COMBI-BOOSTER

INSTALLATION GUIDE

2004-09-20 Part.no. ???????

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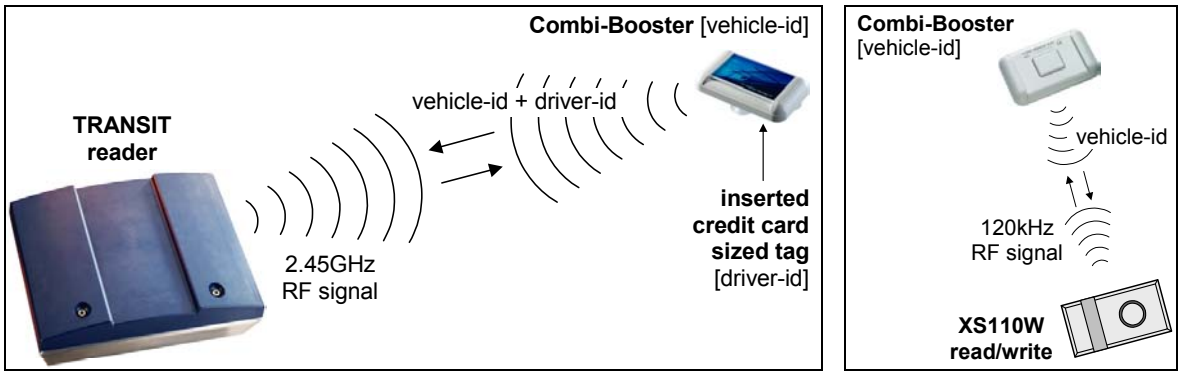
1 INTRODUCTION

The Combi-Booster is an intelligent microwave RF-ID transponder designed for fleet owners who want identification of vehicle and driver at the same time. The Combi-Booster is mounted behind the windshield of a vehicle and is programmed with the vehicle's id-number. The inserted credit card sized tag generates the driver's id-number.
The combination of driver-id and vehicle-id brings the flexibility needed for fleet owners to control their vehicles even when different drivers are driving the vehicles.
The Combi-Booster combines both id-numbers (vehicle and driver) into one message, which is transmitted to the TRANSIT microwave RF-ID reader.

The Combi-Booster was developed based upon the unique patent of the Nedap dual band technology. This patented technology enables reading of the low frequency credit card sized tag by the TRANSIT microwave reader. The microwave technology in the 2.45GHz band allows identification at a distance up to 10 meters, even at high speeding passage.

The Combi-Booster can be used for two types of Nedap low frequency cards, the thin ISO-card and the thicker XS-card. The firmware of the Combi-Booster also supports 64-bit manchester encoded transponders such as the EM4001.

A special Combi-Booster version is available which can read HID-cards. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.



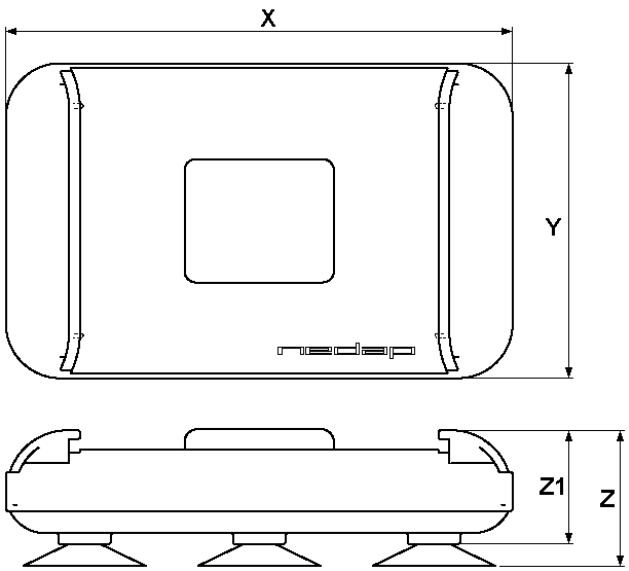
Key features:

- Unique patented dual band technology
- Combined vehicle-id and driver-id
- Easy interior mounting
- Push button activation
- Long life time (up to 6 years)
- Multiple read

2 INSTALLATION

2.1 DIMENSIONS

The combi-booster is easily mounted on the interior of the car's windshield by means of suction cups. Users should ensure the visual contact between the combi-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 combi-booster's suction cups must be faced toward the reader to achieve maximum reading distance.



Dimension		inches	millimeters
Overall length	X	4.57	116
Overall width	Y	2.83	72
Overall height	Z	1.22	31
Body height	Z1	1.02	26

Combi-Booster dimensions

2.2 TEMPERATURE CONSIDERATIONS

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

Nedap advises to either **remove the standard proximity** card when not in use or utilize the ProXS HT card which operates at temperatures from -4°F to 194°F.

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 combi-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.

3 OPERATING MODES

The Combi-Booster can operate in a number of operating modes. These modes can be programmed with a RF-ID programmer (e.g. Nedap XS110W).

3.1 MODE A

Always on mode
This is the default operating mode. In this mode the combi-booster is continuously active and always transmits both vehicle-id and driver-id to the reader.
When the button on the combi-booster is pressed the inserted card is read. When there is no card present in the combi-booster the driver-id is filled with zeros. The combi-booster, without the button being depressed, will attempt to re-read the inserted card every 5 minutes. This function ensures proper driver identification when one card is replaced by another card without pressing the button.

3.2 MODE B

Switched combi-booster / window-tag mode
In this mode the Combi-Booster acts like a normal window tag and continuously transmits only its vehicle-id to the reader.
When the button on the combi-booster is pressed, the inserted card is read and the combi-booster will transmit both vehicle-id and driver-id to the reader for a period of 10 seconds. When there is no card present in the combi-booster, the transmitted driver-id is filled with zeros. After 10 seconds the combi-booster resumes transmitting only the vehicle-id.

3.3 MODE C

Switched combi-booster mode
In this mode the combi-booster is inactive until the button on the combi-booster is pressed.
When the button is pressed the inserted card is read and the combi-booster will transmit both vehicle-id and driver-id to the reader for a period of 10 seconds. When there is no card present the driver-id is filled with zeros. After the 10 second active period has expired, the combi-booster automatically powers down.

3.4 MODE D

'Multi-tag' mode
The combi-booster will transmit at random intervals both the vehicle-id and the driver-id. The inactive period between transmissions allows any other combi-booster in reader ranger to transmit its id.
The inserted card is read when the button is pressed. When there is no card present in the combi-booster the driver-id is filled with zeros. As in Mode A, the combi-booster automatically re-checks the inserted card for proper identification every 5 minutes.

Active period: 1 timeslot of 273ms (vehicle-id and driver-id are transmitted 4 times in this period)
Maximum inactive period: 15 timeslots of 273 ms = 4096ms

4 CUSTOMER CODES

The customer code is an invisible number inside the transponder, which is unique for each customer. All transponders for any particular customer will contain the same customer code. This ensures that transponders belonging to Customer A will not be read by any other TRANSIT reader owned by Customer B.

Each combi-booster is programmed with the customer code and a unique id number. The same applies for the low frequency card as well. The combi-booster does not verify the customer code of the inserted card, but will forward it to the TRANSIT reader. The TRANSIT reader verifies for both id numbers if the customer code matches the customer code programmed to that reader. If the customer code for either id number is invalid, then that id number is ignored. If the customer codes for both vehicle-id and driver-id are invalid, the TRANSIT reader will ignore all transmitted data.

Customer codes are never transmitted to a host system.

5 FACILITY CODES

Facility codes used by some card manufacturers, such as HID, are very similar to customer codes.
A facility code, which is sometimes called a site code, also differentiates one user's card group from another. The facility code is programmed into the card at the time of manufacture.

The facility code is sent to the host system.

Nedap cards do not contain a facility code.

6 MICROWAVE 2.45GHZ RF INTERFACE

The combi-booster is 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 combi-booster does not support programming by the TRANSIT microwave interface.

6.1 READING THE COMBI-BOOSTER WITH NEDAP CARDS

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).

Combi-Booster in operating mode A
The driver inserts his card and pushes the button on the combi-booster. As soon as the combi-booster is within the detection range of the reader it is automatically recognized. Both vehicle-id and driver-id are transmitted to the host system.

Example: vehicle-id = 000001, driver-id = 009472, TXD = U00000000010000009472$^{C_R L_F}$

Combi-Booster in operating mode B
As soon as the combi-booster is within the detection range of the reader it is automatically recognized. Only the vehicle-id is transmitted to the host system.

Example: vehicle-id = 000012, TXD = N000012$^{C_R L_F}$

When the driver inserts his card and pushes the button, the combi-booster will read the inserted card and the reader is able to recognize both vehicle-id and driver-id for 10 seconds.

Example: vehicle-id = 000123, driver-id = 008361, TXD = U00000001230000008361$^{C_R L_F}$

Combi-Booster in operating mode C
The combi-booster is not read until the driver inserts his card and pushes the button on the combi-booster. Both vehicle-id and driver-id are transmitted to the host system. After 10 seconds the combi-booster automatically deactivates again.

Example: vehicle-id = 001234, driver-id = 007250, TXD = U00000012340000007250$^{C_R L_F}$

Combi-Booster in operating mode D
The driver inserts his card and pushes the button on the combi-booster. As soon as the combi-booster is within the detection range of the reader it is automatically recognized. Both vehicle-id and driver-id are transmitted to the host system. The combi-booster deactivates at random intervals to allow the reader to identify other transponders which may be within the detection range as well.

Example: vehicle-id = 012345, driver-id = 006149, TXD = U00000123450000006149$^{C_R L_F}$

6.2 READING THE COMBI-BOOSTER WITH AN EM4001 CARD

The combi-booster also supports 64-bit manchester encoded transponders like the EM4001. These cards contain 40-bits of user data (driver-id). The TRANSIT reader does not check for a customer code for these cards but does check if it is valid to identify manchester encoded cards.

The example below assumes that a TRANSIT PS270 reader with P81 firmware is used and illustrates the messages transmitted on the RS-232 interface to a host system (TXD).

Example: vehicle-id = 123456, driver-id = 010073A94C, TXD = U0000123456010073A94C$^{C_R L_F}$

6.3 READING THE COMBI-BOOSTER WITH A HID-CARD

The combi-booster HID is a special version of the combi-booster that only supports HID-cards.

The examples below assume that a TRANSIT PS270 reader with P81 firmware is used and illustrate the messages transmitted on the RS-232 interface to a host system (TXD).

HID 26-bit format H10301
The 26-bit format is the industry standard format, and is an open format. The range of card numbers available in this format is limited and therefore there is a potential for card numbers to be duplicated. HID does not insure that card numbers will not be duplicated in this format. HID does not control or restrict the ordering of cards encoded with the standard 26 bit format.
The 26-bit format consists of 255 possible facility codes. Within each facility code there is a total of 65,535 unique card numbers.
The combi-booster transmits the facility code and the card number to the reader (including the parity bits).

Example: combi-booster with vehicle-id 000022, HID-card with facility code 10 and driver-id 1093:

TXD = `U0000000022000014088B`$^{C_R L_F}$

HID proprietary 37-bit format H10302
In an effort to provide an open format to the industry, while at the same time provide assurance that the numbers are unique and will not be duplicated, the 37 bit format was developed. Under this format, HID controls the issuing of card numbers and does not duplicate the numbers.
The 37-bit format can be used to program a wide range of unique card numbers. The format is available for all customers. There is no facility code.
The combi-booster transmits the card number to the reader (including the parity bits).

Example: combi-booster with vehicle-id 000333, HID-card with driver-id 123456789:

TXD = `U0000000333100EB79A2B`$^{C_R L_F}$

HID proprietary 37-bit format with facility code H10304
The 37-bit format with facility code differs from the 37-bit format only in that it also contains a facility code. Just like the 37 bit without facility code, this format provides the customer with an open format in which card numbers will not be duplicated, because HID tracks the manufacture of cards to prevent duplication.
This 37-bit format has 65,535 facility codes available and over 500,000 card numbers within each facility code.
The combi-booster transmits the facility code and the card number to the reader (including the parity bits).

Example: combi-booster with vehicle-id 004444, HID-card with facility code 1000 and driver-id 123456:

TXD = `U0000004444003E83C481`$^{C_R L_F}$

HID Corporate 1000 35-bit format
The Corporate 1000 format is a 35 bit format designed to provide large end users with their own proprietary format. This provides them with an assurance that their cards will not be duplicated, because HID reserves an exclusive Corporate 1000 format for each OEM. This format also provides the end user the freedom to work with any system and with any dealer of their choice.
The Corporate 1000 format is a 35 bit format with a unique Company ID Code and over 1,000,000 card numbers available for use.
The combi-booster does not make any modifications to the format and sends all card information to the reader.

Example: combi-booster with vehicle-id 055555, HID-card in Corporate 1000 format

TXD = `U000005555500xxxxxxxx`$^{C_R L_F}$ (where xxxxxxxx is according to the Corporate 1000 format)

7 LOW FREQUENCY 120KHZ RF INTERFACE

The combi-booster's vehicle-id can be read and written by all NEDAP 120kHz readers and writers

7.1 READING THE VEHICLE-ID NUMBER

The combi-booster automatically detects if an external 120kHz field is applied. When this is the case the combi-booster will act as a normal low frequency transponder. Any Nedap low frequency RFID reader is able to read the vehicle-id of the combi-booster. Refer to the manual of the RFID reader for more details.

7.2 WRITING THE VEHICLE-ID NUMBER

The combi-booster's vehicle-id number is normally programmed during production, but can also be programmed by the customer. Programming the combi-booster's vehicle-id number is done by an low frequency writer (e.g. XS110W).

NEDAP LabelProgrammer is a 32 bit Windows application for programming NEDAP RF-ID tags.
NEDAP LabelProgrammer can be started stand-alone for manually programming the NEDAP tags but can also be remotely controlled by OLE Automation.

The vehicle-id number can not be programmed in 128-bit formats like EF-code (also called 80-bit tags).

7.3 READING THE OPERATING MODE

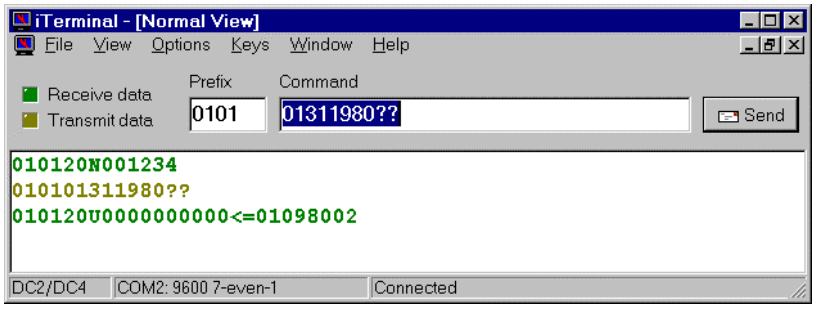
Use NEDAP iTerminal and a XS110W to read/write the operating mode.

Send the following command to the XS110W to read the current operating mode:

```
01311980??
```

The combi-booster will respond with a data message to the reader. This data contains the combi-booster's firmware name and version and also the current operating mode. The following replies are possible (the characters '`cbvv`' indicate the combi-booster's firmware name and version):

`010120U0000000000cbvv098000`	Mode A (default)
`010120U0000000000cbvv098001`	Mode B
`010120U0000000000cbvv098002`	Mode C
`010120U0000000000cbvv098003`	Mode D
`010120U0000000000cbvv0980??`	Operating mode was not programmed. Mode A is used.



7.4 WRITING THE OPERATING MODE

The operating mode is programmed in the same way the vehicle-id number is programmed.

Use NEDAP iTerminal and a XS110W to read/write the operating mode.

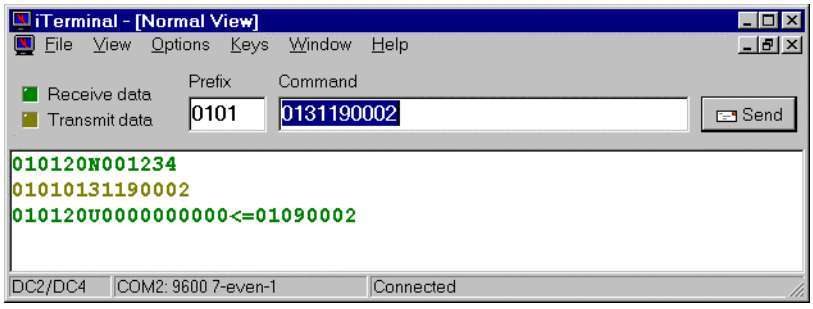
Send the following command to the XS110W to program operating mode A: `0131190000`

Send the following command to the XS110W to program operating mode B: `0131190001`

Send the following command to the XS110W to program operating mode C: `0131190002`

Send the following command to the XS110W to program operating mode D: `0131190003`

The reply message should echo the last 4 characters of the command message otherwise the programming has failed.



A TECHNICAL SPECIFICATIONS

Dimensions	116 x 72 x 27 mm
Weight	95 gram
Protection	IP42 (only for interior mounting)
Operating temperature	-4°F … +185°F (-20°C … +85°C)
Storage temperature	-40°F … +185°F (-40°C … +85°C)
Colour	Grey (RAL 7035)
Relative humidity	10% … 93% (non condensing)
Identification range	Typical 10 meters (line-of-sight required)
Power supply	Built-in battery with 5 years lifetime in avery usage
Certifications	EMC 89/336/EEC, EN 50081-1, EN 50082-1, EN-50082-2, ETS 0908

B PART NUMBERS

COMBI-BOOSTERS

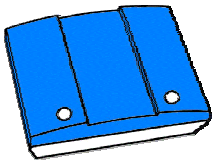
Combi-Booster ISO with ProXS HT card (set) — part number: 9887989

Combi-Booster for ISO cards — part number: 9884025

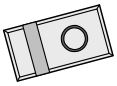
Combi-Booster for XS-cards — part number: 9884017

Combi-Booster for HID-cards — part number: 9888888

READERS/PROGRAMMERS



TRANSIT PS270 long range reader — part number: 9990410



XS110W low frequency RFID writer, desktop model — part number: 9836527

SOFTWARE

NEDAP LabelProgrammer software for programming RFID tags in combination with low frequency RFID writer — part number: 9990410

NEDAP iTerminal. Terminal application for communication with all NEDAP RFID readers/writers. — part number: 9880801