

Limelight by Lutron OEM Integration Guide

This document is intended for luminaire/fixture manufacturers who are integrating Limelight by Lutron radio sensor modules into their luminaires: either LL-EN-INTMOUNT (in-module internal antenna) or LL-EN-INTMOUNT-A (supplied with an additional fixture-external antenna which enables bypassing Lutron's RF validation process) into their luminaires. Both can be installed with or without LL-PIR-L/M/H sensor assemblies. This guide provides recommendations for electrical and mechanical integration of these parts into a luminaire and their recommended manufacturing test procedures.

1. Standards

- RoHS Compliant
- FCC15.247/IC RSS-247
- cULus Recognized for internal mounting at a fixture OEM
- IP65 and UL Wet Locations (LL-PIR-L/M/H) when lens assembly is installed correctly at fixture manufacturer
- IP65 and UL Wet Locations (external antenna) when antenna is installed correctly at fixture manufacturer

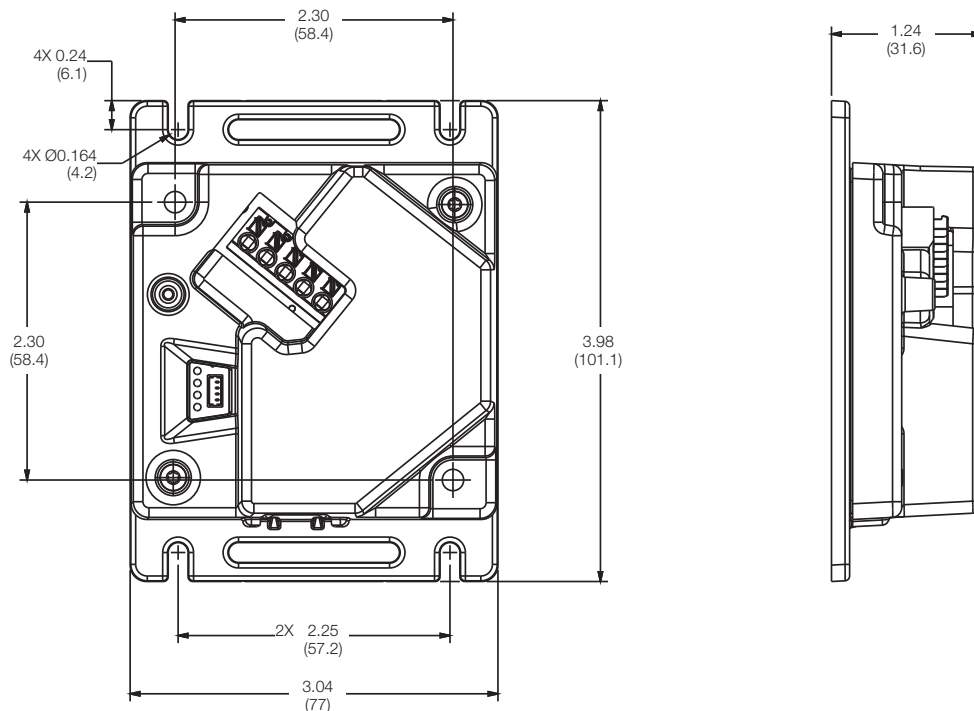
2. Model Numbers

Model Number	Description
LL-EN-INTMOUNT	Limelight by Lutron Radio Sensor Module with Internal Antenna
LL-EN-INTMOUNT-A	Limelight by Lutron Radio Sensor Module with External Antenna
LL-PIR-L	Limelight by Lutron PIR Sensor Assembly; for 8 to 15 ft (2.4 to 4.6 m) mounting height
LL-PIR-M	Limelight by Lutron PIR Sensor Assembly; for >15 to 30 ft (>4.6 to 9.1 m) mounting height
LL-PIR-H	Limelight by Lutron PIR Sensor Assembly; for >30 to 40 ft (>9.1 to 12.2 m) mounting height

3. LL-EN-INTMOUNT Integration

Mechanical Integration

Dimensions shown as: in (mm)



RF Validation Process

This testing is for RF performance only of LL-EN-INTMOUNT integration (see Section 4. for LL-EN-INTMOUNT-A); it is the OEM's responsibility to ensure they follow all other Limelight product specifications

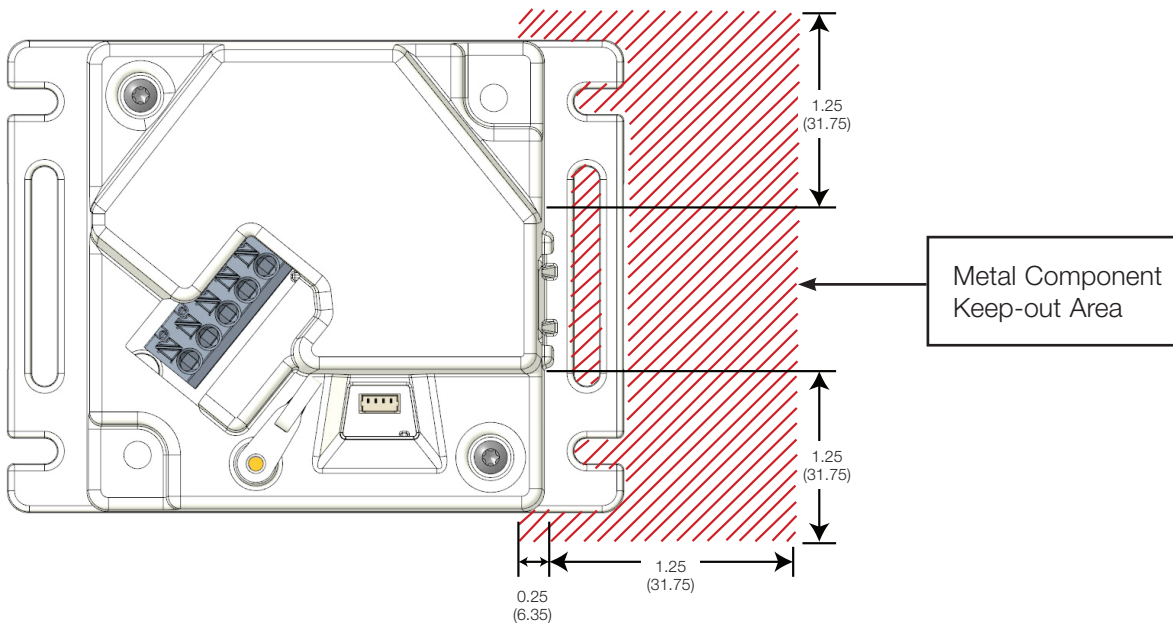
In order to ensure proper Limelight by Lutron system functionality, all lighting fixtures being considered for LL-EN-INTMOUNT integration will need to be reviewed and validated by Lutron for RF performance. A picture of the intended LL-EN-INTMOUNT integration or fixture design plan with the intended detailed install location and orientation specified should be provided to Lutron via limelightOEMintegration@lutron.com. Lutron may request additional fixture information along with fixture samples for further RF testing. If samples are requested, the required performance testing may take up to 3 weeks, starting from the day the samples are received by Lutron.

For best RF performance of the LL-EN-INTMOUNT, the antenna should be kept 1.25 in (31.75 mm) from any metal components (see Top View below) and the product should be elevated 0.25 in (6.35 mm) with standoffs from a metal surface (see Side View below). The LL-EN-INTMOUNT should not be fully concealed in metal. Lutron will request fixture samples for testing if either of these installation requirements are violated.

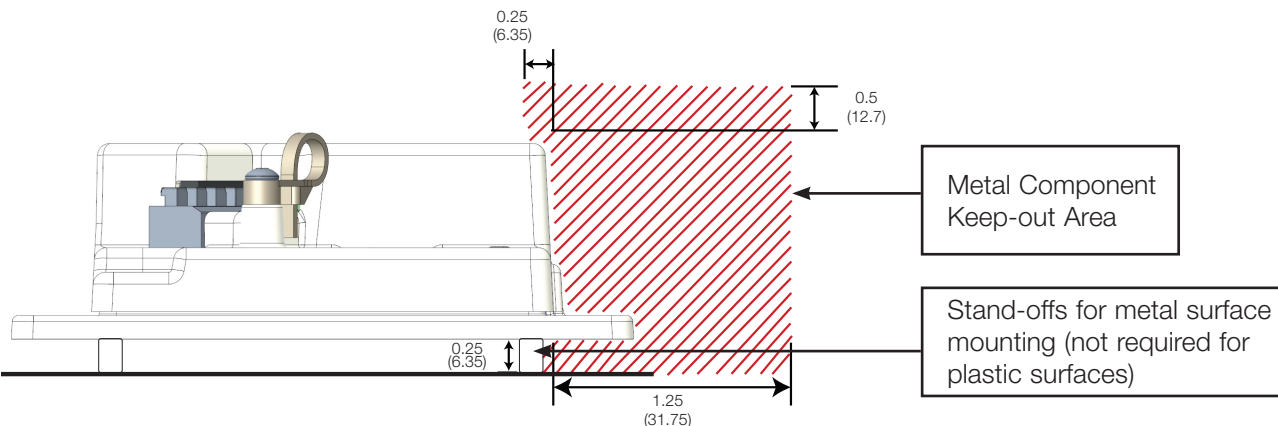
Metal Component Keep-out Area

Dimensions shown as: in (mm)

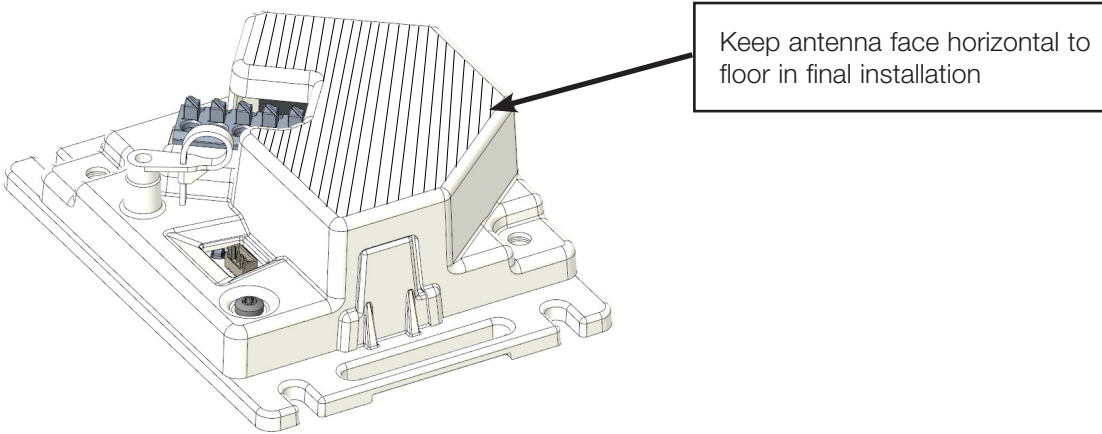
Top View



Side View

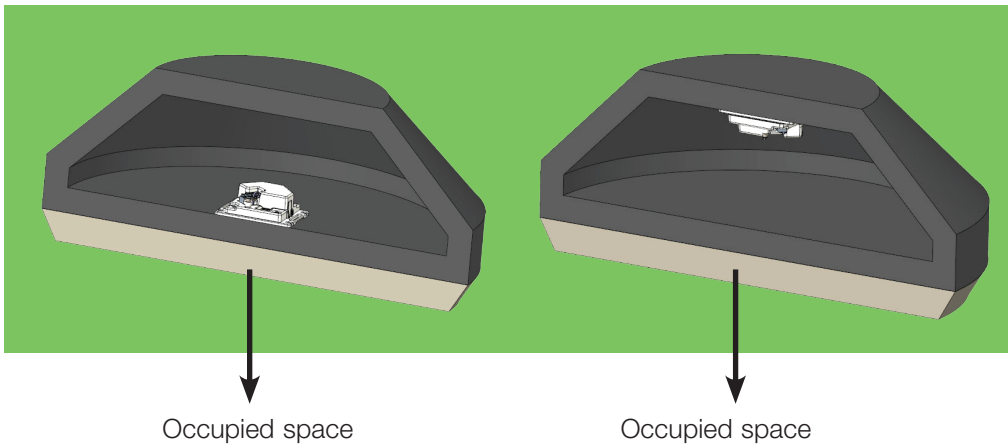


LL-EN-INTMOUNT Fixture Mounting Orientation

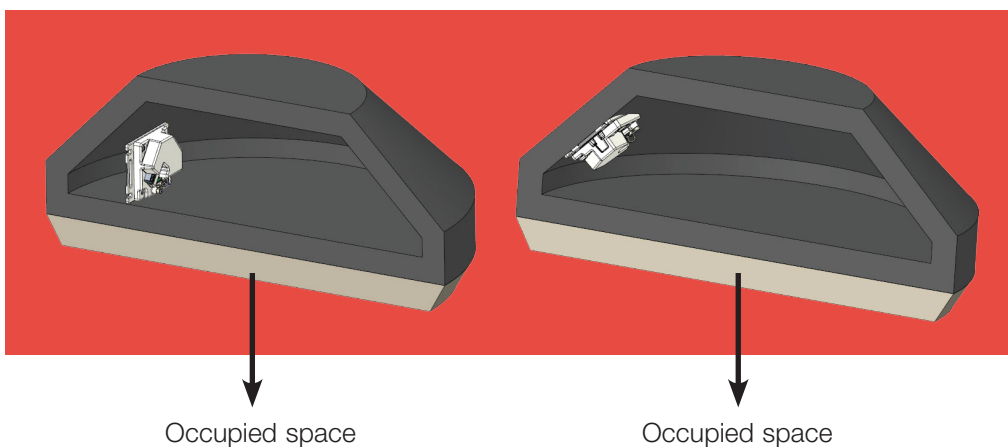


The LL-EN-INTMOUNT should be mounted such that the product's antenna face is horizontal (parallel to) the floor in the intended final installation.

Proper Installation (LL-EN-INTMOUNT illustrated in light fixtures parallel to the floor)



Improper Installation (LL-EN-INTMOUNT illustrated in light fixtures parallel to the floor)



Electrical Integration

WARNING: Shock Hazard! May result in serious injury or death. Disconnect power before servicing or installing. This is a line voltage product and should only be installed/assembled into a fixture when power is not applied.

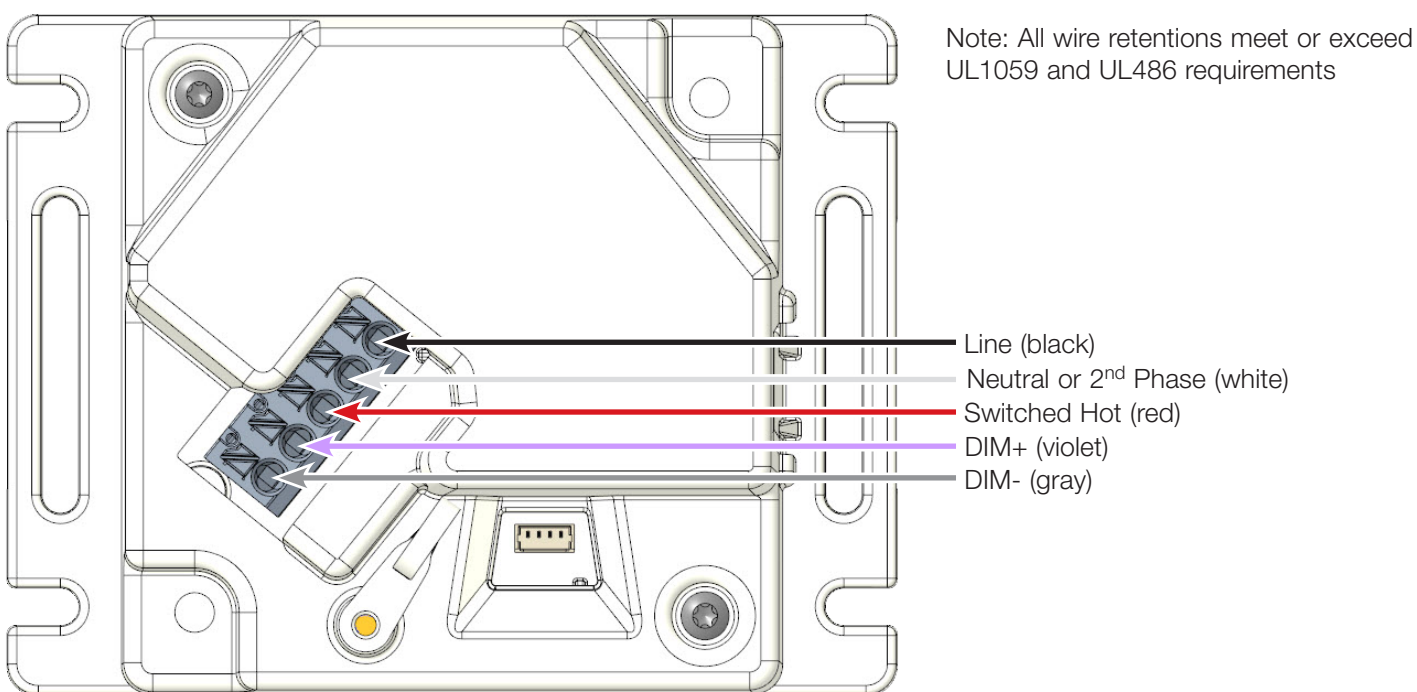
5-Pin Connector

The LL-EN-INTMOUNT has a 5-pin connector for connection to the AC power and the luminaire (identified in the image below). During manufacturing, solid core or tinned wires can be pressed into the connector slots. For stranded wires, press down on the button next to each connector slot to allow wire entry. Releasing the button will cause the connector to grip the wire.

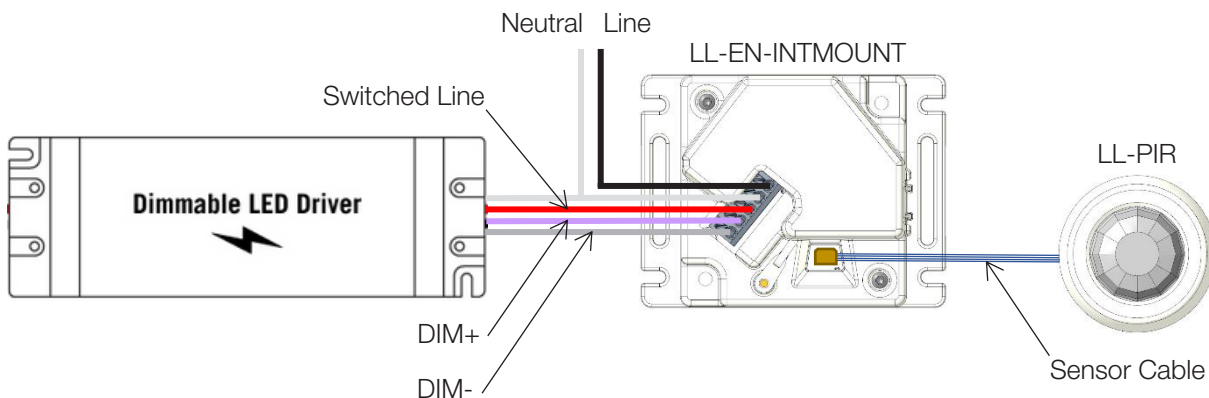
Wire Gauge: The 5-pin connector can accept wire gauges in the range of 16–20 AWG (1.5–0.5 mm²).

Wire Strip Length: Wires should be stripped 0.31–0.35 in (8–9 mm) for optimal fit into the 5-pin connector.

The 5 pins are called out in the image below.



Typical Wiring Diagram



Continued on next page...

Electrical Integration *(continued)*

Power Connections

The LL-EN-INTMOUNT can accept an input voltage range of 120–277 V \sim (phase-to-phase possible). The LL-EN-INTMOUNT switches to the load the same voltage it is fed.

The load output connection can support an electronic ballast or driver load of up to 1000 W at 277 V \sim and 600 W at 120 V \sim . Multiple loads can be controlled by the same LL-EN-INTMOUNT as long as the total wattage does not exceed the maximum wattage for the given supply voltage.

Dimming Connections

The LL-EN-INTMOUNT outputs an analog 0.5–10 V \equiv for diagnostic purposes only. For 0–10 V \equiv driver control the LL-EN-INTMOUNT is capable of sinking up to 1.0 mA of 0–10 V \equiv signal. The sum of the dimming input sink current for all drivers connected to the LL-EN-INTMOUNT should not exceed this requirement.

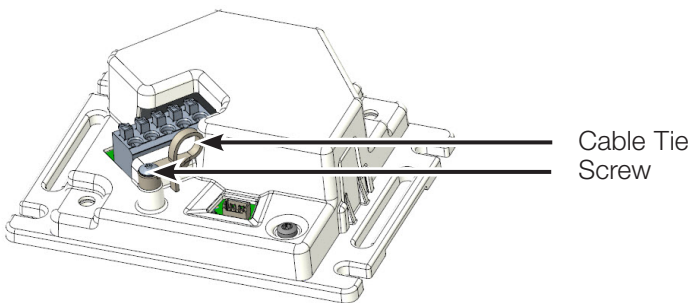
The dimming connection is separated from all other external connections (neutral, hot, load, external sensor connector) with 100k ohms of resistance. This circuit is still an electric shock hazard and should not be accessible in the end product.

Strain Relief

It is strongly recommended to cable tie the wires together (coming from the 5-pin connector) within 2 in (51 mm) of the connector to provide strain relief as shown below. This will provide strain relief for both manufacturing and field service. The screw boss on the housing accommodates a #4 thread forming screw. Screw and cable tie are not included.

Screw reference: Thread Forming Pan Head, #4 x.375

Cable tie reference: T&B TY533M



Handling / ESD

Appropriate ESD protection should be taken when handling LL-EN-INTMOUNT.

Surge Suppression

If the LL-EN-INTMOUNT will be used in an environment that requires additional surge protection, such as outdoor lighting, then it is up to the manufacturer of the luminaire to ensure that the additional surge protection is provided. This is typically done with a separate surge protection device (SPD) rated for at least 10 kV.

Temperature / Humidity

The LL-EN-INTMOUNT is designed to be installed inside a luminaire and rated to operate in an ambient temperature of -40–158 °F (-40–70 °C). Ambient air temperature is measured at least 1 in (25.4 mm) away from the LL-EN-INTMOUNT.

The LL-EN-INTMOUNT is not waterproof and should not be mounted in a location where it will receive direct contact with water. Although it is conformal coated and can withstand humid or moist conditions, an outdoor fixture with LL-EN-INTMOUNT must at a minimum be rated IP-65 or UL Wet Locations.

Regulatory Labeling Requirements

FCC

When integrating the LL-EN-INTMOUNT into a product it must be ensured that the FCC labeling requirements are met. This includes a clearly visible label on the outside of the finished product specifying the FCC identifier (FCC ID: S4GEM35XB) as well as the FCC notice shown below. This exterior label can use wording such as “Contains Transmitter Module FCC ID: S4GEM35XB” or “Contains FCC ID:S4GEM35XB” although any similar wording that expresses the same meaning may be used. The label should also show the FCC Symbol as shown below.

FCC Notice: 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.

FCC Symbol:



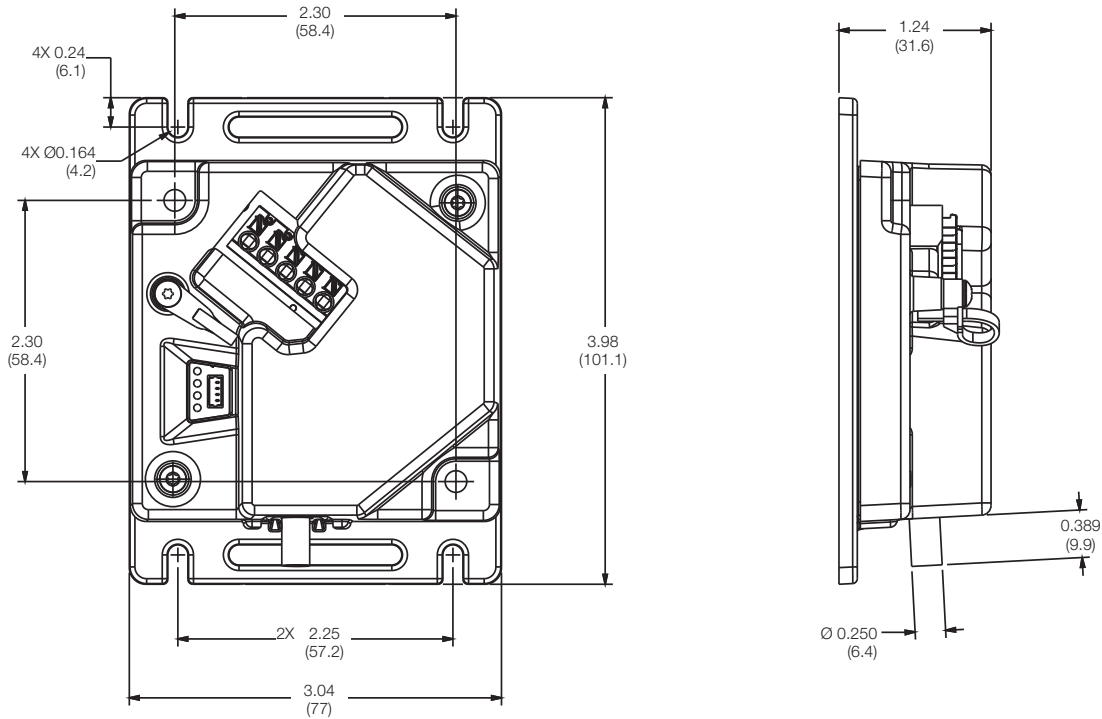
Industry Canada (IC-ID: 8735A-EM35XB)

The labeling requirements for Industry Canada are similar to those of the FCC. Again a clearly visibly label must be placed on the outside of the finished product stating something like “Contains Transmitter Module, IC: 8735A-EM35XB”, although any similar wording that expresses the same meaning may be used.

4. LL-EN-INTMOUNT-A Integration

Mechanical Integration

Dimensions shown as: in (mm)



RF Validation Process

Unlike with LL-EN-INTMOUNT, the external antenna assembly with LL-EN-INTMOUNT-A does not require Lutron validation of RF performance, as long as the mounting guidelines for the antenna described on the next page are followed.

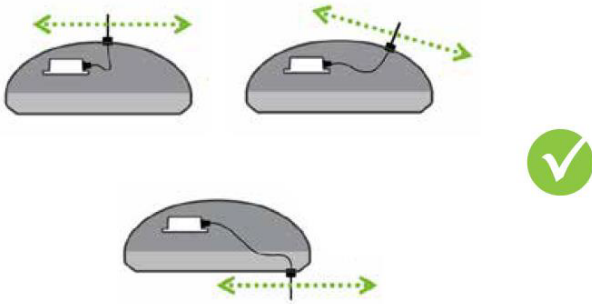
Submit your fixture being integrated with the LL-EN-INTMOUNT-A with corresponding documentation to limelighttoemintegration@lutron.com to be added to the Lutron High Performance Fixture list (<https://www.lutron.com/en-US/Pages/HPFL/hpfl.aspx>).

LL-EN-INTMOUNT-A Fixture Mounting

The LL-EN-INTMOUNT-A can be mounted at any location and any orientation inside a light fixture that has IP65 or UL Wet Locations rating. The antenna cable length (18 in [457 mm]) and the sensor assembly cable length (10 in [254 mm]) form practical constraints to LL-EN-INTMOUNT-A positioning inside the fixture.

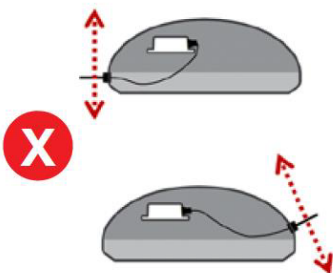
The external antenna has restrictions on its location and orientation. The antenna is designed to be compliant to UL and IP65 requirements for outdoor equipment. The opening made for the antenna must be within 0.68 in to 0.69 in (17.2 mm to 17.5 mm). For example, a 11/16-inch drill bit is the appropriate size. The radio wave pattern from the antenna requires that the antenna dome points perpendicular to earth ground, ± 30 degrees. Note that the antenna may point up or down. See figures below for illustrations of proper and improper antenna directions.

Proper Installation of Antenna (vertical ± 30 degrees)



Floor/Ground

Improper Installation of Antenna (more than ± 30 degrees off vertical)



Floor/Ground

Electrical Integration

WARNING: Shock Hazard! May result in serious injury or death. Disconnect power before servicing or installing. This is a line voltage product and should only be installed/assembled into a fixture when power is not applied.

The LL-EN-INTMOUNT-A electrical connections/connectors are the same as described for LL-EN-INTMOUNT in section 3, except for the external antenna SMA connector. The electrical, mechanical and regulatory precautions, recommendations and statements are the same as for LL-EN-INTMOUNT. See Section 3 for details on power connections, dimming connections, strain relief, handling/ESD, surge suppression, temperature/humidity and regulatory labeling requirements.

The SMA output of the LL-EN-INTMOUNT-A is a reverse polarity female, and the SMA connector of the supplied antenna cable is a reverse polarity male. The antenna cable length is 18 in (457.2 mm). The order of OEM assembly is as follows. Refer to the antenna drawing for terminology and location of parts.

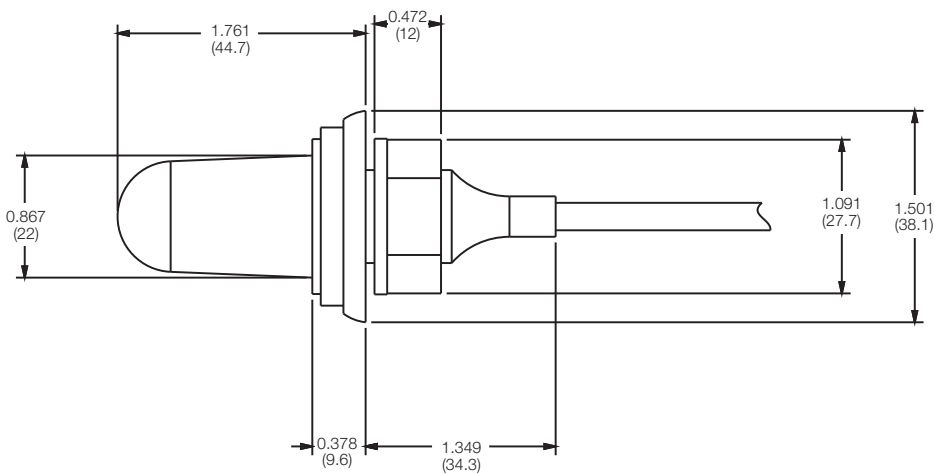
1. Remove antenna fastening nut from threading below antenna dome.
2. Push gasket against dome housing. Dome and gasket will be outside the fixture wall.
3. Route the antenna's SMA reverse polarity male end through opening made into the fixture for the antenna cable and threading. The opening must be circular with diameter 0.677-0.689 in (17.2-17.5 mm).
4. Place nut back over antenna cable and twist over threading, and tighten antenna to a torque of 15 in-lb \pm 5 in-lb (1.7 N•m \pm 0.6 N•m).
5. Twist Antenna cable RP SMA Male connector to LL-EN-INTMOUNT-A RP SMA Female connector. Hand tighten firmly.



Antenna Mechanical Dimensions Summary:

1. Antenna length = 18.0 in (457.2 mm)*
2. Antenna opening diameter = 0.677-0.689 in (17.2-17.5 mm)
3. Dome height outside fixture = 1.76 in (44.7 mm)
4. SMA connector rigid length = 1.75 in (44.5 mm)**

Antenna*** dimensions shown as: in (mm)



* Note: Antenna cable extensions are not supported

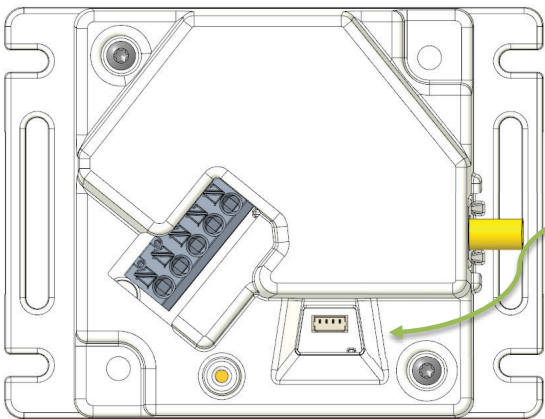
** Note: Antenna conductors are not electrically isolated; voltage isolation is provided by UL244A

*** Note: If a replacement antenna is needed, contact Customer Assistance

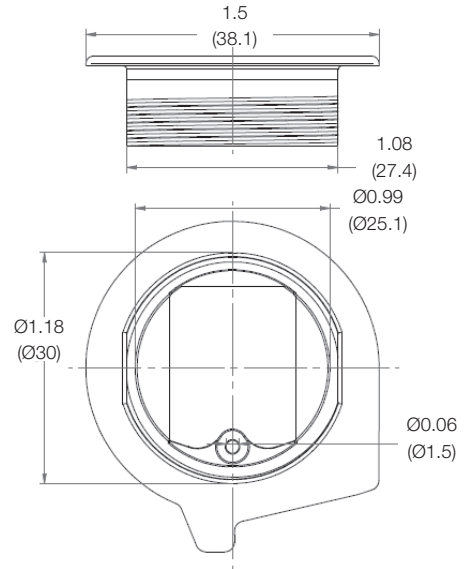
5. LL-PIR-(L/M/H) Integration

The LL-EN-INTMOUNT and LL-EN-INTMOUNT-A can be connected to an external Limelight by Lutron passive infrared sensor for occupancy/vacancy features (LL-PIR-[L/M/H]) through the 4-pin connector shown below.

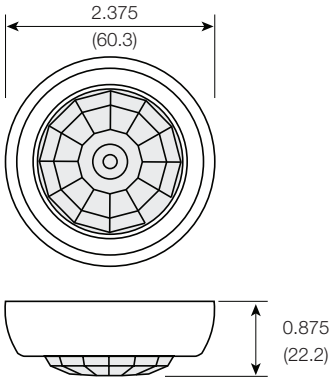
Dimensions shown as: in (mm)



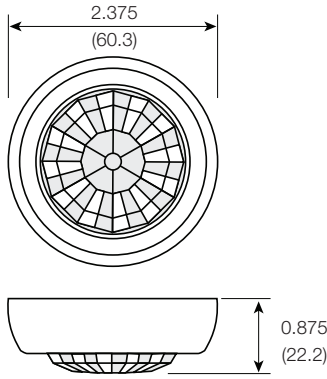
LL-PIR External Sensor Connector



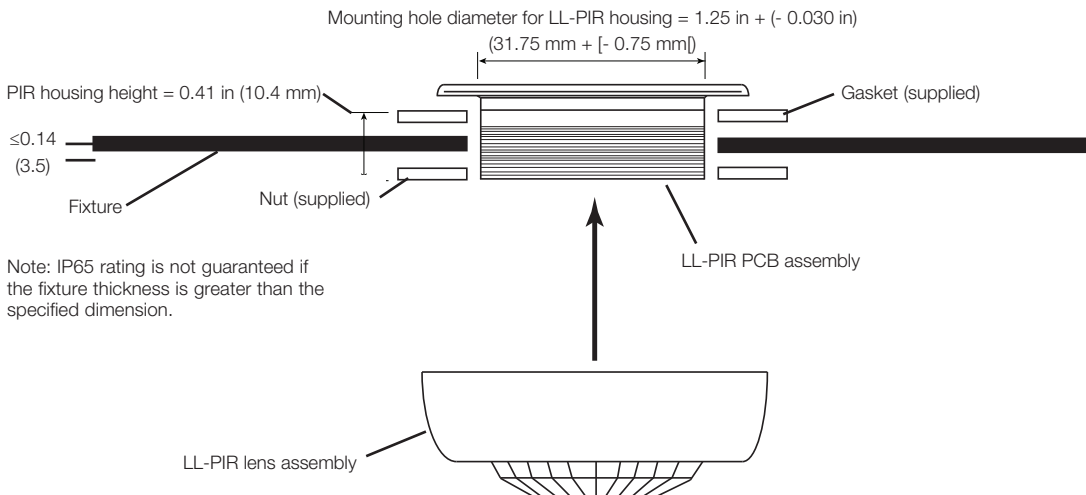
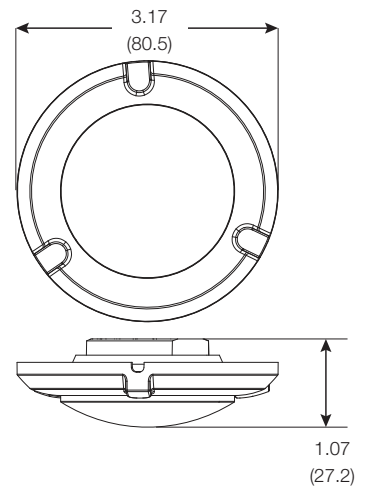
LL-PIR-L Lens



LL-PIR-M Lens



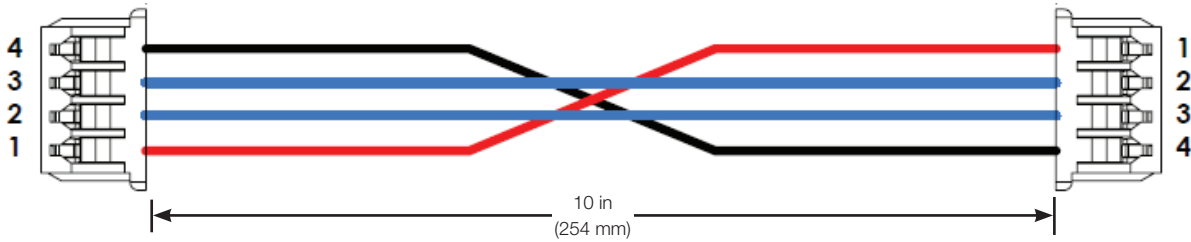
LL-PIR-H Lens



Note: IP65 rating is not guaranteed if the fixture thickness is greater than the specified dimension.

5. LL-PIR-(L/M/H) Integration (continued)

1. Connect LL-PIR to LL-EN-INTMOUNT or LL-EN-INTMOUNT-A with cable assembly shown below (either end can connect to either LL-PIR, LL-EN-INTMOUNT or LL-EN-INTMOUNT-A).



2. Recommended plastic PIR lens assembly should be installed in a fixture of 0.14 in (3.5 mm) thickness or less and tightened to 4 in-lbs (0.45 N•m) to properly engage the internal seal.
3. Visually inspect to verify plastic PIR lens assembly is seated properly, and not tilted relative to the fixture. Tilting could imply cross-threading, which can lead to leaks and eventual failure of the product.

Good



Consistent spacing around the perimeter

Bad



Uneven spacing around the perimeter

4. Do not place PIR sensor such that fixture LED lights shine directly onto the LL-PIR structure.

6. Manufacturing Test

The LL-EN-INTMOUNT and LL-EN-INTMOUNT-A have features which can aid in integrating Limelight by Lutron during manufacturing. These features can be used to efficiently determine that the LL-EN-INTMOUNT or LL-EN-INTMOUNT-A was correctly assembled into the luminaire and can be incorporated into an automated manufacturing test process.

Luminaire Power Up Timing

When the LL-EN-INTMOUNT or LL-EN-INTMOUNT-A powers up, it cycles the luminaire through various states so the manufacturer can determine if the luminaire has been wired up correctly. The power up sequence is as follows:

Light State	Low	Off	Low	Medium	High
Duration	1 second*	1 second*	3 seconds	3 seconds	Indefinitely

* This time may vary due to driver/ballast capacitance variability.

Power Up Troubleshooting:

It is strongly recommended to zip tie the 5 wires, coming from the 5-pin connector, together within 2 in (51 mm) of the connector to provide strain relief as shown on page 5.

1. Luminaire never turns off: The LL-EN-INTMOUNT or LL-EN-INTMOUNT-A has been bypassed. The luminaire driver line input (black wire) should be connected to LL-EN-INTMOUNT or LL-EN-INTMOUNT-A switched hot terminal.
2. Luminaire never turns on:
 - a. Line wire of driver is not connected to LL-EN-INTMOUNT or LL-EN-INTMOUNT-A switched hot terminal.
 - b. Hot (black) wire not connected to LL-EN-INTMOUNT or LL-EN-INTMOUNT-A line terminal.
 - c. Neutral (white) wire not connected to luminaire neutral and LL-EN-INTMOUNT or LL-EN-INTMOUNT-A neutral terminal.
3. Luminaire turns on and stays on high: Dim wires not connected or reversed. Double check dim wire connections.

7. Warranty

Limelight by Lutron products come with a 5 year, parts replacement warranty. If you need to request a return merchandise authorization (RMA) to return parts, contact Lutron Customer Assistance at www.lutron.com/support or 1.844.LUTRON1.

Information on conditions of acceptability can be found at:

https://www.lutron.com/TechnicalDocumentLibrary/Limelight_Conditions_of_Acceptability.pdf

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