HRI M-Bus Protocol Specification

Release: 19 October 2010 - modified for customer / items in red are new!

GLOSSARY

HSW	HRI Status Word
| **PW PW PW PW** |	Password for “Operator Mode”
| **68 L L 68** |	Header
MT	meter type byte
PA	primary address {0.. 250, 253, 254, 255}
L	length of send bytes
CS 16	sequence: Checksum, Stop sign
DIF	data information field
VIF	value information field
GB	generation byte
TC	transfer counter
ID	Identification number
MD	Medium byte
ST	M-Bus status byte
| **TAB** |	Package of data in PARAMETERS TELEGRAM
FDH	Fixed Data Header: ID, ID , ID, ID, AE, 4C,GB, MD, TC, ST, 00, 00
REQ_UD2	sequence 10, 5B/7B, PA, CS, 16
RSP_UD	sequence: 68, L, L, 68, 08, PA, 72, **FDH**
SND_NKE	sequence: 10, 40, PA, CS, 16
SND_UD	sequence: 68, L, L, 68, 53/73, PA
SND_SET	sequence: **SND_UD**, 51, 0f, MT, 1f, 20

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1 INTRODUCTION

The HRI-Mei/Bx, Residia M are a microprocessor-based, battery-operated units that using M-Bus/Mini-Bus.
The baud rate switches automatically 300/ 2400 baud.

This document specifies the communications protocol in accordance with European Standard “EN 13757-3:2004: E” and “M-Bus Documentation Ver 4.8”

Meter Type [MT] values

- HRI-Mei/Bx : **2**.
- Residia-M : **3**.

Generation Byte:

- HRI-MEI/Bx : **0x49h**
- Residia M : **0x52h**

1.1 IDENTIFICATION

The “**Fabrication number**” is a 32-bit number that uniquely identifies each individual HRI. This number is assigned at the factory and is located at RAM.

Also **“ID Number“** and **“Customer Location”** are used for identification.

1.2 OPERATING MODES

The HRI-Mei/Bx, Residia M are microprocessor-based, battery-operated units that consumes very low power when in “sleep” mode. In this mode all electronic circuits are turned off with the exception of the microprocessor.
In the case of M-Bus/Mini-Bus link microprocessor wakes up when have received command with valid address.
If there are no commands with valid address while standby timeout (60 seconds) microprocessor go back to sleep.

2 CONFIGURATION MODES

HRI units support three configuration modes:

- Operator Mode
- User Mode

“User Mode” provides access to no protected commands.

It is a good practice, but it is not necessary, if master software (MiniCom SenProSoft) will use Operator commands in ONE BATCH like

- Open device
- Send one or some commands requested by the user.
- Close device

And this cannot be interrupted by the user, so the meter will always be closed.

Meter will not remain in Operator mode for long time.
If there are no commands with valid address while standby timeout (60 seconds) microprocessor go back to sleep and automatically exited this modes.

Note 3: *In command “Set Password” value password can be zero. Zero value of operator password means that function of password protection is OFF, and you can use any password value to open HRI.*

2.1 OPERATOR MODE

Before using password protected commands in “Operator Mode” need make command “**Open device**” or command “**Set Service Mode**” or Power ON. In “operator Mode” open commands from “User Mode “ are available too.

2.1.1 Open device

Master to slave: **SND_SET** | **A0** | **PW PW PW PW** | CS 16 |

Example (1) 68 0C 0C 68 73 FE 51 0F 02 1F 20 **A0 01 00 00 00** B3 16

Slave to master: e5

The command opens access to protected commands.

The value of password | **PW PW PW PW** | must be equal to this value in the command “**Set Password”.** Default password is |**00 00 00 00**| it means no protect.

2.1.2 Close device

Master to slave: **SND_SET** | **A5** | CS 16 |

Example 68 08 08 68 53 FE 51 0F 02 1F 20 **A5** 97 16

Slave to master: e5

The command closes access to protected commands.

2.1.3 Set Password

Master to slave: **SND_UD** | 51 | 04 fd 16 | **PW PW PW PW** | CS 16 |

Example (1) 68 0A 0A 68 53 FE 51 04 FD 16 **01 00 00 00** BA 16

Slave to master: e5

| **PW PW PW PW** | is the value of password (HEX 0 … FFFFFFFF)

Note: *Zero operator password means that function of password protection is OFF and any password value can be used to open HRI*

2.1.4 Update Date and Time

Master to slave: **SND_UD |** 51 | 04 6d | **xx xx xx xx** | CS 16 |

Example (23/02/10 12:02) 68 09 09 68 73 FE 51 04 6D **02 0C 57 12** AA 16

Slave to master: e5

2.1.5 Set Key Date

Master to slave (day month) : **SND_SET** | **b5** | **xx xx** | CS 16 |

Example (31 December) 68 0A 0A 68 73 FE 51 0F 02 1F 20 **B5 1F 0C** F2 16

Slave to master: e5

Default value: (31 December)

"Key Date" indicates date of the year in which values of yearly telegrams are storing (the time point of the storing is 23:59)

Note : *"Yearly historical data" are not clearing after changing "Key Date".*

2.1.6 Set Billing Day

Master to slave : **SND_SET** | **ba** | **xx** | CS 16 |

Example (31) 68 09 09 68 53 FE 51 0F 02 1F 20 **BA 1F** CB 16

Slave to master: e5

"Billing day" indicates the day of the month in which the values of 24 monthly telegrams are storing (the time point of the storing is 23:59 o'clock.)

If "Billing day" overrides number of days in month ,HRI will store at last month day at 23:59 o'clock.

For example if Billing day equals to 31, for April, June, September, and November HRI-Mei/Bx will store at 30th and for February normally at 28th , but for leap year at the 29th of February, for all other months at 31th.

Default values:
31: HRI-Mei/Bx
1: Residia M

2.1.7 Initialize Register Value

Master to slave (0): **SND_SET** | **70** | **xx xx xx xx** | CS 16 |

Example (12345678) 68 0C 0C 68 73 FE 51 0F 02 1F 20 **70 4E 61 BC 00** ED 16

Slave to master: e5

Command synchronizes Register value. Register is the same as mechanical register (including overflow).

Value (0… 999 999 999) (HEX 0 … 3B9AC9FF)
0: Default value

2.1.8 Clearing Rotation Counters

Master to slave: **SND_SET** | **7a** | CS 16 |

Example: 68 08 08 68 73 FE 51 0F 02 1F 20 **7A** 8C 16

Slave to master: e5

The command cleans counters of forward and backward rotations.

2.1.9 Set Liters per Rotation

Master to slave (0): **SND_SET** | **7d** | **xx** | CS 16 |

Example (0) 68 09 09 68 53 FE 51 0F 02 1F 20 **7D 00** 6F 16

Slave to master : e5

Value : Liters per Rotation
0: 1 (Default for Residia M*)*
1: 10 (Default for HRI-Mei/Bx)
2: 100
3: 1000

2.1.10 Set Pulse Duration (*no support in Residia M*)

Master to slave (1): **SND_SET** | **60** | **xx** | CS 16 |

Example (1): 68 09 09 68 73 FE 51 0F 02 1F 20 **60 01** 73 16

Slave to master: e5

Values (0, 1, 2) define standard pulse durations.
0: 32 ms (default), 1: 128 ms, 2: 500 ms

2.1.11 Set Divider Value (*no support in Residia M*)

Master to slave (1): **SND_SET** | **65** | **xx** | CS 16 |

Example (1) 68 09 09 68 73 FE 51 0F 02 1F 20 **65 01** 78 16

Slave to master: e5

Value:	divider	**{ ratio}**	Value:	divider	**{ratio}**
0:	1	{1000 }(**Default)**	6:	100	{ 10 }
1:	2.5	{ 400 }	7:	250	{ 4 }
2:	5	{ 200 }	8:	500	{ 2 }
3:	10	{ 100 }	9:	1000	{ 1 }
4:	25	{ 40 }	5:	50	{ 20 }

2.1.12 Set Pulses Mode(*no support in Residia M*)

Master to slave (0): **SND_SET** | **6a** | **xx** | CS 16 |

Example (0) 68 09 09 68 73 FE 51 0F 02 1F 20 **6A 00** 7C 16

Slave to master: e5

Value:	Mode
0.	Off pulse output.
1.	B1
2.	B2 (*default for HRI-Mei/Bx)*
3.	B3
4.	B4
5.	B5 NAMUR with direction
6.	B6 NAMUR with balanced pulses
7.	B7 (parallel)

***Note**: Clear negative pulses counter for balanced modes (B1,B4,B6).*
*For manufacture testing after first start or hardware reset of HRI-MEI/Bx pulse mode is set to **B2**.*

2.1.13 Set Limit Time for Leakage

Master to slave (1): **SND_SET** | **85** | **xx** | CS 16 |

Example (5): 68 09 09 68 53 FE 51 0F 02 1F 20 **85 05** 7C 16

Slave to master: e5

Time limit values in minutes (1 … 59)
5 : Default value

***Note**: Clear flag ALARM_FLOW_LEAKAGE in "HRI Status Word"*

2.1.14 Set Leakage Period

Master to slave (24): **SND_SET** | **87** | **xx** | CS 16 |

Example (24): 68 09 09 68 53 FE 51 0F 02 1F 20 **87 18** 91 16

Slave to master: e5

Leakage period value in hours (1 … 255)
Default value : 24

***Note**: Clear flag ALARM_FLOW_LEAKAGE in "HRI Status Word"*

2.1.15 Set Limit Time for Break

Master to slave (1): **SND_SET** | **8a** | **xx** | CS 16 |

Example (5): 68 09 09 68 53 FE 51 0F 02 1F 20 **8A 05** 81 16

Slave to master: e5

Time limit value in minutes (1…59)
5 : Default value

***Note**: Clear flag ALARM_FLOW_BREAK in "HRI Status Word"*

2.1.16 Set Limit Flow for Break

Master to slave (1): **SND_SET** | **8d** | **xx xx** | CS 16 |

Example (28800) 68 0A 0A 68 73 FE 51 0F 02 1F 20 **8D 80 70** 8F 16

Slave to master: e5

Value : (1…65535) Rotations per hour.

Default values:

- HRI-Me/Bx (8 Hz*3600) : **28800**(288 m^3/hour for 10 Liters per Rotation)
- Residia M (0.83Hz*3600) : **3000**(3 m^3/hour for 1 Liters per Rotation)

***Note**: Clear flag ALARM_FLOW_BREAK in "HRI Status Word"*

2.1.17 Set Error Masks

Master to slave(AF10h): **SND_SET** | **8e** | **xx xx** | CS 16 |

Example (AF10h) 68 0A 0A 68 53 FE 51 0F 02 1F 20 **8E 10 AF** 3F 16

Slave to master: e5

Value : (0…0xFFFF) defines alarms that will enabled in output I2 (not in Residia M) and bits in "M-Bus Status Byte" .

Default value (0x0700h **)** (see "HRI Status Word")
STATUS_ OPEN ***OR*** STATUS_ NO_INIT ***OR*** STATUS_ SERVICE

2.1.18 Set Medium Byte

Master to slave : **SND_UD**| **51** | 01 fd 09 | **xx** | CS 16 |

Example (07) 68 07 07 68 73 FE 51 01 FD 09 **07** D0 16

Slave to master: e5

2.2 USER MODE

In "User Mode "only no protected commands are available, in other modes these commands are available too.

2.2.1 SND NKE

Master to slave: |10 40 PA CS 16|

Example: | 10 40 FE 3E 16 |

Slave to master: e5

Note: *for multi-telegram reply after "**SND_NKE**" the meter begins answer with the first telegram-MAIN TELEGRAM.*

2.2.2 Set_ID Number

Master to slave: **SND_UD** | 51 | 0c **79** | **xx xx xx xx** | CS 16 |

*Example (*12345678) 68 09 09 68 73 FE 51 0C **79 78 56 34 12** 5B 16

Slave to master: e5

The command sets a 32-bit Identification No (8 BCD) that identifies device in network. About Identification No **(" ID Number ")** see [1] chapter **6.4.2**

Note*: With this optional data record the secondary address can be changed. See* [2] *chapter 11.3 "Selection and Secondary Addressing".*

2.2.3 Set_Primary Address

Master to slave: **SND_UD** | 51 | 01 7a | xx | CS 16 |

Example (250) 68 06 06 68 53 FE 51 01 7A **FA** 17 16

Slave to master: e5

Values of primary address (0…250, 253). Default address: 0.

2.2.4 Set Customer Location

Master to slave: **SND_UD** | 51 | 0c fd 10 | xx xx xx xx | CS 16 |

Example (12345678): 68 0A 0A 68 73 FE 51 0C FD 10 **78 56 34 12** EF 16

Slave to master: e5

The command sets a 32-bit number (8 BCD) that identifies device location.

In HRI **"Customer Location"** doesn't use for "Enhanced Selection and Secondary Addressing"

2.2.5 Reset Errors

Master to slave: **SND_SET** | **10** | CS 16 |

Example: 68 08 08 68 53 FE 51 0F 02 1F 20 **10** 02 16

Slave to master: e5

The command clears temporary errors and alarms .

2.2.6 Reset Maxima

Master to slave: **SND_SET** | **15** | CS 16 |

Example: 68 08 08 68 73 FE 51 0F 02 1F 20 **15** 27 16

Slave to master: e5

The command resets minimum , maximum flow values.

2.2.7 Application Reset (CI = $50)

Master to slave: **SND_UD** | **50** | CS 16 |

Example 68 03 03 68 53 FE **50** A1 16

Slave to master: e5

See item 6.1, "The M-Bus A Documentation Vers, 4.8 November 11.1997".

"With the CI-Code $50 the master can release a reset of the application layer in the slaves. Each slave himself decides which parametrs to change - e.g. which data output is default - after it has received such an application reset. This application reset by a SND_UD with CI=$50 is the counterpart to the reset of the data link layer by a SND_NKE. "

HRI reset readout to default multi-telegram reply **"Select Multi-Telegrams".**

2.2.8 Select Telegram

Master to Slave: **SND_UD** | **50** | xx | CS 16 |

Example (0): 68 04 04 68 53 FE **50 00** A1 16

Slave to Master: E5

The command implements "Application Reset sub-code"
(4.2.1 : pr EN 13757-3:2003 E)

After (first) boot procedure, after command "Application Reset" and after command "Application Reset" with Sub code = 0x00 device will answer with multi telegram reply. After "Warm Boot" procedure (normal reset) last selected telegram will be hold !

Next sub codes are used for telegram selection:
00h: Multi-telegrams reply **(default).**
11h : ENCODER COMPATIBLE TELEGRAM.

The multi-telegrams reply consists of ten telegrams which can be read by following procedure:

SND_NKE -> Answer is E5: Put pointer to first telegram.
1. REQ_UD2 (FCB toggle) -> Answer is MAIN TELEGRAM (First)
2. REQ_UD2 (FCB toggle) -> Answer is STATISTIC TELEGRAM
3. REQ_UD2 (FCB toggle) -> Answer is QUARTER_1 TELEGRAM
4. REQ_UD2 (FCB toggle) -> Answer is QUARTER 2 TELEGRAM
5. REQ_UD2 (FCB toggle) -> Answer is QUARTER_3 TELEGRAM
6. REQ_UD2 (FCB toggle) -> Answer is QUARTER_4 TELEGRAM
7. REQ_UD2 (FCB toggle) -> Answer is QUARTER_5 TELEGRAM
8. REQ_UD2 (FCB toggle) -> Answer is QUARTER_6 TELEGRAM
9. REQ_UD2 (FCB toggle) -> Answer is QUARTER_7 TELEGRAM
10. REQ_UD2 (FCB toggle) -> Answer is QUARTER_8 TELEGRAM (Last)

After 11 REQ_UD2 with FC Bit toggling the first MAIN TELEGRAM will be read again.

To get every time the only MAIN TELEGRAM do this:
SND_NKE -> Answer is E5
REQ_UD2 (FCB = 0) -> Answer is MAIN TELEGRAM
REQ_UD2 (FCB = 0) -> Answer is MAIN TELEGRAM

Note: *The user can select the PARAMETERS TELEGRAM with the command "Select PARAMETERS TELEGRAM" . After next REQ_UD2 slave will be the answer with the last preset telegram (normally multi-telegram reply).*

2.2.9 Select_PARAMETERS_TELEGRAM

The user can select the PARAMETERS TELEGRAM for the next REQ_UD2 with the command

Master to slave: **SND_UD**| **51** | 0f MT **2f** 20 **c0** | CS 16 |

Example: 68 08 08 68 73 FE 51 0F 02 **2F** 20 **C0** E2 16

Slave to master: e5

Master to slave: **REQ_UD2**

Example: **10 7B FE 79 16**

Slave to master: **RSP_UD** | 0f MT **1f** 20 **c0** | **TAB** | CS 16 |

Answer is independent of FCB and FCV Bits.
About content of |**TAB** | see PARAMETERS TELEGRAM.

If RSP_UD answer of PARAMETERS TELEGRAM is disturbed, master must send again the command “Select Parameter Telegram”, as was described above.

For the next REQ_UD2 in the case of multi telegrams reply slave will answer with the next multi telegram if FCB-bit toggle or FCV-bit reset, otherwise with the same telegram that was before command “Select PARAMETERS TELEGRAM”. In the case of non-multi telegrams slave will answer with the appropriate telegram, independent of FCB and FCV Bits.

3 REPLY TELEGRAMS

All telegrams are shorter 128 bytes.

3.1 MAIN TELEGRAM (*first*)

1. Volume Register. *(with overflow)*
2. Backward volume
3. Volume flow
4. Fabrication Number
5. Customer location
6. Actual Date and Time
7. HRI status word (*Error Flags 16 bits*)
8. Last year storage date **(Storage number = 30)**
9. Volume Register at last year storage date **(Storage number = 30)**
10. Year before last storage date **(Storage number = 31)**
11. Volume Register at year before last storage date **(Storage number = 31)**
~~12 Model / version (water meter number) ASCII~~
12. Special byte (1Fh)

3.2 STATISTIC TELEGRAM

1. Max. flow rate
2. Date+Time point of max. flow rate
3. Min. flow rate
4. Date+Time point of min. flow rate
5. Date+Time point of Last backward event **(Storage number = 25)**
6. Max. backward flow rate **(Storage number = 25)**
7. Date+Time point of max backward flow rate **(Storage number = 25)**
8. Min. backward flow rate **(Storage number = 25)**
9. Date+Time point of min. backward flow rate **(Storage number = 25)**
10. Date+Time point of the First Start.
11. Number of Tamper alarms.
12. Date+Time point of End Last Tamper alarm.
13. Date+Time point of End Last Magnet alarm. **(Storage number = 26)**
14. Total duration of all Magnet alarms [sec] **(Storage number = 26)**
15. Special byte (1Fh)

3.3 QUARTER_1 TELEGRAM

The QUARTER_1 TELEGRAM contains the information of the last three month historic data – values with storage number s: 1,2,3.

1. Date+Time point of storage **(Storage number = 1)**
2. Volume Register **(Storage number = 1)**
3. Backward Volume **(Storage number = 1)**
4. HRI Month's Status Word **(Storage number = 1)**
5. Date+Time point of storage **(Storage number = 2)**
6. Volume Register **(Storage number = 2)**
7. Backward Volume **(Storage number = 2)**
8. HRI Month's Status Word **(Storage number = 2)**
9. Date+Time point of storage **(Storage number = 3)**
10. Volume Register **(Storage number = 3)**
11. Backward Volume **(Storage number = 3)**
12. HRI Month's Status Word **(Storage number = 3)**
13. Special byte (1Fh)

Device will always put 3 months information in this telegram**.** If system doesn't have necessary information yet, these records will fill by zeros.

3.4 QUARTER_2 TELEGRAM

The telegram contains the information of three months (4,5,6) historic data.
The stored information will look like QUARTER_1 TELEGRAM with storage numbers: 4,5,6**.**
Device will always put three months information in this telegram**.** If system doesn't have necessary information yet, these records will fill by zeros.

3.5 QUARTER_3 TELEGRAM

The telegram contains the information of three months (7,8,9) historic data.
The stored information will look like QUARTER_1 TELEGRAM with storage numbers: 7,8,9.
Device will always put three months information in this telegram**.** If system doesn't have necessary information yet, these records will fill by zeros.

3.6 QUARTER_4 TELEGRAM

The telegram contains the information of three months (10,11,12) historic data.
The stored information will look like QUARTER_1 TELEGRAM with storage numbers: 10,11,12.
Device will always put three months information in this telegram**.** If system doesn't have necessary information yet, these records will fill by zeros.

3.7 QUARTER_5 TELEGRAM

The telegram contains the information of three months (13, 14,15) historic data.
The stored information will look like QUARTER_1 TELEGRAM with storage numbers: 13,14,15.
Device will always put three months information this telegram**.** If system doesn't have necessary information yet, these records will fill by zeros.

3.8 QUARTER_6 TELEGRAM

The telegram contains the information of three months (16, 17, 18) historic data.
The stored information will look like QUARTER_1 TELEGRAM with storage numbers: 16,17,18.
Device will always put three months information in this telegram. If system doesn't have necessary information yet, these records will fill by zeros.

3.9 QUARTER_7 TELEGRAM

The telegram contains the information of three months (19, 20, 21) historic data.
The stored information will look like QUARTER_1 TELEGRAM with storage numbers: 19,20,21.
Device will always put three months information in this telegram**.** If system doesn't have necessary information yet, these records will fill by zeros.

3.10 QUARTER_8 TELEGRAM (*last*)

The telegram contains the information of three months (22, 23,24) historic data.
The stored information will look like QUARTER_1 TELEGRAM with storage numbers: 22,23,24 ***without*** *Special byte* (**1Fh**) at the end of telegram.
Device will always put three months information in this telegram**.** If system doesn't have necessary information yet, these records will fill by zeros.

3.11 ENCODER COMPATIBLE TELEGRAM

1. Fabrication Number
2. Volume Register *(with overflow)*.

Note: *Unused records will read with zero values.*

3.12 PARAMETERS TELEGRAM(*special selection*)

This telegram has a manufacture specific content with the sequence of 17 bytes which give information about values of device parameters.

Slave reply to master: **RSP_UD** | 0f MT **1f** 20 **c0** | **TAB** | CS 16 |

TAB has following meaning:

Byte	Low/High	Meaning	Range Comment
1		Select Telegram	{ 00h, 11h}
2		Billing Day	{ 1..31 }
3		Key Day	{ 1..31 }
4		Key Month	{ 1..12 }
5	Low Byte	Limit Flow for Break	
6	High Byte	Limit Flow for Break	{ 1..65535 }
7		Limit Time for Break	{ 1..59 } (minutes)
8		Limit Time for Leakage	{ 1..59 } (minutes)
9		Liter Per Rotation	{ 0,1,2,3 } (1, 10, 100, 10000)
10		Number of Digits	{ 5,6,7,8,9}
11		Leakage Period	{ 1..255} (hours)
12		VOLDIF	{ 0,1,2 } (BCD8 ; BCD 12; BCD8 $m.^3$)
13	Low Byte	Error Masks	
14	High Byte	Error Masks	{ 0000..FFFFh }
15		Pulses Mode	{ 0..7 } (0, B1 - B7) *(not used in Residia M)*
16		Pulse Duration	{ 0,1,2, 8…255} *(not used in Residia M)*
17		Divider Value	{ 0…9, 10 } *(not used in Residia M)*

Note: *For Residia M the last **3 bytes** will always read with zero values.*

3.13 HRI STATUS WORD [HSW]

Flags Name	Values	Clearing Commands
ALARM_ FLOW_RETURN ALARM_ FLOW_LEAKAGE ALARM_ FLOW_BREAK ALARM_HALT	0x0001 0x0002 0x0004 0x0008	Reset Errors, Reset Errors, Reset Errors, Reset Errors,
ALARM_ TAMPER ALARM_ POWER _LOW ALARM_ WARM_BOOT ALARM_ SOFTWARE	0x0010 0x0020 0x0040 0x0080	Reset Errors, Reset Errors, Reset Errors, Reset Errors,
STATUS_ OPEN STATUS_ NO_INIT STATUS_ SERVICE ALARM_ MAGNET	0x0100 0x0200 0x0400 0x0800	Close Device, Time Out Complete Initialize Exit Service Mode, Complete Initialize Time Out Reset Errors, *(optional for Residia M)*
ERROR_ TAMPER_DEFECTED ERROR_ PICKUP ERROR_ STORAGE ERROR_ HARDWARE	0x1000 0x2000 0x4000 0x8000	Reset Errors, Reset Errors, Erase Historical Data, Complete Initialize Power OFF, HRI Reset,

"HRI Status Word" contains device specific information about HRI state.
Value equal to zero means "No Errors", "No Alarm", "Initialize completed".

Note: *"HRI Month's Status Word" has the same structure, but it is clearing automatically after saving historical month data.*

4 M-BUS STANDARD NOTES

This section describes the specific of implementation European Standard “EN 13757-3:2004: E” for HRI.

4.1 M-BUS STATUS BYTE

Each of bits: 0, 3…7 in “M-Bus Status Byte” is disjunction of the following “HRI Status Word” flags. If **HSW** equal to zero, “M-Bus Status Byte” is zero too. See item 5.9 in [2])

Bit 0: Application Busy
- STATUS_OPEN
- STATUS_ SERVICE

Bit 1: Any Application Error
- ALARM_SOFTWARE

Bit 2: Power low
- ALARM_ POWER _LOW

Bit 3: Permanent errors
- ERROR _HARDWARE
- ERROR _STORAGE
- STATUS _NO_INIT

Bit 4: Temporary errors
- ERROR_PICKUP
- ERROR _TAMPER_DEFECTED
- ALARM _WARM_BOOT

Bit 5: Alarm Tamper
- ALARM _TAMPER
- ALARM _MAGNET *(optional for Residia M)*

Bit 6: Alarm Flow
- ALARM _FLOW_RETURN
- ALARM _FLOW_LEAKAGE
- ALARM _FLOW_BREAK

Bit 7: Alarm Halt (Stop measure)
- ALARM _HALT

The bits of device status bit are filtered by error mask before set appropriate bit at “M-Bus Status Byte”: like error output line at HRI-MEI/Bx.
Example*: If "Alarm Power Low" Bit at error mask is zero, an error "Alarm Power Low" bit set at device status word, will never set output error line or 2nd bit at M-Bus status byte!*

4.2 REQ_UD2

Command **"Select Multi-Telegram"** provides multi-telegrams global readout request answers (RSP_UD) from slave to master. See of items 6.4.3, 5.5.1 "The M-Bus A Documentation Version 4.8, November 11 1997".

"If the selected data is supported by the slave but too long for one RSP_UD telegram (especially for readout of all historic values), the slave transmits an additional data record consisting only of the **DIF=$1F**, which means that more data records follow in the next respond telegram. In this case the master must readout the slave again until the respond telegram is only an **$E5 (no data)** or there is no **DIF=$1F** in the RSP_UD."

"To avoid lost of data respond telegrams the slave should in this case support the Frame Count Bit (**FCB**). If the master wants to premature end such a multi-telegram sequential readout of the selected data, it may send an application reset with CI=$50 instead of further REQ_UD2´s."

HRI will transmit **DIF=$1F** at the end of telegram, which means that more data records follow in the next respond telegram otherwise **no DIF=$1F** for last reply telegram or for the single telegram.

4.3 STORAGE NUMBER

In HRI Storage Number (6.5 : EN 13757-3:2004: E) uses for historical values.

1-24: Monthly historical values in QUARTER TELEGRAMs,
30: Last year historical values, in MAIN TELEGRAM.
31: Year before last year historical values MAIN TELEGRAM.
25: Backward flow values in STATISTIC TELEGRAM.
26: Magnet Alarm values in STATISTIC TELEGRAM.

4.4 TARIFF INFORMATION

HRI uses tariff fields for optional test values.

4.5 SUBUNIT INFORMATION

Unit-field is unused in HRI.

4.6 SECONDARY ADDRESSIND

HRI support secondary addressing with "**Enhanced ID Number**" only for mode 1 see **[2])** chapters 11.3,11.
"*Enhanced selection with fabrication number*" is not supported.
See: **[2])** chapter 11.4.

4.7 SND_UD

Otherwise to REQ_UD2 HRI no support multi-telegram data from master to slave see **[1])** chapter 5.5 , so HRI ignores the FCB in the **SND-UD**.