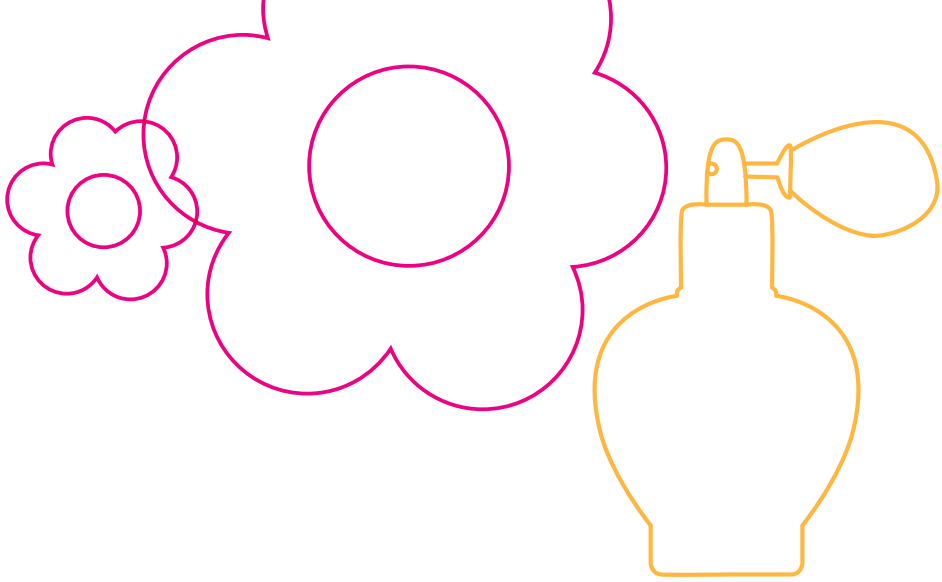

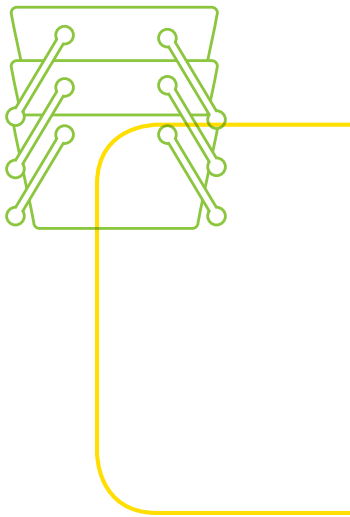

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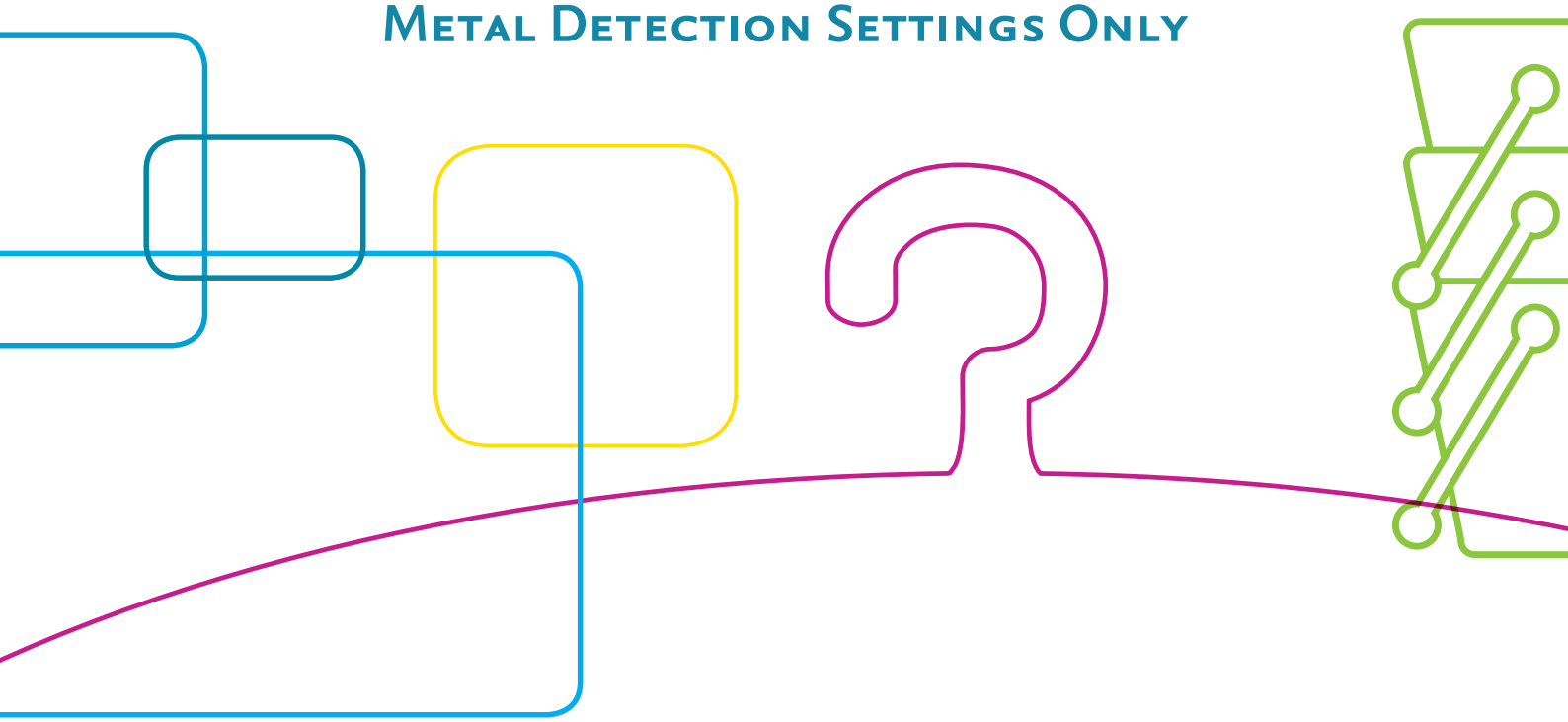
XQ MK2 Electronics

manual

Metal Detection Settings Only

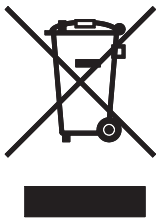


Januari, 2010

Technical Support

E-Mail : support-rs@nedap.com

Safety precautions

	CAUTION - RISK OF ELECTRIC SHOCK - DO NOT OPEN
CAUTION: TO REDUCE THE RISK OF ELECTRICAL SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED NEDAP SERVICE PERSONNEL.	
	Lightning flash with an arrowhead, enclosed in a triangle, alerts you to the presence of uninsulated voltage points inside the product which could cause a serious electrical shock.
	An exclamation mark enclosed in a triangle alerts you to important operating and maintenance instructions in the documentation provided with the product.
WARNING! To avoid the risk of fire or electrical shock, never expose these products to water or operate in a high humidity environment.	
 EN 50419:2005	EN 50419:2005 This European Standard specifies a marking • of electrical and electronic equipment in accordance with Article 11(2) of Directive 2002/96/EC (WEEE); This is in addition to the marking requirement in Article 10(3) of this Directive which requires producers to mark electrical and electronic equipment put on the market after 13 August 2005 with a 'crossed-out wheeled bin' symbol. • that applies to electrical and electronic equipment falling under Annex IA of Directive 2002/96/EC, provided the equipment concerned is not part of another type of equipment that does not fall within the scope of this Directive. Annex IB of Directive 2002/96/EC contains an indicative list of the products, which fall under the categories set out in Annex IA of this Directive; • that serves to clearly identify the producer of the equipment and that the equipment has been put on the market after 13 August 2005.

Documentation version **Manual XQ MK2 2010 1 PRELIMINARY**

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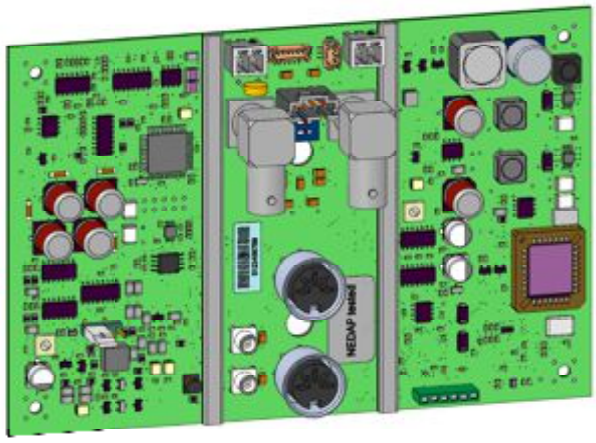
Table of Contents

1. Introduction

The XQ MK2 Units are the successors of the XQ series internal OS/T electronics. The complete redesign has many new features:

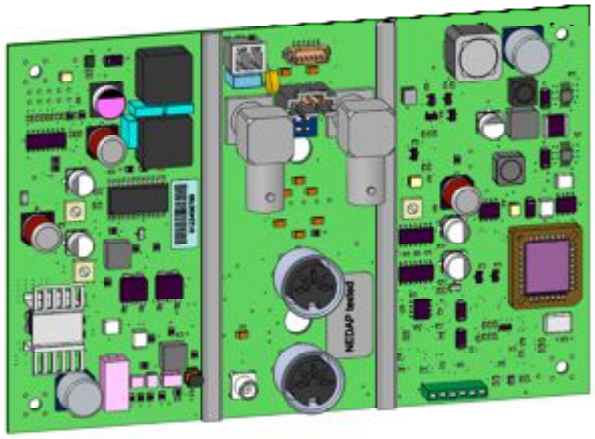
- Powerful transmitter (4 watt)
- Attenuator setting can be done for every aisle separately
- Attenuation jumpers are replaced by a firmware setting
- Integral customer counting
- Integral Metal detection, fully (remote) configurable with OS/T configurator

1.1 XQ MK2 RX (R2)



1.2 XQ MK2 Tx (T2)

The Tx units come with a 4 watt transmitter, which can be switched on with a special functionality module.



1.3 | 4 Watt transmitter

The advantages of the new transmitter are:

- Aisle width between panels can be proximally 10 % more for the same label

OR

- Distance between the panels will be the same and smaller labels can be used

OR

- To suppress interference from other systems

In combination with an AIM module (Aisle Improvement Module) the full features of the transmitter can be used.

1.3.1 The AIM (Aisle Improvement Module)

The module increases the power up to 4Watt.
All antennas suitable for the XQ Mk2 internal units with metal detection will be suitable for 4 Watt (effective power). The outside of the antenna will be marked with a '4W' addition to the serial label. Inside the antenna the will be a label "Suitable for 4 W "

1.4 New Attenuator

The advantages for the attenuator are:

- Easy installation
- Additional external attenuators are not necessary anymore
- Hardware jumper settings are replaced through software settings
- Useful for aisles with different aisle width, example system with 2 aisles
    - First aisle width is 1.60 meters
    - Second aisle width is 1.00 meters

1.5 Performance Indicator

Firmware version 1.8xx and up contains performance indicators. This means that it is possible to actually trace the delivered system performance.

A Nedap EAS system contains several different signal processing functions, which are mapped to several different hardware units. For example we have a power supply, a sweep generator, a transmitter, a receiver, and deactivation units. To monitor the performance of the system from bird's eye view we have to look at and integrate all performance indicators of each comprising unit. The actual data integration is done off line, in the TOPserver and or Easinet.

For all OST units we need performance indicators:

1. Performance indicator for a power supply.
   A measure which indicates in time the actual delivery of good power. In practice as long as the system is working the power is considered to be good. So this performance is not separately monitored. System uptime is used as indicator.
2. Performance indicator for a sweep generator.
   A measure which indicates in time the actual delivery of good sweeps to the system. In practice as long as the system is working the sweep generator is considered to be good. This performance is not separately monitored. System uptime is used as indicator.
3. Performance indicator for transmitters.
   A measure which indicates in time the actual delivery of good sweeps to the transmitter panel. Interruptions of the power delivery due to AGC actions are monitored. This is a new performance indicator.
4. Performance indicator for receivers.
   A measure which indicates in time the actual reception of clean sweeps from the panel. This is not explicitly monitored. And a measure which indicates in times the actual level of external noise. This level must contain all detection prohibit-

ing signals. This signal is monitored. This is the second new performance indicator.
With these performance indicators it should be possible to monitor accurately the performance of the system. These indicators cover the primary detection function. Also the communication is checked continuously of course.

Altogether it is expected that the most frequent occurring disturbances and failures are covered. Some mechanical failures are not covered, like receiver antennae wire failures. To cover these type of events it is sufficient to look at the occurrence of label detection events at all. If alarm events occurs one can safely assume that the system is not dead yet.

The most important feature is the logging of EAS detection performance over time. Covered events are downtime due to power outages, loss of transmit signal due to AGC events, occurrence of alarms, and environmental noise which degrades the detection performance's. Of course it is not possible to distinguish between false alarms and true label alarms, because if that would be possible then all false alarms could be eliminated beforehand.

5. Performance indicator for standalone label deactivation units.
   A measure which indicates in time:
   - the actual delivery of good power
   - the actual delivery of good sweeps to the system
   - the actual delivery of good sweeps to the antenna

   These parameters are covered by the system uptime indicator.

   - the actual reception of clean sweeps from the panel

   This parameter is monitored by the receiver (type) performance indicator.

2. Block diagrams

The XQ MK2 Transmitter with integral customer counting and metal detection.

2.1 Network communication and sync

The XQ units are slave-only, they need an RF signal originating from a master output . This could be an NCC, SQ unit or TDC unit. The RF signal has a frequency of four times 8.2 MHz and sweeps between 30.... 36 MHz.
The RF signal is used to drive the transmitters as well as the receivers. The Coaxial cable between master-output and slave input is also used to distribute DC power and data-communication

2.1.1 Hand-terminal-connection (K100)

A standard NEDAP RS handheld terminal (HT) may be connected to connector K100. With this HT you can edit the various local settings. With this terminal all digital settings can be made, even if the network is nonfunctional.
Some settings can only be adjusted by using an OS/T Configuration Manager
Especially the Metal detection settings are only possible with the configurator

2.1.2 Data communication over coax

One of the important features from the OS/T system is the data-com over the coax-cable. With this feature it's no longer necessary to use an extra data-cable between the units, which simplifies the installation of the system. All the connected units are interrogated periodically by the master. If there are messages like an alarm on a connected Rx unit, then the master unit will process this and takes the necessary action: Sending a command to turn on the lamps on the activated aisle.
The XQ MK2 unit has two slave-sync connectors (K101 and K102) from which the unit can be driven from a NCC-4, SQ, or TDC unit. DC supply is from the sync-connectors.

2.2 Transmitter

The Transmitter generates an 8.2 MHz RF signal with a maximum power level of 4 Watt to feed the transmitter antenna.
The transmitter receives its RF reference signal and configuration data from the local communication control section.
The start-pulse is distributed as a 1 microsecond break of the RF signal (32 periods) and indicates the start of the 1.6 ms sweep. All timing of the OS/T-system is related to this start-pulse.
The RF signal (with a 30 till 36 MHz sweep) for the power amplifier is divided by for 4 to create the 8.2 MHz transmitter signal. The power amplifier consists of a class D MOSFET driver stage. The square wave output is filtered to achieve a cleaner carrier. The 50 ohm output impedance is regulated by measuring output current and output voltage and adjusting the drive signal of the MOSFET power stage accordingly. These two output parameters are measured with a current transformer and a capacitive voltage divider circuit at the output stage. From these signals a phase control signal and the amplitude control signal are derived. Both signals can be seen on the test connector. The signals are the feedback to the driver stage.

2.2.1 Anti-deactivation regulation

If a RF label comes close to the antenna, it could be deactivated by the transmitter field. To prevent this phenomenon a tag detection circuit is used. A tag close to the antenna can be detected by looking at the antenna signal. A resonating tag in proximity causes a small phase-disturbance in the antenna impedance, which can be seen on the phase control signal of the transmitter. When in a sweep a tag pulse is found the processor can reduce the transmit power in the next sweep to prevent deactivation of the tag. After the tag signal disappeared the transmit power is gradually increased to the desired power level.

2.2.2 Output multiplexer

The transmitter can feed one antenna. The RF signal is switched during the fly-back period of the RF sweep. The multiplexer is a 1 out of 2 type build with PIN diodes. In the fly-back-period the antenna is switched off.
The second output of the multiplexer goes to an internal dummy load. This is used for multiplexing when more than one aisle is used. The "unused" phases can be dumped in the dummyload.
The antenna-output has his own lamp-control-circuit and can be switched on or off individually. The lamps are controlled by software. The outputs have open, overload and short-circuit detection. These signals are under processor control.
The lamp control circuit is also used for driving the new-style (two-wire) buzzer.

2.2.3 Tx output power setting

Default power setting is 2 Watts. This is suitable for almost every situation. With large aisle withs (2 meters or more) it can be usefull to increase the power to 4 watts.

2.3 Receiver

The Receiver detects the tag signals generated by tags in the aisle formed by a transmitter panel and a receiver panel. Even very small signals can be detected to achieve a very high pick rate. Aided by heavy use of digital signal processing the false alarm rate is very low, even under difficult noise conditions. The receiver receives its RF reference signal and configuration data from the local communication control section.
The antenna is connected to K202. Every sweep the antenna canl be connected to the receiver. This is done in the multiplexer circuit. After the multiplexer an attenuation stage can be used to reduce the level of direct feed through in case of very close antenna distance. The attenuator can be selected as 0, -6dB, -12dB and -18dB. The setting is possible with the hand terminal (under the sensitivity menu) or with the OS/T Configuration Manager.

A new feature is the possibility to set the attenuator per phase. The reference RF signal is split in four phases and fed to two mixers together with antenna input. Each mixer generates a LF signal which is filtered, amplified and muted in the fly back period of the RF carrier. The mute circuitry consists of several stages which are controlled by software. The mixers are fed with 90 degrees phase shift. The resulting LF signals are further processed by the digital signal processor (DSP).
The DSP uses digital memory to store the past quarter of a second to compare different sweeps and improve on noise level and other unwanted signals components. The filtered signal after processing can be seen on the scope by looking at the DAC signal.

2.3.1 Input multiplexer

The receiver can process two antenna signals. This means that at most 2 antennas can be connected. The antenna signal is switched during the fly back period of the RF sweep. The multiplexer is a 1 out of 2 type build with PIN diodes. In the fly back period all antennas are switched off.
Antenna input 1 (K202) has his own lamp control circuit and can be switched on or off individually. The lamps are controlled by software. The outputs have an open, overload, and short circuit detection. These signals are under processor control.
The secondairy antenna input (K201) is only meant for floor antennas and has no lamp/buzzer functionality.

2.3.4 Processor

The XQ MK2 series boards (Tx and Rx) have only one processor for RX, TX and Communication control.
The processor has several different tasks. It must maintain the status of the transmitter and receiver and controls several functions:

- lamp detection
- lamp/lamp overload
- multiplexer
- data communication
- handheld terminal communication
- customer-counting 1x2 inputs

- metal detection

All the processor software and all the settings (including the network address) are contained in flash memory. Software is downloadable in runtime. A new version can be distributed over the network. After downloading, flashing and verifying a new version the unit resets and is operational again. This can be done remotely.

2.3.5 Customer counting

The XQ MK2 PCB has customer counting on board. Two sensors can be connected to monitor the entrance with direction sensitivity.
The passage between sensors is shaped and buffered and processed by the processor. In this way incoming and outgoing label alarms can be counted for separately.
The sensor power output is 12 V dc. It is possible to connect sensor with positive or negative going output signals.

2.3.6 Test-connectors

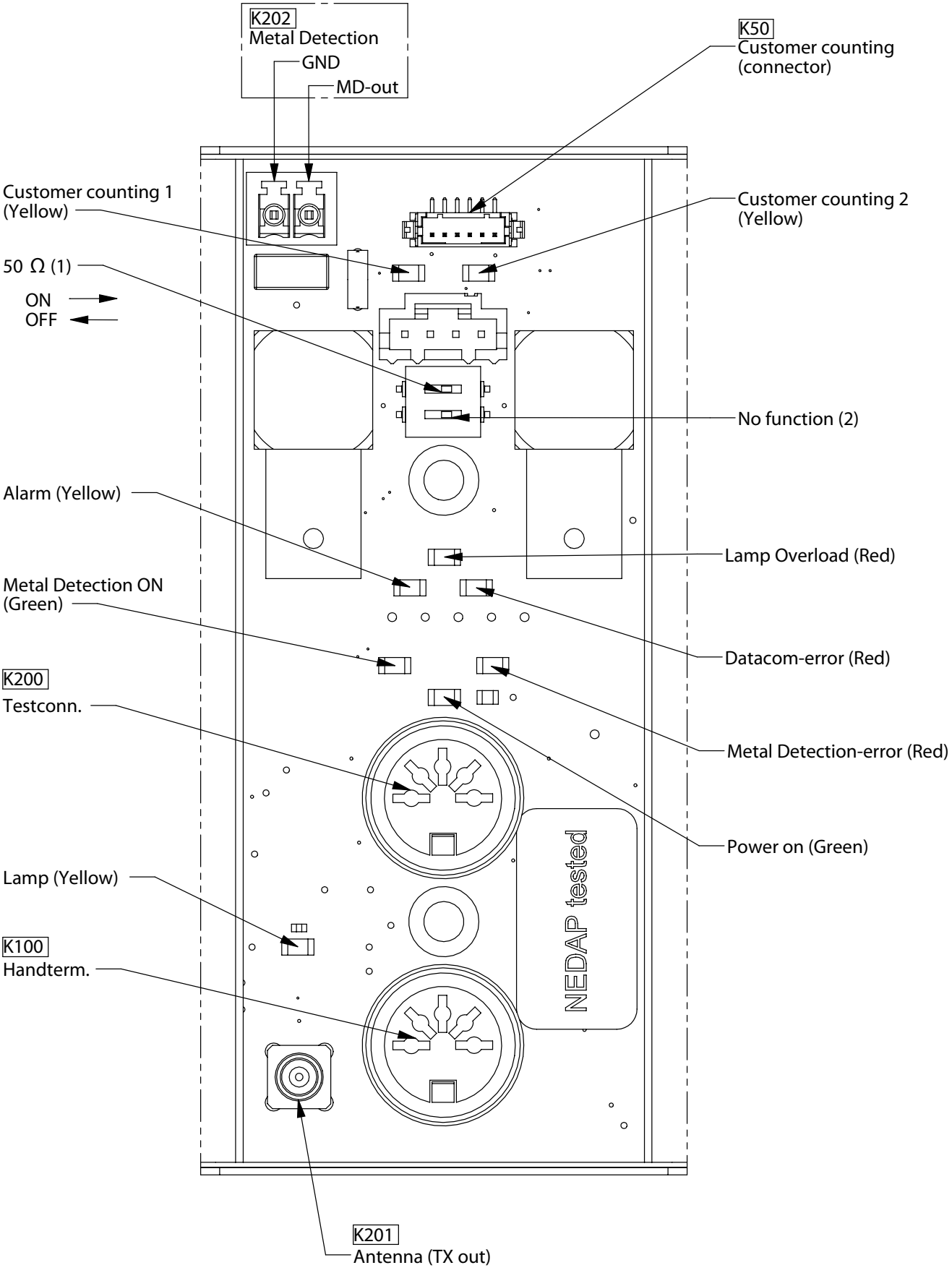
K200: The receiver test-connector shows 3 analogue signals to aid in installing and servicing the receiver section. For easy external triggering a start pulse is available.
The transmitter test connector shows the analogue signals needed to align and verify the transmitter.

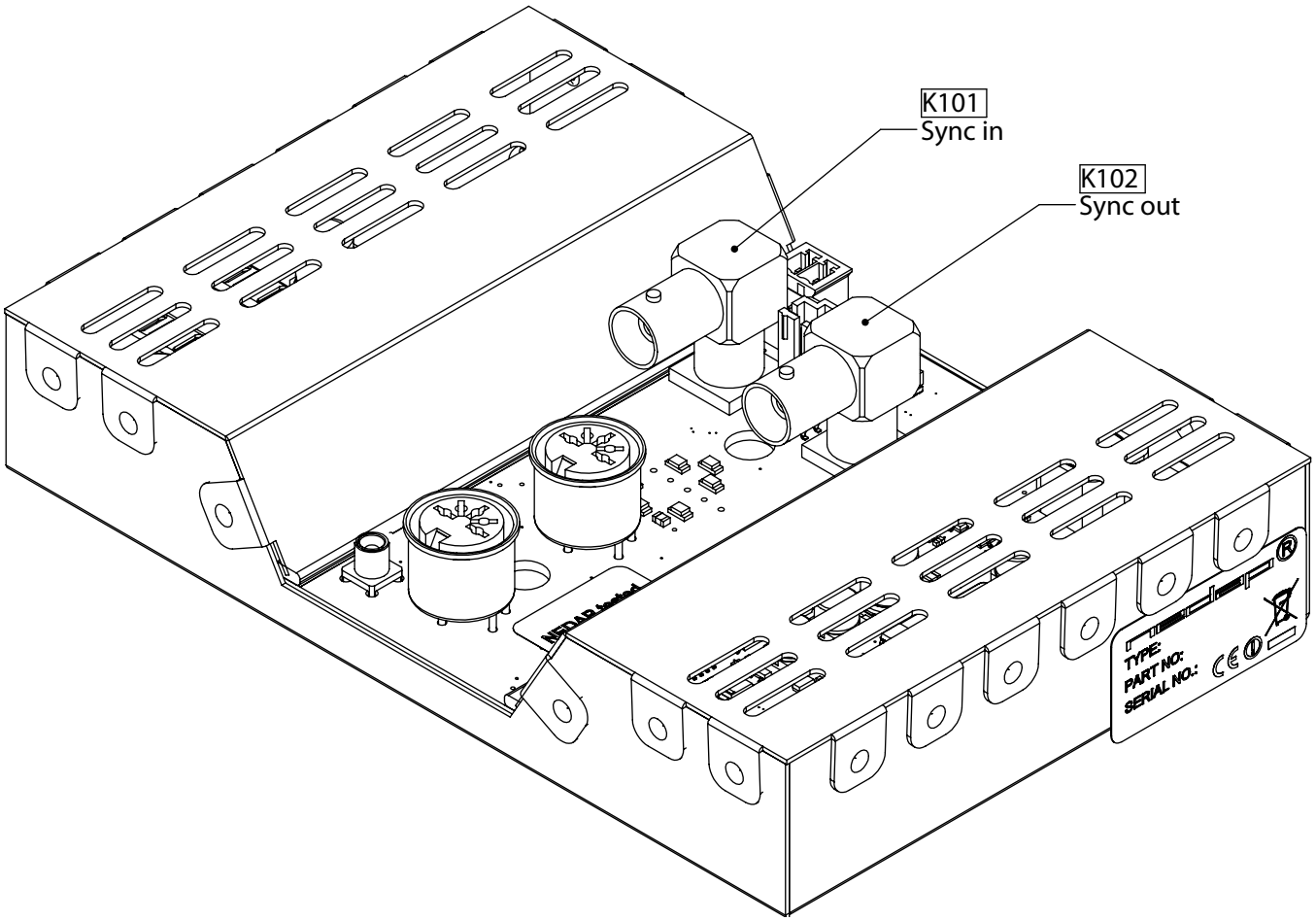
2.4 Dummy loads

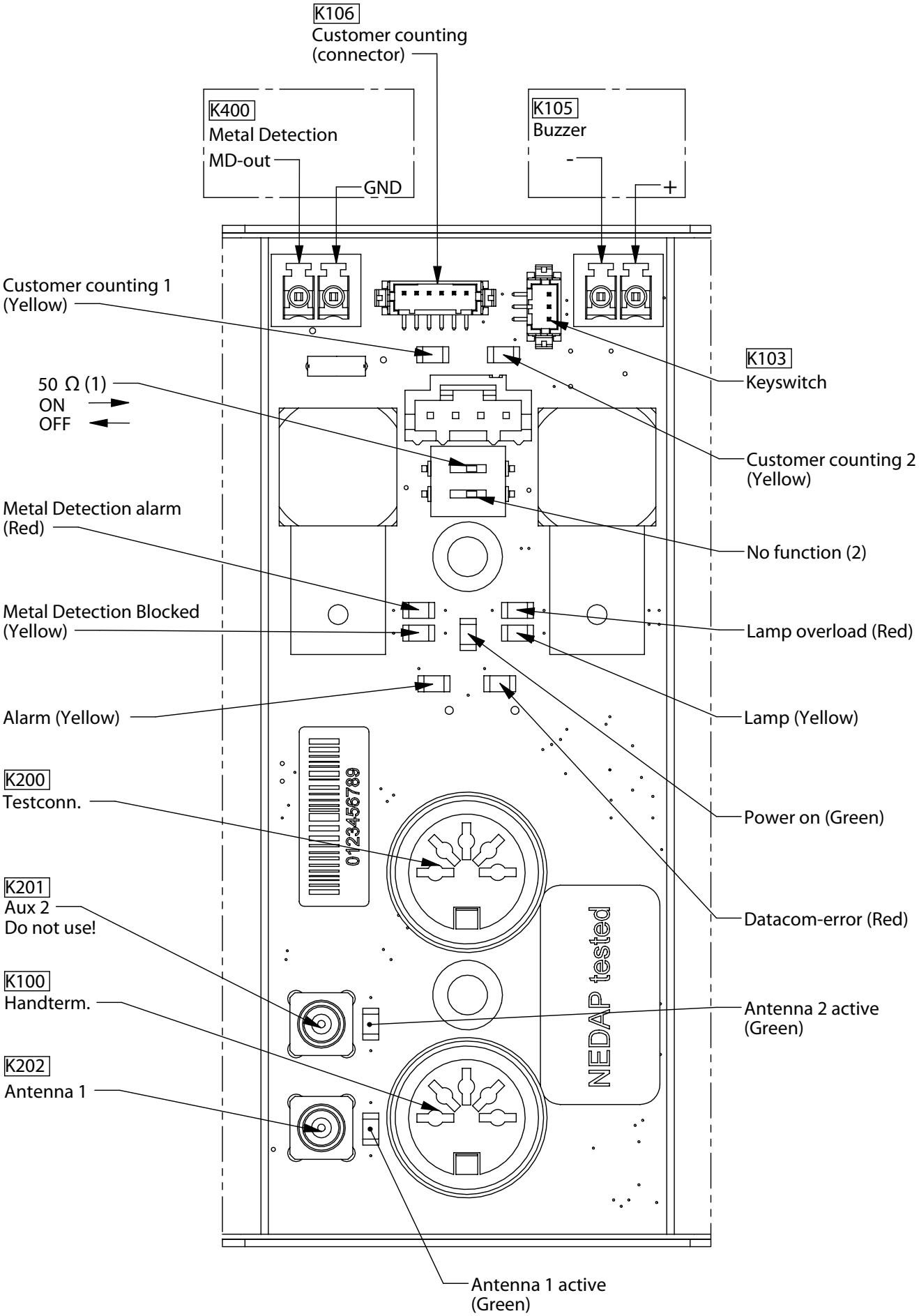
Dummy loads are no longer needed for the XQ MK2 PCB's. Unused channels will be programmed as channel "0".

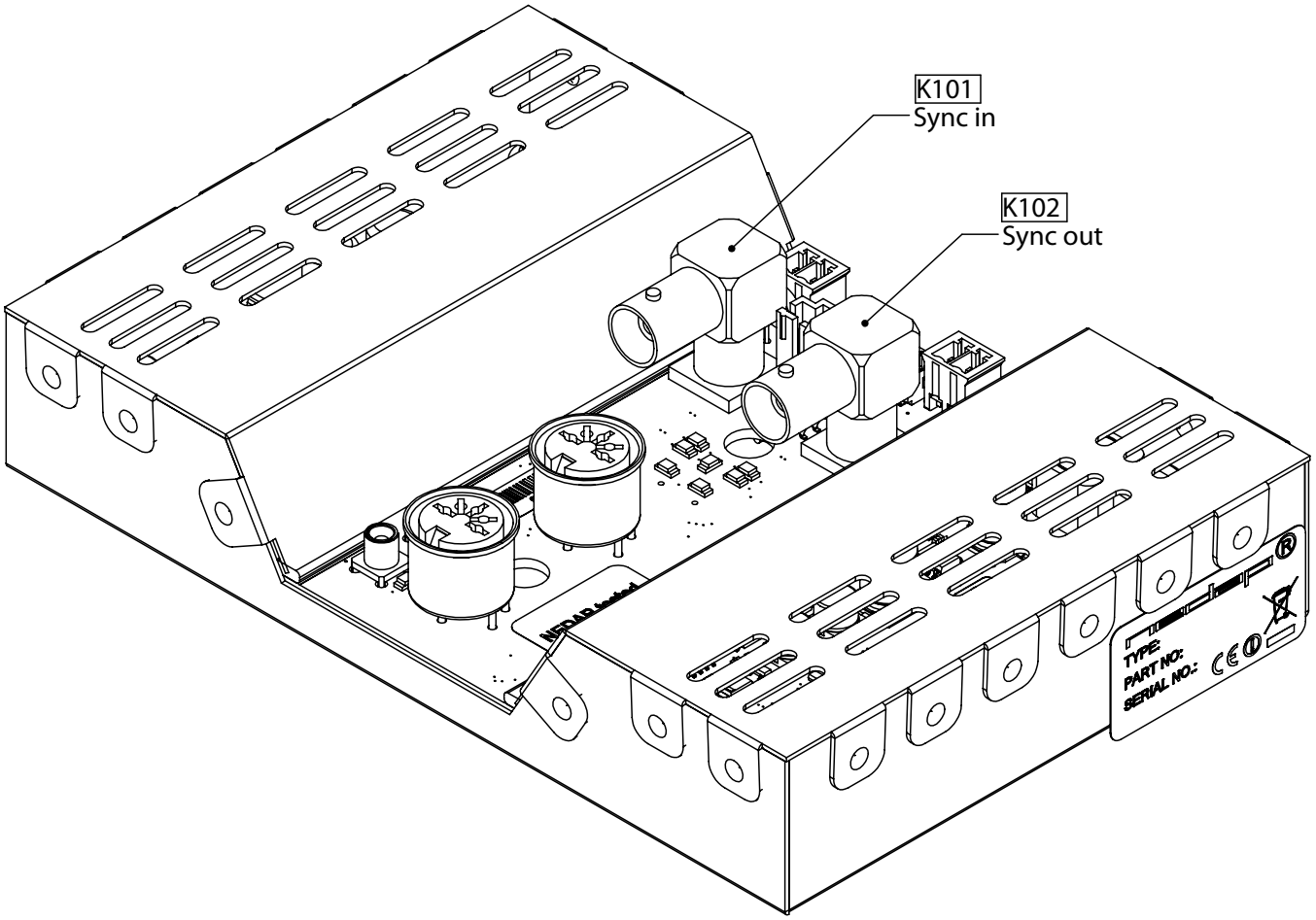
3. PCB Components overview

3.1 Connector overview XQ TX




K101
Sync in
K102
Sync out
TYPE:
PART NO:
SERIAL NO.:


K106
Customer counting
(connector)
K400
Metal Detection
MD-out
GND
K105
Buzzer
-
+
Customer counting 1
(Yellow)
50 Ω (1)
ON
OFF
K103
Keyswitch
Customer counting 2
(Yellow)
Metal Detection alarm
(Red)
No function (2)
Metal Detection Blocked
(Yellow)
Lamp overload (Red)
Alarm (Yellow)
Lamp (Yellow)
K200
Testconn.
Power on (Green)
K201
Aux 2
Do not use!
Datacom-error (Red)
K100
Handterm.
Antenna 2 active
(Green)
K202
Antenna 1
Antenna 1 active
(Green)
012345678
NEDAP tested


K101
Sync in
K102
Sync out
TYPE:
PART NO:
SERIAL NO.:

4. Unit address

Each XQ MK2 unit has an unique network address. The address is entered in the master unit to enable data communication.

The unit address is an 8 digit address; the last four digits will be a fixed couple of characters, these characters will be used in the OS/T Configuration Manager and in the hand held terminal (for instance slave table etc.)

5. Connection to PC / Laptop

The X2 uses a min-usb connector for a direct connection with the Configuration Manager.

6. Networking with NCC MK2

NCC (networking electronics)

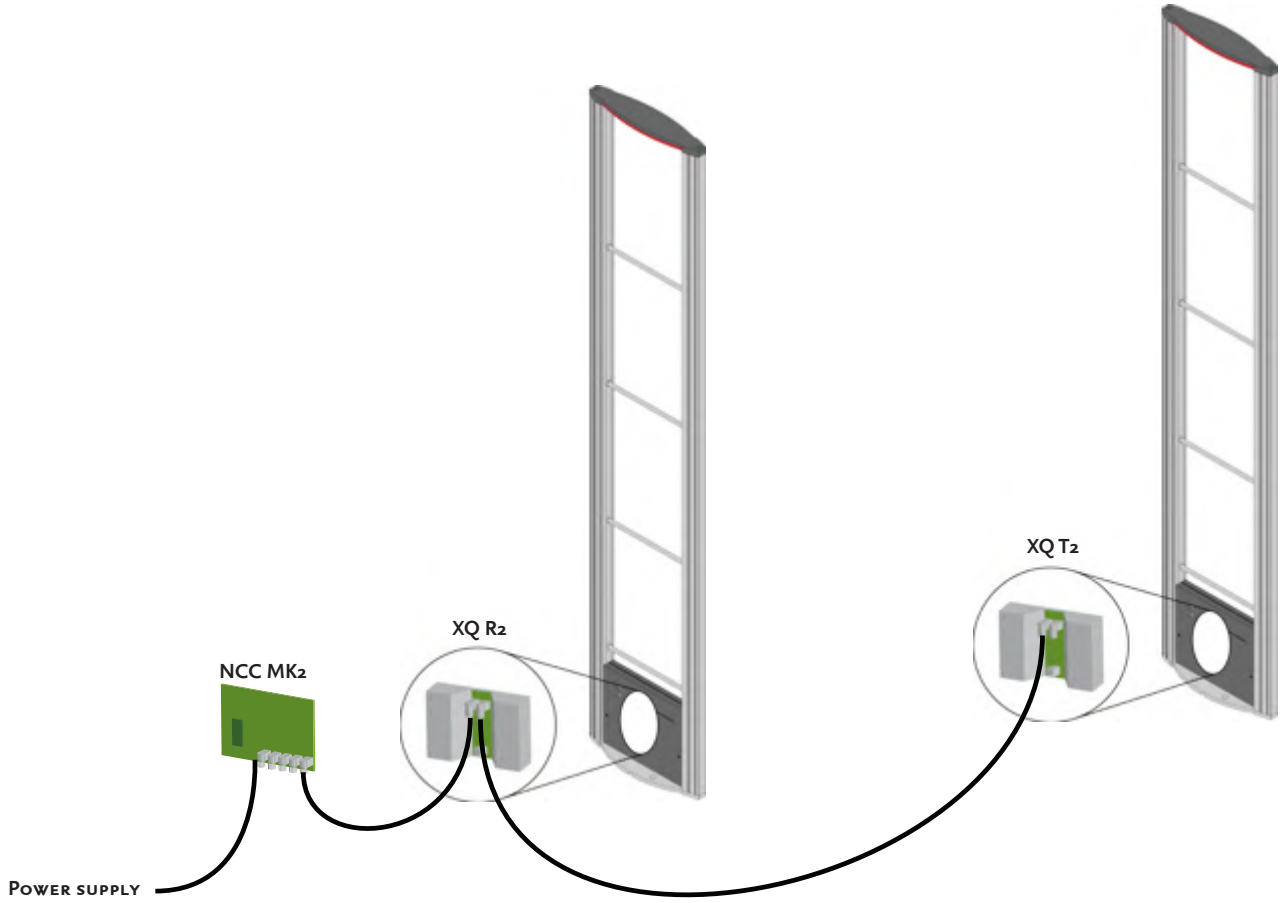
- including power supply
- synchronization of upto 16 antennas (max. 6 antennas per output)
- The NCC MK2 can deliver power for a maximum 10 antennas with XQ MK2 electronics. Iin case of >10 antennas, a power inserter is needed for the next 10 antennas with XQ MK2 electronics.

Overview of necessary NCC's and power inserters

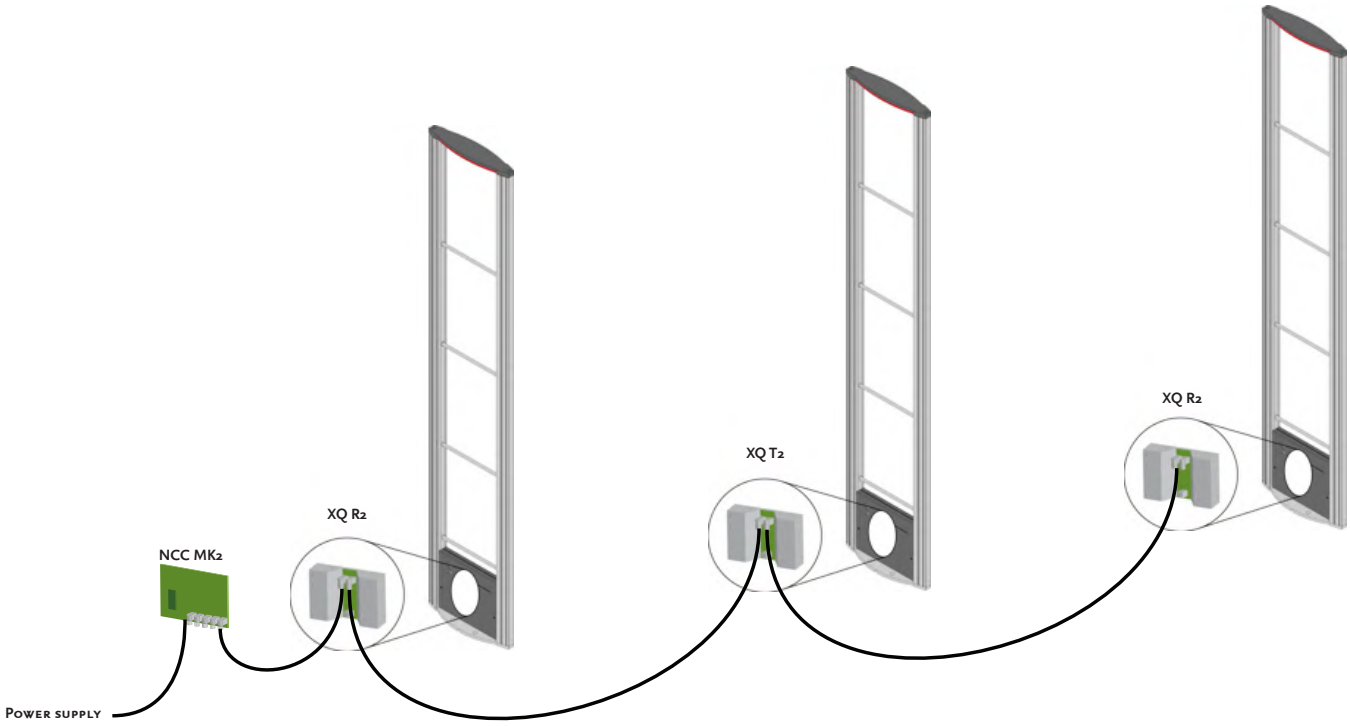
Number of antennas	Required
1 t/m 10	1 NCC
11 t/m 16	1 NCC + 1 power inserter
17 t/m 26	2 NCC + 1 power inserter
27 t/m 32	2 NCC + 2 power inserter
33 t/m 42	3 NCC + 2 power inserter
43 t/m 48	3 NCC + 3 power inserter
49 t/m 58	4 NCC + 3 power inserter
59 t/m 64	4 NCC + 4 power inserter
etc.	etc.

In case of large configurations, we advice you to contact Nedap Retail

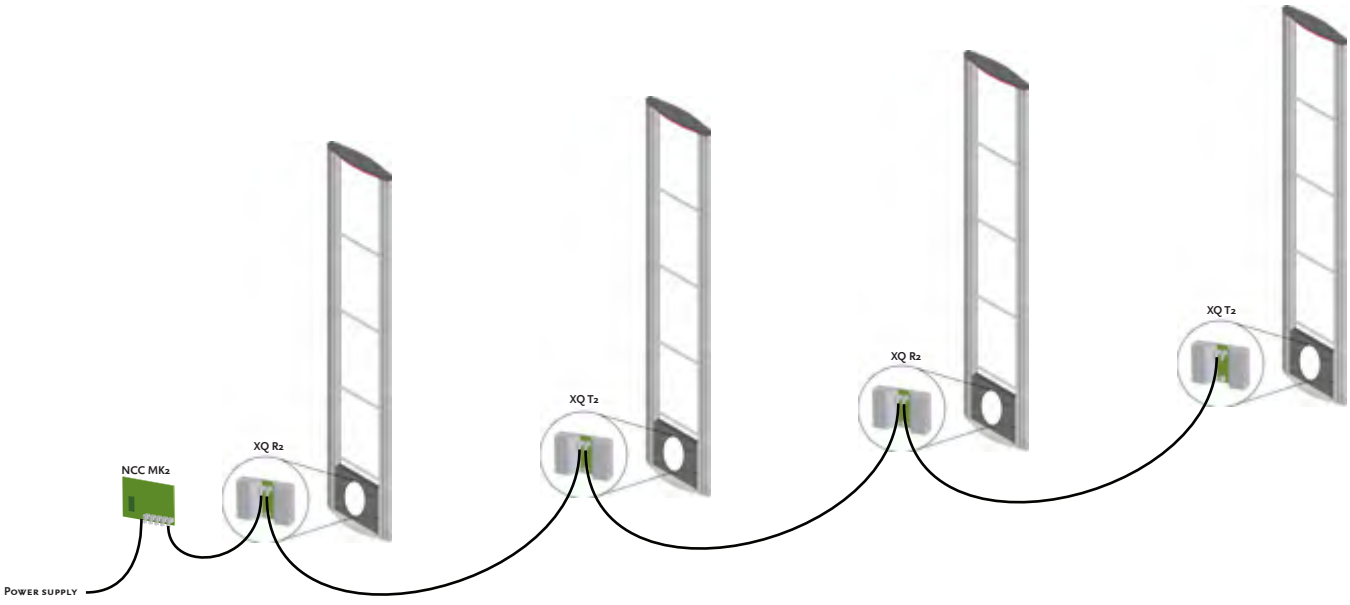
2 antennas XQ MK2 configuration



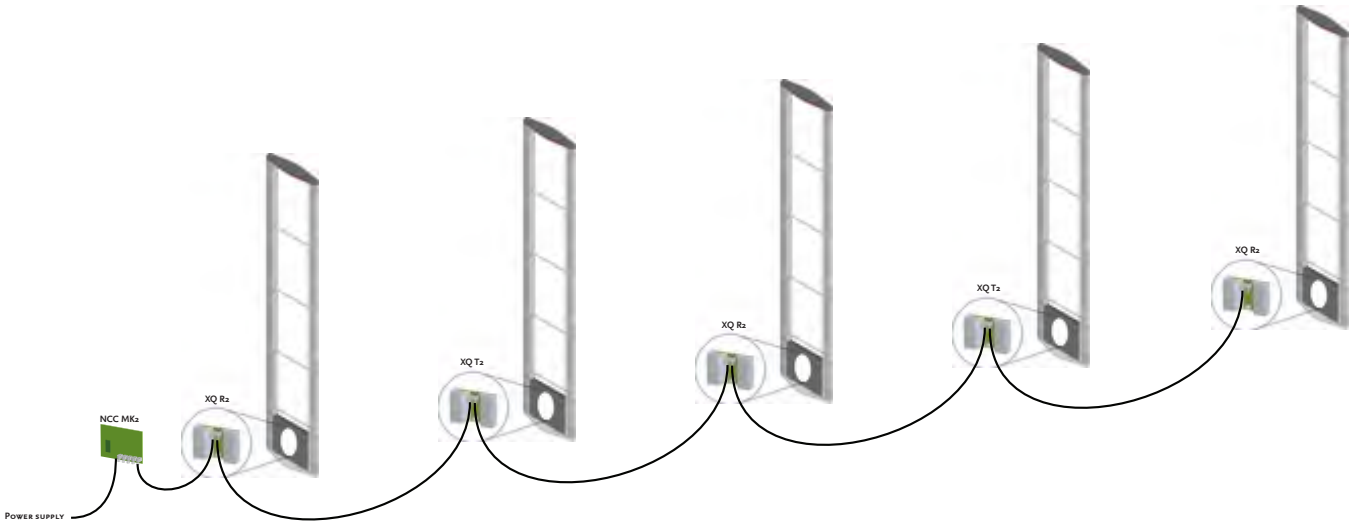
3 ANTENNAS XQ MK2 CONFIGURATION



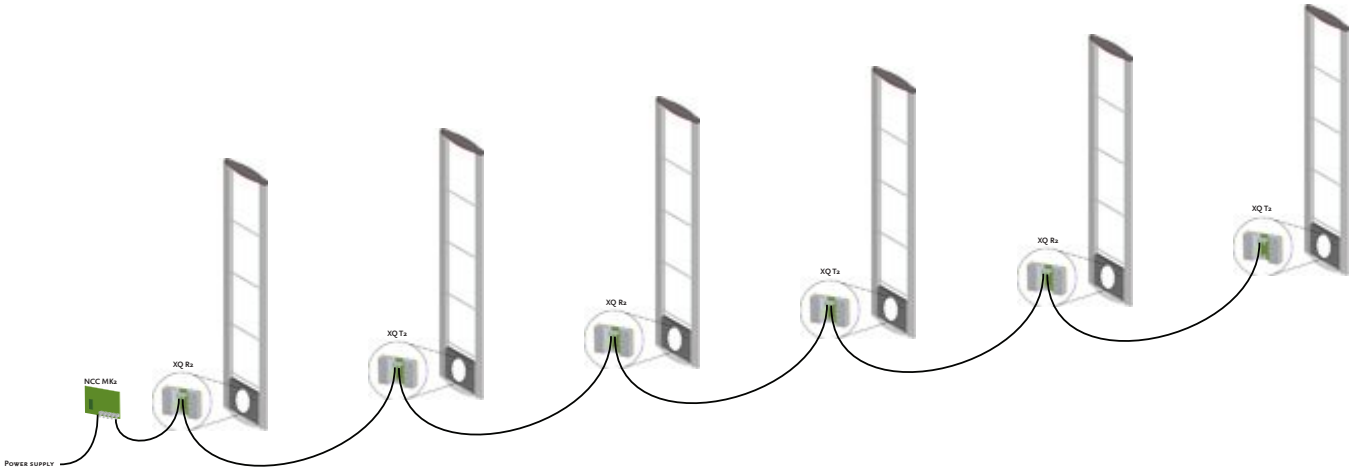
4 ANTENNAS XQ MK2 CONFIGURATION



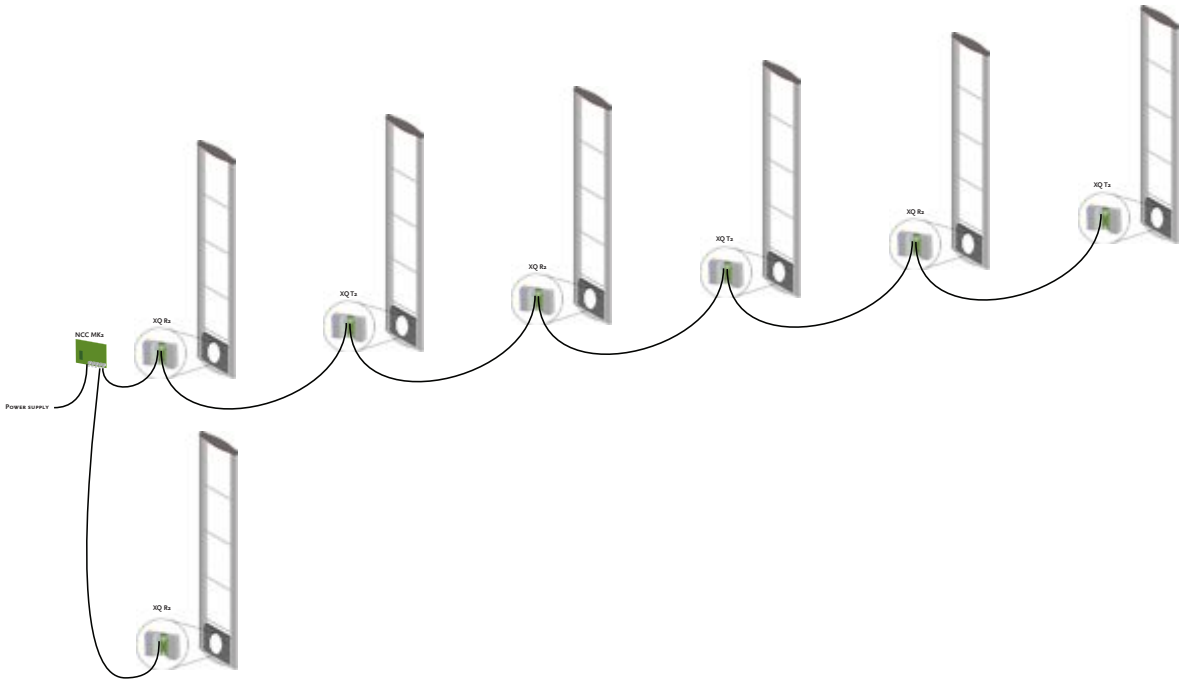
5 ANTENNAS XQ MK2 CONFIGURATION



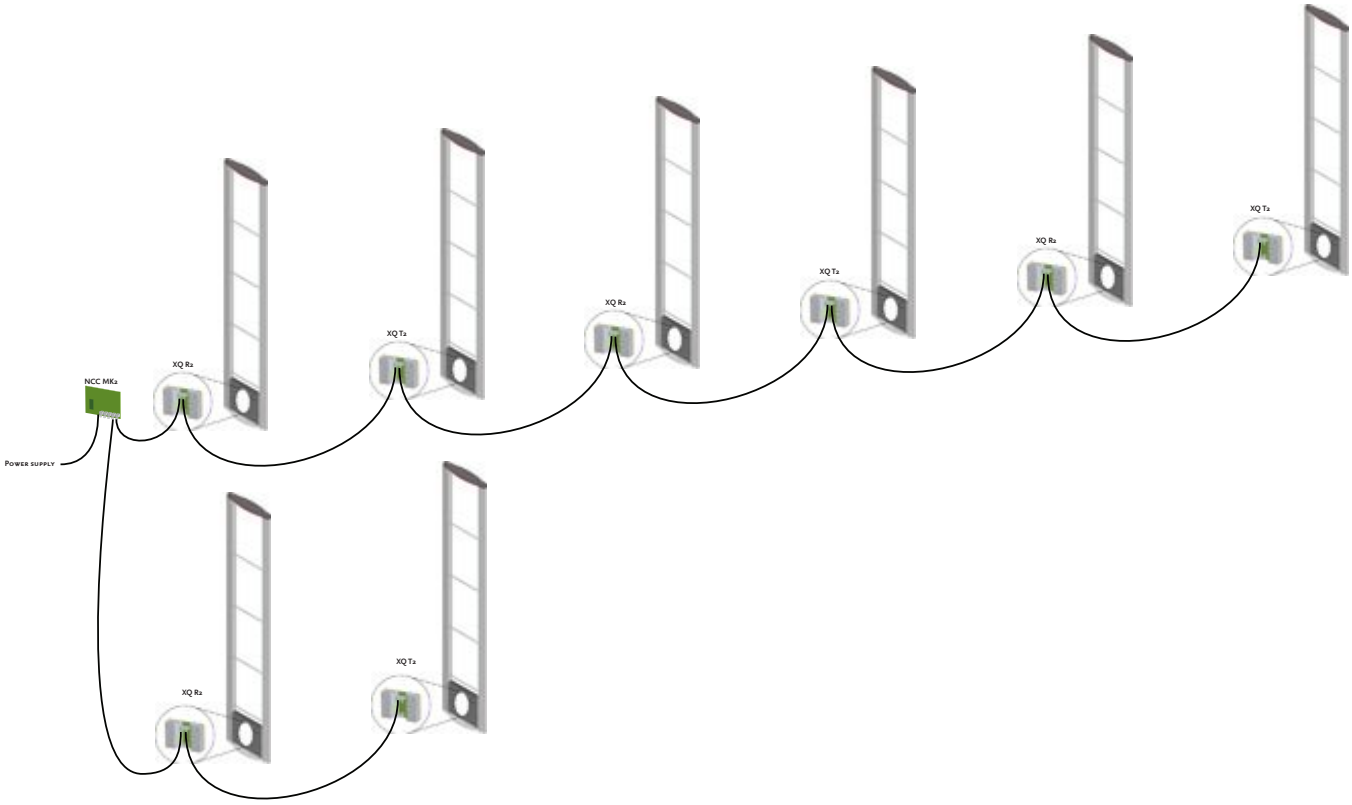
6 ANTENNAS XQ MK2 CONFIGURATION



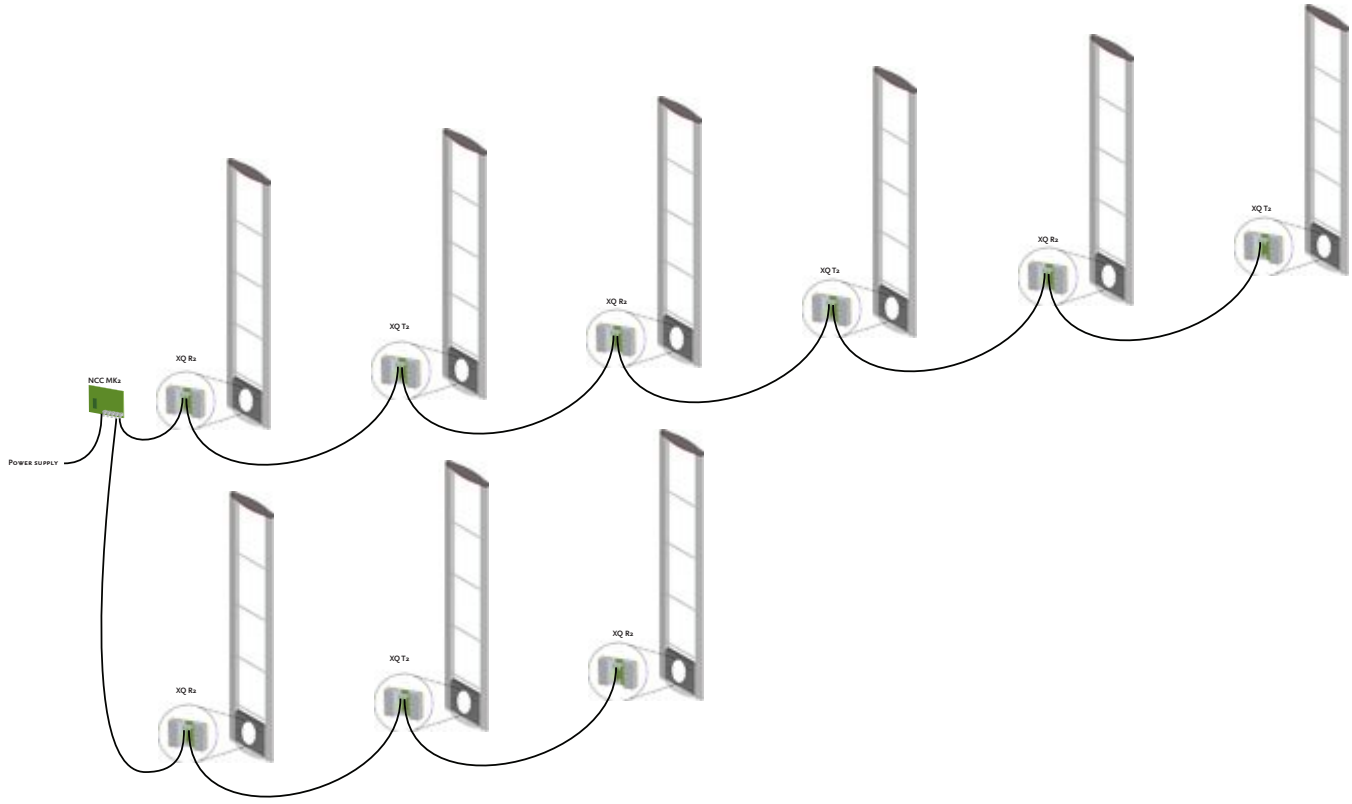
7 ANTENNAS XQ MK2 CONFIGURATION



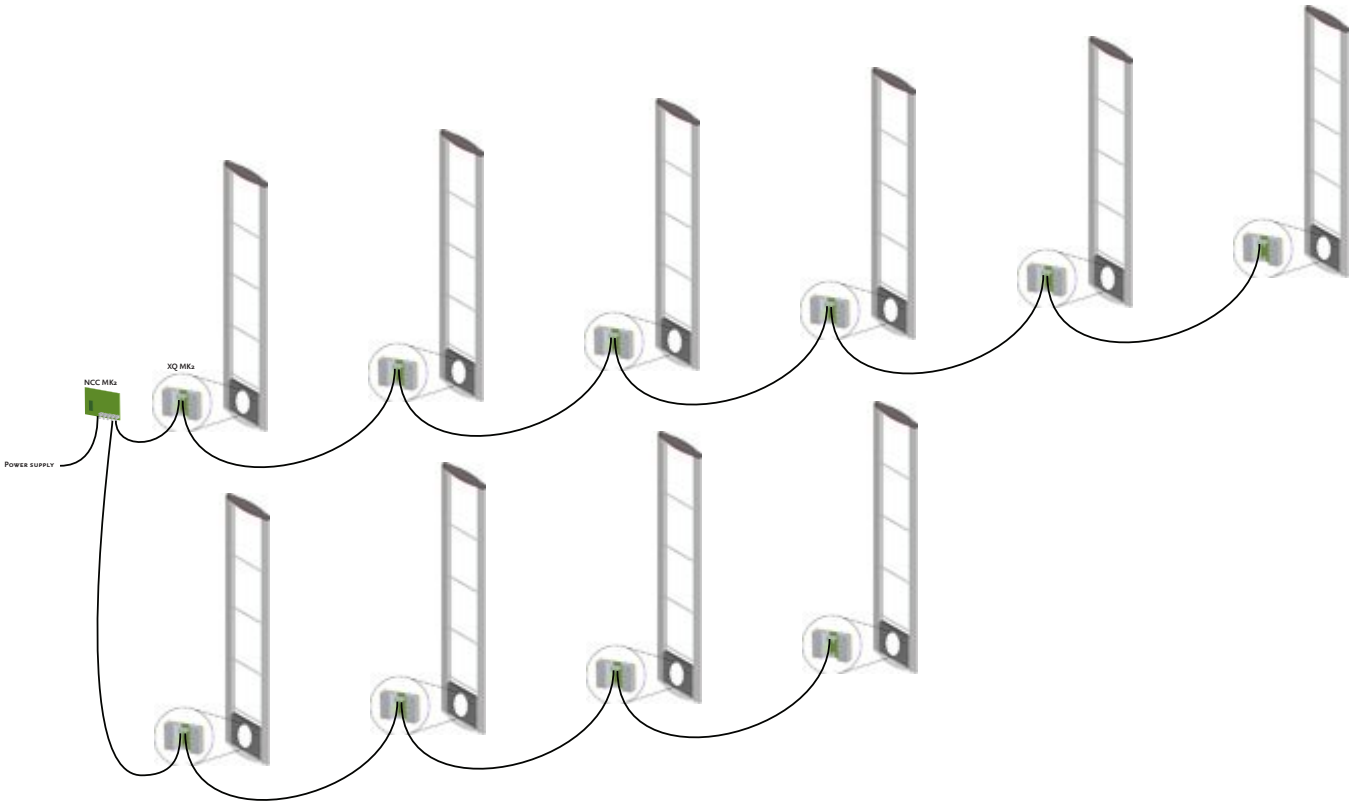
8 ANTENNAS XQ MK2 CONFIGURATION



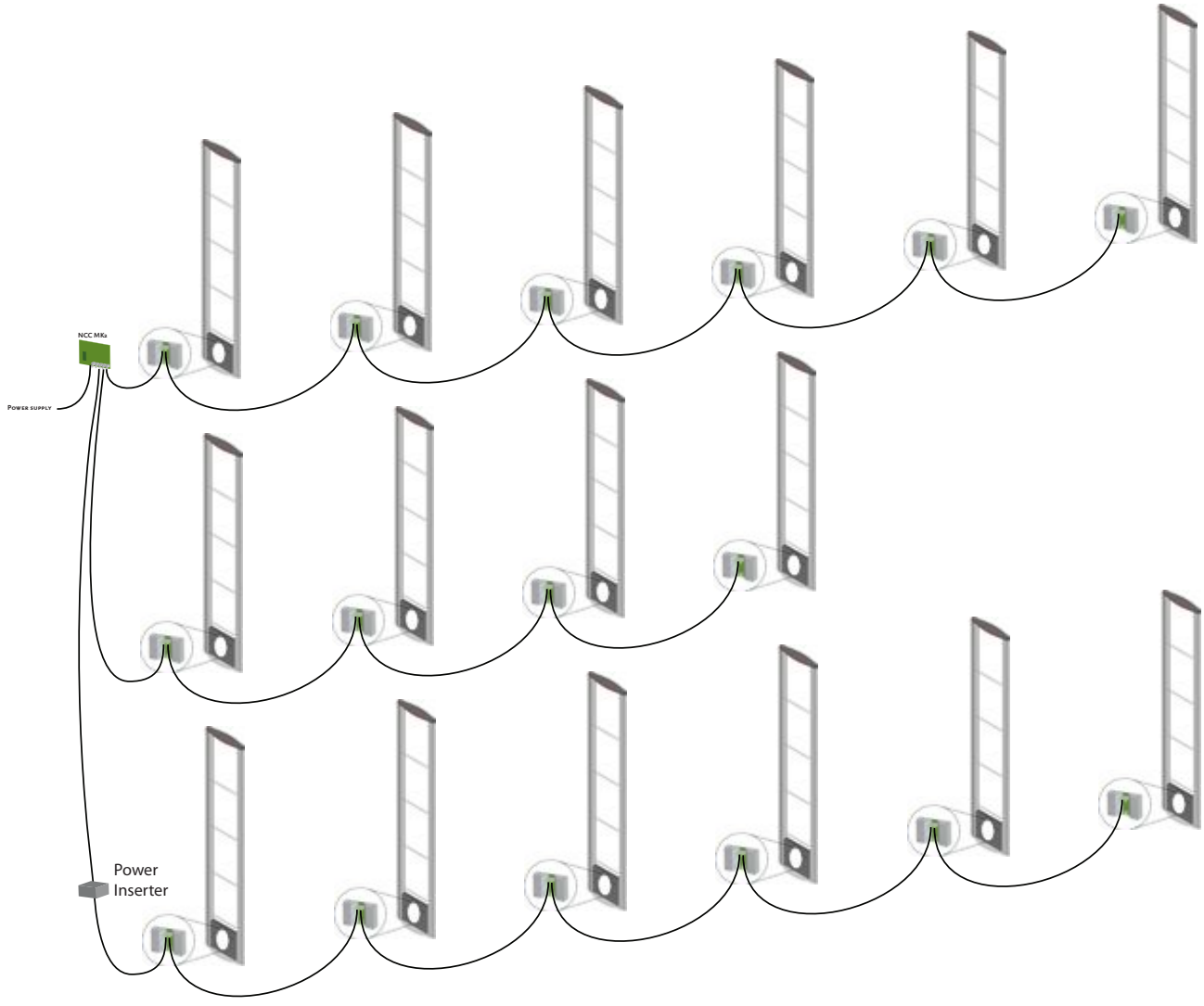
9 ANTENNAS XQ MK2 CONFIGURATION



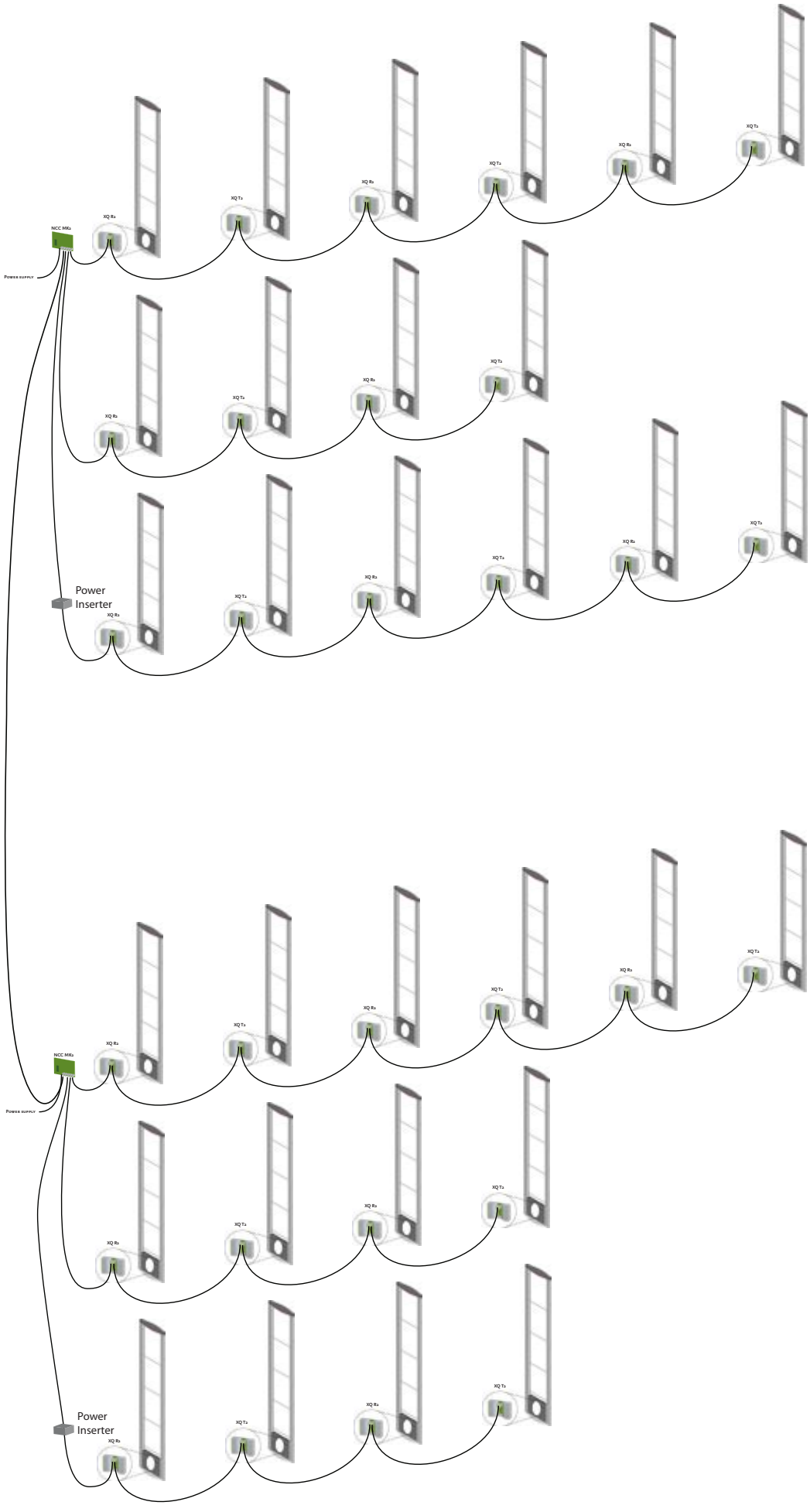
10 ANTENNAS XQ MK2 CONFIGURATION



11-16 ANTENNAS XQ MK2 CONFIGURATION



30 ANTENNAS XQ MK2 CONFIGURATION



7. Configuration Manager

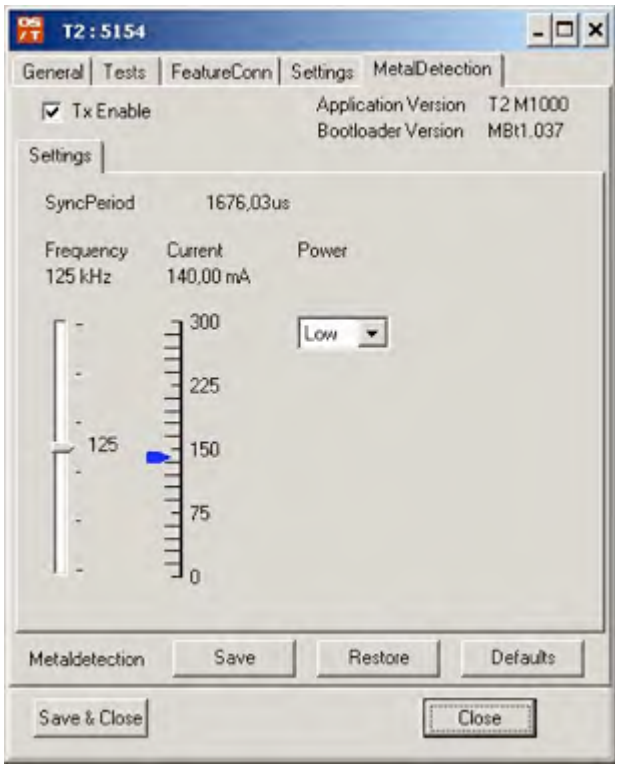
All real-time data displayed in the configuration manager, is a subset from the real data. The data communication is not showing all data, to limit the load on the data bus.

8. Metal Detection

8.1 T2 settings

8.1.1 Tx Enable

Enables or disables the metaldetection transmitter. Default is disabled.



8.1.2 Applicatien Version

Firmware version of the metaldetection. This firmware can be remotely updated.

8.1.3 Bootloader version

Firmware version of the bootloader. This firmware can only be programmed in the factory.

8.1.4 Sync Period

The measured period time of the OST sync pulse (Sweep setting 0 1 2 3).

8.1.5 Frequency

The required metal detection frequency. In the future the range will be limited from 120..130 kHz. Now the range is from 100..150kHz for testing the PLL and filters. In the field only use the range of 120..130kHz.
The Frequency is only an indication. The actually generated frequency is calculated from the measured period time of the sync pulse.

8.1.6 Current

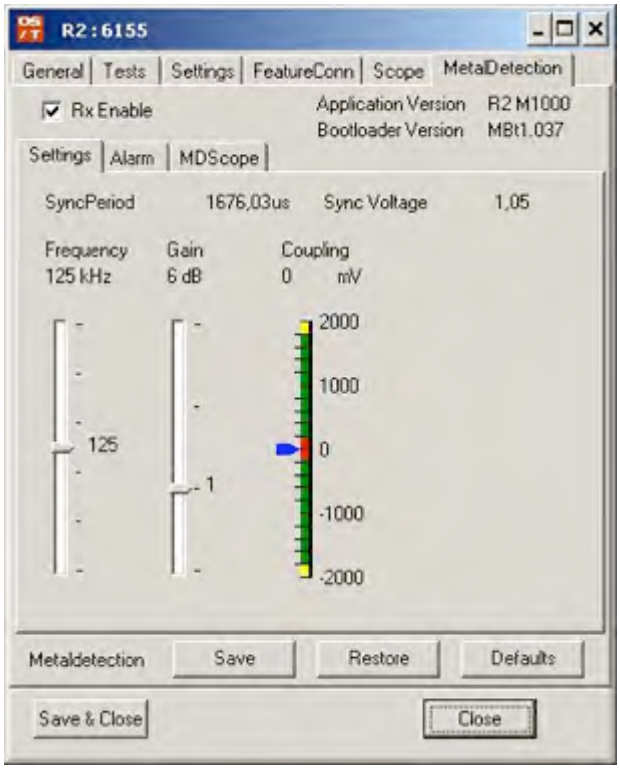
An indication of the mean current drawn by the Tx Transmitter stage. The amount of current drawn depends very much on the frequency that is set, the type of antenna in use and the tolerance in the filtering components used.
Therefore this is only a very rough indication. The current in the Tx transmitter stage is also limited by hardware.

8.1.7 Power

The output power of the transmitter output stage. Low and high power are available. Step between Low and High is 6dB. The High power setting does not give any advantage in the sense of increased metaldetection sensitivity. High Power is ony needed at extreme distances between the panels and in Panels where the Antenna PCB is in the center of the antenna like EQ45 and D50. These antenna's give half the field compared with antenna's with their PCB at the end of the eight antenna . Current coming from the center will flow equally in both loops of the eight loop.
In an antenna with antenna PCB at the end of the eight loop The High power setting could be used when there is extreme environmental noise.
When this is the case it is better to use another frequency setting.

8.1.8 Adjusting the transmitter settings

- Check the Tx Enable box to enable the transmitter
- Adjust the frequency (Default 125kHz will be ok normally)
- Adjust the Power Setting (Default Low is preferred)
- Save the metaldetection settings by pushing the Metaldetection Save button. In the future this button will be combined with the save & close button



8.2.1 RxEnable

Enables or disables the metaldetection receiver. Default is disabled.

8.2.1 Applicatien Version

Firmware version of the metaldetection. This firmware can be remotely updated.

8.2.2 Bootloader version

Firmware version of the bootloader. This firmware can only be programmed in the factory.

8.2.3 Sync Period

The measured period time of the ost sync pulse (Sweep setting 0 1 2 3).

8.2.4 Sync Voltage

This is the measured voltage at the output of the phase-correction integrator. The Phase-correction will adjust the phase error caused by phaseshift through the air (little) and phaseshift caused by the receivers input filter (much and depending on the frequecy that is set). The Voltage that is displayed is only an indication and does not always have to be the same with the same frequency setting. In a correct working system it wil be stable.

8.2.5 Frequency

The required metal detection frequency. In the future the range will be limited from 120..130 kHz. Now the range is from 100..150kHz for testing the PLL and filters. In the field only use the range of 120..130kHz.
The Frequency is only an indication. The actually generated frequency is calculated from the measured period time of the sync pulse.

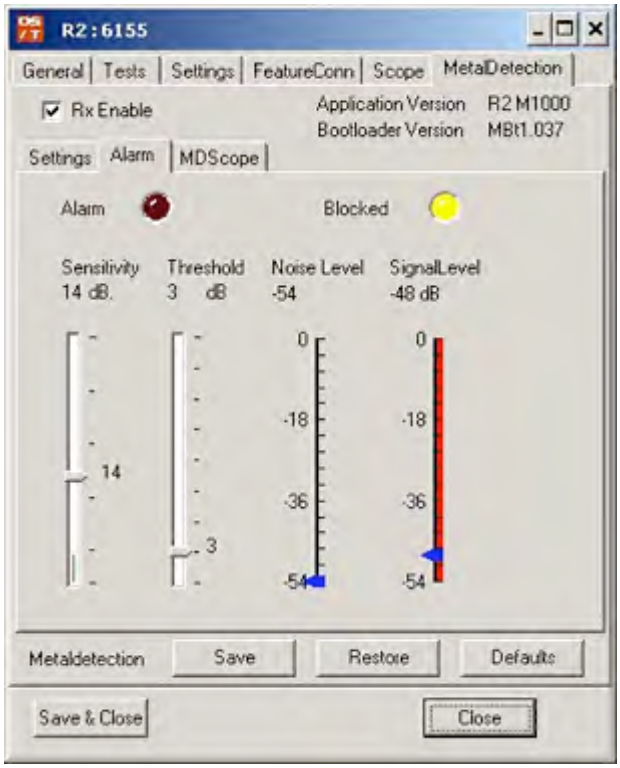
8.2.6 Gain

This is the gain of the preamplifier stage. It wil influence the direct coupling as well as the metaldetection signal equally.

8.2.7 Coupling

The measured direct coupling at the receiver Mixer (Vtop). The direct coupling has to be 200mV minimal. When the coupling is less than 200mV the Phase correction integrator does not function propery. The receiver will be blocked by the software and generate no alarms.

8.3 R2 Alarm



8.3.1 Alarm

Indicates if there is a metal detection alarm.

8.3.2 Blocked

Indicates if the reiceiver is blocked. This happens after a reboot and if the direct coupling runs below 200mV.

8.3.3 Sensitivity

The Sensitivity together with the Threshold give the Threshold for the Metaldetection alarm. The Sensitivity is related to the direct couping. Large Direct coupling gives us a large metal signal. For alarming the Metal signal has to be a Sensitivity (dB) amount of the direct coupling.
By relating to the direct couling the distance of antenna's and the power setting have no influence on the calcutated alarm threshold. (This is not totally correct yet but will be in the near future).
Good setting of the sensitivity is about 10..20dB.

8.3.4 Threshold

This setting determines by what factor the measured Noise is multiplied and the alarm threshold is raised.
Noise is caused by Rx and Tx Pll jitter and noise picked up from the environment. Noise is measured continuously and dynamically increases the Alarm threshold.
A lot of noise results in a less sensitive system.
By decreasing the Noise Threshold the system becomes more sensitive but the probability of false alarm is increased.
Good setting for the Noise threshold is 3..9dB.

8.3.5 Noise level

Indication of the measured noise.

8.3.6 Signal Level

Indication of the measured Metal signal

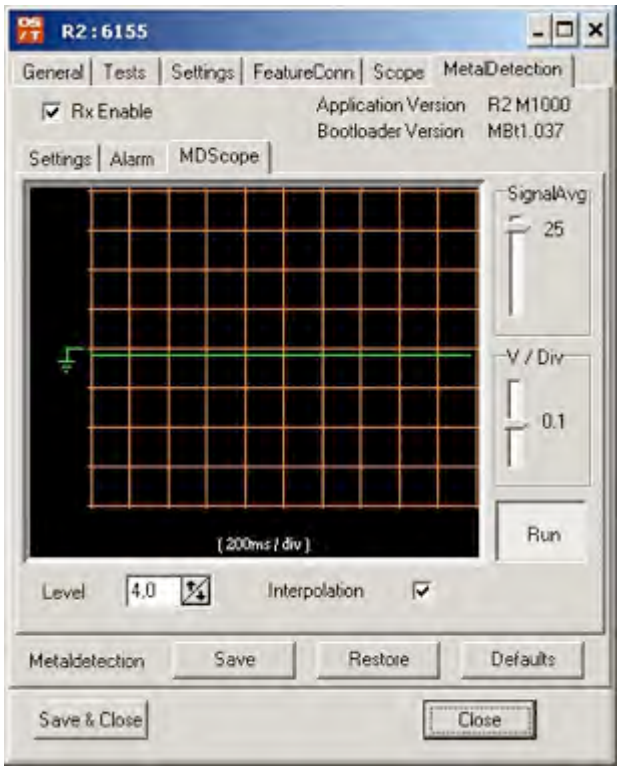
8.3.7 Adjusting receiver settings

Check Rx Enable to enable the receiver.
Adjust the frequency so that it is the same as the transmitters frequency
Adjust the Gain until the direct coupling indicator is in the green area.
Green is ok but preferably about 1000mV.
Wait until the receiver is recovered from changing the settings. When it is recovered On the

Alarm Tab you will see that the Noise level is Low (about -54dB).
Adjust the sensitivity to the required sensitivity.
Save the metaldetection settings by pushing the Metaldetection Save button.
In the future this button will be combined with the save & close button.

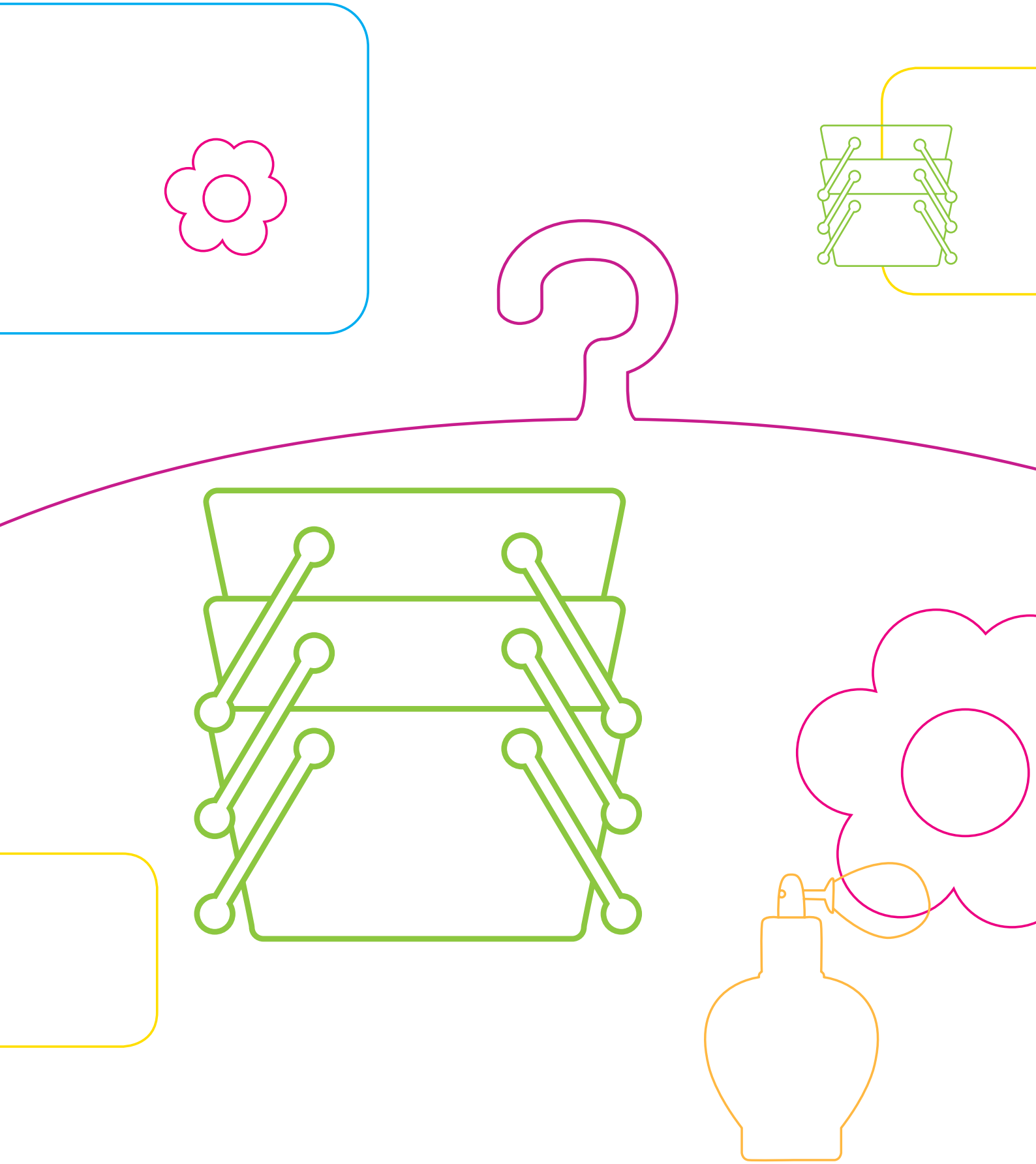
8.4 R2 Scope

This scope displays the Metal signal that is measured. It gives a good indication of what is happening in the system.



9. Specifications X2

Frequency	: 8.2 MHz
Antenna Connections	: 1x 50 Ohm BNC Transceiver connector
Synchronization	: 1x input 50 Ohm BNC
1x output 50 Ohm BNC	
Weight	: 3 kg
Temperature range	: 0°C ...+40°C
Power Supply	: 30~33V DC, 400mA



nedap
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