sttID
scemtec Transponder Technology GmbH

Manual & Specification

SmartRead Feature   **3.2.10**

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Contents

1 Introduction

1.1 Background

The SmartRead Feature has been designed as a firmware extension aimed to be used as an autonomous controller and protocol interface to be placed between an sttID RFID device and an arbitrary host system, hiding the STX/ETX protocol layer and providing standard ASCII terminal/telnet output in a highly configurable way. It also supports full standalone functionality without any connection to a host system ("headless" operation), e. g. an alarm triggered by tag detection.

1.2 Design Objectives

The typical sttID device reads transponders on request only; this makes it necessary to cyclically send read commands from the SmartRead firmware component to the reader. SmartRead was designed to suit as many application requirements as possible.

All settings are stored in non-volatile memory so that they will not be lost after power off.

1.3 Compatibility

The SmartRead feature works completely transparent; standard sttID STX/ETX protocol commands can be passed to the reader at any time, although this is not recommended for everyday use.

1.4 Suspending and Resuming

Sending an ESC character (1Bh) to the device stops all standalone functionality so that any sttID application utilizing the *DeviceLink Connector* can be used at any time (with the option "Begin initialization with ESC/RxFlush" enabled, which is the default).

Once in STX/ETX mode (ESC character has been submitted), SmartRead operation can be resumed by transmitting STX/ETX command 1074 (see STX/ETX protocol specification).

1.5 Terminal Application

Even if a custom host application is used to receive and process (e. g. store in a data base) all data sent by SmartRead, usually a terminal application is required to configure the device's stand-alone behaviour.

As a terminal application on Windows (particularly on newer versions than XP, which don't come with the somewhat questionable HyperTerminal) we recommend PuTTY, which is free software (see "http://www.chiark.greenend.org.uk/~sgtatham/putty/").

Of course, the choice of a terminal software is also a question of personal taste. The next two chapters describe the usage of PuTTY just as an example, in order to get you started.

1.5.1 Configuring PuTTY for Serial Connections

This configuration is used for both physical COM ports (like COM1, COM2 on most PCs) and virtual COM ports (like USB, Bluetooth, ...).

- In the "Session" page, which is opened automatically when PuTTY is started, select "Serial" as a connection type.
- Now specify the desired COM port number, and you're done. The default baud rate of 9600 is the same as sttID's default baud rate.
- Click "Open".

1.5.2 Configuring PuTTY for TCP/IP Connections

This configuration is used for all TCP/IP connections.

- In the "Session" page, which is opened automatically when PuTTY is started, select "Raw" as a connection type.
- Enter the device's IP address in the Host Name text box. If DHCP is used, you may use for example the sttID Device Connector to detect the actual IP address.
- Enter the device's TCP port in the "Port" text box (2101 is the default).
- Go to the "Terminal" page and set both "Local echo" and "Local line editing" to "Force off".
- Click "Open".

1.6 SmartManager

As an alternative to the simple terminal, sttID offers the PC application "SmartManager", which comes with the following features:

- Full terminal emulation
- Versatile connectivity:
    - Serial mode
    - TCP/IP client mode
    - TCP/IP host mode
- Simplified SmartRead configuration
- Direct data routing from one or multiple SmartRead devices to one of the following targets:
    - Text file
    - CSV file
    - Clipboard
    - Database (currently MySQL or MS SQL Server)
- SmartRead configuration import and export

- Tag Buffer import and export

- Add millisecond-accurate PC timestamp to each packet

- Nice GUI and lots of additional options

  SmartManager installation packages for Windows and Linux systems can be found on sttID's download page at ***www.stt-rfid.com***. If unsure, mail to ***info@stt-rfid.com***.

1.7 Version

This document applies to SmartRead firmware v3.2. It may be partially applicable to other versions, but differences in appearance and/or behaviour are likely.

2 Overview

2.1 The Main Loop

The typical application for SmartRead is some sort of stand-alone mode, no matter if there is a host connected to evaluate the results passed to the interface or if there is nothing but a light bulb wired to one of the reader's general purpose digital output ports.

The following flow chart outlines the basic stand-alone sequence.

```
                    ┌──────────────────┐
                    │      Start       │
                    └──────────────────┘
                             │
          ┌──────────────────┼──────────────────┐
          │                  ◇                   │
          │            Primary            No     │
          │            Read          ───────────►│
          │            configured                │
          │                  │                   │
          │                 Yes                  │
          │                  ▼                   │
          │         ┌──────────────────┐         │
          │         │     Repeat        │         │
          │         │  Primary Read     │         │
          │         │  until Timeout    │         │
          │         └──────────────────┘         │
          │                  │                   │
          │                  ◇                   │
          │            Secondary          No     │
          │            Read          ───────────►│
          │            configured                │
          │                  │                   │
          │                 Yes                  │
          │                  ▼                   │
          │         ┌──────────────────┐         │
          │         │     Repeat        │         │
          │         │ Secondary Read    │         │
          │         │  until Timeout    │         │
          │         └──────────────────┘         │
          │                  │                   │
          └──────────────────┴───────────────────┘
```
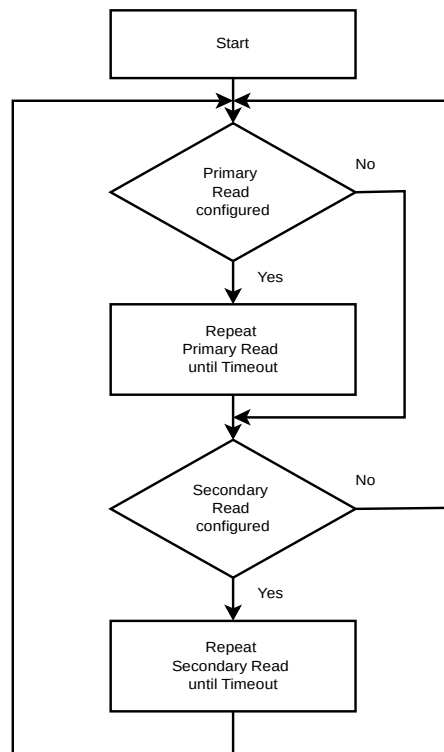
The stand-alone sequence basically consists of two single read loops (primary and secondary, each with configurable minimum duration), both embedded together in an endless loop. Each read operation pushes its results to the host interface in a fairly configurable way. In addition, the reader's digital output ports can be configured to react to certain events. When a reader (primary or secondary) does not detect any transponder, no message to the host is generated by default.

If no Secondary Read is configured, only Primary Read is active continuously, and vice versa. If neither is configured, all stand-alone operation remains inactive.

2.2 Read Loops

2.2.1 Primary Read

The Primary Read operation is the most commonly used one: it performs read operations on the primary target device, which can be almost any sttID RFID reader. In most cases, this is equivalent to the reader itself.

Actually, this operation can consist of quite a lot of commands to the reader, including up to several different read commands (for different tag types) and optional antenna multiplexer control.

The following flow chart outlines the Primary Read operation.
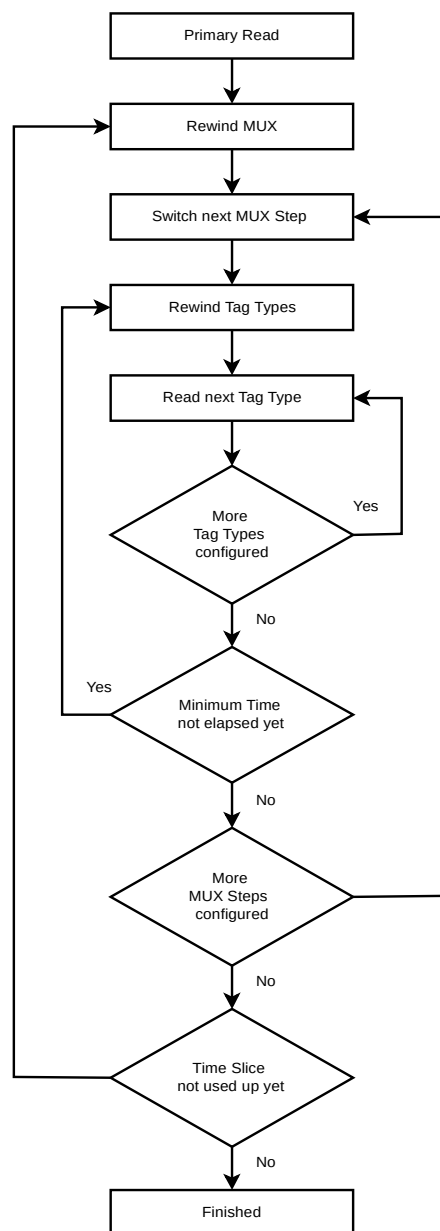
There are four loops:

- The Tag Type (inner) loop ensures that all selected tag types are addressed.

- The Minimum Time loop can be used to enforce a minimum dwelling time per antenna MUX step (e. g. in order to reduce excessive switching on mechanical relays).

- The MUX loop ensures that all MUX steps are switched for each complete Tag Type loop cycle.

- The Time Slice (outer) loop ensures that the Primary Read does not finish before the configured duration time has expired.

As the diagram already implies, each loop is cycled at least once. That means that if a duration time of zero is configured (which is the default and can be considered appropriate for most situations), each configured tag type is addressed once with each configured MUX step.

An input trigger (like a general purpose digital input port or a key on the keyboard of a handheld device) can optionally be used to perform read operations depending on certain conditions and for a limited time span.

Output triggers can optionally be used to produce external effects (e. g. set general purpose output port) on several events ("Read", "No Read", "EAS Alarm").

2.2.2 Secondary Read

The Secondary Read operation can be used for one of several main purposes:

- To acquire data from a specific secondary target device.
- To monitor either digital input ports or keys of a keyboard.
- To generate a pause of arbitrary length between the Primary Read operations.

The following flow chart outlines the Secondary Read operation.
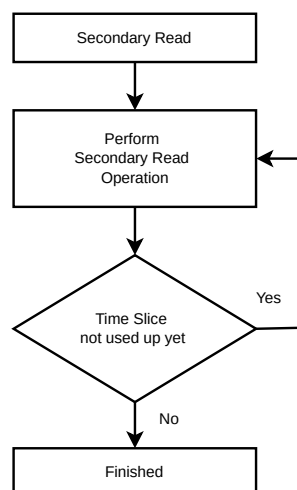
Obviously, the flow chart does not go into the details, but since the Secondary Read operation can behave quite differently depending on its configured mode, more details would render the diagram

all cluttered with conditional branches. The basic idea should be obvious, though.

An input trigger (like a general purpose digital input port or a key on the keyboard of a handheld device) can optionally be used to perform read operations depending on certain conditions and for a limited time span.

Output triggers can optionally be used to produce effects (e. t. set general purpose digital output port) on several events ("Read", "No Read", "EAS Alarm").

3 Configuration

3.1 Entering the Setup Menu

A simple terminal software can be used to configure the SmartRead mode. The setup mode will be activated if the CAN character (18h="Cancel"; [Ctrl]+[x] on a standard PC keyboard) is received within 10 seconds after power on. By default, the terminal software must be configured with 9600 baud, 8 data bits, no parity and no handshake ("8n1").

3.2 Menu Structure

Each menu consists of several items, each of which is usually made up of one text line. Each menu item can be invoked by pressing its assigned key, which is shown enclosed in square brackets ("[ ]") at the beginning of the line.

The parsing of assigned keys is *not* case sensitive.

Apart from the main menu, which consists solely of sub menu branches, most menu items have a value of a specific type. The current value of each item is displayed at the end of the line.

Some status or comment lines come with no assigned key for obvious reasons.

3.3 Data Types

3.3.1 Boolean Values

Boolean values are simple binary switches which can be either "on" or "off".

They are displayed in pointy brackets ("< >"); a selected ("on") value is displayed as "<X>".

When the assigned key is pressed to select a boolean item, the item's value is toggled.

3.3.2 Tristate Values

Tristate values can be regarded as some sort of "extended boolean" values, supporting the states "on", "off" and "not defined". An undefined value means that the normal device settings are not overwritten by the SmartRead subsystem during startup. In most cases of tristate values, "not defined" is the default.

They are displayed in pointy brackets ("< >"); a selected ("on") value is displayed as "<X>", whereas an undefined value is displayed as "<*>".

When the assigned key is pressed to select a tristate item, the item's value is cycled.

3.3.3 Mutex Values

Mutex (short for *mutually exclusive*) values are known from various graphical user interfaces as "radio buttons". They act almost like boolean values, with the exception that within a so-called mutex group (consisting of several mutex items) always exactly one item can (and must) be selected.

They are displayed in round brackets ("( )"); the selected item is marked as "(X)".

Beginning with SmartRead v2.7, Mutex values are controlled with only one single control character. Instead of directly selecting an item (like Boolean or Tristate values), the Mutex group is cycled to the next item if the specified control key is pressed.

3.3.4 Numerical Values

Numerical values always have a fixed length (which is, in most cases, 2 or 4 digits, but can be between 1 and 8 digits). They can be either decimal or hexadecimal. In the latter case, they are displayed with an "h" appended. Decimal values have no appendix.

All numerical values are displayed in braces ("{ }").

When the assigned key is pressed to select a numerical item, the user is prompted for the input of a new value. Values with less digits than prompted may either be entered with leading zeroes, or finished using the "Enter" key.

3.3.5 Text Values

Text values (or "strings") can be up to 20 characters wide.

Text values are also displayed in braces ("{ }").

When the assigned key is pressed to select a text item, the user is prompted for the input of a new text string. Strings with less characters than prompted may either be padded with spaces, or finished using the "Enter" key.

3.4 Multiple Configurations

Beginning with SmartRead v2.8, multiple configurations are supported. Each configuration is assigned a name (which is also used as a key for storage, comparable to a file name) and an additional single character to be used for identification e. g. in small LCDs.

In theory, up to 7 configurations can be stored in non-volatile memory. There is a space of 1000 bytes available where configurations are stored in a compressed format. Depending on the actual compression ratio achieved, the total amount of free configuration slots can decrease. An amount of 4-5 configurations should be realistic for everyday use.

Each time a configuration is saved, it is written after the last existing configuration. If a configuration of the same name exists, it will be deleted beforehand, but the new version will be stored at the end anyway.

4 Main Menu

4.1 Overview

The menu layout can be seen on the following terminal screenshot.

```
SCEMTEC SmartRead Setup - Main Menu

[C] Current Configuration {Default}

[P] Primary Read {Default}
[T] Primary Read Tag Types {Default}
[O] Primary Read Device Options {Default}
[M] Primary Read Antenna MUX {Default}
[S] Secondary Read {Default}

[L] Data Analysis {Default}
[B] Tag Buffer {Default}
[Z] Post-Processing {Default}

[D] Tag Data Manipulation {Default}
[A] Ancillary Data {Default}
[E] Timestamps {Default}
[F] Data Framing {Default}
[K] Packet Assembly {Default}
[I] Interface Settings {Default}

[G] Input Triggers {Default}
[R] Output Triggers {Default}

[Q] Exit & Save - [X] Exit & Discard - [U] Restore Defaults - [Y] Test Cycle

>
```

The main menu itself allows no configuration. Instead, it offers several sub menus, sorted by categories. As a quick overview, each menu item is followed by a short (and in many cases quite incomplete) summary of the currently active settings, enclosed in braces ("{ }").

To enter a sub menu simply requires pressing the assigned key. All sub menus are described in the following chapters.

Depending on the actual reader hardware, the menu may appear slightly different.

4.2 Details

4.2.1 Exit & Save (Q)

This is the usual way to leave the setup menu. All changes previously made to the settings are

stored to non-volatile memory and thus will survive even a power-down.

After storing the settings, the system is restarted; the new settings are then active immediately. Since the system is restarted, the setup menu can be re-invoked during the timeout period described above, in case this is required.

4.2.2 Exit & Discard (X)

This can be seen as a "cancel" option. In case the user only wanted to review the current configuration, or decided that the changes just made were completely wrong, this is the way to go.

The system is then restarted; the most recent settings will be restored. Since the system is restarted, the setup menu can be re-invoked during the timeout period described above.

4.2.3 Restore Defaults (U)

This command returns the device to its factory settings. However, these are not yet stored permanently until the main menu is left with the Q key.

4.2.4 Test Cycle (Y)

This command can be used to trigger a single test cycle of the main loop (as described in chapter 2.1) using the current settings. This may include Primary Read, Secondary Read, both or none, depending on the configuration. All results will be sent to the terminal screen, followed by a pause of one second. Afterwards, the system will return to the terminal menu.

To perform a quick test of changed parameters, the test cycle may be quite helpful.

5 Current Configuration Menu

5.1 Overview

The menu layout can be seen on the following terminal screenshot. Please note that options related to a specific mode are actually only visible if the corresponding mode is selected.

```
SCEMTEC SmartRead Setup - Current Configuration Menu

[N] Configuration ID Name ......................... {SmartRead        }
[I] Configuration ID Character ......................................... {S}

[A] Configuration is Active ........................................... <X>
[K] Use Keyboard to Cycle Configuration ............................... <X>
  [P] Input Key Pattern ........................................... {01h}

     Configuration Memory (Bytes) Available ......................... {1000}
     Configuration Memory (Bytes) in Use ............................ {0437}
     Total Number of Configurations ................................. {3}
     Current Configuration .......................................... {1}

[W] Store Current Configuration
[S] Select Next Configuration
[C] Delete Current Configuration
[D] Delete All Configurations

[R] Restore Default Configurations

[Q] Return to Main Menu

>
```

This sub menu can be used to manage multiple SmartRead configurations. The Q key is used to return to the main menu.

5.2 Details

5.2.1 Configuration ID Name (N)

This is the name assigned to the configuration. It can be considered a file name, as it is used to identify the configuration within configuration storage.

5.2.2 Configuration ID Character (I)

This character is used to identify a configuration on small spaces, e. g. an LCD.

5.2.3 Configuration is Active (A)

Each configuration can be marked as either active or inactive. When cycling through configurations e. g. using a push button, only active configurations are available, so it's possible to skip certain configurations by marking them as inactive.

5.2.4 Use Keyboard to Cycle Configuration (K)

On devices equipped with a keypad (usually hand held devices), this option can be used to assign a single key (usually the MODE key) to configuration switching.

5.2.5 Input Key Pattern (P)

This is the key pattern to use to cycle the SmartRead configuration (see Input Triggers, chapter 21.2.19 for details about the pattern). The preset value `01h` corresponds to the MODE key on most devices. The pattern is entered by pressing the desired button on the device.

5.2.6 Store Current Configuration (W)

For convenience purposes, the "Save" part of the "Exit & Save" function in the main menu can be accessed directly in the Current Configuration menu.

It saves the current configuration to non-volatile memory, using the Configuration ID Name (see above) as a key or handle. If the name already exists, the configuration will be overwritten – or, to be more precise, the existing configuration will be deleted before saving the current one.

5.2.7 Select Next Configuration (S)

This option is used to load the next available configuration from configuration storage. Within the SmartRead menu, configurations marked as inactive are *not* skipped.

The current configuration pointer is stored in non-volatile memory, so the configuration selected here is the one to be loaded at startup, no matter if it is marked active or inactive.

Please be aware that all current changes will be lost!

5.2.8 Delete Current Configuration (C)

This option can be used to delete the configuration currently displayed from configuration storage.

5.2.9 Delete All Configurations (D)

This option can be used to delete *all* configurations from configuration storage. There will be no configurations left – until the next configuration is stored.

5.2.10 Restore Default Configurations (R)

This option can be used to restore a set of pre-defined default configurations. Configurations already stored will not be overwritten, unless the configuration name is equal to one of the default configuration names.

6 Primary Read Menu

6.1 Overview

The menu layout can be seen on the following terminal screenshot. Please note that options related to a specific mode are actually only visible if the corresponding mode is selected.

```
SCEMTEC SmartRead Setup - Primary Read Menu

[P] Primary Read enabled ...................................................... < >
[T] Primary Read Time (*100ms) ........................................ {0000}

[M] Transponder ID or EAS Mode ............................................ (X)
  [N] Prefer Realtime Inventory (if available) .......................... <X>
    [V] Realtime Inventory Response Limit (IDs) ................... {16}
[M] Block Read Mode (Data instead of ID) .............................. (X)
  [K] Memory Bank (0=Reserved, 1=EPC/UII, 2=TID, 3=User) ................ {1}
  [S] Block Read Start .............................................. {04h}
  [C] Block Read Count -1 (i. e. "00h" means 1 block etc.) ........... {03h}
[M] Sensor Read Mode (Sensor Data instead of ID) ........................ ( )

[A] Anticollision enabled ................................................ <X>
[3] Inventory Filter (if available) enabled .............................. <X>
    [4] Filter Memory Bank (0=Reserved, 1=EPC/UII, 2=TID, 3=User) ........ {1}
    [5] Filter Mask Offset (Bits) .................................. {0020h}
    [6] Filter Mask Length (Bits) .................................. {0060h}
    [7] Filter Mask Data (Hex Bytes) ............. {                     }
[8] Prefix ID Descriptor (if available) in ID Mode ..................... < >
[U] Prefix Unique ID (if available) in all Non-ID Modes ................ <X>
  [E] Separate Unique ID from Data .................................. < >
[1] Revert Data Blocks .................................................. <X>
  [2] Block Size -1 (i. e. "00h" means 1 byte etc.) ................. {03h}
[I] Revert Data Bytes ................................................... < >
[J] Revert Bits of each Data Byte ...................................... < >

[H] Tag Reset before each Scan enabled ................................. <X>
[F] Tag Reset after each Scan enabled .................................. < >
[O] Switch Carrier Off after Primary Read ............................. < >
[D] Output Port Pattern to set while Primary Read is active ............ < >

[L] Data Analysis Link enabled ......................................... < >
[B] Tag Buffer Link enabled ............................................ < >
[Z] Post-Processing Link enabled ....................................... < >
[W] Tag Data Manipulation Link enabled ................................. < >
[G] Input Trigger Link enabled ......................................... < >
[R] Output Trigger Link enabled ........................................ < >

[Q] Return to Main Menu

>
```

This sub menu configures the Primary Read loop. The Q key is used to return to the main menu.

6.2 Details

6.2.1 Primary Read enabled (P)

This is the main switch to quickly enable/disable the Primary Read loop.

6.2.2 Primary Read Time (T)

This is the length of the time slice granted to the Primary Read loop, given in steps of 100ms. The preset value of 0 means that each configured tag type is addressed once with each configured MUX step.

6.2.3 Transponder ID or EAS Mode (M)

This is the default operation mode, in which the transponder IDs are sent to the host interface.

In EAS modes, the string "EAS" is transmitted instead of an ID by default. It can, however, be altered using options from the Tag Data menu.

For SST-xxxx measurement transponders, the measurements are transmitted as four-digit hex values, e. g. temperature values as Kelvin*10 to avoid signs and fractions. These can be converted to human readable values, e. g. temperature values to degrees centigrade, using the respective option in the Tag Data menu.

6.2.4 Prefer Realtime Inventory (N)

This option is only displayed when "Transponder ID or EAS Mode" is active. It can be activated to internally use the "Realtime Inventory" commands rather than the regular inventory commands. In this mode, each anticollision cycle may produce multiple (partial) results, depending on the actual anticollision algorithm.

If no Realtime Inventory is available, the standard inventory command is used automatically as a safe fallback.

6.2.5 Realtime Inventory Response Limit (V)

This item is only displayed when "Prefer Realtime Inventory" is active. It sets the maximum packet size to be used for realtime inventory. Each realtime inventory response may contain this maximum number of IDs.

The purpose of this limitation is to avoid buffer overflow in case of large tag populations.

6.2.6 Block Read Mode (M)

In block read mode, after obtaining the tag ID(s) a specified range of data blocks is read from the tag (if the tag supports data blocks). This data is then sent to the host interface instead of the tag ID. However, the tag ID can be prefixed using the "Prefix Unique ID" option.

6.2.7 Memory Bank (K)

This option is only displayed when "Block Read Mode" is active. Since some tags like EPC Gen.2 provide four memory pages (page 0 being reserved), the page to be read can be selected here.

6.2.8 Block Read Start (S)

This option is only displayed when "Block Read Mode" is active. It specifies the start block for block read mode.

6.2.9 Block Read Count (C)

This option is only displayed when "Block Read Mode" is active. It specifies the number of blocks to be read in block read mode. Actually, it is the number of blocks *minus one*, since reading 0 blocks would not make much sense anyway and this way the decimal value 256 can still be specified using two digits.

6.2.10 Sensor Read Mode (M)

In sensor read mode, after obtaining the tag ID(s) sensor data is read from the tag (if the tag is a sensor tag). This data is then sent to the host interface instead of the tag ID. It can be converted to human readable format using the appropriate item in the Tag Data Menu. The tag ID can be prefixed using the "Prefix Unique ID" option.

6.2.11 Anticollision enabled (A)

When anticollision is enabled, SmartRead performs complete anticollision cycles in both ID and Block Read Mode – given that the reader supports anticollision for the specified tag type. This is slower, but in case of more than one tag in the field the collisions are automatically resolved and data packets are sent to the host interface one after another. When anticollision is disabled, simultaneous detection of multiple transponders is not possible.

It's usually a good idea to have this option enabled, unless anticollision is explicitly not desired.

6.2.12 Inventory Filter enabled (3)

Some tags, e. g. EPC Gen.2, support bit-masking tags during inventory. To utilize this feature, the inventory filter option can be enabled.

6.2.13 Filter Memory Bank (4)

This item is only displayed when "Inventory Filter" is enabled. It is the memory bank the filter mask (see below) shall be applied to. Default value is the typical application value (EPC bank).

6.2.14 Filter Mask Offset (5)

This item is only displayed when "Inventory Filter" is enabled. It is the offset in bits within the specified bank where the filter mask shall be applied. Default value is the typical application value (EPC offset).

6.2.15 Filter Mask Length (6)

This item is only displayed when "Inventory Filter" is enabled. It is the length of the filter mask in bits. Default value is *not quite* the typical application value (complete EPC).

6.2.16 Filter Mask Data (7)

This item is only displayed when "Inventory Filter" is enabled. It is the bit mask to be applied to the memory bank specified above. It must be a string of hex digits, its length a multiple of 2 and is completely empty by default.

6.2.17 Prefix ID Descriptor (if available) in ID Mode (8)

Some tag types transmit an additional ID descriptor, like the PC for EPC Gen.2 and ISO 18000-3 Mode 3. This is discarded by default, but can be left intact using this option.

6.2.18 Prefix Unique ID in all Non-ID Modes (U)

In some cases it may be of great advantage to have any data output (e. g. block data or measurement values) preceded by the tag's unique ID. Especially when anticollision is used, this may become a necessity. This behaviour can be enabled here. Please note that this unique ID field cannot be subject to any further data manipulation; it's a fixed field. All data manipulation is applied to the tag data instead.

6.2.19 Separate Unique ID from Data (E)

This option is only displayed when "Prefix Unique ID in all Non-ID Modes" is enabled. When activated, a globally configured separator character is inserted between unique ID and tag data.

6.2.20 Revert Data Blocks (1)

When enabled, the block order of tag data is reverted.

6.2.21 Block Size (2)

This option is only available when "Revert Data Blocks" is enabled. It specifies the common block size to be used when reverting, since various tag types may have different block sizes. To be more precise, it is the number of bytes *minus one*, since blocks of length 0 would not make much sense anyway. The default is 03h, which represents the most common block size of 4 bytes.

6.2.22 Revert Data Bytes (I)

If the byte order of Primary Read data is to be reverted, this option can be used.

6.2.23 Revert Bits of each Data Byte (J)

This option, when enabled, turns around the bit order of each data bit.

6.2.24 Tag Reset before each Scan enabled (H)

This option makes an HF reset happen at the beginning of each Primary Read, i. e. once *before* all potential MUX steps, returning the tags to a defined state before each Primary Read.

On some systems, e. g. when using Class 1 Gen.2 compatible protocols, the HF reset is replaced by a specific tag reset command to support persistence.

6.2.25 Tag Reset after each Scan enabled (F)

This option, being activated by default, makes an HF reset happen at the end of each Primary Read, i. e. once *after* all potential MUX steps, returning the tags to a defined state after Primary Read.

On some systems, e. g. when using Class 1 Gen.2 compatible protocols, the HF reset is replaced by a specific tag reset command to support persistence.

6.2.26 Switch Carrier Off after Primary Read (O)

When this option is enabled, the primary HF carrier is switched off at the end of each primary phase. This can be helpful if the secondary device is influenced by the primary HF, or just for saving power.

If no Secondary Read is configured, this option should be left disabled anyway.

6.2.27 Output Port Pattern to set while Primary Read is active (D)

If a binary output port pattern is configured here, it is set as long as Primary Read is in progress. As soon as Secondary Read starts, the pattern is removed from the output ports.

6.2.28 Data Analysis Link enabled (L)

When this option is enabled, the Data Analysis subsystem is linked to Primary Read. Depending on its currently configured mode (see Data Analysis menu), it can be used e. g. for filtering data output based on specific contents.

6.2.29 Tag Buffer Link enabled (B)

When this option is enabled, the Tag Buffer is linked to Primary Read. Depending on its currently configured mode (see Tag Buffer menu), it can be used to compress output in a variable degree by removing redundancies, or to filter output and trigger events.

6.2.30 Post-Processing Link enabled (Z)

When this option is enabled, Post-Processing is linked to Primary Read. Depending on its currently configured mode (see Post-Processing menu), it can be used to perform specific additional transactions on detected tags.

6.2.31 Tag Data Manipulation Link enabled (W)

When this option is enabled, all tag data manipulation steps configured in the Tag Data Manipulation menu are linked to Primary Read.

6.2.32 Input Trigger Link enabled (G)

When this option is enabled, all configured input triggers are linked to Primary Read.

6.2.33 Output Trigger Link enabled (R)

When this option is enabled, all configured output triggers are linked to Primary Read.

7 Tag Type Menu

7.1 Overview

The menu layout can be seen on the following terminal screenshot.

```
SCEMTEC SmartRead Setup - Tag Types Menu

[1] I*Code-1 enabled .......................................... < >
[2] I*Code-1 EAS enabled ...................................... < >
[3] Tag-it enabled ............................................ < >
[4] ISO 15693 enabled ......................................... < >
[5] ISO 15693 I*Code-SLI EAS enabled ......................... < >
[6] SST-20xx Measurement enabled ............................. < >
[7] I*Code EPC enabled ........................................ < >
[8] I*Code UID enabled ........................................ < >
[-] ISO 14443-A not supported
[A] ISO 18000-3 Mode 3 enabled ............................... < >
[B] ISO 18000-3 Mode 3 I*Code ILT EAS enabled ................ < >

[Q] Return to Main Menu

>
```

This sub menu configures the tag types used in Primary Read mode. The tag types shown are meant as an example only and may be completely different depending on the device being used. The Q key is used to return to the main menu.

For some tag types, there are special EAS modes, which do not return a tag ID, but a boolean information only (EAS Alarm). The default output for EAS Alarm in place of tag data is "EAS", but this can be shortened or altered using options from the Tag Data menu.

For measurement transponder types, the measurement results are transmitted as four-digit hex values. These can be converted to human readable values using the respective option in the Tag Data menu.

Tags which are not supported by the current device are listed here anyway, but cannot be selected.

8 Device Options Menu

8.1 Overview

The menu layout can be seen on the following terminal screenshot. Please note that options related to a specific mode are actually only visible if the corresponding mode is selected.

```
SCEMTEC SmartRead Setup - Device Options Menu

[P] RF Power Step (0 = Leave Unchanged) ................................. {00}
[B] Bypass Power Splitter ............................................. <*>
[C] Disable Per-Cycle Repetition Filter ............................... <*>

[O] Use Global Inventory Overscan ..................................... <X>
  [V] Inventory Overscan Value ....................................... {0000}
[K] Use Global Signal Level Threshold ................................. <X>
  [L] Signal Level Threshold Value (0 = disable) ..................... {0000}
[E] Use Specific Inventory Session .................................... <X>
  [N] Inventory Session is S0 ........................................ (X)
  [N] Inventory Session is S1 ........................................ ( )
  [N] Inventory Session is S2 ........................................ ( )
  [N] Inventory Session is S3 ........................................ ( )
  [N] Inventory Session is S2+S3 (alternating) ...................... ( )
[G] Use Specific Inventory Target .................................... <X>
  [T] Inventory Target is A .......................................... (X)
  [T] Inventory Target is B .......................................... ( )
  [T] Inventory Target is A/B (alternating) ......................... ( )
  [T] Inventory Target is B once on Trigger, then A ................. ( )
    [J] Target B Overscan Value ..................................... {0003}
[U] Add EPC/UII in TID Mode .......................................... <*>

[A] ISO 15693 AFI #1 (Single/Multiple AFI Mode) ..................... {00h}
[F] ISO 15693 AFI #2 (Multiple AFI Mode) ........................... {00h}
[I] ISO 15693 AFI #3 (Multiple AFI Mode) ........................... {00h}

[M] Use 20% Modulation Index for ISO 15693 ......................... <*>
[S] Use Single Subcarrier (ASK) for ISO 15693 ...................... <*>
[R] Reverse ISO 15693 ID and Data Bytes ............................ <*>

[Q] Return to Main Menu

>
```

This sub menu configures the special options used in Primary Read mode for 13.56MHz devices. Most of these options are only available for specific devices. The Q key is used to return to the main menu.

8.2 Details

8.2.1 RF Power Step (P)

This option can be used to configure the reader's RF power. Depending on the device connected, these steps can have different meanings (e. g. SHL2100: "1"=0.7W, "2"=1W, "3"=2W, "4"=4W or SIL2125: "1"=2.5W, "2"=5W, "3"=7.5W, "4"=10W).

A value of 0 means that the device settings are not overwritten by the SmartRead subsystem during startup.

8.2.2 Bypass Power Splitter (B)

This option is only available if the device is equipped with an internal antenna splitter. When enabled, the antenna splitter is bypassed and all RF power is sent to the first antenna port. Output power is then automatically limited to a maximum of 7.5W to avoid damage to external components.

This is a tristate value; a value of "*" means that the current device settings are not overwritten by the SmartRead subsystem during startup.

8.2.3 Disable Per-Cycle Repetition Filter (C)

Depending on device and configuration, it may be possible that some tag IDs are presented more than once **per cycle**. Normally, these repetitions are automatically filtered out. This option can be used to disable that filter.

This is a tristate value; a value of "*" means that the current device settings are not overwritten by the SmartRead subsystem during startup.

8.2.4 Use Global Inventory Overscan (O)

This option can be used to configure the reader's inventory overscan settings. The specified value overwrites each tag type's individual inventory overscan value.

8.2.5 Inventory Overscan Value (V)

This option is only available if "Use Global Inventory Overscan" is selected. The value specified here will be used to overwrite the overscan settings for all supported tag types.

8.2.6 Use Global Signal Level Threshold (K)

This option can be used to configure the reader's signal level threshold settings. The specified value overwrites each tag type's individual signal level threshold value.

8.2.7 Signal Level Threshold Value (L)

This option is only available if "Use Global Signal Level Threshold" is selected. The value specified here will be used to overwrite the signal level threshold settings for all supported tag types.

8.2.8 Use Specific Inventory Session (E)

To configure a specific session to be used for the EPC Gen.2 / ISO 18000-3 Mode 3 protocol, this option can be set to "enabled".

8.2.9 Inventory Session is S*x* (N)

This option is only available if "Use Specific Inventory Session" is selected. Sessions S0 – S3 can be configured; in addition sessions S2 and S3 can be used in alternating mode.

8.2.10 Use Specific Inventory Target (G)

To configure a specific target to be used for the EPC Gen.2 / ISO 18000-3 Mode 3 protocol, this option can be set to "enabled".

8.2.11 Inventory Target is *x* (T)

This option is only available if "Use Specific Inventory Target" is selected. Target A or B can be configured; in addition both targets can be used in alternating mode. Another additional mode is available for use in combination with Input Triggers: when the trigger becomes active, the first inventory cycle is performed with target B, all remaining cycles with target A.

8.2.12 Target B Overscan Value (J)

This option is only available if "Use Specific Inventory Target" is selected and Target is "B on Trigger, then A". It can be used to raise the number of Target B cycles beyond 1.

8.2.13 Add EPC/UII in TID Mode (U)

This option is only available if either EPC Gen.2 or ISO 18000-3 Mode 3 is supported. When enabled, TIDs are always transmitted together with the corresponding EPC/UII.

8.2.14 ISO 15693 AFI #1 (A)

This option can be used to configure the reader's ISO 15693 AFI byte. When not zero, only tags with an AFI byte equal to the one configured here respond to ID/read requests.

Please note that the AFI byte's impact is limited to ISO 15693 ID/Data scan in anticollision mode!

8.2.15 ISO 15693 AFI #2 (F)

Whenever one AFI byte for selection is not enough, the slots AFI #2 and AFI #3 can be configured in addition to AFI #1. This will enable Multiple AFI mode, which means that ISO anticollision will be performed sequentially using each AFI byte that is not zero. When AFI #1 is zero, Multiple AFI mode is disabled.

8.2.16 ISO 15693 AFI #3 (I)

See ISO 15693 AFI #2.

8.2.17 Use 20% Modulation Index for ISO 15693 (M)

This switch makes the modulation index (reader to tag command) configurable. "disabled" means the default (100% modulation), whereas "enabled" means 20% modulation. Please note that according to the ISO 15693 specification, the use of 20% modulation forces the reader into a slower timing scheme.

This is a tristate value; a value of "*" means that the current device settings are not overwritten by the SmartRead subsystem during startup.

8.2.18 Use Single Subcarrier (ASK) for ISO 15693 (S)

This switch makes the modulation type (tag to reader response) configurable. "disabled" means the default (FSK modulation), whereas "enabled" means ASK modulation.

This is a tristate value; a value of "*" means that the current device settings are not overwritten by the SmartRead subsystem during startup.

8.2.19 Reverse ISO 15693 ID and Data Bytes (R)

By default, the reader returns all tag data (including tag IDs) in the same byte order as the tag transmits it to the reader, which is LSB first. Unfortunately, this makes the tag ID appear in the wrong byte order. This option can be used to reverse the byte order of all ID and user data.

Since this is a reader option, it is completely independent from the settings done in the "Reverse Data Bytes" menu. When both are active, ISO data is reversed twice – and thus not reversed at all.

This is a tristate value; a value of "*" means that the current device settings are not overwritten by the SmartRead subsystem during startup.

9 Antenna MUX Menu

9.1 Overview

The menu layout can be seen on the following terminal screenshot. Please note that options related to a specific mode are actually only visible if the corresponding mode is selected.

```
SCEMTEC SmartRead Setup - Antenna MUX Menu

[M] Antenna MUX enabled ......................................... <X>
[I] Minimum Dwelling Time for each MUX Step (*100ms) ................. {0000}
[A] Use Native MUX instead of SmartRead MUX ............................ < >
[P] Feed Antenna MUX Position into Port Buffer ........................ < >
  [W] Port Buffer Bit Wrap ......................................... {8}

    AVAILABLE: 4h Power Steps, Primary MUX-8, Secondary MUX-8

    MUX Step #01 ............................................. {0001h}
    MUX Step #02 ............................................. {0002h}
    MUX Step #03 ............................................. {0003h}
    MUX Step #04 ............................................. {0004h}
      Timeout for MUX Step #04 (*100ms) .............................. {10}
    MUX Step #05 ............................................. {0010h}
    MUX Step #06 ............................................. {0020h}
      Timeout for MUX Step #06 (*100ms) .............................. {05}

[N] Add New MUX Step (ABCD: A=Power; B=Phase; C=Secondary; D=Primary)
[T] Set Timeout for last MUX Step (*100ms; 0=none)
[D] Delete last MUX Step
[C] Clear MUX Sequence

[Q] Return to Main Menu

>
```

This sub menu configures the antenna multiplexer to be used in Primary Read mode. The Q key is used to return to the main menu.

Please be aware that this applies only to devices equipped with NEW internal or external multiplexing units. If no such unit is connected, the old "Internal/External" MUX menus are available instead.

Beside the selectable commands, this menu shows the available (i. e. auto-detected) MUX features and the current MUX sequence consisting of several steps, each with optional timeout value.

9.2 Details

9.2.1 Antenna MUX enabled (M)

This is the main switch to quickly enable/disable control of the antenna multiplexer.

9.2.2 Minimum Dwelling Time for each MUX Step (I)

In some cases, it may be desired that each single antenna remains active at least for a specified minimum time. That minimum time can be configured here.

9.2.3 Use Native MUX instead of SmartRead MUX (A)

This option is only available if the device supports Native MUX. Native MUX means that the reader module is capable of controlling the antenna ports alone.

When this option is enabled, the Native MUX is used, i. e. SmartRead will no longer control the antenna ports. This may be faster (in terms of antenna switching) for some solutions, but it also bears disadvantages:

- Per-antenna power setting is not supported
- MUX status is not accessible for SmartRead and hence cannot be added as Ancillary Data

As a rule of thumb, Native MUX is recommended only when using large Overscan values (i. e. each cycle takes a lot of time). With no (or small) Overscan, Native MUX should be left disabled.

9.2.4 Feed Antenna MUX Position into Port Buffer (P)

The Port Buffer can be used to conditionally set digital output ports. When this option is enabled, the antenna MUX position is fed into the Port Buffer as a single bit binary pattern, each MUX step represented by one bit.

9.2.5 Port Buffer Bit Wrap (W)

This option is only available when the "Feed Antenna MUX Position into Port Buffer" option (see above) is enabled. This value can be used to reduce the output bit width to match the number of ports physically available. All bits beyond the limit specified here are wrapped down to the lower bits, as many times as necessary to fit. Examples: pattern `0100b` limited to 2 bits becomes `01b`, pattern `1000b` limited to 2 bits becomes `10b`, and pattern `0001b` becomes... `01b`.

9.2.6 Add New MUX Step (N)

This command asks for a 4-digit hex number to be used as the next step in the MUX sequence.

Each step is assembled as follows, regarding a hex value consisting of the digits "1234":

Hex Digit #	Range	Description	When zero
1	`1`...`F` (max.)	The power step to use.	Leave previous configuration unchanged.
2	`1`...`2` (max.)	Set the power splitter to this phase configuration: 1=0°, phase aligned; 2=180°, phase divergent.	Leave previous configuration unchanged.
3	`0`...`4` or `0`...`8`	Secondary MUX antenna port (if two antenna MUXes are equipped).	Disable all antenna ports on this MUX. If both antenna ports are set to 0, both antennas remain unchanged.
4	`0`...`4` or `0`...`8`	(Primary) MUX antenna port (if one or two antenna MUXes are equipped).	Disable all antenna ports on this MUX. If both antenna ports are set to 0, both antennas remain unchanged.

The special case where both antennas are set to zero can be used to change power step and/or phase configuration without touching the current antenna configuration, or if only a power splitter with no antenna MUX is equipped.

9.2.7 Set Timeout for last MUX Step (T)

Each MUX step can be assigned a timeout value, causing the inventory function to be interrupted if it is not finished within the time specified as timeout.

Please be aware that this is the timeout for an interrupt request; usually the currently active inventory function will finish its current anticollision round before actually returning. Hence, together with data transmission and internal processing, an additional offset must be taken into account. This timeout value is not to be taken literally, but rather as a rough hint.

Only the timeout value for the last step can be assigned. To change any other timeout value, it is necessary to either clear the sequence or delete all subsequent steps.

9.2.8 Delete last MUX Step (D)

Single steps can be deleted only from the bottom of the sequence. Alternatively, the whole sequence can be cleared (see below).

9.2.9 Clear MUX Sequence (C)

This command clears the complete MUX sequence.

10 Secondary Read Menu

10.1 Overview

The menu layout can be seen on the following terminal screenshot. Please note that options related to a specific mode are actually only visible if the corresponding mode is selected.

```
SCEMTEC SmartRead Setup - Secondary Read Menu

[S] Secondary Read enabled ............................................. < >
[T] Secondary Read Time (*100ms) ................................... {0000}

[M] Pause Mode ........................................................ ( )
[M] Input Port Monitor Mode ........................................... (X)
  [C] Add Character to Port Status .................................... <X>
    [V] ASCII Value for Port Status Character ........................ {50h}
[M] Keyboard Monitor Mode ............................................. (X)
  [C] Add Character to Keyboard Status ............................... <X>
    [V] ASCII Value for Keyboard Status Character .................... {4Bh}
[M] Secondary Device - Transparent Mode ............................... ( )
[M] Secondary Device - Custom Mode 1 .................................. ( )
[M] Secondary Device - Custom Mode 2 .................................. ( )

[1] Revert Data Blocks ................................................ <X>
  [2] Block Size -1 (i. e. "00h" means 1 byte etc.) ................... {03h}
[I] Revert Data Bytes ................................................. < >
[J] Revert Bits of each Data Byte ..................................... < >
[D] Output Port Pattern to set while Secondary Read is active .......... < >

[L] Data Analysis Link enabled ........................................ < >
[B] Tag Buffer Link enabled ........................................... < >
[Z] Post-Processing Link enabled ...................................... <X>
[W] Tag Data Manipulation Link enabled ................................ < >
[G] Input Trigger Link enabled ........................................ < >
[R] Output Trigger Link enabled ....................................... < >

[Q] Return to Main Menu

>
```

This sub menu configures the Secondary Read loop. The Q key is used to return to the main menu.

10.2 Details

10.2.1 Secondary Read enabled (S)

This is the main switch to quickly enable/disable the Secondary Read loop.

10.2.2 Secondary Read Time (T)

This is the length of the time slice granted to the Secondary Read loop, given in steps of 100ms. The preset value of 0 means that no time is granted to the secondary system; SmartRead will not wait for a response to appear on the secondary device interface. When one of the monitor modes is active with Secondary Read Time 0, ports/keys will be queried once each cycle.

10.2.3 Pause Mode (M)

In this mode, the Secondary Read loop simply serves as a pause of configurable time.

10.2.4 Input Port Monitor Mode (M)

In this mode, the device's digital input ports will be queried for changes during secondary read. It is highly recommended to set both Primary and Secondary Read Time to zero in that case to ensure quick reactions.

Whenever a state change on any input port is detected, all input ports will be transmitted in form of an 8-bit (two-character) hex value.

As the Tag Buffer doesn't make too much sense in this mode, it will be internally disabled.

10.2.5 Add Character to Port Status (C)

This option is only displayed when Input Port Monitor Mode is active. When enabled, an additional character is placed before the two hex digit port status to make it clearly distinguishable from transponder data (see also the next option).

10.2.6 ASCII Value for Port Status Character (V)

This option is only displayed when Input Port Monitor Mode is active and "Add Character to Port Status" is enabled. This option configures the additional character described above by means of a two-digit ASCII hex value. Preset is 50h, which corresponds to a capital "P" (for "Ports", actually).

10.2.7 Keyboard Monitor Mode (M)

In this mode, the device's keyboard will be queried for any key down events during secondary read. It is highly recommended to set both Primary and Secondary Read Time to zero in that case to ensure quick reactions.

Whenever a key down event is detected, it will be transmitted in form of an 8-bit (two-character) hex value. See "Input Key Pattern" for key code definitions.

As the Tag Buffer doesn't make too much sense in this mode, it will be internally disabled.

10.2.8 Add Character to Keyboard Status (C)

This option is only displayed when Keyboard Monitor Mode is active. When enabled, an additional character is placed before the two hex digit keyboard status to make it clearly distinguishable from transponder data (see also the next option).

10.2.9 ASCII Value for Keyboard Status Character (V)

This option is only displayed when Keyboard Monitor Mode is active and "Add Character to Keyboard Status" is enabled. This option configures the additional character described above by means of a two-digit ASCII hex value. Preset is 4Bh, which corresponds to a capital "K" (for "Key", actually).

10.2.10 Secondary Device – Transparent Mode (M)

When a secondary reader device is connected to the secondary device interface, this mode can be used to utilize that reader during the Secondary Read loop.

Data packets are expected on secondary RS-232 interface.

10.2.11 Secondary Device – Custom Mode 1 (M)

When a secondary reader device of custom type "1" is connected to the secondary device interface, this mode can be used to utilize that reader during the Secondary Read loop.

10.2.12 Secondary Device – Custom Mode 2 (M)

When a secondary reader device of custom type "2" is connected to the secondary device interface, this mode can be used to utilize that reader during the Secondary Read loop.

During read time, digital output port #1 of primary device is set to HIGH; data packets are expected on secondary RS-232 interface, separated by <CR>+<LF>.

10.2.13 Revert Data Blocks (1)

When enabled, the block order of tag data is reverted.

10.2.14 Block Size (2)

This option is only available when "Revert Data Blocks" is enabled. It specifies the common block size to be used when reverting, since various tag types may have different block sizes. To be more precise, it is the number of bytes *minus one*, since blocks of length 0 would not make much sense anyway. The default is 03h, which represents the most common block size of 4 bytes.

10.2.15 Revert Data Bytes (I)

If the byte order of Secondary Read data is to be reverted, this option can be used.

10.2.16 Revert Bits of each Data Byte (J)

This option, when enabled, turns around the bit order of each data bit.

10.2.17 Output Port Pattern to set while Secondary Read is active (D)

If a binary output port pattern is configured here, it is set as long as Secondary Read is in progress. As soon as Primary Read starts, the pattern is removed from the output ports.

10.2.18 Data Analysis Link enabled (L)

When this option is enabled, the Data Analysis subsystem is linked to Secondary Read. Depending on its currently configured mode (see Data Analysis menu), it can be used e. g. for filtering data output based on specific contents.

10.2.19 Tag Buffer Link enabled (B)

When this option is enabled, the Tag Buffer is linked to Secondary Read. Depending on its currently configured mode (see Tag Buffer menu), it can be used to compress output in a variable degree by removing redundancies, or to filter output and trigger events.

10.2.20 Post-Processing Link enabled (Z)

When this option is enabled, Post-Processing is linked to Secondary Read. Depending on its currently configured mode (see Post-Processing menu), it can be used to perform specific additional transactions on detected tags.

10.2.21 Tag Data Manipulation Link enabled (W)

When this option is enabled, all tag data manipulation steps configured in the Tag Data Manipulation menu are linked to Secondary Read.

10.2.22 Input Trigger Link enabled (G)

When this option is enabled, all configured input triggers are linked to Secondary Read.

10.2.23 Output Trigger Link enabled (R)

When this option is enabled, all configured output triggers are linked to Secondary Read.

11 Data Analysis Menu

11.1 Overview

The menu layout can be seen on the following terminal screenshot. Please note that options related to a specific mode are actually only visible if the corresponding mode is selected.

```
SCEMTEC SmartRead Setup - Data Analysis Menu

[M] Data Analysis disabled ........................................ (X)
[M] Use Data Analysis as Output Filter ................................ ( )
[M] Feed Decision Byte into Port Buffer .............................. ( )

[O] Offset of Decision Byte within Tag Data ......................... {00h}
[B] Binary Byte Mask to apply to Decision Byte ....................... {00h}
[V] Binary Byte Value to match ...................................... {00h}

[I] Invert Decision (Positive on Mismatch) or Port Buffer .............. < >
[H] Omit Gen.2 PC Word on Data Analysis ............................... < >
[G] Apply Data Analysis to Output Triggers ............................ < >

[Q] Return to Main Menu

>
```

This sub menu configures Data Analysis, which can be put into several operation modes and linked to Primary and/or Secondary Read. The Q key is used to return to the main menu.

Please note that the "Data Analysis Link enabled" option in Primary/Secondary Read must be enabled for Data Analysis to take any effect at all.

11.2 Details

11.2.1 Data Analysis disabled (M)

When this mode is selected, Data Analysis remains completely and entirely unused.

11.2.2 Use Data Analysis as Output Filter (M)

When this mode is selected, data which does not match the specified criteria (see below) will simply not be transferred to host.

11.2.3 Feed Decision Byte into Port Buffer (M)

The Port Buffer can be used to conditionally set digital output ports. When this mode is selected,

the (bit masked) decision byte is fed into the Port Buffer. Since the "Apply Data Analysis to Output Triggers" option does not make sense in the mode, it is automatically disabled upon mode change. The "Binary Byte Value to compare with" is a don't care in this mode.

11.2.4 Offset of Decision Byte within Tag Data (O)

This is the byte offset of the decision byte which is taken into account for Data Analysis. A value of 03h, for example, would mean that the fourth byte (starting from zero) of tag data is compared using the parameters specified in the following menu items. When using a 32 bit block which contains the value 00000001, one would specify 03h to get the byte value 01.

11.2.5 Binary Byte Mask (M)

Only the bits which are set in this binary value are actually compared. A value of 00h means that nothing is compared (and hence does not make too much sense), whereas a value of FFh means that all bits are compared.

11.2.6 Binary Byte Value to match (V)

This is the value to be compared to the decision byte specified above, using the bit mask which is also specified above.

11.2.7 Invert Decision or Port Buffer (I)

To invert the decision result (positive on mismatch), this option can be used. When the "Feed Decision Byte into Port Buffer" mode is selected, the complete decision byte is binary inverted.

11.2.8 Omit Gen.2 PC Word on Data Analysis (H)

When this option is activated, the PC word of all Gen.2 protocols (UHF EPC Class 1 Gen.2, ISO 18000-3 Mode 3) will *not* be treated as part of the ID when it comes to Data Analysis.

11.2.9 Apply Data Analysis to Output Triggers (G)

When this option is enabled, Data Analysis will also be used to delay/drop trigger events specified in the Output Triggers menu. When disabled, trigger events can be thrown independently from data transmission.

When the mode is switched to "Port Buffer", this option is automatically disabled, since it does not make any sense in that context.

12 Tag Buffer Menu

12.1 Overview

The menu layout can be seen on the following terminal screenshot. Please note that options related to a specific mode are actually only visible if the corresponding mode is selected.

```
SCEMTEC SmartRead Setup - Tag Buffer Menu

[S] Tag Buffer Size Limit ........................................ {0920}
[T] Tag Buffer ID Expiration Time (*100ms, 0 = Infinite) ............. {0000}
[I] Compensate Processing Time ....................................... <X>

[V] Volatile Tag Buffer disabled ..................................... (X)
[V] Use Volatile Tag Buffer to inhibit Output Repetitions .............. ( )
  [R] Refresh IDs in Tag Buffer to disable Isochronous Output .......... <X>
  [M] Match ID and MUX Status ......................................... <X>
    [A] Invert MUX Status Match (Positive on Mismatch) ................ <X>
[V] Use Volatile Tag Buffer to produce IN/OUT Events .................. ( )
  [F] IN/OUT Marker follows Data ..................................... < >
[V] Use Volatile Tag Buffer to generate Presence Time Span ............. ( )
  [U] Replace OUT Timestamp with Duration ............................ < >
[V] Use Volatile Tag Buffer to store IDs for Input Trigger ............ ( )

[P] Permanent Tag Buffer disabled .................................... (X)
[P] Use Permanent Tag Buffer to Collect IDs .......................... ( )
  [E] Tag Buffer Write Interval (*1s, 0 = None) ..................... {0010}
[P] Use Permanent Tag Buffer to Filter Output ........................ ( )
  [N] Invert Filter (i. e. output Tags NOT found in Tag Buffer) ........ < >
[P] Use Permanent Tag Buffer to Preset Inventory ...................... ( )

[W] Show Tag Buffer (Value = Tag Buffer Level) ...................... {0000}
[L] Perform Single Learn Cycle
[C] Clear Tag Buffer

[H] Omit Gen.2 PC Word on Tag Buffer ................................. < >
[D] Discard New IDs when Tag Buffer full ............................. < >
[O] Apply Tag Buffer to Output Triggers .............................. <X>

[Q] Return to Main Menu

>
```

This sub menu configures the Tag Buffer, which can be put into several operation modes and linked to Primary and/or Secondary Read. The Q key is used to return to the main menu.

Please note that the "Tag Buffer Link enabled" option in Primary/Secondary Read must be enabled for the Tag Buffer to take any effect at all.

There are two general operation modes which can actually be combined: Volatile Tag Buffer (for temporary use) and Permanent Tag Buffer (for use across system resets). Both modes can be

configured independently but actually operate on the same buffer internally. The separation into "volatile" and "permanent" can be regarded as two different points of view on the same thing. This approach may come in handy to e. g. use the permanent buffer as a filter for selective output and/or triggering and the volatile buffer to inhibit output repetitions at the same time.

The Tag Buffer is used to store tag IDs only, so even if e. g. Block Read mode is active, the corresponding tag ID (or EPC if there is no actual ID) is stored in the Tag Buffer as a unique reference. All comparisons and decisions will refer to tag Ids, whereas the output will consist of the actually configured data again. Although this may seem like a limitation, it conserves a considerable amount of memory, allowing for more tags to be handled effectively using the Tag Buffer.

The maximum tag ID length which can be stored in the Tag Buffer is 14 bytes, which corresponds to a maximum of 96 bits EPC plus 16 bits PC (HF/UHF Gen.2). Tag IDs longer than 14 bytes (e. g. ICode UID or Gen.2 tags with longer EPC) will get truncated when used with Tag Buffer.

12.2 Details

12.2.1 Tag Buffer Size Limit (S)

The size of the Tag Buffer can be limited artificially. By default, it is set to the largest supported size. Please note that the limit is not specified in bytes, but in actual IDs.

12.2.2 Tag Buffer ID Expiration Time (T)

The expiration time specifies how long an item resides in the Volatile Tag Buffer before it gets removed automatically. If the Permanent Tag Buffer is enabled, items are marked "inactive" rather than actually being removed.

When the Tag Buffer mode is changed, this value is automatically set to the most sensible value.

12.2.3 Compensate Processing Time (I)

When this option is enabled, the total processing time of primary and secondary read is added to the configured Tag Buffer ID Expiration Time. This is strongly recommended for IN/OUT Events mode and Presence Time Span mode to avoid glitches caused by additional operations like e. g. block reading. On the other hand, when Inhibit Output Repetitions mode is selected, a constant timing would usually be desirable, which is achieved by turning off this option.

When the Tag Buffer mode is changed, this value is automatically set to the most sensible value.

12.2.4 Volatile Tag Buffer disabled (V)

When this mode is selected, the Tag Buffer is not used in its volatile representation.

12.2.5 Use Volatile Tag Buffer to inhibit Output Repetitions (V)

The "Inhibit Repetitions" mode is the simplest use of the Volatile Tag Buffer. Tag data which is currently present in the Tag Buffer will not be transmitted to the host again, so repetitions are suppressed as long as an ID remains in the buffer (and is marked "active").

12.2.6 Refresh IDs in Tag Buffer to skip Isochronous Output (R)

This option is only displayed when the "Use Volatile Tag Buffer to inhibit Output Repetitions" mode is active. It specifies how to behave when an ID is read which is already contained in the Tag Buffer (and marked "active"). When enabled, the internal Tag Buffer timestamp for this item is refreshed in that case; when disabled, nothing happens.

In fact, that means that when this option is enabled, the expiration time starts when the tag is removed from the antenna – otherwise it starts when that tag is first read and restarts if it is still read afterwards, resulting in isochronously repeated output.

To make sure a tag is reported only once as long as it remains in the HF field, set this option to enabled.

12.2.7 Match ID and MUX Status (M)

When an antenna multiplexer (MUX) is used, the current MUX position is stored in the Tag Buffer together with the tag's UID. If this option is enabled, the new MUX position is compared to the previous one together with the tag ID, and the new item is considered a repetition only if both ID *and* MUX position match.

Please note that this may cause additional write operations to the Tag Buffer. Each tag ID can be stored multiple times, uniquely identified in combination with the related MUX status. If a tag is read by two different antennas, it will be stored in the Tag Buffer twice – once for each antenna it was read on. This is not actually relevant in Volatile Tag Buffer mode, but when one of the Permanent Tag Buffer modes is active, the sight of multiple entries of one and the same tag ID may occur strange. This is perfectly normal, though, and it does *not* break any of the Permanent Tag Buffer modes. On the other hand, great tag populations may easier lead to Tag Buffer capacity problems due to multiple entries.

12.2.8 Invert MUX Status Comparison (A)

This option is only displayed when "Match ID and Mux Status" is enabled. If enabled, the new item is considered a repetition only if the ID matches whereas the MUX position does *not* match.

Here's a direct comparison for better understanding:

Normal	*Inverted*
Inhibit repetitions per antenna, i. e. use an individual counter for each antenna; antennas are treated independently.	Inhibit repetitions of a specific ID on all antennas but the one which first read the ID; output on the first antenna is *not* inhibited, i. e.

	transmitted repeatedly.

12.2.9 Use Volatile Tag Buffer to produce IN/OUT Events (V)

In some applications it is desirable to receive the events "Tag has entered antenna field" and "Tag has left antenna field" rather than continuous data output while the tag is in field. In that case, this mode comes in handy, but there are a few precautions to take:

- The "Tag Buffer ID Expiration Time" should be set as low as possible (usually `0001`=100ms), which means high enough to prevent bouncing and low enough to allow for an appropriately prompt OUT event. *It is adapted automatically when this mode is selected but can be changed afterwards.*

  - The "Compensate Processing Time" option should be enabled to avoid accidental glitches. *It is adapted automatically when this mode is selected but can be changed afterwards.*

To distinguish between IN and OUT events in this mode, a "+" character is added to the tag data for an IN event, whereas a "-" character is added for an OUT event.

As the Tag Buffer contains only IDs and no block data, the data shown for the OUT event will always be the tag ID, even if Block Read mode is active. In that case, it may be a good idea to use the UID prefix option to allow for a proper assignment on the host side.

For many applications, this mode is a very efficient means of data compression and can greatly help reduce interface traffic.

12.2.10 IN/OUT Marker follows Data (F)

This option is only displayed when the "Use Volatile Tag Buffer to produce IN/OUT Events" mode is active. By default, the In/Out marker ("+"/"-") is inserted *before* the tag data. To have it inserted *after* the tag data, this option can be activated.

12.2.11 Use Volatile Tag Buffer to generate Presence Time Span (V)

To reduce output traffic even further, each packet of tag data can be transmitted only once, after the tag has left the antenna field. In this mode, two timestamps are added instead of one (given that timestamps are enabled): the IN timestamp and the OUT timestamp. These can, for example, easily be transferred into a start time and a dwell time by the host application.

If timestamps are not enabled (or even supported), the "Presence Duration" in the Ancillary Data Menu (see chapter Fehler: Referenz nicht gefunden) can be used together with this mode. In that case, the output format is similar to the "Replace OUT Timestamp with Duration" option (see below), since then only a relative time difference can be measured.

In this mode, the same precautions apply as in the "Use Tag Buffer to produce IN/OUT Events" mode above.

As the Tag Buffer contains only IDs and no block data, the data shown will always be the tag ID,

even if Block Read mode is active.

For many applications, this mode is a very efficient means of data compression and can greatly help reduce interface traffic.

12.2.12 Replace OUT Timestamp with Duration (U)

This option is only displayed when the "Use Volatile Tag Buffer to generate Presence Time Span" mode is active. When enabled, the output packet will consist of an IN timestamp and an 8 digits hex value representing the actual presence time span in seconds, rather than an IN timestamp and an OUT timestamp.

Please note that if the RTC is used to generate the duration, having a resolution of 1 second, accuracy at the lower end is quite limited. For short periods, the "Presence Duration" available in the Ancillary Data menu (see chapter Fehler: Referenz nicht gefunden) is probably preferable since it is precise to the millisecond.

12.2.13 Use Volatile Tag Buffer to store IDs for Input Trigger (V)

As the name of this mode already suggests, its main purpose is to be used in combination with an Input Trigger (configured in "Triggered Tag Buffer Output Mode", see chapter 21.2.13). Instead of transmitting data to the host, IDs are written into the Tag Buffer exclusively. An Input Trigger event can be used to fetch the current Tag Buffer contents at any time, clearing (or marking "inactive") the Tag Buffer automatically.

12.2.14 Permanent Tag Buffer disabled (P)

When this mode is selected, the Tag Buffer is not used in its permanent representation.

12.2.15 Use Permanent Tag Buffer to Collect IDs (P)

This is a permanent Tag Buffer mode, i. e. the Tag Buffer contents are permanently stored in non-volatile memory and obsolete items are marked "inactive" rather than being actually deleted.

In this mode, tag IDs are added to the Tag Buffer upon each successful read operation. It is saved to non-volatile memory with a specified interval (see below) to reduce EEPROM wear.

To read out the Tag Buffer contents, the STX/ETX protocol can be used.

12.2.16 Tag Buffer Write Interval (E)

This option is only displayed when the "Use Permanent Tag Buffer to Collect IDs" mode is active. As a means of protecting EEPROM from excessive wear, the Tag Buffer is not written each time new data arrives. Instead, write operations are performed in an interval specified in seconds. Low values are only recommended for short periods of time, or if most of the time no data is generated. If no data has changed, nothing is written.

12.2.17 Use Permanent Tag Buffer to Filter Output (P)

This is a permanent Tag Buffer mode, i. e. the Tag Buffer contents are permanently stored in non-volatile memory and obsolete items are marked "inactive" rather than being actually deleted.

In this mode, tag Ids are *not* added to Tag Buffer upon each successful read operation. Instead, the Tag Buffer can be filled with IDs during a preparation step, either using "Perform Single Learn Cycle" (see below), or via STX/ETX protocol.

Data is transmitted to host only if the corresponding tag ID is found in the Tag Buffer. This behaviour can, of course, also be applied to the Output Triggers part of SmartRead.

A typical application for this mode would be access control, where for instance a bunch of "cleared for admission" tags is permanently stored in a reader's Tag Buffer and an Output Trigger is used to control an electronic door lock or a barrier.

12.2.18 Invert Filter (N)

This option is only displayed when the "Use Permanent Tag Buffer to Filter Output" mode is active. The normal operation of Output Filter mode is to process only tags which can be found in the Tag Buffer. When this option is enabled, the filter is inverted, which results in all tags being processed *except* for the ones currently stored in Tag Buffer.

Due to reasons which should appear most logical at second thought, this option cannot be combined with Volatile Tag Buffer operation, since Volatile Tag Buffer uses data being contained in the buffer, whereas an inverted filter uses data being *not* contained in the buffer (which has no stored timestamps, obviously). Hence, this option cannot be activated together with a Volatile Tag Buffer mode.

12.2.19 User Permanent Tag Buffer to Preset Inventory (P)

This is a permanent Tag Buffer mode, i. e. the Tag Buffer contents are permanently stored in non-volatile memory and obsolete items are marked "inactive" rather than being actually deleted.

In this mode, tag Ids are *not* added to the Tag Buffer upon each successful read operation. Instead, the Tag Buffer can be filled with IDs during a preparation step, either using "Perform Single Learn Cycle" (see below), or via STX/ETX protocol.

Any inventory command is replaced by simply copying the Tag Buffer to the inventory buffer. This may be useful when e. g. block read operations are to be performed on a fixed population of tags.

However, it is not recommended to only read IDs from the Tag Buffer, since apart from being complete nonsense, this will hopelessly flood the interface (due to the lack of any delay caused by tag transaction).

12.2.20 Show Tag Buffer (W)

This option is only displayed when one of the "permanent" Tag Buffer modes is active. It can be used to transfer the current Tag Buffer contents to the host, as if it were just read as an inventory.

Beware that all additionally configured SmartRead options are active during this transfer and may modify the visible result. This has no effect on the ID data stored in the Tag Buffer.

The value displayed as belonging to this option is the number of IDs currently present in the Tag Buffer.

12.2.21 Perform Single Learn Cycle (L)

This option is only displayed when one of the "permanent" Tag Buffer modes is active. To prepare the Tag Buffer with static data, it is possible to run one or several learn cycles. In each learn cycle, all currently configured read loops (Primary/Secondary) are triggered once, the results being displayed via terminal screen.

Beware that all additionally configured SmartRead options are active during this transfer and may modify the visible result. This has no effect on the ID data stored in the Tag Buffer.

There is no value displayed for this option, since it's rather a command than a setting.

12.2.22 Clear Tag Buffer (C)

This option is only displayed when one of the "permanent" Tag Buffer modes is active. It can be used to clear a previously filled Tag Buffer in order to start over again.

There is no value displayed for this option, since it's rather a command than a setting.

12.2.23 Omit Gen.2 PC Word on Tag Buffer (H)

When this option is activated, the PC word of all Gen.2 protocols (UHF EPC Class 1 Gen.2, ISO 18000-3 Mode 3) will *not* be treated as part of the ID when it comes to the Tag Buffer.

12.2.24 Discard New IDs when Tag Buffer full (D)

This option specifies how to behave when a new ID is read but the Tag Buffer is full. When enabled, the new ID is discarded; when disabled, the oldest item is removed from the Tag Buffer.

But beware – if all tags remain on the antenna, the previously oldest item is read again at once, causing the next oldest item to be removed, and so on. In that case, the Tag Buffer cannot be used to effectively slow down data output!

This option does not apply if a Permanent Tag Buffer mode is active because in that case old items cannot be deleted.

12.2.25 Apply Tag Buffer to Output Triggers (O)

When this option is enabled, Tag Buffer will also be used to delay/drop trigger events specified in the Output Triggers menu. When disabled, trigger events can be thrown independently from data transmission.

13 Post-Processing Menu

13.1 Overview

The menu layout can be seen on the following terminal screenshot. Please note that options related to a specific mode are actually only visible if the corresponding mode is selected.

```
SCEMTEC SmartRead Setup - Post-Processing Menu

[A] Addressed Mode enabled ......................................... < >
[P] Pedantic Mode (Discard Output on Error) enabled .................... < >

[E] New EAS Flag Value ............................................. < >

[Q] Return to Main Menu

>
```

This sub menu configures Post-Processing, which can be used for performing specific transactions on detected tags and linked to Primary and/or Secondary Read. The Q key is used to return to the main menu.

Please note that the "Post-Processing Link enabled" option in Primary/Secondary Read must be enabled for Post-Processing to take any effect at all.

13.2 Details

13.2.1 Addressed Mode enabled (M)

When this option is enabled, a previously acquired tag UID is used to perform addressed operations (if applicable) rather than non-addressed ones. *This should be activated for most applications, except non-addressed access is explicitly desired!*

13.2.2 Pedantic Mode enabled (P)

When this option is enabled, Post-Processing acts as an output filter: in case of any errors, data output is suppressed for the affected tag. When disabled, data output always remains enabled.

13.2.3 New EAS Flag Value (E)

This is a tristate value; the default value of "*" means that the EAS flag will not be changed. When this option is set to disabled, the EAS flag will be removed on all detected tags (if supported); when set to enabled, the EAS flag will be activated on all detected tags (if supported).

14 Tag Data Manipulation Menu

14.1 Overview

The menu layout can be seen on the following terminal screenshot. Please note that options related to a specific mode are actually only visible if the corresponding mode is selected.

```
SCEMTEC SmartRead Setup - Tag Data Manipulation Menu

[E] Truncate Head Raw Bytes ......................................... {00}
[I] Truncate Tail Raw Bytes ......................................... {00}

[C] Pass Input Data without Conversion ................................ ( )
[C] Convert Data to 64 Bit Decimal ................................... ( )
[C] Convert Data to String .......................................... (X)
  [N] Enable Null Termination ....................................... < >
  [V] ASCII Value for Non-Printable Characters ........................ {3Fh}
[C] Make SST-xxxx ScemTag Measurement Values Human Readable ............. ( )

[H] Truncate Head Characters ........................................ {00}
[T] Truncate Tail Characters ........................................ {00}

[O] Discard Substring Offset ........................................ {00}
[L] Discard Substring Length ........................................ {00}

[S] Strip Leading Zeroes from Response Data ........................... < >
[P] Pad Responses to Minimum Length .................................. {0016}
  [A] ASCII Value for Padding Character .............................. {30h}

[B] Append two characters BCC (pseudo checksum) ........................ < >

[Q] Return to Main Menu

>
```

This sub menu is used to configure the first data stage, comprising various processing options for the tag data itself. The Q key is used to return to the main menu.

14.2 Details

14.2.1 Truncate Head Raw Bytes (E)

When this value is greater than zero, the specified number of bytes are discarded from the beginning of the raw data (i. e. binary tag data before any processing).

14.2.2 Truncate Tail Raw Bytes (I)

When this value is greater than zero, the specified number of characters are discarded from the end of the raw data (i. e. binary tag data before any processing).

14.2.3 Pass Input Data without Conversion (C)

This is the default mode which disables any data conversion.

14.2.4 Convert Data to 64 Bit Decimal (C)

Whenever hex data seems inappropriate, the output can be converted to an 80 bit decimal value using this option. The result always consists of 20 decimal digits, padded with leading zeroes. If the tag data is longer than 64 bits (8 bytes), only the last 64 bits are used, the rest being discarded.

14.2.5 Convert Data to String (C)

When this option is enabled, the hex data read from the tag is converted to characters bytewise, resulting in an output string instead of hex data. Non-printable characters are replaced by a specified character (see below).

14.2.6 Enable Null Termination (N)

This option is only displayed when the "Convert Data to String" mode is active. When it is enabled, a null byte (00h) in the tag data is interpreted as a string termination.

14.2.7 ASCII Value for Non-Printable Characters (V)

This option is only displayed when the "Convert Data to String" mode is active. It can be used to change the replacement character for non-printable characters. The default value is 3Fh, which stands for "?".

14.2.8 Make SST-xxxx ScemTag Measurement Values Human Readable (C)

When this mode is active, all tag data remains unchanged except ScemTag measurement values. Whereas in all other modes measurement values are transmitted as 4 digit hex values, this mode converts them to human readable values, e. g. "22.5°C" or "-4.9°C".

14.2.9 Truncate Head Characters (H)

When this value is greater than zero, the specified number of characters are discarded from the beginning of the response.

14.2.10 Truncate Tail Characters (T)

When this value is greater than zero, the specified number of characters are discarded from the end of the response.

14.2.11 Discard Substring Offset (O)

The discard substring offset and length can be used to discard a variable number of characters from within the response. This value specifies the position of the first character to be removed.

14.2.12 Discard Substring Length (L)

The discard substring offset and length can be used to discard a variable number of characters from within the response. This value specifies the number of characters to be removed.

14.2.13 Strip Leading Zeroes from Response Data (S)

When enabled, all leading zeroes are removed from the response data.

14.2.14 Pad Responses to Minimum Length (P)

When this value is greater than zero, all responses shorter than the specified length are padded (from the beginning) with a specified character (see below).

14.2.15 ASCII Value for Padding Character (A)

This option is only available when the "Pad Responses to Minimum Length" value is greater than zero. It is the padding character used to extend responses to a specified minimum length. This only applies if the "Pad Responses to Mimimum Length" option is enabled. The default value is 30h, which stands for the digit "0". That default would pad all responses with leading zeroes.

14.2.16 Append two characters BCC (B)

To append a very simple checksum to all displayed transponder data (including padding), this option can be used. The checksum is the two-digits XOR value of all displayed characters.

15 Ancillary Data Menu

15.1 Overview

The menu layout can be seen on the following terminal screenshot. Please note that options related to a specific mode are actually only visible if the corresponding mode is selected.

```
SCEMTEC SmartRead Setup - Ancillary Data Menu

[S] Concatenate using Separator Character ............................. <X>

[F] Add Free Text to Output ......................................... <X>
  [G] Free Text String ............................. {blurb         }
[A] Add Reader Name to Output ....................................... <X>
  [E] Reader Name String ........................... {SHL2100-11040006   }
[R] Add Reader ID to Output ......................................... <X>
  [I] Reader ID ................................................. {11040006h}

[D] Add Number of Dropped Packets to Output ........................... < >
[P] Add Tag Presence Duration to Output ............................... < >
[O] Add Port Buffer Value to Output ................................... < >

[K] Add Tag Repetition Counter to Output .............................. < >
[M] Add Antenna MUX Status to Output .................................. < >
[J] Add Response Signal Level to Output ............................... < >
[T] Add Tag Type ID to Output ......................................... < >
[C] Add SFR (Special Function Register) to Output ..................... < >
[H] Add Data Length to Output ......................................... < >

[Q] Return to Main Menu

>
```

This sub menu is used to configure the second data stage, comprising (almost) all optional data to be added to data output. Each field of data is appended at the beginning of the output packet. The Q key is used to return to the main menu.

15.2 Details

15.2.1 Concatenate using Separator Character (S)

When this option is enabled, all additionally appended data fields are separated using the global separator character (which can be configured in the Packet Assembly menu).

15.2.2 Add Free Text to Output (F)

With this option, a free text (see below) can be added to the data packet. The free text works almost the same way as the reader name.

15.2.3 Free Text String (G)

The free text can be edited here. A maximum of 20 ASCII characters is possible; shorter texts can be concluded by pressing <Enter>.

15.2.4 Add Reader Name to Output (A)

With this option, the reader name (see below) can be added to the data packet.

15.2.5 Reader Name String (E)

The reader name can be edited here. A maximum of 20 ASCII characters is possible; shorter names can be concluded by pressing <Enter>. The default is a combination of device name and device serial number. This default can be retrieved at any time by just pressing <Enter> instead of entering a new name.

15.2.6 Add Reader ID to Output (R)

With this option, the Reader ID (a 32 bit hex number which can be configured either via terminal or using the STX/ETX protocol) can be added to the data packet.

15.2.7 Reader ID (I)

This option is only displayed when the "Add Reader ID to Output" switch is active. The Reader ID can be changed here.

15.2.8 Add Battery Status to Output (B)

This option is only displayed for battery powered (i. e. hand held) devices. When enabled, a two-digit hex byte is added to the data packet, yielding the current battery status.

15.2.9 Add Number of Dropped Packets to Output (D)

If Asynchronous Output is enabled (see chapter 19.2.29), it is possible that single data packets are purged due to a non-responsive interface. The number of packets dropped since the last successful transmission can be added to output using this option, so the host is at least aware of any data loss.

Please note that it may occur that the number of dropped packets is added to two subsequent packets before being cleared. This is due to the fact that the packets are assembled before it is

known if they are transmitted successfully and thus the dropped packets counter can be cleared.

15.2.10 Add Tag Presence Duration to Output (P)

If available, an 8 digits hex value representing the actual presence time span in milliseconds will be added to the output packet when this option is enabled. For packets which don't provide a presence duration information (e. g. heartbeat), a value of `00000000` is added, to make sure the output packet format is not violated.

This field is completely independent from the Timestamps, since it does not rely on a realtime clock; instead it uses the internal system timer for counting milliseconds. This value is preferable for short periods (or if an RTC is not installed, of course), since its precision is higher, whereas the presence duration generated using timestamps is preferable for long periods due to its higher long term accuracy.

15.2.11 Add Port Buffer Value to Output (O)

This option is primarily intended for debugging purposes. When enabled, the current Port Buffer value is added to output in form of a two-digit hex byte.

15.2.12 Add Tag Repetition Counter to Output (K)

This item and all possible sub-items are still experimental and may not work as expected (or even not at all).

When enabled, some devices may add a repetition counter for each ID that was read multiple times and cannot be transmitted repeatedly multiple times (due to slow interface).

15.2.13 Add MUX Status to Output (M)

In some cases, the host application may require knowledge about which antenna MUX configuration produced the current result. If this option is enabled, a 16-bit hex value will be added to the data packet, representing the currently active MUX configuration.

15.2.14 Add Response Signal Level to Output (J)

If available, the signal level of the tag response is added to the output. Some devices return actual dBm values (negative complement code values), whereas some other devices return dimensionless values suitable for comparison (positive values less than `0x8000`).

15.2.15 Add Tag Type ID to Output (T)

When this option is enabled, a two-digit hex byte is added to the data packet, showing what tag type the tag data corresponds to.

The following table shows all tag type IDs that are currently distinguished.

Freq. Range	Tag Type Classification							Hex	Tag Type Name
Bit #7	Bit #6	Bit #5	Bit #4	Bit #3	Bit #2	Bit #1	Bit #0		
0	0	0	0	0	0	0	0	0x00	Undefined
0	0	0	1	0	0	0	0	0x10	Virtual Common
0	0	0	1	0	0	0	1	0x11	Heartbeat
0	0	0	1	0	0	1	0	0x12	Secondary System
0	0	1	0	0	0	0	0	0x20	Barcode Common
0	0	1	1	0	0	0	0	0x30	Custom Common
0	1	0	0	0	0	0	0	0x40	LF Common
0	1	0	0	0	0	0	1	0x41	PCF7930
0	1	0	0	0	0	1	0	0x42	Hitag 1
0	1	0	0	0	0	1	1	0x43	EM 4001
0	1	0	0	0	1	0	0	0x44	Titan
0	1	0	0	0	1	0	1	0x45	E5530
0	1	0	0	0	1	1	0	0x46	E5550
0	1	0	0	0	1	1	1	0x47	Nova
0	1	0	0	1	0	0	0	0x48	Hitag 2
0	1	0	0	1	0	0	1	0x49	FDX-B
0	1	0	0	1	0	1	0	0x4a	EM 4x05
0	1	0	0	1	0	1	1	0x4b	Hitag AES
0	1	0	0	1	1	0	0	0x4c	Hitag Pro
0	1	0	0	1	1	0	1	0x4d	Megacoder
0	1	0	0	1	1	1	0	0x4e	Hitag 3
1	0	0	0	0	0	0	0	0x80	HF Common
1	0	0	0	0	0	0	1	0x81	I*Code 1
1	0	0	0	0	0	1	0	0x82	I*Code 1 EAS
1	0	0	0	0	0	1	1	0x83	Tag-it
1	0	0	0	0	1	0	0	0x84	ISO 15693
1	0	0	0	0	1	0	1	0x85	I*Code EPC
1	0	0	0	0	1	1	0	0x86	I*Code UID
1	0	0	0	0	1	1	1	0x87	I*Code SLI(X)(-S) EAS
1	0	0	0	1	0	0	0	0x88	I*Code SLI(X) Inventory Read
1	0	0	0	1	0	0	1	0x89	I*Code SLI(X)-S Inventory Page Read
1	0	0	0	1	0	1	0	0x8A	ISO 14443-A
1	0	0	0	1	0	1	1	0x8B	EM4237 Inventory Block Read

1	0	0	0	1	1	0	0	0x8C	ISO 18000-3 Mode 3
1	0	0	0	1	1	0	1	0x8D	ISO 18000-3 Mode 3 TID
1	0	0	0	1	1	1	0	0x8E	ISO 18000-3 Mode 3 I*Code ILT EAS
1	1	0	0	0	0	0	0	0xC0	UHF Common
1	1	0	1	0	0	0	0	0xD0	433MHz Common
1	1	0	1	0	0	0	1	0xD1	Lyngsoe PosTag
1	1	0	1	0	0	1	0	0xD2	SC-433
1	1	1	0	0	0	0	0	0xE0	800-900MHz Common
1	1	1	0	0	0	0	1	0xE1	EPC Class 1 Gen. 2
1	1	1	0	0	0	1	0	0xE2	EPC Class 1 Gen. 2 TID
1	1	1	1	0	0	0	0	0xF0	>1GHz Common

15.2.16 Add SFR (Special Function Register) to Output (C)

When enabled, a special function register (SFR) can be added to output if available.

15.2.17 Add Data Length to Output (H)

With this option enabled, an additional byte containing the data length (in bytes) will be added to output.

16 Timestamps Menu

16.1 Overview

The menu layout can be seen on the following terminal screenshot. Please note that options related to a specific mode are actually only visible if the corresponding mode is selected.

```
SCEMTEC SmartRead Setup - Timestamps Menu

[T] Timestamps enabled ......................................... < >
[S] Separate Timestamp from Data ....................... < >

[F] Vanilla Time&Date Format (YYYY-MM-DD[<sep>]hh:mm:ss) ................ (X)
[F] Vanilla Time Only Format (hh:mm:ss) ................................ ( )
[F] UTC Format (32 Bit Hex) ........................................... ( )
[F] DOS Format (32 Bit Hex) ........................................... ( )
[F] RFC 1123 Compliant Format (Verbose) ............................... ( )
[F] ISO 8601 Compliant Format (YYYY-MM-DDThh:mm:ssZ) ................... ( )

[V] ASCII Value for Time Span Character ............................ {2Fh}

[Q] Return to Main Menu

>
```

This sub menu is used to configure the third data stage, comprising an optional timestamp to be added to data output. If the hardware involved doesn't contain a realtime clock, this menu remains disabled. The Q key is used to return to the main menu.

16.2 Details

16.2.1 Timestamps enabled (T)

This is the main switch to quickly enable/disable timestamp output.

16.2.2 Separate Timestamp from Data (S)

When this option is enabled, the globally configured separator character will be embedded between timestamp and data.

16.2.3 Vanilla Time&Date Format (F)

Time and date will be added in a simple ("vanilla") format which looks like this: "YYYY-MM-DD[<sep>]hh:mm:ss". The separator can be configured in the Packet Assembly menu. If the

---

separator is disabled, no separator character will be inserted.

16.2.4 Vanilla Time Only Format (F)

Only time will be added in a simple ("vanilla") format which looks like this: "hh:mm:ss".

16.2.5 UTC Format (F)

Time and date will be added in UTC format, which is an 32 bit (8 digits) hex number representing the number of seconds passed since 1970-01-01.

16.2.6 DOS Format (F)

Time and date will be added in UTC format, which is an 32 bit (8 digits) hex number. Precision is 2 seconds.

16.2.7 RFC 1123 Format (F)

Time and date will be added in RFC 1123 format, which is used e. g. by web servers. Example: "Mon, 17 Aug 2009 08:34:13 GMT".

Please note that the time zone is currently always reported as GMT.

16.2.8 ISO 8601 Format (F)

Time and date will be added in ISO 8601 format which looks like this: "YYYY-MM-DDThh:mm:ssZ".

Please note that the time zone is currently always reported as GMT.

16.2.9 ASCII Value for Time Span Character (V)

This option can be used to specify an ASCII hex value to be used as a separator character between two timestamps (Default: "/"). Currently, this only applies to the "Presence Time Span" Tag Buffer mode (see Tag Buffer menu).

17 Data Framing Menu

17.1 Overview

The menu layout can be seen on the following terminal screenshot. Please note that options related to a specific mode are actually only visible if the corresponding mode is selected.

```
SCEMTEC SmartRead Setup - Data Framing Menu

[1] SOH Character (first before response) enabled ...................... <X>
  [A] ASCII Value for SOH Character ................................. {00h}
[2] STX Character (second before response) enabled ..................... <X>
  [B] ASCII Value for STX Character ................................. {00h}
[3] Header Text (start of response) enabled ........................... <X>
  [C] Header Text String ........................... {some header text   }

[4] Footer Text (end of response) enabled ............................. < >
  [D] Footer Text String ........................... {some footer text   }
[5] ETX Character (first after response) enabled ...................... <X>
  [E] ASCII Value for ETX Character ................................. {0Dh}
[6] EOT Character (second after response) enabled ..................... <X>
  [F] ASCII Value for EOT Character ................................. {0Ah}

[Q] Return to Main Menu

>
```

This sub menu is used to configure the fourth data stage, comprising the framing characters to be added to data output. The Q key is used to return to the main menu.

17.2 Details

17.2.1 SOH Character enabled (1)

The SOH character is the first of two characters to send before the actual response data. It is sent only when this option is enabled.

17.2.2 ASCII Value for SOH Character (A)

This option is only displayed when the SOH Character is enabled. This is the ASCII value for the first character to be sent before the actual response data.

17.2.3 STX Character enabled (2)

The STX character is the second of two characters to send before the actual response data. It is sent

only when this option is enabled.

17.2.4 ASCII Value for STX Character (B)

This option is only displayed when the STX Character is enabled. This is the ASCII value for the second character to be sent before the actual response data.

17.2.5 Header Text (start of response) enabled (3)

With this option, a free text (see below) can be added immediately before the data packet.

17.2.6 Header Text String (C)

This option is only displayed when the header text is enabled. The actual header text can be edited here. A maximum of 20 ASCII characters is possible; shorter texts can be concluded by pressing <Enter>. Spaces are allowed but not displayed.

17.2.7 Footer Text (end of response) enabled (4)

With this option, a free text (see below) can be added directly after the data packet.

17.2.8 Footer Text String (D)

This option is only displayed when the footer text is enabled. The actual footer text can be edited here. A maximum of 20 ASCII characters is possible; shorter texts can be concluded by pressing <Enter>. Spaces are allowed but not displayed.

17.2.9 ETX Character enabled (5)

The ETX character is the first of two characters to send after the actual response data. It is sent only when this option is enabled.

17.2.10 ASCII Value for ETX Character (E)

This option is only displayed when the ETX Character is enabled. This is the ASCII value for the first character to be sent after the actual response data. The default is 0Dh, which means a carriage return.

17.2.11 EOT Character enabled (6)

The ETX character is the second of two characters to send after the actual response data. It is sent only when this option is enabled.

17.2.12 ASCII Value for EOT Character (F)

This option is only displayed when the EOT Character is enabled. This is the ASCII value for the second character to be sent after the actual response data. The default is 0Ah, which means a line feed.

18 Packet Assembly Menu

18.1 Overview

The menu layout can be seen on the following terminal screenshot. Please note that options related to a specific mode are actually only visible if the corresponding mode is selected.

```
SCEMTEC SmartRead Setup - Packet Assembly Menu

[S] ASCII Value for Common Separator Character ...................... {20h}

[N] NO TAG Results enabled ......................................... <X>
  [R] Use Data Frame as NO TAG Result ................................ < >
  [T] NO TAG Result String ......................... {                }
[E] Empty Results for Non-ID Modes enabled ......................... <X>
[C] One Cluster per Anticollision Cycle enabled ........................ <X>
  [P] Insert Separator Character .................................... < >
[H] Heartbeat enabled .............................................. <X>
  [I] Heartbeat Interval (s) .................................... {0001}
  [F] Use Data Frame as Heartbeat .................................. < >
  [A] ASCII Value for Heartbeat Character ......................... {2Eh}

[D] Debug Output enabled ........................................... < >

[Q] Return to Main Menu

>
```

This sub menu configures how output packet are assembled for transfer to the host. The Q key is used to return to the main menu.

18.2 Details

18.2.1 ASCII Value for Common Separator Character (S)

The common (global) separator character, which can optionally be inserted to separate additional data, can be configured here. It is referred to in several menus, whenever separation is mentioned without a custom separator character option.

18.2.2 NO TAG Results enabled (N)

In some cases, a notification that a read cycle was performed without any response is desired. To enable "No Tag" responses, this option can be used.

18.2.3 Use Data Frame as NO TAG Result (R)

This option is only available when NO TAG results are enabled. When active, the NO TAG result consists of an empty data frame, i. e. anything that is configured to be added to transponder data. This can be reader ID, tag type ID (heartbeat tag type ID is E8h), or anything else. Obviously, this mode is not recommended when no actual data frame is configured!

18.2.4 NO TAG Result String (T)

This option is only available when the NO TAG results is enabled and the "Use Data Frame as NO TAG Result" option is not selected. It is the text string to be used as the NO TAG response.

18.2.5 Empty Results for Non-ID Modes enabled (E)

In all non-ID modes (e. g. block read mode, sensor tag types) there is the possibility that an ID is read but the subsequent tag data access fails. To produce empty result packets upon failure rather than no result packets at all, this option can be enabled. In combination with clustered output mode (see below), it is even obligatory.

18.2.6 One Cluster per Anticollision Cycle enabled (C)

This option can be used to enable or disable clustered result output, hence controlling the scope of a single "output unit":

- When clustering is disabled, an output unit consists of all acquired data from one tag only. For example, if framing contains a line feed, the result will be one tag per line.

- With clustering enabled, an output unit is a concatenation of all data from one anticollision cycle. For example, if framing contains a line feed, the result will be all tags of one anticollision cycle per line. If a timestamp is configured, one timestamp will be added to the whole anticollision cycle results.

18.2.7 Insert Separator Character (P)

When this option is enabled, a separator character (see above) will be inserted between the single results of one cluster.

18.2.8 Heartbeat enabled (H)

When this option is activated, the heartbeat functionality is activated. This means that as soon as no data has been transmitted to the host for a specified time (heartbeat interval in seconds), a single character (heartbeat character, see below) is transmitted. This may be useful e. g. to show the host cyclically that the device is still alive or simply to keep a TCP/IP connection active.

18.2.9 Heartbeat Interval (I)

This option is only available when the heartbeat is enabled. It is the interval in seconds which must pass between a previous data or heartbeat packet and the next heartbeat packet.

18.2.10 Use Data Frame as Heartbeat (F)

This option is only available when the heartbeat is enabled. When active, the heartbeat signal consists of an empty data frame, i. e. anything that is configured to be added to transponder data. This can be reader ID, tag type ID (heartbeat tag type ID is E8h), or anything else. Obviously, this mode is not recommended when no actual data frame is configured!

18.2.11 ASCII Value for Heartbeat Character (A)

This option is only available when the heartbeat is enabled and the "Use Data Frame as Heartbeat" option is not selected. It is the ASCII value for a single heartbeat character. The default is 2Eh, which corresponds to a decimal point (".").

18.2.12 Debug Output enabled (D)

When this option is selected, debug information is transmitted to host in between data packets.

The debug message consists of several fields:

Field no.	Format	Description
1	Decimal	System counter in milliseconds
2	Hex	Tag ID
3	Hex	MUX step numbers (left digit = external; right digit = internal)
4	Text	Category
5	Text	Cause (optional)

Each debug message starts with ">>>" and ends with CR+LF.

Here's an example:

```
>>> 0000006842 5DDE9401000104E0 00 TAGBUF_REFRESH
>>> 0000008544 5DDE9401000104E0 01 OUTPUT_SUPPRESS: Tag buffer match
```

First message: at system time 6842, tag ID 5DDE9401000104E0 with internal (and external) MUX position 0 has been refreshed in the Tag Buffer.

Second message: at system time 8544, tag ID 5DDE9401000104E0 with internal MUX position 1 has been read, but no output packet was generated because tag ID 5DDE9401000104E0 with internal MUX position 1 is already contained in the Tag Buffer.

Currently, debug output is primarily supported by the Tag Buffer and can help finding out why certain packets are not transmitted.

Please remember to disable debug mode when returning to productive operation!

19 Interface Settings Menu

19.1 Overview

The menu layout can be seen on the following terminal screenshot. Please note that options related to a specific mode are actually only visible if the corresponding mode is selected.

```
SCEMTEC SmartRead Setup - Interface Settings Menu

[T] Terminal Menu Timeout (*1s, 0 = Infinite) ....................... {0120}
[W] Stop terminal timeout at first wrong character ..................... <X>
[E] Stop via ESC enabled ............................................... <X>
[R] Output Recovery Time (*100ms) ................................... {0000}

[I] No Data Output ..................................................... (X)
[I] Data Output Interface is RS-232 .................................... ( )
  [H] RS-232 Host Interface Baud Rate ............................. {009600}
[I] Data Output Interface is USB ...................................... ( )
  [M] USB Interface Mode is CDC Serial ............................... ( )
  [M] USB Interface Mode is CDC + HID Composite ...................... ( )
    [K] Data Output via USB HID Keyboard Emulation .................... <X>
      [O] HID Keymap CC (0=def., 1h=us, 21h=fr, 2Ch=uk, 31h=de) ..... {0000h}
  [M] USB Interface Mode is HID Keyboard Emulation ................... ( )
    [O] HID Keymap CC (0=def., 1h=us, 21h=fr, 2Ch=uk, 31h=de) ....... {0000h}
[I] Data Output Interface is TCP/IP Host .............................. ( )
  [A] TCP/IP Host IP Address .................................... {C0A80001h}
  [N] TCP/IP Host Netmask ...................................... {FFFFFF00h}
  [G] TCP/IP Host Default Gateway .............................. {C0A8000Ah}
  [P] TCP/IP Host TCP Port ......................................... {0835h}
[I] Data Output Interface is TCP/IP Client ............................ ( )
  [A] TCP/IP Host IP Address .................................... {C0A80001h}
  [N] TCP/IP Host Netmask ...................................... {FFFFFF00h}
  [G] TCP/IP Host Default Gateway .............................. {C0A8000Ah}
  [D] TCP/IP Client Target IP Address .......................... {C0A80002h}
  [P] TCP/IP Client Target TCP Port ................................ {BEEFh}
  [K] TCP/IP Client keeps up Connection .............................. <X>
[I] Data Output Interface is Bluetooth ................................ ( )
  [M] Bluetooth Interface Mode is SPP-IN ............................. ( )
  [M] Bluetooth Interface Mode is SPP-OUT ............................ (X)
    [H] Remote Host ...................... {"AGYSSIUM" 00:02:72:C4:1A:2C}
  [M] Bluetooth Interface Mode is HID ................................ ( )

[C] Asynchronous Output enabled ....................................... <X>
  [L] Asynchronous Output Timeout (*100ms) .......................... {0010}
[B] Use FIFO Buffer for Host Transmission ............................. <X>
  [F] Use FIFO Buffer in AUTO Mode .................................. (X)
  [F] Use FIFO Buffer in TRIGGERED Mode ............................. ( )
  [F] Use FIFO Buffer in STX/ETX Mode ............................... ( )
      FIFO Buffer Total Size .................................... {032720}
      FIFO Buffer Used .......................................... {000000}

[S] Secondary RS-232 Interface Baud Rate ........................... {009600}
```

```
[D] Mirror Data to LCD ......................................... <X>
  [J] Display Timeout (s) ...................................... {0000}
  [V] Show Tag ID Only (if available) .......................... < >
  [Y] Truncate Head Characters ................................. {00}
  [Z] Truncate Tail Characters ................................. {00}
  [W] Bounce Scrolling enabled ................................. < >

[Q] Return to Main Menu

>
```

This sub menu configures common interface settings of the SmartRead firmware component. The Q key is used to return to the main menu.

19.2 Details

19.2.1 Terminal Menu Timeout (T)

This is the timeout for pressing the menu activation character after power on, given in seconds. After this timeout, the device must be restarted in order to activate the menu.

To enable the SmartRead menu for infinite time, the timeout can be set to zero.

19.2.2 Stop Terminal Timeout after first wrong character (W)

When this option is activated, the menu will also be deactivated until restart whenever a character different from the menu activation character is received. This rule, of course, applies only as long as the menu has not been activated yet.

19.2.3 Stop via ESC enabled (E)

When this option is activated, SmartRead will terminate all standalone activities when an ESC character is received on the host interface.

19.2.4 Output Recovery Time (R)

To insert a pause between single outputs (e. g. tag IDs), use this menu item to specify the pause length in units of 100 milliseconds.

19.2.5 No Data Output (I)

When this mode is active, no data is transmitted. This mode can be useful if output triggers are activated and no data transmission is needed.

19.2.6 Data Output Interface is RS-232 (I)

When this mode is active, all SmartRead data packets are routed through the RS-232 interface. This can be a native interface, but also an external USB-to-RS232 cable.

19.2.7 RS-232 Host Interface Baud Rate (H)

The baud rate of the serial host interface (RS232) can be configured here. Supported baud rate values are: 1200, 2400, 4800, 9600 (default), 19200, 28800, 38400, 57600, 115200 and 230400.

19.2.8 Data Output Interface is USB (I)

When this mode is active, all SmartRead data packets are routed through the USB interface. One of several available native USB modes can be configured, including CDC (serial interface emulation) or HID (keyboard emulation).

19.2.9 USB Interface Mode is CDC Serial (M)

This USB mode enables the serial interface emulation (CDC, character device class) only.

A mode change will take effect upon the next USB connection, i. e. when the device submits the new descriptors to the host.

Additional notes for Windows systems:

- Serial mode requires at least Windows 2000 and `scemtec-cdc.inf`.
- It may be necessary to install an additional driver (see above) after changing the USB mode and reconnecting.

Additional notes for Linux systems:

- None; all modes should work out of the box with no additional drivers.

19.2.10 USB Interface Mode is CDC + HID Composite (M)

This USB mode enables both the serial interface emulation and HID keyboard emulation as a composite device.

A mode change will take effect upon the next USB connection, i. e. when the device submits the new descriptors to the host.

Additional notes for Windows systems:

- Composite mode requires at least Windows XP SP3 and `scemtec-cdc-hid.inf`.
- It may be necessary to install an additional driver (see above) after changing the USB mode and reconnecting.

Additional notes for Linux systems:

- None; all modes should work out of the box with no additional drivers.

19.2.11 Data Output via USB HID Keyboard Emulation (K)

This option is only displayed when USB mode is "CDC + HID Composite". When this checkbox is selected, all formatted tag data is sent to the USB HID interface instead of the USB CDC serial data link. The terminal menu, on the other hand, is *not* redirected by this setting.

Please note that this feature is primarily intended for transferring raw hex tag data; any special characters (framing or ASCII tag data) may be dropped. Internally, ASCII data needs to be converted into keyboard scan codes, which is currently not supported for all possible characters. The "standard" <CR><LF> combination will work correctly, since the <CR> is converted into the ENTER key, whereas the <LF> is dropped as unknown character. Also the TAB (09h) and ESC (1Bh) characters are supported.

19.2.12 HID Keyboard CC (O)

This option is only displayed when USB mode is "CDC + HID Composite" (with HID data output enabled) or "HID Keyboard Emulation". This is the country code to be used for HID keyboard translation. The following keymaps are supported at the moment:

CC	Country	Description
0000h, 0001h, 002Ch	Default, US (1), UK (44)	Standard QWERTY keyboard.
0021h	France (33)	French AZERTY keyboard with numbers shifted.
0031h	Germany (49)	German QWERTZ keyboard with umlauts.

Unsupported key mappings or special characters can be added on request.

19.2.13 USB Interface Mode is HID Keyboard Emulation (M)

This USB mode enables the HID (human interface device) keyboard emulation only.

Please note that this pure HID mode can be unavailable on some USB-only devices to prevent bricking the unit (once the USB interface is pure HID, there would be no way to access the SmartRead configuration menu).

A mode change will take effect upon the next USB connection, i. e. when the device submits the new descriptors to the host.

Additional notes for Windows systems:

- HID mode requires at least Windows 2000.

- It may be necessary to install an additional driver (see above) after changing the USB mode and reconnecting.

Additional notes for Linux systems:

- None; all modes should work out of the box with no additional drivers.

19.2.14 HID Keyboard CC (O)

See above, chapter 19.2.12.

19.2.15 Data Output Interface is TCP/IP Host (I)

When this mode is active, all SmartRead data packets are routed through the TCP/IP Host interface. An external client opens a connection to the device, and all upcoming data is sent over this connection.

19.2.16 TCP/IP Host IP Address (A)

This is the device's own IP address in hex notation. For example, `192.168.0.1` would translate to `C0.A8.00.01`, which is seen in the example screen shot.

When the IP address is zero, DHCP is active and instead of `00000000h`, the IP address reads "`D H C P`".

19.2.17 TCP/IP Host Netmask (N)

This option is only displayed when DHCP is not active (see IP address above). It is the device's own net mask in hex notation. For example, `255.255.255.0` would translate to `FF.FF.FF.00`.

19.2.18 TCP/IP Host Default Gateway (G)

This option is only displayed when DHCP is not active (see IP address above). It is the device's own default gateway in hex notation. For example, `192.168.0.10` would translate to `C0.A8.00.0A`.

19.2.19 TCP/IP Host TCP Port (P)

This is the TCP port a client must use to connect to this device (in hex notation, of course). Default is port 2101, which corresponds to `0835h` in hex notation.

19.2.20 Data Output Interface is TCP/IP Client (I)

When this mode is active, all SmartRead data packets are routed through the TCP/IP Client interface. The SmartRead device opens a connection to a preconfigured IP address and sends all upcoming data over this connection.

19.2.21 TCP/IP Client Target IP Address (D)

This is the target IP address the device is supposed to connect to, in hex notation. For example, `192.168.0.2` would translate to `C0.A8.00.02`.

19.2.22 TCP/IP Client Target TCP Port (P)

This is the TCP port (in hex notation) the device is supposed to use when connecting to a host. Default is port 12101, which corresponds to 2F45h in hex notation.

19.2.23 TCP/IP Client keeps up Connection (K)

When enabled, the device establishes one connection and transmits all data on this connection afterwards. When disabled, the device closes the connection after each output packet and establishes a new connection for the next one.

The optimum for this switch depends very much on the specific application.

19.2.24 Data Output Interface is Bluetooth (I)

When this mode is active, all SmartRead data packets are routed through the Bluetooth interface. One of several available Bluetooth modes can be configured, including SPP-IN (host), SPP-OUT (client) or HID (keyboard emulation).

19.2.25 Bluetooth Interface Mode is SPP-IN (M)

This bluetooth mode enables SPP-IN operation: the device acts as a host. Connections are always established from outside.

19.2.26 Bluetooth Interface Mode is SPP-OUT (M)

This bluetooth mode enables SPP-OUT operation: the device acts as a client. It establishes a connection to specified host (see "Remote Host" below) as soon as there is data to be transmitted.

19.2.27 Remote Host (H)

This option is only displayed when SPP-OUT mode is active (see above). Here the target host address can be selected. Once selected, the device will search for available hosts; every subsequent selection cycles through the list of available hosts. Upon reaching the first host again, a new search will be performed.

19.2.28 Bluetooth Interface Mode is HID (M)

This bluetooth mode enables the HID (human interface device) keyboard emulation.

19.2.29 Asynchronous Output enabled (C)

By default, host data transmission blocks SmartRead until all data has been transmitted and the transmitter is ready for the next data packet. The Asynchronous Output option can be used to switch

to asynchronous transmission, i. e. data is transmitted while SmartRead continues reading. If new data packets arrive before transmission has finished, they are dropped after a specified timeout (see below). The number of dropped packets can be accessed via Ancillary Data (see chapter 15.2.9).

Since Asynchronous Output is a simple version of the FIFO Buffer (see below), both modes cannot be used simultaneously.

19.2.30 Asynchronous Output Timeout (L)

This option is only displayed when Asynchronous Output is enabled (see above). To avoid uncontrollable data loss due to the transmitter not being ready in time, a timeout can be specified. The ideal timeout value depends very much on the application and the decision between quick responsiveness and completeness of data.

19.2.31 Use FIFO Buffer for Host Transmission (B)

This menu item is only visible if the device is equipped with FIFO memory. Instead of transmitting data directly to host, it is routed through a FIFO (first in, first out) queue buffer. Depending on its operation mode (see below), FIFO buffer contents can be transmitted to host either automatically or manually.

Since the FIFO Buffer is an advanced version of Asynchronous Output (see above), both modes cannot be used simultaneously.

19.2.32 Use FIFO Buffer in AUTO Mode (F)

This item is only visible if the device is equipped with FIFO memory and FIFO Buffer is enabled (see above). When this mode is active, data is transmitted to host as soon as a host link is detected (all interfaces with link detection support, i. e. all except RS232), or immediately (all interfaces without link detection support, i. e. RS232).

19.2.33 Use FIFO Buffer in TRIGGERED Mode (F)

This item is only visible if the device is equipped with FIFO memory and FIFO Buffer is enabled (see above). This mode is similar to AUTO mode, the difference being that data is transmitted only as soon and as long as an input trigger (see Input Triggers Menu, chapter 21) event is detected and input trigger is configured to FIFO mode.

19.2.34 Use FIFO Buffer in STX/ETX Mode (F)

This item is only visible if the device is equipped with FIFO memory and FIFO Buffer is enabled (see above). When this mode is active, data is not transmitted automatically. Instead, the STX/ETX function $107A$ can be used to read data from the FIFO buffer (see sttID STX/ETX protocol specification).

19.2.35 FIFO Buffer Total Size

This item is only visible if the device is equipped with FIFO memory and FIFO Buffer is enabled (see above). It is not selectable, and only shows the total number of bytes available in the FIFO buffer. Bytes in use are not subtracted.

19.2.36 FIFO Buffer Used

This item is only visible if the device is equipped with FIFO memory and FIFO Buffer is enabled (see above). It is not selectable, and only shows the number of currently used bytes in the FIFO buffer.

19.2.37 Secondary Interface Baud Rate (S)

This menu item is only visible if there is a secondary RS232 interface equipped on the device. The baud rate of that interface can be configured here. Supported baud rate values are: 1200, 2400, 4800, 9600 (default), 19200, 28800, 38400, 57600, 115200 and 230400.

20 Display Settings Menu

20.1 Overview

The menu layout can be seen on the following terminal screenshot. Please note that options related to a specific mode are actually only visible if the corresponding mode is selected.

```
SCEMTEC SmartRead Setup - Display Settings Menu

[D] Show Data on LCD ....................................... <X>

[T] Display Timeout (s) ................................... {0000}
[I] Show Tag ID Only (if available) ...................... < >
[H] Truncate Head Characters ............................. {00}
[L] Truncate Tail Characters ............................. {00}
[B] Bounce Scrolling enabled ............................. < >
[R] Remove old data on NOTAG event ....................... < >

[C] Fixed view enabled ................................... ( )
[C] Cycle views enabled .................................. (X)
  [P] Input Key Pattern .................................. {81h}

[0] Display data in two rows ............................. <X>
[1] Display old data in second row ....................... <X>
[2] Display statistics in second row ..................... <X>
[3] Display group information in second row .............. < >
[4] Display FIFO information in second row ............... <X>

[Q] Return to Main Menu

>
```

This sub menu configures common display settings of the SmartRead firmware component. The Q key is used to return to the main menu. Some of the options are only visible if supported by the device and current configuration.

20.2 Details

20.2.1 Show Data on LCD (D)

When enabled, each packet that is transferred to the host is also shown on the LCD. Data is displayed accordingly to the view currently selected (see below).

20.2.2 Display Timeout (T)

This option defines the time after which the last displayed data will be automatically cleared from

the LCD screen.

20.2.3 Show Tag ID only (I)

When enabled, only the tag ID is shown instead of all data formatted through the several data processing steps. This can be necessary if data output to the host is too complex to be shown on LCD.

20.2.4 Truncate Head Characters (H)

To make output data fit the LCD screen and reduce or eliminate scrolling, it can be cropped using this option. It represents the number of characters to be cut at the beginning.

20.2.5 Truncate Tail Characters (L)

To make output data fit the LCD screen and reduce or eliminate scrolling, it can be cropped using this option. It represents the number of characters to be cut at the end.

20.2.6 Bounce Scrolling enabled (B)

When enabled, data is always scrolled from right to left and back again. The default is to always cycle the data from right to left.

20.2.7 Remove old data on NOTAG event (R)

By enabling this option, the last displayed data will be cleared from the display if no transponder was found in the current cycle.

20.2.8 Fixed view enabled (C)

This option selects one fixed view to display the data. See below how to select the view.

20.2.9 Cycle views enabled (C)

Using this option, the view can be changed by pressing a button on the device. See below how to enable views.

20.2.10 Input Key Pattern (P)

This is the key pattern to use to cycle the SmartRead display view (see Input Triggers, chapter 21.2.19 for details about the pattern). The preset value `81h` corresponds to the MODE key pressed for more than one second on most devices. The pattern is entered by pressing the desired button on

the device.

20.2.11 Display data in two rows (0)

The data is displayed in the first line of the display. If the data is too long for one line, each half of the data is displayed in one of the first two lines.

20.2.12 Display old data in second row (1)

The data is displayed in the first line only. If the data is too long for this line, the data is scrolled. The second line is used to display the last data.

20.2.13 Display statistics in second row (2)

The data is displayed in the first line only. If the data is too long for this line, the data is scrolled. The second line is used to show the amount of tags in the current cycle and, if configured, the number of items stored in the Tag Buffer.

20.2.14 Display group information in second row (3)

The data is displayed in the first line only. If the data is too long for this line, the data is scrolled. The second line is used to show the group information comprising the current group and the items stored in this group.

20.2.15 Display FIFO information in second row (4)

The data is displayed in the first line only. If the data is too long for this line, the data is scrolled. The second line is used to show the size of the used memory in bytes and the fill level of the FIFO in per cent.

21 Input Triggers Menu

21.1 Overview

The menu layout can be seen on the following terminal screenshot. Please note that options related to a specific mode are actually only visible if the corresponding mode is selected.

```
SCEMTEC SmartRead Setup - Input Triggers Menu

[T] Input Triggers enabled ............................................... < >
[D] Switch-Off Delay Time (*100ms) .................................. {0000}
  [R] No Refresh on Tag Detect ........................................ (X)
  [R] Refresh Switch-Off Delay Time on Tag Detect ...................... ( )
  [R] Immediately Switch Off Trigger on Tag Detect .................... ( )
  [L] Total Refresh Limit (*100ms, 0 = Unlimited) .................... {0025}
    [E] Count Limit from End Of Trigger rather than Start ............... <X>
[O] Hold Output until End Of Trigger .................................. < >
[J] Discard Data after End Of Trigger .................................. < >
[U] Feed Input Trigger Status into Port Buffer ......................... < >

[M] Triggered Read Mode .................................................. (X)
[M] Triggered Data Output Mode ......................................... ( )
[M] Triggered Tag Buffer Output Mode ................................... ( )
[M] Triggered FIFO Buffer Output Mode .................................. ( )

[S] Source is Digital Input Port(s) .................................... (X)
  [P] Input Port Pattern ............................................. {00h}
  [I] Invert Input Port(s) ........................................... < >
[S] Source is Keyboard .................................................. ( )
  [K] Input Key Pattern .............................................. {00h}
[S] Source is Host Interface ........................................... (X)
  [B] Feed Trigger Character into Port Buffer ......................... <X>
  [C] Require Specific Trigger Character .............................. <X>
    [V] ASCII Value for Trigger Character ............................ {0Dh}
[S] Source is EAS Detection ............................................ ( )

[H] Tag Reset on Trigger Start enabled ................................. < >
[F] Tag Reset on Trigger End enabled .................................. < >

[Q] Return to Main Menu

>
```

This sub menu configures the input triggers which can be enabled/disabled for both Primary and Secondary Read. The Q key is used to return to the main menu.

21.2 Details

21.2.1 Input Triggers enabled (T)

This is the main switch to quickly enable/disable all configured input triggers.

21.2.2 Switch-Off Delay Time (D)

This is the delay time for which a trigger remains active internally after its source has become inactive. Imagine a key pressed for 100ms, or a light barrier tripped for 200ms, but you wish to read for at least one second. In that case, you would enter a delay of one second here.

A delay of 0 means that even in case of an extremely short external trigger pulse, one complete reading cycle is processed.

21.2.3 No Refresh on Tag Detect (R)

The given delay time is used regardless of transponder recognition. This menu is only visible if a Switch-Off Delay Time is configured.

21.2.4 Refresh Switch-Off Delay on Tag Detect (R)

The delay time is refreshed as long as a transponder is detected. The input trigger expires if no tag is detected for the configured delay time. This menu is only visible if a Switch-Off Delay Time is configured.

21.2.5 Immediately Switch Off Trigger on Tag Detect (R)

The input trigger expires immediately after the detection of a transponder. This menu is only visible if a Switch-Off Delay Time is configured.

21.2.6 Total Refresh Limit (L)

This option is only displayed when "Refresh Switch-Off Delay on Tag Detect" is selected. It can be used to wrap a global timeout around refreshing the Switch-Off Delay Time. Once this time is reached, counting from the beginning (or end, depending on the "Count Limit from End Of Trigger rather than Start" option below) of the trigger signal, any further refresh will be suppressed until there is another input trigger signal.

21.2.7 Count Limit from End Of Trigger rather than Start (E)

This option is only displayed when "Refresh Switch-Off Delay on Tag Detect" is selected and Total Refresh Limit is enabled (i. e. non-zero). It determines where exactly the Total Refresh Limit is

applied: when unselected, the limit is counted from the start of the input trigger signal, whereas when selected, the limit is counted from the end of the input trigger signal.

21.2.8 Hold Output until End Of Trigger (O)

When enabled, all data output (or NO TAG message) will be deferred until the trigger is no longer active, as well as any configured output triggers.

Please be aware that actually no data is buffered when using this option; hence only the first available response will be transmitted when the trigger becomes inactive, effectively disabling anticollision (if enabled) and multiple tag types (also if enabled).

21.2.9 Discard Data after End Of Trigger (J)

When enabled, all data output (or NO TAG message) will be discarded if the trigger became inactive during the tag scan cycle. This option can be used if it must be made sure that absolutely no data is transmitted as long as the input trigger is inactive.

Please keep in mind that this mode bears the risk of (purposely) losing data.

21.2.10 Feed Input Trigger Status into Port Buffer (U)

The Port Buffer can be used to conditionally set digital output ports. When this option is enabled, the current Input Trigger status is fed into the Port Buffer as a binary pattern.

21.2.11 Triggered Read Mode (M)

This mode makes the most sense in typical applications. It means that when a trigger event is detected, the reading procedure is started, and it is stopped when the trigger is removed (plus delay time as described above).

21.2.12 Triggered Data Output Mode (M)

In contrast to the Triggered Read Mode, in this mode reading takes place continuously, as if no input triggers were configured at all. Instead, data output is suppressed as long as there is no trigger active. The delay time (see above) also applies to this mode.

21.2.13 Triggered Tag Buffer Output Mode (M)

This mode is particularly useful with the Tag Buffer mode "Use Tag Buffer to store IDs for Input Trigger". Any Input Trigger event causes the current Tag Buffer contents to be immediately transmitted to the host; afterwards the Tag Buffer is cleared.

21.2.14 Triggered FIFO Buffer Output Mode (M)

This menu item is only visible if the device is equipped with FIFO memory. When the FIFO (first in, first out) queue buffer is configured to TRIGGERED mode (see chapter 19.2.33 et seqq.), SmartRead waits for this trigger event before transmitting data to host.

21.2.15 Source is Digital Input Port (S)

When selected, one (or more) of the general purpose digital input ports provided by many device types is/are used as an input trigger. If no ports are available, this source never raises a trigger.

21.2.16 Input Port Pattern (P)

This option is only displayed when "Digital Input Port" is selected as a source. It contains a binary coded hex value with each input port represented by one bit. Bit #0 is first port, bit #1 is second port, and so on. To use input 1 as a trigger, enter "01h" here. To use input 2 as a trigger, enter "02h". To get a trigger event when either input 1 or input 2 becomes active, enter "03h".

21.2.17 Invert Input Port (I)

This option is only displayed when "Digital Input Port" is selected as a source. If you wish the input port trigger to become low-active, i. e. inverted, enable this option.

21.2.18 Source is Keyboard (S)

When selected, a specified key of a handheld device is used as an input trigger. If no keyboard is available, this source never raises a trigger.

21.2.19 Input Key Pattern (K)

This option is only displayed when "Keyboard" is selected as a source. This is the key code to be used as a trigger. The pattern is entered by pressing the desired button on the device.

Valid key codes for SIH-900 and SIH-2100 devices:

Key code	Key name	Key press duration [s]
00h	Power	< 1
01h	Mode	< 1
02h	Read	< 1
80h	Power	≥ 1
81h	Mode	≥ 1
82h	Read	≥ 1

21.2.20 Source is Host Interface (S)

When selected, any available host interface can be used to send an input trigger. Whenever either an arbitrary or a specific character (see below) is received via host interface, a trigger is fired.

21.2.21 Feed Trigger Character into Port Buffer (B)

This option is only displayed when "Host Interface" is selected as a source. The Port Buffer can be used to conditionally set digital output ports. When this option is enabled, the received trigger character is fed into the Port Buffer as a binary pattern. This can be useful when Input Trigger is directly coupled to Output Trigger in order to make output ports host controllable.

21.2.22 Require Specific Trigger Character (C)

This option is only displayed when "Host Interface" is selected as a source. When enabled, a specific character is required to fire the trigger (see below). When disabled, the trigger will be fired on any character.

21.2.23 ASCII Value for Trigger Character (V)

This option is only displayed when "Host Interface" is selected as a source. It contains a hex ASCII value for the character to be used as a trigger character. The default value is "0Dh" (carriage return), so pressing the <Enter> key in the terminal will fire a trigger.

21.2.24 Source is EAS Detection (S)

When selected, EAS alarm detection is used as an input trigger. Internally, only EAS alarm functions available for the configured transponder types are polled, e. g. Icode SLI for ISO15693. The "EAS" transponder types do not need to be selected if no additional EAS output is desired.

21.2.25 Tag Reset on Trigger Start enabled (H)

This option makes an HF reset happen when the configured input trigger becomes active, returning the tags to a defined state before scanning.

On some systems, e. g. when using Class 1 Gen.2 compatible protocols, the HF reset is replaced by a specific tag reset command to support persistence.

When using this option, it is usually a good idea to disable the Tag Reset options in the Primary Read menu!

21.2.26 Tag Reset on Trigger End enabled (F)

This option, makes an HF reset happen when the configured input trigger becomes inactive, returning the tags to a defined state after scanning.

On some systems, e. g. when using Class 1 Gen.2 compatible protocols, the HF reset is replaced by a specific tag reset command to support persistence.

When using this option, it is usually a good idea to disable the Tag Reset options in the Primary Read menu!

22 Output Triggers Menu

22.1 Overview

The menu layout can be seen on the following terminal screenshot. Please note that options related to a specific mode are actually only visible if the corresponding mode is selected.

```
SCEMTEC SmartRead Setup - Output Triggers Menu

[C] Trigger Holdoff Time (*100ms, 0=Continuous Retriggering) ........ {0500}
  [6] Isochronously Repeated Trigger enabled ........................... < >
[7] Set TAG/EAS Triggers BEFORE Data Transmission .................... < >
[8] Operate TAG/EAS Triggers in AND Mode ............................. < >

[1] Port Set Time for INPUT TRIGGER (*100ms) ........................ {0005}
[T] Port Set Time for TAG DETECT (*100ms) ........................... {0005}
[M] Port Set Time for MULTI TAG (*100ms) ............................ {0005}
[E] Port Set Time for EAS ALARM (*100ms) ............................ {0005}
[N] Port Set Time for NO TAG (*100ms) ............................... {0005}

[2] GP Relay coupled to INPUT TRIGGER ................................ < >
[R] GP Relay coupled to TAG DETECT .................................. < >
[U] GP Relay coupled to MULTI TAG ................................... < >
[L] GP Relay coupled to EAS ALARM ................................... < >
[G] GP Relay coupled to NO TAG ...................................... < >

[3] Buzzer Pattern on INPUT TRIGGER ............................... {0000h}
[B] Buzzer Pattern on TAG DETECT .................................. {0000h}
[Z] Buzzer Pattern on MULTI TAG ................................... {0000h}
[S] Buzzer Pattern on EAS ALARM ................................... {0000h}

[4] Display Backlight Pattern on INPUT TRIGGER .................... {0000h}
[J] Display Backlight Pattern on TAG DETECT ....................... {0000h}
[K] Display Backlight Pattern on MULTI TAG ........................ {0000h}
[V] Display Backlight Pattern on EAS ALARM ........................ {0000h}

[5] Output Port Pattern to set on INPUT TRIGGER ..................... {00h}
[D] Output Port Pattern to set on TAG DETECT ....................... {00h}
[W] Output Port Pattern to set on MULTI TAG ........................ {00h}
[A] Output Port Pattern to set on EAS ALARM ........................ {00h}
[O] Output Port Pattern to set on NO TAG ........................... {00h}
[H] Use Port Buffer Value as INPUT Output Port Pattern ............. <X>
[P] Use Port Buffer Value as TAG Output Port Pattern ............... < >
[F] Use Port Buffer Value as EAS Output Port Pattern ............... < >
[I] Inversion Pattern for Output Ports ............................. {00h}

[Q] Return to Main Menu

>
```

This sub menu configures the output triggers which can be enabled/disabled for both Primary and

Secondary Read. The Q key is used to return to the main menu.

22.2 Details

22.2.1 Trigger Holdoff Time (C)

This option determines what to do when a trigger occurs repeatedly (e. g. a continuous TAG DETECT event in case a tag is placed in the field permanently).

When the Holdoff Time is zero, Output Triggers will be set continuously as long as the trigger event is supplied (plus the configured Set Time, see below).

When the Holdoff Time is non-zero, it specifies how long ports and relay will be forced into their default state after the configured Set Time (see below) has elapsed and before being set the next time. This operation mode is supplemented by the "Isochronously Repeated Trigger" option (see below).

22.2.2 Isochronously Repeated Trigger enabled (6)

This option is only displayed if the "Trigger Holdoff Time" (see above) is configured to a non-zero value.

When disabled, output ports and relay remain in their default state after returning from a trigger until the trigger status actually changes (e. g. tag removed from the field for a short time). To put it simple, a trigger will be generated only once.

When enabled, the port is reactivated after the configured Holdoff Time even if the tag remains in the field, leading to isochronous trigger activation.

22.2.3 Set TAG/EAS Triggers BEFORE Data Transmission (7)

The default behaviour is to process all triggers during a summary process after having finished reading all selected tag types. Before this point, there is not enough data available to decide upon the "NO TAG" and "MULTI TAG" triggers.

In some cases, it may be necessary to set the "TAG" or "EAS" trigger even before data output. Imagine a slow or unstable WLAN connection – it may be critical if a port switch is delayed for several seconds.

As a supplement, it is recommended to activate Asynchronous Output (see chapter 19.2.29) to make sure SmartRead does not get blocked by a non-responsive interface.

Please note that a combination of "Set Triggers BEFORE Data Transmission" and "Operate Triggers in AND Mode" is not possible and will automatically be deactivated.

22.2.4 Operate TAG/EAS Triggers in AND Mode (8)

The default behaviour is OR operation mode, i. e. outputs are triggered if at least ONE of the selected tag types has been read.

In some truly exotic cases it may be desirable to have an AND operation mode rather than the default OR mode, e. g. if you have EAS and ID mode active and want a trigger event only if both EAS and ID have been detected in one and the same cycle.

Please note that a combination of "Set Triggers BEFORE Data Transmission" and "Operate Triggers in AND Mode" is not possible and will automatically be deactivated.

22.2.5 Port Set Time for INPUT TRIGGER (1)

This is the duration (in milliseconds) between a triggered *set* and the automatic *reset* of the relay/ports in case of an "input trigger" event, hence the output being coupled directly to the input trigger.

22.2.6 Port Set Time for TAG DETECT (T)

This is the duration (in milliseconds) between a triggered *set* and the automatic *reset* of the relay/ports in case of a "tag detect" event.

22.2.7 Port Set Time for MULTI TAG (M)

This is the duration (in milliseconds) between a triggered *set* and the automatic *reset* of the relay/ports in case of a "multiple tag detect" (more than one tag in an anticollision round) event.

22.2.8 Port Set Time for EAS ALARM (E)

This is the duration (in milliseconds) between a triggered *set* and the automatic *reset* of the relay/ports in case of an "EAS alarm" event.

22.2.9 Port Set Time for NO TAG (N)

This is the duration (in milliseconds) between a triggered *set* and the automatic *reset* of the ports in case of a "no tag" event.

22.2.10 GP Relay coupled to INPUT TRIGGER (2)

When this mode is selected, the reader's general purpose relay is activated whenever an input trigger event is fired, hence the output being coupled directly to the input trigger. The relay is reset automatically after the configured duration for "input trigger" has expired.

22.2.11 GP Relay coupled to TAG DETECT (R)

When this mode is selected, the reader's general purpose relay is activated whenever at least one tag is detected during a read function. The relay is reset automatically after the configured duration for "tag detect" has expired.

22.2.12 GP Relay coupled to MULTI TAG (U)

When this mode is selected, the reader's general purpose relay is activated whenever more than one tag is detected during a read function. The relay is reset automatically after the configured duration for "tag detect" has expired.

22.2.13 GP Relay coupled to EAS ALARM (L)

When this mode is selected, the reader's general purpose relay is activated whenever an EAS alarm occurs during a read function. The relay is reset automatically after the configured duration for "EAS alarm" has expired.

22.2.14 GP Relay coupled to NO TAG (G)

When this mode is selected, the reader's general purpose relay is activated whenever no tag is detected during a read cycle. The relay is reset automatically after the configured duration for "no tag" has expired.

22.2.15 Buzzer Pattern on INPUT TRIGGER (3)

This option is only displayed when a buzzer is available. When configured, the reader's buzzer is activated according to the pattern whenever an input trigger event is fired, hence the output being coupled directly to the input trigger. The most significant bit is shifted out first.

22.2.16 Buzzer Pattern on TAG DETECT (B)

This option is only displayed when a buzzer is available. When configured, the reader's buzzer is activated according to the pattern whenever at least one tag is detected during a read function. The most significant bit is shifted out first.

22.2.17 Buzzer Pattern on MULTI TAG (Z)

This option is only displayed when a buzzer is available. When configured, the reader's buzzer is activated according to the pattern whenever more than one tag is detected during a read function. The most significant bit is shifted out first.

22.2.18 Buzzer Pattern on EAS ALARM (S)

This option is only displayed when a buzzer is available. When configured, the reader's buzzer is activated according to the pattern whenever an EAS alarm occurs during a read function. The most significant bit is shifted out first.

22.2.19 Display Backlight Pattern on INPUT TRIGGER (4)

This option is only displayed when an LCD with backlight is available. When configured, the reader's LCD backlight is activated according to the pattern whenever an input trigger event is fired, hence the output being coupled directly to the input trigger. The most significant bit is shifted out first.

22.2.20 Display Backlight Pattern on TAG DETECT (J)

This option is only displayed when an LCD with backlight is available. When configured, the reader's LCD backlight is activated according to the pattern whenever at least one tag is detected during a read function. The most significant bit is shifted out first.

22.2.21 Display Backlight Pattern on MULTI TAG (K)

This option is only displayed when an LCD with backlight is available. When configured, the reader's LCD backlight is activated according to the pattern whenever more than one tag is detected during a read function. The most significant bit is shifted out first.

22.2.22 Display Backlight Pattern on EAS ALARM (V)

This option is only displayed when an LCD with backlight is available. When configured, the reader's LCD backlight is activated according to the pattern whenever an EAS alarm occurs during a read function. The most significant bit is shifted out first.

22.2.23 Output Port Pattern to set on INPUT TRIGGER (5)

Whenever an input trigger event is fired, the bits specified in this binary pattern are set to *high* on the digital output ports, hence the output being coupled directly to the input trigger. They are reset to *low* automatically after the configured duration for "input trigger" has expired.

22.2.24 Output Port Pattern to set on TAG DETECT (D)

Whenever at least one tag is detected during a read function, the bits specified in this binary pattern are set to *high* on the digital output ports. They are reset to *low* automatically after the configured duration for "tag detect" has expired.

22.2.25 Output Port Pattern to set on TAG DETECT (W)

Whenever more than one tag is detected during a read function, the bits specified in this binary pattern are set to *high* on the digital output ports. They are reset to *low* automatically after the configured duration for "tag detect" has expired.

22.2.26 Output Port Pattern to set on EAS ALARM (A)

Whenever an EAS alarm occurs during a read function, the bits specified in this binary pattern are set to *high* on the digital output ports. They are reset to *low* automatically after the configured duration for "EAS alarm" has expired.

22.2.27 Output Port Pattern to set on NO TAG (O)

Whenever no tag is detected during a read cycle, the bits specified in this binary pattern are set to *high* on the digital output ports. They are reset to *low* automatically after the configured duration for "no tag" has expired.

22.2.28 Use Port Buffer Value as INPUT Output Port Pattern (H)

The Port Buffer can be used to conditionally set digital output ports. When this option is enabled, the current Port Buffer value is applied to the digital output ports upon input trigger events, overriding any "Output Port Pattern" specified above.

22.2.29 Use Port Buffer Value as TAG Output Port Pattern (P)

The Port Buffer can be used to conditionally set digital output ports. When this option is enabled, the current Port Buffer value is applied to the digital output ports upon tag detection, overriding any "Output Port Pattern" specified above.

22.2.30 Use Port Buffer Value as EAS Output Port Pattern (F)

The Port Buffer can be used to conditionally set digital output ports. When this option is enabled, the current Port Buffer value is applied to the digital output ports upon EAS detection, overriding any "Output Port Pattern" specified above.

22.2.31 Inversion Pattern for Output Ports (I)

This option applies to the three output port patterns described above. It can be used to invert specific output ports. All ports whose bit is set in the inversion pattern become inverted.

23 Appendix A: TCP/IP Host Demo (Java)

The following Java source code is supposed to help set up a simple TCP/IP host for testing the SmartRead TCP/IP client mode. It is multi-threaded to allow multiple connections, but that's about it already – nothing too sophisticated, to keep it straightforward and comprehensible.

The source code is also available directly from sttID.

```java
/*
 * File TcpIpHost.java
 * Created on 2010-10-20
 */

package com.stt_rfid.tcpiphost;

import java.io.*;
import java.net.*;

/**
 * The TCP/IP Host demo
 * @author H. Lenz
 */
public class TcpIpHost {
  private static final int PORT=0xbeef; // The TCP port to listen on
  private static boolean KEEP_UP=true; // True to keep up one single connection; false to close connection on EOF
  private static int id=0; // The connection ID which is increased for each connection

  /**
   * The main function
   * @param args Command line arguments (not used)
   */
  public static void main(String[] args) {
    ServerSocket servsock=null;
    System.out.println("TCP/IP Host Demo by Scemtec Transponder Technology");
    System.out.println("Please make sure the correct mode is configured in global variable KEEP_UP.");
    System.out.println("*** Current mode: KEEP_UP="+Boolean.toString(KEEP_UP)+" "+
        (KEEP_UP?"(one connection for all transactions from each client).":
                 "(one connection for each transaction from each client)."));
    try { // Create the server socket
      servsock=new ServerSocket(PORT);
    } catch(IOException x) { // Socket is occupied
      System.out.println("*** Port "+PORT+" is already in use - exiting.");
      System.exit(1);
    }
    while(true) { // Keep on listening for new connections and servicing them
      TcpIpHost server=new TcpIpHost();
      server.tcpIpHostService(servsock);
    }
    // System.exit(0); // We'll never get here
  }

  /**
   * Listen for a new connection and create a connection thread when connected
   * @param servsock The server socket to listen on
   */
  private void tcpIpHostService(ServerSocket servsock) {
    System.out.println("["+id+"] Listening for TCP/IP connection on port "+PORT+"...");
    try {
      Socket sock=servsock.accept(); // Wait until a new connection from outside is requested
      System.out.println("["+id+"] Incoming connection established from "+
                  sock.getInetAddress().getCanonicalHostName()+" ("+
                  sock.getInetAddress().getHostAddress()+").");
      Thread input=new TcpIpHostInThread(sock, id++, KEEP_UP); // Create new connection thread...
      input.start(); // ...and start it
    } catch(IOException x) { // An exception occurred: print stack trace and exit
      printStackTrace(x);
      System.exit(1);
    }
  }
}
```

```java
/**
 * Print a stack trace for specified exception
 * @param x Exception to print a stack trace for
 */
private static void printStackTrace(Throwable x) {
  for(int i=0; i<x.getStackTrace().length; i++) {
    System.out.println(x.getStackTrace()[i].toString());
  }
}

/**
 * TCP/IP Host input thread class
 * @author H. Lenz
 */
class TcpIpHostInThread extends Thread {
  Socket _sock;
  int _id;
  boolean _keep;

  /**
   * Constructor
   * @param sock Socket for this connection
   * @param id This connection's numeric ID
   * @param keep True to keep up one single connection; false to close connection on EOF
   */
  public TcpIpHostInThread(Socket sock, int id, boolean keep) {
    _sock=sock;
    _id=id;
    _keep=keep;
  }

  /**
   * The actual code for this thread
   */
  public void run() {
    try {
      while(_sock.getInputStream().available()==0) { // No data has arrived yet
        try { // Wait 10 milliseconds and try again
          Thread.sleep(10);
        } catch(InterruptedException x) { }
      }
      do { // Now we can be sure transmission has started
        while(_sock.getInputStream().available()>0) { // Read all available data and print it to standard output
          System.out.print((char)(_sock.getInputStream().read()&0xff));
        }
      } while((_keep)&&(!_sock.isClosed())); // _sock.isClosed() will never be true,
                                             // but it's here anyway for better understanding
      _sock.close(); // Make sure the socket gets closed
      System.out.println("["+_id+"] Socket closed.");
    } catch (IOException x) { // An exception occurred: print stack trace and exit
      printStackTrace(x);
    }
  }
}
}
```

24 Version History

Version	Date	Author	Changes
1.0.0	06.11.2007	H. Lenz	• Initial version.
1.0.1	19.11.2007	H. Lenz	• Sub menu "Global System Settings" added.
1.0.2	26.11.2007	H. Lenz	• Sub menu "Common Options" added. • References to repeat buffer updated. • Primary carrier off is now optional. • Host interface baud rate is now configurable.
1.0.3	27.11.2007	H. Lenz	• Sub menu "Trigger Events" was modified and moved out of the primary read section. • Trigger Events can now be enabled/disabled for primary and secondary read individually. • Sub menu "Tag Options" was enhanced and renamed to "Device/Reader Options".
1.0.4	10.12.2007	H. Lenz	• New menu item "Reverse ISO Tag ID and Data".
1.0.5	17.12.2007	H. Lenz	• New menu item "Bytewise Reverse Output". • Secondary modes renamed.
1.0.6	17.12.2007	H. Lenz	• New sub menu "Reverse Tag Data" as a replacement for menu item "Bytewise Reverse Output". • Menus slightly rearranged.
1.0.7	20.12.2007	H. Lenz	• Inversion pattern for output ports added.
1.0.8	22.01.2008	H. Lenz	• Main Loop description enhanced. • ISO15693 AFI mode enhanced.
1.0.9	07.02.2008	H. Lenz	• Anticollision mode is now default; EAS mode removed (EAS now via Tag Selection). • Tag Type Menu updated for EAS. • Trigger Events Menu: order of items changed.
1.0.10	17.03.2008	H. Lenz	• Heartbeat functionality added. • Document renamed.
1.0.11	14.04.2008	H. Lenz	• SEC1500 now supports all baud rates on secondary UART. This requires hardware revision 03.
1.0.12	18.08.2008	H. Lenz	• Option Key support added. • Sensitivity to ESC character can be turned off.
1.0.13	20.11.2008	H. Lenz	• USB HID output option added. • Options for ISO15693 modulation index and modulation type added.
1.0.14	16.12.2008	H. Lenz	• Correction: Strg-x is CAN, not ESC. • Output Recovery Time option added. • Data conversion to decimal added. • USB HID now also supports TAB and ESC.
1.0.15	19.01.2009	H. Lenz	• USB interface mode can now be changed.
1.0.16	23.04.2009	H. Lenz	• Another correction: standalone operation is

			terminated by ESC (1Bh) and not CAN (18h).
1.0.17	18.05.2009	H. Lenz	• Conversion modes in "Data Processing" are now mutually exclusive. • Option keys removed.
1.0.18	17.08.2009	H. Lenz	• Timestamps menu added.
1.0.19	16.09.2009	H. Lenz	• Repeat Buffer can now be used on Trigger Events.
1.1.0	19.10.2009	H. Lenz	• Primary Read menu changed to allow combination of Block Read Mode and anticollision. • HF Reset can be added to Primary Read.
1.1.1	27.01.2010	H. Lenz	• Clustered Results Menu added.
1.1.2	22.02.2010	H. Lenz	• BCC pseudo checksum calculation added.
1.1.3	03.05.2010	H. Lenz	• Tristate values introduced for primary read options menu.
1.1.4	12.07.2010	H. Lenz	• Block Read Mode: Limitations to anticollision removed. • Internal MUX menu added. • Primary Read flow chart and description updated.
1.1.5	15.07.2010	H. Lenz	• Interface Settings Menu was missing secondary UART item.
1.2.0	20.10.2010	H. Lenz	• New host interface "TCP/IP Client" added. • TCP/IP settings available as part of interface settings. • Interface settings split up into four different chapters. • Some menus hide options which don't apply to current operation mode. • TCP/IP Host Demo added.
1.2.1	27.10.2010	H. Lenz	• Repeat Buffer can now be used to generate IN/OUT events.
1.2.2	15.11.2010	H. Lenz	• MUX status output added. • Repeat Buffer now offers three operation modes. • Separator character is now configured in Common Options menu. • Menus adjusted. • Lots of details fixed.
1.2.3	03.02.2011	H. Lenz	• USB HID keymap support added.
1.2.4	08.03.2011	H. Lenz	• Tag type menus added for 125kHz and 868MHz. • Options menus added for 125kHz and 868MHz. • Gen.2 bank selection added. • Numerical input values can now be finished

			with "Enter" key.
			• Baud rate values are now displayed and entered as 6-digit decimal values.
			• TCP/IP addresses and masks are now displayed and entered as 8-digit hex values.
			• PuTTY description added.
1.3.0	09.03.2011	H. Lenz	• Input trigger events added.
			• Document title corrected.
1.3.1	29.03.2011	H. Lenz	• Combi Board renamed to SmartRead.
1.3.2	14.04.2011	H. Lenz	• Secondary read: input port monitor mode added.
1.3.3	18.04.2011	H. Lenz	• Reverse Data Bytes menu removed; reversal for ISO15693 is still supported via primary read device options.
1.3.4	19.04.2011	H. Lenz	• Added reader name support.
1.4.0	26.04.2011	H. Lenz	• Ancillary Data Menu added.
			• Various items moved from other menus to the Ancillary Data Menu.
			• Menus now support indentation.
1.4.1	02.05.2011	H. Lenz	• 13.56MHz tag types ISO14443A and ScemTag Measurement added.
			• ScemTag data conversion added.
			• Option "Prefix Unique ID" added.
			• Buzzer support added.
1.4.2	19.05.2011	H. Lenz	• Internal MUX menu updated.
1.4.3	27.05.2011	H. Lenz	• Heartbeat functionality enhanced.
			• Internal MUX menu updated again.
1.4.4	29.06.2011	H. Lenz	• Tag type ID for heartbeat changed.
1.5.0	06.07.2011	H. Lenz	• Keyboard Monitor mode for Secondary Read added.
			• Bluetooth added as new default host interface option.
1.5.1	07.07.2011	C. Pauls	• Key Code definitions added.
1.6.0	13.08.2011	H. Lenz	• Main menu redesigned for better overview.
			• Test Cycle added to main menu.
			• Common Options menu renamed to Tag Buffer menu.
			• Clustered Results menu renamed to Packet Assembly menu.
			• Tag Buffer modes "disabled" and "Output Filter" added.
			• Input Trigger mode "Host Interface" added.
			• Added hint that Tag Buffer stores tag IDs only.
			• Presence Time Span: Duration mode added.
			• Presence Duration added to Ancillary Data.

1.6.1	09.09.2011	H. Lenz	• Selective Processing menu added.
1.6.2	05.10.2011	H. Lenz	• Tag Buffer: Collect Mode added.
1.6.3	07.10.2011	H. Lenz	• External MUX: Slots are now 16 bits wide instead of 8 bits, to support SIR2720 (ext.) and SIR900-MUX8. • LCD Mirror option added.
1.6.4	11.10.2011	H. Lenz	• Output Trigger "MULTI TAG" added.
1.6.5	04.11.2011	H. Lenz	• Internal MUX: Splitter mode added. • Options: Splitter bypass switch added.
1.6.6	08.11.2011	H. Lenz	• Internal and external MUX: Power steps can now be specified individually.
1.6.7	28.11.2011	H. Lenz	• Support for ISO 18000-3 Mode 3 tags added.
1.6.8	08.12.2011	C. Pauls	• Output Triggers Backlight added. • Buzzer Output Trigger uses bit patterns.
1.6.9	30.01.2012	H. Lenz	• Tag Buffer "Presence Time Span" mode description had become ambiguous. • ISO 18000-3 Mode 3 support improved.
1.6.10	20.02.2012	H. Lenz	• Port Buffer functionality added.
1.6.11	21.02.2012	H. Lenz	• Tag Buffer "Preset Inventory" mode added. • Tag Buffer menu restructured.
1.6.12	20.03.2012	H. Lenz	• Ancillary Data menu cleaned up. • Timestamps menu cleaned up. • Some minor corrections.
1.6.13	29.03.2012	H. Lenz	• Input Trigger mode "Tag Buffer" and Tag Buffer mode "Input Trigger" added. • Option to enable empty result packets added.
1.6.14	29.07.2012	H. Lenz	• Sequence of Reader ID, Reader Name and Free Text reverted (to enable free text as packet header for classification).
1.7.0	20.09.2012	H. Lenz	• New antenna MUX menu added. • Several details have been updated.
1.7.1	29.10.2012	H. Lenz	• FIFO buffer (Interface Menu) support added. • Input Triggers now supports FIFO mode. • Secondary Transparent Mode added.
1.7.2	05.11.2012	H. Lenz	• Sensor Read Mode added to Primary Read. • Input Trigger "EAS Detection" added.
1.7.3	15.11.2012	H. Lenz	• UHF tag mode "EPC Gen.2 (TID Mode)" added.
1.7.4	31.01.2013	H. Lenz	• Tag Buffer option "Compensate Processing Time" added.
1.7.5	07.02.2013	H. Lenz	• Heartbeat options moved from Interface Settings to Packet Assembly menu.
1.8.0	15.02.2013	H. Lenz	• Mutex values are now cycled instead of directly controlled. • Interface Settings menu overhauled. • Framing now supports header and footer text

				strings.
1.8.1	25.02.2013	H. Lenz	•	Direct coupling of Output Trigger to Input Trigger is now supported.
			•	Copy/Paste errors in LCD backlight Output Triggers corrected.
1.9.0	07.03.2013	H. Lenz	•	Current Configuration Menu added.
1.9.1	12.03.2013	H. Lenz	•	Asynchronous Output mode added.
			•	Dropped Packets field added to Ancillary Data.
			•	Output triggers TAG, EAS can now be activated before data transmission.
1.9.2	23.05.2013	H. Lenz	•	AND operation mode for output triggers added.
1.9.3	20.08.2013	H. Lenz	•	Updated to SmartRead v2.9.
			•	Tag Buffer menu overhauled.
			•	Debug Output added.
			•	Antenna MUX: Port Buffer Bit Wrap added.
			•	MUX Pattern renamed to MUX Position.
1.9.4	03.09.2013	H. Lenz	•	Gen.2 PC word option added to Tag Buffer and Selective Processing.
1.9.5	10.10.2013	H. Lenz	•	Holdoff Time options added to Output Trigger menu.
1.9.6	13.12.2013	H. Lenz	•	Terminal Menu Timeout changed.
1.9.7	21.01.2014	H. Lenz	•	Implied HF reset during anticollision can be deactivated now.
1.9.8	14.03.2014	H. Lenz	•	Store function added to Current Configuration menu.
1.9.9	01.04.2014	C. Pauls	•	New Interface No Output added.
			•	Refresh option for Input Trigger added.
			•	Immediate Switch-off Input Trigger added.
1.10.0	09.04.2014	C. Pauls	•	Updated to SmartRead v2.10
			•	Display Menu added.
			•	Display options moved from Interface Menu to Display Menu.
			•	Key patterns can selected by pressing the desired button on the device.
1.10.1	11.07.2014	H. Lenz	•	Revert data bytes/bits for primary and secondary read added.
1.10.2	22.07.2014	H. Lenz	•	Primary/Secondary Read port pattern option added.
1.11.0	08.08.2014	H. Lenz	•	Realtime Inventory support added.
			•	Overscan added to device options menu.
1.11.1	21.08.2014	H. Lenz	•	Overscan settings corrected.
			•	SFR value in Ancillary Data added.
3.0.0	17.09.2014	H. Lenz	•	Updated to SmartRead v3.0.
			•	Manual version now matches SmartRead

			•	version.
			•	Disable Per-Cycle Filter option added.
			•	Repetition Counter option added.
3.0.1	14.10.2014	H. Lenz	•	Native MUX can now be disabled.
3.0.2	26.01.2015	H. Lenz	•	Tag Data Manipulation Links added.
3.0.3	12.02.2015	H. Lenz	•	NO TAG response options added.
			•	Output Triggers: Time values changed from milliseconds to units of 100ms.
3.0.4	02.03.2015	H. Lenz	•	Revert Data Blocks option added to Primary Read and Secondary Read.
			•	Hold Output option for Input Triggers added.
3.0.5	04.08.2015	H. Lenz	•	Inventory Filter options added to Primary Read.
3.0.6	13.04.2016	C. Pauls	•	Reader IP Address can be configured in TCP/IP client mode.
3.0.7	02.06.2016	H. Lenz	•	Input Triggers: Total Refresh Limit option (plus sub-option) added.
3.0.8	07.07.2016	H. Lenz	•	HF Reset relabeled to Tag Reset.
3.0.9	26.07.2016	H. Lenz	•	Tag Reset restructured.
3.1.0	28.07.2016	H. Lenz	•	Main menu restructured; Post-Processing menu added.
3.1.1	01.08.2016	H. Lenz	•	Tag Reset options added to Input Triggers menu.
3.1.2	15.08.2016	H. Lenz	•	Mode 3 and Gen.2 session can now be configured in the options menu.
3.1.3	30.08.2016	H. Lenz	•	Mode 3 and Gen.2 target can now be configured in the options menu.
3.1.4	01.09.2016	H. Lenz	•	Target B Overscan Value added to options menu.
3.2.0	11.11.2016	H. Lenz	•	MUX step structure updated to new scheme.
			•	Tag type table updated to new scheme.
			•	Tag types and options menu each consolidated to one for all frequency ranges.
			•	Obsolete Internal/External/Standard/Splitter MUX menu description removed.
3.2.1	25.11.2016	H. Lenz	•	ID descriptor added to Primary Read menu.
			•	Ancillary Data menu updated.
3.2.2	09.01.2017	H. Lenz	•	Input Triggers: Discard Data after End Of Trigger option added.
3.2.3	12.01.2017	H. Lenz	•	Changed order in options menu.
3.2.4	09.02.2017	H. Lenz	•	LF tag types added.
3.2.5	16.03.2017	H. Lenz	•	Input Trigger status can now be fed into Port Buffer.
3.2.6	11.04.2017	H. Lenz	•	Minimum Dwelling Time added to Antenna MUX menu.
3.2.7	02.05.2017	H. Lenz	•	General description flow charts updated.

			•	Document structure updated.
3.2.8	29.05.2017	H. Lenz	•	TID/EPC option added.
3.2.9	06.11.2017	C. Pauls	•	Stop Terminal Timeout after first wrong character added.
3.2.10	30.11.2017	H. Lenz	•	Truncate Raw Bytes options added to Tag Data Manipulation menu.
			•	Strip Leading Zeroes option added to Tag Data Manipulation menu.