

OptConnect ema™

emaLink

AT Command Manual

V1.2 Updated January 2020



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1. Introduction

1.1 Scope

This document serves as a guide for the usage of AT commands on the OptConnect emaLink interface. The electrical specification for the emaLink interface is a standard Universal Asynchronous Receiver/Transmitter (UART). This interface is available at pins 17 (ema_DOOUT) and 18 (ema_DIN) of the OptConnect ema™ modem.

1.2 Contact Information

For more information regarding OptConnect ema™ contact OptConnect Sales at 1.877.678.3343 ext. 2020 during normal business hours. For technical support contact OptConnect Customer Care Center at 1.877.678-3343 ext. 2021 from 8 am till 9 pm MST Monday through Saturday.

1.1 Orderable Part Numbers

Orderable Device	Modem Firmware Revision	Operating Temperature	LTE Bands	3G UMTS	Network	Region
EMA-L4-1-XX-A-A	20.00.005	-40 to +85°C	FDD B2, B4, B5, B12, B13	B2, B5	AT&T, Verizon	North America
EMA-L4-1-US-B-A	20.00.005	-40 to +85°C	FDD B2, B4, B5, B12, B13	B2, B5	AT&T, Verizon	United States

Unless instructed otherwise EMA-L4-1-XX-A-A will utilize AT&T as the primary carrier and Verizon as the secondary carrier. Unless instructed otherwise, EMA-L4-1-US-B-A will utilize Verizon as the primary carrier and AT&T as the secondary carrier.

Orderable Device	Description	Operating Temperature	Region
EMA-ZZ-1-XX-Z-B	ema:Play Evaluation Kit, OptConnect ema™ evaluation platform	-40 to +85°C	North America
EMA-L4-1-XX-A-B	ema:Play Evaluation Kit, OptConnect ema™ evaluation platform, EMA-L4-1-XX-A-A ema modem included	-40 to +85°C	North America
EMA-L4-1-US-B-B	ema:Play Evaluation Kit, OptConnect ema™ evaluation platform, ema EMA-L4-1-US-B-A ema modem included	-40 to +85°C	United States

1.2 Additional Resources

OptConnect ema™ is supported by a full range of documentation in addition to this Manual; including User Guides and Application Notes as well as an ema:Play Evaluation Kit User Guide and related code samples. The latest versions of these resources can be found at <http://optconnect.com/ema> .

1.3 Definitions

For consistency, the AT Command interface outlined in this manual follows closely to the same definitions as Telit's AT command definitions. Please reference Section 3.1 of the Telit LE910-V2 Series AT Commands Reference Guide for more information.

2. AT Command Formatting

2.1 Overview

The OptConnect ema™ modem uses the emaLink interface for interacting with the Management Microcontroller Unit (MCU). This allows the host to interact with ema using AT commands. This interface is also reserved for future feature support.

This interface also allows ema to notify the host of various events that may be occurring and of any actions that are in progress. The format for these notifications is an Unsolicited Result Code (URC).

2.2 ERROR Formatting

Any AT command that results in an Error response follows the following format:

ERROR: <n>, <str>

where <n> is a zero-index integer, and <str> is a verbose output message. This allows the host to consider the verbose message when doing initial development, and parse the integer value for processing.

Possible ERROR Messages	
Message	Description
ERROR: 0, Unknown command	An invalid, unknown, or unsupported AT command was entered.
ERROR: 1, Invalid format otherwise	The AT command was recognized, but was improperly formatted or is missing required arguments.

2.3 Response Formatting

If an AT command is successfully accepted and processed, the response will be in the following format:

<CR><LF>OK<CR><LF>

If an error occurs, the error response will be in the following format:

<CR><LF>ERROR: <n>, <str><CR><LF>

2.4 Sending AT Commands

All AT commands need to be terminated with:

<CR>

It is not necessary to send both:

<CR><LF>

The UART communication settings for the emaLink interface are **19200 8N1**. This is not configurable at the release of this document.

3. AT Commands

3.1 Starting A Command Line – AT

Starting A Command Line – Used to verify successful communication with ema.	
AT	AT is the prefix for all commands. Used alone, it is a test command to verify communications are established.
Response	OK if successful, otherwise ERROR: 0, Unknown command
Example	AT OK

3.2 Command Echo - E

Command Echo – Used to enable or disable echo.	
ATE[<n>]	Set command enables/disables the command echo. Parameter: <n> 0 - Disables command echo 1 - Enables command echo (default). Each byte of the AT command will be echoed back in real time.

Response	OK if successful, otherwise ERROR: 1, Invalid Format
Examples	ATE1 OK ATE? ERROR: 1, Invalid format

3.3 Available AT Commands - +CLAC

List Available AT Commands – Used to list all supported AT commands.	
AT+CLAC	Lists available AT commands in the format: <AT cmd1> <AT cmd2> <AT cmd3> <AT cmdn> OK where <AT cmdn> is an available AT command.
Response	OK if successful, otherwise ERROR: 1, Invalid Format
Example	AT+CLAC AT+OCBID ATE AT+CLAC AT+GSN AT OK

3.4 Serial Number - +GSN

Get Serial Number – Used to get the ema serial number.	
AT+GSN	Get command that returns the ema serial number in the format: <SERIAL#> ema-n19834e60001 OK

	Max length of serial number = 16
Response	OK if successful, otherwise ERROR: 1, Invalid Format
Example	AT+GSN ema-n19834e60001 OK

3.5 Board ID - +OCBID

Get/Set Board ID – Used to set and get the Board ID.	
AT+OCBID=" <bid> "	<p>Set command to specify the Board ID. This is a custom ID that can be used by the host for identification purposes.</p> <p>Parameter: <bid> - Board ID string. Valid characters are alphanumeric characters only (A-Z, a-z, 0-9).</p> <p>Note: Any non-alphanumeric characters, including spaces, will be replaced by a dash (-).</p> <p>Note: Any <bid> entries longer than 64 bytes will be truncated to 64 bytes.</p> <p>Note: This value is saved to ema's non-volatile memory (NVM).</p> <p>Note: Subsequent uses of this command will overwrite the current Board ID. To clear out the current Board ID, you can issue AT+OCBID="" (empty string, no spaces between quotation marks).</p>
AT+OCBID?	<p>Get command returns the current Board ID that is stored in ema's NVM in the format:</p> <p>+OCBID: " <bid> "</p> <p>OK</p>
AT+OCBID=?	<p>Test command returns the formatting information for this command in the format:</p>

	+OCBID: (64, [a-z 0-9]) OK
Response	OK if successful, otherwise ERROR: 1, Invalid Format
Example	AT+OCBID="OptConnect ema" OK AT+OCBID? +OCBID: "OptConnect-ema" OK

3.6 Firmware Version - +GMR

Get Firmware Version – Used to get the current ema firmware version.	
AT+GMR	Get command to get the ema MCU firmware version in the following format: <FIRMWARE VERSION> <CR> <LF>
Response	OK if successful, otherwise ERROR: 1, Invalid Format
Example	AT+GMR V1.0.0-0-xxx BUILD=dev A OK

3.7 Extended Firmware Information - ATI

Get Extended Firmware Information – Used to get extended firmware version information.	
ATI[<n>]	Read command to get ema microcontroller firmware information in the format: <FIRMWARE INFORMATION> <CR> <LF> Parameter: <n> 0 - Full firmware information

	<p>1 - Firmware revision 2 - Firmware sub-revision 3 - Firmware hash 4 - Build information 5 - A/B Version used for firmware over the air (FOTA) update testing</p> <p>Note: If parameter is omitted, the command has the same behavior as AT10.</p>
Response	<p>OK if successful, otherwise ERROR: 1, Invalid Format</p>
Examples	<p>AT1 V1.0.0-0-xxx BUILD=dev A</p> <p>OK</p> <p>AT11 V1.0.0</p> <p>OK</p> <p>AT12 0</p> <p>OK</p> <p>AT13 xxx</p> <p>OK</p> <p>AT14 BUILD=dev</p> <p>OK</p> <p>AT15 A</p> <p>OK</p>

3.8 Glimpse - +OCGLIMPSE

OptConnect Glimpse is a powerful feature that allows the local host system to inquire over the emaLink interface about ema's management and monitoring activities. Valuable information including, but not limited to; signal analytics, failover time, primary carrier, active carrier, cellular tower location, etc., can be queried, without the need to pause or bring down an active cellular data session.

Glimpse query – Used to gather information regarding ema's management and monitoring activities.

AT+OCGLIMPSE[<group>]	<p>Read command to get Glimpse information.</p> <p>Parameter: <group> - Glimpse group to read. This value is optional. Omit this parameter to read all groups. Valid values are 1 – 5.</p> <p><group> description:</p> <p>+OCGLIMPSE1: <ema Uptime>, "<ema FW>", "<Serial Number>", "<Model>"</p> <p>+OCGLIMPSE2: "<Primary Carrier>", "<Active Carrier>", "<Active Firmware>", "<Reg. status>", "<Failover Enabled>", "<Last Failover Event>", "<Access Tech.>"</p> <p>+OCGLIMPSE3: <Cell ID>, <MCC>, <MNC>, <TAC></p> <p>+OCGLIMPSE4: <Signal quality>, <Curr. RSSI>, <Curr. RSRQ>, <Curr. RSRP>, <RSSI Min.>, <RSSI Max.>, <RSSI Avg.>, <RSRQ Min.>, <RSRQ Max.>, <RSRQ Avg.>, <RSRP Min.>, <RSRP Max.>, <RSRP Avg.></p> <p>+OCGLIMPSE5: "<ema Services State>"</p> <p>where: <ema Uptime> - ema uptime(since boot) in seconds "<ema FW>" - ema firmware version "<Serial Number>" - ema serial number "<Model>" - ema model number "<Primary Carrier>" - primary cellular carrier ("<i>AT&T</i>" or "<i>Verizon Wireless</i>"), as dictated by the ema Model "<Active Carrier>" – currently active cellular carrier ("<i>AT&T</i>" or "<i>Verizon Wireless</i>") "<Active Firmware>" – currently active cellular firmware version "<Reg. Status>" – current cellular registration status:</p>
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	<p> <i>"Not Registered, Not Searching"</i> <i>"Registered, Home Network"</i> <i>"Not Registered, Searching"</i> <i>"Registration Denied"</i> <i>"Registration, Roaming"</i> <i>"Registration Status Unknown"</i> </p> <p> "<Failover Enabled>" - failover enabled state ("Enabled" or "Disabled") <Last Failover Event> - failover timestamp in seconds, relative to <ema Uptime> "<Access Tech.>" - currently active cellular access technology: <i>"GSM"</i> <i>"UTRAN"</i> <i>"E-UTRAN"</i> </p> <p> <Cell ID> - Cellular ID. A value of 0 is unknown. <MCC> - Mobile country code. A value of 999 is unknown. <MNC> - Mobile network code. A value of 999 is unknown. <TAC> - Tracking area code. A value of 0 is unknown. <Signal Quality> - Signal quality 0 - Unknown 1 - Poor 2 - OK 3 - Good 4 - Excellent </p> <p> <Curr. RSSI> - Current Received Signal Strength Indicator (RSSI) <Curr. RSRQ> - Current Reference Signal Received Quality (RSRQ) <Curr. RSRP> - Current Reference Signal Received Power (RSRP) <RSSI Min.> - Minimum RSSI since module power on <RSSI Max.> - Maximum RSSI since module power on <RSSI Avg.> - Average RSSI since module power on <RSRQ Min.> - Minimum RSRQ since module power on <RSRQ Max.> - Maximum RSRQ since module power on <RSRQ Avg.> - Average RSRQ since module power on <RSRP Min.> - Minimum RSRP since module power on <RSRP Max.> - Maximum RSRP since module power on <RSRP Avg.> - Average RSRP since module power on <ema Services State> - current connection status to OptConnect services ("<i>Connected</i>" or "<i>Not Connected</i>") </p> <p> Note: When ema is unable to connect to OptConnect services, it will no longer collect signal information. <Curr. RSSI>, <Curr. RSRQ>, and <Curr. RSRP> will be 0. Any collected minimum, maximum, and average information will remain. </p> <p> Note: This command may take up to 30 seconds to get a response. </p>
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AT+OCGLIMPSE=?	<p>Test command returns the formatting information for this command in the format:</p> <p>AT+OCGLIMPSE[1-5] +OCGLIMPSE1: Ema Uptime, "Ema FW", "Serial Number", "Model" +OCGLIMPSE2: "Primary Carrier", "Active Carrier", "Active Firmware", "Reg. Status", "Failover Enabled", Last Failover Event, "Access Tech." +OCGLIMPSE3: Cell ID, MCC, MNC, TAC +OCGLIMPSE4: Signal Quality, Curr. RSSI, Curr. RSRQ, Curr. RSRP, RSSI Min., RSSI Max., RSSI Avg., RSRQ Min., RSRQ Max., RSRQ Avg., RSRP Min., RSRP Max., RSRP Avg. +OCGLIMPSE5: "Ema Services State"</p> <p>OK</p>
Response	<p>OK if successful, otherwise ERROR: 1, Invalid Format</p>
Examples	<p>AT+OCGLIMPSE +OCGLIMPSE1: 10400, "v1.0.0-0-01234567 BUILD=dev A", "ema-k1abcdef9999", "EMA-L4-1-XX-A-A" +OCGLIMPSE2: "AT&T", "AT&T", "20.00.505", "Registered, Home Network", "Enabled", 8032, "E-UTRAN" +OCGLIMPSE3: 4E6300A, 310, 410, 17937 +OCGLIMPSE4: 3, -51.00, -6.00, -81.00, -51.00, -51.00, -51.00, -9.50, -6.00, -7.75, -81.00, -81.00, -81.00 +OCGLIMPSE5: "Connected"</p> <p>OK</p> <p>AT+OCGLIMPSE3 +OCGLIMPSE3: 4E6300A, 310, 410, 17937</p> <p>OK</p> <p>AT+OCGLIMPSE5 +OCGLIMPSE5: "Connected"</p> <p>OK</p>

4. Unsolicited Response Code (URC) Formatting

4.1 Overview

OptConnect ema™ outputs unsolicited response codes (URCs) on the emaLink interface to notify the user of various events, or to instruct the user. Failure to observe these URCs may damage the ema MCU or cellular module.

4.2 URC Formatting

URCs asynchronously appear as an event occurs. URCs have the following format:

<CR><LF>OCURC: <n>, "<str>"<CR><LF>

where **<n>** is a zero-index integer signified by a value shown in section 5, and **<str>** is a corresponding verbose output message signified by a message. This allows the user to view the verbose message when doing initial development, and parse the integer value when developing on the host system.

5. Unsolicited Response Codes

5.1 ema AT Interface Ready

ema AT Interface Ready – Occurs shortly after power has been applied to pin 1 (VCC). The on-board cellular module may or may not be ON, depending on the state of pin 20 (ON_OFF). AT commands can now be sent to ema.	
Value	0
Message	"ema AT interface ready."
Description	Displays when the ema AT interface is ready for use. This occurs once power is applied to ema.
Action Needed	None

5.2 Cellular Module Powering ON

Cellular Module Powering ON – Occurs once ema has started the power on sequence of the on-board cellular module.	
Value	1
Message	"Cellular module powering on."
Description	Displays when the ema ON_OFF pin is pulled LOW or during a reboot cycle.

Action Needed	None
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5.3 Cellular Module Ready for Use

Cellular Module Ready for Use – Occurs once ema has successfully completed the power on sequence of the on-board cellular module and the cellular module is ready for use with the host system.

Value	2
Message	“Cellular module ready for use.”
Description	Displays when the cellular module has properly booted and is ready for use by the host system.
Action Needed	None

5.4 Cellular Module Powering OFF

Cellular Module Powering OFF – Occurs once ema has started the powering off sequence of the on-board cellular module.

Value	3
Message	“Cellular module powering off.”
Description	Displays when the cellular module is in the process of powering off. Note: This could be caused by releasing the ON_OFF pin, a local reset request, a remote reset request, etc.
Action Needed	Wait for this URC before removing power.

5.5 Cellular Module Powered OFF

Cellular Module Powered OFF – Occurs once ema has successfully completed the powering off sequence of the on-board cellular module.

Value	4
Message	“Cellular module powered off.”
Description	Displays when the cellular module is powered off.
Action Needed	None

5.6 ema Rebooting now

ema Rebooting Now – Occurs immediately before both ema and the on-board cellular module will reboot.	
Value	5
Message	“ema rebooting now.”
Description	Displays immediately before ema and the cellular module reboots. Note: Another message(“ ema rebooting in 60 seconds. ”) with a time remaining before a reboot occurs will precede this URC.
Action Needed	Immediately stop all operations that are using ema.

5.7 ema Rebooting in 60 seconds

ema Rebooting in 60 Seconds – Occurs as a warning for the host system, indicating that both ema and the on-board cellular module will be rebooting shortly.	
Value	6
Message	“ema rebooting in 60 seconds.”
Description	Warning message displayed 60 seconds before ema and the cellular module reboots.
Action Needed	Complete short term (<30 seconds) operations that are using ema, and gracefully close any connections.

5.8 Establishing Modem UART Interface

Establishing Cellular UART Interface – Occurs once ema has made the Modem UART Interface available for use.	
Value	7
Message	“Establishing cellular UART interface.”
Description	Displays when the modem (cellular module) UART interface is ready after being taken down.

	Note: Displays after URC (" Removing cellular UART interface. ").
Action Needed	None

5.9 Establishing USB Interface

Establishing Cellular USB Interface – Occurs once ema has made the USB interface available for use.

Value	8
Message	"Establishing cellular USB interface."
Description	Displays when the cellular module USB interface is ready after being taken down. Note: Displays after URC (" Removing cellular USB interface. ").
Action Needed	None

5.10 Removing Modem UART Interface

Removing Cellular UART Interface - Occurs once ema has removed the Modem UART Interface and it is periodically unavailable for use.

Value	9
Message	"Removing cellular UART interface."
Description	Displays when the modem (cellular module) UART interface is periodically not available for use. Note: The modem UART interface will not be usable until URC (" Establishing cellular UART interface. ") appears, or pin 13 (STATUS) drives HIGH.
Action Needed	Immediately stop all operations that are using this interface until it becomes available again.

5.11 Removing USB Interface

Removing Cellular USB Interface – Occurs once ema has removed the USB Interface and it is periodically unavailable for use.	
Value	10
Message	“Removing cellular USB interface.”
Description	<p>Displays when the cellular module USB interface is periodically not available for use.</p> <p>Note: The cellular module USB interface will not be usable until URC (“Establishing cellular USB interface.”) appears, or pin 13 (STATUS) drives HIGH.</p>
Action Needed	None

5.12 Cellular Module Reset Requested

Cellular Module Reset Requested – Occurs once ema has detected a successful toggle of pin 5 (nRESET_REQUEST) and a reset is pending.	
Value	11
Message	“Cellular module reset requested.”
Description	<p>Displays when the cellular module pin 5 (nRESET_REQUEST) is toggled successfully.</p>
Action Needed	Prepare for a cellular module reboot.

5.13 Cellular Module Resetting

Cellular Module Resetting – Occurs once ema has begun the reset sequence of the on-board cellular module.	
Value	12
Message	“Cellular module resetting.”
Description	<p>Displays when the cellular module reset is in progress.</p> <p>Note: This URC will follow (“Cellular module reset requested.”).</p>

Action Needed	None
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5.14 Cellular Module Reset

Cellular Module Reset – Occurs once ema has completed the reset sequence of the on-board cellular module.

Value	13
Message	“Cellular module reset.”
Description	Displays after the cellular module has reset. Note: This URC will follow (“Cellular module resetting.”).
Action Needed	None

5.15 Cellular Module Reset Not Observed

Cellular Reset Pin Time Not observed – Occurs if ema detected that pin 5 (nRESET_REQUEST) was not held LOW long enough and the reset sequence cannot begin yet.

Value	14
Message	“Cellular reset pin time not observed.”
Description	Displays if ema pin 5 (nRESET_REQUEST) was not held LOW long enough (\geq one (1) second).
Action Needed	Hold pin 5 (nRESET_REQUEST) LOW for at least one (1) second if a reset is desired.

5.16 microFOTA Download Starting

Microcontroller FOTA Download Starting – Occurs once ema has begun the process of downloading a new firmware image in the background.

Value	30
Message	“Microcontroller FOTA download starting.”
Description	Displays when the microcontroller firmware update over the air (microFOTA) download is starting.

Action Needed	None
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5.17 microFOTA Download Complete

Microcontroller FOTA Download Complete – Occurs once ema has completed downloading a new firmware image in the background.	
Value	31
Message	“Microcontroller FOTA download complete.”
Description	Displays when the microcontroller firmware update over the air (microFOTA) download has completed.
Action Needed	Preparations should be made for a pending ema and cellular module reboot.

5.18 microFOTA Download Failed

Microcontroller FOTA Download Failed. Resuming later. – Occurs if ema has detected that the downloading of a new firmware image could not complete successfully, and will retry shortly.	
Value	32
Message	“Microcontroller FOTA download failed. Resuming later.”
Description	Displays when the microcontroller firmware update over the air (microFOTA) download has failed and will retry later.
Action Needed	None

5.19 Cellular Module FOTA Pending

Cellular FOTA Will Begin in 60 Seconds. Please Close All Connections. – Occurs as a warning that ema will begin to download and update the on-board cellular module’s firmware image.	
Value	40
Message	“Cellular FOTA will begin in 60 seconds. Please close all connections.”

Description	Displays when a firmware update over the air (FOTA) for the cellular module is available, and will begin in 60 seconds.
Action Needed	Begin to close all active connections.

5.20 Cellular Module FOTA Starting

Cellular FOTA Update Starting – Occurs once ema has begun the process of updating the new cellular module’s firmware image.

Value	41
Message	“Cellular FOTA update starting.”
Description	Displays when a firmware update over the air (FOTA) for the cellular module is starting.
Action Needed	None

5.21 Cellular Module FOTA Complete

Cellular FOTA Update Complete – Occurs once ema has completed updating the new cellular module’s firmware image.

Value	42
Message	“Cellular FOTA update complete.”
Description	Displays when a firmware update over the air (FOTA) for the cellular module has completed.
Action Needed	None

5.22 Cellular Module FOTA Failed

Cellular FOTA Update Failed. Resuming Later. – Occurs if ema has detected that the updating of the new cellular module’s firmware image could not complete successfully, and will retry shortly.

Value	43
Message	“Cellular FOTA update failed. Resuming later.”
Description	Displays when the firmware update over the air (FOTA) for the cellular module has failed and will retry later.

Action Needed	None
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5.23 Administrative Activity Pending

Administrative Activity Will Begin in 60 Seconds. Please Close All Connections. – Occurs as a warning that ema has detected that administrative activity is required and will begin shortly.

Value	90
Message	“Administrative activity will begin in 60 seconds. Please close all connections.”
Description	Displays when administrative activity is pending and will begin in 60 seconds.
Action Needed	Begin to close all active connections, until instructed otherwise by a different URC.

5.24 Administrative Activity Starting

Administrative Activity Starting – Occurs once ema has started an administrative activity.

Value	91
Message	“Administrative activity starting.”
Description	Displays when administrative activity is starting.
Action Needed	None, unless instructed otherwise by a different URC.

5.25 Administrative Activity Complete

Administrative Activity Complete – Occurs once ema has completed an administrative activity.

Value	92
Message	“Administrative activity complete.”
Description	Displays when administrative activity has completed.
Action Needed	None, unless instructed otherwise by a different URC.

5.26 Board Notify

Board Notify – Occurs with <i>cmd data</i> that has been sent or pushed from OptConnect Summit cloud services. The Summit API <code>/devices/ema/boardnotify/serial/{serial}</code> must be invoked with <i>cmd data</i>. Reference Summit API here: https://docs.optconnect.com/documentation	
Value	99
Message	"<i>cmd data</i>"
Description	<p>Displays after the Board Notify Summit API has been invoked.</p> <p>Valid characters for <i>cmd data</i> are alphanumeric characters (A-Z, a-z, 0-9) and \$-_.+!*'(),;:/?:@=&,Space(0x20h)</p> <p>Note: Any non-valid characters, will be replaced by a dash (-).</p> <p>Note: <i>cmd data</i> length longer than 160 bytes will be truncated to 160 bytes.</p>
Action Needed	None, host application must process <i>cmd data</i>

5.27 Sample URC Sequence Outputs

5.27.1 microFOTA

microFOTA Sample URC Output. microFOTA initiated (server side).

```

OCURC: 30, "Microcontroller FOTA download starting."      // ema has started the download.
OCURC: 31, "Microcontroller FOTA download complete."     // ema has completed the download.
OCURC: 06, "ema rebooting in 60 seconds."                // warning of a pending reboot.
OCURC: 03, "Cellular module powering off."              // ema powering off on-board cellular module.
OCURC: 09, "Removing cellular UART interface."          // ema removing use of Modem UART/USB
                                                            // interfaces due to the cellular module being
                                                            // powered off.

OCURC: 10, "Removing cellular USB interface."
OCURC: 04, "Cellular module powered off."              // ema has powered off the on-board cellular
                                                            // module.

OCURC: 05, "ema rebooting now."                          // ema is now rebooting.
OCURC: 00, "ema AT interface ready."                    // ema has rebooted and emaLink is ready for
                                                            // use.

OCURC: 01, "Cellular module powering on."               // ema powering on the on-board cellular
                                                            // module.

OCURC: 09, "Removing cellular UART interface."          // ema taking steps to make the Modem UART
OCURC: 10, "Removing cellular USB interface."            // and USB interfaces available, but not ready
OCURC: 09, "Removing cellular UART interface."          // yet.
OCURC: 10, "Removing cellular USB interface."            //
OCURC: 07, "Establishing cellular UART interface."       // ema has made the Modem UART/USB
OCURC: 08, "Establishing cellular USB interface."       // interfaces available for use.
OCURC: 02, "Cellular module ready for use."             // the on-board cellular module is now ready for
                                                            // use by the host system.
  
```

5.27.2 ema Powered ON

Power has been applied to pin 1 (VCC):

```

OCURC: 00, "ema AT interface ready."                    // Power has been applied to ema, ON_OFF pin
                                                            // has not been pulled LOW yet
  
```


5.27.3 ema Cellular Module Turned ON

Pin 20 (ON_OFF) has been driven and held LOW, power has been applied to pin 1 (VCC) for some time:

```

OCURC: 01, "Cellular module powering on."           // ema powering on the on-board cellular
                                                         // module.
OCURC: 09, "Removing cellular UART interface."       // ema taking steps to make the Modem UART
OCURC: 10, "Removing cellular USB interface."       // and USB interfaces available, but not ready
OCURC: 09, "Removing cellular UART interface."       // yet.
OCURC: 10, "Removing cellular USB interface."       //
OCURC: 07, "Establishing cellular UART interface."   // ema has made the Modem UART/USB
OCURC: 08, "Establishing cellular USB interface."   // interfaces available for use.
OCURC: 02, "Cellular module ready for use."         // the on-board cellular module is now ready for
                                                         // use by the host system.
  
```

5.27.4 ema Cellular Module Turned OFF

Pin 20 (ON_OFF) has been released, power still applied to pin 1 (VCC):

```

OCURC: 03, "Cellular module powering off."         // ema powering off on-board cellular module.
OCURC: 09, "Removing cellular UART interface."       // ema shutting down Modem UART/USB
OCURC: 10, "Removing cellular USB interface."       // interfaces.
OCURC: 04, "Cellular module powered off."         // ema has powered off the on-board cellular
                                                         // module.
  
```

5.27.5 ema Cellular Module Reset

Pin 5 (nRESET_REQUEST) has been driven and held low for at least one (1) seconds and released, power still applied to pin 1 (VCC) and pin 20 (ON_OFF) is still being held LOW.

```

OCURC: 11, "Cellular module reset requested."       // ema has detected a reset request for the
                                                         // on-board cellular module
OCURC: 12, "Cellular module resetting."           // ema has started the reset sequence of the
                                                         // on-board cellular module
OCURC: 03, "Cellular module powering off."         // ema powering off on-board cellular module.
OCURC: 09, "Removing cellular UART interface."       // ema shutting down Modem UART/USB
OCURC: 10, "Removing cellular USB interface."       // interfaces.
OCURC: 04, "Cellular module powered off."         // ema has powered off the on-board cellular
  
```

```

OCURC: 13, "Cellular module reset." // module.
// ema has completed the reset sequence of the
// on-board cellular module
OCURC: 07, "Establishing cellular UART interface." // ema has made the Modem UART/USB
OCURC: 08, "Establishing cellular USB interface." // interfaces available for use after the reset.
OCURC: 02, "Cellular module ready for use." // the on-board cellular module is now ready for
// use by the host system.

```

5.27.6 ema Board Notify

The OptConnect ema™ Board Notify feature is a very powerful and useful method to send one-way notification messages from cloud to host system via ema. The Summit API must be used to start the process

Summit API /devices/ema/boardnotify/serial/{serial} invoked with *cmd data "do something"*

```

OCURC: 99, "do something" // ema sends out the board notify URC
// for the host to process

```

6. Revision History

Revision	Date	Description	Author
1.0	6/4/2019	Initial Release	MSV
1.1	9/10/2019	Updated sections 3 & 4. Added section 5.27. General cleanup of the document.	MSV
1.2	11/26/2019	Added sections 3.7, 3.8, 5.26 and 5.27.6. ema Management UART is now referred to as emaLink	MSV