TWN4 MultiTech Nano Development Kit
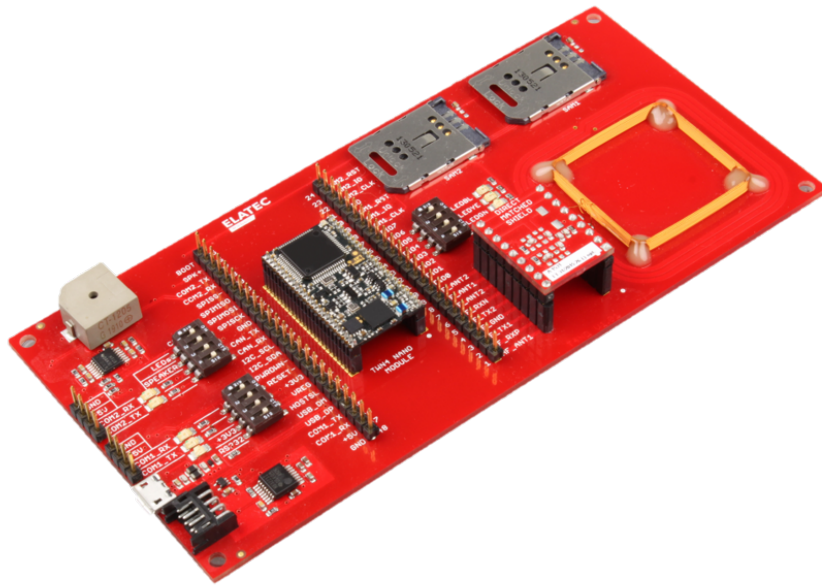
Technical Handbook

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Elatec GmbH

Contents

1. Introduction

The TWN4 MultiTech Nano Module is a configurable Reader/Writer of RFID transponders. It provides ports that can be connected to antennas operating at low (125kHz, 134.2kHz) and high (13.56MHz) frequencies. The Module can be accessed via a set of interfaces including USB, I2C, SPI, SAM, CAN, GPIO and COM (x2). The Nano device leaves to the User the implementation of the circuits required for full I/O and antenna functionality. As a result, the Nano boasts the smallest footprint within the TWN4 family, while affording the User the maximum flexibility in terms of Peripheral and Interface selection as well as Antenna properties.

This Development Kit is a vehicle intended to support the User with the integration of the Nano Module into their Product and the development of the required software. The Kit contains the fundamental functionalities needed to develop a working RFID Reader prototype.

Package Contents:

- Development board

- TWN4 MultiTech Nano Module

- Micro USB cable

- Lever for Nano Module extraction

- 2 x sample tags 125kHz

- 2 x sample tags 13.56MHz

2. Getting Started

2.1. Functional Overview

The functional layout of the Development Board is shown on Figure 2.1. Main features of the Development Board are:

- Ready-to-Use primary interfaces to the USB (8-pin DF11 or Micro USB) and UART (DF11) ports

- 2 SAM card slots.

- General COM2 port that can be configured for a custom application

- impedance-matched LF and RF antennas

- speaker

- 4 configurable LEDs

The Board also offers a breakout connector (Expansion slot) for the entire Nano Module pinout. This extra interface allows for live monitoring of the signals going to/from the Nano Module. The breakout connector can also be used with the I/O Extender Module documented separately. The I/O Extender provides extra debug functionality, an LCD screen and a number of serial interface adapters for the COM2 port.
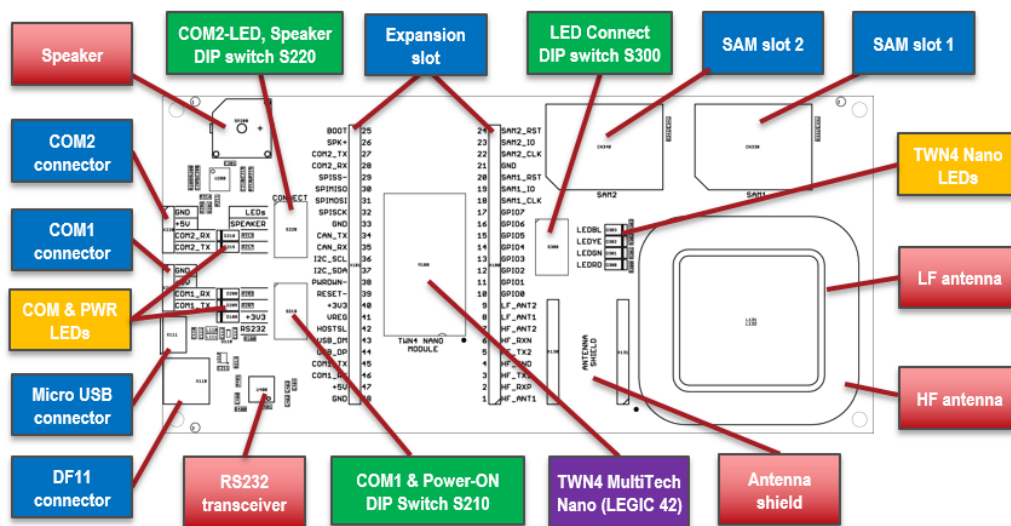

Figure 2.1.: Development Board Functional Overview

2.2. Replacing the Nano Module

Please use the set of Levers provided with the package to replace the Nano Module on the Development board. Place the levers on both sides of the Nano Module as shown on Figure 2.2. Gently and simultaneously push them down to extract the Nano Module from the board.
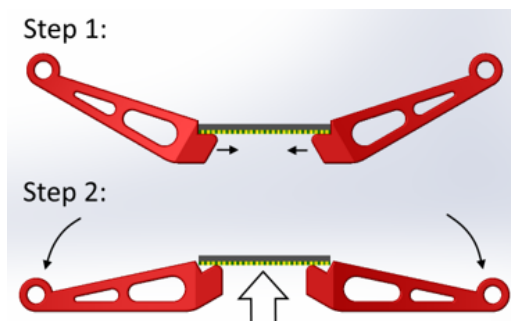

Figure 2.2.: Nano Module extraction levers

When inserting the Nano Module into the Development Board, please observe the correct polarity of the Module. The connector marking for Pin 1 (white dot) should be aligned with the small indentation on the Nano Module.

Warning: inserting the Nano Module into the board with incorrect polarity can cause permanent damage to the Module!

2.3. Establishing Connection

The Development Board can be connected to via USB (DF11 or Micro USB) or RS232 (DF11) port. In the case of the RS232 port, a DC Power Source of 5V has to be provided. In order to start operating the TWN4 MultiTech Nano (LEGIC 42), simply connect the desired port to the Host. The settings of the "COM1 & Power-On" DIP Switch (see Figure 2.1) need to be adjusted depending on connection type. Please see Table 2.1 for details.

Connector	Instructions
USB	1) On Development Board, plug in broken-out USB cable to the appropriate pins of DF11 connector; alternatively use Micro USB connector. Connect other side of cable to a PC. 2) "COM1 & Power-On" DIP Switch: Bit 3=ON You can still use COM1 or RS232 ports. See Table 3.1 for instructions.
RS232	1) Plug in the DF11 connector of the RS232 cable to the appropriate connector of the development board and the D-Sub 9 connector to a PC. Plug in a suitable power adapter to the DC jack of the D-Sub connector. 2) "COM1 & Power-On" DIP Switch bits: 1=ON, 2=ON, 3=ON, 4=ON

Table 2.1.: Establishing Connection

Once the board is connected to a host, a driver must be installed (in case of USB connection). Therefore install the driver included in TWN4 DevPack. When driver installation is finished, a new virtual COM port is available on the PC. Now you can set up a connection to the TWN4 MultiTech Nano using this COM port.

2.4. Flashing Firmware and Application Code

TWN4 MultiTech Development Pack contains ready-to-use Firmware images that can be programmed into the Nano Module using the AppBlaster program (present within the same Development Pack). Generic Firmware used to identify most RFID cards can be found at the path below:

- TWN4DevPack###\Firmware\Nano Module\TWN4_NKx###_STD201_Nano_Keyboard_Standard.bix

Please see the AppBlaster User Guide for instructions on flashing Firwmare and programming custom Applications.

2.5. Demo: Reading Cards

The easiest way to demonstrate the reading capability of the TWN4 MutiTech Nano Module is with the *Director* software (for Windows), included in the DevPack. To start reading card IDs, execute the *Director* software and follow the steps below:

- To setup a connection to the reader, select USB on the *Port* drop-down menu or, in case of RS232 connection, the appropriate COM port.

- Click the button *Connect*.

- Enable the checkbox *Cycle*. This will make the TWN4 MultiTech Nano (LEGIC 42) search for transponders cyclically.

- Optional: use the *Select Tag Types* drop-down menu to restrict the types of cards that can be detected.

- Now just place a transponder near the antenna, and the Director software will print the UID out in the log window, as shown on Figure 2.3.
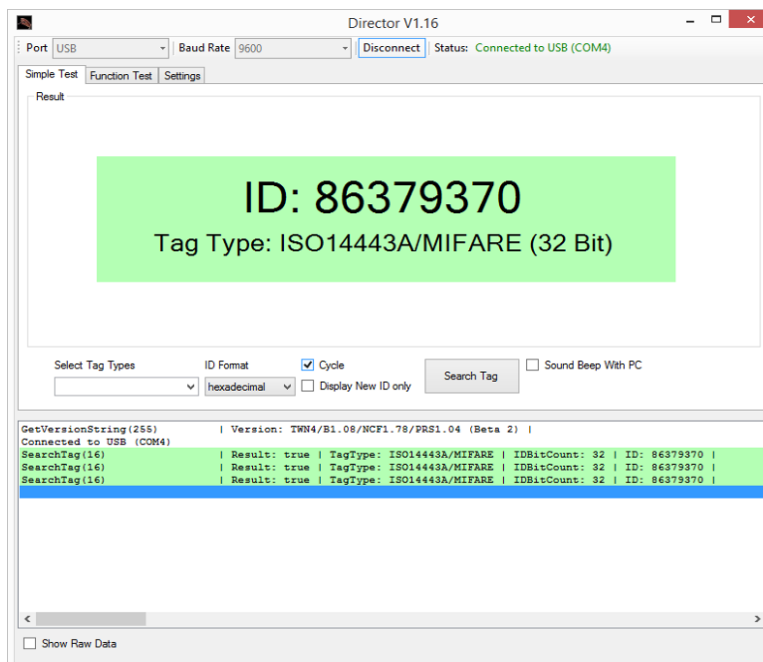

Figure 2.3.: Reading Card IDs with Director Software

3. Using Peripherals

3.1. Ready-to-Use Functionality on Dev Board

Table 3.1 contains instructions on how to enable built-in functionality of the Development Board. Refer to TWN4 MultiTech API documentation for detailed instructions on programming these devices. Refer to Section 2.1 for help locating components on the board.

Peripheral	Instructions to Enable
Speaker	"COM2-LED & Speaker" DIP Switch bit 2: ON to use Speaker.
Debug LEDs	There is a bank of 4 LEDs available next to the "LED Connect" DIP Switch. Use the DIP Switch to enable individual LEDs. These LEDs are driven by Nano Module GPIO ports 0-3.
COM-Side LEDs	There are 5 LEDs next to the COM ports. These include "Nano Module Power-ON", and RX/TX traffic indicators for both COM 1 and 2 ports. To enable these LEDs, set "COM2-LED & Speaker" DIP Switch bit 1 to ON. For COM2 port, see also entry directly below.
COM Port 2	COM2 port is functional without any extra board changes. To enable traffic LEDs on COM2 port, set "COM2-LED & Speaker" DIP Switch bits 3 and 4 to ON. See Table B.4 for details.
SAM Slots 1,2	No additional steps needed to activate. Simply insert card.
COM Port 1	Can be used as a general-purpose port if the main interface to Host is USB (Micro or DF11). Set "COM1 & Power-ON" DIP Switch bits: 1=ON, 2=OFF, 3=ON, 4=OFF. Also disable RS232 transceiver by floating Pin 8 (MGND) of DF11 port.
RS232 Port	Can be used as a general-purpose port if the main interface to Host is USB (Micro or DF11). Set "COM1 & Power-ON" DIP Switch bits: 1=ON, 2=ON, 3=ON, 4=ON. The same connector can be used for both USB and RS232. See Table B.1 for instructions.

Table 3.1.: Ready-to-Use Functionality on Dev Board

3.2. I/O Extender

The I/O Extender serves to provide additional Interfaces to the Nano Module for the customer to interact with. These include Wiegand, RS485/422, CAN and Relais. An LCD Screen is also available to assist with application bring-up.

The I/O Extender can be connected to the TWN4 MultiTech Nano Module via the Expansion slot on the Development Board. Please see the I/O Extender Technical Handbook for more information.

4. Disclaimer

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A. Appendix: DIP Switch Settings Reference

Bit	Function
1	Connect TWN4 MultiTech Nano to COM1 RX **and** RX out of RS232 transceiver. These 2 sources are channeled to Nano Module through an AND-Gate. Unused port will be pulled up to 3.3V.
2	Connect COM1 TX of TWN4 MultiTech Nano to RS232 transceiver. This also enables COM1 TX LED*. Recommend setting to OFF when using COM1 connector (not RS232 transceiver).
3	Connect VREG to +3V3. This powers up the TWN4 MultiTech Nano (LEGIC 42).
4	Connect MGND to GND. This enables RS232 transceiver.

Table A.1.: COM1 & Power-ON DIP Switch S210
*Bit 1 of "COM2-LED & Speaker DIP Switch S220" must also be set to ON.

Bit	Function
1	Enable COM-Side LEDs (Power-ON, COM port TX/RX traffic)
2	Enable Speaker on Development Board
3	Enable COM2 RX LED. Bit 1 must also be set to ON.
4	Enable COM2 TX LED. Bit 1 must also be set to ON.

Table A.2.: COM2-LED & Speaker DIP Switch S220

Bit	Function
1	Enable blue LED (Nano Module GPIO3)
2	Enable yellow LED (Nano Module GPIO2)
3	Enable green LED (Nano Module GPIO1)
4	Enable red LED (Nano Module GPIO0)

Table A.3.: LED Connect DIP Switch S300

B. Appendix: Connector Pinout Reference

Pin	Pin Name	Function
1	UGND	USB Ground. Fed to DevBoard Ground through noise-reduction circuit.
2	USB_D+	USB Data +
3	UVCC	USB VCC (5V). When using RS232, connect this to external 5V supply.
4	USB_D-	USB Data -
5	V24_RXD	RS232 RXD (Input)
6	GND	Ground
7	V24_TXD	RS232 TXD (Output)
8	MGND	Serial Cable Sense. Short to Pin 6 (GND) when using DF11 with RS232.

Table B.1.: DF11 Port (X110) Pin Configuration

Pin	Pin Name	Function
1	UVCC	USB VCC (5V).
2	USB_D-	USB Data -
3	USB_D+	USB Data +
4	ID	Not connected
5	UGND	USB Ground. Fed to DevBoard Ground through noise-reduction circuit.

Table B.2.: Micro USB Port (X111) Pin Configuration

Pin	Pin Name	Function
1	GND	Ground
2	+5V	Supply Voltage
3	COM1_RX	Active-Low TTL input with internal pull-up resistor of asynchronous RXD to COM1. The signal is linked with the RX output of the RS232 interface by a logical AND.
4	COM1_TX	Active-Low TTL output (push/pull) of asynchronous TXD from COM1.

Table B.3.: COM 1 Port (X210) Pin Configuration

Pin	Pin Name	Function
1	GND	Ground
2	+5V	Supply Voltage
3	COM2_RX	Active-Low TTL input with internal pull-up resistor of asynchronous RXD to COM2.
4	COM2_TX	Active-Low TTL output (push/pull) of asynchronous TXD from COM2.

Table B.4.: COM 2 Port (X220) Pin Configuration