

# Telit GNSS Bundle Solutions Application Note

80000NT11300A r1 – 2015-04-14



## APPLICABILITY TABLE

CELLULAR PRODUCT	GNSS PRODUCT
GC864-QUAD V2	JF2 ROM
GE864-QUAD V2	JF2 EEPROM
GE865-QUAD	JF2 Flash
GE866-QUAD	JN3 ROM
GL865-QUAD	JN3 EEPROM
GL865-DUAL	JN3 Flash
GL865-QUAD V3	SE880
GL865-DUAL V3	SL869
GL868-DUAL	SE868-V2
GL868-DUAL V3	
GE910-QUAD V3	
GE910-QUAD	
GE910-QUAD AUTO	
HE910-D	
HE910-EUD	
HE910-EUR	
HE910-NAD	
HE910-NAR	
UE910-EUD	
UE910-EUR	
UE910-NAD	
UE910-NAR	
UL865-EUD	
UL865-EUR	
UL865-NAR	
UL865-NAD	



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# 1. Introduction

## 1.1. Scope

Scope of this document is to provide customers with the necessary information on how to configure the Telit cellular module in order to manage a Telit GNSS module through the Telit AT commands.

## 1.2. Audience

This document is intended for customers who are developing applications with Bundle Solutions.

## 1.3. Contact Information, Support

For general contact, technical support, to report documentation errors and to order manuals, contact Telit Technical Support Center (TTSC) at:

[TS-EMEA@telit.com](mailto:TS-EMEA@telit.com)  
[TS-NORTHAMERICA@telit.com](mailto:TS-NORTHAMERICA@telit.com)  
[TS-LATINAMERICA@telit.com](mailto:TS-LATINAMERICA@telit.com)  
[TS-APAC@telit.com](mailto:TS-APAC@telit.com)

Alternatively, use:

<http://www.telit.com/en/products/technical-support-center/contact.php>

For detailed information about where you can buy the Telit modules or for recommendations on accessories and components visit:

<http://www.telit.com>

To register for product news and announcements or for product questions contact Telit Technical Support Center (TTSC).

Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.

Telit appreciates feedback from the users of our information.



## 1.4. Document Organization

This document contains the following chapters:

[“Chapter 1: “Introduction”](#) provides a scope for this document, target audience, contact and support information, and text conventions.

[“Chapter 2: “Overview”](#) gives an overview of the features of the product.

[“Chapter 3: “Software Bundle Configuration”](#) describes in details which are the properly AT commands for the bundle.

[“Chapter 4: “Patching ROM SiRFStar IV in a bundle solution”](#) provides the step required in order to patching though the Telit cellular module a ROM2.2 receiver.

[“Chapter 5: “AGPS for SiRFStar IV and SiRFStar V”](#) describes in details how to download and inject SGEE through Telit cellular module.

[“Chapter 6: “AGPS for SL869”](#) describes in details how to download and inject SEED file through Telit cellular module.

[“Chapter 7: “Bundling with 3G modules”](#) shows AT commands used in Telit 3G cellular module for bundling.

[“Chapter 8: “Document history”](#) shows the history of this document.

## 1.5. Text Conventions



**Danger – This information MUST be followed or catastrophic equipment failure or bodily injury may occur.**



***Caution or Warning – Alerts the user to important points about integrating the module, if these points are not followed, the module and end user equipment may fail or malfunction.***



**Tip or Information – Provides advice and suggestions that may be useful when integrating the module.**

All dates are in ISO 8601 format, i.e. YYYY-MM-DD.

## 1.6. Related Documents

- [1] Telit\_AT\_Commands\_Reference\_Guide
- [2] Telit\_Jupiter\_Host\_NVM\_Storage\_Application\_Note





- [3] Telit\_EVK2\_User\_Guide
- [4] Telit\_SiRF\_InstantFix\_Application\_Note
- [5] Telit\_SL869\_Server\_AGPS\_Application\_Note
- [6] Telit\_SiRF\_StarIV\_ROM\_Patching\_Application\_Note



## 2. Overview

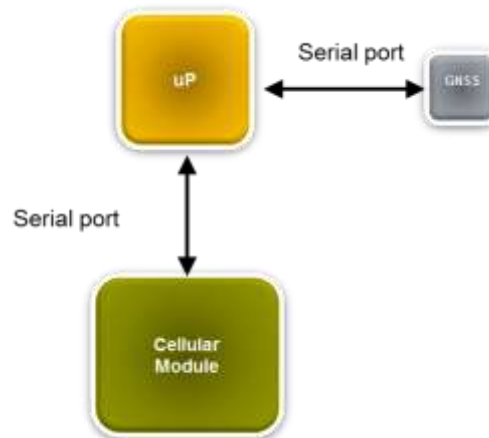
With bundle application is intended an application that contains different layers, apps or modules that act and exchange data and/or resources in order to execute a defined task. Telit Bundle implementation provides customers a straightforward solution to bundle the Telit GNSS and Cellular technologies and manage both of them through a single module, with a single communication port and a single communication protocol.

### 2.1. Why Bundling?

There are different ways to implement an application that uses either Cellular than GNSS modules:

- Stand-alone solution approach,
- bundle solution
- a mix of the two approaches.

In stand-alone approach, the application microprocessor handles both cellular and GNSS modules as separated entities like in the figure below:



Cellular / GNSS application with standard implementation

This implementation has pros and cons. Some pros are for instance:

- Cellular and GNSS modules can be managed fully independently by microprocessor
- Achievable battery life is generally well optimized since the cellular and /or GNSS can be switched on/off independently by the application microprocessor.

On the other side, some cons are for instance that the application processor:

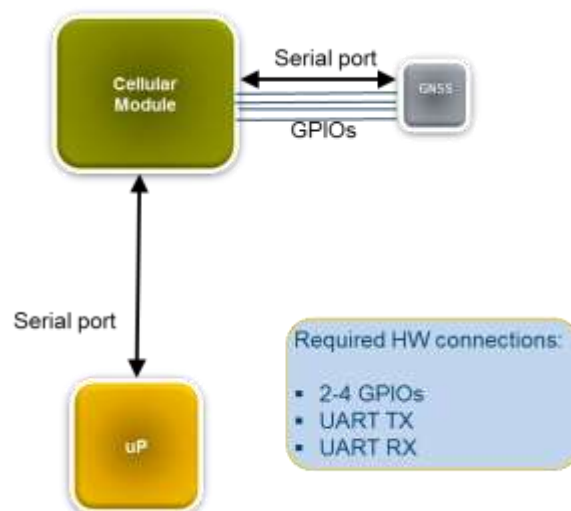
- uses two different UARTs (one for GNSS and the other for cellular)



- manages two different protocols (AT commands for cellular, NMEA or binary for GNSS)
- need to embed the Assisted GPS downloader(if A-GPS is requested) into the application microprocessor (to download the A-GPS file from Telit AGPS server)
- manage the upload of the AGPS file into the GNSS module when required.
- in addition, and only for ROM-based GNSS devices it could be also required to:
  - embed ROM SW patcher in the application microprocessor (SW patch could contain general improvements or customization parameters)
  - reserve a storage area of microprocessor's memory to store the SW patch for the GNSS ROM device (if existing)
  - reserve a storage area of microprocessor's memory to store the A-GPS files computed in the GNSS module (Telit GNSS modules are able to create a prediction of ephemeris for the next 3-5 days, but this feature can be disable if not required)
  - reserve a storage area of microprocessor's memory to store the AGPS files server generated (since they must be injected in the ROM device at each power on of the GNSS)

The implementation of some of the bullets mentioned above, like A-GPS and or ROM patching is not mandatory and the effort implementation is related to the complexity of the application as well as the customer's skill.

An alternative way to integrate such cellular + GNSS application is by means the bundle solution.



Integration through bundle solution approach



This solution requires that the main UART of GNSS module is directly connected to the 2<sup>nd</sup> UART of the cellular module (often it is also the TRACE UART).

Some cellular GPIOs need to be connected to the GNSS module to manage some key pins (power control, boot, ..., etc.).

Obviously, this implementation has pros and cons.

Benefits of the bundle solution are for instance:

- only one UART is used by application processor
- No effort to integrate and manage the GNSS protocol since GNSS is managed by cellular through AT commands
- Assisted GPS downloader / manager is already embedded in cellular module SW
- Patcher SW engine (for GNSS ROM) is already embedded in cellular module SW
- Application microprocessor could, at least, be removed and the whole application managed by Python or AppZone engine running in the Telit cellular module.

Some cons of this solution are that:

- since the GNSS is managed through the cellular modules, the latest need to be in power-on status every time the microprocessor need to send or update or exchange data with the GNSS module. This results in a more complex power management in order to match a power consumption comparable with standard solution.
- Not all the features of the GNSS modules can be driven through the cellular module, but only the most common features (see Telit AT commands User guide)

Conclusion: Either standard and bundle solutions has pros and cons. Customer has to make a careful balance between pros and cons and the requirements before choosing the implementation approach.

A third option is to use a mix of the two solutions that through a proper design and a proper usage of AT/NMEA commands, allows the application microprocessor to receive the NMEA sentences from GNSS without power on the cellular for most of the standard usages.

## 2.2. Telit Bundle Solution

The Telit Bundle solution's advantage is to combine multiple technologies and manage the whole set through a single dedicated communication port.

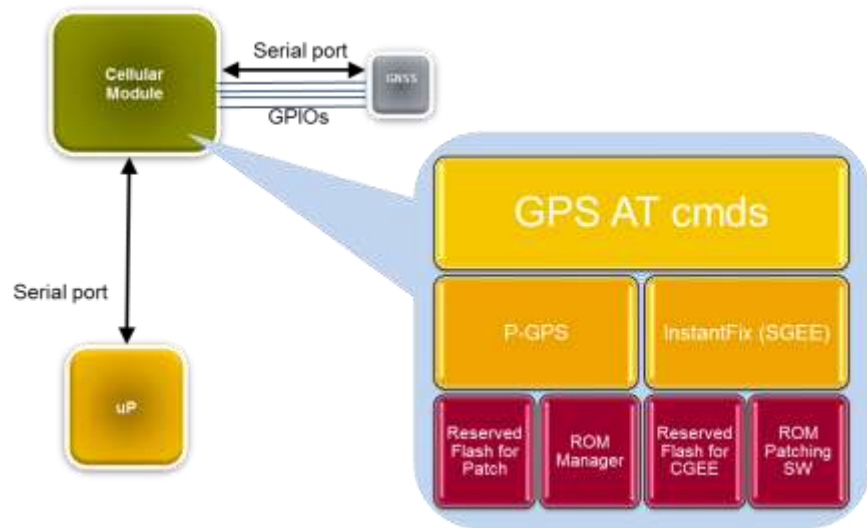
In Telit Bundle solution, the master module is the cellular module while the GNSS module is the slave.

The GNSS module is managed through the cellular module by means dedicated AT commands; in this case, the customer does not need to know or use any other protocol in order to manage the external GNSS device.

Moreover, this solution does not require to include any AGPS Download Manager or Patching SW engine in the external Application Microprocessor to manage AGPS aiding and Patcher SW engine for ROM modules.

In fact, the Telit Bundle solution is composed by different SW blocks that allows customer to manage, keep up-to-date and assist the GNSS device.





Telit Bundle solution implementation

## 2.3. Hardware Configuration

The Telit cellular and GNSS modules communicate each other through standard UART port. Both serial port and pins configuration setup are reported in the following paragraphs. Setup could change depending on the Cellular and GNSS model applied.

### WARNING:



*Please note that the information reported below are the minimum requested to set up communication the Telit cellular module with the GNSS receiver.*

*Since Telit GNSS products are based on different platforms, please make sure to adjust the voltage levels by the means the proper level translator.*

*Refers to the Hardware User Guide of both products selected for further design explanation.*

### 2.3.1. Serial port (UART) configuration

In order to set up the bundle communication, the 2<sup>nd</sup> UART of Telit cellular module (normally used for trace) has to be connected to the Telit GNSS module main UART port.

Cellular	2 <sup>nd</sup> UART	GNSS UART
	TX_AUX	GPS_RX
	RX_AUX	GPS_TX



## 2.3.2. Pin configuration

The following table summarizes the GNSS module's pins that cellular module has to manage in order to control the external GNSS module.

		GNSS key pin / signal			
		ON_OFF/ LDO Enable	SYSTEM_ON	BOOT	RESET
GNSS Module	JF2 Flash	YES	YES	YES	YES
	JF2 ROM/Eeprom SE868-V2	YES	YES	NO	NO
	JN3 FLASH	YES	NO	YES	YES
	JN3 ROM/Eeprom	YES	NO	NO	NO
	SE880 ROM	YES	YES	NO	NO
	SL869	YES	NO	YES	NO

Table 1

The GNSS control pins will be driven through the cellular module by means a proper setup and control of some GPIOs.

### NOTE:



Customer has the option to choose whatever set of cellular GPIOs (among those available in every cellular module) to manage the GNSS module.

Since the cellular GPIOs could have shared functions in certain GPIOs, the customer needs to take into account also these additional features.



*The first of the selected GPIOs of Telit cellular module must be always connected to the ON-OFF/LDO Enable pin of the external Telit GNSS receiver.*

*This will be applied through the AT\$GPSGPIO command (see next paragraphs).*



## 3. Software Bundle Configuration

In order to setup the cellular module in “bundle mode” a proper set of AT commands is required. The setup of the configuration depends on the GNSS module connected to the cellular module.

### 3.1. JF2 Flash

The Telit Cellular module is configured to manage the JF2 Flash GPS module issuing the following AT commands (see [1]):

- **AT\$GPSD=2,0**, this command configures the serial port #1 of the Telit cellular Module (TRACE) to manage the external GPS module JF2 flash. Moreover, it enables the whole set of “bundle” GPS AT commands.
- **AT\$GPSP=1**, this command turns the JF2 ON.
- **AT\$GPSGPIO= x,y,w,z**, this command configures GPIOs # x, y, w and z to manage the JF2 GPS\_ON/OFF, GPS\_SYSTEM\_ON, GPS\_BOOTSEL and GPS\_RESET signals respectively.
- **AT\$GPSSAV**, this command saves the bundle configuration in the cellular flash memory.
- **AT#REBOOT**, this command reboots the entire system.

From now on, the JF2 (FLASH) GPS module will be managed through the Telit Cellular module (so-called “controlled mode”).



#### **Important:**

*The first GPIO of “AT\$GPSGPIO= x,y,w,z” must be always connected to the ON-OFF pin of the external Telit GNSS receiver.*



#### **NOTE:**

The above mentioned configuration is valid for JF2 Flash variant with default baud rate @ 4800bps. In case the JF2 baudrate is 9600 bps, the AT command AT\$GPSSERSPEED=9600 must be sent before AT\$GPSSAV.

Issuing AT\$GPSSAV after AT\$GPSP=1 will turn on GPS Module at every Telit Cellular Module power up.

For further information about the AT Commands see Telit AT Command user Guide.

#### 3.1.1. Example

Bundle solution with GE865-QUAD+ JF2 Flash.



Cellular module's GPIOs chosen to control JF2 Flash: #4, 5, 6, 7

The list of AT commands to configure GE865 to control the JF2 Flash is:

- AT\$GPSD=2,0
- AT\$GPSGPIO=4,5,6,7
- AT\$GPSSAV
- AT#REBOOT
- AT\$GPSP=1

### 3.2. JF2 ROM

The Telit Cellular module is configured to manage the JF2 ROM GPS module by issuing the following AT commands (see AT Command User Guide):

- **AT\$GPSD=2,1**, this command configures the serial port #1 of the Telit cellular module (TRACE) to be used with a JF2 ROM module. Moreover, it enables the whole set of “bundle” GPS AT commands.
- **AT\$GPSGPIO= x,y,0,0** this command configures GPIOs # x, y to drive the JF2 GPS\_ON/OFF, GPS\_SYSTEM\_ON respectively.
- **AT\$GPSSAV**, this command saves the configuration applied above.
- **AT#REBOOT**, this command reboots the entire system.
- **AT\$GPSP=1**, this command turns the JF2 ON.

From now on, the JF2 ROM GPS module will be managed through the Telit cellular module.




---

**Important:**

*The first GPIO of “AT\$GPSGPIO= x,y,w,z” must be always connected to the ON-OFF pin of the external Telit GNSS receiver.*

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**NOTE:**

The above-mentioned configuration is valid for JF2 ROM variant with default baud rate @ 4800bps. In case the JF2's baudrate is 9600 bps, the AT command AT\$GPSSERSPEED=9600 must be sent before AT\$GPSSAV. Issuing AT\$GPSSAV after AT\$GPSP=1 will turn on GPS Module at every Telit cellular Module power up.

For further information see the AT Commands Reference Guide.

---



### 3.2.1. Example

Platform: GE865-QUAD+ JF2 ROM

As an example, the following GPIOs has been chosen to control JF2 ROM: #4, 5

These two GPIOs will be used to drive the ON\_OFF and SYSTEM\_ON pins of JF2 ROM.

The proper AT command sequence is:

- AT\$GPSD=2,1
- AT\$GPSGPIO=4,5,0,0
- AT\$GPSSAV
- AT#REBOOT
- Wait the URC “\$SIFIXEV: Host EE Files Successfully Created”
- AT\$GPSP=1

For further information on the EE Host Storage Mode please refer to [2] and Telit AT command User Guide.

### 3.3. JF2 EEPROM

The Telit Cellular module is configured to manage the JF2 EEPROM GPS module by issuing the following AT commands (see Telit AT command user Guide):

- **AT\$GPSD=2,2**, this command configures the serial port #1 of the Telit cellular module (TRACE) to be used with a JF2 EEPROM. Moreover, it enables the whole set of “bundle” GPS AT commands.
- **AT\$GPSGPIO= x,y,0,0** this command configures GPIOs # x, y to drive the JF2 GPS\_ON/OFF and GPS\_SYSTEM\_ON respectively.
- **AT\$GPSSAV**, this command saves the configuration applied above.
- **AT#REBOOT**, this command reboots the entire system.
- **AT\$GPSP=1**, this command turns the JF2 ON.

From now on, the JF2 GPS module will be managed through the Telit cellular module.




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**Important:**

***The first GPIO of “AT\$GPSGPIO= x,y,w,z” must be always connected to the ON-OFF pin of the external Telit GNSS receiver.***

---





#### NOTE:

The above-mentioned configuration is valid for JF2 EEPROM variant with default baud rate @ 4800bps. In case the JF2's baudrate is 9600 bps, the AT command AT\$GPSSERSPEED=9600 must be sent before AT\$GPSSAV.

Issuing AT\$GPSSAV after AT\$GPSP=1 will turn on GPS Module at every Telit cellular Module power up.

For further information see the AT Commands Reference Guide see.

### 3.3.1. Example

Platform: GE865-QUAD+ JF2 EEPROM

Cellular GPIOs chosen to control JF2 EEPROM: #4,5

- AT\$GPSD=2,2
- AT\$GPSGPIO=4,5,0,0
- AT\$GPSSAV
- AT#REBOOT
- Wait the URC “\$SIFIXEV: Host EE Files Successfully Created”
- AT\$GPSP=1

For further information on the EE Host Storage Mode please refer to [2] and [1].

### 3.4. JN3 Flash

The Telit Cellular module is configured to manage the JN3 Flash GPS module by issuing the following AT commands (see Telit AT command user guide):

- **AT\$GPSD=3,0**, this command configures the serial port #1 of the Telit cellular module (TRACE) to be used with JN3 module. Moreover, it enables the whole set of “bundle” GPS AT commands
- **AT\$GPSGPIO= x,0,w,z** this command configures GPIOs # x, w and z to drive the JN3 LDO enable, BOOT and RESET respectively.
- **AT\$GPSSAV**, this command saves the configuration applied above.
- **AT#REBOOT**, this command reboots the entire system.
- **AT\$GPSP=1**, this command turns the JN3 ON.

From now on, the JN3 Flash module will be managed through the Telit Cellular module.





**Important:**

*The first GPIO of “AT\$GPSGPIO= x,y,w,z” must be always connected to the ON-OFF pin of the external Telit GNSS receiver.*



**NOTE:**

The above-mentioned configuration is valid for JN3 Flash variant with default baud rate @ 4800bps. In case of JN3 baudrate is 9600 bps, the AT command AT\$GPSSERSPEED=9600 must be sent before AT\$GPSSAV. Issuing AT\$GPSSAV after AT\$GPSP=1 will turn on GPS Module at every Telit cellular Module power up.

For further information see the AT Commands Reference Guide.

### 3.4.1. Example

Platform: GE865-QUAD + JN3 Flash

Cellular GPIOs chosen to control JN3 Flash: #4, 6, 7

- AT\$GPSD=3,0
- AT\$GPSGPIO=4,0,6,7
- AT\$GPSSAV
- AT#REBOOT
- AT\$GPSP=1

## 3.5. JN3 ROM

The Telit Cellular module is configured to manage the JN3 ROM GPS module by issuing the following AT commands (see Telit AT command user guide):

- **AT\$GPSD=3,1**, this command configures the serial port #1 of the Telit cellular module (TRACE) to be used with a JN3 ROM module (Controlled Mode). Moreover, it enables the whole set of “bundle” GPS AT commands.
- **AT\$GPSGPIO= x,0,0,0** this command configures GPIOs # x to manage the JN3 LDO enable.
- **AT\$GPSSAV**, this command saves the configuration applied above.
- **AT#REBOOT**, this command reboots the entire system.
- **AT\$GPSP=1**, this command turns the JN3 ON.





From now on, the JN3 ROM module will be fully managed through the Telit cellular module.



**Important:**

*The first GPIO of “AT\$GPSGPIO= x,y,w,z” must be always connected to the ON-OFF pin of the external Telit GNSS receiver.*



**NOTE:**

The above-mentioned configuration is valid for JN3 ROM variant with default baud rate @ 4800bps. In case of JN3 baudrate is 9600 bps, the AT command AT\$GPSSERSPEED=9600 must be sent before AT\$GPSSAV. Issuing AT\$GPSSAV after AT\$GPSP=1 will turn on GPS Module at every Telit cellular Module power up.

For further information see the AT Commands Reference Guide.

### 3.5.1. Example

Platform: GE865-QUAD + JN3 ROM

Cellular GPIOs chosen to control JN3 ROM: #4

- AT\$GPSD=3,1
- AT\$GPSGPIO=4,0,0,0
- AT\$GPSSAV
- AT#REBOOT
- Wait the URC “\$SIFIXEV: Host EE Files Successfully Created”
- AT\$GPSP=1

For further information on the EE Host Storage Mode please refer to [2] and [1].

## 3.6. JN3 EEPROM

The Telit Cellular module is configured to manage the JN3 EEPROM GPS module by issuing the following AT commands (see Telit AT command user guide):

- **AT\$GPSD=3,2**, this command configures the serial port #1 of the Telit cellular module (TRACE) to be used with a JN3 EEPROM. Moreover, it enables the whole set of “bundle” GPS AT commands.
- **AT\$GPSGPIO= x,0,0,0** this command configures GPIOs # x to drive the JN3 LDO enable.
- **AT\$GPSSAV**, this command saves the configuration applied above.





- **AT#REBOOT**, this command reboots the entire system.
- **AT\$GPSP=1**, this command turns the JN3 ON.

From now on, the JN3 EEPROM module can be managed through the Telit cellular module.



**Important:**

*The first GPIO of “AT\$GPSP=1” must be always connected to the LDO enable signal which supplies the external Telit GNSS receiver.*



**NOTE:**

The above-mentioned configuration is valid for JN3 EEPROM variant with default baud rate @ 4800bps. In case the JN3 baudrate is 9600 bps, the AT command AT\$GPSSERSPEED=9600 must be sent before AT\$GPSSAV.

Issuing AT\$GPSSAV after AT\$GPSP=1 will turn on GPS Module at every Telit cellular Module power up.

For further information see the AT Commands Reference Guide.

### 3.6.1. Example

Platform: GE865-QUAD + JN3 EEPROM

Cellular GPIOs chosen to control JN3 EEPROM: #4

- AT\$GPSD=3,2
- AT\$GPSP=1
- AT\$GPSSAV
- AT#REBOOT
- Wait the URC “\$SIFIXEV: Host EE Files Successfully Created”
- AT\$GPSP=1

For further information on the EE Host Storage Mode please refer to [2] and Telit AT command user guide.

### 3.7. SE880

The Telit Cellular module is configured to manage the Se880 GPS module by issuing the following AT commands (see Telit AT command user guide):

- **AT\$GPSD=2,1**, this command configures the serial port #1 of the Telit cellular module (TRACE) to be used with a SE880 module. Moreover, it enables the whole set of “bundle” GPS AT commands.



- **AT\$GPSGPIO= x,y,0,0** this command configures GPIOs # x, y to drive the SE880 GPS\_ON/OFF, GPS\_SYSTEM\_ON respectively.
- **AT\$GPSSAV**, this command saves the configuration applied above.
- **AT#REBOOT**, this command reboots the entire system.
- **AT\$GPSP=1**, this command turns the SE880 ON.

From now on, the SE880 GPS module can be managed through the Telit cellular module.



**Important:**

*The first GPIO of “AT\$GPSGPIO= x,y,w,z” must be always connected to the ON-OFF pin of the external Telit GNSS receiver.*



**NOTE:**

In case that the baud rate of SE880 used is different from 4800 AT\$GPSSERSPEED=9600 must be sent before AT\$GPSSAV.

Issuing AT\$GPSSAV after AT\$GPSP=1 will turn on GPS Module at every Telit cellular Module power up.

For further information see the AT Commands Reference Guide.

### 3.7.1. Example

Platform: GE865-QUAD + SE880

Cellular GPIOs chosen to control SE880: #4, 5

- AT\$GPSD=2,1
- AT\$GPSGPIO=4,5,0,0
- AT\$GPSSAV
- AT#REBOOT

Wait the URC “\$SIFIXEV: Host EE Files Successfully Created”

- AT\$GPSP=1

For further information on the EE Host Storage Mode please refer to [2] and [1].

### 3.8. SL869

The Telit Cellular module is configured to manage the SL869 GPS module by issuing the following AT commands (see Telit AT command user Guide):



- **AT\$GPSD=4**, this command configures the serial port #1 of the Telit cellular module (TRACE) to be used with a SL869 module. Moreover, it enables the whole set of “bundle” GPS AT commands.
- **AT\$GPSGPIO= x,0,w,0** this command configures GPIOs # x and w to manage the SL869 LDO enable and BOOT respectively.
- **AT\$GPSSAV**, this command saves the configuration applied above.
- **AT#REBOOT**, this command reboots the entire system.
- **AT\$GPSP=1**, this command turns the SL869 ON

From now on, the SL869 GNSS module will be fully managed through the Telit cellular module.




---

**Important:**

*The first GPIO of “AT\$GPSGPIO= x,y,w,z” must be always connected to the LDO enable signal which supplies the external Telit GNSS receiver.*

---




---

**NOTE:**

Issuing AT\$GPSSAV after AT\$GPSP=1 will turn on GNSS Module at every Telit Cellular Module power up.

For further information see the AT Commands Reference Guide.

---

### 3.8.1. Example

Platform: GE865-QUAD + SL869

Cellular GPIOs chosen to control SL869: #4, 6

- AT\$GPSD=4
- AT\$GPSGPIO=4,0,6,0
- AT\$GPSSAV
- AT#REBOOT
- AT\$GPSP=1



## 3.9. SE868-V2

The Telit Cellular module is configured to manage SE868-V2 GNSS module by issuing the following AT commands (see AT Command User Guide):

- **AT\$GPSD=5,2**, this command configures the serial port #1 of the Telit cellular module (TRACE) to be used with a SE868V2 module. Moreover, it enables the whole set of “bundle” GPS AT commands.
- **AT\$GPSGPIO= x,y,0,0** this command configures GPIOs # x, y to drive the SE868V2 GPS\_ON/OFF, GPS\_SYSTEM\_ON respectively.
- **AT\$GPSSERSPEED=9600** this command configures trace serial port baudrate
- **AT\$GPSSAV**, this command saves the configuration applied above.
- **AT#REBOOT**, this command reboots the entire system.
- **AT\$GPSP=1**, this command turns the SE868-V2 ON.

From now on, the SE868-V2 GNSS module will be managed through the Telit cellular module.




---

**Important:**

*The first GPIO of “AT\$GPSGPIO= x,y,w,z” must be always connected to the ON-OFF pin of the external Telit GNSS receiver.*

---




---

**NOTE:**

AT\$GPSSERSPEED=9600 must be sent before AT\$GPSSAV. Issuing AT\$GPSSAV after AT\$GPSP=1 will turn on GPS Module at every Telit cellular Module power up.

For further information see the AT Commands Reference Guide.

---

### 3.9.1. Example

Platform: GE865-QUAD + SE868-V2

Cellular GPIOs chosen to control SE868-V2: #4, 5

- AT\$GPSD=5,2
- AT\$GPSGPIO=4,5,0,0
- AT\$GPSSERSPEED=9600
- AT\$GPSSAV
- AT#REBOOT



- AT\$GPSP=1



## 4. Patching ROM-based SiRFStar IV modules in Bundle Solution

The JF2 ROM, JN3 ROM and SE880 are based on SiRF Star IV ROM variant.

A ROM-based GNSS module cannot neither permanently store a custom configuration nor be updated with an enhanced SW. This is due to the specific ROM (Read Only Memory) configuration.

By the way, A ROM device can receive temporary updates or custom settings through a config file (ROM patch), but these updates are stored in the RAM of the GNSS module and then they are erased whenever the module's battery backup supply is removed.

In order to patch a GPS ROM Based (ROM based variants of JF2, JN3 and the SE880) in a bundle solution, a proper set of AT commands is required.

This set of AT commands allows customer to use the Patch Manager embedded into the cellular module and follow all the required steps for a successful Patching Operation. For further information about ROM Patching please refers to [6].

The following example show how to patch the JN3, JF2 and SE880 based on the SiRF Star IV vROM2.2.

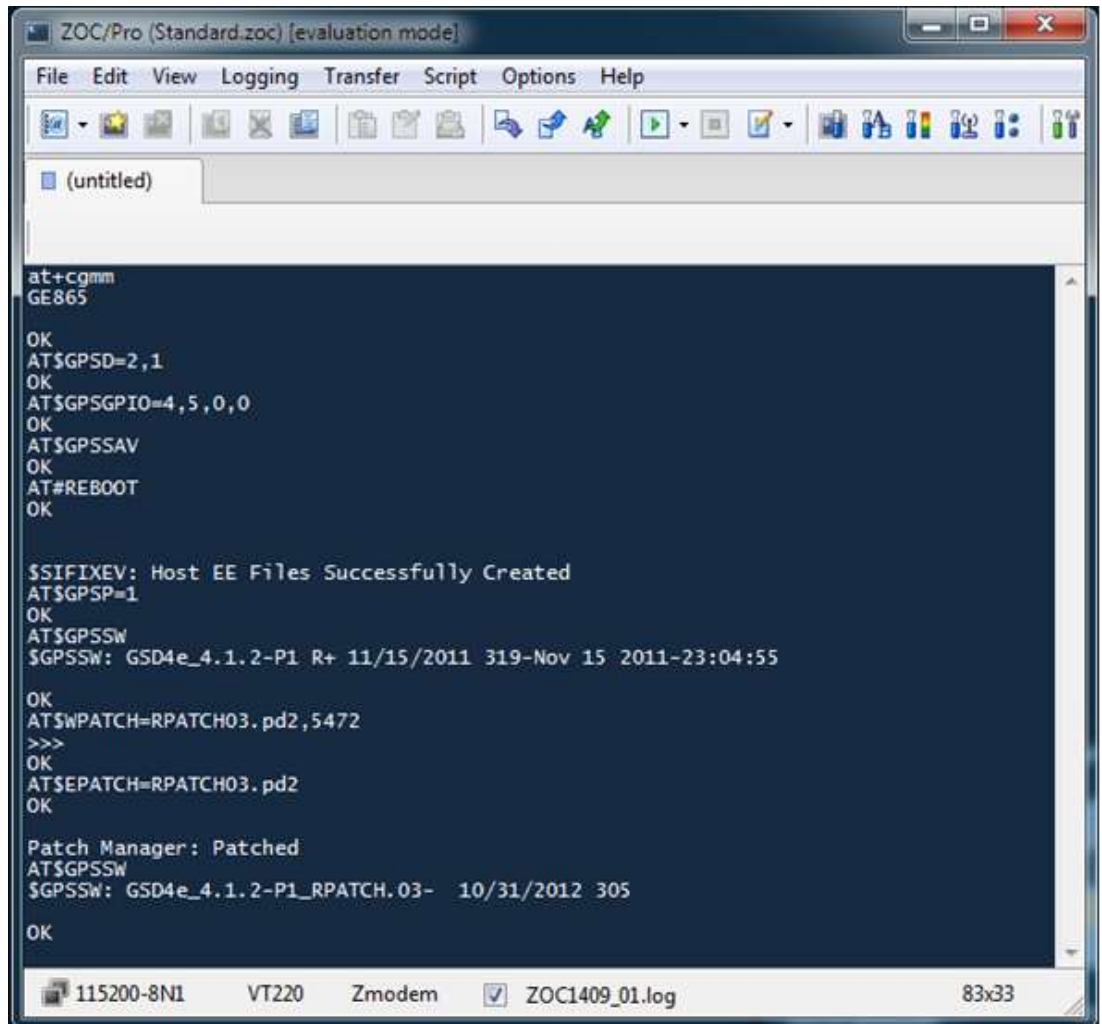




## 4.1. How to patch SiRFStar IV ROM 2.2

This procedure can be applied to JF2 ROM, JN3 ROM and SE880.

An example of AT commands to setup the bundle mode (controlled mode) and to patch the ROM GNSS device (though the GE865 in this case) is reported in the figure below.



```

at+cgmm
GE865

OK
AT$GPSD=2,1
OK
AT$GPSGPIO=4,5,0,0
OK
AT$GPSSAV
OK
AT#REBOOT
OK

$$IFIXEV: Host EE Files Successfully Created
AT$GPSP=1
OK
AT$GPSSW
SGPSSW: GSD4e_4.1.2-P1 R+ 11/15/2011 319-Nov 15 2011-23:04:55

OK
AT$WPATCH=RPATCH03.pd2,5472
>>>
OK
AT$EPATCH=RPATCH03.pd2
OK

Patch Manager: Patched
AT$GPSSW
SGPSSW: GSD4e_4.1.2-P1_RPATCH.03- 10/31/2012 305

OK
  
```

AT commands for ROM patching

Issue the AT\$GPSSAV command if the patch has to be automatically applied at every power up of the cellular module and whenever the backup battery power is lost.

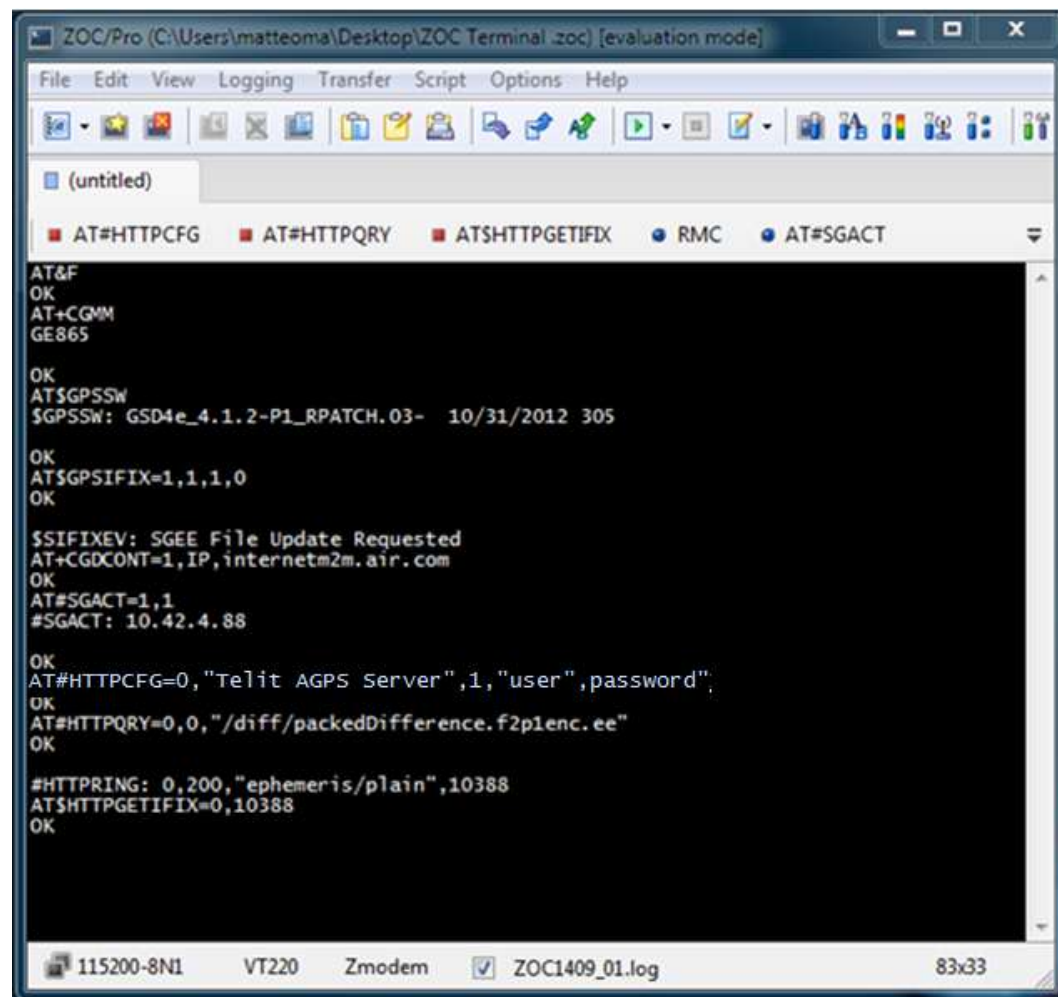


## 5. AGPS for SiRFStar IV and SiRFStar V

### 5.1. JF2, JN3 and SE880: How to download and inject SGEE

This procedure can be applied to all JF2 variants, all JN3 variants and SE880.

In order to download and evaluate the SiRF InstantFix feature (for SiRF based modules) through the usage of SGEE (Server Generated Extended Ephemeris) files, the following set of AT Command is required:



```

ZOC/Pro (C:\Users\matteoma\Desktop\ZOC Terminal .zoc) [evaluation mode]
File Edit View Logging Transfer Script Options Help
[untitled]
AT#HTTPCFG AT#HTTQRY AT$HTTGETIFIX RMC AT$SGACT
AT&F
OK
AT+CGMM
GE865
OK
AT$GPSSW
$GPSSW: GSD4e_4.1.2-P1_RPATCH.03- 10/31/2012 305
OK
AT$GPSIFIX=1,1,1,0
OK
$SIFIXEV: SGEE File Update Requested
AT+CGDCONT=1,IP,internetm2m.air.com
OK
AT$SGACT=1,1
#SGACT: 10.42.4.88
OK
AT#HTTPCFG=0,"Telit AGPS Server",1,"user",password";
OK
AT#HTTQRY=0,0,"/diff/packedDifference.f2p1enc.ee"
OK
#HTTTPRING: 0,200,"ephemeris/plain",10388
AT$HTTGETIFIX=0,10388
OK
115200-8N1 VT220 Zmodem [x] ZOC1409_01.log 83x33
  
```

#### Important:



***In a bundle solution with ROM2.2 variant, the SGEE (server Generated Extended Ephemeris) and CGEE (client Generated Extended Ephemeris) data are saved in the NVM of Telit cellular module since the GNSS is not able to permanently store any data.***



***Therefore if, for whatever reason, the cellular module is turned off it will be not possible to use the SGEE/CGEE aiding in the GNSS for a faster TTFF.***

---

In order to obtain the credentials to access and download extended ephemeris files from Telit AGPS Server an NDA is required.

Please contact our Telit Technical Support in order to get the proper documentation.

For further information about SiRF InstantFix Technology please see [4].

---

**WARNING:**

***The GSD4E\_4.1.2-P1\_RPATCH\_03 is the minimum patch level required in order to use the SGEE feature in ROM2.2 based modules.***



***In a bundle solution with ROM2.2 if the VBATT (battery backup) is removed, the SGEE file must be downloaded into the GNSS again since the VBATT removal causes the erase of the GNSS module SRAM.***

***Please contact our Telit Technical Support in order to verify if your Telit cellular firmware supports all the commands for the SGEE feature.***

---

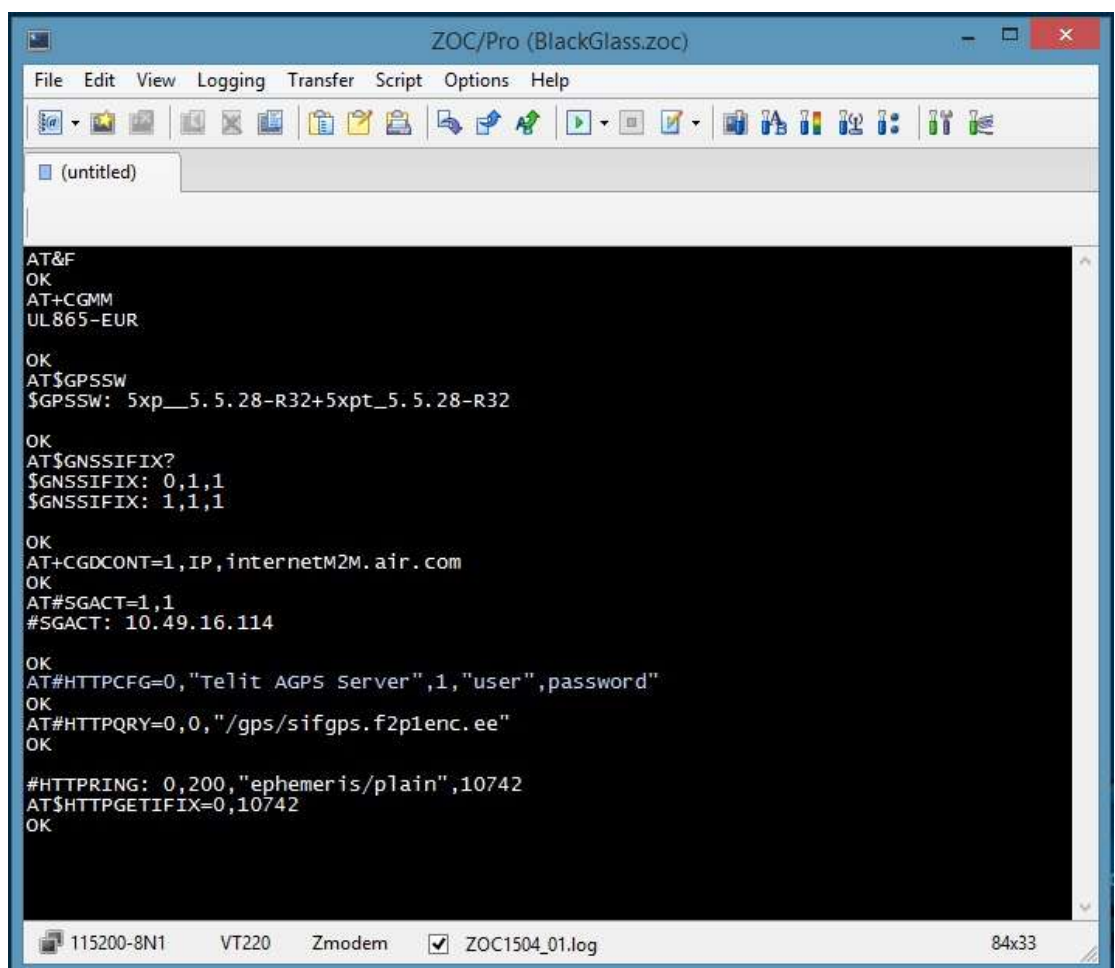


## 5.2. SE868V2: How to download and inject GNSS SGEE

This procedure can be applied only to the SE868-V2.

In order to download and evaluate the SiRF InstantFix feature (for SiRF based modules) through the usage of SGEE (Server Generated Extended Ephemeris) files, the following set of AT Command is required.

In the SE868-V2 is possible to inject GPS and GLONASS extended ephemeris file.



```

ZOC/Pro (BlackGlass.zoc)
File Edit View Logging Transfer Script Options Help
[untitled]
AT&F
OK
AT+CGMM
UL865-EUR

OK
AT$GPSSW
$GPSSW: 5xp__5.5.28-R32+5xpt_5.5.28-R32

OK
AT$GNSSIFIX?
$GNSSIFIX: 0,1,1
$GNSSIFIX: 1,1,1

OK
AT+CGDCONT=1,IP,internetM2M.air.com
OK
AT#SGACT=1,1
#SGACT: 10.49.16.114

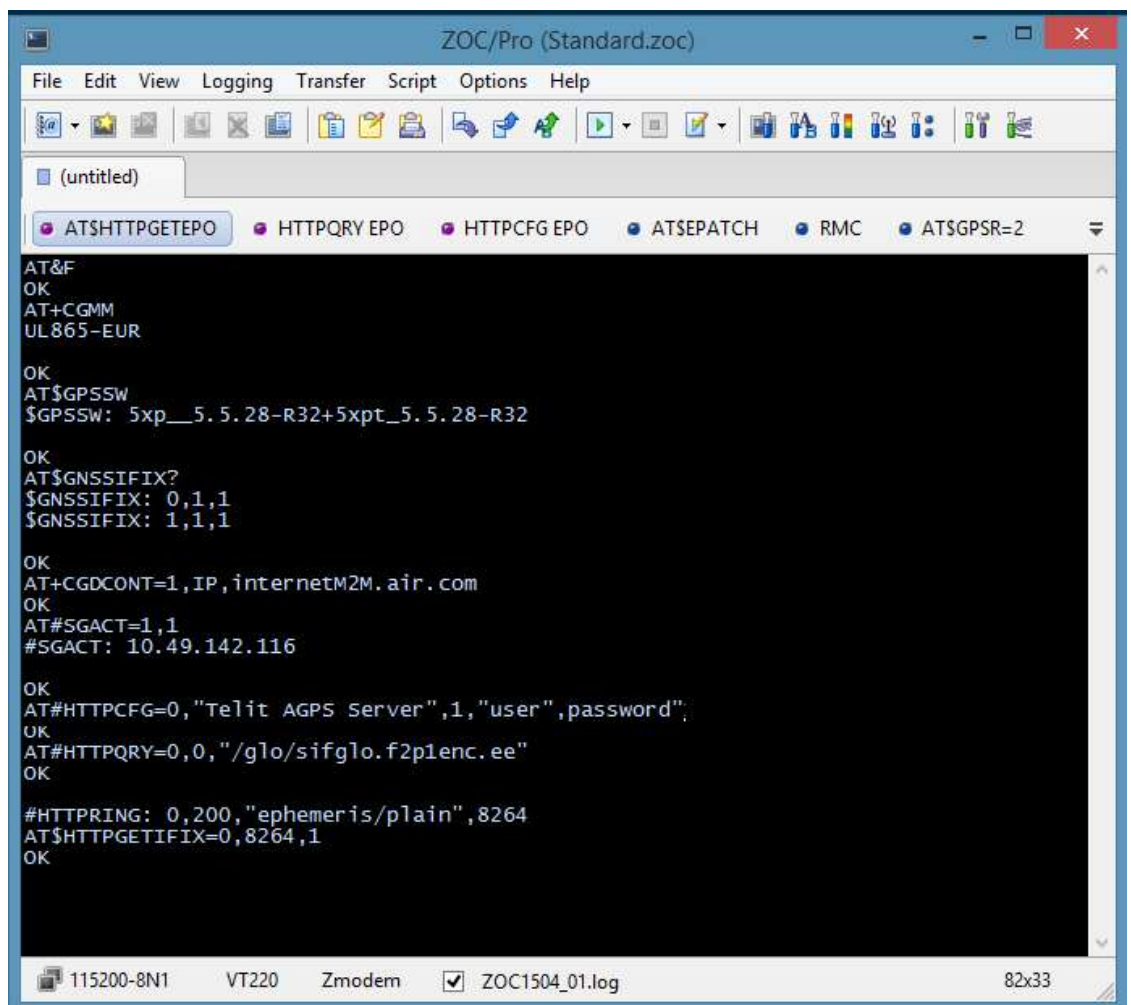
OK
AT#HTTPCFG=0,"Telit AGPS Server",1,"user",password"
OK
AT#HTTPQRY=0,0,"/gps/sifgps.f2plenc.ee"
OK
#HTTPrING: 0,200,"ephemeris/plain",10742
AT$HTTPGETIFIX=0,10742
OK
115200-8N1 VT220 Zmodem [x] ZOC1504_01.log 84x33
  
```



## 5.3. SE868-V2: How to download and inject GLONASS SGEE

This procedure can be applied only to the SE868-V2.

In order to download and evaluate the SiRF InstantFix feature (for SiRF based modules) through the usage of SGEE (Server Generated Extended Ephemeris) files, the following set of AT Command is required.



```

ZOC/Pro (Standard.zoc)
File Edit View Logging Transfer Script Options Help
[untitled]
AT$HTTPGETEPO HTTPQRY EPO HTTPCFG EPO AT$PATCH RMC AT$GPSR=2
AT&F
OK
AT+CGMM
UL865-EUR
OK
AT$GPSSW
$GPSSW: 5xp__5.5.28-R32+5xpt_5.5.28-R32
OK
AT$GNSSIFIX?
$GNSSIFIX: 0,1,1
$GNSSIFIX: 1,1,1
OK
AT+CGDCONT=1,IP,internetM2M.air.com
OK
AT#SGACT=1,1
#SGACT: 10.49.142.116
OK
AT#HTTPCFG=0,"Telit AGPS Server",1,"user",password",
OK
AT#HTTPQRY=0,0,"/glo/sifglo.f2p1enc.ee"
OK
#HTTPRING: 0,200,"ephemeris/plain",8264
AT$HTTPGETIFIX=0,8264,1
OK
115200-8N1 VT220 Zmodem [x] ZOC1504_01.log 82x33
  
```

**WARNING:**

*The GSD5xp\_5.5.28. is the minimum patch level required in order to use the SGEE feature in the SE868V2.*

*Please contact our Telit Technical Support in order to verify if your Telit cellular firmware supports all the commands for the SGEE feature.*

In order to obtain the credentials to access and download SGEE extended ephemeris files from Telit AGPS Server an NDA is required.

Please contact our Telit Technical Support in order to get the proper documentation.

For further information about specific Telit AT commands please see [1].

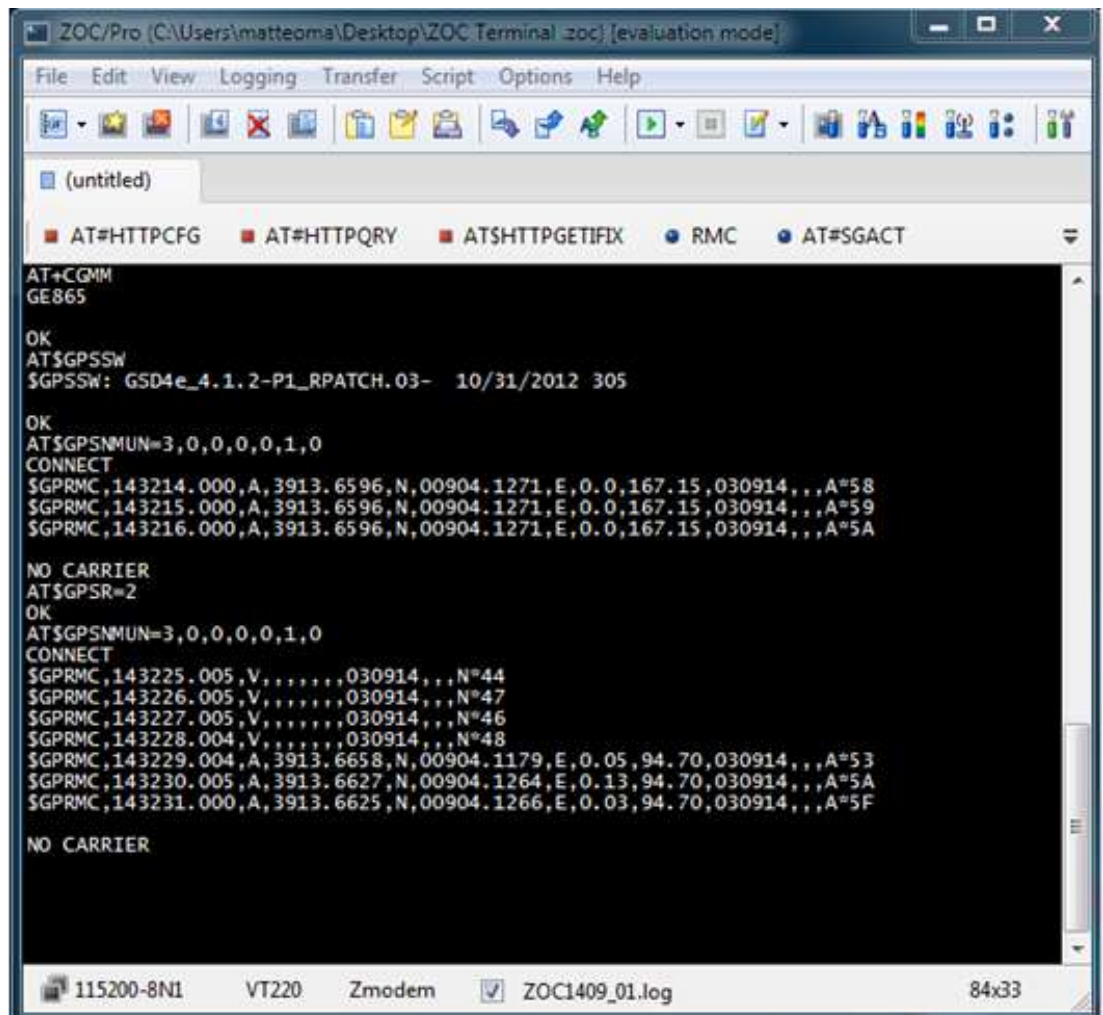




## 5.4. How to verify SGEE Feature

This procedure can be applied to all JF2 variants, all JN3 variants, SE880 and SE868-V2.

Under Warm and Cold Start conditions, the usage of SGEE files reduces the TTFF of the GNSS module.



```

ZOC/Pro [C:\Users\matteoma\Desktop\ZOC Terminal .zoc] [evaluation mode]
File Edit View Logging Transfer Script Options Help
[untitled]
AT#HTTPCFG AT#HTTPORY AT$HTTGETIFIX RMC AT$SGACT
AT+CGMM
GE865
OK
AT$GPSSW
$GPSSW: GSD4e_4.1.2-P1_RPATCH.03- 10/31/2012 305
OK
AT$GPSNMUN=3,0,0,0,0,1,0
CONNECT
$GPRMC,143214.000,A,3913.6596,N,00904.1271,E,0.0,167.15,030914,,,A*58
$GPRMC,143215.000,A,3913.6596,N,00904.1271,E,0.0,167.15,030914,,,A*59
$GPRMC,143216.000,A,3913.6596,N,00904.1271,E,0.0,167.15,030914,,,A*5A
NO CARRIER
AT$GPR=2
OK
AT$GPSNMUN=3,0,0,0,0,1,0
CONNECT
$GPRMC,143225.005,V,,,,,,030914,,,N*44
$GPRMC,143226.005,V,,,,,,030914,,,N*47
$GPRMC,143227.005,V,,,,,,030914,,,N*46
$GPRMC,143228.004,V,,,,,,030914,,,N*48
$GPRMC,143229.004,A,3913.6658,N,00904.1179,E,0.05,94.70,030914,,,A*53
$GPRMC,143230.005,A,3913.6627,N,00904.1264,E,0.13,94.70,030914,,,A*5A
$GPRMC,143231.000,A,3913.6625,N,00904.1266,E,0.03,94.70,030914,,,A*5F
NO CARRIER
115200-8NI VT220 Zmodem ZOC1409_01.log 84x33
  
```

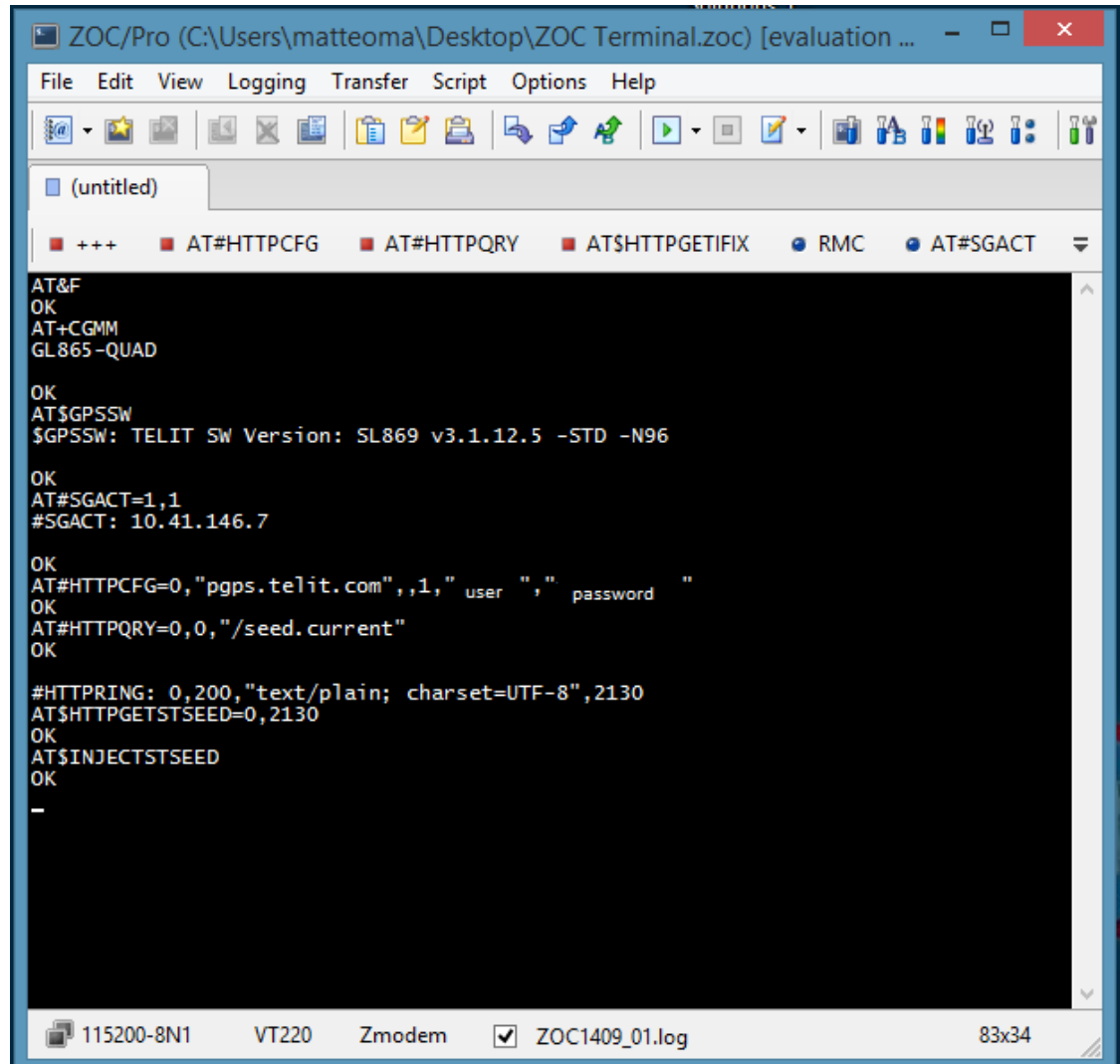
### WARNING:



*Please note the External GNSS modules requires a valid time stamp before using properly the SGEE, since it is necessary to calculate if the SGEE files previously downloaded is still valid or not. Old files will be rejected.*

## 6. AGPS for SL869: How to download and inject SEED file

In order to download and evaluate the server-based assistance provide by ST-AGPS the following set of AT Command is required:



```

ZOC/Pro (C:\Users\matteoma\Desktop\ZOC Terminal.zoc) [evaluation ...
File Edit View Logging Transfer Script Options Help
[untitled]
+++ AT#HTTPCFG AT#HTTPQRY AT$HTTPGETIFIX RMC AT#SGACT
AT&F
OK
AT+CGMM
GL865-QUAD
OK
AT$GPSSW
$GPSSW: TELIT SW Version: SL869 v3.1.12.5 -STD -N96
OK
AT#SGACT=1,1
#SGACT: 10.41.146.7
OK
AT#HTTPCFG=0,"pgps.telit.com",,1," user "," password "
OK
AT#HTTPQRY=0,0,"/seed.current"
OK
#HTTPRING: 0,200,"text/plain; charset=UTF-8",2130
AT$HTTPGETSTSEED=0,2130
OK
AT$INJECTSTSEED
OK
-
115200-8N1 VT220 Zmodem [x] ZOC1409_01.log 83x34
  
```

In order to obtain the credentials to access and download seed file from Telit PGPS Server an NDA is required.

Please contact our Telit Technical Support in order to get the proper documentation.



For further information about ST-AGPS Technology please see [5].



---

**WARNING:**

ST-AGPS is available starting with firmware version 3.1.5.1

Please note before inject the seed file a valid UTC time is required and for SEED computation time please refer to the AGPS Server Based Application Note for SL869.

Please contact our Telit Technical Support in order to verify if your Telit cellular firmware supports all the commands for the ST-AGPS feature.

---



## 7. Bundling with Telit 3G modules

The hardware and software configuration reported in the previous chapters is valid when using a Telit 3G cellular module in the bundling solution.

The only additional step required when using a Telit 3G module is that every 3G Module requires that a mandatory command is issued at very first startup configuration:

AT#PORTCFG=11.

this command will enable the communication with the external GNSS receiver connected to the TRACE port.



---

**Important:**

*The AT#PORTCFG=11 must be issue only on Telit 3G Modules (HE910 family, UE910 family, UL865 family) It mustn't be issued on Telit Cellular 2G variants (GE865 family).*

---

### 7.1. Example

Platform: UL865-EUR + SE868-V2

Cellular GPIOs chosen to control SE868-V2: #4, 5

- AT#PORTCFG=11
- AT\$GPSD=5,2
- AT\$GPSGPIO=4,5,0,0
- AT\$GPSSERSPEED=9600
- AT\$GPSSAV
- AT#REBOOT
- AT\$GPSP=1



## 8. Document History

Revision	Date	Changes
0	2014-09-01	First issue
1	2015-04-14	Updated Applicability Table. Added SE868-V2 support configuration procedure Added 3G modules bundling solution configuration beside 2G.

