NORMA.CPU
MODBUS MANUAL

1 CONTENTS

NORMA.CPU_MODBUS_MANUAL				
Rev.	Date	Description/Modification	Written by	Approved by
1.0	18/12/2018	Preliminary version. **Register 128 :** add of bit 4 to change de day/night mode over modbus. **Register 184 :** improvement of the informations. **Register 129 :** add of bit 3 for switeched supply source. add of bit 4 for status of main power supply. add of bit 5 for status of emergency power supply. add of bit 8 for status of main power supply on the second NORMA.PWR. add of bit 9 for status of emergency power supply on the second NORMA.PWR. **Register 130:** Add of bit 3 for acknowledgement over the Modbus. **Register 188 :** add of bit 1 for I2C communication system fault. add of bit 2 for RS485 communication system fault. add of bit 3 for EEprom system fault. **Register 190:** New Register for the outputs system faults.	BS	JMA
1.1	04/09/2019	Corrections. **Register 184 :** add of bit 11 for communication with NORMA.CP.	BS	JMA
1.2	17/10/2019	**Register 184** : suppression of bit 10 for local/distant mode indication. **Register 128** : add of bit 5 for local/distant mode indication.	BS	JMA
1.3	12/04/2021	New address 192 for register “Lifetime counter reset”.	BS	JMA

2 INTRODUCTION

2.1 Characteristics of the physical link

The dialogue between the NORMA_CPU and external equipments is done with an **RS485** link. .
Date exchange between the devices is based on a **MODBUS® RTU** protocol. The communication parameters are set as follow:

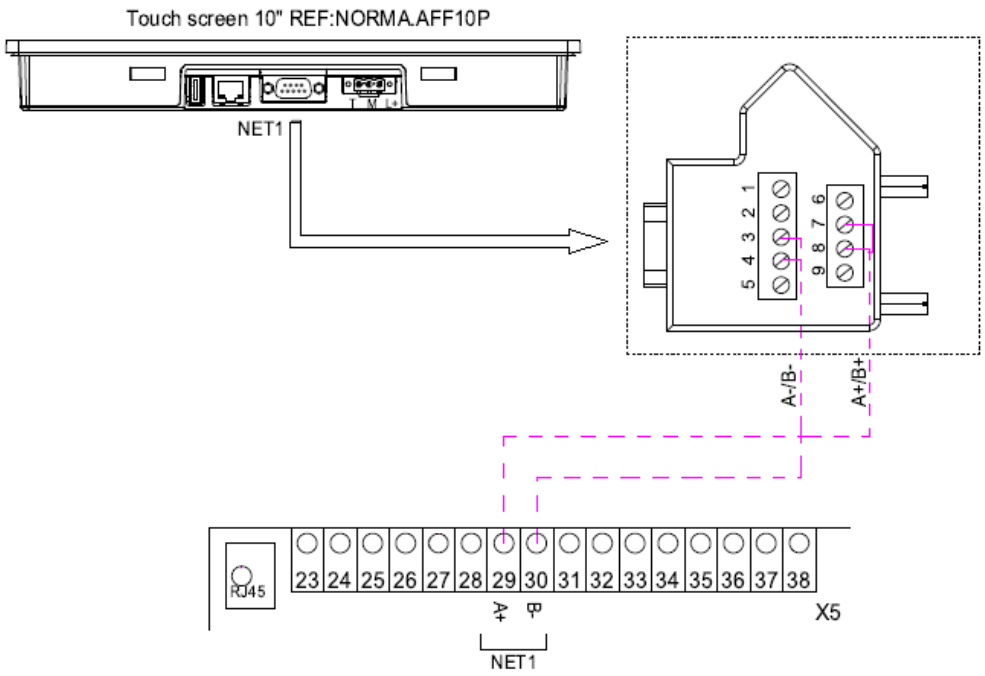
- 9600 bauds
- 8 bits of data
- No parity
- 1 bit of stop

The NORMA.CPU master module acts has a Modbus RTU server (slave), it will answer the requests from a Modbus client (master).

2.2 Connection to NORMA.CPU

To establish the RS485 communication, the connection between the NORMA.CPU master module and a client (NORMA.AFF, AMS, etc...) has to be done over the NORMA.CPU NET1 port.
The RX/TX+ and RX/TX- wires must be respectively connected to pins 29 and 30 of the X5 connector.

Example below of how to connect the NORMA.AFF10P touch screen with a NORMA.CPU module:



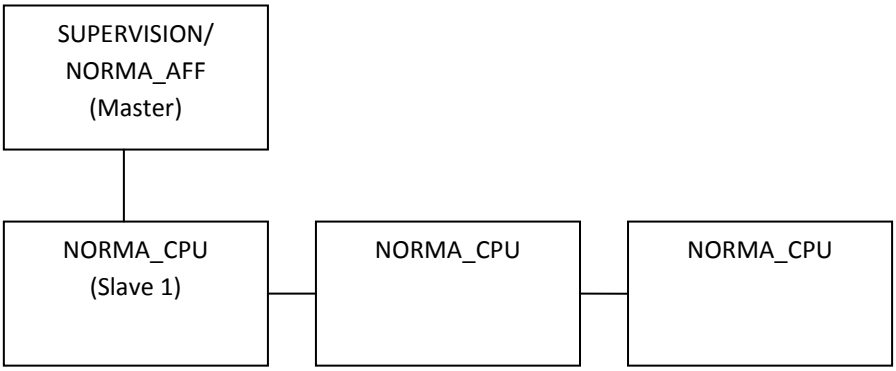
More details about the wiring in the document "NORMA_ELEC REVX.pdf".

2.3 MODBUS requests

2.3.1 Frame overview

All words are coded Most Significant Word (MSW) in mind, except the Cyclic Redundancy Check word.

Address PS $1_H \leq n \leq 3F_H$	Function number $1_H \leq n \leq 7F_H$	Data 1	Data	Data n	CRC	Or 0 for broadcast



2.3.2 Modbus slave address

On 1 byte, it's the number which identifies the NORMA_CPU recipient or producer of MODBUS frames. (Default slave MODBUS address: 32)

2.3.3 Function number

Functions recognized by the NORMA_CPU are:

03: Reading of n consecutives words
06: Writing of one word
16: Writing of several words

2.3.4 Data

The information needed at one request is:

- ➔ Address of words or bits
- ➔ Values of words or bits
- ➔ Number of words or bits

2.3.5 Exception responses

The NORMA.CPU master module may answer an exception response in case of problem in the request message
In the NORMA.CPU exception response, the MSB of the function code is set to 1 in order to warn there is an exception, then the exception code is placed to give details. Below the table of the different exception codes:

Code	Name	Details
0x01	**Illegal function**	The Modbus request is not an allowable action for the NORMA.CPU module. This exception occurs when there is an attempt to write in a read only register.
0x02	**Illegal data address**	The Modbus request is trying to reach a register that doesn't exist in the NORMA.CPU Modbus table. This exception occurs when there is an attempt to read or write in a register that is out of the Modbus table.

- Example of illegal function exception code response

Request from the master:

20	10	0	B8	0	1	2	0	1	E8	B9

0x20	Slave address : 32
0x10	Function code 16: multiple write register.
0x00 0xB8	Address of the first register to write in: 184.
0x00 0x01	Number of register to write : 1.
0x02	Number of data byte to follow : 2.
0x00 0x01	Data to write in the first register : 1
0xE8 0xB9	CRC

Response from NORMA.CPU:

20	90	1	DD	CA

0x20	Slave address: 32.
0x90	Function code 16 with most significant bit set to **1**.
0x01	Exception code: Illegal function. The register 184 is in read access only, so it's illegal trying to write something in.
0xE8 0xB9	CRC

3 MODBUS REGISTERS

3.1 Product Identification

Register 40000 to 40015 — Product name and version

Each register contain two ASCII characters, the concatenation of the 16 registers form the product identification (name and revision).

Start Address	0
End address	15
Size	16 words
Access	Read only

Format:

1st word	1st and 2nd characters of the product ID.
2nd word	3rd and 4th characters of the product ID.
….	
16th word	31st and 32nd characters of the product ID.

NORMA ID < 7-0 >	Norma identification 1st character
NORMA ID < 15-8 >	Norma identification 2nd character

3.2 Information of the navigation lights lifetime

Register 40017 to 40112 — Lights hours of use

The combination of two registers represents the number of operating hours from one navigation light.

Start Address	17
End address	112
Size	96 words
Access	Read only
Default value	0

Format:

1st and 2nd word	Hours of use of navigation light N°1
3rd and 4th word	Hours of use of navigation light N°2
….	
95th and 96th word	Hours of use of navigation light N°48

Register 40131 to 40178 — Lifetime alarms threshold

Start Address	131
End address	178
Size	48 words
Access	Read / write
Default value	50 (in thousands of hours).
Description	Each register contains the lifetime alarm threshold in thousands of hours of navigation light.

Format:

1st word	Navigation light N°1 lifetime alarm threshold (in thousands of hours)
2nd word	Navigation light N°2 lifetime alarm threshold (in thousands of hours)
….	
95th and 96th word	Navigation light N°48 lifetime alarm threshold (in thousands of hours)

Note: b_0 is the least significant bit

Register 40122 to 40124 — Lifetime alarms status

Start Address	122
End address	124
Size	3 words
Access	Read only
Default value	0
Description	Each registers contain the alarm lifetime status of 16 navigations lights.

Format:

b_0	0 → No lifetime alarm on navigation light N°1 1 → Lifetime alarm on navigation light N°1
b_1	0 → No lifetime alarm on navigation light N°2 1 → Lifetime alarm on navigation light N°2
b_0	0 → No lifetime alarm on navigation light N°3 1 → Lifetime alarm on navigation light N°3
….	
b_{47}	0 → No lifetime alarm on navigation light N°1 1 → Lifetime alarm on navigation light N°1

Note: b_0 is the least significant bit

Register 40125 to 40127 — Lifetime alarms acknowledgement status

Start Address	125
End address	127
Size	3 words
Access	Read only
Default value	0
Description	These registers give the lifetime alarm acknowledgement status of each navigation light.

Format:

b_0	0 → Not acknowledged lifetime alarm on navigation light N°1 1 → Acknowledged lifetime alarm on navigation light N°1

b_1	0 → Not acknowledged lifetime alarm on navigation light N°2 1 → Acknowledged lifetime alarm on navigation light N°2
….	
b_{47}	0 → Not acknowledged lifetime alarm on navigation light N°48 1 → Acknowledged lifetime alarm on navigation light N°48

Note: b_0 is the least significant bit

Register 40181 to 40183 — Type of navigation lights

Start Address	181
End address	183
Size	3 words
Access	Read only
Default value	0
Description	Each bit indicates the type of each navigation light (LED or bulb).

Format:

b_0	0 → Navigation light N°1 is a bulb navigation light 1 → Navigation light N°1 is a LED navigation light
b_1	0 → Navigation light N°2 is a bulb navigation light 1 → Navigation light N°2 is a LED navigation light
b_{15}	0 → Navigation light N°16 is a bulb navigation light 1 → Navigation light N°16 is a LED navigation light
….	
b_{47}	0 → Navigation light N°48 is a bulb navigation light 1 → Navigation light N°48 is a LED navigation light

Note: b_0 is the least significant bit

Register 40192 to 40194 — Lifetime counter reset

Start Address	192
End address	194
Size	3 words
Access	Read/ Write
Default value	0
Description	When setting the bit to 1 it resets the operating hour counter of the corresponding navigation light, then the bit is automatically set to 0 by NORMA.CPU.

Format:

b_0	Set to 1 to reset the operation hour counter of the navigation light N°1
b_1	Set to 1 to reset the operation hour counter of the navigation light N°2
b_{15}	Set to 1 to reset the operation hour counter of the navigation light N°16
….	
b_{47}	Set to 1 to reset the operation hour counter of the navigation light N°48

Note: b_0 is the least significant bit

3.3 Navigation lights control

Register 40113 to 40115 — Navigation lights control

Start Address	113
End address	115
Size	3 words
Access	Read / Write
Default value	0
Description	Each bit allows controlling a navigation light.

Format:

b_0	0 → Switch OFF navigation light N°1 1 → Switch ON navigation light N°1
b_1	0 → Switch OFF navigation light N°2 1 → Switch ON navigation light N°2
b_{15}	0 → Switch OFF navigation light N°16 1 → Switch ON navigation light N°1 6
….	
b_{47}	0 → Switch OFF navigation light N°48 1 → Switch ON navigation light N°48

Note: b_0 is the least significant bit

3.4 Navigation lights status

Register 40116 to 40118 — Navigation lights alarms

Start Address	116
End address	118
Size	3 words
Access	Read only
Default value	0
Description	Each bit gives the alarm status of one navigation light. 0 when there is no alarm and 1 when the navigation light is in alarm. These alarms are not related to the navigation lights lifetime faults.

Format:

b_0	Navigation light N°1 alarm status
b_1	Navigation light N°2 alarm status
b_{15}	Navigation light N°16 alarm status
….	
b_{47}	Navigation light N°48 alarm status

Note: b_0 is the least significant bit

Register 40119 to 40121 — Acknowledgement status of navigation lights alarms

Start Address	119
End address	121
Size	3 words
Access	Read only
Default value	0
Description	Each bit gives the acknowledgement status of the navigation light alarm. **0**: the alarm is acknowledged. **1**: the alarm is not acknowledged.

Format:

b_0	Acknowledgement status of navigation light N°1
b_1	Acknowledgement status of navigation light N°2
b_{15}	Acknowledgement status of navigation light N°16
….	
b_{47}	Acknowledgement status of navigation light N°48

Note: b_0 is the least significant bit

Register 40185 to 40187 — Switched navigation lights status

Start Address	185
End address	187
Size	3 words
Access	Read only
Default value	0
Description	Logical "AND" between the word « Navigation lights control » and « Navigation lights alarms ».

Navigation lights control	Navigation lights alarms	Navigation lights switched
0	0	0
0	1	X
1	0	1
1	1	0

Format:

b_0	0 → Navigation light N°1 is switched OFF 1 → Navigation light N°1 is switched ON
b_1	0 → Navigation light N°2 is switched OFF 1 → Navigation light N°2 is switched ON
b_{15}	0 → Navigation light N°16 is switched OFF 1 → Navigation light N°16 is switched ON
….	
b_{47}	0 → Navigation light N°48 is switched OFF 1 → Navigation light N°48 is switched ON

Note: b_0 is the least significant bit

3.5 Global controls

Register 40128 — Global controls

Start Address	128
Size	1 word
Access	Read / write
Default value	0
Description	This register allow the global control of the NORMA.CPU

Format:

b_0	0 → Power OFF the NORMA.CPU. 1 → Power ON the NORMA.CPU.
b_1	0 → Manual control of the main power supply 1 → Manual control of the emergency power supply.
b_2	1→ Acknowledgement command. **This bit is automatically reset to 0 by NORMA.CPU module**.
b_3	0 → Set the dimming for day mode. 1 → Set the dimming for night mode.
b_5	0 → Distant mode selected on NORMA.CPU for control and surveillance by NORMA.CP/NORMA.AFF/AMS. 1 → Local mode selected on NORMA.CPU for control and surveillance by mimic panel.

Note: b_0 is the least significant bit

Register 40184 — Global configuration settings

Start Address	184
Size	1 word
Access	Read only
Default value	0x00
Description	This registers gives the state of the configuration of the different micro-switches.

Format:

b_0	0 → Mimic panel only 1 → NORMA.CP/NORMA./AMS
b_1 to b_3	Number of NORMA.CPU modules (1 to 6) in binary
b_4	0 → NORMA.CPU terminal option disabled 1 → NORMA.CPU terminal option enabled
b_5	Not used
b_6	0 → Configuration with only AC or DC voltage 1 → Configuration with AC & DC voltage
b_7	0 → Power supply in manual switching mode 1 → Power supply in automatic switching mode
b_8 and b_9	00 → No blinking navigation lights 01 → Lights 7 and 8 in blinking mode. 10 → Lights 7, 8, 13 and 14 in blinking mode. 11 → Reserved for future use.
b10	Reserved for future use.
b_{11}	0 → NORMA.CP not in operation, control of navigation lights available by NET1 (AMS/NORMA.AFF) 1 → NORMA.CP in operation, control of navigation lights not available by NET1 (AMS/NORMA.AFF)

Note: b_0 is the least significant bit

3.6 Power supplies

Register 40129 — Power supplies status

Start Address	129
Size	1 word
Access	Read only
Default value	0x00
Description	Information about the power supplies (alarms, states, etc...)

Format:

b_0	0 → Main power supply not in alarm 1 → Main power supply in alarm
b_1	0 → Emergency power supply not in alarm 1 → Emergency power supply in alarm
b_2	0 → Power supply in manual switching mode 1 → Power supply in automatic switching mode
b_3	0 → Main power supply is actually switched 1 → Emergency power supply is actually switched
b_4	0 → Main power supply is power off 1 → Main power supply is power on
b_5	0 → Emergency power supply is power off 1 → Emergency power supply is power on
b_8	0 → Main power supply of NORMA.PWR n°2 not in fault 1 → Main power supply of NORMA.PWR n°2 in fault
b_9	0 → Emergency power supply of NORMA.PWR n°2 not in fault 1 → Emergency power supply of NORMA.PWR n°2 in fault

Note: b_0 is the least significant bit

Register 40130 — Power supplies alarms acknowledgement status

Start Address	130
Size	1 word
Access	Read only
Default value	0x00
Description	Information about the power supplies alarms acknowledgement status.

Format:

b_0	0 → Main power supply alarm not acknowledged 1 → Main power supply alarm acknowledged
b_1	0 → Emergency power supply alarm not acknowledged 1 → Emergency power supply alarm acknowledged
b_2	0 → No acknowledgement 1 → External acknowledgement detected

Note: b_0 is the least significant bit

3.7 System faults

Register 40188 — System faults status

Start Address	188
Size	1 word
Access	Read only
Default value	0x00
Description	This register gives information about system faults on the NORMA. installation.

Format:

b_0	0 → No system fault 1 → System fault on NORMA
b_1	0 → No I2C faults 1 → System fault on I2C
b_2	0 → No system fault on RS485 1 → System fault on RS485
b_3	0 → No system fault on EEPROM 1 → System fault on EEPROM
b_4	0 → No system on WATCHDOG 1 → System fault on WATCHDOG
B_{15}	0 → System fault not acknowledged 1 → System fault acknowledged

Note: b_0 is the least significant bit

3.8 Output status register

Register 40190 — Outputs faults status

Start Address	190
Size	1 word
Access	Read only
Default value	0x00
Description	This register gives information about the outputs faults of the NORMA.CPU.

Format:

b_0	0 → Navigation light fault output is OFF (Contact NO) 1 → Navigation light fault output is ON (Contact NO)
b_1	0 → Navigation light Life time fault output is OFF 1 → Navigation light Life time fault output is ON
b_2	0 → Power supply fault output is OFF (Contact NC) 1 → Power supply fault output is ON (Contact NC)
b_3	0 → System fault output is OFF (Contact NC) 1 → System fault output is ON (Contact NC)
b_4	0 → Buzzer output is disabled 1 → Buzzer output is enabled

Note: b_0 is the least significant bit

4 MODBUS REGISTERS SUMMARY

Modbus table summary				
Label	**Address**	**Size (words)**	**Access mode**	**Status** A : Added M : Modified R : Removed
Product identification				
NORMA_CPU identification	0	16	Read only	
Navigation lights control				
Navigation lights control	113	3	Read / Write	
Navigation lights status				
Navigation lights alarms (except lifetime alarm)	116	3	Read only	
Acknowledgement status of navigation lights alarms	119	3	Read only	
Switched navigation lights status	185	3	Read only	
Information of the navigation lights lifetime				
Hours of use	17	96	Read only	
Lifetime alarms status	122	3	Read only	
Acknowledgement status of lifetime alarms	125	3	Read only	
Lifetime alarms threshold	131	48	Read / Write	
Type of navigation lights	181	3	Read only	
Lifetime counter reset	192	3	Read / Write	
Global controls				
Global controls	128	1	Read / Write	M
Global settings	184	1	Read only	M
Power supplies				
Power supplies status	129	1	Read only	M
Acknowledgement status of power supplies alarms	130	1	Read only	M
System fault				
System fault on NORMA	188	1	Read only	M
Output faults				
Outputs faults status	190	1	Read only	A

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