

### Introduction

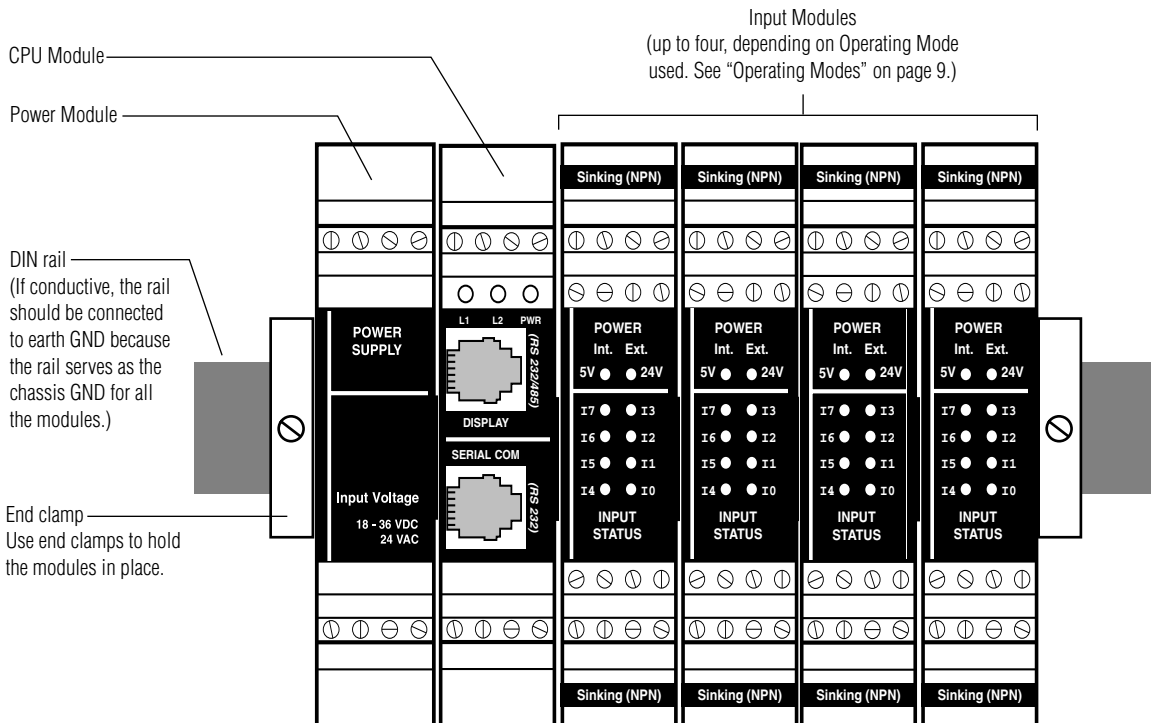
The ALPHA Discrete Input Interface allows messages to be displayed on standard ALPHA electronic signs by using simple on/off contacts to trigger messages that have been stored in a sign. The ALPHA Discrete Input Interface is designed for low-voltage applications.

Messages to be displayed are stored in a sign using either:

- Infrared handheld remote control
- Adaptive software such as ALPHA Messaging software (see "Creating messages using ALPHA Messaging software" on page 23)

The ALPHA Discrete Input Interface consists of three types of modules which can be connected in any order:

- CPU Module — serves as an interface between the Input Modules and ALPHA signs
- Input Module (up to four can be used, depending on the Operating Mode used) — the eight, dry contact inputs of each Input Module can be configured to one of five possible Operating Modes (see "Operating Modes" on page 9):
  - Mode 0: Discrete Fixed
  - Mode 1: Momentary Triggered
  - Mode 2: Binary Coded Decimal (BCD)
  - Mode 3: Binary
  - Mode 4: Counter
- Power Module — supplies power to the CPU Module and Input Modules



NOTE: Modules should be mounted in an appropriate NEMA enclosure to ensure isolation from noise and protection from harsh environments.

## Related documentation

Title	Part #	Description
Network Configurations	9708-8046	Detailed information on how to network ALPHA signs.
ALPHA Remote Control Programming Manual	9704-0002	Examples of how to program messages into ALPHA signs using a handheld infrared remote control.
ALPHA Messaging Software User Manual v1.0	9701-0202	Instructions on using the ALPHA Messaging software to program messages into ALPHA signs.

## Technical specifications

<b>All Modules</b>	
Dimensions:	2.75"W x 4.25"H x 1"D
Weight:	4 oz per module
Operating temperature:	60°C
Humidity range:	10 – 95% non-condensing
Mounting:	DIN rail 35 x 7 mm
<b>Power Module</b>	
AC input voltage <sup>1</sup>	
Max. AC voltage:	25 Vrms
Min. AC voltage:	14 Vrms
Power consumption:	15W @ 24 Vrms
DC input voltage	
Max. DC voltage:	36 VDC
Min. DC voltage:	18 VDC
Output voltage 24 VDC	
Max. voltage:	36 VDC
Min. voltage:	18 VDC
Max. current:	700 mA
Bus output voltage 5 VDC	
Max. voltage:	5.05 V
Min. voltage:	4.95 V
Max. current:	500 mA
Protection	
Type:	Polyswitch
Self-resetting:	Yes
Terminals	
Type:	Screw
Wire size:	0, 14-2, 5 <sup>2</sup> / AWG 26 - 14
<b>CPU Module</b>	
Operating voltage:	5 V
Current draw:	150 mA
Power consumption:	0.75 W
Communications	
Serial (in):	Communication type: RS232 Terminal type: RJ11 Protocol: EZ95

Display (out):	Communication type: RS485 Terminal type: RJ11 Protocol: EZ95
Terminals (out):	Communication type: RS485 Terminal type: Screw Wire size: 0, 14-2, 5 <sup>2</sup> / AWG 26 - 14 Protocol: EZ95 Max. number of drops: 32 Max. distance: 4000 ft (1200 m)
<b>Input Module</b>	
Bus power required (5 VDC)	
Max. operating voltage:	5.05 V
Min. operating voltage:	4.95 V
Max. current:	15 mA
Input power required (24 VDC)	
Max. operating voltage:	36 VDC
Min. operating voltage:	18 VDC
Max. current:	90 mA
Min. current:	5 mA
Inputs per module:	8
Discrete fixed:	8
Discrete momentary:	8
BCD:	8
Binary:	7
Counter:	3 (min.)
Protection:	Polyswitch, 300 mA
Terminals:	
Type:	Screw
Wire size:	0, 14-2, 5 <sup>2</sup> / AWG 26 - 14
Input impedance:	3600 ohms
Max. input voltage:	36 VDC
Min. input voltage:	18 VDC
Max. current draw:	3.5 mA (36 V)
Min. current draw:	4.1 mA (18 V)
<sup>1</sup> Only one power supply, 18 – 36 VDC or 24 VAC, can be used to power this product.	

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## Installation

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1. Determine the type of Operating Mode to be used and set the internal Input Module jumpers as required. See "Operating Modes" on page 9.
2. Determine the circuit type (i.e., Sinking or Sourcing) to be used and wire the circuit for the modules as required. See "Operating Modes" on page 9.
3. Determine the content of the messages to be displayed on the ALPHA sign(s). Then create the messages and store them on the sign(s). See "Creating messages using ALPHA Messaging software" on page 23.

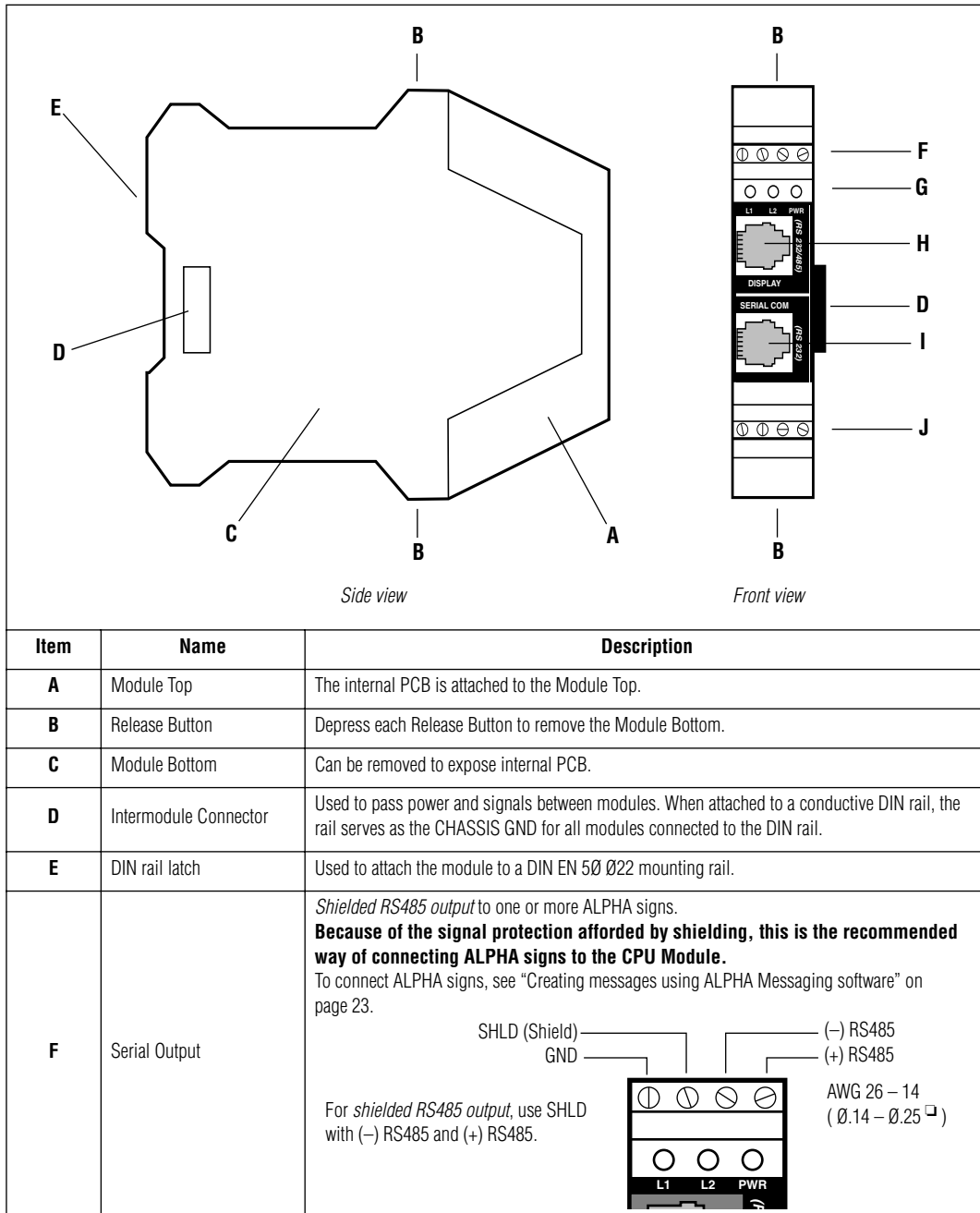
## Module descriptions

**NOTE:** Always remove power from a module before changing wiring or jumper settings.  
Failure to do so may damage the equipment.

**NOTE:** Parts are not serviceable on any of the modules. In case of malfunction, return to the manufacturer.

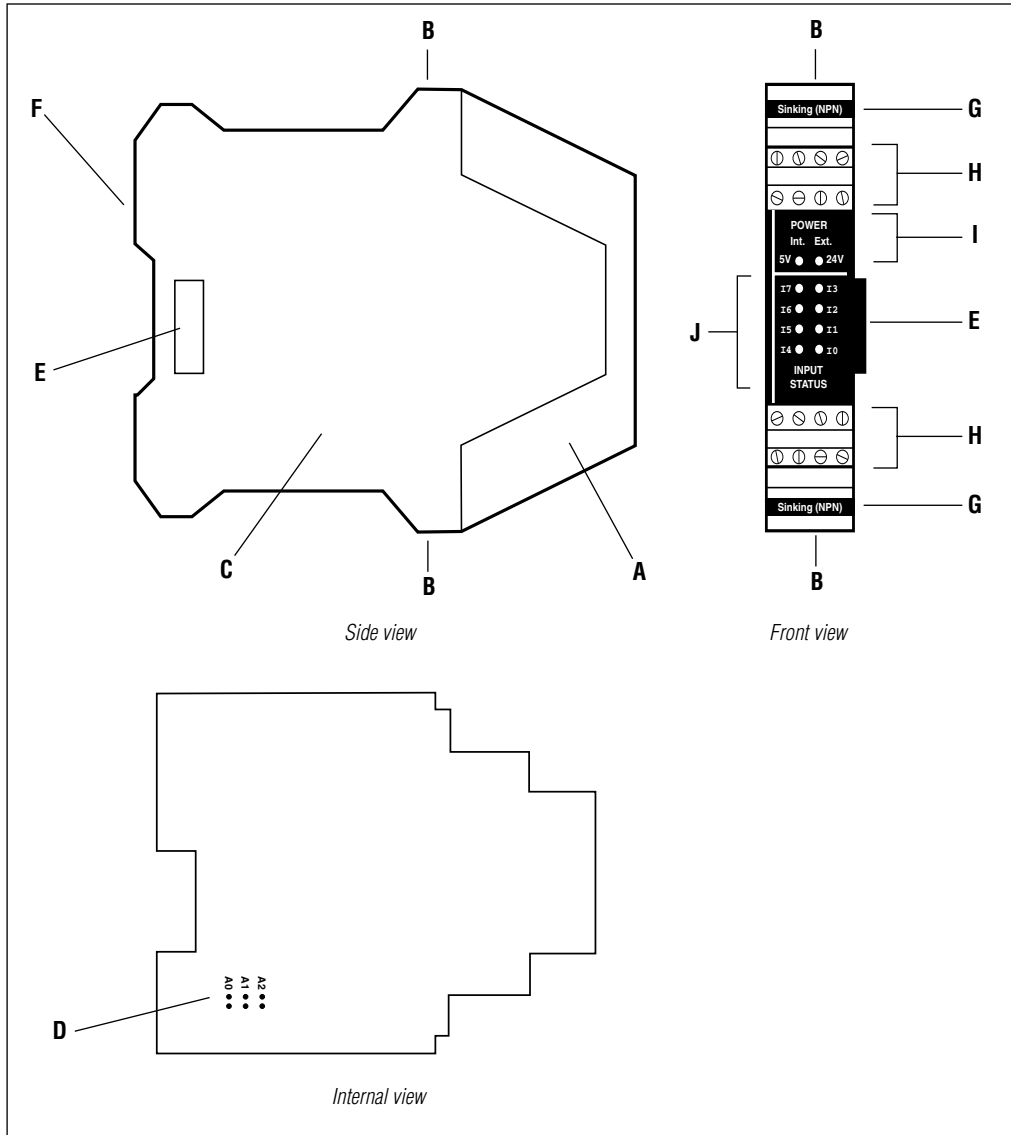
### CPU Module

**NOTE:** Only one CPU Module can be used at a time. See “Operating Modes” on page 9.

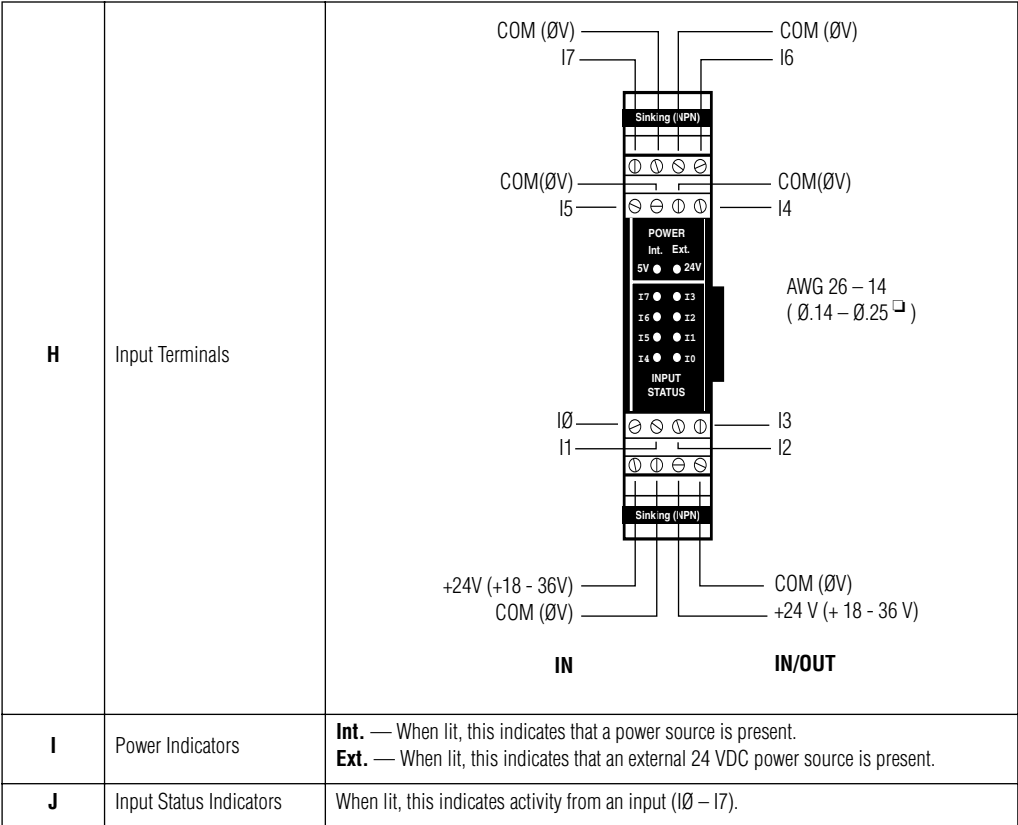


<b>G</b>	CPU Status Indicators	<p><b>PWR</b> — When lit, this indicates the unit is powered.</p> <p><b>L1</b> — Lit during power up until the CPU Module initializes.</p> <p>If <i>indicator on continuously</i> after power up, this indicates that the power source is <i>not</i> sufficient.</p> <p>If <i>indicator flashing continuously</i>, this indicates one of four possible conditions:</p> <ul style="list-style-type: none"> <li>• no Input Module is connected</li> <li>• too many Input Modules are attached for the current Operating Mode</li> <li>• Input Modules are set to <i>different</i> Operating Modes</li> <li>• an Input Module has failed or a communication failure to an Input Module has occurred</li> </ul> <p>If <i>indicator flashes once</i>, this means that the binary input is greater than or equal to 80 or that count is either &lt; -2,147,483,647 or &gt; +2,147,483,647.</p> <p><b>L2</b> — During power up, L1 and L2 flash together X+1 times, where X = Mode number (0 - 4). During normal operation, L2 flashes when the CPU Module is processing an input event.</p>
<b>H</b>	DISPLAY	<p><i>Unshielded RS485 output</i> to a <i>single</i> ALPHA sign. Used to:</p> <ul style="list-style-type: none"> <li>• program messages into a sign</li> <li>• trigger messages already in a sign</li> </ul> <p><b>This is not a telephone connector.</b></p>
<b>I</b>	SERIAL COM	<p><i>RS232 input</i> from a PC. Used to program messages and send them to a CPU Module that is <i>up to 50 feet from the PC</i>.</p> <p><b>This is not a telephone connector.</b></p>
<b>J</b>	Serial Input	Unused.

## Input Module

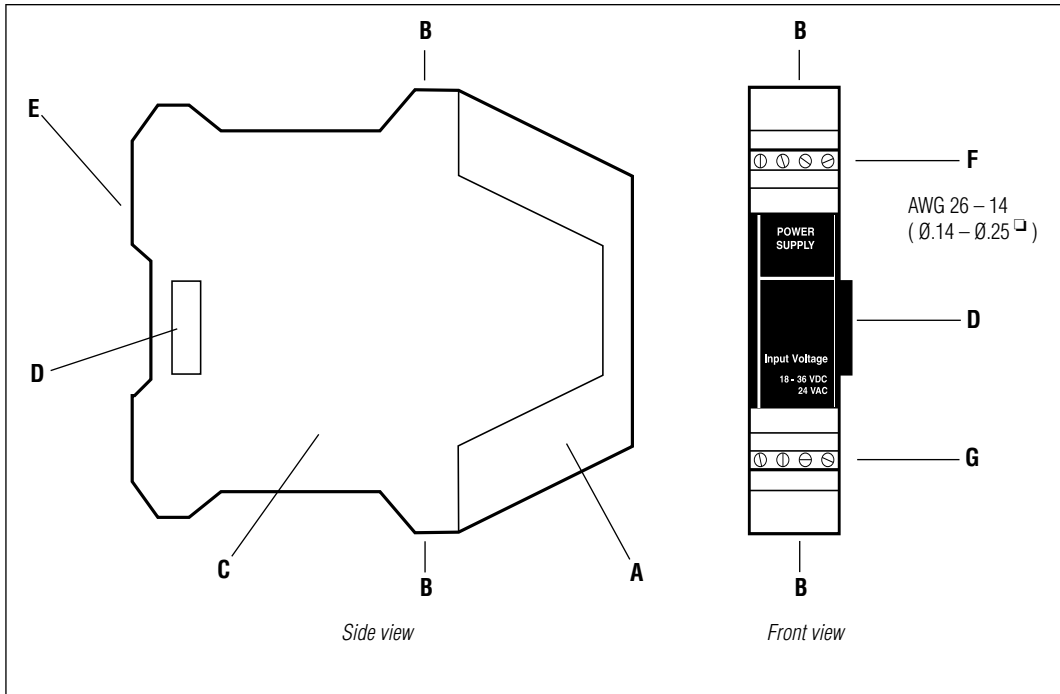


Item	Name	Description
A	Module Top	The internal PCB is attached to the Module Top.
B	Release Button	Depress each Release Button to remove the Module Bottom.
C	Module Bottom	Can be removed to change jumpers on the internal PCB.
D	Internal Jumpers	The A0, A1, and A2 internal jumpers are used to set the Operating Mode and Input Module Address. (See "Operating Modes" on page 9.) <b>NOTE:</b> Spare jumpers are included inside each Input Module.
E	Intermodule Connector	Used to pass power and signals between modules.
F	DIN rail latch	Used to attach the module to a DIN EN 50 Ø22 mounting rail.
G	Type of Input Module	Input Modules are configured for either Sinking (NPN) or Sourcing (PNP) current applications.



## Power Module

**NOTE:** Only one Power Module can be used at a time. See “Operating Modes” on page 9.



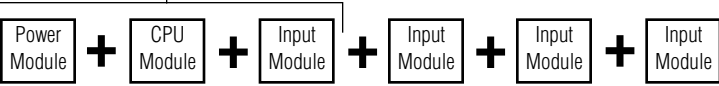
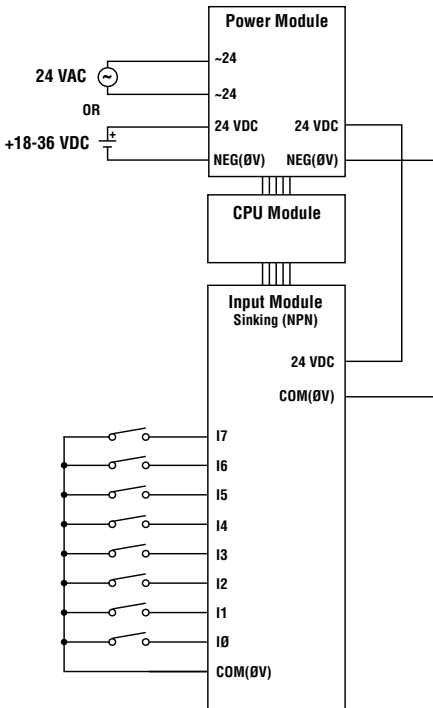
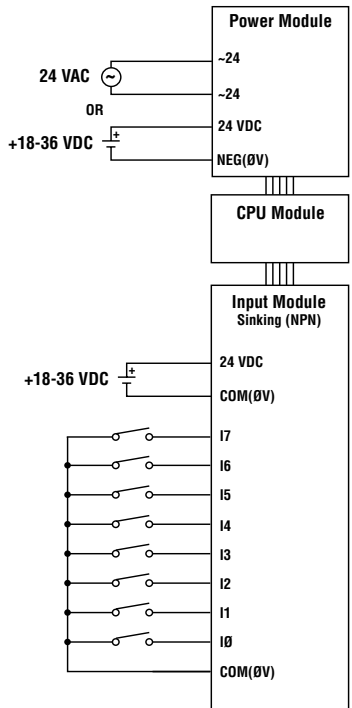
Item	Name	Description
A	Module Top	The internal PCB is attached to the Module Top.
B	Release Button	Depress each Release Button to remove the Module Bottom.
C	Module Bottom	Can be removed to expose the internal PCB.
D	Intermodule Connector	Used to pass power and signals between modules.
E	DIN rail latch	Used to attach the module to a DIN EN 5Ø Ø22 mounting rail.
F	Power Output	
G	Power Input	



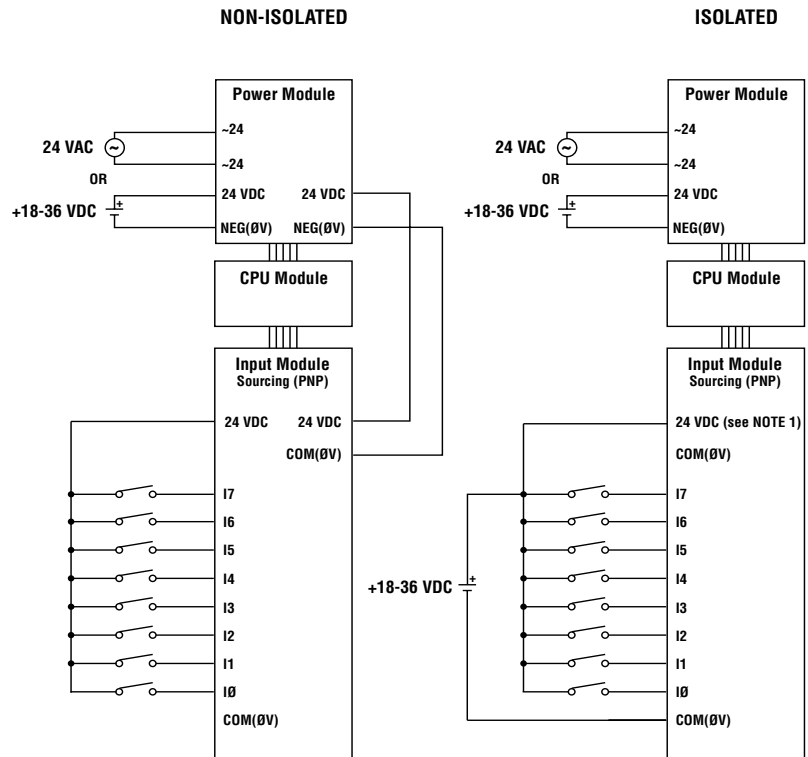
# Operating Modes

**NOTE:** Only one Operating Mode can be used at a time. For example, if three Input Modules were connected together, *all three* modules would have to use the *same* Operating Mode.

## Discrete Fixed (Mode 0)

<b>Description:</b>	When an input (I0 - I7) is high, the associated sign message is displayed. It is possible to have several messages running simultaneously on a sign.												
<b>Module configuration:</b> (modules can be connected in any order)	<p style="text-align: center;">Minimum configuration</p> <div style="text-align: center;">  </div> <p style="text-align: center;"><b>Input Module internal jumper settings:</b></p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td>A0 = 0</td> <td>A0 = 1</td> <td>A0 = 0</td> <td>A0 = 1</td> </tr> <tr> <td>A1 = 0</td> <td>A1 = 0</td> <td>A1 = 1</td> <td>A1 = 1</td> </tr> <tr> <td>A2 = 0</td> <td>A2 = 1</td> <td>A2 = 1</td> <td>A2 = 1</td> </tr> </table>	A0 = 0	A0 = 1	A0 = 0	A0 = 1	A1 = 0	A1 = 0	A1 = 1	A1 = 1	A2 = 0	A2 = 1	A2 = 1	A2 = 1
A0 = 0	A0 = 1	A0 = 0	A0 = 1										
A1 = 0	A1 = 0	A1 = 1	A1 = 1										
A2 = 0	A2 = 1	A2 = 1	A2 = 1										
<b>Maximum no. of messages:</b>	32												
<b>Maximum no. of inputs:</b>	32 (8 inputs per module x 4 Input Modules connected)												
<b>Sinking (NPN) circuit:</b>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p><b>NON-ISOLATED</b></p>  </div> <div style="text-align: center;"> <p><b>ISOLATED</b></p>  </div> </div> <p style="text-align: center; font-size: small;">COM(0V) is internally connected. 24 VDC is internally connected.</p> <p><b>NOTE:</b> All Input Modules are internally fused. Also, the Power Module is internally fused.</p> <p><b>NOTE:</b> Wire the modules according to local electrical code.</p>												

Sourcing (PNP) circuit:



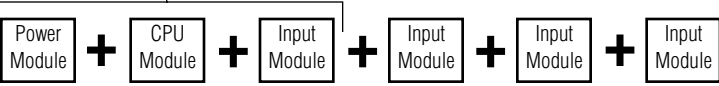
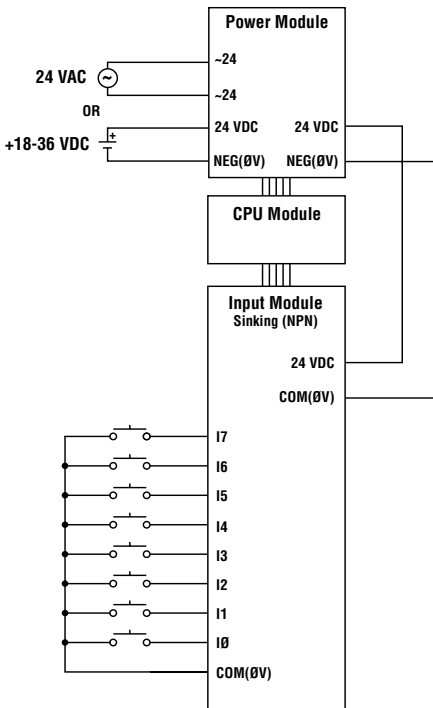
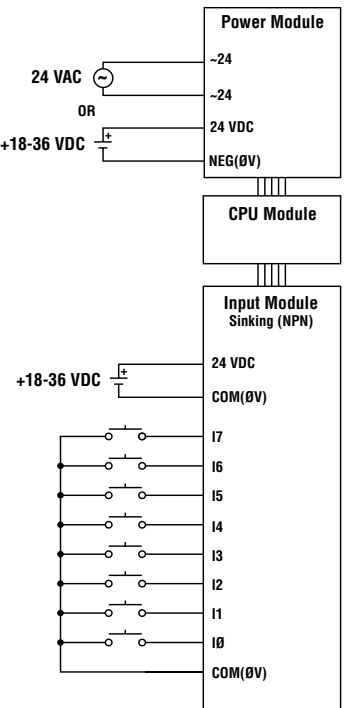
COM(0V) is internally connected.  
24 VDC is internally connected.

NOTE 1: This connection is only necessary to light the 24 VDC LED to show that power is present.

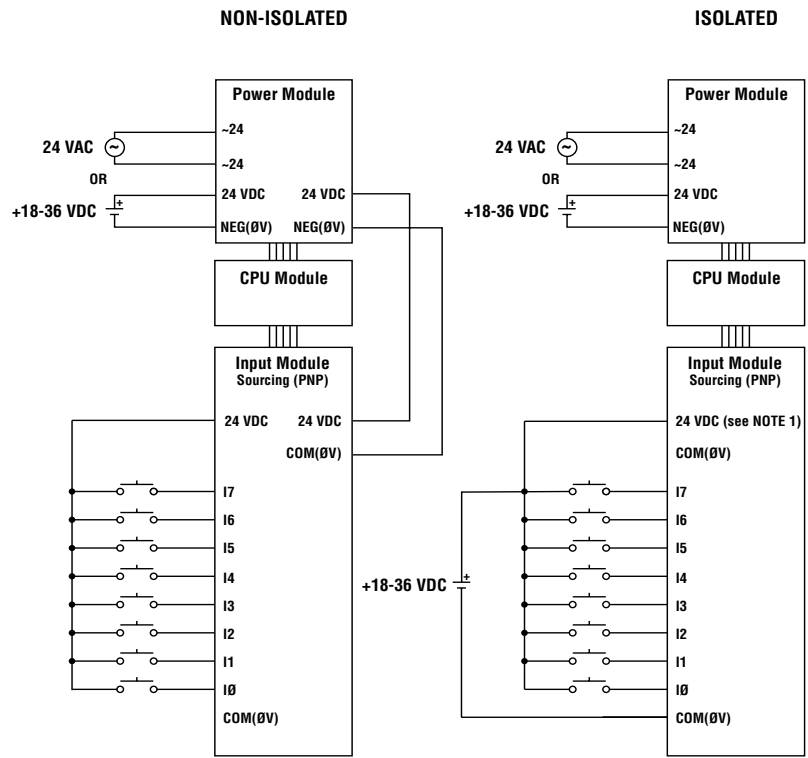
**NOTE:** All Input Modules are internally fused. Also, the Power Module is internally fused.

**NOTE:** Wire the modules according to local electrical code.

## Momentary Triggered (Mode 1)

<b>Description:</b>	When an input (I0 - I7) goes to a high state (i.e., rising edge), the associated sign message is displayed until a new message is triggered.												
<b>Module configuration:</b> (modules can be connected in any order)	<p style="text-align: center;">Minimum configuration</p>  <p style="text-align: center;"> <b>Input Module internal jumper settings:</b> </p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>A0 = 1</td> <td>A0 = 1</td> <td>A0 = 0</td> <td>A0 = 1</td> </tr> <tr> <td>A1 = 0</td> <td>A1 = 0</td> <td>A1 = 1</td> <td>A1 = 1</td> </tr> <tr> <td>A2 = 0</td> <td>A2 = 1</td> <td>A2 = 1</td> <td>A2 = 1</td> </tr> </table>	A0 = 1	A0 = 1	A0 = 0	A0 = 1	A1 = 0	A1 = 0	A1 = 1	A1 = 1	A2 = 0	A2 = 1	A2 = 1	A2 = 1
A0 = 1	A0 = 1	A0 = 0	A0 = 1										
A1 = 0	A1 = 0	A1 = 1	A1 = 1										
A2 = 0	A2 = 1	A2 = 1	A2 = 1										
<b>Maximum no. of messages:</b>	32												
<b>Maximum no. of inputs:</b>	32 (8 inputs per module x 4 Input Modules connected)												
<b>Sinking (NPN) circuit:</b>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p><b>NON-ISOLATED</b></p>  </div> <div style="text-align: center;"> <p><b>ISOLATED</b></p>  </div> </div> <p style="text-align: center; margin-top: 10px;">                 COM(0V) is internally connected.                  24 VDC is internally connected.             </p> <p style="margin-top: 20px;"><b>NOTE:</b> All Input Modules are internally fused. Also, the Power Module is internally fused.</p> <p style="margin-top: 10px;"><b>NOTE:</b> Wire the modules according to local electrical code.</p>												

**Sourcing (PNP) circuit:**



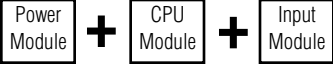
COM(0V) is internally connected.  
24 VDC is internally connected.

NOTE 1: This connection is only necessary to light the 24 VDC LED to show that power is present.

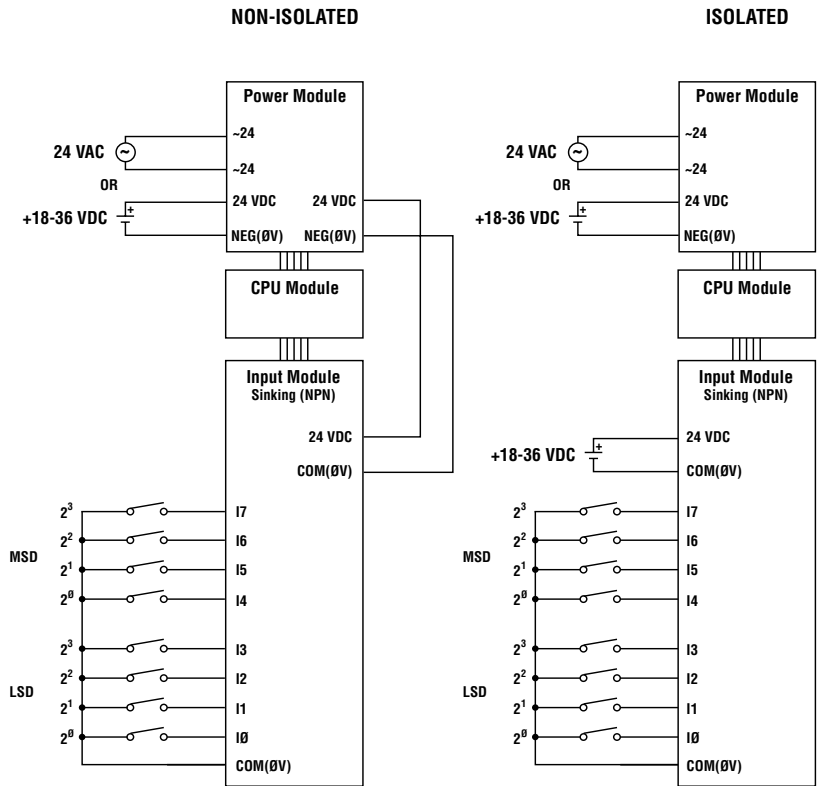
NOTE: All Input Modules are internally fused. Also, the Power Module is internally fused.

NOTE: Wire the modules according to local electrical code.

## Binary Coded Decimal (Mode 2)

<b>Description:</b>	The BCD value read at the inputs (I0 – I7) determines the message to run (see “For BCD and Binary modes . . .” on page 21).
<b>Module configuration:</b> (modules can be connected in any order)	 <p style="text-align: center;"><b>Input Module internal jumper settings:</b></p> <p style="text-align: right;">A0 = 0 A1 = 1 A2 = 0</p>
<b>Maximum no. of messages:</b>	80
<b>Maximum no. of inputs:</b>	8 (with 1 Input Module connected)

### Sinking (NPN) circuit:

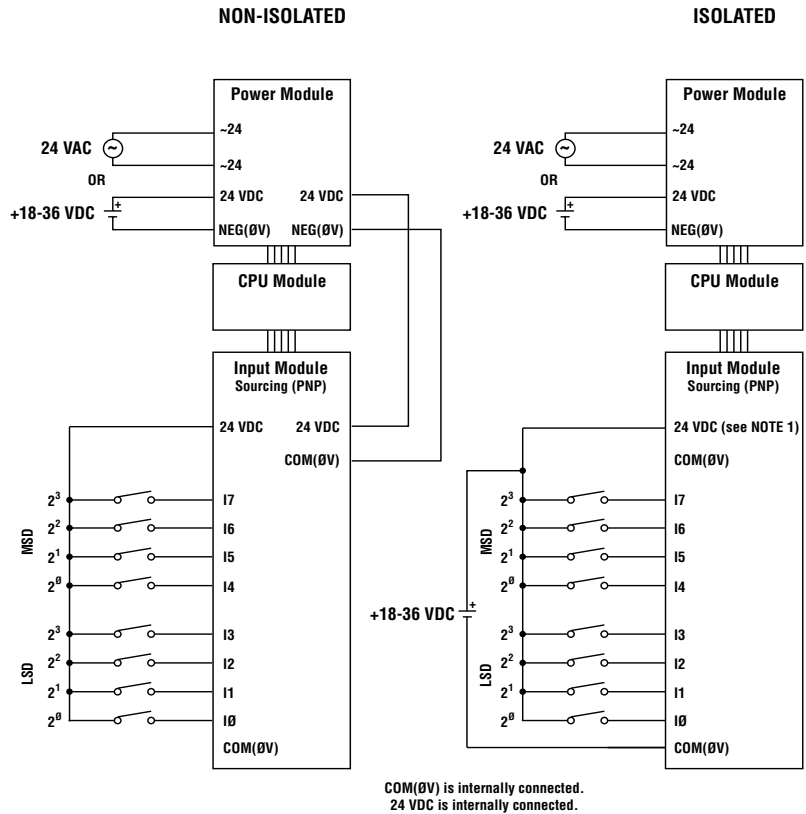


COM(0V) is internally connected.  
24 VDC is internally connected.

**NOTE:** All Input Modules are internally fused. Also, the Power Module is internally fused.

**NOTE:** Wire the modules according to local electrical code.

**Sourcing (PNP) circuit:**

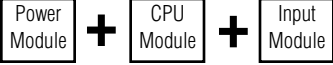


**NOTE 1:** This connection is only necessary to light the 24 VDC LED to show that power is present.

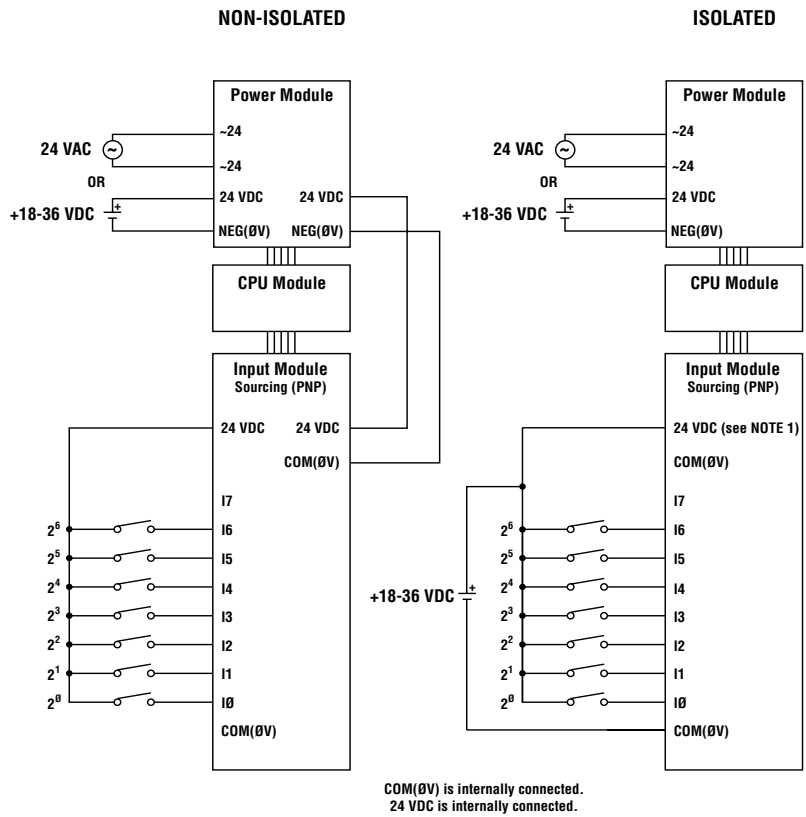
**NOTE:** All Input Modules are internally fused. Also, the Power Module is internally fused.

**NOTE:** Wire the modules according to local electrical code.

## Binary (Mode 3)

<b>Description:</b>	The Binary value read at the inputs (I0 – I7) determines the messages to run (see “For BCD and Binary modes . . .” on page 21).
<b>Module configuration:</b> (modules can be connected in any order)	 <p style="text-align: center;"> <b>Input Module</b>  <b>internal jumper settings:</b> </p> <p style="text-align: right;">         A0 = 1          A1 = 1          A2 = 0       </p>
<b>Maximum no. of messages:</b>	80
<b>Maximum no. of inputs:</b>	8 (with 1 Input Module connected)
<b>Sinking (NPN) circuit:</b>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p><b>NON-ISOLATED</b></p> </div> <div style="text-align: center;"> <p><b>ISOLATED</b></p> </div> </div> <p style="text-align: center; margin-top: 10px;"> <b>COM(0V) is internally connected.</b>  <b>24 VDC is internally connected.</b> </p> <p><b>NOTE:</b> All Input Modules are internally fused. Also, the Power Module is internally fused.</p> <p><b>NOTE:</b> Wire the modules according to local electrical code.</p>

Sourcing (PNP) sample:



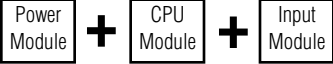
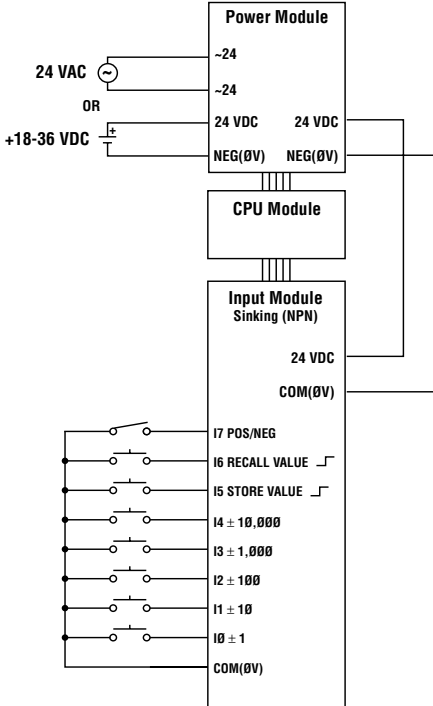
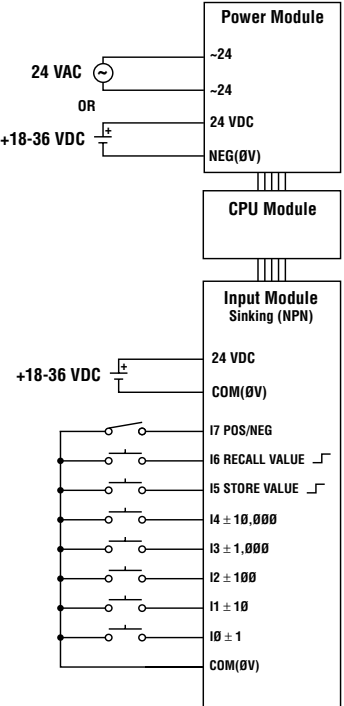
NOTE 1: This connection is only necessary to light the 24 VDC LED to show that power is present.

NOTE: All Input Modules are internally fused. Also, the Power Module is internally fused.

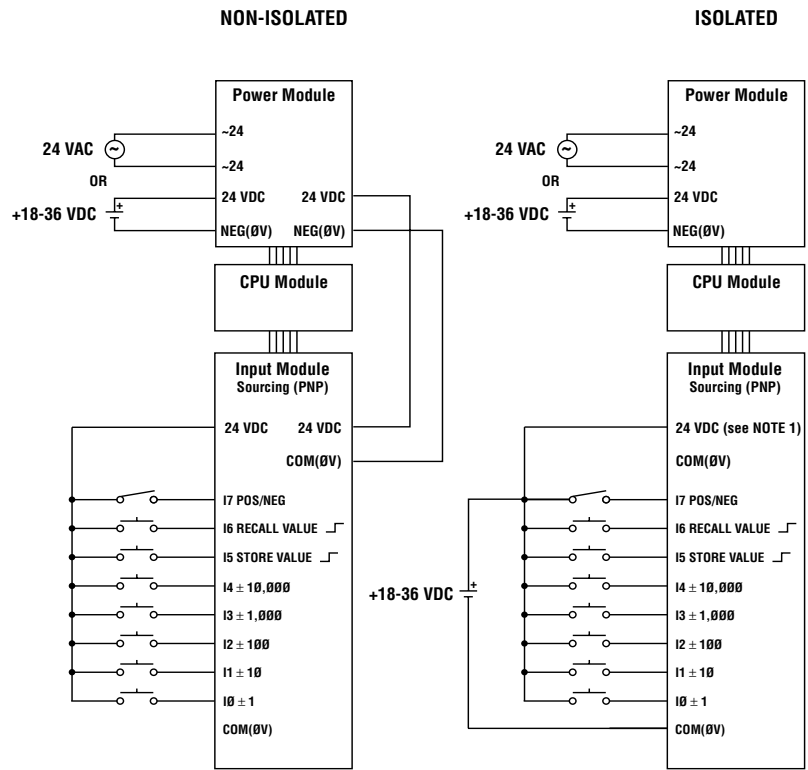
NOTE: Wire the modules according to local electrical code.



## Counter (Mode 4)

<p><b>Description:</b></p>	<p>This mode refreshes the sign's String file "1" each time a command is processed, using the following configuration:          I0: +/- 115: Store current value in the CPU Module          I1: +/- 1016: Recall stored value from the CPU Module          I2: +/- 10017: Positive/Negative number (Pos. if high, Neg. if low).          I3: +/- 1000Max. pos. value = +2,147,483,647. Max. neg. value = -2,147,483,647          I4: +/- 10000</p>
<p><b>Module configuration:</b> (modules can be connected in any order)</p>	 <p><b>Input Module internal jumper settings:</b>          A0 = 0          A1 = 0          A2 = 1</p>
<p><b>Maximum no. of messages:</b></p>	<p>1 (the "A" message file). <b>This message should be programmed using a handheld remote control, and not the ALPHA Messaging software.</b></p>
<p><b>Maximum no. of inputs:</b></p>	<p>8 (with 1 Input Module connected)</p>
<p><b>Sinking (NPN) circuit:</b></p>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p><b>NON-ISOLATED</b></p>  </div> <div style="text-align: center;"> <p><b>ISOLATED</b></p>  </div> </div> <p style="text-align: center;"><b>COM(0V) is internally connected. 24 VDC is internally connected.</b></p> <p><b>NOTE:</b> All Input Modules are internally fused. Also, the Power Module is internally fused.</p> <p><b>NOTE:</b> Wire the modules according to local electrical code.</p>

Sourcing (PNP) circuit:

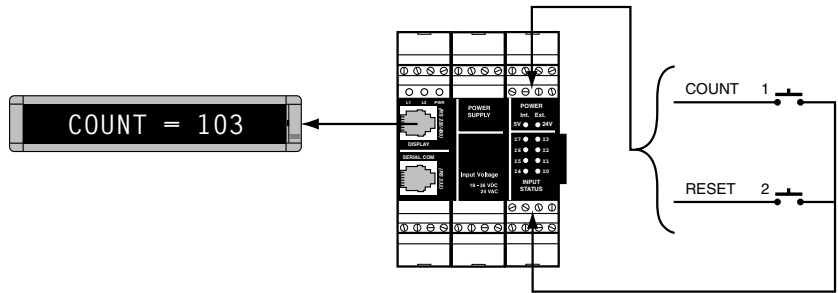


COM(0V) is internally connected.  
24 VDC is internally connected.

NOTE 1: This connection is only necessary to light the 24 VDC LED to show that power is present.

NOTE: All Input Modules are internally fused. Also, the Power Module is internally fused.

NOTE: Wire the modules according to local electrical code.



Here is an example of how to use the above counter circuit:

1. Initiate Counter mode by triggering I5 and I6 at the same time for at least 5 seconds. This clears ALL messages from the signs networked to the Input Module and creates an "A" message file for use as a counter. This also stores a counter value of 0 in the CPU Module.
2. Wait 1 minute before proceeding.
3. (Optional) Use a handheld remote control to edit the "A" message file. For example, if you wanted the text "COUNT =" to appear before the counter value (as shown above), use a remote control to add this text: (A two-line sign is used as an example below.)

**Sample counter application:**

Press **PROGRAM**:



Press **ADV** until the text stops scrolling:



Press **BACK** until [RED] is at the end of the line:



Press **INSERT**. Type: *COUNT =*. Then press **INSERT** again.



Press **ADV** again until the text stops scrolling:



Press **RUN** twice:



4. To increase the count, trigger I0, and *COUNT = 1*, *COUNT = 2*, etc will appear on the sign.
5. To reset the count to 0, trigger I6.



For BCD and Binary modes . . .

IR Remote (up to 76 messages can be programmed)  Message File Letter	ALPHA Messaging Software  Message Number (decimal)	CPU Module  Message Number (decimal)	Operating Mode																
			BCD (Mode 2)								Binary (Mode 3)								
			10's digit				1's digit				MSB							LSB	
			8	4	2	1	8	4	2	1	128	64	32	16	8	4	2	1	
			I7	I6	I5	I4	I3	I2	I1	I0	I7	I6	I5	I4	I3	I2	I1	I0	
"A"	1	0	No input = message "A" displayed on sign																
"B"	2	1															1		
"C"	3	2															1		
"D"	4	3															1	1	
"E"	5	4															1		
"F"	6	5															1	1	
"G"	7	6															1	1	
"H"	8	7															1	1	1
"I"	9	8																	
"J"	10	9																	
"K"	11	10																	
"L"	12	11																	
"M"	13	12																	
"N"	14	13																	
"O"	15	14																	
"P"	16	15																	
"Q"	17	16																	
"R"	18	17																	
"S"	19	18																	
"T"	20	19																	
"U"	21	20																	
"V"	22	21																	
"W"	23	22																	
"X"	24	23																	
"Y"	25	24																	
"Z"	26	25																	
"a"	27	26																	
"b"	28	27																	
"c"	29	28																	
"d"	30	29																	
"e"	31	30																	
"f"	32	31																	
"g"	33	32																	
"h"	34	33																	
"i"	35	34																	
"j"	36	35																	
"k"	37	36																	
"l"	38	37																	
"m"	39	38																	
"n"	40	39																	
"o"	41	40																	
"p"	42	41																	
"q"	43	42																	

IR Remote (up to 76 messages can be programmed)  Message File Letter	ALPHA Messaging Software  Message Number (decimal)	CPU Module  Message Number (decimal)	Operating Mode																	
			BCD (Mode 2)								Binary (Mode 3)									
			10's digit				1's digit				MSB									LSB
			8	4	2	1	8	4	2	1		128	64	32	16	8	4	2	1	
17	16	15	14	13	12	11	10	17	16	15	14	13	12	11	10					
"1"	44	43		1						1	1					1	1			
"2"	45	44		1						1						1				
"3"	46	45		1						1						1	1			
"4"	47	46		1						1	1					1	1			
"5"	48	47		1						1	1	1				1	1			
"6"	49	48		1					1											
"7"	50	49		1					1								1			
"8"	51	50		1		1										1				
"9"	52	51		1		1										1	1			
"0"	53	52		1		1					1									
"1"	54	53		1		1					1	1					1			
"2"	55	54		1		1				1						1	1			
"3"	56	55		1		1				1						1	1			
"4"	57	56		1		1				1	1									
"5"	58	57		1		1				1	1	1					1			
"6"	59	58		1		1	1									1				
"7"	60	59		1		1	1									1	1			
"8"	61	60		1	1															
"9"	62	61		1	1												1			
"0"	63	62		1	1						1					1	1			
"1"	64	63		1	1						1	1				1	1			
"2"	65	64		1	1						1					1				
"3"	66	65		1	1						1						1			
"4"	67	66		1	1						1	1				1				
"5"	68	67		1	1						1	1	1			1	1			
"6"	69	68		1	1						1					1				
"7"	70	69		1	1						1					1	1			
"8"	71	70		1	1	1										1	1			
"9"	72	71		1	1	1										1	1			
"0"	73	72		1	1	1						1								
"1"	74	73		1	1	1						1	1				1			
"2"	75	74		1	1	1					1					1				
"3"	76	75		1	1	1					1					1	1			
"4"	77	76		1	1	1					1	1								
"5"	78	77		1	1	1					1	1	1				1			
"6"	79	78		1	1	1	1									1	1			
"7"	80	79		1	1	1	1									1	1			

<sup>1</sup> This message cannot be programmed using an IR Remote Control.

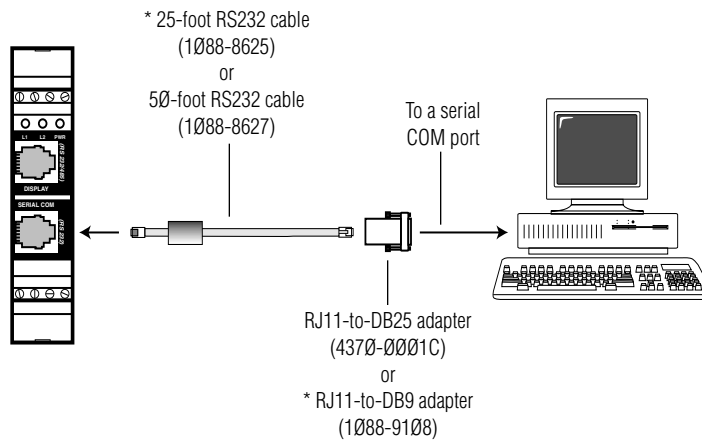
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## Creating messages using ALPHA Messaging software

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**NOTE:** If one or more Input Modules are connected to the CPU Module, you may want to temporarily disconnect the CPU Module from the Input Modules. Otherwise, signals coming into the Input Modules may interfere with downloading messages from the ALPHA Messaging software.

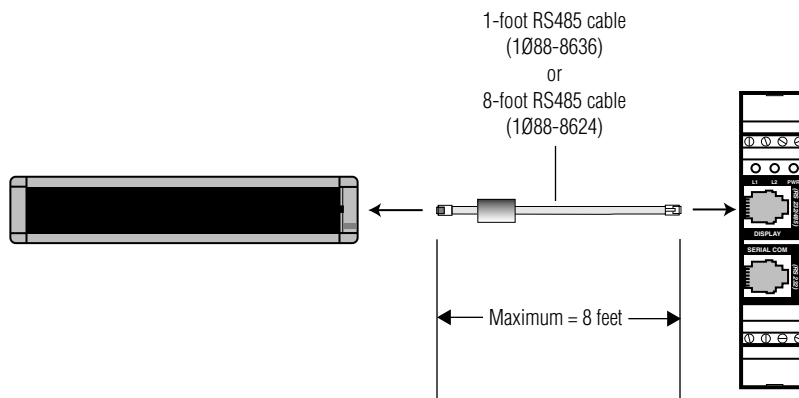
1. Connect a PC to the CPU Module:



\* Included with the ALPHA Messaging software

2. Create messages using the ALPHA Messaging software.
3. Network one or more ALPHA signs to the CPU Module (below). Then store the messages in the signs using ALPHA Messaging software.

### Networking a single sign (unshielded)



## Networking one or more signs (shielded)

