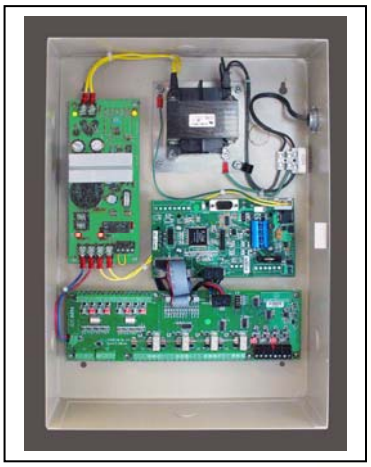
4900 SERIES PLC INTERLOCK SYSTEM

The 4900 series PLC interlock controller is a cost effective method for operating door interlock and mantrap systems of up to 120 doors. The basic system consists of a controller and one or more I/O (Input Output) modules. The I-O Modules are available as a 4X4 or an 8X8 configuration depending on the number of inputs and outputs required. Outputs are a combination of DPDT relays and open collector powered auxiliary outputs able to drive low voltage loads directly, up to 40 mA per channel. The 4900 controller is pre-programmed for most applications and shipped from stock. It can be programmed at the factory for custom application requiring timed sequences (such as airlock, wash down etc.) or Interlocks involving multiple rooms and up to 120 doors.



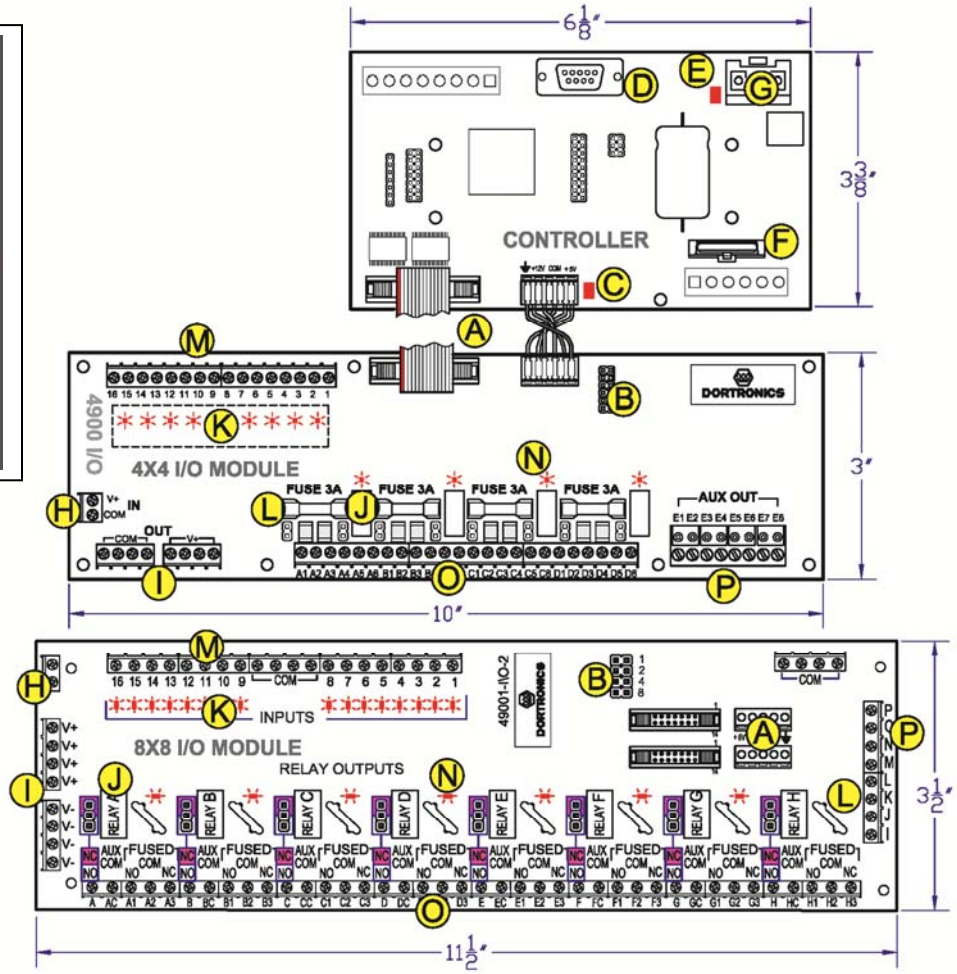


FIG. 1

A	Inter-board Connectors	G	Power Connector 12-24 VDC	M	Signal (Dry Contact) Input Terminals
B	I-O Address Jumper Matrix	H	Module Power In – Factory Wired	N	Output Relay Status Indicating LED
C	Watch Dog blink rate 3 times/sec	I	Power Out Terminals	O	Relay Contact Terminals
D	Programming Port	J	Output Relays – switch 3 Amp Max	P	Powered Output Terminals
E	Power Indicating LED	K	Input Status Indicating LEDs		
F	Memory Backup Coin Cell	L	Output Fuse – In series with Com		

HOOKUP

The standard 4900 controller comes mounted in a lockable NEMA enclosure with one or more Input/Output (I/O) relay modules and a 4 Amp power supply with user selectable output of 12 or 24 VDC.

The 4X4 I/O module (see Figure 2) has 8 input channels and 8 outputs comprised of 4 independent DPDT relay contact sets (one of each is fused) and 4 powered outputs (40 mA max. per channel) that may be used to drive indicators, and/or auxiliary relays.

The power supply has a Fire Alarm Interface. An interruption of a normally closed fire alarm circuit (such as the activation of a pull box) will cause the power supply fire alarm relay to de-energize cutting low voltage power to all door locks and other devices connected to the switched power terminals. Devices connected to the un-switched power terminals remain powered.

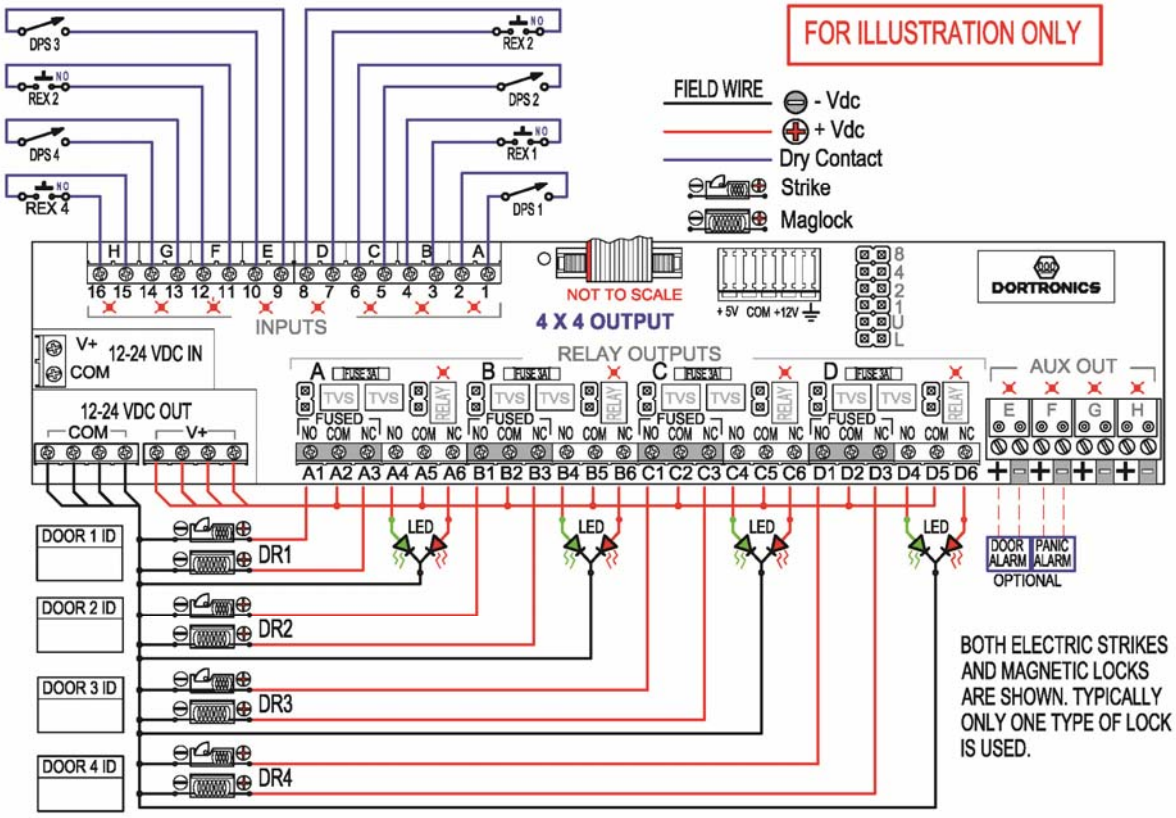


FIG. 2 TYPICAL INSTALLATION

DOOR POSITION SWITCH

Door switch contacts must be closed when the door is closed – corresponding Input LED lights to indicate closed contacts at the input. Twisted pair wiring – AWG gauge 22 or larger is recommended for all signal inputs.

REQUEST FOR ACCESS DEVICES

Unless otherwise specified, controller follows access control device unlock time (typically a card reader). Inputs require dry contact only. Use an isolation relay for non-dry contact connections (such as an output from an intercom). AWG gauge 22 twisted pair or larger is recommended. Use sufficient wire diameter to minimize voltage drop for long wire runs. Use shielded wire in proximity to sources of interference such as large motors, network servers, and sources of electromagnetic radiation.

DOOR LOCKS

Mag locks and strikes are connected to the designated relay contacts by labeled screw terminals. Relay outputs are dry contacts. Power for maglocks, strikes and indicators may be external or sourced from the I-O Module. See Figure 1 (I). Jumpers may be used to connect relay common to supply positive (+). When relays are operated with wet contacts shorting the output **will blow the fuse and may damage the I-O board!**

NOTE: Use a wire of sufficient diameter and rating to minimize voltage drop, especially over long wire runs. AWG 18 gauge is recommended for power circuits.

TRAFFIC AND LOCK STATUS LIGHTS

LED and incandescent indicator lights, typically red to show a locked or inaccessible condition and green to show an unlocked or freely accessible condition, may be connected as shown in Figure 2.

AWG 22 gauge or larger is recommended for signaling and low-power indicator circuits.

DOOR ALARM

A relay output is provided on most, but not all, 4900 interlock systems, to indicate an interlock violation. Refer to the hookup drawing supplied with the mantrap as built. The Door Alarm signals when a door has been opened without a valid request for access, or in the case of normally unlocked systems, when 2 doors are open simultaneously. Wiring should be sized according to the signaling load.

PANIC EGRESS OPTION

Most 4900 interlock systems have an emergency egress function. This is in addition to the Fire Alarm Relay. The Panic release unlocks all doors regardless of door status for immediate egress in case of a door position switch failure, a stuck door, an environmental emergency or any other reason that requires immediate egress.

To enable the emergency egress, install a maintained contact normally open switch at the terminals shown on the drawing for the system being installed. When actuated, the doors will unlock for as long as the switch contacts remain closed. The Door Alarm Relay (on all 2 & 3 door systems) will be energized to alert others to the unsecured condition.

Building codes vary by location. The installer is responsible for understanding and working in compliance with all local codes and regulations as defined by the local governing authority.

INTER-BOARD CONNECTORS (A)

Up to sixteen 4X4 modules and eight 8X8 modules can be connected to a single controller.

ADDRESS JUMPER MATRIX (B)

Each I-O Module connected to the controller must have a unique address. Jumpers are used to select a binary code representing the address of each I-O Module.

WATCHDOG LED (C)

The PLC status is continually monitored by a watchdog function. The watchdog LED (see Fig 1) blinks rapidly (at a rate of 3 times per second) to indicate that a program is loaded and is being executed correctly. If the watchdog indicator is not blinking, verify that there is 12 or 24 VDC at the correct power terminals. If power is present and the watchdog indicator is not blinking, or blinking slowly, contact Dortronics for technical assistance.

POWER OUT TERMINALS (I)

For convenience, each I-O module has four positive and four negative terminals to distribute power supply voltage to the locks and other powered devices. Complex hookups may require an additional external terminal strip to accommodate all of the necessary connections.

RELAY OUTPUTS (J)

The output relays have contacts rated for 2 Amp holding current at 30 VDC. When connected to inductive loads (including almost all electric strikes and magnetic locks) a protection diode or TVS (Transient Voltage Suppressor) is required (already included on 4x4 output boards). “Kickback” from a coil can cause arcing and damage to the contacts if not protected. Dortronics locks have an integral TVS. If a single relay is used to switch power to a pair of locks, connect the 2nd lock to the second set of contacts to distribute the load.

INPUT STATUS INDICATORS (K)

When an input is grounded (closed dry contacts) the input is active. This is indicated by a lighted LED. The inputs for the 4900 series I-O modules are opto-isolated for protection against most kinds of interference.

For Door Position Switches, Magnetic Bond Sensors and similar devices used to signal door status, the Normally Open contacts should be connected so that **when the door is closed the contacts are closed**.

For easy trouble shooting, when a door is closed the input LED for the door will be lighted. When the door opens, the LED should turn off.

For other REX devices such as Bio-sensors, card readers, motion detectors, pushbuttons, pneumatic switches and the like, the input LED should be on when the REX is active.

NOTE: The 4X4 module has a pair of terminals for each input. The odd numbered terminal is common (ground). The 8X8 module has only four common terminals grouped together. In either case, when the input circuit is completed to ground, the input is on.

FUSED OUTPUT CONTACTS (L)

One set of contacts on each output relay (DPDT) is fused. The 4X4 I-O module has four user replaceable BUS type fuses (3 Amp quick blow). Never replace a blown fuse with one with a higher rating. The 8X8 I-O Module has eight resettable Polyfuses. These open the circuit when the current flow exceeds a threshold and they automatically begin to conduct again when the over-current is corrected. These are not user replaceable.

Each DPDT output has a fused set of contacts. The other set are not fused.

OUTPUT RELAY STATUS INDICATOR LED (N)

When an output relay is energized, the LED indicator for that relay is on. Magnetic Locks are normally connected to the Normally Closed relay contacts and electric strikes are connected to the normally open contacts so that in either case, **when the relay is energized the door is unlocked**.

For verifying correct operation, compare lighted inputs to the lighted relay indicators. A common wiring error is to fail to match the input to the correct relay output. Note that the numbering for inputs and outputs begin with zero (digital convention). This can lead to confusion as door 1is often controlled by relay 0.

RELAY CONTACT TERMINAL STRIP (O)

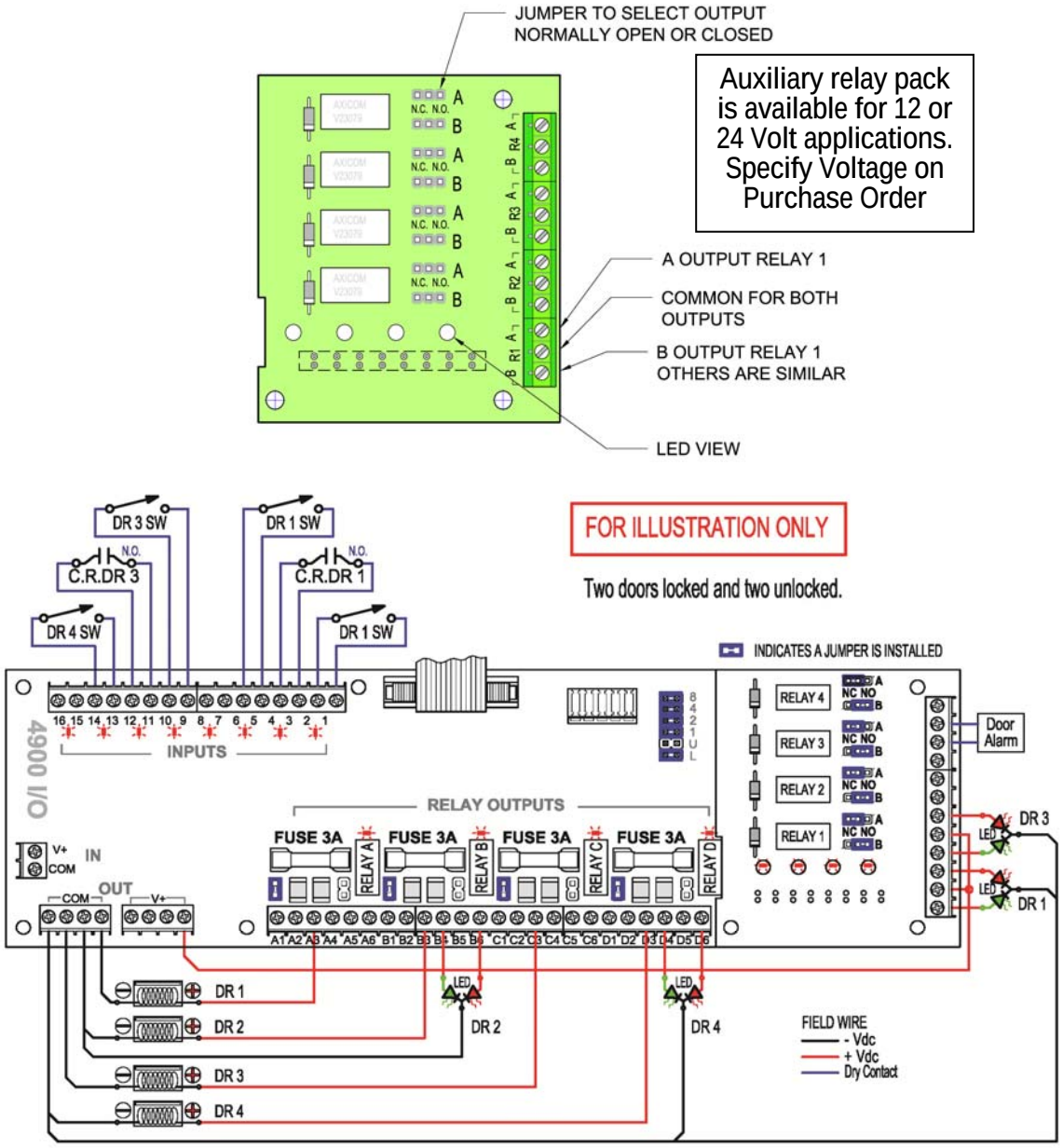
The 4X4 I-O Module provides a terminal for each relay contact and common. The 8X8 I-O Module provides a terminal for each primary (fused) contact and common, but uses a jumper to select the desired operation of the auxiliary non-fused set of relay contacts, either normally open or normally closed. If no jumper is present the auxiliary contacts are disabled. For double doors and doors using both a strike and a magnetic lock, use a separate set of relay contacts for each lock.

PROGRAMMABLE POWERED OUTPUTS (P)

Programmable powered auxiliary outputs are provided. When programmed, these may be used to power lights, beepers or off-board relay coils. Check with the specifications for a particular installation to see if the powered outputs have been enabled.

AUXILIARY RELAY PACK OPTION - 4X4 I-O Module Only

The 4X4 I-O Module can be expanded to 8 relay outputs using the auxiliary relay pack option. The output function of each auxiliary relay is selectable by jumper for either Normally Open or Normally Closed action. If no jumper is installed the output is disabled.

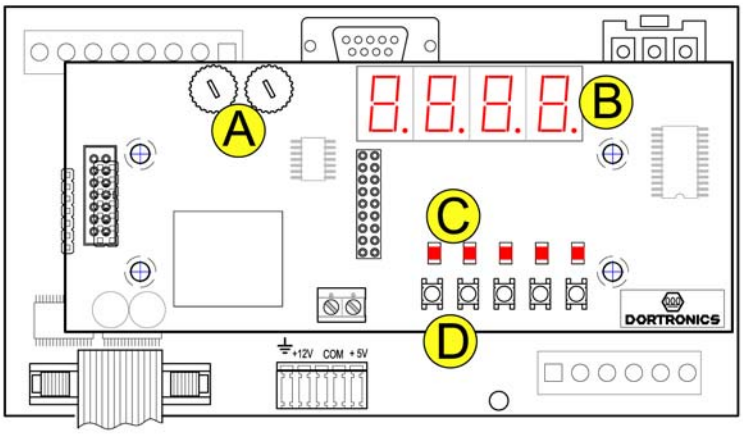


NOTE: Aux Relay output contacts (DPDT) have a shared common. Do not mix voltage sources on a single Aux Relay contact set.

Aux Relay coils are powered by the programmable open collector outputs. When the output is powered, an indicator LED lights and the aux relay is energized.

DISPLAY MODULE OPTION

Some applications require the ability to adjust program variables on-site. The optional Display Module features a four digit, seven segment display and 5 programmable pushbuttons. The stacking design of the Controller with Display Module has the same footprint as a standard Controller.



ANALOG INPUT (A)

Two programmable analog adjustment wheels are available. When programmed, the system allows for essentially endlessly variable adjustments for one or two values such as two different time delays.

SEVEN SEGMENT, FOUR CHARACTER DISPLAY (B)

A programmable four character display is available for user feedback. It can be programmed to show changes in user adjusted variables, the status of count down or count up timers, or which setting is currently operable.

PROGRAMMABLE STATUS LEDs (C)

There are five programmable status lights. These are typically used to alert the user that a programming step has been completed or that a programming pushbutton is active.

PROGRAMMABLE PUSHBUTTONS (D)

There are five programmable pushbuttons that may be used to enter changes to variable, store variables in memory, recall stored values, increase or decrease the value of stored values, set delay times and reset or clear pending actions.

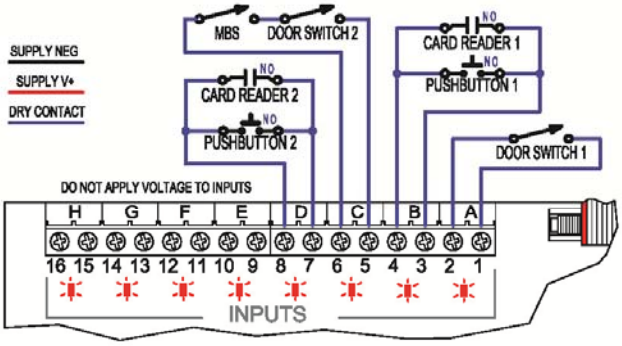
SUGGESTED APPLICATIONS

The ability to adjust variables on site makes it possible to easily:

- Sequence multi-stage functions such as airlock equalization followed by deflation of door seals;
- Set and adjust timing variables such as unlock time, grace time before alarm sounds, timed system reset;
- Save event count to memory, retrieve count from memory and clear memory;
- Change to one or more alternate Interlock Patterns, or other logic functions;
- Event triggered camera on time.

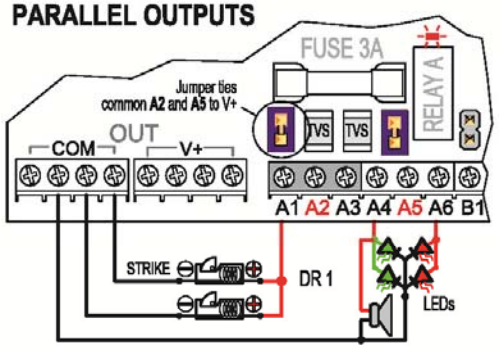
CONNECTIONS FOR SPECIAL CONDITIONS

PARALLEL and SERIES INPUTS



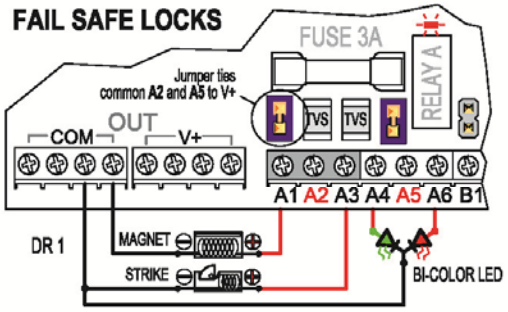
Two or more normally open **dry contact** switches can be connected in parallel at any input. Similarly, Door Position Switches and Magnetic Bond Sensors (or other sensor outputs) can be connected in series as long as the contacts are dry.

PARALLEL OUTPUTS



Use Parallel connections to operate multiple devices from a single DPDT relay output. Wet contact jumpers eliminate having to connect relay common back to V+ out terminals. Though fused for 3 Amps, do not exceed 1 Amp holding current per set of contacts to ensure optimum service life.

FAIL SAFE LOCKS

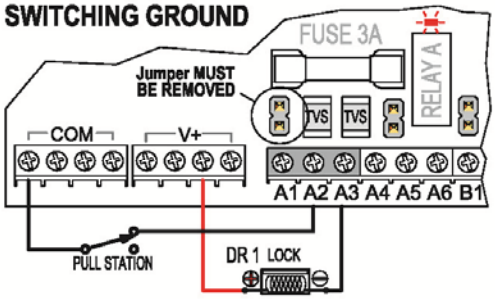


The convention for Dortronics controllers is that the relay energizes to unlock the door. For mag locks, this is inherently FAIL SECURE.

FAIL SAFE operation of a magnetic lock requires that the relay energizes to lock the door. The 4900 controller can be programmed for either operation, but **FAIL SAFE MUST BE SPECIFIED PRIOR TO PROGRAMMING.**

Electric strikes can be connected to either output and do not usually require special programming for Fail Safe or Fail Secure operation.

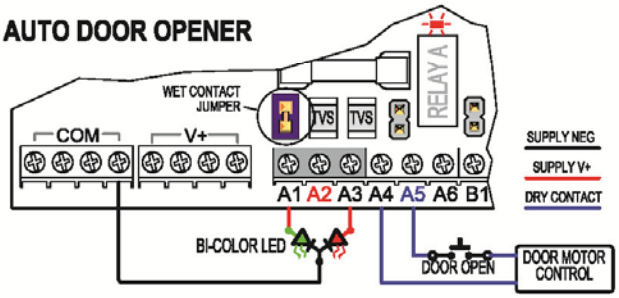
SWITCHING GROUND



Some installations require that the lock relay switches the lock ground lead. Relay common must be wired to the ground and the WET CONTACT jumper must be removed to prevent a short circuit and possible damage to the board.

Shown with Pull Station for emergency exit by cutting lock power at the door.

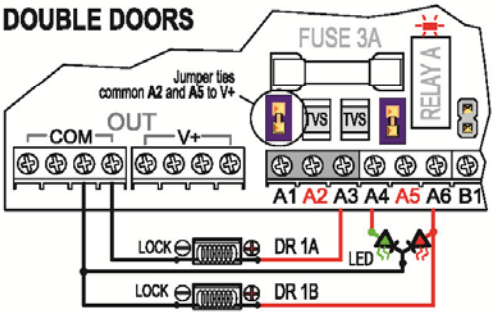
AUTO DOOR OPENER



When the relay is energized the door OPEN request circuit is enabled. The LED turns green to indicate that the door may be opened. When the relay is not energized, the door OPEN request circuit is interrupted. The red LED shows that the door is not available for access.

NOTE: a wet contact jumper is used to tie A Common (**A2**) to V+. There is no jumper at **A5** because dry contacts are required.

DOUBLE DOORS



For double doors, connect each lock to one set of the DPDT contacts to distribute the load. The LED for lock status indication can be connected in parallel as shown.

NOTE: Wet contact jumpers are used to tie common (A2 & A5) to V+ to eliminate having to wire common back to V+ terminal.

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RECOMMENDED EQUIPMENT –

DORTRONICS PART#	DESCRIPTION
Dortronics #1110xDxB	1200 lb electromagnetic 12/24 VDC maglocks with built-in door position switch.
Dortronics #7201xL2-H	High intensity Red / Green LEDs on single gang S/S wall plate.
Dortronics #7202xL2-HxCS	High intensity Red / Green LEDs with Piezo sounder on double gang S/S wall plate. (Optional for use with security breach alarm output.)
Dortronics #5216 PP23PPXE2	Panic mushroom switch latching push, pull.

OPTIONS (AVAILABLE AT EXTRA COST) –

- Lock Status Indicators – Use Dortronics #7201xL2-H at either side of each controlled door. LEDs follow lock status (Red when secure & Green when unlocked for access). LED indicators can share low voltage (12 or 24 VDC) lock power & control relays.
- Door Prop Alarm – Use Dortronics #7281-EA Local Door Alarm or #7286-PT5 Door Prop Alarm.
- Security Breach Alarm – Contact factory for additional relay outputs to operate Dortronics sounder. Use Dortronics #7201xCS Piezo Sounder on single gang S/S wall plate (or add xCS option to LED Indicators).
- Custom Functions – Contact factory for special customer specified operations. Additional charges for engineering may apply.
- Fused power distribution board. Dortronics # xFO
- Auxiliary Relay Pack 4900-RLY

SPECIFICATIONS

	Qty	Description	Remarks
Power In		12 or 24VDC regulated - plus, common and earth ground	3 - Screw Terminals
Inputs	8 or 16	Single or Dual I-O Module – dry contact only	Screw Terminals
Outputs	4 or 8	Single or Dual I-O Module - DPDT Relays rated 2Amps @ 30 VDC	Screw Terminals
	4 or 8	Single or Dual I-O module – open collector powered outputs	Screw Terminals
Temperature		Operating 0-60° C	
Current		See table below.	

Current Draw - Condition	Current in mA	Volts
Controller only	45	12
with 1 I/O board quiet	65	12
With 1 I/O board all driven (Relay Aux Board)	170	12
With 2 (or dual) I/O boards quiet	< 100	12
With 2 (or dual) I/O boards + Aux relay board - all driven	< 300	12
Controller only	35	24
with 1 I/O board quiet	60	24
With 1 I/O board all driven (Relay Aux Board)	240	24
With 2 (or dual) I/O boards quiet	< 90	24
With 2(or dual) I/O boards all driven (relay aux boards)	< 330	24

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SALES - WARRANTIES

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Product Warranties:

All electromagnetic locks have a **LIFETIME GUARANTEE** against defects in material and workmanship. Defective units will be replaced or repaired based upon incoming evaluation and inspection.

All other Dortronics components of the Electric Locking System shall be similarly warranted for a period of one year. Expressed warranties are conditionally based on the requirement that the items covered within the guarantee are used and maintained in accordance with the manufacturer's recommendations.

A Return Authorization Number must be obtained and accompany all returns within 14 days of issue. Unused items returned for credit must be complete and packed in original unit box and are subject to a 15% restocking fee. Any shipping or order discrepancies must be reported within 5 days of receipt.

www.dortronics.com

INSTALLATION AND OPERATION NOTES