WHEEL TURTLE®
Bluetooth Protocol
Version 2.1 Dec 2024

Bluetooth Standard: Bluetooth 4. (Bluetooth Low Energy - BLE)

Advertised Device Names:

TPWT-xx-yyyyyyyyyy

Where:
- xx = wheel location. (LF, RF, LR, RR)
- Yyyyyyyyyy = 10 character device ID starting with WT containing numbers and upper case letters
- Device ID is printed on wheel turtle serial number label.

Service UUID:

"1ff5"

Characteristic UUIDs:

Data Characteristic 1 – Tyre Data: (read,notify)

Left Front (LF):	"0100"
Right Front (RF):	"0102"
Left Rear (LR):	"0101"
Right Rear (RR):	"0103"

Data Characteristic 2 – Accessory Data: (read,notify). (optional PRO version only)

Left Front (LF):	"0104"
Right Front (RF):	"0106"
Left Rear (LR):	"0105"
Right Rear (RR):	"0107"

Config Characteristic: (ready, write, notify)

"0008"

Thermal Image Characteristic: (read, notify)

"0009"

Message Formats:

Data Characteristic 1 – Notify format: updating at 8-15 times per second depending on sensor model.

Each notification data message is a single comma delimited blob. The blob value could be any length, but the correct part of the message is null terminated (0x0).

The blob contains a Utf-8 single line comma delimited string for each update that contains a header code and then PID and value pairs for each data item:

Item	Format	Notes
Header	"$TPWT$"	Fixed string
Device ID:	"00:yyyyyyyyyy"	yyyyyyyyyy = 10 character device ID starting with WT containing numbers and upper case letters Device ID is printed on wheel turtle serial number label.
Wheel position code:	"xxx"	xxx = 3 digit wheel position ID: LF = "C3A" RF = "C3B" LR = "C3C" RR = "C3D"
Distance Sensor:	"xxxA:ddd"	xxx = 3 digit wheel position ddd = 1-4 digit distance integer in mm
Temperature 1:	"xxx0:ttt"	xxx = 3 digit wheel position ttt = 1-3 character integer of temp in degrees Celsius
Temperature 2:	"xxx1:ttt"	xxx = 3 digit wheel position xxx = 3 digit wheel position ttt = 1-3 character integer of temp in degrees Celsius
Temperature 3:	"xxx2:ttt"	xxx = 3 digit wheel position ttt = 1-3 character integer of temp in degrees Celsius
Temperature 4:	"xxx3:ttt"	xxx = 3 digit wheel position ttt = 1-3 character integer of temp in degrees Celsius
Temperature 5:	"xxx4:ttt"	xxx = 3 digit wheel position ttt = 1-3 character integer of temp in degrees Celsius
Temperature 6:	"xxx5:ttt"	xxx = 3 digit wheel position ttt = 1-3 character integer of temp in degrees Celsius
Temperature 7:	"xxx6:ttt"	xxx = 3 digit wheel position ttt = 1-3 character integer of temp in degrees Celsius
Temperature 8:	"xxx7:ttt"	xxx = 3 digit wheel position ttt = 1-3 character integer of temp in degrees Celsius
Tyre Colour Sensor RGB Red:	"xxxB:rrr"	xxx = 3 digit wheel position rrr = integer 0-255 representing red component of RGB colour of tyre.
Tyre Colour Sensor RGB Green:	"xxxC:ggg"	xxx = 3 digit wheel position ggg = integer 0-255 representing red component of RGB colour of tyre.

Tyre Colour Sensor RGB Blue:	"xxxD:bbb"	xxx = 3 digit wheel position bbb = integer 0-255 representing red component of RGB colour of tyre.
Wheel Turtle Battery level:	"xxxE:ccc"	xxx = 3 digit wheel position ccc = 0-100 integer representing battery charge percentage
Wheel Turtle Ambient Temperature	"xxxF:ttt"	xxx = 3 digit wheel position ttt = 1-3 character integer of temp in degrees Celsius
End of Data	0x0	Null end of string marker.

Example:

$TPWT$,00:WT15ZS4F0L,C3DA:67,C3D0:24,C3D1:28,C3D2:28,C3D3:28,C3D4:27,C3D5:27,C3D6:25,C3D7:26,C3DB:188,C3DC:133,C3DD:133,C3DE:100,C3DF:23,

Data Characteristic 2 – Notify format: updating at 8-15 times per second depending on sensor model.

This is an optional characteristic. It may not exist for older firmware devices or some models of Wheel Turtle.

Each notification data message is a single comma delimited blob. The blob value could be any length, but the correct part of the message is null terminated (0x0). The blob contains a Utf-8 single line comma delimited string for each update that contains a header code and then PID and value pairs for each data item:
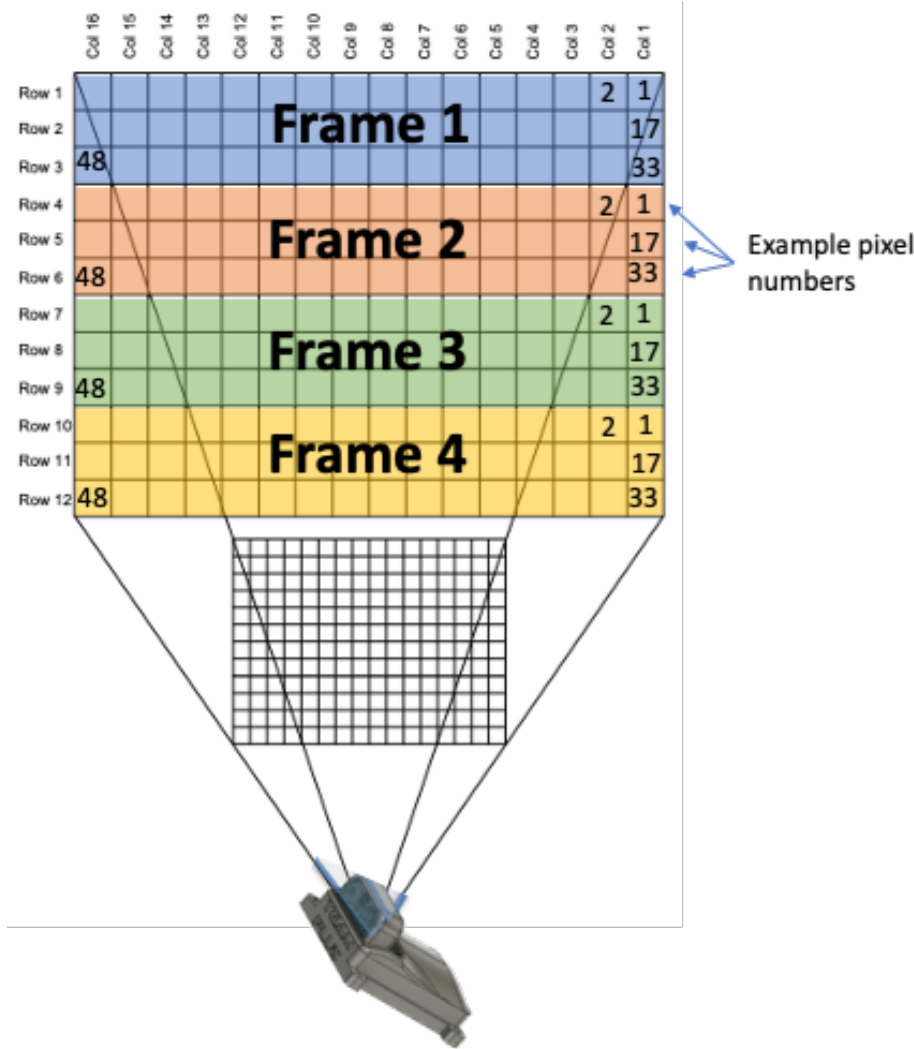
Item	Format	Notes
Header	"$TPWT2$"	Fixed string
Wheel Turtle Device ID:	"00:yyyyyyyyyy"	yyyyyyyyyy = 10 character device ID starting with WT containing numbers and upper case letters Device ID is printed on wheel turtle serial number label.

Wheel position code:	"xxx"	xxx = 3 digit wheel position ID:
		    LF = "C30"
		    RF = "C31"
		    LR = "C32"
		    RR = "C33"

Closest TPMS Device ID:	"xxx0:yy:yy"	yy:yy = 2 digit hex, colon, 2 digit hex ID of TPMS is stamped onto the TPMS cover
TPMS Signal Strength:	"xxx1:sss"	xxx = 3 digit wheel position sss = 1-3 character integer of signal RSSI
TPMS Pressure:	"xxx2:ppp"	xxx = 3 digit wheel position ppp = 1-3 character integer of pressure in kPa
TPMS Temperature:	"xxx3:ttt"	xxx = 3 digit wheel position ttt = 1-3 character integer of temp in degrees Celsius
TPMS Battery:	"xxx4:v.v"	xxx = 3 digit wheel position v.v = volts with 1 decimal place

TPMS Connected:	"xxx5:b"	xxx = 3 digit wheel position
		b = binary integer indicating if Wheel Turtle is currently connected to this TPMS.
		    0=not connected
		    1=connected

Closest Brake Turtle Device ID:	"6:yyyyyyyyyy"	yyyyyyyyyy = 10 character device ID starting with BT containing numbers and upper case letters
Brake Turtle Signal Strength:	"xxx7:sss"	xxx = 3 digit wheel position sss = 1-3 character integer of signal RSSI
Brake Temperature:	"xxx8:tttt"	xxx = 3 digit wheel position tttt = 1-4 character integer of temp in kelvin
Brake Turtle Ambient Temperature:	"xxx9:ttt"	xxx = 3 digit wheel position ttt = 1-3 character integer of temp in kelvin
Brake Turtle Battery:	"xxxA:v.v"	xxx = 3 digit wheel position v.v = volts with 1 decimal place
Brake Turtle Connected:	"xxxB:b"	xxx = 3 digit wheel position

		b = binary integer indicating if Wheel Turtle is currently connected to this Brake Turtle.
		   0=not connected
		   1=connected

End of Data	0x0	Null end of string marker.

Example:

$TPWT2$,00:WT15ZS4F0L,C300:3d:4d, C301:-88,C302:120,C303:28,C304:3.1,C305:1,C306:BTW4CA12AB,C307:-66,C308:3500,C309:133,C30A:5.1,C30B:1,

Thermal Image Characteristic – Notify format: updating at 1-2 times per second
Each notification data message is a single comma delimited blob. The blob value
could be any length, but the correct part of the message is null terminated (0x0).
Image size is 16 columns x 12 rows. (a total of 192 pixels)
each image is broken into 4 frames of 48 pixels representing 3 rows of the image

4 messages (frames) sent per update, 1 per frame.
Utf-8 comma delimited strings are notified for each
message contains a header code and pixel heat values in degrees Celsius.

Item	Format	Notes
Header	"$TPWTTx$"	Where x is the frame number (1-4) of the message. Each message should contain 4 frames.
Wheel position code:	"xxx"	xxx = 3 digit wheel position ID: LF = "C3A" RF = "C3B" LR = "C3C" RR = "C3D"
Thermal Image Temperatures for this frame:	48 comma delimited integers of 0-300 degrees Celsuis	

End of Data	0x0	Null end of string marker.

Example:

$TPWTT1$,C3D,23,24,24,23,24,24,24,24,24,23,24,25,25,26,27,28,24,24,24,23,24,24,23,23,23,23,24,24,25,25,25,26,27,23,24,24,24,23,23,23,23,23,23,24,24,24,25,26,26,

$TPWTT2$,C3D,23,24,24,24,23,24,24,24,27,23,24,25,25,26,27,28,24,24,24,23,24,24,23,23,23,23,24,24,25,25,25,26,27,23,24,24,24,23,23,23,23,23,23,24,24,24,25,26,26,

$TPWTT3$,C3D,23,24,24,24,23,24,24,24,24,23,26,25,25,22,27,28,24,24,24,23,24,24,23,23,23,23,24,24,25,25,25,26,27,23,24,24,24,23,23,23,23,23,23,24,24,24,25,26,26,

$TPWTT4$,C3D,23,24,24,24,23,24,24,24,23,24,25,22,26,27,28,24,24,24,23,24,24,23,23,23,23,24,25,25,25,26,27,23,24,24,24,23,23,23,23,23,23,24,24,24,25,26,26,

Config Characteristic

Notify format: updating every 1-5 seconds

Each message is a single comma delimited blob. The blob value could be any length, but the correct part of the message is null terminated (0x0).

UTF-8 single line comma delimited string for each update that contains a header code and then each data item:

Item	Format	Notes
Header	"$TPWTS$"	Fixed string
Wheel Turtle Device ID:	"00:yyyyyyyyyy"	yyyyyyyyyy = 10 character device ID starting with WT containing numbers and upper case letters Device ID is printed on wheel turtle serial number label.
Wheel location code setting:	"x"	x = 1 digit wheel position ID: LF = "1" RF = "2" LR = "3" RR = "4"
Wheel Reverse setting:	"b"	b = binary integer indicating if temps 1-8 are being sent in normal or reverse order. User changes to suit how they mounted the sensor 0 = normal temp direction 1 = reverse temp direction
Distance Sensor Scale setting:	"xx.xx"	xx.xx = value used to scale distance sensor.
Distance Sensor Offset setting:	"xx.xx"	xx.xx = value used to offset distance sensor.
Temp Sensor Scale setting:	"xx.xx"	xx.xx = value used to scale temp sensor values.
Temp Sensor Offset setting:	"xx.xx"	xx.xx = value used to offset temp sensor values.
Use Colour sensor White LED:	"b"	b = binary integer representing if the white LED should be used for colour sensor 0 = no 1 = yes (always no at the moment)
Colour Sensor LED trigger level setting:	"n"	n = colour sensor on/off trigger level setting. Not currently used.
Wheel Turtle Model String:	String	Text String with name of Wheel Turtle Model from firmware
Wheel Turtle Temp Sensor Type:	String	Text String with sensor type from firmware
Wheel Turtle Firmware Version:	String	Text String with Wheel Turtle firmware version from firmware
End of Data	0x0	Null end of string marker.

Write format:
    Used to update Wheel Turtle Settings
    Write a UTF-8 single line comma delimited string:

Item	Format	Notes
Header	"$TPWTU$"	Fixed string

Wheel location code setting:	"x"	x = 1 digit wheel position ID:
		  LF = "1"
		  RF = "2"
		  LR = "3"
		  RR = "4"

Wheel Reverse setting:	"b"	b = binary integer indicating if temps 1-8 are being sent in normal or reverse order. User changes to suit how they mounted the sensor 0 = normal temp direction 1 = reverse temp direction
Distance Sensor Scale setting:	"xx.xx"	xx.xx = value used to scale distance sensor.
Distance Sensor Offset setting:	"xx.xx"	xx.xx = value used to offset distance sensor.
Temp Sensor Scale setting:	"xx.xx"	xx.xx = value used to scale temp sensor values.
Temp Sensor Offset setting:	"xx.xx"	xx.xx = value used to offset temp sensor values.
Use Colour sensor White LED:	"b"	b = binary integer representing if the white LED should be used for colour sensor 0 = no 1 = yes (always no at the moment)
Colour Sensor LED trigger level setting:	"n"	n = colour sensor on/off trigger level setting. Not currently used.

For latest updates please check http://wheelturtle.com