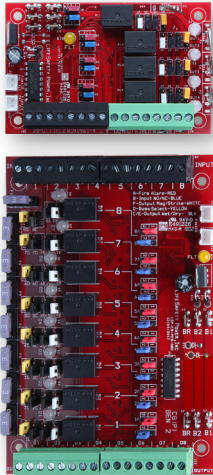


**OVERVIEW**



**FLEXPOWER's** C4 and C8 provide 4 or 8 controlled outputs for powering locks or any other devices where controlled power is required. Each output has an associated input which is highly flexible, accepting fail-safe or fail-secure dry contact inputs, voltage input, or open collector (transistor) input.

Each output is configurable for fail-safe or fail-secure, voltage or dry-contact output, and FAI action. Models ending in "P" replace the 3A automotive fuse with a 2.5A PTC for Class 2 Power Limiting.

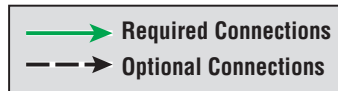
This application note refers to locks as the load device, however other types of devices may be powered and controlled by the C4 or C8.

For simplicity, this application also references primarily the C8. The C4 is identical to the C8, other than layout and zone count and may be substituted for the C8 in any of the descriptions or drawings.

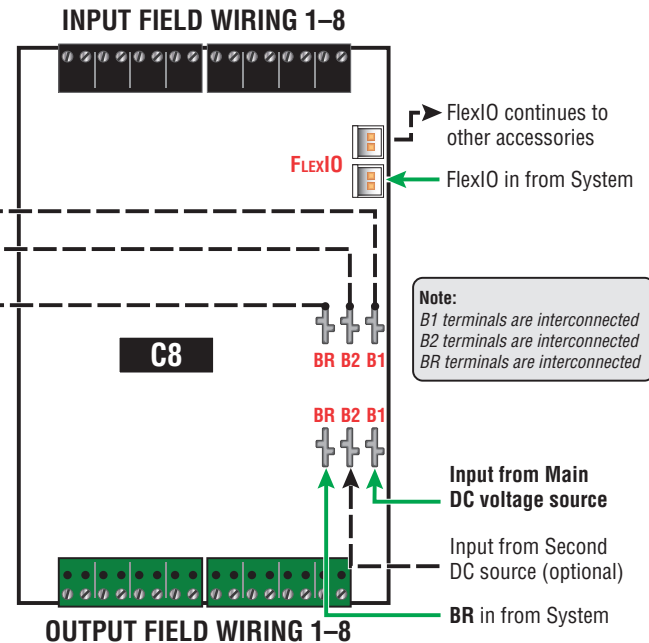
**NOTE:** There have been two generations of C8 boards. The first generation has the inputs located on the bottom edge of the board and the outputs located on the top. Early first generation C8 boards had all black jumpers. Second generation C8 boards have the inputs on the top edge of the board. The illustrations in this application note depict the second generation C8 board, but the same principles apply to the first generation board.

**Powering the Lock Control Module**

The C8 will accept one or two voltage inputs for distribution to the outputs. The C8 also uses this voltage to power its internal circuitry. The C8 will distribute any voltage from 5-24VDC, but at least one of the two voltage inputs **MUST** be at least 12V for the C8's internal circuitry to work properly. Typically, the C8 is powered from the DC1 output of an FPO power supply or from the DCOUT of a B100 secondary power supply. The voltage supplied to the C8 must be a continuous voltage - do not supply FAI-switched voltage to the C8. The C8 board controls each output directly in response to FAI.



**Main DC voltage** continues to other accessories  
**Second DC Source** continues to other accessories  
**BR** continues to other accessories



Each of the **B1, B2, BR,** and **FlexIO** busses has *two* connectors. These connectors may be used interchangeably.  
 For example: **FlexIO** from the power supply may be connected to either of the C4/C8's FlexIO connectors, the Main DC voltage source may connect to either B1 terminal, etc.

**JUMPER DESCRIPTIONS**

Each zone on the C8 has six jumpers for configuration. Jumpers are colored by function for easy identification.

**Each jumper has two possible positions: 1 or 2**

**⚠ Check the markings on the board carefully for EVERY jumper to ensure the correct location of position 1 versus position 2**

**Red Jumper A: Zone FAI Enable**

This jumper enables or disables FAI for the selected zone. The FAI control input is on the FPO power supply board. See the FPO manual and AN27 for more information on the FAI input. Note that for FAI to work properly, the C8 must be configured so that the LED is flashing when the door is unlocked. If the LED is flashing when the door is locked, FAI will have no effect.

**Position 1 (FAI Enabled)** When this jumper is placed in position 1, the zone will unlock the door when the FAI Input is active. When the C8 is configured properly, the zone will drop power to a maglock or apply power to a fail-secure strike when FAI is active. When FAI is active, the door will remain unlocked, regardless of the zone's input terminals.

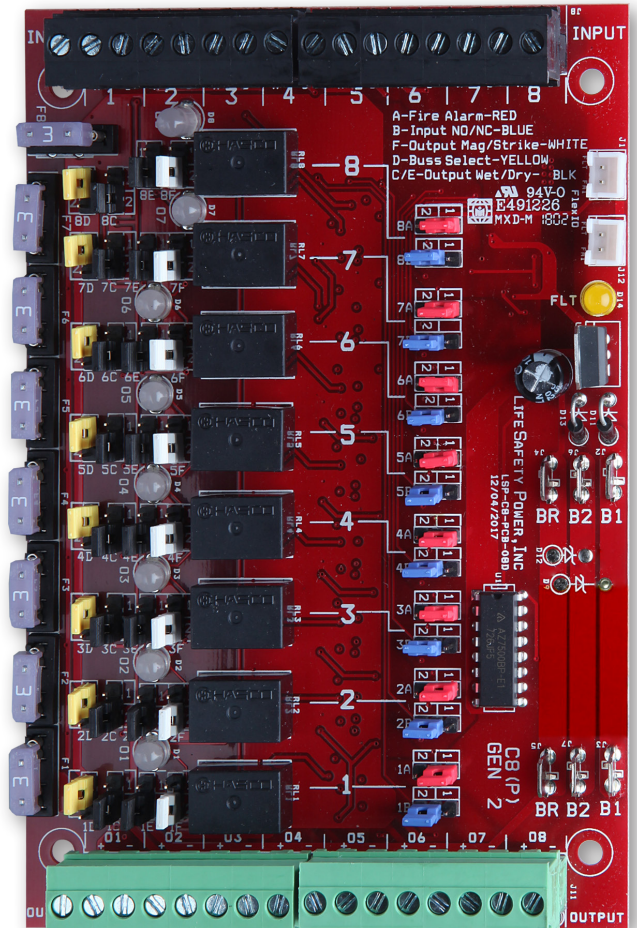
**Position 2 (FAI Disabled)** When this jumper is placed in position 2, the output will not change when FAI is activated.

**Blue Jumper B: Input Invert**

This jumper is used to select fail-safe or fail-secure for the zone's INPUT. Adjust this jumper so that the zone's output LED is FLASHING when the door is UNLOCKED. If this jumper is set incorrectly so that the zone's LED is flashing when the door is locked, FAI will not operate properly. Use the White Output Invert jumper (Jumper F) to set the output once the BLUE jumper is set properly.

**Position 1 (Fail Safe)** Use this position for a NC contact input (contact OPENS to unlock door) or for a voltage input where the voltage is REMOVED to unlock the door.

**Position 2 (Fail Secure)** Use this position for a NO contact input (contact CLOSES to unlock door) or for a voltage input where the voltage is APPLIED to unlock the door.



**JUMPER PROGRAMMING**

Reference Jumper Color

|     |  |                |
|-----|--|----------------|
| A   | <span style="background-color: red; color: white; padding: 2px;">RED</span>                | FAI            |
| B   | <span style="background-color: blue; color: white; padding: 2px;">BLUE</span>              | INVERT input   |
| C&E | <span style="background-color: black; color: white; padding: 2px;">BLACK</span>            | WET/DRY output |
| D   | <span style="background-color: yellow; padding: 2px;">YELLOW</span>                        | V SELECT       |
| F   | <span style="background-color: white; border: 1px solid black; padding: 2px;">WHITE</span> | INVERT output  |

**JUMPER DESCRIPTIONS**

Each zone on the C8 has six jumpers for configuration. Jumpers are colored by function for easy identification.

**Each jumper has two possible positions: 1 or 2**

**⚠ Check the markings on the board carefully for EVERY jumper to ensure the correct location of position 1 versus position 2**

**Black Jumper C & E: Voltage or Relay Output**

These jumpers select whether the output is a relay contact output or a voltage output. BOTH jumpers must be set to the same position for proper operation.

**Position 1 (Relay Contact Output)** By placing both jumpers in position 1, the zone's output is set as a relay contact output. Use the White Output Invert jumper (Jumper F) to select a NC or NO output. When enabled, FAI will affect a relay contact output. NOTE: The C8 has reverse protection diodes across each set of output terminals to dampen spikes returned from magnetic load devices. Because of this, the relay output is not a truly "Dry" contact output. The more positive side of the voltage being switched should be connected to the "B" terminal.

**Position 2 (Voltage Output)** By placing both jumpers in position 2, the zone's output is set to a voltage output. The voltage on the output is determined by the position of the Yellow Voltage Buss Selection jumper (Jumper D) and the source power supply(s) connected to the C8.

**Yellow Jumper D: Voltage Buss Selection**

The C8 can accept one or two power supply inputs connected to B1 and B2. This jumper selects which of these two power supplies is used for the zone's output. If only a single power supply is used, this jumper must be set for position 1. If the output is set as a relay contact output, the position of this jumper has no effect.

**Position 1 (B1 Buss)** This position selects the power supply connected to the B1 input of the C8 board.

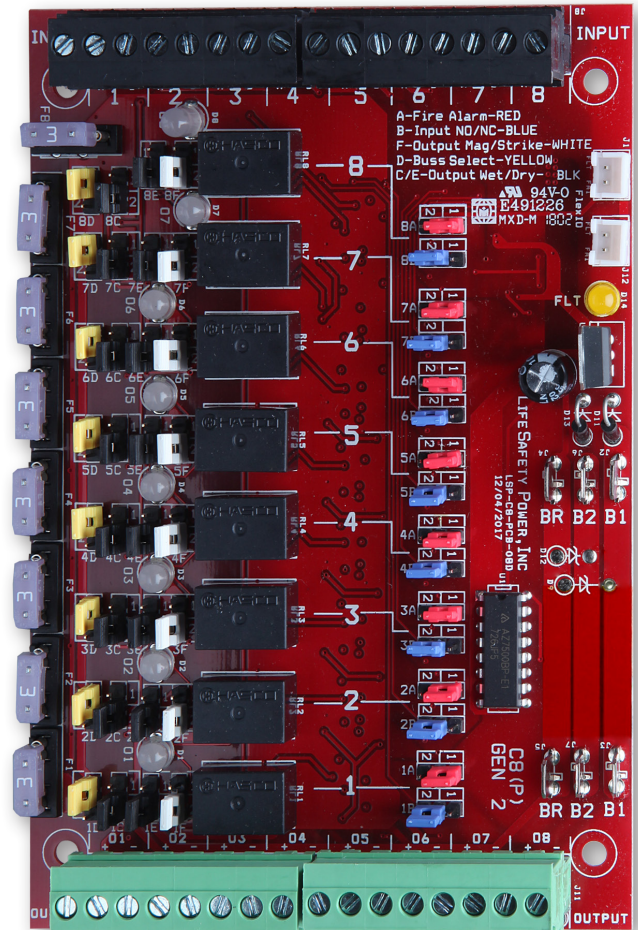
**Position 2 (B2 Buss)** This position selects the power supply connected to the B2 input of the C8 board.

**White Jumper F: Output Invert**

This jumper is used to select a fail-safe or fail-secure OUTPUT. Set this jumper in conjunction with the BLUE Input Invert jumper (Jumper B) so that the zone's LED FLASHES when the door is unlocked.

**Position 1 (NC / Voltage When Input is Activated)** By placing this jumper in position 1, the zone's output terminals will connect through the zone relay's NC contact if set for a relay contact output or will output a voltage when the input is active if set for a voltage output. The position is typically used for fail-secure door strikes.

**Position 2 (NO/Voltage When Input is Deactivated)** By placing this jumper in Position 2, the zone's output terminals will connect through the zone relay's NO contact if set for a relay output or will remove voltage from the output when the zone is activated. This position is typically used for Mag Locks.



### JUMPER PROGRAMMING

Reference Jumper Color

|                |   |                       |
|----------------|---|-----------------------|
| <b>A</b>       | <span style="background-color: red; color: white; padding: 2px 5px;">RED</span>     | <b>FAI</b>            |
| <b>B</b>       | <span style="background-color: blue; color: white; padding: 2px 5px;">BLUE</span>   | <b>INVERT input</b>   |
| <b>C&amp;E</b> | <span style="background-color: black; color: white; padding: 2px 5px;">BLACK</span> | <b>WET/DRY output</b> |
| <b>D</b>       | <span style="background-color: yellow; padding: 2px 5px;">YELLOW</span>             | <b>V SELECT</b>       |
| <b>F</b>       | <span style="border: 1px solid black; padding: 2px 5px;">WHITE</span>               | <b>INVERT output</b>  |

## WIRING THE INPUTS

Each input of the C8 has two terminals, labeled A and B. The function of these terminals is as follows:

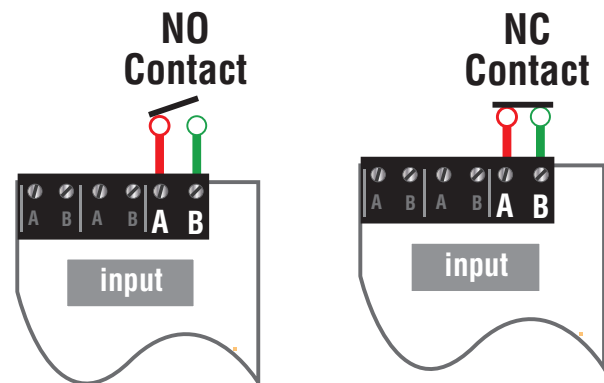
**Terminal A** This terminal supplies a current-limited voltage which may be used to activate terminal B. The voltage on this terminal will be the higher of the voltages supplied to the B1 and B2 power inputs. For example, if supplying the C8 with only 12V, the A terminal will be approximately 12V (with no load). If using 12V on B1 and 24V on B2, terminal A will be approximately 24V. Current from this terminal is limited to 10mA maximum.

**Terminal B** This terminal is the input to the C8. The input will activate when voltage is applied to this terminal. Either the voltage from terminal A may be used, or a separate voltage may be used, as long as it is common grounded with the FPO power supply powering the C8 board.

### The versatility of the C8 allows activation of the input by virtually any input method

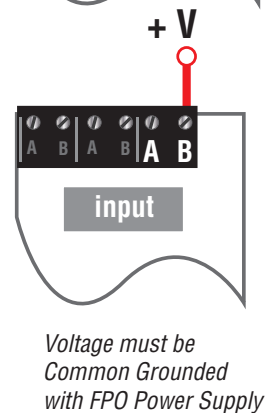
#### Dry Contact (Relay or Switch Input)

To activate the input with a dry contact, the contact should be placed directly across the A and B terminals. This will connect the voltage from the A terminal to the B terminal through the contact. Configure the C8 for normally open or normally closed by setting the Input Invert jumper (Jumper B - BLUE) so that the green zone LED flashes when the door should be unlocked.



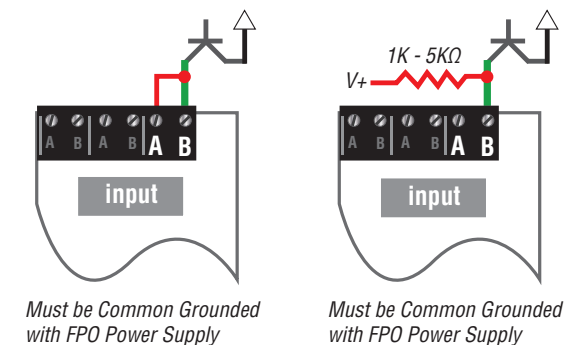
#### Voltage Input

Since terminal B is a voltage input, any voltage between 9 and 30V may be connected directly to terminal B to activate the input. The voltage used to activate the input **MUST** be common grounded with the FPO power supply for reliable activation of the input. The C8 may also be set to activate on removal of voltage by setting the Input Invert jumper (Jumper B - BLUE) so that the zone LED flashes when the door should be unlocked.



#### Open Collector (Transistor) Input

When using an open collector to activate a C8 input, a current limited voltage must be supplied to the B terminal to hold it activated. The open collector will then shunt that voltage to ground when the internal transistor turns on. The current limited voltage may come either from terminal A on the C8 or from a separate source. If the source used is not current limited, a resistor (approximately 1K-5K ohm) must be placed in series with the source to prevent damage to the open collector output. The open collector and voltage source must be common grounded with the FPO power supply to ensure reliable activation of the C8 input.



## WIRING THE OUTPUTS

Each output of the C8 has two terminals, labeled A and B. The function of these terminals varies based on the setting of jumpers C and E (Black).

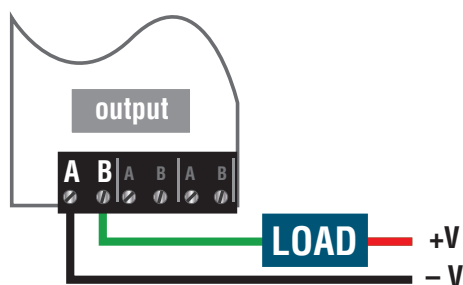
### Relay Output

**⚠** The C8 has reverse protection diodes across each set of output terminals to dampen spikes returned from magnetic load devices. Because of this, the relay output is not a truly "Dry" contact output. The more positive side of the voltage being switched should be connected to the "B" terminal.

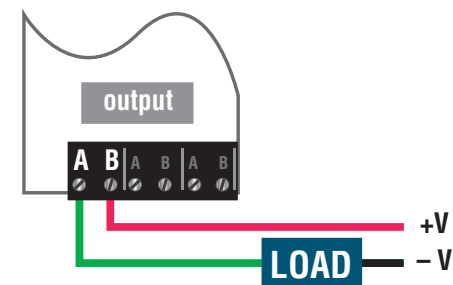
**Terminal A** One leg of the output relay contact. This terminal should be connected on the more negative side of the circuit being switched.

**Terminal B** The other leg of the output relay contact. This terminal should be connected to the more positive side of the circuit being switched.

### Switching the negative side of the load



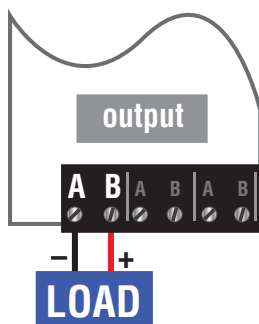
### Switching the positive side of the load



### Voltage Output

**Terminal A Constant DC - (Common)** This terminal connects to DC common. This connection is constant and does not change when the zone input of the C8 is activated.

**Terminal B Switched DC +** This connection switches between positive voltage and open circuit when the input of the C8 is activated.



| C4 / C8 COMMON JUMPER SETTINGS                             | Jumper   |           |            |             |            |            |
|--|----------|-----------|------------|-------------|------------|------------|
|  | xA (red) | xB (blue) | xC (black) | xD (yellow) | xE (black) | xF (white) |
| <b>Continuous Auxiliary Output (No zone control input)</b> |          |           |            |             |            |            |
| With FAI   | 1        | 2         | 2          | Note 1      | 2          | 2          |
| Without FAI  | 2        | 2         | 2          | Note 1      | 2          | 2          |
| <b>Maglock Output</b>                                      |          |           |            |             |            |            |
| NC Contact Input - with FAI                                | 1        | 1         | 2          | Note 1      | 2          | 2          |
| NC Contact Input - without FAI                             | 2        | 1         | 2          | Note 1      | 2          | 2          |
| NO Contact Input - with FAI                                | 1        | 2         | 2          | Note 1      | 2          | 2          |
| NO Contact Input - without FAI                             | 2        | 2         | 2          | Note 1      | 2          | 2          |
| Voltage Input - with FAI                                   | 1        | 1         | 2          | Note 1      | 2          | 2          |
| Voltage Input - without FAI                                | 2        | 1         | 2          | Note 1      | 2          | 2          |
| Transistor Input - with FAI                                | 1        | 1         | 2          | Note 1      | 2          | 2          |
| Transistor Input - without FAI                             | 2        | 1         | 2          | Note 1      | 2          | 2          |
| <b>Door Strike Output</b>                                  |          |           |            |             |            |            |
| NC Contact Input - with FAI                                | 1        | 1         | 2          | Note 1      | 2          | 1          |
| NC Contact Input - without FAI                             | 2        | 1         | 2          | Note 1      | 2          | 1          |
| NO Contact Input - with FAI                                | 1        | 2         | 2          | Note 1      | 2          | 1          |
| NO Contact Input - without FAI                             | 2        | 2         | 2          | Note 1      | 2          | 1          |
| Voltage Input - with FAI                                   | 1        | 1         | 2          | Note 1      | 2          | 1          |
| Voltage Input - without FAI                                | 2        | 1         | 2          | Note 1      | 2          | 1          |
| Transistor Input - with FAI                                | 1        | 1         | 2          | Note 1      | 2          | 1          |
| Transistor Input - without FAI                             | 2        | 1         | 2          | Note 1      | 2          | 1          |
| <b>NC Relay Output (Note 2)</b>                            |          |           |            |             |            |            |
| NC Contact Input - with FAI                                | 1        | 1         | 1          | N/A         | 1          | 2          |
| NC Contact Input - without FAI                             | 2        | 1         | 1          | N/A         | 1          | 2          |
| NO Contact Input - with FAI                                | 1        | 2         | 1          | N/A         | 1          | 2          |
| NO Contact Input - without FAI                             | 2        | 2         | 1          | N/A         | 1          | 2          |
| Voltage Input - with FAI                                   | 1        | 1         | 1          | N/A         | 1          | 2          |
| Voltage Input - without FAI                                | 2        | 1         | 1          | N/A         | 1          | 2          |
| Transistor Input - with FAI                                | 1        | 1         | 1          | N/A         | 1          | 2          |
| Transistor Input - without FAI                             | 2        | 1         | 1          | N/A         | 1          | 2          |
| <b>NO Relay Output (Note 3)</b>                            |          |           |            |             |            |            |
| NC Contact Input - with FAI                                | 1        | 1         | 1          | N/A         | 1          | 1          |
| NC Contact Input - without FAI                             | 2        | 1         | 1          | N/A         | 1          | 1          |
| NO Contact Input - with FAI                                | 1        | 2         | 1          | N/A         | 1          | 1          |
| NO Contact Input - without FAI                             | 2        | 2         | 1          | N/A         | 1          | 1          |
| Voltage Input - with FAI                                   | 1        | 1         | 1          | N/A         | 1          | 1          |
| Voltage Input - without FAI                                | 2        | 1         | 1          | N/A         | 1          | 1          |
| Transistor Input - with FAI                                | 1        | 1         | 1          | N/A         | 1          | 1          |
| Transistor Input - without FAI                             | 2        | 1         | 1          | N/A         | 1          | 1          |

Note 1 - Set Jumper D according to which input voltage source (B1/B2) should be directed to the output

Note 2 - Relay OPENS when the input is activated

Note 3 - Relay CLOSES when the input is activated

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