

Status-P

3 Channel Pulse Counter User Guide

RF-LW-PULSE

LoRaWAN Wireless Pulse Counter

- LoRaWAN long range wireless.
- Battery powered
- Counts meter pulses to easily track energy consumption
- S0 standard pulse duration counting
- Up to 3 pulse inputs



Status -P counts pulses or monitors Change of State on up to three channels and transmits the accumulated data to the cloud using long range LoRaWAN wireless, where it can be displayed and analysed.

Battery powered, Pulse is the easiest way to access your energy data in real time. Meter consumption data and input state is transmitted using long range LoRa wireless for integration with cloud services to reveal operational performance and generate alerts.

The units are battery powered with long life of 3+ year[‡].

A built in USB port allows all parameters including pulse counts, operational mode, switch debounce period, sampling interval, wireless signal strength and wireless network configuration to be viewed and set using simple menus via any USB enabled host, such as a PC or Mac.

Features

- 3 channel meter pulse counting
- LoRa long range wireless
- Frequency Range 863-870MHz^{*}
- Frequency Range 902-928MHz^{*}
- Up to +16dBm Tx Power
- Built in USB port for power and configuration
- Battery powered
- CE / FCC compliant
- RoHS compliant
- Made in the UK

^{*}Option / Model dependent

[‡] Dependent on settings and environment

- Input Change of State monitoring

Introduction

Status-P Pulse counter accumulates pulse counts on up to three channels and can optionally monitor Change of State on the inputs.

Common applications for the pulse counter are energy monitoring and water consumption monitoring. The unit counts the number of pulses received from a meter and transmits the data using long range LoRaWAN wireless so the consumption can be monitored and controlled.

The Change of State mode can be used to monitor the contact status of a switch or output, for example a door open/closed, a piece of equipment on/off or an alarm condition in alarm/normal.

The operational mode of pulse counting or pulse counting plus Change of State monitoring is selected via the USB menu.

2. Configuration

LoRaWAN devices are configured using OTAA (Over-the-Air-Activation).

OTAA is the most secure way to connect a device to the LoRaWAN network. In OTAA, the device performs a Joinprocedure with the network, during which a dynamic DevAddr (device address) is assigned and security keys are negotiated with the device.

The OTAA configuration requires the following parameters to be correctly set:

- DevEUI: End-device Identifier. It is unique for every device and is set at device manufacture.
- AppEUI: Application Identifier. Used to identify the end application.
- AppKey: Application key. Used to create the session keys.

*Note: In LoRaWAN 1.1, AppEUI was renamed to JoinEUI.

Providing the LoRa gateway has the matching values, the join process will happen automatically once the Status unit is in wireless range and switched on.

The DevEUI is always set at device manufacture and is unique. The device AppEUI and AppKey can easily be set via the USB connection if required and the process is detailed later in this document.

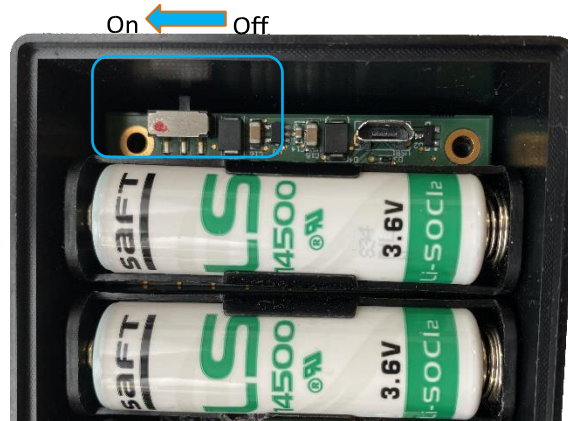
Join devices to the LoRaWAN network

Devices in wireless range and with the correct AppEUI and AppKey settings set will automatically join the LoRaWAN network when they are first powered up.

The unique **DevEUI** is printed on all devices and is also present in the QR code. The **DevEUI** can be used to identify the device once joined to the network.

To power the device ON, remove the cover of the Status by unscrewing the two screws on the cover.

Locate the power switch and using small screwdriver gently slide the power switch towards the ON position as shown.



Switch to the ON position

Once powered ON, the device will send a Join request message to the LoRaWAN network server. The Status LED will blink RED as shown below whilst the Join process is taking place. Depending on factors such as signal strength, RF interference etc. the join process may take several seconds to complete.



Blinking Red LED – Attempting Join

When the device has successfully joined the network, the Mode LED will blink GREEN five times to show that the join has been completed. The LED's will then switch off to conserve the batteries.



Blinking Green LED – Device Successfully Joined

Setting / changing the LoRaWAN keys

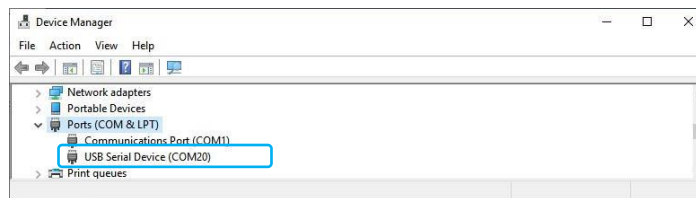
If the LoRa gateway has matching keys the join process will happen automatically once the unit is in wireless range and switched on.

The DevEUI is always set at device manufacture and is unique. The device **AppEUI** and **AppKey** can easily be set via the USB connection as detailed below.

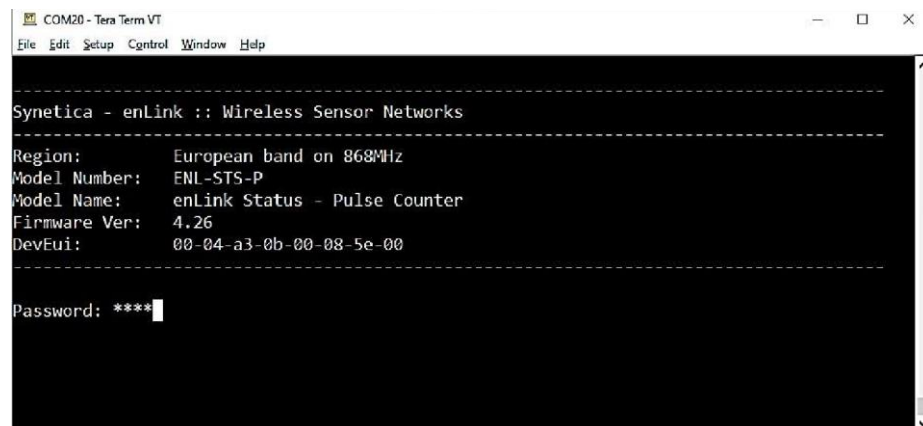
Connect a micro USB cable to the unit. The device will attach to a COM port on your PC.

Using a terminal program (e.g. Tera Term <https://tssh2.osdn.jp/>) connect to the COM port used by the device.

To verify which COM port is being used, check the Windows™ Device Manager (In Windows - Click the **Start** button, type **device manager** into the search box and tap **Device Manager** on the menu.) Expand the **Ports (Com & LPT)** menu as shown below.



In your terminal program press the **Enter** key. An summary screen will appear as shown below. The default password is the last four digits of the displayed **DevEUI**, in the screen below this is 5e00.



enLink logon screen

The screen below will show with the Main Menu options. Enter **Q** to enter the **Quick Start Menu**.

```

COM20 - Tera Term VT
File Edit Setup Control Window Help

enlink Main Menu:
-----
Q - Quick Start Menu
L - LoRa Radio Settings
C - Configure Device
P - Password and Security
T - Test Mode
R - Reboot
X - Log off

Select an option:
  
```

Main Menu

The **Quick Start Menu** contains only the parameters that normally need to be configured to setup the device and join the LoRa network.

From the **Quick Start Menu** you can change the **AppEUI** and **AppKey**.

```

COM20 - Tera Term VT
File Edit Setup Control Window Help

enlink Main Menu:
-----
Q - Quick Start Menu
L - LoRa Radio Settings
C - Configure Device
P - Password and Security
T - Test Mode
R - Reboot
X - Log off

Select an option:
  
```

Quick Start Settings Menu

From the **Quick Start Settings Menu**, access the **AppEUI** setting by entering **e**. Enter the 16 character **AppEUI** using numbers and letters a to f. Do not include spaces or any other characters. Pressing **S** will enter the default **AppEUI** which you can then edit. **R** will set a random AppEUI. Press **Enter** when the key is correctly entered to return to the **Quick Start Settings Menu**.

```

E - AppEui          53-79-6e-00-00-00-00
K - AppKey          e6-ba-6c-c9-61-87-47-75-9d-13-e4-e0-9a-5f-40-0d
T - Transmit Interval 15 mins
X - Exit Menu

Select an option: e

Enter a new 16 character AppEUI using only numbers and the letters A to F (no separators)
Hit <S> to enter the default value or <R> for a random value

Current Setting: AppEUI = 53-79-6e-00-00-00-00

-----
New AppEUI: 53796e0000000000
  
```

AppEUI setting

From the **Quick Start Settings Menu** access the **AppKey** setting by entering **k**. Enter the 32 character **Appkey** using numbers and letters a to f. Do not include spaces or any other characters. Pressing **S** will enter the default **AppKey** which you can then edit. **R** will set a random AppKey. Press **Enter** when the key is correctly entered to return to the **Quick Start Settings Menu**.

```
E - AppEui          53-79-6e-00-00-00-00
K - AppKey         e6-ba-6c-c9-61-87-47-75-9d-13-e4-e0-9a-5f-40-0d
T - Transmit Interval 15 mins
X - Exit Menu

Select an option: k

Enter a new 32 character AppKey using only numbers and the letters A to F (no separators)
Hit <S> to enter the default value or <R> for a random value

Current Setting: AppKey = e6-ba-6c-c9-61-87-47-75-9d-13-e4-e0-9a-5f-40-0d

-----
New AppKey: █
```

AppKey setting

Press **X** from the **Quick Start Settings Menu** to return to the Main menu.

The header will show **** Reboot Required **** as shown below. The new key settings will not take effect until the device is restarted. Enter **R** to reboot followed by **OK**. The device will restart with the entered **AppEUI** and **AppKey** and attempt to join the LoRa network.

```
enLink Main Menu:  ** Reboot Required **
=====
Q - Quick Start Menu
L - LoRa Radio Settings
C - Configure Device
P - Password and Security
T - Test Mode
R - Reboot
X - Exit and log off

Enter Selection: █
```

Reboot Required notification

Check your LoRaWAN network server to verify that the device has joined successfully.

5. Setting / changing the transmit interval

Access the **Transmit Interval** setting by entering **t** from the quick start menu.

```
Select an option: t
Current Setting: Transmit Interval = Adaptive

Transmit Interval:
=====
1 - 30 s
2 - 1 min
3 - 2 mins
4 - 5 mins
5 - 10 mins
6 - 15 mins
7 - 20 mins
8 - 30 mins
9 - 60 mins
10 - 2 hours
11 - 3 hours
A - Adaptive <==
I - Adaptive Min interval: 15 mins
M - Adaptive Max interval: 60 mins
X - Exit Menu

Enter Selection: █
```

Transmit Interval settings

Select a fixed transmit interval from the menu options. 15 minutes or longer is recommended to extend battery life. For Change of State monitoring, you must select **Adaptive**. See section 7 for more details.

Press **X** to return to the **Quick Start Settings Menu**.

Setting / changing the pulse counter parameters

The pulse counter parameters including the operational mode, switch debounce periods and cumulative count reset can be changed using the **Configure Device** menu.

From the **Main Menu** access the configuration menu by entering **C**. This screen will display the current device temperature, humidity, pulse count values and also provide access to live readings.

```
Sensor Readings:
-----
Temperature/Humidity      23.5°C / 59%
-- Pulse Counter
Pulse Count for Input #1    0
Pulse Count for Input #2    0
Pulse Count for Input #3    0

Device Options:
-----
D - Live readings display
P - Pulse Counter
X - Exit Menu

Select an option: [ ]
```

Enter **P** to view the **Pulse Counter** menu

```
Select an option: p

Pulse Counter Options:
=====
I - Set number of inputs to Transmit    3
C - Transmit on Change of State        Disabled
S1 - Set Count for Input #1            0
S2 - Set Count for Input #2            0
S3 - Set Count for Input #3            0
Z - Zero All Counters
D1 - Set Debounce Time for Input #1    30ms
D2 - Set Debounce Time for Input #2    30ms
D3 - Set Debounce Time for Input #3    30ms
DA - Set All Debounce Times
T - Set Sensor Test Duration           5 minutes
X - Exit Menu

Select an option: [ ]
```

Enter **I** to select how many pulse channels to transmit in the LoRaWAN data packet.

Enter **S1**, **S2** or **S3** to pre-set the pulse count on each channel. This can be used, for example, to match a current meter reading.

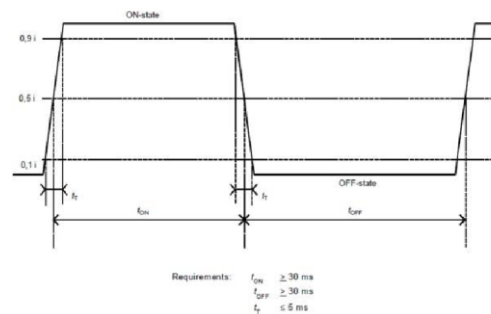
Z can be used to reset all pulse counters to zero.

D1, D2, D3, or DA can be used to set the switch debounce period for each channel independently or for all channels at once.

```
Select an option: d1
Enter the debounce time for input #1 (10 to 250 ms, normally '30') [30 ms]: []
```

Meter pulse output debounce

Depending on the cable length and its electrical characteristics, a meter pulse signal can “ring” or “bounce” causing false counting. To address this, most energy meters adhere to the S0 standard as defined in EN62053-31.



S0 Standard Pulse Timing

The S0 standard stipulates that a meter pulse output should remain in the ON-state for at least 30mS and in the OFF-state for at least 30mS and with a rise/fall time of less than 5mS. enLink Status-P samples the inputs many times on each transition to ensure that the signal remains constant for the required time and therefore prevents false counting.

The debounce time can be independently set for each channel for periods of between 10mS to 250mS, however this should be used with caution as it can cause mis-counts. Leave this setting at 30mS to match the S0 standard requirements.

7. Operating Mode

The unit can be used as a Pulse Counter, or as a Pulse Counter and Change of State monitor. The operational mode is set via the **Pulse Counter Options** menu.

```
Select an option: p

Pulse Counter Options:
=====
I - Set number of inputs to Transmit      3
C - Transmit on Change of State          Disabled
S1 - Set Count for Input #1              0
S2 - Set Count for Input #2              0
S3 - Set Count for Input #3              0
Z - Zero All Counters
D1 - Set Debounce Time for Input #1      30ms
D2 - Set Debounce Time for Input #2      30ms
D3 - Set Debounce Time for Input #3      30ms
DA - Set All Debounce Times
T - Set Sensor Test Duration             5 minutes
X - Exit Menu

Select an option: █
```

With the Transmit on Change of State **disabled** the unit operates as a standard pulse counter.

With the Transmit on Change of State **enabled** the unit operates as a standard pulse counter and also transmits a LoRaWAN message when the state of the input changes from *closed* to *open* or *open* to *closed*.

The message transmitted sends the current status of all three inputs (*open* or *closed*) plus the “trigger status” which indicates the reason for the transmission, e.g., input changed from *Closed* to *Open*.

To enable or disable the Transmit on Change of State, enter **C** and confirm **e** to enable or **d** to disable.

When Transmit on Change of State is enabled you must also enable Adaptive Transmit Intervals as shown below.

Enter **Q** to enter the **Quick Start Menu**.

```
enlink Quick Start Menu:
=====
Status                Joined 2m 27s ago
Join Check in         3h 26m 25s

E - AppEui              53-79-6E-00-00-00-00
K - AppKey              9E-26-01-37-FD-08-4B-7C-92-C6-62-6F-25-A3-22-09
T - Transmit Interval   15 mins
X - Exit Menu

Select an option: █
```

Quick Start Settings Menu

Access the **Transmit Interval** setting by entering **t**.

```
Transmit Interval:
=====
1 - 30 s
2 - 1 min
3 - 2 mins
4 - 5 mins
5 - 10 mins
6 - 15 mins <==
7 - 20 mins
8 - 30 mins
9 - 60 mins
10 - 2 hours
11 - 3 hours
A - Adaptive
I - Adaptive Min interval: 5 mins
M - Adaptive Max interval: 60 mins
X - Exit Menu
Enter Selection: |
```

Transmit Interval settings

To select a fixed transmit interval select the required interval from the menu options.

To select **Adaptive Transmit Interval** select the **A** option and then change the settings for the **Adaptive Min interval** and **Adaptive Max interval** as required.

With adaptive transmit interval set, when a Change of State occurs a wireless message is sent immediately, however messages will not be sent more frequently than the **Adaptive Min interval**. The **Adaptive Max interval** acts like a heartbeat, so if no Change of State occurs then a message is sent at the **Adaptive Max interval**.

Press **X** to return to the **Quick Start Settings Menu**.

LED pulse activity indicator

The device features a pulse activity indicator useful when installing and commissioning the unit. The LED's on the front of the unit can be set to flash when a valid, debounced, pulse is received.

To activate the feature press and hold the CONFIG button on the front of the unit for more than a second.

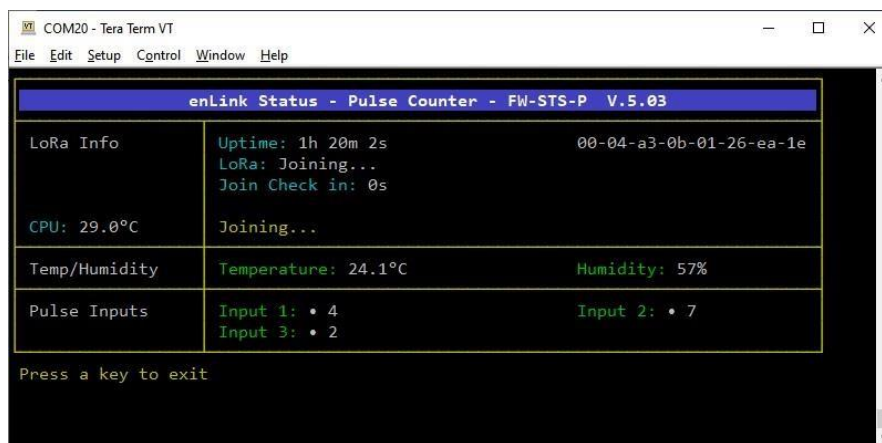
The STATUS and MODE LED's will both flash rapidly to indicate that the unit is in pulse test mode. When a valid pulse is detected, the LED's will remain on for a period of two seconds according to the following:

- Pulse received on channel 1 – MODE LED (Green LED)
- Pulse received on channel 2 – STATUS LED (Red LED)
- Pulse received on Channel 3 – MODE and STATUS simultaneously (Green and Red LED's)

Once activated the unit will remain in pulse test mode for 5 minutes (by default). After this interval the unit will return to low power mode. The test duration period can be changed in the **T** menu - "Set Sensor Test Duration". The valid duration is 1 to 20 minutes. Long intervals consume more battery power.

Enter **X** to return to the **options** menu.

The **D** option displays live readings, which can be used to verify the readings before deployment.



The pulse counts for each channel are written to non-volatile memory every 5 – 10 minutes. Pulse counts are therefore preserved between resets and battery changes. The pulse count values can be manually set and reset using the options detailed above.

9. Input Connections.

Pulse has an 8-way terminal block with screwless terminals for rapid connection of the meter pulse inputs.



The unit is designed for voltage free connections only. Do not apply any external voltage to the unit or it may be damaged irreparably. The voltages for pulse counting and Change of State monitoring are produced by the unit.

| Terminal Number | Function |
|-----------------|----------|
|-----------------|----------|

| | |
|---|-----------|
| 1 | Not Used |
| 2 | Not Used |
| 3 | Pulse 1 + |
| 4 | Pulse 1 - |
| 5 | Pulse 2 + |
| 6 | Pulse 2 - |
| 7 | Pulse 3 + |
| 8 | Pulse 3 - |

The connector is designed to accommodate the following cable sizes with a minimum of 10mm strip length.

- Connection capacity (single-wire): 0.2 – 0.5 mm²
- Connection capacity (single-wire): AWG 26 – 20

Strip a suitable length of outer cable sheath from the pulse cable to be used and insert through the cable glands. Twist the gland to secure the cable. The gland will accommodate cables of between 2 and 4.8mm diameter.

10. Battery Installation / Replacement

Devices use EVE ER14505 AA size 3.6 Volt Lithium Thionyl Chloride (Li-SOCl₂) batteries (non-rechargeable) or direct equivalent.

No other batteries are approved for use in the device.

Lithium Thionyl Chloride batteries have very high energy capacity and must be used and handled with care observing the guidance below.



WARNING

Risk of death or serious injury from explosion or fire.

- Keep out of sight and reach of children.
- Fire, explosion and burn hazard - do not recharge, short circuit, crush, disassemble, incinerate.

- Due to the high terminal voltage (3.6V), they are not suitable as direct replacements for other battery technologies in the same can sizes.
- When not in use the Batteries must be stored in a non-Hazardous Area.
- Do not change batteries in an explosive gas atmosphere.
- When installing batteries, do not snag the battery terminal on the clip or the battery may be damaged. Do not apply excessive force.
- Do not drop. Dropping the battery may cause damage. If a battery is dropped, do not install the dropped battery into the unit. Dispose of dropped battery promptly per local regulations or per the battery manufacturer's recommendations.

Guidance

- Always install the batteries correctly as per instructions taking great care to observe the battery polarity.
- Ensure that the contact points are clean and conductive.
- All batteries must be the same model from the same manufacturer.
- Do not mix old and new batteries or batteries from different manufacturers.
- Do not heat or attempt to recharge the battery.
- Do not dispose of in a fire.
- Only install approved batteries: EVE ER14505 / SAFT LS14500 Lithium Thionyl Chloride AA Battery 3.6 Volt, or direct equivalent.

Safe disposal



- Please recycle responsibly, a wide range of schemes are available.
- Do not dispose of in normal waste or in a fire.

