FRESHDATA

FRESHDATA RELAY

DUAL-MODE LoRa® RELAY

Put sensors where they’re needed, not where coverage allows.

Placing gateways is a hard call: a sensor’s range shifts with walls, terrain and interference, so dead zones often show up only after installation. Covering them with another gateway means backhaul, mains power and a site to host it — for a handful of devices.



FRESHDATA closes those gaps for about the price of an end device. It runs on batteries and works entirely over the LoRa® radio link — no backhaul, no power connection — and one device serves your whole fleet: TS011 devices in Relay mode, LoRaWAN® 1.0.3 devices in Extender mode.

One device, two modes

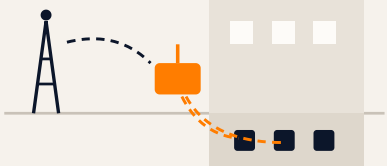
EXTENDER MODE — LoRaWAN® 1.0.3 and earlier

- **No changes anywhere.** No firmware change on the sensor, no integration on the network server.
- **Frame repeated unchanged.** The server sees a normal uplink from the end device.
- **Holds no keys.** Frames are selected by DevAddr alone — payloads stay encrypted end to end.

RELAY MODE — TS011 end devices

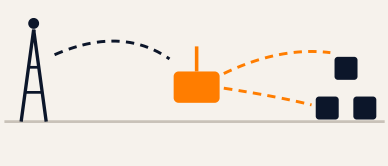
- **Built to TS011 1.0.1.** Fully implements the LoRa Alliance® relay specification.
- **Payloads stay encrypted.** Frames are wrapped with the relay’s own session keys; it cannot read or alter them.
- **Managed from the server.** Up to 15 end devices, paired and configured with the standard relay MAC commands.

Where it fits



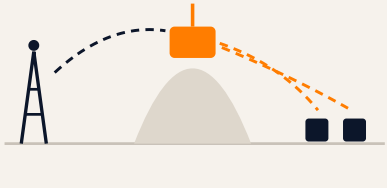
Basement metering

Meters in basements and utility rooms the gateway cannot hear.



Beyond gateway reach

Outlying sensors at the edge of a rural or agricultural deployment.



Obstructed terrain

Hills and buildings blocking the direct path to the gateway.

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TECHNICAL SPECIFICATIONS

Physical

Module	Semtech SX1262-based
Dimensions	120 × 76 × 70 mm
Weight	81 g empty · < 250 g fitted
Enclosure	ABS, outdoor, IP67
Antenna	2 dBi external, 50 Ω, SMA / U.FL
Operating temp.	−20 °C to +70 °C
Interfaces	USB Type-C console · RS-485 (optional)
Clock drift	±20 ppm @ 25 °C (≈ 72 ms/h)

Radio & power

Frequency band	EU868 / US915
Spreading factors	SF7 – SF12, programmable
Bandwidth	125 / 250 / 500 kHz
RX sensitivity	−137 dBm @ SF12 / 125 kHz
TX power	Up to +16 dBm EIRP (EU868 limit)
Battery	2 × AA $LiSOCl_2$ 3.6 V
Power source	Battery only, no mains

Modes	Extender mode	Relay mode
Protocol	Proprietary LoRa® relay	LoRa Alliance® TS011 1.0.1
End devices	LoRaWAN® 1.0.3 and earlier	LoRaWAN® 1.0.4+ with TS011 support
Activation	ABP only	OTAA and ABP
Traffic relayed	Unconfirmed uplinks only	Uplinks (all types) and downlinks
Channels	Single fixed channel, ADR off	Multi-channel
Reporting	Periodic only	Periodic or event-driven
Network server	No integration — sees a normal uplink	TS011-aware server
Keys held	None — DevAddr filter only	Relay's own session keys
Devices served	Tested with 10 — no fixed limit	Up to 15
Battery life	10 years — 10 devices, 12 h period	3 years — varies with setup

Battery life scales with the number of end devices and how often they report — forwarding takes most of the energy. Contact FRESHDATA for a deployment estimate.

How each mode works

Extender mode

1. Registered by DevAddr from the USB console
2. Exploration learns the reporting period
3. Wakes only when that device transmits
4. Repeats the frame exactly as it arrived

Relay mode

1. End device sends a Wake-on-Radio preamble
2. Relay detects it by CAD, replies with WOR-ACK
3. End device sends its encrypted frame
4. Relay forwards it on LA_FPORT_RELAY

FRESHDATA is a research-driven company specializing in Low Power Wide Area Networks, founded in 2022 as a spin-off from the Communication Networks Research Group, an ERC-funded research group at METU. FRESHDATA develops LPWAN infrastructure for industrial IoT — relays, smart grid monitoring and non-terrestrial IoT connectivity — turning world-leading research into deployable technology for terrestrial and space-based networks.

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