metraTec
RFID Solutions

MPS-Beacon Protocol Guide

MPS - Multi-purpose Positioning System

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Generic Edition

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Chapter 1. Communication Principle

The communication between the device and the host system is based on ASCII strings. Each string is terminated with a carriage-return (0x0D), *not* the null byte, and will be transmitted with the most significant byte first.

The communication from the device to the host system (i.e. the response) is the same as above but in some cases the response from the device comprises more than one line.

General syntax:

```
{ Instruction } [ <SPACE> Parameter ...] <CR>
```

```
REV<CR>
```

Example 1. Command without Parameter

```
char REV[] = {'R','E','V',13};
```

Example 2. Command without Parameter in ANSI C

```
SET<SPACE>HEX<SPACE>ON<CR>
```

Example 3. Command with Parameter

```
char SET[] = {'S','E','T',0x20,'H','E','X',0x20,'O','N',0x0D};
```

Example 4. Command with Parameter in ANSI C

1.1. Connecting a device

To use the folowing commands for communication with a beacon device you need to connect to the device. Basically there are two ways to do so:

- Connect a USB to UART to the UART pins of the device. Theese can either be accessable via a dedicated pin header or the eight-pin debug needle pads. Use 115200 Baud/s 8N1 as frame format.
- The more convenient way to contact the device is via a MPS-Master. For this you need a MPS-Master device (e.g. USB-Stick or ERS-PoE) in range configured to the same system ID and the same channel as the target beacon. For MPS-Master configuration and details on linking to a beacon see the MPS-Master protocol guide. The folowing example is just a briefly introduction in how to use the MPS wireless protocol for over-the-air configuration.

```
LNK <SP> 0123456789ABCDEF <CR>
LNK <SP> 0123456789ABCDEF <SP> OK <CR>
CFG <SP> RSN <CR>
CFG <SP> RSN <SP> 20150202180500 <CR>
ULK <CR>
ULK <SP> OK <CR>
```

Example 5. Link to a beacon (EID=0123456789ABCDEF), read its serial number and unlink

Chapter 2. Instructions

This list gives an overview of all the instructions supported by the device.

Note

Responses to any command are always prefixed with this command to avoid confusion with asynchronous messages.

```
REV<CR>
REV  MPS_MASTER       0305<CR>
```

Example 6. Prefixed response

Command	Name	Description
SSID	Set System ID	Set the Sytem ID.
RSID	Read System ID	Get the System ID.
REID	Read Extended ID	Get the Extended ID (EID).
SPL	Set RF Power Level	Set the RF transmitter power level in dBm.
RPL	Read RF power level	Read RF power level.
SCH	Set Broadcast Channel	Set the channel for broadcast messages.
RCH	Read Broadcast Channel	Read the channel for broadcast messages.
SPI	Set Beacon Ping Interval	Set the ping interval for beacon frames.
RPI	Read Beacon Ping Interval	Read the ping interval for beacon frames.
SPR	Set Beacon Ping Ratio	Set the ratio for linkable beacon pings.
RPR	Read Beacon Ping Ratio	Read the ratio for linkable beacon pings.
SDI	Set Data Request Interval	Set the interval for data request frames in linked state.
RDI	Read Data Request Interval	Read the interval for data request frames in linked state.
RFW	Read Firmware Revision	Read firmware name and version.
RHW	Read Hardwrae Revision	Read hardware name and version.
RSN	Read Serial Number	Read serial number of the device.
RST	Reset	Reset the device.
FRST	Factory Reset	Reset all parameters to default values.
SLOK	Set Command Lock	Set the command lock.
CLOK	Clear Command Lock	Clear the command lock.
RLOK	Read Command Lock State	Get the command lock state.

Table 1. Overview of Instructions

2.1. Set System ID (SSID)

Configure device's System ID (SID). This setting *persists* a power up reset.

Caution

A device is only capable to communicate with other devices configured to the same System ID.

The default System ID is ABCD.

Instruction

SSID *<SPACE>* {*SID*} *<CR>*

Parameters

Name	Type	Description
SID	Hexadecimal Integer ($1_{16} \leq x \leq FFFE_{16}$)	System ID as 16 bit hexadecimal value.

Examples

```
SSID ABCD<CR>
```

Example 7. Set SID to ABCD

Return Values in Case of Success

`SSID OK <CR>`

Return Values in Case of Failure

"`SSID NOR <CR>`", "`SSID LOK <CR>`", "`SSID UPA <CR>`" or "`SSID ERR <CR>`"

2.2. Read System ID (RSID)

Returns the device's System ID (SID) (see Section 2.1, "Set System ID (**SSID**)").

Instruction

RSID *<CR>*

Examples

```
RSID<CR>
```

Example 8. Get the System ID

Return Values in Case of Success

`RSID` *`{SID}`*
The currently configured System ID (a 16 bit hexadecimal value).

Return Values in Case of Failure

"`RSID UPA` *`<CR>`*" or "`RSID ERR` *`<CR>`*"

2.3. Read Extended ID (REID)

Returns the device's unique Extended ID (EID).

Note

The Extended ID is unique address for every device. It is hard-coded to the device and can not be changed by the user.

Instruction

`REID` *`<CR>`*

Examples

```
REID<CR>
```

Example 9. Get the Extended ID

Return Values in Case of Success

`REID` *`{EID}`*
The currently configured System ID (a 16 bit hexadecimal value).

Return Values in Case of Failure

"`REID UPA` *`<CR>`*" or "`REID ERR` *`<CR>`*"

2.4. Set RF Power Level (SPL)

Configure the RF power level for the transmission of any wireless data in dBm. This setting *persists* a power up reset.

The default power level is +4 dBm.

Instruction

SPL *<SPACE> {RF power level} <CR>*

Parameters

Name	Type	Description
RF power level	Decimal Integer (≤ x ≤ 4)	RF power level in *dBm*.

Examples

```
SPL 0<CR>
```

Example 10. Set RF power level to 0 dBm

Return Values in Case of Success

SPL OK *<CR>*

Return Values in Case of Failure

"SPL NOR *<CR>*", "SPL LOK *<CR>*", "SPL UPA *<CR>*" or "SPL ERR *<CR>*"

2.5. Read RF power level (RPL)

Returns the currently configured RF power level (see Section 2.4, "Set RF Power Level (**SPL**)").

Instruction

RPL *<CR>*

Examples

```
RPL<CR>
```

Example 11. Read RF power level

Return Values in Case of Success

RPL *{RF power level}*
The currently configured RF power level (a signed decimal integer in dBm).

Return Values in Case of Failure

"RPL UPA *<CR>*" or "RPL ERR *<CR>*"

2.6. Set Broadcast Channel (SCH)

Configure the channel for broadcast messages like beacon frames (BCN). This setting *persists* a power up reset.

The default broadcast channel is 26.

Note

In order to avoid collision of data frames and broadcast frames the communication channel is supposed to be different from the broadcast channel!

Caution

A device is only capable to communicate with other devices configured to the same broadcast channel.

Instruction

SCH *<SPACE>* {*Channel*} *<CR>*

Parameters

Name	Type	Description
Channel	Decimal Integer (11 ≤ x ≤ 26)	Channel number.

Examples

```
SCH 26<CR>
```

Example 12. Set channel to 26

Return Values in Case of Success

SCH OK *<CR>*

Return Values in Case of Failure

"SCH NOR *<CR>*", "SCH LOK *<CR>*", "SCH UPA *<CR>*" or "SCH ERR *<CR>*"

2.7. Read Broadcast Channel (RCH)

Returns the currently configured broadcast channel (see Section 2.6, "Set Broadcast Channel (**SCH**)").

Instruction

RCH *<CR>*

Examples

```
RCH<CR>
```

Example 13. Read broadcast channel

Return Values in Case of Success

`RCH {Channel}`
The currently configured broadcast channel number.

Return Values in Case of Failure

"`RCH UPA <CR>`" or "`RCH ERR <CR>`"

2.8. Set Beacon Ping Interval (SPI)

Set the interval for non-linked pings broadcasted by a beacon. This setting *persists* a power up reset.

The default ping interval is 5000 milliseconds.

Note

The MPS Master's *Beacon Timeout* is supposed to be greater than the device's ping interval multiplied by the ping ratio. A good tradeoff is a timeout twice as long as the ping interval x ping ratio. (See Section 2.10, "Set Beacon Ping Ratio (**SPR**)")

Instruction

`SPI` `<SPACE> {Ping Interval} <CR>`

Parameters

Name	Type	Description
Ping Interval	Decimal Integer (100 ≤ x ≤ 60000)	Ping interval in ms.

Examples

```
SPI 5000<CR>
```

Example 14. Set ping interval to 5 seconds

Return Values in Case of Success

`SPI OK <CR>`

Return Values in Case of Failure

"`SPI NOR <CR>`", "`SPI LOK <CR>`", "`SPI UPA <CR>`" or "`SPI ERR <CR>`"

2.9. Read Beacon Ping Interval (RPI)

Returns the interval for non-linked pings broadcasted by a beacon (see Section 2.8, "Set Beacon Ping Interval (**SPI**)").

Instruction

RPI *<CR>*

Examples

```
RPI<CR>
```

Example 15. Read ping interval

Return Values in Case of Success

`RPI` *{Ping Interval}*
The currently configured beacon ping interval in millisecons.

Return Values in Case of Failure

"`RPI UPA` *<CR>*" or "`RPI ERR` *<CR>*"

2.10. Set Beacon Ping Ratio (SPR)

Set the ratio of linkable pings to all pings broadcasted by a beacon. If set to 1 every beacon ping enables the MPS-Master to link to that beacon. If set to 0 the beacon can not be linked to by any MPS-Master. A ping ratio of 10 means that every tenth ping is linkable. This setting *persists* a power up reset.

The default ping ratio is 1.

Caution

Setting the ping ratio to 0 disables the possibility of linking and with that the over-the-air configuration feature. Once set to 0 the configuration mode is only accessible by a UART cable!

Note

The MPS Master's *Beacon Timeout* is supposed to be greater than the device's ping interval multiplied by the ping ratio. A good tradeoff is a timeout twice as long as the ping interval x ping ratio. (See Section 2.8, "Set Beacon Ping Interval (**SPI**)")

Instruction

SPR *<SPACE>* *{Ping Ratio}* *<CR>*

Parameters

Name	Type	Description
Ping Ratio	Decimal Integer ($0 \leq x \leq 255$)	Ping ratio.

Examples

```
SPR 10<CR>
```

Example 16. Set ping ratio to 10, thus every tenth ping is linkable

```
SPR 1<CR>
```

Example 17. Set ping ratio to 1, thus every ping is linkable

Return Values in Case of Success

`SPR OK <CR>`

Return Values in Case of Failure

"`SPR NOR <CR>`", "`SPR LOK <CR>`", "`SPR UPA <CR>`" or "`SPR ERR <CR>`"

2.11. Read Beacon Ping Ratio (RPR)

Returns the ratio of linkable pings to all pings broadcasted by a beacon (see Section 2.10, "Set Beacon Ping Ratio (**SPR**)").

Instruction

RPR *<CR>*

Examples

```
RPR<CR>
```

Example 18. Read ping ratio

Return Values in Case of Success

RPR *{Ping Ratio}*
: The currently configured beacon ping ratio.

Return Values in Case of Failure

"`RPR UPA <CR>`" or "`RPR ERR <CR>`"

2.12. Set Data Request Interval (SDI)

Set the interval for linked pings broadcasted by a beacon. This setting *persists* a power up reset.

The default data request interval is 1000 milliseconds.

Note

The MPS Master's *Data Request Timeout* is supposed to be greater than the device's ping interval. A good tradeoff is a timeout twice as long as the Data Request Interval.

Instruction

SDI *<SPACE> {Data Request Interval} <CR>*

Parameters

Name	Type	Description
Data Request Interval	Decimal Integer ($100 \leq x \leq 60000$)	Data request interval in ms.

Examples

```
SDI 500<CR>
```

Example 19. Set data request interval to 500 milliseconds

Return Values in Case of Success

`SDI OK <CR>`

Return Values in Case of Failure

"`SDI NOR <CR>`", "`SDI LOK <CR>`", "`SDI UPA <CR>`" or "`SDI ERR <CR>`"

2.13. Read Data Request Interval (RDI)

Returns the interval for linked pings broadcasted by a beacon (see Section 2.12, "Set Data Request Interval (**SDI**)").

Instruction

RDI *<CR>*

Examples

```
RDI<CR>
```

Example 20. Read data request interval

Return Values in Case of Success

`RDI {Data Request Interval}`
The currently configured data request interval in millisecons.

Return Values in Case of Failure

"`RDI UPA <CR>`" or "`RDI ERR <CR>`"

2.14. Read Firmware Revision (RFW)

Returns the firmware name and version.

Instruction

`RFW` `<CR>`

Examples

```
RFW<CR>
```

Example 21. Read firmware revision

Return Values in Case of Success

`RFW {Name}{Major}{Minor}`
The name of the firmware is padded to 16 characters with spaces, followed by a two-digit major revision, followed by a two-digit minor revision.

For instance version 3.5 of MPS_MASTER firmware yields the following response to `RFW`:

```
RFW MPS_MASTER      0305<CR>
```

Example 22. Revision Response

Return Values in Case of Failure

"`RFW UPA <CR>`" or "`RFW ERR <CR>`"

2.15. Read Hardwrae Revision (RHW)

Returns the hardware name and version.

Instruction

`RHW` `<CR>`

Examples

```
RHW<CR>
```

Example 23. Read hardware revision

Return Values in Case of Success

`RHW {Name}{Major}{Minor}`
The name of the hardware is padded to 16 characters with spaces, followed by a two-digit major revision, followed by a two-digit minor revision.

For instance version 1.2 of ERS_PoE hardware yields the following response to **RHW**:

```
RHW ERS_PoE          0102<CR>
```

Example 24. Revision Response

Return Values in Case of Failure

"RHW UPA <CR>" or "RHW ERR <CR>"

2.16. Read Serial Number (RSN)

Returns the serial number of the device.

Instruction

RSN <CR>

Examples

```
RSN<CR>
```

Example 25. Read serial number

Return Values in Case of Success

`RSN {Serial Number}`
The serial number consists of 16 characters coding the date, time and place of production.

```
RSN 2014103119391200<CR>
```

Example 26. Serial Number Response

Return Values in Case of Failure

"RSN UPA <CR>" or "RSN ERR <CR>"

2.17. Reset (RST)

Performs a hardware reset.

Instruction

RST *<CR>*

Examples

```
RSN<CR>
```

Example 27. Read serial number

Return Values in Case of Success

RST OK *<CR>*

Return Values in Case of Failure

"RST LOK *<CR>*", "RST UPA *<CR>*" or "RST ERR *<CR>*"

2.18. Factory Reset (FRST)

Resets all parameters to default values and performs a new initialization afterwards.

Instruction

FRST *<CR>*

Examples

```
FRST<CR>
```

Example 28. Reset all parameters to default values.

Return Values in Case of Success

FRST OK *<CR>*

Return Values in Case of Failure

"FRST LOK *<CR>*", "FRST UPA *<CR>*" or "FRST ERR *<CR>*"

2.19. Set Command Lock (SL0K)

Enables the command lock and sets the lock password. The lock affects *all set-commands*, *RST*, *FRST* and *BTL*. This setting *persists* a power up reset.

Caution

To release the lock you will need the previously set password. (See Section 2.20, "Clear Command Lock (**CL0K**)")

If you forgot the password it is imposible to release the command lock!

Instruction

SL0K *<SPACE>* {*Password*} *<CR>*

Parameters

Name	Type	Description
Password	Hexadecimal Integer ($0_{16} \leq x \leq FFFFFFFF_{16}$)	Arbitrarily chosen password as 32 bit hexadecimal value.

Examples

```
SL0K 01234567<CR>
```

Example 29. Set lock with password 01234567

Return Values in Case of Success

SL0K OK *<CR>*

Return Values in Case of Failure

"SL0K NOR *<CR>*", "SL0K L0K *<CR>*", "SL0K UPA *<CR>*" or "SL0K ERR *<CR>*"

2.20. Clear Command Lock (CL0K)

Releases the command lock with the previously set password. (See Section 2.19, "Set Command Lock (**SL0K**)") This setting *persists* a power up reset.

Instruction

CL0K *<SPACE>* {*Password*} *<CR>*

Parameters

Name	Type	Description
Password	Hexadecimal Integer ($0_{16} \leq x \leq FFFFFFFF_{16}$)	Password as 32 bit hexadecimal value.

Examples

```
CLOK 01234567<CR>
```

Example 30. Release lock with password 01234567

Return Values in Case of Success

`CLOK OK <CR>`

Return Values in Case of Failure

"`CLOK NOR <CR>`", "`CLOK WPW <CR>`", "`CLOK UPA <CR>`" or "`CLOK ERR <CR>`"

2.21. Read Command Lock State (RLOK)

Returns the command lock state. (See Section 2.19, "Set Command Lock (**SLOK**)")

Instruction

`RLOK` *`<CR>`*

Examples

```
RLOK<CR>
```

Example 31. Get the command lock state

Return Values in Case of Success

`RLOK` *`{State}`*
: The currently configured state of the command lock.

Return Values in Case of Failure

"`RLOK UPA <CR>`" or "`RLOK ERR <CR>`"

Chapter 3. Error Codes

Error Code	Name	Description
ERR	Unknown Error	An unknown (miscellaneous) error occurred.
LOK	Command locked	The requested command was locked. (See Section 2.19, "Set Command Lock (**SLOK**)")
NOR	Number Out of Range	This error code may refer to an input parameter or output value. When referring to an input parameter, it signifies that a parameter is too small or large. On output, it means that the number cannot be represented — usually because of a numeric overflow.
NOS	Not Supported	Command or parameter not supported by this specific device type
TOE	Timeout Exception	A timeout exception occured during communication to a remote device.
UCO	Unknown Command	An invalid command has been passed to a function. Common error source: • Typo in command string • Wrong firmware version
UPA	Unknown Parameter	An invalid parameter has been passed to a function. Common error source: • Typo in command string • Given parameter is out of range • Parameter missing (formerly EPX)
WPW	Wrong password	The entered password is not correct.

Version Control

Version	Change	By	Date
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