SIR-A

Feeder Protection and Recloser Control



MODBUS PROTOCOL MANUAL

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1. MODBUS PROTOCOL

Communication parameters are:

Modbus RTU:
- Slave Address: 2 (by default)

Rear Serial COM:
- Baudrate: 19200 (by default)
- Serial Settings: 8-N-1 (by default)

Modbus TCP/IP:
- Slave Address: 2 (by default)
- Port: 502 (by default)

Rear TCP COM:
- IP: 192.168.200.100 (by default)
- Subnet: 255.255.255.0 (by default)
- Gateway: 192.168.200.1 (by default)
- Retries Number: 10
- Confirmation time: 2000 ms

This document describes the steps to follow to read and write data on the SIR-A relay, as per the Modbus protocol. This memory map is only valid for one piece of equipment and one version of the memory. The positions of existing objects in the memory remain fixed from one version to the next, but new objects will naturally have new addresses which will, in turn, remain fixed in future versions. The memory map is described further on.

The standard Modbus protocol is used, so any program or PC can communicate easily with the equipment.

The SIR-A always acts as a slave, which means that it never initiates communications. The master is always responsible for initiating communications.

Only a subset of the Modbus functions is implemented:

- Reading function 3.
- Writing function 16.

The MODBUS/RTU protocol is independent from the hardware. Therefore, the physical layer can exist in different hardware configurations: RS232, RS485, fibre optic or Ethernet.

Specifically, the relay has a front RS232 port and, as an option, a rear RS485 port. The data stream in any of the configurations is “half-duplex”.er

Each byte of data is transmitted asynchronously and is made up of: 1 start bit, 8 data bits, 1 stop bit and 1 parity bit, if this is how it is programmed. Therefore, the data has 10 or 11 bits, depending on whether it includes parity.

If the relay only offers with Modbus on the front port, the address (1 to 247) is configurable but the rest of the paarmeters are fixed and equal to: baudrate 19200, No parity and stop bit 1.

If the relay offers RS485 Modbus protocol, the address (1 to 247), baudrate (4800, 9600, 19200, 38400, 57600 or 115200) and the serial setting (8-N-1, 8-E-1, 8-O-1, 9-N-1, 8-N-2, 8-E-2, 8-O-2 or 9-N-2) can be changed by the user.

The master must know the address of the slave that it is going to communicate with. No unit will act on requests from the master if the message is not addressed to them. The exception is when the 0 address, or “broadcast” address, is used, in which case the relay will act but will not send an answer of any type.

Communications are made in packages or frames, which are groups of data that are sent asynchronously. The master transmits a frame to the slave, and the slave then replies with another frame (except in the case of “broadcast” messages).

The end of the frame is marked by a dead time or silence time in the communication medium. The length of this time of silence varies depending on the transmission speed, as it is equivalent to 3 characters.

The following table shows the generic package format that is valid for transmission and reception. However, each function has its own peculiarities, as will be described further on.

1.1. Modbus RTU pachage format

CUSTOMER ADDRESS	1 byte	Each device on a communication bus must have a unique address, otherwise two different units could reply simultaneously to the same request. All ports of the relay will use this address which can be set a value between 1 and 247. When the master transmits a frame with the slave address to 0 indicates a Broadcast. All the slaves in the communications bus will carry out the requested action, but no one will reply to the master. The Broadcast will only be accepted to write, as it makes no sense to make a read request in the Broadcast, as no one will reply this request.
FUNCTION CODE	1 byte	This is one of the function codes supported by the equipment. In this case, the only function codes supported are 3 to read and 16 to write. When the slave has to reply with an exception one of these frames, it is indicated by putting 1 in the most important bit of the correspondent function. Thus, an exception for the function 3, will be indicated with a 83 as a function code; and an exception for the function code 16 or 0x10 in hexadecimal, will be indicated with an 0x90.
DATA	N bytes	This part consists of a variable number of bytes, depending on the function code. It may include addresses, data lengths, settings, commands or exception codes sent by the user.
CRC	2 bytes	Control code of two bytes. The ModBus/RTU includes a 16-bit CRC in each frame, to detect errors. If the slave detects an erroneous frame, based on a CRC that is not correct, it won’t take any action, nor will reply anything to the master. The management of the CRC is LSB-MSB.
DEAD TIME	Necessary time to transmit 3,5 Bytes	A frame is terminated when nothing is received for a period of 3,5 bytes. It means: 15 ms at 2400 bps 2 ms at 19200 bps ...etc.

1.2. Function Codes

HEX DEC CODE	MODBUS NAME	DEFINITION	COMMENT
0x03 3	Read Holding Registers	Reading of Any Value	This function allows the master to read 1 or more consecutive addresses of a relay. The registers always are of 16 bits, with the most important byte at first. The maximum number of registers to be read in a package are 60.
HEX DEC CODE	**MODBUS NAME**	**DEFINITION**	**COMMENT**
0x10 16	Preset Multiple Registers	Script	This function allows to write one or more registers that represent one or more settings. The registers are values of 2 bytes of length, transmitted with the most important byte at first. The maximum number of registers to be written in a package is 60.

1.3. Exceptions Responses

The error codes defined by the ModBus protocol are as follows:

01	ILLEGAL FUNCTION	The slave does not support any function with the function code received in this message.
02	ILLEGAL DATA ADDRESS	The master is trying to do an operation in a wrong address.
03	ILLEGAL DATA VALUE	The slave has detected that the value sent by the master is not valid.
04	SLAVE DEVICE FAILURE	Indicates an error occurred in the slave while trying to execute the request of the master.
05	ACKNOWLEDGE	Generic recognition.
06	SLAVE DEVICE BUSY	The slave is busy and unable to perform the required operation.
07	NEGATIVE ACKNOWLEDGE	Generic non-recognition.

When the data format takes up more than one BYTE, the most important BYTE is sent through the communications first, and the least important BYTE is sent last.

1.4. Data type

TYPE	LENGTH (Registers)	DESCRIPTION
ASCIIxx	xx/2	String: In length variable character chain. Final of String marked with '\0'. E. g.: "ABC" 0x41x42x43x00....
ASCII88	44	88 string character chain
ENUM	-	Each of the possible values of the integer will have a correspondence in the auxiliary list of the database. This list is the correspondence chain which must be shown for each of the values. Memory will only receive an integer value. E. g.: 0, 1 Correspondence to "CLOSED", "OPEN"
ENUM4	2	4 option ENUM (0-3)
ENUM8	2	8 option ENUM (0-7)
ENUM16	2	16 option ENUM (0-15)
ENUM80	2	80 option ENUM (0-79)
EVENT	9	Criteria Directory (UINT). Event Identifier (UINT). Value (UINT). Associated Measure (UINT).Date and Time(FH)
EVENTO2	11	Antiquity (UINT). Event (EVENT)
FH	5	*Year*(UINT).*month*(UCHAR).*day*(UCHAR).*hour*(UCHAR).*minutes*(UCHAR).*seconds*(UCHAR) .*hundredth*(UCHAR).*thousandth*(UINT)
FLOAT INVERSE	2	Number in FLOAT INVERSEing decimal point "FLOAT INVERSE" of 4 bytes
IP	2	Unsigned Integer of 32 bit, in decimal point format.
TAP	2	Number in FLOAT INVERSE type with restrictions on the accepted values. See the user manual for more information in each specific case.
TEXT10	5	10 Character string
TEXT16	8	16 Character string
UINT32	2	Integer without sign of 16 bytes

When the data format takes up more than one BYTE, the most important BYTE is sent through the communications first, and the least important BYTE is sent last.

1.5. General Memory Map

1.5.1. Relay information Map

The function code implemented to **reading is 0x03 (Read Holding Registers).**

The function code implemented to **writing is 0x16 (Write Holding Registers).**

Function	Description	Start address	Number of registries	Format	Reference
16	Write access code	168	5	TEXT10	See Passwords and Access Levels
03	Read of Model and Version	100	44	ASCII88	
03 & 16	Date and Time	170	5	FH	
03	Serial number	252	2	UINT32	

1.5.2. Events Map

The function code implemented to **reading is 0x03 (Read Holding Registers).**

The function code implemented to **writing is 0x16 (Write Holding Registers).**

Function	Description	Start address	Number of registries	Format	Reference
16	Write event index	1	2	UINT	
03	One event reading	410	11	EVENTO2	See States map (Event Number)
16	Delete All Events	420	2		

1.5.3. States Map

The function code implemented to **State reading is 0x03 (Read Holding Registers).**

Number of registries: 2.

Type: Bit string 32 bits, Most significant bit first (MSB-LSB)

FW M01.12.00 onwards:

Address	Description	Bit	Event NO	Status
712	25	0	1	Synchrocheck
		1	2	Dead L & Dead B
		2	3	Dead L & Live B
		3	4	Live L & Dead B
		4	5	Live L & Live B
		5	6	Voltage Diff.
		6	7	Frequency Diff
		7	8	Phase Diff.
738	27-L	0	1	Phase A Pickup
		1	2	Phase B Pickup
		2	3	Phase C Pickup
		3	4	Phase Pickup
		8	8	Phase A Trip
		9	9	Phase B Trip
		10	10	Phase C Trip
		11	11	Phase Trip
668	27-1	0	1	Phase A Pickup
		1	2	Phase B Pickup
		2	3	Phase C Pickup
		3	4	Phase Pickup
		8	8	Phase A Trip
		9	9	Phase B Trip
		10	10	Phase C Trip
		11	11	Phase Trip
670	27-2	0	1	Phase A Pickup
		1	2	Phase B Pickup
		2	3	Phase C Pickup
		3	4	Phase Pickup
		8	8	Phase A Trip
		9	9	Phase B Trip
		10	10	Phase C Trip
		11	11	Phase Trip
680	32-1	0	1	Phase A Pickup
		1	2	Phase B Pickup
		2	3	Phase C Pickup
		3	4	Phase Pickup

		8	5	Phase A Trip
		9	6	Phase B Trip
		10	7	Phase C Trip
		11	8	Phase Trip
682	32-2	0	1	Phase A Pickup
		1	2	Phase B Pickup
		2	3	Phase C Pickup
		3	4	Phase Pickup
		8	5	Phase A Trip
		9	6	Phase B Trip
		10	7	Phase C Trip
		11	8	Phase Trip
684	32-3	0	1	Phase A Pickup
		1	2	Phase B Pickup
		2	3	Phase C Pickup
		3	4	Phase Pickup
		8	5	Phase A Trip
		9	6	Phase B Trip
		10	7	Phase C Trip
		11	8	Phase Trip
686	32-4	0	1	Phase A Pickup
		1	2	Phase B Pickup
		2	3	Phase C Pickup
		3	4	Phase Pickup
		8	5	Phase A Trip
		9	6	Phase B Trip
		10	7	Phase C Trip
		11	8	Phase Trip
664	37	0	1	Phase A Pickup
		1	2	Phase B Pickup
		2	3	Phase C Pickup
		3	4	Phase Pickup
		8	5	Phase A Trip
		9	6	Phase B Trip
		10	7	Phase C Trip
		11	8	Phase Trip
660	46	3	1	Pickup
		11	2	Trip
742	46BC	3	1	Pickup
		11	2	Trip
720	47	3	1	Pickup
		11	2	Trip
722	47-L	3	1	Pickup
		11	2	Trip

662	49	3	1	Alarm
		11	2	Trip
634	50-1	0	1	Phase A Pickup
		1	2	Phase B Pickup
		2	3	Phase C Pickup
		3	4	Phase Pickup
		8	5	Phase A Trip
		9	6	Phase B Trip
		10	7	Phase C Trip
		11	8	Phase Trip
636	50-2	0	1	Phase A Pickup
		1	2	Phase B Pickup
		2	3	Phase C Pickup
		3	4	Phase Pickup
		8	5	Phase A Trip
		9	6	Phase B Trip
		10	7	Phase C Trip
		11	8	Phase Trip
700	52	0	1	Startup
		1	2	Error
		2	3	Open
		3	4	Opening Time
		4	5	Opening Error
		5	6	Closed
		6	7	Closing Time
		7	8	Closing Error
		8	9	Openings Alarm
		9	10	I2t Alarm
		10	11	Openings/T Alarm
		11	-	52B contact
		12	-	52A contact
740	59-L	0	1	Phase A Pickup
		1	2	Phase B Pickup
		2	3	Phase C Pickup
		3	4	Phase Pickup
		8	8	Phase A Trip
		9	9	Phase B Trip
		10	10	Phase C Trip
		11	11	Phase Trip
672	59-1	0	1	Phase A Pickup
		1	2	Phase B Pickup
		2	3	Phase C Pickup
		3	4	Phase Pickup
		8	8	Phase A Trip

		9	9	Phase B Trip
		10	10	Phase C Trip
		11	11	Phase Trip
674	59-2	0	1	Phase A Pickup
		1	2	Phase B Pickup
		2	3	Phase C Pickup
		3	4	Phase Pickup
		8	8	Phase A Trip
		9	9	Phase B Trip
		10	10	Phase C Trip
		11	11	Phase Trip
708	60VTS	3	1	Phase Pickup
		8	2	Phase A Alarm
		9	3	Phase B Alarm
		10	4	Phase C Alarm
		11	5	Alarm
638	67/51-1	0	1	Phase A Pickup
		1	2	Phase B Pickup
		2	3	Phase C Pickup
		3	4	Phase Pickup
		8	5	Phase A Trip
		9	6	Phase B Trip
		10	7	Phase C Trip
		11	8	Phase Trip
		16	9	Directionality A
		17	10	Directionality B
		18	11	Directionality C
		28	12	Directionality
640	67/51-2	0	1	Phase A Pickup
		1	2	Phase B Pickup
		2	3	Phase C Pickup
		3	4	Phase Pickup
		8	5	Phase A Trip
		9	6	Phase B Trip
		10	7	Phase C Trip
		11	8	Phase Trip
		16	9	Directionality A
		17	10	Directionality B
		18	11	Directionality C
		28	12	Directionality
642	67/51-3	0	1	Phase A Pickup
		1	2	Phase B Pickup
		2	3	Phase C Pickup
		3	4	Phase Pickup

		8	5	Phase A Trip
		9	6	Phase B Trip
		10	7	Phase C Trip
		11	8	Phase Trip
		16	9	Directionality A
		17	10	Directionality B
		18	11	Directionality C
		28	12	Directionality
644	67/51-4	0	1	Phase A Pickup
		1	2	Phase B Pickup
		2	3	Phase C Pickup
		3	4	Phase Pickup
		8	5	Phase A Trip
		9	6	Phase B Trip
		10	7	Phase C Trip
		11	8	Phase Trip
		16	9	Directionality A
		17	10	Directionality B
		18	11	Directionality C
		28	12	Directionality
704	74TCS	3	1	Pickup
		11	2	Alarm
718	78	11	1	Trip
702	79	0	1	Standby
		1	2	Reclose Time
		2	3	Is 52 Open?
		3	4	Hold Time
		4	5	Closing Time
		5	6	Reset Time
		6	7	Lockout
		7	8	Safe Time
		8	9	79 Blocked
		9	10	Reclose N1
		10	11	Reclose N2
		11	12	Reclose N3
		12	13	Reclose N4
		13	14	79 In Progress
728	SCM	0	1	Standby
		1	2	Wait to Open
		2	3	Lockout
		3	4	Wait to 79
		4	5	Reset Time
688	81-1	3	1	Pickup
		11	2	Trip

690	81-2	3	1	Pickup
		11	2	Trip
692	81-3	3	1	Pickup
		11	2	Trip
694	81-4	3	1	Pickup
		11	2	Trip
696	81-5	3	1	Pickup
		11	2	Trip
698	81-6	3	1	Pickup
		11	2	Trip
730	SZM	0	1	Standby
		1	2	Wait to Open
		2	3	Wait to Close
		3	4	Reset Time
		4	5	Open
		5	6	Lockout
736	27V1	3	1	Pickup
		11	2	Trip
724	27V1-L	3	1	Pickup
		11	2	Trip
750	SOTF	0	1	Phase A Pickup
		1	2	Phase B Pickup
		2	3	Phase C Pickup
		3	4	Phase Pickup
		8	5	Phase A Trip
		9	6	Phase B Trip
		10	7	Phase C Trip
		11	8	Phase Trip
		16	9	SOTF
646	50G	4	1	Ground Pickup
		12	2	Ground Trip
648	50N	4	1	Neutral Pickup
		12	2	Neutral Trip
658	50BF	3	1	Pickup
		11	2	Alarm
726	59N-L	4	1	Neutral Pickup
		12	2	Neutral Trip
676	59N-1	4	1	Neutral Pickup
		12	2	Neutral Trip
678	59N-2	4	1	Neutral Pickup
		12	2	Neutral Trip
762	64REF	3	1	Pickup
		11	2	Trip
		19	3	IN SHB Block

732	67GI	4	1	Ground Pickup
		12	2	Ground Trip
		19	3	Directionality
734	67NI	4	1	Neutral Pickup
		12	2	Neutral Trip
		19	3	Directionality
650	67G/51G-1	4	1	Ground Pickup
		12	2	Ground Trip
		19	3	Directionality
654	67N/51N-1	4	1	Neutral Pickup
		12	2	Neutral Trip
		19	3	Directionality
652	67G/51G-2	4	1	Ground Pickup
		12	2	Ground Trip
		19	3	Directionality
656	67N/51N-2	4	1	Neutral Pickup
		12	2	Neutral Trip
		19	3	Directionality
706	60CTS	3	1	Pickup
		11	2	Alarm
714	81R-1	3	1	Pickup
		11	2	Trip
716	81R-2	3	1	Pickup
		11	2	Trip
760	GOOSE IN	0	1	GOOSE I. 1
		1	2	GOOSE I. 2
		2	3	GOOSE I. 3
		3	4	GOOSE I. 4
		4	5	GOOSE I. 5
		5	6	GOOSE I. 6
		6	7	GOOSE I. 7
		7	8	GOOSE I. 8
		8	9	GOOSE I. 9
		9	10	GOOSE I. 10
		10	11	GOOSE I. 11
		11	12	GOOSE I. 12
		12	13	GOOSE I. 13
		13	14	GOOSE I. 14
		14	15	GOOSE I. 15
		15	16	GOOSE I. 16
		16	17	GOOSE I. 17
		17	18	GOOSE I. 18
		18	19	GOOSE I. 19
		19	20	GOOSE I. 20

		20	21	GOOSE I. 21
		21	22	GOOSE I. 22
		22	23	GOOSE I. 23
		23	24	GOOSE I. 24
		24	25	GOOSE I. 25
		25	26	GOOSE I. 26
		26	27	GOOSE I. 27
		27	28	GOOSE I. 28
		28	29	GOOSE I. 29
		29	30	GOOSE I. 30
		30	31	GOOSE I. 31
		31	32	GOOSE I. 32
746	AFD	0	1	AFD Output 1
		1	2	AFD Output 2
		2	3	AFD Output 3
		3	4	AFD Output 4
		8	5	AFD Input 1
		9	6	AFD Input 2
		10	7	AFD Input 3
		11	8	AFD Input 4
		16	9	AFD TestOK 1
		17	10	AFD TestOK 2
		18	11	AFD TestOK 3
		19	12	AFD TestOK 4
		20	13	AFD Phase OC
		21	14	AFD Neutral OC
		22	15	AFD Overcurrent
610	GENERAL	0	1	Trip
		1	2	Ready
		2	3	Wrong Password
		3	4	Date/Time Set
		4	5	Local
		5	6	Error: SER
		6	7	SER Deleted
		7	8	Wrong Access
		8	9	Settings Change
		9	10	Config Change
		10	11	LDP Deleted
		11	12	SER Overflow
		12	13	New DFR
		13	14	Phase Trip
		14	15	Trip Block
		15	16	Pickup
		16	17	Phase A Pickup

		17	18	Phase B Pickup
		18	19	Phase C Pickup
		19	20	Neutral Pickup
		20	21	Phase A Trip
		21	22	Phase B Trip
		22	23	Phase C Trip
		23	24	Neutral Trip
		24	25	SettingsG. 1
		25	26	SettingsG. 2
		26	27	SettingsG. 3
		27	28	SettingsG. 4
		28	29	SettingsG. 5
		29	30	SettingsG. 6
		30	-	Set to FALSE
		31	-	Set to TRUE
600	SELF DIAGNOSIS	51457	51457	SELF DIAGNOSIS
600	SELF DIAGNOSIS	0	1	Model Error
		1	2	HW Error
		4	-	Slot 3 Empty
		5	-	Slot 4 Empty
		6	-	Slot 5 Empty
		12	4	COM Loading
		13	3	Test State
		14	5	Default Settings
		15	6	Error:Settings
		16	7	Default Config
		17	8	Error:Config
		18	9	Error: Curves
		20	10	ENVM Full
666	SHB	8	1	Phase A Block
		9	2	Phase B Block
		10	3	Phase C Block
		11	4	Phase Block
710	CLP	0	1	CLP Disable
		1	2	CB Closed
		2	3	CB Open
		3	4	CB Def.Open
		4	5	Close CLP
		5	6	Open CLP
		11	7	CLP
608	HMI	1	2	Open Breaker
		2	3	Close Breaker
		3	4	79 Block
		4	5	79 Unblock

		5	6	Local Control
		6	7	Remote Control
		7	8	Reset
		9	10	Thermal I. Reset
		11	16	HLT On
		12	17	HLT Off
		13	18	User Command 1
		14	19	User Command 2
		15	20	User Command 3
		16	21	User Command 4
		17	22	User Command 5
		18	23	User Command 6
		25	15	Set Counter
		27	11	Key Reset
		29	12	Activity
		30	13	Identification
		31	14	Test State
764	DATE	0	1	Date/Time Set
		1	2	Need Sync.
		2	3	Summer Time
744	ALARM LEDS	0	-	Alarm 1
		1	-	Alarm 2
		2	-	Alarm 3
		3	-	Alarm 4
		4	-	Alarm 5
		5	-	Alarm 6
		6	-	Alarm 7
		7	-	Alarm 8
		8	-	Alarm 9
		9	-	Alarm 10
		10	-	Alarm 11
		11	-	Alarm 12
		12	-	Alarm 13
		13	-	Alarm 14
		14	-	Alarm 15
		15	-	Alarm 16
		16	-	Alarm 17
		17	-	Alarm 18
		18	-	Alarm 19
		19	-	Alarm 20
		20	-	Alarm 21
		21	-	Alarm 22
		22	-	Alarm 23
		23	-	Alarm 24

		24	-	Alarm 25
		25	-	Alarm 26
		26	-	Alarm 27
		27	-	Alarm 28
		28	-	Alarm 29
		29	-	Alarm 30
		30	-	Alarm 31
		31	-	Alarm 32
626	IEC60870-5-103	1	2	Open Breaker
		2	3	Close Breaker
		3	4	79 Block
		4	5	79 Unblock
		5	6	Local Control
		6	7	Remote Control
		7	8	Reset
		9	10	Thermal I. Reset
		11	16	HLT On
		12	17	HLT Off
		13	18	User Command 1
		14	19	User Command 2
		15	20	User Command 3
		16	21	User Command 4
		17	22	User Command 5
		18	23	User Command 6
		21	24	SettingsG. 1
		22	25	SettingsG. 2
		23	26	SettingsG. 3
		24	27	SettingsG. 4
		25	28	SettingsG. 5
		26	29	SettingsG. 6
		28	12	Activity
754	IEC60870-5-104	1	2	Open Breaker
		2	3	Close Breaker
		3	4	79 Block
		4	5	79 Unblock
		5	6	Local Control
		6	7	Remote Control
		7	8	Reset
		9	10	Thermal I. Reset
		11	16	HLT On
		12	17	HLT Off
		13	18	User Command 1
		14	19	User Command 2
		15	20	User Command 3

		16	21	User Command 4
		17	22	User Command 5
		18	23	User Command 6
		28	12	Activity
624	DNP3 Serial	1	2	Open Breaker
		2	3	Close Breaker
		3	4	79 Block
		4	5	79 Unblock
		5	6	Local Control
		6	7	Remote Control
		7	8	Reset
		9	10	Thermal I. Reset
		11	16	HLT On
		12	17	HLT Off
		13	18	User Command 1
		14	19	User Command 2
		15	20	User Command 3
		16	21	User Command 4
		17	22	User Command 5
		18	23	User Command 6
		28	12	Activity
748	DNP3 TCP	1	2	Open Breaker
		2	3	Close Breaker
		3	4	79 Block
		4	5	79 Unblock
		5	6	Local Control
		6	7	Remote Control
		7	8	Reset
		9	10	Thermal I. Reset
		11	16	HLT On
		12	17	HLT Off
		13	18	User Command 1
		14	19	User Command 2
		15	20	User Command 3
		16	21	User Command 4
		17	22	User Command 5
		18	23	User Command 6
		28	12	Activity
758	IEC61850	1	2	Open Breaker
		2	3	Close Breaker
		3	4	79 Block
		4	5	79 Unblock
		5	6	Local Control
		6	7	Remote Control

		7	8	Reset
		9	10	Thermal I. Reset
		11	16	HLT On
		12	17	HLT Off
		13	18	User Command 1
		14	19	User Command 2
		15	20	User Command 3
		16	21	User Command 4
		17	22	User Command 5
		18	23	User Command 6
		28	12	Activity
612	USB COM	1	2	Open Breaker
		2	3	Close Breaker
		3	4	79 Block
		4	5	79 Unblock
		5	6	Local Control
		6	7	Remote Control
		7	8	Reset
		9	10	Thermal I. Reset
		11	16	HLT On
		12	17	HLT Off
		13	18	User Command 1
		14	19	User Command 2
		15	20	User Command 3
		16	21	User Command 4
		17	22	User Command 5
		18	23	User Command 6
		25	15	Set Counter
		28	12	Activity
		29	13	Identification
620	MODBUS RTU	1	2	Open Breaker
		2	3	Close Breaker
		3	4	79 Block
		4	5	79 Unblock
		5	6	Local Control
		6	7	Remote Control
		7	8	Reset
		9	10	Thermal I. Reset
		11	16	HLT On
		12	17	HLT Off
		13	18	User Command 1
		14	19	User Command 2
		15	20	User Command 3
		16	21	User Command 4

		17	22	User Command 5
		18	23	User Command 6
		25	15	Set Counter
		28	12	Activity
		29	13	Identification
622	MODBUS TCP	1	2	Open Breaker
		2	3	Close Breaker
		3	4	79 Block
		4	5	79 Unblock
		5	6	Local Control
		6	7	Remote Control
		7	8	Reset
		9	10	Thermal I. Reset
		11	16	HLT On
		12	17	HLT Off
		13	18	User Command 1
		14	19	User Command 2
		15	20	User Command 3
		16	21	User Command 4
		17	22	User Command 5
		18	23	User Command 6
		25	15	Set Counter
		28	12	Activity
		29	13	Identification
756	WEB SERVER	1	2	Open Breaker
		2	3	Close Breaker
		3	4	79 Block
		4	5	79 Unblock
		5	6	Local Control
		6	7	Remote Control
		7	8	Reset
		9	10	Thermal I. Reset
		11	16	HLT On
		12	17	HLT Off
		13	18	User Command 1
		14	19	User Command 2
		15	20	User Command 3
		16	21	User Command 4
		17	22	User Command 5
		18	23	User Command 6
		28	12	Activity
614	WIFI COM	1	2	Open Breaker
		2	3	Close Breaker
		3	4	79 Block

		4	5	79 Unblock
		5	6	Local Control
		6	7	Remote Control
		7	8	Reset
		11	16	HLT On
		12	17	HLT Off
		13	18	User Command 1
		14	19	User Command 2
		15	20	User Command 3
		16	21	User Command 4
		17	22	User Command 5
		18	23	User Command 6
		25	15	Set Counter
		27	11	Link
		28	12	Activity
		29	13	Identification
		31	14	WIFI Enabled
632	PGC	0	1	Open Breaker
		1	2	Close Breaker
		2	3	79 Block
		3	4	79 Unblock
		4	5	Local Control
		5	6	Remote Control
		6	7	52a
		7	8	52b
		8	9	SettingsG. x1
		9	10	SettingsG. x2
		10	11	SettingsG. x4
		11	12	SZM Start
		12	13	Hot Line Tag
		13	14	79 Enable
		14	15	79N1 Start
		15	16	79N2 Start
		16	17	79N3 Start
		17	18	79N4 Start
		18	19	DFR Start
		19	20	50BF Start
		20	21	SOTF Start
		21	22	Thermal I. Reset
		22	23	74TCS Coil A
		23	24	74TCS Coil B
		24	25	Neutral Block
		25	26	Phase Block
		26	27	External Trip

		27	33	Reset
		28	34	Opening Blk
		29	35	Closing Blk
		30	36	WIFI ON
		31	28	PGC 1
752	CONTROL LEDS	0	1	Led Local
		1	2	Led 79
		2	3	Led 52
		3	4	Virtual Led-1
		4	5	Virtual Led-2
		5	-	Virtual Led-3
628	INPUTS	0	1	Input 1
		1	2	Input 2
		2	3	Input 3
		3	4	Input 4
		4	5	Input 5
		5	6	Input 6
		6	7	Input 7
		7	8	Input 8
		8	9	Input 9
		9	10	Input 10
		10	11	Input 11
		11	12	Input 12
		12	13	Input 13
		13	14	Input 14
		14	15	Input 15
		15	16	Input 16
		16	17	Input 17
		17	18	Input 18
		18	19	Input 19
		19	20	Input 20
		20	21	Input 21
		21	22	Input 22
		22	23	Input 23
		23	24	Input 24
630	OUTPUTS	0	1	Output 1
		1	2	Output 2
		2	3	Output 3
		3	4	Output 4
		4	5	Output 5
		5	6	Output 6
		6	7	Output 7
		7	8	Output 8
		8	9	Output 9

		9	10	Output 10
		10	11	Output 11
		11	12	Output 12
		12	13	Output 13
		13	14	Output 14
		14	15	Output 15
		15	16	Output 16
		16	17	Output 17
		17	18	Output 18
		18	19	Output 19
		19	20	Output 20
		20	21	Output 21
		21	22	Output 22
		22	23	Output 23
		23	24	Output 24
		24	25	Output 25
		25	26	Output 26
		26	27	Output 27
		27	28	Output 28
		28	29	Output 29
		29	30	Output 30
		30	31	Output 31
		31	32	Output 32
602	MEASUREMENTS	0	1	Error:Measurem.
		1	2	Net Freq.50Hz
		2	3	Blocked FreqLine
		3	4	Blocked Freq Bar
		4	5	Simulation
		8	8	VA Zero Crossing
		9	-	VB Zero Crossing
		10	-	VC Zero Crossing
		11	-	VLA Zero Crossing
		12	-	VLB Zero Crossing
		13	-	VLC Zero Crossing

1.5.4. States identifiers

CRITERIA	IDENTIFIER
25	6401
27-L	6915
27-1	6945
27-2	6977
32-1	8225
32-2	8257
32-3	8289
32-4	8321
37	9473
46	11777
46BC	11778
47	12033
47-L	12034
49	12545
50-1	12833
50[79]	12837
50-2	12865
52	13313
59-L	15107
59-1	15137
59-2	15169
60VTS	15361
67/51-1	17185
67[79]	17189
67/51-2	17217
67/51-3	17249
67/51-4	17281
74TCS	18945
78	19969
79	20225
SCM	20481

CRITERIA	IDENTIFIER
81-1	20769
81-2	20801
81-3	20833
81-4	20865
81-5	20897
81-6	20929
SZM	20993
27V1	32513
27V1-L	32514
SOTF	37889
50G	38401
50N	38402
50BF	38913
59N-L	40705
59N-1	40737
59N-2	40769
64REF	41985
67GI	42755
67NI	42756
67G/51G-1	42785
67N/51N-1	42786
67G/51G-2	42817
67N/51N-2	42818
60CTS	44545
81R-1	46369
81R-2	46401
GOOSE IN	47361
AFD	50948
GENERAL	51201
SELF DIAGNOSIS	51457
SHB	51714

CRITERIA	IDENTIFIER
CLP	51969
HMI	52481
DATE	52737
ALARM LEDS	53505
LDP	61185
IEC60870-5-103	61442
IEC60870-5-104	61444
DNP3 Serial	61698
DNP3 TCP	61700
IEC61850	61956
Rear TCP COM	63233
Rear Serial COM	63489
USB COM	63745
MODBUS RTU	63746
MODBUS TCP	63748
WEB SERVER	63750
WIFI COM	63751
PGC	64001
CONTROL LEDS	64257
DFR	64513
INPUTS	64769
OUTPUTS	65025
MEASUREMENTS	65281

1.5.5. Measurements Map

The function code implemented to **State reading is 0x03 (Read Holding Registers).**

Number of registries: 2.

Format: Float

Address	Description
800	Phase A current IA
802	Phase B current IB
804	Phase C current IC
806	Neutral current IN
808	Phase-Neutral V-A
810	Phase-Neutral V-B
812	Phase-Neutral V-C
816	Line Phase-Neutral VL-A
818	Line Phase-Neutral VL-B
820	Line Phase-Neutral VL-C
830	Current 3I0
832	Positive Sequence current I-1
834	Negative Sequence current I-2
836	I-2/I-1
824	Phase A second harmonic current I-A2H
826	Phase B second harmonic current I-B2H
828	Phase C second harmonic current I-C2H
922	Neutral second harmonic current I-N2H
932	THD I-A
934	THD I-B
936	THD I-C
838	Maximum current I-Max
814	3V-0
840	V-1
842	V-2
822	3VL-0
844	VL-1
846	VL-2
848	Phase-Phase Voltage U-AB
850	Phase-Phase Voltage U-BC
852	Phase-Phase Voltage U-CA
854	V-Max
856	VL-Max
858	Active Power P-3P
860	Reactive Power Q-3P
862	Apparent Power S-3P

Address	Description
930	cosPhi
864	Active Power P-A
866	Reactive Power Q-A
868	Apparent Power S-A
924	cosPhiA
870	Active Power P-B
872	Reactive Power Q-B
874	Apparent Power S-B
926	cosPhiB
876	Active Power P-C
878	Reactive Power Q-C
880	Apparent Power S-C
928	cosPhiC
882	Ang I-A
884	Ang I-B
886	Ang I-C
888	Ang I-N
890	Ang 3I0
892	Ang V-A
894	Ang V-B
896	Ang V-C
898	Ang 3V0
900	Ang L-A
902	Ang L-B
904	Ang L-C
906	Ang 3VL-0
908	Ang UAB
910	Ang UBC
912	Ang UCA
944	Ang UL-AB
946	Ang UL-BC
948	Ang UL-CA
914	Bar Frequency f-Bar
916	Line Frequency f-Line
918	df/dt
920	Thermal image

1.5.6. Fault reports Map

The function code implemented to **State reading is 0x03 (Read Holding Registers).**

Address	Description	Format	Associated Measurement	Number of registries	SIR-A
8334	Trip reason (with date and time)	ASCII	-	16	✓
8350	Fault report Phase A current IA	FLOAT INVERSE	I-A (A)	2	✓
8352	Fault report Phase B current IB		I-B (A)	2	✓
8354	Fault report Phase C current IC		I-C (A)	2	✓
8356	Fault report Neutral current IN		I-N (A)	2	✓
8358	Fault report Phase A voltage		V-A (V)	2	✓
8360	Fault report Phase B Voltage		V-B (V)	2	✓
8362	Fault report Phase C Voltage		V-C (V)	2	✓
8364	Fault report Phase A Line voltage		VL-A (V)	2	✓
8366	Fault report Phase B Line Voltage		VL-B (V)	2	✓
8368	Fault report Phase C Line Voltage		VL-C (V)	2	✓

Addresses and functions related to fault reports are the following:

The function code implemented to **reading is 0x03 (Read Holding Registers).**

The function code implemented to **writing is 0x03 (Write Holding Registers).**

Function	Description	Start address	Number of registries
16	Write fault report index	8000	2
16	Write event index from a fault report	8002	2
03	Read event from a fault report	8123	11
16	Delete All DFR	8200	2
03	Read trip reason and date	8334	16

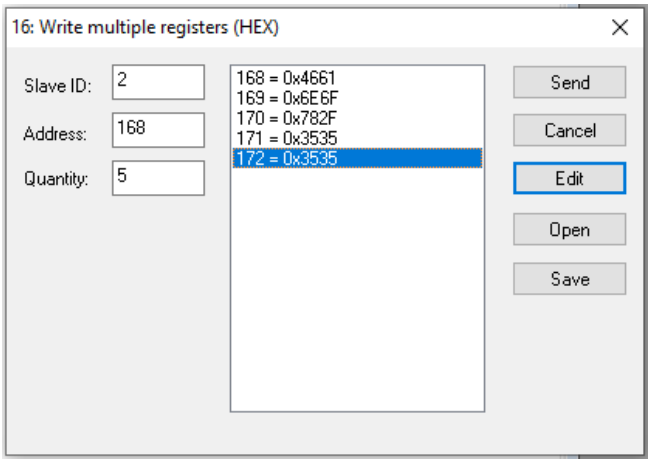
1.5.7. Example of obtaining information from a Fault Report

There are multiple ways to obtaing information from the fault report.

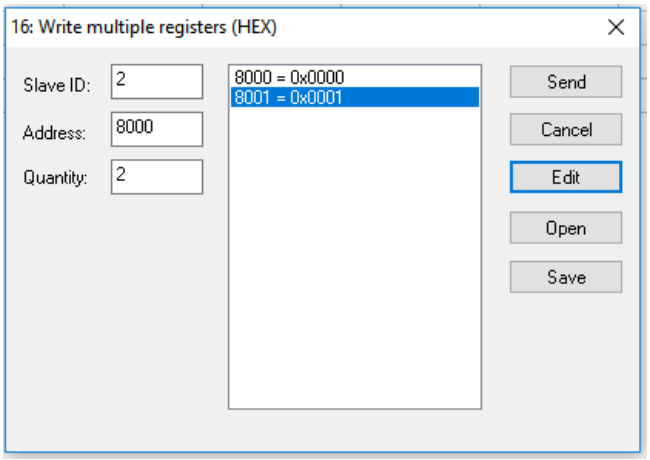
1.5.7.1. Ask for each event of a fault report

First start the session using the function 16 (write multiple registers) for entering the password at address 168.

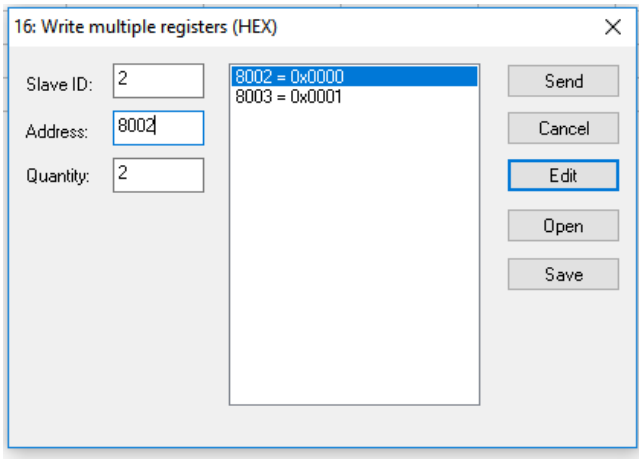
Default password “Fanox/5555” entered in HEX, as in the image:



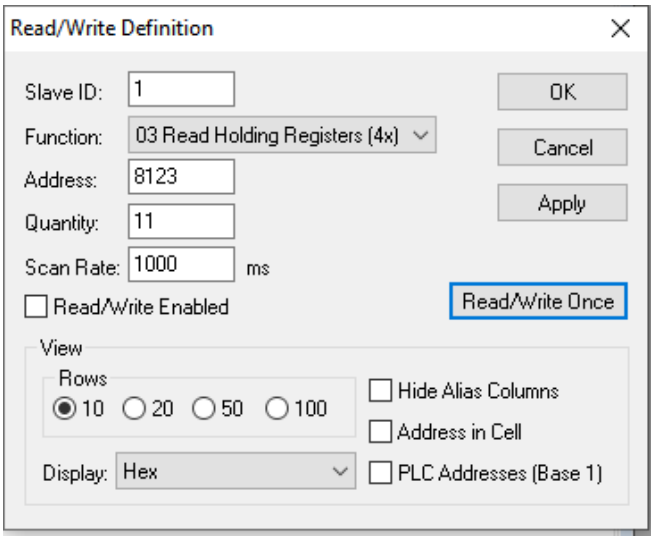
Next, write the fault report index you want to read on the 8000 address. The newest fault report has the index number one, so for reading the last fault report:



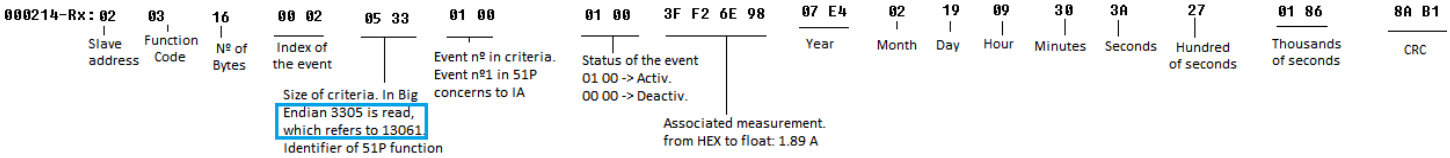
Then write the event index from which you want to start reading on the 8002 address. For reading the first event:



To conclude, read the selected event with function 3 (read holding register) on address 8123 and 11 registers:



The response includes the identifier of the criteria, number of the event in that criteria (info available on the status map), status of the event (active/desactivate) and associated measurement and date:

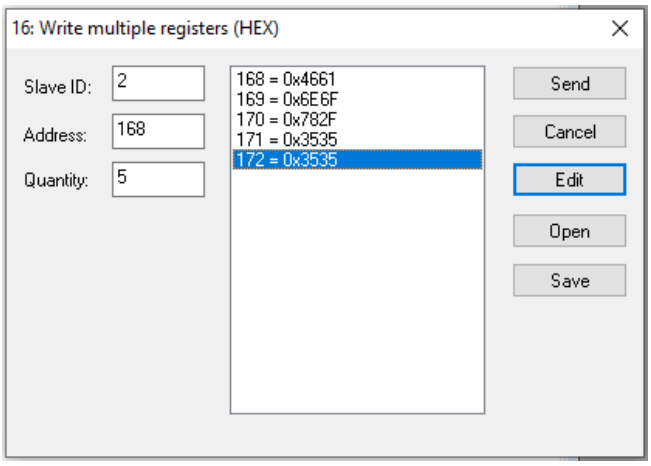


Continue reading in same 8123 direction for obtaining the nexts events of the report.

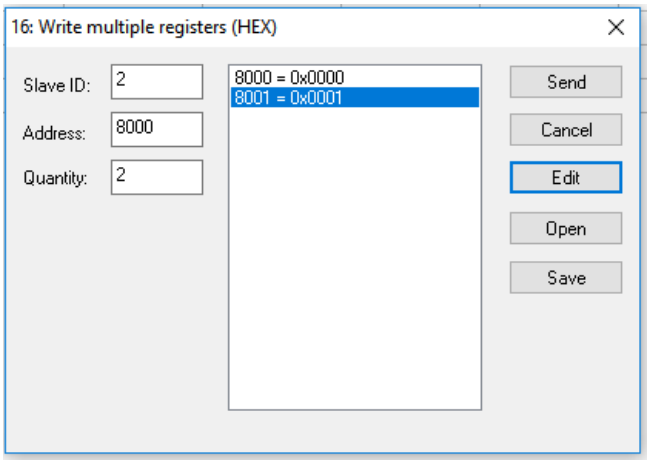
1.5.7.2. Ask for the trip reason of a fault report

First start the session using the function 16 (write multiple registers) for entering the password at address 168.

Default password “Fanox/5555” should be entered in HEX, as in the image:



Next, write the fault report index you want to read on the 8000 address. The newest fault report has the index number one, so for reading the last fault report:



And finally read 16 registers starting on address 8334. On the response the trip reason is given on ASCII format:

```
000004-Tx:02 03 20 8E 00 10 2F DE
000005-Rx:02 03 20 07 E4 00 0B 00 0B 00 09 00 23 00 07 00 31 01 EB 47 45 4E 45 52 41 4C 00 00 00 00 00 00 00 00 00 A2 8D
```

Slave Address | Function Code | Nº of bytes | Year | Month | Day | Hour | Minutes | Seconds | Thousand of seconds | Trip Reason | CRC

1.5.8. Settings Map

The function code implemented to **State writing is 0x16 (Write Holding Registers).**

Number of registries: 2.

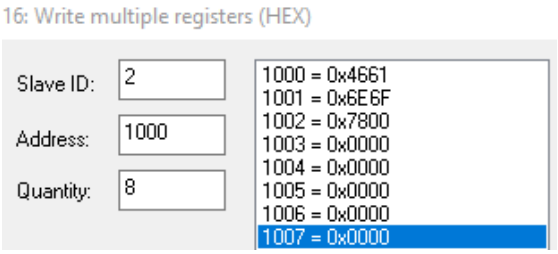
Settings	Address	Description	Format	Enumeration	SIR-A
General settings / Measurements	**1018**	Frequency	ENUM4	00 → 60 Hz 01 → 50 Hz	✓
	1020	P. Nominal current	ENUM4	00 → 5 A 01 → 1 A	✓
	1022	N. Nominal Current	ENUM4	00 → 5 A 01 → 1 A	✓
	1024	CT Phase Ratio	FLOAT INVERSE	-	✓
	1026	CT Neutral ratio	FLOAT INVERSE	-	✓
	1030	Nominal V. P-P	UINT32	-	✓
	1032	Volt. Sensor Ratio	FLOAT INVERSE	-	✓
	1036	V-A RCF	FLOAT INVERSE	-	✓
	1038	V-B RCF	FLOAT INVERSE	-	✓
	1040	V-C RCF	FLOAT INVERSE	-	✓
	1042	VL-A RCF	FLOAT INVERSE	-	✓
	1044	VL-B RCF	FLOAT INVERSE	-	✓
	1046	VL-C RCF	FLOAT INVERSE	-	✓
	1048	IA Deadband	TAP	-	✓
	1050	IB Deadband	TAP	-	✓
	1052	IC Deadband	TAP	-	✓
	1054	IN Deadband	TAP	-	✓
	1056	VA Deadband	TAP	-	✓
	1058	VB Deadband	TAP	-	✓
	1060	VC Deadband	TAP	-	✓
	1062	VN Deadband	TAP	-	✓
	1064	VA-L Deadband	TAP	-	✓
	1066	VB-L Deadband	TAP	-	✓
	1068	VC-L Deadband	TAP	-	✓
	1070	VN-L Deadband	TAP	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
General settings / DFR	1166	Num. Of Records	ENUM4	00 → 5 x 260 cycles 01 → 25 x 60 cycles 02 → 50 x 30 cycles 03 → 100 x 15 cycles	✓
	1168	Cycles Prefault	UINT32	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
General settings / LDP	1170	Current Level	TAP	-	✓
	1172	Interval Time	UINT32	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
General settings / General	1000	Identification	TEXT16*	-	✓
	1012	Language	ENUM4	00 → English 01 → Spanish 02 → German or Russian 03 → French or Turkish	✓
	1014	Active Setting Group	UINT32	01 → Set. Group 1 02 → Set. Group 2 03 → Set. Group 3 04 → Set. Group 4 05 → Set. Group 5 06 → Set. Group 6	✓
	1016	Clearing Time	FLOAT INVERSE	-	✓
	1764	Min. Response Time	FLOAT INVERSE	-	✓

*TEXT16 type needs 8 registers, 1 register for each 2 characters. For example, for writing “Fanox”, the following hexadecimal values must be sent:



Settings	Address	Description	Format	Enumeration	SIR-A
52	1182	Max Number of Openings	UINT32	-	✓
	1184	Max Accumulated Amperes	UINT32	-	✓
	1186	Excessive Repetitive Openings	UINT32	-	✓
	1188	Repetitive Openings/Time	UINT32	-	✓
	1190	Opening Time	FLOAT INVERSE	-	✓
	1192	Closing Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
79	1526	Reclose Number	ENUM8	00 → No Reclose 01 → 1 Shot 02 → 2 Shots 03 → 3 Shots 04 → 4 Shots	✓
	1528	Reset Time	FLOAT INVERSE	-	✓
	1530	Reclose 1 Time	FLOAT INVERSE	-	✓
	1532	Reclose 2 Time	FLOAT INVERSE	-	✓
	1534	Reclose 3 Time	FLOAT INVERSE	-	✓
	1536	Reclose 4 Time	FLOAT INVERSE	-	✓
	1538	Hold Enable	ENUM4	00 → No 01 → Yes 02 → No Time	✓
	1540	Hold Time	FLOAT INVERSE	-	✓
	1542	Safe Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
SCM	1662	Number of shots	ENUM8	00 → No Permited 01 → 1 Shot 02 → 2 Shots 03 → 3 Shots 04 → 4 Shots	✓
	1664	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
SZM	1666	Number of shots	ENUM8	00 → No Permited 01 → 1 Shot 02 → 2 Shots 03 → 3 Shots 04 → 4 Shots	✓
	1668	Reset Time	FLOAT INVERSE	-	✓
	1670	Max. Open Time	FLOAT INVERSE	-	✓
	1672	Max. Close Time	FLOAT INVERSE	-	✓
	1674	Current Tap	TAP	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
25	1568	Dead Tap	TAP	-	✓
	1570	Live Tap	TAP	-	✓
	1572	V. Supervis. Time	FLOAT INVERSE	-	✓
	1574	Voltage Diff	TAP	-	✓
	1576	Phase Diff.	UINT32	-	✓
	1578	Frequency Diff.	FLOAT INVERSE	-	✓
	1580	Synchrocheck Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
Inputs	**1164**	Debounce Time	UINT32	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
AFD	**1746**	Function Enable	ENUM4	0 → Disable 01 → Alarm 02 → Trip	✓
	1748	Current Tap	UINT32	-	✓
	1750	Time Delay	UINT32	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
SHB	1394	Function Enable	ENUM4	00 → No 01 → Yes	✓
	1396	Current Tap	UINT32	-	✓
	1398	Reset Time	FLOAT INVERSE	-	✓
	1400	Block Threshold	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
CLP	**1174**	Function Enable	ENUM4	00 → No 01 → Yes	✓
	1176	Settings Group	UINT32	-	✓
	1178	No Load Time	FLOAT INVERSE	-	✓
	1180	Cold Load Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
SOTF	1752	Function Enable	ENUM4	0 → Disable 01 → Alarm 02 → Trip 03 → SHB Trip	✓
	1754	Current Tap	TAP	-	✓
	1756	Time Delay	FLOAT INVERSE		✓
	1758	Safe Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
50-1	1194	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip 03 → SHB Trip	✓
	1196	Current Tap	TAP	-	✓
	1198	Time Delay	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
50-2	1200	Function Enable	ENUM4	0 → Disable 01 → Alarm 02 → Trip 03 → SHB Trip	✓
	1202	Current Tap	TAP	-	✓
	1204	Time Delay	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
50G	1278	Function Enable	ENUM4	0 → Disable 01 → Alarm 02 → Trip 03 → SHB Trip	✓
	1280	Current Tap	TAP	-	✓
	1282	Time Delay	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
50N	1284	Function Enable	ENUM4	0 → Disable 01 → Alarm 02 → Trip 03 → SHB Trip	✓
	1286	Current Tap	TAP	-	✓
	1288	Time Delay	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
67-1	**1206**	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip 03 → SHB Trip	✓
	1208	Curve Type	ENUM16	(1)	✓
	1210	Time Dial (TMS)	FLOAT INVERSE	(2)	✓
	1212	Current Tap	TAP	-	✓
	1214	Time Delay	FLOAT INVERSE	-	✓
	1216	Directionality	FLOAT INVERSE	0 → No 01 → Direct 02 → Inverse	✓
	1218	Polarization V	TAP	-	✓
	1220	Operating angle	UINT32	-	✓
	1222	Halfcone Angle	UINT32	-	✓

(1) Definite time and 67 curves are included to be selected by the user following this numbering for all the 67 functions:

TYPE	Enumeration
DT	00 → Definite Time
IEC	01 → Long Time Inverse
	02 → Standard Inverse
	03 → Very Inverse
	04 → Extremely Inverse
	05 → Short time Inverse
IEEE	06 → Moderately Inverse
	07 → Very Inverse
	08 → Extremely Inverse
U	09 → U1 - MI
	10 → U2 - I
	11 → U3 - VI
	12 → U4 - EI
	13 → U5 - STI
SMU	14 → 15E
	15 → 20E
	16 → 25E
	17 → 30E
	18 → 40E
	19 → 50E
	20 → 65E
	21 → 80E
	22→ 100E

TYPE	Enumeration
SMU	23 → 125E
	24 → 150E
	25 → 175E
	26 → 200E
RC	27 → A - 101
	28 → B - 117
	29 → C - 133
	30 → D - 116
	31 → E - 132
	32 → F - 163
	33 → G - 121
	34 → H - 122
	35 → J - 164
	36 → KP - 162
	37 → L - 107
	38 → M - 118
	39 → N - 104
	40 → P - 115
	41 → R - 105
	42 → T - 161
	43 → V - 137
	44 → W - 138
	45→ Y - 120

TYPE	Enumeration
RC	46 → Z - 134
	47 → 1 - 102
	48 → 2 - 135
	49 → 3 - 140
	50 → 4 - 106
	51 → 5 - 114
	52 → 6 - 136
	53 → 7 - 152
	54 → 8 - 113
	55 → 8 - PLUS 111
	56 → 9 - 131
	57 → KG - 165
	58 → 11 - 141
	59 → 13 - 142
	60 → 14 - 119
	61 → 15 - 112
	62 → 16 - 139
	63 → 17 – 103
	64 → 18 - 151
	65 → 200
	66 → 201
	67 → 202

(2) The range of the time Multiplier setting will depend on the curve. The range of this setting for each curve family is as follows for all the 67 functions:

TIME DIAL (TMS)						
	Description	**Minimum**	**Maximum**	**Step**	**Unit**	**Default**
IEC	Time Multiplier	0.05	1.00	0.01	-	1.00
IEEE	Time Multiplier	0.10	25.00	0.01	-	1.00
U	Time Multiplier	0.05	15	0.01	-	1.00
SMU20	n/a					
RC	Time Multiplier	0.10	2.00	0.01	-	1

Settings	Address	Description	Format	Enumeration	SIR-A
67-2	**1224**	Function Enable	ENUM4	0 → Disable 01 → Alarm 02 → Trip 03 → SHB Trip	✓
	1226	Curve Type	ENUM16	(1)	✓
	1228	Time Dial (TMS)	FLOAT INVERSE	(2)	✓
	1230	Current Tap	TAP	-	✓
	1232	Time Delay	FLOAT INVERSE	-	✓
	1234	Directionality	ENUM4	0 → No 01 → Direct 02 → Inverse	✓
	1236	Polarization V	TAP	-	✓
	1238	Operating angle	UINT32	-	✓
	1240	Halfcone Angle	UINT32	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
67-3	**1242**	Function Enable	ENUM4	0 → Disable 01 → Alarm 02 → Trip 03 → SHB Trip	✓
	1244	Curve Type	ENUM16	(1)	✓
	1246	Time Dial (TMS)	FLOAT INVERSE	(2)	✓
	1248	Current Tap	TAP	-	✓
	1250	Time Delay	FLOAT INVERSE	-	✓
	1252	Directionality	ENUM4	0 → No	✓

				01 → Direct 02 → Inverse	
	1254	Polarization V	TAP	-	✓
	1256	Operating angle	UINT32	-	✓
	1258	Halfcone Angle	UINT32	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
67-4	**1260**	Function Enable	ENUM4	0 → Disable 01 → Alarm 02 → Trip 03 → SHB Trip	✓
	1262	Curve Type	ENUM16	(1)	✓
	1264	Time Dial (TMS)	FLOAT INVERSE	(2)	✓
	1266	Current Tap	TAP	-	✓
	1268	Time Delay	FLOAT INVERSE	-	✓
	1270	Directionality	ENUM4	0 → No 01 → Direct 02 → Inverse	✓
	1272	Polarization V	TAP	-	✓
	1274	Operating angle	UINT32	-	✓
	1276	Halfcone Angle	UINT32	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
67G-1	**1290**	Function Enable	ENUM4	0 → Disable 01 → Alarm 02 → Trip 03 → SHB Trip	✓
	1292	Curve Type	ENUM16	(1)	✓
	1294	Time Dial (TMS)	FLOAT INVERSE	(2)	✓
	1296	Current Tap	TAP	-	✓
	1298	Time Delay	FLOAT INVERSE	-	✓
	1300	Directionality	ENUM4	0 → No 01 → Direct 02 → Inverse	✓
	1302	Polarization V	TAP	-	✓
	1304	Operating angle	UINT32	-	✓
	1306	Halfcone Angle	UINT32	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
67G-2	1308	Function Enable	ENUM4	0 → Disable 01 → Alarm 02 → Trip 03 → SHB Trip	✓
	1310	Curve Type	ENUM16	(1)	✓
	1312	Time Dial (TMS)	FLOAT INVERSE	(2)	✓
	1314	Current Tap	TAP	-	✓
	1316	Time Delay	FLOAT INVERSE	-	✓
	1318	Directionality	ENUM4	0 → No 01 → Direct 02 → Inverse	✓
	1320	Polarization V	TAP	-	✓
	1322	Operating angle	UINT32	-	✓
	1324	Halfcone Angle	UINT32	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
67N-1	1326	Function Enable	ENUM4	0 → Disable 01 → Alarm 02 → Trip 03 → SHB Trip	✓
	1328	Curve Type	ENUM16	(1)	✓
	1330	Time Dial (TMS)	FLOAT INVERSE	(2)	✓
	1332	Current Tap	TAP	-	✓
	1334	Time Delay	FLOAT INVERSE	-	✓
	1336	Directionality	ENUM4	0 → No 01 → Direct 02 → Inverse	✓
	1338	Polarization V	TAP	-	✓
	1340	Operating angle	UINT32	-	✓
	1342	Halfcone Angle	UINT32	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
67N-2	1344	Function Enable	ENUM4	0 → Disable 01 → Alarm 02 → Trip 03 → SHB Trip	✓
	1346	Curve Type	ENUM16	(1)	✓
	1348	Time Dial (TMS)	FLOAT INVERSE	(2)	✓

	1350	Current Tap	TAP	-	✓
	1352	Time Delay	FLOAT INVERSE	-	✓
	1354	Directionality	ENUM4	0 → No 01 → Direct 02 → Inverse	✓
	1356	Polarization V	TAP	-	✓
	1358	Operating angle	UINT32	-	✓
	1360	Halfcone Angle	UINT32	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
67GI	**1676**	Function Enable	ENUM4	0 → Disable 01 → Alarm 02 → Trip 03 → SHB Trip	✓
	1678	Directionality	ENUM4	0 → No 01 → Direct 02 → Inverse	✓
	1680	Low Tap	TAP	-	✓
	1682	Voltage Low Tap	TAP	-	✓
	1684	High Tap	TAP	-	✓
	1686	Voltage High Tap	TAP	-	✓
	1688	Time Delay	FLOAT INVERSE	-	✓
	1690	Operating angle	UINT32	-	✓
	1692	Halfcone Angle	UINT32	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
67NI	**1694**	Function Enable	ENUM4	0 → Disable 01 → Alarm 02 → Trip 03 → SHB Trip	✓
	1696	Directionality	ENUM4	0 → No 01 → Direct 02 → Inverse	✓
	1698	Low Tap	TAP	-	✓
	1700	Voltage Low Tap	TAP	-	✓
	1702	High Tap	TAP	-	✓
	1704	Voltage High Tap	TAP	-	✓
	1706	Time Delay	FLOAT INVERSE	-	✓
	1708	Operating angle	UINT32	-	✓

	1710	Halfcone Angle	UINT32	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
46	**1366**	Function Enable	ENUM4	0 → Disable 01 → Alarm 02 → Trip 03 → SHB Trip	✓
	1368	Curve Type	ENUM16	(1)	✓
	1370	Time Dial (TMS)	FLOAT INVERSE	(2)	✓
	1372	Current Tap	TAP	-	✓
	1374	Time Delay	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
46BC	**1740**	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1742	Current Tap	UINT32	-	✓
	1744	Time Delay	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
49	**1376**	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1378	Current Tap	TAP	-	✓
	1380	Heating Constant	UINT32	-	✓
	1382	Cooling Constant	UINT32	-	✓
	1384	Alarm Level	UINT32	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
37	**1386**	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1388	Current Tap	TAP	-	✓
	1390	Minimum Level	TAP	-	✓
	1392	Time delay	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
27-1	1402	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1404	Voltage Tap	TAP	-	✓
	1406	Minimum Level	TAP	-	✓
	1408	Time delay	FLOAT INVERSE	-	✓
	1410	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
27-2	1412	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1414	Voltage Tap	TAP	-	✓
	1416	Minimum Level	TAP	-	✓
	1418	Time delay	FLOAT INVERSE	-	✓
	1420	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
27-L	1722	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1724	Tap	TAP	-	✓
	1726	Minimum Level	TAP	-	✓
	1728	Time delay	FLOAT INVERSE	-	✓
	1730	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
27-LB	1722	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1724	Tap	TAP	-	✓
	1726	Minimum Level	TAP	-	✓
	1728	Time delay	FLOAT INVERSE	-	✓
	1730	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
27V1	1712	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1714	Voltage Tap	TAP	-	✓
	1716	Minimum Level	TAP	-	✓
	1718	Time delay	FLOAT INVERSE	-	✓
	1720	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
27V1-L	1644	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1646	Voltage Tap	TAP	-	✓
	1648	Minimum Level	TAP	-	✓
	1650	Time delay	FLOAT INVERSE	-	✓
	1652	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
59-1	1422	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1424	Voltage Tap	TAP	-	✓
	1426	Time delay	FLOAT INVERSE	-	✓
	1428	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
59-2	1430	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1432	Voltage Tap	TAP	-	✓
	1434	Time delay	FLOAT INVERSE	-	✓
	1436	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
59-L	1732	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1734	Voltage Tap	TAP	-	✓
	1736	Time delay	FLOAT INVERSE	-	✓
	1738	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
59-LB	1732	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1734	Voltage Tap	TAP	-	✓
	1736	Time delay	FLOAT INVERSE	-	✓
	1738	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
59N-1	1438	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1440	Voltage Tap	TAP	-	✓
	1442	Time delay	FLOAT INVERSE	-	✓
	1444	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
59N-2	1446	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1448	Voltage Tap	TAP	-	✓
	1450	Time delay	FLOAT INVERSE	-	✓
	1452	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
59N-L	1654	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1656	Voltage Tap	TAP	-	✓
	1658	Time delay	FLOAT INVERSE	-	✓
	1660	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
47	1628	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1630	Voltage Tap	TAP	-	✓
	1632	Time delay	FLOAT INVERSE	-	✓
	1634	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
47-L	1636	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1638	Voltage Tap	TAP	-	✓
	1640	Time delay	FLOAT INVERSE	-	✓
	1642	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
32-1	1454	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1456	Activation level	TAP	-	✓
	1458	Operating angle	UINT32	-	✓
	1460	Time delay	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
32-2	1462	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1464	Activation level	TAP	-	✓
	1466	Operating angle	UINT32	-	✓
	1468	Time delay	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
32-3	1470	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1472	Activation level	TAP	-	✓
	1474	Operating angle	UINT32	-	✓
	1476	Time delay	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
32-4	1478	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1480	Activation level	TAP	-	✓
	1482	Operating angle	UINT32	-	✓
	1484	Time delay	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
81-1	1486	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1488	Type	ENUM4	00 → Over 01 → Under	✓
	1490	Activation Level	FLOAT INVERSE	-	✓
	1492	Time Delay	FLOAT INVERSE		✓
	1494	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
81-2	1496	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1498	Type	ENUM4	00 → Over 01 → Under	✓
	1500	Activation Level	FLOAT INVERSE	-	✓
	1502	Time Delay	FLOAT INVERSE		✓
	1504	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
81-3	1506	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1508	Type	ENUM4	00 → Over 01 → Under	✓
	1510	Activation Level	FLOAT INVERSE	-	✓
	1512	Time Delay	FLOAT INVERSE		✓
	1514	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
81-4	1516	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1518	Type	ENUM4	00 → Over 01 → Under	✓
	1520	Activation Level	FLOAT INVERSE	-	✓
	1522	Time Delay	FLOAT INVERSE	-	✓
	1524	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
81-5	1602	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1604	Type	ENUM4	00 → Over 01 → Under	✓
	1606	Activation Level	FLOAT INVERSE	-	✓
	1608	Time Delay	FLOAT INVERSE	-	✓
	1610	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
81-6	1612	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1614	Type	ENUM4	00 → Over 01 → Under	✓
	1616	Activation Level	FLOAT INVERSE	-	✓
	1618	Time Delay	FLOAT INVERSE	-	✓
	1620	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
81R-1	1582	Function Enable	ENUM4	00 → Disable 01 → Alarm 02 → Trip	✓
	1584	Type	ENUM4	00 → Increase 01 → Decrease	✓
	1586	Activation Level	FLOAT INVERSE	-	✓
	1588	Time Delay	FLOAT INVERSE	-	✓
	1590	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
81R-2	**1592**	Function Enable	ENUM4	00 → No 01 → Alarm 02 → Trip	✓
	1594	Type	ENUM4	00 → Increase 01 → Decrease	✓
	1596	Activation Level	FLOAT INVERSE	-	✓
	1598	Time Delay	FLOAT INVERSE	-	✓
	1600	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
78	**1622**	Function Enable	ENUM4	00 → No 01 → Alarm 02 → Trip	✓
	1624	Activation Level	UINT32	-	✓
	1626	Reset Time	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
50BF	**1362**	Function Enable	ENUM4	00 → No 01 → Ys	✓
	1364	Time Delay	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
74TCS	1544	Function Enable	ENUM4	00 → No 01 → Yes	✓
	1546	Time Delay	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
60CTS	1548	Function Enable	ENUM4	00 → No 01 → Yes	✓
	1550	Time Delay	FLOAT INVERSE	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
60VTS	1552	Function Enable	ENUM4	00 → No 01 → Yes	✓
	1554	Time Delay	FLOAT INVERSE	-	✓
	1556	V1 Tap	TAP	-	✓
	1558	V2 Tap	TAP	-	✓
	1560	VP Tap	TAP	-	✓

	1562	I1 Tap	TAP	-	✓
	1564	I2 Tap	TAP	-	✓
	1566	I30 Tap	TAP	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
General settings / USB COM	**1078**	Slave Address	UINT32	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
General settings / WIFI COM	**1080**	Slave Address	UINT32	-	✓
	1082	Channel NO.	UINT32	-	
	1084	Port	UINT32	-	
	1086	IP Address	IP*	-	
	1088	Subnet	IP	-	
	1090	Gateway	IP	-	

*IP type consists of 4 bytes divided in 2 registers. For example:

192.168.200.100

C0 A8 C8 64

Settings	Address	Description	Format	Enumeration	SIR-A
General settings / Rear Serial COM	**1092**	Protocol	ENUM4	00 → Modbus RTU 01 → DNP3 serial 02 → IEC-103	✓
	1094	Baudrate	ENUM8	00 → 4800 01 → 9600 02 → 19200 03 → 38400 04 → 57600 05 → 115200	✓
	1096	Serial setting	ENUM4	00 → 8-N-1 01 → 8-E-1 02 → 8-O-1 03 → 9-N-1 04 → 8-N-2 05 → 8-E-2 06 → 8-O-2 07 → 9-N-1	✓

Settings	Address	Description	Format	Enumeration	SIR-A
General settings / MODBUS RTU	**1112**	Slave Address	UINT32	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
General settings / DNP3 SERIAL	1130	Slave Address	UINT32	-	✓
	1132	DNP3 Master Addss	UINT32	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
General settings / IEC-103	1152	Slave Address	UINT32	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
General settings / Rear TCP COM	1098	Protocol	ENUM4	00 → Modbus TCP 01 → DNP3 TCP	✓
	1100	IP Address	IP	-	✓
	1102	Subnet	IP	-	✓
	1104	Gateway	IP	-	✓
	1760	DNS-1	IP	-	✓
	1762	DNS-2	IP	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
General settings / MODBUS TCP	1120	Slave Address	UINT32	-	✓
	1122	Port	UINT32	-	✓

Settings	Address	Description	Format	Enumeration	SIR-A
General settings / DNP3 TCP	1140	Slave Address	UINT32	-	✓
	1142	DNP3 Master Addss	UINT32	-	✓
	1144	Port	UINT32	-	✓

1.6. Counters

The function code implemented to **State reading is 0x03 (Read Holding Registers).**

The function code implemented to **State writing is 0x16 (Write Holding Registers).**

Number of registries: 2.

Function	Description	Start address	Number of registries	Format
03 & 16	Openings Number	500	2	FLOAT INVERSE
03 & 16	Recloses Number	502	2	
03 & 16	Accumulated Amps	504	2	
03 & 16	AE+	508	2	
03 & 16	AE-	510	2	
03 & 16	RE+	512	2	
03 & 16	RE-	514	2	

1.7. Command List

The function code implemented to **State writing is 0x16 (Write Holding Registers).**

Number of registries: 2.

2 ways to execute commands are given:

- **Writing the same address for all the commands and changing the enumeration:**

Address	Description	Number of registries	Enumeration	Format	SIR-A
198	Open Breaker	2	01	UINT16	✓
	Close Breaker	2	02	UINT16	✓
	79 Block	2	03	UINT16	✓
	79 Unblock	2	04	UINT16	✓
	Local Control	2	05	UINT16	✓
	Remote Control	2	06	UINT16	✓
	Reset	2	07	UINT16	✓
	Reset Thermal Image	2	09	UINT16	✓
	Hot Line Tag ON	2	11	UINT16	✓
	Hot Line Tag OFF	2	12	UINT16	✓
	User Command 1	2	13	UINT16	✓
	User Command 2	2	14	UINT16	✓
	User Command 3	2	15	UINT16	✓
	User Command 4	2	16	UINT16	✓
	User Command 5	2	17	UINT16	✓
	User Command 6	2	18	UINT16	✓

- **Writing different command addresses:**

  There is no need to start the session, these are direct operate commands.

Address	Description	Number of registries	Enumeration	Format	SIR-A
220	Open Breaker	1	0x00000001	UINT16	✓
	Close Breaker	1	0x00000000	UINT16	✓
222	79 Block	1	0x00000001	UINT16	✓
	79 Unblock	1	0x00000000	UINT16	✓
224	Local Control	1	0x00000001	UINT16	✓
	Remote Control	1	0x00000000	UINT16	✓
226	Reset	1	0x00000001	UINT16	✓
228	Reset Thermal Image	1	0x00000001	UINT16	✓

1.8. Setting-up the session: Password and access levels

The relay is provided with ten passwords associated to four access levels allowing the user to carry out different actions depending on the selected password.

The passwords and their associated levels of access can be set up using the SIcom program. The password must consist of 10 characters (passwords with more or less characters will not be accepted), and must include at least 1 number, 1 lowercase letter, 1 uppercase letter and 1 symbol.

By default, the relay is programmed with the following passwords and their associated levels:

ACCESS LEVEL	PASSWORD	Read-only permission: Status and measurements Settings Configuration Events/DFR	Permission to: Change settings	Permission to: Execute Commands Set Counters Delete Events Delete DFR	Permission to: Change user´s Configuration	Permission to: Upgrade the FW (flashing process)	Permission to: Read and change access levels	Permission to: Change manufacturer´s Configuration
0	Fanox/0000	YES	NO	NO	NO	NO	NO	NO
1	Fanox/1111 Fanox/2222 Fanox/3333 Fanox/6666 Fanox/7777 Fanox/8888	YES	YES	NO	NO	NO	NO	NO
2	Fanox/4444	YES	YES	YES	NO	NO	NO	NO
3	Fanox/5555 Fanox/9999	YES	YES	YES	YES	YES	YES	NO

1.9. Example of Modbus Frames

Writing the access password “Fanox/5555” to equipment address no. 2

Address	Function	H Pickup Address	L Pickup Address	Number of H Registers	Number of L Registers	Number of Bytes	Password	Checksum H	Checksum L
0x02	0x10	0x00	0xA8	0x00	0x05	0x0A	0x4661 0x6E6F 0x782F 0x3535 0x3535	0x30	0xF4

And the SIR-A will reply OK:

Address	Function	H Pickup Address	L Pickup Address	Number of H Registers	Number of L Registers	Checksum H	Checksum L
0x02	0x10	0x00	0xA8	0x00	0x05	0x81	0xD9



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