INSTER LEO MANPORTABLE TERMINAL FOR ONEWEB

MANPORTABLE OW USER MANUAL

CUSTOMER REF	INSTER REF
N/A	1025230000_0622.17

Ed. 02 Rev. 00

20 September 2023

SIGNATURE CONTROL AND VALIDATION

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VERSION CONTROL

EDITION	REVISION	DATE	NOTES
1	0	04/28/2023	First Version
2	0	09/18/2023	Second Version

MODIFICATION CONTROL

EDITION	REVISION	DATE	SECTION CHANGED	DESCRIPTION OF CHANGE
2	0	09/18/2023	2	Included main specifications table Recommendation about electrical installation
			3.3.4	Updated figure with connectors panel

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LIST OF ACRONYMS

ACRONYM	DESCRIPTION
AC/DC	Alternating Current/Direct Current
ACU	Antenna Control Unit
DHCP	Dynamic Host Configuration Protocol
EGR	External GNSS Receiver
EIRP	Effective Isotropic Radiated Power
ETH	Ethernet
GNSS	Global Navigation Satellite System
IP	Internet Protocol
LED	Light Emitting Diode
LEO	Low Earth Orbit
LUI	Local User Interface
PC	Personal Computer
PPS	Pulse per second
PWR	Power
SSM	Satellite Subscriber Module
UT	Unit Terminal
3D	Three Dimensional

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1. OBJECTIVE

1.1. SCOPE

The scope of this document is to provide the User Manual of the INSTER Oesia-Group Low Earth Orbit (LEO) Manportable Terminal of the OneWeb satellite constellation.

1.2. GENERAL REFERENCES

REFERENCE	STANDARD/DOCUMENT	DOCUMENT TITLE
REF-1	AQAP-2110-STANDARD	The Quality Assurance requirements NATO for design, development and production.
REF-2	UNE-EN-ISO-9001	The Quality Management System
REF-3	UNE-EN-ISO-14001	Environmental Management System
REF-4	UNE-EN 9100	Quality Management Systems. Requirements for aviation, space and defense organizations
REF-5	AQAP-2310-STANDARD	NATO Quality Assurance Requirements for Aviation, Space and Defense supplier

Table 1 General References

2. GENERAL DESCRIPTION

The INSTER LEO ManPortable Terminal is a portable and easy deployable satellite communication terminal with capability to operate in Ku-band, within the LEO OneWeb satellite communication network. This terminal integrates both the smart satellite antenna system and the baseband system (modem), being able to provide high throughput IP data transmissions to the final user. Once connected and powered on, the ManPortable Terminal acquire the satellite network automatically without manual intervention.

The INSTER LEO ManPortable Terminal includes two independent TX and RX radiating apertures, which allows to provide full-duplex operation. These apertures are electronically steerable, being able to perform real-time beam switching and handover procedures, which is a critical issue in LEO satellite communication systems.

A dual Global Navigation Satellite System (GNSS) is used to automatically obtain the position and the True North Direction of the system. An accelerometer is also included to properly obtain the terminal roll and pitch. All these sensors not only improve the overall performance of the system, but also simplify the terminal deployment since it does not need to be perfectly aligned with any specific direction.

The Antenna Control Unit (ACU) allows the terminal to automatically perform LEO tracking. INSTER has proven experience in developing tracking algorithms for very different markets and terminals: SatCom on the Move, Manpacks, static big gain antennas, etc. In this sense, the ACU implements different optimum algorithms for fine searching, which leads to a very high efficiency pointing and smooth tracking operation.

The INSTER LEO ManPortable Terminal provides two Ethernet interfaces to the end user: a wired primary Ethernet interface connected to the traffic port off the SSMv2, and a secondary Ethernet interface connected to the debug port off the ACU.

The ManPortable Terminal is fully operable from a remote Monitor and Control (M&C) tablet or Personal Computer (PC). The user can monitor alarms, warnings, and sensors of the Terminal. Briefly, the Local User Interface (LUI) provides information about the entire Terminal.

The INSTER LEO ManPortable Terminal can be powered from any 18 – 36 VDC source. Additionally, INSTER can provide an external AC/DC converter, 85 – 264VAC, 47 – 63Hz, allowing the terminal to be powered from a wide variety of power sources: mains, batteries, solar panels, and military vehicle DC source.

Please make sure that the electrical installation is protected according to the current legislation before connecting the equipment.

Next a table with the main specifications for the INSTER LEO ManPortable:

LEO ManPortable MAIN SPECIFICATIONS	
Parameter	**Value**
Tx RF Frequency Range	14.0GHz – 14.5GHz
Rx RF Frequency Range	10.7GHz – 12.7GHz
Antenna Scanning Range	Elevation: 37° – 90° Azimuth: 0° – 360°
EIRP	37dBW whole scanning range
G/T	9dBK @ boresight
Operating Voltage Range	18 VDC – 36 VDC
Nominal Power Consumption	150W
Max Power Consumption	190 W
Temperature	-40°C - +55°C
Humidity	Up to 100%
Size Folded	447mm x 374mm x 116mm
Size Unfolded	855mm x 374mm x 57mm
ManPortable Terminal weight: 12 Kg	12 Kg
ManPortable Terminal weight (Including external AC/DC converter, tripod, cables, and batteries)	19.5 Kg

Table 2: Main specifications

Next an image of the interface panel:

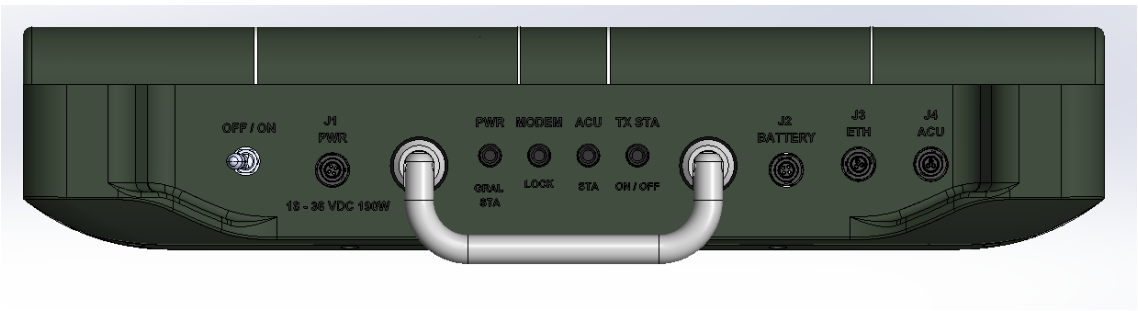

Figure 1: UT Interface Panel

The ManPortable Terminal is specially designed to be packed into ruggedized transit cases, for easy transportation and deployment. The whole Terminal is designed in compliance with MIL-STD 810H, MIL-STD 461G and CE marking.

Figure 2: INSTER LEO ManPortable Terminal

3. START UP PROCEDURE

Before starting to use the terminal, the user needs to know how to operate with it. This entails to learn how to deploy the terminal, how to prepare the set up and finally how to fold the terminal again.

The main steps are summarized:

1. User Terminal PC network configuration
2. UT Deployment
3. UT Start Up
4. UT Operation
5. UT Folding

3.1. USER TERMINAL PC NETWORK CONFIGURATION

Before starting the start up procedure, the user may need to perform a preliminary step to configure the PC properly. It consists of a configuration of the IP address which is used to access the LUI.

In the Windows start menu, the user must go to:

- Settings→Network and Internet→Ethernet

Once there, select the available Ethernet connection and look for the 'Network Configuration' menu. Select edit and in the IPv4 section, enter the following values:

- IP Assignment: Manual
- IP Address: 192.168.100.254
- Subnet prefix length: 24
- Gateway: 192.168.100.1

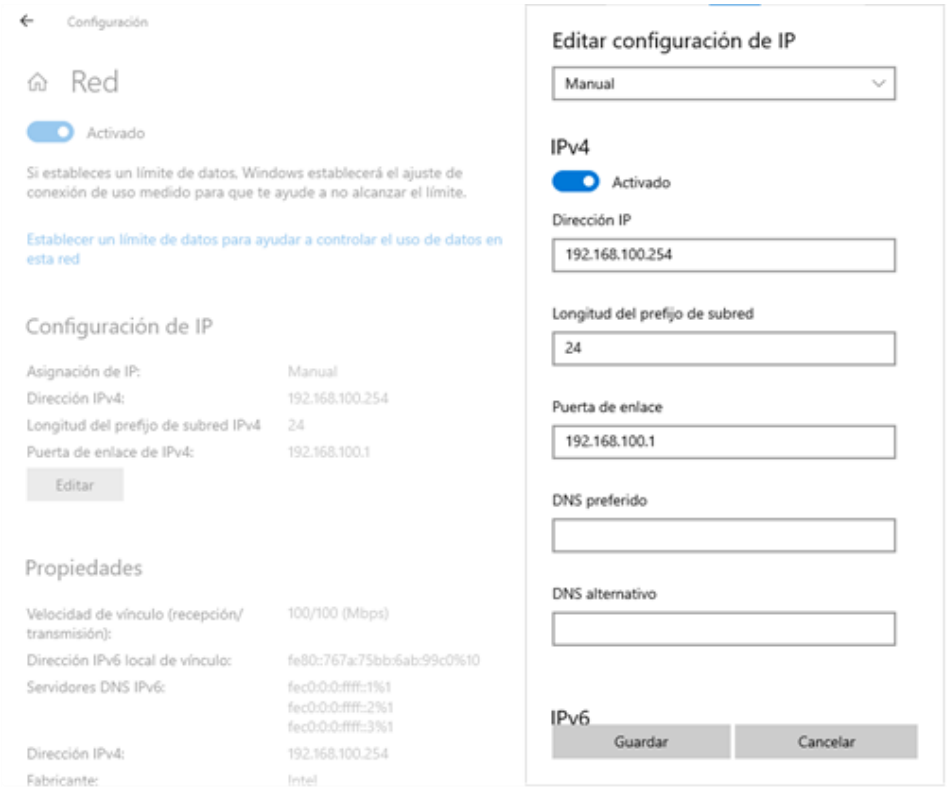

Figure 3: IP configuration

After configuring the IP, we can now access the LUI through a browser, simply by entering the gateway value (192.168.100.1) in the browser in order to control and monitor the UT.

3.2. UT DEPLOYMENT

3.2.1. POSITIONING

Firstly, it is important to accommodate the environment for deploying the UT. For this purpose, the user will place the tripod on the ground ensuring the stability of the structure. Optionally, the user can anchor the tripod to the ground.

After that, the user will proceed to unfold the UT completely and place it on the tripod, locking the joint between both. It is important to place the UT completely flat and parallel to the ground so the user should use the bubble level for that. In case the user needs to correct the orientation of the UT, there is a lock/unlock handle that allows 3D movement of it while the UT is attached to the tripod.

3.2.2. CABLE CONNECTIONS

Once the UT is properly positioned, the user will connect the power cable from the AC/DC power supply to the J1 PWR connector.

Then, the user will connect the ethernet cable to J3 ETH connector (SSM data traffic). This cable can be connected to the Wi-Fi router or a PC.

Optionally, the user can connect the ethernet cable to J4 ACU connector (ACU/SSM debug).

Now, everything is ready to switch on the UT.

Figure 4: UT deployment

3.3. UT START UP

3.3.1. UT POWER ON

When the user moves the UT power switch to ON, all the LEDs light up.

Figure 5: UT Interface Panel

After a few seconds, the LEDs will gradually turn off except the PWR LED, which indicates that the UT is receiving the power supply. Also, fans will turn on.

3.3.2. LUI ACCESS AND VERIFICATIONS

To access the LUI there are 2 options:

1. Connect 1 PC to J4 ACU connector with a static IP in the 192.168.100.x subnet.
2. Connect 1 PC to J3 ETH connector (SSM data traffic) with DHCP.

3.3.2.1. LUI AUTO-REFRESH ACTIVATION

When accessing the LUI, the first thing the user must do is change the Auto-Refresh parameter to 1 because if it is left at its default value (0) the page will not be refreshed. This option is located in the upper right-hand corner.

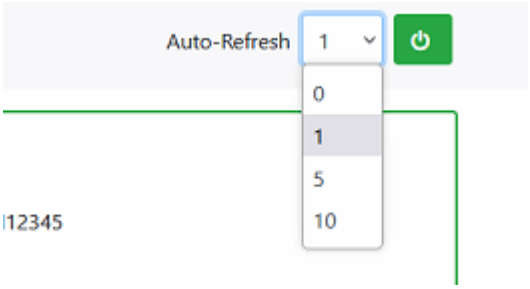

Figure 6: Auto-Refresh activation

3.3.2.2. PPS STATUS VERIFICATION

A few minutes later, SSM starts receiving PPS from the EGR. User can check PPS stats in the SSM LUI.

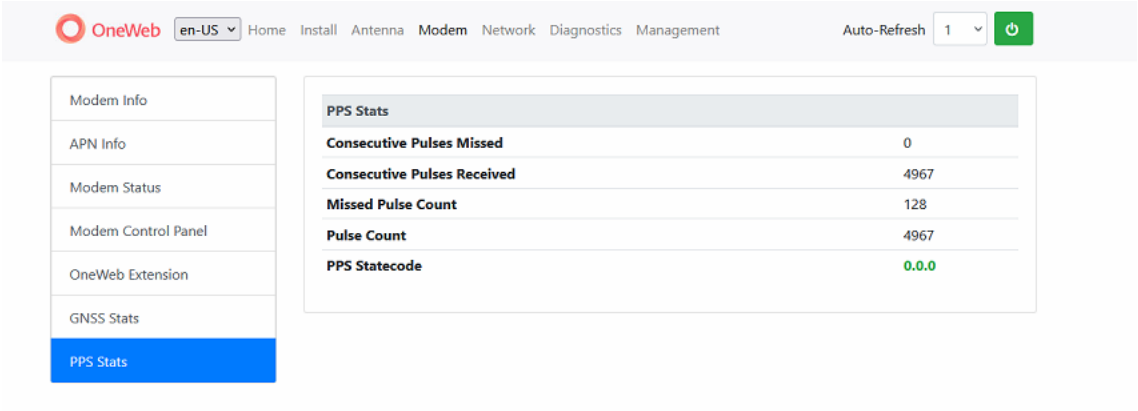

Figure 7: PPS status

3.3.2.3. GNSS VERIFICATION

When Dual GNSS reaches RTK fix status, heading acquisition is available and ACU STA LED turns on. When the SSM is ready, it automatically goes online.

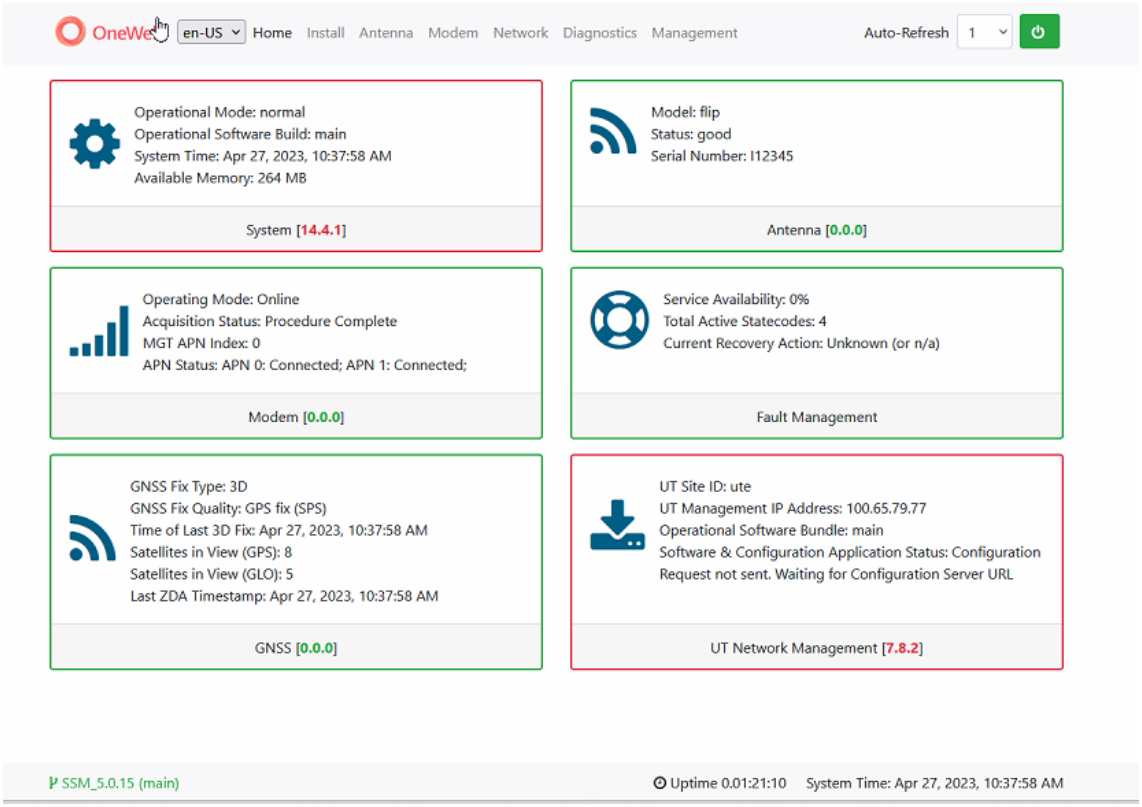

Figure 8: General Status

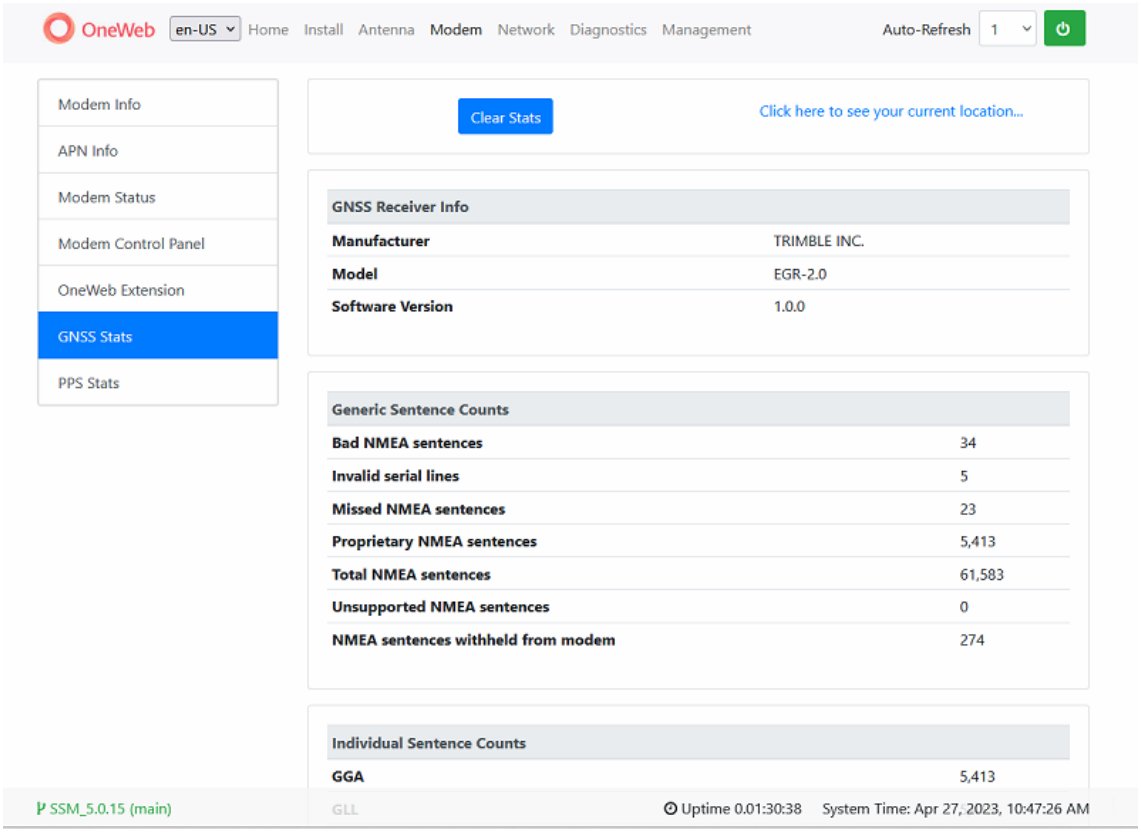

Figure 9: GPS status

3.3.2.4. MODEM LOCK VERIFICATION

Once the warm start procedure is complete (the UT is receiving signal from the satellites), MODEM LOCK LED turns on. If the warm start is restarted, this LED turns off.

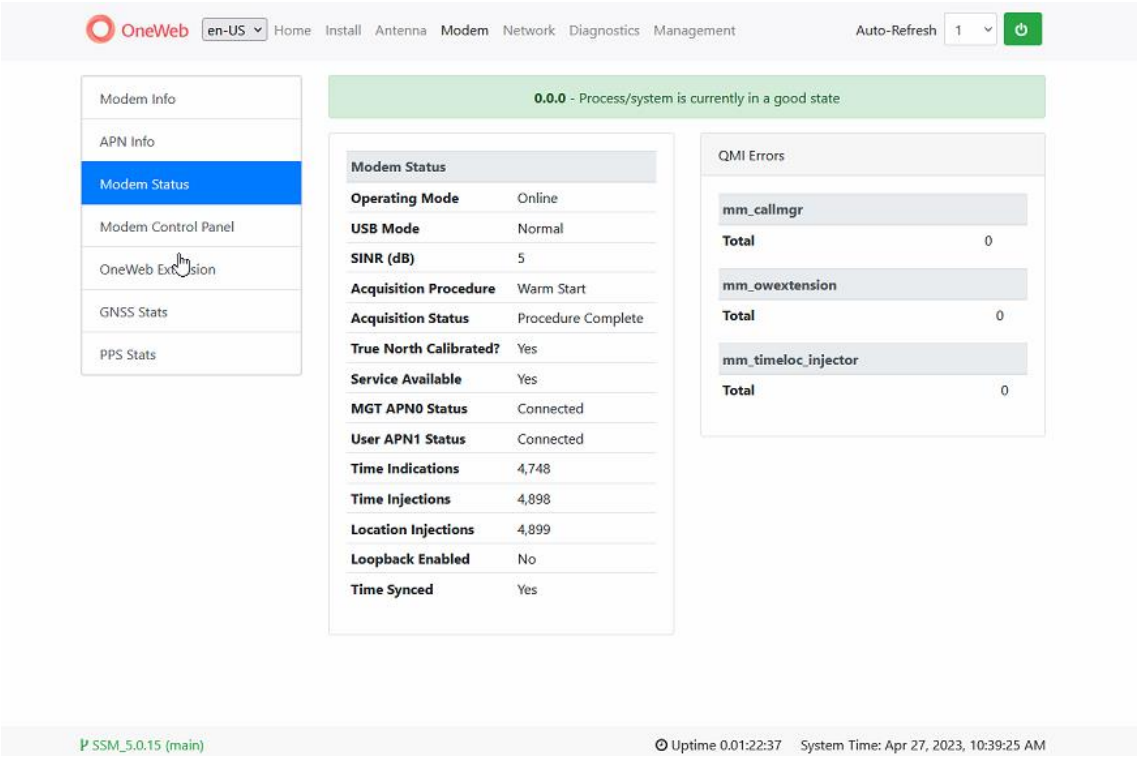

Figure 10: Modem status

When SSM starts transmitting, TX STA LED turns on. If the warm start is restarted, this LED turns off.

When all LEDs are turned on, user can check if connection is established through the SSM LUI. Then, internet through OneWeb network is available.

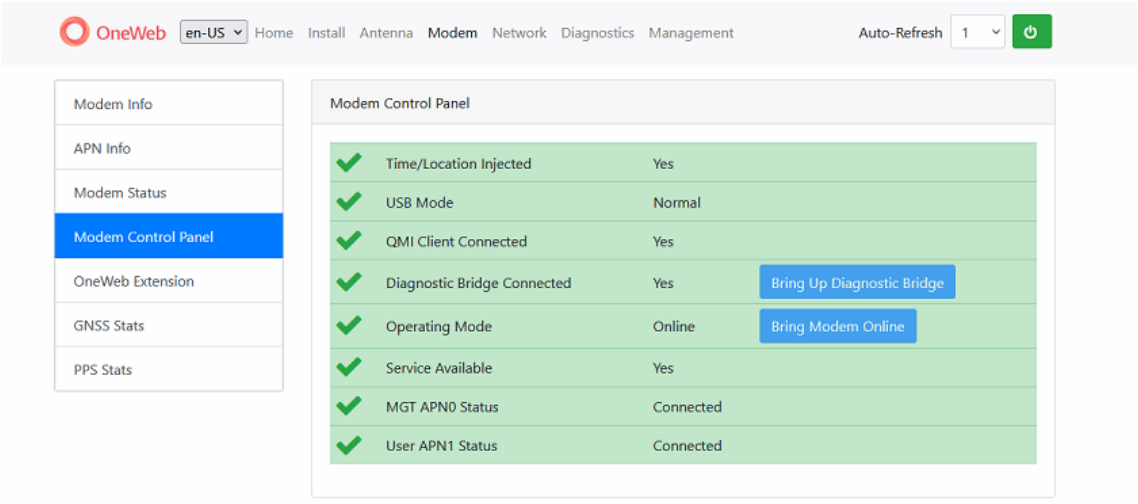

Figure 11: Modem network OK connected

Once the connection is established, the user can check if internet through OneWeb network is available connecting the Wi-Fi router to the J3 ETH connector if it has not been done before. Then, some devices can be connected to the router (**SSID: oneweb_inster**; **password: onewebinster12**) and try to surf the net.

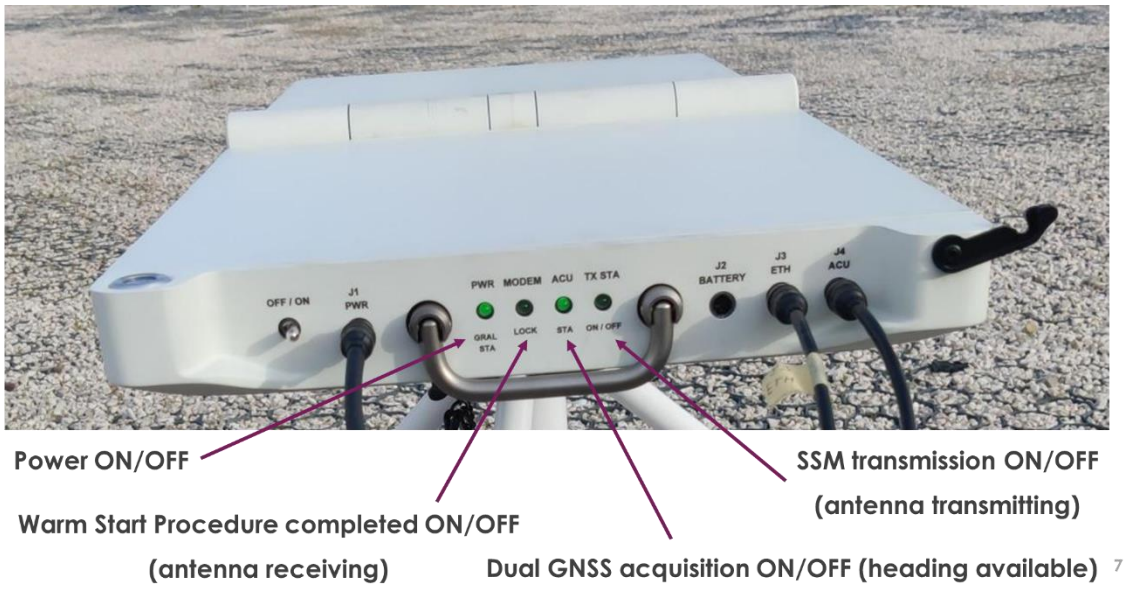

Figure 12: UT LEDs

3.4. FOLDING

When the user finishes using the UT, the procedure to fold it again is:

1. Switch off the UT.
2. Disconnect all cables.
3. Unlock the joint between UT and tripod.
4. Hold the tripod with one foot preferably and lift the UT.
5. Fold the UT and pick up the tripod.