

Enertrek C30 Communication Module Technical Specification

RS485 to 4G General-Purpose Gateway / Modbus RTU Communication Module

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1 Product Positioning

Enertrek C30 is a 4G general-purpose Gateway product with RS485 communication capability. It connects to downstream Modbus RTU sub-devices through an RS485 interface and uploads data to a designated private cloud platform through a 4G network.

The product uses a modular design and is suitable for smart power distribution, smart home systems, industrial automation, energy metering, equipment status monitoring, and similar scenarios. It supports Modbus RTU data acquisition, data transparent transmission, remote control, sub-device management, cloud registration, and OTA firmware upgrade.

2 System Architecture

The typical communication path is as follows:

| Name | LED indication | Status |
|--------------------|------------------------|--|
| Downstream Devices | Modbus RTU sub-devices | Meters, sensors, controllers, PLCs, data acquisition terminals, etc. |
| Gateway Device | Enertrek C30 Gateway | RS485 master responsible for polling or transparent transmission |
| Uplink Network | 4G | Accesses the mobile network via Nano-SIM and external antenna |
| Cloud Platform | Private cloud | Completes data upload, registration, and remote management via MQTT / HTTP |

3. Core Functions

| Function Module | Technical Description |
|-----------------------|--|
| RS485 Communication | Supports one RS485 differential interface |
| Modbus Protocol | Supports Modbus RTU master communication |
| Sub-device Management | Supports up to 32 Modbus sub-devices |
| 4G Upload | Connects to a private cloud through a 4G network |
| Cloud Protocol | Supports MQTT / HTTP upload |
| Remote Management | Supports cloud registration, remote parameter delivery, and remote control |
| Data Modes | Supports polling acquisition mode and transparent transmission mode |
| Local Cache | Supports breakpoint recording and automatic retry after disconnection |
| OTA Upgrade | Supports remote firmware upgrade and cloud-based version management |

4. Hardware Specifications

| Item | Specification |
|-------------------------------|--------------------------------------|
| Product Name | Communication Module |
| Model | Enertrek C30 |
| Brand | Enertrek |
| Communication Type | 4G general-purpose module |
| Power Input | AC 100-240V, 50/60Hz |
| Downlink Interface | 1 x RS485 A/B differential interface |
| Downlink Protocol | Modbus RTU |
| Downlink Role | Master |
| Uplink Network | 4G |
| Uplink Protocol | MQTT / HTTP |
| Cloud Platform | Private cloud |
| SIM Card Interface | Nano-SIM standard interface |
| Antenna Interface | External SMA antenna interface |
| Button | Reset Key |
| Indicators | Network Status, RS485 Activity |
| Housing Material | Flame-retardant ABS/PC |
| Recommended Protection Rating | IP20 |
| Operating Temperature | -10°C to +55°C |

5. Installation and Wiring

| Name | LED indication | Status |
|--------------------|------------------------|--|
| Downstream Devices | Modbus RTU sub-devices | Meters, sensors, controllers, PLCs, data acquisition terminals, etc. |
| Gateway Device | Enertrek C30 Gateway | RS485 master responsible for polling or transparent transmission |
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6. Indicator Status

| Indicator | Status | Behavior | Meaning |
|----------------|------------------|-------------------------------------|--|
| Network Status | Normal | Solid green | Registered to the 4G network; connection is normal |
| Network Status | Registering | Slow green flashing, about 1 second | Registering or connecting to the 4G network |
| Network Status | Abnormal | Off | No SIM card or network disconnected |
| RS485 Activity | Communicating | Green flashing | Modbus RTU communication in progress |
| RS485 Activity | No communication | Off | No downstream device activity detected or device offline |

7. RS485 / Modbus RTU Communication Specifications

| Item | Specification |
|---------------------------|---|
| Communication Interface | RS485 |
| Protocol Type | Modbus RTU |
| Operating Role | Master |
| Supported Sub-devices | Up to 32 |
| Baud Rate | 1200-115200 bps configurable |
| Default Serial Parameters | 9600 / 8 / N / 1 |
| Polling Configuration | Supports polling list configuration |
| Transparent Transmission | Supported |
| Sub-device Configuration | Supports sub-device ID, address, and command set configuration |
| Exception Handling | Supports breakpoint recording and automatic retry after disconnection |

8. Uplink 4G Communication Specifications

| Item | Specification |
|--------------------|--|
| Network Type | 4G |
| SIM Card | Nano-SIM |
| Antenna | External 4G antenna |
| Cloud Connection | Private cloud |
| Upload Protocol | MQTT / HTTP |
| Network Parameters | Supports backend APN configuration |
| Online Logic | Automatically goes online after acquiring the 4G network |
| Registration Logic | Supports cloud-triggered registration or device parameter delivery |

9. Operating Modes

Enertrek C30 supports two operating modes, which can be switched by parameter configuration.

9.1 Operating Modes

The Gateway works as a Modbus RTU master. Based on the polling task list configured locally or from the cloud, it periodically reads data from RS485 sub-devices, processes the data, and uploads it to the private cloud platform.

| Application Scenario | Description |
|---------------------------|--|
| Periodic Data Acquisition | Periodically reads data from meters, sensors, controllers, and other devices |
| Status Monitoring | Periodically obtains equipment operating status and alarm status |
| Energy Management | Acquires metering data such as current, voltage, power, and energy |
| Industrial Automation | Acquires data from PLCs, instruments, and Modbus data acquisition terminals |

9.2 Transparent Transmission Mode

The Gateway works as a forwarding device. It sends Modbus commands issued by the cloud platform to RS485 sub-devices without modification, and uploads the device responses to the cloud platform without modification.

| Application Scenario | Description |
|---------------------------|---|
| Remote Control | Cloud platform directly issues Modbus control commands |
| Real-time Reading | Platform reads specific device registers in real time |
| Protocol Compatibility | Modbus data is parsed by the cloud or upper-level system |
| Debugging and Maintenance | Remote diagnosis of RS485 sub-device communication status |

10. Sub-device Management

| Item | Specification |
|-----------------------|--|
| Maximum Sub-devices | 32 |
| Sub-device Parameters | Supports device ID, communication address, and command set configuration |
| Polling Tasks | Supports polling list configuration |
| Offline Handling | Supports automatic retry after disconnection |
| Breakpoint Recording | Supports local breakpoint recording |
| Data Recovery | Supports continued upload after network recovery |

11. Data Transmission Capability

| Function | Description |
|---------------------------------|--|
| Modbus Transparent Transmission | Supports transparent forwarding of Modbus commands and responses |
| Data Upload | Supports upload to private cloud through MQTT / HTTP |
| JSON Extension | Reserved capability for JSON-encoded upload |
| Field Parsing | Supports cloud-side field parsing adaptation |
| Local Cache | Supports local cache and breakpoint resume |

12. OTA Upgrade

| Item | Specification |
|---------------------|--|
| Upgrade Method | Remote OTA upgrade |
| Firmware Management | Unified cloud-based version management |
| Upgrade Target | Gateway firmware |

13. Button Functions

| Operation | Function |
|-------------------------------|--------------------------|
| Press and hold for 5 seconds | Device unbinding |
| Press and hold for 10 seconds | Restore factory settings |

14. EMC and Safety Requirements

| Item | Standard / Level |
|-------------------------|---|
| ESD | IEC 61000-4-2, +/-6kV contact discharge, +/-8kV air discharge |
| EFT | IEC 61000-4-4, +/-2kV |
| Surge | IEC 61000-4-5, +/-2kV common mode |
| RS Immunity | IEC 61000-4-3, 10V/m |
| CE Emission / Conducted | EN 55022 Class B, 3 m |

15. User Workflow

1. Configure 4G APN parameters in the backend system.
2. Insert a Nano-SIM card.
3. Connect the external 4G antenna.
4. Connect AC 100-240V power input.
5. The Gateway powers on and registers to the 4G network.
6. After network access is established, the device automatically goes online to the private cloud.
7. The cloud issues registration commands or device parameters.
8. The Gateway pulls sub-device configuration.
9. The Gateway starts Modbus RTU communication.
10. Acquired data or transparent transmission responses are uploaded to the private cloud through MQTT/HTTP.

16. Packaging and Labeling Requirements

| Item | Requirement |
|-----------------|---|
| Housing Marking | Model, SN, input voltage, communication method |
| Package Label | Product model, batch number, production date, QR code |

17. Product Definition

Enertrek C30 is a 4G RS485 Gateway for private cloud platforms. It can operate as a Modbus RTU master, connect to up to 32 downstream sub-devices, and implement data upload, remote control, device management, and OTA upgrade through MQTT/HTTP.



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