BASR

Building Automation System Remote I/O

BAS Remote

User Manual

TD040300-0MC

CONTEMPORARY CONTROLS®

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Disclaimer

Contemporary Control Systems, Inc. reserves the right to make changes in the specifications of the product described within this manual at any time without notice and without obligation of Contemporary Control Systems, Inc. to notify any person of such revision or change.

**WARNING — This is a Class A product as defined in EN55022.
In a domestic environment this product may cause radio interference
in which case the user may be required to take adequate measures.**

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1 Table of Contents

2 History

3 Introduction

The BAS Remote provides a convenient method of expanding building automation systems in the field when using Ethernet for network communication. Modern building automation systems are quickly adopting information technology standards such as Ethernet for communication. The BAS Remote complies with BACnet/IP as defined in ANSI/ASHRAE Standard 135-2004 while providing six universal input/output points and two relay outputs. By incorporating a 10/100 Mbps Ethernet port, the BAS Remote can be connected anywhere in a buildings' structured wiring system at a point convenient to mechanical equipment. This eliminates the need to pull proprietary network cable to the source of the I/O. By being BACnet/IP compliant, there is no need for an external router. The BAS Remote is ideal for applications where several points of I/O must be accessed in areas void of proprietary BAS networks. If additional I/O is required, up to three expansion modules can be connected to one BAS Remote master.

Besides being BACnet/IP compliant, the BAS Remote master functions as a Modbus TCP Server Gateway allowing access to Modbus serial devices attached to a 2-wire Modbus EIA-485 serial port. Even the internal BAS Remote master and expansion units can be assigned Modbus addresses in the same Modbus address space.

Both the BAS Remote master and expansion modules have the same I/O capability. Six universal input/output points are provided on each module. Depending upon configuration, each unit can accommodate a contact closure from a digital point, a thermistor, voltage or current analog input from a field transmitter or supervisory controller. Analog inputs can range from 0-5 VDC, 0-10 VDC or 0-20 mA. Inputs can be scaled to accommodate ranges such as 1-5 VDC, 2-10 VDC, and 4-20 mA. Input point resolution is 10-bits.

Type II and III 10 kΩ thermistor calibration curves are resident in the BAS Remote. Single-point calibration of temperature is accomplished using the units' web server. Inputs can accept pulse trains in the range of 0 to 40 hertz (50% duty cycle) to measure flow rates.

Analog outputs can be 0-10 VDC or 0-20 mA. However, scaling for 2-10 V, 0-5 V, 1-5 V and 4-20 mA is possible. LED indicators identify the state of I/O points. Output point resolution is 12 bits.

There are two relay outputs available with both normally open (NO) and normally closed (NC) contacts. The relay output rating is 30 VAC/VDC, 2A.

There are two non-isolated 2-wire EIA-485 expansion ports on the master module. The downstream port (DN) is intended for expansion modules while the Modbus (MB) port functions as a Modbus TCP Server Gateway allowing for the attachment of Modbus 2-wire or 3-wire EIA-485 serial devices. On BAS Remote expansion modules, the two ports are marked UP and DN, and are dedicated for communication with the BAS Remote master module and other expansion modules.

All field connectors are removable making field replacement of units quick and simple.

A single RJ-45 shielded connector provides the 10/100 Mbps twisted-pair Ethernet connection. The unit supports auto-negotiation of data rate and duplex. A resident web server facilitates commissioning and troubleshooting. Configuration is accomplished via Ethernet. Java must be enabled in the browser used to access the BAS Remote.

Power for the BAS Remote can be derived from a 24 VAC Class 2 transformer capable of delivering 10 VA or from a 24 VDC power supply capable of at least 10 W. Since the unit incorporates a half-wave rectified power supply, attached I/O points and the power supply can share a common ground. Therefore, the BAS Remote can be powered by the same control transformer used to power other half-wave rectified control equipment. The BAS Remote can be DIN-rail mounted into a control panel. If panel mounting is required, use the supplied mounting tabs.

The BAS Remote conforms to the BACnet/IP standard and therefore allows field I/O to be directly accessed via Ethernet without the need of a router. A standard web browser with Java enabled is used for commissioning and troubleshooting. The BAS Remote adheres to the BACnet Application Specific Controller (B-ASC) profile.

3.1 Features and Benefits

- Network accessible I/O with built-in 10/100 Mbps Ethernet port
- Supports BACnet/IP® eliminating the need for an external router
- Adheres to BACnet Application Specific Controller (B-ASC) profile
- Six universal input/output points & two relay outputs
- Supports thermistor, 0-10 VDC, 0-20 mA, contact closure, 0-40Hz pulse train inputs, and 0-10 VDC and 0-20 mA outputs
- Relay outputs 30 VAC/VDC, 2A.
- Expansion port for additional expansion I/O modules
- Modbus TCP sever gateway for Modbus serial devices
- Removable field connectors
- Web server for convenient commissioning and troubleshooting
- Low-voltage 24 VAC or VDC powered
- LED indicators for inputs, outputs, CPU status, and Ethernet activity/link/data rate
- DIN-rail mount installation or optional panel mounting
- UL 508 Listed, Industrial Control Equipment
- CE Mark

3.2 Software

The provided CD-ROM contains:

- This User Manual
- An Installation Guide
- Additional information of interest
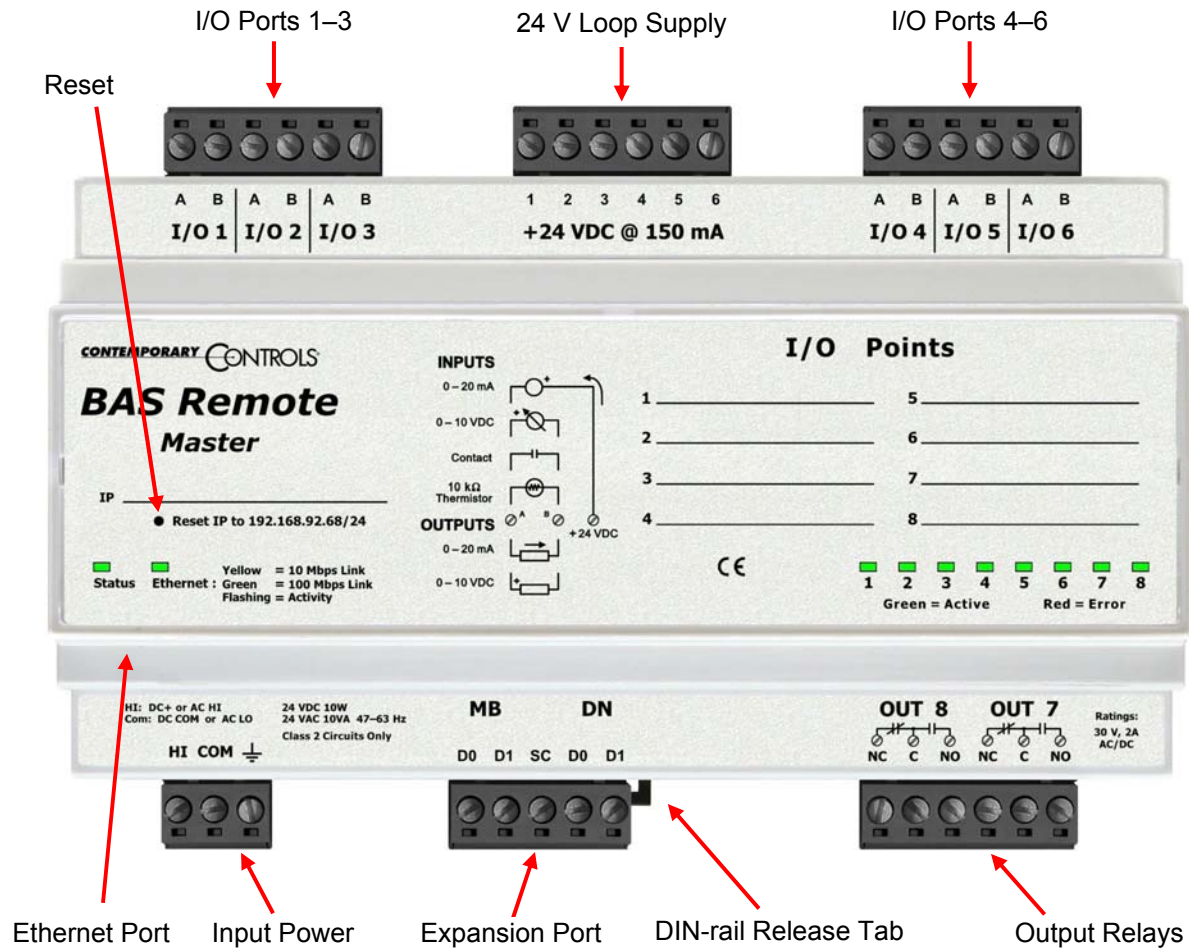
3.3 Product Image (Master Module)

Figure 1 — BAS Remote Master Main Features

4 Specifications

4.1 Universal Input/Outputs — Channels 1 – 6

Configured As	Limits
Analog Input	0-5 VDC, 0-10 VDC or 0-20 mA scalable by user. 10-bit resolution. Input impedance 100 kΩ on voltage and 250 Ω on current.
Temperature Input	Type II or type III thermistors –35°F to +110°F (–37°C to +44°C)
Contact closure input	Excitation current 2 mA. Open circuit voltage 24 VDC. Sensing threshold 0.3 VDC. Response time 20 ms.
Pulse input	0–10 VDC scaleable by user. User adjustable threshold. 40 Hz maximum input frequency with 50% duty cycle.
Analog Output	0–10 VDC or 0–20 mA scalable by user. 12-bit resolution. Maximum burden 750 Ω when using current output.

4.2 Relay Outputs — Channels 7 – 8

Limits
Form "C" contact with both NO and NC contacts available. 30 VAC/VDC 2 A. Class 2 circuits only.

4.3 Communications

Protocol	Data Link and Physical Layers
BACnet/IP — Master only	ANSI/IEEE 802.3 10/100 Mbps Ethernet. 10BASE-T, 100BASE-TX, auto-negotiation of speed and duplex.
Modbus TCP — Master only	Auto-MDIX. 100 m maximum segment length. Default IP address is 192.168.92.68/24.
Expansion Bus	Modified Modbus serial protocol. 2-wire non-isolated EIA-485 57.6 kbaud. Maximum segment length 100 m.
Modbus Serial — Master only	Modbus serial ASCII or RTU protocol. 2-wire non-isolated EIA-485. 2.4, 4.8, 9.6, 19.2, 38.4, 57.6, 115.2 kbps. Max segment length 100 m. Jumper selectable bias and termination.

4.4 Protocol Compliance

Protocol	Compliance
BACnet/IP	ASHRAE 135-2004 annex J. Application specific controller device profile B-ASC.
Modbus TCP	Modbus Application Protocol Specification V1.1b Dec. 28, 2006, Modbus.org. Modbus Messaging on TCP/IP Implementation Guide V1.0b October 24, 2006, Modbus.org.
Modbus serial	Modbus over Serial Line Specification and Implementation Guide V1.02 December 20, 2006, Modbus.org.

4.5 Power Requirements

Item	Limits
Input power	Master module: 24 VAC/VDC ± 10%, 47-63 Hz, 10 VA Expansion module: 24 VAC/VDC ± 10%, 47-63 Hz, 8 VA
Loop supply	+24 VDC ± 10%, 150 mA maximum

4.6 General Specifications

Item	Description
Protection	All inputs and outputs (except for relay outputs and communications ports) are over-voltage protected up to 24 VAC and short-circuit protected.
Environmental	Operating temperature 0° to +60°C. Storage temperature -40°C to +85°C. Relative humidity 10 to 95%, non-condensing.
Weight	0.6 lbs. (0.27 kg).

4.7 LED Indicators

LED Indicator	Indication
I/O 1–6 configured as Analog input	Green: > 1% of range, otherwise off
I/O 1–6 configured as Temperature input	Green: sensor detected Red: open
I/O 1–6 configured as Contact input	Green: contact closed, otherwise off
I/O 1–6 configured as Pulse input	Green: pulse sensed, otherwise off
I/O 1–6 configured as Analog output	Green: commanded output Red: expected output not within 40 mV on voltage or 0.2 mA on current
Status	Red: device in reset Green flashing: booting up Green: running application Green flashing: Modbus serial activity after application is running — *master only*
Ethernet — Master module only	Yellow: 10Mbps; flashes with activity Green: 100 Mbps; flashes with activity
Network — Expansion module only	Green flashing: expansion bus activity

4.8   Electromagnetic Compatibility

Standard	Test Method	Description	Test Levels
EN 55024	EN 61000-4-2	Electrostatic Discharge	6 kV contact
EN 55024	EN 61000-4-3	Radiated Immunity	10 V/m, 80 MHz to 1 GHz
EN 55024	EN 61000-4-4	Fast Transient Burst	1 kV clamp & 2 kV direct
EN 55024	EN 61000-4-5	Voltage Surge	1 kV L-L & 2 kV L-Earth
EN 55024	EN 61000-4-6	Conducted Immunity	10 V (rms)
EN 55024	EN 61000-4-11	Voltage Dips & Interruptions	1 Line cycle, 1-5 s @100% dip
EN 55022	CISPR 22	Radiated Emissions	Class A
EN 55022	CISPR 22	Conducted Emissions	Class B
CFR 47, Part 15	ANSI C63.4	Radiated Emissions	Class A

4.9 Field Connections

Terminal	Universal I/Os 1 – 3
I/O 1 A	Universal I/O point 1 high
I/O 1 B	Universal I/O point 1 low
I/O 2 A	Universal I/O point 2 high
I/O 2 B	Universal I/O point 2 low
I/O 3 A	Universal I/O point 3 high
I/O 3 B	Universal I/O point 3 low

Terminal	Universal I/Os 4 – 6
I/O 4 A	Universal I/O point 4 high
I/O 4 B	Universal I/O point 4 low
I/O 5 A	Universal I/O point 5 high
I/O 5 B	Universal I/O point 5 low
I/O 6 A	Universal I/O point 6 high
I/O 6 B	Universal I/O point 6 low

Terminal	Relay Outputs
OUT 8 NC	Output 8 normally-closed contact
OUT 8 C	Output 8 common
OUT 8 NO	Output 8 normally-open contact
OUT 7 NC	Output 8 normally-closed contact
OUT 7 C	Output 8 common
OUT 7 NO	Output 8 normally-open contact

Terminal	+24 VDC @ 150 mA Loop Supply
1	+24 VDC
2	+24 VDC
3	+24 VDC
4	+24 VDC
5	+24 VDC
6	+24 VDC

Terminal	Expansion Ports — Master Module	Expansion Ports — Expansion Module
MB/UP-D+	Modbus terminal D1 (+)	Upstream expansion term. D1 (+)
MB/UP-D–	Modbus terminal D0 (–)	Upstream expansion term. D0 (–)
SC	Modbus signal common	Not used
DN-D+	Downstream expansion terminal D1 (+)	
DN-D–	Downstream expansion terminal D0 (–)	

Terminal	Power — Master Module	Power — Expansion Module
HI	High AC or DC +	High AC or DC +
COM	AC or DC common	AC or DC common
Earth	Optional earthing connection	No connection

4.10 Ordering Information

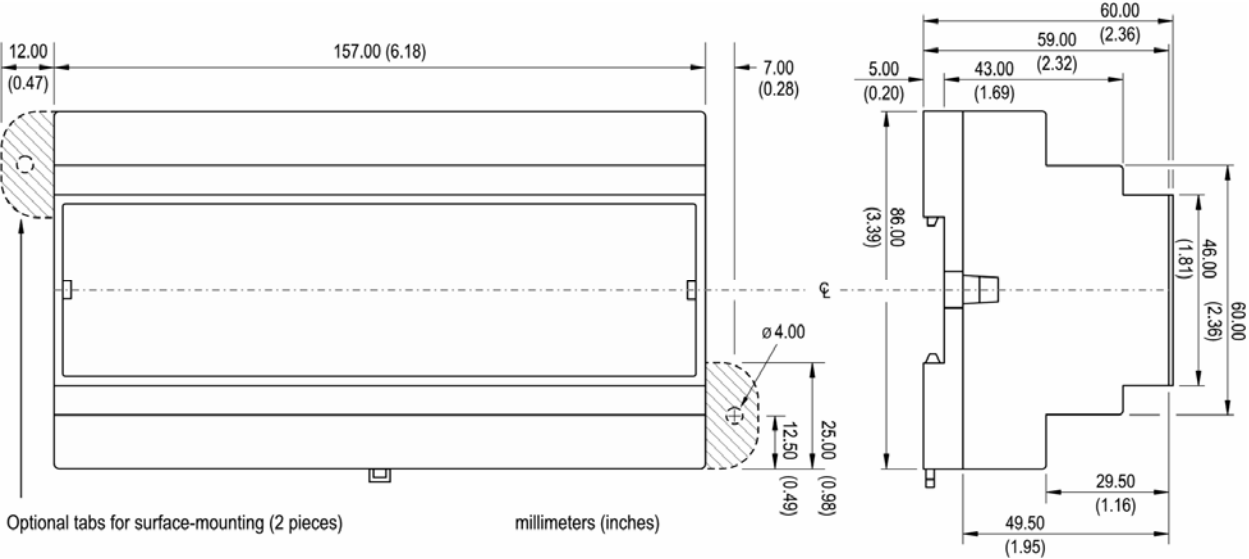| Model	Description
BASR-8M	BAS Remote master with eight I/O points
BASR-8X	BAS Remote expansion with eight I/O points
BASR-MT	Pair of panel mounting tabs (one set included with each unit)

4.11 Dimensional Drawing

Figure 2 — BAS Remote Dimensions

4.12 PICS Statement

BACnet Protocol Implementation Conformance Statement (Annex A)

Date: July 30, 2007
Vendor Name: Contemporary Controls
Product Name: BAS Remote
Product Model Number: BASR-8M
Applications Software Version: **Firmware Revision:**   **BACnet Protocol Revision:**

Product Description: BACnet/IP compliant 8-point remote input/output device that allows a direct connection to Ethernet without the need of a BACnet router.

BACnet Standardized Device Profile (Annex L):
☐ BACnet Operator Workstation (B-OWS)
☐ BACnet Building Controller (B-BC)
☐ BACnet Advanced Application Controller (B-AAC)
☒ BACnet Application Specific Controller (B-ASC)
☐ BACnet Smart Sensor (B-SS)
☐ BACnet Smart Actuator (B-SA)

List all BACnet Interoperability Building Block Supported (Annex K):
DS-RP-B Data Sharing — ReadProperty-B
DS-WP-B Data Sharing — WriteProperty-B
DM-DDB-B Device Management — Dynamic Device Binding-B
DM-DOB-B Device Management — Dynamic Object Binding-B
DM-DCC-B Device Management — Device Communication Control-B

Segmentation Capability:
☐ Able to transmit segmented messages   Window Size:
☐ Able to receive segmented messages   Window Size:

Object Type Supported	Can Be Created Dynamically	Can Be Deleted Dynamically
Analog Input	No	No
Analog Output	No	No
Binary Input	No	No
Binary Output	No	No
Device	No	No

Data Link Layer Options:
☒ BACnet IP, (Annex J)
☐ BACnet IP, (Annex J), Foreign Device
☐ ANSI/ATA 878.1, EIA-485 ARCNET (Clause 8), baud rate(s):
☐ MS/TP master (Clause 9), baud rate(s):
☐ MS/TP slave (Clause 9), baud rate(s):
☐ Point-To-Point, EIA 232 (Clause 10), baud rate(s):
☐ Point-To-Point, modem, (Clause 10), baud rate(s):
☐ LonTalk, (Clause 11, medium:
☐ Other:

Device Address Binding:
Is static device binding supported? (This is currently necessary for two-way communication with MS/TP slaves and certain other devices.) ☐ Yes ☐ No

Networking Options:
☐ Router, Clause 6 – List all routing configurations, e.g., ARCNET-Ethernet-MS/TP, etc.
☐ Annex H, BACnet Tunneling Router over IP
☐ BACnet/IP Broadcast Management Device (BBMD)
    Does the BBMD support registrations by Foreign Devices? ☐ Yes ☐ No

Character Sets Supported:
Indicating support for multiple character sets does not imply that they can all be supported simultaneously.

☐ ANSI X3.4   ☐ IBM™/Microsoft™ DBCS   ☐ ISO 8859-1
☐ ISO 10646 (UCS-2)   ☐ ISO 10646 (UCS-4)   ☐ JIS C 6226

5 Installation

The BASR is intended to be mounted in an industrial enclosure or wiring closet on 35-mm DIN-rail or panel-mounted with screws (not provided). The panel-mounting tabs are packaged in a plastic bag within the shipping box. To use these tabs, Figure 3 illustrates how the two studs of each tab are press fitted into their respective holes in opposing corners of the case.
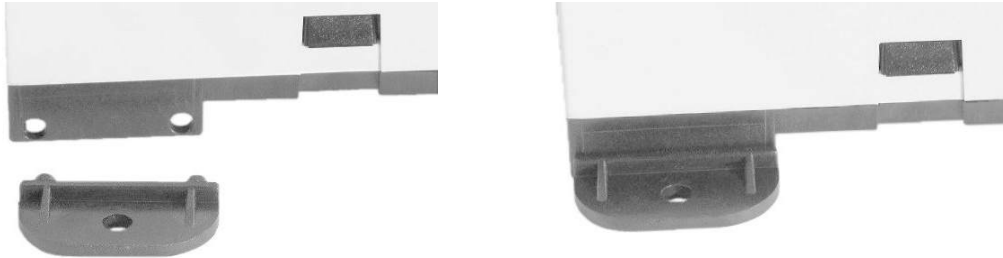

Figure 3 — Attaching Panel-Mounting Tabs

5.1 Power Supply

An internal portion of the BAS Remote provides the 24 VDC loop supply to power external devices attached as inputs to the BAS Remote — you do not need a separate loop supply. Since the BAS Remote can source current via its analog outputs, an internal source of 24 VDC is provided for powering outputs. Collectively, the sum of input and output power cannot exceed 150 mA.

The power source for the internal supply is applied via the three terminals labeled *Earth*, *COM*, and *HI*. *Earth* allows external connection to earth if better EMC compliance is needed. *COM* is for the power source return and also serves as the BAS Remote common ground connection. Primary 24 VAC/VDC (± 10%) power is applied to *HI* and *COM*. *HI* connects to a diode accomplishes half-wave rectified power — while providing reverse input voltage protection.

Maximum current draw for any I/O channel is 20 mA — yielding a total draw of 120 mA for all six channels. Analog output current sources from the same internal supply, so an external source of 24 VDC is unneeded — ***but a return common is***. Six +24 VDC pins are present to serve external transmitters, so they do not need a separate loop supply. However, the power supply must serve only its own BAS Remote module.

The BASR requires 24 VDC or VAC from a source via a three-pin removable keyed connector. The proper connections for various power options are shown in Figure 4.

The recommended size for power conductors is 16–18 AWG (solid or stranded). Ground is directly connected to zero volts. Input connections are reverse-polarity protected.

An internal source provides 24 VDC (allowing a maximum current draw of 150 mA) to power external transmitters connected as inputs to the BASR — so a separate loop supply is unneeded.

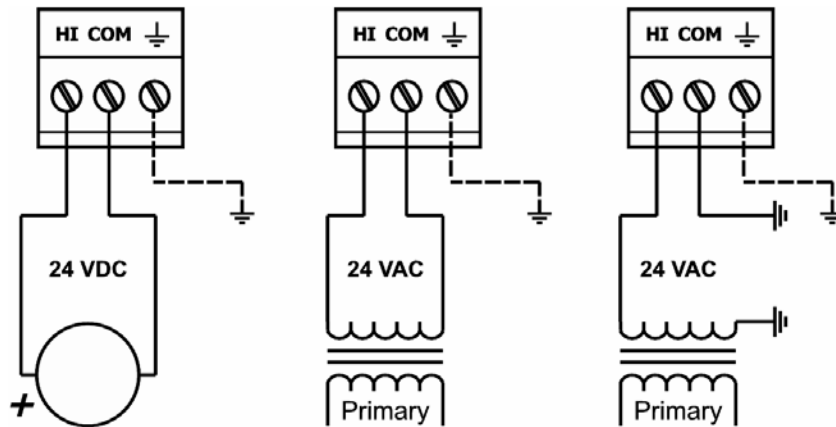**NOTE:** **This device is intended for use with Class 2 circuits.**

Figure 4 — Power Options

WARNING: Powering devices can present hazards. Read the next two sections carefully.

5.1.1 Power Supply Precautions

Internally, the BASR utilizes a half-wave rectifier and therefore can share the same AC power source with other half-wave rectified devices. Sharing a common DC power source is also possible. Sharing AC power with full-wave rectified devices is NOT recommended. Full-wave rectified devices usually require a dedicated AC power source that has a secondary elevated above ground. Both secondary connections are considered HOT. AC power sources that power several half-wave devices have a common secondary connection called COMMON, LO, or GROUND. This connection might be tied to earth. The other side of the secondary is considered the HOT or HI side of the connection. Connect the HOT side of the secondary to the *HI* input on the BASR and the LO side to *COM* on the BASR. All other half-wave devices sharing the same AC power source need to follow the same convention. When using a DC power source, connect its positive terminal to the *HI* input on the BASR and the negative terminal to *COM* on the BASR. Reversing polarity to the BASR will not damage the BASR.

WARNING: Devices powered from a common AC source could be damaged if a mix of half-wave and full-wave rectified devices exist. If you are not sure of the type of rectifier used by another device, do not share the AC source with it.

5.1.2 Limited Power Sources

The BASR should be powered by a limited power source complying with the requirements of the National Electric Code (NEC) article 725 or other international codes meeting the same intent of limiting the amount of power of the source. Under NEC article 725, a Class 2 circuit is that portion of the wiring system between the load side of a Class 2 power source and the connected equipment. For AC or DC voltages up to 30 volts, the power rating of a Class 2 power source is limited to 100 VA. The transformer or power supply complying with the Class 2 rating must carry a corresponding listing from a regulatory agency such as Underwriters Laboratories (UL).

5.2 Connecting Expansion Equipment

Input/output points beyond those available from the BASR master module can be increased by adding expansion modules or by connecting to Modbus serial devices. expansion is accomplished by making connections to the *MB* and *DN* ports on the master module. The *MB* port is used for connecting to 2-wire Modbus serial devices while the *DN* port is used for connecting to BASR expansion modules. Both ports are non-isolated EIA-485 compatible.

When installing equipment, make a record that identifies the power source, equipment locations, IP and MAC ID numbers, protocol in use, baud rate, cable color coding, etc. — anything that will be helpful for future staff.

5.2.1 Expansion Module Connections

Expansion modules are intended to occupy positions to the right or left of the master module on the same DIN-rail or on additional DIN-rails within the same control panel. In this situation only a short 2-wire twisted-pair cable is needed for making connections between *MB* on the master module and *DN* on the expansion module. Up to three expansion modules can attach to the master module using a daisy-chain wiring scheme. The second expansion module has its *UP* port connected to the preceding expansion module's *DN* port. The last expansion module will have a vacant *UP* port. The *D+* terminal on one device must attach to the *D+* terminal on the other. The same applies to the *D–* terminals. Bias and termination exists on the *UP* terminals. See Figure 6 for wiring details. For short connections, unshielded cable can be used.

5.2.2 Modbus Connections

The Modbus port on the BASR master module is non-isolated EIA-485 compatible. When connecting to other non-isolated devices, care must be exercised to ensure that all non-isolated Modbus devices share the same ground reference (*COM*) with the BASR master module. This is usually accomplished by sharing the same power source. Configure the Modbus data rate and protocol using the BASR Modbus port web page.
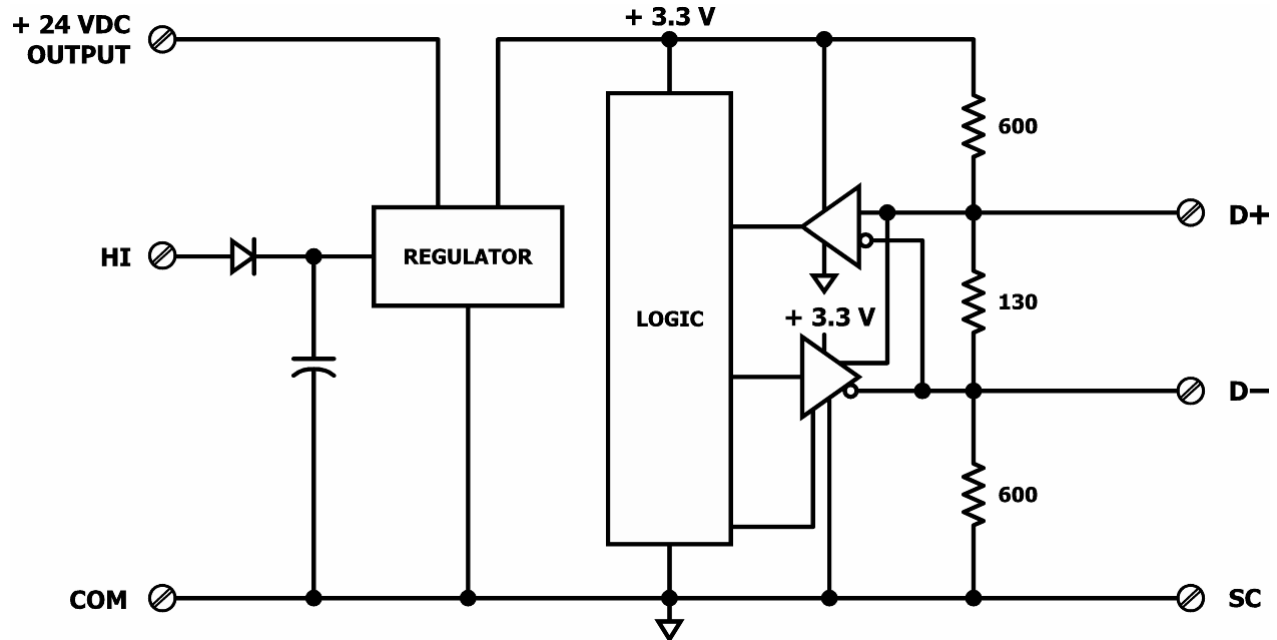

Figure 5 — Internal Termination and Bias

When connecting to a isolated 3-wire Modbus device, the signal common of the isolated device must be connected to the *SC* pin between the *MB* and *DN* ports. This ties the two reference points together for reliable communications. Refer to Figure 6 for wiring details.

Modbus serial device can only be attached to the *MB* port on the master module. Refer to Figure 5 for details on the bias and termination network present on the *MB* port. Together, these resistors approximate one 120 Ω terminating resistor.   Terminal *D+* represents the more positive connection for the EIA-485 Modbus serial network while *D–* represents the less positive connection.   Make corresponding connections to Modbus serial devices.   The last device on the bus should have applied bias and termination or just termination.   A shielded twisted-pair cable should be used with interconnecting devices. Connect the shields together and attached to chassis at only one point. Refer to Figure 6 for wiring details.

5.2.3   Cabling Considerations

When attaching cables to the BASR, Table 1 should be considered.

Function	Signaling and Data Rate	Minimum Required Cable	Maximum Segment Distance
Ethernet	10BASE-T 10 Mbps	Category 3 UTP	100 m (328 ft)
Ethernet	100BASE-TX 100 Mbps	Category 5 UTP	100 m (328 ft)
I/O	Unspecified	Solid: 16-22 AWG Stranded: 16–18 AWG	Unspecified
Expansion	Unspecified	Belden® 9841 or equivalent*	100 m (328 ft)
Modbus	Varied	Belden® 9841 or equivalent*	100 m (328 ft)

Table 1 — Cabling Considerations

* If using shielded cable, connect to chassis at only one point.

NOTE: Wire size may be dictated by electrical codes for the area where the equipment is being installed. Consult local regulations.

Observe in Table 1 that 10BASE-T segments can successfully use Category 3, 4 or 5 cable — but 100BASE-TX segments *must* use Category 5 cable. Category 5e cable is highly recommended as the minimum for new installations.

The Ethernet port of the BASR employs Auto-MDIX technology so that either straight-through or crossover cables can be used to connect to the network.

6 Field Connections

6.1 Sample BAS Remote Wiring Diagram
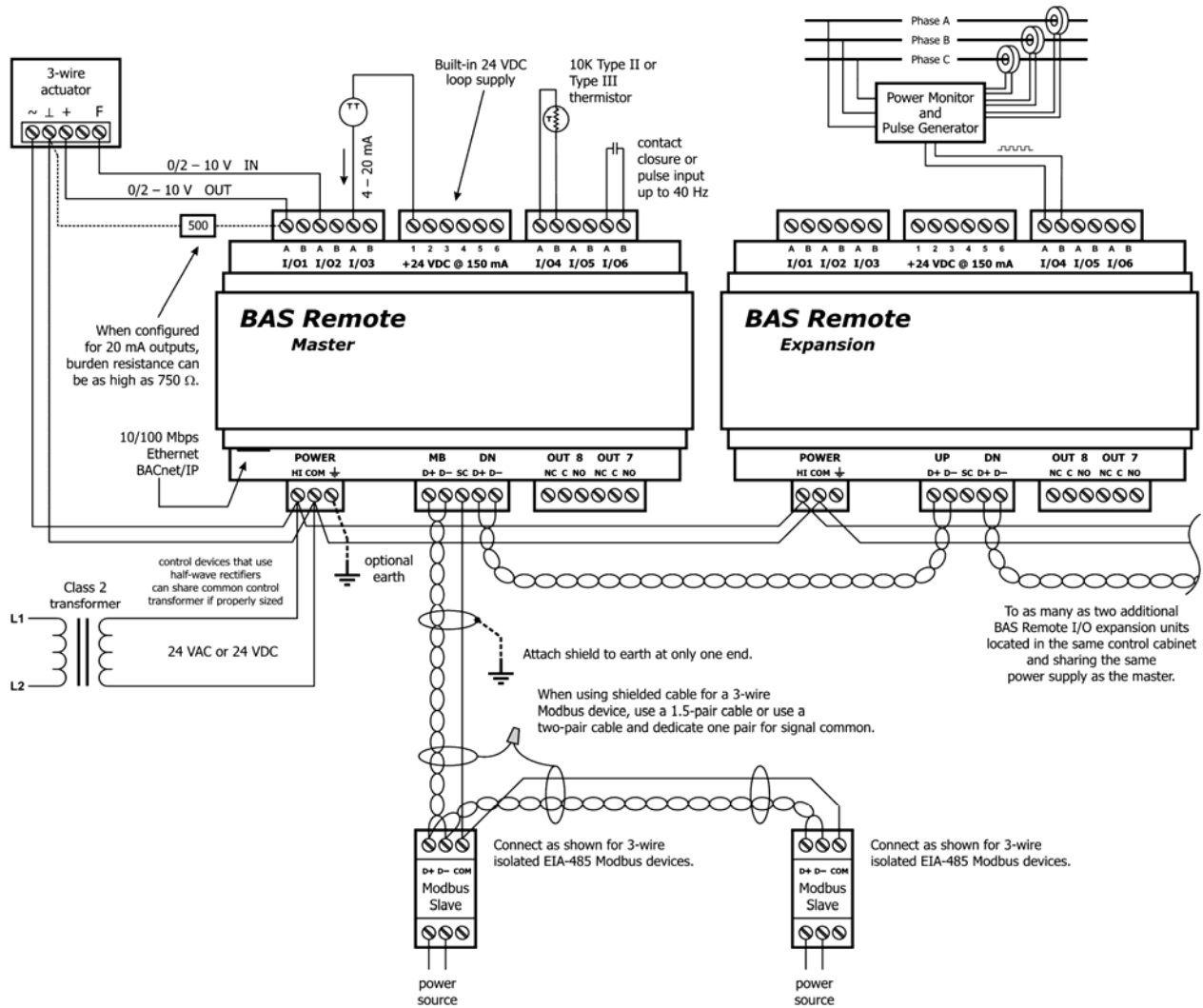
Figure 6 — Sample BAS Remote Wiring Diagram

Wire Channels 1–6 so the most positive wire goes to the "A" terminal and the most negative wire to the "B" terminal.

The wiring options for Channels 1–6 are shown in Figure 7. For each case in which polarity matters, proper polarity is indicated.

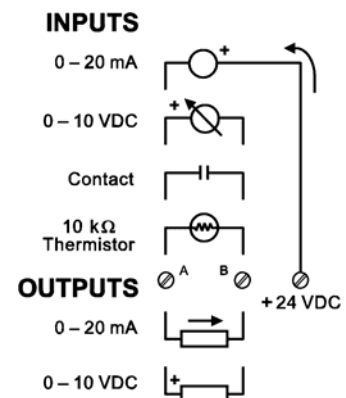Considerations in making field connections for various types of input and output devices are discussed in the following pages.

Figure 7 — I/O Options (Channels 1–6)

TD040300-0MC

6.2 Thermistors

The BAS Remote has built-in calibration curves for 10 kΩ Type II or Type III thermistors. These devices have a non-linear with a negative coefficient of resistance to temperature and provide a nominal resistance of 10 kΩ at 25°C. Using the web server, configure an input for either Type II or Type III thermistor. As shown in Figure 8, connect the two-wire thermistor to points A and B. Polarity is not an issue. If averaging of temperature is desired, connect multiple thermistors in a series-parallel combination so that the nominal resistance remains at 10 kΩ as shown. Make sure that all devices are of the same type. The effective range of temperature measurement is from –35° to +110°F (–37° to +44°C). An open input results in a fault condition that produces a red LED indication for that channel.
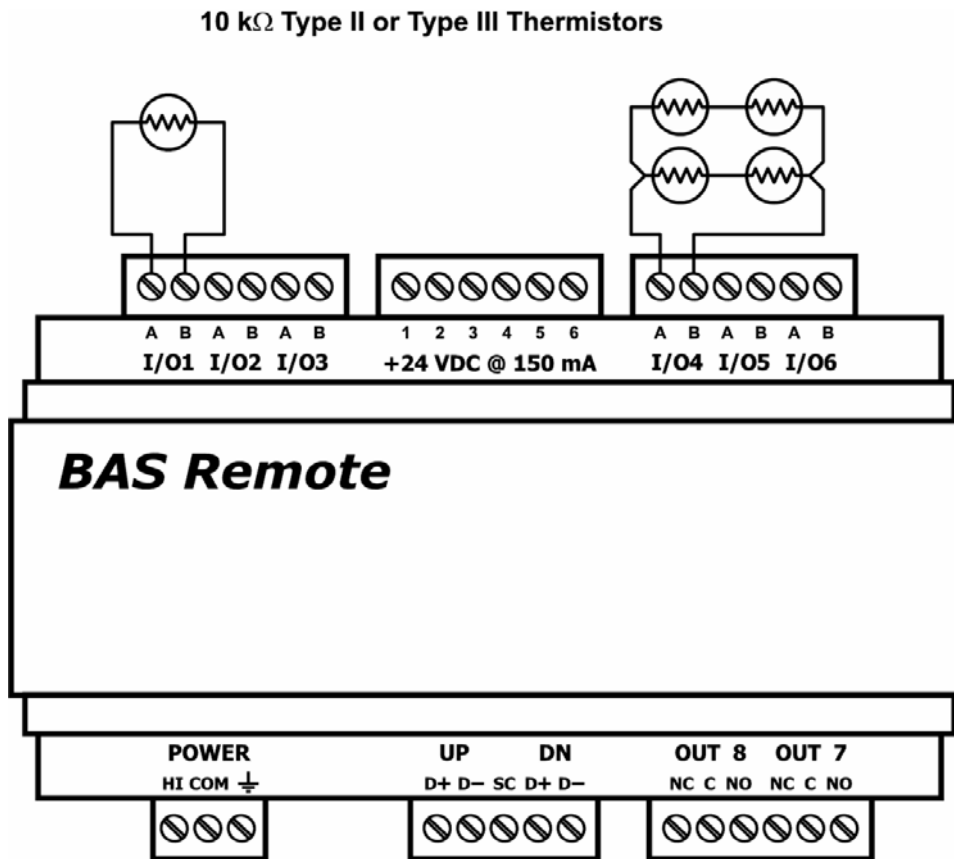
Figure 8 — Thermistor Connections

6.3 Contact Closure

The BAS Remote can sense the make or break of a contact from a relay or push-button. The contacts being sensed must be absent of any applied source of energy, and be rated for low-voltage, low-current switching. The BAS Remote will provide the electrical energy to be sensed. Using the web server, configure an input for contact closure. As shown in Figure 9, simply connect the contacts between points *A* and *B*. For common mechanical contacts, polarity is not an issue. The open-circuit voltage is 24 VDC and the short-circuit current is 2 mA.
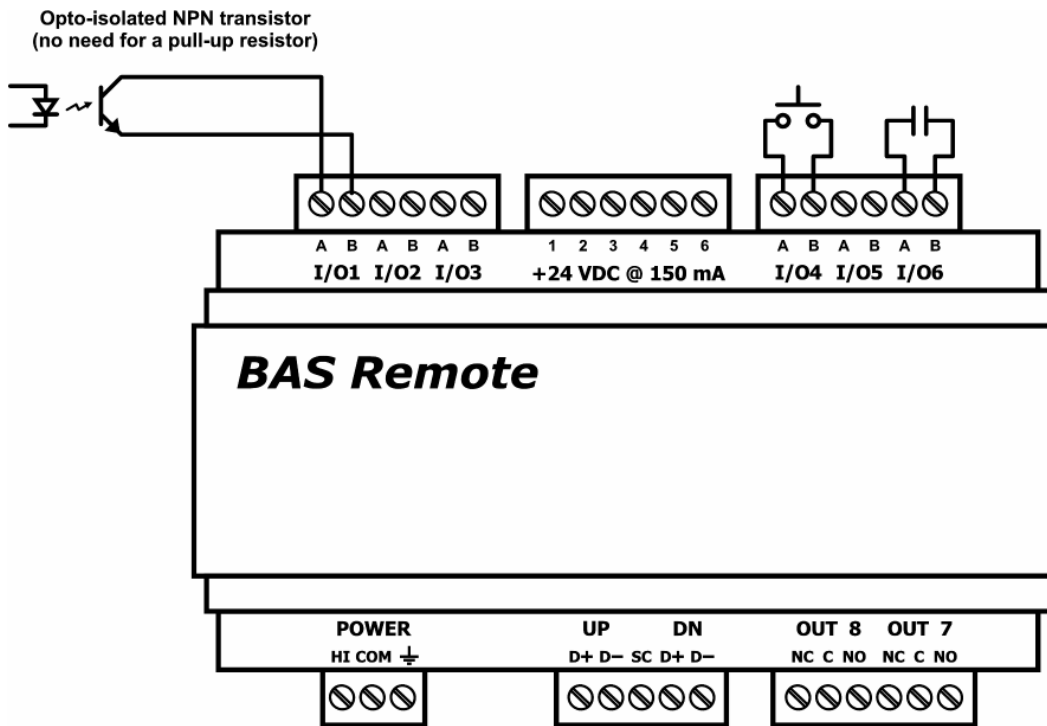
TD040300-0MC

Figure 9 — Contact Closure Connections

For solid-state switches, there are further concerns. It is recommended that a solid-state device have an opto-isolated open-collector NPN transistor output stage with a collector-emitter output voltage (Vce) of at least 30 V. Output sinking current should be greater than 5 mA. The collector-emitter saturation voltage should be less than 0.2 V when sinking 2 mA. The emitter should be connected to point *B* and the collector to point *A* which is the more positive point. This polarity must be observed when using solid-state devices. When an input is configured for a contact closure, the BAS Remote sets the low-threshold to 2 V and the high-threshold to 3 V. When a contact is made or the solid-state switch is on (resulting in a saturated output), the voltage at point *A* is close to zero volts. The corresponding LED for that channel will be on. If the contact is opened or the solid-state switch is turned off, the voltage at point B will quickly begin to rise towards 24 V. Once the voltage passes the 3 V high-threshold, the input channel will sense the "off" state. To return to the "on" state, this voltage needs to return to 2 V. The one-volt difference is called *hysteresis*. There is no need to add an external pull-up resistor when using a contact closure input.

Contact closure inputs are sampled every 10 ms and for a change of state to be recognized, the input state must be stable for two consecutive samples. Therefore, contact closure response is from 20–30 ms.

6.4 Pulse Inputs

A variation on contact closure inputs is pulse inputs. In this situation speed is critical so the input filtering that limits the time response is removed.   When an input is configured for Pulse Input, a pulse rate up to 40 Hz can be measured, assuming a 50% duty cycle. The pulse device could have an opto-isolated open-collector NPN transistor output stage like the one identified under Contact Closure, or it could provide an active sinusoidal output signal that needs to be detected. Data can be in the form of *frequency* or *pulse count*.

The Pulse Input voltage range is 0–10 VDC and the installer can set both the low-threshold and high-threshold on the Pulse Input web page. The difference in the two thresholds is the hysteresis. You can detect *sinusoidal* input signals by setting the high threshold below the positive peak and the low threshold above the negative peak. Setting the two thresholds well toward the center of the sinusoidal waveform (rather than near its peaks) offers some noise immunity. It is not necessary for the input signal to swing from zero to 10 V. Any substantial swing within this range can be detected. The input impedance using Pulse Input is 100 kΩ. Connect the output of the pulse device to point *A* and the common to BAS Remote common as shown in Figure 10.
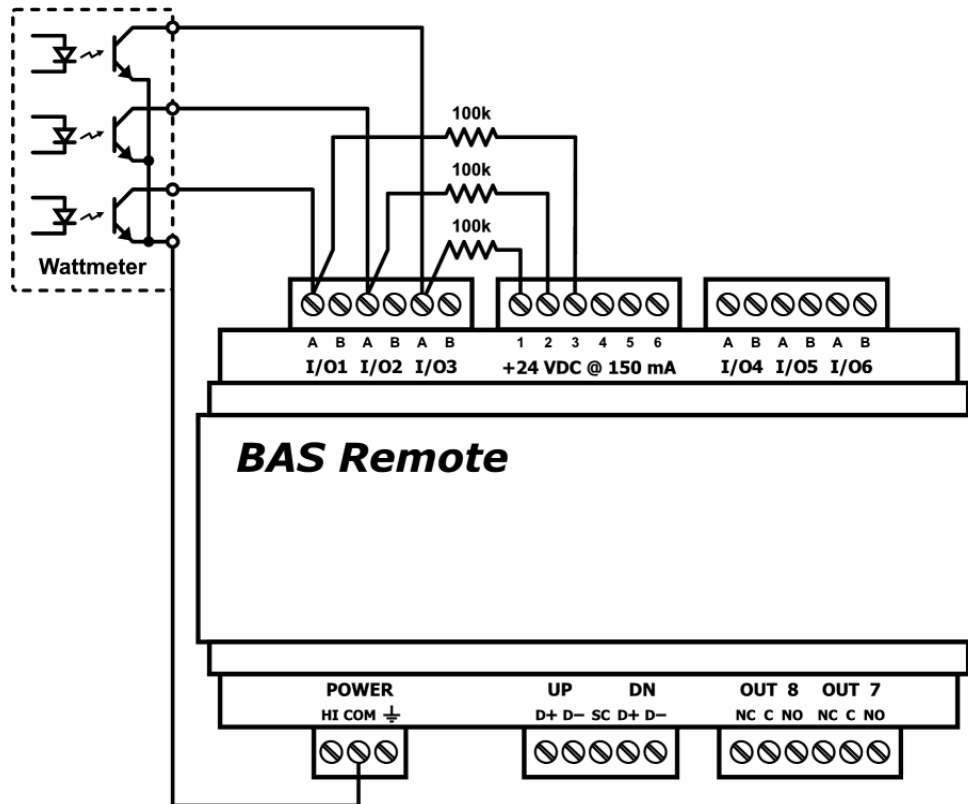
Figure 10 — Pulse Input Connections

The pulse output could be sinusoidal with no DC offset so the BAS Remote could experience both positive and negative excursions of the signal. The BAS Remote can only detect positive voltages so the negative excursions will be ignored. It is still possible to detect the input signal by only sensing the positive excursions.

When interfacing to a pulse device that has an opto-isolated open-collector output, a pull-up resistor must be added to the device output. In Figure 10, a 3-phase wattmeter has three opto-isolated open-collector outputs, each requiring an external pull-up resistor. Since each of the opto-isolators is rated for 60 VDC, install a 100 kΩ pull-up resistor between each output and the +24 V loop supply. The common of the opto-isolators connects to the common of the BAS Remote. Since each BAS Remote input has a 100 kΩ input impedance, the resulting voltage divider sets the off-state voltage to 12 V. Even though the BAS Remote input range is 0–10 VDC, this will not harm it. Set the two thresholds to 2 V and 3 V. The threshold points on digital signals are not critical. Consult the pulse device manual for more guidance.

6.5 Analog Input

An analog input can measure voltage in the range of 0–5 VDC or 0–10 VDC or it can measure current in the range of 0–20 mA. Transmitters that produce an elevated "zero" such as 1–5 VDC, 2–10 VDC or 4–20 mA can be measured as well. Using the web page, configure the input for either voltage or current and select an appropriate range. Scaling the input is accomplished by assigning the low and high points to engineering units. When set as a voltage input, the input impedance is 100 kΩ and for a current input, the impedance is 250 Ω.

With voltage measurement, connect the more positive voltage to point *B* and the less positive to BAS Remote common as shown in Figure 11. On three-wire devices such as damper actuators, the output signal is referenced to the damper's power supply common. That common must be at the same reference as the BAS Remote common. Notice the connections in the diagram. In this situation it is only necessary to attach the transmitter output to point *A* on the BAS Remote input.
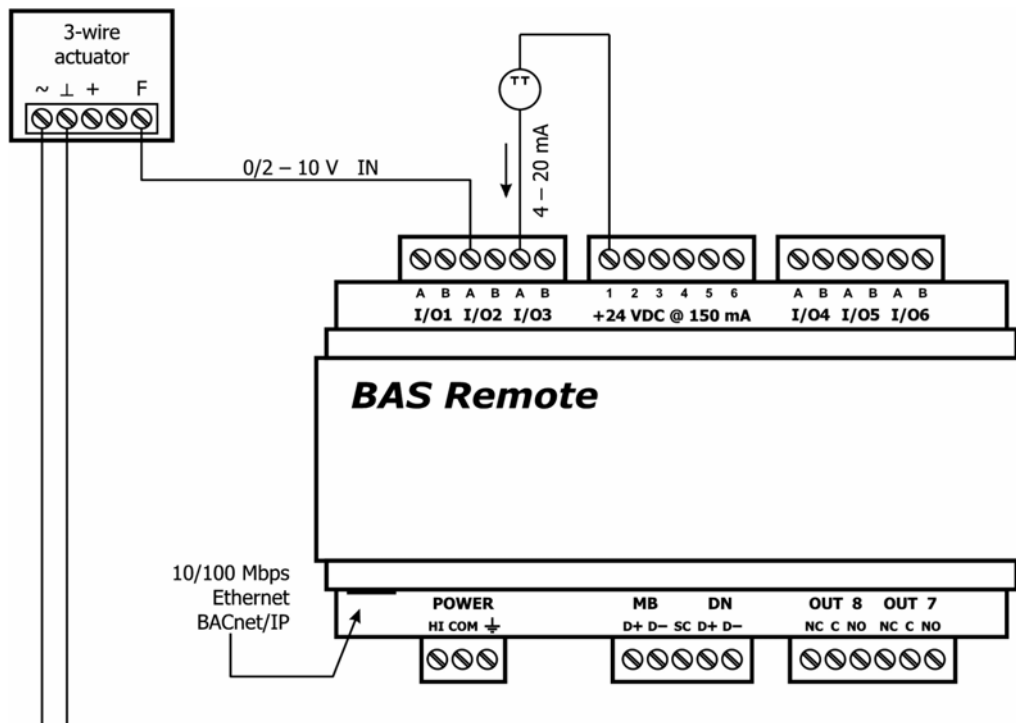

Figure 11 — Analog Input Connections

TD040300-0MC

24

When measuring current, remember the BAS Remote sinks current to ground. A 250 Ω impedance is effectively applied between points *A* and *B* on the input. To measure current, it must be driven into point *A* with respect to point *B*. For two-wire current transmitters, the more positive point on the transmitter attaches to the +24 V on the BAS Remote loop supply or it can attached to an external loop supply as long as that loop supply has a common connection with the BAS Remote. The less positive connection is made to point *A* on the input.

Care should be exercised when connecting to a three-wire current transmitter. These are usually non-isolated devices between the power source and signal output. The BAS Remote will sink current from its input to ground so the transmitter must source current from a positive potential to ground. If the three-wire transmitter works in this manner, it can be accommodated.

Four-wire transmitters usually have isolation between power supply and signal output so their output stage can usually be treated as a two-wire transmitter.

6.6 Analog Output

Either voltage in the range of 0–10 VDC or current in the range of 0–20 mA can be outputted by assigning analog outputs. Configure an output using a web page. Select the appropriate range. For DC voltage, the output voltage is applied to point A with respect to common. For DC current, the output current is sourced from point A to common so there is no need for a loop supply. A current output can source up to 20 mA into a resistive load not exceeding 750 Ω. Verify the burden that a current output device will present. The BAS Remote can not generate enough voltage to drive loads with higher resistance.
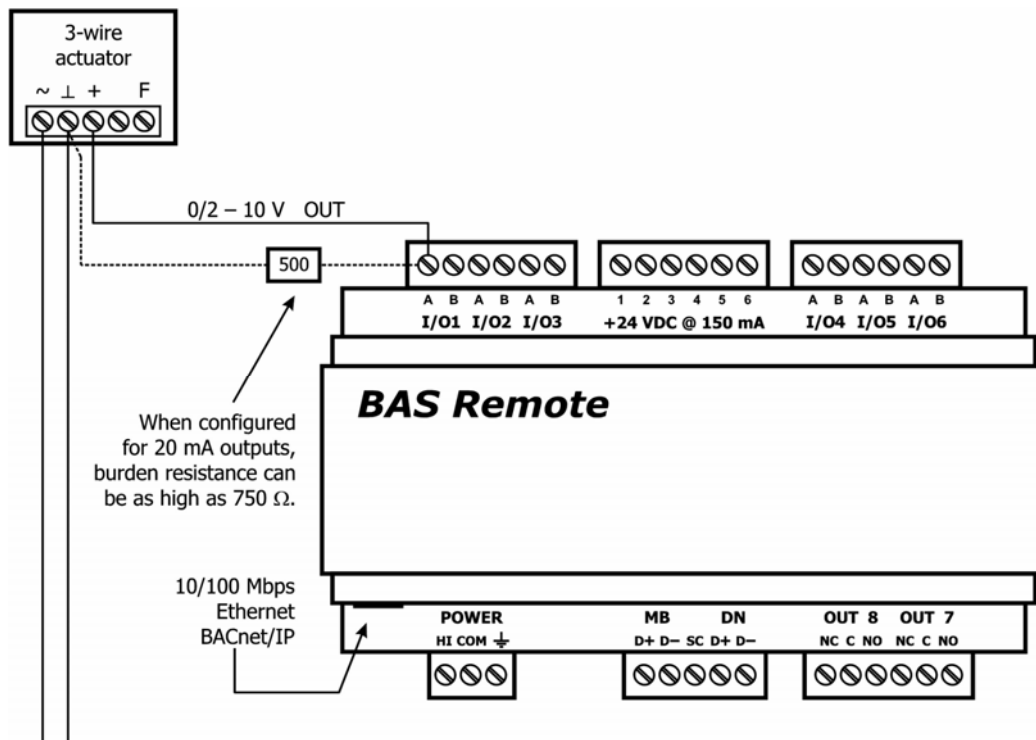

Figure 12 — Analog Output Connections

TD040300-0MC

Figure 12 illustrates connections to a three-wire damper actuator. The damper requires a 0–10 V command signal which can easily be accomplished by the BAS Remote. However, if a current output is desired it is possible to set the BAS Remote analog output to 4–20 mA and install an external 500 Ω resistor that will convert the 4–20 mA signal to 2–10 V.

7 Operation

7.1 General Considerations

Configuration is accomplished while the unit is connected to a computer running a web browser (Java-enabled) that accesses the unit's built-in web server.

7.1.1 Ethernet Port on the Master Module

Auto-Negotiation

The Ethernet port on the BAS Remote master unit offers full auto-negotiation. A single cable links two Ethernet devices. When these devices auto-negotiate, the data rate will be 100 Mbps only if both are capable of that speed. Likewise, full-duplex will only be selected if both can support it. If only one device supports auto-negotiation, then it will default to half-duplex mode and match the data rate of the non-auto-negotiating device.

Auto-MDIX (Auto-Crossover)

The Ethernet port offers Auto-MDIX. When interconnecting two Ethernet devices, a straight-through cable or crossover cable can be used — but if one device uses Auto-MDIX, the cable wiring does not matter; Auto-MDIX adjusts for either type.

Reset Switch

The IP Address, Subnet Mask and Gateway Address on the master can be reset to their factory defaults by means of the Reset switch (located in Figure 1) as follows: Recycle power to the switch and immediately push a paper clip or similar device through the Reset hole until actuating the switch. Keep pressure on the Reset switch while the unit boots up and until 3 seconds after the Status LED stops flashing. Remove the paper clip and recycle power again. After this second reboot, the default values will apply.

7.1.2 LEDs

To aid in troubleshooting, several LEDs have been provided.

The **Status LED** flashes green during boot up — then glows solid green while operation is fault-free. If a fault occurs, the LED glows solid red. On the master module, this LED flashing green (after boot up) indicates Modbus serial activity.

The master module has an **Ethernet LED** that glows green when properly linked to equipment operating at 100 Mbps (yellow for 10 Mbps) and indicates activity by flashing.

The expansion module has a **Network LED** that flashes green to indicate data transfers.

I/O LEDs 1–8 follow the behavior described in the chart below **:**

If the I/O channel is …	Green indicates …	Red indicates …
a **Relay** output	the coil is energized.	*(not used for relay output.)*
an **Analog** output	the command is greater than zero.	10% deviation from command
a **Contact** input	the contact is made.	*(not used for contact input.)*
a **Pulse** input	the input state changed.	*(not used for pulse input.)*
a **Thermistor**	current flow is detected	No current flow detected
an **Analog** input	the signal is greater than 1% of span.	*(not used for analog input.)*

7.1.3   Accessing the Web Server on the Master Unit

7.1.3.1   Web Browser

The master contains an interactive web server, accessible from any Internet-compatible PC on the local network. It is compatible with recent versions of Internet Explorer (5.0 or later, suggested) or Netscape Navigator (7.1 or later, required). It is factory-programmed with a default IP address of 192.168.92.68 and a Class C subnet mask of 255.255.255.0. Once configured, changing the BAS Remote IP address is strongly encouraged.

7.1.3.2   Initial Access

The hardware arrangement for initially setting the master IP address appears in Figure 13. The PC should be temporarily disconnected from the Ethernet LAN in case the master's default address matches that of a device on the existing LAN. The procedure for altering the IP address creates a *temporary LAN* composed of nothing but the master, the PC used to configure it and a CAT5 cable connecting the two. Since the master supports Auto-MDIX, either straight-through or crossover cable can be used.
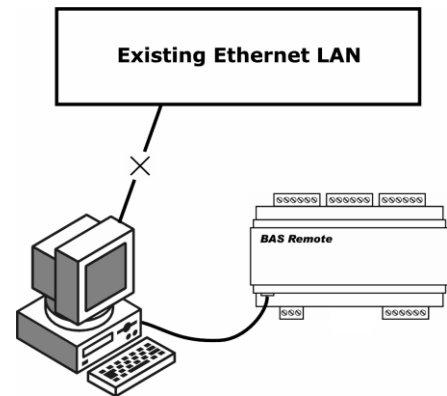
Figure 13 — Setup for Initial IP Address Configuration by Web Browser

For initial configuration, the PC chosen for the procedure should temporarily have its IP address modified as shown in Figure 14 — which employs a Windows 2000 example.
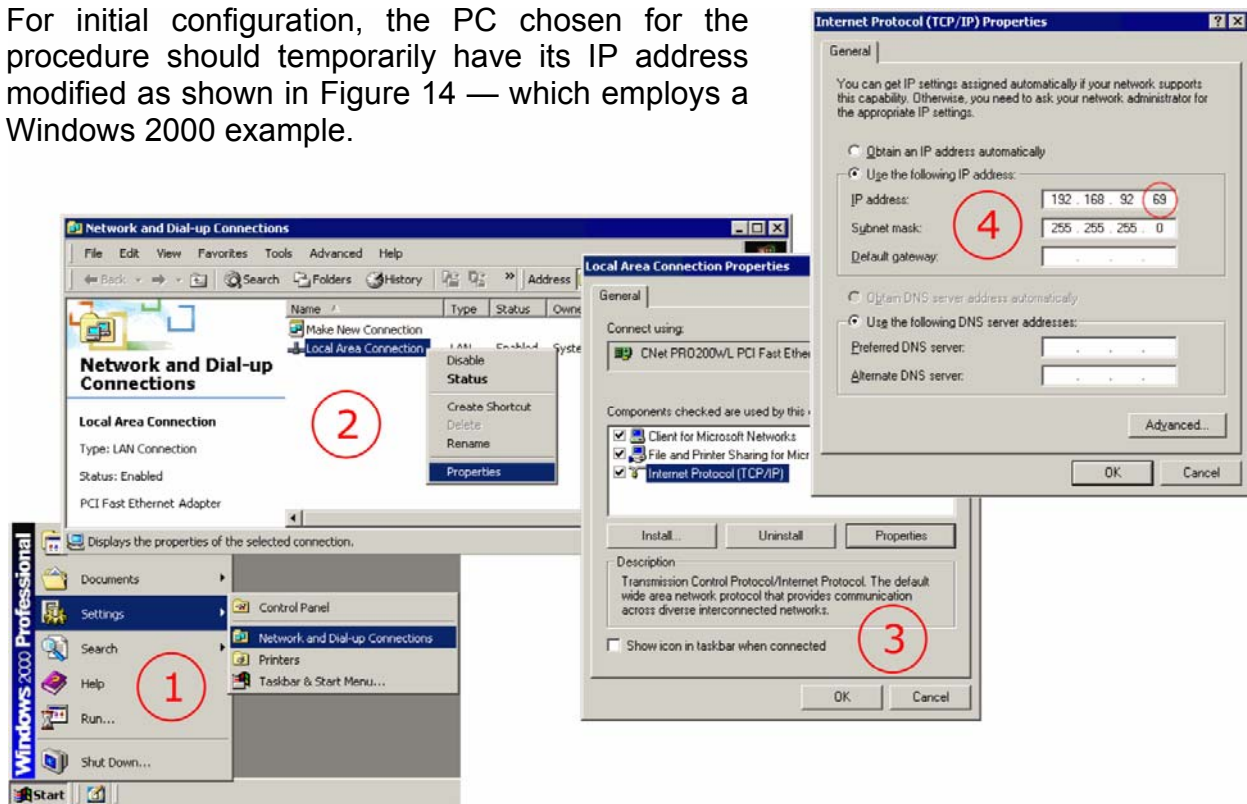
Figure 14 — Steps for Changing the IP Address of the PC Used for Setup

Figure 14 suggests an IP address for the PC of 192.168.92.**69**, but the final quad of the address could be any value from 1 to 254 — except for **68** which is used by the master. After the IP address of the PC has been set to the same LAN as the master, a browser can access the master's default IP address. The master does **not** support DHCP.

Figure 15 displays just the *relevant upper portion* of the screen that appears when you access the master. Just beneath the device image is a link named "Configure Settings". Clicking this link opens another window where you can adjust the values shown in Figure 17. The *System Configuration* portion is discussed in Section 7.1.3.3 below. The *Modbus Configuration* portion (not relevant for all users) is discussed in Section 7.1.7.
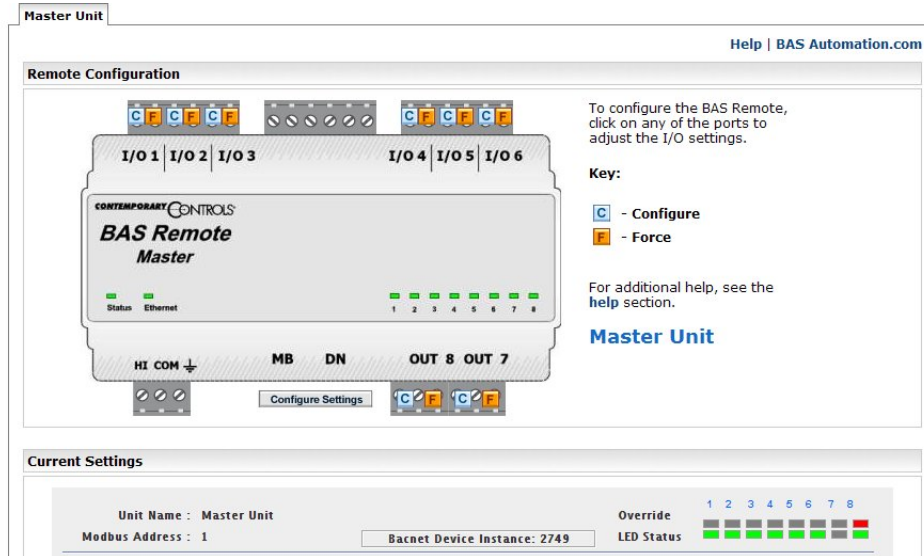
Figure 15 — Master Main Page (Partial View)
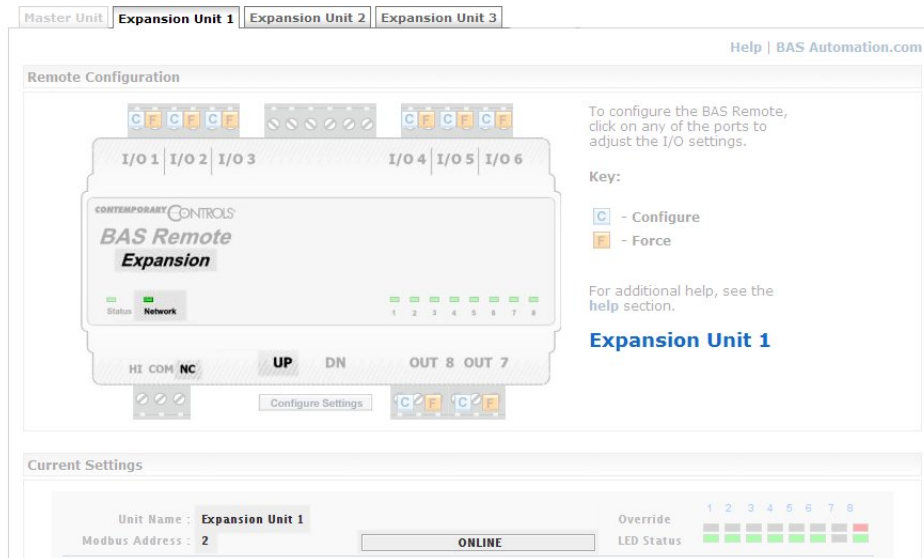
Figure 16 — Expansion Main Screen (Partial View)

Figure 16 displays a faded view of an expansion main screen (for three expansion Units) except for those elements that *differ* from the master screen.

7.1.3.3 System Configuration (Figure 17)

System Name   Give your system any name you wish.

IP Address   Changing the default value of 192.168.92.68 is recommended.

Subnet Mask   The default value of 255.255.255.0 is adequate for most users.

Gateway Address   If your Ethernet LAN has a gateway (router) enter its address here.

Device Instance   On a BACnet network, each device must have a unique 22-bit number to identify itself. The BAS Remote master instance has a valid range of 0–4194302 (including the boundary).

Master Unit Name   Give your master module any name you wish.

Modbus Address   The default value is 1.

Expansion Units   Choose from the default of 0 to as many as 3 units. This value will set the number of tabs that you see atop the main screen.

> **NOTE:** Whether you are adjusting *System Configuration* or *Modbus Configuration* Clicking "UPDATE" will **save** your values to internal memory, but you must **reboot** the master module before the new values will **apply**!

After the master has been given its initial configuration, it will be ready for use in the full original Ethernet network. The temporary Ethernet network constructed in Figure 13 should be dismantled and the PC re-configured to restore its original IP address.

Figure 17 — Configuring the Master Module

7.1.4 Web Server Screen Overview

From the **Web Server Screen** (Figure 18) you can configure all I/O channels, view their status or force them as part of a commissioning process. (The figure uses the master unit as an example, but the expansion unit appears very similar and functions the same.) Immediately beneath the right side of the banner, the following links are displayed:

Help displays a new window (Figure 20) with context-sensitive information.

BASAutomation.com links to the WWW home page for further helpful information.

Figure 18 — Web Server Page

The *Configure Settings* button (just below the device image) provides access to the basic device configuration fields already discussed (Figure 17).

The BAS Remote image includes a graphic representation of each I/O Channel. Each of the 8 channels has two icons (C and F) that open additional windows used for *configuring* or *forcing* each Channel. The use of these links is discussed in Section 7.3.

The large gray section at the bottom of the screen labeled *Current Settings* is the device "Monitor" — a read-only display of information for the BAS Remote module currently selected. The tab in **bold face** near the top of the screen indicates the module selected. Figure 19 below is an example in which expansion Unit 2 has been selected.

Figure 19 — The Tab in Bold Face Indicates the Selected Module

In the upper-left portion of the Monitor shown in Figure 18, two values (*Unit Name* and *Modbus Address*) are displayed for the currently selected module.

To the right of the Modbus Address value is a box which reports one of two possible pieces of information — depending on the type of BAS Remote module currently selected. When the master is selected, the box will display the *BACnet Device Instance* of the master. If an expansion module is selected, the box will report the module's status: It will be *ONLINE* if its connection to the master is valid or *OFFLINE* if the connection is invalid. An *OFFLINE* report usually means the expansion module cannot communicate with the master due to a cabling issue.

In the upper-right portion of the Monitor, the status of each channel (point) is reported with the *Override* indicators and the *LED Status* indicators*.* All of these LEDs are refreshed at the rate of once per second.

The lower portion of the Monitor displays the *Channel Names* and their *Present Values*.

7.1.5   On-Screen Help

There are several screens used for *configuring* or *forcing* each channel. The upper-right portion of each screen displays a **Help** option. Clicking this option launches another browser window with helpful information about the current screen.
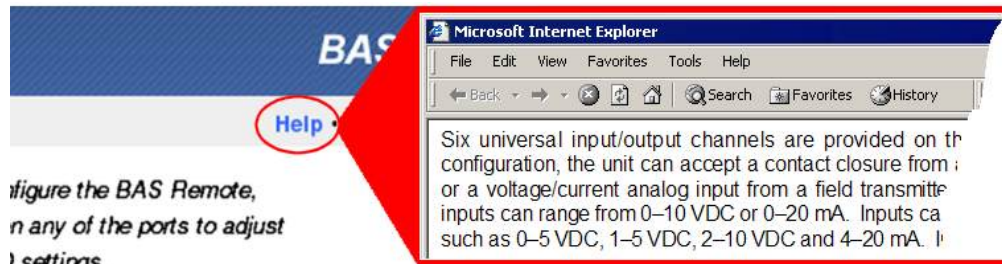

Figure 20 — Help Window

TD040300-0MC

7.1.6   Bias and Termination

Each master and expansion module has two expansion ports. The master ports are labeled MB and DN; the expansion ports are *UP* and *DN*. These are shared buses where only one device drives the bus at any one time. When no device is driving the bus, the bus floats. To prevent noise from being interpreted as data, the bus must be biased to a valid state. (The Modbus Serial specification calls this polarization.) With no data on the bus, the *D+* pin is biased to be more positive than the *D-* pin. Bias is applied at only one point on the bus: the master provides bias internally on its MB port, the expansion does so on its UP port.

7.1.7   Communicating With Modbus Slaves

The master is compliant with the Modbus TCP specification and functions as a server gateway to Modbus slave devices. It passes data between a Modbus TCP host and Modbus slaves attached on its *MB* port which must be properly configured using a web browser. As illustrated in the lower section of Figure 1, you must specify the *Baudrate* (2.4 k, 4.8 k, 9.6 k, **19.2 k**, 38.4 k, 57.6 k or 115.2 k), the *Protocol* (ASCII or **RTU**), *Parity* (odd, **even** or none) and the *Timeout* (seconds the master will wait for a reply from an attached Modbus device). In the previous sentence, *default* settings are indicated by **bold-face** type. If no parity is selected, two stop bits are inserted instead of one.

Each master and expansion module can be accessed through the Modbus TCP server gateway using a Java-enabled web browser. Each master and expansion module must be assigned a *unique* Modbus address from 1 to 247, preventing a conflict with any Modbus slave address. The only configuration needed for accessing master and expansion modules is their address assignment.

Attach EIA-485 Modbus slave devices to the master's *MB* port. Match the *D+* and *D-* pins on the *MB* connector to the corresponding pins on the Modbus slave.

For a 2-wire Modbus slave, make earth connections on **both** the master and the slave.

For a 3-wire isolated EIA-485 Modbus slave, its common connection must be made to the *SC* pin on the *MB* port. If shielded cable is employed, use two-pair cable with one pair for data and one pair (with wires shorted together) connected to signal common. Connect the shield to earth at only one point, preferably near the master.

7.1.8   Communicating from Master to Expansion Modules

The master uses the downstream port *DN* to communicate to the upstream port *UP* on the expansion. If additional expansion modules are used, they are cascaded such that the *DN* port of the expansion module nearest the master is connected to the *UP* port on the added expansion module. Commands received by an expansion module's *UP* port are relayed to its *DN* port while being read by the module itself. Similarly, a response received at the *DN* port is transferred to the *UP* port — eventually arriving at the master. Thus all connections (master-expansion and expansion-expansion) are point-to-point with termination and bias in each *UP* transceiver. *DN* ports have termination only.

7.2 Input/Output Channels (I/O)

7.2.1 Universal I/Os

Six identical universal I/O channels allow any mix of inputs and outputs requiring only two connections labelled **A** and **B**. Pin **A** is always more positive than pin **B**. Channels are labelled *I/O 1* through *I/O 6* and are divided equally between two six-pin terminal blocks. One terminal block is for I/O 1–3 and the other is for I/O 4–6. Configuring is done via the built-in web server. Input resolution is 10 bits; output resolution is 12 bits.

Schottky barrier diodes protect the electronics from over-voltage faults on inputs **A** and **B**. Also, a PPTC (*p*olymeric *p*ositive *t*emperature *c*oefficient) resettable fuse protects terminal **B** from over-voltage when driven to ground.

Pin **A** can be an input or output. Pin **B** can be an input or ground. A D/A converter is used for generating analog voltage or current outputs, and for providing excitation current for contact closure sensing and for thermistor measurement.

In current output mode, pin **B** is grounded. The output burden applied to pins **A** and **B** can range from 0 to 750 Ω. Since the internal burden is 250 Ω, the output voltage at pin **A** can range from 0–20 volts when driving 20 mA.

When measuring input voltages, pin **A** receives input while pin **B** is held at ground. Any DC voltage in the range of 0–5 V or 0–10 V can be measured.

When measuring current, pin **B** is unused and the input on pin **A** sees a 250 Ω load.

To sense contact closure, 2 mA is output at pin **A** while pin **B** is grounded. Then the voltage at pin **A** is measured. Any value below 0.3 volts (150 Ω) is considered a closed circuit. Dry-contact or solid-state switches being sensed must withstand an open-source voltage of 24 VDC and a current of 2 mA. For solid-state switches, the most positive connection is at pin **A** and a saturation voltage under 0.3 V is required.

A 10 kΩ thermistor is applied between pins **A** and **B**. Thermistors are non-linear heat sensing devices with a negative temperature coefficient of resistance. At nominal room temperature (77 °F), the resistance of a Type II or Type III thermistor is 10 kΩ. Both have curves with an accuracy of ±0.36 °F from 32 °F to 158 °F. Because higher resistance thermistors (such as 10 kΩ) introduce error due to the self-heating effect, lower thermistor current is used — thus minimizing self-heat and measurement inaccuracy.

7.2.2 Relay Outputs

There are two independent SPDT relay outputs. For each output, both the **NO** and **NC** contacts are brought out to a six-pin terminal block. Contacts are rated at *2A* at *30 V*AC and *2A* at *30 VDC.* Wiring to the BAS Remote should only be Class 2. To control higher voltages, the safer approach is to connect the coils of Class 2 interposing relays to the contacts of the BAS Remote and have the contacts of the interposing relays connect to the Class 1 circuits. These interposing relays should be further from the BAS Remote and closer to the Class 1 equipment.

7.3 Channel Configuring

To configure a channel, access the Web Server Page, click on the [C] icon for the channel of interest and make adjustments in the new screen that appears. Your selected channel is confirmed by the blue number on the left side of the new screen. As shown in Figure 21, once you click on the *Save* button, a confirmation is displayed in the lowest box in the screen. If you attempt to set an illegal value, this box will display an error message.

7.3.1   Analog Voltage Input Configuring

You can define any channel 1–6 as "INPUT: 0–10V Analog" or "INPUT: 0–5V Analog" (Figure 21 uses Channel 1 and 0-10V as an example). Such a channel can accept an input voltage in the range of 0–10 volts or 0–5 volts. On this screen, you can adjust these parameters:

Channel Name   You can rename the channel using no more than 48 characters.

BACnet Unit Group   The *Electrical* default can be set to any option in the list.

BACnet Unit Value   The *VOLTS* default can be set to any option in the list. These options change automatically to agree with the BACnet Unit Group you specify.

User Scaling section of the screen:

ACTUAL HIGH   This specifies the highest value within the range.

ACTUAL LOW   This specifies the lowest value within the range.

SCALED HIGH   You can set a physical value corresponding to the high value.

SCALED LOW   You can set a physical value corresponding to the low value.

Figure 21 — Analog Input Configuration

7.3.2 Analog Voltage Output Configuring

You can define any channel 1–6 as type "OUTPUT : 0–10V Analog" as shown in Figure 22, using Channel 1 as an example. Such a channel can supply an output voltage in the range of 0–10 V. On this screen, you can adjust any of the following parameters.

Channel Name   You can rename the channel using no more than 48 characters.

BACnet Unit Group   The *Electrical* default can be set to any option in the list.

BACnet Unit Value   The *VOLTS* default can be set to any option in the list. These options change automatically to agree with the BACnet Unit Group you specify.

User Scaling section of the screen:

ACTUAL HIGH   This specifies the highest value within the range.

ACTUAL LOW   This specifies the lowest value within the range.

SCALED HIGH   You can set a physical value corresponding to the high value.

SCALED LOW   You can set a physical value corresponding to the low value.

Figure 22 — Analog Output Configuration

7.3.3 Binary Input Configuring

You can define any channel 1–6 as type "INPUT: Binary" as shown in Figure 23 which uses Channel 1 as an example. On this screen, you can adjust these parameters.

Channel Name   You can name the channel using no more than 48 characters.

BACnet Unit Group   The *Others* default can be set to any option in the list.

BACnet Unit Value   The *NO_UNITS* default can be set to any option in the list. These options change automatically to agree with the BACnet Unit Group you specify.

Figure 23 — Binary Input Configuration

7.3.4 Current Input Configuring

You can define any channel 1–6 as type *INPUT: 0–20 mA* as shown in Figure 24 which uses Channel 1 as an example. Such a channel can accept an input current in the range of 0–20 mA. On this screen, you can adjust any of the following parameters.

Channel Name   You can rename the channel using no more than 48 characters.

BACnet Unit Group   The *Electrical* default can be set to any option in the list.

BACnet Unit Value   The *MILLIAMPERES* default can be set to any option in the list. These options change automatically to agree with the BACnet Unit Group you specify.

User Scaling section of the screen:

ACTUAL HIGH   This specifies the highest value within the range.

ACTUAL LOW   This specifies the lowest value within the range.

SCALED HIGH   You can set a physical value corresponding to the high value.

SCALED LOW   You can set a physical value corresponding to the low value.

Figure 24 — Current Input Configuration

7.3.5   Thermistor Input Configuring

You can define any channel 1–6 as a Type II or III thermistor input as shown in Figure 25 which uses a Type 3 thermistor and Channel 1 as an example. On this screen, you can adjust any of the following parameters.

Channel Type You can select a Type II or Type III thermistor profile.

Channel Name You can name the channel using no more than 48 characters.

BACnet Unit Group The *Temperature* default can be set to any option in the list.

BACnet Unit Value The *DEGREES_FAHRENHEIT* default can be set to any option in the list. These options change to agree with the BACnet Unit Group you specify.

Temperature Input section of the screen:

Offset You can specify a (+) or (–) number of degrees offset — if, for example, the thermistor in use is known to be delivering an inaccurate reading.

Temp Units The default *Fahrenheit* temperature scale can be changed to Celsius.

Figure 25 — Thermistor Input Configuration

7.3.6 Pulse Input Configuring

You can define any channel 1–6 as type "INPUT: Pulse" as shown in Figure 26 which uses Channel 1 as an example. Such a channel can accept a pulse train in the range of 0–40 Hz. On this screen, you can adjust any of the following parameters.

Channel Name   You can rename the channel using no more than 48 characters.

BACnet Unit Group   The *Others* default can be set to any option in the list.

BACnet Unit Value   The *NO_UNITS* default can be set to any option in the list. These options change automatically to agree with the BACnet Unit Group you specify.

User Scaling section of the screen:

ACTUAL HIGH   This specifies the highest value within the range.

ACTUAL LOW   This specifies the lowest value within the range.

SCALED HIGH   You can set a physical value corresponding to the high value.

SCALED LOW   You can set a physical value corresponding to the low value.

Pulse Input section of the screen:

Period   If the "Rate" option has been selected, this specifies the period in seconds — otherwise, this field is not present on the screen.

Rate   This specifies that the rate of the input is being obtained.

Accumulate   This specifies that the input pulses are being accumulated (absolute count) — with no limit to the time during which pulses are counted.

High Level (V)   You can specify a value from 10 down to (but more than) the "Low Level".

Low Level (V)   You can specify a value from 0 up to (but less than) the "High Level".

Figure 26 — Pulse Input Configuration

7.3.7 Relay Output Configuring

Channels 7 and 8 are fixed as type *OUTPUT: Relay* as shown in Figure 27 which uses Channel 8 as an example. Each channel provides a relay contact rated at 30 VAC/DC, 2A. Each relay has a normally-open and a normally-closed set of contacts. On this screen, you can adjust one parameter.

Channel Name   You can name the channel using no more than 48 characters.

BACnet Unit Group   The *Others* default can be set to any option in the list.

BACnet Unit Value   The *NO_UNITS* default can be set to any option in the list. These options change automatically to agree with the BACnet Unit Group you specify.

Figure 27 — Relay Output Configuration

7.4 Channel Forcing

To force a channel, access the Web Server Page, click on the ▣ icon for the channel of interest and make adjustments in the new screen that appears. Your selected channel is confirmed by the blue number on the left side of the new screen. If you apply an override value, the override condition will be indicated by a simulated LED on the main Web Server Screen — as described in Section 7.1.4.

For any channel type selected, the "Forcing" screen will report information for the following read-only fields:

Channel Type This reports the type that you have defined for this channel.

Channel Name This reports the name that you have specified for this channel.

Status This reports any of the following conditions:

Status OK	**Input Shorted or Open**
Output Overload	**Input Open**
	Input Shorted

7.4.1 Analog Input Forcing

In addition to *type*, *name* and *status* — this screen displays the following fields **:**

Input Value This reports the Input Value (read-only).

Override Value You can specify an Override Value.

Override Checking this box will put the Override Value in effect — after the *Apply* button is clicked.

Figure 28 — Analog Input Forcing

7.4.2 Digital Input Forcing

In addition to *type*, *name* and *status* — this screen displays the following fields **:**

Input Value   This reports the Input Value (read-only) as ON or OFF.

Override Value You can specify an Override Value as ON or OFF.

Override   Checking this box will put the Override Value in effect — after the *Apply* button is clicked.

Figure 29 — Digital Input Forcing

7.4.3 Current Input Forcing

In addition to *type*, *name* and *status* — this screen displays the following fields **:**

Input Value   This reports the Input Value (read-only).

Override Value   You can specify an Override Value.

Override   Checking this box will put the Override Value in effect — after the *Apply* button is clicked.

Figure 30 — Current Input Forcing

7.4.4 Thermistor Input Forcing

In addition to *type*, *name* and *status* — this screen displays the following fields **:**

Input Value   This reports the Input Value (read-only).

Override Value   You can specify an Override Value.

Override   Checking this box will put the Override Value in effect — after the *Apply* button is clicked.

Figure 31 — Thermistor Input Forcing

7.4.5 Relay Output Forcing

In addition to *type*, *name* and *status* — this screen displays the following fields **:**

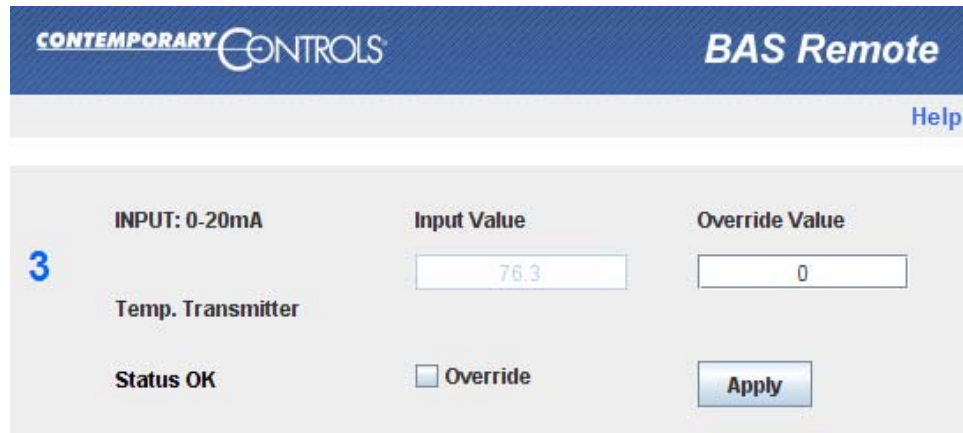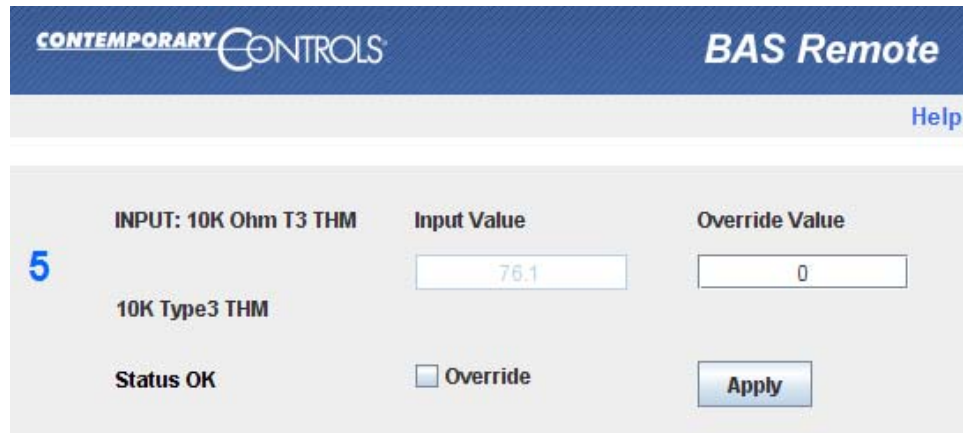|	
Input Value	This reports the Input Value (read-only) as ON or OFF.
Override Value	You can specify an Override Value as ON or OFF.
Override	Checking this box will put the Override Value in effect — after the *Apply* button is clicked.

Figure 32 — Relay Output Forcing

8 Appendix

8.1 BACnet Object Model

The BAS Remote complies with ANSI/ASHRAE Standard 135-2004.

8.2 Device

Property Identifier	Property Datatype	Code	Value
Object_Identifier	BACnetObjectIdentifier	R	(Device, Instance 2749)
Object_Name	CharacterString	R	"BAS System Building 1"
Object_Type	BACnetObjectType	R	DEVICE
System_Status	BACnetDeviceStatus	R	(OPERATIONAL)
Vendor_Name	CharacterString	R	"Contemporary Controls"
Vendor_Identifier	Unsigned16	R	245
Model_Name	CharacterString	R	"BASR-8M"
Firmware_Revision	CharacterString	R	"1.0"
Application_Software_Version	CharacterString	R	"1.0"
Protocol_Version	Unsigned	R	2
Protocol_Revision	Unsigned	R	
Protocol_Services_Supported	BACnetServicesSupported	R	(List of Services)
Protocol_Object_Types_Supported	BACnetObjectTypesSupported	R	(List of Object Types)
Object_List	BACnetARRAY[N]of ..Identifier	R	(List of all the objects)
Max_APDU_Length_Accepted	Unsigned	R	1476
Segmentation_Supported	BACnetSegmentation	R	(NO SEGMENT)
APDU_Timeout	Unsigned	R	(3000 MSEC)
Number_Of_APDU_Retries	Unsigned	R	0
Device_Address_Binding	List of BACnetAddressBinding	R	
Database_Revision	Unsigned	R	1

Object Identifier (comprised of the object type *DEVICE* and an *instance number*) must be unique within the complete BACnet network. The default instance (2749) is changed during commissioning. *Object Name* can be set to some meaningful description (e.g.: device location). The remaining fields are set by the manufacturer.

8.3 Analog Input

Property Identifier	Property Datatype	Code	Remarks
Object_Identifier	BACnetObjectIdentifier	R	
Object_Name	CharacterString	R	
Object_Type	BACnetObjectType	R	
Present_Value	REAL	R	
Status_Flags	BACnetStatusFlags	R	
Event_Stte	BACnetEventState	R	
Out_Of_Service	BOOLEAN	R	
Units	BACnetEngineeringUnits	R	

8.4 Analog Output

Property Identifier	Property Datatype	Code	Remarks
Object_Identifier	BACnetObjectIdentifier	R	
Object_Name	CharacterString	R	
Object_Type	BACnetObjectType	R	
Present_Value	REAL	W	
Status_Flags	BACnetStatusFlags	R	
Event_Stte	BACnetEventState	R	
Out_Of_Service	BOOLEAN	R	
Units	BACnetEngineeringUnits	R	
Priority Array	BACnetPriorityArray	R	
Relinquish_Default	REAL	R	

8.5 Binary Input

Property Identifier	Property Datatype	Code	Remarks
Object_Identifier	BACnetObjectIdentifier	R	
Object_Name	CharacterString	R	
Object_Type	BACnetObjectType	R	
Present_Value	BACnetBinaryPV	R	
Status_Flags	BACnetStatusFlags	R	
Event_State	BACnetEventState	R	
Out_Of_Service	BOOLEAN	R	
Polarity	BACnetPolarity	R	

8.6 Binary Output

Property Identifier	Property Datatype	Code	Remarks
Object_Identifier	BACnetObjectIdentifier	R	
Object_Name	CharacterString	R	
Object_Type	BACnetObjectType	R	
Present_Value	BACnetBinaryPV	W	
Status_Flags	BACnetStatusFlags	R	
Event_State	BACnetEventState	R	
Out_Of_Service	BOOLEAN	R	
Polarity	BACnetPolarity	R	

BAS Remotes comply with the BACnet Application Specific Controller (B-ASC) profile of the six possible standardized BACnet devices. A B-ASC device can do the following:

Data Sharing

- Ability to provide the values of any of its BACnet objects
- Ability to allow modification of some or all of its BACnet objects by another device

Alarm and Event Management

- No requirement

Scheduling

- No requirement

Trending

- No requirement

Device and Network Management

- Ability to respond to queries about its status
- Ability to respond to request for information about any of its objects
- Ability to respond to communication control messages

Based upon these requirements, a B-ASC must comply with the following BACnet Interoperability Building Blocks (BIBBs).

	B-ASC
Data Sharing	DS-RP-B
	DS-WP-B
Device and Network Management	DM-DDB-B
	DM-DOB-B
	DM-DCC-B

8.7 BIBBs

BIBBs are collections of one or more BACnet services between devices on a BACnet network. An "A" device is generally the user of the service or client while the "B" device is the provider of the service or the server. These references are necessary when understanding the BIBBs.

8.7.1   DS-RP-B Data Sharing — ReadProperty — B

The BAS Remote functions as the B device and is a provider of data to an A device.

BACnet Service	Initiate	Execute
ReadProperty		X

8.7.2   DS-WP-B Data Sharing — WriteProperty — B

The BAS Remote functions as the B device and allows a value to be changed by the A device.

BACnet Service	Initiate	Execute
WriteProperty		X

8.7.3   DM-DDB Device Management — Dynamic Device Binding — B

The BAS Remote functioning as the B device provides information about its device attributes and responds to requests to identify itself.

BACnet Service	Initiate	Execute
Who-Is		X
I-Am	X	

8.7.4   DM-DOB-B Device Management — Dynamic Object Binding — B

The BAS Remote functioning as the B device provides address information about its objects upon request.

BACnet Service	Initiate	Execute
Who-Has		X
I-Have	X	

8.7.5   DM-DCC-B Device Management — Device Communication Control — B

The BAS Remote functions as a B device and responds to communication control exercised by an A device.

BACnet Service	Initiate	Execute
DeviceCommunicationControl		X

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Version 2, June 1991

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