

# THE Resource



CORPORATE UPDATE

## SMART BUILDINGS A CYBERSECURITY LIABILITY



APPLICATION ENGINEERING

TECHNICAL SUPPORT

RESEARCH & DEVELOPMENT

SALES & MARKETING



## OFFICIAL SOFTWARE RELEASE **RCGrafxSet**® 3.5

- *Smart buildings: A cybersecurity liability*
- *Insight: Standards prioritize return on investment*
- *Contact support*
- *Did you know? You can use Wireshark to diagnose issues on a BACnet internetwork*
- *Official software release: RC-GrafxSet 3.5*
- *New MACH-ProView LCD Operator Display*
- *Training*
- *Dealer training incentive package*
- *RC-GrafxSet: Isometric section*
- *Promotional products*

## SMART BUILDINGS A CYBERSECURITY LIABILITY

CORPORATE UPDATE

APPLICATION ENGINEERING

TECHNICAL SUPPORT

RESEARCH &amp; DEVELOPMENT

SALES &amp; MARKETING

Citizens are concerned about the ability of public and private institutions to adequately protect their data, particularly after the high-profile LifeLabs data breach in 2019 and the devastation brought by Ryuk malware on three hospitals in Ontario the same year.<sup>1</sup> In the hospitality industry, a breach of data at Marriott exposed the privacy of nearly half a billion guests who stayed at the hotel chain between 2014 and 2018.<sup>2</sup> It is crucial for organizations to be proactive when it comes to cybersecurity.

Security breaches are often the result of blind spots for IT and security teams. This is especially the case when organizations don't manage their own assets or are not aware of their existence. Internet of Things (IoT) devices are a prime example of such assets. Building owners and operators rely on many types of IoT devices, such as refrigeration, HVAC, and lighting systems, to diagnose faults, collect data, and remotely operate and service equipment. Each of these systems offers a tempting open pathway for an attacker. In 2017 a casino's high-roller database was exposed to hackers who infiltrated the network through a smart thermostat and pulled data to the cloud.<sup>3</sup> It is more important than ever for building owners and designers to map their smart buildings' attack surface, expose that shadow risk, and eliminate all attack vectors.



Smart buildings collect data from equipment and sensors and analyze them to improve operational efficiency, reduce waste, and ensure occupant comfort—all worthy efforts. An example of the many government and non-profit efforts to improve building energy efficiency and environmental impact is the Government of Canada's Smart Buildings Initiative, part of a broader goal to make federal buildings energy efficient and reduce greenhouse gas emissions.<sup>4</sup> But as smart buildings and IoT devices gain momentum in the market, unless we carefully consider their security, we risk exposing our data and privacy to malicious actors.



## BACNET PROTOCOL

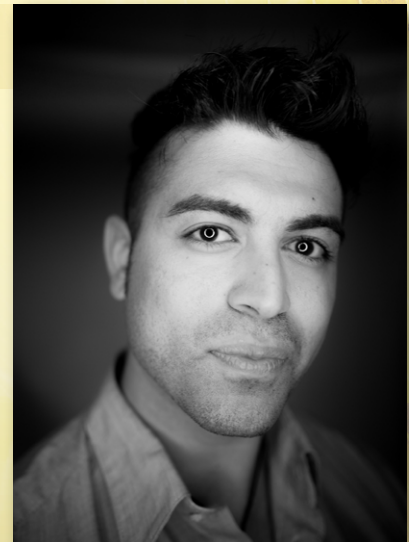
Smart buildings need smart devices to deliver the information needed for energy analytics, fault detection, and remote operations management. These devices communicate over Wi-Fi, Ethernet, Bluetooth, EIA-485, and a variety of other networks. Smart devices also provide information to direct digital control (DDC) controllers for status, temperature, CO<sub>2</sub> levels, and various other parameters. DDC controllers operate everything from large air handlers to small light sensors using a centralized, network-oriented approach and open protocol languages such as BACnet, Modbus, and KNX.



Open protocol languages are the cornerstone of easy integration and plug-and-play installation. BACnet protocol, developed and maintained by ASHRAE, has become an industry standard for smart buildings and was ISO certified in 2003. BACnet is used to control lighting, security access, elevators, HVAC, and life-safety devices. However, as with devices that use Modbus and other open protocols, BACnet-controlled devices offer little to no security in the way they integrate and communicate. This makes smart buildings vulnerable to attacks and system breaches.

## SECURE COMMUNICATIONS

Product owner Faisal Hamood and the RC-RemoteAccess team have been improving the way encrypted BACnet networks are managed. Reliable Controls was one of the first organizations to encrypt BACnet communications and develop a server-based router that can manage multiple systems. RC-RemoteAccess is unique in that it does not rely on additional devices to route and manage encryption; it provides security within the building as well as secure access into it. Our encrypted BACnet networks are interoperable with any standard BACnet device, and many of the IP challenges of BACnet/IP, such as static IP addresses and broadcast management, are eliminated. This not only secures a smart building's network but also simplifies its architecture.



As smart-building technology advances, we can expect cybersecurity challenges to increase. Think of encryption as a lock on your door. It can only delay a determined malicious actor. The bigger and stronger the lock, the more specialized tools and knowledge the malicious actor needs to break it. It is not enough to rely on encryption. Smart-building designers need to supplement encryption with network segmentation, social engineering training for staff and operators, and a strong IT policy with contingencies and alarms. Segmentation limits the damage of a break-in, and alarms alert you of suspicious activity on the network, but cybersecurity is not just a technological challenge; it also has a human element. The best lock can't protect you if the robber has the key.



## SMART CITIES

Today, cities are beginning to use digital technologies to make better decisions and improve quality of life. Smart cities collect data from citizens, buildings, and assets and use it to monitor, track, and optimize energy, water and waste, traffic, comfort, safety, and a variety of other aspects of our daily lives. The more interoperability that occurs between devices, buildings, and infrastructure, the more opportunity for our data and information to be vulnerable; the challenge of cybersecurity is ever present. Future cybersecurity systems will likely be based in artificial intelligence, but they will always rely on fundamental safeguards like encryption and alarming—and on our ability to adapt our human defenses.



## REFERENCES

1. Ikeda, Scott. "The LifeLabs Data Breach," *CPO Magazine*, January 8, 2020. <https://www.cpomagazine.com/cyber-security/lifelabs-data-breach-the-largest-ever-in-canada-may-cost-the-company-over-1-billion-in-class-action-lawsuit>.
2. "Marriott's Data Breach Points to Cybersecurity Complacency: Stealthcare." *BloT Canada*. December 11, 2018. <https://www.biotcanada.ca/marriotts-data-breach-points-to-cybersecurity-complacency-stealthcare/1002880346>.
3. Beck, Kellen. "Hackers Exploit Casino's Smart Thermometer to Steal Database Info." *Mashable*, April 15, 2018. <https://mashable.com/2018/04/15/casino-smart-thermometer-hacked>.
4. Government of Canada. "Smart Buildings Initiative." February 12, 2020. <https://www.tpsgc-pwgsc.gc.ca/biens-property/intelligents-smart/index-eng.html>.

For more information on how you can protect your systems from intruders, visit our Security Alerts page. [reliablecontrols.com/support/technical/cybersecurity.php](https://reliablecontrols.com/support/technical/cybersecurity.php)



## insight

### STANDARDS PRIORITIZE RETURN ON INVESTMENT

Given the option, few people would eschew a washing machine to launder their clothes in a tub with a washboard. Few choose to make their own soap or grind their own flour when these staples are readily available. Why? It is often a matter of neither expertise nor even efficacy but rather of efficiency and priority. It is more efficient and requires less effort to launder clothes in a washing machine, to clean flatware in a dishwasher, or to purchase commodities like soap and flour. There is insufficient value to performing these tasks manually. Most people would agree their time is better spent on other, more valuable activities.

The concept of prioritizing time, even subconsciously, draws attention to the fact that time, like money, is a resource to be spent. Money is spent for goods and services. Time is spent in attention and activity. The difference is that money can be earned and saved; time cannot. The choice to spend time on a more valuable activity is an important assessment that happens, often passively, every day.

In a business, particularly in the service sector, time should be judiciously stewarded, spent as efficiently as possible on activities that hold the greatest value. This discipline ensures time is dedicated to things that provide the greatest return on investment, which makes the activities, and the business, sustainable.

One opportunity for such stewardship in the building automation industry — operational standardization — was presented in the preceding installment of [insight](#). Like most worthwhile endeavors, operational sustainability and standardization require good planning and execution. Over many years we have developed and maintained the Reliable Controls standard applications library to provide examples of application standardization.





## STANDARDIZATION

Standardization is a process of developing and implementing technical, consensus-based standards that maximize repeatability, efficiency, and quality over custom processes. Reliable Controls application engineering standards are developed according to the 80 percent rule: to address 80 percent of the typical requirements for 80 percent of the most common applications. By following this rule, we find commonalities that maximize repeatability, efficiency, and quality. Eighty percent is often the threshold for diminishing returns in standardization of built environment applications and process control. The other 20 percent of effort is arguably the most critical and represents the greatest opportunity for customization and optimization.

## STANDARD NAMING CONVENTION

A cornerstone to standardization in the Reliable Controls application engineering process is a standard naming convention, a structured scheme that defines object names. Thoughtful development of names for all objects used by all technicians on all projects ensures that concepts are consistently identified, easy to recognize, and simple to group with intuitive relationships. Simple, consistent representation of data diminishes the learning curve, reduces engineering time, and improves programming efficiency. A standard approach at the organizational level makes projects more accessible to a greater number of technicians and easier for users to understand, find, and reference specific objects when they create graphics, develop programs, commission systems, and optimize operation. It can also make it easy to modify or report on data, such for as energy meters, space-temperature setpoints, and damper or valve positions.<sup>1</sup>

The *Reliable Controls Standard Naming Convention: A Best-Practice Informative Guideline* and the Standard Naming Convention Builder tool (Figure 1) are available in the Engineering Manuals section under the Engineer tab in the Dealer Support Center. Using standard names maximizes repeatability, efficiency, and quality.

Characters	Object Name	Copy
17	FL02-IVAV08-RMT-SP	Copy
Object Description	Copy	
Floor 02 pressure independent variable air volume air terminal unit 08 room temperature setpoint	Copy	

Figure 1: Standard Naming Convention Builder tool in the Dealer Support Center.

<sup>1</sup> For more information about standard naming conventions, please refer to the *Insight* article in the August 2020 Resource.



## STANDARD ENGINEERING

Design standardization requires some initial effort, but it results in applications that are efficient and intuitive to deploy, maintain, troubleshoot, and operate. Consistency empowers technicians and operators to quickly understand and navigate even complex applications.

Engineering documents, such as drawing elements, wiring diagrams, details, and installation notes, are labor-intensive design assets that can be standardized to maximize repeatability, efficiency, and quality. A library of Microsoft Visio stencils for standard wiring and riser diagrams is available in the Product Drawings area under the

APPLICATION	Size		CONDUCTOR			CAPACITANCE		REFERENCE (Waco City Wire)		
	AWG	MM²				µF/ft	µF/m	Description	PIN	
Power	Standard	18	1.0	2	Copper	Stranded	N	-	18-02 UNS STR CMP Wht Jkt	DO2360
	Link-power	16	1.5	2	Copper	Stranded	N	-	16-02 UNS STR CMP Wht Jkt	DO1360
VO	2-wire, Non-shielded	18	1.0	2	Copper	Stranded	N	-	18-02 UNS STR CMP Wht Jkt	DO2360
	2-wire, shielded	18	1.0	2	Copper	Stranded	Y	-	18-02 OAS STR CMP Wht Jkt	DO2320
	3-wire, Non-shielded	18	1.0	3	Copper	Stranded	N	-	18-03 UNS STR CMP Wht Jkt	DO2370
	3-wire, shielded	18	1.0	3	Copper	Stranded	Y	-	18-03 UNS STR CMP Blu Strp	DO2332
MS/TP	2-wire	22	0.5	1 pair	Copper	Stranded	Y	< 25 < 80	22-02 OAS STR CMP LC Resp REL	0043260REL
	3-wire	22	0.5	3	Copper	Stranded	Y	< 25 < 80	22-03 OAS STR CMP LC	D043339
SMART-Net	24	0.25	3 UTP	Copper	Solid	N	-	24-3P UNS SOL CMP C3 Gm Jkt	D61002	
Ethernet	24	0.25	4 UTP	Copper	Solid	N	-	24-4P UNS SOL CMP C33 Wht Jkt	555610	

**TEMPERATURE CONTROL WIRE SCHEDULE**

Figure 2: Sample wire schedule.

and MACH-ProLight Lighting Control Panels are designed to help you develop applications using standard elements. The Microsoft Visio lighting control panel standard engineering templates (Figure 3) use configurable layers for terminal blocks, controllers, transformers, wiring, and jumper positions.

The engineering documentation packaged with each standard application incorporates consistent object assignment, drawing formats, and templates as well as general installation notes that significantly reduce engineering time and improve quality (Figure 4).

The sequence of operation describes how each application is controlled. Control schematics clearly identify hardware objects, object type, bill of material tags, and physical characteristics. Wiring diagrams are provided in both elementary and schematic formats to align with standards employed by local application engineers, technicians, and electricians. The configuration strategy highlights the database objects that define specific operational parameters. The bill of materials details all the control components for the application. You can deploy these Microsoft Visio templates with minimal documentation effort and drastically improve engineering time with repetition that reduces the likelihood of error.

Engineer tab in the Dealer Support Center. You can also find legends, applications, and general notes to further improve efficiency and efficacy, including suggested wire specifications for common applications (Figure 2). You can use these components with confidence on all projects, saving time and improving quality.

In addition, you can find examples of standard engineering documentation in the Standard Applications section of the eForum under Miscellaneous Engineering Modules. Standard wiring diagrams and details for the MACH-CheckPoint

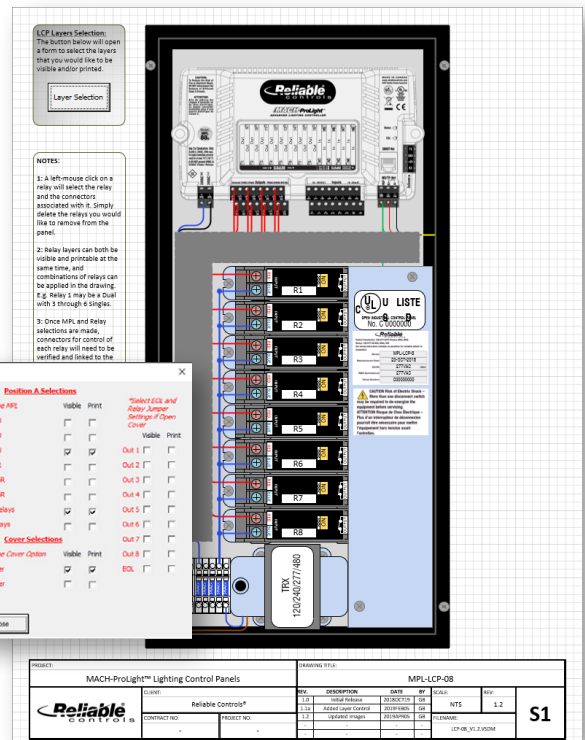


Figure 3: Lighting control panel template.



# THE Resource



The development of each standard application series is built on a base application that incorporates the most basic sequence of operation and hardware configuration necessary for database objects, Control-BASIC programming, and System Groups (Figures 6). These base applications are then built on to create a library of applications that address diverse hardware configurations and sequences of operation. For example, all the objects and programming necessary for a cooling-only variable air-volume application are built on to create applications with reheat and fan configurations. Foundational single-stage water source heat pumps or rooftop units are expanded to create multistage or modulating applications. Applications

Figure 6: Base application with sequence of operation and hardware configuration.

70 FCU01-RMT-SP-CLG = LIMITE FCU01-RMT-SP + A, FCU01-RMT-SP-HTG + FCU01-CFG-RMT-SP-DB, FCU01-CFG-RMT-SP-HI)

limited between the configured setpoint low limit and the occupied cooling setpoint preserving the configured deadband.

The occupied cooling space temperature setpoint is defined as the operator adjustable setpoint plus the effective space temperature deadband and then limited between the heating setpoint preserving the configured deadband and the configured setpoint high limit.

STANDARD APPLICATION GUIDE  
FCUxSA11MMQ.E

TABLE 5: Annotated value objects:

NAME	DESCRIPTION
1	
2	
3	
4	FCU01-SF-ENA Supply fan enable. Request for supply fan based upon space temperature deviation from setpoint, occupancy schedule, or operator command.
5	
6	
7	
8	
9	FCU01-RMT-ACT Actual space temperature. Mapped to SS11.
10	FCU01-RMT-SP-ACT Automatically resolved active space temperature setpoint. This value is not intended for operator adjustment. This control point is automatically resolved and used to cycle the equipment based upon occupancy and HVAC modes.
11	FCU01-RMT-SP Operator adjustable space temperature setpoint.
12	FCU01-RMT-SP-H Automatically resolved occupied heating space temperature
13	FCU01-RMT-SP-C

are created to replace SMART-Sensor devices with SPACE-Sensor Temperature devices. In this way, the standard applications library satisfies the 80 percent rule by reusing as many standard documents, databases, programs, background images, and System Groups as possible. Even the process of creating standard applications maximizes repeatability, efficiency, and quality.

To complement the standard engineering documentation and fully functional database, each standard application includes an in-depth guide that describes the intent of its database design and development. Each guide provides the sequence of operation, samples of the engineering, and a detailed description of the controller database. A table of database values describes the purpose of every runtime value, operator-adjustable setpoint, and configuration parameter in the application. Line-by-line annotation of the Control-BASIC programs explains the logic of each program, and System Groups describe the graphical user experience (Figure 7). Reliable Controls standard application guides not only minimize the time and complexity required to deploy an application but also are an excellent educational tool for new application engineers or those new to Reliable Controls.

To access the standard applications library, in the Dealer Support Center, click **eForum** under the Technical tab, and scroll to the Standard Applications section. Simple Control-BASIC modules and complete standard applications for variable air-volume, rooftop, fan-coil, water-source heat pump, and variable volume and temperature systems include complete engineering instructions, Panel Files, and graphics. This section also includes individual

STANDARD APPLICATION GUIDE  
FCUxSA11MMQ.E

ANNOTATED SYSTEM GROUPS

(GRP1) FCU-01: STATUS  
This is the primary status group for daily operation and monitoring. The annotations with the subtle green background are designed for operator interaction.

- SCHEDULE**: Link to the local occupancy schedule.
- BYPASS**: Enable temporary occupancy.
- HVAC MODE**: Present HVAC Mode (e.g., Cooling).
- SUPPLY FAN**: Supply fan command.
- OCCUPANCY MODE**: Present occupancy state (e.g., Occupied).
- STANDBY**: Enable temporary standby setpoints.
- OAT**: Present outdoor air temperature.
- SUPPLY FAN STATUS**: Supply fan feedback.
- DAT**: Present discharge air temperature.
- COOLING SETPOINT**: Automatically resolved cooling setpoint.
- COOLING VALVE**: Cooling valve position command.
- TREND LOG**: Link to the trend log for the associated value.
- SPACE TEMPERATURE**: Present space temperature.
- HEATING SETPOINT**: Automatically resolved heating setpoint.
- HEATING VALVE**: Heating valve position command.
- RUNTIME REPORT**: Link to the runtime report for the associated value.

Figure 7: System Group annotation.

CORPORATE UPDATE

APPLICATION ENGINEERING

TECHNICAL SUPPORT

RESEARCH & DEVELOPMENT

SALES & MARKETING



topics dedicated to specific applications. For example, the Water-Source Heat Pumps topic has various applications, such as one designed for a thermostatic, single-stage water-source heat pump using a SMART-Sensor LCD with a single setpoint.

The first topic presented in each thread is Quick Reference, an index organized by characteristics such as controller type, room-sensor type, hardware configuration, and sequence of operation for fast and easy identification (Figure 8). Use the embedded links to easily navigate to individual applications. Each application post in the eForum provides a brief description of the sequence of operation and links to download the associated engineering drawings, application guide, and complete Panel Files.

The standard applications library will soon have more than 100 recently updated applications, with many more in the coming months. We invite all Reliable Controls application engineers and technicians to review these resources. Reliable Controls standard applications are an excellent step to developing standards that maximize the sustainability and recoverable value of our operations.

## LEAD THE WAY

In everyday life people choose dishwashers and washing machines, staples and commodities, and automation of all kinds to save even moments of time for better uses. In business the same careful stewardship of time can help you identify activities that offer the greatest return on investment and contribute to operational sustainability. Each use of a standard element, from a simple drawing to a comprehensive application, increases your return on the initial investment of resources. The increase in recoverable value gained from the use of standards over time is exponential, and quality improves with each iteration as issues are identified until there are none. Developing a standard application is like buying a washing machine; it's a smart investment that pays for itself for years in the easy return of time.

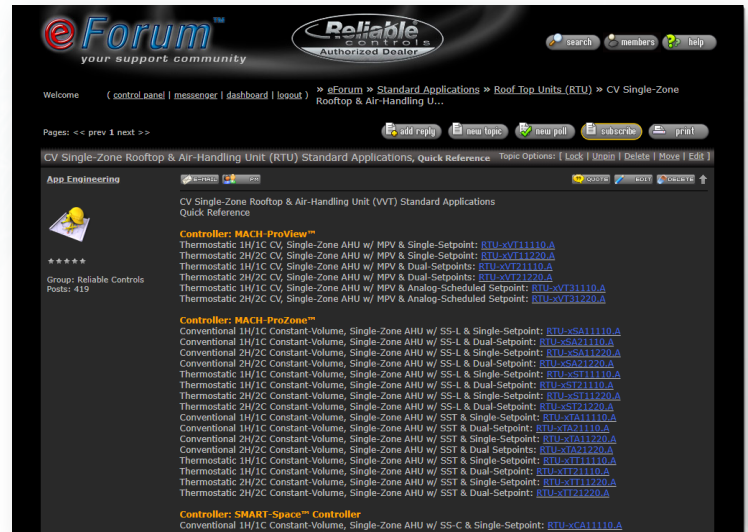


Figure 8: Quick Reference topic in a standard application thread on the eForum.

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## Did you know?

### You can use Wireshark to diagnose issues on a BACnet internetwork

Modern networks can be a jumble of protocols with complex, often changing infrastructure and multiple interpretations of underlying standards. Navigating, decoding, and understanding the flow and content on the network is critical to troubleshooting your building automation system.

Wireshark is a free network protocol analyzer that lets you see what's happening on your network at a microscopic level. But how do you know which filter to apply to Wireshark data to identify exactly which packet has the critical information?

The best starting point is to identify the failing device or software and apply a filter to display only that data. You can do this quickly in a number of ways, but you need to understand what device you are attempting to talk to and how it is communicating.

If the device is IP based (BACnet or Modbus over IP, for example), you could filter by its IP address (Figure 1).

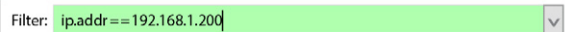


Figure 1: Example of an IP filter.

Or you could filter by the port, which is typically defined by the protocol but can often be redefined (Figures 2 and 3).

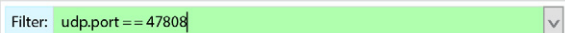


Figure 2: Example of default BACnet port filter.

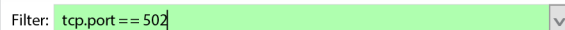


Figure 3: Example of default Modbus TCP port filter.

## WIRESHARK

These are not perfect filters by any means. You might have multiple controllers behind a single router or many devices communicating on the same port. To restrict them further, add another section of the filter specific to BACnet.

If you apply the destination network filter, Wireshark shows only traffic on UDP port 47808, which is destined for network 20 (Figure 4).



Figure 4: Example of BACnet port and destination network filter.

Or you could apply the source network filter to show traffic from source network 20 (Figure 5).

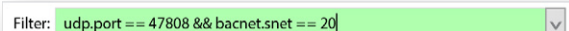


Figure 5: Example of BACnet port and source network filter.

You could still have a lot of packets to weed through. Next, use a filter to reduce the traffic to a single device, for either MS/TP or Ethernet. Changing the filter from “dadr” to “sadr” changes it from destination addresses to source addresses (Figures 6 and 7).

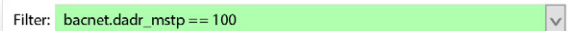


Figure 6: Example of BACnet MS/TP destination address.

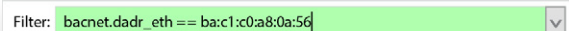


Figure 7: Example of BACnet Ethernet destination address.

We regularly use one more filter that identifies broadcasts. Because these requests are not destined for a specific source, the filters we have talked about don't catch broadcasts. Any packet with a destination address length of zero should be a broadcast (Figure 8).

Filter: `bacnet.dlen == 0`

Figure 8: Example of a zero-length destination address that indicates a broadcast.

The filters we have applied so far look at information from the packets' network protocol data unit (Figure 9). These rough filters are good to restrict to a device or group of devices but do little to identify which specific service or packet is failing.

```

# Frame 139: 37 bytes on wire (296 bits), 37 bytes captured (296 bits)
# BACnet MS/TP, src (0), Dst (0), BACnet Data Not Expecting Reply
# Building Automation and Control Network NPDU
  Version: 0x01 (ASHRAE 135-1995)
  Control: 0x2c
  Destination Network Address: 202
  Destination MAC Layer Address Length: 1
  DADR: 4
  Source Network Address: 0
  Source MAC Layer Address Length: 6
  SADR: bc:c1:c0:a8:0a:56 (ba:c1:c0:a8:0a:56)
  Hop Count: 255
# Building Automation and Control Network APDU
  
```

Figure 9: Example network protocol data unit from Wireshark.

To look at the specific BACnet services on the network, we need to filter based on the application protocol data unit. These filters start with "bacapp" instead of "bacnet." Each service has a unique identifier defined in the BACnet standard. We will look at two basic types of services: confirmed and unconfirmed. When you use confirmed services, the expectation is that the controller will respond with an acknowledgement, or "ACK." Unconfirmed services fire and forget; once they are on the network, there

is no expectation of a response from the device to confirm receipt of the request.

Two commonly used filters assist with device discovery. The unconfirmed service 8 filter is for "Who Is?" packets, and the unconfirmed service 0 filter is for "I Am" packets (Figure 10). We generally combine them into a single filter because you usually need the matched set.

Filter: `bacapp.unconfirmed_service == 0 || bacapp.unconfirmed_service == 8`

Figure 10: Example filter for "Who Is?" or "I Am" packets.

We also regularly use three other unconfirmed service filters: for change-of-value (COV) notifications, event notifications, and time synchronization (Figures 11, 12, and 13).

Filter: `bacapp.unconfirmed_service == 2`

Figure 11: Example of filter for unconfirmed COV notifications.

Filter: `bacapp.unconfirmed_service == 3`

Figure 12: Example of filter for unconfirmed event notifications.

Filter: `bacapp.unconfirmed_service == 6`

Figure 13: Example of filter for time synchronization.

We frequently use six filters for confirmed services: read property, read property multiple, write property, write property multiple, confirmed COV notifications, and subscribe COV (Figures 14–19).

Filter: `bacapp.confirmed_service == 12`

Figure 14: Example of filter for read property.

# THE Resource



Filter: `bacapp.confirmed_service == 14`

Figure 15: Example of filter for read property multiple.

Filter: `bacapp.confirmed_service == 15`

Figure 16: Example of filter for write property.

Filter: `bacapp.confirmed_service == 16`

Figure 17: Example of filter for write property multiple.

Filter: `bacapp.confirmed_service == 1`

Figure 18: Example of filter for confirmed COV notification.

Filter: `bacapp.confirmed_service == 5`

Figure 19: Example of filter for subscribe COV.

You can also build filters to remove annoyance traffic, to remove all token passing from an MS/TP capture (Figure 20), or to display only IP-based broadcasts (Figure 21).

Filter: `mstp.frame_type > 2`

Figure 20: Filter to remove token pass messages.

Filter: `bvlc.function == 0x0b`

Figure 21: Display only BACnet/IP broadcasts.



CORPORATE UPDATE

APPLICATION ENGINEERING

TECHNICAL SUPPORT

RESEARCH & DEVELOPMENT

SALES & MARKETING



Once you have selected a filter that matches the service type used by the BACnet device, you can either skim through the remaining packets manually or put a specific filter in place. Here are some quick examples you can modify for your search.

`bacapp.instance_number == 1` <- Object instance 1

`bacapp.object_name matches "RAT-South Building"` <- packet must contain the text exactly

`bacapp.object_name contains "RAT"` <- packet must contain the text

`bacapp.objectType == 1` <- Object type (see BACnet Read/Write Properties in RC-Studio)

`bacapp.property_identifier == 111` <- packet must contain property 111 (status bits)

As a last resort, we sometimes search for a specific value. Try to search for something with a unique present value (777, for example) that you wouldn't otherwise expect to see. One filter for each datatype is shown below.

`bacapp.present_value.bit_string`

`bacapp.present_value.boolean`

`bacapp.present_value.char_string`

`bacapp.present_value.enum_index`

`bacapp.present_value.int`

`bacapp.present_value.null`

`bacapp.present_value.octet_string`

`bacapp.present_value.real`

`bacapp.present_value.uint`



Seeing Wireshark information in real time gives you a fundamental understanding of how the process works and helps build your knowledge for when you stumble into something unknown in the field. As always, if you need help with a custom filter or a deeper analysis of a Wireshark-generated PCAP file, please contact [helpdesk@reliablecontrols.com](mailto:helpdesk@reliablecontrols.com).





## OFFICIAL SOFTWARE RELEASE



# RCGrafxSet® 3.5

We recently released version 3.5 of RC-GrafxSet, our graphical images and services software. RC-GrafxSet saves you time and money by allowing you to easily create stunning, professional graphical interfaces.

### NEW FEATURES

RC-GrafxSet 3.5 includes the following new features:

- New HMI Console folder that simplifies the creation of EQUIPMENTviews with common application templates and formatted background images
- New graphical user interface with improved navigation in the Isometric and Conical libraries
- Access to more than 1,700 new assets, including an additional 406 images and 1,303 animations since version 3.4
- Newly updated *RC-GrafxSet Software Manual* with instructions for using the RC-GrafxSet Flash Utility to automatically replace existing Flash animations with HTML5 animations

Choose from thousands of professionally rendered images and animations across a broad spectrum of categories, drop them into your System Groups, and link them to create interactive opening pages, navigation menus, dashboards, and more. You can also use RC-GrafxSet to develop interactive HVAC, lighting, and security graphics; build real-time integrated fault and diagnostic interfaces; and integrate analytics and charting components into your System Groups.

*RC-GrafxSet makes your graphical interfaces great!*

[Learn more about RC-GrafxSet 3.5](#)

[RC-GrafxSet  
Isometric Section](#)



## NEW RELEASE

# MACH-ProVIEW™ LCD Operator Display

The new MACH-ProView LCD Operator Display is a powerful, elegant BACnet Building Controller (B-BC) and BACnet Operator Display (B-OD) designed to provide a cost-effective user interface to your building automation system when you do not need direct control of equipment.

Like the MACH-ProView LCD, the MACH-ProView LCD Operator Display provides a plenitude of attractive, high-resolution graphical interfaces that allow you to gather system insights using a variety of configurable views, such as EQUIPMENTview, SPACEview, LISTview, STATview, and more. What makes the Operator Display model different is that it has no inputs or outputs and therefore provides a less expensive way to interact with the energy, comfort, and security systems in your facility.



With multiple available onscreen themes and several enclosure colors, the MACH-ProView LCD Operator Display fits a wide range of design environments. Base models reside on MS/TP, Ethernet, Power over Ethernet, or Wi-Fi networks. The MACH-ProView LCD Operator Display with Router supports connectivity to BACnet MS/TP devices, Modbus RTU devices, or any MACH-ProPoint expansion module.

Purchase the new  
MACH-ProView LCD Operator  
Display today!

The device includes a dedicated onboard 10 kΩ thermistor, with available options for CO<sub>2</sub>, humidity, occupancy, and VOC sensing.

Learn more about the MACH-ProView LCD Operator Display:

[reliablecontrols.com/products/controllers/MPV-L-OD/](http://reliablecontrols.com/products/controllers/MPV-L-OD/)  
[reliablecontrols.com/products/controllers/MPV-L-OD-R/](http://reliablecontrols.com/products/controllers/MPV-L-OD-R/)





## TRAINING

As part of our commitment to having the most satisfied customers in the industry, we offer a range of training options and formats to help you derive maximum potential from your Reliable Controls system. All in-class training is paused until it is safe to travel and hold group training sessions. In the meantime, our distance-learning classes are broadcast live to students worldwide. We regularly add new courses, so please visit the [Reliable Controls Learning Center](#) to see the current schedule.

### Training for technicians

**Reliable Controls Authorized Dealer (RCAD)** certification must be completed by at least one individual in every Authorized Dealer office. Students work with the latest Reliable Controls hardware, firmware, and software to learn installation techniques and program a typical air-handling unit. Register now for distance RCAD certification training in North America:

November 9–13 and 16–20, 6:00 AM to 10:00 AM Pacific Time **\*\*FULL\*\***

January 11–15 and 18–22, 8:00 AM to 12:00 PM Central Time

February 21–25 and Feb 28–Mar 4, 9:00 AM to 1:00 PM Australia Eastern Time

### Advanced training for level 3 technicians

In our advanced classes, students with level 3 technical certification learn to leverage the Reliable Controls system to improve building performance, reduce energy consumption, and simplify maintenance. Please check the [Learning Center](#) for current course offerings.

**BACnet Integration:** This course explores strategies for success with third-party BACnet products. Students learn how to evaluate third-party products using PICS and BTL documents, work with BACnet properties, write Control-BASIC, and build System Groups. (8 hours)

December 2–3, 8:00 AM to 12:00 PM Central Time **\*\*FULL\*\***

**Advanced RC-WebView:** Advanced technicians who install and configure RC-WebView learn to build efficient Enterprise Websites for the Reliable Controls system using powerful features like BACnet File Synchronization, enterprise scheduling, and Points Reports. (8 hours)

December 8–9, 8:00 AM to 12:00 PM Singapore Time

December 16–17, 8:00 AM to 12:00 PM Central Time

**Modbus:** This course teaches students to build custom Modbus profiles using the Modbus Profile Creator in RC-Toolkit and explores how Modbus can complement BACnet in a modern building automation system. (8 hours)

December 10–11, 8:00 AM to 12:00 PM Singapore Time

We add classes to the schedule regularly. Please check the [Learning Center](#) for upcoming dates and times.



## RELIABLE CONTROLS AUTHORIZED DEALER TRAINING INCENTIVE PACKAGE

Authorized Dealers who want to become certified in RC-Passport® software and BACnet security management can take advantage of an exclusive training incentive package.

Included with the incentive package is one seat in RCAD-410 Integrated Facility Security, a 32-hour instructor-led class. Begin your journey to whole-facility integration by learning about access control, and take your building automation services to the next level.

Also included is one Integrated Security Dealer Kit, which contains the following software and equipment:

- **RC-Passport server license**
- **MACH-CheckPoint controller**
- **Four card readers**
- **25 clamshell cards**

Purchase your Integrated Security Dealer Kit today.

Contact Customer Care.



RC-Passport software license



MACH-CheckPoint



Four card HID readers



25 clamshell cards

\* Offer not available online. Items are for Authorized Dealer internal use only; hardware products are serial-number noted and marked as not for resale. No item or quantity substitutions. Additional items available at regular pricing.



## RC-GRAFXSET ISOMETRIC SECTION



### HMI Console

RC-GrafXSet 3.5 includes a new section in the Isometric library called HMI Console (Figure 1), intended to simplify the creation of EQUIPMENTviews with templates for common applications. Use these templates as a starting point for configuring a MACH-ProView LCD console interface. Each template is packaged in a zip file that includes illustrated instructions, an optional background image, and related images and animations.



Figure 1: HMI Console section in the Isometric library.

## HMI Generic

The HMI Generic subsection in the HMI Console section (Figure 2) contains eight background images sized specifically for EQUIPMENTviews (480 x 272 pixels): blue, blue swirl, green, black, white, yellow, and orange.

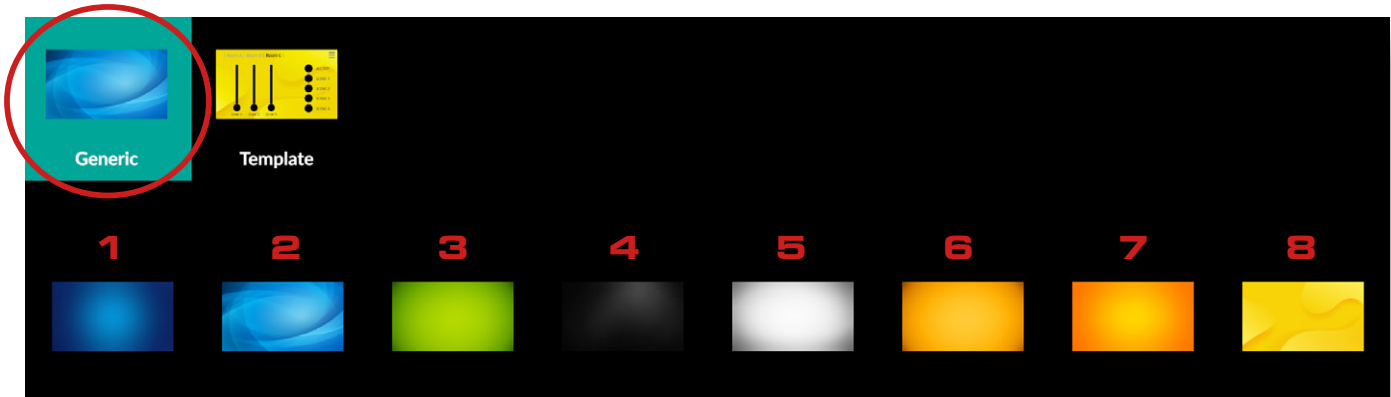


Figure 2: Background images in the HMI Generic subsection.

When you create an EQUIPMENTview, it is a good idea to choose a background that contrasts with its content. For example, use light text and assets such as buttons on dark backgrounds, and vice versa.

## HMI Template

The HMI Template subsection under HMI Console contains the following five EQUIPMENTview templates.

**3-Zone-5-Scene-Lighting-V01:** Includes assets to create a control interface for a room with three zones of dimmable lighting and up to five scenes per EQUIPMENTview (Figure 3).

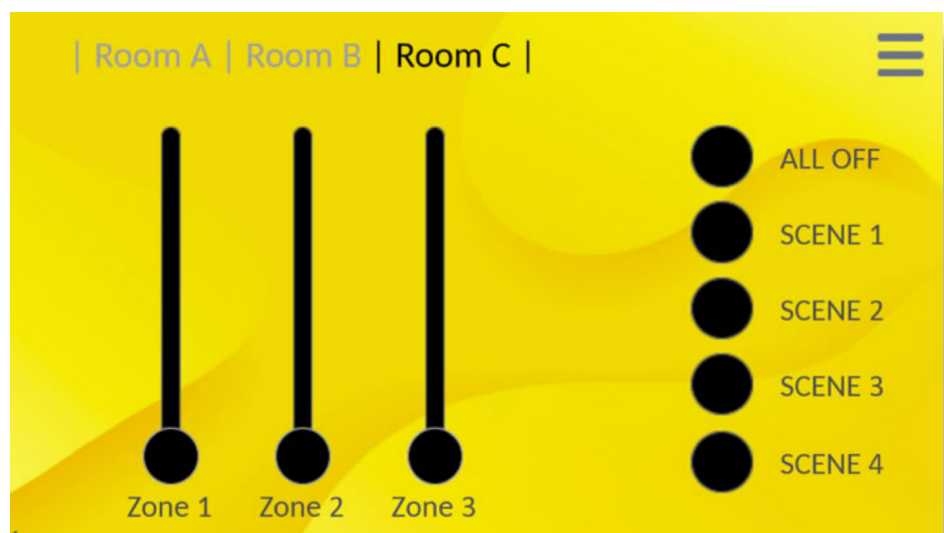


Figure 3: 3-Zone-5-Scene-Lighting-V01 template.



**4-Zone-5-Scene-Lighting-V01:** Includes assets to create a control interface for a room with four zones of dimmable lighting and up to five scenes per EQUIPMENTview (Figure 4).

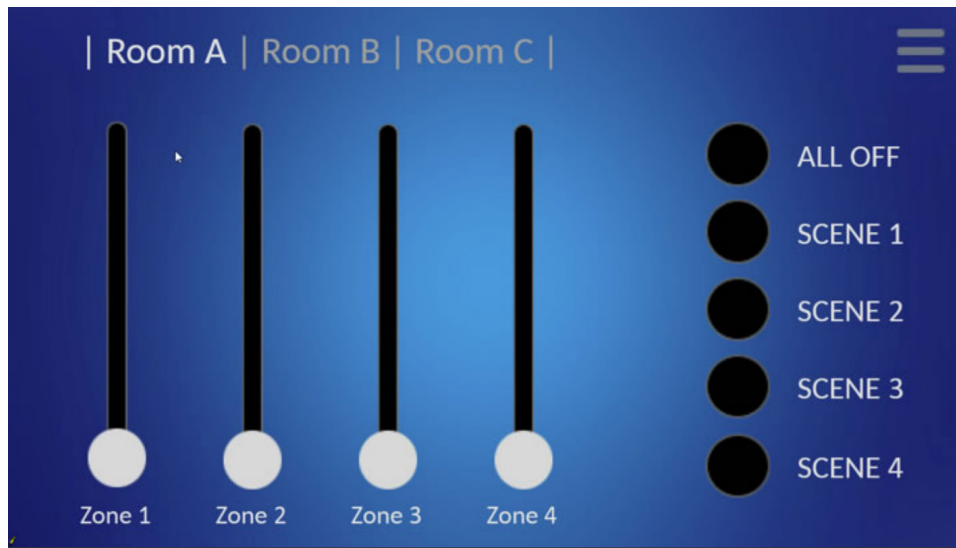


Figure 4: 4-Zone-5-Scene-Lighting-V01

**Guest-Room-V01:** Includes assets to create a control interface for a guest room with options for housekeeping service, lighting and blind control, and HVAC setpoint adjustment (Figure 5).



Figure 5: Guest-Room-V01 template.



**Nurse-Station-V01:** Includes assets to create a control interface for a nurses' station with up to seven zones per EQUIPMENTview (Figure 6).

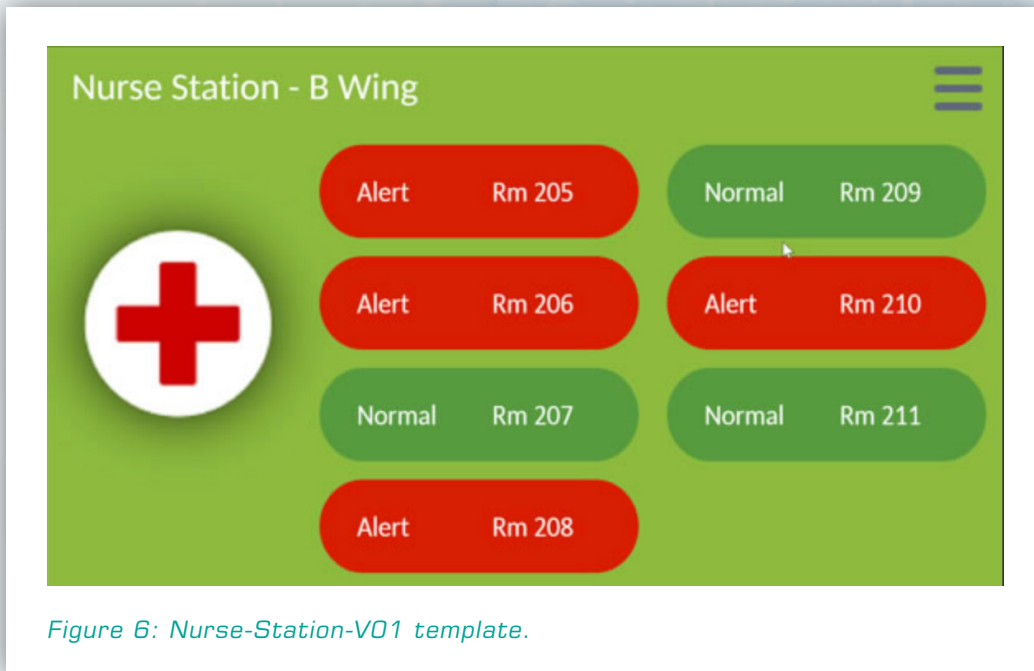


Figure 6: Nurse-Station-V01 template.

**Room-Monitor-V01:** Includes assets to create a control interface for highly controlled space such as a negative pressure, isolation, or cleaning room. Allows you to display six environmental variables plus a logo and animations in one easy-to-use EQUIPMENTview (Figure 7).

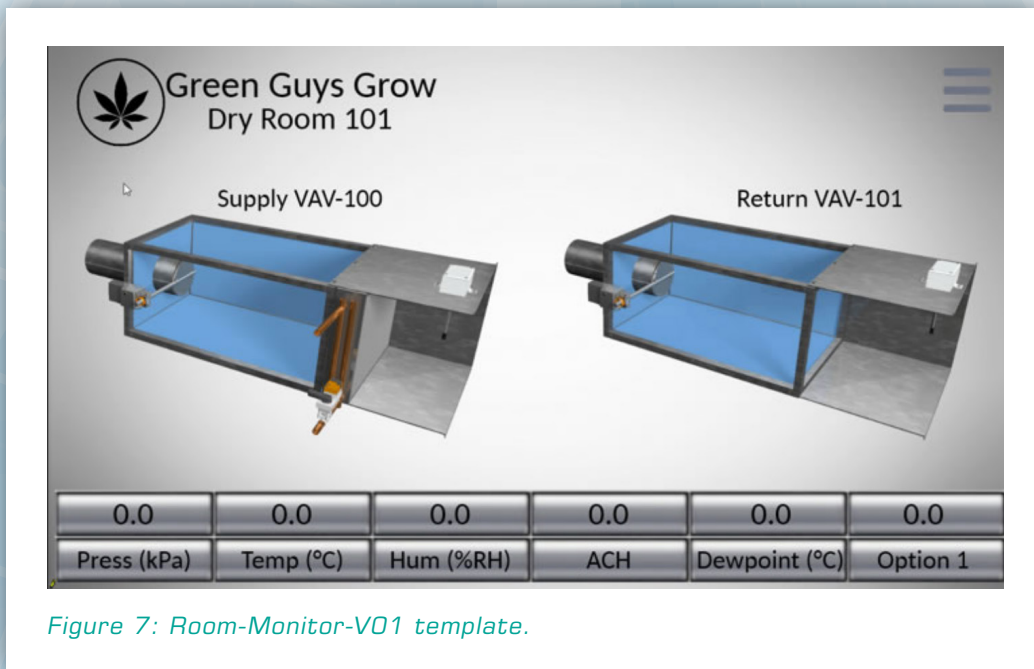


Figure 7: Room-Monitor-V01 template.

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## RC-GrafXSet®

### Using the template files

Download and extract the zipped folder for the template you would like to use. Each folder contains a Read Me PDF with step-by-step instructions, a temporary background image with layout guides, and the static and animated assets needed (Figure 8).

Name	Date modified	Type	Size
4 Zone 5 Scene Lighting-Readme.pdf	10/14/2020 10:31 ...	Adobe Acrobat D...	412 KB
4Z-5S-TMP-480x272.png	10/14/2020 10:31 ...	PNG File	134 KB
Button-Interactive-11-V01.rca	10/14/2020 10:31 ...	RCA File	13 KB
Button-Interactive-Slider-05-V02.rca	10/14/2020 10:31 ...	RCA File	11 KB
Button-Interactive-Slider-06-V02.rca	10/14/2020 10:31 ...	RCA File	10 KB
Gradient-bkgrd-04-480x272.png	10/14/2020 10:31 ...	PNG File	82 KB

Figure 8: Each template folder contains detailed instructions, a background image, and animated assets.

The PDF provides instructions for inserting static text, correctly sized animations that can be easily positioned on the temporary background image, and the required animation settings.

The templates are not only useful for their specific applications but also provide a generalizable approach to creating a dashboard layout for an EQUIPMENTview with minimal time and effort.



*Empower your creativity.*

*Do you have any suggestions for alternative styles or attributes?  
Send a request via the RC-GrafXSet request form.*

Subscribe to  
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[reliablecontrols.com/support/marketing/promos.php](https://reliablecontrols.com/support/marketing/promos.php)

We have several new Reliable Controls hoodies. The women's Metro high-end full-zip hoodie is made from high-density 370-gram fleece with an ultra-soft brushed back. It features contrast color zippers, articulated elbows, a scuba hood, and textured ribbed underarm and side body panels for incredible comfort.

Promotional products

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The women's Metro hoodie is available with gray or colored logos.

Gray logo hoodie shown

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### Men's dress shirt:

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Promotional products

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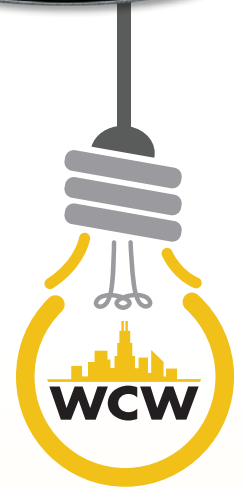
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End 1: First checkpoint in determining the installed length.



End 2: Second checkpoint. The installed length of this cable is 375 ft.

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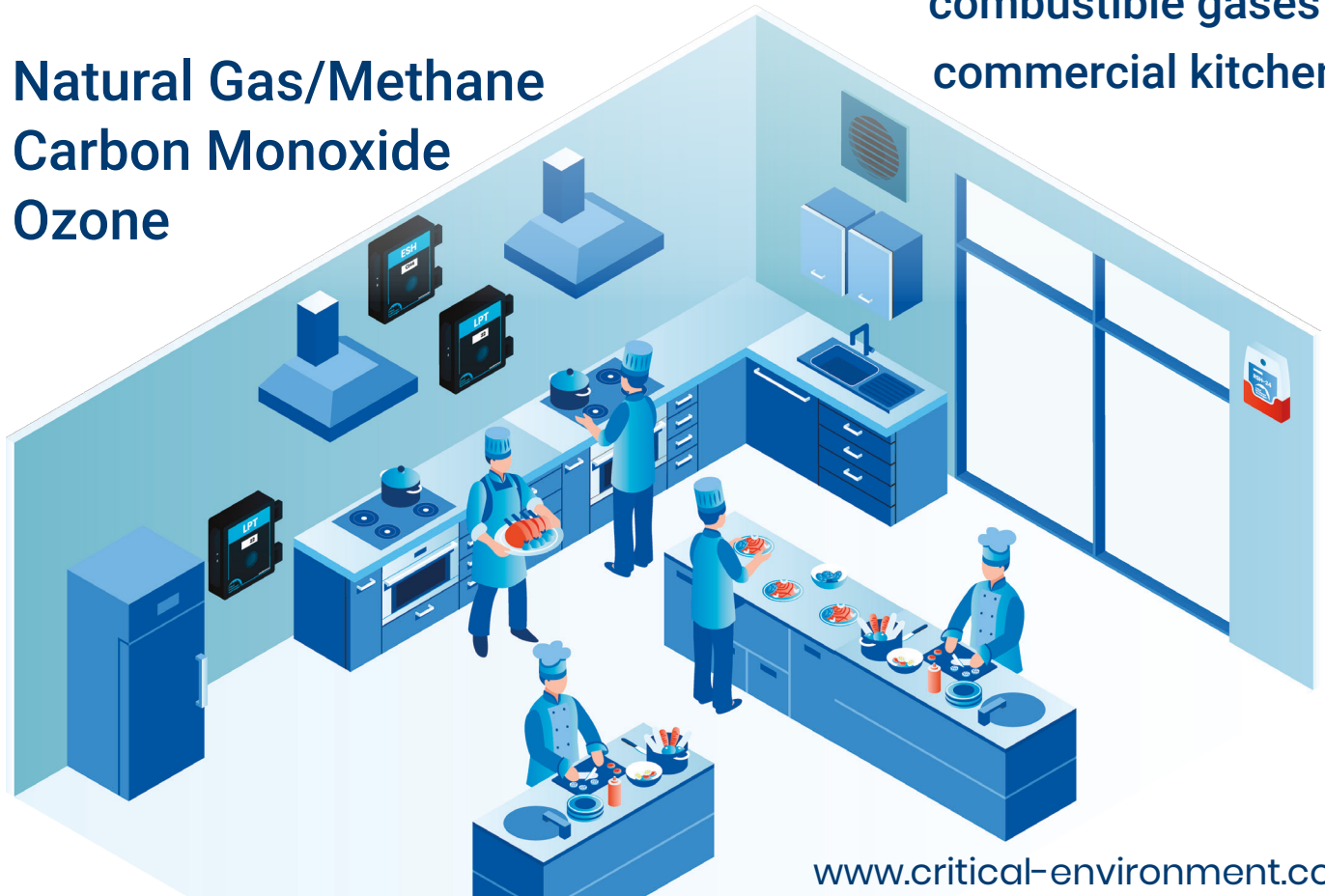
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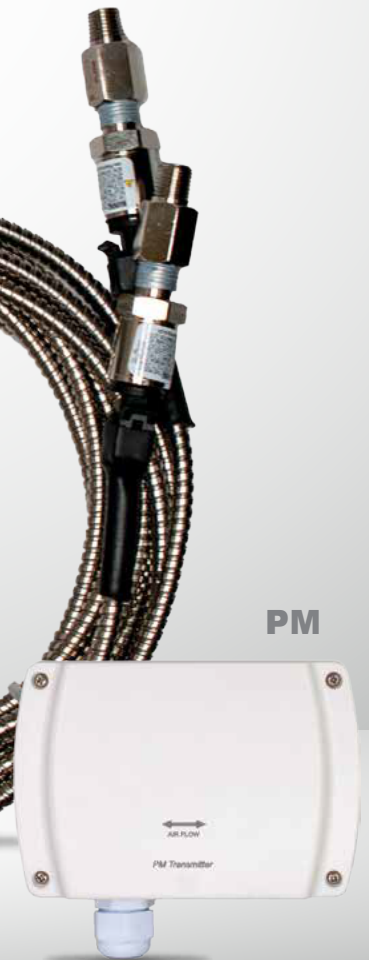


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2 Wire Status or Low Voltage  
Auxiliary Contact reporting

**FDL20ALRMU**  
2 Wire Load Side Status reporting

- Control Input: 24 Vac/dc
- Relay Type: SPST Mechanically Latching
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