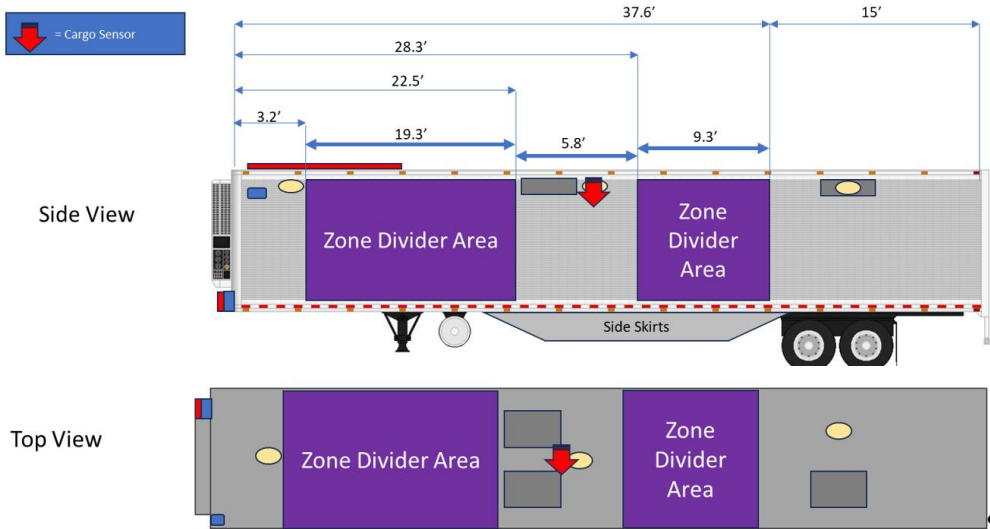


1. Abstract

The Montage Object Detection Sensor is a stand-alone Time of Flight Volumetric Sensor with advanced hardware and firmware features. It is designed around an advanced Time of Flight imager chip. The system detects the presence or absence of cargo inside a container or a trailer and communicates data collected to a gateway over Bluetooth. It is mounted on the inside ceiling of a trailer and powered from an external 12VDC power source. By looking down from the ceiling, it senses the presence of cargo on the floor of the trailer.

2. Specifications

1. Mechanical		
1.1	Dimensions Sensor Block	Rectangular 107 x 52 x 25.4 mm
1.2	Dimensions Power Source	Cable with 12VDC on a customized 4 pin connector Connector. Power can be from a battery and joined with other units within the trailer
1.3	Installation Location	<p>Sensor (shown by red arrow) will be attached to the EB and look down unobstructed to the floor.</p> <p>The sensor will be mounted to the ceiling, centered between the walls. The mount will be no more than 4" below the ceiling, connected by cables down the center of the ceiling to the Energo Bridge (EB, shown by yellow oval).</p> <p>Phase 1:</p>  <p>Side View</p> <p>Top View</p>
1.4	Housing Material	Product: Molded Valox FR Resin V3900WX Polycarbonate + PBT
1.5	Housing Color	White

1.6	Mounting	x4 Internal Rivets or sheet metal screws. Installation from inside. Needs to be with 2" of roof center and have < 2-degree tilt relative to the floor. Tilt and compensation for being off center can be adjusted with angle Alignment Plates underneath the housing during mounting.
1.7	IP Rating	IP67 rated water resistant housing to ensure device can withstand fine dust and protection from condensing humidity within the reefer.

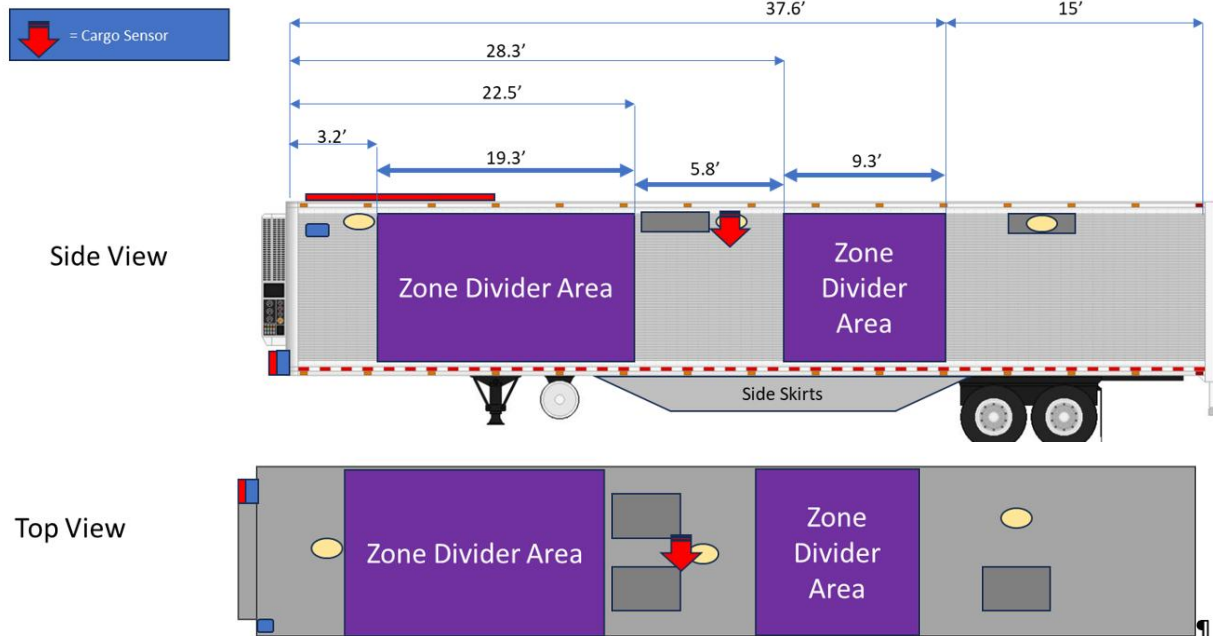
1.8	Operating Temperature	-20°C to +60°C (-4°F to 140°F)
1.9	Flammability Rating	UL 94 V-0
2. Design		
2.1	Bluetooth® Antenna	Internal antenna positioned inside the Sensor enclosure for good reception.
2.2	Trailer Ambient Temperature	Temperature sensor to measure the trailer internal ambient conditions is placed near the connector for thermal conduction.
2.3	Shock & Vibration Rating	U.S. Military Standards 202G and 810F, SAE J1455
2.4	EMC / EMI	SAE J1113; FCC-Part 15B Industry Canada
3. Laser and Optics		
3.1	Imager	FPA = 8x8 pixel (VCSEL emission) Resolution of up to 64 points
3.2	Operating Range	9'
3.3	Operating Condition	For indoor use only
4. Power Supply		
4.1	Source-1	12VDC power source power range (up to 24Vnom, 32V limit), resettable fuses, watchdog timer.
4.2	Battery Capacity	Onboard battery 800mAh
5. Electronics		
5.1	Main CPU	NORDIC nRF52840 with OTA DFU Capabilities
5.2	Bluetooth® SoC	NORDIC nRF52840 with OTA DFU Capabilities
5.3	Bluetooth® Radio Front End Amplifier	+18 dBm

6. Connectivity		
Bluetooth®		
6.1	Wireless Connectivity	Pairs nearby Bluetooth Gateway through a defined communication structure in both data through BLE advertisement and connection profiles
6.2	Version	Bluetooth Low Energy BLE 5.0
6.3	Transmission Power	-20dBm to +8dBm Selectable through Firmware
7. Certification		
7.1	FCC	Product shall comply with all applicable wireless standards/rules
7.2	UL / CE	Yes
7.3	RoHS	Product shall be RoHS compliant and not have any known-harmful materials or substances on any external surface
7.4	Eye Safety	Class-1

3. Product Images



4. Installation Example

Phase-1-**FCC Regulations**

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.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/ TV technician for help.

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

FCC RF Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. To comply with FCC RF Exposure compliance requirements, this grant is applicable to only Mobile Configurations. The antennas used for the transmitter must be installed to provide a separation distance of at least 20cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.