PCR2 are radar peopleflow sensors for use with LoRaWAN® connectivity. The system includes powerful signal processing that enables directional measurement. Counters are transmitted in regular intervals over a public or private LoRaWAN® network. PCR2 detects both direction independently if there is some space between the persons.

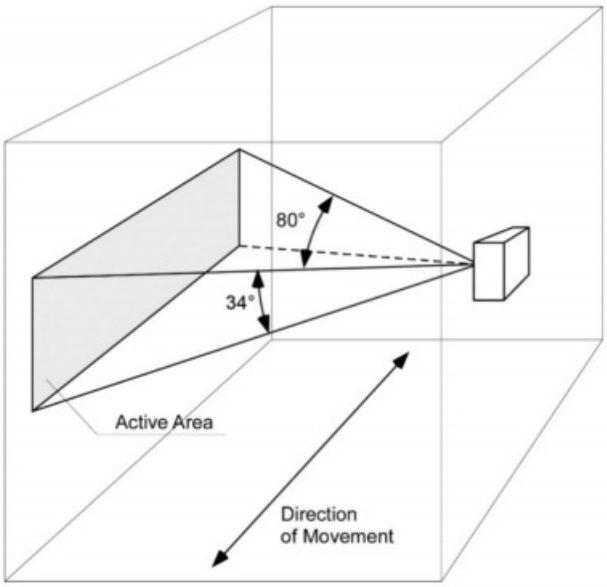
Installation

Field of view and optimal placement

PCR2 are 1D sensors measuring Peopleflow walking along a virtual line. The device can be mounted on walls, door frames or overhead.

Side mounted PCR2

PCR2 devices should be mounted sidewise if possible for best performance.

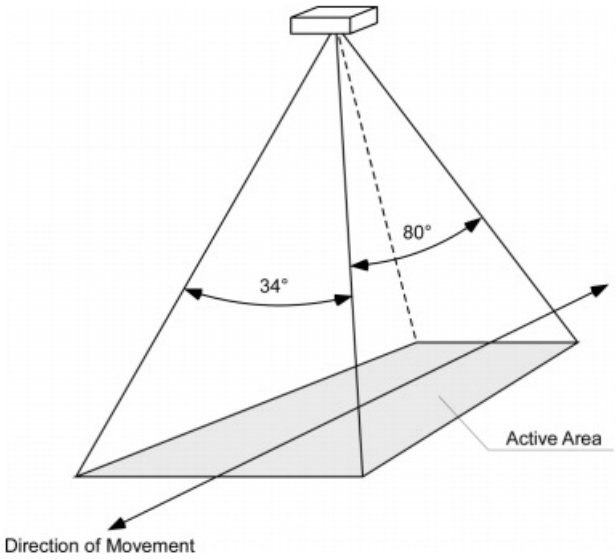


Installation height:	1.2-1.4m above ground
Direction:	Surface should be parallel to direction of movement
Distance between persons:	40° or more

Top down mounting

PCR2 could be mounted over head.

Note: Detection wide is reduced to 34° when placed over heads. Minimum distance from sensor to person's head should be more than 0.5m



Installation height:	0.5-4m above person's head
Direction:	Surface should be parallel to direction of movement
Distance between persons:	40° or more

Please avoid

To increase counting accuracy we strongly recommend avoiding following situations

- Objects like poles, wall, doorframes in radar field of view (FOV) can generate reflexions and reduce measurement performance
- Moving objects others than people (escalators, ventilators, curtains)
- People walking side by side
- Too wide entries will reduce accuracy (lots of side-by-side entries)

Power Supply

Integrated radar technology results in a constant power consumption between 127-160mW.
All PCR2 Indoor sensors need to be external powered.

USB powered

Use a USB power supply to power the PCR2 device by connecting the Micro-USB plug to the "CONFIG" socket.

Note: Use a power supply with low power output. Big power supplies tend to oscillate when there is a very small load.

DC powered

Alternatively you can power PCR2 devices by using a 5-12V DC constant voltage power supply connected to the terminals "POWER".

Operation

Device startup sequence

After switching on the device, following sequence will start.

1. Initialization of Radar Processor. LEDs are constantely on.
2. Start Join-Procedure (only if LoRa Modem is enabled). LEDs are blinking slowly
3. After receiving *Join Accept*, the device switches sends the Configuration Payload on port 190

Detection mode

1. LEDs are off and are quickly flashing if a object gets detected.
2. After Interval time is up, the device sends the PCR2 Application Payload on port 14. This can be done in Confirmed or Unconfirmed Mode.
3. In Confirmed mode LEDs are on until successful received a ACK. After receiving the ACK LTR and RTL counters will be reset. If the device operated in Unconfirmed Mode counters will be immediately reset after sending w/o waiting for an ACK.

LED Signalisation

- LEDs will by on during hardware initialisation (10s)
- LED will start to blink during Join Sequence
- LED go off when network has joined
- Left or right LED will blink shortly when detection movement

Inactivity Timeout

The inactivity timeout can be used to automatically reset sum counters (RTL_SUM and LTR_SUM) if there is no movement for a certain time. This is useful if absolute counting of persons is used and one would like to start with zero in the morning. Inactivity Limit can be enabled by setting the value to zero.

LinkCheck Intervals

There are several reasons why an end device could land in a stranded state where it does not receive any downlink messages from the network, including:

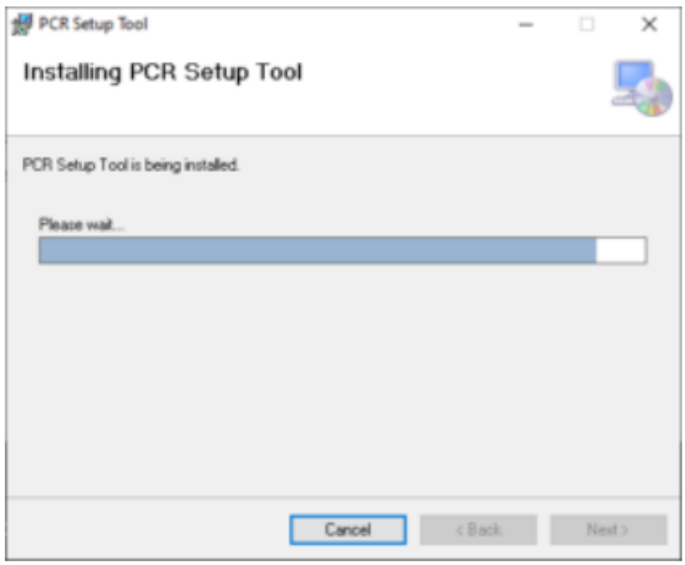
- The device transitioned quickly between two gateways with channel maps that don’t overlap
- The device’s RX1 and RX2 reception parameters become out of sync with the network server
- The device roamed to a different network provider’s region (if there is no roaming agreement between those two providers)

PCR2 devices using the Link Check Request/Answer mac command for detecting if there is still a connection to a Gateway. (see command set/get lci for more info)

Setup using 10 PCR Setup Tool (Win10 only)

We provide a free Windows 10 Software to configure PCR2 devices.
Download the **PCR Setup Tool** from here. Follow the instructions of the installer. Ignore all security warnings.

Note: This is a .Net Application designed and tested for Windows 10 64Bit PCs.



Setup using the Command Line Interface CLI

PCR2 can be alternatively configured using the virtual serial interface (Serial over USB). There should be no need to install drivers on Windows 10. Otherwise look for STM32 VCP drivers to install first.

Serial Port Settings

Use **19200 8N1** to communication with device.

All commands are terminated by **\r\n** (Carriage Return, Line Feed)

Device Information

Get Device Type

Device types include:

IN	Indoor People Counter
OD	Outdoor People Counter
R	Railway Counter
T	General Traffic Counter
XIO	Industrial Object Counter with digital outputs
ODS	Outdoor People Counter, Solar powered

LoRaWAN™ bands include:

EU868	EU 863-870MHz ISM Band
AS923	AS923MHz ISM Band
US915	US 902-928MHz ISM Band
AU915	Australia 915-928MHz ISM Band

Command

get typestr

Example:

get typestr
PCR2-EU868-IN

Get Firmware Version

Command

get fw_version

Example:

get fw_version
3.8.0

Get Serial Number

Get the device unique serial number

Command

get serial

Example:

get serial
3334373981377504

Get Device Status

This returns the actual device status

init	Device is initializing
joining	Device trying to join a LoRaWAN™ network
active	Device is connected to LoRaWAN™ network
error	Hardware or Configuration Error

Command

get status

Example:

get status

joining

Get CPU temperature

Get the intenal CPU temperature. Temperature is in 1/10 °

Examples:

```
210 21.0°C
321 32.1°C
```

Commands

get temp

Example:

```
get temp
330
```

Get Left-to-Right Counter Value (All Speed Groups)

Get the counter value of all left-to-right counts. You can overwrite the value by using the set command.

Commands

get ltr

Example:

```
get ltr
1
```

Get Right-to-Left Counter Value (All Speed Groups)

Get the counter value of all right-to-left counts. You can overwrite the value by using the set command.

Commands

get rtl

Example:

```
get rtl
22
```

Get Left-to-Right Counter of Speed Group 1

Commands

get l1

Example:

```
get l1
5
```

Get Left-to-Right Counter of Speed Group 2

Commands

get l2

Example:

```
get l2
5
```

Get Right-to-Left Counter of Speed Group 1

Commands

get r1

Example:

get r1
2

Get Right-to-Left Counter of Speed Group 2

Commands

get r2

Example:

get r2
2

Clear all counters

Commands

clear

Example:

clear
ok

Application Settings

Get/Set Operation Mode

PCR2 can run in four different modes:

0 Timespan, used to sum up detection and send after a certain time (Sending Interval)
1 NotZero, Same as Timespan but w/o sending if counters are 0 (zero)
2 Trigger, Send on every events. Events can be filtered with Hold Off setting
3 Capacity Alert Mode

New mode will be active only after a restart.

Commands

get mode

set mode <val>

Example:

get mode
2

set mode 0
0

restart

Get/Set Radar Sensititivy

Set the radar sensitivity can be set from 10 ... 100% (100% is very sensitive) Default: 50

Commands

get sens

set sens <val>

Example:

get sens

80

set sens 50
50

restart

Get/Set Measurement Interval

Set the accumulation interval in minutes (1…1440 minutes). Default: 10 During this time, alle persons will be counted and sums are transfered. After transfer counters will be reset.

Commands

get interval

set interval <val>

Example:

get interval
15

set interval 60
60

Get/Set Inactivity Timeout

Reset sum counters if there is no movement for a certain time (1…1440m) 0 = no timeout.

Commands

get timeout

set timeout <val>

Example:

get timeout
0

set timeout 60
60

Get/Set Hold Off time

This is a timer (0…600s) can be used to filter events. Default: 0

Commands

get hold

set hold <val>

Example:

get hold
60

set hold 0
0

Get/Set LTR Sum

ltr count event will increase LTR sum by 1

Commands

get sumltr

set sumltr <val>

Example:

get sumltr
-21

set sumltr -20
-20

Get/Set RTL Sum

rtl count event will increase RTL sum by 1

Commands

get sumrtl

set sumrtl <val>

Example:

get sumrtl
12

set sumltr 0
0

Get/Set XIO Operation Mode

If the PCR2 is equiped with a XIO Board following operation modes can be enabled

0 Off	Switch XIO Board off
1 Pulse	Generate a 500ms pulse on O1 if RTL detected, O2 if LTR is detected
2 Detection	O1 is always on. If LTR or RTL is detected, O2 will be on during holdoff time
3 CapacityAlert	O1 on when sum < lim, O2 on when sum >= lim
4 RC	Remote controlled by LoRa Downlink

New mode will be active only after a restart.

Commands

get xiomode

set xiomode <val>

Example:

get xiomode
2

set xiomode 0
0

restart

LoRaWAN™ Network Settings

Get/Set Enabled

Enable or disable LoRaWAN™ radio. If disabled you can use the device as a wired-sensor connnected wie USB. ‘LTR’ or ‘RTL’ will be sent over the serial interface on detection

Commands

lora get enabled

lora set enabled <val>

Example:

lora get enabled
1

lora set enabled 0
0
LTR
LTR
RTL
.
.
.

Get/Set Device Class

Set the LoRa Device class to A or C

Commands

lora get class

lora set class [A|C]

Example:

lora get class
A

lora set class C
C
restart

Get/Set DevEUI

Set / Get the uniqe 64 bit end-device identifier (EUI-64)

Commands

lora get deveui

lora set deveui <val>

Example:

lora get deveui
0123456789abcdef

lora set deveui 0123456789abcdf
01234567890abcdef

Get/Set AppEUI

Set / Get the unique 64 bit application identifier (EUI-64)

Commands

lora get appeui

lora set appeui <val>

Example:

lora get appeui
deadbeefdeadbeef

lora set appeui deadbeefdeadbeef
deadbeefdeadbeef

Get/Set AppKey

Set / Get the Application Session Key (AppSKey). AppSKEy is used for encryption and decryption of the payload. The payload is fully encrypted between the Node and the Handler/Application Server component of The Things Network (which you will be able to run on your own server). This means that nobody except you is able to read the contents of messages you send or receive.

Commands

lora get appkey

lora set appkey <val>

Example:

lora get appkey
deadbeefdeadbeefdeadbeefdeadbeef

lora set appkey deadbeefdeadbeefdeadbeefdeadbeef
deadbeefdeadbeefdeadbeefdeadbeef

Get/Set Frequency Sub-Band (FSB)

For US915 and AU915 devices only. 8 sub-bands are available (set 1-8). 0 = all channels enabled

Hints:

- Use FSB1 for Comcast machineQ networks
- Use FSB2 for myDevices networks

Commands

lora get fsb

lora set fsb <val>

Example:

lora get fsb
1

lora set fsb 0
0

Enable/Disable Confirmed Uplink Messages

Enable/Disable confirmed uplink messages.

Default: 0

Commands

lora get confirmed

lora set confirmed <val>

Example:

lora get confirmed
0

lora set confirmed 1
1

restart

Set/Get LinkCheck Interval

We will send a LinkCheck MAC command together with an uplink regularly to make sure gateway responds properly. If there is no answer we try to re-join. */ci* is in range ... 1440 minutes.

LinkCheck can be disabled completely by setting to **0**.

Commands

lora get lci

lora set lci <val>

Example:

lora get lci
10

lora set lci 1440
1440

restart

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