Ouster, Inc.
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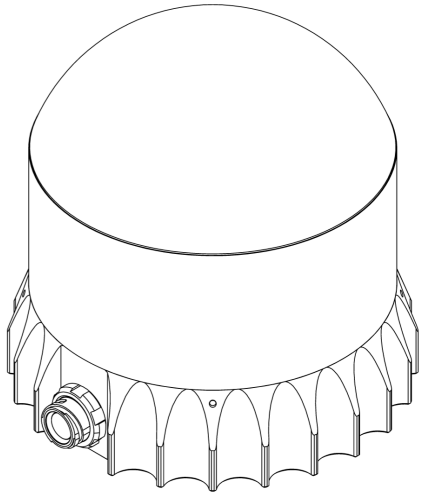
San Francisco, CA 94110

OSDome

Hemispherical View High-Resolution Imaging Lidar

FIRMWARE VERSION: 3.0.x and 3.1.x

HARDWARE VERSION: REV7.1



SUMMARY

The OSDome offers a complete 180º hemispherical field of view, up to 20 m of range at 10% reflectivity, and high resolution. The OSDome delivers full coverage for indoor people tracking, and near-range detection for mobile robots and vehicles.

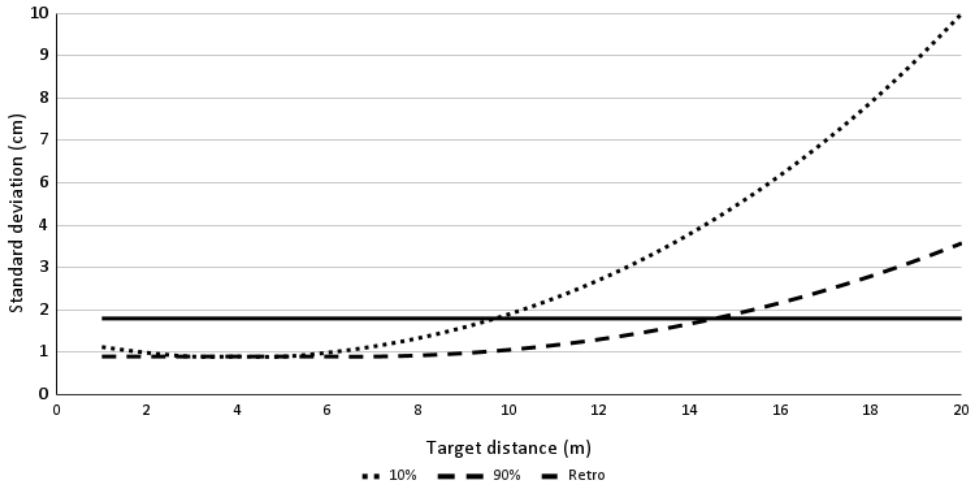
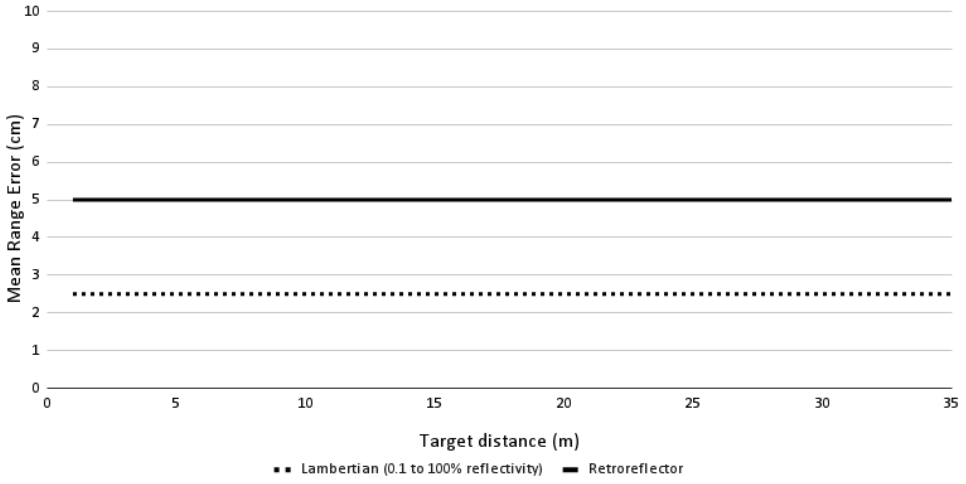
REV7.1 is a rolling change to REV7.0 with minor improvements to sensor reliability.

HIGHLIGHTS

- Configurable Minimum Range and Return Ordering
- Low Data Rate Profile now available with Dual Returns
- Camera-grade near-infrared and signal data
- Multi-sensor crosstalk suppression
- Ouster Studio for pointcloud evaluation
- Ouster SDK, ROS, and C++ drivers for SW development

OPTICAL PERFORMANCE

Range (80% Lambertian reflectivity, 1024 @ 10 Hz mode)	45 m @ 100 klx sunlight, >90% detection probability
Range (10% Lambertian reflectivity, 1024 @ 10 Hz mode)	20 m @ 100 klx sunlight, >90% detection probability
Minimum Range	0.0 m (0.3 m optional, and 0.5 m default); 0.5 m for FW 3.0.x
Vertical Resolution	32, 64, or 128 channels
Horizontal Resolution	512, 1024, or 2048 (configurable)
Rotation Rate	10 or 20 Hz (configurable)
Field of View	Vertical: 180° Horizontal: 360°
Angular Sampling Accuracy	Vertical: ±0.01° / Horizontal: ±0.01°
False Positive Rate	1/10,000
Range Resolution	0.1 cm **Note**: For *Low Data Rate Profile* the Range Resolution = 0.8 cm
Vertical Angular Resolution	Up to 0.7º angular resolution
# of Returns	up to 2
Return Order	Strongest to Weakest, Farthest to Nearest, and Nearest to Farthest

Range Precision (Typical on Lambertian and Retroreflective targets beyond 1 m, 1024 @ 10 Hz mode, 1 standard deviation) **Note:** Precision is calculated based on the standard deviation of 100 measurements on a static target at a given range	Min: ±1.0 cm, Max: ±10 cm 
Range Accuracy (Typical on Lambertian and Retroreflective targets beyond 1 m, 1024 @ 10 Hz mode) **Note:** Accuracy is calculated based on the error between the mean of 100 measurements on a static target at a given range and the true range	±2.5 cm for lambertian targets, ±5 cm for retroreflective targets 

LASER

Laser Product Class	Class 1 eye-safe per IEC/EN 60825-1: 2014
Laser Wavelength	865 nm
Beam Diameter Exiting Sensor	5 mm
Beam Divergence	0.35º (FWHM)

LIDAR OUTPUT

Connection	UDP over gigabit Ethernet
Points Per Second	1,310,720 (32 channel) 2,621,440 (64 channel) 5,242,880 (128 channel)
Data Rate (megabits per second) (Low Data Rate Profile, 1 return, 1024 @ 10 Hz mode)	up to 11.83 Mbps (32 channel) up to 22.32 Mbps (64 channel) up to 43.29 Mbps (128 channel)
Data Rate (megabits per second) (Low Data Rate Profile, 2 returns, 1024 @ 10 Hz mode)	up to 22.32 Mbps (32 channel) up to 43.29 Mbps (64 channel) up to 85.24 Mbps (128 channel)
Data Rate (megabits per second) (Single Return Profile, 1024 @ 10 Hz mode)	up to 32.81 Mbps (32 channel) up to 64.26 Mbps (64 channel) up to 127.18 Mbps (128 channel)

Data Rate (megabits per second) (Dual Return Profile, 1024 @ 10 Hz mode)	up to 43.29 Mbps (32 channel) up to 85.24 Mbps (64 channel) up to 169.12 Mbps (128 channel)
Data Per Point	Range, Signal, Reflectivity, Near-infrared, Channel, Azimuth angle, and Timestamp
Timestamp Resolution	< 1 µs
Data Latency	< 10 ms
Data Integrity	End to End CRC that covers entire data packet

IMU OUTPUT

Connection	UDP over 1000Base-T or 1000Base-T1
Samples Per Second	100
Data Per Sample	3 axis gyro, 3 axis accelerometer
Timestamp Resolution	< 1 µs
Data Latency	< 10 ms
Additional Details	InvenSense IAM-20680HT; datasheet for more details: https://invensense.tdk.com/download-pdf/iam-20680ht-datasheet/

CONTROL INTERFACE

Connection	HTTP API	
Time Synchronization	Input sources: • IEEE1588 Precision Time Protocol (PTP); Accuracy: <1 ms error • gPTP; Accuracy: <1 ms error • NMEA $GPRMC UART message support • External PPS; Accuracy: <1 ms error • Internal 10 ppm drift clock; Accuracy: <20 ppm error Output sources: • Configurable 1 - 60 Hz output pulse	
Lidar Operating Modes	• x 512 @ 10 Hz or 20 Hz • x 1024 @ 10 Hz or 20 Hz • x 2048 @ 10 Hz	
Additional Programmability	• Multi-sensor phase lock • Queryable intrinsic calibration information: • Beam angles • IMU pose correction matrix	• Return ordering • Minimum range • Azimuth masking • Low-power standby mode

MECHANICAL/ELECTRICAL

Power Consumption	14 - 20 W • 16 W nominal • 28 W peak at startup if operating at -40 °C **Note:** Ouster recommends use of a power supply of no less than 30 W if using in cold conditions
Connector	Standard 1000BASE-T or Automotive Standard 1000BASE-T1
Operating Voltage	9.5 V - 51 V • Suitable for 12 VDC to 24 VDC nominal systems • Not suitable for 48 V nominal battery based systems • Under-voltage WARNING level alert occurs at 9.5 VDC at the connector • Under-voltage ERROR level alert occurs at 9.0 VDC at the connector • Below 9.0 VDC at connector, sensor may shutdown • Over-voltage conditions/alarms occur at 51 VDC at the connector • Over-voltage lockout onset at 58 VDC (±1 V) at the connector • Over-voltage lockout release at 55 VDC (±1 V) at the connector
Dimensions	Diameter: 87 mm (3.42 in) Height: • Without baseplate: 85.27 mm (3.35 in) • With baseplate: 107.77 mm (4.2 in)

Weight	470 g (16.6 oz)
Mounting	Bottom: 4x M3 screws, 2x locating 2 mm pin holes

OPERATIONAL

Operating Temperature	-40 °C to +60 °C (with mount, in free air and no solar loading) Between +53 °C and +60 °C, sensor automatically reduces range (max 20% range reduction)
Storage Temperature	-40 °C to +85 °C
Ingress Protection	IP68 (1 m submersion for 1 hour, with I/O cable attached) IP69K (with I/O cable attached)
MTTF	>250,000 hours
Shock	IEC 60068-2-27 (Amplitude: 100 g, Shape: 11 ms half-sine, 3 shocks x 6 directions)
Vibration	IEC 60068-2-64 (Amplitude: 3 G-rms, Shape: 10 - 1000 Hz, Mounting: sprung masses, 3 axes w/ 8 hr duration each)
Compliance **Note:** Ouster UK (Ltd): 125 Princes Street, Edinburgh EH2 4AD, Scotland, United Kingdom Contact: Neil Calder, Phone Number: +44(0).131.563.9078	For US Laser Safety: • IEC 60825-1:2014 Class 1 eye safe • FDA US 21CFR1040 Notice 56 Class 1 Product Safety: • UL 62368-1 • UL 60950-22 (outdoor use) • CSA-C22.2 No. 62368-1-19 • CSA-C22.2 No. 60950-22-07 (outdoor use) EMC: FCC 47CFR Part 15, Subpart B, Class A For EU Laser Safety: EN 60825-1:2014+A11:2021– Class 1 eye safe Product Safety: EN/IEC 62368-1 EMC: • EN 55032:2012/AC 2013; CISPR 32:2015 • EN 55035:2017/A11:2020 • EN 61000-3-2:2014 • EN 61000-3-3:2013 For Korea • KS C 9832:2023 • KS C 9835:2019 For Australia: AS/NZS CISPR 32: 2015

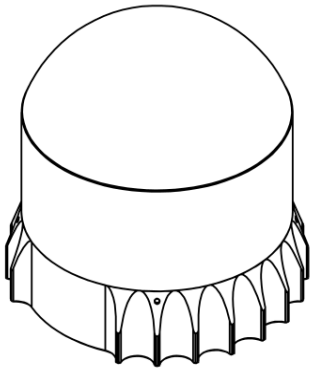
ACCESSORIES

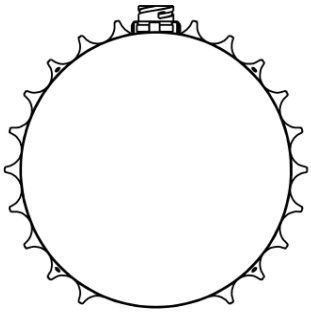
Interface Box	Polycarb/FR4, 100 g, 75 mm x 50 mm x 25 mm (LxWxH), 2 m CAT6 cable, 24 V power adapter, 5 m sensor cable
Optional Mount	Aluminum, 530 g, 110 mm x 110 mm x 20.5 mm (LxWxH), 4 x M8 thru holes

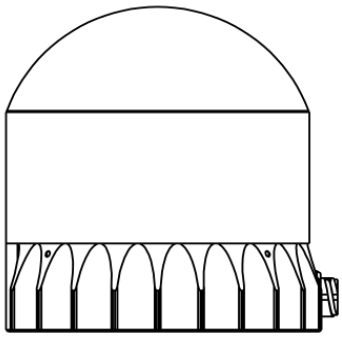
SOFTWARE

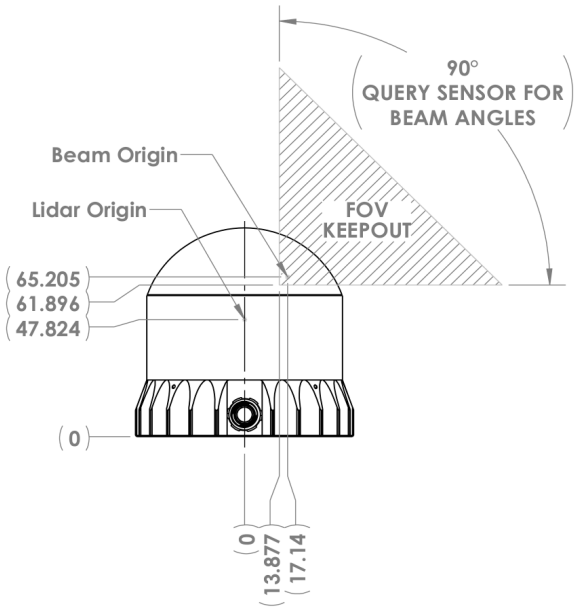
Sample Drivers	Ouster SDK, ROS, C++
Visualizer	Ouster Studio

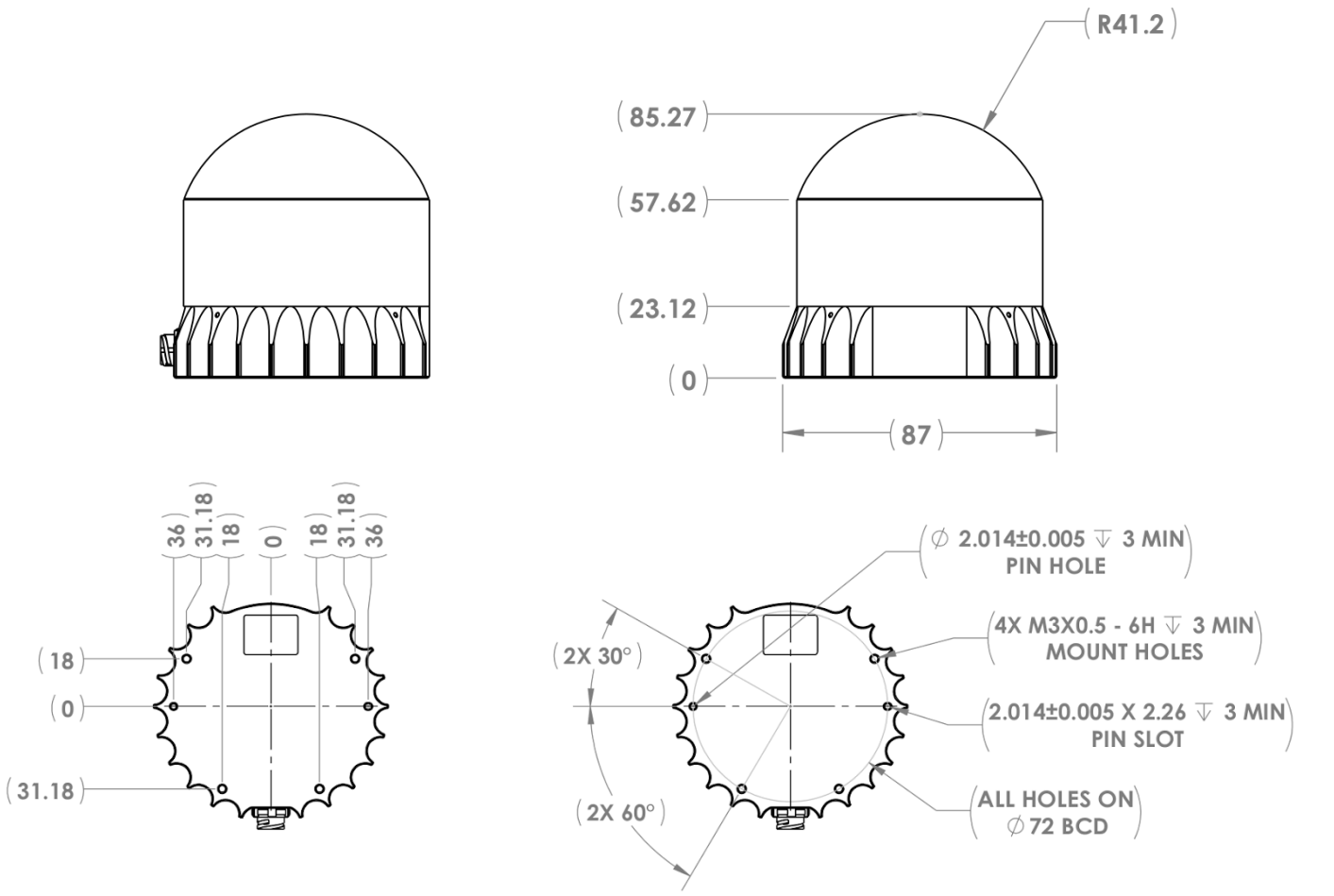
EXTERIOR DIMENSIONS



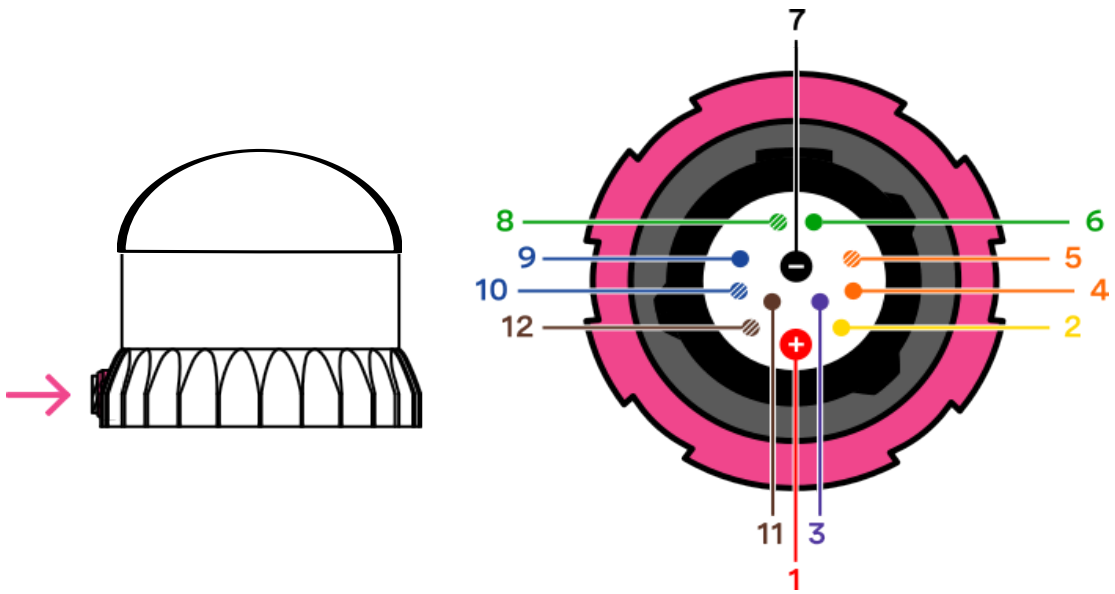








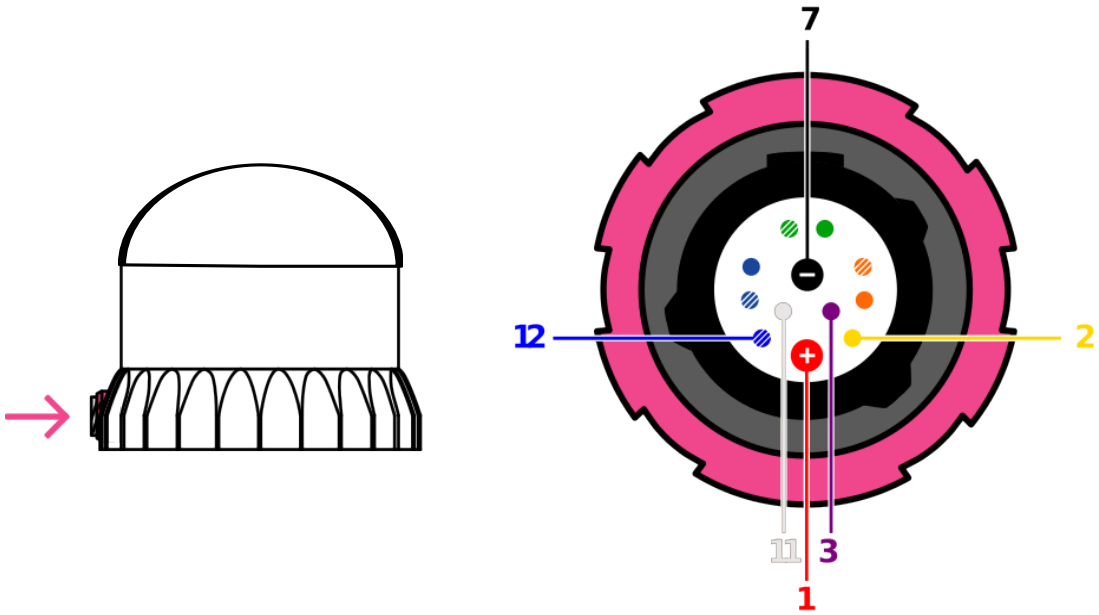
CABLE PINOUT DIAGRAM FOR TYPE 1, 2 and 3 (1000BASE-T)



Pinout and wire gauges for Types 1, 2, and 3 (1000BASE-T) cables

Function	Pin No.	Wire Color	Type-1, 24V	Type-2, 24V	Type-3, 12V	Twisted with	Color (Display)
VCC	1	Red	22 AWG	22 AWG	18 AWG	N/A	
GROUND	7	Black	22 AWG	22 AWG	18 AWG	N/A	
MULTI-PURPOSE_IO	3	Purple	26 AWG	28 AWG	28 AWG	N/A	
SYNC _PULSE_IN	2	Yellow	26 AWG	28 AWG	28 AWG	N/A	
Ethernet BI_DA+	5	White /Orange	26 AWG	28 AWG	28 AWG	Orange	
Ethernet BI_DA-	4	Orange	26 AWG	28 AWG	28 AWG	White /Orange	
Ethernet BI_DB+	8	White /Green	26 AWG	28 AWG	28 AWG	Green	
Ethernet BI_DB-	6	Green	26 AWG	28 AWG	28 AWG	White /Green	
Ethernet BI_DC+	9	Blue	26 AWG	28 AWG	28 AWG	White /Blue	
Ethernet BI_DC-	10	White /Blue	26 AWG	28 AWG	28 AWG	Blue	
Ethernet BI_DD+	12	White /Brown	26 AWG	28 AWG	28 AWG	Brown	
Ethernet BI_DD-	11	Brown	26 AWG	28 AWG	28 AWG	White /Brown	

CABLE PINOUT DIAGRAM FOR TYPE 4 (1000BASE-T1)



Pinout and wire gauges for Type 4 (1000BASE-T1) cables

Net Name	Pin No.	Wire Color	Type-4, Base 1000 T1	Twisted with	Color (Display)
VCC	1	Red	18 AWG	NA	
GROUND	7	Black	18 AWG	NA	
MULTIPURPOSE_IO	3	Purple	28 AWG	NA	
SYNC_PULSE _IN	2	Yellow	28 AWG	NA	
Ethernet BI_DA+	12	Blue	26 AWG	White	
Ethernet BI_DA-	11	White	26 AWG	Blue	

*Specifications are subject to change without notice.