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# **Temperature Monitor Cabled (set of four sensors)**

TMC04 – Tire Monitor Cabled  
BMC04 – Brake Monitor Cabled

Manual  
(11.06.2025)

v1.1 – Changed connector to DTM06-4S  
v1.2 – CAN Protocol Update (from firmware 0.130 onwards)  
v1.3 – first CANchecked release



## Temperature Monitor Cabled - Manual

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## Temperature Monitor Cabled - Manual

### 1. Introduction

Thank you for purchasing the Temperature Monitor Cabled. The following guide is aimed at providing an overview of the typical install process for both a single sensor as well as for a complete set.

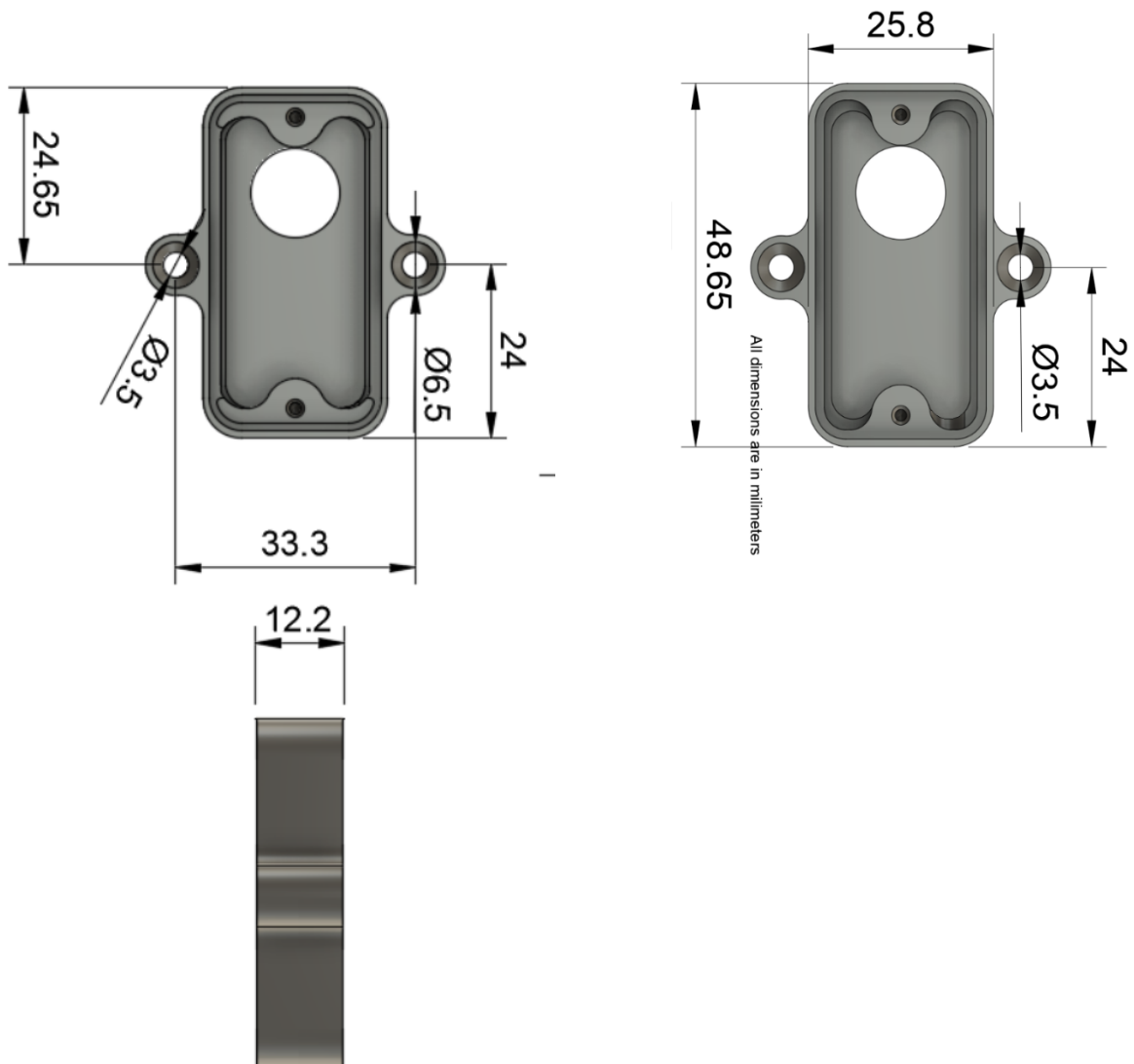
### 2. Specifications

<b>CAPABILITIES</b>	Number of Channels	16/8/4/1 (16 default)
	Sample Rate	1-64Hz (20Hz default)
	Field of view	110°
	Accuracy	1°C
	Emissivity	0.01 – 1
<b>ELECTRICAL</b>	Supply Voltage	5 – 20V
	Supply Current	15 mA
<b>PHYSICAL</b>	Dimensions	
	Weight	
	Protection Rating	IP66
<b>CONNECTIVITY</b>	Wiring	0.5m unterminated DTM04-4P
	CAN	2.0A (11bit identifier)
	Bit Rate	500kbps/1Mbps (500kbps default)

### 3. Physical Installation

Before installing the sensor in its final position, please ensure:

1. All the necessary configuration parameters have been set (number of channels and order, emissivity, startup delay time).
2. There are provisions for installing the required 120  $\Omega$  CAN bus termination resistors. Please see section '4. Electrical Installation' for further details



The sensor should be mounted in its final position using the mounting holes situated on the sides of the housing. For temporary installs we've successfully used 3M Dual-Lock tape, but extra care should be provided when using such a solution.

We do mount the sensor such that it avoids direct exposure to significant heat sources (i.e. exhausts).

The IR sensor has a horizontal field of view of 110°. As the sensor is placed further away, the maximum width of measured surface increases. Please consult the table and the graph below or get in touch if you have any questions. Please consult 'Figure 1' in order to determine how to orient the sensor.

Maximum Brake Width (mm)	Mounting Distance (mm)
100	35
150	52
225	79
250	88
275	96
300	105
350	123
400	140

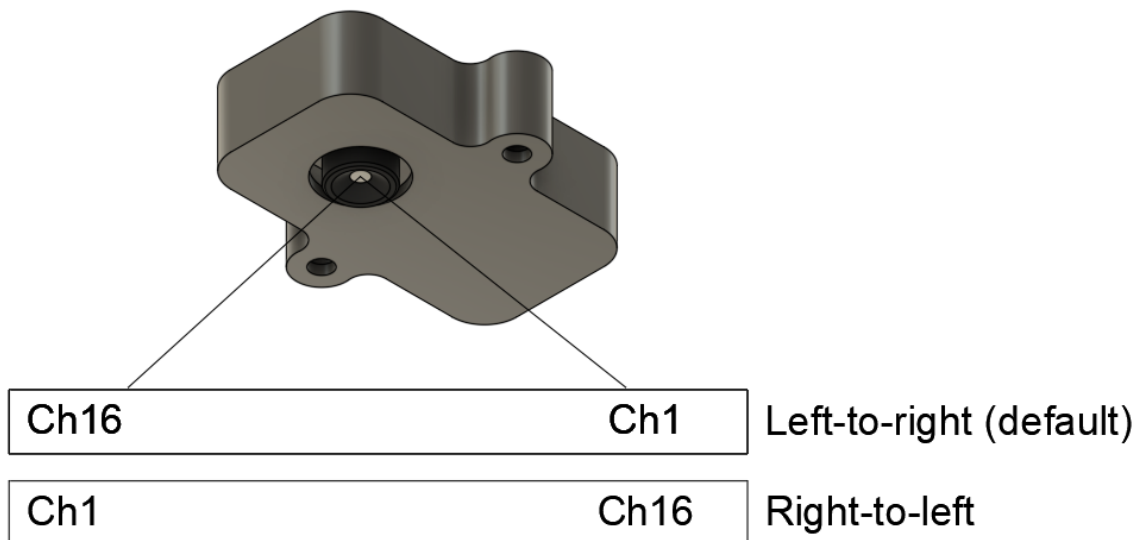


Figure 1 – Channel assignment / sensor data order

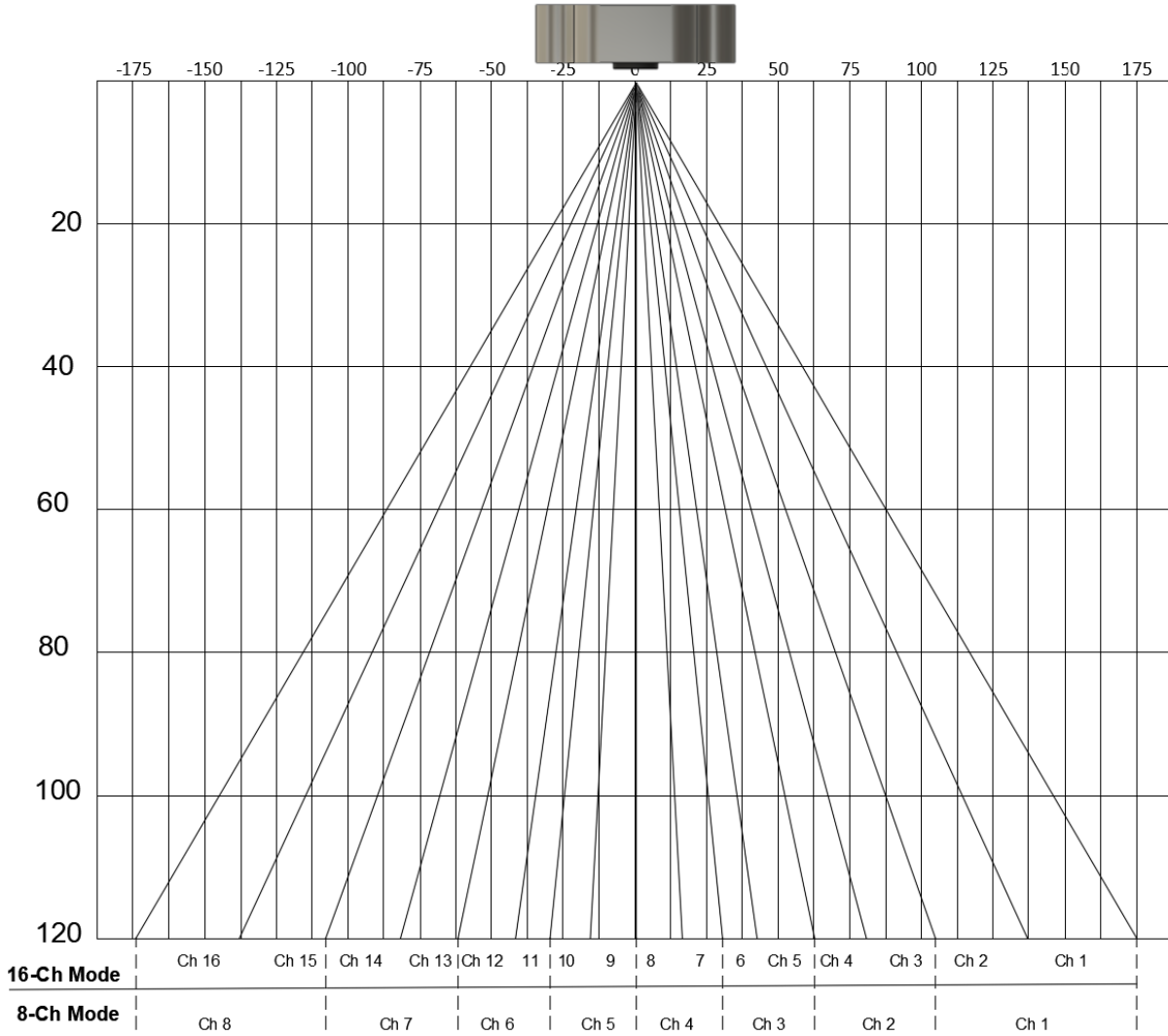


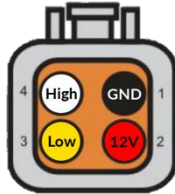
Figure 2 - Visual Representation of channel assignments (measures in millimeters)

Example: 245/35 Tire has a width of 245mm -> Round to 250mm. So, the Sensor must be placed 125mm from each side in the middle. This leads to a mounting distance of roughly 90mm above the surface of the tire when the car is standing still on the ground.

### 4. Electrical Installation

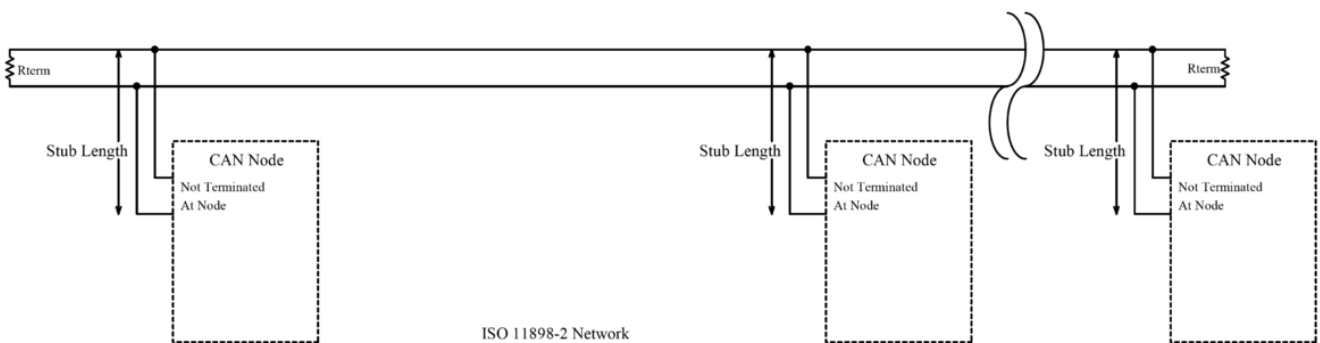
The kit's sensors will come with a DTM04-4P connector. The mating connector is DTM06-4S.

- Pin 1 - GND
- Pin 2 - 12V
- Pin 3 - CAN Low
- Pin 4 - CAN High



#### CAN Connectivity

Every CAN bus network requires two 120 Ohm resistors placed at each end, as the diagram below ( $R_{term} = 120\text{ Ohms}$ ) shows. If you are not familiar with CAN bus, we recommend that you consult with a professional. Incorrect installation can damage the devices or produce unsatisfactory performance.



Each sensor has a built-in 120 Ohm resistor that can be activated by soldering a jumper on the board. We generally recommend installing the resistor externally as it provides more flexibility.

Always use twisted paired cable for CAN Low and CAN High wiring as it greatly improves the signal's tolerance to electrical noise. Also try and keep wiring stubs (cables going from the main CAN bus lines to individual devices) at a minimum. Our sensors come with a 0.5m cable, it's generally ok to have another 0.5m in addition to that.



## 5. Configuration

The default settings are as follows, along with a short description of what their function is:

Parameter	Default Value	Function
<b>Transmit CAN Base ID</b>	Tire: 0x310 - Front Left 0x330 - Front Right 0x350 - Rear Left 0x370 - Rear Right  Brake: 0x210 - Front Left 0x230 - Front Right 0x250 - Rear Left 0x270 - Rear Right	Transmit Base CAN ID for all messages sent from the sensor
<b>Emissivity</b>	Tire: 0.75          Brake: 0.83	Lowering the emissivity increases the temperature.  Suggested tire values depending on mounting distance: <ul style="list-style-type: none"> <li>• 50mm - 0.86</li> <li>• 150mm - 0.8</li> <li>• 200 - 0.77</li> </ul> Suggested brake values depending on material of the disk: <ul style="list-style-type: none"> <li>• 0.83 - for ceramic disks</li> <li>• 0.55 - for normal steel disks</li> </ul> Accepted values (1 is 0.01): 1-100
<b>Sample Rate</b>	20 Hz	Sampling and reporting rate for the sensor



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<b>Number of Channels</b>	8	Number of channels used for sampling
<b>Sensor Data Order</b>	Left to Right ( <i>Figure 1</i> )	Channel numbering direction when looking at the sensor's camera
<b>CAN Bit Rate</b>	500 kbps	
<b>Initial Configuration Delay</b>	15 seconds	The delay, in seconds, between the sensor powering up and it starting to send temperature data over CAN. This is when new configuration parameters can be sent.

Please consult Appendix A: Temperature Monitor Cabled CAN Protocol for complete information on the CAN protocol.

### Typical Configuration Procedure:

1. Ensure the sensor is powered and with correct CAN connectivity to the device you're using to transmit CAN messages from.
2. If you're using a device with CAN sniffing capabilities, please confirm that, after powering the sensor, you're seeing the SYS\_INFO\_1 CAN (Base CAN ID + 0x08) message come in every 5 seconds during the initial configuration delay.
3. Form the configuration message (CFG\_REQ\_1) in your CAN transmit tool and, if valid, you'll receive back a response (CFG\_RSP\_1) to confirm the new settings. These get applied after a power cycle.

## 6. CAN Temperature Data Decoding

The complete format of temperature data reported by the sensor is described in Appendix A: Temperature Monitor Cabled CAN Protocol. The formula to calculate each individual channel is as follows:

$$\text{Temperature Value} = (\text{Byte 0} * 256 + \text{Byte 1}) / 10 - 200^{\circ}\text{C}$$



## 7. Troubleshooting / FAQ

### Situation 1: Not getting any data in my CAN dash/logger

- a. Use a multimeter to check that the sensor is getting 12V on its power supply pins.
- b. Double check wiring and make sure your CAN stubs' length is not more than 150cm. Ensure the correct 120 Ohm termination resistors are installed. If possible, simplify the connectivity by wiring the sensor directly to a CAN sniffer.
- c. If your CAN logger/dash allows you to, check that CAN receive count is increasing.
- d. Double-check the configuration parameters on your CAN dash/logger.
  - Baud Rate
  - CAN IDs
  - Formulas and byte order

### Situation 2: Can you suggest a USB-CAN configuration tool?

- a. We're working on our configuration tool with a dedicated interface for our products. Please keep in touch if you're interested in purchasing one.
- b. CAN BUS Analyzer Tool (Microchip, APGDT002)
- c. PCAN-USB (requires DB9 wiring adaptor)

## 8. Support

Please make sure to check the downloads section of our support page as it provides the product's datasheet and configuration files for the most common CAN dashboards/loggers.

### Downloads:

<http://www.canchecked.de/tmc04>



## Appendix A: Temperature Monitor Cabled

### CAN Communication Protocol V1.0

Updated 04.10.2024

#### A. Default CAN Specifications

1.

##### Transmit Base ID Tire

- FL - 0x310
- FR - 0x330
- RL - 0x350
- RR - 0x370

##### Transmit Base ID Brake

- FL - 0x210
- FR - 0x230
- RL - 0x250
- RR - 0x270

2. Baud Rate: 500kbps

#### B. System Configuration

**Name:** CFG\_REQ\_1

**Direction:** To Device

**CAN Id:** < Transmit Base ID -0x10> e.g.: Tire-FL:0x300

Byte	Name	Formula	Description
0	New Base Id MSB		New Base ID for CAN messages. Requires a power cycle. I.e. 0x310 would be: Byte 0 - 0x03 Byte 1 - 0x10
1	New Base Id LSB		
2	Emissivity	= Value / 100	I.e. setting to 75 is 0.75
3	Sample Rate	= Value	1 - 64 Hz (Values outside this range are replaced with the closest valid one)
4	Sensor Data Order	= Value	0 - temperatures are output right to left 1 - temperatures are output left to right



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5	Initial Configuration Duration (seconds)	= Value	Duration for the "Initial Configuration" phase. In seconds. Minimum value is 10s.
6	CAN Baud Rate	= 0 - 500kbps 1 - 1Mbps	Any value different than '0' or '1' will make the system default to 500kbps.
7	Number of Channels	= Value	1/4/8/16 (Invalid values are replaced with '4')

**Name:** CFG\_RFP\_1

**Direction:** From Device

**CAN Id:** <Transmit Base ID -0x09> e.g.: Tire-FL:0x301

Byte	Name	Formula	Description
0	New Base Id MSB		New Base ID for CAN messages. Requires a power cycle. I.e. 0x310 would be: Byte 0 - 0x03 Byte 1 - 0x10 <b>0xFF &amp; 0xFF for default address</b>
1	New Base Id LSB		
2	Emissivity	= Value / 100	I.e. setting to 75 is 0.75
3	Sample Rate	= Value	1 - 64 Hz (Values outside this range are replaced with the closest valid one)
4	Sensor Data Order	= Value	0 - temperatures are output right to left 1 - temperatures are output left to right
5	Initial Configuration Duration (seconds)	= Value	Duration for the "Initial Configuration" phase. In seconds. Minimum value is 10s.
6	CAN Baud Rate	= 0 - 500kbps 1 - 1Mbps	Any value different than '0' or '1' will make the system default to 500kbps.
7	Number of Channels	= Value	1/4/8/16 (Invalid values are replaced with '16')



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**The device echoes back the settings sent in the first message. <Base Id> is still the one before the change. New settings are applied after a power cycle.**



## C. System Information

**SYS\_INFO\_1** is sent until the "Initial Configuration" period expires.

**Name:** SY\_INFO\_1

**Direction:** From Device

**CAN Id:** < Transmit Base ID -0x02> e.g.: Tire-FL:0x308

**Time Interval:** Every 5s

Byte	Name	Formula	Description
0	FW Major		
1	FW Minor		
2	Emissivity	= Value / 100	I.e. setting to 75 is 0.75
3	Sample Rate	= Value	1 - 64 Hz (Values outside this range are replaced with the closest valid one)
4	Initial Configuration Duration (seconds)	= Value	Number of seconds to allow at startup for configuration.
5	Sensor Data Order	= Value	0 - temperatures are output right to left 1 - temperatures are output left to right
6	Num Chans	= Value	
7	Reserved		



## D. Data Reporting

After the <Initial Configuration Delay> expires, the following messages will be sent over CAN (depending on the configured number of channels)

- 1 x DATA\_TEMPS\_1 (Temperature Channels 0 - 3)
- 1 x DATA\_TEMPS\_2 (Temperature Channels 4 - 7)
- 1 x DATA\_TEMPS\_3 (Temperature Channels 8 - 11)
- 1 x DATA\_TEMPS\_4 (Temperature Channels 12 - 15)
- 1 x DATA\_SUMMARY (Sensor Information and Ambient Temperature)

**Name:** DATA\_TEMPS\_1

**Direction:** From Device

**CAN Id:** <Transmit Base ID > e.g.: Tire-FL:0x310

**Time Interval:** Depending on <Sample Rate>

Byte	Name	Formula	Description
0	Chan 0 MSB	= (Temp. Value + 200) * 10	The temperature reading is offset by 200* C and then multiplied by 10. This gives a usable reporting range of: -200 *C -> 6300* C with 0.1 *C per bit. I.e. 88.9*C => 2889 MSB: 0x0B LSB: 0x49
1	Chan 0 LSB		
2	Chan 1 MSB		
3	Chan 1 LSB		
4	Chan 2 MSB		
5	Chan 2 LSB		
6	Chan 3 MSB		
7	Chan 3 LSB		



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**Name:** DATA\_TEMPS\_2

**Direction:** From Device

**CAN Id:** <Transmit Base ID +0x01> e.g.: Tire-FL:0x311

**Time Interval:** Depending on <Sample Rate>

Byte	Name	Formula	Description
0	Chan 4 MSB	= (Value + 200) * 10	The temperature reading is offset by 200* C and then multiplied by 10. This gives a usable reporting range of: -200 *C -> 6300* C with 0.1 *C per bit.  I.e. 88.9*C => 2889 MSB: 0x0B LSB: 0x49
1	Chan 4 LSB		
2	Chan 5 MSB		
3	Chan 5 LSB		
4	Chan 6 MSB		
5	Chan 6 LSB		
6	Chan 7 MSB		
7	Chan 7 LSB		

**Name:** DATA\_TEMPS\_3

**Direction:** From Device

**CAN Id:** <Transmit Base ID+0x02> e.g.: Tire-FL:0x312

**Time Interval:** Depending on <Sample Rate>

Byte	Name	Formula	Description
0	Chan 8 MSB	= (Value + 200) * 10	The temperature reading is offset by 200* C and then multiplied by 10. This gives a usable reporting range of: -200 *C -> 6300* C with 0.1 *C per bit.  I.e. 88.9*C => 2889 MSB: 0x0B LSB: 0x49
1	Chan 8 LSB		
2	Chan 9 MSB		
3	Chan 9 LSB		



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4	Chan 10 MSB		
5	Chan 10 LSB		
6	Chan 11 MSB		
7	Chan 11 LSB		

**Name:** DATA\_TEMPS\_4

**Direction:** From Device

**CAN Id:** < Transmit Base ID +0x03> e.g.: Tire-FL:0x313

**Time Interval:** Depending on <Sample Rate>

Byte	Name	Formula	Description
0	Chan 12 MSB	= (Value + 200) * 10	The temperature reading is offset by 200* C and then multiplied by 10. This gives a usable reporting range of: -200 *C -> 6300* C with 0.1 *C per bit.  I.e. 88.9*C => 2889 MSB: 0x0B LSB: 0x49
1	Chan 12 LSB		
2	Chan 13 MSB		
3	Chan 13 LSB		
4	Chan 14 MSB		
5	Chan 14 LSB		
6	Chan 15 MSB		
7	Chan 15 LSB		



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**Name:** DATA\_SUMMARY

**Direction:** From Device

**CAN Id:** < Transmit Base ID +0x04> e.g.: Tire-FL:0x314

**Time Interval:** Every10s

Byte	Name	Formula	Description
0	FW Major		
1	FW Minor		
2	Emissivity	= Value / 100	I.e. setting to 75 is 0.75
3	Sample Rate	= Value	1 - 64 Hz (Values outside this range get truncated to the closest valid one)
4	Reserved	= Value	
5	Sensor Data Order	= Value	0 - temperatures are output right to left 1 - temperatures are output left to right
6	Num Chans	= Value	
7	Ambient Temperature	= Value + 100	Ambient temperature around the sensor