Control Solutions, Inc.
BAS-700 Series Modular Hardware
for LonWorks®, Modbus/TCP and SNMP

User Guide

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IMPORTANT SAFETY CONSIDERATIONS:

Proper system design is required for reliable and safe operation of distributed control systems incorporating BAS-700 series modules and other such devices. It is extremely important for the user and system designer to consider the effects of loss of power, loss of communications, and failure of components in the design of any monitoring or control application. This is especially important where the potential for property damage, personal injury, or loss of life may exist. By using the BAS-700 series modules or any other Control Solutions, Inc., product, the user has agreed to assume all risk and responsibility for proper system design as well as any consequence for improper system design.

WARRANTY

The BAS-700 series modules are warranted against defects in materials and workmanship for a period of 1 (one) year from date of shipment from factory. Defective units will be repaired or replaced, at manufacturer's discretion, at no cost to user except when negligence or improper use has resulted in damage. The express warranty stated herein is in lieu of all other warranties, express or implied, including without limitation any warranties of merchantability or fitness for a particular purpose and all other warranties are hereby disclaimed and excluded by Control Solutions, Inc.

INTRODUCTION

The BAS-700 product line was created to provide maximum flexibility and expandability with point counts from 2 to 64 (or more) I/O points per node. There are several different processor modules to pick from. There are a wide variety of I/O expansion modules that may be added to the processor module.

The BAS-700 concept was developed following several months of market research. A wide variety of applications were evaluated, and the conclusion was drawn that there was no one multiple-point node design that did a good job of addressing the variety of needs. This led to the the "building block" approach that provided a very flexible and expandable means of creating a LonWorks node while keeping the cost per point relatively low. BAS-700 processor options were later expanded to include Ethernet with support for Modbus/TCP and SNMP.

The next few pages provide general information applicable to the entire BAS-700 series product line. Additional sections follow, with one section per model number. New BAS-700 modules are introduced from time to time. If the model number of interest is not found in this manual, contact the factory for an updated manual or copy of the particular section of interest.

MECHANICAL OVERVIEW

The BAS-700 modules are all a uniform height of 3.25", which is the height of the "snap track" channel used to mount any number of modules. The track comes in 4-foot lengths, and may easily be cut to exact size as needed. The track includes mounting holes for securing the track to a panel or enclosure.

All field wiring is attached at the bottom of the track using pluggable screw terminals. Modules connect to each other via expansion connectors found at the top left and top right corners of each module. Power is provided to the system via the processor module, which is always at the left-hand end of the track.

Typically a maximum of 8 I/O modules may be added to a processor module. A bus extender can be created to expand beyond 8 I/O modules; however, the user is advised to consider whether the processor can adequately support a higher quantity of I/O without adversely affecting the application.

The system will normally consist of one contiguous track. If the system consists

of a larger number of modules, the track can become rather long. To facilitate easier mounting of the system, it is possible to split the system into a double track system. The BAS-EXT is used to link the split tracks together.

MOUNTING TIP: The snap track is typically screwed or rivited onto a control panel. It is very helpful to insert spacers (e.g., flat washers) between the track and the panel. This provides clearance that allows the track to flex when attempting to remove boards from the track.

IMPORTANT GROUNDING INFORMATION

The BAS-700 modules are mounted in a plastic snap track thus preventing any chassis grounding via mounting hardware. Therefore, grounding straps are provided on most BAS-700 series modules. The lugs on the ends of these green wires should be screwed down to chassis ground. It is important that the ground wires provide a solid ground as these provide the discharge path for ESD protection where designed into the circuitry. This includes the clamping on the LonWorks network transceiver as well as analog inputs.

EXPANSION BUS

The I/O modules attach to the processor module via the BAS-700 expansion bus. This bus provides power to the I/O modules, provides the system reset signal, and provides the data bus and board select signals. This expansion bus consists of 20-pin headers that connect one board to the next when snapped into the mounting track and slid together.

The processor module contains only one bus connector (female) on the right-hand side. The matching male connector on the first I/O module is plugged into the processor. The second I/O module will plug into the first module, the third I/O module plugs into the second, and so on.

Power is connected via the processor module. The power input to the processor is processor specific. Consult specifications for the particular processor module to determine power requirements for the system. The processor modules typically contain power regulators accepting a wide range of input voltages; however, some models may require regulated power input to the processor. In any case, power to the rest of the system is provided by the processor module.

Power provided by the processor module includes +5VDC as well as an unregulated DC voltage which is either derived from the wide range power input, or connected separately in the case of processors not having an onboard regulator. This unregulated DC is made available for sourcing higher voltage outputs. The system generally runs on +5VDC; however, the analog output module requires a higher supply voltage to generate 0-10VDC or 4-20mA outputs. When the analog output module is used, there are further restrictions on power input to the processor in order to obtain proper operation of the analog output. Refer to the analog output module specifications for further information.

The reset signal on the bus is an output from the processor module, and is driven low during system reset. The processor modules typically include a low voltage detection circuit which will reset the system in brownout conditions.

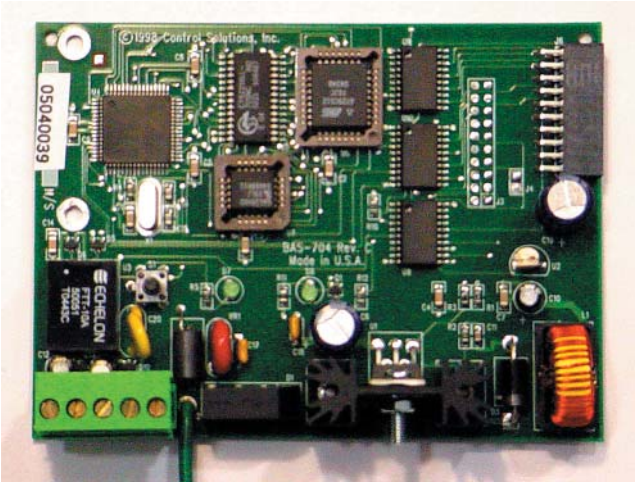
The data transfer mechanism of the BAS-700 expansion bus is the Neuron® Chip's Neurowire™ I/O model. The serial data input, serial data output, and data clock are buffered on the processor module and presented to all I/O modules in parallel. Only one I/O module should be enabled at a time in order to prevent contention on the data lines which would result in invalid data.

The processor module generates 8 board select signals which are carried across the expansion bus using 8 pins of the 20-pin header. Each I/O module uses the select signal presented on the position #1 pin. Each I/O module then reroutes the remaining board signals upward such that its select signal #2 is presented to the select signal #1 position at the next I/O module. Board decoding is thus automatic and addressing via DIP switches and the like is eliminated.

The implementation details of the board decoding are not important as long as the application developer simply understands this simple rule: The I/O module plugged directly into the processor module is always decoded as board position #1. The second I/O module in the string, counting from left to right, is decoded as board position #2, and so on. If a total of 8 I/O modules are connected, the module furthest from the processor is position #8. And if a ninth board is plugged in, it is not accessible (without special bus extension considerations).

1. LonWorks Processor Modules

1.1. BAS-704 LonWorks Processor



DESCRIPTION

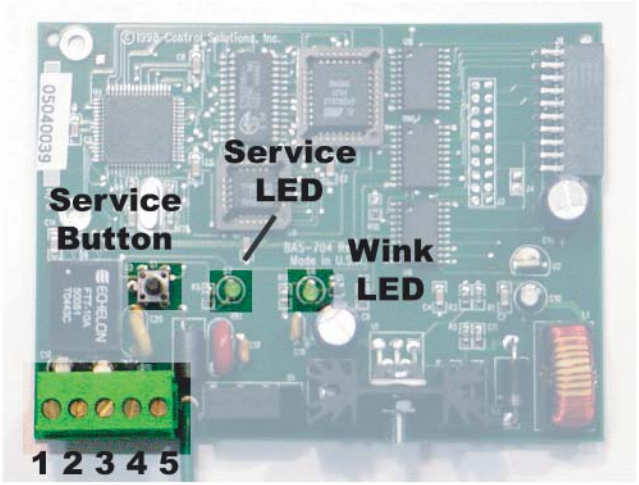
The BAS-704 processor module is the “brains” of a typical BAS-700 system. It contains a 3150 Neuron Chip, Flash EPROM and external RAM, the FTT-10A network transceiver, and a power supply for the entire system. The BAS-704 also includes an expansion bus for connection of up to 8 BAS-700 series I/O modules of various types.

SPECIFICATIONS

- 3150 Neuron Chip (10Mhz clock)
- 64K Flash EPROM (socketed), 48K decoded
- 32K external RAM, 10K decoded in standard configuration
- Memory decoding set by socketed PLD
- FTT-10A LonWorks network transceiver (standard)
- Optionally configurable for any SMX transceiver
  (TP, power line carrier, fiber optic, etc.)
- BAS-700 standard I/O expansion bus
- Accepts up to 8 I/O modules
- Plug-in screw terminal for field wiring
- Snap track mounting
- Size: 3.25”H x 4.40”W (x1.5”H)
- Power supply input: 10-40VDC, 12-24VAC standard
  10-60VDC, 12-35VAC with HV option
- Operating temperature: 0-70ºC, 5-95% RH non-condensing

FIELD WIRING

The field wiring on the processor module provides connections for the communications network and system power.



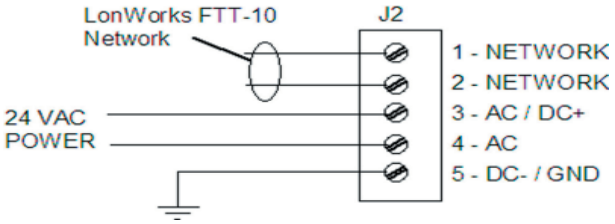
Pinout is as follows for the BAS-704 processor module, Revision C and higher (with pin 1 on the left if the connector side of the board is closest to you):

Pin 1:	LonWorks network
Pin 2:	LonWorks network (not polarity sensitive)
Pin 3:	Power: +V if DC, or AC
Pin 4:	Power: AC
Pin 5:	Common, -V if DC, Ground reference in any case

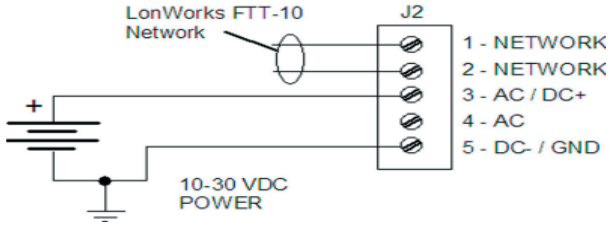
IMPORTANT: Since the BAS-704 Revision C or higher uses a full wave rectifier in its power supply, ***IF AC POWER IS USED, NEITHER SIDE MAY BE GROUNDED.*** Damage will occur if either side of AC is also connected to ground. Transformer isolation of power is highly recommended.

IMPORTANT: For proper operation and ESD protection, pin 5 of connector J2 must always be grounded.

The following diagram illustrates connection of 24VAC power:



The following diagram illustrates connection of 10-30VDC power:



INDICATORS & SERVICE BUTTON

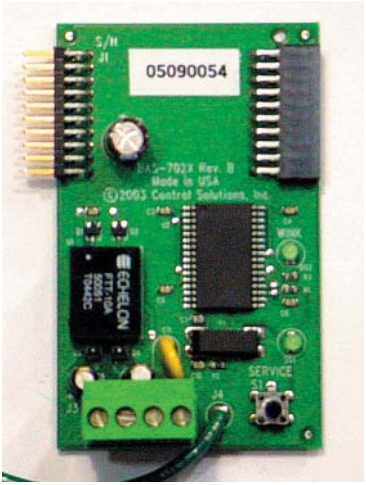
The BAS-704 includes 2 LED indicators, one for the service pin (LonWorks standard), and one for the network "wink" function. The wink LED is under software control; it is recommended that this indicator be used as the wink LED, but this is not mandated.

The BAS-704 also includes a single push button. This is the service button, and is pressed to cause the board's Neuron Chip to transmit its Neuron ID to the network.

CONFIGURATION

The BAS-704 can be configured for either FTT-10A transceiver type, populated onboard, or for an SMX transceiver which would be piggy-backed on the BAS-704 board. This is an assembly option, and is not configurable in the field. The BAS-704 is offered in two standard configurations: (1) FTT-10A; (2) SMX socket only. Contact the factory regarding ordering fully configured transceiver options using the SMX option. SMX options include power line carrier, fiber optic, RF, etc.

1.2. BAS-702X LonWorks Processor



DESCRIPTION

The BAS-702X is designed to be a network variable re-transmitter and nothing more than that. Its benefit is in its large capacity for alias table entries. The BAS-702X may be powered by an external 5VDC supply, or by installing it in a BAS-700 track along side an existing system thus using its power supply.

SPECIFICATIONS

- 3120E2 Neuron Chip (10Mhz clock)
- FTT-10A LonWorks network transceiver
- Transparent to BAS-700 I/O bus (not connected to I/O)
- Plug-in screw terminal for field wiring
- Snap track mounting
- Size: 3.25”H x 2.00”W (x1.5”H)
- Power supply input: 5.0 VDC *only*
- Operating temperature: 0-70ºC, 5-95% RH non-condensing

FIELD WIRING

The field wiring on the processor module provides connections for the communications network and system power.

Pinout is as follows for the BAS-702X processor module, (with pin 1 on the left if the connector side of the board is closest to you):

Pin 1:	LonWorks network
Pin 2:	LonWorks network (not polarity sensitive)
Pin 3:	Power: +5.0VDC *only*
Pin 4:	Ground

INDICATORS & SERVICE BUTTON

Indicators and service button are located as shown above. Functionality is standard as described for the BAS-704.

CONFIGURATION

There are no hardware configuration options for the BAS-702X.

2. Ethernet Processor Modules

2.1. BAS-7050 Ethernet Processor (Modbus, SNMP, etc.)

DESCRIPTION

The Control Solutions BAS-7050 processor module features a high powered RISC processor with Ethernet network capability. This brings the entire series of BAS-700 I/O modules to Ethernet, and to the Internet if you choose. Support is available for SNMP, HTTP, FTP, email, and other Internet protocols.

SPECIFICATIONS

- High Performance 32-bit RISC Processor (ARM 7)
- 2MB Flash
- 8MB RAM
- Battery Backed Real Time Clock
- 10/100 BaseT Ethernet port
- 2MB serial EEPROM for file storage
- I/O expansion bus supports 8 BAS-700 series I/O modules
- 1 Amp power supply, 10-30VDC or 12-24VAC input
- Snap track mounting, 3.25”H x 2.50”W
- Operating temperature: 0-70ºC, 5-95% RH non-condensing

FIELD WIRING

The terminal block is used to connect power to the BAS-7050, and the RJ-45 jack connects the Ethernet network.

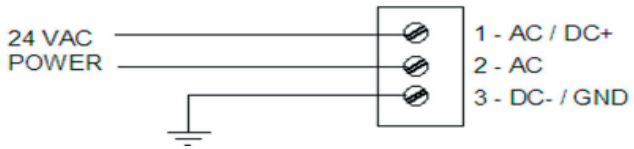
Pinout is as follows for the BAS-7050 processor module (with pin 1 on the left if the connector side of the board is closest to you):

Pin 1:	Power: +V if DC, or AC
Pin 2:	Power: AC
Pin 3:	Common, -V if DC, Ground reference in any case

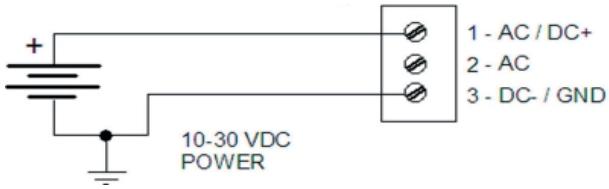
IMPORTANT: Since the BAS-7050 uses a full wave rectifier in its power supply, ***IF AC POWER IS USED, NEITHER SIDE MAY BE GROUNDED.*** Damage will occur if either side of AC is also connected to ground. Transformer isolation of power is highly recommended.

IMPORTANT: For proper operation and ESD protection, pin 3 of connector J1 must always be grounded.

The following diagram illustrates connection of 24VAC power:

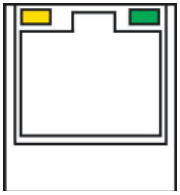


The following diagram illustrates connection of 10-30VDC power:



INDICATORS

The indicators on the BAS-7050, located just above the RJ-45 Ethernet connector, are illustrated below. The yellow LED is the Link indicator, and will illuminate when a link is present. The green LED is the Activity indicator, and will flash when network traffic is present. The green LED will also come on at power up, and remain on until boot-up initialization is complete.

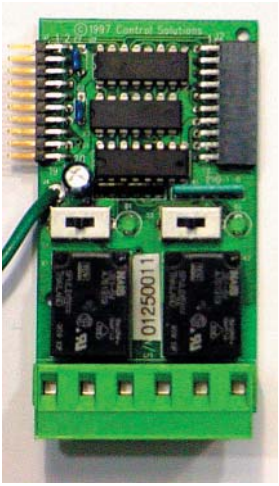


CONFIGURATION

There are no hardware options to configure on the BAS-7050.

3. Discrete Output Modules

3.1. BAS-722 Two Channel Discrete Output Module



DESCRIPTION

The BAS-722 provides the BAS-700 system with discrete outputs for control of low to medium power loads using dry contact relays. The outputs are rated to 240VAC maximum voltage, and 12 Amp maximum current (see specifications). Each output includes a status indicator showing whether the relay is switched "on". Each output also includes a HOA switch for manual override of any output.

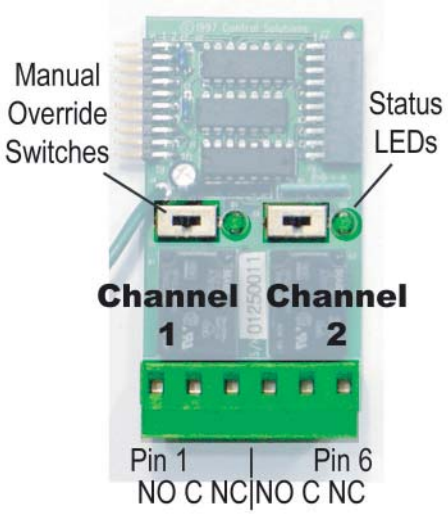
SPECIFICATIONS

- 2-channel dry contact Form C relay output
- Load connections are isolated from BAS-700 system
- Load ratings per relay:
  - 12A @ 28VDC or 120VAC
  - 6A @ 240VAC
  - 1500W Ballast @ 277VAC
  - 1/4HP @ 120VAC
- Plug-in screw terminal for field wiring
- N.O. and N.C. terminals both provided (3 terminals per output)
- Snap track mounting
- Size: 3.25"H x 1.80"W (x1.5"D)

FIELD WIRING

The discrete (relay) output module provides 3 terminals per output. Per each 3-terminal set, the left-hand terminal is the NC (normally connected) terminal, the center is the common (C), and the right-hand terminal is the NO (normally open) terminal. All terminals of the discrete (relay) output module are electrically isolated from all other terminals.

The screw terminal blocks of the BAS-722 are rated for 12 amps at 400 volts. The relays are rated for 12 amps at 120VAC, 6 amps at 240VAC, or 1500W Ballast at 277VAC.



Pinout is as follows for the BAS-722 (with pin 1 on the left if the connector side of board is closest):

Pin 1:	Output #1 (NO) normally open
Pin 2:	Output #1 (C) common
Pin 3:	Output #1 (NC) normally closed
Pin 4:	Output #2 (NO) normally open
Pin 5:	Output #2 (C) common
Pin 6:	Output #2 (NC) normally closed

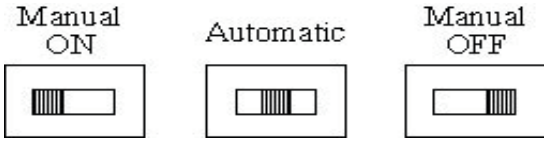
INDICATORS

Each output has a status LED which lights any time the relay is energized, wheth-

er under automatic control or manual override.

MANUAL OVERRIDE

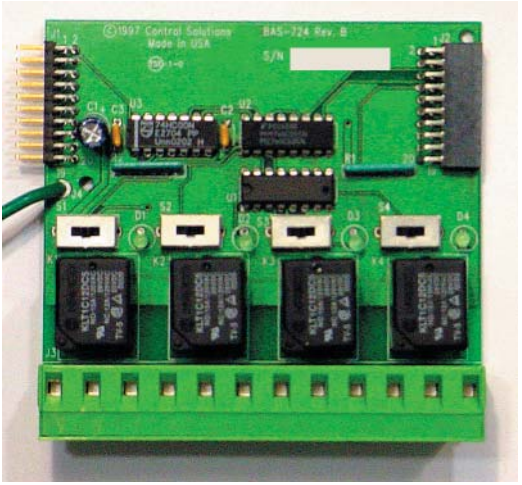
The HOA switch provides for manual override of computer control. The switch should be in the center position for automatic or computer control. The switch may be moved to the right or left position to manually turn the output on or off and override computer control.



CONFIGURATION

The BAS-722 does not have any hardware configuration settings.

3.2. BAS-724 Four Channel Discrete Output Module



DESCRIPTION

The BAS-724 provides the BAS-700 system with discrete outputs for control of low to medium power loads using dry contact relays. The outputs are rated to 240VAC maximum voltage, and 12 Amp maximum current (see specifications). Each output includes a status indicator showing whether the relay is switched "on". Each output also includes a HOA switch for manual override of any output.

SPECIFICATIONS

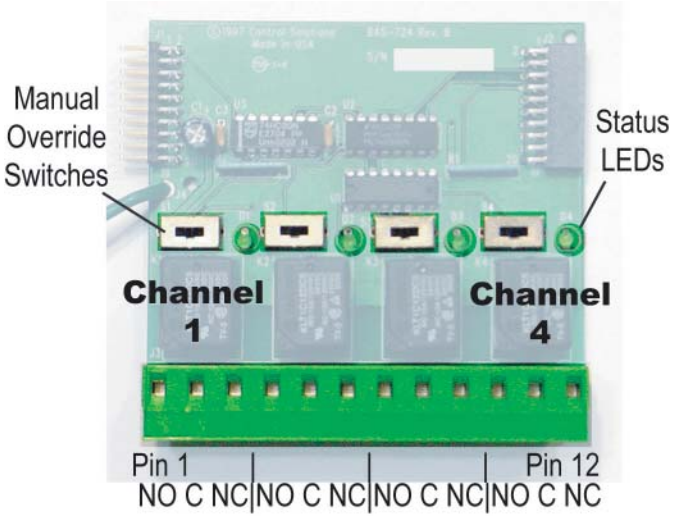
- 4-channel dry contact Form C relay output
- Load connections are isolated from BAS-700 system
- Load ratings per relay:
  - 12A @ 28VDC or 120VAC
  - 6A @ 240VAC
  - 1500W Ballast @ 277VAC
  - 1/4HP @ 120VAC
- Plug-in screw terminal for field wiring
- N.O. and N.C. terminals both provided (3 terminals per output)
- Snap track mounting
- Size: 3.25"H x 3.60"W (x1.5"D)

FIELD WIRING

The discrete (relay) output module provides 3 terminals per output. Per each 3-terminal set, the left-hand terminal is the NC (normally connected) terminal, the

center is the common (C), and the right-hand terminal is the NO (normally open) terminal. All terminals of the discrete (relay) output module are electrically isolated from all other terminals.

The screw terminal blocks of the BAS-724 are rated for 12 amps at 400 volts. The relays are rated for 12 amps at 120VAC, 6 amps at 240VAC, or 1500W Ballast at 277VAC.



Pinout is as follows for the BAS-724 (with pin 1 on the left if the connector side of board is closest):

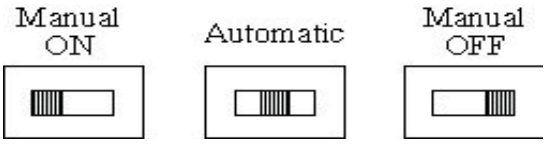
Pin 1:	Output #1 (NO) normally open
Pin 2:	Output #1 (C) common
Pin 3:	Output #1 (NC) normally closed
Pin 4:	Output #2 (NO) normally open
Pin 5:	Output #2 (C) common
Pin 6:	Output #2 (NC) normally closed
Pin 7:	Output #3 (NO) normally open
Pin 8:	Output #3 (C) common
Pin 9:	Output #3 (NC) normally closed
Pin 10:	Output #4 (NO) normally open
Pin 11:	Output #4 (C) common
Pin 12:	Output #4 (NC) normally closed

INDICATORS

Each output has a status LED which lights any time the relay is energized, whether under automatic control or manual override.

MANUAL OVERRIDE

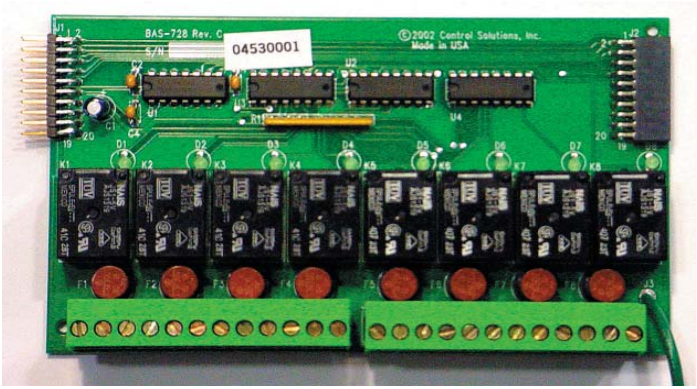
The HOA switch provides for manual override of computer control. The switch should be in the center position for automatic or computer control. The switch may be moved to the right or left position to manually turn the output on or off and override computer control.



CONFIGURATION

The BAS-724 does not have any hardware configuration settings.

3.3. BAS-728 Eight Channel Discrete Output Module



DESCRIPTION

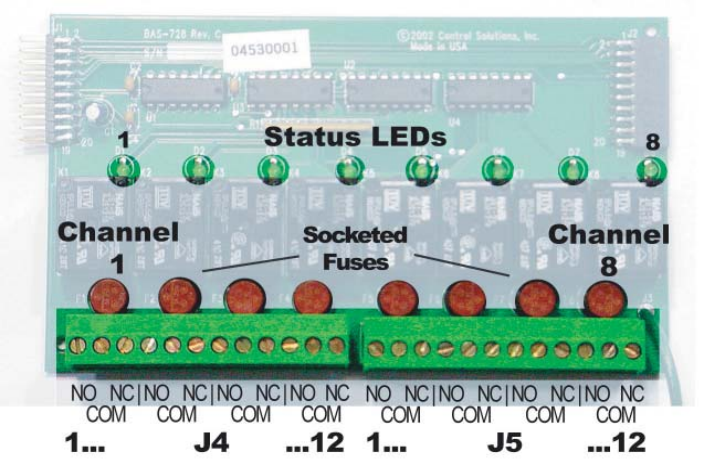
The BAS-728 provides the BAS-700 system with discrete outputs for control of low to medium power loads using dry contact relays. The outputs are rated to 120VAC maximum voltage, and 5 Amp maximum current (see specifications). Each output includes a status indicator showing whether the relay is switched "on".

SPECIFICATIONS

- 8-channel dry contact Form C relay output
- Load connections are isolated from BAS-700 system
- Load ratings per relay:
  - Standard BAS-728 fused for 5A @ 28VDC or 120VAC
  - Max. load 10A @ 120VAC
  - May be fused for 0.25A to 10A, connectors & relays rated to 10A
- Plug-in screw terminal for field wiring
- N.O. and N.C. terminals both provided (3 terminals per output)
- Snap track mounting
- Size: 3.25"H x 5.55"W (x1.5"D)

FIELD WIRING

The discrete (relay) output module provides 3 terminals per output. Per each 3-terminal set, the left-hand terminal is the NC (normally connected) terminal, the center is the common (C), and the right-hand terminal is the NO (normally open) terminal. All terminals of the discrete (relay) output module are electrically isolated from all other terminals.



Pinout is as follows for the BAS-728 (with pin 1 on the left if the connector side of board is closest). Each of the two connectors have the same pinout.

Pin 1:	Output #1/5 (NO) normally open
Pin 2:	Output #1/5 (C) common
Pin 3:	Output #1/5 (NC) normally closed
Pin 4:	Output #2/6 (NO) normally open
Pin 5:	Output #2/6 (C) common
Pin 6:	Output #2/6 (NC) normally closed
Pin 7:	Output #3/7 (NO) normally open
Pin 8:	Output #3/7 (C) common
Pin 9:	Output #3/7 (NC) normally closed
Pin 10:	Output #4/8 (NO) normally open
Pin 11:	Output #4/8 (C) common
Pin 12:	Output #4/8 (NC) normally closed

INDICATORS

Each output has a status LED which lights any time the relay is energized.

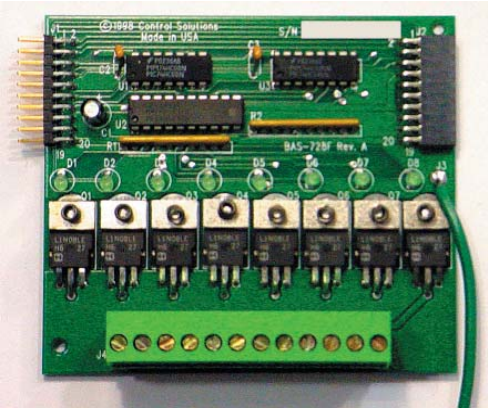
FUSES

The fuses on the BAS-728 are socketed for easy replacement. The standard fuse shipped by default is a 5A fast acting fuse. Any Wickmann TR-5 fuse may be used. Fuses ranging from 50mA to 10A in either fast acting or slow blow are available.

CONFIGURATION

The BAS-728 does not have any hardware configuration settings.

3.4. BAS-728/F Eight Channel Discrete Output Module



DESCRIPTION

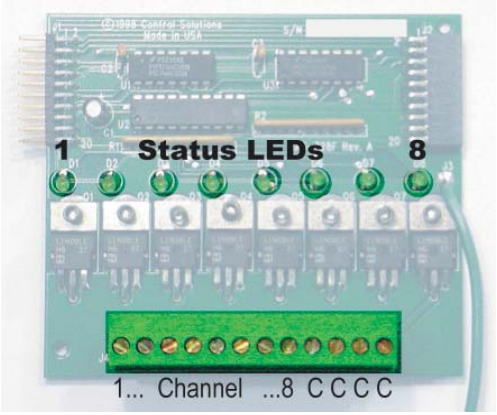
The BAS-728/F provides the highest density output module in the BAS-720 series. This module is useful for interfacing to contact inputs of other equipment, or for driving pilot relays or indicators. Each FET is ESD protected, and includes an internal diode protecting it from inductive loads.

SPECIFICATIONS

- 8 Outputs
- Open Drain FET Output
- 1A load @30VDC
- Status LED on each output
- Thermal & current overload protected
- ESD protected
- Plug-in screw terminal block
- Snap track mounting, 3.25”H x 3.65”W (x 1.5” D)

FIELD WIRING

The BAS-728/F has 8 output terminals, plus 4 return or common terminals. The common terminals are electrically common to power supply ground and to the green wire ground lug.



Pinout is as follows for the BAS-728/F (with pin 1 on the left if the connector side of board is closest):

Pin 1:	Output #1
Pin 2:	Output #2
Pin 3:	Output #3
Pin 4:	Output #4
Pin 5:	Output #5
Pin 6:	Output #6
Pin 7:	Output #7
Pin 8:	Output #8
Pin 9:	Common
Pin 10:	Common
Pin 11:	Common
Pin 12:	Common

INDICATORS

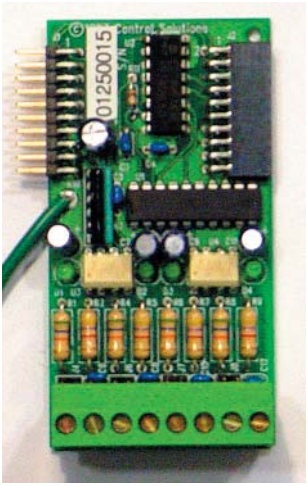
Each output has a status LED which lights any time the FED is energized.

CONFIGURATION

The BAS-728/F does not have any hardware configuration settings.

4. Discrete Input Modules

4.1. BAS-714 Four Channel Discrete Input Module



DESCRIPTION

The BAS-714 provides the BAS-700 series system with isolated inputs suitable for monitoring presence or absence of a wide range of voltages from TTL level and up. Inputs may be either AC or DC, and either high or low range is selected by a jumper setting. Each channel is individually configured and individually isolated so multiple types of voltages may be monitored by a single board.

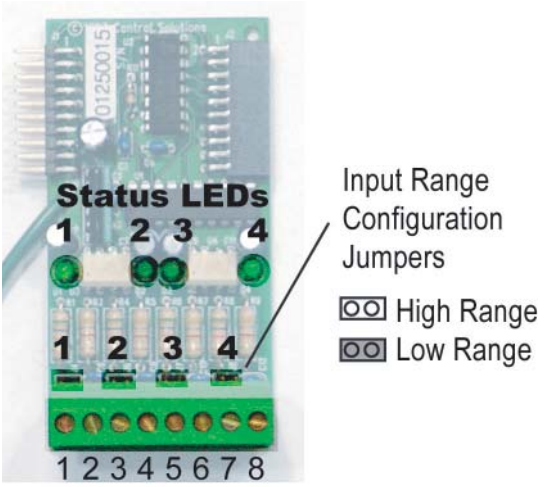
The BAS-714 includes a status LED per channel which will light when voltage is being sensed by that channel. The status information is read by the processor via the Neurowire bus using the BAS-700 series standard bus connector.

SPECIFICATIONS

- 4-channel discrete input
- Inputs optically isolated from system and from each other
- Inputs accept AC or DC of either polarity
- Inputs rated to 150V peak
- Input range selected by jumper per channel
- Low range: 5V to 60V (DC or peak)
- High range: 60V to 150V (DC or peak)
- Plug-in screw terminal block for field wiring
- Snap track mounting
- Size: 3.25”H x 1.70”W (x1.5”D)

FIELD WIRING

The terminal block on the discrete input module provides two screw terminals per input point. The opto-isolator input per channel is bi-directional, thus input connections are not polarity sensitive. However, for preferred ESD immunity, the left-hand terminal (per pair) should be considered the positive signal input while the right-hand terminal (per pair) should be considered the negative or ground terminal. If the right-hand terminal is connected to ground, the input will be well protected against ESD strikes.



Pinout is as follows for the BAS-714 (with pin 1 on the left if the wires are extending toward you):

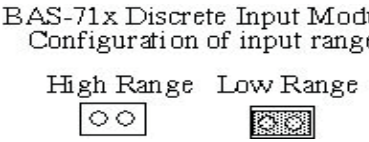
Pin 1:	Input #1
Pin 2:	Input #1 common
Pin 3:	Input #2
Pin 4:	Input #2 common
Pin 5:	Input #3
Pin 6:	Input #3 common
Pin 7:	Input #4
Pin 8:	Input #4 common

INDICATORS

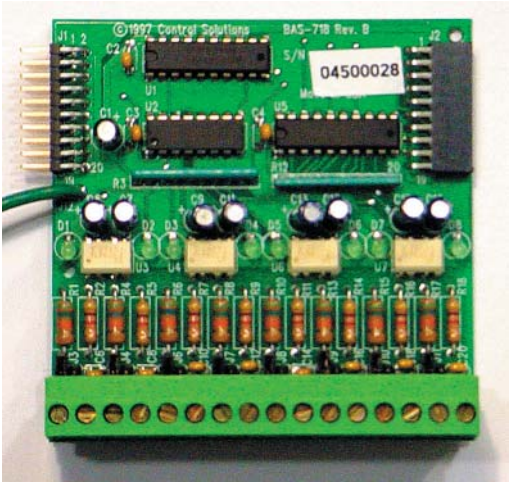
The BAS-714 includes one LED per input channel. The LED will light when voltage is sensed. The LED will be off if voltage is not sensed. The LED will glow dimly in the presence of voltage that is too close to the switching threshold to cause a solid on or off sense. The left-most LED indicates the state of Input #1 while the right-most LED indicates the state for Input #4.

CONFIGURATION

Each input channel has a respective jumper block to configure high or low voltage range. The jumper is installed or ON to select LOW voltage range. The jumper is removed or OFF to select HIGH voltage range. Low voltage range is TTL level through about 60VDC. High range is from 30VDC and above (to maximum of 150V peak). The inputs accept either AC or DC in either high or low range.



4.2. BAS-718 Eight Channel Discrete Input Module



DESCRIPTION

The BAS-718 provides the BAS-700 series system with isolated inputs suitable for monitoring presence or absence of a wide range of voltages from TTL level and up. Inputs may be either AC or DC, and either high or low range is selected by a jumper setting. Each channel is individually configured and individually isolated so multiple types of voltages may be monitored by a single board.

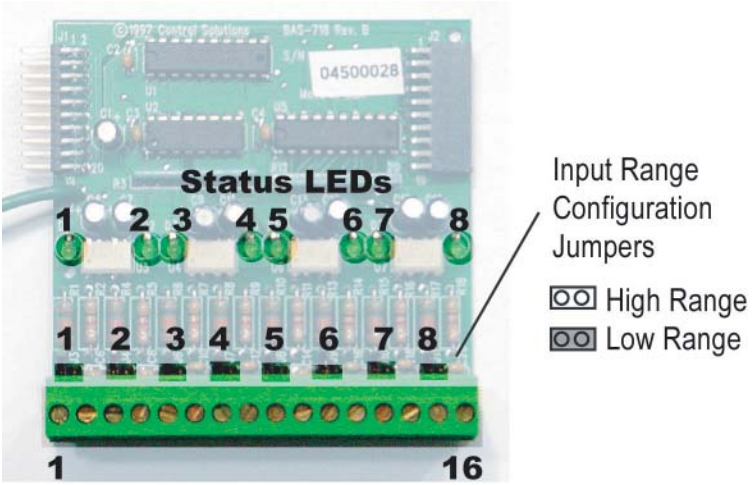
The BAS-718 includes a status LED per channel which will light when voltage is being sensed by that channel. The status information is read by the processor via the Neurowire bus using the BAS-700 series standard bus connector.

SPECIFICATIONS

- 8-channel discrete input
- Inputs optically isolated from system and from each other
- Inputs accept AC or DC of either polarity
- Inputs rated to 150V peak
- Input range selected by jumper per channel
- Low range: 5V to 60V (DC or peak)
- High range: 60V to 150V (DC or peak)
- Plug-in screw terminal block for field wiring
- Snap track mounting
- Size: 3.25”H x 3.25”W (x1.5”D)

FIELD WIRING

The terminal block on the discrete input module provides two screw terminals per input point. The opto-isolator input per channel is bi-directional, thus input connections are not polarity sensitive. However, for preferred ESD immunity, the left-hand terminal (per pair) should be considered the positive signal input while the right-hand terminal (per pair) should be considered the negative or ground terminal. If the right-hand terminal is connected to ground, the input will be well protected against ESD strikes.



Pinout is as follows for the BAS-718 (with pin 1 on the left if the wires are extending toward you):

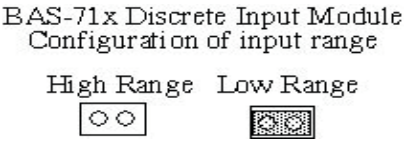
Pin 1:	Input #1
Pin 2:	Input #1 common
Pin 3:	Input #2
Pin 4:	Input #2 common
Pin 5:	Input #3
Pin 6:	Input #3 common
Pin 7:	Input #4
Pin 8:	Input #4 common
Pin 9:	Input #5
Pin 10:	Input #5 common
Pin 11:	Input #6
Pin 12:	Input #6 common
Pin 13:	Input #7
Pin 14:	Input #7 common
Pin 15:	Input #8
Pin 16:	Input #8 common

INDICATORS

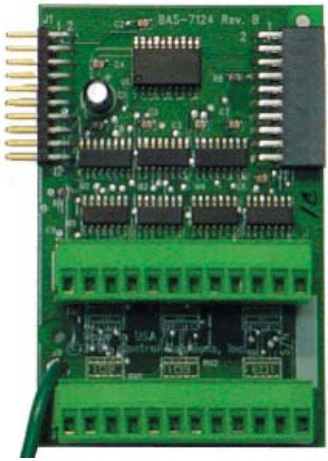
The BAS-718 includes one LED per input channel. The LED will light when voltage is sensed. The LED will be off if voltage is not sensed. The LED will glow dimly in the presence of voltage that is too close to the switching threshold to cause a solid on or off sense. The left-most LED indicates the state of Input #1 while the right-most LED indicates the state for Input #8.

CONFIGURATION

Each input channel has a respective jumper block to configure high or low voltage range. The jumper is installed or ON to select LOW voltage range. The jumper is removed or OFF to select HIGH voltage range. Low voltage range is TTL level through about 60VDC. High range is from 30VDC and above (to maximum of 150V peak). The inputs accept either AC or DC in either high or low range.



4.3. BAS-7124 Twenty-Four Channel Discrete Input Module



DESCRIPTION

The BAS-7124 provides the BAS-700 series system with a high density of inputs capable of sensing dry contact closures to ground (or power supply common). The BAS-7124 includes internal pullup resistors which present an open input voltage of +5VDC, and a contact closed current of less than 1mADC.

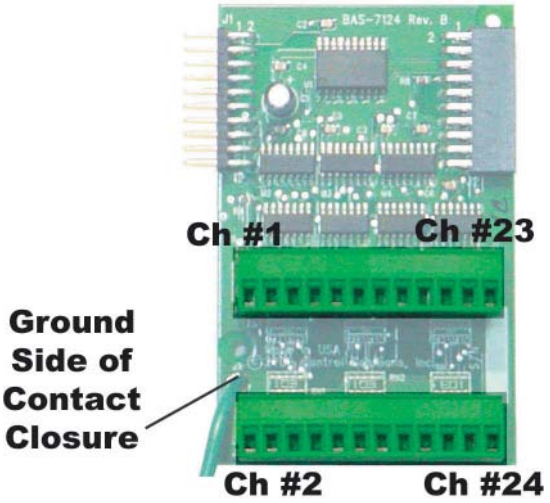
The BAS-7124 does not require any configuration jumpers. The status information sensed by the BAS-7124 is read by the processor via the Neurowire bus using the BAS-700 series standard bus connector.

SPECIFICATIONS

- 24-channel discrete contact monitor input
- Inputs sense contact closure to ground (power supply common/chassis ground)
- Internal pullup resistors, open input voltage +5VDC
- Plug-in screw terminal block for field wiring
- Snap track mounting
- Size: 3.25”H x 2.10”W (x1.5”D)

FIELD WIRING

The “ground” side of the contact closure to ground circuit is made via the green wire grounding lug attached to the board. The 24 individual inputs are connected via the two screw terminal blocks with one terminal per input. The input to the screw terminal block is usually the normally open side of the dry contact being sensed while its common is connected to ground.



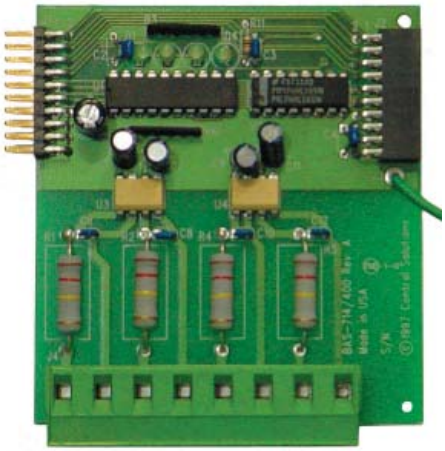
The pinout is as illustrated in the above diagram.

CONFIGURATION

There are no configuration settings to be made on the BAS-7124.

IMPORTANT: The BAS-7124 is designed to ONLY sense contact closures to ground via a dry contact. DO NOT connect the inputs of the BAS-7124 to any type of active signal or external voltage. Doing so will result in permanent damage to the BAS-7124.

4.4. BAS-714/400 Four Channel Discrete Input Module



DESCRIPTION

The BAS-714/400 Discrete Input Module extends the range of discrete inputs to 400 volts peak (400VDC, 277VAC). The BAS-714/400 is designed to sense on/off conditions in commercial lighting or other higher voltage applications.

The BAS-714/400 includes a status LED per channel which will light when voltage is being sensed by that channel. The status information is read by the processor via the Neurowire bus using the BAS-700 series standard bus connector.

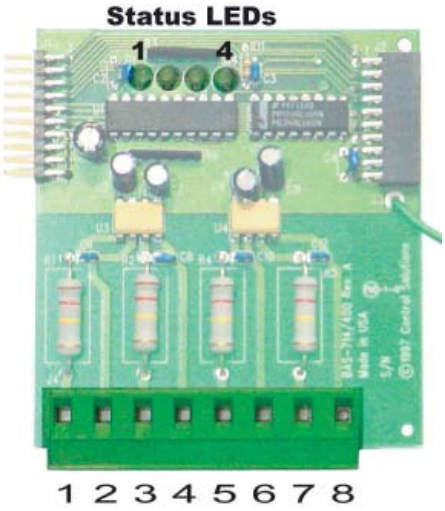
SPECIFICATIONS

- 4-channel discrete input
- Inputs optically isolated from system and from each other
- Inputs accept AC or DC of either polarity
- Inputs rated to 400VDC or 277VAC
- Input range: 60V to 400V (DC or peak)
- Plug-in screw terminal block for field wiring
- Snap track mounting
- Size: 3.25”H x 3.00”W (x1.5”D)

FIELD WIRING

The terminal block on the discrete input module provides two screw terminals per input point. The opto-isolator input per channel is bi-directional, thus input connections are not polarity sensitive. However, for preferred ESD immunity, the left-hand terminal (per pair) should be considered the positive signal input while

the right-hand terminal (per pair) should be considered the negative or ground terminal. If the right-hand terminal is connected to ground, the input will be well protected against ESD strikes.



Pinout is as follows for the BAS-714/400 (with pin 1 on the left if the wires are extending toward you):

Pin 1:	Input #1
Pin 2:	Input #1 common
Pin 3:	Input #2
Pin 4:	Input #2 common
Pin 5:	Input #3
Pin 6:	Input #3 common
Pin 7:	Input #4
Pin 8:	Input #4 common

INDICATORS

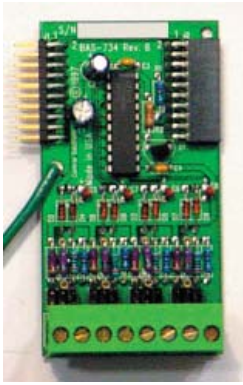
The BAS-714/400 includes one LED per input channel. The LED will light when voltage is sensed. The LED will be off if voltage is not sensed. The LED will glow dimly in the presence of voltage that is too close to the switching threshold to cause a solid on or off sense. The left-most LED indicates the state of Input #1 while the right-most LED indicates the state for Input #4.

CONFIGURATION

The input range on the BAS-714/400 is fixed. There are no hardware configuration settings.

5. Analog Input Modules

5.1. BAS-734 & BAS-734/1 Four Channel Analog Input Module



DESCRIPTION

The BAS-734 (non-isolated) provides the BAS-700 system with analog inputs suitable for measurement of 0-10VDC signals, 4-20mA signals, or thermistors. The input type is selected by a jumper, and each channel is individually configurable. If the socketed range resistor option is also present, the 10VDC input may be scaled to as high as 60VDC.

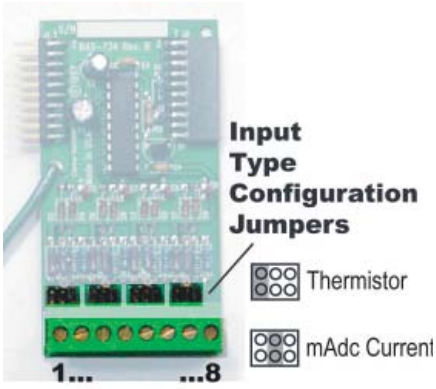
SPECIFICATIONS

- 4-channel analog input
- 12-bit resolution, ±0.5 bit linearity error max., ±1.0 bit gain error max.
- Channels individually configurable for 0-10VDC, 4-20mADC, or thermistors
- Optionally sockted range resistor allows scaling of inputs to 60VDC
- Plug-in screw terminal for field wiring
- Snap track mounting
- Size: 3.25”H x 1.75”W (x1.5”D)

FIELD WIRING

The terminal block on the analog input module provides two screw terminals per input point. The inputs are polarized, with the left-hand terminal being the positive connection, and the right-hand connection being the common or ground connection. For best ESD protection, the right-hand terminal should be grounded.

The input levels acceptable to the BAS-734, using the factory standard configuration, are 0-10 VDC or 4-20mA. These levels are as measured at the left-hand terminal with respect to the right-hand terminal or ground.

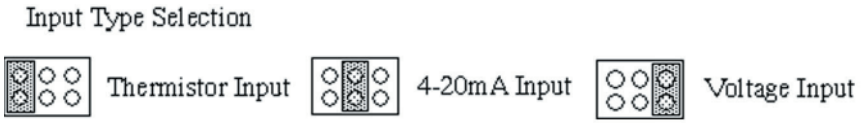


Pinout is as follows for the BAS-734 (with pin 1 on the left if the wires are extending toward you):

Pin 1:	Input #1
Pin 2:	Input #1 common
Pin 3:	Input #2
Pin 4:	Input #2 common
Pin 5:	Input #3
Pin 6:	Input #3 common
Pin 7:	Input #4
Pin 8:	Input #4 common

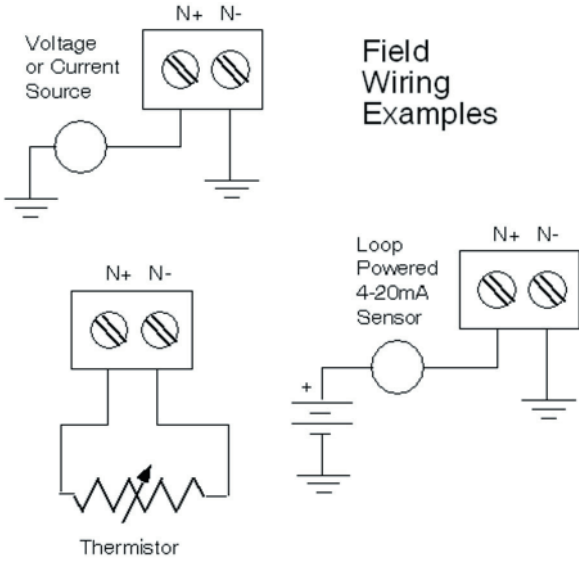
CONFIGURATION

The BAS-734 inputs are configured by a jumper on a channel by channel basis to select input type. Each channel has a 3-position jumper. The left-hand position selects thermistor input. The center position selects 4-20mA input. The right-hand position selects voltage input, 0-10VDC or range programmed by range resistor (734/1 only).



The current input range is fixed at 4-20mA (or 0-20mA), and sinks current provided by the external current source. The thermistor properties are optimized for 10k type 3 thermistors. The thermistor is sourced by the 4.096VDC reference (buffered reference from A/D), and this source is presented to the thermistor via a 4.12kΩ series resistor. (Note: Rev A boards used a 5VDC reference and 15K

series resistor.) The source voltage and series resistor have been selected to allow the 10k type 3 thermistor to measure temperatures over a -35°F to +240°F temperature range with the finest granularity occurring in the room temperature vicinity. Note that software linearization must be used to convert raw analog input readings to temperature.



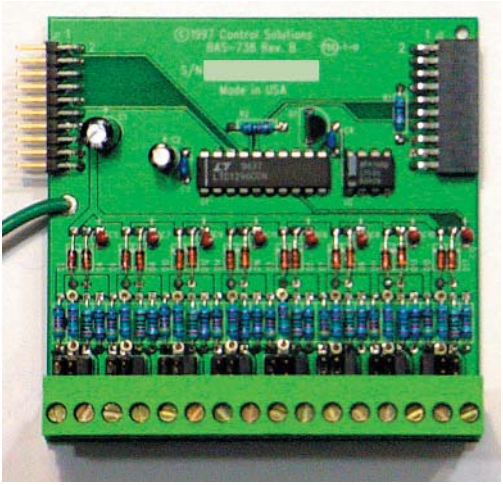
The BAS-734/1 provides a socketed range resistor (applicable only in voltage input configuration). The default value for the range resistor is 15.0kΩ. The 15.0k value will yield the 10V range set by default. The range resistor is in series between the screw terminal block and the A/D input, and there is a 10.0kΩ resistor to ground across the A/D input. The A/D reference voltage is 4.096 VDC (12-bit). The default configuration of a 15k over 10k voltage divider reduces a 10VDC input to the 4V range of the A/D (with a few bits allowed for overrange indication). Other ranges may be calculated accordingly. For example, a 0-50VDC input range may be realized using a 115kΩ range resistor, with 50V representing a 100% input level. The formula for calculating the range resistor is

$$R = (V / .0004) - 10{,}000$$

where V is the input voltage and R is the range resistor in ohms.

The DC input level should not exceed 60VDC even with appropriate range resistors, and the DC input should never exceed the level set by the resistive voltage divider. Clamping diodes will enforce the voltage limits, but sustained excessive input levels will damage the circuit board and such damage is not covered under manufacturer's warranty.

5.2. BAS-738 & BAS-738/1 Eight Channel Analog Input Module



DESCRIPTION

The BAS-738 (non-isolated) provides the BAS-700 system with analog inputs suitable for measurement of 0-10VDC signals, 4-20mA signals, or thermistors. The input type is selected by a jumper, and each channel is individually configurable. If the socketed range resistor option is also present (738/1), the 10VDC input may be scaled to as high as 60VDC.

SPECIFICATIONS

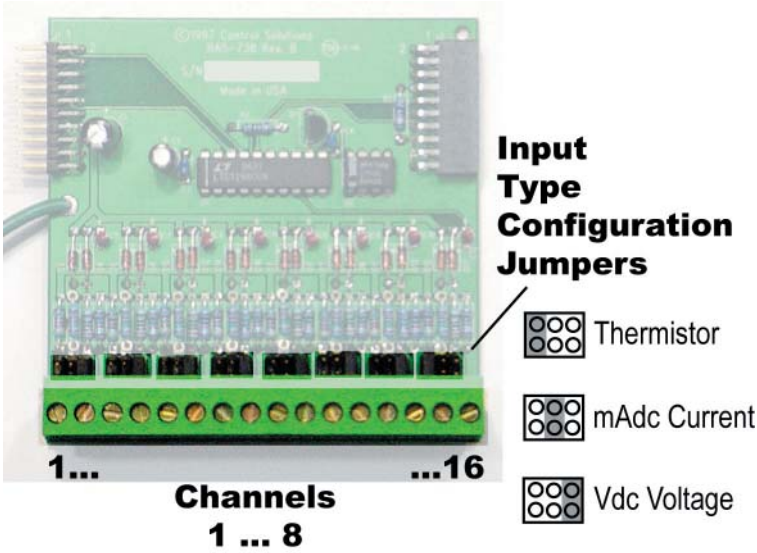
- 8-channel analog input
- 12-bit resolution, ±0.5 bit linearity error max., ±1.0 bit gain error max.
- Channels individually configurable for 0-10VDC, 4-20mADC, or thermistors
- Optionally sockted range resistor allows scaling of inputs to 60VDC
- Plug-in screw terminal for field wiring
- Snap track mounting
- Size: 3.25”H x 3.30”W (x1.5”D)

FIELD WIRING

The terminal block on the analog input module provides two screw terminals per input point. The inputs are polarized, with the left-hand terminal being the positive connection, and the right-hand connection being the common or ground connection. For best ESD protection, the right-hand terminal should be grounded.

The input levels acceptable to the BAS-738, using the factory standard configuration, are 0-10 VDC or 4-20mA. These levels are as measured at the left-hand

terminal with respect to the right-hand terminal or ground.



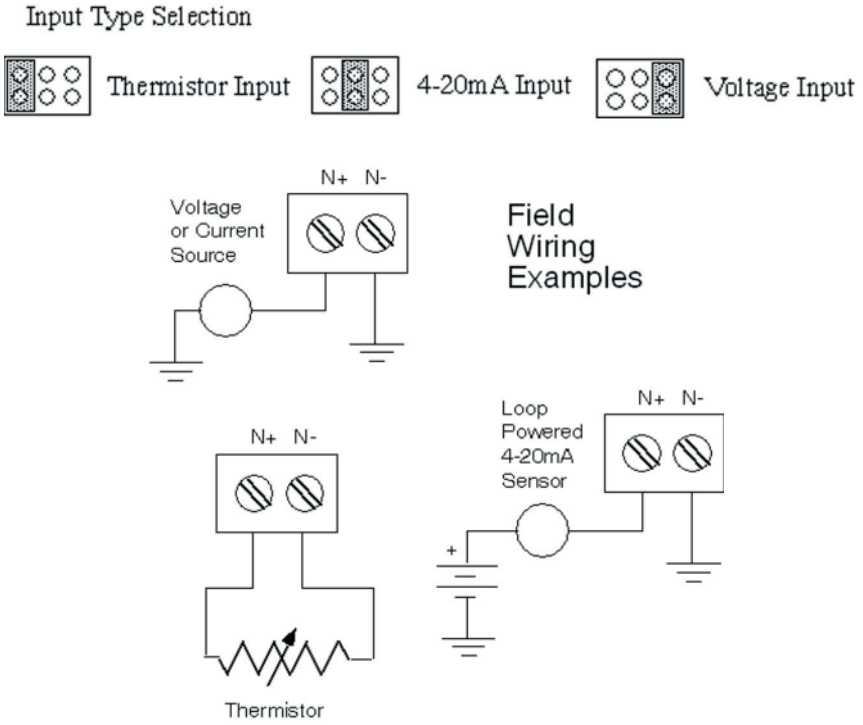
Pinout is as follows for the BAS-738 (with pin 1 on the left if the wires are extending toward you):

Pin 1:	Input #1
Pin 2:	Input #1 common
Pin 3:	Input #2
Pin 4:	Input #2 common
Pin 5:	Input #3
Pin 6:	Input #3 common
Pin 7:	Input #4
Pin 8:	Input #4 common
Pin 9:	Input #5
Pin 10:	Input #5 common
Pin 11:	Input #6
Pin 12:	Input #6 common
Pin 13:	Input #7
Pin 14:	Input #7 common
Pin 15:	Input #8
Pin 16:	Input #8 common

CONFIGURATION

The BAS-738 inputs are configured by a jumper on a channel by channel basis to select input type. Each channel has a 3-position jumper. The left-hand position selects thermistor input. The center position selects 4-20mA input. The right-hand

position selects voltage input, 0-10VDC or range programmed by range resistor.



The current input range is fixed at 4-20mA (or 0-20mA), and sinks current provided by the external current source. The thermistor properties are optimized for 10k type 3 thermistors. The thermistor is sourced by the 4.096VDC reference (buffered reference from A/D), and this source is presented to the thermistor via a 4.12kΩ series resistor. (Note: Rev A boards used a 5VDC reference and 15K series resistor.) The source voltage and series resistor have been selected to allow the 10k type 3 thermistor to measure temperatures over a -35°F to +240°F temperature range with the finest granularity occurring in the room temperature vicinity. Note that software linearization must be used to convert raw analog input readings to temperature.

The BAS-738/1 provides a socketed range resistor (applicable only in voltage input configuration). The default value for the range resistor is 15.0kΩ. The 15.0k value will yield the 10V range set by default. The range resistor is in series between the screw terminal block and the A/D input, and there is a 10.0kΩ resistor to ground across the A/D input. The A/D reference voltage is 4.096 VDC (12-bit). The default configuration of a 15k over 10k voltage divider reduces a 10VDC input to the 4V range of the A/D (with a few bits allowed for overrange indication). Other ranges may be calculated accordingly. For example, a 0-50VDC input

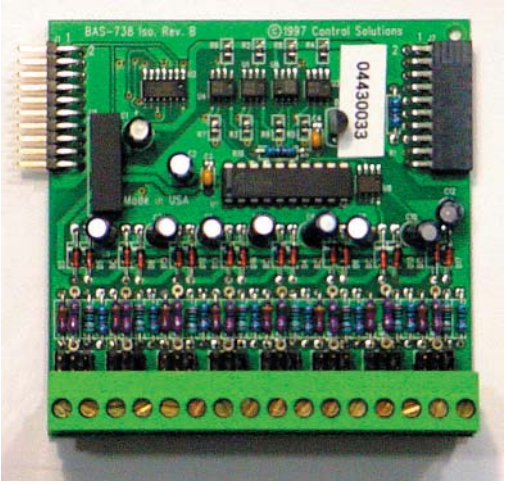
range may be realized using a 115kΩ range resistor, with 50V representing a 100% input level. The formula for calculating the range resistor is

$$R = (V / .0004) - 10{,}000$$

where V is the input voltage and R is the range resistor in ohms.

The DC input level should not exceed 60VDC even with appropriate range resistors, and the DC input should never exceed the level set by the resistive voltage divider. Clamping diodes will enforce the voltage limits, but sustained excessive input levels will damage the circuit board and such damage is not covered under manufacturer's warranty.

5.3. BAS-738/3 Eight Channel Isolated Analog Input Module



DESCRIPTION

The BAS-738/3 (BAS-738/1 with isolation option) provides the BAS-700 system with analog inputs suitable for measurement of 0-10VDC signals, 4-20mA signals, or thermistors. The input type is selected by a jumper, and each channel is individually configurable. If the socketed range resistor option is also present, the 10VDC input may be scaled to as high as 60VDC.

The isolation option (BAS-738/3) provides isolation between input channels and the rest of the system. This is accomplished with a DC/DC converter to provide power to the isolated side of the input circuitry, and opto-isolators to pass data back and forth. Although isolated from the rest of the BAS-700 system, all input channels are electrically common to each other. If isolation between groups of channels is needed, multiple BAS-738/3 boards may be used.

SPECIFICATIONS

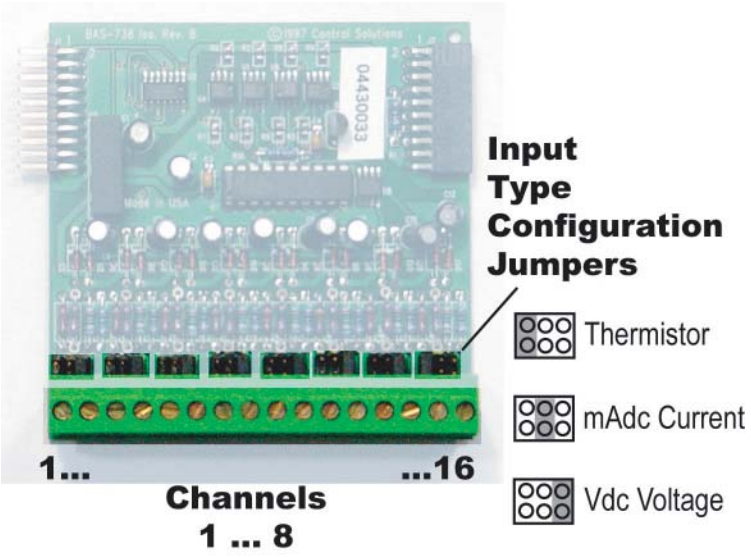
- 8-channel analog input
- 12-bit resolution, ±0.5 bit linearity error max., ±1.0 bit gain error max.
- Inputs isolated from system (but not from each other)
- Isolation rating of 500 V peak
- Channels individually configurable for ±10VDC, 4-20mADC, or thermistors
- Sockted range resistor allows scaling of inputs to 60VDC
- Plug-in screw terminal for field wiring
- Snap track mounting, Size: 3.25”H x 3.30”W (x1.5”D)

FIELD WIRING

The terminal block on the analog input module provides two screw terminals per input point. The inputs are polarized, with the left-hand terminal being the positive connection, and the right-hand connection being the common, negative, or ground connection. For best ESD protection, the right-hand terminal should be grounded. In the case of the ISOLATED version of the BAS-738, the right-hand terminal should NOT be grounded to the same ground as the rest of the BAS-700 system, but be grounded to the equipment being monitored (and the isolated ground may be a positive or negative ground in a DC system).

The input levels acceptable to the BAS-738, using the factory standard configuration, are 0-10 VDC or 4-20mA. The BAS-738/3 can also accept -10 to +10 VDC (bipolar) input. These levels are as measured at the left-hand terminal with respect to the right-hand terminal (or ground on a non-isolated model).

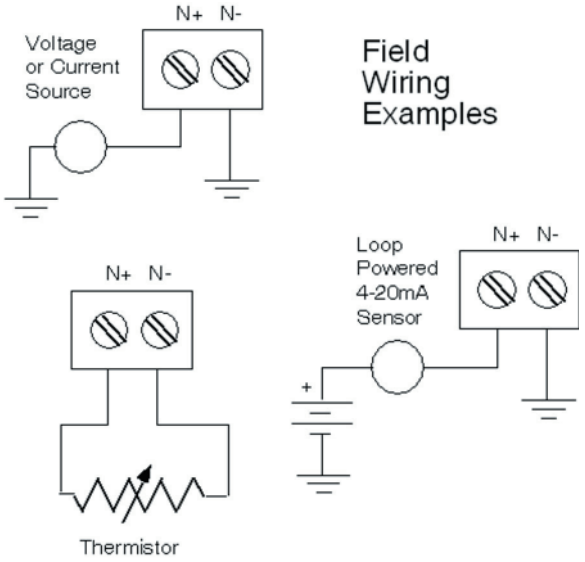
IMPORTANT: The isolation provided by the isolated input version of the BAS-738 is strictly input to system, and does not provide channel to channel isolation. Thus, ALL INPUTS MUST BE ELECTRICALLY COMMON TO EACH OTHER even though they are electrically isolated from all other I/O points connected to the system via other I/O modules within the same system.



Pinout is as follows for the BAS-738/3 (with pin 1 on the left if the wires are extending toward you):

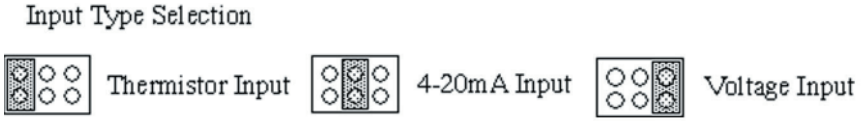
Pin 1: Input #1

Pin 2:	Input #1 common
Pin 3:	Input #2
Pin 4:	Input #2 common
Pin 5:	Input #3
Pin 6:	Input #3 common
Pin 7:	Input #4
Pin 8:	Input #4 common
Pin 9:	Input #5
Pin 10:	Input #5 common
Pin 11:	Input #6
Pin 12:	Input #6 common
Pin 13:	Input #7
Pin 14:	Input #7 common
Pin 15:	Input #8
Pin 16:	Input #8 common



CONFIGURATION

The BAS-738/3 inputs are configured by a jumper on a channel by channel basis to select input type. Each channel has a 3-position jumper. The left-hand position selects thermistor input. The center position selects 4-20mA input. The right-hand position selects voltage input, either 0-10VDC or -10 to +10VDC as configured by software on the BAS-738/3.



The current input range is fixed at 4-20mA (or 0-20mA), and sinks current provided by the external current source. The thermistor properties are optimized for 10k type 3 thermistors. The thermistor is sourced by the 4.096VDC reference (buffered reference from A/D), and this source is presented to the thermistor via a 4.12kΩ series resistor. (Note: Rev A boards used a 5VDC reference and 15K series resistor.) The source voltage and series resistor have been selected to allow the 10k type 3 thermistor to measure temperatures over a -35°F to +240°F temperature range with the finest granularity occurring in the room temperature vicinity. Note that software linearization must be used to convert raw analog input readings to temperature.

The BAS-738/3 provides an optionally socketed range resistor (applicable only in voltage input configuration). The default value for the range resistor is 15.0kΩ. The 15.0k value will yield the 10V range set by default. The range resistor is in series between the screw terminal block and the A/D input, and there is a 10.0kΩ resistor to ground across the A/D input. The A/D reference voltage is 4.096 VDC (12-bit). The default configuration of a 15k over 10k voltage divider reduces a 10VDC input to the 4V range of the A/D (with a few bits allowed for overrange indication). Other ranges may be calculated accordingly. For example, a 0-50VDC input range may be realized using a 115kΩ range resistor, with 50V representing a 100% input level. The formula for calculating the range resistor is

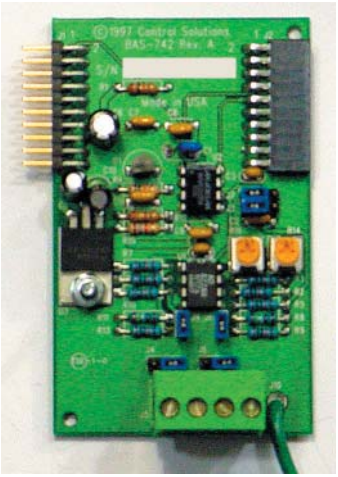
$$R = (V / .0004) - 10{,}000$$

where V is the input voltage and R is the range resistor in ohms.

The DC input level should not exceed 60VDC even with appropriate range resistors, and the DC input should never exceed the level set by the resistive voltage divider. Clamping diodes will enforce the voltage limits, but sustained excessive input levels will damage the circuit board and such damage is not covered under manufacturer's warranty.

6. Analog Output Modules

6.1. BAS-742 Two Channel Analog Output Module



DESCRIPTION

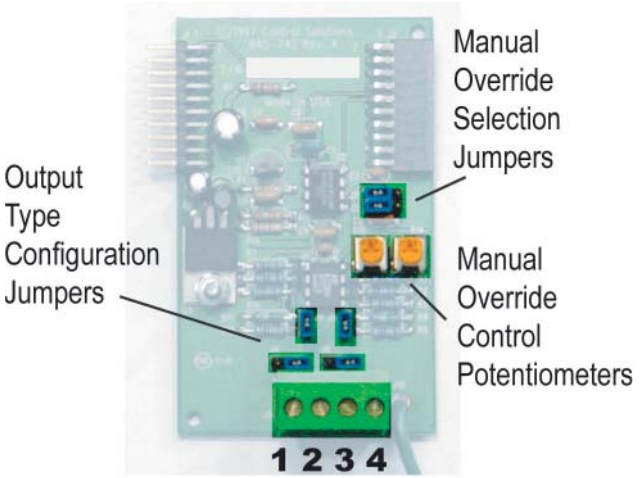
The BAS-742 provides the BAS-700 system with analog outputs which may be used to source process signals to other equipment. Outputs may be either 4-20mA or 0-10VDC. Each channel is individually configured. Outputs are non-isolated.

SPECIFICATIONS

- 2-channel analog output
- 8-bit resolution
- Channels jumper configurable for 4-20mA or 0-10VDC
- Source 20mA into 250Ω max. load
- Manual override available via potentiometer onboard
- Plug-in screw terminal for field wiring
- Snap track mounting
- Size: 3.25”H x 2.00”W (x1.5”D)

FIELD WIRING

The analog output module provides 2 terminals per output, a signal and common.

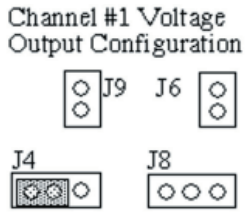


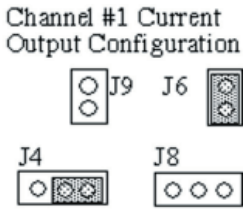
Pinout is as follows for the BAS-742 (with pin 1 on the left if the connector side of the board is closest to you):

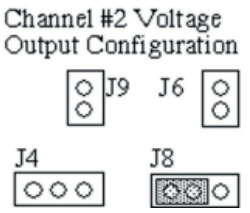
Pin 1:	Output #1 Signal
Pin 2:	Common
Pin 3:	Output #2 Signal
Pin 4:	Common

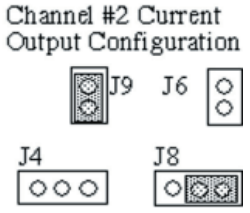
CONFIGURATION

Each channel is individually configurable for either 0-10VDC or 4-20mADC. The jumper positions for voltage type and current type outputs for each channel are illustrated in the diagrams below.









Channel #1 is set by jumpers J4 and J6. J4 is installed in the 1-2 position for voltage output. J4 is installed in the 2-3 position and J6 is installed for current output.

Channel #2 is set by jumpers J8 and J9. J8 is installed in the 1-2 position for voltage output. J8 is installed in the 2-3 position and J9 is installed for current output.

IMPORTANT: Power supply requirements specified for the BAS-700 processor module, which contains the system power supply, are restricted when the BAS-742 is included in the system. The power input voltage normally specified as 10-30VDC must be increased to 15-30VDC when the BAS-742 is used. In addition, the 12-24VAC specification should be set at 24VAC.

The power supply requirements noted above are to provide for the proper source voltage for the BAS-742's onboard regulator. This regulator provides the necessary drive current and voltage for 4-20mA current loop outputs. This regulator is still necessary even for voltage outputs since the same circuitry is used with slightly different configuration of certain resistors (via the jumper settings).

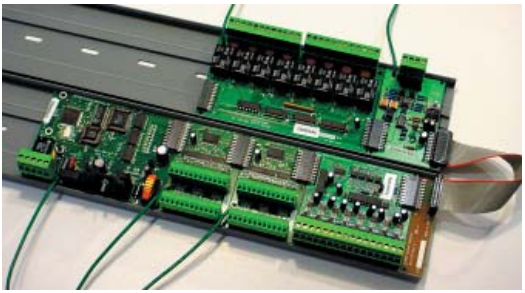
MANUAL OVERRIDE

The BAS-742 provides for a manual override, meaning you may manually override the processor and set the output level via an on-board potentiometer. The jumper positions illustrated below indicate the normal and override positions for each channel.

Once the jumper has been set in the override position, the output level is determined by potentiometers labelled R16 for Channel #1 and R14 for Channel #2. The most counter clockwise position is minimum output level, and the most clockwise position is the maximum output level.

7. System Support Modules

7.1. BAS-EXT Bus Extender



DESCRIPTION

The BAS-EXT bus extender allows splitting a track. The length of the track can become cumbersome in a large system. Splitting the track allows a shorter wider profile.

The BAS-EXT/6 (6-inch ribbon cable) is used for above/below configurations as pictured above. The BAS-EXT/2 (2-inch ribbon cable) is used for over/under stacking.

7.2. BAS-DC48 DC/DC Converter

DESCRIPTION

The BAS-DC48 allows operation of a BAS-700 series system from a 48VDC supply as often found in telecommunications installations. The supply may be operated from a positive ground system, and converts the BAS-700 supply to negative ground.

SPECIFICATIONS

- Isolated 48VDC input
- 12VDC @ 2.1A output (or 24VDC @ 1.0A)
- Used for positive ground Telecom installations
- Plug-in screw terminal block
- Snap track mounting, 3.25”H x 2.60”W

FIELD WIRING

The 48VDC input is connected to the positive and negative terminals as indicated above. The positive terminal is positive with respect to the negative terminal, and either side may be power source “ground”. The output should be connected to the BAS-70x processor power input, positive to positive and negative to negative.

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