



# Remote Thermostats Offer Benefits to Buildings without Building Automation Systems

## SUMMARY

Many buildings and portfolios have straightforward mechanical systems that do not warrant the use of sophisticated Building Automation Systems. In these buildings, remote thermostats offer building managers an opportunity to optimize building operation, comfort, and efficiency by changing set points and schedules remotely. The market for remote thermostats is young but promising, with many market-ready products offering a variety of features and applications. This whitepaper helps provide building operators with the information they need to take the first steps towards implementation.

## TYPICAL APPROACHES AND CHALLENGES WITH MANAGING BUILDING SYSTEMS

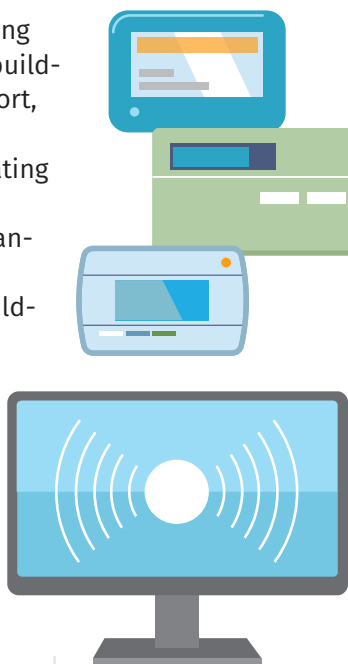
Building automation is the automatic centralized control of a building's heating, ventilation, and air conditioning (HVAC), lighting, and other systems through a Building Management System (BMS) or Building Automation System (BAS). The objectives of building automation are improved occupant comfort, efficient operation of building systems, and reductions in energy consumption and operating costs. Building automation has introduced a dramatically different approach to facility management, with which building managers can virtually visit and control aspects of their building(s) through a computer or phone app, significantly reducing effort and travel time and increasing real-time knowledge of building operations.

Building management, however, is not a one-size-fits-all solution. For building operators of a single building with several large air-handling units, a chiller plant, and/or other complex systems, the cost and technical input required to implement

and maintain a full BAS solution is easy to justify. This is less feasible, however, for building operators charged with overseeing facilities with less complex building systems and multiple occupancy schedules, such as mid-sized hotels with several conference rooms, and groups of independent facilities, such as a parks and recreation department with numerous rentable small buildings for events. These spaces traditionally require facilities staff to make an on-site visit before the start of an event to meet the program needs of each space—a cumbersome and time-consuming approach. Many of these kinds of buildings handle scheduling by using **7-day programmable thermostats**. More often than not, thermostats are programmed to turn on at the earliest time the space is available for use and shut off at the latest time, regardless of planned schedules or actual use. Furthermore, thermostat schedules are usually not updated when a space's programming changes, are often overridden by building occupants, or are simply neglected for a variety of reasons. Together, this results in a significant waste of energy and money.

## REMOTE THERMOSTAT SOLUTIONS

Remote thermostats offer a BAS-like solution to these common challenges with real-time remote capabilities to make schedule changes, adjust set points, and in many models, integrate with event space scheduling programs, without the need to hire a controls engineering firm. The good news is that this technology has become increasingly common, easier to use, and more affordable.



## DECIDING FACTORS: CONSIDERATIONS FOR SELECTING THE RIGHT REMOTE THERMOSTAT

There are a variety of products that offer a range of benefits to building and portfolio types. It is important to understand the capabilities and limitations of each so that building owners and managers make the right decisions the first time. Here are five factors a building operator should consider in the process to implement wireless thermostats.

### Number of Sites

Devices that mainly target the consumer market can effectively support facilities of 10 or fewer sites. Managing a greater number of sites makes navigation of the thermostat control interfaces cumbersome, requiring time consuming, repetitive input to achieve simple actions on each device. A more commercially-oriented device will generally have an interface tailored towards managing multiple sites, allowing a single input command to affect multiple thermostats at once and providing interfaces that resemble those of a BAS.



### Storage and Service

The majority of the remote thermostats on the market today have an associated cloud-based service, through which the control commands are relayed. On the upside, this greatly simplifies the initial configuration process and may remove the need for an owner's IT personnel to commit resources. On the downside, this removes some control from the facility owner. Specifically, should the manufacturer go out of business or stop supporting the product and the servers hosting the supporting software be shut down, the thermostat's remote control capability may be lost. Additionally, at present, the services are provided with the purchase of the thermostat, at no additional cost. However, there is nothing to stop the manufacturer from deciding to charge a subscription fee to keep the service active in the future. Lastly, depending on the owner's IT policies, letting a local system be controlled by an internet-based service may not be desired or allowed.

### Integration Capabilities

In the event that a facility already has a remote HVAC control system in place, such as a BAS or other remote thermostats, integration should be a key consideration. It is also important to consider future expansion if the owner is looking to increase the total number of facilities over time. The ideal integration provides a single inter-

face, from which all the systems can be controlled, regardless of manufacturer. This could be achieved either on the manufacturer's side, by providing a system that can communicate with multiple products, or by a third party developing an application to translate between each device and present a unified interface.

### Schedule Consistency

Even in cases in which a facility's use schedule is fairly predictable, the remote monitoring capabilities and controls can be very useful. Furthermore, if there is no need to frequently adjust the operational schedule of remote facility equipment, devices tailored to the residential market can be effectively used in a commercial capacity, helping to save upfront costs.

### Expandability

At present, many of the consumer grade remote thermostats available do not have the capability to control external devices, such as economizers. However, the majority of commercial grade devices can either directly connect to the equipment or provide an ability to connect to an interface device, which can relay the required information or commands. Depending on the existing HVAC system and its needs, this capability may be important. However, it has become increasingly common for larger HVAC equipment with economizer capabilities to be provided with internal controls from the manufacturer, requiring only signals for heating or cooling from the thermostat.

## REMOTE THERMOSTAT MARKET OVERVIEW

To illustrate what capabilities are available in the market today, several models of existing remote thermostats were chosen. The general feature set and some additional information for each are provided here. This listing of thermostats represents only a small portion of remote thermostats available on the market. These particular products have features capable of meeting the needs of a wide variety of customers, the following thermostats have been chosen based on their market share, manufacturer reputation, and feature sets satisfying the majority of the deciding factors.

### Common Functional Features

Each of these thermostats can also operate as a standard 7-day programmable thermostat, with local override capabilities, ensuring the system can continue to operate as planned in the event of a network failure. In general, all the thermostats covered are universal in nature: each is capable of controlling a single piece of HVAC equipment,

including heat pumps with multiple stages of heating, multi-stage cooling units, and hydronic heating systems. Additionally, each thermostat possesses an intelligent recovery feature that learns how long the system requires to reach a temperature. Over time, this learning is utilized to determine an appropriate start time for the system, so that the controlled space meets the set temperature at the scheduled time. For example, if it takes 45 minutes for the building to get to the 68°F and the building is scheduled to be occupied at 7:00am, the system will turn on at 6:15am and run until the set point is achieved. Another common feature in the highlighted products is the capability to provide email alerts. Events available vary by manufacturer, but generally the set of events includes temperatures exceeding defined temperatures and high or low humidity.

### Individual Product Details

**The Honeywell RTH6580WF** is just one of several Wi-Fi thermostats made by Honeywell. Notably, it is one of the few Wi-Fi thermostats costing less than \$100, though it has a relatively bare feature set. While there are other internet-connected thermostats in this price range, Honeywell is one of the strongest and most reputable brands on the market. The remote interface allows the user to view multiple thermostat statuses at once, but requires multiple clicks or taps to setup each unit. Over time, operators may find that controlling multiple units is cumbersome, especially in cases where schedules for more than 5 sites need to be adjusted regularly. In terms of integration with other systems, Honeywell announced that it was opening an application program interface (API) to programmers, but as of the publishing of this paper (June 2015), it is only possible to sign up for email updates—the planned public release date is yet unannounced.

**Network Thermostats** occupies a unique niche in the remote thermostat marketplace, as asserted to be the only truly standalone product that does not rely on cloud-based services. All commands and other communications are included directly with the thermostat. Although the pricing is significantly higher than similar products available, it is one of the few products directly aimed at the commercial sector, specifically targeting customers who cannot justify a full BAS. The manufacturer's software interface is clearly tailored towards a facility manager handling multiple sites and offers integration

with facility reservation systems. This is perhaps best illustrated by contrasting with the interface provided by the Honeywell WiFi thermostat, which requires a separate set of actions for each controlled system. The Network Thermostats interface allows for grouping, simultaneously issuing a single command to multiple thermostats. Further enhancing this solution's flexibility, there is also a product that can connect 40 of the Network Thermostats directly to an existing BAS, or allow for continued use of the Network Thermostats should a BAS be added at a later date.



The **ecoBee EMS** is a commercially-aimed product that retains the company's traditional focus on function (reliable, internet-connectable energy saving device) over form, yet adds new capabilities that more readily approach the functionality of a BAS-based system. With the ability to add wired and wireless sensors and adjust the thermostat's behavior based on the sensors' input, the ecoBee EMS may appeal to facilities managers wavering between a BAS and remote thermostat options, though the options are not quite as advanced as the Network Thermostats system.

**Nest** targets the residential market and its first product prompted many homeowners to think about their thermostats. With capabilities that include occupancy sensing, schedule learning, remote control capability supported by an iPhone, and webpage interface, it is a powerful device. However, as the manufacturer points out, it is only a thermostat. Nest's future plans remain focused on the residential market and include products that communicate with the Nest thermostat. Integration with existing network services such as security systems or BAS are not included. While Nest is one of the more costly consumer-grade devices, its feature set for commercial facility management applications is minimal. For example, to issue a schedule or set point change to 10 Nest thermostats, an operator would need to repeat the same set of actions 10 times, whereas a commercial solution will typically allow an operator to enter the command once and have it apply to 10 units at once. Yet for the facility manager with five or fewer buildings, Nest may be an attractive device.

The **ecoBee 3** is the significantly redesigned consumer model remote thermostat from ecoBee, intended to compete directly with the Nest at a similar price point and feature set. Unlike the Nest, ecoBee does not

## Product Overview Matrix

Product	Relative Price Point	Key	Applicability							
			Residential/ Commercial (≤10 sites)	Commercial (>10 sites)	BAS Connectivity	Supports Remote Sensors	Supports External Devices	Cloud- Hosted Backend	API Access Available	Batch Issue Commands
Honeywell RTH6580WF WiFi Thermostat	\$	Reliable Name Low Price	✓					✓		
Network Thermostats	\$\$\$	BAS Integration Scheduling software integration		✓	✓	✓	✓		✓	✓
ecoBee EMS	\$\$\$	BAS-like interface		✓		✓	✓	✓	✓	
ecoBee 3	\$\$	Attractive Design Built-in occupancy sensor Includes 1 remote temperature/occupancy	✓			✓		✓	✓	
Nest	\$\$	Nest	✓			✓		✓	✓	

advertise the ecoBee 3 as tailored to commercial applications, perhaps in part because of the better suited ecoBee EMS. A key feature of the ecoBee 3 is wireless remote temperature and occupancy sensors, one of which is included with each thermostat—up to 32 sensors may be assigned to each thermostat. The thermostat can then average all of the sensors directly, or use a weighted average based on the occupancy state of each sensor.

## About the Smart Buildings Center

The Smart Buildings Center (SBC) is a project of the Northwest Energy Efficiency Council (NEEC), which is a non-profit industry association of the energy efficiency industry. The SBC supports growth and innovation in the Pacific Northwest's energy efficiency industry, serving as a hub for industry activities and raising the visibility of energy efficiency companies and projects.



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