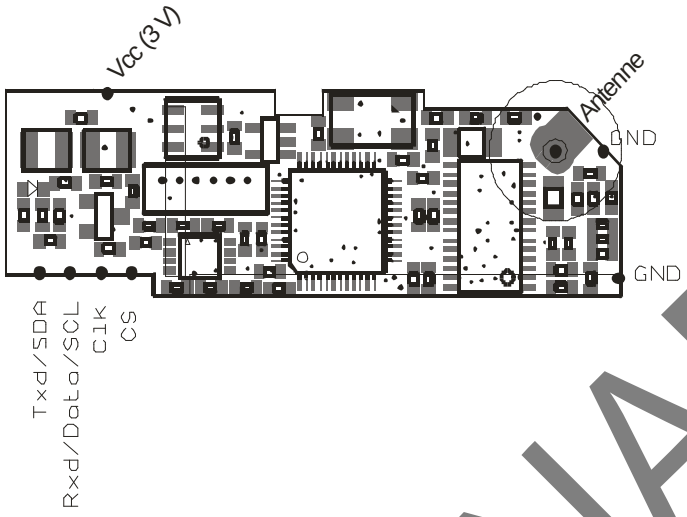
# 1 Overview

## *1.1 Pin configuration*




## *1.2 Quick start*



# 2 Operating modes

## *2.1 Overview*

The TN9040 unit has four modes of operation which are adopted depending on the state of the CS signal and the (remote) communication to the module.

| CS-Signal | Mode | | User port | Transceiver (most of the time) | Ping delay | Average Current (@ 3V) |
|---|---|---|---|---|---|---|
| Enabled | 1 | Normal | active | Power down | PingClk | 9 mA |
| | 2 | Receive | active | RX mode | PingClk | 22 mA |
| Disabled | 3 | Standby | Input: inactive<br>Output: active or inactive | Power down | PingClk | 50 µA |
| | 3 | Sleep | Input: inactive<br>Output: active or inactive | Power down | PingClkSleep | 50 µA |

## *2.2 Normal mode (operating mode 1)*

This is the normal operating mode of the unit when enabled by the CS pin. The user interface is active, the transceiver is most of the time in a power down state. The TN9040 periodically connects to the base station (e.g. TN9000) to check for waiting commands or data. This procedure is called “ping”. The time between those pings can be set using the command

| | | |
|---|---|---|
| Write: | Config Timing PingClk <Delay in s> | 0…60 s |
| Read: | OK | |

The standard value is 2 s.
When data or certain commands are to be transmitted to the TN9040, the unit switches to Receive mode for a certain periode of time.

## 2.3 Receive mode (operating mode 2)

After receiving data the unit stays in receive mode for a certain period of time which can be set using the command

| | | |
|---|---|---|
| Write: | Config Timing RXTimeout <Delay in s> | 0…600 s<br>601: Stay in Receive Mode forever |
| Read: | OK | |

After that the unit switches to Normal mode or Standby mode depending on the state of the CS pin.

## 2.4 Standby mode (operating mode 3)

This is the normal operating mode of the TN9040 when disabled by the CS pin. The transceiver is in power down most of the time, the user port is disabled. (However, if the user port is configured as an UART the user may allow the TN9040 to send data via the user port even if the unit is disabled). As is Normal mode the TN9040 connects periodically to the base station and queries for data or commands.

## 2.5 Sleep mode (operating mode 4)

The unit switches to sleep mode, when the module is disabled for more certain period of time (standby mode) and has not received data or commands during this time. The time can be modified using the following command.

| | | |
|---|---|---|
| Write: | Config Timing SleepDelay <Delay in s> | 0…3600 s |
| Read: | OK | |

In sleep mode the delay between connections to the base station is increased to PingClkSleep. It can be changed using the command

| | | |
|---|---|---|
| Write: | Config Timing PingClkSleep <Delay in s> | 0…60 s |
| Read: | OK | |

PinClkSleep should be larger than PinClk to reduce power consumption in sleep mode. A typical value is 15s.

# 3 TN9040 user interface

The user interface of the TN9040 can be configured as an asynchronous Interface (RS232) or as a synchronous SPI (Mode 0,1 2,3).
The unit is ready to receive data only when enabled by the CS signal. When activating the unit from standby or sleep mode allow a sufficient wait time before sending data to the user port (see Electrical characteristics).
If an SPI type interface is selected data can be read from the TN9040 also only when the unit is enabled. However, if an asynchronous interface is selected the user can allow the unit to send data via the user port even if the unit is disabled.

## *3.1 Modes*

### 3.1.1 Asynchronous interface (RS232)

Configure the user interface as a full-/half-duplex asynchronous interface using the following commands:

| | | |
|---|---|---|
| Write: | Config UART Mode 0 | Select asynchronous mode |
| Read: | OK | |
| Write: | Config UART baud <baud rate> | Set baud rate [100 bit/s] |
| Read: | OK | |
| Write: | Config UART Duplex 0/1 | 0: Halfduplex<br>1: Fullduplex |
| Read: | OK | |

#### 3.1.1.1 Full Duplex

In full duplex mode the user can send data/commands to the TN9040 at any time as long as the unit is enabled. The TN9040 will send data out of the user port immediately when they are generated or received. The user may allow the TN9040 to send data via the user port even if the unit is disabled using the command

| | | |
|---|---|---|
| Write: | Config Userport OE 1/0 | 0: Userport output enable depends on CS signal<br>1: Userport output is always enabled |
| Read: | OK | |

**Hardware Connection:**

| TN9040 | Host µC |
|---|---|
| TXD/SDA | RXD |
| RXD/Data/SCL | TXD |

**Hardware Configuration:**

| | |
|---|---|
| R12 | - |
| R15 | - |
| R4 | - |
| R11 | - |
| R12 | - |
| D1 | - |

### 3.1.1.2 Half Duplex

In Normal operating mode (mode 0 or mode 1)
The TN9040 will send data out of the user port immediately when they are generated or received. The user may allow the TN9040 to send data via the user port even if the unit is disabled using the command

| | | |
|---|---|---|
| Write: | Config Userport OE 1/0 | 0: Userport output enable depends on CS signal<br>1: Userport output is always enabled |
| Read: | OK | |

**Hardware Connection:**

| TN9040 | Host µC |
|---|---|
| RXD/Data/SCL | RXDTXD |

**Hardware Configuration:**

| | |
|---|---|
| R12 | - |
| R15 | 1k |
| R4 | - |
| R11 | - |
| R12 | - |
| D1 | - |

## 3.1.2 SPI (Mode 0,1,2,3)

The TN9040 always operates as a slave and supports the SPI modes 0, 1, 2 and 3.
The CS signal can be configured as either active high or active low.
Data is serially transmitted to and received from the TN9040 in units of bytes (8 bits).

Configure the user interface as a full-/half-duplex synchronous interface (SPI) using the following commands:

| | | |
|---|---|---|
| Write: | Config UART Mode <n> | Select SPI mode<br>n = 1: SPI Mode 0<br>n = 2: SPI Mode 1<br>n = 3. SPI Mode 2<br>n = 4. SPI Mode 3 |
| Read: | OK | |
| Write: | Config UART Duplex 0/1 | 0: Halfduplex<br>1: Fullduplex |
| Read: | OK | |



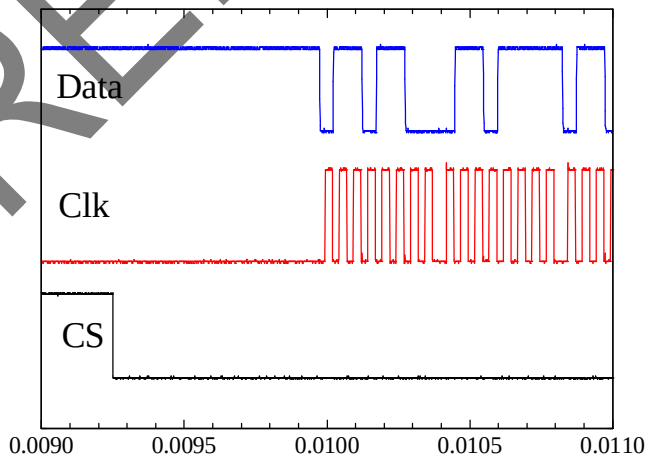
### 3.1.2.1 Full Duplex

This mode is currently not available.

### 3.1.2.2 Half Duplex

#### Write cycle

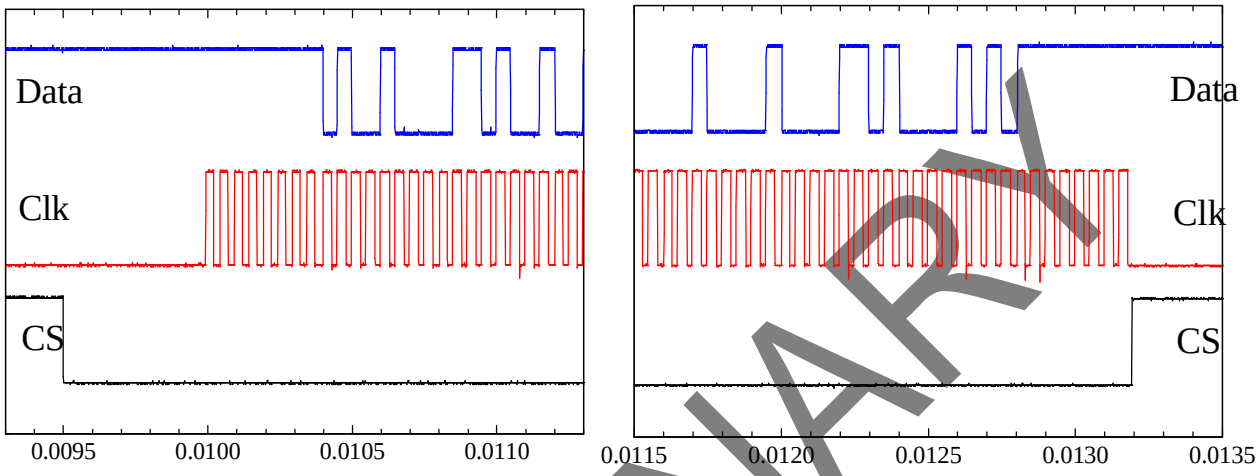
After activating the unit by the CS signal and a sufficient delay (see specifications) the SPI is in receive mode.
Now the user may simply send the command or data string.
In the sample graph the interface is configured in SPI mode 0 with an active low CS signal.




#### Read cycle

The user starts a read cycle by writing (sending) one byte with all bits set. When the user continues to apply the clock signal, the TN9040 applies data onto the data line as long as data are waiting in the output buffer of the

TN9040. When the output buffer is empty, the data line remains high, the read cycle is completed and the TN9040 switches to SPI receive mode. The user may then stop the communication by disabling the unit or he may send further commands to the TN9040.
In the sample graph the interface is configured in SPI mode 0 with an active low CS signal.
Note:
Once a read cycle has started, the master should continue to apply the clock signal until the TN9040 terminates the write cycle by sending 0xFF. However, if the master wants to terminate the write cycle it has to disable the TN9040 by the CS signal for a duration of at least 1 ms !




**Hardware Connection:**

| TN9040 (SPI slave) | Host µC (SPI master) |
|---|---|
| Clk | Clk |
| RXD/Data/SCL | Data |

**Hardware Configuration:**

| | |
|---|---|
| R12 | 0 |
| R15 | 1k |
| R4 | 4.7k |
| R11 | - |
| R12 | - |
| D1 | BZX84 3V, When Vcc(µC) > 3V |

### 3.1.3 I2C

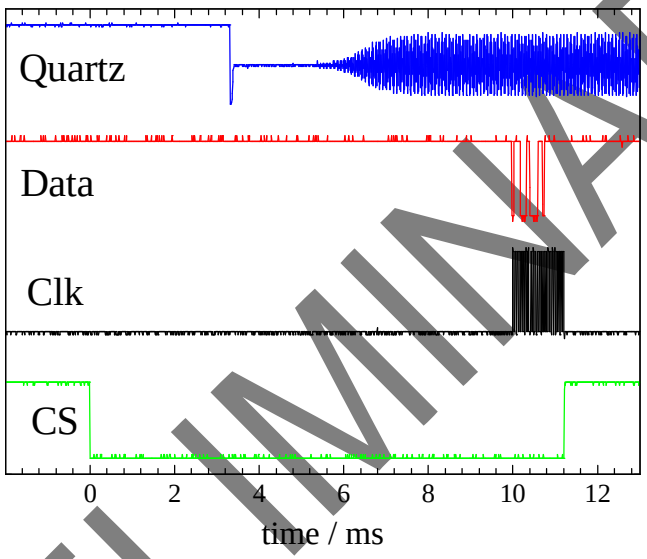
The I2C mode is currently not available.

## 3.2 Chip select signal (CS)

The chip select input is used to enable/disable the TN9040-module. It can be configured as either high active or low active using the command

| | | |
|---|---|---|
| Write: | Config Userport CS 1/0 | 0: CS active low<br>1: CS active high |
| Read: | OK | |

High active means, that CS high enables and CS low disables the unit.
When activating the unit from standby or sleep mode allow a sufficient wait time before sending data to the user port (see Electrical characteristics). As shown in the graph, the main quartz oscillator starts to operate about 5 ms after enabling the TN9040 and a few milliseconds later the unit is ready to receive data.
The sample graph shows a write cycle. The CS signal is active low






## 3.3 Data transmission

Transmitting data from a local device to a remote device is in general accomplished by writing
- a header (operator) specifying the destination (and the source),
- the data to be transmitted and
- a CRC_CCITT checksum of header and data

The CRC checksum and the header can be omitted under certain circumstances.

### 3.3.1 Source-/Destination Header (Operator)

The general form of the source-/destination header is:

sa#sp>>da#dp — for transmitting data from device sa, port sp to device da, port dp (Data enter the local unit (TN9040) via the user port (hardware) which is devided into several software ports. Data leave the remote unit (e.g. TN9000) via the user port (hardware) which is also devided into several software ports.)

or

sa#sp>da — for transmitting data/commands from device sa, port sp to device da

(Data/Commands enter the local unit (TN9040) via the user port (hardware) which is devided into several software ports. The data/commands are destined for the remote unit itself.)

sa: source address. This has to be the address of the local device
sp: source port (software port), default: 00
da: destination address, default: 00 (for TN9040)
dp:destination port (software port), default: 00

The four parameters sa,sp,da,dp are 8 bit hexadecimal numbers written in 2 characters (00…ff)
Each parameter can be omitted. In this case default values are used instead. The following table gives an overview over several abbreviated headers and it's full representation

| Shortcut | Equivalent full header | |
|---|---|---|
| sa>>da#dp | sa#00>>da#dp | |
| >>da#dp | sa#00>>da#dp | |
| >>da | sa#00>>da#00 | |
| >> | sa#00>>00#00 | Standard destination address is 00 for an TN9040 |
| >>#dp | sa#00>>00#dp | |
| #sp>>dp | sa#sp>>00#dp | |
| #sp>> | sa#sp>>00#00 | |
| | | |
| >da | sa#00>da | |
| #sp> | sa#sp>00 | |

Example:

| Write: | >>00#07 Test | Send the text "Test" to device 00, port 07 |
|---|---|---|
| Read: | | No reply, if handshake is disabled |

| Write: | >>00 Test | Send the text "Test" to device 00, port 00 |
|---|---|---|
| Read: | | No reply, if handshake is disabled |

| Write: | >> Test | Send the text "Test" to device 00, port 00 |
|---|---|---|
| Read: | | No reply, if handshake is disabled |

### 3.3.2 CRC

A16 bit CRC (Cyclic Redundancy Check) can be used to detect transmission errors at the user interface. The TN9040 uses the CRC_CCITT with the generator polynomial $X^{16}+X^{12}+X^5+1$.
You may append a CRC, which runs over header and data, surrounded by squared bracket to every transmit sequence. In case of a transmission error you get an error message and no data are transmitted. The CRC has to be written as a 16 bit hexadecimal number using 4 characters (0000…ffff).

Example:

| Write: | >>00 Test[0bf3] | Send the text "Test" to device 00 (port 00), using the CRC 0bf3 |
|---|---|---|
| Read: | | No reply, if handshake is disabled |

| Write: | >>00 Test[1234] | Send the text "Test" to device 00 (port 00), using the wrong CRC 1234 |
|---|---|---|
| Read: | Error 110: CRC wrong | No data are sent |

### 3.3.3 Handshake

When data are transmitted to the TN9040 user port you may get a handshake from the TN9040 (local unit) and/or the target unit (remote unit, e.g. TN9000). The handshake contains the CRC of the received data. The type of handshake can be selected using the command

| | | |
|---|---|---|
| Write: | Config Userport HdShk <n> | n = 0: No handshake<br>n = 1: Only handshake from the local unit<br>n = 2: Only handshake from the remote unit<br>n = 3: Handshake from local and remote unit |
| Read: | OK | |

Example (local and remote handshake enabled):

| | | |
|---|---|---|
| Write: | >>00 Test | Send the text “Test” to device 00 (port 00) |
| Read: | >01 Recvd 0bf3 | Handshake from local unit (address: 01) |
| Read: | >00 Recvd 0bf3 | Handshake from remote unit (address: 00) |

## *3.4 Configuration: The commands*

### 3.4.1 Overview

| | |
|---|---|
| Q | : Query |
| ?STATE | : Read status |
| LOGIN <Level> <Password> | : Login at accesslevel <Level> |
| CHGP <Level> <NewPassword> <NewPassword> | . Change password |
| RESTART | : Restart TN9040 (Software Reset) |
| SAVE <what to save> | : Save (e.g. settings) to flash |
| LOAD <what to read> | : Load (e.g. settings) from flash |
| RESET <what to reset> | : Reset something (e.g. settings) |
| ?T | : Query Time |
| ?D | : Query Date |
| CONFIG <Type> <Param> <Data> | : Configure system setup |
| ?CONFIG <Type> <Param> | : Show configure system |
| UPDATE: | : Start Update |
| SECURITY | : Some security settings |
| TEST | : For test purpose only |

### 3.4.2 Description

| | |
|---|---|
| Command | ">" or ">>" |
| Description | Transmit operator (header) for transmitting commands or data to a target unit |
| AccLevel | 0 |
| Parameters | - |
| Note | |

| | |
|---|---|
| Command | "Q" |
| Description | Query |
| AccLevel | 0 |
| Parameters | - |
| Reply | TN9040 v1.3<br>14 xx xx xx xx xx xx xx tt<br><br>xx: Bytes of serial number<br>tt: Hardware type code (20) |

| | |
|---|---|
| Command | "?STATE" |
| Description | Query state |
| AccLevel | 0 |
| Parameters | - |
| Reply | STATE x1 x2/x3 x4<br>x1: 1/0: Connection to base station ok/no ok<br>x2: Number of datesets in TX queue<br>x3: Size of TX queue<br>x4: RSSI (not yet available !) |

| Command: | "LOGIN <Level> <Code>" | | |
|---|---|---|---|
| Description | Login with access level <Level> | | |
| AccLevel | 0 | | |
| Parameters | - Level: accesslevel<br>- Code:password (max. 10 characters) | | |
| | Parameter | Valid data | Description |
| | Level | 1..5 | Access level |
| | Code | | Password for access level <Level> |
| Reply | - "Hi ! | | |
| | - "access denied !" | | |
| e.g. | "Login 2 MyPassword " | | |

| Command: | "CHGP <Level> <NewPassword> <NewPassword>" | | |
|---|---|---|---|
| Description | Change password for access level <Level> | | |
| AccLevel | At least <Level> | | |
| Parameters | - Level: Access level<br>- NewPassword: New password for access level <Level> (max. 10 characters) | | |
| | Parameter | Valid data | Description |
| | Level | 1..5 | Access level |
| | NewPassword | Up to 10 characters | New password for access level <Level> |
| Reply | - "password changed | | |
| | - "access denied !" | | |
| Note | Changes are NOT saved to flash. Use Command "SAVE <settings>" | | |
| e.g. | "Chgp 2 potato potato" | | |

| Command | "RESTART" |
|---|---|
| Description | Restart TN9040 (Software Reset) |
| AccLevel | 0 |
| Parameters | - |
| Reply | “Bye Bye” |

| Command: | "SAVE <what to save>" | | |
|---|---|---|---|
| Description | Save something from RAM to flash | | |
| AccLevel | 3 | | |
| Parameters | - Param: What to save | | |
| | Parameter | Valid data | Description |
| | Param | "settings" | Save some settings of the FSH2 |
| Reply | - "OK"<br>- "error flash read", "error flash write" | | |
| e.g. | "Save settings | | |

| Command: | "LOAD <what to read>" | | |
|---|---|---|---|
| Description | Load something from flash to RAM | | |
| AccLevel | 3 | | |
| Parameters | - Param: What to load | | |
| | Parameter | Valid data | Description |
| | Param | "settings" | Load some settings of the TN9040 |
| Reply | - "OK"<br>- "Reset"<br>- "error flash read", "error flash write" | | |
| e.g. | "Load settings | | |

| Command: | "RESET <Param>" | | |
|---|---|---|---|
| Description | Reset something (in RAM) | | |
| AccLevel | 4 | | |
| Parameters | - Param: What to reset | | |
| | Parameter | Valid data | Description |
| | Param | "settings" | Reset some settings of the TN9040 |
| Reply | "OK" | | |
| Note | Changes are NOT saved to flash. Use Command "SAVE <..>" | | |
| e.g. | "RESET settings | | |

| Command | “?T” |
|---|---|
| Description | Query Time (The TN9040 time is synchronized to the receiver (e.g. TN9000) time) |
| AccLevel | 0 |
| Parameters | - |
| Reply | “hh.mm.ss” |

| Command | "?D" |
|---|---|
| Description | Query Date (The TN9040 time is synchronized to the receiver (e.g. TN9000) time) |
| AccLevel | 0 |
| Parameters | - |
| Reply | “dd.mm.yyyy” |

| Command: | "CONFIG <Type> <Param> <Data>" | | | |
|---|---|---|---|---|
| Description | Configure system setup | | | |
| AccLevel | 4 | | | |
| Parameters | - Type: Type of control<br>- Param: Parameter to configure<br>- Data: Value | | | |
| | Type | Param | Data | Description |
| | Tools | MonitorPort | 1/0 or On/Off | Enable/disable monitor function |
| | UART | Mode | 0,1,2,3,4 | Operating mode of the user port<br>0: Asynchronous interface<br>1. SPI Mode 0<br>2: SPI Mode 1<br>3. SPI Mode 2<br>4. SPI Mode 3 |
| | | Duplex | 0,1 | 0: Halfduplex<br>1: Fullduplex |
| | | Baud | 48..1152 | Set baudrate of the user port [100bit/s] |
| | | Echo | 1/0 or On/Off | Switch automatic echo at the user port on or off |
| | TRX | Channel | 1..49, 51..84 | Set transceiver channel. Valid settings are:<br>In the USA: 1(902.265 MHz)…49(927.543 MHz),<br>In Europe: 51(868.034 MHz)… 84(869.840 MHz) |
| | | Datarate | 300, 600, 1200, 2400, 4800, 9600, 19200, 38400 | Set datarate of the transceiver [bit/s]<br>Always use 38400 baud. No changes should be made |
| | | PowerdBm | -20…0…5 | Set output power of the transceiver [dBm] |
| | GEN | FSHADDR | 8 bit hex | 8-Bit-Address of FSH (only numeric characters allowed) |
| | | BASEADDR | 16 bit hex | 16-Bit-Baseaddress of FSB/FSH |
| | | Country | 0,1 | 0: USA<br>1: Europa |
| | | FSHType | 8 bit hex Typecode | Set type of wrench (0x32…0x41) |
| | Timing | PingClk | 1…60 | Set time between pings [s] |
| | | PingClkSleep | 1…60 | Time between pings in sleep mode[s] |
| | | PWMClk | 11..1900 | [ms] |
| | | RXTimeout | 0…600, 601 | After receiving data the unit stays in receive mode for RXTimeout seconds [s]<br>601: Stay in RX mode forever |
| | | SleepDelay | 0…3600 | Switch to sleep mode, when the module is disabled for more than SleepDelay s and has nor received data or commands during that period.[s] |
| | Userport | HdShk | 0,1,2,3 | Select type of handshake at the user port<br>0: No handshake<br>1: Only handshake from the local unit<br>2: Only handshake from the remote unit<br>3: Handshake from local and remote unit |
| | | HeaderIn | 0,1 | Select, whether an header, e.g. specifying the destination address, is required for transmitting data.<br>0: No header required (Incomming date that are not commands are transmitted to the standard destination)<br>1: Header required |

| | | | | |
|---|---|---|---|---|
| | | HeaderOut | 0,1,2,3,4 | Select the type of header which is output in front of the data at the userport.<br>0: No header<br>1: Short source-/destination header (defaults omitted)<br>2: Full source-/destination header (xx#xx>>xx#xx)<br>3: Full source-/destination header plus receiver info and decode info<br>4: Automatic:<br>Local: Use setting in received datasets<br>Remote (in outgoing datasets): Mode 1 used |
| | | OE | 0,1 | 0: Userport output enable depends on ChipSelect signal<br>1: Userport output is always enabled (This option is available only in UART mode 0 (asynchronous interface) |
| | | CS | 0,1 | 0: CS active low (CS=1 => Standby, CS=0 => Active)<br>1: CS active high (CS=0 => Standby, CS=1 => Active) |
| Reply | "OK"<br>("invalid value","out of range") | | | |
| Note | Changes are NOT saved to flash. Use Command "SAVE Settings"<br>Some settings require an access level of 5 (trx datarate, gen country)<br>Some settings require an restart of the system (after saving the changes !) | | | |
| e.g. | Command | | Reply | |
| | "CONFIG GEN FSHADDR 10"<br>"CONFIG MODE SYNCLIMITS ON" | | "OK"<br>"OK" | |

| Command: | "?CONFIG <Type> <Param>" | | | |
|---|---|---|---|---|
| Description | Show system setup | | | |
| AccLevel | 4 | | | |
| Parameters | - Type: Type of control<br>- Param: Parameter to show | | | |
| | Type | Param | Returned Data | Description |
| | Tools | MonitorPort | 1/0 | Monitor function enabled/disabled |
| | UART | Mode | 0,1,2,3,4 | Operating mode of the user port<br>0: Asynchronous interface<br>1. SPI Mode 0<br>2: SPI Mode 1<br>3. SPI Mode 2<br>4. SPI Mode 3 |
| | | Duplex | 0,1 | 0: Halfduplex<br>1: Fullduplex |
| | | Baud | 48..1152 | Baudrate of user port [100bit/s] |
| | | Echo | 1/0 | Automatic Echo at the user port on or off |
| | TRX | Channel | 1..49, 51..84 | Transceiver channel. |
| | | Datarate | 300, 600, 1200, 2400, 4800, 9600, 19200, 38400 | Datarate of the transceiver [bit/s] |
| | | PowerdBm | -20…0…5 | Output power of the transceiver [dBm] |
| | GEN | FSHADDR | 8 bit hex | 8-Bit-Address of FSH |
| | | BASEADDR | 16 bit hex | 16-Bit-Baseaddress of FSB/FSH |
| | | Country | 0,1 | 0: USA<br>1: Europa |
| | | FSHType | 8 bit hex Typecode | Type of wrench |
| | Timing | PingClk | 1…60 | Time between pings [s] |
| | | PingClkSleep | 1…60 | Time between pings in sleep mode[s] |
| | | PWMClk | 11..1900 | [ms] |
| | | RXTimeout | 0…600, 601 | After receiving data the unit stays in receive mode for RXTimeout seconds [s]<br>601: Stay in RX mode forever |
| | | SleepDelay | 0…3600 | Switch to sleep mode, when the module is disabled for more than SleepDelay s and has nor received data or commands during that period.[s] |
| | Userport | HdShk | 0,1,2,3 | Type of handshake at the user port<br>0: No handshake<br>1: Only handshake from the local unit<br>2: Only handshake from the remote unit<br>3: Handshake from local and remote unit |
| | | HeaderIn | 0,1 | Requirement for an header for transmitting data.<br>0: No header required (Incomming date that are not commands are transmitted to the standard destination)<br>1: Header required |
| | | HeaderOut | 0,1,2,3,4 | Type of header which is output in front of the data at the userport.<br>0: No header<br>1: Short source-/destination header (defaults omitted)<br>2: Full source-/destination header (xx#xx>>xx#xx)<br>3: Full source-/destination header plus receiver info and decode info<br>4: Automatic:<br>Local: Use setting in received datasets<br>Remote (in outgoing datesets): Use mode 1 |

| | | | | |
|---|---|---|---|---|
| | | OE | 0,1 | 0: Userport output enable depends on ChipSelect signal<br>1: Userport output is always enabled |
| | | CS | 0,1 | 0: CS active low (CS=1 => Standby, CS=0 => Active)<br>1: CS active high (CS=0 => Standby, CS=1 => Active) |
| Reply | “<Param > <Data>” | | | |
| e.g. | Command | | | Reply |
| | "?CONFIG gen fshaddr" | | | “FSHADDR 99” |
| | “?CONFIG gen baseaddr” | | | “ BASEADDR cb50” |

| | |
|---|---|
| Command | "UPDATE" |
| Description | Start update manager software |
| AccLevel | 4 |
| Parameters | - |
| Note | You should know what you are doing ! |

| | | | |
|---|---|---|---|
| Command: | "SECURITY <Parameter> <Data>" | | |
| Description | Security settings | | |
| AccLevel | 1 | | |
| Parameters | - Parameter<br>- Data | | |
| | Parameter | Valid data | Description |
| | HWKey | Hardware key | Define hardware key<br>This command can only be executed once ! |
| | ERASE | Erase key | Erase flash memory |
| Reply | "OK" | | |
| Note | You should know what you are doing !!! | | |
| e.g. | - | | |

| | |
|---|---|
| Command | "TEST" |
| Description | For test purpose only |
| AccLevel | 4 |
| Parameters | - |
| Note | You should know what you are doing ! |

## *3.5 Error messages*

| | |
|---|---|
| | |
| Error 001: Syntax error | Syntax error |
| Error 002: Too few parameters | |
| Error 003: Out of range | |
| Error 004: Invalid value | |
| Error 005: Not available | |
| Error 006: Password too long | |
| Error 007: This value is not possible for your country. | |
| Error 010: Access denied ! | |
| Error 011: Invalid key | |
| | |
| Error 031: EEPROM read | |
| Error 032: EEPROM write | |
| | |
| Error 041: Flash read | |
| Error 042: Flash write | |
| Error 043: Verify | |
| | |
| Error 050: Error in ow device | |
| | |
| Error 060: Transceiver error | Error in transceiver unit |
| | |
| Error 100: UART collision | A collision occurred when reading data on a half duplex interface. Please retry reading. |
| Error 101: UART buffer overflow | Overflow in user port input buffer |
| Error 110: CRC wrong | Appended CRC is wrong. No data are transmitted. |
| Error 120: Target address not available | |
| Error 121: Target unit not logged in | |
| Error 130: TX queue overflow | Overflow in dataset transmit queue. Refer to the specifications for the maximum number of datasets (strings) in the queue. |
| Error 131: Command queue overflow | |
| | |

# 4 Specifications

Electrical characteristics:

| Symbol | Parameter | Condition | Standard | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| $V_{CC}$ | Supply voltage | | 2.7 | 3.0 | 3.6 | V |
| | | | | | | |
| | | | | | | |
| $I_{CC}$ | Power supply current @ $V_{CC}$ = 3V | Operating mode 1 (Normal mode) | | 9 | | mA |
| | | Operating mode 2 (Receive mode) | | 22 | | mA |
| | | Operating mode 3 (Standby mode) | | 50 | 100 | µA |
| | | Operating mode 4 (Sleep mode) | | 50 | 100 | µA |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Timing characteristics:

| Symbol | Parameter | Condition | Standard | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| | | | | | | |
| $t_{Wakeup}$ | Wakeup time from Standby mode (or sleep mode) to Normal mode | $V_{CC}$ = 3V | | 8.2 | 10 | ms |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Userport specification:

| Symbol | Parameter | Condition | Standard | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| f(UART) | Datarat in UART mode (asynchronous) | | 4800 | 38400 | 115200 | bit/s |
| f(SPI) | Datarate in SPI mode | | | 20 | | kbit/s |
| | | | | | | |
| N | Maximum number of datasets in transmit queue | | | | 3 | - |
| | Input string size | | | | 120 | characters |
| | Output string size | | | | 80 | characters |
| | | | | | | |