# Automate

*Computrols' Building Automation Newsletter*

November 2015

**In This Issue:**



*Plus...*

**New Product Showcase:**

CBAS 15

computrols

# Editor's Note

Welcome to Computrols' Automate. Automate is a free newsletter dedicated to bringing you the latest in building automation technology with a focus on Computrols Building Automation Systems and products. Our goal is to provide continuing education to our readers in the field of Building Automation and to inform readers of product releases.

In October, Computrols celebrated its 32nd birthday. For 32 years, Computrols has provided our customers with innovative products and solutions as well as superior customer service. This edition of Automate showcases several new CBAS features as well as an exciting research and development project. Computrols' R&D team continues to push the envelope by incorporating emerging technologies into our products, and we're happy to keep everyone informed about these advancements. The features and products you read about today are certainly going to revolutionize the way that you interact with your building automation system tomorrow. These new features and products will ultimately save time, energy and money. So, enjoy this latest publication and we look forward to any feedback you might have.

Also, if you know anyone that would be interested in receiving this newsletter, please forward it to them via e-mail. This way your friends and colleagues can easily subscribe to Automate themselves. Our goal is to make Automate a useful and informative tool for all of our partners.

We're excited to bring you our next issue of Automate,

Andrew Mire

*Vice President, Operations*
Computrols

**November 2015**

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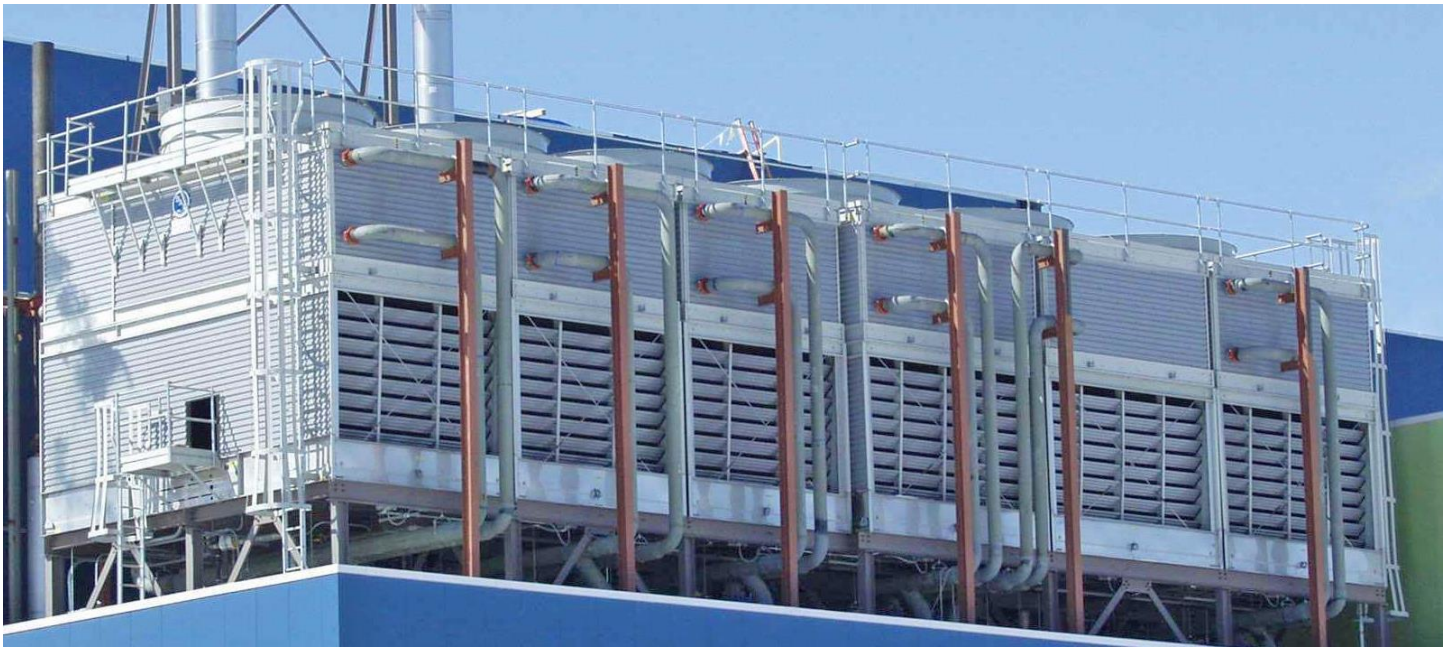


# Cooling Tower Control Based on *"Approach"*

*By Mike Donlon, Director of Research and Development, Computrols*

The most common Cooling Tower Control System uses a fixed temperature setting for the condenser water supplied back to the chillers. For convenience, let's label this temperature:

**TO = Tower Outlet temperature**

To control this value, most controls technicians would program a control loop (PID or similar) to vary the overall Cooling Tower Fan usage in order to maintain this temperature. In most large buildings, multiple Cooling Tower Fans are available for this purpose. These fans can be:

- Simple two-state fans (ON/OFF)
- Multi-speed fans (OFF/HIGH/LOW…MED)
- Variable speed fans (VFD)
- Any combination above

Most controls techs are familiar with how to program multiple fans under a single loop to maintain Tower Outlet temperature (TO), so we won't cover this in this article. What we will be discussing is how a single constant TO setpoint is not the best practice for cooling tower control.

Best practice dictates that the TO setpoint be programmed as a moving target that varies with outside air conditions. But, before we cover how to program this moving TO setpoint, let's first cover a little theory behind this phenomenon.

Generally speaking, a Cooling Tower fan system can achieve a TO at or below the dry bulb temperature of the outside air. However, it CANNOT achieve a TO at or below the wet bulb temperature of the outside air. This limitation is because of the physics behind how Cooling Tower fans cool the condenser water. For convenience, let's label the outside air wet bulb temperature as:

**TWB = Wet Bulb Temperature**

In the HVAC industry, the term **"Approach"** is used to describe the difference between the tower outlet temperature (TO) and the outside air wet bulb temperature (TWB). So let's define Approach as:

**Approach = TO - TWB**

## A Tower Outlet (TO) temperature setpoint that is optimal under some outside air conditions, can NEVER be achieved in others.

Using our definitions, we will never be able to get the TO to reach the TWB. Or in other words, we will never get the Approach down to zero.

How close can we get TO to the wet bulb temperature (TWB)? That depends on several factors including the individual equipment. You can typically use 7° F as a general rule. Or put another way:

> **You will probably be wasting fan energy if you try to achieve an Approach below 7° F.**

For instance, if the wet bulb temperature (TWB) is 78 °F, and you want to get an 82 °F condenser water temperature back to the chillers (TO), your Approach would have to be 4 °F. But according to our rule, you will never be able to achieve a 4 °F Approach. So if you leave the TO setpoint at 82 °F your fans will continue to work overtime trying to achieve an impossible goal. The bottom line: You'd be wasting fan energy!

A better method would be to use a setpoint that is a moving target. This would be analogous to programming a Supply Air Reset for an air handler, a concept that most of you are familiar with. The fan usage varies quickly to meet the TO setpoint, and the TO setpoint moves slowly to adjust to outside air changes.

The best practice in Cooling Tower programming is to first make a simple calculation point for the "Minimum Achievable TO" based on Approach and outside air temperature. This quantity could be embedded inside the setpoint logic, but making it a separate point may be valuable to those who understand the concept. Logic on this calculated point would look something like:

```
Command "Minimum Achievable TO" to equation begin (
      7.0
       + "Outside TWB"
      ) Equation End
```

The point "Minimum Achievable TO" will reflect the best you can do for TO. If you have access to the Approach value from the Cooling Tower's initial design, you can use this value. Otherwise, a 7 °F Approach is a good rule-of-them.

Finally, program logic for the TO setpoint itself:

```
Command "TO Setpoint" to equation begin (
      Maximum of begin (
            82.0
            "Minimum Achievable TO"
      ) End MinMaxAverage
) Equation End
```

Chiller specs will limit the range for TO and you should consult these specs before programming. Usually the number previously used for a constant setpoint will now be considered the minimum setpoint. For our example, we will use 82 °F as the minimum acceptable temperature for the chiller. This final statement will incorporate the concepts discussed in this article.

### Some Key Cooling Tower Concepts:

*When in doubt, use a 7 °F Minimum Approach*

*Using colder condenser water reduces the chiller KW by 1% to 1.5% per °F. So the colder the water, the better the KW efficiency. So set the low limit on the TO setpoint based on what the chillers can handle. Raise it only when outside air conditions make that setpoint unachievable.*

*For undersized cooling towers, diminishing returns will reduce much of the chiller savings.*

Cooling Tower Efficiency:

**μ = (ti - to) 100 / (ti - twb)**

*(Commonly 70 - 75%)*

Where:

**μ** = Tower Efficiency
**TI** = Inlet water Temp
**TO** = Outlet water Temp
**TWB** = Wet Bulb Temp

# Group Commander for CBAS

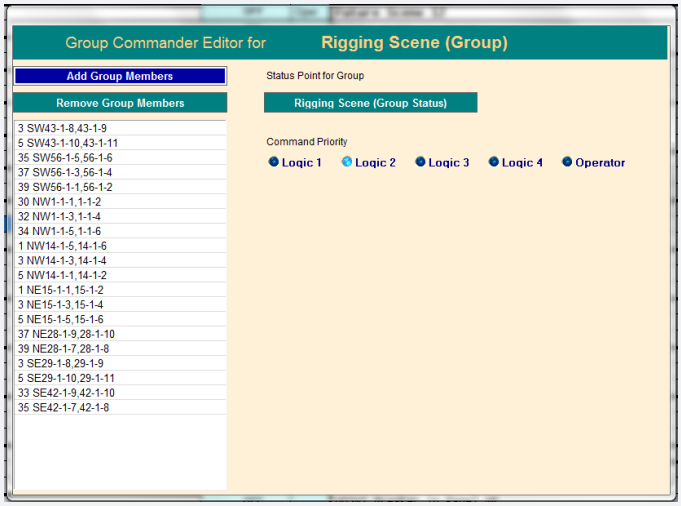
*By George Hingle, Senior Technical Representative, Computrols*

In early 2014, the group commander feature was added to the CBAS software. This feature was added to allow multiple binary outputs to be commanded to ON, OFF, or Auto via a single click without using logic. All points within a particular group get commanded to the state of the group point. There are (2) points associated with each Group Commander:

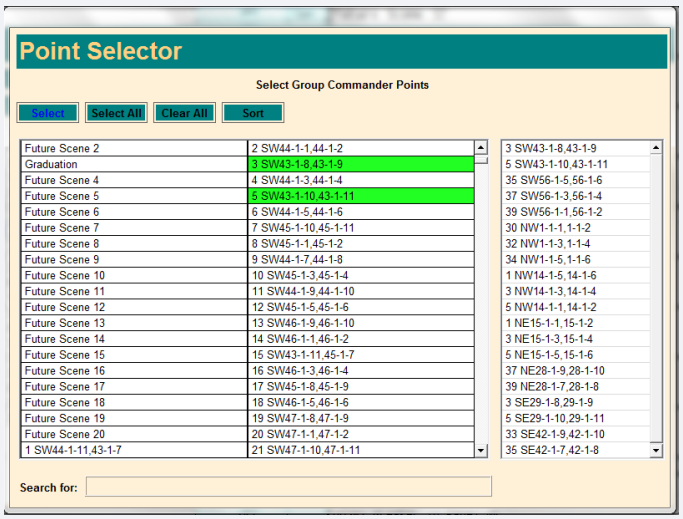
1. The **Group Point**, and
2. A **Status Point**.

The group point is where the point configuration is defined and is also the point which gets commanded. Moreover, the status point is used as a counter to show if there are any points within the group in the wrong state. The group commander feature has proven to be a viable solution for several lighting control projects, along with HVAC control and automation.

## Group Commander in CBAS




*A Group Command screen for a point called "Rigging Scene"*




*A Point Selector screen showing how multiple points can be selected*

# Truly Wireless Humidity Sensor

*By Mike Donlon, Director of Research and Development, Computrols*

## *The Age of Wireless Devices*

If you read Building Automation news, or regularly review new BAS products, you've undoubtedly heard a lot of talk about wireless devices and sensors for Building Automation Systems (BAS). Certainly we live in a wireless age, and wireless products abound in both our homes and our pockets. So, why don't we see more wireless products in BAS?

## *The Power Problem*

In a typical temperature sensor, if you were to combine this sensor with a radio, you would save the cost of no longer needing to run wire from the controller to the sensor. The temperature data would be transmitted wirelessly. The radio makes it wireless, right? This seems easy enough but where does this new sensor/radio get its power from? Most of the wireless devices you know about either run on a battery or plug into the wall. But unlike your phone, BAS sensors are stuck in some weird places, and they run continuously, 24/7—forever.

Using a battery to power the sensor/radio would create a maintenance issue. With 1000's of sensors in the building, owners and engineers do not need another preventive maintenance job. Replacing all of the batteries every so often is a highly undesirable and expensive solution.

Why not just plug in the sensor? We all know that there won't be a 120 VAC plug right next to where you want to mount the sensor. If there was, what about someone unplugging it, conduit requirements, NEC, etc.

So, batteries and wall plugs are out. I know … you can simply run a wire from the 24 VAC transformer to the new wireless device. Wait… you just ran wire to your "wireless" device. Believe it or not, many companies do this every day and still call their product a wireless sensor.

In all wireless design circles this problem is affectionately referred to as the "Power Problem". Basically, if you're going to run a power wire to a device, you may as well run communication, too. If engineered properly, you can even utilize a single pair of wires for both power and communications, as is done with most smoke detectors. Either way, it's not truly wireless, and not cost effective.

### Prototype: Duct-Mount Relative Humidity Sensor


Highlighted in the photo:

- Duct-Mount Plastic Case
- Humidity probe
- Energy Harvesting Antenna

## *Energy Harvesting*

The holy grail of a wireless BAS is to produce devices that require no battery or power wiring of any kind. They simply harvest energy from the environment to communicate sensor values to the BAS. Possible solutions include harvesting electrical energy from existing temperature differences, vibration, and pressures. But currently, none of these solutions are commercially practical. Today, the only widely used wireless devices for BAS are either:

- Devices far from the receiver that have a local power source (like some of the space sensors out there)
- Devices next to a window or light so that solar power harvesting can be used

Most of the costs associated with the installation of a BAS are in the sensors, wiring, and conduit inside of a mechanical room and neither of these two options will help there. Therefore, in order to get the most dollar savings from a wireless BAS application, Computrols has focused its research and development on reducing the cost of installing controls within mechanical equipment rooms.

## *Truly Wireless Duct Sensor*

Our senior hardware design engineer has been diligently working on solving this problem. Recently, he has delivered a prototype that is the industry's first.

We designed the duct sensor to harvest radio frequency (RF) energy and transmit wireless data back to our controller. Basically, a RF transmitter is installed at a central location inside the mechanical equipment room. Each installed wireless sensor harvests RF power to transmit its data back to the BAS controller

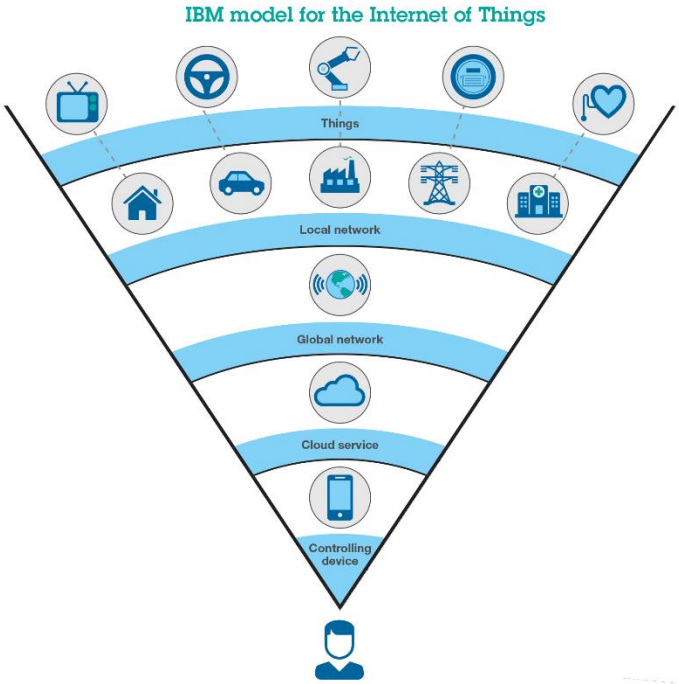
**No wires. No battery. No plugs.**

This sounds easy enough, but only a very small amount of energy can be harvested this way. A reliable and effective solution requires extensive research in power management techniques as well as sophisticated algorithms to hone data transfers down to the smallest essential packet. However, we are so optimistic about our wireless designs that we are planning to permanently move our product line to an all wireless offering for mechanical equipment room applications.

## *The Future*

Emerging Internet of Things (IoT) technologies like energy harvesting and ultra-low powered radios will represent the next wave in building automation. The days of large metal enclosures, rigid conduit, and labor intensive installations will soon be replaced by small, wireless, and energy harvesting smart devices.

Our first all wireless installation will be completed before the end of this year with market introduction to follow early next year. As always, Computrols is committed to pushing the envelope with emerging technologies and revolutionary product designs of the best quality available anywhere.



# Computrols Training Courses

*By Roy Lynch, President and Founder, Computrols*

Computrols is happy to announce that we are currently putting together materials for new proposed training courses. In order for us to better focus our efforts and make the most of these courses, we'd like to hear from you: our customers. We've put together a survey of all of the proposed topics. Primarily, we'd like to know which topics would be beneficial for you to receive training on. Topics include:

- CBAS Software Basics
- Advanced CBAS Software
- CBAS Graphics
- CBAS Web
- HVAC Systems Overview
- Fire and Life Safety Systems
- Access Control Systems
- Lighting Systems
- Energy Management and Metering

The survey includes a brief description of each course to make it easier for you to choose which courses you might be most interested in attending. We recommend that you read each one of the brief course descriptions before selecting them throughout the survey. We have also provided space for you to include any suggestions on potential training topics. Please add a brief description on what you expect to learn in your suggested courses.

We look forward to hearing from you. You can participate by following the hyperlink below:

https://docs.google.com/forms/d/1Atg5dV6u5JzfsPNd6LInhqArJ-rO1uFGskoh-DThqb4/viewform

Thank you for your consideration,

Roy Lynch

*President and Founder*
Computrols

# New Product Showcase: CBAS 15

*By George Hingle, Senior Technical Representative, Computrols*

The release of CBAS 15 has finally arrived. We hope that you will enjoy many of the new features and enhancements that this latest version brings. Many of the changes can be appreciated immediately, while others were introduced as part of a long-term strategy to grow and evolve the product. As always, as we roll out this new product we encourage your feed back and look forward to hearing from you. Here are some highlights of our latest software effort:

## Windows OS

In an effort to evolve the software and take advantage of new Windows features, CBAS 15 will no longer be compiled for Windows XP or Vista. For example, CBAS Graphics View has been made more touch screen friendly. The latest touch screen functionality only works with Windows 7 or 8, 64 bit version. But don't worry, if you have an older OS, CBAS 15 will work. But, some of the touch screen functions will not.

## New Working Folder

In an effort to support multiple revisions, CBAS 15 now installs to and runs from the CBAS 15 folder. So all future major revisions will reside in their own directory and not overwrite previous versions of the product.

## Automatic Offsite Backup

CBAS 15 introduces automatic offsite backup. Every night at a random time between 1 and 4 AM these programs will check the CBAS 15/Backups directory for the most recent CBAS backup. If a backup is found that has not already been synced, the file will be sent to the offsite backup server. The filename is stored locally so that the same file will not be backed up again.

## Internet Weather

This program will get the internet weather from the Computrols Weather server once every 5 minutes. This includes local temperature, humidity, etc. and is based off of the zip code. These weather values are then available as points in CBAS.

## MySQL

In an ongoing effort to more tightly integrate the CBAS and CBAS Web products, CBAS 15 will now be using MySQL as the database engine for static data. MySQL is a true client/server database system and is the most popular database used in web sites today. During the upgrade to 15, MySQL gets installed in the C:\MySQL\ directory.

## Menu Reorganization

The main pull-down menus in CBAS have grown over the years. In an effort to make them more intuitive for new users, we've reorganized their placement and descriptors. For example, you will notice that all Database operations are now under The Database heading in all modes.

## Changes to Graphics Editing

CBAS 15 also contains some changes to our Graphics engine. These include:

- Better Menu Organization
- Easier Panning - for graphics that are bigger than the display area
- Log Off from Graphic – to allow users to remain in a Graphic between logins
- Enhancements to Restore Graphics
- Support for Animated GIF Animations

## Change Point Type

In CBAS 15 you can now change Analog Input point types.

# Did You Know?

*By George Hingle, Senior Technical Representative, Computrols*

Have you ever stood over someone's shoulder to watch them work and said:

*"Hey! How did you do that?"*

I think we've all been there. You watch someone with a little more experience make quick work of something the rest of us struggle with every day. That's why we've included '**Did You Know?'** In each issue of Automate we hope to bring you a few nuggets of knowledge that can make your life in Building Automation go just a little bit smoother. A few helpful tips…

## Graphics Location

You should always locate your CBAS Graphics and background pictures in

The database directory C:\CBAS\[database name]\Graphics.

Place all graphics in that folder. Subfolders are not necessary. This will make it easier to back-up graphics background pictures as well as make them work on workstations (GW).

## CBAS Graphic Workstation Shortcuts

Did you know that you can make site specific GW shortcuts using additions to the mode=gw string? If you have multiple CBAS servers that you need to monitor by workstation, you can make a GW shortcut for each. Here are some examples:

C:\CBAS\CBAS14.exe mode=gw clientname=SECURITYremoteaddress=192.168.1.13

C:\CBAS\CBAS14.exemode=gw

clientname=WORKSTATIONremoteaddress=192.168.1.25

Client name is the GW name that you are connecting as. Remote address is the IP address of the CBAS Server (DPU).