IPE50 and IPE50P

WEIGHT INDICATORS

PROFIBUS Communication Protocol

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1 – Generalities

The Profibus communication protocol defines the structure of the messages and the communication mode between one or more "master" devices which manage the system and one or more "slave" devices which respond to the interrogations of a master (technical master-slave, of the multi-master type).
The masters, called also active devices, define the data traffic on the bus and periodically scan the slaves; when a master has an access permit (token), it can transmit data without external requests. The slaves, defined also as passive devices, do not have the access permit to the bus, but can only either confirm the received messages or transmit messages when requested by a master.
A master can either address single slaves or transmit a broadcast message to all (in the multi-master case each slave is linked to a master).

1.1 – Selection of the PROFIBUS serial communication mode

To select the Profibus communication protocol one should enter the *SET-UP ENVIRONMENT* of the instrument (see Figure 1):

Input in the Set-up Environment

- Turn on the indicator, press the ZERO key or the TARE key during the countdown (the display shows the "tYPE" menu).
- Select "SEtuP" (using the ZERO or TARE keys) ⇨ press PRINT to confirm the step.
- Select "SEriAL" (using the ZERO or TARE keys) ⇨ press PRINT to confirm the step.
- Select "Pc.SEL" (using the ZERO or TARE keys) ⇨ press PRINT to enter in the
  Selection menu of the PC port
  - Select "485" with DGT4PB indicator or "COM1" with DGTQPB indicator and press PRINT to confirm.
- Select "CoM.PC" (using the ZERO or TARE keys) ⇨ press PRINT to enter in the:

  Set-up menu of the Communication Parameters of the PC port:

  - The "PCMode" item appears ⇨ press PRINT to enter in this submenu and select the "Profibus" item ⇨ press PRINT again to confirm.

    Now the setting of the instrument's serial address is requested.

    Instrument serial address

    ⇨ for a few instants the "Pro.Add" message is displayed ⇨ then type the serial address of the instrument (or slave) ⇨ confirm the entered value with PRINT.

- Press various times the C key until the message "SAVE?" appears on the display.
- Press PRINT to confirm the changes made or another key for not saving.

CAREFUL: If the address is not saved it may be necessary to remove the power supply and turn back on the instrument.

1.2 – Serial transmission parameters: Baud Rate and Data Format

The transmission speed (baud rate) and the serial word format, in case of Profibus transmission, which are not modifiable in the SET-UP ENVIRONMENT, but by default are set at:

- Baud Rate (*or transmission speed*): 9600 bit / sec

- Data Format (*or serial word format*): n - 8 - 1 (no parity – 8 data bits – 1 stop bit)

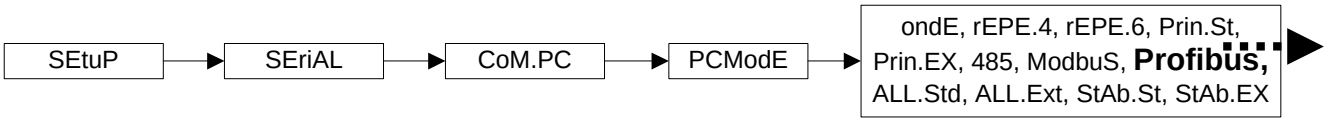

Figure 1*: Selection from the SET-UP ENVIRONMENT of the MODBUS communication.*

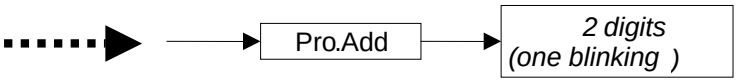

Figure 2*: Setting the instrument's serial address (or slave).*

2 – Input and Output data areas

There are two data areas, an input and an output one, defined in this way due to the master's point of view: while the input area is read by this device, the output one is written.
Both the areas are organised in registers (input and output ones), on which the Profibus protocol functions operate.
All the numeric values have the Big Endian format (the 1st byte is the most significant one) for the Input Data Area and the Output Data Area, while these have the Little Endian format (the 1st byte is the least significant one) for the SET-UP area.

2.1 –INPUT DATA AREA

The input data area is <u>read</u> by the master (is therefore read by the instrument) and is made up of 16 registers, each of 2 bytes (32 bytes overall).

Table 1: Input Data Area

I°Reg.	Input Registers		N° bytes
0	Gross Weight Value	(byte 3)	0
	Gross Weight Value	(byte 2)	1
1	Gross Weight Value	(byte 1)	2
	Gross Weight Value	(byte 0)	3
2	Net Weight Value	(byte 3)	4
	Net Weight Value	(byte 2)	5
3	Net Weight Value	(byte 1)	6
	Net Weight Value	(byte 0)	7
4	Input Status Register	(MSB)	8
	Input Status Register	(LSB)	9
5	Command Status Register	(MSB)	10
	Command Status Register	(LSB)	11
6	Output Status Register	(MSB)	12
	Output Status Register	(LSB)	13
7	N°last page read or written	(MSB)	14
	N°last page read or written	(LSB)	15
8	1st set-up page word		16
			17
– – – – – – – – – – – – – – – –			
15	8th set-up page word		30
			31

<u>NOTE</u>: *GROSS WEIGHT and NET WEIGHT value format (0-3 registers)*
Whole in absolute value (without decimals)
Example: if 3 decimals are set, in order to enter the 3,000 value → one should write 3000
If 2 decimals are set, in order to enter the 3,00 value → one should write 300

2.1.1 - Input Status Register (Table 2.1.1)

It is the input register number 4; two bytes defined in the following manner:

Bit	Description	Bit Meaning 0	1
(LSB)			
0	Net Weight Polarity	+	--
1	Gross Weight Polarity	+	--
2	Weight Stability	NO	YES
3	Underload Condition	NO	YES
4	Overload Condition	NO	YES
5	Entered Tare Condition	NO	YES
6	Manual Tare Condition	NO	YES
7	Gross ZERO zone	Out of Zone 0	In Zone 0
(MSB)			
8	Input 1	DISABLED	ENABLED
9	Input 2	DISABLED	ENABLED
10	*Not used*		
11	*Not used*		
12	*Not used*		
13	*Not used*		
14	Displayed Channel (low bit) (1)		
15	Displayed Channel (high bit)(from 0 to 3) (1)		

(1) : *High bit, Low Bit:* *0 0* → Channel 1 *0 1* → Channel 2
(15) (14) *1 0* → Channel 3 *1 1* → Channel 4

2.1.2 - Output Status Register (Table 2.1.2)

It is input register number 6; two bytes defined in the following way:

Bit	Description	Bit meaning 0	1
(LSB)			
0	RELAY 1	NOT EXCITED	EXCITED
1	RELAY 2	NOT EXCITED	EXCITED
2	*Not used*		
3	*Not used*		
4	*Not used*		
5	*Not used*		
6	*Not used*		
7	*Not used*		
(MSB)			
8	*Not used*		
9	*Not used*		
10	*Not used*		
11	*Not used*		
12	*Not used*		
13	*Not used*		
14	*Not used*		
15	*Not used*		

2.1.3 - Command Status Register

It is input register number 5; two bytes defined in the following way:

High Byte → *Last command received* (see Table 2.2.1)
Low Byte: low nibble → *Counting of processed commands* (module 16)
high nibble → *Result of last command received*

In which *Result of last command received* can take on the following values:

- OK = 0 Correct command and carried out
- ExceptionCommandWrong = 1 Wrong command
- ExceptionCommandData = 2 Wrong data in the command
- ExceptionCommandNotAllowed = 3 Not allowed command
- ExceptionNoCommand = 4 Inexistent command

2.2 –Output Data Area

The output data area is written by the master (is therefore read by the instrument) and is made up of 16 registers, each of 2 bytes (32 bytes overall).

Tabella 2: Output Data Area

Reg. Nr.	Output Registers		N° bytes
0	Command Register	(MSB)	0
	Command Register	(LSB)	1
1	Parameter 1	(byte 3)	2
	Parameter 1	(byte 2)	3
2	Parameter 1	(byte 1)	4
	Parameter 1	(byte 0)	5
3	Parameter 2	(byte 3)	6
	Parameter 2	(byte 2)	7
4	Parameter 2	(byte 1)	8
	Parameter 2	(byte 0)	9
5	*Not used*		10
	Not used		11
6	*Not used*		12
	Not used		13
7	*Not used*		14
	Not used		15
8	1st set-up page word		16
			17
– – – – – – – – – – – – – – – –			
15	8th set-up page word		30
			31

2.2.1 - Command Register

It is the output register number 0. It is made up of two bytes and can take on the following values, which correspond to the implemented commands described in the table.

Execution of a Command

The execution of a command is made when the contents of the Command Register vary (therefore in order to repeat the last command one should first set the Command register to the NO COMMAND value, and then to the command value).

The only exceptions are the READ_SETUP, WRITE_SETUP and CHANGE_PAGE commands, which are executed even upon just the varying of Parameter 1 (page nr. to be read/written). Therefore:

To read various set-up pages one just needs to set the READ_SETUP command with the first page that one intends to write in Param.1, then change each time Param.1 with the new page nr. to be read.

To write various pages one should set the WRITE_SETUP command with the nr. of the first page to be written in Param.1 and the data in registers 8-15 of the output area; then each time one varies the data of the registers 8-15 and the page nr. in Param.1.

Table 2.2.1: Command Register

Implemented Command	Command Register Value	Description
NO_COMMAND	0 (0000 Hex)	NO COMMAND
ZERO_REQUEST	1 (0001 Hex)	ZERO SCALE execution
TARE_REQUEST	2 (0002 Hex)	AUTOMATIC TARE execution
TAREMAN_REQUEST	3 (0003 Hex)	MANUAL TARE execution (the value will be entered in Parameter 1 (2))
NET_SWITCH_REQUEST	4 (0004 Hex)	Display Switch on the NET WEIGHT (3)
GROSS_SWITCH_REQUEST	5 (0005 Hex)	Display Switch on the GROSS WEIGHT (3)
CHANNEL_1_REQUEST	6 (0006 Hex)	Switching on CHANNEL 1
CHANNEL_2_REQUEST	7 (0007 Hex)	Switching on CHANNEL 2
CHANNEL_3_REQUEST	8 (0008 Hex)	Switching on CHANNEL 3
CHANNEL_4_REQUEST	9 (0009 Hex)	Switching on CHANNEL 4
WRITE_SETPOINT_1	10 (000A Hex)	SETPOINT 1 writing (ON value in Param. 1; OFF value in Param. 2) (2)
WRITE_SETPOINT_2	11 (000B Hex)	SETPOINT 2 writing (ON value in Param. 1; OFF value in Param. 2) (2)
SET_OUTPUT	25 (0019 Hex)	Setting the RELAY (4)
READ_SETUP	26 (001A Hex)	SET-UP PAGE READING
WRITE_SETUP	27 (001B Hex)	SET-UP PAGE WRITING
WRITE_FLASH	28 (001C Hex)	SAVING THE SET-UP in FLASH
CHANGE_PAGE	29 (001D Hex)	ALIBI PAGE (5)
READ_ALIBI	30 (001E Hex)	WEIGH READING ON ALIBI (6)
WRITE_ALIBI	31 (001E Hex)	STORAGE OF WEIGH ON ALIBI (5)

(2) NOTE: *Value format of Parameter 1 and Parameter 2:*

→ *For the MANUAL TARE (only Param1):*

→ *For SETPOINTS 1and 2:*
Whole in absolute value (without decimals)

Example: If 3 decimals are set, in order to enter the value 3,000 → one should write 3000
If 2 decimals are set, in order to enter the value 3,00 → one should write 300

(3) : active functions only in NTGS mode (net / gross switch).

(4) Setting of the RELAYS
The status of the relays is settable using Parameter 1:

Parameter 1:

bit 0 → RELAY 1 in which bit 0 = 1 → RELAY 1 CLOSED; bit 0 = 0 → RELAY 1 OPEN
bit 1 → RELAY 2 in which bit 1 = 1 → RELAY 2 CLOSED; bit 1 = 0 → RELAY 2 OPEN
OPTIONAL RELAYS (ONLY DGTQ PB)
bit 2 → RELAY 3 in which bit 2 = 1 → RELAY 3 CLOSED; bit 2 = 0 → RELAY 3 OPEN
bit 3 → RELAY 4 in which bit 3 = 1 → RELAY 4 CLOSED; bit 3 = 0 → RELAY 4 OPEN
bit 4 → RELAY 5 in which bit 4 = 1 → RELAY 5 CLOSED; bit 4 = 0 → RELAY 5 OPEN
bit 5 → RELAY 6 in which bit 5 = 1 → RELAY 6 CLOSED; bit 5 = 0 → RELAY 6 OPEN
bit 6 ÷15 (not used)

NOTES:

- *Value format of Parameter 1 and Parameter 2 for the RELAYS:*

→ Bit configuration

In the case a relay is linked to a setpoint, the command, relative to that relay, is ignored.

- The writing of the setpoint values does not cause the automatic flash saving, but are set temporarily. In order to save these in flash one should execute the WRITE_FLASH command.

(5) ALIBI PAGE

To go to the ALIBI page set the value 1000 in Parameter 1. With the writing command, if one wants to fill the page with the values described in the table below, one must first use this command and then transmit the writing command.

Format of the Parameter 1 value:

Whole in absolute value (without decimals)

Table 2.2.1.1: CONTENTS OF ALIBI PAGE

	Input Data Area (N° Byte)	Description
ALIBI PAGE (16 bytes)	16	Stored gross weight value (byte 3)
	17	Stored gross weight value (byte 2)
	18	Stored gross weight value (byte 1)
	19	Stored gross weight value (byte 0)
	20	Stored tare weight value (byte 3)
	21	Stored tare weight value (byte 2)
	22	Stored tare weight value (byte 1)
	23	Stored tare weight value (byte 0)
	24	ID: Weigh number (byte 3)
	25	ID: Weigh number (byte 2)
	26	ID: Weigh number (byte 1)
	27	ID: Weigh number (byte 0)
	28	Alibi status register (MSB)
	29	Alibi status register (LSB)
	30	*Not used*
	31	*Not used*

- *Format of the* Alibi status register value:

  2 bytes defined in the following way:

  BIT MEANING

  ---

  bit from 7 to 0 → Number of rewritings (from 0 to 255).

  bit from 10 to 8 → Number of scale (from 1 to 4).

  bit 11 → Type of tare; bit 11 = 1 → manual tare; bit 1 = 0 → null or semiautomatic tare

  bit 12 → Not used

  bit 13 → Not used

  bit 14 → Not used

  bit 15 → Not used

(6) WEIGH READING ON ALIBI

To read a weigh stored in the ALIBI set the rewriting number in Parameter 1 and the weigh number (ID) in Parameter 2. The command automatically executes the change on the ALIBI page: see table 2.2.1.1.

Format of the Parameter 1 and Parameter 2 values:

Whole in absolute value (without decimals)

2.3 –SET-UP area

The set-up area is the one stored in flash (1024 bytes) and is made up of 64 pages (from 0 to 63).
In the case of an approved instrument it's not possible to write the metric parameters which are between page 0 and the first half of page 38. It is possible to write only the data between the second half of page 38 and page 63.
By writing one of the pages between 0 and 37 when the instrument is approved, the result of the command is ExceptionCommandNotAllowed,by writing instead the others one obtains CommandOk. In any case page 38 is not copied completely, but only the second half.

	Input Data Area (Byte Nr)	Output Data Area (Byte Nr)	Description
Area Setup: PAGE 5 (16 bytes)	16	16	
	17	17	
	18	18	
	19	19	
	20	20	
	21	21	RANGE 1 channel 1 (LSB)
	22	22	RANGE 1 channel 1
	23	23	RANGE 1 channel 1
	24	24	RANGE 1 channel 1 (MSB)
	25	25	RANGE 2 channel 1 (LSB)
	26	26	RANGE 2 channel 1
	27	27	RANGE 2 channel 1
	28	28	RANGE 2 channel 1 (MSB)
	29	29	*Not used*
	30	30	*Not used*
	31	31	*Not used*

	Input Data Area (N° Byte)	Output Data Area (N° Byte)	Description
Area Setup: PAGE 6 (16 bytes)	16	16	*Not used*
	17	17	RANGE 1 channel 1 Division (LSB)
	18	18	RANGE 1 channel 1 Division (MSB)
	19	19	RANGE 2 channel 1 Division (LSB)
	20	20	RANGE 2 channel 1 Division (MSB)
	21	21	*Not used*
	22	22	*Not used*
	23	23	Channel 1 decimals
	24	24	Channel 1 Unit of Measure ([5])
	25	25	
	26	26	
	27	27	
	28	28	
	29	29	
	30	30	
	31	31	

	Input Data Area (N° Byte)	Output Data Area (N° Byte)	Description
Area Setup: PAGE 14 (16 bytes)	16	16	RANGE 1 channel 2 (LSB)
	17	17	RANGE 1 channel 2
	18	18	RANGE 1 channel 2
	19	19	RANGE 1 channel 2 (MSB)
	20	20	RANGE 2 channel 2 (LSB)
	21	21	RANGE 2 channel 2
	22	22	RANGE 2 channel 2
	23	23	RANGE 2 channel 2 (MSB)
	24	24	*Not used*
	25	25	*Not used*
	26	26	*Not used*
	27	27	*Not used*
	28	28	RANGE 1 channel 2 Division (LSB)
	29	29	RANGE 1 channel 2 Division (MSB)
	30	30	RANGE 2 channel 2 Division (LSB)
	31	31	RANGE 2 channel 2 Division (MSB)

	Input Data Area (N° Byte)	Output Data Area (N° Byte)	Description
Area Setup: PAGE 15 (16 bytes)	16	16	*Not used*
	17	17	*Not used*
	18	18	Channel 2 decimals
	19	19	Unit of Measure channel 2 (5)
	20	20	
	21	21	
	22	22	
	23	23	
	24	24	
	25	25	
	26	26	
	27	27	
	28	28	
	29	29	
	30	30	
	31	31	

	Input Data Area (N° Byte)	Output Data Area (N° Byte)	Description
Area Setup: PAGE 22 (16 bytes)	16	16	
	17	17	
	18	18	
	19	19	
	20	20	
	21	21	
	22	22	
	23	23	
	24	24	
	25	25	
	26	26	
	27	27	RANGE 1 channel 3 (LSB)
	28	28	RANGE 1 channel 3
	29	29	RANGE 1 channel 3
	30	30	RANGE 1 channel 3 (MSB)
	31	31	RANGE 2 channel 3 (LSB)

	Input Data Area (N° Byte)	Output Data Area (N° Byte)	Description
Area Setup: PAGE 23 (16 bytes)	16	16	RANGE 2 channel 3
	17	17	RANGE 2 channel 3
	18	18	RANGE 2 channel 3 (MSB)
	19	19	*Not used*
	20	20	*Not used*
	21	21	*Not used*
	22	22	*Not used*
	23	23	RANGE 1 channel 3 Division (LSB)
	24	24	RANGE 1 channel 3 Division (MSB)
	25	25	RANGE 2 channel 3 Division (LSB)
	26	26	RANGE 2 channel 3 Division (MSB)
	27	27	*Not used*
	28	28	*Not used*
	29	29	Channel 3 decimals
	30	30	Channel 3 unit of measure (5)
	31	31	

	Input Data Area (N° Byte)	Output Data Area (N° Byte)	Description
Area Setup: PAGE 31 (16 bytes)	16	16	
	17	17	
	18	18	
	19	19	
	20	20	
	21	21	
	22	22	RANGE 1 channel 4 (LSB)
	23	23	RANGE 1 channel 4
	24	24	RANGE 1 channel 4
	25	25	RANGE 1 channel 4 (MSB)
	26	26	RANGE 2 channel 4 (LSB)
	27	27	RANGE 2 channel 4
	28	28	RANGE 2 channel 4
	29	29	RANGE 2 channel 4 (MSB)
	30	30	*Not used*
	31	31	*Not used*

	Input Data Area (N° Byte)	Output Data Area (N° Byte)	Description
Area Setup: PAGE 32 (16 bytes)	16	16	*Not used*
	17	17	*Not used*
	18	18	RANGE 1 channel 4 Division (LSB)
	19	19	RANGE 1 channel 4 Division (MSB)
	20	20	RANGE 2 channel 4 Division (LSB)
	21	21	RANGE 2 channel 4 Division (MSB)
	22	22	*Not used*
	23	23	*Not used*
	24	24	Channel 4 decimals
	25	25	Channel 4 unit of measure ([5])
	26	26	
	27	27	
	28	28	
	29	29	
	30	30	
	31	31	

([5]) NOTE: *Meaning of the numeric value in the Unit of Measure field:*

- 0 → Grams
- 1 → Kilograms
- 2 → Tons
- 3 → Pounds

3 – The GSD file structure

```
;=========================================================
; Profibus Device Database of HMS Industrial Networks AB
; Model : ANYBUS-IC PDP
; Description : ANYBUS-IC Profibus DP slave
; Language : English
; Date : 30 September 2003
; Author : HMS Industrial Networks AB
;
; MODIFICATIONS:
; 30 September 2003:
;  - 'MaxTsdr_xxx' for all baudrates have been optimized for the SPC3 ASIC.
;  - 'Revision' upgrade
;  - 'Hardware_Release' upgrade
;  - 'Software_Release' upgrade
;=========================================================
#Profibus_DP

GSD_Revision  = 2

; Device identification
Vendor_Name  = "HMS Industrial Networks AB"
Model_Name    = "AnyBus-IC PDP"
Revision          = "Version 1.1"
Ident_Number  = 0x1810
Protocol_Ident  = 0            ; DP protocol
Station_Type    = 0            ; Slave device
FMS_supp       = 0            ; FMS not supported
Hardware_Release     = "Version 1.1"
Software_Release      = "Version 1.1"

;Used bitmap
Bitmap_Device = "ABIC_DE"
Bitmap_Diag    = "ABIC_DI"
Bitmap_SF      = "ABIC_SF"

; Supported baudrates
9.6_supp         = 1
19.2_supp       = 1
45.45_supp      = 1
93.75_supp      = 1
187.5_supp      = 1
500_supp        = 1
1.5M_supp       = 1
3M_supp         = 1
6M_supp         = 1
12M_supp        = 1

; Maximum responder time for supported baudrates
MaxTsdr_9.6        = 15
MaxTsdr_19.2       = 15
MaxTsdr_45.45      = 15
MaxTsdr_93.75      = 15
MaxTsdr_187.5      = 15
MaxTsdr_500        = 15
MaxTsdr_1.5M       = 25
MaxTsdr_3M         = 50
MaxTsdr_6M         = 100
MaxTsdr_12M        = 200
```

```
; Supported hardware features
Redundancy              = 0     ; not supported
Repeater_Ctrl_Sig       = 2     ; TTL
24V_Pins                = 0     ; not connected
Implementation_Type = "SPC3"

; Supported DP features
Freeze_Mode_supp    = 1     ; supported
Sync_Mode_supp      = 1     ; supported
Auto_Baud_supp      = 1     ; supported
Set_Slave_Add_supp = 1      ; supported

; Maximum polling frequency
Min_Slave_Intervall    = 1      ; 100 us

; Maximum supported sizes
Modular_Station         = 1     ; modular
Max_Module              = 24
Max_Input_Len           = 48
Max_Output_Len          = 48
Max_Data_Len            = 96
Modul_Offset            = 1

Fail_Safe               = 1     ; Data telegram without data in state CLEAR accepted

Slave_Family            = 0
Max_Diag_Data_Len  = 6

; Definition of modules
Module = "IN/OUT:   1 Byte" 0x30
EndModule
;
Module = "IN/OUT:   2 Byte ( 1 word)" 0x70
EndModule
;
Module = "IN/OUT:   4 Byte ( 2 word)" 0x71
EndModule
;
Module = "IN/OUT:   8 Byte ( 4 word)" 0x73
EndModule
;
Module = "IN/OUT:  16 Byte ( 8 word)" 0x77
EndModule
;
Module = "IN/OUT:  32 Byte (16 word)" 0x7F
EndModule
;
Module = "INPUT:    1 Byte" 0x10
EndModule
;
Module = "INPUT:    2 Byte ( 1 word)" 0x50
EndModule
;
Module = "INPUT:    4 Byte ( 2 word)" 0x51
EndModule
;
Module = "INPUT:    8 Byte ( 4 word)" 0x53
EndModule
;
Module = "INPUT:   16 Byte ( 8 word)" 0x57
EndModule
;
Module = "INPUT:   32 Byte (16 word)" 0x5F
```

```
EndModule
;
Module = "OUTPUT:   1 Byte" 0x20
EndModule
;
Module = "OUTPUT:   2 Byte ( 1 word)" 0x60
EndModule
;
Module = "OUTPUT:   4 Byte ( 2 word)" 0x61
EndModule
;
Module = "OUTPUT:   8 Byte ( 4 word)" 0x63
EndModule
;
Module = "OUTPUT:  16 Byte ( 8 word)" 0x67
EndModule
;
Module = "OUTPUT:  32 Byte (16 word)" 0x6F
EndModule
```