INSTALLATION AND MODBUS PROTOCOL GUIDE

SLC TWIN PRO3/RT3
4 ÷ 10 kVA I/I

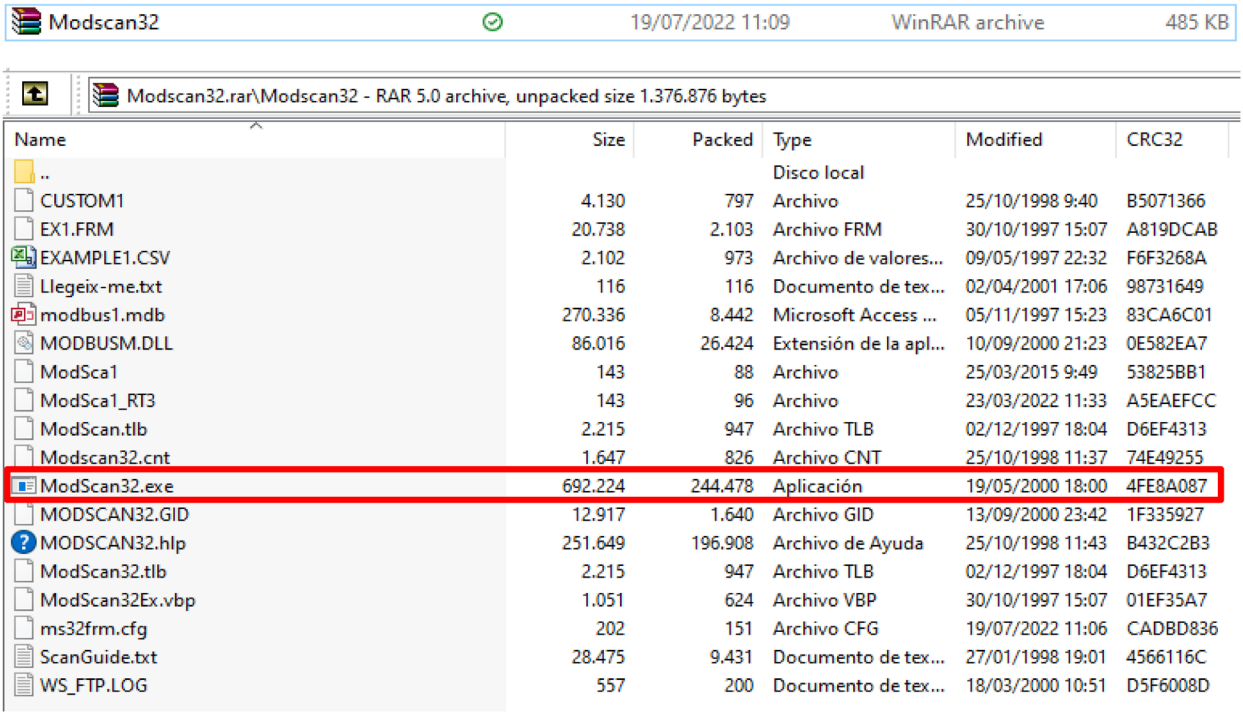
salicru

General index

1. MODBUS INSTALLATION.

Follow the following steps for the protocol installation:

1. Download the folder and run the file ModScan32.exe.

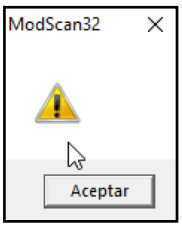


Modscan32 — 19/07/2022 11:09 — WinRAR archive — 485 KB

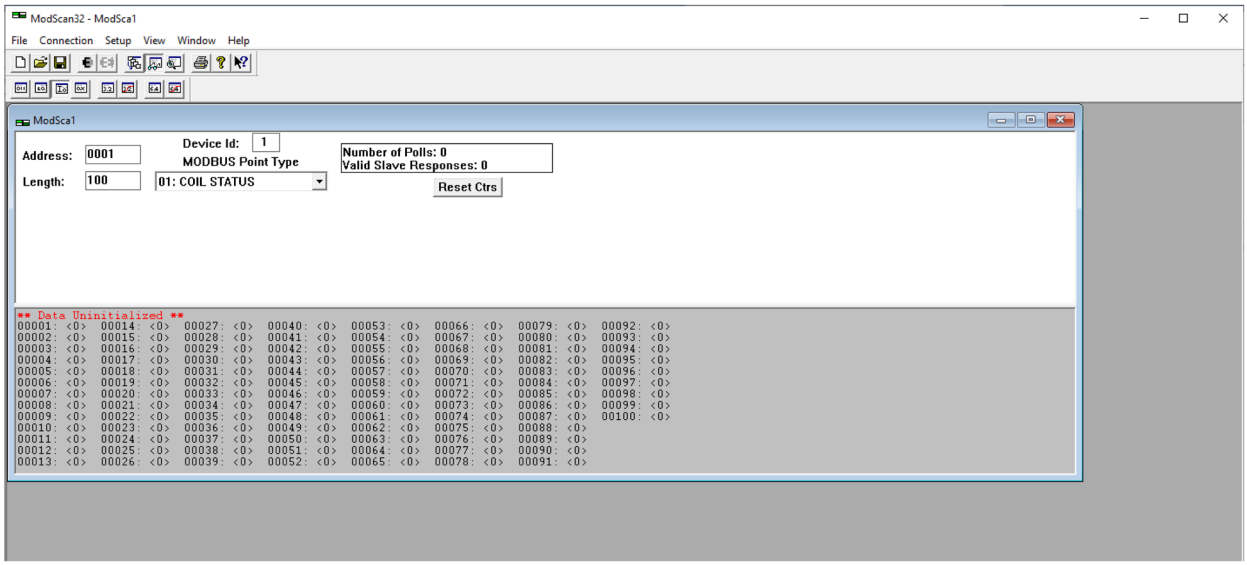
Modscan32.rar\Modscan32 - RAR 5.0 archive, unpacked size 1.376.876 bytes

Name	Size	Packed	Type	Modified	CRC32
..			Disco local		
CUSTOM1	4.130	797	Archivo	25/10/1998 9:40	B5071366
EX1.FRM	20.738	2.103	Archivo FRM	30/10/1997 15:07	A819DCAB
EXAMPLE1.CSV	2.102	973	Archivo de valores...	09/05/1997 22:32	F6F3268A
Llegeix-me.txt	116	116	Documento de tex...	02/04/2001 17:06	98731649
modbus1.mdb	270.336	8.442	Microsoft Access ...	05/11/1997 15:23	83CA6C01
MODBUSM.DLL	86.016	26.424	Extensión de la apl...	10/09/2000 21:23	0E582EA7
ModSca1	143	88	Archivo	25/03/2015 9:49	53825BB1
ModSca1_RT3	143	96	Archivo	23/03/2022 11:33	A5EAEFCC
ModScan.tlb	2.215	947	Archivo TLB	02/12/1997 18:04	D6EF4313
Modscan32.cnt	1.647	826	Archivo CNT	25/10/1998 11:37	74E49255
ModScan32.exe	692.224	244.478	Aplicación	19/05/2000 18:00	4FE8A087
MODSCAN32.GID	12.917	1.640	Archivo GID	13/09/2000 23:42	1F335927
MODSCAN32.hlp	251.649	196.908	Archivo de Ayuda	25/10/1998 11:43	B432C2B3
ModScan32.tlb	2.215	947	Archivo TLB	02/12/1997 18:04	D6EF4313
ModScan32Ex.vbp	1.051	624	Archivo VBP	30/10/1997 15:07	01EF35A7
ms32frm.cfg	202	151	Archivo CFG	19/07/2022 11:06	CADBD836
ScanGuide.txt	28.475	9.431	Documento de tex...	27/01/1998 19:01	4566116C
WS_FTP.LOG	557	200	Documento de tex...	18/03/2000 10:51	D5F6008D

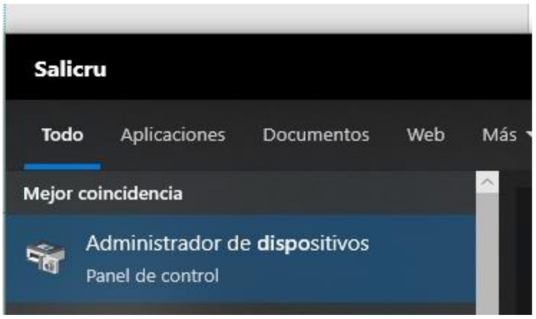
2. Click "Acept" in the window that will appear.

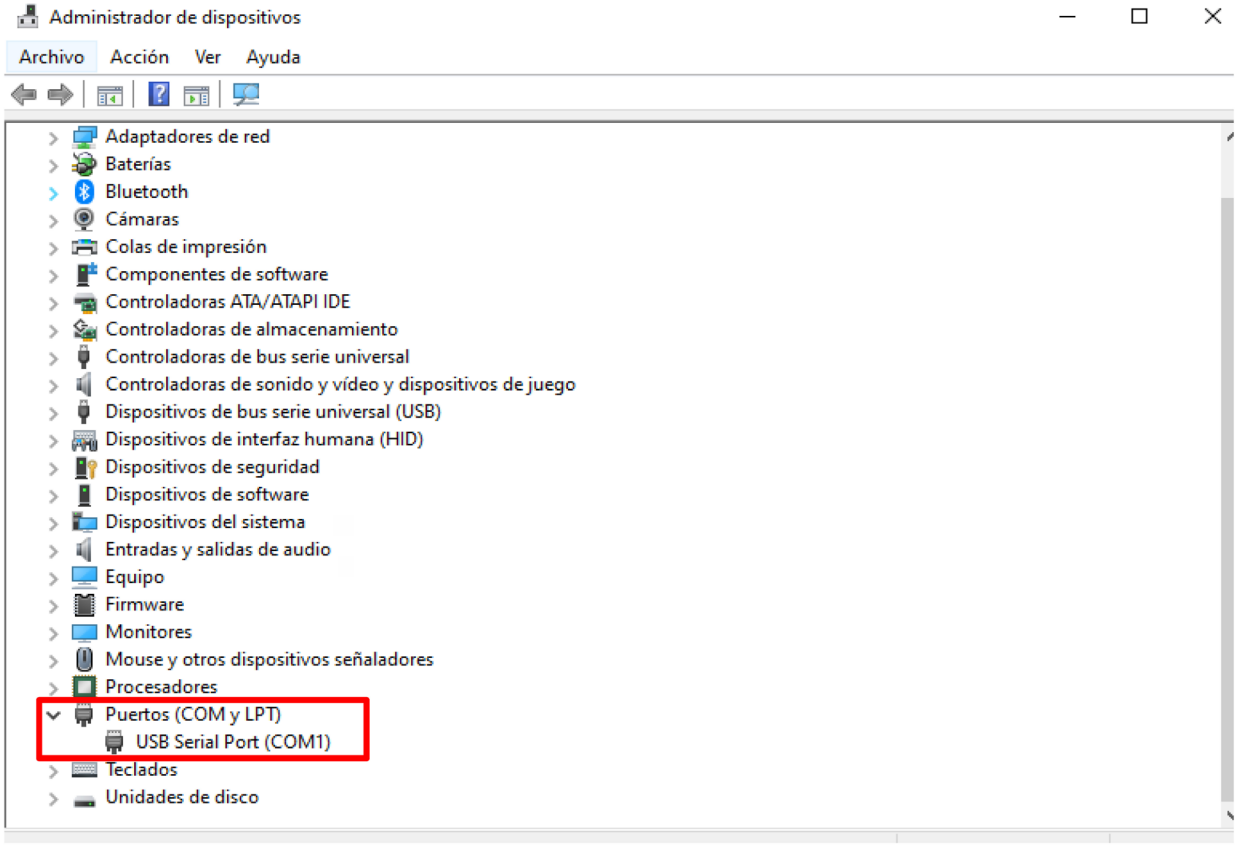


3. Proceed to configure the ModScan program.

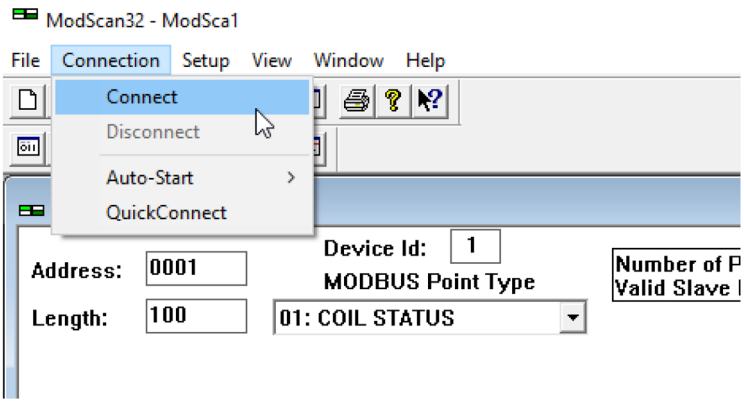


4. Connect the RS232 cable between the UPS port and the computer. Once connected, open the "Device Manager" in the computer's Control Panel to find the COM Port number that has been established.

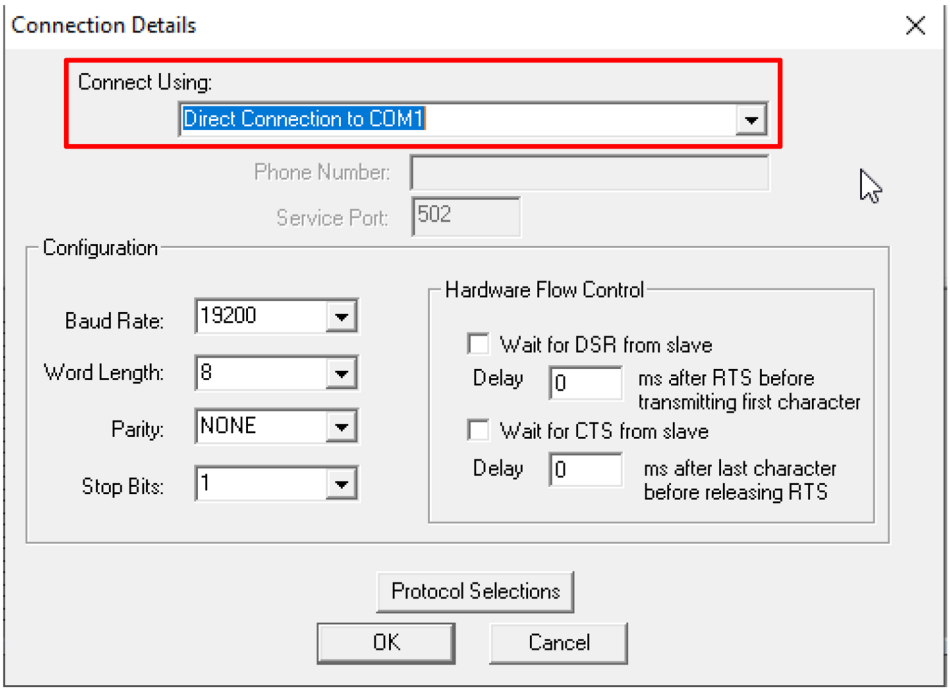




5. Click on "Connection" menu → "Connect.".



6. In the "Connect Using" section, type in the COM Port number.

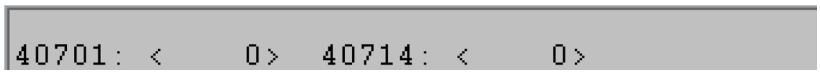


7. There are 3 types of status indications:

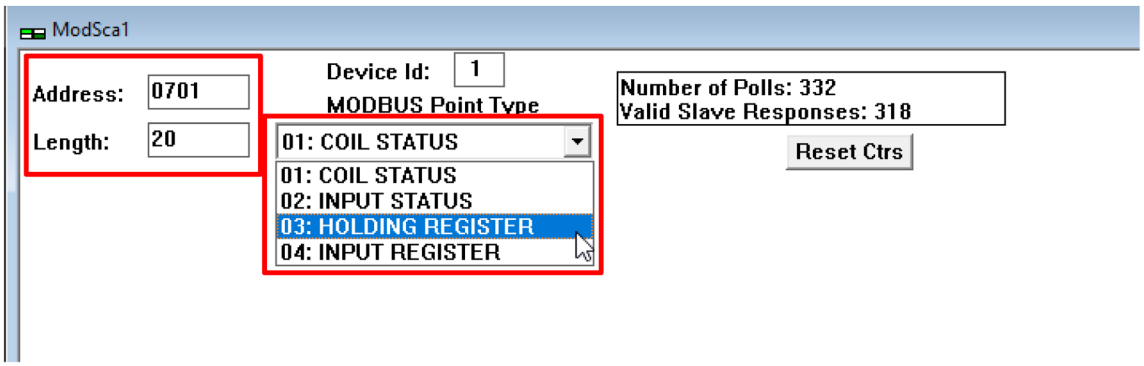
   a. This picture suggests that the device is not connected. This could be due to various reasons such as the cable not being connected, improper cable connections, the failure to complete the previous step for device connection, or potentially a defective cable resulting in a lack of detected connection.

   b. The second picture indicates a communication problem with the UPS, causing it to cease receiving commands from the Modbus protocol. This issue may arise from incorrect addressing, surpassing the maximum cable length, or the absence of parameters for the selected numbers.

   c. In the third picture, the absence of any alerts indicates that everything is in order, and the Modbus protocol will send commands to the UPS without any issues.



8. On the main page of the ModScan software, make the following changes to the three specified parameters as indicated below



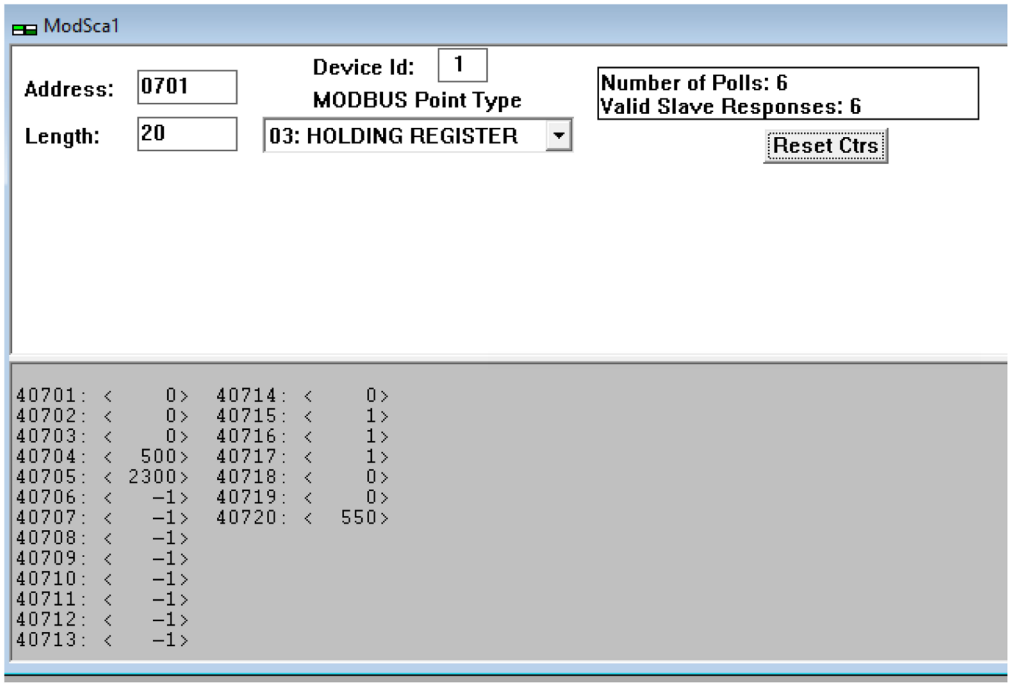
- In the *"Address"* field, enter the register address you wish to modify (found in the attached Excel file containing all available functions for the program).

  IMPORTANT: Add **1** to the register address if you want to view or make changes to it. For example, if you want to perform a battery test located at address 700, consider using 701 instead of 700.

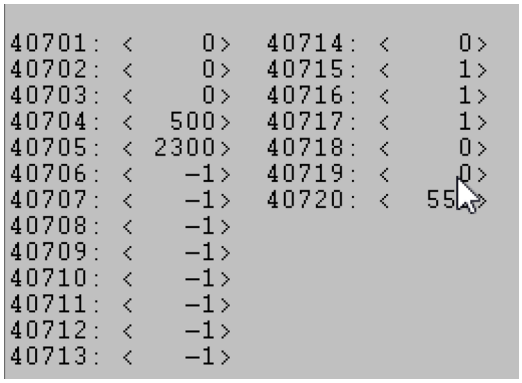
- In the *"Lengh"* field, please indicate the number of registers or addresses you want to display on the screen. It is advisable to select a number between 10 and 30 registers, at most.

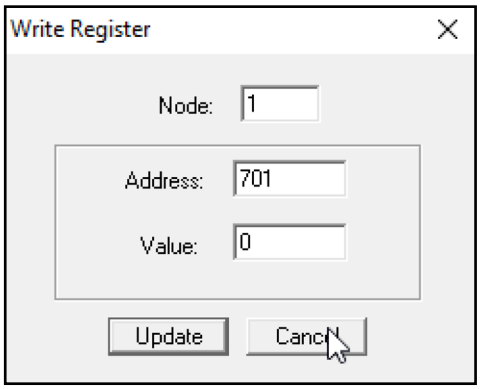
- In the *"MODBUS Point Type"* dropdown menu, always choose option **03: HOLDING REGISTER**.

9. There are two options for interacting with the values within the registers and executing different actions on the UPS:

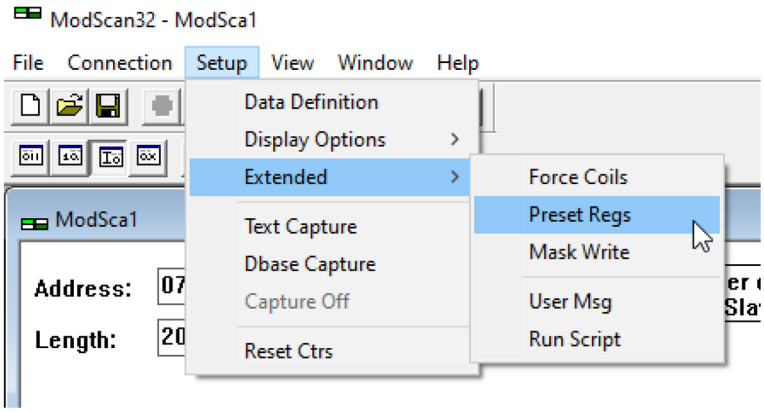


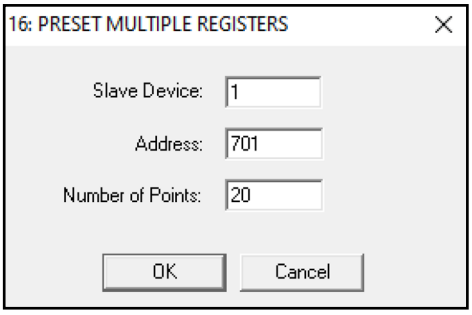
a. To modify a specific address, simply double-click on it:

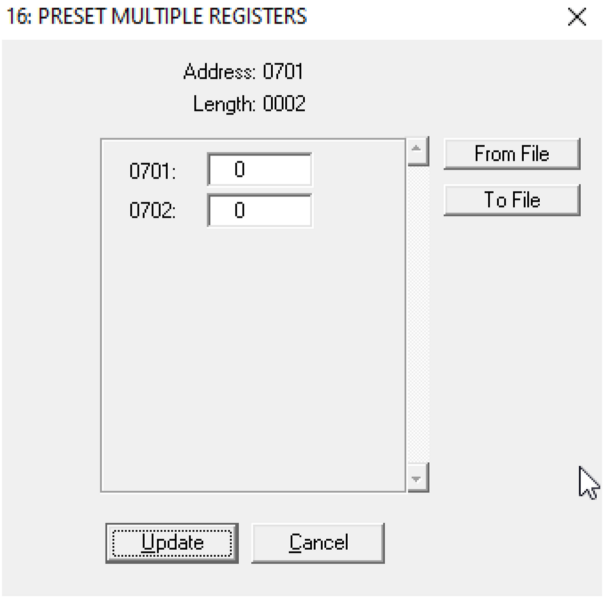




b. Click on Setup → Extended → Preset Regs.







2. GUIDE TO THE OPERATION OF THE MODBUS PROTOCOL (RW).

For a clearer understanding of this guide, we provide several examples to demonstrate how the Modbus protocol function. You can find a comprehensive list of all available actions along with their addresses in the Excel document titled "Innova Unity Modbus protocol-Salicru-1.3."

Below, find some Read-Write (RW) options that allow users to both modify UPS parameters and gather information:

1. Battery Test.

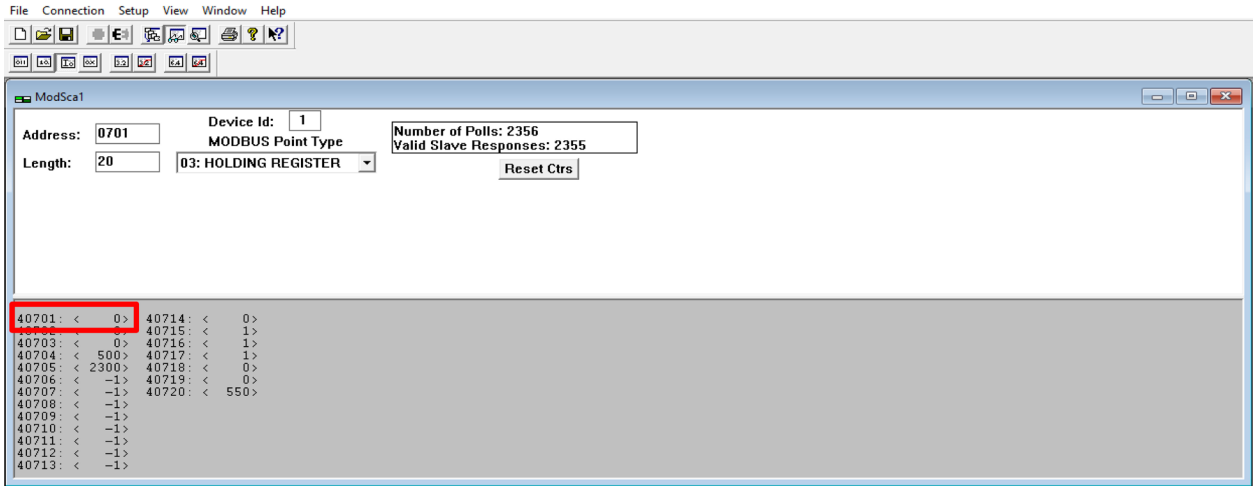
Description	Length(byte)	Register (dec)	DataType	MQTT group	Detailed Description	RWRO	Unit	Unity 1~3K	Unity 4~10K
Battery test general command	1	700	Command	/	Battery test command 0: Reserved 1: Quick test 2: reserved 3: Abort test	RW	-	Y	Y

Note that in the chart above, at address (register) 700, you can choose from four different options to perform different functions: **0 - reserved -, 1 - quick start of the battery test, 2 - reserved -, and 3 - abort any ongoing battery test**.

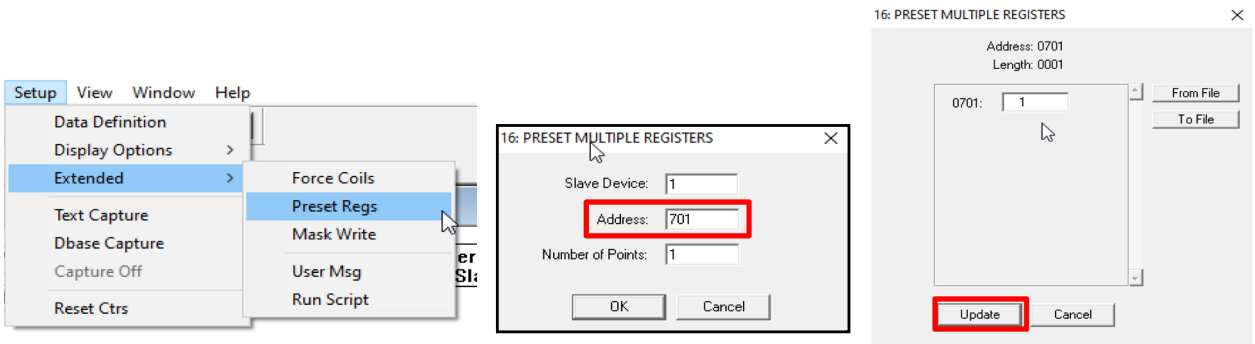
First, locate the register in MODBUS.

IMPORTANT: As mentioned earlier, to act on any register, you must add one (1) to it.

Therefore, filter the protocol by address 0701 and a length of 20 (standard measurement), as indicated in the following image:



At register 701, there is a 0. To initiate a battery test, you need to modify this 0 and write a 1. If a battery test is already running for another reason, you should write a 3 instead. After entering the desired number, click on "Update," and the command will be executed immediately. In this case, the UPS will begin a battery test.

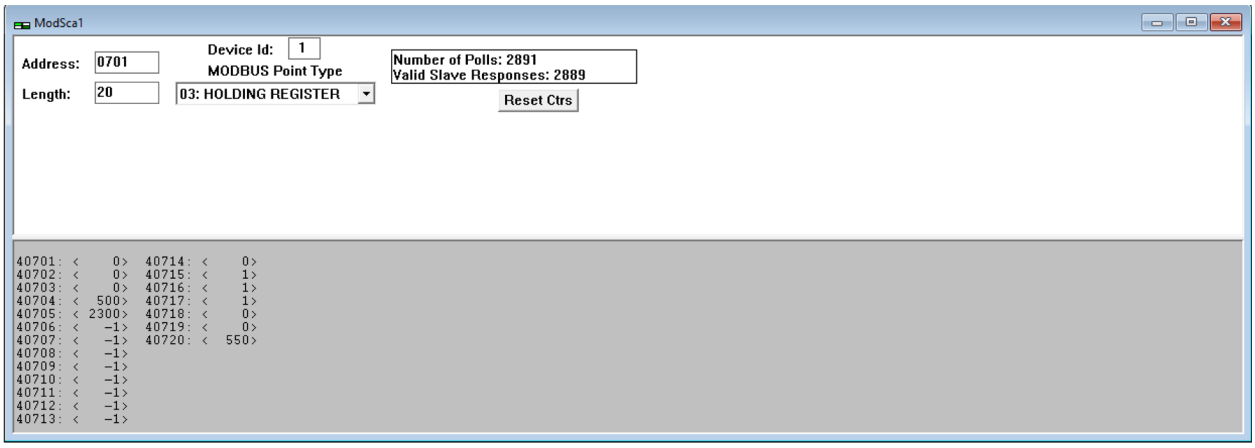


2. Battery Test with Specific Duration.

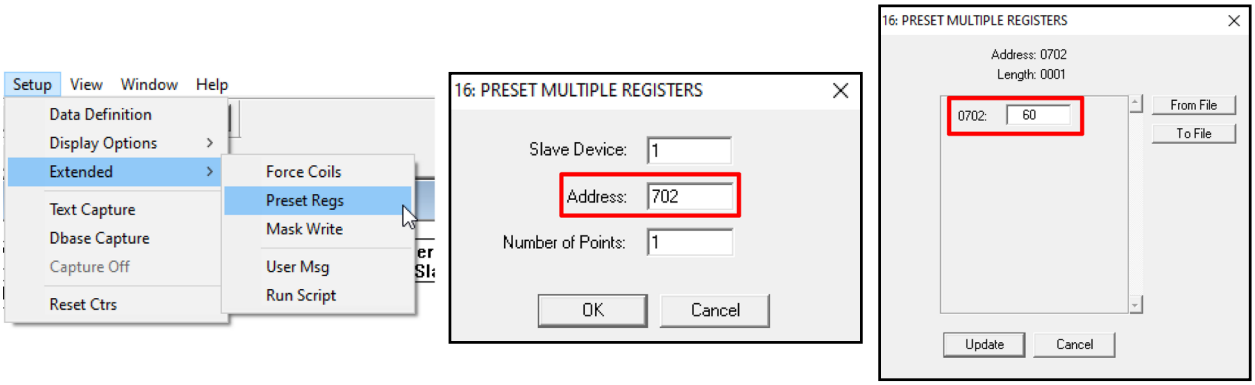
Description	Length(byte)	Register (dec)	DataType	MQTT group	Detailed Description	RWRO	Unit	Unity 1~3K
Battery test with duration	2	701	Command	/	Battery advance test for specific duration	RW	s	Y

To perform a battery test for a specific duration, please use register 701, and in the MODBUS protocol, you will specify one more value: 702 to act within register 701.

In this case, you won't choose from a set of actions but rather indicate the number of seconds the test will last.



Please enter the correct address in the next step:



IMPORTANT: Enter a value ≥ 60 seconds for the UPS to detect it correctly, to initiate the battery test successfully.

3. Battery Test Based on Remaining Battery Discharge Level Percentage.

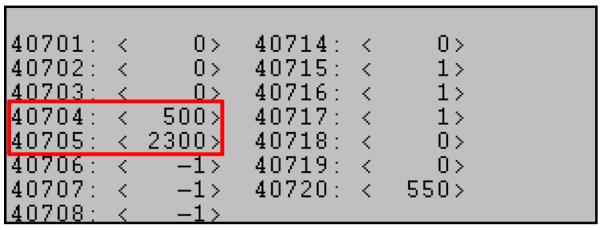
Description	Length(byte)	Register (dec)	DataType	MQTT group	Detailed Description	RWRO	Unit	Unity 1~3K
Battery test with level	1	702	Command	/	Battery advance test until specific battery level	RW	%	Y

In this specific scenario, navigate to register 703 (702 + 1) and follow the same steps as previously described to access this address. The value you enter here represents the percentage by which you permit the battery voltage to decrease during the test.

4. Configuration of Nominal Voltage and Frequency.

Description	Length(byte)	Register (dec)	DataType	MQTT group	Detailed Description	RWRO	Unit
Config frequency	2	703	Parameter	/	Nominal value of output frequency	RW	dHz
Config Voltage	2	704	Parameter	/	Nominal output voltage.	RW	dV

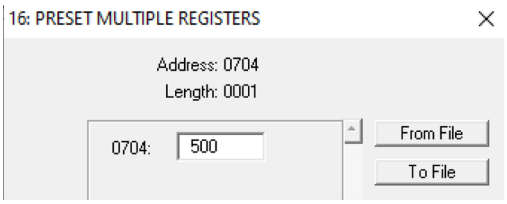
Repeat the same procedure, choose the register by adding 1 to it, and enter the appropriate values: in this case, 704 and 705.



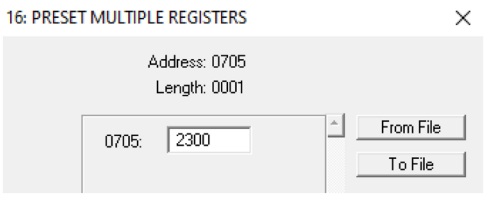
Despite the appearance of 500 and 2300, it's important to note that the last 0 should not be considered. Therefore, the initial values are 50 Hz and 230 V.

For modification:

- **Frequency adjustment:** You can adjust the value, but it's important to ensure that the system is in frequency converter mode; otherwise, an error will occur. To set the desired frequency, enter 600 for 60 Hz or 500 for 50 Hz in address 704.



- **Voltage adjustment:** You can modify the voltage value, but it's crucial to ensure that the system is not in inverter mode or bypass mode. To do this, re-enter the correct address (705) and input either 2300 for 230 V, 2080 for 208 V, or 2200 for 220 V, depending on your requirements.

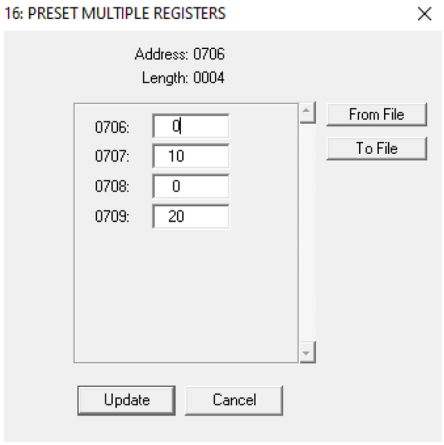


5. Delaying Output Shutdown/Startup.

Description	Length(byte)	Register (dec)	DataType	MQTT group	Detailed Description	RWRO	Unit
Outlet1 delaybeforeshutdown (Retraso de la salida 1 antes del apagado)	4	705	Command	/	1-n: Delayed action 0: Immediat action -1: Cancel / No action	RW	s
Outlet1 delaybeforestartup (Retraso de la salida 1 antes de la puesta en marcha)	4	707	Command	/	1-n: Delayed action 0: Immediat action -1: Cancel / No action	RW	s

As evident in the two displayed options, each one spans across two registers, with 706 being part of register 705 and 708 being part of register 707..

Use this option to manage your loads. The first option introduces a delay time before shutting down the loads, while the second option introduces a delay time before activating them. Just like in previous cases, remember to use addresses 706 and 708, even though the settings primarily involve registers 705 and 707.



In this scenario, you will utilize two registers for each option. It's essential to keep the smaller register at 0 while modifying the other register to specify the desired delay time.

IMPORTANT NOTE: When specifying the delay time in seconds for each of the options, both options start counting from the same initial point. For instance, if register 707 shows 10, it signifies that the loads will turn off after a 10-second delay. Conversely, if register 709 displays 20, this does NOT mean the loads will activate in 20 seconds. Instead, it indicates that the loads will activate 10 seconds after the completion of the previous action, as 10 seconds out of those 20 have already elapsed during the previous action.

6. Additional Parameters You Can Modify Using the Same Previous Procedure.

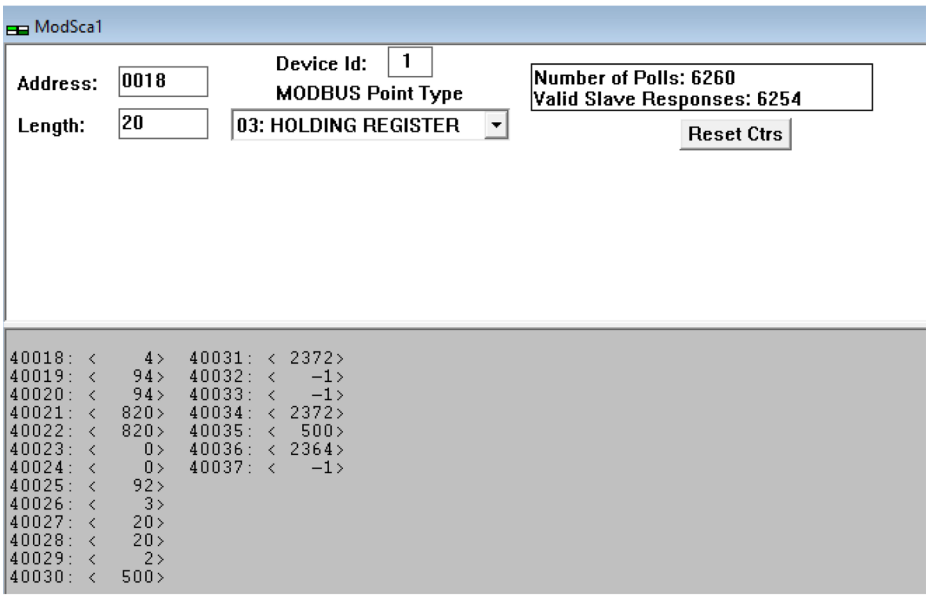
Description	Length(byte)	Register (dec)	DataType	MQTT group	Detailed Description	RWRO	Unit
Converter mode	1	713	Parameter	Measurement - Fast group	0: AutoRanging 1:Frequency Converter	RW	-
Auto Restart	1	714	Parameter	Measurement - Fast group	0: Auto restart disabled 1: Auto restart enabled	RW	-
Control Standby	1	715	Parameter	Measurement - Fast group	1 : Bypass standby is enabled 0 : Bypass standby is disabled	RW	-
HE enable	2	718	Parameter	Measurement - Fast group	ECO mode : 0: Not enabled 1: High Efficiency mode enabled,	RW	-
Buzzer setting	1	727	Parameter	Measurement - Fast group	1: Disabled 2: Enabled	RW	-
Delay before shutdown	4	728	Command	/	Delay before the output shutoff. 1 to n: Delayed action 0 : Immediat action -1: Cancel / No action	RW	s
Delay before startup	4	730	Command	/	Delay before the output restart. 1 to n: Delayed action 0 : Immediat action -1: Cancel/No action	RW	s

3. OPERATION GUIDE FOR MODBUS PROTOCOL (RO).

In this chapter, we explore the read-only options (RO), which serve solely as sources of information. To access this data, utilize the MODBUS register screen and refer to the Excel document containing the relevant information.

For instance, to understand the values found at address 0018, the first image illustrates their presentation on the MODBUS register screen, while the second image offers the corresponding data from the Excel file."

IMPORTANT: Starting from this point, the registers will be assumed to have the +1 value already included.

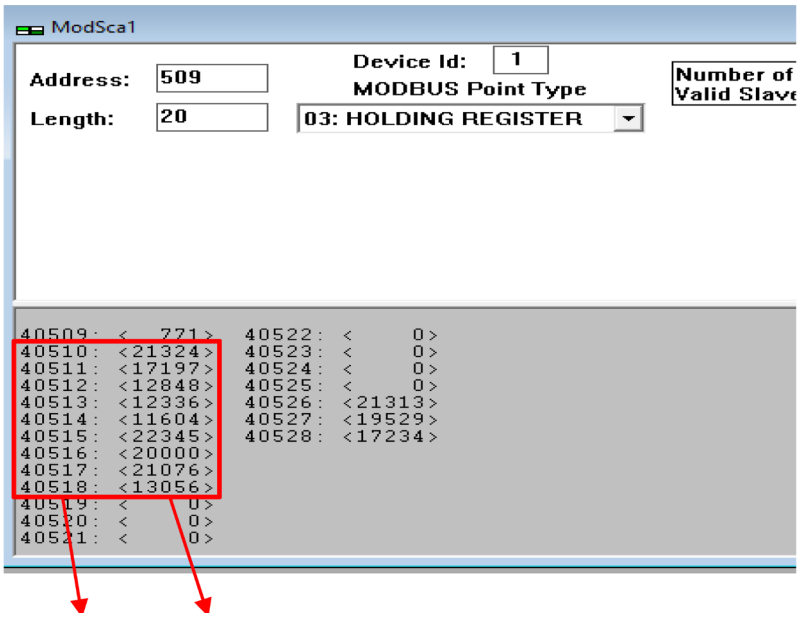


Description	Length(byte)	Register (dec)	DataType	MQTT group	Detailed Description	RWRO	Unit
Battery test result	1	17	Measure	Measurement - Fast group	Battery test result value: 1: Done and Passed 2: Reserved 3: Done and Error 4: Aborted 5: In progress 6: No *test* iniated	RO	-
Charger mode	1	25	Measure	Measurement - Fast group	Battery charging status 1 charging 2 discharging 3 floating 4 resting 5 Charger off	RO	-
Config Active power	2	26	Measure	Measurement - Fast group	Nominal value of active power	RO	100W
Config Apparent power	2	27	Measure	Measurement - Normal group	Nominal value of apparent power	RO	100VA
Converter Type	1	28	Measure	Measurement - Normal group	1: Off Line / Line interactive 2: On Line (single UPS) 3: On Line - Unitary/Parallel (in parallel with another UPS)	RO	-
Mains1 frequency	2	29	Measure	Measurement - Normal group	Actual value of Main AC frequency	RO	dHz
Mains1 phase 1 voltage	2	30	Measure	Measurement - Normal group	Actual value of Main AC voltage phase 1	RO	dV

In register 18, the last battery test result was "canceled" because a previous action led to that outcome. Subsequently, in register 26, the battery status (float) is displayed. The apparent and active power are shown in registers 27 and 28 (2 kVA). Finally, the frequency and voltage are found in registers 30 and 31, which are 50 Hz and 237.2 V, respectively.

Therefore, it's possible to obtain information about the UPS using each of the read-only (RO) registers in the Excel document through the MODBUS protocol.

To retrieve information such as the model name, product details, serial number, firmware version, and more, having access to the ASCII table is essential. The following example demonstrates how to locate record 510, which contains the UPSs model name.



Example:

Registro	Decimal	Hexadecimal	ASCII
40510	21324	0x53 4C	S L
40511	17197	0x 43 2D	C -
40512	12848	0x 32 30	2 0
40513	12336	0x 30 30	0 0
40514	11604	0x 3D 54	- T
40515	22345	0x 57 49	W I
40516	20000	0x 4E 20	N
40517	21076	0x 52 54	R T
40518	13056	0x 33 00	3

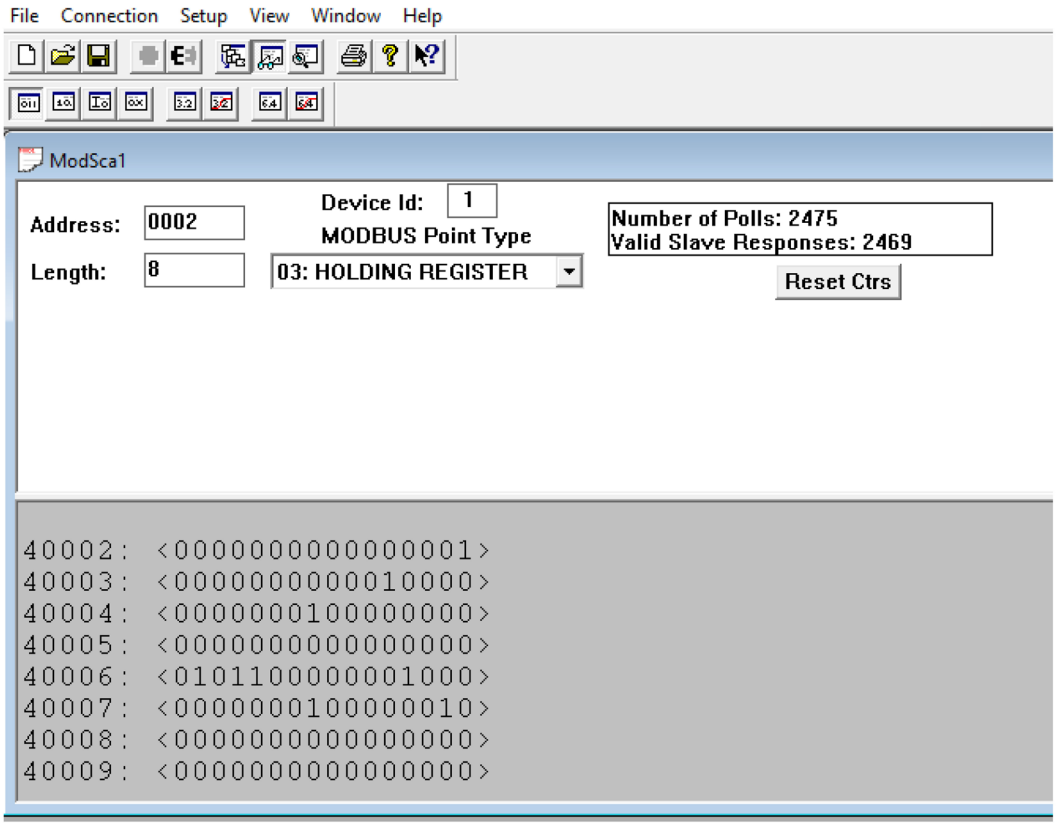
Description	Length(byte)	Register (dec)	DataType	MQTT group	Detailed Description	RWRO
UPS Protocol version	2	508	UPS_Information	/	Modbus protocol version.	RO
UPS Model name	31	509	UPS_Information	/	Model name	RO
UPS PartNO.	21	531	UPS_Information	/	Part number	RO
UPS Product name	20	542	UPS_Information	/	Product name	RO
UPS Serial number	16	555	UPS_Information	/	Serial number	RO
UPS FW version	11	565	UPS_Information	/	Firmware version	RO
UPS Battery type	1	571	UPS_Information	Measurement - Fast group	0: Acid battery 1: Li-ion battery	RO

4. DISPLAYING ALARM REGISTERS USING MODBUS.

To display the alarm register, select the "Binary" menu using ModScan32. This configuration allows you to view all alarms in binary format, making it easier to visualize the data. The following image illustrates the option to choose:

The alarm system employs addresses or registers labeled as "Address / Register" ranging from 1 to 8. However, it's crucial to remember that you should add 1 to each of these addresses. Therefore, the correct addresses for visualizing the alarms should be from 2 to 9.

In the following image, all the previously mentioned registers or addresses are presented, each accompanied by its corresponding binary numbers. Understanding the position of each number within the row is essential, as it will determine whether an alarm is active or not.



IMPORTANT: Bit positions should be counted from right to left, with the rightmost bit labeled as 1 and the leftmost bit as bit 16. Consequently, the accurate configuration should appear as follows:

Dirección	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1
Posición Bit	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

It is crucial to consider that multiple alarms can coexist within a single address or register, as long as each alarm occupies a distinct position within that address. In simpler terms, each alarm must be assigned a specific bit for its activation.

Within this particular alarm register, this condition is consistently met, as it accommodates various distinct alarms under a single umbrella. It becomes feasible to simultaneously monitor all these alarms, contingent upon the knowledge of the specific bit to be read for each one. We will proceed to present three examples to illustrate the seamless operation of select options within the alarm register and how to effectively retrieve pertinent information:

4.1. ENABLING / DISABLING EPO (EMERGENCY POWER OFF):

In this scenario, the objective is to confirm the status of the Emergency Power Off (EPO) function, whether it is currently active or not. To achieve this, we refer to the following alarm register point:

Bit (1~16)	Registro (dec)	HidPath	Descripción
2	5	UPS.Power Summary. Present Status. Emergency Stop	0: Sin emergencia off 1: Emergencia off

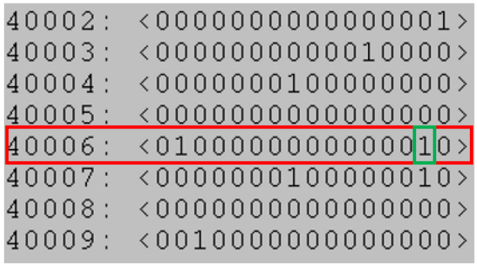
To pinpoint the specific alarm indicating the status of the Emergency Power Off (EPO), you should focus on Register 5 (which is Register 6 in the program) and examine the bit at position 2.

1. Select Register 6 in your program or control interface.
2. Check if bit number 2 within Register 6 is set to the "on" position.

If the bit is activated, it will confirm that the EPO alarm is currently active.

In this context, as evident from the highlighted green box in the previous image, it's clear that the EPO is currently not active, indicated by the "0" displayed.

However, if you were to activate the EPO (by triggering an "Emergency Off" action), the associated bit for the EPO alarm would shift from 0 to 1, as illustrated below. This change in the bit's state signifies the activation of the EPO alarm:



4.2. CONNECTED / DISCONNECTED BATTERIES.

In this particular scenario, the goal is to ascertain the status of battery connections, specifically whether the batteries are currently connected or disconnected. To do so, we will refer to the designated point within the alarm register:

Bit (1~16)	Register (dec)	HidPath	Description
1	1	UPS.Battery System. Battery. Present Status. Present	0: Battery not present 1: Batería present

To identify the alarm that indicates whether the batteries are connected or disconnected, you should inspect Register 2 (in the program) and specifically, Bit 1.

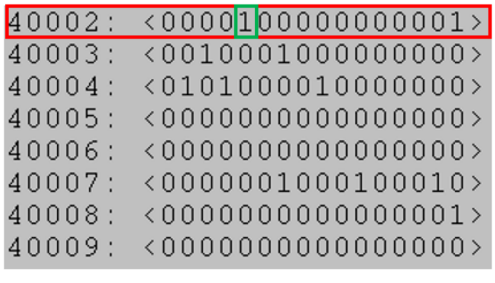
In the context of the image provided, if you observe a "1," it indicates that the batteries are indeed connected. Conversely, when a "0" is displayed, as shown in the subsequent image, it signifies the absence of connected batteries within the UPS.

4.3. END OF BACK UP TIME.

In this scenario, you can ascertain the occurrence of an end of backup time in the UPS by examining Register number 1 and specifically looking at Bit 12. This information is also accessible within the alarm register, as demonstrated below:

Bit (1~16)	Register (dec)	HidPath	Description
12	1	UPS.Battery System. Battery. Present Status. TerminateDischarge	0: Without end of autonomy 1: End of autonomy

Initially, there is enough back up time for the device, as depicted in the first image below. However, after some time, the battery capacity depletes, and this is indicated through the previously mentioned bit, as demonstrated in the second image provided subsequently.



5. ANNEX I. ASCII TABLE.

Dec	Hx	Oct	Char	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr
0	0	000	NUL (null)	32	20	040		Space	64	40	100	@	@	96	60	140	`	`
1	1	001	SOH (start of heading)	33	21	041	!	!	65	41	101	A	A	97	61	141	a	a
2	2	002	STX (start of text)	34	22	042	"	"	66	42	102	B	B	98	62	142	b	b
3	3	003	ETX (end of text)	35	23	043	#	#	67	43	103	C	C	99	63	143	c	c
4	4	004	EOT (end of transmission)	36	24	044	$	$	68	44	104	D	D	100	64	144	d	d
5	5	005	ENQ (enquiry)	37	25	045	%	%	69	45	105	E	E	101	65	145	e	e
6	6	006	ACK (acknowledge)	38	26	046	&	&	70	46	106	F	F	102	66	146	f	f
7	7	007	BEL (bell)	39	27	047	'	'	71	47	107	G	G	103	67	147	g	g
8	8	010	BS (backspace)	40	28	050	(	(	72	48	110	H	H	104	68	150	h	h
9	9	011	TAB (horizontal tab)	41	29	051	)	)	73	49	111	I	I	105	69	151	i	i
10	A	012	LF (NL line feed, new line)	42	2A	052	*	*	74	4A	112	J	J	106	6A	152	j	j
11	B	013	VT (vertical tab)	43	2B	053	+	+	75	4B	113	K	K	107	6B	153	k	k
12	C	014	FF (NP form feed, new page)	44	2C	054	,	,	76	4C	114	L	L	108	6C	154	l	l
13	D	015	CR (carriage return)	45	2D	055	-	-	77	4D	115	M	M	109	6D	155	m	m
14	E	016	SO (shift out)	46	2E	056	.	.	78	4E	116	N	N	110	6E	156	n	n
15	F	017	SI (shift in)	47	2F	057	/	/	79	4F	117	O	O	111	6F	157	o	o
16	10	020	DLE (data link escape)	48	30	060	0	0	80	50	120	P	P	112	70	160	p	p
17	11	021	DC1 (device control 1)	49	31	061	1	1	81	51	121	Q	Q	113	71	161	q	q
18	12	022	DC2 (device control 2)	50	32	062	2	2	82	52	122	R	R	114	72	162	r	r
19	13	023	DC3 (device control 3)	51	33	063	3	3	83	53	123	S	S	115	73	163	s	s
20	14	024	DC4 (device control 4)	52	34	064	4	4	84	54	124	T	T	116	74	164	t	t
21	15	025	NAK (negative acknowledge)	53	35	065	5	5	85	55	125	U	U	117	75	165	u	u
22	16	026	SYN (synchronous idle)	54	36	066	6	6	86	56	126	V	V	118	76	166	v	v
23	17	027	ETB (end of trans. block)	55	37	067	7	7	87	57	127	W	W	119	77	167	w	w
24	18	030	CAN (cancel)	56	38	070	8	8	88	58	130	X	X	120	78	170	x	x
25	19	031	EM (end of medium)	57	39	071	9	9	89	59	131	Y	Y	121	79	171	y	y
26	1A	032	SUB (substitute)	58	3A	072	:	:	90	5A	132	Z	Z	122	7A	172	z	z
27	1B	033	ESC (escape)	59	3B	073	;	;	91	5B	133	[	[	123	7B	173	{	{
28	1C	034	FS (file separator)	60	3C	074	<	<	92	5C	134	\	\	124	7C	174			|
29	1D	035	GS (group separator)	61	3D	075	=	=	93	5D	135	]	]	125	7D	175	}	}
30	1E	036	RS (record separator)	62	3E	076	>	>	94	5E	136	^	^	126	7E	176	~	~
31	1F	037	US (unit separator)	63	3F	077	?	?	95	5F	137	_	_	127	7F	177	&#127;	DEL

To convert from decimal to hexadecimal, you can use online calculators such as "Decimal to Hexadecimal Converter" available on websites like rapidtables.org.

IMPORTANT: Additionally, there is also a document that explains the functioning of binary/decimal/hexadecimal numbers, which will facilitate the implementation and reading of the information provided by the MODBUS protocol.

6. ANNEX II. MODBUS TABLE.

Description	Length (byte)	Regis-tration (dec)	Data type	Detailed description	RWRO	Un.	UPS 1~3K	UPS 4~10K
Alarm record 1	2	1	Alarm	See "Definition of alarm records".	RO	-	Y	Y
Alarm record 2	2	2	Alarm	See "Definition of alarm records".	RO	-	Y	Y
Alarm record 3	2	3	Alarm	See "Definition of alarm records".	RO	-	Y	Y
Alarm record 4	2	4	Alarm	See "Definition of alarm records".	RO	-	Y	Y
Alarm record 5	2	5	Alarm	See "Definition of alarm records".	RO	-	Y	Y
Alarm record 6	2	6	Alarm	See "Definition of alarm records".	RO	-	Y	Y
Alarm record 7	2	7	Alarm	See "Definition of alarm records".	RO	-	Y	Y
Battery test result	1	17	Measure	Value of the battery test result: 1: Performed and passed 2: Reserved 3: Completed and Error 4: Aborted 5: In progress 6: Test not started	RO	-	Y	Y
Charger mode	1	25	Measure	Battery state of charge: 1: charging 2: discharging 3: floating 4: at rest 5: charger off	RO	-	Y	Y
Active power setting	2	26	Measure	Nominal value of active power	RO	100W	Y	Y
Apparent power configuration	2	27	Measure	Apparent power rating	RO	100VA	Y	Y
Converter type	1	28	Measure	1: Off Line / Line interactive 2: On Line (single UPS) 3: On Line - Unitary/Parallel (in parallel with another UPS)	RO	-	Y	Y
Network frequency 1	2	29	Measure	Actual value of AC mains frequency	RO	dHz	Y	Y
Mains voltage 1 phase 1	2	30	Measure	Actual voltage value of phase 1 AC mains voltage	RO	dV	N	Y
Mains voltage 1 phase 2	2	31	Measure	Actual voltage value of phase 2 AC mains voltage	RO	dV	N	Y
Mains voltage 1 phase 3	2	32	Measure	Actual voltage value of phase 3 AC mains voltage	RO	dV	N	Y
Mains voltage 1	2	33	Measure	For single-phase UPS, actual AC mains voltage value. For three-phase UPS, average of the measurements of the 3 phases.	RO	dV	Y	Y
Network frequency 2	2	34	Measure	Actual value of AC Bypass frequency	RO	dHz	Y	Y
Mains voltage 2	2	38	Measure	Actual value of AC Bypass voltage	RO	dV	Y	Y
Active power output	2	39	Measure	Actual value of active power	RO	W	Y	Y
Apparent power output	2	40	Measure	Real value of apparent power	RO	VA	Y	Y
Output current	2	41	Measure	Real value of the output current	RO	dA	Y	Y
Output frequency	2	43	Measure	Real value of frequency	RO	dHz	Y	Y
Output voltage	2	59	Measure	Real output voltage	RO	dV	Y	Y
Input phase Output phase	1	60	Measure	1: 1 phase in / 1 phase out 2: 2 phase in / 2 phase out (or separate phases) 3: 3 phase in / 1 phase out 4: 3 phase in / 3 phase out	RO	-	Y	Y
Battery voltage configuration	2	61	Measure	Nominal battery voltage	RO	dV	Y	Y
Working mode	1	62	Measure	UPS operating mode If n=0, the UPS is in Power On mode. If n=1, the UPS is in Standby mode If n=2, the UPS is in Bypass mode If n=3, the UPS is in Line mode If n=4, the UPS is in Battery mode If n=5, the UPS is in Battery test mode If n=6, standby If n=7, the UPS is in Converter mode If n=8, the UPS is in ECO mode	RO	-	Y	Y
Percentage output load	1	63	Measure	Percentage output load	RO	%	S	S

Description	Length (byte)	Regis-tration (dec)	Data type	Detailed description	RWRO	Un.	UPS 1~3K	UPS 4~10K
Remaining capacity	1	64	Measure	Remaining battery level	RO	%	Y	Y
Working time until cut	4	66	Measure	Battery remaining time	RO	s	Y	Y
Ambient temperature	2	67	Measure	UPS internal temperature	RO	°K	Y	Y
Battery voltage	2	68	Measure	Battery branch voltage	RO	dV	Y	Y
Supported load segment	1	69	Measure	1: Load segment supported 0: Load segment not supported	RO	-	Y	Y
Number of battery branches	1	76	Measure	Number of external battery branches	RO	-	Y	Y
Output power factor	1	103	Measure	Power factor, -1.0~1.0	RO	%	Y	Y
Battery design capacity	4	110	Measure	UPS battery capacity. Normally this is the capacity of the internal battery. When the customer adds an external battery, - Internal battery capacity + external battery	RO	As	Y	Y
ABM enabled charger	1	112	Measure	0 : ABM disabled 1 : ABM enabled	RO	-	Y	Y
Battery start-up	1	115	Measure	0 : ABM disabled 1 : ABM enabled	RO	-	Y	Y
High output voltage transfer threshold	2	116	Measure	High threshold on mains AC voltage for switching to battery.	RO	V	Y	Y
Output undervoltage transfer threshold	2	117	Measure	Low threshold on mains AC voltage for switching to battery.	RO	V	Y	Y
Overload alarm threshold	1	118	Measure	Percentage output load threshold, line to UPS design and cannot be configured by users.	RO	%	Y	Y
Counting of load segments	1	119	Measure	Load segment count. 0: load segment not supported 1: supported schedulable load segment 1 2: programmable load segment 2 supported	RO	-	Y	Y
UPS protocol version	2	508	UPS_ Information	Modbus protocol version	RO	-	Y	Y
UPS model name	31	509	UPS_ Information	Model name	RO	-	Y	Y
UPS Part No.	21	531	UPS_ Information	Part number	RO	-	Y	Y
UPS Product name	20	542	UPS_ Information	Product name	RO	-	Y	Y
UPS serial number	16	555	UPS_ Information	Serial number	RO	-	Y	Y
FW version of the UPS	11	565	UPS_ Information	Firmware version	RO	-	Y	Y
UPS battery type	1	571	UPS_ Information	0: Acid battery 1: Li-Ion battery	RO	-	Y	Y
General battery test command	1	700	Command	General battery test command 0: Reserved 1: Quick test 2: Reserved 3: Test aborted	RW	-	Y	Y
Battery test with life	2	701	Command	Advanced battery test for specific battery life	RW	s	Y	Y
Battery test with level	1	702	Command	Advanced battery test up to a specific level	RW	%	Y	Y
Frequency setting	2	703	Parameter	Nominal value of the output frequency	RW	dHz	Y	Y
Voltage setting	2	704	Parameter	Rated output voltage	RW	dV	Y	Y
Delay of output 1 before shutdown	4	705	Command	1-n: delayed action 0: immediate action -1: Cancel / No action	RW	s	Y	Y
Delay of departure 1 before start-up	4	707	Command	1-n: delayed action 0: immediate action -1: Cancel / No action	RW	s	Y	Y
Delay of output 2 before shutdown	4	709	Command	1-n: delayed action 0: immediate action -1: Cancel / No action	RW	s	Y	Y

Description	Length (byte)	Regis-tration (dec)	Data type	Detailed description	RWRO	Un.	UPS 1~3K	UPS 4~10K
Delayed start 2 before start-up	4	711	Command	1-n: delayed action 0: immediate action -1: Cancel / No action	RW	s	Y	Y
Converter mode	1	713	Parameter	0: Automatic range 1:Frequency Converter	RW	-	Y	Y
Auto restart	1	714	Parameter	0: Auto restart disabled 1: Auto restart enabled	RW	-	Y	Y
Control Standby	1	715	Parameter	1 : Bypass standby enabled 0 : Bypass standby disabled	RW	-	Y	Y
High Efficiency enabled	2	718	Parameter	ECO mode: 0: Disabled 1: High Efficiency Mode enabled	RW	-	Y	Y
Buzzer setting	1	727	Parameter	1: Disabled 2: Enabled	RW	-	Y	Y
Delay before shutdown	4	728	Command	Delay before start cut-off 1 to n: Delayed action 0 : Immediate action -1: Cancel / No action	RW	s	Y	Y
Delay before start-up	4	730	Command	Delay before restart of the output 1 to n: Delayed action 0 : Immediate action -1: Cancel / No action	RW	s	Y	Y
IoT connection status	2	1006	Information IoT	IOT connection status Low byte: 0: IoT embedded not connected. 1: IoT embedded connected.	RO	-	Y	Y

7. ANNEX III. DEFINITION OF ALARM REGISTERS.

Bit (1~16)	Registration (dec)	HidPath	Description	UPS 1~3K	UPS 6~10K
1	1	SAI.BatterySystem.Battery.PresentStatus.Present	0: Battery not present 1: Battery present	Y	Y
4	1	SAI.BatterySystem.Charger.PresentStatus.InternalFailure	0: Charger OK 1: Charger failure	Y	Y
12	1	SAI.BatterySystem.Battery.PresentStatus.TerminateDischarge	0: No end of backup time 1: End of backup time	Y	Y
6	2	SAI.PowerConverter.Input[1].PresentStatus.WiringFault	0: Input wiring OK 1: Input wiring defective	Y	Y
10	2	SAI.PowerConverter.Input[1].PresentStatus. FrequencyOutOfRange	0: AC frequency in range 1: AC frequency out of range	Y	Y
14	2	SAI.PowerConverter.Input[1].PresentStatus.VoltageOutOfRange	0: AC voltage in range 1: AC voltage out of range	Y	Y
8	3	SAI.PowerConverter.Input[2].PresentStatus. FrequencyOutOfRange	0: Bypass frequency within range 1: Bypass frequency out of range	Y	Y
10	3	SAI.PowerConverter.Input[2].PresentStatus.InternalFailure	0: Bypass device OK 1: Bypass device failure	Y	Y
11	3	SAI.PowerConverter.Input[2].PresentStatus.Overload	0: No bypass overload 1: Bypass overload fault	Y	Y
1	4	SAI.PowerConverter.Output.Overload[1].PresentStatus. OverThreshold	0: No power overload pre-alarm 1: Power overload prealarm	Y	Y
2	4	SAI.PowerConverter.Output.Overload[2].PresentStatus. OverThreshold	0: No output short-circuit 1: Output short-circuit	Y	Y
11	4	SAI.PowerConverter.Output.PresentStatus.ShortCircuit	0: No output short-circuit 1: Output short-circuit	Y	Y
1	5	SAI.PowerSummary.PresentStatus. BelowRemainingCapacityLimit	0: Low battery clear 1: Battery low	Y	Y
2	5	SAI.PowerSummary.PresentStatus.EmergencyStop	0: No emergency shutdown 1: Emergency shutdown	Y	Y
3	5	SAI.PowerSummary.PresentStatus.FanFailure	0: Fan OK 1: Fan failure	Y	Y
4	5	SAI.PowerSummary.PresentStatus.Good	0: The load is not powered. 1: The load is powered.	Y	Y
5	5	SAI.PowerSummary.PresentStatus.InternalFailure	0: No fault 1: Failure occurs	Y	Y
6	5	SAI.PowerSummary.PresentStatus.Overload	Overload alarm and fault summary: 0: No output overload 1: Alarm or overload fault	Y	Y
7	5	SAI.PowerSummary.PresentStatus.OverTemperature	0: UPS temperature OK 1: UPS temperature high	Y	Y
9	5	SAI.PowerSummary.PresentStatus.NeedReplacement	0: Battery OK 1: Battery defective	Y	Y
13	5	SAI.OutletSystem.Outlet[2].PresentStatus.SwitchOnOff	0: Group 1 off 1: Group 1 on	Y	Y
15	5	SAI.PowerSummary.PresentStatus.ACPresent	0: Normal AC loss 1: Normal AC present	Y	Y
16	5	SAI.PowerConverter.Inverter.PresentStatus.CurrentLimitation	0: No current limit 1: Current limit alarm	Y	Y
3	6	SAI.BatterySystem.Charger.PresentStatus.VoltageTooHigh	0: Charger voltage OK 1: Charger voltage high	Y	Y
4	6	SAI.BatterySystem.Charger.PresentStatus.VoltageTooLow	0: Charger voltage OK 1: Charger voltage low	Y	Y
5	6	SAI.PowerConverter.Chopper.PresentStatus.InternalFailure	0: DC/DC OK 1: DC/DC fault	Y	Y
10	6	SAI.PowerConverter.Input[5].PresentStatus. FrequencyOutOfRange	0: High efficiency frequency OK 1: High efficiency frequency loss	Y	Y
1	7	SAI.PowerConverter.Input[5].PresentStatus.VoltageOutOfRange	0: High efficiency voltage OK 1: High efficiency voltage loss	Y	Y

Bit (1~16)	Registration (dec)	HidPath	Description	UPS 1~3K	UPS 6~10K
4	7	SAI.PowerConverter.Inverter.PresentStatus.InternalFailure	0: Inverter OK 1: Inverter failure	Y	Y
7	7	SAI.PowerConverter.Inverter.PresentStatus.VoltageTooHigh	0: Inverter voltage OK 1: Minimum inverter voltage	Y	Y
8	7	SAI.PowerConverter.Inverter.PresentStatus.VoltageTooLow	0: Inverter voltage OK 1: Minimum inverter voltage	Y	Y
9	7	SAI.PowerConverter.Rectifier.PresentStatus.DCBusUnbalanced	0: DC bus OK 1: DC bus unbalanced	Y	Y
12	7	SAI.PowerConverter.Rectifier.PresentStatus.InternalFailure	0: Rectifier OK 1: Rectifier failure	Y	Y
14	8	SAI.BatterySystem.Battery.PresentStatus.BatteryTestOK	0: The battery test result is in progress, unknown or the battery test is not successful. 1: Battery test is successful	Y	Y
15	8	SAI.BatterySystem.Battery.PresentStatus.BatteryTestFAIL	0: Battery test result is in progress, unknown or battery test does not fail 1: Battery test fails	Y	Y
16	8	SAI.BatterySystem.Battery.PresentStatus.BatteryTestAborted	0: The battery test result is in progress, unknown or the battery test has not been aborted. 1: Battery test has been aborted.	Y	Y

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