

### 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 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:
  - In colder climates, prioritize heat recovery and insulation strategies.
  - In warmer regions, focus on shading, ventilation, and cooling efficiency.
  - In temperate zones, leverage free cooling and dynamic scheduling.



#### 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.

#### ADDITIONAL RESOURCES

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

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

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