



Apartment Owners/Managers AND Tenants Benefit from Enterprise-Wide Thermostat Control

Don Millstein, H2O Degree

INTRODUCTION

H2O Degree is well recognized as a leading provider of wireless utility submetering and leak detection systems deployed in multi-unit housing complexes. The system, based on the utilization of battery-powered water meters and a wireless communications network, has well-documented water conservation results achieved through a combination of proactive leak detection (through daily leak reports) and tenants' behavior change (based on awareness of actual usage.) In a similar fashion, networked, battery operated, wireless thermostats and control devices integrated into H2O Degree's wireless network, provides energy savings and control for both building management and their tenants.

This paper will describe the components of a system designed to provide enterprise-wide control and management of the temperature environment in multi-housing complexes.

WIRELESS THERMOSTAT CONTROL

H2O Degree's wireless thermostat control solutions allow property owners and managers to take charge of their heating and air conditioning systems in their buildings. Owners can control temperature set-points, establish time of day setbacks, view real-time temperature inside the units as well as alarm for potential maintenance issues with equipment. These same types of features are made available to residents. Owners and tenants are able to better manage their utility costs in occupied spaces as well as establish a program to control vacant unit utility costs.

Tenants have the advantage of access to a web portal or mobile app to be used on their smart phones to control their thermostat. This creates a partnership among management and residents to conserve energy. Documented savings have exceeded 20% in many properties.



H2O Degree's System can be Utilized on a Variety of Systems Including:

Thermostat Control = Energy Savings

H2O Degree's system utilizes a wireless network device (gateway) within the facility to transmit and gather data from each thermostat. Both owners and tenants access thermostats via a password protected online portal or mobile app.

H2O Degree's thermostat control system utilizes a wireless network device (gateway) within the facility to transmit and gather data from each thermostat. The gateway is connected to a cloud-based server that requires a unique username and password for users to access the online portal and mobile app for monitoring and thermostat control features. (Figure 1.)

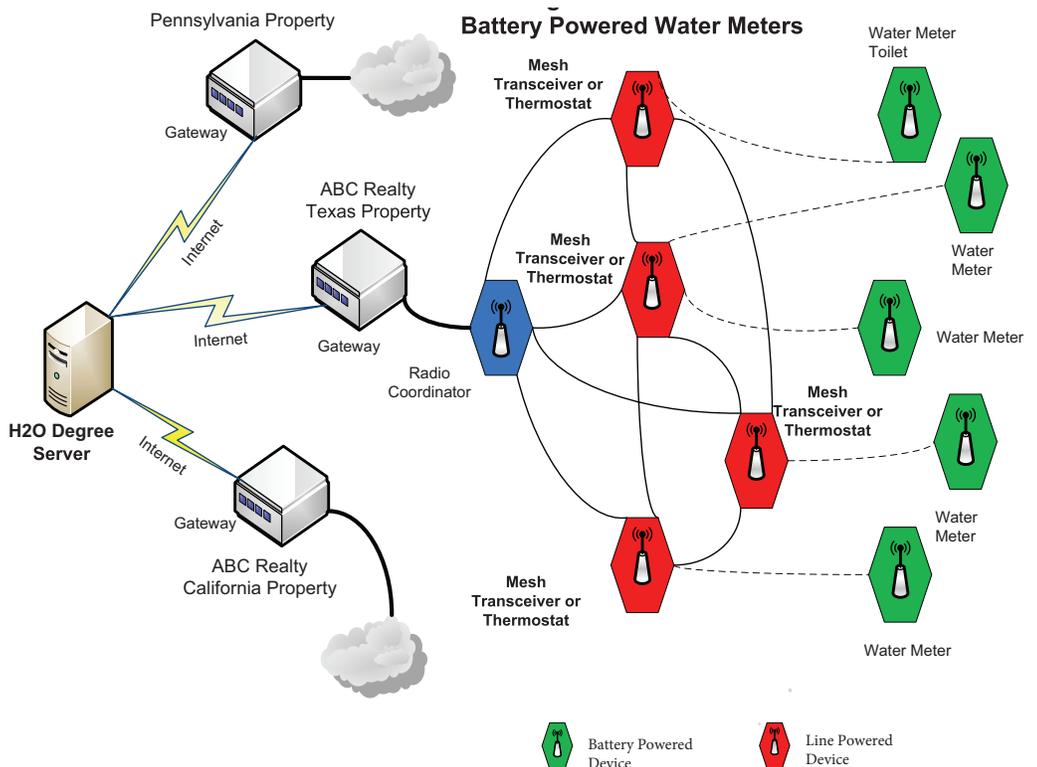


Figure 1. Block diagram of Enterprise-Wide Thermostat System

- Electric Baseboard
- Electric/Gas Heat
- Hydronic Heat
- Fan Coil Systems

- PTAC (Packaged Terminal Air Conditioner) Units
- Furnaces
- Heat Pumps

Wireless Actuator & Thermostat Control for Hydronic Radiators



Wireless System Components

SYSTEM COMPONENTS

As depicted in Figure 1, thermostat data is gathered and transmitted to a cloud-based server via a wireless gateway. The wireless network can provide two-way communication to gather the data and communicate to the individual thermostats throughout the property via H2O Degree's wireless mesh architecture that is well-suited for many multi-housing facilities.

The data in the cloud server is then accessible by both building management and tenants from any device with an internet connection. Within each apartment (and common spaces within the facility), control of the heat and air conditioning is monitored and controlled using a wireless thermostat and, in some applications, accessory devices as described below.

T1000 WIRELESS THERMOSTAT



The H2O Degree T1000 wireless, networked smart thermostat is simple to install and is a direct replacement for many 24 VAC based units. The T1000 maintains local HVAC control, even if network communication is lost. The smart thermostat communicates with the H2O Degree gateway wirelessly then connects to the H2O Degree server in the cloud.

Measurements controlled and reported by the T1--- include: heat run-time, cool run-time, humidity, heat set-point, temperature and cool set-points. The device allows property managers to set units to vacant to conserve energy. The thermostat is 7-day programmable with night setback for increased energy savings. The unit has non-volatile memory to maintain the last reading in the event of a power failure.



H2O Degree Systems enable both owners & tenants to better manage energy costs.

Wireless System Components

W54455-MIN RELAY MODULE

In many situations, the wireless thermostat is the only hardware required within the apartment to control heating. However, in installations where baseboard electric or hydronic heating is utilized, this relay module provides an effective labor reducing solution. The W54455-MIN relay module is a wireless network line powered node with an integrated relay and current detector packaged in an industry standard enclosure and capable of monitoring a load current up to 15A.

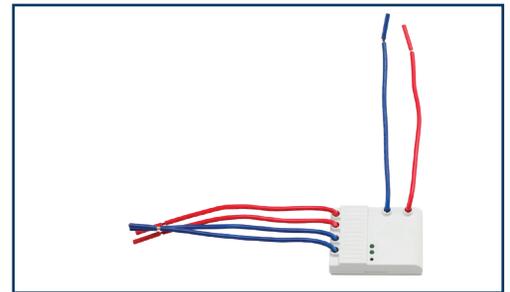


Figure 3. The relay module can be used to operate electric or hydronic baseboard heating

The module is available in either 120 VAC or 208-240 VAC configurations and features 3 small LEDs that help verify device status: Power, Link and Relay Status. Typical connection is shown in Figure 4.

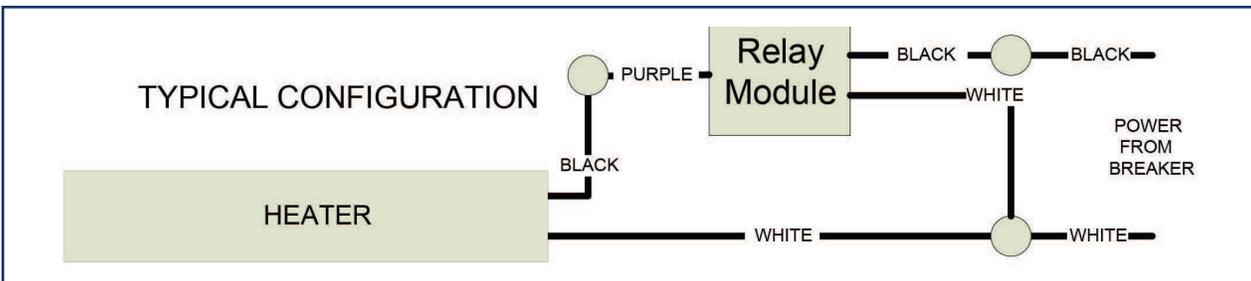


Figure 4 Relay module connection to operate baseboard heater.

OWNERS

- Create high and low set-points for tenants
- Manage common areas
- Manage vacant spaces

TENANTS

- Programmable thermostats for energy savings & comfort
- Online access via web portal or mobile app

Wireless Solutions for Thermostat Control

ENERGY HARVESTING HCV0104 WIRELESS RADIATOR ACTUATOR

The H2O Degree HCV0104 Wireless Radiator Actuator mounts directly onto thermostatic radiator valves where it controls the room temperature based on signals from the Wireless Thermostat fitted with an HCB0104 Thermostat Radiator Bridge. The wireless radiator actuator is radio-controlled and self-powered by harvesting heat energy from the hot water supplying the radiator. The wireless actuator does not require any cabling work nor does it consume batteries. It is designed for maintenance-free operation.

The wireless design makes the unit ideal for retrofit installation and cost-sensitive projects where cabling cost is prohibitive. The HCV0104 contains a thermoelectric harvesting module and integral energy storage. Beyond this, it contains an electromechanical valve actuator, a radio module and a micro-controller that makes all parts of the system work together.

ENTERPRISE-WIDE SYSTEM UTILIZATION

Enterprise-wide monitoring and control of temperature in apartment units and in facility lobbies, meeting rooms, laundry and other common spaces is conducted by building management utilizing simple and convenient dashboard displays. These displays access real-time data downloaded from the H2O Degree cloud-based server and provide command and control of the entire system. Figure 6 presents an example of the display for a large, multi-unit facility that is employing H2O Degree wireless thermostats throughout the complex. This display allows building management to remotely set heating and cooling set-points, set limits on tenant ability to adjust the set-points, identify and reduce energy costs in unoccupied areas and identify problems. For example, the run time data would identify a malfunction of the air conditioner (or perhaps an open patio door or window) in a space when the room temperature remains above the set-point for an extended period of time.



Figure 5. Energy Harvesting Radiator Actuator is ideal for retrofit installations.

ENTERPRISE-WIDE SYSTEM UTILIZATION

Figure 7 displays the information for a single zone (in this case, Apartment 201) in this facility. The graph shows no heating but air conditioning usage going from early summer to early fall. The display also shows the actual usage on a day-by-day basis for the prior seven days. The information is also available for each tenant to review.

EUI	Rkt/Fr	Apt	Mode	Temp	Heat Set Pt	Cool Set Pt	Sch Mode	Activity	Comm	Try	Fail	Set	OW Time
00C027001000A0D	06	601 Bedroom	cool	69.8	62.0	70.0	permanent	system idle	1	0	0		10/09/2019 10:10:20
00C027001000A0C	06	602 Bedroom	cool	69.8	70.0	69.0	permanent	system idle	1	0	0		10/09/2019 10:10:27
00C027001000A73	06	603 Back Room							1	1	0		
00C027001000A0E	06	603 Front Room							1	1	0		
00C027001000A02	06	Club East	cool	69.8	72.0	72.0	permanent	system idle	1	0	0		10/09/2019 10:11:07
00C027001000A0D	06	Club West	cool	71.6	72.0	71.0	permanent	system idle	1	0	0		10/09/2019 10:11:33
00C027001000FF3	06	Conference Room	heat	68.0	68.0	85.0	permanent	heating	1	0	0		10/09/2019 10:11:53
00C02700100090E	06	Exercise North	cool	69.8	70.0	70.0	permanent	system idle	1	0	0		10/09/2019 10:12:07
00C02700100090E	06	Exercise Northeast	cool	69.8	70.0	70.0	permanent	system idle	1	0	0		10/09/2019 10:12:23
00C027001000A0C	06	Exercise Small Room							1	1	0		
00C027001000A08	06	Exercise South	cool	69.8	70.0	70.0	permanent	system idle	1	0	0		10/09/2019 10:13:02
00C027001000A05	06	Exercise Southeast	cool	69.8	70.0	70.0	permanent	system idle	1	0	0		10/09/2019 10:13:17
00C027001000A75	06	Game Room East	cool	64.4	62.0	68.0	permanent	system idle	1	0	0		10/09/2019 10:13:35
00C027001000A01	06	Game Room West	heat	71.6	---	---	program	system idle	1	0	0		10/09/2019 10:13:54
00C027001000348	06	Leasing Office	heat	71.6	70.0	85.0	permanent	system idle	1	0	0		10/09/2019 10:14:16
00C0270010002AC	06	Leasing Waiting Room	heat	69.8	69.0	85.0	permanent	system idle	1	0	0		10/09/2019 10:14:38
00C027001000A08	06	Library East	cool	71.6	62.0	71.0	permanent	system idle	1	0	0		10/09/2019 10:15:03
00C027001000A0F	06	Library West	cool	69.8	62.0	71.0	permanent	system idle	1	0	0		10/09/2019 10:15:22
00006F0003513C97	06	Multipur West	cool	69.8	65.0	56.0	permanent	cooling	1	0	0		10/09/2019 10:15:40
00C027001000A09	06	Screening Room	cool	68.0	62.0	68.0	permanent	system idle	1	0	0		10/09/2019 10:15:59
00C027001000962	07	701 Bedroom	cool	69.8	70.0	72.0	permanent	system idle	1	0	0		10/09/2019 10:16:23
00C027001000952	07	701 Hallway							1	1	0		
00C027001000390	07	702 Living Room	cool	75.2	70.0	76.0	permanent	system idle	1	0	0		10/09/2019 10:17:07
00C027001000986	07	703 Living Room	cool	71.6	---	---	program	system idle	1	0	0		10/09/2019 10:17:26
00C027001000344	07	704 Living Room	heat	78.8	78.0	85.0	permanent	system idle	1	0	0		10/09/2019 10:17:50

BUILDING MANAGEMENT DISPLAY

Figure 6. Building Management display provides a snapshot of all the zones in the facility.

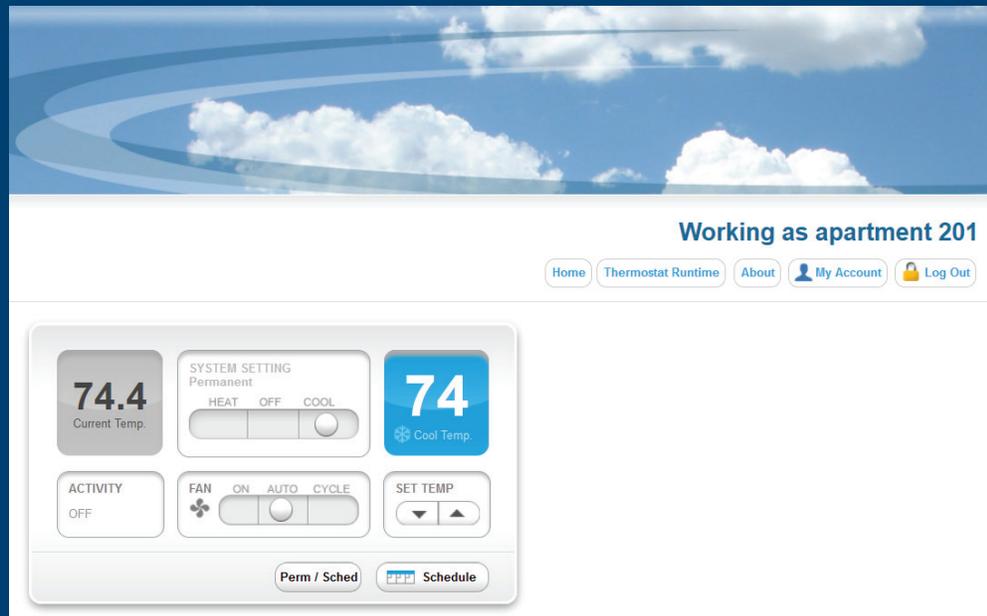
SINGLE UNIT DISPLAY

Figure 7. Single unit displays provide key information about energy usage.



TENANT THERMOSTAT CONTROL

Each tenant has access to the thermostat display, as shown in Figure 8, via the internet on their computer or mobile device. This online display mirrors the actual functions and information available on the thermostat(s) in their unit. It enables each tenant to remotely control (within limits set by the building management) the temperature in their environment.



SINGLE UNIT DISPLAY

Figure 8 . Single unit displays provide key information about energy usage.

CONCLUSION

Enterprise-wide thermostat systems provide building owners/managers as well as tenants another valuable tool enabling energy reduction and cost savings. Information provided by the intelligent system provide management with exceptional visibility and control over the property's heating and air conditioning operations. And, as has been well documented with water submetering systems, tenant awareness of their usage leads to energy-reducing behavioral changes.

For complete information on H2O Degree's utility submetering, water leak detection and thermostat control solutions visit us online at www.H2ODegree.com, call (215) 788-8485 or email info@h2odegree.com.





H2O Degree

H2O Degree has been the leading supplier of utility management products for multi-family facilities for more than 10 years. H2O Degree has enabled building owners and managers to recover and reduce utility costs with their facilities creating increased net operating income and boosting property value while reducing energy consumption costs.

H2O DEGREE SOLUTIONS

- *Submetering for tenant billing — water, electric, gas & BTU*
- *Water leak detection, alarming & reporting*
- *Thermostat control and management*
- *Water & energy conservation, identification,*



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H2O Degree



(215) 788-8485



info@h2odegree.com



3580 Progress Drive, Suite L