

AUTONOMY SENSOR DATASHEET

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AUTONOMY SENSOR

OVERVIEW

Autonomous Lighting Control (ALC) is the evolution of Smart Lighting (SL) for commercial buildings. ALC provides all of the advanced SL energy conservation, facility management and user access capabilities but is effortless to deploy, adapts to changes and continually improves its performance over time. ALC is built on three technology platforms: AI, edge-computing and data-fusion. These technologies work together to eliminate all design, setup and maintenance work, remove the need for physical control infrastructure, improve motion detection accuracy and lower energy consumption.



The JDRF Autonomy Sensor is a luminaire mounted ALC device that performs all sensing, control and configuration functions to provide a complete lighting control system.

DECENTRALIZED SYSTEM

Autonomy Sensors automatically build a secure Bluetooth Mesh network using multi-factor authentication and without any user involvement. Autonomy Sensors message each other without the use of intermediary control hardware. Each Autonomy Sensor is an independent decision making entity that runs advanced lighting strategies using a built-in rules based engine. As a system, Autonomy Sensors coordinate the response to several simultaneous types of inputs, such as motion, daylight, user overrides and messages from 3rd party building automation systems.

AUTONOMOUS GROUPING

The Autonomy Sensor relies on temporal and spatial data generated by the motion patterns of the building occupants, natural daylight distribution patterns and the physical arrangement of light fixtures to automatically configure all groups. Machine learning and Near Infrared (NIR) localization technology underpin the configuration of motion, daylight and wall switch groups. Each group configuration complies with ASHRAE regulations and does not require any programming before, during or after installation. Grouping is dynamic, automatically adapting to changes in the layout of the space, and addition/removal of new devices.

AUTONOMY SENSOR

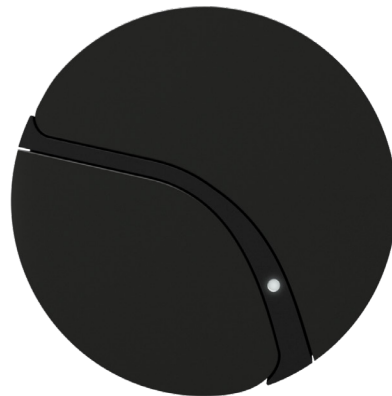
SPECIFICATIONS

FEATURES

Daylight Groups are automatically defined based on the similarity of ambient lighting conditions among neighboring Autonomy Sensors. NIR localization ensures that only devices that are in the same room are candidates for grouping. The grouping is dynamic, automatically adapting to changes in the layout of the space, and addition/removal of new devices.

Motion Groups are automatically defined based on the similarity of motion patterns detected by neighboring Autonomy Sensors. NIR localization ensures that only devices that are in the same room are candidates for grouping. The grouping is dynamic, automatically adapting to changes in the layout of the space, and addition/removal of new devices.

Wall Switch Groups are automatically defined based on the physical arrangement of light fixtures equipped with an Autonomy Sensor. NIR localization is used to determine the number of light fixtures within a room and their spatial arrangement to within 50 cm.



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SPECIFICATIONS

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Motion Detection is performed with NIR that is reflected as an occupant passes through the field of view. The coverage area does not have blind-spots and there are no distance restrictions for placement near HVAC vents. The Autonomy Sensor leverages Machine Learning to reduce the number of false trips and improve detection accuracy.

Decentralized System Architecture allows Autonomy Sensors to message each other directly and eliminate the design and installation effort associated with control hardware. Each Autonomy Sensor runs a local rules based engine to resolve contention among several types of inputs (motion, daylight, wall switches, mobile devices, 3rd party systems).

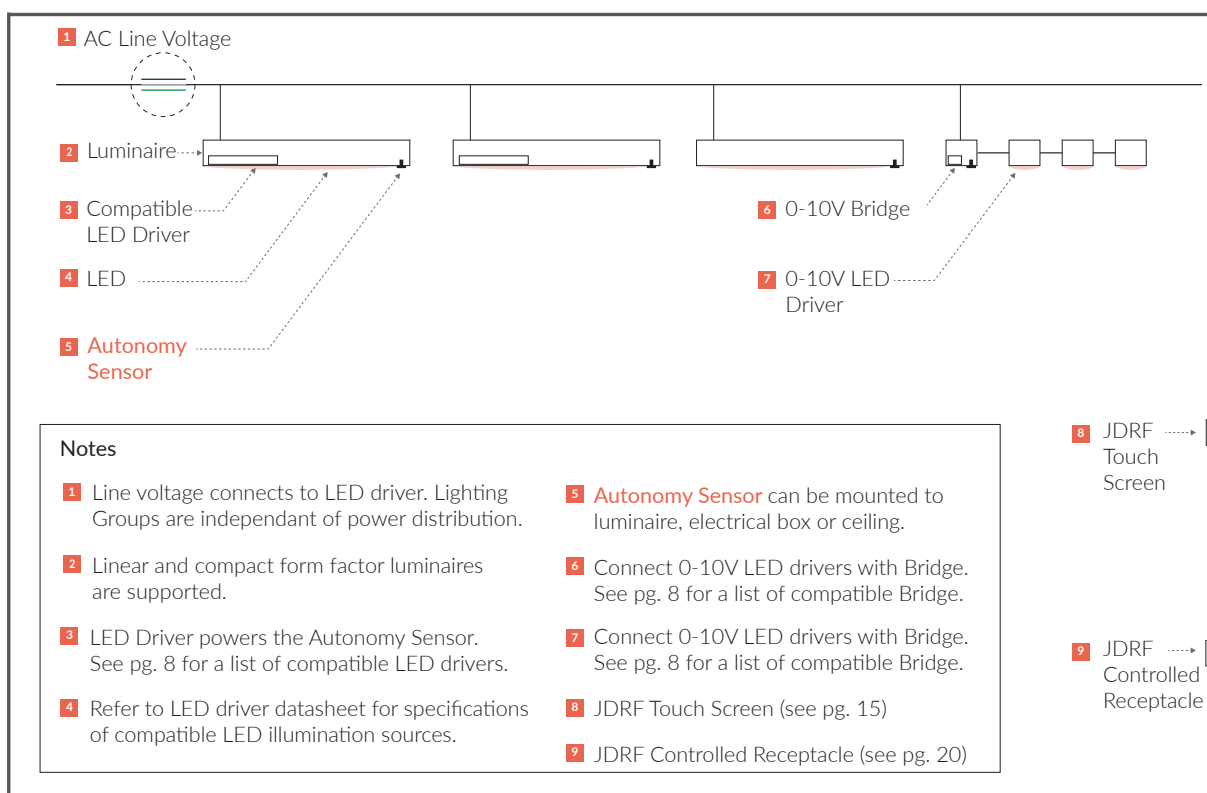
Network Build Automatically and securely builds and joins Bluetooth Mesh using multi-factor authentication that ensures only authorized devices join the network.

AUTONOMY SENSOR

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SYSTEM

Application Architecture is decentralized and eliminates the need for lighting control panels or distributed room controllers. The full system consists of the Autonomy Sensor, compatible LED driver or Bridge, wall switches and controlled receptacles.



AUTONOMY SENSOR

SPECIFICATIONS

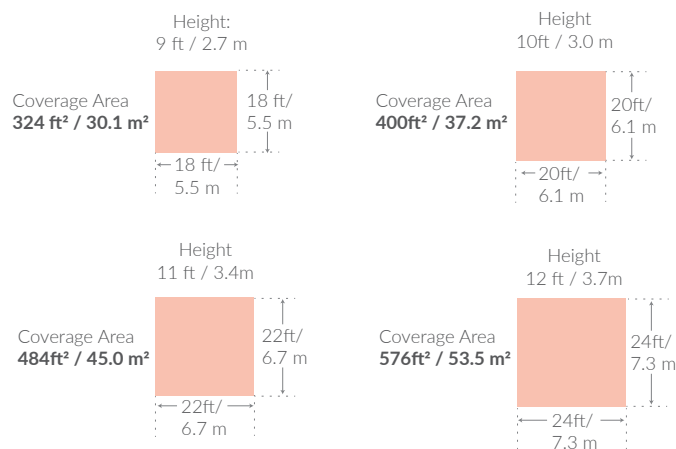
MOTION DETECTION & GROUPING

Detection Technology Near Infrared (NIR)

Number Detection Zones 900 (30 x 30)

Accuracy F1-Score of 0.999

Coverage Area Top view illustrated below at rated heights below



Major and Minor motion defined according to NEMA WD-7-2011

Hold Time 20 minute default, auto-adjusts down to 5 min

Occupancy Level Default of 50% (as per ASHRAE 90.1 section 9.4)

Vacancy Level Default of 0% (as per ASHRAE 90.1 section 9.4)

Group Configuration Automatic and adaptive (no design or setup required)

AUTONOMY SENSOR

SPECIFICATIONS

DAYLIGHT CONTROL

Range 0 - 5000 lux / 0 - 465 fc.

Control Closed Loop PID, dims to off

Grouping Automatic

Configuration Time 5 minutes typical under nominal ambient

Calibration Automatic

ON-BOARD INDICATOR

Normal 1 blink every 30 seconds

Network Building sequence of 1 blink with 3 second pause

Network Testing sequence of 2 blinks with 3 second pause

Internal Error sequence of 3 blinks with 3 second pause

Supply Over-voltage sequence of 4 blinks with 3 second pause

Supply Under-voltage sequence of 5 blinks with 3 second pause

LED DRIVERS & BRIDGES

1 Signify/Philips Advance Xitanium SR FlexTune XI040C110V050VWT1

2 Signify/Philips Advance Xitanium SR XI040C110V054VPT2

3 Signify/Philips Advance Xitanium SRB-BS/SRB-LD

EMERGENCY LIGHTING

1 Bodine BSL310/BSL310LP/BSL10ST/BSL6LST (refer to manufacturer datasheet/application notes for best practices).

ENVIRONMENT

Temperature 32°F - 122° F / 0°C - 50°C

Humidity 0% - 90% (non-condensing)

Environment Dry indoor use only

AUTONOMY SENSOR

SPECIFICATIONS

STANDARDS

UL cULus listed 8750, UL 2043 plenum
IEC 61347-1 Part 1, 61347-2-11 Part 2-11
FCC Class A Part 15 Subpart C
ISED RSS-247
Intra-Luminaire D4i and DALI 2 compliant (*certification underway*)

POWER

Voltage 9.5 - 22.5 VDC
Current 60 mA maximum
Wiring 2x18 AWG (supplied) connect to LED Driver
NEC Class 2

WIRELESS

Communication Protocol Bluetooth Low Energy and Proprietary Mesh
Frequency 2.4GHz
Latency 200 ms (typical)
Modulation Type Frequency-Shift Keying
Data Rate 2 MBps (maximum)

MODELS

JDRF-AS-BTM-01: Bluetooth Mesh Autonomy Sensor
JDRF-LF-01: Autonomy Sensor Luminaire Fitting
JDRF-CF-01: Autonomy Sensor Ceiling Tile Fitting

WARRANTY

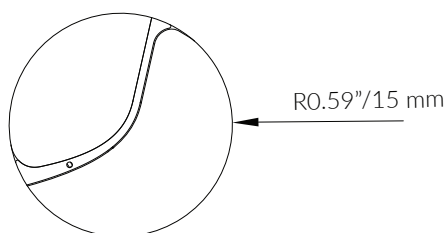
5 Year manufacturer limited liability

AUTONOMY SENSOR

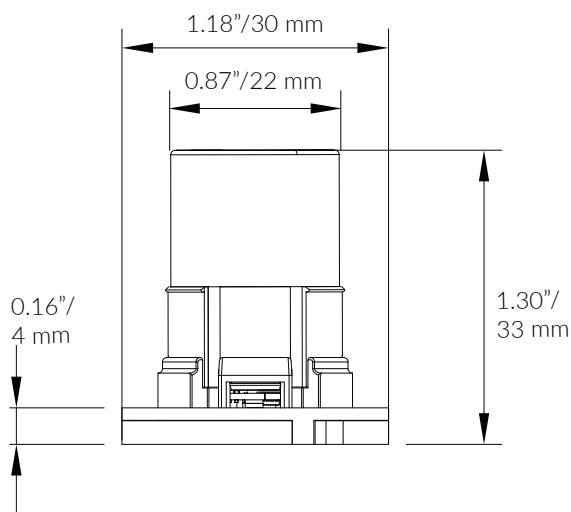
SPECIFICATIONS

DIMENSIONS

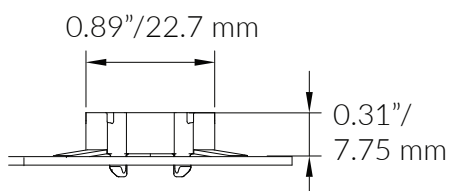
Bottom View



Side View



Luminaire Fitting



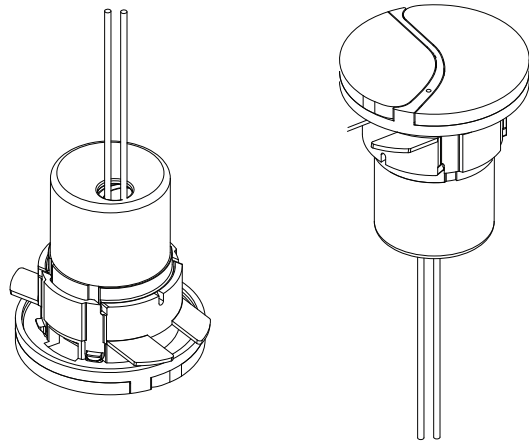
AUTONOMY SENSOR

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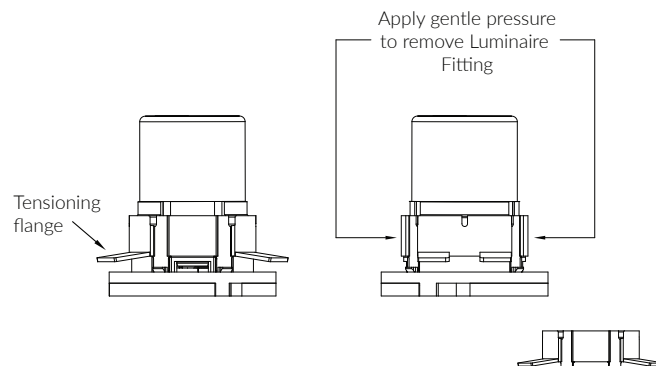
LUMINAIRE
INSTALLATION
& WIRING

Overview

The Autonomy Sensor is installed in the luminaire with the use of the Luminaire Fitting. The Luminaire Fitting provides a secure mounting mechanism for the Autonomy Sensor and facilitates field servicing by allowing the Autonomy Sensor to be installed in and removed from the Luminaire without any tools or fixture disassembly.



The shipping package contains an equal quantity of Autonomy Sensors and Luminaire Fittings. Begin by removing the Autonomy Sensor and Luminaire Fitting from the packaging and observe how they are secured to each other. Disengage and remove the Luminaire Fitting from the Autonomy Sensor by applying gentle pressure to the side of the Luminaire Fitting (the surface without the tensioning flange) and slide it towards the Autonomy Sensor wires.



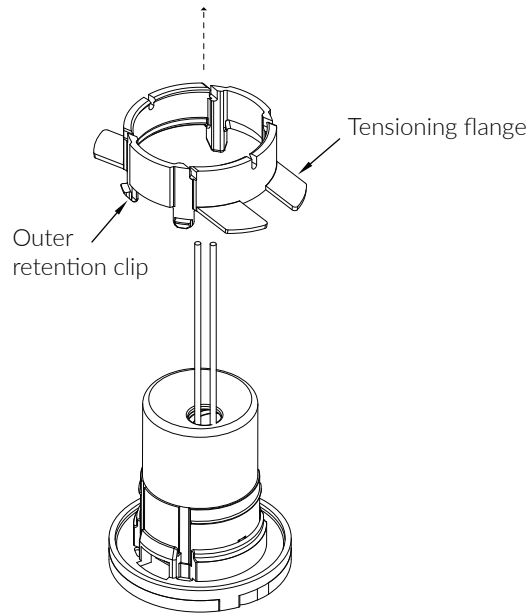
AUTONOMY SENSOR

SPECIFICATIONS

LUMINAIRE INSTALLATION & WIRING

Once the Autonomy Sensor and Luminaire Fitting have been separated, the installation process can begin.

Warning: Read and adhere to the electrical specifications listed in the datasheet. The Autonomy Sensor maximum input voltage is 24VDC and should never be connected to line-voltage. The Autonomy Sensor should only be connected to the sensor output of compatible LED drivers.



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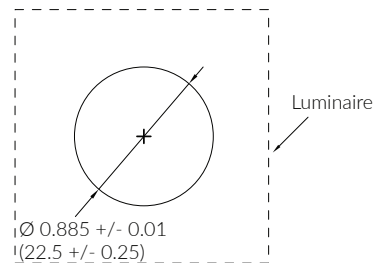
INSTALLATION

Knockout Dimensions

The Autonomy Sensor is designed to fit into a standard 1/2" trade size hole (punch is 0.885" or 22.5mm). The dimension shown below represents the hole diameter in units of inches (millimeters).

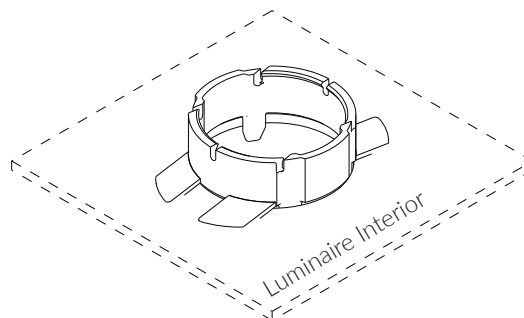
The material thickness must be within the range of 0.04 - 0.12 inches (1 - 3 mm).

Actual hole size shown below



Secure the Luminaire Fitting to the Luminaire

Inspect the mounting hole, deburr any sharp edges and remove any oils or debris. Fasten the Luminaire Fitting to the luminaire by pushing the outer retention clips through the mounting hole. The body of the Luminaire Fitting should be located within the interior of the luminaire. The support flanges should rest firmly on the inner surface of the luminaire and the bottom retention clips should grip the outer surface of the luminaire. The Luminaire Fitting is allowed to rotate and can be placed in rotational position. The diagram below shows the correct orientation of the Luminaire Fitting. Note that the body of the Luminaire Fitting is located in the interior of the Luminaire.



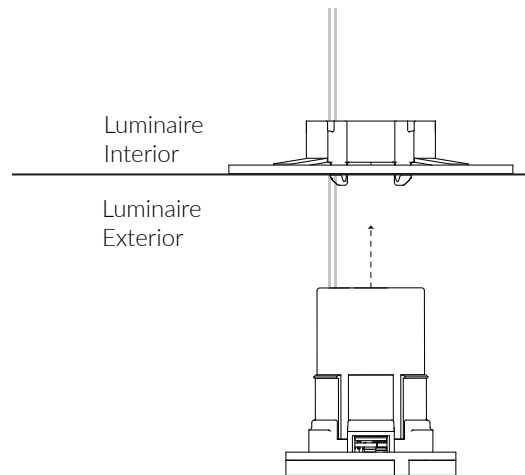
AUTONOMY SENSOR

SPECIFICATIONS

LUMINAIRE INSTALLATION & WIRING

Sensor Installation

Thread the Autonomy Sensor wires through the Luminaire Fitting and slide the Autonomy Sensor into the Luminaire Fitting. Use the guides on the Luminaire fitting to align the sensor correctly. The Autonomy Sensor will snap into the Luminaire Fitting with a minimal application of force. The Autonomy Sensor can be easily removed and re-inserted into the luminaire with a small clock-wise rotation.



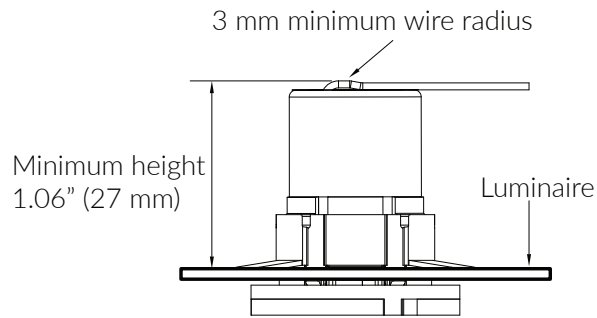
AUTONOMY SENSOR

SPECIFICATIONS

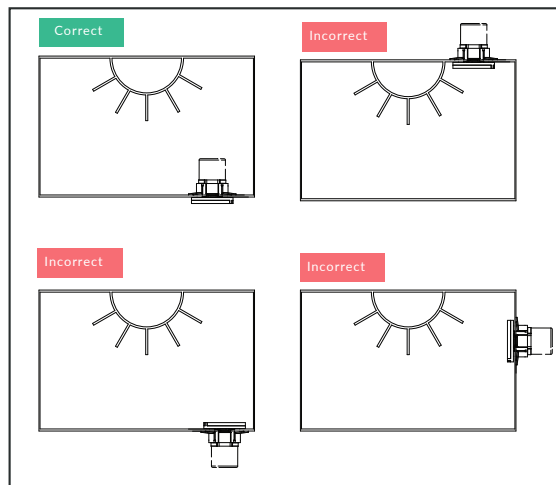
LUMINAIRE
INSTALLATION
& WIRING

Minimum Required Fixture Depth

The Autonomy Sensor is designed to fit into low-profile luminaires and requires a vertical depth of 1.06" (27mm). The illustration below shows the side profile of the Autonomy Sensor installed in the luminaire with the clearance required for the wires.



When properly installed, the self-contained antenna of the Autonomy Sensor will be positioned below the exterior facade of the luminaire. As such, the Autonomy Sensor can be placed adjacent to a metallic side wall, only requiring clearance for the Luminaire fitting to be mounted flush to the Luminaire. Do not mount on curved surfaces. The front face of the Autonomy Sensor must have an unobstructed view of the detection area. Autonomy Sensor front face should be parallel to the floor in the final field installation.



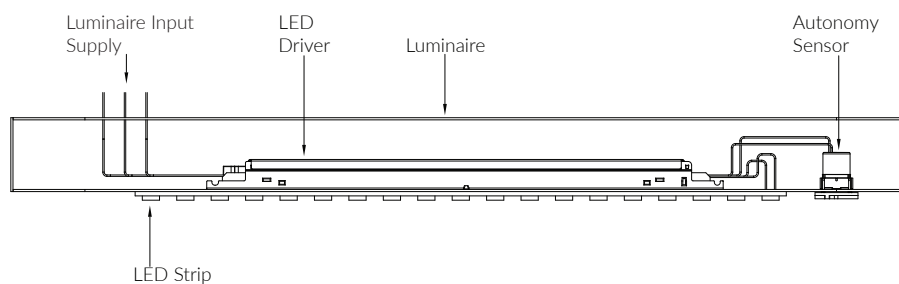
AUTONOMY SENSOR

SPECIFICATIONS

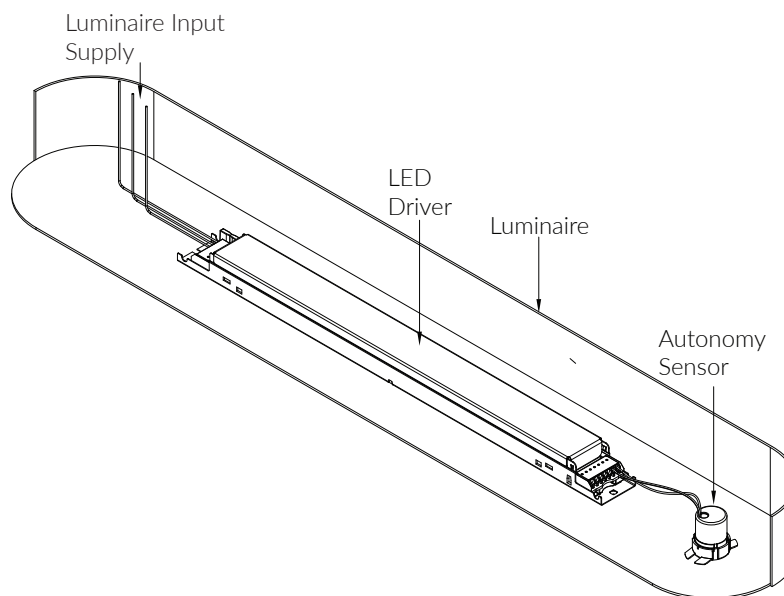
LUMINAIRE
INSTALLATION
& WIRING

The following diagrams show the luminaire with the LED Driver, LED strip, Autonomy Sensor, Luminaire Fitting and their interconnections.

Side View



Isometric View



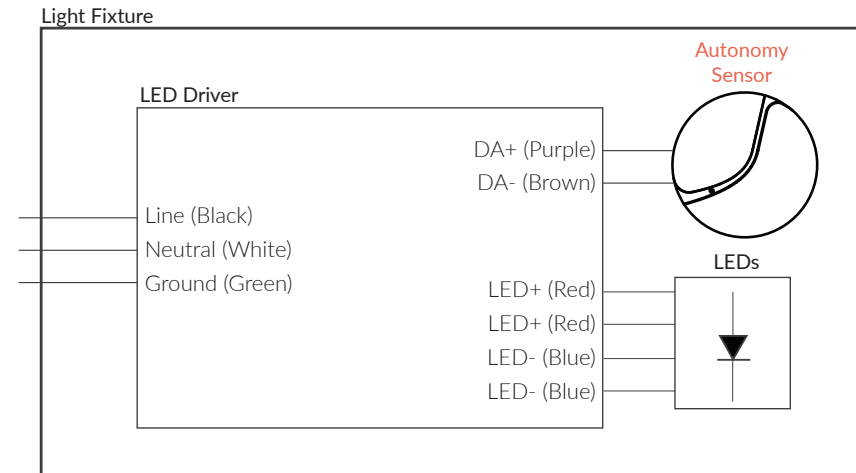
AUTONOMY SENSOR

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LUMINAIRE INSTALLATION & WIRING

LED Driver

Only use approved LED drivers to provide power and data to Autonomy Sensor.
Use 18AWG rated to connect the LED Driver.



Packaging

Luminaire manufacturer to provide rigid packaging that prevents damage to the Autonomy Sensor during shipping.

Emergency Luminaires

Refer to [application note](#) provided by compatible LED driver manufacturer.

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LUMINAIRE TESTING

In-Fixture Testing

Every autonomy sensor is thoroughly tested by JDRF Electromag before being shipped to the luminaire factory. However, it is advisable that an end-of-line test is performed to confirm that all wiring and components within the luminaire are in working order.

The **In-Fixture Test** can be done at anytime upon the installation, wiring and energizing the Autonomy Sensor. No special mode or requisite configuration is required prior to initiating the **In-Fixture Test**.

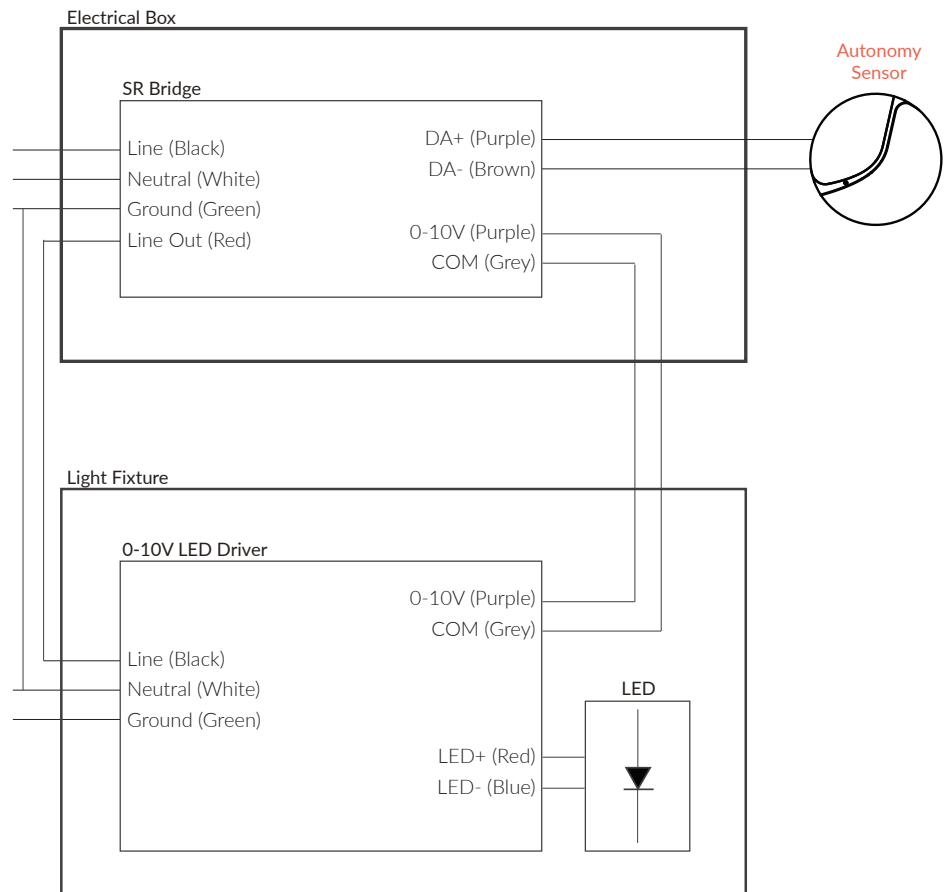
The **In-Fixture Test** is conducted by pointing a handheld flashlight directly towards the Autonomy Sensor. Position the flashlight approximately 2 feet away from the Autonomy Sensor and shine light on it for three (3) seconds. A successful test result will cause the luminaire to adjust the light level between minimum and maximum values for a period of ten (10) seconds.

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REMOTE
INSTALLATION
& WIRING

0-10V LED Drivers are supported through the use the SR Bridge. Autonomy sensor connects to the sensor interface on the SR Bridge. Refer to SR bridge datasheet for instructions on how to wire the SR Bridge to 0-10V LED drivers.



AUTONOMY SENSOR

ISED & FCC COMPLIANCE STATEMENT

ISED Non-Interference Disclaimer

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference.
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- (1) L'appareil ne doit pas produire de brouillage;
- (2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

RF Exposure Statement

This equipment complies with ISED RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm (7.6 inches) between the radiator and any part of your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Pour se conformer aux exigences de conformité ISED RSS-102 RF exposition, une distance de séparation d'au moins 20 cm doit être maintenue entre l'antenne de cet appareil et toutes les personnes. Lanceurs ou ne peuvent pas coexister cette antenne ou capteurs avec d'autres.

AUTONOMY SENSOR

ISED & FCC COMPLIANCE STATEMENT

FCC Compliance Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation. Please note that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

RF Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, this equipment should be installed and operated with minimum distance 20 cm (7.8 inches) between the antenna and your body during normal operation. Users must follow the specific operating instructions for satisfying RF exposure compliance.

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