

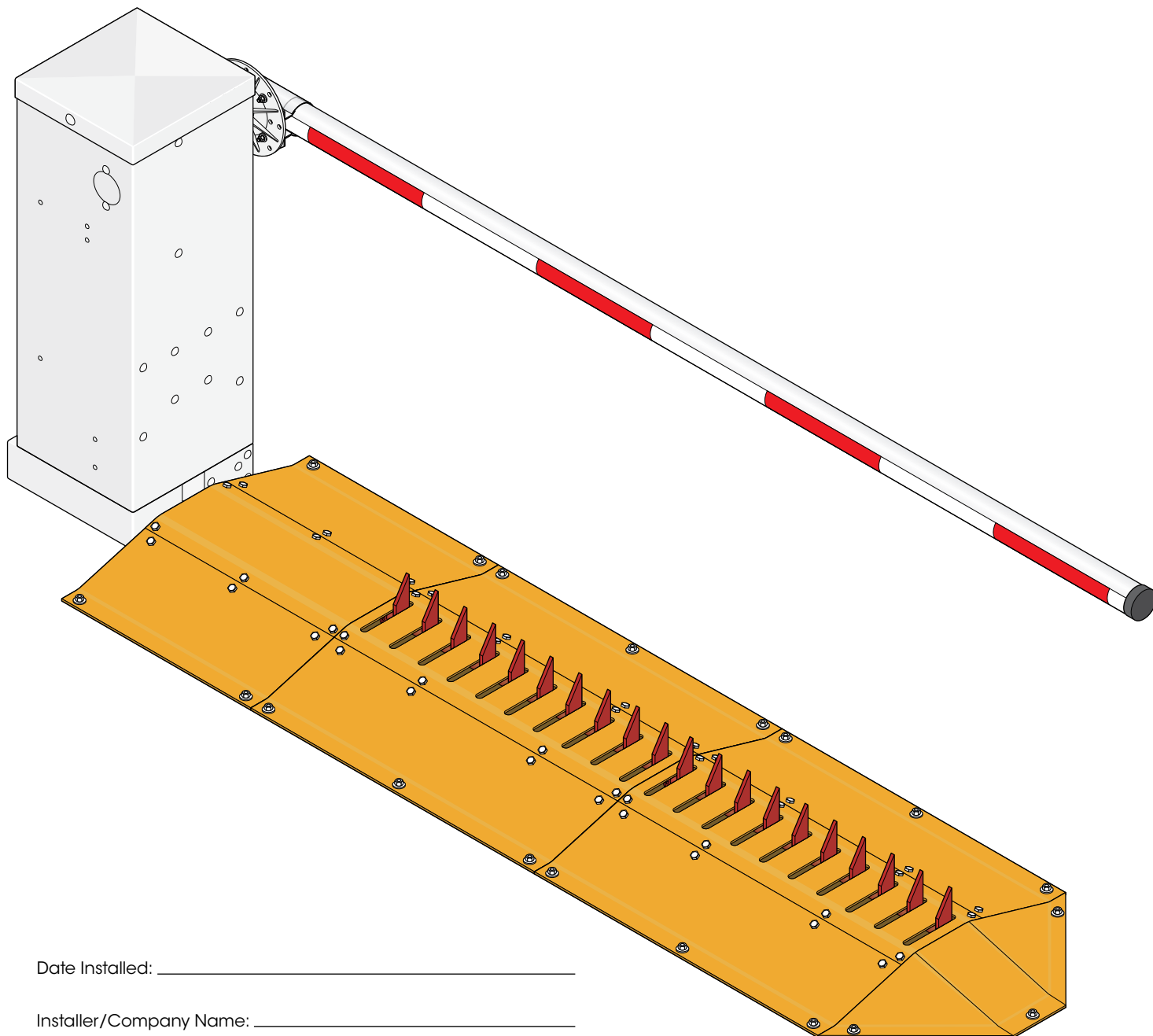
Installation/Owner's Manual

1603

Barrier Gate Operator with Auto Spike System

Use this manual for circuit board 1601-010 Revision V or higher.

1603-065-S-2-13



Date Installed: _____

Installer/Company Name: _____

Phone Number: _____

Circuit Board
Serial Number
and Revision Letter: _____

Leave Manual with Owner

Copyright 2013 DoorKing, Inc. All rights reserved.



UL 325 Compliant



1603 SPECIFICATIONS

Use this manual for the Model 1603 operators with circuit board 1601-010 Rev V or higher ONLY.

Class of Operation

Model 1603 - UL 325 Class II, III, IV – ETL Listed

Type of Gate

Single Traffic Lane Vehicular Barrier Gate Only

Arm Types

Aluminum – Straight or Folding Arm

Max Arm Length

14 Ft.

Max Spike Length

12 Ft.

Gate Cycles

High Cycle

Speed

90° in approximately 1.5 seconds

Primary Entrapment Protection

Inherent entrapment sensing system (Type A)

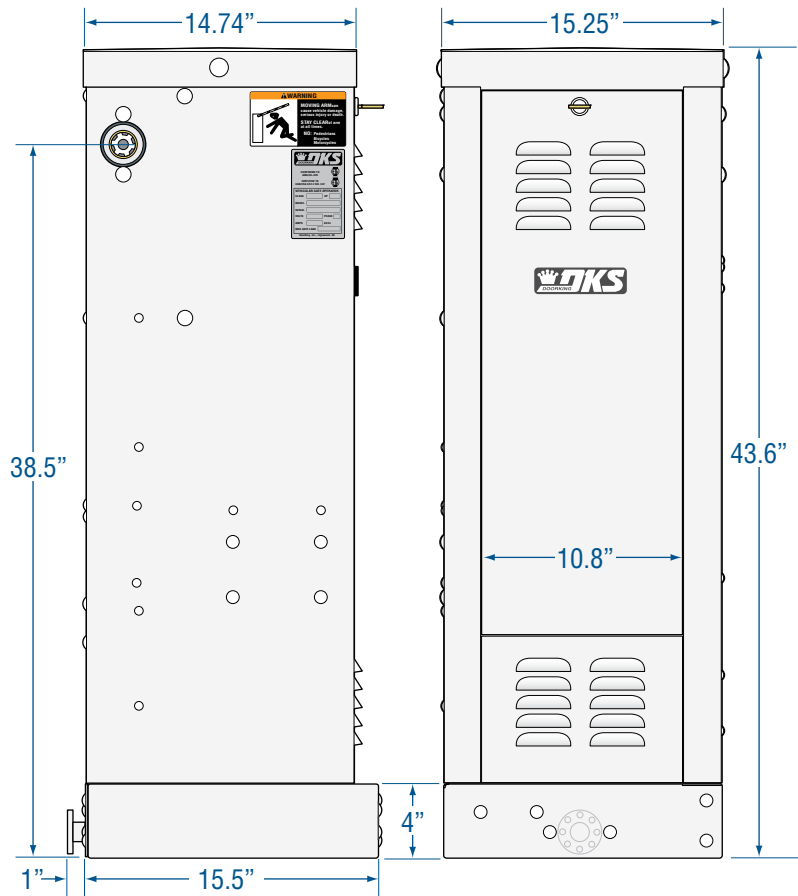
Secondary Entrapment Protection

Provision for connection of a non-contact sensor (Type B1) and/or contact sensor (Type B2)

Model #	Convenience Open	Horsepower - Volts	Amp
1603-080	No	1/2 HP - 115 VAC	5.7
1603-081	Yes	1/2 HP - 115 VAC	5.7

Note: 208/230/460/575 VAC input voltage can be connected to the operator by installing an “Optional” High Voltage Kit (P/N 2600-266).

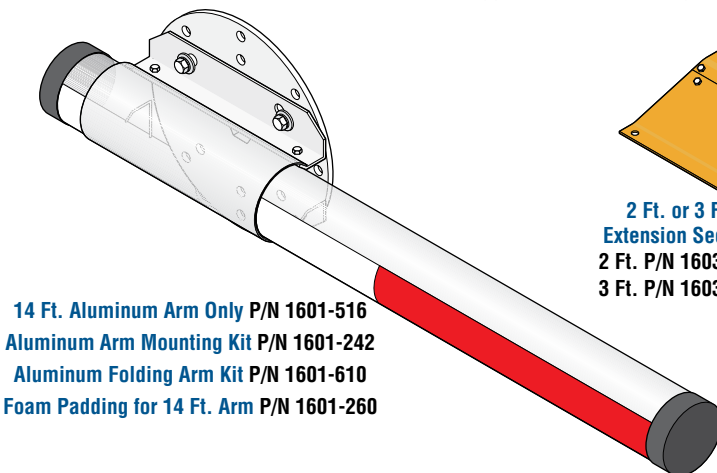
1603 Housing



Drawings not to scale

1603 Aluminum Arm

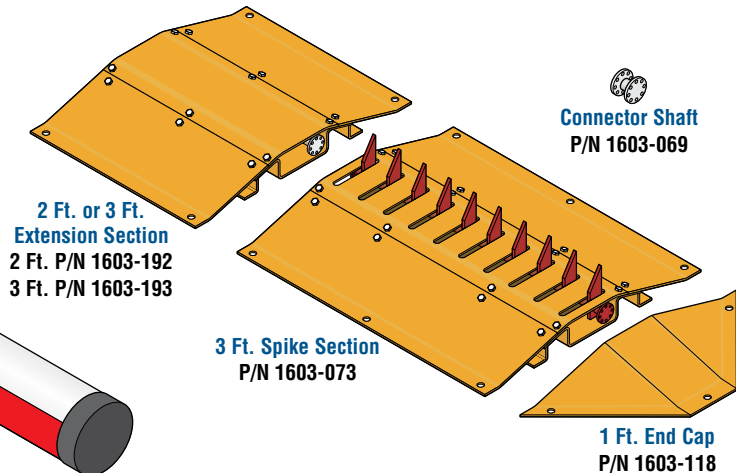
Folding arm assembly can be installed for low headroom application.



14 Ft. Aluminum Arm Only P/N 1601-516
 Aluminum Arm Mounting Kit P/N 1601-242
 Aluminum Folding Arm Kit P/N 1601-610
 Foam Padding for 14 Ft. Arm P/N 1601-260

1603 Auto Spike System

Multiple sections can connect together allowing different spike configurations.



DoorKing, Inc. reserves the right to make changes in the products described in this manual without notice and without obligation of DoorKing, Inc. to notify any persons of any such revisions or changes. Additionally, DoorKing, Inc. makes no representations or warranties with respect to this manual. This manual is copyrighted, all rights reserved. No portion of this manual may be copied, reproduced, translated, or reduced to any electronic medium without prior written consent from DoorKing, Inc.

TABLE OF CONTENTS

SPECIFICATIONS 1

Safety Information for Vertical Barrier Arm	3
UL 325 Entrapment Protection	4

SECTION 1 - INSTALLATION OF OPERATOR 5

1.1 Operator Positioning and Conduit Requirements	5
1.2 Concrete Pad Requirements	6
1.3 Mount Operator	6
1.4 Dual Operator Installation (Primary/Secondary)	7

SECTION 2 - WIRING 8

2.1 High Voltage Wire Runs	8
2.2 High Voltage Terminal Connections	8
2.3 Main Terminal Description	9
2.4 Control Wiring	10

SECTION 3 - INSTALLATION OF AUTO SPIKE SYSTEM 11

3.1 Lay Sections on Concrete Pad	11
3.2 Assemble Shafts	12
3.3 Test Spikes and Adjustment of Spikes If Necessary	12-13
3.4 Secure Tunnel Plates and Ramps to Concrete	13

SECTION 4 - LOOP DETECTOR LANE SETUPS 14

4.1 Entry Lane Only	14
4.2 Exit Lane Only	15
4.3 2-Way Traffic Lane	16
4.4 Ticket Spitter Entry Lane	17
4.5 Operator Timer ON Entry Lane (No Down Loop)	18

SECTION 5 - ARM INSTALLATION 19

5.1 Mounting Hub	19
5.2 Mounting Aluminum Arm	19

SECTION 6 - ADJUSTMENTS 20

6.1 1601 Circuit Board Description and Adjustments	20
6.2 DIP-Switch SW 1 and SW 2 Settings	21-23
6.3 Magnetic Limit Adjustment	24
6.4 Reverse Sensor Adjustment	24
6.5 Manual Operation of Arm and Spikes	25

SECTION 7 - OPTIONAL CONVENIENCE OPEN SYSTEM 26

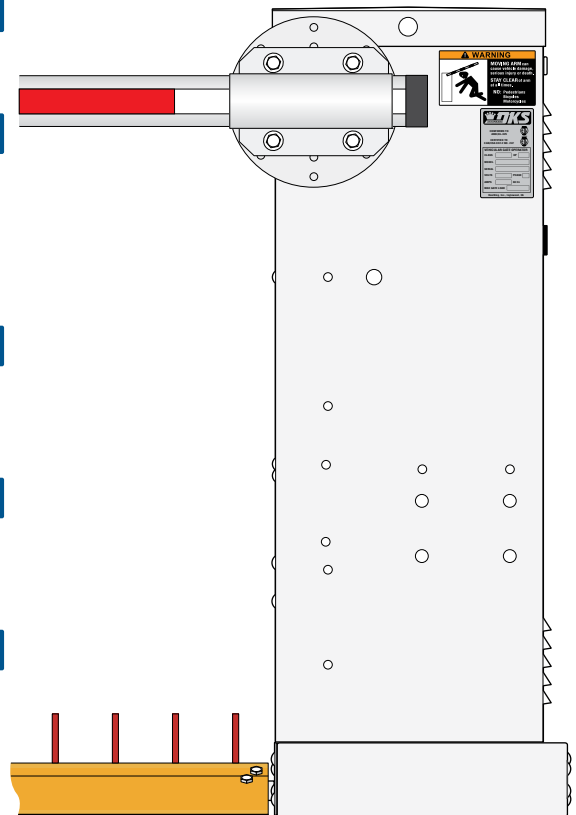
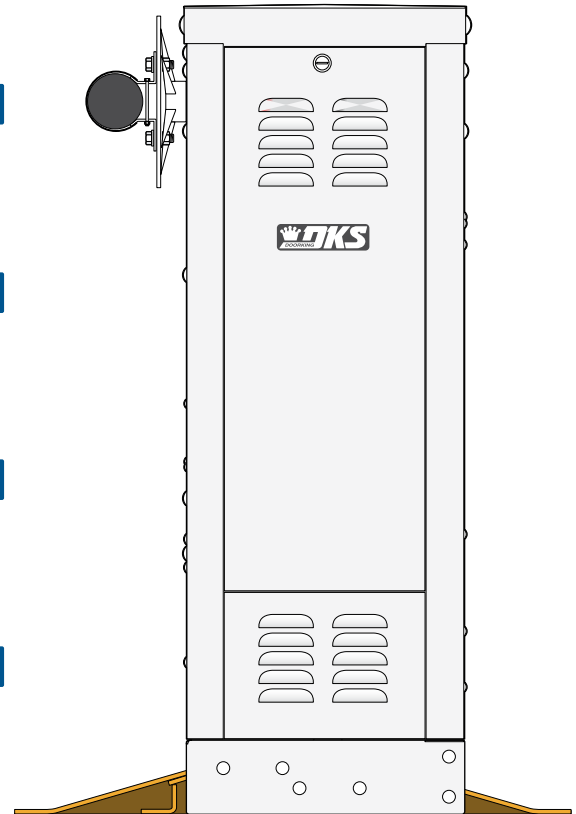
7.1 Operating Mode	26
7.2 DC System Description	27
7.3 DIP-Switch Settings	27

SECTION 8 - OPTIONAL ACCESSORIES INSTALLATION 28

8.1 Contact Sensor (Reversing Edge)	28
8.2 Fan Kit	29
8.3 Heater Kit	30

SECTION 9 - TECHNICAL INSTRUCTIONS 31

9.1 Maintenance Schedule	31
9.2 Diagnostics Check	32
9.3 Troubleshooting	32-33
9.4 Accessories Parts List	34
Wiring Schematics	35-36

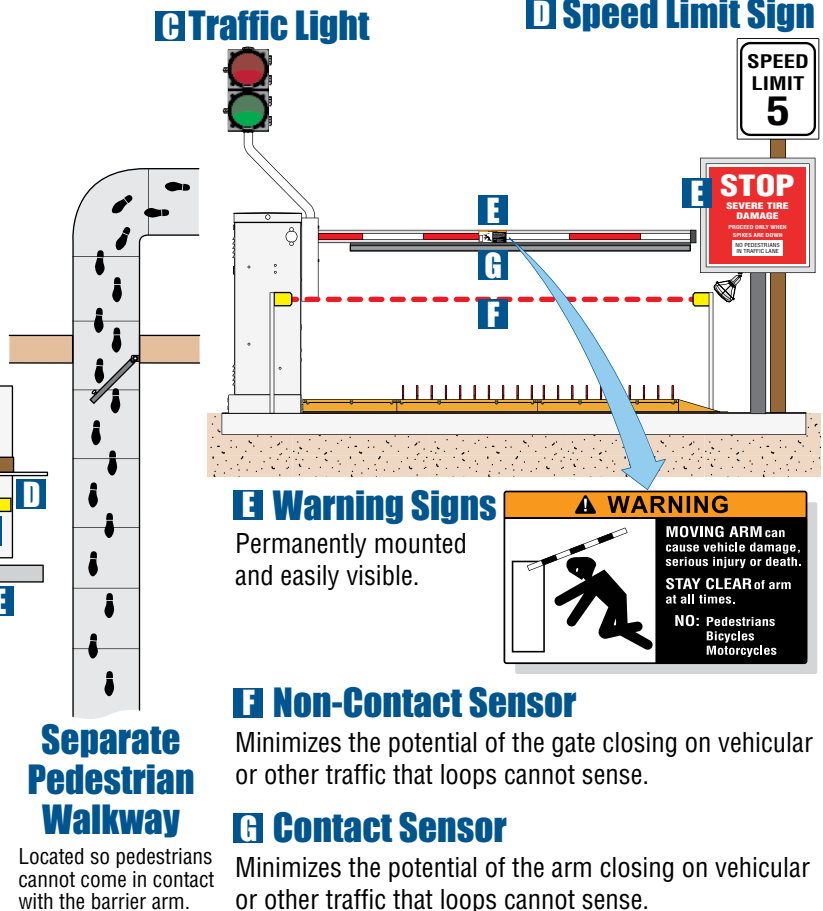
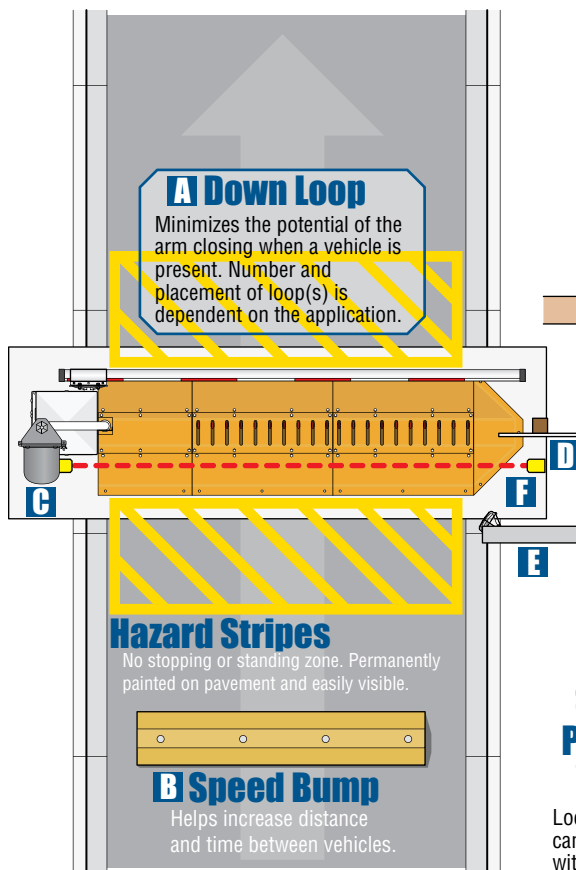


Safety Information for Vertical Barrier Arm

Reduce the risk of injury or death, read and follow all instructions.

Familiarize yourself with safety warnings, instructions, illustrations, and wiring guidelines to ensure that the installation is performed in a safe and professional manner. **Prior to installation check all local building codes and ordinances to ensure compliance**

- **Do not install the operator in such a way that the arm moves within 2 feet of a rigid object.**
- **Speed limit through barrier area is 5 MPH.** Install speed bumps, warning signs and hazard stripes where visible in the area of the barrier gate, failure to do so may result in injury, damage to operator and vehicle.
- Users should be familiar with proper use of operator, these include; hardware operation, reversing functions and testing, reversing loops, inherent reversing system, electric edges, photoelectric cells related external devices and possible hazards.
- **Keep adults, children and objects away from operator and HAZARD ZONES.** Pedestrians must be provided with a separate access.
- All electrical connections should be made in accordance with local electrical codes.
- Security features should be installed to **avoid unauthorized use.**
- Controls must be installed away from the operator to avoid any contact when operating the controls. If the installed hardware is in violation of these restrictions remove the operator from service immediately and contact your service dealer.
- When **manually** operating the gate operator arm, the user **MUST** make sure that the gate area is clear **BEFORE** operating the controls.
- When removing the operator lift the arm to the full open position and **shut off power at the service panel.**
- **Operators and components should be properly installed and maintained** following the recommended service schedule, test the operator monthly. Keep all debris away from operator housing vents and off of arm. Contact your service dealer for any maintenance or repairs.
- Vehicular operators can produce high levels of force, it is important that you are aware and **eliminate possible HAZARDS; Pinch Points, Entrapment Areas, Absence of Controlled Pedestrian Access, Traffic Backup.**

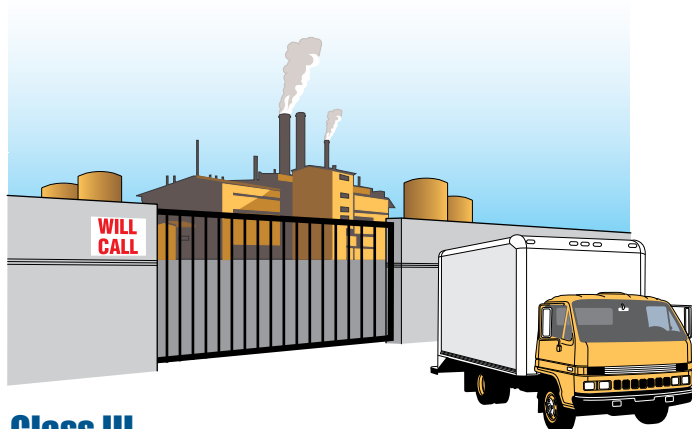


UL 325 Entrapment Protection



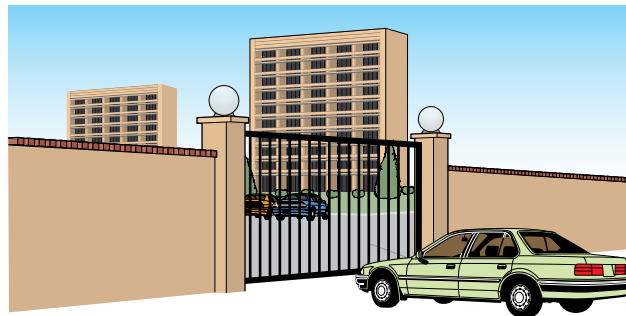
Class I

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



Class III

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



Class II

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



Class IV

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

This table illustrates the entrapment protection requirements for each of the four UL 325 classes.

UL 325 Classifications	Horizontal Slide, Vertical Lift, Vertical Pivot		Swing and Vertical Barrier (arm)	
	Primary Protection	Secondary Protection	Primary Protection	Secondary Protection
Class I and II	A	B1, B2 or D	A or C	A, B1, B2, C or D
Class III	A, B1 or B2	A, B1, B2, D or E	A, B1, B2 or C	A, B1, B2, C or D
Class IV	A, B1, B2 or D	A, B1, B2, D or E	A, B1, B2, C or D	A, B1, B2, C, D or E

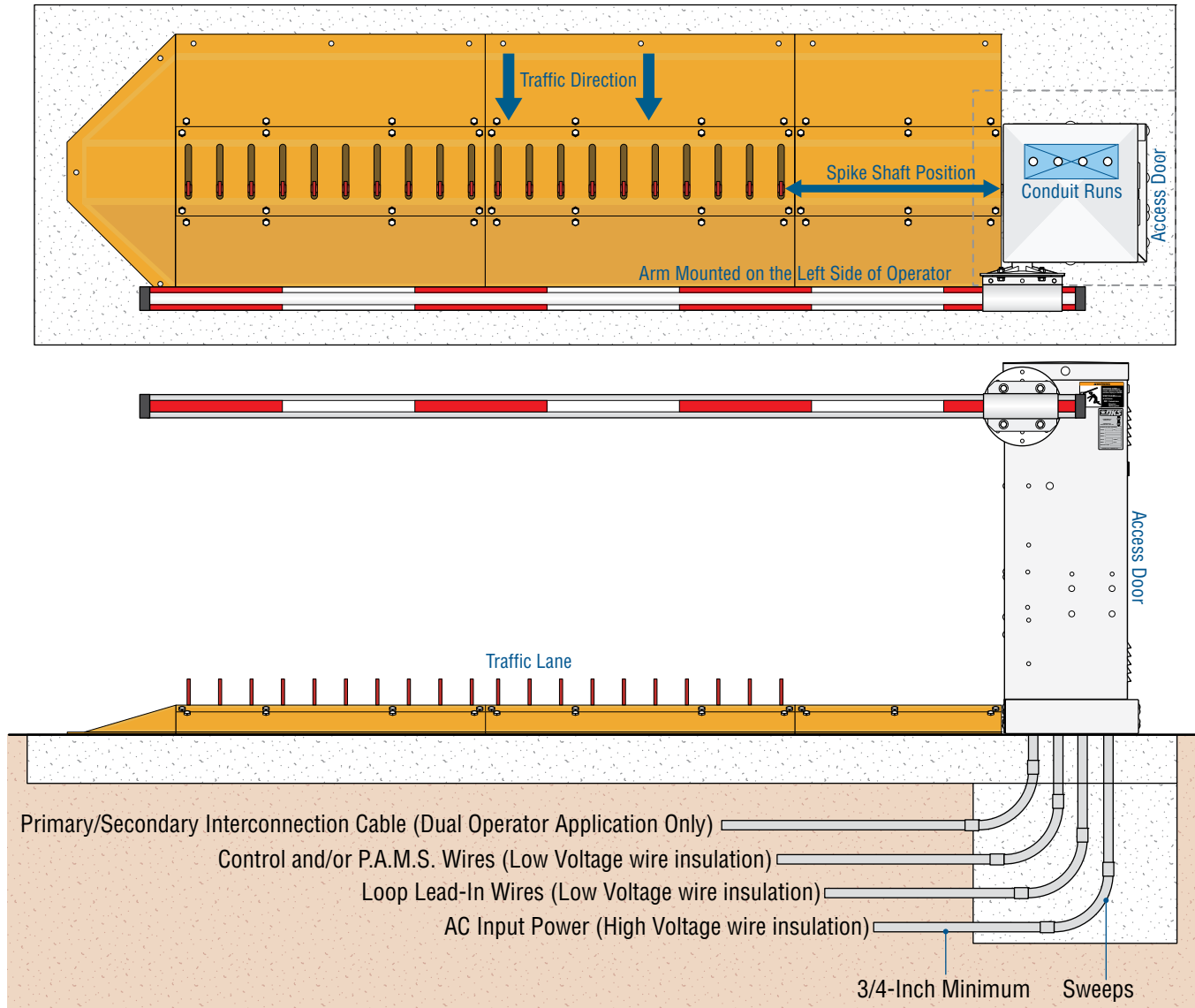
- A** - Inherent entrapment protection system.
- B1** - Provision for connection of, or supplied with, a non-contact sensor (photoelectric sensor or the equivalent). When used as the PRIMARY device, must be monitored.
- B2** - Provision for connection of, or supplied with, a contact sensor (edge device or the equivalent). When used as the PRIMARY device, must be monitored.
- C** - Inherent adjustable clutch or pressure relief device.
- D** - Provision for connection of, or supplied with, an actuating device requiring continuous pressure to maintain opening or closing motion of the gate.
- E** - An inherent audio alarm.

SECTION 1 - INSTALLATION OF OPERATOR

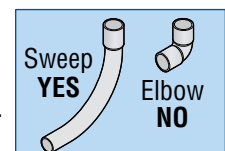
Prior to beginning the installation of the barrier gate operator, we suggest that you become familiar with the instructions, illustrations, and wiring guide-lines in this manual. This will help insure that your installation is performed in an efficient and professional manner.

The proper installation of the vehicular barrier gate operator is an extremely important and integral part of the overall access control system. Check all local building ordinances and building codes prior to installing this operator. Be sure your installation is in compliance with local codes.

1.1 Operator Positioning and Conduit Requirements



- The conduit requirements are for a typical barrier gate operator installation. **The conduit requirements for your application may vary from this depending on your specific needs.**
- Use only sweeps for conduit bends. Do not use 90° connectors as this will make wire pulls very difficult and can cause damage to wire insulation.
- We suggest that minimum 3/4-inch conduit be used.
- **Never** run low voltage rated wire insulation in the same conduit as high voltage rated wire insulation.
- Be sure that all conduits are installed in accordance with local codes.

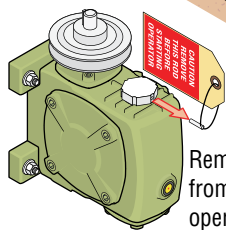
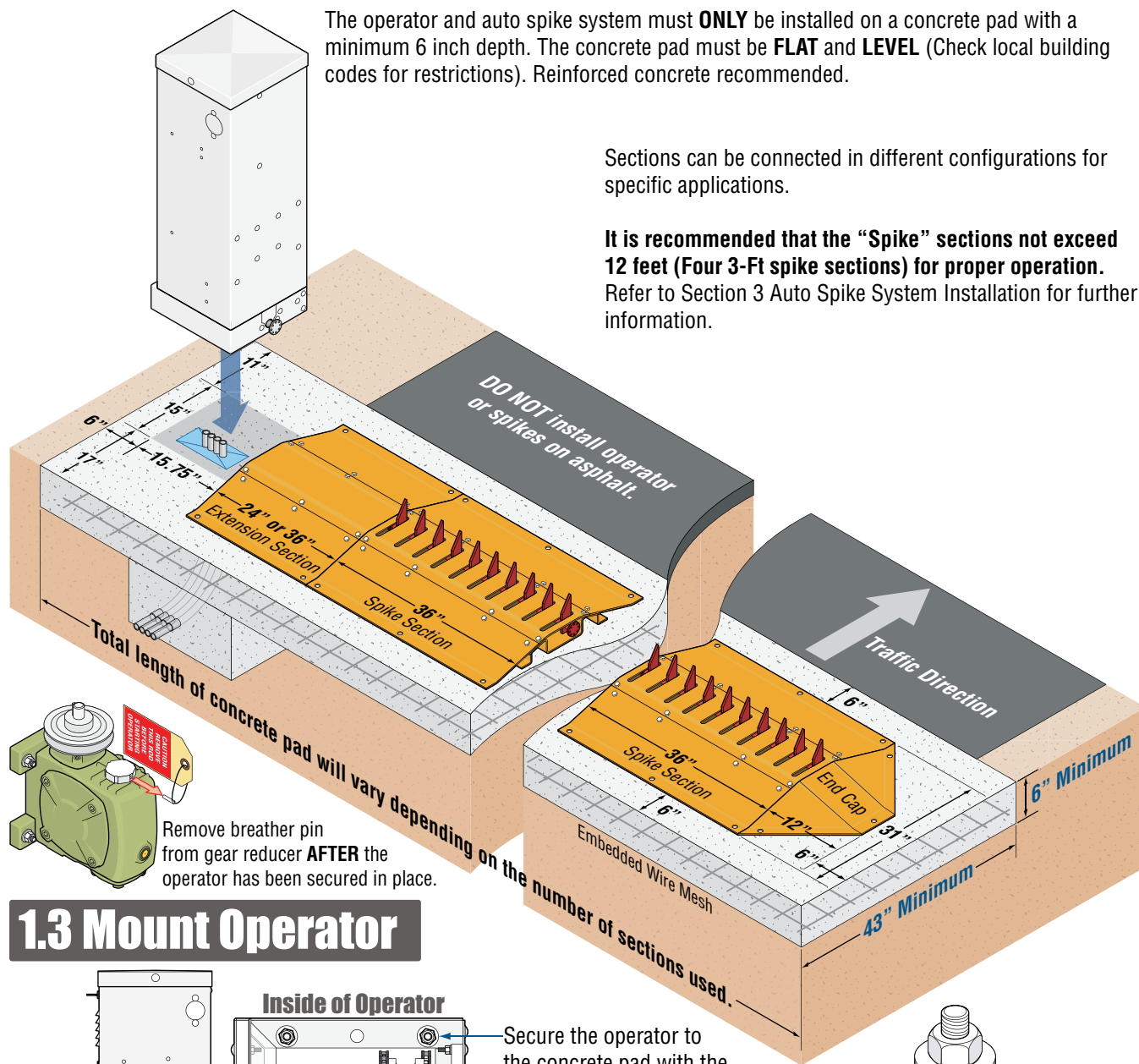


1.2 Concrete Pad Requirements

The operator and auto spike system must **ONLY** be installed on a concrete pad with a minimum 6 inch depth. The concrete pad must be **FLAT** and **LEVEL** (Check local building codes for restrictions). Reinforced concrete recommended.

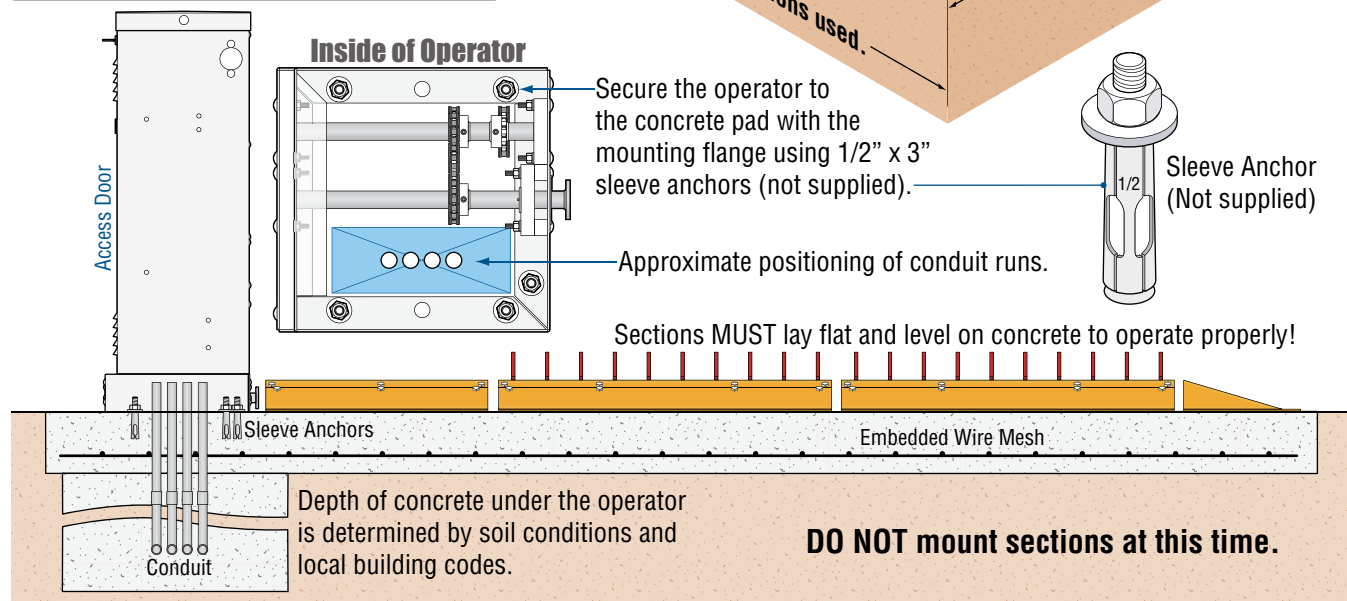
Sections can be connected in different configurations for specific applications.

It is recommended that the "Spike" sections not exceed **12 feet (Four 3-Ft spike sections)** for proper operation. Refer to Section 3 Auto Spike System Installation for further information.



Remove breather pin from gear reducer **AFTER** the operator has been secured in place.

1.3 Mount Operator



1.4 Dual Operator Installation (Primary/Secondary)

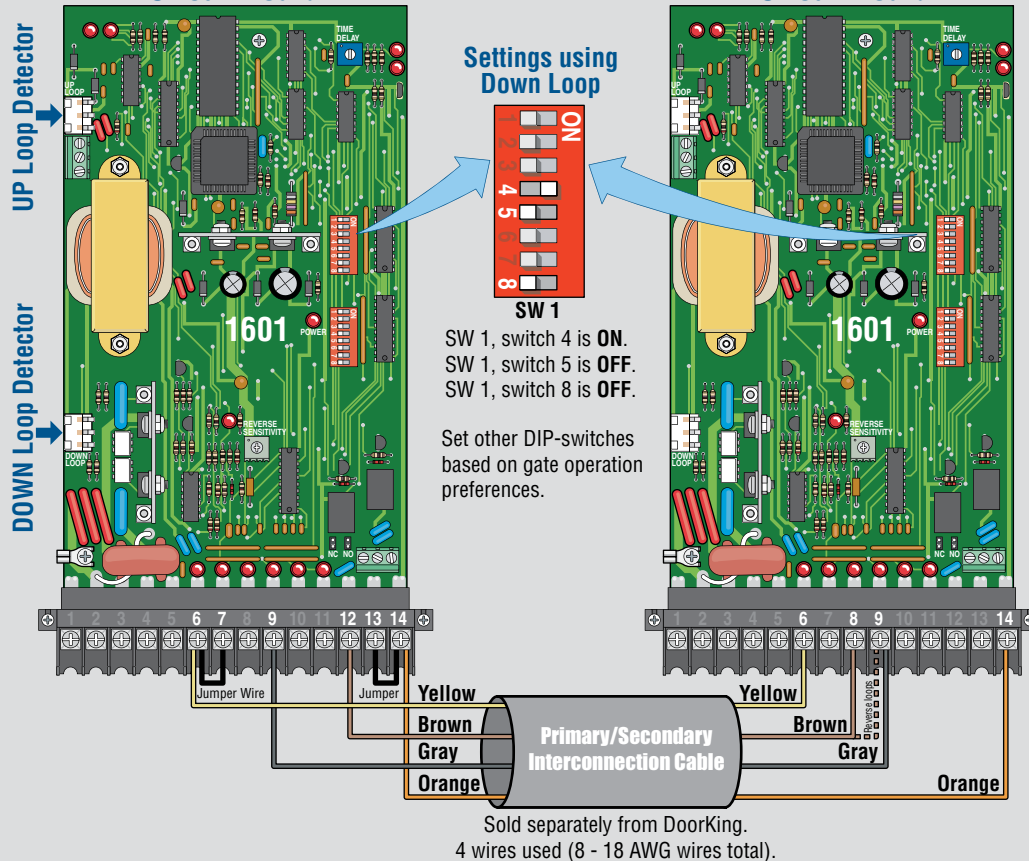
For use in areas needing **more** than four 3-Ft sections of spikes (12 ft.) in a traffic lane. Up to eight 3-Ft spike sections (24 feet of spikes) can be used with dual operators.

Install dual operators the **same** as installing two single operators except for:

- There are no end cap sections used.
- For spike sections to align, secondary operator will be offset 3.5" from the primary operator. Secondary spike shaft will not align with primary spike shaft and secondary spikes will rotate the opposite direction as the primary spikes.
- Secondary operator's arm is mounted on the right side of the operator.
- Operators need to be wired together with an interconnection cable (Sold separately).
- Each operator requires AC power.
- Both operator's DIP-switches (SW 1, SW 2) must be set the same.
- Connect all loop detectors and access control devices to the **PRIMARY** operator **ONLY**.

Primary Operator Circuit Board

Secondary Operator Circuit Board



When using Reverse Loops:

DIP-Switch settings: SW 1, switch 4 is OFF. SW 1, switch 5 is OFF. SW 1, switch 8 is OFF. Set other DIP-switches based on gate operation preferences.

Interconnection cable: The **BROWN** wire must be connected to **SECONDARY TERMINAL #9** along with the **GRAY** wire. All other terminal wire connections are the same as shown above.

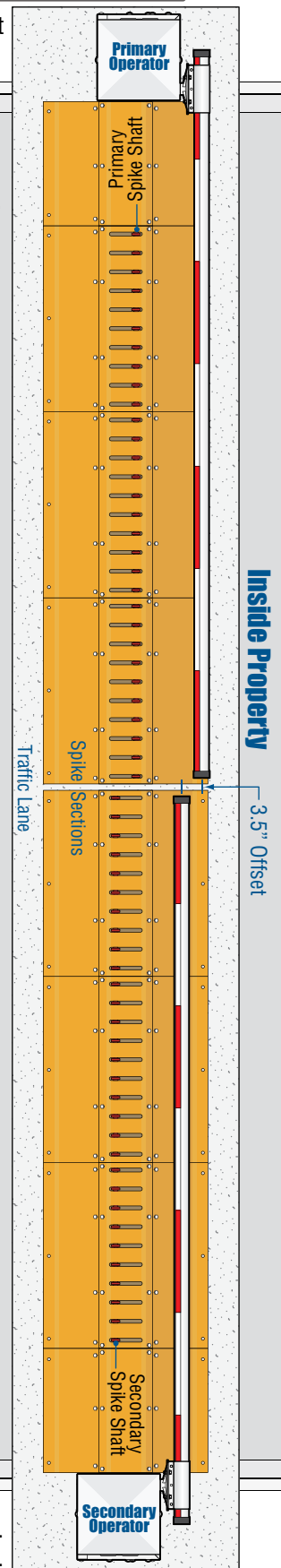


Illustration shows six 3-ft spike sections (18 ft. of spikes).
Each operator controls three 3-ft spike sections.

SECTION 2 - WIRING

Before attempting to connect any wiring to the operator, be sure that the circuit breaker in the electrical panel is in the OFF position. Permanent wiring must be installed to the operator as required by local electrical codes. It is recommended that a licensed electrical contractor perform this work.

Since building codes vary from city to city, we highly recommend that you check with your local building department prior to installing any permanent wiring to be sure that all wiring to the operator (both high and low voltage) complies with local code requirements.

THIS GATE OPERATOR MUST BE PROPERLY GROUNDED!!

2.1 High Voltage Wire Runs

The distance shown in the chart is measured in **"Feet"** from the operator to the power source. If power wiring is greater than the maximum distance shown, it is recommended that a service feeder be installed. When large gauge wire is used, a separate junction box must be installed for the operator connection. The wire table is based on stranded copper wire. Wire run calculations are based on the NEC recommended maximum 3% voltage drop on the power line, plus an additional 10% reduction in distance to allow for other losses in the system.

This table illustrates the high voltage AC power wire size and distance limitations.

Model Type	Voltage Required	Amps Required	Wire Size / Max Distance in Feet			
			12 AWG	10 AWG	8 AWG	6 AWG
1603 1/2 HP	115	5.7	170	275	460	690

Never run low voltage rated wire insulation in the same conduit as high voltage rated wire insulation.

"Optional" Heater Installation Note: When installing a heater, refer to the **"high voltage AC power wire size and distance limitations"** table on the instruction sheet with the heater kit for AC power wire run limitations.

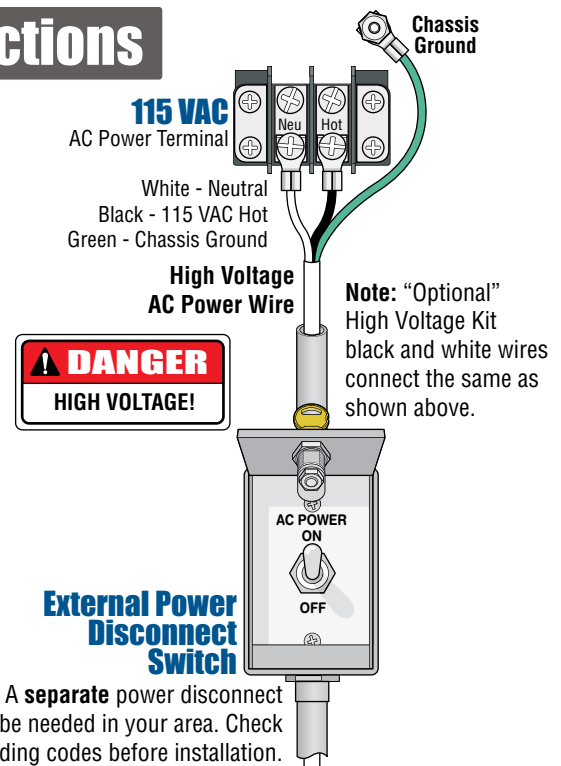
"Optional" High Voltage Kit Installation Note: When installing the high voltage kit for 208/230/460/575 VAC input power, refer to the **"high voltage AC power wire size and distance limitations"** table on the instruction sheet with the high voltage kit (P/N 2600-266) for AC power wire run limitations.

2.2 High Voltage Terminal Connections

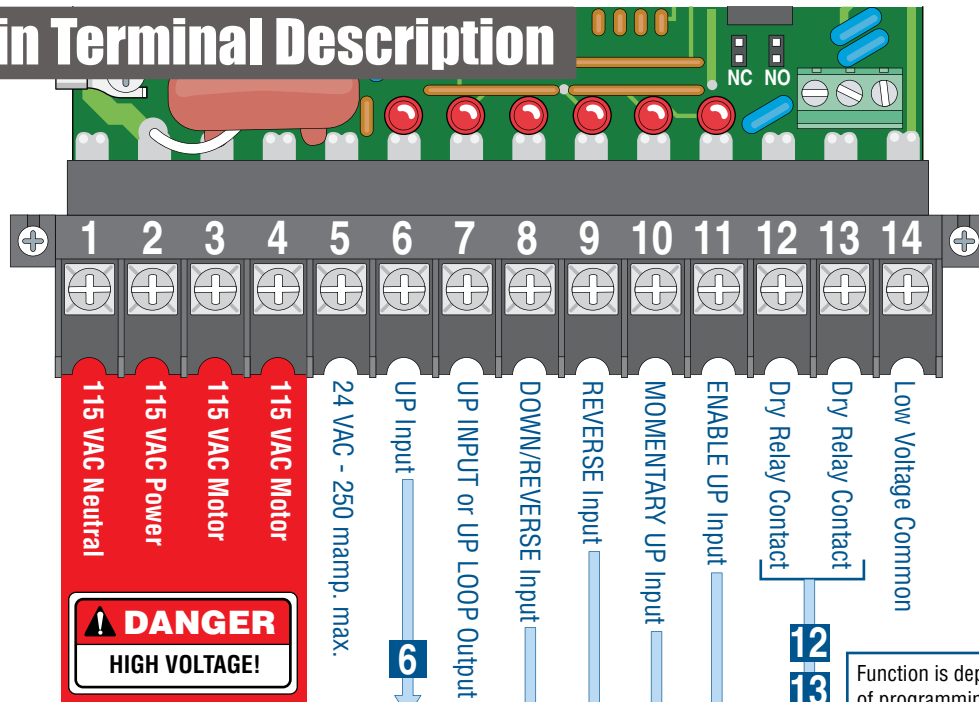
- Route incoming high voltage power in it's **OWN** conduit.
- Be sure wiring is installed in accordance with local codes. Be sure to color code all wiring.
- It is recommended that a surge suppressor be installed on the high voltage power lines to help protect the operator and circuit board from surges and power fluctuations.
- Dual operators (Primary/Secondary) require AC power to each operator.

⚠ Keep wire clear of all moving parts.

DO NOT power up and cycle the operator until the **"DIP-Switches"** have been set for the 1603 model (See pages 20 and 21). The operator will not function properly unless the switches have been correctly set.



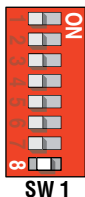
2.3 Main Terminal Description



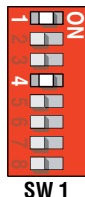
Function is dependent on the setting of programming SW 1, switch 6. When switch 6 is **OFF**, this input will cause the operator to rotate the arm to the up position. If the arm is in the down cycle, this input will reverse the arm to the up position. If this terminal has a constant input, the arm will remain in the up position regardless of any down input or timer command to rotate down. When switch 6 is **ON**, this input will cause the operator to rotate the arm to the up position when it is down, and will cause the operator to rotate the arm to the down position when it is up. If the auto timer is turned ON (Not recommended if switch 6 is ON), this input will override the timer and rotate the arm to the down position. If the arm is in the down cycle, this input will reverse the arm to the up position.



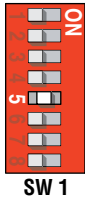
Function is dependent on the setting of programming SW 1, switch 8. When switch 8 is **ON**, the function of this input is identical to terminal 6. When switch 8 is **OFF**, this terminal becomes the logic output of the up loop detector.



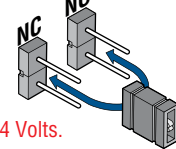
Function is dependent on the setting of programming SW 1, switches 1 and 4. With switch 1 **OFF** and switch 4 **ON**, activation and then deactivation of this input will rotate the arm to the down position, provided that the deactivation of the input happens while the arm is in the full up position. This input will override the auto timer if it is turned **ON**. If the arm is in the down position, traveling in the down cycle, or traveling in the up cycle, activation and deactivation of this input has no effect on the arm. With switches 1 and 4 are **ON**, activation and then deactivation of this input will rotate the arm to the down position after it reaches the full up position regardless of when the deactivation of the input occurred. When switch 4 is **OFF**, this input is identical to the reverse input, terminal 9.



Function is dependent on the setting of programming SW 1, switch 5. When switch 5 is **OFF**, activation of the down loop will activate the relay. When switch 5 is **ON**, activation of the UP loop will activate the relay.



Relay contacts can be set for Normally Open (NO) or Normally Closed (NC) operation. Contact rating is 1 amp maximum at 24 Volts.



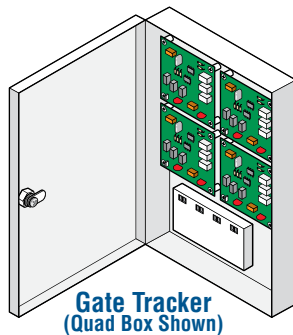
This input is used when sequencing the 1601 with a slide or swing gate operator in **PAMS** applications. This input is only active after a MOMENTARY UP input is received. Activation of this input will rotate the arm to the up position or reverse an arm in the down cycle to the up position.

This input is used when sequencing the 1601 with a slide or swing gate operator in **PAMS** applications. Activation of this input will rotate the arm to the up position one time, and activates the enable up input.

When the arm is in the down position, activation of this input has no effect. When the arm is in the up position, activation of this input will prevent the arm from rotating to the down position. If the arm is in the down cycle, activation of this input will reverse the arm to the up position.

2.4 Control Wiring for Single/Primary Operator

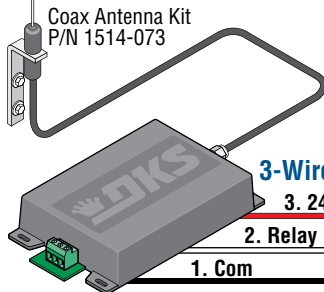
DoorKing Access Control System (Model 1833, 1835, 1837 or 1838) tracker system can be connected. This system can keep track of gate operator cycle count, shorted inputs, loop detector problems, any forced entry attempts, if the gate has struck anything during the open or close cycle, power interruptions, etc. For more detailed information refer to the Tracker Installation and Wiring Manual, DoorKing P/N 2351-010.



Gate Tracker (Quad Box Shown)
Terminal 6 required only if the tracker board will activate the gate operator. Refer to the manual 2351-065 for detailed information.

Antenna mounted outside operator housing.

Coax Antenna Kit
P/N 1514-073

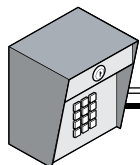


3-Wire Radio Receiver

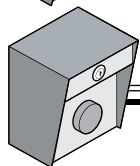
3. 24 Volt

2. Relay

1. Com



Up-Inputs



Down-Inputs



Manual Gate Control Toggle

P/N 1200-017

⚠ WARNING

User **MUST** make sure gate area **IS CLEAR** before manually operating gate arm.

Up toggle position: User toggles switch up to hold gate open.

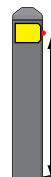
Center toggle position: Is neutral for normal operation.

Down toggle position: User momentarily toggles switch down to open gate.



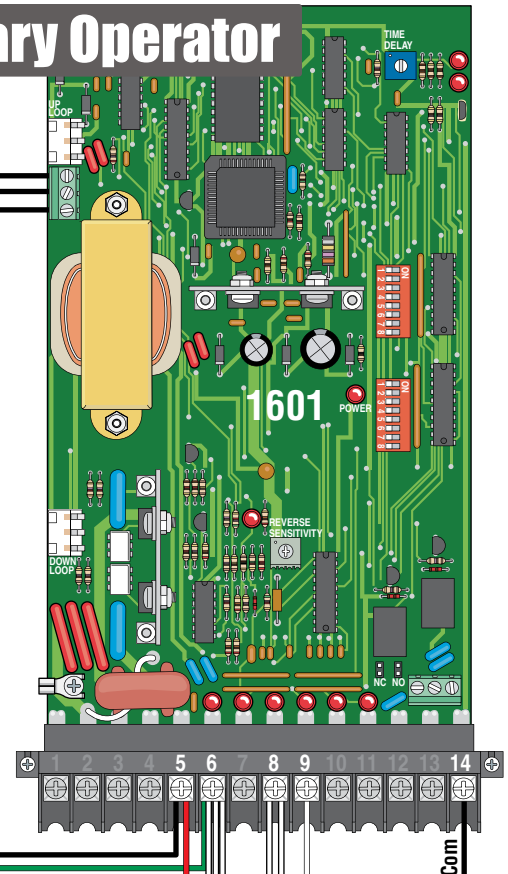
Contact Sensor (Reversing Edge)

See page 28



Non-Contact Sensor (Photo Sensors)

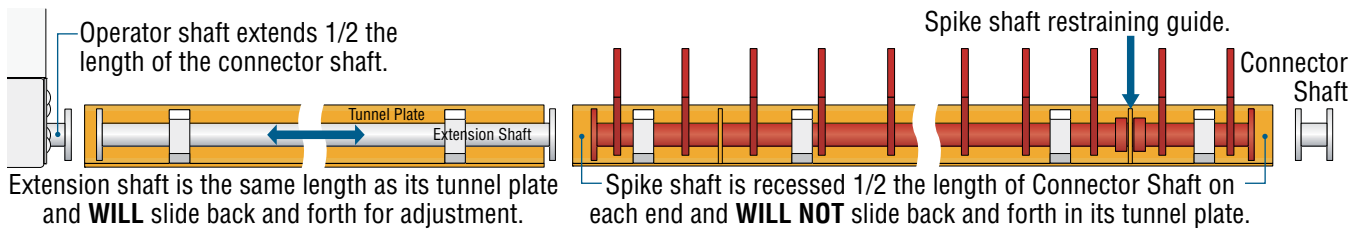
21" Typical Beam Height.
27.5" Max. Beam Height.



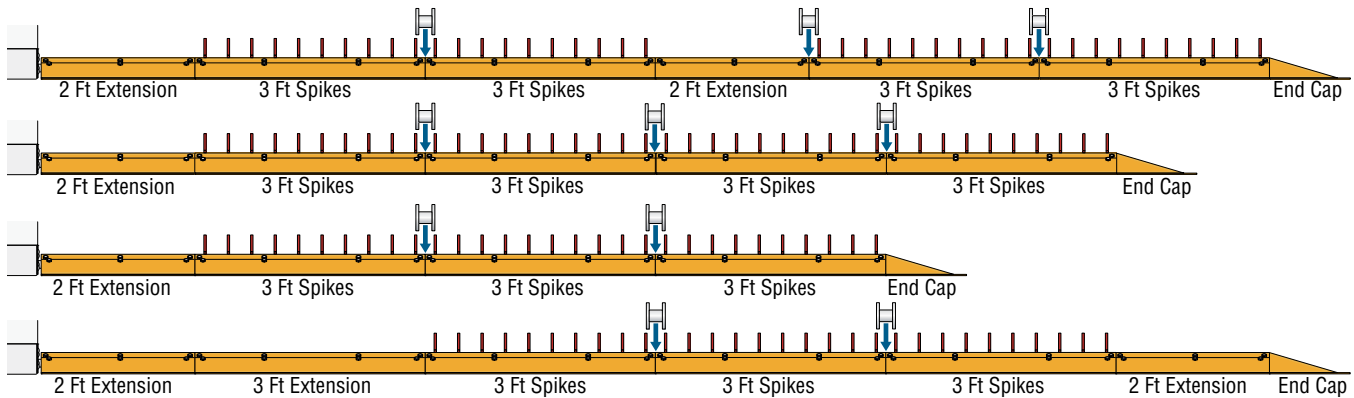
Contact and Non-Contact Sensors Note:
Helps minimize the potential of the arm lowering on vehicular or other traffic that loops cannot sense.

SECTION 3 - AUTO SPIKE SYSTEM INSTALLATION

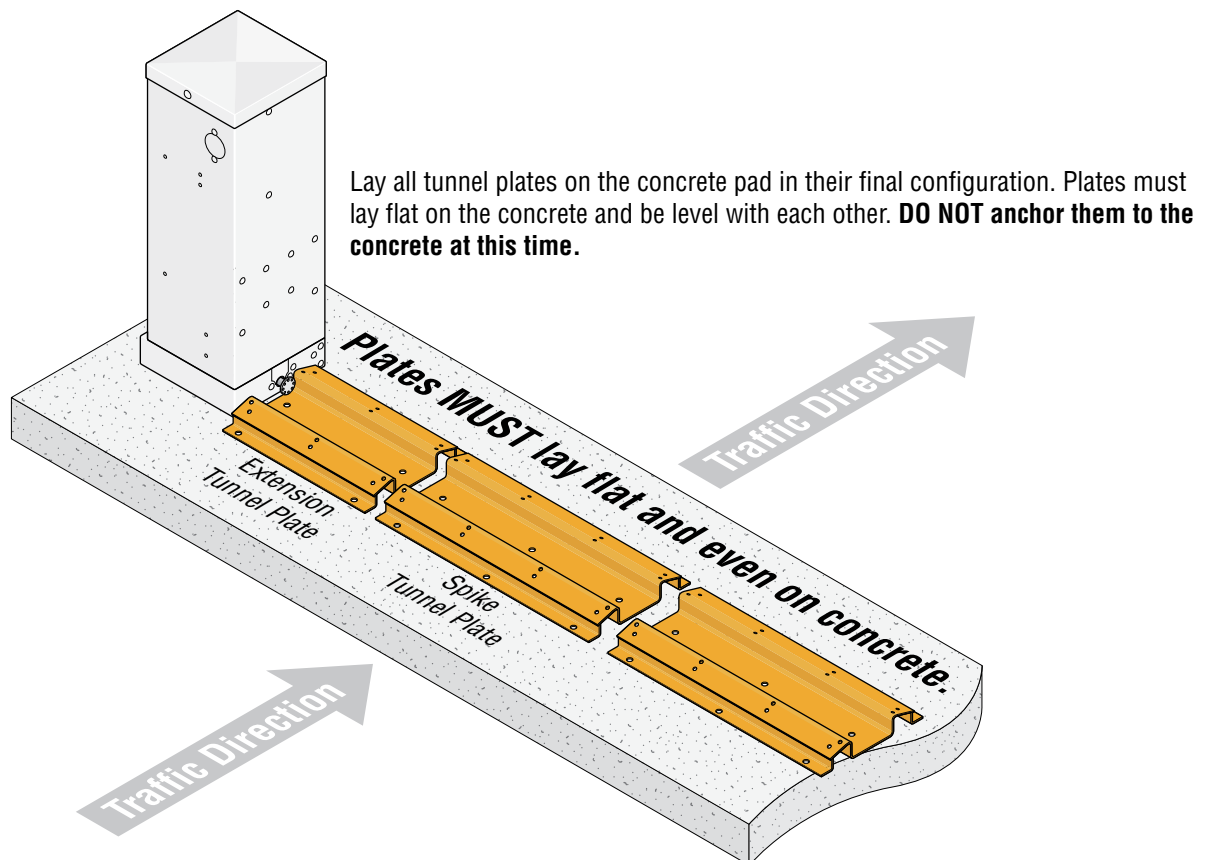
The operator and auto spike system must be installed on a flat and level concrete pad with a minimum 6 inch depth (Check local building codes for restrictions). Reinforced concrete recommended.



Examples: Sections can be connected in different configurations for specific applications. It is recommended that the "Spike" sections not exceed 12 feet for proper operation.

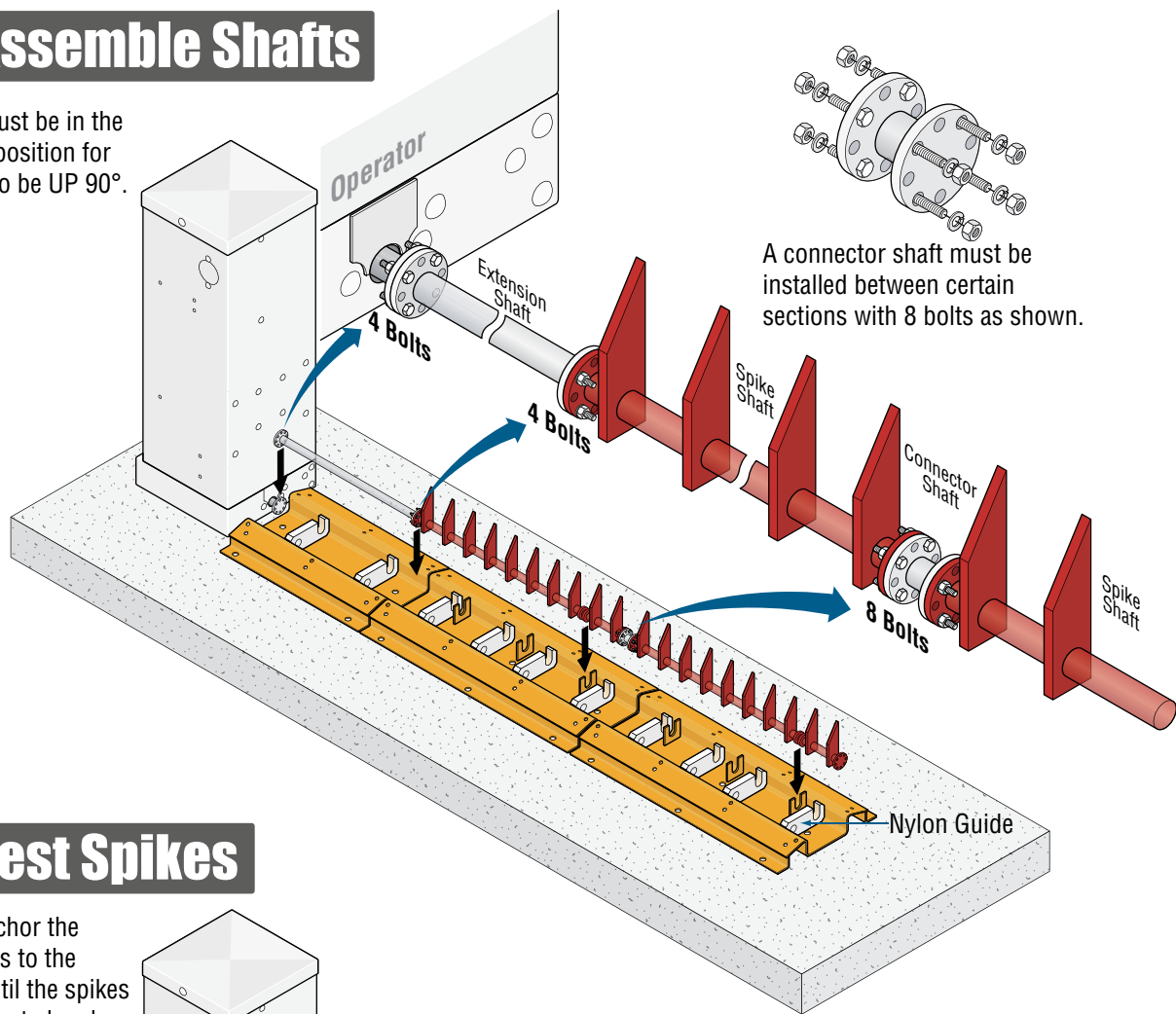


3.1 Lay Sections on Concrete Pad



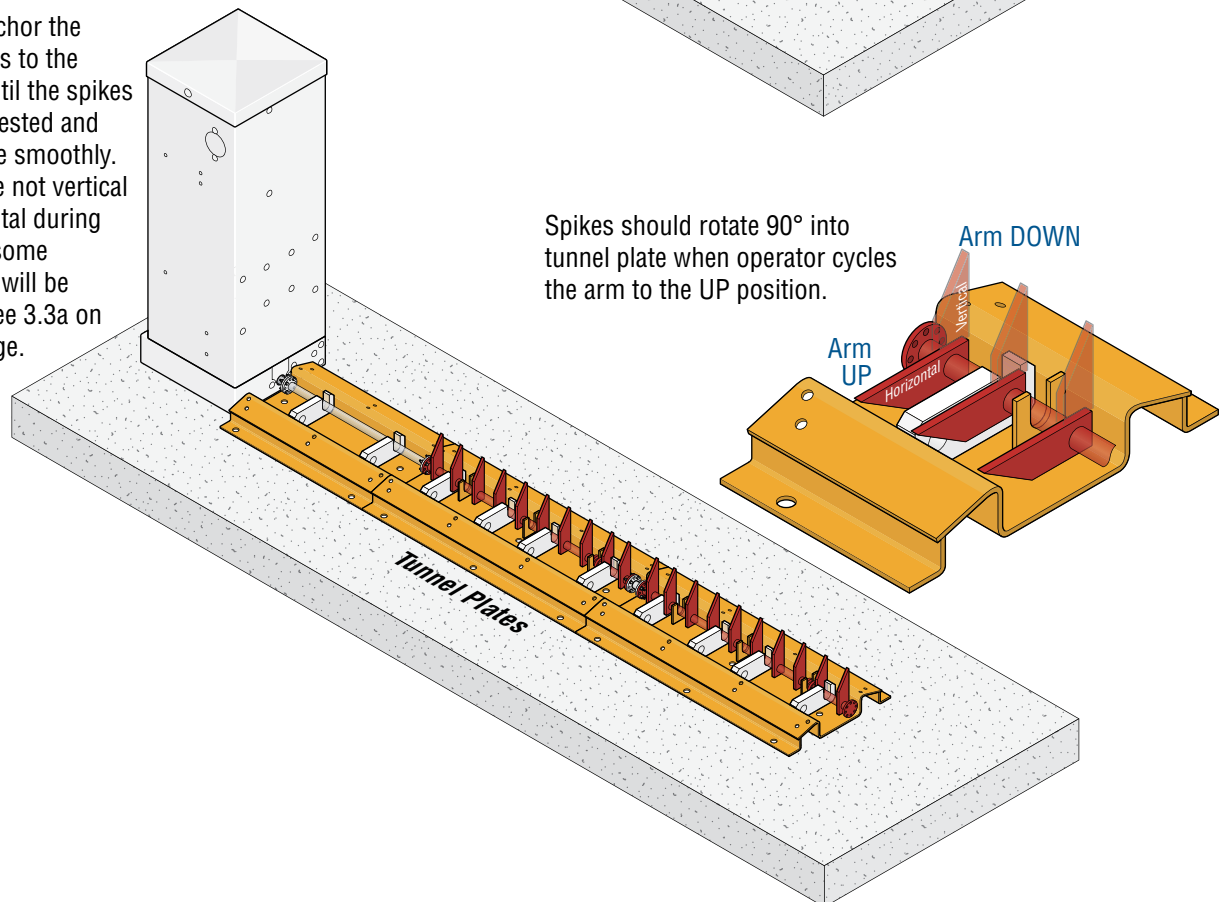
3.2 Assemble Shafts

Operator must be in the Down arm position for the spikes to be UP 90°.

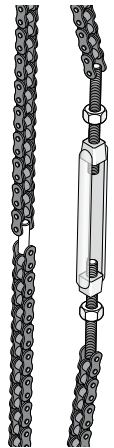


3.3 Test Spikes

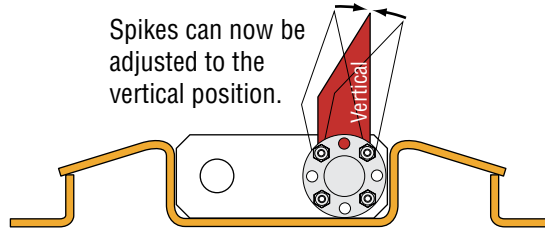
DO NOT anchor the tunnel plates to the concrete until the spikes have been tested and they operate smoothly. If spikes are not vertical and horizontal during operation, some adjustment will be required. See 3.3a on the next page.



3.3a Adjust Spikes If Necessary



With operator in the Down arm position, loosen turnbuckle on crossed chain to release chain from the lower sprocket.

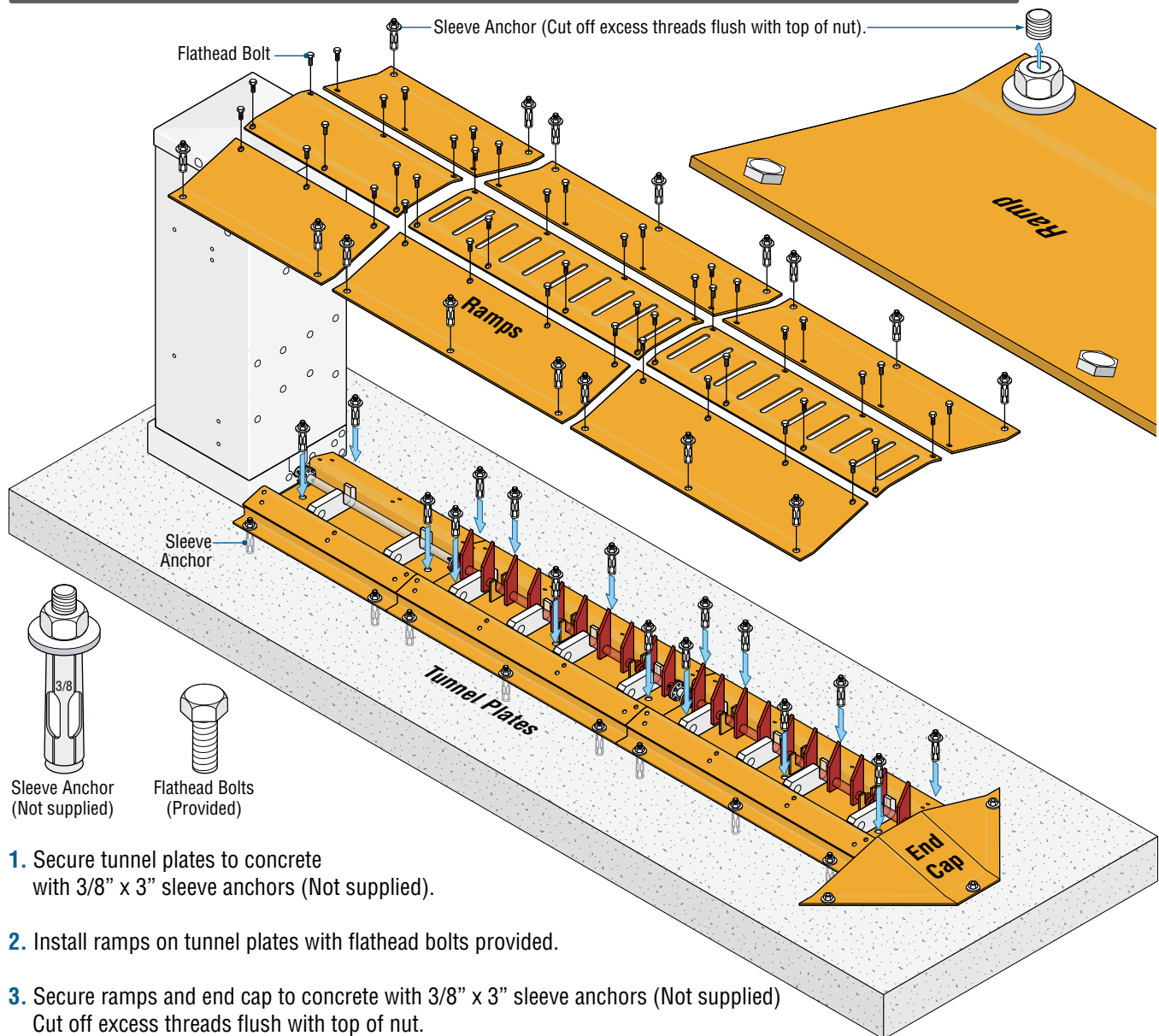


Spikes can now be adjusted to the vertical position.



Replace the chain back into lower sprocket and tighten turnbuckle after spikes are vertical.

3.4 Secure Tunnel Plates and Ramps to Concrete



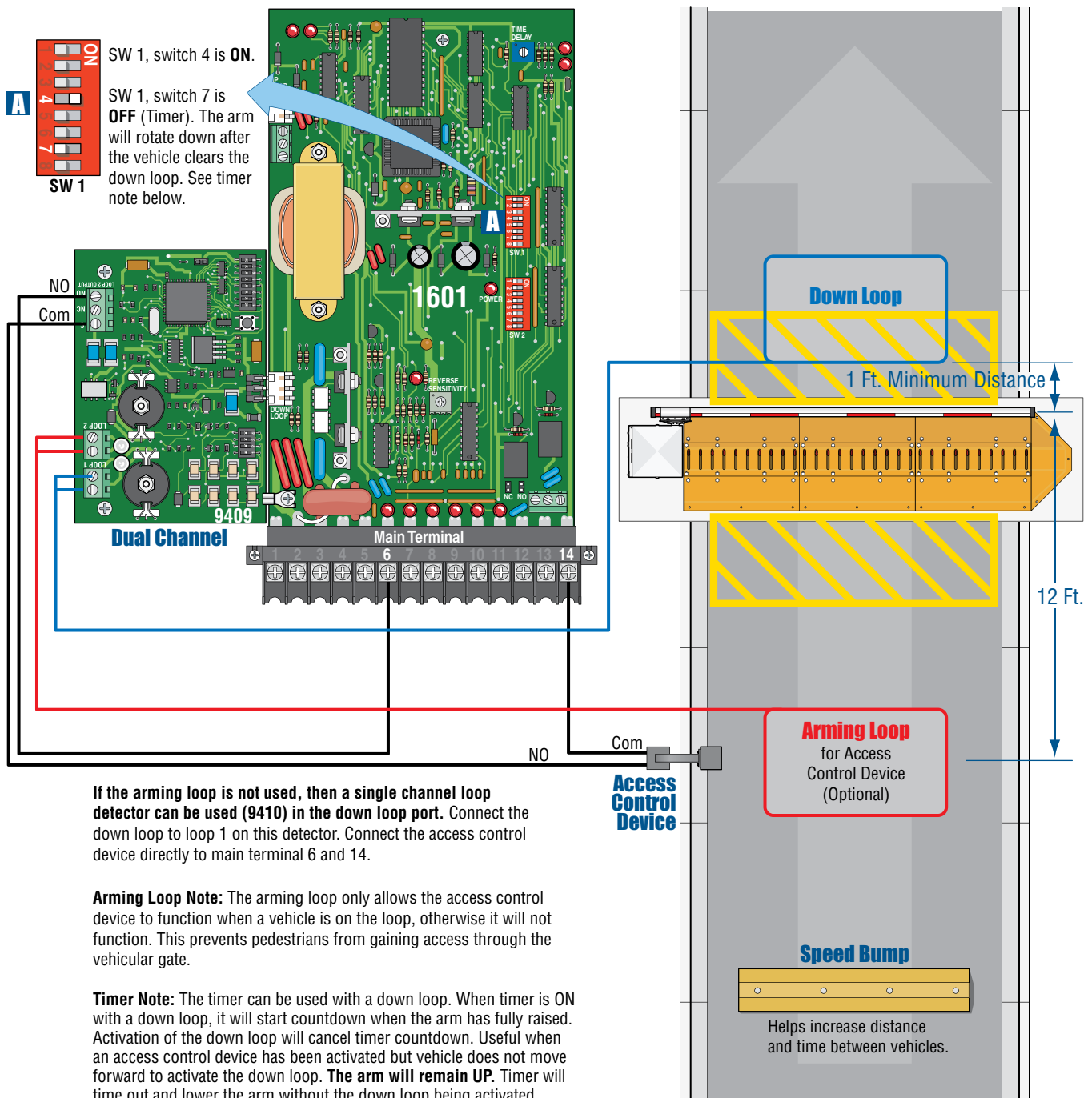
1. Secure tunnel plates to concrete with 3/8" x 3" sleeve anchors (Not supplied).
2. Install ramps on tunnel plates with flathead bolts provided.
3. Secure ramps and end cap to concrete with 3/8" x 3" sleeve anchors (Not supplied)
Cut off excess threads flush with top of nut.

SECTION 4 - LOOP DETECTOR LANE SETUPS

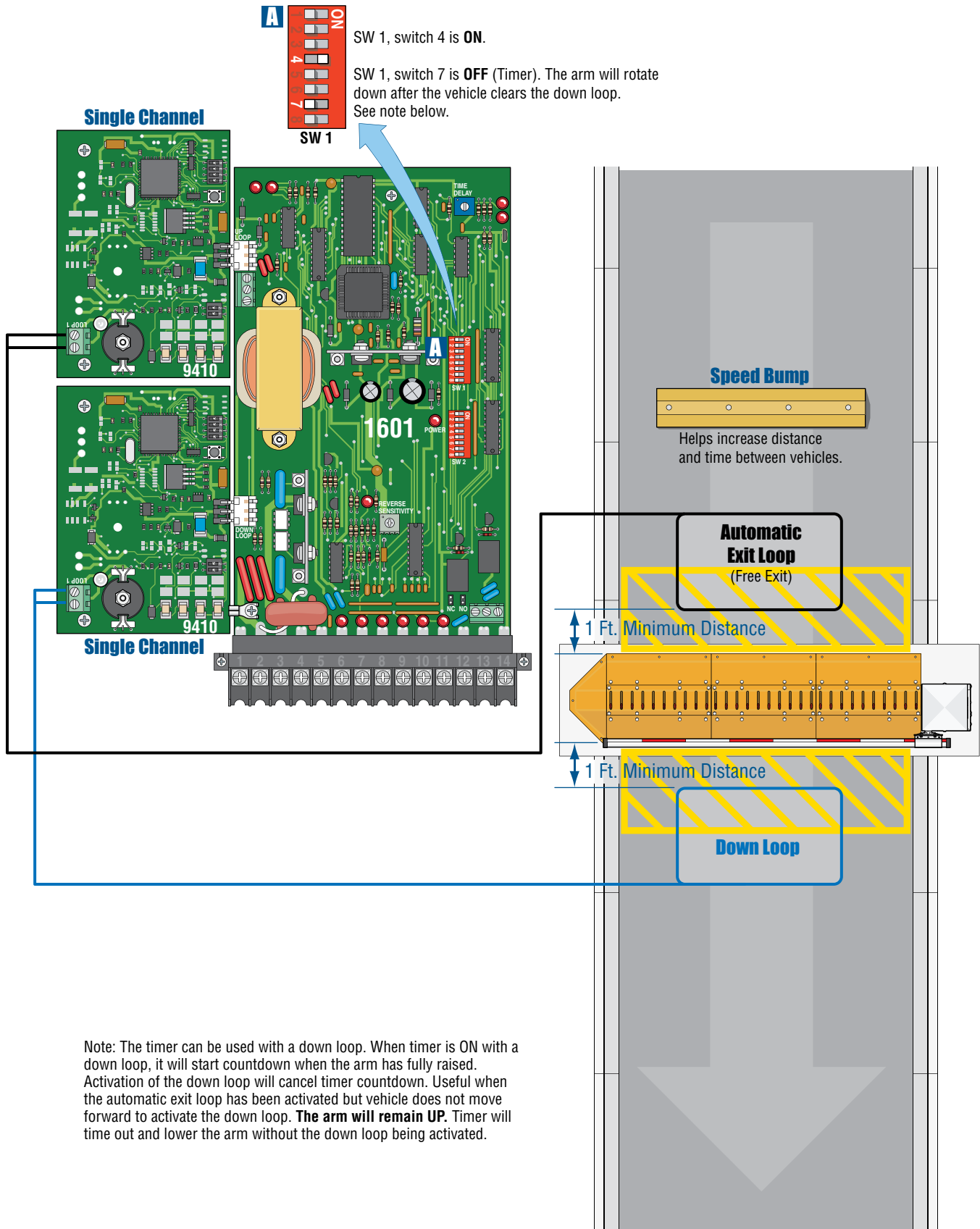
Before attempting to connect any wiring to the operator, be sure that the circuit breaker in the electrical panel is in the OFF position. Permanent wiring must be installed to the operator as required by local electrical codes. It is recommended that a licensed electrical contractor perform this work.

Loop detector wiring shown is for DoorKing model 9409 Dual Channel and 9410 Single Channel plug-In loop detectors only. If using other loop detectors refer to the separate Loop Information Manual for installation instructions, loops/preformed loops and wiring diagrams. All inputs to the main terminal are NORMALLY OPEN.

4.1 Entry Lane Only



4.2 Exit Lane Only

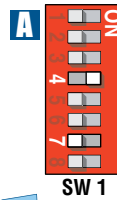
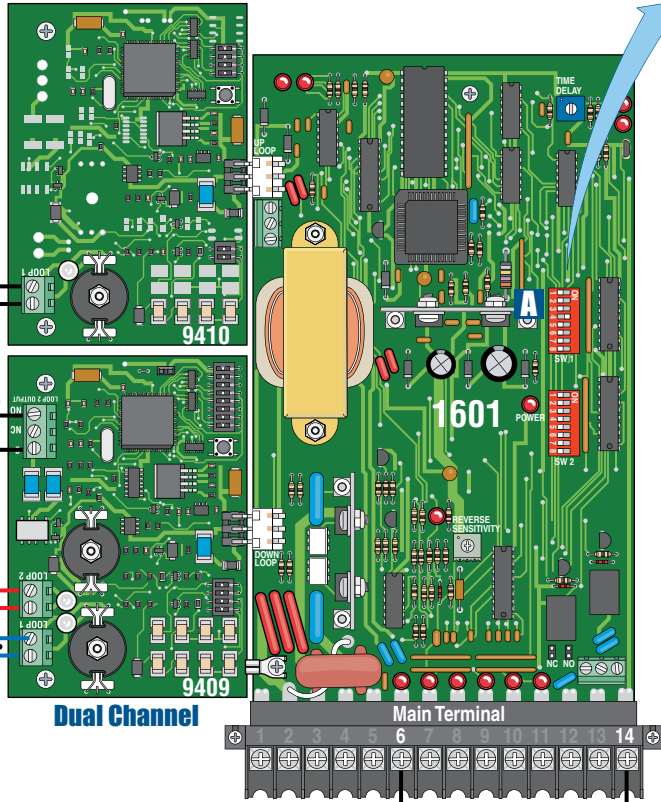


4.3 Two-Way Traffic Lane

When a vehicle enters, the down loop will be overridden by the automatic exit loop which will continue to hold the arm up. When the interior down loop has been cleared by the vehicle, the arm will lower.

When a vehicle exits, the automatic exit loop will raise arm and when the down loop is cleared, the arm will lower. The interior down loop is inoperative for exiting vehicles.

Single Channel



SW 1, switch 4 is **ON**.

SW 1, switch 7 is **OFF** (Timer). The arm will rotate down after the vehicle clears the down loops. See timer note below.

Spacing between loops is critical when using this configuration. Be sure that the loops are spaced as shown in the diagram.

Interior Down Loop

Speed Bump

Automatic Exit Loop
(Free Exit)

Down Loop

1 Ft. Minimum Distance

Arming Loop
for Access
Control Device
(Optional)

Speed Bump

Helps increase distance
and time between vehicles.

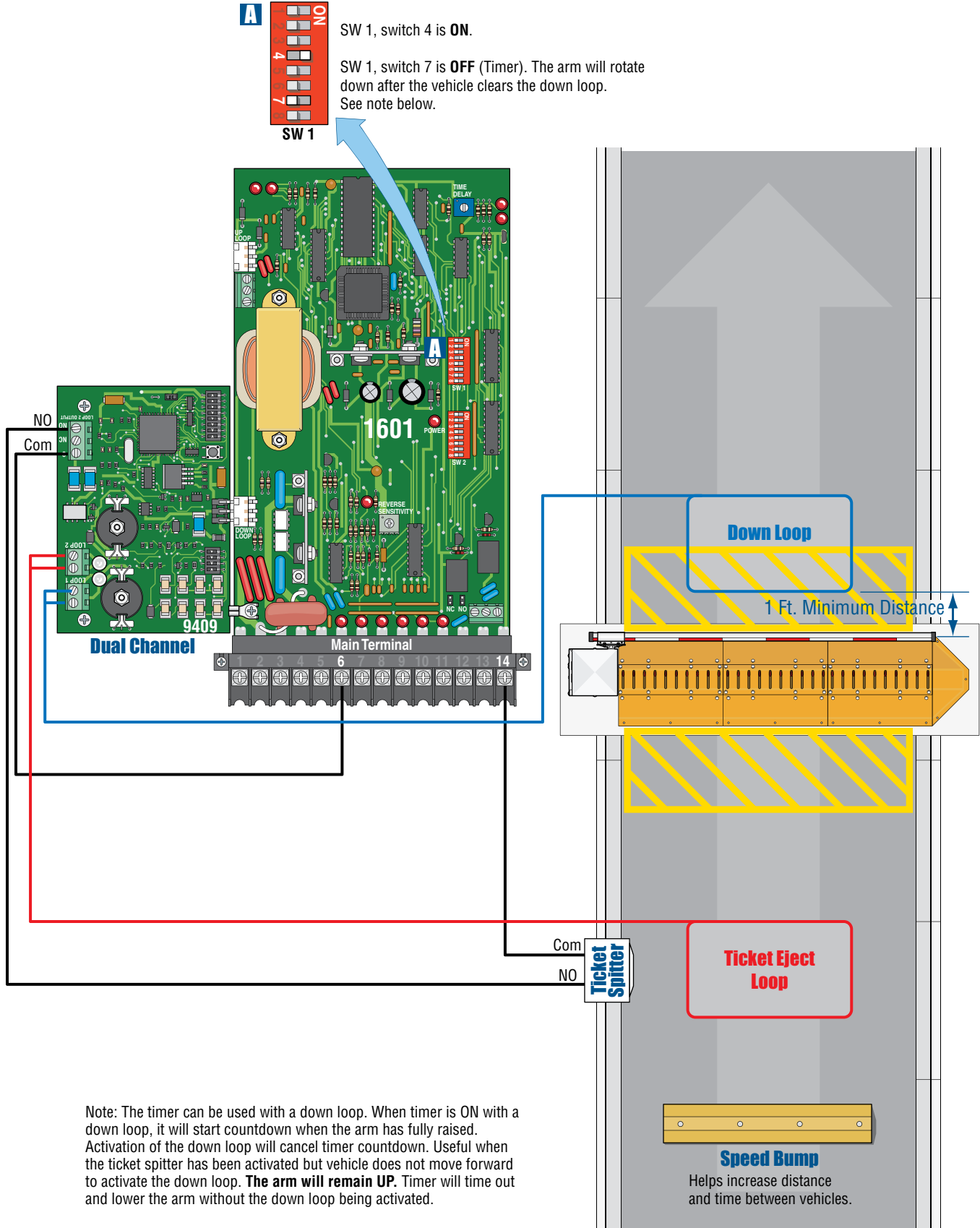
If the arming loop is not used, then a Single Channel Loop Detector can be used (9410) in the down loop port. Connect the down loops to loop 1 on this detector. Connect the access control device directly to main terminal 6 and 14.

Arming Loop Note: The arming loop only allows the access control device to function when a vehicle is on the loop, otherwise it will not function. This prevents pedestrians from gaining access through the vehicular gate.

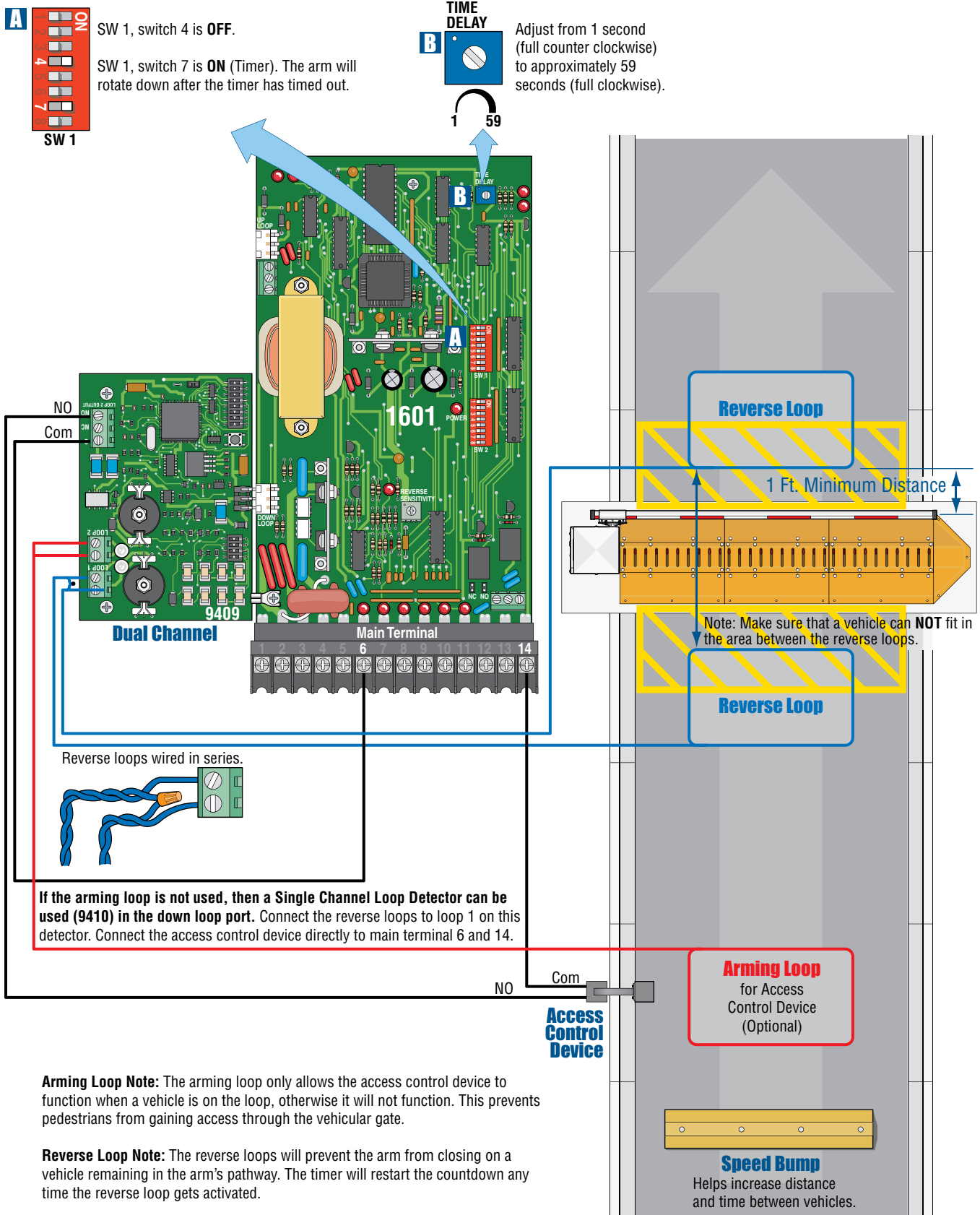
Timer Note: The timer can be used with down loops. When timer is ON with a down loop, it will start countdown when the arm has fully raised. Activation of the down loop will cancel timer countdown. Useful when the access control device or automatic exit loop has been activated but vehicle does not move forward to activate the down loop. **The arm will remain UP.** Timer will time out and lower the arm without the down loop being activated.

Access Control Device

4.4 Ticket Spitter Entry Lane



4.5 Operator Timer ON Entry Lane (No Down Loop)



Arming Loop Note: The arming loop only allows the access control device to function when a vehicle is on the loop, otherwise it will not function. This prevents pedestrians from gaining access through the vehicular gate.

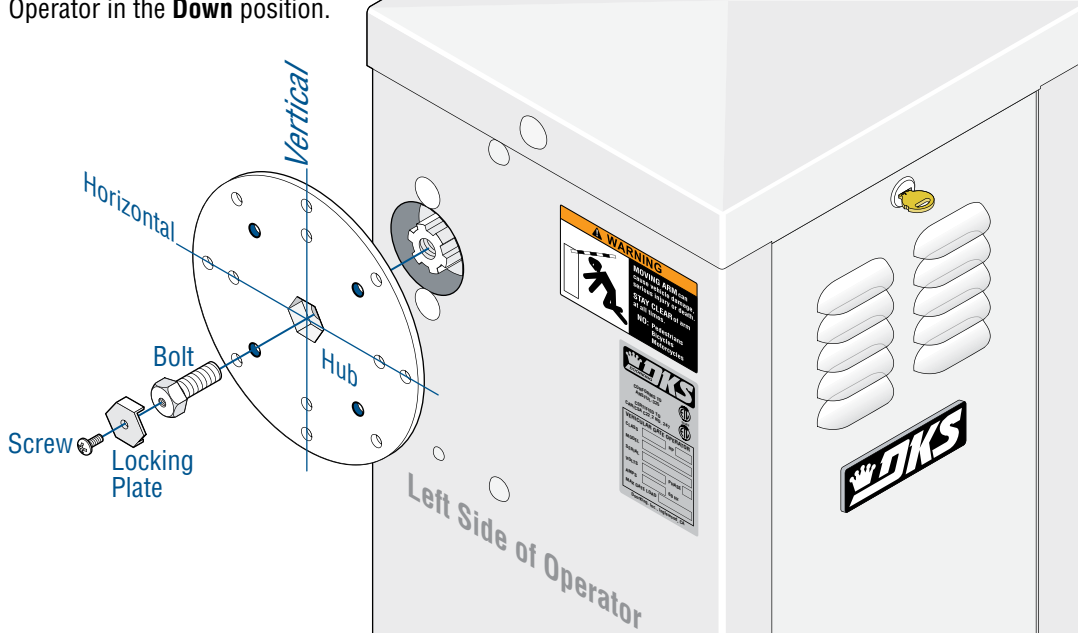
Reverse Loop Note: The reverse loops will prevent the arm from closing on a vehicle remaining in the arm's pathway. The timer will restart the countdown any time the reverse loop gets activated.

SECTION 5 - ARM INSTALLATION

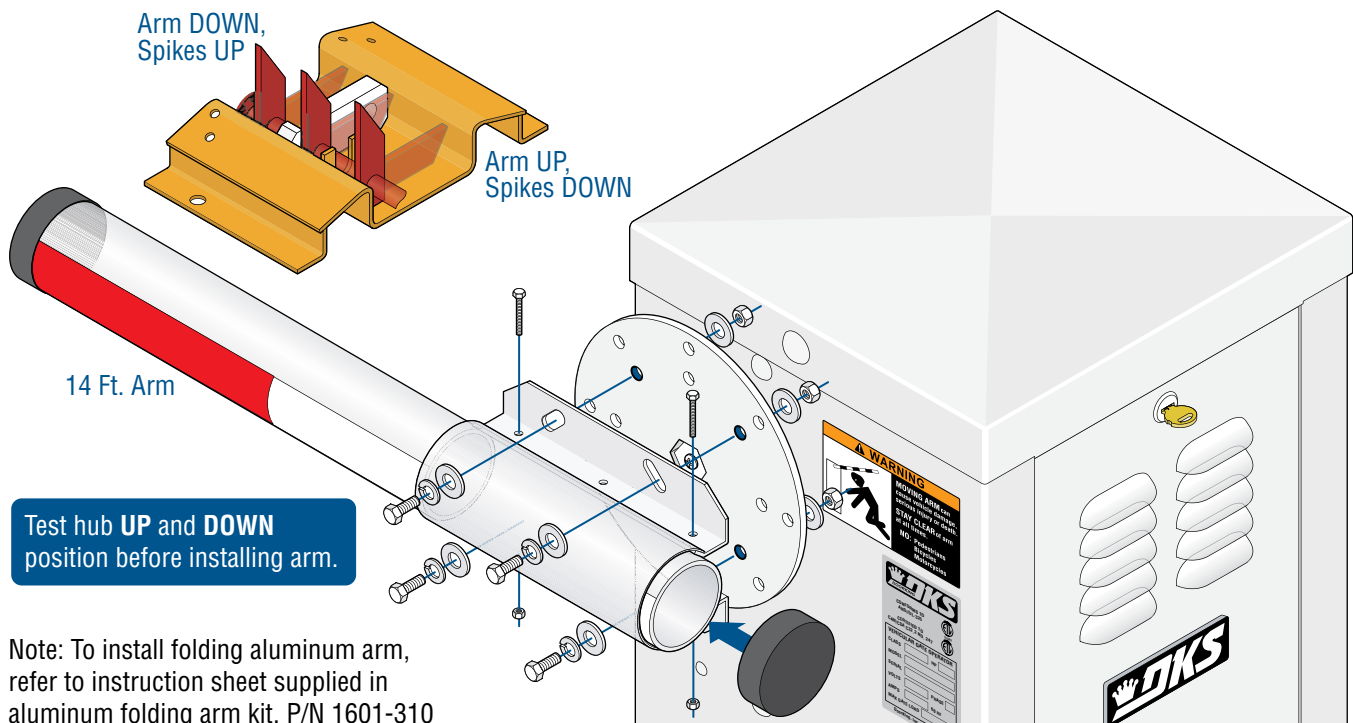
The 14 ft. aluminum arm mounts on the left side of the operator (either straight or folding arm).

5.1 Mounting Hub

Operator in the **Down** position.



5.2 Mounting Aluminum Arm



SECTION 6 - ADJUSTMENTS

The switch settings and adjustments in this chapter should be made after your installation and wiring to the operator is complete. **Whenever any of the programming switches on the circuit board are changed, power must be shut-off, and then turned back on for the new setting to take effect.**

6.1 1601 Circuit Board Description and Adjustments

Gate Tracker Activity LED

An automatic sensor system that senses entrapment of a solid object and is incorporated as a permanent and integral part of the operator.

Gate Operator Data Terminal

Operator status reporting; cycle count, shorted inputs, loop detector problems, power interruptions, etc. See page 10.

Auto Close Timer

Auto close timer (when turned on) SW 1, switch 7.

Adjust from 1 second (full counter clockwise) to approximately 59 seconds (full clockwise).



SW 1



1 59

How LEDs Function



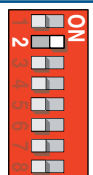
Illuminated **LEDs** Indicates that low voltage power is being applied to the circuit board.

Input LEDs should be OFF and will only illuminate when the input is activated.

Limit LEDs will only illuminate when the respective limit sensor has been activated.

Self Test

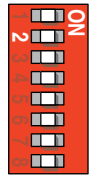
Self test (when turned on) SW 1, switch 2.



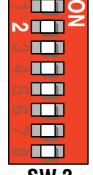
SW 1

DIP-Switches

Set the DIP-switches on the circuit board to the desired setting. See switch settings information on the next 3 pages.



SW 1



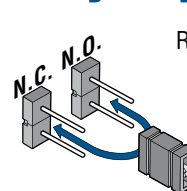
SW 2

Note: SW 2, switch 1 **MUST** be set for the correct model operator that has been installed.

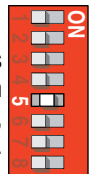
Arm Relay Contacts

(C – NC – NO) This relay can be used for a variety of purposes and is typically used to signal when the arm is up or down.

Dry Relay Contact



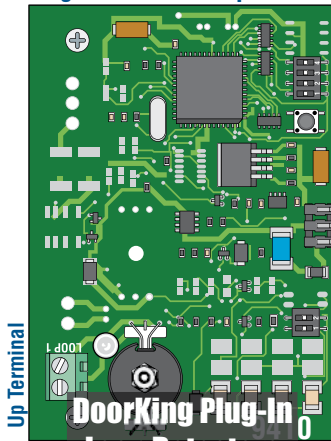
Relay activation is dependant on setting of SW 1, switch 5.



SW 1

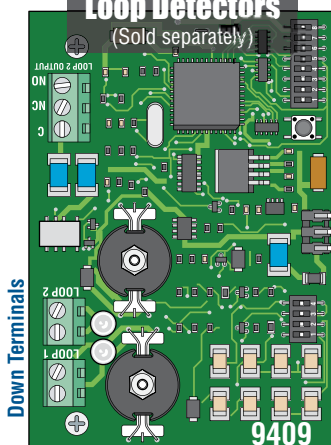
Dry relay contacts (terminals 12-13) can be set for Normally Open (NO) or Normally Closed (NC) operation by placing the relay shorting bar on the N.O. or N.C. pins respectively. See page 9 and next page.

Single Channel Loop Detector



DoorKing Plug-In Loop Detectors

(Sold separately)

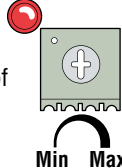


Dual Channel Loop Detector

Reverse Sensor

Adjust reversing sensitivity for the DOWN direction of arm.

See page 24.



Min Max

6.2 DIP-Switch SW 1 and SW 2 Settings

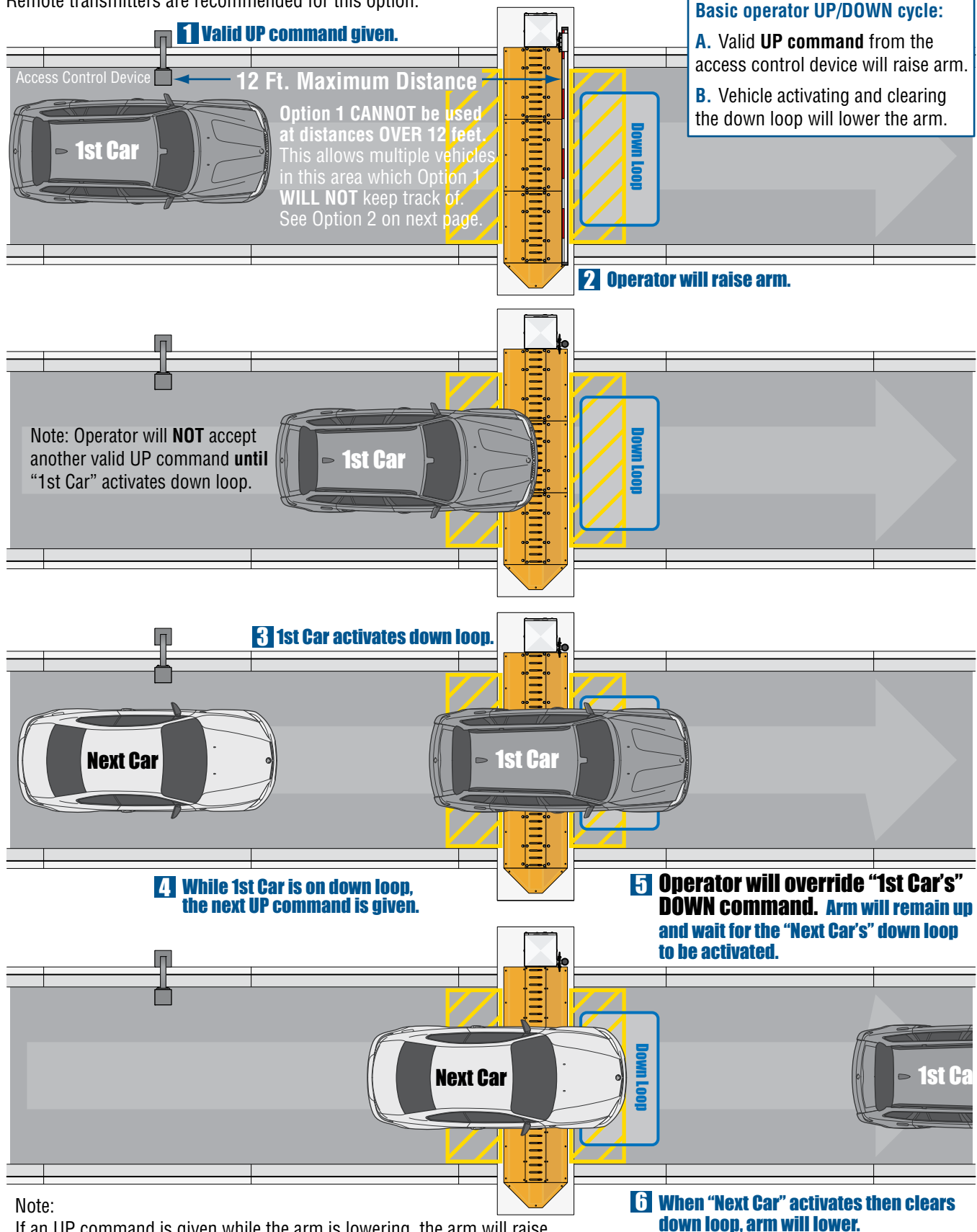
The two DIP-switches located on the circuit board are used to program the operator to operate in various modes and to turn on or off various operating features. Whenever a switch setting is changed, power to the operator must be turned OFF and then turned back on for the new setting to take affect. Check and review ALL switch settings prior to applying power to the operator.

SW 1 (Top 8 Switches)			
Switch	Function	Setting	Description
1	Down Active when arm is full up.	OFF	Activation and then deactivation of the down loop or down / reverse input will cause the arm to rotate down ONLY if the deactivation occurred after the arm reached the FULL UP position.
	Down Active when arm is moving up or is up.	ON	Activation and then deactivation of the down loop or down / reverse input will cause the arm to rotate down AFTER reaching the FULL UP position regardless of when the deactivation occurred.
2	Self-Test	OFF	Normal setting. Self-test is turned off.
		ON	Run self-test.
3	Gear Box Travel	OFF	Normal setting. Operator uses 360° of gearbox. Extends wear life of gearbox.
		ON	Operator uses 180° of gearbox.
4	Down / Reverse Loop and Input	OFF	Down / Reverse loop and input will function as a REVERSE loop and REVERSE input.
		ON	Normal setting. Down / Reverse loop and input will function as a down input and cause the arm to rotate down upon deactivation of the input. See SW 1, switch 1 for additional information.
5	Relay 1 Activation	OFF	Normal setting. Relay activates when the DOWN loop detector (DoorKing plug-in detector only) senses a vehicle presence.
		ON	Relay activates when the UP loop detector (DoorKing plug-in detector only) senses a vehicle presence.
6	Up Input Function	OFF	Up Input will raise arm and/or reset the down timer. Input will not lower the arm.
		ON	Up Input will raise arm if it is down, or will lower arm if it is up.
7	Timer	OFF	Timer to lower arm is OFF.
		ON	Timer to lower arm is ON. Set from 1 to 59 seconds for close time delay. Timer can be used as a secondary closing command for a down loop. Timer countdown starts when arm has fully raised. Down loop activation will cancel timer and lower arm OR arm will lower when timer has timed out.
8	Up Loop Port Input	OFF	Output of the loop detector plugged into the UP loop port is switched to terminal 7 for connection to other input terminals.
		ON	Normal setting. Output of the loop detector plugged into the UP loop port will raise arm when activated.

SW 2 (Bottom 8 Switches)			
Switch	Function	Setting	Description
1	Model 1603	OFF	Switch must be OFF for model 1603 barrier gate operator.
2	Multiple Input Memory ON/OFF Switch	OFF	Normal setting. Operator will respond to a single UP command, then require a DOWN command. Operator will not accept multiple Up commands. Operator will not accept the next UP command until the previous DOWN command is in progress.
		ON	Turns ON the multiple input memory option 1 or 2 (See switch 3). SW 1, switch 4 must also be on.
3	Multiple Input Memory Options (SW2, Switch 2 must be ON) (SW1, Switch 4 must be ON)	Option 1 (OFF Position)	Override a DOWN command – When the arm is in the up position for a vehicle passing through and the next vehicle's UP command is received, the operator will hold the arm up and wait for the next vehicle to clear the down loop before lowering the arm. The operator will not count multiple UP commands. Distance between access control device and barrier operator is a factor when using this option. Remote transmitters recommended for this option. See next page for more information.
		Option 2 (ON Position)	Override Multiple DOWN commands – The operator will count multiple UP commands received during an UP command and require a matching number of DOWN commands before lowering the arm. Distance between access control device and barrier operator is a factor when using this option. Remote transmitters NOT recommended for this option. See page 23 for more information.
4	Stop Arm Function	OFF	Normal setting. Arm will NOT stop DURING the down cycle.
		ON	Stop Arm Function – Arm will stop DURING the down cycle if a vehicle activates the down loop. An UP command will raise the arm, or the arm will continue down AFTER the down loop is cleared.
5	Reverse Delay	OFF	Arm reversal is delayed approximately .5 seconds when a reverse input from terminal 9 is received during the down cycle. (eg. non-contact sensor beam is blocked). Limited application use.
		ON	Normal setting. Instant Reverse – Arm reversal is delayed approximately .1 second when a reverse input from terminal 9 is received during the down cycle. (eg. non-contact sensor beam is blocked)
6	Arm Rotation Direction	OFF	Normal setting. Leave in OFF position.
7	Spare	OFF	Normal setting. Leave in OFF position.
8	Spare	OFF	Normal setting. Leave in OFF position.

Option 1 - Override a DOWN Command SW2, Switch 3 OFF

Remote transmitters are recommended for this option.



Note:

If an UP command is given while the arm is lowering, the arm will raise.

Basic operator UP/DOWN cycle:

- A. Valid **UP** command from the access control device will raise arm.
- B. Vehicle activating and clearing the down loop will lower the arm.

Option 2 - Override Multiple DOWN Commands sw2, Switch 3 ON

Basic operator UP/DOWN cycle:

- A. Valid **UP** command from the access control device will raise arm.
- B. Vehicle activating and clearing the down loop will lower the arm.

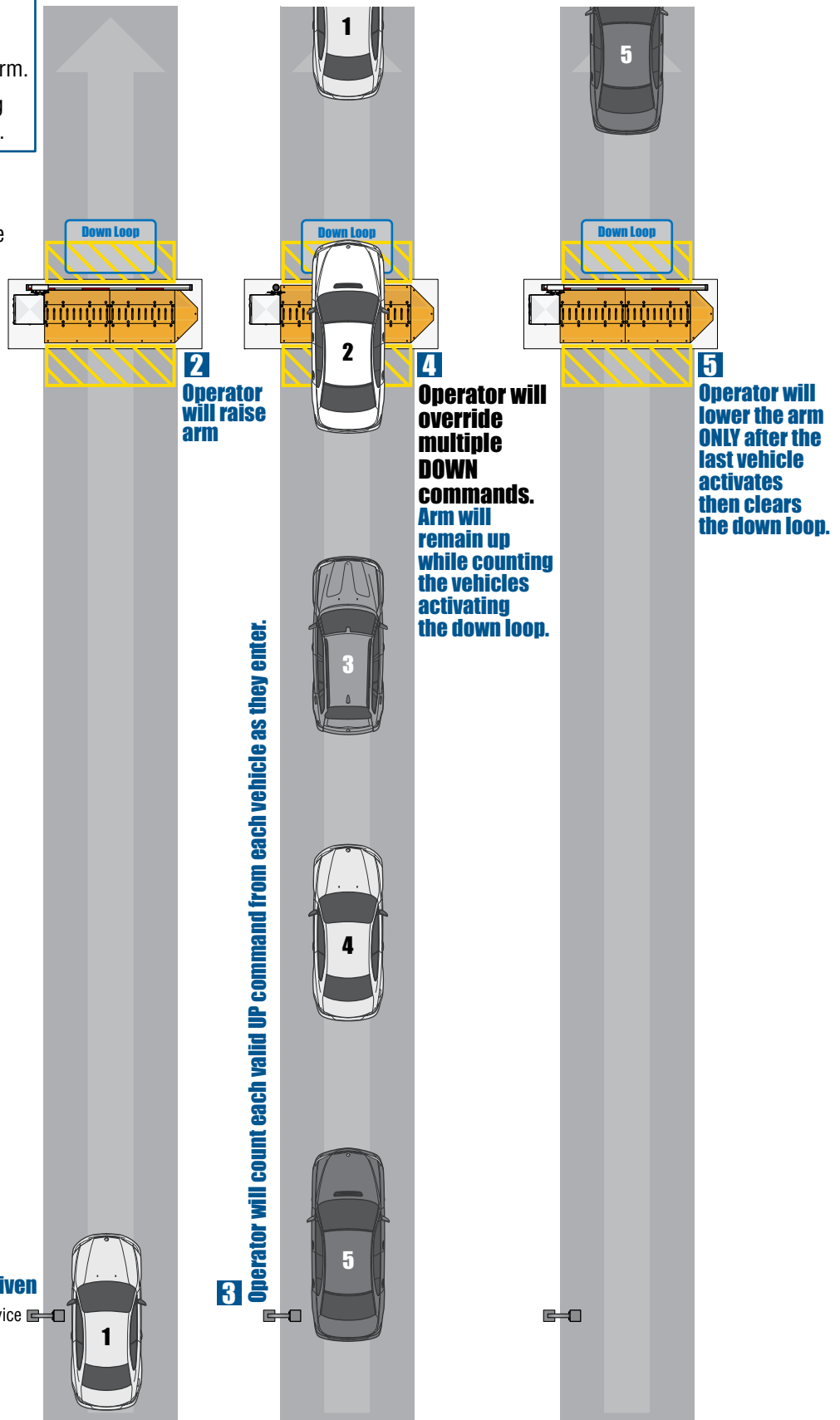
This option allows the access control device and the barrier gate operator to have multiple vehicles in the area between them. The operator will count all the valid UP commands received and require a down loop activation for each one. The arm will lower only after the last vehicle activates then clears the down loop.

Remote transmitters are **NOT** recommended for this option because **one vehicle's remote** can accidentally be pressed **multiple times** which will get counted by the operator as multiple vehicles.

Note:
If an UP command is given while the arm is lowering, the arm will raise.

1 Valid UP command given

Access Control Device



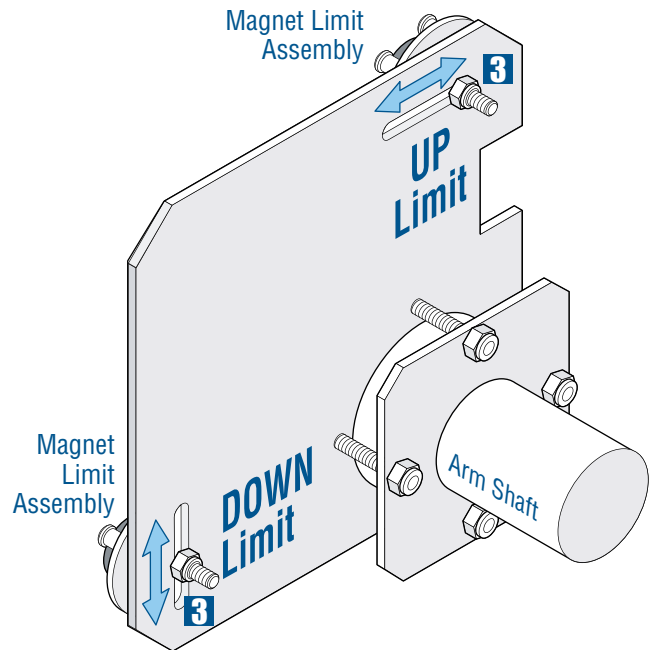
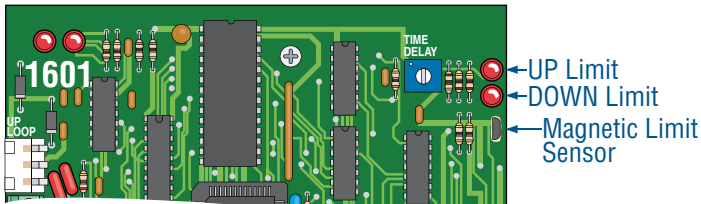
6.3 Magnetic Limit Adjustments

The operator has been preset at the factory to rotate 90°. **No adjustments are necessary when used in a normal 90° setup.**

If the arm needs to rotate less than 90°:

- 1** Turn operator power **OFF**.
- 2** Set the DIP-switch SW 1, switch 3 to **ON**.
This changes the rotation of the gearbox from 360° to 180° allowing the gearbox to rotate the arm less than 90°.

Note: The arm will **always** cycle to 90° open with the 360° gearbox setting.
- 3** Loosen magnet limit assembly nuts and slide the assemblies to the desired **UP** and **DOWN** positions. Tighten nuts when desired positions are achieved.



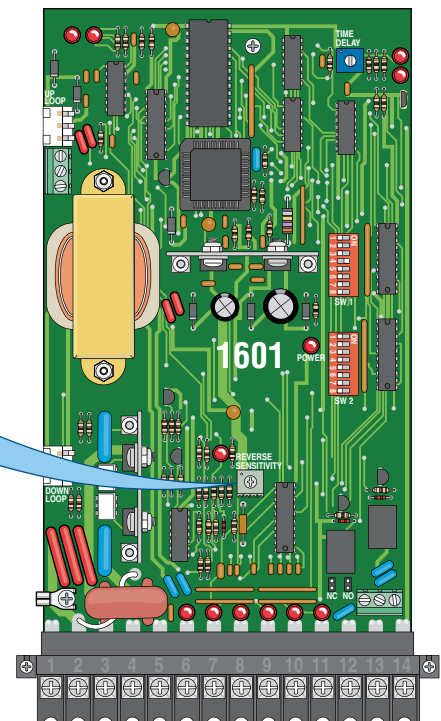
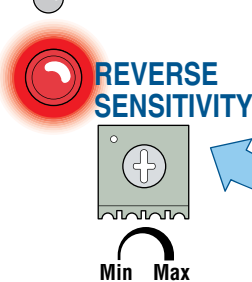
6.4 Reverse Sensor

Reverse sensitivity adjustment will cause the barrier arm to reverse direction of travel should an object be encountered during the down cycle. The amount of force required for the arm to reverse direction depends on the reverse sensitivity potentiometer.

CAUTION: Keep pedestrians and vehicles clear of the arm zone while adjusting sensor!

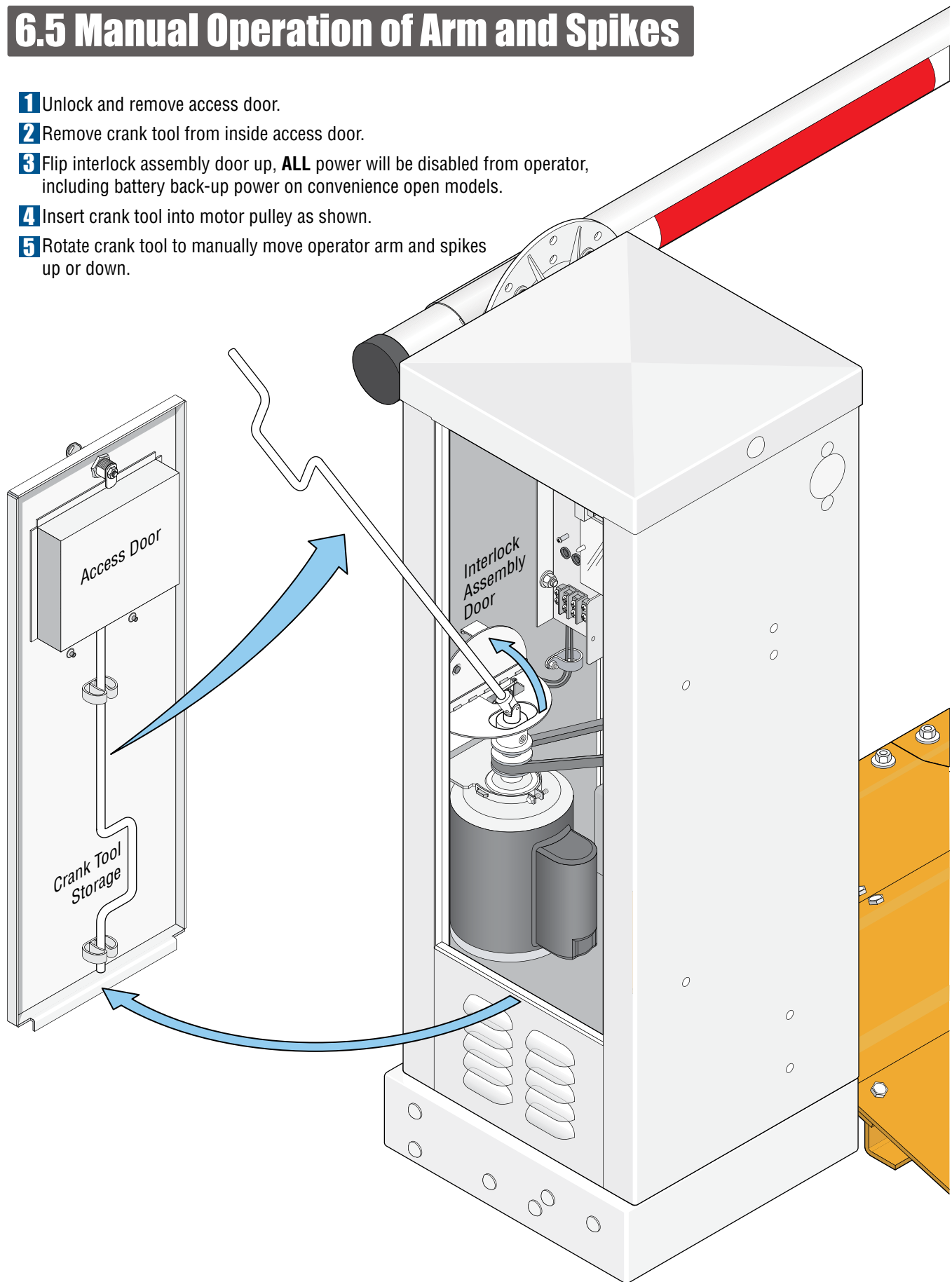
While operator has AC power:

- 1** Turn control switch to **UP**. Arm will rotate UP.
- 2** Turn control switch to **DOWN**. While arm is traveling down, rotate reverse sensor clockwise until the **reverse LED lights up** and the arm reverses direction. Rotate reverse sensor back counterclockwise approximately 1/8 turn.
- 3** Repeat the adjustment as needed to find a satisfactory setting.



6.5 Manual Operation of Arm and Spikes

- 1** Unlock and remove access door.
- 2** Remove crank tool from inside access door.
- 3** Flip interlock assembly door up, **ALL** power will be disabled from operator, including battery back-up power on convenience open models.
- 4** Insert crank tool into motor pulley as shown.
- 5** Rotate crank tool to manually move operator arm and spikes up or down.



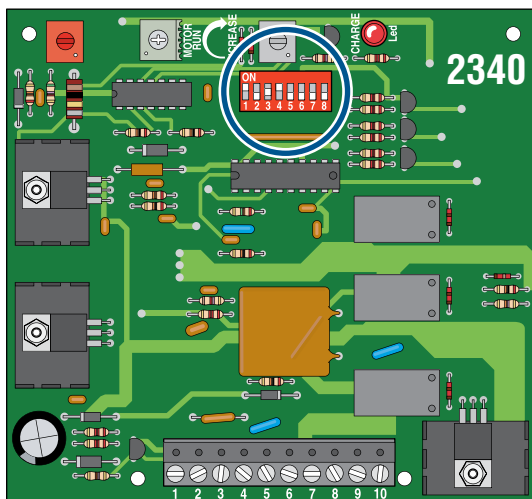
SECTION 7 - OPTIONAL CONVENIENCE OPEN SYSTEM

The optional convenience open system installed in your vehicular gate operator is designed as a convenience enhancement only. It is not designed or intended to provide continuous gate operation during a power outage. Its sole purpose is to provide a method to open the vehicular gate to allow unimpeded traffic flow when the gate and access control system is without power. If your access control system requires 100% power backup and continuous operation when primary (AC) power has failed, a power inverter / backup system, such as DoorKing's Model 1000 or 2000, is required.

- The convenience open system cannot provide continuous gate operation during a power outage.
- **This system cycles the arm to the open position one time only after AC power failure.**
- The convenience open system requires testing on a monthly basis to insure the batteries are fully charged and that the system is operational.
- The convenience open system uses two 12-volt, 3.0 amp-hour gel-cell batteries. These batteries should be replaced every two years on average, or sooner if required.
- Batteries are affected by temperature. Cold temperatures will reduce the effectiveness of the batteries. High temperatures will result in a shortened battery life.
- Batteries are not covered under warranty.

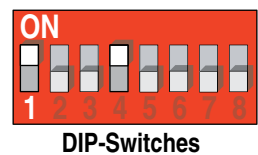
7.1 Operating Mode

This convenience open system consist of a control board (2340-010), motor and power supply (batteries) providing a completely redundant drive system to open the barrier arm should a power outage occur. This system is not designed to maintain continuous barrier operation; rather it provides a convenient method to open the arm **once** during adverse conditions. **If continuous barrier and access control system operation is required, refer to the DoorKing Model 1000 or 2000 Inverter / Backup Power System.**



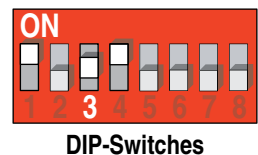
Automatic Open after loss of AC Power

Turn switch 1 **ON** and the system will automatically open the arm approximately 3 seconds after loss of AC power. Automatic mode is **always** used for barrier arms in general access applications such as gated communities, apartment complexes, etc. Switch 1 **OFF** is not used.



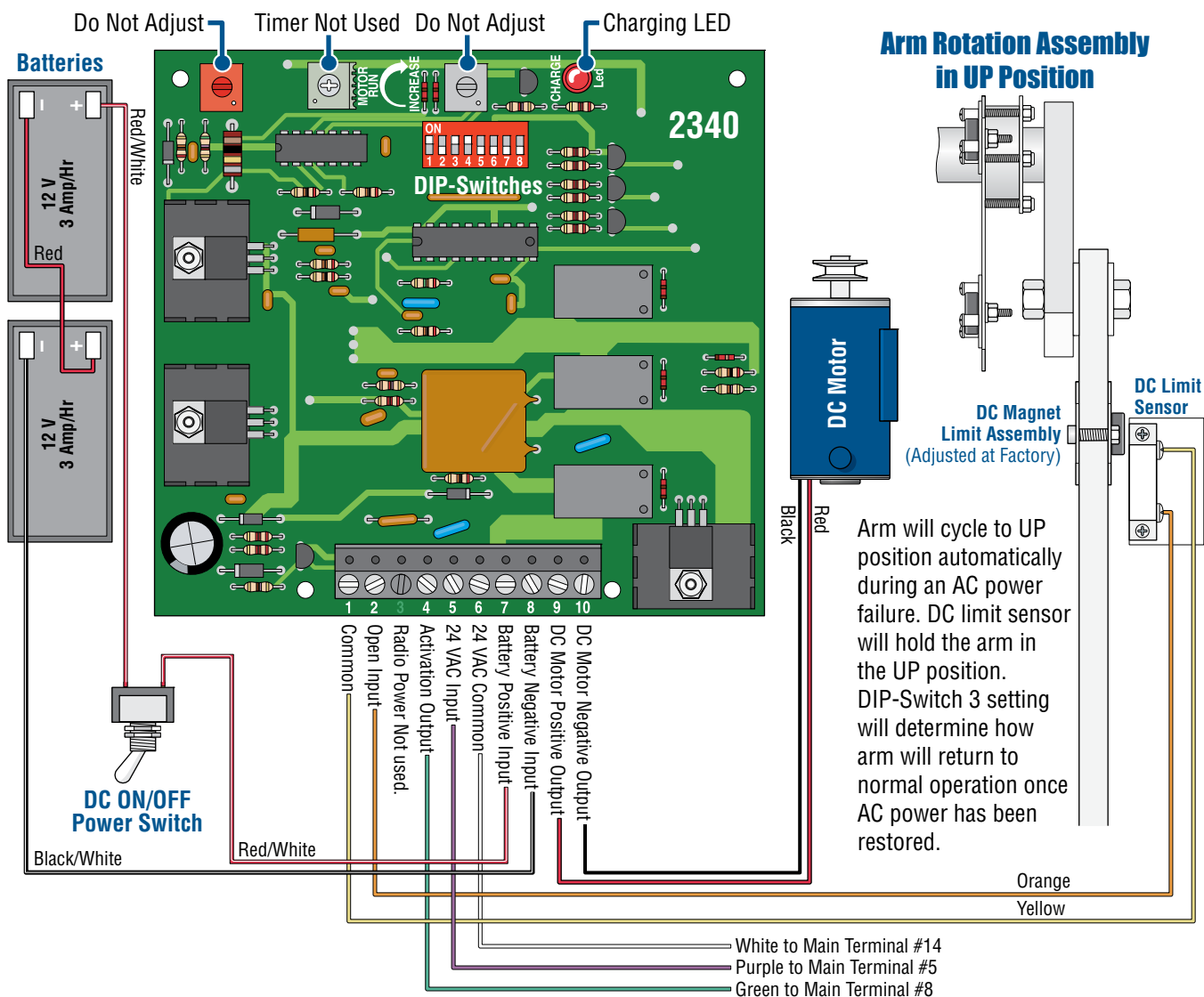
Restart Options once AC Power is restored

Once AC power is restored, the system's control board can be set to "**automatically re-key**" the operator (switch 3 **ON**) to establish normal operation, or can be set to require a "**manual input**" (switch 3 **OFF**) before the operator resumes normal operation.



Initial Power Up Convenience Open Note: The DC power is not present on the main circuit board until the first initial cycle.

7.2 DC System Description



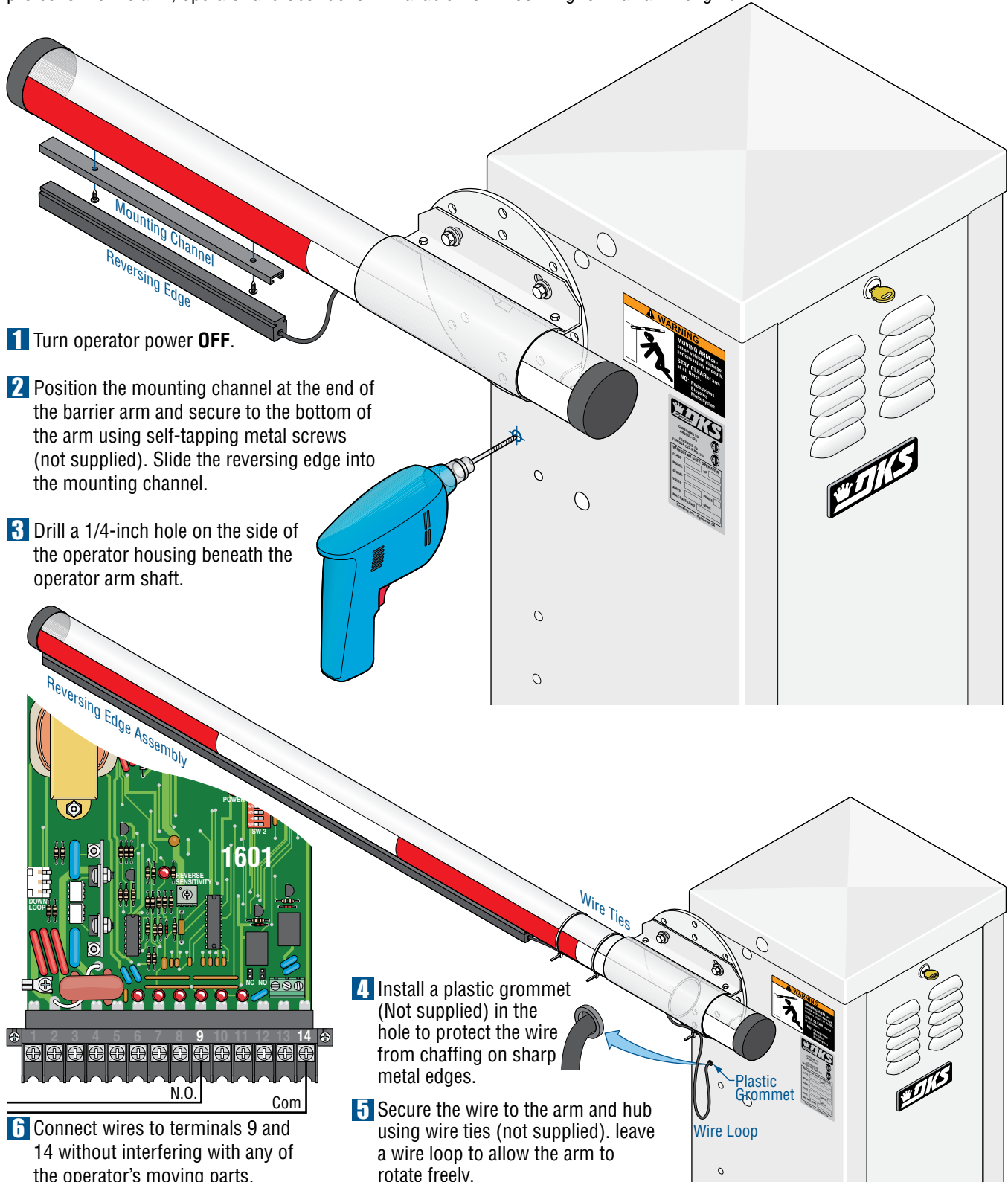
7.3 DIP-Switch Settings

Switch	Function	Setting	Description
1	Operation	OFF	Not Used
		ON	Arm will automatically open when a power outage occurs.
2	Changes Open Direction	OFF	Set so that the arm runs to the open (up) direction upon loss of AC power.
3	Automatic Power-up Activation	OFF	When AC power is restored, an input (push button, loop, radio receiver, etc.) is required to return the arm to normal operation.
		ON	When AC power is restored, a 1-second pulse is sent to the gate operator input to automatically restore normal operation.
4	Operator Type	ON	Must be in the ON position.
5	Not Used	OFF	
6	Not Used	OFF	
7	Not Used	OFF	
8	Not Used	OFF	

SECTION 8 - OPTIONAL ACCESSORIES INSTALLATION

8.1 Contact Sensor (Reversing Edge)

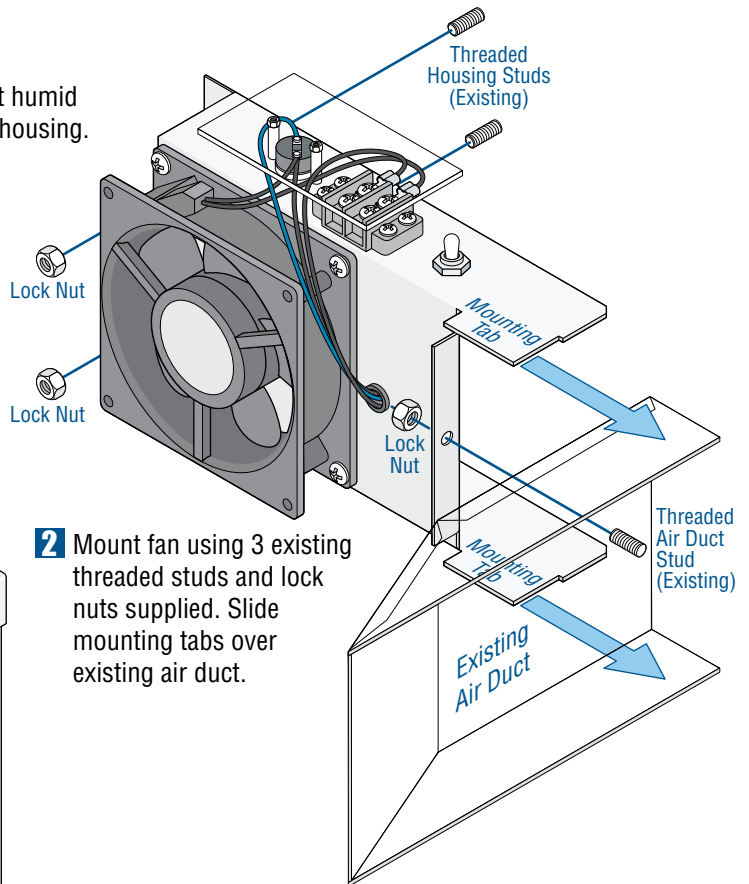
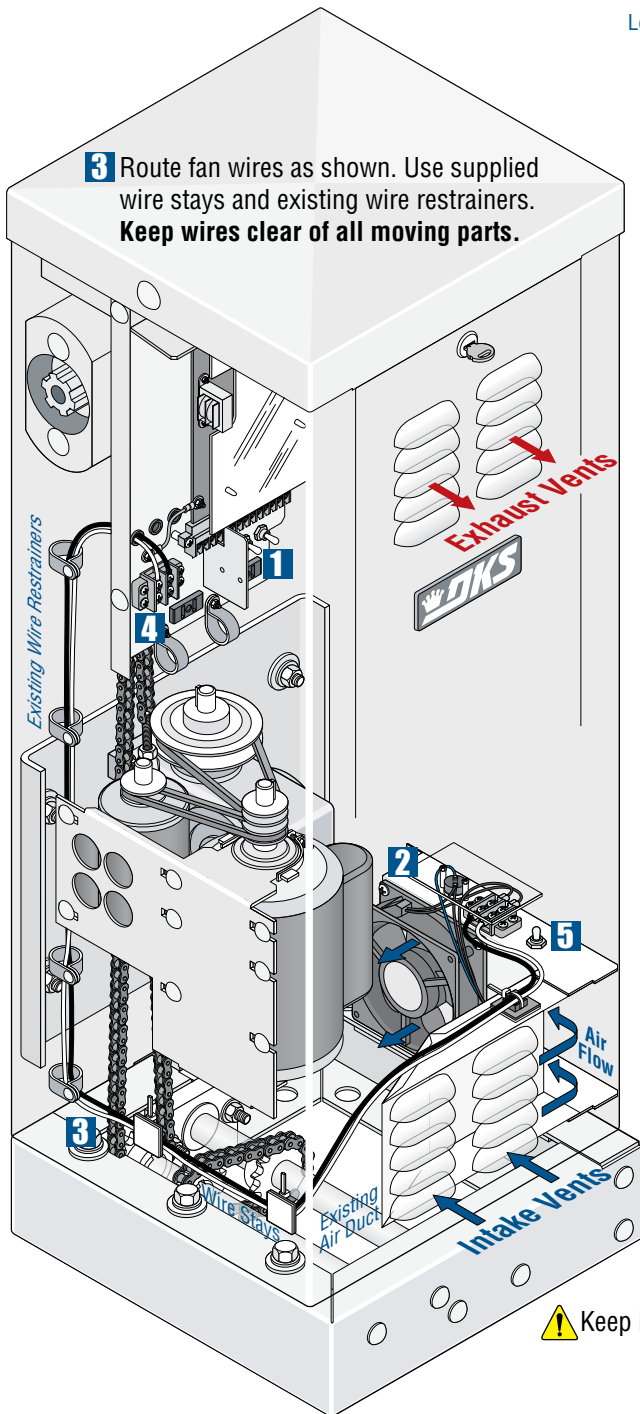
In addition to the electronic reversing device (ERD) an optional electric reversing edge may be installed offering additional protection to the arm, operator and obstruction. Available from DoorKing to fit all arm lengths.



8.2 Fan Kit

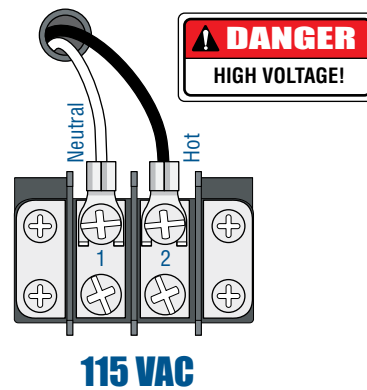
An optional fan kit (P/N 1601-093) is recommended in hot humid climates to prevent heat and moisture build-up inside the housing.

- 1 Shut off AC power to operator.
Turn off DC power switch on certain models.



- 2 Mount fan using 3 existing threaded studs and lock nuts supplied. Slide mounting tabs over existing air duct.

- 4 Connect the fan power wires.



- 5 Fan switch settings.



OFF - Turns the fan off.

ON - Turns the fan on continuously.

AUTO - **Normal setting.** Automatically turns the fan **ON** when the temperature rises above 90°F inside the housing, and turns the fan **OFF** when the temperature drops below 90°F.

⚠ Keep intake vents clear of debris.

8.3 Heater Kit

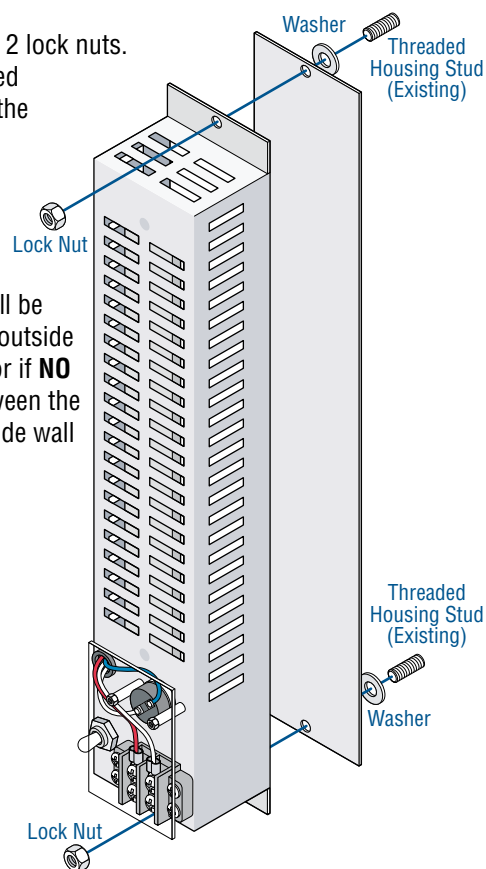
To avoid the gearbox oil from freezing an optional heater kit (115 VAC - P/N 1601-092) is recommended in areas where temperatures routinely drop below 40°F (4°C).

- 1 Shut off AC power to operator.
Turn off DC power switch on certain models.

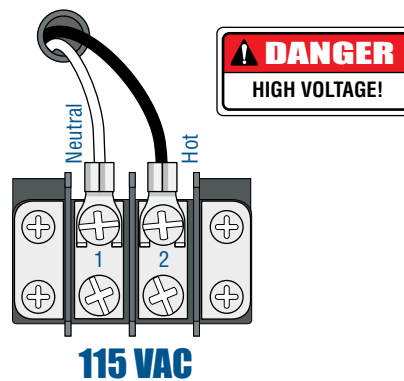
- 3 Route heater wires as shown. Use supplied wire stays and existing wire restrainers.
Keep wires clear of all moving parts.

- 2 Mount heater with 2 lock nuts.
Place the 2 supplied washers between the operator wall and the heater to create an air gap.

CAUTION: Heat will be transferred to the outside wall of the operator if **NO** air gap exists between the heater and the inside wall of the operator.



- 4 Connect the heater wires.



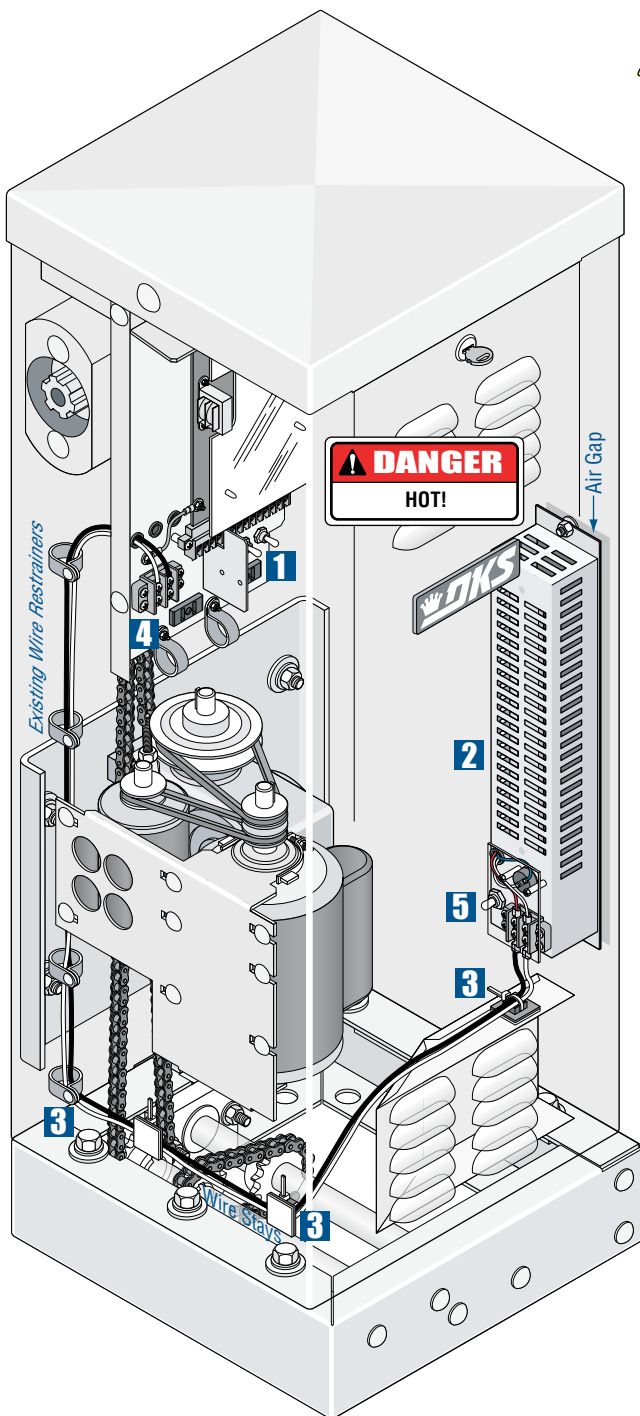
- 5 Heater switch settings.



AUTO - Normal setting. Automatically turns the heater **ON** when the temperature drops below 40°F inside the housing, and turns the heater **OFF** when the temperature rises above 40°F inside the housing.

OFF - Turns the heater off.

ON - Turns the heater on continuously. The heater will become **VERY HOT** when running continuously.



SECTION 9 - MAINTENANCE AND TROUBLESHOOTING

Inspection and service of this gate operator by a qualified technician should be performed anytime a malfunction is observed or suspected. High cycle usage may require more frequent service checks.

9.1 Maintenance

When servicing the gate operator, always check any secondary (external) reversing devices (loops, photo eyes, etc.) for proper operation. If external reversing devices cannot be made operable, do not place this operator in service until the malfunction can be identified and corrected.

Always check the inherent reversing system when performing any maintenance. If the inherent reversing system cannot be made operable, remove this operator from service until the cause of the malfunction is identified and corrected. Keeping this operator in service when the inherent reversing system is malfunctioning creates a hazard for persons which can result in serious injury or death should they become entrapped.

When servicing this gate operator, always turn power **OFF!!** If equipped with batteries, make sure battery power switch is **OFF**.

If gearbox requires oil, use only Mobil SHC-629 Synthetic Gear Oil. Do not completely fill gearbox with oil. Gearbox is full when oil completely covers inspection window.

Operator Component	Maintenance	Monthly Interval		
		3	6	12
Arm(s)	Check for alignment, tightness and wear.		✓	✓
Auto Spike System	Check for shaft alignment, tightness of hardware and wear of spikes. Make sure all tunnel plates and ramps are securely fastened to concrete.			✓
Drive Belt(s)	Check for alignment, tightness and wear.		✓	✓
ERD Reversing System	Check that the arm reverses on contact with an object in closing cycle. Adjust the reversing sensor if necessary.	✓		✓
Batteries (On select models)	If operator is equipped with optional convenience open system, check the batteries for any leakage or loose connections. Batteries should be replaced every two years.	✓		
Convenience Open System (Not on all models)	If operator is equipped with optional DC open system, check to be sure the system opens the arm upon loss of AC power. Operator should resume normal operation when AC power has been restored.	✓	✓	✓
Fire Dept.	Check emergency vehicle access device for proper operation.	✓		✓
Gearbox	Check oil level and fill if necessary. Do not overfill.			✓
Linkages	Check internal linkages for wear. Inspect bushing for wear.		✓	✓
Loop(s)	Check all external ground loops for proper operation.	✓		✓
Pulleys	Check set screw for tightness.		✓	✓
Secondary Reverse Device(s)	Check electric reversing edges and photo-cells for proper operation.	✓		✓
Complete System	Perform a complete system check. Include all reversing devices, loops, access system devices, Fire Dept. access devices, etc.			✓

9.2 Diagnostics Check

Have the following diagnostic tools available: VOM meter with minimum voltage memory or min-max range to check voltage and continuity. Meg-ohm meter capable of checking up to 500 megohms of resistance to properly check ground loop integrity.

A malfunction can be isolated to one of the following:

- Gate Operator
- Loop System
- Keying Devices.

Disconnect all external inputs to the circuit board terminal.

1. Use caution when checking high voltage areas: terminals 1 through 6, the motor capacitor and the motor.
2. Check the input indicator LED's. They should only come ON when a keying device (card reader, push button, etc.) is activated. If any of the input LED's are ON continuously, this will cause the gate operator to hold the arm up. Disconnect the keying devices one at a time until the LED goes OFF (see troubleshooting guide).
3. If the operator stops or holds open, check external secondary entrapment protection devices for any shorts or malfunction.
4. A malfunction in a loop or loop detector can cause the gate operator to hold the arm up, or not detect a vehicle when it is present over the loop. Pull the loop detector circuit boards from the loop ports on the operator circuit board. If the malfunction persists, the problem is not with the loop system. For more information refer to the loop detector instruction sheet and the DoorKing Loop and Loop Detector Information Manual.
5. Check that there are no shorted or open control wires from the keying devices to the gate operator. If a keying device fails to open the arm, momentarily jumper across terminals 6 and 14 on the control board terminal. If the gate operator starts, this indicates that a problem exist with the keying device and not with the gate operator.
6. Check the supply voltage and batteries. A voltage drop on the supply line (usually caused by using wires that are too small) will cause the operator to malfunction. Batteries should be fully charged for proper operation, replace batteries every two years on average.

9.3 Troubleshooting

Symptom	Possible Solution(s)
Operator will not run. Power LED is OFF.	<ul style="list-style-type: none">• Check that power to the operator is turned ON.• Check for 117 VAC with a voltmeter at control board terminals 1 and 2. If voltage measures 0, check power supply to operator or check terminal strip. If voltage measures OK, replace control board.

9.3 Troubleshooting Continued

Symptom	Possible Solution(s)
Operator will not run. Power LED is ON.	<ul style="list-style-type: none"> • Momentarily jumper terminal 6 to terminal 14. If input LED does not come ON, check terminal strip or replace control board. If LED does come on, go to the next step. • Momentarily jumper terminal 2 to terminal 3 (Caution – High Voltage). The motor should run. • Momentarily jumper terminal 2 to terminal 4 (Caution – High Voltage). The motor should run in opposite direction of above. • If motor does not run in either or both steps above, bad motor, motor capacitor or wiring to motor.
Arm rotates up, but will not rotate down.	<ul style="list-style-type: none"> • Check LEDs on terminals 6, 7 and 9. Any of these ON will hold the arm in the UP position. This indicates a shorted input. • Check the LEDs on the loop detectors. Any ON will hold the arm in the UP position. Possible loop or loop detector problem. • If auto timer is not used (SW1, switch 7 off), check to be sure SW1, switch 6 is in the ON position. This will cause terminal 6 to rotate the arm down when it is activated. • Check to be sure SW1, switch 4 is ON. This will cause terminal 8 activation, then deactivation to rotate arm down.
Down input / down loop will not rotate arm to down position.	<ul style="list-style-type: none"> • Check to be sure SW1, switch 4 is in the ON position. • Down input must be activated, and then deactivated to cause arm to rotate down.
Loop detector LED is on continuously.	<ul style="list-style-type: none"> • Activate the reset switch on the loop detector. • Decrease loop detector sensitivity. • Check loop wire for resistance to ground with meg-ohm meter. Should be 100 meg-ohms or higher. If less than 50 meg-ohms, replace loop wire. • Be sure loop lead-in wire is twisted at least 6 turns per foot. • Be sure all loop connections are soldered. • Replace loop detector.
Loop detector LED never activates.	<ul style="list-style-type: none"> • Increase loop detector sensitivity. • Check continuity of loop wire. Should be 0 ohms. If continuity check indicates anything other than 0 ohms, check all connections. Replace loop wire. • Move loop detector board to the other loop detector port on the control board, and then check loop operation. If loop detector still fails, replace loop board. • If loop detector operates OK in the other loop port, replace control board.
Battery back-up system will not raise arm upon power outage.	<ul style="list-style-type: none"> • Check that the back-up system toggle switch is in the ON position. • Check to be sure that the 2340-010 battery back-up control board switch settings are set as described in SECTION 7. • Check the batteries for proper voltage, replace if necessary. • Replace the 2340-010 Back-up control board.

9.4 Accessories Parts List

The following accessories are available for the 1603 barrier gate operator.

Loop Detector - Plug directly into ports on circuit board simplifying wiring.

P/N 9410-010 - Single channel detector.

P/N 9409-010 - Two channel detector.

Loop Wire - XLPE insulation is available in 500 and 1000 foot rolls, available in Black, Blue and Red insulation.

Loop Sealant - P/N 2600-771 Asphalt, P/N 2600-772 Concrete

Meg Ohm Meter - Checks the integrity of ground loops. P/N 9401-045

Reverse Edge - Installs on the bottom of the aluminum arm. P/N 8080-016 - 6 ft. Available from DoorKing to fit all arm lengths.

Photo Cell - Prevents arm from lowering on vehicles or pedestrians. P/N 8080-018

Time Clock - 7 and 365 day clocks, used to automatically open gate at pre-set time, fits inside operator.

P/N 2600-791 7 day clock

P/N 2600-795 365 day clock

Surge Devices - Helps prevent circuit board failure caused by lightning strikes and power surges.

P/N 1879-080 - High Voltage

P/N 1878-010 - Low Voltage

Replacement Battery - Convenience open system. P/N 1801-009 (2 required)

Speed Bump - Prefabricated 6-foot speed bump reduces traffic speed through gate system. P/N 1610-150

Heater Kit - Thermostatically controlled heater for cold weather areas. 115 VAC - P/N 1601-092

Fan Kit - Thermostatically controlled fan for hot humid environments. P/N 1601-093

Manual Gate Control Toggle - Allows user to manually operate gate arm. Fits inside single-gang electrical box. P/N 1200-017

Interconnection Cable - Interconnection cable contains all the necessary wires to interconnect primary / secondary operators.

Cable length: 30 ft. - P/N 2600-755 40 ft. - P/N 2600-756 50 ft. - P/N 2600-757

High Voltage Kit - Alter the input AC voltage on a 115 VAC 1603 to 208, 230, 460 or 575 VAC. P/N 2600-266

Gate Tracker™ - Optional control board allows the barrier gate operator to report activity to a companion 1833, 1835, 1837 or 1838 access control system.

Auto Spike System Parts

2 Ft Extension Section - 2 Ft extension shaft, tunnel plate and ramps. P/N 1603-192

3 Ft Extension Section - 3 Ft extension shaft, tunnel plate and ramps. P/N 1603-193

3 Ft Spike Section - 3 Ft spike shaft, tunnel plate and ramps. P/N 1603-073

End Cap - P/N 1603-118

Connector Shaft - P/N 1603-069

Aluminum Arm Only - 14-foot replacement aluminum arm. P/N 1601-571

Aluminum Folding Arm Kit - Low headroom applications (Arm included). P/N 1601-610

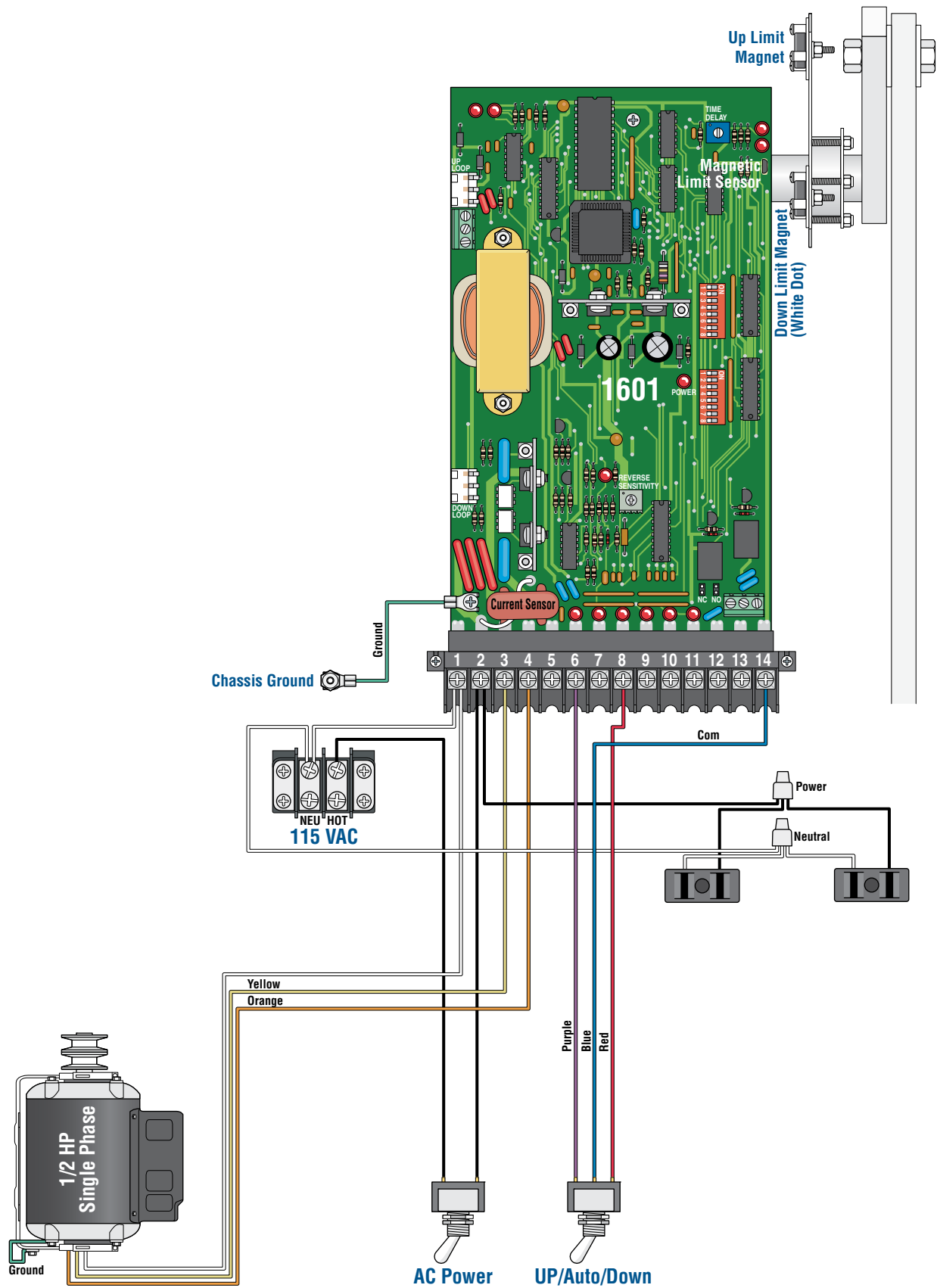
Aluminum Arm Mounting Kit - Aluminum mounting bracket, hub and mounting hardware. P/N 1601-242

Arm Padding - Foam padding for the aluminum or wood arm. P/N 1601-211

Lighted Auto Spike Warning Sign - Backlit spike warning sign with adjustable light for spike illumination. P/N 1615-081

Traffic Light (Red, Green) - Manage the traffic flow with red-green lights. Bolts onto the 1603 operator. P/N 1603-210

1/2 HP 115 VAC



1/2 HP 115 VAC / Convenience Open

