OTT HydroMet

SUTRON
an OTT HydroMet brand

XLink 100/500 Data Logger

Operational Manual

8800-1218, Rev.4 | 01-2024

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Table of contents

1 Scope of supply

The following items are included with delivery:

- Site controller
- USB-A to micro-USB cable

2 Order numbers and variant code

2.1 Product variants

Variant	Order number
Basic (Logger only)	
XLINK 100 no modem	XLINK100-1
XLINK 100 no modem, NEMA 4-box	XLINK100-1E
XLINK 500 no modem	XLINK500-1
XLINK 500 no modem, NEMA 4-box	XLINK500-1E
EU LTE	
XLINK 100, EU LTE	XLINK100-C3-1
XLINK 100, EU LTE, NEMA 4-box, external antenna	XLINK100-C3-1C
XLINK 100, EU LTE, NEMA 4-box, internal antenna	XLINK100-C3-1E
XLINK 500, EU LTE	XLINK500-C3-1
XLINK 500, EU LTE, NEMA 4-box, external antenna	XLINK500-C3-1C
XLINK 500, EU LTE, NEMA 4-box, internal antenna	XLINK500-C3-1E
Global Cat M1 LTE	
XLINK 100, Global LTE	XLINK100-C6-1
XLINK 100, Global LTE, NEMA 4-box, external antenna	XLINK100-C6-1C
XLINK 100, Global LTE, NEMA 4-box, internal antenna	XLINK100-C6-1E
XLINK 500, Global LTE	XLINK500-C6-1
XLINK 500, Global LTE, NEMA 4-box, external antenna	XLINK500-C6-1C
XLINK 500, Global LTE, NEMA 4-box, internal antenna	XLINK500-C6-1E
North America LTE	
XLINK 100, NA LTE	XLINK100-C7-1
XLINK 100, NA LTE, NEMA 4-box, external antenna	XLINK100-C7-1C
XLINK 100, NA LTE, NEMA 4-box, internal antenna	XLINK100-C7-1E
XLINK 500, NA LTE	XLINK500-C7-1
XLINK 500, NA LTE, NEMA 4-box, external antenna	XLINK500-C7-1C
XLINK 500, NA LTE, NEMA 4-box, internal antenna	XLINK500-C7-1E
Iridium	
XLINK 100, IRIDIUM	XLINK100-IR-1
XLINK 100, IRIDIUM, NEMA 4-box, external antenna	XLINK100-IR-1C
XLINK 100, IRIDIUM, NEMA 4-box, internal antenna	XLINK100-IR-1E
XLINK 500, IRIDIUM	XLINK500-IR-1
XLINK 500, IRIDIUM, NEMA 4-box, external antenna	XLINK500-IR-1C
XLINK 500, IRIDIUM, NEMA 4-box, internal antenna	XLINK500-IR-1E
Iridium DOD (Restricted)	
XLINK 100, IRIDIUM DOD	XLINK100-IRD-1
XLINK 100, IRIDIUM DOD, NEMA 4-box, external antenna	XLINK100-IRD-1C

Variant	Order number
XLINK 100, IRIDIUM DOD, NEMA 4-box, internal antenna	XLINK100-IRD-1E
XLINK 500, IRIDIUM DOD	XLINK500-IRD-1
XLINK 500, IRIDIUM DOD, NEMA 4-box, external antenna	XLINK500-IRD-1C
XLINK 500, IRIDIUM DOD, NEMA 4-box, internal antenna	XLINK500-IRD-1E
Pluggable option cards	
Iridium telemetry pluggable modem card	IRIDIUM-MOD-1
Iridium DOD (restricted) telemetry pluggable modem card	IRIDIUM-MOD-1D
EU LTE telemetry pluggable modem card	CELLULAR-MOD-3
Global LTE telemetry pluggable modem card	CELLULAR-MOD-6
North America LTE telemetry pluggable modem card	CELLULAR-MOD-7
Other	
Externally mounted RF coaxial lightning arrestor to be used on a NEMA-4 enclosure variant (3 ft type N male - n male cable included)	8111-1113-1

2.2 Accessories and spare parts

Spare parts

Item	Order number
Terminal block (2 position, vertical)	3129-1037

3 About this manual

3.1 Other applicable documents

The following documents contain further information on installation, maintenance and calibration:

– Operations & Maintenance Manual SUTRON XLINK 100/500

3.2 General signs and symbols

The signs and symbols used in the operating manual have the following meaning:

Practical tip

This symbol indicates important and useful information.

Action

✓ Prerequisite that must be met before performing an action.

▸ Step 1

⇨ Intermediate result of an action

▸ Step 2

⇨ Result of a completed action

List

– List item, 1st level

– List item, 2nd level

3.3 Explanation of warnings

To avoid personal injury and material damage, you must observe the safety information and warnings in the operating manual. The warnings use the following danger levels:

WARNING

WARNING

This indicates a potentially hazardous situation. If the hazardous situation is not avoided, it may result in death or serious injuries.

CAUTION

CAUTION

This indicates a potentially hazardous situation. If the hazardous situation is not avoided, it may result in moderately serious or minor injuries.

NOTICE

NOTE

This indicates a situation from which damage may arise. If the situation is not avoided, products may be damaged.

4 General safety instructions

4.1 Intended use
The site controller is used to collect, store and transmit sensor data.

4.2 Potential misuse
Any use of the product that does not comply with the intended use, be this intentional or negligent, is forbidden by the manufacturer.

- Use the product only as described in the operational manual.

4.3 Personnel qualification
The equipment described in this manual must be installed, operated, maintained and repaired by qualified personnel only.

- Obtain training from OTT HydroMet if necessary.

4.4 Operator obligations
The installer is responsible for observing the safety regulations. Unqualified personnel working on the product can cause risks that could lead to serious injury.

- Have all activities carried out by qualified personnel.
- Ensure that everybody who works on or with the product has read and understood the operational manual.
- Ensure that safety information is observed.
- File the operational manual together with the documentation of the entire system and ensure that it can be accessed at all times.
- The operational manual is part of the product, forward the operational manual together with the product.

4.5 Personnel obligations
To avoid equipment damage and injury when handling the product, personnel are obliged to the following:

- Read the operational manual carefully before using the product for the first time.
- Pay attention to all safety information and warnings.
- If you do not understand the information and procedure explanations in this manual, stop the action and contact the service provider for assistance.
- Wear the necessary personal protective equipment.

4.6 Correct handling
If the product is not installed, used and maintained correctly, there is a risk of injury. The manufacturer does not accept any liability for personal injury or material damage resulting from incorrect handling.

- Install and operate the product under the technical conditions described in the operational manual.
- Do not change or convert the product in any way.
- Do not perform any repairs yourself.
- Get OTT HydroMet to examine and repair any defects.
- Ensure that the product is correctly disposed of. Do not dispose of it in household waste.

4.7 Risk of burns due to hot surfaces

If the ambient temperature is too high, the metal parts of the housing may heat up (> 60 °C). Touching the housing can cause burns.

- Do not touch the housing.
- Wear protective gloves during installation and maintenance.

4.8 Risks due to radio frequency signals

4.8.1 Risk of exposure to radio frequency

The device contains an internal Wi-Fi module with an antenna and a cellular or iridium option card that have a corresponding transmit antenna. The antennas can cause RF exposure hazard.

- Install the device at least 27 cm away from all persons.
- Install the cellular or iridium antenna at least 27 cm away from all persons.

4.8.2 Health hazard due to electromagnetic fields

Radio Frequency signals generate electromagnetic fields that can cause malfunctions of cardiac pacemakers. This can be life-threatening for users of pacemakers.

- Follow the recommendations and precautions of your medical provider.
- Maintain a safe distance of 27 cm between the device and the cardiac pacemaker.
- Ensure that the transmitter is disabled before approaching the transmit antenna.

4.9 Use of rechargeable batteries

If the device includes a rechargeable battery, the following safety regulations apply:

4.9.1 Risk of fire and explosion due to improper handling

Improper handling of rechargeable batteries can cause serious injury due to fire and explosion.

- Avoid electrical short circuits.
- Avoid mechanical damages.
- Do not open rechargeable batteries.
- Do not expose rechargeable batteries to high temperatures.
- Do not throw rechargeable batteries into fire.
- Do not perform soldering work on rechargeable batteries.
- Protect rechargeable batteries from moisture.

4.9.2 Risk of burns due to accumulator acid

Rechargeable batteries contain highly corrosive acid. This acid can escape through degassing openings or if battery housing is damaged and causes severe burns to skin and eyes.

Observe the following when handling rechargeable batteries:

- Wear eye protection.
- Wear protective gloves.
- Do not smoke.

4.9.3 Observing ambient conditions

Continuously high outside temperatures (>30 °C) can cause damage to the battery housing and accumulator acid can leak. Accumulator acid damages the device and can cause burns to skin and eyes.

- Observe the electrical and climatic limit values given in the specifications.
- Only use rechargeable batteries and chargers that are suitable and specified for the expected climatic conditions. Note that temperatures inside a protective housing that is exposed to direct sunlight can be up to 20 °C higher.
- Provide effective shading for the housing containing the rechargeable battery. The housing must always be shaded during the day.

4.10 Certification

4.10.1 CE

The equipment meets the essential requirements of EMC Directive 2014/30/EU and RED 2014/53/EU.

4.10.2 Wi-Fi module

Contains the following ID:

- FCC ID: OA3RN1723
- IC ID: 7693A-RN1723

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.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

4.10.3 Iridium

Regulatory approvals	Radio tests	Identification
CE	ETSI EN 301 441 V1.1.1 (2000-05)	N/A
FCC	FCC CFR47 parts 2(2013), 15B (2013), & 25 (2013)	Q639603N
Industry Canada	Industry Canada RSS170 Issue 2, March, 2011 Industry Canada RSS-GEN Issue 3, December, 2010	4629A-9603N

FCC Warning Statement

- This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
  - This device may not cause harmful interference.
  - This device must accept any interference received, including interference that may cause undesired operation.
- This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter that is not preapproved.
- Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Industry Canada Warning Statement

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

4.10.4 Cellular compliance information

Cellular version	Description	Radio	FCC ID	IC ID
CELLULAR-MOD-1	Verizon LTE modem	NL-SW-LTE-TSVG	RI7LE910SV	5131A-LE910SV
CELLULAR-MOD-3	EU LTE modem	NL-SW-LTE-TC4EU	–	–
CELLULAR-MOD-5	HSPA+ Global	NL-SW-HSPA	RI7HE910	5131A-HE910
CELLULAR-MOD-6	LTE Global	NL-SW-LTE-QBG95	XMR201910BG95M3	89148000005976205013
CELLULAR-MOD-7	North America LTE	NL-SW-LTE-TC4NAG	RI7LE910CXNF	5131A-LE910CXNF

The cellular option card can be found in the option card slot, see section Installing option card [▶ 23]. The FCC ID is located on the modem serial label on the back side.

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

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

FCC Warning Statement

This device complies with Part 15 of the FCC Rules and Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

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

While these modems with our cellular option cards will work with other antennas from other manufacturers, we recommend the following antennas as they have been tested with our products:

Manufacturer	Part number
Laird	TRA6927M3
Pulse Larsen	SB698MAXX

FCC Class A digital device notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

5 Product description

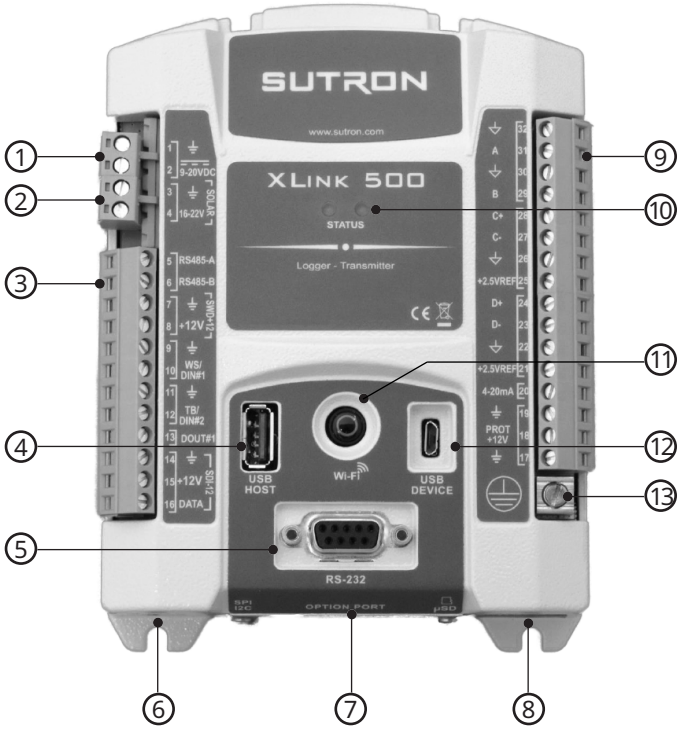
5.1 Design and function

The XLink devices are site controllers with optional built-in cellular or irdium modems.

The devices have been designed for hydrometry, meteorology, and environmental monitoring, and provide the following functions:

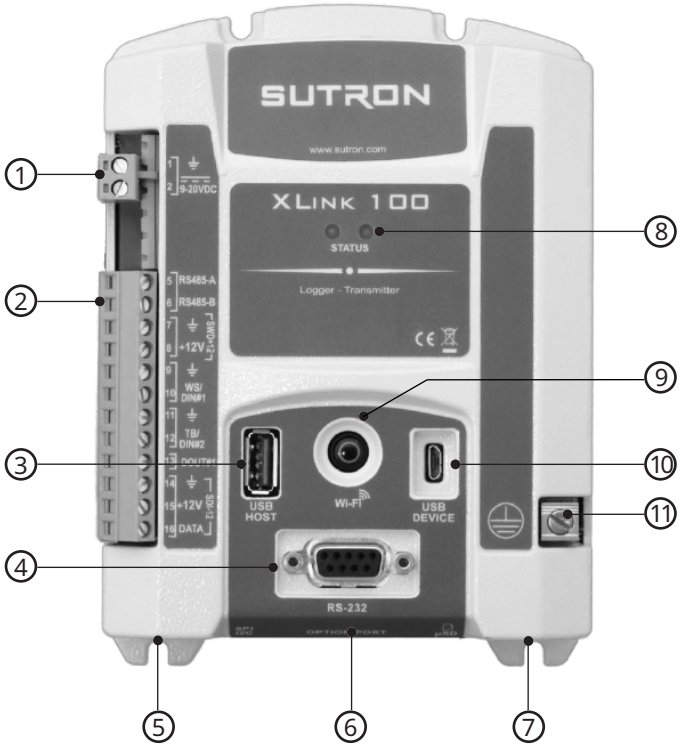
- Make measurements from sensors monitoring the environment.
- Perform special calculations.
- Record data into non-volatile memory.
- Transmit data to automated receiving systems.

5.2 Product overview



XLink 500 connections

1	Power or battery	8	Micro SD slot
2	Solar panel input	9	Right terminal strip
3	Left terminal strip	10	Status LED
4	USB Host	11	Multi-function button: Wi-Fi, reboot
5	RS-232 to PC	12	USB Micro to PC
6	SPI/I2C expansion port	13	Earth ground
7	Option card slot		



XLink 100 connections

1	Power or battery	7	Micro SD slot
2	Left terminal strip	8	Status LED
3	USB Host	9	Multi-function button: Wi-Fi, reboot
4	RS-232 to PC	10	USB Micro to PC
5	SPI/I2C expansion port	11	Earth ground
6	Option card slot		

5.2.1 Multi-function button

The multi-function button can be used to set up Wi-Fi and reboot the device.

- Press the button briefly to turn on the Wi-Fi.
- To reboot the device, press the button for 5 seconds.
  - ⇨ The status LED lights up red.
- Keep holding the button until the red LED turns off.

⇨ The device reboots.

5.2.2 Status LEDs

The status LEDs give information on how the device is operating. The following table describes the different colors and states of the LEDs.

Status	Top left LED	Top right LED	Multi-function button
Device is operating properly	Green blink every 5 seconds	–	–
Device has a setup or operating error	–	Red blink every 3 seconds	–

Status	Top left LED	Top right LED	Multi-function button
Multi-function button pressed	–	–	Fast flashing blue
Wi-Fi turned on but no one connected	–	–	Blue blink every 3 seconds
Active Wi-Fi connection	–	–	Solid blue
Transmitting	–	Solid blue	–
Power fail imminent	–	Red flash 9 Hz	–
Unit is in test mode	Green blink every second	Red blink every second	–
USB thumb drive operation	Amber blink while operation is in progress. Green LED on solid if operations complete successfully.	Red LED on solid if operations fails.	–

Power on sequence

When power is applied to the device, the following light sequence will take place:

1. Immediately after power on, the system software will briefly blink amber and purple LEDs.
2. As the system completes bootup, it will light up in a colorful sequence: Multi-function button, green, blue, amber, purple, amber, green, all off.
3. As the system continues to operate, it will either blink red (indicating errors) or green (system running).

A failure of the system to display the power on sequence indicates either a problem providing power to the device, or a hardware failure that requires repair.

5.2.3 RS-232 connection

The RS-232 port is a standard DB9-F connection for serial communications to a PC and can be used for setup, maintenance, and troubleshooting. The RS-232 port has a default baud rate of 9600 (No parity, 8 data bits, 1 stop bit, HW flow control) but other baud rates are supported. The port may also be used for collecting data from Modbus sensors. Python scripts may use the RS-232 port in order to drive displays, send data to modems, or communicate with other devices.

- Activate DTR to talk to the device via RS-232.
- Ensure that the device does NOT go into low power mode while DTR is asserted.

5.2.4 USB Micro (OTG) connection

The USB OTG port is the primary port for connecting to a PC. The USB port is a micro-B and compatible with a standard micro-B to Type A male USB cable that works with most PC's. The primary use of the connection is to allow the PC to setup, maintain and troubleshoot the device. The PC will typically run LinkComm software to configure the device.

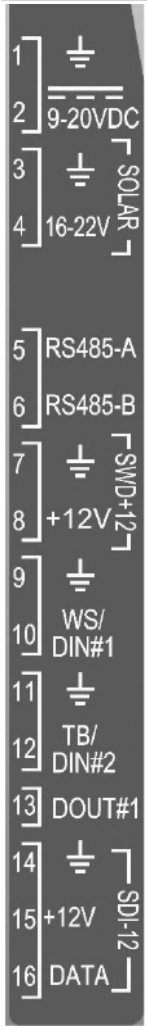
5.2.5 USB Host connection

The USB Host connection is used to download sensor data or update the firmware in the device using a USB flash drive (USB thumb drive). Plugging in a flash drive will automatically download all logged data since the last download and store the log on the flash drive. It will also store station setup and status on the flash drive. The flash drive can be used to change station settings, update the firmware and execute a batch file.

5.2.6 Left terminal strip

XLink 500 has two terminal strips to provide the connections for sensors and outputs. XLink 100 has only one terminal strip on the left side.

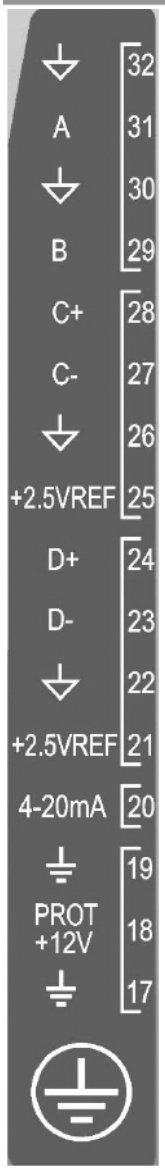
The table below describes the purpose of each connection on the left terminal strip for XLink 500 and XLink 100:

Left terminal strip	No.	Connection	Description
	1	GND	Main battery or power ground
	2	9– 20VDC	Main battery or power
	3	GND	Solar panel -
	4	16-22V	+ Solar (20 W max) Solar panel +
	5	RS485-A	SDI-12 over RS-485, Modbus over RS-485
	6	RS485-B	SDI-12 over RS-485, Modbus over RS-485
	7	Ground	Ground
	8	+12V	+SW Power Switched main power (9 – 20 V DC) Turned on during warm-up and analog sensor measurement
	9	Ground	Ground
	10	WS/DIN#1	WS/DIG IN 1 Wind speed or digital input 1
	11	Ground	Ground for sensor
	12	TB/DIN#2	TB/DIG IN 2 Tipping bucket or digital input 2
	13	DOUT#1	Digital output Open collector, turned on manually, with alarms, or via equations
	14	Ground	Ground
	15	+12V	SDI-12 PWR Isolated main power (9 – 20 V DC) to SDI-12 sensors (500 mA max)
	16	DATA	SDI-12 DATA

5.2.7 Right terminal strip

No connections except for earth ground are available on XLink-100.

The table below describes the purpose of each connection on the right terminal strip on XLink-500:

Right terminal strip	No.	Connection	Description
	32	Analog ground	Analog ground
	31	A	0 –5 V A Voltage input for sensors with 0 – 5 V output
	30	Analog ground	Analog ground
	29	B	0 –5 V B Voltage input for sensors with 0 – 5 V output
	28	C+	Diff C+ Differential voltage input for bridge type sensors
	27	C-	Diff C- Differential voltage input for bridge type sensors
	26	Analog ground	Analog ground
	25	+2.5VREF	VREF 2.5 V output Turned on during warm-up and analog sensor measurement
	24	D+	Diff D+ Differential voltage input for bridge type sensors
	23	D-	Diff D- Differential voltage input for bridge type sensors
	22	Analog ground	Analog ground
	21	+2.5VREF	VREF 2.5 V output Turned on during warm-up and analog sensor measurement
	20	4-20mA	4 –20 mA input
	19	GND	Ground
	18	PROT +12V	Isolated main power, 0.75
	17	GND	Ground
	⏚	Earth ground	Attach via a heavy gauge (4 to 10 AWG) wire to earth ground rod driven 6 feet into earth.

5.3 Symbols on the product

Symbol	Meaning
	Direct current
	Protective earth ground Connection to an earth ground electrode for lightning protection of internal components
	Digital ground Connection to the digital sensor ground, negative terminals of the batteries and the solar panel
	Signal ground Connection to analog sensor ground
	Chassis ground
	With this symbol, the manufacturer declares the conformity of the product with the applicable EU directives.
	Do not dispose of in the trash.

6 Transport, storage, and unpacking

6.1 Unpacking

- Carefully remove the product from the packaging.
- Check that the delivery is complete and undamaged.
- If you find any damage or if the delivery is incomplete, then immediately contact the supplier and manufacturer.
- Keep the original packaging for any further transportation.

6.2 Storage

- Store within specified temperature ranges.
- Store in dry area.
- Store in original box where possible.

7 Installation

7.1 Mechanical installation

7.1.1 Requirements of the installation site

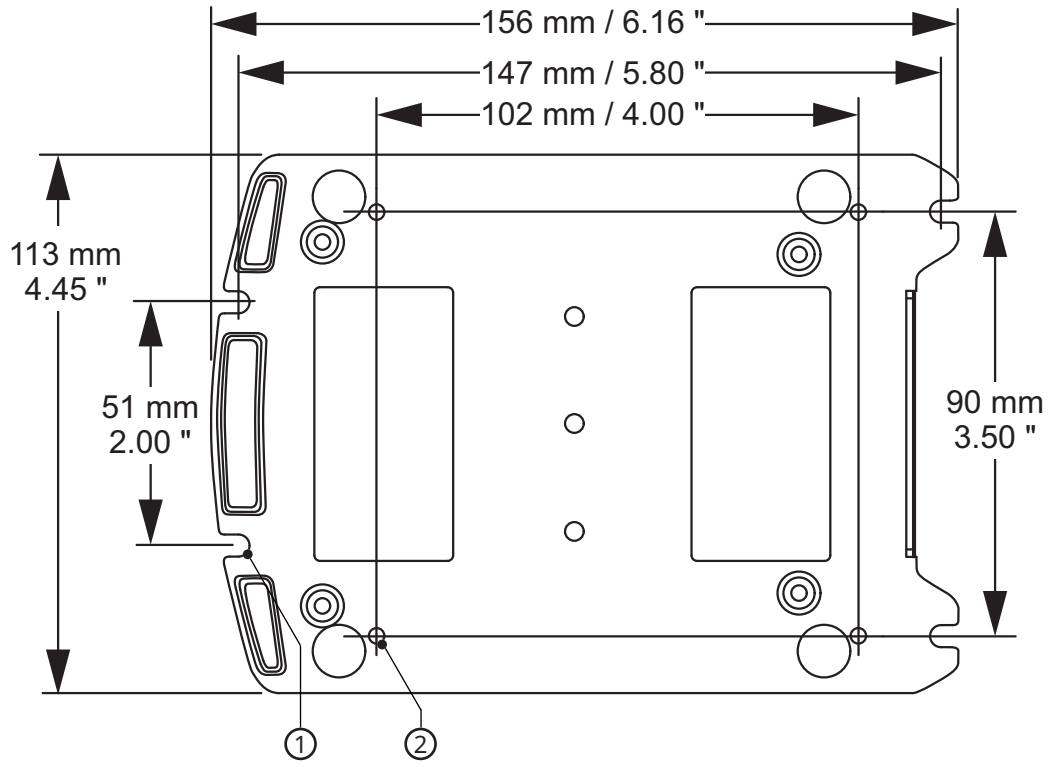
The following requirements apply to the installation site:

- Sufficient protection from moisture for an IP 41 device
- Proper space for the electrical cables
- Battery cable with an inline fast fuse to handle current up to 5 A
- Temperature range -40 °C to +70 °C.
- Space for installation using the mounting ears
- Earth ground point
- Closed control cabinet or fire protection cabinet if the power supply is not a low power source 12 – 20 V DC.
- Ventilated housing for the rechargeable battery if no NEMA housing is used.

i A minimum 70 °C rated cable or wire is recommended to be used for installation.

7.1.2 Installing device

The following dimensions must be observed when installing the device:

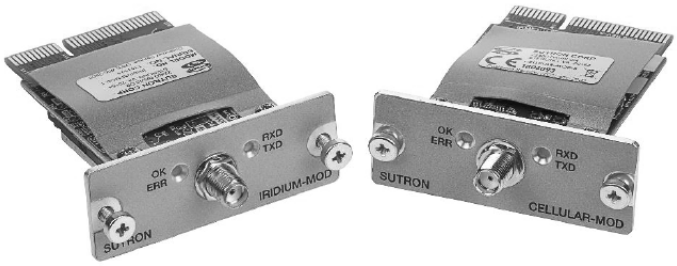


1 Panel mounting slots (# 8 screw)

2 NEMA mounting bracket holes (#4 –40)

7.1.3 Installing option card

The device may be ordered with either a cellular card or an iridium card from the factory which will be preinstalled into the device.



If the option card is replaced, proceed as follows:

> If a cellular card is used, the modem must have a SIM card.

- Remove power from the device and disconnect the USB cable.

- Remove the 2 screws holding the option card in place and remove the card.
- Slide the new option card into the open port.
- If necessary, loosen the 2 screws on the option card slightly to allow the card to slide fully into the slot.
- Ensure that the option card sits fully in the slot.
- Screw in the 2 screws to fix the option card in place.
  - ⇨ The option card is fully installed.
- Switch on the power.
  - ⇨ The new option card is automatically detected.
- To verify the option card navigate in LinkComm to the *Diagnostics* tab and look in the *Firmware Versions* box.
- Attach the sticker with the IMEI number outside of the device.
- Activate your modem and data plan by contacting your provider and supplying them with the IMEI number.
  - ⇨ The activation process may take 30 minutes or more.
- Ensure that the antenna is connected.

7.1.4 Installing SIM card

NOTICE

Damage due to dirt or smudges!

Dirt and smudges can damage the SIM card.

- Handle the SIM card with clean hands.

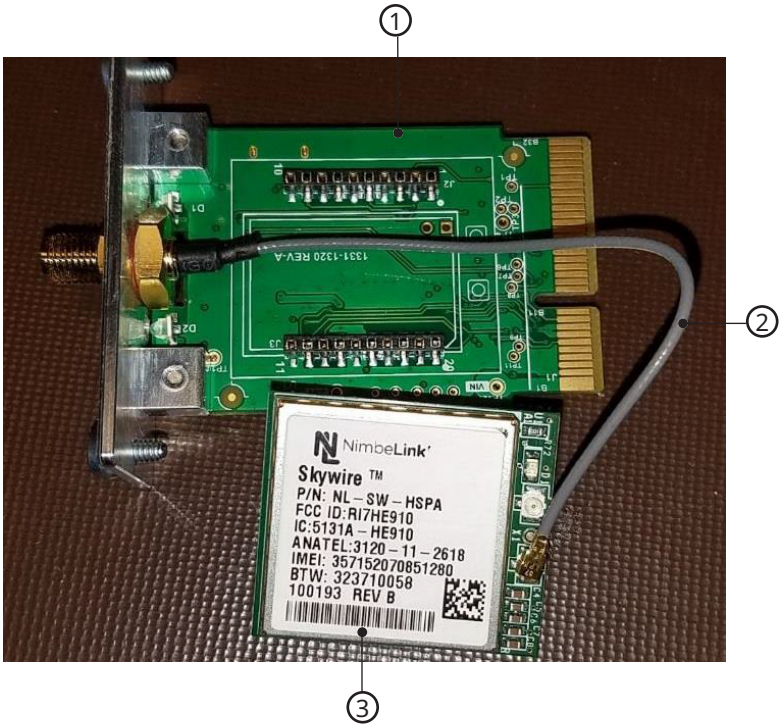
NOTICE

Damage due to unclean environment!

Dirt accumulation can damage the modem and cause Electro Static Discharge (ESD).

- Handle the modem in a clean environment.

Sutron Cell modems only support micro SIM cards.



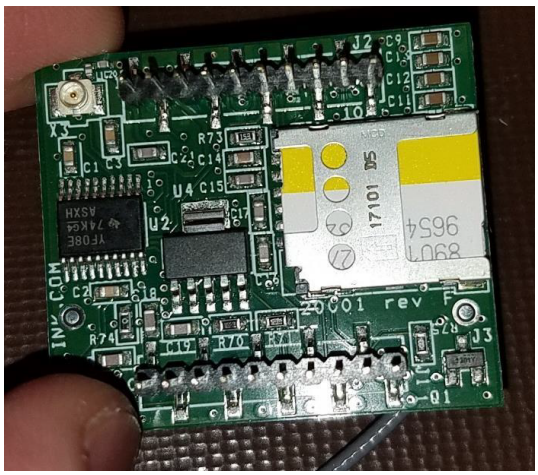
1	Carrier board	3	Modem board
2	U.FL cable		

- If the modem board is installed in XLink 100/500, remove power to XLink 100/500, and carefully pull the cellular board out.
- Remove the modem board from the carrier board carefully.
- Flip the modem board carefully, without much stress on the U.FL cable.

- If there is a SIM card, remove it.

- Insert the new SIM card.

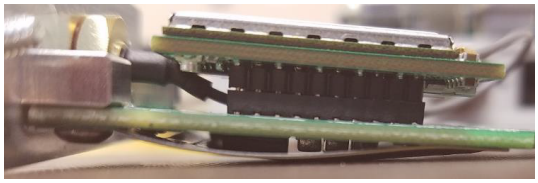
- Push the SIM card all the way into the SIM card slot.

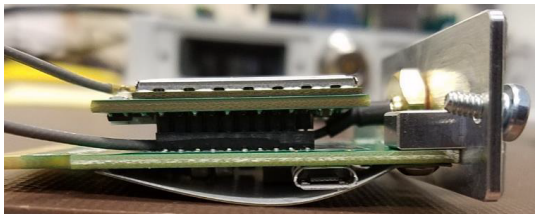


- Flip the modem board to correctly align the modem with respect to the carrier board.

- Ensure that the U.FL cable ist placed correctly.

- Align the pins on the modem board and gently push the modem into the carrier board.





- Use LinkComm “Cell Diags” to verify that the new SIM card is working correctly.

7.2 Electrical installation

7.2.1 Connecting to earth ground point

NOTICE

Damage due to surges!

If the earth ground point is not connected properly, this may result in surges that can damage the device.

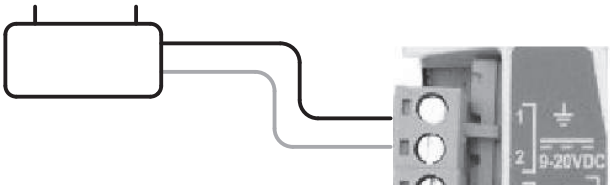
- Connect the earth ground point to a suitable ground at the site.
- Do not rely on AC power ground connections as they are not always properly grounded.

Connection point for earth ground

- Use a copper ground rod driven into the ground at least 2 m (6 feet).
- Attach a 4-gauge copper wire between the rod and the earth ground point on the device.
- If the copper wire has a larger cross-section, use a reducer for the connection to the terminal on the device.
- Tighten the screw at the earth ground point firmly onto the copper wire.

7.2.2 Connecting battery to power supply

- Connect the battery or power source (9 – 20 V DC) to the device across the terminals 1 and 2. The battery cable must have an inline fast fuse to handle current up to 5 A.



- Ensure that the power supply is properly rated.
- Ensure that all wires are properly attached to the terminal strips.
- After all sensors are connected, switch on the power.

⇨ As soon as power is applied, the LED will flash as the device goes through a self-test sequence.

⇨ The green LED flashes when the device is running without problems.

⇨ The red LED flashes if there is a problem.

i The red LED flashes when power is first applied. Once the device has verified good network signal, the green LED flashes.

7.2.3 Connecting to PC

For USB connection:

- Connect the PC to the USB micro port of the device using a micro USB cable.

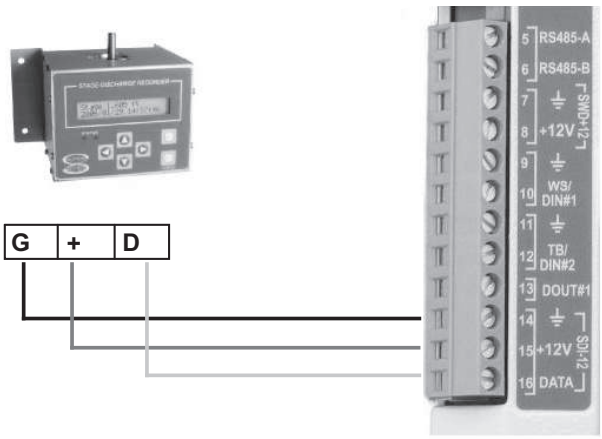
For Wi-Fi connection:

- Press the Wi-Fi button on the device to turn on the XLink 100/500 hotspot.
- Select on the PC the Wi-Fi network from *Network Connections*.

7.2.4 Connecting SDI-12 sensors

There is an SDI-12 bus for sensor connections. The bus has an isolated power connection rated for 500 mA. SDI-12 sensors are addressable. If no two sensors have the same address, multiple SDI-12 sensors can be connected to the terminal strip.

- When connecting multiple new SDI sensors to a bus, connect them one at a time. So the address can be made unique using the SDI A command.



Typical SDI-12 connection

7.2.5 Connecting RS-485 sensors

The RS-485 bus is used to collect data from sensors. Alternatively, it can be used to have a Modbus client collect data from the station.

When connecting an RS-485 sensor, the following applies:

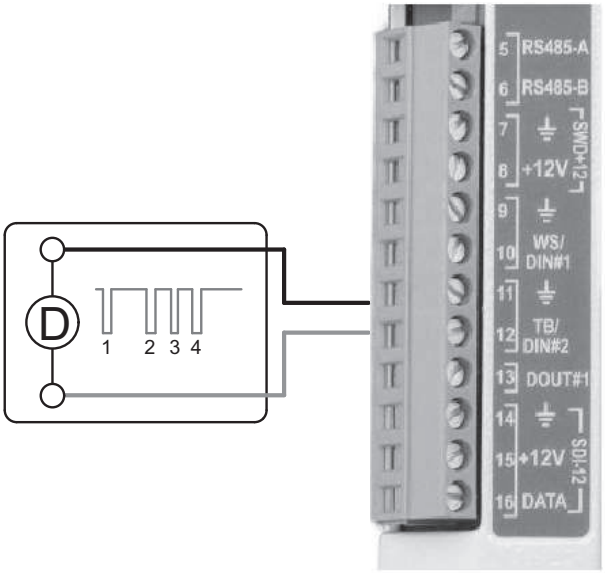
- RS-485 sensors that use the SDI-12 protocol for its messaging are supported.
- Collecting data using the Modbus protocol over RS-485 is supported,
- Multiple devices can be attached on the RS-485 bus; each of those devices must have a different address.
- SDI-12 sensors and Modbus sensors can be mixed on the RS-485 bus.

Wiring RS-485 involves two lines: RS-485 A and RS-485 B:

- If there is an issue talking to a sensor over RS-485, try reversing the A and B wires.
- If a Modbus sensor is not responding, ensure that the Modbus communications settings in XLink match the sensor settings.

7.2.6 Connecting tipping bucket

A tipping bucket rain gauge is supported via the TB/DIN#2 connection. This connection provides a pull-up resistor (100 K) to 3.3 V to provide power for the contact switch in the rain gauge. Each time the bucket in the rain gauge “tips” the internal switch closes momentarily causing a pulse on the TB/DIN#2 connection. This pulse is counted and used to provide accumulated precipitation or precipitation rate data.



Typical connection of the tipping bucket rain gauge

8 Commissioning

8.1 Installing and running LinkComm

LinkComm is a application used to view status and configure OTT HydroMet data loggers .

LinkComm is used to:

- Check status and measurement data
- Set up configuration
- Download the log and graph the data
- Perform diagnostics (e.g. send a command, set the time)
- Upgrade the firmware

8.2 Installing LinkComm

LinkComm can be installed on PC and MAC. Mobile versions are available in the respective app stores.

Install LinkComm on PC or MAC as follows:

- Download the required version of LinkComm: www.otthydromet.com/en/software_firmware
- Unzip LinkComm to its own folder.
- Run *setup.exe*.
- If USB drivers are needed, run *Install USB Drivers* from *Start Menu – LinkComm*, or run *install-usb.bat* in the download folder.

Install the mobile version as follows:

- Open the Apple App Store or Google Play Store.
- Search on LinkComm.
- Select *Install*.

8.3 Running LinkComm on Windows

LinkComm may be run directly from the download folder.

- To run LinkComm select: *Start Menu – Link Comm – LinkComm.exe*.
- If *LinkComm.exe* does not appear to start properly, try running either *LinkComm.exe (DirectX)* or L*inkComm.exe (SoftOpenGL)* from the Start menu.

8.4 Getting connected

When LinkComm is opened for the first time, the stations list view appears and *New Station* is selected by default.

- If the station list does not appear on small displays, use the *Stations* link to see the list and select *New Station*.

- Specify the *Station type*, e.g. *XLink 100* or *XLink 500*.
- Go to the section *Connection Settings* and configure to connect to the station. For further explanations, see below.
- After configuring the *Connection Settings*, use the **Connect** button.

Setting	Description
USB	Select this option to connect to XLink 100 or XLink 500 via USB.
Station Wi-Fi	Select this option if the data logger's Wi-Fi is active and within range. If the Wi-Fi is not active, do the following:

Setting	Description
	▸ Press the XLink Wi-Fi button. ▸ Use the device's network settings to connect to the station's Wi-Fi.
Serial	Select this option to connect to station via serial cable. XLink uses a virtual serial port over USB.
Redirector	Select this option if the data logger has been set up access via the Sutron Redirector services. ▸ Set *User name* and *Password* to the values provided by Sutron ▸ Select the *Station name*.
Check setup on connect	Visible for Redirector connections, only. When this option is activated, LinkComm checks the station's setup content for each connection to alert of differences. ▸ Disable this feature to reduce data costs.
Get recent data on connect	When this option is activated, LinkComm downloads the last week's data each time a connection is made to graph it on the *Dashboard* tab. This can be a lot of data. ▸ Disable this feature to reduce data costs.

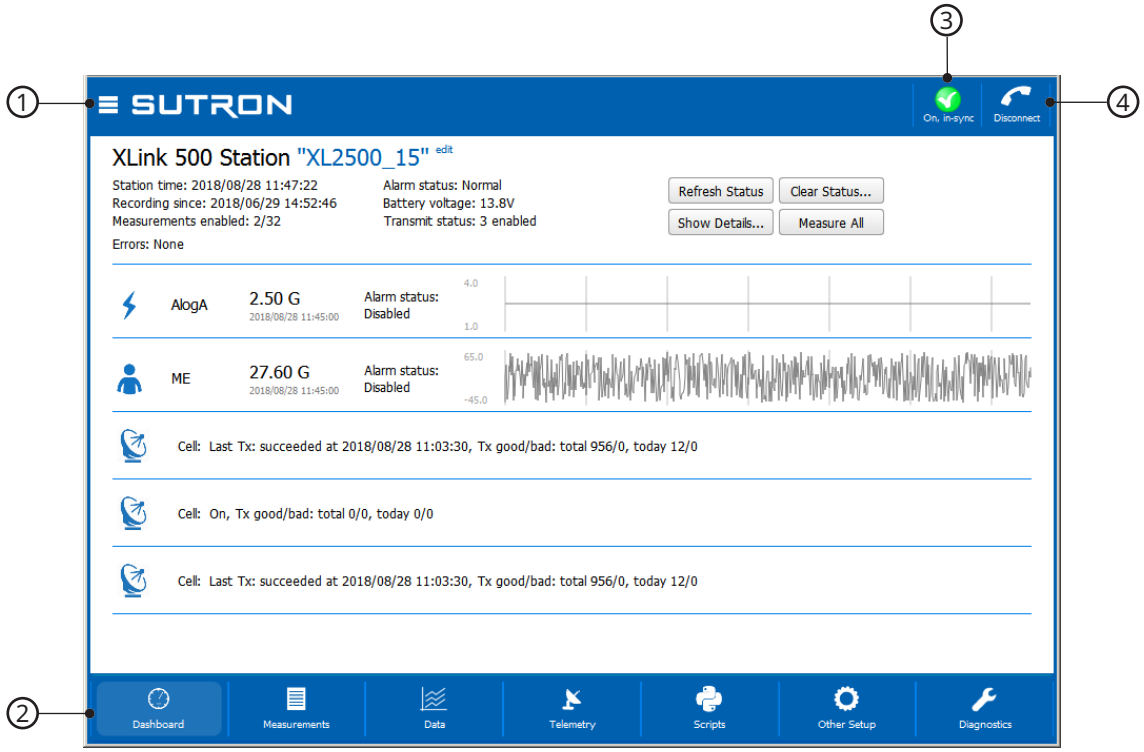
8.5 Working offline

When choosing the **Work Offline** button in the stations list view, instead of the **Connect** button, LinkComm enters offline mode. In this mode, LinkComm does not try to communicate with a data logger over the network. This mode is useful for making changes to setups that are later loaded into a station.

ℹ Changes made in offline mode are not saved in the data logger.

8.6 Station view

After LinkComm is connected to a station, the station view appears.

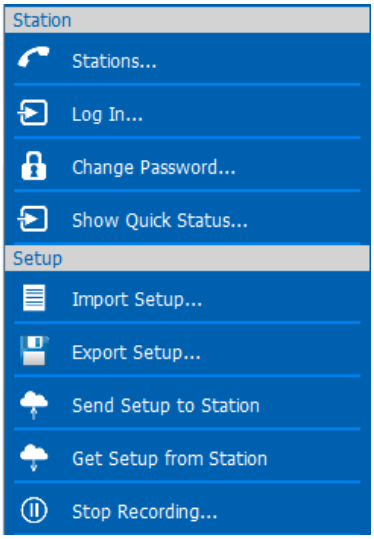


1	Main menu	3	Setup status button
2	Tabs	4	Disconnect / Connect button

8.6.1 Main menu

The main menu shows different options, depending on whether LinkComm is connected to a station or working offline.

- Use the  in the upper left to access the main menu.



Main menu in station view

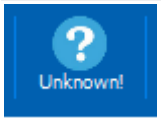
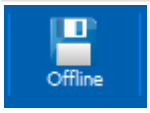
8.6.2 Tabs

Depending on the product variant, different tabs are displayed.

- Use the Tab buttons to select the different tabs, such as:
  - Dashboard
  - Measurements
  - Data
  - Telemetry
  - Scripts
  - Other Setup
  - Diagnostics

8.6.3 Setup status button

The button shows the setup status and whether LinkComm and the station have the same status. After making changes to the setup locally, the changes must be sent to the station.

Button	State	Action
	LinkComm is connected to the station, recording is ON, and the setups are “in-sync”.	▸ Use the button to turn off recording. ⇨ LinkComm will prompt for confirmation.
	A change has been made to the setup in LinkComm. It no longer matches the setup in the station.	▸ Use the button to send setup changes to the station. ⇨ LinkComm will prompt for confirmation: – Yes: Only the changes required to be “in-sync” are sent. – No: LinkComm prompts to retrieve the setup from the station, overwriting local changes.
	The setup in the station is unknown, and so may differ from the one displayed by LinkComm.	▸ Use the button to send the setup to the station. ⇨ LinkComm will prompt for confirmation: – Yes: LinkComm sets the setup in the station to defaults, and then sends the changes required to be in sync.
	Recording is OFF in the station. No measurements are being made.	▸ Use the button to turn recording ON in the station. ⇨ LinkComm will prompt for confirmation.
	LinkComm is working offline. Not connected to the station.	▸ Use the button to connect to the station.

8.6.4 Disconnect / connect button

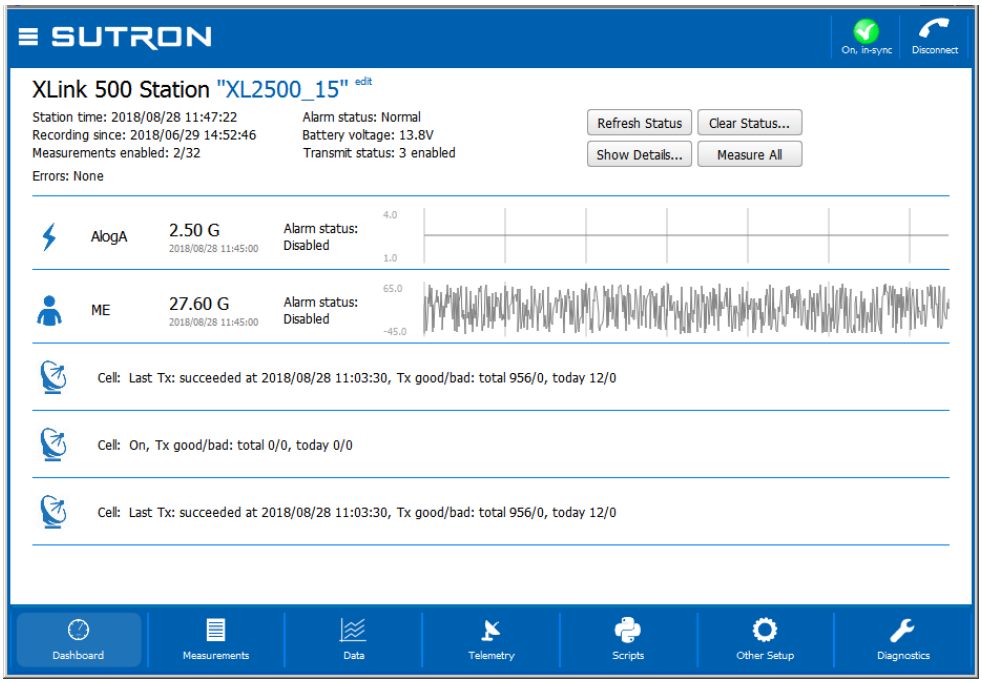
The button shows the status of the current connection from LinkComm to the station.

Button	State	Action
	LinkComm is connected to the station.	▸ Use the button to disconnect LinkComm from the station.
	LinkComm is not connected to the station.	▸ Use the button to connect LinkComm to the station.

8.7 Viewing station status

The Dashboard tab shows the status of the data logger.

▸ Select the *Dashboard* tab.



▸ Use the **Refresh Status** button to refresh the status displayed.

▸ Use the **Clear Status** button to reset all status data like error counts, etc. This cannot be undone.

▸ Use the **Show Details** button to view the status text stream that was reported.

▸ Use the **Measure All** button to measure and update all sensors.

▸ Click or touch the data graph to see a pop-up menu in which the data can be refreshed, or see the selected data in a larger graph on the *Data* tab.

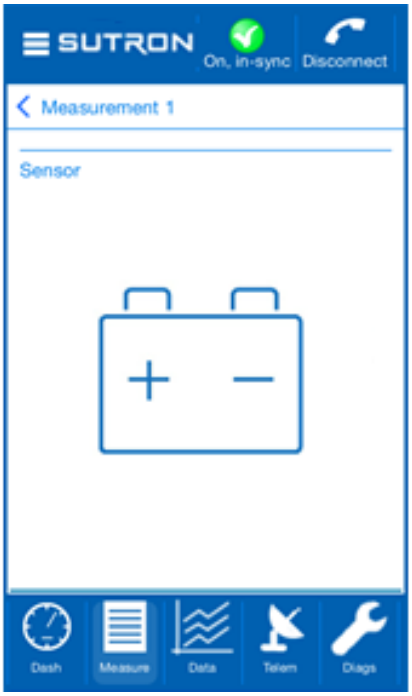
8.8 Making changes

The *Measurements* and *Telemetry* tabs can be used to make changes to the setup.

The following steps are described for the measurements and also apply to change the telemetry setup:

- Select the *Measurements* tab.

- Select the desired measurement from the list on the left side.
- On smaller displays use the *Measurement 1* link to open the list and select the desired measurement.



- Change the setup.

  ⇨ The setup status button at the top left of the screen changes from  to  .

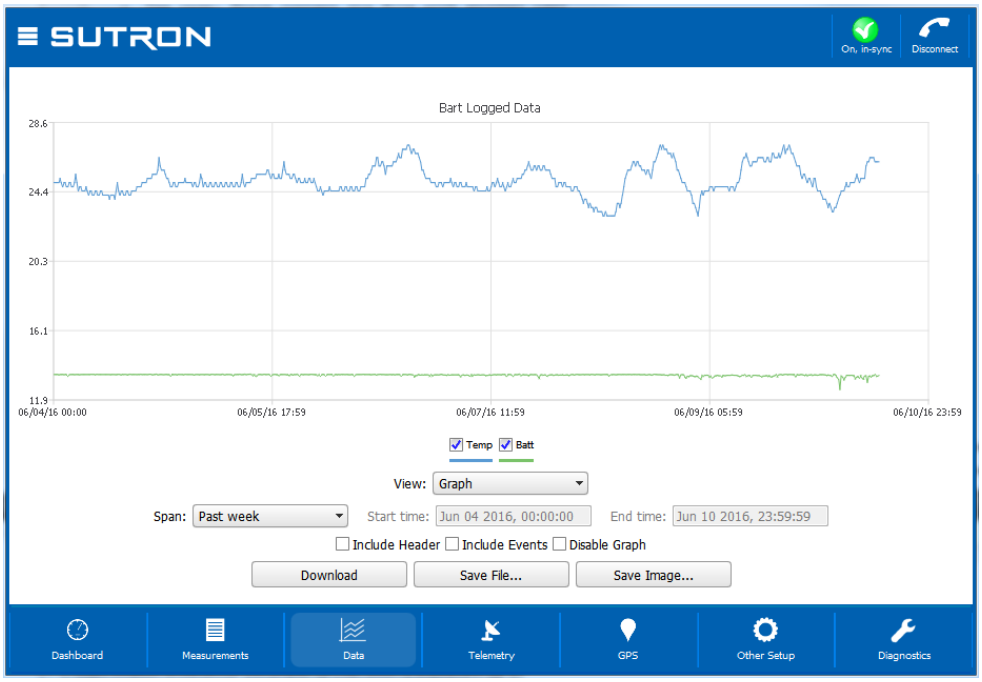
- Click or press the button  to send the changed setup to the station.

> Some settings cannot be changed if there is a remote connection via GPRS or CDMA. For example, recording cannot be turned off, listening cannot be deactivated and transmission cannot be disabled.

8.9 Viewing data

The *Data* tab can be used to view historical data, and to download the log. If recent data was downloaded when connecting to the data logger, the graph displays this data when the *Data* tab is selected for the first time.

- Select the *Data* tab.



- To zoom-in on subsets of data, click-and-drag to create a rectangle around the data you want to zoom to.
- To restore the zoom to all data, double-click.
- When using a touchscreen, use the finger to draw the rectangle, and double-tap to reset the zoom.
- Right-click or touch the graph to show a menu that allows to select all series, deselect all series, or show points.
- Use the legend just below the graph, to select or deselect individual data series for display.
- Select the *Span* of the period to graph.
- Whenever a change to span is made, press the **Download** button to retrieve the data for display.
  - ⇨ When the defined span no longer matches the displayed span, the download button text changes to **Download*****.
- Click or press the **Save File** button to save the raw data to a text file.
- Click or press the **Save Image** button to save an image of the graph to file.
- In mobile versions, use the **Share File** and **Share Image** buttons to share files via services like email or a file sharing platform.
- Use *Include Header* and *Include Events* only for raw data file content downloaded from the station.
- On smaller displays, turn the device to landscape to hide the blue header and footer sections and showing more data content.

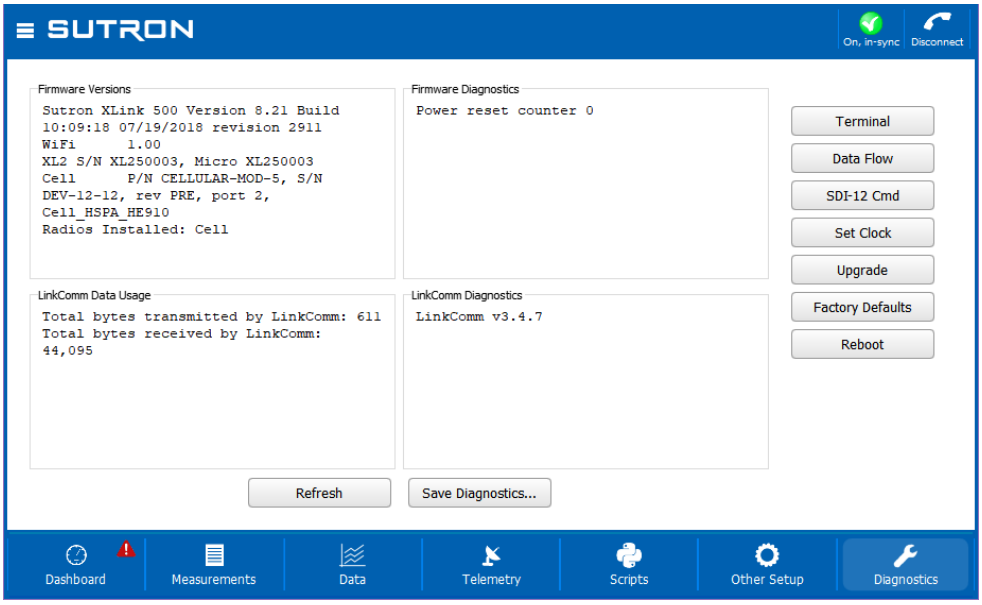
8.10 Generating diagnostics

The *Diagnostics* tab provides extensive diagnostics information and offers tools for performing various diagnostics and maintenance operations.

For example:

- Get diagnostics information including software versions and data usage
- Terminal and data flow views
- SDI-12 command utility
- Set the station clock

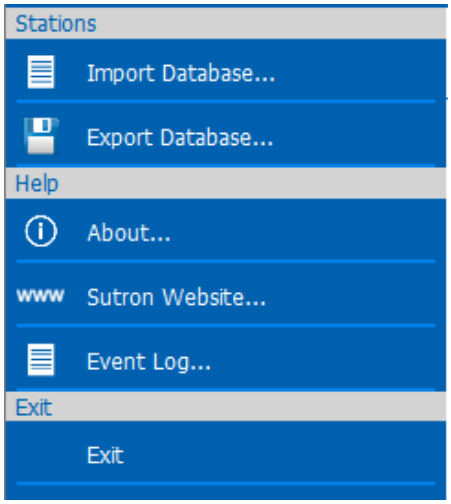
▸ Select the *Diagnostics* tab.



8.11 Sharing database

All station definitions are saved in a database. This database can be exported to a file and imported into LinkComm running on another device.

▸ Open the main menu  in the stations list view.



▸ Use *Export Database* or *Import Database* to share the station database across devices.

9 Operation

9.1 Operating XLink

The following sections describe how to perform some common functions with an XLink station. This requires that the station is powered on, LinkComm is running, and there is a connection to the station via USB, RS-232, or Wi-Fi.

> Further information can be found in the Operations & Maintenance Manual SUTRON XLINK 100/500.

> An overview of the LinkComm interface can be found in the section Station view [▶ 33].

9.1.1 Creating new station in LinkComm

When LinkComm is opened, the stations list view appears.

- Select *New Station* from the station list.
- Specify the *Station type*, e.g. *XLink 100* or *XLink 500*.
- Go to the section *Connection Settings* and configure to connect to the station.
- After configuring the *Connection Settings*, use the **Connect** button.
- Alternatively, use the **Work Offline** button, if the station is not connected.
- Select the *Dashboard* tab and edit the *Station name*.
- Select the *Measurements* or *Telemetry* tab.
- Edit the desired measurement or make changes in the telemetry setup.
- Select *Diagnostics* tab and use the **Factory Defaults** button to reset to factory default settings.
- Select *Save Station* from the main menu to add the new station to the station list.

9.1.2 Connecting to a station in the station list

When LinkComm is opened, the stations list view appears.

- Select the appropriate station from the station list.
- Go to the section *Connection Settings* and configure to connect to the station.
- After configuring the *Connection Settings*, use the **Connect** button.
- View the **Setup status** button and whether LinkComm and the station have the same status. See Setup status button [▶ 34] for a definition of the buttons.
- If a change has been made to the setup in LinkComm, use the **Setup status** button to send setup changes to the station.

⇨ LinkComm will prompt for confirmation:

– Yes: Only the changes required to be “in-sync” are sent.

– No: LinkComm prompts to retrieve the setup from the station, overwriting local changes.

9.1.3 Importing setups from another user or station

- Create or connect to a station, see above.
- Use *Import Setup* from the main menu.

- Locate and open the desired setup file. The setup file is a .txt file and may have been created via *Export Setup* or the *Diagnostics* tab.

⇨ LinkComm will prompt for confirmation of “replace the current setup ... Continue with import?“:

– Yes: The new setup is sent to LinkComm.

9.1.4 Testing measurements

- Select the *Measurements* tab.
- Select a measurement.
- Go to the section *Processing*.
- Use the **Refresh** button to view the last measurement.
- Use the **Measure** button to make a new measurement.

9.1.5 Examining measurements

- Select the *Dashboard* tab.
- Use the **Refresh Status** button to see the latest data from each measurement.
- Right-click and select **Refresh recent data** to update graphs.

9.1.6 Examining transmissions

- Select the *Dashboard* tab.
- Use the **Show Details** button to view the statistics on the transmissions.
- Select the *Telemetry* tab.
- Go to the section *Telemetry status* to view the telemetry statistics.

9.1.7 Examining transmission data

- Select the *Telemetry* tab.
- Use the **Show Tx Data** button.

⇨ The data from the last and actual transmission as well as details on size and time required to transmit are displayed.

9.1.8 Entering manual data

- Select the *Measurements* tab.
- Select the desired measurement.
- Go to the section *Processing* and use the **Calibrate** button.
- Enter the desired value and confirm with the **OK** button.

9.1.9 Calibrating sensors

- Select the *Measurements* tab.
- Select the desired measurement.
- Go to the section *Processing* and use the **Calibrate** button.

- Enter the desired sensor reading and confirm with the **OK** button.
  ⇨ The system logs two events:

– The value before the calibration of sensor reading.
– The value after the calibration of the sensor reading.

- Set the Tx Data content to “Last” and calibrated values will be transmitted.

9.1.10 Configuring SDI-12 sensors

- Select the *Measurements* tab.
- Select the desired measurement of an SDI-12 sensor.
- Go to the section *Configuration* and use the **Send SDI-12 Command** button.
  ⇨ A menu will show-up, where address, commands and SDI-12 details can be entered.
- If the desired command is not on the command drop-down list, enter the desired command in the command box.
- Another option to enter the SDI Command menu: Go to the *Diagnostics* tab and open the menu **SDI-12 Cmd**.

9.1.11 Downloading log data

- Select the *Data* tab.
- Select the desired span and use the **Download** button.
- Use the button **Save As**.

⇨ The file is named by the end time in the span.

9.1.12 Viewing and clearing the status

- Select the *Dashboard* tab.
  ⇨ The status is displayed in the top left with the following data: station name, time, recording since, number of measurements enabled, errors, alarm status, battery voltage, transmission status.
- Use the **Refresh Status** button to see the latest data from each measurement.
- Use the **Show Details** button to see additional information.
- Use the **Clear Status** button to clear any errors.

9.1.13 Obtaining software version

The *Diagnostics* tab provides extensive diagnostics information. For example: Software version or instrument serial number.

- Select the *Diagnostics* tab and obtain the software version.
- Alternatively use the VER command to obtain the software version.

9.1.14 Setting time

The station time can be viewed on the *Dashboard* tab. The time shown in the dashboard is a snapshot.

- Select the *Diagnostics* tab.
- Use the **Set Clock** button.
- Select the *Other Setup* tab.
- Go to the section *Time*.
- Convert the time from UTC to local time zone: Select the time in the *Local time offset* drop-down list.

9.1.14.1 Automatic time sync

Stations equipped with a modem will automatically sync the clock to network time. By default the local time offset setting of the station is UTC time.

- Stations equipped with an Iridium modem will automatically sync the clock to network time.
- Stations equipped with a cell modem will automatically sync, if they use firmware version 8.28 or newer.

9.2 Setting up XLink

XLink operation is controlled by its setup. The setup is stored in non-volatile memory and will not be affected when the unit loses power. Any part of the setup can be changed at any time using the LinkComm application. Changes to the setup are noted in the log with the entry "setup changed" and will not affect previously logged data. The setup in LinkComm can be different from the setup in the station and must be synchronized if necessary. As an alternative to LinkComm, any terminal program can be used to access all of the features via the command line interface.

> Further information can be found in the Operations & Maintenance Manual SUTRON XLINK 100/500.

9.2.1 Measurement setup

The measurements tab in LinkComm is where the measurement setups are managed. A measurement is the process of collecting data from a sensor. XLink can collect up to 32 measurements (M1 to M32). Each measurement has its own setup and is carried out at regular intervals. Measurement results may be logged or just used for alarms or by other measurements.

The settings for the sensor and the measurement time and measurement intervals are described below.

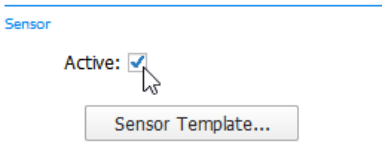
> Further information can be found in the Operations & Maintenance Manual SUTRON XLINK 100/500.

9.2.1.1 Setting up sensor

Setting up the sensor is explained using an air temperature/relative sensor as an example.

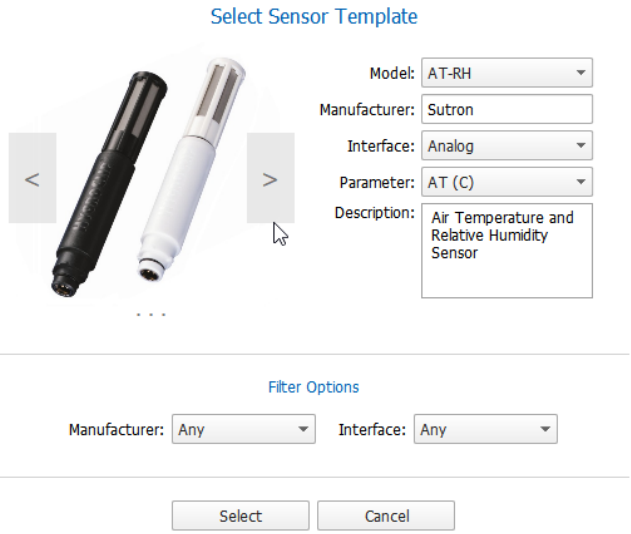
To set up the sensor for measurement, follow these steps:

- Select the *Measurements* tab.
- Select the *Active* checkbox, to activate the measurement for the sensor.



- Use the **Sensor Template** button to select a sensor.
  - ⇨ The *Select Sensor Template* appears.

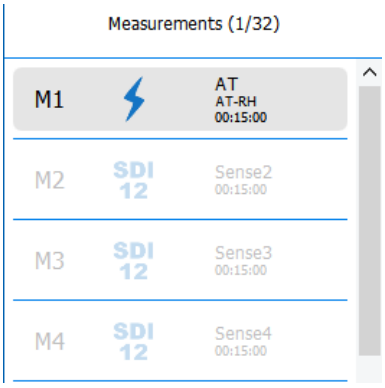
- Use the right and left arrows to scroll between the sensor templates.



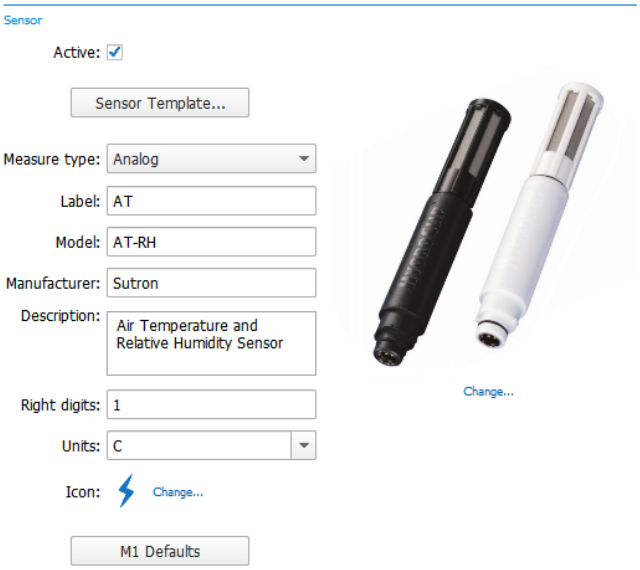
  ⇨ The sensor parameters are predefined, including the metadata: sensor picture, wiring diagram, manufacturer, model, description, and units.

The sensor metadata is not stored in XLink, only in the station definition in LinkComm.

- Go to the *Filter Options* section and select the *Manufacturer* and the *Interface*.
  ⇨ The template is adapted according to the selection.
- Adjust the *Parameter* and the *Interface* in the upper section if necessary.
- Use the **Select** button to save the sensor settings.
  ⇨ The sensor setup is saved under *Measurements* as *M1*.



- Go to the *Sensor* section.



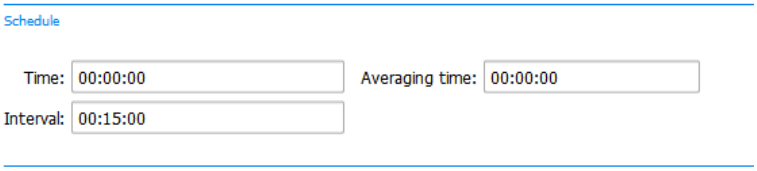
- Select the *Measure type* and the *Units*.
  - ⇨ Changes are automatically saved to setup.
- Adjust the text fields as necessary. For further explanations, see the table below.
- Use the *Change* links to adjust the *Icon* and the sensor picture.
- Use the **M1 Defaults** button to set all settings, including metadata, for the measurement to default values. The default measurement type is SDI-12.

Parameter	Description
Measure type	– Tells the station what kind of measurement to make. – Partially determines what physical connection the sensor needs to be wired to. – Controls the possible configuration in the setup.
Label	User set name given to measurement, up to 11 bytes. – Used to identify and differentiate measurements. – Will be placed in the log each time a measurement is made. – When downloading the log, XLink identifies each logged value with the label.
Model	Model name or model number for a sensor (Metadata)
Manufacturer	Manufacturer information for the sensor (Metadata)
Description	Additional information for the sensor (Metadata)
Right digits	Number of digits after the decimal point to be rounded before logging Example: 10,12345 => 10,12 (2 digits right of the decimal point)
Units	– Can be specified for any measurement and will be stored with the data when it is logged. – Can be entered directly into the text field. – Can only be 3 characters long.
Icon	Symbol for the measurement The icon will show on the *Dashboard* and *Measurements* list.
Picture	LinkComm includes pictures for many common sensors and measurement types.

9.2.1.2 Setting up measurement time and interval

Measurement time and interval dictate when the measurement will be made. The time controls when the measurement is started. The interval controls how often the measurement is made.

- Select the *Measurements* tab.
- Go to the *Schedule* section.



- Set the *Time* and *Interval* for the measurement.

Example 1

The measurement is logged every 10 minutes at 0 seconds past the minute:
Time 00:00:00, *Interval* 00:10:00

- 00:10:00 data measured and logged
- 00:20:00 data measured and logged
- 00:30:00 data measured and logged
- every 10 minutes afterwards

Example 2

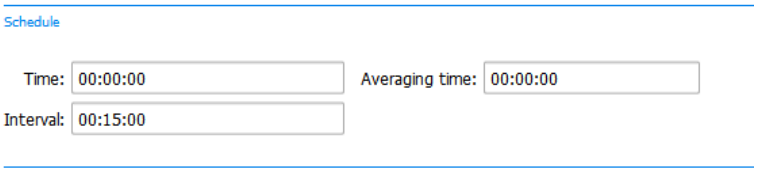
The measurement is taken and logged every 5 minutes at 30 seconds past the minute:
Time 00:00:30, *Interval* 00:05:00

- 00:00:30 data measured and logged
- 00:05:30 data measured and logged
- 00:10:30 data measured and logged

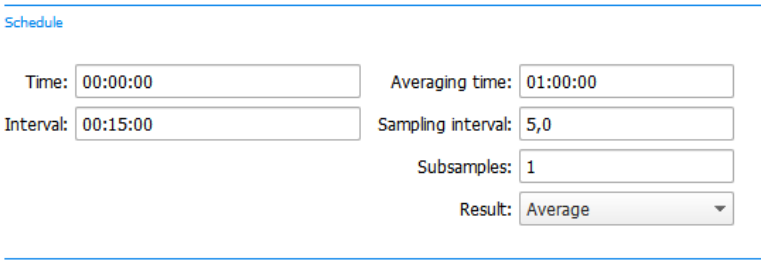
9.2.1.3 Setting up averaging time

XLink can collect multiple samples and average them in order to produce a single result. Averaging is useful for measuring changing conditions, such as wind and water level. The averaging time is set to 00:00:00 by default. Further samples are only displayed if a value is set for the averaging time.

- Select the *Measurements* tab.
- Go to the *Schedule* section.



- Set the *Averaging time*.



- Specify the samples:

Parameter	Description
Averaging time	Determines how long to collect samples for.
Sampling interval	Dictates how often to collect each sample.
Subsamples	Tells how many sensor readings to include in each sample. Do not use *Subsamples* unless you need two levels of averaging.

- Select *Result* to specify what statistical value to log:

Parameter	Description
Average	– Starts a new average each measurement interval. – Computes average only at the end of all the samples. – Tracks minimum and maximum of each sample as it is measured.
Minimum	Minimum measuremet per sample
Maximum	Maximum measuremet per sample
Running Avg	Running average – Continues across measurement intervals – Is recomputed with each sample – Tracks minimum and maximum measurements throughout the interval, not just for individual samples
Running Min	Minimum measurement across intervals
Running Max	Maximum measurement across intervals

If the average, minimum and maximum results are to be transmitted for a sensor, three identical measurements must be set up, each with a result for the average, minimum and maximum.

The system reads the sensor only once, even with several measurements, as long as the schedule is identical.

The minimum and maximum values for the average and running average are timestamped when they occur, not when the measurement was scheduled.

Example: Average temperature over an hour

- To know the average temperature for an hour, set the *Averaging time* to 1 hour.
- Do not change *Sampling interval* and *Subsamples*.
  ⇨ The station collects sensor data all throughout the hour.
- If the power consumption is unacceptable to measure the sensor continuously for an hour, set the *Sampling interval* to 1 minute to take 1 sample every minute.
  ⇨ Every hour, 60 samples are taken with approximately a one-minute break between each sample.
- If the sensor is noisy and needs to be filtered, set several *Subsamples* to average into one sample.

If the number of *Subsamples* is set to five, five readings are collected at the start of every minute and averaged. That result is used as a sample. Once an hour, 60 samples are averaged into a final result.

Data collection starts at measurement *Time* + measurement *Interval* – *Averaging time* + *Sampling interval*, and the last sample is taken at measurement *Time* + measurement *Interval*.

In the example below, temperature is measured every 15 minutes and averaged for an hour:

- Measurement *Time* 00:00:00
- Measurement *Interval* 01:00:00
- *Averaging time* 01:00:00
- *Sampling interval* 900 (900 seconds is 15 minutes)
- Data Collection:
  - 00:15:00 first sample collected
  - 00:30:00 next sample collected
  - 00:45:00 next sample collected
  - 01:00:00 last sample collected
  - 01:00:00 all 4 samples are averaged and the result is logged with the 01:00:00 timestamp

Example: Running average
The running average is used when readings need to be averaged over a period of time longer than the logging interval, for example, when an hourly average is to be produced every 15 minutes. In that case, the *Averaging time* is 01:00:00 and the measurement *Interval* is 00:15:00. For running average, *Averaging time* is longer than the *Interval*.

If a five-minute average value is to be logged every minute, follow these steps:

- Set the *Averaging time* to 5 minutes.
- Set the *Time* to 1 minute.
- Set the *Sampling interval* to 60 seconds.

This is the schedule for the data produced:

- 12:01 Sample sensor (reading = 1.0). There are not enough samples to produce an average. System will still compute and log a result producing a value of 1.0.
- 12:02 Sample sensor (reading = 2.0). There are not enough samples to produce an average. System will still compute and log a result producing a value of 1.5.

- 12:03 Sample sensor (reading = 3.0). There are not enough samples to produce an average. System will still compute and log a result producing a value of 2.0.
- 12:04 Sample sensor (reading = 4.0). There are not enough samples to produce an average. System will still compute and log a result producing a value of 2.5.
- 12:05 Sample sensor (reading = 5.0). Compute and log 5-minute average. Result = 3.0, computed as (1.0+2.0+3.0+4.0+5.0)/5
- 12:06 Sample sensor (reading = 6.0). Compute and log 5-minute average. Result = 4.0, computed as (2.0+3.0+4.0+5.0+6.0)/5
- 12:07 Sample sensor (reading = 7.0). Compute and log 5-minute average. Result = 5.0, computed as (3.0+4.0+5.0+6.0+7.0)/5

In comparison, a simple average over 5 minutes produces a reading every 5 minutes:

- Set the *Interval* to 5 minutes.
- Set the *Averaging time* to 5 minutes.
- Set the *Sampling interval* to 60 seconds.

This results in the following schedule:

- 12:01 Sample sensor (reading = 1.0). No reading is logged.
- 12:02 Sample sensor (reading = 2.0). No reading is logged.
- 12:03 Sample sensor (reading = 3.0). No reading is logged.
- 12:04 Sample sensor (reading = 4.0). No reading is logged.
- 12:05 Sample sensor (reading = 5.0). Compute and log 5-minute average. Result = 3.0, computed as (1.0+2.0+3.0+4.0+5.0)/5
- 12:06 Sample sensor (reading = 6.0). No reading is logged.
- 12:07 Sample sensor (reading = 7.0). No reading is logged.

The system holds up to 180 samples for the running average. To calculate the number of samples used, the averaging time is divided by the sampling interval. How many samples are to be used is computed by dividing the *Averaging time* with the *Sampling interval*. For more than 180 samples, the system displays a setup error. If the measurement is completed without all the samples, the system will log a “Missing samples” error.

Example: Logging and transmitting minimum and maximum
The time for the average will be computed based on the measurement time and interval, as described previously. However, the timestamp for the minimum and maximum will be the actual time when the minimum or maximum occurred.

For an hourly average measurement with samples every minute, where the data is not in time sequence, the following can be displayed in the log:

- 4/14/2016 16:00:00 AVG 30.335 G
- 4/14/2016 15:24:00 MX 31.248 G
- 4/14/2016 15:15:00 MN 25.661 G
- 4/14/2016 17:00:00 AVG 30.225 G
- 4/14/2016 16:12:00 MX 32.060 G
- 4/14/2016 16:39:00 MN 28.454 G

At 16:00 the hourly measurement that started at 15:00 is complete. The average gets timestamped with 16:00. However, the actual maximum value of 31.248 happened at 15:24 and the minimum value of 25.661 happened at 15:15. Likewise, at 17:00, the measurement that started at 16:00 is complete. The maximum happened at 16:12 and the minimum at 16:39.

When minimum and maximum results are transmitted, a unique timestamp is included with each transmitted value. The example below illustrates the formatting:

```
:ATMIN 91 #60 22.47 :ATMIN 101 #60 22.50 :ATMIN 191 #60 22.53
:ATMAX 71 #60 22.52 :ATMAX 136 #60 22.54 :ATMAX 216 #60 22.58
:ATAVG 41 #60 22.50 22.52 22.56
```

- :ATMIN 91 #60 22.47 means that a minimum of 22.47 occurred 91 minutes ago.
- :ATMIN 101 #60 22.50 means that a minimum of 22.50 occurred 101 minutes ago.
- :ATAVG provides four readings on the same line, most recent one 41 minutes ago, and subsequent readings each an hour later.

9.2.2 Telemetry setup

Optionally, the device has a built-in modem which is used to transmit data to a remote destination. In the telemetry setup the transmission of data is managed. Multiple telemetry setups are required to transmit data to different servers over the cellular network. Also multiple setups are required to allow both scheduled and alarm transmissions.

> Further information can be found in the Operations & Maintenance Manual SUTRON XLINK 100/500.

10 Maintenance

10.1 Maintenance schedule

The frequency of cleaning is dependent upon the local weather and environmental conditions.

The following maintenance works are recommended for all devices:

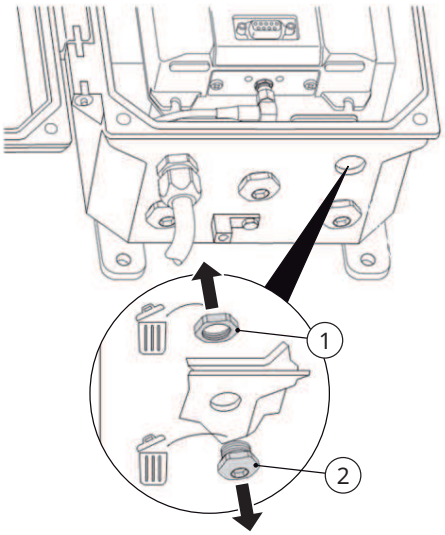
Interval	Activity	Performed by
Minimum once per year	▸ Clean the device using common mild window cleaning products. ▸ Spray the cleaner on to a clean cloth and wipe the device. ▸ Never spray cleaner directly on the device.	Operator
Minimum once per year	▸ Check the vent openings of the battery housing to ensure unhindered air circulation. ▸ Remove any contamination.	Operator
Minimum once per year	▸ Check the rechargeable battery for damage, deformation of the housing and any leaking battery acid.	Operator
Minimum once per year	▸ Check the connection terminals of the rechargeable battery for dirt and tightly connected leads.	Operator
Minimum once per year	▸ Check the battery voltage (fully charged, not loaded $U_{min} \geq 12$ V).	Operator
Minimum once per year	▸ Check the remaining capacity of the rechargeable battery with an appropriate battery tester.	Operator
10 years	▸ Replace the rechargeable battery after 10 years of operation at the latest; earlier if the remaining capacity is low or in extreme climatic conditions.	Operator

10.2 Retrofitting NEMA housing with ventilation

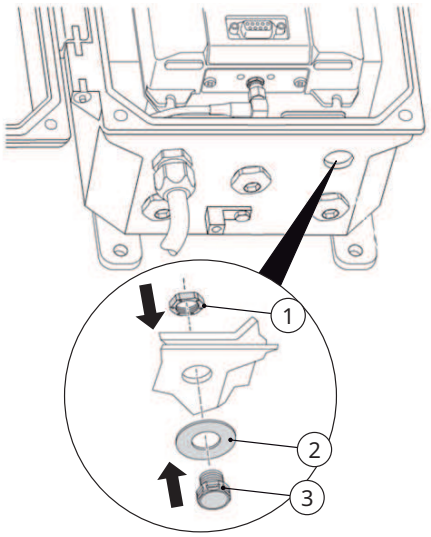
When charging rechargeable batteries, certain amounts of hydrogen and oxygen gas (oxyhydrogen gas) escape, depending on the battery technology used. This gas mixture is extremely flammable and must be transported to the outside.

If the NEMA housing does not have a vent, the supplied venting device must be retrofitted as follows:

- Remove the dummy plug (1) including the counter nut (2) or any other if this inlet is already in use. Wrench size: 22 (metric)



- Install vent (1), washer (2) and counter nut (3). Wrench size: 18 (metric)



- Tighten the counter nut carefully. Tightening torque maximum 1.5 Nm
- Do not remove the O-ring on the thread of the vent.

For product variants with NEMA housing see section Product variants [▸ 7].

11 Troubleshooting

11.1 Fault elimination

Fault	Possible cause	Measures
Sensor failure	SDI-12 sensor: Error is recorded when the SDI-12 sensor does not reply to the measure and to the data commands Analog sensor: Error is recorded when analog to digital converter cannot read the input, such as input voltage being out of range or not being connected	▸ Check the sensor wiring. ▸ Replace the sensor.
Meas interval too short	Error is recorded when the station missed a scheduled measurement: likely due to measurement taking longer than *Meas Interval* to complete - e.g. system should measure every 5 seconds, but sensor takes 10 seconds to complete *Equations* are enabled and the *Meas Interval* is short (once a second or once every two seconds). The system may take several seconds to compute a lengthy equation and cannot complete a measurement as quickly and the system realizes that more than one measurement interval has been passed between two subsequent measurements	▸ Increase the measurement interval.
Sampling too short	Sensor response time is longer than the sampling interval; for SDI-12 readings e.g., the error occurs, if a sensor requires 10 seconds to produce a reading and the sampling interval is 10 seconds	▸ Increase the sampling interval.
Averaging too short	The averaging interval is shorter than the sampling interval or than the sensor reply time	▸ Increase the averaging interval or decrease the sampling interval.
Bad setup	Error is recorded to indicate one of the following: – The equation processor reported an error. This can be a divide by 0 or syntax error – The meta measurement referenced an inappropriate measurement – The SDI-12 command was set to an invalid value	▸ Check the equation. ▸ Check the meta measurement setup. ▸ Check the SDI-12 command. ▸ Check the SDI-12 parameter.

Fault	Possible cause	Measures
	– The SDI-12 sensor did not provide enough data values in the result (*check SDI-12 Param*)	
Bad wind setup	Invalid setup for wind measurements	▸ Check the user manual for instructions on how to setup wind measurements.
Recording off	The station does not collect data, if the recording is turned off	▸ Turn the recording on.
Time not set	The system does not have valid time	▸ Set the clock. ▸ Alternatively, if a cell or Iridium modem is installed, wait for the system to get network time.
Battery low	The system considers any battery voltage below 9.00 V to be an error, indicating that the battery needs to be changed. The system does not make any measurements or transmissions when the voltage is too low	▸ Replace the battery, or provide a sufficient power supply.
Transmission failures	Error is recorded to indicate one of the following: – Two or more consecutive transmissions fail – More than 25 % of total transmissions fail – No measurements are set up to be included in the transmission data	▸ Check the status to find the reason for the failures.
Hardware failure	Any hardware issues noted since boot up. The hardware error is also placed in the log with a code and indicates a serious problem with the unit.	▸ Contact the OTT HydroMet customer service representatives.
Device transmits an unknown error value		▸ Report any malfunction to the representative of OTT HydroMet.

12 Repair

12.1 Customer support

- Have repairs carried out by OTT HydroMet service personnel.
- Only carry out repairs yourself if you have first consulted OTT HydroMet.
- Contact your local representative: www.otthydromet.com/en/contact-us
- Include the following information:

– instrument model
– instrument serial number
– details of the fault or problem
– examples of data files
– readout device or data acquistion system
– interfaces and power supplies
– history of any previous repairs or modifications
– pictures of the installation
– overview of the local environment conditions

13 Notes on disposing of old devices

Member States of the European Union

In accordance with the German Electrical and Electronic Equipment Act (ElektroG; national implementation of EU Directive 2012/19/EU), OTT HydroMet takes back old devices in the Member States of the European Union and disposes of them in the proper manner. The devices that this concerns are labeled with the following symbol:

- For further information on the take-back procedure contact OTT HydroMet:

OTT Hydromet Corp.
Service & Technical Support
22400 Davis Drive, Suite #100
Sterling, VA 20164
USA
phone: +1 703 406-2800
email: NAtechsupport@otthydromet.com

All other countries

- Dispose of the product in the proper manner following decommissioning.
- Observe the country-specific regulations on disposing of electronic equipment.
- Do NOT dispose of the product in household waste.

14 Technical data

14.1 Electrical data

Specification	Value
Protection type	XLink: IP41 XLink variants with NEMA enclosure: IP66
Operating temperature range	-40 °C to +70 °C (-40 °F to +158 °F)
Humidity	Maximum relative humidity 80 % for temperatures up to 31 °C decreasing linearly to 50 % relative humidity at 40 °C
Compliance	CE, FCC, ISED
Wire gauge	Power inputs: 12 - 18 AWG Terminal block inputs: 16 - 24 AWG Earth ground: 4 - 10 AWG Operational temperature range: -40 to +70 °C (or better)
Input voltage	9 - 20 V DC SDI-12 sensor support: 10 - 16 V Reverse power protected
Quiescent power consumption	< 1 mA typical (at 12.5 V)
Means of protection	Class III
SDI-12 compliance	V1.3 data recorder
SDI-12 power supplied	500 mA, short-circuit protected
Number of inputs	2
Input type	1 15 V, optional low-level input Status, counter, frequency
Max. input frequency	10 KHz, optional debouncing, internal pull
Number of outputs	1
Output types	On/off/pulse
Precision analog reference (XLink 500 only)	2 terminals, 2.5 V, 10 mA (total)
Switch 12 V	1 A, 1 port, overload protected
Protected 12 V (XLink 500 only)	0.75 A, 1 port
RS-485	1 port; SDI-12, MODBUS, custom communications with Python
RS-232	DB9; terminal interface, user interface, MODBUS, custom communications with Python
USB Device (Micro B)	1 port; PC/MAC communication using Sutron's LinkComm
USB Host (Type A)	1 port; setup, firmware update, log download using a USB flash drive

Specification	Analog - Single ended (XLink 500 only)	Analog - Differential (XLink 500 only)	Analog - 4 - 20 mA (XLink 500 only)
Number of inputs	2	2	1
Range*	0 to 5 V	± 39 mV, ± 312 mV, ± 2.5 V	0 to 22 mA
Accuracy at 25 °C	0.04 % typ. FS	0.04 % typ. FS over 2.5 V	0.14 % FS
Resolution	0.3 µV	0.3 µV at ± 2.5 V scale	–
Load	–	–	Internal 200 Ohms

* Nominal. Guaranteed analog input range over temperature is 0 to 4.98 V, ± 2.49 V, ± 311 mV, ± 38.9 mV (preliminary).

14.2 Dimensions and weight

Specification	XLink 100-1 XLink 500-1	NEMA-4
Instrument weight	1 lbs (500 g)	
Dimensions	4.5 x 6.2 x 1.6 inches (11.4 x 15.8 x 4.1 cm)	7.3 x 9.5 x 5.2 inches (18.5 x 24.2 x 13.2 cm)

OTT HydroMet

Contact Information