PhloMetric Water Meter Node

User Manual

Firmware 2.13.0 · June 2026 · PhloMetric Water Meter System by Competition Software

1. What the Node Does

The PhloMetric Water Meter Node is an ESP32-based receiver that listens for the over-the-air broadcasts your utility water meter already transmits, decodes them, and makes the readings available three ways:

- A live **web dashboard** served by the Node itself
- Scheduled **email reports** (daily, weekly, or monthly)
- A 433 MHz **mesh link** that forwards readings to an optional PhloMetric Gateway for whole-site archiving

The Node never touches the meter. It is a passive receiver: it only listens to transmissions the meter already makes for the utility's drive-by readers.

Supported meter protocols

Protocol	Meter family	Radio behavior
GIF2006B	2006-era endpoints	Fixed frequency, 916.45 MHz
GIF2014WOSE	2014-era endpoints	Frequency hopping, 50 channels, 904.56 to 924.16 MHz
GIF2020OCECNA	2020-era endpoints	Same channel plan as GIF2014WOSE at twice the data rate

One protocol is active at a time, selected on the Setup page. Changing protocol saves the setting and reboots the Node.

2. Getting Started

2.1 First connection

1. Power the Node. Within a few seconds it broadcasts its own WiFi access point named **WaterMeter-NN**, where NN is the Node's ID (for example `WaterMeter-04`).
2. Join that network from a phone or laptop using the WiFi access-point password (the factory default is `phoa1234`).

3. Browse to **http://192.168.4.1**. This is the public dashboard.
4. To change settings, open **http://192.168.4.1/setup** and log in with the Setup password (factory default `phoa1234`). The login session lasts 24 hours.

2.2 Joining your home WiFi (recommended)

On the Setup page, under **WiFi Station**:

1. Click **Scan** and pick your network from the SSID dropdown.
2. Enter the network password.
3. Click **Save & Reboot**.

After reboot the Node connects to your network and is reachable at the address your router assigns. The `WaterMeter-NN` access point stays on as a fallback, so you can always get back in at 192.168.4.1 even if your WiFi changes.

A WiFi connection is required for email reports (internet plus time sync) and for firmware updates. The meter radio and the mesh link work with no WiFi at all.

2.3 Picking your meter (the default meter)

In normal operation the Node may hear many meters in the neighborhood, but it only publishes one: **your** meter, called the *default meter*. Until you set it, the dashboard shows nothing and reports are empty.

1. Let the Node listen for a few minutes so your meter appears in the list.
2. On the Setup page, under **Default Meter**, pick your meter's serial number from the dropdown. Each entry shows the serial, current volume, protocol, signal strength, and how recently it was heard. The serial printed on your meter's register is the easiest way to identify yours.
3. Click **Set**.

The default meter is remembered per protocol family, so switching protocols and back does not lose your selection.

2.4 Passwords

The Node has three independent passwords, each shipping from the factory as `phoa1234`. Change them on the Setup page, under **Passwords**; every change requires the current value for that password.

- **AP / OTA** secures the `WaterMeter-NN` WiFi access point and over-the-air firmware updates. It must be 8 to 63 characters (a WiFi requirement). Changing it reboots the Node and disconnects anything joined to the access point; reconnect with the new password.
- **Setup** gates the `/setup` login. Changing it logs you out, so you sign back in with the new value.
- **Debug** is required to enable Debug mode (section 4) and to Clear Meter Data.

If you forget the Setup or Debug password, click **Reset all to default** on the Setup page and enter the current AP/OTA password; all three return to `phoa1234` and the Node reboots. If the AP/OTA password itself is lost there is no remote recovery: the Node must be re-flashed over USB.

3. The Dashboard

The dashboard at the Node's address (port 80) auto-refreshes every 3 seconds and shows:

- **WiFi status**: access point IP, station IP (if joined to your network), and which meter radio the board carries
- **Statistics**: packets decoded per protocol, CRC errors, mesh transmit/acknowledge counts
- **Gateway link**: signal strength and age of the last direct contact with a PhloMetric Gateway, color coded (green is stronger than -60 dBm, yellow to -75 dBm, red beyond that)
- **Channel status** (hopping protocols): current channel, frequency, and whether the receiver is locked or scanning
- **Meter table**: your default meter's serial, volume in gallons, signal strength, receive count, and last-seen age

If no default meter is set, the dashboard shows: *"Showing your default meter only. Set the default meter, or enable Debug, on the Setup page."*

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4. Privacy Model and Debug Mode

The Node is privacy-first by design. In normal mode, every public surface (dashboard, JSON API, email reports) exposes **only your default meter**. Readings from neighboring meters are kept internal and never published.

Debug mode is for installation and troubleshooting. When enabled it reveals every meter the Node can hear, plus RF diagnostic controls (fixed-frequency override, receive-mode selection).

- Enable it on the Setup page: check **Enable debug**, enter the Debug password, click **Enable**. The password is required even if you are already logged in.
- Debug mode is held in RAM only. It turns itself **off at every reboot**, so the Node can never be left accidentally exposed.
- Disabling debug mode never requires a password.

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5. Setup Page Reference

All configuration lives at `/setup` (login required).

Section	What it does
Debug Mode	Reveals all meters and RF controls until next reboot. Password required.

Section	What it does
Mesh Configuration	Mesh ID (0 to 254, default 0) and Node ID (1 to 254, default 1). The Node ID names the access point and identifies this Node to the Gateway. Save & Reboot to apply.
Protocol	GIF2006B, GIF2014WOSE, or GIF2020OCECNA. Save & Reboot to apply.
External LNA	Check if an external low-noise amplifier is fitted. Adjusts receiver gain to avoid overload.
WiFi Station	Scan, select, and save your home network. Leave blank for AP-only operation.
Meter Sampling	Stop/Start the meter radio. Not persisted: sampling always resumes after a reboot.
Default Meter	Pick which meter this Node publishes. Saved immediately, per protocol family.
Clear Meter Data	Erases all stored meter readings (RAM and flash) after Debug-password confirmation. Your default-meter choice, WiFi, and other settings are kept; the table rebuilds as meters are heard again.
Passwords	Change the AP/OTA, Setup, or Debug password, or reset all three to the factory default. See section 2.4.
Email Reports	Interval, recipient list, Send Now. See section 6.
Fixed Frequency	Debug mode only. Pins the receiver to one channel, or a custom frequency between 902 and 928 MHz, instead of hopping. **Resume Hopping** returns to normal.

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6. Email Reports

The Node can email a usage summary for your default meter.

- **Interval**: Off, Daily, Weekly (Mondays), or Monthly (1st). Reports send during the 08:00 hour local time; the exact minute is derived from the Node ID so multiple Nodes do not send at the same instant.
- **Recipients**: up to 16 addresses. Add and remove on the Setup page; changes save immediately.
- **Send Now**: queues an immediate report without disturbing the schedule.
- Each report shows the current reading, the usage since the previous report, signal quality, and when the meter was last heard.

Email requires the Node to be joined to a WiFi network with internet access and a successful time sync. The status line under the email settings shows the last send time, connectivity, and time-sync state.

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7. Working with a PhloMetric Gateway

If your site runs a PhloMetric Gateway, the Node forwards default-meter readings to it automatically over the 433 MHz mesh. Nothing needs to be configured on the Node beyond its Mesh ID and Node ID.

- Readings are pushed whenever the volume changes, and acknowledged by the Gateway.
- If an acknowledgment does not arrive, the Node re-sends the reading through a neighboring Node as a **relay**, so meters at the edge of radio range still get archived.
- The Gateway can remotely query the Node, change its protocol, set its default meter, pause sampling, clear its data, or reboot it. These remote commands work even when the Node has no WiFi, as long as it is in mesh range.
- The dashboard's **GW link** readout is the site-survey tool: when choosing a mounting spot, watch the RSSI and age to find a location with a healthy link.

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8. Firmware Updates

Updates are delivered over WiFi; the Node must be joined to your network (station mode).

1. Browse to `http://<node-ip>/update`.
2. Choose the supplied `.bin` firmware file and upload. Progress is shown on the page.
3. The Node pauses its radios automatically during the flash, reboots itself when done, and resumes sampling.

If the upload fails, the Node keeps running its current firmware; just retry.

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9. HTTP API Quick Reference

Every endpoint is on port 80. Responses are JSON unless noted. In normal mode, meter data is limited to the default meter.

Endpoint	Method	Purpose
`/`	GET	Dashboard (HTML)
`/setup`	GET	Configuration page (HTML, login)
`/update`	GET/POST	Firmware update form / upload
`/api/status`	GET	WiFi, radio, gateway-link summary
`/api/meters`	GET	Meter readings
`/api/diag`	GET	Full diagnostics: counters, radio state, uptime

Endpoint	Method	Purpose
`/api/config`	GET/POST	Read or write configuration (login)
`/api/default_meter`	POST	Set the default meter (login)
`/api/radio/enable`	POST	Pause or resume meter sampling
`/api/clear_db`	POST	Erase stored readings (Debug password)
`/api/debug`	GET/POST	Read or set debug mode (Debug password to enable)
`/api/passwords`	POST	Change one password (login plus current value)
`/api/passwords/reset`	POST	Reset all passwords to the factory default (current AP password)
`/api/email`	GET/POST	Email interval and status
`/api/email/add_recip` `/api/email/del_recip`	POST	Manage recipients
`/api/email/send_now`	POST	Send a report immediately
`/api/channels`	GET	Hopping channel table
`/api/wifi_scan`	GET	Visible WiFi networks

A machine-readable specification is published at `https://eheuristics.com/api/node.json`.

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10. Troubleshooting

Dashboard shows no meters. Make sure the correct protocol is selected for your meter generation, then give the Node time: hopping protocols can take up to about an hour to first find a meter, and a few minutes thereafter. Check antenna placement; a window-side mount facing the meter helps.

My meter is missing from the default-meter list. Enable the *show all protocols* checkbox in the picker, or temporarily enable debug mode to see everything the Node hears and confirm signal strength.

Emails are not arriving. The status line under Email Reports must show *online* and a good time sync. Both require station WiFi with internet access. Check spam folders for the first report.

Cannot reach the Node on my network. The `WaterMeter-NN` access point is always available as a fallback at 192.168.4.1. Log in there and re-save the WiFi settings.

Readings look 10x too large. GIF2014WOSE and GIF2020OCECNA meters report in tenths of a gallon; the dashboard and emails already divide for display. Raw API consumers should divide `volume` by 10 for those

protocols.

Node seems stuck after experimenting with debug controls. Reboot it (power cycle, or the Gateway's Reboot command). Debug mode and any fixed-frequency override that was not saved clear at boot.

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11. Factory Behavior Summary

Setting	Default	Survives reboot
Node ID / Mesh ID	1 / 0	Yes
Protocol	GIF2006B	Yes
WiFi station	not configured	Yes
Default meter	none	Yes (per protocol family)
Email reports	Off	Yes
Meter sampling	running	Always resumes on
Debug mode	off	Always off at boot
AP/OTA, Setup, Debug passwords	`phoa1234` each	Yes
