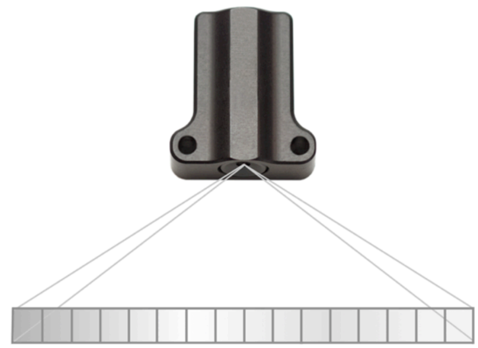
Infrared Tire Temperature Sensor Kit, IRTS-UK-V2 – Datasheet

The Izze-Racing infrared sensor is specifically designed to measure the highly transient surface temperature of a tire with spatial fidelity, providing invaluable information for chassis tuning, tire exploitation, and driver development.



Each sensor is capable of measuring temperature at 16, 8, or 4 laterally-spaced points, at a sampling frequency of up to 100Hz, object temperature between -20 to 300˚C, using CAN 2.0A protocol, enclosed in a compact IP66 rated aluminum enclosure, and priced to be affordable to all tiers of motorsport.

The sensor is now offered as a complete kit for any data acquisition system that can log CAN messages. The kit includes four 4, 8, or 16-channel infrared tire temperature sensors with wide (60˚) or ultra-wide (120˚) field-of-views and a complete motorsport-grade wiring harness.

SENSOR SPECIFICATIONS

Temperature Measurement Range, T_o	-20 to 300˚C
Package Temperature Range, T_p	-20 to 85˚C
Accuracy (Central 10 Channels, Nominal) (16-Ch Sensor)	±1.0˚C for 0˚C < T_p < 50˚C ±2.0˚C for T_p < 0˚C and T_p > 50˚C
Accuracy (First & Last 3 Channels, Nominal) (16-Ch Sensor)	±2.0˚C for 0˚C < T_p < 50˚C ±3.0˚C for T_p < 0˚C and T_p > 50˚C
Noise Equivalent Temperature Difference, NETD	0.5˚C at 16Hz, ε = 0.85, T_o = 25˚C
Field of View, FOV	60˚x 8˚ (wide) 120˚x 15˚ (ultra-wide)
Number of Channels	16, 8, or 4
Sampling Frequency	100[1], 64[1], 32, 16, 8, 4, 2, or 1Hz
Thermal Time Constant	2 ms
Effective Emissivity	0.01 to 1.00 (default = 0.78)
Spectral Range	8 to 14 µm

1 – Optional Extra, 64Hz limit for IRTS-120-V2, 100Hz limit for IRTS-60-V2

ELECTRICAL SPECIFICATIONS (SENSOR)

Supply Voltage, V_s	5 to 8 V
Supply Current, I_s (typ)	30 mA
Features	• Reverse polarity protection • Over-temperature protection (125˚C)

MECHANICAL SPECIFICATIONS (SENSOR)

Weight	20 g
L x W x H (max, 60˚ FOV)	36.6 x 26.0 x 12.3 mm
L x W x H (max, 120˚ FOV)	31 x 29.0 x 12.3 mm
Protection Rating	IP66

CAN SPECIFICATIONS

Standard	CAN 2.0A (11-bit identifier), ISO-11898
Bit Rate	1 Mbit/s
Byte Order	Big-Endian / Motorola
Data Conversion	0.1˚C per bit, -100˚C offset, unsigned
Base CAN ID's (Default)	LF Sensor: 1200 (Dec) / 0x4B0 (Hex) RF Sensor: 1204 (Dec) / 0x4B4 (Hex) LR Sensor: 1208 (Dec) / 0x4B8 (Hex) RR Sensor: 1212 (Dec) / 0x4BC (Hex)
Termination	None

CAN ID: Base ID

Channel 1		Channel 2		Channel 3		Channel 4	
Byte 0 (MSB)	Byte 1 (LSB)	Byte 2 (MSB)	Byte 3 (LSB)	Byte 4 (MSB)	Byte 5 (LSB)	Byte 6 (MSB)	Byte 7 (LSB)

CAN ID: Base ID+1

Channel 5		Channel 6		Channel 7		Channel 8	
Byte 0 (MSB)	Byte 1 (LSB)	Byte 2 (MSB)	Byte 3 (LSB)	Byte 4 (MSB)	Byte 5 (LSB)	Byte 6 (MSB)	Byte 7 (LSB)

CAN ID: Base ID+2

Channel 9		Channel 10		Channel 11		Channel 12	
Byte 0 (MSB)	Byte 1 (LSB)	Byte 2 (MSB)	Byte 3 (LSB)	Byte 4 (MSB)	Byte 5 (LSB)	Byte 6 (MSB)	Byte 7 (LSB)

CAN ID: Base ID+3

Channel 13		Channel 14		Channel 15		Channel 16	
Byte 0 (MSB)	Byte 1 (LSB)	Byte 2 (MSB)	Byte 3 (LSB)	Byte 4 (MSB)	Byte 5 (LSB)	Byte 6 (MSB)	Byte 7 (LSB)

WIRING SPECIFICATIONS (SENSOR)

Wire	26 AWG M22759/32, DR25 jacket
Cable Length (typ.)	500 mm
Connector	Deutsch DTM 4P (gold contacts)

Supply Voltage, V_s	Red	(Pin 3)	(twisted)
Ground	Black	(Pin 4)	
CAN +	Blue	(Pin 2)	(twisted)
CAN -	White	(Pin 1)	

SENSOR CONFIGURATION:

To modify the sensor's configuration, send the following CAN message at 1Hz for at least 10 seconds and then reset the sensor by disconnecting power for 5 seconds:

CAN ID: Current Base ID

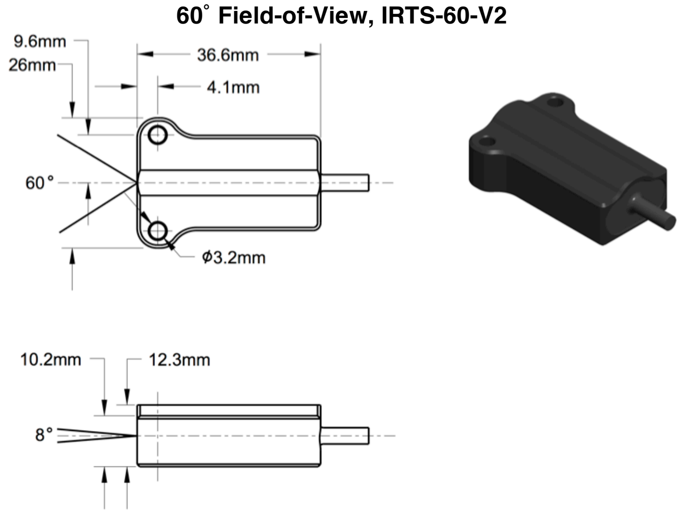
Programming Constant		New CAN Base ID (11-bit)		Emissivity	Sampling Frequency	Channels	
Byte 0 (MSB)	Byte 1 (LSB)	Byte 2 (MSB)	Byte 3 (LSB)	Byte 4	Byte 5	Byte 6	Byte 7
30000 = 0x7530		1 = 0x001 ⋮ 2047 = 0x7FF		1 = 0.01 ⋮ 100 = 1.00	1 = 1Hz, 5 = 16Hz 2 = 2Hz, 6 = 32Hz 3 = 4Hz, 7 = 64Hz[1] 4 = 8Hz, 8 = 100Hz[1]	40 = 4Ch 80 = 8Ch 160 = 16Ch	

1 – Optional Extra, 64Hz limit for IRTS-120-V2, 100Hz limit for IRTS-60-V2

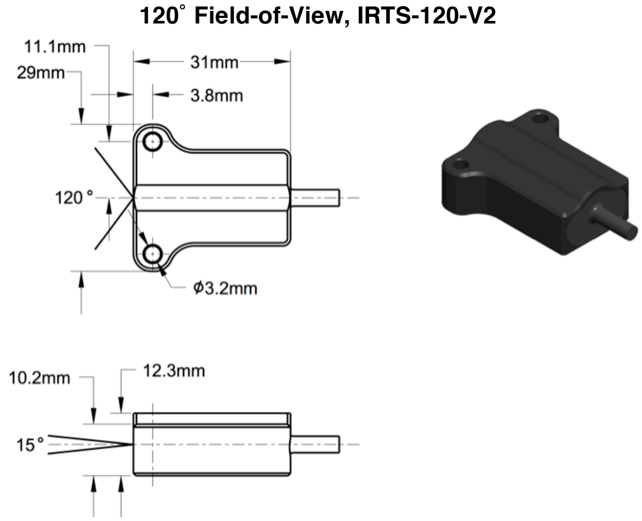
CAN messages should only be sent to the sensor during the configuration sequence.
DO NOT continuously send CAN messages to the sensor.

DIMENSIONS:

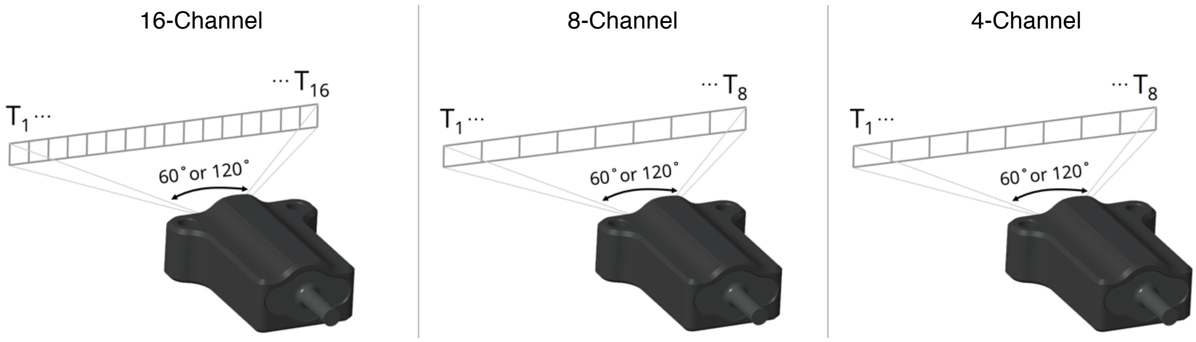
60° Field-of-View, IRTS-60-V2



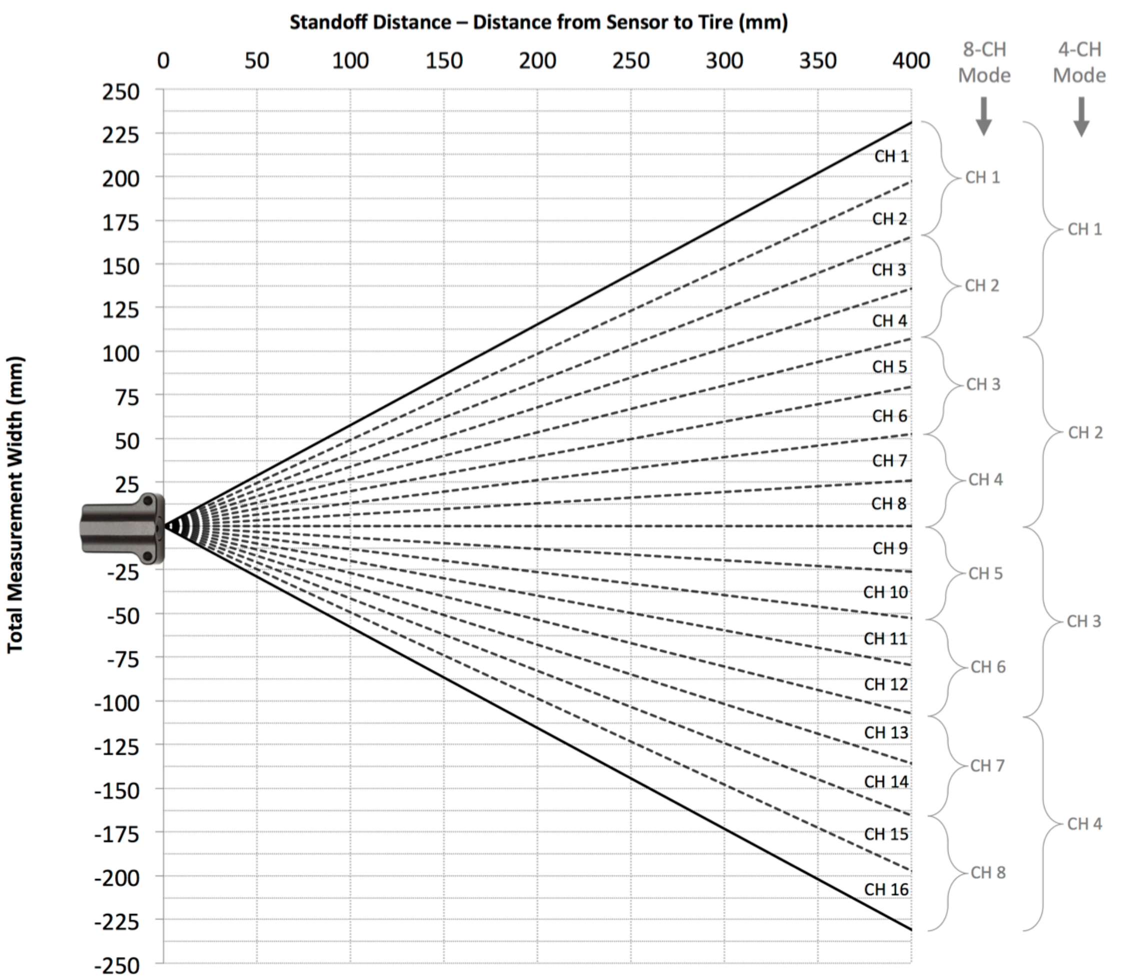
120° Field-of-View, IRTS-120-V2



Field of View (FOV):

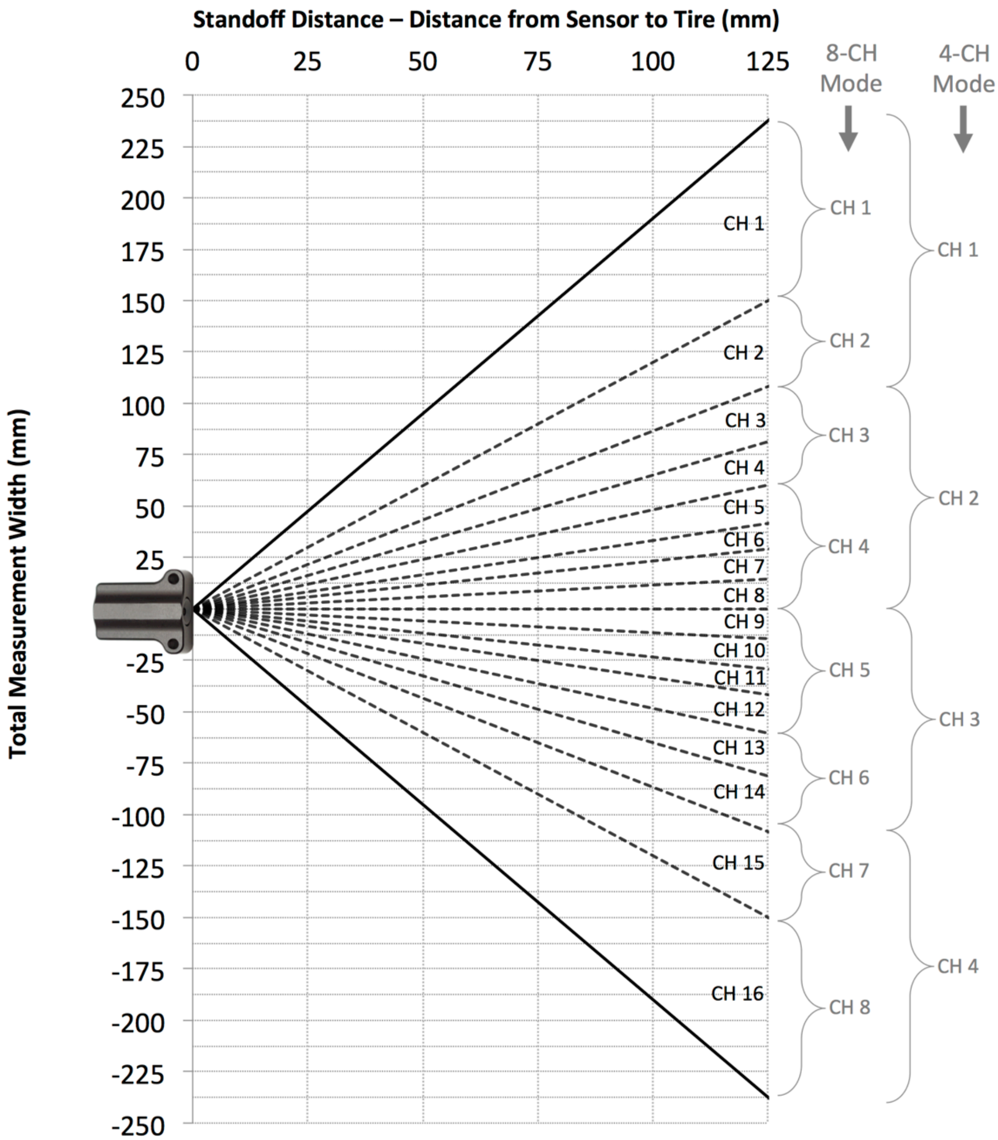


60° Field-of-View, IRTS-60-V2:



(Approximate. Angle offset (z-axis rotation) between -5° and +5°, mounts should allow adjustment accordingly)

120˚ Field-of-View, IRTS-120-V2:



(Approximate. Angle offset (z-axis rotation) between -5˚ and +5˚, mounts should allow adjustment accordingly)

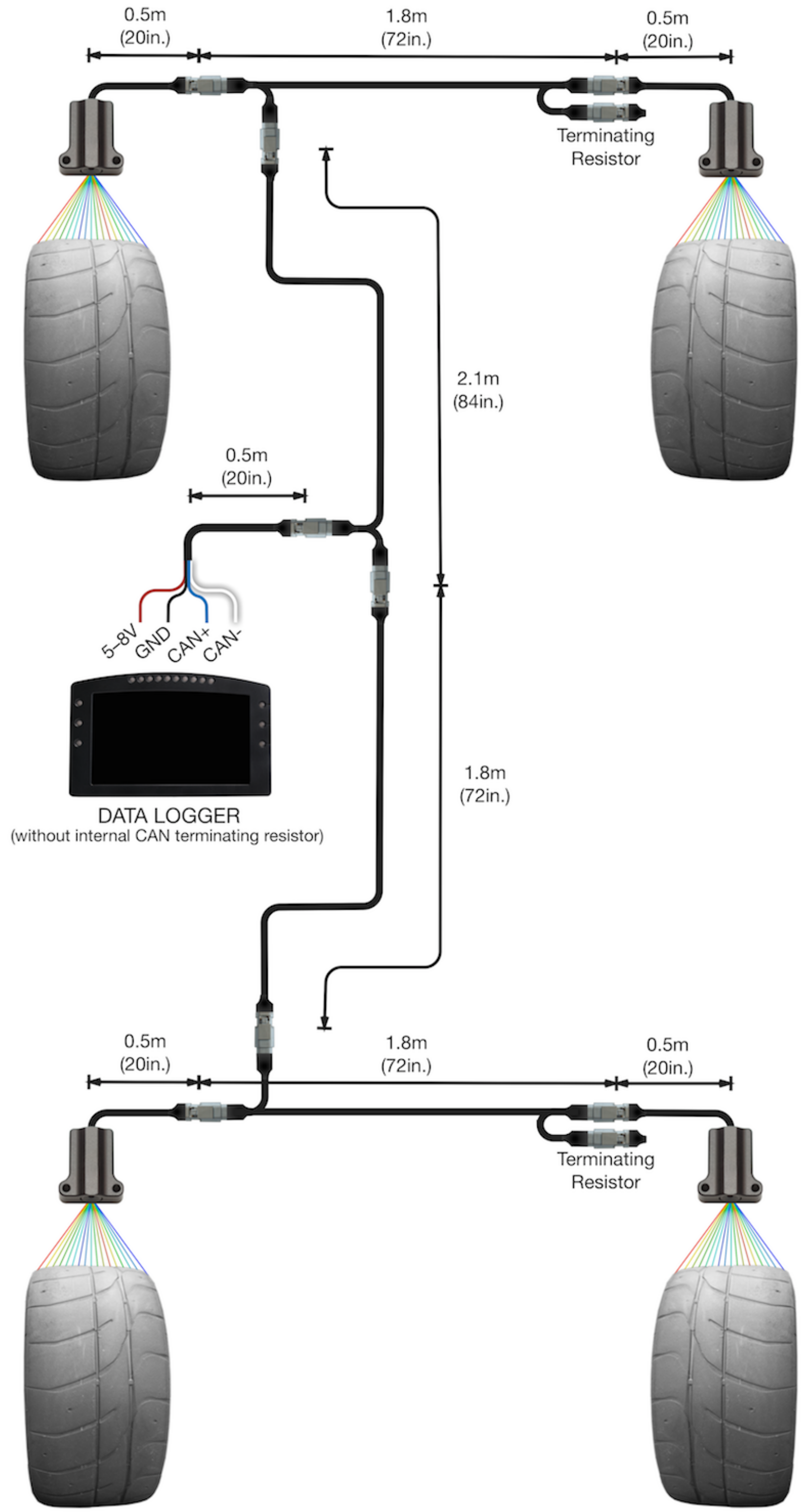
WIRING SPECIFICATIONS (HARNESS):

Wire	22 AWG M22759/32, DR25 jacket, ATUM boots
Cable Length (typ.)	1.8-2.1m trunk segments, 0.5m branches
Connectors	Deutsch DTM 4P (gold contacts)

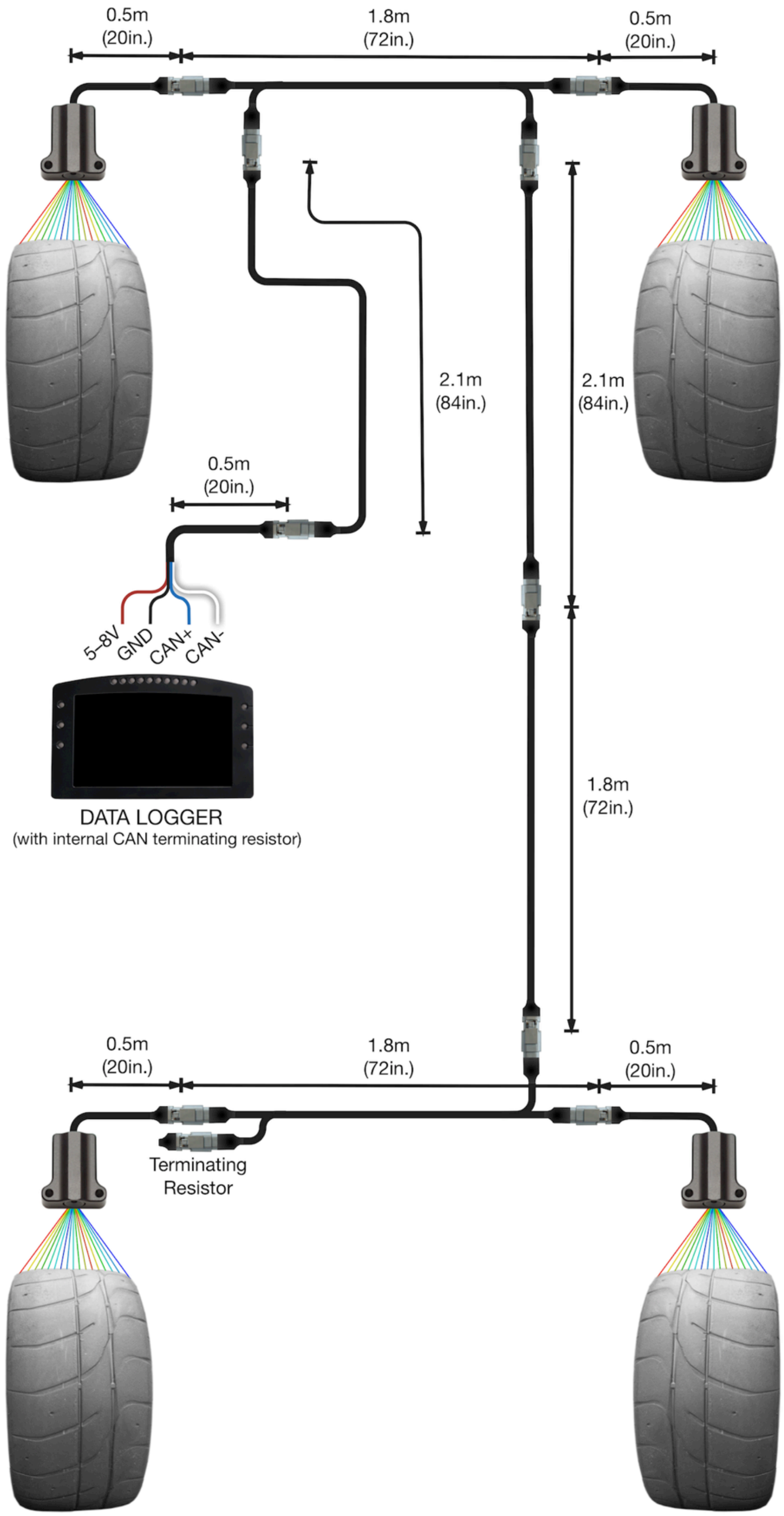
Supply Voltage, V_s	Red	(Pin 3)	(twisted)
Ground	Black	(Pin 4)	
CAN +	Blue	(Pin 2)	(twisted)
CAN -	White	(Pin 1)	

- The default wiring harness layout is shown in the first diagram below and is designed for data loggers <u>without</u> an internal CAN terminating resistor (MoTeC, Cosworth, Bosch, Stack, 2D, AEM, RaceCapture/Pro systems).
    - The harness can be modified upon request for data loggers with an internal CAN terminating resistor (AiM systems). The layout of this harness is shown in the second diagram below.
- The harness needs to be powered with 5-8 volts (120mA) but may be extended to 6.5-36 volts upon request.
- The CAN terminating resistors are integrated into the short Deutsch DTM connectors. Resistor value is 120Ω.
- Female pins for MoTeC Tyco/AMP Superseal connectors or female pins (38943-22) for AS Deutsch Autosport connectors (e.g., AS620-35SN connector for C185, C187, L180, ADL/EDL) may be added to the flying leads for the data logger upon request.
- Additional CAN sensors (strain gauge amplifiers, brake temperature sensors, etc.) may be added to the harness by using a y-harness at each corner.
- Harness lengths may be modified upon request. Please contact us if you would like to modify the wiring harness / kit; we are glad to accommodate your specific requirements.

DEFAULT WIRING HARNESS LAYOUT:
(Data logger without internal CAN terminating resistor)



ALTERNATIVE WIRING HARNESS LAYOUT:
(Data Logger with internal CAN terminating resistor)



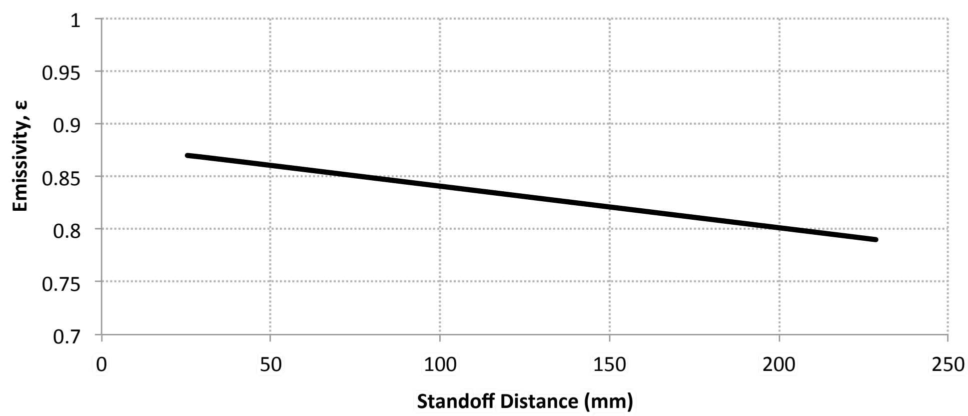
ADDITIONAL INFORMATION:

– Stated accuracy is under isothermal package conditions; for utmost accuracy, avoid abrupt temperature transients and gradients across the sensor's package.

– Point the sensor in the downstream direction (facing front of tire) to avoid contamination, pitting, and/or destruction of the sensor's lens from debris. Protective windows are available upon request.

– The *effective* emissivity of most tires ranges from approximately 0.75 to 0.90 in the 8 to 14 μm spectrum.

  - Generally, the emissivity should be lowered as the standoff distance (distance from tire to sensor) increases; this is particularly important with the 60˚ FOV sensor due to the larger standoff distances required. The suggested emissivity vs. standoff distance is shown in the graph below:



  - Lowering the emissivity increases the measured object temperature and vice versa

– Noise Equivalent Temperature Difference (NETD) increases with increasing sampling frequency:

  - Provided that tire surface temperature is highly transient, it is usually advantageous to use a higher sampling frequency at the cost of increased noise. A sampling frequency of 16 or 32 Hz is recommended for most applications.