



microSpider2 lite Modbus

User Manual

Models	HML-030, HML-031, HML-034, HML-036, HML-037
Date	September 2026

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1. Introduction

1.1 Overview

The microSpider2 lite Modbus is a compact 4G low power logging and alarm system designed for remote monitoring applications. Cat-M1 / NB-IoT variants are also available. It features an IP68 sealed enclosure with integrated long-life lithium batteries and a mobile modem — no external power supplies, enclosures, or solar panels are required. The unit is configured and operated via a built-in web server accessible from any standard web browser.

The microSpider2 lite Modbus supports a range of native and intelligent sensor inputs, automatic data reporting via email, FTP, and HTTP, and 16 configurable alarms with SMS and email alerts. Data is stored in non-volatile flash memory and can be downloaded locally or transmitted automatically to a remote server.

1.2 Package Contents

Item	Notes
microSpider2 lite Modbus unit	With internal battery (disconnected)
7-pin I/O mating connector	Loose — wire up to your sensors. Not supplied with HML-034.
110 Ω ¼ W resistor	Shunt for a 4–20 mA sensor
Halytech Comm Port sealing cap	Fitted to Comm Port
4 hex screws and nuts	Case fasteners (fitted)
O-ring	Pre-greased, fitted in lid groove

HML-034 is different. It has a flying lead fitted at the factory instead of a connector. No mating connector is supplied with it, and you do not need one. {accentis-items-prices Sep 2026}

External antennas, mounting brackets, LANlink cables, and HLink dongles are ordered separately. See Section 1.4 for variant details.

1.3 Typical Applications

- Environmental monitoring
- Automatic Meter Reading (AMR)
- Irrigation and bore monitoring
- Agriculture
- Water treatment
- Traffic monitoring

1.4 Variants

This manual covers the **Modbus variants** of the microSpider2 lite — RS-485 interface, 1 digital input, 1 analogue input, system monitors, low voltage out, and Modbus warmup control.

Item code	Modem	Antenna
HML-030	Cat-M1 / NB-IoT	External connector
HML-031	Cat-M1 / NB-IoT	Internal
HML-034	Cat-M1 / NB-IoT	External connector (flying lead)
HML-036	4G	Internal
HML-037	4G	External connector

External antenna variants do not include an external antenna — order separately.

RS-485 is a build variant, not an add-on. It is fitted at manufacture and cannot be added to a standard microSpider2 lite afterwards. Standard variants (HML-021, HML-022, HML-023, HML-025) are covered by the separate microSpider2 lite User Manual, and the pulse metering variants (HML-026 to HML-029) by their own guide.

Software options:

Item code	Description
FML-001	Standard — included with all units
FML-005	DNP3 — enables DNP3/SCADA communication. See Appendix G

Accessories:

Item code	Description
HML-006	Stainless steel pipe mounting bracket — includes 4 screws
HML-018	7-Way Modbus Cable — 1 m
HME-018	I/O cable — 8-way, 1 m
HME-019	I/O cable — 8-way, 2 m
HME-017	I/O cable — 8-way, 10 m

The 8-way cables fit this unit. The 7-pin connector is the 8-pin shape with the centre pin removed. An 8-way cable plugs straight in, and its centre wire (red) is not connected. Use an 8-way cable when you need more than 1 m of cable — HML-018 is made in 1 m only. A 7-way cable does not fit an 8-pin connector, so HML-018 suits this unit alone.

2. System Overview

2.1 Inputs

The microSpider2 lite Modbus has up to 8 configurable input channels. All channel types — native inputs, intelligent sensor channels, system monitors, and super channels — share a single channel pool. Users choose how to allocate channels across input types.

Native input types:

Type	Description
Switch	Detects open/closed state. Logs each state change and ON duration. Minimum stable state: 3 seconds.
Switch State	Like Switch, but logs state at each logging period rather than on each change. Does not log ON duration.
Counter	Counts pulses up to 100 Hz. Range: 0–999,999.999, rolls over to 0.
Event	Records each pulse with a timestamp. Suitable for pulses less frequent than once per 30 seconds.
Analogue (Voltage)	Records voltage at each logging period. Range: 0–2.5 V. External resistors required for 0–5 V or 0–10 V.
Analogue (Switch)	Connects a switch or digital sensor to an analogue input when no spare digital input is available. ON if < 1.25 V, OFF if 1.25–2.5 V.
Difference	Records the difference between two counter inputs. Range: ±999,999.999.

4–20 mA sensors. The microSpider2 lite Modbus has **no Analogue (4–20 mA) input type and no internal shunt**. Fit the supplied 110 Ω ¼ W resistor across the AIN pin and Ground, select **Analogue (Voltage)** as the input type, then scale the channel using the **4-20mA Calibration** method on the Calibration page — enter the engineering value at 4 mA and at 20 mA.

⚠ **Loop power.** The microSpider2 lite Modbus cannot power a 4–20 mA loop — it has no switched power output and no external power input, and the Low Voltage Out (5 V, 20 mA) is not a loop supply. The loop must be powered by a **self-powered (externally powered) sensor** or by a **separate power supply** fitted in the loop.

Intelligent sensor interfaces (Modbus variants):

Type	Description
Modbus (RS-485)	Communicates with Modbus sensors over RS-485. Low-current 5 V Modbus sensors (under 20 mA) can be powered directly via the Low Voltage Out; higher-current sensors require an external power source. Typical uses: humidity sensors, flow meters, water level sensors.

SDI-12 is not supported. There is no SDI-12 option, variant or accessory for the microSpider2 lite Modbus. The unit cannot supply the 12 V that most SDI-12 sensors need. For SDI-12 sensors, use the microSpider2 Environmental.

Super channels (virtual calculations derived from other inputs):

Type	Description
Rating Table	Linear or logarithmic interpolation from a lookup table.
$Ax + By + C$	Sum, difference, or scaled combination of two channels.
Evapotranspiration	Hargreaves model calculation.
Wind Speed / Direction	Vector average, angular average, or Sigma Theta.
SWL	Standing Water Level: $SWL = OFFSET - Head$.

There is no galvanic isolation between digital inputs, or between inputs and the internal circuitry.

2.2 System Monitors

Built-in monitors that can be logged and used to trigger alarms:

Monitor	Description
System temperature	Internal enclosure temperature
Battery voltage	Voltage of the internal battery
Internal moisture sensor	Detects moisture inside the enclosure

2.3 Controls (Outputs)

Control	Description
Low Voltage Out	Provides 5 V only , up to about 20 mA. Powered by the internal battery. The +5 V rail is shared with the RS-485 transceiver, which takes about 55 mA when the bus is terminated. The rail supplies about 100 mA in total, so about 20 mA is left for a sensor.
Modbus Warmup	Sends a Modbus read message to wake a sensor before a reading is taken.

Modbus variants have **no open collector output**.

Controls can be operated manually via the web interface, triggered by alarms, or used as sensor warmups (powering a sensor for a set duration before each reading).

The microSpider2 lite Modbus does not have a switched power output.

2.4 Alarms

Up to 16 alarms can be configured. Each alarm can:

- Monitor a channel value (above, below, rate of change, switch state, or event)
- Trigger at a scheduled date/time or at a periodic interval
- Combine the state of other alarms (Super Alarm — AND/OR logic)
- Send SMS alerts to up to 3 phone numbers
- Send email alerts to up to 3 email addresses
- Activate or pulse a control output
- Increment or reset a virtual counter
- Force an immediate log of another channel
- Initiate fast logging and/or fast reporting while active

Alarms are acknowledged via the web interface, or automatically after a configurable time.

2.5 Logger

Parameter	Value
Capacity	300,000 records
Storage	Non-volatile flash memory
Time resolution	1 second
Time synchronisation	Automatic daily via NTP
Clock drift (without NTP)	Up to 30 seconds per month

The logger records channel readings, control state changes, alarm events, SMS and email transmissions, NTP sync events, and system events. Data is reported automatically via email, FTP, or HTTP POST, and can also be downloaded locally via the web interface.

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

2.6 Web Server

The microSpider2 lite Modbus has a built-in web server accessible from any standard web browser. No special software is required.

The web interface is used to:

- View current input readings, alarm status, and control states
- Configure all device settings
- Download logged data
- Calibrate sensors
- Run modem diagnostics and signal tests
- Update firmware

Two connection methods are available: LAN (via LANlink cable) and Wi-Fi (via HLink dongle). See Appendix A for connection procedures.

3. Installation

Audience: Installer

3.1 Opening the Case

A new microSpider2 lite Modbus is shipped with the battery disconnected. The case must be opened to install the SIM card and connect the battery.

1. Undo the 4 hex screws holding the two halves of the case together.
2. Carefully separate the two halves, taking care not to put strain on the cables connecting them.

3.2 SIM Card Installation

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 lite Modbus.

1. If the battery is connected, disconnect it by squeezing the locking latch and gently pulling the connector upwards.
2. Push the SIM tray into the receptacle until it clicks and springs out.
3. Place the nano SIM card into the tray — gold contacts facing down, observing the notched corner orientation.
4. Push the tray back into the receptacle until it clicks into place.

If the SIM card has previously been used in an iPhone, disable iMessage before installing. See Appendix B.

3.3 Battery Connection

1. Connect the battery lead by pushing it onto the battery connector on the circuit board until it clicks into place. The battery slides into the case behind the circuit board.

The microSpider2 lite Modbus has no on/off switch — it starts operating as soon as the battery is connected.

To disconnect the battery: press the white tab and pull the connector off.

3.4 Closing the Case

1. Insert the O-ring into the groove of the top half of the case. Hold one corner in and run a finger around the groove a few times.
2. Align the two halves, ensuring the antenna cable is not caught between them. Pinch the flange at both ends with thumb and forefinger and squeeze gently until the halves slide together.
3. Insert the four hex screws and nuts. Do not over-tighten — force is not required to maintain the seal.

The O-ring is pre-greased when shipped. If more lubrication is needed, use tap grease (e.g. "Fix-a-tap", available from hardware stores).

If the O-ring is pushing the halves apart, the assembly is incorrect — remove the O-ring and repeat from step 1.

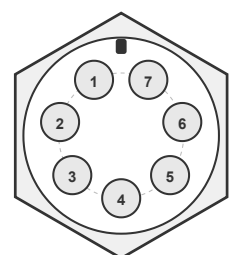
3.5 Mounting

The microSpider2 lite Modbus has an integrated mounting bracket built into the enclosure.

An optional stainless steel pipe mounting bracket (HML-006) is available for installation on vertical or horizontal pipework.

3.6 I/O Connector and Sensor Wiring

The microSpider2 lite Modbus has a single 7-pin circular IP68 connector on the bottom of the case — the 8-pin form factor with the centre pin omitted. A standard 8-pin I/O cable mates with it. Pin numbering is as viewed from the back (solder) end of the mating plug with the notch facing upwards.



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

Pin	Wire colour	Function	Notes
1	Green	Analogue 1	0–2.5 V range
2	Orange	RS-485 D+	Differential data, non-inverting
3	Black & Shield	Ground	Common ground
4	Yellow	RS-485 D–	Differential data, inverting
5	White	Digital 1	Active is short to Ground
6	Purple	Ground	Common ground
7	Blue	Low Voltage Out	5 V only, max 20 mA

Both Ground pins are equivalent — all inputs and outputs are referenced to this common ground.

RS-485 sensor wiring:

Sensor terminal	Connect to
D+ / A / Data+	Pin 2 (Orange)
D– / B / Data–	Pin 4 (Yellow)
GND / 0 V	Pin 3 or Pin 6 (Black/Shield or Purple)
Sensor power (5 V sensors only, ≤ 20 mA)	Pin 7 (Blue)

- **Several sensors can share one bus** — RS-485 is multi-drop. Wire additional Modbus sensors in parallel across the same D+ / D– pair, giving each a unique device address (1–255). Every reading occupies one channel, so the limit is the 8-channel pool rather than the number of sensors.
- Use shielded twisted-pair cable for the RS-485 bus. Bond the shield to Ground at the microSpider2 lite Modbus end only.
- Where sensor terminals are labelled A and B rather than D+ and D–, the convention is A = D+ and B = D–. If communication fails, try swapping them.

- For long cable runs or multi-drop buses, fit a 120 Ω termination resistor across D+ and D– at each end of the bus.
- Sensors drawing more than 20 mA, or requiring 3.3 V, 12 V or 24 V, must be powered externally.

Wiring the native inputs:

- **Switch / Counter / Event:** connect between Pin 5 (Digital 1) and a Ground pin. Active state = shorted.
- **Analogue (Voltage):** connect the sensor output to Pin 1 (Analogue 1) and sensor ground to a Ground pin. Native range 0–2.5 V. For 0–5 V or 0–10 V sensors, external voltage divider resistors are required — these are not supplied.
- **4–20 mA sensors:** fit the supplied 110 Ω ¼ W resistor across Pin 1 and Ground, then connect the sensor current loop across the same two points. Set the input type to **Analogue (Voltage)** and scale it with **4-20mA Calibration**. There is no internal shunt, so the external resistor is required.

⚠ **Loop power.** The microSpider2 lite Modbus cannot power a 4–20 mA loop — it has no switched power output and no external power input, and the 5 V Low Voltage Out is not a loop supply. The loop must be powered by a self-powered sensor or a separate power supply fitted in the loop.

3.7 Antenna Installation

Internal antenna variants: No installation required.

External antenna variants:

1. After closing the case, connect the SMA antenna to the connector on the bottom of the case.
2. Hand-tighten only — do not use tools.
3. Seal the connection with self-vulcanising rubber tape.

For sites with poor signal, Halytech offers directional and high-gain antenna options. Contact Halytech for advice.

3.8 Protecting Connectors

Before leaving site, fit the supplied sealing cap to the Halytech Comm Port. This keeps the contacts clean. The unit has one I/O connector and it stays in use, so it does not need a cap.

4. System Configuration

Audience: Installer / advanced user

4.1 Connecting for the First Time

See Appendix A for detailed connection procedures (LAN via LANlink or Wi-Fi via HLink).

After connecting, open a web browser and navigate to the device's IP address:

- **LAN (LANlink):** `http://192.168.0.177`
- **Wi-Fi (HLink):** `http://192.168.2.177`

Log in with the default credentials:

Field	Default value
Username	<code>user</code>
Password	<code>changeme</code>

Change the default password immediately after first login. If credentials are lost, contact Halytech for assistance.

4.2 Change Setup Mode

Click **Change Setup** in the left navigation menu to access configuration pages. While in Change Setup mode:

- Logging and alarm activation are suspended. Events that would have occurred during this time are not recorded.
- All controls are turned off by default (this can be changed in Advanced Settings).
- Change Setup mode exits automatically after 20 minutes of inactivity.

Recommended configuration order for a new unit:

1. Set the date and time (4.3)
2. Set the location name (4.4)
3. Change the default passwords (4.5)
4. Configure the network settings — APN and primary network method (4.6)

5. Test mobile connectivity — signal strength test and test SMS (4.6)
6. Configure email (4.7)
7. Configure inputs (4.8), including Modbus channels (4.9)
8. Calibrate inputs (4.10)
9. Configure controls (4.11)
10. Configure alarms (4.12)
11. Configure reports (4.13)
12. Set up automatic software upgrades — optional (6.3)
13. Save the setup to disk as a backup (4.15)
14. Reset the report starting point to exclude test data (4.13)

4.3 Setting Date and Time

Set the clock first, straight after logging in. Do this before location, network, or any other setting.

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

- Click **Set from computer** to synchronise the device clock from the browser's system time. This copies the date, the time and the time zone from the computer running the browser.
- Or enter the date and time manually.
- NTP synchronisation runs automatically once per day. Default NTP server: `time.google.com`.

Why the clock comes first. The unit stamps every logged reading with its own clock. A reading logged before you set the clock keeps the wrong time stamp, and you cannot correct it later. Wrong time stamps make the history useless for diagnostics, because you cannot line a reading up against a site event.

Use **Set from computer**, not NTP, at this stage. NTP needs a working data connection, and that does not exist until you set the APN (see 4.6 Network Configuration).

Clock drift without NTP is up to 30 seconds per month.

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

4.4 Setting Location Name

Navigate to **Change Setup** → **Location**.

- **Location (short):** Appears in SMS messages, report subject lines, and the About page. Maximum ~16 characters.

- **Location (long):** Used in report content. Can be longer and more descriptive.

4.5 Setting Username and Password

Navigate to **Change Setup → User and Password**.

Three access levels are available:

Account	Default username	Default password	Access
Administrator	user	changeme	Full control — view and change all settings
Service	service	changeme	View readings, run diagnostics, calibrate inputs, save setup, manual software upgrade — cannot change report or alarm settings
User (read-only)	user	user	View settings and status only

Change all default passwords to prevent unauthorised access.

4.6 Network Configuration

Navigate to **Change Setup → Network**.

Primary Network — used for reports, emails, NTP clock sync, and software updates:

1. Set **Method** to Mobile Internet (Modem) for mobile deployments.
2. Enter the **APN** for the SIM card — contact your carrier for the correct value.
3. Enable **Authentication** only if required by the SIM.
4. Set a **Data limit** (MB per day). No further reports are sent once the limit is reached until the next day.
5. Optionally enable **Report signal strength** to log signal quality with each connection.
6. Enter the **Modem phone number** in the field provided — this is not read automatically from the SIM.

Secondary Network — used for report failover only (not for emails, NTP, or updates).

Easy Connect: Enabled by default for direct computer-to-device connections. Disable when connecting the device to a network.

SMS Recovery: When enabled, the modem stays active for up to 3 minutes at a scheduled time (daily or weekly) to receive queued SMS messages. Enable this if SMS commands are used.

Modem Diagnostics (Change Setup → Modem Diagnostics):

Connect the antenna before you run a signal test.

Signal Strength Test. Click **Mobile Signal Test**. A warning about battery use appears. Click **OK** to continue. The modem turns on and shows the reading continuously until you close the test. Allow about 25 seconds for the first reading.

The test dialog shows the following.

Line	Example	Meaning
Status	Registered	Shows Failed to connect. Check APN and SIM card when the APN is not set
Signal Strength	80%	Follows the format set on the Network page — Percentage (%) or Power (dBm)
Min / Max	Min: 77% Max: 87%	The range seen since the test started
RSRP	-84 dBm	Reference Signal Received Power
RSRQ	-8 dB	Reference Signal Received Quality
Quality	4-box bar	Derived from RSRQ. More filled boxes is better

Click **Enlarge Signal** for a large display. Use this while you move the antenna, because the reading stays legible from a distance. The button then reads **Shrink Signal**.

Signal strength reference:

Signal 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

Strength and quality are two different measurements. Signal Strength is how much signal arrives. Quality is how clean it is. A site can show high strength and poor quality, usually from interference or a busy cell. Both must be acceptable. Never read the Quality bar as a strength rating.

Three or four filled Quality boxes is good. One or two boxes means you should move the antenna, even when the signal strength is high.

Signal strength format. Go to **Change Setup** → **Network** and set **Signal strength format** to Percentage (%) or Power (dBm). The setting controls the Signal Strength line in the test dialog, the logged channel, and the test SMS. It does not change the Quality bar. RSRP, RSRQ and the Quality bar always appear.

SMS Test. Click **Close** to end the signal test first. Enter a phone number in the **Phone number** field, then click **Send Test SMS**. The SMS contains the location name, serial number, current signal strength, and date and time.

The modem may be off when you start a test. If it is off, it needs 30 to 60 seconds to start and find a signal. Wait at least 75 seconds before you decide a test has failed. This applies to the test SMS, the test email, and the test report.

4.7 Email Configuration

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

Email must be configured before the device can send email alerts or reports.

Field	Description
"From" email address	Address the device uses to identify itself. Failure notices are sent here.
SMTP mail server	Outgoing mail server. Use the server given by your email provider, for example <code>your.preferred.smtp.server</code> .
Authentication	Enable only if required by the mail server.
Username / Password	Required only if Authentication is enabled.

Port selection:

- Without authentication: port 25 (standard SMTP)
- With authentication: port 587 (submission port)

SSL/TLS is not supported. Mail servers that require only encrypted connections (e.g. Gmail) are not compatible.

Testing email: Use the Email Test section on the email settings page — enter an address and click Send Test Email to verify the configuration.

If the modem is not already on, a diagnostic test will first power up the modem. Allow 30–60 seconds for the modem to establish a connection, and up to ~75 seconds total before expecting a result.

4.8 Configuring Inputs

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

For each channel, set:

- **Type** — select the input type (see Section 2.1 for available types)
- **Source** — physical input connector or system monitor
- **Name** — user-defined channel name (used in reports and the web interface)
- **Units** — engineering units for display and calibration
- **Logging** — how often to log data. Set to "General" to use the shared logging period.

Always name channels before configuring alarms that reference them. An unnamed channel appears as "New Channel" in all dropdown menus.

Use the **Options** icon (cog) for additional per-channel settings:

Option	Description
Log Difference	Log the change since last log instead of the absolute value. Options: Any / Positive only.
Minimum Change	Minimum change required before logging. Combined with Force Log interval.
Periodic Reset	Reset accumulated value at a set interval (1, 3, 6, 12, or 24 hours).
Sampling Period	How often readings are taken. Enables averaging or integration over the logging period.
Log Min/Max	Log minimum and maximum sampled values in addition to the average.
Filter Type	Average (all types), or Integrate (Modbus/RS-485, Rating Table and $Ax+By+C$ only).
Warmup Source	Activate a control before each reading to power the sensor.

Use the **Examine** icon (magnifying glass) to request a new reading from the sensor. For counter and event inputs, enable test mode to verify pulses without affecting accumulated counts.

Global logging settings (bottom of the page):

Setting	Description
General logging period	How often channels set to "General" are logged
General fast logging period	Logging rate during alarm-triggered 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, regardless of logging period.

4.9 Configuring a Modbus Channel

Before configuring Modbus channels, open the sensor manual — you will need the **device address**, **function code**, **data type** and **data address** for each value you want to log.

1. Navigate to **Change Setup** → **Input Setup**.
2. On a free channel row, set **Type** to **Modbus-485** and **Source** to **Interface**.
3. Enter a channel **Name**, optional **Units**, and a **Logging period**.
4. Click the **cog icon** at the right-hand end of the row to open the channel Options dialog, and enter the Modbus parameters:

Field	Description
Device address	1 to 255 — must match the sensor's bus address. Each device on the bus must have a unique address.
Function	Modbus read function: 1 (Coil), 2 (Discrete Input), 3 (Holding Register) or 4 (Input Register). Some sensor manuals use legacy notation — <code>40001</code> = function 3, <code>30001</code> = function 4.
Data type	How the retrieved value is interpreted (16-bit unsigned, 32-bit float, LSW/MSW byte order, and so on). Match to the sensor manual.
Data address	0 to 65535. Modbus addressing starts at 0; some manuals start at 1 — subtract 1 if the sensor returns exceptions. Convert hexadecimal addresses (e.g. <code>0x03E8</code>) to decimal (<code>1000</code>). For legacy-format addresses (e.g. <code>40001</code>), remove the leading digit and subtract 1 → <code>0</code> .
Warmup source	If the sensor is powered from the Low Voltage Out, select the control that switches sensor power on.
Number of Retries	Default 3 — how many times a failed read is re-sent before giving up.
Retry Interval	Default 5 s — gap between retry attempts.

Test Sensor Configuration. The Options dialog has a **Test Sensor Configuration** button. It powers the sensor, performs one read immediately, and logs the full Modbus exchange to the **Diagnostic Trace** panel below the dialog. Use it to commission a channel without waiting for the logging period, to investigate an unexpected reading, or to poll ad-hoc registers while working out what a sensor is doing.

- Click **OK**, then **Save** on the Input Setup page.
- Repeat for each reading you want to log — one channel per reading (for example one for pressure, one for temperature).

Serial settings apply to the whole bus — every sensor on it must use the same values. Set them under **Change Setup** → **Advanced** → **Modbus Settings**: baud rate (default 19200), parity (default Even) and stop bits (default 1). Match them to the sensor manual.

Warmup. Some Modbus sensors sleep between readings and need waking before they respond reliably. Configure a control with **Type** set to **Modbus Warmup**, set a warmup time appropriate for the sensor (typically 1 to 5 seconds), then point the relevant input channel's **Warmup** at that control.

Verifying communication. Before leaving site, confirm each Modbus channel shows a value on the live Home or Channels page rather than a fault or timeout, and compare it against the

sensor's own display where one is available. If readings are wrong or missing: check D+ / D- have not been swapped, check the device address matches the sensor, check baud rate and parity, try subtracting 1 from the data address, and check the data type — a float read as a 16-bit integer returns nonsense.

4.10 Calibrating Inputs

Select a channel from the **Select Input to Calibrate** dropdown on the Change Setup page.

Analogue inputs — calibration formula: `calibrated = (raw × scaler) + offset`

Method	Description
Change Offset Only	Adjust zero point without changing scale
4–20 mA Calibration	Enter the real-world value at 4 mA and 20 mA
2-point Calibration	Apply two known inputs and enter expected outputs. The two points must be separated by at least 1000 raw counts.
Manual Calibration	Enter scaler and offset directly

Counter and Event inputs:

Method	Description
Change Desired Value	Enter the correct current reading — device adjusts offset
Manual Calibration	Enter Pulses per unit and Desired value directly

4.11 Configuring Controls

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

For each control, set:

- **Custom name** — a descriptive name (e.g. "Sensor Power", "Pump Control")
- **Warmup time** — how long the control stays active before a sensor reading, if used as a warmup source

Low Voltage Out has an additional setting:

- **Voltage** — fixed at 5 V on Modbus variants (no selector)

4.12 Setting Up Alarms

Navigate to **Change Setup** → **Alarms** and select an alarm to configure.

Each alarm has:

- **Alarm name**
- **Trigger source** — channel value, date/time, periodic, or Super Alarm
- **Trigger condition** — above, below, change of, rising, falling, event, or switch state
- **Qualifying time** — how long the condition must persist before the alarm activates
- **Control action** — turn a control on/off, or pulse for 1–999 seconds (optional)
- **Counter action** — increment or reset a virtual counter (optional)
- **Log action** — immediately log another channel (optional)
- **Perform actions** — when actions execute (once until reactivated / once until acknowledged and reactivated / on each log while active)
- **Fast logging** — enable faster logging rate while alarm is active
- **Fast reporting** — send additional reports while alarm is active
- **Message** — text included in SMS and email alerts (maximum ~32 characters)
- **SMS alerts** — up to 3 phone numbers (digits only, no spaces or brackets)
- **Email alerts** — up to 3 email addresses
- **Auto acknowledge time** — time after triggering when the alarm is automatically acknowledged (default: 1440 minutes / 24 hours)

How alarms work:

- An alarm is **active** when its trigger condition is met, **inactive** when not met.
- An alarm **triggers** (sends alerts, performs actions) only when active AND unacknowledged.
- After triggering, the alarm will not re-trigger until it is acknowledged AND has gone inactive then active again.

SMS alert format: `[location]: [message] / Time: HH:MM:SS DD/MM/YY`

Email alert format: `[device] at [location] / [message] / Generated by Alarm: [number]`

`([name])`

4.13 Configuring Reports

Navigate to **Change Setup** → **Reports**.

Report destinations:

Destination	Details
Email	Up to 3 email addresses
FTP Server 1 / 2	Set server, username, password, directory
HTTP / HTTPS	POST to a URL

Two independent automatic report slots. Settings per slot:

Setting	Description
Period	1 minute to 1 day
Send report	Always, or only when new data is available
Offset	Delay from the start of each period
Enable recovery	Unsent data included in next report (up to 30,000 records)
Format	See Appendix D
Time order	Oldest first or newest first

Reset Report Starting Point: After initial setup and testing, click this to mark all existing logged records as sent — prevents test data from appearing in the first real report.

This also stops that data reaching a DNP3 master. See Appendix G.

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

4.14 Advanced Settings

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

Setting	Description
Turn all controls off on entry to Change Setup	Default: enabled. Disable to leave controls active during configuration (e.g. to calibrate a sensor powered by a control).
Minimum auto-acknowledge time	Default: 60 minutes. Configurable down to 5 minutes. Times under 60 minutes increase SMS frequency and power consumption.
Store messages with channel data	When disabled, information messages are stored separately — increases channel data capacity.
Enable 4–20 mA 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 instead of the short Location.
Modbus-485 baud rate	Default: 19200. Match to connected sensor.
Modbus-485 parity	Default: Even. Match to connected sensor.

A **DNP3** block also appears on this page when the DNP3 software option is installed. See Appendix G → Advanced DNP3 settings.

4.15 Saving and Loading Settings

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

- **Save setup to disk** — downloads the current configuration as a `.cfg` file. Use as a backup or template for similar units.
- **Load setup from disk** — loads a configuration file. The file must be from the same product type and from the same or earlier firmware version. Loading overwrites all current settings.
- **Email setup** — sends the current configuration file as an email attachment.
- **Restore to Factory Defaults** — resets all settings. Log file data is not affected.

Some browsers flag `.cfg` files as potentially harmful during download. This is a false positive.

4.16 Automatic Setup Updates

The device can collect setup changes from an FTP server on its own. You put a setup file on the server, and the device downloads and installs it. You do not need to visit the site.

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

Field	Description
Automatic Setup Updates	Enable to make the device check for a new setup file once per day, after a report is sent.
FTP Server	Address of the FTP server the device connects to.
Username / Password	Login for the FTP server.
Setup directory	Directory on the server where you put the setup file.
Response directory	Directory where the device uploads its response file. Leave blank to use the Setup directory.

File naming. The device asks for a file named `msc[serial].cfg`, where `[serial]` is its own serial number. A device with serial `000D98` asks for `msc000D98.cfg`. Give each device its own file when you update more than one at a time.

Response file. The device uploads a response file after each install. The file is plain text. It says whether the install worked, and lists any errors if it did not. Read it to confirm the update took effect.

Automatic setup updates do not run when reporting is disabled. The device only checks for a new file after it sends a report.

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

⚠ **The setup file must use CRLF line endings.** A file with LF-only line endings fails silently. The device reports the install as successful, but the settings do not change. Write CRLF explicitly when you create a setup file with a script.

4.17 Exiting Change Setup

Click **Home** or navigate to any page outside Change Setup. Logging, alarms, and timer schedules restart immediately.

5. Normal Operation

Audience: End user

5.1 Connecting via Web Browser

See Appendix A for connection procedures. After logging in, the Alarms page is displayed.

The left navigation menu provides access to:

- **Alarms** — current alarm status
- **Inputs** — current channel readings
- **Controls** — manual control of outputs
- **History** — download logged data
- **View Setup** — view current configuration (read-only)
- **Change Setup** — access configuration pages (Administrator only)
- **About** — device information, serial number, firmware version

5.2 Alarms Page

The Alarms page is the home page after login. It displays the current status of all configured alarms.

- **Active** (red) — alarm condition is met and alarm is unacknowledged.
- **Active** (green) — alarm condition is met but alarm has been acknowledged.
- **Inactive** — alarm condition is not met.

Click an unacknowledged (red) alarm to acknowledge it, or click the link at the bottom to acknowledge all alarms.

5.3 Inputs Page

Displays the current reading for each configured input channel. Readings are taken at the time the page loads — click **Update** or **Update All** to refresh.

5.4 Controls Page

Displays the current state of each control. Click **ON** or **OFF** to manually activate or deactivate a control, then click **Save** to apply.

Multiple controls can be changed before clicking Save.

5.5 History (Logged Data)

Download logged data from the History page:

1. Set **End Date** and **End Time** for the data range.
2. Set **No. of Records** to download.
3. Select a **Format** (see Appendix D).
4. Select **Direction** (oldest first or newest first).
5. Click **Download**.

5.6 Automatic Reports

Automatic reports are sent according to the schedule configured in Section 4.13. Report delivery status is logged and visible in the History page (Raw or Diagnostic format).

6. Maintenance

6.1 Service Mode

Audience: Installer / service technician

Service Mode lets field staff test and calibrate a unit without being able to change its setup. Report settings and alarm settings stay locked. Use it when someone needs to check a sensor on site but must not alter how the unit reports.

Log in with the **Service** account (default `service` / `changeme`). **Service Mode** then appears in the menu in place of Change Setup.

The device warns you that logging is disabled while you are in Service Mode. This is on purpose. It keeps test readings out of the logged data. Logging restarts when you leave Service Mode.

What the Service account can do:

Task	Notes
View all current channel readings	Same readings as the Inputs page
Set the date and time	Cannot change the NTP settings — only the Administrator can
Calibrate inputs	Same methods as 4.10, plus Examine and Test
Run modem diagnostics	Signal strength test and test SMS, same as 4.6
Save the setup to disk	Backup only — cannot load a setup file
Run a manual software upgrade	Same as 6.3

The Service account cannot change report settings, alarm settings, network settings, email settings, or input configuration.

Examine and Test (counter and event inputs)

In Service Mode the calibration page adds an **Examine and Test** button. Use it to check that pulses reach the device.

1. Click **Examine and Test** on the input calibration page.
2. The reading resets to zero. The real accumulated value is kept in memory and is not changed.

3. Apply a known number of pulses. For example, pour a measured amount of water into a rain gauge. The page counts each pulse as it arrives.
4. Click **Exit**. The device restores the original accumulated value.

Test pulses are discarded. They are never logged and they never affect the live reading.

6.2 Battery Replacement

Expected battery life is up to 5 years under the standard reference scenario (1-hour logging, daily reports, good signal, self-powered sensor, 1 alarm/month). Actual life varies with reporting frequency, signal conditions, sensor power draw, and temperature.

Monitor battery voltage via the Battery Voltage system input. When replacement is required:

1. Carefully open the case (see Section 3.1) — do not lose nuts or screws.
2. Keep the O-ring clean and free of debris.
3. Disconnect the battery lead by pressing the white tab and pulling the connector off the circuit board.
4. Remove the old battery pack and insert the replacement.
5. Connect the new battery lead (see Section 3.3).
6. Close the case (see Section 3.4).

See Appendix C for battery safety information.

6.3 Firmware Updates

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 upgrade.

Automatic upgrade:

The device can check for new software once per day after a report is sent. Configure via Change Setup → Automatic Software Upgrades. Two methods are available:

- **Halytech Upgrade Server** — managed by Halytech, no user intervention required
- **Self-Managed FTP Server** — upgrade files named `msf[serial].hal`

Automatic upgrades require reporting to be enabled.

7. Specifications

Hardware

Parameter	Value
Configurable input channels	8 (shared pool — native, intelligent, system, and super channels)
Native analogue inputs	1
Native digital inputs	1
System monitors	System temperature, Battery voltage, Moisture sensor
Analogue input range	0–2.5 V (native); 4–20 mA via supplied 110 Ω external shunt
Analogue resolution	12-bit
Digital input	Voltage-free switch contact
Counter max frequency	100 Hz (5 ms min pulse width)
Counter range	0–999,999.999
Controls	2 (types vary by variant — see Section 2.3)
Alarms	16
Logger capacity	300,000 records
Logger storage	Non-volatile flash memory

Communications

Parameter	Value
Modem (4G variants)	4G LTE
Modem (Cat-M1 variants)	LTE Cat-M1 / NB-IoT
LAN (LANlink)	Via Halytech Comm Port. Default IP: 192.168.0.177
Wi-Fi (HLink)	Via Halytech Comm Port. Default IP: 192.168.2.177
Reporting protocols	HTTP/HTTPS POST, FTP, Email; DNP3 (paid software option)
SMS alerts	Up to 3 numbers per alarm
Email alerts	Up to 3 addresses per alarm

Physical

Parameter	Value
Dimensions	165 (W) × 80 (H) × 85 (D) mm
Weight	800 g
Enclosure	ABS, IP68
Operating temperature	−20 °C to +60 °C
Mounting	Integrated bracket; optional stainless steel pipe bracket (see the Accessories table in Section 1.4)
I/O connector	7-pin circular waterproof (IP68) — the 8-pin shape with the centre pin removed
Antenna (external variants)	SMA male connector

Power

Parameter	Value
Power supply	Internal non-rechargeable 7.2 V Li-SOCl ₂ 13 Ah battery pack
External power input	Not supported
Expected battery life	up to 5 years (1-hour logging, daily reports, good signal, self-powered sensor)
Warranty	12 months manufacturers warranty — batteries excluded

8. Appendices

Appendix A — Connecting to a microSpider2 lite Modbus

Option A — LAN connection (LANlink cable)

1. Connect the LANlink cable between the Halytech Comm Port on the device and a USB port on your computer.
2. Open a web browser and navigate to `http://192.168.0.177`.
3. Log in with your username and password (default: `user` / `changeme`).

Easy Connect must be enabled (default) for direct computer-to-device connections. If connecting to a network, disable Easy Connect and configure the IP address to suit the network.

Changes to LAN settings take effect after the LANlink cable USB connector is disconnected and reconnected.

Option B — Wi-Fi connection (HLink dongle)

1. Connect the HLink dongle to the Halytech Comm Port on the device.
2. On your computer or mobile device, open Wi-Fi settings.
3. Connect to the network named `192.168.2.177_MS1_[serial]` (where [serial] is the serial number from the side of the unit). Password: **Halytech**.
4. Open a web browser and navigate to `http://192.168.2.177`.
5. Log in with your username and password.

Changes to Wi-Fi settings take effect after disconnecting the HLink dongle, waiting for the LEDs to turn off, then reconnecting.

Appendix B — SIM Cards and iPhones

If a SIM card has been activated in an iPhone, Apple may have registered that number for iMessage. When iMessage is active, SMS messages sent to the device will be intercepted by Apple and never delivered.

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 device.

If the iPhone is no longer available:

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

Appendix C — Battery Safety

The microSpider2 lite Modbus uses a non-rechargeable lithium-thionyl chloride (Li-SOCl₂) battery.

Warning: Incorrect use or mishandling of batteries may result in fire or explosion.

Battery contents are flammable, corrosive, and extremely irritating to the lungs and respiratory system. Lithium metal and thionyl chloride cause chemical burns on contact with skin.

Safe handling guidelines:

- Do not short-circuit
 - Protect wiring from damage
 - Do not attempt to recharge
 - Do not open, crush, deform, or disassemble
 - Do not expose to water
 - Do not solder anything to the battery
 - Do not incinerate
 - Do not leave discharged batteries in the unit
 - Do not drop or subject to mechanical shocks
 - Spare batteries are supplied in individual packaging — keep the packaging and store used batteries in it until disposal
 - Lithium batteries (charged or discharged) are classed as Dangerous Goods for transportation — declare them as such when shipping
-

Appendix D — Report Formats

Format	Description
Raw	Date, time, primary ID, secondary ID, value
Diagnostic	As Raw, plus running total for "log difference" channels and debug info
Filtered	Channel name, date/time, value — no debug messages
Multi-column	One column per channel; one row per timestamp
Multi-column (aligned)	As Multi-column but records snapped to the logging period — useful for Modbus channels
User ID	Uses user-defined channel IDs instead of default IDs
User ID (with controls)	As User ID, plus control on/off events
Custom format 1	Counter channels with log difference only — period start/end, difference, units
NSW DPIE eagle.io	NSW water metering framework compliant

Appendix E — Log Codes

System log codes appearing in Raw and Diagnostic 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 F — SMS Commands

An SMS command is a text message you send to the device. It tells the device to do something, such as send a report or return its setup file. You do not need a computer and you do not need to visit the site.

SMS commands work on every microSpider2 lite Modbus. You do not need a software option.

The device only receives an SMS while its modem is on. The modem turns on for a short time around each scheduled report. A command you send between reports waits in the network until the next time the modem turns on. The reply can be hours later. Send several commands if you need to — the device handles them in the order it receives them. Turn on SMS Recovery (see 4.6) so the modem also turns on at a set time each day to collect waiting messages.

Message format

Every command message starts with the device **serial number**. The serial number is on the label on the side of the unit. Each command takes a value in single quotes.

```
002716 getrep='joe@example.com'
```

Rules:

- Use the bare 6-character serial number, including the leading zero — `002716`, not `DSTG-002716`.
- Put exactly one space between the serial number and the first command.
- Put exactly one space between commands.
- Do not put a space on either side of the `=` sign.
- Wrap the value in straight single quotes (`'`). Curly quotes and back-ticks do not work. Phone keyboards often replace straight quotes with curly quotes, so check the message before you send it.

Where the file is sent

The value sets the destination. It is either an email address or an FTP server.

Value	Destination
<code>joe@example.com</code>	The file is emailed to this address as an attachment
<code>ftp:1</code>	Reports FTP Server 1 — set up on the Report Settings page
<code>ftp:2</code>	Reports FTP Server 2 — set up on the Report Settings page
<code>ftp:3</code>	Self-Managed FTP Server — set up on the Automatic Software Upgrades page. Setup files only
<code>ftp:4</code>	Automatic setup updates FTP server — set up on the Automatic Setup Management page (see 4.16). Setup files only

Reports can only go to `ftp:1` or `ftp:2`. Setup files can go to any of the four servers.

To choose a directory, add it after a slash. For example, `getcfg='ftp:2/configs'` puts the setup file in the `configs` directory on Reports FTP Server 2.

Commands

Command	What it does	Example
<code>getrep</code>	Send a report holding everything since the last daily report	<code>002716 getrep='joe@example.com'</code>
<code>getrepN</code>	Send a report holding all data from <code>N</code> days ago. <code>N</code> is 0 to 30	<code>002716 getrep10='ftp:1'</code>
<code>getrepd</code>	Send a report for one date, in <code>dd/mm/yy</code> format. Add a second date after a hyphen for a range	<code>002716 getrepd='01/08/26-31/08/26 ftp:1'</code>
<code>getrepfmt</code>	Set the report format. See the table below	<code>002716 getrep='joe@example.com' getrepfmt='d'</code>
<code>getrepdir</code>	Set the time order — <code>inc</code> for oldest first, <code>dec</code> for newest first	<code>002716 getrep='ftp:1' getrepdir='inc'</code>
<code>getcfg</code>	Send the current setup as a <code>.cfg</code> file	<code>002716 getcfg='joe@example.com'</code>

A report is sent in raw format in decreasing time order unless you set `getrepfmt` or `getrepdir`.

Report format values for `getrepfmt`:

Value	Format
<code>r</code>	Raw
<code>f</code>	Filtered
<code>u</code>	User ID
<code>m</code>	Multi-column
<code>a</code>	Multi-column (aligned)
<code>d</code>	Diagnostic

Combined example

```
002716 getrep='01/08/26-31/08/26 ftp:1' getrepfmt='m' getrepdir='inc'
```

This sends all data logged in August 2026 to Reports FTP Server 1, in multi-column format, oldest record first.

Getting a diagnostic report

Support staff often ask for a diagnostic report. It holds the logged data plus the system messages that show what the modem, the reports and the alarms have been doing. Request it with:

```
002716 getrep='support@halytech.com.au' getrepfmt='d'
```

Replies

The device replies by SMS when it accepts a command.

If a SIM has been used in an iPhone, Apple may still hold the number for iMessage. Apple then intercepts your SMS commands and the device never receives them. See Appendix B.

Appendix G — DNP3

Requires the DNP3 software option (FML-005).

DNP3 lets the microSpider2 lite Modbus join a SCADA system as a remote terminal unit (RTU), also called an outstation. A central master station monitors it. The device supports DNP3-L2, the level 2 subset of the standard.

To keep power use low, the device can connect to the DNP3 master and send its logged data as unsolicited responses. It does this at a set interval, when an alarm triggers, or both.

No special SIM and no special IP addressing is needed. The device calls the server. The server does not need to reach the device.

Navigate to **Change Setup → DNP3**.

How the device connects

The device reaches the DNP3 master over LAN or over the mobile modem. Which one it uses follows the Internet method you set in 4.6 Network Configuration.

Internet method	How it works
LAN	The device listens for the SCADA system to connect to it. Set the SCADA system to connect to the device IP address on your Ethernet LAN.
Mobile Internet (Modem)	The device connects out to the DNP3 server. It does this at the reporting interval, or when an alarm triggers. The modem turns off in between, which saves power.

Modem is the common case for this product.

Your SCADA system must accept incoming connections when the device uses the modem. In ClearSCADA, set the outstation communications availability to **Incoming Only**.

⚠ **Listen mode over the mobile modem is not possible on the microSpider2 lite Modbus.** It needs the LiveSMS software option to hold the modem on, and LiveSMS is not available on any microSpider2 lite. Listen mode works over LAN only.

Communications settings

Setting	Description	Default
Server IP address 1–3	IP addresses of up to 3 DNP3 master servers. When connecting out, the device tries each one in turn until a connection succeeds. In listen mode, leave all three blank to accept any master, or enter addresses to accept only those servers.	—
Server port	TCP port the device connects to. Not used in listen mode.	20000
Listen port	TCP port the device listens on. Listen mode only.	20000
Local DNP3 address	The DNP3 address of this outstation. Change it if your master has several outstations. Each outstation on the network must have a unique address.	4
Server DNP3 address	The DNP3 address of the master. 3 is the usual default for a DNP3 master station.	3
Status	The connection state — closed, listening, connecting, or connected — with the IP address in use.	—

Over the mobile modem, the servers must be reachable from the Internet. Enter their **public** IP addresses, not their internal network addresses. Ask your IT support if you are not sure.

Click **Save and Restart DNP3** to apply the settings and try a connection straight away.

Watch the Status line. It shows the connection attempt as it happens, including any failure. Use it to confirm the connection works before you leave Change Setup. The same Status line appears on the DNP3 page under View Setup, so you can check the connection at any time.

Event reporting

By default the device treats every logged input value as a DNP3 event and sends it to the master.

- **Over LAN** — the device sends each event as the input is logged.
- **Over the modem** — the device sends events at an interval, to limit how often the modem turns on.

You can instead send only the values that changed. The master can rebuild the full history of a channel from that sequence of change events. This is the DNP3 equivalent of sending automatic reports by email or FTP. Use it instead of automatic reports, or alongside them.

Setting	Description
Enable Unsolicited	Whether the device sends unsolicited responses to the master
Report all logged data	Clear this to report only changes in input values. The device then only connects when it has changed data to send
Period	How often the device sends unsolicited responses — 1 minute to 1 day, or Disabled
Fast Period	The reporting rate while an alarm with Repeat (fast period) is active
Offset	A delay added to the event send time

Use **Offset** in three cases:

- To send events at a time other than midnight. An offset of 6 hours and 30 minutes sends at 6:30 am.
- To move DNP3 events away from your report times, so a report is not held up while unsolicited responses go out.
- To include a slow sensor. A Modbus sensor may log a fraction of a second after the hour, and would otherwise miss the send. An offset of 10 seconds catches it.

⚠ **Do not disable unsolicited responses when the device dials out over the modem.** The modem only connects when it has something to send. With unsolicited responses off it never has anything to send, so it never connects.

Keep test data out of the SCADA system. The **Reset starting point** button on the Reports page (see 4.13) marks everything logged so far as sent. That data is then never sent to the DNP3 server. Click it after commissioning, before you leave site.

DNP3 alarms

Periodic updates may be too slow when the SCADA system must know about a condition at once — a switch closing, or a sensor crossing a threshold. Set up an alarm as normal (see 4.12) and select **DNP3 Alerts** as one of its alerting options.

When the alarm goes active, the device connects to the master and sends all unsent events. One of those events is the input change that set the alarm off.

Select **Repeat (fast period)** to keep sending events while the alarm stays active. The device connects at the Fast Period rate until the alarm goes inactive. This lets you watch an alarm condition with faster updates than the normal reporting period.

Set up a matching alarm in the SCADA system. DNP3 does not mark one event as more important than another. Every event is treated the same. The device sends the changed input value, and the SCADA system decides what it means. The SCADA system sees only the new input level.

DNP3 Alerts work alongside the other alarm options. One alarm can switch a control, send an SMS, email a report and send a DNP3 update, all at once.

Input point mapping

The microSpider2 lite Modbus has 8 input channels, numbered 1 to 8. DNP3 uses arrays of input points instead. Each array is indexed from 0. DNP3 has three input point types: binary (on/off), analog (a signed decimal such as –12.34) and counter (a whole non-negative number that increases over time).

Channel numbers start at 1. DNP3 point indexes start at 0. Subtract 1.

Channel 1 is point 0. Channel 2 is point 1. Channel 8 is point 7.

Channel type	DNP3 input point type	Also available as
Switch	Binary	
Switch State	Binary	
Counter	Counter	Analog
Event	Counter	Analog
Analogue (Voltage)	Analog	
Analogue (Switch)	Binary	
Difference	Analog	
Modbus-485	Analog	
System (Voltage)	Analog	
System (Temperature)	Analog	
System (Moisture)	Analog	
Super channel	Analog	

Most channel types map to a DNP3 analog input.

The analog value is the calibrated value. It is the same number you see on the Inputs page and in reports. If you calibrated a channel to read in metres, DNP3 reports metres. Do not scale it again in the SCADA system.

The device reports the calibrated value even when you set **Log Difference** on that channel.

Why counter channels get two points. DNP3 counter points must hold whole non-negative numbers. The device lets you calibrate a counter into engineering units such as litres, which produces a decimal value. So a counter or event channel appears twice:

- a **counter point** holding a 32-bit integer, 0 to 4294967295
- an **analog point** holding the calibrated decimal value in engineering units

Use the analog point to read engineering units. Use the counter point when you need the DNP3 freeze or clear operations, because only counter points support them.

- **Freeze** copies the counter value into a matching frozen counter point. The counter keeps incrementing, and the frozen value stays put. The SCADA system can tell the outstation to freeze all counters at once, giving a snapshot at one moment in time, then read the frozen values one at a time.
- **Clear** resets a counter point to zero. DNP3 only allows counter points to be cleared. To clear a counter or event channel from the SCADA system, operate on its counter point, even when you read its analog point for reporting.

Send Level 2 Responses Only removes the analog point. Turning that advanced setting on stops the device reporting the calibrated analog point for counter and event channels. See **Advanced DNP3 settings** below.

Example. Channel 1 is a Switch named Float. Channel 2 is a Counter named Flow. Channel 3 is a Modbus-485 channel named Pressure.

Channel	Name	DNP3 points
1	Float	Binary input point 0
2	Flow	Counter input point 1, and analog input point 1. Frozen counter point 1 after a freeze
3	Pressure	Analog input point 2

Output point mapping

The microSpider2 lite Modbus has 2 controls. DNP3 treats a control as a binary output. Analog outputs are not used. Output points are indexed from 0, the same as input points.

Control	DNP3 binary output point index
Low Voltage Out	2

The point index follows the control **type**, not its position in the list. Low Voltage Out is index 2 because indexes 0 and 1 belong to Switched Power Out and Open Collector, which this product does not have.

The Modbus Warmup control is not in the table. It is a sensor warmup control, and DNP3 does not switch a control used for sensor warmup.

Controls accept `LATCH_ON` and `LATCH_OFF` to switch on and off. `PULSE_ON` sends one pulse with an on-time between 100 ms and 600 seconds. Multiple pulses (count greater than 1) are not supported.

The device supports all DNP3 binary output commands — the control relay output block (CROB) actions select, operate and direct operate. You can read the state of an output point at any time.

DNP3 cannot override the device. It will not switch a control that an alarm or the web interface is already forcing on, and it will not switch a control used for sensor warmup. If DNP3 asked for a control to be on and an alarm then forces it off, the control stays off while the alarm is active. DNP3 switches it back on afterwards.

Setting the clock

DNP3 can set the device date and time. The device works in UTC internally, so configure the SCADA system to report UTC times for this outstation.

NTP is not needed when the SCADA system updates the clock regularly. Running both does no harm.

Resetting the device

Reset	What it does
Warm reset	Restarts DNP3 only. The same as the Save and Restart DNP3 button. Nothing else on the device is affected.
Cold reset	Reboots the device. It is the same as switching the power off and on. The log records a power on event, even though power was never lost. Any activity such as sending a report is stopped. All alarms reset to inactive.

Both resets drop the DNP3 connection. It comes back after a minute or two. A device in listen mode listens again. A device in connect mode dials the server again.

You should never need these commands. They exist so the device meets the level 2 DNP3 standard in full.

Reading device attributes

The device reports these attributes over DNP3, so you can identify the right unit in the SCADA system: software version, serial number, short location name, long location name, product name, and hardware version.

Attribute	Value
Hardware version	37

The hardware version is the same number as the device type code in a setup file header (`.DEV=37`).

File transfer

DNP3 file transfer can read the setup file, write a new setup file, and write a firmware upgrade.

Authentication. You must authenticate before opening any file, using the standard DNP3 file access mechanism. Use the Administrator username and password (see 4.5). The factory defaults are `user` and `changeme`.

You cannot read the firmware — it can only be written. You cannot delete the setup file or the firmware file.

File	Name	Direction
Setup file	<code>msc[serial].cfg</code>	Read and write
Firmware file	<code>msf[serial].hal</code>	Write only

`[serial]` is the device serial number. **The filename is case sensitive. Any letters in the serial number must be UPPER CASE.** A device with serial `000D98` uses `msc000D98.cfg` and `msf000D98.hal`.

After any file transfer, send a DNP3 activate configuration request. The transfer alone changes nothing. In ClearSCADA, the Download File dialog has an **Activate** checkbox that you

must tick.

The setup file you read back is the same file that **Save setup to disk** produces (see 4.15). The same filenames are used by automatic setup updates (see 4.16) and automatic software upgrades (see 6.3).

Firmware upgrades. A firmware file takes about 10 minutes to download over the mobile modem. Turn off data link layer confirmations while you upload firmware. They make the transfer much slower, and TCP/IP already acknowledges every frame. After you activate the file, the device reboots to install it. This takes up to 90 seconds.

Advanced DNP3 settings

Navigate to **Change Setup** → **Advanced Settings**. The DNP3 block appears only when the DNP3 software option is installed.

You should not need to change any of these. They exist for strict level 2 DNP3 conformance. The defaults suit almost every SCADA integration.

Listen Mode

Value	What it does
Enabled	The device listens for the DNP3 server to connect to it. Normal when the server connection is over LAN.
Disabled	The device connects out to the DNP3 server. Modem only. The modem turns on only when needed, which saves power, and no public IP SIM is required. The modem turns off again once the master has the data.

The device sets this automatically from the Internet method you chose, so you rarely touch it. Two reasons to change it:

- On LAN, disable listen mode to switch the device DNP3 function off.
- Over the modem, do not enable it. Listen mode over the modem needs LiveSMS, which is not available on this product.

Send Level 2 Responses Only

Limits replies to what a level 2 master must be able to read. When you turn it on, the device:

- leaves timestamps out of analog and counter events
- reports analog inputs as integers only
- stops reporting the calibrated analog point for counter and event channels

⚠ **This reduces what the device can report.** Turn it on only when your master strictly enforces level 2 conformance.

Event Buffer Size

The number of unconfirmed events in one group — all analog inputs, for example — that can queue before the device sets the event buffer overflow flag.

The flag does not mean events were lost. It means more than this many events are waiting. Events may be lost after the flag is set, so the server should collect some.

This setting does not change how much the device can store or report. There is no reason to change it.

Unsolicited response timing

Four settings control how often, and how many times, the device retries an unsolicited response before the master confirms it.

Setting	Description
Unsolicited Confirm Timeout	How long, in seconds, the device waits for the master to confirm it received an unsolicited response.
Unsolicited Retry Delay	Extra time, in seconds, to wait after the timeout before sending the response again.
Unsolicited Max Retries	How many retries the device makes before it decides the master is offline.
Unsolicited Offline Delay	Extra time, in seconds, to wait between retries once the device has switched to offline mode.

How they work together:

1. The device sends an unsolicited response.
2. It waits for the **Confirm Timeout**.
3. If no confirmation arrives, it waits a further **Retry Delay**, then sends again. The gap between attempts is Confirm Timeout plus Retry Delay.
4. After **Max Retries** attempts, the device treats the master as offline and switches to offline mode.
5. In offline mode it keeps retrying, but the gap is now Confirm Timeout plus **Offline Delay**.

Two special cases:

- **To stop retrying in offline mode**, enter an Offline Delay above 86400 seconds (1 day). The device converts it to 2678400, which it reads as an infinite delay. The total number of retries then equals Max Retries.
- **To retry forever at the same rate**, set the Offline Delay equal to the Retry Delay. Max Retries then does not apply.

These four show the word `default`, not a number. The device calculates each one from the connection type, and for a modem connection from the event reporting period. Type your own value into any field and the device uses that instead, whatever the connection type.

Restore DNP3 Defaults

The button in the same block resets every advanced DNP3 field to its built-in default. Use it if a change has broken an integration that used to work.



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microSpider2 lite Modbus — User Manual · 2637.1003 · September 2026

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