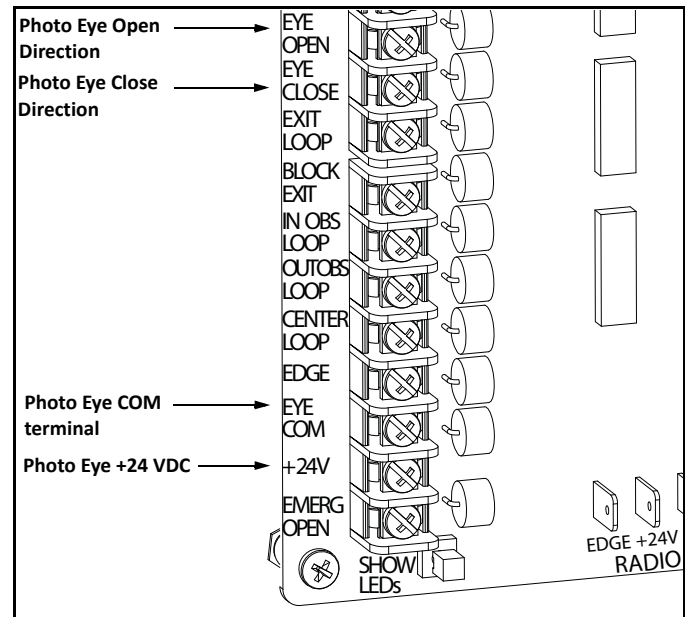


Figure 6-10. Connections for Entrapment Protection only

Note: EYE COM & +24V is the recommended way to connect standard photo eyes to Smart DC Controller.

Other options include:

- Photo eye ON continuously: COM & +24VDC or +24VAC (if the photo eye uses 24VAC).
- Photo eye ON continuously with anti-fog feature: COM & +24VAC (connecting to DC will negatively affect battery charging).
- Photo eye and peripherals draw more than 1A off one power supply: Requires a separate power supply connected to the service outlet.

— NOTE —

If photo eyes are to be used for vehicle detection and logically function the same as a vehicle detector, connect the common wires to the COM terminals on the left side of the board and wire the NO output contact to the appropriate vehicle detector input: EXIT LOOP, IN OBS LOOP, and OUT OBS LOOP.

If the photo eye has an internal switch for setting Light Operate vs. Dark Operate, select Light Operate. If the photo eye has a relay output and has both NO and NC terminals, some experimentation may be required to determine the proper connection. This is because, in the Light Operate mode, the output relay is normally energized and releases when the beam is blocked. Some manufacturers label an output as NO, when it is actually an NC contact. If the photo eye has a solid-state output you must choose a sinking type connection.

Three wires to the receiver and two wires to the emitter are all that is required.

- Depending on how the photo eyes are to be wired, +24VAC, +24VDC, or +12VDC, power is provided via spades located just to the right of the COM terminal strip near the left side of the board.
- The receiver and emitter common wires are connected to the EYE COM terminal at the bottom, left of the Smart DC Controller. (See NOTE.)
- The photo eye NO or NC output wires connect to the Smart DC Controller at the EYE CLOSE terminal if the photo eye spans the road, or at the EYE OPEN terminal if the photo eye spans the area between an open gate and a wall or other structure. (See NOTE).

SUPERVISED CONNECTION:

— NOTE —

This connection REQUIRES that both the Eye Open and Eye Closed inputs be connected to photoelectric eyes.

If two photo eyes are being installed and both have true NC output (one that is NC when the photo eye is powered, aligned and set for Light Operate), then a supervised connection is recommended. A supervised connection will signal a system Fault and prevent gate operation if either the open or close photo eye connection ever becomes an open circuit or a short circuit. The Installer Menu item PC - Photo Eye Output must be changed from a 0 to a 1 to enable this feature.

PHOTO EYE FUNCTION:

A tripped photo eye will prevent the gate from starting in either direction if the gate is stationary. If tripped while in motion, the standard function is to stop the gate motion and then automatically restart again if the photo eye is clear within five seconds. An optional setting in the Installer Menu will cause a two second reversal of travel.

Alignment:

Most photo eyes require careful optical alignment in order to aim the emitter beam to the center of the receiver or reflector. In order to avoid false triggering, it is important to carefully align the system, especially with retro-reflective photo eyes. The best way to assure true centering of the beam is with some trial testing where the emitter is shifted to move the beam left and right and up and down until the range of the invisible cone of the infrared beam is known. Photo eyes usually provide alignment aid LED's for this setup, but they can be hard to see. HySecurity has provided a unique feature that turns power on to the photo eyes and causes our buzzer to chirp when the photo eyes enter and exit alignment. See *Table 3-1 "Smart DC Controller - User Menu Functions"* on page 3-13 to enable this feature. Set the menu item PE - PHOTO EYE ALIGN from a 0 to a 1. The buzzer chirps once when the emitter and photo eye receiver are not aligned. When the emitter and receiver are aligned, the buzzer chirps twice. If they go out of alignment again, the buzzer will chirp once. This "alignment mode" will automatically reset to 0 the next time the Close Limit Switch is triggered or the RESET key is pressed.

Notes about retro-reflective systems:

Correct installation and alignment of a retro-reflective photo eye and its reflector is important for trouble free performance. Any system operating at a range greater than 16 feet is more prone to false triggering due to dirty optics, condensation or poor weather. If care is taken in the initial mounting and alignment of the 3-inch reflector, the chance of problems is greatly reduced. Use only through beam photo eyes for a distances greater than 24 feet because the function of a retro-reflective photo eye will be too unreliable.

Taking steps to protect the photo eye and the reflector from being exposed to fog and being absolutely certain the photo eye is perfectly aligned will greatly reduce any false triggering of the system. The ideal mounting of a retro-reflective photo eye is inside an enclosure.

The ideal reflector mounting suspends it inside a 12-inch long piece of 3-inch PVC conduit. Cut the opening of the PVC conduit at a 45-degree angle to act as a drip shield. Hold the reflector against the backside of the PVC conduit by attaching a 3-inch male connector. Do not cement the connector. This would prevent the reflector from being reached for future cleaning. To create a mounting base, attach a 3-inch aluminum flange (electric meter hub) to the connector. This whole package can be mounted to any flat surface.

Locate the reflector in the center of the invisible beam of infrared light to achieve the most sensitive alignment. The beam center is determined by the following test: while holding the reflector in your hand, slowly raise it until the beam is no longer returned and the photo eye trips. Mark this maximum height. Now lower your hand and determine the lower limit of the infrared beam by watching for the trip point. Mark this position as well. Repeat the same procedure for left and right at the center elevation of the beam, as determined by the previous test. Once the four limits have been determined, either mount the reflector in the center of the area outlined or realign the eye for the position of the reflector. If the photo eye is realigned, be sure to perform the centering test again to verify that the reflector is truly in the center.

INSTALLING GATE EDGE SENSORS

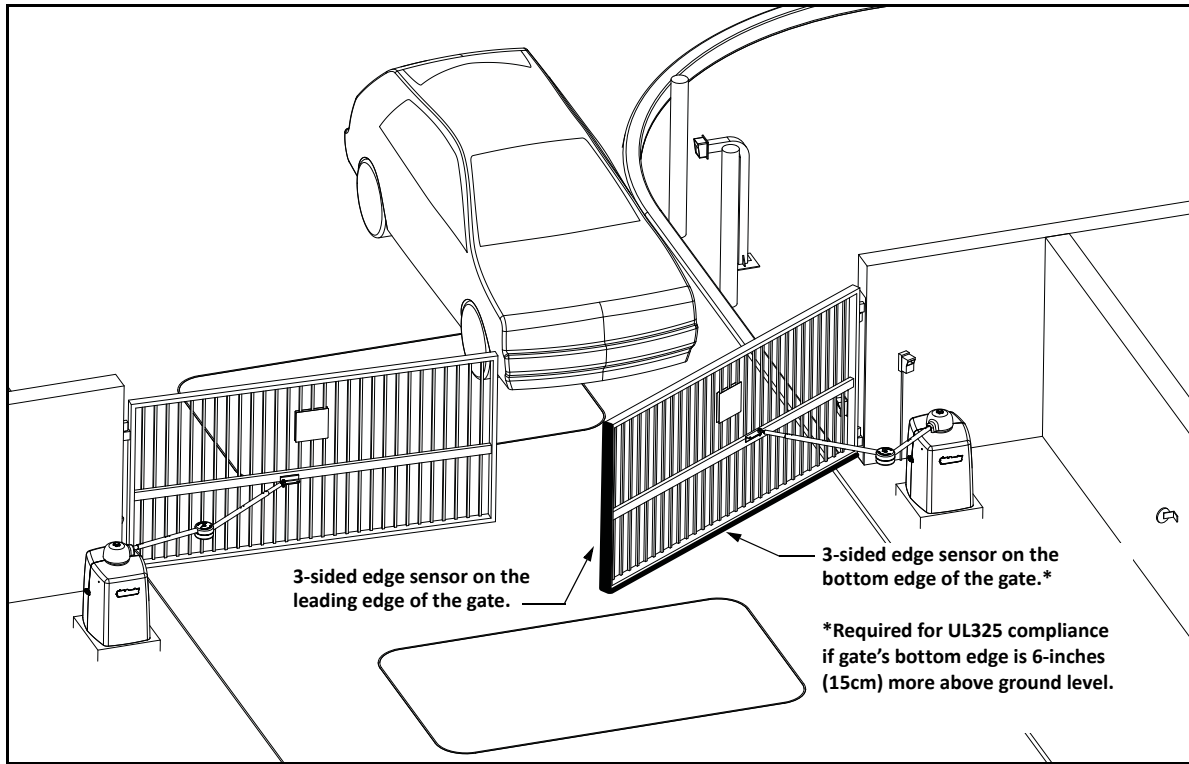


Figure 6-11.

Refer to Figure 6-11 to plan the most appropriate placement of the edge sensors being installed. For swinging gates, one or more contact sensors (edge sensors) shall be located inside and outside the leading edge. Three-sided detectors are ideal for swing gates. If the clearance of the gate is 6 inches (15cm) or more above the road, then an edge sensor must be mounted on the bottom edge. Underwriters Laboratories requires that any contact sensor used as an external entrapment protection device, must be laboratory tested to, and recognized by, the UL 325 Standard.

Drill holes through the edge's mounting channel and through the surface that each gate edge is to be mounted. Securely fasten every edge sensor. Make sure sensors extend to within 6 inches (15cm) of the pavement on the leading edge of the gate.

Edge sensors that are not attached to the moving gate, such as post mounted sensors, must be wired in parallel and directly connected to the gate operator:

- If the gate is swinging open to a wall with less than 16 inches (41cm) of clearance, mount an edge sensor to the wall that aligns with the gate when it is in the open position. Always route the leads from the edge sensors to the gate operator so that they are protected from physical damage.
- The preferred receiver connections are shown in Figure 6-12. An optional method is to connect one edge sensor lead to a COM terminal at the top, left side of the Smart DC Controller, and the other lead to the EDGE terminal, at the bottom, left side of the controller.

Edge sensors may be used with an edge transmitter and a receiver in order to transmit to the gate operator. The use of retractable cord reels or curl cords is not recommended because of durability problems with these devices in outdoor environments.

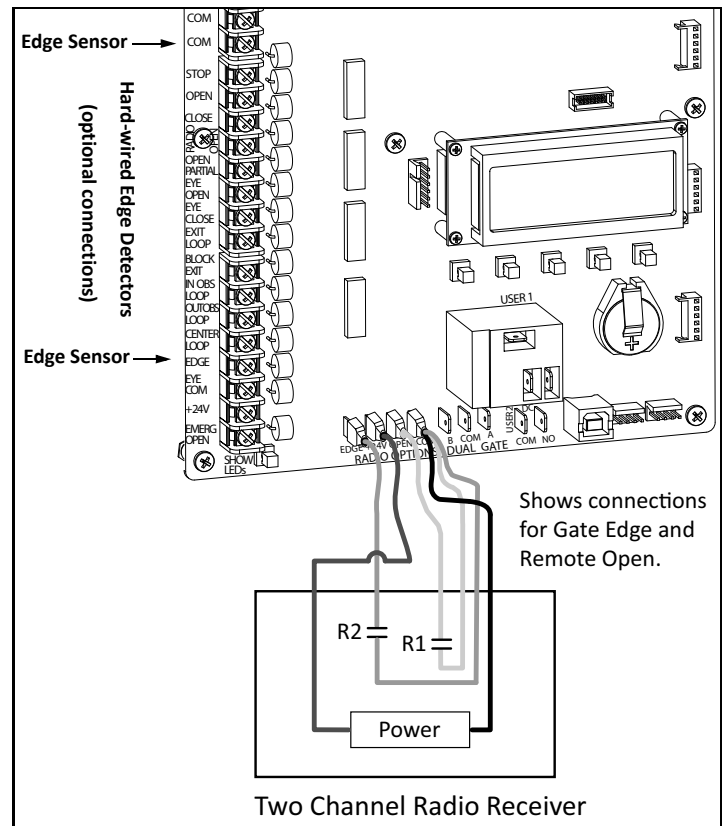


Figure 6-12.

- Mount gate edge sensors to the leading edge and bottom edge of the gate so that entrapment protection is provided in both directions of travel.
- Mount one or two edge transmitters (Linear Model #3022 or equivalent) onto the gate panel near the upper corner of the leading edge of the gate. All edge sensors will function correctly if only one transmitter is used, but wiring multiple edges to a single transmitter may be impractical or displeasing visually.
- Connect the edges to the terminals in the edge transmitter and set the “DIP” switches of the transmitter to match the setting in the receiver to be used. Refer to Figure 6-12.

Mount a commercial style radio receiver* (external antenna type) in the channel of the chassis on either side of the operator. Knock out the nearest hole in the bottom of the electrical box, and route the wires to the area labeled RADIO OPTIONS. Only three wire connections are needed because the common wire and one radio output wire connect to the same terminal. Being certain to observe polarity, crimp together the black radio common wire and one of the radio output wires using a 0.25-inch spade connector, and fasten the wires to the COM terminal. Connect the red wire to the +24V terminal and connect the other radio output contact wire to the spade marked EDGE (this is the same as the EDGE input on the terminal strip near the left side of the board).

- Mount an external antenna onto the top of a fixed post of the fence near the operator.
- Connect the antenna into the socket on the radio receiver.
- Set the “DIP” switches in the receiver to match the same code used in the transmitter.

Test the operation of the reversing edge to make sure that it functions correctly. Advise the gate user that they must retest this vital function weekly.

* If there is also to be a radio receiver for a hand held transmitter to operate the gate, be certain to use a two channel commercial receiver. The edge and hand held transmitters must have their codes set to match the receiver or they will not function.

SMART DC CONTROLLER TROUBLESHOOTING

This section is available to help you troubleshoot any problems that may occur with the SwingSmart operator. It provides information about the Smart DC Controller display codes.

The Smart DC Controller system includes many self diagnostics. Specific messages appear on the LCD and the Audio Alert buzzer sounds distinctive chirps. Any alerts, faults or errors are also logged into memory and date/time stamped. For diagnostic purposes these messages can be retrieved with optional START software available from HySecurity. Refer to *Smart Touch Analyze and Retrieve Tool (S.T.A.R.T.)*.

The following Table 6-1 provides solutions to the error codes, faults, and alerts that may appear on the Smart DC Controller display.

Table 6-1. Smart DC Controller - Troubleshooting

Display Condition	Description		Possible Causes	Solutions
	Alert, Error or Fault			
SAFE MODE	Safe Mode Alert		Occurs when either the edge sensor or Inherent sensor has been tripped. In Safe Mode, the automatic close timer is disabled, but any command will reset and/or start the gate in motion. Safe Mode clears when full travel is reached or the RESET button is pressed. Gate Binding, wind, a faulty edge sensor, or worn motor brushes can cause a false alert.	1. Remove the obstruction. 2. Adjust the IES sensitivity. 3. Correct the gate hardware. 4. Correct faulty edge sensor. 5. Check for worn motor brushes and replace, if necessary.
ENTRAPMENT MODE	Entrapment Mode Alert		Occurs when the Inherent sensor is tripped when the gate is already in Safe Mode. The operator will not function until it is reset, which can occur by: - An Open or Stop command from a push-button control - Pressing the red button on the side of the operator - Pressing the RESET button below the display With any one of these inputs, the operator will return to Safe Mode. Gate Binding or wind can cause a false alert.	1. Remove the obstruction. 2. Adjust the IES sensitivity. 3. Correct the gate hardware.
NO AC POWER	No AC Input Power Advisory only.		AC power is shut off at the source (breaker) or is not connected. The AC power switch on the operator (lower rocker switch) is turned off, or the circuit breaker on the operator has tripped.	1. Turn AC power switch on or connect power to the operator. 2. Reset the operator circuit breaker or connect power to AC switch. 3. Reset circuit breaker at electrical panel. 4. Have a licensed electrician check the wiring.
LOW 24VDC	Low 24VDC UPS Batteries Advisory only.		Occurs when the battery voltage has dropped to less than 22 Volts. At this level, the batteries are 80% depleted. Normal function until 21Volts.	1. No AC Power. See above item. 2. Wiring / Connector problem - check all connections. Clean or repair as required. 3. Check battery condition. 4. Smart DC Controller charger failure - check charger voltage and replace Smart DC Controller. 5. Transformer failure - replace Transformer.

Table 6-1. Smart DC Controller - Troubleshooting

Display Condition	Description	Possible Causes	Solutions
	Alert, Error or Fault		
DEAD BATTERY	Extremely low UPS batteries – no automatic operation - batteries below 21 Volts.	Occurs when the battery voltage has dropped to less than 21 Volts. At this level, the batteries are 90% depleted. The gate will automatically open or close depending upon the setting chosen. Refer to <i>Setting AC Power Loss Gate Function</i> . No additional automatic function is possible, but limited push button control is available to 18 Volts.	1. No AC Power. See above item. 2. Wiring / Connector problem - check all connections. Clean or repair as required. 3. Check battery condition. 4. Smart DC Controller charger failure - check charger voltage and replace Smart DC Controller. 5. Transformer failure - replace Transformer.
HYSECURITY BAD POWER	Critically low 24V supply power. This message can occur only on initial start up if power is critically low.	DC power is below 14V – no control functions will be allowed at all.	1. No AC Power. See above item. 2. Wiring / Connector problem - check all connections. Clean or repair as required. 3. Check battery condition.
No display, LED blinking	Smart DC Controller is receiving power, but battery voltage is very low.	Several possible causes: - The AC power has been shut off from the operator for too long and the batteries are drained. - Wiring problem. - Batteries no longer hold a charge. - Bad Smart DC Controller. - Bad transformer.	1. No AC power. See item above. 2. Wiring/Connector problem - check all connections. Clean or repair as needed. 3. Check battery condition. 4. Smart DC Controller charger failure - check charger voltage and replace Smart DC Controller. 5. Transformer failure - replace transformer.
HYSECURITY LOADER	The Smart DC Controller cannot locate the system software or software is being loaded into the Smart DC Controller.	There is no software loaded on the Smart DC Controller or software is being loaded.	Load the latest software version (H5.XX) using START with a download cable (preferably USB) or wait for software to finish loading.
ALERT 1 FORCE OPEN	Gate forced open.	The gate has been forced off its closed limit and is being prevented from re-closing. Must be enabled in User Menu.	Will self-clear after an open or close input.
ALERT 2 DRIFT CLOSED	Gate drifted closed.	The gate has been forced off its open limit and is being prevented from re-opening. Must be enabled in User Menu.	Will self-clear after an open or close input.
ALERT 3 EXCESS DRIFT	Not used in SwingSmart.		
ALERT 4 MOTOR OVERLOAD	The motor has exceeded its capacity.	The operator has been tested for continuous duty. A motor overload is indicative of excessive loading. Check for poor gate hardware or gate outside specifications.	Check gate hardware, weight/length of gate.

Table 6-1. Smart DC Controller - Troubleshooting

Display Condition	Description	Possible Causes	Solutions
	Alert, Error or Fault		
ALERT 5 BOTH LIM ACTIVE	Both limit switches are on at the same time.	1. Stuck limit switch. 2. Short in wiring. 3. Debris in limit plate area.	1. Check limit switches and replace as required. 2. Check limit switch wiring, correct as required. 3. Remove debris from limit area.
ALERT 6 LIM NOT RELEASED	The limit did not release when the operator was commanded to move.	1. Taper clamp loose. 2. Broken drive belt. 3. Stuck Limit Switch. 4. Broken Limit Plate. 5. Debris in limit plate area.	1. Tighten Taper Clamp. 2. Check and replace drive belt. 3. Check limit switches and replace as required. 4. Check Limit Plate and replace as required. 5. Remove debris from limit area.
ALERT 7 FREQ SHIFT FAULT	The HY-5A has detected a frequency change outside the normal range.	Likely causes are poor integrity of loops or metallic objects within range. This message will also indicate which detector the alert applies to: Exit Loop (ELD), Inside Obstruction Loop (IOLD), Outside Obstruction Loop (OOLD), or Center Loop (CLD).	The loop lead in wires and roadway should be checked for problems or replaced.
ALERT 8 LOOP SHORTED	The HY-5A has detected a loop shorted to ground.	Caused by inadequate insulation of loop wires.	The loop lead in wires and roadway should be checked for problems or replaced.
ALERT 9 LOOP OPEN	The HY-5A has detected a lack of continuity in the loop wire.	Caused by broken loop wire or wire has come unplugged from detector.	The loop and lead in wires should be checked for problems or replaced.
ALERT 10 12C BUS ERROR	The Smart DC Controller has detected a communication error with a HY-5A vehicle detector.	Caused by removal of HY-5A or lack of integrity of the socket connection. This message will also indicate which detector the alert applies to: Exit Loop (ELD), Inside Obstruction Loop (IOLD), Outside Obstruction Loop (OOLD), or Center Loop (CLD).	Remove and re-install the HY-5A and press RESET. Replace the HY-5A, if necessary.
ALERT 11 DETECTOR FAULT	The Smart DC Controller has detected a problem within an HY-5A vehicle detector.	Caused by a fault within the HY-5A. This message will also indicate which detector the alert applies to: Exit Loop (ELD), Inside Obstruction Loop (IOLD), Outside Obstruction Loop (OOLD), or Center Loop (CLD).	Remove and re-install the HY-5A and press RESET. Replace the HY-5A, if necessary.
ALERT 12 ON TOO LONG	The Smart DC Controller has an active loop input (HY-5A or box detector output) for more than 5 minutes.	Caused when the Smart DC Controller sees an active loop for more than 5 minutes. The “active” loop can be actual or false. This message will also indicate which detector the alert applies to: Exit Loop (ELD), Inside Obstruction Loop (IOLD), Outside Obstruction Loop (OOLD), or Center Loop (CLD).	Check traffic patterns at the site. The loop and lead in wires should be checked for problems or replaced.

Table 6-1. Smart DC Controller - Troubleshooting

Display Condition	Description	Possible Causes	Solutions
	Alert, Error or Fault		
ALERT 13 STIFF GATE	The Smart DC Controller has detected a gate that, over time, has taken more power to move than it used to.	Caused by degrading gate hardware.	Check and correct gate hardware as required.
ALERT 14 STUCK GATE	The Smart DC Controller has detected that it cannot move the gate at all.	Caused by broken gate hardware or ice/snow buildup.	Check and correct gate hardware as required.
ALERT 15 NO PICKLE	Not used in SwingSmart.		
ALERT 16 COM BUS ERROR	The Smart DC Controller has detected an internal communications error.	Several possible causes: - Excessive electrical noise. - Lack of earth grounding. - Internal problem on Smart DC Controller.	1. Determine and remedy the source of electrical noise. 2. Install a ground rod. Refer to Chapter 1. 3. Replace the Smart DC Controller.
ALERT 17 BAD COIN BATTERY	The small battery on the Smart DC Controller is loose or needs replacing.	The coin battery is loose or dead.	1. Verify that the battery is properly seated. 2. Replace coin battery. 3. Restore power. 4. Press RESET button.
ALERT 18 CHANGE BATTERY	The Smart DC Controller has detected that the 24VDC UPS batteries need to be replaced.	Batteries are not taking a charge properly.	Replace the UPS batteries.
ALERT 19 FALSE SLOWDOWN	Not used in SwingSmart.		
ALERT 20 LI BLOCK OPEN	Not used in SwingSmart.		
FAULT 1 MOTOR RUN TIME	The Smart DC Controller has detected the motor is on longer than the maximum run time selected.	Several possible causes: - Taper clamp loose. - Broken drive belt. - Broken Limit Plate. - Max Run Timer may need to be increased.	1. Tighten Taper Clamp. 2. Check and replace drive belt. 3. Check Limit Plate and replace, as required. 4. Increase Max Run Timer in the Installer Menu.
FAULT 2 PHOTO EYE	The photo eye is missing or not working.	This fault can only occur if the special supervised photo eye function is enabled in the Installer Menu. See <i>Installing Photoelectric Sensors For Secondary Entrapment Protection</i> Only for details.	Correct malfunctioning photo eye.

Table 6-1. Smart DC Controller - Troubleshooting

Display Condition	Description	Possible Causes	Solutions
	Alert, Error or Fault		
FAULT 3 VOLTAGE SAG	Not used in SwingSmart.	Caused by inadequate supply wire size.	Correct AC supply to use longer wires.
FAULT 4 GATE NO LOAD	The Smart DC Controller has detected there is no load on the operator.	Several possible causes: - Linkage failure. - Taper clamp being too loose. - Broken drive belt. - Disconnected motor.	1. Correct linkage. 2. Tighten taper clamp. 3. Replace drive belt. 4. Check DC motor wires.
FAULT 5 LIMIT FAILED	Not used in SwingSmart.		
ERROR 1 DIRECTION ERROR	The Smart DC Controller has detected that operator ran in the wrong direction.	Several possible causes: - Limit switch wiring. - Motor wiring. - Debris on limit plate	1. Check limit switch wiring and correct, as needed. 2. Check motor wiring and correct, as needed. 3. Remove debris from the limit switch area.
ERROR 3 HY-5A FAILED	The Smart DC Controller has detected a communication error with a HY-5A vehicle detector.	Caused by removal of HY-5A or lack of integrity of the socket connection. This message will also indicate which detector the alert applies to: Exit Loop (ELD), Inside Obstruction Loop (IOLD), Outside Obstruction Loop (OOLD), or Center Loop (CLD).	1. Press RESET. 2. Remove and re-install the HY-5A. 3. Replace the HY-5A, if needed.
ERROR 4 MASTER-SLAVE COM	The Smart DC Controller has detected a communication error in the communication link between master and slave in a dual gate installation.	Several possible causes: - Master/Slave communication cable has not been installed correctly. See Chapter 5. - Master/Slave not configured properly through the Installer Menu. - Operator not properly earth grounded. - Master/Slave communication cable installed in same conduit as high-voltage AC power. - One operator does not have power applied to it.	1. Correct communication cable. 2. Verify that each operator is configured properly through the Installer Menu. One operator must be set as Master and the other operator must be set as Slave using the Installer Menu. 3. Install ground rod per Chapter 1. 4. Install separate conduit for communication cables. 5. Ensure AC power is present at both operators and both power switches are in the ON position.
ERROR 5 No display	The display provides no indication of this error, but it can appear in the START log and means that the Smart DC Controller has detected a serious internal error.	Internal software /hardware error. Report any instance of this error to HySecurity Engineering.	1. Turn both switches off to reset software. 2. Update to latest software version using START. 3. Replace Smart DC Controller.

Table 6-1. Smart DC Controller - Troubleshooting

Display	Description		Possible Causes	Solutions
	Alert, Error or Fault			
ERROR 6 DRIVE BOARD	Not used in SwingSmart.			
ERROR 7 MENU CHECKSUM	Software issue exists that may require factory reset.		Corrupt software or data.	Call HySecurity Technical Support for assistance.
ERROR 8 RPM SENSOR	Not used in SwingSmart.			
ERROR 9 BATTERY DISCONN	The Smart DC Controller detected there is no battery connected.		The batteries are disconnected, or a wiring fault exists. SwingSmart operators ship with a wire disconnected to prevent battery drain.	1. Ensure the red wire in the upper left corner of the electrical box is connected to the switch. 2. Correct any issues with battery wiring. 3. Check the 30 amp fuse on the circuit board.
ERROR 10 SLOWDOWN SWITCH	Not used in SwingSmart.			

Vehicle Detector and Loop Fault Diagnostics

If HySecurity HY-5A vehicle detector modules are used, the Smart DC Controller has the ability to store and report detector and loop fault information for performance diagnostics.

If the Smart DC Controller senses a loop or detector problem:

- The LCD display flashes the name of the affected detector or error and the appropriate alert code.
- The buzzer chirps continuously at regular intervals until the issue is resolved.

Table 6-2 HY-5A Vehicle Detector Faults and Errors

Alert or Error #	LCD Description	Advisory	Resolution
ALERT 7	FREQ SHIFT FAULT	HY-5A vehicle detector - Abnormal frequency change alert.	The alert indicates an unstable loop frequency. Check the loop and lead in wires for problems. Replace them, if necessary.
ALERT 8	LOOP SHORTENED	HY-5A vehicle detector - Loop is shorted.	The alert indicates that the loop and lead in wires are shorting out. check the wires for problems. Replace them, if necessary.
ALERT 9	LOOP OPEN	HY-5A vehicle detector - Disconnected loop alert.	The alert indicates the loop wires are loose or disconnected. Check the wires for problems. Replace them, if necessary.
ALERT 10	I ² C BUS ERROR	HY-5A vehicle detector - Communications alert.	The alert indicates the detector is not communicating properly with the Smart DC Controller. The alert occurs if the detector is unplugged or the connection is unstable. If communication is not re-established within 30 seconds, the controller will reset and the message changes to ERROR 3.
ALERT 11	DETECTOR FAULT	HY-5A vehicle detector - Malfunction alert.	The display indicates the HY-5A detector malfunction. Check detector for problems. Replace it, if necessary.
ALERT 12	ON TOO LONG	Detector input triggered too long - More than five minutes.	The display indicates the HY-5A detector malfunction. It alert also works for any input connected to the terminal strip for standard box detectors. Check that a vehicle is not parked on the loop. Also, determine if the loop is stable. An unstable loop can hold the detector in a triggered state.
ERROR 3	DETECTOR FAILED	HY-5A vehicle detector - Communication failed. The Smart DC Controller will behave as if the detector is triggered, usually holding the gate fully open.	The alert indicates the detector is not communicating properly with the Smart DC Controller. The alert occurs if the detector is unplugged or the detector has failed. To replace the detector, press the RESET button to clear the error and re-seat the detector or install a new one.

Even if the loop problem self heals, historical data about detector/loop performance and a log of Alerts, Faults and Errors can be retrieved from the Smart DC Controller by downloading from the RS232 communications port or the USB port. HySecurity's free START software, a PC computer, and a special download cable or USB cable are required to retrieve and read this data.

Frequency:

Knowing the exact frequency of a loop can be useful as a diagnostic tool, and verifying that the loop frequency is stable is also very valuable information. To view the actual loop frequency of a specific vehicle detector, go to the setting for that detector in the Installer Menu, switch the selection from 0 to 1, and press the Select button. The display will show the loop frequency. The frequency is usually between 20,000 to 80,000 Hertz.

Changing the Loop Frequency:

HY-5A detectors can never crosstalk. If for any reason, you want to manually change the loop frequency, change the Installer Menu option for the desired loop from 0 to 3, and then press the Select button. Each detector has a choice of four frequencies. Press the Select button when the desired frequency setting is found, and the controller will perform a reset and tune to the new frequency setting.

Call Strength Level:

Knowing the call strength of a detector is valuable because it provides information about how well the loop is actually "seeing" a specific vehicle. For example, it may be useful to check to see if the loop is easily detecting the middle of a high bed semi-truck. The strength of a detector call can be displayed in real time, on a scale of 0 to 7. As indicated in the table below, when the Installer Menu setting for a given detector is set to 2, and the Menu button is pressed, the LCD display will read Level 0 - 7 Call Level. If the call strength on the display appears as a level 4 or less, consider increasing the sensitivity level by adjusting the rotary switch on the HY-5A detector.

Table 6-3 HY-5A Vehicle Detector Call Level Display

Installer Menu	LCD Description	Setting Options (Bold = Factory Settings)
ELD 0	EXIT LOOP SET	0 = Run mode 1 = Show frequency 2 = Show call level 0-7 3 = Set Frequency
ILD 0	IN OBS LOOP SET	0 = Run mode 1 = Show frequency 2 = Show call level 0-7 3 = Set Frequency
OLD 0	OUT OBS LOOP SET	0 = Run mode 1 = Show frequency 2 = Show call level 0-7 3 = Set Frequency
CLD 0	CENTER LOOP SET	0 = Run mode 1 = Show frequency 2 = Show call level 0-7 3 = Set Frequency

SwingSmart Schematics

Figure 6-13 and Figure 6-14 illustrate the schematics for SwingSmart DC 20 and SwingSmart DCS 20.

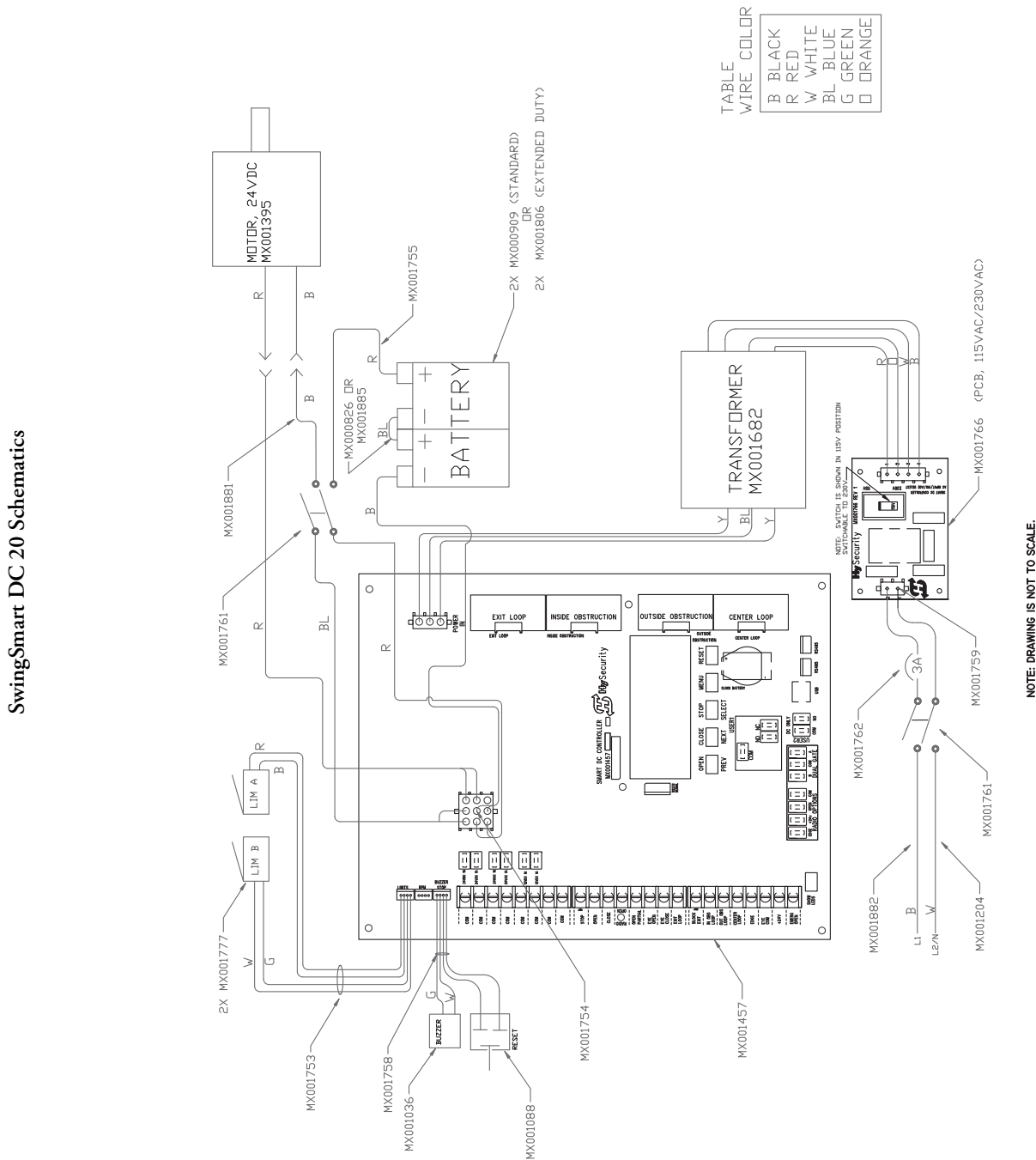
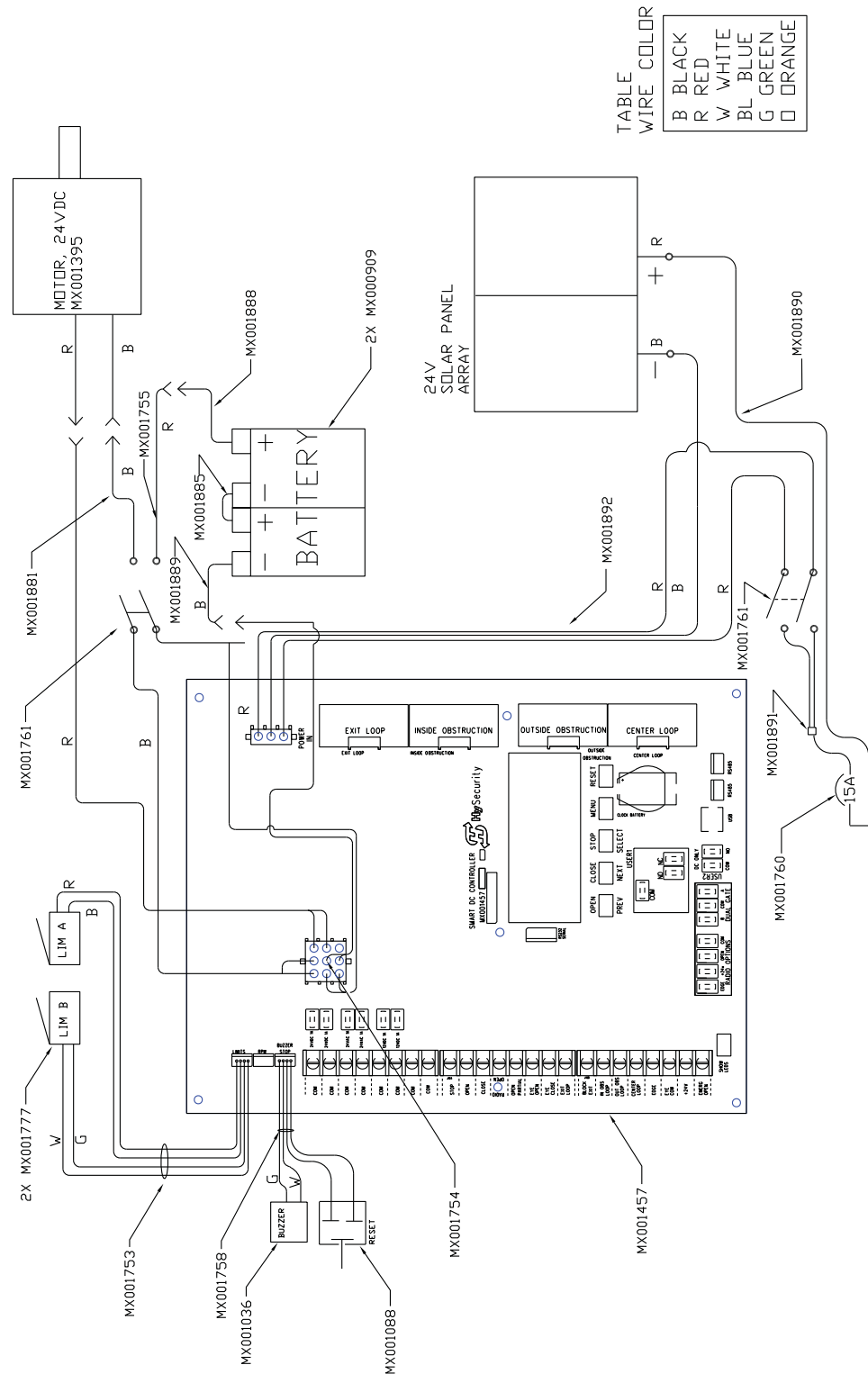


Figure 6-13. SwingSmart DC 20 Schematics

SwingSmart DCS 20 Schematics



NOTE: DRAWING IS NOT TO SCALE.

Figure 6-14. SwingSmart DC 20 Solar Schematics

GENERAL MAINTENANCE

Smart Touch Analyze and Retrieve Tool (S.T.A.R.T.)

HySecurity provides Smart Touch Analyze and Retrieve Tool (START) software to help HySecurity gate operator users and installers conduct the following field service activities:

- Configure installer and user menu settings
- View the operator history (event) log
- Display monitored inputs for operator diagnostics
- Load Smart touch Controller (STC) software

With START software loaded on your laptop computer, you have an invaluable management tool for all HySecurity operators. Either the USB port or the RS232 serial port, found on the Smart DC Controller (see Figure 6-15), allows you to download system diagnostics and upload system configurations using the START software. The free START software is conveniently located on the www.hysecurity.com website. Instructions for downloading START are found on the website, as well.

WHAT YOU NEED

- Standard USB connection or HySecurity Serial RS232 communication cable. Be sure to install the USB driver in your laptop, if you are using the HySecurity RS-232 to USB adapter.
- Laptop computer with Windows PC operating system (XP, Vista or 7)
- Minimum 128MB of RAM
- Minimum 5MB of hard drive disk space
- VGA graphics card (minimum resolution of 800 x 600)

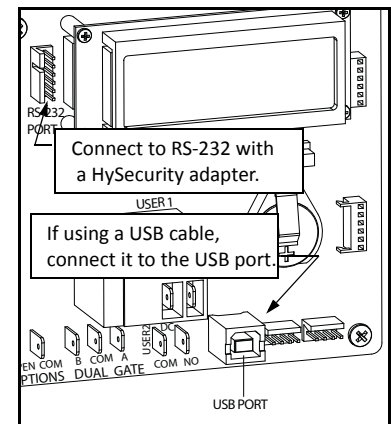


Figure 6-15.

INSTALLING START SOFTWARE

Read the START User Manual, and then take the following steps to download START software:

1. Bring up your web browser and type in <http://www.hysecurity.com> in the command line.
2. Click **Technical Support** on the HySecurity home page.
3. Click **Download Smart Touch Software**.
4. Enter your user name and password. If you do not have a user name, register as an online member.
5. Click on **START software for Smart touch and Smart DC**.
6. Click **I Accept**.
7. Click **RUN**. A setup window appears.

continued....

Installing START Software, continued

— NOTE —

If the operating system on your laptop is VISTA or Windows 7, you must first disable the “User Account Control Settings.” refer to the procedure in *Setting User Account Controls*, and then continue with step 9.

8. Follow the step-by-step instructions to complete the installation.
9. When the download is complete, log out of the HySecurity website. Shortcuts for the START and Smart Touch Controller History Logs appear on your laptop’s desktop.

SETTING USER ACCOUNT CONTROLS

Because of the security settings inherent in VISTA and Windows 7, you need to disable the “user account controls” in the operating system before uploading START software onto your laptop. Take the following steps:

In Windows 7:

Go to Start Menu -> Control Panel -> User Accounts -> User Account -> Change User Account Control Settings “slide the slide bar to the lowest value (toward Never Notify), with description showing Never notify me -> Press Ok -> Reboot Computer.

In Vista:

Go to the Start Menu type “msconfig” and press Enter -> In System Configuration select the tools tab -> Scroll down till you find “Disable UAC” and single click it -> Press the Launch button -> Press the Apply button -> Press OK -> Reboot Computer.

Electrical Controls



Before servicing, turn off all power switches.

No routine maintenance is needed for the electrical system or controls. If the environment is very sandy or dusty, or has many insects, be certain to seal all holes in the electrical enclosure. Blow the dust out of the electric panel with compressed air. Use *Table 6-1 “Smart DC Controller - Troubleshooting” on page 6-17* to assess and fix error, alert, and fault codes. If it is necessary to call a distributor for assistance, be sure to have your model and serial number ready. Other helpful information includes the name of the job, approximate date of installation, and the service record of the operator, especially any work that has been done recently.

Mechanical Maintenance



Before checking the internal mechanisms of the operator, turn off all power switches.

The SwingSmart mechanical maintenance is not in depth or difficult, but should be performed on a routine basis. The operator chassis is zinc plated, but some environments may speed corrosion of this plating.

Schedule regular maintenance and look for the following:

- Assess that the drive belt has the proper tension. Check for drive belt wear. Fraying edges or missing teeth indicate that the drive belt needs to be replaced. Refer to *Drive Belt Tension and Alignment*.
- Check for signs of rust. If any areas of rust are found, reduce the spread of corrosion by treating the areas with a rust inhibitor.
- Check the motor. DC motors contain carbon brushes which wear over time and must be replaced. Failure to replace the brushes will result in damage to the DC motor. Brushes should be inspected every year in high usage applications or every 100,000 cycles and replaced as needed.
- Replace worn-out batteries. Refer to *DC Battery Replacement* and *Clock Battery Replacement*.

DRIVE BELT TENSION AND ALIGNMENT

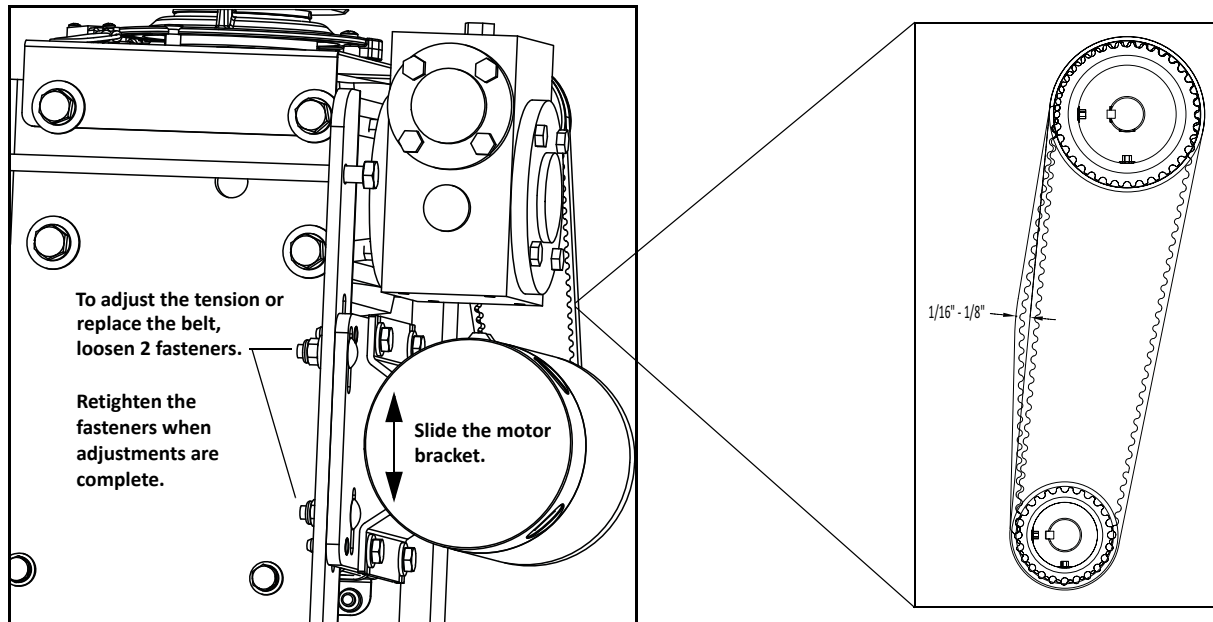


Figure 6-16.

Proper drive belt tension is important for prolonging the life of the drive belt and maintaining the superior performance of the operator. To check the drive belt tension, take the following steps:

Remove the SwingSmart covers. Refer to *Unpacking the Operator*.

1. Turn off the DC and AC power switches.
2. Check to make sure the pulley is aligned vertically.
3. With your finger, apply light outward pressure to the drive belt. If it is properly tensioned, it should only move about 1/16-inch to 1/8-inch (1.6 to 3.2mm). See Figure 6-16.
4. To replace or re-tension the drive belt. Loosen the two motor bracket bolts and move the bracket accordingly.

DC BATTERY REPLACEMENT

HySecurity provides a one year warranty from the date of shipment for the all batteries supplied with the SwingSmart operator.

Indicators of a low battery include:

- LOW BATTERY or DEAD BATTERY appears on the Smart DC Controller display which may or may not be indicative of normal discharge.
- Alert 18 CHANGE BATTERY appears on the Smart DC Controller display.
- AP (#) AC LOSS appears on the Smart DC Controller display. Gate operation is affected by AC power loss depending on customer preferences and the configuration set by the installer in the AP (#) AC LOSS User Menu.

— NOTE —

For detailed information about the AP AC LOSS configuration, refer to *Setting AC Power Loss Gate Function*.

Symptoms of a low battery may include:

- Gate remains locked in the open position
- Gate remains locked in the closed position
- Gate opens five seconds after AC power loss and locks open

CAUTION

Before replacing the batteries, turn off all power switches. Use only AGM batteries as replacements (part number MX002008 or equivalent). The batteries supplied in the SwingSmart operator are state-of-the-art AGM batteries. Do NOT use flooded cell batteries as damage may occur to the unit.

The two 8Ah batteries are easily accessible at the back of the operator on a tray behind the motor.

To replace the batteries, take the following steps:

1. Turn off the DC and AC power switches.
2. Unlock side latches to remove the SwingSmart front cover. Remove the two Phillips-head screws and the two wing nuts that secure the rear cover. Set the covers aside.
3. Cut the two black zip ties which secure the 8Ah batteries to the tray.
4. To disconnect the battery wires, loosen the two rear screws and remove the front two screws that secure the support tray. See Figure 6-17.
5. Carefully rotate the support tray to access the battery wires and disconnect the black and blue wires.

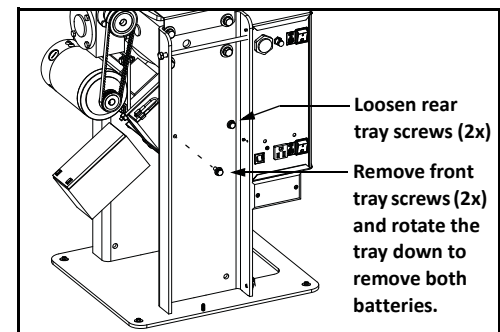


Figure 6-17.

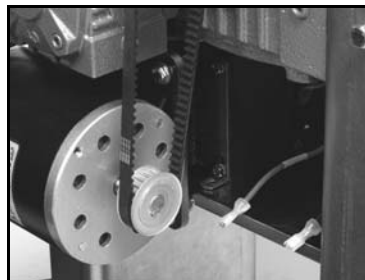
6. Remove the first battery from the support tray.
7. Slide the second battery to the right, disconnect the red and black wires and remove it from the tray.

To install the two new batteries, reverse the removal procedure.

1. Connect the red wire to the red terminal on left battery and slide the battery onto the tray and move it behind the motor.
2. Connect the blue wire between the left and right batteries (black and red terminals).
3. As you slide the battery onto the tray, connect the black wire to the black terminal on the right battery. See Figure 6-18.
4. Return the support tray to its original position and secure it properly.



Remove batteries.



Disconnect wires.



Reconnect the wires onto the replacement batteries.

Figure 6-18.

CLOCK BATTERY REPLACEMENT

A lithium coin battery supports the clock so the date and time is retained even when the main power is turned off. See Figure 6-19. Replace the battery about every five years (or as needed) with a DL 2025, DL 2032, or CR 2025, or CR 2032 battery.

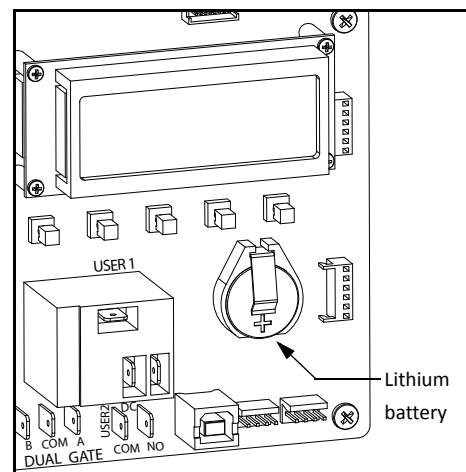
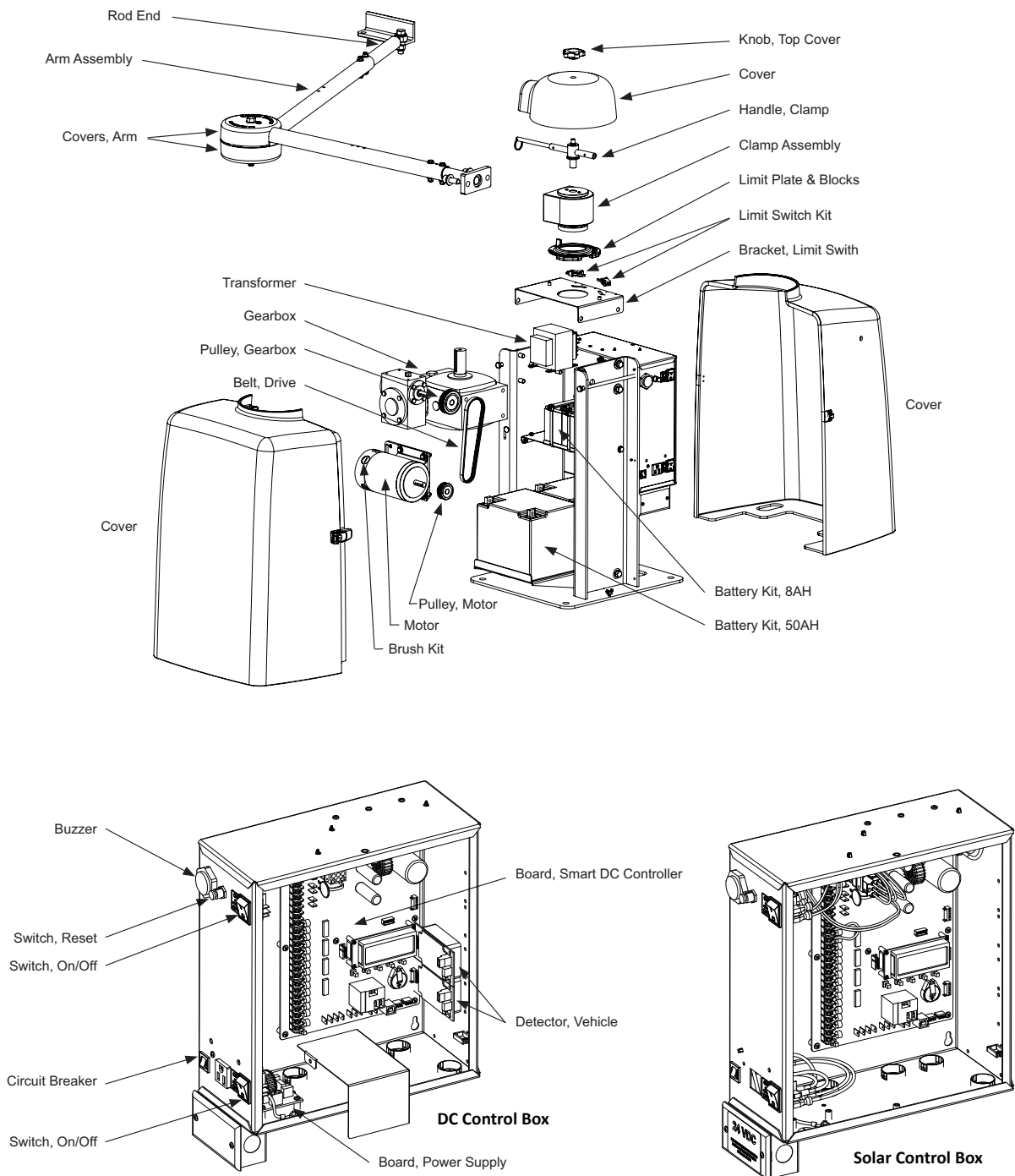


Figure 6-19.

Parts & Limited Warranty

SWINGSMART PARTS



SWINGSMART PARTS LIST

<i>Part Name</i>	<i>Part Number</i>	<i>SwingSmart Models</i>
Arm Assembly, Articulating	MX002011	all
Arm Assembly, Left Hand	MX002010	all
Arm Assembly, Right Hand	MX002009	all
Battery Kit, 50AH, Replacement	MX002013	all
Battery Kit, 8AH, Replacement	MX002008	all
Belt, Drive, SwingSmart	MX001744	all
Board, Power Supply, 115/230VAC	MX001766	all
Board, Smart DC Controller, SwingSmart	MX001457-1	all
Bracket, Limit Switch, SwingSmart	MX001658	all
Brush Kit, 24VDC Motor	MX001920	all
Buzzer, Piezo, for all Operators	MX001036	all
Circuit Breaker, 15 Amp	MX001760	Solar only
Circuit Breaker, 3 Amp	MX001762	AC only
Clamp Assembly, Taper, SwingSmart	MX001743	all
Cover, 3-Piece, SwingSmart	MX001926	all
Covers, Arm Pinch Protection	MX001815	all
Detector, Vehicle, HY-5A	MX000041	all
Gearbox, Double Reduction, SwingSmart	MX002005	all
Handle, Clamp, Replacement Kit	MX001933	all
Knob, Top Cover	MX001703	all
Limit Plate & Blocks Assembly, SwingSmart	MX001745	all
Limit Switch Kit, SwingSmart	MX002006	all
Motor, Electric, 24VDC	MX001395	all
Pulley, Gearbox	MX001404	all
Pulley, Motor	MX001403	all
Rod End, Ball Joint, Male	MX001695	all
Switch, On/Off	MX001761	all
Switch, Reset, Internal	MX001088	all
Transformer, 115/230VAC	MX001682	AC only

LIMITED WARRANTY

1. Warranty.

Hy-Security Gate, Inc. ("HySecurity") warrants that at the time of sale each of its products will, in all material respects, conform to its then applicable specification and will be free from defects in material and manufacture. This warranty does not extend to items listed as "accessories" in HySecurity's price list, when those items carry another manufacturer's name plate and they are not a part of the base model. HySecurity disclaims all warranties for such accessory components, which carry only the original warranty, if any, of their original manufacturer. HySecurity hereby assigns its rights under such manufacturer warranties to the extent that such rights are assignable to Buyer.

The following additional durational warranties apply to HySecurity's products. The term of these additional warranties is determined by whether (1) the product is purchased through an authorized HySecurity distributor and (2) whether a timely and complete warranty registration is submitted to HySecurity. It is therefore important that you register your product with HySecurity within the 60 day period described below.

1a. Five Year / Seven Year Warranty Items (Registered Gate Operators Purchased from Authorized Distributors)

For any gate operator product that is purchased from an authorized HySecurity distributor (this excludes product purchased through internet resellers or any distributor not authorized by HySecurity), if the online Warranty registration is completed at www.hysecurity.com/warranty within 60 days of the date of purchase by the dealer/installer or if the warranty registration form sent with every HySecurity gate operator is completely filled out and returned to HySecurity within the same 60-day period, the following Warranty terms will apply: HySecurity will warrant that the product will remain serviceable for the following periods:

- a Hydraulic Gate Operators: Five Years or 500,000 gate cycles (whichever occurs first) after the date of installation, or
- b Electromechanical operators: Five Years after the date of installation-unless installed in a single family residential application, in which case the warranty term shall be Seven Years after the date the product is shipped from HySecurity;
provided that the Five Year warranty period will not extend beyond Seven Years from the date that the product was shipped from HySecurity. This warranty does not apply to the components described below, which have the shorter warranty period indicated:
- c Hydraulic Gate Operator Drive Wheels: Two Years
- d Batteries used in all D.C. operators: One Year from date of shipment from HySecurity.
- e Items subject to normal wear including, but not limited to, chains, belts, idler wheels, sprockets, fuses and motor brushes: One Year from date of installation.

1b. One Year Warranty Items (Operators Not Purchased from an Authorized Distributor or Registered within 60 Days)

For any gate operator product that is not purchased from an authorized HySecurity distributor or for which the online Warranty registration or warranty registration form sent with every HySecurity operator was not filled out completely or not returned to HySecurity within 60 days of the date of purchase by the dealer/installer, the following One-Year Warranty will apply to that product: HySecurity warrants that the product will remain serviceable for the following periods, which begin on the date that the product was shipped from HySecurity:

- a All Gate Operators: One Year or 100,000 gate cycles whichever comes first.
- b Hydraulic Gate Operator Drive Wheels: One Year

1c. Replacement parts

HySecurity warrants that replacement parts (whether new or reconditioned) will remain serviceable for One Year from the date that the product was shipped from HySecurity.

1d. Limitations and Exclusions Applicable to Each of the Preceding Warranties

The preceding warranties shall not apply to equipment that has been (1) installed or maintained improperly or contrary to instructions; (2) subjected to negligence, accident, vandalism, or damaged by severe weather, wind, flood, fire, or war; or (3) damaged through improper operation, maintenance, storage or abnormal or extraordinary use or

abuse. Any modification made to products will void the warranty unless the modifications are approved in writing by HySecurity, in advance of the change (this exclusion does not apply to normal installation of approved accessories and/or protective devices or sensors).

THESE ARE THE ONLY WARRANTIES GIVEN BY HYSECURITY AND ARE IN PLACE OF ALL OTHERS.

These warranties extend to HySecurity's Distributors, to the Dealer/Installer, and to the First User of the product following installation. They do not extend to subsequent purchasers. Dealer/Installers or First Users may receive a replacement HySecurity Warranty form by calling HySecurity at 800-321-9947.

2. Exclusion of Other Warranties.

The warranties contained in Section 1 are the exclusive warranties given by HySecurity and supersede any prior, contrary or additional representations, whether oral or written. Any prior or extrinsic representations or agreements are discharged or nullified. HYSECURITY HEREBY DISCLAIMS AND EXCLUDES ALL OTHER WARRANTIES-WHETHER EXPRESS, IMPLIED, OR STATUTORY-INCLUDING ANY WARRANTY OF MERCHANTABILITY, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND ANY IMPLIED WARRANTIES OTHERWISE ARISING FROM COURSE OF DEALING, COURSE OF PERFORMANCE, OR USAGE OF TRADE.

3. Buyer's Exclusive Remedies for Any Nonconformity.

If a HySecurity product fails to conform to the warranties in Section 1, Buyer must notify and order replacement parts from the Distributor through which the product was purchased within a reasonable time and in no event more than thirty (30) days after the discovery of the nonconformity. HySecurity will investigate and, in the event of a breach, will provide, within a reasonable period of time, one of the following: (1) repair or replacement of any nonconforming products or components or (2) refund of the price upon return of the nonconforming items. Replacement goods will conform to this warranty for the unexpired duration of the warranty period for the original, nonconforming product. HySecurity reserves the right to supply used or reconditioned material for all warranty claims. This warranty does not cover or extend to any incidental expenses, including labor, shipping, travel time or standby time, that are incurred for inspection or replacement of any nonconforming items. As a condition of warranty coverage, warranty claims must be submitted in accordance with the following paragraph. THE REMEDY SELECTED BY HYSECURITY IN ACCORDANCE WITH THIS PARAGRAPH SHALL BE THE EXCLUSIVE AND SOLE REMEDY OF BUYER FOR ANY BREACH OF WARRANTY. IN NO EVENT SHALL HYSECURITY BE OBLIGATED TO INDEMNIFY BUYER FOR ANY BREACH OF WARRANTY.

For warranty coverage, you must follow the procedures described on HySecurity's form, "RMA Procedures." A current version of the form is available from HySecurity.

4. Exclusion of Consequential and Incidental Damages.

IN NO EVENT SHALL HYSECURITY BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM NONDELIVERY OR FROM THE USE, MISUSE, OR INABILITY TO USE THE PRODUCT OR FROM DEFECTS IN THE PRODUCT OR FROM HYSECURITY'S OWN NEGLIGENCE OR OTHER TORT. This exclusion applies regardless of whether such damages are sought for breach of warranty, breach of contract, negligence, or strict liability in tort or under any other legal theory. This exclusion does not apply to claims for bodily injury or death.

5. Severability.

If any provision of this warranty is found to be invalid or unenforceable, then the remainder shall have full force and effect, and the invalid provision shall be partially enforced to the maximum extent permitted by law to effectuate the purpose of the agreement.

6. Applicable Law.

This Warranty will be interpreted, construed, and enforced in all respects in accordance with the laws of the State of Washington, without reference to its choice of law principles. The U.N. Convention on Contracts for the International Sale of Goods will not apply to this Warranty.

SWINGSMART DC SPECIFICATIONS

Model	SwingSmart DC 20	SwingSmart DC Solar 20
Max. Gate Length	20 foot per leaf @ 600 lbs. (6 meters per leaf @ 275 kg.)	20 foot per leaf @ 600 lbs. (6 meters per leaf @ 275 kg.)
Max. Gate Weight	1, 300 lbs. @ 12 ft. leaf (590 kg. @ 4 meter leaf)	1, 300 lbs. @ 12 ft. leaf (590 kg. @ 4 meter leaf)
Time to Open/Close	Approximately 10 to 15 seconds. Variable speed, open/close set separately	Approximately 10 to 15 seconds. Variable speed, open/close set separately
UPS Operation on Batteries only	Maximum 300 cycles in 1 day (8Ah batteries) or 250 cycles over 2 days	Maximum 1,500 cycles over 5 days (50Ah batteries fully-charged)
Duty Cycle	Continuous	Continuous
Power: Single phase (switch selectable)	115 volts, 3amps, 50/60 Hertz 230 volts, 1.5 amps, 50/60 Hertz	Solar-powered (24VDC) 100 cycles/day requires two 10WATT Panels and 5 Sun hours
Horsepower	½ hp	½ hp
Accessory Power	1 amp each at 12VDC, 24VDC, and 24VAC	1 amp each at 12VDC, 24VDC, and 24VAC
Communication	USB, RS232, RS485	USB, RS232, RS485
Temperature Rating	-13°F to 158°F (-25°C to 70°C)	-13°F to 158°F (-25°C to 70°C)
Certification	500,000 cycles	500,000 cycles
DC Batteries	Two 8Ah (50Ah optional)	Two 8Ah (50Ah optional)
Est. Shipping Weight	205 lbs. (93 kg)	205 lbs. (93 kg)
UL Listing	Class I, II, III, IV	Class I, II, III, IV
Warranty	5 years commercial use (7 years for single-family residence)	5 years commercial use (7 years for single-family residence)

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