TMT250 Bluetooth® 4.0 settings

☐

Contents

Disclaimer

If you are not using Bluetooth®, **please consider turning it off** or **change Bluetooth® PIN** to remove potential risks.

If you are using Bluetooth® we strongly recommend **using AES encryption** for enhanced security.

Bluetooth® 4.0 settings

TMT250 offers Bluetooth® 4.0 (Bluetooth® Low Energy, also referred as BLE) functionality.

Configurable parameters:

- **Non Stop Scan** - Enabled Non Stop Scan feature, the device will try to scan for the sensors all the time if any of them are configured.
- **BLE Scan Start period** - Device will start BLE scanning at each period. Not used if 'Non Stop Scan' is enabled.
- **BLE Scan Duration** - At each scan period start, device will scan for BLE Scan duration. Not used if 'Non Stop Scan' is enabled.
- **Scan retries until error** - Configured scan retries, to show the Error Value '3000' - sensor disconnected.
- **BT Power Level'** *- Higher level will allow device to be seen at a longer distance, but will increase power usage.*
- **BLE broadcasting service ID** - This service ID will be placed into device's advertising message. Needs to be specified, in order to start broadcasting.
- **BLE connection control** - Allows other devices to connect via BLE.
- **Backup Tracker** - Enables Backup Tracker feature.
- **Sensor Configuration** – Custom Sensor - Bluetooth® connection mode. *Disabled*:

Bluetooth® 4.0 connection will not be used. **TZ-BT04/05/05B sensor***:* this Bluetooth® connection will be used to communicate with TZ-BT04/05/05B sensor. **Advanced** - It allows to gather data from BLE device's broadcast packets regardless of what data packing protocol is used. EYE Sensor - allows to read EYE Sensor data by Name or MAC address.

Configuration modes

Non Stop Scan Enabled.

In Configurator when Non Stop sensor scans is active update frequency & scan retries until error will be hidden. Although BLE scan duration will still be active because it is important for btgetlist SMS command.

Non Stop Scan Disabled, Scan period is selected manually.

From the picture above, the Scan time period will be selected from two sources, **BLE Scan Duration -** the time when sensors are scanned and the **Update frequency** - The time when the sensor information is packed as the AVL Data record.

For example:

Update frequency *- 120 seconds.*

BLE Scan Duration *- 60 Seconds*

Device will start the first scan after 120 seconds and will scan nearby BLE devices for 60 seconds to update configured sensor data. The sensor data will be updated every 120 seconds. Update Frequency is counted even while a scan is performed.

Update frequency period passes. 120 seconds -> 0 seconds, a 60 second scan is initiated. Update Frequency countdown is restarted (countdown from configured value to 0) while the scan (according to the BLE Scan duration parameter) is performed.

Advanced Mode

When Advanced mode is selected a table with configurable parameters will appear:

- The table has 9 types of parameters:
    1. Type – EIR data type. This parameter will indicate which type to look for and work with. Note: We have also added type with value 0xFE which will indicate to work with a whole data packet and not just a single data type.
    2. Data Offset – start index of data we are interested in.

3. Data Size – size of the data we are interested in.
4. Action – two actions are possible: Match and Save. Match means that we want to perform a validation of certain data. Save means that we want to get certain data and later save it to an AVL record.
5. IO – tells which IO element's data will be saved to. **Used only with Save action.**
6. Match – hex string to be matched with BLE sensor data. **Used only with Match action.**
7. Endianness – endianness of data: little endian (ex. 0x1122) or big endian (ex. 0x2211). **Used only with Save action.**
8. Multiplier – value to be used to multiply output data. **Used only with Save action.**
9. Offset – value to be added to output data. **Used only with Save action.**

EYE Sensors

Note: Feature only available from firmware version 55.02.03.Rev.02 and later.

For this feature to work **BLE Devices** need to be selected under Beacon List - Beacon Detection.

When **EYE Sensors** is selected, Eye Sensor connectionless functionalities or EYE list search window will appear, depending on the selected EYE Sensor filter.

Name

When EYE Sensors Filter is set to **Name**, the Eye List search window will appear on the configurator. With this setting, separate EYE Sensor records (AVL ID: 11317) will be generated according to the configured parameters, which are described below:

- **Data Clear period**- defines how long the FM tracker waits when the Eye sensor is not detected before removing it from the Eye Sensor list and not sending the sensor values. If Data Clear Period is set to 0, then the EYE Sensor will not be removed from the EYE Sensor list and it will always be included in the periodic records.

- **RSSI**- Parameter defines the dBm threshold value of when the EYE sensor will be added to the sensor list. If the FM tracker detects the RSSI lower than the configured value, it will not be added to the EYE Sensor list.

- **Record period** - Defines how often the EYE Sensor record (AVL ID: 11317) will be generated when tracker is operating On Stop or On Move modes.

- **EYE Sensor Settings** - Define what sensor readings data is included in to the EYE Sensor Records. Sensor readings which are not needed can be disabled, to reduce data consumption.

- **EYE Name list** - Defines what EYE sensors will be added to EYE Sensor list. For EYE Sensors to be added to the list, only the beginning part of the EYE Sensor local name has to match. For example, if in the EYE name list "EYE_SENSOR" is added and the FM tracker detects EYE_SENSOR1, EYE_SENSOR2, EYE_SENSORXYZ, all these EYE Sensors will be added to EYE Sensor list. If the EYE name list is left empty, all the detected EYE Sensors will be included in the EYE Sensor list. **NOTE:** If EYE Sensor has a name that matches configured one in EYE Name List and if it has a MAC address, that matches configured one in EYE Sensors filtered by MAC address, then such sensor will not be added to EYE Sensor list, but it's data will be added according EYE Sensor filtered by MAC IO elements.

Once Eye Sensor filtering by name list is selected, EYE Sensor records containing the AVL ID:11317 will start being generated. Below is an example of how EYE Sensor data is packed into AVL ID 11317

AVL ID 11317 structure

Eye Sensor #1

EYE Sensor #1 Data length	1 byte
1st Parameter ID	1 byte
1st Parameter Data Length	1 byte
1st Parameter Data	variable
2nd Parameter ID	1 byte
2nd Parameter Data Length	1 byte
2nd Parameter Data	variable
<...>	
Nth Parameter ID	1 byte
Nth Parameter Data Length	1 byte
Nth Parameter Data	variable

Eye Sensor #2

Eye Sensor #2 Data length	1 byte
1st Parameter ID	1 byte
1st Parameter Data Length	1 byte
1st Parameter Data	variable
2nd Parameter ID	1 byte
2nd Parameter Data Length	1 byte
2nd Parameter Data	variable
<...>	
Nth Parameter ID	1 byte
Nth Parameter Data Length	1 byte
Nth Parameter Data	variable

Eye Sensor #N

...   ...

Parameter IDs are used to identify what type of EYE Sensor information is included in the packet. Below is the table describing the possible EYE Sensor parameter IDs, along with their data type and data length.

Table 1. EYE Sensor Parameter IDs

Parameter ID	Name	Data type	Description
5	Eye Sensor Device Name	Array	Device's name from Device Name List tab
6	EYE Sensor Temperature	2 byte signed integer	Temperature value measured by EYE Sensor from List Values from -32768 to +32768 with 0.01 C delta
7	EYE Sensor Humidity	1 byte unsigned integer	Humidity measured by EYE Sensor from List Values from 0 to 100%
8	EYE Sensor Magnet presence	1 byte unsigned integer	Magnet measured by EYE Sensor from List Values from 0 to1
9	EYE Sensor Movement presence	1 byte unsigned integer	Movement measured by Eye Sensor from List Values
10	EYE Sensor Movement count	2 byte unsigned integer	Movement counts measured by EYE Sensor from List Values

11	EYE Sensor Pitch	1 byte signed integer	Pitch angle measured by Eye Sensor from list Values
12	EYE Sensor Angle Roll	2 byte signed integer	Roll Angle measured by EYE Sensor from List Values
13	EYE Sensor Low battery indicator	1 byte unsigned integer	Low battery state measured by EYE Sensor from List Values from 0 to1
14	EYE Sensor Battery voltage	2 byte unsigned integer	Low battery state measured by EYE Sensor from List Values from 0 to1
15	EYE Sensor MAC adress	6 byte unsigned integer	Device's MAC adress
16	EYE Sensor Magnet trigger count*	2 byte unsigned integer	Magnet trigger counts measured by EYE Sensor from List Values *Only available with evaluation firmware BTSX.1.2.8.magcounter.R.0 of EYE Devices

MAC

IF EYE Sensors are selected to be filtered by **MAC address**, separate EYE sensor records will not be generated; EYE sensor values will be included into regular records with their corresponding IO elements. Up to 4 EYE Sensors can be configured with different MAC Addresses. In the case of filtering by MAC Address, more advanced configuration is possible, as EYE Sensors' IOs' Low, High level, Event Only and Operand parameters can also be configured separately for each IO.

- **Working Mode** - parameter has 2 options – Disabled and EYE Sensor. When it is disabled, EYE Sensor IO values will not be included into the records. When EYE Sensor is selected, EYE Sensor IO values will be included into records.
- **MAC Settings** - parameter specifies the MAC address of the EYE Sensor for the FM tracker to read, parse its data and put to corresponding IO elements. If the sensor is not found for set amount of scan retries, error values will be stored into IO elements.
- **I/O elements** - allows for advanced EYE sensor I/O elements configuration.

EYE Sensor AVL IDs

Table below describes I/O elements which were added for EYE sensor with the new functionalities release.

Property ID in AVL packet	Property name	Bytes	Type	Min	Max	Multiplier	Units	Description
11317	EYE Sensor List	variable length	HEX	0 bytes	1024 bytes	-	-	EYE Sensor List
10800	EYE Temperature 1	2	Signed	-32768	32768	0,01	°C	Temperature measured by EYE sensor 1
10801	EYE Temperature 2	2	Signed	-32768	32768	0,01	°C	Temperature measured by EYE sensor 2
10802	EYE Temperature 3	2	Signed	-32768	32768	0,01	°C	Temperature measured by EYE sensor 3
10803	EYE Temperature 4	2	Signed	-32768	32768	0,01	°C	Temperature measured by EYE sensor 4
10804	EYE Humidity 1	1	Unsigned	0	100	-	%	Humidity measured by EYE sensor 1
10805	EYE Humidity 2	1	Unsigned	0	100	-	%	Humidity measured by EYE sensor 2

10806	EYE Humidity 3	1	Unsigned	0	100	-	%	Humidity measured by EYE sensor 3
10807	EYE Humidity 4	1	Unsigned	0	100	-	%	Humidity measured by EYE sensor 4
10808	EYE Magnet 1	1	Unsigned	0	1	-	-	Magnet measured by EYE sensor 1
10809	EYE Magnet 2	1	Unsigned	0	1	-	-	Magnet measured by EYE sensor 2
10810	EYE Magnet 3	1	Unsigned	0	1	-	-	Magnet measured by EYE sensor 3
10811	EYE Magnet 4	1	Unsigned	0	1	-	-	Magnet measured by EYE sensor 4
10812	EYE Movement 1	1	Unsigned	0	1	-	-	Movement state and count measured by EYE sensor 1
10813	EYE Movement 2	1	Unsigned	0	1	-	-	Movement state and count measured by EYE sensor 2
10814	EYE Movement 3	1	Unsigned	0	1	-	-	Movement state and count measured by EYE sensor 3
10815	EYE Movement 4	1	Unsigned	0	1	-	-	Movement state and count measured by EYE sensor 4
10816	EYE Pitch 1	1	signed	-90	90	-	-	Pitch and Roll angles measured by EYE sensor 1
10817	EYE Pitch 2	1	signed	-90	90	-	-	Pitch and Roll angles measured by EYE sensor 2
10818	EYE Pitch 3	1	signed	-90	90	-	-	Pitch and Roll angles measured by EYE sensor 3
10819	EYE Pitch 4	1	signed	-90	90	-	-	Pitch and Roll angles measured by EYE sensor 4
10820	EYE Low Battery 1	1	Unsigned	0	1	-	-	Low Battery indication EYE sensor 1
10821	EYE Low Battery 2	1	Unsigned	0	1	-	-	Low Battery indication EYE sensor 2
10822	EYE Low Battery 3	1	Unsigned	0	1	-	-	Low Battery indication EYE sensor 3
10823	EYE Low Battery 4	1	Unsigned	0	1	-	-	Low Battery indication EYE sensor 4
10824	EYE Battery Voltage 1	2	Unsigned	0	65535	-	-	Battery Voltage of EYE sensor 1
10825	EYE Battery Voltage 2	2	Unsigned	0	65535	-	-	Battery Voltage of EYE sensor 2
10826	EYE Battery Voltage 3	2	Unsigned	0	65535	-	-	Battery Voltage of EYE sensor 3
10827	EYE Battery Voltage 4	2	Unsigned	0	65535	-	-	Battery Voltage of EYE sensor 4
10832	EYE Roll 1	2	signed	-180	180	-	-	Roll value of EYE Sensor 1
10833	EYE Roll 2	2	signed	-180	180	-	-	Roll value of EYE Sensor 2

10834	EYE Roll 3	2	signed	-180	180	-	-	Roll value of EYE Sensor 3
10835	EYE Roll 4	2	signed	-180	180	-	-	Roll value of EYE Sensor 4
10836	EYE Movement Count 1	2	unsigned	0	65535	-	-	Movement count value of EYE Sensor 1
10837	EYE Movement Count 2	2	unsigned	0	65535	-	-	Movement count value of EYE Sensor 2
10838	EYE Movement Count 3	2	unsigned	0	65535	-	-	Movement count value of EYE Sensor 3
10839	EYE Movement Count 4	2	unsigned	0	65535	-	-	Movement count value of EYE Sensor 4

Eye sensor parameters have error code values, which will written to the I/O value if parameter data is not received. From the error code value, it is possible to distinguish whether the issue is on the FM tracker side or the EYE Sensor. Below is a table describing these values.

Eye Sensor Error Values

Parameter	Data length (bytes)	Data type	Error codes		Additional Notes
			Data Not Received by FM tracker	**EYE Sensor indicates error**	
Temperature	2	signed	25000	25001	
Humidity	1	unsigned	250	251	
Magnet	1	unsigned	250	251	
Magnet trigger count	2	unsigned	65000	65001	Only available with evaluation firmware BTSX.1.2.8.magcounter.R.0 of EYE Devices
Movement	1	unsigned	250	251	
Movement counter	2	unsigned	65000	65001	
Pitch	1	signed	120	121	
Roll	2	signed	250	251	
Low battery status	1	unsigned	250	251	
Battery voltage	1	unsigned	250	251	

IO elements choices

Name	Connection #1 AVL ID	Connection #2 AVL ID	Connection #3 AVL ID	Connection #4 AVL ID
None	-	-	-	-
Temperature	25	26	27	28
Battery	29	20	22	23
Humidity	86	104	106	108
Custom1	331	332	333	334
Fuel	270	273	276	279
Luminosity	335	336	337	338

Fuel Frequency	306	307	308	309
Custom2	463	467	471	475
Custom3	464	468	472	476
Custom4	465	469	473	477
Custom5	466	470	474	478

Backup Tracker

FMB devices from **03.28.06.Rev.02** firmware version have an ability to set up TAT100 device as a backup tracker. When the feature is enabled - FMB device starts to advertise encrypted BLE packets. In this solution - FMB device is a main tracker and TAT100 is set up as a backup tracker - TAT100 periodically checks if FMB advertised packets are available. If no FMB packets are read - an alarm is sent from TAT100 side and tracker switches it's mode to become the main tracker.

To enable Backup tracker:

1) BLE Connection control must be prohibited:

2) Enable Backup Tracker:

Note: when Backup Tracker is enabled - **BLE sensor and Beacon settings become disabled**. Additionally - **Ultra Deep Sleep mode is also disabled** (in this mode BLE packets would not be advertised)

TAT100 device recognizes the BLE packets by FMB devices IMEI, therefore after FMB configuration is done - additional TAT100 device configuration is required to support the full solution. You can learn more about the backup tracker and TAT100 configuration in our [wiki site](#) }}}