

WTU-518

USER MANUAL



Ahead of the CurveSM



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Guidelines for Safe and Efficient Use:

Read this information before using your WTU-518.

Warnings, Cautions, and Important notices throughout this manual guide you to avoid injury, prevent equipment damage, and determine equipment use when varying components or configurations exist. Notes provide tips or additional information.

SERCEL is not responsible for damages or injuries that result from failure to observe the information provided.



When a Warning or Caution appears with an exclamation-point icon, as shown in this example, this is to indicate possible equipment damage or potential risk of misuse and incorrect operation.



Important notices appear in the manual to highlight information that does not affect the risk of bodily injury, death, or equipment damage, but is nevertheless important. These notices appear with a stop-sign icon, as shown in this example.

IMPORTANT

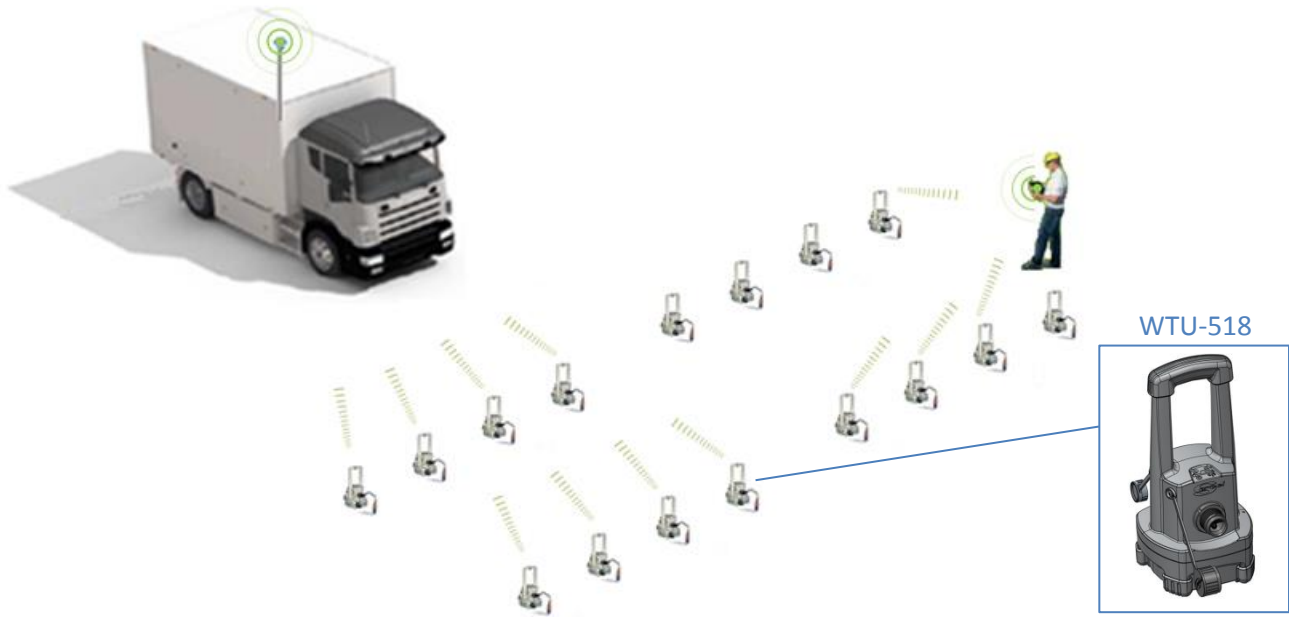


Warranty is void if the product shows evidence of being damaged as a result of disassembly/reassembly by anyone other than qualified, service-trained personnel authorized by SERCEL.

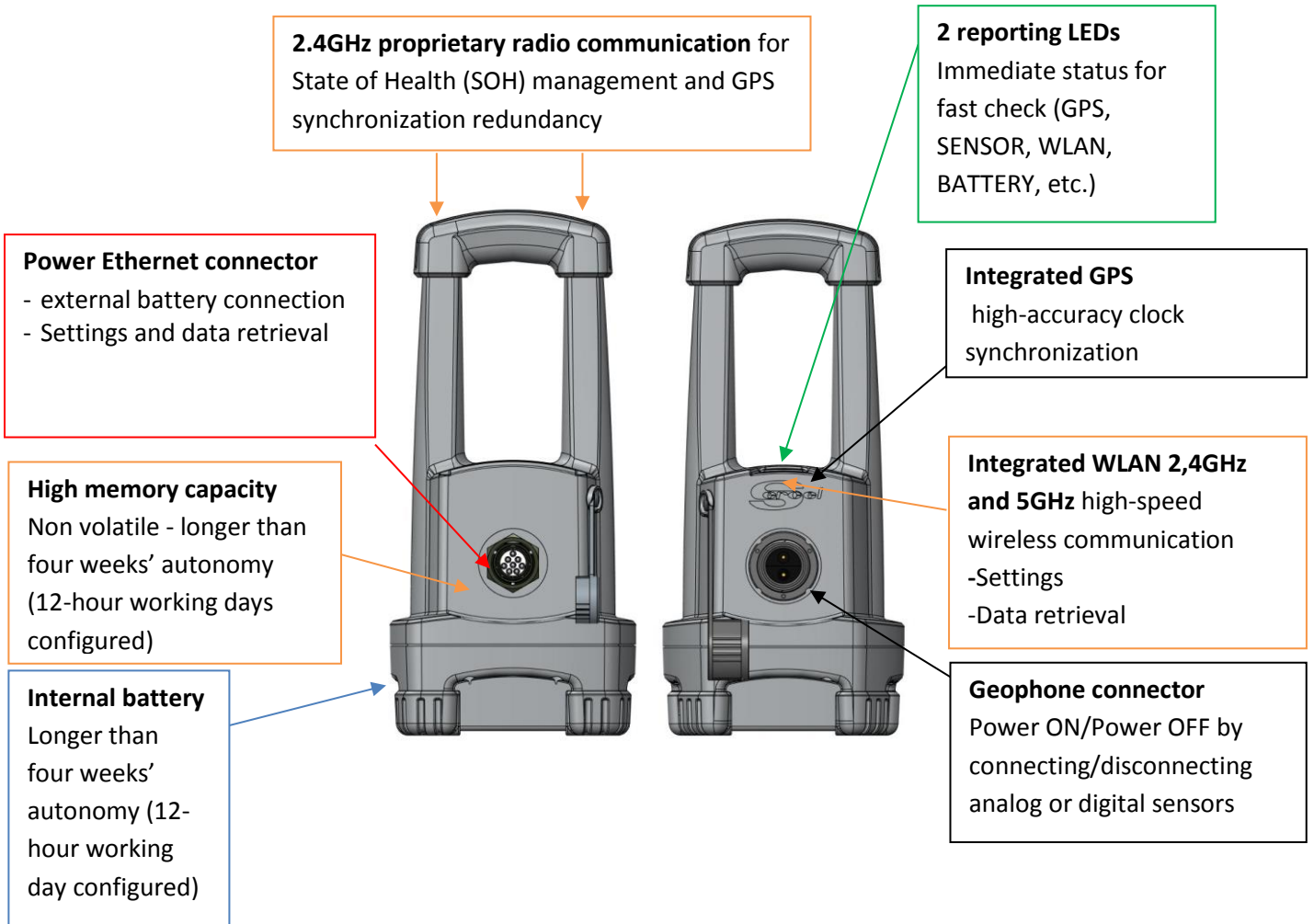
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Description:



The WTU-518 acquires and stores data coming from the analog or digital sensor plugged on its geophone connector. By WLAN or LAN communication links, the WTU-518 transmits these stored data to recorder or field unit's equipment. State Of Health are transmitted through the UNITE system via a 2.4GHz radio communication link.



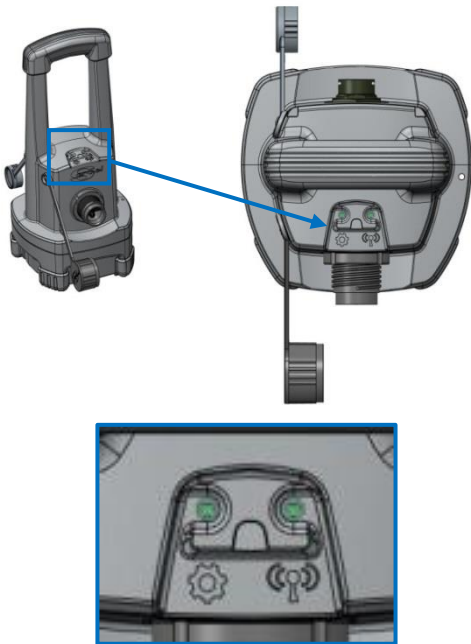
Deployment:

IMPORTANT



Whenever any connector is unused, put its connector protective cap in place.

LEDs Function:



Two LEDs flashing in red



acquisition not started or issue after TTFF timeout

Two LEDs flashing every 1s in green



Harvest and acquisition is running.
GPS is locked or unlocked.

Two LEDs flashing every 4s in green



Acquisition is running.
GPS is locked.

Power / Ethernet port:

This port has two main functions:

- configure the WTU-518 and harvest data by connecting the Ethernet cable supplied by Sercel
- Power the WTU-518 when there is no internal battery, by plugging an external battery, or charge the internal battery by an external battery or a stabilized power supply. This power input works between 11 and 16.8Vdc.

Two kinds of batteries can be plugged on this port:

- Lead-acid battery
 - Lithium-ion battery
-

CAUTION



Use only the power/Ethernet cable, supplied with the WTU-518, to connect it to the battery or other tools.

Input geophone port:

- Power ON/Power OFF of the WTU-518 by connecting/ disconnecting the geophones, analog or digital.
 - Automatic recognition of geophones' types (analog or digital).
-

Configuring the WTU-518:

The user has to program WTU-518 parameters.

In this version of document, only the GPS, WLAN and radio configuration are described.

GPS configuration:

- list of allowed GNSS constellations (QZSS,GALILEO,BEIDOU,GLONASS,GPS)
 - GPS Only is the default mode
 - GPS Only + SBAS
 - GLONASS only
 - GPS+GLONASS+SBAS

- Navigation model
 - Stationary (Default mode)
 - Pedestrian

WLAN configuration:

Set WLAN Regulatory Domain:

Use this menu to choose the appropriate operating frequency bands for compliance with the local regulations of the country in which the radio unit is to be used:

- CE for Europe: 2400-2483.5MHz band, 5.470-5.725GHz

- FCC/RSS for US/Canada: 2400-2483.5MHz band, 5.470-5.725GHz, 5.725-5.825GHz

Set WLAN Access Point Scanning Channel List:

Use this menu to set the channels to be scanned in order to find an Access Point.

In order to avoid interference with 2.4GHz proprietary radio, prefer 5GHz channels

Set WLAN SSID:

Use this menu to set the network name (SSID) which the WTU-518 has to associate to.

Radio configuration:

The radio parameters of the WTU-518 are:

Radio data rates:

The following data rates are supported:

- 100 kbps
The packet duration is up to 22ms. Moreover, the maximum radiated output power is limited to +13 dBm eirp in Europe countries, +16dBm eirp in US (FCC) and Canada (RSS)

- 500 kbps
The packet duration is up to 8.5 ms. Moreover, the maximum radiated output power is limited to +13 dBm in Europe countries, +16dBm eirp in US (FCC) and Canada (RSS).

Set Radio Regulatory Domain:

Use this menu to choose the appropriate maximum radiated output power for compliance with the local regulations of the country in which the radio unit is to be used:

- CE for Europe: +13 dBm eirp at 100 kbps and 500 kbps
- FCC/RSS for US/Canada: +16 dBm eirp at 100 kbps and 500 kbps

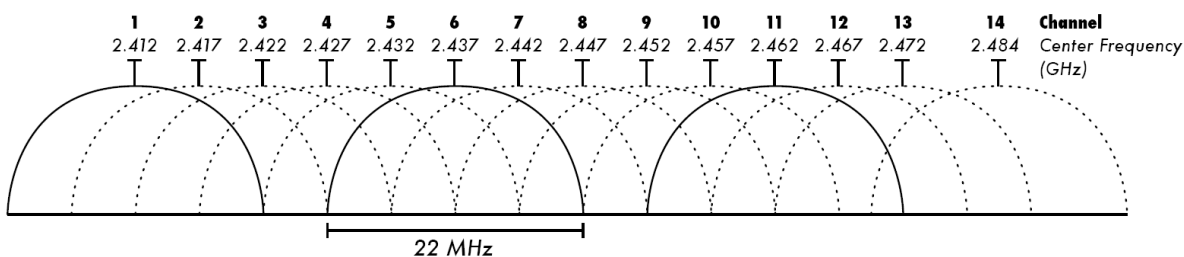
Set Radio frequencies:

Use this menu to choose one of these sets of frequencies used in the Frequency Hopping Spread Spectrum (FHSS):

- 2405-2469 hopset #1 : full 2.4GHz frequency band hopset #1
{2405.5;2409.5;2413.5;2417.5;2420.5;2424.5;2428.5;2432.5;2436.5;2439.5;2443.5;2447.5;2451.5;2455.5;2458.5;2462.5;2466.5 MHz } is the set of frequencies
- 2405-2469 hopset #2 : full 2.4GHz frequency band hopset #2
{2406.5;2410.5;2414.5;2418.5;2421.5;2425.5;2429.5;2433.5;2437.5;2440.5;2444.5;2448.5;2452.5;2456.5;2459.5;2463.5;2467.5 MHz } is the set of frequencies
- 2405-2469 hopset #3 : full 2.4GHz frequency band hopset #3
{2407.5;2411.5;2415.5;2419.5;2422.5;2426.5;2430.5;2434.5;2438.5;2441.5;2445.5;2449.5;2453.5;2457.5;2460.5;2464.5;2468.5 MHz } is the set of frequencies
- 2405-2422 hopset : narrow 2.4GHz frequency band #1
{2405.5 MHz; 2406.5 MHz;....2421.5 MHz }
- 2429-2446 hopset : narrow 2.4GHz frequency band #2
{2429.5 MHz; 2430.5 MHz;....2445.5 MHz }
- 2452-2469 hopset : narrow 2.4GHz frequency band #3
{2452.5 MHz; 2453.5 MHz;....2468.5 MHz }

The hopset has to be chosen to reduce interference with other radio equipment in 2.4 GHz frequency band.

For example, if a Wifi access point is configured at channel 6, the frequency band of the access point is 2426MHz-2448MHz. Thus, the 2405-2422 hopset and 2452-2469 hopset have no interference with this Wifi access point.



Set Radio Security Keys :

Use the Hop Sequence and the Synchro Word keys to secure the WTU-518 network.

Use the Hop Sequence key to limit the interference with another Sercel network. The Hop Sequence key defines a unique frequency sequence. Two different Frequency keys define two frequency sequences, using the same set of 17 frequencies but correlation between the two different sequences is about null.

Use the Synchro Word key to prevent connection to another Sercel network. The radio packets transmitted with a Synchro Word key cannot be received by a Sercel network configured with another Synchro Word key.

Hop Sequence key = 1 (default),...xxx

For example :

Hop Sequence #1 = 10 15 1 6 11 16 2 7 12 3 8 13 4 9 14 0 5;

Hop Sequence #2 = 5 0 14 9 4 13 8 3 12 7 2 16 11 6 1 15 10 ;

Hop Sequence #3 = 0 5 9 14 4 15 10 1 6 11 16 2 12 7 3 13 8

Hop Sequence # = ...

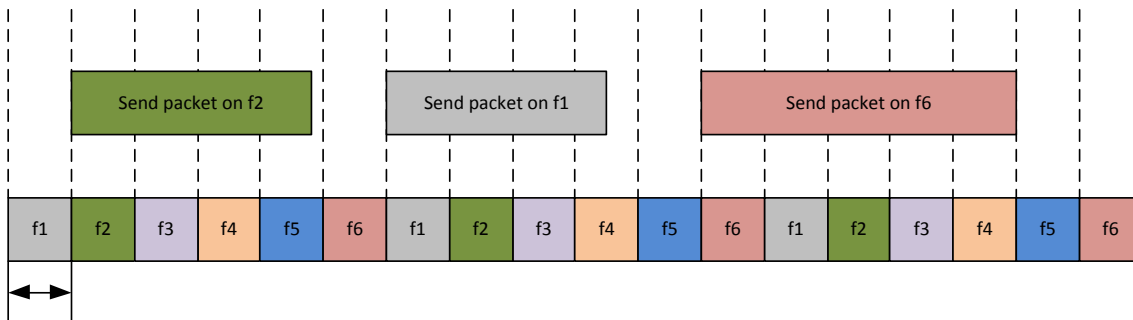
Synchro Word key = 1 (default),...xxx

Description of radio protocol:

The WTU-518 uses a half-duplex transmission protocol with a Frequency Hopping Spread Spectrum (FHSS) method. A mechanism of Listen Before Talk (LBT) is implemented to avoid radio collisions inside the WTU-518 network or with an external radio network. Moreover, two security keys are configured to secure the WTU-518 network.

Frequency Hopping Spread Spectrum (FHSS)

The FHSS operates on a set of frequencies. It will use one frequency for a fixed period of time and then switches to another channel. The next frequency will be given by a pseudo-random sequence. In order to communicate, the transmitter and the receiver have to use the same set of frequencies, the same frequency sequence defined by the Frequency key. FHSS synchronization can be based on the date delivered by the internal GPS receiver or based on the reception of packets issued from another WTU-518.



Example of FHSS based on a set of 6 frequencies

Listen Before Talk (LBT)

The LBT is based on a Channel Control Access mechanism: the WTU-518 measures the Received Signal Strength Indication (RSSI) before beginning packet transmission. If the RSSI is too high, the media is said “busy” and the WTU-518 postpones the transmission for a random backoff time.

IMPORTANT

Prior to connecting any plug, make sure there is no water inside connectors.

Electrostatic discharge:

Use the following guidelines to provide a static-free repair station that will preclude any ESD-related damage to electronic circuits:

- All spare parts (circuit boards and ESD sensitive devices) should be stored and transported in static-shielding bags.
- Unless the repair station rests on a conductive floor, chairs or stools should rest on a grounded, rigid-type, static-dissipative floor mat.
- Use a static-dissipative table mat.
- Wear a static-control wrist strap or foot grounder.
- Provide common-point grounding for all conductive items (including personnel and soldering iron tip).
- To control the discharge rate and protect workers from electric shocks, both the table mat and wrist strap should be grounded through a 1-M Ω resistor. The mat should be connected to the same earth ground point as the wrist strap.
- Wear static-dissipative garments.

Repairs:

WTU-518 disassembly instructions:

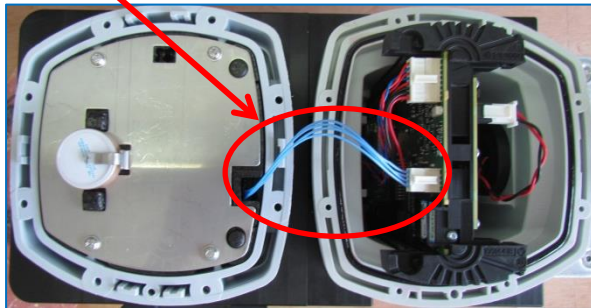
To disassemble the WTU-518, remove the 8th screws visible when the unit is resting upside down.



CAUTION

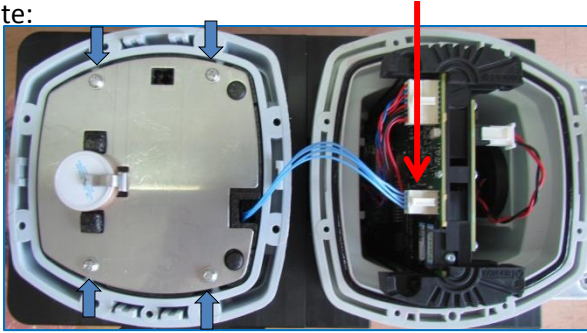


Pay attention to not pull on the internal battery's cables when disassemble the battery's part with the lid.

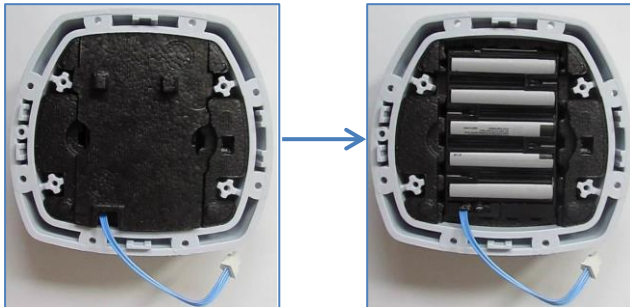


Internal battery replacement:

Disconnect the battery's connector from the WTU-518's board and then, remove the 4th screws placed on the clamping plate:



Remove the holding foam to access the internal battery



CAUTION



Pay attention of the insertion 'direction of the internal battery.

CAUTION



Use only the type of battery specified by Sercel.

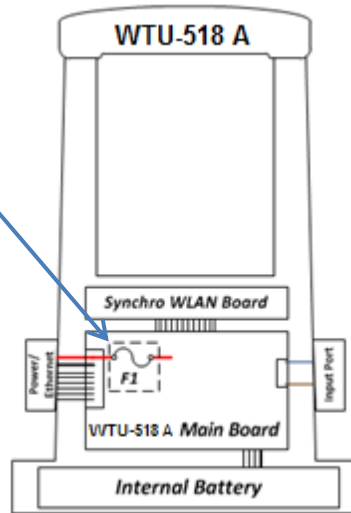
Fuse replacement:

CAUTION



Before to change the out of service fuse, unplug the external battery from the WTU-518 A.

The WTU-518 A has one fuse placed on the hot point on the main board of the WTU-518 A



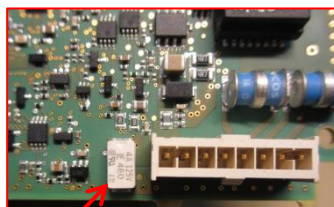
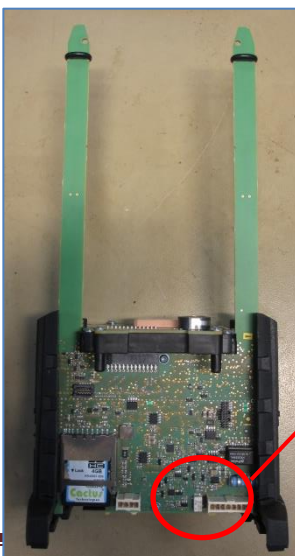
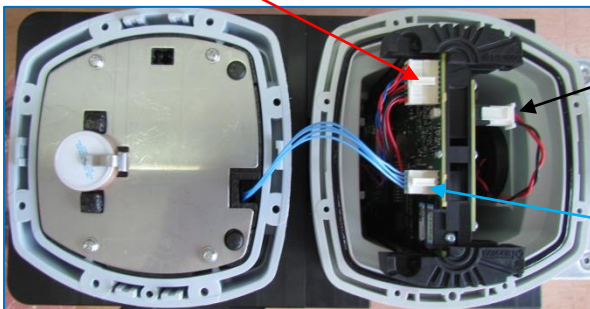
WTU-518 A Main board fuse access:

To access to the fuse placement, disconnect the connectors described below, and then remove the electronic set from the lid:

Power / Ethernet connector

Input Connector

Internal battery connector



Replace the out of service fuse by a new fuse.

CAUTION



Use only this type of fuse:

Constructor: **Littelfuse**

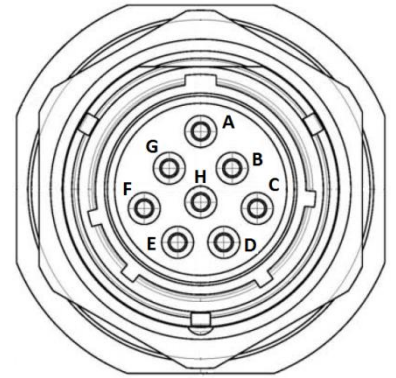
Current rating: **4A**

Constructor reference: **0460.004ER**

WTU-518 connectors:

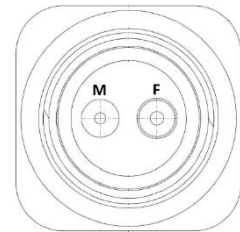
Power / Ethernet connector:

Power / Ethernet plug	Signal Name	I/O type	Other signal
A	+VBAT	In	
B	GND	In	
C	Reset_dongle	In	
D	Ethernet_dongle	In	
E	TX+	Out	
F	TX-	Out	
G	RX+	In	
H	RX-	In	



Input geophone connector:

Input geophone plug	Signal Name	I/O type	Other signal
Femelle	Input_n	In-Out	0V in digital mode
Male	Input_p	In-Out	+5.93V in digital mode



Specifications:

Operating Voltage	11 – 16.8 Vdc
Current consumption	up to 2.5A with 12V external power supply when charging internal battery 10mA with 12V external power supply when no internal battery
Power consumption	120 mW (Typical power consumption) 1,1W (Max power consumption in CE configuration)
Radio data rates	100 , 500 kbps
Radio Frequency Characteristics:	
Frequency band	2405 – 2470 MHz
Spreading method	FHSS
Number of channels	17
Radio Output power	
CE Mode at 100 and 500 kbps	+13 dBm eirp typ
FCC/RSS Mode at 100 and 500 kbps	+16 dBm eirp typ
WLAN standard	802.11 a,b,g ; 802.11n single stream- 20MHz bandwidth
WLAN frequency band	2400-2483.5GHz 5.47-5.725GHz 5.725-5.825GHz (only FCC/IC regulatory domain)
WLAN Output power	
802.11b/g	+19 dBm eirp typ
802.11n 2.4GHz band	+17 dBm eirp typ
802.11a	+15dBm eirp typ
802.11n 5GHz band	+13dBm eirp typ
Supported GNSS Constellations	GPS L1 C/A, GLONASS
Weight	2,1kg
Operating Temperatures	-20°C to +60°C with internal battery 0°C to +40°C when charging internal battery -40°C to +70°C with no internal battery option
Operating Environment	IP68

Regulatory Information:

US:

The FCC ID of the WTU-518 is KQ9-0500A

The WTU-518 contains FCC ID: KQ9-W161A

This device complies with part 15 of the FCC Rules. 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

Note: This equipment 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 a residential installation. 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 communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help

WARNING



This device must be professionally installed.

WARNING



Changes or modifications not expressly approved by Sercel could void the user's authority to operate this equipment.

WARNING



This equipment complies with FCC's radiation exposure limits set forth for an uncontrolled environment under the following conditions :

This equipment should be installed and operated such that a minimum separation distance of 20cm is maintained between the radiator (antenna) and user's/nearby person's body at all times. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.



CANADA:

The IC ID of the WTU-518 is 1317A-0500A
CAN ICES-3 (A) / NMB-3(A)

The WTU-518 contains IC ID: 1317A-W161A

This device complies with Industry Canada's licence-exempt RSSs.

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 of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes :

1. L'appareil ne doit pas produire de brouillage ;
2. l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This equipment should be installed and operated with a minimum distance of 1 cm between the radiator and your body.

Cet équipement devrait être installé et actionné avec la distance minimum 1 cm entre le radiateur et votre corps.

Europe:

Conforms to the essential requirements of the following EEC directives:

R&TTE 1999/5/CE

EMC 2004/108/CE

LV 2006/95/CE

WARNING



The WTU-518 is a class-A device. In residential areas, the user may be requested to take appropriate measures in the event of RF interference caused by this device.

WARNING



The WTU-518 meets the reference level set by the 1999/519/CE recommendation:

Electric field strength in the far field of a radio frequency point source is calculated as follows:

$$E = \frac{\sqrt{30 * P * G}}{d}$$

With: E = Electric field in V/m

P = Maximum average transmit power capability of the radio, in W

G = total Tx gain as a factor, converted from dB

D = distance from the point source, in m

band	P*G	E at 20cm	E limit ⁽¹⁾
WLAN 2.4GHz emission only ⁽²⁾	0.08W (+19dBm)	7.7V/m	61V/m
Proprietary radio 2.4GHz emission + WLAN 5GHz emission	0.02W (+13dBm) +0.032W (+15dBm)	6.2V/m	61V/m

⁽¹⁾ reference level of the table 2 of the 1999/519/CE

⁽²⁾ WLAN 2.4GHz emission and proprietary radio 2.4GHz emission can not happen simultaneously