MIRA

Gamma Dose Rate Monitoring System

User Manual

ENVINET

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1_1_4rev0	B. Stocker/ Dr. S. Reinhardt / Prof. H. Kristl	All	Update, Battery monitor, accuracy test
1_3_1rev0	Dr. S. Reinhardt	All	Update, MIRA App
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1_5rev2	Dr. Wolfgang Rieck	9.2	Transport Case with Charging Function
1_5rev3	Dr. H. Breitkreutz	5.3	More details on GDR calculation
1_5rev4	Dr. H. Breitkreutz	10.5	Sound sequences of MIRA
1_5rev5	Dr. Philipp Lösel	10.3.2.2	Updated examples for usage of config command
1_6rev6	Dr. H. Breitkreutz	10.5	Beautified table with sound signals

1 Introduction

MIRA is a highly versatile and very flexible gamma dose rate monitoring system. Due to its modular design, it can be configured and used in different ways and thus covers many applications. It facilitates both a gamma detector and a gamma monitoring station. MIRA is designed for either fixed or temporary installation or mobile applications. A particular feature is its autonomous operation capability due to highly reduced power consumption.

The content of this manual is

Product Identification shows for which products this manual is valid and the address of the manufacture for support is given.

Definitions define the nomenclature and general definitions used out in this document.

Product Description contains the description and specifications for the products.

Functional Description contains the description how the system works and calculates the values.

Installation and Configuration explains how the product must be stored and transported. It describes also the initial installation and configuration of the gamma detector.

MIRA APP and Integrated Accuracy Test and integrated accuracy test describes the app provided with the test set for the accuracy test needed for quality assurance.

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2 Product Identification and Contact

2.1 Product names and types

This manual covers products of the MIRA system. In the covered products are summarized.

Table 2-1 Overview the MIRA products covered by this manual

MIRA product name	**Description**
MIRA	All types

2.2 Firmware and manual version

The manual describes the configuration and operation of the product using the firmware version **1.5.x**

The version of the manual is 1_5rev6 released on Monday, September 28, 2020

2.3 Name and Address of the manufacture

In Table 2-2 the contact information of the manufacture are given if needed.

Table 2-2 Contact information

ENVINET GmbH	Tel.: +49 (89) 456657-0
Hans-Pinsel-Strasse 4	Fax: +49 (89) 45 66 54-820
85540 Haar (Munich)	E-Mail: info@envinet.com
Germany	www.envinet.com

3 Definitions

In this chapter terms and definitions are explained that are used in this document.

Definition	Short cut	Description
Ambient Dose Equivalent	H*(10)	The ambient dose equivalent, H*(d), at a point in a radiation field, is the dose equivalent that would be produced by the corresponding expanded and aligned field in the ICRU* sphere at a depth, d, on the radius opposing the direction of the aligned field. Unit: J/kg=Sv *International Commission on Radiation Units and measurements
Ambient Dose Equivalent Rate	h*(10)	The ambient dose equivalent rate h*(10) is the quotient of dH by dt, where dH is the increment of dose equivalent in the time interval dt. Unit: J/kg/s=Sv/s
Sievert	Sv	The Sievert is the International System of Units (SI) derived unit of equivalent radiation dose, effective dose, and committed dose. Quantities that are measured in Sieverts are designed to represent the stochastic biological effects of ionizing radiation.
Geiger-Mueller Detector	GM-detector	A Geiger–Mueller detector, also called a Geiger counter, is a type of particle detector that measures ionizing radiation. It detects the emission of nuclear radiation: alpha particles, beta particles or gamma rays by the ionization produced in a low-pressure gas.
Coordinated Universal Time	UTC	Coordinated Universal Time is the primary time standard by which the world regulates clocks and time. It is one of several closely related successors to Greenwich Mean Time (GMT).
Network Time Protocol	NTP	Network Time Protocol (NTP) is a networking protocol for clock synchronization between computer systems over packet-switched, variable-latency data network.
Central Radio Communication Unit	CRU	Is a separate device which is needed for radio communication.

4 Product Description

4.1 General description

MIRA is a highly versatile and very flexible gamma dose rate monitoring system. Due to its modular design it can be configured and used in different ways and thus covers many applications. It facilitates both a gamma detector and a gamma monitoring station. MIRA can be used either for fixed or temporary installation or mobile applications. A particular feature is its autonomous operation capability due to highly reduced power consumption. Thus, it can be operated for many weeks with its integrated battery or for unlimited operation time with the integrated solar panel. Utilizing the wireless data transmission technologies, MIRA can also be used as an autonomous monitoring station. In this case, data communication between MIRA and the Monitoring Centre (NMC) uses either the LTE service of cellular networks, a radio communication link or the combination of both (cellular networks plus radio) where redundant or highly reliable communication is required.

MIRA can be powered by 5 V DC, supplied for instance from a standard cell phone power unit, or it can be operated autonomously with its integrated battery or solar power system. For stationary application, MIRA can be easily fixed on a pole or a wall. In combination with a tripod, MIRA works as a mobile monitoring station and can be quickly deployed in case of an emergency situation. For this use, MIRA is available with an integrated GPS receiver that enables the automatic recognition of a new location after deployment.

The manifold data communication capabilities permit numerous operation possibilities and uses. ETHERNET is the standard interface that can be used for configuration, periodic test and data readout. MIRA comes with a wireless Bluetooth for service. For wireless remote data access, a version with integrated LTE and/or radio modems is available. Further interface options are RS232, RS485, Bluetooth and USB (only power). The Bluetooth interface is also used for communication with the MIRA App used for the accuracy test.

Another option is the maintenance-free rain sensor integrated on top of the detector housing. It supports differentiation of artificial from natural wash-out effects.

Two Geiger–Mueller (GM) detectors provide a wide detection range from natural background up to > 10 Sv/h. The high volume low dose rate detector (LD) enables detection of minor changes in the radiation at background levels within short detection cycles. The second detector (HD) is used for measurement of higher dose rates (>100 µSv/h [>10 mrem/h]). The hermetically sealed detector housing protects the electronics and detectors from external conditions.

Figure 4-1 The MIRA mobile version

4.2 System description gamma detector

The MIRA is a system measuring ambient radiation with sophisticated elements for detecting variations of the ambient gamma dose rate. The following block diagram shows the major electronic components of the intelligent probe MIRA. This diagram is referred to in the description of the implemented functions.

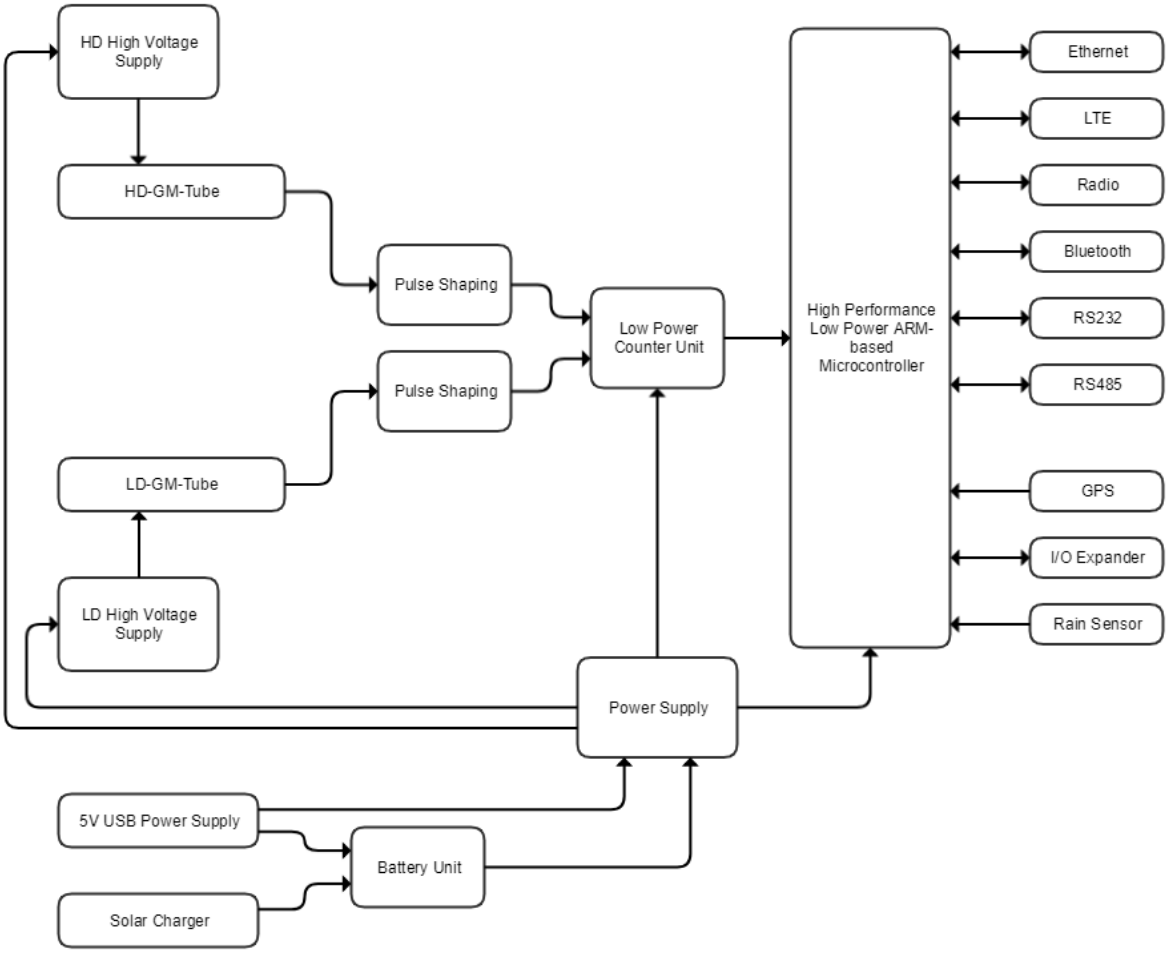

Figure 4-2: MIRA block diagram

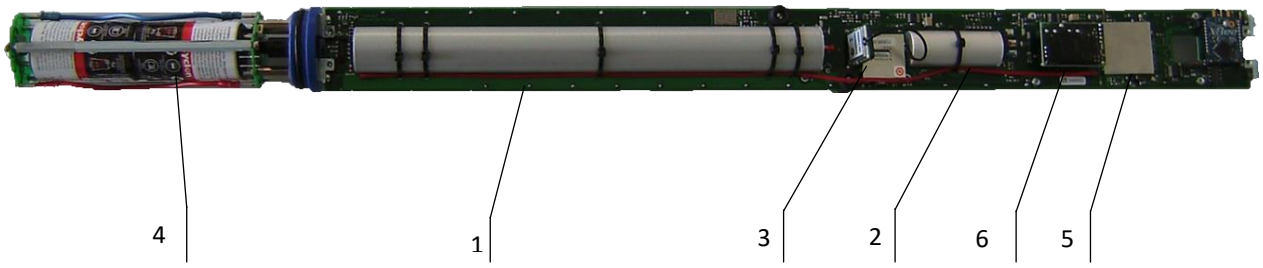

Figure 4-3: MIRA inside

The radiological sensors are two Geiger Mueller Counter Tubes with one tube of large volume detector for low dose rate (1) and a second smaller tube for the detection of higher dose rate (2).

Additional a rain detector may be applied in order to distinguish alterations of the dose rate caused by natural events from artificial sources.

For mobile applications, a GPS (global positioning system) (3) for position determination is available as option.

For independent operation an optional solar panel with backup battery (4) is placed at the top of the detector. Due to the smart design of the detector only a small solar panel (not shown in the picture above) must be used to ensure reliable operation in most regions of the world.

For communication, several interfaces are possible. For wire based communication Ethernet is the standard solution and for wireless communication LTE (5) and/or radio (6) is possible.

Functions

Data acquisition on real time

Count rate detection at three user configurable time intervals*

Temperature detection at two user configurable time intervals*

Ambient Dose Equivalent Rate H*(10) at three user configurable time intervals*

Intrinsic background correction

Temperature compensation of intrinsic background

Temperature compensation of LD/HD characteristic

Local background correction

Automatic switch-over between LD and HD

Overload detection of HD detector

Alarm management with two thresholds

Notification on threshold exceeding or status change (spontaneous call)

Storage of all measured values for an unlimited time (>10 years)

Battery state of charge detection at two user configurable time intervals*

Status supervision of detectors, battery and electronic

Secured VPN data transmission with external router (option)

* must be a multiply of the time base interval. Shortest time base interval 1 minute

Features

Unlimited autonomous operation

Lightweight and extremely mobile

Easy to install or to deploy

Rugged design (IP68 / IP65)

Operation under harsh environmental conditions

Wireless data communication (LTE and/or radio)

Redundant data communication

Integrated accuracy test

Power supply or battery charging with standard cellphone power supply unit or by USB

Unlimited and nonvolatile storage of all readings

Wireless service interface Bluetooth

ETHERNET interface is always included

5 Functional Description

5.1 Status Information

The MIRA has several different types of status. Which status is used in which context is described in chapter 5.2, The Concept of the Ensembles. A detailed listing of status bits and their meaning can be found in the appendix (see chapter 10.1 Status bits, page 55).

The Status are used in three different contexts:

- Actual status: information on the state of the system
- Registered status: historical information on all status bits that changed from 0 to 1 since the last data call
- Spontaneous call mask: parameter for communication. Determines which status bits in the registered status trigger a spontaneous call

5.1.1 Registered Status

While status bits in the actual status switch between 0 and 1 depending on the state of the system, status bits in the registered status only switch from 0 to 1. When the registered status is read out in a data call, all bits are reset to 0. This allows quick identification of active status bits since the last time the probe connected.

Name	**Registered status available?**
System Status	Yes
Measurement Evaluation Status	Yes
Battery System	Yes
Measurement Status	No
GPS Status	No

5.1.2 Spontaneous Call Mask

Spontaneous call mechanism is based on the registered status. Thus, only status bits having a registered status can only be configured as trigger for spontaneous calls. This call is carried out in the same minute the registered status bit becomes 1. During any data call the registered status is reset. As a result, the next spontaneous call can only be triggered once the status bit is released. This mechanism prevents a “permanent spontaneous call” mode.

Figure 5-1 gives an example on how actual status, registered status and the spontaneous call mask interact.

Status Type	Status bit threshold exceeded				
Actual status	0	1	1	0	0
Registered status	0	1	0	0	0

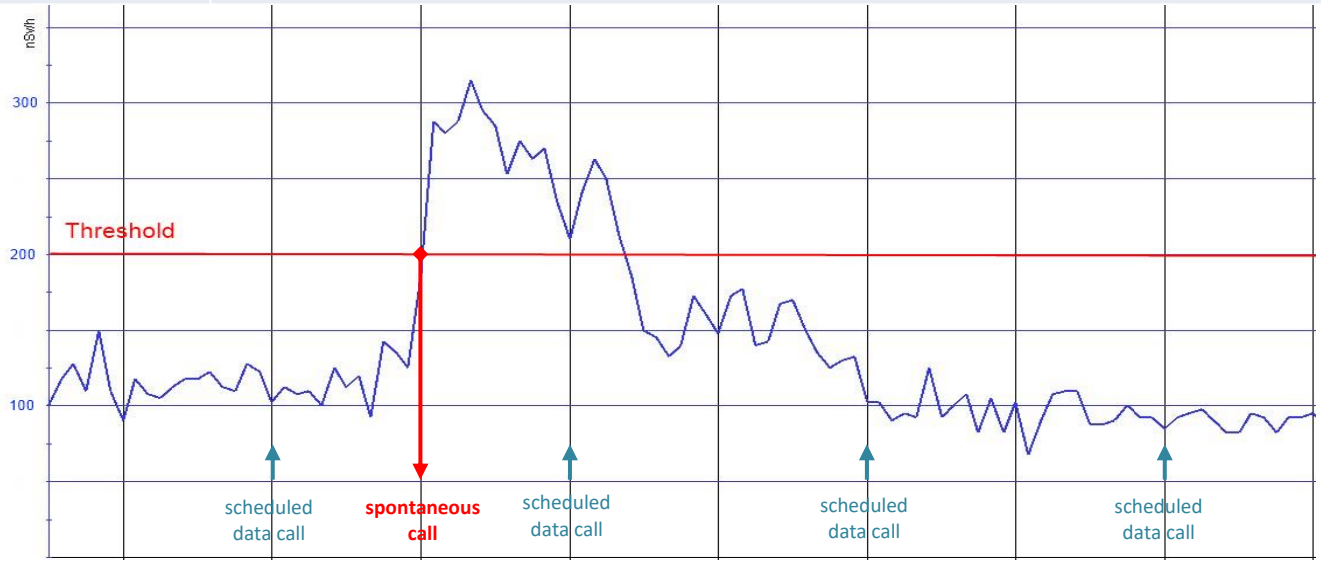

Figure 5-1: Example: registered status and spontaneous calls

5.2 The Concept of the Ensembles

5.2.1 Ensembles and Time Intervals

An ensemble is a structure to describe measure events. It contains calculated values and the measured values used in the calculation. The MIRA knows several different ensembles in different aggregation intervals.

- *Base Interval*

  The base interval is the shortest of the time intervals. All measured values used in the calculation of the GDR are generated on this interval. The time interval is configurable.

- Aggregation Intervals (Interval 0-2)

  The MIRA knows three time intervals (interval 0-2) has to be an integer multiple of the base interval with $1 \leq n_0 < n_1 < n_2$. The aggregated values are evaluated at the real-time-boundary.

- *Custom Intervals*

  Length and offset of the time interval can be any integer multiple of the base interval. Minimum size of the interval is the base interval.

5.2.2 List of Ensembles

The MIRA knows the following ensembles:

ensemble	time interval	
	name	default length
System Status	base interval	10 s
GDR Evaluation Status	base interval	10 s
GDR 0	interval 0	1 min
GDR 1	interval 1	10 min
GDR 2	interval 2	1 h
Battery	interval 1	10 min
GPS	custom	1 d

5.2.3 Considerations of the Contents of the Ensembles

All ensembles start with the same two values: a time stamp (seconds since 1.1.2000, 32-bit) and a status (see 10.1 Status bits, 32-bit). Where the time stamp is the time when the ensemble entry was created. The data values listed in the entry are related to the time interval before.

The following data values are dependent of type of the ensemble.

5.2.3.1 Data Values in Ensemble

5.2.3.1.1 System and GDR Evaluation Status

Field	Description
Time stamp	time in seconds since 01.01.2000 00:00
Status	System / GDR Evaluation status

5.2.3.1.2 GDR 0, GDR 1 and GDR 2

Field	Description
Time stamp	time in seconds since 01.01.2000 00:00
Status	Measurement Value status
GDR	Gamma dose rate in µSv/h
HD count rate	Count rate in the HD-Channel in cpm
LD count rate	Count rate in the LD-Channel in cpm
Temperature	Temperature in °C

5.2.3.1.3 Battery

Field	Description

Time stamp	time in seconds since 01.01.2000 00:00
Status	Battery Status
Capacity	Charging level of battery in %
Charge	Charging level of battery in mAh
Voltage	Battery voltage in V

5.2.3.1.4GPS

Field	**Description**
Time stamp	time in seconds since 01.01.2000 00:00
Status	GPS Status
Latitude	Latitude of GPS-coordinate in °
Longitude	Longitude of GPS-coordinate in °
Horizontal DOP	Horizontal dilution of position

5.3 Calculation of Gamma Dose Rate

The MIRA-system is equipped with two Geiger-Mueller-Tubes (GMT), one for high dose measurement (HD) and a second for low dose measurement (LD).

Below, the basic calculation procedure for the dose rate is explained. For a more detailed description of the functionality, please refer to the Technical Reference.

5.3.1 Dose Rate Acquisition

The total number of pulses from the GMT(s) and the temperature are acquired at the real time border of the base interval.

$$\dot{D} = \dot{D}_0 - \dot{D}_{\text{self-effect}} - \dot{D}_{\text{loc}}$$

$\dot{D}_0$: Doserate, calculated from the dead-time corrected count rate.

$$\dot{D}_0 = \frac{n}{e} \cdot \frac{1}{1 - n \cdot \tau}$$

where

n	count rate observed during base interval [cpm]
e	sensitivity [cpm / µSv/h]
τ	dead time constant [1 / cpm]

$\dot{D}_{\text{self-effect}}$: The temperature-dependent self-effect compensation is performed using

$$\dot{D}_{\text{self-effect}} = \dot{D}_{\text{null}} + \frac{1}{e} \cdot \left(p_1 + \frac{1 + p_2 \cdot (T + p_3)^2}{1 + p_4 T} \right)$$

where

e	sensitivity [cpm / µSv/h]
$p_1 \ldots p_4$	parameters (determined individually for each probe during climate test) [a.u.]
T	Temperature [°C]
$\dot{D}_{\text{null}}$	Null effect

The formular is valid between -25°C and 65°C.

Below -25°C, the value for T=-25°C is used.

Above 65°C, the value for T=65°C is used.

The temperature correction is generally limited to 10 nSv/h (excluding the contribution of $\dot{D}_{\text{null}}$).

$\dot{D}_{\text{loc}}$: User-defined location correction (default: 0)

The count rate n is defined as $n = N/t_r$, where N is the number of recorded counts and t_r the real time of the base interval.

The source of the number of counts is either the LD or the HD detector, depending on the measurement regime. The limits for the regimes are set in the configuration and ensure that a sufficient overlap with smooth transitions is present. The parameters e, τ and $p_1 \ldots p_4$ have been determined for each channel separately.

5.3.2 Dose Rate Aggregation

The calculation of mean dose rate $\overline{\dot{D}}$ is based on the arithmetic average for the p available individual values $\dot{D}_i$, weighted with the according measurement real time $t_{r,i}$:

$$\overline{\dot{D}} = \frac{\sum_{i=1}^{p} t_{r,i} \dot{D}_i}{\sum_{i=1}^{p} t_{r,i}}$$

The calculation takes place at the real time boundary of the aggregation interval (e.g. full 1 minute for interval 0, full 10 minutes for interval 1), regardless of the number of values gathered until then.

For example, for values of an aggregation interval that is 1 minute with the base interval of 10 sec:

p	= 6	Number of base interval values to be used
x_i	= $D_{10sec,i}$	Dose rate of the i-th base interval measured value
y	= D_{1min}	Dose rate of the 1 min mean value

If $\sum_{i=1}^{p} t_{r,i}$ is smaller than a given limit, the measurement will be considered as invalid. The default value for this limit is 80% of the nominal aggregation time.

Similar mean values are calculated for the count rates of LD and HD, as well as the temperature.

5.3.3 Alarming

Thresholds for the GDR can be set, above which a spontaneous call is triggered. Please refer to chapters 5.1.2, 5.2.3.1.1, 5.2.3.1.2 and 10.1.2 for more information.

5.4 Energy management

The MIRA can be equipped with an integrated battery which can be charged externally via power supply or by the optional integrated solar panel.

5.4.1 Charging time

Using a USB power supply to charge the battery the charging time is approximately 6 hours (the charging current is limited to 400 mA by the MIRA hardware).

Using the optional integrated solar panel, the maximum charging current is 60 mA. Compared to the battery capacity of 2500 mAh this requires a charging time of at least 42 hours under good conditions. In reality this requires several days of good weather conditions. If the battery is discharged by a long-term bad weather condition or high power consumption due to frequently communication it can take some days of charging to bring the battery back into the normal status after it was discharged.

6 Installation and Configuration

6.1 Unpacking

After delivery of the ordered product you inspect the packaging for damaging. You open carefully the package in such a way that it could use in future for transportation or shipment. Compare the delivered parts with the delivery note and your order. If something is wrong contact your distributor

6.2 Installation location

The parts of the MIRA system must be installed on solid flat ground that is sufficient for the operation time and weight of the MIRA system (see datasheet).

The recommend installation orientation of the detector is vertical with the electric connectors on the bottom. If you use the rain detector, this is the only valid installation orientation, because the rain sensor is on the top of the gamma detector.

If the MIRA system is equipped with LTE, GPS, Solar and/or rain detector, you must take care that walls, trees, neighbored buildings and so on to obtain the full performance, do not obstruct the part.

6.3 Mechanical installation

Do not obstruct the connectors and the detector housing with your mount (s. Figure 10-1). A mount for the detector is available as accessory.

6.4 Electric installation

Depending on the configuration the MIRA has up to four electrical connectors (Figure 6-1).

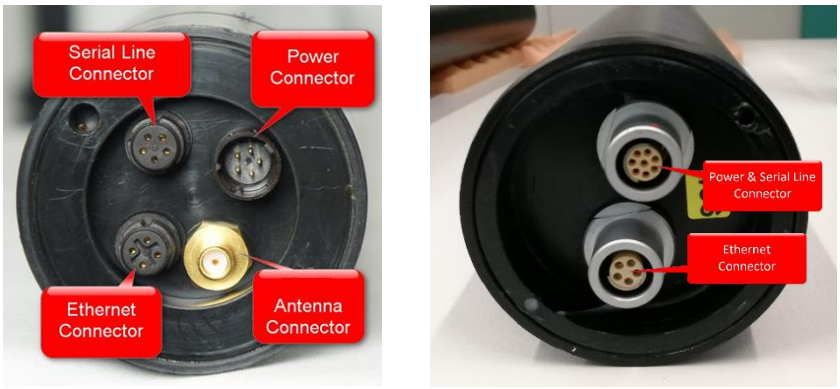

Figure 6-1 Overview of the MIRA connectors

The electrical connectors are

4-connector configuration	**2-connector configuration**
Power connector (5-pin male)	Power & Serial Line connector (8-pin female)
Serial line connector RS-232 (5-pin female)	Ethernet connector (5-pin female)
Ethernet connector (4-pin female)	
Radio antenna connector	

Connect the delivered cables with the corresponding connectors. First make sure that the transformer is not plugged into a power socket if you connect the power cable. Please consider the little white stripes (4 connectors) / red dots (2 connectors) on the plug and the connector. These stripes/dots must be aligned to ensure proper fitting.

Figure 6-2 Power line connector

The Ethernet interface is a four pin male connector. Please consider the little white stripes on the plug and the connector. These stripes must be aligned to ensure proper fitting.

Figure 6-3 Ethernet connector

In the 4-connector configuration, the serial interface is a five pin male connector. With two connectors, the serial interface. Please consider the little white stripes on the plug and the connector. These stripes must be aligned to ensure proper fitting.

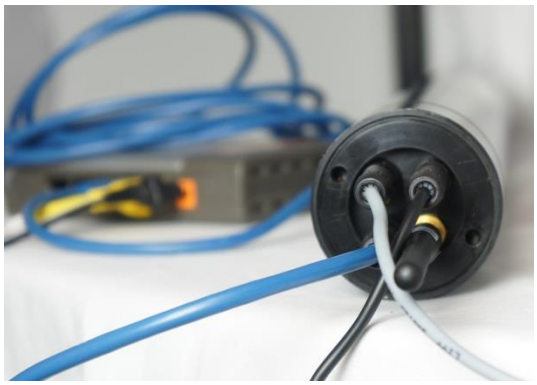

Figure 6-4 Serial line connector

If you connect the RADIO antenna put the antenna straight onto the plug to avoid thread distortion.

Figure 6-5 Connection of the RADIO antenna

6.5 Network installation gamma detector

6.5.1 First connection and test

To connect the MIRA over the serial RS-232 port the port must be configured as given in Table 6-1. Open a serial connection using an appropriate application (i.e. PuTTY).

Table 6-1 Serial RS-232 port configuration

Speed	38 400 baud
Data bits	8
Parity	None
Stop bits	1
Flow control	None

6.5.2 Start

To start the probe, plug in the power transformer into the power socket. Use the magnet (s. Figure 6-6) to active the MIRA by putting the magnet on the marked position of the magnetic switch (s.

Figure 6-7). It is always good to move the magnet above the sign to activate the magnetic switch for sure. Afterwards, the device will boot. For a restart move two times the magnet over the on/restart symbol. A second magnetic switch on the other side of the housing activates the service interface.

Figure 6-6 Magnet to activate magnetic switches

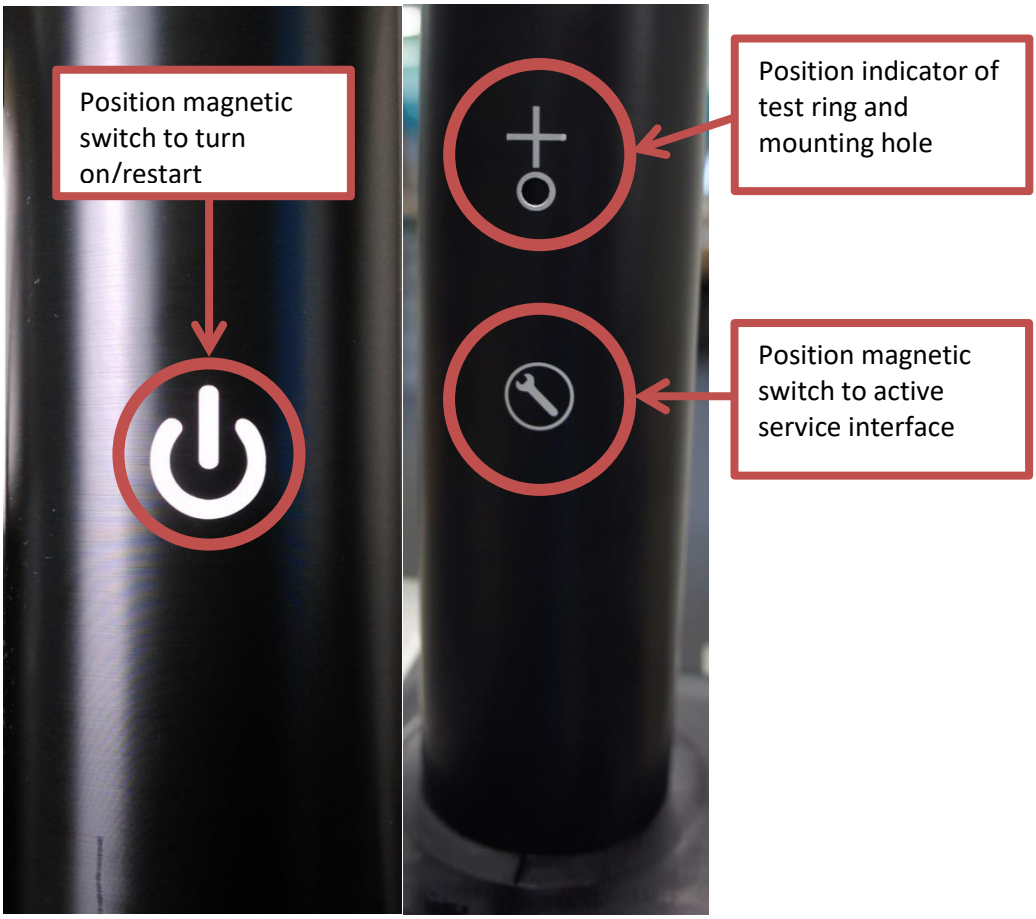

Figure 6-7 Position magnetic switch

For an easier positioning of the test ring needed for the accuracy test a position indicator above the mounting hole is print on the housing.

The measurement will start immediately after booting and will output the result on the serial line. The boot process looks like

```
STIEFL
options:
```

```
   1: load a:\FIRMWARE\Updater.sbf
   2: load a:\FIRMWARE\Factory.sbf
   3: load a:\FIRMWARE\Firmware.sbf
   4: enter shell
   5: enter updater
   7: force reinstall
   8: reload configuration
   9: reset boot parameters
   0: enter sleep mode
```

The probe waits 5 seconds for input. If no input is given, the probe starts automatically the firmware.

```
selected: 3
installed: 3
.....
  version installed: 1.3.1 flash checksum ok


____ _  _ _  _ _ _  _ ____ ___     ____ _  _ ___  _  _
|___ |\ | |  | | |\ | |___  |      | __ |\/| |__] |__|
|___ | \|  \/  | | \| |___  |      |__] |  | |__] |  |


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-----   MIRA Firmware version 1.0.0 branch develop revision 383 hash cbc4de9




-----  MIRA Firmware initialization  -----

Station Id: 30103
-----  MIRA basic device initialization  -----
```

```
startup time: 06.03.2014 08:42:20 UTC
-----  MIRA basic initialization complete  -----

-----  MIRA device initialization  -----
-----  MIRA initialization complete  -----



-----  MIRA Firmware loaded  -----
```

After the firmware is loaded the probe configures the communication interface (here the ethernet) and tries to connect the preconfigured central monitoring station. The next step is to start the measurement automatically.

```
scheduler: Initialising Scheduler with base intervall 60 seconds
scheduler: Installing RTC interrupt for alarm ...
06.03.2014 08:43:00 UTC
comm: starting communication with 192.168.145.67:31000 with id 30103
eth0: Waiting for ethernet cable plug in ...
eth0: Cable connected
eth0: Contacting DHCP server ...
eth0: IP address bound successfully.
eth0: IP Address      : 192.168.150.18
eth0: Subnet Address  : 255.255.248.0
eth0: Gateway Address : 192.168.144.6
eth0: DNS Address     : 192.168.145.20
TCPconnection: launching client...
TCPconnection: connected to 192.168.145.67:31000
Using Timeserver 0xc0a89142
TCPConnection: communication completed in 16627 ms
connection: close
connection: next at 06.03.2014 08:48:00 UTC
06.03.2014 08:44:00 UTC  T(in °C): 22.0 gdr(in uS/h): 1min 0.084
06.03.2014 08:45:00 UTC  T(in °C): 22.0 gdr(in uS/h): 1min 0.107
06.03.2014 08:46:00 UTC  T(in °C): 22.0 gdr(in uS/h): 1min 0.099
06.03.2014 08:47:00 UTC  T(in °C): 22.0 gdr(in uS/h): 1min 0.116
```

6.5.3 Stop

To stop the data acquisition of the probe and to bring the probe into the sleep mode for transportation, put the magnet on the marked position as for the start process (s. Figure 6-7) and select option **0** in the boot menu (the boot menu waits 5 seconds for input otherwise the firmware is loaded again).

```
STIEFL
options:
   1: load a:\FIRMWARE\Updater.sbf
   2: load a:\FIRMWARE\Factory.sbf
   3: load a:\FIRMWARE\Firmware.sbf
   4: enter shell
   5: enter updater
   7: force reinstall
   8: reload configuration
   9: reset boot parameters
   0: enter sleep mode
selected: 3
installed: 3
..0
entering sleep mode...
```

7 MIRA APP and Integrated Accuracy Test

It is strongly recommended to prove the precision of the probe. This should be done regularly in time distances of a few months but at least once a year. For this accuracy test the MIRA Test Set is available including a tablet with app to do this test user friendly over a graphical user interface. All values of the measurement during a test will be marked with the measured value status “accuracy test” and also stored in the “system status”.

7.1 Introduction

MIRA App is intended for fast verification of latest detector statuses and measured gamma dose rate, analyzing of historical values and accuracy/reference tests of MIRA probes via Bluetooth connection.

The application allows:

- connect to MIRA probe via Bluetooth;
- display latest measured gamma dose rate and statuses of MIRA detectors;
- display historical data in graphical representation;
- control and configure accuracy/reference tests;
- send/receive ASCII commands to/from probe in terminal mode.

7.2 Quick start Guide

The quick start guide comprises a short description of the operations and designated to provide an overview of the main system functions and allow the user to quickly familiarize themselves with the system operation

Figure 7-1 Main view

Main application view brings access to next application modes:

Discovering and representing of latest measured gamma dose rate and detector states.

Graphical representation of saved historical values.

Terminal communication mode.

Change of configuration parameters, view saved results history and current progress of running accuracy/reference tests.

7.2.1 Start application

MIRA application can be started by pressing of according icon:

Figure 7-2 MIRA App shortcut

Then it's necessary to establish Bluetooth connection to target device. It should be done in several steps:

Activate Bluetooth interface on target MIRA device (by default it disabled because of power consumption reasons). To see how to do it, please, follow according user manual (usually this type of connection can be enabled by bringing a magnet to marked place on MIRA housing).

In application menu choose <***Connect***>*:*

Figure 7-3 Main menu items

2. Choose target device or press <***SCAN FOR DEVICES***> to discover new devices.

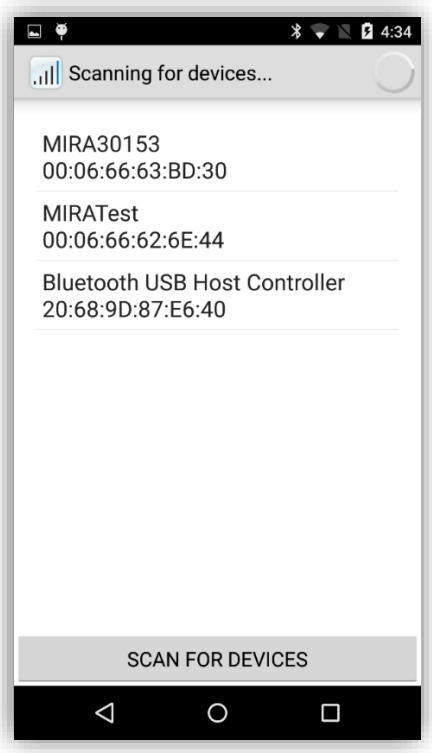


Figure 7-4 Scanning for devices

3. If connection was established successfully, status message in application title will be replaced with the name of the attached device. In other case “Connection failed” message will be displayed.

Figure 7-5 Successful connection

4. To finish work, please, select <***Disconnect***> in the main menu:

Figure 7-6 Disconnet

7.2.2 Status

Status frame displays latest measured gamma dose rate and status of MIRA detectors. In this mode application will endlessly request latest information from connected device.

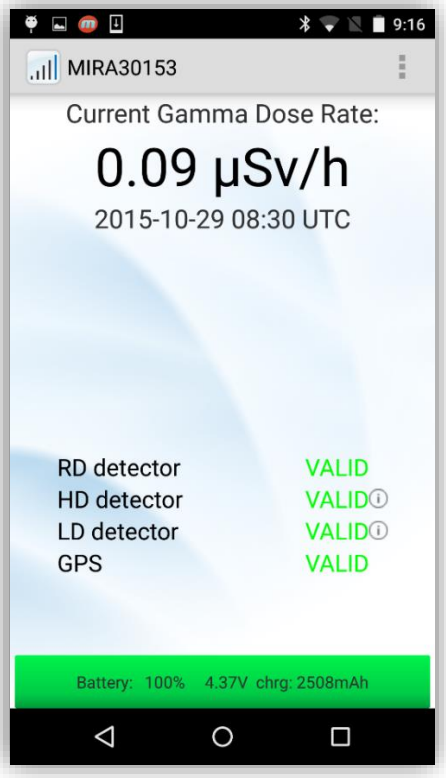


Figure 7-7 Status frame

If case of detecting some special status bits for listed detectors, according information icon (ⓘ) will be appear near by value status sign. If operator will press this icon, application will show a detailed description of discovered bits.

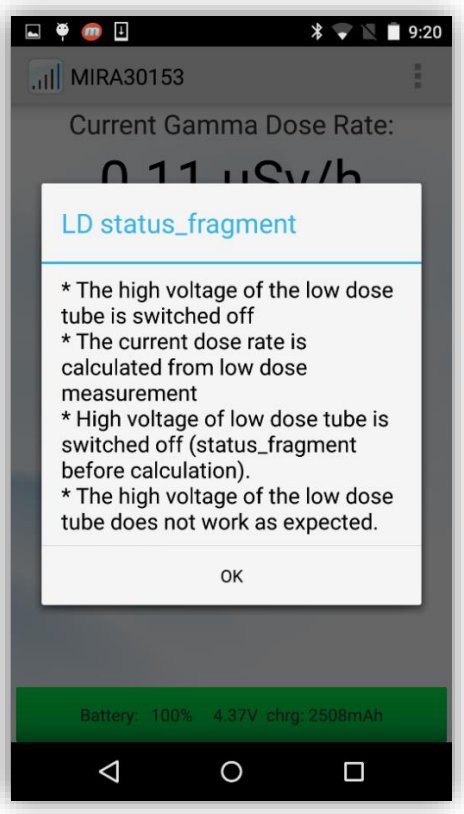


Figure 7-8 Status description

7.2.3 Historical data

This view will show saved historical data in chart representation. It possible or request data from the device (using  button), or display it from internal application cache. Operator can change displayed time interval and measured component using according control elements.

Figure 7-9 Drop menu

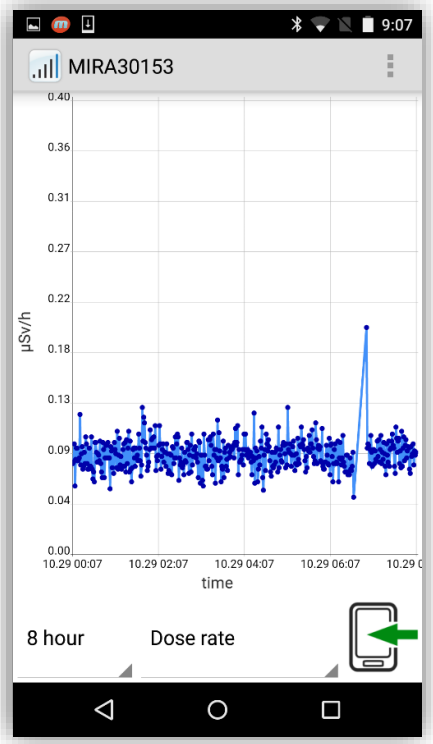


Figure 7-10 Time series chart

7.2.4 Terminal

It allows communicate with device by means of ASCII commands.

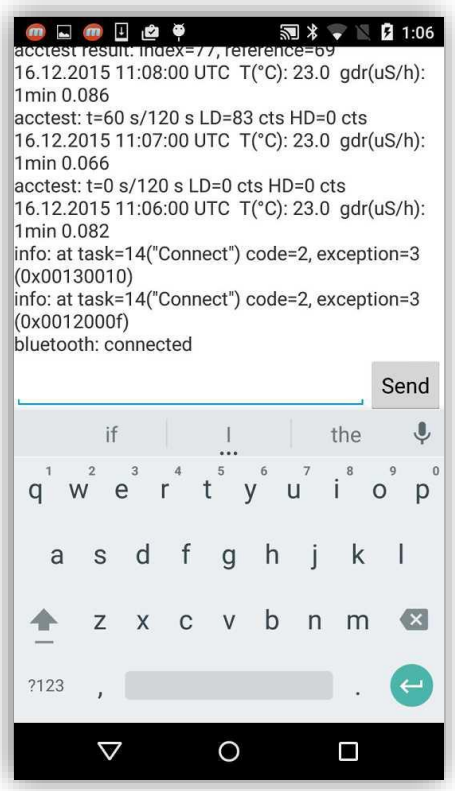


Figure 7-11 Terminal screen

7.3 Accuracy Test

7.3.1 State machine of the accuracy test

As an overview of the accuracy test procedure the state machine is given in Figure 7-12.

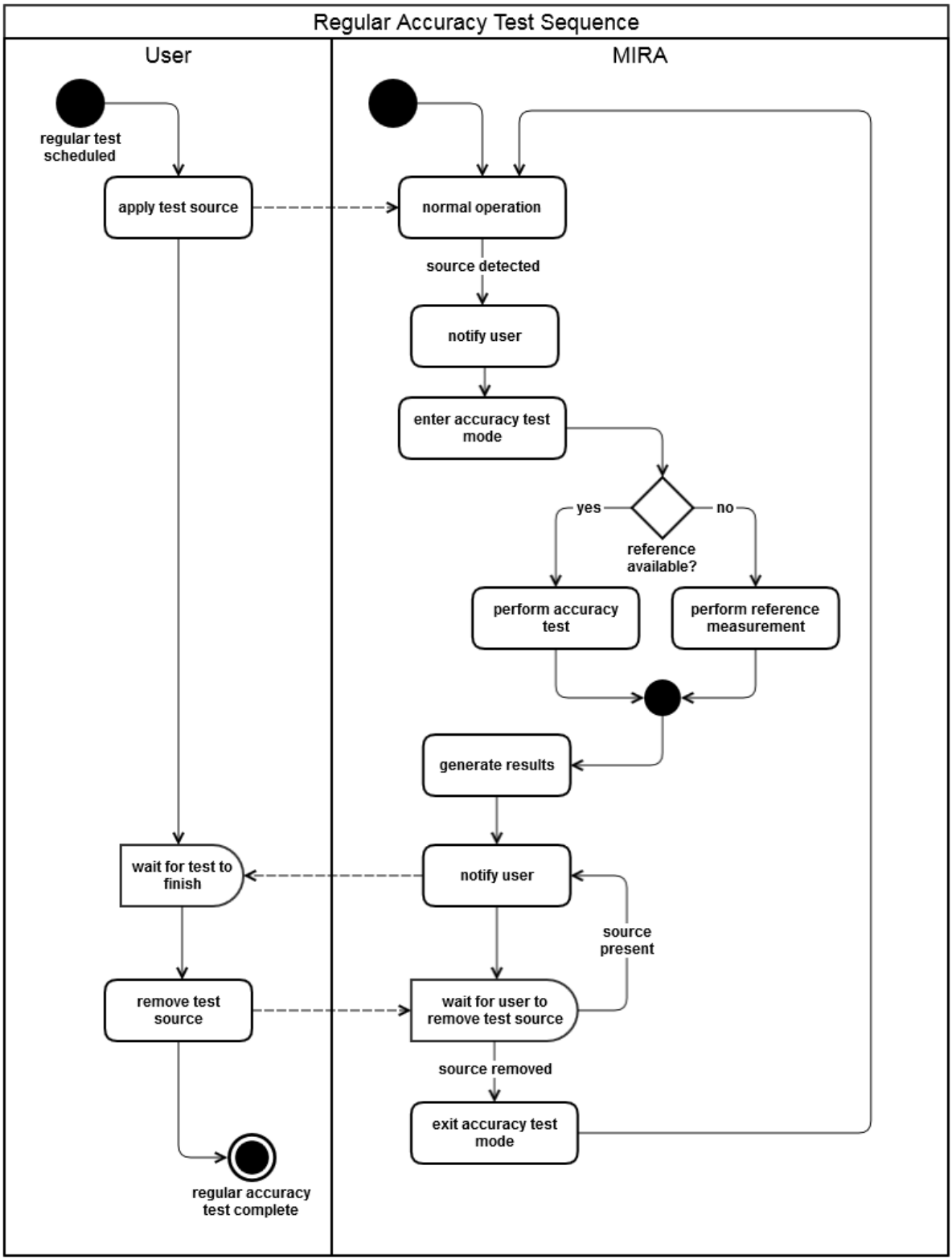


Figure 7-12 State machine accuracy test

7.3.2 Main test view

In this mode the application will periodically request current device state and, in case of detected accuracy/reference test, will redirect to according test progress page.

To start a new accuracy test just put a source into marked on probe housing position. Move the test ring over the MIRA until it reaches the marker as shown in Figure 7-13. Ensure that the upper side of the test ring is on the height of the cross and the bolt is on the same line as the cross. Now the bolt is directly over the mounting hole and if the bolt is released it should snap into the hole. The MIRA indicates the recognition if the test ring by 5 subsequent sound signals (see appendix 10.5).

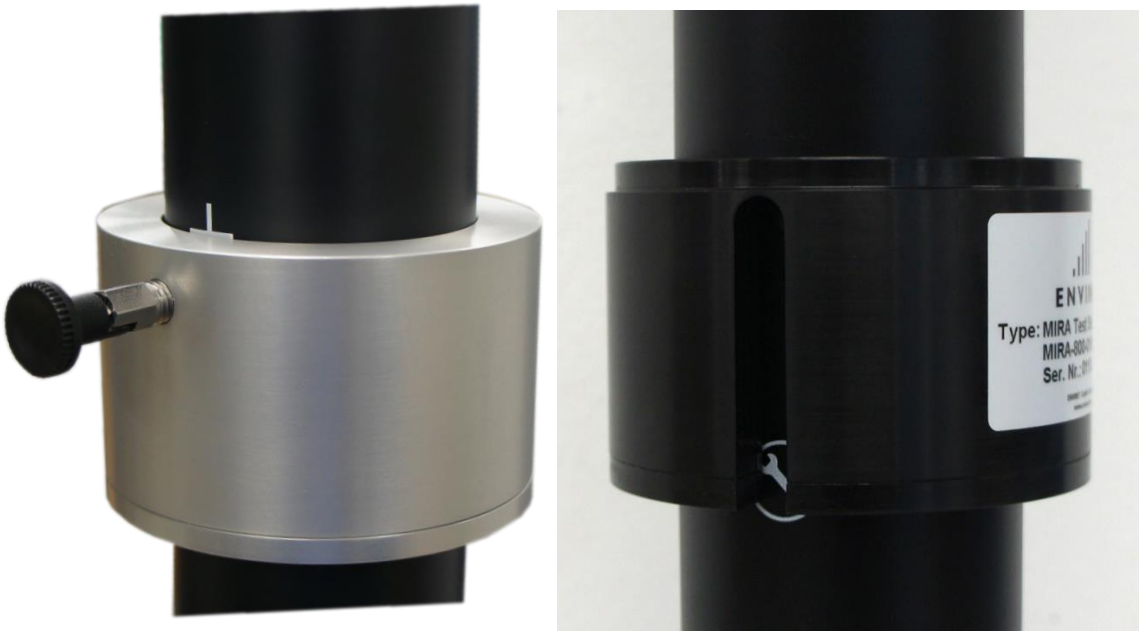


Figure 7-13 Correct position of the test ring

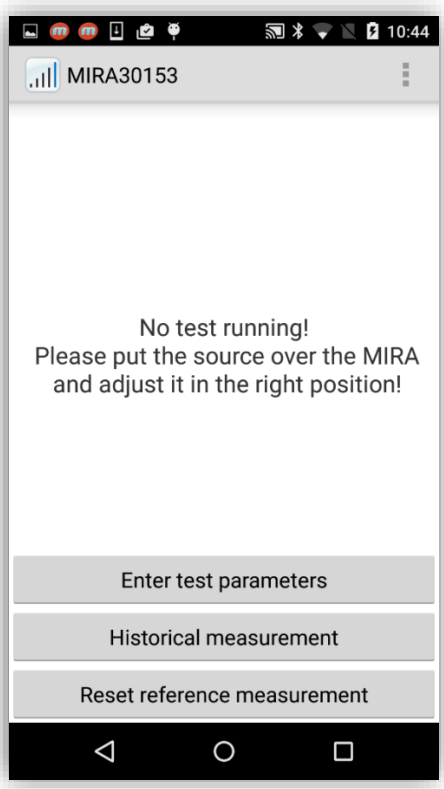


Figure 7-14 Accuracy test screen

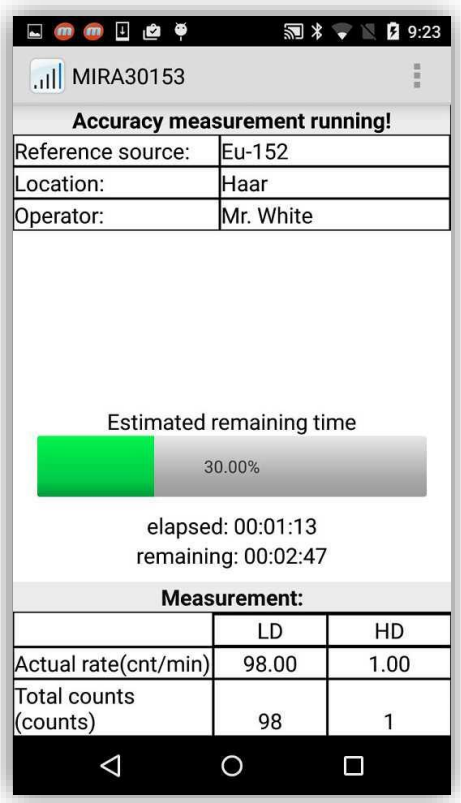


Figure 7-15 Progress screen of the test

At the end of the test it's necessary to remove source, and confirm that action, then the application will show latest test results.

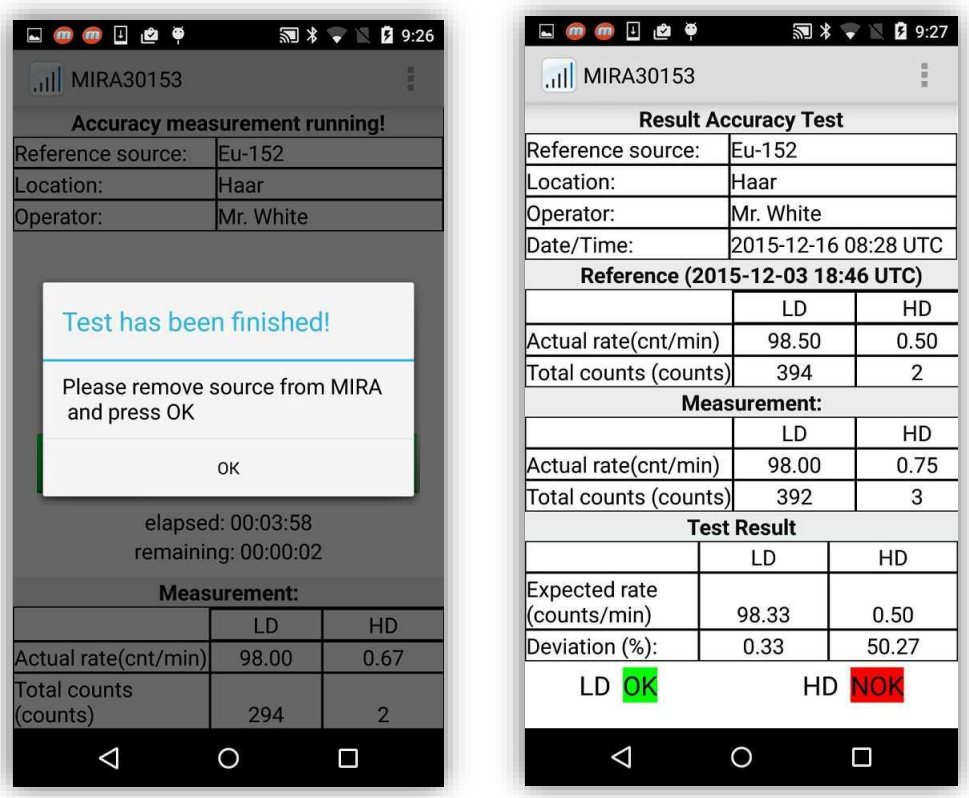


Figure 7-16 Result of the test as report

7.3.3 Change test configuration

It possible to change accuracy/reference tests configuration parameters (operator name, location, source type, test duration…). <***Enter test parameters***> button will display a view with saved on the device configuration. To change current configuration, enter the new parameters and press <***Store***> button.

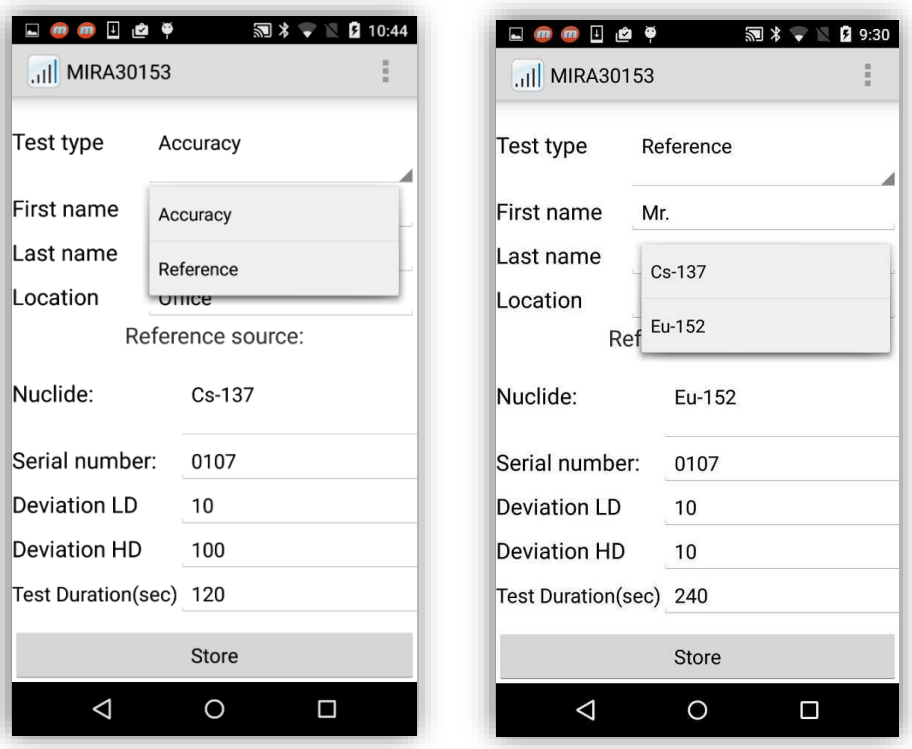


Figure 7-17 Change test parameters

7.3.4 New reference measurement

To plan a new reference test is necessary to press <***Reset reference measurement***> and confirm according notification dialog.

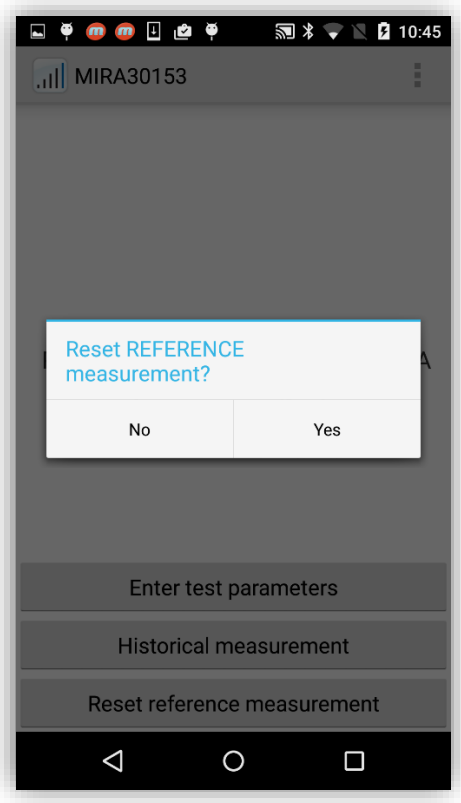


Figure 7-18 Reset reference measurement

7.3.5 Historical measurements

To view a history of previous accuracy/reference test operator should switch to <***Historical measurements***> view. To see the details of a measurement, select it in the list.

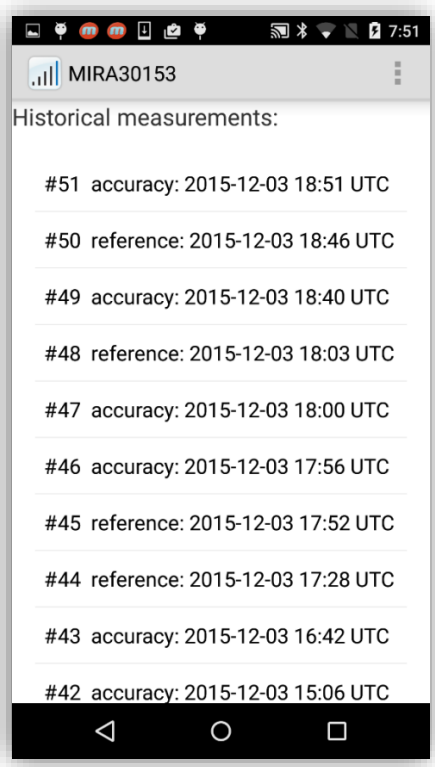


Figure 7-19 Historical accuracy test

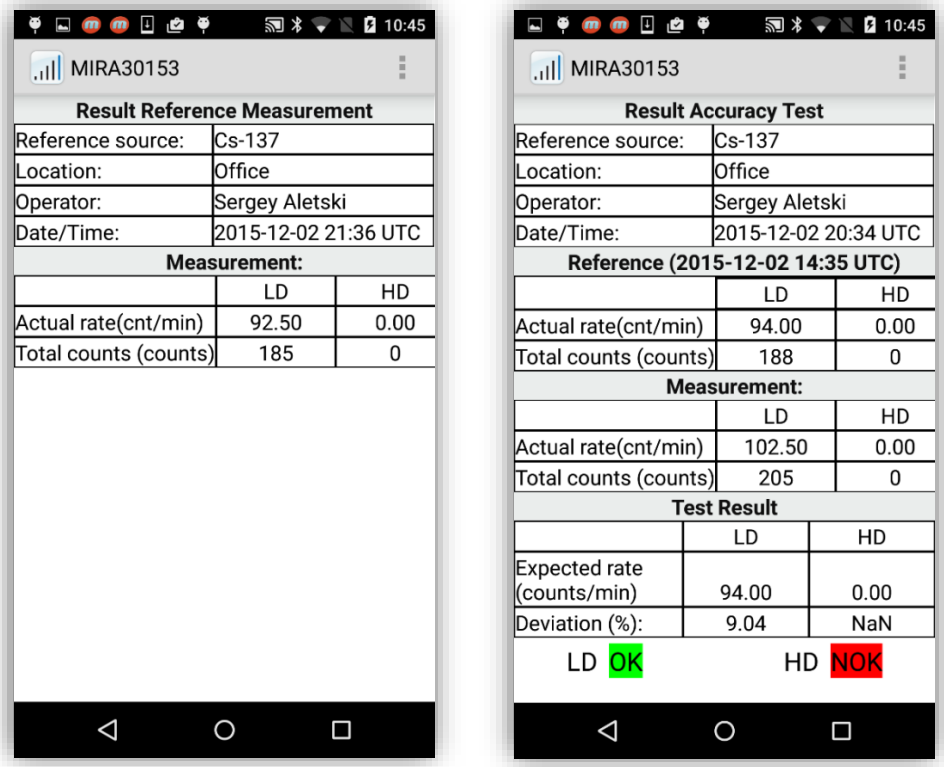


Figure 7-20 Report of historical test

8 Service Console (RS-232)

The boot menu is shown at the beginning of the boot sequence immediately after the magnet switch is activated. To interact with the device you need to connect the serial cable to the probe and your laptop/PC. Open a serial connection using an appropriate application (i.e. PuTTY).

Boot Menu

```
STIEFL
options:
   1: load a:\FIRMWARE\Updater.sbf
   2: load a:\FIRMWARE\Factory.sbf
   3: load a:\FIRMWARE\Firmware.sbf
   4: enter shell
   5: enter updater
   7: force reinstall
   8: reload configuration
   9: reset boot parameters
   0: enter sleep mode
selected: 3
installed: shell
.....
```

The boot loader waits 5 seconds for input before performing the selected actions.

8.1 Option 1: "load a:\FIRMWARE\Updater.sbf"

Tries to install the updater firmware from the SD card and executes it. The process starts immediately after choosing the option.

On failure the boot loader selects option 3 and performs a software reset.

8.2 Option 2: "load a:\FIRMWARE\Factory.sbf"

Tries to install the factory default firmware from the SD card and executes it. The process starts immediately after choosing the option.

On failure the boot loader continues with option 1.

8.3 Option 3: "load a:\FIRMWARE\Firmware.sbf"

Tries to install the firmware contained in "a:\FIRMWARE\Firmware.sbf" from the SD card and executes the firmware. The process starts immediately after choosing the option.

On failure the boot loader switches to option 2.

8.4 Option 4: Enter Shell

Tries to install the shell firmware and executes it. The process starts immediately after choosing the option. For detailed information on the shell, see chapter 10.3 Shell Operation

On failure the boot loader continues with option 3.

8.5 Option 5: Enter Updater Firmware

Tries to install the updater firmware installed in the Flash-EPROM and executes it. The process starts immediately after choosing the option.

On failure the boot loader continues with option 3.

8.6 Option 7: Force Firmware Installation

Forces (re)installation of the firmware chosen afterwards.

After selecting this option boot loader waits another 5 seconds for input.

8.7 Option 8: Reload Configuration

During installation process, the configuration will be reloaded from SD-card.

After selecting this option boot loader waits another 5 seconds for input.

8.8 Option 9: Reset Boot Parameters

This option resets the boot parameters to default values and restarts the boot loader.

8.9 Option 0: Enter Sleep Mode

This option sends the device to a low power consumption sleep mode.

To wake the device up, trigger the reset button once.

8.10 Reset to Factory Defaults

To reset the probe to factory settings, choose the following options from the boot menu:

1. Option 9
2. Option 2

9 Accessories

For the MIRA gamma detector system several accessories are available.

9.1 Mounting

9.1.1 Tripod

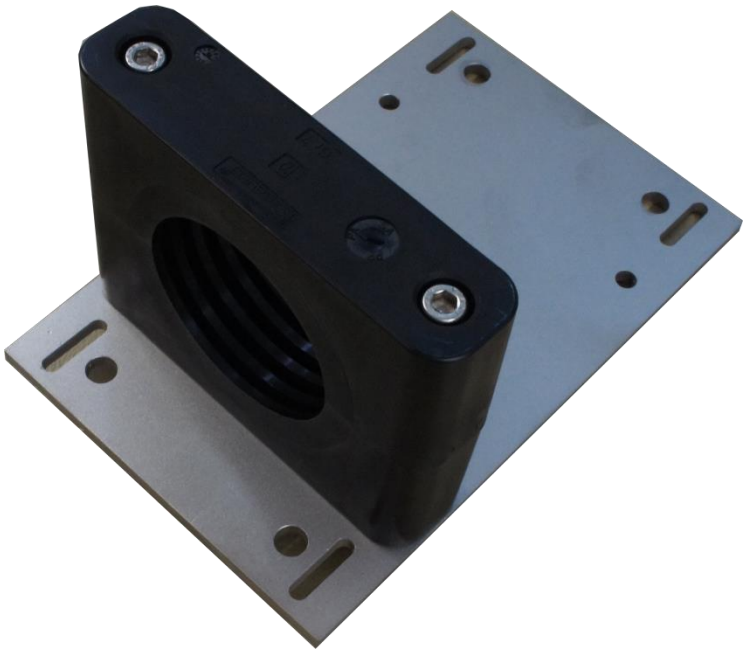
The tripod is used as mount for the MIRA detector, if the MIRA detector is used as mobile station. Two versions are available: A plastic version (lightweight) and a stainless steel version (heavy version for better stability).

Tripod plastic	Tripod metal
	

Description	Article
Tripod plastic	MIRA-800-0010
Tripod metal	MIRA-800-0011

9.1.2 Pole/wall bracket

For a pole/wall mounting brackets are available.



Description	Article
Pole bracket	MIRA-800-0020

9.2 Transport Case

To transport the MIRA detector with the tripods for mobile applications a carrying case is available.

The version MIRA-800-0034 allows charging of the two MIRA detectors including external battery packs during storage. A charger with 4 USB ports is installed underneath the foam insert. The mains power cable is externally connected at the short side of the case. Two charging cables are connected and pass through the foam insert to the MIRA connections. During storage it is recommended to keep both MIRA detectors connected to the charging cables and to keep the charger powered.

The case also carries the optional external batteries which come with a USB charging cable each. The cables can be pulled through the pass throughs parallel with the MIRA cables and connected to the free outlets of the charger.

Description	Article
Carrying case for two MIRA including tripod	MIRA-800-0033
Carrying case for two MIRAs with battery charger	MIRA-800-0034
Carrying case for five MIRA including tripod	MIRA-800-0035

9.3 Weather Station

The MIRA offers the possibility to connect a Vaisala WXT520 weather transmitter to monitor also the environmental conditions. The MIRA weather station (mobile) uses a foldable tripod with two section-legs and is equipped with a solar panel and battery for long term operation. The data of the weather transmitter is collected by the MIRA and transmitted using the MIRA communication system. The weather transmitter monitors following parameters:

Wind speed: 0 m/s – 60 m/s

Wind direction: 0° - 360°

Rainfall: resolution 0.01 mm

Rainfall duration: resolution 10 s

Rain intensity: 0 mm/h – 200 mm/h

Barometric pressure: 600 hPa – 1100 hPa

Air temperature: -52°C – 60°C

Relative humidity: 0 %RH – 100 %RH

Description	Article
MIRA weather station (mobile)	MIRA-800-0200
MIRA weather station (fixed)	MIRA-800-0210

9.4 Base Unit S – SOLAR

This solar power station is used for permanent installation, if no infrastructure like power grid is accessible. It can be placed directly on a flat surface using an additional mount without need of special constructions.

The power supply for the station is a combination of a solar panel with battery backup. The extended power supply allows data transmission in shorter intervals compared to the integrated solar/battery combination of the MIRA detector.

The stainless steel cabinet has an IP 66 rating and has the dimension 300 x 200 x 155 mm. The access to the cabinet is secured by a lockable door.

Description	Article
Base Unit S – SOLAR	MIRA-800-0220

9.5 MIRA – External battery

Designed for the mobile version of MIRA, the operation time can be extended by factors by using the mobile battery pack. The battery pack is mounted to the tripod using a simple click-mechanism and connected to the MIRA via a USB cable. The battery pack is equipped with an additional solar cell. It can be charged directly in the MIRA carrying case (MIRA-800-0034, see above), so it is always fully charged when deployed.

Capacity: 92.5 Wh (nominal at 20°C)
Type: Li-Ion (LiCoO2)
Weight: 700g

Description	Article
MIRA – External battery pack	MIRA-800-0500

9.6 MIRA – Test Set

For testing the MIRA detector a Test Set is available. The Test Set consists of a metal ring with bolt for fixing the set. The radioactive source is secure integrated in the metal ring. Included in the Test Set a tablet with an App for the MIRA service is delivered (s. MIRA-200-T).

Two nuclides are possible

Nuclide type: Eu-152
Activity: 500 kBq, other activity on request

or

Nuclide type: Cs-137
Activity: 360 kBq, other activity on request

The permitted limits for Eu-152 and Cs-137 are different. In 96/29/Euratom the permitted limit for Eu-152 is 1 MBq and for Cs-137 is 10 kBq. The Eu-152 is the recommended source.

Description	Article
MIRA – Test Set with Eu-152	MIRA-800-0102
MIRA – Test Set with Cs-137	MIRA-800-0100

10 Appendix

10.1 Status bits

10.1.1 Measurement Value Status

Each measured Dose Rate value has status bits describing the current measurement situation while the measurement value was built. This is a measurement value status.

Name	Description	Measurement Valid?
Rain	Rain Detected	valid
Time Sync	A Time synchronization has been executed in the measurement interval	valid
HD Minimum Criteria	The minimum criteria of the high dose tube are not reached	conditional
LD Minimum Criteria	The minimum criteria of the low dose tube are not reached	conditional
Communication Error	Communication to the internal measurement device could not be established (SPI-Bus)	invalid
HD LD Comparison Short Term	The comparison between high dose and low dose channels are not feasible (short term).	conditional
HD LD Comparison Long Term	The comparison between high dose and low dose channels are not feasible (long term).	conditional
HD Range	The current dose rate is calculated from high dose measurement	valid
Test Source Present	Test source is mounted to the device.	conditional
Test Mode	The probe is in test mode. GDR calculation State Machine is in State 0.	valid
Value Inaccurate	This value was calculated based on insufficient statistics or invalid data.	conditional

10.1.2 Measurement Evaluation Status

The Measurement Evaluation Status represents the current situation of the Gamma Dose Rate measurement. When processing the Ensemble's measured value, the result of the evaluation is stored at the Measurement Evaluation Status. Each Gamma Dose Rate Ensemble configured for threshold evaluation stores it's results in this status. It is valid system wide.

Name	Description	Criteria
Rain	Rain detected.	Rain sensor indicates rain.
Time Sync	A time synchronization has been executed in the measurement interval.	
HD Minimum Criteria	The minimum criteria of the high dose tube are not reached.	At least a configured number of pulses within configured time window.
LD Minimum Criteria	The minimum criteria of the low dose tube are not reached.	At least a configured number of pulses within configured time window.
Communication Error	Communication to the internal measurement device could not be established (SPI-Bus).	Connection via SPI failed
HD LD Comparison Short Term	The comparison between high dose and low dose channels are not feasible (short term).	Dose rate h_{LD} and h_{HD} accumulated until there is at least 1 count in LD and HD. The comparison is successful (status = 0) if $(R_1 + 1) \cdot \lvert h_{LD} - h_{HD} \rvert < (R_1 - 1) \cdot \lvert h_{LD} + h_{HD} \rvert$
HD LD Comparison Long Term	The comparison between high dose and low dose channels are not feasible (long term).	Dose rate h_{LD} and h_{HD} accumulated until total dose in either LD or HD exceeds ($h_{MH} \cdot 1h$). The comparison is successful (status = 0) if $(R_2 + 1) \cdot \lvert h_{LD} - h_{HD} \rvert < (R_2 - 1) \cdot \lvert h_{LD} + h_{HD} \rvert$
Test Source Present	Test source is mounted to device.	Both REED switches active at the same time.
Test Mode	The probe is in test mode. GDR calculation State Machine is in State 0.	GDR calculation enters and remains in test state (zero) until accuracy test is completed successfully. Both GMTs, LD & HD, are on. High Sampling Frequency.
Interval 0: threshold 1 exceeded	The first threshold of the base ensemble has been exceeded.	Aggregated Dose Rate in Interval 0 > First Threshold
Interval 0: threshold 2 exceeded	The second threshold of the base ensemble has been exceeded.	Aggregated Dose Rate in Interval 0 > Second Threshold
Interval 1: threshold 1 exceeded	The first threshold of the first ensemble has been exceeded.	Aggregated Dose Rate in Interval 1 > First Threshold
Interval 1: threshold 2 exceeded	The second threshold of the first ensemble has been exceeded.	Aggregated Dose Rate in Interval 1 > Second Threshold
Interval 2: threshold 1 exceeded	The first threshold of the second ensemble has been exceeded.	Aggregated Dose Rate in Interval 2 > First Threshold
Interval 2: threshold 2 exceeded	The second threshold of the second ensemble has been exceeded.	Aggregated Dose Rate in Interval 2 > Second Threshold

10.1.3 System Status

The System Status represents the general state of the system. Its scope is system wide.

Name	Description
System Starting	MIRA is starting.
Service Mode	Service mode is active.
Test Mode	GDR test mode active (GDR calculation state machine in state 0).
Minute Timeout	Base interval trigger timed out.
First Minute	First base interval since last system start.
Source Detected	Test source is mounted to the device.
Source Removed	Test source has been removed.
SD-Card failed	Access to SD-Card failed.
Wake Up	System woke up from Sleep Mode
Interval Invalid	Length of last base interval differs from configured value.
Time Invalid	RTC time failure.
Time synchronization	Time synchronization has been performed successfully.
GPS fix failed	GPS fix acquisition timed out.
GPS fix available	GPS fix acquisition successful.
Moisture detected	Moisture detected inside the device.
Door open	Door of electric cabinet is open.
Time Synchronization Failed	Time synchronization could not be completed successfully.
Communication failed	MIRA failed to execute a scheduled communication
2G Fallback	LTE module uses 2G fallback instead of 4G.
Task Timeout	MIRA Scheduler failed to execute any of its tasks
Task Critical	MIRA Scheduler failed to recover after a task timed out
Continuous Test Mode	The probe is continuously running in test mode.

10.1.4 Battery Status

The Battery Status describes the situation of the battery power supply. It is available as both system wide status and measurement value status.

Name	Description
Battery Low	Low battery charge.
Battery Serious	Seriously low battery charge.
Battery Critical	Critically low battery charge.
External Battery Low	Low external battery charge/voltage
Voltage Low	Low battery voltage.
Voltage Critical	Critically low battery voltage.
Communication Error	Error in communication to battery monitoring device.
Power On Reset	Power on reset occurred on battery monitor.
Battery Sleep	System sleeping due to battery conditions.
Runtime Estimate	Estimated remaining battery runtime in hours.

10.1.5 GPS Status

The GPS Status stores additional information on GPS fixes. This status is a measurement value status.

Name	Description
# of Satellites	Average number of satellites visible
# of Fixes	Number of GPS-fixes used for averaging

10.2 Detector positions

In Figure 10-1 the position of the detectors and the area for mounting is indicated.

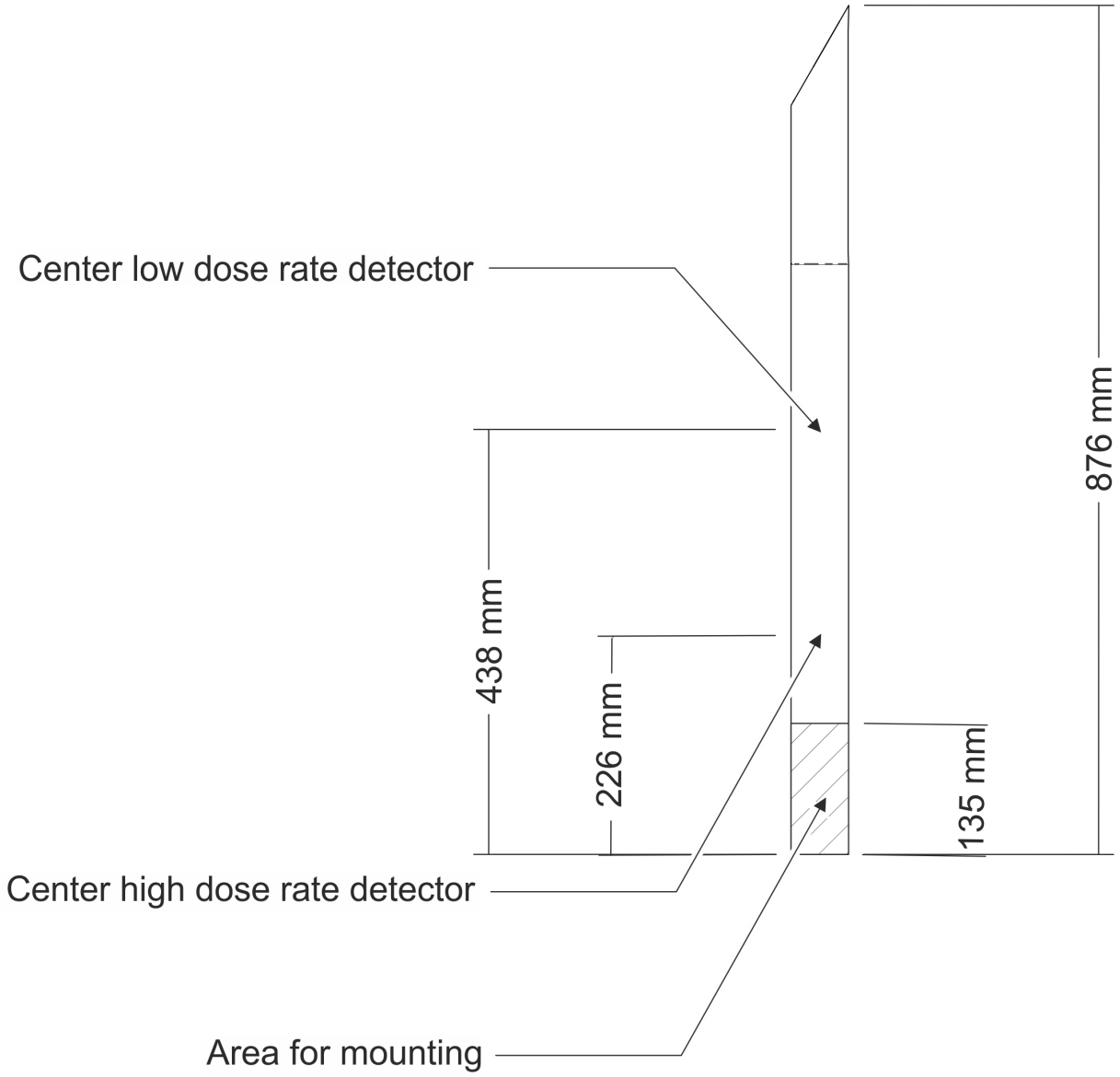


Figure 10-1 Position of detectors and area for mounting

For a 1 m height installation of the low dose rate detector with a pole the MIRA can be mounted as shown in Figure 10-2.

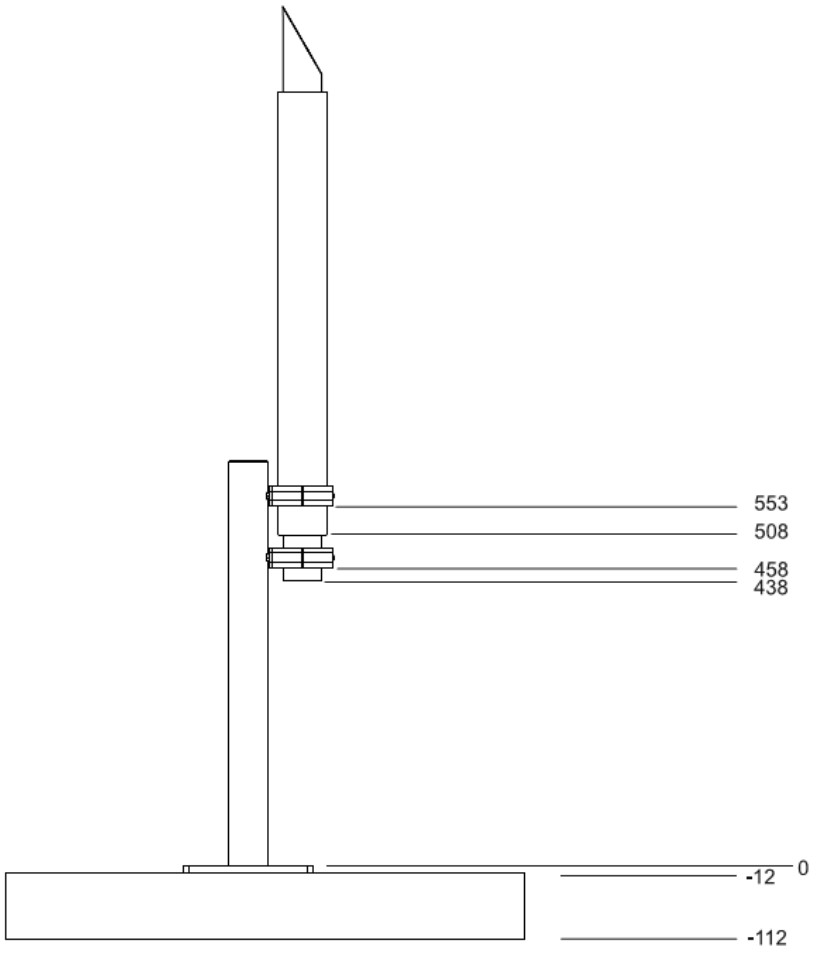


Figure 10-2 Position of the solar protection (if used) and the mounts for an installation of 1m height above ground (-112 mm) of the low dose rate (all number in mm).

10.3 Shell Operation

The shell is a separate firmware that can be launched from the boot menu. It does not run parallel to the gamma dose rate firmware (standard operation).

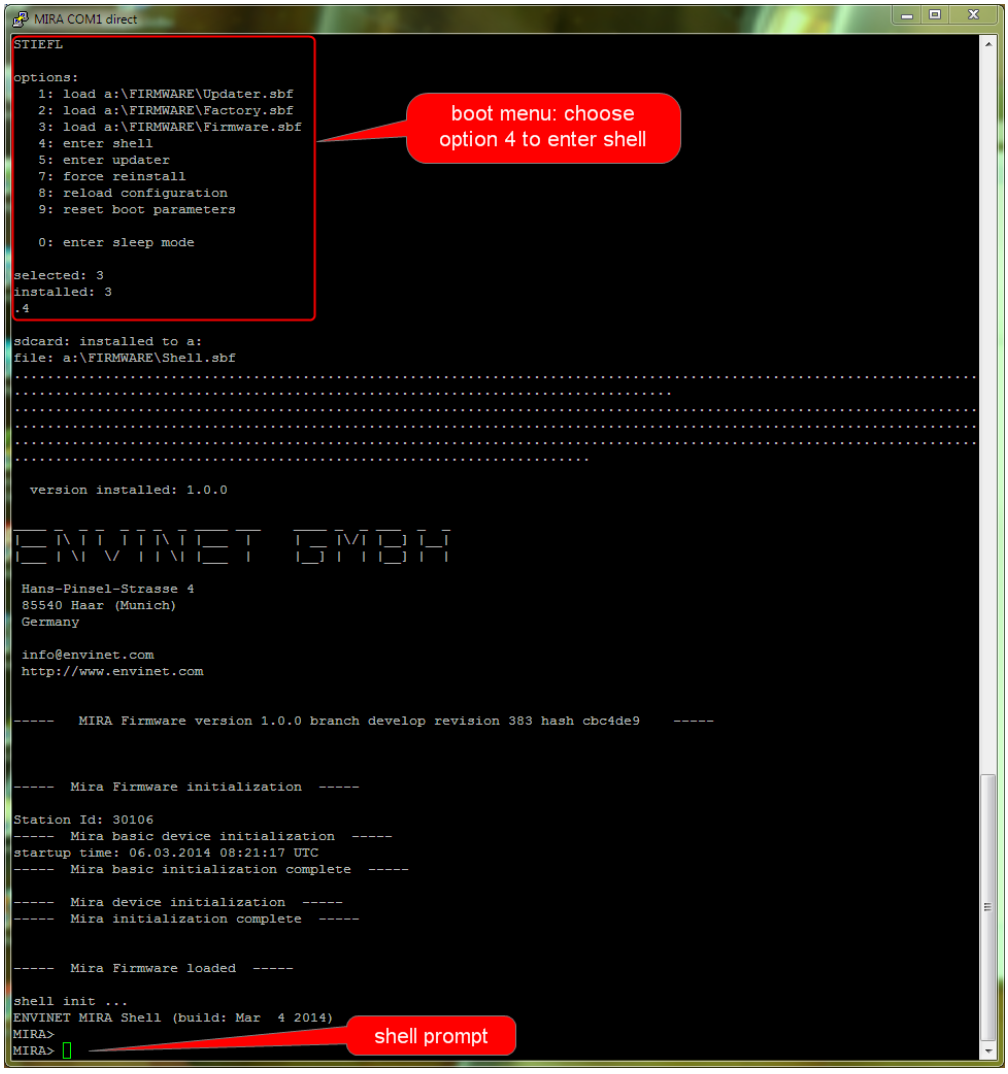
10.3.1 Entering the Shell and Basic Usage

To enter the shell, connect the serial cable to the probe and your laptop/PC.

Open a serial connection using an appropriate application (i.e. PuTTY) and reboot the probe.

Select option 4 from the boot by entering '4' on your terminal window.

When the boot process is complete, you will see a prompt and the probe will be waiting for your commands.



Use the keyboard of your Laptop/PC to type and enter commands.

Type "help<enter>" to get an overview over the list of commands.

10.3.2 Command overview

10.3.2.1 Help

Get help on how to use shell commands.

Command: help

```
MIRA> help help
Usage: help [<command>]
   <command> = command to get help on
```

Example: 'help'

```
MIRA> help
Available commands:
   gate <gateway> [<ipaddr>] [<netmask>]
   help [<command>]
   walkrt
   cd <directory>
   create <filename> [<mode>]
   del <file>
   dir [<filespec>] [<attr>]]
   format <drive:> [<volume label>]
   mkdir <directory>
   pwd
   ren <oldname> <newname>
   rmdir <directory>
   ping <ip> [<n>]
   test <device> [<device>]...
   sdcard <on|off>
   sk <start <n>|stop>
```

```
   gmtpic <hr|lr|hdon|hdoff|ldon|ldoff|dly <n>> [...]

   ethernet <on|off|dhcp|static|ip <ip address>|mask <subnet mask>|gateway
<ip address>|dly <n>> [...]

   lte <on|off|dialin|hangup|simid|signal <n>|2g|4g|dly <n>> [...]

   radio <on|off|dly <n>> [...]

   gps <on|off|start|stop|dly <n>> [...]

   bluetooth <on|off|dly <n>> [...]

   synctime [<ip-address> [<ip-address> [<ip-address> [<ip-address> [<ip-
address>]]]]]

   update <ip address [<port>]> | <stop>

   checkmem <short|detailed|stack>

   reset

   createdir <directory> [<directory> [...]]

   todaydir <directory> [<directory> [...]]

   config list/store   ?


MIRA> help lte

Usage: lte <action> [<action> [...]]

   parameter <action> is one out of:

      on         = turn on els61

      off        = turn off els61

      dialin     = open PPP connection

      hangup     = close PPP connection

      simid      = print SIM Id

      signal <n> = check signal quality n times

      2g         = register to GPRS

      4g         = register to LTE

      dly <n>    = delay action by n milliseconds
```

Command: '?' - short help

```
MIRA> help ?

Usage: ?
```

```
MIRA> <command> ?
<command> = command to get short help on
```

Example: '?' - short help

```
MIRA> ?
gate     help     walkrt   cd       create   del      dir      format
mkdir    pwd      ren      rmdir    ping     test     sdcard   sk
gmtpic   ethernet lte      radio    gps      bluetooth synctime update
checkmem reset    createdir todaydir config   ?

MIRA> lte ?
lte <on|off|dialin|hangup|simid|signal <n>|2g|4g|dly <n>> [...]
```

10.3.2.2 CONFIG

This command allows the user to view and edit configuration entries.

Command: config

```
MIRA> config ?
config store <a-z> [<a-z> [...]] [<index>:]value [[<index>:]value [...]] or
config list [<a-z/*> [<a-z/*> ...]] or
config load [<Name of Configfile>] or
config setfile [<Name of Configfile>] or
config show
```

Usage depends on whether you want to view or change an entry.

10.3.2.2.1 LIST

Example: config list

```
MIRA> config list
list: Categories:
   a :  System
   b :  Devices
   c :  GDR
   d :  Battery Monitor
   e :  Accuracy Test
   f :  Storage
   g :  Communication
```

```
MIRA> config list a *
list: System
   a :  Probe Id: 0:30300
   b :  Station Id: 0:30300
   c :  Probe Type: "MIRA-100-L" (MaxSize=31)
   d :  Log Level: 0:0
   e :  Test Modes:
     a :  Self Test Interval (s)
     b :  Continuous Self Test: false
   f :  Time Intervals:
     a :  Base Interval
     b :  Time Intervals
   g :  Task Configuration:
      0 :  CollGDR  is active
      1 :  CollBat  is inactive
      2 :  CollGPS  is inactive
      3 :  CollIOE  is inactive
      4 :  GDRCalc  is active
      5 :  SDSaver  is active
      6 :  BatMon   is inactive
      7 :  Comm     is active
      8 :  AccTest  is active

MIRA> config list g
list: Communication
   a :  Enabled: active
   b :  Station Id: 0:30300
   c :  # of Retries: 0:0
   d :  Time Servers: 0:192.53.103.108 1:192.53.103.104 2:192.53.103.103
3:0.0.0.0
   e :  Central Connection Information:
     a :  Central 0
     b :  Central 1
     c :  Central 2
     d :  Central 3
     e :  Central 4
     f :  Special

MIRA> config list g e
list: Communication.Central Connection Information:
   a :  Central 0
   b :  Central 1
   c :  Central 2
```

```
   d :  Central 3
   e :  Central 4
   f :  Special

MIRA> config list g e a
list: Communication.Central Connection Information.Central 0:
   a :  Enabled: false
   b :  Execution Time
   c :  Spontaneous Calls
   d :  Device List

MIRA> config list g e * a
list: Communication.Central Connection Information
   a :  Central 0.Enabled: false
   b :  Central 1.Enabled: false
   c :  Central 2.Enabled: true
   d :  Central 3.Enabled: false
   e :  Central 4.Enabled: false
   f :  Special.Updater:
     a :  Execution Time
     b :  Spontaneous Calls
     c :  Device List

MIRA> config list g e * d
list: Communication.Central Connection Information
   a :  Central 0.Device List:
     a :  Device 0:
       0 :  Device Id [-1,0-3,12-15,?]: 0 Ethernet(TCP/IP)
       1 :  Ip Address: 192.168.145.134
       2 :  Port: 31000
       3 :  SNTP server: 0.0.0.0
       4 :  SNTP timeout: 21000 ms
     b :  Device 1:  0 :  Device Id [-1,0-3,12-15,?]: -1 device disabled
     c :  Device 2:  0 :  Device Id [-1,0-3,12-15,?]: -1 device disabled
     d :  Device 3:  0 :  Device Id [-1,0-3,12-15,?]: -1 device disabled
   b :  Central 1.Device List:
     a :  Device 0:
       0 :  Device Id [-1,0-3,12-15,?]: 0 Ethernet(TCP/IP)
       1 :  Ip Address: 192.168.145.134
       2 :  Port: 31000
       3 :  SNTP server: 0.0.0.0
       4 :  SNTP timeout: 21000 ms
     b :  Device 1:  0 :  Device Id [-1,0-3,12-15,?]: -1 device disabled
```

```
  c :  Device 2:  0 :  Device Id [-1,0-3,12-15,?]: -1 device disabled
  d :  Device 3:  0 :  Device Id [-1,0-3,12-15,?]: -1 device disabled
c :  Central 2.Device List:
  a :  Device 0:
    0 :  Device Id [-1,0-3,12-15,?]: 0 Ethernet(TCP/IP)
    1 :  Ip Address: 192.168.145.134
    2 :  Port: 31000
    3 :  SNTP server: 0.0.0.0
    4 :  SNTP timeout: 21000 ms
  b :  Device 1:  0 :  Device Id [-1,0-3,12-15,?]: -1 device disabled
  c :  Device 2:  0 :  Device Id [-1,0-3,12-15,?]: -1 device disabled
  d :  Device 3:  0 :  Device Id [-1,0-3,12-15,?]: -1 device disabled
d :  Central 3.Device List:
  a :  Device 0:
    0 :  Device Id [-1,0-3,12-15,?]: 0 Ethernet(TCP/IP)
    1 :  Ip Address: 192.168.145.134
    2 :  Port: 31000
    3 :  SNTP server: 0.0.0.0
    4 :  SNTP timeout: 21000 ms
  b :  Device 1:
    0 :  Device Id [-1,0-3,12-15,?]: 2 Radio(TCP/IP)
    1 :  Ip Address: 192.168.145.134
    2 :  Port: 31000
    3 :  SNTP server: 0.0.0.0
    4 :  SNTP timeout: 21000 ms
  c :  Device 2:  0 :  Device Id [-1,0-3,12-15,?]: -1 device disabled
  d :  Device 3:  0 :  Device Id [-1,0-3,12-15,?]: -1 device disabled
e :  Central 4.Device List:
  a :  Device 0:
    0 :  Device Id [-1,0-3,12-15,?]: 0 Ethernet(TCP/IP)
    1 :  Ip Address: 192.168.145.134
    2 :  Port: 31000
    3 :  SNTP server: 0.0.0.0
    4 :  SNTP timeout: 21000 ms
  b :  Device 1:
    0 :  Device Id [-1,0-3,12-15,?]: 1 GPRS(TCP/IP)
    1 :  Ip Address: 82.194.117.14
    2 :  Port: 31000
    3 :  SNTP server: 0.0.0.0
    4 :  SNTP timeout: 21000 ms
  c :  Device 2:  0 :  Device Id [-1,0-3,12-15,?]: -1 device disabled
  d :  Device 3:  0 :  Device Id [-1,0-3,12-15,?]: -1 device disabled
f :  Special: unknown subcategory 'd'
```

```
MIRA> config list g e a *
list: Communication.Central Connection Information.Central 0
   a :  Enabled: false
   b :  Execution Time:
     a :  Time Offset: from 01.01.2000 00:00:00 UTC = 0 s since 01.01.2000
00:00:00
     b :  Repeat Base: every 300 sec = 5 min
     c :  Window Size (0=off): every 0 sec
     d :  Repeat On Success: every 7200 sec = 2 h
     e :  Repeat On Failure: every 1800 sec = 30 min
   c :  Spontaneous Calls:
     a :  System Status: 0:0x00286089
     b :  GDR Evaluation: 0:0x033307c0
     c :  Battery Status: 0:0x0000000f
   d :  Device List:
     a :  Device 0:
       0 :  Device Id [-1,0-3,12-15,?]: 0 Ethernet(TCP/IP)
       1 :  Ip Address: 192.168.145.134
       2 :  Port: 31000
       3 :  SNTP server: 0.0.0.0
       4 :  SNTP timeout: 21000 ms
     b :  Device 1:  0 :  Device Id [-1,0-3,12-15,?]: -1 device disabled
     c :  Device 2:  0 :  Device Id [-1,0-3,12-15,?]: -1 device disabled
     d :  Device 3:  0 :  Device Id [-1,0-3,12-15,?]: -1 device disabled
```

10.3.2.2.2 LOAD & SETFILE

Example: config load and config setfile

```
MIRA> config load a:\firmware\cfgnew.sbf
load file a:\firmware\cfgnew.sbf: 1.0.0 success

MIRA> config load
load file a:\FIRMWARE\Config.sbf: 1.0.0 success

MIRA> config setfile a:\firmware\cfgnew.sbf
set file a:\firmware\cfgnew.sbf: 1.0.0 ok

MIRA> config load
load file a:\firmware\cfgnew.sbf: 1.0.0 success

MIRA> config setfile a:\firmware\Config.sbf
set file a:\firmware\Config.sbf: 1.0.0 ok
```

```
MIRA> config load
load file a:\firmware\Config.sbf: 1.0.0 success
```

10.3.2.2.3 STORE

Warning: changes in configuration can cause serious malfunction

Undo your changes
reboot by typing “reset”
choose option 8 from the boot menu
or
type “config load”

Example: config store

```
# changing station id
MIRA> config list a b
list: System.Station Id: 0:30300
MIRA> config store a b 4
store: System.Station Id: 0:4

# changing configuration of device 0 of data server 1
MIRA> config list g e b d a
list: Communication.Central Connection Information.Central 1.Device
List.Device 0:
   0 :  Device Id [-1,0-3,12-15,?]: 0 Ethernet(TCP/IP)
   1 :  Ip Address: 192.168.145.134
   2 :  Port: 31000
   3 :  SNTP server: 0.0.0.0
   4 :  SNTP timeout: 21000 ms
MIRA> config store g e b d a 1:192.168.121.1 3:192.168.121.1 10000
store: Communication.Central Connection Information.Central 1.Device
List.Device 0:
   0 :  Device Id [-1,0-3,12-15,?]: 0 Ethernet(TCP/IP)
   1 :  Ip Address: 192.168.121.1
   2 :  Port: 31000
   3 :  SNTP server: 192.168.121.1
   4 :  SNTP timeout: 10000 ms
MIRA> config list g e b d a
list: Communication.Central Connection Information.Central 1.Device
List.Device 0:
   0 :  Device Id [-1,0-3,12-15,?]: 0 Ethernet(TCP/IP)
```

```
   1 :  Ip Address: 192.168.121.1
   2 :  Port: 31000
   3 :  SNTP server: 192.168.121.1
   4 :  SNTP timeout: 10000 ms

# changing time servers:
#           #0 to 192.168.0.1
#           #2 to 0.0.0.0 (deactivate)
MIRA> config list g d
list: Communication.Time Servers: 0:192.53.103.108 1:192.53.103.104
2:192.53.103.103 3:0.0.0.0
MIRA> config store g d 0:192.168.0.1 2:0.0.0.0
store: Communication.Time Servers: 0:192.168.0.1 1:192.53.103.104 2:0.0.0.0
3:0.0.0.0

# changing from data server 0 to data server 1
MIRA> config list g e * a
list: Communication.Central Connection Information
   a :  Central 0.Enabled: true
   b :  Central 1.Enabled: false
   c :  Central 2.Enabled: false
   d :  Central 3.Enabled: false
   e :  Central 4.Enabled: false
   f :  Special.Updater:
     a :  Execution Time
     b :  Spontaneous Calls
     c :  Device List
MIRA> config store g e a a false
store: Communication.Central Connection Information.Central 0.Enabled:
false
MIRA> config store g e b a true
store: Communication.Central Connection Information.Central 1.Enabled: true
MIRA> config list g e * a
list: Communication.Central Connection Information
   a :  Central 0.Enabled: false
   b :  Central 1.Enabled: true
   c :  Central 2.Enabled: false
   d :  Central 3.Enabled: false
   e :  Central 4.Enabled: false
   f :  Special.Updater:
     a :  Execution Time
     b :  Spontaneous Calls
     c :  Device List
```

10.3.2.2.4 Configuration Entry Overview

For better overview and accessibility from command line the configuration entries are arranged in a tree structure. The different levels of the structure are accessed by single lower-case letters.

Configuration Entry Tree						
a	System					General settings
a	a	Probe Id				Probe's serial number. Read Only!
a	b	Station Id				Identification number for data server communication.
a	c	Probe Type				Probe's article identification code. Read Only!
a	d	Log Level				Verbosity level (0=Critical, 1=Serious, 2=Info, 3=Debug, -1=Off)
a	e	Test Modes				Test Mode settings
a	e	a	Self Test Interval			Time between two consecutive self tests in seconds.
a	e	b	Continuous Self Test			Perform self test continuously? "true" or "false"
a	f	Time Intervals				Aggregation time intervals Read Only!
a	f	a	Base Interval			Length of basic time interval (default: 10 seconds)
a	f	b	Time Intervals			Length of the three aggregation time intervals. All have to be multiple of the base interval!
a	f	b	a	Interval 0		Aggregation time interval 0 (default: 60 seconds) The NMC software is configured interval length of 60 seconds only! Other values may yield unpredictable results.
a	f	c	b	Interval 1		Aggregation time interval 1 (default: 600 seconds) The NMC software is configured for interval 1 length of 10 minutes only! Other values may yield unpredictable results.
a	f	d	c	Interval 2		Aggregation time interval 2 (default: 3600 seconds) The NMC software is configured for interval 2 length of 60 minutes only! Other values may yield unpredictable results.
a	g	Task Configuration				List of tasks to be run on device. This entry has fundamental influence on operation. Change only if you understand what you are doing.
		0:	CollGDR			Data collection task for GDR calculation
		1:	CollBat			Data collection task for battery monitor
		2:	CollGPS			Data collection task for GPS module
		3:	CollIOE			Data collection task for i/o-expander
		4:	GDRCalc			GDR calculation task (needs CollGDR)
		5:	SDSaver			Data storage task
		6:	BatMon			Battery monitor task (needs CollBat)
		7:	Comm			Communication task
		8:	AccTest			Accuracy Test task
b	Devices					General device settings.
b	a	Ethernet				Ethernet adapter settings.
b	a	a	DHCP			Use DHCP-Server? Can be "true" or "false".
b	a	b	Ip Address			Static Ipv4-address. Used only if DHCP is not used or fails.
b	a	c	Subnet Mask			Ipv4 subnet mask. Used only if DHCP is not used or fails.
b	a	d	Gateway			Default Gateway. Used only if DHCP is not used or fails.

b	a	e	Routes				Ipv4-address plus subnet mask. Not implemented!
b	a	e	a	Route 0			
b	a	e	b	Route 1			
b	a	e	c	Route 2			
b	a	e	d	Route 3			
b	b	Rain Sensor					rain sensor settings
b	b	a	Enabled				Device enabled. Read Only! "true" or "false"
b	b	b	PWM Frequency / 10				These entries influences internals of the sensor. Wrong values can lead to unpredictable behavior.
b	b	c	Duty Cycle				
b	b	d	Interval (0<=x<19)				
b	b	e	# of hits				
b	c	IO Expander					io expander settings. All entries in this category are read only!
b	c	a	Enabled				Device enabled. "true" or "false"
b	c	b	Activate Tracking				Enable
b	c	c	Pin Configuration				Configuration of i/o-expander pins.
b	c	c	a	Initial Output(0=low,1=high)			Initial output logic value (bit 0..7 = pin 0..7).
b	c	c	b	Polarity Inversion (0=non,1=inv)			Select whether pin is active high (non-inverted) or active low (inverted) (bit 0..7 = pin 0..7).
b	c	c	c	Pin Direction (0=out,1=in)			Select whether pin is output or input (bit 0..7 = pin 0..7).
b	c	d	Status Bits				Configuration of status bits for each pin. Behavior depends on pin direction: For output pins: If any of the selected status bits is set, output level of the pin is active. If all the bits are clear, output is inactive. For input pins: If any of the pin input level is active, all selected status bits are set. If input level is inactive, all status bits are cleared.
b	c	d	a	Pin 0			
b	c	d	a	a	System Status		
b	c	d	a	b	GDR Evaluation Status		
b	c	d	a	c	Battery Status		
b	c	d	b	Pin 1			
b	c	d	b	a	System Status		
b	c	d	b	b	GDR Evaluation Status		
b	c	d	b	c	Battery Status		
b	c	d	c	Pin 2			
b	c	d	c	a	System Status		
b	c	d	c	b	GDR Evaluation Status		
b	c	d	c	c	Battery Status		
b	c	d	d	Pin 3			
b	c	d	d	a	System Status		
b	c	d	d	b	GDR Evaluation Status		
b	c	d	d	c	Battery Status		
b	c	d	e	Pin 4			
b	c	d	e	a	System Status		
b	c	d	e	b	GDR Evaluation Status		
b	c	d	e	c	Battery Status		
b	c	d	F	Pin 5			

b	c	d	f	a	System Status	
b	c	d	f	b	GDR Evaluation Status	
b	c	d	f	c	Battery Status	
b	c	d	g	Pin 6		
b	c	d	g	a	System Status	
b	c	d	g	b	GDR Evaluation Status	
b	c	d	g	c	Battery Status	
b	c	d	h	Pin 7		
b	c	d	h	a	System Status	
b	c	d	h	b	GDR Evaluation Status	
b	c	d	h	c	Battery Status	
b	d	LTE-Modem				
b	d	a	Enabled			Device enabled. Read Only! "true" or "false"
b	d	b	Uart No			Number of Uart used for LTE-Modem Read Only!
b	d	c	SIM PIN			PIN 1 of installed SIM-card. Leave empty if PIN is disabled.
b	d	d	PLMN			Your service provider's PLMN. Leave empty for auto-detect.
b	d	e	APN			Your service provider's APN. Use "!<APN>" for private APN.
b	d	f	PPP			
b	d	f	a	Username		Username for PPP-authentication.
b	d	f	b	Password		Password for PPP-authentication.
b	d	g	Routes			Ipv4-address plus subnet mask. Not implemented!
b	d	g	a	Route 0		
b	d	g	b	Route 1		
b	d	g	c	Route 2		
b	d	g	d	Route 3		
b	e	Radio-Modem				
b	e	a	Enabled			Device enabled. Read Only! "true" or "false"
b	e	b	Uart No			Number of Uart used for Radio-Modem Read Only!
b	e	c	Tx Power Level			Transmission Power Level 0 = 1mW, 1 = 23 mW, 2 = 100 mW, 3 = 158 mW, 4 = 316 mW Read Only! Minimum distance between sender and receiver dependent on power level needed!
b	e	d	Address			Address of destination module
b	e	d	a	high		high 32 bit of Address
b	e	d	b	low		low 32 bit of Address
b	e	e	Security Key			16 byte security key for encryption (all 0 = off) Read Only! All probes must use the same key!
b	e	f	Listen Time			Time (in 100 ms) the device listens for ongoing transmissions before starting to send (0 = start without listening)
b	e	g	PPP			

b	e	g	a	Username	Username for PPP-authentication.
b	e	g	b	Password	Password for PPP-authentication.
b	e	h	Routes		Ipv4-address plus subnet mask. Not implemented!
b	e	h	a	Route 0	
b	e	h	b	Route 1	
b	e	h	c	Route 2	
b	e	h	d	Route 3	
b	f	GPS			
b	f	a	Enabled		Device enabled. Read Only! "true" or "false"
b	f	b	Uart No		Number of Uart used for Radio-Modem Read Only!
b	f	c	Fix Timeout		Seconds after which GPS-module is turned off if no fix can be acquired.
b	f	d	Execute		Acquire GPS-fix starting from this time. In seconds since 01/01/2000 00:00:00.
b	f	e	Repeat		Seconds until next GPS-fix acquisition.
b	g	Uarts			
b	g	a	Bluetooth		Bluetooth device settings.
b	g	a	a	PIN Code	Bluetooth PIN needed for pairing
b	g	a	b	Transmission Power	Device's transmission power level in dBm. Allowed values are 16, 12, 8, 4, 0, -4, -8 and -12.
b	g	b	Baud Rates		Baud rate settings for the UARTs available on the system. All entries in this category are read only! Allowed values are 9600, 38400, 57600, 115200 and 230400.
b	g	b	a	Uart0 Baud Rate	
b	g	b	b	Uart2 Baud Rate	
b	g	b	c	Uart3 Baud Rate	
b	g	b	d	Uart4 Baud Rate	
b	g	B	e	Uart5 Baud Rate	
c	GDR				Parameters for calculation of GDR.
c	a	Enable			Tasks for GDR Measurement All entries in this category are read only!
c	a	a	Measurement		GDR measurement task (CollGDR) is active ("true" or "false").
c	a	b	Calculation		GDR calculation task (GDRCalc) is active ("true" or "false").
c	b	Minimum Aggregation Ratio			Minimum fraction of aggregation time, that marks the measured value as valid (default: 0.8)
c	c	Location Correction			User defined gamma dose rate value in µSv/h to be subtracted from the measured value (default: 0 µSv/h)
c	d	Thresholds			Parameters for gamma dose rate threshold evaluation
c	d	a	Interval 0		Thresholds for aggregation time interval 0.
c	d	a	a	Number of Thresholds	Number of threshold values used. 0: no threshold evaluation, 1: upper value only, 2: both thresholds
c	d	a	b	Lower Value	Threshold 1 (lower than threshold 2)
c	d	a	c	Upper Value	Threshold 2 (greater than threshold 1)
c	d	a	d	Violation Time	Time in minutes for which the lower threshold value has to be exceeded before an alarm is raised.
c	d	b	Interval 1		Thresholds for aggregation time interval 1.
c	d	b	a	Number of Thresholds	Number of threshold values used. 0: no threshold evaluation, 1: upper value only, 2: both thresholds

c	d	b	b	Lower Value	Threshold 1 (lower than threshold 2)
c	d	b	c	Upper Value	Threshold 2 (greater than threshold 1)
c	d	b	d	Violation Time	Time in minutes for which the lower threshold value has to be exceeded before an alarm is raised.
c	d	c	Interval 2		Thresholds for aggregation time interval 2.
c	d	c	a	Number of Thresholds	Number of threshold values used. 0: no threshold evaluation, 1: upper value only, 2: both thresholds
c	d	c	b	Lower Value	Threshold 1 (lower than threshold 2)
c	d	c	c	Upper Value	Threshold 2 (greater than threshold 1)
c	d	c	d	Violation Time	Time in minutes for which the lower threshold value has to be exceeded before an alarm is raised.
c	e	GDR Ranges			Gamma Dose Rate limits for GDR Range State Machine
c	f	HD Tube			HD-Tube Characteristics. All entries in this category are read only! Changes can yield wrong GDR measurements.
c	f	a	Sensitivity		Calibration factor e in (cpm / (µSv/h)).
c	f	b	Deadtime		Dead time correct factor τ in minutes.
c	f	d	Self Effect(T)		Correction for temperature dependent self-effect.
c	g	LD Tube			LD-Tube Characteristics. All entries in this category are read only! Changes can yield wrong GDR measurements.
c	g	a	Sensitivity		Calibration factor e in (cpm / (µSv/h)).
c	g	b	Deadtime		Dead time correct factor τ in minutes.
c	g	d	Self Effect(T)		Correction for temperature dependent self-effect.
c	h	Self Tests			All entries in this category are read only!
c	h	a	Minimum Criterion HD		Minimum activity to identify the HD-tube as operational.
c	h	a	a	Pulses	Minimum number of counts.
c	h	a	b	Test Time	Duration of test in minutes.
c	h	b	Minimum Criterion LD		Minimum activity to identify the LD-tube as operational.
c	h	b	a	Pulses	Minimum number of counts.
c	h	b	b	Test Time	Duration of test in minutes.
c	h	c	Plausibility Check		Comparison of LD-tube and HD-tube gamma dose rates
c	h	c	a	Short Term Ratio	Parameter R1 of the short term comparison
c	h	c	b	Long Term Ratio	Parameter R3 of the long term comparison
d	Battery Monitor				Battery Monitor settings
d	a	Enabled			Battery monitoring task (BatMon) is active ("true" or "false").
d	b	Status Transitions			Battery status bits parameters.
d	b	a	Capacity		Limits for battery status bits BatteryLow, BatterySerious and BatteryCritical.
d	b	a	a	From Normal to Low (mA)	BatteryLow=0, BatterySerious=0, BatteryCritical=0 → BatteryLow=1, BatterySerious=0, BatteryCritical=0
d	b	a	b	From Low to Normal (mA)	BatteryLow=1, BatterySerious=0, BatteryCritical=0 → BatteryLow=0, BatterySerious=0, BatteryCritical=0
d	b	a	c	From Low to Serious (mA)	BatteryLow=1, BatterySerious=0, BatteryCritical=0 → BatteryLow=0, BatterySerious=1, BatteryCritical=0
d	b	a	d	From Serious to Low (mA)	BatteryLow=0, BatterySerious=1, BatteryCritical=0 → BatteryLow=1, BatterySerious=0, BatteryCritical=0
d	b	a	e	From Serious to Critical (mA)	BatteryLow=0, BatterySerious=1, BatteryCritical=0 → BatteryLow=0, BatterySerious=0, BatteryCritical=1

d	b	a	f		From Critical to Serious (mA)	BatteryLow=0, BatterySerious=0, BatteryCritical=1 → BatteryLow=0, BatterySerious=1, BatteryCritical=0
d	b	b	Voltage			Limits for battery status bits VoltageLow and VoltageCritical.
d	b	b	a		From Normal to Low (V)	VoltageLow=0, VoltageCritical=0 → VoltageLow=1, VoltageCritical=0
d	b	b	b		From Low to Normal (V)	VoltageLow=1, VoltageCritical=0 → VoltageLow=0, VoltageCritical=0
d	b	b	c		From Low to Critical (V)	VoltageLow=1, VoltageCritical=0 → VoltageLow=0, VoltageCritical=1
d	b	b	d		From Critical to Low (V)	VoltageLow=0, VoltageCritical=1 → VoltageLow=1, VoltageCritical=0
d	c	Parameters				Battery parameters
d	c	a	Nominal Battery Capacity (mAh)			Total battery capacity.
d	c	b	Maximum Voltage (V)			Battery voltage when fully charged.
d	c	c	Minimum Voltage (V)			Battery voltage when empty (0=ignore).
d	c	d	Average Current Usage (mA)			Initial current estimate
d	c	e	Current Average Weighting			Weighting factor for current averaging
d	c	f	Trickle Charge			Parameters for trickle charge detection
d	c	f	a		Current Limit (mA)	Maximum averaged current for trickle charge.
d	c	f	b		Current Average Weighting	Weighting factor for capacity correction in trickle charge.
d	c	g	Open Circiut			Parameters for open circuit.
d	c	g	a		Current Limit (mA)	Open circuit minimum averaged current.
d	c	g	b		Current Peak Limit (mA)	Open circuit minimum peak current.
d	c	g	c		Capacity Weighting	Weighting factor for capacity estimation using voltage.
d	c	g	d		Voltage Count	Number of times the conditions have to be fulfilled consecutively in order to qualify for open circuit.
e	Accuracy Test					Accuracy Test settings
e	a	Enabled				Accuracy test task (AccTest) is active ("true" or "false").
f	Storage					
f	a	SD-Card Saver				Settings for the task saving data to SD-card.
f	a	a	Enabled			data storage task (SDSaver) is active ("true" or "false").
f	a	b	Execute			Access SD-card for regular data storage starting from this time. In seconds since 01/01/2000 00:00:00.
f	a	c	Repeat			Seconds until next regular data storage to SD-card.
f	b	Ring Buffers				All entries in this category are read only! Editing entries from this category will have unpredictable consequences!
f	b	a	System			
f	b	a	a	System Status		Buffer for changes in system status.
f	b	a	a	a	Filename	Name of file.
f	b	a	a	b	Definition	Definition code of internal structure
f	b	a	a	c	Directory Level	Directory level: 7 = store in base directory, 0 = directory based on year, 1 = directory based on month, 2 = directory based on day, 3 = directory based on hour, 4 = directory based on minute, 5 = directory based on second.
f	b	a	a	d	Size	# of buffer entries.
f	b	a	b	Evaluation Status		Buffer for changes in evaluation status.
f	b	a	b	a	Filename	Name of file.
f	b	a	b	b	Definition	Definition code of internal structure
f	b	a	b	c	Directory Level	Directory level: 7 = store in base directory, 0 = directory based on year,

						1 = directory based on month, 2 = directory based on day, 3 = directory based on hour, 4 = directory based on minute, 5 = directory based on second.
f	b	a	b	d	Size	# of buffer entries.
f	b	b	GDR			
f	b	b	a	Base Interval		Buffer for GDR measurements on interval 0.
f	b	b	a	a	Filename	Name of file.
f	b	b	a	b	Definition	Definition code of internal structure
f	b	b	a	c	Directory Level	Directory level: 7 = store in base directory, 0 = directory based on year, 1 = directory based on month, 2 = directory based on day, 3 = directory based on hour, 4 = directory based on minute, 5 = directory based on second.
f	b	b	a	d	Size	# of buffer entries.
f	b	b	b	Interval 1		Buffer for GDR measurements on interval 1.
f	b	b	b	a	Filename	Name of file.
f	b	b	b	b	Definition	Definition code of internal structure
f	b	b	b	c	Directory Level	Directory level: 7 = store in base directory, 0 = directory based on year, 1 = directory based on month, 2 = directory based on day, 3 = directory based on hour, 4 = directory based on minute, 5 = directory based on second.
f	b	b	b	d	Size	# of buffer entries.
f	b	b	c	Interval 2		Buffer for GDR measurements on interval 2.
f	b	b	c	a	Filename	Name of file.
f	b	b	c	b	Definition	Definition code of internal structure
f	b	b	c	c	Directory Level	Directory level: 7 = store in base directory, 0 = directory based on year, 1 = directory based on month, 2 = directory based on day, 3 = directory based on hour, 4 = directory based on minute, 5 = directory based on second.
f	b	b	c	d	Size	# of buffer entries.
f	b	c	Battery Monitor			Buffer for battery monitoring.
f	b	c	a	Interval 1		
f	b	c	a	a	Filename	Name of file.
f	b	c	a	b	Definition	Definition code of internal structure
f	b	c	a	c	Directory Level	Directory level: 7 = store in base directory, 0 = directory based on year, 1 = directory based on month, 2 = directory based on day, 3 = directory based on hour, 4 = directory based on minute, 5 = directory based on second.
f	b	c	a	d	Size	# of buffer entries.
f	b	d	GPS			
f	b	d	a	Data		Buffer for GPS-coordinates.
f	b	d	a	a	Filename	Name of file.
f	b	d	a	b	Definition	Definition code of internal structure
f	b	d	a	c	Directory Level	Directory level: 7 = store in base directory, 0 = directory based on year, 1 = directory based on month, 2 = directory based on day, 3 = directory based on hour, 4 = directory based on minute, 5 = directory based on second.
f	b	d	a	d	Size	# of buffer entries.
f	b	e	Base Directory			Directory where data files are stored.
g	Communication					Settings for connections using protocol buffers.

g	a	Enabled					Communication task (Comm) is actvie ("true" or "false").
g	b	Station Id					Identification number for data server communication.
g	c	# of Retries					Number of tries to open a socket connection to any data server before aborting the communication attempt.
g	d	Time Servers					List of Ipv4-Addresses of NTP-Servers.
g	e	Central Connection Information					Settings for communication with central server(s).
g	e	a	Central 0				Connection information for central 0.
g	e	a	a	Enabled			Try to communicate with this data server? ("true" or "false")
g	e	a	b	Execution Time			Communication time definitions
g	e	a	b	a	Time Offset		First time to start a communication attempt. In seconds since 01/01/2000 00:00:00.
g	e	a	b	b	Repeat Base		Communication can take place every n seconds starting from Time Offset.
g	e	a	b	c	Window Size		Communication Time Window (0=off). Communication can only take place from (Time Offset + n×Repeat Base) till (Time Offset + n×Repeat Base + Window Size).
g	e	a	b	d	Repeat On Success		If data server does not specify anything at the end of communication, use this to calculate next communication time.
g	e	a	b	e	Repeat On Failure		If communication cannot be established / ended successfully, use this to calculate next communication time.
g	e	a	c	Spontaneous Calls			Immediate communication triggers
g	e	a	c	a	System Status		Spontaneous calls to data server based on system status.
g	e	a	c	b	GDR Evaluation		Spontaneous calls to data server based on evaluation status.
g	e	a	c	c	Battery Status		Spontaneous calls to data server based on battery status.
g	e	a	d	Device List			List of devices used to contact the server
g	e	a	d	a	Device 0		0: device (0=ethernet, 1=lte(tcp/ip), 2=radio(tcp/ip), 3=rs485(tcp/ip), 12=radio(serial), 13=rs485(serial), 14=rs232(serial), 15=bluetooth(serial), -1=disabled) 1: server ip-address 2: server port (default=31000) 3: SNTP-server address 4: SNTP timeout
g	e	a	d	b	Device 1		
g	e	a	d	c	Device 2		
g	e	a	d	d	Device 3		
g	e	b	Central 1				Connection information for central 1.
g	e	b	a	Enabled			Try to communicate with this data server? ("true" or "false")
g	e	b	b	Execution Time			Communication time definitions
g	e	b	b	a	Time Offset		First time to start a communication attempt. In seconds since 01/01/2000 00:00:00.
g	e	b	b	b	Repeat Base		Communication can take place every n seconds starting from Time Offset.
g	e	b	b	c	Window Size		Communication Time Window (0=off). Communication can only take place from (Time Offset + n×Repeat Base) till (Time Offset + n×Repeat Base + Window Size).
g	e	b	b	d	Repeat On Success		If data server does not specify anything at the end of communication, use this to calculate next communication time.
g	e	b	b	e	Repeat On Failure		If communication cannot be established / ended successfully, use this to calculate next communication time.
g	e	b	c	Spontaneous Calls			Immediate communication triggers
g	e	b	c	a	System Status		Spontaneous calls to data server based on system status.
g	e	b	c	b	GDR Evaluation		Spontaneous calls to data server based on evaluation status.
g	e	b	c	c	Battery Status		Spontaneous calls to data server based on battery status.

g	e	b	d	Device List		List of devices used to contact the server
g	e	b	d	a	Device 0	0: device (0=ethernet, 1=lte(tcp/ip), 2=radio(tcp/ip), 3=rs485(tcp/ip), 12=radio(serial), 13=rs485(serial), 14=rs232(serial), 15=bluetooth(serial), -1=disabled) 1: server ip-address 2: server port (default=31000) 3: SNTP-server address 4: SNTP timeout
g	e	b	d	b	Device 1	
g	e	b	d	c	Device 2	
g	e	b	d	d	Device 3	
g	e	c	Central 2			Connection information for central 2.
g	e	c	a	Enabled		Try to communicate with this data server? ("true" or "false")
g	e	c	b	Execution Time		Communication time definitions
g	e	c	b	a	Time Offset	First time to start a communication attempt. In seconds since 01/01/2000 00:00:00.
g	e	c	b	b	Repeat Base	Communication can take place every n seconds starting from Time Offset.
g	e	c	b	c	Window Size	Communication Time Window (0=off). Communication can only take place from (Time Offset + n×Repeat Base) till (Time Offset + n×Repeat Base + Window Size).
g	e	c	b	d	Repeat On Success	If data server does not specify anything at the end of communication, use this to calculate next communication time.
g	e	c	b	e	Repeat On Failure	If communication cannot be established / ended successfully, use this to calculate next communication time.
g	e	c	c	Spontaneous Calls		Immediate communication triggers
g	e	c	c	a	System Status	Spontaneous calls to data server based on system status.
g	e	c	c	b	GDR Evaluation	Spontaneous calls to data server based on evaluation status.
g	e	c	c	c	Battery Status	Spontaneous calls to data server based on battery status.
g	e	c	d	Device List		List of devices used to contact the server
g	e	c	d	a	Device 0	0: device (0=ethernet, 1=lte(tcp/ip), 2=radio(tcp/ip), 3=rs485(tcp/ip), 12=radio(serial), 13=rs485(serial), 14=rs232(serial), 15=bluetooth(serial), -1=disabled) 1: server ip-address 2: server port (default=31000) 3: SNTP-server address 4: SNTP timeout
g	e	c	d	b	Device 1	
g	e	c	d	c	Device 2	
g	e	c	d	d	Device 3	
g	e	d	Central 3			Connection information for central 3.
g	e	d	a	Enabled		Try to communicate with this data server? ("true" or "false")
g	e	d	b	Execution Time		Communication time definitions
g	e	d	b	a	Time Offset	First time to start a communication attempt. In seconds since 01/01/2000 00:00:00.
g	e	d	b	b	Repeat Base	Communication can take place every n seconds starting from Time Offset.
g	e	d	b	c	Window Size	Communication Time Window (0=off). Communication can only take place from (Time Offset + n×Repeat Base) till (Time Offset + n×Repeat Base + Window Size).
g	e	d	b	d	Repeat On Success	If data server does not specify anything at the end of communication, use this to calculate next communication time.
g	e	d	b	e	Repeat On Failure	If communication cannot be established / ended successfully, use this to calculate next communication time.
g	e	d	c	Spontaneous Calls		Immediate communication triggers
g	e	d	c	a	System Status	Spontaneous calls to data server based on system status.

g	e	d	c	b	GDR Evaluation	Spontaneous calls to data server based on evaluation status.
g	e	d	c	c	Battery Status	Spontaneous calls to data server based on battery status.
g	e	d	d	Device List		List of devices used to contact the server
g	e	d	d	a	Device 0	0: device (0=ethernet, 1=lte(tcp/ip), 2=radio(tcp/ip), 3=rs485(tcp/ip), 12=radio(serial), 13=rs485(serial), 14=rs232(serial), 15=bluetooth(serial), -1=disabled) 1: server ip-address 2: server port (default=31000) 3: SNTP-server address 4: SNTP timeout
g	e	d	d	b	Device 1	
g	e	d	d	c	Device 2	
g	e	d	d	d	Device 3	
g	e	e	Central 4			Connection information for central 4.
g	e	e	a	Enabled		Try to communicate with this data server? ("true" or "false")
g	e	e	b	Execution Time		Communication time definitions
g	e	e	b	a	Time Offset	First time to start a communication attempt. In seconds since 01/01/2000 00:00:00.
g	e	e	b	b	Repeat Base	Communication can take place every n seconds starting from Time Offset.
g	e	e	b	c	Window Size	Communication Time Window (0=off). Communication can only take place from (Time Offset + n×Repeat Base) till (Time Offset + n×Repeat Base + Window Size).
g	e	e	b	d	Repeat On Success	If data server does not specify anything at the end of communication, use this to calculate next communication time.
g	e	e	b	e	Repeat On Failure	If communication cannot be established / ended successfully, use this to calculate next communication time.
g	e	e	c	Spontaneous Calls		Immediate communication triggers
g	e	e	c	a	System Status	Spontaneous calls to data server based on system status.
g	e	e	c	b	GDR Evaluation	Spontaneous calls to data server based on evaluation status.
g	e	e	c	c	Battery Status	Spontaneous calls to data server based on battery status.
g	e	e	d	Device List		List of devices used to contact the server
g	e	e	d	a	Device 0	0: device (0=ethernet, 1=lte(tcp/ip), 2=radio(tcp/ip), 3=rs485(tcp/ip), 12=radio(serial), 13=rs485(serial), 14=rs232(serial), 15=bluetooth(serial), -1=disabled) 1: server ip-address 2: server port (default=31000) 3: SNTP-server address 4: SNTP timeout
g	e	e	d	b	Device 1	
g	e	e	d	c	Device 2	
g	e	e	d	d	Device 3	
g	e	f	Special			List of settings for connections used in Updater and Configuration Mode.
g	e	f	a	Updater		Connection information for Updater.
g	e	f	a	Execution Time		Communication time definitions do not edit any entries in this category!
g	e	f	a	a	Time Offset	= 0
g	e	f	a	b	Repeat Base	= 10
g	e	f	a	c	Window Size	= 0
g	e	f	a	d	Repeat On Success	= 20
g	e	f	a	e	Repeat On Failure	= 30
g	e	f	a	b	Spontaneous Calls	Immediate communication triggers do not edit any entries in this category!
g	e	f	a	b	System Status	= 0x00000001
g	e	f	a	b	GDR Evaluation	= 0x00000000

g	e	f	a	b	d	Battery Status	= 0x00000000
g	e	f	a	c		Device List	List of devices used to contact the server
g	e	f	a	c	a	Device 0	0 (ethernet); 82.194.117.14; 31111; 0.0.0.0; 21000
g	e	f	a	c	b	Device 1	1 (lte(tcp/ip)); 82.194.117.14; 31111; 0.0.0.0; 21000
g	e	f	a	c	c	Device 2	2 (radio(tcp/ip)); 82.194.117.14; 31111; 0.0.0.0; 21000
g	e	f	a	c	d	Device 3	-1 (disabled)
g	e	f	b			Service Mode	Connection information for Service Mode. do not edit any entries in this category!
g	e	f	b	a		Execution Time	
g	e	f	b	a	a	Time Offset	= never
g	e	f	b	a	b	Repeat Base	= never
g	e	f	b	a	c	Window Size	= 0
g	e	f	b	a	d	Repeat On Success	= never
g	e	f	b	a	e	Repeat On Failure	= never
g	e	f	b	b		Spontaneous Calls	
g	e	f	b	b	a	System Status	= 0x00000002
g	e	f	b	b	b	GDR Evaluation	= 0x00000000
g	e	f	b	b	d	Battery Status	= 0x00000000
g	e	f	b	c		Device List	
g	e	f	b	c	a	Device 0	15 (bluetooth(serial)); 0x0000000a; 0x00000000; 115200 baud; 0.0.0.0
g	e	f	b	c	b	Device 1	-1 (disabled)
g	e	f	b	c	c	Device 2	-1 (disabled)
g	e	f	b	c	d	Device 3	-1 (disabled)

10.3.2.3 ETHERNET

Control ethernet adapter.

Command: ethernet

```
MIRA> help ethernet
Usage: ethernet <action> [<action> [...]]
   parameter <action> is one out of:
      on                   = turn on ethernet
      off                  = turn off ethernet
      dhcp                 = set dynamic ip
      ip <ip address>      = set static ip
      mask <subnet mask>   = set subnet mask
      gateway <ip address> = set gateway
      dly <n> = delay action by n milliseconds
```

Example: ethernet

```
 MIRA> ethernet dhcp on dly 2500 off
   eth0 dhcp: automatic ip
eth0: Waiting for ethernet cable plug in ...
eth0: Cable connected
eth0: Contacting DHCP server ...
eth0: IP address bound successfully.
eth0: IP Address      : 192.168.150.15
eth0: Subnet Address  : 255.255.248.0
eth0: Gateway Address : 192.168.144.6
eth0: DNS Address     : 192.168.145.20 delay for 2500 ms
```

10.3.2.4 GMTPIC

Control GDR measurement devices.

Command: gmtpic

```
MIRA> help gmtpic
Usage: gmtpic <action> [<action> [...]]
   parameter <action> is one out of:
      hr      = Switch to high frequency on pic
      lr      = Switch to low frequency on pic
      hdon    = Switch HV for HD on
```

```
      hdoff    = Switch HV for HD off
      ldon     = Switch HV for LD on
      ldoff    = Switch HV for LD off
      dly <n> = delay action by n milliseconds
```

Example: gmtpic

```
MIRA> gmtpic ldon hr hdon
```

10.3.2.5 LTE

Control LTE-modem.

Command: lte

```
MIRA> help lte
Usage: lte <action> [<action> [...]]

   parameter <action> is one out of:

      on          = turn on els61
      off         = turn off els61
      dialin      = open PPP connection
      hangup      = close PPP connection
      simid       = print SIM Id
      signal <n> = check signal quality n times
      2g          = register to GPRS
      4g          = register to LTE
      dly <n>     = delay action by n milliseconds
```

Example: lte

```
MIRA> lte simid
   els61 sim id: Unknown
MIRA> lte on dly 250 simid


LTE: Data Carrier lost!
LTE: Data Carrier detected!
LTE: Data Carrier lost!
LTE: trying to configure modem.
LTE: power reduction level set to 0
```

```
LTE: operator mode = -2
LTE: deregister from network
LTE: modem configured successfully
LTE: at command timed out!
LTE: operator mode = -2
LTE: deregister from network
LTE: wait for +PBready!
LTE: at command timed out!
LTE: at command timed out!
LTE: at command timed out!
LTE: at command timed out!
LTE: SIM PIN authentication URC.
LTE: at command timed out!
LTE: operator mode = 0
LTE: operator mode = 0
LTE: already in automatic mode
LTE: operator mode = 0
LTE: Modem ready delay for 250 ms
   els61 sim id: 89492023175232772273

MIRA> lte signal 10

 testing signal 10 times

LTE: RSRQ = -16 dBm
LTE: camping on 4G cell, Quality: 6
   els61 signal quality: 6

LTE: RSRQ = -16 dBm
LTE: camping on 4G cell, Quality: 6
   els61 signal quality: 6
```

```
LTE: RSRQ = -18 dBm
LTE: camping on 4G cell, Quality: 6
   els61 signal quality: 6

LTE: RSRQ = -17 dBm
LTE: camping on 4G cell, Quality: 6
   els61 signal quality: 6

LTE: RSRQ = -16 dBm
LTE: camping on 4G cell, Quality: 6
   els61 signal quality: 6

LTE: RSRQ = -16 dBm
LTE: camping on 4G cell, Quality: 6
   els61 signal quality: 6

LTE: RSRQ = -16 dBm
LTE: camping on 4G cell, Quality: 6
   els61 signal quality: 6

LTE: RSRQ = -15 dBm
LTE: camping on 4G cell, Quality: 5
   els61 signal quality: 5

LTE: RSRQ = -15 dBm
LTE: camping on 4G cell, Quality: 5
   els61 signal quality: 5

LTE: RSRQ = -15 dBm
LTE: camping on 4G cell, Quality: 5
```

```
   els61 signal quality: 5

MIRA> lte dialin dly 5000 hangup off

LTE: signal quality very poor.
LTE: Data Carrier detected!
LTE: modem connected!
ppp: Trying to initiate PPP connection.  Waiting...
ppp: local  ip: 10.241.184.3
     remote ip: 0.0.0.0
LTE: PPP-Connection established delay for 5000 ms

LTE: modem received NC message.
LTE: Data Carrier lost!

LTE: turned off
```

10.3.2.6 GPS

Turn GPS-module on and off and starts GPS-coordinate measurement.

Command: gps

```
MIRA> help gps
Usage: gps <action> [<action> [...]]
   parameter <action> is one out of:
      on      = turn on CondorC2626
      off     = turn off CondorC2626
      start   = start GPS-fix acquisition
      stop    = stop GPS-fix acquisition
      dly <n> = delay action by n milliseconds
```

Example: gps

```
MIRA> gps on dly 5000 off
 delay for 5000 ms
```

10.3.2.7 Radio

Control radio-modem

Command: radio

```
MIRA> help radio
Usage: radio <action> [<action> [...]]
   parameter <action> is one out of:
      on      = turn on XBeeProS5
      off     = turn off XBeeProS5
      ppp on  = open PPP connection
      ppp off = close PPP connection
      dly <n> = delay action by n milliseconds
```

Example: radio

```
MIRA> radio on dly 250 ppp on
xbeepros5: turning on
xbeepros5: sending "+++"
xbeepros5: (2) "OK"
modem: sending "AT"
xbeepros5: (2) "OK"
modem: sending "ATCN"
xbeepros5: (2) "OK"
xbeepros5: Modem ready delay for 250 ms
ppp: hdlc initialization
ppp: initialization
ipcp_bind: called
ppp_open: called
ppp: Trying to initiate PPP connection.  Waiting...
ipcp: lower up
ppp: link up.
ppp: link up
 PPP device bound.
    local  address: 192.168.150.16
    remote address: 192.168.150.49
    connection established on 192.168.150.49
xbeepros5: PPP-Connection established

MIRA> radio ppp off dly 500 off
```

```
ppp: link down.
ipcp: lower down
PPP connection closed delay for 500 ms
xbeepros5: turning off
xbeepros5: closing ppp
PPP connection closed
xbeepros5: turning off uart
xbeepros5: turning off GPIOs
xbeepros5: power off
xbeepros5: turned off
```

10.3.2.8 REFLASH

Select firmware file, reboot and install.

Command: reflash

```
Usage: reflash <n>
   reload firmware from SDCard
   configured files:
      0   a:\FIRMWARE\Updater.sbf
      1   a:\FIRMWARE\Factory.sbf
      2   a:\FIRMWARE\Firmware.sbf
   installed: 11 version=1.0.0
```

Example: reflash

```
MIRA> reflash 2

STIEFL
options:
   1: load a:\FIRMWARE\Updater.sbf
   2: load a:\FIRMWARE\Factory.sbf
   3: load a:\FIRMWARE\Firmware.sbf
   4: enter shell
   5: enter updater
   7: force reinstall
   8: reload configuration
   9: reset boot parameters
   0: enter sleep mode
```

```
selected: 3
installed: none
.....
```

10.3.2.9 RESET

Reboot the device.

Command: reset

```
MIRA> help reset
Usage: reset
   resets the system
```

No short help available for this command.

Example: reset

```
MIRA> reset
STIEFL
options:
   1: load a:\FIRMWARE\Updater.sbf
   2: load a:\FIRMWARE\Factory.sbf
   3: load a:\FIRMWARE\Firmware.sbf
   4: enter shell
   5: enter updater
   7: force reinstall
   8: reload configuration
   9: reset boot parameters
   0: enter sleep mode
selected: 3
installed: shell
.....
```

10.3.2.10 SDCARD

Turn SD-card on and off.

Command: sdcard

```
MIRA> help sdcard
Usage: sdcard <on|off>
```

```
   on    = Enable the sdcard
   off   = Disable the sdcard
```

Example: sdcard

```
MIRA> sdcard on
sd-card turned on successfully.


MIRA> sdcard off
sd-card turned off successfully.
```

10.3.2.11 SYNCTIME

Contact NTP-server and perform time sync. Needs open TCP/IP connection (e.g. ethernet, lte or radio).

Command: synctime

```
MIRA> help synctime
Usage: synctime [<ip-address> [<ip-address> [<ip-address> [<ip-address>
[<ip-address>]]]]]
   tries to synchronise system time against a list of ntp-servers.
   ip-address    = IP-Address of time server (up to 5 times)
                   if no time server is given, the default list
                   of time servers from configuration is used.
```

Example: synctime

```
MIRA> synctime
using 192.53.103.108
using 192.53.103.104
using 192.53.103.103


sntp: failed to send: server ip = 192.53.103.108
sntp: failed to send: server ip = 192.53.103.104
sntp: failed to send: server ip = 192.53.103.103 MIRA>
MIRA>
MIRA> ethernet on


eth0: IP address bound successfully.
eth0: IP Address  : 192.168.150.34/255.255.248.0
eth0: Gateway Address : 192.168.144.6
MIRA>
MIRA> synctime
using 192.53.103.108
```

```
using 192.53.103.104
using 192.53.103.103


SNTP ok


New time: 15.02.2016 08:48:48 UTCMIRA>
MIRA>
MIRA> synctime 192.168.145.66


SNTP ok


New time: 15.02.2016 08:49:04 UTCMIRA>
MIRA>
MIRA> ethernet off
```

10.3.2.12 TEST

Perform device test.

Command: test

```
MIRA> help test
Usage: test <device> [<device>]...
   dip
   ethernet
   gasgauge
   gmtpic
   gps
   ioexp
   lte
   moisture
   radio
   rainpic
   sdcard
   tmp100
   or  all
```

Example: test

```
MIRA> test ethernet
```

```
eth0: IP address bound successfully.
testEthernet:
   SNTP ok
   ip: 192.168.146.109
{ethernet[OK,25.03.2015 09:09:31 UTC,3135,DOK,IPOK,192.168.146.109]}

MIRA> test tmp100
testTMP100:
   temperature: 22.500000 °C
{tmp100[OK,18.03.2014 09:42:10 UTC,250,COK,22.500000]}

MIRA> test sdcard gasgauge
testSDCard:
   Bytes written: 14
   Bytes read: 14
   Success!
{sdcard[OK,25.03.2015 09:07:42 UTC,195,DOK,Success]}
testSTC3100:
   Unique Id: 10:012ce34b0500:7d
   Q = -134.322250 mAh
   I = 0.000000 mA
   U = 4.416400 V
{gasgauge[OK,25.03.2015 09:07:42 UTC,31,COK,10:012ce34b0500:7d,-
134.322250,0.000000,4.416400,n/a]}
```

10.3.2.13 UPDATE

Use custom IP-address and port to connect to a server and try to update firmware.

Command: update

```
MIRA> help update
Usage: update <ip address> [<port>]
   ip address = server ip address
   port       = server port (default=31000)
   stop       = stop current communication
```

Example: update

```
MIRA> update 192.168.150.14
contacting server: 192.168.150.14:31000
data servers: unknown server
MIRA>
eth0: IP address bound successfully.
connection: tcpip: connecting to 192.168.150.14:31000 connected.
MIRA> update stop
```

```
stopping communication...
connection: received stop
connection: closing...
connection: communication successful
connection: duration: 9046 ms
connection: communication finished after 19 sec
connection: next at 25.03.2015 08:55:30 UTC
comm: stopping current transmission
comm task: connection successfulterminating ...
comm: finished communication stopped
```

10.4 Parameters in NMC

In the following table configuration elements are listed.

If certain parameters are changed the MIRA performs a reset (marked with “y” in column “Requires Reset”).

Name	Description	Requires Reset
Station ID	Unique ID for registration in NMC.	n
Continuous Seft-Test Mode	Enable continuous seft-test mode. In this mode both GM-tubes are always on.	n
Ethernet: Automatic IP-Address	Contact DHCP-Server to obtain IP-address.	n
Ethernet: Static IP-Address	Static IP-Address of ethernet adapter.	n
Ethernet: Subnet Mask	Subnet mask of ethernet adapter.	n
Ethernet: Gateway	Ethernet IP Gateway	n
Ethernet: Route 0	Route 0 for ethernet modem.	n
Ethernet: Route 1	Route 1 for ethernet modem.	n
Ethernet: Route 2	Route 2 for ethernet modem.	n
Ethernet: Route 3	Route 3 for ethernet modem.	n
Bluetooth: PIN Code	PIN Code required for pairing. Default is "0562".	n
Bluetooth: Tx Power Level	Bluetooth module's transmit power in dBm. Default value is 16 dBm.	n
LTE: SIM-PIN	PIN of LTE-Modem SIM-Card.	n
LTE: PLMN	PLMN for LTE-Modem.	n
LTE: APN	APN for LTE-Modem. Use "!<APN>" for private APN.	n
LTE: PPP User Name	User name for LTE-Modem PPP-Tunnel.	n
LTE: PPP Password	Password for LTE-Modem PPP-Tunnel.	n
LTE: Route 0	Route 0 for LTE-Modem.	n
LTE: Route 1	Route 1 for LTE-Modem.	n
LTE: Route 2	Route 2 for LTE-Modem.	n
LTE: Route 3	Route 3 for LTE-Modem.	n
Radio: TX Power Level	Radio-Modem transmission power level.	y
Radio: Address (High)	Central radio unit device address (High).	n
Radio: Address (Low)	Central radio unit device address (low).	n
Radio: Security Key	16 byte security key for radio transmission.	y

Name	Description	Requires Reset
Radio: Listen Time	Time the radio-modem listens before opening the PPP-tunnel in 100 ms.	n
Radio: PPP User Name	User name for radio-modem PPP-Tunnel.	n
Radio: PPP Password	Password for radio-modem PPP-Tunnel.	n
Radio: Route 0	Route 0 for radio modem.	n
Radio: Route 1	Route 1 for radio modem.	n
Radio: Route 2	Route 2 for Radiomodem.	n
Radio: Route 3	Route 3 for Radiomodem.	n
GPS: Time Offset	Time offset for execution of GPS coordinate acquisition.	n
GPS: Time Interval	Time after which execution of GPS coordinate acquisition is repeated.	n
GDR Minimum Aggregation Ratio	GDR Minimum Aggregation Value	y
GDR Parameter: Location Correction	GDR Parameter: Location Correction	n
GDR 0 Number of Thresholds	0:No Threshold, 1:High Threshold only, 2:Both Thresholds	n
GDR 0 Threshold Lower Value (uSv/h)	Lower threshold value for GDR in uSv/h	n
GDR 0 Threshold Upper Value (uSv/h)	Upper threshold value for GDR in uSv/h	n
GDR 0 Violation Time (min)	Time in minutes for which the lower threshold value has to be exceeded before an alarm is raised.	n
GDR 1 Number of Thresholds	0: No Threshold, 1: High Threshold only, 2: Both Thresholds	n
GDR 1 Threshold Lower Value (uSv/h)	Lower threshold value for GDR in uSv/h	n
GDR 1 Threshold Upper Value (uSv/h)	Upper threshold value for GDR in uSv/h	n
GDR 1 Violation Time (min)	Time in minutes for which the lower threshold value has to be exceeded before an alarm is raised.	n
GDR 2 Number of Thresholds	0: No Threshold, 1: High Threshold only, 2: Both Thresholds	n
GDR 2 Threshold Lower Value (uSv/h)	Lower threshold value for GDR in uSv/h	n
GDR 2 Threshold Upper Value (uSv/h)	Upper threshold value for GDR in uSv/h	n
GDR 2 Violation Time (min)	Time in minutes for which the lower threshold value has to be exceeded before an alarm is raised.	n
Data Storage: Time Offset	Time offset for regular calls to data storage.	n
Data Storage: Time Interval	Time interval for regular calls to data storage.	n
Central 0	Enable central 0.	y

Name	Description	Requires Reset
Central 0: Time Offset	Time offset for regular calls to central 0.	n
Central 0: Basic Time Interval	Basic time interval for communication with central 0.	n
Central 0: Time Window	Length of time window in which connection to central 0 is allowed (0=infinite).	n
Central 0: Repeat on Success	Time after which connection to central 0 will be retried in case of success.	n
Central 0: Repeat on Failure	Time after which connection to central 0 will be retried in case of a failure.	n
Central 0: Device 0	Communication device id.	n
Central 0: Device 0: Port (TCP/IP)	Port of central 0.	n
Central 0: Device 0: Address (High) (Serial)	Address of central 0 serial receiver (high).	n
Central 0: Device 0: Address (TCP/IP)	IP-Address of central 0.	n
Central 0: Device 0: Address (Low) (Serial)	Address of central 0 serial receiver (low).	n
Central 0: Device 0: SNTP Server	Preferred time server for device 0.	n
Central 0: Device 0: SNTP Timeout	Time server timeout for device 0.	n
Central 0: Device 1	Communication device id.	n
Central 0: Device 1: Port (TCP/IP)	Port of central 0.	n
Central 0: Device 1: Address (High) (Serial)	Address of central 0 serial receiver (high).	n
Central 0: Device 1: Address (TCP/IP)	IP-Address of central 0.	n
Central 0: Device 1: Address (Low) (Serial)	Address of central 0 serial receiver (low).	n
Central 0: Device 1: SNTP Server	Preferred time server for device 1.	n
Central 0: Device 1: SNTP Timeout	Time server timeout for device 1.	n
Central 0: Device 2	Communication device id.	n
Central 0: Device 2: Port (TCP/IP)	Port of central 0.	n
Central 0: Device 2: Address (High) (Serial)	Address of central 0 serial receiver (high).	n
Central 0: Device 2: Address (TCP/IP)	IP-Address of central 0.	n
Central 0: Device 2: Address (Low) (Serial)	Address of central 0 serial receiver (low).	n
Central 0: Device 2: SNTP Server	Preferred time server for device 2.	n
Central 0: Device 2: SNTP Timeout	Time server timeout for device 2.	n

Name	Description	Requires Reset
Central 0: Device 3	Communication device id.	n
Central 0: Device 3: Port (TCP/IP)	Port of central 0.	n
Central 0: Device 3: Address (High) (Serial)	Address of central 0 serial receiver (high).	n
Central 0: Device 3: Address (TCP/IP)	IP-Address of central 0.	n
Central 0: Device 3: Address (Low) (Serial)	Address of central 0 serial receiver (low).	n
Central 0: Device 3: SNTP Server	Preferred time server for device 3.	n
Central 0: Device 3: SNTP Timeout	Time server timeout for device 3.	n
Central 0: Spontaneous Calls: System Status	System status bits triggering spontaneous calls to Central 0.	n
Central 0: Spontaneous Calls: GDR Evaluation Status	GDR evaluation status bits triggering spontaneous calls to Central 0.	n
Central 0: Spontaneous Calls: Battery Status	Battery status bits triggering spontaneous calls to Central 0.	n
Central 1	Enable central 1.	y
Central 1: Time Offset	Time offset for regular calls to central 1.	n
Central 1: Basic Time Interval	Basic time interval for communication with central 1.	n
Central 1: Time Window	Length of time window in which connection to central 1 is allowed (0=infinite).	n
Central 1: Repeat on Success	Time after which connection to central 1 will be retried in case of success.	n
Central 1: Repeat on Failure	Time after which connection to central 1 will be retried in case of a failure.	n
Central 1: Device 0	Communication device id.	n
Central 1: Device 0: Port (TCP/IP)	Port of central 1.	n
Central 1: Device 0: Address (High) (Serial)	Address of central 1 serial receiver (high).	n
Central 1: Device 0: Address (TCP/IP)	IP-Address of central 1.	n
Central 1: Device 0: Address (Low) (Serial)	Address of central 1 serial receiver (low).	n
Central 1: Device 0: SNTP Server	Preferred time server for device 0.	n
Central 1: Device 0: SNTP Timeout	Time server timeout for device 0.	n
Central 1: Device 1	Communication device id.	n
Central 1: Device 1: Port (TCP/IP)	Port of central 1.	n

Name	Description	Requires Reset
Central 1: Device 1: Address (High) (Serial)	Address of central 1 serial receiver (high).	n
Central 1: Device 1: Address (TCP/IP)	IP-Address of central 1.	n
Central 1: Device 1: Address (Low) (Serial)	Address of central 1 serial receiver (low).	n
Central 1: Device 1: SNTP Server	Preferred time server for device 1.	n
Central 1: Device 1: SNTP Timeout	Time server timeout for device 1.	n
Central 1: Device 2	Communication device id.	n
Central 1: Device 2: Port (TCP/IP)	Port of central 1.	n
Central 1: Device 2: Address (High) (Serial)	Address of central 1 serial receiver (high).	n
Central 1: Device 2: Address (TCP/IP)	IP-Address of central 1.	n
Central 1: Device 2: Address (Low) (Serial)	Address of central 1 serial receiver (low).	n
Central 1: Device 2: SNTP Server	Preferred time server for device 2.	n
Central 1: Device 2: SNTP Timeout	Time server timeout for device 2.	n
Central 1: Device 3	Communication device id.	n
Central 1: Device 3: Port (TCP/IP)	Port of central 1.	n
Central 1: Device 3: Address (High) (Serial)	Address of central 1 serial receiver (high).	n
Central 1: Device 3: Address (TCP/IP)	IP-Address of central 1.	n
Central 1: Device 3: Address (Low) (Serial)	Address of central 1 serial receiver (low).	n
Central 1: Device 3: SNTP Server	Preferred time server for device 3.	n
Central 1: Device 3: SNTP Timeout	Time server timeout for device 3.	n
Central 1: Spontaneous Calls: System Status	System status bits triggering spontaneous calls to Central 1.	n
Central 1: Spontaneous Calls: GDR Evaluation Status	GDR evaluation status bits triggering spontaneous calls to Central 1.	n
Central 1: Spontaneous Calls: Battery Status	Battery status bits triggering spontaneous calls to Central 1.	n
Central 2	Enable central 2.	y
Central 2: Time Offset	Time offset for regular calls to central 2.	n
Central 2: Basic Time Interval	Basic time interval for communication with central 2.	n
Central 2: Time Window	Length of time window in which connection to central	n

Name	Description	Requires Reset
	2 is allowed (0=infinite).	
Central 2: Repeat on Success	Time after which connection to central 2 will be retried in case of success.	n
Central 2: Repeat on Failure	Time after which connection to central 2 will be retried in case of a failure.	n
Central 2: Device 0	Communication device id.	n
Central 2: Device 0: Port (TCP/IP)	Port of central 2.	n
Central 2: Device 0: Address (High) (Serial)	Address of central 2 serial receiver (high).	n
Central 2: Device 0: Address (TCP/IP)	IP-Address of central 2.	n
Central 2: Device 0: Address (High) (Serial)	Address of central 2 serial receiver (high).	n
Central 2: Device 0: SNTP Server	Preferred time server for device 0.	n
Central 2: Device 0: SNTP Timeout	Time server timeout for device 0.	n
Central 2: Device 1	Communication device id.	n
Central 2: Device 1: Port (TCP/IP)	Port of central 2.	n
Central 2: Device 1: Address (High) (Serial)	Address of central 2 serial receiver (high).	n
Central 2: Device 1: Address (TCP/IP)	IP-Address of central 2.	n
Central 2: Device 1: Address (Low) (Serial)	Address of central 2 serial receiver (low).	n
Central 2: Device 1: SNTP Server	Preferred time server for device 1.	n
Central 2: Device 1: SNTP Timeout	Time server timeout for device 1.	n
Central 2: Device 2	Communication device id.	n
Central 2: Device 2: Port (TCP/IP)	Port of central 2.	n
Central 2: Device 2: Address (High) (Serial)	Address of central 2 serial receiver (high).	n
Central 2: Device 2: Address (TCP/IP)	IP-Address of central 2.	n
Central 2: Device 2: Address (Low) (Serial)	Address of central 2 serial receiver (low).	n
Central 2: Device 2: SNTP Server	Preferred time server for device 2.	n
Central 2: Device 2: SNTP Timeout	Time server timeout for device 2.	n
Central 2: Device 3	Communication device id.	n
Central 2: Device 3: Port (TCP/IP)	Port of central 2.	n
Central 2: Device 3: Address (High)	Address of central 2 serial receiver (high).	n

Name	Description	Requires Reset
(Serial)		
Central 2: Device 3: Address (TCP/IP)	IP-Address of central 2.	n
Central 2: Device 3: Address (Low) (Serial)	Address of central 2 serial receiver (low).	n
Central 2: Device 3: SNTP Server	Preferred time server for device 3.	n
Central 2: Device 3: SNTP Timeout	Time server timeout for device 3.	n
Central 2: Spontaneous Calls: System Status	System status bits triggering spontaneous calls to Central 2.	n
Central 2: Spontaneous Calls: GDR Evaluation Status	GDR evaluation status bits triggering spontaneous calls to Central 2.	n
Central 2: Spontaneous Calls: Battery Status	Battery status bits triggering spontaneous calls to Central 2.	n
Central 3	Enable central 3.	y
Central 3: Time Offset	Time offset for regular calls to central 3.	n
Central 3: Basic Time Interval	Basic time interval for communication with central 3.	n
Central 3: Time Window	Length of time window in which connection to central 3 is allowed (0=infinite).	n
Central 3: Repeat on Success	Time after which connection to central 3 will be retried in case of success.	n
Central 3: Repeat on Failure	Time after which connection to central 3 will be retried in case of a failure.	n
Central 3: Device 0	Communication device id.	n
Central 3: Device 0: Port (TCP/IP)	Port of central 3.	n
Central 3: Device 0: Address (High) (Serial)	Address of central 3 serial receiver (high).	n
Central 3: Device 0: Address (TCP/IP)	IP-Address of central 3.	n
Central 3: Device 0: Address (Low) (Serial)	Address of central 3 serial receiver (low).	n
Central 3: Device 0: SNTP Server	Preferred time server for device 0.	n
Central 3: Device 0: SNTP Timeout	Time server timeout for device 0.	n
Central 3: Device 1	Communication device id.	n
Central 3: Device 1: Port (TCP/IP)	Port of central 3.	n
Central 3: Device 1: Address (High) (Serial)	Address of central 3 serial receiver (high).	n
Central 3: Device 1: Address (TCP/IP)	IP-Address of central 3.	n

Name	Description	Requires Reset
Central 3: Device 1: Address (Low) (Serial)	Address of central 3 serial receiver (low).	n
Central 3: Device 1: SNTP Server	Preferred time server for device 1.	n
Central 3: Device 1: SNTP Timeout	Time server timeout for device 1.	n
Central 3: Device 2	Communication device id.	n
Central 3: Device 2: Port (TCP/IP)	Port of central 3.	n
Central 3: Device 2: Address (High) (Serial)	Address of central 3 serial receiver (high).	n
Central 3: Device 2: Address (TCP/IP)	IP-Address of central 3.	n
Central 3: Device 2: Address (Low) (Serial)	Address of central 3 serial receiver (low).	n
Central 3: Device 2: SNTP Server	Preferred time server for device 2.	n
Central 3: Device 2: SNTP Timeout	Time server timeout for device 2.	n
Central 3: Device 3	Communication device id.	n
Central 3: Device 3: Port (TCP/IP)	Port of central 3.	n
Central 3: Device 3: Address (High) (Serial)	Address of central 3 serial receiver (high).	n
Central 3: Device 3: Address (TCP/IP)	IP-Address of central 3.	n
Central 3: Device 3: Address (Low) (Serial)	Address of central 3 serial receiver (low).	n
Central 3: Device 3: SNTP Server	Preferred time server for device 3.	n
Central 3: Device 3: SNTP Timeout	Time server timeout for device 3.	n
Central 3: Spontaneous Calls: System Status	System status bits triggering spontaneous calls to Central 3.	n
Central 3: Spontaneous Calls: GDR Evaluation Status	GDR evaluation status bits triggering spontaneous calls to Central 3.	n
Central 3: Spontaneous Calls: Battery Status	Battery status bits triggering spontaneous calls to Central 3.	n
Central 4	Enable central 4.	y
Central 4: Time Offset	Time offset for regular calls to central 4.	n
Central 4: Basic Time Interval	Basic time interval for communication with central 4.	n
Central 4: Time Window	Length of time window in which connection to central 4 is allowed (0=infinite).	n
Central 4: Repeat on Success	Time after which connection to central 4 will be retried in case of success.	n

Name	Description	Requires Reset
Central 4: Repeat on Failure	Time after which connection to central 4 will be retried in case of a failure.	n
Central 4: Device: 0	Communication device id.	n
Central 4: Device 0: Port (TCP/IP)	Port of central 4.	n
Central 4: Device 0: Address (High) (Serial)	Address of central 4 serial receiver (high).	n
Central 4: Device 0: Address (TCP/IP)	IP-Address of central 4.	n
Central 4: Device 0: Address (Low) (Serial)	Address of central 4 serial receiver (low).	n
Central 4: Device 0: SNTP Server	Preferred time server for device 0.	n
Central 4: Device 0: SNTP Timeout	Time server timeout for device 0.	n
Central 4: Device 1	Communication device id.	n
Central 4: Device 1: Port (TCP/IP)	Port of central 4.	n
Central 4: Device 1: Address (High) (Serial)	Address of central 4 serial receiver (high).	n
Central 4: Device 1: Address (TCP/IP)	IP-Address of central 4.	n
Central 4: Device 1: Address (Low) (Serial)	Address of central 4 serial receiver (low).	n
Central 4: Device 1: SNTP Server	Preferred time server for device 1.	n
Central 4: Device 1: SNTP Timeout	Time server timeout for device 1.	n
Central 4: Device 2	Communication device id.	n
Central 4: Device 2: Port (TCP/IP)	Port of central 4.	n
Central 4: Device 2: Address (High) (Serial)	Address of central 4 serial receiver (high).	n
Central 4: Device 2: Address (TCP/IP)	IP-Address of central 4.	n
Central 4: Device 2: Address (Low) (Serial)	Address of central 4 serial receiver (low).	n
Central 4: Device 2: SNTP Server	Preferred time server for device 2.	n
Central 4: Device 2: SNTP Timeout	Time server timeout for device 2.	n
Central 4: Device 3	Communication device id.	n
Central 4: Device 3: Port (TCP/IP)	Port of central 4.	n
Central 4: Device 3: Address (High) (Serial)	Address of central 4 serial receiver (high).	n
Central 4: Device 3: Address (TCP/IP)	IP-Address of central 4.	n
Central 4: Device 3: Address (Low)	Address of central 4 serial receiver (low).	n

Name	Description	Requires Reset
(Serial)		
Central 4: Device 3: SNTP Server	Preferred time server for device 3.	n
Central 4: Device 3: SNTP Timeout	Time server timeout for device 3.	n
Central 4: Spontaneous Calls: System Status	System status bits triggering spontaneous calls to Central 4.	n
Central 4: Spontaneous Calls: GDR Evaluation Status	GDR evaluation status bits triggering spontaneous calls to Central 4.	n
Central 4: Spontaneous Calls: Battery Status	Battery status bits triggering spontaneous calls to Central 4.	n
Updater: Device 0	Communication device id.	n
Updater: Device 0: Port (TCP/IP)	Port of updater.	n
Updater: Device 0: Address (High) (Serial)	Address of updater serial receiver (high).	n
Updater: Device 0: Address (TCP/IP)	IP-Address of updater.	n
Updater: Device 0: Address (Low) (Serial)	Address of updater serial receiver (low).	n
Updater: Device 0: SNTP Server	Preferred time server for device 0.	n
Updater: Device 0: SNTP Timeout	Time server timeout for device 0.	n
Updater: Device 1	Communication device id.	n
Updater: Device 1: Port (TCP/IP)	Port of updater.	n
Updater: Device 1: Address (High) (Serial)	Address of updater serial receiver (high).	n
Updater: Device 1: Address (TCP/IP)	IP-Address of updater.	n
Updater: Device 1: Address (Low) (Serial)	Address of updater serial receiver (low).	n
Updater: Device 1: SNTP Server	Preferred time server for device 1.	n
Updater: Device 1: SNTP Timeout	Time server timeout for device 1.	n
Updater: Device 2	Communication device id.	n
Updater: Device 2: Port (TCP/IP)	Port of updater.	n
Updater: Device 2: Address (High) (Serial)	Address of updater serial receiver (high).	n
Updater: Device 2: Address (TCP/IP)	IP-Address of updater.	n
Updater: Device 2: Address (Low) (Serial)	Address of updater serial receiver (low).	n
Updater: Device 2: SNTP Server	Preferred time server for device 2.	n

Name	Description	Requires Reset
Updater: Device 2: SNTP Timeout	Time server timeout for device 2.	n
Updater: Device 3	Communication device id.	n
Updater: Device 3: Port (TCP/IP)	Port of updater.	n
Updater: Device 3: Address (High) (Serial)	Address of updater serial receiver (high).	n
Updater: Device 3: Address (TCP/IP)	IP-Address of updater.	n
Updater: Device 3: Address (Low) (Serial)	Address of updater serial receiver (low).	n
Updater: Device 3: SNTP Server	Preferred time server for device 3.	n
Updater: Device 3: SNTP Timeout	Time server timeout for device 3.	n
Connection Retries	Number of retries on connection failure.	n
Time Servers	List of Time Servers.	n
Task List	List of active tasks.	y

10.5 Sound sequences

Activity	Morse code	Sound signals
Mira basic device initialization	·	1_short (dit)
Bluetooth operation		
Bluetooth is ready to connect	·_·_·	3_short (dit sil dit sil dit)
Bluetooth is connected	- - -	3_middle (dah dah dah)
Bluetooth is disconnected	–_–_–	3_long (lng sil lng sil lng)
Bluetooth reply timeout	–	1_long (lng)
REED Switch		
Source detected Service mode	-	1_middle (dah)
Entering service mode AckknowledgeReset PossibleReset PossibleSourceRemoved	·	1_short (dit)
Wait4Buttons Source removed	–	1_long (lng)
Reset	·_–-·	1_short 1_long 1_middle 1_short (did sil lng dah did)
Delayed reset while communication	·_____·	1_short long_silence 1_short (did sil sil sil sil sil … did)
Accuracy test		
Test started	- - -	3_middle (dah dah dah)
Test finished	–_–_–	3 long (lng sil lng sil lng)
Test aborted	· · · · · · · ·	8 short (dit dit dit dit dit dit dit did)
Source is removed	· · · –·	3 short 1 long 1 short (dit dit dit lng did)