BASview3 – Supervisory Graphical Interface for Control Systems

BASview3 is a stand-alone, embedded, web-based graphical interface for building automation and process automation systems. It can be accessed from any web browser — providing supervisory functionality to any BACnet/IP or Modbus TCP system. By using Contemporary Controls BASrouter or BASgateway products, additional protocols such as BACnet MS/TP and Modbus RTU are supported.

The BASview3 is simple to install and use. The BASview3 is housed in a DIN rail mounted metal enclosure and it is 24VAC/VDC powered for convenient installation. A 10/100 Mbps Ethernet connection is all that is needed for communication. Supervisory features include animated graphic screens, scheduling, historical trending, runtime accumulation and

email alarms. BASview3 will automatically toggle outputs and change setpoints on schedule, collect runtime and trend data, and monitor alarm conditions. As an embedded device, BASview3 uses Flash memory for internal storage to maintain its ruggedness. The BASview3 is totally self-contained, requiring no external application for its use. Multiple, simultaneous web browser users can access the device.

The BASview3 is ideal for small to medium buildings or processes that require a simple-to-use graphical interface with no licensing requirements. The BASview3 can handle up to 2000 nodes - a combination of devices, points, schedules, alarms, trends, etc.
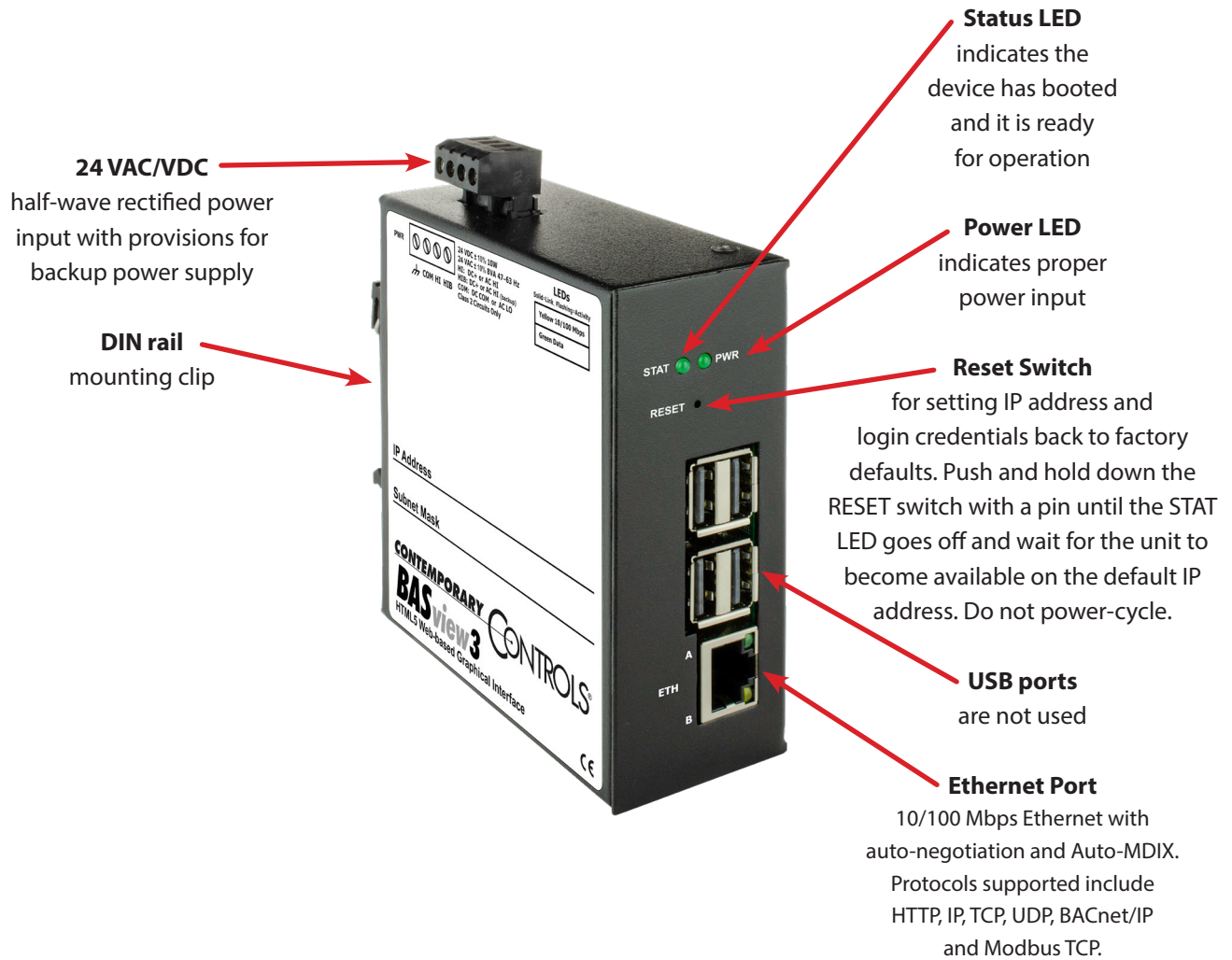
Features ...

- Animated graphics
- Internally maintained schedules with sunrise/sunset and stagger offsets with time retention on power loss
- Trend collection, display and export
- Runtime accumulation with email notification
- Alarm condition monitoring with email notification
- Calculated point values (average, min, max, etc)
- Python programming language for controlling equipment
- Database of up to 32 users and 32 user groups
- Multiple simultaneous users with permission levels
- Activity log for tracking important user actions
- Template system for quickly cloning points, graphics, devices or entire networks
- Calculations may be performed on data points
- Support for up to 2,000 tree nodes which can be any combination of devices, points, graphics, trends, etc.
- No software licensing requirements
- No external tools or software required - completely self contained web browser interface
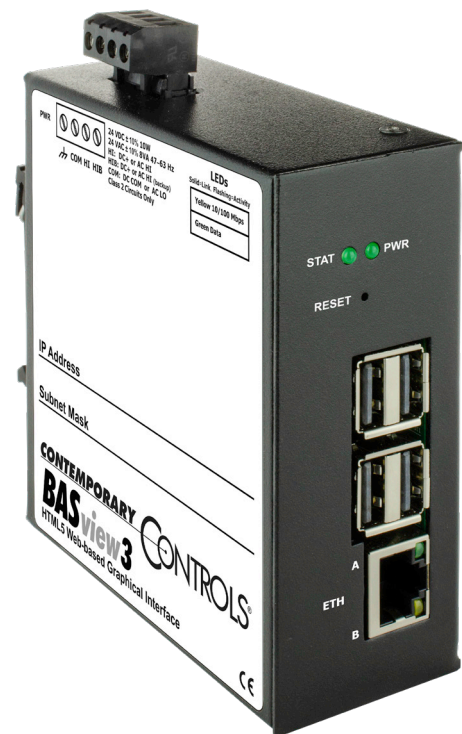
BASview3 — Overview

The BASview3 is housed in a compact metal enclosure that is DIN-rail mounted. It requires a 24VAC/VDC voltage source and could share power with other devices thanks to its half wave rectifier input power circuit. Powered by a 1.2GHz quad core ARM CPU, it has 1GB RAM and 8GB of Flash memory for data storage. The device has a capacitor-backed real-time clock. Installation is easy - simply connect the device to a BACnet/IP or Modbus TCP

Ethernet network to access both BACnet and Modbus compliant equipment. For non-Ethernet based equipment, BACnet MS/TP to BACnet/IP routers or Modbus serial to Modbus TCP routers can be used. By using Modbus serial to BACnet/IP gateways, the complete system can be treated as a BACnet/IP system.

Status LED
indicates the device has booted and it is ready for operation

24 VAC/VDC
half-wave rectified power input with provisions for backup power supply

DIN rail
mounting clip

Power LED
indicates proper power input

Reset Switch
for setting IP address and login credentials back to factory defaults. Push and hold down the RESET switch with a pin until the STAT LED goes off and wait for the unit to become available on the default IP address. Do not power-cycle.

USB ports
are not used

Ethernet Port
10/100 Mbps Ethernet with auto-negotiation and Auto-MDIX. Protocols supported include HTTP, IP, TCP, UDP, BACnet/IP and Modbus TCP.

The User Home Page — Toolbar

Each user has access to a personal home page that contains a custom toolbar at the top and a device tree on the left side. Depending upon user permissions, the user can add devices and points from the system being monitored and define services such as scheduling, trending and alarming. Up to 32 users can be authorized to belong into one of 32 possible user groups. User groups define the permission levels.

⚙ **Open the System Menu.**

⬅] **Logout of the system and return to the login screen.**

🔔 **Display the Alarm Report.** This button will flash red if new alarms are available. It will be solid red if any active alarms are detected.

⏳ **Display the Runtime Log.** This button will flash yellow if new runtime notifications are available. It will be solid yellow if any active notifications are detected.

❓ **Display help on the currently opened screen** (dashboard, trend, schedule, etc.)

✖ **Maximize screen.** Maximize mode hides the device tree and status bars so the currently opened screen takes up all available space. Users can swipe the screen left or right to move between opened screens.

◀| **Return to the root of device tree.** Basically, a "Home" button.

⬅ **Go back one level in the device tree.**

✔ **Toggles select mode.** This allows selecting multiple items in the tree for deleting or moving.

CONTEMPORARY CONTROLS®
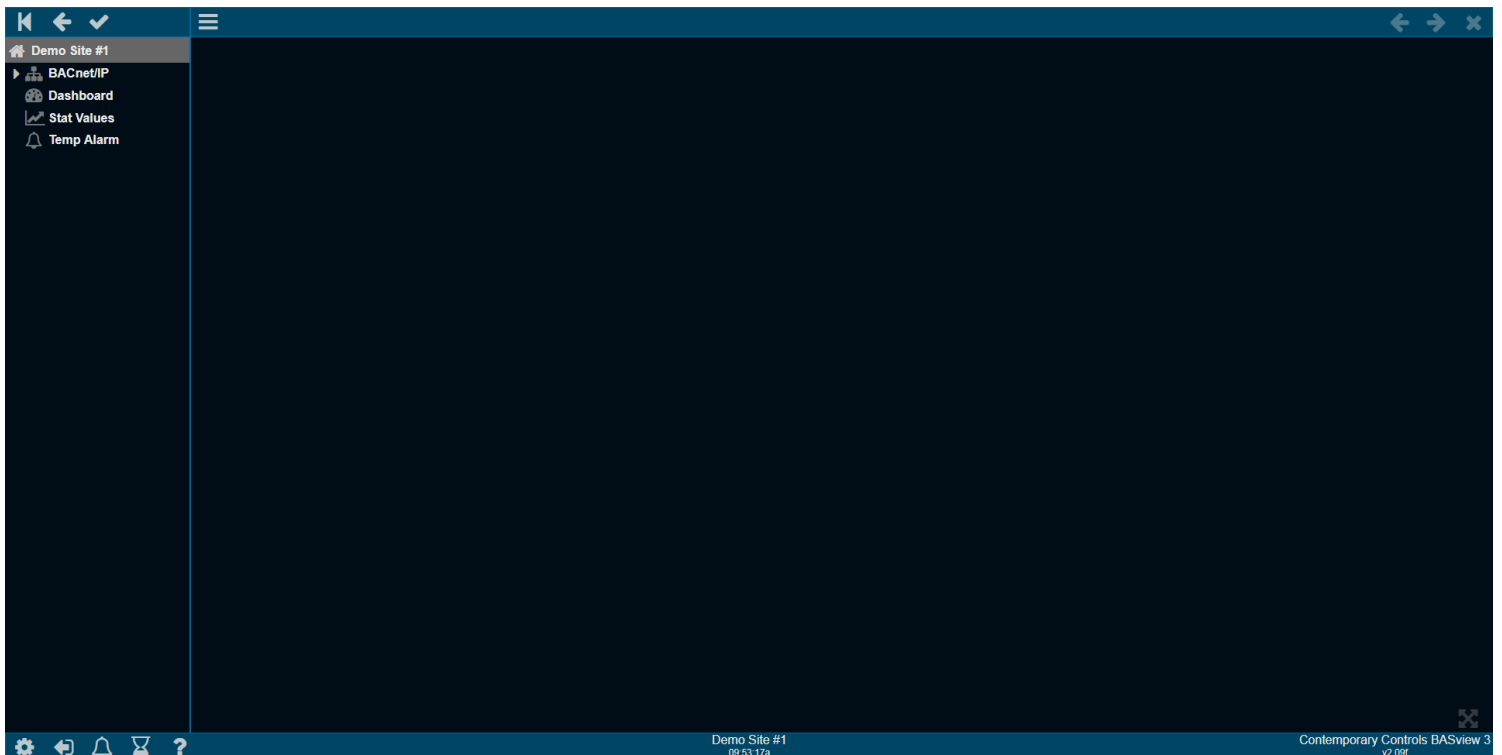
The User Home Page — Device Tree

The device tree appears on the left side of the main window. It displays all interactive items in the system. Each type of item is represented by one of the following icons:

🔔 **Alarms** - Monitors specified conditions and generates an alarm message and optional email alerts.

▦ **Calculations** - Reads the value of one or more points and performs a calculation on them. For example, averaging several temperatures.

📦 **Devices** - Any physical device, panel or I/O unit in the system.

🎛 **Dashboards** - Used to display information from the system and to control equipment. Dashboards are mobile-friendly and adapt to any screen size.

🔀 **Drivers** - A physical network or logical grouping of devices based on the protocol they use. For example, an entire ModBus network is a single driver.

📁 **Folders** - Used to help organize other items. Folders may contain other folders.

🖵 **Graphics** - Used to display information from the system and to control equipment. Graphics are useful for floor plans or animating control systems. They can be embedded in dashboards.

🔗 **Links** - Used to access other units, web pages or other web content.

💡 **Points** - Any physical or logical control point on a device. Inputs, outputs, setpoints and variables on a device are all considered "points".

⚙ **Programs** - Allows simple programs to be written to control setpoints, outputs and other points.

⧗ **Runtimes** - Monitors specified conditions and accumulates the amount of time the conditions are true, and generates a message and optional email alerts when a limit is reached.

📅 **Schedules** - Allows for control of several points based on the time of day.

📈 **Trends** - Automatically records point values at specified intervals to allow for later viewing.
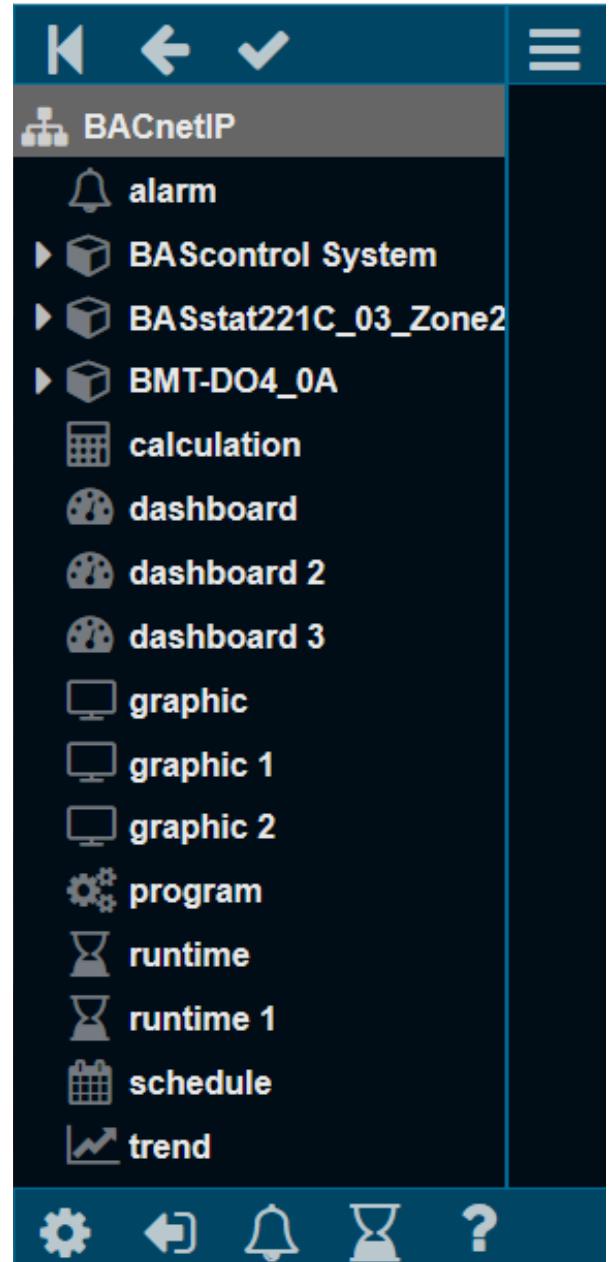
Configuring a System

The first step in the configuration process is to add a driver based on the network protocol being monitored. There are five possible resident drivers and multiple drivers can be loaded, if desired.

BACnet/IP and **Modbus TCP** are Ethernet-based and thus require no additional hardware. These can be used with external Modbus serial to Modbus TCP routers such as the BASremote or BASgateway or BACnet MS/TP to BACnet IP routers such as the BASrouter.

After the interface has been chosen, the appropriate network driver is selected under the *Site* icon on the device tree.

Physical devices are then added to the device tree under the appropriate network driver. Using a network protocol that supports discovery (such as BACnet), devices and their objects can be found with a simple *Scan* command. Objects can be scanned to find all points within a device. You have the option to add those points that are found — but there is no requirement to use all points. Once devices and points are entered, the appropriate icons appear in the device tree. These points can now be referenced using BASview3's built-in services.
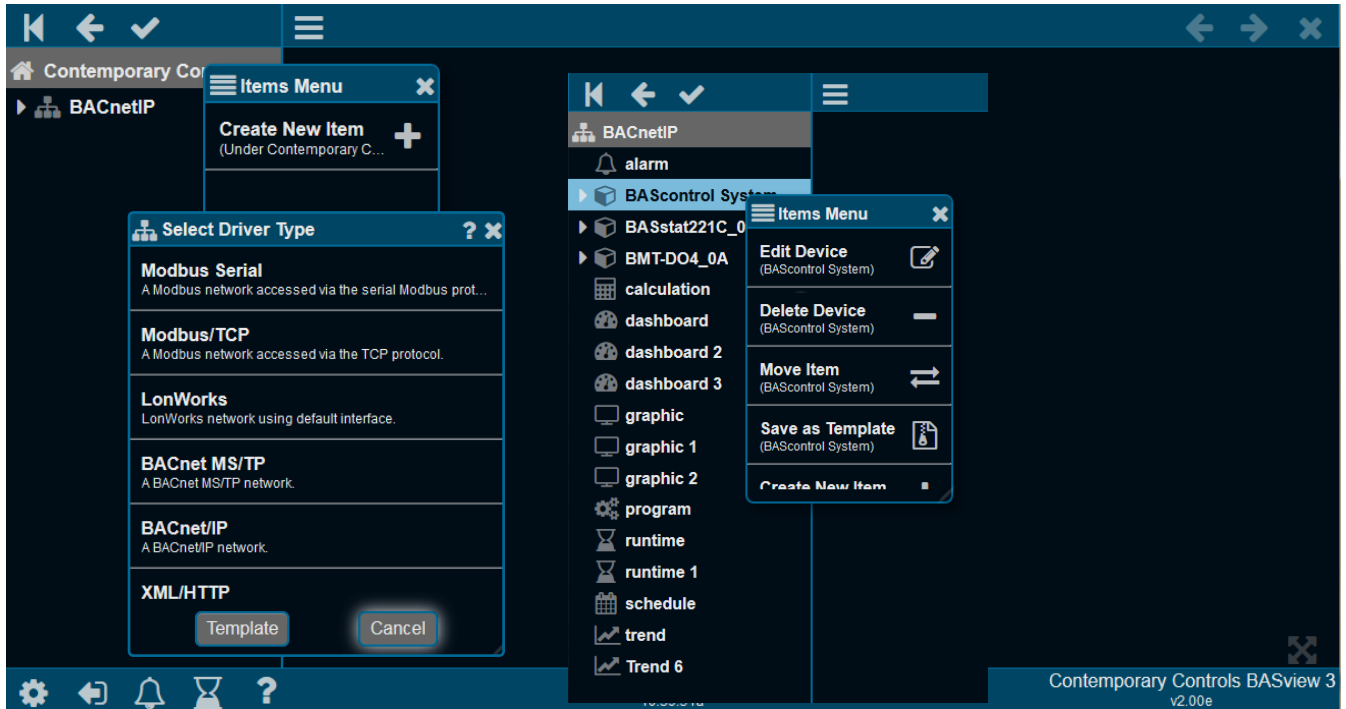
Scheduling

Schedules allow for control of several points based on the time of day within a seven-day week. A schedule is active if the current time of day falls within one of its specified time periods. Up to 32 points can be controlled by a schedule. An active and inactive value are defined for each point. For example, the schedule is active from 8 am to 6 pm and a setpoint is modified to 72°F during active periods and to 78°F during inactive periods.

Each day of the week has a horizontal bar where time periods are displayed. These settings can be changed if the current user access permits it.

Schedules are easily created. Daily entries can be easily copied to other days. Exceptions to the rule — such as holidays — can be entered to override the schedule.

The points list displays all points affected by this schedule — the active/inactive values of each point and the number of seconds by which to offset the changing of this point. Offsets allow points to be staggered on or off to minimize demand spikes and to sequence equipment in the proper order.
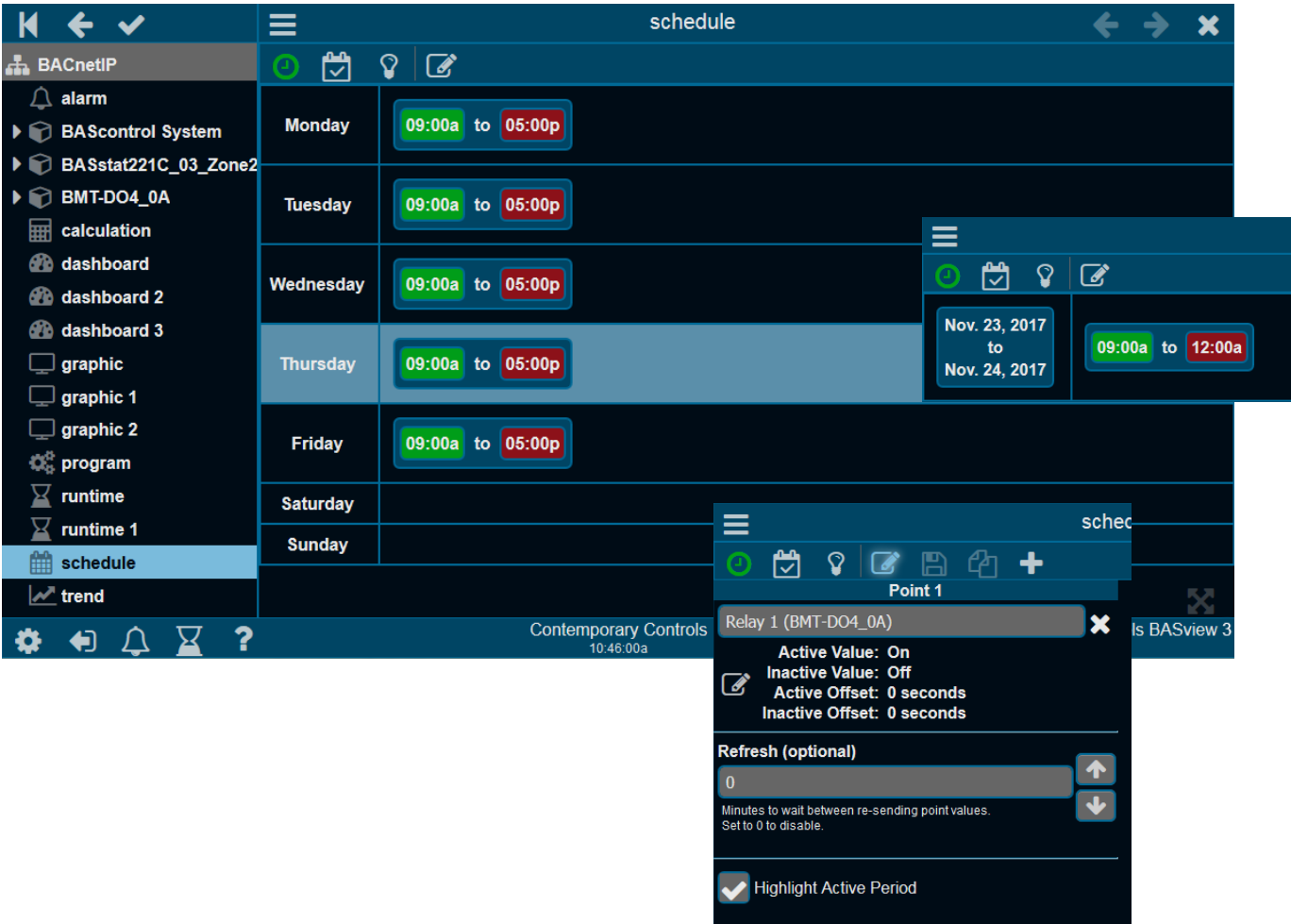
Trending

Trends automatically record point values at specified intervals of time to allow for later viewing. Up to six points may be specified for a trend. Both a graphical line chart and a tabular text view are available per trend. A pop-up calendar makes it easy to choose the date and time. An option allows you to export your data.

Using the *Chart* option. The vertical axes shows the value of the variable being trended with the horizontal axis displays time. Both scales are automatically adjusted to fit the data currently displayed. Up to six variables can be trended on the charts. In the background a grid shows where the value and time scales intersect. With the mouse hovering the

point, information about the value of the variable at that time is displayed.

The *Data* tab displays the same data as the chart, but in a tabular text format. The first column is the date/time of the reading. Each point is then listed in order, from left to right. Any column header can be clicked to sort the data by that field. Clicking the header a second time will reverse the sort order. If there is more data than can fit on the screen, a scroll bar will appear to allow scrolling through the data. A mouse wheel may also be used to scroll.
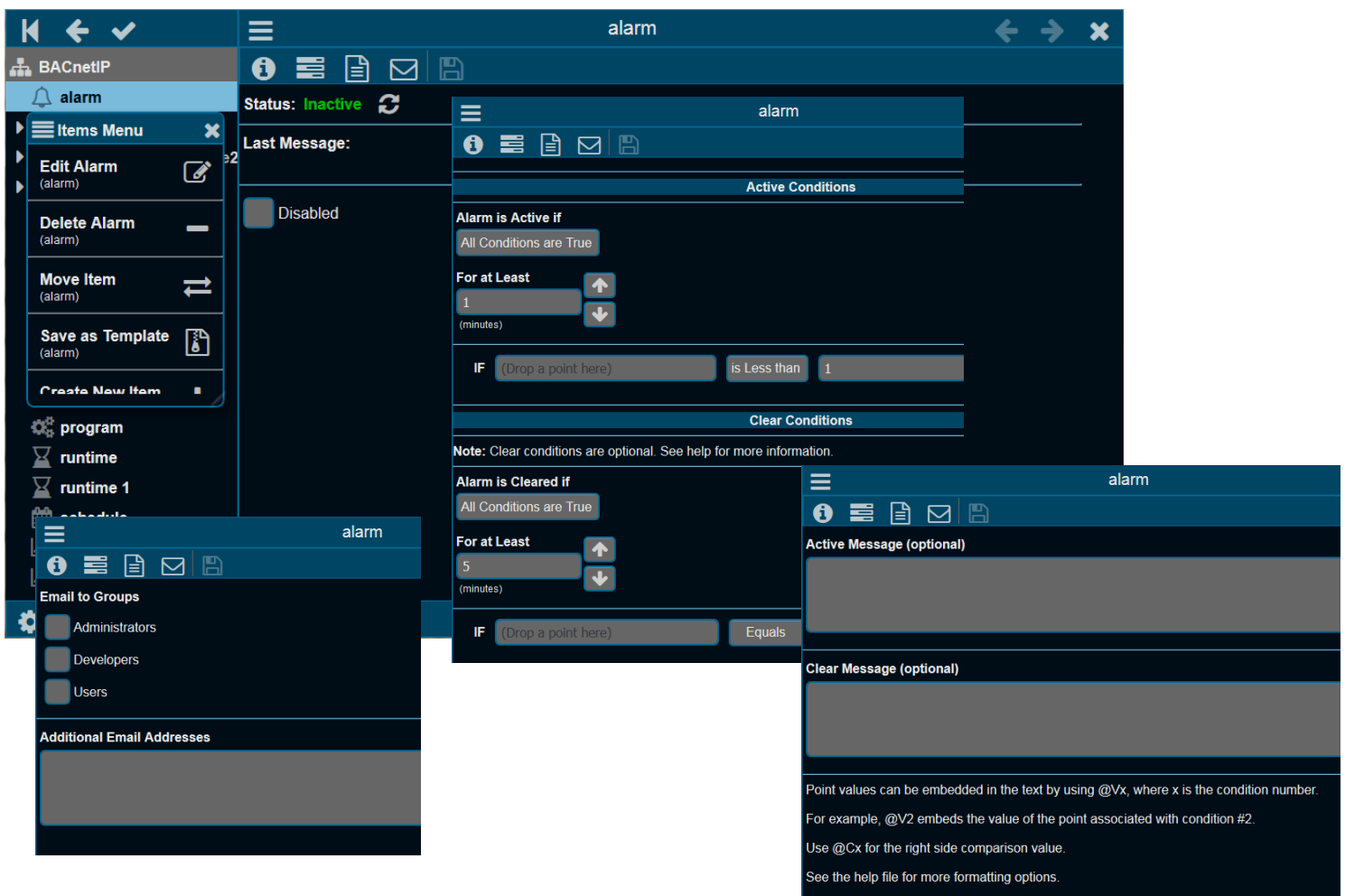
Alarming

Using alarming, the operator can be notified when points assume a particular condition. Up to six conditions can be used to enable a particular alarm. Alarms are logged based upon time of occurrence and can be saved for up to one year. When an alarm condition returns to the normal state, they are automatically cleared.

The alarm editor allows editing of alarm conditions, messages and email recipients. Creating an alarm condition is very easy to do. The user creates an alarm by first right-clicking in the tree and selecting "Create New Item" and then selecting "New Alarm". Right click the created alarm and select "Edit Alarm". Then the point to be monitored is then simply dragged to the condition window in the alarm monitor. At this time, up to six conditions can be used to enable the alarm. An activation alarm text

message is then entered, and if desired, a clear alarm text message can be entered. If this alarm notice is to be sent by email to an associate or a group of associates, there is a box to enter the proper email address or addresses. The alarm is then applied and scanning for the alarm begins. To eliminate any nuisance alarms, where short-term alarm conditions can be tolerated, a time window can be assigned to the condition logic.

On the Toolbar is an Alarm icon that flashes when active conditions exist. By clicking the icon, the alarm log can be viewed and the flashing of the icon ceases. Alarms are stored for one year and are grouped into months. A large alarm log can be filtered by month or can be finely sorted using a filter.

Runtime Monitoring

Equipment can be easily monitored to notify you that preventive maintenance is needed — such as filter changing — or to determine high duty-cycles that could point to control problems.

Setting up runtimes is similar to setting up alarms. With the runtime editor you can define up to six conditions that

determine if a runtime accumulates. You can check the runtime status, define the runtime notification message, and determine who is notified when a runtime limit has been reached.

To view the status of all runtimes, a report can display the accumulated results of the various runtimes.

Performing Calculations

Calculations read points from one or more devices and perform a calculation on them — such as average, minimum or maximum or conversion (e.g. Celsius to Fahrenheit). Custom calculations may also be used. Calculations may be used on graphics, trends, alarms and even other calculations — just like physical points. Points must be dragged from the device tree and dropped in the points list. Every point that will be part of the calculation is dropped. The order of the points is generally not important

unless a custom function is used. For example, to average three temperatures, drag the three temperature points to the point list and select "Average". Custom functions are also supported by selecting "Custom" and entering a calculation in the "Post-function Calculation" window. The post-function calculation is used to perform an additional calculation on the result of the function, or to specify a custom function.

Graphics/Dashboard

To obtain a more understandable view of the process or equipment, graphics with embedded tags and values are created for viewing in a browser window.

The BASview3 supports two types of "graphics", one is the traditional graphic where you have user-uploaded images, graphical elements with values from points and some animated elements. The position of the elements on the screen are dynamic (image 1). The other is a Dashboard (image 2). Here the position of the elements can move based on the display resolution. This works very well on smaller displays such as smart phones or tablets.

Graphics/Dashboards are used to display system information and to control equipment. Edit mode is only available to users given permission to edit graphics. Several Components are available -- including text labels, check boxes, gauges, animations, etc. To add an item to a graphic, drag it from the device tree to the graphic area — then a dialog appears for choosing a component to use with the item. To change the point attached to a component, drag the new point from the device tree and drop it on the component. Components may be copied and pasted between graphics.
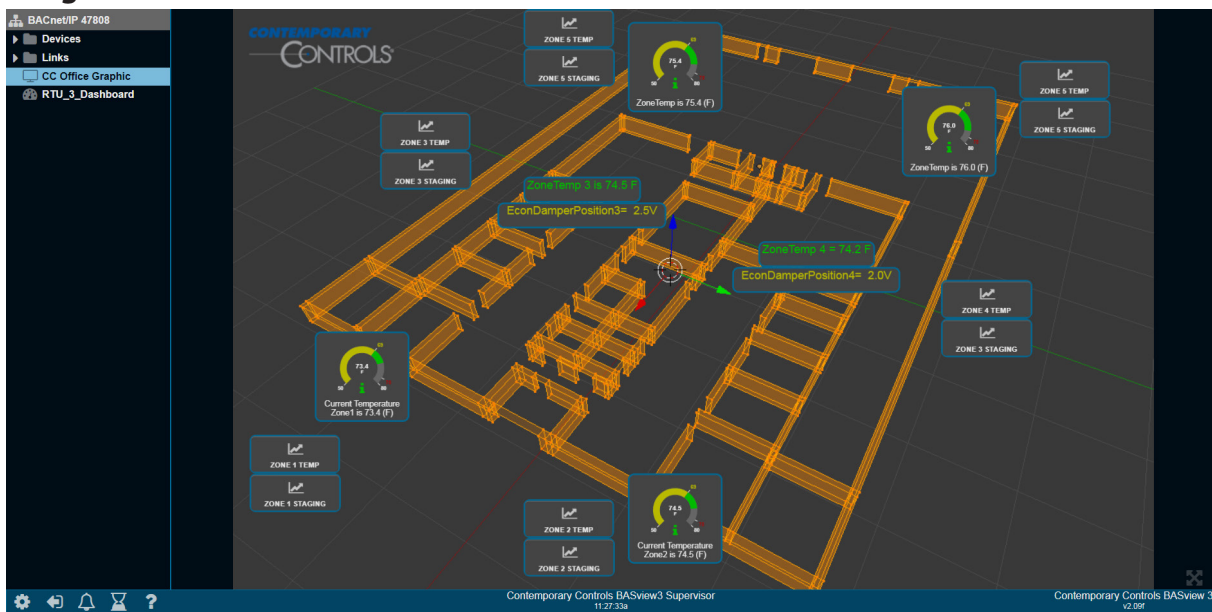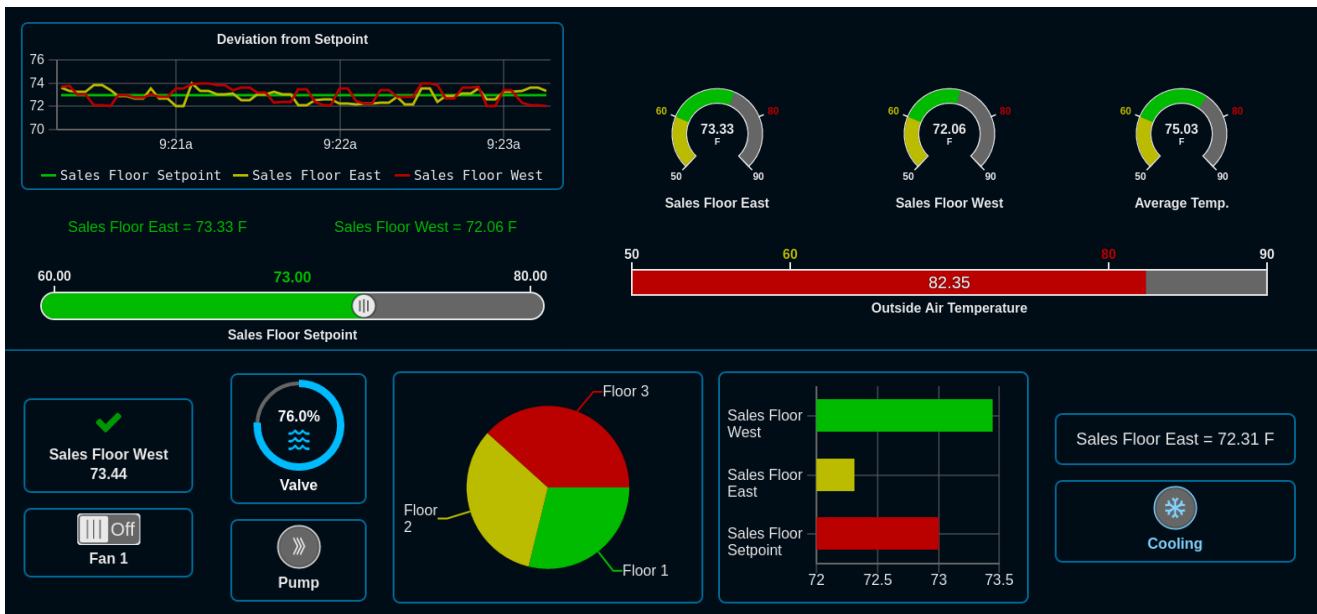
Image 1

Image 2

Templates

Templates are a powerful tool to make system setup easier. Any item in the device tree may be saved as a template. That item can then be quickly recreated without worrying about the details.

For example, a temperature setpoint for the first floor may be defined, including a label, description, modify limits and calculations to convert from Fahrenheit to Celsius. It may then be saved as a template. Use the saved template to create a similar setpoint for the second floor, changing the name and address to distinguish the new setpoint from the old.

Saving a driver, device or folder as a template saves all sub-items in the tree as a single template. It may then be restored to quickly duplicate it.

For example, in the illustration below, the entire BACnet/IP network — all points, graphics, schedules, alarms, etc.

under the BACnet/IP driver — will be copied into the created template. Then you can create a *second* BACnet/IP network with a new driver, but using the template created from the original driver — in essence, copying the original network. Then only the new addressing will need changing to make the new item functional. This can save an immense amount of time and work.

When a new item is created from a template, the new item uses the template *as it exists at that time*. Changing a template later will have no effect on items previously created from it.

Also, it is important to fully test an item before duplicating it as a template. Otherwise, mistakes in the original item will need to be corrected in the duplicate item — perhaps taking much effort.
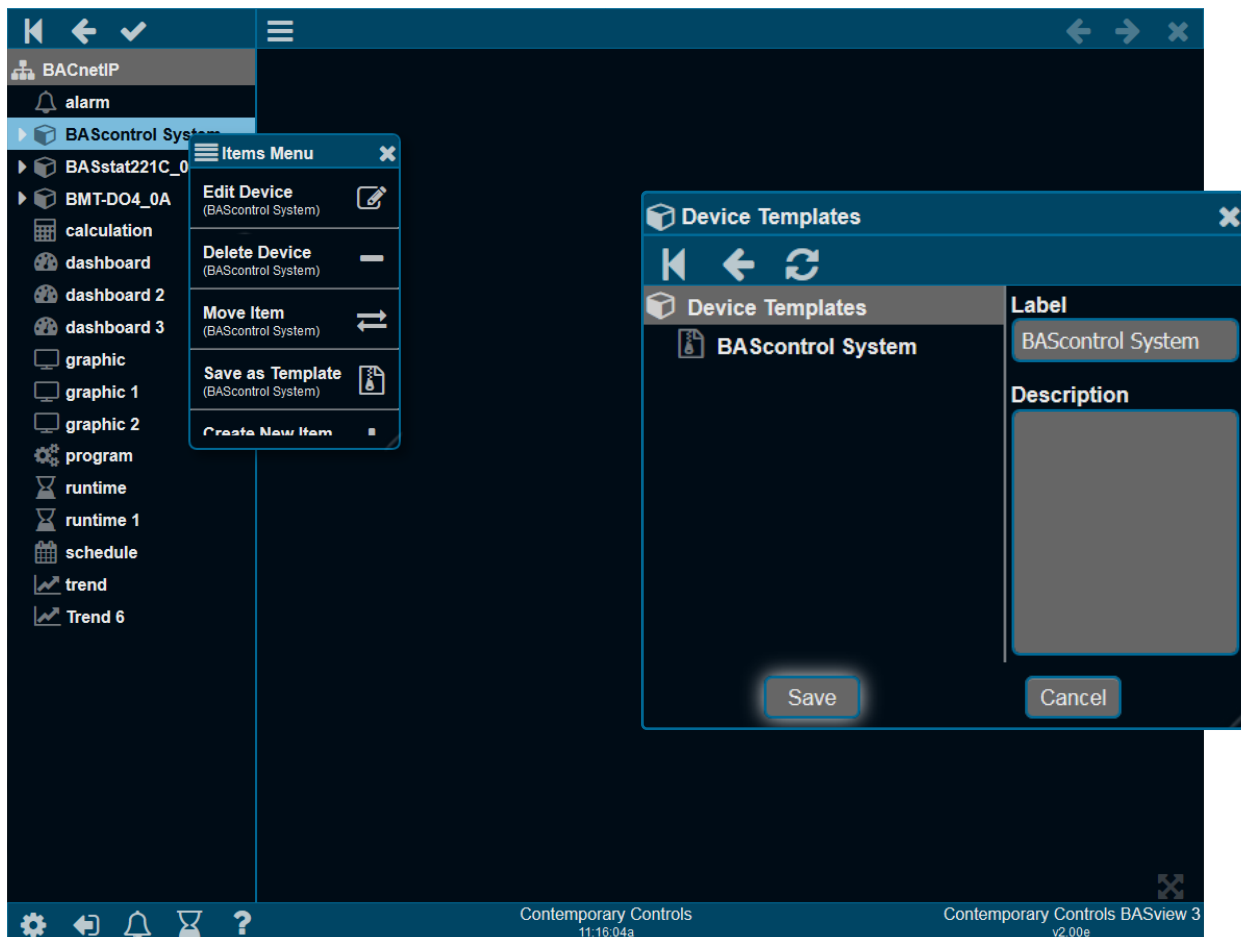
Python Programming

If the schedule or calculation feature is not sufficient, you can use the BASview3's programming feature to add one or many programs to control connected BACnet, Modbus — or re-calculate data from these devices. The BASview3 utilizes the simple Python programming language for its user programs. This language is similar to BASIC and provides standard *if-then-else* and *loop* operations. The BASview3 also provides special functions to read/write points within connected devices, functions for time and date, and other useful functions. Data between programs can also be shared. Each user program can execute on a timed basis or upon demand. Comments are also supported.

Because the internal point names can be somewhat complex, the BASview3 provides a simplified version of the point names used in programming. Simply drag a point from the point tree and drop it onto the points table and the BASview3 will assign a simplified name for the user program. These names will begin with the '@' symbol to help differentiate them from the variable names in the user program.

The real strength of the programming feature lies in the BASview3's program debug feature. This allows you to write your program and debug it directly from the webpage of the BASview3. Errors discovered in the user program will also be displayed in the debug webpage. Press the *Debug* tab and you will see the current status of the variables in the program. Also, all user debug print messages will appear in the bottom portion of the screen.
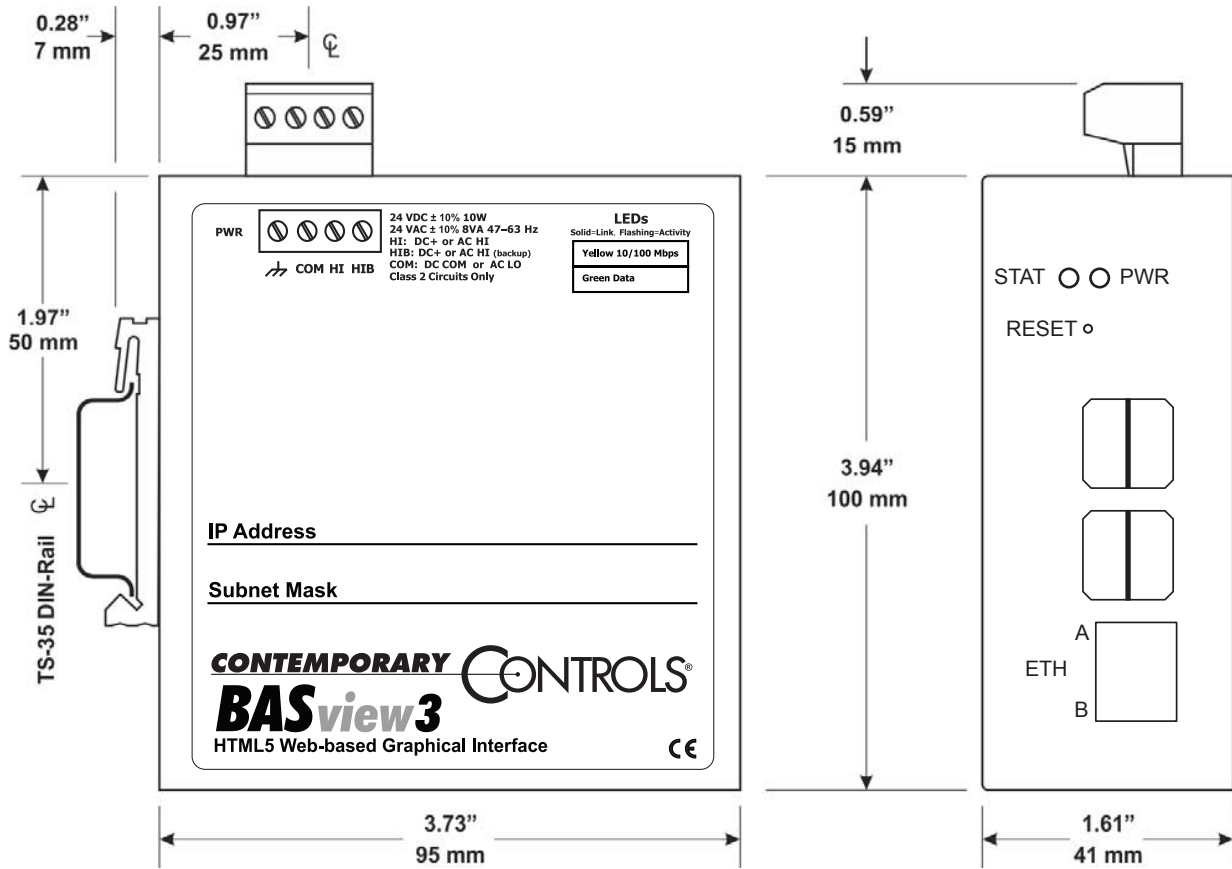
Application Example — Minimal Building Integration

For small systems or processes, the BASview3 can interface to Modbus RTU and BACnet MS/TP through connected Ethernet routers and gateways. In the example shown below, the BASview3 is communicating via the Ethernet port to support BACnet devices.

Mechanical Drawing

Connector Pin Assignments
Ethernet

Pin	Function
1	TD +
2	TD –
3	RD +
4	N/C
5	N/C
6	RD –
7	N/C
8	N/C

Specifications

Power Requirements	24 VDC ±10% 10 W or 24 VAC ±10% 8 VA 47–63 Hz
Operating Temperature	0°C to 60°C
Storage Temperature	–40°C to 85°C
Relative Humidity	0–95%, non-condensing
Protection	IP30
Ethernet Port	IEEE 802.3 10/100 Mbps data rate
	10BASE-T, 100BASE-TX physical layer
	100 m (max) CAT5 cable length
USB Ports	USB 2.0, Type A

LEDs	Power	Green:	On = power OK
	Status	Green:	On = status OK
	Ethernet	Green:	On = Link; Flashing = Activity
		Yellow:	On = 10/100 Mbps

Regulatory Compliance	CE Mark; CFR 47, Part 15 Class A; RoHS

Ordering Information

Model	RoHS	Description
BASV-3	✔	BACnet/IP Supervisor HTML5 Graphical Interface