



microSpider2 Environmental

User Manual

Models HME-100 – HME-107

Date September 2026

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Preface

This manual describes the installation, configuration, and operation of the Halytech microSpider2 Environmental telemetry, logging, and alarm system.

The manual is ordered in the recommended sequence for getting a new unit installed and reporting:

1. Read §1 Introduction and §2 System Overview to understand the product and its capabilities.
2. Follow §3 Installation to commission the hardware on site.
3. Use §4 Web Interface and §5 Configuration to set up the device for the application.
4. Refer to §6 Service Mode for field maintenance, and §7 Maintenance for routine and battery-replacement procedures.
5. Use §8 Specifications and §9 Accessories as a reference for product detail and replacement parts.

The Appendices contain reference material — connector pinouts, sensor wiring, communication protocols, file formats, alert formats, log codes, troubleshooting, and full DNP3 detail.

For the latest version of this document, visit halytech.com.au/microspider2-environmental.

1. Introduction

1.1 Overview

The microSpider2 Environmental is an ultra low power telemetry, logging, and alarm system designed for long-term unattended monitoring at outdoor sites. The IP68 enclosure and integrated long-life lithium batteries are designed to deploy at any outdoor site with no additional weatherproofing or external power infrastructure — connect your sensors and the unit is ready for installation.

The microSpider2 Environmental is configured and monitored via a built-in web server, accessible from any web browser — no special software is required. Configuration is performed via a computer or tablet connected either by LANlink cable (Ethernet) or HLink dongle (Wi-Fi).



1.2 Package Contents

Item
microSpider2 Environmental unit (battery pack fitted, disconnected for shipping)
8-pin I/O mating connector — 1
Connector sealing caps — 2
Input conditioning components — 1 pack, for sensor wiring (see Appendix B)
Quick Start Guide

A SIM card is not supplied — source one from your preferred carrier with mobile data and SMS enabled.

The mobile antenna is internal on units with an internal antenna option (HME-100, HME-103, HME-106). Units with an external antenna connector (HME-101, HME-102, HME-104) require a separately ordered antenna — see §9 Accessories.

The LANlink Cable and HLink Dongle are available separately from Halytech and are required for initial configuration.

1.3 Typical Applications

- Environmental monitoring — air quality, soil moisture, water quality
- Surface and groundwater level monitoring
- Irrigation and bore monitoring
- Agriculture
- Automatic Meter Reading (AMR)
- Water treatment

1.4 Part Numbers and Options

Current models:

Item code	Modem	Antenna	Battery
HME-100	4G	Internal	Standard
HME-101	4G	External connector	Standard
HME-102	4G	External connector	HVI
HME-103	4G	Internal	HVI
HME-104	Cat-M1	External connector	Standard
HME-106	Cat-M1	Internal	Standard

External antenna connector units do not include an external antenna — order separately from the antenna range in §9 Accessories.

For satellite connectivity, see microSpider2 Environmental satellite (separate product).

Software options (ordered separately from Halytech):

Item code	Description
FME-002	FlowShark — interface for ADS FlowShark Triton flow units
FME-003	LiveSMS — extended SMS capabilities: remote web access, alert escalation, modem scheduling, additional SMS commands — see Appendix F
FME-005	DNP3 — SCADA integration via DNP3 protocol — see Appendix H
FME-006	DNP3 + LiveSMS — both options bundled

LiveSMS: Not recommended for battery-only operation — the modem stays powered to receive incoming SMS, which significantly reduces battery life. If LiveSMS is required without external power, expected battery life claims do not apply.

Key accessories:

Item code	Description
HHS-013	LANlink Comms Cable — required for configuration via Ethernet
HHS-080	HLink Wi-Fi Dongle — required for configuration via Wi-Fi
HME-015	SDI-12 / RS-485 Intelligent Interface — adds intelligent sensor support
HME-016	RS-232 External Module
HML-006	Stainless steel pipe mounting bracket — includes 4 screws (hose clamps not supplied)
RBT-004	Replacement battery pack — 7.2V Li-SOCl ₂ 13 Ah (standard)
RBT-008	Replacement battery pack — 14.4V Li-SOCl ₂ 13 Ah (HVI)

See §9 Accessories for the complete list including antennas, cables, and breakout boxes.

2. System Overview

2.1 Inputs

The microSpider2 Environmental has 4 analogue and 4 digital native inputs distributed across two 8-pin I/O connectors. The optional SDI-12 / RS-485 Intelligent Interface is an external accessory that connects to one of the I/O connectors — fitting it consumes the analogue, digital, and output pins on the occupied connector.

Input type	Standard	With Intelligent Interface
Analogue (native)	4	2
Digital (native)	4	2
System monitors	6	6
SDI-12 / Modbus	—	up to total limit
Virtual (Super Channels)	up to total limit	up to total limit

Fitting the Intelligent Interface consumes I/O Connector 1. All 8 pins of Connector 1 are used by the interface — AIN1, AIN2, DIN1, DIN2, PWR OUT (Control 1), and PWR IN are not directly available. AIN3, AIN4, DIN3, DIN4, OC OUT, and LV OUT on Connector 2 remain available. External power can still be supplied to the unit via the Intelligent Interface — see Appendix C.

Analogue inputs accept voltage signals (0–2.5V native range) or current loop signals (4–20mA, factory calibrated). External resistors are required to accept 0–5V or 0–10V signals — see Appendix B.

Digital inputs accept voltage-free switch contacts. They can be configured as: Switch, Switch State, Counter, Event, or Difference. There is no galvanic isolation between digital inputs or between inputs and internal circuitry.

SDI-12 and Modbus inputs (units fitted with the optional Intelligent Interface only) connect via the auxiliary interface cable. Each physical sensor may provide one or more channel values — each value occupies one channel slot. There is no limit on the number of physical devices connected; the total channel count is the constraint. See Appendix C for connection and configuration.

Virtual channels (Super Channels) are software-calculated channels derived from other inputs.

All channel types — native inputs, system monitors, intelligent sensor readings, and virtual channels — share the same firmware channel pool. Total configurable channels: **20**.

2.2 System Monitors

The following system inputs are built in:

Input	Description
System temperature	Internal temperature
Battery voltage 1	Voltage of internal battery pack 1
Battery voltage 2	Voltage of internal battery pack 2 (when fitted)
External power voltage	Voltage at the external power input
LAN power voltage	Voltage supplied to the LAN port
Internal moisture sensor	Detects moisture inside the enclosure

System monitors share the same channel pool as native inputs and intelligent sensors. Use them as alarm sources (e.g. low battery, moisture detected) or include them in reports.

2.3 Controls

The microSpider2 Environmental has three physical control outputs. When the Intelligent Interface is fitted, two additional software-only controls are also available:

Control	Label	Type	Function
Control 1	PWR OUT	Physical	Switched power — connects external power to the PWR OUT pin; max 1A
Control 2	OC OUT	Physical	Open collector — creates connection to GND through a current-limiting resistor; nominal 10mA
Control 3	LV OUT	Physical	Low voltage sensor supply — 3.3V or 5V selectable; max 100mA
Control 4	—	Software	SDI-12 Command — sends a custom SDI-12 string on activation/deactivation (Intelligent Interface only)
Control 5	—	Software	Modbus Warmup — sends a Modbus read message to wake a sleeping sensor (Intelligent Interface only)

Physical controls can be activated manually via the web interface, triggered by alarms, or used as sensor power warmups before a logging or report event. Control names are user-definable.

When the Intelligent Interface is fitted, **Control 1 (PWR OUT)** is not directly available — Pin 7 of I/O Connector 1 is consumed by the interface. Controls 2 (OC OUT) and 3 (LV OUT) on Connector 2 remain available.

2.4 Alarms

The microSpider2 Environmental supports 16 independently configurable alarms. Each alarm can:

- Trigger on a channel value, date/time schedule, periodic interval, or as a Super Alarm (combination of other alarms)
- Send SMS alerts to up to 3 phone numbers and email alerts to up to 3 email addresses
- Activate or pulse a control output
- Trigger faster logging while active

Alarms can be acknowledged via the web interface, by SMS command (LiveSMS option), or automatically after a configurable timeout.

2.5 Logger

The logger stores up to 300,000 records in non-volatile FLASH memory — records are retained without power. The logger records channel readings, control state changes, alarm events, communication events, and system events. Time resolution is 1 second.

The microSpider2 Environmental supports two independent automatic report slots, each configurable for period (1 minute to 1 day), format, and delivery destination (FTP, email, or HTTP/HTTPS POST).

For a full list of report formats, see Appendix I.

2.6 Communications

Interface	Detail
Mobile	4G or LTE Cat-M1 — see §1.4 Part Numbers
Ethernet	Via LANlink Cable — for configuration and local access
Wi-Fi	Via HLink Dongle — for configuration and local access
SIM card	Nano SIM
Antenna	Internal on internal-antenna variants; external SMA connector on external-antenna variants — antenna ordered separately

The default LAN IP address is `192.168.0.177`. The default Wi-Fi IP address (via HLink) is `192.168.2.177`.

2.7 Web Interface

The microSpider2 Environmental is configured and operated via a built-in web server. Any standard web browser can be used — no special software is required. The web interface provides access to:

- Live input readings and alarm status
 - Control activation and deactivation
 - Logged data download
 - Full configuration (via Change Setup)
 - Modem diagnostics and software upgrade
-

3. Installation

Recommendation: Before going on site, configure the microSpider2 Environmental using your sensors or simulate them. Halytech devices allow setups to be saved and restored — make use of this. If you have similar site configurations or standard templates, start with one of them. Much easier in the workshop than out in the field.

A new microSpider2 Environmental is shipped without a SIM card and with the battery disconnected from the circuit. The unit must be opened to insert the SIM card and connect the battery before deployment.

3.1 Opening the Case

1. Undo the four hex screws holding the two halves of the case together, using a **3 mm hex head screwdriver**.
2. Carefully separate the two halves, taking care not to put any strain on the cables connecting the two halves.



Keep the two halves accessible — do not over-extend the cables between them. All internal work (SIM card, battery) is done with the case open.

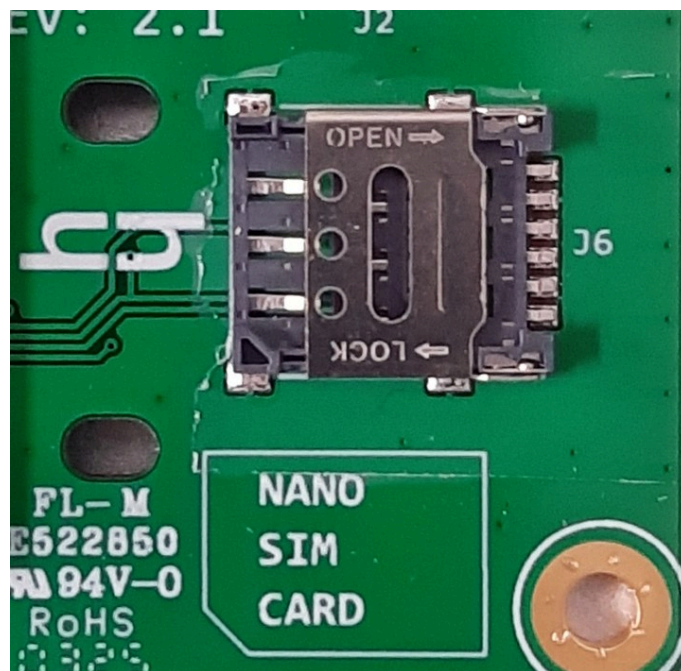
3.2 Installing the SIM Card

A SIM card is required to send SMS and receive automatic reports over the mobile network. The microSpider2 Environmental uses a Nano SIM card.

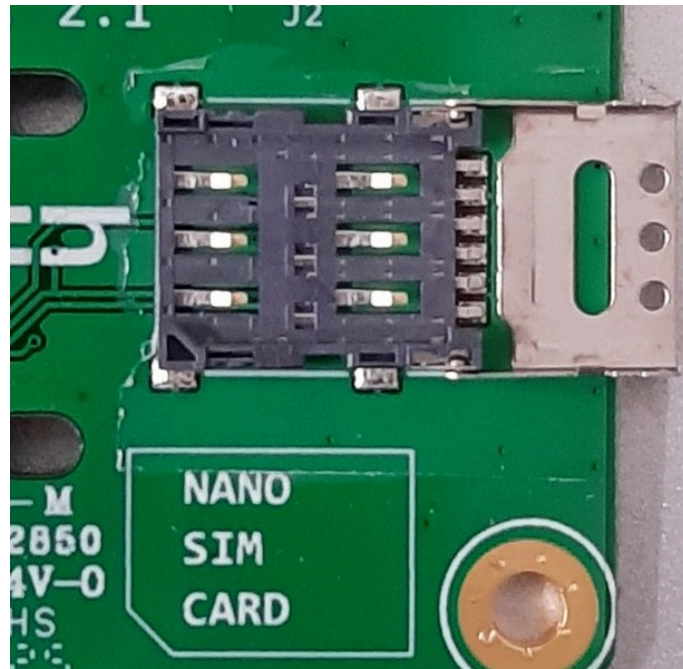
SIM PIN: Most SIMs ship with no PIN enabled. If yours does have one, insert it into a mobile phone first and disable the PIN in the phone's settings before installing it in the microSpider2 Environmental.

If the SIM was previously used in an iPhone, disable iMessage before installation — see Appendix M.

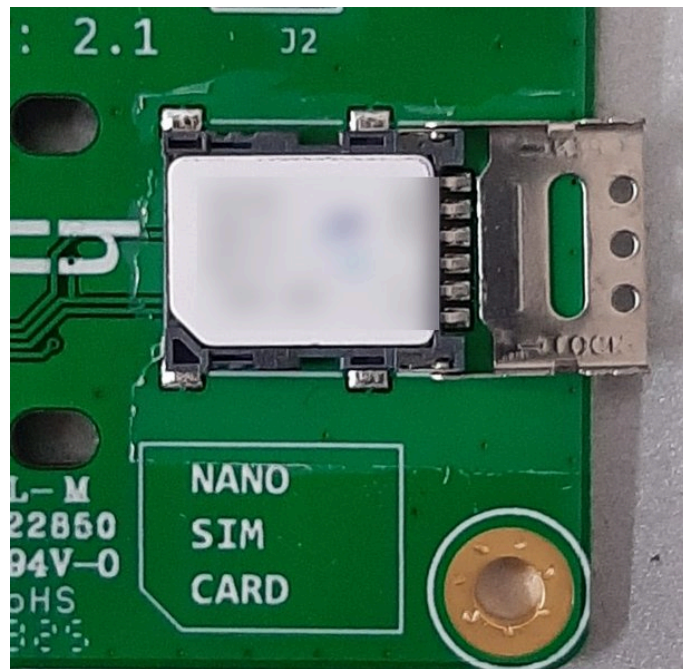
1. Open the case as described in §3.1.
2. Remove the metal bar protecting the circuit board by gently lifting it out of the grooves.
3. If the battery is connected, disconnect it from the circuit board by squeezing the locking latch and gently pulling the connector upwards.
4. Locate the SIM holder on the circuit board.



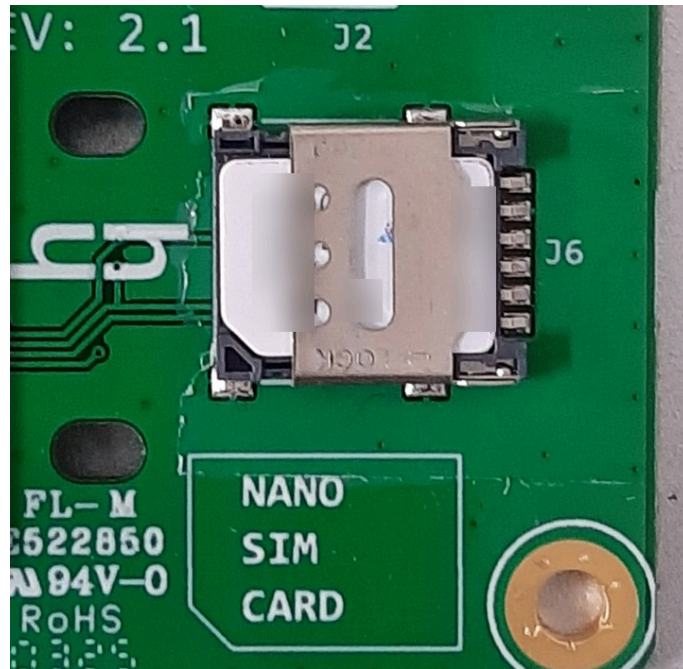
5. Slide the SIM cover to the **OPEN** position.
6. Lever the cover upwards on its hinge to open it.



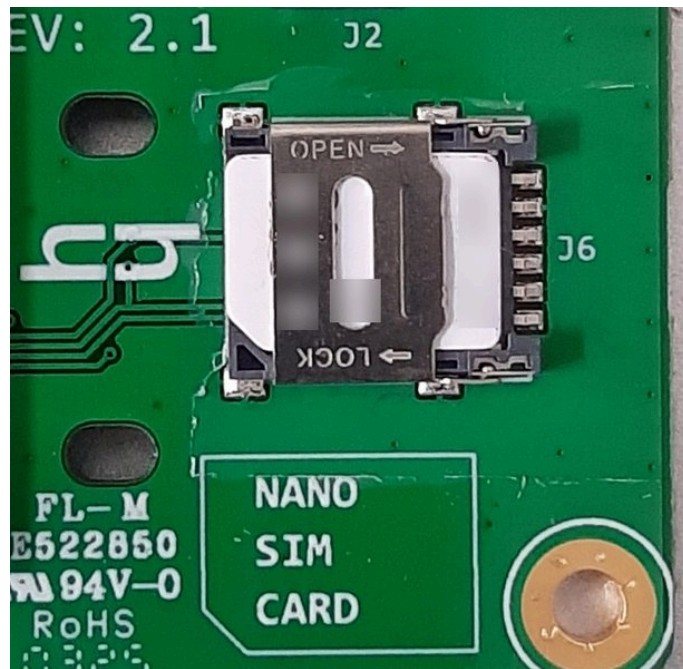
7. Lay the SIM card flat into the socket, observing the notched corner orientation.



8. Close the cover back down over the SIM.



9. Slide the cover to the **LOCK** position.



10. Reconnect the battery as described in §3.3.

11. Replace the metal protective bar over the circuit board, inserting it into the case grooves.

12. Close the case as described in §3.4.

3.3 Connecting the Battery

Antenna leads are connected by Halytech at the factory and must not be disconnected — the circuit board antenna connectors are difficult to re-mate correctly in the field. This applies to the internal antenna lead and, on external antenna variants, to the internal lead running to the SMA connector. Only the battery is connected during installation.

1. With the case open and the metal protective bar removed, connect the battery lead to **BATT1** on the circuit board, pushing it on until it clicks into place.
2. If the unit has a second battery pack, connect it to **BATT2**.

To disconnect a battery: squeeze the locking latch on the connector and gently pull upwards. Do not pull on the cable.

3. Replace the metal protective bar by inserting it into the case grooves. Check the antenna cable passes the bar on the **same side as the battery lead** so neither is pinched.

External antenna variants have an SMA male connector on the top of the case, internally connected to the circuit board at the factory. The external antenna itself is fitted to this SMA connector after mounting — see §3.5.

3.4 Closing the Case

The case seal is maintained by an O-ring around the perimeter. The O-ring must seat correctly to maintain the IP68 rating.

1. Check that the O-ring is seated in the groove around the battery half of the case.
2. Re-assemble the two halves and tighten the four hex screws in a diagonal sequence. Do not over-tighten.

Confirming the seal: when correctly assembled, the two halves stay together once finger pressure is removed. If the O-ring pushes them apart the assembly is wrong — separate the halves and repeat from step 1.

A damaged, missing, or misaligned O-ring will compromise the IP68 seal. Inspect the O-ring before each reassembly and replace if it shows any cuts, cracks, or compression damage.

3.5 Mounting

The microSpider2 Environmental enclosure has integrated mounting points for easy mounting on any flat surface. An optional mounting bracket is available for mounting on poles and pipes.

Position the unit so the I/O connectors face downwards where practical — this reduces the chance of standing water around the connector heads. Ensure all unused connectors and the communications port are sealed (see §3.8).

For external-antenna variants, fit and seal the external antenna to the SMA connector on top of the case after mounting.

3.6 Connecting External Power (Optional)

The microSpider2 Environmental runs from internal lithium batteries by default and does not require external power for normal operation. External power can be connected to extend battery life — for example, when paired with a solar panel and 12V SLA battery, or for permanently mains-powered installations.

External power is connected to **Pin 8 (PWR IN)** of I/O Connector 1.

Parameter	Value
Voltage	12V DC nominal (range 12–22V DC)
Current	1A minimum
Polarity	Positive to PWR IN, negative to GND

The internal lithium batteries are non-rechargeable. External power **does not** charge the internal batteries — when external power is connected, it powers the unit directly and the internal batteries are held in reserve.

Reverse polarity will damage the unit. Verify polarity before applying power.

3.7 Connecting Sensors

Sensors are connected via the two 8-pin IP68 I/O connectors on the bottom of the case. The unit is supplied with one mating connector for DIY sensor wiring — additional connectors and pre-made breakout cables are available separately (see §9 Accessories). Sensor wiring is site-specific — for full wiring details by sensor type, see Appendix B. For the complete pin assignment of both connectors, see Appendix A.

Summary of input connections:

Sensor type	Connect to
Switch, counter, event (pulse)	DINx → GND
Difference counter	Forward → DIN1, Reverse → DIN2, or Forward → DIN3, Reverse → DIN4
4–20mA current loop	AINx → GND
Voltage 0–2.5V	AINx → GND (direct)
Voltage 0–5V or 0–10V	AINx with resistor divider — see Appendix B
SDI-12 / Modbus sensors	Via Intelligent Interface (optional accessory) — see Appendix C

Switch debounce: the unit registers a switch transition only after the input is held shorted to GND for 3 seconds — brief glitches are filtered out. This applies to channels configured as Switch type only, not Counter or Event types.

No external resistor needed for 4–20mA: the AIN inputs contain an internal precision resistor and are factory pre-calibrated. Do not add external resistors when configured as 4–20mA inputs.

Protecting unused connectors: before leaving site, fit the supplied sealing caps to any unused I/O connector and to the communications port. Open contacts can corrode and cause unreliable readings.

3.8 Controls and Outputs

Control outputs are wired to the I/O connectors — see Appendix A for the pin assignment. The microSpider2 Environmental has three physical control outputs:

Control 1 — Switched Power Out (PWR OUT, I/O Connector 1 Pin 7):

- Connects external power (PWR IN) to the PWR OUT pin when active.
- Maximum output current: 1A.
- Typical use: switching power to a sensor or peripheral before sampling.

Control 2 — Open Collector (OC OUT, I/O Connector 2 Pin 7):

- Creates a connection to GND through a current-limiting resistor when active; nominal 10mA.
- Typical use: activating accessories or external relays.

Control 3 — Low Voltage Sensor Supply (LV OUT, I/O Connector 2 Pin 8):

- Provides regulated 3.3V or 5V (selectable in Change Setup) supplied by the internal battery.
- Maximum output current: 100mA.
- Typical use: powering low-voltage sensors that do not require switched power.

When connecting an inductive load (e.g. a relay coil) to the OC OUT, fit a flyback diode across the load to prevent voltage spikes — refer to the input conditioning components included in the box.

When the Intelligent Interface is fitted, **Control 1 (PWR OUT) on I/O Connector 1** is not directly available — see §2.3.

Physical controls can be activated manually via the web interface, triggered by an alarm, or used as sensor power warmups (configured in Change Input Setup → Options → Warmup source).

3.9 Commissioning Checklist

Before leaving site, confirm all of the following:

- Mobile signal $\geq 40\%$ (shown on the web interface under Network status) — see §5.11 Modem Diagnostics
- Location name and site ID set correctly
- Date and time correct
- All configured inputs are reading as expected
- Administrator password changed from default
- APN configured and modem is successfully connected
- Test report sent and received at the configured destination
- Setup saved to disk as a backup copy
- All unused I/O connectors and the communications port fitted with sealing caps
- External antenna SMA connection (if fitted) sealed with self-vulcanising rubber tape
- Case lid screws tightened in diagonal sequence and the O-ring seal undamaged

Signal strength reference:

Level	Threshold	Action
Excellent	$\geq 75\%$	No action
Good	$\geq 50\%$	No action
Acceptable	$\geq 40\%$	No action
Poor	$< 40\%$	Reposition antenna

4. Web Interface

The microSpider2 Environmental is configured and monitored via a built-in web server. Any standard web browser can be used — no special software is required.

4.1 Connecting to the microSpider2 Environmental

Identifying the Comms port. It is the **left-hand** of the three connectors when the unit is viewed from the front, identified by a **red washer** around its base. The middle connector is I/O Connector 1 and the right is I/O Connector 2. The Comms port and I/O connectors take different cables and cannot be cross-plugged.

Option A — Via LANlink Cable (Ethernet):

1. Power up the microSpider2 Environmental.
2. Disconnect the computer from all networks, including Wi-Fi.
3. Plug the round microSpider-end of the LANlink cable into the **Comms** port.
4. Plug the computer-end connectors into the computer's LAN and USB ports.
5. Wait 30 seconds for the microSpider2 Environmental to register.
6. Open a browser and go to: `http://192.168.0.177`

Option B — Via HLink Dongle (Wi-Fi):

The HLink dongle plugs into the **Comms** port and creates a Wi-Fi access point directly from the microSpider2 Environmental. Any Wi-Fi capable device — phone, tablet, or laptop — can connect without needing a LAN port. Keep the cable plugged in throughout the session.

1. Plug the HLink dongle into the **Comms** port.
2. On your device, connect to the Wi-Fi network created by the microSpider2 Environmental.
3. Open a browser and go to: `http://192.168.2.177`

4.2 Logging In

The login page is shown on first access. Enter the username and password.

Field	Default value
Username	user
Password	changeme

Change the password on first login — see §5.3.

If credentials are lost, contact Halytech for assistance. The user cannot recover access independently.

Three access levels are available — see §5.3 for details.

4.3 Alarms Page

The Alarms page is shown by default after login. It displays the current state of all configured alarms, auto-refreshing every 10 seconds.

To acknowledge an active alarm, click on it in the alarm list. For alarm status codes, see Appendix D.

4.4 Inputs Page

The Inputs page shows the current reading of all configured input channels at the time the page was loaded. Refresh the page to get updated readings.

4.5 Controls Page

The Controls page shows the current state of each control output and allows manual activation and deactivation. Multiple controls can be changed before saving — click **Save** to apply all changes at once.

4.6 History — Download Logged Data

The History page allows logged data to be downloaded from the microSpider2 Environmental as a CSV file.

1. Set the **End Date** and **End Time** — the download will include records up to this point.
2. Set the **Number of Records** to download.
3. Select the **Format** — see Appendix I for available formats.
4. Select the direction: **Oldest first** or **Newest first**.
5. Click **Download** — the browser will save the file.

4.7 View Setup

View Setup displays the current configuration in read-only form. Use this to verify settings without entering Change Setup.

4.8 Change Setup

Change Setup is the configuration area. All configuration changes are made here.

Important: Logging and alarm generation are suspended while Change Setup is active. This applies for the entire time any Change Setup page is open. Change Setup exits automatically after 20 minutes of inactivity.

All controls are turned off by default when Change Setup is entered (configurable via Advanced Settings).

4.9 About

The About page displays the device serial number, firmware version, and licence information.

4.10 On-Page Help

Most Change Setup pages include a built-in **Help** button. Click it to display context-sensitive help for that page directly in the browser.

5. Configuration

All configuration is performed via Change Setup in the web interface. Connect using the LANlink or HLink dongle — see §4.1.

On-page Help. Each Change Setup page has a ? Help button that opens an in-context help window with field-by-field guidance. This manual covers configuration at a reference level — for screen-by-screen detail of every field, use the Help (?) buttons in the device.

Recommended first-time configuration order:

1. Set location name and site ID
2. Configure network — APN, primary/secondary network method
3. Test mobile connectivity — signal strength test and test SMS
4. Configure input channels
5. Configure controls
6. Configure alarms
7. Configure reports
8. Save setup to disk
9. Reset report starting point

5.1 Location and Site ID

Navigate to **Change Setup** → **Change Location / Site ID**.

- **Location name** — used in SMS alerts, report filenames, and the web interface. Up to 16 characters.
- **Site ID** — secondary identifier included in reports.
- **Long location name** — extended location name used in reports when the "Use long location name" Advanced Setting is enabled.
- **Modem phone number** — the SIM card's phone number. Must be entered manually — it is not read automatically from the SIM.
- **SMS PIN** — 4-digit PIN required for control activation and remote access commands (LiveSMS option). Set to to disable.

5.2 Time and Date

Navigate to **Change Setup** → **Date and Time Settings**.

1. Click **Set from computer** to synchronise the device clock from the browser's system time.
2. Or enter the date and time manually.

Always set the clock to standard (non-DST) time — daylight saving is not supported.

NTP synchronisation: The microSpider2 Environmental synchronises its clock automatically once per day via NTP when a mobile connection is available. Without NTP, the clock may drift up to 30 seconds per month. To sync immediately, click **Synchronise now**. NTP settings can only be modified by the Administrator account.

5.3 Username and Password

Navigate to **Change Setup** → **Change Usernames and Passwords**.

Three access levels are available:

Level	Default username	Default password	Permissions
Administrator	user	changeme	Full configuration access
Service	service	changeme	View readings, diagnostics, calibration, save setup, manual upgrade
User	user	user	View readings only

Change the Administrator password on first access. Default credentials are the same on all devices from the factory.

5.4 Input Channels

Navigate to **Change Setup** → **Change Input Setup**.

For each channel:

1. Set the **Type** — select input type (see below).
2. Set the **Name** — user-defined channel name (used in reports and the web interface).
3. Set the **Units** — engineering units for display and calibration.
4. Set the **Logging period** — how often to log data, or select **General** to use the shared logging period.
5. Use the **Options** icon (cog) for additional per-channel options.
6. Use the **Examine** icon (magnifying glass) to request a new reading from the sensor.

Global logging settings (at the bottom of Change Input Setup):

Setting	Description
General logging period	Logging interval for all channels set to "General"
General fast logging period	Logging rate during alarm fast-logging
Logging offset	Shifts logging time from on-the-hour (e.g. offset 20 min → logs at :20 past each hour)

All channels are also logged automatically at midnight each day, regardless of logging period.

5.4.1 Input Types

Native inputs (physical inputs on the I/O connectors):

Type	Description
Switch	Logs each state change (ON/OFF) and duration the switch was ON. Active = digital input shorted to GND. Minimum stable state: 3 seconds.
Switch State	Logs state at each logging period. Does not log ON duration.
Counter	Increments on each pulse. Max 100 Hz (5ms minimum pulse width). Calibratable to engineering units (e.g. litres per pulse).
Event	Records each pulse with timestamp and running total. Suitable for pulses less than once per 30 seconds.
Difference	Records the difference between two counter inputs.
Analogue (Voltage)	Records voltage at each logging period. Native range: 0–2.5V.
Analogue (4–20 mA)	Factory calibrated with built-in biasing resistors. EOR indicates sensor not connected or not functioning.
Analogue (Switch)	Connects a switch to an analogue input. Reads ON if voltage < 1.25V; OFF if 1.25–2.5V.

5.4.2 System Inputs

System inputs are built-in monitors — see §2.2 for the full list. They are configured the same way as native inputs and share the same channel pool.

To log a system monitor, configure an input channel with **Type = System** and select the desired system input from the **Source** dropdown — for example, Battery voltage 1, System temperature, or Internal moisture. The selected system value will then be logged at the channel's logging period and included in reports the same as any other input. Useful for trending battery health, internal temperature, or moisture detection over time.

5.4.3 Super Channels

Super Channels are derived channels calculated from other input values. Up to 2 Super Channels are available. They share the same channel pool as native and system inputs.

Type	Description
Rating Table	Interpolates from a user-supplied stage/discharge lookup table (up to 100 pairs)
Ax + By + C	Sum, difference, or scaled combination of two channels
Evapotranspiration	Hargreaves model using solar radiation and mean temperature
Wind Speed / Direction	Vector average, angular average, or Sigma Theta (Yamartino method)
SWL	Standing Water Level: SWL = OFFSET – Head

Super Channels can be used in reports and as alarm trigger sources, the same as native or system channels. They are not normally calibrated — the input channels are calibrated and Super Channel calculations operate on those calibrated values. The exception is **SWL**, which must be calibrated once to set the current reading; the offset is calculated automatically from there.

Rating Table

Selects an input channel and applies linear or logarithmic interpolation against a user-supplied lookup table. The table is generated from Hydstra software and uploaded to the device.

Once a Rating Table Super Channel is set up:

1. **Change Input Setup** → **cog (Options)** — choose the input channel that feeds the rating table.
2. A **Rating Table Options** button appears at the bottom of the Change Input Setup page. Open it to:
 - Upload a rating table (Hydstra format)
 - Select the **Interpolation Method**: Linear or Logarithmic
3. After upload, a **Rating Table Management** page becomes accessible from Change Setup — use this to download the existing table or upload a replacement.

Ax + By + C

Performs the calculation:

$$z = (A \times x) + (B \times y) + C$$

Where A and B are scaling factors (can be negative), x and y are input channels, and C is a fixed offset (added or subtracted from the result).

Use the cog (Options) icon to select the input channels and enter A, B, and C.

Example — water depth from a pressure sensor with atmospheric compensation:

A pressure sensor at the bottom of a tank reads gauge pressure (water depth + atmospheric); a second sensor reads atmospheric pressure. To get water depth in metres from sensors reading in bars (1 bar $\approx$ 10.19 m of water):

- A = 10.19, x = depth-pressure channel (bar)
- B = -10.19, y = atmospheric-pressure channel (bar)
- C = 0

Result: water depth in metres, atmospheric pressure subtracted.

Evapotranspiration

Calculates daily reference evapotranspiration (ET_0) using the Hargreaves model:

$$ET_0 = 0.0135 \times (T + 17.78) \times R_s \times (595.5 - 0.55 \times T) / 238.8$$

Where:

- **T** = mean daily temperature (°C)
- **R_s** = total daily solar radiation (MJ/m²/day)

Use the cog (Options) icon to select the input channels for temperature and solar radiation.

Wind Speed and Direction

Four calculation methods are available, depending on what the input channels report. Each method averages over the Super Channel's logging period.

Method	Inputs	Result
Wind Speed Vector Avg	Instantaneous wind speed + instantaneous direction	Vector-averaged wind speed
Wind Direction Vector Avg	Instantaneous wind speed + instantaneous direction	Vector-averaged wind direction
Wind Direction Average	Instantaneous wind direction	Mean direction (correctly handles 0°↔360° wrap)
Wind Direction Sigma Theta	Instantaneous wind direction	Standard deviation of direction (Yamartino method)

SWL — Standing Water Level

Calculates standing water level in a bore from a head-of-water input.

$$\text{SWL} = \text{OFFSET} - \text{Head}$$

Where Head is the water depth above the sensor and OFFSET is set automatically during calibration.

To use:

1. Set up a head-of-water input channel (typically a pressure sensor calibrated in metres of water).
2. Add a Super Channel with type **SWL** and select the head channel as input.
3. Calibrate SWL once: enter the **current standing water level** as the desired value. The offset is computed automatically from there.

5.4.4 Channel Logging Options

Option	Description
Log Difference	Logs the change since the last log rather than the raw value. Variants: Any / Positive only. Useful for meters.
Minimum change	Minimum change threshold before a log entry is made, combined with a Force Log interval.
Filter type	Average (all input types); Integrate (SDI-12, RS-485, Rating Table, Ax+By+C inputs).
Log Min/Max	Logs minimum and maximum values within each logging period in addition to the standard value.
Periodic Reset	Resets the accumulated value at a set interval (1, 3, 6, 12, or 24 hours) — used for daily totals such as rainfall.
Warmup source	Assigns a control output as a sensor power supply that activates before each reading.

5.5 Input Channel Calibration

Navigate to **Change Setup** → **Change Input Setup** → **Calibrate** (for the relevant channel).

Calibration formula: `value_calibrated = (value_raw × scaler) + offset`

Available calibration methods:

Method	Description
Change Offset Only	Adjusts offset only — useful for fine-tuning a zero point
4-20mA Calibration	Enter the real-world value at 4 mA and 20 mA — device calculates scaler and offset
2-point calibration	Apply two known inputs and enter expected outputs — see §5.5.1
Manual calibration	Enter scaler and offset directly
Change Desired Value	Align the running counter to the source meter's current reading — see §5.5.2 (counter / event inputs only)

5.5.1 2-Point Calibration (Analogue)

Applies to: Analogue (Voltage), Analogue (4–20 mA).

2-point calibration automatically calculates the scaler and offset by taking two raw readings and the user's real-world values for each.

Procedure:

1. Apply a known low input to the sensor (e.g. immerse a pressure sensor in 20 cm of water).
2. On the calibration page, take a reading. Enter the real-world value (e.g.) in the **desired reading** field.
3. Click **Click here** to lock in the first point.
4. Apply a known high input (e.g. immerse the sensor in 290 cm of water).
5. Take a reading. Enter the real-world value in the desired reading field.
6. Click **Click here** to lock in the second point.
7. Click **Save** to commit the calibration.

Constraints:

- The two points must be separated by at least **1000 raw counts** for analogue voltage inputs, or at least **4 mA** for 4–20 mA inputs. If the spacing is less than this, calibration will fail and the procedure must be restarted.
- Larger spacing between the two points produces more accurate calibration.

5.5.2 Change Desired Value (Counter)

Applies to: Counter, Event.

Used to align the microSpider2 Environmental's running count to the current reading on the source meter — for example, after pulses were missed (sensor temporarily disconnected, or meter was reset).

1. Read the current value from the source meter.
2. On the channel's calibration page, enter that value in the **desired value** field.
3. Save. The microSpider2 Environmental continues counting from that value.

The current calibrated value is also displayed on this page; click **Update** at any time to refresh it.

5.6 Controls

Navigate to **Change Setup** → **Change Controls**.

For each control:

1. Set the **Custom name** — user-defined label (e.g. "Sensor Power", "Alarm Output").
2. Set the **Warmup time** — how long the control stays active before a sensor reading, if used as a warmup.

All controls are turned off by default when Change Setup is entered (configurable via Advanced Settings).

When the Intelligent Interface is fitted, **Control 1 (PWR OUT)** is not configurable — see §2.3 and §3.8.

5.7 Alarms

Navigate to **Change Setup** → **Change Alarm Setup**.

For each alarm:

1. Set the **Alarm name**.
2. Set the **Trigger source** — channel value, date/time, periodic, or Super Alarm.
3. Set the **Control action** (optional) — turn a control on continuously, or pulse for 1–999 seconds.
4. Set the **Counter action** (optional) — increment or reset a virtual counter.
5. Set the **Log action** (optional) — immediately log another channel when the alarm triggers.
6. Set **Send alarm report** — Disabled / Once only / Two times / Repeat (fast period).
7. Enable **Fast logging** to increase logging rate while the alarm is active.
8. Set the **Message** — text included in SMS and email alerts.
9. Set the **Auto acknowledge time** — time after triggering when the alarm is automatically acknowledged (minimum 5 minutes, default 60 minutes).
10. Enter up to 3 **phone numbers** and 3 **email addresses** for alerts.

Alarm trigger sources:

Source	Description
Channel	Triggers when channel value is above, below, or changes by a set amount; or on switch state or error
Date / Time	Triggers at a specified time on selected days, months, and weekdays — see below
Periodic	Triggers at a regular interval with optional offset — see below
Super Alarm	Triggers based on combined active/inactive state of other alarms (AND/OR logic) — see below

Date / Time alarm options:

Option	Description
Trigger Time	Time of day at which the alarm should go active
Remain Active For	How long (seconds) the alarm stays active after triggering
Months of the Year	January–December — the months in which the alarm may activate
Days of the Month	1–31 — the days of the month on which the alarm may activate
Days of the Week	Monday–Sunday — the weekdays on which the alarm may activate

All three calendar conditions (Months of the Year, Days of the Month, Days of the Week) must be met for the alarm to activate. For example, a weekly alarm on Mondays at 00:00 = all months selected, all days of the month selected, only Monday selected as day of the week.

Periodic alarm options:

Option	Description
Period	How often the alarm triggers (e.g. every 1 hour, every 30 minutes)
Offset	A delay added to the trigger time. Example: period 1 hour + offset 20 minutes triggers at 20 past each hour
Remain Active For	How long (seconds) the alarm stays active after triggering

Periodic and Date / Time alarms can be combined via a **Super Alarm** — for example, "trigger every hour, but only on weekdays between 08:00 and 18:00".

Alarm behaviour:

- An alarm is **active** when its trigger condition is met, **inactive** when not.
- An alarm **triggers** (sends alerts) only when active AND unacknowledged.
- After triggering, the alarm will not re-trigger until acknowledged AND gone inactive, then active again.
- Fast logging runs at the General fast logging period while the alarm is active. Fast logging stops when the alarm deactivates, not when acknowledged.

Acknowledging alarms:

- Web interface — click the unacknowledged alarm on the Alarms page.

- Auto-acknowledge — the device acknowledges automatically after the configured time.
- SMS — using `ACK ALx` or `ACK ALL` command (LiveSMS option only).

For alarm status codes, see Appendix D.

5.7.1 Using Alarms to Drive Controls

Alarms can be used to control external systems by assigning them a **Control action**. Beyond a simple ON/OFF, two behaviours are available:

- **Continuous** — the control follows the alarm's active state. The control activates whenever the alarm enters the active state (regardless of acknowledgement) and deactivates when the alarm goes inactive.
- **Once until alarm acknowledged and reactivated** — the control action fires only once per acknowledgement cycle. Subsequent re-activations of the alarm do not trigger the control until the alarm has been acknowledged AND has gone inactive AND active again.

Example 1 — pump control on tank water level:

To maintain water in a tank between low and high levels, set up two alarms:

- *Alarm 1 (low level)*: trigger when the tank's water level falls below the low level. Control action: **PWR OUT ON Continuously** (wired to the pump start). The pump runs whenever the level is low.
- *Alarm 2 (high level)*: trigger when the level rises above the high level. Control action: **PWR OUT OFF Continuously**. The pump stops when the tank is full.

Continuous control actions are used here because the pump should operate fully automatically without waiting for human acknowledgement.

Example 2 — fire-once sampler:

A control output is wired to trigger an automatic sampler. After an alarm (e.g. high temperature) fires, the sampler takes one sample. No further samples should be taken until the previous sample has been removed and the operator acknowledges the alarm.

Use the **Once until alarm acknowledged and reactivated** option for the control action. The sample is taken once when the alarm activates; subsequent re-activations are ignored until the operator acknowledges the alarm.

Example 3 — periodic pulse with rate limit:

A pump should run for 5 minutes whenever an alarm is active, but no more than once per hour.

- Connect the pump to a control output and set the control action to **PULSE for 300 seconds**.
- Select the **Once until alarm acknowledged and reactivated** option.
- Set the alarm's auto-acknowledge time to 60 minutes.

When the alarm activates, the pump runs for 5 minutes. The auto-acknowledge timer then resets the cycle 55 minutes later, allowing the pump to fire again on the next alarm activation.

5.8 Network Settings

Navigate to **Change Setup → Change Network Settings**.

Mobile Internet (Modem)

1. Set **Method** to Mobile Internet (Modem).
2. Enter the **APN** for the SIM card — confirm the correct value with your carrier or SIM provider.
3. If LiveSMS remote access is required, enter the **Remote APN** — a SIM with a public dynamic IP address is required. Contact your carrier to enable this and obtain the correct Remote APN value.
4. Enable **Authentication** only if required by the SIM — not needed in most cases.
5. Set a **Data limit** (maximum MB per day) if required.
6. Enter the **Modem phone number** — must be entered manually; it is not read from the SIM.

Primary and Secondary Network

- **Primary network** — used for reports, emails, NTP, and software/setup updates.
- **Secondary network** — used for report failover only; not for emails or updates.
- **Transmit mode** — Fail over or Both. Both (simultaneous) is only available when one network is Iridium satellite.

SMS Recovery

When enabled, the modem becomes active for up to 3 minutes at the configured interval (daily at midnight, or weekly) to allow delivery of queued incoming SMS messages. Works whether or not reporting is enabled.

5.9 Email

Navigate to **Change Setup → Change Email Settings**.

Setting	Value
SMTP port (unauthenticated)	25
SMTP port (authenticated)	587
SSL / TLS	Not supported

Enter the SMTP server address, From address, and optionally a test email address. Enable authentication and enter credentials if required by the SMTP server.

To test email delivery, navigate to **Change Setup** → **Email Diagnostics** and send a test email. The SMTP conversation is displayed in real time — server response codes in red identify any issues.

5.10 Reports

Navigate to **Change Setup** → **Change Report Settings**.

The microSpider2 Environmental supports two independent automatic report slots. For each slot:

Setting	Description
Reports to send	Email, FTP 1, FTP 2, HTTP — any combination
Period	1 minute to 1 day
Send report	Always, or only when new data available
Offset	Delay from start of period (e.g. daily at 6:30am: offset 6h 30m)
Enable recovery	Unsent data included in next report (up to 30,000 records)
Format	See Appendix I
Time order	Oldest first or newest first

Reset Report Starting Point: marks all existing logged records as already sent — use after setup and testing to prevent test data appearing in the first real report.

Daily Heartbeat Report: an optional status report sent once per day regardless of logging activity.

For report formats, see Appendix I.

5.11 Modem Diagnostics

Navigate to **Change Setup** → **Modem Diagnostics**.

Use this page to verify mobile connectivity after inserting a SIM card or changing antenna location.

Signal Strength Test:

1. Click **Mobile Signal Test**.
2. The modem turns on and displays signal strength continuously until the test is closed.

Use this test to confirm the SIM card is active and that the antenna location has adequate signal before leaving site.

SMS Test:

1. Enter a phone number in the **Phone number** field.
2. Click **Send Test SMS**.

The unit sends an SMS to the nominated number containing the unit's location name, serial number, current signal strength, and date/time. A successful send confirms end-to-end mobile communication.

Signal strength reference:

Level	Threshold	Action
Excellent	≥75%	No action required
Good	≥50%	No action required
Acceptable	≥40%	No action required
Poor	<40%	Reposition antenna — connection may be unreliable

5.12 Setup Management

The microSpider2 Environmental supports two ways of managing setup files:

- **Manual Setup Management** — save, load, email, or factory-reset the configuration via the web interface.
- **Automatic Setup Updates** — the device polls an FTP server periodically and applies any new configuration found.

5.12.1 Manual Setup Management

Navigate to **Change Setup → Manual Setup Management**.

Save setup to disk:

1. Click **Save setup to disk**.
2. Save the `.cfg` file to a known location — use as a backup or template for similar units.

Some browsers flag `.cfg` files as potentially harmful during download. This is a false positive — dismiss the warning and save the file.

Load setup from disk:

1. Click **Browse** and select a setup file.
2. Click **Load setup from disk**.

The setup file must be from the same product type and the same or earlier firmware version.

Email setup: sends the current setup file as an email attachment — useful for off-site backup.

Restore factory defaults: resets all settings to defaults. Log file data is unaffected.

5.12.2 Automatic Setup Updates

The microSpider2 Environmental can check an FTP server once per day for an updated configuration file and apply it automatically — useful for fleets where central configuration changes need to roll out without site visits.

Navigate to **Change Setup → Automatic Setup Management**.

Field	Description
Automatic Setup Updates	Enable or disable polling. When enabled, the device checks for a new setup file once per day after a report is sent.
FTP Server	Address of the FTP server to connect to for setup updates.
Username	FTP server username.
Password	FTP server password.
Setup directory	Directory on the server where the setup file is located.
Response directory	Directory where the device uploads a result file describing whether the update succeeded or failed. If left blank, the result file is uploaded to the Setup directory.

Setup file naming: the device requests a uniquely named file from the FTP server in the form `msc<serial number>.cfg`. For example, a unit with serial number `000D98` will request `msc000D98.cfg`. To roll out the same configuration to multiple units, place a separately named file for each unit on the server.

The serial number in the filename is **case-sensitive** — any letters in the serial number must be UPPER CASE.

Automatic setup updates will not run if reporting is disabled.

Testing the configuration: click **Save and Update** at the bottom of the page to save the settings and immediately attempt a setup update — useful for verifying the FTP server credentials and paths.

For the format of the setup file itself, see Appendix O.

5.13 Software Upgrades

Manual upgrade:

1. Navigate to **Change Setup** → **Manual Software Upgrade**.
2. Click **Choose File** and select the upgrade file (`.hal`).
3. Click **Upgrade Now**.
4. Wait up to 5 minutes, then reconnect to the web interface.

No progress indicator is shown during the upgrade.

Automatic upgrade: The microSpider2 Environmental can check for and install new firmware automatically once per day after a report is sent, either from the Halytech upgrade server or a self-managed FTP server. Automatic upgrades will not run if reporting is disabled.

5.14 Advanced Settings

Navigate to **Change Setup** → **Advanced Settings**.

Setting	Description
Turn all controls off on entry to Change Setup	Default: on. Disable to prevent controls being turned off when entering Change Setup.
Minimum auto-acknowledge time	Default: 60 min. Configurable down to 5 min.
Store messages with channel data	When off, info messages go to a separate diagnostic area — increases channel data capacity.
Enable 4-20mA error handling	Escalates out-of-range 4–20 mA readings from warnings to errors, enabling alarm triggering.
Use long location name	Uses the Long Location field in reports.
Modbus baud rate	Default: 19200. Must match connected Modbus sensor. Maximum 38400 — do not select 57600 or 115200. (Intelligent Interface only.)
Modbus parity	Default: Even. Must match connected Modbus sensor. (Intelligent Interface only.)
Modbus stop bits	Default: 1. Must match connected Modbus sensor. (Intelligent Interface only.)

6. Service Mode

Service Mode provides a restricted configuration interface for field commissioning without the risk of altering report or alarm settings.

Log in with the **Service** account credentials (default username: `service`, password: `changeme`).

Available in Service Mode:

- View all current channel readings
- Access and adjust Time/Date (NTP settings cannot be changed)
- Calibrate inputs (including Examine and Test — see §6.3)
- Modem diagnostics
- Save setup to disk
- Manual software upgrade

Exiting Service Mode re-enables normal logging.

6.1 Time and Date

Time and date can be set in Service Mode — see §5.2 for the procedure. NTP settings cannot be modified from the Service account.

6.2 Modem Diagnostics

Available in Service Mode — see §5.11 for the procedure.

6.3 Input Channel Calibration and Test

Navigate to **Calibration** → **[channel]** → **Examine and Test**.

1. Click **Examine and Test** on the input calibration page.
2. The input reading is temporarily reset to zero (the original accumulated value is preserved and unaffected in the log).
3. Apply test pulses — the display counts each pulse in real time.
4. Click **Exit** — the original accumulated value is restored.

This allows field pulse verification (e.g. checking a water meter reed switch) without corrupting the live reading.

6.4 Software Upgrade

Manual software upgrade is available in Service Mode — see §5.13 for the procedure.

7. Maintenance

7.1 Replacing the Lithium Battery Pack

The microSpider2 Environmental runs from one or two non-rechargeable Lithium-Thionyl Chloride (Li-SOCl₂) battery packs. Two pack types are used across the variant range:

Pack	Voltage	Capacity	Used in
Standard	7.2V	13 Ah	HME-100, HME-101, HME-104, HME-106
HVI	14.4V	13 Ah	HME-102, HME-103

Expected service life: up to 5 years from a single internal pack under the standard reference scenario (1-hour logging, daily report, good mobile signal, self-powered sensors, one alarm per month).

Service life depends heavily on logging rate, report frequency, mobile signal strength, sensor power requirements, and alarm activity. Heavy SMS/LiveSMS traffic, frequent reporting, weak signal, or high-power sensors significantly reduce battery life.

A second internal pack of the same type can be fitted to extend life — see §1.4 Accessories for replacement pack item codes.

Checking battery condition:

Battery voltage is available via the web interface — see §4.4 Inputs Page. Each fitted pack reports its voltage as a system input.

Pack type	Healthy	Replace
Standard (7.2V nominal)	Above 7.0V	Below 7.0V
HVI (14.4V nominal)	Above 14.0V	Below 14.0V

Li-SOCl₂ cells have a very flat discharge curve — the pack holds close to its nominal voltage until near end-of-life, when it drops sharply. Acting on the threshold above gives the most reliable replacement signal.

Replacement procedure:

1. Open the case — see §3.1.

2. Remove the metal protective bar over the circuit board.
3. Disconnect the old battery from the circuit board by squeezing the locking latch on the connector and gently pulling upwards. Do not pull on the cable.
4. Remove the old battery from its compartment in the case.
5. Place the new battery pack in the compartment. Use the same pack type that was fitted — do not mix Standard and HVI packs in the same unit.
6. Connect the new battery lead to a battery connector on the circuit board (typically labelled BATT1) until it clicks into place.
7. If a second pack is fitted, repeat steps 3–6 for the second pack.
8. Replace the metal protective bar by inserting it into the case grooves.
9. Close the case — see §3.4. Verify the O-ring is correctly seated to maintain the IP68 rating.
10. Verify the unit is operating correctly — log in via the web interface (§4.1) and confirm the battery voltage reading on the Inputs page matches the new pack's nominal voltage.

Used Li-SOCl₂ batteries must be disposed of in accordance with local regulations for primary lithium cells. Do not incinerate, puncture, short-circuit, or expose to temperatures above 100°C.

7.2 External 12V Power (Optional)

External 12V power can be connected to extend battery life — see §3.6 for connection details. When external power is connected, the unit operates from external power and the internal lithium pack(s) are held in reserve.

External power is typically used for:

- Permanently mains-powered installations (with a regulated 12V DC supply)
- Solar-powered installations (12V solar panel + 12V SLA battery wired to PWR IN)
- Workshop bench testing for extended periods

The internal lithium batteries are non-rechargeable. External power does not charge them — it only powers the unit while connected.

7.3 Routine Site Checks

On each site visit, check:

- **Battery voltage** — view on the web interface system inputs (§4.4); compare against the replacement threshold in §7.1
 - **Signal strength** — should be $\geq 40\%$ (see §5.11 Modem Diagnostics); reposition the antenna if below threshold
 - **Connectors** — inspect the I/O connectors, communications port, and (where fitted) external antenna SMA connector for corrosion, dirt, water ingress, or damage. Replace any missing or damaged sealing caps on unused connectors.
 - **Case seal** — inspect the case lid screws for tightness. Look for any sign of moisture inside the case via the moisture monitor (§4.4 Inputs Page) — if the moisture sensor is flagging detection, open the case at the next opportunity to inspect the O-ring.
 - **External antenna seal** — for external-antenna variants, check the self-vulcanising rubber tape around the SMA connector for cracking or peeling. Reseal if damaged.
 - **Sensor readings** — verify each configured input is returning plausible values; address any issues before leaving site.
-

8. Specifications

8.1 Hardware Specifications

Inputs:

Type	Count
Analogue (native)	4
Digital (native)	4
System monitors	6

An optional SDI-12 / RS-485 Intelligent Interface adds intelligent sensor support; fitting it consumes one I/O connector. All channel types — native inputs, system monitors, intelligent sensor readings, and virtual channels (Super Channels, max 2) — share a pool of **20 total configurable channels**. See Appendix C.

Analogue inputs:

Parameter	Value
Resolution	12 bits
Input range (native)	0–2.5V
Current input	4–20 mA (factory calibrated)
Sampling period	User definable (1 second minimum)

Digital / Counter inputs:

Parameter	Counter	Event
Minimum pulse width	5 ms	10 ms
Maximum frequency	100 Hz	< once per 30 seconds
Range	0–999,999.999	0–999,999.999

Outputs:

Output	Type	Rating
Control 1 (PWR OUT)	Switched Power Out	Max 1A
Control 2 (OC OUT)	Open Collector	Nominal 10 mA
Control 3 (LV OUT)	Low Voltage Sensor Supply	3.3V or 5V selectable, max 100 mA

Alarms:

Parameter	Value
Total alarms	16
Phone numbers per alarm	3
Email addresses per alarm	3
Alert mechanisms	SMS, Email, Exception Reports; DNP3 (paid software option)

Logger:

Parameter	Value
Capacity	300,000 records
Storage	Non-volatile FLASH
Time resolution	1 second

Communications:

Interface	Detail
Mobile	4G or LTE Cat-M1 (variant-dependent)
SIM card	Nano SIM
Ethernet	Via LANlink Cable
Wi-Fi	Via HLink Dongle
Antenna	Internal (standard) or external SMA connector (variant-dependent)

Power:

Parameter	Value
Battery — standard	7.2V Li-SOCl ₂ , 13 Ah
Battery — HVI option	14.4V Li-SOCl ₂ , 13 Ah
Battery life	up to 5 years from a single pack under standard reference scenario
Additional battery	Second pack (same type) optional, for extended life
External power input	12–22V DC, 1A minimum (PWR IN, I/O Connector 1 Pin 8)
Internal charger	None — internal batteries are non-rechargeable

8.2 Physical Specifications

Parameter	Value
Dimensions	165(W) × 145(H) × 85(D) mm
Weight (standard battery)	800 g
Weight (HVI battery)	1030 g
Enclosure rating	IP68 (including connectors)
Enclosure material	ABS
Mounting	Integrated points for flat surfaces; optional bracket for poles/pipes
Operating temperature	–20°C to +60°C
Warranty	12 months manufacturers warranty

9. Accessories

Separately-available items for installation, configuration, and spare parts:

Configuration tools:

Item code	Description
HHS-013	LANlink Cable — Ethernet comms cable for setup
HHS-080	HLink Wi-Fi Dongle — Wi-Fi comms for setup

Sensor interface options:

Item code	Description
HME-015	SDI-12 / RS-485 Intelligent Interface — adds intelligent sensor support
HME-016	RS-232 External Module
HME-048	High Voltage external battery pack — for powering 2× 4–20 mA sensors

Cables:

Item code	Description
HME-018	Input cable — 1 m, with 8-pin mating connector
HME-019	Input cable — 2 m, with 8-pin mating connector
HME-017	Input cable — 10 m, with 8-pin mating connector
HME-080	Cable Breakout Box — I/O cable to sealed enclosure with 2 I/O connectors
HME-081	Cable Breakout — I/O connector to 1× external sensor power + 2× 4–20 mA leads
HME-082	Cable Breakout — I/O connector to 2 flying leads
HME-092	Cable Breakout Box — I/O cable to sealed enclosure with terminal strip
HME-097	Cable Breakout Box — I/O cable to glanded enclosure with terminal strip
HME-098	Cable Breakout Box — I/O cable to 3-glanded enclosure with terminal strip
HME-090	Termination of customer-supplied meter probe
HME-091	Termination of customer-supplied pressure sensor (no vent tube protection)
HME-093	Cable Breakout — I/O connector to customer-supplied pressure sensor with flying lead

Replacement battery packs:

Item code	Description
RBT-004	Battery pack — 7.2V Li-SOCl ₂ 13 Ah (standard)
RBT-008	Battery pack — 14.4V Li-SOCl ₂ 13 Ah (HVI)

Antennas (for external-antenna variants):

Item code	Description
HAN-001	Whip antenna 3–5 dB, 5 m cable, bracket and SMA connector
HAN-004	High Gain Heavy Duty Fibreglass Whip, 5 m cable, bracket and SMA connector
HAN-005	High Gain Heavy Duty Fibreglass Whip, 10 m cable, bracket and SMA connector
HAN-006	High Gain Heavy Duty Fibreglass Whip, 15 m cable, bracket and SMA connector
HAN-002	Directional 12–13 dBi Dipole Array, 10 m cable, SMA connector
HAN-003	Directional 12–13 dBi Dipole Array, 5 m cable, SMA connector

Mounting:

Item code	Description
HML-006	Stainless steel pipe mounting bracket — includes 4 screws (hose clamps not supplied)

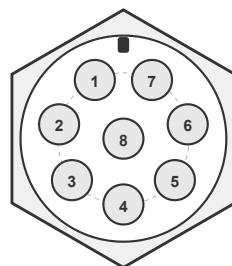
Contact sales@halytech.com.au for ordering.

Appendix A — I/O and Power Connector Pinout

The microSpider2 Environmental has two 8-pin circular IP68 I/O connectors on the bottom of the case:

- **I/O Connector 1** — middle of the case
- **I/O Connector 2** — right-hand side of the case (viewed from the front)

Both connectors share the same physical pin layout. Pin numbering is shown below, viewed from the back (solder) end of the connector with the notch facing upwards.



I/O Connector Pins
Panel view. Same as plug solder-cup view.

Both I/O connectors share the same physical pin layout. The view above is the connector face with the **keyway at the top** — it reads the same whether you are looking at the socket on the case or wiring the back of the mating plug. All GND pins are equivalent.

I/O Connector 1

Pin	Name	Function	Notes
1	DIN1	Switch 1 / Counter 1	Active = short to GND
2	AIN1	Analogue 1	0–2.5V or 4–20 mA
3	GND	Ground	—
4	DIN2	Switch 2 / Counter 2	Active = short to GND
5	AIN2	Analogue 2	0–2.5V or 4–20 mA
6	GND	Ground	—
7	PWR OUT	Switched Power Output	Driven by Control 1, max 1A
8	PWR IN	External Power Input	Nominal 12V DC, minimum 1A

I/O Connector 2

Pin	Name	Function	Notes
1	DIN3	Switch 3 / Counter 3	Active = short to GND
2	AIN3	Analogue 3	0–2.5V or 4–20 mA
3	GND	Ground	—
4	DIN4	Switch 4 / Counter 4	Active = short to GND
5	AIN4	Analogue 4	0–2.5V or 4–20 mA
6	GND	Ground	—
7	OC OUT	Open Collector Output	Driven by Control 2, nominal 10 mA
8	LV OUT	Low Voltage Sensor Supply	3.3V or 5V selectable, max 100 mA

When the optional Intelligent Interface is fitted, the inputs and outputs on the occupied connector are not available — see §2.3 and §3.8.

Appendix B — Connecting Sensors

Sensor wiring is site-specific. The following table summarises connection points by sensor type. For the full pin assignment of each I/O connector, see Appendix A.

Sensor type	Connect to	Notes
Switch / counter / event	DINx → GND	Active = short to ground
4–20 mA current loop	AINx → GND	Factory calibrated — no external resistor required
Voltage 0–2.5V	AINx → GND	Direct connection
Voltage 0–5V	AINx with 1.2 k Ω + 1 k Ω resistor divider	See note below
Voltage 0–10V	AINx with 3.3 k Ω + 1 k Ω resistor divider	See note below
SDI-12 / Modbus	Via Intelligent Interface	Optional accessory only — see Appendix C

Resistor divider (0–5V and 0–10V inputs):

The analogue input has a native range of 0–2.5V. To accept 0–5V or 0–10V signals, fit a resistor voltage divider between the signal source and the AINx pin. Resistors are included in the input conditioning components pack supplied with the unit.

Do not apply signals above 2.5V directly to an AINx pin. Use a resistor divider. Higher voltages may damage the input.

Sensor power (warmup):

For sensors requiring power to be applied before sampling, connect the sensor supply to the PWR OUT (Control 1) output on I/O Connector 1. Set the warmup time in Change Input Setup → Options → Warmup source.

For low-power sensors that can run continuously from 3.3V or 5V, the LV OUT (Control 3) output on I/O Connector 2 provides a regulated supply directly from the internal battery — see §3.8.

Appendix C — SDI-12 / RS-485

Applies to units fitted with the optional SDI-12 / RS-485 Intelligent Interface only.

The Intelligent Interface is an external accessory (HME-015) supporting SDI-12 and RS-485 (Modbus) sensors. Both SDI-12 and Modbus sensors can be connected simultaneously. Each physical sensor may provide one or more channel values; each value occupies one channel slot from the device's 20-channel total. There is no limit on the number of physical devices connected.

The Intelligent Interface is supplied as an inline IP68 module with two connectors — an 8-pin connector that mates with **I/O Connector 1** of the microSpider2 Environmental, and a 9-pin connector for sensor wiring. The 8-pin connector will physically fit Connector 2, but only **Connector 1** is functional with the interface.

Pins consumed by the Intelligent Interface

Fitting the Intelligent Interface consumes all 8 pins of I/O Connector 1:

Connector 1 pin	Lost native function	Used by Interface for
1 — DIN1	Switch / Counter 1	Interface signalling
2 — AIN1	Analogue 1	Interface signalling
3 — GND	Ground	Ground
4 — DIN2	Switch / Counter 2	Interface signalling
5 — AIN2	Analogue 2	Interface signalling
6 — GND	Ground	Ground
7 — PWR OUT	Switched Power Out (Control 1)	Driven by Interface
8 — PWR IN	External Power Input	Power from Interface (see Powering below)

Connector 2 (DIN3, DIN4, AIN3, AIN4, OC OUT, LV OUT) remains fully available.

Powering the Intelligent Interface

The Intelligent Interface and its connected sensors require power. Two powering options are supported:

Option 1 — External power source. Supply external power (typical range 7.5–24V DC) to the Sensor Supply In pin on the sensor-side connector. The Interface uses this supply for itself, regulates a 12V output to connected sensors, and feeds power back to the microSpider2 Environmental's PWR IN pin via the 8-pin microSpider-side connector. This option works with all variants — Standard or HVI.

Option 2 — Internal HVI battery (HVI variants only). When fitted with the HVI battery (HME-102, HME-103), the unit can supply 12V from its internal battery to power the Intelligent Interface and connected sensors directly. No external power source is required. Note: connected intelligent sensors draw power directly from the internal battery — battery life will be reduced compared with self-powered sensor scenarios.

Standard 7.2V battery variants (HME-100, HME-101, HME-104, HME-106) cannot power the Intelligent Interface from internal batteries alone — an external power source is required.

Sensor-side connector pin assignments

The sensor-side of the Intelligent Interface is a 9-pin male connector. Wire your sensors to the supplied female mating connector following Table C-1.

Pin	Wire colour	Function
1	Red	Modbus Bias A
2	Orange	Modbus A (+)
3	White	Sensor Supply In
4	Purple	Sensor Supply Out
5	Blue	Switched Power Out
6	Yellow	Modbus B (–)
7	Green	Modbus Bias B
8	Black	Ground
9	Brown	SDI-12 Data

For Modbus operation, short the Modbus Bias pins to their respective data lines (Pin 1 to Pin 2, and Pin 6 to Pin 7) on the solder side of the female connector to bias the data lines to their default state. This is required for reliable RS-485 communication.

SDI-12:

Parameter	Value
Protocol compliance	SDI-12 v1.3
Supported commands	M, C, CC, R, RC
Device address range	0–9, a–z, A–Z (each sensor must have a unique address)

Modbus (RS-485):

Parameter	Default	Notes
Baud rate	19200	Selectable 9600 / 19200 / 38400 via Advanced Settings (§5.14) — 38400 is the maximum
Parity	Even	Configurable via Advanced Settings (§5.14)
Stop bits	1	Configurable via Advanced Settings (§5.14)
Device address range	1–255	Each device must have a unique address
Supported function codes	3, 4, 6	Read Holding Registers, Read Input Registers, Write Single Register
Register addressing	0-based index	

Baud rate, parity, and stop bits must be configured to match the connected sensor.

The Intelligent Interface does not operate above **38400 baud**. The Advanced Settings dropdown lists higher rates — do not select them.

Appendix D — Alarm Status Codes

The following status codes appear in the Alarms page and in diagnostic reports:

Code	Meaning
AL ACT	Alarm activated
AL DEACT	Alarm deactivated
AL ACK	Alarm acknowledged (manual)
AL ATACK	Alarm acknowledged (automatic)
ALSMS OK	Alarm SMS sent successfully
ALSMS FL	Alarm SMS failed
ALEML OK	Alarm email sent successfully
ALEML FL	Alarm email failed

Appendix E — SMS Commands

SMS commands allow basic remote control and status queries to be sent to the microSpider2 Environmental by SMS. The modem must be on to receive them.

Commands may be sent in upper or lower case. One space between words. No spaces before or after commas.

Valid commands are acknowledged with a return SMS: `Location: OK SMS command`

Command	Description	Example
<code>HELP</code>	Request list of supported commands	<code>HELP</code>
<code>GET ST</code>	Get current state of all inputs	<code>GET ST</code>
<code>GET CN</code>	Get current state of all controls	<code>GET CN</code>
<code>GET AL</code>	Get current state of all alarms	<code>GET AL</code>
<code>ACK ALx</code>	Acknowledge alarm x	<code>ACK AL3</code>
<code>ACK ALL</code>	Acknowledge all alarms	<code>ACK ALL</code>
<code>ON CNx</code>	Activate control x (no PIN)	<code>ON CN1</code>
<code>yyyy ON CNx</code>	Activate control x with PIN	<code>1234 ON CN1</code>
<code>OFF CNx</code>	Deactivate control x (no PIN)	<code>OFF CN1</code>
<code>yyyy OFF CNx</code>	Deactivate control x with PIN	<code>1234 OFF CN1</code>
<code>PULSE CNx</code>	Pulse control x for 1 second (no PIN)	<code>PULSE CN1</code>
<code>yyyy PULSE CNx</code>	Pulse control x for 1 second with PIN	<code>1234 PULSE CN1</code>
<code>GET REP</code>	Request current day's report via normal delivery	<code>GET REP</code>
<code>yyyy GPRS n,email</code>	Request remote web access session (LiveSMS only)	<code>1234 GPRS 10,me@example.com</code>

Control activation commands (`ON`, `OFF`, `PULSE`) and remote access (`GPRS`) can be protected with a 4-digit SMS PIN. Configure via Change Setup → Change Location / Site ID.

Appendix F — LiveSMS

LiveSMS is a software option that extends the SMS and remote access capabilities of the microSpider2 Environmental. Order from Halytech.

LiveSMS not recommended for battery-only operation. LiveSMS keeps the modem powered to receive incoming SMS, which significantly reduces battery life. If LiveSMS is required without external power, expected battery life claims do not apply.

LiveSMS features:

- Remote web access via mobile network (see Appendix G)
- Alert escalation — resend alerts if not acknowledged within a set time
- Modem scheduling — set the modem to be on at specific times
- Additional SMS commands

Modem operating modes (configured via LiveSMS settings):

Mode	Description
Never	Modem is never left on to receive SMS commands
Always	Modem is always on
Schedule + Alarms	Modem follows the configured schedule; also turns on when an alarm triggers
Alarms Only	Modem turns on only when an alarm triggers

Appendix G — Remote Web Access

Requires LiveSMS software option.

Remote web access allows the microSpider2 Environmental web interface to be accessed over the mobile network from anywhere with internet access.

Pre-requisites (one-time setup):

1. SIM card must be enabled for dynamic public IP address — contact your carrier to request this.
2. Set Network Method to Mobile Internet (Modem) and enter the Remote APN value provided by your carrier.
3. Configure email settings correctly — send a test email to confirm before attempting remote access.
4. Configure LiveSMS to keep the modem on (Always or Schedule + Alarms).

Connecting remotely:

1. Send the following SMS to the device: `yyyy GPRS n,yourEmailAddress`
 - `yyyy` = LiveSMS PIN (omit if no PIN set)
 - `n` = minutes to wait online (10 recommended)
 - `yourEmailAddress` = address where the link will be sent
 - Example (no PIN): `GPRS 10,me@example.com`
2. The device responds with an acknowledgement SMS.
3. The device sends an email containing a link to the web interface.
4. Open the link — the login page will appear.

Session behaviour:

- Session closes automatically after 5 minutes of inactivity or 30 minutes total.
- To reconnect after a session closes, send the `GPRS` SMS again.

Appendix H — DNP3

Requires DNP3 software option.

The microSpider2 Environmental supports the DNP3 protocol (Distributed Network Protocol) for participation in SCADA systems as an intelligent remote terminal unit (RTU) or outstation. The unit complies with the level 2 subset (DNP3-L2).

To support low-power operation, the unit can be configured to connect to the DNP3 server and transmit logged data via unsolicited responses periodically and/or whenever specific alarms are triggered. No special SIM or IP addressing is required for the modem-based active-connect mode.

H.1 Connection Modes

DNP3 connections can be made over either of the device's Internet methods (LAN or modem). Two modes are supported:

- **Listen mode** — the unit listens for an incoming connection from the DNP3 server. Typical when the unit is connected over a customer LAN; the SCADA system initiates the connection. With LiveSMS, listen mode can also be used over a modem with a public-IP SIM, but this is uncommon.
- **Active connect mode** — the unit actively connects to the DNP3 server periodically (or in response to an alarm) and uploads queued events. Typical when the unit uses a modem connection. Does not require a public-IP SIM.

H.2 Communications Settings

Configure via **Change Setup** → **DNP3**.

Setting	Description
Server IP address 1–3	Up to 3 DNP3 master server IP addresses — tried in order until a connection succeeds. In listen mode, leave blank to allow any server, or specify to restrict incoming connections.
Server port	TCP port to connect to (not used in listen mode); default 20000
Listen port	TCP port to listen on (listen mode only); default 20000
Local DNP3 address	This device's outstation address — must be unique across all outstations on the network. Default 4.
Server DNP3 address	DNP3 address of the master server. Default 3.
Status	Shows the current connection state (closed, listening, connecting, connected) including the IP address

After entering settings, click **Save and Restart DNP3** to immediately attempt a connection. The Status line shows the result, allowing verification before leaving site.

When using a modem for the server connection, server IP addresses must be **external public** IP addresses — not internal LAN addresses.

The connection mode is set automatically from the configured Internet method (LAN → listen, modem → active connect). Override via **Advanced Settings → DNP3 Settings → Listen Mode** if required.

H.3 Event Reporting

By default, every logged input value is sent to the master server as a DNP3 event (unsolicited response). To reduce traffic — particularly important on modem connections — events can be limited to value changes only.

Setting	Description
Enable Unsolicited	Whether the unit sends unsolicited responses to the server at all
Report all logged data	When cleared, only changes in logged values are reported as DNP3 events
Period	How often to send unsolicited responses (1 minute to 1 day, or Off)
Fast Period	Faster send rate while an alarm with "Repeat (fast period)" is active
Offset	Delay added to the send time. Useful for: aligning daily uploads to a non-midnight time, separating DNP3 from automatic-report timing, or waiting for late-running SDI-12 sensors to finish reading before sending.

Modem in active-connect mode: do not disable Enable Unsolicited. The modem only connects when there is data to send — with unsolicited responses disabled, no connection attempts will be made.

H.4 DNP3 Alarms

For low-latency notification of specific events (switch closures, threshold crossings, etc.), configure an alarm with **DNP3 Alerts** enabled. When the alarm activates, the unit immediately connects to the DNP3 master server and sends the queued events as unsolicited responses.

DNP3 Alerts setting	Behaviour
Once only	The unit connects and sends events once when the alarm activates.
Repeat (fast period)	The unit continues to connect at the Fast Period rate (see §H.3) for the duration the alarm remains active.

The corresponding alarm point must also be configured in the SCADA system — DNP3 itself has no concept of an "alarm event"; all events are equivalent. The SCADA system applies meaning based on the input that changed.

DNP3 Alerts can be combined with SMS, Email, or other alert mechanisms on the same alarm.

H.5 DNP3 Input Point Mapping

DNP3 considers an outstation to have a fixed set of input *points* of three types — Binary, Analog, Counter. The unit's input channels are mapped onto these point types as follows:

Channel type	DNP3 Input Point type	Additional DNP3 Input Point type
Switch	Binary	—
Counter	Counter	Analog
Event	Counter	Analog
Analogue (Voltage)	Analog	—
Analogue (4–20 mA)	Analog	—
Difference	Analog	—
SDI-12	Analog	—
Modbus	Analog	—
System (Voltage)	Analog	—
System (Temperature)	Analog	—
System (Moisture)	Analog	—
Super Channel	Analog	—

Channel-to-point indexing: unit channel numbers start from 1; DNP3 point indexes start from 0. Subtract 1 to convert: Channel 1 → point 0, Channel 2 → point 1, ..., Channel 20 → point 19.

Calibrated values: the analog point reports the calibrated value as shown on the Inputs page and in reports — no additional scaling is required in the SCADA system. This is true even when "Log difference" is enabled on the channel (the underlying calibrated value is still reported).

Counter dual-mapping: Counter and Event channels map to **both** a Counter point and an Analog point at the same index. Use the Counter point if you need DNP3 freeze/clear operations on the channel; use the Analog point if you only need the calibrated reading. Counter points report the raw 32-bit non-negative integer (0–4,294,967,295); the corresponding Analog point reports the calibrated floating-point value.

Frozen counters: when a counter is frozen, its value is copied into a "frozen counter" point at the same index. The frozen value is retained even as the live counter continues to increment, allowing the SCADA system to read a coherent snapshot.

Clearing counters: DNP3 clear (reset to zero) operations are supported on counter points only. To clear a counter or event channel from the SCADA system, operate on the corresponding counter point.

H.6 DNP3 Output Point Mapping

DNP3 supports binary outputs (on/off) and analog outputs. The unit's controls are exposed as binary outputs:

Control	DNP3 binary output point index
Switched Power Out (Control 1, PWR OUT)	0
Open Collector (Control 2, OC OUT)	1
Low Voltage Out (Control 3, LV OUT)	2
SDI-12 Command (software control — Intelligent Interface only)	3

Supported operations: LATCH_ON, LATCH_OFF, and PULSE_ON (single pulse, 100 ms to 600 sec).

PULSE_ON with a count greater than 1 is **not** supported.

The unit accepts the full DNP3 binary output command set — *select*, *operate*, and *direct operate* (CROB).

Conflict behaviour: the unit will not activate a control via DNP3 if it is being held on by an alarm or web interface, or if it is configured as a sensor warmup. If DNP3 has commanded a control on and an alarm subsequently forces it off, the control stays off while the alarm is active and DNP3 reasserts on once the alarm clears.

H.7 Setting the Clock

DNP3 can be used to set the unit's date and time. The unit uses UTC internally — the SCADA system should be configured to report UTC times to the outstation.

Using DNP3 clock synchronisation does not preclude NTP. Both can be enabled simultaneously.

H.8 Resetting the Unit

DNP3 supports two reset commands:

- **Warm reset** — restarts the DNP3 stack only. Equivalent to clicking **Save and Restart DNP3** in the web interface.
- **Cold reset** — full device restart (reboot). The log records a `POWERON` event, any current activity (e.g. report send) is aborted, and all alarms reset to their inactive state.

Both reset commands cause the DNP3 connection to drop. Re-establishment takes one to two minutes.

H.9 Reading Device Attributes

The unit exposes the following attributes via DNP3:

- Software version
- Serial number
- Long location name
- Short location name
- Product name (`microSpider2`)
- Hardware version (`30` for microSpider2 Environmental)

Use these to identify and verify each outstation in the SCADA system.

H.10 Transferring Setup Files and Software Upgrades

DNP3 file transfer can be used to:

- **Read** the unit's current configuration and save it as a setup file
- **Write** a setup file to update the configuration
- **Write** a firmware file to upgrade the software

Authentication: DNP3 file access uses the standard DNP3 file access authentication mechanism. The Administrator account credentials are required for read or write access to configuration files, and for write access to firmware files. Default Administrator credentials are username `user` / password `changeme`.

File naming:

- Setup file: `mssc<serial number>.cfg` (e.g. `mssc000D98.cfg`)
- Firmware file: `msf<serial number>.hal` (e.g. `msf000D98.hal`)

Filenames are **case-sensitive** — any letters in the serial number must be UPPER CASE.

Activation: after transferring a setup or firmware file, the new configuration must be **activated** via a separate DNP3 "activate configuration" request. SCADA systems such as ClearSCADA expose this as an "Activate" checkbox in the file download dialog.

Firmware upload: a firmware file is approximately several megabytes. Over a 3G/modem link, expect ~10 minutes. Disable DNP3 link layer confirmations for the duration of the firmware upload — confirmations significantly slow the transfer because the underlying TCP/IP layer already provides reliability.

After firmware upload and activation, the unit reboots to install the upgrade. The reboot/install takes up to 90 seconds.

The unit's firmware cannot be **read** via DNP3 — only written. Configuration and firmware files cannot be deleted via DNP3.

H.11 Advanced DNP3 Settings

Most installations do not require any of the advanced settings. They are exposed for strict Level 2 conformance and unusual master-server configurations.

Configure via **Change Setup** → **Advanced Settings** → **DNP3 Settings**.

Setting	Default	Purpose
Listen Mode	Auto from Internet method	Override the automatic LAN/modem selection. Enable for a public-IP modem SIM; disable on a LAN-connected unit to deactivate DNP3.
Send Level 2 Responses Only	Off	Restrict responses to a strict Level 2 subset — analog/counter events sent without timestamps; analog inputs reported as integers only; counter inputs reported only at their counter index, not the analog dual-mapping. Reduces functionality — only enable if the master strictly requires it.
Event Buffer Size	65535	Maximum number of unconfirmed events queued per group before the "event buffer overflow" flag is set. Does not affect storage capacity; only the overflow flag.
Unsolicited Confirm Timeout	default	Time (seconds) the unit waits for the master to confirm an unsolicited response.
Unsolicited Retry Delay	default	Additional time (seconds) before resending an unconfirmed unsolicited response. The total period between attempts is timeout + retry delay.
Unsolicited Max Retries	default	Number of retries before the unit considers the master offline and switches to offline mode.
Unsolicited Offline Delay	default	Additional retry delay used while the unit considers the master offline. Set above 86400 seconds (1 day) to disable retries in offline mode.

Values shown as `default` are calculated automatically based on connection mode (LAN or modem) and event reporting period. Override only if you have a specific master-server requirement. Click **Restore DNP3 Defaults** to revert.

Appendix I — Report Formats

The microSpider2 Environmental logs data internally in an efficient binary format. When a report is sent or downloaded via the History page, the binary log is converted to a CSV (comma-separated values) text file in one of the supported formats listed below.

I.1 Format Summary

Format	Description
Raw	Date, time, numeric category, numeric identifier, value
Diagnostic	As Raw, plus a 6th column with running total for "log difference" channels; includes system messages and diagnostic codes
Diagnostic Only	System messages and diagnostic codes only — no channel data
Filtered	Input name, date/time, value — no system messages
Multi-column	One column per channel, one row per timestamp; header row identifies columns
Multi-column (aligned)	As Multi-column, with all records in a logging period snapped to that period's timestamp — recommended for SDI-12/Modbus sensors that respond late
User ID	Like Filtered but uses the user-defined channel ID instead of the channel name
User ID (with controls)	As User ID, plus control on/off events
Custom format 1	Counter channels with log difference enabled — long location, channel name, period start, period end, difference, units, channel User ID
RID HTTP	Royal Irrigation Department (Thailand) format — sent as HTTP GET requests; rainfall (RQ) and water level (WL) channels only
NSW DPIE eagle.io	NSW water metering framework compliant report

Report file naming: where is R (Raw), F (Filtered), D (Diagnostic), M (Multi-column), or S (User ID).

I.2 Raw / Diagnostic Format

Each record consists of five fields (Raw) or six fields (Diagnostic):

Field	Example	Description
1 — Record date	14/05/03	DD/MM/YY
2 — Record time	12:34:15	HH:MM:SS
3 — Category	(numeric)	Type of record — see §1.6
4 — Identifier	(numeric)	Unique ID built from category and source — see §1.6
5 — Value	123.445 or INP RST	Calibrated value for inputs; text description for system events
6 — Totalised value	(numeric)	Diagnostic only — running total / absolute value for "log difference" channels

Diagnostic Only has the same structure but excludes channel data — only system messages and diagnostic codes.

1.3 Filtered Format

Each record consists of four fields:

Field	Example	Description
1 — Input name	Temperature	The user-defined channel name
2 — Record date and time	23-Jan-06 13:00:00	DD-Mon-YY HH:MM:SS
3 — Value	123.445	Calibrated value, or special-case label (see below)

Special cases for Filtered records:

Case	Filtered record
Switch input transitions ON → OFF	<input name>_run, <date:time>, <ON duration>
Midnight log (all inputs)	<input name>_reading, <date:time>, <input value>
Min/max logging — analogue maximum	<input name>_max, <date:time>, <max value>
Min/max logging — analogue minimum	<input name>_min, <date:time>, <min value>

For channels with "Log difference" enabled, the midnight log shows the running total / absolute value of the channel rather than the period delta.

I.4 Multi-Column Format

The Multi-column format produces one row per timestamp with each channel value in its own column. A header row identifies the columns.

Record fields:

1. Record date and time
2. One column per logged channel (system channels and Intelligent Sensor channels included)
3. Modem signal strength

Midnight logs, switch ON-duration records, min/max logs, and other "information" messages are omitted from this format. Switch and Event channel records are included at their actual activation time.

If multiple events occur at the same time on the same channel, only the most recent is recorded — for example, if an event counter records 3 pulses in 1 second, only the count after the 3rd pulse appears.

Channels not logged at a given timestamp appear as blank columns.

Multi-column (aligned): identical column structure to standard Multi-column, but every record in a logging period is moved to the closest general logging period timestamp. Useful for late-running SDI-12 or Modbus sensors that read after the on-the-hour mark — without alignment, records from one logging period appear in 3+ separate rows; with alignment, all rows snap to a single logging timestamp.

Aligned multi-column is **not** suitable for Switch and Event channels, since their actual activation time is overwritten by the logging timestamp.

I.5 User ID Formats

The User ID format is identical in structure to Filtered, except field 1 contains the user-defined channel ID rather than the channel name.

If the channel User ID is left blank, a default identifier is used (see §1.6 — input identifier ranges). To ensure each channel has a unique identifier, include at least one letter (A–Z) in any User ID — system identifiers (e.g. modem signal strength = 100) are purely numeric and do not include letters.

User ID (with controls): as above, plus records logging when each control turns on or off, with the description `ON CN#` or `OFF CN#` where `#` is the control number (0 = Switched Power Out, 1

= Open Collector, 2 = Low Voltage Out).

I.6 Numeric Category and Identifier Reference

Used in Raw and Diagnostic format reports. Diagnostic reports may include additional internal codes used by Halytech engineers; only the customer-facing codes are listed here.

Inputs (category 0–999):

Identifier	Meaning
Unique ID per channel	Constructed from channel type and data source — value of the input
10000 + Unique ID	Analogue <i>sampled minimum</i> (when min/max logging enabled)
20000 + Unique ID	Analogue <i>sampled maximum</i> (when min/max logging enabled)
30000 + Unique ID	Switch <i>On Time</i> (duration the switch was ON)
40000 + Unique ID	Midnight log entry (running total / absolute value if "Log difference" enabled)

System (category 1000):

Identifier	Description	Text
0	Device powered on	POWERON
10	Settings reset to defaults	SRAMRST
11	Settings upgraded to a new version	SRAMUPG
50	Logfile erased	LOGERASE
100	Reboot to install upgrade	REBOOTRQ
101	Reboot at web server request	REBOOTRQ
200	Clock reset to 1/10/2010	CLKRST
201	Clock reset to most recent log record	CLKRST
300	Clock changed (last record before change)	CLKCHG
301	Clock changed (first record after change)	CLKCHG
400	Software upgrade installed	UPG OK
401	Software upgrade failed	UPG FAIL
402	Software upgrade cancelled — already current	UPGNONEW
500	Setup installed via FTP	CFG OK
501	Setup install via FTP failed	CFG FAIL
502	Setup installed via web browser	CFG OK
503	Setup install via web browser failed	CFG FAIL
550	Config emailed successfully	CFGEMLOK
551	Config email failed	CFGEMLFL
1000–1999	Input # — count was reset	INP RST
2000–2999	Input # — was calibrated	INP CAL
3000–3999	Input # — was calibrated remotely via SMS	INP RCAL
10000	Admin entered Change Setup	ENTRSETP
10001	Admin left Change Setup	EXITSETP

Identifier	Description	Text
10100	LAN connected / turned on	LANON
10101	LAN disconnected / turned off	LANOFF
60000	Diagnostic log partition boundary	START/END OF DIAGNOSTICS PARTITION

Output / Control (category 2000–2999):

Identifier	Description	Text
2000 + 0 (Switched Power Out OFF)	Output off	OFF CN#
2000 + 1 (Switched Power Out ON)	Output on	ON CN#
2001 + 0/1 (Open Collector OFF/ON)	Output state	OFF/ON CN#
2002 + 0/1 (Low Voltage Out OFF/ON)	Output state	OFF/ON CN#

Alarms (category 3000–3999, identifier = 3000 + alarm number):

Sub-identifier	Description	Text
0	Alarm activated	AL ACT
1	Alarm deactivated	AL DEACT
2	Alarm acknowledged	AL ACK
3	Alarm auto-acknowledged	AL ATACK
10000–19999 (100 × SMS # + Attempt #)	Alarm SMS sent OK	ALSMS OK
20000–29999 (100 × SMS # + Attempt #)	Alarm SMS failed	ALSMS FL
30000–39999 (Attempt #)	Alarm email sent OK	ALEML OK
40000–49999 (Attempt #)	Alarm email failed	ALEML FL

Reports (category 4000–4999, identifier = 4000 + report number):

Sub-identifier	Description	Text
10000–19999 (Attempt #)	Report FTP upload OK	R FTP OK
20000–29999 (Attempt #)	Report FTP upload failed	R FTP FL
30000–39999 (Attempt #)	Report email sent OK	R EML OK
40000–49999 (Attempt #)	Report email failed	R EML FL

Response (category 5000–5999):

Sub-identifier	Description	Text
10000–19999 (Attempt #) — type 5000 (Upgrade)	Response FTP upload OK	RSPFTPOK
20000–29999 (Attempt #) — type 5001 (Setup)	Response FTP upload failed	RSPFTPFL

Modem (category 6000):

Identifier	Description	Text
0	Modem turned on	MODEMON
1	Modem turned off	MODEMOFF
100	Modem signal strength (%)	Signal Strength %
101	Modem signal strength (dBm)	Signal Strength dBm
102	Modem signal strength (raw value)	Signal Strength
200	Connection to mobile data failed	GPRSFAIL
300	Received an SMS	Last 8 digits of sender's number
700–715 (LiveSMS)	SMS Acknowledge for Alarm 1–16	SMS ALxK
718 (LiveSMS)	SMS Acknowledge for all alarms	SMS ALLK
719 (LiveSMS)	SMS Acknowledge for invalid alarm	SMS AL?K
720–725	SMS turned ON/OFF control x	SMS CxON / SMS CxOF (x = 1: PWR OUT, 2: OC, 3: LV OUT, 4: SDI-12)
758	Incorrect SMS PIN	SMS BPIN
759	Incorrect control number for OFF	SMS C?OF
759	Incorrect control number for ON	SMS C?ON
760	Received GET ST SMS	SMS GTST
761	Received GET CN SMS	SMS GTCN
762	Received HELP SMS	SMS HELP
763	Received GET AL SMS	SMS GTAL
764	Received GET REP SMS	SMS GTRP
796	Received invalid SMS	SMS INV

Identifier	Description	Text
797	Reply SMS sent OK	SMS REOK
798–800 (Attempt #)	Reply SMS failed	SMS REFL
860–862	SMS performed 1-second pulse output	SMS CxPS (x = 1: PWR OUT, 2: OC, 3: LV OUT)

Services (category 7000):

Identifier	Description	Text
0	NTP updated the system clock	NTP OK
1	NTP failed	NTP FAIL

I.7 Custom Format 1

Reports counter channels with "Log difference" enabled, one row per channel per logging period.

Field	Description
1	Long location
2	Channel name
3	Period start (YYYY-MM-DD HH:MM)
4	Period end (YYYY-MM-DD HH:MM)
5	Difference in value over the period
6	Channel units
7	Channel User ID

I.8 RID HTTP

Used to send rainfall and water level data to the Royal Irrigation Department (Thailand) servers via HTTP GET requests.

- Only inputs with User ID set to RQ (rainfall quantity) or WL (water level) are included.

- A maximum of one rainfall input and one water level input per device.
- The unit's short location name should be set to the station's site ID.
- HTTP must be selected as the report delivery method, with a server and path specified (e.g. `host.domain.com/datainput.php`).

I.9 NSW DPIE eagle.io

A pre-built format compliant with the New South Wales water metering framework as accepted by the eagle.io platform. Select this format when reporting to NSW DPIE / NSW Government data ingestion services. No additional configuration is required beyond the standard delivery destination.

Appendix J — Alert Formats

SMS alert format: [location name]: [alarm message text] / Time: HH:MM:SS DD/MM/YY

SMS alerts are sent to each configured phone number in order. If a send fails, it is retried 3 times at 1-minute intervals before moving to the next number.

Email alert format: [device] at [location] / [alarm message] / Generated by Alarm: [number]
([name])

Email alerts are sent to all configured addresses simultaneously. If a send fails, it is retried 3 times at 3-minute intervals.

DNP3 alerts: unsolicited responses — sent once only, or repeated at the configured fast period while the alarm is active.

Appendix K — Log Codes

The following codes appear in Raw and Diagnostic format reports:

Code	Event
POWERON	Device turned on
SRAMRST	Settings reset to defaults
LOGERASE	Log file erased
REBOOTRQ	Device rebooting
CLKCHG	Clock changed
UPG OK / UPG FAIL	Software upgrade result
CFG OK / CFG FAIL	Setup file install result
NTP OK / NTP FAIL	Clock sync result
LANON / LANOFF	LAN connected / disconnected
AL ACT / AL DEACT	Alarm activated / deactivated
AL ACK / AL ATTACK	Alarm acknowledged (manual / automatic)
ALSMS OK / ALSMS FL	Alarm SMS sent / failed
ALEML OK / ALEML FL	Alarm email sent / failed
R FTP OK / R FTP FL	Report FTP upload result
R EML OK / R EML FL	Report email result
MODEMON / MODEMOFF	Modem turned on / off

Appendix L — Power Considerations

The microSpider2 Environmental is powered by one or two non-rechargeable Lithium-Thionyl Chloride (Li-SOCl₂) battery packs fitted internally. There is no on/off switch — the unit starts operating as soon as the battery is connected.

Power source priority:

When multiple sources are available, the unit draws power in the following order:

1. **External power input** (PWR IN, I/O Connector 1 Pin 8) — used in preference when present, preserving internal battery life.
2. **USB** (via LANlink Cable / HLink Dongle) — powers all device functions except the modem during configuration sessions. The modem still draws from the internal battery.
3. **Internal battery** — primary source when no external power is connected.

The internal lithium batteries are non-rechargeable. External power does not charge them — it only powers the unit while connected.

Reference scenario for battery life:

The up-to-5-year battery life claim assumes the following standard scenario:

- Logging: 1 hour interval
- Reporting: 1 daily report
- Mobile signal: good (≥50% on the signal strength scale — see §5.11)
- Sensor power: self-powered sensors only (no continuous draw from PWR OUT or LV OUT)
- Alarm activity: approximately 1 alarm per month

Deviations from this scenario will reduce battery life — sometimes significantly:

Factor	Effect on battery life
Faster logging (e.g. every 5 minutes)	Increased FLASH writes; modest reduction
More frequent reporting	Each report wakes the modem — substantial reduction
Weak signal	Modem retries and longer transmit times — substantial reduction
Continuous sensor power via PWR OUT or LV OUT	Highly dependent on sensor draw
LiveSMS (modem on continuously)	Battery life claims do not apply
Frequent alarm activations and fast-logging	Increased modem and FLASH activity

Extending battery life:

- Add a second battery pack of the same type (Standard or HVI) — see §1.4 and §9 Accessories.
- Connect external 12V DC to PWR IN — see §3.6.
- Use HVI (14.4V) packs for higher-current applications — required when 4–20 mA sensors draw their power from the unit.
- Use modem scheduling (LiveSMS) carefully — frequent modem cycling may increase rather than reduce consumption. Consider whether scheduled reporting alone meets the application's needs.

Replacement battery packs: see §9 Accessories.

Appendix M — SIM Cards and iPhones

If a SIM card has been activated in an iPhone before installation, Apple may have registered that number for iMessage. When iMessage is active, Apple intercepts SMS messages sent to that number — so your SMS commands to the microSpider2 Environmental will never be delivered to it.

Before installing a SIM that has been used in an iPhone:

1. On the iPhone, go to **Settings** → **Messages**.
2. Turn off **iMessage**.
3. Remove the SIM from the iPhone, then install it in the microSpider2 Environmental.

If iMessage is already registered and the iPhone is no longer available:

Use Apple's online deregistration tool at **selfsolve.apple.com** to remove the number from iMessage before commissioning.

Appendix N — Troubleshooting

Symptom	Likely cause	Action
No signal strength shown	SIM not activated, poor coverage, or (external variants) antenna not fitted	For external-antenna variants, check the antenna is fitted to the SMA connector on top of the case and the connection is sealed. Confirm the SIM is activated with the carrier.
Registration failed	Incorrect APN, SIM not activated, or weak signal	Verify APN settings match your carrier; confirm SIM is activated; run a Mobile Signal Test (§5.11) and reposition antenna if signal is below 40%.
Signal present but SMS send fails	SIM plan does not allow SMS	Contact carrier to enable SMS on the SIM.
Signal present but email fails	APN, SMTP, or address configuration error; mobile data not enabled on the SIM	Confirm APN is correct; check SMTP server settings; verify to/from email addresses are valid; confirm mobile data is enabled with your carrier.
Internal moisture indicator triggered	O-ring damaged, screws loose, or external antenna seal compromised	Open the case (§3.1) and inspect the O-ring for damage. Replace if cracked or compressed. Re-tighten lid screws in diagonal sequence. Inspect external antenna seal and re-tape if needed.
Battery voltage low	Battery aged, or high-power application has exceeded design life	Replace the battery pack (§7.1). Consider adding a second pack or connecting external power if site usage exceeds the standard reference scenario (Appendix L).
Cannot connect to web interface (LANlink)	LANlink not seated; computer connected to Wi-Fi; computer network adapter not set to DHCP	Confirm LANlink is fully seated in the Comms port and both LAN and USB ends are plugged into the computer. Disconnect from Wi-Fi. Set the network adapter for the LANlink connection to obtain an IP address automatically (DHCP).
Cannot connect to web interface (HLink)	HLink not seated; device not joined to HLink Wi-Fi network	Confirm HLink is fully seated in the Comms port. Connect the computer or phone to the Wi-Fi network broadcast by the HLink.

Appendix O — Setup File Format

Setup files are saved and loaded via **Change Setup** → **Manual Setup Management**. The format is a plain text file with a fixed header, parameter list, and footer.

Format

```
.MICROSPIDER2
.DEV=<device code>
.VER=<version number>
<parameter assignments, one per line>
.END
```

Header

The first three lines must be:

- `.MICROSPIDER2` — file type marker
- `.DEV=<device code>` — must match the unit's device type. Wrong code is rejected.
- `.VER=<version number>` — must match or be lower than the firmware version running on the unit. Higher version is rejected.

Device Codes

Device Type	Device Code
microSpider2 Environmental	30

The Intelligent Interface (HME-015) does not affect the device code — all microSpider2 Environmental variants and configurations use code **30**.

Body

One parameter assignment per line. Only parameters being changed need to be listed — anything not in the file keeps its current value.

Footer

The file must end with `.END`.

Editing setup files manually

Setup files exported via **Save setup to disk** can be edited in any plain-text editor and reloaded via **Load setup from disk**. Useful for: bulk-deploying many units with similar configurations, restoring a known-good config, or making targeted changes without using the web interface.

Appendix P — Connecting to Your PC

This appendix expands on §4.1 with detailed steps for connecting a PC to the microSpider2 Environmental for configuration. Use this if §4.1 is insufficient or if a connection cannot be established.

P.1 Connecting via LANlink Cable (Ethernet)

1. Use the supplied microSpider2 LANlink (Y-cable) — a standard Ethernet cable will not work.
2. Power up the microSpider2 Environmental — i.e. ensure the internal battery is connected.
3. Disconnect the PC from all networks, including Wi-Fi.
4. Plug the round connector end of the LANlink cable into the **Comms** port of the microSpider2 Environmental. The Comms port is on the side of the case.
5. Connect the Y-end of the cable into the PC by plugging the RJ-45 connector into a LAN port and the USB connector into a free USB port.
6. Wait approximately 15 seconds for the microSpider2 Environmental to register.
7. Open a web browser and navigate to: `http://192.168.0.177`
8. The microSpider2 Environmental login page will be displayed.
9. Enter the default credentials — username `user`, password `changeme` — or your configured credentials.
10. The Alarms page will be displayed.

While the LANlink is connected, the PC supplies power to the microSpider2 Environmental for all functions other than the modem. There is no need to minimise PC connection times — the internal battery is unaffected. The internal battery still supplies modem power; you are notified in the browser whenever the modem turns ON.

P.2 Connecting via HLink Wi-Fi Dongle

1. Plug the HLink dongle into the **Comms** port of the microSpider2 Environmental.
2. On a phone, tablet, or laptop, scan for available Wi-Fi networks.
3. Connect to the Wi-Fi network broadcast by the HLink — the network name typically includes the device's serial number.
4. Open a web browser and navigate to: `http://192.168.2.177`
5. The microSpider2 Environmental login page will be displayed.
6. Enter the default credentials and continue as in §P.1.

P.3 Connection Troubleshooting

If the browser cannot reach the unit after following the steps above, check the following.

Browser settings (Internet Explorer 11 — other browsers similar):

1. Disable automatic dialing (Tools → Internet Options → Connections, select "Never dial a connection").
2. Disable proxy servers (Tools → Internet Options → Connections → LAN Settings, uncheck "Use a proxy server for your LAN").
3. If you changed any browser settings, quit and restart the browser.

PC network adapter:

- Confirm the PC's network adapter for the LANlink connection is set to obtain an IP address automatically (DHCP). Do **not** set a fixed IP address on the LANlink interface unless instructed.
- Confirm Wi-Fi is disabled while using the LANlink — Windows may prefer the Wi-Fi route and skip the LANlink.

Cabling:

- Confirm the round LANlink connector is fully seated in the Comms port.
- Confirm the RJ-45 and USB ends are both plugged in — the LANlink requires both to function.
- Test with a different USB port if connection is unstable.

HLink:

- Confirm the dongle is fully seated.
- Power-cycle the unit — disconnect and reconnect the internal battery — and try again.
- If the HLink Wi-Fi network does not appear, check whether the dongle's LED is on. Replace the HLink if the LED does not light when seated.

If the connection still fails, contact Halytech support — see the inside back cover.

Appendix Q — Rating Table File Format

Rating tables are CSV files used by Rating Table Super Channels (see §5.4.3) to convert a stage measurement into a discharge value via interpolation.

Q.1 Required columns

A rating table CSV file must contain at least three columns. Columns may appear in any order; the file may include additional columns for reference or annotation. The required columns are identified by their header text:

Column header	Meaning
STAGE	Input value (e.g. water level) — used as the lookup key
DISCH	Output value (discharge) corresponding to the STAGE value on the same row
TABLE	Source table identifier — used by the device to identify the uploaded table

If any of the three required columns are missing, the device will reject the file and warn the user.

Q.2 Limits

- **Maximum rows:** 100 data rows per file.
- The table is generated externally — typically from Hydstra software — and uploaded via Change Setup → Rating Table Options.

Q.3 Interpolation

Two interpolation methods are supported:

- **Linear** — straight-line interpolation between adjacent (STAGE, DISCH) pairs.
- **Logarithmic** — logarithmic interpolation, suitable for rating curves that follow a power-law relationship across most of their range.

Select the method in **Change Input Setup → cog (Options) → Interpolation Method**.

Q.4 Replacing an uploaded table

After a rating table is uploaded, the **Rating Table Management** page becomes accessible from Change Setup. Use it to:

- Download the currently active rating table (for verification or backup)
- Upload a replacement rating table (overwrites the active table)

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