General Device Operation

RM2TRACK-1-0 configuration shall be dependent upon the pallet's end user. As such the device configuration can be considered as a combination of:

- Baseline functionality
  - Visibility of pallet movements (using LTE CAT-M and BLE local area network)
- Optional features
  - Global visibility of pallet movements (2G)
  - Integrity monitoring – Shock / Tip events
  - Temperature logging and alerts
  - Logging of short stops
  - Locations of loading/unloading of BLE tagged goods (and/or pallets)
  - Recovery – A-GPS
  - Recovery – BLE (long-range)

Please Note:

❖ As 'Optional features' are activated there is additional demand on the battery, and therefore the operational life of the device is expected to reduce. For each optional feature, the power requirement shall be estimated to provide input to a Cost-Benefit-Analysis (CBA).

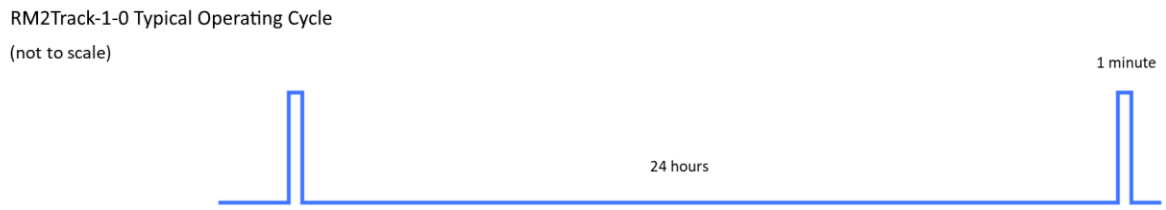
Baseline functionality

The RM2TRACK-1-0 'baseline functionality' device configuration:

- Report on Journey start
  - Based on B minutes of movement
    - *[B shall be configurable, default value = 20 minutes]*
  - *Each Journey start report shall contain a listing of visible pallet IDs*
- Report on Journey end
  - Based on C minutes of no movement (after movement)
    - *[C shall be configurable, default value = 20 minutes]*
  - *Each Journey start report shall contain a listing of visible pallet IDs, from the listing of visible observed at Journey start.*
- Status reporting
  - If there has been no pallet journey for D days the RM2TRACK-1-0 shall send a report to confirm that its location and operational status.
    - *[D shall be configurable, default value = 7 days]*
  - *Status report will attempt LTE CAT-M connectivity, but then fallback to 2G upon LTE CAT-M connectivity failure.*

Typical Operating Cycle

The RM2TRACK-1-0's reporting cycle may vary depending on the use case, but it is designed to be asleep for most of the time to preserve battery life. As such a typical operating cycle can be characterised as:



Optional features

1. Global visibility

The RM2TRACK-1-0 has the ability for 2G fallback. Usage of the device on the 2G network is expected to have a significant detrimental impact on the battery. As such, it is expected that there shall be a device configuration operation that allows operation on the 2G network.

When this option is set, reports on journey start/end will attempt to use 2G if connectivity with LTE CAT-M fails.

2. Integrity monitoring – Shock / Tip events

The RM2TRACK-1-0 has a single accelerometer. The accelerometer is used for movement detection. Changes in the orientation can be observed and used to communicate tip events. To detect Shock, the accelerometer must be configured to sample at a faster rate. The monitoring for Shock / Tip can generate significantly more data communications (and in turn use more of the battery). As such, these events shall be a configuration option.

The device with Shock / Tip events enabled shall:

- Report on Shock over specified 'G' threshold
  - A report will be generated upon breach of Shock threshold.
    - This shall be based upon the resultant value of Shock observed.
- Report on Tip over specified tip angle
  - A report will be generated upon breach of tip threshold.
    - This shall be based upon the angle change observed between 10s sensor readings.

Please Note:

- The accuracy and consistency of the Shock value observed shall depend upon the sample rate of the accelerometer.

3. Temperature logging and alerts

The RM2TRACK-1-0 has a NIST traceable temperature sensor. With temperature monitoring enabled, the RM2TRACK-1-0 shall read this temperature sensor at a predefined interval (every X seconds), and shall log the temperature (every Y minutes) for communication upon its next report. Thresholds (both lower and upper limits) for temperature can be assigned. If the temperature reading exceeds one of these limits a report shall be communicated to enable immediate action.

Please Note:

- The temperature observed in the pallet may require some settling time before it is consistent with that of its environment.

4. Logging of short stops

The RM2TRACK-1-0 can be configured to log Cellular and WiFi information observed at short stops (> S seconds) during the journey. The locations of these 'stops' and their duration can be used to validate/identify routes, traffic, and driving patterns. They will be reported back on the units next report.

5. Locations of loading/unloading of BLE tagged goods (and/or pallets)

The RM2TRACK-1-0 can be configured to enable BLE tagged goods and other RM2TRACK-1-0 enabled pallets to be read. This BLE read shall be based upon a change in movement status from moving to stationary for Z seconds. As such, after a journey has commenced, if there is a short stop, after Z seconds the RM2TRACK-1-0 shall monitor the presence of other RM2TRACK-1-0 devices (pallets) and any BLE tags inserted in the goods.

A report will be generated if there is a change in the presence messages observed by the RM2TRACK-1-0, which in turn can be used to validate locations of loading/unloading.

Please Note:

- Initial release of RM2TRACK-1-0 production firmware shall not include BLE broadcast messaging or BLE reception.

6. Recovery – A-GPS

The RM2TRACK-1-0 can be configured use A-GPS for a location update. It is expected that the use for A-GPS will be seldom, and only for recovery purposes. It is acknowledged that use of GPS will significantly reduce battery life.

7. Recovery – BLE (long-range)

The RM2TRACK-1-0 can be configured to activate a BLE (long-range) beacon every T seconds for recovery purposes. Whilst sending its BLE (long-range) beacon the RM2TRACK-1-0 will report every (T * N) seconds, so that the beacon can be turned back off. It is acknowledged that use of BLE long-range beacon will significantly reduce battery life.

Please Note:

- Initial release of RM2TRACK-1-0 production firmware shall not include BLE broadcast messaging or BLE reception.

8. Product Label

The product label can be found under the modem antenna. The label contains the following information:

- Device ID – The device ID is unique to each device and is used to locate and monitor the device via the LocoAware website. The barcode is an encoded version of the Device ID that can be scanned.
- IMEI – The unique IMEI number allocated to the BG95 modem fitted to the device.
- FCC ID – The FCC ID for the BG95 modem.
- Date – Production date in WEEK/YEAR format.
- Model/Hardware version – RM2-TRACK-1-0.
- Regulatory Symbols, FCC, CE and do not dispose symbol.

The product label format is shown here. The dimensions are Height: 20mm, Width: 37mm.

9. Batteries

⚠ The unit uses 4 x Energizer Lithium AA (L91) batteries.

- Do not expose to temperatures > 60°C.
- Do not incinerate or disassemble.
- Recycle unit after use.

10. Product Certification

This product is certified to the following standards

- EN-60950
- EN 300 328
- EN 301 511
- EN 301 908-1 and EN 30198-1-13
- EN 62311
- EN 301 489-1, EN 301 489-17, EN 301 489-19 and EN 301 489-52
- EN 55032 and EN 55035
- FCC Part 15B

11. Regulatory Information

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC ID: XXXXXXXXXXXXXXX

FCC statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

NOTE: Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the equipment.

12. RF exposure warning

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

13. Environmental Considerations

The equipment may contain substances that are harmful to the environment or human health. Please recycle this unit appropriately. Please contact your local authority for disposal or recycling information.