

# Modbus RTU & TCP on the securityProbe



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#### Section #1 - Introduction to Modbus

MODBUS RTU is a non-proprietary serial communications protocol that is widely used in the process control industry actuation. The hardware over which MODBUS RTU communications are performed is not defined by the protocol.

MODBUS RTU is supported on RS232, RS422, RS485, Ethernet and other electrical standards. The securityProbe supports, RS485 and Ethernet. The Modbus/RTU protocol defines how a "master" device polls one or more "slave" devices to read and write data in real time over the RS485 serial data communication connection.

Modbus/TCP, an extension of Modbus/RTU, defines how Modbus/RTU and Modbus/ASCII messages are encoded within and transported over TCP/IP-based networks. Modbus/TCP is just as simple to implement and flexible to apply as the original Modbus/RTU. The securityProbe can represent both "master" and "slave" devices and supports both Modbus RTU and Modbus TCP protocols.

#### **Transactions on Modbus Networks**

Controllers communicate using a master–slave technique, in which only one device (the master) can initiate transactions (called 'queries'). The other devices (the slaves) respond by supplying the requested data to the master, or by taking the action requested in the query. Typical master devices include host processors and programming panels. Typical slaves include programmable controllers.

The master can address individual slaves, or can initiate a broadcast message to all slaves. Slaves return a message (called a 'response') to queries that are addressed to them individually. Responses are not returned to broadcast queries from the master.

The Modbus protocol establishes the format for the master's query by placing into it the device (or broadcast) address, a function code defining the requested action, any data to be sent, and an error–checking field.

The slave's response message is also constructed using Modbus protocol. It contains fields confirming the action taken, any data to be returned, and an error–checking field. If an error occurred in receipt of the message, or if the slave is unable to perform the requested action, the slave will construct an error message and send it as its response.

Important Note:



#### Section #2 - AKCP and Modbus Integration diagram



## Section # 3 - Setting up MODBUS on the securityProbe

АКС	P	A	KCP secu	rityProbe			Admin
Location: Systen	n Location				Cur	rent System Time: 20	/8/08 18:46:2
Summary	Мар	Picture Log / Sound Log	Sensors	Notification	Settings	Applications	Help
				Modbus			
Setu	p		Modbu	sTCP 🔘 On 🔍 O	)ff		
± <u>General</u>			Modbu	sRTU 🔘 On 🔍 O	M		
± <u>Camera</u>				Save Res	et		
Connectivity		-			_		
Ethernet Ne	etwork						
Wifi Netwo	<u>rk</u>						
Modbus							
<u>SNMP</u>							
<u>Bluetooth</u>							
<u>Dial-In Mod</u>	<u>em</u>						
Dial-Out Mo	<u>odem</u>						
Serial to Ne	etwork Proxy						
E Feature							
🗄 System Admi	inistrator						

1. From the "Settings" tab in the securityProbes web interface, expand "Connectivity, then click on "Modbus" in the left hand column. Set the Modbus TCP and Modbus RTU to off for the Master device (this is the Reading unit). See screen shot above.



2. Now set the Modbus TCP or Modbus RTU (this depends on your connection type) setting to "on" for your Client device

АКСР	2	A	KCP secu	ityProb	e		Admin
Location: System Loc	cation				с	urrent System Time: 20	)/8/08 18:48:36
Summary	Мар	Picture Log / Sound Log	Sensors	Notificati	on Settings	Applications	Help
				Mod	bus		
Setup			Modbus	TCP 💿 On	n 🔘 Off		
🗉 General			Modbus TCP	Port 502			
± Camera			Modbus TCP Tin	neout 10			
Connectivity							
Ethernet Netwo	<u>rk</u>		Modbus	RTU 🔘 Or	n 🖲 Off		
Wifi Network				Save	Reset		
Modbus			М	odbus Senso	rs Addressing		
<u>SNMP</u>			Select Online Ser	isors Tem	perature Port 3	•	
<u>Bluetooth</u>		Modbus IN	PUT Register Add	Iress 258	( 0x0102 )		
<u>Dial-In Modem</u>		t					
Dial-Out Modern	1						
Serial to Netwo	rk Proxy						
⊞ Feature							
🗄 System Administr	ator						

2.1 For setting up the Modbus TCP, first set the TCP port and TCP timeout (default TCP port is 502 and TCP timeout is 10 seconds). See screen shot above.

Location: System Location   Current System Time: 20/8/08 1     Summary   Map   Picture Log / Sound Log   Sensors   Notification   Settings   Applications   H     Setup   Modbus   Modbus TCP   On   Off   General   Modbus RTU   On   Off     General   Modbus RTU   On   Off   General   Modbus RTU   On   Off     Camera   Modbus RTU   On   Off   General   Modbus RTU   On   Off     Camera   Modbus RTU   On   Off   General   Modbus RTU   On   Off     Camera   Modbus RTU   On   Off   General   Modbus RTU   On   Off     Camera   Modbus RTU   Serial Port RS485 •   I   Intervent RS485 •   Intervent RS485 •	АКС	Ρ	A	KCP security	Probe			Admin
Modbus     Setup   Modbus TCP   On   Off     General   Modbus RTU   On   Off     Camera   Modbus Address   1     Connectivity   Serial Port   RS485 •     Ethernet Network   Serial Port Speed   9600 •     Wffi Network   Serial Port Speed   9600 •     Modbus   Serial Port Stop Bits   1 •     SNMP   Serial Port Stop Bits   1 •     Bluetooth   Modbus Sensors Addressing   0     Dial-In Modem   Select Online Sensors   Temperature Port 3 •	Location: System I	Location				Cu	rrent System Time: 20	8/08 18:49:16
Setup   Modbus TCP   On   Off     General   Modbus RTU   On   Off     Camera   Modbus Address   1     Connectivity   Serial Port   RS485 •     Ethernet Network   Serial Port Speed   9600 •     Wifi Network   Serial Port Parity   None •     Modbus   Serial Port Stop Bits   1 •     SNMP   Save   Reset     Bluetooth   Modbus Sensors Addressing     Dial-In Modem   Select Online Sensors	Summary	Map	Picture Log / Sound Log	Sensors	Notification	Settings	Applications	Help
General   Modbus RTU   On   Off     Camera   Modbus Address   1     Connectivity   Serial Port   RS485 •     Ethernet Network   Serial Port Speed   9600 •     Wiffi Network   Serial Port Speed   9600 •     Modbus   Serial Port Speed   9600 •     Modbus   Serial Port Speed   9600 •     Modbus   Serial Port Stop Bits   1 •     SNMP   Save   Reset     Bluetooth   Modbus Sensors Addressing     Dial-In Modem   Select Online Sensors     Dial-Out Modem   Select Online Sensors					Modbus			
Genera   Modbus Address   1     Connectivity   Serial Port   RS485 •     Ethernet Network   Serial Port Speed   9600 •     Wifi Network   Serial Port Parity   None •     Modbus   Serial Port Stop Bits   1 •     SNMP   Save   Reset     Bluetooth   Modbus Sensors Addressing     Dial-In Modem   Select Online Sensors	Setup			Modbus TC	P 🔘 On 🧕	Off		
Statistic   Serial Port   RS485 •     Ethernet Network   Serial Port Speed   9600 •     Wifi Network   Serial Port Parity   None •     Modbus   Serial Port Stop Bits   1 •     SNMP   Save   Reset     Bluetooth   Modbus Sensors Addressing     Dial-In Modem   Select Online Sensors     Temperature Port 3   •	⊞ <u>General</u>			Modbus RT	U 🖲 On 🔘	Off		
Ethernet Network Serial Port Speed 9600 •   Wffi Network Serial Port Parity None •   Modbus Serial Port Stop Bits 1 •   SNMP Save Reset   Bluetooth Modbus Sensors Addressing   Dial-In Modem Select Online Sensors   Dial-Out Modem Select Online Sensors	∃ <u>Camera</u>			Modbus Addres	s 1	1		
Wifi Network Serial Port Parity   Modbus Serial Port Stop Bits   SNMP Save   Bluetooth Modbus Sensors Addressing   Dial-In Modem Select Online Sensors   Dial-Out Modem Select Online Sensors	🗆 Connectivity			Serial Po	rt RS485	-		
Modbus Serial Port Stop Bits 1 •   SNMP Save Reset   Bluetooth Modbus Sensors Addressing   Dial-In Modem Select Online Sensors   Temperature Port 3 •	Ethernet Netw	<u>work</u>		Serial Port Spee	d 9600 🔻	•		
SNMP Save Reset   Bluetooth Modbus Sensors Addressing   Dial-In Modem Select Online Sensors   Dial-Out Modem Select Online Sensors	Wifi Network			Serial Port Pari	y None 🔻			
Bluetooth Modbus Sensors Addressing   Dial-In Modem Select Online Sensors   Dial-Out Modem Select Online Sensors	Modbus			Serial Port Stop Bi	s 1 🔻			
Dial-In Modem     Select Online Sensors     Temperature Port 3       Dial-Out Modem     Temperature Port 3     Temperature Port 3	<u>SNMP</u>			[	Save Re	eset		
Dial-In Modem Select Online Sensors Temperature Port 3	Bluetooth			Modb	us Sensors Ad	ddressing		
Dial-Out Modem Modbus INPUT Register Address 258 (0x0102)					procession	a see the	•	
Serial to Network Proxy			Modbus INI	PUT Register Addres	s 258 ( 0x	0102)		
⊞ Feature	⊞ Feature							

🗄 System Administrator

2.2 For setting up the Modbus RTU

- First set the Modbus Address,
- Serial Port, Serial Port Speed,
- Serial Port Parity
- Serial Port Stop bits

(The default Modbus Address is 1, Serial Port is RS485, Serial Port Speed is 9660, Serial Port Parity is none and Serial Port Stop bit is 1)



3. The Modbus Sensors Addressing is now showing the Modbus INPUT Register Address of each sensor that is online on client device. Example; The Modbus INPUT Register Address of the Temperature on port 3 is 258 (0x0102)

Мар	Pictur	e Log /	Sound L	og	s	ensors			Notific	ation		Set	tings		Арр	lication	s		Help	
								Vi	rtual S	Setting	5									
/irtual Sensors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	1	1	ĩ	Ĩ	Ĩ	ĩ	1	t	ĩ	ĩ	ĩ	1	ĩ	I	Ĩ	ĩ	ĩ	t	î	1
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
	Ĩ	1	ĩ	ĩ	ĩ	1	Ĩ	Ĩ	Î	1	Ĩ	1	ĩ	1	Ĩ	1	Ĩ	ĩ	1	1
	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	6
	1	ĩ	ĩ	P	1	1	1	ĩ	Î	1	ĩ	P	1	1	1	ĩ	î	1	î	1
	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	8
	1	1	1	Ĩ	P	1	Ĩ	Ĩ	Ĩ	1	1	1	ĩ	1	1	1	Ĩ	Ĩ	1	1
								s	ource	MODE	US	•								
																	ancel	Next		
																		·	_	
																	ancer	Nex		

4. From the "Sensors" tab (on Master device) select virtual sensors, then set the "Source" to Modbus and then click "Next". See screen shot above

Sensor Name	Virtual Sensor Port 1		
Modbus Protocol	Modbus TCP 🔻	_	
Modbus IP Address			
Modbus TCP Port			
Modbus Command	(0x01) Read Coil Status	-	
Modbus Register Address		0xNAN	
Sensor Style	Analog 🔻		
Value Factor	x1 🔻		
Unit Text	Unit	6	
Value Range for Slider Bar	0 To 100	T.	
			Cancel Back Next

#### 4.1 For the Modbus TCP

- Set the "Modbus Protocol" to Modbus TCP
- Enter the Client device IP address in "Modbus IP Address"
- Enter the TCP port in "Modbus TCP Port"
- Set the "Modbus command: to get the sensor value or get the sensor status, (0x03 Read Holding Register for getting the sensor status and 0x04 Read Input Register for getting the sensor value).
- Now set the Modbus INPUT Register Address value to Modbus Register Address (see #3 above for the Modbus INPUT Register Address Value) Example; Set 258 for the read value of the Temperature on port 3 is 258). See screen shot above



Sensor Name	Virtual Sensor Port 1		
Modbus Protocol Serial Port Serial Port Speed Serial Port Parity Serial Port Stop Bits Modbus Slave ID	Modbus RTU • RS485 • 9600 • None • 1 •	ŗ	
Modbus Command	(0x01) Read Coil Status	*	
Modbus Register Address Sensor Style	Analog 👻	0xNAN	
Value Factor Unit Text	x1 - Unit	6	
Value Range for Slider Bar	0 To 100		
			Cancel Back Next

#### 4.2 For Modbus RTU

- Set "Modbus Protocol" to Modbus RTU
- Set "Serial Port" to RS485 or other (this setting depends on the connection you are using)
- Set "Serial Port Speed" (this setting should be the same as shown in number 2.2 above)
- Set "Serial Port Parity" (this setting should be the same as shown in number 2.2 above)
- Set "Serial Port Stop Bits" (this setting should be the same as shown in number 2.2 above)
- Input the same "Modbus Address" value from step number 2.2 into "Modbus Slave ID"
- Select the Modbus command for getting the sensor value or the sensor status (0x03 Read Holding Register for getting the sensor status and 0x04 Read Input Register for getting the sensor value).
- Input the Modbus INPUT Register Address value into "Modbus Register Address". An example of the Modbus INPUT Register Address Value can be found in step number 3 (Example input of 258 for the read value of the Temperature on port 3 is 258)

4.3 Sensor Style. Set the Sensor Style to Analog

4.3.1 Analog Style "Value Factor", Set "Value Factor" for multiple with normal value (Example; if raw value is 1234 and needs to show a value to 12.34, then this should be set to x0.01. Default is x1). Input the Unit of sensor value into the "Unit Text" field, or click show to input a special character



Sensor Name	Virtual Sensor Port 1		
Modbus Protocol Serial Port Serial Port Speed Serial Port Parity Serial Port Stop Bits Modbus Slave ID	Modbus RTU • RS485 • 9600 • None • 1 •	ŗ	
Modbus Command	(0x01) Read Coil Status	•	
Modbus Register Address		0xNAN	
Sensor Style Value Factor	Analog - x1 -		
Unit Text	Unit	6	
Value Range for Slider Bar	0 To 100	[]	
			Cancel Back Next

Low Critical		40	60	80	High Critical	
		Low Warning	High Wa	rning		
Low Critica	•	Low Warning	High Warning	High	Critical	
20	ľ.	40	60	80		

Input the Minimum and Maximum of the sensor values into the "Value Range for Slider Bar" field then click "Next"

Set the Low Critical, Low Warning, High Warning and High Critical thresholds as shown in the screen shot above, then click "Next" again

Sensor Name	Virtual Sensor Port 1		
Modbus Protocol	Modbus RTU 👻		
Serial Port	RS485 -		
Serial Port Speed	9600 -		
Serial Port Parity	None 🔻		
Serial Port Stop Bits	1 🔻		
Modbus Slave ID		1	
Modbus Command	(0x01) Read Coil Status	•	
Modbus Register Address		0xNAN	
Sensor Style	Switch 👻		
Normal State Value	0		
Description of Status When Normal	Normal	j.	
Description of Status When Critical	Critical	1	



4.3.2 Switch Style

- Set the "Sensor Style" to Switch
- Input the Normal value of the sensor into "Normal State Value".
- Input the Description of Normal and Critical status into "Description of Status When Normal" and "Description of Status When Critical"

(See screen shot on previous page)

Polling Interval	15	15 secs	
Execute Time Out	10	10 secs	
Retry	3	Times	
			Cancel Back Finish

5. Set Time to Polling

- Input the time to polling into "Polling Interval" (Default is 15 secs)
- Input "Execute Time Out" (Default is 10 secs) and "Retry" (Default is 3 times)
- Click the "Finish" button

#### Section # 4 – Return value from Holding Register

The following is a list of what each of the return values from the Holding Register represent

No Status (Sensor has not been initialized)
Normal
High Warning
High Critical
Low Warning
Log Critical
Sensor Error
Switch Low (Output)
Switch High (Output)

For the INPUT Register

If the sensor is OFFLINE, the INPUT register will return 32767 If the sensor is No Status or Sensor Error, the INPUT register is -32768

## Section #5 - Troubleshooting & Example of configuration of a 3<sup>rd</sup> party power meter

#### Some troubleshooting steps to try when having problems with Modbus RTU:-

1. Make sure that the securityProbe is not configured as a Modbus <u>slave</u> device in the Modbus settings in the units web UI if you are monitoring FROM the securityProbe with the Modbus equipment connected to the RS485 port, or you will not see any readings. The Modbus setting must be set to Master in order to receive the Modbus data from the equipment connected to the RS485 port.



2. Verify the cabling and wire polarity to the Modbus slave device are correct as the manual explains above.

3. Verify the Modbus slave device is powered.

4. Verify that the Modbus address is correct and register parameters are correct in the Modbus virtual sensor settings.

For example : often the address is actually the register – 1 or the data ordering is often "Low byte first, High word first."

#### How to configure a 3<sup>rd</sup> party power meter on the securityProbe

In this example the customer is trying to connect a Schneider PM5110 power meter.

After our engineer changed the settings he was able to receive values for the register "Nominal voltage" (address = 2020, value = 230 volts). See the screenshot below in the securityProbe's Modbus virtual sensor settings.

House HH2 EMS																		Cur		m Time: 19/0
Summary	Мар				Senso	rs		Ĺ		Notification		Í			Settings	<u> </u>	Help			
										Virtua	l Sensors									
Sensors Menu	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
5		t			1	1	1	1	1	t	1	1	1	1	2	t	1	1	1	1
12	•							a												
Help	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
he Remote Sensor ports. The Remote Sensors	1	1	1	1	1	1	1	1	1	1	1	1	P	1	1	1	1	1	1	1
that can run SNMP get commands, Ping IP te MODBUS equipment, and receive SNMP p Receiver.	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Preceiver.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
	I.	I.	I	I	1	- A	I	I	I	I.	I.	A.	I.	I	X	I.	I.	N.	1	1
									, ,	/irtual Se	nsors Port	t 80								
									Sensor	Jame Vir	ual Sensors	Port 80								
								Se N Value Fa Modbus	Serial Port 5 Serial Port 1 rial Port Stop Modbus Com Data Ord Data Octor in Com Register Ad Sensor Value F	I Port RS ipped 19 Parity Ev D Bits 1 1 us ID 2 mand (0) rering Lo Typo 32 mand 1 dress 201 Style An actor 1 t Text Unit	03) Read Ho w Byte First, bits IEEE flow 7 alog ¥	olding Regis	First *							
																	Cancel	Back	Next	
																_				

These settings were changed to the following: Even parity Register address = address - 1 Low byte first, High word first The last one is float The first one is unsigned integer

Then he went ahead and checked the voltage settings & readings as follows: Voltage A-N, Register 3028 Voltage = 242.0 V

As shown in the screenshots below.



#### Modbus RTU/TCP Manual Firmware version 405s

ation: Holland House HH2 EMS																		Cur		m Time: 19/06/2019
Summary	Мар				Senso	irs -		Ĺ		Notification		<u>í</u>		5	ettings		Í			ielp
										Virtua	l Sensors									
Sensors Menu	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
sor Ports																				
ansion Boards	I.	I	I	I	1	1	I	I	1	I.	I.	1	I	I	1	I.	I	I.	I.	I
ual Sensors	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Help																				
page shows the Remote Sensor ports. The Remote Sensors	I	I	I	I	1	1	I	I	I	I	I	I	P	1	I	I	I	I	I	I
virtual sensors that can run SNMP get commands, Ping IP resses, integrate MODBUS equipment, and receive SNMP	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
as with the Trap Receiver.																				
	I	I	I	I	1	1	x	I	I	T.	1	x	I	I	X.	T.	X.	X	1	I
	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	I
								Se N Value Fa	Modbus Pro Serial Port S Serial Port Sto Modb Iodbus Com Data Ord Data Iodous Com Register Add Sensor Value F	Port RS peed 192 Parity Even Bits 1 • us ID 2 mand (0x ering Low Type 32t mand 1 dress 302 Style An	03) Read Ho w Byte First, bits IEEE floc 7 alog v	lding Regist	First *							
	Unit Test Volue Range for Stofer Dar 0 100											Next								

ocation: Holland House HH2 EMS	Map	N							-			cu		m Time: 19/06/2019						
Summary Sensors Menu Sensor Ports	Мар	Sensors				Notification Virtual Sensors					Settings				H			lelp		
										Virtua	I Sensors					-	_			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ansion Boards	1	1	1	1	1	1	1	T	1	1	1	1	1	1	8	1	1	1	1	1
ual Sensors					•				•					•			•		•	-
Help	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
The same frame is the Reverse Sector cores. The Reverse Sector is not all lensers the source of Reverse Sector accesses, integras IMCOUD exponent, and reverse SMMT Tage with the Tage Reverse.	ĩ	ĩ	1	1	1	I	1	I	Î	ĩ	I	1	T	1	T	T	1	1	1	1
	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
	1	I	1	1	1	1	1	1	1	1	I	1	1	1	1	1	1	1	1	1
	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	$\overline{n}$	78	79	80
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	9
	-		-							-					-		-			
	Virtual Sensors Port 80																			
	Normal Settings Advanced Settings Continuous Time Settings Minimum Time												Time Setting	gs						
	Sensor Name Virtual Sensors Fort 80																			
	Source MODBUS Change Configurations																			
	Current Reading 242.0 Volts																			
	Status High Critical																			
	Sensor Currently 📃 Online																			
	242 Volts																			
	242 yours																			
	Low Critical 60 120 160 240 High Critical Low Warming High Warming																			
						Lo	w Critical		ow Warning		High Warr		High	Critical						
						60	10		120		180	-	240							
						1cm			1.44				le ce							
										Save	Reset									



The customer then inquired if the engineer was getting these registers from the Schneider documentation. Our engineer confirmed he was getting these from the

PM5100\_PM5300\_ModbusRegisterList.xls document. This document was obtained from the meter manufacturer by the customer and previously sent to us.

The customer then asked where it was dictated about the data type needing to change. Which our engineer replied, the voltage is 3028, but they had used 3027 and got a value, however if in the excel doc the Data Type was declared as "FLOAT32" then this data type needed to be set to "32 bits IEEE floating point"

If in the excel doc the Data Type was declared as "INT16U" then this data type would need to be set to "..."

Moreover, the address should be decreased by 1 and the data ordering always should be "Low byte first, High word first".

So, there were 2 issues: with address and the byte ordering. The address (no matter what it is) needs to be decreased by 1. And to add you need wait a little bit before the readings will be displayed from the meter in the securityProbe's web UI.

The customer then enquired about the "Active Power" reading. They tested with active power 3054 and entered in 3053 and got 0

This would be expected as the power meter is not monitoring anything, just plugged in to mains/wall power socket. Because if there is no current the active power is going to be 0.

In this environment only the voltage and product are the only readings that can really be tested, however it does prove that the meter is communicating with the securityProbe.

For the frequency the register 3110 (need to enter 3109) which was now reading 50, or 50.1hz.

Regarding the question about the address (no matter what it is) needs to be decreased by 1. For this PMS, yes the addressing of the registers in the manuals can vary from manufacturer to manufacturer. There is no specific reason for this it just depends on the manufacturer's implementation of the Modbus protocol and how they enter the information into their manuals.

Modbus operates with the term "register", which starts from 1, but most all manufacturers use "address" which starts from 0.

Please contact <u>support@akcp.com</u> if you have any further technical questions or problems.

### **Thanks for Choosing AKCP!**