SPIKE™ SYSTEMS

DIRECTIONAL TRAFFIC CONTROLLERS

DAB---

100/120/140/160/180

/200 SYSTEM MANUAL

Automated Motorized Drop Arm Barrier

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This manual describes the operational requirements of the
DAB Drop Arm Barrier
as it is normally configured on site.

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1.1 WARNINGS AND NOTICES

The Spike Systems Drop Bar Barriers (DAB) are designed to regulate the flow of traffic through a secure control point. The DAB is also designed and manufactured to ensure personnel safety when the equipment is operated properly and all safety precautions are strictly followed.

Persons responsible for the operation and field maintenance of the system should read this manual carefully before attempting to operate the equipment or perform any service or adjustment procedures.

The Warnings, Cautions, and Notes in this manual represent the following information:

- A WARNING is an operation, procedure or condition that can cause injury or death.
- A CAUTION is an operation, procedure or condition that can cause damage to the equipment.
- A NOTE provides helpful information.

The warnings and cautions that follow apply to all parts of this manual.

WARNING:	**POTENTIALLY LIFE-THREATENING HAZARDS MAY EXIST DURING EQUIPMENT OPERATION. ONLY QUALIFIED PERSONNEL SHOULD ATTEMPT TO OPERATE, SERVICE OR MAKE ADJUSTMENTS TO THE HYDRAULIC TRAFFIC CONTROL SYSTEM EQUIPMENT.**
WARNING:	**FOLLOW THE PRECAUTIONARY INSTRUCTIONS EXACTLY. DO NOT TAKE SHORTCUTS. DO NOT ASSUME THAT SOMEONE ELSE HAS ACTED ON YOUR BEHALF. IF ANY RULE OR PRECAUTION IS NOT CLEAR TO YOU, SEE YOUR SUPERVISOR BEFORE USING THE MACHINE.**
WARNING:	**THIS UNIT CONTAINS A THERMALLY FUSED ELECTRIC MOTOR. IF THE MOTOR STOPS, DO NOT ASSUME POWER IS NOT PRESENT. UNEXPECTED MOTOR START-UP IS POSSIBLE AFTER THE PROTECTOR TRIPS. DISCONNECT POWER FROM CIRCUIT BEFORE PERFORMING ANY SERVICE TO THE MOTOR. WHEN POWER IS RECONNECTED, RESET PROTECTOR BEFORE ACTIVATING SYSTEM.**
WARNING:	**TO AVOID PERSONAL INJURY, BE AWARE THAT VOLTAGES ARE PRESENT IN THE HYDRAULIC TRAFFIC CONTROL SYSTEM. VOLTAGES AS LOW AS 28 VOLTS CAN CAUSE SERIOUS INJURY UNDER SOME CONDITIONS. DO NOT BE MISLED BY THE TERM LOW VOLTAGE.**

NOTE: Spike Systems assumes no liability for accident or injury incurred through improper installation, operation, maintenance and use of this equipment.

1.2 Product Model Numbers

The DAB-100/120/140/160 and 200 are available with clear widths of 10, 12, 14, 16 and 20 feet, respectively, as shown in the table below.

Model Number Guide	Spike DAB System	Orientation	Options	Clear Width
	DAB-100	RH or LH	N/A	10’
	DAB-120	RH or LH	N/A	12’
	DAB-140	RH or LH	N/A	14’
	DAB-160	RH or LH	N/A	16’
	DAB-180	RH or LH	N/A	18’
	DAB-200	RH or LH	N/A	20’

RH	Right Hand (placement of Control Cabinet as you drive toward the DAB system.)
LH	Left Hand (placement of Control Cabinet as you drive toward the DAB system.)

1.3 Product Family Description and Specifications

The DAB family is an automated drop arm barrier gate that is surface mounted. The product line is designed primarily to prevent against unauthorized vehicles from either entering or exiting a secured control point. Using motorized and solid state components, and with it’s customizable control logic, it can easily be adapted to variety of uses, for example, revenue control, rental car agency, security checkpoints, and others.

Operating Time:	Cycle to lower barrier 3 seconds
	Cycle to raise barrier 3 seconds
Drive Configuration:	Automated arm control power unit
Power Requirements:	1-1/2 HP, 110V Single-phase 18A. The unit can be built to meet any local power requirement as to voltage, frequency and phase
Finish:	Powder Coat: Red or Yellow standard.
Control Circuit:	The system is completely pre-wired requiring only the connection of the power feed and the control circuits. The circuits and power connections are terminated at the wire connector strips in the electrical control box located in the locked Control Cabinet. The controls are pre-wired to accommodate a wide range of control options including: remote open and close from multiple locations; radio open and close; open by card reader, guard shack, key switch or vehicle detector
Options:	Radio Receiver-Remote Radio Control, High Security Card Readers, Key Lock Switch, Directional Indication System

1.4 Right or Left Side Configuration

All DAB system configurations are shipped from the factory as either a right or left hand control, depending on the specific installation requirements. For the purposes of this manual, all drawings depict a left hand control. However, all installation steps are the same regardless of orientation of the Barrier Arm and control.

Spike DAB systems ships to the installation location with all possible assembly and installation steps pre-performed by the factory. Each system is specifically configured to match and address each sales order prior to shipment to the installation location.

The client is responsible for running necessary power to the installation location(s) with separate conduit for low voltage controls. These controls often connect between the Control Cabinet and a guard shack, but optionally can also attach to card readers and other optional system inputs. Prior to commencing any installation steps, the installer should ensure that all power and data connections have been properly installed, connected and configured.

1.5 Spike Systems Arm Barrier Gate (DAB) Product Family Overview

1.5.1 DAB-200 As Installed and Dimensions for Installation Planning

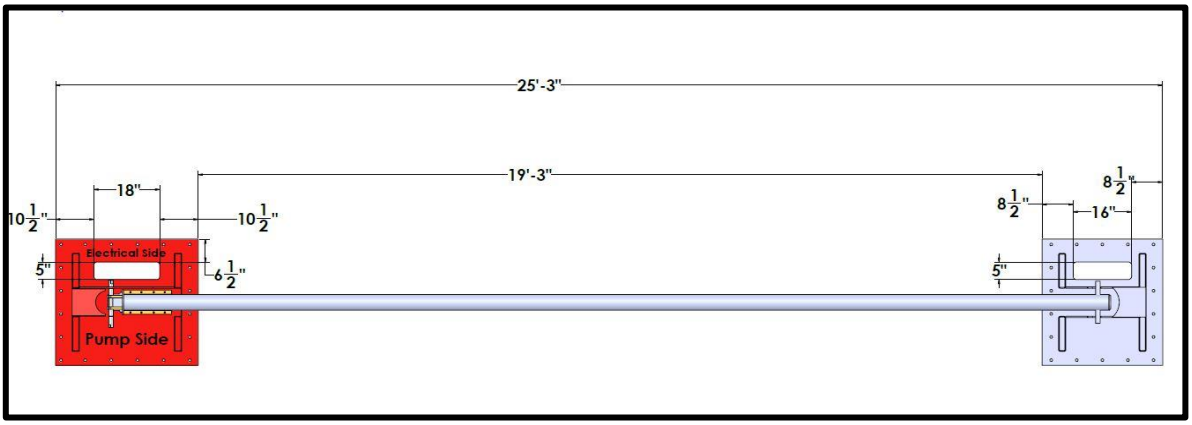

Figure 1 DAB-200 As Installed and Dimensions for Installation Planning

DAB-100	Clear Width	System Width	Left Plate Width	RT Plate width	Plate Depth
	10’	15’ 3”	39”	33’	36”
DAB-120	Clear Width	System Width	Left Plate Width	RT Plate width	Plate Depth
	12’	17’ 3”	39”	33’	36”
DAB-140	Clear Width	System Width	Left Plate Width	RT Plate width	Plate Depth
	14’	19’ 3”	39”	33”	36”
DAB-160	Clear Width	System Width	Left Plate Width	RT Plate width	Plate Depth
	16’	21’ 3”	39”	33”	36”
DAB-180	Clear Width	System Width	Left Plate Width	RT Plate width	Plate Depth
	18’	23’ 3”	39”	33”	36”
DAB-200	Clear Width	System Width	Left Plate Width	RT Plate width	Plate Depth
	20’	25’ 3”	39”	33”	36”

1.5.1 DAB System Family Parts Identification and Shipping Contents

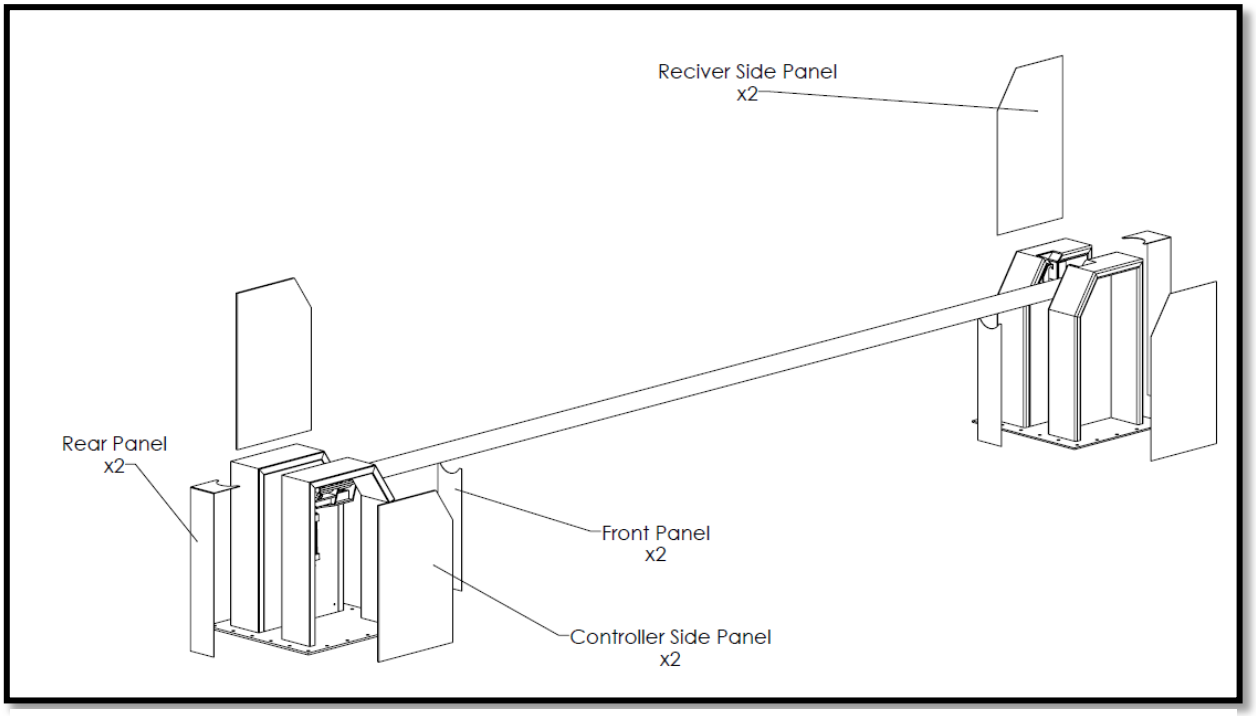

Figure 2 DAB Product Family Major Component Identification

Shipped Components Not Pictured

- Standard and optional safety signs
- Pre---turned wires for Inductive Control Loops and electronic unit to be installed on TB---1 within Control Cabinet
- Traffic Control lighting and associated installation equipment

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Section 2 – Physical Installation

2.2 Installation Preparation: System Unpacking

All DAB systems are shipped to the installation site on custom designed pallets. An example is shown below. **NOTE** – Use a forklift or a sufficient number of laborers to lift the shipped pallets, the Control Cabinet (shown on the left), and the Non-Control Cabinet (shown on the right), the Arm Barrier Gate assembly (not pictured). The use of safety gloves is advised whenever lifting or handling DAB cabinets and components. Unbolt the Control and Non-Control Cabinets from the custom pallet using a 1/2“ wrench or ratcheting socket.

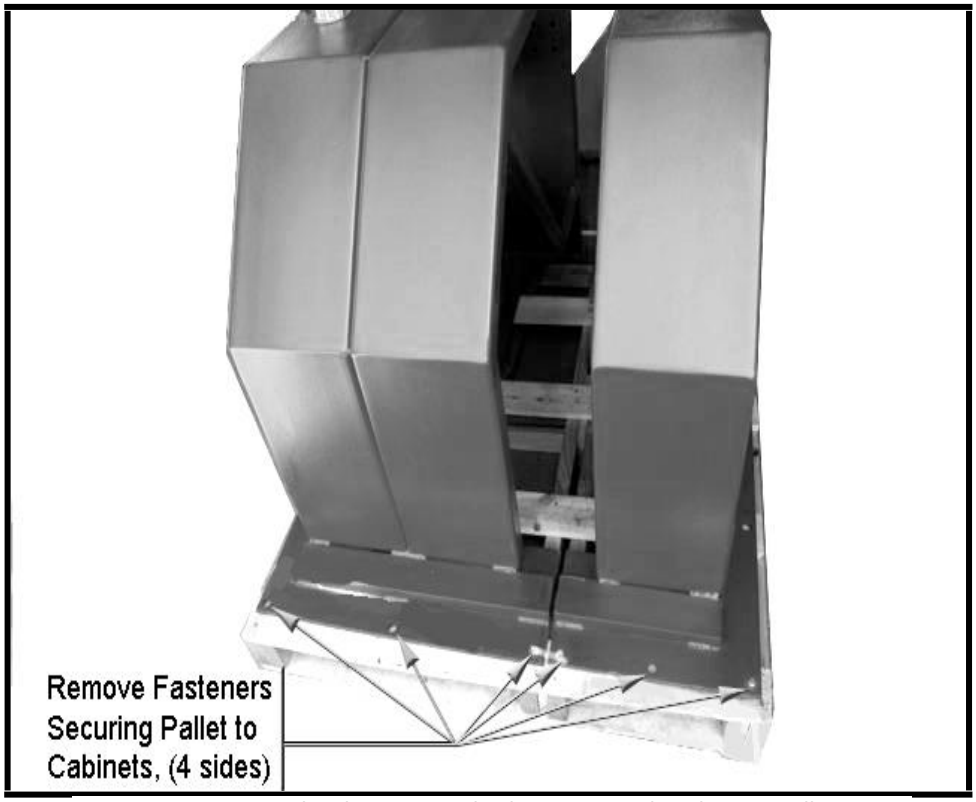


Figure 3 Control and Non-Control Cabinets Secured to Shipping Pallet

Tool Required	Tool Type	Tool Specification
	½” Wrench/Socket	To remove hardware securing system cabinets to pallets
	Safety Gloves	

2.3 Drop Arm Barrier Component Weights

Component(s) Weights	Component(s)	Weight (pounds)
	Cabinets	
	Pallet with Control and Non-Control Cabinet	860
	Control Cabinet	495
	Non-Control Cabinet	330
	Arm	
	DAB-100 Arm	42
	DAB-120 Arm	50
	DAB-140 Arm	59
	DAB-160 Arm	67
	DAB-180 Arm	76
	DAB-200 Arm	84

All weights are *approximate* and may vary or change without notification.

Prior to any installation process, ensure that the area where the Spike System is to be installed is free of any debris to ensure that all components rest squarely on the ground.

Tool Required	Tool Type	Tool Specification
	Broom and dust pan; air compressor and or vacuum cleaner	As available to clean surface where system is to be installed

2.4 Drop Arm Barrier (DAB) System Installation

For ease of installation, it is recommended that the inner panels be removed from the Control and Non-Control Cabinet assemblies. The illustration below shows both inner panels exploded from the assembly view of a DAB.

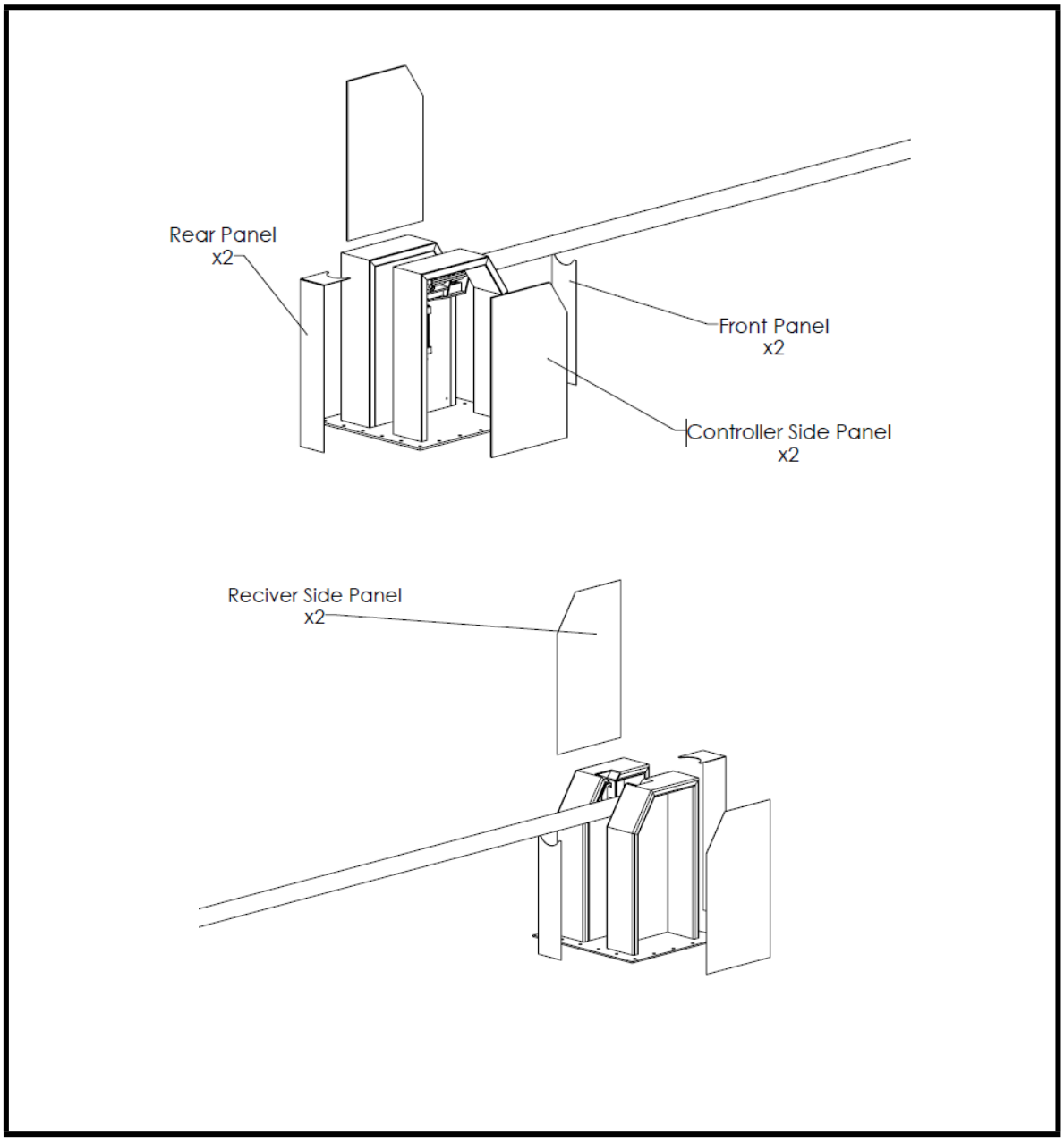


Figure 4 Inner Panel Removal from Control and Non-Control Cabinets

Tool Required	Tool Type	Tool Specification
	Wrench/Socket	7/16”

2.5 Pre-Installation: Ensure Power and Data Conduits are in Place

Verify that the client-supplied power conduit and any low voltage data connections, for example to a guard shack for a control switch, are properly installed beneath where the Control Cabinet will be secured.

Any other options to be installed, for example cabling for an electronic card reader, should have the conduit run to the Control Cabinet prior to positioning the Control Cabinet in place. Once the Control Cabinet has been anchored to the ground, it is very difficult to route any cabling into the unit. (Drilling into the side of the unit is not recommended.) For this reason it is imperative to ensure that all power and control data wiring be properly installed prior to installation. Cabling for control data must always be run in a separate conduit from AC power.

2.6 Pre-Installation Considerations: Inductive Loop Vehicle Detector

If the installation is to include an Inductive Control Loop Detector, the rectangular loop should be cut and prepared prior to the system installation process.

IMPORTANT NOTE — the cut that leads from the loop to the area under the Control Cabinet must be cut and extended under the base of the cabinet prior to any other installation steps.

Tool Required	Tool Type	Tool Specification
	Concrete Saw	3/16" Blade depth set to 2", unless otherwise specified
	Inductive Loop Vehicle Detector or Saw Cut Control Module (option)	As supplied by factory
	Broom, vacuum or air compressor	To clean debris after saw cut is performed
	Pizza wheel, putty knife or screwdriver	To place wires into cut groves evenly
	Sealant for Inductive Loop Vehicle Detector or saw cut loop	Self-leveling concrete (Sikaflex SL or similar)

2.7 Saw Cut Inductive Loop Vehicle Detector as Preparation for Installation

If the installation is to include an Inductive Loop Vehicle Detector (saw cut control loop), follow the instructions precisely as defined by the option's manufacturer.

To prepare the installation for a saw cut loop, first place Control Cabinet in desired location for temporary positioning only.

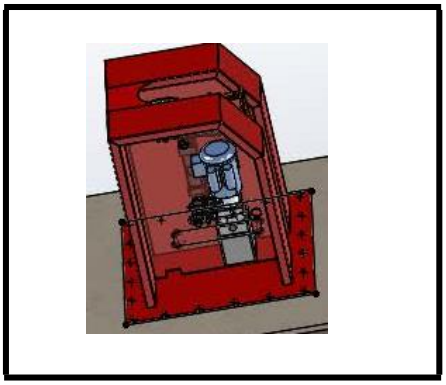


Figure 5 Temporary Placement of Control Cabinet to Mark Location of Saw Cut beneath the Control Cabinet

Mark the path for saw cut underneath where cabinet will be installed. The location of where the Inductive Loop Vehicle Detector wires should be routed out of the saw cut loop will be near where power and other data conduit will be located under the Control Cabinet

Once the path for the saw cut control wires has been established, remove the cabinet from its temporary installation position to gain access to the ground beneath.

Saw cut the path under where Control Cabinet will be located.

The hidden line figure below shows the extension of the cut to the proper approximate location beneath the Control Cabinet.

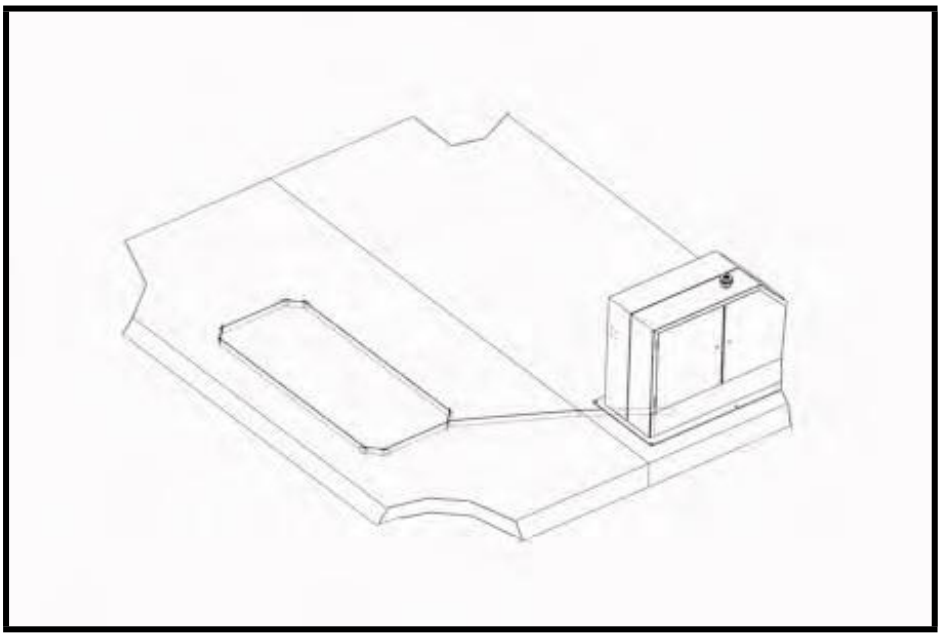


Figure 6 Inductive Loop Vehicle Detector (Saw Cut Loop) Beneath Cabinet

Refer to Appendix B for further information on the Optional Inductive Vehicle Detector installation.

Note — Ensure there is enough spare loop wire by leaving at least 12 inches of slack (beyond what is required to reach the control panel termination point) as a service loop.

2.8 Cabinet Placement and Preparation

2.8.1 Main Control Cabinet

Place the Control Cabinet over the electrical conduit. Conduit should come up through the slotted base plate hole. Align the control cabinet in the final location. Do not anchor the control cabinet to the concrete. This will be done later

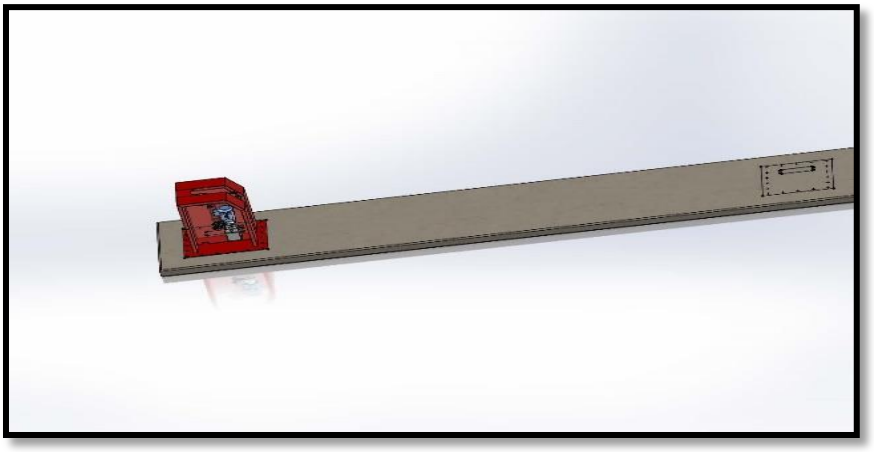


Figure 7 Locate Control Cabinet over Electrical Conduit

2.8.2 Position the Non-Control Cabinet

Install the non-control cabinet over opposite end of electrical conduit using spacing provided in figure 8. Do not anchor to the concrete. This will be done later

Tool Required	Tool Type	Tool Specification
	Forklift for unit placement	Forklift is required

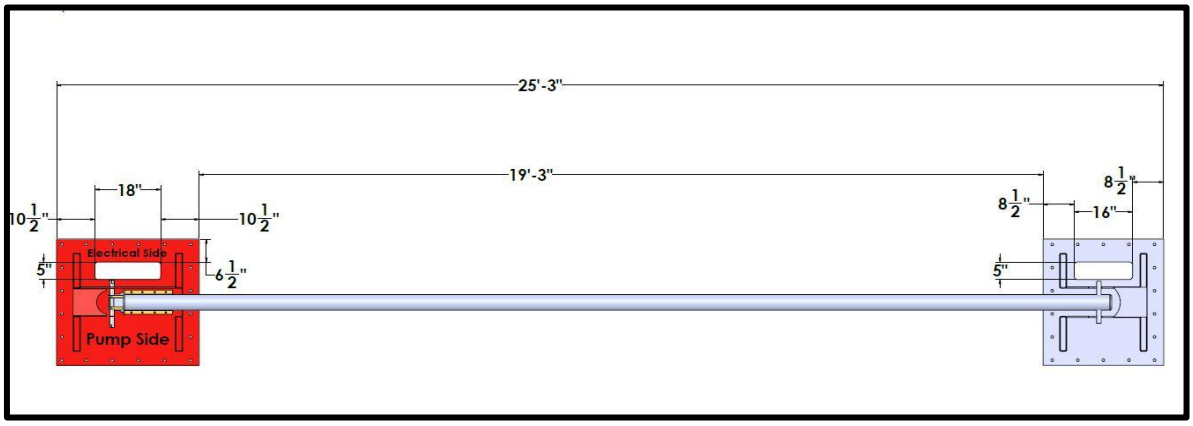


Figure 8 Locate Non-Control Cabinet near the Plate and Hinge for Installation

DAB-100	Clear Width	System Width	Left Plate Width	RT Plate width	Plate Depth
	10’	15’ 3”	39”	33’	36”
DAB-120	Clear Width	System Width	Left Plate Width	RT Plate width	Plate Depth
	12’	17’ 3”	39”	33’	36”
DAB-140	Clear Width	System Width	Left Plate Width	RT Plate width	Plate Depth
	14’	19’ 3”	39”	33”	36”
DAB-160	Clear Width	System Width	Left Plate Width	RT Plate width	Plate Depth
	16’	21’ 3”	39”	33”	36”
DAB-180	Clear Width	System Width	Left Plate Width	RT Plate width	Plate Depth
	18’	23’ 3”	39”	33”	36”
DAB-200	Clear Width	System Width	Left Plate Width	RT Plate width	Plate Depth
	20’	25’ 3”	39”	33”	36”

2.8.3 Install Main Gate Arm

Install the main gate arm into the control side clamp. See figure 9

Tool Required	Tool Type	Tool Specification
	Allen Wrench	3/8” bolts
	Allen Wrench	½” bolts

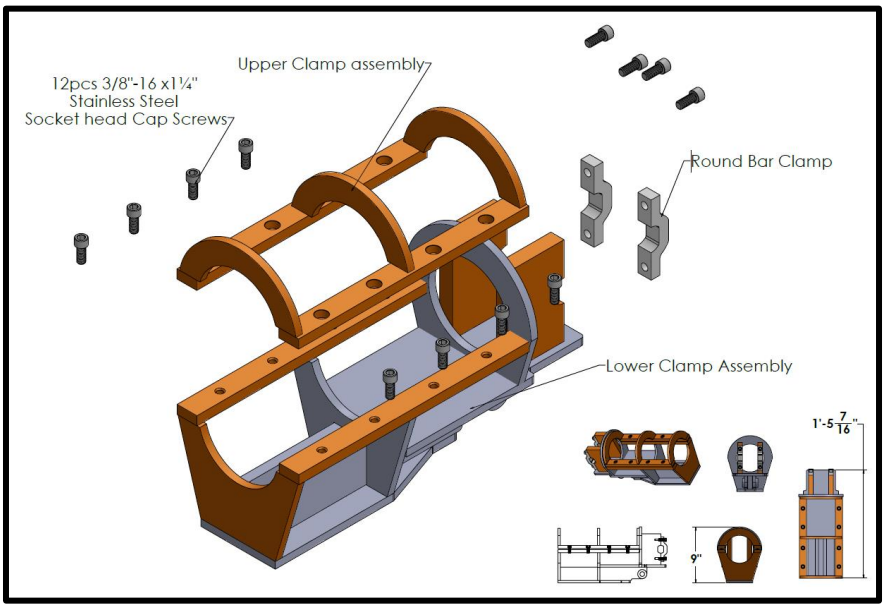


Figure 9 Control Side Arm Clamp

1. Slip ¾” cable through 4” aluminum gate arm all the way to the other end. See figure 10

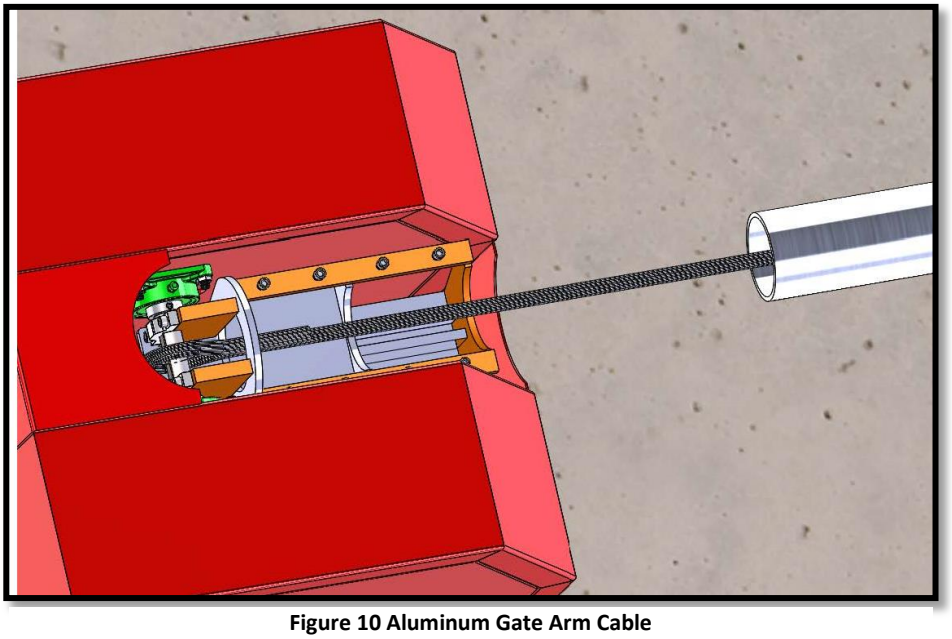


Figure 10 Aluminum Gate Arm Cable

2. Slide aluminum tube in to the arm clamp until the aluminum tube bottoms out in the back of the clamp.
3. Install upper bar clamp using 8 3/8" socket head cap screws. Do not tighten the socket head cap screws. This will be done at a later date. See figure 11.

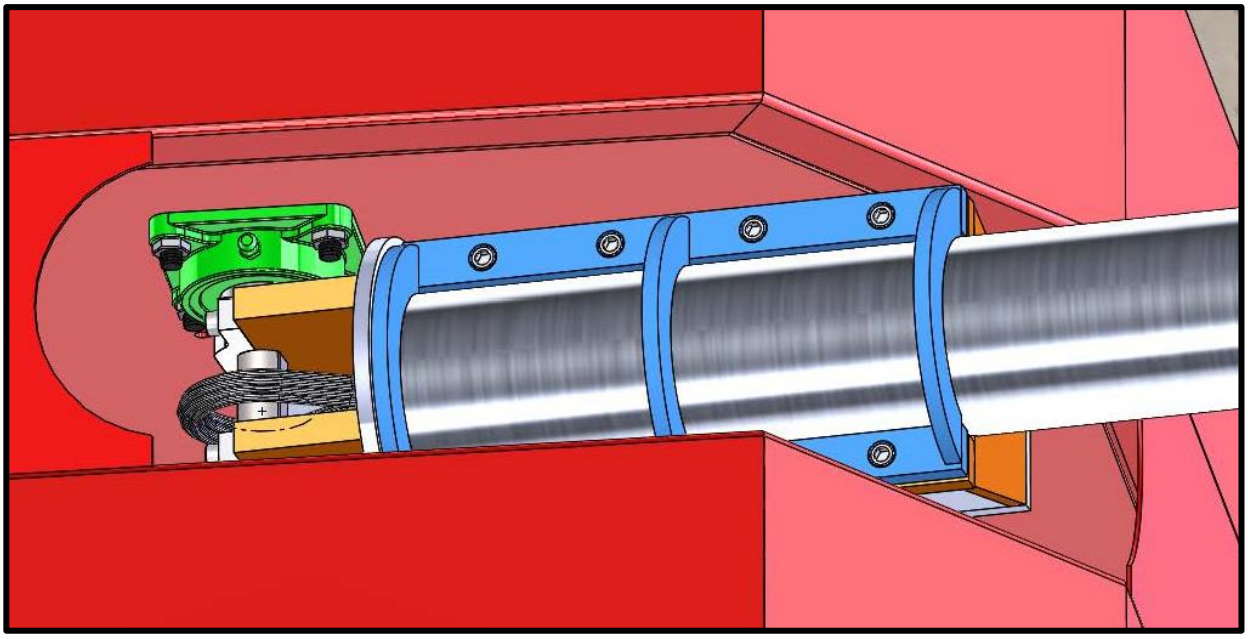


Figure 11 Upper Arm Clam

4. Install 1 ¼" bar on opposite end of aluminum bar. 1 ¼" bar should go through the loop on the cable inside the aluminum tube. See Figure 12

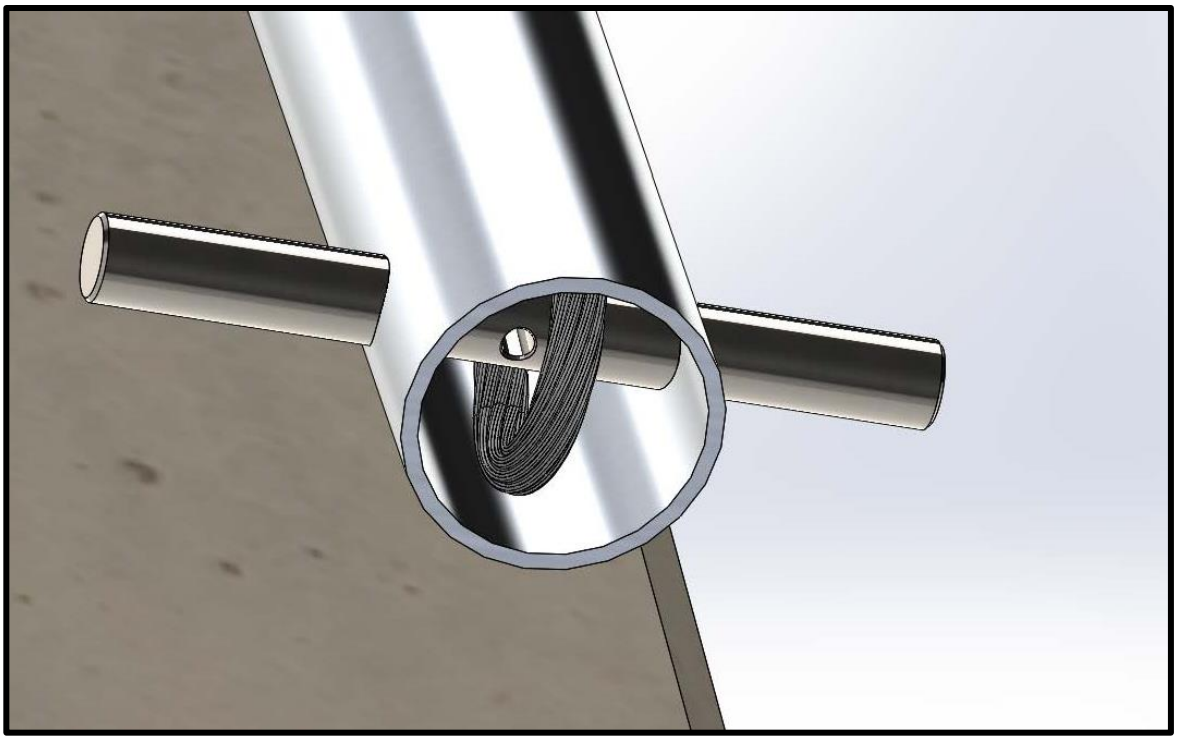


Figure 12 1 ¼" Bar Receiver end of Arm

5. Rotate aluminum tube so that the 1 ¼" bar is parallel to the ground
6. Rotate 1 ¼" bar so that threaded hole in center of bar is centered in the aluminum tube see figure 14
7. Install aluminum end cap on aluminum tube using ½" x 20 x 4" bolt supplied and torque down to 27ft lbs. See figure 13.
8. Tighten the 8 3/8" socket head cap screws installed during step 3 and torque down to 11ft lbs.

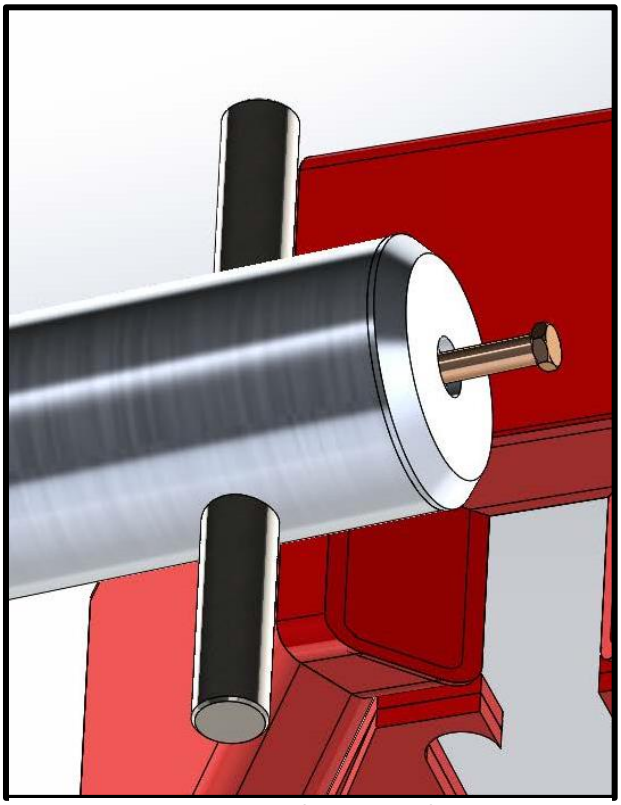


Figure 13 Arm Aluminum End Cap

9. Make sure gate arm control and non-control cabinets are aligned to that the aluminum arm sits centered in the non-control cabinet with the end of the arm location on the receiver. See figures 14 and 15.

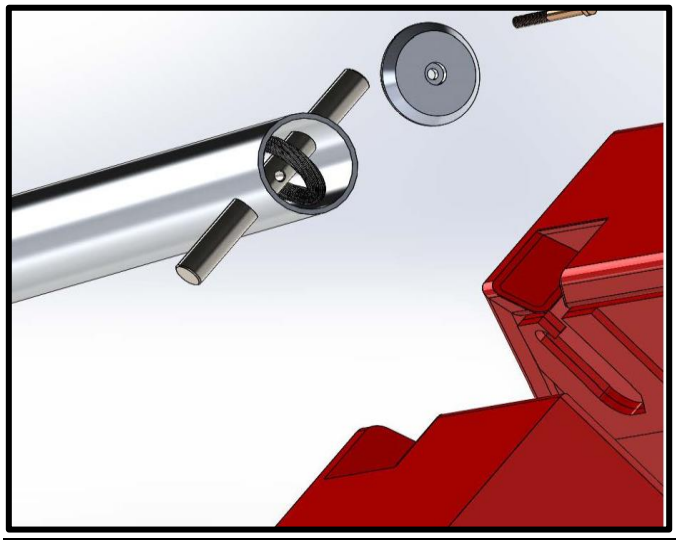


Figure 14 Aluminum Arm Alignment above Receiver

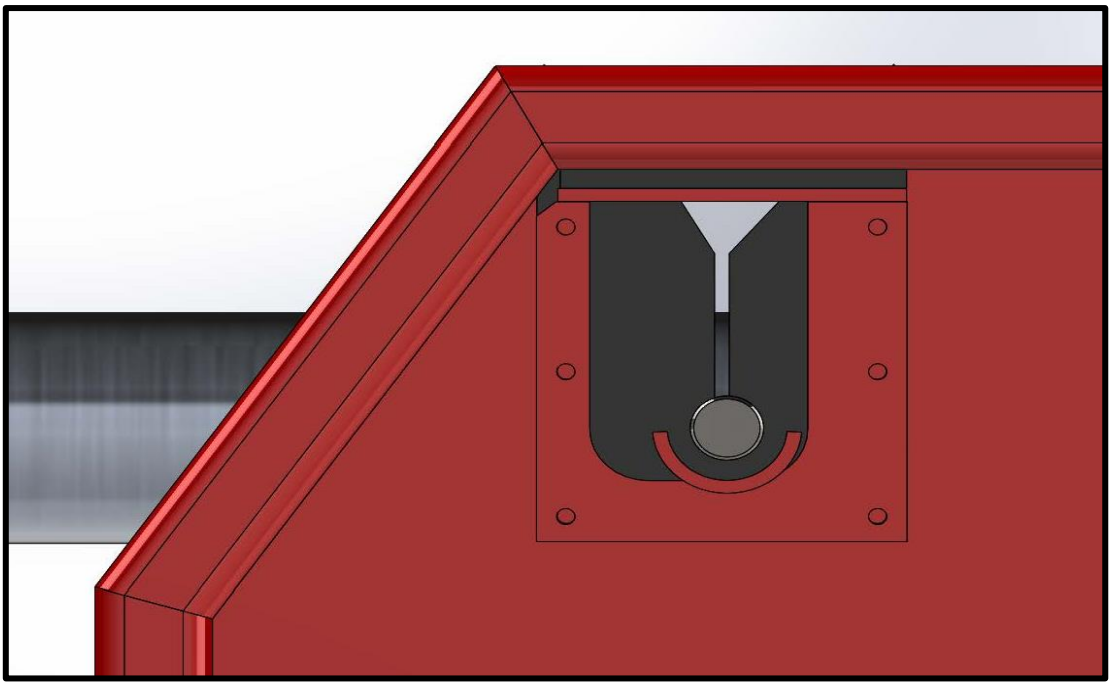


Figure 15 Aluminum Arm in Receiver

2.9 Installation of Concrete Anchors

2.9.1 System View Prior to Anchor Installation

Before concrete anchors are installed, the DAB system should resemble the figure below.

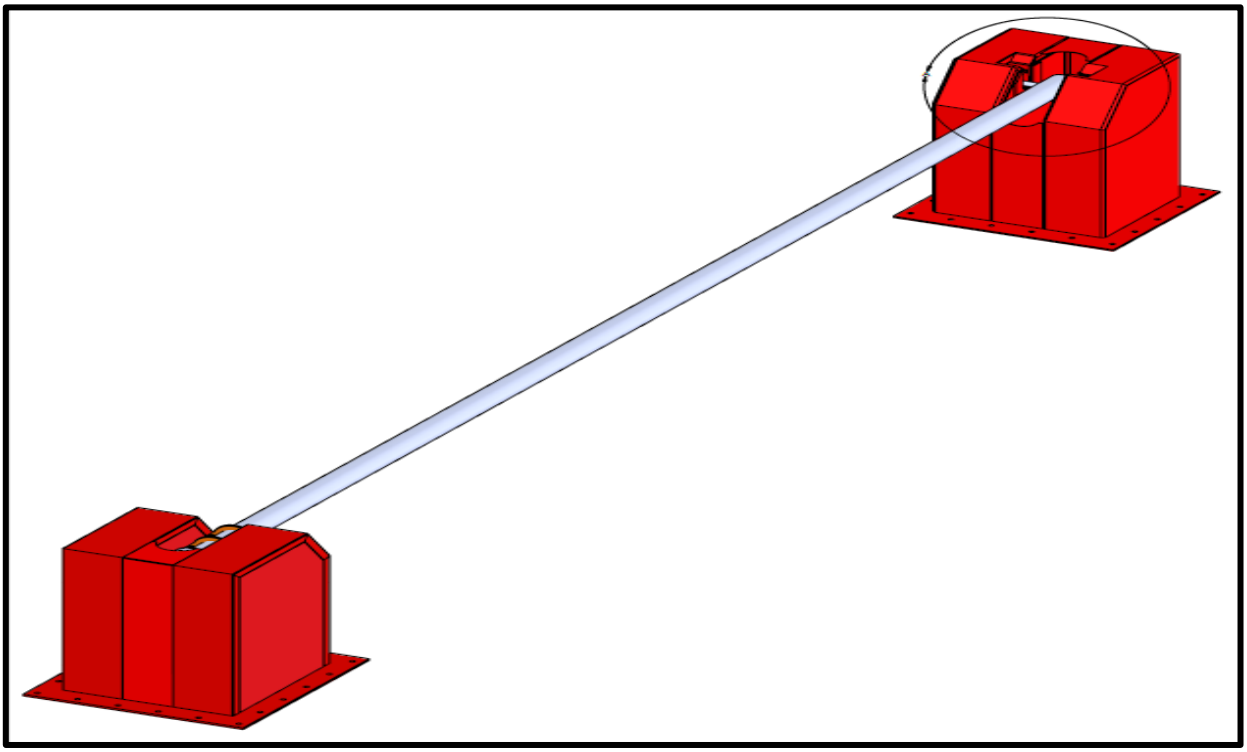


Figure 16 System View Prior to Anchor Installation

2.9.2 Anchor Bolt Installation

Spike DAB systems are anchored to the ground with Hilti 4” x 5/8” concrete anchors as shown in Figure 17. Use a 5/8” masonry drill bit to pilot holes for the anchors at least 4 inches deep. Remove all dust and debris with an air compressor and ensure that the pilot holes are as clean as possible.

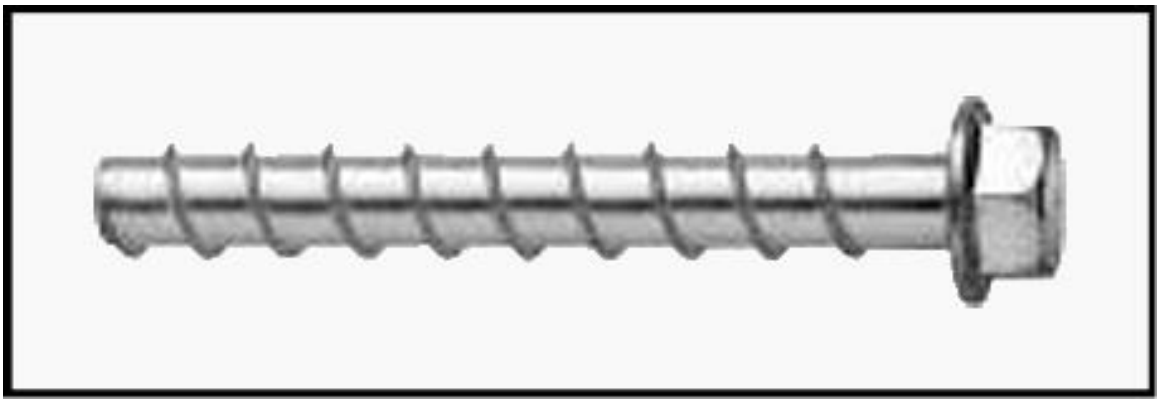


Figure 17 Hilti Concrete Anchor Bolt (4” x 5/8”)

Tool Required	Tool Type	Tool Specification
	Hammer Drill or similar for concrete drilling	
	Concrete Bit	5/8” masonry bit. Drill a minimum depth of 4”
	Air Compressor or similar	To remove dust and debris from drilling
	Wrench/Socket	15/16”
	Concrete Anchors	5/8” x 3.5” Hilti Concrete Screw Anchor

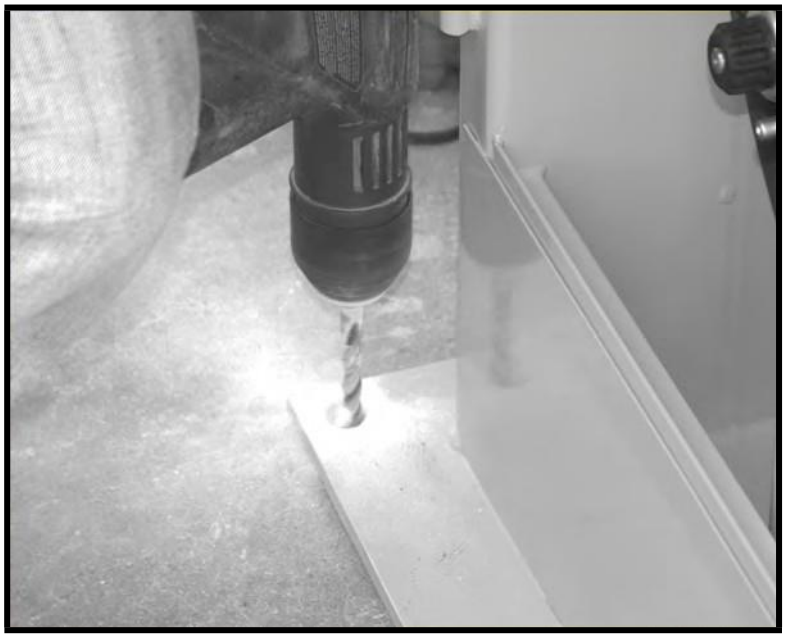


Figure 18 Drilling Pilot Holes for Concrete Anchors

Figure 19 Secure Anchors with Wrench for Final Attachment

Section 3 Electrical Installation

3.1 AC Power Connection

The client-supplied power is to be connected to the 4-gang junction box via flexible conduit. The flexible conduit and power wires are to be routed through the bottom of the junction box in the location shown in the photo below. Local code may require that a licensed electrical contractor perform this step.

NOTE – The Switch on the 4-gang junction box, when switched to the ON position, allows power to flow to the Spike system from the AC power source.

WARNING — When servicing the system, this switch should be placed in the OFF position and the power going to the junction box should be shut off at the breaker box. When AC power is OFF at this switch and breaker box, voltages may still be present within the Spike System Control Box. Use caution.

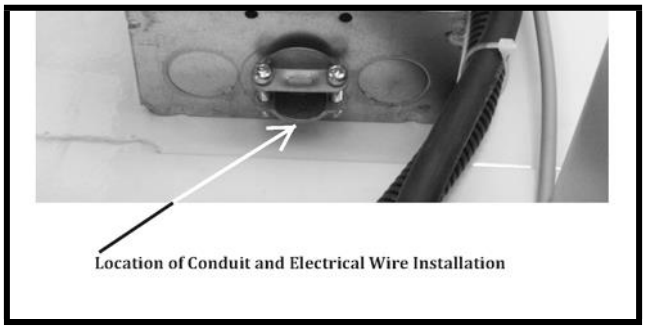


Figure 20 AC Power Junction Box Inside Control Cabinet

Tool Required	Tool Type	Tool Specification
	Flexible Conduit	To connect power conduit stub-up to 4 gang box
	Conduit Fitting	To connect flexible conduit to client-installed rigid conduit
	Flat Blade Screw Driver	To open junction box and terminate power cables
	Wire Strippers	To make electrical connection (Licensed contractor)

The figure below shows a typical routing of the flexible conduit that will provide power to the DAB system. A locally licensed electrical contractor should perform electrical power connection to the Spike System.

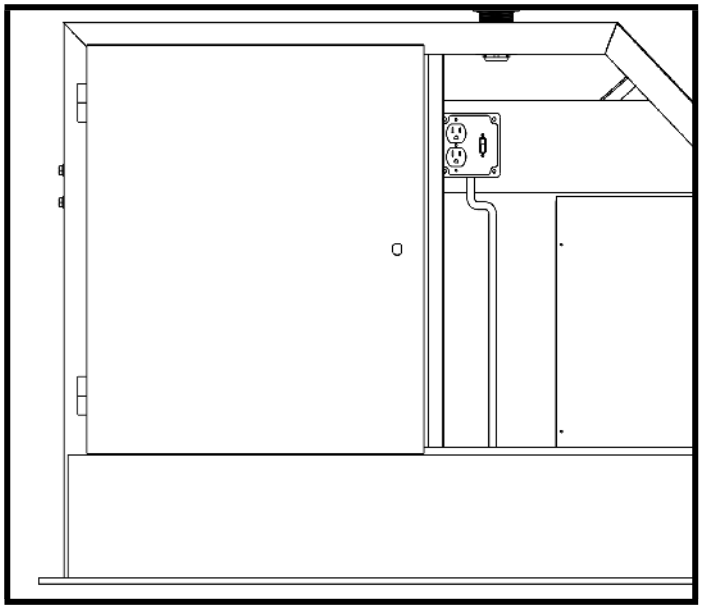


Figure 21 Location of Flexible Conduit Installation to AC Junction Box

(Note: The bend in the flexible conduit should be more gradual than depicted above.

3.2 Test Locations and Set Limit Switches

Locate the upper and lower limit switches on the side of the control cabeint

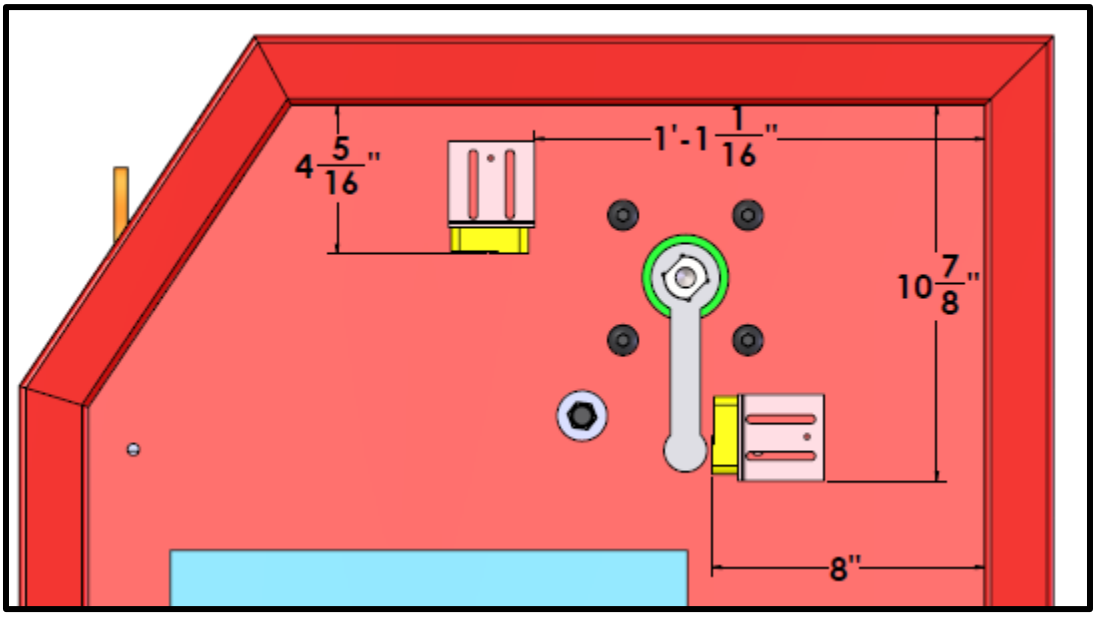


Figure 22 Limit Switches Location

It may be necessary to make a slight adjustment to the upper and lower limit switches. Turn on power to the control cabinet. With the arm in the lower position adjust the lower limit switch by loosening the two screws on the limit switch bracket. See figure 22.
Move the limit switch up or down until the light on the limit switch is on. Then install the TEKS set screw provided in the lower hole in the limit switch bracket. See Figure 22. Move the arm to its upper position and Repeat this procedure for the upper limit switch.

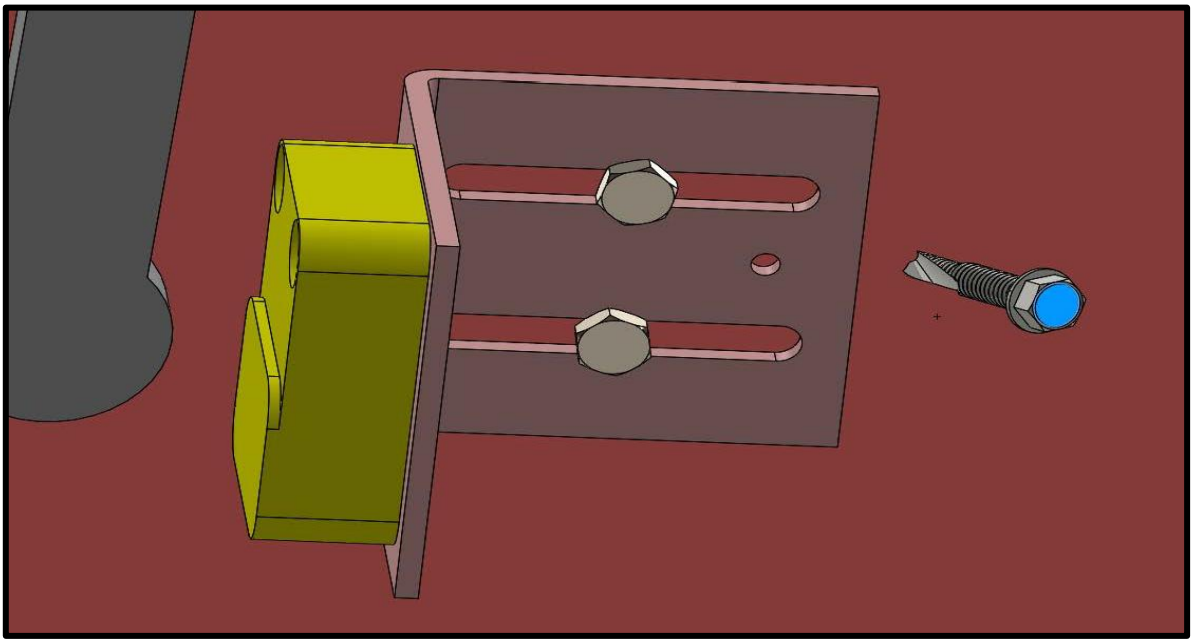
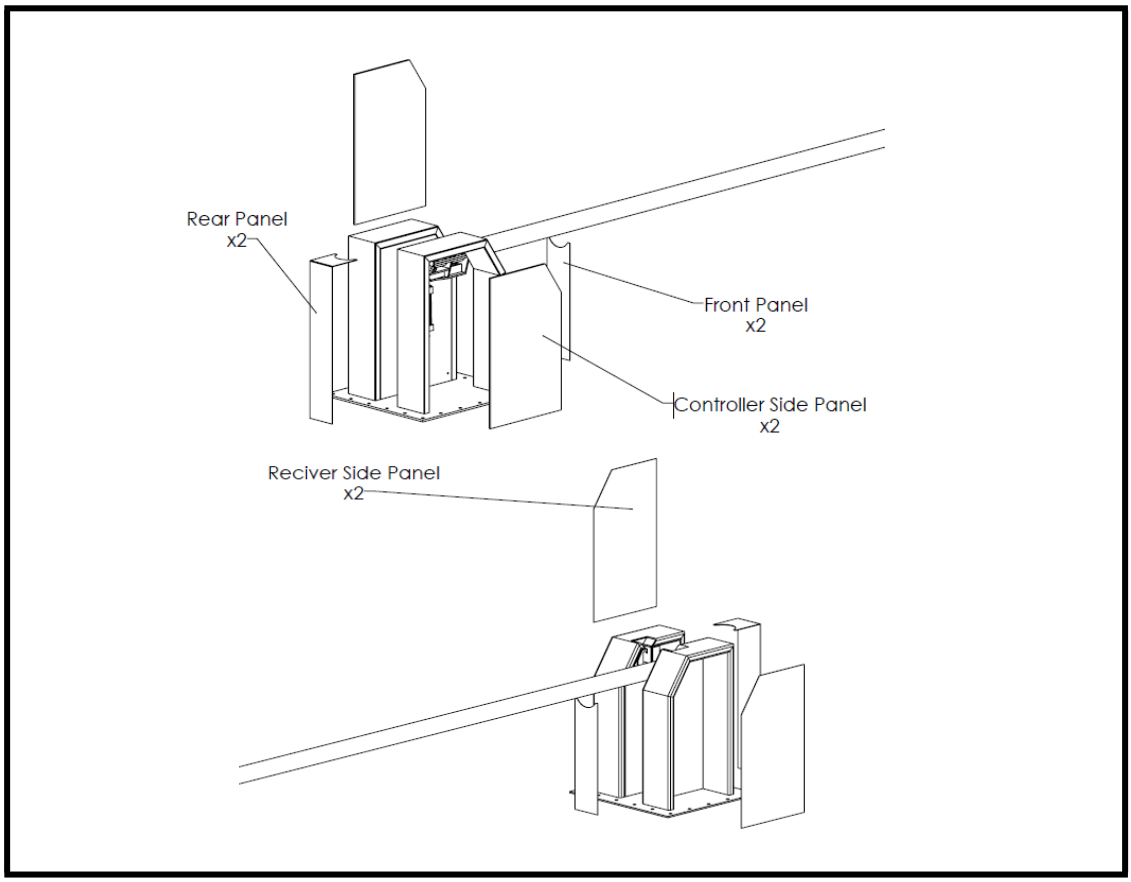


Figure 23 View of Upper and Lower Limit Switches

3.3 Replace Inside Panels for Control and Non-Control Cabinets

At this time, replace the inner panels of both the Control and Non---Control Cabinets as shown in the figure 23.



Tool Required	Tool Type	Tool Specification
	Wrench/Socket	7/16 “

3.4 Traffic Control Signal Mounting

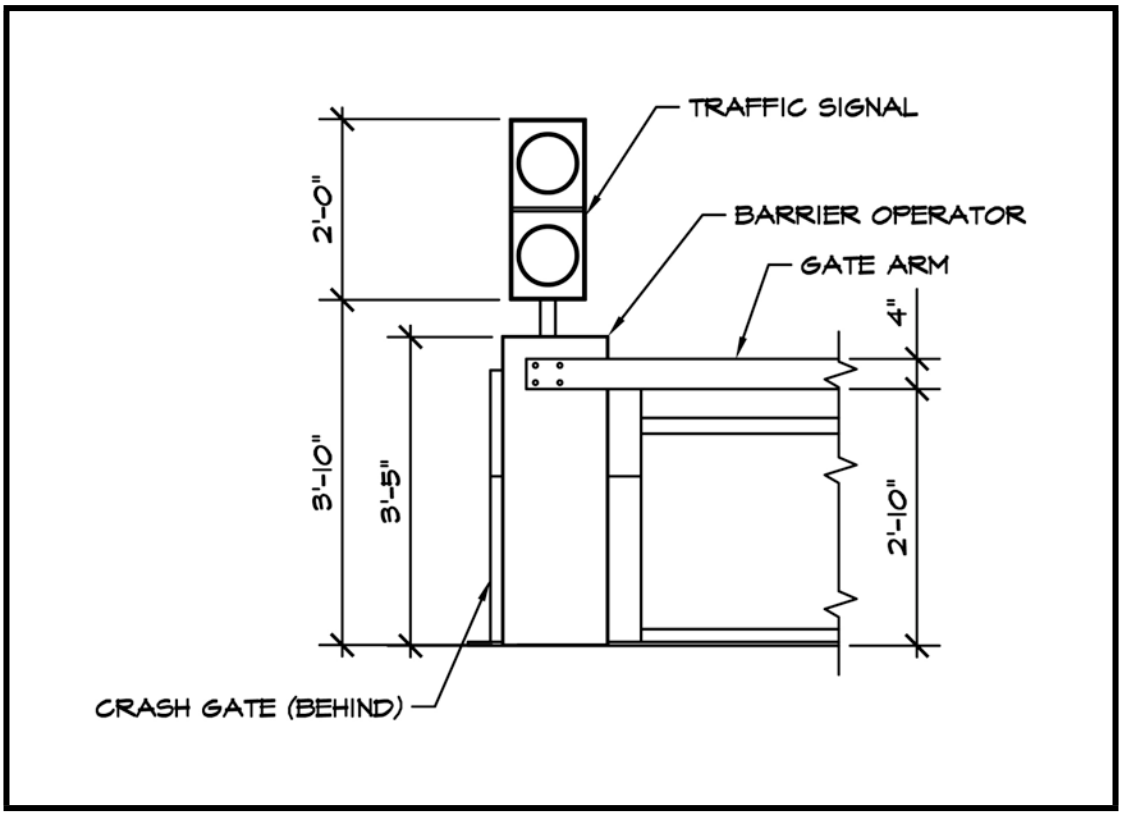


Figure 25 Traffic Control Lighting Installation Guidelines

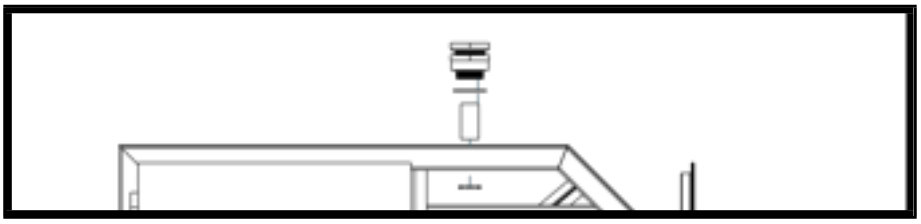


Figure 26 Location of Traffic Control Mounting Adapter, Control Cabinet

Install the traffic control light fixture as shown in the figure above. This step is often performed at the factory. Thread the wires for the signal through the pole and flange for attachment at the control panel.

Tool Required	Tool Type	Tool Specification
	Channel Locks	Large size to secure mounting hardware

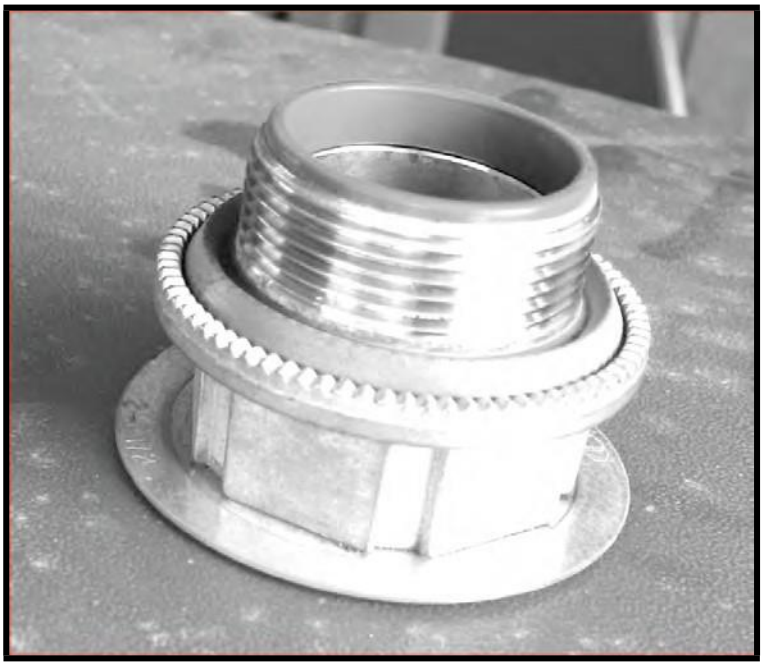


Figure 27 Assembled Traffic Control Mounting Adapter, Control Cabinet

3.4.1 Wiring for Traffic Control Signal

As shown in the figure below, the wiring for the traffic control signal terminates on TB2 (terminal block on right side). The yellow light signal connects to terminal 9, the red light signal wire connects to terminal 10, and the common wire connects to terminal 47.

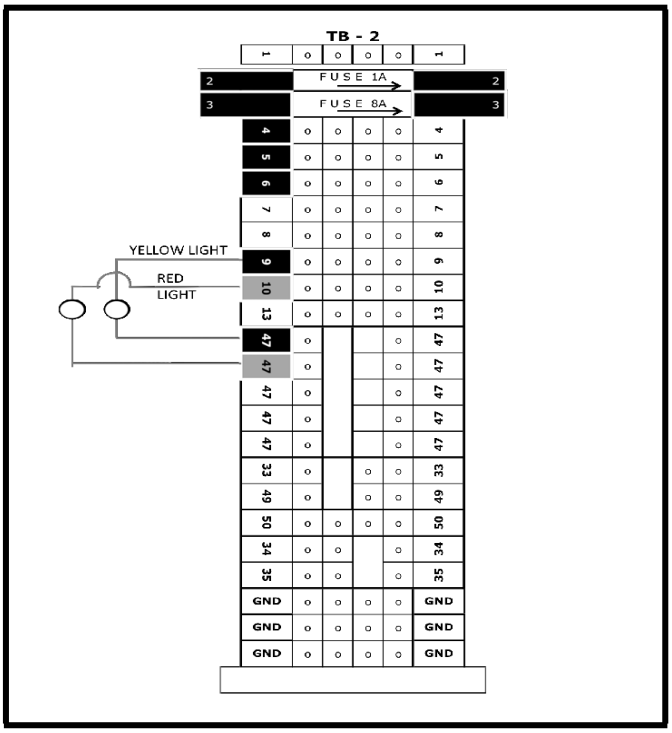


Figure 28 Traffic Control Signal Wiring

Tool Required	Tool Type	Tool Specification
	Screw Driver	Flat, Small
	Wire Strippers	If required for cable connection

3.5 Wiring for Remote Operating Switch (Guard Shack, Typically)

As indicated in the figure below, a field connection barrier operated switch or control is wired to TB2. The Common wire is attached to terminal 4, the Open wire is attached to terminal 5, and the Close wire is attached to terminal 6.

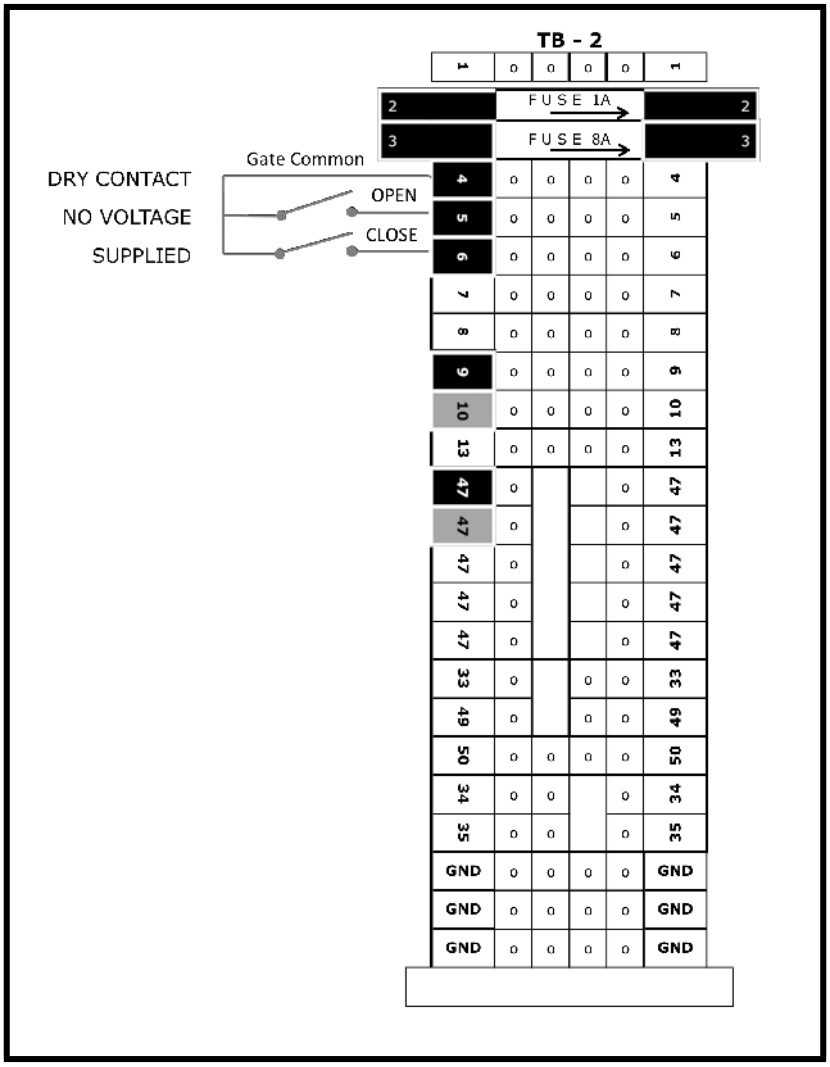


Figure 29 Installation Location of Field Connection Barrier Operator

Tool Required	Tool Type	Tool Specification
	Screw Driver	Flat, Small
	Wire Strippers	If required for cable connection

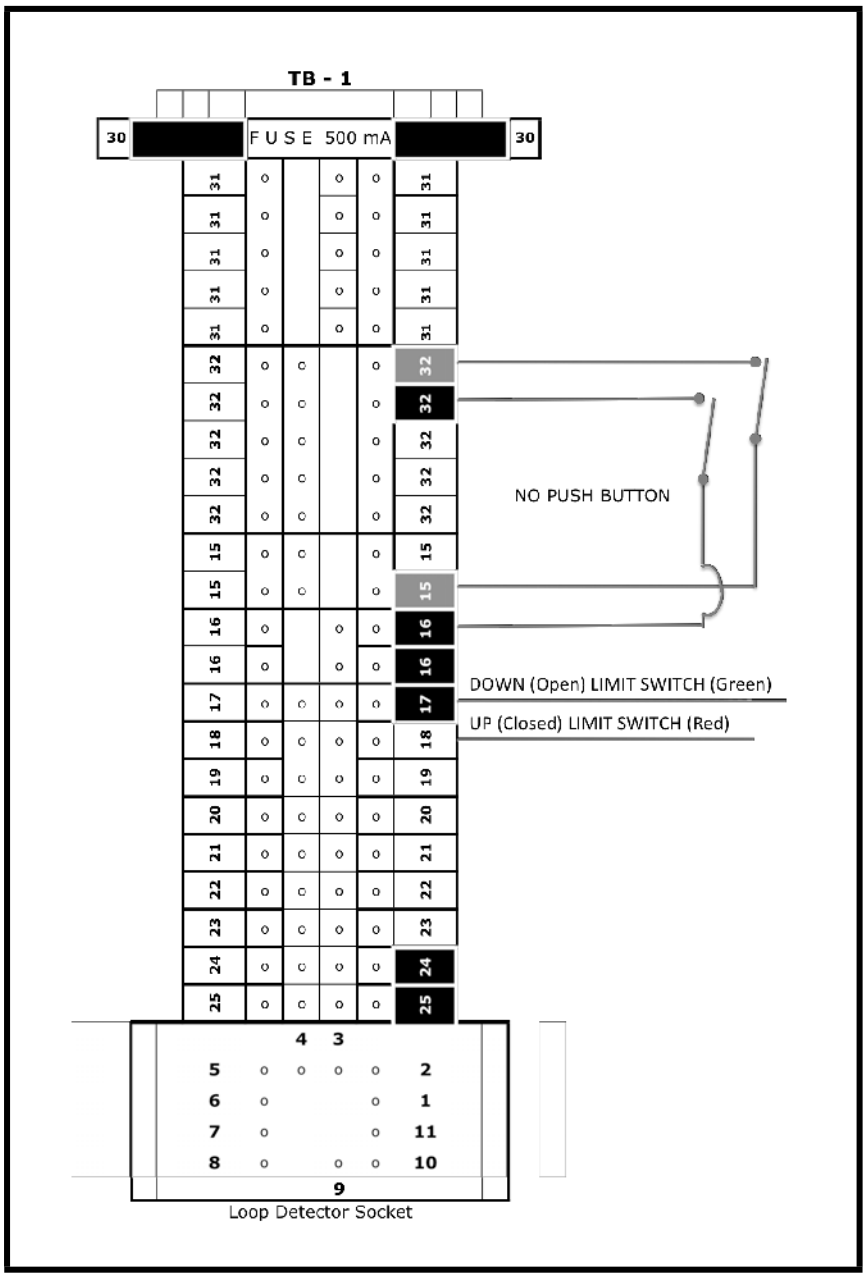


Figure 30 Limit Switch Wiring (Usually Performed at Factory)

3.6 Installation Electrical Reference Information

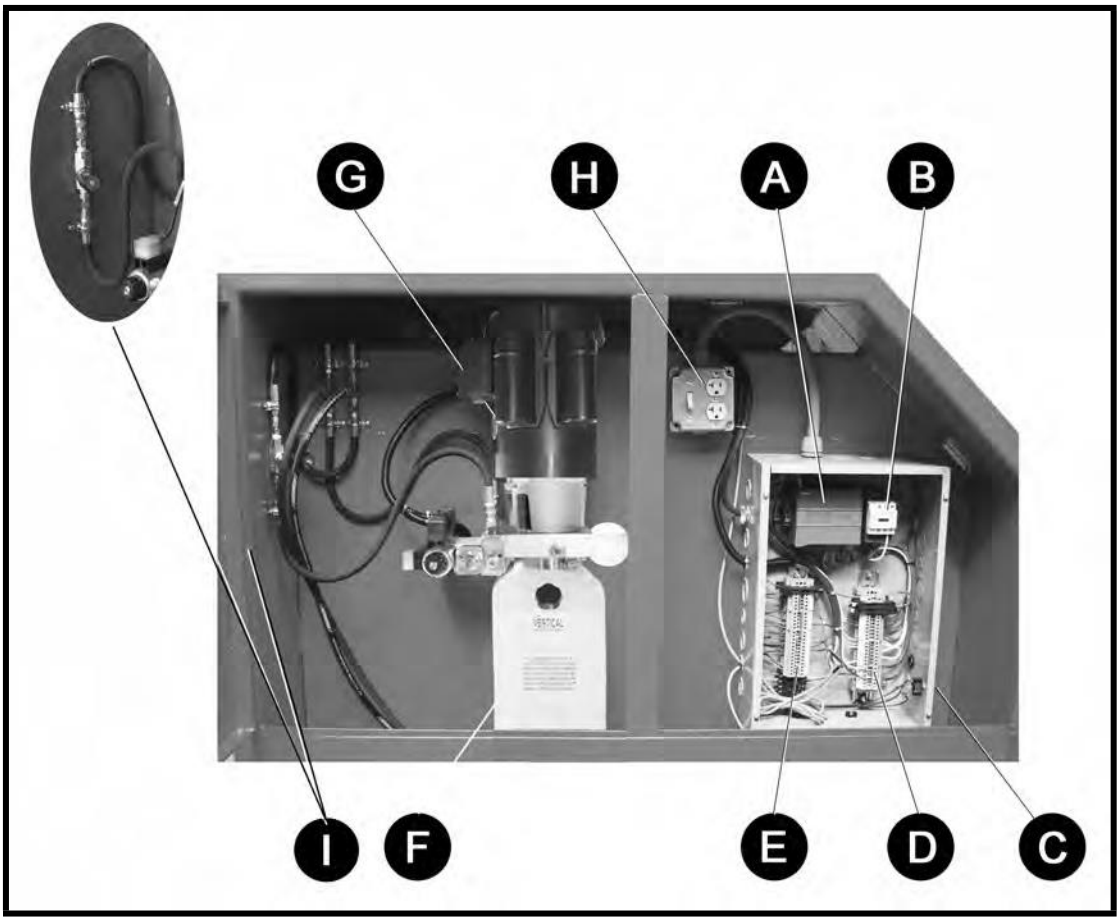


Figure 31 Electronic Control Panel Components, Control Cabinet

Component Identification	Photo Callout	Component
	A	Siemens S7-1200 PLC
	B	Schneider Control Relay LC1 D25
	C	Momentary On-Off Toggle Switch
	D	TB2 Terminal Block
	E	TB1 Terminal Block
	F	Hydraulic Fluid Reservoir
	G	Leeson 1.5 HP Motor/Pump
	H	AC Junction Box with Master Power Switch
	I	Flow Control Valve

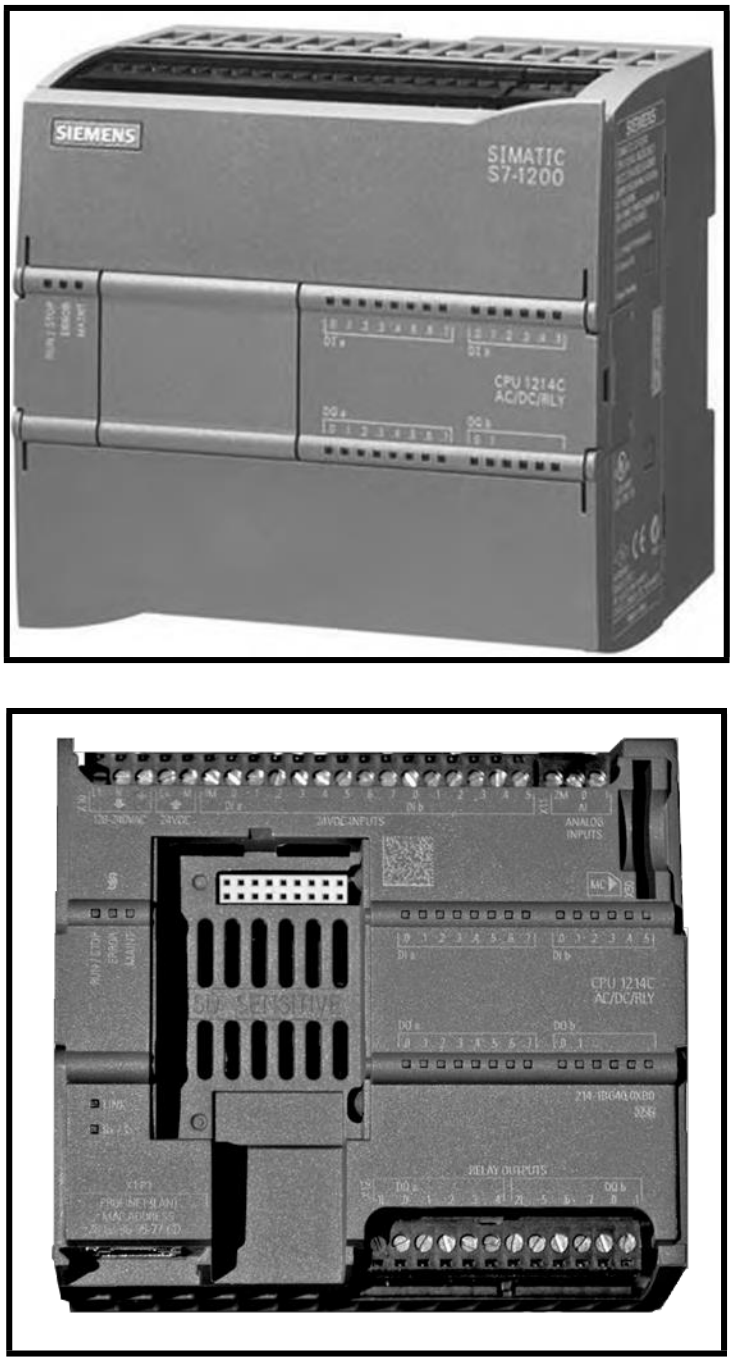
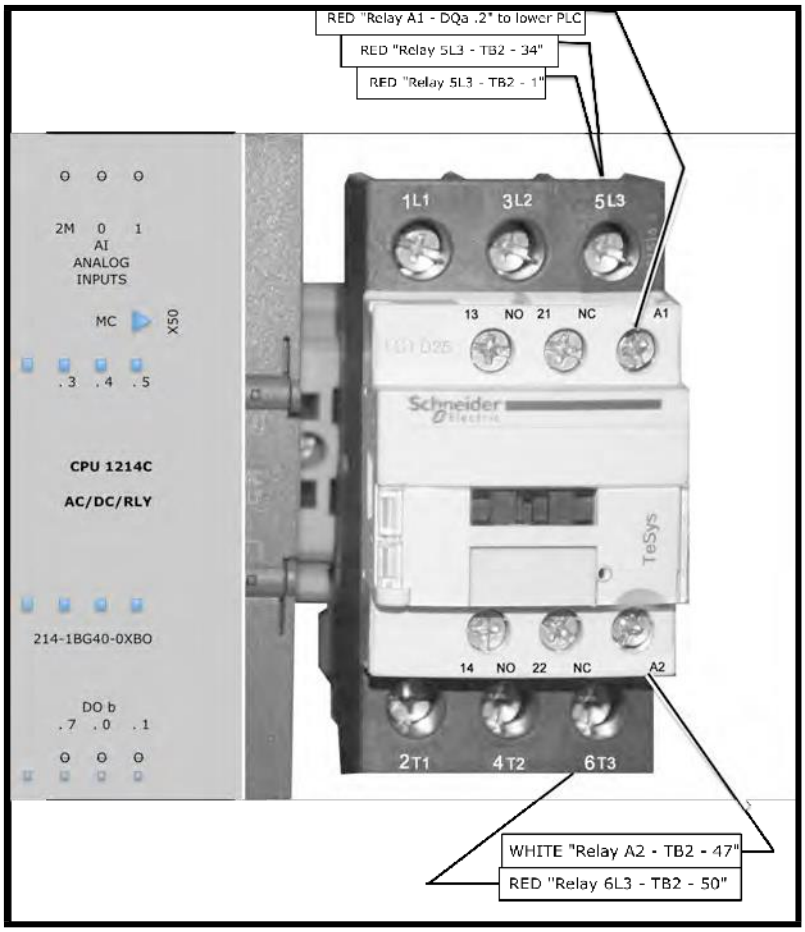


Figure 32 Siemens S7-1200 PLC, Control Cabinet -- With (Top) and Without (Bottom) Covers Removed



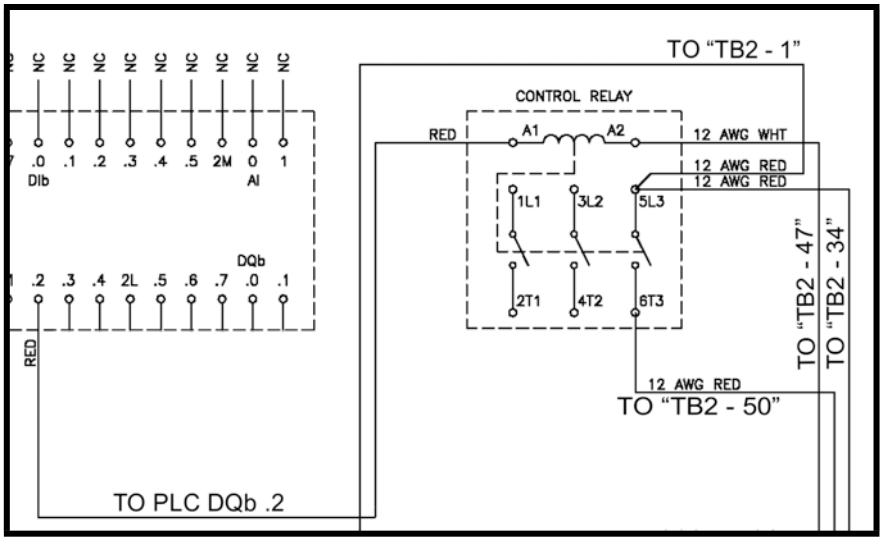


Figure 33 Schneider LC1 D25 Relay, Control Cabinet

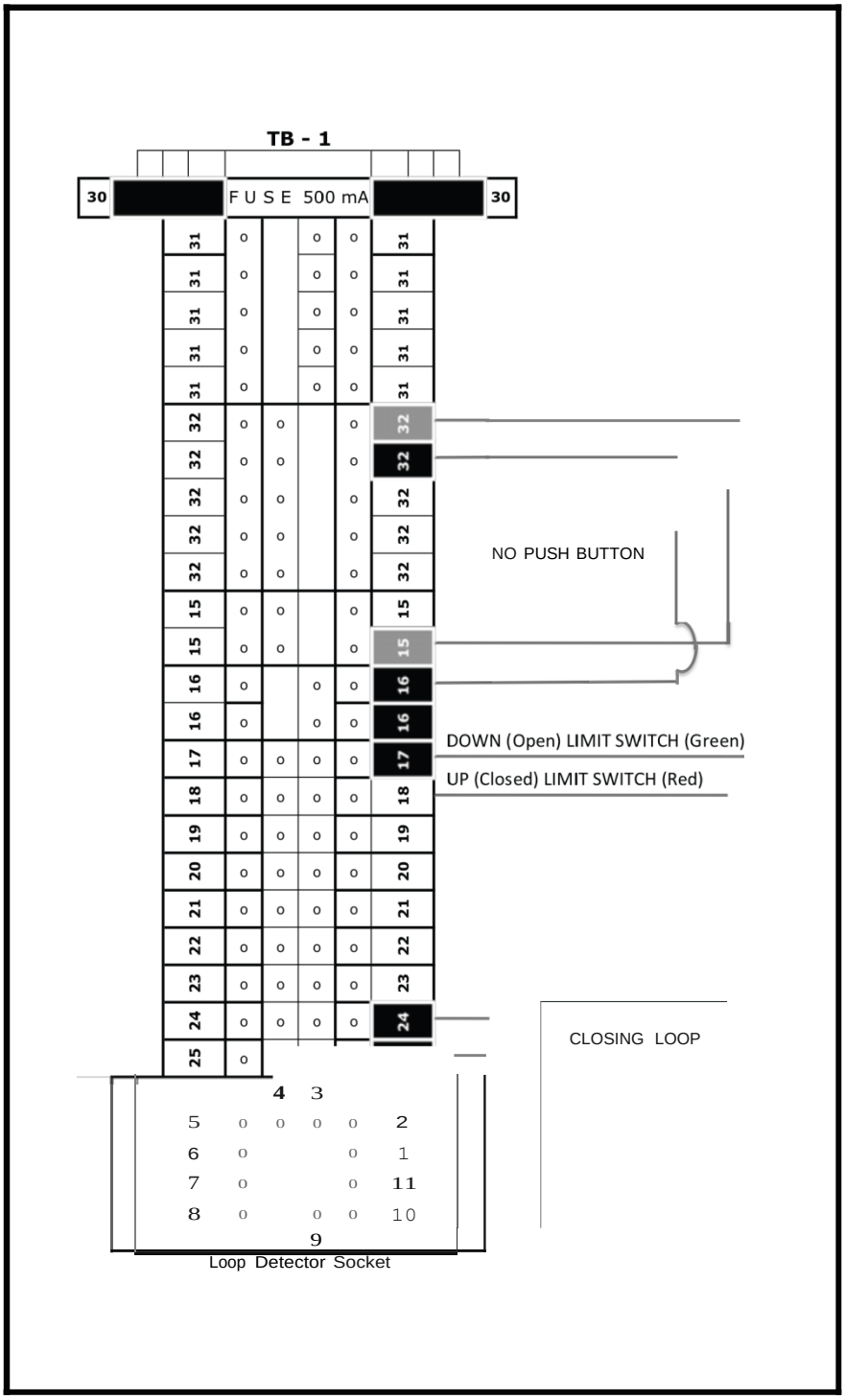


Figure 34 TB 1 Terminal Block, Installation Wiring, Control Cabinet

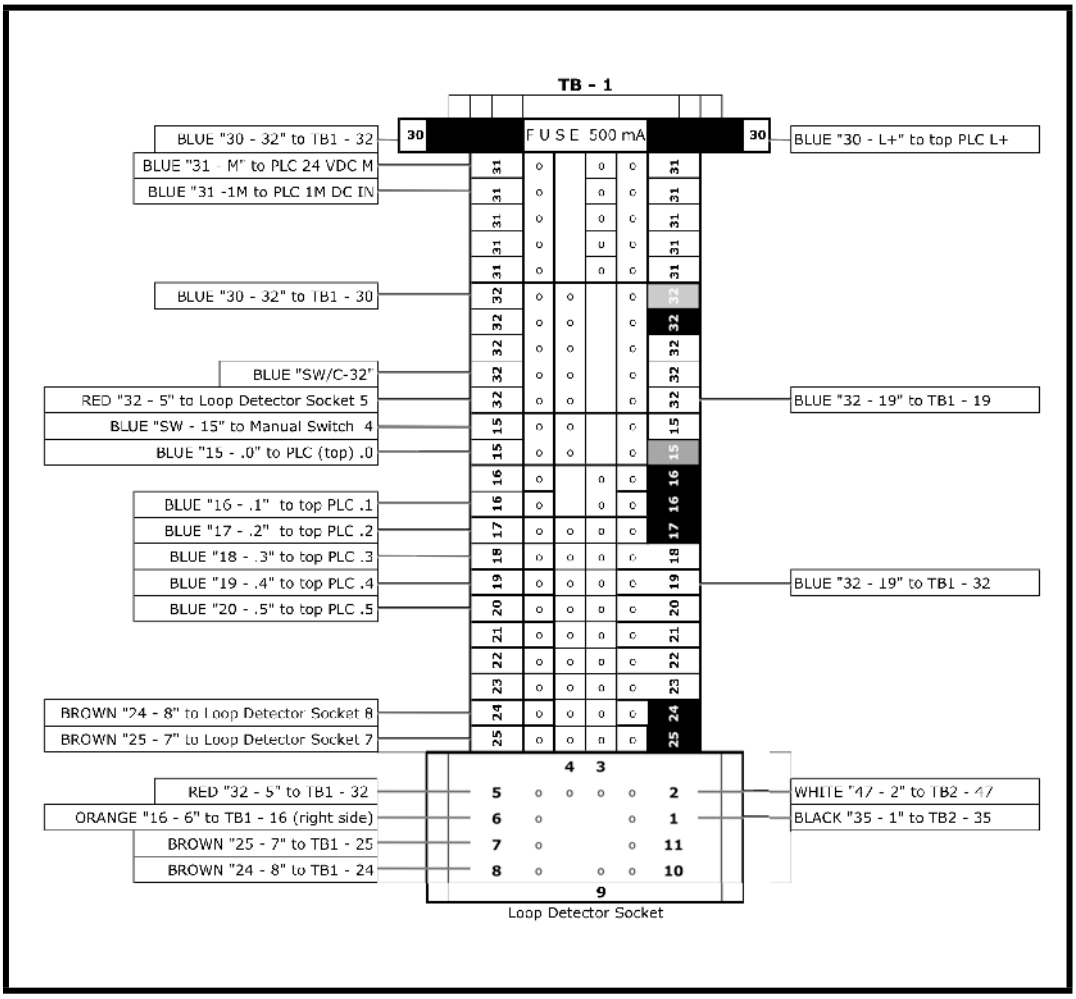


Figure 35 TB 1 Terminal Block, Factory Wiring, Control Cabinet

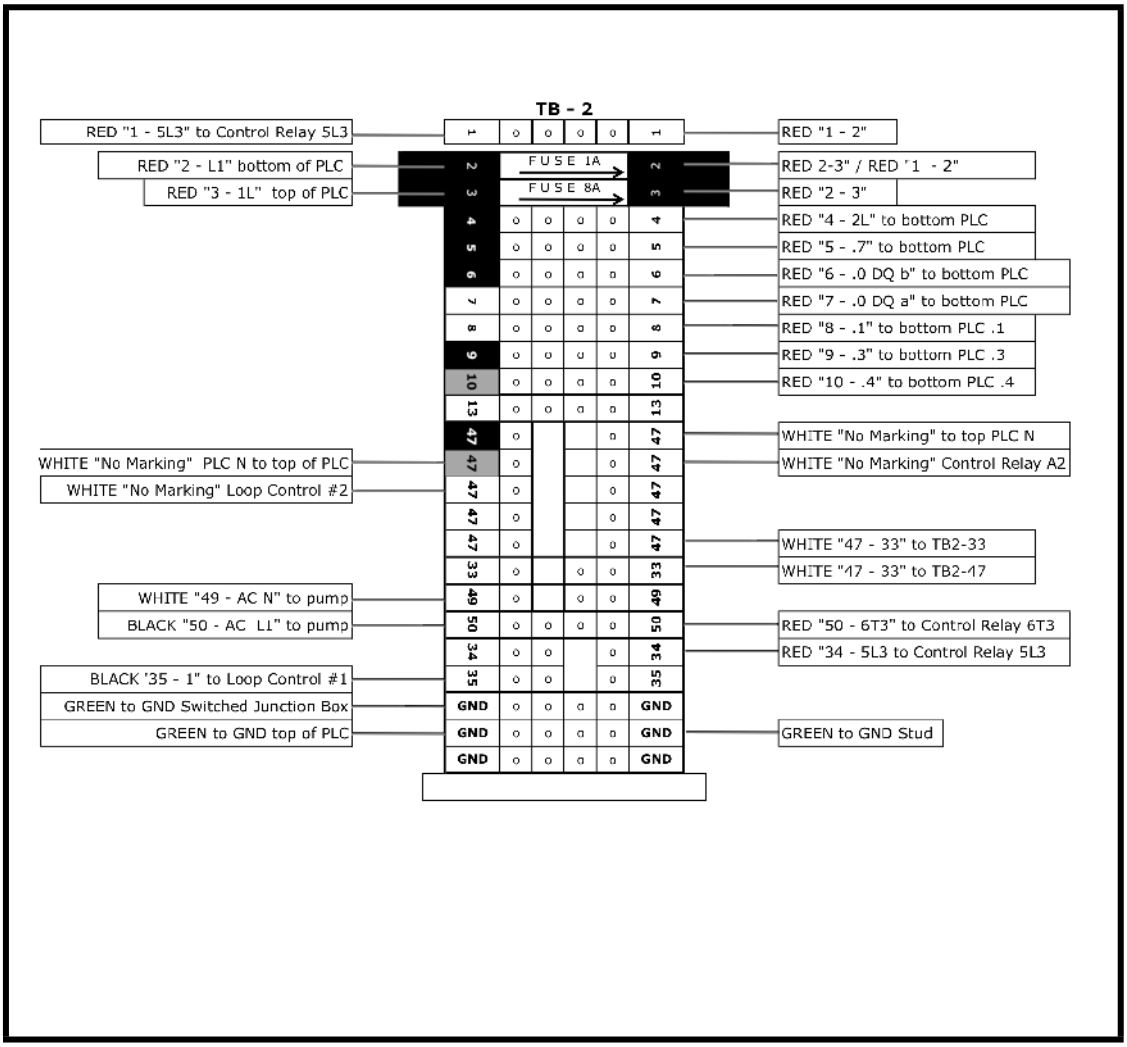


Figure 36 TB 2 Terminal Block, Factory Wiring, Control Cabinet

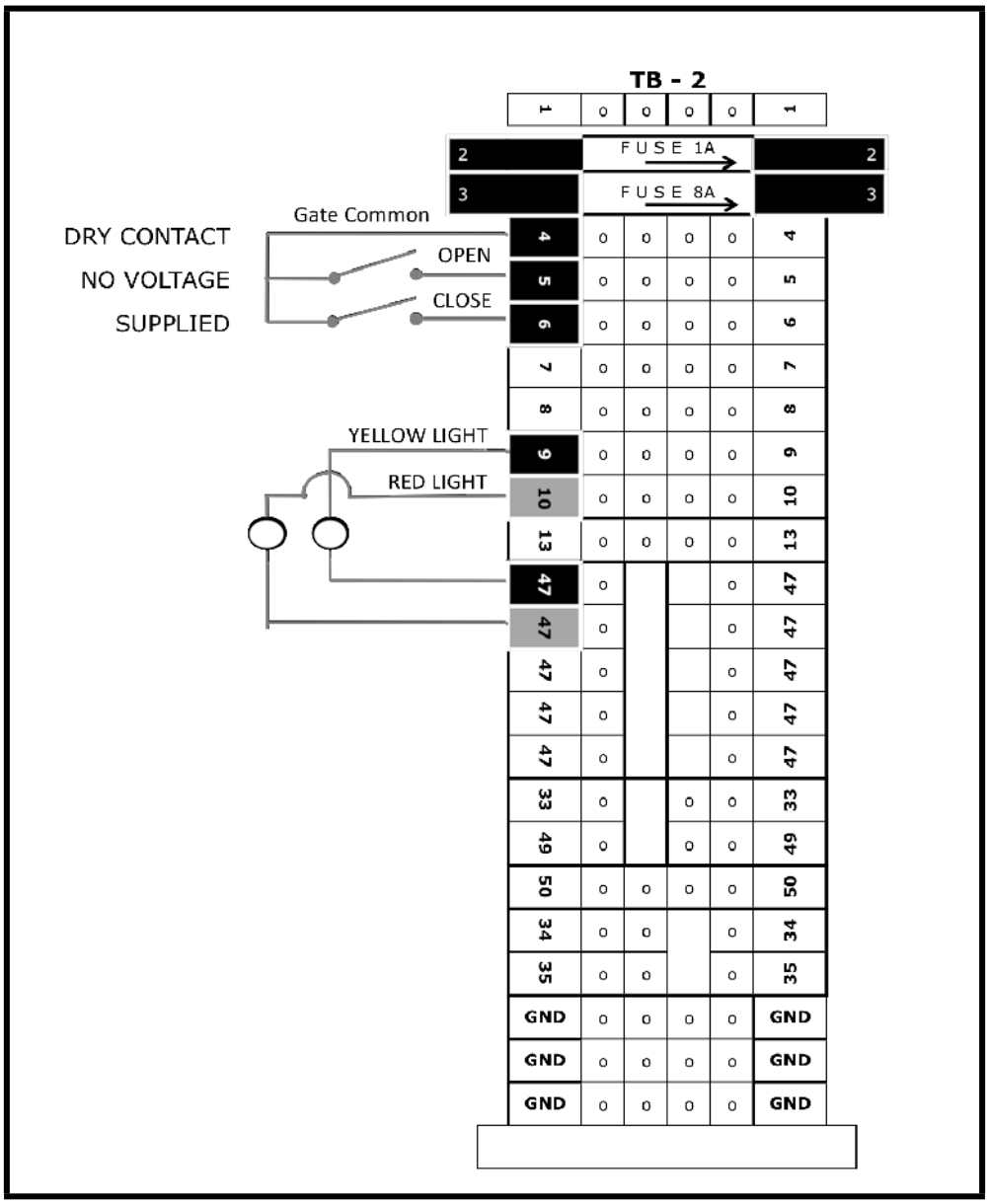


Figure 37 TB 2 Terminal Block, Installation Wiring, Control Cabinet

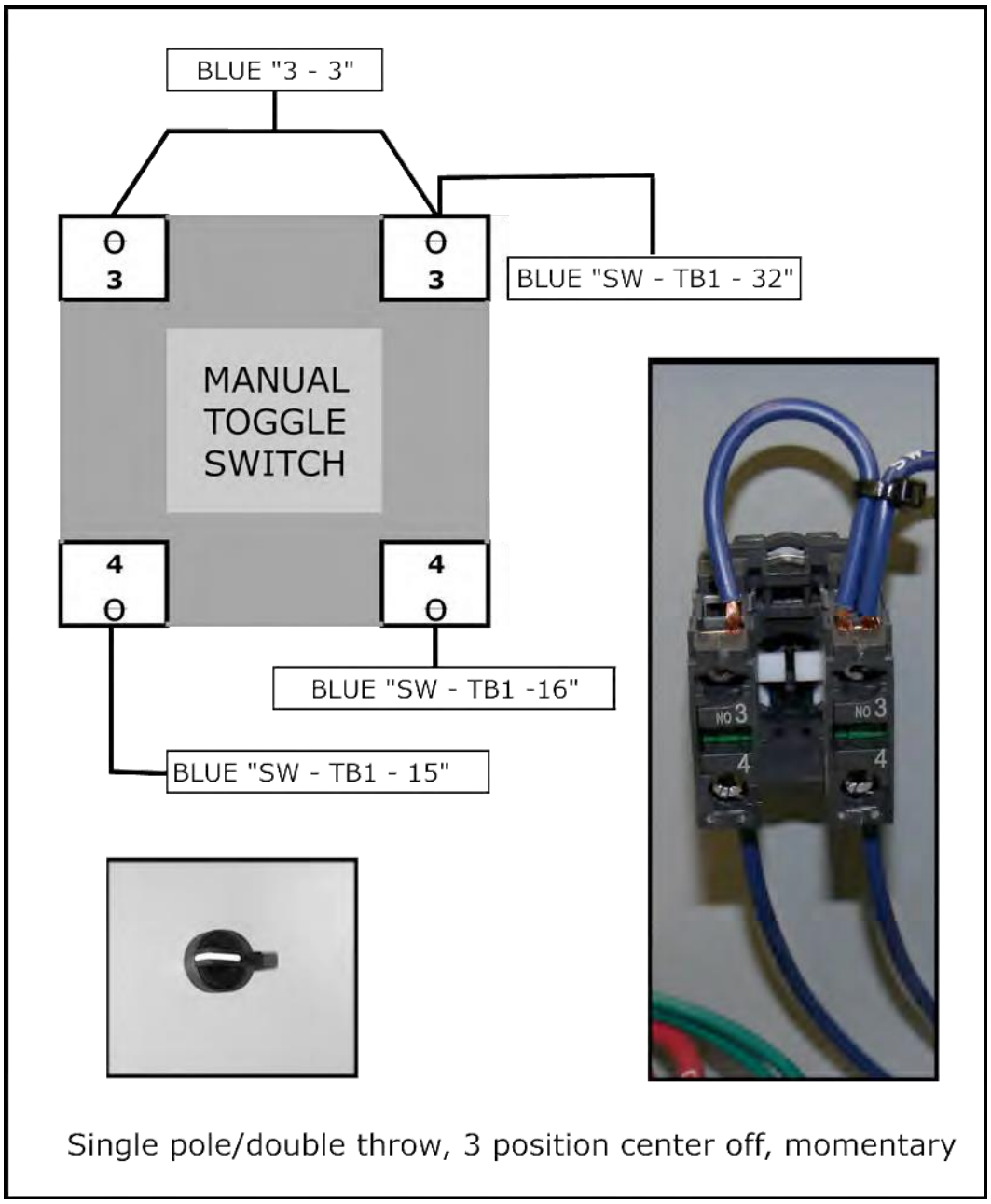


Figure 38 Momentary On/Off Operation Switch, Wired at Factory, Control Cabinet

Figure 39 Momentary Switch in OFF or Neutral Position

Figure 40 Momentary Switch in Up (Raise) Drop Arm Barrier

Figure 41 Momentary Switch for DOWN or Lower Drop Arm Barrier

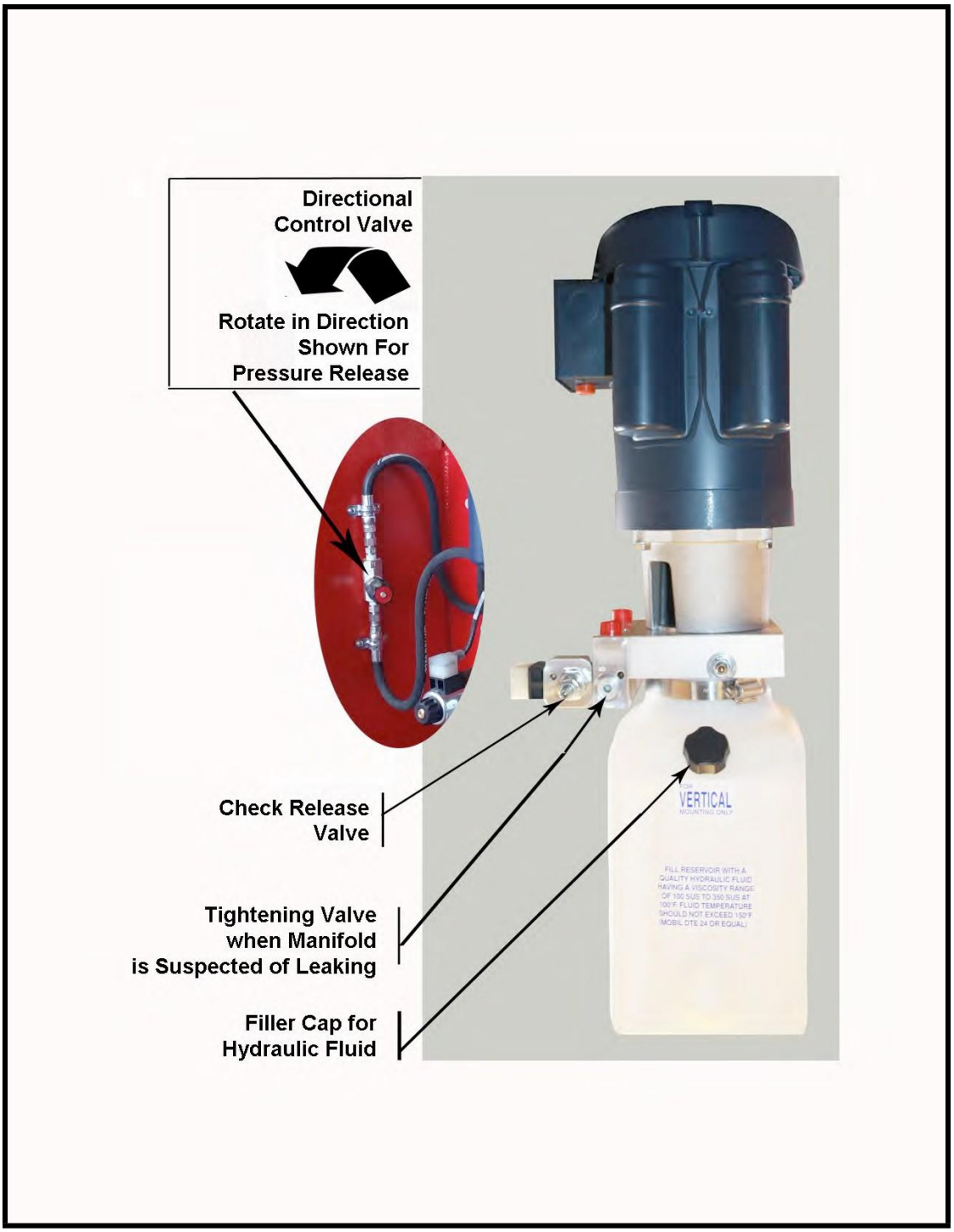


Figure 42 Motor/Pump and Fluid Reservoir, Control Cabinet

Section 4 – System Operation and Maintenance

4.1 Drop Arm Barrier Manual Operation

When all electrical connections have been made for the system, including all options, apply power to the system via the AC circuit breaker. Next, ensure that the power switch on the 4---gang electrical junction box is placed in the ON position.

Before testing the remote access devices (for example from a control shack), it is recommended that the system operation be tested using the manual operating switch, located on the outside of the electronic control compartment within the Control Cabinet. This switch is identified in the figure below. When system functionality has been verified from the manual operating switch, verify all other system controls.

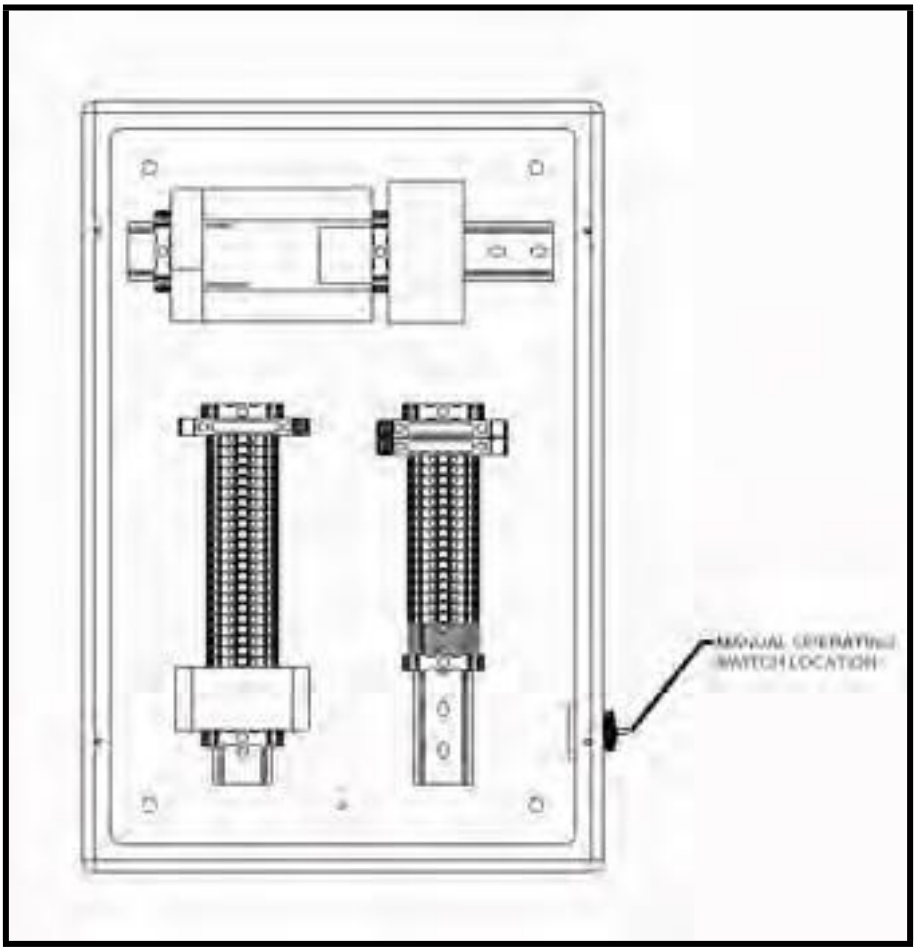


Figure 43 Manual Operating Switch Location

4.2 Drop Arm Barrier Emergency Operation: Manual Arm Lowering

If it ever becomes necessary to lower a Drop Arm Barrier manually, for example in the event of power loss or other unusual situation, open the locking door on the Control Cabinet to gain access to the system hydraulic pump. As pictured below, turning the pump

release valve in the clockwise direction will allow the arm to go down manually. Ensure that this valve is turned in the opposite direction (counter---clockwise) once system operation has been restored.

Figure 44 Manual Arm Lowering in Case of Power Loss or Other Unusual Event

4.3 Important Hydraulic Power Unit (Pump) Information

4.3.1 Observations and Recommendations

When connecting AC current, please observe the indicated rotation of the electric motor. Running the motor in the opposite direction of the indication will result in shaft seal damage. All electric connections should be done according to local standards. Failure to comply with local standards **and use of non-certified components may result in injury**. All hydraulic connections should be made, and the proper fluid should be present in the reservoir before, running the Hydraulic pump.

4.3.2 Seal Kits and Components

To obtain a seal kit, the model number and serial number of the power pack is needed. Most parts are available separately, however the pump is only replaced in whole and separate trust---plates or loose shafts cannot be obtained. In order to ensure the quality and performance of our product, all Hydraulic pumps are tested for performance at the factory.

4.3.3 Hydraulic Hose Connections

Hoses and fittings connected to the pump should be clean and free of any burs, oxidation and carbon deposits. The hydraulic connections must be of adequate pressure rating, and should be inspected on a regular basis to avoid leakage or possible bursting due to high pressure. The size of the hydraulic connections must be determined with the oil flow of the hydraulic pump in mind (1000 PSI) to avoid backpressure in the system. This could create unwanted heat buildup. **The fluid level in the reservoir should be monitored at regular intervals.** A fluid level below the intake strainer will cause damage to the pump due to cavitation's of the pump. The hydraulic pump is designed to stand vertically.

4.3.4 Pump Adjustments

Since the hydraulic pump has a fixed displacement pump installed, oil flow is constant and determined by the speed of the electric motor. Therefore, the pump flow cannot be adjusted. The adjustment for the pressure relief valve will adjust pressure only. It will not increase pump flow. The relief valve is set to a pressure specified when the hydraulic pump was tested. The specified pressure applies to the specific system in which it is installed. The setting can be changed in the field and should be as close as possible to the maximum working pressure of the system. The standard pressure relief valve protects the pump; it should only be adjusted if the pressure reaches an unwanted high level. It is an emergency valve only. It should not be blocked off or turned in completely to avoid bursting of components. Removing the cap nut and loosening the lock nut make adjustments. A clockwise rotation of the adjustment stem increases the pressure and a counter---clockwise rotation decreases pressure. The lock nut should be tightened after adjustment, and the cap nut should be re---installed to avoid changing the setting by vibration and to avoid hydraulic fluid leakage.

Please contact the factory if you have any questions or concerns relating to your hydraulic pump.

4.3.5 On-Going Maintenance Tasks: Hydraulic Pump

WARNING: BEFORE YOU USE A MATERIAL, REFER TO THE MANUFACTURES' MATERIAL SAFETY DATA SHEETS FOR SAFETY INFORMATION. SOME MATERIALS CAN BE DANGEROUS.

Scheduled Maintenance

Period	Maintenance
Daily	Check HPU manifold for leakage.
Weekly	Check HPU reservoir fluid level.
Semi-Annually	Change hydraulic fluid (heavy use).
Annually	Change hydraulic fluid (moderate use).

Material Part Numbers

Description	Brand	Part No.	Quantity
Hydraulic Fluid	DEXRON III ATF Fluid	HO-2	3 Liters

4.4 Maintenance Reference Information

Gate Access Controller I/O

Terminal No.	PLC Address	Description	Voltage	Notes
L1	X	Main Power Terminal Block	110 VAC	
1	X	Switched Power Terminal Block	110 VAC	
2	X	PLC Fuse Block	110 VAC	Fuse size 1A
3	X	PLC Output Fuse Block	110 VAC	Fuse size 8A
47	X	Neutral	110 VAC	
49	X	Pump Neutral	110 VAC	Pump Terminal
50	X	Pump Power	110 VAC	

Gate Access Controller Input 24 VDC

Terminal No.	PLC Address	Description	Voltage	Notes
30	X	Fuse block F4 +24 VDC fusing PLC power supply (to PLC L+)	+24 VDC	Fuse size 500mA
31	X	-24 VDC PLC sensor power return	-24 VDC	

32	X	Fused from F4 +24 VDC fusing PLC sensor power supply (PLC L+ to TB1 30)	+24 VDC	Fused @ 500mA
15	DIa .0	Trip signal (OPEN)	Sinking 24 VDC	
16	DIa .1	Retract signal (CLOSE)		
17	DIa .2	Limit switch signal (Down position)	Sinking 24 VDC	
18	DIa .3	Limit switch signal (Up position)	Sinking 24 VDC	
19	-	-	-	
20	-	-	-	
21	-	-	-	
22	-	-	-	
23	-	-	-	
24	-	Loop Wire	-	
25	-	Loop Wire	-	

Gate Access Controller Output

Terminal No.	PLC Address	Description	Voltage	Notes
4	2L	Gate arm controller signal common	N/A	No power from controller
5	.7	Gate arm controller signal open dry contact	N/A	No power from controller
6	DQb .0	Gate arm controller signal closed dry contact	N/A	No power from controller
7	DQa .0	Solenoid Control Valve (down/open) Extend Down	120 VAC	
8	DQa .1	Solenoid Control Valve (up/close) Retract UP	120 VAC	
9	DQa .3	Traffic Control Light (Green/Yellow)	120 VAC	
10	DQa .4	Traffic Control Light (Red)	120 VAC	
11	-	-	-	
12	-	-	-	
13	DQa .2	Pump contactor	120 VAC	

Terminal Board 1

From	To
30 Jumper 32	
32	Inductive Loop Detector 5 (Red)
32	Down Limit Switch (Brown)
32	Up Limit Switch (Black)
30	DIa L+
31	PLC DIa M (24VDC -) PLC DIa 1M Down Limit Switch (Blue) Up Limit Switch (Brown)
22	NC
21	NC
20	PLC DIa .5
19	PLC DIa .4
19 Jumper 32	(Blue)
23	NC
18	PLC DIa .3 Up Limit Switch (Blue)
17	PLC .2 Down Limit Switch (Blue)
16	Inductive Loop Detector 6 Toggle Switch A (Orange)
15	PLC .0 Toggle Switch A (Blue)

Terminal Board 2

From	To
Jumper 1 to 2	-
Jumper 2 to 3	-
1	Schneider, 5L3 (Red)
4	PLC 2L (Red)
5	PLC DQb .7
6	PLC DQb .0
7	PLC DQa .0
8	PLC DQa .1
9	PLC DQa .3
10	PLC DQa .4
13	NC
47	Relay A2 (White)
Jumper 47 to 33	White Wire
50	Relay 6T3
34	Relay 5L3
GND	Ground Stud
GND	PLC GND
GND	Switched Junction Box (Green Wire)
35	Loop Detector Socket Pin 1 (Black)
34	Pump (Black Wire)
49	Switched Junction Box AC N (White)
47	Directional Control Valve
47	Directional Control Valve
47	Control Loop Socket 2 (White)
47	PLC N (White)
47	Field Connection Traffic Signal
13	NC
10	Traffic Signal Red Light
9	Traffic Signal Yellow Light
8	Directional Control Valve Retract (Teeth Up)
7	Directional Control Valve Extend (Teeth Down)
6	Barrier Operator Close
5	Barrier Operator Open
4	Barrier Operator Common
3	PLC – 1L
2	PLC – L1
1	Control Relay 5L3

Inductive Loop Vehicle Detector Model LMA-1150-HV

1	AC Line 120V TB-2 35
2	AC Neutral TB2-47
3	NC
4	NC
5	Output Relay, Common TB-1 32
6	Output Relay, Normally Open (Closes for DETECT) TB1-16
7	Loop Input TB1-25
8	Loop Input TB1-24
9	NC
10	NC
11	NC

Schneider LC1 D25

(Relay)	
A1	Siemens PLC DQa .2 (Red)
A2	TB2-47 (White)
1 L1	
2 T1	
5L3	TB2-1 (Red) TB2-34 (Red)
6T3	TB2-50 (Red)

Manual Override Switch (Wired at Factory)

Up	TB1-15
Center	TB1-32
Down	TB1-16

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Appendix A - Warranty

SPIKE SYSTEMS, Inc., hereinafter referred to as **Spike Systems**, warrants it's products will be free from defects in workmanship and materials when installed, and used and serviced as intended, for a period of one (1) year from date of original invoice**.**

PBG – Automated Hydraulic Plate Barrier Gate

Model Numbers – DAB-100/-120/-140/-160/-180/-200

Spike Systems agrees to repair or replace, at **Spike Systems** choice and expense, any defective product at no additional charge. This warranty extends only to the original Purchaser. It is not transferable to anyone who subsequently purchases, leases, or otherwise obtains the Product from the original Purchaser. This warranty does not cover road surfaces, concrete or other structures, underground equipment or fittings, repair labor, travel time, mileage, shipping, or freight charges, taxes, preventive maintenance and inspections or the replacement of items that are by nature, consumable. No allowance for damages to equipment due to power fluctuations will be considered; a clean power supply is the responsibility of the customer. The warranty is voided if any modifications, changes or additions to the equipment are performed without written approval from **Spike Systems**. In addition, this warranty may be voided or further limited if required and or recommended repairs, maintenance, or inspections are not carried out as specified, or if defect is due to normal wear, misuse, abuse, accident, installation not in accordance with instructions or applicable codes, unauthorized repair or incidents commonly referred to as Acts of God. **Spike Systems** retains the right to the final determination as to the cause of any defect.

Except for the warranties set forth herein, **Spike Systems** disclaims all other warranties, expressed or implied or statutory, including but not limited to the implied warranties of merchantability, or fitness or suitability for any particular purpose, activity or location.

Spike Systems will in no event be liable for any loss of business, profits, data or use, or any direct, indirect, incidental or consequential damages resulting from any such defect in materials or workmanship. You agree that repair, replacement or refund, as applicable, under this warranty described herein is your sole and exclusive remedy with respect to any breach of the **Spike Systems** Limited warranty set forth herein.

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Appendix B – Optional Inductive Loop Vehicle Detector Installation

For Specific Installation Instructions, Refer to Manufacturer's Documentation

Cut the rectangle for Inductive Loop Vehicle Detector per manufacturer's instructions and ensure that the loop makes proper connection to the cut that runs under the Control Cabinet. Ensure there is enough spare loop wire to reach the control panel, leaving at least 12 inches of slack (beyond what is required to reach the control panel termination point) as a service loop.

Specific installation instructions can be found at the following Internet sites.

http://www.editraffic.com/

http://www.renoae.com

Note 1 – All systems that include an Inductive Loop Vehicle Detector option ship with sufficient material for a 4' x 6' saw cut loop. It may be advisable in some cases to create a custom saw cut loop for certain installations. To do this, locally acquire sufficient lengths of 18 or 16-gauge wire (14 gauge is acceptable if 16 or 18 gauge are not available). Hand-twist the locally acquired wire per manufacturer's specification for twists per foot. Install the module within Control Cabinet as per normal instructions.

When all saw cuts have been made, blow out any debris and moisture from the sawed area with an air compressor or similar device. Ensure that no sharp objects are in the cut tracks.

Place Inductive Loop Vehicle Detector wires in place by positioning the wires over the cuts, ensuring the proper twists per foot per manufacturer instructions. Standard 4' x 6' loops are shipped with proper wire twists in place.

Using a pizza wheel, putty knife or screwdriver, carefully press wires into cut groves.

Once all wires are in place, seal the cut groves with self-leveling concrete or Sikaflex SL Self-Leveling Sealant or similar. It is important to do this before the Control Cabinet is permanently installed.

B.2 Inductive Loop Vehicle Detector (Saw Cut Control Loop) Relay Connection

The figure below indicates the location where the Inductive Vehicle Loop Detection module is to be attached within the electronic control panel. The pins on this device are keyed so that there is only one correct way to plug in the module. Attach the loop wires to pins 24 and 25 on the Terminal Block marked TB1. Note – TB1 is the vertical terminal on the left in the figure below, and TB2 is on the right.

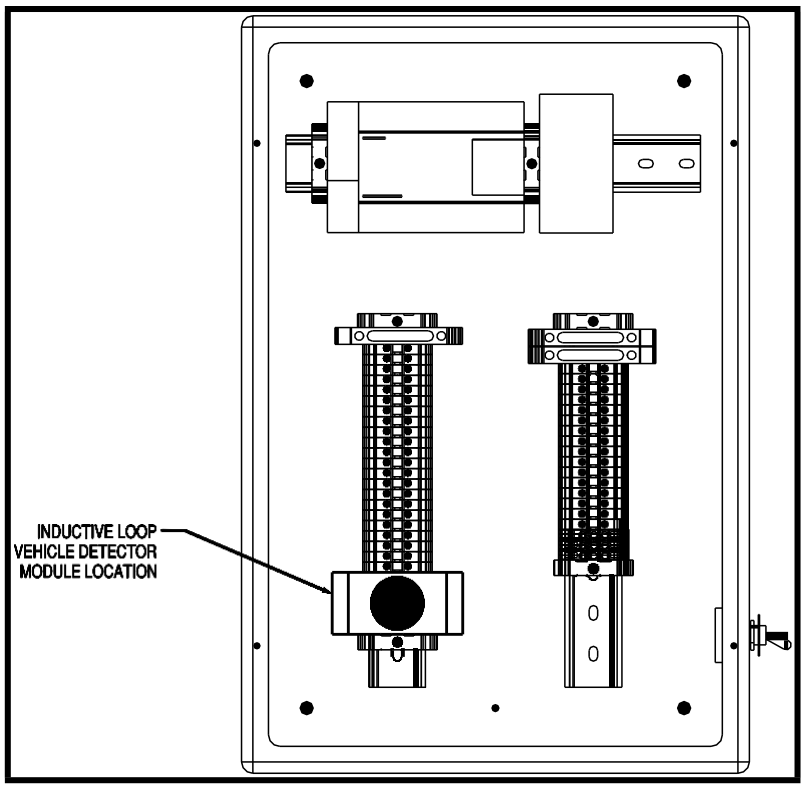


Figure 45 Installation Location of Optional Inductive Vehicle Detection Module

(Saw Cut Control), Control Cabinet)

Figure 46 Typical Inductive Vehicle Detection Module (Saw Cut Control)

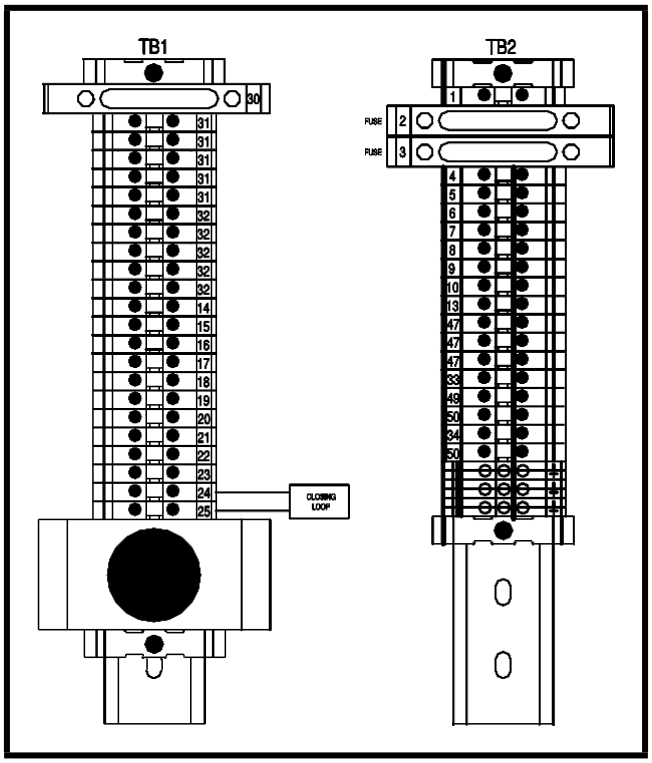


Figure 47 Wiring of Optional Inductive Vehicle Detection Module

Tool Required	Tool Type	Tool Specification
	Screw Driver	Flat, Small
	Wire Strippers	If required for cable connection

Appendix C – General Safety

C.1 General Safety Considerations

The following safety instructions, and any/all applicable local, city, state and federal regulations/laws/codes are to be observed for the installation and operation of this barricade.

1. Locate the barrier away from pedestrian traffic and restrict all pedestrian traffic away from the barricade.
2. Locate the barricade far enough from the street so an exiting or entering vehicle can clear the barricade completely while waiting to pull into or out into traffic.
3. The closing and opening actions must be observed. The mounting of operating switches or signals outside the field of direct view is not permissible; there must be a line of site between the barrier and the control switches.
4. It is forbidden for person or goods to be anywhere within the swing zone or the barrier while in operation. Severe damage. Injury or loss of life may occur.
5. Provide adequate nighttime illumination of the unit and signs warning of its presence.

C.2 Safety Signs

The following illustrations depict safety-related signs that are available from Spike Systems to address a range of possible client needs.


WARNING
DO NOT
ENTER
SEVERE TIRE DAMAGE
WALKING PROHIBITED IN DRIVEWAY
SPIKE SYSTEMS INC. 602-243-0291


WARNING
DO NOT
ENTER
EMPLOYEE'S ONLY
SPIKE SYSTEMS INC. 602-243-0291


DANGER
NO PEDESTRIANS
NO BICYCLES
NO MOTORCYCLES
SPIKE SYSTEMS INC. 602-243-0291


WARNING
DO NOT
ENTER
BUSES
ONLY
SPIKE SYSTEMS INC. 602-243-0291


WARNING
DO NOT
ENTER
SPIKE SYSTEMS INC. 602-243-0291


WARNING
STOP HERE
ON RED
ONLY ONE CAR
PER YELLOW
SPIKE SYSTEMS INC. 602-243-0291

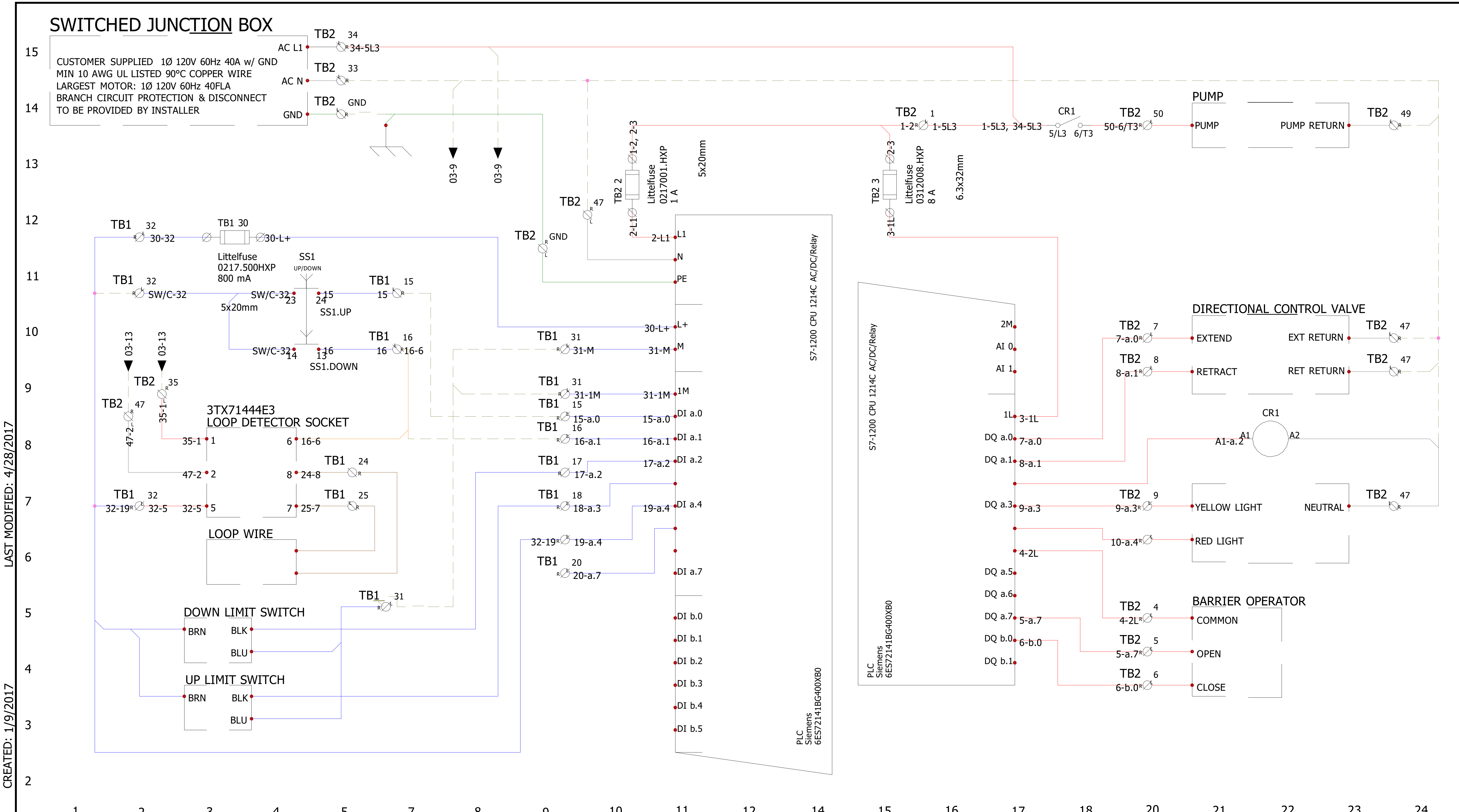

WARNING
STOP HERE
ON RED
ONLY ONE CAR
PER YELLOW
SPIKE SYSTEMS INC. 602-243-0291


WARNING
STOP HERE
ON RED
FAILURE TO STOP WILL RESULT IN
SEVERE TIRE DAMAGE
ONLY ONE CAR PER GREEN
SPIKE SYSTEMS INC. 602-243-0291


WARNING
STOP HERE
ON RED
ONLY ONE CAR PER YELLOW
FAILURE TO STOP WILL RESULT
IN SERIOUS INJURY
NO PEDESTRIANS
IN TRAFFIC LANES
SPIKE SYSTEMS INC. 602-243-0291

LAST MODIFIED: 4/28/2017

CREATED: 1/9/2017



SWITCHED JUNCTION BOX
CUSTOMER SUPPLIED 1Ø 120V 60Hz 40A w/ GND
MIN 10 AWG UL LISTED 90°C COPPER WIRE
LARGEST MOTOR: 1Ø 120V 60Hz 40FLA
BRANCH CIRCUIT PROTECTION & DISCONNECT
TO BE PROVIDED BY INSTALLER
AC L1
AC N
GND
TB2 34
34-5L3
TB2 33
TB2 GND
03-9
03-9
TB2 47
TB2 GND
TB2 2
2-L1
1-2, 2-3
Littelfuse
0217001.HXP
1 A
5x20mm
TB2 3
3-1L
2-3
Littelfuse
0312008.HXP
8 A
6.3x32mm
TB2 1
1-2
1-5L3
1-5L3, 34-5L3
CR1
5/L3
6/T3
TB2 50
50-6/T3
PUMP
PUMP
PUMP RETURN
TB2 49
TB1 32
30-32
TB1 30
30-L+
Littelfuse
0217.500HXP
800 mA
5x20mm
SS1
UP/DOWN
TB1 32
SW/C-32
SW/C-32
23
24
15
SS1.UP
TB1 15
15
TB1 16
16
16-6
SW/C-32
14
13
16
SS1.DOWN
03-13
03-13
TB2 35
35-1
TB2 47
47-2
3TX71444E3
LOOP DETECTOR SOCKET
35-1 1
6 16-6
47-2 2
8 24-8
TB1 24
TB1 32
32-19
32-5
32-5 5
7 25-7
TB1 25
LOOP WIRE
TB1 31
31-M
TB1 31
31-1M
TB1 15
15-a.0
TB1 16
16-a.1
TB1 17
17-a.2
TB1 18
18-a.3
32-19
19-a.4
TB1 20
20-a.7
TB1 31
DOWN LIMIT SWITCH
BRN
BLK
BLU
UP LIMIT SWITCH
BRN
BLK
BLU
2-L1 L1
N
PE
30-L+ L+
31-M M
31-1M 1M
15-a.0 DI a.0
16-a.1 DI a.1
17-a.2 DI a.2
19-a.4 DI a.4
DI a.7
DI b.0
DI b.1
DI b.2
DI b.3
DI b.4
DI b.5
S7-1200 CPU 1214C AC/DC/Relay
PLC
Siemens
6ES72141BG400XB0
S7-1200 CPU 1214C AC/DC/Relay
PLC
Siemens
6ES72141BG400XB0
2M
AI 0
AI 1
1L 3-1L
DQ a.0 7-a.0
DQ a.1 8-a.1
DQ a.3 9-a.3
4-2L
DQ a.5
DQ a.6
DQ a.7 5-a.7
DQ b.0 6-b.0
DQ b.1
DIRECTIONAL CONTROL VALVE
TB2 7
7-a.0
EXTEND
EXT RETURN
TB2 47
TB2 8
8-a.1
RETRACT
RET RETURN
TB2 47
CR1
A1-a.2
A1
A2
TB2 9
9-a.3
YELLOW LIGHT
NEUTRAL
TB2 47
10-a.4
RED LIGHT
BARRIER OPERATOR
TB2 4
4-2L
COMMON
TB2 5
5-a.7
OPEN
TB2 6
6-b.0
CLOSE

HEITEK AUTOMATION	2102 W. Quail Ave. Ste. 4 PHOENIX, ARIZONA 85027 PH 602.269.7931 FX 602.269.8037 www.heitek.com | info@heitek.com	Spike Systems 3623 S 7th Street Phoenix, AZ 85040

CONTRACT N° : HTA-SSS-091615-000-00

LOCATION: L1

Spike System Control Panel

Schematic

APPROVED BY: shillmeyer

APPROVED DATE: 4/3/2017

REV.	DATE	NAME	CHANGES
B	4/28/2017	shillmeyer	New enclosure and jumper
A	1/9/2017	shillmeyer	

DRAWN BY: shillmeyer

DATE: 1/9/2017

CHECKED BY: shillmeyer

CHECKED DATE: 4/3/2017

REVISION

SHEET: 03

OF: 11