

## MAXIMIZE BAS PERFORMANCE

# A PRACTICAL GUIDE FOR BAS OPTIMIZATION

A building automation system (BAS) is a centralized platform that integrates and manages various building systems—such as HVAC, lighting, energy metering, and security. Importantly, a BAS is not a control system itself; rather, it coordinates the operation of multiple subsystems to improve performance, efficiency, and occupant comfort.

A BAS doesn't inherently save energy. It's the control strategies implemented within the system—tailored to the specific building and its usage—that drive energy efficiency and performance improvements.



## STEP 1: ESTABLISH A STRONG FOUNDATION BY UNDERSTANDING WHAT A BAS IS AND HOW IT FUNCTIONS

- **Purpose of a BAS:**
  - Improve energy efficiency
  - Enhance occupant comfort and indoor environment quality
  - Increase system reliability and equipment longevity
  - Automate routine operational tasks and fault detection
- **Key components:**
  - Sensors, controllers, Graphical User Interface/Human Machine Interface (GUI/HMI), Communication Protocols
- **Co-Benefits of BAS Implementation:**
  - Emission reduction: Supports lower carbon footprints through energy-efficient control
  - Health: Maintains healthier air through proper ventilation and filtration controls
  - Resilience: Enhances a building's ability to respond to extreme weather, equipment faults, and power outages
  - Property Value: Modern automation capabilities can boost property value, appeal to tenants, and support certifications (e.g. LEED, ENERGY STAR)



## STEP 2: DEVELOP BUILDING CONTROL LITERACY TO INTERPRET, MANAGE, AND FINE-TUNE BAS OPERATIONS EFFECTIVELY

- **Grasp control basics:** Direct digital control (DDC), control loops (open/closed), sensor types (temperature, humidity, CO<sub>2</sub>, pressure).
- **Learn about** typical heating, ventilation, and air-conditioning (HVAC) systems and their BAS configurations.
- **Learn about** input/output points: Analog, digital, and virtual.
- **Understand** the importance of sensor calibration and accuracy.



## STEP 3: OPTIMIZE OPERATIONAL PERFORMANCE BY ALIGNING SYSTEM SETTINGS WITH REAL-TIME OCCUPANCY, USAGE PATTERNS, AND ENERGY GOALS

- **Apply energy-saving strategies** such as scheduling, supply air temperature reset, demand control ventilation with CO<sub>2</sub> sensors, economizer control strategies, and lighting controls.
- **Learn about best practices** for setting up BAS graphics and screens.
- **Recognize the value of recommissioning and maintenance** to identify inefficiencies, outdated components, and integration issues.
- **Account for local climate,** lighting and HVAC controls must suit seasonal conditions.



#### **STEP 4: LEVERAGE ADVANCED DIAGNOSTICS AND CONTROL STRATEGIES TO PROACTIVELY DETECT ISSUES AND ENHANCE SYSTEM RESPONSIVENESS**

- Dive into proportional-integral-derivative (PID) tuning methods: Ziegler-Nichols, Cohen-Coon, and Lambda.
- **Learn about** the ASHRAE Guideline 36 standard. Learn about strategies such as trim and respond and areas where it could be deployed.
- **Learn how to set up trends, including sampling rates:** Focus on high-value variables such as supply air temperature, occupancy, and setpoints. Use proper sampling intervals to avoid data overload. Understand how to conduct trend analysis to diagnose operational issues.



#### **STEP 5: ENSURE STRATEGIC INTEGRATION AND THOROUGH COMMISSIONING OF ALL BAS COMPONENTS TO ENABLE SEAMLESS PERFORMANCE ACROSS SYSTEMS**

- **Understand BAS design specs:** Performance vs. detailed specifications.
- **Learn about** OPRs (owner's project requirements) and BOD (basis of design) and how these tools can help ensure quality when procuring a new BAS or upgrading an existing system.
- **Explore** commissioning and recommissioning processes for system optimization. Thorough commissioning ensures that system goals align with design intent and operational needs.



#### **STEP 6: IMPLEMENT A CYCLE OF CONTINUOUS IMPROVEMENT THROUGH ONGOING FAULT DETECTION, PERFORMANCE REVIEWS, AND THOUGHTFUL DESIGN REFINEMENTS**

- **Integrate fault detection and diagnostics (FDD):** Rule-based, model-based, data-driven.
- **Use FDD** as a persistence tool to maintain performance.
- **Understand that RCx** (recommissioning) should precede FDD for best results.
- **Consider local climate conditions.** HVAC and lighting control strategies should be adapted to regional weather patterns, daylight availability, and seasonal variations:
  - o In colder climates, prioritize heat recovery and insulation strategies.
  - o In warmer regions, focus on shading, ventilation, and cooling efficiency.
  - o In temperate zones, leverage free cooling and dynamic scheduling.

#### **ADDITIONAL RESOURCES**

[Save on Energy: Buying Guide: Building automation systems](#) ➔

[The ultimate guide to building automation systems](#) ➔

[What is a building automation system \(video\)](#) ➔