BOOSTERS 2G

USER'S GUIDE

PROX-BOOSTER 2G
SMARTCARD-BOOSTER 2G
TRANSITION-BOOSTER 2G
PROX-BOOSTER TACHO 2G

INCL. CONFIGURATION SOFTWARE

2012-06-05

CONTENTS

1 INTRODUCTION

The Prox-Booster, Smartcard-Booster and Transition-Booster are dual ID tags enabling simultaneous identification of the inserted personal ID card and the embedded vehicle ID resulting in rapid driver and vehicle monitoring. The Prox-Booster tacho additionally sends the tacho-counter value, which relates to the travelled distance of the vehicle.

The Booster allows an inserted Proximity or Smartcard driver ID card and embedded vehicle ID to be read from a distance up to 10 meters (33 feet) in combination with NEDAP TRANSIT readers. This solution substantially enhances the level of security when controlling activities of vehicles that are regularly used by different drivers. Additionally a fully integrated vehicle and personnel access solution can be implemented.

For more details about the NEDAP TRANSIT reader refer to the TRANSIT installation guide.

The combined vehicle and driver ID is a unique NEDAP patented feature. Optionally the vehicle-ID can be sacrificed if more information from the personal ID card is required.

The following personal ID card types are identified with the Boosters.

- Prox-Booster (tacho)   NEDAP, EM and HID PROX
- Smartcard-Booster   MIFARE (incl. DESFIRE EV1), HID iCLASS, ISO14443A, ISO15693 and Calypso.
- Transition-Booster   all of the above

2   INSTALLATION

2.1   DIMENSIONS

The Boosters are easily mounted to the inside of the car's windshield by means of suction cups. Users should ensure the visual contact between the Booster and any TRANSIT reader is unobstructed with items such as stickers or metallized windshields (see also chapter 2.3 about solar control windshields).
Note that the Booster's suction cups must be faced toward the reader to achieve maximum reading distance.
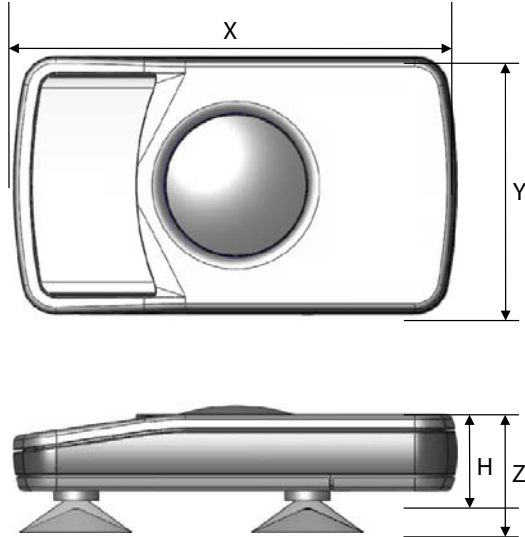
Dimension			
Length	X	111 mm	4.37 "
Width	Y	65 mm	2.56 "
Height	Z	32 mm	1.26 "
Body height	H	24 mm	0.95 "
Tacho wire			
wire length		1700 mm	67 "
wire thickness		2 x 0.25 mm^2	2 x AWG 23

Booster Dimensions

2.2   TEMPERATURE CONSIDERATIONS

The Booster is designed to operate within the extreme temperature ranges, which often occur behind a vehicle's windshield during the winter or summer seasons (-20°C to 85°C / -4°F to +185°F). However the personal identification card inserted in the Booster may not be designed to withstand such temperatures and could suffer damage as a result.

Nedap recommends to **remove the personal identification card** when not in use.

CAUTION: DO NOT LEAVE CARD IN ACCESS DEVICE WHEN LEAVING THE VEHICLE, AS THIS PRESENTS A SECURITY RISK.

CAUTION: DO NOT LEAVE CARD IN ACCESS DEVICE FOR LONG PERIODS OF TIME IN EXTREME HEAT, AS THIS MAY DAMAGE THE CARD.

2.3   SOLAR CONTROL WINDSHIELDS

From 1997 onwards several car manufacturers introduced vehicles with solar control windshields. The solar control windshields are equipped with a metalized coating, which can block the TRANSIT signal from the Booster mounted on the inside of the windshield of the vehicle.
Most of these windshields have a metal free zone where transponders can be mounted. The metal free zone of metalized windshields is most often found in the middle of the windshield behind and slightly below the rear view mirror. In vehicles manufactured after 1998 the metal free zone should be indicated on the window.
We advise the owner to contact the local car dealer if it is not clear where the aperture is exactly positioned in a certain vehicle and where the transponder should be mounted.

2.4 PROX-BOOSTER TACHO

The prox-booster tacho is a special booster version that should be wired to the speed pulse generator of your vehicle. The exact wiring details and connection location very much depend upon the brand, type and model of your vehicle. Contact your vehicle dealer for more information about the speed pulse generator in your vehicle.

Tacho input specifications:
- Input voltage: 6V to 24V (max. 30V).
- Polarity reversal tolerant.
- Input prescaler 1:256.
- Maximum pulse frequency 850Hz.
- Maximum vehicle speed 255km/h (at 12 pulses/meter).

$$= \frac{850}{12} \times 3.6 = 255 km/h \cdot$$

3 IDENTIFYING THE BOOSTER WITH A TRANSIT

3.1 HOW TO USE THE BOOSTER

Place the Booster on the inside of the windscreen of your vehicle as described in chapter 2.
The driver inserts his personal identification card and activates the Booster's button.
A beep should indicate that the card was successfully read. A low beep indicates that card reading failed [1].
The TRANSIT reader can identify your card up to a distance of 10 meters (=33 ft).
After 5 seconds the Booster returns into sleep mode. The booster will remain active when in 'always-on'-mode.
The driver should remove his personal identification card from the Booster when leaving the vehicle.

3.2 READER OUTPUT BOOSTER INFO

The Prox/Smartcard-Booster is a battery operated passive tag. The information from the tag is sent to the reader by a method called modulated backscatter. This means that the 2.45GHz signal coming from the reader's antenna is modified in such way that it can be recognized by the reader.

The examples below assume that a TRANSIT PS270 reader with P81 firmware is used and show the messages transmitted on the RS-232 interface to a host system (TXD). Refer to the TRANSIT firmware manuals for more details about the reader communication protocol.

Combi-Booster mode (Vehicle-ID + Driver-ID)
The Booster cannot be identified until the driver inserts his personal identification card and pushes the Booster's button. Once the button is pushed the Booster reads the personal identification card and beeps[1] upon a successful read. Both vehicle-id and driver-id are transmitted to the host system for 5 seconds. Afterwards the Booster automatically deactivates again. The booster will remain active when in 'always-on'-mode.

Example: vehicle-id = 123, driver-id = E4947C46,

TXD = Y000000012300000000000000E4947C46$^C{}_R{}^L{}_F$

If 'Standard-length' is configured, the following message is transmitted to the host.

TXD = U000000012300E4947C46$^C{}_R{}^L{}_F$

- Event identifier ('Y' or 'U').
- Vehicle-id (10 digits).
- Driver-id (10 or 22 digits).

Booster mode (Only Driver-ID)
The Booster is 'sleeping' until the driver inserts his personal identification card and pushes the Booster's button. Once the button is pushed the Booster reads the personal identification card and beeps[1] upon a successful read. The data is transmitted to the host system for 5 seconds. After that the Booster automatically deactivates again. The booster will remain active when in 'always-on'-mode.

Example: driver-id = 871111111117100944,

TXD = Z00000000000000871111111117100944$^C{}_R{}^L{}_F$

If 'Standard-length' is configured, the following message is transmitted to the host.

TXD = U0087111111117100944$^C{}_R{}^L{}_F$

- Event identifier ('Z' or 'U').
- Driver-id (20 or 32 digits).

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[1] See chapter 6 for details about the buzzer indications.

3.3   READER OUTPUT TACHO INFO

Tacho-Booster mode (Vehicle-ID + Driver-ID + Tacho-Counter)
The prox-booster tacho should be connected to the speed pulse generator of your vehicle. The prox-booster will count the number of pulses generated.
The Booster cannot be identified until the driver inserts his personal identification card and pushes the Booster's button. Once the button is pushed the Booster reads the personal identification card and beeps❶ upon a successful read. Both vehicle-id, driver-id and tacho-counter are transmitted to the host system for 5 seconds. Afterwards the Booster automatically deactivates again. The tacho counter will be updated while the booster is deactivated. The booster will remain active when in 'always-on'-mode.

Example reader output: vehicle-id = 123, driver-id = E4947C46, tacho-counter = 2AC4,

TXD = X000000012300E4947C468000002AC4$^C_R$$^L_F$

- Event identifier ('X' = triple identifier detection event).
- Vehicle-id (10 digits).
- Driver-id (10 digits).
- Additional data identifier ('80' = tacho counter).
- Additional data (in this case the tacho counter value).

How to calculate the constant factor required to convert tacho counter value into travelled distance.

- Get the vehicle's initial mileage $(= M_1)$ and the initial tacho counter value $(= T_1)$.

- Drive the vehicle for a significant amount of miles (or kilometers).

- Then again get the actual mileage $(= M_2)$ and the actual tacho counter value $(= T_2)$.

- Now calculate the number of counts per mile (or km) by using the following formula:

$$K = \frac{(T_2 - T_1)}{(M_2 - M_1)}$$

How to calculate the vehicle's travelled distance.

- Get the actual tacho counter value $(= T_n)$

- Calculate travelled distance by using the following formula:

$$D_n = \frac{(T_n - T_1)}{K}$$

- Calculate the current mileage by using the following formula:

$$M_n = D_n + M_1 .$$

4   SMARTCARD CONFIGURATION

The Smartcard-Booster and the Transition-Booster can be configured by means of a configuration card. This configuration card is a Mifare Classic 1K or 4K card that is programmed with the configuration settings.

Configuration is only required if the factory default settings are not sufficient. The default settings are described in chapter 4.2.3.

4.1   CONFIGURATION PROCEDURE

Every Booster used in the application should be configured with the configuration card. The simple configuration procedure is described below.

Insert the configuration card in the Booster and push the button. The Booster sounds the buzzer with an increasing frequency (♪ ♪ ♪) to indicate that the configuration card is accepted[1].

4.2   HOW TO CREATE A CONFIGURATION CARD

NEDAP has developed a software application that allows system integrators to create configuration cards. This software can be downloaded from our website **www.nedapavi.com**.
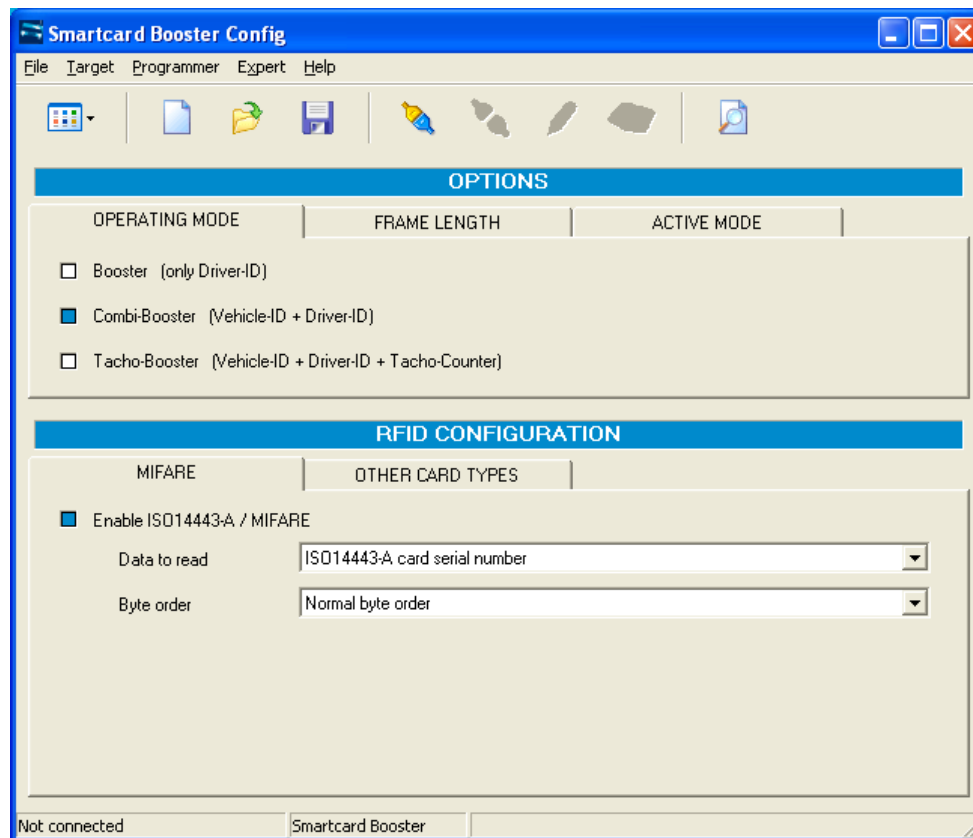
Smartcard-Booster Config software

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[1] See chapter 6 for details about the buzzer indications.

4.2.1   TARGET DEVICE

The Booster Configuration software can be used to configure a number of different devices. The user-interface is adapted to the selected target device. Select in the 'Target' menu which device you are about to configure.

- ☐   Smartcard-Booster
- ☐   Transition Booster
- ☐   Prox Booster EM4x50   *not covered in this manual*
- ☐   MTR Module   *see chapter 5*

4.2.2   CREATION PROCEDURE

Follow the procedure below to create a configuration card with application specific settings.
1.   Specify OPERATING MODE   (see chapter 4.2.2.1)
2.   Specify FRAME LENGTH   (see chapter 4.2.2.2)
3.   Specify ACTIVE_MODE   (see chapter 4.2.2.3)
4.   Specify RFID CONFIGURATION settings   (see chapter 4.2.2.4)
5.   Save the configuration settings into a file.
6.   Write the configuration into a blank Mifare Classic 1K or 4K card.

4.2.2.1   OPERATING MODE

Booster (only Driver-ID)

Up to 16 bytes of data from the personal identification card is read. The Vehicle-ID is omitted.

Combi-Booster (Vehicle-ID + Driver-ID)

Vehicle-ID combined with up to 11 bytes from the personal identification card is read.

Tacho-Booster (Vehicle-ID + Driver-ID + Tacho-Counter)

Vehicle-ID and Driver-ID combined with Tacho-Counter value. If this option is selected than automatically extended-length is selected.

4.2.2.2   FRAME LENGTH

This affects the length of the message sent to TRANSIT reader.

Extended length (longer Driver-ID)

Select extended-length in order to support all transponder types and maximum amount of data. The extended-length may be not compatible with older firmware versions in the TRANSIT reader. You might need to upload new firmware into the reader.
The identification speed is a bit slower compared to applying standard-length.

Standard length (backwards compatible, faster identification)

Select standard-length in applications where compatibility with older types of transponders or where fast identification is important.

Please note that when reading low-frequency cards with a Transition-Booster this setting is not used.
For NEDAP and EM cards the extended-length is not required and therefore the Booster will automatically use standard-length (even if extended-length is selected in the configuration).
For HID PROX the extended-length is required so extended-length is used automatically if such a card is identified (even if standard-length is selected in the configuration).

4.2.2.3   ACTIVE MODE

Two activation modes are possible: Switched or Always-on.
The setting can only be changed when the Booster originally was in switched mode !!!
Switched mode is selected when the operating mode is Booster (only Driver-ID).

Switched mode (active for approx. 5 seconds)

In switched mode the booster is active for approx. 5 seconds after the booster's button is pushed and then autmatically returns into sleep mode.

Always-on (continuously active)

In always-on mode the booster remains active. When the booster's button is pushed the booster will read the inserted card. If a card is identified, the booster will check every few minutes if the inserted card is still present.

4.2.2.4   RFID CONFIGURATION

ISO14443-A / MIFARE

Enable or disable the reading of ISO14443-A / MIFARE cards.

Data to read:

For ISO14443-A cards the card serial number can be read. The cascaded card serial number (e.g. used in Mifare UltraLight cards) is also supported. For MIFARE cards also other encrypted information from the card can be read. Select one of the following choices:

☐   ISO14443-A card serial number
☐   MIFARE UltraLight data   (see chapter 4.2.2.5 for more details)
☐   MIFARE Classic sector data   (see chapter 4.2.2.6 for more details)
☐   MIFARE DESFIRE file data   (see chapter 4.2.2.7 for more details)

The byte order can be set to normal or reversed.

NEDAP PM [1] [2]

Enable or disable the reading of NEDAP PM cards. NEDAP PM cards are always transmitted to the TRANSIT using standard-length.

EM4102 (and compatible) [1] [2]

Enable or disable the reading of EM4102 and compatible cards. EM4102 cards are always transmitted to the TRANSIT using standard-length.

HID PROX [1]

Enable or disable the reading of HID PROX cards. HID PROX cards are always transmitted to the TRANSIT using extended-length.

HID iCLASS CSN

Enable or disable the reading of HID iCLASS cards. Only the card serial number can be read from these cards.

ISO15693 / LEGIC Advant CSN

Enable or disable the reading of ISO15693 / LEGIC Advant cards. Only card serial number can be read from these cards.

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[1] Not supported on the Smartcard-Booster.
[2] Cannot be disabled on MTR.

Calypso

Enable or disable the reading of Calypso cards.

Data to read:

For Calypso cards the 4-byte PUPI or information from always accessible files can be read. The Booster does not support the Calypso SAM to fully support the Calypso encrypted file system. Select one of the following choices:

- ☐ PUPI (pseudo unique PICC identifier)
- ☐ Calypso file data

Byte order:

The byte order can be set to normal or reversed.

Short File Identifier:

Calypso SFI (Short File Identifier) in range from 1 .. 30. Some files have no SFI. Only files with an SFI are supported.

Record Number:

A file may contain more than one record. Numbered from 1 to the maximum number of records.

Data Length:

Number of bytes to transmit. The maximum number of bytes is dependant upon the operating-mode and frame-length settings.

Data Offset:

Number of bytes to skip.

4.2.2.5   READING MIFARE ULTRALIGHT DATA

The Mifare UltraLight transponders' 512 bit EEPROM memory is organized in 16 pages with 4 bytes each.

Page Number

Page number to start reading from (in range from 0 .. 15).
Always 4 pages are read. The reading will wrap around to page number 0 if additional data after page 15 should be read.

Data Length

Number of bytes to transmit. The maximum number of bytes is dependant upon the operating-mode and frame-length settings.

Data Offset

Number of bytes to skip.

Example:
Data to read: | MIFARE UltraLight data
Byte order: | Normal
Page Number: | 4
Data Length: | 8
Data Offset: | 2

Always 16 bytes are read from the card and in this example the reading starts at page 4, thus pages 4, 5, 6 and 7 are read. The first 2 bytes are skipped because the offset is set to 2. The following 8 bytes are transmitted because the configured data length is 8.

	Byte 0	Byte 1	Byte 2	Byte 3
Page 4	skipped	skipped	DATA	DATA
Page 5	DATA	DATA	DATA	DATA
Page 6	DATA	DATA	ignored	ignored
Page 7	ignored	ignored	ignored	ignored

Reverse example:
Data to read: | MIFARE UltraLight data
Byte order: | Reverse
Page Number: | 5
Data Length: | 10
Data Offset: | 6

Always 16 bytes are read from the card and in this example the reading starts at page 5, thus pages 5, 6, 7 and 8 are read. After the byte order is reversed, the first 6 bytes are skipped because the offset is set to 6. The following 10 bytes are transmitted because the configured data length is 10.

	Byte 3	Byte 2	Byte 1	Byte 0
Page 8	skipped	skipped	skipped	skipped
Page 7	skipped	skipped	DATA	DATA
Page 6	DATA	DATA	DATA	DATA
Page 5	DATA	DATA	DATA	DATA

4.2.2.6   READING MIFARE CLASSIC SECTOR DATA

The Mifare Classic 1K and 4K cards are fully supported. Also other Mifare cards which are compatible (such as Mifare Plus and SmartMX) can be used. The memory is organized in sectors with blocks. Every block consists of 16 bytes.

Upon configuring the smartcard-booster for reading MIFARE DESFIRE cards, the following parameters must be specified.

Sector Number
    Sector number to read data from (in range from 0 .. 39).

Block Number
    Block number to read data from. The block number must be in range from 0 .. 3 for the first 32 sectors. For the sectors 32 .. 39 the block number can range from 0 .. 15.

Data Length
    Number of bytes to transmit. The maximum number of bytes is dependant upon the operating-mode and frame-length settings.

Data Offset
    Number of bytes to skip.

Read Key
    Key A or Key B can be used to authenticate to the card.
    Select which key to use and the key itself.

Example:
Data to read: MIFARE Classic sector data
Byte order: Normal
Sector Number: 1
Block Number: 1
Data Length: 8
Data Offset: 2
The settings above will read the data below shown in blue.

Sector	Block	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	1	x	x	D	D	D	D	D	D	D	D	x	x	x	x	x	x
	2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	3	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Reverse example:
Data to read: MIFARE Classic sector data
Byte order: Reverse
Sector Number: 2
Block Number: 0
Data Length: 10
Data Offset: 6
The settings above will read the data below shown in blue.

Sector	Block	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
2	0	x	x	x	x	x	x	D	D	D	D	D	D	D	D	D	D
	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	3	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

4.2.2.7   READING MIFARE DESFIRE FILE DATA

The MIFARE DESFIRE cards are fully supported. Also other newer DESFIRE EV1 cards can be used. Including the DES, 3DES, 3 Key 3DES and AES encryptions.

The DESFIRE card's memory is organized using a flexible file system. This file system allows several different applications on a single card. Every application is identified by it's 3 byte application identifier (AID). Each application may contain up to 32 files.

Upon configuring the smartcard-booster for reading MIFARE DESFIRE cards, the following parameters must be specified.

Application ID
>   Three byte application identifier (AID).

File number
>   File number in the range from 0 .. 31.

Communication mode
>   ☐   Plain.
>   ☐   Plain secured by MACing.
>   ☐   Fully enciphered.

Data Length
>   Number of bytes to transmit. The maximum number of bytes is dependant upon the operating-mode and frame-length settings.

Data Offset
>   Number of bytes to skip.

Encryption
>   ☐   None (skip authentication)
>   ☐   Native DES/3DES
>   ☐   ISO DES/3DES
>   ☐   3 Key 3DES
>   ☐   AES

Key number
>   Key number in range from 0 to 13.

Key
>   Security authentication key. Depending upon the selected encryption method and key number. The encryption key is 16 or 24 bytes.

4.2.3   DEFAULT CONFIGURATION

In the table below the default configuration is shown.

Configuration settings	Default value
Operating mode	Combi-Booster (Vehicle-ID + Driver-ID)
Frame length	Extended-length (longer Driver-ID)
Active mode	Switched mode
ISO14443-A / MIFARE	Enabled
Data to read	ISO14443-A card serial number
Byte order	Normal
NEDAP PM	Enabled
EM4102 (and compatible)	Enabled
HID PROX	Enabled
HID iCLASS CSN	Enabled
ISO15693 / LEGIC Advant CSN	Enabled
Calypso	Enabled
Data to read	PUPI
Byte order	Normal

4.3   PROGRAM THE CONFIGURATION CARD

4.3.1   USING A SUPPORTED PROGRAMMER

The software supports a few different programming devices. The NXP Pegoda, the HID OMNIKEY 5x21 and PC/SC contactless readers from the Springcard CSB6 Family (e.g. Prox 'n' Roll PC/SC).

4.3.1.1   NXP PEGODA PROGRAMMER

Connect the NXP Pegoda Mifare programmer to a USB port on your computer. USB drivers must be installed as described in the NXP documentation.
In the 'Programmer' menu select the 'NXP Pegoda' and click 'Connect' to connect to the programmer.

4.3.1.2   HID OMNIKEY 5x21-CL PROGRAMMER

Connect the HID OMNIKEY 5x21-CL USB programmer to a USB port on your computer. USB drivers must be installed as described in HID documentation.
In the 'Programmer' menu select 'HID OMNIKEY' and click 'Connect'.

4.3.1.3   SPRINGCARD CSB6

The SpringCard CSB6 and Prox 'n' Roll PC/SC share the same architecture. Install the PC/SC drivers as described in the SpringCard documentation. Connect the CSB6 to a USB port on your computer.
In the 'Programmer' menu select 'SpringCard CSB6' and click 'Connect'.

4.3.1.4   PROGRAMMING

Once the connection has been established and all configuration settings are entered, place an empty Mifare Classic 1K or 4K card on the programmer.

To program the configuration into the Mifare card click 'Write configuration into card' in the 'Programmer' menu. The message 'Configuration written into card' should appear to indicate that the programming action was successful. [1]

The software will warn you with the message 'Overwrite configuration card' if there is already a configuration on the Mifare card. Click 'Yes' to proceed and overwrite the configuration on the card or click 'No' to abort.

4.3.1.5   READ BACK

It is also possible to read back what configuration is programmed into a configuration card. Click 'Read configuration from card' in the 'Programmer' menu. [1]
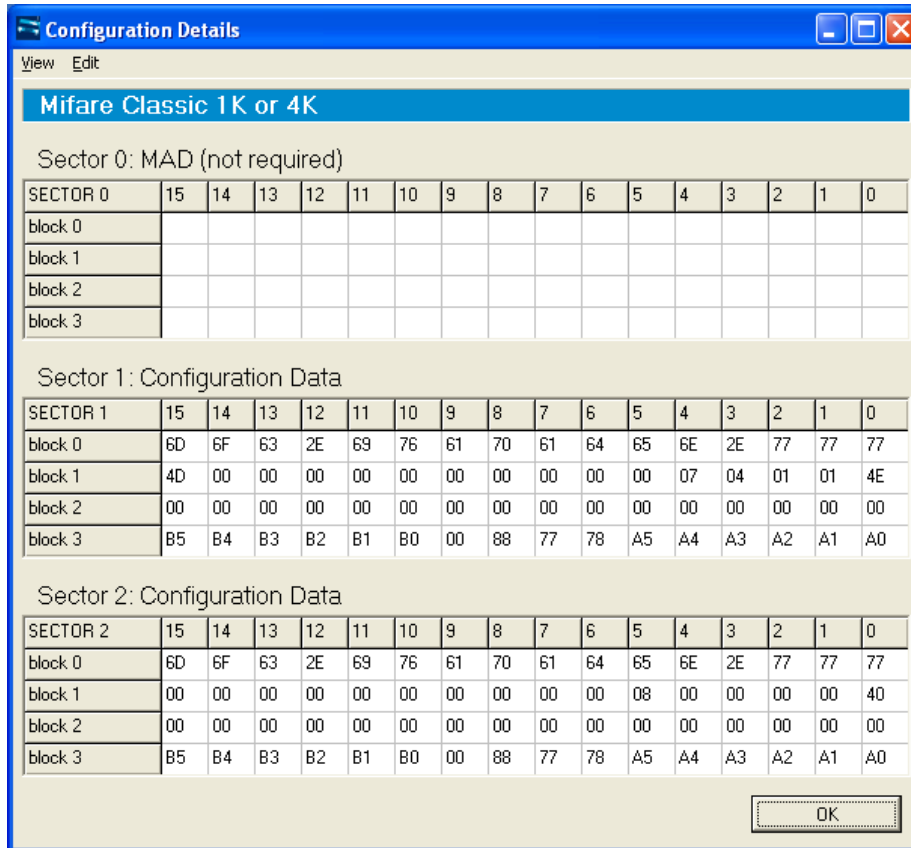
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[1]   The HID OMNIKEY programmer sometimes requires to remove and replace the config card before re-accessing the card is possible.

4.3.2   USING ANOTHER PROGRAMMER

If there is no supported programmer available you can use any other Mifare programmer to write the configuration into a Mifare classic card.

The configuration data should be written into sector 1 and 2 of a Mifare Classic 1K or 4K card. The contents of these sectors is not explained, but can be shown by the configuration software by clicking 'Show configuration details' in the 'Expert' menu.

Mifare Classic 1K or 4K

Sector 0: MAD (not required)

SECTOR 0	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
block 0																
block 1																
block 2																
block 3																

Sector 1: Configuration Data

SECTOR 1	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
block 0	6D	6F	63	2E	69	76	61	70	61	64	65	6E	2E	77	77	77
block 1	4D	00	00	00	00	00	00	00	00	00	00	07	04	01	01	4E
block 2	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
block 3	B5	B4	B3	B2	B1	B0	00	88	77	78	A5	A4	A3	A2	A1	A0

Sector 2: Configuration Data

SECTOR 2	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
block 0	6D	6F	63	2E	69	76	61	70	61	64	65	6E	2E	77	77	77
block 1	00	00	00	00	00	00	00	00	00	00	08	00	00	00	00	40
block 2	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
block 3	B5	B4	B3	B2	B1	B0	00	88	77	78	A5	A4	A3	A2	A1	A0

Configuration Data

Sector 0 is reserved for MAD (Mifare Application Directory). If the MAD is programmed, the Nedap configuration sectors should have application id 517F.

4.3.2.1   COPY TO CLIPBOARD

Copy the configuration data to clipboard by clicking 'Copy to clipboard' in the 'Edit' menu.

4.3.2.2   CUSTOMIZING VIEW

In the 'View' menu the viewing can be customized in such way that it best matches your programming software. Click 'Change Hex Prefix…' to specify a specific prefix that is shown before every configuration data byte. Below is shown the configuration data with prefix '0x'.

```
0x77 0x77 0x77 0x2E 0x6E 0x65 0x64 0x61 0x70 0x61 0x76 0x69 0x2E 0x63 0x6F 0x6D
0x4E 0x01 0x01 0x07 0x07 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x4E
0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00
0xA0 0xA1 0xA2 0xA3 0xA4 0xA5 0x78 0x77 0x88 0x00 0xB0 0xB1 0xB2 0xB3 0xB4 0xB5
```

Besides the hex prefix also the byte order can be changed from within the 'View' menu.
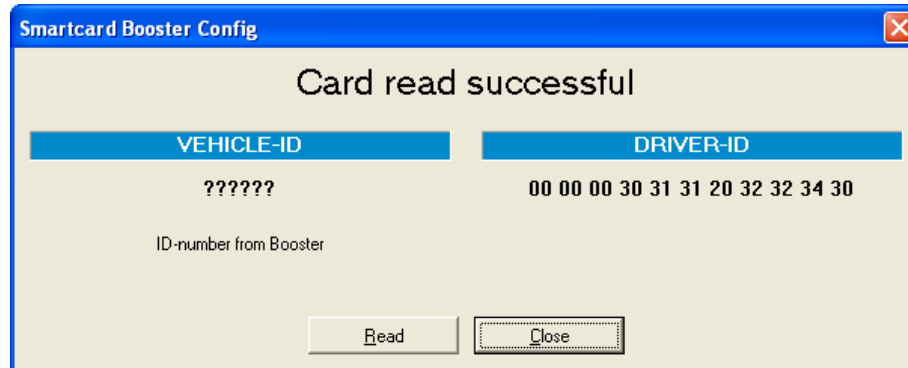
4.4 TESTING THE CONFIGURATION

The MIFARE settings can be tested before loading it into the Smartcard-Booster using a supported mifare reader.
From the 'Programmer' menu choose 'Test configuration'.
Place the Mifare card (not the config card) on the reader and click the 'Read' button.
The reader reads the Mifare card according to the current configuration settings.
The software displays the driver-id number as it will be identified by the TRANSIT.

Configuration Test

If the card is not read or if the wrong data is shown under DRIVER-ID then check if the configuration settings are correct. Remember that only MIFARE cards can be tested this way.

4.5 CONFIGURATION FILES

Your configuration can be saved into a so-called Smartcard Booster Config File (*.sbcf). These files contain all the configuration settings as you have defined them. Saved Config Files can be easily opened from within the File menu.

5 MTR CONFIGURATION

The MTR Module (Multi-Technology Reader) is especially designed to read low-frequency proximity cards and ISO compliant smartcards directly on the TRANSIT Entry reader at short range without Booster.

The MTR is configured in exactly the same way as the Smartcard Booster. Refer to chapter 4 on page 8 for more information about the configuration procedure.

For more details about the TRANSIT Entry reader and the MTR refer to the separate documentation.

6   BUZZER INDICATIONS

The Booster's built-in buzzer gives audible feedback upon various conditions. The table below describes the buzzer indications.

Buzzer	Description
1 beep	Card read
1 short low beep	Failed to read card (not in configuration)
3 beeps increasing frequency ♪ ♪ ♪	Configuration card accepted
6 beeps increasing frequency	Power on (Smartcard-Booster / Transition-Booster / MTR)
3 beeps	Power on (Prox-Booster)

7   BATTERY REPLACEMENT

The Smartcard-Booster contains two replaceable non-rechargeable AAA batteries. The average lifetime of these batteries is approximately 5 years. When replacement becomes necessary follow the procedure below.

1. Open the battery compartment.
2. Remove both batteries. Follow local environment protection laws / regulations for disposal of used batteries.
3. Replace with two new batteries. Make sure that the polarity matches the indicated polarity. Refer to appendix A for battery requirements.
4. Close the battery compartment and verify if the booster is working properly.
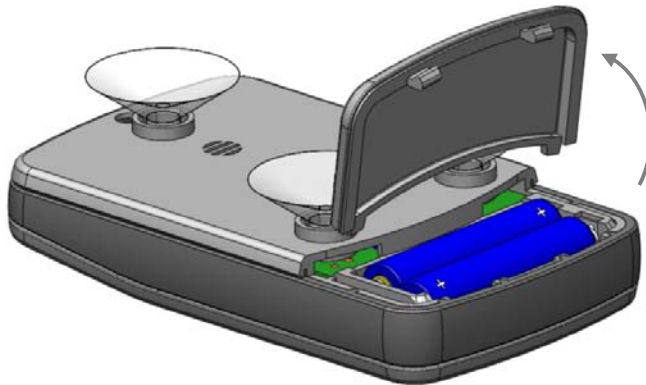
A   TECHNICAL SPECIFICATIONS

Dimensions	111 x 65 x 24 mm	(4.4 x 2.6 x 1.0 in)	
Weight	120 gram	(4.2 oz)	
Protection	IP32		Approx. NEMA 2
Operating temperature	-20°C … +85°C	(-4°F … +140°F)	
Storage temperature	-40°C … +85°C	(-40°F … +140°F)	
Color	Grey		RAL 7016 / RAL 7040
Relative humidity	10% … 93%		non-condensing
Identification range	Typically 10 meters	(33 ft)	line-of-sight required
Battery, size AAA, 1.5V	2 x Duracell Procell PC2400		Or equivalent (I_{max} < 8A, < 100VA)

B   PART NUMBERS

PROX/SMARTCARD-BOOSTERS

Prox-Booster 2G   part number: 9948538

Smartcard-Booster 2G   part number: 9948554

Transition-Booster 2G   part number: 9948562

Prox-Booster tacho 2G   part number: ………

READER

TRANSIT PS270 long range reader   part number: 9990410

TRANSIT Entry reader   part number: 9876200

ENTRY READER ACCESSORIES

MTR Module   part number: 7816650