HAMEG
Instruments

Description of interface commands

Date: *15th September 2003*

Valid for oscilloscopes:
HM305-2, HM404, HM404-2, HM407, HM1004-2, HM1004-2A, HM1004-3, HM1505-2, HM1507, HM1507-2, HM1507-3, HM2005.

RS-232 cable

A 9 conductor serial interface cable (1:1 connection, i.e. without crossed pin connections) will be required to connect the oscilloscope to an external instrument.

Setting the baud rate

The RS 232 interface must be initialized before use. This is effected by the first transmission of SPACE CR (20 hex., 0D hex.) after POWER UP ***(switching on)***. This will automatically set the baud rate. The following baud rates will be recognized:

110 Baud	4800 Baud
150 Baud	9600 Baud
300 Baud	19200 Baud
600 Baud	38400 Baud (1.19
1200 Baud	56700 Baud (1.19
2400 Baud	115200 Baud (1.19

Data transmission format: No parity, data length 8 bits,
2 stop bits, RTS/CTS handshake.

If the PC has a COM interface with FIFO buffer, then the maximum depth of the send buffer must be set to 8 bytes.
The baud rate set will remain operative until POWER DOWN ***(switch off)*** or until the remote mode is disabled with the command 'RM0', or until the pushbutton LOCAL (AUTOSET button) is activated, assuming this is not inhibited (LK=0).
Once the remote mode is disabled, the data transmission can be only restored by again sending SPACE CR.
If the oscilloscope does not recognize SPACE CR as first characters, or if Low-level exists on the RTS line longer than for about 2 seconds, then the oscilloscope exits the remote mode and sets the TxD Low for about 0.3s and thus generates a frame error.
The oscilloscope answers with a RETURNCODE (0 CR LF) if it has recognized SPACE CR and has set the baud rate.
The scope sends 'ESC RMLK=0' (ESC=1B hex.) and exits the Remote state if the button LOCAL is activated in Remote-ON state. The time between the reception of the RETURNCODE Remote-OFF and Remote-ON must be at least

$$t_{min} = 2*(1/\text{Baudrate}) + 60\mu s$$

Data transmission

After successfully setting the baud rate, the oscilloscope is in Remote state and is ready to accept commands. The commands can be in capital or lower case. The commands can be divided into two basic groups:

Interrogation of parameters

This group of commands is distinguished by a question mark at the end of the command. When such a command is transmitted to the scope, it answers by repeating the syntax followed by a colon and the parameters asked for. These can be binary or ASCII data depending on the command. The number of data bytes to be received is dependent on the command and can be seen from the command description.

Example:	Command to the scope:	VERS?
	Answer:	VERS:FC1.01 DG1.02

Set parameter

The parameters of the scope can be influenced with this command. Here commands with and without parameter can be differentiated.

Example:	Command to the scope:	LK=1
	Answer:	RETURNCODE

Example:	Command to the scope:	RES
	Answer:	RETURNCODE

All commands are answered either with parameters or with a RETURNCODE in ASCII format (see description of commands). One must wait for all parameters or RETURNCODE for the previous command before a new command can be sent to the scope.
WORD-parameters require first the low byte and then the high byte. The setting of the scope is effected over the instrument data field (Device Data Field DDF) as *binary array*. Each byte of this data field can also be accessed by individual commands.

The following tables show the build up of the instrument data field and the corresponding individual commands.

Definition of characters for the commands

Interrogation	?	Interrogates for parameters
Assign	=	Set parameter
State	:	Gives current parameter
Binary data	b	Data field is binary data of 1 byte
ASCII data	a	Data field is ASCII data of 1 Byte
WORD (2 bytes)	w	Data field consists of 2 bytes (low and high bytes)
ASCII data	ARRAY	Data field is ASCII data
Binary data	array	Data field is binary data
Terminating character	CR LF	Carriage return and/or Line feed
RETURNCODE	R	ASCII parameter
Parameter	x	x stands for A or B
Parameter	z	z stands for 1 or 2

Table of commands:

Command: PC -> Scope	**Acknowledgment** Scope -> PC	**Description**
AUTOSET	(R CR LF)	**AUTO SET** function will be carried out
AVRNM? (3	AVRNM:(b)	**AV**E**R**AGE **N**U**M**BER OF ACQUISITIONS Delivers the number of acquisitions carried out for averaging b = 01 hex.: 2^1 = 2 acquisitions b = 02 hex.: 2^2 = 4 acquisitions ... b = 09 hex.: 2^9 = 512 acquisitions
AVRNM=(b) (3	(R CR LF)	**AV**E**R**AGE **N**U**M**BER OF ACQUISITIONS Sets the number of acquisitions to be carried out for averaging
AVRNMSW? (3 (5	AVRQTSW:(a)	**AV**E**R**AGE **N**U**M**BER OF ACQUISITIONS **SW**ITCH Delivers the function of the Store Up/Down buttons a = 0: Store Up/Down buttons change Store Mode a = 1: Store Up/Down buttons change Average Number of Acquisitions
AVRNMSW=(a) (3 (5	(R CR LF)	**AV**E**R**AGE **N**U**M**BER OF ACQUISITIONS Sets Average Number of Acquisition Switch
BELL=(a)	(R CR LF)	Tone output a = 0: Buttons OK tone a = 1: Buttons ERROR tone a = 2: ERROR (longer tone) a = 3: 2 short tones a = 4: 3 short tones a = 5: 6 short tones
CH<z>?	CH<z>:(b)	Delivers **CH1**/**2** settings see table of instrument fields DDF
CH<z>=(b)	(R CR LF)	Sets **CH1**/**2** settings see table of instrument fields DDF
CH<z>VAR?	CH<z>VAR:(b)	Delivers **CH1**/**2 VARI**-GAIN setting b = FF hex.: CH<z> (1 or 2) calibrated
CH<z>VAR=(b)	(R CR LF)	Sets **CH1**/**2 VARI**-GAIN setting
CTRLBP?	CTRLBP:(a)	Delivers **C**ON**TRO**L **B**EE**P** setting a = 0: Off (key activation without control tone) a = 1: On
CTRLBP=(a)	(R CR LF)	Sets **C**ON**TRO**L **B**EE**P** setting

Command: PC -> Scope	**Acknowledgment** Scope -> PC	**Description**
CURCFG? (3.24 (3	CURCFG: (array)	Delivers **CUR**SOR **C**ON**FIG**URATION Activates and deactivates single cursor functions. (Bit = 1 activates the function) function — readout — dimension 1. Byte: D0 frequency — f — Hz D1 delta t — Δt — s D2 time cursor — CX — s D3 amplitude cursor — CY — V D4 amplitude difference — ΔY — V D5 amplitude maximum — Y? — V D6 amplitude minimum — Y? — V D7 amplitude peak to peak — Ypp — V 2. Byte: D0 dc voltage — Y= — V D1 ac voltage — Y˜ — V D2 rms value — $\overline{Y}$ — V D3 – D7 reserved 3. to 6. Byte: reserved
CURCFG= (array) (3.24 (3	(R CR LF)	Sets **CUR**SOR **C**ON**FIG**URATION
CURMOD1? (3.24 (3	CURMOD1: (array)	Delivers **CUR**SOR **MOD**E**1** and measuring values function — readout — dimension 1. Byte: 01 frequency — f — Hz 02 delta t — Δt — s 03 time cursor — CX — s 04 amplitude cursor — CY — V 05 amplitude difference — ΔY — V 06 amplitude maximum — Y? — V 07 amplitude minimum — Y? — V 08 amplitude peak to peak — Ypp — V 09 dc voltage — Y= — V 0A ac voltage — Y˜ — V 0B rms value — $\overline{\overline{Y}}$ — V 0C voltage CH1 — ΔV1 — V 0D voltage CH2 — ΔV2 — V 2. to 16. Byte: Measuring values in ASCII format. The measuring value relates to the channel used as the trigger source. ASCII code for special characters: 01 hex : ˜ — 13 hex : µ 05 hex : Δ — 14 hex : fill character 11 hex : ? — 17 hex : $\overline{Y}$ 12 hex : ?
CURMOD1= (b) (3.24 (3	(R CR LF)	Sets **CUR**SOR **MOD**E**1** b : see CURMODE 1st byte

Command: PC -> Scope	**Acknowledgment** Scope -> PC	**Description**
CURSET= (array) (3.09	(R CR LF)	Readout **CUR**SOR **SET** Activates cursors and sets them for Vpp or period measurement (depends on bit D10/12 in RODDF). In analog mode only Vpp is available. The measurement relates to the signal used as the trigger source. 1. Byte = 00 Cursors are set on the signal used for triggering. 01 to FF reserved 2. Byte = 01 Cursor mode RODDF bit D10/12 determines the automatical cursor setting. In analog mode only Vpp is available. 02 to FF reserved
DCREF? (4.06	DCREF: (a)	Delivers **DC REF**ERENCE display a = 0 : DC reference display disabled a = 1 : DC reference display enabled
DCREF= (a) (4.06	(R CR LF)	Sets **DC REF**ERENCE display
DDF?	DDF:(array)	Delivers **D**EVICE **D**ATA **F**IELD see table of instrument fields (4 bytes of commands + 14 bytes of parameters)
DDF=(array)	(R CR LF)	Sets new **D**EVICE **D**ATA **F**IELD see table of instrument fields DDF
DDF1?	DDF1:(array)	Delivers **D**EVICE **D**ATA **F**IELD**1** see table of instrument fields DDF1 (5 bytes of commands + 16 bytes of parameters.)
DDF1=(array)	(R CR LF)	Sets new **D**EVICE **D**ATA **F**IELD**1** see table of instrument fields DDF1
DELPOS?	DELPOS:(w)	Delivers **DEL**AY **POS**.(12 Bit) w = 000 hex.: Shortest DELAY time
DELPOS=(w)	(R CR LF)	Sets **DEL**AY **POS**.(12 bit)
ERRBP?	ERRBP:(a)	Delivers **ERR**OR **B**EE**P** setting a = 0: Off (no error tone output) a = 1: On (with error tone output)
ERRBP=(a)	(R CR LF)	Sets **ERR**OR **B**EE**P**
ERRMSGE?	ERRMSGE:(a)	Delivers **ERR**OR **M**E**S**SA**G**E setting a = 0: Off (Error messages are only sent to the interface) a = 1: On (Error messages are displayed with Read out and also sent to the interface)
ERRMSGE=(a)	(R CR LF)	Sets **ERR**OR **M**E**S**SA**G**E setting
FCCMD? (1.1	FCCMD:(a)	**F**RONT **C**ONTROLLER **C**O**M**MAN**D** Informs whether the scope has been manually operated. Will be reset after each interrogation.. a = 0: Scope has not been manually operated. a = 1: Scope has been operated manually (in the mean time).
HLD<z>POS? (3	HLD<z>POS:(b)	Delivers **HOLD 1/2 POS**ITION Y-offset carried out after HOLD referred to Store position. b = 00 hex.: Position shifted maximum upwards.

Command: PC -> Scope	**Acknowledgment** Scope -> PC	**Description**
HLD<z>POS=(b)[3]	(R CR LF)	Sets **HOLD 1/2 POS**ITION
HOLDOFF?	HOLDOFF:(b)	Delivers **HOLD OFF** value b = 00 hex.: Shortest Hold off time
HOLDOFF=(b)	(R CR LF)	Sets **HOLD OFF** value
HORMODE?	HORMODE:(b)	Delivers **HOR**IZONTAL **MODE** setting see table of instrument fields DDF
HORMODE=(b)	(R CR LF)	Sets **HOR**IZONTAL **MODE** setting see table of instrument fields DDF
HLDWFM? [3]	HOLDWFM:(a)	**HOLD WAVE FORM** Delivers HOLD function setting in Store mode a = 0: Off (HOLD switched off) a = 1: On (HOLD switched on)
HLDWFM=(a) [3]	(R CR LF)	**HOLD WAVE FORM** Sets HOLD setting
ID?	ID: (ARRAY)(CR LF)	**ID**ENTIFICATION (Hardware) Delivers instrument name and hardware identification bytes (3 bytes of commands + 27 bytes of parameters)
INT<x>?	INT<x>:(b)	Delivers **INT**ENS **A**/**B** [9] value b = 00 hex.: Trace blank time base <x> (A or B[9])
INT<x>=(b)	(R CR LF)	Sets **INT**ENS **A**/**B** [9] value
INTRO?	INTRO:(b)	Delivers **INT**ENS **R**EAD **O**UT value b = 00 hex.: Read out blanked
INTRO= (b)	(R CR LF)	Sets **INT**ENS **R**EAD **O**UT value
LK?	LK:(a)	Delivers the function of **LO**CAL LOC**K** OUT key (AUTO SET) a = 0: Locked a = 1: Free (The Remote mode will be exited on activation of the AUTOSET button and 'RMLK=0' will be sent to the interface)
LK=(a)	(R CR LF)	Setting the **LO**CAL LOC**K** OUT function
MEANVAL? (4.06	MEANVAL: (a)	Delivers **MEAN VAL**UE display a = 0 : mean value disabled a = 1 : mean value enabled
MEANVAL = (a) (4.06	(R CR LF)	disables or enables the **MEAN VAL**UE display
PSINT?	PSINT:(a)	Delivers **P**ULSE **S**WITCH **INT**ENS function of the rotary control: INTENS a = 0: INT A (Intensity trace A) a = 1: INT RO (Intensity Read out) a = 2: INT B (Intensity trace B) [9]
PSINT=(a)	(R CR LF)	Sets **P**ULSE **S**WITCH **INT**ENS function of the rotary control: INTENS

Command: PC -> Scope	**Acknowledgment** Scope -> PC	**Description**
PSY1POS?	PSY1POS:(a)	Delivers **P**ULSE **S**WITCH **Y 1 POS**ITION function of the rotary control: Y-POS. I a = 0: Y1 Position setting a = 3: Y Position setting of time base B (Trace sep.) in alternating time base mode (9
PSY1POS=(a)	(R CR LF)	Sets **P**ULSE **S**WITCH **Y 1 POS**ITION (function of the rotary control: Y-POS. I)
PSY2POS?	PSY2POS: (a CR LF)	Delivers **P**ULSE **S**WITCH **Y 2 POS**ITION function of the rotary control: Y-POS. II a = 0: Y2 Position setting
PSY2POS=(a)	(R CR LF)	Sets **P**ULSE **S**WITCH **Y 2 POS**ITION function of the rotary control: Y-POS. II
PSTB?	PSTB:(a)	Delivers **P**ULSE **S**WITCH **TB** function of the rotary control: TIME/DIV. a = 0: COARSE (1-2-5 sequence) a = 1: FINE (variable, depending on the time base mode A or B)
PSTB=(a)	(R CR LF)	Sets **P**ULSE **S**WITCH **TB** function of the rotary control: TIME/DIV.
PSCH<z>?	PSCH<z>:(a)	Delivers **P**ULSE **S**WITCH **CH1/2** function of the rotary control: VOLTS/DIV (CH I or CH II) a = 0: CHI or II COARSE (1-2-5 sequence) a = 1: CHI or II FINE (variable)
PSCH<z>=(a)	(R CR LF)	Sets **P**ULSE **S**WITCH **CH1/2** function of the rotary control: VOLTS/DIV (CH I or CH II)
QUICKST? (1.05	QUICKST:(a)	Delivers **QUICK ST**ART MODE a = 0: QUICK START off a = 1: QUICK START on
QUICKST=(a) (1.05	(R CR LF)	Sets **QUICK ST**ART MODE
RDWFM<z>: (w w)(3 (7 1st WORD Offset hex. (2 Kbytes) 2nd WORD length hex. (2 Kbytes)	RDWFM<z>: (W W array) (7	**R**EA**D W**AVE **F**OR**M 1/2** Delivers signal data of channel <z> (1 or 2), from Offset address (first WORD) with the given length (second WORD) Offset + length max. 2 Kbytes Complete transmission from channel 1: Offset = 0, length = 2048 dec. (2 Kbytes) 'RDWFM1:00000008' (figures in hex.) Data from the right half of the signal of channel 2: Offset = 1024 dec., length = 1024 dec. 'RDWFM2:00040004' (figures in hex.)
READOUT?	READOUT:(a)	Delivers **READ OUT** setting a = 0: Read out off a = 1: Read out on
READOUT=(a)	(R CR LF)	Sets **READ OUT** setting

Command: PC -> Scope	**Acknowledgment** Scope -> PC	**Description**
RDREF<z>: (w w)(3 (7 1st WORD Offset hex. (2 Kbytes) 2nd WORD length hex. (2 Kbytes)	RDREF<z>: (W W array) (7	**R**EA**D** **REF**ERENCE **1/2** Delivers Signal data from Reference store <z> (1 or 2), from Offset address (first WORD) with given length (second WORD) Offset + length max. 2 Kbytes See 'RDWFM<z>'
RECDF=(a)	(R CR LF)	**REC**ALL D**DF** Reads instrument data field of „SAVE/ RECALL-Store" (a = 1 ... 9) and sets the scope accordingly.
REF<z>POS? (3	REF<z>POS:(b)	Delivers **REF 1/2 POS**ITION Y Position of the reference traces in Digital mode b = FF hex. REF<z> shifted max. upwards
REF<z>POS=(b)(3	(R CR LF)	Sets **REF 1/2 POS**ITION
REF<z>PRE? (3	REF<z>PRE: (array)	**REF**ERENCE **1/2 PRE**AMBLE Sets the scope in the state in which the reference traces were stored. Besides, information will be sent to the PC. array: 1st WORD: Memory address at the time of triggering 2nd WORD: X resolution = 200 bit/DIV 3rd WORD: Y resolution = 25 bit/DIV 4th WORD: Y1 standardized position based on the value of WORD 3 (Integer value) 5th WORD: Y2 standardized position based on the value of WORD 3 (Integer value)
RES(CR LF) (2	(R CR LF)	Sets **RES**ET function in SINGLE mode
RM0(CR LF)	(R CR LF)	**R**E**M**OTE Exit remote mode
RREFPRE (3	(R CR LF)	**R**ECALL **REF**ERENCE **PRE**AMBLE Sets the scope in the state in which the current acquisition was stored as reference. (HM1507/1507-2: The REF1 preamble will be loaded if both traces are switched on.)
RODDF?	RODDF:(array)	Delivers **R**EAD **O**UT **D**EVICE **D**ATA **F**IELD (RO device data field) (6 bytes of commands + 10 bytes of parameters) See table read out data field RODDF
RODDF=(array)	(R CR LF)	Sets new **R**EAD **O**UT **D**EVICE **D**ATA **F**IELD (RO device data field)
SAVEDF=(a)	(R CR LF)	**SAV**E DEVICE **D**ATA **F**IELD Stores the current instrument settings in the „SAVE/RECALL-Store" in memory position a (a = 1 ... 9)
SAVREF<z> (CR LF) (3	(R CR LF)	**SAV**E **REF**ERENCE **1/2** In STORE MODE, stores the current signal data in reference store <z> (1 or 2)

Command: PC -> Scope	**Acknowledgment** Scope -> PC	**Description**
STRMODE? (3	STRMODE:(b)	Delivers **STORE MODE** see table of instrument fields DDF
STRMODE= (b) (3	(R CR LF)	Sets **STORE MODE** see table of instrument fields DDF
TB<x>?	(R CR LF)	**TIMEBASE A/B** Sets time base A/B setting see table of instrument fields DDF
TB<x>= (b)	TB<x>:(b)	**TIMEBASE A/B** Delivers time base A/B setting see table of instrument fields DDF
TB<x>VAR?	TB<x>VAR:(w)	Delivers **TIMEBASE A/B VAR** setting (10 bits) w = 000 hex.: TB<x> (A or B) calibrated w = 001 .. 3FF hex.: TB<x> uncalibrated
TB<x>VAR= (w)	(R CR LF)	Sets **TIMEBASE A/B VAR** setting (10 bit)
TRIG?	TRIG:(b)	Delivers **TRIG**GER parameter see table of instrument fields DDF
TRIG= (b)	(R CR LF)	Sets **TRIG**GER parameter see table of instrument fields DDF
TRIGPOSx? (3.24	TRGPOSx: (w)	Delivers **TR**IGGER **POS**ITION **A/B** 1000 Bit/Div in two`s complement, related to graticule center. Not for : HM200x: HF-, NR-, TV-, LINE-Trigger Coupling and alternating and external Trigger Source. HM200x: HF-, TV-, LINE-Trigger Coupling and alternating and external Trigger Source.
TRGS? (4.06	TRGS: (a)	Delivers TRIGGER SYMBOL display a = 0 : trigger symbol disabled a = 1 : trigger symbol enabled
TRGS= (a) (4.06	(R CR LF)	Sets **TRIG**GER **S**YMBOL display
TRSEP? (9	TRSEP:(b)	Delivers **TR**ACE **SEP**. Y position of the timebase B referred to the Y position of the time base A b = 00 hex.: B maximum above A b = FF hex.: B maximum below A b = 80 hex.: Y position of B = Y position of A
TRSEP=(b) (9	(R CR LF)	Sets **TR**ACE **SEP**.
TRGSTA?	TRGSTA:(b) TRGSTA:(a) (1.17	Delivers **TRIGGERSTA**TUS a(or b) = 0: Instrument does not trigger a(or b) = 1: Instrument triggers a(or b) = 2: Instrument is in SINGLE RESET MODE or, acquisition not yet terminated.

Command: PC -> Scope	**Acknowledgment** Scope -> PC	**Description**
TRGSTA(CR LF)	(R CR LF)	**TRIGGERSTA**TUS Reset Automatic mono flop (≈ 200ms) Enables immediate interrogation with 'TRGSTA?'.
TRGVAL?	TRGVAL:(array)	**TRIGGERVAL**UE Delivers trigger signal voltage value (measured at the trigger amplifier) array: 16 Bit INTEGER; 1st WORD: Positive peak value 2nd WORD: Negative peak value 3rd WORD: Peak to peak value 4th WORD: DC trigger working point (reference value) Weighting : - WORD 1-3 : ca. 20mV/LSB - WORD 4 : ca. 5mV/LSB and 250mV/DIV (2.00: 1st WORD: Positive peak value 2nd WORD: Negative peak value 3rd WORD: Mean arithmetic value 4th WORD: Reserved Weighting: 1000 Bit/DIV
TRGLEV<x>?	TRGLEV<x>:(w)	Delivers **TRIGGER-LEVEL A/B** setting (10 bits) w = 3FF hex.: max. positive (right limit) w = 000 hex.: max. negative (left limit)
TRGLEV<x>=(w)	(R CR LF)	Sets **TRIGGER-LEVEL A/B** setting (10 bits)
VERMODE?	VERMODE:(b)	Delivers **VERTICAL MODE** (vertical setting) see table of instrument fields DDF
VERMODE=(b)	(R CR LF)	Sets **VERTICAL MODE** (vertical setting) see table of instrument fields DDF
VERS?	VERS:(ARRAY)	Delivers SOFTWARE **VERSION** 5 bytes of commands + 15 bytes of parameters
WFMPRE? (3	WFMPRE:(array)	**WAVE FORM PREAMBLE** Delivers Data for the stored traces array: 1st WORD: Memory address at the time of trigger 2nd WORD: X resolution = 200 bit/DIV 3rd WORD: Y resolution = 25 bit/DIV 4th WORD: Y1 position standardized on the value of WORD 3 (integer value) 5th WORD: Y2 position standardized on the value of WORD 3 (integer value)

Command: PC -> Scope	**Acknowledgment** Scope -> PC	**Description**
WRREF<z>: (3 (6 (7 (w w array) 1st WORD Offset hex. (2 Kbytes) 2nd WORD length hex. (2 Kbytes)	(R CR LF)	**WR**ITE **REF**ERENCE **1/2** writes signal data into the reference store <z> (1 or 2), from offset address (first WORD) with given length (second WORD) Offset + length max. 2 Kbytes See 'RDWFM<z>'

XPOS?	XPOS:(w)	Delivers **X-POS**ITION setting (10 bits) w = 3FF hex.: „right limit" w = 000 hex.: „left limit " (1.1: 16 Bit INTEGER value in two's complement referred to graticule center (1000 bits/DIV) (10
XPOS=(w)	(R CR LF)	Sets **X-POS**ITION setting (10 Bit) (1.1: (16 Bit INTEGER)
Y<z>POS?	Y<z>POS:(w)	**Y 1/2 POS**ITION Delivers CH<z> (1 or 2) position setting (10 bits) w = 3FF hex.: Y position maximum upwards w = 000 hex.: Y position maximum downwards (1.1: 16 Bit INTEGER value in twos complement referred to graticule center (1000 bits/DIV) (10
Y<z>POS=(w)	(R CR LF)	**Y 1/2 POS**ITION Sets CH<z> (1 or 2) position setting (10 bits) (1.1: (16 Bit INTEGER)

All commands will be internally checked for any conflicts and protocolled in RETURNCODE.
The following RETURNCODES (ASCII characters) have been implemented:

0 = no error
1 = syntax error
2 = data error
3 = buffer overflow
4 = bad data set
5 = adjustment error
6 = timing error (internal data transmission FC /STORE)

Instrument data field (DDF)

	D7	D6	D5	D4	D3	D2	D1	D0
CH1	GND	AC	INV1	ON	**VOLT/DIV - Counter 0-13** HM200x Counter 0 – 11 (1mV/DIV – 5V/DIV) 0000(1mV/DIV)...1101(20V/DIV)			
CH2	GND	AC	INV2	ON	**VOLT/DIV - Counter 0-13**			
VERMODE	Alt.- TRG	Probe CH1: (2.00 0 = 1:1 1 = 10:1	BWL 0 = OFF 1 = ON (13	CHOP	ADD	Probe CH2: (2.00 0 = 1:1 1 = 10:1	**TR-SOURCE** 00 = CH1 01 = CH2 1x = EXT	
TBA	Z Input 0 = ON 1 = OFF (12.00	0	ANA SING DIGI SING (2.02	**MODE** Analog: Store:(3 Store XY:(3 Store ROLL:(3	**TIME/DIV – Counter** 00hex. - 15hex.{SEA:11hex} 50ns/DIV - 0,5s/DIV{SEA:20ms} 04 {03(8)} hex. - 1Chex 1µs {500ns(8)}/DIV - 100s/DIV 06 {05(8)} hex. - 1Chex 40MS {100MS(8)}/s - 2S/s 12hex. - 1Chex 50mS/s - 100S/s			
TBB	B +/- (1=neg. Trigger- edge)	B-TR	0	**MODE** Analog: Store:(3	**TIME/DIV – Counter** 00hex. – TBA (max.11hex.) 50ns – TBA (max.20ms/DIV) 04 {03(8)} hex. – TBA (max.11hex.) 1µs {500ns(8)}/DIV –TBA (max.20ms/DIV)			
HORMODE	CT (Compo- nent Tester)	XY	x10	STORE(3	PP detect 0 = OFF 1 = ON only HM1507 from (3.24	**TB-MODE** *HM1004-2/-3/1505-2* *HM1507/-2/-3* *HM2005* 000: TBA 001: TBA + TBB 010: TBA alt.TBB 011: TBB	*HM305-2* *HM404/-2* *HM407* TBA reserv. SEARCH DELAY	
TRIG	+/- (1=neg Trigger- edge)	0	P-P	NORM	0	**Kopplung 0-7** *HM1004-2/-3/1505-2* *HM1507/-2/-3* *HM2005* 000: AC 001: DC 010: HF 011: NR 100: LF 101: TVLine 110: TVField 111: LINE	*HM305-2* *HM404/-2* *HM407* AC DC HF LF TVLine TVField LINE reserv.	
STRMODE(3	REF2	REF1	**PRE TRIGGER** 000 = -75% 001 = -50% 010 = -25% 011 = 0% 100 = 25% 101 = 50% 110 = 75% 111 = 100%			**STOREMODE** 000 = REF 001 = SGL (2.02 reserv. 010 = ROL (TB=100s..50ms) 011 = ENV 100 = AVR		
CH2 VAR	**8-BIT**							
CH1 VAR	**8-BIT**							
TRSEP (9	**8-BIT**							
HOLD OFF	**8-BIT**							
INTENS A	**8-BIT**							
INT B (9	**8-BIT**							

Instrument data field 1 (DDF1)

	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
TR A LEV	0	0	0	0	0	0	X	X	X	X	X	X	X	X	X	X
TB A VAR	0	0	0	0	0	0	X	X	X	X	X	X	X	X	X	X
X POS	X (1.1	X (1.1	X (1.1	X (1.1	X (1.1	X (1.1	X	X	X	X	X	X	X	X	X	X
Y2 POS	X (1.1	X (1.1	X (1.1	X (1.1	X (1.1	X (1.1	X	X	X	X	X	X	X	X	X	X
Y1 POS	X (1.1	X (1.1	X (1.1	X (1.1	X (1.1	X (1.1	X	X	X	X	X	X	X	X	X	X
TR B LEV	0	0	0	0	0	0	X	X	X	X	X	X	X	X	X	X
TB B VAR	0	0	0	0	0	0	X	X	X	X	X	X	X	X	X	X
DEL POS	X (4.0	X (4.0	X (4.0	X (4.0	X (4.0	X (4.0	X	X	X	X	X	X	X	X	X	X

Read out data field (RODDF)

	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
CURSOR MODE	1= TRG Crs EN (3.0	0= CH1 1= CH2	1= DC REF EN (3.0	0=X 1=Y	1= Trk	0dt 1=f	0 (14.0	1= Crs On	**I**	**N**	**T**	**-**	**R**	**O**	**U**	**T**
CURSOR X I	X (1.1	X (1.1	X (1.1	X (1.1	X (1.1	X (1.1	X	X	X	X	X	X	X	X	X	X
CURSOR X II	X (1.1	X (1.1	X (1.1	X (1.1	X (1.1	X (1.1	X	X	X	X	X	X	X	X	X	X
CURSOR Y I (11	X (1.1	X (1.1	X (1.1	X (1.1	X (1.1	X (1.1	X	X	X	X	X	X	X	X	X	X
CURSOR Y II (11	X (1.1	X (1.1	X (1.1	X (1.1	X (1.1	X (1.1	X	X	X	X	X	X	X	X	X	X

(1.05 from FC-Version 1.05
(1.1 from FC-Version 1.10
(1.17 from FC-Version 1.17
(1.19 from FC-Version 1.19
(2.00 from FC-Version 2.00
(2.02 from FC-Version 2.02
(3.0 from FC-Version 2.02
(3.09 from FC-Version 2.02
(3.24 from FC-Version 2.02
(4.0 from FC-Version 2.02

(2 RES = 1 arms the trigger unit in combination with SINGLE and Analog mode
RES = 1 starts a new data recording and arms the trigger unit in combination with SINGLE and Digital mode
RES = 1 starts a new data recording in Digital mode

(3 Only in Analog / Digital Scope

(4 The data will be loaded in an EEPROM. This consists of only a limited number *(≥ 1 000 000)* of programming cycles. Therefore this command should not be used unless absolutely necessary.

(5 This function will be reset after a counter has run down (ca. 5s). Each further output before the end of the interval sets the counter anew and thus prolongs the time until reset.

(6 The maximum interval permitted between the transmission of each trace byte is 2s, otherwise the scope will exit the remote state.

(7 Valid for FC-Versions lower 1.05:
For (w w) stands (w,w); comma as ASCII character.
For (w w array) stands (w,w:array); comma and colon as ASCII character.

(8 Only HM1507 and HM1507-2

(9 Only for instruments with 2 time bases.

(10 16 Bit INTEGER value in two's complement based on the graticule center (1000 bit/DIV).

Ex. 1:	Set Y position to graticule center	Output: 0 dec. = 0 hex.
Ex. 2:	Set Y position to +1 division	Output: 1000 dec. = 3E8 hex.
Ex. 3:	Set Y position to -1 division	Output: 64536 dec. = FC18 hex.

(11 400 bit/DIV, since FC 2.09: 1000 bit/DIV

(12 only HM40x since FC 3.17 and HM200x

(13 only HM200x

(14 if D9 is set, D10 becomes invalid. Then “CURMOD1?” must be used for Cursor Mode query.

Examples

Some examples, with detailed explanations regarding the command, are given below.
Most of the commands are terminated with **CR** (ENTER)= 0Dhex and **LF** = 0Ahex. Also, the scope terminates each acknowledgment string with these characters.
The command parameters (given in brackets) may be ASCII characters (a), or binary values (b).

BELL=(a)

Explanation: This command outputs the tone 2.

String to scope: BELL=2 CR

Character sequence in hex representation: 42 45 4C 4C 3D 32 0D

Answer from scope: 0 CR LF

Answer from scope in hex representation: 30 0D 0A

CH1=(b)

Explanation: This command switches the channel on, with 5mV and AC.
See also byte 1 of DDF.

String to scope: CH1= (52hex) CR

Character sequence in hex representation: 43 48 31 3D 52 0D

Answer from scope: 0 CR LF

Answer from scope in hex representation: 30 0D 0A

ERRBP?

Explanation: This command interrogates the status of the control tone
for error. 1 means Error beep is switched on, 0 corresponds to off.

String to scope: ERRBP? CR

Character sequence in hex representation: 45 52 52 42 50 3F 0D

Answer from scope: ERRBP:1

Answer from scope in hex representation: 45 52 52 42 50 3A 31

RDWFM1:(ww)

Explanation : Read signal trace from channel 1.

Parameter 1: Start address in acquisition store = 0 dec. = (00 00)hex.

Parameter 2: Number of bytes to be read = 2048 = (08 00) hex. When transmitting word data, note that the low byte must be output first.
It is possible to read only a part of the acquired signal by transmitting other values for the start address and the number of bytes to read.

String to scope: RDWFM1:(00hex)(00hex)(00hex)(08hex) CR

Character sequence
in hex representation: 52 44 57 46 4D 31 3A 00 00 00 08 0D

Answer from scope
in hex representation: 52 44 57 46 4D 31 3A 08 00 00 08 XX XX ...
... XX ;(2048 Byte XX)

WFMPRE?

String to scope: WFMPRE?

Answer from scope
in hex representation: 57 46 4D 50 52 45 3A XX XX C8 00 19 00 YY YY ZZ ZZ

Explanation:		
	Byte 1 to 7:	WFMPRE:
	Byte 8 & 9:	Number of the byte at trigger
	Byte 10 & 11:	Resolution in X direction per Div. (200)
	Byte 12 & 13:	Resolution in Y direction per Div. (25)
	Byte 14 & 15:	(YY YY) Y1 position as 16 bit integer variable standardized on 25 per Div., where the value 0 signifies no shift, 25 shifted one division up and -25 shifted one division down.
	Byte 16 & 17:	(ZZ ZZ) Y2 position standardized on 25 per Div.

Calculating the voltage of the sampled signal form:

Given: UN : Voltage value of the Nth sample
25 : Y resolution per Div. (see WFMPRE?)
Y1Pos : Y1 position of the signal form (see WFMPRE? YY YY)
ByteN : Value of the signal form byte (see RDWFM1 XX)
V/Div : Attenuator setting (e.g.: 5mV)

Calculation without taking the Y1 position into account:

UN = (ByteN - 128)/25 * V/Div

With this method it is only possible to evaluate the voltage difference of the acquired signal, since there is no reference (Zero voltage). In order to calculate the absolute voltage of the sample one should include the Y position in the calculations.

UN = (ByteN - 128 - Y1Pos)/25 * V/Div

The deflection coefficient (V/DIV) is obtained from the DDF byte 1 or with the command CH1?.

TRGVAL?

With this command it is possible to evaluate the peak value and the arithmetical mean value of the measured signal. This is shown in the following example.

Scope setting: Channel 1 on; 5mV deflection sensitivity; DC input coupling; probe 1:1; 1kHz calibration; probe in the calibration socket; trigger source - channel 1; AC Trigger coupling; Timebase A set to 200µs; analog mode.

A positive square wave signal with an amplitude of 4 div. can be seen on the oscilloscope display.

String to scope: TRGVAL?

Answer from scope
in hex representation: 54 52 47 56 41 4C 3A D0 07 30 F8 D0 07 XX XX

Explanation: Byte 1 to 7: String TRGVAL:
Byte 8 and 9: Positive peak value (signal)
Byte 10 & 11: Negative peak value (signal)
Byte 12 & 13: Arithmetic mean value (signal)
Byte 14 & 15: Reserved (value undefined)

Positive and negative peak values are integer values referred to the mean value with the weighting of 1000/div.

Then follows: 07D0 hex. = +2000 decimal
F803 hex. = - 2000 decimal

Mean value: Um = 2000/1000 * 5mV = 10mV

positive peak value: Upp+ = 2000/1000 * 5mV + Um = 20mV

negative peak value: Upp- = -2000/1000 * 5mV + Um = 0mV

Since the trigger amplifier is not calibrated there can be a deviation from the values.

SOURCE FILE: TERM9X_D.TXT /CHEMNITZ /04.DEC.1994

Remote control with the Term9X program of NORTON COMMANDER

1. Settings

1.1 term90.exe

Under ' Settings \ Interface':	Port:	Your free serial port, e.g. COM2.
	Baud rate:	recommended 19200.
	Data bits:	8 BITS
	Parity:	None
	Stop bits:	2 BITS
	Data exchange:	Xon/Xoff to off.
		RTS/CTS/ to on.

Under 'Settings \ Terminal' mark the 'ANSI' .
Under 'Settings \ ' mark the option 'Echo'.

1.2 term95.exe

Under 'Settings \ Driver' mark the option 'Standard'.

Under 'Settings \ Line...':	Port:	Your free serial port, e.g. COM2.
	Baud rate:	Recommended 19200.
	Data bits:	8 BITS
	Parity:	None
	Stop bits:	2 BITS
	Data exchange:	Xon/Xoff to off.
		RTS/CTS/ to on.

Under 'Settings \ Terminal Emulation' mark the option 'ANSI'.
Under 'Settings \ Terminal settings' mark the option 'Echo'.

2. Remote control

The transmission can be started after all settings have been correctly set,.

Remote On: Enter one after the other a SPACE and ENTER.
The instrument goes into remote mode, which is evident from the Remote LED.
Now you can enter any desired command such as, for example, 'vers?'.

Example: Switch on channel 2 of the instrument and at the same time set it to 5mV.
Enter 'ch2=', press the key "Alt Gr" and simultaneously enter from the number keyboard one after the other the numbers 0,1 and 8. After releasing the "Alt Gr" key, the instrument will be set.
The RETURNCODE will be displayed behind the transmitted command.

The value 0 ("Alt Gr" 000) will not be transmitted.