# NBM-550 Remote Control Documentation

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## 1. Introduction

## 1.1 Communication Parameters

The NBM-550 can be remote controlled via RS-232 (optical link or USB emulation). For remote control the communication parameters of the controlling device (computer) have to be set to the following values:

| | |
|---|---|
| **Baud rate** | 115 200 baud (optical interface) / 460 800 baud (USB) |
| **Start bit** | 1 |
| **Data bits** | 8 |
| **Stop bit** | 1 |
| **Parity** | None |
| **Handshake** | None |

The NBM ignores soft handshake signals (/DC1, /DC3) and does not send soft handshake signals.
The NBM ignores /CR and /LF signals.

## 1.2 Enabling Remote Control

The command "REMOTE ON" has to be sent to the NBM first in order to enable the remote control mode !!!

Sending "REMOTE ON" will close all dialogs and menus (and will stay closed all the time in remote mode). However, the measurement views are shown like in normal operation.

The key pad is not active in remote control mode.

Normal mode can be invoked by sending the command "REMOTE OFF" or by pressing the On/Off key of the NBM.

## 1.3 Syntax Rules

### 1.3.1 Command

The remote commands consist of ASCII strings. The following syntax rules apply to all commands:

A command consists of the command string and optional parameters

**Command** ***[Parameter_1]*** **, … ,** ***[Parameter_n]*** **;**

Note: [ ] marks an optional string. The square brackets are not part of the string.

The command string interpreter does not distinguish between upper and lower case.

**Command** ***[Parameter]*** **;** is the same as **COMMAND [PARAMETER];**

The command string is separated from the parameter string by one or more white spaces (blanks).

Parameters have to be separated by a comma.

A command or response must be terminated with a semicolon.

The NBM sends an additional /CR after the comma at defined places to allow line separation in long responses

A command string for a Get Command contains a question mark. The NBM will answer with a response.

**Command?** ***[Parameter]*** **;**

A command string for a Set Command does not include any question mark.

### 1.3.2 Response

The response to a query has the same syntax as a command, just the command string is missing.

The NBM sends an additional /CR after the semicolon of a response.

The NBM is also sending a response after receiving a Set Command. It's the same response as for an "ERROR?" command. Checking this response may be usefull to verify that communication works properly. Normally a value of zero will be returned. Other values indicate an error occurred by handling the last command. See the chapter "Error Codes " for details. The communication with Get Commands can be verified with the query response. A communication problem is expected in case of no response within 10 seconds.

### 1.3.3 Parameter

Parameters of type "String" must be enclosed with quotation marks (").

Semicolons are not allowed within a string.

### 1.3.4 Examples

Examples for valid commands are:
CMD_A;
CMD_B param1;
CMD_C param1,param2/CR/LFparam3;
CMD_A?;
CMD_B? param1;

Examples for query responses returned by the NBM are:
param1;/CR
param1, param2;/CR
param1, param2, /CR param3;/CR

# 2. Definitions

## 2.1 Parameter Formats

The following table shows the possible formats for parameters:

| | |
|---|---|
| String | The maximum number of characters is specified.<br>Within a string upper and lower case is distinguished.<br>Also white space is maintained within a string |
| Enum | Stored as a four byte value<br>A set of defined strings is specified for each command |
| Float /Double | Stored as 32/64 bit float value<br>Input parameters are converted in to float<br>Output parameters are automatically formatted |
| Byte | Stored as 8 bit unsigned integers<br>Sometimes a allowed range or set of values is specified |
| Integer | Stored as 16 bit signed integers<br>Sometimes a allowed range or set of values is specified |
| LngInt | Stored as 32 bit signed integers<br>Sometimes an allowed range or set of values is specified |
| date<br>(dd.mm.yy) | Date stored as three bytes<br>Input and output as a 8 char string: dd.mm.yy<br>d: 01 to 31, m: 01 to 12, y: 00 to 99.<br>The range of the days is also restricted to possible dates in the years 2000 to 2999 |
| time<br>(hh:mm.ss) | Time stored as three bytes<br>Input and output as a 8 char string: hh:mm:ss<br>h: 00 to 23, m: 00 to 59, s:00 to 59. |
| xtime | same as above, but hours from 0 to 99 |
| Version | Vdd.dd.dd (V00.00.00 … V99.99.99) |

Note: Date and time formats used for remote control are fixed.
They are independent from the selected GUI date and time formats.

## 2.2 Column Abbreviations

The table of commands in the next chapter uses some short column descriptors.
The descriptors are defined below.

**Columns**

| | | |
|---|---|---|
| S | Belongs to | a **S**et command |
| G | Belongs to | a **G**et command |
| R | Belongs to | the **R**esponse of a get command |
| O | Command available with | Option O only |
| P | | not persistent |
| | x | setup parameter |
| | P | recalled at power on |
| | M | Manufacturer Data (saved at production time) |

In the next chapter "Commands" there is also information, regarding parameters and default values, included:
The factory defaults values and the default values for none persistent parameters are shown in "**bold**"
in the column "Range".

## 2.3 Probe Connection Types

Four connection types have been defined to consider differences in probe technology. The table below shows which probe model belongs to which connection type. This kind of association is required to handle measurement and data logger formats.

| Conn. Type | Probe Model | Remark |
|---|---|---|
| A | EF039x, EF069x, EF1891, HF3061, HF0191 | Flat probes, 3 separate axes |
| B | EF5091, EF5092, EF4091, EF609x, EF9091 | Flat probes, 3 combined axes (RSS) |
| C | EA…ED5091 | Shaped probes, 3 combined axes (RSS) |
| D | not available yet | |

## 3. Commands

**Parameters from the measurement settings menu**

Default values are marked **BOLD**

Time Out

| Description | Command | S | G | R | | P | O | Parameter Name | Format | Unit | Range | TO (s) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Language of the GUI | LANGUAGE | x | | | | P | | Language | Enum | | **ENGLISH**, GERMAN … | <.5 | List included in the source code |
| | LANGUAGE? | | x | | | | | | | | | <.5 | |
| | | | | x | | P | | Language | Enum | | **ENGLISH**, GERMAN … | | |
| Averaging time | AVG_TIME | x | | | | x | | Averaging Time | integer | 2 s | 2 …**180** … 900 | <.5 | |
| | AVG_TIME? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | | Averaging Time | integer | 2 s | 2 …**180** … 900 | | |
| Use the frequency dependent | FREQ_COR | x | | | | x | | Frequency Correction | Enum | | ON, **OFF** | <.5 | |
| correction factors of the probe | FREQ_COR? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | | Frequency Correction | Enum | | ON, **OFF** | | |
| Assumed frequency of the RF signal | FREQ | x | | | | x | | Frequency | Double | Hz | 0.001 …**300.000** … 99 999.999 MHz | <.5 | input is rounded to 1 kHz resolution |
| | FREQ? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | | Frequency | Double | Hz | 0.001 …**300.000** … 99 999.999 MHz | | |
| Use the reference values of the | STND_APPLY | x | | | | x | | Apply Standard | Enum | | ON, **OFF** | <.5 | |
| standard to calculate additional | STND_APPLY? | | x | | | | | | | | | <.5 | |
| exposure or field properties | | | | x | | x | | Apply Standard | Enum | | ON, **OFF** | | |
| Select a standard by its ID | STND_SEL | x | | | | x | | Standard ID | Integer | | 0 …**1** …. Number of standards <= 50 | <.5 | 0 = User Standard |
| | STND_SEL? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | | Standard ID | Integer | | 0 …**1** …. Number of standards <= 50 | | |
| | | | | | | | | Standard Name | String | | max. 40 chars | | |
| Switch the alarm function on or off | ALARM | x | | | | x | | Alarm Function | Enum | | ON, **OFF** | <.5 | |
| | ALARM? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | | Alarm Function | Enum | | ON, **OFF** | | |
| Alarm threshold for normal probes | ALARM_THR_N | x | | | | x | | Alarm Limit (Normal) | Integer | | 0 … **60** ...120 | <.5 | Range is in 1 dB steps |
| | ALARM_THR_N? | | x | | | | | | | | | <.5 | default= 100V/m (2.5 mW/cm2) |
| | | | | x | | x | | Alarm Limit (Normal) | Integer | | 0 … **60** ...120 | | |
| Alarm threshold for shaped probes | ALARM_THR_S | x | | | | x | | Alarm Limit (Shaped) | Integer | | 0 ... **33** …50 | <.5 | Range is in 1 dB steps |
| | ALARM_THR_S? | | x | | | | | | | | | <.5 | default= 200% |
| | | | | x | | x | | Alarm Limit (Shaped) | Integer | | 0 ... **33** …50 | | |
| Time interval for automatic zeroing | AUTO_ZERO | x | | | | x | | Auto-Zero Interval | Enum | min | 6, **15**, 30, 60, Off | <.5 | |
| | AUTO_ZERO? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | | Auto-Zero Interval | Enum | min | 6, **15**, 30, 60, Off | | |
| Time from last key stroke until | AUTO_POWER | x | | | | x | | Auto Power-Off | Enum | min | 6, **15,** 30, 60 , Off | <.5 | Disabled in remote mote |
| power off | AUTO_POWER? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | | Auto Power-Off | Enum | min | 6, **15,** 30, 60 , Off | | |
| Time from last key stroke until | AUTO_LIGHT | x | | | | x | | LCD Backlight | Enum | s | OFF, 5, **10**, 30, 60, PERMANENT | <.5 | |
| turn off the back light | AUTO_LIGHT? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | | LCD Backlight | Enum | s | OFF, 5, **10**, 30, 60, PERMANENT | | |
| Audible indicator (hot spot search) | AUDIO_INDICATOR | x | | | | x | | Audible Indicator | Enum | | ON , **OFF** | <.5 | |
| during measurements | AUDIO_INDICATOR? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | | Audible Indicator | Enum | | ON , **OFF** | | |
| Mode of spatial averaging | SPATIAL_MODE | x | | | | x | | Spatial AVG Mode | Enum | | **CONTINUOUS**, DISCRETE | <.5 | Continouslytaken from "Start" to |
| | SPATIAL_MODE? | | x | | | | | | | | | <.5 | "Stop" or separate samples |
| | | | | x | | x | | Spatial AVG Mode | Enum | | **CONTINUOUS**, DISCRETE | | |

**Parameters from the measurement settings menu continued**

| Description | Command | S | G | R | | P | O | Parameter Name | Format | Unit | Range | TO (s) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Use both sensors of a combi probe | EH_PROBE_USE | x | | | | x | | Combi Probe Use | Enum | | **E_H,** E, H | <.5 | |
| or only one of both | EH_PROBE_USE? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | | Combi Probe Use | Enum | | **E_H,** E, H | | |
| Units for the lower result area | EH_PROBE_UNITS | x | | | | x | | Combi Probe Units | Enum | | FIXED, **SELECTED** | <.5 | |
| if a combi probe is used | EH_PROBE_UNITS? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | | Combi Probe Units | Enum | | FIXED, **SELECTED** | | |
| Use fixed or variable triads | RESULT_FORMAT | x | | | | x | | Results Format | Enum | | **FIXED,** VARIABLE | <.5 | Heritage or engineering |
| in the numerical result format | RESULT_FORMAT? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | | Results Format | Enum | | **FIXED,** VARIABLE | | |
| Reminder for calibration due date | CAL_DATE_CHECK | x | | | | x | | Cal. Date Check | Enum | | **ON,** OFF | <.5 | |
| | CAL_DATE_CHECK? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | | Cal. Date Check | Enum | | **ON,** OFF | | |

**Parameters from the data logger menu**

| Description | Command | S | G | R | | P | O | Parameter Name | Format | Unit | Range | TO (s) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Length of the time axis | HISTORY_TIME | x | | | | x | | History Time scale | Enum | min | 2, 8 , **20**, 60,120, 240, 480 | <.5 | 200 measurement intervals over the full |
| in the history view | HISTORY_TIME | | x | | | | | | | | | <.5 | range for each setting |
| | | | | x | | x | | History Time scale | Enum | min | 2, 8 , **20**, 60,120, 240, 480 | | |
| Start time for timer controlled storing | TIMER_START | x | | | | x | | Timer Start | Time | | **00:00:00** … 23:59.59 | <.5 | |
| | TIMER_START? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | | Timer Start | Time | | **00:00:00** … 23:59.59 | | |
| Duration of a timer controlled storing | TIMER_DUR | x | | | | x | | Timer Duration | XTime | | 00:00:00 … **00:10:00** …99:59:59 | <.5 | |
| | TIMER_DUR? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | | Timer Duration | XTime | | 00:00:00 … **00:10:00** …99:59:59 | | |
| Interval of timer controlled storing | TIMER_INT | x | | | | x | | Timer Interval | Enum | s | 1, 2, 3, 5, 10, 20, 30, **60**, 120, 180, 360 | <.5 | |
| | TIMER_INT? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | | Timer Interval | Enum | s | 1, 2, 3, 5, 10, 20, 30, **60**, 120, 180, 360 | | |
| Storing condition | CS_COND | x | | | | x | 2 | Store Condition | Enum | | **UPPER_THRHLD**, OUT_OF_GAP | <.5 | |
| for conditional storing | CS_COND? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | 2 | Store Condition | Enum | | **UPPER_THRHLD**, OUT_OF_GAP | | |
| Mode of conditional storing | CS_MODE | x | | | | x | 2 | Storing Range | Enum | | **ALL,** FIRST_LAST | <.5 | |
| | CS_MODE? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | 2 | Storing Range | Enum | | **ALL,** FIRST_LAST | | |
| Upper threshold for | CS_THR_UP_N | x | | | | x | 2 | Upper Threshold (Normal) | Integer | | 0 … **60** ...120 | <.5 | Range is in 1 dB steps |
| conditional storing | CS_THR_UP_N? | | x | | | | | | | | | <.5 | default= 100V/m (2.5 mW/cm2) |
| and normal probes | | | | x | | x | 2 | Upper Threshold (Normal) | Integer | | 0 … **60** ...120 | | |
| Upper threshold for | CS_THR_UP_S | x | | | | x | 2 | Upper Threshold (Shaped) | Integer | | 0 ... **33** …50 | <.5 | Range is in 1 dB steps |
| conditional storing | CS_THR_UP_S? | | x | | | | | | | | | <.5 | default= 200% |
| and shaped probes | | | | x | | x | 2 | Upper Threshold (Shaped) | Integer | | 0 ... **33** …50 | | |
| Lower threshold for | CS_THR_LOW_N | x | | | | x | 2 | Lower Threshold (Normal) | Integer | | 0 … **48** ...120 | <.5 | Range is in 1 dB steps |
| conditional storing | CS_THR_LOW_N? | | | | | | | | | | | <.5 | default= 25V/m (0.16 mW/cm2) |
| and normal probes | | | | | | x | 2 | Lower Threshold (Normal) | Integer | | 0 … **48** ...120 | | |
| Lower threshold for | CS_THR_LOW_S | x | | | | x | 2 | Lower Threshold (Shaped) | Integer | | 0 ... **27** …50 | <.5 | Range is in 1 dB steps |
| conditional storing | CS_THR_LOW_S? | | x | | | | | | | | | <.5 | default= 50% |
| and shaped probes | | | | x | | x | 2 | Lower Threshold (Shaped) | Integer | | 0 ... **27** …50 | | |
| Use voice comments | VOICE | x | | | | x | 3 | Voice Recorder | Enum | | ON, **OFF** | <.5 | Request for voice comment recording |
| | VOICE? | | x | | | | | | | | | <.5 | when storing a data set |
| | | | | x | | x | 3 | Voice Recorder | Enum | | ON, **OFF** | | |

**Parameters from the interface menu**

| Description | Command | S | G | R | | P | O | Parameter Name | Format | Unit | Range | TO (s) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Select serial interface | COM_IF | x | | | | P | | Serial Interface | Enum | | **USB**, OPTICAL | <.5 | Interface for PC connection not for |
| | COM_IF? | | x | | | | | | | | | <.5 | inter-instrument communication |
| | | | | x | | P | | Serial Interface | Enum | | **USB**, OPTICAL | | |
| Control another NBM unit | COM_MASTER | x | | | | P | | Controller Function | Enum | | ON, **OFF** | ??? | NBM-550 controls a NBM-520 or -550 |
| like an active probe | COM_MASTER? | | x | | | | | | | | | <.5 | using the optical interface only |
| | | | | x | | P | | Controller Function | Enum | | ON, **OFF** | | |
| Enable the external trigger input | EXT_TRIG | x | | | | x | | External Trigger | Enum | | ON, **OFF** | <.5 | |
| | EXT_TRIG? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | | External Trigger | Enum | | ON, **OFF** | | |
| Select the format of the | GPS_FORMAT | x | | | | x | 1 | GPS Position Unit | Enum | | DMS, MINDEC, **DEGDEC** | <.5 | |
| GPS coordinates | GPS_FORMAT? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | 1 | GPS Position Unit | Enum | | DMS, MINDEC, **DEGDEC** | | |
| Playback level of voice comments | VOICE_LEVEL | x | | | | x | 3 | Audio Output Level | Integer | | 0 … **17** …20 | <.5 | 1 % ... **50 % ...** 100 % in 2 dB steps |
| | VOICE_LEVEL? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | 3 | Audio Output Level | Integer | | 0 … **17** …20 | | |

**Parameters from the clock menu**

| Description | Command | S | G | R | | P | O | Parameter Name | Format | Unit | Range | TO (s) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Current time | TIME | x | | | | | | Time | Time | | 00:00:00 … 23.59:59 | <.5 | Default by Real Time Clock |
| | TIME? | | x | | | | | | | | | <.5 | |
| | | | | x | | | | Time | Time | | 00:00:00 … 23.59:59 | | |
| Time format | TIME_FORMAT | x | | | | x | | Time Format | Enum | | 12_h, **24_h** | <.5 | |
| | TIME_FORMAT? | | | | | | | | | | | <.5 | |
| | | | | | | x | | Time Format | Enum | | 12_h, **24_h** | | |
| Current date | DATE | x | | | | | | Date | Date | | 01.01.00 …31.12.99 | <.5 | Default by Real Time Clock |
| | DATE? | | x | | | | | | | | | <.5 | |
| | | | | x | | | | Date | Date | | 01.01.00 …31.12.99 | | |
| Date Format | DATE_FORMAT | x | | | | x | | Date Format | Enum | | **MDY,** DMY, YMD | <.5 | |
| | DATE_FORMAT? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | | Date Format | Enum | | **MDY,** DMY, YMD | | |

**Parameters accessible by soft or hard keys**

| Description | Command | S | G | R | | P | O | Parameter Name | Format | Unit | Range | TO (s) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Select the result type like averaging | RESULT_TYPE | x | | | | x | | Result Type | Enum | | **ACT**, AVG; MAX; MAX_AVG | <.5 | SK in measurement views |
| maximum hold or actual result | RESULT_TYPE? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | | Result Type | Enum | | **ACT**, AVG, MAX, MAX_AVG | | |
| Select the unit of the measurement | RESULT_UNIT | x | | | | x | | Unit | Enum | | V/m, A/m, **mW/cm^2,** W/m^2, uT | <.5 | SK in Main menu |
| results | RESULT_UNIT? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | | Unit | Enum | | V/m, A/m, **mW/cm^2,** W/m^2, uT | | |
| Select the measurement view | MEAS_VIEW | x | | | | x | | Display | Enum | | **NORMAL**, HISTORY, X-Y-Z, MONITOR | <.5 | SK in Main menu |
| | MEAS_VIEW? | | x | | | | | | | | | <.5 | |
| | | | | x | | x | | Display | Enum | | **NORMAL**, HISTORY, X-Y-Z, MONITOR | | |
| Select the setup which is recalled | PWR_ON | x | | | | P | | Power On | Enum | | **PREVIOUS**, DEFAULT | <.5 | SK in Setup menu |
| at power on | PWR_ON? | | x | | | | | | | | | <.5 | |
| | | | | x | | P | | Power On | Enum | | **PREVIOUS**, DEFAULT | | SK in Setup menu |
| Contrast of the LCD display | CONTRAST | x | | | | P | | Contrast | Integer | 2% | 0… **25**… 50 | <.5 | HKs for up and down |
| | CONTRAST? | | x | | | | | | | | | <.5 | |
| | | | | x | | P | | Contrast | Integer | 2% | 0… **25**… 50 | | |

**General functions and data**

| Description | Command | S | G | R | | P | O | Parameter Name | Format | Unit | Range | TO (s) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Remote Mode | REMOTE | x | | | | | | Remote Mode | Enum | | ON, **OFF** | <.5 | must be set to ON to use |
| | REMOTE? | | x | | | | | | | | | <.5 | any other command. Must be set |
| | | | | x | | | | Remote Mode | Enum | | ON. **OFF** | | to OFF to return to normal GUI operation |
| System Error | ERROR? | | x | | | | | | | | | <.5 | See Error Code listing |
| | | | | x | | | | ErrorNumber | Enum | | | | |
| Invoke a zeroing immediately | ZERO | x | | | | | | Zero Mode | Enum | | SWITCH, NO_SWITCH | <1 | Zeroing takes approx. 7 seconds |
| | ZERO? | | x | | | | | | | | | <.5 | |
| | | | | x | | | | Zeroing State | Enum | | ZERO, OK | | |
| Reset AVG and MAX_AVG | RESET_AVG | x | | | | | | | | | | <.5 | |
| Reset MAX | RESET_MAX | x | | | | | | | | | | <.5 | |
| Reset MIN, MAX, AVG, MAX_AVG | RESET_MMA | x | | | | | | | | | | <.5 | |
| Reset history buffer | RESET_HISTORY | x | | | | | | | | | | <.5 | |
| Time remaining until initial averaging | AVG_PROGRESS? | | x | | | | | | | | | <.5 | |
| is complete | | | | x | | | | Average Progress | Integer | s | | | |

**General functions and data - continued**

| Description | Command | S | G | R | | P | O | Parameter Name | Format | Unit | Range | TO (s) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Content of the | DEVICE_INFO? | | x | | | | | | | | | <.5 | |
| device information screen | | | | x | | | | Product Name | String | | max. 15 chars | | |
| | | | | x | | | | Production ID | String | | max. 15 chars | | |
| | | | | x | | | | Serial Number | String | | max. 15 chars | | |
| | | | | x | | | | Device ID | String | | 16 chars | | |
| | | | | x | | | | Device Type | Enum | | BIG, SMALL | | NBM-550 = BIG, NBM-520 = SMALL |
| | | | | x | | | | Firmware Version | Version | | V00.00.00 … V99.99.99 | | |
| | | | | x | | | | Calibration Date | Date | | | | |
| | | | | x | | | | Cal, Due Date | Date | | | | |
| | | | | x | | | | No. of Options | | | 0 to 63 | | |
| | | | | x | | | | Options Name | | | max. 30 chars | | empty if not unlocked |
| Content of the | PROBE_INFO? | | x | | | | | | | | | <.5 | |
| probe information screen | | | | x | | | | Product Name | String | | max. 15 chars | | |
| | | | | x | | | | Production ID | String | | max. 15 chars | | |
| | | | | x | | | | Serial Number | String | | max. 15 chars | | |
| | | | | x | | | | Calibration Date | Date | | | | |
| | | | | x | | | | Cal, Due Date | Date | | | | |
| | | | | x | | | | Field Type | Enum | | E, H, S | | S for connection Type D probes |
| | | | | x | | | | Lower Frequency Limit A | Float | Hz | | | |
| | | | | x | | | | Upper Frequency Limit A | Float | Hz | | | |
| | | | | x | | | | Lower Frequency Limit B | Float | Hz | | | Required for combi probes only (E+H field) |
| | | | | x | | | | Upper Frequency Limit B | Float | Hz | | | Required for combi probes only (E+H field) |
| | | | | x | | | | Shaped | Enum | | YES, NO | | |
| | | | | x | | | | Standard Name | String | | max. 30 chars | | empty if not shaped |

**General functions and data continued**

| Description | Command | S | G | R | | P | O | Parameter Name | Format | Unit | Range | TO (s) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Battery capacity | BATTERY? | | x | | | | | | | | | <.5 | |
| | | | | x | | | | Battery Capacity | Integer | % | 0 … 100 | | |
| GPS coordinates | GPS? | | x | | | | | | | | | <.5 | |
| | | | | x | | P | | GPS Flag | Enum | | NO, FROZEN, FROZEN_2D_ONLY, NORMAL, NORMAL_2D_ONLY, DIFF, DIFF_2D_ONLY | | |
| | | | | x | | P | | GPS Latitude | double | ° | -90.000 00 ° … 90.000 00 ° | | |
| | | | | x | | P | | GPS Longitude | double | ° | - 180.000 00 ° … +180.000 00 ° | | |
| | | | | x | | P | | GPS Altitude | float | m | -9999.9 …. +9999.9 | | |
| Hold Mode | HOLD | x | | | | | | Hold Mode | Enum | | ON, **OFF** | <.5 | |
| | HOLD? | | x | | | | | | | | | <.5 | |
| | | | | x | | | | Hold Mode | Enum | | | | |
| Get the current measurement value(s) | MEAS? | | x | | | | | | | | | <.5 | See Measurement Formats |
| | | | | x | | | | Result 1 | Float | x | | | |
| | | | | x | | | | (Result 2) | Float | x | | | |
| | | | | x | | | | (Result 3) | Float | x | | | |
| | | | | x | | | | (Result 4) | Float | x | | | |
| | | | | x | | | | (Result 5) | Float | x | | | |
| Start cyclic measurement output | MEAS_START | x | | | | | | | | | | <.5 | same format as with MEAS? |
| Stop cyclic measurement output | MEAS_STOP | x | | | | | | | | | | <.5 | |
| The reference field strength of the applied standard (E-Field Limit)) | E_REF_E? | | x | | | | | | | | | <.5 | only available if a standard is applied otherwise returns 0.0 |
| | | | | x | | | | Eref_E(f) | Float | V/m | | | |
| The reference field strength of the applied standard (H-Field Limit) | E_REF_H? | | x | | | | | | | | | <.5 | only available if a standard is applied otherwise returns 0.0 |
| | | | | x | | | | Eref_H(f) | Float | V/m | | | |
| Number of the known standards | STND_NUMBER? | | x | | | | | | | | | <.5 | |
| | | | | x | | | | Number of Standards | Integer | | **0** … 50 | | |
| Name of a specific Standard | STND_NAME? | | x | | | | | Index | Integer | | 0 … Number of standards <= 50 | <.5 | |
| | | | | x | | | | Standard Name | String | | max. 30 chars | | |

**General functions and data continued**

| Description | Command | S | G | R | | P | O | Parameter Name | Format | Unit | Range | TO (s) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Connection type of the probe | PROBE_CT? | x | | | | | | | | | | <.5 | see Definitions |
| | | | x | | | | | Probes Connection Type | Enum | | A, B, C, D | | |
| The minimum field strength of the probes part A | E_MIN_A? | | x | | | | | | | | | <.5 | |
| | | | | x | | | | Emin_A | Float | V/m | | | |
| The minimum field strength of the probes part B | E_MIN_B? | | x | | | | | | | | | <.5 | only available for probe types C and D |
| | | | | x | | | | Emin_B | Float | V/m | | | |
| The maximum filed strength of the probes part A | E_MAX_A? | | x | | | | | | | | | <.5 | |
| | | | | x | | | | Emax_A | Float | V/m | | | |
| The maximum field strength of the probes part B | E_MAX_B? | | x | | | | | | | | | <.5 | only available for probe types C and D |
| | | | | x | | | | Emax_B | Float | V/m | | | |
| Rate at which measurement values are sampled and calculated | SAMPLE_RATE | x | | | | | | Sample Rate | Enum | Hz | **5**, 50, 60 | 8 | 50 and 60 Hz in remote mode only |
| | SAMPLE_RATE? | | x | | | | | | | | | <.5 | |
| | | | | x | | | | Sample Rate | Enum | Hz | **5**, 50, 60 | | |

**Data logger**

| Description | Command | S | G | R | P | O | Parameter Name | Format | Unit | Range | TO (s) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Same as soft key "Save" | SAVE | x | | | | | | | | | 5 | |
| Start conditional storing | CS_START | x | | | | | | | | | <.5 | |
| Exit conditional storing | CS_EXIT | x | | | | | | | | | <.5 | |
| Is conditional storing running? | CS_RUNNING? | | x | | | | | | | | <.5 | |
| | | | | x | | | CS running | Enum | | YES, NO | | |
| Immediate start of timer contr. storing | TIMER_IMMD_START | x | | | | | | | | | <.5 | |
| Programmed start of timer contr. storing | TIMER_PRGM_START | x | | | | | | | | | <.5 | |
| Exit timer controlled storing | TIMER_EXIT | x | | | | | | | | | <.5 | |
| Is timer controlled storing running? | TIMER_RUNNING? | | x | | | | | | | | <.5 | |
| | | | | x | | | TIMER running | Enum | | YES, NO | | |
| Remaining time until timer controlled storing stops | TIMER_PROGRESS? | | x | | | | | | | | <.5 | |
| | | | | x | | | Timer Progress | XTime | | | | |
| Amount of free data logger memory | DL_FREE_MEM? | | x | | | | | | | | <.5 | Minimum in percentage of available bytes or Number of data sets |
| | | | | x | | | Free Memory | Float | % | 0 … 100 | | |
| Delete last data set | DL_DEL_LAST | x | | | | | | | | | 5 | |
| Delete all data sets | DL_DEL_ALL | x | | | | | | | | | 30 | |
| Number of stored data sets | DL_NUMBER? | | x | | | | | | | | <.5 | |
| | | | | x | | | Number of Data Sets | Integer | | 0 … 8 000 | | |
| Info line for one data set | DL_INFO? | | x | | | | Index | Integer | | 1 … Number of Data Sets | <.5 | |
| | | | | x | | | Number of Sub Indices | Integer | | 0 … 32 000 | | = 1 for NOR, MON and XYZ data sets |
| | | | | x | | | Storing Date | Date | | | | |
| | | | | x | | | Storing Time | Time | | | | |
| | | | | x | | | Data Set Type | Enum | | NOR, XYZ, MON, HST, SPA, CON, TIM | | |
| | | | | x | | | Voice Comment Available | Enum | | YES, NO | | |
| Play voice comment | DL_PLAY | x | | | | | Index | Integer | | 1 … Number of Data Sets | <.5 | |
| A complete data set without voice comment | DL_DATA? | | x | | | | Index | Integer | | 1 … Number of Data Sets | <.5 | |
| | | | | x | | | **see "Data Logger Formats"** | | | | | |
| Voice comment data of a data set | DL_VOICE? | | x | | | | Index | Integer | | 1 … Number of Data Sets | <.5 | 8 bit PCM data |
| | | | | x | | | **see "Data Logger Formats"** | | | | | Can be converted to a ".WAV" file |

**Setups**

| Description | Command | S | G | R | P | O | Parameter Name | Format | Unit | Range | TO (s) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Recall the setup | SU_RECALL | x | | | | | Index | Integer | | 0 … 8 | 5 | |
| Save the setup | SU_SAVE | x | | | | | Index | Integer | | 0 … 8 | 5 | |
| Delete the setup | SU_DELETE | x | | | | | Index | Integer | | 0 … 8 | 5 | Deleted = FACTORY |
| Assignment of setup | SU_ ASSIGNMENT? | | x | | | | Index | Integer | | 0 … 8 | <.5 | |
| | | | | x | | | SU Assignment | Enum | | **FACTORY**, USER | | |

## 4. Measurement Formats

**Sample Rate = 5 Hz** RT means selected result type (ACT, MAX, AVG or MAX_AVG)

**NBM-550**

| Parameter Name | Format | Unit | | | Content | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Display | NORMAL | NORMAL | X-Y-Z | HISTORY | MONITOR |
| | | Probe | Normal | Shaped | Type D Probe and use = E_H | NO | YES | don't care | don't care | don't care |
| Result 1 | Float | | "Unit" | % | | RSS (RT) | RSS_S (RT) | RSS(RT) | RSS (RT) | RSS (RT) |
| Result 2 | Float | | "Unit" | % | | RSS (ACT) | RSS_S (ACT) | RSS (ACT) | RSS (ACT) | RSS (ACT) |
| Result 3 | Float | | "Unit" | % | | 0.0 | RSS_E (RT) | X (ACT) | 0.0 | RSS (MAX) |
| Result 4 | Float | | "Unit" | % | | 0.0 | RSS_H (RT) | Y (ACT) | 0.0 | RSS (AVG) |
| Result 5 | Float | | "Unit" | % | | 0.0 | 0.0 | Z (ACT) | 0.0 | RSS (MIN) |

**Sample Rate = 50 Hz and 60 Hz in Normal Mode**

| Parameter Name | Format | Unit | | | Content | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Probe | Normal | Shaped | Probe Type | A | B | C | D |
| Result 1 | Float | | Unit | % | | X (ACT) | RSS (ACT) | RSS (ACT) | RSS _E (ACT) |
| Result 2 | Float | | Unit | % | | Y (ACT) | 0.0 | 0.0 | RSS_H (ACT) |
| Result 3 | Float | | Unit | % | | Z (ACT) | 0.0 | 0.0 | 0.0 |
| Stop Flag | Enum | | | | OK, STOP | | | | |
| Zeroing Flag | Enum | | | | OK, ZERO | | | | |
| Battery Capacity | Integer | | % | | 0 … 100 | | | | |

## 5. Data Logger Formats

| Data Set Fine Type | Data Set Type | Spat. Avg. | Display | Probes Connection Type | Combi probe use |
|---|---|---|---|---|---|
| N1 | NOR | no | NORMAL | A, B or C | don't care |
| N1 | NOR | no | NORMAL | D | E or H |
| N2 | NOR | no | NORMAL | D | E_H |
| XYZ | XYZ | no | X-Y-Z | don't care | don't care |
| MON | MON | no | MONITOR | don't care | don't care |
| HST | HST | no | HISTORY | don't care | don't care |
| S1 | SPA | yes | don't care | A, B or C | don't care |
| S2 | SPA | yes | don't care | D | don't care |
| T1 | TIM | no | don't care | A, B or C | don't care |
| T2 | TIM | no | don't care | D | don't care |
| C1 | CON | no | don't care | A, B or C | don't care |
| C2 | CON | no | don't care | D | don't care |

A "x" indicates that the parameter is present in the data set

**Data sets: A /CR is send after Number of sub data sets and after each sub data set**

| N1 | N2 | XYZ | MON | HST | S1 | S2 | T1 | T2 | C1 | C2 | Parameter | Format | Unit | Range | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | x | x | x | Number of Sub Indices | Integer | | 0 … 32 000 | |
| x | x | x | x | x | x | x | x | x | x | x | Storing Date | Date | | | |
| x | x | x | x | x | x | x | x | x | x | x | Storing Time | Time | | | Start time |
| x | x | x | x | x | x | x | x | x | x | x | Data Set Type | Enum | | NOR, XYZ, MON, HST, SPA, CON, TIM | |
| x | x | x | x | x | x | x | x | x | x | x | Voice Comment Available | Enum | | YES, NO | |
| x | x | x | x | x | x | x | x | x | x | x | Data Set Fine Type | Enum | | N1,N2, XYZ, MON, HST, S1, S2, T1, T2, C1, C2 | |
| x | x | x | x | x | x | x | x | x | x | x | GPS Flag | Enum | | NO, FROZEN, FROZEN_2D_ONLY, NORMAL, NORMAL_2D_ONLY, DIFF, DIFF_2D_ONLY | |
| x | x | x | x | x | x | x | x | x | x | x | GPS Latitude | double | ° | -90.000 00 ° … + 90.000 00 ° | Start position |
| x | x | x | x | x | x | x | x | x | x | x | GPS Longitude | double | ° | - 180.000 00 ° … +180.000 00 ° | Start position |
| x | x | x | x | x | x | x | x | x | x | x | GPS Altitude | float | m | -9999.9 … + 9999.9 | |
| x | x | x | x | x | x | x | x | x | x | x | Probes Product Name | String | | max. 15 chars | |
| x | x | x | x | x | x | x | x | x | x | x | Probes Serial Number | String | | max. 15 chars | |
| x | x | x | x | x | x | x | x | x | x | x | Probes Cal, Due Date | Date | | | |
| x | x | x | x | x | x | x | x | x | x | x | Probes Field Type | Enum | | E, H, S | S for connection Type D probes |
| x | x | x | x | x | x | x | x | x | x | x | Probes Connection Type | Enum | | A, B, C, D | |
| x | x | x | x | x | x | x | x | x | x | x | Probes Lower Frequency Limit A | Float | Hz | | |
| x | x | x | x | x | x | x | x | x | x | x | Probes Upper Frequency Limit A | Float | Hz | | |
| x | x | x | x | x | x | x | x | x | x | x | Probes Lower Frequency Limit B | Float | Hz | | |
| x | x | x | x | x | x | x | x | x | x | x | Probes Upper Frequency Limit B | Float | Hz | | |
| x | x | x | x | x | x | x | x | x | x | x | Probes Emin_A | Float | V/m | | |
| x | x | x | x | x | x | x | x | x | x | x | Probes Emax_A | Float | V/m | | |
| x | x | x | x | x | x | x | x | x | x | x | Probes Emin_B | Float | V/m | | |
| x | x | x | x | x | x | x | x | x | x | x | Probes Emax_B | Float | V/m | | |
| x | x | x | x | x | x | x | x | x | x | x | Shaped Probe | Enum | | YES / NO | |

| N1 | N2 | XYZ | MON | HST | S1 | S2 | T1 | T2 | C1 | C2 | Parameter | Format | Unit | Range | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | x | x | x | Standard ID | Integer | | 0 .. 50 | from probe if shaped |
| x | x | x | x | x | x | x | x | x | x | x | Standard Name | String | | max. 30 chars | from probe if shaped |
| x | x | x | x | x | x | x | x | x | x | x | Apply Standard | Enum | | ON, OFF | |
| x | x | x | x | x | x | x | x | x | x | x | Frequency | Double | Hz | 0.001 …300.000 … 99 999.999 MHz | |
| x | x | x | x | x | x | x | x | x | x | x | Frequency Correction | Enum | | ON, OFF | |
| x | x | x | x | x | x | x | x | x | x | x | Eref_E(f) | Float | V/m | | |
| x | x | x | x | x | x | x | x | x | x | x | Eref_H(f) | Float | V/m | | |
| x | x | x | x | x | x | x | x | x | x | x | Combi Probe Use | Enum | | E_H, E, H | |
| x | x | x | x | x | x | x | x | x | x | x | Device Cal, Due Date | Date | | | |
| x | x | x | | x | | | | | | | Result Type | Enum | | ACT, AVG. MAX. MAX_AVG | |
| x | x | x | x | x | | | | | | | Averaging Time | integer | 2 s | 2 …180 … 900 | |
| x | x | x | x | x | | | | | | | Average Progress | Integer | s | | |
| x | x | x | x | x | x | x | x | x | x | x | Unit | Enum | | V/m, A/m, mW/cm^2, W/m^2 | |
| | x | | | | | | | | | | Combi Probe Units | Enum | | FIXED, SELECTED | |
| x | x | x | x | x | x | x | x | x | x | x | Results Format | Enum | | FIXED, VARIABLE | |
| x | x | x | x | x | x | x | x | x | x | x | Auto-Zero Interval | Enum | min | 6, 15, 30, 60, Off | |
| | | | | | x | x | | | | | Spatial AVG Mode | Enum | | CONTINUOUS, DISCRETE | |
| | | | | | | | | | x | x | Store Condition | Enum | | UPPER_THRHLD, OUT_OF_GAP | |
| | | | | | | | | | x | x | Storing Range | Enum | | ALL, FIRST&LAST | |
| | | | | | | | | | x | x | Upper Threshold (Normal or Shaped) | Float | "Unit" / % | | |
| | | | | | | | | | x | x | Lower Threshold (Normal or Shaped) | Float | "Unit" / % | | |
| | | | | | | | x | x | | | Timer Interval | Enum | s | 1, 2, 3, 5, 10, 20, 30, 60, 120, 180, 360 | |
| | | | | | | | x | x | | | Timer Duration | XTime | | 00:00:00 … 00:10:00 …99:59:59 | |
| | | | | x | | | | | | | History Time scale | Enum | min | 2, 8 , 20, 60,120, 240, 480 | |
| | | | | x | | | | | | | Time progress of current segment | integer | 0,2 s | | |
| x | x | x | | x | | | | | | | RSS (RT) | Float | "Unit" / % | | |
| x | x | x | x | x | | | | | | | RSS (ACT) | Float | "Unit" / % | | |
| | x | | | | | | | | | | RSS_E (RT) | Float | "Unit" / % | | |
| | x | | | | | | | | | | RSS_H (RT) | Float | "Unit" / % | | |
| | x | | x | x | | | | | | | RSS_E (ACT) | Float | "Unit" / % | | 0.0 if not available |
| | x | | x | x | | | | | | | RSS_H (ACT) | Float | "Unit" / % | | 0.0 if not available |
| | | x | | | | | | | | | X (ACT) | Float | "Unit" / % | | |
| | | x | | | | | | | | | Y (ACT) | Float | "Unit" / % | | |
| | | x | | | | | | | | | Z (ACT) | Float | "Unit" / % | | |
| | | | x | | | | | | | | RSS (MIN) | Float | "Unit" / % | | |
| | | | x | | | | | | | | RSS (AVG) | Float | "Unit" / % | | |
| | | | x | | | | | | | | RSS (MAX) | Float | "Unit" / % | | |

| N1 | N2 | XYZ | MON | HST | S1 | S2 | T1 | T2 | C1 | C2 | Parameter | Format | Unit | Range | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | x | x | x | x | x | x | x | Number of sub data sets | Integer | | 0 …. 32 000 | |
| | | | | x | | | x | x | | | RSS (MIN) | Float | "Unit" / % | | |
| | | | | x | | | x | x | | | RSS (AVG) | Float | "Unit" / % | | |
| | | | | x | | | x | x | | | RSS (MAX) | Float | "Unit" / % | | |
| | | | | | | | | x | | | RSS_E (MIN) | Float | "Unit" / % | | |
| | | | | | | | | x | | | RSS_E (AVG) | Float | "Unit" / % | | |
| | | | | | | | | x | | | RSS_E (MAX) | Float | "Unit" / % | | |
| | | | | | | | | x | | | RSS_H (MIN) | Float | "Unit" / % | | |
| | | | | | | | | x | | | RSS_H (AVG) | Float | "Unit" / % | | |
| | | | | | | | | x | | | RSS_H (MAX) | Float | "Unit" / % | | |
| | | | | | x | x | | | x | x | RSS | Float | "Unit" / % | | |
| | | | | | | x | | | | x | RSS_E | Float | "Unit" / % | | |
| | | | | | | x | | | | x | RSS_H | Float | "Unit" / % | | |
| | | | | x | | | x | x | x | x | Zeroing Flag | Enum | | OK, ZERO | |
| | | | | | | | | | | | Averaging Flag | Enum | | OK, NOT_READY | |
| | | | | | | | | | x | x | Condition Flag | Enum | | NO, YES, FIRST , LAST | |
| | | | | | | | | | | x | Condition Flag E | Enum | | NO, YES, FIRST , LAST | |
| | | | | | | | | | | x | Condition Flag H | Enum | | NO, YES, FIRST , LAST | |
| | | | | () | x | x | () | () | x | x | Storing Time | LngInt | 0.2 s | positive | relative to start time |
| | | | | x | x | x | x | x | x | x | GPS Flag | Enum | | NO, FROZEN, FROZEN_2D_ONLY, NORMAL, NORMAL_2D_ONLY, DIFF, DIFF_2D_ONLY | |
| | | | | x | x | x | x | x | x | x | GPS Latitude | double | ° | -90.000 00 ° … + 90.000 00 ° | |
| | | | | x | x | x | x | x | x | x | GPS Longitude | double | ° | - 180.000 00 ° … +180.000 00 ° | |
| | | | | x | x | x | x | x | x | x | GPS Altitude | float | m | -9999.9 … + 9999.9 | |
| | | | | | | | | | x | x | Storing Time | Time | | | Stop Time |
| | | | | | | | | | x | x | GPS Flag | Enum | | NO, FROZEN, FROZEN_2D_ONLY, NORMAL, NORMAL_2D_ONLY, DIFF, DIFF_2D_ONLY | |
| | | | | | | | | | x | x | GPS Latitude | double | ° | -90.000 00 ° … + 90.000 00 ° | Stop Position |
| | | | | | | | | | x | x | GPS Longitude | double | ° | - 180.000 00 ° … +180.000 00 ° | Stop Position |
| | | | | | | | | | x | x | GPS Altitude | float | m | -9999.9 … + 9999.9 | Stop Position |

() Storing time is not real time clock but redundant information calculated by initial storing time (line 25), index ,storing interval and the time progress of the current segment.

Storing time is not transmitted anymore

**Voice Comments: A /CR is send after number of samples and after each 32 sample package**

| Parameter | Format | Unit | Range | Remarks |
|---|---|---|---|---|
| Number of samples | Integer | | 0 …. 32 000 | |
| 32 Sample Package | 32 byte, HEX | | 00 … FF for each sample | Hexadecimal Format, without $<br>no comma inside package<br>8 kHz linear PCM<br>8 bit offset binary format |

## 6. Error codes

| Code | Description |
|---|---|
| 0 | no error |
| 401 | remote command is not implemented in the remote module |
| 402 | invalid parameter |
| 403 | invalid count of parameters |
| 404 | invalid parameter range |
| 405 | last command is not completed |
| 406 | answer time between remote module and application module is too high |
| 407 | wrong quit message from application module |
| 408 | invalid or corrupt data |
| 409 | error while accessing the EEPROM |
| 410 | error while accessing hardware resources |
| 411 | command is not supported in this version of the firmware |
| 412 | remote is not activated (please send "REMOTE ON;" first) |
| 413 | command is not supported in the selected mode |
| 414 | memory of data logger is full |
| 415 | defragmentation of flash file system is required |
| 416 | option code is invalid |
| 417 | incompatible version |
| 418 | no Probe |