CS_IS Modbus Map Specification BM 154 version I

SALICRU

Engineering

V1.2

Resumen

CS_IS Modbus specification

Contents

Document Management

Document History

Date	Ver.	Author	Description
27/09/2023	1.0	Sergi López	First creation
17/11/2023	1.1	Sergi López	Deleted: Overload level 1 Overload level 2 Overload level 3 Overload level 1 timeout Overload level 2 timeout Overload level 3 timeout Added: Minimum overload Maximum overload Timeout minimum overload in inverter Timeout overload in bypass
08/02/2024	1.2	Sergi López	Added: - 451 b0: Status Unit on bypass by any reason Modified: - 400 b1: Alarm Unit on bypass → Alarm unit on bypass by fault - 400 b3: Alarm Output voltaje wrong → Alarm No output

- Introduction

1.1 - Definitions, Acronyms y Abbreviations

Term	Description
SLC	SALICRU

1.2 - References

2 - Characteristics of the Modbus protocol

The Modbus protocol for this system has the following characteristics:

- Frame format: RTU.
- Data bits: 8 Bits.
- Stop bits: 1 Bit.
- Parity: None.

The format of the RTU frame is as follows:

START	ADDRESS	FUNCTION	DATA	CRC	FINAL
3,5 bytes	8 BITS	8 BITS	n x 8 BITS	16 BITS	3,5 bytes

The start and end of the frame are indicated with a minimum silence interval of 3.5 bytes, as shown below. This time will depend on the programmed transmission speed.

If the minimum time between consecutive frames is not respected, both frames will be detected as a single one and, therefore, a reception error will occur.

In this case, no response will be sent by the unit.

2.1.- Available Modbus functions.

The Modbus protocol used by this unit has the following functions:

Code	Function name
3	Read Holding Registers
16	Preset Múltiple Registers

2.2.-Función 3: Read Holding Registers.

This function allows you to check the content of one or more consecutive records of the memory map.

Address	03 H	Start address (High)	Start address (Low)	Number of records (High)	Number of records (Low)	CRC (Low)	CRC (High)

The meaning of each field is shown below:

Address: Address of the unit receiving the message. 03 H: Function code.

Start address (High): High portion of the address, after which the records will be read.

Start address (Low): Low portion of the address, after which the records will be read.
Number of records (High): High portion of the number of records to read.

Number of records (Low): High portion of the number of records to read.

Notes:

- The address n of a specific record is indicated as n-1. In other words, the record with address 0001 H is indicated as 0000 H in the frame, and subsequently with other frames.
- The maximum number of records is 15. An error message will be generated if this number is exceeded.

The response without error will be as follows:

Address	03	Number of Bytes	Record n (High)	Record n (Low)	....	Record m (High)	Record m (Low)	CRC (Low)	CRC (High)

Address: Address of the responding unit.

03 H : Code of the function to which it responds.

Number of bytes: Contains the number of bytes included in the following record content.

Record n (High): High portion of the content in record n.

Record n (Low): Low portion of the content in record n.

Record m (High): High portion of the content in record m.

Record m (Low): Low portion of the content in record m.

Where n is the record with the same address as the start address and m is the record used by the address obtained with the following formula:

Address of m = Start address + Number of records -1.

Example: To read the content of 2 records from address 10H . If we assume that the unit's address is 01 H, the message format will be as follows:

Address	03 H	Start address (High)	Start address (Low)	Number of records (High)	Number of records (Low)	CRC (Low)	CRC (High)
01 H	03 H	00 H	0F H	00 H	02 H	F4H	08 H

The response can be:

Address	03 H	Number of bytes	Record 1 (High)	Record 1 (Low)	Record 2 (High)	Record 2 (Low)	CRC (Low)	CRC (High)
01 H	03 H	04 H	00 H	AE H	00 H	00 H	9B H	D2 H

The field "Number of bytes" indicates the number of bytes in the record content that will be sent in the frame (in this case 4: 00,AE,00 and 00).

Record 1 corresponds to address 0010 H and Record 2 to address 0011 H (000F and 0010 H in the frame of the question message). Therefore:

Record 0010 H contains 00AE H and record 0011 H contains 0000 H.

2.3.- Function 16: Preset Multiple Registers

This function can be used to write one or more consecutive memory records.

Addr	10 H	Start addr. (High)	Start addr. (Low)	Number of records (High)	Number of records (Low)	No. Bytes	Rec. n (High)	Rec. n (Low)	....	Rec. m (High)	Rec. m (High)	CRC (Low)	CRC (High)

Addr.: Address of the unit receiving the message. 10 H: Function code.

Start addr. (High): High portion of the address, after which the records will be written.

Start addr. (Low) Low portion of the address, after which the records will be written.

Number of records (High): High portion of the number of records to write.

Number of records (Low): Low portion of the number of records to write.

No. Bytes: Indicates the number of record data bytes sent.

Record n (High): High part of the content to write in record n.

Record n (Low): Low part of the content to write in record n.

Record m (High): High part of the content to write in record m.

Record m (Low): Low part of the content to write in record m.

Notes:

- Address n of a specific record is indicated as n-1. In other words, the record with address 0001 H is indicated as 0000 H in the frame, and subsequently with other frames.

- The maximum number of records is 10. A reception error will occur if this number is exceeded and no response will be returned.

- If the unit's address is 0 (general address), no response will be returned.

- If one of the values to program is incorrect, the write process will be interrupted and only the records before the error was generated will be written.

The response without error would be of the following type:

Address	10 H	Start address (High)	Start address (Low)	Number of records (High)	Number of records (Low)	CRC (Low)	CRC (High)

Address: Address of the responding unit.

03 H : Code of the function to which it responds.

Start address (High): High portion of the address, after which the records will be written.

Start address (Low): Low portion of the address, after which the records will be written.

Number of records (High): High portion of the number of records written.

Number of records (Low): Low portion of the number of records written.

Example: If you wish to write 2 records from address 3E H of unit 01 H, the data to write would be 00E6 H and 00A3 H, respectively. The message format will be:

Addr	10 H	Start addr. (High)	Start addr. (Low)	Number of records (High)	Number of records (Low)	No. Bytes	Rec. n (High)	Rec. n (Low)	Rec. m (High)	Rec. m (High)	CRC (Low)	CRC (High)
01H	10 H	00 H	3D H	00 H	02 H	04 H	00 H	E6 H	00 H	A3 H	90 H	AC H

Where:

Record n: This is the starting record, indicated by the start address (003E H).

Record m: This is the final record (003F H).

The field "Number of bytes" indicates the number of bytes included in the record and sent in the frame.

The response can be:

Addr	10 H	Start address (High)	Start address (Low)	Number of records (High)	Number of records (Low)	CRC (Low)	CRC (High)
01H	10 H	00 H	3D H	00 H	02 H	D0 H	04 H

2.4.- Error messages.

The The error messages have the following format:

Address	Function code	Error code	CRC (Low)	CRC (High)

Address: This is the address of the unit sent in the message.

Function code: This is the code of the function that generated the error, with bit number 7 set to 1.

Error code: Indicates the type of error that ocurred. The table below shows the different types of errors.

Code	Name	Meaning
01 H	ILLEGAL FUNCTION	The function is not allowed in this unit.
02 H	ILLEGAL DATA ADDRESS	The specified address is incorrect.
03 H	ILLEGAL DATA VALUE	One or more values of the data field are incorrect.
04 H	SLAVE DEVICE FAILURE	Failure in the unit when executing a function.
05 H	ACKNOWLEDGE	The unit is still processing the function.
06 H	SLAVE DEVICE BUSY	The unit is busy processing another function.

Example:

Function 03 H was sent to unit 01 H, requesting information of more than 18 records; the unit returns the following message:

Address	Function code	Error code	CRC (Low)	CRC (High)
01 H	83 H	03 H	01 H	31 H

Address: Address of the unit returning the message.

Function code: This is the result of activating bit number 7 of the function code sent (03 H).

Error code: Indicates the type of error generated. In this case, one of the values of the data field is invalid.

2.5.- Calculation of the CRC.

The content of the CRC field is two bytes. It is calculated using all fields in the frame (except this field). A calculation method is described below:

1. Load a 16-bit record with FFFF H. This record will be called "CRC record".

2. Perform the exclusive OR operation of the byte under the CRC record with the first byte of the message. Include the result in the CRC record.

3. Shift the CRC record one bit to the right, filling the free bit to the left with a 0.

4. If the bit shifted to the right is 0: Repeat step 3.

   If the bit shifted to the right is 1: Perform an exclusive OR operation between the CRC record and value A001 H. Include the result in the CRC record.

5. Repeat steps 3 and 4 until the bit has been shifted 8 times. The message's full byte will already be processed at this stage.

6. Repeat steps 2 to 5 for all message bytes.

7. The final content of the CRC record is the CRC value. The CRC is included in the frame as follows:

a). Set the byte with the lowest CRC weight first.

b). Next, enter the byte with the highest weight..

3 - Record memory space for Modbus.

Simplified map / Map structura del mapa

Base	**Base address: 0dec**
Product identification	**Base address: 1dec**
Basic product configuration	**Base address: 100dec**
Commands	**Base address: 300dec**
Alarms, Warnings and Recognition	**Base address: 400dec**
Status variables	**Base address: 450dec**
Measurements	**Base address: 500dec**
Nominal unit values	**Base address: 700dec**
Advances product configuration	**Base address: 1000dec**
Calibrations	**Base address: 1200dec**

ALL RECORDS SPECIFIED IN THE TABLE BELOW ARE 16-BIT RECORDS.

	Addr dec	Content	Units	Type
Product identification			**Base address: 1dec**	
	1 7	**Reserved**		
	8	Product ID (1)	ASCII	R
	9	Product ID (1)	ASCII	R
	10	Product version (1)	ASCII	R
	11	Highest platform version (Odyssey)	NUMÉRICO	R
	12	Lowest platform version (Odyssey)	NUMÉRICO	R
	13	CPU ID	NUMÉRICO	R
	14	**Free**		
	15	Modbus map version	NUMÉRICO	R
	16	Serial number (1)	ASCII	R
	17	Serial number (1)	ASCII	R
	18	Serial number (1)	ASCII	R
	19	Serial number (1)	ASCII	R
	20	Serial number (1)	ASCII	R
	21	Serial number (1)	ASCII	R
	22	Serial number (1)	ASCII	R
	23 ... 24	**Free**		
	25	Highest version of the application	NUMÉRICO	R

	Addr dec	Content	Unit	Type
	26	Lowest version of application 1	NUMÉRICO	R
	27 ... 29	**Free**	NUMÉRICO	R
	30	Aplication type	0= Release 1= Beta Version	R
	31 ... 40	**Free**		
	41	Manufacturer (1)	ASCII	R
	42	Manufacturer (1)	ASCII	R
	43	Manufacturer (1)	ASCII	R
	44	Manufacturer (1)	ASCII	R
	45	Manufacturer (1)	ASCII	R
	46	Manufacturer (1)	ASCII	R
	47	Manufacturer (1)	ASCII	R
	48	Manufacturer (1)	ASCII	R
	49	Manufacturer (1)	ASCII	R
	50 ... 59	**Free**		
	60	Common HREG layer version	NUMERIC	R
	61	Private HREG layer version	NUMERIC	R
	62	**Free**		
	63	Common SREG layer version	NUMERIC	R

	Addr dec	Content	Unit	Type
	64	Private SREG layer version	NUMERIC	R
	65 ... 66	**Free**		
	67	File system version	NUMERIC	R
	68 ... 95	**Free**		
	96	Control plate ID 1	Dimensionless	R
	97	Control plate ID 2	Dimensionless	R
	98	Control plate ID 3	Dimensionless	R
	99	Control plate ID 4	Dimensionless	R
Basic product configuration			**Base address: 100dec**	
	100	Hours and Minutes	Hours, Minutes (2)	R/W
	101	Seconds and Day of the week	Seconds, Day of the week (2)	R/W
	102	Day of the Month and Month	Day number, Month (2)	R/W
	103	Year	Year (2)	R/W
	104	Modbus address of serial port 1	1-247	R/W
	105	Modbus user (1)	ASCII	R/W
	106	Modbus user (1)	ASCII	R/W
	107	Programming key (1)	ASCII	R/W
	108	Programming key (1)	ASCII	R/W
	109	Programming key (1)	ASCII	R/W
	110	Programming key (1)	ASCII	R/W

	Addr dec	Content	Unit	Type
	111	Programming key (1)	ASCII	R/W
	112	Programming key (1)	ASCII	R/W
	113 ... 114	**Free**		
	115	Serial port 1 protocol	0=Modbus	R/W
	116	Parity of serial port 1	0=SinParidad 1=ParidadImpar 2=ParidadPar	R/W
	117	Baud Rate of serial port 1	0=B1200 1=B2400 2=B4800 3=B9600 4=B19200 5=B57600 6=B115200	R/W
	118	Stop Bits of serial port 1	1=1StopBits 2=2StopBits	R/W
	119 ... 299	**Free**		
System commands			**Base address: 300dec**	
	300	Inverter ON	0=Nothing 1=Command	R/W*
	301	Inverter OFF	0=Nothing 1=Command	R/W*
	302	Inverter Unlock	0=Nothing 1=Command	R/W*
	304 ... 399	**Free**		

	Addr dec	Content	Unit	Type
Alarms, Warnings and Recognition			**Base address: 400dec**	
	400	b0= Inverter fault b1= Unit on bypass by fault b2= Bypass not available b3= No Output b4= IGBT bridge overcurrent b5= Output overload b6= Output overload timeout b7= High ambient temperature b8= High heatsink temperature b9= Battery overvoltage b10= Battery low level b11= End of discharge b12= Bypass overvoltage b13= Bypass voltage too low b14= Output overvoltage b15= Output voltage too low	0=False 1=True	R
	401	b0= High transformer temperature b1= Overtemperature ambient timeout b2= Overtemperature transformer timeout b3= Overtemperature heatsink timeout b4= File system error b5= **Free** b6= **Free** b7= **Free** b8= **Free** b9= **Free** b10= **Free** b11= **Free** b12= **Free** b13= **Free** b14= **Free** b15= **Free**	0=False 1=True	R
	402	**Free**		

	Addr dec	Content	Unit	Type
	403	b0= ACK Inverter fault b1= ACK Unit on bypass b2= ACK Bypass not available b3= ACK Output voltaje wrong b4= ACK IGBT bridge overcurrent b5= ACK Output overload b6= ACK Output overload timeout b7= ACK High ambient temperature b8= ACK High heatsink temperature b9= ACK Battery overvoltage b10= ACK Battery low level b11= ACK End of discharge b12= ACK Bypass overvoltage b13= ACK Bypass voltage too low b14= ACK Output overvoltage b15= ACK Output voltage too low	0=False 1=True	R/W**
	404	b0= ACK High transformer temperature b1= ACK Overtemperature ambient timeout b2= ACK Overtemperature transformer timeout b3= ACK Overtemperature heatsink timeout b4= ACK File system error b5= **Free** b6= **Free** b7= **Free** b8= **Free** b9= **Free** b10= **Free** b11= **Free** b12= **Free** b13= **Free** b14= **Free** b15= **Free**	0=False 1=True	R/W**
	405 ... 449	**Free**		

	Dir Dec	Content	Unit	Type
Status variables			**Base address: 450dec**	
	450	b0= Inverter OK b1= Online b2= Inverter overload b3= Inverter overload timeout b4= Bypass overload b5= Bypass overload timeout b6= Overtemperature heatsink b7= Overtemperature ambient b8= Bypass voltage out of range b9= Bypass frequency out of range b10= Synchronism OK b11= Flag Ad b12= End of discharge b13= Battery low b14= Inverter fault b15= Overtemperature transformer	0=False 1=True	R
	451	b0= Unit on bypass by any reason b1= **Free** b2= **Free** b3= **Free** b4= **Free** b5= **Free** b6= **Free** b7= **Free** b8= **Free** b9= **Free** b10= **Free** b11= **Free** b12= **Free** b13= **Free** b14= **Free** b15= **Free**	0=False 1=True	R
	452 ... 499	**Free**		
Measurements			**Base address: 500dec**	
	500	Bypass voltage	0,1 V	R
	501	Output voltage	0,1 V	R
	502	Output current	0,1 A	R
	503	Battery voltage	0,1 V	R
	Addr Dec	**Content**	**Unit**	**Type**

	504	Ambient/transformer temperature	ºC	R
	505	Heatsink temperature	ºC	R
	506	Output power	0,1 W	R
	507	Bypass frequency	0,01 Hz	R
	508	Output frequency	0,01 Hz	R
	509 ... 699	**Free**		
Nominal unit values			**Base Address: 700dec**	
	700	Rated bypass voltage	0,1 V	R/W**
	701	Rated output voltage	0,1 V	R/W**
	702	Rated output current	0,1 A	R/W**
	703	Rated bypass frequency	0,01 Hz	R/W**
	704 ... 999	**Free**		
Advanced product configuration			**Base address: 1000dec**	
	1000	Synchronism margin	0,01 Hz	R/W**
	1001	Synchronism hysteresis	0,1 Hz	R/W**
	1002	Display lenguage	0=Spanish 1=English 2=French	R/W**
	1003	Synchronism selection	0=No synchronism 1=With sincronismo	R/W**
	1004	Operation mode	0=Online mode 1=Eco mode 2=Manual mode	R/W**
	1005	With or without bypass selection	0=Without bypass 1=With bypass	R/W**
	1006	End of discharge voltage	0,1 V	R/W**
	1007	Low battery voltage	0,1 V	R/W**
	1008	High battery voltage	0,1 V	R/W**
	Addr Dec	**Content**	**Unit**	**Type**

	1009	Maximum fast bypass voltage	%	R/W**
	1010	Minimum fast bypass voltage	%	R/W**
	1011	Maximum bypass voltage	%	R/W**
	1012	Minimum bypass voltage	%	R/W**
	1013	Analog alarm hysteresis	%	R/W**
	1014	Maximum output voltage	%	R/W**
	1015	Minimum output voltage	%	R/W**
	1016	Minimum overload		
	1017	Maximum overload		
	1018	Timeout minimum overload in inverter		
	1019	Timeout overload in bypass		
	1020	Ambient overtemperature	ºC	R/W
	1021	Heatsink overtemperature	ºC	R/W
	1022	Ambient overtemperature timeout	s	R/W
	1023	Heatsink overtemperature timeout	s	R/W
	1024 ... 1199	**Free**		
Calibrations			**Base address: 1200dec**	
	1200	Calibration factor output voltaje adjust	Dimensionless	R/W**
	1201	Calibration factor output current	Dimensionless	R/W**
	1202	Calibration factor ambient/transformer temperaure	Dimensionless	R/W**
	1203	Calibration factor Heatsink temperature	Dimensionless	R/W**
	1204	Calibration factor battery	Dimensionless	R/W**
	1205	Calibration factor bypass voltage	Dimensionless	R/W**
	1206	Calibration factor fast bypass voltage	Dimensionless	R/W**
	Addr Dec	**Content**	**Unit**	**Type**

	1207	Calibration factor Output voltage	Dimensionless	R/W**
	1208	Offset output voltaje adjust. L	Dimensionless	R/W**
	1209	Offset output voltaje adjust. H	Dimensionless	R/W**
	1210	Offset output current. L	Dimensionless	R/W**
	1211	Offset output current. H	Dimensionless	R/W**
	1212	Offset ambient/transformer temperature. L	Dimensionless	R/W**
	1213	Offset ambient/transformer temperature. H	Dimensionless	R/W**
	1214	Offset heatsink temperature. L	Dimensionless	R/W**
	1215	Offset heatsink temperature. H	Dimensionless	R/W**
	1216	Offset battery voltage. L	Dimensionless	R/W**
	1217	Offset battery voltage. H	Dimensionless	R/W**
	1218	Offset bypass voltage. L	Dimensionless	R/W**
	1219	Offset bypass voltage. H	Dimensionless	R/W**
	1220	Offset fast bypass voltage. L	Dimensionless	R/W**
	1221	Offset fast bypass voltage. H	Dimensionless	R/W**
	1222	Offset output voltage. L	Dimensionless	R/W**
	1223	Offset output voltage. H	Dimensionless	R/W**
	1224 ... 1999	**Free**		

*To write these records, the key must be written in the user's "Programming key" first. This record will be deleted 10 minutes after the first write operation, unless the last record written is the same.

** To write these records, the key must be written in the service's "Programming key" first. This record will be deleted 10 minutes after the first write operation, unless the last record written is the same.

*** To write these records, the key must be written in the production's "Programming key" first. This record will be deleted 10 minutes after the first write operation, unless the last record written is the same.

- Appendix A

(1) These records contain information in ASCII format. Each record has 2 characters. The total amount of information is obtained by linking the different records with the same name. The information ends with code 0.

(2) The content of these records is shown in the table below:

First record		Second record		Third record		Fourth record
High	Low	High	Low	High	Low	
Hour	Minutes	Seconds	Day of the week	Day of the month	Month	Year