Positioning Universal

AT700 (GG100) User Guide

Version History

Version	Author	Date	Description
1.0	Alex Zhang	Aug. 13 2024	Initial Release

Regulatory Notice

Federal Communications Commission (FCC) and Industry Canada (IC) Notice

Electronic devices, including computers and wireless modems, generate RF energy incidental to their intended function and are therefore subject to FCC rules and regulations.

This equipment has been tested to, and found to be within the acceptable limits for a Class B digital device, pursuant to Part 15 of the FCC Rules and Industry Canada ICES-003. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment.

This equipment generates radio frequency energy and is designed for use in accordance with the manufacturer's user manual. However, there is no guarantee that interference will not occur in any particular installation. If this equipment causes harmful interference to radio or television reception, which can be determined by turning the equipment off and on, you are encouraged to try to correct the interference by one or more of the following measures.

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Consult the dealer or an experienced technician for help.

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected

This device complies with Part 15 of the Federal Communications Commissions (FCC) Rules and with Industry Canada (ICES-003). Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

Caution: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

RF Exposure Information

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20cm (8 inches) during normal operation.

Le présent appareil est conforme aux CNR Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

(1) l'appareil ne doit pas produire de brouillage, et

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en

Innovation, Science and Economic Development Canada ICES-003 Compliance Label:

CAN ICES-3 (B)/NMB-3(B)

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du

Canada.ISED Radiation Exposure Statement

This device complies with RSS-102 radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the ISED radio frequency exposure limits, human proximity to the antenna shall not be less than 20cm (8 inches) during normal operation.

Cet appareil est conforme aux limites d'exposition aux rayonnements de la CNR-102 définies pour un environnement non contrôlé. Afin d'éviter la possibilité de dépasser les limites d'exposition aux fréquences radio de la CNR-102, la proximité humaine à l'antenne ne doit pas être inférieure à 20 cm (8 pouces) pendant le fonctionnement normal.

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1 Overview

The AT700(GG100) is a remote asset tracking device that uses a GPS satellite receiver to determine location information and an LTE transceiver to communicate information to and from a land-based server. It is designed to facilitate a broad array of asset tracking and telematics services

This document outlines the operation and configuration of the AT700(GG100) product line using the supplied tracking application. The initial implementation of AT700(GG100) will be for the BHPH market but it will be quickly used in general battery powered firmwares in many other industries. The intent here is to have a solution which works for BHPH but is flexible for future use cases.

2 Build States

2.1 Production Versus Debug Build

The device is designed to work in 2 different build states.

1. A debug build which provides plenty of logging and error messages along with LED use.
2. A production build which removes the logging/error messages and LED use and doesn't even initialize the external UART.

A production build is useful for 2 reasons:

1. Save > 12K flash space to make firmware downloads smaller
2. Saves power by not running the external UART

The downside is that units that fail in the field will not be able to be debugged with the build on them. Instead, a diagnostic app will be produced which will be downloaded to these devices and will provide a full analysis of their current capability and any possible defects. This build will contain full debug info.

2.2 External UART Connector

When using the Debug Build, the UART connector can have its VCC line connected or not connected.

When the VCC line is connected the device will always enter debug state (defined below) when the MCU starts up. This is useful for software development but not for field testing since the device doesn't operate normally but always enters debug state.

When the VCC line isn't connected then the device will operate normally but will show log/error messages on external UART. Also when in one of the states: heartbeat, disconnect, tracking, the user will be able to enter commands. However the device will go into shutdown state and the ability to talk to the device will be lost

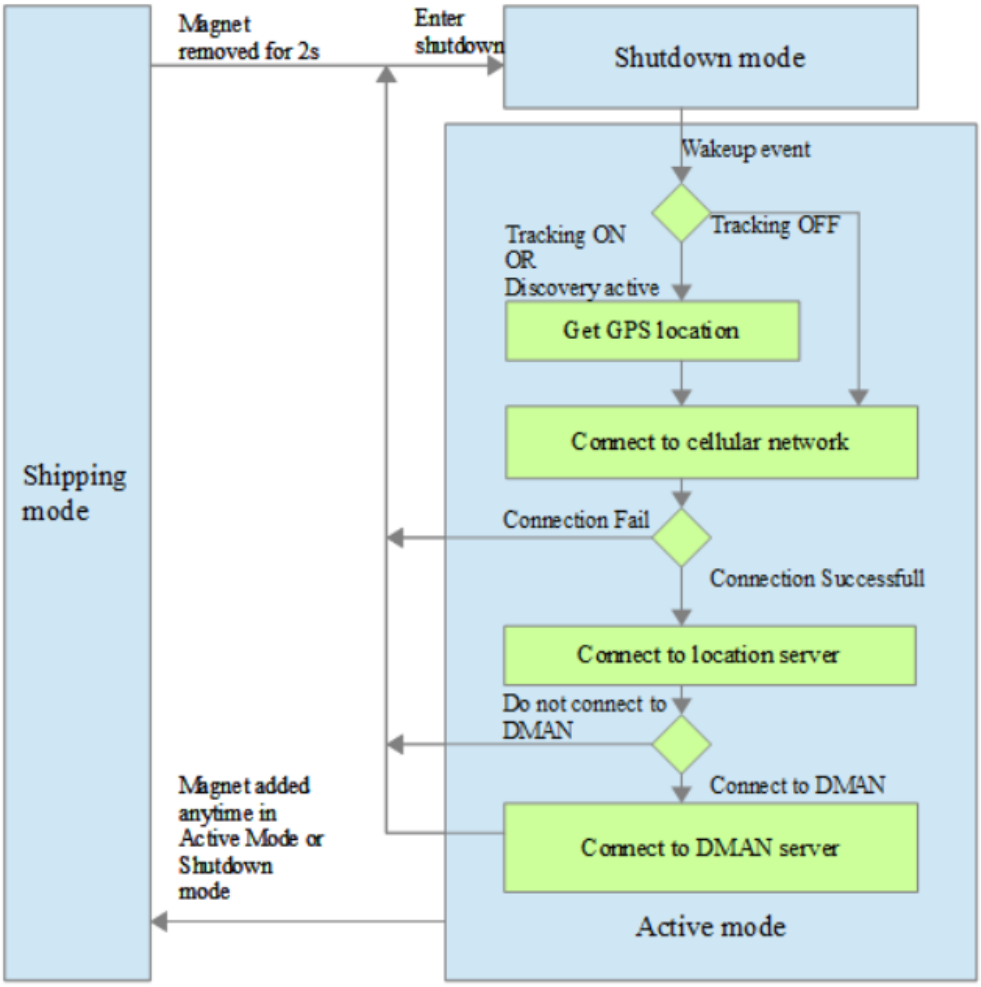
3 Device States

AT700(GG100) supports different modes of operation based upon its need for ultra low power to prolong battery life. Device has three main operating modes:

- Shipping mode
- Shutdown mode
- Active mode

Each modes are explained in more detail later in this document. Refer to section 'Settings' for explanation about the constant values shown in pictures.

High level picture of main modes is shown below:



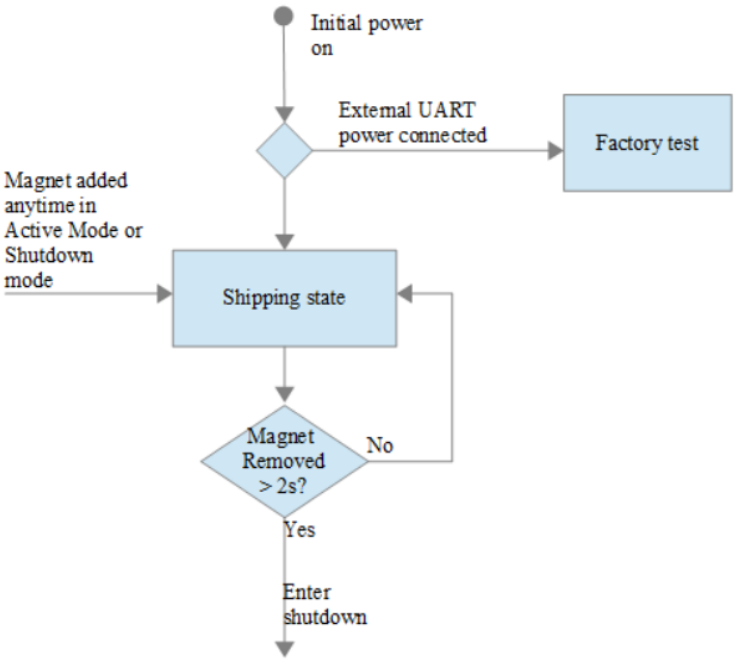
Picture: Device high level modes

3.1 Shipping

This mode is entered when an external magnet is applied to magnetic reed switch. This mode effectively keeps device locked in lowest power state till external magnet is added and then removed. Device will switch to shipping mode from any other state if magnet is added.

LTE Module:	Off
GPS:	Off
MCU:	Shutdown
MEMs:	Shutdown Mode
Avg Power: 3	uA

Shipping mode state transitions are shown below:



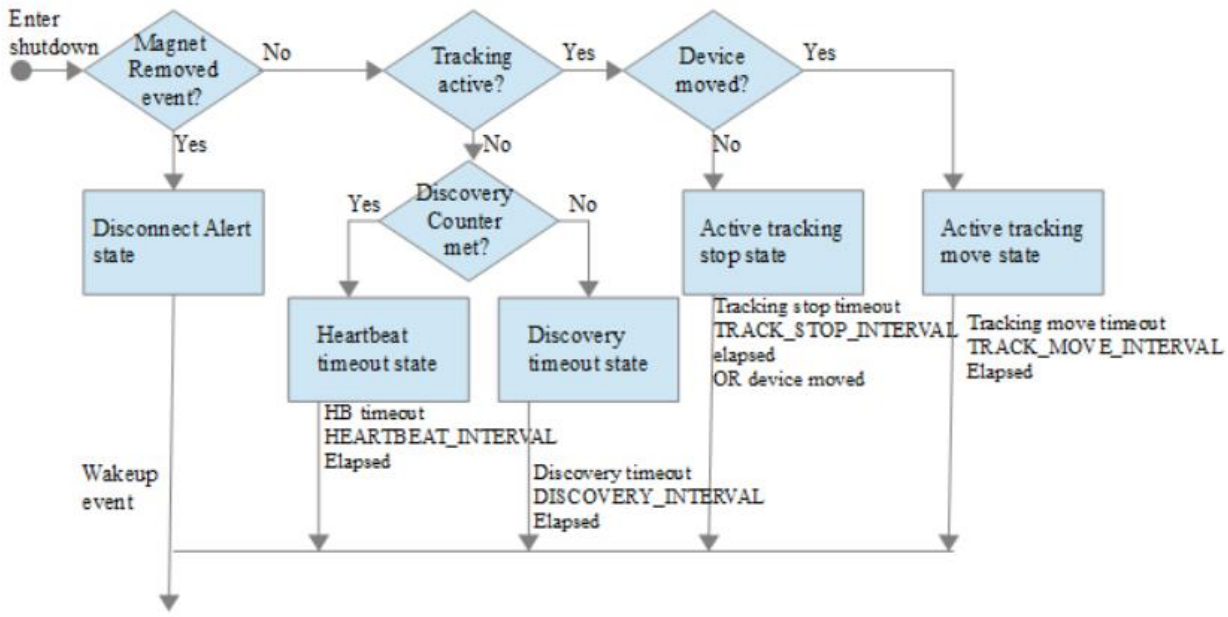
- When power is initially turned on for the device i.e. battery is put in place or external power is connected, device checks whether external UART power is connected.
- If external UART power is ON, device goes to factory test mode and stays in this state until powered down or changes state via console command.
- Device stays in shipping state until magnet is removed for more than 2 seconds, after which device enters shutdown state
- If magnet added anytime in Active Mode or Shutdown mode, device will switch back to Shipping mode.

3.2 Shutdown

Lowest possible power device while waiting for a timer to expire to move to heartbeat report. Can also be moved to disconnect report if a magnet is connected to device and removed. The details of the disconnect alert are contained elsewhere in document.

LTE Module:	Power Savings Mode
GPS:	Off
MCU:	Shutdown
MEMs:	Shutdown Mode
Avg Power: 3	uA in room temperature

Once in shutdown mode, device will exit only if magnet is added or one of the wakeup events happen. Below picture shows different sub-states for shutdown mode:



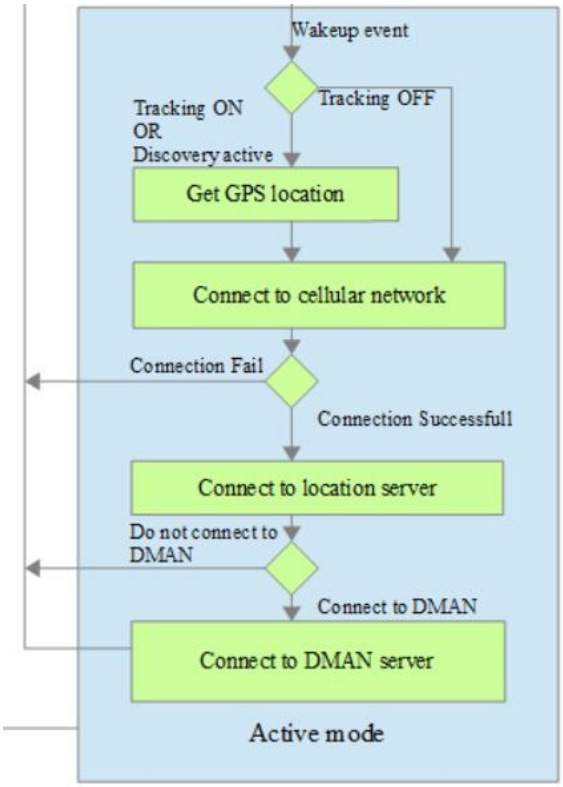
Picture: Shutdown mode state transitions

Execution flow when entering shutdown mode is as follows (from left to right in the picture):

- If entering from shipping mode (magnet was removed):
  - Go to disconnect alert state i.e. prepare disconnect alert report to be sent
  - Switch immediately to active mode
- If tracking is NOT active:
  - If DISCOVERY_HEARTBEAT_COUNT value is NOT met:
    - Go to heartbeat timeout state
    - Once heartbeat timeout HEARTBEAT_INTERVAL elapses, switch to active mode
  - If DISCOVERY_HEARTBEAT_COUNT value IS met:
    - Go to discovery timeout state
    - Once discovery timeout DISCOVERY_INTERVAL elapses, switch to active mode
- If tracking IS active AND device has NOT moved:
  - Go to active tracking stop state
  - Tracking stop state is identical to normal shutdown state except the MEMs is kept alive so it can wake up the device if appropriate vibrations are detected.
  - If tracking stop timeout TRACK_STOP_INTERVAL elapses OR device moves, switch to active mode
- If tracking IS active AND device HAS moved:
  - Go to active tracking move state
  - Once tracking move TRACK_MOVE_INTERVAL timeout elapses, switch to active mode

3.3 Active Mode

Device enters active mode when one of the wakeup events happen. When entering active state, device will go through a series of sub-events as shown below (from top to bottom):

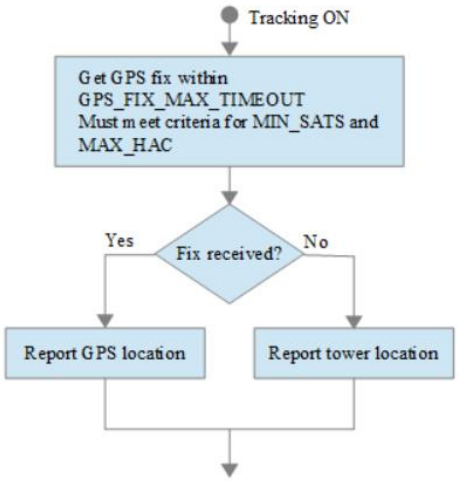


The tracking state is entered when customer wants to track the device in real time. The device determines it should enter this state by reporting in a heartbeat to location backend and getting a "Track On" response. The exact mechanism is specified in the UI Requirements section. There are several sub states to tracking, depending whether device has moved or not. See 'Shutdown' state for more details on it.

When discovery mode is active, i.e. discovery counter value has not been met, device will try to get GPS fix.

3.3.1 Get GPS location

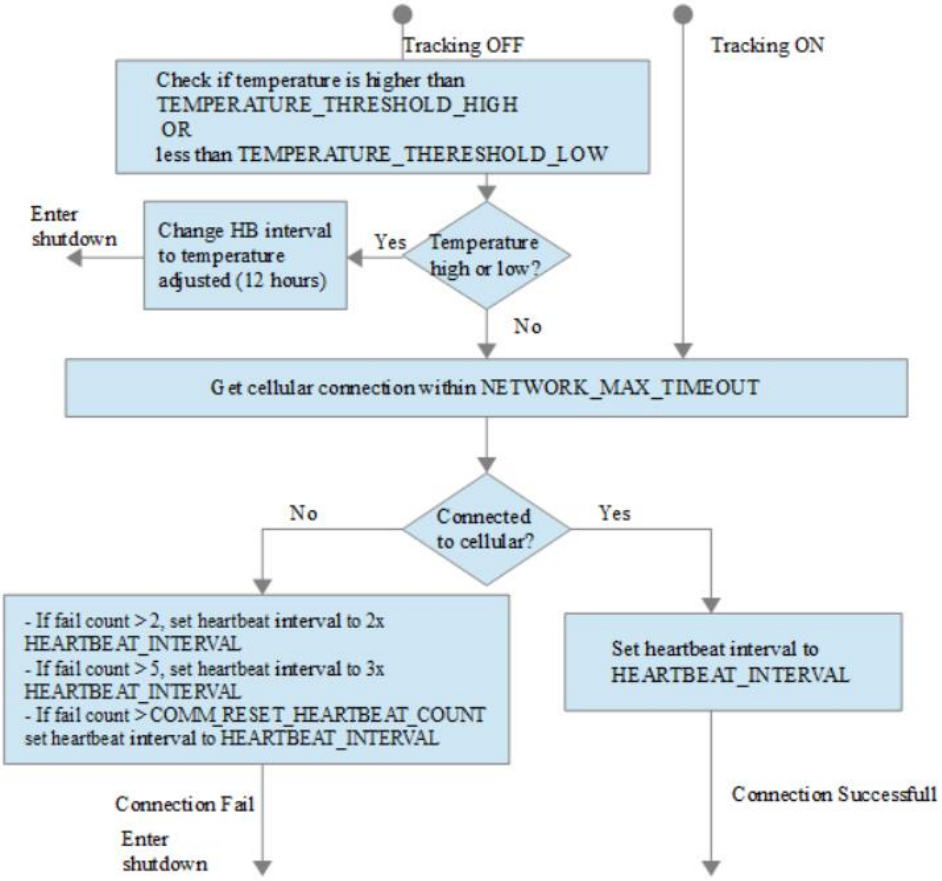
If tracking or discovery mode is active, device will try to get GPS location fix with sequence as shown below:



- Turn on GPS receiver and try to get a fix per criteria that meets criteria for MIN_SATS and MAX_HAC
- If GPS fix received within timeout GPS_FIX_MAX_TIMEOUT, set report as GPS location
- If no GPS fix was obtained, set report as tower location

3.3.2 Connect to cellular network

In this state device scans and tries to connect to cellular network. Scan time is limited to save power in case device is in poor coverage. Execution flow is shown in the picture below:



Picture: Connecting to cellular network

When entering this mode, device checks the tracking state first:

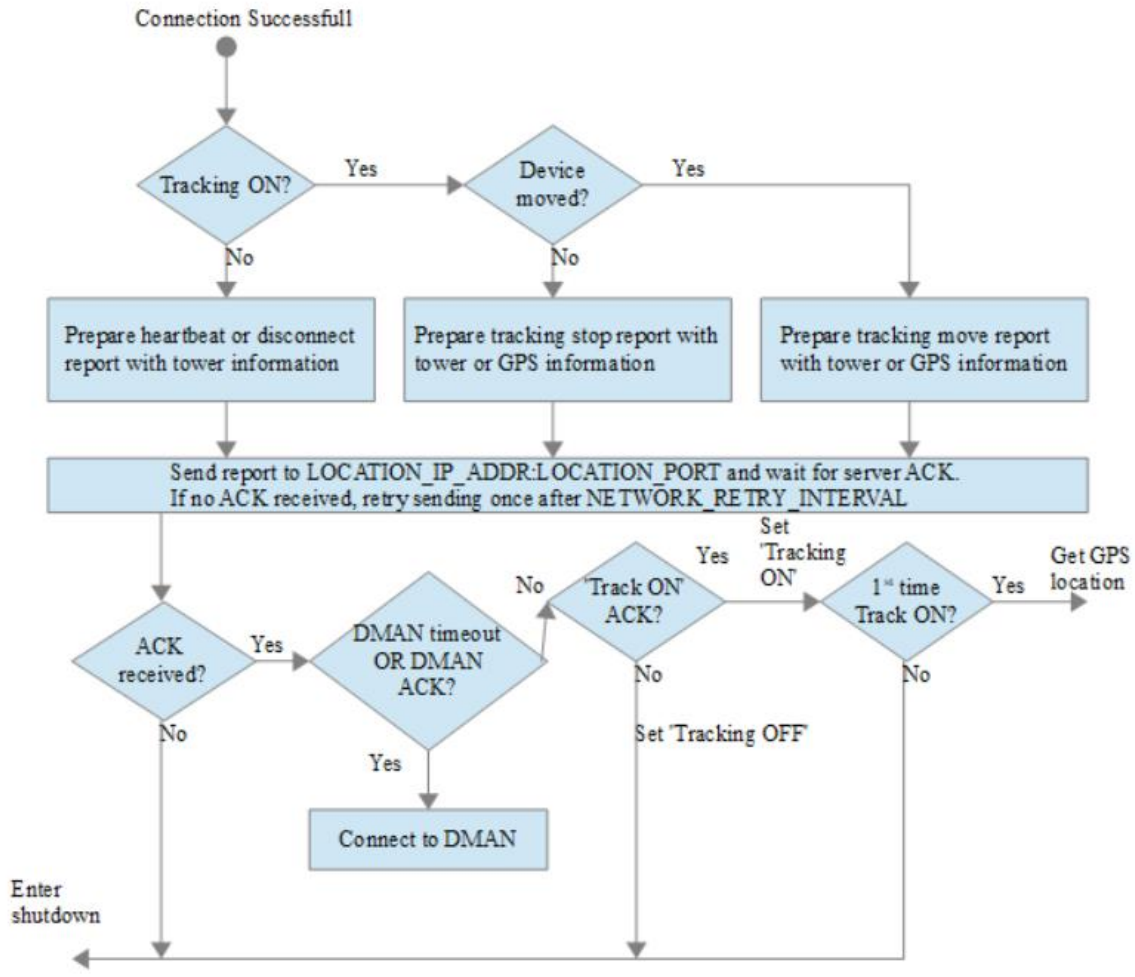
- If tracking is OFF:
    - Temperature is checked, if temperature is higher than TEMPERATURE_THRESHOLD_HIGH OR less than TEMPERATURE_THERESHOLD_LOW then heartbeat interval is adjusted (default is 12 hours) and device goes back to shutdown mode. The purpose is to try to get another time of the day when temperature possibly is more favorable.
- If tracking is ON:
    - No temperature check is made, tracking is seen as high priority and connection to network should try to be established
- Next, device tries to scan for the network within timeout NETWORK_MAX_TIMEOUT. Scanning time is limited to preserve battery. Normally timeout is set to 30s, in typical conditions network is found in less than 15s and extending scan time beyond 30s does not bring much benefit.
- If device is not able to connect to network:
    - If connection has failed more than 2 times in a row, heartbeat interval is increased to 2x HEARTBEAT_INTERVAL

- If connection has failed more than 5 times in a row, heartbeat interval is increased to 3x HEARTBEAT_INTERVAL
- If connection fail count is greater than COMM_RESET_HEARTBEAT_COUNT set heartbeat interval to HEARTBEAT_INTERVAL
- Devices goes back to shutdown mode

- If device was able to connect to network:
  - Heartbeat interval is set back to HEARTBEAT_INTERVAL (if it was extended due to failed connection)
  - Device proceeds to the next step

3.3.3 Connect to location server

Once connection to cellular network is successful, device will prepare the report and send it to the server following the flow is shown in the below picture:



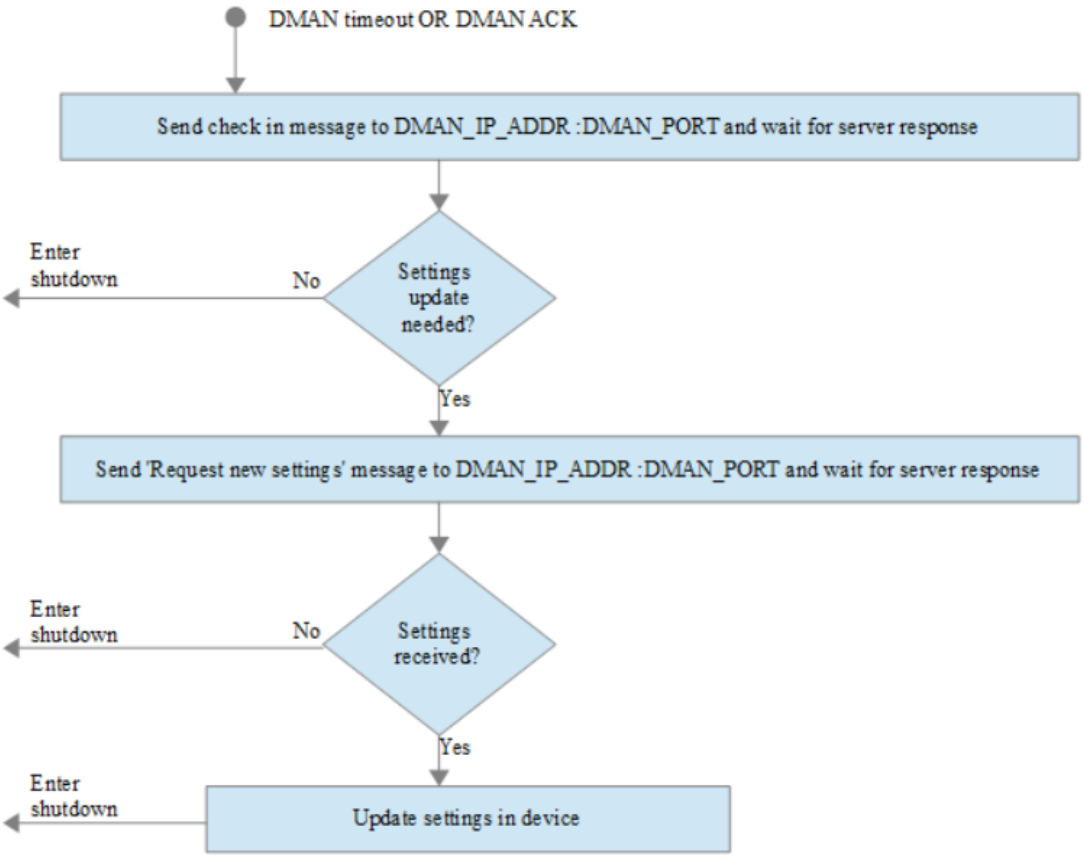
Execution flow when connecting to location server is as follows:

- If tracking is NOT on:
  - Prepare heartbeat or disconnect report with:
    - Tower information in case of regular heartbeat
    - GPS location if obtained for discovery mode

        - Disconnect alert is in case when magnet was just removed
        - Heartbeat report is the default
    - Go to Send report and wait for ACK
- If tracking is ON:
    - Check whether device has moved during active period (MEMS)
    - Location information used depends on whether GPS fix was successful or not. If GPS data is collected then it is included, otherwise the location data is restricted to current cell tower ID, LAC, MCC, MNC so a lat/lng lookup can be done at server .
    - If device has NOT moved:
        - Prepare tracking stop report with tower or GPS information
    - If device HAS moved:
        - Prepare tracking move report with tower or GPS information
    - Go to Send report and wait for ACK
- Send report and wait for ACK
    - Device will try to connect to LOCATION_IP_ADDR:LOCATION_PORT and send report
    - If no ACK is received for the first try, then sending will be repeated once after NETWORK_RETRY_INTERVAL
- If server ACK was NOT received:
    - Go to Enter Shutdown
- If server ACK WAS received:
    - If DMAN timeout (UPDATE_SETTING_INTERVAL) has elapsed OR DMAN ACK was received
        - Go to Connect to DMAN
    - If server ACK is NOT 'Track ON':
        - Set active tracking status to OFF
        - Check if DMAN connection is needed
    - If server ACK is 'Track ON':
        - Set active tracking status to ON
        - If active tracking was set on the 1st time i.e. tracking was just activated, go to get GPS location
        - If not 1st time to set on active tracking, check if DMAN connection is needed
- If DMAN connection is needed
    - Go to connect to DMAN
    - Otherwise, go to shutdown mode

3.3.4 Connect to DMAN server

Device will periodically connect to DMAN server, with UPDATE_SETTING_INTERVAL defined in settings or if DMAN checkin ACK code is received as a response to a location report. The purpose of this check it to see whether new settings or firmware version is needed to be downloaded.
DMAN connection sequence is described below:



- If DMAN timeout (UPDATE_SETTING_INTERVAL) has elapsed OR DMAN checkin ACK code is received:
    - Send check in message to DMAN_IP_ADDR :DMAN_PORT and wait for server response
    - If update is NOT needed, go to shutdown
    - If update IS needed: Send 'Request new settings' message to DMAN_IP_ADDR :DMAN_PORT and wait for server response
    - If settings are NOT received, go to shutdown
    - If settings ARE received, write settings to device flash and then go to shutdown

4 UI

As much as possible it is the intent to minimize changes to existing SVR UI.

4.1 Ability to start/stop tracking

Use existing Recovery Tab + option. Extra fields for these devices may include: (or it might be fixed to make feature simpler)

- Set tracking interval (e.g. 2 minutes)
- Set duration of tracking (e.g. 3 days)

Tracking can be turned off at any time by user by simply deleting the Recovery.

4.2 View devices under tracking

Show device under tracking on existing Recovery Tab, extra status to display whether device has checked in and started active tracking or not.

4.3 Show battery status

On existing device list show battery icon for devices with 4 stages of fullness for each. The battery is based upon start date and expires in 3 years. Not driven by actual battery of device.

4.4 Extra notification

When a device has checked in and tracking has started then send email notification

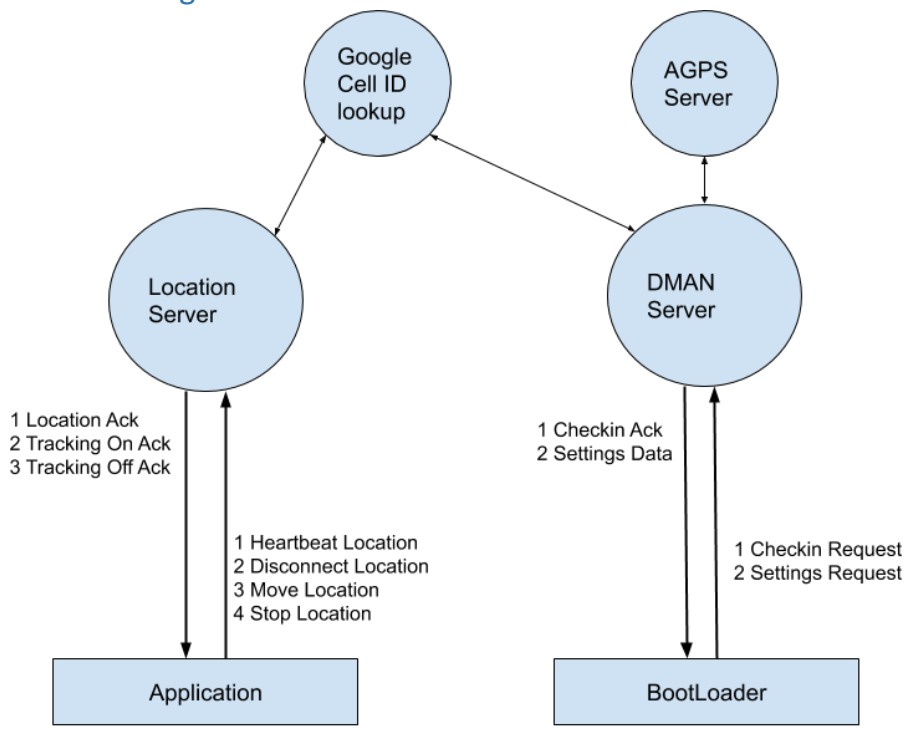
4.5 Show tower locations on map with uncertainty circle

Since a certain number of locations are now going to be collected with only cell tower info we need to show these locations differently on map. We will use a circle representing meters of inaccuracy (hac) surrounding the location marker. These will show for Top Stops, and mapped locations.

5 Messages

All messages have numbers formatted in Big Endian format.

5.1 Server Diagram



5.2 Standard Message Header

All messages from a device start with an IMEI identifier to uniquely identify the device. The IMEI is needed to allow the easy integration of selling to 3rd parties who are not necessarily on the same Carrier and can't share the private IP of the device.

Name	*Format*	*Description*
IMEI	us_long	The unique identifier for the device

5.3 Location Server Messages

5.3.1 Comm Only Location

Name	*Format*	*Description*
Msg ID	us_byte	Comm only msg = 1 (cell tower)
Seq ID	us_byte	Unique msg id
Loc Type	us_byte	Heartbeat, Disconnect, Move, Stop
Date	us_int	Unix based timestamp
MCC	us_short	Mobile Country ID
MNC	us_short	Mobile Network ID
Local Area Code	us_int	A 4 byte unsigned integer value representing LAC
Cell Tower ID	us_int	The Cell Tower ID reported by cell module
Battery Volts	us_short	The voltage of battery in mV
RSSI	s_byte	The strength of the Cellular data connection
IWDG_RST_count	us_uint16	A 2 byte unsigned integer value which contains counter of how many times device has encountered watchdog resets
BOR_RST_count	us_uint16	A 2 byte unsigned integer value which contains counter of how many times device has encountered brownout resets
Registration time	us_uint16	A 2 byte unsigned integer value which contains time the device took to send registration message in seconds
Registration timeout count	us_uint16	A 2 byte unsigned integer value which contains counter of how many times device has timed out when trying to connect to network while sending registration message

Registration no response	us_uint16	A 2 byte unsigned integer value which contains counter of how many times device has sent registration message without receiving response from server
Temperature	us_int16	A 2 byte signed integer value which contains device temperature in Celsius
Optional bitmap	us_uint16	A 2 byte unsigned integer optional bitmap which defines optional fields that are included in the payload. See section 9.3.3. Optional fields

5.3.2 GPS Fix Location

Name	*Format*	*Description*
Msg ID	us_byte	GPS msg = 2
Seq ID	us_byte	Unique msg id
Loc Type	us_byte	Heartbeat, Disconnect, Move, Stop
Date	us_int	Unix based timestamp
Lat	s_int	A 4 byte signed integer value where Latitude = value/10000000 in decimal degrees
Lng	s_int	A 4 byte signed integer value where Longitude = value/10000000 in decimal degrees
Speed	us_byte	A value representing speed in kph, put in def
Heading	us_byte	Heading where 0 = 0 degrees, through 256 = 360 degrees
Battery Volts	us_short	The voltage of battery in mV
Sats	us_byte	Number of satellites used to calculate the Lat, Lng values
HAC	us_byte	A value that hints at the quality of the Lat, Lng fix. HAC = value/10. So a value of 36 = 3.6 HAC
RSSI	s_byte	The strength of the Cellular data connection
IWDG_RST_count	us_uint16	A 2 byte unsigned integer value which contains counter of how many times device has encountered watchdog resets
BOR_RST_count	us_uint16	A 2 byte unsigned integer value which contains counter of how many times device has encountered brownout resets

Registration time	us_uint16	A 2 byte unsigned integer value which contains time the device took to send registration message in seconds
Registration timeout count	us_uint16	A 2 byte unsigned integer value which contains counter of how many times device has timed out when trying to connect to network while sending registration message
Registration no response	us_uint16	A 2 byte unsigned integer value which contains counter of how many times device has sent registration message without receiving response from server
Temperature	us_int16	A 2 byte signed integer value which contains device temperature in Celsius
Optional bitmap	us_uint16	A 2 byte unsigned integer optional bitmap which defines optional fields that are included in the payload. See section 9.3.3. Optional fields

5.3.3 Optional fields

Optional bitmap	us_uint16	A 2 byte unsigned integer optional bitmap which defines optional fields that are included in the payload. If bit is set to 1, field is included in the payload, if set to 0 field is not included. Bit 0: REG_BOOTUP_COUNTER Bit 1: REG_DISCOVERY_COUNT Bit 2: REG_FAIL_ATCMD Bit 3: GPS_ON_TIME Bit 4: – 14: Not in use (0 as default) Bit 15: 0 as a default. If set as 1, then another optional bitmap field will follow.

List of optional fields:

REG_BOOTUP_COUNTER	us_uint16	A 2 byte unsigned integer value which starts from 0 when battery is inserted and is increased by 1 each time device boots up.
REG_DISCOVERY_COUNT	us_uint16	A 2 byte unsigned integer value for device discovery counter

REG_FAIL_ATCMD	us_uint16	A 2 byte unsigned integer value which shows how many times device has failed to send AT command to the modem.
GPS_ON_TIME	us_uint16	A 2 byte unsigned integer value which contains time the device had GPS module powered on in seconds

5.3.4 Debug Message

Name	*Format*	*Description*
Msg ID	us_byte	GPS msg = 3
Seq ID	us_byte	Unique msg id
Length	us_byte	ASCII string length = n
ASCII	us_byte[n]	ASCII array of bytes of length n

- Debug messages are turned on by a debug setting “Debug Mode” in DMAN Settings
- Messages are not acked

5.3.5 Location Ack

Acknowledge a location message. The device is not expected to be in tracking state if this ack is received. If the device is in tracking state then it should move to shutdown state.

Name	*Format*	*Description*
Msg Type	us_byte	42
Seq ID	us_byte	Unique msg id from incoming message getting ack’d

5.3.6 Location Ack Reset State to Shipping

Acknowledge a location message and set device state back to shipping mode

Name	*Format*	*Description*
Msg Type	us_byte	45
Seq ID	us_byte	Unique msg id from incoming message getting ack’d

5.3.7 DMAN check in Ack

This ack code will request the device to check in to DMAN.

Name	*Format*	*Description*
Msg Type	us_byte	46
Seq ID	us_byte	Unique msg id from incoming message getting ack'd

5.3.8 Tracking Ack

The device is expected to be in tracking state when this ack is received. If device is already in tracking state then nothing changes, otherwise the device will move to tracking state.

Name	*Format*	*Description*
Msg Type	us_byte	43
Seq ID	us_byte	Unique msg id from incoming message getting ack'd
Interval	us_int	Seconds between tracking locations, if 0 then use value specified in settings for device.

6 Resend Logic

AGPS messages and location messages have a configurable timeout that is used to attempt communication with appropriate backend. If the timeout is exceeded then the communication attempt is abandoned.

AGPS messages and location messages also have a configurable retry interval in seconds to specify how often to retry the messages during the communication attempt.

7 Message Storage Logic

7.1 AGPS Messages

AGPS messages are not stored. If an attempt to communicate fails the message is lost.

7.2 Location Messages

Pending location messages are stored in flash with a configurable sized queue. The flash parts are load balanced to provide maximal flash life by spreading the writes over a number of flash pages.

It is configurable how many messages are queued

If messages overflow the queue, oldest messages are dropped

In the case of a single outstanding message, it is stored in RAM. If communication fails it is then stored in flash. This helps save flash burnout by not writing locations if they are quickly communicated with backend.

All firmware/settings updates will cause the location message queue to be deleted. This will prevent issues with different formats of location messages between different firmware.

8 Debug Commands

All commands can be issued through external serial connection

Command	Description
gps,<var1>	Allows custom GPS commands to be issued directly to the GPS module. If <var1> is “wake”, the GPS module will wake. If <var1> is “shutdown”, the GPS module will shut down. Need logging enable for GPS_MORE to see results. <var1> = any valid Sony CDX command
pwr	Will send Cell module into sleep, shutdown GPS, shutdown MEMS, and send device into sleep shutdown; The device will transition to the appropriate shutdown state, depending on what mode it’s in.
ping	Will ping the location server at "172.30.166.208"
nrs	Will print to screen the current NETWORK_REPORT_SERVER value in settings
thing	Command to set the NETWORK_REPORT_SERVER in settings back to its default value "172.30.166.208"
state	Will print to screen the current state
qsize,<var1>	Will set the maximum amount of location messages that can be written in flash memory. Cannot be greater than 24 or less than or equal to 0.
mems,shutdown	Will shut down MEMS
agps	Start AGPS download
cell2,<var1>	Writes a command directly to Cell Module, for serial port management

cell,<var1>	If <var1> is “wake”, the Cell module will wake. If <var1> is “sleep”, the Cell module will go into sleep mode. If <var1> is “shutdown”, the Cell module will shut down. <var1> = any Altair 1250 AT command. Need logging enable for COMM_MORE to see results.
heartbeat	Change state to comm only heartbeat report
heartbeat_fix	Change state to get GPS fix heartbeat report
heartbeat_agps	Change state to get AGPS fix heartbeat report
shutdown	Change state to shutdown
shipping	Change state to shipping
track_shutdown	Change state to track shutdown
track	Change state to track active
track_agps	Change state to track AGPS
debug	Change state to debug
disconnect	Change state to comm only disconnect alert
disconnect_fix	Change state to GPS fix disconnect alert
dealership_mode	Change state to dealership track active
settings,<var1>	If <var1> is “hex”, it will dump settings in hex format to console. If just “settings” is sent, it will display all of the current settings on device. See “Appendix B”
consts,init	Will initialize constants saved on flash memory
registers	Display current values of all backup registers to console
log,<var1>	Change the level of logging reported through external UART. <var1> can be one of: ● basic = all basic logging on ● all = all logging on ● <number> = sum of all desired log levels where GPS_BASIC = 2, COMM_BASIC = 4, IO_BASIC = 8, GPS_MORE = 16, COMM_MORE = 32, IO_MORE = 64
set,<var1>,<var2>	Change settings value where <var1> is the number identifying the setting and <var2> is the new number associated with setting.
info	Display all current device information. See “Appendix B” for a

	sample.
update	Mark device as ready to checkin in and reset the device so it enters bootloader.
apn,<var1>	Change the APN associated with the device
ip,<value>	Change the DMAN server to report into
port,<value>	Change the DMAN port to report into

9 Real Time Clock

1. The device supports a real time clock powered by an external crystal (XTAL).
2. Set to network time when available, if no network time has ever been reported then it defaults to 1970/1/1. This should be a short lived condition on a functioning unit once it comes out of shipping state.
3. Updated when network time is more than 2 seconds different from MCU time to keep clock accurate over lifetime of device

10 Settings

Settings are structured as a binary file with known offsets for different values. The settings type will dictate the structure of the binary file. For debug, the values will be available by string.

Settings that are meant for customer to access are highlighted in green in the below table:

Category	ID	TYPE	Name	Init value	Description
General	1	UINT 32	HEARTBEAT_INTERVAL	61200	Time set for device to sleep until heartbeat checkin to server; (Default: 17 hours)
	2	UINT 32	NETWORK_MAX_TIMEOUT	45000	Time set for device to connect to network before timing out when waking from heartbeat; (Default: 45 seconds)
	3	UINT 32	NETWORK_RETRY_INTERVAL	5000	Time set for device to wait between resending outstanding messages in queue; (Default: 5 seconds)
	4	UINT 32	COMM_RESET_HEARTBEAT_COUNT	24	The number of times the device can receive no ACK on heartbeat before resetting the Comm module

	5	INT32	TEMPERATURE_THRESHOLD_HIGH	60	The max temperature (in Celsius) before the device sleeps for 12 hours before waking again at a hopefully lower temperature
	6	INT32	TEMPERATURE_THERESHOLD_LOW	(uint32_t)-35	The minimum temperature (in Celsius) before the device sleeps for 12 hours before waking again at a hopefully higher temperature
	7	UINT 32	UPDATE_SETTING_INTERVAL	604800	The time set in between settings updates for device; (Default: 1 week)
	8	UINT 32	NGP_VERSION	0x0c0d0e0f	Sets NGP version
GPS	9	UINT 32	GPS_FIX_MAX_TIMEOUT	120000	The time set for device to get GPS fix before timing out; (Default: 120 seconds)
	10	UINT 32	MIN_SATS	4	Minimum number of satellites tracked needed for a good GPS fix
	11	UINT 32	MAX_HAC	40	Maximum HAC (Horizontal Accuracy Estimate) value permitted for a good GPS fix
TRACKING	12	UINT 32	TRACK_MOVE_INTERVAL	300	The amount of time the device will sleep while in Recovery Mode, and the device is moving; (Default: 5 minutes)
	13	UINT 32	TRACK_STOP_INTERVAL	61200	The amount of time the device will sleep while in Recovery Mode, and the device is NOT moving, unless woken by vibration; (Default: 17 hours)
	14	UINT 32	TRACK_SHUTDOWN_ODR	2	Accelerator shutdown Output Data Rate for MEMS while awake in Recovery Mode
	15	UINT 32	TRACK_SHUTDOWN_THRESHOLD	3	Accelerator shutdown Interrupt 1 Threshold; Lower Threshold for MEMS vibration going into sleep while awake in Recovery Mode
	16	UINT 32	TRACK_SHUTDOWN_SCALE	0	Accelerator shutdown Full Scale for MEMS while awake in Recovery Mode
	17	UINT 32	TRACK_SHUTDOWN_DURATION	2	Accelerator shutdown Interrupt 1 Duration; Interrupt Duration for MEMS while awake in Recovery Mode

	18	UINT 32	TRACK_WAKEUP_ODR	2	Accelerator wake up Output Data Rate for MEMS during sleep in Recovery Mode
	19	UINT 32	TRACK_WAKEUP_SCALE	0	Accelerator wake up Full Scale for MEMS during sleep in Recovery Mode
	20	UINT 32	TRACK_WAKEUP_THRESHOLD	3	Accelerator wake up Interrupt 1 Threshold; Upper Threshold for MEMS vibration waking from sleep while in Recovery Mode
	21	UINT 32	TRACK_WAKEUP_DURATION	2	Accelerator wake up Interrupt 1 Duration; Interrupt Duration for MEMS during sleep in Recovery Mode
UPDATE_SETTING	22	UINT 32	UPDATE_MAX_TIMEOUT	30000	Time set for device to update settings before timing out; (Default: 30 seconds)
	23	UINT 32	UPDATE_RETRY_INTERVAL	5000	Time set for device to wait between retries of updating settings (Default: 5 seconds)
	7	UINT 32	UPDATE_SETTING_INTERVAL	604800	The time set in between settings updates for device; (Default: 1 week)
Location Server	24	STRING	NETWORK_REPORT_SERVER	"172.30.166.208"	Address for network report server; (Default: Test server)
	25	UINT 32	NETWORK_REPORT_PORT	50010	Network report port
DMAN SERVER	26	STRING	DMAN_IP_ADDR	"172.30.139.127"	DMAN IP Address
	27	UINT 32	DMAN_PORT	51010	DMAN Port
APN	28	STRING	APN	"positioningunivesal.com.attz"	Access Point Name
UUID	29	UINT 32	UUID0	0x010203	UUID0
	30	UINT 32	UUID1	0x04050607	UUID1
	31	UINT 32	UUID2	0x08090a0b	UUID2
	32	UINT 32	UUID3	0x0c0d0e0f	UUID3
	33	UINT 32	DISCOVERY_COUNT_MAX	500	The maximum number of heartbeat or disconnect reports before an immediate

					transition to heartbeat report state is made without getting gps fix first
	34	UINT 32	FAST_HEARTBEAT_INTERVAL	14400	The new time interval in between heartbeats if the Discovery Count Max has been reached; (Default: 4 hours)
Debug	35	UINT 32	NUMBER_GPS_MSGS	24	Maximum number of GPS locations allowed to be written to flash memory
Battery	36	UINT 32	BATTERY_VOLTAGE_GOAL	3400	Target voltage level for algorithm to start running
	37	UINT 32	BATTERY_VOLTAGE_HYSTERESIS	100	If target voltage is Target minus Hysteresis, then de-passivation algorithm is started
	38	UINT 32	BATTERY_MAJOR_CYCLE_SLEEP	61200	
	39	UINT 32	BATTERY_MAJOR_CYCLE_SLEEPX	10	
	40	UINT 32	BATTERY_CYCLE_LENGTH	20000	
	41	UINT 32	BATTERY_CYCLE_REST_LENGTH	90000	
	42	UINT 32	BATTERY_MAX_REFRESH_CYCLES	2	
	43	UINT 32	BATTERY_MAX_TOTAL_CYCLES	75	
Dealership Mode	44	UINT 32	DEALERSHIP_MOVE_INTERVAL	300	The amount of time the device will sleep while in Dealership Mode, and the device is moving; (Default: 5 minutes)
	45	UINT 32	DEALERSHIP_STOP_INTERVAL	61200	The amount of time the device will sleep while in Dealership Mode, and the device is NOT moving, unless woken by vibration; (Default: 17 hours)
	46	UINT 32	DEALERSHIP_SHUTDOWN_ODR	2	Accelerator shutdown Output Data Rate for MEMS while awake in Dealership Mode
	47	UINT 32	DEALERSHIP_SHUTDOWN_THRESHOLD	3	Accelerator shutdown Interrupt 1 Threshold; Lower Threshold for MEMS vibration going into sleep while awake in Dealership Mode

	48	UINT 32	DEALERSHIP_SHUTDOWN_SCALE	0	Accelerator shutdown Full Scale for MEMS while awake in Dealership Mode
	49	UINT 32	DEALERSHIP_SHUTDOWN_DURATION	2	Accelerator shutdown Interrupt 1 Duration; Interrupt Duration for MEMS while awake in Dealership Mode
	50	UINT 32	DEALERSHIP_WAKEUP_ODR	2	Accelerator wake up Output Data Rate for MEMS during sleep in Dealership Mode
	51	UINT 32	DEALERSHIP_WAKEUP_SCALE	0	Accelerator wake up Full Scale for MEMS during sleep in Dealership Mode
	52	UINT 32	DEALERSHIP_WAKEUP_THRESHOLD	3	Accelerator wake up Interrupt 1 Threshold; Upper Threshold for MEMS vibration waking from sleep while in Dealership Mode
	53	UINT 32	DEALERSHIP_WAKEUP_DURATION	2	Accelerator wake up Interrupt 1 Duration; Interrupt Duration for MEMS during sleep in Dealership Mode