CELLULAR

TOBY-L1 and MPCI-L1

Configuring Modules for Certification

Application Note

Abstract

Description of how to configure u-blox cellular TOBY-L1 / MPCI-L1 modules for Verizon certification testing.

TOBY-L1 series

MPCI-L1 series

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UBX- 14039698 - R07

Document Information		
Title	TOBY-L1 and MPCI-L1	
Subtitle	Configuring Modules for Certification	
Document type	Application Note	
Document number	UBX-14039698	
Revision, date	R07	01-Mar-2016
Document status	Early Production Information	

Document status explanation	
Objective Specification	Document contains target values. Revised and supplementary data will be published later.
Advance Information	Document contains data based on early testing. Revised and supplementary data will be published later.
Early Production Information	Document contains data from product verification. Revised and supplementary data may be published later.
Production Information	Document contains the final product specification.

This document applies to the following products:

Name	Type number	Firmware version	PCN / IN
TOBY-L100	TOBY-L100-00S-00	G0.V.00.00.15R	UBX-14002653
TOBY-L100	TOBY-L100-02S-00	G0.V.01.00.05R	UBX-16005625
MPCI-L100	MPCI-L100-00S-00	G0.V.01.00.03	UBX-14043301
MPCI-L100	MPCI-L100-02S-00	G0.V.01.00.05R	UBX-16005625

Contents

1 Introduction

To prepare for the Verizon certification process, the TOBY-L1 / MPCI-L1 module residing in each certification host device needs to be configured by AT-commands specifically for the certification test. There are various test areas required by Verizon, and each requires a different module configuration. If the module fails to properly configure for the applicable test area, this results in test failures and inability to pass certification.

This document describes the process to configure TOBY-L1 / MPCI-L1 cellular modules with AT-commands for the various test configurations needed for Verizon certification.


An index finger points out key information pertaining to module integration and performance.


A warning symbol indicates actions that could negatively impact or damage the module.

2 Configuring modules with AT-commands

2.1 Communication to the module

TOBY-L1 / MPCI modules must be set up for communication via AT commands. For this the following are required:

- USB interface access to the module. This will permit an external computer with a u-blox application installed on it to communicate with the module in order to switch the device from disabled to enabled mode for certification. See section 2.2 for further details.

- Ability to send AT-commands to the module. Typically, this is provided by the host process through pass-through mode, or direct access to the USB interface with the ability to connect to the module with an external computer. Either way, the host must not interfere with the operation by sending AT-commands not manually issued by the user.

2.2 Certification enabled modules

To be able to configure TOBY-L1 / MPCI modules for certification, they must be enabled for certification mode. Without this mode enabled, the necessary AT-command to configure the modules will not work. u-blox offers a Windows based application tool to enable this certification mode. It supports the following operating systems:

- Windows Vista
- Windows 7
- Windows 8

This tool from u-blox to enable certification mode can be requested by contacting u-blox support.

☞ The u-blox tool to enable certification mode may not currently be available for release; please check with u-blox support. Prior to its availablilty, customers will need to use certification enabled module samples. Please contact u-blox ahead of time to request and reserve such samples.

2.3 Configuration with AT-commands

The following steps describe the process to configure TOBY-L1 / MPCI-L1 modules.

1. Establish an AT-command connection with the TOBY-L1 / MPCI-L1 module, either through the host application or by standalone computer through the USB interface (see *EVK-L10 User Guide* [3] or *EVK-L10M User Guide* [5]).

2. If the AT-command connection is through the host application, ensure that the host application is in a pass through mode, which will not interfere with the module in any way, such as sending AT-commands, powering down, or resetting the module.

3. Run AT%EXE=restore-defaults.sh

4. Run the **%EXE** AT-command to apply the desired configuration to match testing configuration needs, as outlined in is the below definition copied from *TOBY-L1 / MPCI-L1 AT Commands Manual* [3].

The **%EXE** command is used by the host to instruct the module to execute a script resident on the device.
This command is only used in conjunction with lab and or certification testing.

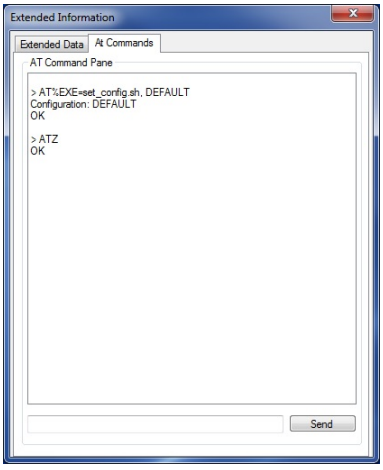
Type	Command Syntax	Response	Example
Set	AT%EXE=<script>,<argument>	OK or Error	AT%EXE=set_config.sh, DEFAULT OK

%EXE command defined values:

Parameter	Type	Description
<script>	string	Indicates the shell script to run set_config.sh is the only option here
<argument>	string	Indicates the argument to the shell script DEFAULT: normal operation. Also used for SMS, Supplementary Signaling, Data Retry, OMADM and IOT testing, IMS Registration and Inter-Band. GCF_RF: TS 36.521-1, TS 36-521-3 and Supplementary RF testing. GCF_PROT: TS 36.523-1 and TS 31.121 testing, and AT Command. GCF_UICC: ETSI 102 230 Testing VZW_DTHPUT: Data Throughput testing VZW_FT: Field testing USAT: USAT Testing

5. After issuing the **%EXE** command to set the configuration, wait for an "OK" response from the module.

6. Use the **ATZ** command to save the current profile parameter settings into NVRAM and reboot the device.



7. After the boot-up is complete, the device is ready for use with the applied configuration. This configuration will not change upon powering down the device until it is reconfigured again.

3 Other considerations for test devices

3.1 Providing devices for certification

In preparation for the certification process, the number of test devices required for Verizon certification should be considered. The number of devices needed for the certification process varies from case to case, and will be determined by Verizon after reviewing documents submitted to them by the applicant at the beginning of the certification process.

Beyond the minimal devices required by Verizon, the following should be considered, and/or discussed with the appropriate parties (Verizon and/or approved Verizon test vendor) if needed:

- Prepare back-up devices, in case there are any unforeseen equipment failures during the certification process
- Provide additional test devices beyond the minimal request to potentially expedite the certification time. This must be agreed by the approved test lab if it is possible on their side.
- Provide additional test units to avoid any reconfiguration logistics

3.2 Handling test device logistics

During the certification process it is the responsibility of the party pursuing certification to handle and manage device test configurations. After receiving feedback from Verizon on what testing and test configuration are applicable, the following is recommended:

- Provide enough test devices, such that each device is configured only once for specific type of testing.
- Once each device is configured, clearly label each device on what configuration the device is set to, and what testing the device has been allocated for.

By following the above recommendation, there will be less chance of misconfiguration errors during testing, and it eases the logistics of handling the test devices.

If there are not enough test devices to have one test configuration for each device, reconfiguration of the device between tests is required. In such a case, the certification applicant is responsible for the following:

- Reconfiguring the TOBY-L1 / MPCI-L1 modules between tests
- Coordinating with approved test lab on reconfiguration logistics

3.3 Test guidelines

In appendix B of this document, there are various guidelines for smoothly getting through certification testing. Be sure to provide this appendix B to your selected Verizon approved test lab, and inform them to relay this information to their testers. It is recommended that the testers review this information ahead of time.

3.4 Equipment list check

Before starting the certification testing, it is highly recommended to check with your Verizon approved third party test lab and make sure their test scripts and test equipment are up to date per Verizon's Test Equipment list. Throughout the year this list is typically updated quarterly by Verizon, which the approved test labs need to follow by a certain date. This list shows what test equipment, equipment platform firmware, and/or test script version has been validated by Verizon and is necessary for a given test plan. Failure to conform to this equipment list will result in invalid test results. Even though making sure everything is up to date should not be the responsibility of the client going for approval, it is still a good topic to bring up with the third party test lab to ensure everything is in order.

4 Common Mistakes

4.1 Airplane mode

In test cases where airplane mode is required, apply the correct +CFUN mode, where:

- AT+CFUN=4 puts the module in airplane mode and should be used for test automation
- AT+CFUN=0 performs a silent reboot and the module will take longer to reattach. (The tester may mistakenly apply this mode instead of using +CFUN=4.)

Appendix

A List of acronyms

Abbreviation / Term	Explanation / Definition
API	Application Programming Interface
APN	Access Point Name
AT	AT Command Interpreter Software Subsystem, or attention
CAT	Card Application Toolkit
DOF	Download One File
DTE	Data Terminal Equipment
eCM	Embedded Connection Manager
EEPROM	Electrically Erasable Programmable Read-Only Memory
EOT	End of Time
FFS	Flash File System
FOAT	Firmware Over AT commands
FOTA	Firmware Over The Air
FW	Firmware
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communication
HTML	HyperText Mark-Up Language
HTTP	HyperText Transfer Protocol
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Station Identity
IP	Internet Protocol
IRC	Intermediate Result Code
NVM	Non Volatile Memory
PC	Personal Computer
RAM	Random Access Memory
ROM	Read Only Memory
SMS	Short Message Service
SW	Software
TCP	Transmission Control Protocol
UA	Update Agent
UART	Universal Asynchronous Receiver-Transmitter
UPI	Update Installer
URC	Unsolicited Result Code
URL	Uniform Resource Locator
USB	Universal Serial Bus
USAT	USIM application toolkit
USIM	Universal Subscriber Identity Module

B Certification test guidelines

This appendix provides guideline information to assist with Verizon certification testing. This information is intended for the Verizon approved test lab that will be executing the applicable lab test cases outlined by Verizon.

Not all AT-commands in this appendix are described in the *TOBY-L1 / MPCI-L1 AT Commands Manual* [3], since these AT-commands are not intended for customer evaluation, engineering, and production use. If further information is required for legitimate reasons, please contact u-blox support.

B.1 Special test case guidelines

Table 2 provides guidelines for specific test cases that Verizon may require an approved test lab to perform for product certification.

Test Type	Test Case	Test Description (and Equipment)	Guidelines
OTA Testing	General	B13 OTA	For Band 13 OTA Testing: • Disable scan plan to attach before timeout with: AT%SETCFG="SCAN_PLAN_EN","0" • AT%TRSHCMD must be used to select Rx path. See AT-Command Manual for details. Use ATZ to soft power cycle.
B13 Supplementary RF Conformance	2.5.3	R&S or Anritsu	Executing TC 2.1 and then 2.5.3 in sequence causes TX issues in 2.5.3 because the later TC uses the previously stored SIB value (with same cell ID) in TC 2.1 and not the updated value that is broadcasted. Either: 1) power cycle UE between test cases or 2) use AT+CFUN=0 -> AT+CFUN=1,1 as "power off" "power on" commands (AT+CFUN=1,1 will reboot the UE).
B4 RF Conformance	General	B4 RF Conformance	May need to disable B13 and scan plan to attach before timeout Disable scan plan: AT%SETCFG="SCAN_PLAN_EN","0" Disable B13: AT%SETCFG="BAND","4" Use ATZ to soft power cycle.
ETSI 102 230	General	Analog	Most of the tests require graceful shutdown of the USIM (de-activation), so at the end of the test you need to send AT+CFUN=1, then AT+CFUN=0 (thereby deactivating the USIM too) and only after that send ATZ or unplug the device.
	ETSI TS 102.230 TC 7.2.1-c2 ETSI TS 102.230 TC 7.2.2	(Comprion)	Close the Connection Manager, and work only with a dummy terminal such as PuTTY (or other external tool for sending AT-commands). When requested, power up the UE Wait long enough (3-4 minutes) to let the USIM finish its initialization. The command-response flow to USIM is very slow, because this test scenario sends the command AT+CPIN? a few times until the expected response appears +CPIN: USIM PIN (which means the USIM initialization has finished). Only when the AT response is received, send the following command for PIN verification: AT+CPIN="2468" (or other PIN code that the Comprion is asking to send at this moment). When asked by Comprion to switch off the device, first send AT+CFUN=0, and only then switch off.
	General	Digital	Some digital test cases require entering a PIN code. If IT3 should ask for a PIN code, then (once the CM is active) use AT+CPIN="xxxx" from the AT commands menu. Note: "xxxx" should be replaced with the PIN code in the IT3 test procedure menu. Some test cases don't need a particular PIN code value, thus any code applied should work. Then you need to send AT+CFUN=1 followed by AT+CFUN=0 for the UICC deactivation procedure.

Test Type	Test Case	Test Description (and Equipment)	Guidelines
Data Through-put	3.1.2.10, 3.1.2.11, 3.1.2.12, 3.4.2.3	(Anritsu)	All tests with the Linux error have passed on TOBY-L1 modules. To overcome the problem in the LTE Driver, use additional endless ping from the server to the PC.
	IPv6 tests	(Anritsu / R&S / Spirent)	Verify that other LAN connections are disconnected. After establishing a connection, run in command line: "IPv6 renew". Set the IPv6 address manually in Windows 7 to: fd00::1:211:22ff:fe33:4456 This uses the Modified_EUI-64 over the MAC address 00:11:22:33:44:56 with the Spirent prefix of fd00:0:0:1 In Windows 7, make it use the EUI-64 by issuing this command in an administrator command prompt: netsh interface IPv6 set global randomizeidentifiers=disabled
	General		Verify connection with ping before starting the test (both IPV4 and IPV6). Anritsu has an option for pause before starting, but for R&S, this is only possible if running in manual mode.
Data Retry & Supple-mentary Signaling		(Any)	Note before proceeding, a detach from cell will change parameters to default. Before each test case in data retry and supplementary signaling, run the command: AT%TSTLTE="rrc","idle","2","7" If asked by eNB to "open connection / application to internet", then use: AT%DPDNACT=1 If asked by eNB to "open connection / application to Admin", then use: AT%ECMAPI= "apdnact",1 If asked by eNB to "change the APN name that connects to the internet", then use: AT%APNN="Enterprise" If asked by eNB to "detach", then use : AT%ECMTST="CMATT",0 If asked by eNB to "power off", then use: AT+CFUN=0 If asked by eNB to "power on" then use: AT+CFUN=1 If asked to disable the class 3 (INTERNET) PDN, then use: AT+VZWAPNE=3,3,,,,Disabled Remember to enable it back with: AT+VZWAPNE=3,3,,,,Enabled
		Anritsu	If there are PRACH issues on the Anritsu platform, it may be caused by the module sending PRACH preamble before the test system is loaded and ready to accept them. For such a case, do the following: AT+CFUN=4 ATZ The module will now reboot with "Airplane" mode enabled. The below is then sent by the test system when it is ready to listen for PRACH preambles AT+CFUN=1
	2.14	Internet PDN open on epsBearerId 6 All other tests the epsBearerID is 7	Use the AT command: AT%TSTLTE="RRC","IDLE","2","6
	2.18	Disable the RNDIS connection	Uninstall (with deletion of the files) and reinstall using windows update.
	2.18	The APN type is IPv4 in step 2b of this test case.	Use the AT command: AT+VZWAPNE=3,3,"<new 63 octet length APN name>","IP",,Enabled

Test Type	Test Case	Test Description (and Equipment)	Guidelines
	2.8	To activate the VZWAPP PDN	First enable the PDN: AT+VZWAPNE=4,4,,,,Enabled Then activate it: AT%PDNACT=1,2
	4.6		Test with Anite Version 1.15. Data Retry TC 4.6a may fail due to a forbidden PLMN stored in the SIM card. If so use this to clear the forbidden PLMN list on The SIM: AT%TSTLTE="USIM","ERASE_EF","1" ATZ
	6.14		Procedure should have: AT%SETACFG=APNTable.Class1.AutoRecoveryDisabled,"true"
	6.2		Verify the router lifetime is configured to 9000 (it is in the bottom left corner of the wrdavs application). After the test, return the router lifetime value to 1800 (default).
	6.3, 6.7x		Each test runs for 45 minutes. Data Retry tests 6.3 and 6.7X require sending AT%DPDNACT=1 every 8 seconds. There is a script in "runAtCommand.zip" that runs it automatically. Extract the zip file and run the "runAtCommand.bat" script on the UE PC.  runAtCommand.zip The script will run AT%DPDNACT=1 500 times with 8 seconds gap between them, enough to pass each test. The script uses the UE socket [10.0.0.1 port 5555]. Thus, make sure it is not occupied by the connection manager (CM). If you are using automation, connect the TAG to the UE com port and close the CM so that the socket port will remain free.
SMS	General	In general, SMS storage in the USIM is supported for 3GPP SMS only.	First change to 3GPP SMS with AT+USMSF="3GPP" Then set the storage using: AT+CPMS="me","me","me". To view the SMS in the current storage settings USEAT+CMGL="all" / AT+CMGR="<index>" To see that a message failed in the storage you first have to send it from storage. First write it to storage using: AT+CMGW (or AT%CMGW) Then send from storage using: AT+CMSS If the SMS remained STO UNSENT, it means the sending failed. If the SMS changes to STO SENT, it means it was sent successfully.
	2.31 2.32		Before the each test, execute the following AT commands: AT%SETACFG=ecm.Mode.VzwImsTestMode,true/false AT%SETACFG=SMSManager.Mode.SMS_Over_IP_Networks_Indication, true/false ATZ Wait for the UE to boot-up, and then start the test case.
	2.22	MO 3GPP2 SMS Message size – more than 1 segment of text	Change the encoding to GSM by sending: AT+CSCS=GSM before the test start

Test Type	Test Case	Test Description (and Equipment)	Guidelines
	2.28 2.38	For SMS content command (CMGW, CMGS) there are two AT commands: standard version with "+" and one-liner proprietary with "%". The difference is that the standard one has a prompt "> " for the SMS text and that can cause issues when using automation.	AT%CMGS=<tel number>#<SMS text> AT%CMGW=<tel number>#<SMS text>
	2.28 2.38	To send a message from the UICC	First, switch to 3GPP and SIM storage: At%USMSF=3GPP At+CPMS="SM" (Remember to revert back after the test since this configuration is saved in the NVM) Then write the message to storage: AT%CMGW Wait for a response in the form of %CMGW: <id> This the memory ID of the SMS. You can now read the SMS to get the status and content of the SMS, using: At+CMGR=<id> The status now will be "STO UNSENT" To send the SMS use AT+CMSS=<id> The response may take a while if a retry 30 sec takes place (Takes about 40sec to return in retry scenarios.) +CMSS:<mr> <CR><LF>OK – indicates successfully sent ERROR – indicates failure Now you can read the status again using At+CMGR=<id> If the status changes to "STO SENT", the message has been sent successfully, and if it is still "STO UNSENT", it means it failed.
	2.36		Don't switch the storage to SIM. To check the memory use: AT+CPMS? To set to default NVM memory use: AT+CPMS="ME"
OMADM		How to change the URL of OTA server, and which Motive server to use	To set, use: AT%SETACFG="alt-vdmc.DmServer.URL", "https://ivzwmdmii.iot.motive.com/southbound-connector/dm" When setting, do not use this server: https://ivzwmdmiv.iot.motive.com For query: AT%GETACFG="altvdmc.DmServer.URL"
		How to assign the client Password.	To set: AT%SETACFG="altvdmc.Optional.ClientAuthPassword","XYZ" For query: AT%GETACFG="altvdmc.Optional.ClientAuthPassword"
IMS	2.29		To pass this test on Anite only there is a need to disable TCP (not necessary on R&S)

Test Type	Test Case	Test Description (and Equipment)	Guidelines
	2.7		Before running this test automatically, do the following: AT%SETACFG=ecm.Mode.VzwImsTestMode,true After that, reset the device. Run the test automatically. When the test finishes running, execute: AT%SETACFG=ecm.Mode.VzwImsTestMode,false Reset the device again.
	2.27.3 2.29		Disable the UE's TCP port to pass these tests. To do so, edit the following: /etc/config/ecrio/SAC_Configuration_File_SUE.xml Comment out the two tcp lines by adding <!-- to the front of the line --> at the end, so they will look like: <!--<CHANNEL protocol="tcp"type="server" compression="true" sending="true" receiving="true" mandatory="false" />--> <!--<CHANNEL protocol="tcp"type="client" compression="true" sending="true" receiving="true" mandatory="false" />--> Save and reboot the UE. Don't forget to remove the comments once the tests have passed.

Table 1: Guidelines for specific test cases

B.2 CAT (USAT) tests

This section provides guidelines for running card application toolkit (CAT) tests, where the term USIM application toolkit (USAT) is a more specific term that describes the CAT test cases.

These are the Table A.1 options that are supported:

- A.1/1
- A.1/132
- A.1/133
- A.1/135
- A.1/17
- A.1/18
- A.1/21
- A.1/72

All CAT tests should run with the following configuration:

1. AT%GETCFG="enable_test_mode" response should be 0
2. AT%GETCFG="vzw_mode" response should be 0
3. Disable the imsclient (rename initial script)
4. eCM with auto connect mode enabled
5. The APN table should be APNTable_for_usat file and second APN name should be VZWADMIN
6. APNTable with the following PDNs configured:

   config PDN1 "Class1"
   - option Class 1
   - option Name "MYDEFUALT"

   config PDN2 "Class2"
   - option Class 2
   - option Name "TestGp.rs"

   config PDN3 "Class3"
   - option Class 3
   - option Name "VZWADMIN"

   config PDN4 "Class4"
   - option Class 4
   - option Name "Test12.rs"

   All PDNs have these options configured:
   - option IP_Type "IPV4V6"
   - option Enabled "true"
   - option AutoRecoveryDisabled "true"

Other guidelines for specific test cases:

1. Test 27.22.4.15.1/4 (PROVIDE LOCAL INFORMATION, Date, Time, Time Zone). When using 7 Layers equipment, the test requires manual configuration of the date in Linux. The procedure to set the time in Linux is to connect via telnet to 10.0.0.1 and run the following command:

- date –s YYYYMMDDHHMM

2. Test 27.22.4.6 (POLL INTERVAL SEQ 1.1). The test may get stuck (not pass / not fail) on 7 Layers (interlab) equipment due to a wrong verification procedure (should be fixed in the next interlab version). If the tests last more than 3 minutes, run the following AT command to pass the test:

- AT%TSTLTE="USIM","SKIPADF","1"

☞ 7 Layers is a Verizon approved test vendor, among a few others.

B.3 APN Table Configuration

For any test cases related to the APN table, this section provides details on APN Table configuration details.

Each PDN defined in the APN table consists of several parameters used by the eCM (Embedded Connection Manager) for internal implementation and by the +CGDCONT AT command:

- Name – APN used for CGDCONT configuration (for ex. "VZWIMS")
  - AT%SETACFG=APNTable.Class<X>.Name,"Enterprise"
- IP_Type – protocol requested (for ex. "IPV4V6")
  - AT%SETACFG=APNTable.Class<X>. IP_Type, "IPV4V6"
- Enabled – PDN enable/disable (true/false)
  - AT%SETACFG=APNTable.Class<X>.Enabled,"true"
- P_CSCF – for IMS PDN only used by CGDCONT (for non IMS should be "0")
  - AT%SETACFG=APNTable.Class<X>.P_CSCF,0
- External – used to identify the "external" PDN (INTERNET PDN) which is tunneled to the host. Only one PDN should be configured as external (true/false)
  - AT%SETACFG=APNTable.Class<X>.External,"true"
- AutoRecoveryDisabled – when PDN was disconnected the eCM will automatically try to recover it. Some tests using ADMIN PDN require this mechanism to be disabled (true/false)
  - AT%SETACFG=APNTable.Class<X>.AutoRecoveryDisabled,"true"

Below is an example configuration for a Verizon Wireless APN Table:

config PDN "Class1"

- option Class 1
- option Name "VZWIMS"
- option IP_Type "IPV4V6"
- option Enabled "true"
- option P_CSCF 1
- option External "false"
- option AutoRecoveryDisabled "false"

config PDN "Class2"

- option Class 2
- option Name "VZWADMIN"
- option IP_Type "IPV4V6"
- option Enabled "true"
- option P_CSCF 0
- option External "false"
- option AutoRecoveryDisabled "true"

config PDN "Class3"

- config PDN "Class3"
- option Name "VZWINTERNET"
- option IP_Type "IPV4V6"
- option Enabled "true"
- option P_CSCF 0
- option External "true"
- option AutoRecoveryDisabled "false"

config PDN "Class4"

- option Class 4
- option Name "VZWAPP"
- option IP_Type "IPV4V6"
- option Enabled "false"
- option P_CSCF 0
- option External "false"
- option AutoRecoveryDisabled "false"

Related documents

[1] u-blox TOBY-L1 Data Sheet, Docu No UBX-13000868
[2] u-blox MPCI-L1 Data Sheet, Docu No UBX-14001412
[3] u-blox TOBY-L1 / MPCI-L1 AT Commands Manual, Docu No UBX-13002211
[4] u-blox EVK-L10 User Guide, Docu No UBX-13002212
[5] u-blox EVK-L10M User Guide, Docu No UBX-14037632

Revision history

Revision	Date	Name	Status / Comments
R01	22-Oct-2014	clee	Early Production Information
R02	18-Nov-2014	clee	Added latest approved FW version
R03	15-Dec-2014	clee	Added info to special test case guidelines
R04	27-Jan-2015	clee	Added info to special test case guidelines; Added "Common Mistakes" section
R05	15-Jun-2015	clee	Early Production Information Updated TOBY-L100 approved FW version Added info to special test case guidelines
R06	18-Jan-2016	clee	Update document status to Advance Information Update applicable type number TOBY-L100-02S, MPCI-L100-02S
R07	01-Mar-2016	pafe	Update document to Early Production Information Added IN document references to product list on page 2.

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