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|  | | RMR – RMR Support System | | | | | | | | |  | |
|  | | **OBU Interface** | | | | | | | | |  | |
|  | | **INTERFACE DESCRIPTION** | | | | | | | | |  | |
|  | | Applicable from the RMR release 1.7.0 | | | | | | | | |  | |
|  | | | | | | | | | | | | |
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| ENG-IS-TEM-035 F | | | | | | | | | | | | |

| **REVISIONS** | | | | |
| --- | --- | --- | --- | --- |
| Version/ Release | Auteur/ Author | Date (fr : jj mois. aaaa) *(en : dd Month. yyyy)* | Page /  Paragraph | Commentaires/ Comments |
| Old reference: RMR\_CRL\_DESG\_0647 | | | | |
| 1.0\_draftA | P. Rose | 23 sept. 2013 |  | First draft for RMR Support system Baseline 3.0 |
| 1.0\_draftB | P. Rose | 26 sept 2013 |  | Included comments from EM, JFS & DEP  Added redundancy management  Updated FTP server section  Added dynamic description of EVC Baseline and configuration file upgrade  Updated message format (mainly appendices) |
| 1.0\_draftC | P. Rose | 12 nov. 2013 |  | Updated section 3.4.2.2: “Watchdog messages”  Included comments from MDE   * Whole doc (Cosmetic): “system” -> “Support System” * Updated table section 3.4.1 * Updated table section 3.4.2 * Renamed section 3.4.3 * Renamed section 3.4.4 * Open question section 3.4.8.3: N packet split solution chosen. * Appendices: mention that SMS section is not valid for Comet * Appendices: updated commands for Comet * Appendices: updated all tables coming from OPC interface document * Updated section 3.4.8.4 (command for configuration file) * Updated introduction of section 3.4.8   Removed board identification from section 3.4.8.2 (RMR configuration file parameters)  Updated section 3.4.8.1 (RMR configuration file version)  Updated message examples following latest message format definition (usage of codes for data Types) |
| 1.0\_draftC2 | P. Rose | 18 nov. 2013 |  | Updated rule type -3 in section 3.4.8.3  Updated 2 commands in section 4.1.2.2 (Send Project Baseline & Send Project Baseline Confirmation)  Updated table in Appendices section 4.2.3.12 ( COMET\_EVC\_CUR\_PRJ\_BASELINE & COMET\_EVC\_CUR\_GATC\_BASELINE)  Updated table in Appendices section 4.2.3.13 (COMET\_EVC\_PRJ\_BASELINE\_NOTIF & COMET\_EVC\_PRJ\_BASELINE\_ CONFIRM)  Updated title section 3.3: SMS messages not for Comet |
| 1.0\_draftD | P. Rose | 17 dec. 2013 |  | Removed implementation note about rule order in section 3.4.8.3  Added list of figures and list of tables  Tagged all requirements |
| 1.0\_draftE | P. Rose | 06 jan. 2014 |  | Integrated comments from VRA:   * [RMR\_CRL\_DESG\_0647\_0025] added OBU\_VER & OBU\_CUSTOM explanation * [RMR\_CRL\_DESG\_0647\_0030] (cosmetic) added “watchdog” in front of “message” * [RMR\_CRL\_DESG\_0647\_0033] added note about checksum to be used. * [RMR\_CRL\_DESG\_0647\_0047] requirement re-worked * [RMR\_CRL\_DESG\_0647\_0048] updated “project baseline upgrade” sequence diagram * [RMR\_CRL\_DESG\_0647\_0050] changed “SERVER\_NAME” into “SERVER\_ADDR” * [RMR\_CRL\_DESG\_0647\_0051] (cosmetic) “RMR” -> “RMR function” * [RMR\_CRL\_DESG\_0647\_0080] added “Reset RMR connection” in sequence diagram * [RMR\_CRL\_DESG\_0647\_0080a] requirement added * Section 4.1.1 updated: added note about future evolution * Section 4.1.2.2 updated: “Reset RMR Connection” explanation, Added “Get position” command, added “End configuration” command, changed “SERVER\_NAME” into “SERVER\_ADDR” (commands 51, 52 & 54) |
| 1.0 | P. Rose | 21 jan. 2014 |  | Integrated comments from MDE:   * Section 4.2.3.11: title formatting correction * Section 4.1.2.2: command 2 description updated * Section 4.1.2.2: command 43 name changed “connection” -> “Application” (also updated figure 3 & 4)   Released v1.0 |
| New reference: A455642 | | | | |
| A | P. Rose | 29 jan. 2014 |  | Imported into Gesdoc  Updated tags with Gesdoc reference |
| 1B | P. Rose | 5 feb. 2014 |  | Updated document references  Updated appendices to reflect updates of OPC interface document (Excel).  Updates following Embedded RMR review:   * Added optional parameters (start/stop) for “Send TRU” command (CMD\_CODE 34) * Added [A455642\_0081b] about configuration file validation at trackside * Added [A455642\_0086/0087/0088] about configuration file error * Added [A455642\_0089/0090] about delayed messages * Added [A455642\_0091] about GSM\_R analysis feedback |
| 2B | P. Rose | 11 feb. 2014 |  | Included comments from MDE (Gesdoc 1B review of A455666):  - renamed COMET\_PERIODIC into RMR\_PERIODIC  - renamed COMET\_EVENT into RMR\_EVENT  - updated [A455642\_0089/90] about delayed transmission  Updated section 4.2.3.14: use UNISIG official name  Updated section 4.2.3.13: remove COMET\_  Added section 4.2.2: OBU\_CUSTOM  Added [A455642\_0093] about message truncation |
| B | P. Rose | 28 feb. 2014 |  | Version B released |
| 1C | P. Rose | 27 mar. 2014 |  | Added [A455642\_0094]: communication method (PSD)  Use “Req\_Text” for requirement body  [A455642\_0017] updated: 1 pair of servers for 200 OBU’s  Renamed [A455642\_0080a] to [A455642\_0095]  Renamed [A455642\_0081a] to [A455642\_0096]  Duplicate [A455642\_0086]: rename second one to [A455642\_0097] |
| 2C | P. Rose | 7 apr. 2014 |  | Update [A455642\_0083]: OBU data/diagnostic file naming convention |
| 3C | P. Rose | 14 apr. 2014 |  | Section 4.1.2.2 updated: new command “Send EVC MM” |
| C | P. Rose | 16 apr. 2014 |  | Version C released |
| 1D | P. Rose | 05 may 2014 |  | Included comments from DEP   * [A455642\_0025] updated regarding the maximum message length. * [A455642\_0025] OBU\_CNT replaced by OBU\_LEN * [A455642\_0026] max command length is 200 * [A455642\_0026] Table2, element3: cosmetic * [A455642\_0042] messages are sent “one by one” * [A455642\_0045] points 2 & 3 removed * [A455642\_0070] added remark regarding number of references to circular buffers. * [A455642\_0087] Remark about detection of several structure errors * [A455642\_0093] Add ref. to 4.2.2 * Renamed “Project baseline” into “Project version” * Appendices: tables updated from OPC interface * [A455642\_0098] added about Endianness * [A455642\_0069/0070] added “on-demand” rule * Section 4.1.2.2: renamed “Send EVC MM” to “send on demand messages” * [A455642\_0099] added “on-demand” rule/command requirement * [A455642\_0079] table updated with “End configuration” |
| D | P. Rose | 26 may 2014 |  | Included comments from MDE (Gesdoc ARC on 1D)   * [A455642\_0078/0093] remove the “old limit” of 1024 bytes.   Included comments from PDE  (A455642\_1D\_SyID\_RMR\_SSYS\_OBU\_Intf-tagged\_COMT\_DEP.docx)   * [A455642\_0045] remark added * [A455642\_0070] “curricular” -> “circular” * [A455642\_0099] moved at beginning of §3.4.8.4 |
| 1E | P. Rose | 01 jul. 2014 |  | [A455642\_0033] updated: CRC shall be ccitt-16 |
| 2E | P. Rose | 01 jul. 2014 |  | Updated section 4.1.2.2: added “Reset RMR Connection” |
| E | P. Rose | 8 jul. 2014 |  | Included comments from MDE (ARC on 2E)   * “Reset RMR Connection” command explanation   Version E release |
| 1F | P. Rose | 25 aug. 2014 |  | [A455642\_0048]: figure 1 updated  Updated section 4.1.2.2: added “Synchronize Fifo” cmd  [A455642\_0036] updated: CMD\_FBCK immediately sent to the RMR\_SSYS  Added [A455642\_0100] : Send CMD\_FBCK before RMR communication stop  Added [A455642\_0101] : upon reception of “Synchronize Fifo” command, queue FIFO\_SYNCHRONIZED event in sending buffer |
| F | P. Rose | 29 aug. 2014 |  | [A455642\_0036] updated: CMD\_FBCK shall be sent in priority to the RMR\_SSYS  Version F release |
| 1G | P. Rose | 17 oct. 2014 |  | Updated section 4.1.2.2: added “Send EVC\_MM status” command |
| 2G | P. Rose | 28 oct. 2014 |  | Added [A455642\_0102] : Send EVC\_MM messages  updated section 4.2.3: added EVC\_MM data type  Added section 4.2.4.15 about EVC\_MM |
| G | P. Rose | 30 oct. 2014 |  | Version G released |
| 1H | P. Rose | 01 dec. 2014 |  | atvcm00592630: section 4.1.2.2 - updated CMD\_CODE of communication management commands.  [A455642\_0049]: updated message format: some ‘;’ by ‘|’  updated appendices section 4.2.4.5: ATB\_ARR  updated appendices section 4.2.4.5: table 20 |
| 2H | P. Rose | 17 dec. 2014 |  | Updated section 4.1.2.2   * Removed “Send Project Version Confirmation” cmd * added “Reset RMR Fifo” & “Control SDD storage” commands   Updated section 4.2.1: GPS is expressed in UTC |
| 3H | P. Rose | 19 dec. 2014 |  | Updated section 4.1.2.2: added “Start message sending” and “Stop message sending” commands |
| 4H | P. Rose | 12 jan. 2015 |  | Renamed “Control SDD storage” to “Control SSD storage” |
| 5H | P. Rose | 19 jan. 2015 |  | Updated section 4.1.2.2: “Start GSM-R monitoring”  Updated section 4.2.4.3: renamed GSM\_R to GSM\_R\_AT  Added section 4.2.4.16: GSM\_R |
| 6H | P. Rose | 17 mar. 2015 |  | Included comments from DEP, MDE, JFS (see “OBU interface addendum 17-03-2015.docx”):  [A455642\_0069]: added “referenced”  [A455642\_0098]: mask parameters defined on 64 bits  [A455642\_0068]: up-to 10 masks  [A455642\_0087]: RMR configuration file structure error  [A455642\_0073]: circular buffer may contain any data type  [A455642\_0056]: Version section is mandatory & unique  [A455642\_0060]: Parameters section is unique  [A455642\_0074]: Filters section is unique  Added [A455642\_0103]: 3 sections in configuration files  [A455642\_0102]: EVCMM sent only upon reception of cmd  [A455642\_0025]: OBU\_LEN MSB first & remark updated  [A455642\_0025/0033/0036]: example updated  Added [A455642\_0104]: comments in configuration file |
| 7H | P. Rose | 29 apr. 2015 |  | Added [A455642\_0105] TLS protocol  [A455642\_0014/0015/0016] updated because of TLS |
| 8H | P. Rose | 7 may 2015 |  | [A455642\_0071/0072/0075] updated Circular Buffers examples |
| 9H | P. Rose | 30 may 2015 |  | Included comments from ARC review:   * Roles added at first page * Spelling correction in [A455642\_0071] |
| H | P. Rose | 5 jun. 2015 |  | Version H released |
| 1I | P. Rose | 17 sep. 2015 |  | atvcm00642021:   * [A455642\_0067] the number of rules is defined by implementation limits * [A455642\_0068] a rule contains up-to 5 masks   atvcm00642098:   * Section 4.1.1 updated: list of SMS commands * Section 4.1.2.1 updated: RACK op commands * [A455642\_0049] updated: max length of files * [A455642\_0061] updated list of parameters for RMR COMET and RMR RACK/PCOM   atvcm00654550:   * [A455642\_0043] ACK for unknown OBU’s |
| 2I | P. Rose | 24 sep. 2015 |  | [A455642\_0068] updated regarding “on changes” rule  Section 4.1.2.2 and [A455642\_0079/0095/0104] updated regarding “line-by-line” configuration file process. |
| I | P. Rose | 21 oct. 2015 |  | Included review comments from M. Demeure:   * [A455642\_0061] example updated   atvcm00669841:   * [A455642\_0069] Rule type -4 removed. * [A455642\_0070] Rule type -2 and -3 shall *accept one or several references to circular buffer* * [A455642\_0071] The reference to circular buffer(s) (2 bytes) is encoded in decimal format * [A455642\_0099] CMD\_PARAM added for “Send on-demand messages” command * Section 4.1.2.2: CMD\_PARAM added for “Send on-demand messages” command |
| 1J | P. Rose | 11 jun. 2018 | 3.4.8.5 | atvcm00576113 - RMR Configuration line-by-line:   * Update [A455642\_0095] & Figure 4 |
| 2J | P. Rose | 16 jul. 2018 | 3.4.8.2  3.4.1  3.4.2 | atvcm00885794: remove EVENT\_DETECTION parameter  atvcm00886866 - Update Max Message Length of RMR messages   * [A455642\_0025] OBU msg: 1166 byte length * [A455642\_0026] RMR\_SSYS msg: 302 byte length |
| J | P. Rose | 30 jul. 2018 |  | Version J released |
| 1K | G. Lauwers | 15 mar. 2019 |  | atvcm00947864: Document alignment |
| K | G. Lauwers | 14 jun. 2019 |  | 1K\_COMT\_GL  1K\_COMT\_DA  1K\_COMT\_RT |
| 1L | L. Décup | 13 dec. 2019 | See rev. marks | atvcm00917804: Modifications related to Subset-027 v3.3.0 |
| 2L | L. Décup | 13 jan. 2020 | See rev. marks | atvcm01033286: Update SIL level of RMR to Q |
| L | L. Décup | 16 jan. 2020 | No change | Version L released |

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# introduction

## Purpose

RMR is a system composed of two elements:

* The On-Board-Unit (OBU) that collects safety equipment data through communication buses (Profibus, Serial link, Ethernet, MVB…)
* The RMR Support System that receives and stores data, implements maintenance functions and displays results to the operator thanks to a graphical interface.

This document describes the Interface between the On-Board-Unit (OBU) and the RMR Support System. The OBU can be the RMR Rack, the Comet Board or other future OBU’s.

The following topics are described:

* Protocol and format of messages exchanged between OBU and RMR Support system
* Dynamic behaviour of message exchange

The FTP server that hosts software and configuration files for the RMR Rack is not in the scope of the RMR Support system.

## Applicable and reference documents

### Reference Documents

|  |  |  |
| --- | --- | --- |
| Document Title | Reference | Version |
| 1. ERTMS Trainborne Maintenance - Program Management Plan | ERTMS\_TRB\_MAINT\_CRL\_PLAN\_0017 | 2.0 |
| 1. FFFIS Juridical Recorder-Downloading tool | SUBSET 27 | 2.0.0 |
| 1. Proposal for modifications in FFFIS Juridical Recorder – Downloading tool | SUBSET 27 | Modif 0.3 |
| 1. FFFIS Juridical Recorder-Downloading tool | SUBSET 27 | 2.3.0 |
| 1. FFFIS Juridical Recorder-Downloading tool | SUBSET 27 | 3.0.0 |
| 1. FFFIS Juridical Recorder-Downloading tool | SUBSET 27 | 3.1.0 |
| 1. FFFIS Juridical Recorder-Downloading tool | SUBSET 27 | 3.3.0 |
| 1. Maintenance interface | GATC\_CRL\_DESG\_0652 | 1.3.1 |
| 1. Maintenance interface | GATC\_CRL\_DESG\_0652 | 1.8 |
| 1. Maintenance interface | GATC\_CRL\_DESG\_0652 | 1.9 |
| 1. Maintenance interface | GATC\_CRL\_DESG\_0652 | 2.0 |
| 1. PKILib - Software User Manual (SUM/MUL) | UM\_T\_E121405 | I |

\*see latest version of ERTMS\_TRB\_MAINT\_CRL\_PLAN\_0022

Table 1 Reference documents

### Applicable Documents

|  |  |  |
| --- | --- | --- |
| Document Title | Reference | Version |
| 1. RMR SSys - SyRS | A455642 | \* |
| 1. RMR SSys - SyAD | A455671 | \* |

\*see latest version of ERTMS\_TRB\_MAINT\_CRL\_PLAN\_0022

Table 2 Applicable documents

## Abbreviations and definitions

|  |  |
| --- | --- |
| OBU | On-Board Unit |
| RMR | Remote Maintenance Recorder |
| RMR SSys | RMR Support System |
| APN | Access Point Name |

# General description

## Role of interface

## Constraints

[A455642\_0001]

OBU’s and RMR Support System shall exchange data during OBU operation.

[A455642\_0002]

It shall be possible for both sides to monitor the connection status.

[A455642\_0003]

The RMR Support System shall respect Q development process.

[A455642\_0004]

This interface shall be generic enough to be able to support RMR specification extensions (further client requirements) and adapt to several types of OBU’s (RMR Rack, COMET…).

[A455642\_0005]

The interface shall be reliable enough to be sure that no important message gets lost. Important message are all messages on which RMR Support System shall perform maintenance functions on. Non-important messages are trace and debug messages.

[A455642\_0006]

Messages shall be transferred without corruptions.

[A455642\_0007]

It shall be possible to quickly and easily verify that the communication between OBU’s and RMR Support System is established to ease integration and installation (for example: seeing exchanged messages using wireshark or other tools).

[A455642\_0008]

It shall be possible to limit the messages exchanged between OBU’s and RMR Support System to the client needs.

[A455642\_0094]

The communication method is PSD only.

### Software compatibility

[A455642\_0009]

The following industry standards shall be used:

* The physical interface is Ethernet for RMR Support System and GPRS or 3G/4G for OBU.
* The protocol interface is TCP/IP and all mobile protocol of GSM network.

[A455642\_0010]

On top of TCP/IP, RMR message exchange shall use a specific RMR encapsulation containing messages from various types. The following list is not exhaustive:

* EVC monitoring
* GSM-R monitoring
* RMR specific
* ATB-ARR

### Hardware compatibility

[A455642\_0011]

Industry standards shall be used

* RJ45 for Ethernet on RMR Support System
* GSM antenna for OBU

### RAM constraints

[A455642\_0020]

The RMR Support System shall be redundant in order to increase availability.

## Implicit choices and justification

These choices have been imposed by the overall system specification.

# detailed Description

## Physical level

[A455642\_0012]

The physical interface shall be Ethernet for RMR Support System and GPRS or 3G/4G for OBU.

## Protocol level

### Static description

[A455642\_0013]

The RMR Support System shall be the server part of a Client/Server application used to allow client (OBU) send/receive data to/from it.

[A455642\_0014]

The communication protocol between the OBU and the RMR Support System shall be either TCP or TLS.

[A455642\_0105]

The TLS protocol shall be implemented by OBU and RMR Support System integrating the PKI lib as described in [R12].

*Remark: when TLS communication is used, all requirements of this document are applicable exactly in the same way as when the TCP protocol is used.*

[A455642\_0023]

OBU’s shall contain address and port of both RMR Support System instances in its configuration.

### Dynamic description

[A455642\_0015]

At start-up, RMR Support System shall open a TCP socket and put it in listen mode (wait for client connection)

*Remark: when TLS protocol is used, this requirement is hidden from the application.*

[A455642\_0016]

The connection message is a TCP message directly answered by the RMR Support System at protocol level, after this connection, the RMR Support System shall begin to receive application messages.

*Remark: when TLS protocol is used, this requirement is hidden from the application.*

[A455642\_0017]

RMR Support System shall accept connections with up to 2000 OBU’s, using scalable architecture (for example: one pair of server for 200 OBU’s).

[A455642\_0018]

As the connection with OBU is intermittent, the RMR Support System shall accept frequent re-connections.

[A455642\_0019]

When not connected, the OBU shall regularly try to connect to RMR Support System. The period shall be defined by a configuration parameter.

[A455642\_0021]

The OBU shall first connect to primary RMR Support System.

[A455642\_0022]

If the connection to primary RMR Support System has failed, the OBU shall connect to redundant RMR Support System.

## Application level

On top of TCP/IP, a RMR application protocol is used for:

* Messages from OBU to RMR Support System
* Messages from RMR Support System to OBU

### Static description

#### Messages from OBU to RMR Support System

[A455642\_0025]

The message shall be up to 1166 bytes length.

The message shall be encapsulated by a XML like marker <G1>…</G1>.

Each element shall be separated from the other by ‘;’

The message shall contain 9 elements

* OBU\_LEN (field 1) is binary encoded and 2 bytes length (MSB first)
* Fields 2 to 8 shall contain only ASCII data, each can be of variable size
* OBU\_DATA (field 9) shall contains ASCII or binary data frame

Message format is described in appendices section **4.2**.

|  |  |  |
| --- | --- | --- |
| **Nb** | **Element** | **Comment** |
| 0 | - | Message markers |
| 1 | OBU\_LEN | Total message length including <G1> and </G1> markers |
| 2 | OBU\_VER | Version of this structure (may depend on OBU) |
| 3 | OBU\_ID | OBU identification. It shall be unique. Depending on project, it can be: - IMEI code (RMR Rack)  - NID\_ENGINE (Comet) |
| 4 | OBU\_ACK | Message ID to be acknowledged (0 means no acknowledgement, other values means that ACK message has to be sent by RMR Ssys to OBU) |
| 5 | OBU\_GPS | GPS data (see **4.2.1**) |
| 6 | OBU\_DATA\_TYPE | A code (ASCII formatted) describing each message transmitted. See "Data Types" sheet for correspondence with data Types (see **4.2.3**) |
| 7 | OBU\_CUSTOM | This field contains specific information (depends on OBU\_VER) (see **4.2.2**) |
| 8 | OBU\_DATA\_LEN | The length of OBU\_DATA field |
| 9 | OBU\_DATA | OBU data (Ascii or binary, depends on OBU\_DATA\_TYPE) (see **4.2.4**) |

Table 3: Message from OBU to RMR Support System

*Remark:*

* *OBU\_VER shall discriminate several versions of this structure. OBU\_VER value shall be C.1 for the first delivery of Comet integrated RMR and R.1 for the first delivery of RMR RACK. If this structure shall be modified to implement future developments, the OBU\_VER value shall be increased.*
* OBU\_CUSTOM may contain any additional information. For example: debug information, OBU internal counters…

*For RMR RACK:*

* OBU\_ACK correspond to the message counter of the CCPU (in current interface, it correspond to the first field after “nb of satellite” in GPS field)
* OBU\_CUSTOM may contain the message counter of the interface board (in current interface, it correspond to the second field after “nb of satellite” in GPS field)

*Example: (GSM-R message)*

<G1>\_z;R.1;35356702000001;24;2,220005,220713,5024.2525N,00426.8952E,155.5,4.6,0.870,109.81,5;31;;19;AT+COPS=1,2,"20431"</G1>

#### Messages from RMR Support System to OBU

[A455642\_0026]

The message shall be up to 302 bytes length.

The message shall be encapsulated by a XML like marker <S1>…</S1>.

Each element shall be separated from the other by ‘;’

The message shall contain 5 ASCII formatted elements; each can be of variable size.

|  |  |  |
| --- | --- | --- |
| **Nb** | **Element** | **Comment** |
| 0 | - | Message markers |
| 1 | SSYS\_CNT | SSYS\_CNT shall be set to  - 0 for acknowledgement messages (SSYS\_DATA\_TYPE = ACK)  - a message counter for commands (SSYS\_DATA\_TYPE = CMD or CMD&FBCK). This counter shall:  \* start at one at start of the RMR Ssys.  \* be increased by one for each message sent. |
| 2 | SSYS\_VER | Version of this structure |
| 3 | SSYS\_DATA\_TYPE | A code (ASCII formatted) describing each message transmitted: -"1": MSG\_ACK -> acknowledge in reply to an OBU to RMR\_SSYS data message (see 3.3.2.3.1)  -"2": WATCHDOG -> watchdog msg sent by RMR Support System to OBU (see 3.3.1.2.2)  -"3": CMD -> a command sent by RMR Support System to OBU (see 3.3.1.2.3)  -"4": CMD&FBCK -> a command sent by RMR Support System to OBU. The OBU shall send back feedback to RMR Support System (see 3.3.1.2.3) |
| 4 | SSYS\_DATA\_LEN | The length of SSYS\_DATA field |
| 5 | SSYS\_DATA | Data sent by RMR Support System to OBU |

Table 4: Message from RMR Support System to OBU

##### Acknowledge messages

[A455642\_0027]

The acknowledge messages sent by RMR Support System to OBU’s shall contain

* SSYS\_DATA\_TYPE set to MSG\_ACK
* SSYS\_DATA set to the OBU\_ACK counter value of the data message, sent by the OBU, requiring an acknowledgement.

*Example:*

<G1>\_z;R.1;35356702000001;24;2,220005,220713,5024.2525N,00426.8952E,155.5,4.6,0.870,109.81,5;31;;19;AT+COPS=1,2,"20431"</G1>

Upon reception of GSM-R data message, RMR Support System shall answer with ACK message.

<S1>0;1;1;2;24</S1>

##### Watchdog messages (**not for COMET**)

*Remark: for the moment, the RMR Rack OBU is waiting for a periodic watchdog message. If no watchdog message is received within 3 minutes, the RMR Rack OBU triggers a software reset.*

[A455642\_0028]

When the OBU is a RMR Rack, the RMR Support System shall send a watchdog message to it.

[A455642\_0029]

The watchdog messages shall be formatted as following:

* SSYS\_DATA\_TYPE set to WATCHDOG
* SSYS\_DATA set to the local time of the server (hh:mm:ss).

[A455642\_0030]

The watchdog message sending period shall be defined by RMR Support system data preparation.

*Example:*

<S1>236;1;2;8;00:06:50</S1>

##### Command messages

[A455642\_0031]

Various commands shall be sent from RMR Support System to OBU’s. The commands shall contain optional parameters.

[A455642\_0032]

If a command feedback shall be received by RMR Support System, the command shall be formatted using SSYS\_DATA\_TYPE set to CMD&FBCK. Otherwise, the command shall be formatted using SSYS\_DATA\_TYPE set to CMD.

[A455642\_0033]

SSYS\_DATA shall be formatted as following (pipe (|) separated fields):

|  |  |  |
| --- | --- | --- |
| **Nb** | **Element** | **Comment** |
| 1 | CMD\_CODE | Codification of the command.  The list of commands is available in appendices of OBU interface document (4.1.1). |
| 2 | CMD\_PARAM | Parameters related to the code (if any) |
| 3 | CMD\_CKS | Checksum associated to the file identified in the command parameters (CMD\_PARAM):   * CRC shall be ccitt-16 with starting value of 0x0000 or 0x1D0F * 0 if not applicable |

Table 5: Command message

*Example:*

<S1>235;1;3;45;1|config\_file\_v3\_4.txt|458A2BCC</S1>

The list of commands is available in appendices section **4.1.1**.

### Dynamic description

#### On-board parameters

[A455642\_0050]

The OBU shall store in project specific storage area, all information concerning connection to RMR Server:

|  |  |
| --- | --- |
| **Parameter** | **Example** |
| FTP\_parameters | See Table 7 |
| IP\_primary\_server | 123.251.2.2 |
| Port\_primary\_server | 9502 |
| IP\_secondary\_server | 123.251.2.3 |
| Port\_secondary\_server | 9502 |
| communication\_authorisation\_management\_activated | FALSE |

Table 6: On-board parameters

*For Comet:* storage area *= data preparation = SW Plug*

[A455642\_0051]

During EVC start-up, the RMR function shall read and use these parameters

#### Dynamic description: RMR Support System -> OBU

[A455642\_0034]

The RMR Support System shall send messages (mainly operator commands) to selected OBU.

[A455642\_0035]

The RMR Support System shall format the message (see section **3.3.1.2**) and send it to the OBU.

[A455642\_0036]

When a confirmation that the command has correctly been processed by the OBU shall be sent back to the RMR Support System, a feedback mechanism shall be used.

* The RMR Support System shall set SSYS\_DATA\_TYPE field to CMD&FBCK.
* Upon reception and treatment of the command, the OBU shall answer with a command feedback message (OBU\_DATA\_TYPE = CMD\_FBCK) formatted as described in section **3.3.1**.
  + The command feedback message shall be sent in priority (before any other messages of the sending buffer of the OBU) to the RMR Support System.
* Upon reception of the command feedback, the RMR Support System shall treat the command feedback message adequately.
* The complete “command feedback” mechanism (from RMR\_SSYS, back to RMR\_SSYS) shall not take more than 5 seconds.

*Remark:* No buffering mechanism is used for commands. If the command feedback message is not received after a defined delay, it is up to operator responsibility to re-send the command.

*Example: (*CMD&FBCK)

<S1>2343;1;4;6;GETTRU||0</S1>

The command acknowledgement message shall be built as following:

<G1>\_\_;C.1;35356702000001;0;2,220005,220713,5024.2525N,00426.8952E,155.5,4.6,0.870,109.81,5;1;;38;2343,OK,ACCEPTED</G1>

[A455642\_0100]

The OBU shall send the command feedback message to the RMR Support System before stopping the RMR communication (for example when GSM\_R analysis has been asked).

[A455642\_0101]

Upon reception of “Synchronize Fifo” command, the OBU shall queue a RMR\_EVENT/FIFO\_SYNCHRONIZED message (RMR\_EVENT\_ID=”10”, RMR\_EVENT\_VALUE=<SSYS\_CNT of the “Synchronize Fifo” command>) in its sending buffer.

#### Dynamic description: OBU -> RMR Support System

[A455642\_0037]

The OBU shall collect data from various interfaces (EVC\_TRU, GSM\_R, MVB, ATB…) and build messages respecting application format described in this document (section **3.3.1**).

[A455642\_0038]

The OBU shall only send messages to RMR Support System if the sending rules, described in section 4.2.3 - Data type (OBU\_DATA\_TYPE field), are respected.

[A455642\_0093]

If the message to be sent is too big for RMR protocol (see [A455642\_0025] regarding maximum RMR message length), the OBU shall truncate the messages and send it to RMR Support System with the OBU\_CUSTOM/MSG\_TRUNCATED field set to “1” (see 4.2.2). Otherwise, OBU\_CUSTOM/MSG\_TRUNCATED field shall be set to “0”.

[A455642\_0039]

Upon message reception, RMR Support System shall

* Get the messages from socket.
* Ensure that the message is complete (included in marker<G1>…</G1>). If not, wait next message for this socket to complete a message. Then remove markers.
  + *Remark*: OBU\_DATA\_LEN has been defined to avoid searching for </G1> marker inside OBU\_DATA.
* Log message in a raw format for archiving.
  + One log file shall be generated each day. The log file name shall contain the date.
* If the message has already been received, discard it (see section 3.3.2.3.2).
* If the received message required to be acknowledged (Field OBU\_ACK contains a message identifier different from 0), the RMR Support System shall send back an acknowledge message to the OBU (see section 3.3.2.3.1).
* Decode message respecting application format.

##### Acknowledgement

*Remark: due to several factors, some messages might get lost during OBU operation. To be sure that important OBU messages are received and treated by RMR Support System, an acknowledgement mechanism shall be used.*

[A455642\_0040]

For all messages that may not get lost, the OBU shall:

* Set the OBU\_ACK field to a value of an internal counter. This counter shall:
  + Start at 1 (0 reserved for non-acknowledged messages)
  + be increased by one for each new message
  + have a range of at least 32 bits
  + be set to 1 after that the maximum value of data range has been reached
  + not be reset during power cycle of the equipment (counter value shall be stored in persistent memory)
* Store the message to be sent (with all header fields including OBU\_ACK) in persistent memory.

[A455642\_0041]

For less important message (may get lost), set the OBU\_ACK field to 0.

[A455642\_0042]

The OBU shall send the message to the RMR Support System and wait for the acknowledge message from it. After having received the corresponding acknowledge message, the OBU shall send the next message.

[A455642\_0043]

If the OBU\_ACK field is different from 0, the RMR Support System shall send back an acknowledge message, containing the same value of OBU\_ACK, to the OBU. The message shall be formatted as described in section **3.3.1.2**.

*Remark: the RMR Support System shall send back an acknowledge message even if the OBU is unknown (not present in the list of managed OBU’s).*

[A455642\_0044]

Upon reception of an acknowledge message, the OBU shall remove the corresponding message from persistent memory.

[A455642\_0045]

The OBU shall re-send stored messages waiting for acknowledgement to the RMR server upon:

* Timeout on the message waiting for acknowledgement. The timeout shall be a configurable parameter.

*Remark*: all fields shall be identical from the first time the message has been sent.

##### Duplicated messages

*Remark: RMR Support System may receive several (twice) the same message because messages (incl. the acknowledge message) may get lost (see section* ***3.3.2.3.1****). This situation also happens after power cycle of the OBU.*

[A455642\_0046]

The RMR Support System shall discard already received/treated messages.

[A455642\_0047]

To do so, the RMR Support System, shall, for each OBU’s, store in a permanent memory (not in DB), the OBU\_ACK value of the X latest received messages that have an OBU\_ACK value different from 0.

X shall be a configurable parameter read at start-up of RMR Support System.

##### Delayed messages

*Remark: RMR Support System may receive delayed message. This situation can happen after start-up of the OBU when several “old” messages haven’t been sent yet. In that case, the OBU shall first send the COMET\_INIT message (with a “recent” value for OBU\_ACK) then “older” messages. The lost message detection function of the RMR Support System could generate a false-positive error.*

[A455642\_0089]

Before sending delayed messages, the OBU shall set (and send) the RMR\_EVENT.COMET\_TRANSM\_TYPE to the value “Dxxxx”, where xxxx is a counter incremented each time a new delayed transmission starts.

The OBU shall repeat the same value in the OBU\_CUSTOM field.

[A455642\_0090]

After having sent all delayed messages, the OBU shall set (and send) the RMR\_EVENT.COMET\_TRANSM\_TYPE to the value “Nxxxx”, where xxxx correspond to the counter of the delayed transmission starting message.

The OBU shall repeat the same value in the OBU\_CUSTOM field.

##### Specific events handling

[A455642\_0091]

Upon reception of the “Start GSM-R monitoring” command (CMD\_CODE 14), the OBU shall set (and send) the RMR\_EVENT.COMET\_GSMR\_ANALYSIS\_FEEDBACK to empty value “”.

[A455642\_0092]

If the GSM\_R analysis is refused by RTM application, the OBU shall set (and send) the RMR\_EVENT.COMET\_GSMR\_ANALYSIS\_FEEDBACK to the value “R”.

[A455642\_0102]

* Obsolete

#### Dynamic description: Project version upgrade (**COMET only**)

[A455642\_0048]

The OBU’s and the RMR Support System shall implement “project version upgrade” function as described in following dynamic description.

EVC Comet RMR

RMR SSys

Operator

Chose Project version

Send Project version

Display desired Project version

Validate Project version

Click “OK” for confirmation (2)

CMD\_FBCK

Notify Project version

MSG\_ACK

COMET\_INIT/

Current Project version (1)

MSG\_ACK

EVC Startup

If desired Project version is different from the current one

REMARK: (1) & (2) can come in any order

If notified Project version is different from the desired one, generate an alarm and stop project version upgrade process

If notified Project version is not received (usage of timer), generate an alarm and stop project version upgrade process

Alarm

Store desired Project version

Alarm

Enter Project version

Figure 1: EVC project version upgrade

#### Dynamic description: software download OTA (**not for COMET**)

[A455642\_0049]

Upon reception of a RMR\_INIT message, which first byte is equal to '0' (ASCII), the RMR Support System shall send a “start DOTA” command (containing the software release of RMR Rack) with SSYS\_DATA field formatted as following:

RELN=@<DOTA\_CODE>|<RELN\_ID>,<FTP\_SERVER\_PATH>,<ftp\_server\_name/address>,<ftp\_server\_login>,<ftp\_server\_pwd>,<force>|<board\_1\_addr>,<board\_1\_type>,<board\_1\_sw\_file>,<board\_1\_config\_file>|...|<board\_N\_addr>,<board\_N\_type>,<board\_N\_sw\_file>,<board\_N\_config\_file>

All fields shall be ASCII formatted:

|  |  |
| --- | --- |
| <DOTA\_CODE> | DOTA code:  1: Release note identification => start DOTA  2: Release note identification & FORCE => FORCE start DOTA  3: Not Enable flag => don’t start DOTA  4: IMEI not found => don’t start DOTA |
| <RELN\_ID> | Name of the release note |
| <FTP\_SERVER\_PATH> | The path on, FTP server, where software and configuration files of this release note are located. |
| <ftp\_server\_name/address> | The name/IP address of the FTP server. |
| <ftp\_server\_login> | The login for FTP access |
| <ftp\_server\_pwd> | The password for FTP access |
| <FORCE> | Optional parameter to force DOTA even if software is already up-to-date on OBU. |
| <board\_X\_addr> | The board address on RMR Rack internal bus (Range 1..20) |
| <board\_X\_type> | The RMR Rack board type (EAGLE, CPU\_0, CPU\_1, SCOM\_0, SCOM\_1…). See RMR Rack specification for complete list. |
| <board\_X\_sw\_file> | The software file name  The maximum length of BOARD\_X\_SW\_FILE is 64 characters |
| <board\_X\_config\_file> | The configuration file name  The maximum length of BOARD\_X\_CONFIG\_FILE is 64 characters |

Table 7: Software download OTA

*Remark 1*: if DOTA\_CODE equals 3 or 4, the SSYS\_DATA field shall be limited to RELN=@<DOTA\_CODE>

*Remark 2:* the FTP server is not part of the RMR Support System delivery.

*Example1:*

<S1>12654;1;3;228;[RELN=@1|RELN\_HLD\_001,RELN,abt\_maintenance.dyndns.o](mailto:RELN=@1|RELN_HLD_001,RELN,abt_maintenance.dyndns.o)rg,Alstom\_ftp,alstomftp,|1,EAGLE,eagle\_v1\_1\_0\_3.dwl,|3,CPU\_1,CPU1\_HLD6264\_20120703\_Build\_259.zip,|4,SCOM\_0,SCOM1\_000,|9,PCOM\_1,PCOM1\_000.HEX,PCOM1\_000.cnf|6,ECOM\_0,,ECOM1\_000.cnf</S1>

*Example2:*

<S1>12654;1;3;233;[RELN=@2|RELN\_HLD\_001,RELN,abt\_maintenance.dyndns.o](mailto:RELN=@2|RELN_HLD_001,RELN,abt_maintenance.dyndns.o)rg,Alstom\_ftp,alstomftp,FORCE|1,EAGLE,eagle\_v1\_1\_0\_3.dwl,|3,CPU\_1,CPU1\_HLD6264\_20120703\_Build\_259.zip,|4,SCOM\_0,SCOM1\_000,|9,PCOM\_1,PCOM1\_000.HEX,PCOM1\_000.cnf|6,ECOM\_0,,ECOM1\_000.cnf</S1>

*Example3:*

<S1>12654;1;3;7;RELN=@3</S1>

*Example4:*

<S1>12654;1;3;7;RELN=@4</S1>

At first message received, the client identification (IMEI) is checked to see if it still exists in the maintenance database. Additional message will also identify the current version of software running in the different board of the RMR.

With that information, it will be possible to verify if new version of software is available. In such a case, the new version information is sent to Eagle and Eagle will start an upload of new version.

The update of software must be available for Eagle itself and for all the board installed in a RMR rack. The boot software of the board is not available for update as well as the firmware of some board (GPS).

DB

Ftp Server

RMR SSys

Eagle

Colibri

Start

Send identification/Init Message

Get RELN

Send RELN to RMR

Ask soft version of all boards

Soft version of all boards

When connected to GPRS

For all boards that need to get new software file

Get File 1

Get File 2

Get File N

Figure 2: Software download OTA

Any errors occurring during file transfer will invalidate the download and a message is logged in DB error table. The transfer will be restarted the next time the RMR connects.

Checksum errors invalidate the transfer.

After successful transfer, the RMR rack waits the power off of the equipment before tacking into service the new file transferred.

The transfer will be validated after the next successful restart.

The process of download can be initiated by the server (button on a web page for train identification).

#### Dynamic description: RMR configuration file update

[A455642\_0054]

The RMR configuration file shall be generated on RMR Support System side and shall be stored in a configurable folder.

[A455642\_0055]

The RMR Support System shall send to the OBU the RMR configuration, line by line, using commands, described in section 3.3.2.6.4.

[A455642\_0103]

The RMR configuration file shall contain up-to three unique sections:

* Version
* Parameters
* Filters

[A455642\_0104]

It shall be possible to document/comment the RMR configuration file using the ‘#’ character as first character of a line. The OBU shall not process any commented line.

##### Version

The RMR configuration file shall be uniquely identified by its version.

[A455642\_0056]

The version section shall be mandatory, unique and the first one in the file.

[VERSION]

[A455642\_0057]

The version shall be a string of maximum 255 characters and formatted as following:

VERSION=VALUE

[A455642\_0058]

The version shall be included in the initialization message (COMET\_INIT.COMET\_EVC\_CUR\_CONFIG\_VERSION) sent by the embedded RMR. The value shall be "Unknown" if configuration file version is not available.

*Example:*

[VERSION]

VERSION=BDK\_1.23

##### Parameters

[A455642\_0059]

It shall be possible to configure some OBU parameters from the RMR Support System.

[A455642\_0060]

The parameter section shall be unique and defined as follow:

[PARAMETERS]

[A455642\_0061]

Each following line is formatted like:

PARAM=VALUE

*Here is the list of parameters to be supported by RMR Comet OBU’s*

|  |  |
| --- | --- |
| POS\_TRACK\_MIN\_PERIOD | The minimum period between periodic successive messages (RMR\_PERIODIC) |
| POS\_TRACK\_FREQ\_V0 | The periodic message (RMR\_PERIODIC) sending frequency at standstill |
| POS\_TRACK\_FREQ\_COEF | The periodic message (RMR\_PERIODIC) sending frequency coefficient. |
| CIRCULAR\_BUFFER\_1\_SIZE | Maximum number of message in circular buffer 1 |
| CIRCULAR\_BUFFER\_2\_SIZE | Maximum number of message in circular buffer 2 |
| CIRCULAR\_BUFFER\_3\_SIZE | Maximum number of message in circular buffer 3 |
| CIRCULAR\_BUFFER\_4\_SIZE | Maximum number of message in circular buffer 4 |
| CIRCULAR\_BUFFER\_5\_SIZE | Maximum number of message in circular buffer 5 |
| CIRCULAR\_BUFFER\_6\_SIZE | Maximum number of message in circular buffer 6 |
| CIRCULAR\_BUFFER\_7\_SIZE | Maximum number of message in circular buffer 7 |
| CIRCULAR\_BUFFER\_8\_SIZE | Maximum number of message in circular buffer 8 |
| CIRCULAR\_BUFFER\_9\_SIZE | Maximum number of message in circular buffer 9 |
| CIRCULAR\_BUFFER\_10\_SIZE | Maximum number of message in circular buffer 10 |
| CIRCULAR\_BUFFER\_11\_SIZE | Maximum number of message in circular buffer 11 |
| CIRCULAR\_BUFFER\_12\_SIZE | Maximum number of message in circular buffer 12 |
| CIRCULAR\_BUFFER\_13\_SIZE | Maximum number of message in circular buffer 13 |
| CIRCULAR\_BUFFER\_14\_SIZE | Maximum number of message in circular buffer 14 |
| CIRCULAR\_BUFFER\_15\_SIZE | Maximum number of message in circular buffer 15 |
| CIRCULAR\_BUFFER\_16\_SIZE | Maximum number of message in circular buffer 16 |

Table 8: Configuration File parameters for RMR Comet

*Here is the list of parameters to be supported by RMR RACK/PCOM OBU’s*

|  |  |
| --- | --- |
| JRU\_COMMON\_START\_POS | JRU “Common Header” start position used for N\_PACKET split in the PCOM board:   * the parameter is bit encoded * 0 < JRU\_COMMON\_START\_POS < JRU\_COMMON\_END\_POS < 1000 |
| JRU\_COMMON\_END\_POS | JRU “Common Header” end position used for N\_PACKET split in the PCOM board:   * the parameter is bit encoded * 0 < JRU\_COMMON\_START\_POS < JRU\_COMMON\_END\_POS < 1000 |

*Example:*

Set the periodic message (RMR\_PERIODIC) sending frequency at standstill to 4 messages per hour.

[PARAMETERS]

POS\_TRACK\_FREQ\_V0=4

##### Filters

[A455642\_0062]

OBU’s naturally collects a lot of (too much) data from various interfaces. It shall be possible to limit the number of messages sent to the RMR Support System by a registration/filtering mechanism because of some technical limitations:

* Connection bandwidth (shared with other flows)
* Connection availability (interrupted regularly)
* RMR Support System capacity

[A455642\_0063]

As the expressed needs may evolve, the filtering definition must be generic in order to:

* be adaptive to project needs
* be compatible with new boards/data flow

[A455642\_0064]

A filtering mechanism shall be implemented on all boards of RMR Rack (CPU, PCOM, SCOM…) and on COMET board.

[A455642\_0065]

All filters shall be defined in one single file. For RMR Rack, this file shall be the configuration file of the Eagle. The Eagle shall be in charge of sending specific filters to adequate boards.

[A455642\_0066]

By default, if no filter is defined for a data type that support filtering, no data shall be sent to the RMR Support System.

*Remark: the section 4.2.3 describes the different data types that support filtering.*

[A455642\_0067]

A filter shall be composed of one or several rule(s).

*Remark: the maximum number of rules, which can be treated by the embedded RMR, is defined by implementation limits. These limits may be different from one RMR solution to the other (RMR Rack, RMR Comet...).*

[A455642\_0068]

Each rule shall be composed of:

* a referenced data type: DATA\_TYPE
* a rule type: RULE\_TYPE
* a reference to circular buffer(s): RULE\_BUFFERS
* up-to 5 MASK(s):
  + The number of masks is indicated by RULE\_NB\_MASK
  + To validate a rule, all MASKs of the rule shall be valid. The rule definition can be read like a logical composition of AND operators (Rule = MASK1 AND MASK2 AND …)

*Remark: if no masks are defined for a rule, the rule is implicitly valid. It means that all messages of the referenced data type shall be selected.*

* + A MASK is defined by its offset (in bit), length (in bit) and value to match, all separated by ‘,’.
  + For “on changes” rule (see [A455642\_0069]), the last MASK of the rule has a special meaning. It refers the data to be monitored for changes. The rule shall be valid if:
    - All MASK except the last one are valid
    - The data referred by the last MASK changed between the previous data frame and the current one being analyzed.

*Remark: By convention, the “value” of the last* MASK *of a “on changes” rule shall be* set to “0”.

[A455642\_0098]

All MASK parameters (offset, length and value) are defined as Big Endian and have values included in the 64 bits unsigned integer.

*Example: Mask with offset=10, length=11 and value=1552(0x610)*



[A455642\_0069]

If a rule is valid for a given data frame, the data frame is sent to RMR Support System at a rate depending on the defined rule type. This RULE\_TYPE can be:

* Any positive value (range 1..3600000, unit msec): the data frames are **sampled** and sent to RMR server at that rate (min: 1 msec, max: 1 hour)
* 0: the data frames are sent **on changes** (current data frame is different from the previous one)
* -1: the data frames are sent at the **on-board acquisition rate**.

*Example1: EVC\_TRU messages are sent every 5 seconds, RMR server will receive EVC\_TRU messages every 5 seconds.*

*Example2: One MVB port is configured at 32msec, RMR server will received MVB messages every 32msec.*

* -2: the data frames are **stored** for (later) sending on specific events (see rule type -3) or upon reception of “Send on-demand messages” command (CMD\_CODE=36). The OBU shall store the latest frames in the referenced circular buffer(s).
* -3: the data frame includes a **specific event** (for example: an incident). The OBU shall send all stored messages in the referenced circular buffer(s) but not this data frame.

Remark: the stored messages in the referenced circular buffer shall **not** be deleted.

[A455642\_0070]

The reference to circular buffer(s) RULE\_BUFFERS shall define:

* In which circular buffer(s), a store rule (rule type = -2) shall store the matching frame
* Which circular buffer(s) a specific event rule (rule type = -3) shall read to send messages to RMR Support System.

*Remark*

* *A store rule (-2) shall accept one or several references to circular buffer*
* *A specific event rule (-3) shall accept one or several references to circular buffer*
* *For all other rules, no reference to circular buffer is allowed*

[A455642\_0071]

The reference to circular buffer(s) is defined on two bytes and encoded in decimal format in the configuration file. Bits that are set to one define the circular buffer(s) ID.

*For example: 257 (in hex: 01 01) refers to circular buffers 1 and 9.*

*Remark: this definition limits references to 16 circular buffer maximum.*

[A455642\_0072]

When several buffers are defined in the circular buffer reference, the OBU shall treat first the buffer corresponding to the less significant bit (in the example above: treat buffer 1 then buffer 9).

[A455642\_0073]

The number of data frames that a circular buffer stores shall be defined by a configuration parameter.

[PARAMETERS]

CIRCULAR\_BUFFER\_1\_SIZE=10

CIRCULAR\_BUFFER\_2\_SIZE=5

*Remark*:

* If a rule refers to non-defined circular buffer(s), the rule shall be rejected (see [A455642\_0087])
* For the RMR Rack, some operations shall be done on interface boards and other ones on the main CPU board. This document doesn’t describe the software architecture split. It has not been decided yet that the whole filtering feature shall be implemented for RMR Rack.
* For the RMR Rack, there is no dynamic allocation. Fixed size buffers are used but it shall be possible to send only a part of the circular buffer content.

[A455642\_0074]

The filter section shall be unique and defined as follow:

[FILTERS]

[A455642\_0075]

The format of a rule is the following:

DATA\_TYPE:RULE\_TYPE:RULE\_BUFFERS:RULE\_NB\_MASK: MASK1: MASK2:...: MASKN

*Example 1:*

A client wants to receive balise (EVC\_TRU, TRU\_NID\_MESSAGE=0, JRU\_NID\_PACKET=6), maintenance manager train (EVC\_TRU, TRU\_NID\_MESSAGE=9, DRU\_NID\_PACKET=1, DRU\_NID\_SOURCE=7), network operator(GSM-R, COPS), maintenance manager RMR (MM\_RMR) and MVB process data message of port 5.

[FILTERS]

EVC\_TRU:-1:0:2:0,8,0:568,8,6

EVC\_TRU:0:0:3:0,8,9:72,8,1:96,8,7

GSM-R:-1:0:1:24,32,0x434F5053

MM\_RMR:0:0:1:0,24,ascii(“MNT”)

MVB:10000:0:2:0,16,205:16,12,5 (ex: port 5 is configured at 32msec but sampled at 10 sec)

*Example 2:*

A client wants to receive the latest 10 JRU train positions (EVC\_TRU, TRU\_NID\_MESSAGE=0), and 5 GSM-R signal strength (GSM-R, CSQ) upon reception of a balise error incident (EVC\_TRU, TRU\_NID\_MESSAGE=0, JRU\_NID\_PACKET=12).

[PARAMETERS]

CIRCULAR\_BUFFER\_1\_SIZE=10

CIRCULAR\_BUFFER\_2\_SIZE=5

[FILTERS]

EVC\_TRU:-2:1:1:0,8,0

GSM-R:-2:2:1:24,32,0x434F5053

EVC\_TRU:-3:3:2:0,8,0:568,8,12

[A455642\_0076]

At RMR Rack Eagle level, there shall be a mapping between data type and destination board of the filter. This is defined on board and not configurable.

[A455642\_0077]

It shall be possible to filter on port (ex: for GSM-R, SCOM uses 4 ports)

* The filter has to be applied after SCOM has put the 7 bytes header (containing MxA (x=1,2,3 or 4)) in front of the data flow

*EVC\_TRU specific:*

*Remark: TRU messages can contain up to 15 (same or different) packets. Each packet corresponds to a specific event. As the JRU\_NID\_PACKET may have a variable offset in the frame, a mechanism shall be defined in order to filter on a specific packet.*

[A455642\_0078]

The OBU (RMR Rack or embedded RMR in Comet) shall split the TRU frame before applying the filter:

* Each newly built frames shall be composed of:
  + The common part with JRU/DRU\_N\_PACKET set to 1 and JRU/DRU\_L\_MESSAGES recomputed
  + The packet specific part
* Advantages:
  + The split TRU frame shall fit in RMR message (see [A455642\_0025] regarding maximum RMR message length)
  + Keep easy filtering mechanism with fix mask offsets
  + Avoid to send to RMR server non useful packets
  + As one packet corresponds to one event, RMR server needs to have the same frame split mechanism implemented.
  + Less data sent to server (depends on filtering setup)

*MVB specific:*

*Remark: the generic filtering mechanism is also valid for MVB. It is not planned to extract, on board, a specific data inside a MVB frame read from a MVB port. Such an extraction needs to have the complete decoding mapping, which is project specific.*

*Remark: the MVB port to be read is implicitly defined by the filter. If no filter is defined, no data acquisition is done on MVB ports.*

*Remark: as the natural refresh rate of some MVB port may be very high for RMR function, the rule type defined with a sampling period shall be used to limit data flow sent to the RMR Support System.*

##### Commands

[A455642\_0079]

Following commands (see appendices section **4.1.1**) shall be sent from RMR Support System to OBU:

|  |  |  |
| --- | --- | --- |
| **Command** | **Parameter** | **OBU action** |
| Initialize Configuration |  | The OBU shall prepare a new and empty RMR configuration file. |
| Send Line | One line of the RMR configuration file | The OBU shall add the received line to its new RMR configuration file |
| End configuration | checksum | The OBU shall close the RMR configuration file and verify the checksum. |

Table 9: RMR Configuration File commands

*Remark: For more information about the process, see next section “Dynamic description”.*

##### Dynamic description

[A455642\_0095]

The OBU’s and the RMR Support System shall implement “RMR configuration line-by-line upgrade” function as described in following dynamic description:

* The RMR Support System shall send one command “Initialize Configuration”
* For each line (commented and non-commented ones) of the RMR configuration file, the RMR Support System shall send one command “Send Line” containing the line without control characters

*Remark: The line shall content only ASCII printable characters from 32 to 126*

* The RMR Support System shall send one command “End Configuration” containing a CRC
  + The CRC shall be ccitt-16 (with starting value of 0x0000 or 0x1D0F) and shall be evaluated on the concatenated lines that have been sent
* The OBU shall apply the same CRC on the concatenated lines that have been received
  + If the CRC matches the received one, the OBU shall
    - build the RMR configuration file for further usage
    - send a CMD\_FBCK message containing “RMR configuration file transfer Success”
  + If the CRC doesn’t match the received one, the OBU shall
    - send a CMD\_FBCK message containing “RMR configuration file transfer Failed”

EVC Comet RMR

RMR SSys

Operator

Chose configuration file

Set Configuration File

Notify Current Configuration file version

MSG\_ACK

EVC Startup

Initialize configuration

CMD\_FBCK

Notify Current Configuration file version

MSG\_ACK

RMR Application Restart

Send Line (1)

Send Line (N)

End configuration

CMD\_FBCK

Reset RMR Application

CMD\_FBCK

Reset RMR Application command

Reset RMR Application

Action 1

Action 2

Figure 3: RMR configuration line-by-line upgrade

##### Configuration file errors

[A455642\_0086]

Upon reception of the “Initialize configuration” command (CMD\_CODE 2), the OBU shall set (and send) the RMR\_EVENT.COMET\_RMR\_CONFIG\_FILE\_STR\_ERROR and RMR\_EVENT.COMET\_RMR\_CONFIG\_FILE\_RT\_ERROR to empty value “”.

[A455642\_0087]

Upon detection of a structure error (following list is not exhaustive)

* [VERSION] section not present
* [VERSION] section not unique
* [PARAMETERS] section not unique
* [FILTERS] section not unique
* unknown section
* same rule defined twice
* rule refers a non-defined parameter
* line wrongly formatted
* out-of-range parameter
* non-managed data type

of the RMR configuration file, the OBU shall:

* set (and send) the RMR\_EVENT.COMET\_RMR\_CONFIG\_FILE\_STR\_ERROR to a value corresponding to the line number at which the error occurred
* ignore the line that caused the error until a new configuration file is received
* continue the parsing of the remaining part of the RMR configuration file

*Remarks: If several structure errors are detected, these actions have to be performed as many times.*

[A455642\_0088]

Upon detection of a run-time error when parsing the rules defined in the RMR configuration file, the OBU shall:

* set (and send) the RMR\_EVENT.COMET\_RMR\_CONFIG\_FILE\_RT\_ERROR to a value corresponding to the line number at which the error occurred
* ignore the line that caused the error until a new configuration file is received

##### Data Preparation on RMR Support System

[A455642\_0081]

The configuration file shall be built by RMR Support System thanks to a data preparation tool.

[A455642\_0096]

The configuration file shall be validated at trackside before sending it to the OBU.

## Intentionally deleted

The FTP server is not in the scope of the RMR Support System

# APPENDICES

## Messages from RMR SSys to OBU description

### Commands

#### RMR Rack only

|  |  |
| --- | --- |
| Stop Watchdog | Allow to remotely restart the Eagle chip of the RACK (see RACK user manual for impact of this command). CMD\_CODE    : 80  CMD\_PARAM   :  *Example : <S1>123;1;4;5;80||0</S1>* |
| Get Module Info | Get IP info from an OBU  CMD\_CODE    : 81  CMD\_PARAM   :  *Example : <S1>123;1;4;5;81||0</S1>* |
| Set APN | Set APN parameters of OBU  CMD\_CODE    : 82  CMD\_PARAM   : APN:user name:password:PIN code  *Example : <S1>123;1;4;5;82|internet.proximus .be:::|0</S1>* |
| Set Server info | Set RMR Support System information in OBU  CMD\_CODE    : 83  CMD\_PARAM   : server access name:protocol:port  *Example : <S1>123;1;4;5;83|abt-maintenance.dyndns.org:TCP:9502|0</S1>* |
| Get Server info | Get RMR Support System information from OBU  CMD\_CODE    : 84  CMD\_PARAM   :  *Example : <S1>123;1;4;8;84||0</S1>* |
| Set RACK param | Set OBU parameters  CMD\_CODE    : 85  CMD\_PARAM   : EAGLE\_MM\_RACK\_PERIOD\_SEC: POS\_TRACK\_FREQ\_V0:POS\_TRACK\_FREQ\_COEF: POS\_TRACK\_MIN\_PERIOD  *Example : <S1>123;1;4;18;85|300:4:10:5000|0</S1>*  *Remark: The minimum value for POS\_TRACK\_MIN\_PERIOD inside RMR Rack is 5000(software minimum value)* |
| Get RACK param | Set OBU parameters  CMD\_CODE    : 86  CMD\_PARAM   :  *Example : <S1>123;1;4;5;86||0</S1>* |
| Reset Module | Allow to remotely reset the RACK (see RACK user manual for impact of this command).  CMD\_CODE    : 87  CMD\_PARAM   :  *Example : <S1>123;1;4;5;87||0</S1>* |
| Start DOTA | Start software download OTA  Command: see section 3.3.2.5  Parameters: see section 3.3.2.5  Response: none, the DOTA mechanism shall be triggered |

Table 10: RMR Rack commands

#### COMET only

|  |  |
| --- | --- |
| Get configuration file  [Reserved for future development] | Ask Comet to retrieve new RMR Configuration File  CMD\_CODE : 1  CMD\_PARAM : CONFIG\_FILE (Ex: “config\_file\_v3\_4.txt”)  CMD\_CKS : CKS (Ex: “458A2BCC”) |
| Initialize configuration | Ask Comet to create a new configuration file using the line-by-line configuration process  CMD\_CODE : 2 |
| Send line | Send one line of the RMR Configuration File to the Comet  CMD\_CODE : 3  CMD\_PARAM : LINE (Ex: “CIRCULAR\_BUFFER\_1\_SIZE=10”, “EVC\_TRU:-1:0x0:2:0,8,0:568,8,6”) |
| End configuration | Warn Comet that the RMR Configuration process is finished  CMD\_CODE : 5  CMD\_CKS : CKS (Ex: “458A2BCC”) |
| Read file | Ask Comet to retrieve Binary File  CMD\_CODE : 6  CMD\_PARAM : FILE (Ex: “file\_v3.4.bin”)  CMD\_CKS : CKS (Ex: “458A2BCC”) |
| Send Project Version | Send EVC Project Version to Comet CMD\_CODE : 7  CMD\_PARAM : PRJ\_VERSION (Ex: “6\_2\_2\_0\_1”) |
| Get Position | Ask OBU to return a command feedback to get latest position of the OBU  CMD\_CODE : 9 |
| Start CANAPE recording | CMD\_CODE : 11 |
| Start SDMU recording | CMD\_CODE : 12 |
| Start debugging recording  [Reserved for future development] | CMD\_CODE : 13 |
| Start GSM-R monitoring | CMD\_CODE : 14  CMD\_PARAM : ANALYSIS DURATION (Range: 0-3600 seconds, unit= sec, 0 means infinite (until EVC stop)) |
| Start message sending | Ask OBU to start the sending of the RMR messages stored in the sending buffer (FIFO).  CMD\_CODE : 15 |
| Stop CANAPE recording | CMD\_CODE : 21 |
| Stop SDMU recording | CMD\_CODE : 22 |
| Stop debugging recording  [Reserved for future development] | CMD\_CODE : 23 |
| Stop message sending | Ask OBU to stop the sending of the RMR messages stored in the sending buffer (FIFO).  CMD\_CODE : 24 |
| Send CANAPE  [Reserved for future development] | CMD\_CODE : 31 |
| Send SDMU  [Reserved for future development] | CMD\_CODE : 32 |
| Send debugging  [Reserved for future development] | CMD\_CODE : 33 |
| Send TRU  [Reserved for future development] | CMD\_CODE : 34  CMD\_PARAM : START:STOP (optional parameters: “DD\_MM\_YYYY\_HH\_MM\_SS:DD\_MM\_YYYY\_HH\_MM\_SS”) |
| Send Novrams  [Reserved for future development] | CMD\_CODE : 35 |
| Send on-demand messages  [Reserved for future development] | Ask OBU to send the messages stored in the circular buffer(s)  CMD\_CODE : 36  CMD\_PARAM : CIRCULAR\_BUFFERS (Remark: the reference to the circular buffers is defined by the same bit-mask as the one used for the -2 and -3 rule types (see [A455642\_0071]) |
| Send EVC\_MM status  [Reserved for future development] | Ask OBU to send the EVC Maintenance Manager status of all LRU’s  CMD\_CODE : 37 |
| Reset Error Counters | CMD\_CODE : 41 |
| Reset Novrams | CMD\_CODE : 42 |
| Reset RMR Application | Ask OBU to reset RMR Application in order to take into account the new RMR configuration (parameters & filters)  CMD\_CODE : 43 |
| Reset RMR Fifo  [Reserved for future development] | Ask OBU to remove all messages older than a given date & time (as parameter) from the RMR Fifo.  CMD\_CODE : 44  CMD\_PARAM : DATE\_TIME (“DD\_MM\_YYYY\_HH\_MM\_SS”) |
| Reset RMR Connection  [Reserved for future development] | Ask OBU to reset RMR Connection in order to take into account FTP and Server parameters (commands 51 to 55)  CMD\_CODE    : 133 |
| Set FTP Parameters  [Reserved for future development] | Set FTP server parameters in OBU CMD\_CODE : 128  CMD\_PARAM : FTP\_SERVER\_ADDR:PATH:LOGIN:PWD (“123.234.2.1:RELN:alstom:alstom”) |
| Set Primary Server  [Reserved for future development] | Set primary RMR Server information in OBU  CMD\_CODE : 129  CMD\_PARAM : SERVER\_ADDR:PROTOCOL:PORT  (“123.234.2.2:TCP:9502”) |
| Reset Primary Server  [Reserved for future development] | Reset primary RMR Server information in OBU  CMD\_CODE : 130 |
| Set Redundant Server  [Reserved for future development] | Set redundant RMR Server information in OBU  CMD\_CODE : 131  CMD\_PARAM : SERVER\_ADDR:PROTOCOL:PORT  (“123.234.2.2:TCP:9502”) |
| Reset Redundant Server  [Reserved for future development] | Reset redundant RMR Server information in OBU  CMD\_CODE : 132 |
| Synchronize Fifo  [Reserved for future development] | RMR Support System asked OBU to queue a FIFO\_SYNCHRONIZED message in its sending buffer  CMD\_CODE : 60 |
| Control SSD storage  [Reserved for future development] | Controls if the COMET boards manage the sending buffer in SSD or not  CMD\_CODE : 61  CMD\_PARAM : “0” (do not used SSD) or “1” (use SSD) |

Table 11: Comet commands

## Messages from OBU to RMR SSys description

### OBU Version (OBU\_VER)

The OBU\_VER field is contains the version of the OBU among:

|  |  |  |
| --- | --- | --- |
| OBU\_VER | TRB baseline | GATC documents |
| C.1 | 6.3.0 | [R5], [R9] |
| C.2 | 6.4.0 | [R5], [R9] |
| C.3 | 6.4.0 R1.2 and later | [R6], [R10] |
| C.4 | 7.1.0 | [R7], [R11] |
| R.1 | 5.2.1 | [R2], [R3] |
| R.2 | 5.8.0 | [R4], [R8] |

### GPS data (OBU\_GPS field)

The OBU\_GPS field can be up to 250 bytes length containing ASCII encoded fields and separated by ‘,’.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Fields** | **Format** | **Unit** | **Example** | **Max Size (byte)** |
| GPS\_VALIDITY | -2 (EVC Time available)  -1 (no data available)  1 (GPS Time available)  2 (GPS Time & Position available) |  | 2 | 2 |
| GPS\_TIME | hhmmss(.mmm) |  | 220008 | 10 |
| GPS\_DATE | DDMMYY |  | 220713 | 6 |
| GPS\_LATITUDE | nnnn.nnnn[S,N] | deg | 5024.2522N | 10 |
| GPS\_LONGITUDE | nnnnn.nnnn[E,W] | deg | 00426.8961E | 11 |
| GPS\_ALTITUDE | nnnn.n (may be negative) | meter | 153.7 | 5 |
| GPS\_HDOP\_STATUS | nnn.n (999.9 if not applicable) |  | 4.5 | 5 |
| GPS\_SPEED | nnn.nnn | km/h | 1.722 | 7 |
| GPS\_DIRECTION | nnn.nn | deg (0-360°) | 76.37 | 6 |
| GPS\_SATELLITE\_NB | nn |  | 5 | 2 |

Table 12: Message description: GPS data

*Remark: the GPS\_DATE/GPS\_TIME is expressed in UTC.*

|  |  |  |
| --- | --- | --- |
| GPS\_VALIDITY | Filled fields | Comment |
| -2 | GPS\_VALIDITY  GPS\_TIME  GPS\_DATE | the GPS\_TIME and GPS\_DATE fields shall contain the EVC Date & Time |
| -1 | GPS\_VALIDITY | No other data provided |
| 1 | GPS\_VALIDITY  GPS\_TIME  GPS\_DATE  GPS\_SATELLITE\_NB | Partial GPS information provided |
| 2 | All fields | Full GPS information provided |

Table 13: Message description: GPS validity

### OBU\_CUSTOM

OBU\_CUSTOM content depends on OBU\_VER.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **OBU\_VER** | **OBU\_CUSTOM** | | | | |
| **Field** | **Description** | **Length** | **Type** | **Format/Example** |
| C.1 (C = Comet) | MSG\_TRUNCATED | Message truncated | 1 char | String | "0": message not truncated "1": message truncated |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| R.1 (R = Rack) |  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

### Data type (OBU\_DATA\_TYPE field)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| DATA\_TYPE | **Info** | **Sending rule** | **Corresponding code** | **OBU type applicability** |
| CMD\_FBCK | Command Feedback | Always | 1 | Both |
| EVC\_TRU | EVC -> TRU messages | Filter | 2 | Both |
| GSM\_R | Gsm/R | Filter | 3 | Not used |
| RBC | RBC | Filter | 4 | Not used |
| ATB\_ARR | ATB -> ARR messages | Filter | 5 | RMR Rack |
| KVB\_ATESS | KVB -> ATESS messages | Filter | 6 | Not used |
| SCMT\_DIS | SCMT -> DIS messages | Filter | 7 | Not used |
| MVB | MVB | Filter | 8 | Not used |
| ETH | Ethernet | Filter | 9 | Not used |
| FILIO | Filio | Filter | 10 | Not used |
| RACK\_MM | MM Status for RMR RACK Board | Filter | 11 | RMR Rack |
| RACK\_INIT | Module Init Message | Always | 12 | RMR Rack |
| RACK\_OP | Module Characteristics | Filter | 13 | RMR Rack |
| COMET\_INIT | COMET Init Messages | Always | 14 | COMET |
| RMR\_EVENT | RMR Event Messages | Parameter | 15 | Both |
| RMR\_PERIODIC | RMR Periodic Messages | Parameter | 16 | Both |
| PROFIBUS | Profibus | Filter | 17 | Not used |
| EVC\_MM | EVC maintenance Manager | See [A455642\_0102] | 18 | Not used |
| GSM\_R | Gsm/R | Always | 19 | COMET |
| GSM\_R\_AT\_M1RX | GSM/R AT commands Mobile1 RX | Filter | 31 | RMR Rack |
| GSM\_R\_AT\_M1TX | GSM/R AT commands Mobile1 TX | Filter | 32 | RMR Rack |
| GSM\_R\_AT\_M2RX | GSM/R AT commands Mobile2 RX | Filter | 33 | RMR Rack |
| GSM\_R\_AT\_M2TX | GSM/R AT commands Mobile2 RX | Filter | 34 | RMR Rack |

Table 14: Message description: data type

The sending rules are described in following section:

* Filter : 3.3.2.6.3 (Filters)
* Parameter : 3.3.2.6.2 (Parameters)

### Data (OBU\_DATA field)

OBU\_DATA format depends on OBU\_DATA\_TYPE field.

#### CMD\_FBCK

This section describes the command feedback message sent by OBU in reply to a RMR Support System command message.

The OBU\_DATA field can be up to 250 bytes length containing ASCII encoded fields and separated by ‘,’.

|  |  |  |  |
| --- | --- | --- | --- |
| **Fields** | **Explanation** | **Example** | **Possible values** |
| CMD\_CNT | ID of the command being acknowledged/answered. | 2343 | uint32 |
| CMD\_STATUS |  | "OK" | OK, NOK, WARN |
| CMD\_TEXT |  | "ACCEPTED" | any string |

Table 15: Message description: CMD\_FBCK

#### EVC\_TRU

This section describes EVC\_TRU messages.

EVC\_TRU content depends on OBU\_VER:

|  |  |  |
| --- | --- | --- |
| OBU\_VER | TRB baseline | GATC documents |
| C.1 | 6.3.0 | [R5], [R9] |
| C.2 | 6.4.0 | [R5], [R9] |
| C.3 | 6.4.0 R1.2 and later | [R6], [R10] |
| C.4 | 7.1.0 | [R7], [R11] |
| R.1 | 5.2.1 | [R2], [R3] |
| R.2 | 5.8.0 | [R4], [R8] |

Note: starting from BSL3 (OBU\_VER C.x), the version of the ETCS system is indicated in the JRU message and shall be used by the RMR server to decode the JRU message.

#### GSM\_R\_AT

[RMR Rack specific]

This section describes AT messages that monitors GSM-R network.

|  |  |  |
| --- | --- | --- |
| **Fields** | **Length** | **Example** |
| OBU\_DATA | OBU\_DATA\_LEN | 41542B434F50533A20312C322C22323034333122 (="AT+COPS: 1,2,"20431"") |

Table 16: Message description: GSM\_R\_AT

*Remarks:*

* *GSM\_R\_AT data type is obsolete*
* *GSM\_R\_AT\_M1RX data type shall be used for GSM/R AT commands Mobile1 RX*
* *GSM\_R\_AT\_M1TX data type shall be used for GSM/R AT commands Mobile1 TX*
* *GSM\_R\_AT\_M2RX data type shall be used for GSM/R AT commands Mobile2 RX*
* *GSM\_R\_AT\_M2TX data type shall be used for GSM/R AT commands Mobile2 RX*

See ETSI TS 127 007 V5.1.0 for more information about AT messages.

**Extract operator**

Extract GSMR\_DATA containing "+COPS:"

+COPS: <mode>[,<format>,<oper>[,< AcT>]]

<mode>:

0 automatic (<oper> field is ignored)

1 manual(<oper> field shall be present, and <AcT> optionally)

2 deregister from network

3 set only<format> (for read command +COPS?), do not attempt registration/deregistration (<oper> and <AcT> fields are ignored); this value is not applicable in read command response

4 manual/automatic (<oper> field shall be present); if manual selection fails, automatic mode (<mode>=0) is entered

<format>:

0 long format alphanumeric <oper>

1 short format alphanumeric <oper>

2 numeric<oper>

<oper>: string type; <format> indicates if the format is alphanumeric or numeric; long alphanumeric format can be up to 16 characters long and short format up to 8 characters (refer GSM MoU SE.13 [9]); numeric format is the GSM Location Area Identification number (refer TS 24.008 [8] subclause 10.5.1.3) which consists of a three

BCD digit country code coded as in ITU-T E.212 Annex A [10], plus a two BCD digit network code, which is administration specific; returned <oper> shall not be in BCD format, but in IRA characters converted from

BCD; hence the number has structure: (country code digit 3)(country code digit 2)(country code digit 1)(network

code digit 3)(network code digit 2)(network code digit 1)

<stat>:

0 unknown

1 available

2 current

3 forbidden

<AcT> access technology selected:

0 GSM

1 GSM Compact

2 UTRAN

**Extract Signal Level**

Extract GSMR\_DATA containing "+CSQ:"

+CSQ: <rssi>,<ber>

<rssi>:

0 -113 dBm or less

1 -111 dBm

2...30 -109... -53 dBm

31 -51 dBm or greater

99 not known or not detectable

<ber> (in percent):

0...7 as RXQUAL values in the table in TS 45.008 [20] subclause 8.2.4

99 not known or not detectable

**Extract Cell ID**

Extract GSMR\_DATA containing "+CREG:"

+CREG: <n>,<stat>[,<lac>,<ci>]

<n>:

0 disable network registration unsolicited result code

1 enable network registration unsolicited result code +CREG: <stat>

2 enable network registration and location information unsolicited result code +CREG:

<stat>:

0 not registered, MT is not currently searching a new operator to register to

1 registered, home network

2 not registered, but MT is currently searching a new operator to register to

3 registration denied

4 unknown

5 registered, roaming

<lac>: string type; two byte location area code in hexadecimal format (e.g. "00C3" equals 195 in decimal)

<ci>: string type; two byte cell ID in hexadecimal format

#### RBC

RBC messages shall not be decoded for RMR baseline 3.0.

#### ATB\_ARR

[RMR Rack specific]

This section describes, for information, ATB messages sent to ARR.

|  |  |  |  |
| --- | --- | --- | --- |
| **ATB-ARR encoding** | **ITEM** | **NUMBER OF BYTES** | **ASCII HEX CODE** |
| **ESC**ape | ESC | 1 | 1b |
| **S**tart of **T**e**X**t | STX | 1 | 02 |
| Frame type **COD**e | COD | 1 | 44 |
| Fra**ME N**umber | MEN | 1 | O..ff |
| **S**ou**RC**e address | SRC | ½ | 0..f |
| **D**e**ST**ination address | DST | ½ | 0..f |
| Frame **LEN**gth LEN 01 0..ff | LEN | 1 | 0..ff |
| **DATA** (MESSAGE) | DATA | LEN-9 (Max 246 bytes) | 0..ff |
| **B**lock **C**heck **C**haracter | BCC | 1 | 0..ff |
| **ESC**ape | ESC | 1 | 1b |
| **E**nd of **T**e**X**t | ETX | 1 | 03 |

Table 17: Message description: ATB\_ARR format

|  |  |  |
| --- | --- | --- |
| The **DATA** field format is described in **Table** 18.**Byte Nb** | **56 Bytes** | **80 Bytes** |
| 0 | SPVAL1 | SPVAL1 |
| 1 | SPVAL2 | SPVAL2 |
| 2 | ODOMAX1 | ODOMAX1 |
| 3 | ODOMAX2 | ODOMAX2 |
| 4 | ODOMAX3 | ODOMAX3 |
| 5 | LOGINFO | LOGINFO |
| 6 | EBC | EBC |
| 7 | TRCODE | TRCODE |
| 8 | RELAY\_PH4INFO | RELAY\_PH4INFO |
| 9 | CABINFO | CABINFO |
| 10 | MODE\_FORREV | MODE\_FORREV |
| 11 | BRF\_SPF | BRF\_SPF |
| 12 | LAMPS | LAMPS |
| 13 | LASOUNDS | LASOUNDS |
| 14 | EXLEDMIN | EXLEDMIN |
| 15 | EXLEDMAX | EXLEDMAX |
| 16 | INLED | INLED |
| 17 | DISTMETER | DISTMETER |
| 18 | LEFT\_RIGHT | LEFT\_RIGHT |
| 19 | DISTOGO1 | DISTOGO1 |
| 20 | DISTOGO2 | DISTOGO2 |
| 21 | TRDATA1 | TRDATA1 |
| 22 | TRDATA2 | TRDATA2 |
| 23 | TRDATA3 | TRDATA3 |
| 24 | TRDATA4 | TRDATA4 |
| 25 | TRDATA5 | TRDATA5 |
| 26 | TRDATA6 | TRDATA6 |
| 27 | TRDATA7 | TRDATA7 |
| 28 | TRDATA8 | TRDATA8 |
| 29 | TRDATA9 | TRDATA9 |
| 30 | TRDATA10 | TRDATA10 |
| 31 | TRDATA11 | TRDATA11 |
| 32 | TRDATA12 | TRDATA12 |
| 33 | TRDATA13 | TRDATA13 |
| 34 | TRDATA14 | TRDATA14 |
| 35 | TRDATA15 | TRDATA15 |
| 36 | VDIENST1 | VDIENST1 |
| 37 | VDIENST2 | VDIENST2 |
| 38 | BAKKEN1 | BAKKEN1 |
| 39 | BAKKEN2 | BAKKEN2 |
| 40 | CARGOLENGTH1 | CARGOLENGTH1 |
| 41 | CARGOLENGTH2 | CARGOLENGTH2 |
| 42 | REM\_VALUE1 | REM\_VALUE1 |
| 43 | REM\_VALUE2 | REM\_VALUE2 |
| 44 | VDS\_VALUE1 | VDS\_VALUE1 |
| 45 | VDS\_VALUE2 | VDS\_VALUE2 |
| 46 | AS\_EQBD1 | AS\_EQBD1 |
| 47 | AS\_EQBD2 | AS\_EQBD2 |
| 48 | DATA\_CHOICE | DATA\_CHOICE |
| 49 | VMRTBR | VMRTBR |
| 50 | VMRC | VMRC |
| 51 | AK-KK | AK-KK |
| 52 | ENH\_flags | ENH\_flags |
| 53 | ENH\_Code | ENH\_Code |
| 54 | Spare 3 | **PLATFORM TYPE** |
| 55 | Spare 4 | **VERSION\_IX** |
| 56 |  | **VERSION\_NBR\_X** |
| 57 |  | **VERSION\_NBR\_Y** |
| 58 |  | **VERSION\_NBR\_Z** |
| 59 |  | **NOVRAM ERROR** |
| 60 |  | **NOVRAM ERROR** |
| 61 |  | **CHANNEL** |
| 62 |  | **CONFIDENCE LEVEL** |
| 63 |  | **CURRENT LEFT ANTENNA** |
| 64 |  | **CURRENT RIGHT ANTENNA** |
| 65 |  | **GAIN LEFT ANTENNA MSB** |
| 66 |  | **GAIN LEFT ANTENNA LSB** |
| 67 |  | **GAIN RIGHT ANTENNA MSB** |
| 68 |  | **GAIN RIGHT ANTENNA LSB** |
| 69 |  | **Spare1** |
| 70 |  | **Spare2** |
| 71 |  | **Spare3** |
| 72 |  | **Spare4** |
| 73 |  | **Spare5** |
| 74 |  | **Spare6** |
| 75 |  | **Spare7** |
| 76 |  | **Spare8** |
| 77 |  | **Spare9** |
| 78 |  | **Spare10** |
| 79 |  | **Spare11** |

Table 18: ATB\_ARR DATA field description

#### KVB\_ATESS

KVB to ATESS messages shall not be decoded for RMR baseline 3.0.

#### SCMT\_DIS

SCMT to DIS messages shall not be decoded for RMR baseline 3.0.

#### MVB

MVB messages shall not be decoded for RMR baseline 3.0.

#### RACK\_MM

[RMR Rack specific]

This section describes Maintenance Manager RMR messages.

Byte at offset 1 of Message is "**Board Address**", it correspond to a "**Board Type**"

The Data structure depends on "**Board Type**"

|  |  |
| --- | --- |
| **Board Address** | **Board Type** |
| 1 | EAGLE |
| 2, 3 | CPU (CPU\_0/1) |
| 4, 5, 18, 19 | SCOM (SCOM\_0/1/2/3) |
| 6, 7 | ECOM (ECOM\_0/1) |
| 8, 9 | PCOM (PCOM\_0/1) |
| 10, 11 | MCOM (MCOM\_0/1) |
| 12, 13 | CCOM (CCOM\_0\_1) |
| 14, 15, 16, 17 | BIN (BIN1\_0/1 & BIN2\_0/1) |

Table 19: Message description: RACK\_MM board address

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Board Type = CPU** | **Offset** | **length** | **Format** | **Unit** |
| LenMM | 0 | 1 | uint8 |  |
| Board\_address | 1 | 1 | uint8 |  |
| MM\_version | 2 | 1 | uint8 |  |
| Board\_status | 3 | 1 | STATUS |  |
| rev\_maj | 4 | 1 | uint8 |  |
| rev\_min | 5 | 1 | uint8 |  |
| rev\_build | 6 | 2 | uint16 |  |
| ccpu\_serial | 8 | 16 | STRING |  |
| running\_time\_ms | 24 | 4 | unit32 |  |
| sd\_status | 28 | 1 | STATUS |  |
| fram\_status | 29 | 1 | STATUS |  |
| spi1\_status | 30 | 1 | STATUS |  |
| spi2\_status | 31 | 1 | STATUS |  |
| bus\_ms\_status | 32 | 1 | STATUS |  |
| reserved | 33 | 1 | N/A |  |
| measure\_5V\_current | 34 | 2 | uint16 | mV |
| measure\_5V\_min | 36 | 2 | uint16 | mV |
| measure\_5V\_max | 38 | 2 | uint16 | mV |
| measure\_3V3\_current | 40 | 2 | uint16 | mV |
| measure\_3V3\_min | 42 | 2 | uint16 | mV |
| measure\_3V3\_max | 44 | 2 | uint16 | mV |
| reserved | 46 | 1 | N/A |  |
| reserved | 47 | 1 | N/A |  |
| measure\_1V2\_Q26\_cur | 48 | 2 | uint16 | mV |
| measure\_1V2\_Q26\_min | 50 | 2 | uint16 | mV |
| measure\_1V2\_Q26\_max | 52 | 2 | uint16 | mV |
| measure\_1V8\_Q26\_cur | 54 | 2 | uint16 | mV |
| measure\_1V8\_Q26\_min | 56 | 2 | uint16 | mV |
| measure\_1V8\_Q26\_max | 58 | 2 | uint16 | mV |
| measure\_2V8\_Q26\_cur | 60 | 2 | uint16 | mV |
| measure\_2V8\_Q26\_min | 62 | 2 | uint16 | mV |
| measure\_2V8\_Q26\_max | 64 | 2 | uint16 | mV |
| measure\_3V8\_Q26\_cur | 66 | 2 | uint16 | mV |
| measure\_3V8\_Q26\_min | 68 | 2 | uint16 | mV |
| measure\_3V8\_Q26\_max | 70 | 2 | uint16 | mV |
| measure\_2V8\_GPS\_cur | 72 | 2 | uint16 | mV |
| measure\_2V8\_GPS\_min | 74 | 2 | uint16 | mV |
| measure\_2V8\_GPS\_max | 76 | 2 | uint16 | mV |
| measure\_12V\_Battery\_cur | 78 | 2 | uint16 | mV |
| measure\_12V\_Battery\_min | 80 | 2 | uint16 | mV |
| measure\_12V\_Battery\_max | 82 | 2 | uint16 | mV |
| eagle\_status | 84 | 1 | STATUS |  |
| gps\_status | 85 | 1 | STATUS |  |
| bluetooth\_status | 86 | 1 | STATUS |  |
| temperature | 87 | 1 | int8 (signed !) | °C |

Table 20: Message description: RACK\_MM CPU

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Board Type = PCOM** | **Offset** | **length** | **Format** | **Unit** |
| LenMM | 0 | 1 | uint8 |  |
| Board\_address | 1 | 1 | uint8 |  |
| MM\_version | 2 | 1 | uint8 |  |
| Board\_status | 3 | 1 | STATUS |  |
| rev\_maj | 4 | 1 | uint8 |  |
| rev\_min | 5 | 1 | uint8 |  |
| rev\_build | 6 | 2 | uint16 |  |
| ccpu\_serial | 8 | 16 | STRING |  |
| running\_time\_ms | 24 | 4 | unit32 |  |
| sd\_status | 28 | 1 | STATUS |  |
| fram\_status | 29 | 1 | STATUS |  |
| spi1\_status | 30 | 1 | STATUS |  |
| spi2\_status | 31 | 1 | STATUS |  |
| bus\_ms\_status | 32 | 1 | STATUS |  |
| reserved | 33 | 1 | N/A |  |
| measure\_5V\_current | 34 | 2 | uint16 | mV |
| measure\_5V\_min | 36 | 2 | uint16 | mV |
| measure\_5V\_max | 38 | 2 | uint16 | mV |
| measure\_3V3\_current | 40 | 2 | uint16 | mV |
| measure\_3V3\_min | 42 | 2 | uint16 | mV |
| measure\_3V3\_max | 44 | 2 | uint16 | mV |
| reserved | 46 | 1 | N/A |  |
| reserved | 47 | 1 | N/A |  |
| profibus\_status\_A | 48 | 1 | STATUS |  |
| profibus\_status\_B | 49 | 1 | STATUS |  |
| ppib\_A\_version | 50 | 8 | STRING |  |
| ppib\_B\_version | 58 | 8 | STRING |  |
| reserved | 66 | 1 | N/A |  |
| reserved | 67 | 1 | N/A |  |

Table 21: Message description: RACK\_MM PCOM

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Board Type = SCOM** | **Offset** | **length** | **Format** | **Unit** |
| LenMM | 0 | 1 | uint8 |  |
| Board\_address | 1 | 1 | uint8 |  |
| MM\_version | 2 | 1 | uint8 |  |
| Board\_status | 3 | 1 | STATUS |  |
| rev\_maj | 4 | 1 | uint8 |  |
| rev\_min | 5 | 1 | uint8 |  |
| rev\_build | 6 | 2 | uint16 |  |
| ccpu\_serial | 8 | 16 | STRING |  |
| running\_time\_ms | 24 | 4 | unit32 |  |
| sd\_status | 28 | 1 | STATUS |  |
| fram\_status | 29 | 1 | STATUS |  |
| spi1\_status | 30 | 1 | STATUS |  |
| spi2\_status | 31 | 1 | STATUS |  |
| bus\_ms\_status | 32 | 1 | STATUS |  |
| reserved | 33 | 1 | N/A |  |
| measure\_5V\_current | 34 | 2 | uint16 | mV |
| measure\_5V\_min | 36 | 2 | uint16 | mV |
| measure\_5V\_max | 38 | 2 | uint16 | mV |
| measure\_3V3\_current | 40 | 2 | uint16 | mV |
| measure\_3V3\_min | 42 | 2 | uint16 | mV |
| measure\_3V3\_max | 44 | 2 | uint16 | mV |
| reserved | 46 | 1 | N/A |  |
| reserved | 47 | 1 | N/A |  |
| connector\_status\_0 | 48 | 1 | STATUS |  |
| connector\_status\_1 | 49 | 1 | STATUS |  |
| connector\_status\_2 | 50 | 1 | STATUS |  |
| connector\_status\_3 | 51 | 1 | STATUS |  |
| remove\_connector | 52 | 1 | uint8 |  |
| replug\_connector | 53 | 1 | uint8 |  |
| reserved | 54 | 1 | N/A |  |
| reserved | 55 | 1 | N/A |  |

Table 22: Message description: RACK\_MM SCOM

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Board Type = ECOM** | **Offset** | **length** | **Format** | **Unit** |
| LenMM | 0 | 1 | uint8 |  |
| Board\_address | 1 | 1 | uint8 |  |
| MM\_version | 2 | 1 | uint8 |  |
| Board\_status | 3 | 1 | STATUS |  |
| rev\_maj | 4 | 1 | uint8 |  |
| rev\_min | 5 | 1 | uint8 |  |
| rev\_build | 6 | 2 | uint16 |  |
| ccpu\_serial | 8 | 16 | STRING |  |
| running\_time\_ms | 24 | 4 | unit32 |  |
| sd\_status | 28 | 1 | STATUS |  |
| fram\_status | 29 | 1 | STATUS |  |
| spi1\_status | 30 | 1 | STATUS |  |
| spi2\_status | 31 | 1 | STATUS |  |
| bus\_ms\_status | 32 | 1 | STATUS |  |
| reserved | 33 | 1 | N/A |  |
| measure\_5V\_current | 34 | 2 | uint16 | mV |
| measure\_5V\_min | 36 | 2 | uint16 | mV |
| measure\_5V\_max | 38 | 2 | uint16 | mV |
| measure\_3V3\_current | 40 | 2 | uint16 | mV |
| measure\_3V3\_min | 42 | 2 | uint16 | mV |
| measure\_3V3\_max | 44 | 2 | uint16 | mV |
| reserved | 46 | 1 | N/A |  |
| reserved | 47 | 1 | N/A |  |
| ethernet\_status | 48 | 4 | ETH\_STATUS |  |
| wifi\_status | 52 | 4 | WIFI\_STATUS |  |
| firmware\_wifi | 56 | 16 | STRING |  |

Table 23: Message description: RACK\_MM ECOM

#### RACK\_INIT

[RMR Rack specific]

The OBU\_DATA field can be up to 250 bytes length containing ASCII encoded fields and separated by ‘,’.

The RMR Support System shall only extract the first byte of OBU\_DATA.

|  |  |  |  |
| --- | --- | --- | --- |
| **Fields** | **Length** | **Data type** | **Example** |
| init | 1 bytes | ascii | '0' |

Table 24: Message description: RACK\_INIT

#### RACK\_OP

[RMR Rack specific]

This section describes RMR operational messages.

The OBU\_DATA field can be up to 250 bytes length containing ASCII encoded fields and separated by ‘,’.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Fields** | **Format** | **Unit** | **Example** | **Treatment** |
| counter nb msg received by GPS till last restart |  |  | 000029 |  |
| RMR rack temperature | ASCII | integer | 34 | Extract this field |
| Power supply (1) applied to the module (0) not powered |  |  | 1 |  |
| Battery status (F: charged) |  |  | F |  |
| X Accelerometer |  |  | 0 |  |
| Y Accelerometer |  |  | 0 |  |
| Z Accelerometer |  |  | 0 |  |
| Antenna signal level (0 to 32) | ASCII | integer | 16 | Extract this field |
| CPU1 board release 0 |  |  | 0 |  |
| Connection to GPS |  |  | 1 |  |
| GPS antenna connected |  |  | 1 |  |
| Short circuit in antenna wire |  |  | 1 |  |
| GSM operator |  |  | Mobistar |  |
| GSM connexion type (3G) |  |  | UTRAN |  |
| Network registration | ASCII |  | +CREG: 1 | extract argument of +CREG unsolicited messages |
| Cell/Antenna |  |  | "1BBD" |  |
| GSM Antenna number |  |  | "03F27872" |  |
| ? |  |  | 2 |  |

Table 25: Message description: RACK\_OP

**Extract network registration**

Extract <stat> in "+CREG: <stat>"

<stat>:

0 not registered, MT is not currently searching a new operator to register to

1 registered, home network

2 not registered, but MT is currently searching a new operator to register to

3 registration denied

4 unknown

5 registered, roaming

#### COMET\_INIT

[COMET specific]

This section describes messages sent by the COMET OBU at start-up.

This message is sent by Comet RMR during EVC start-up.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Fields** | **Description** | **Length** | **Type** | **Format/Example** |
| COMET\_INIT\_VERSION | Version of this structure | 2 chars | String | "1" |
| COMET\_TRAIN\_OP\_TIME | Total of hours in operation | 10 chars | String | "328" |
| COMET\_DMI1\_OP\_TIME | Total of DMI 1 hours in operation | 10 chars | String | "270" |
| COMET\_DMI2\_OP\_TIME | Total of DMI 2 hours in operation | 10 chars | String | "270" |
| COMET\_DMI3\_OP\_TIME | Total of DMI 3 hours in operation | 10 chars | String | "270" |
| COMET\_DMI4\_OP\_TIME | Total of DMI 4 hours in operation | 10 chars | String | "270" |
| COMET\_TRAIN\_MVNT\_TIME | Total of hours when train in movement | 10 chars | String | "125" |
| COMET\_KM\_GPS | Total of kilometres travelled (GPS) | 10 chars | String | "1050" |
| COMET\_KM\_ODO | Total of kilometres travelled (EVC odometry) | 10 chars | String | "1032" |
| COMET\_KMAC\_DATE | Date of the latest upgrade of KMAC key | 19 chars | String | "2013.10.11\_08:12:34" |
| COMET\_EVC\_TEST\_DATE | Date of the latest complete EVC test | 19 chars | String | "2013.10.11\_08:12:34" |
| COMET\_EVC\_TEST\_STATUS | Status of the latest complete EVC test | 20 chars | String | "OK" | "KO test 153" |
| COMET\_EVC\_PRJ\_VERSION\_INCOHERENT | Warning if the project version does not match the expected one | 1 chars | String | "0": no warning "1": warning |
| COMET\_EVC\_CUR\_PRJ\_VERSION | Current Project Version running on EVC | 32 chars | String | "6\_2\_2\_0\_1" |
| COMET\_EVC\_CUR\_GATC\_BASELINE | Current GATC Baseline running on EVC | 32 chars | String | "6\_2\_2\_0\_1" |
| COMET\_EVC\_CUR\_CONFIG\_VERSION | Current RMR configuration version (set of filters) | 32 chars | String | "BDK\_3.12" "Unknown": if config file version is not available |
| COMET\_EVC\_MAX\_TEMPERATURE\_LAST\_RUN | Maximum temperature in EVC Rack during last run | 4 chars | String | "35": temperature in °C "-128": meaning unknown |
| COMET\_FIFO\_CLEARED | Indicates if the FIFO (RMR sending buffer) has been cleared by a train operator or automatically after having reached capacity threshold | 1 chars | String | "0": no specific event "1": Fifo cleared |

Table 26: Message description: COMET\_INIT

#### RMR\_EVENT

[COMET specific]

This section describes messages sent by the COMET OBU during operation.

This event message is sent by Comet RMR upon change of one field.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Fields** | **Description** | **Length** | **Type** | **Format/Example** |
| RMR\_EVENT\_VERSION | Version of this structure | 2 chars | String | "1" |
| RMR\_EVENT\_ID | "1": EVC\_TEMPERATURE "2": EVC\_MODE "3": EVC\_PRJ\_VERSION\_NOTIF "4": EVC\_PRJ\_VERSION\_CONFIRM "5": ACCELEROMETER "6": RMR\_CONFIG\_FILE\_RT\_ERROR "7": RMR\_CONFIG\_FILE\_STR\_ERROR "8": TRANSM\_TYPE (reserved for future use) "9": GSMR\_ANALYSIS\_FEEDBACK  "10": FIFO\_SYNCHRONIZED | 4 chars | String | "2" |
| RMR\_EVENT\_VALUE (The value corresponding to the RMR\_EVENT\_ID) | EVC\_TEMPERATURE: Maximum temperature in EVC Rack during current run | 32 chars | String | "35": temperature in °C "-128": meaning unknown |
| EVC\_MODE: Current operating mode of the EVC (see details below) | "0" |
| EVC\_PRJ\_VERSION\_NOTIF: Notification of EVC Project Version chosen by operator | "6\_2\_2\_0\_1" |
| EVC\_PRJ\_VERSION\_CONFIRM: Confirmation of EVC Project Version chosen by operator | "6\_2\_2\_0\_1" |
| ACCELEROMETER: Raw acceleration measurement at standstill (i.e. local slope of the track) (m/s²) | m/s² (unit = 0.1 m/s²) range -32767 / +32767; "-32768" meaning unknown |
| RMR\_CONFIG\_FILE\_RT\_ERROR: Number of the line containing configuration file run-time error | "" |
| RMR\_CONFIG\_FILE\_STR\_ERROR: Number of the line containing configuration file structure error | "7" |
| TRANSM\_TYPE: Indicates the type of transmission applicable from next message | "Nxxxx": normal transmission "Dxxxx": delayed transmission |
| GSMR\_ANALYSIS\_FEEDBACK: Indicates the GSM\_R analysis feedback from the RTM function | " ": No specific feedback "R": GSM\_R analysis refused |
|  | FIFO\_SYNCHRONIZED: Indicates that RMR\_SSYS is synchronized with the sending buffer of the OBU |  |  | "OP123" |

Table 27: Message description: RMR\_EVENT

COMET\_EVC\_MODE

|  |  |
| --- | --- |
| **Value** | **Mode (possibly others to come)** |
| "0" | Normal (ETCS operation) |
| "1" | Maintenance |
| "2" | Failure |
| "3" | Tests |
| "4" | Isolated |
| "5" | Spare |

Table 28: Message description: RMR\_EVENT EVC mode

#### RMR\_PERIODIC

[COMET specific]

This message is sent periodically by Comet RMR.

The frequency shall be managed by RMR On-Board-Unit based on:

|  |  |
| --- | --- |
| The message sending frequency at standstill (msg/h) | POS\_TRACK\_FREQ\_V0 |
| The message sending frequency coefficient (msg/km) | POS\_TRACK\_FREQ\_COEF |
| The minimum period between message (ms/msg) | POS\_TRACK\_MIN\_PERIOD |

Frequency (at a current EVC speed) = Max(POS\_TRACK\_FREQ\_V0 + (EVC\_SPEED \* POS\_TRACK\_FREQ\_COEF), 3600000/POS\_TRACK\_MIN\_PERIOD)

Where EVC\_SPEED is the current EVC speed (km/h)

At each sending of message, the OBU shall evaluate the time at which the next periodic message shall be sent.

|  |  |  |
| --- | --- | --- |
| **Fields** | **Description** | **Length** |
| RMR\_PERIODIC\_VERSION | Version of this structure | 1 byte |
| TRAIN\_POSITION/Q\_SCALE | Idem EVC\_TRU | 2 bits |
| TRAIN\_POSITION/NID\_LRBG | Idem EVC\_TRU | 10 + 14 bits |
| TRAIN\_POSITION/D\_LRBG | Idem EVC\_TRU | 15 bits |
| TRAIN\_POSITION/Q\_DIRLRBG | Idem EVC\_TRU | 2 bits |
| TRAIN\_POSITION/Q\_DLRBG | Idem EVC\_TRU | 2 bits |
| TRAIN\_POSITION/L\_DOUBTOVER | Idem EVC\_TRU | 15 bits |
| TRAIN\_POSITION/L\_DOUBTUNDER | Idem EVC\_TRU | 15 bits |
| V\_TRAIN | Idem EVC\_TRU | 10 bits |

Table 29: Message description: RMR\_PERIODIC

#### Obsolete

#### GSM\_R

[COMET specific]

This section describes the GSM\_R monitoring messages.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Fields | Description | Length | Type | Format/Example |
| Data type | 1: Network QoS Data Other values are reserved | 1 byte | Binary | 0x01 |
| Mobile Identifier | 1: Mobile 1 2: Mobile 2 | 4 bytes | Binary | 0x01000000 0x02000000 |
| Network ID | MCC (3 bytes) and MNC (3bytes) | 6 bytes | String | "123456" |
|
| Location | Location | 4 bytes | String | “000A” |
| Cell ID | Cell ID | 4 bytes | String | “09CF” |
|
| dBm | dBm | 2 bytes | Binary | 0x0100 |
| BER | BER | 2 bytes | Binary | 0x0100 |
| RSSI | RSSI | 2 bytes | Binary | 0x0100 |
|
| PDP Context state | 0: no PDP  1: with PDP | 1 byte | Binary | 0x00 0x01 |

Table 30: Message description: GSM\_R