Overview

Today's high cost of energy mandates proportional control, you only use the exact amount of energy necessary to get the job done. Modern actuator technology makes proportional control easy for water valves and air dampers, but proportional control for electric heat, fans and refrigeration systems may be complex and cost prohibitive.

The BAPI BA/SQ4 sequences multiple on-off devices based on a single analog output from any controller. Now items such as cooling towers with multiple two-speed fans, staged electric heat and multi-compressor chillers can be cost effectively controlled to provide the utmost efficiency and consistency for the load at hand.

Each BA/SQ4 provides four NO/NC outputs that open and close at fixed voltages across the control voltage range. Two BA/SQ4 devices may be cascaded to provide eight output stages. Each output when closed, provides 24VDC at 80mA. All outputs open when power is removed from the device.

Mounting

The BA/SQ4 plugs into either a BA/BP4 or BA/BP8 as shown in Figure 1.

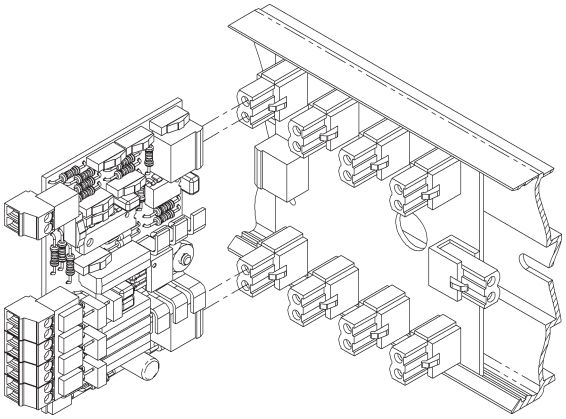
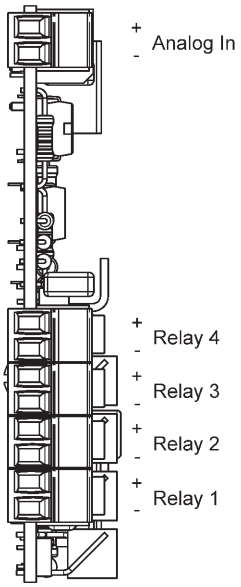


Figure 1 BA/SQ4 plugging into a BA/BP4

Termination

Connect as shown in the table on page 2.



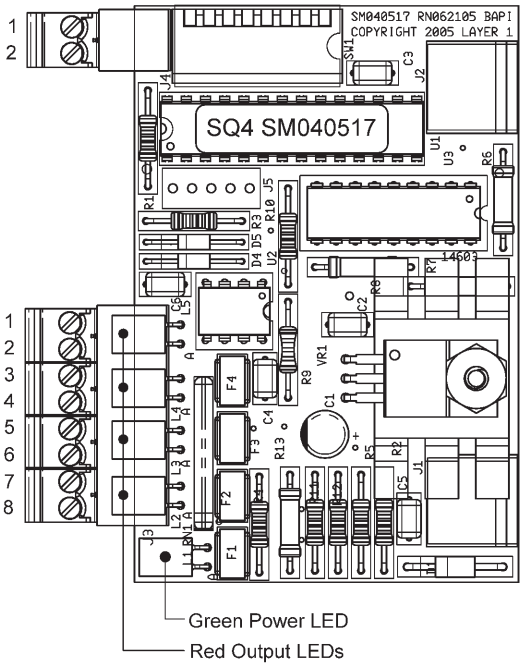


Figure 2 BA/SQ4 component identifier

Specifications subject to change without notice.

Termination continued...

Component identification graphic is shown on previous page.

Table 1: BA/SQ4 Connection List	
J4	
Pin 1	Analog Voltage from Controller +
Pin 2	Analog Voltage from Controller -
J3	
Pin 1	Relay 4, 24 VDC @ 80mA output
Pin 2	Relay 4
Pin 3	Relay 3, 24 VDC @ 80mA output
Pin 4	Relay 3
Pin 5	Relay 2, 24 VDC @ 80mA output
Pin 6	Relay 2
Pin 7	Relay 1, 24 VDC @ 80mA output
Pin 8	Relay 1

Note: The male connectors that plug into the jacks on the board use a rising block screw terminal to hold the wires. If the block is in a partially up position the wire may be inserted under the block and the wire will not be held when the screw is tightened. To avoid improper wiring, turn the male connector screws counterclockwise until the block is below the wire opening before inserting the wire. Lightly tug on each wire after tightening to verify proper termination.

Operation

The switch settings that govern how the BA/SQ4 operates are listed in table 2. (The switch is OFF when the toggle is up and ON when the toggle is down.)

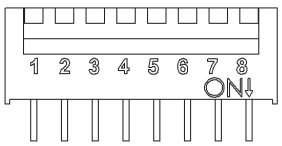


Figure 3
Dip Switch showing switch numbers

Table 2: BA/SQ4 Switch Settings		
Switch	OFF Function (Default)[Switch Toggle Up]	ON function [Switch Toggle Down]
1	Output 1 Polarity normal	Output 1 Polarity inverted
2	Output 2 Polarity normal	Output 2 Polarity inverted
3	Output 3 Polarity normal	Output 3 Polarity inverted
4	Output 4 Polarity normal	Output 4 Polarity inverted
5	Not Used	Not Used
6	0 Volt Offset	5 Volt Offset
7	0-10 Volts in	0-5 Volts in
8	Bar Mode	Dot Mode

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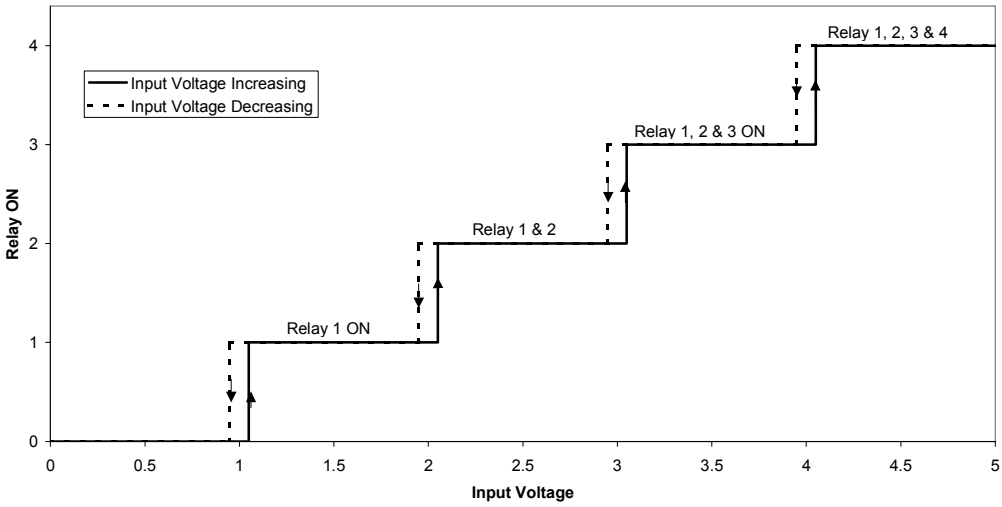

Figure 3: BA/SQ4, 0-5 VDC input, 0 VDC offset, all outputs NO & Bar mode

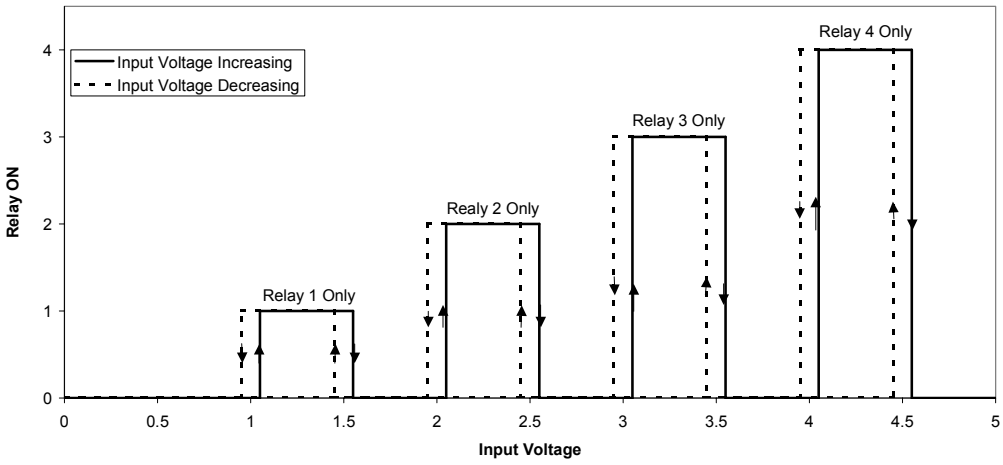

Figure 4: BA/SQ4, 0-5 VDC input, 0 VDC offset, all outputs NO & Dot mode

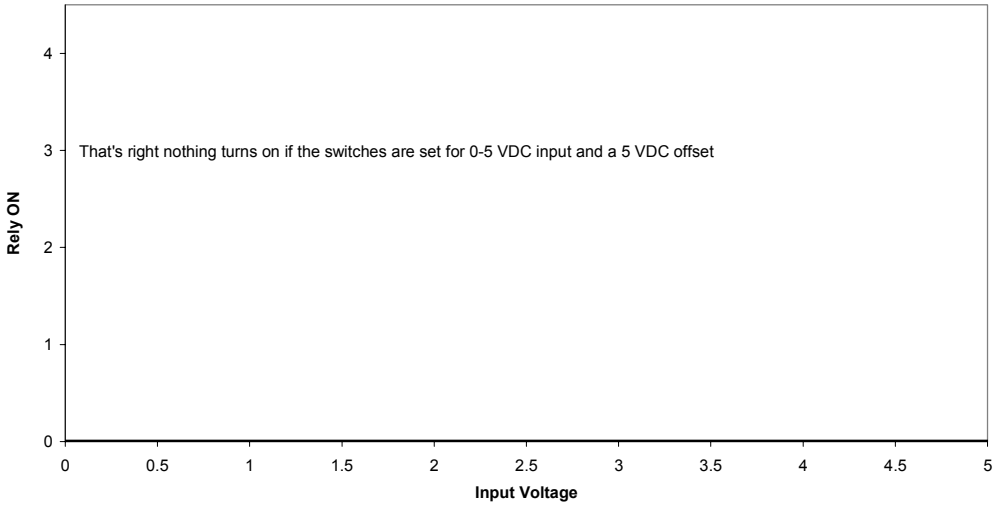

Figure 5; BA/SQ4, 0-5 VDC input, 5 VDC offset & Bar or Dot mode

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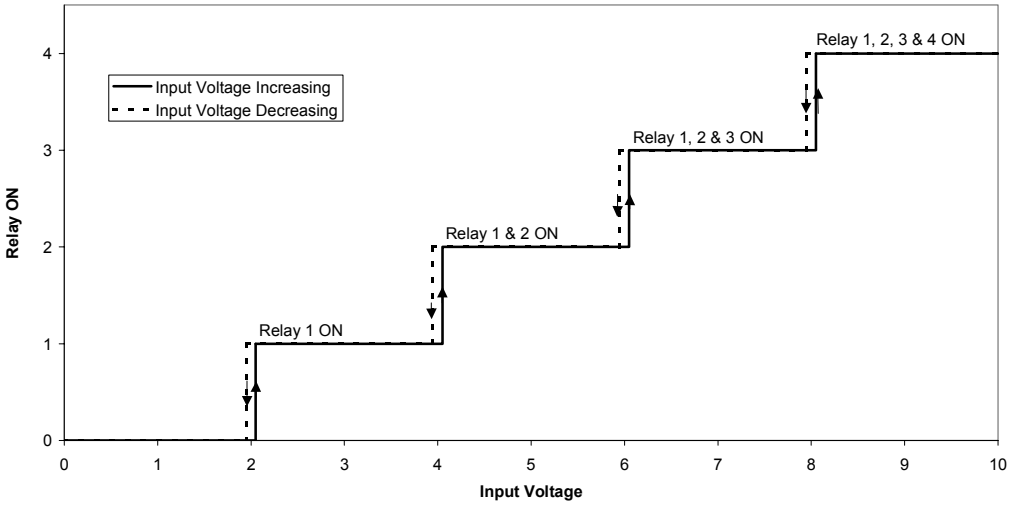

Figure 6: BA/SQ4, 0-10 VDC input, 0 VDC offset, all outputs NO & Bar mode

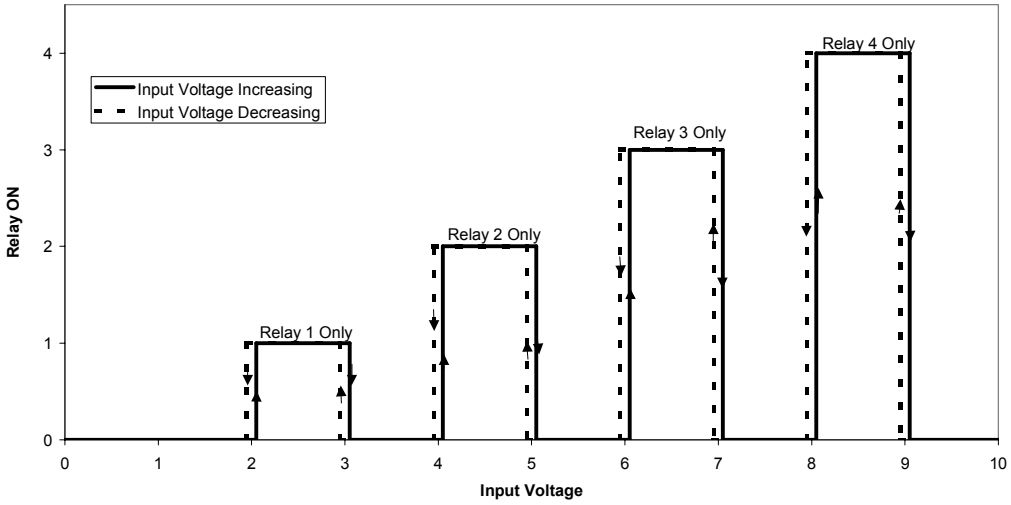

Figure 7: BA/SQ4, 0-10 VDC input, 0 VDC offset, all outputs NO & Dot mode

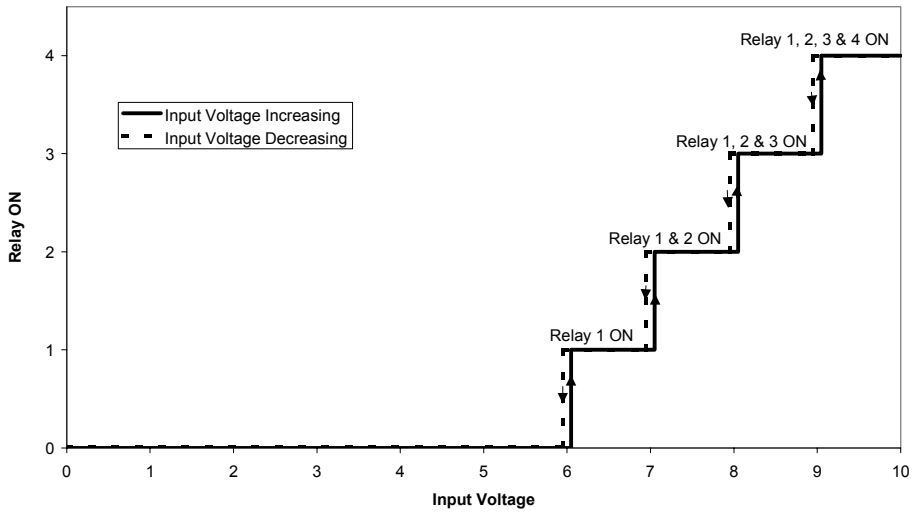

Figure 8: BA/SQ4, 0-10 VDC input, 5 VDC offset, all outputs NO & Bar mode

Specifications subject to change without notice.

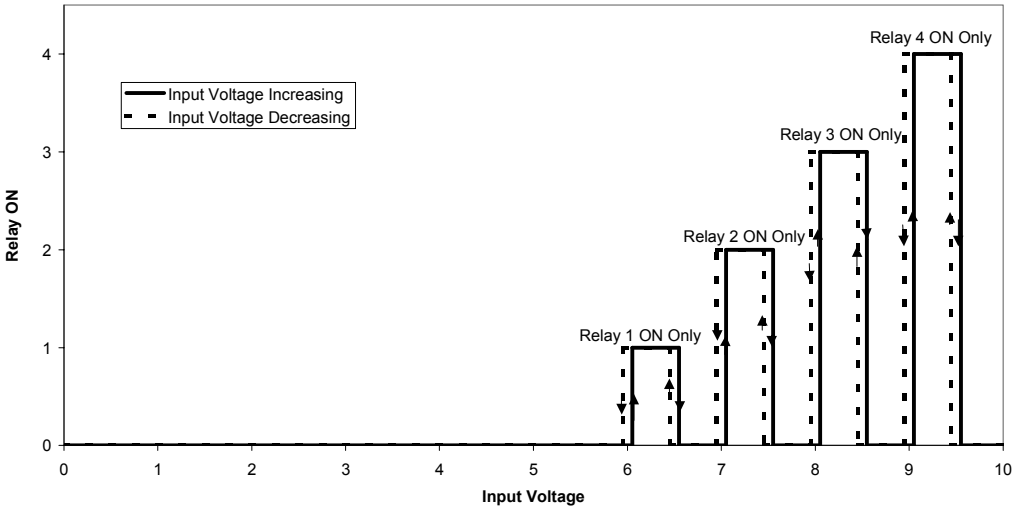

Figure 9: BA/SQ4, 0-10 VDC input, 5 VDC offset, all outputs NO & Dot mode

Eight Outputs

BAPI recognizes the need for very precise control. Two BA/SQ4 devices connected together proportionally energize eight outputs over a 0-10 VDC control voltage input range.

Refer to the two boards as Board_1 and Board_2. Board_1 is configured for 0-5 VDC input and 0 VDC offset. Board_2 is configured for 0-10 VDC input and 5 VDC offset. Connect the 0-10 VDC control voltage to both board's analog input terminals, J4 (See Figure 2). The two following sequence of operation diagrams show how the outputs change for a changing input voltage in Bar and Dot modes.

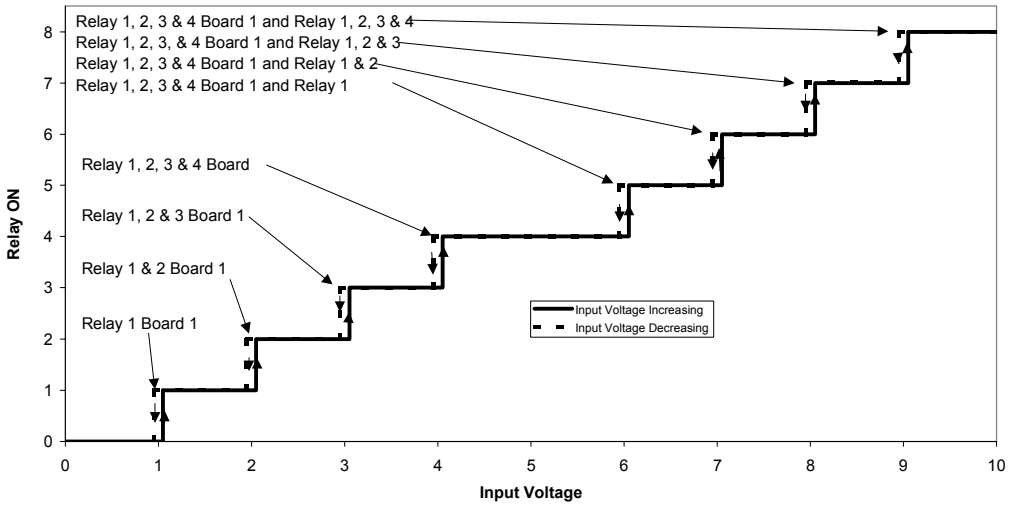

Figure 10: Two-BA/SQ4s connected together for eight outputs in Bar mode

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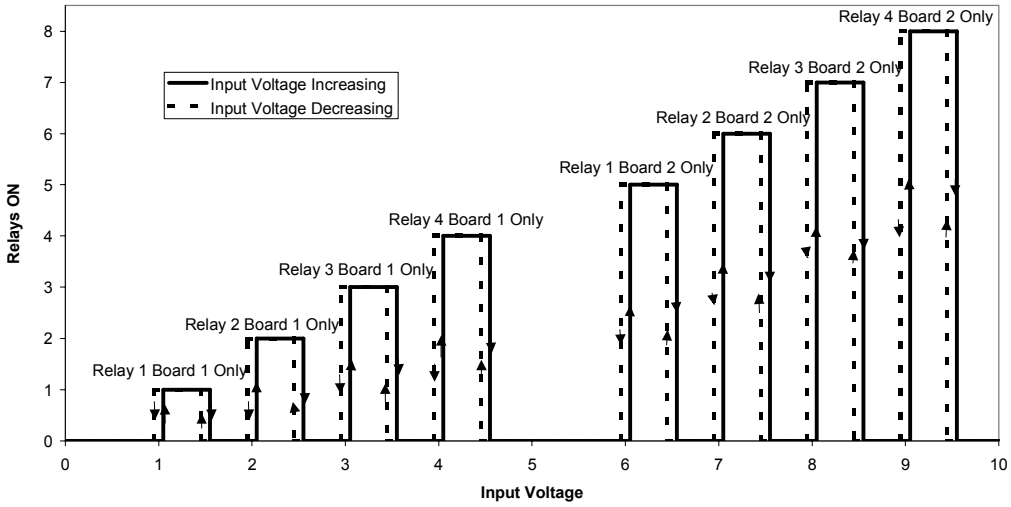

Figure 11: Two-BA/SQ4s connected together for eight outputs in Dot mode

Troubleshooting

Possible Problems:	**Possible Solutions:**
Power LED L1 does not light	- Check to see that the BA/SQ4 is firmly inserted into the backplane - Check to see if the power cable is firmly inserted into the backplane. - Check to see if the PS17 is working correctly - Check to see if the power to the PS17 is turned on
Relay drive LEDs L2 through L5 do not light	- Check output setting to see if drive LED should be on. - Disconnect segment of J3 that does not light, if LED turns on check wiring or load for short to ground

Specifications

Power Voltage	26 to 36 VDC (from BAPI BA/PS17)
Power Current	50mA maximum plus output (1.7VA max plus output)
Input Control Voltage	0 to 5 VDC -OR- 0 to 10 VDC
Output Power Voltage	nominal 24 VDC (23 to 32VDC)
Output Power Current	4 outputs of 80mA maximum (7.04 Watts total, maximum)

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