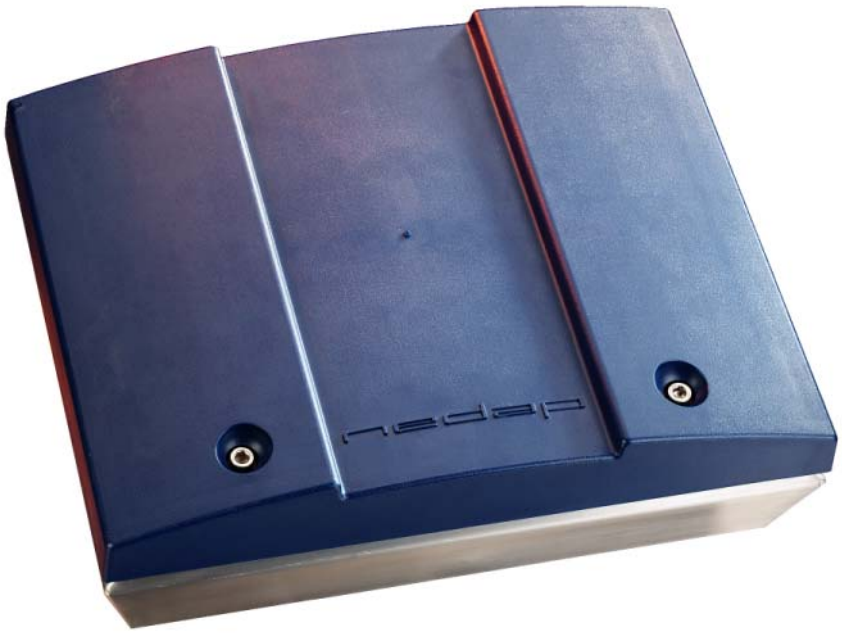
nedap

# TRANSIT



# TRANSIT

## INSTALLATION GUIDE

(For Extended and PS-270 versions)

2004-01-07 Part no : 5268176

Parallelweg 2E
P.O. Box 103
NL - 7140 AC Groenlo

**FCC ID : CGD TRANSIT**

The device complies with part 15 of the FCC rules. Operation is subject to the following conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference that may cause undesired operation.

# CONTENTS

# 1 INTRODUCTION

A high level of performance, security, reliability and convenience is required in various control and monitoring systems. TRANSIT is a long-range automatic vehicle identification system. The TRANSIT reader communicates with a broad range of tags in all environmental conditions.

TRANSIT is based on proven microwave technology in the 2.45 GHz ISM band and allows identification of tags at a distance up to 10 meters, even at high speeding passage. The NEDAP TRANSIT system features radio frequency identification equipment using modulated backscatter. In this method, the tags send there code to the reader by modulating and reflecting the signal transmitted by the reader. To reduce the influence of unwanted reflections, NEDAP applied circular polarization, which also allows orientation freedom of the tags.

## 1.1 GATE-MASTER FUNCTION

TRANSIT combines microwave identification and inductive identification in one unit. The system has the possibility to identify vehicle and persons caring proximity cards. For this purpose a small inductive antenna RefleXS 130 or DC130 can be connected to the reader. The connection of the inductive antenna to the TRANSIT reader is called the gate-master function. The gate-master function enables long and short range access control without requiring an additional inductive reader. Vehicle can enter by means of long-range AVI whereas pedestrians, cyclists and motorists can enter by means of presenting their inductive transponder to the connected inductive antenna. Special firmware will be needed see chapter 4.1.

## 1.2 TRANSPONDERS

TRANSIT system has a wide range of tags characterized by an excellent design and suitability for various applications. The tag circuit is energized by lithium batteries with a lifetime of 8 to 10 years.

- **Heavy-Duty Tag** is developed for applications in which the tag is exposed to harsh environmental conditions. The tag is weatherproof protected and can also be used in explosive zones. The tag allows permanent mounting on the outside of a vehicle or a container.
- The **Window Button** was especially designed to suit the interior of a passenger car and is characterized by exceptional design and excellent performance. The **Window Tag** is a windshield mounted tag that can easily be mounted behind the windshield of a vehicle. The window tags are available in various types and is designed for industrial applications such as the transport industry.
- **Pocket Tag** is a microwave tag designed for the identification of people in long and short range hands-free applications.
- The **Booster** is a special window-tag that can hold an inductive identification card. An inductive card can be placed in the Booster, which amplifies the read range of the card and transmits the card's id to the TRANSIT reader.
- Additionally a separate vehicle ID can be programmed in the **Combi-Booster**[*], which allows a driver ID badge and vehicle ID badge to be read simultaneously.

## 1.3 VERSIONS

- TRANSIT PS-270 — *Long-range microwave reader with built-in antenna that can identify vehicles over distances up to 10 meters.*
- TRANSIT USA — *As TRANSIT PS-270 but now with operating frequency of 2.438 – 2.457 GHz.*
- TRANSIT Extended — *The TRANSIT Extended reader expands[*] the features of the standard reader by adding functionality that enables the reader to store authorisation profiles and data records.*
- TRANSIT EX — *TRANSIT EX is the TRANSIT reader equipped with a EX certified housing especially suited for long-range vehicle identification applications in hazardous environments where security and reliability are essential requirements.*

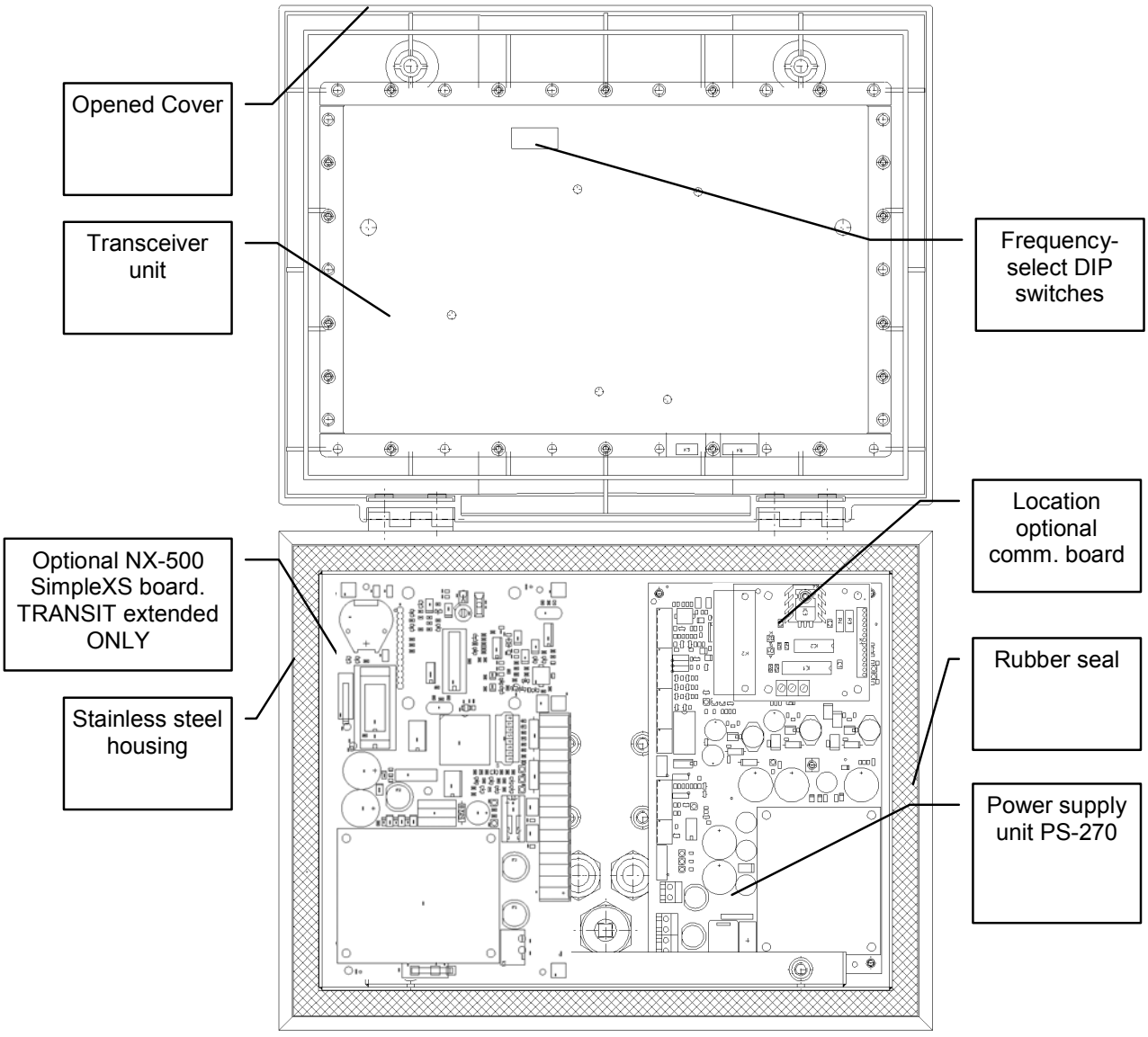
[*] Combi-boosters are not supported by the TRANSIT extended reader.

## 1.4 CHARACTERISTICS

The TRANSIT consists of a stainless steel housing, covered by a synthetic material cover. The cover can be opened by removing the two screws on the cover front. After opening the unit the major components of the system will become visible. The Transceiver-unit is located in the cover of the housing. The Power-supply-unit is located on the bottom of the stainless steel housing. On the Power-supply-unit one of the optional communication boards can be placed. The backside of the unit hosts three PG-adapters;

- two PG-9, to be used for data communication cables
- one PG-13 adapter to be used for Mains connections

**TRANSIT reader with opened cover**



## 1.5 SAFETY PRECAUTIONS

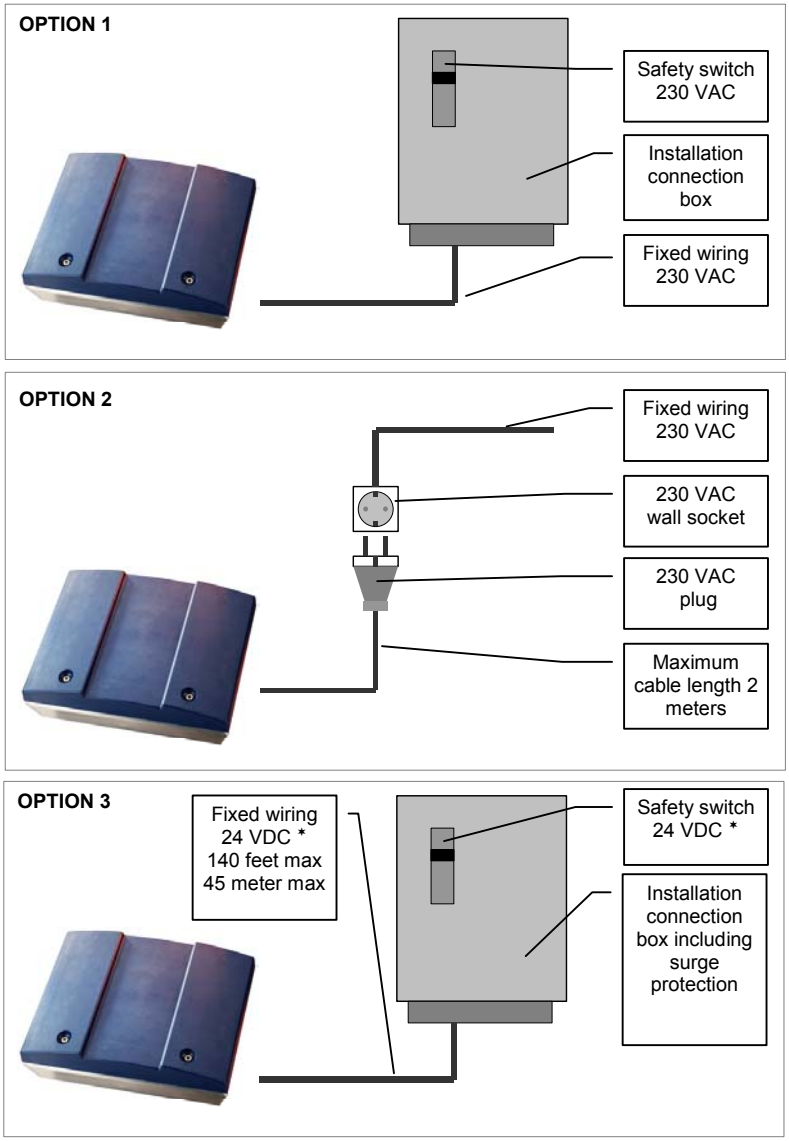
The following safety precautions shall be observed during normal use, service and repair.

- The TRANSIT shall be connected to safety ground
- Disconnecting from main power supply before removing any parts
- The TRANSIT shall only be installed and serviced by qualified service personnel
- To be sure of safety, do not modify or add anything other than mentioned in this manual or indicated by NEDAP N.V.
- Replace fuses only with the same type and rating
- Supply connections
    - The TRANSIT may be connected to 230 VAC or 24VDC (see note 1) mains shall be in accordance with option 1 or option 2 as shown in the figures below.
    - The safety switch shall be a two-pole switch, disconnecting the line and neutral, with a contact distance of at least 3-mm.
    - The TRANSIT-USA for USA and Canada shall be powered from a 24VDC, Class 2, low power system, in compliance with the local regulations, see option 3 in the figures below.
- For USA- and Canada versions the TRANSIT-USA shall be within 140 ft. (45 meter) cable length of the supply and shall be provided with proper surge protection according local regulations. National Electrical Code (NEC) for USA and Canadian Electrical Code (CEC) for Canada.

**CAUTION !**

***For continued protection against risk of fire, replace only with same type of fuse.***

| PS-270 board (See par 2.4) | NX 500 Board (See par 2.5) |
|---|---|
| F1 : 250V, 100mA slow blow | F1 : 250V, 160mA slow blow |
| F2 : 250V, 1A slow blow | F2 : 250V, 1A slow blow |
| | F3 : 250V, 1A slow blow |



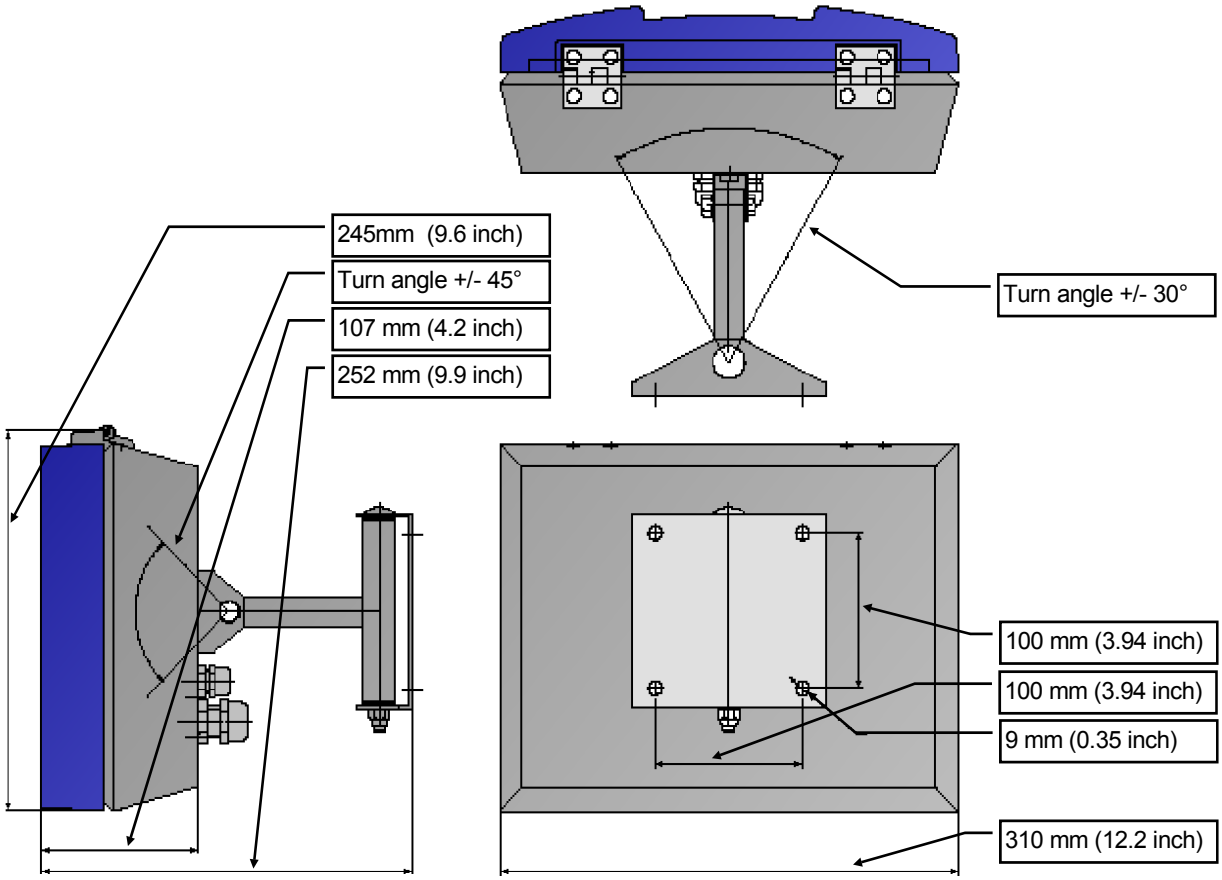

**✶For USA- and Canada versions use option 3, 24VDC connection**

# 2 INSTALLATION

## 2.1 MOUNTING

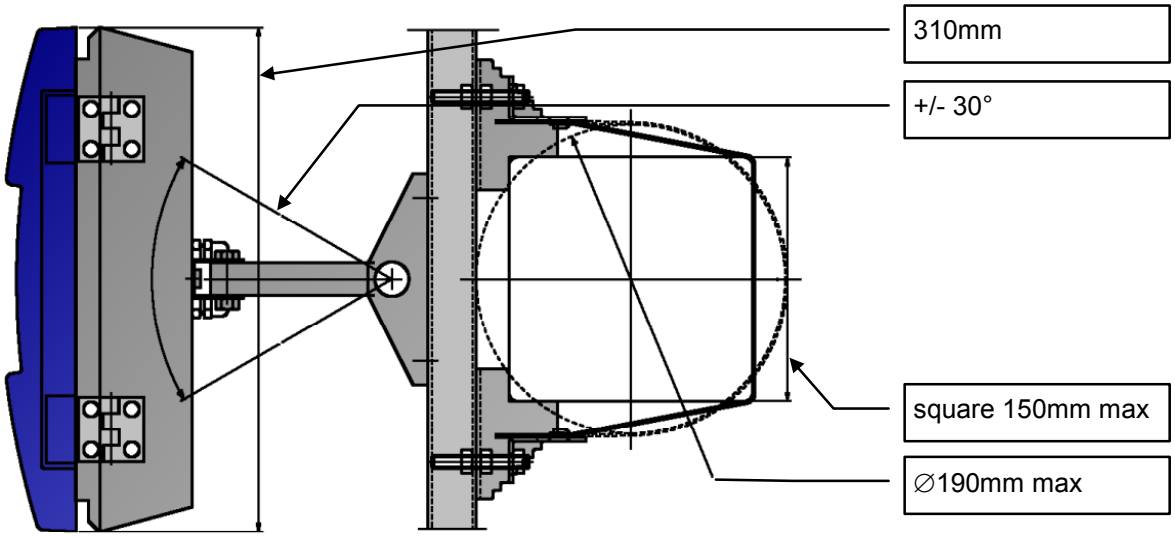
The TRANSIT reader can be installed in any position. Normally the reader shall be mounted in a horizontal position, then the coverage area in the horizontal plane is maximized. In some applications a vertical installation is required to make use of the smaller beam width in the vertical plane. The mounting brackets which make rotation in the vertical and horizontal plane possible is standard included in every TRANSIT.

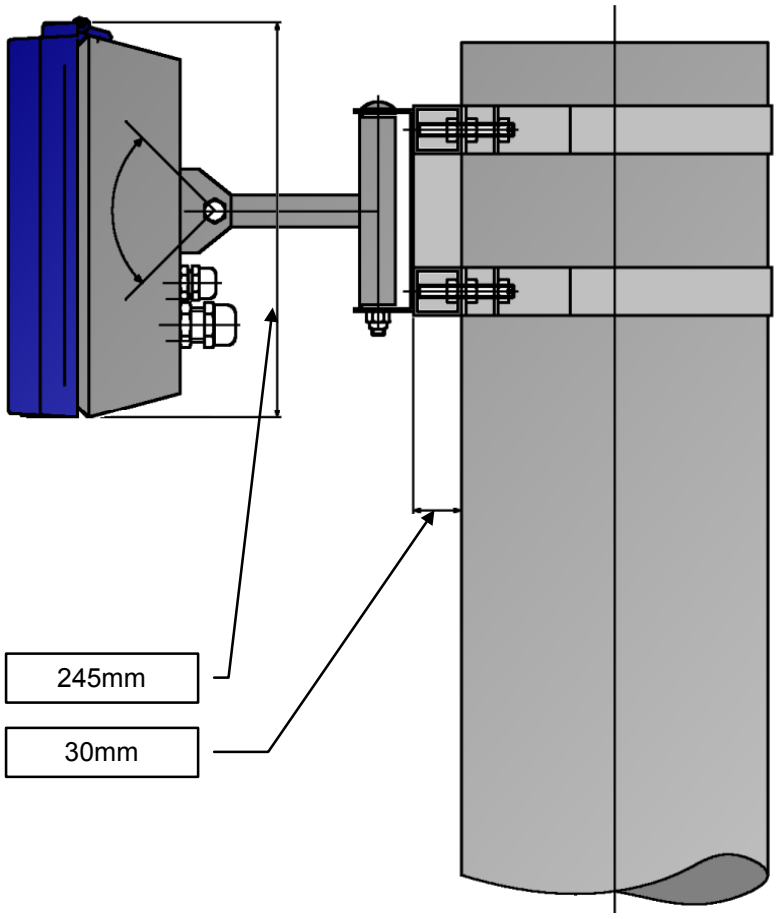
### 2.1.1 WALL MOUNTING



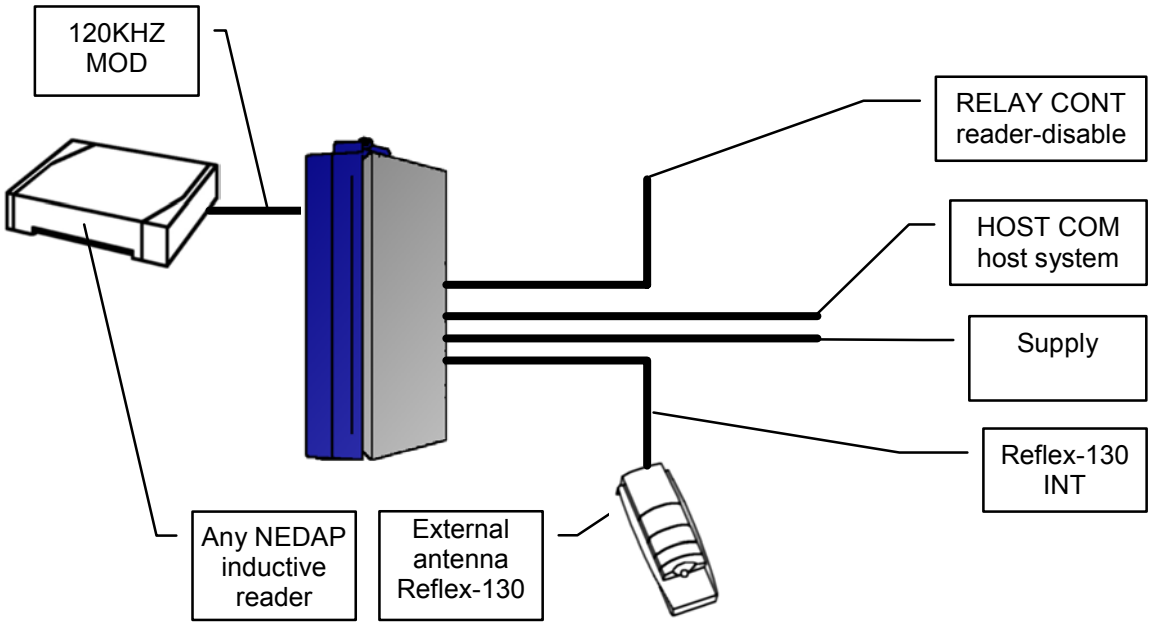
### 2.1.2 MAST MOUNTING

The TRANSIT can be mounted to round masts (max. 190mm / 7.5 inch) and square masts (max. 150mm / 5.9 inch) using the universal mast mounting set (art. nr. 5626595). This mounting set has to be ordered separately.



## 2.2 BASIC CONNECTIONS



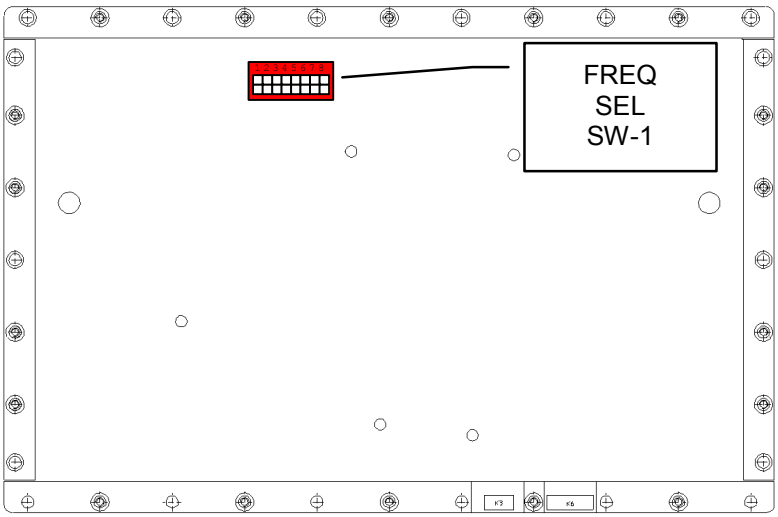

| BASIC CONNECTIONS | CABLE TYPE | MAX LENGTH | FUNCTIONAL DESCRIPTION | SIGNAL NAMES |
|---|---|---|---|---|
| **MAINS-SUPPLY (TRANSIT PS-270)** | 3 * 0.75 mm2 | N/A. | System power supply.<br>The safety ground shall be connected directly to the chassis.<br>**CAUTION: THIS UNIT MUST BE INSTALLED AND SERVICED BY A LICENSED AND CERTIFIED ELECTRICIAN, WHEN CONNECTED TO AN A/C POWER SOURCE.** | Mains-L<br>Mains-N<br>Safety Ground |
| **DC-SUPPLY (TRANSIT PS-270, TRANSIT-USA)** | 2 * 1.5 mm2 | 45 meter (140 ft USA only) | System power supply. | +24VDC<br>GND |
| **RELAY CONT** | 3 * 0.75 mm2 | 25VDC, 2A, Class 2 | Relay contacts normally open, center contact and normally closed. | COM<br>NC<br>NO |
| **Reflex-130 INT** | 4 * 0.25 mm2 shielded | 15 meter (50 ft) | Connection to an optional external inductive antenna Reflex-130. | HF+<br>HF- (shield)<br>UL<br>GND<br>NA |
| **HOST-COM B-W-O-OUT** | 4 * 0.25 mm2 shielded | 50 meter (140 ft USA only) | See firmware manual, special code emulation outputs. | O-1<br>O-2<br>O-3<br>GND |

| BASIC CONNECTIONS | CABLE TYPE | MAX LENGTH | FUNCTIONAL DESCRIPTION | SIGNAL NAMES |
|---|---|---|---|---|
| **RS 232-C** | 3 * 0.25 mm2 shielded (cable capacity <= 100 pF/meter) | Maximum 15 meter (50 ft) | When RS-232 communication board is placed. | TX<br>GND<br>RX |
| **RS-422** | 4 * 0.25 mm2 shielded (cable capacity <= 100 pF/meter) | Maximum 1200 meter (4000 ft)* | When CM-422 communication board is placed. | TX-<br>TX+<br>RX-<br>RX+<br>shield |
| **Reader disable** | 2 * 0.25 mm2 shielded | Maximum 15 meter (50 ft) | The TRANSIT will not read any transponder when RDIS is connected with 5V.<br>Use always a relay contact to connect the internal 5 VDC to the RDIS input.<br>**WARNING: USING AN EXTERNAL 5V SUPPLY CAN DAMAGE THE UNIT!** | RDIS<br>5V |
| **120KHZ MOD** | Coax RG58U | Maximum 100 meter (330 ft)* | Connects any external NEDAP inductive reader to the TRANSIT. The TRANSIT shall modulate the received tag data on the 120 kHz signal from the inductive reader. By doing this it looks as if the TRANSIT is an inductive antenna for the external inductive reader.<br>Select external antenna tuning on NEDAP inductive reader. | HF+<br>HF-(shield) |

*** For outside use in USA and Canada a max. length of 45 meter (140ft ) applies according USA regulations.**

## 2.3 TRANSCEIVER BOARD

### 2.3.1 TRANSCEIVER DIP-SWITCH SETTINGS




| DIP-SWITCH | TYPE | FUNCTION | DESCRIPTION | NUMBER |
|---|---|---|---|---|
| **SW-1** | 8 bit DIP-switch<br><br>(US version 5 bit DIP-switch) | Frequency selection.<br>LSB changes results in 600 kHz frequency changes. | Channel select within sub band | S-1 |
| | | | Channel select within sub band | S-2 |
| | | | Channel select within sub band | S-3 |
| | | | Channel select within sub band | S-4 |
| | | | Sub band selection (not available in US version) | S-5 |
| | | | Sub band selection (not available in US version) | S-6 |
| | | | Sub band selection (not available in US version) | S-7 |
| | | | Sub band selection (not available in US version) | S-8 |

**See next pages for frequency selection tables.**

## Frequency selection table sub band 1 and 2.
## (not available in USA versions)

| SUBBAND 1 | S-5 | S-6 | S-7 | S-8 | SUBBAND 2 | S-5 | S-6 | S-7 | S-8 |
|---|---|---|---|---|---|---|---|---|---|
| SW1 | 1 | 0 | 1 | 0 | SW1 | 0 | 0 | 1 | 0 |
| Frequency kHz | S-1 | S-2 | S-3 | S-4 | Frequency kHz | S-1 | S-2 | S-3 | S-4 |
| | | | | | 2.409.600 | 1 | 1 | 1 | 1 |
| 2.400.600 | 0 | 1 | 1 | 1 | 2.410.200 | 0 | 1 | 1 | 1 |
| 2.401.200 | 1 | 0 | 1 | 1 | 2.410.800 | 1 | 0 | 1 | 1 |
| 2.401.800 | 0 | 0 | 1 | 1 | 2.411.400 | 0 | 0 | 1 | 1 |
| 2.402.400 | 1 | 1 | 0 | 1 | 2.412.000 | 1 | 1 | 0 | 1 |
| 2.403.000 | 0 | 1 | 0 | 1 | 2.412.600 | 0 | 1 | 0 | 1 |
| 2.403.600 | 1 | 0 | 0 | 1 | 2.413.200 | 1 | 0 | 0 | 1 |
| 2.404.200 | 0 | 0 | 0 | 1 | 2.413.800 | 0 | 0 | 0 | 1 |
| 2.404.800 | 1 | 1 | 1 | 0 | 2.414.400 | 1 | 1 | 1 | 0 |
| 2.405.400 | 0 | 1 | 1 | 0 | 2.415.000 | 0 | 1 | 1 | 0 |
| 2.406.000 | 1 | 0 | 1 | 0 | 2.415.600 | 1 | 0 | 1 | 0 |
| 2.406.600 | 0 | 0 | 1 | 0 | 2.416.200 | 0 | 0 | 1 | 0 |
| 2.407.200 | 1 | 1 | 0 | 0 | 2.416.800 | 1 | 1 | 0 | 0 |
| 2.407.800 | 0 | 1 | 0 | 0 | 2.417.400 | 0 | 1 | 0 | 0 |
| 2.408.400 | 1 | 0 | 0 | 0 | 2.418.000 | 1 | 0 | 0 | 0 |
| 2.409.000 | 0 | 0 | 0 | 0 | 2.418.600 | 0 | 0 | 0 | 0 |

## Frequency selection table sub band 3 and 4.
## (not available in USA versions)

| SUBBAND 3 | S-5 | S-6 | S-7 | S-8 | SUBBAND 4 | S-5 | S-6 | S-7 | S-8 |
|---|---|---|---|---|---|---|---|---|---|
| SW1 | 1 | 1 | 0 | 0 | SW1 | 0 | 1 | 0 | 0 |
| Frequency kHz | S-1 | S-2 | S-3 | S-4 | Frequency kHz | S-1 | S-2 | S-3 | S-4 |
| 2.419.200 | 1 | 1 | 1 | 1 | 2.428.800 | 1 | 1 | 1 | 1 |
| 2.419.800 | 0 | 1 | 1 | 1 | 2.429.400 | 0 | 1 | 1 | 1 |
| 2.420.400 | 1 | 0 | 1 | 1 | 2.430.000 | 1 | 0 | 1 | 1 |
| 2.421.000 | 0 | 0 | 1 | 1 | 2.430.600 | 0 | 0 | 1 | 1 |
| 2.421.600 | 1 | 1 | 0 | 1 | 2.431.200 | 1 | 1 | 0 | 1 |
| 2.422.200 | 0 | 1 | 0 | 1 | 2.431.800 | 0 | 1 | 0 | 1 |
| 2.422.800 | 1 | 0 | 0 | 1 | 2.432.400 | 1 | 0 | 0 | 1 |
| 2.423.400 | 0 | 0 | 0 | 1 | 2.433.000 | 0 | 0 | 0 | 1 |
| 2.424.000 | 1 | 1 | 1 | 0 | 2.433.600 | 1 | 1 | 1 | 0 |
| 2.424.600 | 0 | 1 | 1 | 0 | 2.434.200 | 0 | 1 | 1 | 0 |
| 2.425.200 | 1 | 0 | 1 | 0 | 2.434.800 | 1 | 0 | 1 | 0 |
| 2.425.800 | 0 | 0 | 1 | 0 | 2.435.400 | 0 | 0 | 1 | 0 |
| 2.426.400 | 1 | 1 | 0 | 0 | 2.436.000 | 1 | 1 | 0 | 0 |
| 2.427.000 | 0 | 1 | 0 | 0 | 2.436.600 | 0 | 1 | 0 | 0 |
| 2.427.600 | 1 | 0 | 0 | 0 | 2.437.200 | 1 | 0 | 0 | 0 |
| 2.428.200 | 0 | 0 | 0 | 0 | 2.437.800 | 0 | 0 | 0 | 0 |

## Frequency selection table sub band 5 and 6.

| SUBBAND 5 | S-5 | S-6 | S-7 | S-8 | SUBBAND 6 | S-5 | S-6 | S-7 | S-8 |
|---|---|---|---|---|---|---|---|---|---|
| SW1 | 1 | 0 | 0 | 0 | SW1 | 0 | 0 | 0 | 0 |
| Frequency kHz | S-1 | S-2 | S-3 | S-4 | Frequency kHz | S-1 | S-2 | S-3 | S-4 |
| 2.438.400 | 1 | 1 | 1 | 1 | 2.448.000 | 1 | 1 | 1 | 1 |
| 2.439.000 | 0 | 1 | 1 | 1 | 2.448.600 | 0 | 1 | 1 | 1 |
| 2.439.600 | 1 | 0 | 1 | 1 | 2.449.200 | 1 | 0 | 1 | 1 |
| 2.440.200 | 0 | 0 | 1 | 1 | 2.449.800 | 0 | 0 | 1 | 1 |
| 2.440.800 | 1 | 1 | 0 | 1 | 2.450.400 | 1 | 1 | 0 | 1 |
| 2.441.400 | 0 | 1 | 0 | 1 | 2.451.000 | 0 | 1 | 0 | 1 |
| 2.442.000 | 1 | 0 | 0 | 1 | 2.451.600 | 1 | 0 | 0 | 1 |
| 2.442.600 | 0 | 0 | 0 | 1 | 2.452.200 | 0 | 0 | 0 | 1 |
| 2.443.200 | 1 | 1 | 1 | 0 | 2.452.800 | 1 | 1 | 1 | 0 |
| 2.443.800 | 0 | 1 | 1 | 0 | 2.453.400 | 0 | 1 | 1 | 0 |
| 2.444.400 | 1 | 0 | 1 | 0 | 2.454.000 | 1 | 0 | 1 | 0 |
| 2.445.000 | 0 | 0 | 1 | 0 | 2.454.600 | 0 | 0 | 1 | 0 |
| 2.445.600 | 1 | 1 | 0 | 0 | 2.455.200 | 1 | 1 | 0 | 0 |
| 2.446.200 | 0 | 1 | 0 | 0 | 2.455.800 | 0 | 1 | 0 | 0 |
| 2.446.800 | 1 | 0 | 0 | 0 | 2.456.400 | 1 | 0 | 0 | 0 |
| 2.447.400 | 0 | 0 | 0 | 0 | 2.457.000 | 0 | 0 | 0 | 0 |

## Frequency selection table sub band 7 and 8.
## (not available in USA versions)

| SUBBAND 7 | S-5 | S-6 | S-7 | S-8 | SUBBAND 8 | S-5 | S-6 | S-7 | S-8 |
|---|---|---|---|---|---|---|---|---|---|
| SW1 | 1 | 1 | 1 | 1 | SW1 | 0 | 1 | 1 | 1 |
| Frequency kHz | S-1 | S-2 | S-3 | S-4 | Frequency kHz | S-1 | S-2 | S-3 | S-4 |
| 2.457.600 | 1 | 1 | 1 | 1 | 2.467.200 | 1 | 1 | 1 | 1 |
| 2.458.200 | 0 | 1 | 1 | 1 | 2.467.800 | 0 | 1 | 1 | 1 |
| 2.458.800 | 1 | 0 | 1 | 1 | 2.468.400 | 1 | 0 | 1 | 1 |
| 2.459.400 | 0 | 0 | 1 | 1 | 2.469.000 | 0 | 0 | 1 | 1 |
| 2.460.000 | 1 | 1 | 0 | 1 | 2.469.600 | 1 | 1 | 0 | 1 |
| 2.460.600 | 0 | 1 | 0 | 1 | 2.470.200 | 0 | 1 | 0 | 1 |
| 2.461.200 | 1 | 0 | 0 | 1 | 2.470.800 | 1 | 0 | 0 | 1 |
| 2.461.800 | 0 | 0 | 0 | 1 | 2.471.400 | 0 | 0 | 0 | 1 |
| 2.462.400 | 1 | 1 | 1 | 0 | 2.472.000 | 1 | 1 | 1 | 0 |
| 2.463.000 | 0 | 1 | 1 | 0 | 2.472.600 | 0 | 1 | 1 | 0 |
| 2.463.600 | 1 | 0 | 1 | 0 | 2.473.200 | 1 | 0 | 1 | 0 |
| 2.464.200 | 0 | 0 | 1 | 0 | 2.473.800 | 0 | 0 | 1 | 0 |
| 2.464.800 | 1 | 1 | 0 | 0 | 2.474.400 | 1 | 1 | 0 | 0 |
| 2.465.400 | 0 | 1 | 0 | 0 | 2.475.000 | 0 | 1 | 0 | 0 |
| 2.466.000 | 1 | 0 | 0 | 0 | 2.475.600 | 1 | 0 | 0 | 0 |
| 2.466.600 | 0 | 0 | 0 | 0 | 2.476.200 | 0 | 0 | 0 | 0 |

**Frequency selection table sub band 9.**
**(not available in USA versions)**

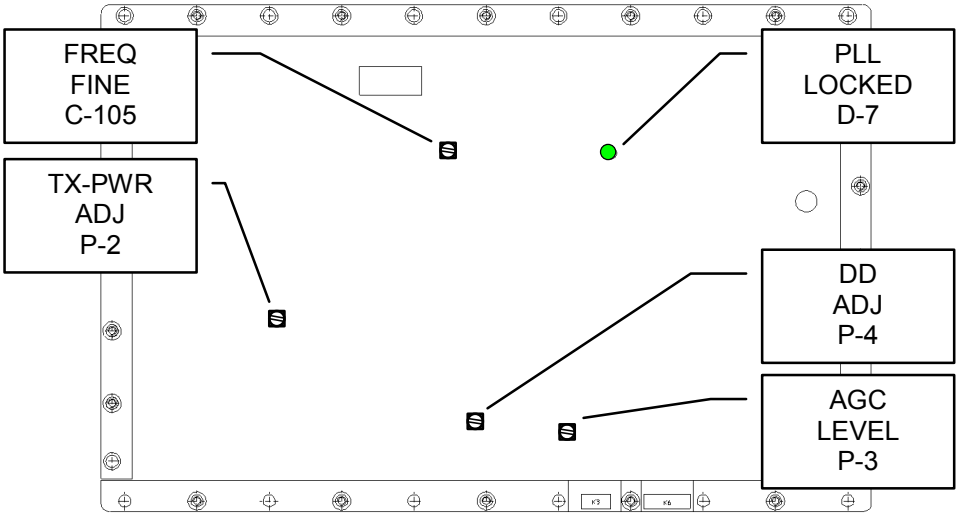
| SUBBAND 9 | S-5 | S-6 | S-7 | S-8 |
|---|---|---|---|---|
| SW1 | 1 | 0 | 1 | 1 |
| Frequency kHz | S-1 | S-2 | S-3 | S-4 |
| 2.476.800 | 1 | 1 | 1 | 1 |
| 2.477.400 | 0 | 1 | 1 | 1 |
| 2.478.000 | 1 | 0 | 1 | 1 |
| 2.478.600 | 0 | 0 | 1 | 1 |
| 2.479.200 | 1 | 1 | 0 | 1 |
| 2.479.800 | 0 | 1 | 0 | 1 |
| 2.480.400 | 1 | 0 | 0 | 1 |
| 2.481.000 | 0 | 0 | 0 | 1 |
| 2.481.600 | 1 | 1 | 1 | 0 |
| 2.482.200 | 0 | 1 | 1 | 0 |
| 2.482.800 | 1 | 0 | 1 | 0 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

### 2.3.2 TRANSCEIVCER INDICATIONS

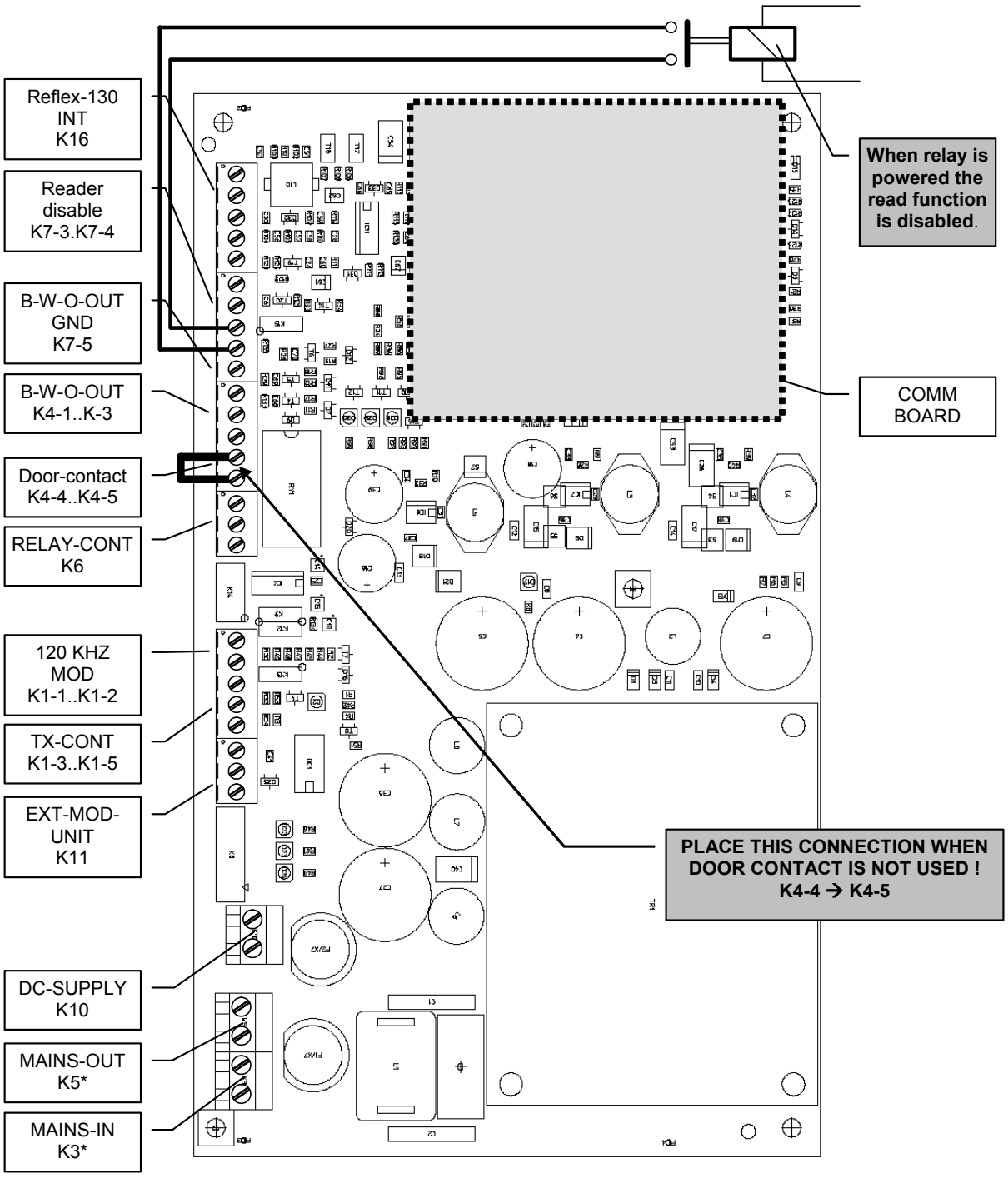
| Indications Transceiver unit | Indication type | Description | Indication number |
|---|---|---|---|
| **PLL LOCKED** | Dual color LED | Red indicates PLL is unlocked.<br>Green indicates PLL is locked. | D-7 |

### 2.3.3 TRANSCEIVER ADJUSTMENTS

| ADJUSTMENT | TYPE | FUNCTION | DESCRIPTION | NUMBER |
|---|---|---|---|---|
| **FREQ –FINE** | Trim cap. | Factory setting | Fine tuning reference frequency for synthesizer. | C-105 |
| **TX-PWR** | Trim pot. | Customer setting | Reduction transmitter power by maximum 20 dB. Maximum EIRP < 18 dBm . | P-2 |
| **DD-ADJ** | Trim pot. | Factory setting | Received data duty cycle correction. | P-4 |
| **AGC-LEVEL** | Trim pot. | Factory setting | AGC reference level adjustment. | P-3 |



## 2.4 PS-270 BOARD



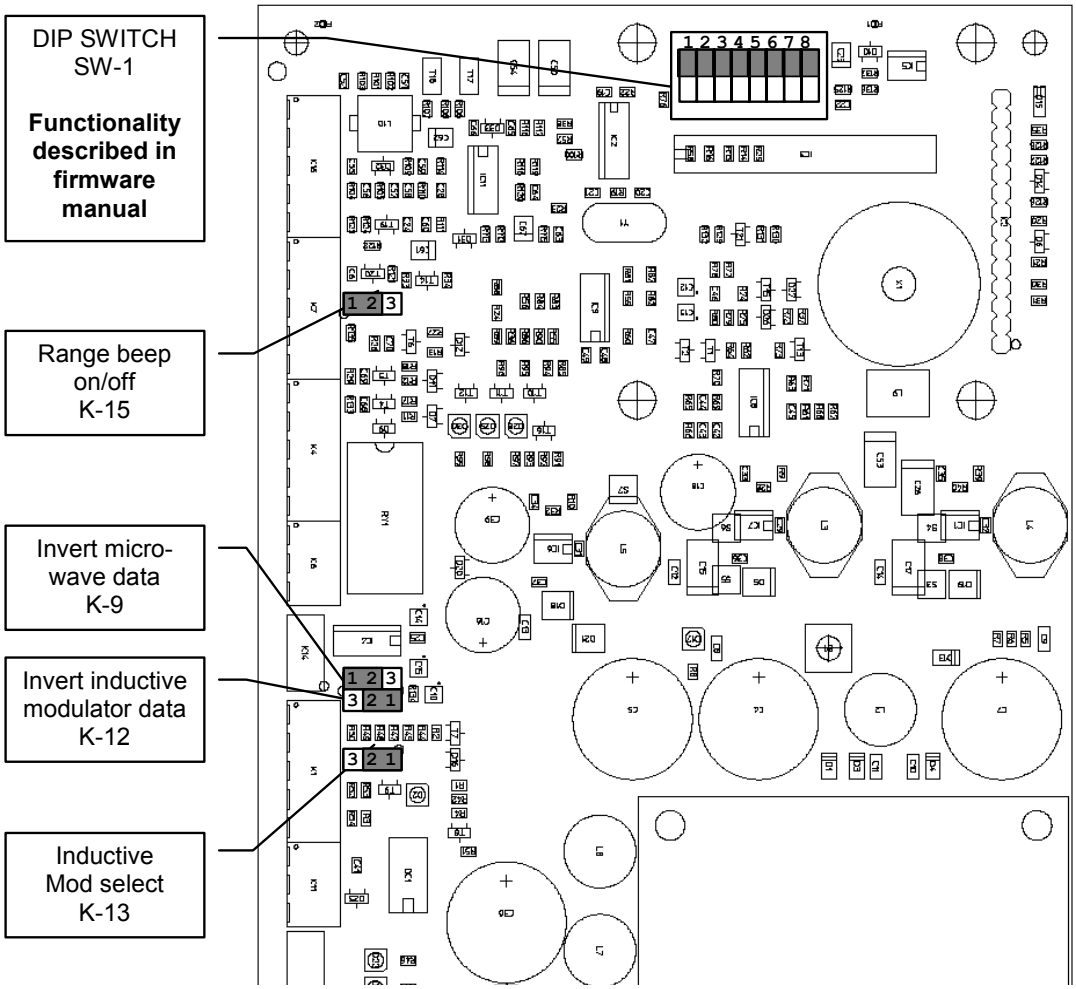

*** Not used for USA and Canada model TRANSIT-USA.**

### 2.4.1 PS-270 CONNECTIONS

| CONNECTION | TYPE | FUNCTION | DESCRIPTION | NAME | NUMBER |
|---|---|---|---|---|---|
| **Reflex-130 INT (K16)** | 5-p mkds phoenix | External connection Reflex-130 | 120 kHz antenna con. | HF+ | 1 |
| | | | 120 kHz antenna con. | HF- | 2 |
| | | | LED cont. high pos. ID | UL | 3 |
| | | | Ground | GND | 4 |
| | | | LED cont. high neg. ID | NA | 5 |
| **Reader disable (K7-1..K7-4)** | 5-p mkds phoenix | Controls the flow of data to the controller. | Spare | n.c. | 1 |
| | | | Spare | n.c. | 2 |
| | | | Reader disable | RDIS | 3 |
| | | | +5 VDC connection | 5V | 4 |
| **B-W-O-OUT GND (K7-5)** | 5-p mkds phoenix | Code emulation. | Ground to be used for Omron, Wiegand and Barcode output. | GND | 5 |
| **B-W-O-OUT (K4-1..K4-3)** | 5-p mkds phoenix | Code emulation. | Output for Omron, Wiegand and Barcode Ground. Refer to the firmware manual. | O-1 | 1 |
| | | | | O-2 | 2 |
| | | | | O-3 | 3 |
| **Door contact (K4-4..K4-5)** | 5-p mkds phoenix | Door contact | Door contact | DOOR | 4 |
| | | | Ground | GND | 5 |
| **RELAY-CONT (K6)** | 3-p mkds phoenix | Floating relay contacts | Center contact | COM | 1 |
| | | | Normally closed contact | NC | 2 |
| | | | Normally open contact | NO | 3 |
| **120 KHZ-MOD (K1-1..K1-2)** | 2-p mkds phoenix | 120 kHz output from external NEDAP inductive reader | 120 kHz connection | HF+ | 1 |
| | | | 120 kHz ground con. | HF- | 2 |
| **TX-CONT (K1-3..K1-5)** | 2-p mkds phoenix | Transmit-ter control | Ground for control sign. | GND | 3 |
| | | | TTL signal PLL locked | LCK | 4 |
| | | | TTL input to enable TX | TXD | 5 |
| **EXT-MOD-UNIT (K11)** | 3-p mkds phoenix | Connects received tag data to external reader | Isolated ground | GND | 1 |
| | | | Optical isolated current loop connection | CLS | 2 |
| | | | 5 VDC supply opto-coupler | +5V | 3 |
| **DC-SUPPLY (K10)** | 2-p mkds phoenix | External 24V Class 2 DC power connection | 24 VDC input | +24VDC | 1 |
| | | | 24 VDC supply ground | GND | 2 |
| **MAINS-OUT (K5)*** | 2-p mkds phoenix | Internal connection to NX-500 optional board. | Mains output line | Mains-L | 1 |
| | | | Mains output neutral | Mains-N | 2 |
| **MAINS-IN (K3)*** | 2-p mkds phoenix | External AC power connection | Mains output line | Mains-L | 1 |
| | | | Mains output neutral | Mains-N | 2 |

***Not used for USA and Canada model TRANSIT-USA**

## 2.4.2 PS-270 U-LINKS

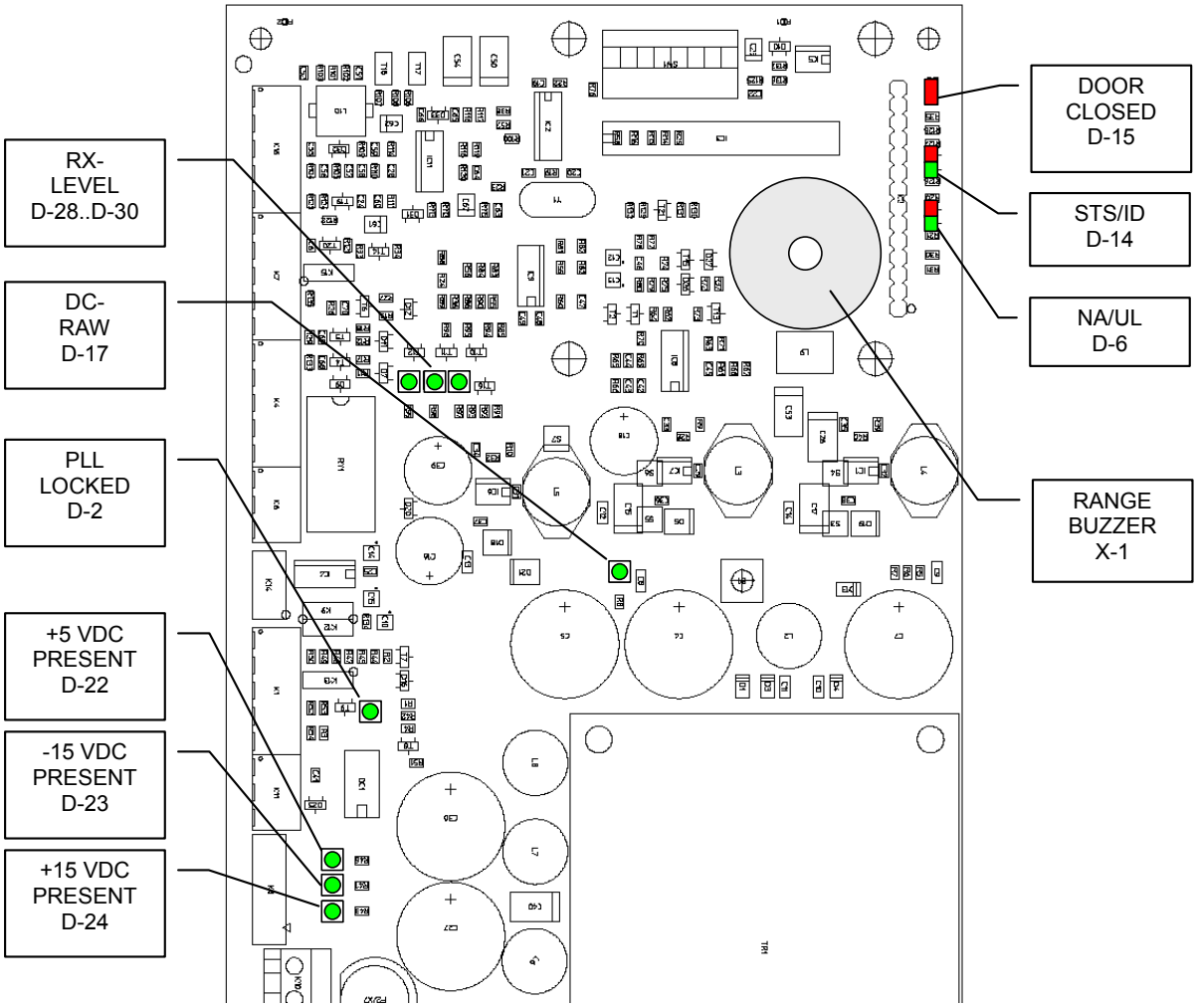



| SETTING | POSITION | | DESCRIPTION | NUMBER |
|---|---|---|---|---|
| **Range beep function** | **12** | | Range beeper off (default) | K-15 |
| | | **23** | Range beeper on | |
| **Invert microwave data** | **12** | | Microwave data not inverted (default) | K-9 |
| | | **23** | Microwave data inverted (may be required for AM) | |
| **Invert inductive modulator data** | **12** | | TTL-data to modulator inverted (default) | K-12 |
| | | **23** | TTL-data to modulator not inverted | |
| **Inductive modulator select** | **12** | | Selects modulator setting for current coupled receivers (as is needed for the NX500 or SimpleXS) (default) | K-13 |
| | | **23** | Selects modulator setting for voltage coupled receivers | |

## 2.4.3 PS-270 DIP-SWITCH SETTINGS

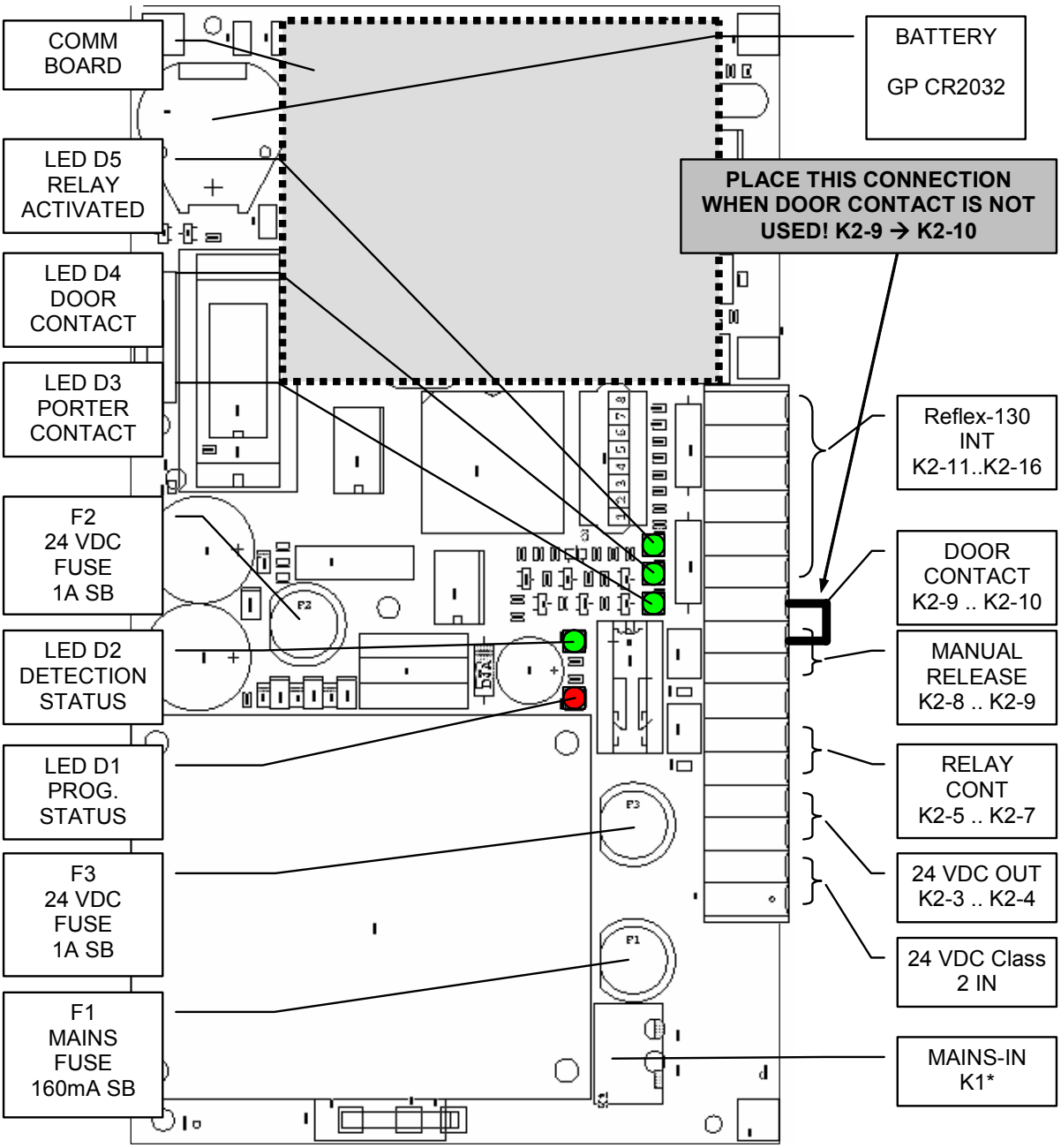
Refer to the firmware manual for a functional description of the DIP-switch settings.

### 2.4.4 PS-270 INDICATIONS




| INDICATION | TYPE | DESCRIPTION | NUMBER |
|---|---|---|---|
| **RX-LEVEL** | LED green | LED bar indicating the received tag signal strength. | **D-28..D-30** |
| **DC-RAW** | LED green | LED active indicates that the DC supply is present. | **D-17** |
| **PLL LOCKED** | LED green | LED active indicates PLL is locked. | **D-2** |
| **+5 VDC PRES** | LED green | LED active indicates that this voltage is present. | **D-22** |
| **-15 VDC PRES** | LED green | LED active indicates that this voltage is present. | **D-23** |
| **+15 VDC PRES** | LED green | LED active indicates that this voltage is present. | **D-24** |
| **NA** | Dual color LED (red) | LED indicates that the TRANSIT is standby and the door is locked | **D-6** |
| **UL** | Dual color LED (green) | LED indicates that a tag is detected, shall stay active during unlock time. The door is unlocked. | **D-6** |
| **STS** | Dual color LED (red) | Status LED indicates that processor is running (heartbeat). | **D-14** |
| **ID** | Dual color LED (green) | LED indicates tag recognition (fast blinking). | **D-14** |
| **DOOR CLOSED** | LED red | LED active indicates door contact closed. | **D-15** |
| **RANGE BUZZER** | Sound | When activated by U-link K-15 and a valid tag is present the beep repeat frequency gives an indication for the received signal strength from the tag. | **X-1** |

## 2.5 NX-500 BOARD (TRANSIT extended only)




*** Not used for USA and Canada model TRANSIT-USA**

# CAUTION !

Risk of explosion if battery is replaced by an in correct type.
Dispose of used batteries according to the local instructions.

### 2.5.1 NX-500 CONNECTIONS

| NX-500 CONNECTIONS | CABLE TYPE | MAX LENGTH | FUNCTIONAL DESCRIPTION | SIGNAL NAMES | PIN NO. |
|---|---|---|---|---|---|
| **MAINS-IN (K1)*** | 3 * 0.75 mm2 | N/A.** | System power-supply. The safety ground shall be connected directly to the chassis. | Mains-L | 1 |
| | | | | Mains-N | 2 |
| | | | | Safety ground | chassis |
| **24 VDC IN (K2-1 .. K2-2)** | 2 * 0.75 mm2 | N/A** | System emergency power-supply. | +24VDC | 1 |
| | | | | GND | 2 |
| **24 VDC OUT (K2-3 .. K2-4)** | 2 * 0.4 mm2 | Maximum 100 meter** | DC supply intended for lock control | +24VDC | 3 |
| | | | | GND | 4 |
| **RELAY CONT (K2-5 .. K2-7)** | 3 * 0.75 mm2 | 25VDC, 2 A, class 2 | Relay contacts normally open, center contact and normally closed. | NC | 5 |
| | | | | COM | 6 |
| | | | | NO | 7 |
| **MANUAL RELEASE (K2-8 .. K2-9)** | 2 * 0.25 mm2 | Maximum 100 meter (330 ft)** | Connect to push button to indicate manual door release. | PORT | 8 |
| | | | | GND | 9 |
| **DOOR CONTACT (K2-9 .. K2-10)** | 2 * 0.25 mm2 | Maximum 100 meter (330 ft)** | Connect to door contact To indicate door closed | GND | 9 |
| | | | | DOOR | 10 |
| **Reflex-130 INT (K2-11 .. K2-16)** | 5 * 0.25 mm2 shielded | Maximum 50 meter (165 ft)** | Connection to the external inductive antenna Reflex-130. | HF+ | 11 |
| | | | | HF- (shield) | 12 |
| | | | | UL | 13 |
| | | | | GND | 14 |
| | | | | NA | 15 |
| | | | | IND | 16 |

*** Not used for USA and Canada model TRANSIT-USA**

**** For outside use in USA and Canada a max. length of 45 meter (140ft) applies according USA regulations**

### 2.5.2 NX-500 INDICATIONS

| INDICATIONS | TYPE | DESCRIPTION | NUMBER |
|---|---|---|---|
| **PROG. STATUS** | LED red | 1 sec on / 1 sec off : Program is operational<br>1 short flash: Not enough RAM.<br>2 short flashes: RAM failure.<br>3 short flashes: EPROM failure | D-1 |
| **DETECTION STATUS** | LED green | FLASH: Transponder/XS-card detected; authorized and not authorized. | D-2 |
| **PORTER CONTACT** | LED green | Activated when manual door-release button activated. | D-3 |
| **DOOR CONTACT** | LED green | Activated when door contact is closed. | D-4 |
| **RELAY ACTIVATED** | LED green | Activated when relay is activated. | D-5 |

# 3 COMMUNICATION INTERFACES

## 3.1 CONNECTIONS TO INDUCTIVE READERS

- Bringing the 120 kHz antenna signal of the external inductive reader to the TRANSIT and connecting it to 120 kHz-MOD connector of the Power supply unit (K1-1 and K1-2). The TRANSIT will modulate the received tag data on the 120 kHz antenna signal of the external inductive reader. The TRANSIT looks for the external inductive reader as an antenna. This feature makes the application of the TRANSIT simple in existing installations. To optimize the quality of the modulating signal the modulation depth can be selected in accordance with the type of receiver used in the external inductive reader. The U-Link setting: " Inductive Mod select, K-13", on the Power supply unit allows for the selection between voltage- or current coupled receivers. Contact NEDAP when in doubt which kind of external inductive receiver you want to connect to the TRANSIT system.

- Remember that when using the modulation function of the TRANSIT on the 120 kHz antenna signal of an external inductive reader, to select external antenna (tuning) on this inductive reader. For the Accessor III-A and Accessor III-B for example this shall be realized by setting J1 in the external position.

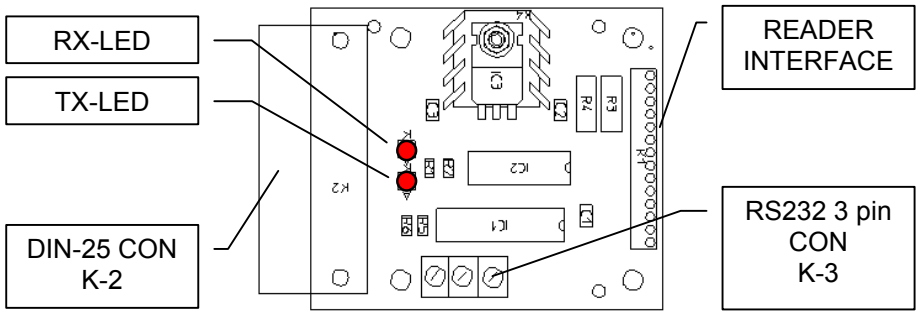
## 3.2 CONNECTIONS VIA THE SPECIAL CODE EMULATION OUTPUTS

- The outputs OUT-1, OUT-2 and OUT-3 used for the emulated output for Wiegand, Omron, Barcode and others are vulnerable for large potential differences. Care shall be taken to connect always the ground of the receiving system to the TRANSIT and use shielded cable.

## 3.3 REMOVING THE OPTIONAL COMMUNICATION BOARD

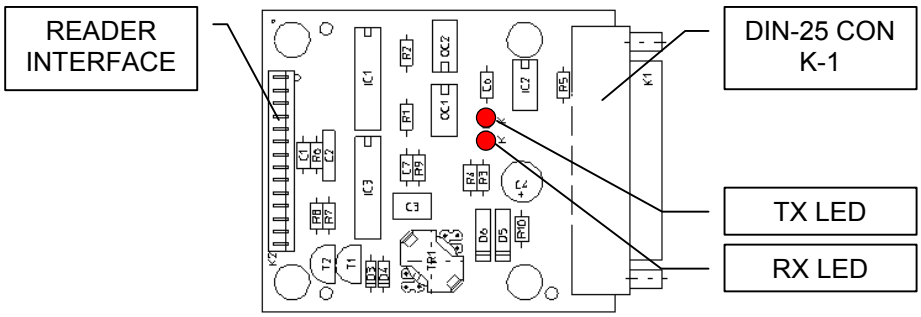
- Remove the optional communication boards only when the TRANSIT is disconnected from the mains supply and from the DC-supply, not doing this will damage the communication board.

## 3.4 RS-232 (RS-232 III, Art. No.: 7806434)




| RS-232 CONN | TYPE | DESCRIPTION | NAME | PIN NO. |
|---|---|---|---|---|
| **RS232 3 pin CON K-3** | 3 pin WECO PCB | Transmit (output) | TX | 1 |
| | | Ground | GND | 2 |
| | | Receive (input) | RX | 3 |
| **DIN-25 CON K-2** | DIN-25 connector female | Transmit (output) | TXD | 2 |
| | | Receive (input) | RXD | 3 |
| | | Ground (shield) | GND | 7 |
| | | Identifier (max 100 mA) | +5VDC | 9 |

## 3.5 RS-422 (CM-422, Art. No.: 7811730)




- The CM-422 board has galvanic isolation.
- Maximum data rate 9600 baud.
- The RX- and RX+ lines are always terminated with a 120 Ω resistor.
- The TX- and TX+ lines have to be terminated at the host side.
- Connection to host:

| | | |
|---|---|---|
| RX+ | → TX- | (host) |
| RX- | → TX+ | (host) |
| TX+ | → RX- | (host) |
| TX- | → RX+ | (host) |

| CM-422 CONN | TYPE | DESCRIPTION | NAME | PIN NO. |
|---|---|---|---|---|
| **DIN-25 CON K-1** | DIN-25 connector female | Receive* (input) | RX- | 15 |
| | | Receive (input) | RX+ | 17 |
| | | Transmit* (output) | TX- | 19 |
| | | Transmit (output) | TX+ | 25 |
| | | Shield | GND | metal shroud |

## 3.6 UNIVERSAL THIN SERVER (Art. No.: 7817940)

The Universal Thin Server (UTS) is designed to connect NEDAP RF-ID to an Ethernet network using the TCP/IP protocol. The Ethernet network interface speed is 10-Mbit.

### 3.6.1 LED Status Display

#### 3.6.1.1 Yellow and Green LED

The green LED displays the status of the serial channel (the red LED will be off while in normal operation).

**Stable color** : Channel idle, no connection

**Blinking, 1 sec cycle** : Connected over the network

#### 3.6.1.2 Red LED

If the red LED is on or blinking, the green LED will give a diagnostics code. There is a fatal error, and the UTS is not working.

**Red LED stable on, green LED blinking:**

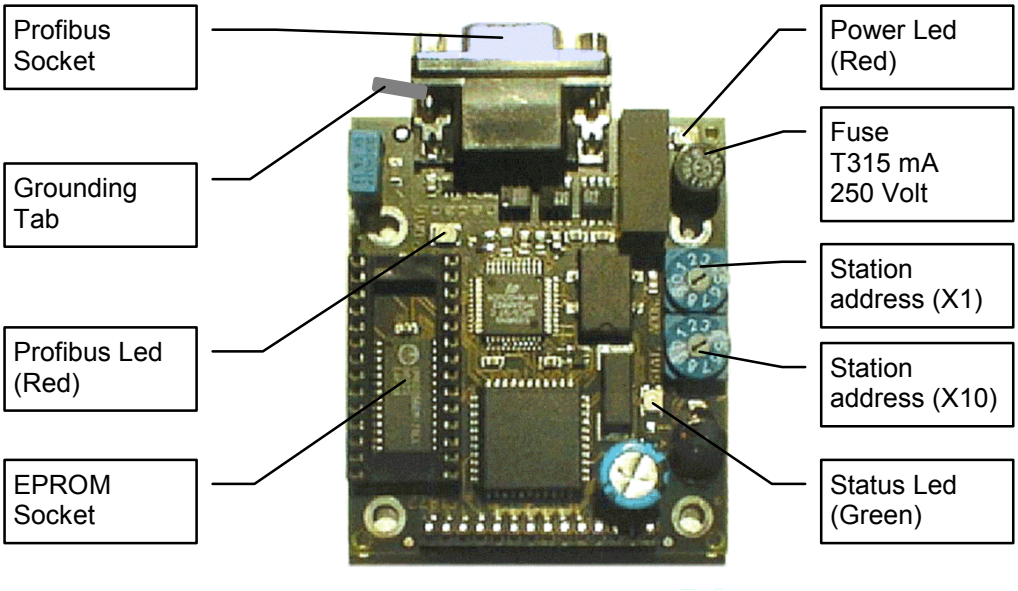
1x: EPROM-checksum error
2x: RAM-error
3x: Network controller error (Token Ring)
4x: E²PROM checksum error or bad
5x: IP address already used on network

**Red LED blinking, green LED blinking:**

4x: The network connection is faulty. This code should only appear after power up. Even though the UTS is going into operation mode, the problem will potentially persist.
5x: No DHCP response was received.

**See user manual Universal Thin Server for detailed information**

## 3.7 PROFIBUS DP (Art. No: 7817134)




| | FUNCTION | DESCRIPTION |
|---|---|---|
| **Profibus socket** | Connection for Profibus cable | Here the Profibus Cable must be connected |
| **Station address X1 and X10** | Address setting | With these two rotation switches a station address from 0 –99 can be selected. Use switch X1 to select the units an x10 to select the tens. Addresses lower then 3 are mostly used by the Profibus master so it is recommended not to use the values 0 – 2. |
| **Power LED** | Indication Red | This LED indicates that power is available. This LED should always be on as soon as power is turned on. |
| **Status LED** | Indication Green | This LED indicates the status of the Profibus DP Interface Module and should always blink. The status is indicated by the on and off time of the LED. See manual for all possible status indications. |
| **Profibus LED** | Indication Red | This LED will be on when the Profibus master recognizes the interface module. When this LED is off then this mostly indicates an error at the Profibus master |
| **Grounding tab** | Earth connection | I connected to Profibus cable shield and must be connected to ground. |
| **Fuse** | Overload protection | Protects the galvanic isolated Profibus circuit. Fuse is blown when Power LED is off and status LED is still blinking. |
| **Eprom socket** | | Here the Eprom with the firmware will be inserted. |

**See the Profibus user manual for detailed information**

# 4 APPLICATION INFORMATION

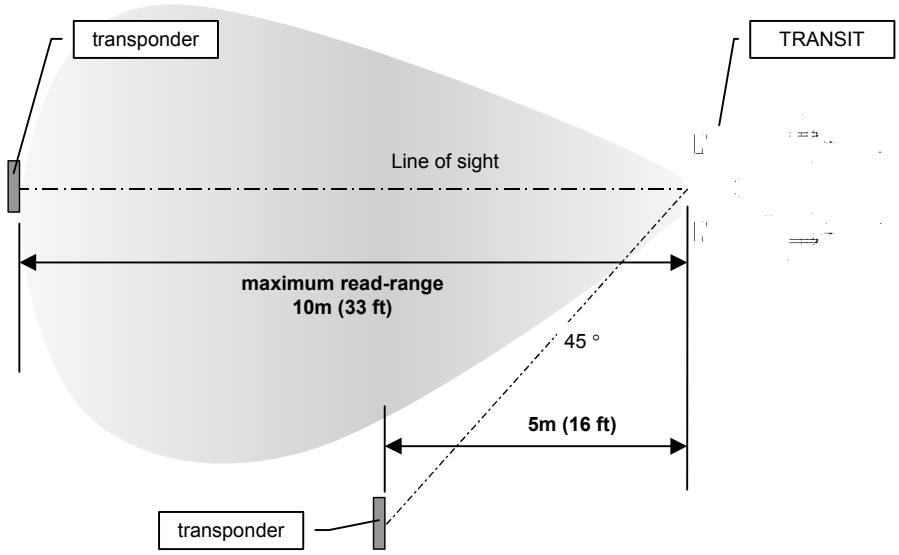
## 4.1 AVAILABLE FIRMWARE

The TRANSIT communication features are defined by the firmware loaded in to the micro controller located on the Power supply unit PS-270. The microcontroller is a Microchip PIC16F876-20I/SP (Art. No.: 2802260).

For every firmware version an installation guide is available. The firmware can be loaded and upgraded in the microcontroller using a special software tool.

Contact Nedap for the possibilities.

## 4.2 COVERAGE AREA




The TRANSIT system operates in the 2.4 to 2.45 GHz ISM band. The tags used with the TRANSIT system are all equipped with lithium battery's to power the internal logic. The tags do not contain a transmitter but are using the received power from the reader, after modification, for re-transmission to the reader. This principle is called modulated backscatter The tags are so called field modifying devices. The received RF power from the reader is modulated with the data from the chip containing the ID-number. To read a tag there has to be a line of sight to the tag from the reader. Most synthetic materials are transparent for RF energy with little attenuation and are forming no obstruction. Snow and ice are no problem as long as it is in crystal form. Closed water films are a problem for the detection range. Heavy rain shall be no problem as long as there is no closed water film on the TRANSIT front cover or on the tag. To reduce the influence of unwanted reflections circular polarization is used, this brings also rotation freedom for the tag. Placing the tags on metal surface is not influencing the read range.

The antenna diagram of the TRANSIT has a vertical beam width of 40° and a horizontal beam width of 80°. The tags are having a symmetrical diagram, 80° in the horizontal and vertical plane. The coverage area is based on the combination of the two diagrams. When defining the reading range between reader and tag one should take in account the misalignment between reader and tag. Good practice is to reduce the read range by a factor of two when the tag is on the –3 dB points of the reader antenna and the normal on the tag still parallel to the main axes of the reader.

One has to keep in mind that the misalignment is most of the time present in two planes. This makes simple evaluation of the coverage area difficult. A computer model has been developed in which most geometries can be evaluated. Contact Nedap when in doubt. In par. 4.5 the detection area for a number of practical situations is given.

## 4.3 SPEED LIMITATIONS

The maximum speed a transponder can pass the reader antenna and the transponder can be read is depended on the following factors:

- Length of the detection trajectory typical 6 meter
- Distance between reader and tag typical 5 meter
- Number of valid frames needed for valid read typical 3
- Length of code (frame length) typical 64 bits
- Data rate 1.875 KBPS
- Frame time 34 msec

In this situation the maximum transponder passage speed is 200 km/hour (125 mph). For every other geometry one should carefully consider the above mentioned parameters before a specification on the maximum speed is defined.

This speed can ONLY be obtained with firmware in the 64 bit detection mode. See firmware user manuals.

## 4.4 USING MORE TRANSIT SYSTEMS AT ONE LOCATION

When two or more TRANSIT readers are within a range of 15 meters (50 ft), these readers should have a frequency offset of at least 600 kHz with respect to each other. The frequency should be factory set. When in doubt or when two readers are 'looking' to each other, frequency offset is recommended. This frequency offset has to stay within the local radio regulations.

When two readers are heaving a frequency offset they can be mounted close together and they can read the same tag at the same time.

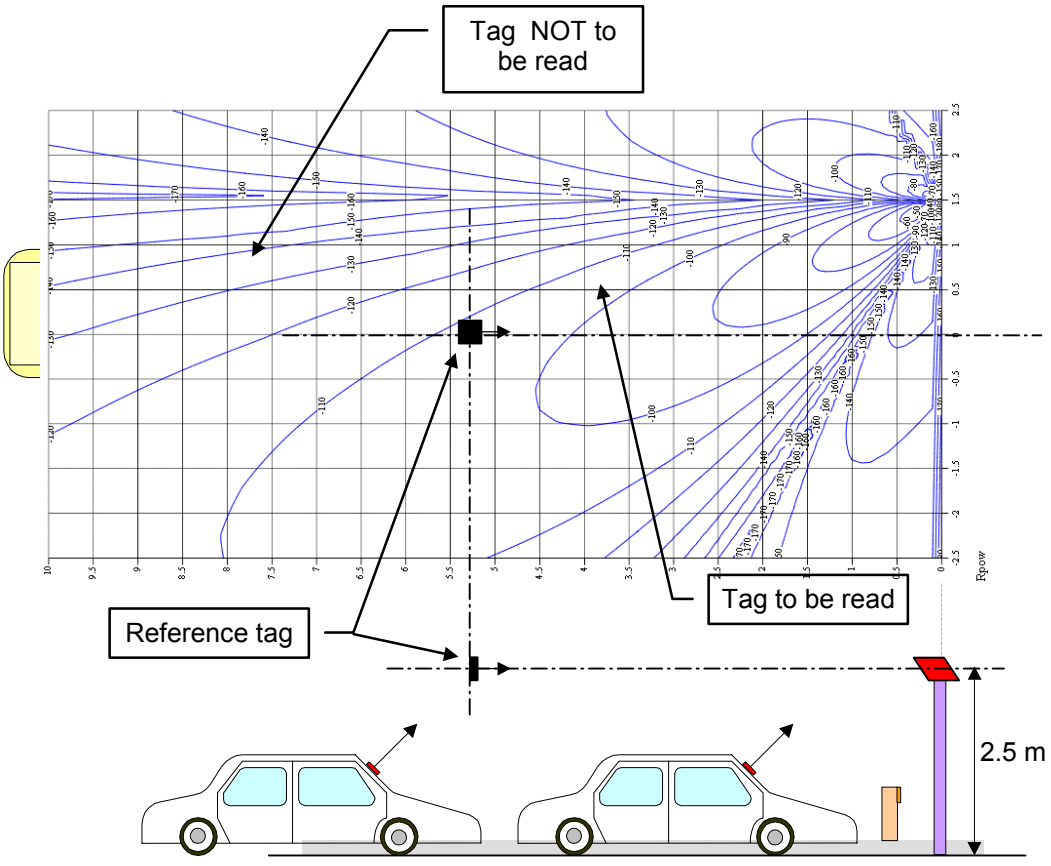
## 4.5 READ RANGE CONTROL

### 4.5.1 REFERENCE TAGS

By means of so called reference tags, read range can be controlled in a practical manor. This can be necessary when no cross readings between adjacent lanes is allowed. Reference tags are normal tags which are programmed with a customer code that is different from the customer code used in the application.

By placing the reference tag in the reading zone of the TRANSIT it sets a certain received signal level. A tag that is to be detected has to have a received signal level above the level set by the reference tag.

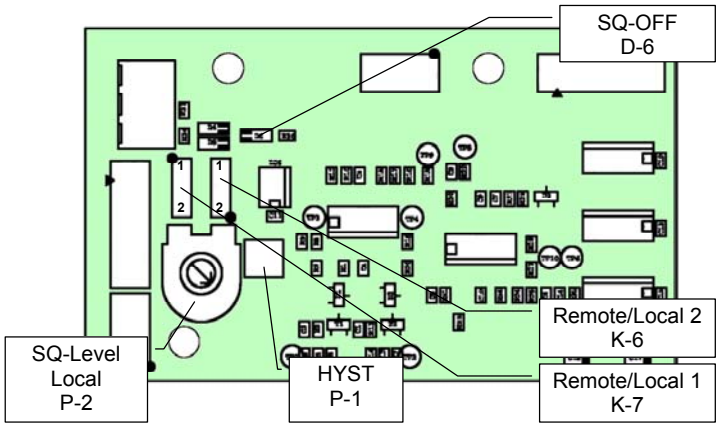
The example below shows how a reference tag is located to limit the TRANSIT reading zone.



### 4.5.2 SUB Squelch Upgrade Board (Art. 7800150)

The SUB is a small PCB board which can be build into any TRANSIT.

The SUB makes use of the already available AGC voltage (Automatic Gain Control Voltage) present in the Transceiver unit. This AGC- voltage represents the received signal strength of a transponder in front of the TRANSIT. When the orientation is fixed and no changes are present in the propagation path when the transponder is approaching the TRANSIT, this AGC voltage is a good measure for the distance between TRANSIT and transponder.




#### 4.5.2.1 SUB U-LINKS

| SUB U-LINKS | POSITION | | DESCRIPTION | NUMBER |
|---|---|---|---|---|
| **Remote/Local 1** | **1** | | Selects remote control via software commands. | **K-7** |
| | | **2** | Selects local control. Squelch level can be set manual by means of P-2 | |
| **Remote/Local 2** | **1** | | Selects remote control via software commands. | **K-6** |
| | | **2** | Selects local control. Squelch level can be set manual by means of P-2 | |

#### 4.5.2.2 SUB ADJUSTMENTS

| SUB ADJUSTMENT | DESCRIPTION | POT. METER |
|---|---|---|
| **HYST** | Turning this potentiometer completely clockwise selects the minimum hysteresis between the states squelch-on and squelch off. | **P-1** |
| **SQ-Level-Local** | Turning this potentiometer completely clockwise selects the minimum squelch level. | **P-2** |

## WARNING:

**When the TRANSIT SUB is placed and minimum squelch level is selected the maximum read range can be shorter then without the TRANSIT SUB.**

## For more detailed information refer to Manual TRANSIT-SUB

## 4.6 TYPICAL SITUATIONS

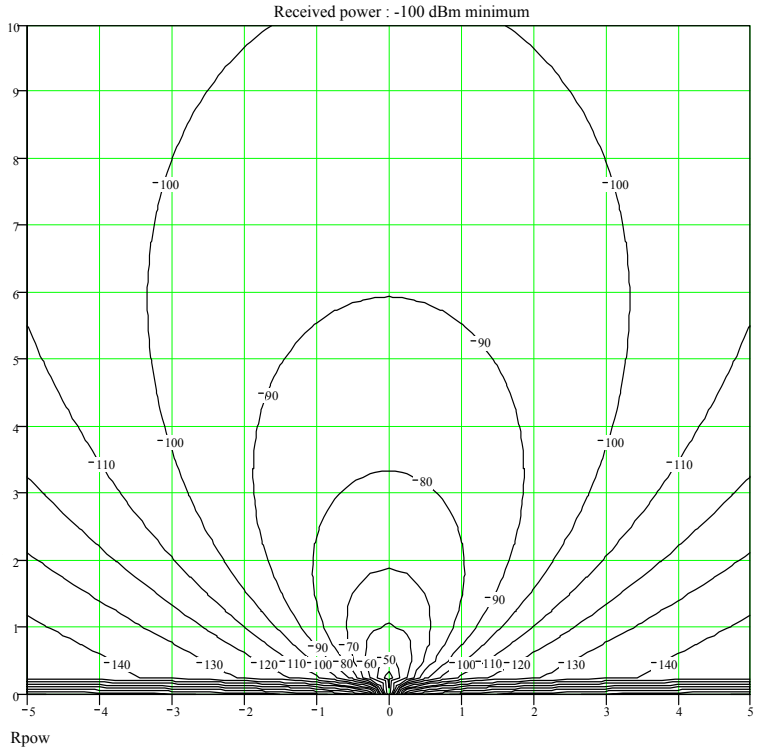
### 4.6.1 INTRODUCTION

In the following diagrams a contour plot is shown of the received tag signal. This contour plot gives always the top view of the situation. The position of the reader is always at 0,0. The tag is positioned in a area of 10 by 10 meter. The scale of the plot is such that every square has a dimension of 1 by 1 meter. The minimum signal needed from the tag is –100 dBm. This means that the area inside the –100 dBm contour represents the detection area.

The following parameters are used within the examples:

| PARAMETER | DESCRIPTION |
|---|---|
| **R-height** | Mounting height of the TRANSIT reader with respect of the ground. |
| **D-angle** | Angle over which the reader is rotated in the vertical plane. When D-angle is 0 degrees the reader 'looks' parallel to the ground. When D-angle is 90 degrees the reader is 'looking' straight down. |
| **A-angle** | Angle over which the reader is rotated in the horizontal plane. |
| **L-height** | Mounting height of the transponder with respect to the ground. |
| **L-angle** | Angle over which the tag is rotated in the vertical plane. When L-angle is 90 degrees the tag is 'looking' parallel to the ground. When L-angle is 0 degrees the tag 'looks' straight up. |

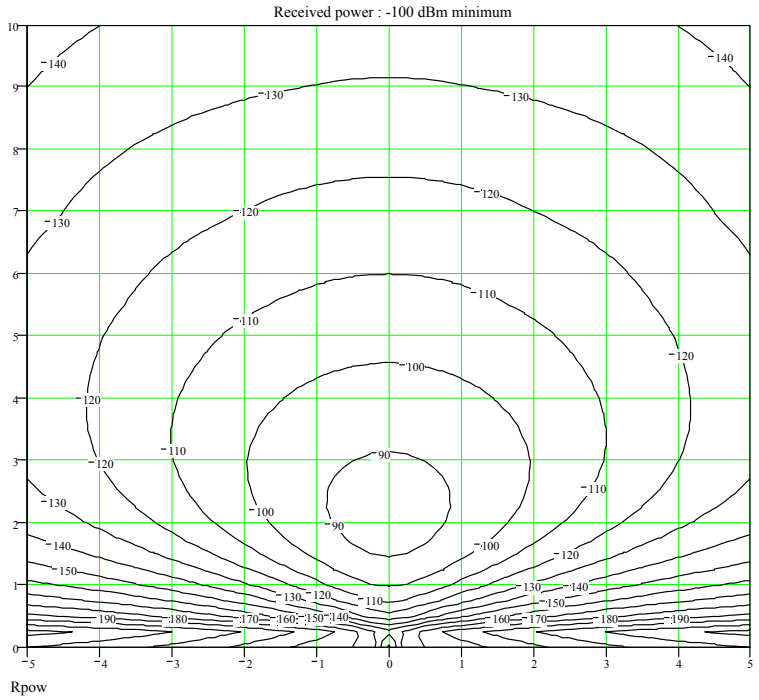
### 4.6.2 Example 1




| Parameter | Value |
|---|---|
| **R-height** | 1 |
| **D-angle** | 0° |
| **A-angle** | 0° |
| **L-height** | 1 |
| **L-angle** | 90° |

This example shows the ideal situation the reader is positioned at the same height as the tag. This figure can be used for approaching tags as for tags passing at certain distance in front of the reader.

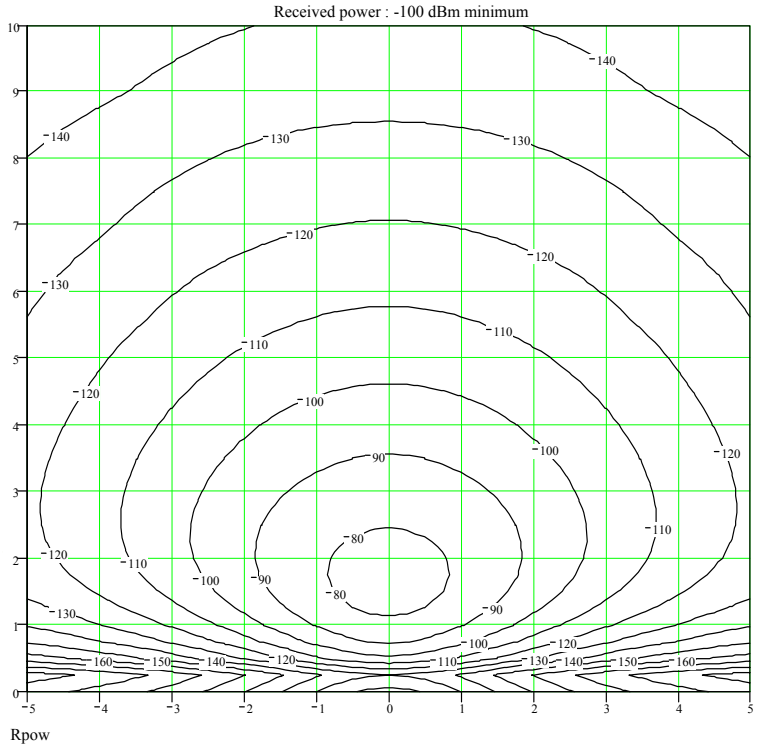
### 4.6.3 Example 2




| Parameter | Value |
|---|---|
| **R-height** | 3 |
| **D-angle** | 45° |
| **A-angle** | 0° |
| **L-height** | 1 |
| **L-angle** | 90° |

By placing the reader on a height of 3 meters and not adjusting the vertical angle of the tag, we see a strong reduction in the detection area.

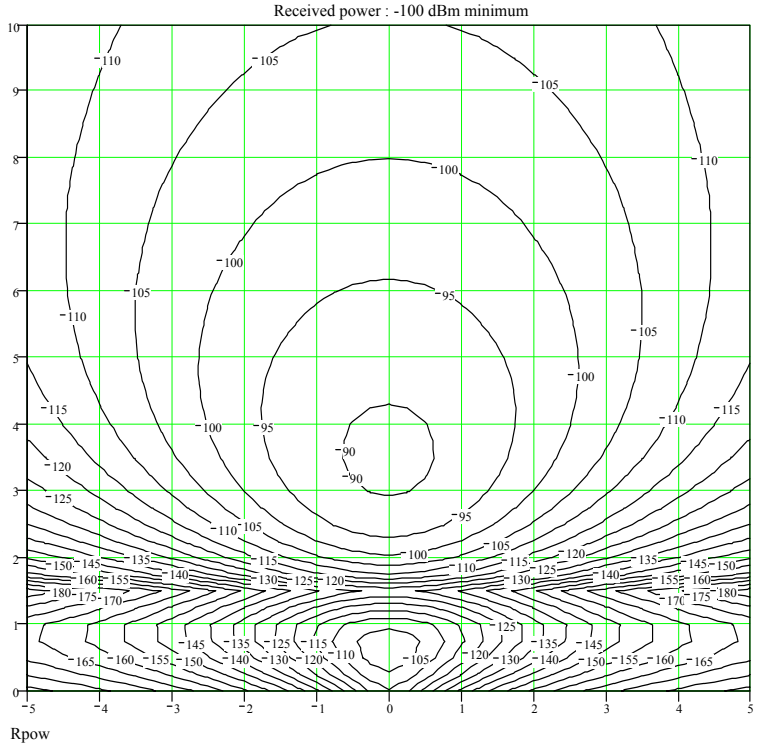
### 4.6.4 Example 3




| Parameter | Value |
|---|---|
| **R-height** | 3 |
| **D-angle** | 45° |
| **A-angle** | 0° |
| **L-height** | 1 |
| **L-angle** | 45° |

By letting the tag look up 45° the detection area increases. Due to the reader D-angle of 45° at a height of 3 meters and a tag height of 1 meter the maximum of energy is approximately 2 meters before the reader. This maximum could be placed much further out to improve the detection area.

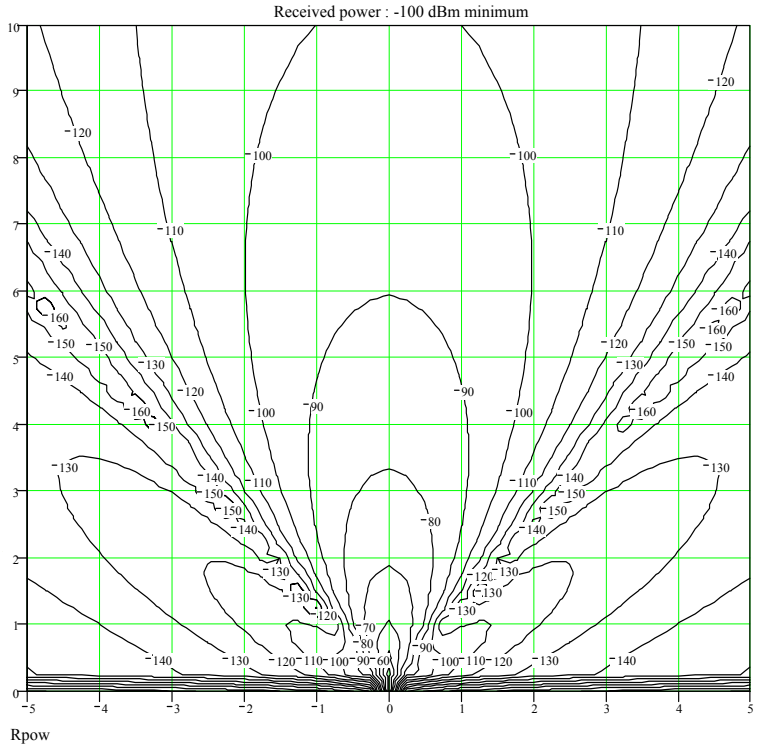
### 4.6.5 Example 4




| Parameter | Value |
|---|---|
| **R-height** | 3 |
| **D-angle** | 15° |
| **A-angle** | 0° |
| **L-height** | 1 |
| **L-angle** | 45° |

By reducing the reader down look angle (D-angle) to 15° the range is again improved.

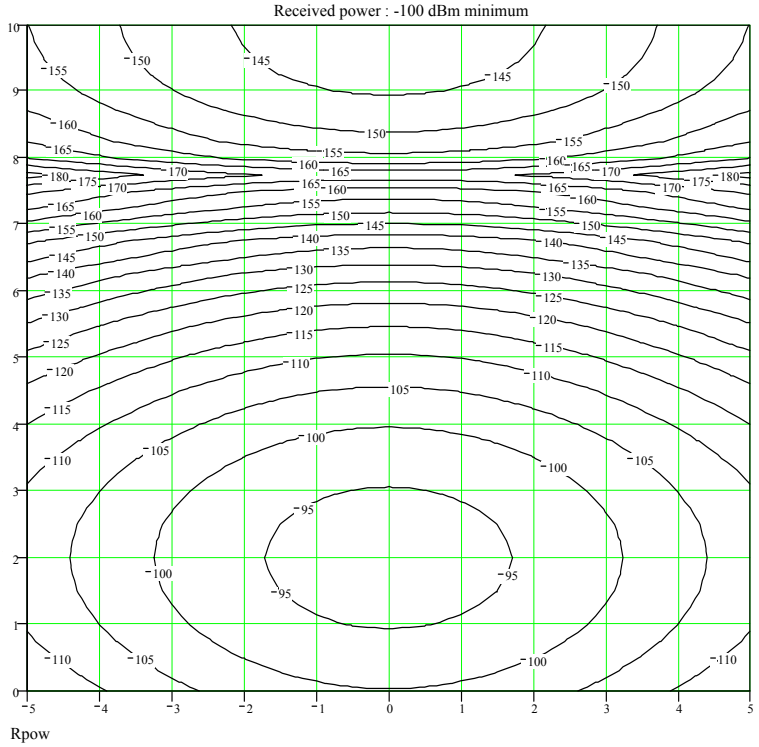
### 4.6.6 Example 5




| Parameter | Value |
|---|---|
| **R-height** | 1 |
| **D-angle** | 0° |
| **A-angle** | 0° |
| **L-height** | 1 |
| **L-angle** | 90° |

This example shows the detection area when the TRANSIT reader is placed 90 degrees rotated. This means that the smaller beam width is in the horizontal plane. This results in a much narrower detection area which can be necessary in certain applications.

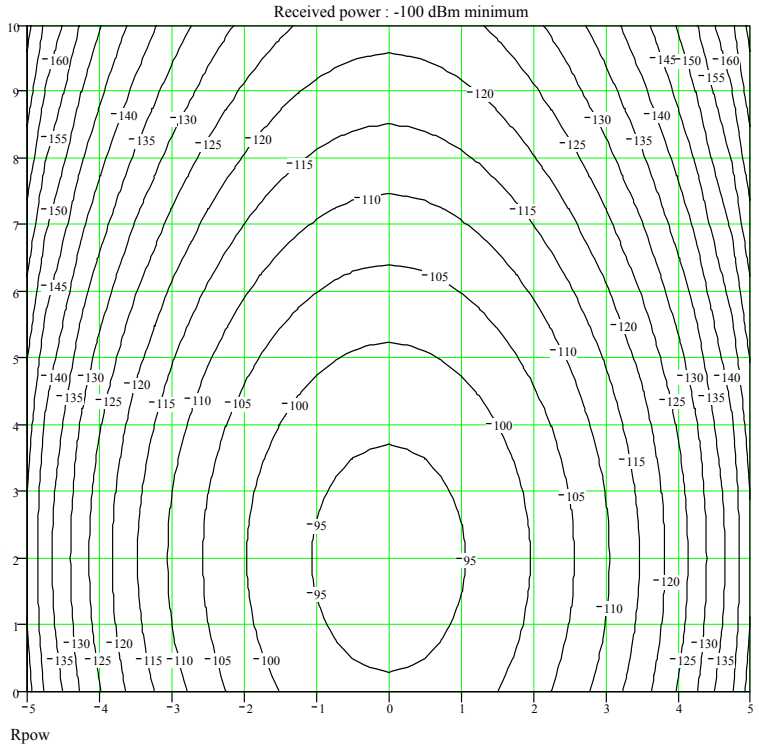
### 4.6.7 Example 6




| Parameter | Value |
|---|---|
| **R-height** | 8 |
| **D-angle** | 90° |
| **A-angle** | 0° |
| **L-height** | 1 |
| **L-angle** | 0° |

This is a situation were the reader sits on the ceiling 8 meters above a door. The reader position is 0, 2. The tags is at a height of 1 meter and is looking straight up.

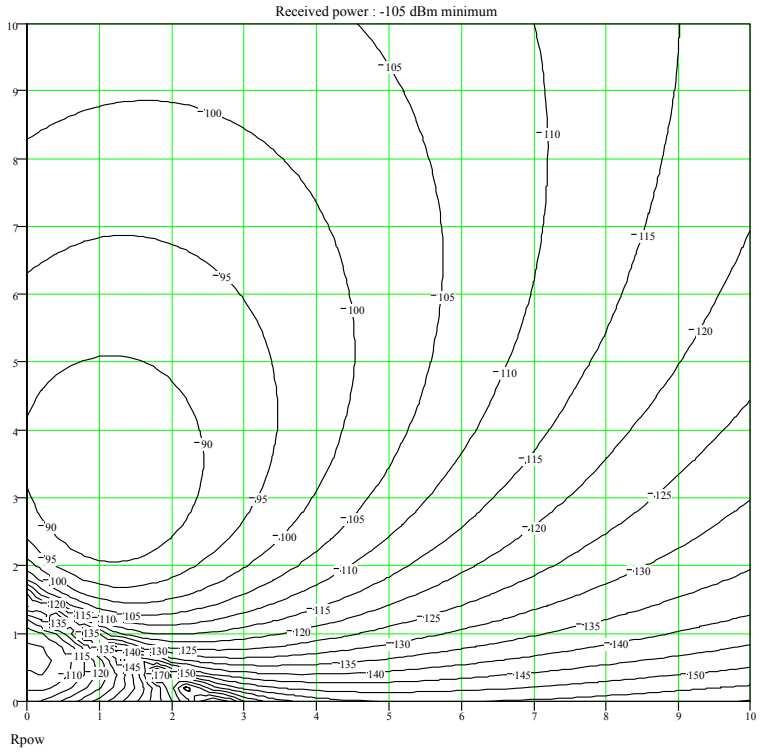
### 4.6.8 Example 7




| Parameter | Value |
|---|---|
| **R-height** | 8 |
| **D-angle** | 90° |
| **A-angle** | 0° |
| **L-height** | 1 |
| **L-angle** | 0° |

This is a situation were the reader sits on the ceiling 8 meters above a door. The reader position is 0, 2. The tags is at a height of 1 meter and is looking straight up. The difference with example 6 is that the reader is rotated 90 degrees to make use of the smaller beam width.

### 4.6.9 Example 8




| Parameter | Value |
|---|---|
| **R-height** | 3 |
| **D-angle** | 15° |
| **A-angle** | 30° |
| **L-height** | 1.25 |
| **L-angle** | 60° |

This example is typical for the situation where a tag is behind the windshield of a car and the reader is placed along the road. The reader is rotated 30° towards the road in the horizontal plane.

# Appendix A TECHNICAL SPECIFICATIONS

| ITEM | SPECIFICATION | REMARKS |
|---|---|---|
| **Housing** | Stainless steel | |
| **Dimensions** | 310 x 250 x 100 (12.2 x 9.8 x 3.9 inch) | |
| **Weight** | < 5 kg (9.9 pounds) | |
| **Protection class** | IP 65 / UL 50 | |
| **Temperature operational** | -30°C .. +50°C | Ambient temperature, and under sun protection. |
| **Temperature storage** | -40°C .. +85°C | |
| **Relative humidity** | 10 .. 93% non-condensing. | |
| **Identification range** | Typical 10 meters (33 ft) | Tag in line of sight. |
| **Object speed** | 200 km/h (125 mph) | Identification trajectory > 5 meter, 64 bit tag only. |
| **Power supply** | 230VAC +/- 10%, 100 mA, 50/60 Hz<br>24 VDC +/- 10 %, 500 mA | DC supply shall be capable of delivering a 1 A inrush current. |
| **Power supply TRANSIT-USA** | 24 VDC +/- 10 %, 500 mA | Class 2 power supply according local regulations |
| **Power consumption** | 30 VA (TRANSIT Extended)<br>18 VA (TRANSIT) | |
| **Frequency range** | 2400.6 MHz..2482.8 MHz<br>2438.4 MHz..2457.0 MHz (USA only) | Selected by DIP-switch, sealed in factory. |
| **Number of channels** | 138 / 32 (USA only) | |
| **Channel spacing** | 600 kHz | To be used when systems are close together. |
| **Polarization** | Circular (LHC) | |
| **EIRP** | Max 18.7 dBm linear | |
| **Receiver sensitivity** | -100 dBm | |
| **Antenna gain** | > 8 dBi | Valid for RX-array and TX-array |
| **EMC** | In accordance with the 89/336/EEC European directive<br>EN 50081-1, EN 50082-1<br>EN 50082-2, ETS 0908 | |
| **Safety** | EN 60950<br>UL 60950 | |
| **Complies to the following regulations** | FCC Part 15.245<br>ETS 300 440 | |

# Appendix B NEDAP PART NUMBERS

## READERS

| PRODUCT | PART NO. | DESCRIPTION |
|---|---|---|
| TRANSIT PS270 | 9990410 | Long range microwave reader with built-in antenna that can identify vehicles over distances up to 10 meters |
| TRANSIT USA | 9875220 | Long range microwave reader with operating frequency of 2.438 – 2.457 GHz |
| TRANSIT Extended | 9873694 | The TRANSIT Extended reader expands on the features of the standard reader by adding functionality that enables the reader to store authorization profiles and data records |
| TRANSIT EX-housing | 9840990 | TRANSIT EX is the TRANSIT reader equipped with a special EX certified housing especially suited for long-range vehicle identification applications in hazardous environments where security and reliability are essential requirements |

## INTERFACES

| PRODUCT | PART NO. | DESCRIPTION |
|---|---|---|
| RS 232 III | 7806434 | Optional communication board |
| CM422 | 7811730 | Optional communication board (RS422) |
| Profibus DP | 7817134 | Optional communication board for Profibus-DP networks |
| Ethernet | 7817940 | Optional communication board for ethernet networks |

## ACCESSORIES

| PRODUCT | PART NO. | DESCRIPTION |
|---|---|---|
| SUB print | 7800150 | Squelch Upgrade Board for read-range adjustment |
| Mast mounting set | 5629595 | Set for easy mounting of the TRANSIT reader to a mast |
| Weather protection hood | 7562640 | Protection hood for long lasting exposure to sun and rain |

For a complete overview of the TRANSIT transponder range see AVI TRANSIT product line specification.