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Comfort Systems USA (Arkansas), Inc.
P.O. Box 16620
Little Rock, AR 72231
Phone 501-834-3320
Fax 501-834-5416

Date: 10/6/2022
Return Request: 10/16/2022
Project: ATU – Jones Hall
Supplier: NW Controls
Manufacturer: Various
Submittal: Direct Digital Controls System
Submittal Number: 23 09 23-01
Drawing # and Installation: Mechanical Drawings

ARCHITECT
SCM Architects
1400 Kirk Rd. Suite 220
Little Rock, AR 72223
501-224-3055

ENGINEER
Pettit & Pettit
201 E. Markham, Suite 400
Little Rock, AR 72201
501-374-3731

GENERAL CONTRACTOR
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N. Little Rock, AR 72113
501-225-6699

MECHANICAL SUBCONTRACTOR
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9924 Landers Rd.
N. Little Rock, AR 72117
501-834-3320

Notes:

CSUSA PROJECT NO.
22-620
sean@comfortar.com

ALESSI KEYES CONSTRUCTION
REVIEWED FOR GENERAL COMPLIANCE
WITH CONTRACT DOCUMENTS
Charley Dawson 10/10/2022

NORTHWEST CONTROLS

O & M Manual

Equipment: Building Automation System

Project: Arkansas Tech University
Jones Residence Hall

Location: Russellville, AR

Engineer: Pettit & Pettit

Mechanical: CSUSA

Submitted for approval by: Virgil Irvin
Northwest Controls Systems, Inc.

Date: 12 December 2023

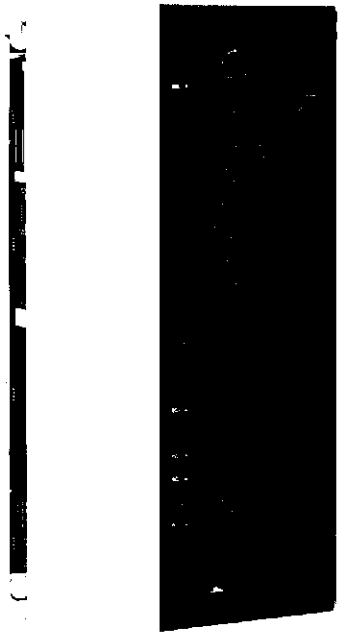
Contents

- Control Diagrams with Sequences of Operation
- Bill of Materials
- Equipment Data Sheets
- Installation and Operation Guide

7631 Northshore Place
North Little Rock, AR 72118
501.280.0404
www.nwcontrols.com

ASCENT CONTROL MODULE
BY ALERTON

Powered by BACtalk



ACM GLOBAL CONTROLLER

The backbone of Alerton's BACtalk™ Ascent product line, the Ascent Control Module (ACM) is the industry's most agile BACnet Building Controller (B-BC) in its class. It combines Alerton's pioneering and proven BACnet® capability with Tridium's® Niagara Framework® flexibility.

It provides a powerful assortment of features such as multiple global controller instances, and multiple communication networks.

The ACM can incorporate up to six (6) global controller instances and supports up to six (6) MS/TP trunks or EIA-485 LANs, consolidating the functionality of these controllers into a single configurable platform, and exceeding the functionality of six individual devices.

Two onboard Ethernet ports support 10/100/1000 Mbps Ethernet connections to the BACnet network, Modbus TCP or for Niagara 4 integration protocols such as LON IP and SNMP.

Easy to add option cards offer scalability for additional communication trunks as needed using the two slots available on the ACM. For example, you can use one option card slot for additional BACnet communication and the second card slot for LON communication by simply adding a dual 485 card and a LON card, respectively. Or you can use up to four card slots to support applications with large point count requirements for a central plant.

The ACM's quad-core processor future-proofs the system by providing high DDC execution speed for all the computing power you need. Two-direction DIN channel and direct panel mount options enable you to mount the ACM in different positions for the best fit.

The ACM hosts automation features such as schedules, trendlogs, alarms, zones and demand limiting.

FEATURES AND HIGHLIGHTS

SCALABLE

- Supports up to six EIA-485 LANs; two EIA-232 connections; two LON LANs; four TUX trunks; or 4 AXM/EXP trunks.

INTEROPERABLE

- Supports the BACnet Protocol on Ethernet, BACnet/IPv4, BACnet/IPv6, and MS/TP; Modbus TCP and RTU (EIA-485 and EIA-232); Alerton TUX, Alerton AXM (and EXP), as well as many Niagara supported protocols.

ENTERPRISE READY

- Supports BACnet/IPv4 and BACnet/IPv6, can be configured to act as a BACnet Broadcast Management Device (BBMD).
- Secure Boot to prevent tampering.

POWERFUL

- Advanced processor and extended memory provide a fast, reliable platform for running DDC programming and global automation routines.

SEGMENTED DDC CODE

- Allows multiple DDC program instances to run within a single controller, providing the ability to logically group sub-systems, improve uptime by enabling service on one system without impacting another, and maximizing flexibility in programming configuration.

TECHNICAL DATA: ACM

POWER 20-30 VAC @ 40 VA, 47 63 Hz, full-wave rectified, with optional battery backup (see other side).

DATA BACKUP/STORAGE One removable microSD card.

PROCESSOR AND MEMORY Efficient, high-speed, quad-core CPU based on the ARM® Cortex™-A9 architecture (Freescale i.MX6Quad); 1GB DDR3 SDRAM, 64-bit-wide, 533 MHz (1066 MT/s).

REAL-TIME CLOCK Provides system date and time.

BACNET/IP IPv4 and IPv6 support for interoperability on enterprise and WANs. Functions as up to four BACnet broadcast management devices (BBMDs) in accordance with Annex J BACnet/IP. Supports both Alerton and BACnet Standard network address translation (NAT) implementations.

MS/TP Supports two onboard networks that can be used for BACnet MS/TP or EIA-485 and up to two expansion cards (two networks each) for a maximum of six BACnet MS/TP networks per ACM.

MODBUS supports both TCP and RTU (EIA-485 and EIA-232) protocols; configuration supports up to 384 Modbus devices.

TUX Supports up to four Alerton TUX trunks for connection of up to 64 TUXs per trunk communicating at 4800/9600 baud or up to 32 TUXs per trunk communicating at 1200 baud. Each TUX Option Card has two TUX trunks.

VLX/AXM (EXP) Supports up to four instances of the VLX application; one instance is included with the ACM.

EXPANSION Supports up to two expansion cards for interface adapters, such as EIA-485, EIA-232, LON, and TUX.

COMMUNICATIONS Provides two Ethernet ports, two onboard EIA-485 networks, two expansion card slots give the ability to add up to four additional EIA-485 networks (for a total of six), or two EIA-232 connections, or two LONworks networks, or up to four TUX Trunks.

MOUNTING 35mm DIN rail, either vertical or horizontal orientation.

DIMENSIONS 7-1/4 W x 8-9/16 H x 1-11/16 D (inches)
185 W x 220 H x 44 D (millimeters); fits 12 x 12 x 4 (inch) panel enclosure.

ENVIRONMENTAL Without battery:
-4 to 149 °F (-20 to 65 °C), 0 to 95% RH, non-condensing.

Storage Temperature:
-4 to 185 °F (-20 to 85 °C), 0 to 95% RH, non-condensing.

ETHERNET Two integrated 8P8C modular connectors for use with two 10Base-T, 100Base-TX, and 1000Base-T Ethernet networks.

SOFTWARE Programming interface is Alerton Compass operator workstation software. Supports Niagara 4 platform when running ACM 2.0 ROC (ACM ROC 2.2.8 supports N4.8).

CERTIFICATIONS AND STANDARDS

- RoHS compliant
- CE (EN 60730-1)
- FCC Part 15 Class B
- ICES-003
- C-Tick listed
- UL 916 for open energy management equipment.
- BTL Listing: BACnet Building Controller (B-BC)

TECHNICAL DATA: ACM BATTERY

The ACM has an optional 12 volt NiMH battery, which provides backup power that allows for orderly shutdown should power remain OFF for more than 60 seconds.

POWER 12 VDC supply voltage

ENVIRONMENTAL

Operational temperature and humidity:
32 to 122 °F (0 to 50 °C), 0 to 95% RH, non-condensing
Recommended storage temperature and humidity (to extend life):
41 to 77 °F (5 to 25°C), RH 65% ±5% non-condensing
Allowed storage temperature and humidity:
32 to 122 °F (0 to 50 °C), RH 5 to 95% non-condensing

CERTIFICATIONS AND STANDARDS

- UL 2054 ed 2 rev 2011-09-14
- EN 62133 ed 1 (2002), ed 2 (2012)

TECHNICAL DATA: TUX OPTION CARD

Each card has two TUX trunks - a total of four TUX trunks can be added in an ACM.

ENVIRONMENTAL

Operational temperature and humidity:
-4 to 149 °F (-20 to 65°C), 5 to 95% RH, non-condensing

Storage temperature and humidity:
-40 to 149 °F (-40 to 65°C), 5 to 95% RH, non-condensing

CERTIFICATIONS AND STANDARDS

- (Same as ACM)

ORDERING INFORMATION* ±

ITEM NUMBER

ACM-BATT	Optional ACM battery
ACM-OC-2X485* ±	Dual EIA-485 option card
ACM-OC-232	EIA-232 option card
ACM-OC-LON	78kbps FTT10A LON option card
ACM-OC-2XTUX	Dual TUX Trunk option card
ACM-MDBS-DR-TCP	Alerton Modbus TCP protocol driver
ACM-MDBS-DR-RTU	Alerton Modbus RTU protocol driver
ACM-DR-VLX	Alerton VLX driver
ACM-DR-FPCS	Integration to FPCS protocol
ACM-DR-HOTEL	Integration to HOTEL protocol
AXM-1048	I/O Module for use with ACM-VLX
AXM-10120	I/O Module for use with ACM-VLX
AXM-2200	I/O Module for use with ACM-VLX

*__IMPORTANT!__ Requires at least one base device license, Alerton (ACM032, ACM064, ACM128, ACM256, ACM384) or Niagara 4 (NC-0005-A, NC-0010-A, NC-0025-A, NC-0100-A, NC-0200-A). Add-on Device packs also available for both Alerton and Niagara 4 base licenses.

± ACM-OC-2X485 is required when using the AXM (EXP) I/O Modules

Specifications subject to change without notice.

INNOVATIVE GLOBAL CONTROLLER WITH EXTENSIVE FLEXIBILITY.

16201 25th Avenue W., Lynnwood, WA 98087
Telephone: (425) 921-4900 / Fax: (425) 921-4872
alerton.com / sales@alerton.com

ASCENT
BY ALERTON

Powered by BACtalk

ASCENT CONTROL MODULE INSTALLATION AND OPERATIONS GUIDE

ALERTON

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Important safety information and installation precautions

Read all instructions

Failure to follow all instructions may result in equipment damage or a hazardous condition. Read all instructions carefully before installing equipment.

Local codes and practices

Always install equipment in accordance with the National Electric Code and in a manner acceptable to the local authority having jurisdiction.

Disposal and Recycling

Waste electrical products should not be disposed of with general waste. Please recycle where these facilities exist. Check with your local authority for recycling advice.

Electrostatic sensitivity

This product and its components may be susceptible to electrostatic discharge (ESD). Use appropriate ESD grounding techniques while handling the product. When possible, always handle the product by its non-electrical components.

High voltage safety test

Experienced electricians, at first contact, always assume that hazardous voltages may exist in any wiring system. A safety check using a known, reliable voltage measurement or detection device should be made immediately before starting work and when work resumes.

Lightning and high-voltage danger

Most electrical injuries involving low-voltage wiring result from sudden, unexpected high voltages on normally low-voltage wiring. Low-voltage wiring can carry hazardous high voltages under unsafe conditions. Never install or connect wiring or equipment during electrical storms. Improperly protected wiring can carry a fatal lightning surge for many miles. All outdoor wiring must be equipped with properly grounded and listed signal circuit protectors, which must be installed in compliance with local, applicable codes. Never install wiring or equipment while standing in water.

Wiring and equipment separations

All wiring and controllers must be installed to minimize the possibility of accidental contact with other potentially hazardous and disruptive power and lighting wiring. Never place 24VAC or communications wiring near other bare power wires, lightning rods, antennas, transformers, or steam or hot water pipes. Never place wire in any conduit, box, channel, duct or other enclosure containing power or lighting circuits of any type. Always provide adequate separation of communications wiring and other electrical wiring according to code. Keep wiring and controllers at least six feet from large inductive loads (power distribution panels, lighting ballasts, motors, etc.). Failure to follow these guidelines can introduce electrical interference and cause the system to operate erratically.

Warning

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

16201 25th Avenue West
Lynnwood, WA 98087
Telephone: (425) 921-4900 Fax: (425) 921-4872
Web Site: www.alerton.com

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About this guide

In addition to technical data and general information about Ascent control module (ACM), this guide provides instructions and guidelines for:

- Mounting
- Connecting power and communications cabling
- Performing initial configuration and setup
- Verifying configuration and setup

Appendixes provide information about configuration connection settings and object and property references to aid in diagnostic and integration activities.

How to use this guide

This document was created to assist engineers and technicians when installing and programming the ACM.

- Check the table below for more information resources.
- Even if you're an expert with the Alerton systems, review "About the Ascent Control Module (ACM)" on page 11. This section gives you important information about how to apply ACMs.
- "Key Illustrations" on page 7 is a good starting point for installation technicians and engineers. Browse this section to become familiar with the hardware and unique installation requirements.
- Programmers and system developers can use the Appendixes at the end of this manual for quick reference information.

Other information resources

Document ID	Contains
ACM data sheet	A summary of applications, capabilities, and technical data.
Compass Installation and Upgrade Guide (LT-COMPASSIUG)	Information needed to use Device Manager to view device information about ACMs or to download a ROC file.
Compass Web Interface User Guide (LT-UG-CMPSWEB) and online Help	Information for setting up automated control features for your Compass system.
Compass Dealer Guide (LT-DG-CMPSWKSTN)	Information about engineering the Compass primary operator workstation.

Key illustrations

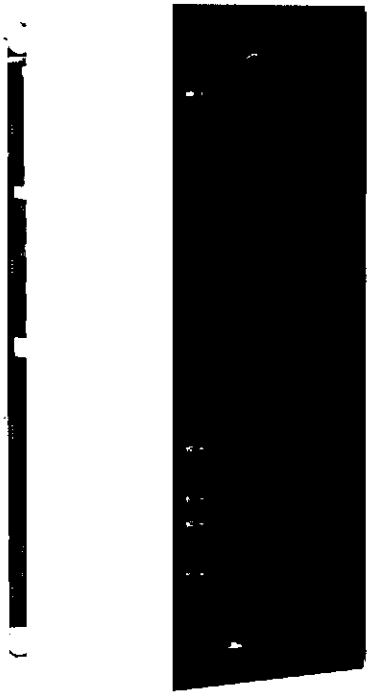


Figure 1 *Ascent Control Module (ACM)*

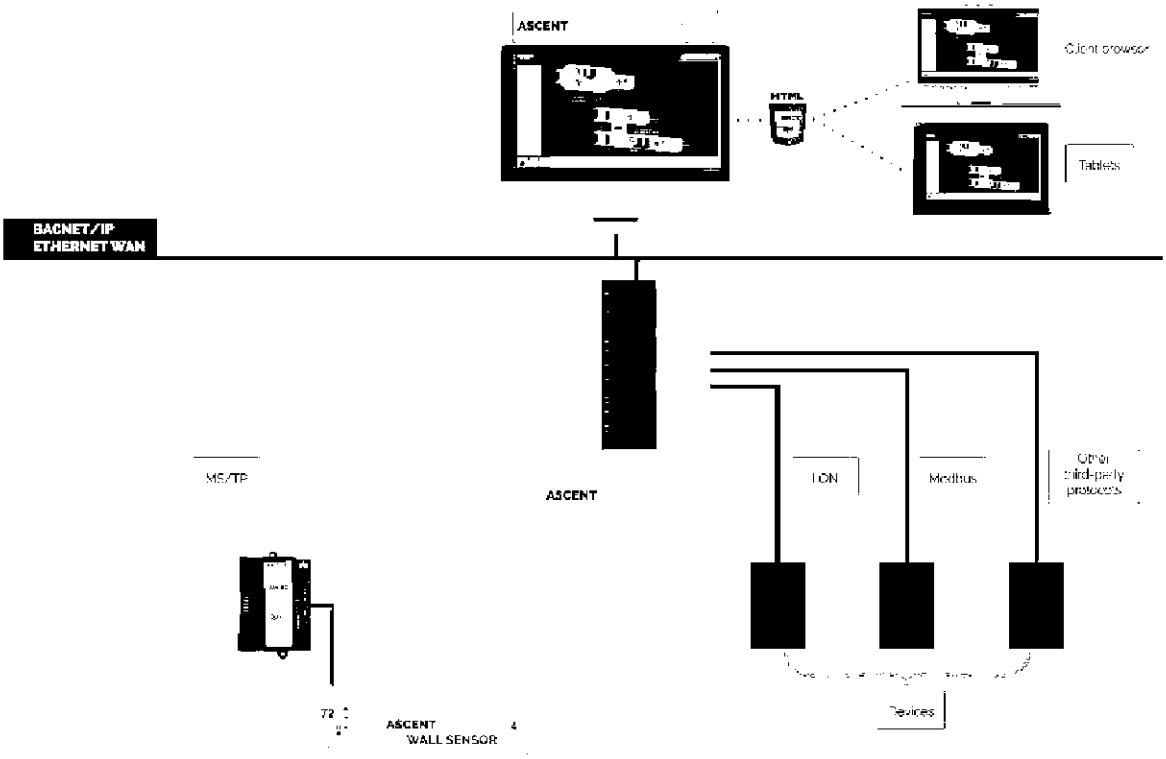


Figure 2 *Simple architecture using the ACM*

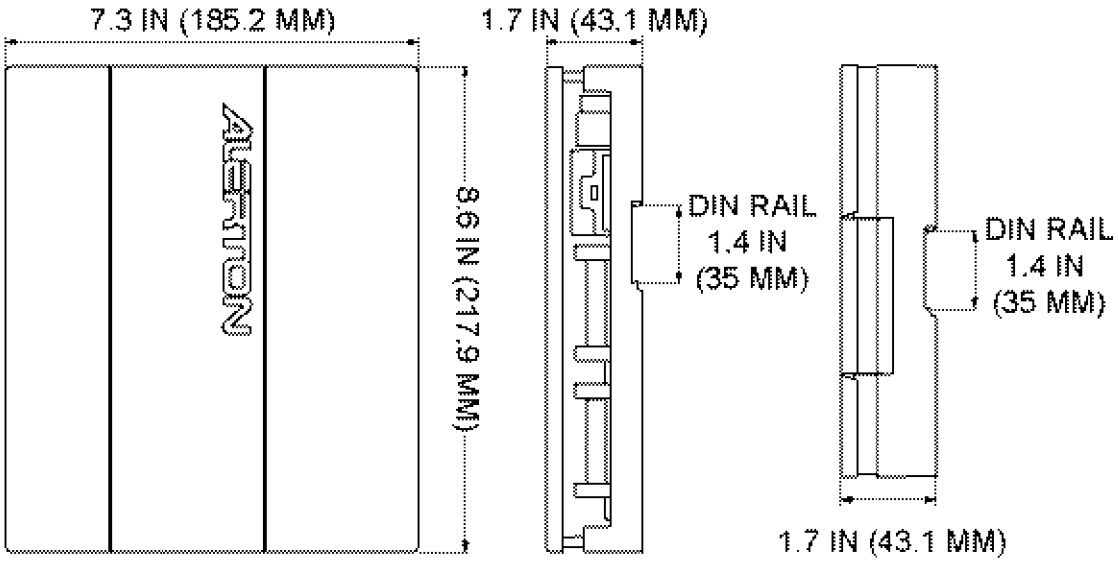


Figure 3 *ACM dimensions*

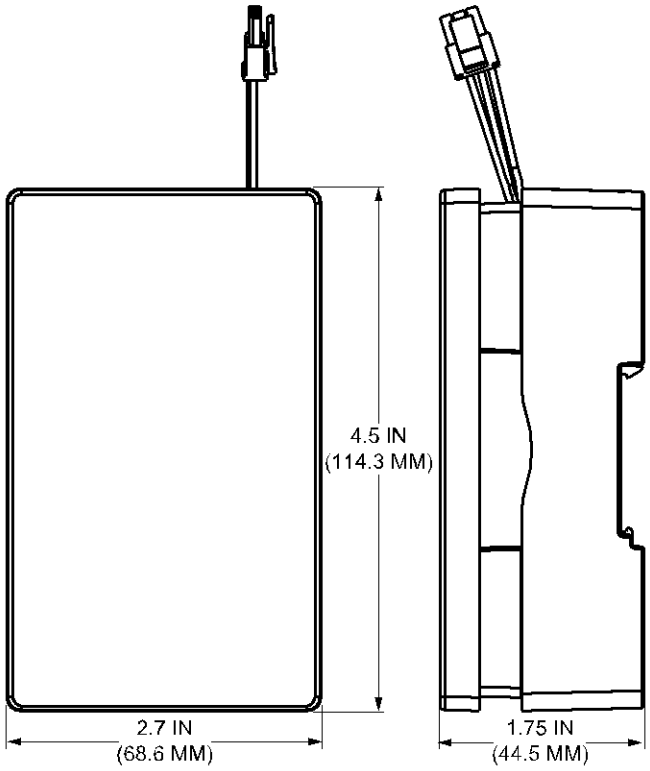


Figure 4 *ACM Battery dimensions (optional accessory)*

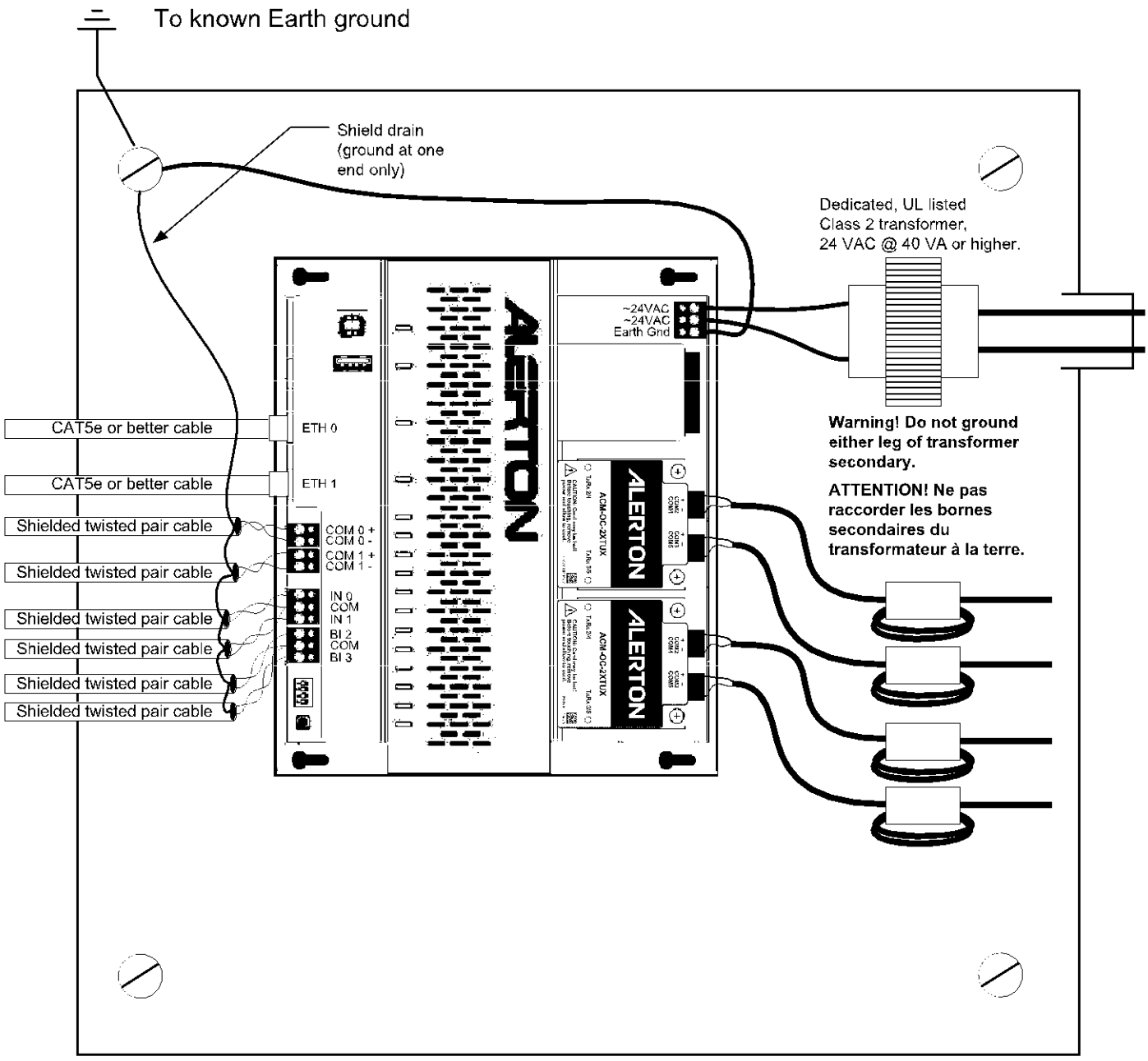


***Figure 5** ACM wiring*

WARNING Do Not ground either leg of the transformer secondary.

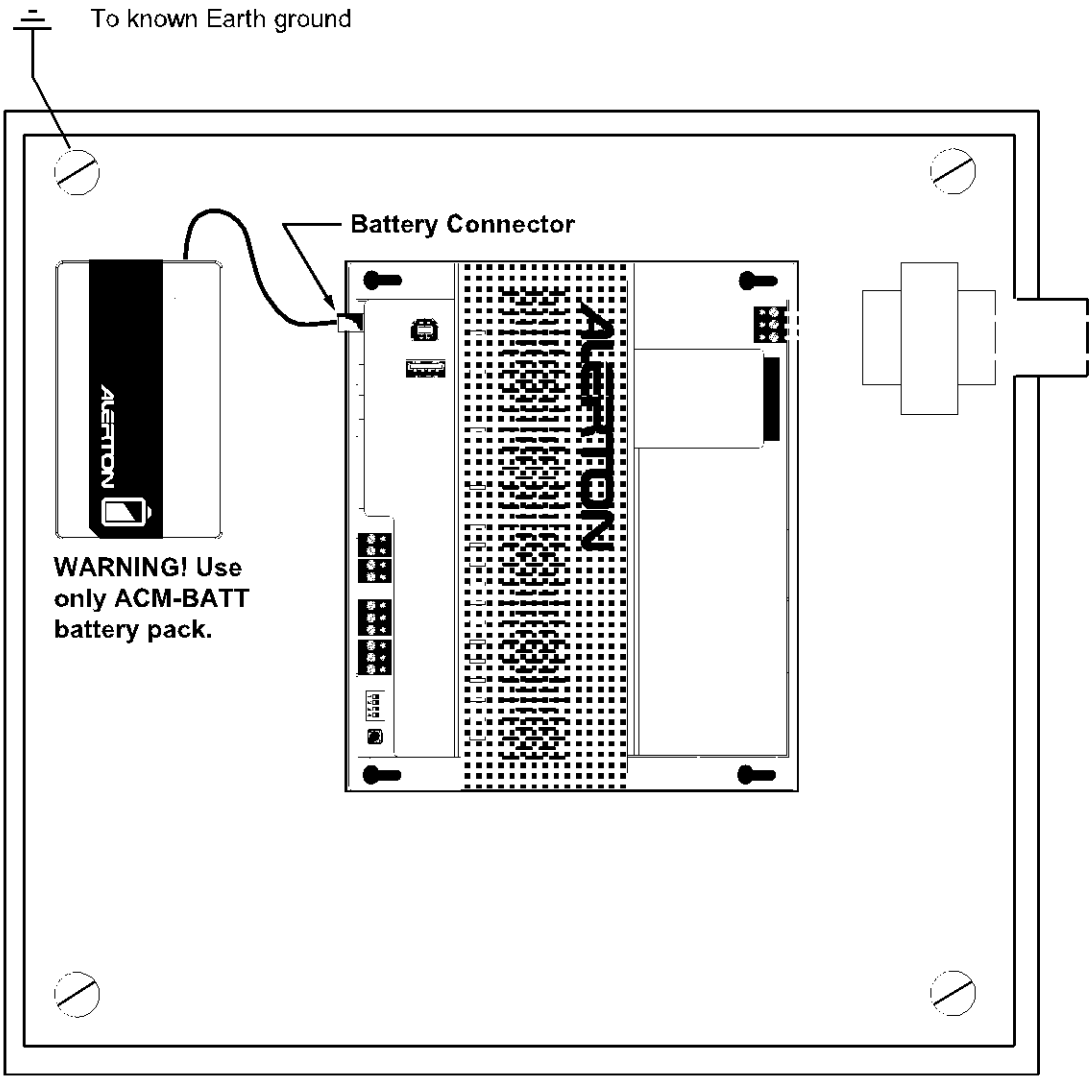


Figure 6 *ACM wiring with optional ACM Battery*

About the Ascent Control Module (ACM)

Overview

The Ascent Control Module (ACM) combines Alerton's proven BACnet® capability with Tridium's® Niagara Framework® flexibility. The ACM provides a powerful assortment of features such as multiple global controller instances and multiple communication networks.

The ACM can incorporate up to six (6) global controller instances and supports up to six (6) MS/TP trunks or EIA-485 LANs, consolidating the functionality of these controllers into a single configurable platform, and exceeding the functionality of six individual devices.

Two onboard general purpose Ethernet ports support 10/100/1000 Mbps Ethernet connections. These two ports are independent and configurable. They may be used for either the BACnet network, NiagaraAX integration protocols (such as LON IP, Modbus TCP, and SNMP), or both BACnet and Niagara.

Plug-in option cards offer scalability for additional communication trunks as needed using the two slots available on the ACM. For example, you can use one option card slot for additional BACnet communication and the second card slot for LON communication by adding a dual EIA-485 card and a LON card, respectively. You can also add up to two ACM-TUX option cards to communicate with Alerton legacy IBEX TUX controllers.

The ACM's quad-core processor future-proofs the system by providing high DDC execution speed for all the computing power you need. Two-orientation DIN channel and direct panel mount options enable you to mount the ACM in different positions for the best fit.

The ACM hosts automation features such as schedules, calendars, trendlogs, alarms, zones and demand limiting.

An optional 12 volt NiMH ACM Battery is available. This provides backup power that ensures data retention and orderly shutdown in case power is lost to the ACM.

Technical specifications

Table 1 Features.

Feature	Highlights
Scalable	Supports up to six EIA-485, or two EIA-485 and two EIA-232, or four TUX trunks, or two EIA-485 and two LON networks. There are two onboard EIA-485 connectors plus two Option Card slots. **NOTE:** These are example configurations.
Inter-operable	Supports the BACnet Protocol on Ethernet, BACnet IP, MS/TP, LON, SNMP, MODBUS, TUX, as well as many NiagaraAX supported protocols. **NOTE:** Protocol integration using Tridium drivers requires the use of NiagaraAX or WorkPlace.
Enterprise ready	Supports BACnet/IP and can operate as a BACnet broadcast management device (BBMD) with NAT support for integration on enterprise and wide-area networks.
Powerful	Powered by a high-speed, quad-core CPU based on the ARM® Cortex™-A9 architecture. 1 GB DDR3 SDRAM provides a fast, reliable platform for running DDC programming and global automation routines.
Segmented DDC code	Allows multiple DDC program instances to run within a single controller, providing the ability to logically group sub-systems, improve uptime by enabling service on one system without impacting another, and maximizing flexibility in programming configuration.

Table 2 Specifications.

Technical Data	
Power	24 VAC @ 40 VA, 47–63 Hz, full-wave rectified.
Data backup/ storage	One removable microSD card.
Processor and memory	Efficient, high-speed, quad-core CPU based on the ARM® Cortex™-A9 architecture (Freescale i.MX6Quad); 1GB DDR3 SDRAM, 64-bit-wide, 533 MHz (1066 MT/s).
Real-time clock	Provides system date and time.
BACnet/IP	IP support for interoperability on enterprise and WANs.Functions as up to four BACnet broadcast management devices (BBMDs) in accordance with Annex J BACnet/IP. Supports Alerton and BACnet Standard network address translation (NAT) implementations.
MS/TP	Supports two onboard networks that can be used for BACnet MS/TP or EIA-485 and up to two expansion cards (two networks each) for a maximum of six BACnet MS/TP networks per ACM.
MODBUS/TCP	Supports up to 384 MODBUS TCP devices on a Ethernet network, using device packs. Supports Modbus TCP devices as virtual BACnet devices.
MODBUS Serial	Supports up to two expansion cards (two networks each) for a maximum of six ACM MODBUS Serial networks per ACM. Modbus serial communications is supported on EIA-485 or EIA-232. In addition to the 2 onboard 485 networks the ACM will support up to four additional 485 networks (by adding 2 dual 485 Option Cards), or two 232 networks (by adding 2 single network 232 Option Cards). Supports Modbus devices as Virtual BACnet devices.
TUX	Supports up to two expansion cards (two networks each) for a maximum of four IBEX TUX networks per ACM.
Expansion	Supports up to two expansion cards for interface adapters, such as EIA-485, EIA-232, TUX, and LON.
Persistent memory	Stores ACM configuration and licensing information through a power outage.

Table 2 Specifications.

Technical Data	
Communications	Provides two Ethernet ports, two onboard EIA-485 networks, two universal inputs, two binary inputs, two expansion cards give the ability to add up to four additional EIA-485 networks (for a total of six), or two EIA-232 networks, four TUX trunks, or two LON networks. MODBUS Serial can communicate over EIA-485 or EIA-232 networks in place of MSTP.
Mounting	35mm DIN rail, either vertical or horizontal orientation.
Dimensions	7-1/4 W x 8-9/16 H x 1-11/16 D (inches) 185 W x 220 H x 44 D (millimeters); fits 12 x 12 x 4 (inch) panel enclosure.
Environmental	-4 to 149 °F (-20 to 65 °C), 0 to 95% RH, non condensing. If ACM Battery is used: 32 to 122 °F (0 to 50 °C), 5 to 95% RH, non-condensing
Platform	Linux
Ethernet	Two integrated RJ-45 modular connectors for use with two 10Base-T, 100Base-TX, and 1000Base-T Ethernet networks.
Networking	Supports both BACnet and Alerton network address translation (NAT). Ethernet port ETH0 can be assigned a Gateway. ETH1 uses RIP to route to other subnets.
Software	Programming interface is the Alerton Compass operator workstation software. Supports full Niagara AX station.
Certifications and standards	ROHS compliant, applicable CE requirements, FCC Class B, IEC 60703, C-Tick listed, WEEE, and UL 916 for open energy management equipment.

Compatibility information for Alerton devices

The ACM operates using Compass operator workstation software. ACMs support Alerton's field level devices.

- **Compass operator workstation software:** Download a ROC file, DDC, or connect to the ACM.
- **Alerton Building Suite (ABS) 3/Envision for BACtalk v3.1**
- **ACM License downloading is supported through Compass**
- **Sending Modbus configuration information is supported using Compass 1.5 and later**
- **Alerton VisualLogic controllers (VLCs)**

Data persistence

All programmed objects (such as schedules, trendlogs, and alarms), DDC, data values, and the ROC file execute in RAM and are periodically backed up in flash memory. Data is retained through power loss as follows:

- Orderly shutdown: no data lost. Requires battery for orderly shutdown. With no battery ACM will lose any data changed since last periodic backup (5 minute intervals).
- ACM-GC data is backed up every 5 minutes or less.
- Niagara has its own periodic writing schedule. This is configurable; the default is once per day.

Configuration parameters are stored in flash memory. Likewise, all configuration data is retained through power loss.

NOTE ACM will not do an orderly shutdown without a battery (unless the user manually initiates the orderly shutdown). The ACM will perform an orderly shutdown if a functional battery is connected. The ACM Battery backup must be connected to the ACM for 24 hours before it provides backup power support.

Configuration parameters can be saved in the DCF file and then sent to the ACM. This facilitates off-site setup and easy replication of settings to other controllers in similar installations.

Real-time Operating Code (ROC) files

The ACM ships with the system boot code and real-time operating code (ROC) file pre-loaded at the factory.

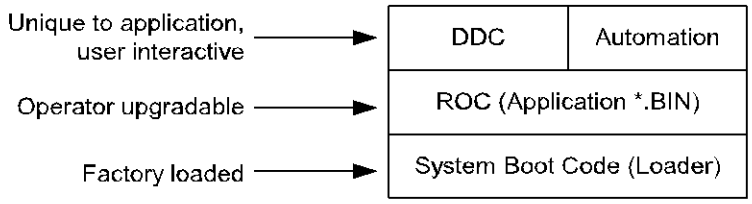


Figure 7 *Relationship of ACM system boot code, ROC, and application files*

The ROC file is the foundation of controller operations and is required for the ACM to host DDC and automation features. Although, an initial ROC file is loaded at the factory, periodic updates may be required (for example, when a new version of operator workstation software becomes available).

Download ROC files from the <bactalk root>\system directory using Compass operator workstation software. See Compass software online Help for more information about downloading ROC files or checking ROC file versions.

Battery backup and ROC files

The ACM must have the 1.2 or later version of the ROC file loaded to enable the battery port.

NOTE The ACM Battery backup must be connected to the ACM for 24 hours before it provides backup power support.

ACM Licensing

When you purchase an ACM you specify the capabilities you want it to support and your purchase includes the ACM unit and a license file. The license file may include licenses for multiple drivers purchased.

If you want to add a license to the ACM, buy the new license, download the license from Niagara Central, and then load the license into the ACM to activate its device capabilities.

There are two methods to add a license to the ACM: through Compass or the Niagara WorkPlace AX.

Compass

To add a license to the ACM using Compass

1. Rename the ACM license you receive via email to **licenses.lar**
2. Copy the **licenses.lar** file into the jobs device folder for the ACM. Typically, C:\Alerton\Compass\1.0\<my REP>\<my JOB>\Devxxxxx.
3. Open Device Manager in Compass and click the ACM you want to license.

   Note It is recommended to save the device configuration before sending to ensure you are resending the latest DCF.
4. Click **Send**, click **Device Configuration**, and then send the license to the device.
5. Compass sends the ACM license to the ACM as part of the Device Configuration option. The Device Configuration option checks for a licenses.lar file and sends it if it is found.
6. Open the User Progress Monitor to verify that the license is sent to the ACM.

Niagara WorkPlace AX

Only Niagara-certified users can use WorkPlace AX to add licenses to the ACM. Add a license using the standard Niagara Licensing mechanism.

Device Counting

This section describes device counting on the "Alerton side" only. Niagara has its own licensing policies for networks it manages, including MS/TP.

Device counting applies to the ACM as a whole. This means the slots must communicate with each other to determine if the overall limit is exceeded. Once the determination is made, each slot individually shuts down networks that are related to the devices being counted. It does NOT shut down networks that have nothing to do with talking to counted devices.

In general, device counting networks will ALL be shut down when the device limit is exceeded. Device counting network types are:

- MS/TP (counting directly connected devices only)
- TUX trunks
- MODBUS networks (both TCP and Serial/RTU)

The following network types are NOT device counting type. When the device limit is exceeded, they will not be shut down.

- BACnet/Eth
- BACnet/IP
- ACM-VLX I/O Expansion ports
- Networks routed through MS/TP
- Example: AZW-5000 (coordinator) directly to ACM MS/TP will be counted but any device connected to the AZW-5000 transeiver (including the transeiver) will not be counted.

ACM-MODBUS

In the case of MODBUS, the device list is static. The number of devices is known right at startup. So unlike MS/TP and TUX trunks, the ACM-MODBUS slots make their device counts known to all slots immediately.

However, the ACM-MODBUS program only counts devices that are licensed. The ACM-MODBUS program has two separate license features for RTU (serial) and TCP, respectively. If your device mapping has a bunch of TCP entries in it, and you don't have a MODBUS TCP license, then these devices never exist in the first place, so they aren't counted. However, the "License Exceeded" BV will turn on in this case, since there was an attempt to use TCP without having a license for it.

The License Exceeded BV turns in if any of the following conditions are met:

- There is no MODBUS-TCP or MODBUS-RTU feature in the license at all (does not cause other networks to shut down)
- Attempt to connect to MODBUS TCP devices without a MODBUS_TCP license (does not cause other networks to shut down)
- Attempt to connect to MODBUS_RTU (serial) devices without a MODBUS_RTU license (does not cause other networks to shut down)
- Device limit exceeded for 10 minutes (causes all device counting networks to shut down)

ACM-VLX

The ACM-VLX is the first case where the number of instances of the program is limited by a license.

The License Exceeded BV turns on (and I/O expansion communication is disabled) if any of the following conditions are met:

- There is no ACM-VLX license (does not cause other networks to shut down)
- The ACM-VLX instance limit is already reached because of ACM-VLX program running in lower numbered slots (does not cause other networks to shut down)

Device counting is reporting normally in ACM-VLX, except that the License Exceeded BV does NOT turn on if the ACM device limit is exceeded. Licensed ACM-VLX programs will continue to operate normally under "device limit exceeded" conditions. Doing otherwise may endanger expensive hardware.

Hardware installation and operation

This section describes installation of ACMs, covering requirements for mounting, connecting to the power supply, and setting up communication connections.

Mounting

The ACM is designed to mount to a 35mm DIN rail, in either the North-South or East-West orientation. Labels can be read easily in either orientation.

The ACM may also be mounted using the screw mounting holes located at each corner of the device.

ACM modules are intended for indoor applications. Install in a UL-listed enclosure, in a dry location, away from direct sunlight, and free from excessive dust, vibration, and electrical interference.

The ACM Battery can be mounted on a 35mm DIN rail, or panel mounted using the screw holes.

Power

24 VAC @ 40 VA, 47–63 Hz, full-wave rectified.

Communications

This topic describes hardware network connections to the ACM.

Using terminal blocks

Each ACM uses removable terminal blocks to simplify field wiring of power and cabling. You can remove the terminal blocks from the unit, terminate the cable, and then re-seat the terminal block when you finish.

To terminate cable

1. Strip a maximum of 3/8" (10 mm) of the wire jacket from the end of the cable.
2. Use a small screwdriver (1/8" max.) to turn the adjustment screw fully counter-clockwise.

   The clamps in the wire slot separate as you turn the screw.
3. When the clamps in the wire slot are fully open, insert the stripped end of the cable (insulation end must be flush with the terminal block). Be sure to insert all cable strands into the wire slot.
4. Hold the cable in place and turn the adjustment screw clockwise to tighten it until the clamps in the wire slot secure the cable.
5. Tug gently on the cable to ensure that it's secure.

CAUTION Set up firmware before physically connecting networks. This helps to avoid potential network conflicts and communication errors.

Ethernet

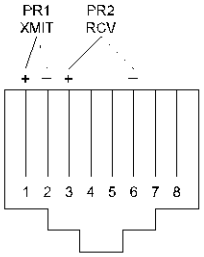
Ethernet is a high-speed LAN widely installed in commercial buildings.

Twisted-pair Ethernet networks use four conductors (two twisted-pair wires) to carry the network signal. The first pair carries the transmit signal positive and negative. The second pair carries the receive signal positive and negative.

The ACM has two integrated RJ-45 modular connectors (ETH 0 and ETH 1) located on the left side for use with two 10Base-T, 100 Base-TX, and 1000 Base-T Ethernet networks.

Ethernet RJ-45 jack

An RJ-45 jack for connection to Ethernet. Pin designations for the RJ-45 jack are shown (perspective is looking upside down into the jack).



1	Transmit +
2	Transmit –
3	Receive +
6	Receive –

Cable type and length

Use an approved Category 5e or better Ethernet drop cable with RJ-45 plugs to connect to an Ethernet switch. Use professionally manufactured cables and a switch that supports 1000 Mbps for best results. Cable length should be no more than 328 feet (100 meters).

MS/TP

MS/TP is a LAN standard designed specifically for BACnet applications. It uses the EIA–485 signaling standard. The ACM communicates over MS/TP through the two on-board EIA-485 networks, or through EIA-485 option cards installed into one or both of the option card slots located on the right side of the ACM.

MODBUS

Modbus is a communications protocol used to establish master-slave and client-server communications between intelligent building controllers. The ACM supports both TCP communications over Ethernet, or RTU/ASCII Serial communications over EIA-485 or EIA-232. Use ACM-Builder to configure ACM-MODBUS to take advantage of creating and reusing "virtual" MODBUS devices and Points Lists. See the *ACM Builder Installation and Operations Guide* (LT-ACMBLDRIOG) for detailed configuration instructions.

TUX

Install ACM-TUX option cards into the option card slots to establish communications with Alerton legacy IBEX TUX controllers. The ACM-TUX provides high-performance global controller capabilities and serves as an IBEX gateway for BACnet systems. The ACM-TUX reads TUX data from Alerton TUX controllers on an IBEX trunk and makes the data available to the BACnet network as BACnet objects and properties.

Auto-tune

Enabling the ACM-TUX auto-tune feature tells the ACM to automatically attempt to tune the TUX trunk current to adequately drive all connected TUXs. A corresponding voltage can be measured at the ACM, and the ACM-TUX auto-tuning feature now gives the user the flexibility of setting the auto-tune target voltage to easily facilitate replacing an APEX. Simply measure the trunk voltage on your APEX TUX Trunks before disconnecting them, and then enter the voltage value into the auto-tune target voltage parameter.

The auto tuning parameters do not need to be set through the DCF file. The ACM-TUX allows the trunks to be dynamically tuned via diagnostic points on a data display. Any changes made to BV 120x71 (auto tune enable), AV 120x71 (virtual potentiometer), and AV 120x74 (auto tune target voltage) are written into the DCF file automatically. The variable "x" indicates the COM Port number associated with the TUX Trunk you want to tune (COM 2-5).

NOTE The BCM-TUX auto-tune target voltage was hard coded to 9.0V.

Manual Tuning

Gives the user the ability to set a virtual potentiometer value (in percent), which simulates the trunk tuning potentiometer on an APEX. Increasing the Potentiometer value increases the drive current.

Device instance

The device instance is a unique number throughout the BACnet internetwork that identifies the device for BACnet communications. Valid range for the device instance is 0 to 4,194,302. Ensure that the device instance is different from any other device on any connected network.

BACnet reserves device instance 4194303 for special purposes. Do not use device instance 4194303.

Using DIP switches on the ACM

Four two-position switches are used to reset the ACM to factory defaults and to force a data backup and orderly shutdown. See the following table for a description of switch placement and associated operation.

Table 3 DIP switches.

Switch 1	Switch 2	Switch 3	Switch 4	Description
OFF	OFF	OFF	OFF	Normal operation.
ON	OFF	OFF	OFF	Resets to factory defaults when reset button is pushed once, and then a second time within 3 seconds.
OFF	OFF	OFF	ON	Performs an orderly shutdown, including data backup. Do not press the reset button after setting SW4 ON. All 4 Status LEDs will flash when backup is complete.

Reset factory defaults

To reset the ACM to factory defaults

1. Set DIP Switch 1 (and only 1) to the ON position.
2. Press the reset button and wait a few seconds for the four status LEDs to turn ON.
3. Once the four status LEDs turn ON, immediately press the reset button a second time.

   Note You only have a few seconds from the time the LEDs come on to do this, otherwise the ACM will treat it as a first-time press of the reset button. If this happens, go back to Step 2.

4. It takes about 1 minute for the ACM to reset to factory defaults. Turn DIP Switch 1 OFF to eliminate the risk of accidentally triggering an unintended reset to factory defaults.

ACM orderly shutdown

When removing the ACM from power **always do an orderly shutdown** to ensure that all data is properly saved to disk and to prevent the file system from becoming corrupt. If a battery is installed, the ACM will automatically do an orderly shutdown when main power is lost. You typically only need to do a manually triggered orderly shutdown if there is no backup battery.

The ACM file system cannot become corrupted due to an unexpected power down. However, unexpected reset or power failure can cause the last 5 minutes (maximum) of Alerton data to be lost, and the last 1 hour (maximum) of Tridium data to be lost. In contrast, with an orderly shutdown, all data is saved from RAM to disk and no data is lost.

To do an orderly ACM shutdown

1. Set DIP Switch 4 to the ON position and wait.
   The ACM will do an orderly shutdown, which may take a couple minutes.

   Note When the shutdown is complete, status LED 4 will flash rapidly, indicating that it is safe to remove power.

2. Remove power from the unit before changing any DIP switch settings.
3. Turn DIP Switch 4 back OFF after removing power.

   Note If, after applying power, you notice that status LED 4 is flashing rapidly, then DIP Switch 4 is still turned ON from a previous power down. DIP Switch 4 must be turned OFF for the ACM to continue booting normally. You do not have to remove power in this case; you may turn OFF the DIP switch with power ON.

ACM configuration

- It is highly recommended that you connect to the ACM and configure it before connecting to networks to minimize the potential for network conflicts.
- The ACM must be connected to power during configuration.
- Configuration parameters and licensing are stored on the microSD card so you can perform configuration tasks offline, remove power, and the ACM will retain settings. and licensing.

Connecting to an ACM with operator workstation software

For initial setup, use Device Manager to scan for the ACM and configure the ACM device profile. Use Compass or Envision for BACtalk v2.0 or later operator workstation software to configure the ACM. You must use BACnet/Ethernet protocol in your network to initially configure the ACM.

1. Power up the ACM (See "Mounting" on page 17.) and start the operator workstation software.
2. Click **Compass** or **BACtalk** and then click **Device Manager** in the menu.
3. Click **Device Scan** and then click **Scan for Configurable Devices** to find the ACM. The ACM should appear as its factory default device instance of 200.
4. If the ACM does not show up in the scan results, then check the network connections and workstation setup.
5. Click the ACM in the results list and then click **Configure** to set the ACM's device profile. The **Edit Device Configuration** dialog box opens displaying the **General ACM Configuration** navigation tree.

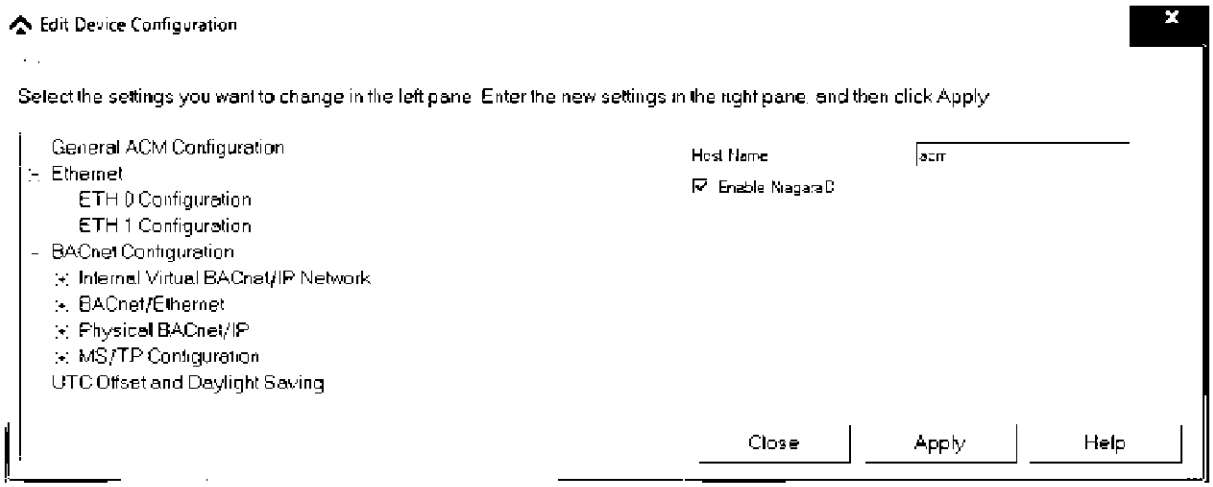
General ACM configuration

How the ACM determines the Host Name

The user-specified host name can be a simple host name, or a fully qualified domain name such as **myacm.my-domain.com**.

To configure Ethernet networks

1. Type a Host Name for the ACM.



2. Click **Apply** to save your changes.

Ethernet configuration

To configure Ethernet networks

1. In the navigation tree click **Ethernet** and then click **ETH 0 Configuration**.
2. Enable ETH 0 and specify the IP Address, Net Mask, and the Default Gateway (for IP installations only). **NOTE** See "Default Gateway" below for more information.

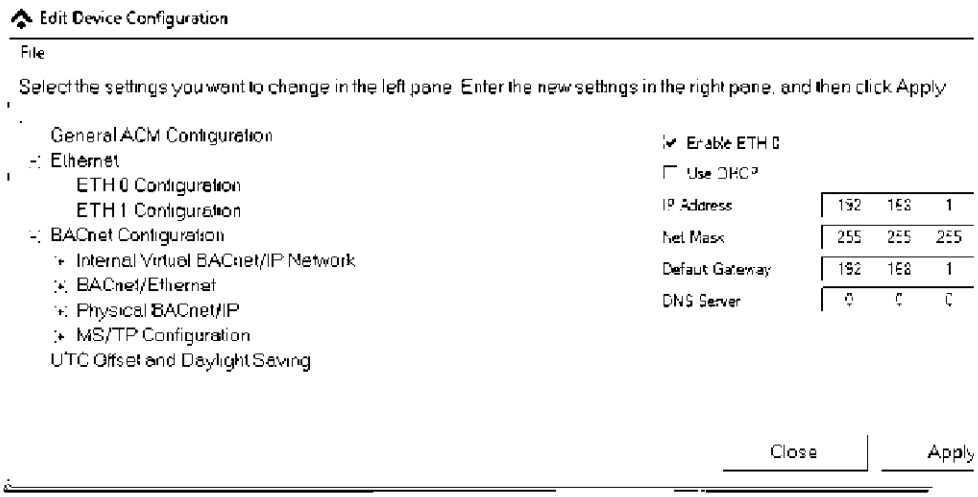


***Figure 8** Sample ACM settings*

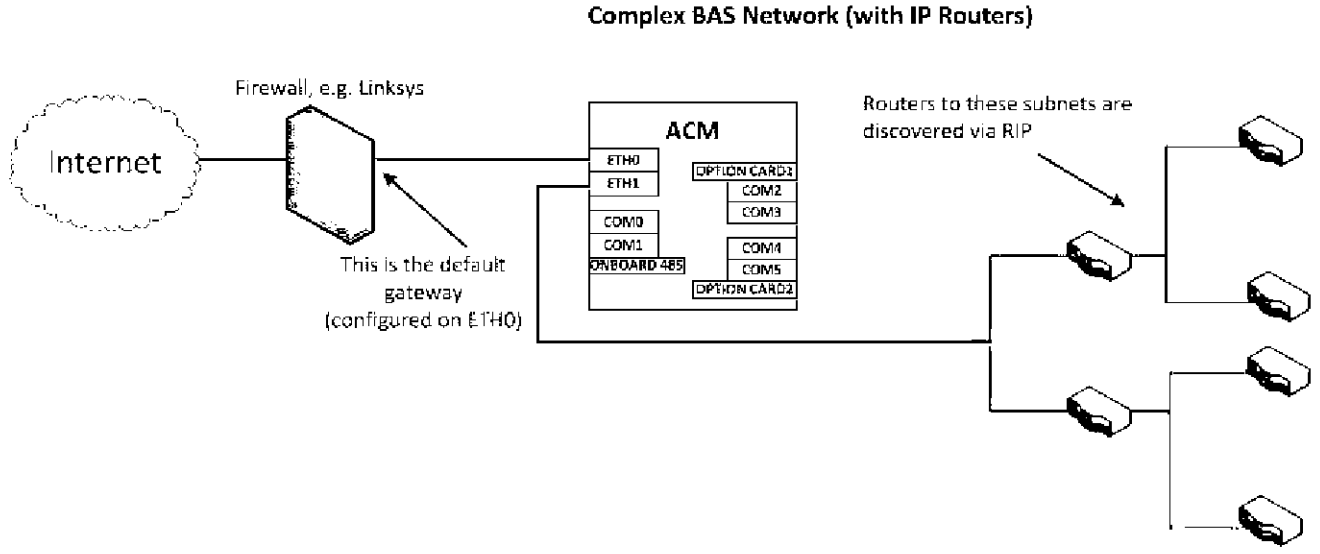
3. Repeat for ETH 1 Configuration, if desired, and then click **Apply**.

Default Gateway

Configure a maximum of one default gateway per ACM. Problems will occur if you set up default gateways on both Ethernet ports. Use address 0.0.0.0 to mean "none."

ACM 1.1 has the RIPD v1 and RIPD v2 protocols enabled so it can automatically discover IP routes through ETH1. This feature allows the ACM to reach subnets in the internal BAS/private network, even if there are IP routers in the building.

Setting a default gateway on ETH0 is appropriate if you are using static (non-DHCP) configuration and you need to reach the Internet through ETH0. In such cases, the ETH0 gateway should be the internal IP address of the NAT firewall between the ACM and the Internet. See the following diagram.



If you are not using ETH0 to reach the Internet, then you can use the Default Gateway setting to specify the address on one IP router. There are legitimate cases where the Niagara components do need Internet access, for example:

- To send e-mail to Internet services such as gmail.com, hotmail.com, etc
- To access time servers
- To access weather services

The Description property of diagnostic AV-100025 shows routing information automatically gathered by the ACM. The description should be displayed using a fixed pitch font such as Courier New.

BACnet configuration

NOTE The ACM is initially configured with BACnet/Ethernet protocols enabled for both Ethernet ports.

The ACM has 6 "slots" for running programs. The Internal Virtual BACnet/IP network must be enabled to communicate with devices in slots 1-5.

All networking is configured through the BACnet device in slot 0, including the choice of which applications to run in the other slots. BACnet devices in slots 1-5 have much smaller configuration data that does not include any networking configuration. Slots can also be left empty; it is not required to run an application in all of them.

To configure BACnet networks

1. Type the Device Instance, and then set the Device Home Port if necessary (this is required for BACnet Network Address Translation [NAT] installations), Default COV Resubscription Interval, Password for Device Communications Control and Reinitialize Device Services, and the number of AVs and BVs.

   Note If you are using NAT, home the ACM on a network other than the NAT network (MS/TP, BACnet/Ethernet, or a non-NAT BACnet/IP). For most installation choose "Standard" as the NAT type.

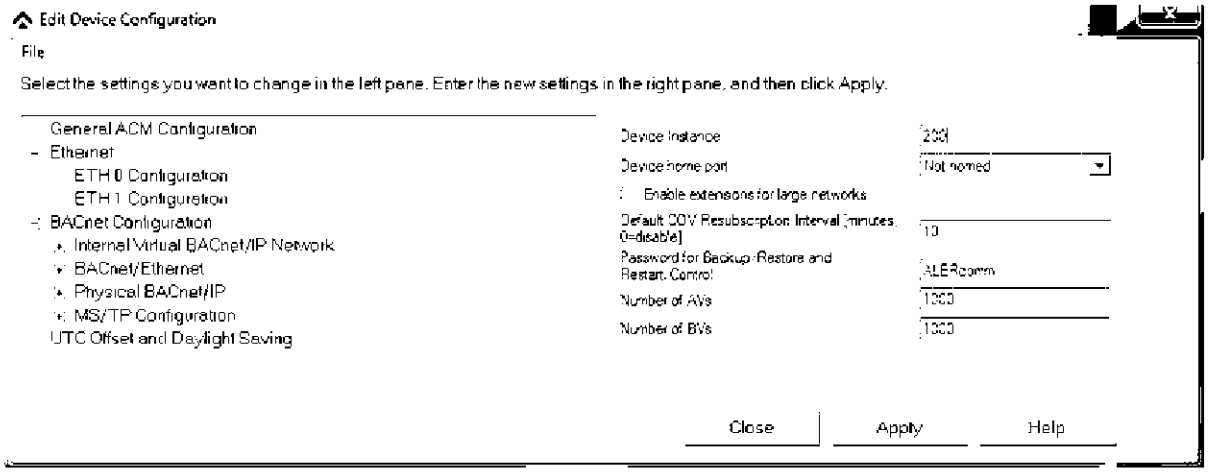


Figure 9 *Sample ACM BACnet settings*

2. Click **Apply**.
3. Under BACnet Configuration click **Internal Virtual BACnet/IP Network**, set up the internal virtual BACnet/IP network, and then click **Apply**.

   Note It is recommended that you do not change factory default settings unless you are certain the default settings conflict with system design or existing system settings.

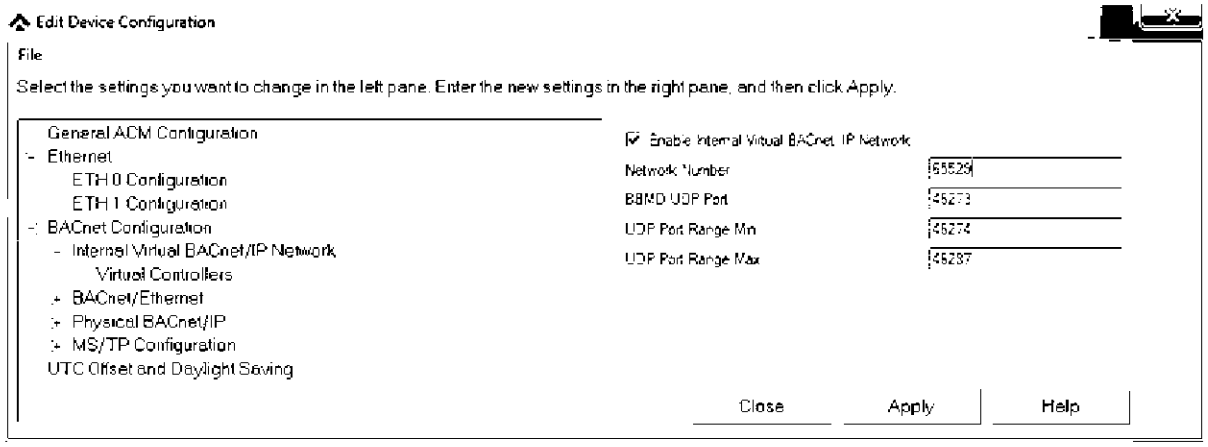


Figure 10 *Sample ACM internal virtual BACnet/IP network settings*

4. Click **Virtual Controllers**, specify the device type for each Slot used, and then click **Apply**.

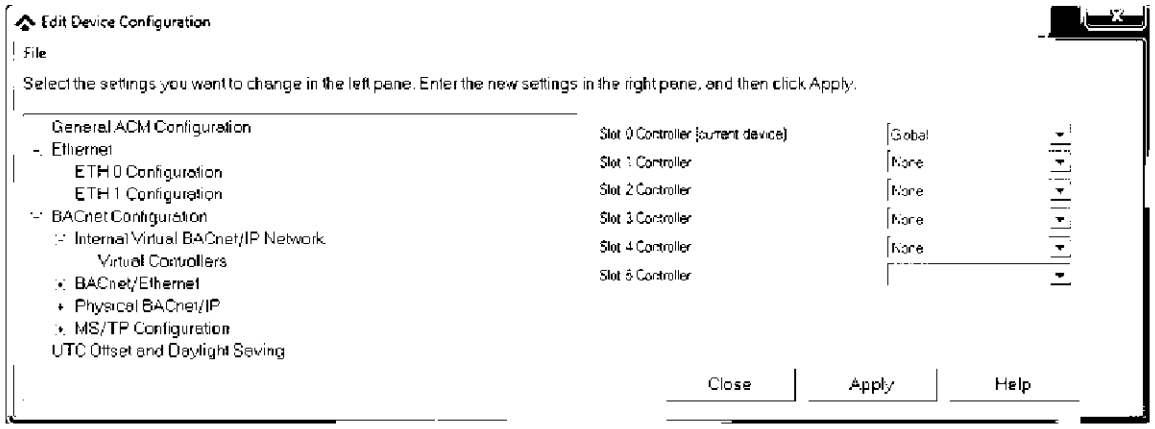


Figure 11 *Sample ACM virtual controller settings*

5. Click **BACnet/Ethernet**, and then click **ETH0 BACnet/Ethernet Configuration** in the tree.
6. Click **Enable or Disable BACnet/Ethernet on eth0** (as dictated by your sites architecture), type the Ethernet Network Number, and then click **Apply**.

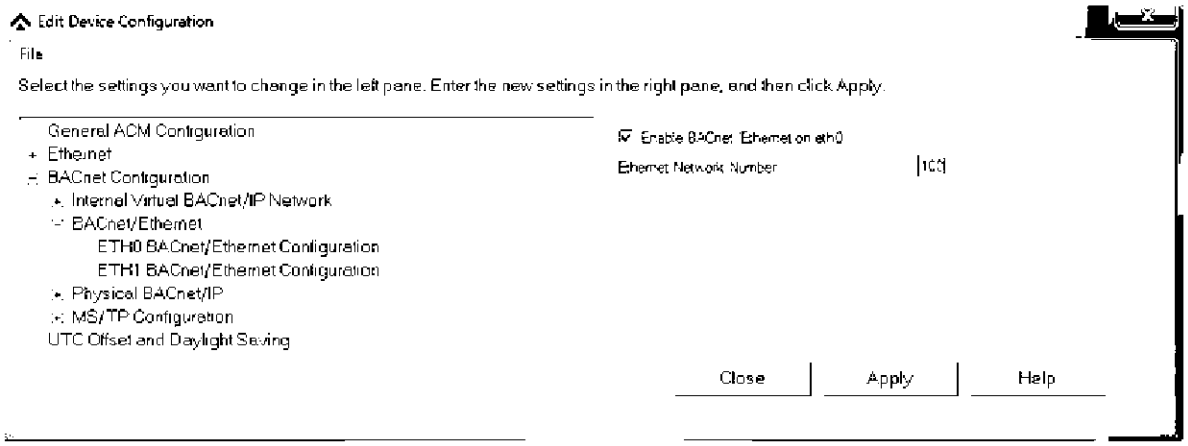


Figure 12 *Sample ACM ETHO BACnet/Ethernet Configuration settings*

7. Repeat for **ETH1 BACnet/Ethernet Configuration**, if desired, and then click **Apply**.

Physical BACnet/IP configuration

WARNING Be careful when enabling both Ethernet ports. If you enable BACnet Ethernet and BACnet IP on the same port on multiple ACMs on the same subnet, this can create network loops resulting in reduced performance and limited system functionality.

To configure physical BACnet/IP networks

1. Under Physical BACnet/IP click **BACnet/IP Instance 0 Configuration** and set the parameters.

   Note BBMD functionality can be disabled or enabled regardless of the BDT table configuration.

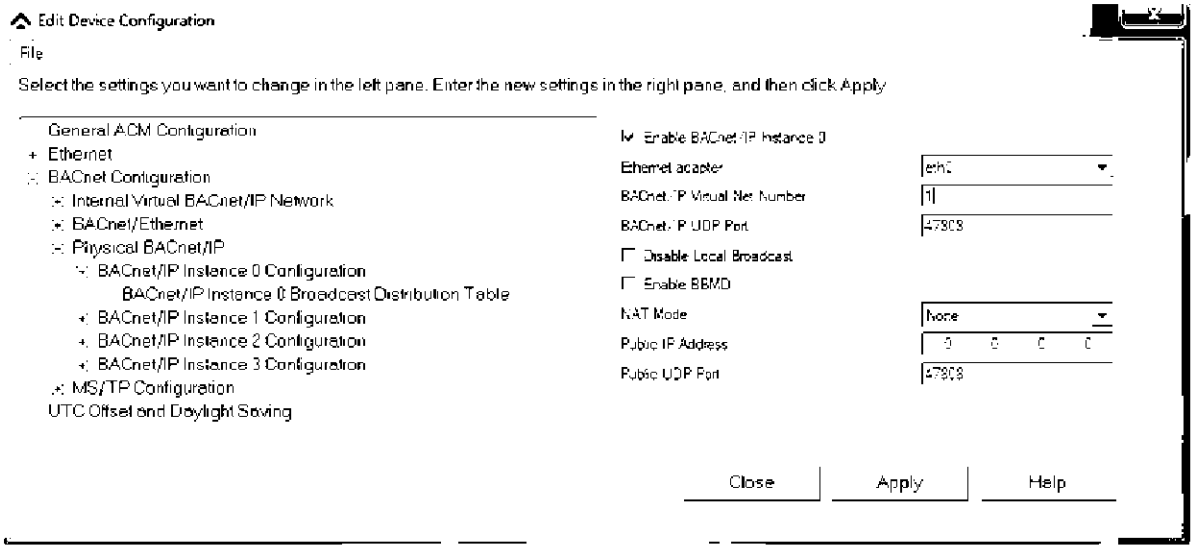


Figure 13 Sample ACM BACnet/IP Instance 0 Configuration parameters

Table 4 Parameter Information

Parameter	Description
BASIC SETTINGS	
Ethernet Adapter	Specifies the Physical Ethernet Port to be used by this Network.
BACnet/IP Virtual Net Number	The BACnet Network Number associated with this Network.
BACnet/IP UDP Port	The UPD Port associated with this network.
ADVANCED SETTINGS	
Disable Local Broadcast	Prevent ACM from sending any Broadcast messages on the specified IP Network (typically only used when reducing excess network traffic is crucial, and the ACM is acting as a BBMD, and is the only BACnet IP device on the network).
Enable BBMD	Enables BBMD functionality on the specified IP network.
NAT SPECIFIC SETTINGS	
NAT Mode	Enables NAT for the specified IP network, and tells the ACM which implementation to use (Alerton NAT, or BACnet Standard NAT).
Public IP Address	Specifies the IP Address of the Public side of the NAT Router.
Public UDP Port	Specifies the UDP Port of the Public side of the NAT Router.

2. (Optional - only necessary for BBMD installations where more than 1 subnet is used.) Click **BACnet/IP Instance 0 Broadcast Distribution Table**, set the parameters, and then click **Apply**.

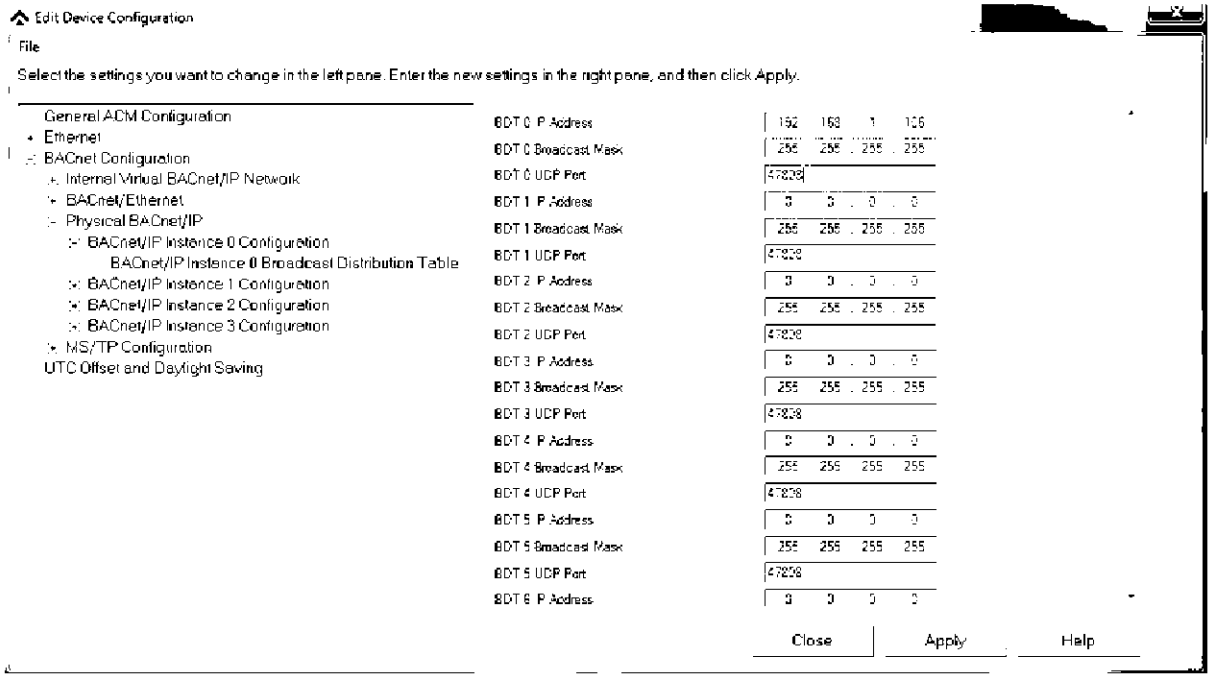


Figure 14 *Sample ACM BACnet/IP Instance 0 Broadcast Distribution Table parameters*

Table 5 Parameter Information

Parameter	Description
BDT x IP Address	Specifies the IP Address(es) of other BBMDs on the Network (only BBMDs, not all IP enabled devices). You can have up to 32 other BBMDs listed in the BDT for each IP Network.
BDT x Broadcast Mask	Specifies the Broadcast Mask(s) of other BBMDs on the Network (also referred to as Subnet Mask).
BDT x UDP Port	Specifies the UDP Port used by other BBMDs on the Network (does not have to be the same as current ACM).

3. Repeat for BACnet/IP Instances 1-3, if desired.

Note Enabling more than 1 IP network allows you to expand a network beyond 32 BBMDs, or bridge networks that include devices that only use the Alerton NAT implementation and devices that use the BACnet NAT implementation.

MS/TP configuration

When a COM port is assigned for MS/TP use, you must choose which slot to route MS/TP through. It is important to not choose an empty slot.

Also, if an MS/TP is routed through slot 1-5, the Internal Virtual BACnet/IP network must be enabled in order to be able to route from Ethernet to that MS/TP network. See "To configure BACnet networks" on page 24. for more information about configuring Internal Virtual BACnet/IP networks.

COM0 MS/TP Configuration and COM1 MS/TP Configuration are the built on MS/TP connections located on the left side of the ACM. COM2 and COM3 MS/TP Configuration are option card Slot0 on the right side of the ACM. COM4 and COM5 MS/TP Configuration are option card Slot1 on the right side of the ACM.

WARNING Only route MS/TP COM ports through slots that have been enabled.

NOTE If a COM port is assigned for MS/TP use, it should not be assigned in the Niagara AX Station for any network.

To configure MS/TP networks

1. Click **MS/TP Configuration** in the tree, click **COM0 MS/TP Configuration**, set the parameters, and then click **Apply**.

   Note Clear the bottom three check boxes in Fig. 15 on p. 28 unless you are certain these features are required.

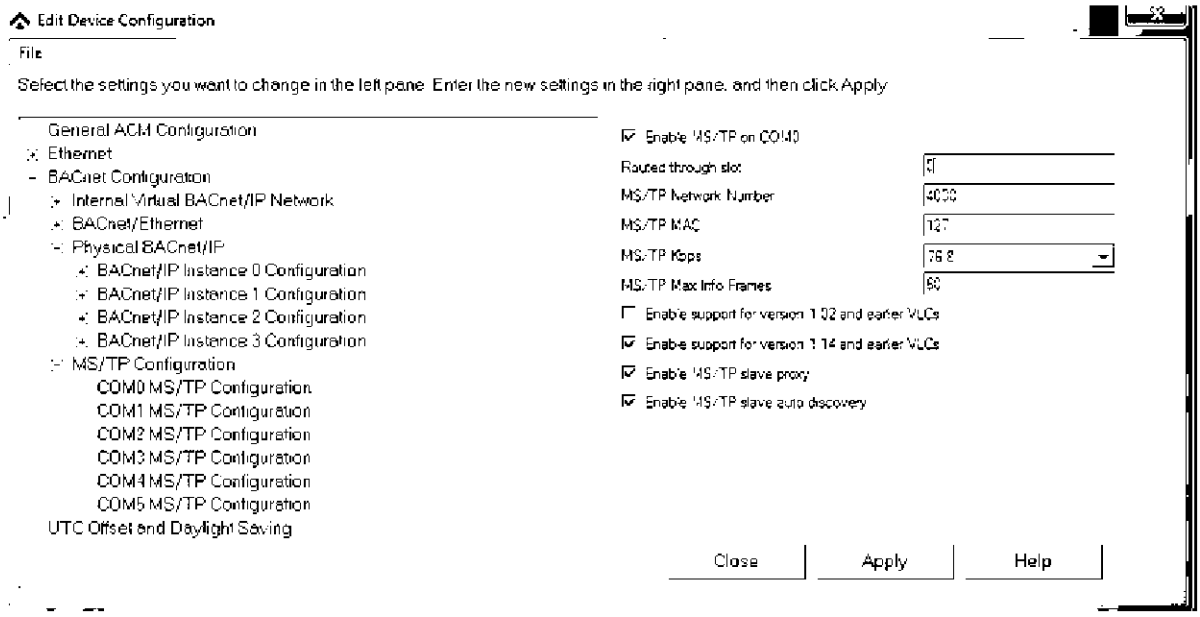


Figure 15 *Sample ACM COM MS/TP Configuration parameters*

2. Repeat for MS/TP COMs 1-5, if desired.

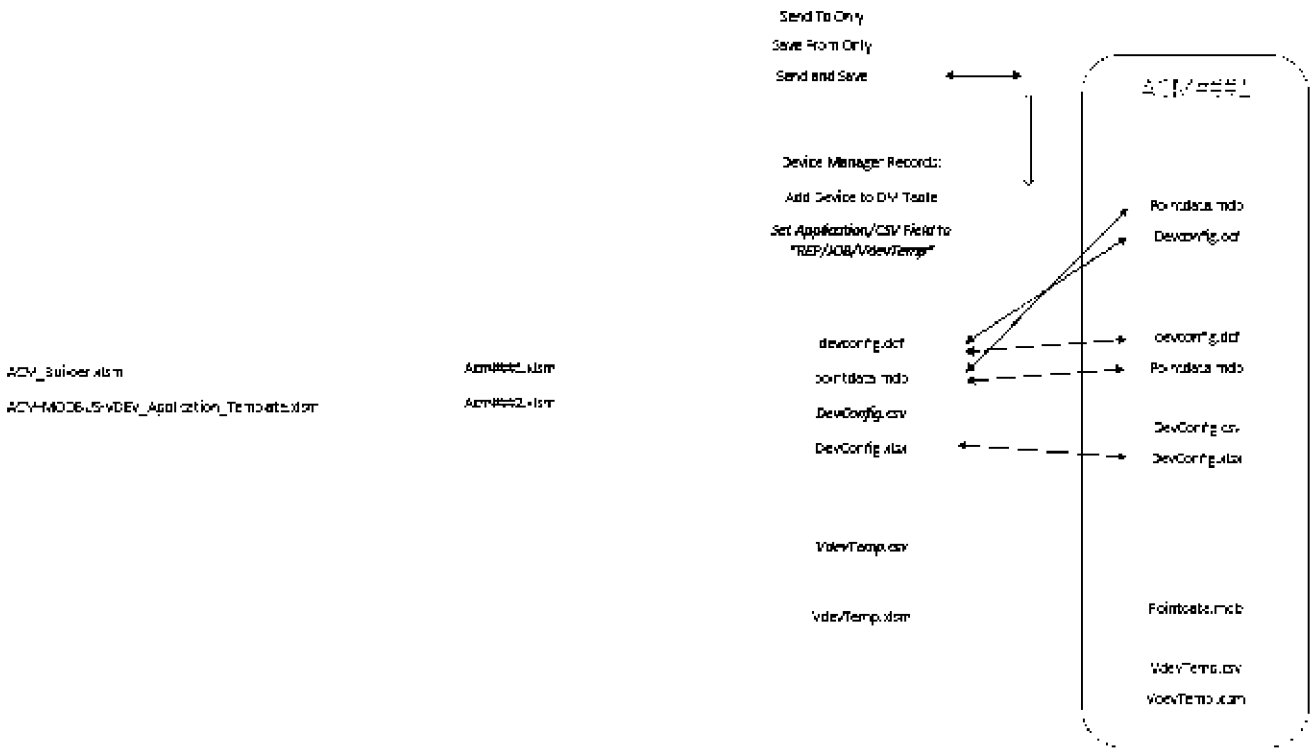
WARNING Do not enable the COM port if it is being used for a TUX trunk, Modbus RTU port or a Niagara driver COM port.

MODBUS configuration

Offline: configuring ACM-MODBUS controllers in the office using ACM-Builder. Configure ACM-MODBUS to take advantage of creating and reusing "virtual" MODBUS devices and Points Lists.

The figure below shows the relationship between the Builder spreadsheets, Compass and the ACM.

- ACM_Builder creates very specific Modbus mapping files (VdevTemp.csv and VdevTemp.xlsm).
- ACM-MODBUS-VDEV_Application_Template creates very specific Modbus mapping files (VdevTemp.csv and VdevTemp.xlsm in this example)
- Use Compass to send the device configuration to the base ACM which enables the ACM Virtual slot defined as "MODBUS"
- Sending "Device Configuration" to the ACM Virtual Slot defined as "MODBUS" sends the Virtual Modbus device definitions (DevConfig.csv and DevConfig.xlsx files).
- Sending the "Application/CSV" to the Virtual Modbus Device sends the VdevTemp.csv only to the Virtual Modbus Device.
- Your Modbus device should now be represented as a BACnet device instance.



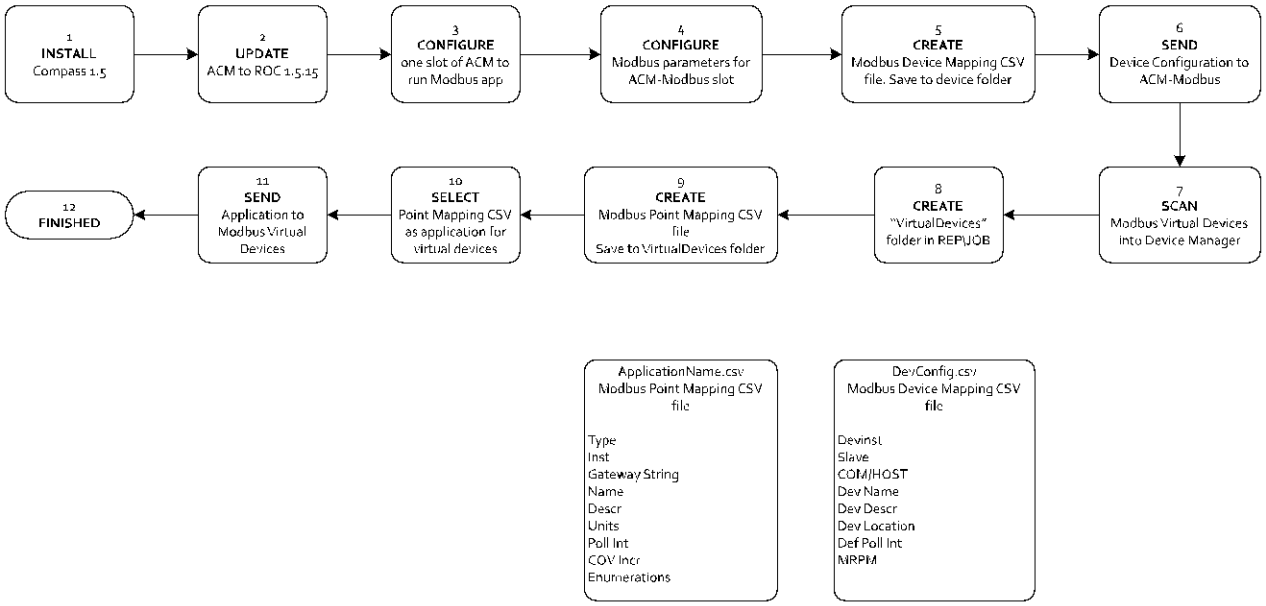
See the *ACM Builder Installation and Operations Guide (LT-ACMBLDRIOG)* for detailed configuration instructions.

Online: configuring ACM-MODBUS controllers without using ACM-Builder. Dealer technicians may choose to configure an ACM-MODBUS without using ACM Builder. This method could be helpful when on a job site and a single or just a couple ACM-MODBUS devices need to be added to the system.

Prerequisites

- Install Compass v1.5 or later.
- Load ACM ROC v1.5.15 or later.

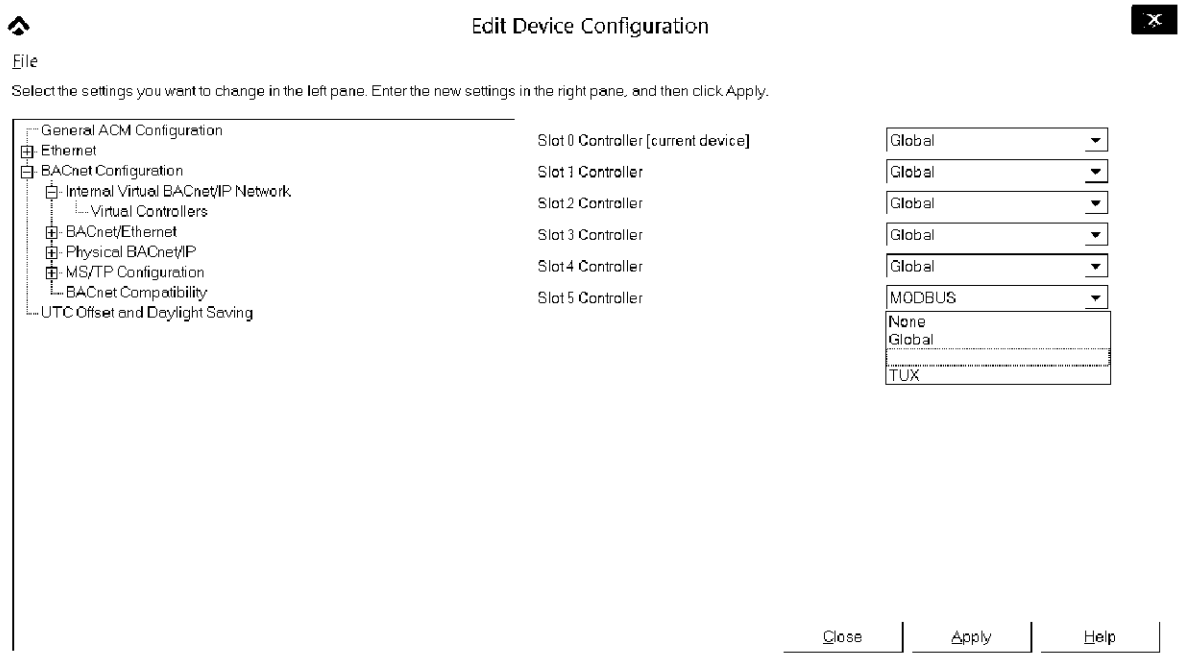
Overview



Configuration files that get sent to the ACM-MODBUS.

Configuring an ACM Slot to Run the Modbus Application

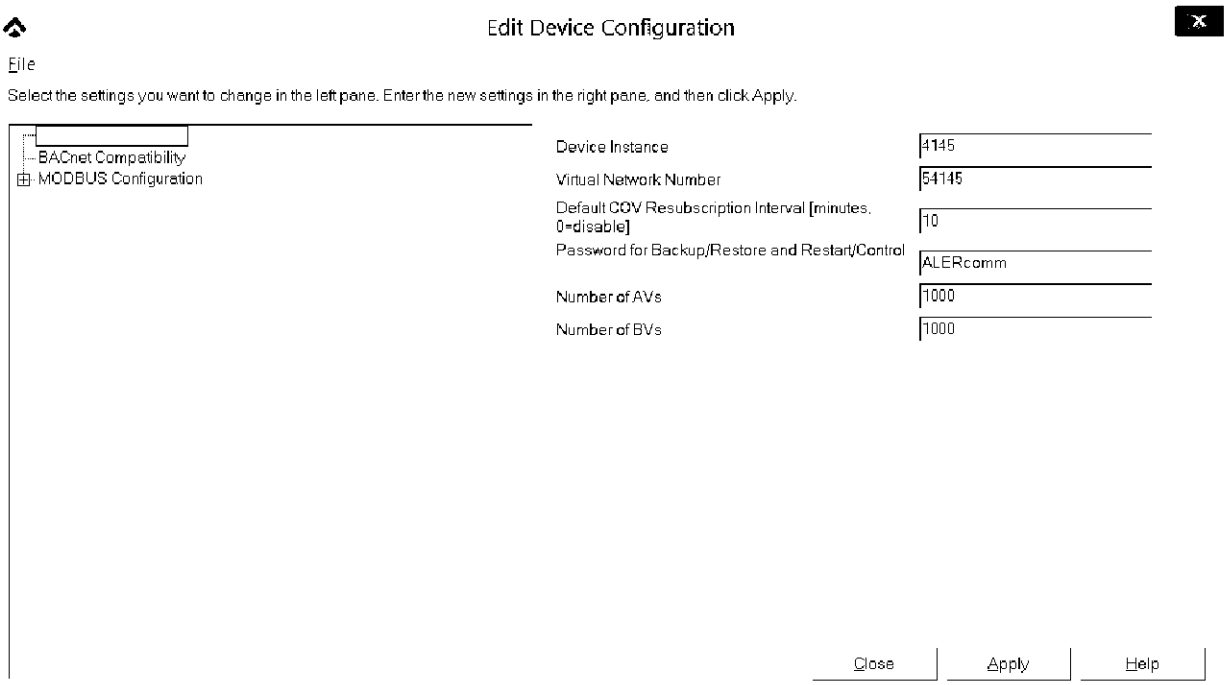
1. Open Compass Device Manager.
2. Highlight Device Instance of ACM Slot 0 Device and select "Configure…".
3. From the **File** menu on the Edit Device Configuration dialog select the "Load from device…" option (this ensures you are seeing all of the features from the updated ROC).
4. Navigate to the Virtual Controllers section under BACnet Configuration →Internal Virtual BACnet/IP Network, and use the drop down to set one of your Slots to Modbus (Slots 1-5).
5. Click **Apply** and **Close** (say Yes to the "Save changes to current file?" pop-up).



Configuring the ACM-Modbus Slot

1. Open Compass Device Manager.
2. Select the Device Scan option.
3. Select the "Scan configurable Alerton devices" option and click the "Scan…" button.
4. Highlight the Device Instance of the ACM-Modbus Slot you just setup and click "configure" (default Device Instance should be 200, and Model will be "ACM-Modbus").
5. On the Select Device dialog that pops up ensure the ACM-Modbus Slot is highlighted and click **OK**.
6. On the Edit Device Configuration dialog set the parameters for the BACnet Configuration, BACnet Compatibility, and MODBUS Configuration as described below.
7. Click **Apply** and **Close** when done configuring Slot (say Yes to the "Save changes to current file?" pop-up).

BACnet Configuration



Device Instance: This is the numeric instance of the ACM-Modbus device on the BACnet network (must be unique for entire system).

Virtual Network Number: This will be the BACnet Network Number assigned to the Internal Virtual Network that is created to support the Modbus Virtual BACnet Devices (must be unique for entire system).

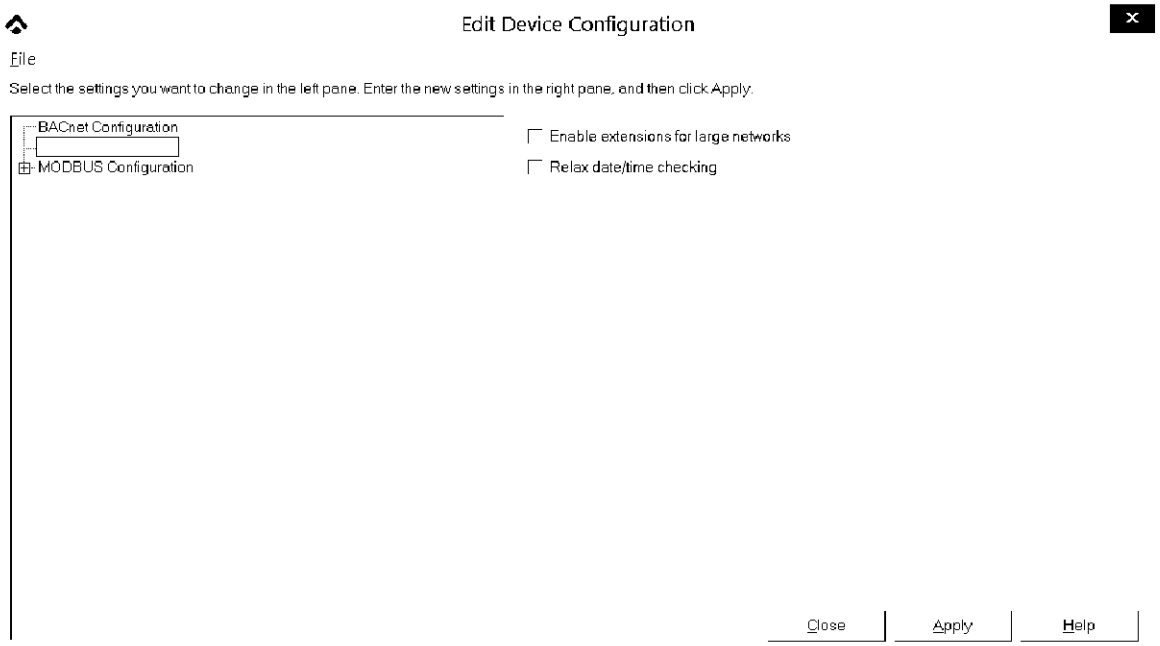
Default COV Resubscription Interval: This value is the interval in minutes that the ACM will use for subscribing to external points to be notified on changes of value (if the external device does not support change of value notifications, the ACM will default to polling). NOTE: A value of 0 will disable the ACMs ability to send COV Subscriptions.

Password for Backup/Restore and Restart/Control: This is the password used for the BACnet Device Communications Control (Enable/Disable communications), and Reinitialize Device (Reinitialize Warmboot and Reinitialize Coldboot) services. Password limit is between 8 and 64 characters. NOTE: BACnet Backup and Restore is not supported for a Modbus Device.

Number of AVs: This is the number of general purpose AVs the ACM Slot will support (Maximum number of 6000, starting at 0).

Number of BVs: This is the number of general purpose BVs the ACM Slot will support (Maximum number of 6000, starting at 0).

BACnet Compatibility

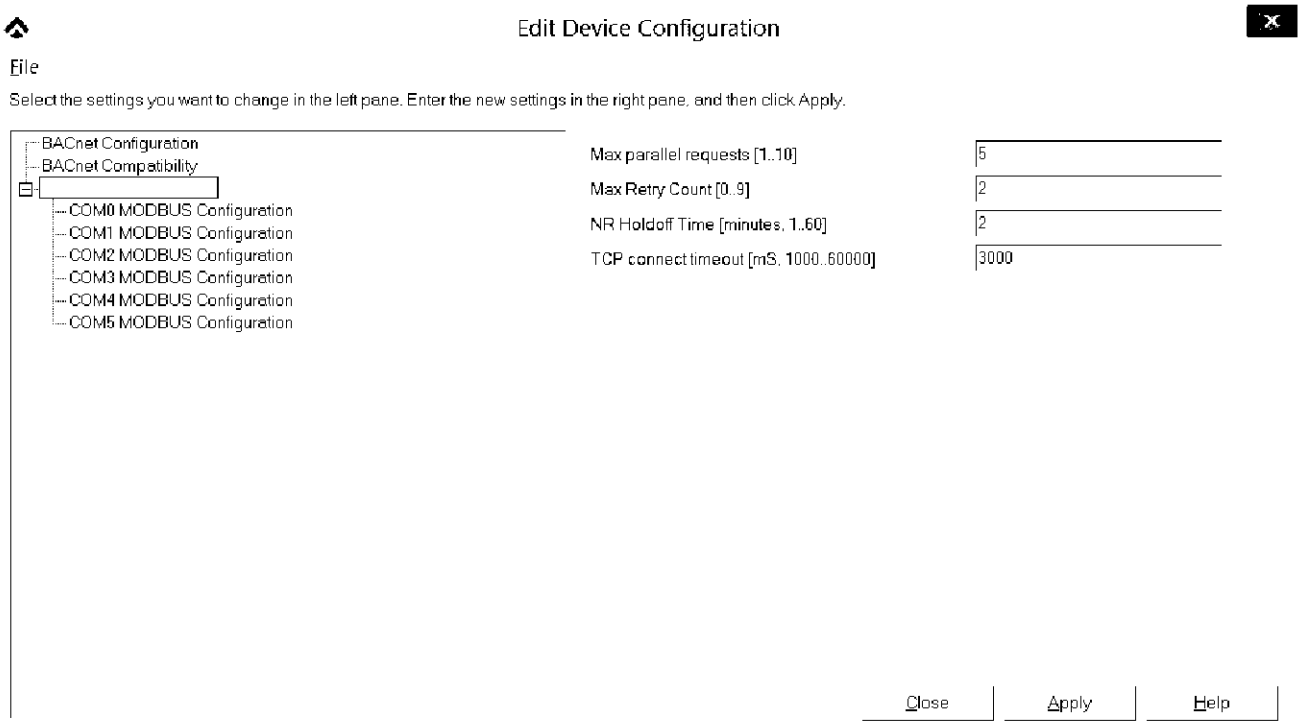


Enable Extensions for Large Networks: This compatibility feature is designed for large networks or networks with a large amount of broadcast traffic, which can effect connected network performance. Enabling this feature will cause the ACM to setup a "proxy" table for all devices connected to its lower level networks (like MS/TP). It will then stop forwarding all Who-Is broadcast requests to those networks, and will instead do a lookup in its proxy table to see if any of the devices being asked for exist on one of its networks. If it does, the ACM will directly respond with a proxy I-Am message for that device.

This feature will also attempt to space out Trendlog notifications on ACMs that have a bunch of Trends setup with the same interval (to distribute load on server).

Relax Date/Time Checking: In BACnet Protocol Revision 13, the BACnet specification was updated to more closely define where wildcards can be used in Dates and Times. In order to meet the specification for a protocol beyond 13 the ACM had to enforce these new requirements, which made some of the default values use by Alerton Front-ends to be no longer allowed. To maintain compatibility with Alerton front-ends older than Compass 1.4 Update 1, we added this option to disable the more restrictive wildcard checking.

Modbus Configuration



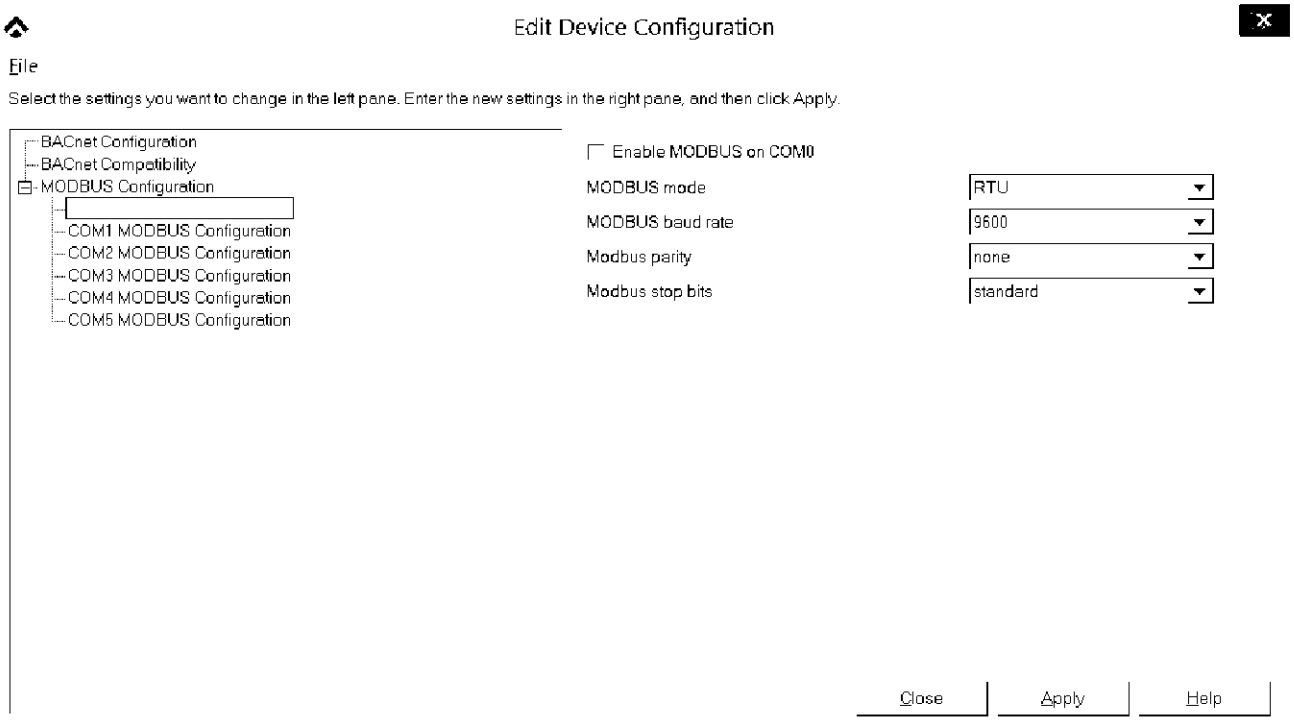
Max parallel requests: Specifies the Maximum number of concurrent requests the ACM will have open at any time (default of 5).

Max Retry Count: Specifies the maximum number of retries that the ACM will use when attempting to talk to Modbus devices (default of 2).

NR Holdoff Time: To enhance performance and reduce wasted bandwidth when Modbus devices are not present, or temporarily offline, the ACM will fall back to a periodic communications check for devices to which it has stop receiving responses. The NR Holdoff Time specifies the time in minutes the ACM will wait after determining a Modbus device is offline before trying to talk to it again. It is recommended to set this value low for initial setup (1-2min), then bump it up once everything is up and working (default of 10).

TCP connection timeout: Specifies the time in milliseconds the ACM will wait after sending a TCP connection request before timing out the request (default 3000).

COMx MODBUS Configuration: Specifies the configuration parameters for the serial network when a Modbus RTU or ASCI serial network is used.



Enable MODBUS on COMx: Enables COMx to be uses by the ACM for a Modbus serial network.

MODBUS mode: Specifies whether the Modbus serial network will be using the RTU or ASCI messaging formats.

MODBUS baud rate: Specifies the baud rate for the Modbus serial network (options are 9600, 19200, 38400, 57600, and 115200).

Modbus parity: Specifies the parity to be use on the Modbus serial network (options are Odd, Even, and None).

Modbus stop bits: Specifies the number of stop bits to use on the Modbus serial network (options are forcing to one, or "standard". NOTE: The "standard" setting will change based on the MODBUS Mode and Parity selected).

Mapping Modbus to BACnet

The ACM-Modbus allows the user to create Virtual BACnet Devices within the ACM and link those BACnet Devices to Modbus Slaves on either a Modbus TCP or Modbus serial network. This linking at the Device level eliminates the need to specify the Slave Addresses for each mapped point in the gateway string and allows for creating generic point mapping "template" files that can be loaded to any number of Virtual BACnet Devices. This can be very useful when connecting to large numbers of the same model units, or when doing similar jobs on different sites.

NOTE: Each Virtual BACnet Device can only be mapped to a single Modbus Slave.

The user can then create a Point Mapping file that can be loaded into the Virtual BACnet Device to create and map BACnet points to Modbus Registers. You can map Analog, Binary and Multi-state type data into BACnet along with custom units and scaling.

Creating Virtual BACnet Devices and Linking to Modbus Slaves

The method used to create your Virtual BACnet Devices and link them to Modbus Slaves is by specifying a few simple setup parameters into a CSV file and loading the CSV file into the ACM-Modbus slot via Compass.

Device Mapping CSV File Format

The Format for Creating and Mapping your Virtual BACnet Devices to Modbus Slaves Devices is as follows.

Devinst	Slave	COM/HOST	Dev Descr	Dev Name	Dev Location	Def Poll Int	MRPM
414501	1	192.168.42.1:502	TPC Slave 1	TCP 1	Test Bench	1	50
414502	2	192.168.42.2:502	TPC Slave 2	TCP 2	Test Bench	1	50
414503	3	192.168.42.3:502	TPC Slave 3	TCP 3	Test Bench	1	50
414504	4	192.168.42.7:502	TPC Slave 4	TCP 4	Lunch Room	1	50
414505	1	COM1	RTU Slave 5	RTU 1	Reception	1	20

The first row in the CSV specifies the names of each of the setup parameters (names must be exactly as defined for ACM to understand them).

Devinst: This is the Device Instance of the Virtual BACnet Device that will get created and link to the following Modbus Slave.

Slave: This is the Modbus Slave Address associated with the Modbus Device to which you will be talking (NOTE: This is typically 1 for Modbus TCP devices.)

COM/HOST: This is either the ACM COM Port specification, or the IP Address and UDP Port where the Modbus Device will be accessed.

Dev Descr: This is the Description Property of the Virtual BACnet Device Object.

Dev Name: This is the Object-Name Property of the Virtual BACnet Device Object.

Dev Location: This is the Location Property of the Virtual BACnet Device Object.

Def Poll Int: This is the Default Polling Interval the ACM will use to access data in the Associated Modbus Device. This value is in seconds and has a maximum (fastest), polling interval of 1sec (recommended default of 1).

MRPM: This is the Maximum Registers Per Message value and defines the maximum number of registers that will be packaged into a single Modbus Query (range is 1-100, recommended default of 50).

Sending Device Mapping CSV to ACM and Scanning in Virtual Devices

1. Copy the CSV file you just created to the Compass Device Folder for the ACM-Modbus Device (typically C:\Alerton\Compass\1.0\<my REP>\<my JOB>\Devnnnnn).
2. Rename file to DevConfig.CSV.
3. Open Compass Device Manager.
4. Highlight Device Instance of ACM-Modbus Device and click "Send…".
5. On the Send Data from Disk to Device(s) dialog select the "Device Configuration" option, and then click Send.
   WARNING: This will send your DCF as well as the Modbus Virtual Device Mapping CSV, so be sure your DCF is up to date before sending.
6. From the Main Device Manager dialog click "Device Scan…".
7. On the Device Scan dialog click "Scan…" to scan in the new Virtual BACnet Devices (Model should show up as "ACM-MODBUS-VDEV").
8. Highlight new Virtual Devices and click "Save to Table".

Creating Virtual Device Points and Mapping to Modbus Registers

The method used to create your Virtual Device Points and link them to Modbus Registers is by specifying a few simple setup parameters into a CSV file and loading the CSV file into the Virtual Device via Compass.

Point Mapping CSV File Format

The Format for Creating and Mapping your Virtual Device Points to Modbus Registers is as follows.

Type	Inst	Gateway String	Name	Descr	Units	Poll Int	COV Incr	Enumerations
AI	1	I,3,1	AI1 - Name	AI1 - Description	3	0	1	
AI	2	I,3,2	AI2 - Name	AI2 - Description	3	0	1	
AI	3	I,4,3	AI3 - Name	AI3 - Description	3	0	3	
BI	1	I,1,1	BI1 - Name	BI1 - Description	95	0		
BI	2	I,1,2	BI2 - Name	BI2 - Description	95	0		
AV	1	I,4,6	AV1 - Name	AV1 - Description	5	0	1	
AV	2	I,4,7,*5	AV2 - Name	AV2 - Description	5	0	5	
AV	3	I,4,8,-4,*10	AV3 - Name	AV3 - Description	5	0	1	
BV	1	I,1,6	BV1 - Name	BV1 - Description	95	0		
BV	2	I,1,7	BV2 - Name	BV2 - Description	95	0		
BV	3	I,1,8	BV3 - Name	BV3 - Description	95	0		
BV	4	O,0,9	BV4 - Name	BV4 - Description	95	0		
BV	5	O,0,10	BV5 - Name	BV5 - Description	95	0		
AV	11	I,4,11,F	AV11 - Name	AV11 - Description	64	0	1	
AV	12	O,4,13,Fb	AV12 - Name	AV12 - Description	64	0	1	
AV	13	I,4,15,L	AV13 - Name	AV13 - Description	64	0	3	
AV	14	O,4,17,Lb	AV14 - Name	AV14 - Description	64	0	4	
BV	11	I,4,19,BU0	BV11 - Name	BV11 - Description	95	0		
BV	12	I,4,19,BU1	BV12 - Name	BV12 - Description	95	0		
MI	1	I,4,21	MI1 - Name	MI1 - Description	95	0		0=First 1=Second 2=Third 3=Forth 5=Fifth 255=Last
MI	2	I,4,22	MI2 - Name	MI2 - Description	95	0		1=Occupied 2=Unoccupied 3=Standby
MV	1	I,4,25	MV1 - Name	MV1 - Description	95	0		0=First 1=Second 2=Third 3=Forth 5=Fifth 6=Sixth 255=Last

MV	2	O,4,26	MV2 - Name	MV2 - Description	95	0		1=Occupied 2=Unoccupied 3=Standby

Type: This is the BACnet Point type in the Virtual Device to which the Modbus Register will get mapped (options are AI, AV, BI, BV, MI, MV).

Inst: This is the BACnet Point instance in the Virtual Device to which the Modbus Register will get mapped.

Gateway String: This is the Mapping to the Modbus Register.
NOTE: Gateway String DOES NOT contain Node (Slave), address. See page 39 for more information.

Name: This is the BACnet Point Name.

Descr: This is the BACnet Point Description.

Units: This is the BACnet Point Units.

Poll Int: This is the interval at which the Modbus Register will get polled on the Modbus Network. This can be set individually on a point by point basis, or if set to 0, it will use the Default Poll Interval defined for the Virtual Device (set in Device Mapping file).

COV Inc: This is the BACnet Change of Value (COV), Increment for the Point. This only applies for Analog points and is used for BACnet COV Notifications (see BACnet COV).

Enumerations: This is a list of Enumerations (and their associated State Text values), for mapping Modbus Register values to/from BACnet Multi-State points. If there is a Modbus Register that represents a set of specific States, you can define an enumeration for each state that will be shown in the BACnet multi-state point. NOTE: If a Modbus Register returns a value that not match a defined enumeration, the multi-state point will remain at the last read state and change to a reliability of "Configuration Error".

Sending Point Mapping CSV to Virtual Devices

1. Copy the CSV file you just created to the "VirtualDevices" folder of your current Rep\Job (typically C:\Alerton\Compass\1.0\<my REP>\<my JOB>\VirtualDevices).
2. Rename file to something with a file name that is 8 characters or less (for example "AHU-550.CSV".
3. Open Compass Device Manager.
4. Highlight Device Instance of ACM-Modbus Device and click "Edit…".
5. On the Add/Edit Device Profile dialog select the Preferences Tab.
6. On the Preferences Tab, click the "Browse…" button in the Application section.
7. Select the Point Mapping file you created above and click OK.
8. From the Main Device Manager dialog Highlight Device Instance of Virtual Device and click "Send…".
9. On the Send Data from Disk to Device(s) dialog select the "DDC or CSV" option, and then click Send.

ACM-Modbus gateway strings

Syntax for description string

The description string is a BACnet property of each AI, BI, AO, BO, AV, BV, MI and MV object. It is used to assign a Modbus data point to a BACnet data object.

- Items in [brackets] are optional.
- Type items in boldface exactly as they appear.
- A vertical line separates exclusive options.
- Items set off in angle brackets and italics are variables.
- Commas are required between each argument with no spaces between items.
- Use a space instead of a comma between the last argument and the descriptor.
- Use uppercase letters only.
- Each string can contain a maximum of 250 characters.

NOTE You do not need placeholder commas for undesired options; list only the options you want.

In most cases, this Modbus mapping information is provided by the manufacturer of the Modbus device as part of the data point assignment.

I | **O** | **W** | **T** | **A**, *<Reference>*, *<Register or Coil Number>*
[, *<Extended Memory File Number>*] [, **F** | **Fb** | **Fl**] [, **L** | **Lb** | **Ll**] [, **BU**<*nn*>]
[, *<Real Number1>*] [, *<Real Number2>*] [, M<*nn*>] *<Descriptor>*

Table 1 Description string arguments

Argument	Explanation
I|O|A|W|T	Message type. Determines if the value will be an input (read-only) or output (writable). The Modbus reference type determines acceptable entries. **I** Read-only input from Modbus to BACtalk. The Modbus value is read into BACtalk and cannot be commanded through the AV or BV present-value property. The BCM-MDBS performs a round-robin poll of all input points to request values from the Modbus equipment. **O** Verified output from BACtalk to Modbus using message code 6 (Preset Single Register) or message code 5 (Force Single Coil). The Modbus value is writable through the AV or BV present-value property. On change-of-state and during round-robin poll, the Modbus data is read and compared against BACtalk data. A write to the Modbus point occurs only if the compared values are different. Type O should be used for output points unless problems are encountered and especially if the Modbus device stores its data in EEPROM. This eliminates unnecessary writes to EEPROM. **Note** Use types A, T, and W when the Modbus device has problems with type O operation. **A** Verified multiple register output from BACtalk to Modbus. The Modbus value is writable through the AV or BV present-value property. Behaves precisely like the **O** point, but **A** values are written on the Modbus side using the "Preset Multiple Registers" message (Modbus message code 16). **NOTE:** The A designator can only be used with AV objects. **W** Unverified output from BACtalk to Modbus using message code 6 (Preset Single Register). The Modbus value is writable through the AV or BV present-value property. The value is not read from the Modbus side or compared to the BACtalk value. A write occurs on BACtalk change-of-state and during round-robin poll of Modbus values. **Note:** The W option was added primarily for compatibility with Liebert Modbus systems, which may flag points internally as NULL on reset. This caused an error message to occur when the BCM-MDBS attempted to read them for comparison using the **O** point. **T** Unverified multiple register output from BACtalk to Modbus. The Modbus value is writable through the AV or BV present-value property. Behaves precisely like the **W** point, but **T** values are written on the Modbus side using the "Preset Multiple Registers" message (Modbus message code 16). Developed primarily for Triatek applications. **NOTE:** The T designator can only be used with AV objects.
<Reference>	Specifies the Modbus reference type. One digit. Acceptable values are **0**, **1**, **3**, **4**, or **6**. **NOTE:** The number in parenthesis below is the Modbus function code. for more information. For operation **I**: 0=read coil status (binary) (1), 1=read input status (binary) (2), 3=read input register (analog) (4), 4=read holding register (analog) (3), 6=read general reference (analog) (20). For operation **O**: 0=read coil status (1) then write (5), 4=read holding register (3) then write (16), 6=read general reference (20) then write (21). For operation **A:** 4=read holding register (3) then write (16). For operation **W**: 0=write coil status (5), 4=write holding register (6) For operation **T**: 4=write holding register (16)
Register or Coil	Specifies the Modbus register or coil address. Range is 1–65536.
<Extended Memory File Number> (optional)	Omit unless Reference is set to **6**. When the reference type is set to 6, File Number must specify a file or group number in the range **0**–9999.

F | Fb | Fl (optional)	Optional floating point designation to support the reading and writing of floating point values when interfacing to Modbus equipment that stores such values in two consecutive Modbus register addresses. The F designator can only be used with AV objects. When F is appended to the I message-type indicator, the Modbus register reference type must be 3 or 4 (not 6). For example, the description string "I,4,206,F Sample float" requests a floating point value from register addresses 40206 and 40207. When F is appended to an output message type (O,A,W,T) the BCM-MDBS writes the BACnet AV floating point value to two consecutive Modbus registers, beginning with the register specified in the gateway string. **NOTE:** The original Modbus standard did not support floating point. Modbus registers normally contain 2 bytes of data. Floating points contain 4 bytes. Some manufacturers store these 4 bytes in "Little endian" order; others use "Big endian" order. Try swapping the order If you are not getting valid floating point data. F= Fb = Big endian Fl = Little endian The option must immediately follow the preceding comma (no intervening spaces).
L | Lb | Ll (optional)	Optional long integer point designation to support reading or writing of 32-bit integers when interfacing with Modbus equipment that stores such values in two consecutive Modbus register addresses. The L designator can only be used with AV objects. When **L** is appended to the I message-type indicator, the Modbus register reference must be 3 or 4. For example, the description string "I,4,206,L Sample long int" requests a long integer value from register addresses 40206 and 40207. When **L** is appended to an output message type (O,A,W,T) the BCM-MDBS converts the BACnet AV floating point value to a long integer and writes it to two consecutive Modbus registers, beginning with the register specified in the gateway string. **NOTE:** The original Modbus standard did not support long integers. Modbus registers normally contain 2 bytes of data. Long integer points contain 4 bytes. Some manufacturers store these 4 bytes in "Little endian" order; others use "Big endian" order. Try swapping the order If you are not getting valid point data. L= Lb = Big endian Ll = Little endian The option must immediately follow the preceding comma (no intervening spaces).
F | Fb | Fl | L | Lb | Ll | U | Ub | Ul (optional)	ACM-Modbus adds a third set of modifiers. They are for doing Unsigned Long Integer values and the options are U, Ul and Ub. U= Ub = Big endian Ll = Little endian
BU <nn> (optional)	Bit Unpack. Some Modbus devices send bit-packed data. If the BU field is present, the bit number specified in nn (0-15) are extracted and used as the present-value of the BACnet object. Use only for message type I (read-only). The option must immediately follow the preceding comma (no intervening spaces).
<Real Number1> (optional)	Any real number, which will be used to scale Modbus data. See Scaling point data .
<Real Number2> (optional)	Any real number, which will be used to scale Modbus data. See Scaling point data .
M <nn> (optional)	Optional argument used to override the multiple register request setting for individual modbus mappings. This option only operates on modbus data read request messages. See Defining multiple register requests for more information.
<Descriptor> (optional)	Optional (recommended) text description. **NOTE:** This text is not used when constructing Modbus messages. It is only used in data displays.

Scaling point data

E-12 where at least one of the symbols *, +, or - must appear. The following table shows valid combinations and their meaning.

Symbol	Meaning
*	Means multiply by a positive number
* +	Means multiply by a positive number
* -	Means multiply by a negative number
+	Means add a positive number
-	Means subtract

- E and E+ are optional and followed by a positive power to 10 exponent.
- E- is optional and is followed by a negative power to 10 exponent.

NOTE Exponent is limited to the range of +/-38.

Examples

The following syntax examples show how scaling works for different situations.

Example 1

Modbus register 4 0032 reports sensed pressure 0-4095. You want AV 15 to read as 0-300 psi. The Modbus slave address is 44.

AV 15 = ModbusValue * 300/4095
300/4095 = 0.07326.

Solution 1

The Description for AV 15 should be **I, 4, 32, *0.07326**.

Example 2

Modbus register 32 now reports 820-4095 as gpm ranges 0-600.
The range is 600/(4095 -820) = 0.1832.
The offset = 820.

Solution 2

The Description for AV 15 should now be I, 4, 32, -820.0, *0.1832.

Defining multiple register requests

The ACM-Modbus can be configured to optimize read messages by requesting multiple registers for each message. The modbus protocol allows you to request more than one register by specifying a base register address and a count of the number of registers requested. Therefore, only sequential register addresses can be requested in the same modbus message. If the “Enable multiple register requests” option is set to Y, the ACM-MDBS analyzes the current modbus mappings and attempts to optimize read requests. Depending on how your data is mapped, this option can significantly increase the speed at which data is refreshed. That is, if there are no sequential registers in the mappings, no optimization can take place. Additionally, if the modbus equipment you are interfacing with does not support multiple register read requests, the requests will fail and most likely generate an exception message reply.

The actual grouping of mapped registers in the various requests is handled automatically by the ACM-MDBS once the feature is enabled (that is, no other user interaction is required). The following example shows how the ACM-MDBS performs this grouping.

Example

AV 6 mapping: I, 4, 34
AV 7 mapping: I, 4, 35
AV 8 mapping: I, 4, 32
AV 9 mapping: I, 4, 33
AV 10 mapping: I, 4, 37
AV 11 mapping: I, 4, 38
BV 5 mapping: I,4, 33, BU4

Multiple Register Limit set to 3.

Actual mappings grouped by request:

x40032 AV 8
x40033 AV 9
x40033 BV 5
x40034 AV 6

x40035 AV 7

x40037 AV 10
x40038 AV 11

Assuming that these are the only mappings found in the ACM-MDBS, three data request messages are made under multiple mode.

- One request is for three registers starting at x40032 (here the Multiple Register Limit has come into play). The returned data is placed in the present-value of AV 8, AV 9, BV 5, and AV 6.
- A second request is made for the single register x40035 since there were no mapped consecutive registers to group it with. Returned data is placed into the present-value of AV 7.
- A third request is made for 2 registers starting at register x40037. The returned data will be placed into the present-value of AV 10 and AV 11. Any scaling, floating point, long integer, or bit unpacking options assigned to the various points will be applied and is not affected by the multiple requests.

Overriding Multiple Mode

Use this option if a multiple register request must take place on a certain register boundary or if a register only responds to a single register request.

When (M <#>) is appended to the end of a mapping, a register request is made (with the register specified in the mapping string as the base register of the request). The number of registers requested is specified by <#> and is limited by the Multiple Register Limit parameter. The returned data from the request is placed in the present-value of the AV specified in the mapping string, and also into the present value of AVs that are mapped in this range.

Example 1

AV 10 mapping: I, 4, 32, M3
AV 11 mapping: I, 4, 33
AV 12 mapping: I, 4, 34

Regardless of the other consecutive mappings that ACM-MDBS discovers while analyzing the mapping strings, requests for registers x40032-34 are always made in a single request. The response data is placed in the present-value of AV 10, AV 11, and AV 12.

Example 2

AV 6 mapping: I, 4, 30
AV 7 mapping: I, 4, 31
AV 10 mapping: I, 4, 32, M1
AV 11 mapping: I, 4, 34
AV 12 mapping: I, 4, 35, M1

Assuming that these are the only assigned mappings, ACM-MDBS will request two registers (x40030 and x40031) with a single request and place the returned data in the present-value of AV 6 and AV 7. A request for the single register x40032 is made with returned data placed into the present-value of AV 10. A request for the single register x40034 is made with returned data placed into the present-value of AV 11 (the ACM-MDBS was not able to optimize to a multiple request because of the "M1" assigned to x40035 in AV 12. A request for the single register x40035 is made with returned data placed into the present-value of AV 12.

Overriding Single Mode

Use Single Mode and this override when most of the data needs to be requested as single registers, but some data is only returned by multiple register request.

When (M <#>) is appended to the end of a mapping, it overrides the single mode and forces a multiple-register request. The number of registers requested is determined by <#> and is limited by the Max Multiple Count parameter. The returned data from the request is placed in the present-value of the AV corresponding to the mapping string, and also into the present-value of AVs that are contained in this range, if they are mapped. The scaling, floating point, or long integer options assigned to AVs in range is applied to the data returned. Each mapping string that has this override assigned will be the base of a modbus request (see Example 2 below).

Example 1

AV 6 mapping: I, 4, 34
AV 7 mapping: I, 4, 35
AV 10 mapping: I, 4, 32, M4

ACM-MDBS makes a single request for four registers starting at x40032. The response data is placed in the present-value of AV 10, AV 6, and AV 7. The data returned for register x40033 will be discarded since there is no string mapping to this register. For clarity it would make sense to map consecutive AVs to consecutive registers, but this was avoided in this example for purposes of instruction.

Example 2

AV 6 mapping: I, 4, 34, M2
AV 7 mapping: I, 4, 35
AV 10 mapping: I, 4, 32, M4

ACM-MDBS makes a request for four registers starting at x40032. The returned data for register x40032 is placed in the present-value of AV 10. The data returned for register x40033-35 is discarded since x40033 is not mapped and the "M2" option assigned to AV 6 specifies that a multiple message is to be used with x40034 as its base. A request for two registers starting at x40034 is made with returned data placed in the present-value of AV 6 and AV 7.

Setting up data mappings

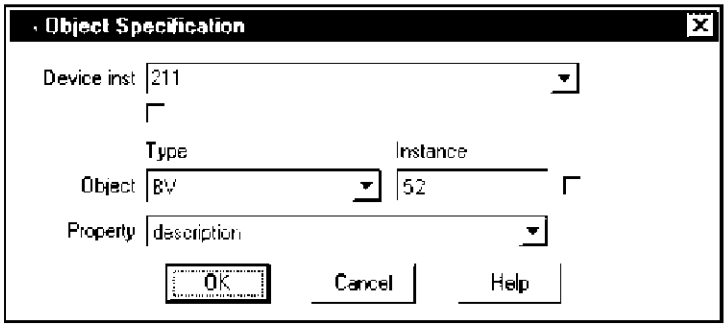
Use the BACnet description property to assign a Modbus data point to a BACnet data object. Each BACnet object can be assigned to read data from or write data to a single Modbus data point.

The description property is a standard ASCII text string. If the ACM-MDBS detects an error in the description string, it reports the error as a text string appended to the front of the description when the string is read.

NOTE You can still use the description property for AVs and BVs that are not intended to be mapped to Modbus points. The ACM-MDBS assumes that any description property that does not contain a comma as the 2nd character is not intended to be a Modbus mapped point and an error string is not inserted.

To map an AV or BV to a Modbus data address:

1. In Edit Mode, open the data display where you want to place Modbus data mappings.
2. From the Place Item menu, choose Prompted Property, and then click the display where you want to place the item.
3. Double-click the item to view the Prompted Property Setup dialog box.
4. Click the command button beside the Property box to open the Object Specification dialog box.
5. In the Device Instance field, type the device instance of the ACM-MDBS and select the object type (AV or BV) and instance of the AV or BV you want to use to map Modbus data.
6. From the Property list, choose description.



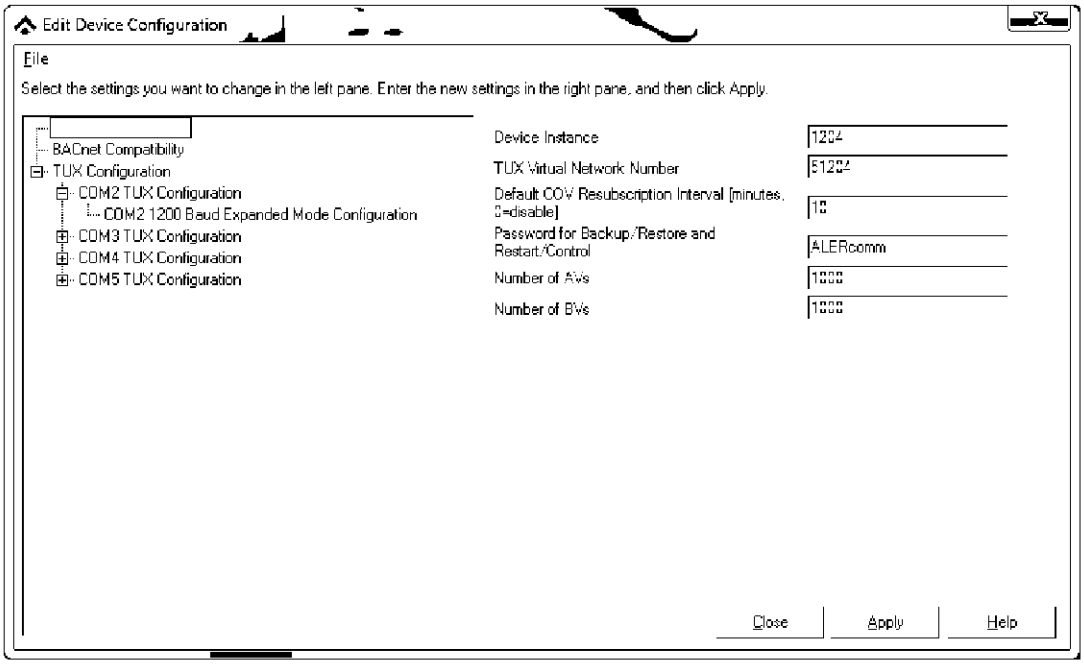
7. Click OK in the Object Specification dialog box, and then click Close in the Prompted Property dialog box.
8. Repeat steps 2 through 7 for all data points you want to map.
9. Resize the prompted item to the size you want, save the display, and close the Display Editor.
10. Open the display for viewing.
11. Click the command button for the prompted property you created.
12. In the Edit Property dialog box, under Value, type a mapping value for the description property according to the guidelines in Click OK.
13. The data mapping is saved to the ACM-MDBS, and the present-value displayed in BACtalk operator workstation software for that point now reflects the value of the Modbus point.

NOTE When finished making assignments, use Device Manager to save point data. On subsequent downloads, this data is available from the hard disk, eliminating the need to reassign it.

TUX configuration

ACM Builder is optional for ACM-TUX configuration. Aside from setting a slot to run the TUX application, and then setting up that slot (which Trunks to access and Trunk setup parameters), the ACM-TUX is very similar to the BCM-TUX.

BACnet configuration definitions



Device Instance: BACnet Device Instance of ACM-TUX Slot.

TUX Virtual Network Number: BACnet Network Number associated with the Virtual Network created inside the ACM to talk to the TUX Virtual BACnet Devices.

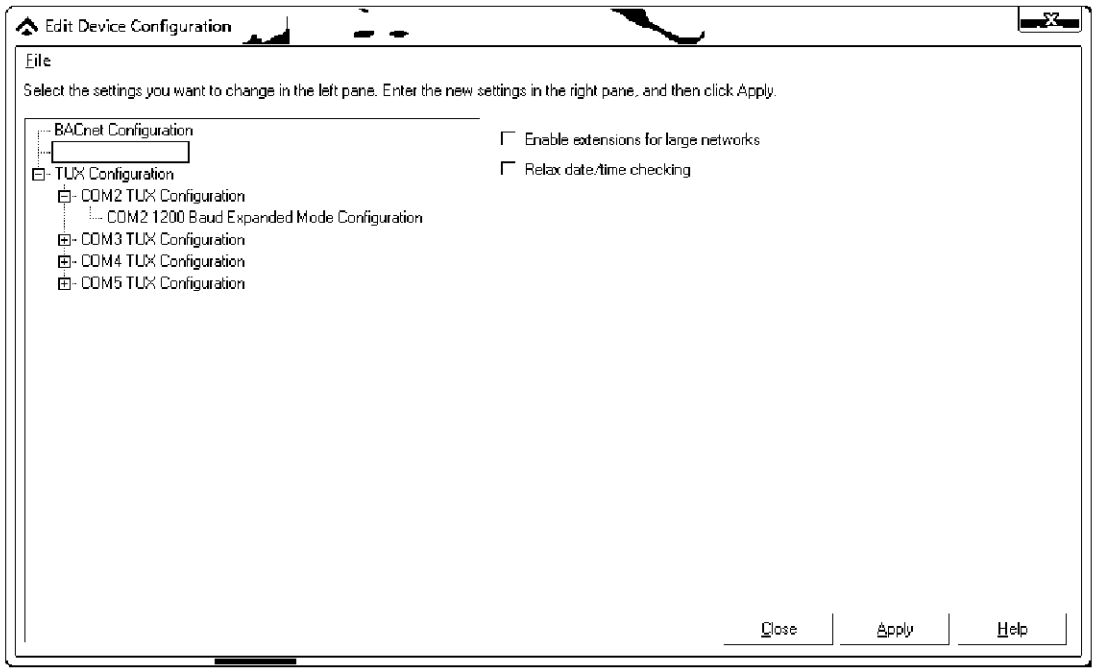
Default COV Resubscription Interval: Interval in minutes that the ACM uses for subscribing to external points asking to be notified about Changes of Value (COV). Dafault is 10 minutes, a value of 0 disables the ACMs ability to initiate COV Subscriptions (ACM reverts to polling for all data).

Password for Backup/Restore and Restart/Control: Password used by BACnet Device Communications Control and Reinitialize services (use for Backup/Restore where supported, and device restart commands).

Number of AVs: Defines how many General Purpose AVs the ACM Slot will create (consecutive instances starting at 0). Default is 1000, range is 0-6000.

Number of BVs: Defines how many General Purpose BVs the ACM Slot will create (consecutive instances starting at 0). Default is 1000, range is 0-6000.

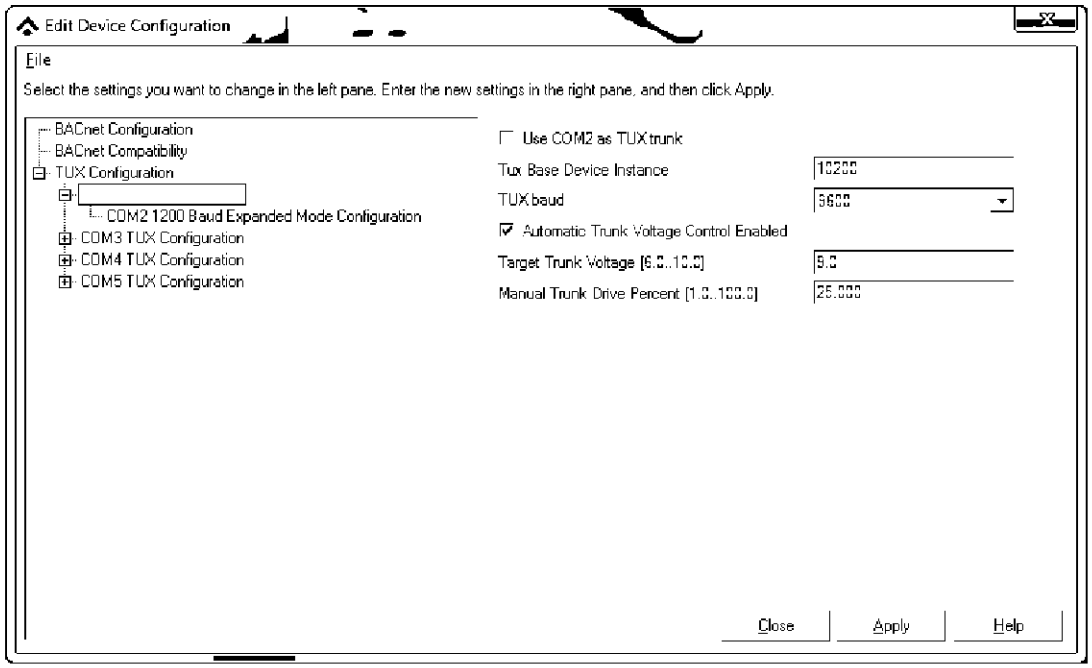
BACnet compatibility



Enable Extensions for large networks: Enables a feature that attempts to maximize performance on large networks by blocking Who-Is broadcast traffic from being forwarded to the MS/TP Networks, having the ACM keep a list of all MS/TP devices and sending Proxy I-Am messages for all Who-Is requests the ACM sees looking for an MS/TP device. ACM will also stagger Trendlog Buffer-Ready Notifications to prevent periodic floods of Trendlog notifications if similar interval Trends are setup.

Relax date/time checking: Disables the more stringent wildcard checking in Dates and Times mandated at BACnet Protocol Revision 13.

TUX settings



Use COMx as TUX trunk: Enables the specified COM Port to be used as a TUX Trunk (requires a TUX Option card be installed).

Tux Base Device Instance: Sets the Base Device Instance the TUXs on the specified TUX Trunk. TUX Virtual Device Instance will be equal to Base Device Instance + TUX DIP Switch Address.

TUX baud: Sets Baud Rate of specified TUX Trunk.

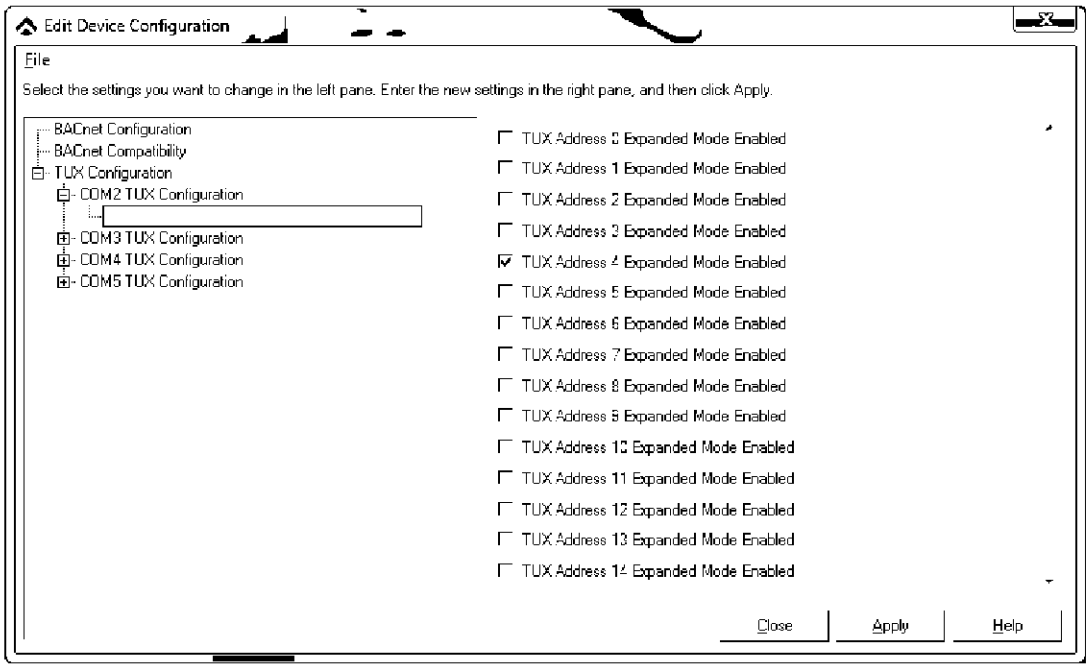
Automatic Trunk Voltage Control Enabled: Enables the ACM to automatically attempt to adjust, or "tune" the TUX Trunk current to meet the Target Voltage. (NOTE: Value writable on the fly through Diagnostics BV 120x71, where x equals the number of the Trunks COM Port).

Target Trunk Voltage: The voltage the ACM will attempt to "tune" the Trunk to when the Automatic Trunk Voltage Control is Enabled. (NOTE: Value writable on the fly through Diagnostics AV 120x74, where x equals the number of the Trunks COM Port).

Manual Trunk Drive Percent: Drive percent of a Virtual TUX Trunk Drive Tuning Potentiometer (similar to drive current tuning potentiometer on an APEX). Value is in on percent with 0% being minimum drive current and 100% being maximum drive current. (NOTE: Value writable on the fly through Diagnostics AV 120x71, where x equals the number of the Trunks COM Port).

NOTE Diagnostics AV 120x72 (where x equals the number of the Trunks COM Port) is a feedback of the actual TUX Trunk Voltage measured at the ACM (no external meter required).

COMx 1200 baud expanded mode configuration



TUX Address nn Expanded Mode Enabled: Sets whether the specified TUX Address (nn), will be set to use 1200 baud Expanded Mode Functionality. Setting an SA type TUX to use Expanded Mode at 1200 baud will cause the TUX Trunk to temporarily "jump" to 4800 baud to talk to the specified TUX Address(s) to get their expanded data set, then drop back to 1200 to talk to other TUXs. Expanded Mode Support can only be applied to SA type TUXs (TX-VAV, TX-SA, TX-SA-651 and TX-HOSTR3).

UTC Offset and Daylight Saving configuration

The UTC Offset value is written to from Device Manager when Sending Device Properties. Make sure the UTC Offset configured in the ACM matches the UTC Offset parameter on the Preferences tab in the ACM's Device Profile.

1. Click **UTC Offset and Daylight Saving** in the tree, and then set the parameters.

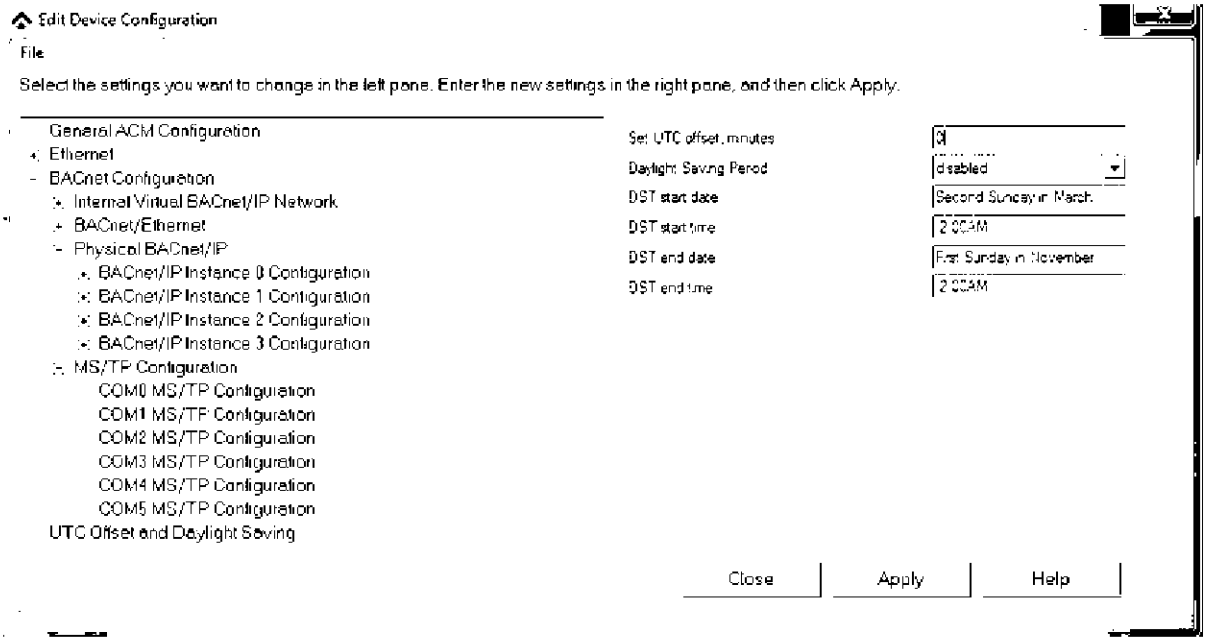


Figure 16 *Sample ACM UTC Offset and Daylight Saving parameters*

2. Click **Apply** and save your changes to the current file.

Note ACM device configuration settings and licensing are saved in the ACM's SD card and are retained through power outage.

Configuring Universal Inputs (AIs, BIs)

Universal Inputs IN-0 and IN-1 on the ACM can accept a variety of input types. Input configuration is done using AVs.

To configure ACM Universal Inputs

- Configure the ACM Universal Inputs using Device Template number **99996008**.

NOTE Mode is also available as "MV-10300 and MV-10301." respectively.

Input:	Mode:	X1	X2	Y1	Y2
IN-0 (AI-0)	AV-10300	AV-10400	AV-10500	AV-10600	AV-10700
IN-1 (AI-1)	AV-10301	AV-10401	AV-10501	AV-10601	AV-10701

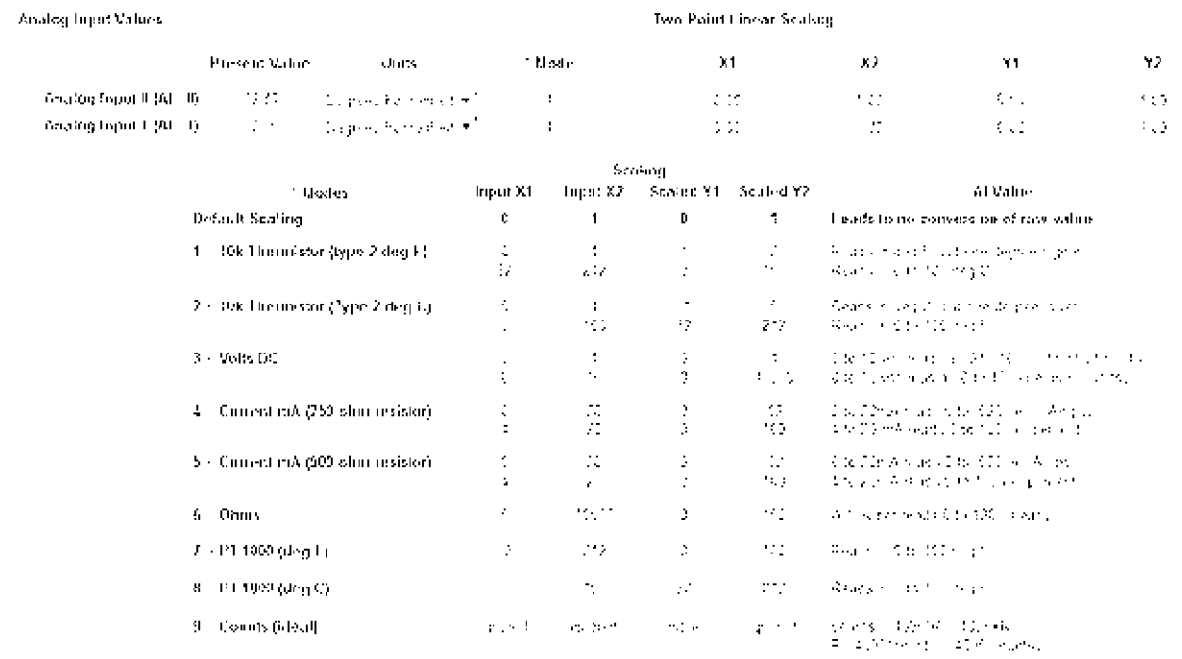


Figure 17 *Device Template 99996008: ACM Universal Inputs Configuration*

Working with the ACM in Device Manager

Use the Device Scan feature in Device Manager to scan the network for the ACM and save it to the Device Manager Table. This is an easy way to ensure the ACM is communicating. A device record for the ACM must exist in Device Manager for you to view and change ACM values using Compass. The device record stores setup information about the ACM. An accurate device record is the key to managing DDC, ROC files, and automation features.

Once a device record exists, use Device Manager to send data to and read data from the ACM. See the *Compass Installation and Upgrade Guide* (LT-COMPASSIUG) or the *Compass Dealer Manual* for more information about working in Device Manager.

NOTE Only add the device record to Device Manager when the ACM does not already exist in the Device Manager table. If the ACM exists in Device Manager DO NOT save to table until sending Device Properties. Doing so will delete Device Profile parameters.

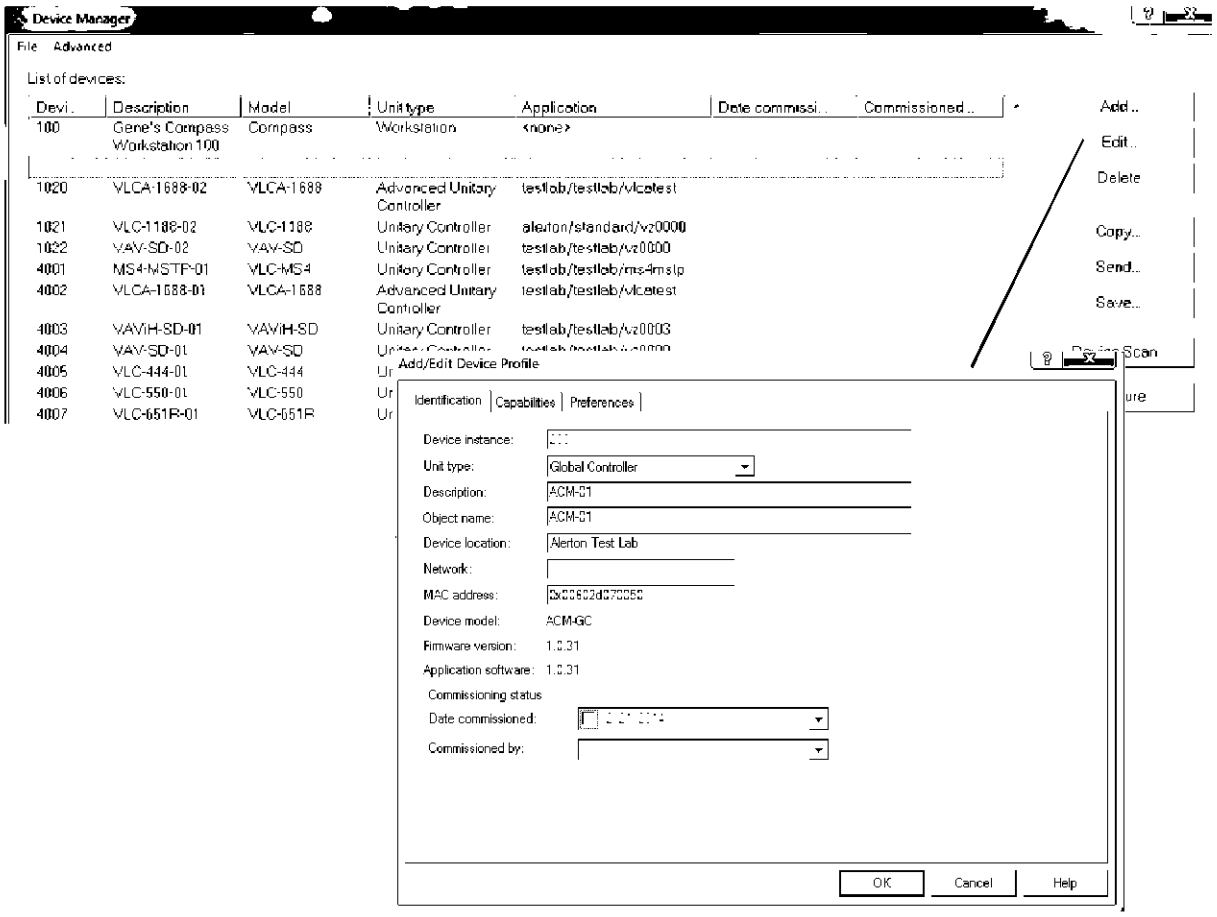
To add the ACM device record to Device Manager

1. In Device Manager click **Scan BACnet devices** and then click **Scan**.

2. Click the ACM you want to add to Device Manager and then click **Save to Table**. The new ACM device record is saved in the Device Manager Table.

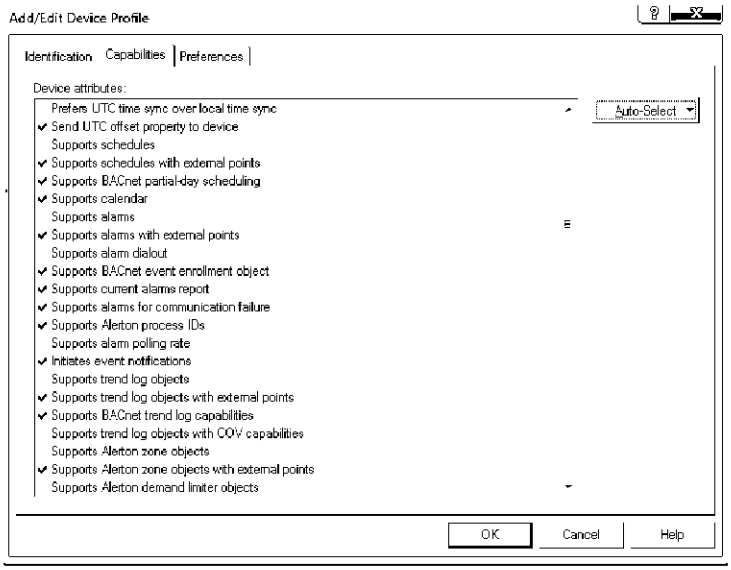
To edit a saved ACM device record

1. Click the ACM record and then click **Edit**. The Add/Edit Device Profile dialog box opens.



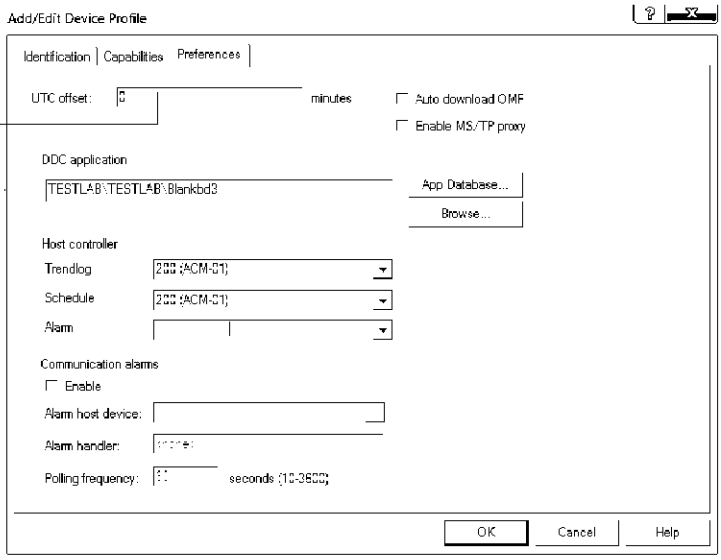
2. Update the ACM parameters on the Identification tab.

3. Click the **Capabilities** tab, click **Auto-Select**, and then click **Select by Polling Device**.



4. Click the **Preferences** tab, set the UTC Offset, DDC, Application, Host Controller, and Communication Alarms parameters, and then click **OK**.

The UTC Offset parameter is sent to the ACM when Sending Device Properties.



5. Click **OK** to save your changes.

Using the Console Port to enable the BACnet Ethernet protocol

IMPORTANT! The Console Port is not the main configuration method for the ACM; use Device Manager in Compass operator workstation software to configure the ACM.

Locked out? The Console Port connection provides a limited number of options and should only be used to enable BACnet/Ethernet if you can no longer communicate with the ACM. The Console Port provides a method to reconnect with the ACM and verify basic settings. You can enable/disable the BACnet/Ethernet protocol and assign BACnet/Ethernet network numbers for either Network Interface Card. The ACM must have a BACnet Ethernet network number to work.

You can change the basic IP settings for each physical port (IP address, subnet mask, gateway, whether to use DHCP), from the console. However, you can't change what BACnet IP networks use

those ports, or the parameters of the BACnet IP networks. You must do that using the remote device configuration tool that is available in Compass.

Console Port requirements and guidelines

- It is highly recommended that you connect to the ACM and configure it before connecting to networks to minimize the potential for network conflicts.
- The ACM must be connected to power during configuration.
- The configuration properties specific to the ACM is that the Baud rate must be 115.2k, 8-N-1
- The Alerton-ACM-Console-USB-Driver-V2.inf is required. Download from http://ascent.alerton.com/wp-content/uploads/Alerton-ACM-Console-USB-Driver-V4.zip
- A terminal emulation program is required to configure the ACM. PuTTY is recommended.
- Configuration testing was performed with PuTTY in a Windows environment. Use PuTTY for best results. (http://www.putty.org/)
- If you plug-in and unplug the USB cable, this serial port will appear and disappear. Using a different USB port causes a new COM port to be created. V4 fixes this issue
- Verify that PuTTY is not running (on the serial port corresponding to the ACM) when you insert the USB cable into the ACM, regardless of whether or not the ACM is powered. If putty is running while you insert it, it may block the virtual serial port from being created.
- HyperTerminal is another terminal emulation program that works with the ACM but it is not included with Windows 7 or Windows 8.
- Configuration parameters and licensing are stored on the microSD card so you can perform configuration tasks offline, remove power, and the ACM will retain settings and licensing.
- Connection issues are often attributed to a disabled or non-standard computer COM port configuration. Use Windows Device Manager or the computer BIOS setup to debug if the COM port doesn't appear to be functional.

NOTE There are two USB ports on the ACM that are reserved for future use; do not use these USB ports. One is located on the top left edge of the ACM and the other is located directly under the Battery port on the top front of the ACM.

To install the Console Port driver

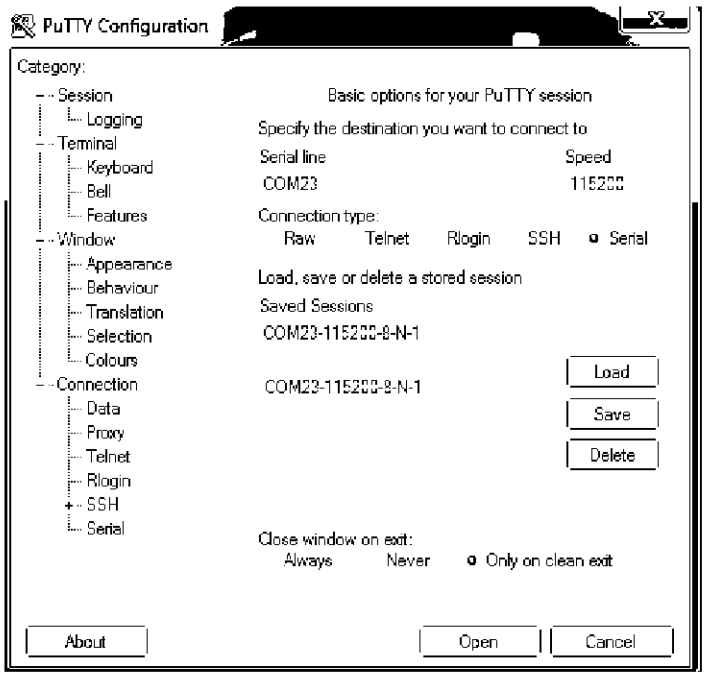
NOTE The Console Port is not the primary method for configuring the ACM. Use Device Manager in Compass to configure the ACM.

1. Download the driver for the USB cable and Console Port from http://ascent.alerton.com/wp-content/uploads/Alerton-ACM-Console-USB-Driver-V2.zip.
2. Select the .INI file for the driver (control panel -> device manager and look for "unknown" USB device).
3. Right-click and choose "update driver software", then "browse my computer for driver software". You need to browse to the folder containing the .INF file for the ACM. When all is working, you should see a serial port corresponding to the ACM.
4. For instructions on how to use Putty or HyperTerminal, please visit the suppliers website.

To connect to the ACM and start a PuTTY session

1. Power up the ACM (See "Mounting" on page 17.) and start the computer.
2. Connect to the Console Port located on the top left front of the ACM using a Type A Type B USB cable (commonly called a Printer Cable). Plug the small end into the ACM and the long flat end into your computer.

3. Launch PuTTY.

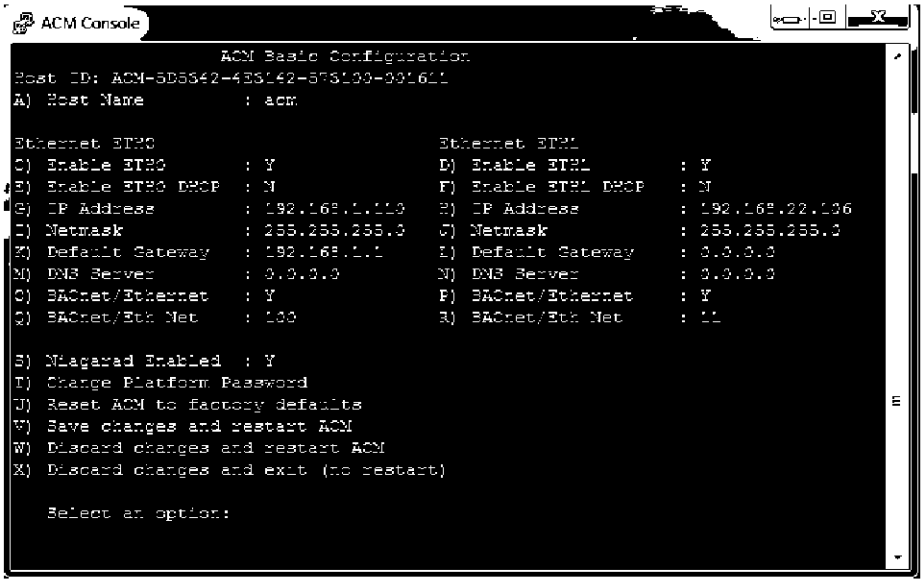


4. Specify the ACM connection parameters, and then click **Open**. At first you might see a blank screen. Press **ENTER** to show the ACM Login prompt in the ACM Console screen.

5. Type the username **config** and then press **ENTER** to proceed.

6. Type the password **pass** and then press **ENTER** to log in.
   The ACM Basic Configuration screen is displayed.

IMPORTANT! Do Not leave the ACM with default login credentials! The installer is strongly encouraged to change the password.



Saving changes

After you make changes in PuTTY, you will have some exit options.

- Save and restart
- Discard changes and restart
- Discard changes without restart

You can also choose to reset the ACM to its factory defaults.

CAUTION You will lose changes if you close the PuTTY session or disconnect without saving. After making any changes, be sure to exit appropriately to save your work.

ACM-TUX Option Card

This section covers mounting and wiring information for the TUX Option Card (ACM-OC-2XTUX) used with an Ascent Control Module (ACM).

The ACM-TUX reads TUX data from up to 64 Alerton TUXs on an IBEX TUX trunk and makes the data available to the BACnet network as BACnet objects and properties. The ACM-TUX enables your BACnet system to read and write TUX point data.

Use the ACM-TUX to:

- Host automation features such as schedules, trendlogs, alarms, optimum start, demand limiting, and tenant activity.
- Run building-wide DDC sequences.

Technical Data

Table 6 ACM-TUX option card hardware capabilities

TUX trunk	Supports up to four Alerton TUX trunks for connection of up to 64 TUXs per trunk communicating at 4800/9600 baud or up to 32 TUXs per trunk communicating at 1200 baud. Each TUX option card has two TUX trunks.
Environmental	Operational temperature and humidity: -4 to 149 deg. F (-20 - 65 deg. C). 5 - 95% RH, non-condensing. Storage temperature and humidity: -40 to 149 deg. F (-40 – 65 deg. C), 5 - 95% RH, non-condensing.
Operating Temperature	-4 to 149 °F (-20 to 65°C)
Operating Humidity	RH 5% to 95%, non-condensing.
Storage Temperatures	-40 to 149 °F (-40 to 65°C)
Agency Listing	UL 2054 ed 2 rev 2011-09-14; EN 62133 ed 1 (2002), ed 2 (2012) China MIIT Order No. 32 (RoHS2)

Mounting

WARNING Turn power OFF to the ACM when installing or removing option cards, or damage will occur! Also, you must be very careful to plug any option card into its connector with the pins properly aligned.

Required Tools

- A #2 Phillips screwdriver

Mount the option card in the slot for Option Card 0 or 1 of the ACM.

To mount the TUX option card on an ACM:

1. Initiate an orderly shutdown of the ACM using DIP Switch 4. Refer to the Installation and Operation Guide for instructions.
2. Remove power from the ACM and then wait for all LEDs on the unit to turn OFF.
3. Open the lid covering the ACM's option card slots.
4. At the slot where the option card will be installed, remove the screws from the mounting posts.

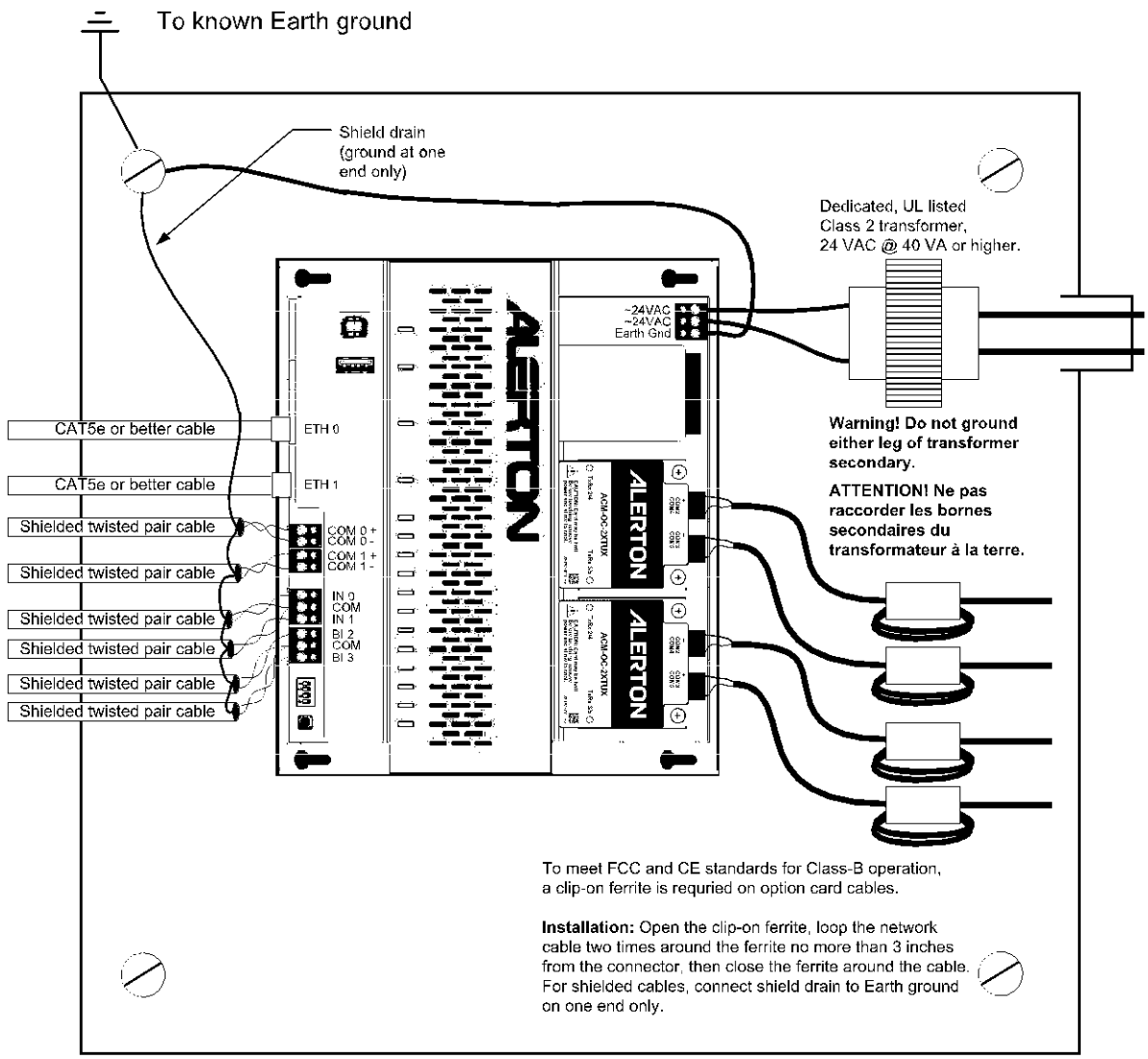
5. Slide the option card into the bracket, aligning the mounting holes.
6. Carefully align the header pins of the TUX with the header receptacle. The mounting holes on the option card and bracket should line up with the mounting posts. Press until the option card is completely seated.
7. Place the protective plastic cover over the option card, making sure the screw holes in the cover line up.
8. Replace the screws through the mounting holes of the option card and bracket and into the mounting posts.
9. Close the ACM lid and restore power to the ACM.

Wiring

Connect to a TUX network using one of the 2-position screw terminal connectors. Screw terminals are plus (+) and minus (-) as indicated on the label. To meet FCC and CE standards for Class-B operation a clip-on ferrite is required on TUX network cables.

To install the clip-on ferrite:

1. Open the clip-on ferrite, loop the network cable through the ferrite no more than 3 inches from the connector, and then close the ferrite around the cable.
2. For shielded cables, connect shield drain to Earth ground at one end only (not shown).



LEDs

Two LEDs are visible on the top of the TUX option card. They are also noted on the label. There is one activity LED for each TUX network. Each LED flashes when data is transmitted or received on its associated TUX network.

COM Port Usage

The TUX option card has two onboard UARTs, and so assigns two TUX trunks on the installed ACM. The ACM automatically resolves the option card's COM addresses.

- If installed in the Option Card 0 Slot, the ports are COM2 and COM3.
- If installed in the Option Card 1 Slot, the ports are COM4 and COM5.

Table X: TUX Option Card COM Port Assignments

Table 7 TUX Option Card COM Port Assignments

Slot Number/Option Card Type	COM Port Assignments
Option Card 0 (upper slot/closer to power connector)	COM2 (upper port)
	COM3 (lower port)
Option Card 1 (lower slot)	COM4 (upper port)
	COM5 (lower port)

How the ACM-TUX exposes TUXs and TUX data to BACnet

On the BACnet network, the ACM-TUX has one device instance associated with its physical presence. The ACM-TUX hosts a virtual network for the TUX trunk and a virtual device instance for each TUX on the TUX trunk (up to 64). These virtual device instances are based on the TUX base device instance added together with the address of the TUX (set with DIP switches).

TUX Virtual DI = TUX Base DI + TUX DIP

For example, if you set a base TUX device instance of 10200 (using HyperTerminal), a TUX with address 2 is identified in BACnet with device instance 10202.

TUX data points as present-values of BACnet objects

The BACnet objects that the BCM-TUX generates from TUX data points depends on the particular TUX model. The BCM-TUX automatically assigns BACnet objects to TUX data points based on the TUX type.

The BCM-TUX makes TUX data available as the present-value property of the BACnet object. The object and its properties are referenced by the Virtual TUX Device Instance.

For example, AI-1 in a TX-VAV, which represents space temperature in degrees, maps to the present-value of BACnet object AI-1 in the corresponding virtual device. If the TUX has its DIP switch address set to 4, and the BCM-TUX has a base TUX device instance of 10200, you reference this data point in BACnet as Device 10204, AI-1, present-value (Device 10204 is the Virtual Device Instance of the TUX in BACnet).

NOTE SA type TUXs behave differently than all other type TUXs. Any point not present in an SA type TUX is not created as a BACnet point (referencing any non-supported BACnet point returns *unknown-object* for all properties). General points in Non-SA type TUXs all return valid data (even if a physical point for that TUX type does not exist).

Using the alerton-gateway-setup property

Use this special property of AIs and AOs to customize data translation if necessary (see “Appendix E: The alerton-gateway-setup property” on page 121) from TUX to BACnet object and vice versa. In most cases, customizing the alerton-gateway-setup property is not necessary. The BCM-TUX uses appropriate defaults.

How to convert APEX DDC for use in the BCM-TUX

The BCM-TUX serves as the global controller for all connected TUXs. If you are converting an existing IBEX system to a BACtalk system, you must first write new global controller DDC in the BCM-TUX to replace functions that were normally provided by the APEX in your IBEX system. Use the following table to determine how to accomplish these functions in your BACtalk system.

Table 8 APEX DDC in the BCM-TUX.

Function	If you did this in IBEX...	Do this in Compass...
Schedule operation of a TUX	Linked a control panel to the TUX and transferred the Zone Generic Day point to the appropriate TUX DO (typically, DO 3) using subroutine DDC.	In the virtual device, set up the BO that represents the TUX as a scheduled point in BACtalk (typically, BO 3). Or Schedule the Zone with the TUX as the referenced device and reference the BACnet object mapping for the specific TUX device.
Enable heating, cooling, and unit operation	Used APEX DDC to send ON values to DOs in application specific TUXs.	Set up DDC in the BCM-TUX to write to the appropriate BO in the virtual device. See the IBEX technical manual to identify the BO to write to (typically BO 1, BO 2, or BO 8).
Programming with zone custom points	Used APEX DDC to generate values for zone custom points that you placed on a control panel template.	Place available AVs and BVs (not mapped to specific TUX points) in the virtual device on a device template.
Zone TUX points	Used TUX points in control panel DDC.	Use the BACnet object mappings in the Zone object references
Pulse data conversion	Used Device 9 (APEX DDC) to convert compound data (AI 1 through AI 6) from a TX-651 Pulse to consumption and rate.	Use DDC math functions in Global/Building Controller DDC.
View, create and edit TUX DDC	Used TUX DDC in IBEX operator workstation software to view, create and edit DDC.	You cannot view, create or edit TUX DDC in BACtalk. Create and edit TUX DDC using IBEX VisualLogic. If the TUX has a direct- connect header, connect using an AC-2650 cable and use the TUX Development System. Otherwise, connect using an IBEX global controller and the TUX Interface Device. NOTE: TDS Development Studio will not work on 64 bit operating systems.
Control Panel Subroutines	The TUX is linked to a control panel using Device 80.	Not applicable

Appendix A: ACM features compared to BCM features

The ACM platform

- Has a four-core CPU at 1GHz and 1GB SDRAM (approximately 80 times more powerful than a single BCM).
- Can connect to a computer with a USB cable; doesn't require an RS-232 port
- Can support up to 6 BACtalk MS/TP trunks, and a variety of AX network types. The ACM has room for two option boards.
- Has two Ethernet ports to allow physically isolating the Internet connection from the BAS network.
- Up to 4 BACnet/IP instances allow a single ACM to link BBMDs on up to 128 different IP Subnets. Each instance can be a BBMD and support NAT. By utilizing the Multiple IP Network feature in multiple ACMs you can expand the number of BBMDs well beyond 128.
- Can host web pages using Niagara

ACM-GC program

Features exceeding the BCM-ETH

- Number of AVs and BVs is configurable per slot.
- One slot can have as many BACnet objects as six BCM-ETH devices combined. However, you cannot max out all 6 slots. The following recommended limits should be observed to maintain high performance:
  - Max 2000 trendlogs
  - Max 2000 alarms
  - Max 6000 AVs
  - Max 6000 BVs
  - Max 384 schedules
  - Max 10 demand limiters
  - Max 384 zones

Contains features from the BCM ROC v3.0

- The BACnet protocol revision 15 feature set is implemented in the ACM-GC.
- Standard NAT support for BACnet/IP (for example, the slot 0 device can be homed)
- Supports outgoing BACnet COV-A subscriptions for any devices that support COV-B. This reduces network traffic otherwise generated by polling.
- Has writable BACnet object names
- Has increased broadcast hardening
- Supports 115.2K baud MS/TP
- BACnet I-Am responses are unicast to lower network global broadcast burden
- Supports Gateway to Modbus (supports Modbus Serial networks similar to BCM-Modbus, but also adds support for Modbus TCP networks).
- Supports Gateway to Legacy Alerton IBEX TUX Controllers.

Limitations Compared to BCM-ETH

Each ACM-GC instance (ie: in one slot) has all the features of a BCM-ETH with the following exceptions:

- Does not support MS/TP slave devices
- Does not support v1.02 VLCs
- Does not support PTP
- Supports only limited BACnet configuration through the Console Port

Appendix B: ACM Niagara implementation

The ACM uses a full Niagara AX station to:

- support exposing point data through web pages
- extend the Alerton offering in the areas of integration and web support.

WorkPlace AX login

The default login for the platform is username=**alerton**, password=**niagara**.

IMPORTANT! Do Not leave the ACM with default login credentials! The installer is strongly encouraged to change the password.

Supported Niagara components

This ACM platform is able to run any Niagara components that do not depend on certain platform support. You can use the Niagara WorkPlace AX> Platform> Software Manager to see what other components are required by a specific component.

NOTE Be sure to update your Work Place AX installation with the components from the Ascent site.

The ACM platform support (as of ACM NRE 3.8.38.9.2) is as follows:

Table 9 ACM platform support.

Platform Component	Supported	Platform component	Supported
platDaemon.jar	Yes	platNdio.jar	No
platform.jar	Yes	platNrio.jar	No
platSerial.jar	Yes	platUsbmon.jar	No
platSerialNpsdk.jar	Yes	platWifi.jar	No
platLon.jar	Yes	platDialup.jar	No
platBacnet.jar	Yes	platDataRecovery.jar	No
platMstp.jar	Yes (added in 1.1)	platDisplay.jar	No
platCcn.jar	No		

Any components with dependencies on non-supported platform components will not work.

Fig. 18 illustrates the relationship between ACM configuration and Niagara IpPort configuration.

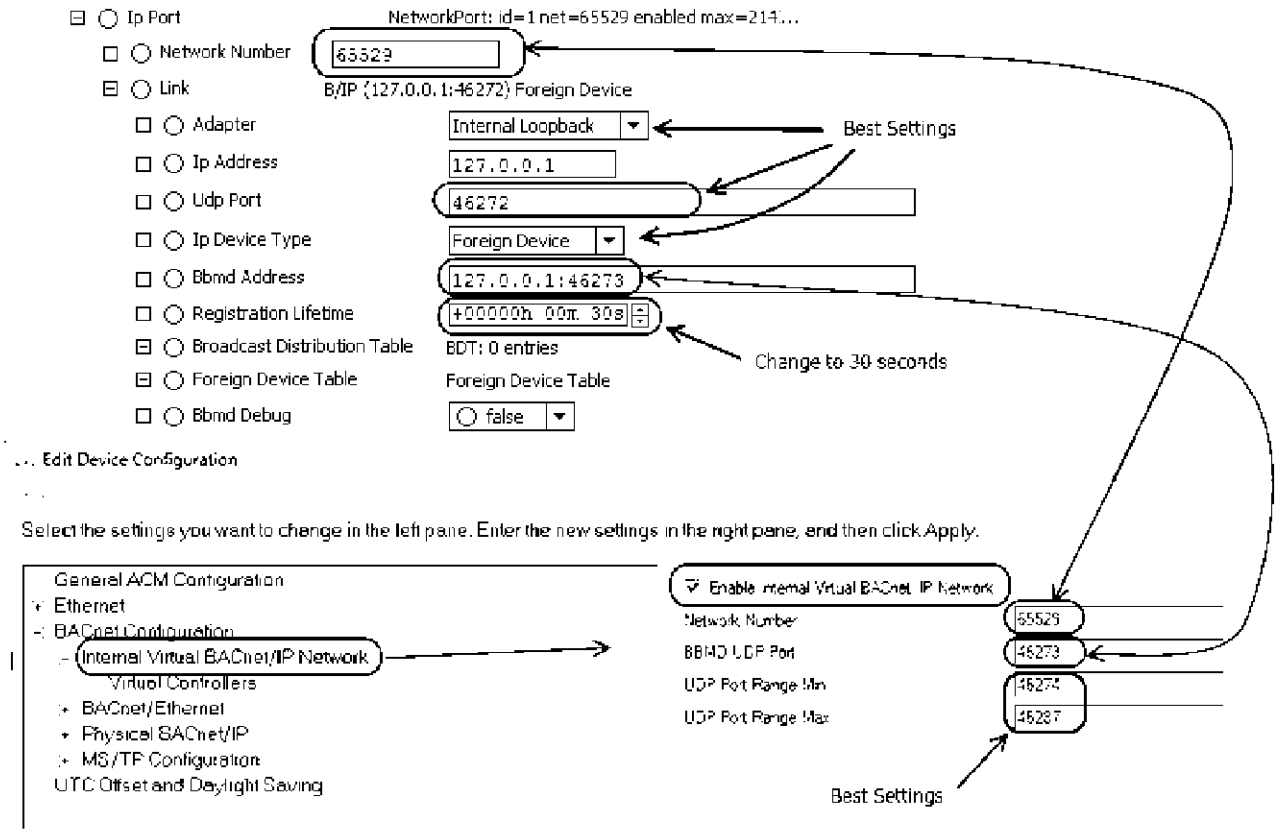


Figure 18 *ACM configuration compared to Niagara IpPort configuration.*

MS/TP drivers

Be sure to use the appropriate driver for the ACM.

- **ACM-DR-MSTP-AX** This driver supports MS/TP communications on all 6 ACM ports when working in a Niagara AX workstation. Order the ACM-DR-MSTP-AX driver with the ACM as a variant configuration (VC) option, or order it later and add it to the ACM. This driver does not work with Alerton AIE or Tridium JACE products.
- **I-DR-MSTP-AX** Do not use this driver with the ACM because it limits MS/TP communications to 5 ports. Use I-DR-MSTP-AX driver with Alerton AIE products.

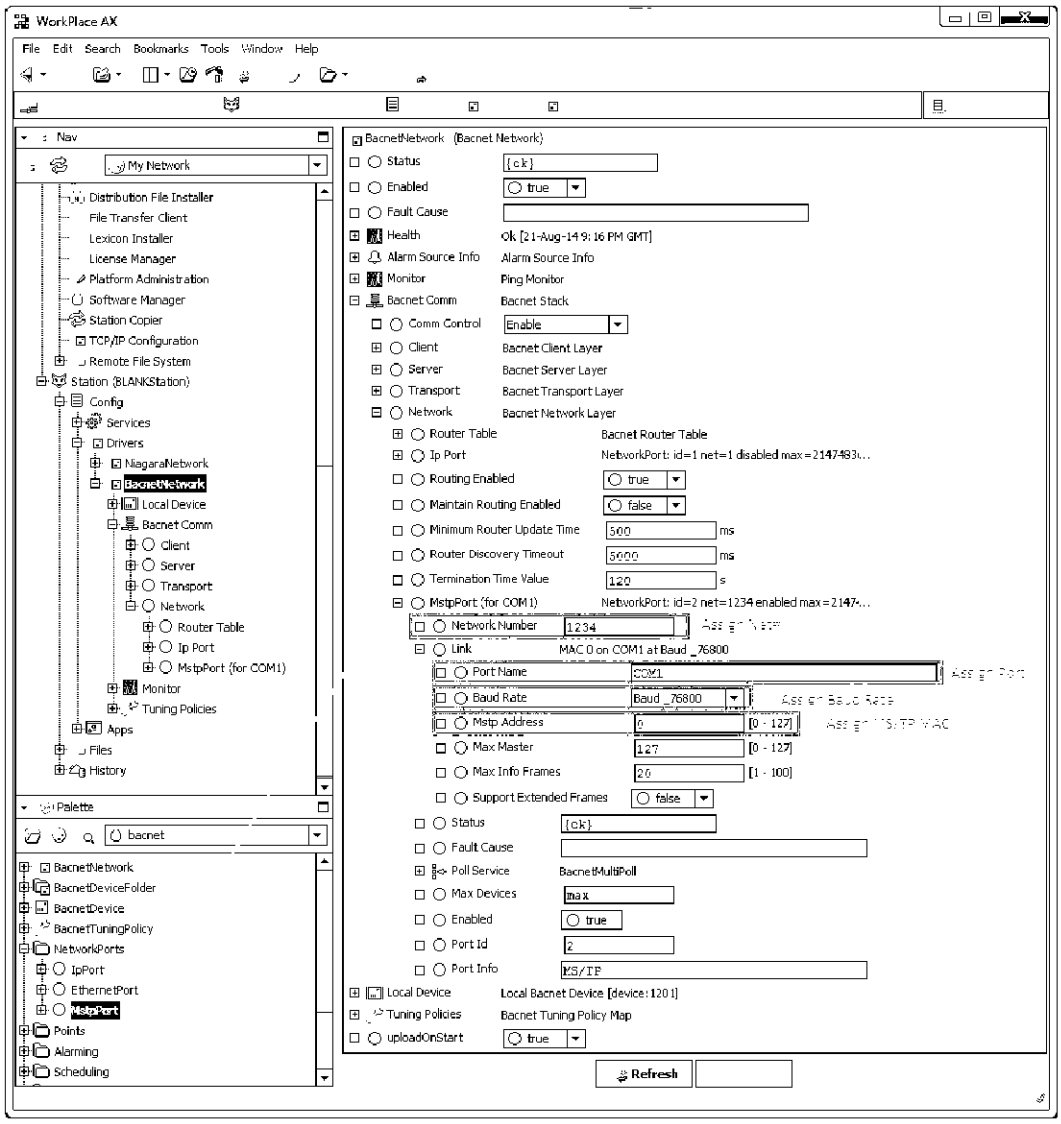
Installing the driver

Install the MS/TP driver using WorkPlace AX. To add the MS/TP network port to the Niagara BACnet network, follow the steps below.

1. Open the BACnet palette in WorkPlace.
2. Add a BACnet Network (if one does not already exist).
3. From the NetworkPorts folder in the BACnet palette, drag **MstpPort** to the Network property of the BACnet Networks, BACnet Comm property.
4. Expand the MstpPort property and assign it a BACnet Network#.
5. Expand the Link property and assign the ACM Comm port this MS/TP port will use, along with the baud rate and MAC address for that network.
6. Click **Save**.

You can add up to 6 MstpPorts to the BACnet Network, depending on installed option cards and licensing.

NOTE If you enable any of the COM ports for MS/TP using the Device Manager's Device Configuration option, you can not use that COM port in WorkPlace AX.



Protocol integration

Alerton has tested and found that the ACM **does** support the protocols in Table 10 and Table 11.

Table 10 Supported Tridium protocols.

Protocol	Vendor	Supported
BACnet/IP	Tridium	Tested
LON Twisted Pair	Tridium	Tested
LON/IP (ILON)	Tridium	Tested
MODBUS RTU Master	Tridium	Tested

Table 10 Supported Tridium protocols.

Protocol	Vendor	Supported
MODBUS RTS Slave	Tridium	Tested
MODBUS/IP Master	Tridium	Tested
MODBUS/IP Slave	Tridium	Tested
MS/TP	Tridium	Tested
SNMP	Tridium	Tested

Table 11 Supported Alerton protocols.

Protocol	Vendor	Supported
MODBUS/Alerton	Alerton	Tested
TUX/Alerton	Alerton	Tested

The ACM **does not** support the following protocols.

Table 12 Unsupported protocols.

Protocol	Vendor	Supported
Carrier CCN	Tridium	No
Honeywell B-Port	Honeywell	No
Allen Bradley CIP	Infocon/MaxLine	No
CNS-Enocean	Control Network Solutions Ltd.	No
SMS Driver	Tridium	No
Z Wave Driver	Tridium	No

Driver compatibility

Alerton drivers

Alerton maintains a list of AX drivers that are compatible with the ACM. This list is updated as Alerton or Alerton dealers test more drivers. View the current Alerton ACM Niagara AX Driver List (LT-ACMDRIVERS) on the Ascent pages, which are available through the Alerton Support Network.

Alternatively, the Tridium website has a list of Niagara AX drivers for JACE products.
Search **http://www.tridium.com** for the latest information; more recent versions might be available.
Use the following guidelines to determine if a driver is likely to work on the ACM:

- If the "Niagara Platform" includes "JACE," then it should also run on the ACM (subject to other criteria below). Otherwise, assume it won't run on the ACM.
- If the "Connection Type" says the driver supports "Serial," "Serial EIA-232," "Serial EIA-485," "TCP," "UDP," or "IP," then it should work on the ACM. If it says anything else (or if it just says "Ethernet"), then assume the driver will not work on the ACM.
- The "Niagara Version" criteria must be met. The ACM runs Niagara version 3.8.

Appendix C: BACnet object and property reference

Use the table below for a general overview of the BACnet objects available in the ACM. Use the tables that follow for details about the properties of each object listed.

Table 13 BACnet objects.

Object (instance range)	Remarks
AI Objects (0,1)	Physical Inputs the ACM supports.
BI Objects(0-3)	
ALER-Comm-Fail Objects	Created when setting the Communications Failure feature in Device Manager.
AV (0–6000)	General use AVs.
AV (100000 and higher)	Diagnostic AVs.
BV (0-6000)	General use BVs.
Calendar	Describes a list of calendar dates, special event dates, holiday dates, and date ranges.
Device	Provides general information about a device.
Event Enrollment	Defines an event and connects the occurrence of the event to the transmission of an event notification. Used in Compass primarily for alarms.
File 0	BACnet File Object containing the ROC File.
File 1024	BACnet File Object containing the DDC File.
MV 10300	MVs used to configure the Input Mode for Inputs 0 and 1.
MV 10301	
Notification Class	Stores a list of available recipients for the distribution of event notifications (alarms, trendlog gathering, and so on.).
Program 0	BACnet Program Object reflecting the Running ROC File.
Program 1024	BACnet Program Object reflecting the Running DDC File.
Schedule	Controls designated properties by periodic schedule that may recur during a range of dates.
Trendlogs	Helps troubleshoot problem areas and identify critical operating trends in the BACnet system.
Zones *	Defines a space in a building that is controlled by a Compass system. Zones provide a convenient mechanism to monitor, manage and arbitrate multiple Envision features, such as, schedules, optimum start, and tenant activity. Optimum start and tenant activity require a zone to be setup. A zone may represent one floor of a building, multiple floors, a particular room or area on a floor, a hallway, foyer, or stairwell.
Demand Limiting*	Monitors and controls energy demand and then automatically adjust equipment operation to limit the demand and reduce costs.

* Alerton proprietary object

Properties of AV objects

Table 14 AV object properties.

Property	Write	Type	Example	Remarks
cov-increment	Yes	Real		If the present-value changes by this amount or greater, a change-of-value notification is sent to subscribed devices.
description	Yes	Character string	Occupied Setpoint	A description assigned to describe the object's function.
event-state		Enumerated	Normal	Always Normal
object-identifier		BACnet_Object_Identifier	AV 1	This property consists of the object-type property and the object instance, which is a numeric code that identifies the object of interest.
object-name	Yes	Character string	AV 1	Shows AV <instance>.
object-type		Enumerated	AV	
out-of-service		Boolean	FALSE	
present-value	Yes	Real	76.4	Range is +/–3 x 1038 (six significant digits of resolution).
property-list		Array[n] of BACnet Property Identifiers		Supported properties: minus object-identifier, object-name, object-type, and property-list
status-flags		Bit string	<Bit string>	A four-position bit string that indicates the status of the AV. If a status bit =1, that status is TRUE.
units	Yes	Enumerated	Deg F	Indicates the unit of measure, in BACnet engineering units, for the AV present-value.

Properties of BV objects

Table 15 BV object properties.

Property	Write	Type	Example	Remarks
change-of-state-time		BACnet Date-Time		Date and Time for the last Change of State of the Present Value.
change-of-state-count	Yes	Unsigned32		Counter indicating how many times the Present Value has changed state (resettable by writing a 0 value to property).
description	Yes	Character string	Occupied Setpoint	A description assigned for the object's function.
elapsed-active-time	Yes	Unsigned32		Time in seconds that the present value have been Active (resettable by writing a 0 to property).
event-state		Enumerated	NORMAL	
object-identifier		BACnet_Object_Identifier	**BV** 5413	This property consists of the object-type property and the object instance, which is a numeric code that identifies the object of interest.
object-name	Yes	Character string	**BV** 5413	
object-type		Enumerated	BV	Indicates a binary value (BV).
out-of-service		Boolean	FALSE	
present-value	Yes	Enumerated	INACTIVE	Either ACTIVE (ON) or INACTIVE (OFF).

Table 15 BV object properties.

Property	Write	Type	Example	Remarks
status-flags		Bit string	In alarm = 0, fault = 0, overridden =0, out of service =0	A four-position bit string that indicates the status of the object. If a status bit =1, that status is TRUE.
time-of-state-count-reset		BACnet Date-Time		
time-of-active-time-reset		BACnet Date-Time		
priority-array		BACnet PriorityArray	<Array of BACnet PriorityValue>	An array of prioritized values (indexes 1-16) controlling the present-value, index 1 having the highest priority. The value with the highest priority controls the present- value. Possible values for priority-array indexes are ACTIVE, INACTIVE, or NULL. A NULL value indicates no command is issued at that priority-array index.
property-list		Array[n] of BACnet Property Identifiers		Supported properties: minus object-identifier, object-name, object-type, and property-list
relinquish-default	Yes	Enumerated	Inactive	Default value to be used for present-value property when all priority-array indexes are NULL.

Properties of the device object

Table 16 Device object properties.

Property	Write	Type	Example	Remarks
aler-dst-mode	Yes	Enumerated		Sets whether Daylight Saving Time is to be used or not.
aler-dst-start-date	Yes	BACnet Date		
aler-dst-start-time	Yes	BACnet Time		
aler-dst-end-date	Yes	BACnet Date		
aler-dst-end-time	Yes	BACnet Time		
active-cov-subscription		List of BACnet COV subscriptions		This is a list of ACM points to which external devices are subscribing for COV notifications.
APDU-Segment Timeout	Yes	Unsigned	6000	The time after transmission of a "segment" until the lack of a reply means it was assumed to be lost (in milliseconds, 1000 = 1 sec.). Default = 6000.
APDU-Timeout	Yes	Unsigned	6000	The time after transmission of an APDU until the lack of a reply means it was assumed to be lost. The APDU timeout value for this device in milliseconds (1000 = 1 sec.). Default = 6000.
Application-Software-Version		Character string	1.0.31	Indicates the version of the application that is running for that slot. For example, ACM-GC application.
backup-failure-timeout	Yes	Unsigned16		Unsigned value indicating number of seconds ACM will wait after receiving a StartBackup command before it will timeout if no backup is started.
backup-preperation-time	Yes	Unsigned16		Unsigned value indicating the maximum time (in sec), the ACM may take to prepare for a device backup after receiving a BACnet StartBackup request.
backup-and-restore-state		Enumerated		Enumerated property indicating the current state of a BACnet Backup, or Restore.
configuration-files		Array[n] of BACnet Object Identifiers		List of files to be backed up with BACnet backup and restore (not populated until a backup has been initiated).
database-revision		Unsigned		Unsigned value indicating current revision of internal Object database. Gets incremented whenever an object is added/removed, or has its object-name, or configuration changed (not affected by changes of present-value).
Daylight-Savings-Status		Boolean	FALSE	Indicates whether daylight savings is in effect (TRUE) or not (FALSE).
Description	Yes	Character string	Second floor controller	Assigned by the user to describe the device's function.
Device-Address-Binding		List of BACnet Address Bindings		Lists all devices bound to the ACM. Basically, all devices the ACM needs to talk to will show up in the list. For example, all external devices referenced by schedules, trendlogs, alarms, DDC, etc, that are hosted in the ACM.
Firmware-Revision		Character string	1.0.31	Indicates the ACM ROC version. The ACM ROC is essentially the OS that allows applications like the ACM-GC application to run.

Table 16 Device object properties.

Property	Write	Type	Example	Remarks
last-restore-time		BACnet Time Stamp		Date/Time of last BACnet Restore.
Local-Date	Yes	Date	Sunday, 09/26/2020	Indicates date: day of the week, month/day/year. **NOTE:** Change the date using the Time Sync or UTC Time Sync services.
Local-Time	Yes	Time	10:15:56.00am	Indicates the time stored in the device. **NOTE:** Change the time using the Time Sync or UTC Time Sync services.
Location	Yes	Character string	East Wing	Indicates the physical location of the device.
Max-APDU-Length-Accepted		Unsigned	1476	The maximum message packet size that the device can handle.
Max-Info-Frames	Yes	Unsigned	60	Number of MS/TP messages the device can send per token hold. Default = 60. Max. = 200.
Max-Master		Unsigned	127	Highest MAC address above this unit's that another MS/TP master should be set to.
max-segments-excepted		Unsigned	750	Unsigned value indicating the max number of segments that can be strung together creating a single message (value 750).
Model-Name		Character string	ACM-GC	Assigned by the vendor to indicate the device model.
Number-Of-APDU- Retries	Yes	Unsigned	3	The number of times a message will be resent after it is assumed to be lost.
Object-Identifier		BACnet_Object_Identifier	**Device** 200	This property consists of the object-type property and the device instance (a numeric code that identifies the device) of this device.
Object-List		Array		An array whose elements list the object-identifier of all objects currently in the device.
Object-Name	Yes	Character string	Controller 200	Every device must have a unique object name.
Object-Type		Enumerated	Device	
Protocol-Object-Types-Supported		Bit string	<Bit string>	An internally used bit string. Indicates which BACnet object types the device can support.
Protocol-Services-Supported		Bit string	<Bit string>	An internally used bit string. Indicates which BACnet services the device can execute.
protocol-revision		unsigned	15	
Protocol-Version		Unsigned	1	Indicates the version of the BACnet protocol supported by the device.
property-list		Array[n] of BACnet Property Identifiers		All supported properties: minus object-identifier, object-name, object-type and property-list.
restore-completion-time	Yes	Unsigned16		Unsigned value indicating the maximum time (in sec), the ACM may need to complete a device restore, and reboot with the restored configuration.

Table 16 Device object properties.

Property	Write	Type	Example	Remarks
restore-preperation-time	Yes	Unsigned16		Unsigned value indicating the maximum time (in sec), the ACM may need to prepare for a device restore after receiving a BACnet StartRestore request.
Segmentation-Supported		Enumerated	segmented both	Device is capable of segmenting both transmission and reply messages.
serial-number		Character string		Property is a character string providing the factory set ACM serial-number.
System-Status		Enumerated	Operational	Indicates device status.
Utc-Offset	Yes	Signed	480	Coordinated Universal Time offset, in minutes. Value has the reverse sign of the expected time zone (that is, if the local Time Zone is -8 hours from GMT, the UTC-Offset is not -480 min, but 480 min).
Vendor-Identifier		Unsigned	18	A unique code assigned by ASHRAE to the manufacturer, in this case, Alerton.
Vendor-Name		Character string	Alerton	Indicates the device manufacturer.

Properties of event enrollment objects

Table 17 Event enrollment object properties.

Property	Write	Type	Example	Remarks
Acked-Transitions	Yes	bit string	To-offnormal =1, To-fault = 1, To-normal = 1	Indicates whether the corresponding transitions have been acknowledged. 1 indicates that the transition was acknowledged. Set in the Event Enrollment Editor at the operator workstation.
Description	Yes	Character string	Event enrollment 0	A description assigned to describe the object's function.
event-detection-enable	Yes	Boolean		Indicates whether event detection is enabled for the EEO (basically an Alarm Enable/Disable property).
Event-Enable	Yes	bit string	To-offnormal =1, To-fault = 1, To-normal = 1	Indicates whether notifications are enabled for these event transition types. 1 indicates that the transition will be reported. Set in the Event Enrollment Editor at the operator workstation.
Event-Parameters	Yes	BACnet Event Parameter	high limit, low limit	
Event-State		Enumerated	NORMAL	Indicates the current state of the event.
event-time-stamps		Array[3] of BACnet Time Stamps		Three element array of BACnet Date-time values indicating the last time an event occurred for each event type.
Event-Type	Yes	Enumerated	change_of_bitstring	Indicates the type of event algorithm to be used to detect events.
Notification-Class	Yes	Enumerated	1	Indicates the notification class to be used for event transitions. Set in the Event Enrollment Editor at the operator workstation.
Notify-Type	Yes	Unsigned	alarm	Indicates whether the object is set up for alarms or events.
Object-Identifier		BACnet_ Object_ Identifier	**Event-enrollment** 0	This property consists of the object type property and the object instance, which is a numeric code that identifies the object of interest.
Object-Name	Yes	Character string	Alarm	Assigned at the operator workstation.
Object-Property-Reference	Yes	BACnet object-property-reference	AV 15, present-value	Specifies the identifier of the object being monitored by the EEO.
Object-Type		Enumerated	Event-enrollment	
property-list		Array[n] of BACnet Property Identifiers		Lists all supported properties (minus object-identifier, object-name, object-type and property-list properties). Applies to all object types.
reliability		Enumerated		Enumerated value indicating the reliability of the EEO itself.
reliability-evaluation-inhibit	Yes	Boolean		Indicates whether the EEO will monitor for reliability conditions.
status-flags		Bit string	In alarm = 0, fault = 0, overridden =0, out of service =0	A four-position bit string that indicates the status of the object. If a status bit =1, that status is TRUE.

Properties of file objects

Table 18 File object properties.

Property	Write	Type	Example	Remarks
Archive	Yes	Boolean	FALSE	Indicates whether the file has been saved for backup.
Description		Character string	ROC FILE	A description assigned to describe the object's function.
File-Access-Method		Enumerated	stream access	
File-Size		Unsigned	983040	The size of the file, in bytes.
File-Type		Character string	BIN	Also DDC.
Modification-Date		Time	Monday, 07/31/20; 10:22:20:00a	The date and time the file was last modified.
Object-Identifier		BACnet_ Object_ Identifier	**file** 0	This property consists of the object-type property and the object instance, which is a numeric code that identifies the object of interest.
Object-Name		Character string	**File** 0	
Object-Type		Enumerated	file	
property-list		Array[n] of BACnet Property Identifiers		Lists all supported properties (minus object-identifier, object-name, object-type and property-list properties). Applies to all object types.
Read-Only		Boolean	FALSE	Indicates whether the file can be written to by BACnet services.

Properties of notification class objects

Table 19 Notification class object properties.

Property	Write	Type	Example	Remarks
Ack-required	Yes	Bit string	To offnormal = 1, to fault = 1, to normal = 1	Indicates whether an acknowledgment is required for event transitions. A 1 indicates that acknowledgment is required. Set up at the operator workstation.
Description	Yes	Character string	Alarm Handler	An editable description of the object's location or function.
Notification-class		Unsigned	1	Echoes the object instance.
Object-Identifier		BACnet_ Object_ Identifier	**Notification-class** 1	This property consists of the object-type property and the object instance, which is a numeric code that identifies the object of interest.
Object-Name	Yes	Character string	Alarm Handler 1	
Object-Type		Enumerated	Notification-class	
property-list		Array[n] of BACnet Property Identifiers		Lists all supported properties (minus object-identifier, object-name, object-type and property-list properties). Applies to all object types.
priority	Yes	Array of Unsigned		Indicates the priority to be used for event notifications for TO-OFFNORMAL, TO-FAULT, and TO-NORMAL events, respectively.

Table 19 Notification class object properties.

Property	Write	Type	Example	Remarks
Recipient-list	Yes	List	<List of BACnet Destination>	Lists the devices that will receive notification when the notification class transitions. Set up at the operator workstation.

Properties of program objects

Table 20 Program object properties.

Property	Write	Type	Example	Remarks
Description		Character string	Application program	A description assigned to describe the object's function.
Description-Of-Halt		Character string	illegal DDC function	
Instance-Of		Character string	alerton hq alerACM-GC 0*00000000*	Header information for the file. Program 0 does not support this property.
Object-Identifier		BACnet_ Object_ Identifier	**program** 1024	This property consists of the object-type property and the object instance, which is a numeric code that identifies the object of interest.
Object-Name		Character string	**Program Object** 1024	
Object-Type		Enumerated	Program	
Out-Of-Service		Boolean	FALSE	
Program-Change	Yes	Enumerated	READY	Used to command the program state. A program can be stopped using the HALT command, for example, and started again with RESTART.
Program-Location		Character string	Sequence 1560	Set when program stops.
Program-State		Enumerated	RUNNING	Possible states include RUNNING, IDLE, HALTED.
property-list		Array[n] of BACnet Property Identifiers		Lists all supported properties (minus object-identifier, object-name, object-type and property-list properties). Applies to all object types.
Reason-For-Halt		Enumerated	INTERNAL	
Status-Flags		Bit string	In alarm = 0, fault = 0, overridden = 0, out of service = 0	A four-position bit string that indicates the status of the object. If a status bit =1, that status is TRUE.

Properties of schedule objects

Table 21 Schedule object properties.

Property	Write	Type	Example	Remarks
Description	Yes	Character string	Weekend Gym	A description assigned to describe the object's function.

Table 21 Schedule object properties.

Property	Write	Type	Example	Remarks
Effective-Period	Yes	Sequence	<BACnet DateRange>	Indicates the date range between which the schedule will be effective and will command its referenced properties. Assigned in schedule setup at operator workstation.
Exception-Schedule	Yes	Sequence	<Array of BACnet Special Event>	Indicates an exception to the normal weekly-schedule property, and overrides the weekly-schedule property with the defined exception. Assigned in schedule setup at operator workstation.
List-Of-Object-Property-References	Yes	List	<List of BACnet Object Property Reference>	The list of objects that this schedule commands.
Object-Identifier		BACnet_ Object_ Identifier	**schedule** 0	This property consists of the object-type property and the object instance, which is a numeric code that identifies the object of interest.
Object-Name	Yes	Character string	schedule 000	Assigned in schedule setup at operator workstation.
Object-Type		Enumerated	schedule	
out-of-service		Boolean	FALSE	
Present-Value			ACTIVE	Indicates the value most recently written to a referenced object property. May be analog, binary, or other, depending on the controlled property. Tracks schedule.
Priority-For-Writing	Yes	Unsigned	16	Indicates the priority the schedule will write to when writing to objects with a Priority-Array property. Assigned in schedule setup at operator workstation.
property-list		Array[n] of BACnet Property Identifiers		Lists all supported properties (minus object-identifier, object-name, object-type and property-list properties). Applies to all object types.
reliability		Enumerated		Enumerated value indicating whether Schedule is setup correctly. For example, can indicate "configuration error" if Schedule is mis-configured.
schedule-default	Yes			Indicates the value the present-value property will be set to if no weekly-schedule property or exception-schedule property is defined for the time period. NOTE: Schedule is set to default at midnight each day if nothing is scheduled for 12:00:00.00am.
Status-Flags		Bit string	In alarm = 0, fault = 0, overridden = 0, out of service = 0	A four-position bit string that indicates the status of the object. If a status bit =1, that status is TRUE.
Weekly-Schedule	Yes	Sequence	<Array of BACnetDailySchedule>	Indicates what the normal schedule will do on each of the weekdays. Assigned in schedule setup at operator workstation.

Appendix D: ACM diagnostic AVs and BVs

The present-value property of the diagnostic AVs and BVs listed are reserved to provide operating information about the ACM. You can reference these present values on data displays or in DDC to assist in troubleshooting and fault detection.

ACM-specific Diagnostic Templates are included in the Compass Alerton/Standard library and the latest versions are available for download from the Ascent site at **http://ascent.alerton.com/**

Table 22 Diagnostic AVs and BVs.

Point		Name Property	Description Property	Pres Val	Units (NOT BACnet)	Clearable
Misc. Global Items						
AV	100000	System Reboot Count				YES
AV	100004	Program restart count				YES
AV	100005	Slot Event Log	Last 50 lines of fault log for this slot			
AV	100006	System Log	Last 50 lines of system log			
AV	100007	Firmware Update Log	Last 50 lines of firmware download activity			
AV	100008	Slot Startup Error Report				
AV	100010	Free Memory			Bytes	
AV	100011	ACM Program Slot				
Battery and Power						
BV	100016	Battery Present				
BV	100017	Battery Charging				
BV	100018	Run From Battery Enabled				
AV	100014	AC Supply Voltage			Volts	
AV	100015	Battery Voltage			Volts	
AV	100016	Battery Temp (C)			Deg C	
AV	100017	Battery Temp (F)			Deg F	
AV	100018	Battery Impedance			Ohms	
IP Status						
AV	100020	Configured Hostname	text here			
AV	100021	Current Hostname	text here			
AV	100022	/etc/hosts	text here			
AV	100023	/etc/resolv.conf	text here			
AV	100025	route info	text here			
DDC Status						

Table 22 Diagnostic AVs and BVs.

Point		Name Property	Description Property	Pres Val	Units (NOT BACnet)	Clearable
AV	100030	DDC State	State in text		0 = DDC not supported 1 = IDLE 2 = Deleting old data 3 = Expanding 4 = Executing	
AV	100031	DDC Read/Exec/Write Time			mS	
AV	100032	DDC Expanded Size			bytes	
AV	100033	DDC Temp RAM Storage			bytes	
AV	100034	DDC Branch Points Used				
AV	100035	DDC Temp Priority Arrays				
AV	100036	DDC Property Access - Total				
AV	100037	DDC Property Access - Reads				
AV	100038	DDC Property Access - Writes				
SD Cards						
AV	100040	SD Card Size			Bytes	
AV	100041	SD Card Est max writes per flash page				
AV	100042	SD Card Est wear leveling overhead			Percent	
AV	100043	SD Card Est lifetime writes				
AV	100044	SD Card Total writes done				
AV	100045	SD Card Est lifetime remaining			Percent	
AV	100046	SD Card Avg # writes over 10 minutes				
AV	100047	SD Card Avg writes/sec over 10 minutes				
AV	100048	SD Card Est life remaining based on 10 min data			Years	
AV	100049	SD Card Avg # writes over 1 hour				
AV	100050	SD Card Avg writes/sec over 1 hour				
AV	100051	SD Card Est life remaining based on hourly data			Years	
AV	100052	SD Card Avg # writes over 1 day				

Table 22 Diagnostic AVs and BVs.

Point		Name Property	Description Property	Pres Val	Units (NOT BACnet)	Clearable
AV	100053	SD Card Avg writes/sec over 1 day				
AV	100054	SD Card Est life remaining based on daily data			Years	
AV	100055	SD Card Avg # writes over 30 days				
AV	100056	SD Card Avg writes/sec over 30 days				
AV	100057	SD Card Est life remaining based on monthly data			Years	
AV	100058	Host ID	ACM-nnnnnn-nnnnnn-nnnnnn-nnnnnn			
Property Requesting						
AV	100060	Property reqs/sec (not incl. special MS/TP reqs)				
AV	100061	Property cycle time (not incl. special MS/TP reqs)			sec	
AV	100065	Total BACnet/IP Packets Dropped (all ports)				
Licensing Stats						
AV	100070	Directly Connected Alerton-Managed Devices Allowed				
AV	100071	Directly Connected Alerton-Managed Devices Detected				
BV	100071	Directly Connected Alerton-Managed Device Limit Exceeded				
AV	100072	Directly Connected Alerton-Managed Device Limit Grace Timer				
BV	100072	Directly Connected Alerton-Managed Device Limit Warning				
AV	100073	Total number of licensed Tridium features				
BV	100073	License Error				
AV	100074	Licensed Alerton features	Shows Alerton features and properties	Number of Alerton features		
AV	100075	Total number of licensed features from other vendors				
Versions						
AV	100080	Boot loader version	Example: 2013.04-ACM-1.0.10			

Table 22 Diagnostic AVs and BVs.

Point		Name Property	Description Property	Pres Val	Units (NOT BACnet)	Clearable
AV	100081	Maintenance image version	Example: 1.0.7			
AV	100082	Normal image (ROC) version	Example: 1.0.29			
AV	100083	NRE Version	Example: 3.8.37.1			
AV	100084	JRE Version	Example: 1.0.7.45			
AV	100085	Reset to factory defaults normal image (ROC) version	Example: 1.0.29			
AV	100086	Reset to factory defaults NRE version	Example: 3.8.37.1			
AV	100087	Reset to factory defaults JRE version	Example: 1.0.7.45			
AV	100088	Product serial number	Example: 1344J001			
AV	100089	Base OS Version	Text here			
ETH0 Stats						
AV	100100	eth0 Enabled				
AV	100101	eth0 Speed			Mbit	
AV	100102	eth0 Duplex	"half" or "full"		0=half, 1=full	
AV	100103	eth0 RX Frames				
AV	100104	eth0 TX Frames				
AV	100105	eth0 RX Bytes				
AV	100106	eth0 TX Bytes				
AV	100107	eth0 RX Errors				
AV	100108	eth0 TX Errors				
AV	100109	eth0 RX Dropped				
AV	100110	eth0 TX Dropped				
AV	100111	eth0 Collisions				
AV	100112	eth0 MAC	A:B:C:D:E:F	A		
AV	100113	eth0 MAC		B		
AV	100114	eth0 MAC		C		
AV	100115	eth0 MAC		D		
AV	100116	eth0 MAC		E		
AV	100117	eth0 MAC		F		
AV	100119	eth0 DHCP Enabled				
AV	100120	eth0 IP Address	A.B.C.D	A		
AV	100121	eth0 IP Address		B		

Table 22 Diagnostic AVs and BVs.

Point		Name Property	Description Property	Pres Val	Units (NOT BACnet)	Clearable
AV	100122	eth0 IP Address		C		
AV	100123	eth0 IP Address		D		
AV	100124	eth0 Net Mask	A.B.C.D	A		
AV	100125	eth0 Net Mask		B		
AV	100126	eth0 Net Mask		C		
AV	100127	eth0 Net Mask		D		
AV	100128	eth0 Default Gateway	A.B.C.D	A		
AV	100129	eth0 Default Gateway		B		
AV	100130	eth0 Default Gateway		C		
AV	100131	eth0 Default Gateway		D		
AV	100132	eth0 DNS Server	A.B.C.D	A		
AV	100133	eth0 DNS Server		B		
AV	100134	eth0 DNS Server		C		
AV	100135	eth0 DNS Server		D		
AV	100136	eth0 DNS Server 2	A.B.C.D	A		
AV	100137	eth0 DNS Server 2		B		
AV	100138	eth0 DNS Server 2		C		
AV	100139	eth0 DNS Server 2		D		
AV	100140	eth0 DHCP Info Received	text here			
ETH1 Stats						
AV	100200	eth1 Enabled				
AV	100201	eth1 Speed			Mbit	
AV	100202	eth1 Duplex	"half" or "full"		0=half, 1=full	
AV	100203	eth1 RX Frames				
AV	100204	eth1 TX Frames				
AV	100205	eth1 RX Bytes				
AV	100206	eth1 TX Bytes				
AV	100207	eth1 RX Errors				
AV	100208	eth1 TX Errors				
AV	100209	eth1 RX Dropped				
AV	100210	eth1 TX Dropped				
AV	100211	eth1 Collisions				
AV	100212	eth1 MAC	A:B:C:D:E:F	A		

Table 22 Diagnostic AVs and BVs.

Point		Name Property	Description Property	Pres Val	Units (NOT BACnet)	Clearable
AV	100213	eth1 MAC		B		
AV	100214	eth1 MAC		C		
AV	100215	eth1 MAC		D		
AV	100216	eth1 MAC		E		
AV	100217	eth1 MAC		F		
AV	100219	eth1 DHCP Enabled				
AV	100220	eth1 IP Address	A.B.C.D	A		
AV	100221	eth1 IP Address		B		
AV	100222	eth1 IP Address		C		
AV	100223	eth1 IP Address		D		
AV	100224	eth1 Net Mask	A.B.C.D	A		
AV	100225	eth1 Net Mask		B		
AV	100226	eth1 Net Mask		C		
AV	100227	eth1 Net Mask		D		
AV	100228	eth1 Default Gateway	A.B.C.D	A		
AV	100229	eth1 Default Gateway		B		
AV	100230	eth1 Default Gateway		C		
AV	100231	eth1 Default Gateway		D		
AV	100232	eth1 DNS Server	A.B.C.D	A		
AV	100233	eth1 DNS Server		B		
AV	100234	eth1 DNS Server		C		
AV	100235	eth1 DNS Server		D		
AV	100236	eth1 DNS Server 2	A.B.C.D	A		
AV	100237	eth1 DNS Server 2		B		
AV	100238	eth1 DNS Server 2		C		
AV	100239	eth1 DNS Server 2		D		
AV	100240	eth1 DHCP Info Received	text here			
BACnet/Ethernet						
BV	100300	eth0 BAC/Eth Enabled				
AV	100301	eth0 BAC/Eth Network #				
AV	100302	eth0 BAC/Eth BACnet Port ID				
AV	100303	eth0 BAC/Eth Frames Received				

Table 22 Diagnostic AVs and BVs.

Point		Name Property	Description Property	Pres Val	Units (NOT BACnet)	Clearable
AV	100304	eth0 BAC/Eth Frames Transmitted				
AV	100305	eth0 BAC/Eth Bytes Received				
AV	100306	eth0 BAC/Eth Bytes Transmitted				
AV	100307	eth0 BAC/Eth Dropped Packets				
BV	100350	eth1 BAC/Eth Enabled				
AV	100351	eth1 BAC/Eth Network #				
AV	100352	eth1 BAC/Eth BACnet Port ID				
AV	100353	eth1 BAC/Eth Frames Received				
AV	100354	eth1 BAC/Eth Frames Transmitted				
AV	100355	eth1 BAC/Eth Bytes Received				
AV	100356	eth1 BAC/Eth Bytes Transmitted				
AV	100357	eth1 BAC/Eth Dropped Packets				
MS/TP Instance 0						
AV	100400	MS/TP 0 Enabled				
AV	100401	MS/TP 0 COM port	COMn	n		
AV	100402	MS/TP 0 BACnet Network #				
AV	100403	MS/TP 0 MAC Address				
AV	100404	MS/TP 0 Baud				
AV	100405	MS/TP 0 RX Frames				
AV	100406	MS/TP 0 TX Frames				
AV	100407	MS/TP 0 RX Bytes				
AV	100408	MS/TP 0 TX Bytes				
AV	100409	MS/TP 0 RX Errors				
AV	100410	MS/TP 0 RX Dropped				
AV	100411	MS/TP 0 Directly Connected Devices				
AV	100412	MS/TP 0 Fast Reqs				
AV	100413	MS/TP 0 Fast Reqs/Sec			prop/sec	

Table 22 Diagnostic AVs and BVs.

Point		Name Property	Description Property	Pres Val	Units (NOT BACnet)	Clearable
AV	100414	MS/TP 0 Fast Cycle Time			sec	
AV	100415	MS/TP 0 BACnet Port ID				
AV	100416	MS/TP 0 TX Data Rate			bytes/sec	
AV	100417	MS/TP 0 TX Queue Delay			mS	
AV	100418	MS/TP 0 TX expire time			mS	
AV	100419	MS/TP 0 TX Dropped				
AV	100420	MS/TP 0 Token Pass Interval			mS	
MS/TP Instance 1						
AV	100500	MS/TP 1 Enabled				
AV	100501	MS/TP 1 COM port	COMn	n		
AV	100502	MS/TP 1 BACnet Network #				
AV	100503	MS/TP 1 MAC Address				
AV	100504	MS/TP 1 Baud				
AV	100505	MS/TP 1 RX Frames				
AV	100506	MS/TP 1 TX Frames				
AV	100507	MS/TP 1 RX Bytes				
AV	100508	MS/TP 1 TX Bytes				
AV	100509	MS/TP 1 RX Errors				
AV	100510	MS/TP 1 RX Dropped				
AV	100511	MS/TP 1 Directly Connected Devices				
AV	100512	MS/TP 1 Fast Reqs				
AV	100513	MS/TP 1 Fast Reqs/Sec			prop/sec	
AV	100514	MS/TP 1 Fast Cycle Time			sec	
AV	100515	MS/TP 1 BACnet Port ID				
AV	100516	MS/TP 1 TX Data Rate			bytes/sec	
AV	100517	MS/TP 1 TX Queue Delay			mS	
AV	100518	MS/TP 1 TX expire time			mS	
AV	100519	MS/TP 1 TX Dropped				
AV	100520	MS/TP 1 Token Pass Interval			mS	
MS/TP Instance 2						
AV	100600	MS/TP 2 Enabled				
AV	100601	MS/TP 2 COM port	COMn	n		
AV	100602	MS/TP 2 BACnet Network #				

Table 22 Diagnostic AVs and BVs.

Point		Name Property	Description Property	Pres Val	Units (NOT BACnet)	Clearable
AV	100603	MS/TP 2 MAC Address				
AV	100604	MS/TP 2 Baud				
AV	100605	MS/TP 2 RX Frames				
AV	100606	MS/TP 2 TX Frames				
AV	100607	MS/TP 2 RX Bytes				
AV	100608	MS/TP 2 TX Bytes				
AV	100609	MS/TP 2 RX Errors				
AV	100610	MS/TP 2 RX Dropped				
AV	100611	MS/TP 2 Directly Connected Devices				
AV	100612	MS/TP 2 Fast Reqs				
AV	100613	MS/TP 2 Fast Reqs/Sec			prop/sec	
AV	100614	MS/TP 2 Fast Cycle Time			sec	
AV	100615	MS/TP 2 BACnet Port ID				
AV	100616	MS/TP 2 TX Data Rate			bytes/sec	
AV	100617	MS/TP 2 TX Queue Delay			mS	
AV	100618	MS/TP 2 TX expire time			mS	
AV	100619	MS/TP 2 TX Dropped				
AV	100620	MS/TP 2 Token Pass Interval			mS	
MS/TP Instance 3						
AV	100700	MS/TP 3 Enabled				
AV	100701	MS/TP 3 COM port	COMn	n		
AV	100702	MS/TP 3 BACnet Network #				
AV	100703	MS/TP 3 MAC Address				
AV	100704	MS/TP 3 Baud				
AV	100705	MS/TP 3 RX Frames				
AV	100706	MS/TP 3 TX Frames				
AV	100707	MS/TP 3 RX Bytes				
AV	100708	MS/TP 3 TX Bytes				
AV	100709	MS/TP 3 RX Errors				
AV	100710	MS/TP 3 RX Dropped				
AV	100711	MS/TP 3 Directly Connected Devices				
AV	100712	MS/TP 3 Fast Reqs				

Table 22 Diagnostic AVs and BVs.

Point		Name Property	Description Property	Pres Val	Units (NOT BACnet)	Clearable
AV	100713	MS/TP 3 Fast Reqs/Sec			prop/sec	
AV	100714	MS/TP 3 Fast Cycle Time			sec	
AV	100715	MS/TP 3 BACnet Port ID				
AV	100716	MS/TP 3 TX Data Rate			bytes/sec	
AV	100717	MS/TP 3 TX Queue Delay			mS	
AV	100718	MS/TP 3 TX expire time			mS	
AV	100719	MS/TP 3 TX Dropped				
AV	100720	MS/TP 3 Token Pass Interval			mS	
MS/TP Instance 4						
AV	100800	MS/TP 4 Enabled				
AV	100801	MS/TP 4 COM port	COMn	n		
AV	100802	MS/TP 4 BACnet Network #				
AV	100803	MS/TP 4 MAC Address				
AV	100804	MS/TP 4 Baud				
AV	100805	MS/TP 4 RX Frames				
AV	100806	MS/TP 4 TX Frames				
AV	100807	MS/TP 4 RX Bytes				
AV	100808	MS/TP 4 TX Bytes				
AV	100809	MS/TP 4 RX Errors				
AV	100810	MS/TP 4 RX Dropped				
AV	100811	MS/TP 4 Directly Connected Devices				
AV	100812	MS/TP 4 Fast Reqs				
AV	100813	MS/TP 4 Fast Reqs/Sec			prop/sec	
AV	100814	MS/TP 4 Fast Cycle Time			sec	
AV	100815	MS/TP 4 BACnet Port ID				
AV	100816	MS/TP 4 TX Data Rate			bytes/sec	
AV	100817	MS/TP 4 TX Queue Delay			mS	
AV	100818	MS/TP 4 TX expire time			mS	
AV	100819	MS/TP 4 TX Dropped				
AV	100820	MS/TP 4 Token Pass Interval			mS	
MS/TP Instance 5						
AV	100900	MS/TP 5 Enabled				
AV	100901	MS/TP 5 COM port	COMn	n		

Table 22 Diagnostic AVs and BVs.

Point		Name Property	Description Property	Pres Val	Units (NOT BACnet)	Clearable
AV	100902	MS/TP 5 BACnet Network #				
AV	100903	MS/TP 5 MAC Address				
AV	100904	MS/TP 5 Baud				
AV	100905	MS/TP 5 RX Frames				
AV	100906	MS/TP 5 TX Frames				
AV	100907	MS/TP 5 RX Bytes				
AV	100908	MS/TP 5 TX Bytes				
AV	100909	MS/TP 5 RX Errors				
AV	100910	MS/TP 5 RX Dropped				
AV	100911	MS/TP 5 Directly Connected Devices				
AV	100912	MS/TP 5 Fast Reqs				
AV	100913	MS/TP 5 Fast Reqs/Sec			prop/sec	
AV	100914	MS/TP 5 Fast Cycle Time			sec	
AV	100915	MS/TP 5 BACnet Port ID				
AV	100916	MS/TP 5 TX Data Rate			bytes/sec	
AV	100917	MS/TP 5 TX Queue Delay			mS	
AV	100918	MS/TP 5 TX expire time			mS	
AV	100919	MS/TP 5 TX Dropped				
AV	100920	MS/TP 5 Token Pass Interval			mS	
BACnet/IP Overview						
Virt BAC/IP						
BV	101000	Virt BAC/IP Enabled				
BV	101001	Virt BAC/IP BBMD Enabled				
BV	101002	Virt BAC/IP Local Broadcasts Disabled				
BV	101003	Virt BAC/IP Adapter Open				
BV	101004	Virt BAC/IP Registered With Foreign Device				
AV	101000	Virt BAC/IP Network Number				
AV	101001	Virt BAC/IP Mode	"normal", "foreign device"		0=normal, 1=foreign device	
AV	101002	Virt BAC/IP Adapter	eth<n>			
AV	101003	Virt BAC/IP UDP Port	0xnnnn	n		
AV	101004	Virt BAC/IP Foreign BBMD Address	0.0.0.0	0		

Table 22 Diagnostic AVs and BVs.

Point		Name Property	Description Property	Pres Val	Units (NOT BACnet)	Clearable
AV	101005	Virt BAC/IP Foreign BBMD Address		0		
AV	101006	Virt BAC/IP Foreign BBMD Address		0		
AV	101007	Virt BAC/IP Foreign BBMD Address		0		
AV	101008	Virt BAC/IP Foreign BBMD UDP Port	0xnnnn	n		
AV	101009	Virt BAC/IP Foreign BBMD Re-registration Interval			seconds	
AV	101010	Virt BAC/IP NAT Mode	none		0 = none 1 = standard 2 = Alerton	
AV	101011	Virt BAC/IP NAT UDP Port	0xnnnn	n		
AV	101012	Virt BAC/IP NAT IP Address A	A.B.C.D	A		
AV	101013	Virt BAC/IP NAT IP Address B		B		
AV	101014	Virt BAC/IP NAT IP Address C		C		
AV	101015	Virt BAC/IP NAT IP Address D		D		
AV	101016	Virt BAC/IP IP Address A	A.B.C.D	A		
AV	101017	Virt BAC/IP IP Address B		B		
AV	101018	Virt BAC/IP IP Address C		C		
AV	101019	Virt BAC/IP IP Address D		D		
AV	101020	Virt BAC/IP Netmask A	A.B.C.D	A		
AV	101021	Virt BAC/IP Netmask B		B		
AV	101022	Virt BAC/IP Netmask C		C		
AV	101023	Virt BAC/IP Netmask D		D		
AV	101024	Virt BAC/IP Frames Received				
AV	101025	Virt BAC/IP Frames Transmitted				
AV	101026	Virt BAC/IP Bytes Received				
AV	101027	Virt BAC/IP Bytes Transmitted				
AV	101028	Virt BAC/IP Dropped Packets				
AV	101029	Virt BAC/IP BDT Entries	<empty>			

Table 22 Diagnostic AVs and BVs.

Point		Name Property	Description Property	Pres Val	Units (NOT BACnet)	Clearable
AV	101030	Virt BAC/IP FDT Entries	multi-line output			
AV	101031	Virt BAC/IP BACnet Port ID				
BAC/IP 0						
BV	101100	BAC/IP 0 Enabled				
BV	101101	BAC/IP 0 BBMD Enabled				
BV	101102	BAC/IP 0 Local Broadcasts Disabled				
BV	101103	BAC/IP 0 Adapter Open				
BV	101104	BAC/IP 0 Registered With Foreign Device				
AV	101100	BAC/IP 0 Network Number				
AV	101101	BAC/IP 0 Mode	"normal", "foreign device"		0=normal, 1=foreign device	
AV	101102	BAC/IP 0 Adapter	eth<n>			
AV	101103	BAC/IP 0 UDP Port	0xnnnn	n		
AV	101104	BAC/IP 0 Foreign BBMD Address	A.B.C.D	A		
AV	101105	BAC/IP 0 Foreign BBMD Address		B		
AV	101106	BAC/IP 0 Foreign BBMD Address		C		
AV	101107	BAC/IP 0 Foreign BBMD Address		D		
AV	101108	BAC/IP 0 Foreign BBMD UDP Port	0xnnnn			
AV	101109	BAC/IP 0 Foreign BBMD Re-registration Interval			seconds	
AV	101110	BAC/IP 0 NAT Mode	none		0 = none 1 = standard 2 = Alerton	
AV	101111	BAC/IP 0 NAT UDP Port	0xnnnn			
AV	101112	BAC/IP 0 NAT IP Address A	A.B.C.D	A		
AV	101113	BAC/IP 0 NAT IP Address B		B		
AV	101114	BAC/IP 0 NAT IP Address C		C		
AV	101115	BAC/IP 0 NAT IP Address D		D		
AV	101116	BAC/IP 0 IP Address A	A.B.C.D	A		
AV	101117	BAC/IP 0 IP Address B		B		
AV	101118	BAC/IP 0 IP Address C		C		

Table 22 Diagnostic AVs and BVs.

Point		Name Property	Description Property	Pres Val	Units (NOT BACnet)	Clearable
AV	101119	BAC/IP 0 IP Address D		D		
AV	101120	BAC/IP 0 Netmask A	A.B.C.D	A		
AV	101121	BAC/IP 0 Netmask B		B		
AV	101122	BAC/IP 0 Netmask C		C		
AV	101123	BAC/IP 0 Netmask D		D		
AV	101124	BAC/IP 0 Frames Received				
AV	101125	BAC/IP 0 Frames Transmitted				
AV	101126	BAC/IP 0 Bytes Received				
AV	101127	BAC/IP 0 Bytes Transmitted				
AV	101128	BAC/IP 0 Dropped Packets				
AV	101129	BAC/IP 0 BDT Entries	multi-line output			
AV	101130	BAC/IP 0 FDT Entries	multi-line output			
AV	101131	BAC/IP 0 BACnet Port ID				
BAC/IP 1						
BV	101200	BAC/IP 1 Enabled				
BV	101201	BAC/IP 1 BBMD Enabled				
BV	101202	BAC/IP 1 Local Broadcasts Disabled				
BV	101203	BAC/IP 1 Adapter Open				
BV	101204	BAC/IP 1 Registered With Foreign Device				
AV	101200	BAC/IP 1 Network Number				
AV	101201	BAC/IP 1 Mode	"normal", "foreign device"		0=normal, 1=foreign device	
AV	101202	BAC/IP 1 Adapter	eth<n>			
AV	101203	BAC/IP 1 UDP Port	0xnnnn	n		
AV	101204	BAC/IP 1 Foreign BBMD Address	A.B.C.D	A		
AV	101205	BAC/IP 1 Foreign BBMD Address		B		
AV	101206	BAC/IP 1 Foreign BBMD Address		C		
AV	101207	BAC/IP 1 Foreign BBMD Address		D		
AV	101208	BAC/IP 1 Foreign BBMD UDP Port	0xnnnn	n		

Table 22 Diagnostic AVs and BVs.

Point		Name Property	Description Property	Pres Val	Units (NOT BACnet)	Clearable
AV	101209	BAC/IP 1 Foreign BBMD Re-registration Interval			seconds	
AV	101210	BAC/IP 1 NAT Mode	none		0 = none 1 = standard 2 = Alerton	
AV	101211	BAC/IP 1 NAT UDP Port	0xnnnn	n		
AV	101212	BAC/IP 1 NAT IP Address A	A.B.C.D	A		
AV	101213	BAC/IP 1 NAT IP Address B		B		
AV	101214	BAC/IP 1 NAT IP Address C		C		
AV	101215	BAC/IP 1 NAT IP Address D		D		
AV	101216	BAC/IP 1 IP Address A	A.B.C.D	A		
AV	101217	BAC/IP 1 IP Address B		B		
AV	101218	BAC/IP 1 IP Address C		C		
AV	101219	BAC/IP 1 IP Address D		D		
AV	101220	BAC/IP 1 Netmask A	A.B.C.D	A		
AV	101221	BAC/IP 1 Netmask B		B		
AV	101222	BAC/IP 1 Netmask C		C		
AV	101223	BAC/IP 1 Netmask D		D		
AV	101224	BAC/IP 1 Frames Received				
AV	101225	BAC/IP 1 Frames Transmitted				
AV	101226	BAC/IP 1 Bytes Received				
AV	101227	BAC/IP 1 Bytes Transmitted				
AV	101228	BAC/IP 1 Dropped Packets				
AV	101229	BAC/IP 1 BDT Entries	multi-line output			
AV	101230	BAC/IP 1 FDT Entries	multi-line output			
AV	101231	BAC/IP 1 BACnet Port ID				
BAC/IP 2						
BV	101300	BAC/IP 2 Enabled				
BV	101301	BAC/IP 2 BBMD Enabled				
BV	101302	BAC/IP 2 Local Broadcasts Disabled				
BV	101303	BAC/IP 2 Adapter Open				
BV	101304	BAC/IP 2 Registered With Foreign Device				
AV	101300	BAC/IP 2 Network Number				

Table 22 Diagnostic AVs and BVs.

Point		Name Property	Description Property	Pres Val	Units (NOT BACnet)	Clearable
AV	101301	BAC/IP 2 Mode	"normal", "foreign device"		0=normal, 1=foreign device	
AV	101302	BAC/IP 2 Adapter	eth<n>			
AV	101303	BAC/IP 2 UDP Port	0xnnnn	n		
AV	101304	BAC/IP 2 Foreign BBMD Address	A.B.C.D	A		
AV	101305	BAC/IP 2 Foreign BBMD Address		B		
AV	101306	BAC/IP 2 Foreign BBMD Address		C		
AV	101307	BAC/IP 2 Foreign BBMD Address		D		
AV	101308	BAC/IP 2 Foreign BBMD UDP Port	0xnnnn	n		
AV	101309	BAC/IP 2 Foreign BBMD Re-registration Interval			seconds	
AV	101310	BAC/IP 2 NAT Mode	none		0 = none 1 = standard 2 = Alerton	
AV	101311	BAC/IP 2 NAT UDP Port	0xnnnn	n		
AV	101312	BAC/IP 2 NAT IP Address A	A.B.C.D	A		
AV	101313	BAC/IP 2 NAT IP Address B		B		
AV	101314	BAC/IP 2 NAT IP Address C		C		
AV	101315	BAC/IP 2 NAT IP Address D		D		
AV	101316	BAC/IP 2 IP Address A	A.B.C.D	A		
AV	101317	BAC/IP 2 IP Address B		B		
AV	101318	BAC/IP 2 IP Address C		C		
AV	101319	BAC/IP 2 IP Address D		D		
AV	101320	BAC/IP 2 Netmask A	A.B.C.D	A		
AV	101321	BAC/IP 2 Netmask B		B		
AV	101322	BAC/IP 2 Netmask C		C		
AV	101323	BAC/IP 2 Netmask D		D		
AV	101324	BAC/IP 2 Frames Received				
AV	101325	BAC/IP 2 Frames Transmitted				
AV	101326	BAC/IP 2 Bytes Received				
AV	101327	BAC/IP 2 Bytes Transmitted				
AV	101328	BAC/IP 2 Dropped Packets				

Table 22 Diagnostic AVs and BVs.

Point		Name Property	Description Property	Pres Val	Units (NOT BACnet)	Clearable
AV	101329	BAC/IP 2 BDT Entries	multi-line output			
AV	101330	BAC/IP 2 FDT Entries	multi-line output			
AV	101331	BAC/IP 2 BACnet Port ID				
BAC/IP 3						
BV	101400	BAC/IP 3 Enabled				
BV	101401	BAC/IP 3 BBMD Enabled				
BV	101402	BAC/IP 3 Local Broadcasts Disabled				
BV	101403	BAC/IP 3 Adapter Open				
BV	101404	BAC/IP 3 Registered With Foreign Device				
AV	101400	BAC/IP 3 Network Number				
AV	101401	BAC/IP 3 Mode	"normal", "foreign device"		0=normal, 1=foreign device	
AV	101402	BAC/IP 3 Adapter	eth<n>			
AV	101403	BAC/IP 3 UDP Port	0xnnnn	n		
AV	101404	BAC/IP 3 Foreign BBMD Address	A.B.C.D	A		
AV	101405	BAC/IP 3 Foreign BBMD Address		B		
AV	101406	BAC/IP 3 Foreign BBMD Address		C		
AV	101407	BAC/IP 3 Foreign BBMD Address		D		
AV	101408	BAC/IP 3 Foreign BBMD UDP Port	0xnnnn	n		
AV	101409	BAC/IP 3 Foreign BBMD Re-registration Interval			seconds	
AV	101410	BAC/IP 3 NAT Mode	none		0 = none 1 = standard 2 = Alerton	
AV	101411	BAC/IP 3 NAT UDP Port	0xnnnn	n		
AV	101412	BAC/IP 3 NAT IP Address A	A.B.C.D	A		
AV	101413	BAC/IP 3 NAT IP Address B		B		
AV	101414	BAC/IP 3 NAT IP Address C		C		
AV	101415	BAC/IP 3 NAT IP Address D		D		
AV	101416	BAC/IP 3 IP Address A	A.B.C.D	A		
AV	101417	BAC/IP 3 IP Address B		B		

Table 22 Diagnostic AVs and BVs.

Point		Name Property	Description Property	Pres Val	Units (NOT BACnet)	Clearable
AV	101418	BAC/IP 3 IP Address C		C		
AV	101419	BAC/IP 3 IP Address D		D		
AV	101420	BAC/IP 3 Netmask A	A.B.C.D	A		
AV	101421	BAC/IP 3 Netmask B		B		
AV	101422	BAC/IP 3 Netmask C		C		
AV	101423	BAC/IP 3 Netmask D		D		
AV	101424	BAC/IP 3 Frames Received				
AV	101425	BAC/IP 3 Frames Transmitted				
AV	101426	BAC/IP 3 Bytes Received				
AV	101427	BAC/IP 3 Bytes Transmitted				
AV	101428	BAC/IP 3 Dropped Packets				
AV	101429	BAC/IP 3 BDT Entries	multi-line output			
AV	101430	BAC/IP 3 FDT Entries	multi-line output			
AV	101431	BAC/IP 3 BACnet Port ID				
BACnet Objects						
AV	106006	Calendar Object Count				
AV	106009	Event Enrollment Object Count				
AV	106015	Notification Class Count				
AV	106017	Schedule Object Count				
AV	106020	Trend Log Count				
AV	106204	Alerton Demand Limiter Count				
AV	106205	Alerton Zone Object Count				
AV	106206	Alerton Device Comm Fail Count				
Program Slots Overview						
AV	107000	Slot 0 application type	"Global", "TUX", etc...			
AV	107001	Slot 0 device instance	Device nnnnn			
AV	107002	Slot 0 Home port	"Not homed", "BAC/ Eth 0", etc...	0		
AV	107003	Slot 0 Directly-Connected/ Alerton-Managed Devices				
AV	107010	Slot 1 application type	"None", "Global", "TUX", etc...			

Table 22 Diagnostic AVs and BVs.

Point		Name Property	Description Property	Pres Val	Units (NOT BACnet)	Clearable
AV	107011	Slot 1 device instance	Device nnnnn			
AV	107013	Slot 1 Directly-Connected/ Alerton-Managed Devices				
AV	107020	Slot 2 application type	"None", "Global", "TUX", etc...			
AV	107021	Slot 2 device instance	Device nnnnn			
AV	107023	Slot 2 Directly-Connected/ Alerton-Managed Devices				
AV	107030	Slot 3 application type	"None", "Global", "TUX", etc...			
AV	107031	Slot 3 device instance	Device nnnnn			
AV	107033	Slot 3 Directly-Connected/ Alerton-Managed Devices				
AV	107040	Slot 4 application type	"None", "Global", "TUX", etc...			
AV	107041	Slot 4 device instance	Device nnnnn			
AV	107043	Slot 4 Directly-Connected/ Alerton-Managed Devices				
AV	107050	Slot 5 application type	"None", "Global", "TUX", etc...			
AV	107051	Slot 5 device instance	Device nnnnn			
AV	107053	Slot 5 Directly-Connected/ Alerton-Managed Devices				
Card Slots Overview						
BV	107100	Slot 0 Card Installed				
AV	107100	Slot 0 Port 0 type	"EIA-485", "EIA-232", "TUX", "LON"	type code		
AV	107101	Slot 0 Port 1 type	"EIA-485", "EIA-232", "TUX", "LON"	type code		
BV	107150	Slot 1 Card Installed				
AV	107150	Slot 1 Port 0 type	"EIA-485", "EIA-232", "TUX", "LON"	type code		
AV	107151	Slot 1 Port 1 type	"EIA-485", "EIA-232", "TUX", "LON"	type code		
COM Ports Overview						
AV	107200	COM0 Directly Connected Alerton-Managed Devices				
AV	107201	COM0 Owner / Usage				
AV	107300	COM1 Directly Connected Alerton-Managed Devices				

Table 22 Diagnostic AVs and BVs.

Point		Name Property	Description Property	Pres Val	Units (NOT BACnet)	Clearable
AV	107301	COM1 Owner / Usage				
AV	107400	COM2 Directly Connected Alerton-Managed Devices				
AV	107401	COM2 Owner / Usage				
AV	107500	COM3 Directly Connected Alerton-Managed Devices				
AV	107501	COM3 Owner / Usage				
AV	107600	COM4 Directly Connected Alerton-Managed Devices				
AV	107601	COM4 Owner / Usage				
AV	107700	COM5 Directly Connected Alerton-Managed Devices				
AV	107701	COM5 Owner / Usage				
	120000 - 129000	Reserved for ACM-TUX				
	130000 - 139000	Reserved for ACM-MODBUS				
	140000 - 149000	Reserved for ACM-FPCS				
	150000 - 159000	Reserved for ACM-VLX				

Appendix E: Troubleshooting

ISSUE: All networks shut down.

If you connect more than the maximum number of devices your license supports, then all networks shut down after 10 minutes. As soon at the ACM detects more BACnet devices on its directly connected networks than the license supports (this is the ALERTON license, and not the Niagara license), then a License Limit Warning BV comes on and a 10 minute "grace period" timer starts counting down.

If the number of devices remains over the license limit the timer will count down to zero and the ACM will disable ALL directly connected networks. If the number of devices drops below the license limit during the grace period, a 60sec dead band timer will start. If the number of connected devices remains below the license limit for the dead band period, then the limit warning is cleared, and the grace timer is cleared.

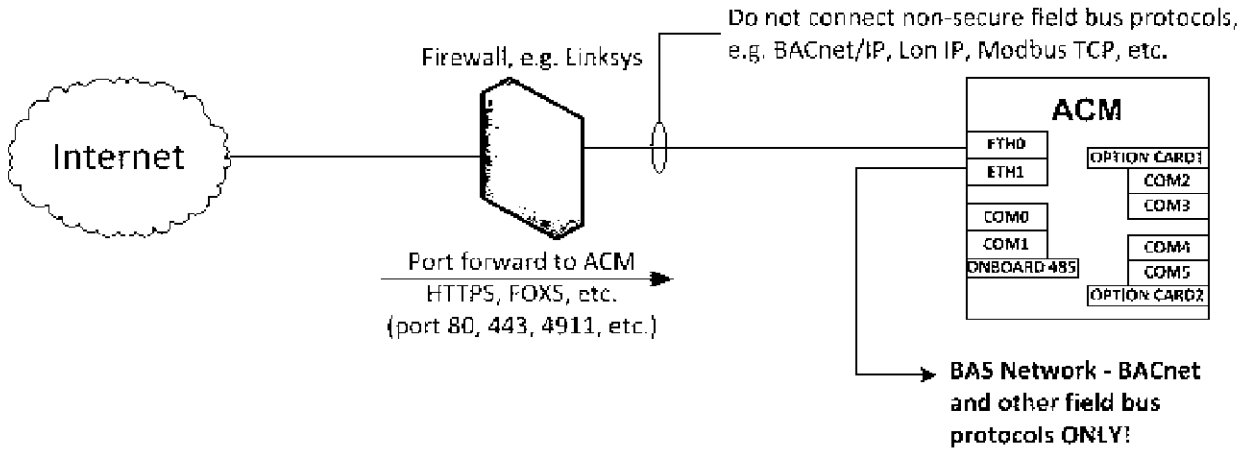
IMPORTANT! If there is less than 60 seconds on the grace period timer when the dead band timer starts, the grace period will expire before the dead band timer, and the networks hosting Alerton devices will be disabled. The ACM must be reset to re-enable the disabled networks.

IMPORTANT! The ACM Time and Date must be current when the ACM starts up for the license to be valid. If it is not current, send a Time Sync and restart the ACM.

Appendix F: ACM Security

Alerton recommends installing ACMs using Implementation 1 below. **DO NOT** install ACMs using Options 3 or 4.

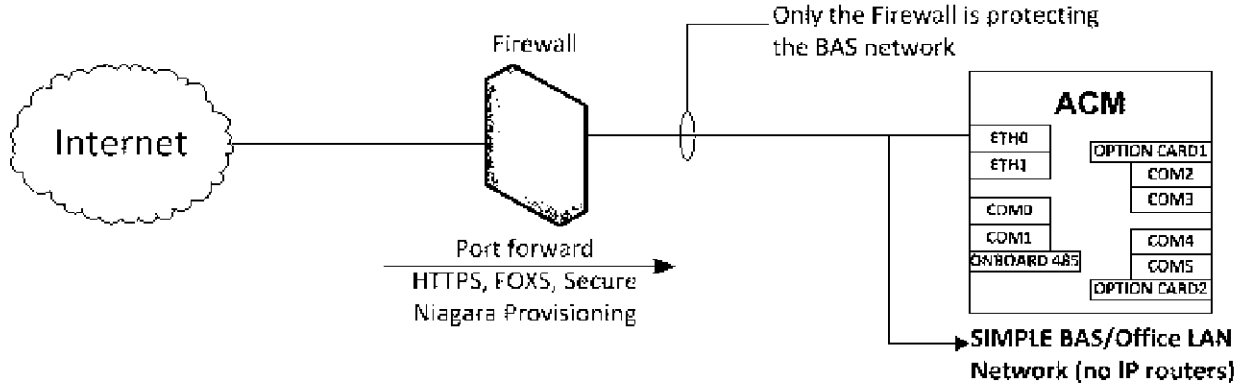
Implementation #1 - Highly Recommended & Preferred



The ACM does not route IP packets. This means the ACM serves as an extra layer of isolation between the firewall and the BAS network. The network segment between ETH0 and the firewall acts like a DMZ.

Implementation #2A - Acceptable...with reservations

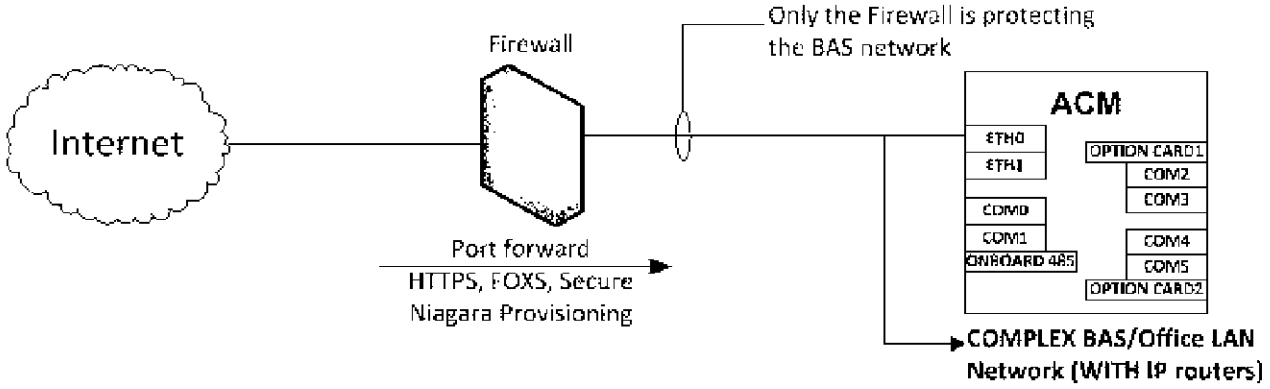
Not the ideal implementation, but if there is no way to segregate the BAS network...What are you going to do?



Due to site-specific considerations, it might not be feasible to do the most preferred installation. Implementation 2A above is not as robust in terms of security, but it is acceptable as a second choice.

Implementation #2B - Acceptable...with reservations

Not the ideal implementation, but if there is no way to segregate the BAS network...What are you going to do?

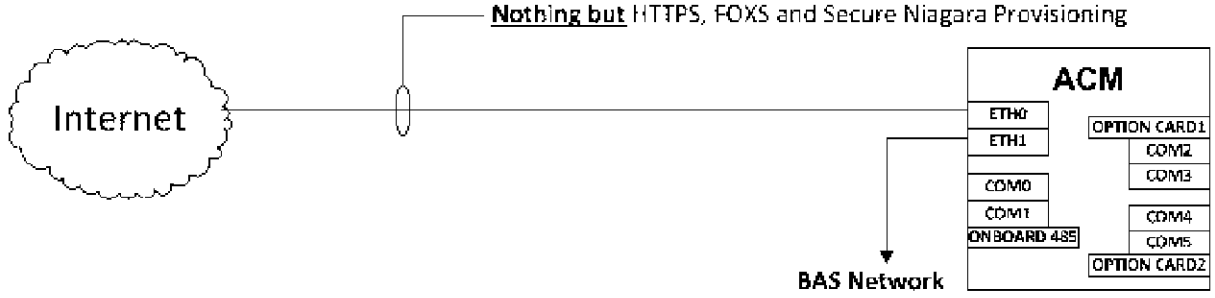


If the building network has IP routers, then ETH1 must be used because it is the only port that supports RIP.

These acceptable installations are less secure than the preferred installation because of the following considerations:

- It may be possible to interact with the BAS protocols through the firewall if a weakness in the firewall exists (or if it is misconfigured). The security of the BAS protocols here depends on the firewall to block all traffic except through the "punched holes" represented by the port forwarding (for example, in the above diagram, HTTPS could be "punched through" to the ACM).
- Because the RIPv1 protocol is enabled on ETH1, it might be possible to discover routing information via the Internet. Doing so would also require exploiting a weakness or misconfiguration in the firewall.

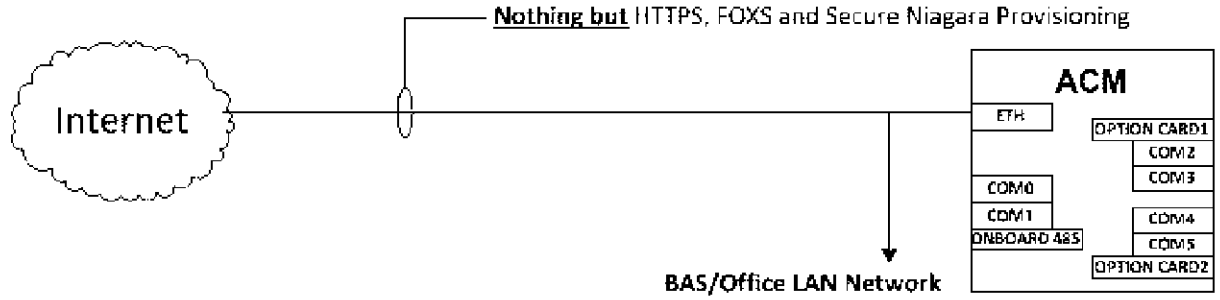
Implementation #3 - Not Acceptable...Implement at Your Own Risk!



Implementation 3 is NOT recommended because the ACM is NOT:

- hardened against denial of service attacks. This may be a secondary consideration for some users.
- tested as a hardened firewall suitable for direct Internet exposure. There are no known issues but this entire installation scenario represents unacceptable risk.

Implementation #4 - Not Acceptable Under Any Circumstances!



NOTE: ETH in this diagram means all ETH ports.

Implementation 4 is unacceptable under all circumstances because BAS protocols (e.g. BACnet/IP) become directly connected to the Internet. These protocols are not secured for public Internet use.

Appendix G: Installing Niagara Distribution Files

IMPORTANT! You need Niagara WorkPlace AX (also known as Niagara WorkPlace) to work with Niagara files.

What are Niagara distribution files?

The Alerton ACM runs two kinds of Niagara distribution files:

acm-nre-x.x.xx.x (.dst) is the Niagara Runtime Environment, which is basically the low-level Niagara system code.

acm-jre-x.x.x.xx (.dst) is the Java Runtime Environment, needed by Niagara.

Do I need the Niagara distribution files?

If you plan on running a Niagara Station in the ACM you should keep up to date with the latest DIST files. If on the other hand, you are not running a Niagara Station, but just using the Alerton side of the ACM for BACnet functionality, then you need a base set of DIST files, but you do not have to update the DIST files every time you update the ROC. Occasionally the Alerton side may implement a new feature that requires a Niagara DIST update to enable the new functionality, but keeping DIST up to date with ROC is not necessary.

Installing the Niagara distribution files

Install the JRE that goes with your NRE version. Once you have downloaded the appropriate JRE, you do not have to download it again. WorkPlace AX saves it and the JRE may be used for your next NRE upgrade. It will not be used for the next NRE upgrade if that NRE version requires the next JRE version.

To install the Niagara distribution files

NOTE This example assumes Niagara WorkPlace AX/Alerton Workplace v3.8.38, JRE 1.7.0.75, and NRE 3.8.38.9.2—substitute versions for your particular needs.

NOTE This installation information is included in the Distribution File Installer in WorkPlace AX Help. See Workplace AX Help for this and more detailed information about working with AX distribution files.

1. Download the ACM Niagara AX files from the ACM product page.
2. Unzip the AX Files to your local machine, and copy the two numbered folders for the JRE and NRE (1.7.0.75 and 3.8.38.9.2) to the software inbox of your Workplace installation (typically **C:\Niagara\Niagara-3.8.38\sw\inbox**).

   Note The folder structure is important, so copy the numbered folders and not the individual files.
3. Run WorkPlace AX.
4. Using WorkPlace AX connect to the ACM Platform.
5. Launch the Distribution File Installer. This will cause Workplace to check the \sw\inbox for any new distribution files and correctly add them to your Workplace AX installation. Workplace only searches the \sw\inbox the first time the Distribition File Installer is launched after Workplace has started. If Workplace has been running, and the Distribution File Installer has previously been used, you will need to restart Workplace to correctly add the distribution files to Workplace.
6. Select the "Choose Directory" option at the bottom of the dialog, and navigate the newly installed NRE file location (typically C:\Niagara\Niagara-3.8.38\sw\3.8.38.9.2).

7. Choose the nre-config-alerton-acm.dist (be sure version says 3.8.38.9.2), and select the Install option from the bottom of the dialog. System will list all dependencies and automatically install them when you follow installation prompts (including updating JRE).
8. Once the installation is complete the controller will automatically restart.
9. Reconnect to the ACM Platform, click Platform Administrator, and then verify that the Niagara Runtime version and Java Runtime version shows the new version number.

Appendix H: ACM Battery

An optional 12 volt NiMH ACM Battery is available. This provides backup power that ensures data retention and orderly shutdown in case power is lost to the ACM.Replace only with ACM Battery. The Battery powers the ACM for approximately 90 seconds while the unit shuts down.

NOTE Installing the ACM Battery changes the operating ambient temperature range specification of the ACM to 32 °F to 122 °F (0 °C to 50 °C).

Specifications

Table 23 ACM battery specifications.

Technical Data	
Supply Voltage	12VDC
Operating Temperature	32 to 122 °F (0 to 50 °C)
Operating Humidity	RH 5% to 95%, non-condensing.
Storage Temperatures	5°C to 25°C (41°F to 77°F) recommended storage temperature to extend life; 0°C to 50°C (32°F to 122°F) allowed storage temperature.
Storage Humidities	RH 65% ±5% non-condensing recommended storage humidity to extend life; RH 5% to 95%, non-condensing allowed storage humidity.
Dimensions	4.5 in. L x 2.7 in. W x 1.75 in. H (114.3 mm W x 68.6 mm W x 44.5 mm H). See Fig. 4.
Weight	0.80 lbs. (0.36 Kg)
Agency Listing	UL 2054 ed 2 rev 2011-09-14; EN 62133 ed 1 (2002), ed 2 (2012)

Installation

See the ACM Battery installation instructions, LT-ACMBATT-II for installation details. The ACM Battery can be mounted to the DIN rail or secured to the panel.

Charging

The ACM Battery is charged by the ACM controller. It might take up to 24 hours for the battery to reach full charge.

Servicing

The ACM Battery is installed or replaced as a single unit, and cannot be field serviced. The cover should only be removed to access screw holes for panel installation.

Appendix I: ACM-MODBUS Virtual Device Objects and Properties

The following is a partial list of Device Object properties and their characteristics.

Table 24 Virtual Device Object Properties

Property	Access	Persistent	Notes
Object Name	R/O		provided by CSV file
Vendor Name	R/O		"Alerton"
Vendor Identifier	R/O		18
Model Name	R/O		ACM-MODBUS-VDEV
Firmware Revision	R/O		indicates the ROC version (also the "OS version" in Niagara)
Application Software Version	R/O		indicates the version of ACM-MODBUS program
Location	R/O		provided by CSV file
Description	R/O		provided by CSV file
Protocol Version	R/O		1
Protocol Revision	R/O		15
Max APDU Length Accepted	R/O		1476
Segmentation Supported	R/O		segmented-both
UTC Offset	R/O		Mirrors value from the main device
Daylight Savings Status	R/O		Mirrors value from the main device
APDU Timeout	R/O		Mirrors value from the main device
APDU Segment Timeout	R/O		Mirrors value from the main device
Number of APDU Retries	R/O		Mirrors value from the main device
Out_Of_Service	R/W	Y	Used to disable MODBUS comm. for this device
Reliability_Evaluation_Inhibit	R/W	Y	Default=FALSE
Reliability	R/O		Used to detect comm. fail
Status_Flags	R/O		Reflects reliability and Out_Of_Service status

ACM-MODBUS Virtual Device Point Objects

The virtual device points are configured by the individual CSV file sent to the virtual device. The types of point objects supported are: AI/AV/BI/BV/MI/MV.

Each virtual AI object implements the following properties:

Table 25 Virtual Device AIs

Property	Access	Persistent	Notes
Object_Identifier	R/O		
Object_Type	R/O		
Object_Name	R/O		Given by CSV file
Description	R/O		Given by CSV file
Present_Value	R/[W]	Y	Value fetched from MODBUS device and converted. Writable when out of service.
Units	R/O		Given by CSV file
COV_Increment	R/O		Value given by CSV file
Status Flags	R/O		Computed from Reliability and Out_Of_Service
Event State	R/O		Always normal
Reliability	R/O		no-fault-detected / configuration-error / communication-failure
Out_Of_Service	R/W	Y	Implements true out of service (default=FALSE)
Reliability_Evaluation_Inhibit	R/W	Y	Default=FALSE
Aler_Data_Age	R/O		Time, in milliseconds, since the MODBUS data was updated.
Aler_Gateway_String	R/O		Given by CSV file

Virtual Device AVs

Each virtual AV object has the following properties:

Table 26 Virtual Device AVs

Property	Access	Persistent	Notes
Object_Identifier	R/O		
Object_Type	R/O		
Object_Name	R/O		Given by CSV file
Description	R/O		Given by CSV file
Present_Value	R[/W]	Y	Behavior configured via CSV file
Units	R/O		Given by CSV file
COV_Increment	R/O		Value given by CSV file

Table 26 Virtual Device AVs

Property	Access	Persistent	Notes
Status Flags	R/O		Computed from Reliability and Out_Of_Service
Event State	R/O		Always normal
Reliability	R/O		no-fault-detected / configuration-error / communication-failure
Out_Of_Service	R/W	Y	Implements true out of service (default=FALSE)
Reliability_Evaluation_Inhibit	R/W	Y	Default=FALSE
Aler_Data_Age	R/O		Time, in milliseconds, since the MODBUS data was updated.
Aler_Gateway_String	R/O		Given by CSV file

Virtual Device BIs

Each virtual BI object implements the following properties:

Table 27 Virtual Device BIs

Property	Access	Persistent	Notes
Object_Identifier	R/O		
Object_Type	R/O		
Object_Name	R/O		Given by CSV file
Description	R/O		Given by CSV file
Present_Value	R/[W]	Y	Value read from MODBUS device. Writable when out of service.
Status Flags	R/O		Computed from Reliability and Out_Of_Service
Event State	R/O		Always normal
Reliability	R/O		no-fault-detected / configuration-error / communication-failure
Out_Of_Service	R/W	Y	Implements true out of service (default=FALSE)
Polarity	R/O		Always normal
Reliability_Evaluation_Inhibit	R/W	Y	Default=FALSE
Aler_Data_Age	R/O		Time, in milliseconds, since the MODBUS data was updated.
Aler_Gateway_String	R/O		Given by CSV file

Virtual Device BVs

Each virtual BV object implements the following properties:

Table 28 Virtual Device BVs

Property	Access	Persistent	Notes
Object_Identifier	R/O		
Object_Type	R/O		
Object_Name	R/O		Given by CSV file
Description	R/O		Given by CSV file
Present_Value	R[/W]	Y	Behavior controlled by CSV file
Status Flags			

Appendix J: ACM-TUX Virtual Device Objects and Properties

ACM-TUX Special Objects

Table 29 ACM-TUX Special Objects

Object	Notes
AV/BV 120xxx	Diagnostic points specific to ACM-TUX (see ACM Diagnostic Points document)

ACM-TUX Device Objects

The following is the list of ACM-TUX Device Object properties and their characteristics.

Table 30 ACM-TUX Device Objects

Property	Access	Persistent	Notes
Object Name	R/W	Y	writable with non-empty string
Vendor Name	R/O		"Alerton"
Vendor Identifier	R/O		18
Model Name	R/O		ACM-TUX
Firmware Revision	R/O		indicates the ROC version (also the "OS version" in Niagara)
Application Software Version	R/O		indicates the version of ACM-TUX program
Location	R/W	Y	
Description	R/W	Y	
Protocol Version	R/O		1
Protocol Revision	R/O		15
Max APDU Length Accepted	R/O		1476
Segmentation Supported	R/O		segmented-both
UTC Offset	R/W	Y (DCF)	
Daylight Savings Status	R/O		computed from daylight saving configuration
APDU Timeout	R/W	Y	Default = 6000, limited to 100..60000
Number of APDU Retries	R/W	Y	Default = 3, limited to 0..16
Object-Identifier	R/O		Device 1001
Object-Type	R/O		device
System-Status	R/O		operational
Protocol-Services-Supported	R/O		
Protocol-Object-Types-Supported	R/O		
Max-Segments-Accepted	R/O		750
Local-Date	R/O		Settable By Time Sync Services

Table 30 ACM-TUX Device Objects

Property	Access	Persistent	Notes
Local-Time	R/O		Settable By Time Sync Services
APDU-Segment-Timeout	R/W		Default=5000, limited to 100...60000
Device-Address-Bindings	R/O		
Database-Revision	R/O		
Active-COV-Subscriptions	R/O		
Serial-Number	R/O		
Property-List	R/O		(Aler Proprietary Properties for Setting Daylight Savings Time)

Virtual Device Device Objects

The following is the list of ACM-TUX Virtual Device Object properties and their characteristics.

Table 31 Virtual Device Device Objects

Property	Access	Notes
Object Name	W	
System Status	R/O	Indicates "operational" if active TUX exists at address
Vendor Name	R/O	"Alerton"
Vendor Identifier	R/O	18
Model Name	R/O	Model is either the actual Model for SA type TUXs (TX-SA, TX-V.A.V., TX-651 and TX-Host-R3), or "TX-NON-SA" for non SA type TUXs.
Firmware Revision	R/O	indicates the ROC version (also the "OS version" in Niagara)
Application Software Version	R/O	indicates the version of ACM-TUX program
Location	R/W	
Description	R/W	
Protocol Version	R/O	1
Protocol Revision	R/O	15
Max APDU Length Accepted	R/O	1476
Segmentation Supported	R/O	segmented-both
APDU Timeout	R/W	Default = 6000, limited to 100..60000
Number of APDU Retries	R/W	Default = 3, limited to 0..16
Object-Identifier	R/O	
Object-Type	R/O	
Protocol-Services-Supported	R/O	
Protocol-Object-Types-Supported	R/O	
Max-Segments-Accepted	R/O	750
APDU-Segment-Timeout	R/W	
Device-Address-Bindings	R/O	
Active-COV-Subscriptions	R/O	
Property-List	R/O	

Virtual Device Point Objects

TUX VDEV point mapping is configured based on TUX type detected. Supports AI, AO, AV, BI, BO, and BV points. Analog type points do support a Gateway Sting, Binary points do not..

Virtual Device AIs

Each virtual AI object implements the following properties:

Table 32 Virtual Device AIs

Property	Access	Notes
Object_Identifier	R/O	
Object_Type	R/O	AI
Object_Name	R/W	AI xxx
Description	R/W	Space Temp
Present_Value	R/O	Value fetched from TUX device and converted
Units	R/O	Based on gateway string settings
COV_Increment	R/W	Default=0
Status Flags	R/O	Computed from Reliability and Out_Of_Service
Event State	R/O	Always normal
Out_Of_Service	R/W	Implements true Out-Of-Service (default=FALSE)
Relinquish-Default	R/W	
Property-List	R/O	
Aler-Gateway-Setup	R/W	

Virtual Device AOs

Each virtual AV object has the following properties:

Table 33 Virtual Device AOs

Property	Access	Notes
Object_Identifier	R/O	
Object_Type	R/O	AO
Object_Name	R/W	AV xxx
Description	R/W	Default based on TUX Type. Example, "Setpoint (deg)"
Present_Value	R[/W]	
Units	R/O	Units based on Gateway String setup.
COV_Increment	R/W	Default=0
Status Flags	R/O	Computed from Reliability and Out_Of_Service
Event State	R/O	Always normal
Out_Of_Service	R/W	Implements true Out-Of-Service (default=FALSE)

Table 33 Virtual Device AOs

Property	Access	Notes
Reliability_Evaluation_Inhibit	R/W	Default=FALSE
Relinquish-Default	R/W	
Property-List	R/O	
Aler-Gateway-Setup	R/W	

Virtual Device AVs

Each virtual AV object has the following properties:

Table 34 Virtual Device AVs

Property	Access	Notes
Object_Identifier	R/O	
Object_Type	R/O	AV
Object_Name	R/W	Default is AV xxx
Description	R/W	Default based on TUX type. Example, "Box Type Code" for application specific point or "" (blank) for general purpose AVs.
Present_Value	R/O or R/W]	Access is dependent on point and application. Behavior configured via CSV file.
Units	R/O	Defined by Gateway String setup.
COV_Increment	R/W	Default=0
Status Flags	R/O	Computed from Reliability and Out_Of_Service
Event State	R/O	Always normal
Out_Of_Service	R/W	Implements true Out-Of-Service (default=FALSE)
Aler-Gateway-Setup	R/W	
Property-List	R/O	

Virtual Device BIs

Each virtual BI object implements the following properties:

Table 35 Virtual Device BIs

Property	Access	Notes
Object_Identifier	R/O	
Object_Type	R/O	BI
Object_Name	R/O	Default is BI xxx
Description	R/O	Default based on TUX type. Example, "Occupied Mode Status"

Table 35 Virtual Device BIs

Property	Access	Notes
Present_Value	R/O	Value read from TUX device
Status Flags	R/O	Computed from Reliability and Out_Of_Service
Event State	R/O	Always normal
Out_Of_Service	R/W	Implements true Out-Of-Service (default=FALSE)
Polarity	R/O	Always normal
Property-List	R/O	

Virtual Device BOs

Each virtual BO object implements the following properties:

Table 36 Virtual Device BOs

Property	Access	Notes
Object_Identifier	R/O	

ASCENT
BY ALERTON

Powered by BACtalk

Alerton.com

16201 25th Avenue West
Lynnwood, WA 98087
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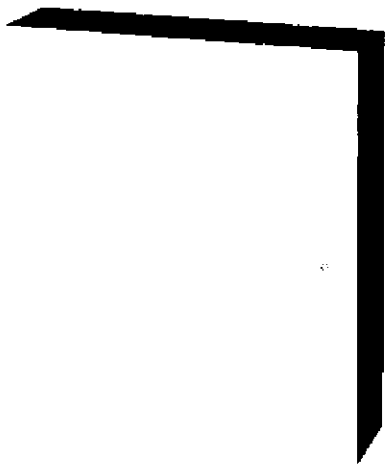
Fax: (425) 921-4872
tech.support@alerton.com

NEMA 1 ENCLOSURES
RET SERIES

Kele

DESCRIPTION

The **RET Series** includes attractive, economical NEMA 1 enclosures designed to house controls and instruments in areas that do not require oil- and dust-tight ratings. The **RET Series** enclosures are furnished with a perforated metal subpanel for easy mounting of components. No drilling or layout is needed. Simply set the control components on the panel and attach with #7 or #8 self-tapping screws in the pre-punched holes. The **RET Series** is also available in a UL listed version.

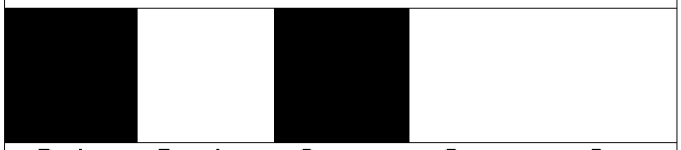


RET-2018

FEATURES

- ***Low cost NEMA 1 enclosure***
- ***Mounted with door hinged on left or right side***
- ***Removable door***
- ***Attractive powder-coated finish, standard brown enclosure with tan door***
- ***Optional colors available***
- ***Key lock, two keys, and attractive powder-coated perf panel furnished***
- ***Mounting of control components simplified with perf panel***
- ***Optional UL listed enclosures available***
- ***UL listed, File #E130598, for RET UL listed panels***

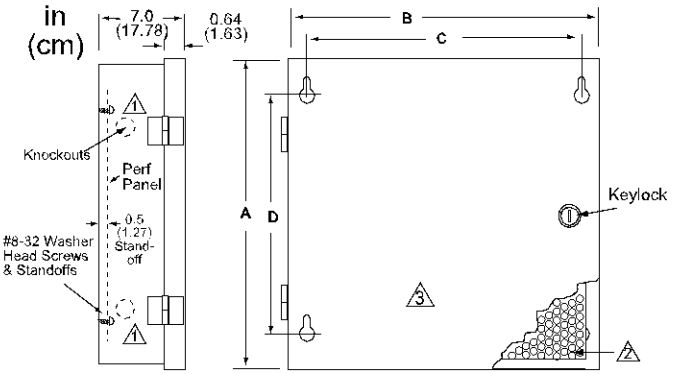
RET OPTIONAL COLOR CHART



Dark Blue | Powder Blue | Orange | Green | Gray

Optional colors are shown in approximate hue.

DIMENSIONS



1. Knockouts are for 3/4" conduit, 2 Knockouts on both sides, 3 Knockouts top and bottom, 4 Knockouts top and bottom on RET3826, RET3626UL, & RET4230.
2. Perf Panel is 16-ga powder-coated steel.
3. Standard Color is brown enclosure with tan door.

ORDERING INFORMATION

ENCLOSURE MODEL	DIMENSIONS in (cm) A	B	C	D	ENCLOSURE MATERIAL	PERF PANEL	WEIGHT lb (kg)	PERF PANEL H x W in (cm)
RET1812†	Discontinued - Use **RET1812ULP**							
RET2018†	Discontinued - Use **RET2018ULP**							
RET2620†	26 (66)	20 (51)	18.5 (47)	20 (51)	16-ga steel	Incl	36 (16.4)	23.5 x 17.5 (60 x 44)
RET3826†	38 (97)	26 (66)	24.5 (62)	32 (81)	16-ga steel	Incl	61 (27.8)	35.5 x 23.5 (90 x 60)
RET4230†	42 (107)	30 (76)	26.0 (66)	38 (97)	14-ga steel	Incl	83 (37.8)	39.5 x 27.5 (100 x 70)
RET1812ULP†	18 (46)	12 (31)	11 (28)	14 (36)	16-ga steel	Incl	16 (7.3)	15.5 x 9.0 (39 x 23)
RET2620ULP†	26 (66)	20 (51)	18.5 (47)	20 (51)	14-ga steel	Incl	41 (18.6)	23.5 x 17.5 (60 x 44)
RET3626ULP†	36 (91)	26 (66)	24.5 (62)	30 (76)	14-ga steel	Incl	69 (31.3)	33.5 x 23.5 (85 x 60)

† **-DB**: Dark Blue, **-PB**: Powder Blue, **-OR**: Orange, **-GN**: Green, **-GY**: Gray (Note: No suffix - Brown/Tan)

24 VAC POWER SOURCE

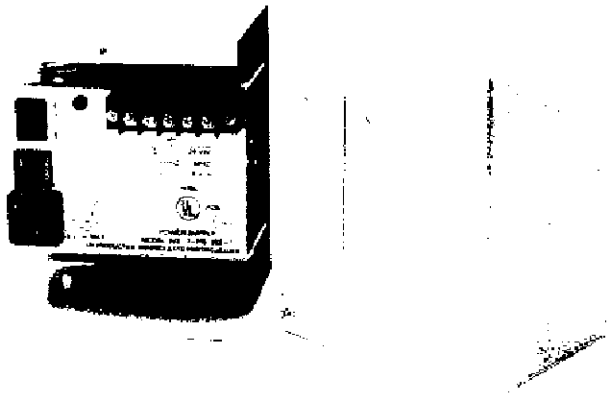
DESCRIPTION

The **T-PB Series** UL listed power source provides 24 VAC from a 115 VAC input. The **T-PB Series** contains an LED that illuminates when the 24 VAC output is operational. An on/off switch is provided in the 115 VAC input. This switch disconnects or connects both the hot and neutral of the input power.

A convenience outlet is located on the front panel. This convenience outlet *is not* controlled by the on/off switch and is always hot.

A circuit breaker is incorporated in the 24 VAC circuit, which must be manually reset if the rated 3.0A (Class 2) or 4.0A (Class 1) is exceeded and the breaker operates.

The **T-PB Series** is available in a metal enclosure for field applications or without the enclosure for panel mounting.



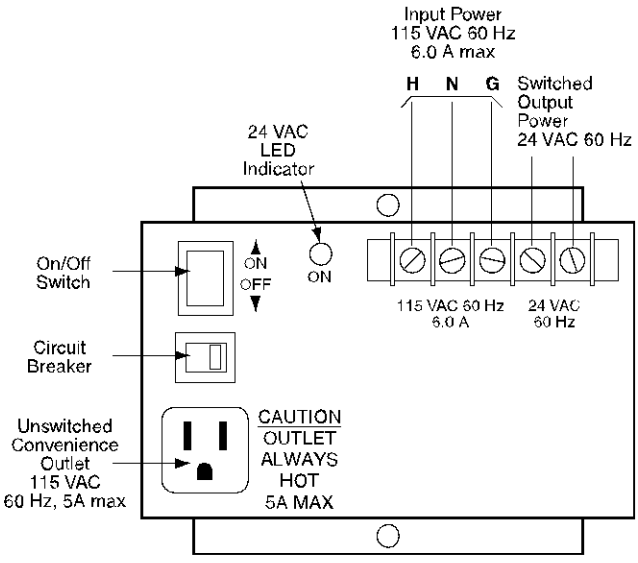
FEATURES

- ***Enclosed and panel-mounted models***
- ***On/Off switch***
- ***Convenience outlet***
- ***Circuit breaker***
- ***Enclosure with removable access panel to on/off switch, breaker, and outlet***

SPECIFICATIONS

Output	
Voltage	24 VAC
Current	
T-PB202	4.0A, 96 VA (Class 1)
T-PB303	3.0A, 72 VA (Class 2)
Convenience outlet	115 VAC, 5.0A max
Input power	115 VAC, 60 Hz, 6.0A max (1A normal operating max, 5A convenience outlet)
Temp	- 13° to 140°F (-25° to 60°C)
Terminals	#12 to #22 AWG
Dimensions	
Enclosed	6.12"H x 5.19"W x 4.12"D (15.5 x 13.2 x 10.5 cm) with 1/2" knock-outs
Panel mount	4.75"H x 5.0"W x 3.75"D (12.1 x 12.7 x 9.5 cm)
Weight	5.85 lb max (2.65 kg)
Approvals	
Enclosed	UL listed, File #E160579
Panel mount	UL recognized component, File #E160579

WIRING



ORDERING INFORMATION

MODEL	DESCRIPTION
T-PB202-1	**24 VAC Power Source, 4A (Class 1) with Enclosure**
[redacted]	[redacted]
T-PB303-1	**24 VAC Power Source, 3A (Class 2) with Enclosure**
T-PB303-0	**24 VAC Power Source, 3A (Class 2) Panel Mount**

REVIEW OF MECHANICAL SUBMITTALS

Project: **Arkansas Tech University – Jones Hall**
Location: **Russellville, Arkansas** **P&P Job No. 21-108**
Date of Receipt: **Tuesday, October 11, 2022**
Date of Review: **Thursday, October 20, 2022**
Reviewed by: **Adam Kelly, P.E.**
Email: **akelly@pettitinc.com**

Signed: Adam Kelly

Checking is for conformance with the design concept of the Project and compliance with the information given in the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site; for information that pertains solely to the fabrication processes or to techniques of construction; and for coordination of the work of all trades.

Item	Approval Status		Comments
Section 23 09 23 – Automatic Temperature Controls	Approved as Corrected	o	- Contractor shall expand on the VRF Control diagram (depict or describe) that this work shall be repeated for the thirteen individual systems.

✓ ✗ o ✳

Note:

Arkansas Tech University
Jones Residence Hall

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PAGE 1	COVER SHEET
Page 2	System Architecture
Page 3	Global Controller
Page 4	VAU-1 Control Diagram
Page 5	Dryer Exhaust System and Exhaust Fan Control Diagram
Page 6	Kitchen Hood and EF Control Diagram
Page 7	VRF Control Diagram
Page 8	Control Wiring Schedule and General Notes

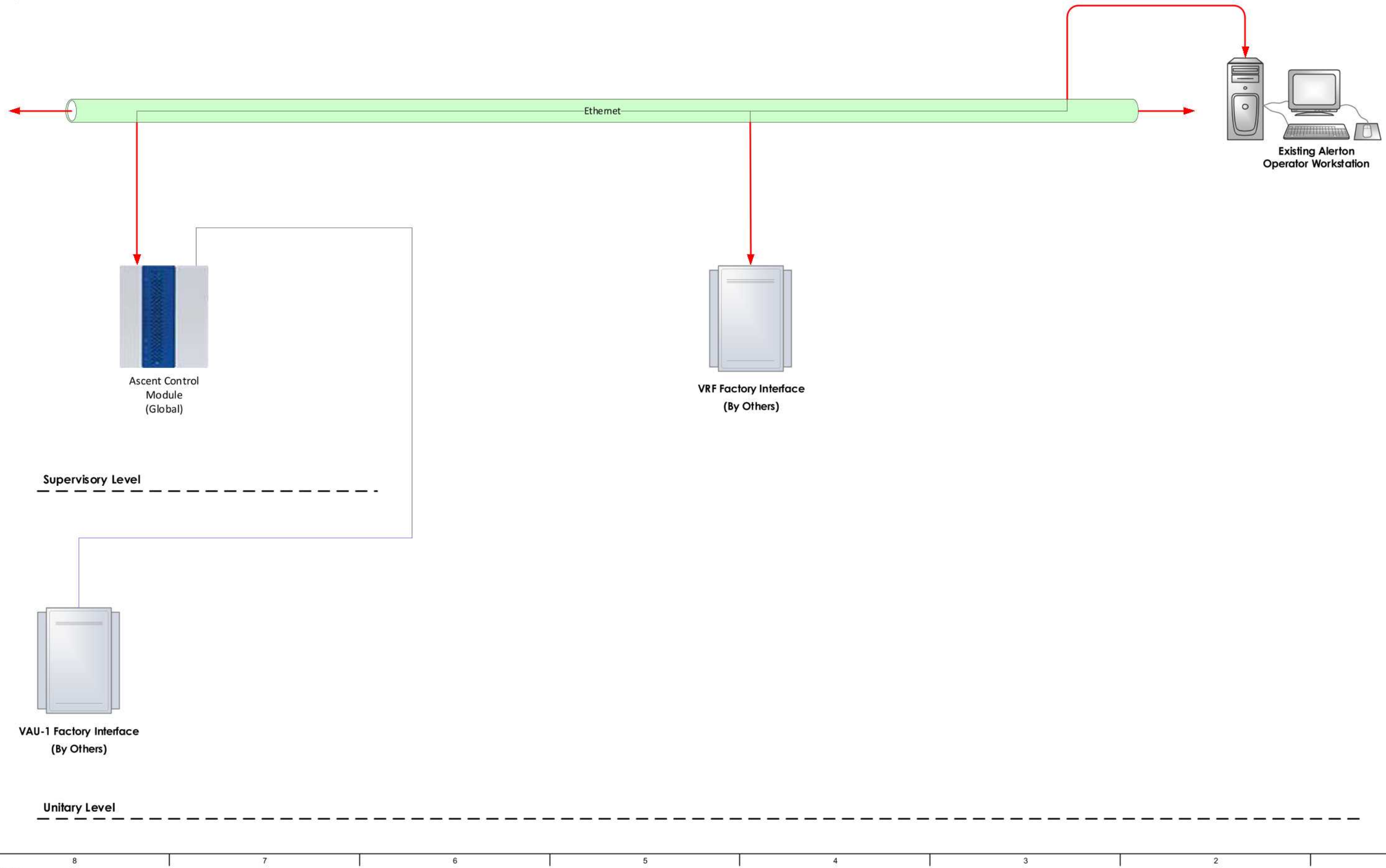
Project name: Arkansas Tech University Jones Residence Hall
Architect: SCM
Engineers: Pettit & Pettit
Mechanical: CSUSA

Northwest Controls
7631 Northshore Place
North Little Rock, AR 72118
Ph: (501) 280-0404 Fax: (501) 280-9200

Project number: L22-13284
Application Engineer: VWI
Drawn by: VWI
Creation Date: 9/26/2022
Revision Date: 9/26/2022

System Architecture

Typical of 1



Project number: L22-13284
Application Engineer: VWI
Drawn by: VWI
Checked by: VWI

Project name: Arkansas Tech University Jones Residence Hall
Phase: Submittal
Creation Date: 9/26/2022
Revision Date: 9/26/2022

Architect: SCM
Engineers: Petfit & Petfit
Mechanical: CSUSA

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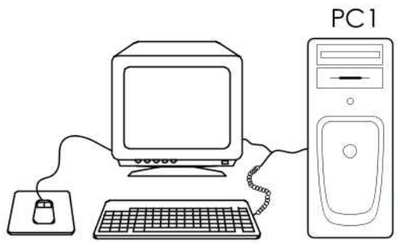
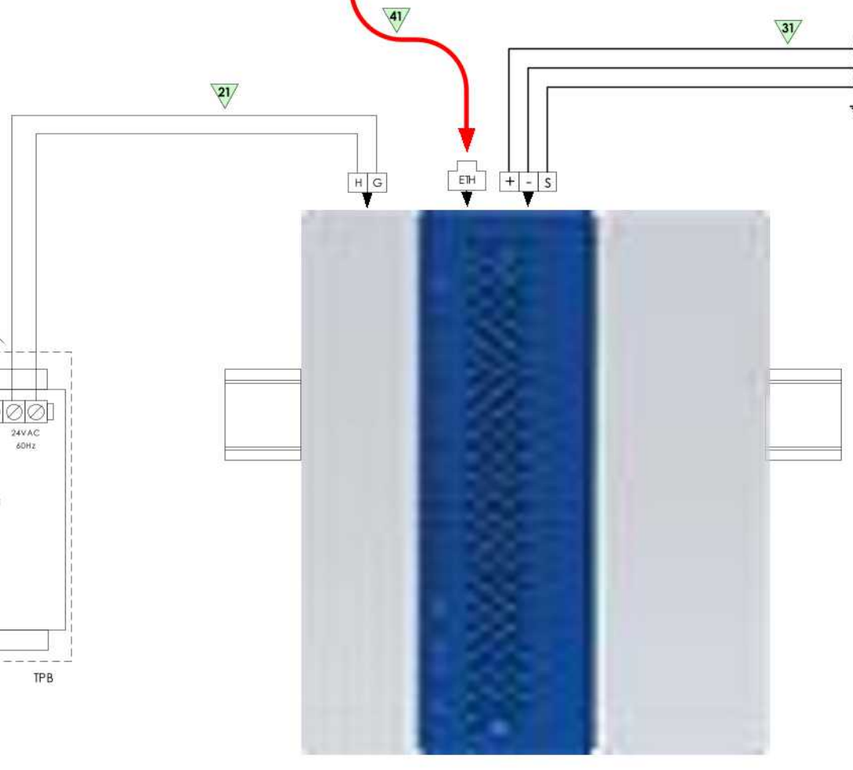
Global Controller

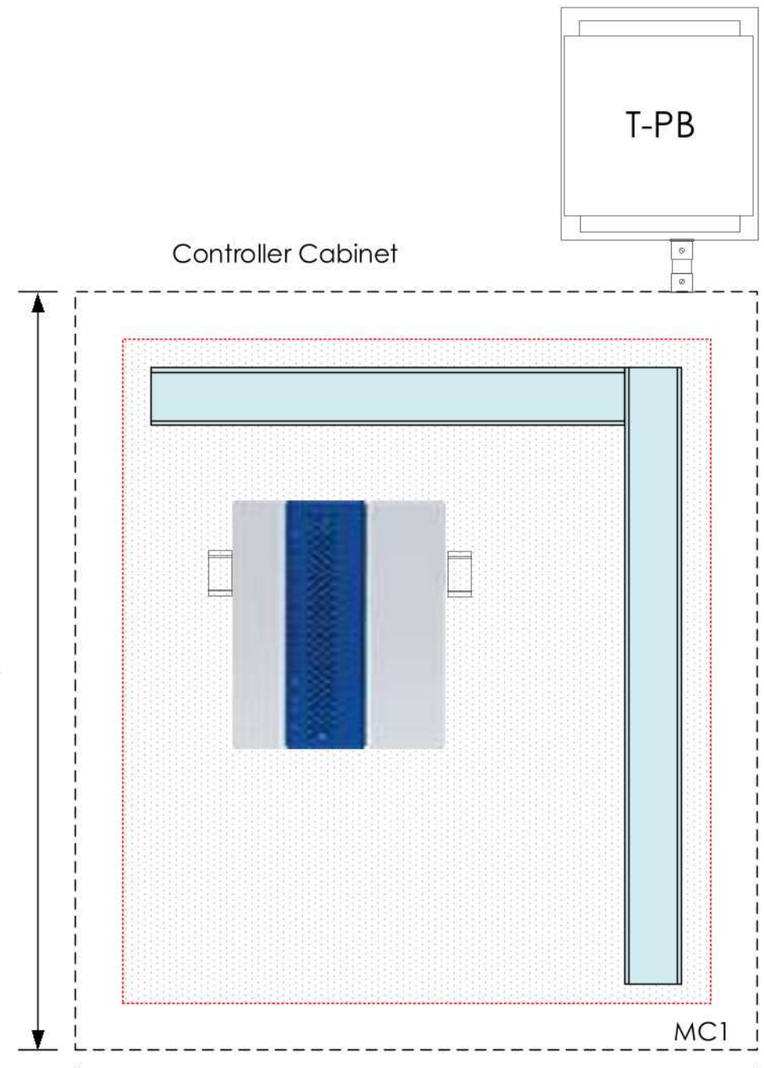
Typical of 1

TAG	QTY.	PART NO.	MANUFACTURER	DESCRIPTION
MC1	1	RET2018ULP-DB	Kele	NEMA 1 Enclosure 20"h x 18"w x 7"d Dk Blue
TPB	1	T-PB-202-0	Kele	24VAC power source, 4A (Class 1) panel mount
ACM	1	ACM	Alerton	Ascent control module global controller
	1	ACM256	Alerton	ACM license for up to 256 devices



Existing Alerton
Operator Workstation





UNIT TYPE	DEVICE INST	MAC ADDR	REP-JOB-APP
ACM	110	0	rep\job\app

I22-13284 submittal.vsd

Project number: I22-13284
Application Engineer: VWI
Drawn by: VWI
Checked by: VWI

Project name: Arkansas Tech University Jones Residence Hall
Architect: SCM
Engineers: Pettit & Pettit
Mechanical: CSUSA
Phase: Submittal
Creation Date: 9/26/2022
Revision Date: 9/26/2022

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VAU-1 Control Diagram

Typical of 1

Sequence of Operation

OCCUPIED/UNOCCUPIED MODE:
THE MAKEUP AIR UNIT SHALL BE INDEXED FROM UNOCCUPIED TO OCCUPIED MODE BY A PRESET SCHEDULE OR MANUAL OVERRIDE.

FAN CONTROL:
SUPPLY AND EXHAUST FAN WILL BE ENABLED BY THE BAS AND SHALL RUN CONTINUOUSLY. THE VFDS SHALL CONTROL THE FANS TO RAMP UP SLOWLY TO THEIR ASSOCIATED DUCT STATIC PRESSURE SETPOINTS. THE SUPPLY FAN WILL BE SHUTDOWN IN THE EVENT OF A SMOKE/FIRE ALARM (HARDWIRE INTERLOCK), BUT THE EXHAUST FAN SHALL REMAIN IN OPERATION. THE OSA DAMPER SHALL BE OPENED FOR FAN OPERATION AND SPRING RETURN CLOSED WHEN THE FAN IS SHUTDOWN.

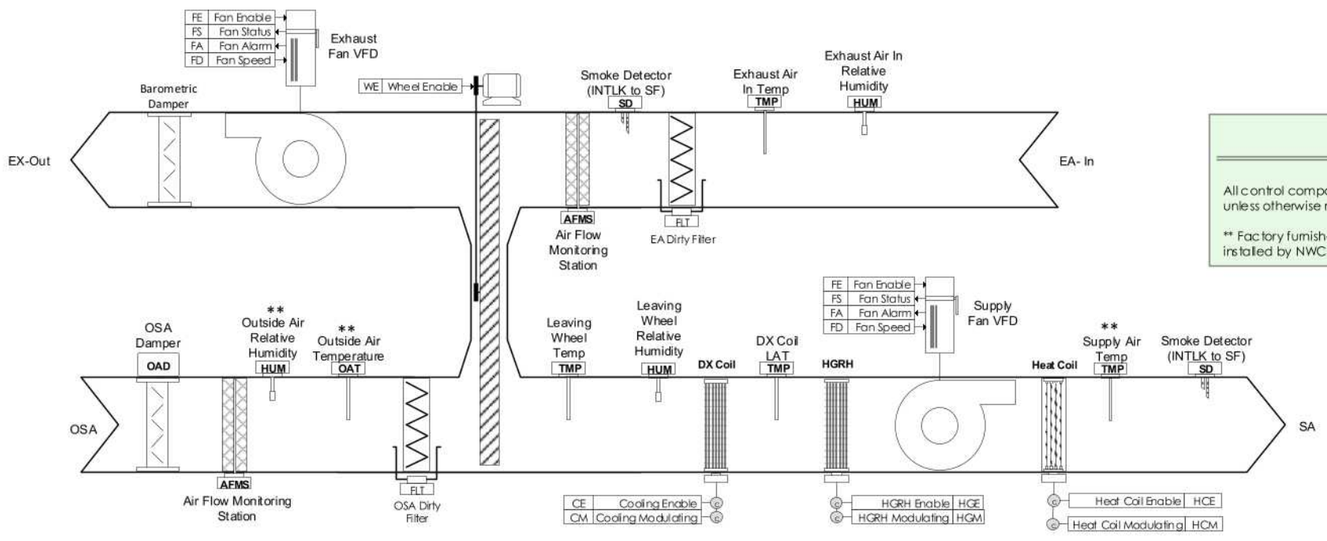
ALARM:
ANY ALARMS SHALL BE VIEWABLE ON THE UNIT MOUNTED TOUCHSCREEN DISPLAY.

COOLING:
WHEN THE RTU IS IN THE COOLING MODE, THE ENERGY RECOVERY WHEEL AND THE COMPRESSORS WILL STAGE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE AT THE DISCHARGE COOLING SET POINT OF 55° F. (ADJ.) THE HOT GAS RE-HEAT COIL SHALL MODULATE AS REQUIRED TO RE-HEAT THE AIR LEAVING THE COOLING COIL TO THE SUPPLY AIR DISCHARGE SETPOINT OF 72°F (ADJ.)

HEATING:
SUPPLY TEMPERATURE CONTROL DURING WHEN HEATING IS REQUIRED IS ACCOMPLISHED BY ENABLING THE ENERGY WHEEL AND THE GAS HEAT AS NEEDED TO MAINTAIN DISCHARGE AIR SETPOINT OF 72°F (ADJ.)

MAKEUP AIR AND OUTSIDE AIR TEMPERATURE AND RH:
RELIEF AIR AND OUTSIDE AIR TEMPERATURE AND RELATIVE HUMIDITY READINGS MAY BE ACQUIRED FROM THE UNIT DISPLAY.

ENERGY RECOVERY WHEEL:
THE ENERGY RECOVERY WHEEL SHALL BE ENABLED ANY TIME THE SUPPLY AND EXHAUST FANS ARE ENABLED AND ENERGY TRANSFER BETWEEN THE EXHAUST AIR AND THE OUTSIDE AIR IS A BENEFIT TO SUPPLY AIR TEMPERATURE CONTROL. THE WHEEL SHOULD BE DISABLED WHEN THE OUTSIDE AIR TEMPERATURE IS EQUAL TO OR HIGHER THAN THE DESIRED SUPPLY TEMPERATURE AS WELL AS LOWER THAN THE EXHAUST TEMPERATURE



General Notes

All control components including VFD's, are factory furnished / installed unless otherwise noted.

** Factory furnished components shipped loose with unit to be field installed by NWC.

Project name: Arkansas Tech University Jones Residence Hall
Architect: SCM
Engineers: Pettit & Pettit
Mechanical: CSUSA

Project number: L22-13284
Application Engineer: VWI
Phase: Submittal
Drawn by: VWI
Creation Date: 9/26/2022
Checked by: VWI
Revision Date: 9/26/2022

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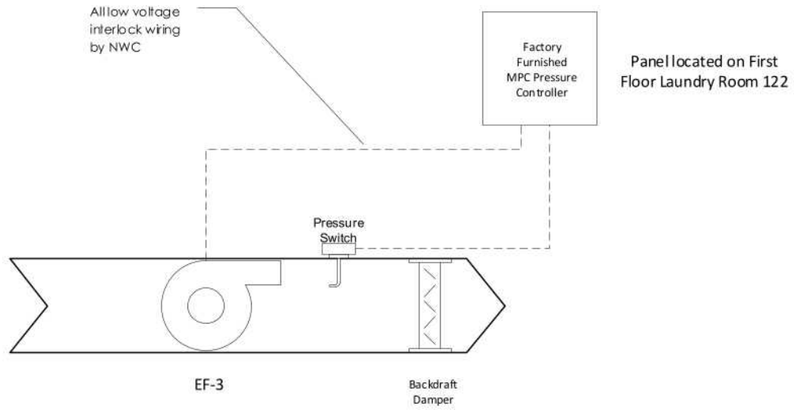
Dryer Exhaust System and Exhaust Fan Control Diagram

Typical of 1



All control components are factory furnished / installed. Any loose shipped 24v control components provided with equipment to be installed by NWC.

Project name: Arkansas Tech University Jones Residence Hall
Architect: SCM
Engineers: Petfit & Petfit
Mechanical: CSUSA

Project number: L22-13284
Application Engineer: VWI
Drawn by: VWI
Checked by: VWI
Phase: Submittal
Creation Date: 9/26/2022
Revision Date: 9/26/2022

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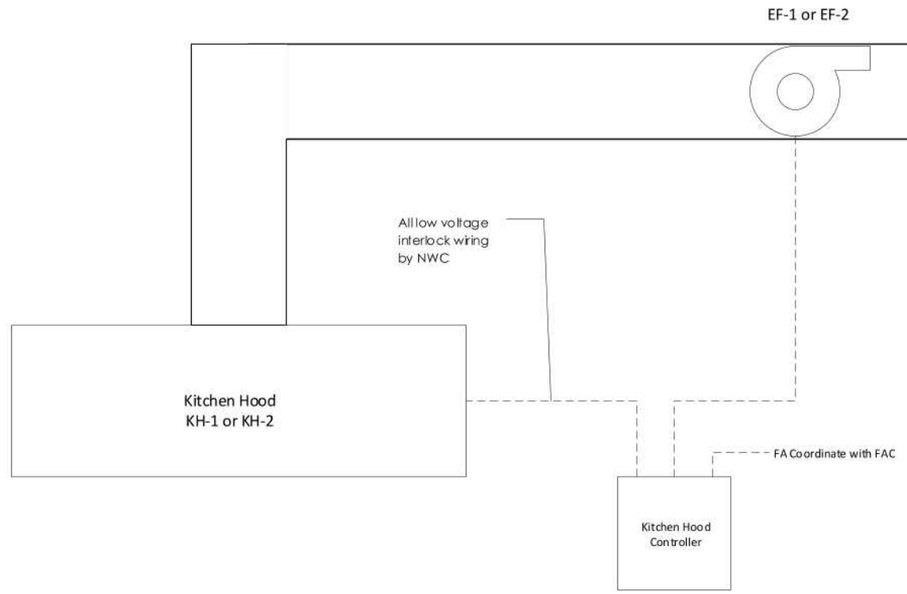
Kitchen Hood and EF Control Diagram

Typical of 2

All control components are factory furnished / installed. Any loose shipped 24v control components provided with equipment to be installed by NWC.



Project name: Arkansas Tech University Jones Residence Hall
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VRF Control Diagram

Typical of 1

Sequence of Operation

UNIT CONTROLS:
VRF SYSTEM SHALL BE PROVIDED WITH EQUIPMENT MANUFACTURER'S UNIT-MOUNTED CONTROLS SYSTEM. CONTROLS INTERFACE SHALL BE TOUCH SCREEN.

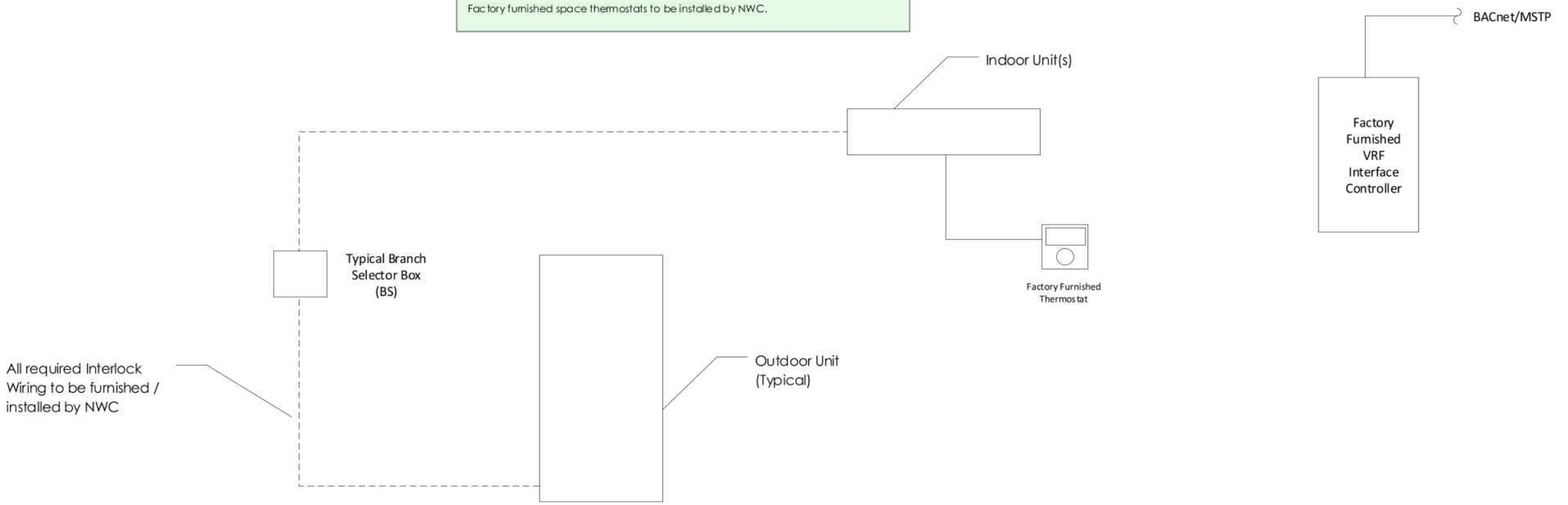
SPACE TEMPERATURE CONTROL:
THE SUPPLY FAN SHALL RUN CONTINUOUS. THE UNIT SHALL UTILIZE HEAT RECOVERY SEQUENCES THAT ALLOW EACH INDIVIDUAL ZONE TO BE IN EITHER HEATING OR COOLING INDEPENDENT OF ALL OTHER ZONES IN THE SYSTEM. COOLING/HEATING SHALL MODULATE TO MAINTAIN THE ACTIVE SPACE TEMPERATURE SETPOINT. THE SPACE TEMPERATURE SHALL BE MAINTAINED BETWEEN THE OCCUPIED COOLING SETPOINT (75°F ADJ) AND THE OCCUPIED HEATING SETPOINT (70°F ADJ).

NWC Scope of Work

All interlock wiring for Mini-Split System equipment to be furnished and installed by NWC.

All control components for Mini-Split Systems to be furnished and factory installed by equipment manufacturer.

Factory furnished space thermostats to be installed by NWC.



Project number: L22-13284
Application Engineer: VWI
Drawn by: VWI
Checked by: VWI

Project name: Arkansas Tech University Jones Residence Hall
Phase: Submittal
Creation Date: 9/26/2022
Revision Date: 9/26/2022

Architect: SCM
Engineers: Petfit & Petfit
Mechanical: CSUSA

Northwest Controls
7631 Northshore Place
North Little Rock, AR 72118
Ph: (501) 280-0404 Fax: (501) 280-9200

GENERAL WIRING NOTES

All controller inputs, outputs and communications trunks must be run separate from any circuits containing voltages greater than 30vac.
Do not run signal or communication wires near high voltage sources such as ballasts, transformers or transmitters.
Wires in conduit must not be nicked, stretched or compromised in any way. Use pulling force of less than 50 lbs.
Wires attached to building structures must be suspended in a way that does cause undue stress on the wire. Do not use any securing method that compresses the wire beyond the outside jacket.

All inputs and analog outputs require shielded wire. Use single-point grounding point in each cabinet or controller location Do not ground any shield to the GRN or COM terminals of modules.

Additional general installation information can be found in the following Alerton manuals:

LTBT-TM-SYSDSGN	System design Manual	LTBT-TM-VLX	VLX Installation Manual
LTBT-TM-GEN4VLC	VLC installation manual	LTBT-TM-NETWRK	Network Design and Installation Manual

CONTROLS WIRING SCHEDULE

SYMBOL	DESCRIPTION	PART NUMBER	INSTALLATION NOTES
1	BACtalk thermostats	Connect Air P/N W233C-2560 White jacket, 3 #18 conductor w/shield, plenum rated	Max distance for a BACtalk Microset or Microtouch is 250 feet. Maximum distance for Microset II is 1000ft.
2	Thermistor/resistor inputs	Connect Air P/N W181P-2540 Mint green jacket, 2 #18 conductors w/shield, plenum rated.	Maximum distance is 1000 feet.
3	2 wire inputs 4-20ma, 0-5volts, 0-10volts	Connect Air P/N W181P-2540 Mint green jacket, 2 #18 conductors w/shield, plenum rated.	Most 4-20ma inputs require input resistors. Consult module page for verification. Do not power controller or attach sensor until verified! Input 0 of the VLC series of controllers require a 470 ohm resister in series with any dry contact.
4	3 or 4 wire inputs 4-20ma, 0-5 volts or 0-10 volts	3-wire use Connect Air P/N W233C-2560 White jacket, 3 #18 conductor w/shield, plenum rated 4-wire use Connect Air P/N W181P-2540 Mint green jacket, 2 #18 conductors w/shield, plenum rated. Run 2 cables, one for signal and 1 for power.	Most 4-20ma inputs require input resistors. Consult module page for verification. Do not power controller or attach sensor until verified.
5	Binary outputs	Use #18 conductors within the mounting cabinet or when the distance to the output load is less than 50 feet (W181P-2540 wire is acceptable). For longer distances consult engineering department.	Return BO loads to transformer ground - not to the controller terminal. Exception are when switching ground based outputs or when the controller load is a pilot relay within 50 feet. Shielded wire can be substituted (of appropriate rating) when in an extremely noisy environment. Connect shield to panel/earth ground at controller end only.
6 7	Analog outputs	Connect Air P/N W181P-2540 Mint green jacket, 2 #18 conductors w/shield, plenum rated.	Maximum distance is 1000 feet.
21 22	Unitary controller power	Match power source conductor size to controller or distribution terminals. Always use #18 conductor or larger to controller terminals.	None
31	MS/TP Communications	Connect Air P/N W221P-2544 Raspberry jacket, 2 #22 conductors w/shield, low capacitance, plenum rated.	Maximum segment length (end-to-end) 4000 ft. All devices must be wired in a BUS or daisy-chained wiring arrangement (including global controllers) with termination resistors at each end of the bus. Ground shield drain wire at single point earth (panel) ground --*not VLC ground*. Tape off shield drain wire at other end. Tie shield drain wire through at each VLC. DO NOT GROUND SHIELD AT MULTIPLE LOCATIONS! The preferred location for grounding is in the physical center of the bus. MS/TP repeaters may be required to extend distance. Consult engineering department before using.
41	Ethernet (IEEE 8802.3) Cat 5 Wiring preferred	Connect Air P/N W244P-2030 or W244P-1026 or equivalent.	Maximum segment length is 328 ft. Multiple units require Ethernet hub or switch. See system architecture page for details. End terminations must follow the TIA/EIA-568-A pinout using color code option #1.

Project name: Arkansas Tech University Jones Residence Hall
Architect: SCM
Engineers: Pettit & Pettit
Mechanical: CSUSA
Project number: L22-13284
Application Engineer: VWI
Drawn by: VWI
Checked by: VWI
Phase: Submittal
Creation Date: 9/26/2022
Revision Date: 9/26/2022

Northwest Controls
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REVIEW OF MECHANICAL SUBMITTALS

Project: **Arkansas Tech University – Jones Hall**
Location: **Russellville, Arkansas** **P&P Job No. 21-108**
Date of Receipt: **Tuesday, October 11, 2022**
Date of Review: **Thursday, October 27, 2022**
Reviewed by: **Adam Kelly, P.E.**
Email: **akelly@pettitinc.com**

Signed: 

Checking is for conformance with the design concept of the Project and compliance with the information given in the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site; for information that pertains solely to the fabrication processes or to techniques of construction; and for coordination of the work of all trades.

Item	Approval Status		Comments
Section 23 09 23 – Automatic Temperature Controls (Product Data)	Approved as Corrected	o	- Contractor to verify compatibility with existing owner's controls.

  o 

Note:

COMFORT SYSTEMS USA

Quality People. Building Solutions.

Comfort Systems USA (Arkansas), Inc.
P.O. Box 16620
Little Rock, AR 72231
Phone 501-834-3320
Fax 501-834-5416

Date: 10/6/2022
Return Request: 10/16/2022
Project: ATU – Jones Hall
Supplier: NW Controls
Manufacturer: Various
Submittal: Direct Digital Controls System
Submittal Number: 23 09 23-01
Drawing # and Installation: Mechanical Drawings

ARCHITECT
SCM Architects
1400 Kirk Rd. Suite 220
Little Rock, AR 72223
501-224-3055

ENGINEER
Pettit & Pettit
201 E. Markham, Suite 400
Little Rock, AR 72201
501-374-3731

GENERAL CONTRACTOR
Alessi Keyes Construction
10623 Maumelle Blvd.
N. Little Rock, AR 72113
501-225-6699

MECHANICAL SUBCONTRACTOR
Comfort Systems USA (Arkansas), Inc.
9924 Landers Rd.
N. Little Rock, AR 72117
501-834-3320

Notes:

CSUSA PROJECT NO.
22-620
sean@comfortar.com

ALESSI KEYES CONSTRUCTION
REVIEWED FOR GENERAL COMPLIANCE
WITH CONTRACT DOCUMENTS
Charley Dawson 10/10/2022

SUBMITTAL

Equipment:	**Building Automation System**
Project:	**Arkansas Tech University** **Jones Residence Hall**
Location:	**Russellville, AR**
Engineer:	**Pettit & Pettit**
Mechanical:	**CSUSA**

Submitted for approval by: **Virgil Irvin**
Northwest Controls Systems, Inc.

Date: **27 September 2022**

Contents

- **Control Diagrams with Sequences of Operation**
- **Bill of Materials**
- **Equipment Data Sheets**

7631 Northshore Place
North Little Rock, AR 72118
501.280.0404
www.nwcontrols.com

ASCENT CONTROL MODULE
BY ALERTON

Powered by BACtalk

ACM GLOBAL CONTROLLER

The backbone of Alerton's BACtalk™ Ascent product line, the Ascent Control Module (ACM) is the industry's most agile BACnet Building Controller (B-BC) in its class. It combines Alerton's pioneering and proven BACnet® capability with Tridium's® Niagara Framework® flexibility.

It provides a powerful assortment of features such as multiple global controller instances, and multiple communication networks.

The ACM can incorporate up to six (6) global controller instances and supports up to six (6) MS/TP trunks or EIA-485 LANs, consolidating the functionality of these controllers into a single configurable platform, and exceeding the functionality of six individual devices.

Two onboard Ethernet ports support 10/100/1000 Mbps Ethernet connections to the BACnet network, Modbus TCP or for Niagara 4 integration protocols such as LON IP and SNMP.

Easy to add option cards offer scalability for additional communication trunks as needed using the two slots available on the ACM. For example, you can use one option card slot for additional BACnet communication and the second card slot for LON communication by simply adding a dual 485 card and a LON card, respectively. Or you can use up to four card slots to support applications with large point count requirements for a central plant.

The ACM's quad-core processor future-proofs the system by providing high DDC execution speed for all the computing power you need. Two-direction DIN channel and direct panel mount options enable you to mount the ACM in different positions for the best fit.

The ACM hosts automation features such as schedules, trendlogs, alarms, zones and demand limiting.

FEATURES AND HIGHLIGHTS

SCALABLE

- Supports up to six EIA-485 LANs; two EIA-232 connections; two LON LANs; four TUX trunks; or 4 AXM/EXP trunks.

INTEROPERABLE

- Supports the BACnet Protocol on Ethernet, BACnet/IPv4, BACnet/IPv6, and MS/TP; Modbus TCP and RTU (EIA-485 and EIA-232); Alerton TUX, Alerton AXM (and EXP), as well as many Niagara supported protocols.

ENTERPRISE READY

- Supports BACnet/IPv4 and BACnet/IPv6, can be configured to act as a BACnet Broadcast Management Device (BBMD).
- Secure Boot to prevent tampering.

POWERFUL

- Advanced processor and extended memory provide a fast, reliable platform for running DDC programming and global automation routines.

SEGMENTED DDC CODE

- Allows multiple DDC program instances to run within a single controller, providing the ability to logically group sub-systems, improve uptime by enabling service on one system without impacting another, and maximizing flexibility in programming configuration.

TECHNICAL DATA: ACM

POWER 20-30 VAC @ 40 VA, 47–63 Hz, full-wave rectified, with optional battery backup (see other side).

DATA BACKUP/STORAGE One removable microSD card.

PROCESSOR AND MEMORY Efficient, high-speed, quad-core CPU based on the ARM® Cortex™-A9 architecture (Freescale i.MX6Quad); 1GB DDR3 SDRAM, 64-bit-wide, 533 MHz (1066 MT/s).

REAL-TIME CLOCK Provides system date and time.

BACNET/IP IPv4 and IPv6 support for interoperability on enterprise and WANs. Functions as up to four BACnet broadcast management devices (BBMDs) in accordance with Annex J BACnet/IP. Supports both Alerton and BACnet Standard network address translation (NAT) implementations.

MS/TP Supports two onboard networks that can be used for BACnet MS/TP or EIA-485 and up to two expansion cards (two networks each) for a maximum of six BACnet MS/TP networks per ACM.

MODBUS supports both TCP and RTU (EIA-485 and EIA-232) protocols; configuration supports up to 384 Modbus devices.

TUX Supports up to four Alerton TUX trunks for connection of up to 64 TUXs per trunk communicating at 4800/9600 baud or up to 32 TUXs per trunk communicating at 1200 baud. Each TUX Option Card has two TUX trunks.

VLX/AXM (EXP) Supports up to four instances of the VLX application; one instance is included with the ACM.

EXPANSION Supports up to two expansion cards for interface adapters, such as EIA-485, EIA-232, LON, and TUX.

COMMUNICATIONS Provides two Ethernet ports, two onboard EIA-485 networks, two expansion card slots give the ability to add up to four additional EIA-485 networks (for a total of six), or two EIA-232 connections, or two LONworks networks, or up to four TUX Trunks.

MOUNTING 35mm DIN rail, either vertical or horizontal orientation.

DIMENSIONS 7-1/4 W x 8-9/16 H x 1-11/16 D (inches) 185 W x 220 H x 44 D (millimeters); fits 12 x 12 x 4 (inch) panel enclosure.

ENVIRONMENTAL Without battery:
-4 to 149 °F (-20 to 65 °C), 0 to 95% RH, non-condensing.

Storage Temperature:
-4 to 185 °F (-20 to 85 °C), 0 to 95% RH, non-condensing.

ETHERNET Two integrated 8P8C modular connectors for use with two 10Base-T, 100Base-TX, and 1000Base-T Ethernet networks.

SOFTWARE Programming interface is Alerton Compass operator workstation software. Supports Niagara 4 platform when running ACM 2.0 ROC (ACM ROC 2.2.8 supports N4.8).

CERTIFICATIONS AND STANDARDS

- RoHS compliant
- CE (EN 60730-1)
- FCC Part 15 Class B
- ICES-003
- C-Tick listed
- UL 916 for open energy management equipment.
- BTL Listing: BACnet Building Controller (B-BC)

TECHNICAL DATA: ACM BATTERY

The ACM has an optional 12 volt NiMH battery, which provides backup power that allows for orderly shutdown should power remain OFF for more than 60 seconds.

POWER 12 VDC supply voltage

ENVIRONMENTAL

Operational temperature and humidity:
32 to 122 °F (0 to 50 °C), 0 to 95% RH, non-condensing
Recommended storage temperature and humidity (to extend life):
41 to 77 °F (5 to 25°C), RH 65% ±5% non-condensing
Allowed storage temperature and humidity:
32 to 122 °F (0 to 50 °C), RH 5 to 95% non-condensing

CERTIFICATIONS AND STANDARDS

- UL 2054 ed 2 rev 2011-09-14
- EN 62133 ed 1 (2002), ed 2 (2012)

TECHNICAL DATA: TUX OPTION CARD

Each card has two TUX trunks - a total of four TUX trunks can be added in an ACM.

ENVIRONMENTAL

Operational temperature and humidity:
-4 to 149 °F (-20 to 65°C), 5 to 95% RH, non-condensing

Storage temperature and humidity:
-40 to 149 °F (-40 to 65°C), 5 to 95% RH, non-condensing

CERTIFICATIONS AND STANDARDS

- (Same as ACM)

ORDERING INFORMATION* ±

ITEM NUMBER

ACM	Ascent Control Module
ACM-BATT	Optional ACM battery
ACM-OC-2X485*±	Dual EIA-485 option card
ACM-OC-232	EIA-232 option card
ACM-OC-LON	78kbps FTT10A LON option card
ACM-OC-2XTUX	Dual TUX Trunk option card
ACM-MDBS-DR-TCP	Alerton Modbus TCP protocol driver
ACM-MDBS-DR-RTU	Alerton Modbus RTU protocol driver
ACM-DR-VLX	Alerton VLX driver
ACM-DR-FPCS	Integration to FPCS protocol
ACM-DR-HOTEL	Integration to HOTEL protocol
AXM-1048	I/O Module for use with ACM-VLX
AXM-10120	I/O Module for use with ACM-VLX
AXM-2200	I/O Module for use with ACM-VLX

*__IMPORTANT!__ Requires at least one base device license, Alerton (ACM032, ACM064, ACM128, ACM256, ACM384) or Niagara 4 (NC-0005-A, NC-0010-A, NC-0025-A, NC-0100-A, NC-0200-A). Add-on Device packs also available for both Alerton and Niagara 4 base licenses.

± ACM-OC-2X485 is required when using the AXM (EXP) I/O Modules

Specifications subject to change without notice.

INNOVATIVE GLOBAL CONTROLLER WITH EXTENSIVE FLEXIBILITY.

16201 25th Avenue W., Lynnwood, WA 98087
Telephone: (425) 921-4900 / Fax: (425) 921-4872
alerton.com / sales@alerton.com

NEMA 1 ENCLOSURES
RET SERIES

DESCRIPTION

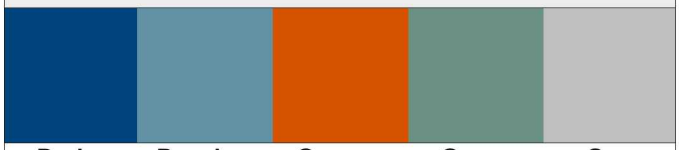
The **RET Series** includes attractive, economical NEMA 1 enclosures designed to house controls and instruments in areas that do not require oil- and dust-tight ratings. The **RET Series** enclosures are furnished with a perforated metal subpanel for easy mounting of components. No drilling or layout is needed. Simply set the control components on the panel and attach with #7 or #8 self-tapping screws in the pre-punched holes. The **RET Series** is also available in a UL listed version.

RET-2018

FEATURES

- ***Low cost NEMA 1 enclosure***
- ***Mounted with door hinged on left or right side***
- ***Removable door***
- ***Attractive powder-coated finish, standard brown enclosure with tan door***
- ***Optional colors available***
- ***Key lock, two keys, and attractive powder-coated perf panel furnished***
- ***Mounting of control components simplified with perf panel***
- ***Optional UL listed enclosures available***
- ***UL listed, File #E130598, for RET UL listed panels***

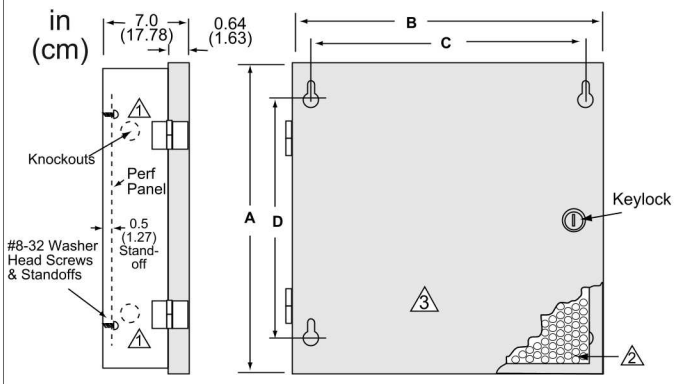
RET OPTIONAL COLOR CHART



Dark Blue | Powder Blue | Orange | Green | Gray

Optional colors are shown in approximate hue.

DIMENSIONS



1 Knockouts are for 3/4" conduit, 2 Knockouts on both sides, 3 Knockouts top and bottom, 4 Knockouts top and bottom on RET3826, RET3626UL, & RET4230.

2 Perf Panel is 16-ga powder-coated steel.

3 Standard Color is brown enclosure with tan door.

ORDERING INFORMATION

ENCLOSURE MODEL	DIMENSIONS in (cm) A	B	C	D	ENCLOSURE MATERIAL	PERF PANEL	WEIGHT lb (kg)	PERF PANEL H x W in (cm)
RET1812†	Discontinued - Use **RET1812ULP**							
RET2018†	Discontinued - Use **RET2018ULP**							
RET2620†	26 (66)	20 (51)	18.5 (47)	20 (51)	16-ga steel	Incl	36 (16.4)	23.5 x 17.5 (60 x 44)
RET3826†	38 (97)	26 (66)	24.5 (62)	32 (81)	16-ga steel	Incl	61 (27.8)	35.5 x 23.5 (90 x 60)
RET4230†	42 (107)	30 (76)	26.0 (66)	38 (97)	14-ga steel	Incl	83 (37.8)	39.5 x 27.5 (100 x 70)
RET1812ULP†	18 (46)	12 (31)	11 (28)	14 (36)	16-ga steel	Incl	16 (7.3)	15.5 x 9.0 (39 x 23)
RET2018ULP†	20 (51)	18 (46)	16.5 (42)	14 (36)	16-ga steel	Incl	27 (12.3)	17.5 x 15.5 (44 x 39)
RET2620ULP†	26 (66)	20 (51)	18.5 (47)	20 (51)	14-ga steel	Incl	41 (18.6)	23.5 x 17.5 (60 x 44)
RET3626ULP†	36 (91)	26 (66)	24.5 (62)	30 (76)	14-ga steel	Incl	69 (31.3)	33.5 x 23.5 (85 x 60)

† **-DB**: Dark Blue, **-PB**: Powder Blue, **-OR**: Orange, **-GN**: Green, **-GY**: Gray (Note: No suffix - Brown/Tan)

24 VAC POWER SOURCE

T-PB SERIES

DESCRIPTION

The **T-PB Series** UL listed power source provides 24 VAC from a 115 VAC input. The **T-PB Series** contains an LED that illuminates when the 24 VAC output is operational. An on/off switch is provided in the 115 VAC input. This switch disconnects or connects both the hot and neutral of the input power.

A convenience outlet is located on the front panel. This convenience outlet *is not* controlled by the on/off switch and is always hot.

A circuit breaker is incorporated in the 24 VAC circuit, which must be manually reset if the rated 3.0A (Class 2) or 4.0A (Class 1) is exceeded and the breaker operates.

The **T-PB Series** is available in a metal enclosure for field applications or without the enclosure for panel mounting.

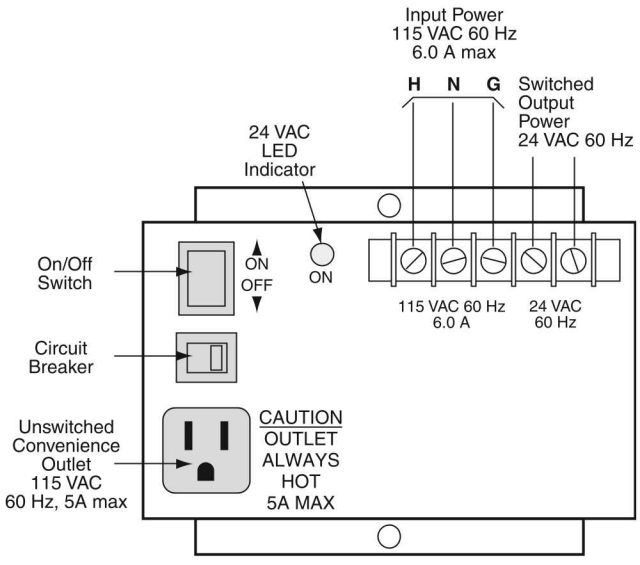
FEATURES

- ***Enclosed and panel-mounted models***
- ***On/Off switch***
- ***Convenience outlet***
- ***Circuit breaker***
- ***Enclosure with removable access panel to on/off switch, breaker, and outlet***

SPECIFICATIONS

Output	
Voltage	24 VAC
Current	
T-PB202	4.0A, 96 VA (Class 1)
T-PB303	3.0A, 72 VA (Class 2)
Convenience outlet	115 VAC, 5.0A max
Input power	115 VAC, 60 Hz, 6.0A max (1A normal operating max, 5A convenience outlet)
Temp	- 13° to 140°F (-25° to 60°C)
Terminals	#12 to #22 AWG
Dimensions	
Enclosed	6.12"H x 5.19"W x 4.12"D (15.5 x 13.2 x 10.5 cm) with 1/2" knock-outs
Panel mount	4.75"H x 5.0"W x 3.75"D (12.1 x 12.7 x 9.5 cm)
Weight	5.85 lb max (2.65 kg)
Approvals	
Enclosed	UL listed, File #E160579
Panel mount	UL recognized component, File #E160579

WIRING



ORDERING INFORMATION

MODEL	DESCRIPTION
T-PB202-1	24 VAC Power Source, 4A (Class 1) with Enclosure
T-PB202-0	24 VAC Power Source, 4A (Class 1) Panel Mount
T-PB303-1	24 VAC Power Source, 3A (Class 2) with Enclosure
T-PB303-0	24 VAC Power Source, 3A (Class 2) Panel Mount