E1313C5

SCM850 / SCM830 / SCM805 / SCM730: MODBUS ADDRESSES

Data: 24/02/2020

1. PREFACE

This document contains the ModBUS database of terminal SCM850 / SCM830 / SCM805 / SCM730 (hereafter mentioned as SCM8xx). ModBUS registers of the following tables will allow you to interact with the instrument, view its status and manage the working operations.

From now on when we will mention ModBUS registers, we will always refer to "1-based registers" (Addr. Base 1), unless otherwise specified.

The ModBUS database of the master terminal SCM850/SCM830/SCM805/SCM730 is made of fields of 256 addresses each.
The first field, that is the first 256 indexes [1-:-256], provides master terminal specific data, see point n°3 and table [1-:-4].
Then, each field of 256 new indexes provides serial slave modules specific data, see point n°4 and table [5-:-11].
The formula to calculate the indexes of the slave module n°**X** is: *[(**X***256) + "base index"]* ; where "base_index" is [256-:-511] with addr. base 0 or [257-:-512] with addr. base 1.
Example, referred to address base 1:

- indexes 256-:-512 refer to serial slave module n° 0;
- indexes s 513-:-768 refer to serial slave module n° 1,
- indexes 4097-:-4352 refer to serial slave module n° 15,
- indexes 15361-:-15616 refer to serial slave module n° 59.
- ModBUS index of the temperature value of the slave module n°5: [(5*256) + 257]= 1537;
- ModBUS index of the comfort set-point value of the slave module n°12: [(12*256) + 512]= 3584;

Communication settings:

- Electrical standard: RS485 (unless otherwise specified)
- Communication protocol ModBUS RTU
- Baud rate: 9600bps
- Data field: 8 bit
- Parity bit: none
- Stop bit: 1
- Inter-Scan time Delay: 500 msec

The MODBUS® specification defines:

- a silent-interval (Pause) of MIN 3.5 chars between two items to transmit.
- within a message two chars may be separated for not more than 1.5 chars.

The MODBus functions implemented are:

- FUN3 (read of a single register or multiple read up to 5 registers);
- FUN6 (write of a single register);

SLAVE ADDRESSING MODEL:
The address field of a slave is 1 - 247.
The "0" address is the broadcast address. When using the address "0", all slave modules execute the only writing command without a response on return.

EXCEPTION CODES
If an error related to the MODBUS function requested occurs, the field contains an exception code that the server application can use to determine the next action to be taken:

- Unsupported function: ***0x01***. For example:
  - The master terminal sends a query for a function different from 0x03 or 0x06.
- Invalid variable address: ***0x02***. For example:
  - Unsupported address.
  - Read-only address.
- Invalid data field: ***0x03***. The value contained in the query data field is incorrect. For example:
  - FUN3 queries to read more than 5 items at the same time.
- Slave device busy: ***0x06***. The device is engaged in processing a long duration program command. The master should retransmit the message later. For example:
  - Slave device SCM8xx engaged by terminal. The device will always return a Slave Device Busy ModBUS exception response, until terminal is released and the user stops working on it.
  - Negative Acknowledgement of Slave device data. The Slave Device may be not present on the network or may be misconfigured; error "12" (or En).
  - Slave device SCM8xx engaged by TCP-IP, software Eye-Lan(H0r=3). The device will always return a Slave Device Busy ModBUS exception response, until terminal is released and the EyeLan software stops querying the master terminal (SCM8xx).

In an exception response, the slave device returns an exception code to the master terminal, as follows:

Slave Device Address / SLAVE	0x80 + function code	Exception code	CRC (LSByte)	CRC (MSByte)

ModBUS ADDRESS BASE

The use of a ModBUS address 0-based "Addr Base 0" or 1-based "Addr Base 1" is up to the user: it depends on whether you start counting the ModBUS addresses at 0 or at 1.
The ModBUS protocol defines that:

- register addresses may be configured using values in between [0 and 65535];
- the first digit of a register reference starts counting at 1. The register reference identifies the register type: Holding Register, Input Register, etc.

Actually the register addresses are in between [1 and 65536], but when they are transmitted their values are in between [0 and 65535] (1 → 0; 2 → 1;….; 65536 →65535), either they are reading or writing registers.

For example: address 1 ("Addr Base 1") equals to address 0 ("Addr Base 0") of ModBUS slave device 4. The normal query structure will be:

Slave Device Address / SLAVE	Function code	Register address (MSByte)	Register address (LSByte)	N° of registers (MSByte)	N° of registers (LSByte)	CRC (LSByte)	CRC (MSByte)
0x04	0x03	0x00	0x00	0x00	0x01	0x84	0x5F

2. COMMAND DESCRIPTION

READ HOLDING REGISTER, ***0x03***.

Example of reading query:

Slave address	Function	Register address (MSByte)	Register address (LSByte)	N° of registers (MSByte)	N° of registers (LSByte)	CRC (LSByte)	CRC (MSByte)

- Slave address: MODBus address of the slave module to read
- Function code: for example 0x03.
- Register address: MODBus address of the starting register.
- Number of registers: it is the number of registers to read. Max 5 registers a time.

- CRC : the Cyclical Redundancy Check is automatically calculated by the transmitting device according to the frame received and checks the contents of the entire message.

Structure of a normal response from the slave to the master query:

Slave address	Function	Byte count	data byte n°1	....	data byte n° N	CRC (LSByte)	CRC (MSByte)

- Byte count: it is the number of bytes in the register data byte field.
- Data byte: it is the value associated to the reading registers. First the MSByte part and then the LSByte part.

WRITE SINGLE REGISTER, ***0x06***.
Function not available in all devices.

Structure of a normal request:

Slave address	Function	Register address (MSByte)	Register address (LSByte)	data (MSByte)	data (LSByte)	CRC (LSByte)	CRC (MSByte)

- Slave address: MODBus address of the slave module to read
- Function code: for example = 0x06.
- Register address: MODBus address of the register to be written.
- Data: value to be written.
- CRC: the Cyclical Redundancy Check is automatically calculated by the transmitting device according to the frame received and checks the contents of the entire message.

CRC
The transmitter automatically calculates the CRC using the transmitted data/frame. The resulted value is attached to the end of the data.
The receiver re-calculates the CRC, then compares its result to the recived CRC; if the two values are different the frame is ignored.
The exception is not generated in case of a broadcast writing command.

The transmitted data have always the following structure:

Word : single data register															
MSByte : most significant byte								LSByte : less significant byte							
bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0

3. DATABASE MODBus OF TERMINAL SCM8xx -

The table is made of the following columns:

- Item : Terminal SCM8xx.
- ModBUS field: decimal number (dec), Base 0 and Base 1.
- Meaning: what the field stands for.
- Field format: read only (RO) or read/write (R/W) and format (signed 16 bit with decimal number, unsigned 16 bit integers, etc.).
- Description: further details about the field.
- Notes.

Table n° 1

ModBUS Field (dec)			Meaning	Field format		Description	Notes
	Addr. Base 0	Addr. Base1					
Terminal SCM8xx	0	1	**Master terminal status**	R/W		**See table n° 4**	… …
	1	2	**Value terminal / remote probe n° 1 - A** (1)(2)(4)(5)	R/W	signed 16 bit decimal number	**See table n° 2 or 3**	… …
	2	3	**Value terminal / remote probe n° 1 - B** (1)(2)(4)(5)	R/W	See table n° 2 or 3	**See table n° 2 or 3**	… …
	3	4	**Value terminal / remote probe n° 2 - A** (1)(3)(4)(5)	R/W	signed 16 bit decimal number	**See table n° 2 or 3**	… …
	4	5	**Value terminal / remote probe n° 2 - B** (1)(3)(4)(5)	R/W	See table n° 2 or 3	**See table n° 2 or 3**	… …
	5	6	**External temperature probe of the terminal SCM8xx**(4)(5)	R/W	signed 16 bit decimal number	**Value outside temperature: 0xnnnn=Value probe**(4)**; 0x7FFE=Sensor fault; 0x7FFF=No sensor;**	… …
	… …	… …	… …			… …	… …

Notes:
(1) The remote probes, depending on the slave module, can read different sizes. Following are two examples that explain the differences between a remote probe for a heating network module and an evaporative cooler network module. See master terminal technical datasheet.
(2) 1A and 1B are the values of the remote probe N°1. See the master parameter /P1 to know the remote module associated to the remote probe N°1. See also the technical instruction of the master terminal.
(3) 2A and 2B are the values of the remote probe N°2. See the master parameter /P2 to know the remote module associated to the remote probe N°2. See also the technical instruction of the master terminal.
(4) The value range of the probe depends on the type probe. See also the technical instruction of the master terminal.
(5) Usually the fields of the remote and external probes are read only, **RO**. To enable the fields of the remote and external probes also in write, **R/W**, to broadcast to the master terminal the values of not Esseci probes, set the master terminal parameter ***/P0*=2**. See also the technical instruction of the master terminal.

Table n 2: SCM8xx with a network for heating plant.

ModBUS Field (dec)			Meaning	Field format		Description	Notes
	Addr Base 0	Addr Base1					
Terminal SCM8xx	1	2	**Terminal / remote probe n° 1 - A: Temperature**	R/W	signed 16 bit decimal number	**0x0101= +25.7 °C 0xFFED= -1,9 °C 0x7FFE= Sensor fault 0x7FFF= No sensor**	
	2	3	**Remote probe n° 1 - B: Temperature (if present on the network module)**	R/W	signed 16 bit decimal number	**0x0101= +25.7 °C 0xFFED= -1,9 °C 0x7FFE= Sensor fault 0x7FFF= No sensor**	
	3	4	**Terminal / remote probe n° 2 - A: Temperature**	R/W	signed 16 bit decimal number	**0x0101= +25.7 °C 0xFFED= -1,9 °C 0x7FFE= Sensor fault 0x7FFF= No sensor**	… …

	4	5	Remote probe n° 2 - B: Temperature (if present on the network module)	R/W	signed 16 bit decimal number	0x0101= +25.7 °C 0xFFED= -1,9 °C 0x7FFE= Sensor fault 0x7FFF= No sensor	… …

Table n 3: SCM8xx with a network for evaporative cooler.

ModBUS Field (dec)			Meaning	Field format		Description	Notes
	Addr Base 0	Addr Base1					
Terminal SCM8xx	1	2	Terminal / remote probe n° 1 - A: Temperature	R/W	signed 16 bit decimal number	0x0101= +25.7 °C 0xFFED= -1,9 °C 0x7FFE= Sensor fault 0x7FFF= No sensor	… …
	2	3	Remote probe n° 1 – B: Humidity	R/W	Not signed 16 bit number	0x0000= 0 rH 0x0063= 99 rH	… …
	3	4	Terminal / remote probe n° 2 - A: Temperature	R/W	signed 16 bit decimal number	0x0101= +25.7 °C 0xFFED= -1,9 °C 0x7FFE= Sensor fault 0x7FFF= No sensor	… …
	4	5	Remote probe n° 2 – B: Humidity	R/W	Not signed 16 bit number	0x0000= 0 rH 0x0063= 99 rH	… …

Table n° 4: SCM8xx master terminal status.

N° bit	Meaning	Description	Notes
15	Available data(1)	0= data not available; 1= available data;	
14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4			
3			
2			
1-:-0	Value H0r(2)	0= ModBUS management inactive 1= ModBUS management active 2= free 3= free	

Notes:

(1) Bit 15 shows if some terminal valid data are available to reading. If bit 15 = 0, the detected data are invalid.

(2) It is the parameter H0r value; see Master terminal technical datasheet.

4. SCM8xx DATABASE MODBus: SET AND VISUALIZATION OF SERIAL SLAVE MODULES DATA

The table is made of the following columns:

- Item: it is the slave module the field is referred to.
- ModBUS field: decimal number (dec), Base 0 and Base 1.
- Meaning: what the field stands for.
- Field format: read only (RO) or read/write (R/W) and format (signed 16 bit decimal number, unsigned 16 bit integers, etc.).
- Description: further details about the field.
- Notes

To calculate the indexes of a slave module see the formula at point n°1, PREFACE.

Table n° 5

Slave n°	ModBUS index (dec)			Field format		Description	Notes
	Addr. Base 0	Addr. Base 1					
0	256	257	Probe n° 1(1)	RO			
	257	258	Probe n° 2(1)	RO			
	258	259	Errors/ Alarms	RO		See table n° 8	
	259	260	Errors/ Alarms	RO		See table n° 9	
	260	261	Status	RO		See table n° 10 or 11	
	261	262	Future use	RO			
	262	263	Future use	RO			
	263	264	Future use	RO			
	… …	… …	… …		… …	… …	… …
	… …	… …	… …		… …	… …	… …
	… …	… …	… …		… …	… …	… …
	504	505	Future use	R/W			
	505	506	Future use	R/W			
	506	507	Heat/Cool mode command(2)	R/W		0x0000= COOL 0x0001= HEAT	
	507	508	Reset command(2)	R/W		0x0000= NO 0x0001= RESET	
	508	509	Status module n° 2 command. A-M (1)(2)	R/W			
	509	510	Status module n° 1 command (1)(2)	R/W			
	510	511	Set-point n° 2(1)(2)	R/W			
	511	512	Set-point n° 1(1)(2)	R/W			

… …	… …	… …	… …		… …	… …	… …
… …	… …	… …	… …		… …	… …	… …
… …	… …	… …	… …		… …	… …	… …
Slave n°	ModBUS index (dec)			Field format		Description	Notes
	Addr. Base 0	Addr. Base 1					
	4096	4097	Probe n° 1(1)	RO			
	4097	4098	Probe n° 2(1)	RO			
	4098	4099	Errors/ Alarms	RO		See table n° 8	
	4099	4100	Errors/ Alarms	RO		See table n° 9	
	4100	4101	Status	RO		See table n° 10 or 11	
	4101	4102	Future use	RO			
	4102	4103	Future use	RO			
	4103	4104	Future use	RO			
	… …	… …	… …		… …	… …	… …
	… …	… …	… …		… …	… …	… …
	… …	… …	… …		… …	… …	… …
15	4344	4345	Future use	R/W			
	4345	4346	Future use	R/W			
	4346	4347	Heat/Cool mode command(2)	R/W		0x0000= COOL 0x0001= HEAT	
	4347	4348	Reset command(2)	R/W		0x0000= NO 0x0001= RESET	
	4348	4349	Status module n° 2 command A-M (1)(2)	R/W			
	4349	4350	Status module n° 1 command (1)(2)	R/W			
	4350	4351	Set-point n° 2(1)(2)	R/W			
	4351	4352	Set-point n° 1(1)(2)	R/W			
… …	… …	… …	… …		… …	… …	… …
… …	… …	… …	… …		… …	… …	… …
… …	… …	… …	… …		… …	… …	… …
Slave n°	ModBUS index (dec)			Field format		Description	Notes
	Addr. Base 0	Addr. Base 1					
	15360	15361	Probe n° 1(1)	RO			
	15361	15362	Probe n° 2(1)	RO			
	15362	15363	Errors/ Alarms	RO		See table n° 8	
	15363	15364	Errors/ Alarms	RO		See table n° 9	
	15364	15365	Status	RO		See table n° 10 or 11	
	15365	15366	Future use	RO			
	15366	15367	Future use	RO			
	15367	15368	Future use	RO			
	… …	… …	… …		… …	… …	… …
	… …	… …	… …		… …	… …	… …
	… …	… …	… …		… …	… …	… …
59	15608	15609	Future use	R/W			
	15609	15610	Future use	R/W			
	15610	15611	Heat/Cool mode command(2)	R/W		0x0000= COOL 0x0001= HEAT	
	15611	15612	Reset command(2)	R/W		0x0000= NO 0x0001= RESET	
	15612	15613	Status module n° 2 command A-M (1)(2)	R/W			
	15613	15614	Status module n° 1 command (1)(2)	R/W			
	15614	15615	Set-point n° 2(1)(2)	R/W			
	15615	15616	Set-point n° 1(1)(2)	R/W			
	… …	… …					
	… …	… …					

Notes:

(1) The value of the different fields can have different meanings depending on the slave module. Following are some examples that explain the differences between the network module n°0 for an heating plant and the network module n°0 for evaporative cooler.

(2) The written field will automatically be sent to the serial slave. Therefore, the device temperature set-point and status will be updated just by writing the field and no further commando are required. *It may take a few seconds before the serial slave receives the written.*

Table n° 6: Network slave for heating plant.

Slave n°	ModBUS index (dec)		Meaning	Field format		Description	Notes
	Addr. Base 0	Addr. Base 1					
	256	257	Probe n° 1: Temperature	RO	signed 16 bit decimal number	0x0101= +25.7 °C 0xFFED= -1,9 °C 0x7FFE= Sensor fault 0x7FFF= No sensor	
	257	258	Probe n° 2: Temperature (if P2 is present on the slave module)	RO	signed 16 bit decimal number	0x0101= +25.7 °C 0xFFED= -1,9 °C 0x7FFE= Sensor fault 0x7FFF= No sensor	
	258	259	Errors/ Alarms	RO		See table n° 8	
0	259	260	Errors/ Alarms	RO		See table n° 9	
	260	261	Status	RO		See table n° 10	
	261	262	Future use	RO			
	262	263	Future use	RO			
	263	264	Future use	RO			
	… …	… …	… …		… …	… …	… …
	… …	… …	… …		… …	… …	… …
	… …	… …	… …		… …	… …	… …
	504	505	Future use	R/W			
	505	506	Future use	R/W			

	506	507	Heat/Cool mode command[2]	R/W		0x0000= COOL 0x0001= HEAT	
	507	508	Reset command[2]	R/W		0x0000= NO 0x0001= RESET	
	508	509	Status module n° 2, A-M: automatic / manual command	R/W		0x0000=OFF 0x0001=Auto 0x0002=On	
	509	510	Status module n° 1 – command	R/W		Future use	
	510	511	Set-point n° 2 - Economy	R/W	signed 16 bit decimal number	0x0101= +25.7 °C 0xFFED= -1,9 °C	
	511	512	Set-point n° 1 – Comfort	R/W	signed 16 bit decimal number	0x0101= +25.7 °C 0xFFED= -1,9 °C	

Table n° 7: Network slave for evaporative cooler.

Slave n°	ModBUS index (dec)		Meaning	Field format		Description	Notes
	Addr. Base 0	Addr. Base 1					
0	256	257	Probe n° 1 – Temperature	RO	signed 16 bit decimal number	0x0101 = +25.7 °C 0xFFED = -1,9 °C 0x7FFE = Sensor fault 0x7FFF = No sensor 50,9°C = sensor unlinked	
	257	258	Probe n° 2 – Humidity	RO	not signed 16 bit number	0x0000= 0 rH 0x0063= 99 rH 109rH = sensor unlinked	
	258	259	Errors/ Alarms	RO		See table n° 8	
	259	260	Errors/ Alarms	RO		See table n° 9	
	260	261	Status	RO		See table n° 11	
	261	262	Future use	RO			
	262	263	Future use	RO			
	263	264	Future use	RO			
	... ...	... ...	... ...		... ...	... ...	... ...
	... ...	... ...	... ...		... ...	... ...	... ...
	... ...	... ...	... ...		... ...	... ...	... ...
	504	505	Future use	R/W			
	505	506	Future use	R/W			
	506	507	Heat/Cool mode command	R/W		0x0000= COOL 0x0001= HEAT	
	507	508	Reset command (FUTURE USE)	R/W		0x0000= NO 0x0001= RESET	
	508	509	Mode command	R/W		0x0000=OFF 0x0001=Auto 0x0002=COOL 0x0003=FAN	
	509	510	Fan Speed command	R/W		0x0000=AUTO 0x0001=F1 0x0002=F2 0x0003=F3	
	510	511	Set-point n° 2: Humidity	R/W	signed 16 bit decimal number	0x0000= 0.0 °C 0x0101= +25.7 °C 0xFFED= -1,9 °C	
	511	512	Set-point n° 1: Temperature	R/W	signed 16 bit decimal number	0x0000= 0.0 °C 0x0101= +25.7 °C 0xFFED= -1,9 °C	

Examples:
i.e. If you wish to set the slave n° 0 set-point temperature to 0x00B4 (+18.0 °C), you just need to write 0x00B4 to the ModBUS address base1 512.
i.e. If you wish to set the evaporative cooler slave n° 15 set-point humidity to 48rH (0x0030), you just need to write 0x0030 to the ModBUS address base1 4351.
i.e. If you wish to set the evaporative cooler slave n° 59 mode to COOL you just need to write 0x0002 to the ModBUS address base1 15614.
i.e. If you wish to set the evaporative cooler slave n° 0 fan speed to "F1" you just need to write 0x0001 to the ModBUS address base1 510.

Table 8: Serial slave module errors / alarms

Bit N°	Item	Description	Notes
15	Errore Eeprom	1= fault	
14	Block	1= 1 or more burners jammed. Or 1 or more evaporative coolers jammed.	
13	MtA	1= generic alarm	
12	AH	1= high temperature alarm	
11	AL	1= low temperature alarm	
10	RTC	1= clock error	
9	AG1	1= AG1 alarm	
8	AG2	1= AG2 alarm	
7	EP8	1= probe 8 fault	
6	EP7	1= probe 7 fault	
5	EP6	1= probe 6 fault	
4	EP5	1= probe 5 fault	
3	EP4	1= probe 4 fault	
2	EP3	1= probe 3 fault	
1	EP2	1= probe 2 fault	
0	EP1	1= probe 1 fault	

NOTE: the evaporative coolers can only warn block alarms.

Table 9: Serial slave module errors / alarms

Bit N°	Item	Description	Notes
15			
14			
13			
12			

11			
10			
9			
8			
7	MER2	1= slave module in alarm. The alarm is not showed on the SCM8xx master.	FUTURE USE
6	ALU	1= low humidity alarm, probe AUX / rH.	
5	AHU	1= high humidity alarm, probe AUX / rH.	
4	Mna_M	1= request of network acquisition	
3	MnA	1= one or more slave units connected to the secondary network iNet with Its/Itse not in compliance. (for slave unit connected to the SCH150 or SCQ65)	
2	Pcr	1 = alarm: parameters of the slave unit not correctly set up	
1	Enb	1=alarm n°54, one or more slave modules connected to the secondary network iNet is in alarm (for slave unit connected to the SCH150 or SCQ65)	
0	SEA	1=alarm	

Table 10: Serial slave module status (only read) for heating plant.

Bit N°	Item	Description	Notes
15	Set data [4]	0= no data available; 1= data present;	
14	Thermal zone "En" fault [5]	0= no error 1= error detected (data referred to a previous scan)	
13	W/S = COOL- summer / HEAT - winter	0= winter / heat; 1= summer / cool;	
12			
11-:-10	Holiday - override	0= no; 1= Holiday; 2= Override;	
9			
8			
7-:-6	Actual set-point	0= rt; 1= SP1/SP1C; 2= SP2/SP1E;	
5	Cooling	0= no cool 1= Cool;	
4	Stand-by	0= Stand-by; 1= no stand-by;	
3	Fan (if present on the slave module)	0= fan off; 1= fan on;	
2	Auto / Manual	0= automatic 1= manual	
1-:-0	Flame status: LO, HI and HHI	0= LO, HI, HII off 1= LO on, HI and HHI off 2= LO and HI on, HHI off 3= LO, HI and HHI on	

Table 11: Serial slave module status (only read) for evaporative coolers.

Bit N°	Item	Description	Notes
15	Set data [4]	0= no data available; 1= data present;	
14	Thermal zone "En" fault [5]	0= no error 1= error detected (data referred to a previous scan)	
13	W/S = COOL-summer / HEAT - winter	0= winter/heat; 1= summer/cool;	
12	Digital input DGT2	0= not actived; 1= actived;	
11	Digital input DGT1	0= not actived; 1= actived;	
10-:-9	Holiday - override	0= no; 1= Holiday; 2= Override;	
8			
7			
6			
5	Fan	0= Fan OFF; 1= Fan ON;	
4	Pump status	0= pump off; 1= pump on;	
3	Cooling	0= cooling off; 1= coooling on;	
2	Auto / Manual	0=automatic; 1= manual;	
1	Dump water	0= no dump water; 1= dump water;	
0	Load water	0= no load water 1= load water	

Note:

[4] Bit 15 shows if some valid data are available to reading (it also includes the read/write data referred to the read only procedure). If bit 15 = 0, the data detected in the slave field (256 addresses) are invalid

[5] It signals a communication error with the specified serial slave. The slave specific data (256 addresses) are not up-to-date. The reading shows the last device status which may not correspond to the actual one (if bit 15 = 1).