TWN4

System Overview

ELATEC GmbH

Contents

1 Introduction

TWN4 is the name of a powerful and versatile series of RFID readers and writers. Here are some of the outstanding features:

- Operation in two frequency bands: 13.56 MHz (HF) and 125 kHz / 134.2 kHz (LF)

- Modular concept consisting of reader/writer modules, carrier boards, antennas and complete devices in housing.

- Security features such as slots for secure access modules or cryptographic functions.

- Possibility to write programs which are running on TWN4 itself (Apps).

- Standalone or host-based operation.

There are several products available, which have in common the TWN4 technology.

2 Firmware

Please Note:

Latest version of firmware exceeds size of older models of TWN4.

The TWN4 firmware V3.00 <u>does</u> fit into following models of TWN4:

- TWN4 MultiTech Desktop or OEM Board: Revision E or later
- TWN4 MultiTech LEGIC 42 Desktop or OEM Board: Revision C or later
- TWN4 MultiTech LEGIC 45 Desktop or OEM Board: Revision D or later
- TWN4 MultiTech SmartCard or OEM Board: Revision B or later
- TWN4 MultiTech Panel OEM Board: Revision D or later
- TWN4 MultiTech Panel LEGIC 42 OEM Board: Revision C or later
- TWN4 MultiTech Core: Revision D or later
- TWN4 MultiTech Core LEGIC 42: Revision E or later
- TWN4 MultiTech Core LEGIC 45: Revision D or later
- TWN4 MultiTech Mini: All revisions
- TWN4 MultiTech Nano: All revisions
- TWN4 MultiTech Nano LEGIC 42: All revisions

TWN4 Firmware V3.00 or later <u>does not</u> necessarily fit into following models of TWN4:

- TWN4 MultiTech Desktop or OEM Board: Revision D or earlier
- TWN4 MultiTech LEGIC 42 Desktop or OEM Board: Revision B or earlier
- TWN4 MultiTech LEGIC 45 Desktop or OEM Board: Revision C or earlier
- TWN4 MultiTech SmartCard or OEM Board: Revision A or earlier
- TWN4 MultiTech SmartCard LEGIC 42 or OEM Board: Revision B or earlier
- TWN4 MultiTech Panel OEM Board: Revision C or earlier
- TWN4 MultiTech Panel LEGIC 42 OEM Board: Revision B or earlier
- TWN4 MultiTech Core: Revision C or earlier
- TWN4 MultiTech Core LEGIC 42: Revision D or earlier
- TWN4 MultiTech Core LEGIC 45: Revision C or earlier

2.1 Memory View

General spoken, TWN4 has internal 256 kBytes or 512 kByte of flash and 96 kByte of RAM. The concrete size depends on the model (TWN4 Core, TWN4 Nano, TWN4 Mini). The memory is divided into several sections as shown in the following diagram:

TWN4 Flash Memory (256 or 512 kByte)			
Bootloader (16 kByte)	Firmware (128 or 384 kByte)	App (64 kByte)	Storage (48 kByte)

TWN4 RAM (96 kByte)	
App (56 kByte)	Firmware (40 kByte)
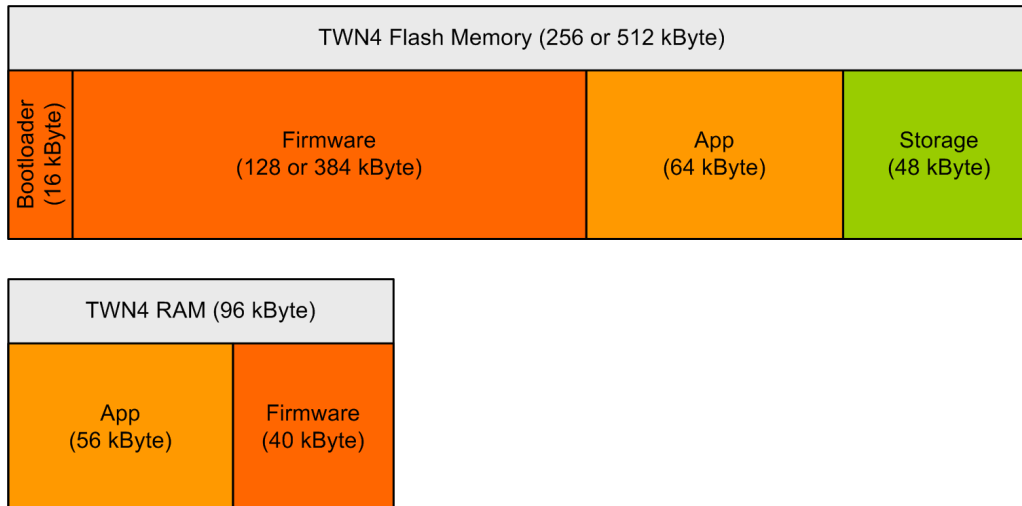
2.1.1 Boot Loader

The boot loader is the entry point for the firmware after powering up TWN4 or after a reset.

Only the boot loader provides functions for programming new firmware or Apps. This means in order to program either a new firmware or another App, the boot loader must be entered.

2.1.2 Firmware

The firmware occupies most space in flash memory. It provides functions for accessing IO or doing RFID operations. Furthermore, the execution of an App is controlled by the firmware.

Both firmware and App cannot be read back from a TWN4.

2.1.3 App

The App is the part of flash memory, which specifies the behavior of a TWN4. Due to this, the programmer of the App has full control over the behavior of the final application. An App can be programmed by the customer. In order to do so, an appropriate developer pack is provided.

An App cannot be read back from a TWN4. This allows to store secret keys and other cryptographic functionality as part of an App. Furthermore, the possibility to clone a device is avoided and the intellectual property is protected.

2.1.4 Storage

Storage is the section, where data is stored, which can be accessed via the storage functions. In other words, in this aera, the file system is located.

2.2 Functional Units
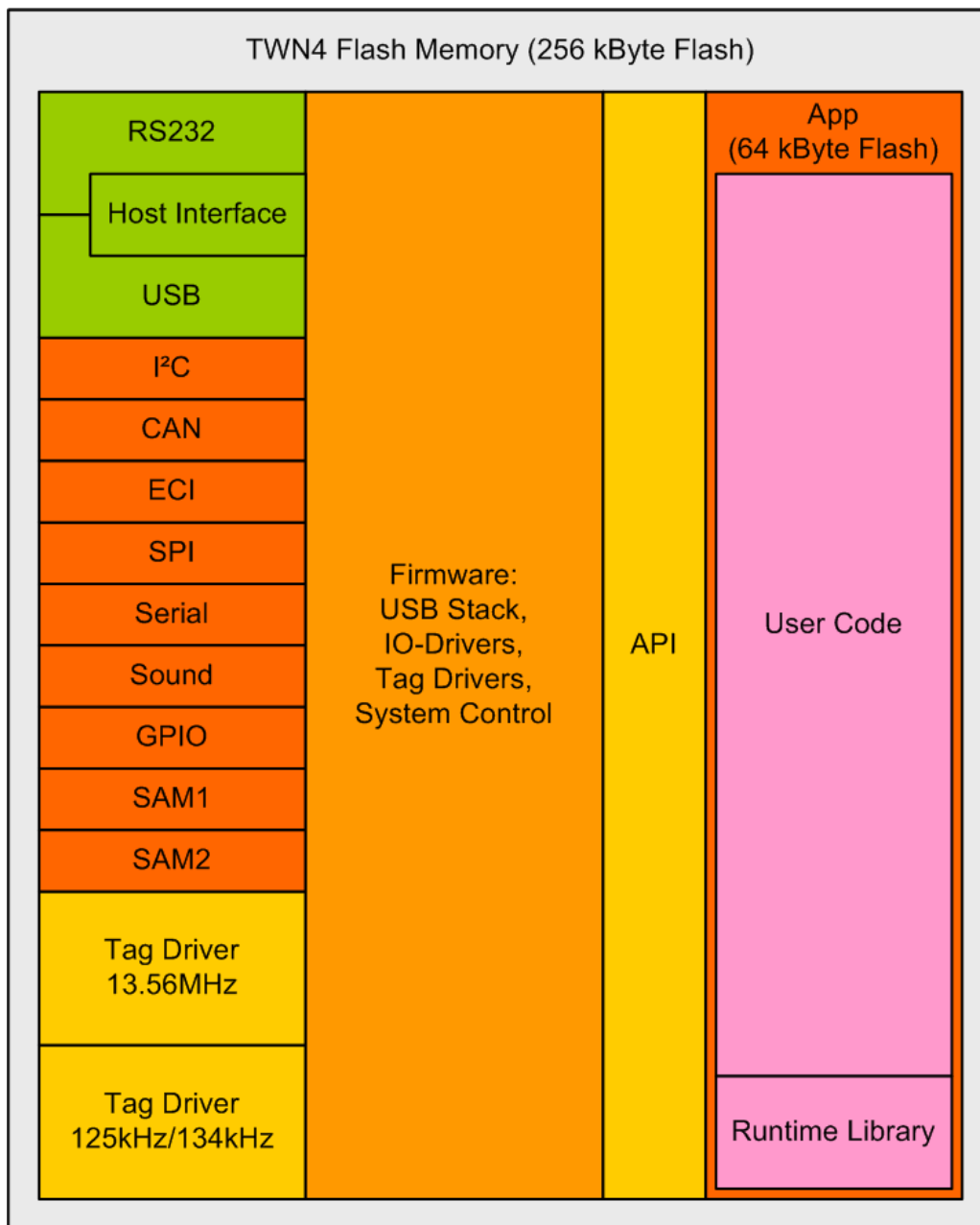
2.3 Firmware Startup Sequence

The diagram below is showing the sequence of how boot loader, firmware and App are started:

```
                    ┌─────────────┐
                    │  Power Off  │
                    └─────────────┘
                           │ Power Up
                           ▼
                    ┌─────────────┐
                    │    Reset    │
                    └─────────────┘
                           │
                           ▼
                    ┌─────────────┐          ┌──────────────────┐
                    │Start Boot   │          │   Show Error/    │
                    │Loader       │          │   Blink Code 1/  │
                    └─────────────┘          │   No Firmware    │
                           │                 └──────────────────┘
                           ▼                          ▲
                    ╱ Firmware ╲        No            │
                    ╲  Valid?  ╱────────────────────►
                           │ Yes
                           ▼
                    ┌─────────────┐
                    │Start        │
                    │Firmware     │
                    └─────────────┘
                           │
                           ▼
                    ╱ App Valid? ╲      No
                    ╲           ╱──────────────┐
                           │ Yes              │
                           ▼                  │
                    ┌─────────────┐           │
                    │  Start App  │           │
                    └─────────────┘           │
                           │                  │
      Reset or             ▼                  │
      Start Boot Loader ◄─( App is running )  │
                           │                  │
                           │ App causes       │
                           ▼ exception        ▼
              ┌──────────────────┐  ┌──────────────────┐
              │   Show Error/    │  │   Show Error/    │
              │   Blink Code 3/  │  │   Blink Code 2/  │
              │   App Exception  │  │   No App         │
              └──────────────────┘  └──────────────────┘
                           │                  │
      Reset or             ▼                  │
      Start Boot Loader ◄─(    Stop    )◄─────┘
```
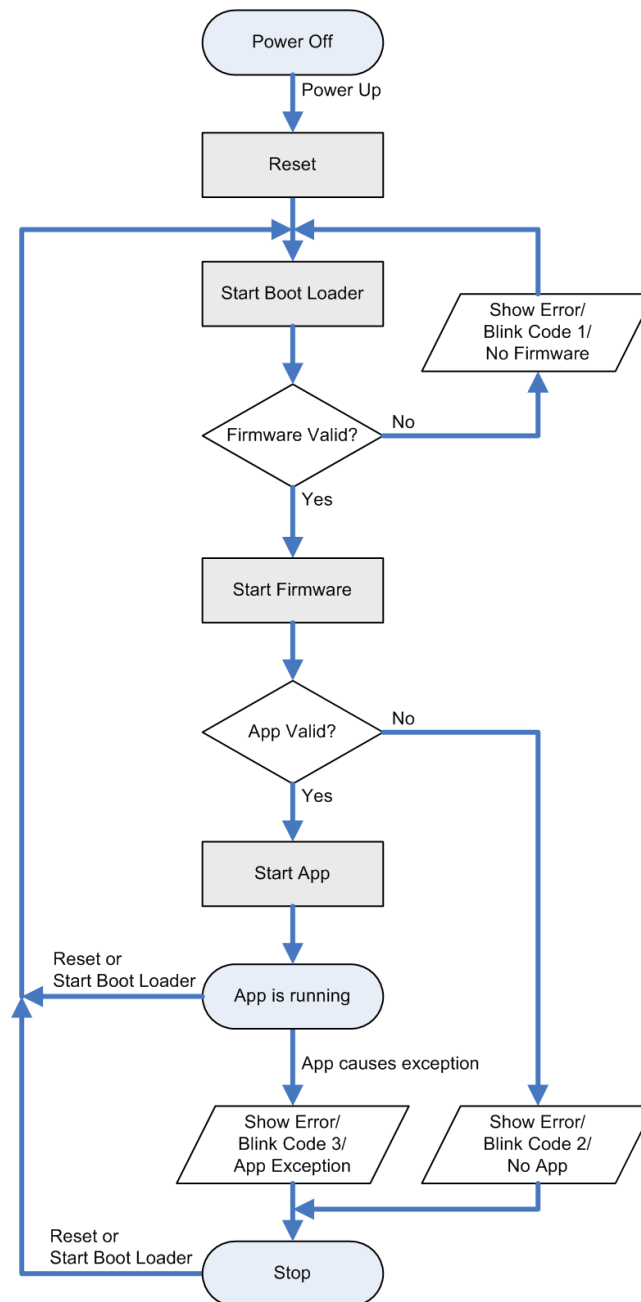
2.4 Firmware Error Conditions

There are several reasons, because the firmware may run into a unwanted condition. If this happens, the condition is shown by a on-board diagnostic red LED of the TWN4 Core Module. The LED is signaling the error code by a number of flashes separated by a pause. This signaling is called blink code. Following blink codes are defined:

- Flash 1 time: There is no valid firmware installed on TWN4. This might be caused, if programming a new firmware onto TWN4 is interrupted by a power failure. In this case, the programming must be

started from the beginning.

- Flash 2 times: There is no valid App installed on TWN4. This might be caused, if programming a new App onto TWN4 is interrupted by a power failure. In this case, the programming must be started from the beginning.

- Flash 3 times: The running App caused an exception. A exception is a invalid memory access or invalid program instruction. An App is allowed to access it's own memory space only (64 kByte ROM/64 kByte RAM).

2.5 Back Door for Starting the Boot Loader

During development of new Apps and under undefined circumstances, the situation might arise, the starting the boot loader is not possible anymore. In such a situation, it is useful to start the boot loader manually. This can be achieved by connecting two pins of the TWN4 core module together and do a power cycle or reset. The two pins, which have to be connected together are C25 and C28 of the TWN4 Core Module.

2.6 Versioning Scheme

There is a standard version scheme, which appears under several conditions:

- Label of the reader

- Startup string (depending on App)

- System function `GetVersionString`

- USB product string (TWN4 firmware V3.00 or later)

The version string is built up as follows:

TWN4 / B1.08 / N K F 4.06 / STD 2.01 / [Options] / [BT1.07EL]

Firmware version of BLE module
(contained on label only)

Several letters, which describe optional features:
  P: Extended set of supported transponders (125 kHz)
  I: Support ICLASS
  U: Host interface fixed to USB (related to TWN4 Mini only)
  B: Support BLE (Bluetooth Low Energy)
  5: LEGIC 45

Version of App (V2.01 here)

Name of App (2-4 numbers or letters)

Firmware version (V4.06 here)

HF Frontend:
  X: No LF, no HF (signalling an error condition)
  A: Support HF (LEGIC 42 or LEGIC 45)
  B: Support LF and HF (LEGIC 42 or LEGIC 45)
  C: Support HF (LEGIC 6300)
  D: Support LF and HF (LEGIC 6300)
  E: Support HF (standard)
  F: Support LF and HF (standard)
  L: Support LF

Type of USB communication:
  K: USB HID keyboard
  C: USB CDC (virtual COM port)
  P: USB CCID (smart card interface)

Underlying hardware technology:
  C: „Core", Core Module, MultiTech
  M: „Mini", Mini Reader
  N: „Nano", Nano Modulem MultiTech 2, MultiTech 3, Palon

Version of boot loader

Product family name

2.7 App & Firmware Images

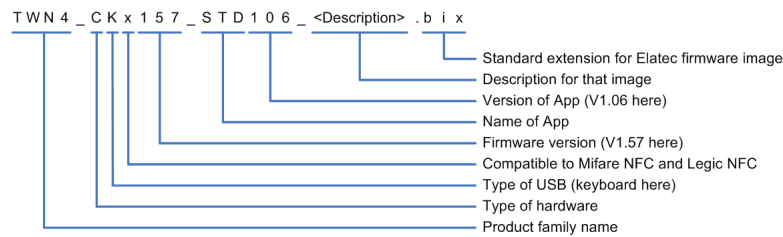Several firmware images are provided to the customer. App and firmware images can be distinguished by the extension of their filename.

2.7.1 Firmware Images

A firmware image has the extension .bix. Normally, such a file contains a firmware for TWN4 and an appropriate App for the intended purpose.

2.7.1.1 Naming Scheme

There is a standard naming scheme for firmware images, which are given to the customer. This is how the name of a firmware image is constructed:

```
T W N 4 _ C K x 1 5 7 _ S T D 1 0 6 _ <Description> . b i x
```
                                                        └─── Standard extension for Elatec firmware image
                                                     └────── Description for that image
                                            └─────────────── Version of App (V1.06 here)
                                         └────────────────── Name of App
                              └───────────────────────────── Firmware version (V1.57 here)
                          └───────────────────────────────── Compatible to Mifare NFC and Legic NFC
                        └─────────────────────────────────── Type of USB (keyboard here)
                      └───────────────────────────────────── Type of hardware
              └───　Product family name

Two types of hardware must be distinguished:

- 'C', All products, which operate a TWN4 Core Module, like TWN4 Desktop, TWN4 OEM PCB, TWN4 Panel

- 'N', Nano Module

- 'M', Mini Reader

There are several types of USB stacks available:

- 'K': USB HID device (keyboard)

- 'C': USB CDC device class (virtual COM port)

- 'H': USB HID device (reports)

- 'P': USB CCID device (reports)

A USB stack is combined with an App. This might be either an App made by the customer or an App provided by the manufacturer. Several Apps are available:

App Short Name	App Name	Description
STD	Standard App	TWN4 is searching for transponder and forwarding the ID to the host
STDC	Standard Accept Config Cards	Standard App which enables TWN4 to be configured by a Config Card
STDU	Standard Accept Upgrade Cards	Standard App which enables TWN4 to get option upgrade by an Upgrade Card
STDX	Standard Accept Config Upgrade Cards	Standard App which enables TWN4 to be configured by a Config Card or to get option upgrade by an Upgrade Card
PRS	Simple Protocol	TWN4 is running under the control by a host. TWN4 executes commands, sent by the host and returns response. In this way, nearly all TWN4 system functions can be executed remotely by the host. There is separate documentation and software available for using this mode of operation.
CFG	Config Card Programmer	App for TWN4, which implements the "Simple Protocol" enriched by functions specific to TWN4 CONFIG
DMP	Dump	Tries to read all data stored on the transponder and send it to the host
LXT	LEGIC Transparent	Enables the host to directly send and receive commands to and from the LEGIC chipset
OSDP	OSDP Protocol	OSDP Protocol App for TWN4 Palon
TRC	Tracer	Determine technology of transponder as detailed as possible
S1SC	CCID 1Slot Standard LF HF	This App lets TWN4 behave as a SmartCard reader with one slot

3 TWN4 Developer Pack

The TWN4 developer pack contains all software and documents necessary to operate, program and configure TWN4. Please see separate document for a detailed description of the program AppBlaster, which is used to prepare TWN4 for operation according to your requirements.

3.1 Installation

You received the TWN4 developer pack as zip file. In order to install the package, please follow these steps:

- Create a empty directory on your hard disk
- Unzip the entire content of the zip file into this empty directory
- You're done!

3.2 System Requirements

These are the minimum system requirements for a serious use of the TWN4 Developer Pack:

- Operating system: Microsoft Windows 7 SP1 or later, 32 or 64 bit
- Microsoft .NET Framework 4.7.2
- Processor (CPU): 2 GHz
- Hard Disk: 200 MB
- RAM: 2 GB

4 Compatibility

The table below is giving an overview about compatibility of TWN4 to various platforms and their requirements.

System	Mode	Supported	Driver	Remark
Windows XP Windows 7 32/64 Bit Windows 8 32/64 Bit Windows 10 32/64 Bit	RS232	Yes	Supported by OS	Port: e.g. COM1:
	USB HID Keyboard	Yes	Supported by OS	
	USB CDC (Virtual COM Port)	Yes	Available	Drivers are part of the developer pack
Linux 32/64 Bit (Ubuntu 10/11/12/13)	RS232	Yes	Supported by OS	Device: e.g. /dev/ttyS0
	USB HID Keyboard	Yes	Supported by OS	
	USB CDC (Virtual COM Port)	Yes	Supported by OS	Device: e.g. /dev/ttyACM0
Linux (ARM Platform)	RS232	No	N/A, platform dependent	
	USB HID Keyboard	Yes	Supported by OS	
	USB CDC (Virtual COM Port)	Yes	Supported by OS	Device e.g. /dev/ttyACM0
Windows CE	RS232	Yes	Supported by OS	Port: e.g. COM1:
	USB HID Keyboard	Yes	Supported by OS	
	USB CDC (Virtual COM Port)	No	N/A, platform dependent	

5 History of Changes

5.1 TWN4 Firmware

5.1.1 Firmware V1.23

- Initially released version.

5.1.2 Firmware V1.40

Firmware:

- LEGIC: System functions `SM4200_xxx` were renamed to `SM4X00` due to support of LEGIC chip SM4500 with identical API. Old style of functions is still available via macros.

- LEGIC: New system functions for reprogramming OS of LEGIC SM4200 or SM4500.

- USB CDC: No modprobe required anymore under Linux.

- USB CDC: TWN4 is mounted as /dev/ttyACMx instead of /dev/ttyUSBx.

- New system functions `Sleep`, `GetDeviceUID`, `SetParameters`.

- Options to keep communication port closed in order to reduce power consumption.

- Option to start an App independent of the current USB enumeration status (standalone applications).

- Support new USB class CCID in various flavours. Please contact your reseller for these features.

- New API ISO7816 for accessing two SAM slots (e.g. on the TWN4 OEM PCB).

- Random number generator, which is available via read to `CHANNEL_RNG`.

- Support for new transponders: AWID, G-Prox, Pyramid and Keri.

- Reworked crypto API with new functionality for cyphered block chaining (CBC).

- Improved (parallel) reading of LF transponders.

- Cotag: Improved reading with the additional option to turn off verify, which further speeds up recognition speed at still reliable reading performance

- Cotag: Decoded reading of ID data instead of a hash value.

- Inditag: Second read mode made available as known from TWN3 system function `IndiTagSearch2`

- Honeytag: Decoded reading of ID data instead of a hash value.

- iCLASS: Support for SIO in a SAM slot.

- iCLASS: Support for reading of PAC from appropriate transponders.

- iCLASS: Support for iCLASS type ISO15693 in addition to ISO14443B.

- MIFARE NFC ISO15693: Improved reading performance.

- New API ISO14443 with new functions for transparent communication to transponder types ISO14443A and ISO14443B.

5.1.3 Firmware V1.47

Firmware:

- Support NFC Peer-to-Peer

- Support ISO FDX-B

- Support EM4x50

- API for AT55xx

- Cotag: Improved reading including start bit

- G-Prox: Modified hash value for improved compatibility

- HITAG 2: Fix bug in Hitag2_SetPassword

- TIRIS: Relaxed read for better support of type multi page.

- App LEGIC Transparent: Support of digital I/O command

- App LEGIC Transparent: Receive-timeout of 1 second for messages

- App Tracer: Support new transponder types + receive of NDEF messages

- App Standard: Support new transponder types + receive of NDEF messages

Runtime environment:

- Optional definition of a manifest, which allows to modify parameters, before the App is started.

- Functions `memcmp`, `memcpy`, `memset` are made available to Apps.

- Definition for `NULL`

- API for using the Simple Protocol from own Apps.

- Function `SetHostChannel` for redirecting output to other than default host port.

5.1.4 Firmware V1.48

Firmware:

- Mifare NFC: Support HF frontend V2

- Mifare NFC: Reset ATS incase of newly found transponder

- Fix issue in EM4150_WritePassword which caused an exception

- Cotag: Improved reading speed

- Cotag: Option for delivering 48 bits instead of 32 bits

Runtime environment:

- More flexible API for Simple Protocol including support of optional transmission of an CRC

5.1.5 Firmware V1.49

Firmware:

- Mifare NFC: Hotfix for support of ISO15693

- Legic NFC: Hotfix for envelope command timeout issue

5.1.6 Firmware V1.57

Firmware:

- Support TWN4 Mini Reader Mifare NFC

- Support TWN4 SmartCard

- ISO7816: New system functions `ISO7816_GetSlotStatus`, `ISO7816_IccPowerOn`, `ISO7816_IccPowerOff`

- ISO14443A: New system functions `ISO14443A_GetATQA`, `ISO14443A_GetSAK`

- ISO14443-4: Fix 14443-4 timeout issue

- ISO7816: Fix T=0 speed/timeout issue

- AT55xx: Fix support of bit rates below f/64

5.1.7 Firmware V1.64

- Hitag 1/S: Increased dynamic range

- Hitag 1/S, Hitag 2: Adjustable timing via parameters

- Hitag S: Read UID of transponders, which are operating in encrypted mode

- DESfire: System function `DESfire_ChangeKey`: Bugfix regarding PICCMasterKey and Application MasterKey

- ISO14443B: Support transparent communication

- ISO14443B: New system functions `ISO14443B_GetATQB`, `ISO14443B_GetAnswerToATTRIB`

- ISO14443: Support high baudrates including parameters for setting up behaviour

- New system function `GetLastError` including error codes

- New API, which provides functions for access of internal flash storage

- MIFARE NFC: Improved reading of ISO15693

- Runtime lib: Systemfunctions `HostTestChar`, `HostWriteByte`, `HostReadByte` are now part of the runtime library

- Runtime lib: Changed naming scheme of all host communication functions by adding a leading "Host"

- Runtime lib: `HostWriteVersion` can handle version strings with up to 50 characters

- ISO7816: Rework and improved API

- LEGIC NFC: Support of system functions `ISO14443A_GetATS`, `ISO14443A_GetATQA`, `ISO14443A_GetSAK`

5.1.8 Firmware V1.68

- New API for MIFARE Plus

- USB keyboard additionaly supports TAB, Backspace, Escape, F1-F12

- LEGIC NFC: Support for MIAFRE Classic API

- New system functions for ISO14443-3

- App Simple Protocol: Support ISO14443B_GetAnswerToATTRIB

- App LEGIC transparent: Optimized timeouts

5.1.9 Firmware V1.71

- New API FELICA

- DESFire: Fixed bug in calculation of MAC in compatible authentication mode

5.1.10 Firmware V1.82

- Improved establishment of a NFC P2P connection

- Support of ICLASS SeOS PACS

- MIFARE Plus: Fixed bug in switching to higher security levels

- MIFARE Classic: Fixed bug - repeated SearchTag after Login obsolete

- Improved timing settings for FeliCa transponder search

- Improved behavior EM4x50

- Support TWN4 Mini Reader MIFARE NFC USB

- Optimized (shortened) search time for many LF transponders

- Function "Sleep": New option to put TWN4 in deeper sleep mode

5.1.11 Firmware V1.85

- Support TWN4 Nano Module.

5.1.12 Firmware V3.00

- Improve performance of Hitag 2.

- Support of contact based memory cards (SLE44xx).

- Support of transponder family NTAG.

- Support of transponder family SRX.

- Support of transponder family MIFARE Ultralight EV1.

- Authentication at MIFARE Ultralight C via SAM AV1/2 supported.

- TWN4 MultiTech Nano: Support of HF transponder types ISO14443A/B, ISO14443B', ISO15693, SRX, ICLASS.

- TWN4 MultiTech Nano: Support of contact based smartcards (ISO7816).

- TWN4 MultiTech Nano: Support of Low Power Card Detection (LPCD).

- Support new transponder type Deister

- EM4102: Determine, if f/64 or f/32 was detected

- EM4102: Setup search for f/64 and/or f/32

- EM4150: Determine, if f/64 or f/40 was detected

- EM4150: Setup search for f/64 and/or f/40

- AT55: Support start marker

- USB delivers firmware version as product string

- USB optionally can be set up to specify unique serial number

- USB keyboard repeat rate can be modified

- USB keyboard support remote wake up of host

5.1.13 Firmware V3.04

- Support of configuration card

- New system functions to support SPI master

- Improved compatibility Deister

- New system functions DESFire_CreateRecordFile, DESFire_ReadRecords, DESFire_WriteRecord, DESFire_ClearRecordFile

- Improved system functions DESFire_ReadData, DESFire_WriteData

- Support ICLASS SEOS

5.1.14 Firmware V3.06

- Support BLE via new API

- TWN4 Nano support of NFC

- TWN4 Nano support of Felica

- New LF tag types Nedap and Cardax

- New system functions ReadBytes, WriteBytes

- EM4102 improved reading of none-standard transponders

- System function ISO14443_3_TDX: Configurable generation of CRC via system parameter

- Simple protocol support of new system functions

- Bugfix in DESFire_CreateRecordFile

- Minor improvements

5.1.15 Firmware V3.08

- Support HID iCLASS Elite key update

- Support new tag types Topaz and MB89R118/119 (HF)

- Support new tag types PAC and IDTECK (LF)

- Support I2C Cards

- Support DESFire FreeGetValue

- TWN4 SmartCard supports ISO7816 EMVCo

- Support NFC LLCP Service Discovery

- Support Synchronous cards voltage select

- Support LPCD on TWN4 Nano Module, TWN4 MultiTech 2

- Firmware update for HF frontend of TWN4 Nano Module

- TWN4 MultiTech 2 BLE support of identification via MAC address

- TWN4 MultiTech 2 BLE now supports secure management with bonding and pairing

- TWN4 MultiTech 2 BLE GATT structure has been extended by 3 additional (none-standard) data fields for custom purposes

- Bugfix DESFire DeleteApplication

- Bugfig Mifare Plus authentication, force ISO14443-3 activation when authentication with Card Master Key or Card Config Key

- Bugfix ISO14443-4 PN5180 S(WTX) handling was missing

- Bugfix preISO14443B: Suppress check of RX-framing on TWN4 Nano Module, TWN4 MultiTech 2

- Defined output of version string in case of LF- or HF-only versions

- TWN4 does not search for transponders at 134.2kHz by default

5.1.16 Firmware V3.10

- Support new tag type CTS (HF)

- Support new tag types UltraProx, ICT and Isonas (LF)

- Bugfix: Support TWN4 CONFIG Card, even if NFC is activated

- Support TWN4 UPGRADE Card (none-official)

5.1.17 Firmware V3.11

- Fix issue, USB serial number was not sent to host correctly

- Fix issue, where under specific circumstances a loss characters occured on USB or RS232

- Fix issue, where DESfire is not recognized, if CONFIG Card is searched

- Cotag supports 64 bits

- Again allow access to SAM card DESfire AV2 by Apps

- Fix issue, where tagtype MIFARE is returned, if only ICLASS is accepted

5.1.18 Firmware V3.12

- New system functions BLEDiscover, BLECheckDiscoveredString, BLEConnectToDevice, BLEDisconnectFromDevice, BLEGattGetAttribute, BLEGattGetValue, BLEGattSetValue

- USB CCID is now compatible to Windows 10

- New system function preISO14443B_GetATR

5.1.19 Firmware V3.18

- Support TWN4 Palon family

- Support OSDP

- SPI Slave

- Support ICLASS read/write

- Optimized support for UltraProx

- Optimized timing for Hitag 2

- Optimized timing for Felica

- Parameter SAM clock during sleep

- LED functions are now implemented as system functions

- Firmware ignores USB reset in case of executed always

- Flush USB buffers upon USB reset

- Boot loader can be started even if communication is going on on other communication channels

- Fix plus-sign in keyboard emulation

- Support electrical S/N

- CCID firmware EMVco (contactbased) compliant

5.1.20 Firmware V3.20

- Improved reading of FDX-B

- Fix issue with support of PI-option in TWN4 Nano and related products

5.1.21 Firmware V3.21

- Support Android/iOS app Mobile Badge BLE 2.0

- Support BLE cable replacement

- Activate pulldowns on unused GPIOs

5.1.22 Firmware V3.22

- BLE: An event from a write to a characteristic with activated indication is automatically confirmed

- BLE: A call of system function BLEInit with parameter BLE_MODE_OFF only executes a reset of the module. No other commands are called.

- BLE: New parameters for system function BLECheckDiscoveredString

- BLE: Additionally to already supported 31 bytes for advertise, 31-byte scan-response strings are supported

- BLE: BLEInit accepts new parameter BLE_MODE_MOBILE_BADGE_2_0_AT2

- OSDP: Fix timeout issue during longer transponder operations

- OSDP: Fix situation, where writing twice occured

- USB Front Reader: Fix issue in conjunction with additional USB hubs

5.1.23 Firmware V4.01

- Support TWN4 Device Security

- Apps support interrupts

- BLE supports extended advertisement with 64 bytes

- Support mirror image, which allows firmware update via almost any device interface (please contact ELATEC)

- COM ports can wake up device from stop mode

- Keyboard emulation supports English, German, French layout

- Support Apple VAS including custom key (please contact ELATEC)

- Support Transact (please contact ELATEC)

5.1.24 Firmware V4.02

- Support Safetrust

- Support KleverKey

- Fix issue with ICLASS under very specific conditions

- Extended support of options offered by upgrade card

5.1.25 Firmware V4.05

- Support Google Smart Tap

- Support new HF frontend SM-6300

- New system functions BeepOn, BeepOff

- Support pin-change interrupt of GPIOs in Apps

- Support of EM4305

- Improved support of Pyramid

- OSDP fix support of RS-485 bias

- App Tracer supports extended information of LEGIC transponders

- App LEGIC transparent (LXT) supports supports Palon to route GPIO commands to the LEDs

- App BLE transparent fixed hardware reset of the module

5.1.26 Firmware V4.06

- Support Mobile Badge BLE NFC on TWN4 Slim LEGIC

- New system function BLEGetDiscoveredData

- Optimize current consumption during stop mode

- Fix support of ISO7816_SetCommSettings by Simple Protocol

5.1.27 Firmware V4.07

- Support 2nd gen MCU

5.1.28 Firmware V4.08

- TWN4 Mini always supports HF

5.1.29 Firmware V4.50

- OSDP now supports configurable local handling of events

- OSDP now supports various modes of security and key handling

- OSDP has a configurable mode of operation raw or formatted IDs

- OSDP support firmware update according standard V2.2

- Support for NFC (peer-to-peer) has been removed

- The function SetHostChannel now is a system function

- CHANNEL_HOST directs data to/from current host channel

- ICLASS is now supported by products with SM-4200 (firmware 4.7.0.0 or later) and SM-6300 (firmware 1.8.2.0 or later). I- or PI-option and HID SE processor is needed to use this feature.

- Apple VAS is supported by products with SM-4200 (firmware 4.7.0.0 or later) and SM-6300 (firmware 1.8.2.0 or later)

- RS-485 improved behavior of the device during reset

- The system function ISO14443_4_TDX now supports more than 200 bytes of payload per call.

- Support for ICLASS/SEOS config cards can be turned on/off with a parameter

- The apps Tracer and Dump now support SM-6300
- The Tracer app now supports EM4305

5.1.30 Firmware V4.51

- Support 3rd gen MCU

5.1.31 Firmware V4.61

- Support next gen of BLE module
- Support HID iCLASS SE R10
- Support LEAF
- Fix bug with partially not working interrupts on GPIOs

5.1.32 Firmware V4.62

- BLE support mode BLE_MODE_BEACON
- COM ports: Fix bug with serial 9 bits vs. parity
- New parameter for adjusting output power of HF (Core and Mini versions only)
- Fix bug with LEGIC readers: Search for all relevant transponder technologoies

5.1.33 Firmware V4.64

- Support HID SE R10

5.2 TWN4 Boot Loader

5.2.1 Boot Loader 1.03

- Initially released version

5.2.2 Boot Loader 1.04

- Support update via COM2

5.2.3 Boot Loader 1.05

- Support TWN4 Mini Reader

5.2.4 Boot Loader 1.06

- Support flash size 512 kByte

5.2.5 Boot Loader 1.07

- Support TWN4 Mini Reader USB

5.2.6 Boot Loader 1.08

- Support TWN4 Nano family

5.2.7 Boot Loader 1.09

- Support LF and HF versions

5.2.8 Boot Loader 1.21

- Support mirror image
- Support TWN4 Device Security

5.2.9 Boot Loader 1.40

- Limit support of 134.2 kHz

5.2.10 Boot Loader 1.50

- More specific error codes
- Accept firmware 4.07 or later

5.2.11 Boot Loader 1.61

- More specific error codes
- Accept firmware 4.51 or later

5.2.12 Boot Loader 1.62

- More specific error codes
- Corrected functionality to actually accept firmware 4.51 or later

5.2.13 Boot Loader 1.64

- Accept firmware 4.64 or later

5.3 BLE Chip Firmware

5.3.1 BLE Chip Firmware V1.04

- Initially released version

5.3.2 BLE Chip Firmware V1.05

- Bluetooth software API reference 2.08
- Scanner mode is now supported

5.3.3 BLE Chip Firmware V1.07

- Bluetooth software API reference 2.11
- Introduce characteristic "SP2 Data" in the "Custom Service 3"
- BLE chip model can be queried (BGM111, BGM121, BGM11S)
- HW handshake of serial line is switched off

5.4 AppBlaster

5.4.1 AppBlaster V1.03

- Initially released version.

5.4.2 AppBlaster V1.40

- New work flow based on projects and templates.
- Save and load of projects.
- Support for all new transponder types of TWN4.
- Support for iCLASS PAC.
- Possibility to generate production images.

5.4.3 AppBlaster V1.47

- Support of new types of transponders including NFC

5.4.4 AppBlaster V1.49

- Support for Cotag 48 bits

5.4.5 AppBlaster V1.57

- Include correct App name and version into firmware image
- Support TWN4 Mini Reader Mifare NFC

5.4.6 AppBlaster V1.64

- Use of C99 language standard

5.4.7 AppBlaster V1.71

- The standard project folder now by default is the folder, where the source code resides or the App-folder in case of configured Apps.
- AppBlaster now automatically fills in information regarding production image, if file name of source code follows the rules (see name of sample Apps).

5.4.8 AppBlaster V1.82

- Temporary files end with additional _temp in order to avoid collision with existing files with identical name.
- Fix minor issue in temporary file, which showed only two digits of firmware version.

5.4.9 AppBlaster V1.85

- Support TWN4 Nano Module.

5.4.10 AppBlaster V2.00

- All new version of AppBlaster:
- Cleaned up interface.
- Support multiple types of transponders with individual configuration of each type.
- Support access to data sections of various transponders.

5.4.11 AppBlaster V2.01

- Support HID PROX bit lengths up to 64 bits
- DESfire: Support encrypted files

5.4.12 AppBlaster V3.00

- Support configuration card

5.4.13 AppBlaster V3.03

- Support BLE
- Support Calypso, Cepas
- Support Cardax, Nedap
- New file format for templates
- Support signalling type "Echo"

5.4.14 AppBlaster V3.05

- Support ID lengths up to 256 bits, depending on type of transponder
- Support HCE (host card emulation)
- Support new LF tag types PAC and IDTECK
- Support BLE reading MAC address (new App "Mobile Badge")

5.4.15 AppBlaster V3.06

- Support BLE reading via GATT structure (new App "Mobile Badge BLE")

5.4.16 AppBlaster V3.07

- Support yellow LED (TWN4 MultiTech 2)

5.4.17 AppBlaster V3.08

- Number of digits can be specified as minimum, exact or maximum value
- Allow to derive output from multiple fields of the input data
- Depending on type of transponder, the offset covers full size of storage size
- Support all with firmware V3.10 newly available types of transponders

5.4.18 AppBlaster V3.10

- Avoid compiler warning under specific configurations

5.4.19 AppBlaster V3.12

- Version number now follows version of supported firmware of TWN4

- Support Android App Mobile Badge BLE+

- Option to specify definition for preprocessor

- Support transponder types Isonas, ICT, UltraProx

5.4.20 AppBlaster V3.12.02

- Support programming of BLE module (main window, Tools - Program BLE Module

- Only support of BLE mode Mobile Badge BLE+ for Android App

- Support search for Upgrade Cards (sheet Behavior/Signaling), which is per default activated

5.4.21 AppBlaster V3.18

- Support OSDP as a separate template

- Support field delimiter

- Fix read version showing TWN3

5.4.22 AppBlaster V3.20

- Support loading of projects saved by older versions of AppBlaster

- Fix display of loaded template

- Display none-configured transponders even after loading a project

5.4.23 AppBlaster V3.21.02

- Support Android/iOS app Mobile Badge BLE 2.0

- Support BLE cable replacement

5.4.24 AppBlaster V3.22.01

- Mobile Badge BLE 2.0: Support range adjustment level

- OSDP: Support crypto

5.4.25 AppBlaster V4.01.02

- Introduce MultiBIX images

- Filtering of templates by device family

- Separate prefix for every field of an output format

- Fields can be reordered/moved

- Keyboard emulation supports English, German, French layout

- Support Apple VAS including custom key (please contact ELATEC)

- Support Transact (please contact ELATEC)

- Support remote upgrade (please contact ELATEC)

5.4.26 AppBlaster V4.02.01

- Support Safetrust

- Support KleverKey

- Mobile Badge BLE 2.0 is renamed to Mobile Badge BLE NFC and split into its two functionalities (BLE and NFC)

- Transact: Allow formatting of key

- .NET Framework 4.7.2 required

5.4.27 AppBlaster V4.05.04

- Support Google Smart Tap

- Mobile Badge BLE NFC, mode NFC allows to select bits to be output

- Mobile Badge BLE NFC, mode NFC has identical output like mode BLE

- Mobile Badge BLE NFC, mode BLE allows to specify custom AES key for authentication

- Fix problem with escape sequences in prefix of fields

- General support of Apple VAS

- Scan order of transponders is configurable

- Option to force a specific hostchannel for output of data

5.4.28 AppBlaster V4.50

- Support new, more flexible OSDP configuration with LED layouts, programmable IDs and programmable local handling of event.

- Both Google Smart Tap and Apple VAS have the option to convert ID data into binary format. This option is turned on by default.

- Both Google Smart Tap and Apple VAS optionally accept IDs with a specific number of bytes only.

- In the sub menu "Tools", there is a new function to reset the file system of TWN4.

5.4.29 AppBlaster V4.61

- Support LEAF

- Create file for firmware update over OSDP (OSDP Update Stream, extension .bix.osdp)

- Create Config Cards directly from a firmware image

- MIFARE Classic: Option to check SAK before access of transponder

- For better scalability, tab sheet DESFire supports scrollbars

- Support next gen of BLE module

- LEGIC Connect: Support reading from Neon files

- LEGIC Connect: Support NFC/HCE (SM-6300 only, Android only)

5.4.30 AppBlaster V4.61.01

- Support latest version of TWN4 CONFIG Programmer

5.5 Director

5.5.1 Director V1.00

- Initially released version.

5.5.2 Director V1.06

- Support system functions of TWN4 firmware V1.40

- Baud rate of serial communication can be adjusted

- "Simple Test": Selectable output format

- "Simple Test": Copy ID in clip board

- "Simple Test": Beep button is removed

- "Simple Test": Allow director to beep if needed

- "Simple Test": Only transponders, which are supported by TWN4 are selectable

- "Simple Test": Transponders, which are supported by TWN4 are selectable

- "Simple Test": Combo box is set up with currently configured transponders

- "Function Test": Possibility to enter a function call manually

5.5.3 Director V1.10

- Support of new transponder types and system functions according to TWN4 firmware version 1.47.

- Support bytes arrays which contain 0(!) bytes

5.5.4 Director V1.11

- Improved GUI

- Support firmware V1.48

5.5.5 Director V1.12

- Improved communication interface

- Support firmware V1.49

5.5.6 Director V1.14

- Support firmware V1.57

- Support of Simple Protocol, ASCII or binary, with or without CRC

- Support of USB HID reports

- Support of TWN4 SmartCard (slot ID-1, ID-0/SAM, slot 3 and 4)

- Support extended version string (Core Module or Mini Reader)

5.5.7 Director V1.16

- Support firmware V1.64

- Resizeable and scrollable history list

- Defined minimum size of main window

- Improved connecting mechanism and behaviour

- Colourful feedback of result of call of system functions

- Simplification of entering parameters for structure TDESFireFileSettings

- Manual input of system calls

- Many minor improvements

5.5.8 Director V1.17

- Support firmware V1.68

5.5.9 Director V1.18

- Support firmware V1.71

5.5.10 Director V1.22

- Support TWN4 Nano Module
- Minor improvements

5.5.11 Director V1.26

- Minor bug fixes
- Support TWN4 firmware V3.00

5.5.12 Director V1.28

- Support new system functions DESFire_CreateRecordFile, DESFire_ReadRecords, DESFire_WriteRecord, DESFire_ClearRecordFile
- Support SPI system functions
- Support of TWN4 Config
- Minor improvements

5.5.13 Director V1.30

- Support BLE, Cardax, Nedap
- Support new system functions (firmware V3.06)
- Minor improvements

5.5.14 Director V1.32

- Support new tag types IDTECK, PAC, Topaz
- Support new system functions (firmware V3.08)
- Minor improvements

5.5.15 Director V1.33

- Support all with firmware V3.10 newly available types of transponders
- Support all with firmware V3.10 newly available system functions
- Improved robustness against unplug of USB device during connected state
- Fix issue with window Z order under Windows 10

- Minor improvements

5.5.16 Director V1.34

- Support all with firmware V3.11 newly available system functions

5.5.17 Director V3.12

- Version number now follows version of supported firmware of TWN4
- Support all with firmware V3.12 newly available system functions
- Support comments in hst-files
- Minor improvements

5.5.18 Director V3.18

- Selectable history items for cycling
- Support new system functions according to firmware 3.18
- Minor improvements

5.5.19 Director V3.21.5

- Support firmware 3.21
- Minor improvements

5.5.20 Director V4.01

- Release version for DevPack 4.01
- Minor improvements

5.5.21 Director V4.02

- Required .NET Framework is 4.7.2

5.5.22 Director V4.05

- Support new system functions of TWN4
- Minor improvements

5.5.23 Director V4.06.05

- Support new system function BLEGetDiscoveredData,

- Fix support for system function ISO7816_SetCommSettings

- Adjustable timeout value

- Minor improvements

5.5.24 Director V4.50

- Support new system functions of TWN4

- Removed NFC peer-to-peer functions, which became obsolete

- Minor improvements

6 Disclaimer

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