ULTIMATE GUIDE TO BUILDING AUTOMATION SYSTEM (BAS)

Building Automation is monitoring and controlling a building’s systems including: mechanical, security, fire and flood safety, lighting, heating, ventilation, and air conditioning.

SUCH SYSTEMS CAN:

- keep building climates within a specified range
- light rooms according to an occupancy schedule
- monitor energy performance and device failures in all systems
- alarm facility managers in the event of a malfunction

A building with a building automation system (BAS) has up to 30% lower energy and maintenance costs. The many benefits of a BAS may not be immediately clear until you understand the mechanisms driving these systems. This guide explains BAS and includes links to topics that may be relevant to your own research.
WHAT IS BUILDING AUTOMATION?

A centralized, networked system of hardware and software that monitors and controls a building’s facility systems (electricity, lighting, plumbing, HVAC, water supply, etc.).

When facilities are monitored and controlled in a seamless fashion, tenants enjoy a more comfortable working environment and facility management benefits from sustainable practices and reduced energy costs.

THE FOUR CORE FUNCTIONS OF A BUILDING AUTOMATION SYSTEM:

1. TO CONTROL THE BUILDING’s ENVIRONMENT
2. TO OPERATE SYSTEMS ACCORDING TO OCCUPANCY AND ENERGY DEMAND
3. TO MONITOR AND CORRECT SYSTEM PERFORMANCE
4. TO ALERT OR SOUND ALARMS WHEN NEEDED
WHAT IS MEANT BY “CONTROLLED”?  

The key component in a BAS is the controller—a small, specialized computer with various applications.

Rewind—the old way of control:  
Imagine a rugged, manual wood-burning stove. It is impossible to precisely regulate temperature or smoke output by heating a building with pure woodfire.

Fast-forward 150 years:  
Intelligent controllers regulate heating systems to set the temperature of a specific room to a precise degree, then automatically cool overnight.

Controllers regulate the performance of various facilities within the building. Traditionally, this includes the following:

- Electrical systems
- Heating, ventilation and air-conditioning systems
- Lighting systems
- Mechanical systems
- Plumbing systems
- Security Systems
- Surveillance Systems

Today’s technology allows a building to learn from itself. A modern BAS monitors facility systems, optimizes for maximum efficiency, remembers who enters which rooms at what times, and adjusts to conserve energy. That’s why automated buildings are called “smart buildings.”

And they’re getting smarter all the time…
Building automation has advanced just within our lifetime at a baffling rate.

1950: Automated buildings rely on pneumatic controls with compressed air.

1980s: Microprocessors move the industry from compressed air to analog then digital controls (nothing short of a revolution).

1990s: Open protocols allow controlled facilities to actually communicate with one another.

2000: Wireless technology allows components to communicate without cable attachments.

**BMS** **BCS**

Building Management System and Building Control System: General terms for systems that control a building’s facilities (not necessarily automation systems).

**DDC**

Direct Digital Control: Innovation in the ‘80s brought small, affordable microprocessors enabling a digital system’s components to communicate.

**BAS**

Building Automation System: A subset that can be a part of the larger BMS or BCS. Building management and building automation have so thoroughly overlapped that the terms are used interchangeably.

**EMS** **EMCS**

Energy Management System and Energy Management Control System: Energy consumption, metering, etc. There’s enough overlap between what a BAS and an EMS do that we consider these terms synonymous.

**API**

Application Programming Interface: The code that defines how two or more pieces of software communicate with one another.

With technology evolving so quickly and different countries using different terms, but still having to communicate with one another, the terminology is bound to be in a state of flux.
HOW DO BUILDING AUTOMATION SYSTEMS WORK?

BASIC BAS HAS FIVE ESSENTIAL COMPONENTS:

**SENSORS**
Devices that measure values such as CO2 output, temperature, humidity, daylight or room occupancy.

**COMMUNICATIONS PROTOCOLS**
The language spoken among the components of the BAS. Example: BACnet.

**CONTROLLERS**
The brains of the systems that take data from sensors and decide how the system will respond.

**OUTPUT DEVICES**
These carry out the commands from the controller. Examples: relays and actuators.

**DASHBOARD OR USER INTERFACE**
Screens or interfaces humans use to interact with the BAS where building data are reported.

Most BAS activity takes place out of sight with controllers and output devices hidden from view, just as wiring and plumbing.
WHAT BAS CAN DO

Sets up lighting and HVAC systems to operate on an intelligent/efficient schedule.

Coordinates components and facilities to work together for greater efficiency.

Optimizes incoming air flow to regulate air quality, temperature and comfort.

Tells when HVAC is running both heating and cooling, to reduce utility costs.

Senses emergencies and turns off facilities that could endanger occupants.

Detects problems (elevator stuck with people inside) and sends an alert.

Identifies who and when someone is entering and leaving a building.

Alerts cameras, records activity, sends alarm and data to a security team.
The brains of the BAS, digital controllers receive input data, apply logic (an algorithm, just as Google does with search data) to that information, then send out a command based on what information was processed.

This is best illustrated through the following basic three-part DDC loop…

**HOW A DDC LOOP WORKS:**

1. Occupancy sensor detects a presence in the boardroom when the room is known to be in unoccupied mode.

2. Controller applies logic commanding the BAS system to change the mode from unoccupied to occupied knowing someone is in the space.

3. HVAC unit in the boardroom changes to occupied mode and will heat or cool to pre-occupied set point or desired temperature.

*Note: Actual algorithm is far more complex than depicted in this example.*
**WHY ARE BUILDING AUTOMATION SYSTEMS USEFUL?**

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<th>COMFORT AND PRODUCTIVITY</th>
<th>SAVING MONEY</th>
<th>ENVIRONMENTALLY FRIENDLY</th>
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<td>Smarter control of the building’s environment keep occupants happier. It also reduces complaints and resolution time.</td>
<td>A BAS can save a building owner a significant amount of money on utility bills, since a more energy-efficient building simply costs less to run.</td>
<td>BAS efficiencies equate to a reduced environmental impact which means better air quality for everyone.</td>
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Let us tell you more about Building Automation Systems can how they be useful to you. Visit us at controlyourbuilding.com or call us today at 616-247-9422

*Informational sources available upon request.*