



The Advantages of a Room-Based Bluetooth® Mesh Lighting Control System

By Leigh Herman, Intermatic IoT Product Marketing Manager



Intermatic.com





Affordable enough
for smaller spaces,
yet full-featured
and scalable
enough for
larger multi-floor
buildings.

Today's lighting professionals have an abundance of options when it comes to designing, installing, and commissioning a code-compliant commercial lighting control system. Naturally, facility managers and business owners want a system that's reliable and secure.

They want a solution that's simple to install in retrofit applications as well as new construction, with the flexibility to meet their current operational requirements as well as the unforeseen needs of tomorrow. Finally, they want a system that optimizes energy efficiency and delivers a great return on investment (ROI).

Lighting control manufacturers strive to meet those broad requirements using a variety of approaches and technologies. While the wired, centralized panel systems that once dominated the market still have their place for some applications, the growing popularity of decentralized distributed lighting controls cannot be denied. These distributed room-by-room control systems can be wired or wireless, using popular RF technologies like Zigbee, Z-Wave, Wi-Fi, Thread, or Bluetooth® mesh.

The same wireless protocols are also commonly used in luminaire-level lighting control solutions, or "LLLCs," where each lighting fixture in a space has a built-in controller and integrated sensors to manage how the fixture behaves individually and as a member of a group, zone, or scene. While sensor-driven code compliance ensures that lights are turned off when

rooms are unoccupied, modern lighting control systems typically offer additional options that optimize energy efficiency, such as advanced scheduling tied to an Astronomic clock.

With so many networked lighting systems on the market, how does a lighting designer or specifier choose the best solution for a particular application? What are the features and characteristics that make one system easier to install than another? As a building owner, how do I know that the system I invest in today will offer the scalability needed for tomorrow? Is the platform I am investing in supported by a reputable and reliable manufacturer? Will I be able to integrate my outdoor lighting as well?

When it comes to networked lighting controls, there is no "one size fits all" approach, and the features that might be critical to a large enterprise customer might not be well-suited or cost-effective for a smaller installation.

To help solve this frequent industry dilemma, Intermatic developed the ARISTA™ Advanced Lighting Control System, a versatile new commercial lighting platform that's powered by Bluetooth® mesh technology. As a room-based system, ARISTA is the perfect choice for a wide range of commercial installations - it's affordable enough for smaller jobs, yet full-featured and scalable enough for larger multi-floor buildings.

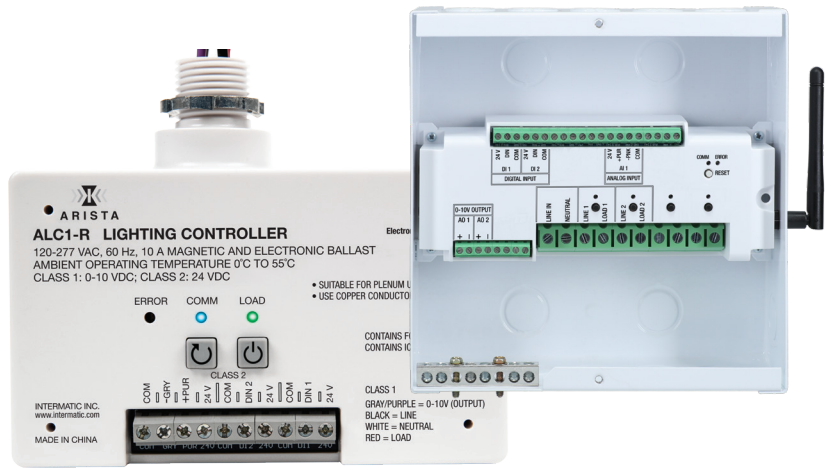
A Room-Based System, with Scheduling

Typically, room-based lighting control systems are characterized by their affordability and simple commissioning process, but they often lack the automated scheduling functionality that more expensive enterprise-level solutions provide. Implementing an advanced 365-day schedule across every space in a facility typically requires a dedicated “always on” gateway or system processor with astronomic clock to synchronize dusk-to-dawn schedules based on the facility’s location. This adds cost and complexity to the installation.

ARISTA is inherently cost-effective and simple to commission, key requirements of any room-based system. However, it also offers the advanced scheduling capabilities usually reserved for pricier lighting control solutions.

How is this possible? As a worldwide leader in timer-based solutions, Intermatic has been incorporating astronomic clocks in commercial, industrial, and residential timer controls for decades. Every ARISTA controller including the single channel, 2 channel, and 4 channel feature an integrated real-time clock (RTC) chip for keeping timing accuracy. During setup, device clocks are first synchronized through the ARISTA mobile app. Then, once the device is assigned to a specific Zone, the RTC aligns with the other devices in the Zone to ensure accuracy. In the unlikely event that a device fails, communication between the remaining devices ensures that all time schedules stay in sync.

Thanks to the integrated RTC, ARISTA controllers can be configured to combine scheduling, occupancy sensing, and light sensing to deliver maximum energy efficiency and occupant comfort. By minimizing the hardware requirements for luminaire scheduling, ARISTA makes it possible to implement timeclock-driven lighting events in any commercial installation, regardless of scale or budget.



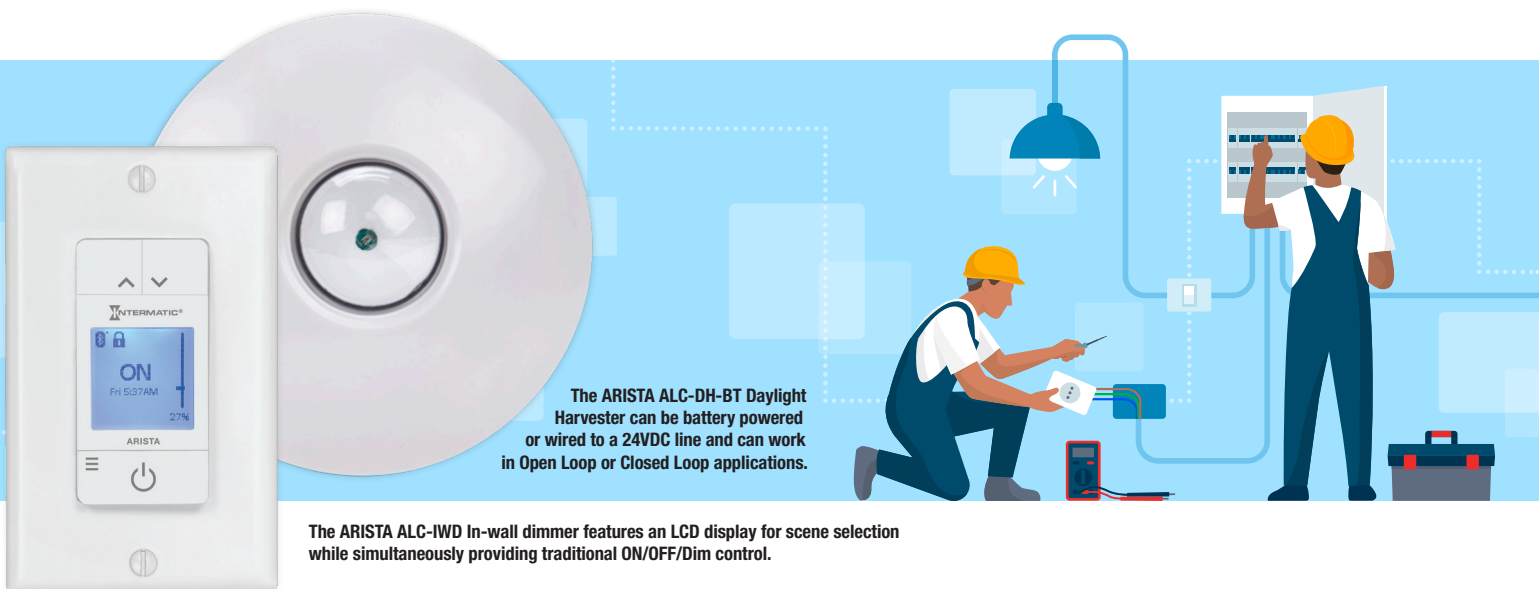
Every ARISTA room controller, including the ALC1-R, ALC2-R, and ALC4-R features an integrated real-time clock (RTC) chip for keeping timing accuracy.

Front to Back System Flexibility

ARISTA was designed for flexibility and scalability. The platform consists of a suite of wired and wireless components, making it easy to adapt ARISTA to nearly any application. In addition to ARISTA load controllers, sensors, and in-wall dimmers, the system supports a wide selection of 3rd party sensors, dimmers, and 24VDC wired input devices.

The ARISTA platform is also versatile – it can easily be scaled from a single room to an entire facility. This versatility is evident not only from an overall system perspective but at the component level as well. For example, the ARISTA ALC-IWD In-wall dimmer features an LCD display for scene selection while simultaneously providing traditional ON/OFF/Dim control.

Another example is the ARISTA ALC-DH-BT Daylight Harvester, an advanced Bluetooth® mesh photosensor that can be battery powered or wired to a 24VDC line and can work in Open Loop or Closed Loop applications.



The ARISTA ALC-DH-BT Daylight Harvester can be battery powered or wired to a 24VDC line and can work in Open Loop or Closed Loop applications.

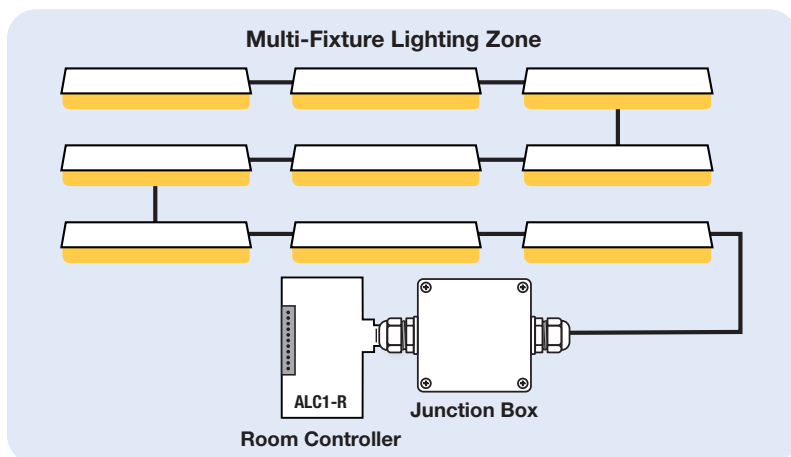
The ARISTA ALC-IWD In-wall dimmer features an LCD display for scene selection while simultaneously providing traditional ON/OFF/Dim control.

Cost-Effective Component Design

Luminaire Level Lighting Controls, or “LLLCs,” have gained attention in recent years. In an LLLC system, each fixture contains a network controller, an occupancy sensor, and a photosensor. Essentially, each luminaire in the building becomes a node on the network, providing the maximum degree of control and data collection because each fixture can be recognized by its unique IP address. While there are certainly some advantages to having this level of granular control in a networked lighting system, these benefits come with additional costs and complexities.

Typical commercial lighting applications are based on luminaires working in groups or zones, not individually. Traditionally, sensors that drive the behaviors of these groups or zones are placed within a space in specific locations to ensure code compliance. In most cases, one or two occupancy sensors meet the requirement. Similarly, in spaces where there is natural light available through a wall of windows or skylights, one or two photosensors more than suffice. Beyond the financial cost associated with adding a controller and occupancy/ photosensor to each luminaire, there are the additional network traffic penalties and complexities to consider.

The ARISTA platform uses individual load controllers to manage multiple fixtures. In the case of the ALC1-R, one JBOX device can control an entire lighting zone using a single controller. Similarly, the ARISTA ALC2-R controller can manage a lighting zone plus a plug load zone in a single device. Multiple ARISTA controllers can be used in a space to accommodate virtually any number of lighting zones and fixtures required, and each ARISTA controller supports wired and wireless sensors. This is all accomplished without the need for a system-wide networked processor or gateway, using any standard off-the-shelf 0-10V or 1-10V lighting fixture. Regardless of the room size or configuration, ARISTA provides a very cost-effective way to intelligently control all your lighting sources, without the cost or complexity associated with luminaire embedded modules.

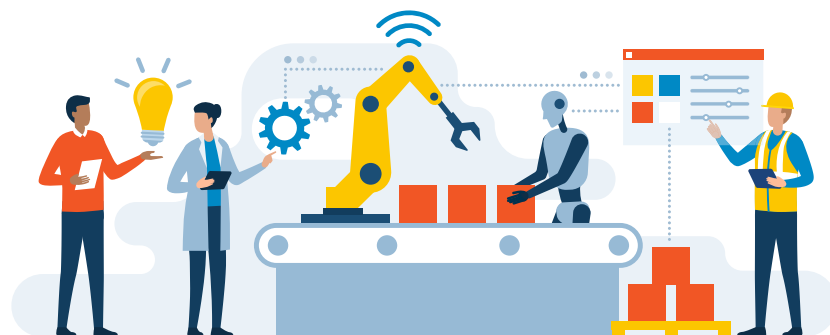


The ARISTA platform uses individual load controllers to manage multiple fixtures. In the case of the ALC1-R, one JBOX device can control an entire lighting zone using a single controller.

Why Bluetooth® Mesh?

Among all the low-powered wireless technologies available for commercial lighting applications, Bluetooth® mesh continues to thrive and grow in popularity. That’s not surprising, considering the many real-world advantages that Bluetooth® mesh can provide to a networked lighting platform like ARISTA, including energy efficiency, security, reliability, and economies of scale. Let’s examine these areas in greater detail.

Bluetooth® Technology is Everywhere



From a baseline practical standpoint, Bluetooth® mesh is the ideal technology for commercial lighting.

Bluetooth® wireless technology has been around for over 20 years, continually evolving to address new applications and markets. Since Bluetooth® technology is built into every mobile device on the market, nearly any iPhone or Android device can become a highly intuitive lighting commissioning tool (via an app).

During setup, the Bluetooth® radio in the installer’s smartphone connects to the ARISTA local lighting network while the cellular radio connects to the ARISTA cloud to store system configuration data and to download system updates. This allows all aspects of installation, commissioning, and daily use to be completed without a gateway or hub.

For customers wishing to control or monitor their systems remotely, or connect to optional cloud services like OpenADR, an ARISTA gateway with cellular modem is expected to be available in 2023.

Beyond the ability to commission ARISTA with any mobile device, there is another important advantage to employing a ubiquitous wireless technology like Bluetooth® mesh. With an estimated 5.2 billion Bluetooth® platform and device shipments expected in 2022 alone, ARISTA customers benefit from economies of scale starting at the chip level, from both a supply chain and cost perspective.

Reliability at Scale

Bluetooth® mesh networks feature a “distributed control architecture,” meaning there is no need for a dedicated site controller or central hub to manage the installation, as each device on the network can communicate with any of the other in-range devices nearby. Essentially, the system management tasks are shared across all nodes.

This contributes to reliability and scalability in two critical ways. The range of the network is dramatically increased, as each device now only needs to be within 20-30 meters of another device instead of needing to be within 20-30 meters of a network hub. The reliability of the network is also improved because there is no single point of failure; if one network node goes down, data can take an alternate path around it to reach its destination.

Another important aspect of reliability in a wireless lighting system like ARISTA is resistance to interference. With so many technologies like Wi-Fi and Zigbee sharing the busy 2.4 GHz ISM frequency band, it is reassuring to know that Bluetooth® technology employs “spread spectrum” and “adaptive frequency hopping” techniques across 40 available channels to optimize transmission integrity and ensure that every bit of data makes it through the “noise.”

How is that accomplished? Simply put, each message is broken into small data packets, and each packet is sent over different channels in a pre-defined sequence known only to the transmitting and destination devices.



Collaborative, Best-Practice-Driven Data Security

Through 20 years of development by thousands of companies, and with billions of devices deployed, the Bluetooth® Special Interest Group (SIG) member community continually strives to improve the security of Bluetooth® technology, strengthening existing protections and introducing new security measures to meet the ever-evolving requirements of today’s wireless connectivity landscape.

As a qualified Bluetooth® system, ARISTA meets and maintains the stringent security guidelines set forth by the SIG, including encryption, authentication permissions, private resolvable addresses, address randomization, and protection against Man-in-the-Middle (MITM) hacking attacks, to name just a few.

Bluetooth® mesh networks feature a “distributed control architecture”



The range of the network is dramatically increased, as each device now only needs to be within 20-30 meters of another device instead of needing to be within 20-30 meters of a network hub.

Energy Code Compliance

With few exceptions, new non-residential buildings in the U.S. and existing buildings upgrading 20% or more of their lighting are required to meet certain energy code requirements. These requirements are usually based on one of two prevailing standards: The 90.1 Energy Standard, published by ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) and the IES (Illuminating Engineering Society), or the IECC (International Energy Conservation Code), published by the International Code Council. Some states develop their own codes; most notably, California's Title 24 standards.

Regardless of the prevailing energy code, the goal is to improve energy efficiency and reduce our collective carbon footprint. Generally, the first step in the process for a commercial facility is a migration to high efficacy LED luminaires in conjunction with advanced lighting control strategies based on occupancy and ambient light sensors. The Bluetooth® mesh networking specification used by ARISTA fully supports occupancy/vacancy sensing and daylight harvesting. The ARISTA app provides multiple tunable parameters and properties, helping to "future-proof" buildings against more rigorous environmental requirements in subsequent statutes. As an example, new guidelines for sensor-driven plug load control have been added to the latest energy codes. The flexibility of the ARISTA platform and our corporate focus on green initiatives have enabled us to address this new code requirement expeditiously, with a targeted release date of Q4 2022.

Conclusion

As a room-based Bluetooth® mesh lighting control system, ARISTA makes it possible for small and mid-sized customers to enjoy automated scheduling and other advanced features without the cost and complexity associated with central processors and gateways. In some instances, the objective is to keep hardware costs down. In other cases, the decision may be driven by a preference to keep the system offline, away from the internet. By integrating the timeclock function into the load controller, ARISTA provides comprehensive scheduling capabilities without requiring an "always connected" gateway as part of the system. For many mainstream commercial lighting applications including retail, hospitality, SMB, education, medical, and more, ARISTA represents a strong choice today and an excellent foundation for the future.

Lighting Controls | Surge Protection | Weatherproof | Photocontrols | Timers | Defrost/Refrigeration Controls



Intermatic.com

Intermatic Incorporated Libertyville, IL 60048

©2022 Intermatic 300AR10012

