NBM-550 Remote Control Documentation

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Narda Safety Test Solutions GmbH,
Sandwiesenstr. 7, 72793 Pfullingen,
Germany

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. Within a string upper and lower case is distinguished. Also white space is maintained within a string
Enum	Stored as a four byte value A set of defined strings is specified for each command
Float /Double	Stored as 32/64 bit float value Input parameters are converted in to float Output parameters are automatically formatted
Byte	Stored as 8 bit unsigned integers Sometimes a allowed range or set of values is specified
Integer	Stored as 16 bit signed integers Sometimes a allowed range or set of values is specified
LngInt	Stored as 32 bit signed integers Sometimes an allowed range or set of values is specified
date (dd.mm.yy)	Date stored as three bytes Input and output as a 8 char string: dd.mm.yy d: 01 to 31, m: 01 to 12, y: 00 to 99. The range of the days is also restricted to possible dates in the years 2000 to 2999
time (hh:mm.ss)	Time stored as three bytes Input and output as a 8 char string: hh:mm:ss 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	EF0391, EF1891, HF3061, HF0191	Flat probes, 3 separate axes
B	EF5091, EF5092, EF6091	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	<.5	SK in Main menu
results	RESULT_UNIT?		x									<.5	
				x		x		Unit	Enum		V/m, A/m, **mW/cm^2,** W/m^2		
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	E_REF_E?		x									<.5	only available if a standard is applied
applied standard (E-Field Limit))				x				Eref_E(f)	Float	V/m			otherwise returns 0.0
The reference field strength of the	E_REF_H?		x									<.5	only available if a standard is applied
applied standard (H-Field Limit)				x				Eref_H(f)	Float	V/m			otherwise returns 0.0
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	E_MIN_A?		x									<.5	
probes part A				x				Emin_A	Float	V/m			
The minimum field strength of the	E_MIN_B?		x									<.5	only available for probe types C and D
probes part B				x				Emin_B	Float	V/m			
The maximum filed strength of the	E_MAX_A?		x									<.5	
probes part A				x				Emax_A	Float	V/m			
The maximum field strength of the	E_MAX_B?		x									<.5	only available for probe types C and D
probes part B				x				Emax_B	Float	V/m			
Rate at which measurement values	SAMPLE_RATE	x						Sample Rate	Enum	Hz	**5**, 50, 60	8	50 and 60 Hz in remote mode only
are sampled and calculated	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	TIMER_PROGRESS?		x									<.5	
controlled storing stops				x				Timer Progress	XTime				
Amount of free data logger memory	DL_FREE_MEM?		x									<.5	Minimum in percentage of available bytes
				x				Free Memory	Float	%	0 … 100		or Number of data sets
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	DL_DATA?		x					Index	Integer		1 … Number of Data Sets	<.5	
comment				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)

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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 $ no comma inside package 8 kHz linear PCM 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