

Building Automation

*The OEM and Installers Guide to
Control Components for
Building Automation Systems (BAS)*



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About c3controls

Since 1976 c3controls (c3controls.com) has provided OEMs and electrical equipment builders a comprehensive portfolio of industrial control products that meet the most demanding applications. By maintaining strict control over the development and manufacturing of all products, c3 can provide customers extraordinary value through unmatched quality, competitive pricing, same-day shipping and a 36-month product warranty. This vertically integrated approach coupled with a direct sales model brings c3 closer to the end-user, fostering a degree of innovation that leads the industry.



We are proud to be ISO 9001:2015 certified for our quality management system.

Glossary of Terms

- Access Control:**
Refers to systems that regulate entry to buildings or specific areas within buildings, ensuring security through keycards, biometric scanners, or PIN pads.
- Actuator:**
A device that converts electrical signals into mechanical movement, used to control valves, dampers, or other physical devices in automation systems.
- BACnet:**
A communication protocol for building automation and control networks, enabling interoperability between different systems such as HVAC, lighting, and access control.
- Building Automation System (BAS):**
An integrated system that monitors and controls building systems such as HVAC, lighting, and energy management to enhance efficiency and occupant comfort.
- Building Management System (BMS):**
A centralized system for monitoring and controlling building operations, including energy usage, HVAC, lighting, and security systems.
- Control Panel:**
An assembly housing electrical or electronic components for controlling various systems. Examples include motor overload panels, circuit breaker panels, and relay panels.
- Direct Digital Control (DDC):**
A system of microprocessor-based controllers used in building automation to monitor and control equipment like HVAC systems.
- Enclosed Controls:**
Controls housed in protective enclosures to ensure safety and reliability. Common examples include motor disconnects, emergency stops, and on/off controls.
- Energy Management System (EMS):**
A system designed to optimize energy use in buildings, reducing costs and environmental impact while maintaining occupant comfort.
- Heating, Ventilation, and Air Conditioning (HVAC):**
A core system in building automation for managing indoor temperature, humidity, and air quality, ensuring comfort and efficiency.
- Internet of Things (IoT):**
A network of interconnected devices that collect and exchange data, enhancing automation, monitoring, and control in smart buildings.
- Lighting Controls:**
Automated systems that control lighting schedules, dimming, and occupancy sensing to improve energy efficiency and occupant convenience.
- ModBus:**
A communication protocol used to transmit data between devices in industrial and building automation systems.
- Monitoring:**
The continuous observation of building systems, such as security alarms, sensors, and equipment performance, to ensure safety and operational efficiency.
- Motor Controls:**
Systems used to regulate motors in applications like heating and cooling, hydronics, ventilation, variable air volume (VAV), and indoor air quality (IAQ).
- Plumbing Controls:**
Automation systems for managing water and wastewater processes, including flow control, pressure regulation, and leak detection.
- Power Supplies:**
Devices providing electrical power for building automation components like thermostats, sensors, actuators, dampers, louvers, and controllers.
- Sensor:**
Devices that detect and measure conditions like temperature, humidity, occupancy, or light levels, providing data for building automation systems to act upon.
- Smart Building:**
A building that integrates IoT and automation technologies to optimize energy efficiency, security, and occupant comfort.
- System Integration:**
The process of connecting different building systems, such as HVAC, lighting, and access control, to operate cohesively under a centralized platform.
- VFD Bypass Panel:**
A specialized panel used in motor control systems, allowing motors to bypass variable frequency drives (VFDs) for maintenance or emergency operation.

-Building Automation Overview

The building automation industry is transforming how buildings operate, integrating advanced technologies to optimize energy efficiency, occupant comfort, and operational control. Building Automation Systems (BAS) and Building Management Systems (BMS) are central to managing HVAC, lighting, security, and energy usage across residential, commercial, and industrial facilities.

Today, the market is experiencing rapid growth, driven by rising energy costs, stricter environmental regulations, and the growing demand for smarter, more sustainable buildings. Technologies such as the Internet of Things (IoT), cloud-based systems, and wireless connectivity are enabling more efficient monitoring and control of building systems. Many key sectors like healthcare, education, and retail are embracing automation to reduce costs and enhance operational efficiency.

Looking ahead, advancements in artificial intelligence (AI) and machine learning (ML) will enable predictive maintenance, adaptive energy management, and personalized user experiences. Smart buildings that leverage IoT and data analytics will become the norm, while cybersecurity will remain critical as systems become more interconnected. Emerging trends like renewable energy integration, advanced HVAC systems, and occupant-centric automation will continue to shape the industry, creating smarter, more sustainable, and secure spaces.

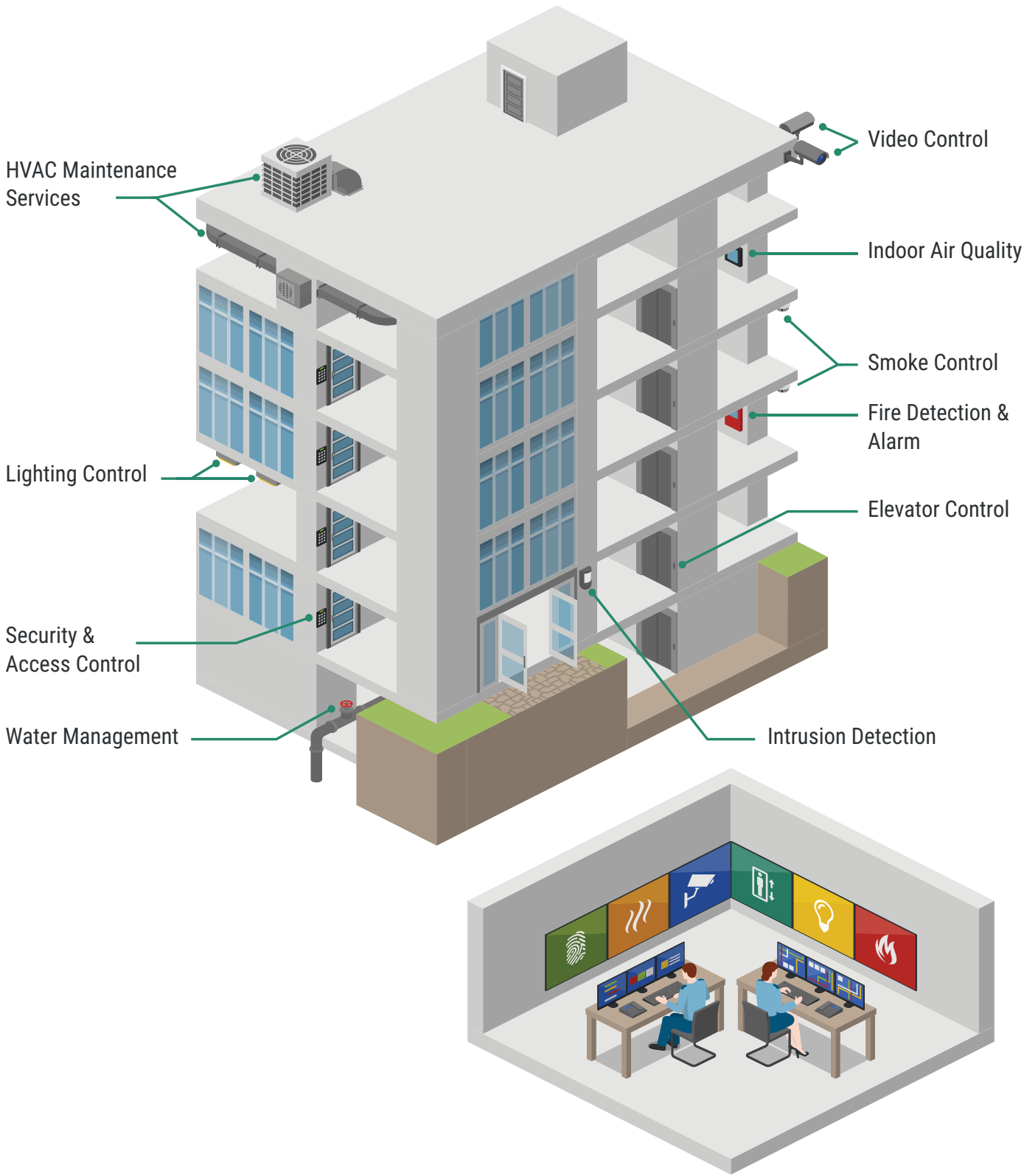
c3controls can help you meet the evolving demands of building automation. With more than 50 years of experience manufacturing quality electrical controls, we provide reliable products designed to support the performance, efficiency, and control requirements of modern buildings. Our vertically integrated approach allows us to operate efficiently, respond quickly to changing market conditions, and provide the electrical control products you need with fast delivery. Our solutions support a wide range of building automation applications, including:

- HVAC
- Lighting
- Plumbing
- Access Control
- Monitoring
- Energy Management
- & more!

With over seventeen million product configurations from c3controls and custom UL 508A-certified panel solutions from Covenant Panelworks (CPW), you have a trusted source for complete electrical control solutions. Contact us today and discover how our expertise can help you optimize building performance, improve efficiency, and meet the evolving demands of modern building automation.

-Building Automation Isometric

Here's a simple example of what a building automation system entails:



Building Automation Products

Pilot Devices



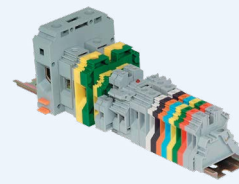
- Modular range of 30mm, 22mm, 16mm, and 13mm
- Maintained and momentary operations
- Type 1, 2, 3, 3R, 4/4X, 12, and 13
- Color-coded, snap-on contact blocks
- Full voltage, multi-voltage, resistor, and dual input light units in a wide range of voltages up to 600VAC/VDC

Miniature Circuit Breakers



- UL 489 & UL 1077
- 1, 2 and 3 Pole combinations
- 10kA SCCR @ 480Y/277VAC
- Current ratings up to 63 Amps
- B, C and D curve ratings

IEC Terminal Blocks



- Screw Clamp, Spring Clamp, and Miniature
- 5mm - 25mm widths
- 25 - 230 Amps
- Feed Through, Ground, Multi-Conductor, Double & Triple Level, Fuse Holder, Power Distribution, and more
- DIN Rail mounting; snap-on, snap-off assembly

Combination Motor Starters



- Enclosure constructions in Polycarbonate or Carbon Steel
- Pre-wired assemblies include: MPCB, contactor, UL489 circuit breaker, a variety of 22mm IEC pilot devices, and external operating handle
- 50kA SCCR @ 480V in high fault applications
- Overload relay can be set to the exact FLA of the motor

Non-Combination Motor Starters



- Polycarbonate enclosure rated Type 4X and IP65
- Pre-wired assemblies include: MPCB or overload relay, contactor, external operating handle, and multiple pilot device configurations
- 50kA SCCR @ 480V in high fault applications
- Factory assemblies provide the convenience of a single catalog number and shorter BOM

Enclosed Motor Protection Circuit Breakers



- Multi-Function: Manual Motor Controller, Motor Disconnect, Group Motor Installations
- Thermal & Magnetic Trip Elements with ratings from 0.1A - 32A
- ABS Plastic enclosure rated IP55
- Padlockable handle, up to three padlocks
- Self-protected, eliminating the need for up-stream fuses and circuit breakers

General Purpose Relays



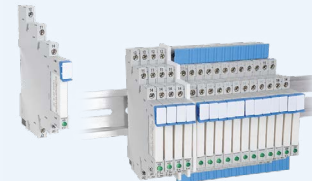
- Octal Base with pin terminals and Square Base with blade-style terminals
- Various pole combinations and coil voltages
- Color-coded push buttons for distinguishing AC and DC
- Built-in retainer clips in relay sockets
- Marking plates on relays and sockets

Electronic Timing Relays



- Compact design, sizes in 17.5mm, 22.5mm, and 45mm wide
- Single, dual and multi-functions
- Timing ranges from 0.01 seconds to 9,999 hours
- DIN Rail, Panel, Socket, and enclosure door mountings
- Voltage inputs 20-240 VAC and 12-240 VDC

Terminal Block Relays



- Rated load: 6A, 250VAC/30VDC
- Single-Pole, Double-Throw contacts
- Screw termination
- Most common AC/DC coil voltages: 12V, 24V, 110-125V, 220-240V

Enclosed Power Supplies



- 24VAC power with on/off control, power indication and equipment overcurrent protection
- Transformer steps down the input voltage to 24VAC at the output
- 100VA Ungrounded Class 2 rating per output circuit
- Optional voltage separation compartments and convenient receptacle outlets
- Durable, Type 1 metallic enclosure

Enclosed Disconnects



- Certified for use in Manual Motor Controller applications suitable as Motor Disconnects
- Configurations in 3- and 4-pole with switch ratings from 16A - 63A, motor loads up to 25HP at 480V (30kW at 400V)
- Variety of operating handle styles and colors rated for Type 1, 2, 3, 3R, 4/4X, 12, 13, and IP65
- ABS plastic, polycarbonate, and carbon steel enclosures with Type 1, 4X, 12, 13 and IP65 ratings

Control Stations (+ E-Stops and Alarm Silence Stations)



- Standard pre-configured assemblies of 30mm and 22mm pilot devices (customizable configurations available)
- Enclosure constructions in Polycarbonate, Polyester, and Die Cast Aluminum
- Operator options in both non-illuminated and illuminated
- Each assembly comes with laminated, laser engraved legend plates
- Fully assembled and ready to use out of the box

Industrial Power Supplies



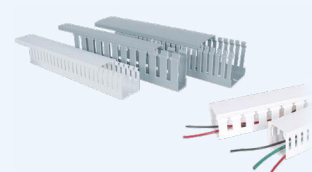
- Designed to deliver the power with up to 93% efficiency
- Adjustable voltage options in 12, 24, and 48V
- Output power range from 60W to 480W
- DC OK relay contacts are standard on 240W and 480W
- Compact design - 43mm wide, up to 60mm

Control Circuit Transformers



- Ratings from 20 to 300VA
- Operating voltages from 120V to 480V on primary side, and 24V on secondary side
- Over-current protection options; inherent or non-inherent, or manual resettable circuit breaker
- Integrated grounding system and space-saving footprint
- Versatile for Class 2, Class 3, and general purpose applications

Wire / Cable Duct



- 13 Selectable dimensions from 25mm wide up to 80mm, and up to 2m in length
- Narrow and Wide Slot
- Rigid "U" shaped duct with non-slip cover in gray or white
- Optional adhesive backing

VFD Bypass Panels



- Can be installed as either a temporary replacement to a VFD or as a system backup
- Each assembly includes: fused disconnect switch, contactors, control transformer, a variety of 22mm IEC pilot devices, and power and control terminal blocks
- Optimized width to save wall space

Electrical Panels



Custom electrical panel solutions are available through Covenant Panelworks (CPW), a UL 508A-certified panel shop specializing in complete finished assemblies and value-added projects such as:

- Motor Overload Panels (MOV)
- Circuit Breaker Panels
- Relay Panels
- & more!

Product Portfolio

Our 17 million+ product configurations deliver durability and reliability—even in the most punishing environments—meeting and exceeding global standards for quality and safety.



DISCONNECT SWITCHES
NON-FUSED & ENCLOSED



MINIATURE CIRCUIT BREAKERS



CONTACTORS & CONTROL RELAYS



OVERLOAD RELAYS



DIRECT-ON-LINE STARTERS
CONTACTOR + OVERLOAD RELAY



ENCLOSED DIRECT-ON-LINE STARTERS
CONTACTOR + OVERLOAD RELAY



MOTOR PROTECTION CIRCUIT BREAKERS
OPEN & ENCLOSED



DIRECT-ON-LINE STARTERS
MOTOR PROTECTION CIRCUIT BREAKER + CONTACTOR



ENCLOSED DIRECT-ON-LINE STARTERS
MOTOR PROTECTION CIRCUIT BREAKER + CONTACTOR



30MM PILOT DEVICES
FOR INDUSTRIAL & HAZARDOUS LOCATION



22MM PILOT DEVICES
IEC & NEMA



WORLD TOWER LIGHTS



CAM SWITCHES



16MM PILOT LIGHTS



13MM PILOT LIGHTS



CONTROL STATION ENCLOSURES



ENCLOSED UL508A COMBINATION MOTOR STARTERS



ENCLOSED POWER SUPPLIES



VFD BYPASS PANELS



INDUSTRIAL POWER SUPPLIES



CONTROL CIRCUIT TRANSFORMERS



CONTROL POWER TRANSFORMERS



TERMINAL BLOCKS



TERMINAL BLOCK RELAYS



ELECTRONIC TIMING RELAYS



GENERAL PURPOSE RELAYS



WIRING DUCT



DIN RAIL

White Papers

Product professionals AND subject experts!
Check out c3controls' extensive library of white papers:

Commercial HVAC Industry New Trends in Technology

New Trends in HVAC Industry You Need To Know

HVAC has evolved and grown over the past 120 years and there are numerous facets of developing technology still emerging. In this paper, we touch on how Smart Systems, Smart Sensors, and Internet of Things (IoT) are changing many aspects of how the industry will conduct business today. Click to learn about some of these advancements.

[READ WHITEPAPER](#)

Systems Integration Industry New Trends in Technology

What is Systems Integration? Exploring New Trends in Industry

Explore the cutting-edge trends shaping the systems integration industry. Discover new technologies enhancing efficiency and performance.

[READ WHITEPAPER](#)

Optimizing Control System Reliability With Redundant Power Supplies

Optimizing Control System Reliability With Redundant Power Supplies

Learn how redundant power supplies can prevent disruptions and ensure smooth operations in industrial automation. c3controls shares some practical tips to enhance system reliability and minimize downtime.

[READ WHITEPAPER](#)

INDUSTRIAL CONTROL BASICS: Part 3 - Starters

Industrial Motor Control Starters & Magnetic Motor Starter

Explore the fundamentals of industrial control with c3controls. Learn about the basics of motor starters, including their function, types, and applications.

[READ WHITEPAPER](#)

A Quick Guide: UL 489 or UL 1077 in Control Panels and Equipment

UL 489 or UL 1077 in Control Panels and Equipment – A Quick Guide

How do I know when to use UL 1077 or UL 489 breakers? The answer is seemingly simple, but like most simple questions, there is usually some confusion.

[READ WHITEPAPER](#)

PANEL ESSENTIALS 3: UL508A Control Panel Design Considerations

Panel Essentials Series 3: UL508A Control Panel Design Considerations

Learn about the UL 508A standard for control panel design, including its requirements and recommendations.

[READ WHITEPAPER](#)

10.



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