LS230 Technical Datasheet

Effective August 28, 2016

Starfield Lighting Automation

DALI Compliant Sensor with options for PIR motion sensing, Passive Dual Technology, Daylighting, Plug-load and HVAC control, DALI Relay Driver, and Temperature Measurement.

Made in USA

CA Title 24

Overview

The LS230 is a family of compact, high performance, networked sensors that mount on ceilings or luminaires. These sensors work better and design and install easier because the use next generation sensor technology and Starfield's patented object-oriented architecture which fundamentally changes the way lighting sensors are used and operate.

LS230 DALI Multi-Sensor

Highlights

High Resolution More PIR detection zones (up to 6x more), uniform coverage, ceiling mounting, and exceptional noise resistance add up to reliable, error-free operation.

Efficient Coverage Common sense says that covering a rectangular room with a rectangular sensor will be more efficient and it is, up to 44% more efficient than radial sensors.

Small to Large Add Scout sensors as needed to cover small to large rooms without the hassle and potential errors of reconfiguring the Master.

Resilience Scout sensors can be added, removed, or fail without stopping operation of the other sensors.

Passive Dual Technology Reliably detects occupancy with precision sensors that both see and hear activity.

Goof Proof Two wire connections are hard to get wrong especially when they are non-polarized, free-topology, and use standard building wire and connectors.

Ceiling or Fixture Mount The LS230's small size and ¼" stem allows it to be mounted on ceilings or light fixtures and flat or curved surfaces.

Daylighting That Works Starfield's patented daylighting is user friendly, ultra efficient, self setting, maintenance free, and multi zone without special setup requirements.

Digital Output The optional digital output can be configured for occupancy control of plug-loads and HVAC systems or as a full function DALI relay.

Compatibility Installs and operates on both DALI or IRIS network control buses without power packs.

Special functions

Fade Guard ™ Prevents daylighting from interfering with user adjustments and fade cycles.

Room Aware ™ Keeps the LS230 synchronized with other sensors, controls, AV. and other applications.

Cycle Sentry ™ Manages the DALI auto-on function by turning DALI lights off in unoccupied rooms 10 minutes after normal power is restored.

Remote Trip ™ Starfield's unique patented architecture allows both Master and Scout sensors to be remotely tripped for testing, operation, and maintenance.

General Specifications

Size 1.66 x 1.66 x 0.64 inch

Weight 1oz

Material 94v0 flame retardant PC/ABS blend

Color NEMA WD1 White

Mounting ¼ x 1" plastic stem through ¼" clearance hole using provided speed nut or optional adhesive pad.

DALI Bus Load 7mA includes night light and 20% charging current allowance.

Configuration User buttons or network.

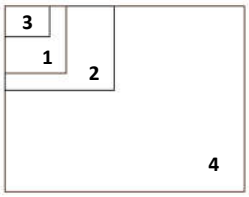
Indicators Three indicators for location, programming, PIR and PAR trips, and daylighting adjustments.

Patents Starfield's occupancy and daylighting technology are protected by one or more issued or pending patents including US9459601 and US9084308.

Warranty 3-year limited.

LS230 Ordering

LS230 multi-sensors are available with three physical configuration options which may be field customized using the sensor buttons or DALI network commands.



PIR Coverage Diagram

LS230 - 2D P R

1. PIR Sensor	2. PAR Sensor	3. Daylighting	4. Digital Output
Blank - None **1** - Fine **2** - Standard **3** - Spot **4** - Wide	**D** – Passive Audio Range (PAR) acoustic sensor	**Blank** - None **P** - Light sensor and daylighting harvesting controller	**Blank**– None **R** - Electrically isolated digital output (DO)

LS230 Ordering Notes

PIR Motion Sensor

- **Blank** - no PIR sensor
- **1-4** - PIR sensor type

  PIR sensors are line-of-sight motion detectors and are required for all occupancy functions.

PAR Acoustic Sensor

- **D** - PAR

  The Passive Audio Range (PAR) range sensor may be adjusted or disabled with the sensor buttons or via the DALI network.

Daylighting

- **Blank** - no daylighting sensor
- **P** - Daylighting sensor and control

  Daylighting can be ordered by itself or in conjunction with the occupancy and the digital output.

Digital Output

- **Blank** - Leave blank for no relay driver
- **R** - Electrically isolated digital output (DO) for HVAC, Plug-load, and DALI relay

  As a DALI relay driver, the DO can operate independently of occupancy but HVAC and Plug-Load must be in a Master configured sensor with occupancy detection.

LS230 Order Examples

LS230 - 2D
Type 2 PIR Dual Tech

LS230 - P
Daylighting Only

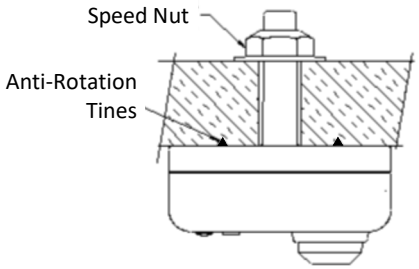
LS230 - R
Digital Output Only

LS230 - 2DP
Combo Sensor with Occupancy and Daylighting

LS230 - 2DPR
Combo Sensor with Occupancy, Daylighting, and Digital Output

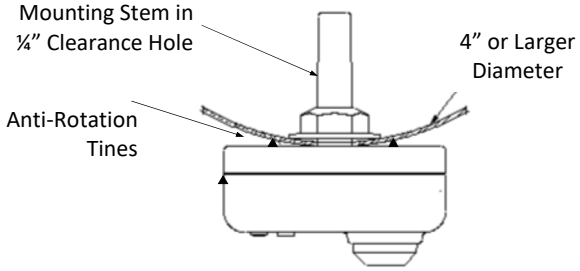
LS230 Mounting & Dimensions

The LS230's ability to mount on ceilings or light fixtures provides the placement options necessary to work around the many obstacles and restrictions of a typical ceiling installation.



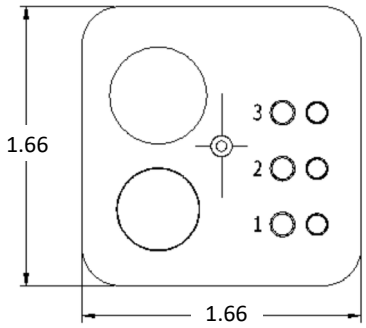
Flat Panels

Mounts on ceiling tile and flat panels up to 5/8" thick or on thicker panels with optional adhesive pad.

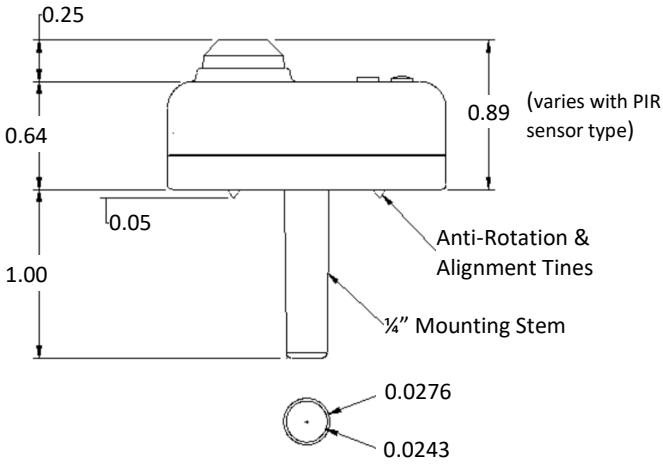


Curved Surfaces

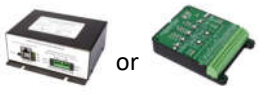
Mounts on light fixtures and other curved surfaces with diameters as small as 4".



All dimensions in inches

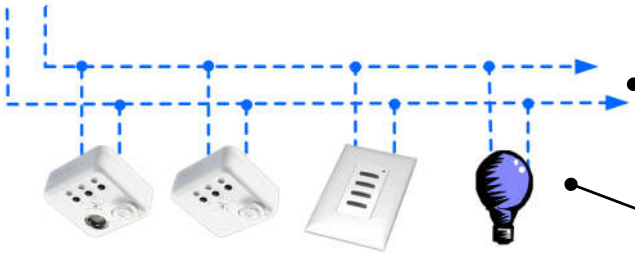


LS230 Wiring



RT03 or TR588 — DALI bus power supply

LS230 sensors will work on any DALI compliant control bus and may be added or removed as needed up to the power capacity of the DALI bus.



DALI compliant control bus: 2-wire, non-polarized, and free topology.

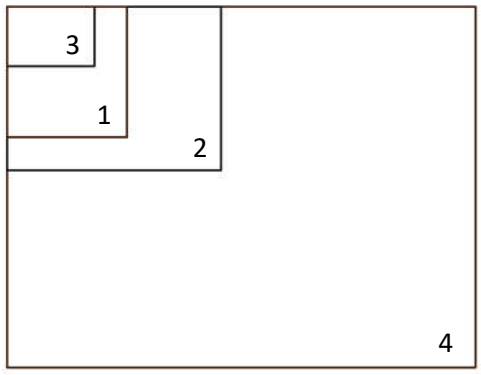
DALI powered control and luminaire devices up to the power capacity of the control bus.

LS230 Sensors

TR218 and other DALI Compatible User Controls

DALI Lighting & Gateways Loads

LS230 PIR Sensor



Type 1-4 PIR Proportional Coverage

Overview - PIR sensors detect line-of-sight motion but cannot see through windows or partitions. Typical applications are type 1 for offices, type 2 for classrooms, type 3 for cubicles, and type 4 for gyms and similar high-bay areas.

Larger Zones - Cover larger zones by installing multiple sensors with about 10% overlap.

Coverage Size Adjustment - The coverage footprint of LS230 ceiling mounted sensors is proportional to their mounting height so a 9 foot footprint increases by 11% when mounted at 10 feet and decreases by 11% when mounted at 8 feet.

Sensor—>	1. Fine	2. Standard	3. Spot	4. Wide
Mounting Height (ft)	9.0*	9.0	9.0	18
Coverage (ft)	16 dia or 15 x 15 225sf	26 x 20 520sf	7.6 x 8.9 68sf	57x44 2500sf
Max Detection Distance (ft)	6.5*	16.4	16.4	32.8

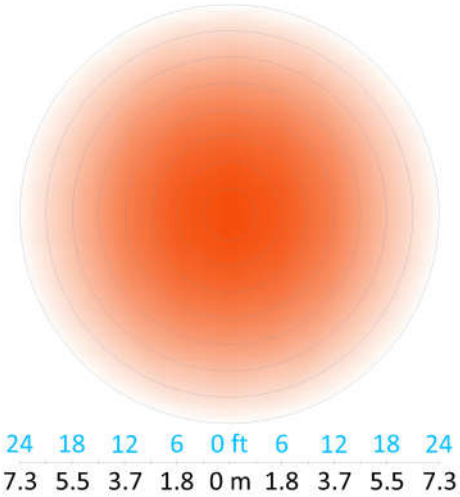
* A Fine sensor mounted at 9 feet will reliably detect hand motion on a 30 inch or higher work surface as well as detecting walking motion within the larger floor zone.

LS230 PAR Sensor

Overview - Starfield's patented Passive Audio Range (PAR) sensor hears around obstacles to provides the perfect compliment to PIR line-of-site detection.

Highlights

- Low power and completely passive
- Full range audio detection "hears" around obstacles
- Detects sharp sounds like speech, walking, chairs moving, and knuckle taps
- 5 sensitivity adjustments allows use in small to large zones.
- Dynamically filters out background noise.
- PAR-only occupancy periods are limited to 20 minutes.
- Must be activated by a PIR trip.
- Covers up to 1200 ft² in a 20ft radius in rooms with typical finishes.



PAR Coverage - PAR sensor in a typical room and set to medium sensitivity covers up to 1200 ft² in a 20 foot radius depending of acoustic properties of room surfaces.

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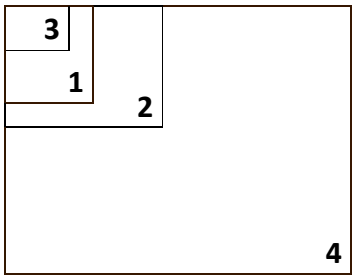
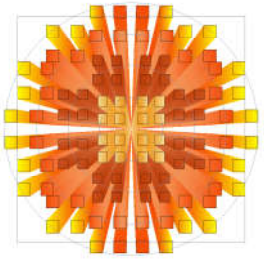
LS230 PIR Sensor Footprints

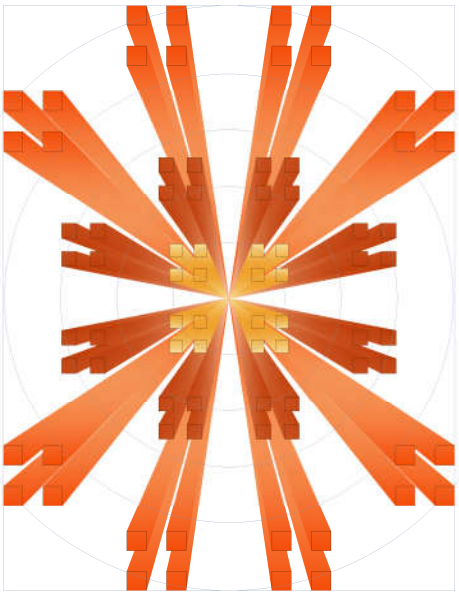


PIR Proportional Coverage

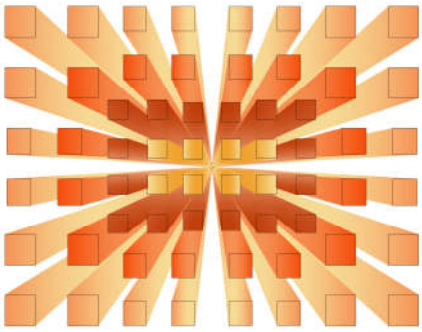
Type 3 - Spot



Type 1 - Fine



Type 4 - Wide



Type 2 - Standard

Coverage for sensor 1-3 is shown in proportion to each other.

PIR Coverage Table

1. Type 1 has maximum resolution at desktop level. Detects walking motion at floor level.
2. Coverage is proportional to height so coverage at 10 feet is 11% larger than at 9 feet.

Factor	1 - Fine	2 - Standard	3 - Spot	4 - Wide
Typical Applications	Offices	Classroom, Halls, Restrooms	Cubicles, Curtain Walls	Gymnasium, Warehouse
Typical Mounting Height (ft) [2]	6.5 above desk	9.0	9.0	18
Maximum Detection Distance (ft)	6.5 [1]	16.4	16.4	32.8
Coverage at Typical Mount (ft)	16Φ or 15x15	26x20	7.6x8.9	56Φ, 56x43
PIR Detection Zones	104	64	24	80
Coverage Area (ft^2)	225	520	55	2,500
Nominal Minimum Detection Level	Hand	Arm	Hand	Body

LS230 Daylighting

Overview

Starfield's patented **Adaptive Setpoint Daylighting** ™ is ultra-efficient, single or multi-zone, and requires no manual calibration or settings. As daylight levels change, the daylighting controller continuously measures the light level and issues commands to maintain the user selected light level.

Operation

Pairing - See LS230 Installation Instructions.

Calibration and Setpoint - Automatic. No manual calibration or setpoint is required or available.

Combination with Occupancy Sensor– Adaptive Setpoint Daylighting is location tolerant so the conventional requirement to use separate sensors placed at different locations does not apply.

Multi-Zone Daylighting - Separate daylight sensors may be placed in multiple daylight zones in accordance with the sensor placement guidelines covered in the *LS230 Design and Installation Guide*.

Fade Guard ™ - Assures that dimmable light sources are allowed to reach their destination light level by suspending daylighting until fading and user adjustments are complete.

Room Aware ™ - Assures that daylighting stays synchronized with other controls and the on/off state of the daylighting zone.

Button Settings - Capture a maximum allowed setpoint (SPmax) and enable daylighting.

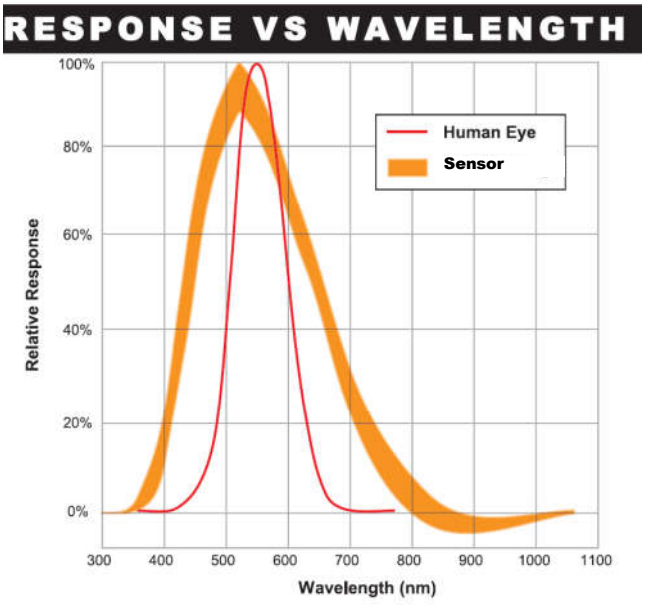
Indicators - Indicator #3 flashes each time a daylighting adjustment command is sent. This feature may be disabled with an advanced operation setting.

Advanced Operation

Management - Daylighting objects may be operated and managed over the network including:

Properties (Read and Write unless stated otherwise): Deadbands, Restart Delay, Sensitivity, Setpoint Max, SPmax Adjustment Factor, Red Indicator Enable/ Disable, Adaptive Setpoint (Read).

LS230 Light Sensor Specifications



Operating Specifications

- Linear response
- 1% accuracy photodiode
- Peak light detection frequency: 520nM
- Temperature stable
- UV and IR filtration

Standard Range: 1200 Lux saturation. Suitable for most indoor applications up work surface luminance of about 400fc.

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LS230 Digital Output

Operation

The LS230 Digital Output (DO) option can be con gured for occupancy or DALI control. The Occupancy driver activates the DO when occupancy is detected while the DALI driver provides a switched point of control with all applicable DALI properties and functions.

Plug-Load and HVAC

This function is limited to Master sensors and activates the DO when occupancy is detected. This operation is independent of lighting so it works even if lights are o making it applicable for both plug-load control and an HVAC interface.

DALI Control Point

Both Master and Scout sensors support the DO con gured as a switched DALI control point complete with all applicable features including DALI address, scenes, and groups. After being activated locally or via the network, the DALI control point may be addressed and managed like any other DALI point. Disabling DALI control erases the DALI address and restores the DO to occupancy control.

General Specifications

Initial Configuration Disabled

Type Optically isolated transistor

Allowable Loads Not rated for solenoids, motors, and other inductive loads. May be used to drive up to five Starfield PPUV relays for plug-load or switched lighting or connected directly to provide an occupied signal to HVAC controllers.

Isolation Voltage 3750 Vrms

Max Current Capacity 50mA at 25C

Voltage Range 10-48vdc

Response Time Less than 1ms

DALI Relay Driver Operation Electrically latched (*Returns to previous position after a DALI bus power cycle)*

Operation Maintained

Number of Relays per Driver - 5 PPUV relays wired in parallel.

Control Commands:

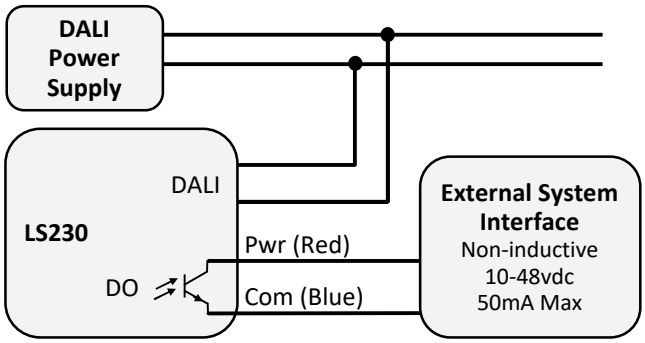
Enable DALI addressing: 129-10

Disable DALI addressing: 128-10

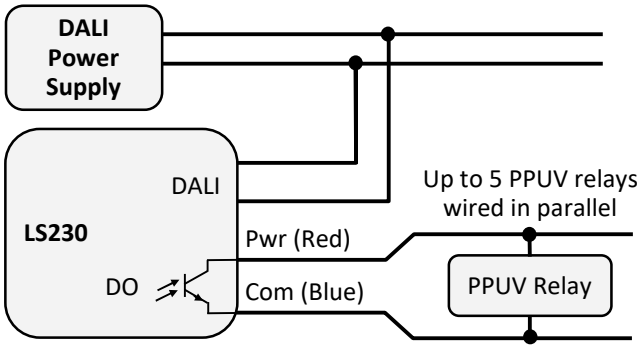
Query DALI enabled state: 130-14

Activate DO: 128-9

Deactivate DO: 129-9



Direct External System Interface



Relays

Query DO state: 130-13

Remote control and configuration commands may be accessed and sent to the LS230 control address via the Starfield Scripting Tool program.

DALI Commands

DO Closed: Level (1-254), On, On Scenes, Min, Max

DO Open: Level (0), Off, Off Scenes

DALI commands may be sent by any DALI transmitter including: TR218 controllers, LS230 sensors, DALI test & configuration tools, and Starfield Admin or Scripting Tool programs.

DALI Settings

Power On Level: Not applicable as sensors are only powered by the DALI network.

System Fail: Operating value loaded each time the DALI bus power is cycled. 0=Off, 1-254=On, 255=last setting before power cycle.

All other DALI Setting: Standard DALI defaults

LS230 Specifications

Physical

Size 1.66 x 1.66 x 0.64 inch
Weight 1oz
Mounting ¼" x 1" plastic stem through a ¼" clearance hole on flat or curved surfaces with a 4" or larger diameter using a speed nut (provided) or adhesive pad (accessory order).
Color NEMA WD1 White
Buttons 3
Indicators 3

Electrical

Rating Class 2
Current Draw 7mA includes 20% charging allowance
Hookup Wire 22ga stranded, 600v insulation, 8"
Voltage 12-22vdc Class 2
Connection 2-wire, un-Polarized
Power DALI compliant control bus

Environmental Specs

Operating Temp 32 to 131°F
Storage Temp 14 to 158°F
Relative Humidity 15-85% non-condensing

Digital Output

Type Optically isolated transistor.
Application Not rated for solenoids, motors, and other inductive loads. May be used to drive Starfield PPUV relays and provide a dry contact interface to other controllers and systems.
Isolation Voltage 3750 Vrms
Rated Current 10mA at 25C
Rated Voltage 10-48vdc
Leakage Current 200nA
Response Time Less than 1ms
DALI Relay Driver Operation Electrically latched (*Returns to previous position after an DALI bus power cycle)*
Number of Relays per Driver - 5 PPUV relays wired in parallel.

PIR Specs

Minimum Movement Speed 2.6 ft/s
Minimum Background Temp Objects must be at least 7.2°F warmer their background.

Button Settings

Groups: Whole Room parent group and User and Daylighting subgroups.
O**ccupancy:** Delay Time, Logic (Occupancy or Vacancy). PAR sensitivity, Role (Master or Scout).
Daylighting: SPmax calibration and daylighting enable.
DO Logic: Occupancy controlled for Plug-Load and HVAC, DALI addressable for DALI relays.
Network: All button setting may also be made and queried via the control network.

Warranty

5-year limited.

Factory Defaults

Indicator #1 (Enabled) Night Light and button press indicator.
Indicator #2 (Enabled). PIR and PAR and trip indicator.
Indicator #3 (Enabled). Daylighting adjustment indicator.
Occupancy Delay (10 minutes). Button or network adj 5-20 minutes.
Grace Period (15 seconds). Network adj 0-255 seconds.
PAR Sensitivity (Medium). Button or Network adj High-to off
PAR Override Timer (20). Network adj 5-20 minutes
Scout Transmit Delay (3 seconds). Network traffic management setting. Network adj 1-20 seconds
Role (Master). Button or Network adj Master or Scout
Group (Group 0 for all three tiers). Each group Field or Network adj 0-15.
Individual Control Address (unassigned). Network adj 0-63.
DO Logic (occupancy). Button or Network adj for Occupancy control or DALI relay.
Button Configuration (Enabled). Network adj on/off.
Button Operation (Enabled). Network adj on/off.
( ) = Default setting

Queriable Parameters

- Occupancy delay time remaining
- Grace period time remaining
- Light sensor reading
- PIR trip counter
- PAR trip counter
- Temperature