タイヤ内部温度計測システム

タイヤ内部温度センサーは、ワイヤレスでタイヤの内部温度と圧力を計測することができます。

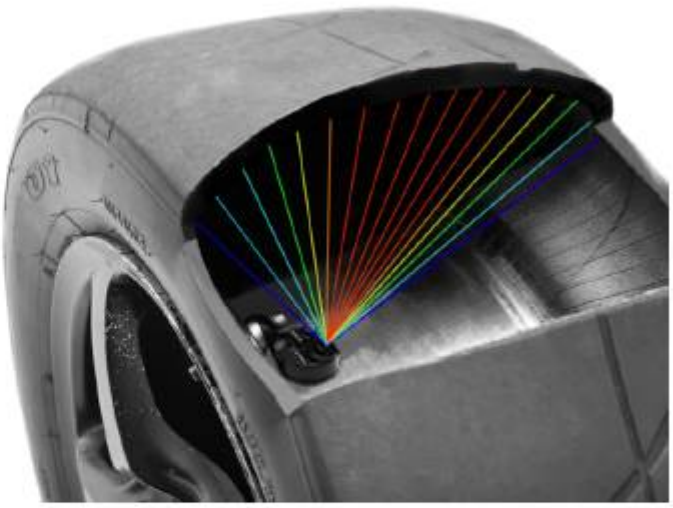
小型軽量でタイヤ内部に設置できる設計になっています。

内部の温度センサーは、タイヤの内部温度を横一列に16ch に分けて計測します。

タイヤ内の圧力は 24bit の分解能をもつセンサーで計測されます。

測定されたデータは無線で、受信機に転送され、受信機から CAN で出力されます。

注：使用される無線機は日本の電波法のライセンスは取得していません。



SPECIFICATIONS – TTPMS SENSOR

Pressure, Range (Gauge)	0 to 5000 mBar
Pressure, Resolution	1 mBar
Pressure, FS Accuracy (typ)	±10 mBar
Internal Temperature, Range	-40 to 150˚C
Internal Temperature, Resolution	0.1˚C
Internal Temperature, FS Accuracy	±1.0˚C
IR Temperature, Range	-20 to 300˚C
IR Temperature, Resolution	0.1˚C
IR Temperature, Accuracy (typ)	±3.0˚C
Sampling Period at Speed	1.2 seconds
Operating Temperature Range*	0 to 135˚C
Battery Life (typ)	1.5 million transmissions
Encryption	AES-128
RF Frequency	868, 915, 920 MHz
RF Output Power	1mW
Wireless Range, Open Space	> 100m

*Will survive brief temperature excursions < 150˚C

SPECIFICATIONS – RECEIVER

Voltage Input	5 to 16 V
Supply Current	30 mA
Temperature Range	-20 to 85˚C
Max No. of Sensors	120 (30 / corner)
RF Center Frequency	868, 915, 920 MHz
Sensitivity (typ)	-110dBm

MECHANICAL SPECS – SENSOR

Weight	21 ± 1g
Material	7075-T6
Max. Centrifugal Accel.	2000G (SF = 3)
L x W x H (max)	44 x 32 x 18 mm
Protection Rating	IP61

MECHANICAL SPECS – RECEIVER

Weight	18 ± 1g
Material	6061-T6
L x W x H (max)	50.5 x 35.5 x 8 mm
Protection Rating	IP65

VBOX JAPAN 株式会社　222-0035 横浜市港北区鳥山町 237 番地　カーサー鳥山 202　August 2018
Tel 045-475-3703　Fax 045-475-3704　E-mail support@vboxjapan.co.jp　Web www.vboxjapan.co.jp

RACELOGIC VBOX

タイヤ内部温度計測システム

CAN SPECIFICATIONS – RECEIVER

Standard	CAN 2.0A, ISO-11898	
Bit Rate	1 Mbit/s (configurable)	
Byte Order	Big-Endian / Motorola	
Data Conversion	1 integer per bit	SN, TC, Node ID
	1 dBm per bit	RSSI
	1mV per bit	Battery Voltage
	1 mBar per bit	Pressure
	0.1˚C per bit, -100˚C offset	Temperature
	(all variables unsigned except RSSI)	
Base CAN ID (default)	1030 (Dec) / 0x406 (Hex)	
Termination	None	

WIRING SPECS – RECEIVER:

Wire	M22759/32-26, DR25
Cable Length	500 mm
Connector	None

Supply Voltage, V_s	Red
Ground	Black
CAN +	Blue
CAN -	White

CAN MESSAGE STRUCTURE – RECEIVER:

CAN ID: 0x406 (LF) / 0x40C (RF) / 0x412 (LR) / 0x418 (RR)

Serial Number		Battery Voltage		Pressure		Gauge Pressure	
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: 0x407 (LF) / 0x40D (RF) / 0x413 (LR) / 0x419 (RR)

Infrared Temp, CH 1		Infrared Temp, CH 2		Infrared Temp, CH 3		Infrared Temp, CH 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: 0x408 (LF) / 0x40E (RF) / 0x414 (LR) / 0x41A (RR)

Infrared Temp, CH 5		Infrared Temp, CH 6		Infrared Temp, CH 7		Infrared Temp, CH 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: 0x409 (LF) / 0x40F (RF) / 0x415 (LR) / 0x41B (RR)

Infrared Temp, CH 9		Infrared Temp, CH 10		Infrared Temp, CH 11		Infrared Temp, CH 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: 0x40A (LF) / 0x410 (RF) / 0x416 (LR) / 0x41C (RR)

Infrared Temp, CH 13		Infrared Temp, CH 14		Infrared Temp, CH 15		Infrared Temp, CH 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)

CAN ID: 0x40B (LF) / 0x411 (RF) / 0x417 (LR) / 0x41D (RR)

Transmission Count		RSSI		Sensor Temperature		Sensor Node ID	
Byte 0 (MSB)	Byte 1 (LSB)	Byte 2 (MSB)	Byte 3 (LSB)	Byte 4 (MSB)	Byte 5 (LSB)	Byte 6 (MSB)	Byte 7 (LSB)

* The base CAN ID (0x406) is adjustable

VBOX JAPAN 株式会社 222-0035 横浜市港北区鳥山町 237 番地 カーサー鳥山 202 August 2018
Tel 045-475-3703 Fax 045-475-3704 E-mail support@vboxjapan.co.jp Web www.vboxjapan.co.jp

BASE CAN ID PROGRAMMING – RECEIVER:

To modify the wireless receiver's base CAN ID, sensor assignment mode, or bit rate, send the following CAN message at 1Hz for at least 10 seconds and then reset the receiver by disconnecting power for 5 seconds. For more details and options, refer to the Appendix.

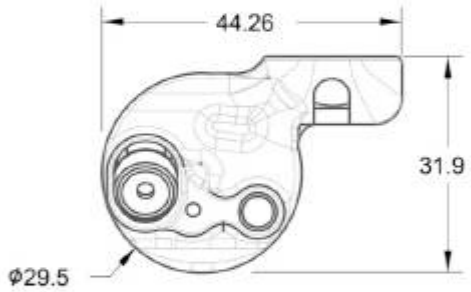
CAN ID = Base ID (Default = 0x406)

Programming Constant		New CAN Base ID (11-bit)		Sensor Assignment	Bit Rate	Emissivity	
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 = Default 2 = Custom	1 = 1 Mbit/s 2 = 500 kbit/s 3 = 250 kbit/s 4 = 125 kbit/s	1 = Default 2 = Custom	

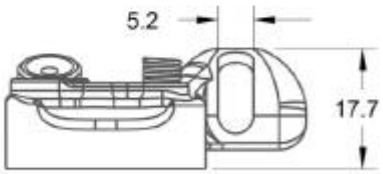
CAN messages should only be sent to the receiver during the configuration sequence.
DO NOT continuously send CAN messages to the receiver.

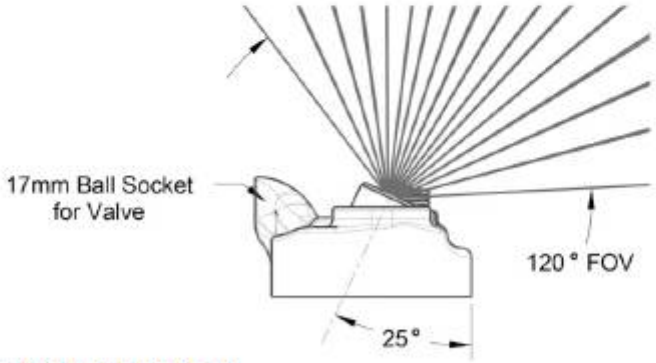
DIMENSIONS:

TTPMS Sensor, TTPMS-V2

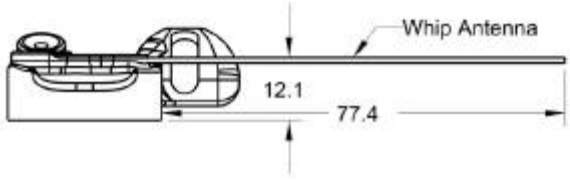


ALL DIMENSIONS IN MM

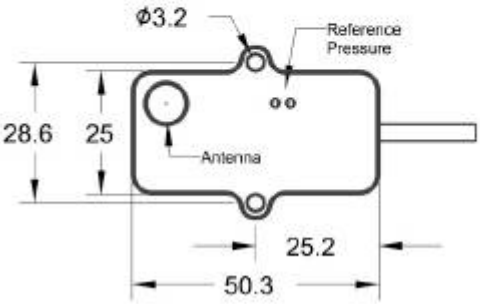




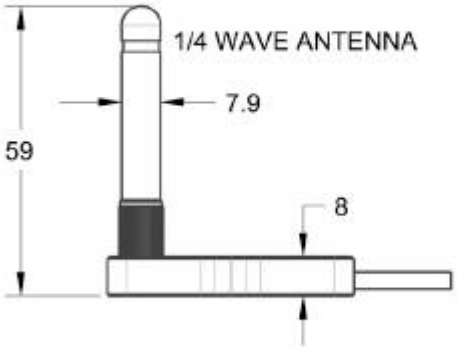
WHIP ANTENNA VARIANT

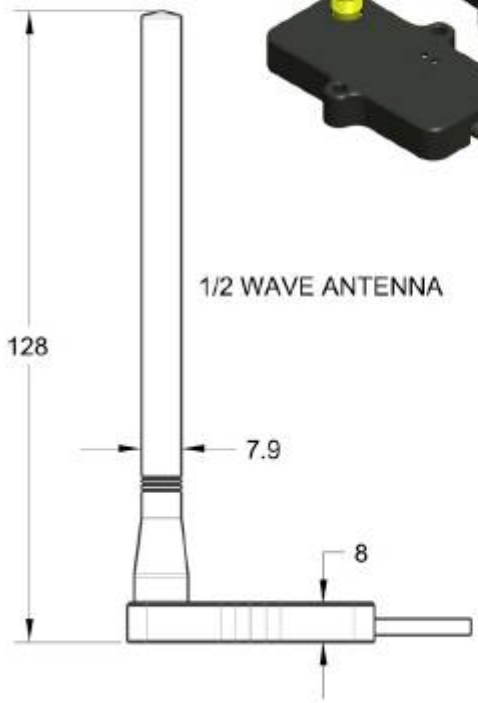


TTPMS Receiver, W-REC-V2

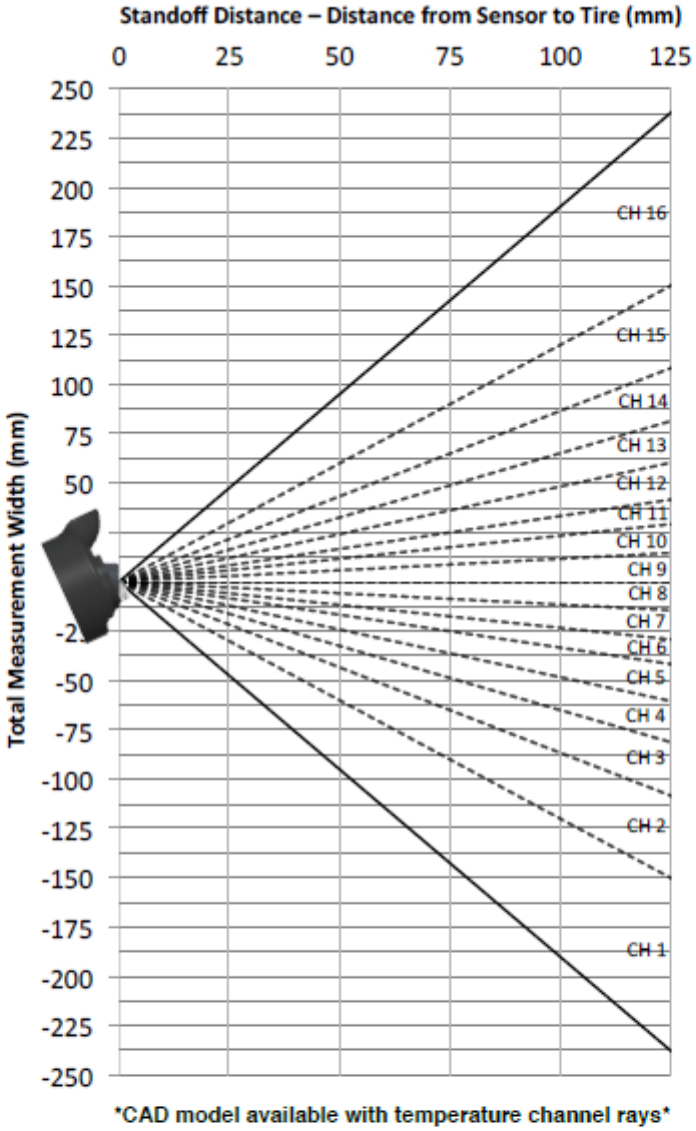


ALL DIMENSIONS IN MM





120˚ Field-of-View, Spatial Mapping of Temperature Channels:



CAD model available with temperature channel rays

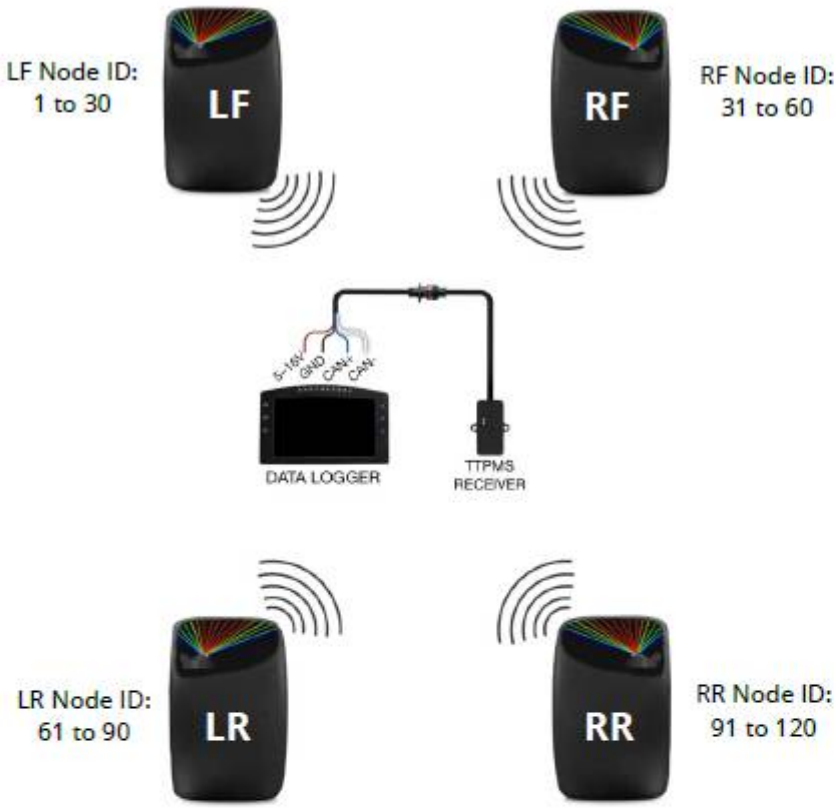
TRANSMISSION RATE:

State	Criteria	Data	Update Period
Uninflated or Cold	P_{gauge} < 250mBar T_{sensor} < 5˚C	None	N/A (sleeping)
Inflated	P_{gauge} > 250mBar	Pressure	240 seconds
Inflated & Heated	P_{gauge} > 250mBar T_{sensor} > 40˚C	Pressure	10 seconds
Inflated & ΔP	P_{gauge} > 250mBar ΔP_{gauge} > 10mBar	Pressure, Infrared	1.2 seconds*
Rotation	Wheel movement	Pressure, Infrared	1.2 seconds*

* 10 second overrun before switching to lower state / longer update period

タイヤ内部温度 計測システム

SYSTEM LAYOUT (DEFAULT):



- Place receiver near center of car, in cockpit, with antenna perpendicular to any metal or carbon-fiber surface. Most applications will only require one receiver, but a chassis with difficult RF penetration may require two receivers (front and rear).

TIRE CORNER ASSIGNMENT – TTPMS SENSOR:

- By default, each TTPMS sensor is assigned to a specific corner/tire with a unique Node ID:

  LF Node ID's: 1 to 30

  RF Node ID's: 31 to 60

  LR Node ID's: 61 to 90

  RR Node ID's: 91 to 120

- The corner assignment for each Node ID is adjustable; refer to the Appendix for details.
- Each team/set will be assigned a receiver with a unique Network ID and AES-128 encryption, therefore, protecting data between teams and cars.
- The receiver will acquire data from all active TTPMS sensors in the pits but will only receive data from the fitted, active tires when away from the pits.

ADDITIONAL INFORMATION:

- Battery life depends on a multitude of operating conditions but will typically exceed 1 million transmissions (347 track hours) or up to approximately 3 years.
    - The TTPMS sensor is fitted with a serviceable battery.
- The maximum recommended sensor temperature is 120˚C for utmost reliability and battery life, but transient temperature excursions up to 150˚C are survivable.
- To avoid dropped packets, the average Received Signal Strength Indication (RSSI) should be no less than -90dBm.
    - Two receivers may be used when signal strength is too weak with one receiver.
- Do not wash the TTPMS sensors – keep dry.
- Do not repeatedly remove and reinstall the sensor & valve assembly.