

# CelloTrack Nano and MultiSense User Guide





V2.11 17-May-2016

### **CELLOTRACK NANO**

CelloTrack nano





# Cargo and light asset management

# CelloTrack Nano Delivers

### Real Time Cargo & Asset Visibility, Efficiency and Security

### • Visibility

Enables real-time awareness of cargo and asset location, condition, problems and delays using a portable gateway and short range **Wireless Sensor Network (WSN)**.

### • Efficiency

Ensures continuous recording, event-triggered logic and 'management by exceptions' through flexible programming of business rules to avoid supply chain mistakes, delays or damages and to lower insurance expenses.

#### Security

Prevents losses due to theft, loss and misplacement using proximity, tampering and location sensing throughout the entire transport chain.











# CelloTrack Nano™ Hub

### Innovative, Smart and Compact asset monitoring device:

- SiRFstarV inside: multi GNSS (GPS, Glonass) with AGPS support (at 2<sup>nd</sup> phase)
- Internal sensors: temperature, light, impact, movement, pressure, sound (microphone)
- Used as a **hub** for a Wireless Sensor Network via **BLE** interface
- 2G/3G communication to back-office application
- Advanced MMI: buzzer, status LEDs, multi-function buttons
- Low profile / compact and slick design (85x60x23mm, 94 gram)
- Dual Tampering detection
- Long life rechargeable Li-ion battery (up to 5 weeks of transport chain usage)
- Micro USB connector for recharging the battery
- OTA update for Firmware and configuration
- IP 56 (dust and water jets), UV and chemicals protected





# MultiSense Devices

### A game changer in remote cargo & asset monitoring applications:

- Small, low cost device with rich **embedded sensing capabilities**:
  - Temperature
  - Humidity
  - Movement
  - Free Fall
  - Impact
  - Light
  - Open/Close door/window
- BLE communication forms a cost effective Wireless Network with the Nano
- Long battery life for more than 1 year in common use case scenarios
- Easy battery replacement access (CR2450)
- Simple pairing with CelloTrack Nano
- On/Off Button
- LED indication for power on/off
- Small dimension (58.5 x 46 x 15mm, 26g including battery) and **IP 67** enclosure

While paired with CelloTrack Nano, MultiSense provides a wireless sensing capability to a remote location/facility where a wired interface is impractical. A Number of low cost MultiSense devices with Nano GW dramatically reduces system's TCO and improves monitoring efficiency





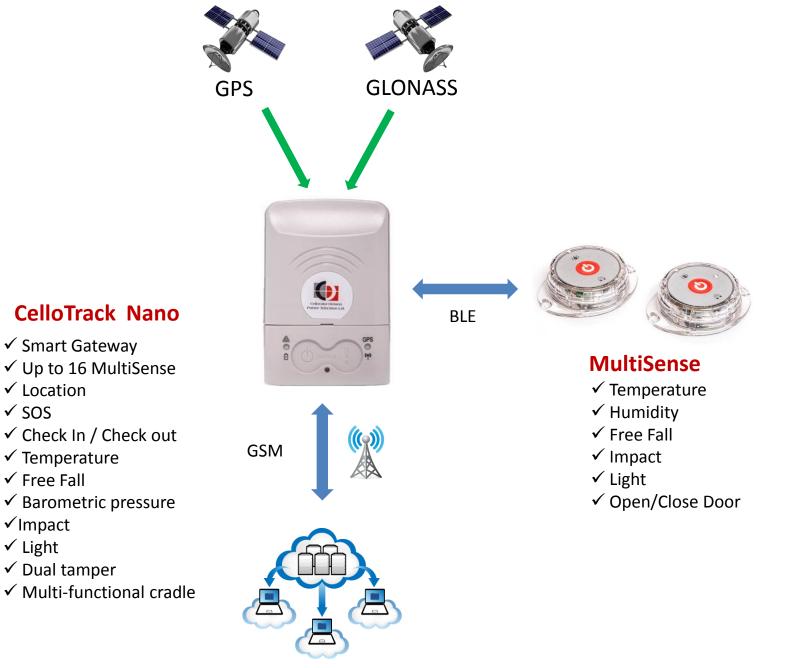


## Solution Overview

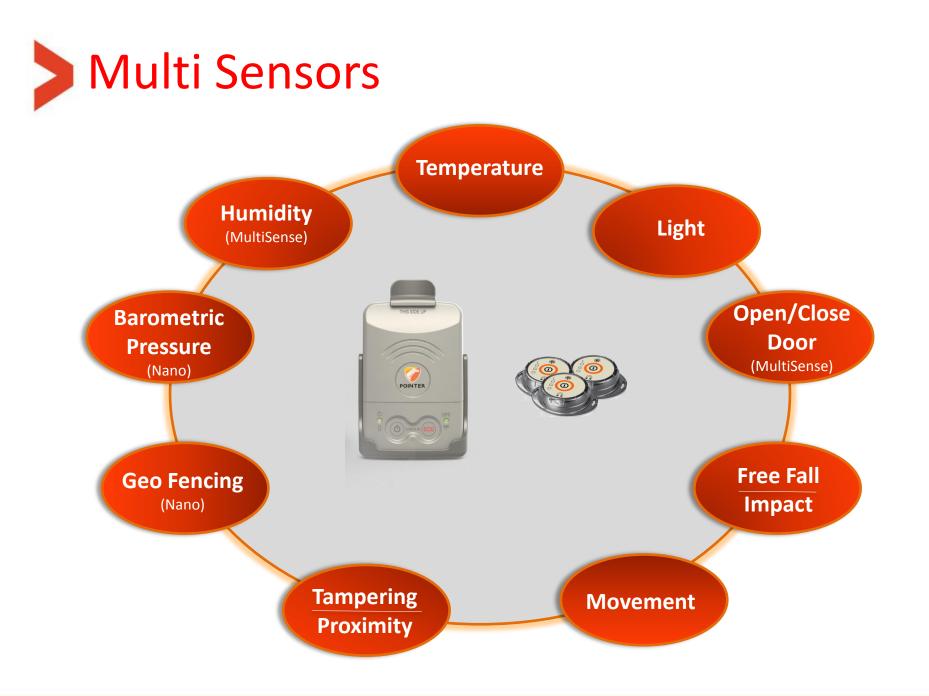








#### **Remote Management**









## System Operation





# CelloTrack nano terminology

- Active state = ON state = Unit is turned ON
- Inactive state = OFF state = Unit is turned OFF (the lowest power consumption)
- "Indications time window" = the time window that the LEDs and buzzer are active. After that time, they are shut down to save energy. This window opens after power up, reset and pressing one of the buttons. This size of this window is configurable.
- "Check-in" = A feature that when both buttons are pressed the unit sends it location with a check-in transmission reason.
- MultiSense pairing = When the operator wants the nano to be connected/linked/paired with a certain MultiSense unit, the nano and the MultiSense must first perform a pairing process, where the nano register the MultiSense MAC address in one place of its 16 cells table.
- BIST = Build-In Self-Test process, preformed after reset or power-up (battery connection).
- "Guest mode" = When this mode is enabled in the nano, it will communicate with any MultiSense in its range, forwarding its sensors data to the server.



Buttons overview table while the unit is in active state:



Pressing Duration	Left button	Right button	Both simultaneously
T < 200mS	Ignored		
T > 200mS	Very short feedback from buzzer, Open the indications time window		
1 Sec > T > 200mS	-	-	Check-in event
2 Sec > T > 1 Sec	-		Check-in event
5 Sec > T > 2 Sec		Panic event	Check-in event
T > 5 Sec	Power-off unit	Panic event	MultiSense pairing window open

# User interface - Buttons

### **Buttons:**

- Every press on a button when the unit is active will get a short audible beep feedback by the buzzer, if enabled at parameter "Button press Buzzer feedback".
- The Right button Panic button (marked "!"):
   Pressing for 2 seconds or more (even if not released), followed by engagement feedback (configurable by Buzzer enable bits), A panic event will be sent to the server. ACK by the server will generate another reception feedback configurable by "Panic was ACKed by server Buzzer feedback" bit.
- The Left button Power button (marked " O "):
   Short press (<5 seconds) will open the configurable size indication time window.</li>
- Also, this button is turning the unit ON and OFF:
  - Turning ON pressing 3 seconds while turned OFF. After that the system shall go to self test as described at <u>this slide</u>.
  - Turning OFF pressing 5 seconds while turned on.
- At the end of that period, the turning ON/OFF take place even if the button is not released.







### Check in feature:

- Pressing simultaneously on both buttons for at least 1 second (and less than 5 seconds), followed by a 0.5 second buzzer beep every elapsed second if enabled at the PL, and/or LEDs feedback (configurable at the PL), and shall transmit the current location once.
- It is also related to set the baseline reference accelerometer position of the man down feature detailed in the programming manual.

### MultiSense pairing feature:

 Pressing simultaneously on both buttons for more than 5 second will initiate the MultiSense in-field pairing process.





### Left LED – Battery and deviations:

- marked "
   marked "
   and "
   gives indication on the power/battery and deviations (as explained in next slide).
  - deviations (as explained in next slide). When unit is turned ON, or a short press on left button (shorter than 5 seconds), or following reset command, all the following LED indications are restarted according to "nano indications time window".
- Battery status: When unit is turned ON, short blink of 100mS every X seconds to show battery status according to the following legend:

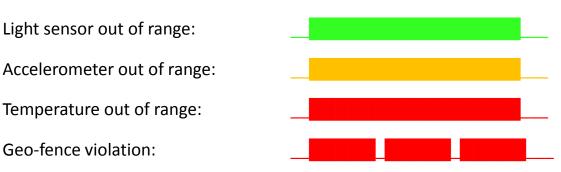






### Out of range indications on Left LED:

- When unit is turned ON, or a short press (shorter than 5 seconds) on left button is pressed, only the most severe indication from the following list is displayed once if that violation/deviation still exists.
- When any sensor creates an out-of-range (alert) event, and if enabled by a parameter in the PL, the left LED will signal a 3 seconds long continuous (once) or non-continuous pulse according to the following color scheme:



- "Light sensor out of range" means: light level of the local sensor crossed the "open/close package threshold" event.
- "Accelerometer out of range" means: orientation change event only.
- "Temperature out of range" means: local temperature sensor is either above the upper TH or below the lower TH.
- "Geo-fence violation" means: all the possible violation kinds supported and defined in legacy.





### Charging indications on Left LED:

 When micro-USB connector is plugged-in and charging is in fact in progress, whether from charger (AC wall adaptor) or PC, the left LED will act as described in the table below:



	Unit mode:	OFF (inactive)	ON (active)
During actual charging		Constantly orange	Constantly orange
After charge completion	Inside the "Indications time window"	Constantly green	Regular LEDs indications
	After (outside) the "Indications time window"		Constantly green
Battery Fault		Constantly red	Constantly red

- These indications have the highest priority and they override all other indications on this LED



#### Right LED – Cellular/GPS status:

- marked "**GPS**" and  $((\bullet))$ ".
- Two time slots of 5 seconds long each. The first one is for indications from cellular modem in green and the second one is for GNSS module indications in orange.
- Each pulse is 500mS ON and 500mS OFF.
- Cellular modem indications:

Celocator Division Delete Telocation Ltd.

HSDPA/HSUPA (3G) communication:	
GPRS/EDGE communication:	
Registered (GSM-2G):	
Not registered (no activated network found):	
GNSS module indications:	
Tracking good (Fix "Tight"):	
Tracking poor (Fix "Plain"):	
Acquisition (from power-up to "Plain" or "Tight") :	
No satellites at all ("no fix" after fix), only at the first operation and cannot be reached if using A-GPS:	
For example the light for a GPRS communication and good tracking will look like that:	
←5Sec→	

- All these indications are displayed only for the "nano indications time window" time. After that they are cleared and not displayed.



#### **Buzzer types:**

Buttons feedback beep = 20mS ON. \_\_\_\_\_ Short beep = 200mS ON. \_\_\_\_\_ Dual short beeps = 200mS ON, 200mS OFF, 200mS ON. \_\_\_\_\_ Dual long beeps = 1 Sec ON, 200mS OFF, 1 Sec ON. \_\_\_\_\_ Long beep = 2 Sec.

#### **Buzzer logic:**

- Upon power-up (turning ON) or system reset from any reason, short beep.
- After a successful BIST (Build-In Self-Test) process, dual short beeps.

If enabled in PL:

- Every valid pressing on buttons, will sound the "Buttons feedback beep" (20mS).
- Panic /Check-in event activation operates the beeps as explained in the programming manual.
- After Panic (special distress) event got acknowledged by the server, long beep.
- When any active sensors go out of the defined limits (all meanings of the "out-of-range" are explained in the programming manual), plus geo-fences (all legacy violation related to geo-fences are relevant here too), the unit shall sound short beeps every PL configurable time if the "Indications time window" is open/active.
- Short beep upon any power-up packet received from a paired/preregistered MultiSense.

See SR-RF pairing (and un-pairing) process related beeps at this slide.

### Indications after power up (Build-In Self-Test)

- The unit shall perform a Build-In Self-Test (BIST) upon any of the following cases:
  - 1. When battery is connected, while system was active before disconnection.
  - 2. After turning ON (moving unit from inactive to active mode, at the end of the 3 second press duration).
  - **3**. Upon receiving a reset command.
- The Build-In Self-Test (BIST) shall include GNSS module, Cellular modem basic (local) communication + SIM exists and battery.
- The indications looks like that for the first 5÷10 seconds only, on the right LED:

Turning ON press feedback from the buzzer:	
If all tested component are OK:	
l	
and on the buzzer:	
GNSS module failure (Basic communication):	
Cellular modem failure (Basic communication + SIM card valid):	
Battery failure:	



- The priority of failures is in descending order, battery is the highest. And only the highest priority is displayed.
- Timing is 500mS ON and 500mS OFF.
- All buttons are blocked/ignored during the entire BIT period.

### Indications for shutdown sequence

- When the user shut down the unit by pressing the power button and one of the configuration bits of "Transmission before shutdown" are enabled, the unit will push to the log the event message of Transmission-reason = 102 ("Activation mode change") with STR= 0 ("About to move to Inactive mode").
- The unit is If any form of immediate transmission method is selected by the user ("Active log event" and/or "Distress"), the unit shall also initiate communication with the server and transmit its entire log too, while blinking this LED (higher priority than all other indications) green at 200mS ON and 200mS OFF pace until completion and full shutdown.
- Buzzer shall beep in 200mS ON and 800mS OFF along the transmission.
- Anyway (even if not transmitting), a "Dual short beeps" shall be sound before actually going to inactive mode.

b is pressed for >5S: Shutdown Buzzer:



### Usage:

Micro-B female USB connector, through which the unit can perform the following functions:

- Charging the internal battery from the supplied AC-adaptor or PC USB port.
- USB port serial communication for PL update.
- USB port serial communication for FW upgrade.

### Charging:

The CelloTrack battery operates on a Li-Ion battery of 1000mAh nominal capacity.

The internal changer supports 2 level of charging speeds:

- The slow speed is used when the unit recognizes the source as "weak". It could be USB 1.0 PC port, weak AC-adaptors or weak car-adaptors.
- The charging current in this case is ~100mA so full charge time can sometimes be more than 10 hours.
- The faster speed is automatically chosen when the source is recognized to be able to supply enough current. Then the charging current in this case is ~330mA so full charge time will be less than 5 hours.



### Charging modes:

The unit has 2 modes of charging:

 FW controlled – the nano FW decide when to start and stop charging. It charges the battery to a certain hardcoded high-level charge point (e.g. 90%) and then let the battery be consumed to the level of an hardcoded low-level charge point (e.g. 75%) before another charge cycle is started. In this way, the battery oscillates between 90% and 75% forever and the left LED toggles between green and yellow forever.

To set this mode, set the parameter of "Charging Stop upon Battery Full detection" to "Stop charging".

This mode of operation is more suitable for constantly powered systems and it keeps the battery health better in the long run.

 HW controlled – the charger chip decides when the battery has reached full charge (100%) and then stops charging it. Indication on left LED turns then from orange to green.

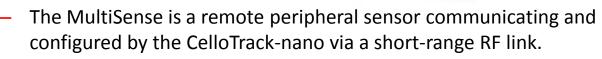
This operation is restarted every 5 hours.

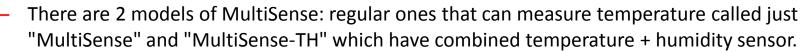
To set this mode, set the parameter of "Charging Stop upon Battery Full detection" to "Keep charging".

This mode is more suitable for systems that get charged from time to time, but the system is not powered constantly.



### Overview:





- The MultiSense unit has the following sensors on it:
  - 1. Temperature sensor
  - 2. Humidity sensor (only in MultiSense-TH model)
  - 3. Hall effect magnetic sensor
  - 4. Ambient Light Sensor (ALS)
  - 5. Accelerometer sensor
- The system supports up to 16 fully programmable MultiSense units.
- If "guest mode" is enabled in the parameter "Process ID tags not in the list", the nano unit will also connect with MultiSense units not in its list, read their sensors and pass the data (in raw format) to the server. Only listed MultiSense units also gets configuration block and their readings are fully processed by the nano.











### More information:

- The MultiSense is a configurable sleepy peripheral slave, which means it is configurable by the tools (via the nano) and it transmits according to the preconfigured policy.
- The nano, if enabled in parameter "Nano is master of several slave sensors enable" is always listening to RF links and intercepts MultiSense units.
- The RF range between the MultiSense and nano unit can reach more than 100m at open space (optimal conditions), and lower in various installations. All according to attenuation at 2.4GHz of the RF signal.
- If the MultiSense is not received by the nano for 5 x "Proximity & keep-alive transmission timer" it will report it as lost. (could be due to: Dead battery, shutdown, totally out-of-range or stolen).
- The battery of the MultiSense is the Lithium coin CR2450 (~600mAh) battery and its lifetime depends heavily on its configuration. Typically several months.
- MultiSense units can be intercepted by an updated cellular phone<sup>\*</sup> but data is encrypted so it cannot be understood.
- The CelloTrack-nano cannot interface with other sensors in the market.







### Transmission policy:

- All the MultiSense units related to a nano system has the same configuration of the following timers:
  - 1. Relaxed (R) parameter in PL: "Active sensors sampling relaxed timer". Used when the temperature and humidity are within their (configurable) limits.
  - 2. Violation(V) parameter in PL: "Active sensors sampling violating timer". Used when the temperature and humidity are out of their (configurable) limits.
  - **3**. Proximity(P) parameter in PL: "Proximity & keep-alive transmission timer". Used all the time <u>independently</u> from the previous ones.
- If "TX on violations only" mode is enabled (configurable per MultiSense), the R timer shall be used for determine sensors sampling rate only (without transmission), but the V (when violation occurs) and P shall be working normally.
- Besides that, there are few asynchronous events that will cause a single transmission:
  - 1. Pressing the button.
  - 2. Impact or free-fall event generated by the accelerometer (crossing a pre-configured threshold).
  - **3**. Sensing a change in the magnetic field (opening/closing of a door or window, that the permanent magnet is installed on).
  - From FW version 4V50 and up, also crossing the light threshold to either direction (darkness ←→ light).







### Precautions and warnings:

- The MultiSense should NOT be paired with more than 1 nano (in the same area), otherwise it will drop its chances for successful communication greatly.
- The "Guest mode" in the nano which is enabled by the "Process ID tags not in the list" parameter in the PL, should be used with great caution, because it then will connect with every MultiSense in its range, whether paired or not. This may prevent from other nano units to communicate with their paired units.
- The case is even worse if more than one nano with this "Guest mode" enabled are in the same area, since they will race and interfere each other.
- The MultiSense is intended to be attached to the tracked equipment and should not be worn on a human body or in the range of 20 cm from it.





### Marking:

- The magnet icon symbolizes the location of the magnet sensor. The permanent magnet should be installed against it with distance of body-to-body of 1-3cm, while the small triangle on the magnet points to the icon in the MultiSense.
- The eye icon symbolizes the light sensor direction, to which the source of light should be directed.



### Battery:

- Use only CR2450 size battery. Be careful not to install it at the wrong polarity as it could damage the unit.
- Choose the exact battery model and manufacturer of the battery according to the needed temperature range.
- To install a battery unscrew the upper half from the base half until the two triangles on the side are aligned and then pull it.





### Button and blue LED:

- When battery is inserted, the unit always goes to active mode and the blue LED lights for 3 seconds.
- When active, every short press (up to 1 second long) triggers sampling + transmission and the blue LED blinks 5 times.
- When active, a long press (>4 seconds) will turn the unit OFF (inactive mode), accompanied by 3 blue LED blinks.
- When the unit is off (inactive mode), a long press (>4 seconds) will turn the unit ON and the blue LED lights for 3 seconds (same as battery insertion above).



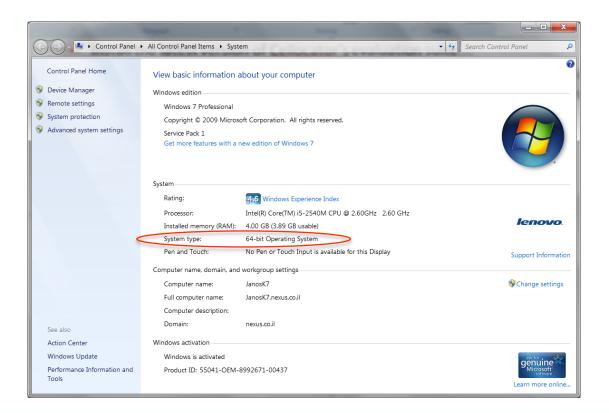
# Step by step guides



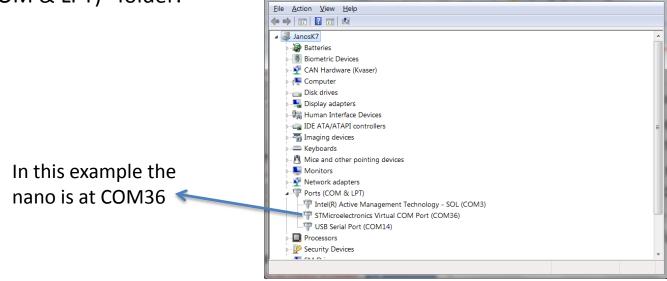


- The tools we provide for evaluation called "Evaluation Suite" and can be loaded from our internet site at <u>this address</u> (requires login with username+password).
- This set of tools include the following nano related tools:
  - The "Cellocator programmer" which is used to configure a single nano unit and its related MultiSense units. It also includes the nano editor screen.
  - The "Communication Center" which is used to get and interpreted / parse the messages sent by a nano unit via the cellular link and also to send some commands to the nano over the cellular link.
  - The "Serial CSF STK Flasher" which is used to perform local FW upgrades of the nano.
  - The "Communication Logger" which can be used to sniff on various serial communication links inside the nano board.

- Install the latest version of Cellocator's evaluation suite. Install it as an administrator.
- Be sure to select the 64-bit or 32-bit installer version according to your windows version. (Start button, or Windows+e then right click on computer -> properties will reveal your version number). See example:



- Select the 'Complete' installation type, and then next->next...
- Follow security instructions related to installation of the evaluation suite.
- The installation process will automatically install the "ST virtual COM port" windows driver if needed.
- After connecting the nano via the supplied micro-USB cable to the PC it will be recognized and windows will allocate it a new COM port.
- Windows will declare which COM port number has been allocated. Anyway, this port number can be found when opening the windows "Device manager" under "Ports (COM & LPT)" folder:

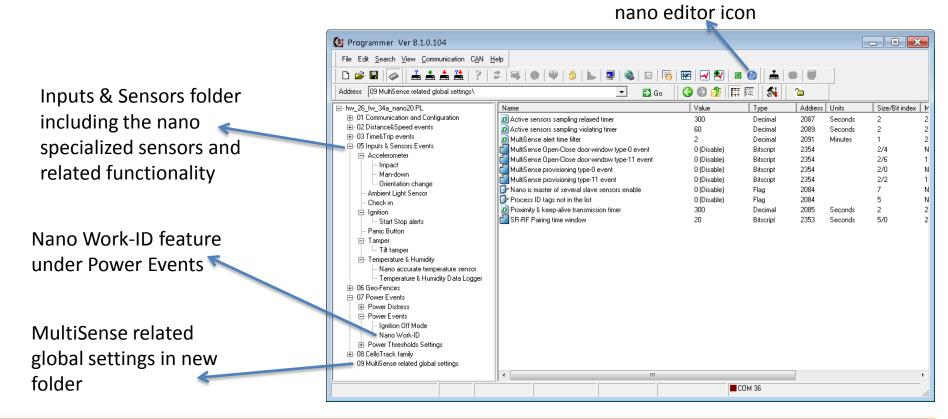


- Open Cellocator programmer utility. File open-> choose the latest nano PL file.
- For initial communication to begin, the nano COM port number should be set.
- Click on the "Configuration icon" (see below), select the "Communication" tab, and set the COM port number. Then choose Baud rate of 115200, and Unit type "Cello 4K". Close by pressing the OK button.
- The "Connection icon" (lock icon) should show closed-lock now and the connection indication dot at the bottom of the window should turn from red to green.

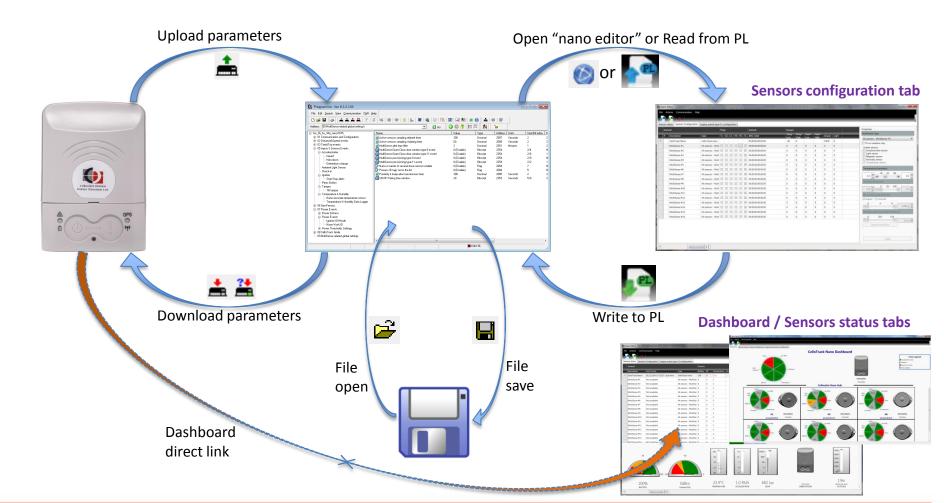
Communication Dal	las   Memory   H/S Version	
Communication por Baud Rate	t 36	Cancel
Unit type: Cello	• (4k) 💽	
🔲 Use Handshak	e	

🐏 Programmer Ver 8.1.0.104		
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Address 09 MultiSense related global settings\	🔽 🔁 Go 🛛 🚱 🌮 🗍	I 📖   🕵   海
hw_26_fw_34a_nano20.PL     1	Name       Value         Active sensors sampling relaxed timer       300         Active sensors sampling violating timer       60         MultiSense Open-Close door-window type-0 event       0 (Disable)         MultiSense Open-Close door-window type-11 event       0 (Disable)         MultiSense provisioning type-0 event       0 (Disable)         MultiSense provisioning type-11 event       0 (Disable)         MultiSense provisioning type-11 event       0 (Disable)         Process ID tags not in the list       0 (Disable)         Proximity & keep-alive transmission timer       300         SR-RF Pairing time window       20         Configure         iccon         Configure         indication	Type         A ddress         Units         Size/Bit index         M           Decimal         2007         Seconds         2         2           Definal         2009         Seconds         2         2           Decimal         2091         Minutes         1         2           Biscript         2354         2/6         1           Intscript         2354         2/2         1           Flag         2084         7         N           Plag         2084         5         N           Decimal         2085         Seconds         2         2           Bitscript         2354         2/2         1         Flag         2084         7         N           Plag         2084         5         N         2         2         2         2           Bitscript         2353         Seconds         2         2         2           Bitscript         2353         Seconds         5/0         2         2           Connection         icon         icon         icon         icon         icon         icon
09 MultiSense related global settings	· · · · · · · · · · · · · · · · · · ·	•
		СОМ 36

- The nano related parameters (on top of CelloTrack legacy parameters) resides in 2 areas. See the below screenshot.
- MultiSense units global settings is in separate folder (09). See below.
- All MultiSense units individual settings are under the "nano editor" screen. Press the "nano editor" icon to open it and then select the "Sensors configuration" tab.



 The concept of operation and parameters flow between the 4 entities of HW, programmer screen, storage and "nano editor" screen is as follows:

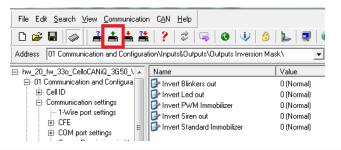


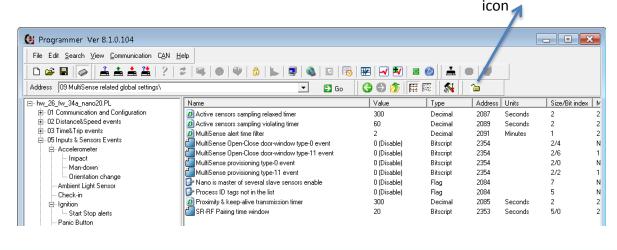
- If you want to pair a MultiSense to the nano, first verify that parameter "Nano is master of several slave sensors enable" is enabled.
- Go over the rest of the MultiSense parameters to fit your needs.
- If any of the above parameters are changed, it requires to reset the nano unit for the changes to take effect. If needed, press the green reset button.
- If reset takes place, the connection with nano is lost and should be restored manually after the reset sequence has completed (a beep is sound from the nano). Reconnection is performed by pressing the connection (lock) icon.

	Res	et button		Conr	nectio	on icon	
😢 Programmer Ver 8.1.0.104				- /			×
File Edit <u>S</u> earch <u>V</u> iew <u>C</u> ommunication CAN <u>H</u> e	lp l						
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⊕- 01 Communication and Configuration	Active sensors sampling relaxed timer	300	Decimal	2087	Seconds	2	2
⊕ 02 Distance&Speed events	Active sensors sampling violating timer	60	Decimal	2089	Seconds	2	2
⊞- 03 Time&Trip events	D MultiSense alert time filter	2	Decimal	2091	Minutes	1	2
□ 05 Inputs & Sensors Events	MultiSense Open-Close door-window type-0 event	0 (Disable)	Bitscript	2354		2/4	N
Accelerometer	MultiSense Open-Close door-window type-11 event	0 (Disable)	Bitscript	2354		2/6	1
Impact	MultiSense provisioning type-0 event	0 (Disable)	Bitscript	2354		2/0	N
Man-down Orientation change	MultiSense provisioning type-11 event	0 (Disable)	Bitscript	2354		2/2	1
Orientation change	🚱 Nano is master of several slave sensors enable	0 (Disable)	Flag	2084		7	N
- Check-in	Process ID tags not in the list	0 (Disable)	Flag	2084		5	N
	Proximity & keep-alive transmission timer	300	Decimal	2085	Seconds	2	2
- Start Stop alerts	SR-RF Pairing time window	20	Bitscript	2353	Seconds	5/0	2

- To enter the nano to Pairing window, it is recommended to open the lock by pressing the "Connection icon" to disconnect the communication.
- Then disconnect the nano from the micro-USB cable.
- Press both nano buttons until sequence of 4 beeps and then a double-beep is sound from its buzzer.
- The left LED will start blinking orange. This means the paring window is open for the duration configured in "SR-RF Pairing time window" parameter.
- If any unknown to the nano MultiSense will be powered on (pushing the button for 5 seconds while unit is in OFF state, or battery insertion) in the vicinity, during this window, it will be paired.
- If successfully paired, a long beep (2 seconds) will be sound from nano buzzer. Connection

After successful pairing, to view the newly paired MultiSense in the tool, you need to read the list from the Nano back to the PC by pressing the "Upload parameters" button. See below:





- Inside that pairing window, if any paired MultiSense (with this nano) is turned OFF, by pressing its button (when in ON mode) for >5 seconds, it will be "Unpaired".
- The pairing window is prolonged after each successful pairing or un-pairing operation.
- When the window closed, the unit will either blink its right LED red shortly if nothing has been paired or unpaired, or reset itself if some MultiSense units have been paired or unpaired.
- After the reset, reconnect the USB cable and push the connection icon (the lock).
- Perform "Upload parameters" (
   ) to update the programmer on the newly paired MultiSense units.
- Open the nano editor (
   ) and you can see in both "Sensors status" and "Sensors configuration" tabs the new MultiSense status and configuration respectively.
- Select the desired line to focus on by clicking on it.

The first tab is a dashboard showing an overview status, in real-time, of the system components.

> The second tab shows the current status, in realtime, of selected device, nano or one of the MultiSense units.

SUIS	status Sensors Configuration	Legacy events type	2-11 c	onfig	jurati	n									
Ge	neral		Flag	<b>j</b> s				General	Ranges						Properties
	Description	Туре	Tx	AS	LS	HE F	IS TS	MAC Addr	Temp	Temp High	Humi Low	Humi High	Impact	Light	MultiSense Type
	CelloTrack Nano	CelloTrack nano						00.00.00.00.00.00	-20	0	LUM	Tilgit	2.016	8	All sensors - MultiSense-TH
	MultiSense #1	All sensors - Mult						00.00.00.00.00.00	0	0	0	0	0	0	TX on violation only Enable sensors
	MultiSense #2	All sensors - Mult		=			3 12	00.00.00.00.00.00	0	0	0	0	0	0	Accelerometer sensor
	MultiSense #3	All sensors - Mult						00.00.00.00.00.00	0	0	0	0	0	0	Light sensor     Magnetic sensor
	MultiSense #4	All sensors - Mult	1	=				00.00.00.00.00.00	0	0	0	0	0	0	Humidity sensor
	MultiSense #5	All sensors - Mult					1	00.00.00.00.00	0	0	0	0	0	0	Temperature sensor
	MultiSense #6	All sensors - Mult	1	111				00.00.00.00.00.00	0	0	0	0	0	0	Temperature thersholds
	MultiSense #7	All sensors - Mult		177				00.00.00.00.00.00	0	0	0	0	0	0	
	MultiSense #8	All sensors - Mult						00.00.00.00.00.00	0	0	0	0	0	0	
	MultiSense #9	All sensors - Mult	100	103	63		1	00.00.00.00.00.00	0	0	0	0	0	0	Humidity thresholds
	MultiSense #10	All sensors - Mult						00.00.00.00.000	0	0	0	0	0	0	
	MultiSense #11	All sensors - Mult						00.00.00.00.00	0	0	0	0	0	0	Movement event threshold
	MultiSense #12	All sensors - Mult	100		=			00.00.00.00.00	0	0	0	0	0	0	Impact O Free Fall
	MultiSense #13	All sensors - Mult		=			1 12	00.00.00.00.00	0	0	0	0	0	0	0 4 8
	MultiSense #14	All sensors - Mult						00.00.00.00.00	0	0	0	0	0	0	e 0.000 g
	MultiSense #15	All sensors - Mult	1					00.00.00.00.00	0	0	0	0	0	0	Package open/closed light threshold
	MultiSense #16	All sensors - Mult					1	00.00.00.00.00	0	0	0	0	0	0	0 255 510



The third tab is a configuration screen where some of the Nano parameters and the individual settings of each MultiSense unit can be changed. (also support multiple edits in single operation)

🚺 Nano Editor

File Actions Communication Help

The 4<sup>th</sup> tab is a configuration screen for setting each legacy (type-0) event, whether to be sent also in an "Encapsulated" way over type-11 message or not.

ors status Sensors Configuration Legacy events type	-11 configuration		
Description T	Base Address T	Bit Offset 🛛 🝸	Туре Т
TR #4: Emergency (Distress) mode by command	541	0	Disable
TR #6: Engine Activated (Security Event)	541	4	Disable
TR #8: Location change detected on Ignition is Off	542	0	Disable
TR #31: Reply to Command	547	6	Disable
TR #32: IP changed / connection up	548	0	Disable
TR #33: GPS Navigation Start	548	2	Disable
TR #34: Over-speed Start	548	4	Disable
TR #35: Idle Speed Start	548	6	Disable
TR #36: Distance	549	0	Disable
TR #38: GPS Factory Reset (Automatic only)	549	4	Disable
TR #41: GPS Navigation End	550	2	Disable
TR #42: End of Over-speed	550	4	Disable
TR #43: End of Idle Speed	550	6	Disable
TR #44: Timed Event	551	0	Disable
TR #53: Driving Stop Event	553	2	Disable
TR #69: Driving Start Event	557	2	Disable
TR #81: Main Power Low Level	560	2	Disable
TR #84: Halt (movement end) event	561	0	Disable
TR #85: Go (movement start) event	561	2	Disable
TR #87: Main Power Connected (be unconditionally log	561	6	Disable
TR #88: Main Power High Level	562	0	Disable
TR #89: Backup Battery Connected, In Cellotrack3G Pow	562	2	Disable
TR #99: Harsh Braking Sensor Triggered	564	6	Disable
TR #100: Sudden Course Change Sensor Triggered	565	0	Disable
TR #101: Harsh Acceleration Sensor Triggered	565	2	Disable
TR #158: Tamper switch Active Event	579	4	Disable
TR #159: Tamper switch Inactive Event	579	6	Disable
TR #190: No Modem Zone entry	587	4	Disable
TR #191: Geo-HOT Spot violation	587	6	Disable
TR #200: Modem's Auto Hardware Reset (AHR)	590	0	Disable
TR #202: Wake Up event	590	4	Disable
TR #203: Pre-Hibernation event	590	6	Disable
TR #204: Vector (course) change	591	0	Disable

## Step by step nano FW upgrade

- To update the FW version of the CelloTrack nano device, you will need the tool called "Serial CSF STK Flasher" (separate installation from the evaluation tools).
- Close all application that might open the nano COM port, like Cellocator programmer etc.
- − Open the tool, direct it to the nano's COM port number and press the lightning icon:
- If communication is OK, the "Com Port" light will change from red to green.
- Select the desired CSF file by pressing on The \_\_\_\_\_ button.
- Push the "Automatic Burn" button.
- Follow the on screen instructions to the completion of the process.
- The whole process takes around 7 minutes.
- At completion, the COM port is reconnected by the tool.
- Just close the application or disconnect and connect to another unit.

36 🔹 🐔	P:\GuyT\Nano releases\F0001_CTnanoHW026_BGS2·W_STM32L151RDT6_S1024_34a_CTnz
aud Rate	
115200 👻	Log Platform Manifest
utomatic Custom	18:42:41: Chunk 900 of 903 18:42:41: Received ACK 18:42:41: Received ACK 18:42:41: Received ACK 18:42:41: Received ACK 18:42:41: Chunk 902 of 903
📤 Automatic Burn	18:42:41: Received ACK 18:42:41: Chunk 903 of 903 18:42:41: Received ACK 18:42:41: End Chunk Upload
Abort Process	18:42:41: Process Completion 18:42:41: Please wait several minutes until acknowledgement receiving 18:42:43: Received NACK (Reason 241 - Busy, cannot perform the action at the moment.) 18:42:43: Completion ACK 18:42:43: USB Device, Comport closed! 18:42:46: The Com Port is Closed
hunk Upload hunk Position Size	I 18:42:46: Automatic verify process started 18:42:46: Received ACK 18:48:51: USB Device, Comport opened. 18:48:51: The Com Port is opened
240 🔏	18:48:51: Verify FW version 18:48:51: Received ACK 18:48:51: Received ACK 18:48:51: Current: FirmwarelD 1 Firmware Ver 34a 18:48:51: CSF FW: 1, SW: 34A
onfiguration	18:48:51: Unit and CSF match!
leader M2C	18(4):01: Verity process ended.
	Progress[100%]



### Overview about Type-11 integration





## Messaging concept in CelloTrack-nano

- All functionality of the CelloTrack nano events uses Type-0 legacy events and/or the advanced Type-11 messages, all according to the configuration bits per feature.
- Each nano specialized feature will have these 4 bits of configuration:

Bit 3	Bit 2	Bit 1	Bit 0
Туре	- 11	Туре	e - 0
Logged	"Active log event"	Logged	Distress

 Type-0 could also be "Active log event" or not, depending at the global (one per system) bit of "Enable Active Events" (at address 0000.0 of the PL).

# Messaging concept in CelloTrack-nano

This will enable the user to select between the following options:

Type-11 options: 0= Disable 1= "Active Log Event" 2= Logged

#### Type-0 options:

- 0= Disable (the global "Active log event" bit will be ignored)
- 1= Distress (the global "Active log event" bit will be ignored)
- 2= Logged

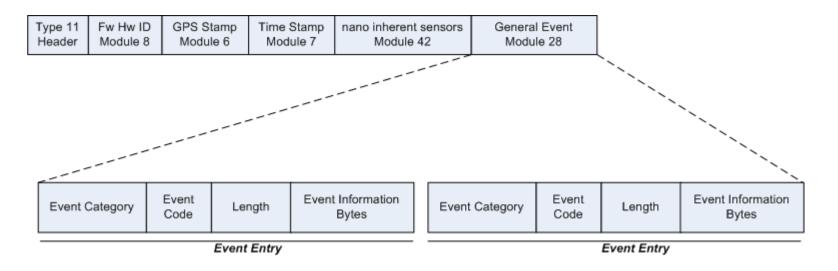
3= Logged & Distress (not a recommended setting if the "Active log event" bit is set, it will cause sending 2 messages per the event).

The log memory supports both types simultaneously, as a continuous and united space.

<u>Note:</u> When "Active log event" is used, the unit turn on the GNSS and wait for a fix (up to 90 seconds timeout), if fixed is achieved, both the GPS stamp and time stamps of the event are overridden.

# Type-11 message structures

 The "General Event Message is a Type 11 message designed to reflect system events and notifications towards the server. The message is built as follows:



- Modules 8, 6, 7 and 42 are mandatory fields, and always come first in this exact order, everything else (module 28 is just an example here) shall come after that.
- For more details go to the "Cellocator Wireless Communication Protocol" document on section 5.





### Parsing example





### Example of an Type-0 message parsing

This is an example of type-0 message with the CelloTracknano internal sensors data fields, passed over the "Multipurpose bytes (33-38)" aka Dallas bytes.

ه	Communication Cer	nter (Cell	oTrack)	Ver 3.2.0.9					
Eile	<u>Communication</u>	Actions	<u>H</u> elp						
Traf	fic Filter							Message from	Ext. Memory
l m	Filter					Filter A	ctive	Message Numerator	90
	In the second secon				Ĩ	🗸 Ar		Hardware Version	26
					(	<b>V</b> A	ihià	Hardware type Modern Type	CelloTrack nano 20 Cinterion BGS2-W.Rel2 (Telit SE868-V2 GNSS)
Dir	Date Time	Unit	Channel	Application	Numerator	Туре	C.4 A	Firmware Version	34
							Jui	Firmware subversion	a
1	17/12/2014 12:47:17	883140	GPRS	Fleet	46	0		GPS Communication Unit Status (Mode)	Available Standby Engine Off
÷	17/12/2014 12:47:17	883140	GPRS	Fleet	47	0		Transmission Reason	COM-Location glancing
1	17/12/2014 12:47:17	883140	GPRS	Fleet	50	0		Transmission Reason ID	252
ŧ	17/12/2014 12:47:18	883140	GPRS	Fleet	51	0		Transmission Reason Specific Data	Plain COM-Location Glancing
Ŧ	17/12/2014 12:47:20	883140	GPRS	Fleet	52	0		Transmission Reason Specific ID Unit Odometer	0
-	17/12/2014 12:47:20	883140	GPRS	Fleet	53	0		Last GPS fix	Day 18 Time 6:36
÷.	17/12/2014 12:47:20	883140	GPRS	Fleet	54	0		Network	HOME GSM
÷.	17/12/2014 12:47:20	883140	GPRS	Fleet	55 59	0		Invalid Time Unit Hibernation	Correct Time Yes
Ŧ	17/12/2014 12:47:20	883140	GPRS	Fleet	56	0		Index of the violated point	0
1	17/12/2014 12:47:20	883140	GPRS	Fleet	57	0		Direction (hot spot)	Exit hot spot
Ŧ	17/12/2014 12:47:20	883140	GPRS	Fleet	58 58	0		PLMN	42502
Ŧ	17/12/2014 12:47:20	883140	GPRS	Fleet	59	0		Inputs	00000011111000001
ŧ	17/12/2014 12:47:20	883140	GPRS	Fleet	60 61	0		All Inputs Movement Sensor	000001111000001 Not moving
<b>†</b>	17/12/2014 12:47:21	883140	GPRS	Fleet	61 62	0		Tamper switch	High
÷.	17/12/2014 12:47:22	883140	GPRS	Fleet	62 62	0		Button_1 status	Not pressed
1	17/12/2014 12:48:33	883140	GPRS	Fleet	63	0	_	Button_2 status USB power	Not pressed connected
-	17/12/2014 13:44:12	883140	GPRS	Fleet	64	0		Package state	Package is open
1	17/12/2014 13:44:13	883140	GPRS	Fleet	65	0		- Outputs	
Ŧ	17/12/2014 13:45:13	883140	GPRS	Fleet	66 67	0		All Outputs	0000011101001000
-	17/12/2014 14:39:30	883140	GPRS	Fleet	67 62	0 N		GPS Power Status	Inactive Not Charging
÷.	17/12/2014 15:33:39	883140	GPRS	Fleet	68	0		Charger status	Not Charging
÷.	17/12/2014 16:28:22	883140	GPRS GPRS	Fleet	69 70	0		Analog Inputs Main Power Level	4.32
-	17/12/2014 17:23:06	883140		Fleet	70 71	0		Analog Inputs Nano	4.32
-	17/12/2014 18:18:03	883140	GPRS GPRS	11001	72	0		USB Input Voltage	5.20 V
Ì	17/12/2014 19:10:32	883140		Fleet		0		Battery Voltage	4.00 V
-	17/12/2014 19:11:34	883140	GPRS	Fleet	73	-		NTC Temperature	24.95 °C
3	17/12/2014 20:06:34	883140 883140	GPRS GPRS	Fleet Fleet	74 75	0 N		Temperature sensor (onboard)	24.00 °C
-	17/12/2014 21:01:38		GPRS	Fleet	75 76	0	Ξ	GPS Data	
	17/12/2014 21:56:37	883140	GPRS	Fleet	76 77	0		Location Status PMODE I	0000000
1	17/12/2014 22:51:32	883140	GPRS		78	0		PMODE II	0000000
1	17/12/2014 23:46:18	883140		Fleet	78 79			Satellite Count Used in Fix	9
1	18/12/2014 00:40:05 18/12/2014 00:41:02	883140 883140	GPRS GPRS	Fleet Fleet	79 80	0 0		Longitude	34*58'06.47'' E 32*06'29.37'' N
<b>7</b>			GPRS		81	0		Altitude	99.60 'M'
1	18/12/2014 01:35:52 18/12/2014 02:14:09	883140 883140	GPRS	Fleet Fleet	81	0		Speed	0.04 'KM/h'
1	18/12/2014 02:14:09	883140 883140	GPRS	Fleet	82 83	0		Course UTC Time	211.08 <sup>***</sup> <del>86.37:</del> 20
1	18/12/2014 03:08:36	883140 883140	GPRS	Fleet	83 84	0		UTC Date	18/12/2014
1	18/12/2014 04:03:38	883140 883140	GPRS	Fleet	84 85	0		CelloTrack nano data	
1	18/12/2014 05:53:43	883140 883140	GPRS	Fleet	85 86	0		Management byte	nano readings
1	18/12/2014 05:53:43	883140 883140	GPRS	Fleet	86 87	0		Acceleration on X axis	0.00 g
1	18/12/2014 06:46:50	883140	GPRS	Fleet	88	0		Acceleration on Y axis Acceleration on Z axis	0.00 g +0.75 a
1	18/12/2014 07:42:32	883140	GPRS	Fleet	89	0		Unit's Orientation	Orientation A
	10/12/2014 07.42.32	003140		riodi	55	•	1	Ambient light value	184.50 lux
•			III					Compass course Heading Air Pressure (meters above sea-level)	South-West 16 meters above sea-level
Sele	cted: 1 D	isplayed:	71	Total: 71				Air ressure (meters above searlevel)	TO INCICIO GLUVE SEGUEVEL
								Header: MCGP	
1			- 2				$\mathbf{v}$	CheckSum: EB(Pass)	
							_		
0	Unit ID: 883140	80	) Send Ru	SMS SkyW	ave Prog	ramming	J Saf	ety Forward Data Units List / Map F	Pet Status Reset Commands
				thentication Cod		rogramn	ning 🛛	Reflasher Reservation Slot	Charles Commanus
0	Multiple K Selec	ct units		d/Write Auth table		-			Custom Text Decode
	<u></u>		lifea	arwhite Authrable					

### Example of an Type-0 message parsing

4D43475000C4790D0008815A1A220400 A600FC01C103480706DDF49718000000 0000D1E2620DA49100000093A44A303 8A175703E82600000100000640E1425 06120CDE07EB

Are parsed as follows:

00: nano readings

00: X= 0g , Y=0g

D1: Z= signed (0xD) = (-3) = -3\*0.25g = -0.75g

E2 and 62: ADC= 0x2E2= 738 \*0.25 = 184.5 lux

0D: Altitude = 13\*32-400 = 16m

			•						
Byte no.	Desc	ription		Containing					
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	
33	nano: 0x00 0x01	-purpos = nano = nano = Multi	readin event	gs	nanage	ement	byte ir	0x00= nano readings	
34	Slow Accele +1.75 to "SI (LSB= +1.75	7÷4]: filtered eration 5g÷-2g INT4 fo = 0.25g 5g, = -0.2!	, limite and sh rmat". I, so 01	runk 11 =	Slow Accel +1.7 shrun form (LSB = +1	5g÷-2 nk to " at". = 0.25 .75g,	d Y n, limi	0111	
35	Slow1 Accele +1.75 to "SI (LSB= +1.75	7÷4]: filtered eration 5g÷-2g (NT4 fo = 0.25g 5g, = -0.2!	, limite and sh rmat". I, so 01	runk 11 =	Bit [3 If uni valid, readi 37.bi thist " <u>orie</u> " <u>orie</u> Bits [	8]: It has /releva ng (By Its4÷7 oit repi ntatio	'≠0) th resent <u>n A</u> "=0 <u>n B</u> "=1	npass nen ) or	
36	ADCr	raw rea	ding of	Ambie	nt Ligh	t in 12	2-bit (L	SB)	In nano 10 = 0
37	Bits [ Comp 0 = Iri 1 = N(0 2 = N(0 3 = Ea 4 = S(0 5 = S(0 6 = S(0 7 = W 8 = N(0	orth-Ea ast outh-Ea outh outh-W est orth-W	3 direct t readin ist ast est est	ng	ADC Amb 12-b	ient Lig	ading ght in B)		In nano 10 = 0
38	8= North-West Average of 2 last samples Pressure, translated to meters above sea-level, UINT8 format, where 400m <b>below</b> sea-level is =0 and the value is divided by 32, i.e. 200→6000m.								In nano 10 = 0
	divide	ed by 32	z, i.e. z	00-00	JUUIII.				

### Example of an Type-11 message parsing

This is an example of type-11 message with the mandatory modules and also module 28 for conveying the actual event.

~	Communication Cer	-		Ver 3.2.0.9					
_	<u>Communication</u>	Actions	<u>H</u> elp						
Traf	iic Filter								🔄 FW & HW ID Module
+	Filter						Filter Acti	ve	
							🗸 🗸 Apply		Firmware and Hardware ID FW Version: 34a , HW Version: 26 BAW Data 0
<b>n</b> :			~ .			-			CPS Stawn Modula
Dir	Date Time	Unit	Channel	Application	Numerator		Sub Types	^	HDOP 0
÷	17/12/2014 12:47:20	883140	GPRS	Fleet	52	0			GPS Mode-1 4
÷.	17/12/2014 12:47:20	883140	GPRS	Fleet	53	0			GPS Mode-2 2 Satellites Count Used in Fix 9
÷	17/12/2014 12:47:20	883140	GPRS	Fleet	54	0			Longitude 34°58'06.52'' E
÷	17/12/2014 12:47:20	883140	GPRS	Fleet	55	0			Latitude 32°06'28.30" N
1	17/12/2014 12:47:20	883140	GPRS	Fleet	56	0			Altitude 121.80 m Ground Speed 2.00 Km/h
÷.	17/12/2014 12:47:20	883140	GPRS	Fleet	57	0			Speed direction (true course) 0.00 *
-	17/12/2014 12:47:20	883140	GPRS	Fleet	58	0			RAW Data 0
÷	17/12/2014 12:47:20	883140	GPRS	Fleet	59	0			Time Stamp Module
ŧ	17/12/2014 12:47:20	883140 883140	GPRS GPRS	Fleet Fleet	60 61	0 0			Validity Valid Time Stamp 06:58:30 18/12/2014
1	17/12/2014 12:47:21 17/12/2014 12:47:22	883140 883140	GPRS	Fleet	62	0			RAW Data 0
1	17/12/2014 12:47:22	883140 883140	GPRS	Fleet	62 63	0			🝵 nano Self Sensors Readings
ŧ	17/12/2014 12:46:33	883140	GPRS	Fleet	63 64	0			X acceleration -0.03 g
1	17/12/2014 13:44:12	883140	GPRS	Fleet	65	0			Y acceleration 0.00 g
1	17/12/2014 13:44:13	883140	GPRS	Fleet	66	0			Z acceleration -0.97 g Ambient Light Value 52.0 lux
t	17/12/2014 14:39:30	883140	GPRS	Fleet	67	õ			Compass coarse Heading South-West
1	17/12/2014 15:33:39	883140	GPRS	Fleet	68	ñ			Air Pressure (meters above sea-level) 22 meters above sea-level Current Temperature 30.00 °C
	17/12/2014 16:28:22	883140	GPRS	Fleet	69	ñ			Current Temperature 30.00 °C Unit's Orientation Orientation A
•	17/12/2014 17:23:06	883140	GPRS	Fleet	70	Ő			Battery Level 96 %
1	17/12/2014 18:18:03	883140	GPRS	Fleet	71	0			Nano RSSI value -67.00 dBm
1	17/12/2014 19:10:32	883140	GPRS	Fleet	72	0			General Status Event
1	17/12/2014 19:11:34	883140	GPRS	Fleet	73	0			Event Category CelloTrack nano Event Code Check-in
	17/12/2014 20:06:34	883140	GPRS	Fleet	74	0			
1	17/12/2014 21:01:38	883140	GPRS	Fleet	75	0			
<b>1</b>	17/12/2014 21:56:37	883140	GPRS	Fleet	76	0			
1	17/12/2014 22:51:32	883140	GPRS	Fleet	77	0			
1	17/12/2014 23:46:18	883140	GPRS	Fleet	78	0			
1	18/12/2014 00:40:05	883140	GPRS	Fleet	79	0			
\$	18/12/2014 00:41:02	883140	GPRS	Fleet	80	0			
\$	18/12/2014 01:35:52	883140	GPRS	Fleet	81	0		Ξ	=
	18/12/2014 02:14:09	883140	GPRS	Fleet	82	0			
	18/12/2014 03:08:36	883140	GPRS	Fleet	83	0			
1	18/12/2014 04:03:38	883140	GPRS	Fleet	84	0			
	18/12/2014 04:58:39	883140	GPRS	Fleet	85	0			
•	18/12/2014 05:53:43	883140	GPRS	Fleet	86	0			
•	18/12/2014 06:46:50	883140	GPRS	Fleet	87	0			
•	18/12/2014 06:47:42	883140	GPRS	Fleet	88	0			
1	18/12/2014 07:42:32	883140 883140	GPRS GPRS	Fleet	89 90	0 0			
ŧ	18/12/2014 08:37:20	883140 883140	GPRS	Fleet	90 91	U 0			
1	18/12/2014 08:42:20 18/12/2014 08:42:21	883140 883140	GPRS	Fleet Fleet	91 92	U 0			
1	18/12/2014 08:42:21	883140 883140	GPRS	Fleet	32 2	0			
	18/12/2014 08:42.21	883140	GPRS	Fleet	0	11	8,6,7,42,28		
•	10/12/2014 00:50:55	000140	00000			~	0,0,1,42,20	Ŧ	× _
elec	cted: 1 D	isplayed:	76	Total: 76					
1				Ð				Ļ	Header: MCGP CheckSum: A6(Pass)
				_	Prov	u ammir	n C-t-t	г.	amund Data Haita Link / Mars D. (1)
۲	Unit ID: 883140		Send B	y 🗌 SMS 📃 SkyW	ave	yrammin			orward Data Units List / Map Pt 🕐 Status Reset Command
$\odot$	Multiple 🖄 Selec	et units	_	Ithentication Cod ad/Write Auth table	le P	-	ming 🔲 Rel	lasi	asher 🗏 Reservation Slot

### Example of an Type-11 message parsing

4D4347500BC4790D00088100004C000000000080600000122011A000613 00000402095244A30384155703942F000002000070700011E3A06120C0E 2A0F008EFF0C007BF0D0607C102C010160BD1C0A000101000B0004000000 00A6

Are parsed as follows:

Module 8 – HW and FW IDs.

Module 6 – GPS stamp.

Module 7 – GPS Time stamp

2A: Module 42

OF, 00: Length=15 bytes

8E, FF: (SINT16) X= -114 \* 250µg= -0.0285g

0C, 00: (SINT16) Y= 12 \* 250µg= 0.003g

7B, F0: (SINT16) Z= -3973 \* 250µg= -0.99325g

D0, 60: ADC= 0x0D0= 208 \*0.25 = 52 lux

7C, 10: Altitude = 0x107C→4220/10-400= +22m

2C, 01: Temperature= 0x12C/10 = 30°C

01: Infrastructure

60: Battery level= 96%

BD: Cellular RSSI= -67dBm

1C: Module 28
0A, 00: Length=1
01: Number of entries=1
01, 00: Event category= nano
0B, 00: Event Code= Check-in
04: Length of data=4 bytes
0000000: Reserved (4 bytes)



### Templates and expected battery life







In the PL file, there is a new feature that enables the user to quickly set a typical use case configuration, that can be later fine tuned if needed.

This is done by using ready made templates. Currently we have 7 of them and they can be selected by pressing the file  $\rightarrow$  Select Template from the main screen, or from the template icon in the Nano editor screen.

For example: Template #1 is intended for long shipments, with paired MultiSense units, with transmission every 15 minutes ("almost live tracking").

Under nominal conditions, with 4 paired MultiSense units, the expected battery life of the Nano is around 5.5 days.

Another example: Template #3 is a typical legacy use case of CelloTrack-T, using only type-0 messages, but with addition of MultiSense units.

Under nominal conditions, with 4 paired MultiSense units, the expected battery life of the Nano is around 40 days.



Template number:	#1	#2	#3	#4	#5	#6
Template name:	Long shipment with MS almost live- tracking	Long shipment without MS almost live- tracking	Typical CelloTrack-T users improved tracking	Long shipment with MS, offline tracking (15-25 C)	High value goods (3 <sup>rd</sup> party shipper)	Land shipment - cold chain 2-8C (food, Pharmaceutical, flowers, antiques)
Scenario:	Nano: Tx every 15 min, MS: Sample every 1 min	<b>Nano</b> : Tx every 15 min	Nano: Tx every 24 hours, MS: Sample every 1 min	Nano: Live tracking 8h per day, logging location every 5 min MS: Tx every 5 min	15 min	Nano: Tx every
	5.5 days	6 days	33 days 5 days 6 days		6 days	5 days
	16 months	NA	16 months	22 months	NA	12 months

- Where temperature wasn't mentioned, the battery performance is valid for +20°C
- The templates above and battery performances are based on calculated parameters (tens of parameters)

# **FCC Compliance Statement**

This device has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in residential installations. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio and television reception. However, there is no guarantee that interference will not occur in a particular installation. If this device does cause such interference, which can be verified by turning the device off and on, the user is encouraged to eliminate the interference by one or more of the following measures:

- Re-orient or re-locate the receiving antenna.
- Increase the distance between the device and the receiver.
- Connect the device to an outlet on a circuit different from the one that supplies power to the receiver.
- Consult the dealer or an experienced radio/TV technician.

**WARNING!** Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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

This device complies with Industry Canada license-exempt RSS standards. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation." Then put the French translation in the same box. (Le present appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisee aux deux conditions suivantes :(1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioelectrique subi, meme si le brouillage est susceptible d'en compromettre le fonctionnement.).

To comply with FCC Section 1.1310 for human exposure to radio frequency electromagnetic fields and IC requirements, implement the following instruction:

A distance of at least 20 cm. between the equipment and all persons should be maintained during the operation of the equipment.



Product name	P/N	HVIN	FVIN
CelloTrack Nano 20	GC9770001-000	А	34
CelloTrack Nano 20 3G	GC9771004-000	В	34
CelloTrack Nano 10	GC9770002-000	А	34
CelloTrack Nano 10 3G	GC9771003-000	В	34
MultiSense	715-50100	С	4
MultiSense-TH	715-50200	D	4



### > Thank You!



