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1. INTRODUCTION

1.1 Purpose of this document

This document describes the characteristics of the different communication protocol of **MiCOM P111Enh** relay.

The available communication protocols of **MiCOM P111Enh** relay are as follows:

- MODBUS.
- IEC 60870-5-103.

NOTE:

P111Enh has hardware options which are called Models: Model L, Model N, Model B, Model A, Model E, which has different functions.

This document shows all available functions in P111Enh. To see which function are available in model refer to the rest chapters/sections of this manual.

For example: disturbance recorder is available in model A and E only, etc.

1.2 Glossary

IA, IB, IC : currents measured on the concerned phases (A, B, C)

IN : residual current measured by earth input (= 3.I zero sequence)

pf : soft weight of a word of 16 bits

PF : heavy weight of a word of 16 bits.

2. MODBUS PROTOCOL

MiCOM P111Enh relay can communicate by a RS 485 link behind the unit following the MODBUS MODICON RTU protocol.

In MiCOM P111Enh the status of the rear communication port is signalled by flashing rectangles in the top and bottom right corners of the display. Tx (Transmit) is assigned to the top right corner, Rx (Receive) is assigned to the bottom right corner of the display. Flashing of the rectangles indicate the operation of the communication port only (not frames received and/or transmitted).

2.1 Technical characteristics of the MODBUS connection

2.1.1 Parameters of the MODBUS connection

The different parameters of the MODBUS connection are as follows :

- Isolated two-point RS485 connection (2kV 50Hz),
- MODBUS MODICON line protocol in RTU mode
- Communication speed can be configured by an operator dialog in the front panel of the relay :

Baud rate
4800
9600
38400
57600
115200

Transmission mode of the configured characters by operator dialog:

Mode
1 start / 8 bits / 1 stop : total 10 bits
1 start / 8 bits / even parity / 1 stop : total 11 bits
1 start / 8 bits / odd parity / 1 stop : total 11 bits
1 start / 8 bits / 2 stop : total 11 bits

2.1.2 Synchronisation of exchanges messages

All character received after a silence on the line with more or equal to a transmission time of 3 characters is considered as a firm start.

2.1.3 Message validity check

The frame validity is working with a cyclical redundancy code CRC with 16 bits. The generator polynomial is:

$$1 + x^2 + x^{15} + x^{16} = 1010\ 0000\ 0000\ 0001\ \text{binary} = A001h$$

Address of the MiCOM relays

The address of the MiCOM relay on a same MODBUS network is situated between 1 and 254. The address 0 is reserved for the broadcast messages

2.2 MODBUS functions of the MiCOM relays

The MODBUS functions implemented on the MiCOM relays are :

Function 3 or 4 :	Reading of n words
Function 5 :	Writing of 1 bit
Function 6 :	Writing of 1 word
Function 7 :	Fast reading of 8 bits
Function 16 :	Writing of n words

2.3 Presentation of the MODBUS protocol

Master slave protocol, all exchange understands a master query and a slave response

Frame size received from **MiCOM P111Enh Dual-powered** relay

Frame transmitted by the master (query) :

Slave number	Function code	Information	CRC16
1 byte	1 byte	n bytes	2 bytes
0 à FFh	1 à 10h		

Slave number:

The slave number is situated between 1 and 254.

A frame transmitted with a slave number 0 is globally addressed to all pieces of equipment (broadcast frame)

Function code:

Requested MODBUS function (1 to 16)

Information:

Contains the parameters of the selected function.

CRC16:

Value of the CRC16 calculated by the master.

Note: The MiCOM relay does not respond to globally broadcast frames sent out by the master.

2.3.1 Format of frames sent by the MiCOM relay

Frame sent by the MiCOM relay (response)

Slave number	Function code	Data	CRC16
1 byte	1 byte	n bytes	2 bytes
1 à FFh	1 à 10h		

Slave number :

The slave number is situated between 1 and 254.

Function code :

Processed MODBUS function (1 to 16) .

Data :

Contains reply data to master query .

CRC 16:

Value of the CRC 16 calculated by the slave.

2.3.2 Messages validity check

When **MiCOM P111Enh** relay receive a master query, it validates the frame :

- If the CRC is false, the frame is invalid. **MiCOM P111Enh** relay do not reply to the query. The master must retransmit its query. Excepting a broadcast message, this is the only case of non-reply by **MiCOM P111Enh** relay to a master query.
- If the CRC is good but the MiCOM relay can not process the query, it sends an exception response.

Warning frame sent by the MiCOM relay (response)

Slave number	Function code	Warning code	CRC16
1 byte	1 byte	1 byte	2 bytes
1 to FFh	81h or 83h or 8Ah or 8Bh		pf ... PF

Slave number :

The slave number is situated between 1 and 254.

Function code :

The function code returned by the MiCOM relay in the warning frame is the code in which the most significant bit (b7) is forced to 1.

Warning code :

On the 8 warning codes of the MODBUS protocol, the MiCOM relay manages two of them :

- code 01 : function code unauthorised or unknown.
- code 03 : a value in the data field is unauthorised (incorrect data).

Control of pages being read

Control of pages being written

Control of addresses in pages

Length of request messages

CRC16:

Value of the CRC16 calculated by the slave.

2.4 MiCOM P111Enh Dual-powered relay database organisation

2.4.1 Description of the application mapping

2.4.1.1 Settings

MiCOM P111Enh application mapping has 9 pages of parameters.

Page 0h: Product information, remote signalling, measurements

Page 1h: General remote parameters

Page 2h: Setting group 1 remote parameters

Page 3h: Setting group 2 remote parameters

Page 4h: Remote controls

Pages 5h/6h: Reserved pages

Pages 7h: Quick reading byte

Pages 8h: Time synchronisation

2.4.1.2 Disturbance Records

Before uploading any disturbance record, a service request must be send to select the record number to be uploaded.

The answer following this request contain the following information:

- Numbers of samples (pre and post time)
- Phase CT ratio
- Earth CT ratio
- Internal phase and earth ratios
- Number of the last disturbance mapping page
- Number of samples in this last disturbance mapping page

The mapping pages used for this service request are from 38h to 3Ch.

Pages 9h to 21h : Contain the disturbance data (25 pages)

A disturbance mapping page contains 250 words:

0900 to 09FAh :	250 disturbance data words
0A00 to 0AFAh :	250 disturbance data words
0B00 to 0BFAh :	250 disturbance data words

.....

2100 to 21FAh :	250 disturbance data words
-----------------	----------------------------

The disturbance data pages contain the sample of a single channel from a record.

Page 22h : contains the index of the disturbance

Page 38h to 3Ch : Selection of the disturbance record and channel

Page 3Dh : A dedicated request allows to know the number of disturbance records stored in FRAM memory.

2.4.1.3 Event records

To upload the event records two requests are allowed:

Page 35h: Request to upload an event record without acknowledge of this event.

Used addresses:

3500h : EVENT 1

.....

3563h : EVENT 100

Page 36h: Request to upload the non-acknowledged oldest stored event record.

Two modes are available for the acknowledgement: automatic acknowledgement or manual acknowledgement

The mode depends of the state of bit 12 of telecommand word (address 400 h).

If this bit is set, then the acknowledgement is manual else the acknowledgement is automatic.

In automatic mode, the reading of the event acknowledges the event.

In manual mode, it is necessary to write a specific command to acknowledge the oldest event

(set the bit 13 of control word 400 h)

2.4.1.4 Fault records

Page 37h: Page dedicated to upload fault record

Used addresses:

3700h : FAULT 1

3701h : FAULT 2

.....

3704h : FAULT 5

Page 3Eh: Request to upload the non-acknowledged oldest stored fault record.

Two modes are available for the acknowledgement: automatic acknowledgement or manual acknowledgement

The mode depends of the state of bit 12 of telecommand word (address 400 h).

If this bit is set, then the acknowledgement is manual else the acknowledgement is automatic.

In automatic mode, the reading of the fault acknowledges automatically the event.

In manual mode, it is necessary to write a specific command to acknowledge the oldest fault.

(set the bit 14 of control word 400 h)

2.4.1.5 Characteristics

Page 0h can only be read through communication.

Pages 1h, 2h, 3h and 4h can be read and write.

Page 7h can be access in quick reading only.

Page 8h can be write.

They are describe more precisely in the following chapters.

2.4.2 Page 0h : Product information, remote signalling, measurements

Read access only

Address	Group	Description	Values range	Step	Unit	Format	Default Value
0000	Product Information	Relay description characters 1 and 2	32-127	1	-	F10	P1
0001		Relay description characters 3 and 4	32-127	1	-	F10	16
0002		Relay description characters 5 and 6	32-127	1	-	F10	
0003		Unit reference characters 1 and 2	32-127	1	-	F10	SE
0004		Unit reference characters 3 and 4	32-127	1	-	F10	
0005		Software Version	10 to 99		-	F15	
0006		Hardware Version	0 to 3		-	F58	
0007		Line CT Sec	0 to 1		-	F23	
0008		E/Gnd CT Sec	0 to 1		-	F23A	
0009		Active Set Group	0 to 1		-	F32	0
000A		Nominal frequency	0 to 1	1	-	F57	0
000B		Software Version Number	0 to 1	1	-	F90	
000C-000F		Reserved			-		
0010	Remote signalling	Logical inputs	0 to 15	1	bits	F11	
0011		Current Protection disable status (1)	0 to 15	1	bits	F12	
0012		Protection Function disable status (2)	0 to 15	1	bits	F12A	
0013		Output contacts status	0 to 15	1	bits	F24	
0014		Logical LEDs status	0 to 15	1	bits	F25	
0015		Latched Output info.: Current Protection starting status (1)	0 to 15	1	bits	F28	
0016		Latched Output info.: Protection Fuction starting status (2)	0 to 15	1	bits	F28A	
0017		Latched Output info.: Current Protection trip status (1)	0 to 15	1	bits	F29	
0018		Output information: Protection Fuction trip status (2)	0 to 15	1	bits	F29A	
0019		Latched Output info.:Current Protection Alarm status 1	0 to 15	1	bits	F31	
001A		Latched Output info.: Protection Fuction Alarm status 2	0 to 15	1	bits	F31A	
001B		CB status	0 to 15	1	-	F30	
001C		[79] Status	0 to 15	1	-	F59	
001D		[79] Blocking Status	0 to 15	1	-	F60	
001E		Local/Romote Mode Status	0 to 15	1	-	F61	

CT

Address	Group	Description	Values range	Step	Unit	Format	Default Value
001F		Maintenance Mode	0 to 15	1	-	F62	
0020		Hardware Warning	0 to 15	1	-	F26	
0021		Output information: I>	0 to 15	1	bits	F37	
0022		Output information: I>>	0 to 15	1	bits	F37	
0023		Output information: I>>>	0 to 15	1	bits	F37	
0024		Output information: IN_1 stage	0 to 15	1	bits	F50	
0025		Output information: IN_2 stage	0 to 15	1	bits	F50	
0026		Output information: IN_3 stage	0 to 15	1	bits	F50	
0027		Output information: AUX1	0 to 15	1	bits	F51	
0028		Output information: AUX2	0 to 15	1	bits	F51	
0029		Output information: CB Fail	0 to 15	1	bits	F51	
002A		Output information: tCB ext. sign	0 to 15	1	bits	F51	
002B		Output information: SOTF	0 to 15	1	bits	F37	
002C		Output information: I<	0 to 15	1	bits	F50	
002D		Output information: I2>	0 to 15	1	bits	F50	
002E		Output information: Brkn.Cond	0 to 15	1	bits	F50	
002F		Output information: Thermal OL	0 to 15	1	bits	F50	
0030		Output information: AUX3	0 to 15	1	bits	F51	
0031		Output information: AUX4	0 to 15	1	bits	F51	
0032		Output information: Input Protection blocking 1	0 to 15	1	bits	F101	
0033		Output information: Input Protection blocking 2	0 to 15	1	bits	F102	
0034		Output information: Input Selective logic 1	0 to 15	1	bits	F103	
0035		Output information: Input logic data	0 to 15	1	bits	F104	
0036		Output information: Internal logic data	0 to 15	1	bits	F105	
0037 to 003F		Reserved					
0040	Remote measurements	Phase IA (L1) current [A]	0 to 60 000	1	[A]/100	F1	
0041		Phase IB (L2) current [A]	0 to 60 000	1	[A]/100	F1	
0042		Phase IC (L3) current [A]	0 to 60 000	1	[A]/100	F1	
0043		E/GND IN (IE) current [A]	0 to 60 000	1	[A] x 100	F1	
0044		I2 (negative sequence) current [A]	0 to 60 000		[A] x 100	F1	
0044		I1 (positive sequence) current [A]	0 to 60 000		[A] x 100	F1	
0045-004F		Reserved					
0050		Phase IA (L1) current [In]	0 to 60 000		[In]	F1	

Address	Group	Description	Values range	Step	Unit	Format	Default Value
0051		Phase IB (L2) current [In]	0 to 60 000	1	[In]	F1	
0052		Phase IC (L3) current [In]	0 to 60 000	1	[In]	F1	
0053		E/F current [Ien]	0 to 60 000	1	[Ien]	F1	
0054		I2 (negative sequence) current [In]	0 to 60 000	1	[In]	F1	
0055		I1 (positive sequence) current [In]	0 to 60 000	1	[In]	F1	
0056-005F		Reserved					
0060		I2/I1 current [%]	0 to 100	1	[%]	F1	
0061		Thermal Overload [%]	0 to 300	1	[%]	F1	
0062		2th harmonic [%] Phase A	0 to 100	1	[%]	F1	
0063		2th harmonic [%] Phase B	0 to 100	1	[%]	F1	
0064		2th harmonic [%] Phase C	0 to 100	1	[%]	F1	
0066-00FF		Reserved					

2.4.3 Page 1h, MiCOM P111Enh : general remote parameters

Read and write access

Address	Group	Description	Values range	Step	Unit	Format	Default Value
0100	Remote parameters	Address	1 to 127	1	-	F1	254
0101		Protocol for RS485	0 to 1	1		F56	0
0102		Baud Rate	0 to 5	1		F19	2
0103		Parity	0 to 2	1		F20	0
0104		Stop bits	0 to 1	1		F22	0
0105-010F		Reserved					
0110	Counters	Trips Number	0 to 65535	1	-	F1	0
0111		Close Number	0 to 65535	1	-	F1	0
0112		Fault Trips Number	0 to 65535	1	-	F1	0
0113		Fault Start Number	0 to 65535	1	-	F1	0
0114		Alarm Number	0 to 65535	1	-	F1	0
0115		HW Warnings Number	0 to 65535	1	-	F1	0
0116		79 Action Total	0 to 65535	1	-	F1	0
0117		79 Total Trips&Lockout	0 to 65535	1	-	F1	0
0118		79 Successful Number	0 to 65535	1	-	F1	0
0119		79 Cycle 1 Recloses	0 to 65535	1	-	F1	0
011A		79 Cycle 2 Recloses	0 to 65535	1	-	F1	0
011B		79 Cycle 3 Recloses	0 to 65535	1	-	F1	0
011C		79 Cycle 4 Recloses	0 to 65535	1	-	F1	0
011D		CB close Monitoring	0 to 65535	1	-	F1	0
011E		CB open Monitoring	0 to 65535	1	-	F1	0
011F		CB AMPS Value	0 to 65535	1	-	F1	0
0116-011F		Reserved					
0120	CT Ratio	Line CT primary	1 to 30000	1	A	F1	
0121		Line CT Sec.	0 to 1	1	-	F91	
0122		E/Gnd CT Primary	1 to 30000	1	A	F1	
0123		E/GND CT Sec.	0 to 1	1	-	F92	
0122-012F		Reserved					
0130	Blocking Inrush	Inrush Blocking ?	0 to 2	1	-	F74	0
0131		2nd Harmonic Ratio	10 to 50	1	%	F1	20
0132		Inrush Reset Time	0 to 20000	1	1/100 s	F1	100
0133		Unblock Inrush Time	0 to 20000	1	1/100 s	F1	100
0134-013F		Reserved					
0137	O/C Advanced Settings	I< stage for Broken Conductor	10 to 100	1	[In]/100	F1	10
0138		IDMT interlock by DMT stage	0 to 1	1	-	F88	0

CT

Address	Group	Description	Values range	Step	Unit	Format	Default Value
GLOBAL SETTINGS							
0140	LOC	Language	0 to 5	1	-	F52	0
0141		Default display	0 to 2	1	-	F53	0
0142		LEDs Reset by	0 to 1	1	-	F54	0
0143		Ltchd Outp Reset	0 to 1	1	-	F54	0
0144		Trip Info Reset	0 to 1	1	-	F54	0
0145		Alarm Display Reset	0 to 1	1	-	F55	0
0146		Nominal frequency	0 to 1	1	-	F57	0
0147		Reserved					
0148		Control Keys Confirmation	0 to 1	1	-	F82	0
0149		I>, I>>, I>>> (1harmonic or True RMS)	0 to 1	1	-	F81	0
014A-014F		Reserved					
0150	SETTING GROUP SELECT	Number of Setting Groups	0 to 1	1	-	F71	0
0151		Setting group change	0 to 1	1	-	F32	0
0152		t Change Setting G1->G2	0 to 20000	1	1/100 s	F1	0
0153-015F		Reserved					
0160	[79] ADVANCED SETTINGS	[79] CB Healthy Monit?	0 to 1	1	-	F63	
0161		[79] Block via Input ?	0 to 1	1	-	F63	0
0162		[79] Start Dead t On	0 to 1	1	-	F64	1
0163		Rolling Demand?	0 to 1	1	-	F54	0
0164		Max cycles Nb Rol.Demand	2 to 100	1	-	F1	2
0165		Time Period Rol.Demand	1 to 1410	1	mn	F1	
0166		[79] Time Inhibit on Close	1 to 60000	1	1/100 s	F1	100
0167		[79] Reset Signaling on Close	0 to 1	1	-	F106	0
0168-017F		Reserved					
0180	CIRCUIT BREAKER	tOpen pulse min	10 to 1000	1	1/100 s	F1	50
0181		tClose Pulse	10 to 1000	1	1/100 s	F1	50
0182		Time Delay for close Command	0 to 20000	1	1/100 s	F1	0
0184		tCB FLT ext.sign.	1 to 200	1	S	F1	16
0185		Remote Mode	0 to 1	1	-	F73	
0186		52 Unblock SOTF Time	10 to 20000	1	1/100 s	F1	100
0187		TC Supervision?	0 to 1	1	-	F107	0
0188		tSUP	10 to 1000		1/100 s	F1	10
0189		CB Supervision?	0 to 1	1	-	F63	0
018A		Max CB Open Time	1 to 1000	1	1/100 s	F1	10
018B		Max CB Close Time	1 to 1000	1	1/100 s	F1	10

CT

Address	Group	Description	Values range	Step	Unit	Format	Default Value
018C		CB Diagnostic?	0 to 1	1	-	F63	0
018D		Max CB Open No.	0 to 65535	1	-	F1	0
018E		Max Sum AMPS^n	0 to 65535	1	-	F1	0
018F		AMPS's n=	1 to 2	1	-	F1	2
0190		Reserved					
019A	DISTURBANCE RECORDER	Pre-Time	10 to 700	1	1/100 s	F1	10
019B		Post TripTime	10 to 100	1	1/100 s	F1	10
019C		Distrurb Rec Trig	0 to 1	1	-	F65	0
019D		Max record Time	150 to 750	1	1/100 s	F1	10
019E-01A4		Reserved					
01A5	COMMISSIONING	Maintenance Mode	0 to 1	1	-	F54	0
01A6		Test Pattern			bits	F40	00000000
01A7		Contact Test Time	0-20000	1	1/100 s	F1	10
01A8		Test Outputs	0 to 1	1	-	F75	0
01A9		Functional Test Pattern	0 to 12	1	-	F76	0
01AA		Functional Test End	0 to 1	1	-	F77	0
01AB		Functional Test Time	10-20000	1	1/100 s	F1	10
01AC		Functional Test	0 to 1	1	-	F75	0
01AD-01AF		Reserved					
01C3-01FF		Reserved					

2.4.4 Page 2h : setting Group 1

Access in reading and in writing

Address	Group	Description	Values range	Step	Unit	Format	Default Value
0200	Setting Group 1 / Protection G1 /Phase O/C	I> ?	0-4	1	-	F16A	0
0201		I> threshold	10 to 4000	1	In/100	F1	140
0202		ItI>/TMS/TD	2 to 20000	1	1/100 s	F1	100
0203		I> Delay Type	0 to 15	1	-	F18	1
0204		I> Reset Delay Type	0 -1	1	-	F41	0
0205		I> DMT/RTMS tReset	0 to 20000	1	1/100 s	F1	0
0206		I>>?	0-4	1	-	F16A	0
0207		I>> Threshold	10 to 4000	1	In/100	F1	140
0208		tI>>/TMS/TD	2 to 20000	1	1/100 s	F1	100
0209		I>> Delay Type	0 to 15	1	-	F18	1
020A		I>> Reset Delay Type	0 -1	1	-	F41	0
020B		I>> DMT/RTMS tReset	0 to 20000	1	1/100 s	F1	0
020C		I>>>?	0-4	1	-	F16A	0
020D		I>>> Threshold	10 to 4000	1	In/100	F1	400
020E		tI>>>	0 to 20000	1	1/100 s	F1	100
020F	Setting Group 1 / Protection G1 /SOTF G1	SOTF?	0-4		-	F16	0
0210		SOTF Threshold	10 to 4000	1	In/100	F1	400
0211		tSOTF	0 to 60000	1	1/100 s	F1	100
0212	Setting Group 1 / Protection G1 /E/GND Fault	IN_1 stage?	0-4	1	-	F84	0
0213		IN_1 Threshold	Ref TD	1	len/100	F1	10 50 100
0214		tIN_1/TMS/TD	2 to 20000	1	1/100 s	F1	100
0215		IN_1 Delay Type	0 to 12	25	-	F18	1
0216		IN_1 Reset Delay Type	0 -1	5	-	F41	0
0217		IN_1 DMT tReset	0 to 20000	1	1/100 s	F1	0
0218		IN_2?	0-2	0-2	-	F84	0
0219		IN_2 Threshold	Ref TD	1	len/100	F1	options
021A		tIN_2	0 to 20000	1	1/100 s	F1	10
021B		IN_3?	0-2	0-2	-	F84	0
021C		IN_3 Threshold	Ref TD	1	len/100	F1	options
021D		tIN_3	0 to 20000	1	1/100 s	F1	10
0221	Setting Group 1 / Protection G1	I2>?	0-4	1	-	F16	0

CT

Address	Group	Description	Values range	Step	Unit	Format	Default Value
	/Neg.Seq.O/C						
0222		I2> threshold	10 to 400	1	In/100	F1	140
0223		tI2>/TMS/TD	2 to 20000	1	1/100 s	F1	100
0224		I2> Delay Type	0 to 15	1	-	F18	1
0225		I2> Reset Delay Type	0 -1	25	-	F41	0
0226		I2> DMT/RTMS tReset	0 to 60000	5	1/100 s	F1	0
0227	Setting Group 1 / Protection G1 /Broken Conductor	Broken Cond.?	0-4	1	-	F16	0
0228		Ratio I2/I1	20 to 100	1	%	F1	20
0229		tBCond	0 to 60000	1	1/100 s	F1	100
022A	Setting Group 1 / Protection G1 /Thermal Overload	Therm OL?	0-1	1	-	F109	0
022B		Itheta>	10 to 300	1	In/100	F1	140
022C		Therm Alarm?	0-1	1	-	F109	0
022D		Te	1 to 200	1	min	F1	1
022E		Tr	1 to 999	1	min	F1	1
022F		Theta Trip	50 to 200	1	%	F1	100
0230		Theta Reset	20 to 99	1	%	F1	95
0231		Theta Alarm	20 to 200	1	%	F1	80
0232	Setting Group 1 / Protection G1 /Aux Timers	AUX1?	0-7	1	-	F110	0
0233		tAUX1	0 to 60000	1	1/100 s	F1	0
0234		AUX2?	0-7	1	-	F110	0
0235		tAUX2	0 to 60000	1	1/100 s	F1	0
0236		AUX2?	0-7	1	-	F110	0
0237		tAUX2	0 to 60000	1	1/100 s	F1	0
0238		AUX2?	0-7	1	-	F110	0
0239		tAUX2	0 to 60000	1	1/100 s	F1	0
023A	Setting Group 1 / Protection G1 /CB Fail	CB Fail?	0-2	1	-	F111	0
023B		CB Fail Time tBF	0 to 1000	1	1/100 s	F1	20
023C		I< Threshold CBF	10 to 200	1	In/100	F1	10
023D		IN< Threshold CBF	10 to 200	1	Ien/100	F1	10
023E		Block I>	0 to 1	1	-	F63	0
023F		Block IN>	0 to 1	1	-	F63	0
0240	Setting Group 1 / Protection G1 /Logic Selective	Sel1?	0-1	1	-	F109	0
0241		tSEL1	0 to 60000	5	1/100 s	F1	0

CT

Address	Group	Description	Values range	Step	Unit	Format	Default Value
0242		Sel2?	0-1	1	-	F109	0
0243		tSEL2	0 to 60000	5	1/100 s	F1	0
0244	Setting Group 1 / Protection G1 / Cold Load PU	Cold Load PU?	0-1	1	-	F109	0
0245		Cold Load PU Level	20 to 999	1	%	F1	100
0246		Cold Load PU tCL	0 to 60000	1	1/100 s	F1	0
0247		Cold Load PU I>	0 -1	1	-	F63	0
0248		Cold Load PU I>>	0 -1	1	-	F63	0
0249		Cold Load PU I>>>	0 -1	1	-	F63	0
024A		Cold Load PU IN_1	0 -1	1	-	F63	0
024B		Cold Load PU IN_2	0 -1	1	-	F63	0
024C		Cold Load PU IN_3	0 -1	1	-	F63	0
024D		Cold Load PU Brkn Cond	0 -1	1	-	F63	0
024E		Cold Load PU Itherm	0 -1	1	-	F63	0
024F		Cold Load PU I2>	0 -1	1	-	F63	0
0250	Setting Group 1 / Protection G1 / Autoreclose	Autoreclose?	0 -1	1	-	F109	0
0251		Dead Time tD1	0 to 60000	1	1/100 s	F1	0
0252		Dead Time tD2	0 to 60000	1	1/100 s	F1	0
0253		Dead Time tD3	0 to 60000	1	1/100 s	F1	0
0254		Dead Time tD4	0 to 60000	1	1/100 s	F1	0
0255		Dead Time tR	0 to 60000	1	1/100 s	F1	0
0256		Fast O/C Trip	0 to 1	1	Bits	F72	00000
0257		Fast O/C Trip Delay	0 to 999	1	1/100 s	F1	0
0258		Fast E/GND Trip	0 to 1	1	Bits	F72	00000
0259		Fast E/GND Trip Delay	0 to 999	1	1/100 s	F1	0
025A		tl> Close Shot ?	0 to 1	1	Bits	F67	0000
025B		tl> Inhibit Trip : Shot	0 to 1	1	Bits	F67	00000
025C		tl>> Close Shot ?	0 to 1	1	Bits	F67	0000
025D		tl>> Inhibit Trip : Shot	0 to 1	1	Bits	F67	00000
025E		tl>>> Close Shot ?	0 to 1	1	Bits	F67	0000
025F		tl>>> Inhibit Trip : Shot	0 to 1	1	Bits	F67	00000
0260		tlIN_1 Close Shot ?	0 to 1	1	Bits	F67	0000
0261		tlIN_1 Inhibit Trip : Shot	0 to 1	1	Bits	F67	00000
0262		tlIN_2 Close Shot ?	0 to 1	1	Bits	F67	0000
0263		tlIN_2 Inhibit Trip : Shot	0 to 1	1	Bits	F67	00000
0264		tlIN_3 Close Shot ?	0 to 1	1	Bits	F67	0000
0265		tlIN_3 Inhibit Trip : Shot	0 to 1	1	Bits	F67	00000
0266		tAUX1 Close Shot ?	0 to 1	1	Bits	F67	0000
0267		tAUX1 Inhibit Trip : Shot	0 to 1	1	Bits	F67	00000

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Address	Group	Description	Values range	Step	Unit	Format	Default Value
0268		tAUX2 Close Shot ?	0 to 1	1	bits	F67	0000
0269		tAUX2 Inhibit Trip : Shot	0 to 1	1	bits	F67	00000
026A	Setting group 1 /Inputs configuration	Reverse Input Logic	0 to 1	1	bits	F35	000000
026B		Maintenance Mode	0 to 1	1	bits	F35	000000
026C		Reset Latched Signaling	0 to 1	1	bits	F35	000000
026D		Reset Latched Outputs	0 to 1	1	bits	F35	000000
026E		Blocking tI>	0 to 1	1	bits	F35	000000
026F		Blocking tI>>	0 to 1	1	bits	F35	000000
0270		Blocking tI>>>	0 to 1	1	bits	F35	000000
0271		Blocking tSOTF	0 to 1	1	bits	F35	000000
0272		Blocking tIN_1	0 to 1	1	bits	F35	000000
0273		Blocking tIN_2	0 to 1	1	bits	F35	000000
0274		Blocking tIN_3	0 to 1	1	bits	F35	000000
0275		Reserved					
0276		Blocking tI2>	0 to 1	1	bits	F35	000000
0277		Blocking tBroken Conductor	0 to 1	1	bits	F35	000000
0278		Blocking tItherm	0 to 1	1	bits	F35	000000
0279		Blocking tAUX1	0 to 1	1	bits	F35	000000
027A		Blocking tAUX2	0 to 1	1	bits	F35	000000
027B		Blocking tAUX3	0 to 1	1	bits	F35	000000
027C		Blocking CB Fail	0 to 1	1	bits	F35	000000
027D		Blocking Autoreclose [79]	0 to 1	1	bits	F35	000000
027E		Selectivity Logic 1 tI>>	0 to 1	1	bits	F35	000000
027F		Selectivity Logic 1 tI>>>	0 to 1	1	bits	F35	000000
0280		Selectivity Logic 1 tIN_2	0 to 1	1	bits	F35	000000
0281		Selectivity Logic 1 tIN_3	0 to 1	1	bits	F35	000000
0282		Selectivity Logic 2 tI>>	0 to 1	1	bits	F35	000000
0283		Selectivity Logic 2 tI>>>	0 to 1	1	bits	F35	000000
0284		Selectivity Logic 2 tIN_2	0 to 1	1	bits	F35	000000
0285		Selectivity Logic 2 tIN_3	0 to 1	1	bits	F35	000000
0286		AUX1	0 to 1	1	bits	F35	000000
0287		AUX2	0 to 1	1	bits	F35	000000
0288		AUX3	0 to 1	1	bits	F35	000000
0289		AUX4	0 to 1	1	bits	F35	000000
028A		AUX5	0 to 1	1	bits	F35	000000
028B		AUX6	0 to 1	1	bits	F35	000000
028C		Cold Load Pick Up	0 to 1	1	bits	F35	000000
028D		Start tBF (CB Fail)	0 to 1	1	bits	F35	000000
028E		CB status 52A	0 to 1	1	bits	F35	000000

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Address	Group	Description	Values range	Step	Unit	Format	Default Value
028F		CB status 52B	0 to 1	1	bits	F35	000000
0290		CB Faulty External Signal	0 to 1	1	bits	F35	000000
0291		Setting Group 2	0 to 1	1	bits	F35	000000
0292		Manual Close	0 to 1	1	bits	F35	000000
0293		Manual Trip	0 to 1	1	bits	F35	000000
0294		Trip Circuit Supervision	0 to 1	1	bits	F35	000000
0295		Reset Theta value	0 to 1	1	bits	F35	000000
0296		Start Disturbance Recorder	0 to 1	1	bits	F35	000000
0297		Local CTRL Mode	0 to 1	1	bits	F35	000000
0298		Time Synchronization	0 to 1	1	bits	F35	000000
0299	Setting group 1 /Outputs relays configuration	Latched outputs	0 to 1	1	bits	F36	000000
029A		Reverse output Logic	0 to 1	1	bits	F36	0000000
029B		Protection Trip	0 to 1	1	bits	F36	0000000
029C		Protection Trip (pulse)	0 to 1	1	bits	F36	0000000
029D		Trip CB order	0 to 1	1	bits	F36	0000000
029E		Close CB order	0 to 1	1	bits	F36	0000000
029F		Alarm	0 to 1	1	bits	F33	00000000
02A0-02A2		Reserved					
02A3		Start I>	0 to 1	1	bits	F36	0000000
02A4		Start I>>	0 to 1	1	bits	F36	0000000
02A5		Start I>>>	0 to 1	1	bits	F36	0000000
02A6		Start SOTF	0 to 1	1	bits	F36	0000000
02A7		Start IN_1	0 to 1	1	bits	F36	0000000
02A8		Start IN_2	0 to 1	1	bits	F36	0000000
02A9		Start IN_3	0 to 1	1	bits	F36	0000000
02AA		Reserved					
02AB		Start I2>	0 to 1	1	bits	F36	0000000
02AC		Start Broken Conductor	0 to 1	1	bits	F36	0000000
02AD		AUX1	0 to 1	1	bits	F36	0000000
02AE		AUX2	0 to 1	1	bits	F36	0000000
02AF		AUX3	0 to 1	1	bits	F36	0000000
02B0		AUX4	0 to 1	1	bits	F36	0000000
02B1		AUX5	0 to 1	1	bits	F36	0000000
02B2		AUX6	0 to 1	1	bits	F36	0000000
02B3		tl>	0 to 1	1	bits	F36	0000000
02B4		tl>>	0 to 1	1	bits	F36	0000000
02B5		tl>>>	0 to 1	1	bits	F36	0000000
02B6		tSOTF	0 to 1	1	bits	F36	0000000
02B7		tlIN_1	0 to 1	1	bits	F36	0000000
02B8		tlIN_2	0 to 1	1	bits	F36	0000000
02B9		tlIN_3	0 to 1	1	bits	F36	0000000
02BA		Reserved					
02BB		tl2>	0 to 1	1	bits	F36	0000000

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Address	Group	Description	Values range	Step	Unit	Format	Default Value
02BC		t Broken Conductor	0 to 1	1	Bits	F36	0000000
02BD		Thermal Trip	0 to 1	1	Bits	F36	0000000
02BE		Thermal Alarm	0 to 1	1	bits	F36	0000000
02BF		CB Fail	0 to 1	1	bits	F36	0000000
02C0		tAUX1	0 to 1	1	bits	F36	0000000
02C1		tAUX2	0 to 1	1	bits	F36	0000000
02C2		tAUX3	0 to 1	1	bits	F36	0000000
02C3		tAUX4	0 to 1	1	bits	F36	0000000
02C4		Communication Order 1 (remote via RS485)	0 to 1	1	bits	F36	0000000
02C5		Communication Order 2 (remote via RS485)	0 to 1	1	bits	F36	0000000
02C6		[79] Autoreclose in progress	0 to 1	1	bits	F36	0000000
02C7		[79] Autoreclose Final Trip	0 to 1	1	bits	F36	0000000
02C8		[79] Autoreclose Lockout (internal block)	0 to 1	1	bits	F36	0000000
02C9		[79] Autoreclose blocked (external blocking)	0 to 1	1	bits	F36	0000000
02CA		79 Autoreclose Successful	0 to 1	1	bits	F36	0000000
02CB		TCS Trip Circuit Supervision (52) : CB Fail	0 to 1	1	bits	F36	0000000
02CC		CB Alarm (CB diagnostic)	0 to 1	1	bits	F36	0000000
02CD		Reserved					
02CE		tCB Faulty detection based on External Signal (input)	0 to 1	1	bits	F36	0000000
02CF		Setting Group 1 is set	0 to 1	1	bits	F36	0000000
02D0	Setting group 1 /LEDs configuration	Latched LEDs	0 to 1	1	bits	F39	000000
02D1		Protection Trip	0 to 1	1	bits	F39	000000
02D2		Alarm	0 to 1	1	bits	F39	000000
02D3		General Start	0 to 1	1	bits	F39	000000
02D4		Start Phase A	0 to 1	1	bits	F39	000000
02D5		Start Phase B	0 to 1	1	bits	F39	000000
02D6		Start Phase C	0 to 1	1	bits	F39	000000
02D7		Start I>	0 to 1	1	bits	F39	000000
02D8		Start I>>	0 to 1	1	bits	F39	000000
02D9		Start I>>>	0 to 1	1	bits	F39	000000
02DA		Start SOTF	0 to 1	1	bits	F39	000000
02DB		Start IN_1	0 to 1	1	bits	F39	000000
02DC		Start IN_2	0 to 1	1	bits	F39	000000
02DD		Start IN_3	0 to 1	1	bits	F39	000000
02DE		AUX1	0 to 1	1	bits	F39	000000
02DF		AUX2	0 to 1	1	bits	F39	000000
02E0		AUX3	0 to 1	1	bits	F39	000000
02E1		AUX4	0 to 1	1	bits	F39	000000
02E2		AUX5	0 to 1	1	bits	F39	000000
02E3		AUX6	0 to 1	1	bits	F39	000000

Address	Group	Description	Values range	Step	Unit	Format	Default Value
02E4		tl>	0 to 1	1	bits	F39	000000
02E5		tl>>	0 to 1	1	bits	F39	000000
02E6		tl>>>	0 to 1	1	bits	F39	000000
02E7		tSOTF	0 to 1	1	bits	F39	000000
02E8		tIN_1	0 to 1	1	bits	F39	000000
02E9		tIN_2	0 to 1	1	bits	F39	000000
02EA		tIN_3	0 to 1	1	bits	F39	000000
02EB		Reserved					
02EC		tl2>	0 to 1	1	bits	F39	000000
02ED		tBroken Conductor	0 to 1	1	bits	F39	000000
02EE		Thermal Trip	0 to 1	1	bits	F39	000000
02EF		Thermal Alarm	0 to 1	1	bits	F39	000000
02F0		tCB Fail	0 to 1	1	bits	F39	000000
02F1		tAUX1	0 to 1	1	bits	F39	000000
02F2		tAUX2	0 to 1	1	bits	F39	000000
02F3		tAUX3	0 to 1	1	bits	F39	000000
02F4		tAUX4	0 to 1	1	bits	F39	000000
02F5		[79] Autoreclose in progress	0 to 1	1	bits	F39	000000
02F6		[79] Autoreclose Final Trip	0 to 1	1	bits	F39	000000
02F7		[79] Autoreclose Lockout (internal block)	0 to 1	1	bits	F39	000000
02F8		[79] Autoreclose blocked (external blocking)	0 to 1	1	bits	F39	000000
02F9		[79] Autoreclose Successful	0 to 1	1	bits	F39	000000
02FA		Local CTRL Mode	0 to 1	1	bits	F39	000000
02FB		CB Alarm (CB diagnostic)	0 to 1	1	bits	F39	000000
02FC		Maintenance Mode	0 to 1	1	bits	F39	000000
02FD		tCB Faulty detection based on External Signal (input)	0 to 1	1	bits	F39	000000
02FE		Setting Group 1 is set	0 to 1	1	bits	F39	000000

2.4.5 Page 3h : setting Group 2

Access in reading and in writing

Address	Group	Description	Values range	Step	Unit	Format	Default Value
0300	Setting Group 1 / Protection G2 /Phase O/C	I> ?	0-4	1	-	F16	0
0301		I> threshold	10 to 4000	1	In/100	F1	140
0302		tI>/TMS/TD	2 to 20000	1	1/100 s	F1	100
0303		I> Delay Type	0 to 15	1	-	F18	1
0304		I> Reset Delay Type	0 -1	1	-	F41	0
0305		I> DMT/RTMS tReset	0 to 20000	1	1/100 s	F1	0
0306		I>>?	0-4	1	-	F16	0
0307		I>> Threshold	10 to 4000	1	In/100	F1	140
0308		tI>>/TMS/TD	2 to 20000	1	1/100 s	F1	100
0309		I>> Delay Type	0 to 15	1	-	F18	1
030A		I>> Reset Delay Type	0 -1	1	-	F41	0
030B		I>> DMT/RTMS tReset	0 to 20000	1	1/100 s	F1	0
030C		I>>>?	0-4	1	-	F16	0
030D		I>>> Threshold	10 to 4000	1	In/100	F1	400
030E		tI>>>	0 to 20000	1	1/100 s	F1	100
030F	Setting Group 2 / Protection G2 /SOTF G1	SOTF?	0-4		-	F16	0
0310		SOTF Threshold	10 to 4000	1	In/100	F1	400
0311		tSOTF	0 to 60000	1	1/100 s	F1	100
0312	Setting Group 2 / Protection G2 /E/GND Fault	IN_1 stage?	0-4	1	-	F84	0
0313		IN_1 Threshold	Ref TD	1	len/100	F1	10 50 100
0314		tIN_1/TMS/TD	2 to 20000	1	1/100 s	F1	100
0315		IN_1 Delay Type	0 to 12	25	-	F18	1
0316		IN_1 Reset Delay Type	0 -1	5	-	F41	0
0317		IN_1 DMT tReset	0 to 20000	1	1/100 s	F1	0
0318		IN_2?	0-2	0-2	-	F84	0
0319		IN_2 Threshold	Ref TD	1	len/100	F1	options
031A		tIN_2	0 to 20000	1	1/100 s	F1	10
031B		IN_3?	0-2	0-2	-	F84	0
031C		IN_3 Threshold	Ref TD	1	len/100	F1	options
031D		tIN_3	0 to 20000	1	1/100 s	F1	10
031E -0320		Reserved					

CT

Address	Group	Description	Values range	Step	Unit	Format	Default Value
0321	Setting Group 2 / Protection /Neg.Seq.O/C	I2>?	0-4	1	-	F16	0
0322		I2> threshold	10 to 400	1	In/100	F1	140
0323		tI2>/TMS/TD	2 to 20000	1	1/100 s	F1	100
0324		I2> Delay Type	0 to 15	1	-	F18	1
0325		I2> Reset Delay Type	0 -1	25	-	F41	0
0326		I2> DMT/RTMS tReset	0 to 60000	5	1/100 s	F1	0
0327	Setting Group 2 / Protection /Broken Conductor	Broken Cond.?	0-4	1	-	F16	0
0328		Ratio I2/I1	20 to 100	1	%	F1	20
0329		tBCond	0 to 60000	1	1/100 s	F1	100
032A	Setting Group 2 / Protection /Thermal Overload	Therm OL?	0-1	1	-	F109	0
032B		Itheta>	10 to 300	1	In/100	F1	140
032C		Therm Alarm?	0-1	1	-	F109	0
032D		Te	1 to 200	1	min	F1	1
032E		Tr	1 to 999	1	min	F1	1
032F		Theta Trip	50 to 200	1	%	F1	100
0330		Theta Reset	20 to 99	1	%	F1	95
0331		Theta Alarm	20 to 200	1	%	F1	80
0332	Setting Group 2 / Protection /Aux Timers	AUX1?	0-7	1	-	F110	0
0333		tAUX1	0 to 60000	1	1/100 s	F1	0
0334		AUX2?	0-7	1	-	F110	0
0335		tAUX2	0 to 60000	1	1/100 s	F1	0
0336		AUX2?	0-7	1	-	F110	0
0337		tAUX2	0 to 60000	1	1/100 s	F1	0
0338		AUX2?	0-7	1	-	F110	0
0339		tAUX2	0 to 60000	1	1/100 s	F1	0
033A	Setting Group 2 / Protection /CB Fail	CB Fail?	0-2	1	-	F111	0
033B		CB Fail Time tBF	0 to 1000	1	1/100 s	F1	20
033C		I< Threshold CBF	10 to 200	1	In/100	F1	10
033D		IN< Threshold CBF	10 to 200	1	Ien/100	F1	10
033E		Block I>	0 to 1	1	-	F63	0
033F		Block IN>	0 to 1	1	-	F63	0
0340	Setting Group 2 / Protection /Logic Selective	Sel1?	0-1	1	-	F109	0

CT

Address	Group	Description	Values range	Step	Unit	Format	Default Value
0341		tSEL1	0 to 60000	5	1/100 s	F1	0
0342		Sel2?	0-1	1	-	F109	0
0343		tSEL2	0 to 60000	5	1/100 s	F1	0
0344	Setting Group 2 / Protection G2 /Cold Load PU	Cold Load PU?	0-1	1	-	F109	0
0345		Cold Load PU Level	20 to 999	1	%	F1	100
0346		Cold Load PU tCL	0 to 60000	1	1/100 s	F1	0
0347		Cold Load PU I>	0 -1	1	-	F63	0
0348		Cold Load PU I>>	0 -1	1	-	F63	0
0349		Cold Load PU I>>>	0 -1	1	-	F63	0
034A		Cold Load PU IN_1	0 -1	1	-	F63	0
034B		Cold Load PU IN_2	0 -1	1	-	F63	0
034C		Cold Load PU IN_3	0 -1	1	-	F63	0
034D		Cold Load PU Brkn Cond	0 -1	1	-	F63	0
034E		Cold Load PU Itherm	0 -1	1	-	F63	0
034F		Cold Load PU I2>	0 -1	1	-	F63	0
0350	Setting Group 2 / Protection G2 /Autoreclose	Autoreclose?	0 -1	1	-	F109	0
0351		Dead Time tD1	0 to 60000	1	1/100 s	F1	0
0352		Dead Time tD2	0 to 60000	1	1/100 s	F1	0
0353		Dead Time tD3	0 to 60000	1	1/100 s	F1	0
0354		Dead Time tD4	0 to 60000	1	1/100 s	F1	0
0355		Dead Time tR	0 to 60000	1	1/100 s	F1	0
0356		Fast O/C Trip	0 to 1	1	bits	F72	00000
0357		Fast O/C Trip Delay	0 to 999	1	1/100 s	F1	0
0358		Fast E/GND Trip	0 to 1	1	bits	F72	00000
0359		Fast E/GND Trip Delay	0 to 999	1	1/100 s	F1	0
035A		tI> Close Shot ?	0 to 1	1	bits	F67	0000
035B		tI> Inhibit Trip : Shot	0 to 1	1	bits	F67	00000
035C		tI>> Close Shot ?	0 to 1	1	bits	F67	0000
035D		tI>> Inhibit Trip : Shot	0 to 1	1	bits	F67	00000
035E		tI>>> Close Shot ?	0 to 1	1	bits	F67	0000
035F		tI>>> Inhibit Trip : Shot	0 to 1	1	bits	F67	00000
0360		tIN_1 Close Shot ?	0 to 1	1	bits	F67	0000
0361		tIN_1 Inhibit Trip : Shot	0 to 1	1	bits	F67	00000
0362		tIN_2 Close Shot ?	0 to 1	1	bits	F67	0000
0363		tIN_2 Inhibit Trip : Shot	0 to 1	1	bits	F67	00000
0364		tIN_3 Close Shot ?	0 to 1	1	bits	F67	0000
0365		tIN_3 Inhibit Trip : Shot	0 to 1	1	bits	F67	00000
0366		tAUX1 Close Shot ?	0 to 1	1	bits	F67	0000

Address	Group	Description	Values range	Step	Unit	Format	Default Value
0367		tAUX1 Inhibit Trip : Shot	0 to 1	1	bits	F67	00000
0368		tAUX2 Close Shot ?	0 to 1	1	bits	F67	0000
0369		tAUX2 Inhibit Trip : Shot	0 to 1	1	bits	F67	00000
036A	Setting group 2 /Inputs configuration G2	Reverse Input Logic	0 to 1	1	bits	F35	000000
036B		Maintenance Mode	0 to 1	1	bits	F35	000000
036C		Reset Latched Signaling	0 to 1	1	bits	F35	000000
036D		Reset Latched Outputs	0 to 1	1	bits	F35	000000
036E		Blocking tI>	0 to 1	1	bits	F35	000000
036F		Blocking tI>>	0 to 1	1	bits	F35	000000
0370		Blocking tI>>>	0 to 1	1	bits	F35	000000
0371		Blocking tSOTF	0 to 1	1	bits	F35	000000
0372		Blocking tIN_	0 to 1	1	bits	F35	000000
0373		Blocking tIN_2	0 to 1	1	bits	F35	000000
0374		Blocking tIN_3	0 to 1	1	bits	F35	000000
0375		Reserved					
0376		Blocking tI2>	0 to 1	1	bits	F35	000000
0377		Blocking tBroken Conductor	0 to 1	1	bits	F35	000000
0378		Blocking ttherm	0 to 1	1	bits	F35	000000
0379		Blocking tAUX1	0 to 1	1	bits	F35	000000
037A		Blocking tAUX2	0 to 1	1	bits	F35	000000
037B		Blocking tAUX3	0 to 1	1	bits	F35	000000
037C		Blocking CB Fail	0 to 1	1	bits	F35	000000
037D		Blocking Autoreclose [79]	0 to 1	1	bits	F35	000000
037E		Selectivity Logic 1 tI>>	0 to 1	1	bits	F35	000000
037F		Selectivity Logic 1 tI>>>	0 to 1	1	bits	F35	000000
0380		Selectivity Logic 1 tIN_2	0 to 1	1	bits	F35	000000
0381		Selectivity Logic 1 tIN_3	0 to 1	1	bits	F35	000000
0382		Selectivity Logic 2 tI>>	0 to 1	1	bits	F35	000000
0383		Selectivity Logic 2 tI>>>	0 to 1	1	bits	F35	000000
0384		Selectivity Logic 2 tIN_2	0 to 1	1	bits	F35	000000
0385		Selectivity Logic 2 tIN_3	0 to 1	1	bits	F35	000000
0386		AUX1	0 to 1	1	bits	F35	000000
0387		AUX2	0 to 1	1	bits	F35	000000
0388		AUX3	0 to 1	1	bits	F35	000000
0389		AUX4	0 to 1	1	bits	F35	000000
038A		AUX5	0 to 1	1	bits	F35	000000
038B		AUX6	0 to 1	1	bits	F35	000000
038C		Cold Load Pick Up	0 to 1	1	bits	F35	000000
038D		Start tBF (CB Fail)	0 to 1	1	bits	F35	000000

CT

Address	Group	Description	Values range	Step	Unit	Format	Default Value
038E		CB status 52A	0 to 1	1	bits	F35	000000
038F		CB status 52B	0 to 1	1	bits	F35	000000
0390		CB Faulty External Signal	0 to 1	1	bits	F35	000000
0391		Setting Group 2	0 to 1	1	bits	F35	000000
0392		Manual Close	0 to 1	1	bits	F35	000000
0393		Manual Trip	0 to 1	1	bits	F35	000000
0394		Trip Circuit Supervision	0 to 1	1	bits	F35	000000
0395		Reset Theta value	0 to 1	1	bits	F35	000000
0396		Start Disturbance Recorder	0 to 1	1	bits	F35	000000
0397		Local CTRL Mode	0 to 1	1	bits	F35	000000
0398		Time Synchronization	0 to 1	1	bits	F35	000000
0399	Setting group 2 /Outputs relays configuration G2	Latched outputs	0 to 1	1	bits	F36	0000000
039A		Reverse output Logic	0 to 1	1	bits	F36	0000000
039B		Protection Trip	0 to 1	1	bits	F36	0000000
039C		Protection Trip (pulse)	0 to 1	1	bits	F36	0000000
039D		Trip CB order	0 to 1	1	bits	F36	0000000
039E		Close CB order	0 to 1	1	bits	F36	0000000
039F		Alarm	0 to 1	1	bits	F33	00000000
03A0-03A2		Reserved	0 to 1	1	bits	F36	0000000
03A3		Start I>	0 to 1	1	bits	F36	0000000
03A4		Start I>>	0 to 1	1	bits	F36	0000000
03A5		Start I>>>	0 to 1	1	bits	F36	0000000
03A6		Start SOTF	0 to 1	1	bits	F36	0000000
03A7		Start IN_1	0 to 1	1	bits	F36	0000000
03A8		Start IN_2	0 to 1	1	bits	F36	0000000
03A9		Start IN_3	0 to 1	1	bits	F36	0000000
03AA		Reserved					
03AB		Start I2>	0 to 1	1	bits	F36	0000000
03AC		Start Broken Conductor	0 to 1	1	bits	F36	0000000
03AD		AUX1	0 to 1	1	bits	F36	0000000
03AE		AUX2	0 to 1	1	bits	F36	0000000
03AF		AUX3	0 to 1	1	bits	F36	0000000
03B0		AUX4	0 to 1	1	bits	F36	0000000
03B1		AUX5	0 to 1	1	bits	F36	0000000
03B2		AUX6	0 to 1	1	bits	F36	0000000
03B3		tI>	0 to 1	1	bits	F36	0000000
03B4		tI>>	0 to 1	1	bits	F36	0000000
03B5		tI>>>	0 to 1	1	bits	F36	0000000
03B6		tSOTF	0 to 1	1	bits	F36	0000000
03B7		tIN_1	0 to 1	1	bits	F36	0000000
03B8		tIN_2	0 to 1	1	bits	F36	0000000
03B9		tIN_3	0 to 1	1	bits	F36	0000000
03BA		Reserved					

Address	Group	Description	Values range	Step	Unit	Format	Default Value
03BB		tI2>	0 to 1	1	bits	F36	0000000
03BC		t Broken Conductor	0 to 1	1	bits	F36	0000000
03BD		Thermal Trip	0 to 1	1	bits	F36	0000000
03BE		Thermal Alarm	0 to 1	1	bits	F36	0000000
03BF		CB Fail	0 to 1	1	bits	F36	0000000
03C0		tAUX1	0 to 1	1	bits	F36	0000000
03C1		tAUX2	0 to 1	1	bits	F36	0000000
03C2		tAUX3	0 to 1	1	bits	F36	0000000
03C3		tAUX4	0 to 1	1	bits	F36	0000000
03C4		Communication Order 1 (remote via RS485)	0 to 1	1	bits	F36	0000000
03C5		Communication Order 2 (remote via RS485)	0 to 1	1	bits	F36	0000000
03C6		[79] Autoreclose in progress	0 to 1	1	bits	F36	0000000
03C7		[79] Autoreclose Final Trip	0 to 1	1	bits	F36	0000000
03C8		[79] Autoreclose Lockout (internal block)	0 to 1	1	bits	F36	0000000
03C9		[79] Autoreclose blocked (external blocking)	0 to 1	1	bits	F36	0000000
03CA		79 Autoreclose Successful	0 to 1	1	bits	F36	0000000
03CB		TCS Trip Circuit Supervision (52) : CB Fail	0 to 1	1	bits	F36	0000000
03CC		CB Alarm (CB diagnostic)	0 to 1	1	bits	F36	0000000
03CD		Reserved					
03CE		tCB Faulty detection based on External Signal (input)	0 to 1	1	bits	F36	0000000
03CF		Setting Group 2 is set	0 to 1	1	bits	F36	0000000
03D0	Setting group 2 /LEDs configuration G2	Latched LEDs	0 to 1	1	bits	F39	000000
03D1		Protection Trip	0 to 1	1	bits	F39	000000
03D2		Alarm	0 to 1	1	bits	F39	000000
03D3		General Start	0 to 1	1	bits	F39	000000
03D4		Start Phase A	0 to 1	1	bits	F39	000000
03D5		Start Phase B	0 to 1	1	bits	F39	000000
03D6		Start Phase C	0 to 1	1	bits	F39	000000
03D7		Start I>	0 to 1	1	bits	F39	000000
03D8		Start I>>	0 to 1	1	bits	F39	000000
03D9		Start I>>>	0 to 1	1	bits	F39	000000
03DA		Start SOTF	0 to 1	1	bits	F39	000000
03DB		Start IN_1	0 to 1	1	bits	F39	000000
03DC		Start IN_2	0 to 1	1	bits	F39	000000
03DD		Start IN_3	0 to 1	1	bits	F39	000000
03DE		AUX1	0 to 1	1	bits	F39	000000
03DF		AUX2	0 to 1	1	bits	F39	000000
03E0		AUX3	0 to 1	1	bits	F39	000000
03E1		AUX4	0 to 1	1	bits	F39	000000
03E2		AUX5	0 to 1	1	bits	F39	000000

Address	Group	Description	Values range	Step	Unit	Format	Default Value
03E3		AUX6	0 to 1	1	bits	F39	000000
03E4		tI>	0 to 1	1	bits	F39	000000
03E5		tI>>	0 to 1	1	bits	F39	000000
03E6		tI>>>	0 to 1	1	bits	F39	000000
03E7		tSOTF	0 to 1	1	bits	F39	000000
03E8		tIN_1	0 to 1	1	bits	F39	000000
03E9		tIN_2	0 to 1	1	bits	F39	000000
03EA		tIN_3	0 to 1	1	bits	F39	000000
03EB		Reserved					
03EC		tI2>	0 to 1	1	bits	F39	000000
03ED		tBroken Conductor	0 to 1	1	bits	F39	000000
03EE		Thermal Trip	0 to 1	1	bits	F39	000000
03EF		Thermal Alarm	0 to 1	1	bits	F39	000000
03F0		tCB Fail	0 to 1	1	bits	F39	000000
03F1		tAUX1	0 to 1	1	bits	F39	000000
03F2		tAUX2	0 to 1	1	bits	F39	000000
03F3		tAUX3	0 to 1	1	bits	F39	000000
03F4		tAUX4	0 to 1	1	bits	F39	000000
03F5		[79] Autoreclose in progress	0 to 1	1	bits	F39	000000
03F6		[79] Autoreclose Final Trip	0 to 1	1	bits	F39	000000
03F7		[79] Autoreclose Lockout (internal block)	0 to 1	1	bits	F39	000000
03F8		[79] Autoreclose blocked (external blocking)	0 to 1	1	bits	F39	000000
03F9		[79] Autoreclose Successful	0 to 1	1	bits	F39	000000
03FA		Local CTRL Mode	0 to 1	1	bits	F39	000000
03FB		CB Alarm (CB diagnostic)	0 to 1	1	bits	F39	000000
03FC		Maintenance Mode	0 to 1	1	bits	F39	000000
03FD		tCB Faulty detection based on External Signal (input)	0 to 1	1	bits	F39	000000
03FE		Setting Group 2 is set	0 to 1	1	bits	F39	000000

2.4.6 Page 4h : remote controls

In P111Enh it is possible to use both functions Function 5 or Function 6

Access in writing.

a) MODBUS Function 6

Note: A one control can be executed in a one message only. Two control commands in a one message will be rejected by P111Enh

Address	Group	Description	Values range	Step	Unit	Format	Default Value
0400	Remote control	Remote control word 1	0 to 15	bits	-	F38	0
0401		Remote control word 2	0 to 15	bits	-	F38A	0
0402		Remote control word 3	0 to 15	bits	-	F38B	0

Examples of messages

The example 1

Query to apply "Thermal State reset" via MiCOM P111Enh:

An example of request to "Thermal state reset" in slave 10 (dec):		
Field name	Value (hex)	Remarks
Slave Address	0A	P111 setting value
Function	06	
Register Address Hi (Address Hi)	04	Address
Register Address Lo (Address Lo)	01	(See table above)
Preset Data Hi	00	bit 3
Preset Data LO	08	(See format F38A)
Error Check (CRC)	-	-

The example 2:

Query to apply "Remote CB Close Command" via MiCOM P111Enh:

An example of request to "Remote CB close command" in slave 17 (dec):		
Field name	Value (hex)	Remarks
Slave Address	11	P111 setting value
Function	06	
Register Address Hi (Address Hi)	04	Address
Register Address Lo (Address Lo)	00	(See table above)
Preset Data Hi	80	bit 15
Preset Data LO	00	(See format F38)
Error Check (CRC)	-	-

b) MODBUS Function 5

Group	Modbus Coil Address Hi (hex)	Modbus Coil Address Lo (hex)			Force Data Hi (hex)	Force Data Lo (hex)
		Number of control	Values range	Step		
Remote control	04	See format: F113	0 to 21	1	FF	00

The example of query to apply “Remote CB Close Command” via MiCOM P111Enh:

An example of request to “remote CB close command” (force coil 0F - ON) in slave 17 (dec):

Field name	Value (Hex)	Remarks
Slave Address	11	P111 setting value
Function	05	
Coil Address Hi	04	See table above
Coil Address Lo	0F	See format F113
Force Data Hi	FF	Fixed value
Force Data Lo	00	Fixed value
Error Check (CRC)	-	-

2.4.7 Pages 5h/6h

These pages are reserved

2.4.8 Page 7h

Access in quick reading only (MODBUS 07 function)

Address	Group	Description	Values range	Step	Unit	Format	Default Value
0700	Quick reading byte	Relay status description		1	-	F49	0

2.4.9 Page 8h : time synchronisation

Access in writing for n words (function 16). The time synchronisation format is based on 8 bits (4 words) (Inverted IEC 870-5-4 CP56Time2a):.

Timer	Address (hex)	Nb bytes	Mask (hex)	Values range	Unit
	0800	1 (Hi)			
Year		1 (Lo)	7F	0 – 99 (2000-2093)	Year
Month	0801	1 (Hi)	0F	1 - 12	month
Day of week		1 (Lo)	E0	Not used in P111Enh	-
day of month		1 (Lo)	1F	1 – 31	Day
Season	0802	1 (Hi)	80	0 – 1 (summer-winter) Not used	
Hour		1 (Hi)	1F	0-23	Hour
Invalidity		1 (Lo)	80	0 -1 (valid – invalid)	
Minute		1 (Lo)	3F	0-59	Minute
Millisecond pF+pf	0803	2	FFFF	0 – 59999	ms

CT

2.4.10 Mapping access characteristics

- Description of accessible addresses in reading of words (**function 03** and **04**).

PAGE 00h	PAGE 01h	PAGE 02h
0000h to 0054h	0100h to 0184h	0200h to 02FAh

PAGE 03h
0300h to 03F6h

- Definition of accessible addresses in writing of 1 word (**function 06**).

PAGE 01h	PAGE 02h	PAGE 03h
0100h to 0184h	0200h to 02FAh	0300h to 03FAh

- Definition of accessible addresses in writing of n words (**function 16**).

PAGE 01h	PAGE 02h	PAGE 03h
0100h to 0184h	0200h to 02FAh	0300h to 03FAh

PAGE 08h
0800h to 0803h

- Definition of accessible addresses in reading of bits (**function 01** and **02**).

Not available

- Definition of accessible addresses in writing of 1 bit (**function 05**).

PAGE 04h
0400h to 0402h

WARNING: THE BITS NUMBER MUST NOT BE HIGHER THAN 16.

2.4.11 Page 9h to 21h: disturbance record data (25 pages)

Access in words writing (**function 03**)

Each disturbance mapping page contain 250 words.

Address	Contents
0900h to 09FAh	250 disturbance data words
0A00h to 0AFAh	250 disturbance data words
0B00h to 0BFAh	250 disturbance data words
0C00h to 0CFAh	250 disturbance data words
0D00h to 0DFAh	250 disturbance data words
0E00h to 0EFAh	250 disturbance data words
0F00h to 0FFAh	250 disturbance data words
1000h to 10FAh	250 disturbance data words
1100h to 11FAh	250 disturbance data words
1200h to 12FAh	250 disturbance data words
1300h to 13FAh	250 disturbance data words
1400h to 14FAh	250 disturbance data words
1500h to 15FAh	250 disturbance data words
1600h to 16FAh	250 disturbance data words
1700h to 17FAh	250 disturbance data words
1800h to 18FAh	250 disturbance data words
1900h to 19FAh	250 disturbance data words
1A00h to 1AFAh	250 disturbance data words
1B00h to 1BFAh	250 disturbance data words
1C00h to 1CFAh	250 disturbance data words
1D00h to 1DFAh	250 disturbance data words
1E00h to 1EFAh	250 disturbance data words
1F00h to 1FFAh	250 disturbance data words
2000h to 20FAh	250 disturbance data words
2100h to 21FAh	250 disturbance data words

NB: The disturbance data pages contain values of one channel from one given disturbance record.

2.4.11.1 Meaning of each value channel

- IA, IB, IC and IN channels:

The value is an signed 16 bits word equivalent to the ADC value

Calculation formula for phase current values

Values in Amps can be calculated in following way:

$$\text{Value IA} = \sqrt{2} \cdot \frac{\text{sample_IA} \cdot \text{Internal_PhA} \cdot \text{Phase_Primary_CT_In}}{\text{Phase_Secondary_CT_In} \cdot 2000}$$

$$\text{Value IB} = \sqrt{2} \cdot \frac{\text{sample_IB} \cdot \text{Internal_PhB} \cdot \text{Phase_Primary_CT_In}}{\text{Phase_Secondary_CT_In} \cdot 2000}$$

$$\text{Value IC} = \sqrt{2} \cdot \frac{\text{sample_IC} \cdot \text{Internal_PhC} \cdot \text{Phase_Primary_CT_In}}{\text{Phase_Secondary_CT_In} \cdot 2000}$$

Where:

Internal_PhA, Internal_PhB, Internal_PhC: Internal scaling (see point 2.4.17 (Page 38h to 3Ch))

Calculation formula for earth current values

Value in Amps can be calculated in following way:

$$\text{Value IN} = \sqrt{2} \cdot \frac{\text{sample_IN} \cdot \text{Internal_N} \cdot \text{Earth_Primary_CT_Ien}}{\text{Earth_Secondary_CT_Ien} \cdot 2000}$$

Where:

Internal_N: Internal scaling (see point 2.4.17 (Page 38h to 3Ch))

- Frequency channel:

Time between two samples in microseconds

- Logic channels:

Logic channel	Contents
Bit 0	Binary Input 1
Bit 1	Binary Input 2
Bit 2	Binary Input 3
Bit 3	Binary Input 4
Bit 4	Binary Input 5
Bit 5	Binary Input 6
Bit 6	Binary Input 7
Bit 7	Binary Input 8
Bit 8	Output RL1
Bit 9	Output RL2
Bit 10	Output RL3
Bit 11	Output RL4
Bit 12	Output RL5
Bit 13	Output RL6
Bit 14	Protection Trip
Bit 15	Start of protection which trips

2.4.12 Page 22h: disturbance record index frame

Access in word reading (function 03)

Address	Contents
2200h	Disturbance data index frame

Disturbance record index frame

Word	Contents
n° 1	Disturbance record number
n° 2	Disturbance record finish date (second)
n° 3	Disturbance record finish date (second)
n° 4	Disturbance record finish date (millisecond)
n° 5	Disturbance record finish date (millisecond)
n° 6	Disturbance record starting condition : 1 : tripping 2 : instantaneous 3 : remote command 4 : logic input
n° 7	Frequency at the post-time beginning

2.4.13 Page 35h (addresses 3500h to 354Ah) : event record data (9 words)

Word n° 1: Event meaning

Word n° 2: MODBUS associated value

Word n° 3: MODBUS address

Word n° 4: *Reserved*

Words n° 5 & 6 & 7 & 8: Event date is Inverted IEC 870-5-4 CP56Time2a:

See format Page 8h

Word n° 9: Acknowledge
0=event non acknowledged
1= event acknowledged)

Code	Meaning of the event	Type	MODBUS address
00	No event	-	
01	CB closing (Remote/menu HMI)	F38 ↑	0400h (bit 15)
02	CB tripping (Remote/menu HMI)	F38 ↑	0400h (bit 7)
03	Reset latched outputs (Remote)	F38 ↑	0400h (bit 2)
04	Reset signaling (Remote)	F38 ↑	0400h (bit 1)
05	Reset signaling and latched outputs (Remote)	F38 ↑	0400h (bit 3)
06	Clear fault and disturbance recorder	F38A ↑	0401h (bit 0)
07	Clear event recorder	F38A ↑	0401h (bit 1)
08	Reserved		

CT

Code	Meaning of the event	Type	MODBUS address
09	Warm restart	↑	-
10	Reserved		
11	Current Protection disable status	↑↓	-
12	START I>	F37↑↓	0021h (bit 0)
13	START I>>	F37↑↓	0022h (bit 0)
14	START IN_1	F50 ↑↓	0024h (bit 0)
15	START IN_2	F50 ↑↓	0025h (bit 0)
16	tl>	F37↑↓	0021h (bit 6)
17	tl>>	F37↑↓	0022h (bit 6)
18	tlN_1	F50 ↑↓	0024h (bit 6)
19	tlN_2	F50 ↑↓	0025h (bit 6)
20	tAUX1	F51 ↑↓	0027h (bit 6)
21	CB status: opened	F30 ↑	001Bh (value 0)
22	CB status: closed	F30 ↑	001Bh (value 1)
23	CB status: faulty	F30 ↑	001Bh (value 3)
24	CB status: undefined	F30 ↑	001Bh (value 4)
25	tCB Faulty External Signal.	F31A ↑	001Ah (bit 10)
26	Start tCB Fail Ext.	F51 ↑↓	002Ah (bit 0)
27	CHANGE OF INPUT LOGIC STATE	F11 ↑↓	0010h
28	CHANGE OF OUTPUT LOGIC STATE	F24 ↑↓	0013h
29	START I>>>	F37↑↓	0023h (bit 0)
30	tl>>>	F37↑↓	0023h (bit 6)
31	Start I2>	F50 ↑↓	002Dh (bit 0)
32	tl2>	F50 ↑↓	002Dh (bit 6)
33	tAUX2	F51 ↑↓	0028 (bit 6)
34	tCB Fail	F51 ↑↓	0029h (bit 6)
35	Setting Group 1 active	F32↑	0009h (bit 0)
36	Setting Group 2 active	F32↑	0009h (bit 1)
37	tl> Alarm	F31↑↓	0019h (bit 0)
38	tl>> Alarm	F31↑↓	0019h (bit 1)
39	tl>>> Alarm	F31↑↓	0019h (bit 2)
40	tlN_1 Alarm	F31 ↑↓	0019h (bit 4)
41	tlN_2 Alarm	F31 ↑↓	0019h (bit 5)
42	tAUX1 Alarm	F31A ↑↓	0020h (bit 5)
43	tAUX2 Alarm	F31A ↑↓	0020h (bit 6)
44	tl2> Alarm	F31 ↑↓	0019h (bit 8)
45	tCB Fail Alarm	F31 ↑↓	0019h (bit 10)
46	Start AUX1	F51 ↑↓	0027h (bit 0)
47	Start AUX2	F51 ↑↓	0028h (bit 0)

CT

Code	Meaning of the event	Type	MODBUS address
48	[79] Autoreclose blocked (Remote/menu HMI)	F38 ↑	0400h (bit 8)
49	[79] Autoreclose unblocked (Remote/menu HMI)	F38 ↑	0400h (bit 9)
50	Reset latched Alarms	F38 ↑	0400h (bit 5)
51	Reserved		
52	Reserved		
53	Reserved		
54	Reserved		
55	Acknowledgement of the hardware alarm	F38A↑	0401h (bit 9)
56	Disturbance recorder start (Remote)	F38A↑	0401h (bit 5)
57	Communication order 1	F38A↑	0401h (bit 14)
58	Communication order 2	F38A↑	0401h (bit 15)
59	Thermal state reset (Remote/menu HMI)	↑	
60	Recloser counters reset (Remote/menu HMI)	F38A↑	0401h (bit 3)
61	Fault counters reset (Remote/menu HMI)	F38A↑	0401h (bit 10)
62	Control couters reset (Remote/menu HMI)	F38A↑	0401h (bit 12)
63	Maintenance mode	F38A↑	0401h (bit 13)
64	End of maintenance mode	F38A↑	0401h (bit 6)
65	START IN_3	F38A	0401h (bit 7)
66	tIN_3	F50 ↑↓	0026h (bit 0)
67	tIN_3 Alarm	F50 ↑↓	0026h (bit 6)
68	Start SOTF	F31 ↑↓	0019h (bit 6)
69	tSOTF	F37 ↑↓	002Bh (bit 0)
70	tSOTF Alarm	F37 ↑↓	002Bh (bit 6)
71	Reserved		
72	Reserved		
73	Reserved		
74	Start Broken Couductor	F31 ↑↓	0019h (bit 7)
75	tBroken Conductor	F50 ↑↓	002Eh (bit 0)
76	tBroken Conductor Alarm	F50 ↑↓	002Eh (bit 6)
77	ltherm>	F31 ↑↓	0019h (bit 9)
78	Thermal OL Trip	F50 ↑↓	002Fh (bit 0)
79	Thermal OL Alarm	F50 ↑↓	002Fh (bit 6)
80	START AUX3	F31 ↑↓	0019h (bit 11)
81	tAUX3	F51 ↑↓	0030h (bit 0)
82	tAUX3 Alarm	F51 ↑↓	0030h (bit 6)
83	Start AUX4	F31A ↑↓	001Ah (bit 7)
84	tAUX4	F51 ↑↓	0031h (bit 0)
85	tAUX4 Alarm	F51 ↑↓	0031h (bit 6)
86	Peak and rolling value reset (Remote/menu HMI)	F31A ↑	001Ah (bit 8)

Code	Meaning of the event	Type	MODBUS address
87	Max. values of the averag. in sub period reset (Remote/menu HMI)	F38A↑	0401h (bit 4)
88	Acknowledgement of the hardware alarm	F38A↑	0401h (bit 11)
89-95	Reserved		
96	Local CTRL mode	F61↑	001Eh (value: 2)
97	Remote CTRL mode	F61↑	001Eh (value: 1)
98	Local and remote CTRL mode	F61↑	001Eh (value: 0)
99	Setting change to Group 1 (Remote)	F38↑	0400h (bit 6)
100	Setting change to Group 2 (Remote)	F38↑	0400h (bit 11)
101	Protection Function disable status	↑↓	
102	Setting Group 2 set via Input	F104↑↓	0035h (bit 8)
103	Relays Test (Commissioning Test) active	↑	-
104	Test I> On	↑	-
105	Test I> Off	↑	-
106	Test I>> On	↑	-
107	Test I>> Off	↑	-
108	Test I>>> On	↑	-
109	Test I>>> Off	↑	-
110	Test SOTF On	↑	-
111	Test SOTF Off	↑	-
112	Test IN_1 On	↑	-
113	Test IN_1 Off	↑	-
114	Test IN_2 On	↑	-
115	Test IN_2 Off	↑	-
116	Test IN_3 On	↑	-
117	Test IN_3 Off	↑	-
118	Reserved		
119	Reserved		
120	Test I2> On	↑	-
121	Test I2> Off	↑	-
122	Test Brkn. Cond. On	↑	-
123	Test Brkn. Cond. Off	↑	-
124	Test Thermal OL On	↑	
125	Test Thermal OL Off	↑	
126	Test CBF On	↑	-
127	Test CBF Off	↑	-
128	Blocking tI> active	F101↑↓	0032h (bit 0)
129	Blocking tI>> active	F101↑↓	0032h (bit 1)
130	Blocking tI>>> active	F101↑↓	0032h (bit 2)
131	Blocking tSOTF active	F101↑↓	0032h (bit 3)

CT

Code	Meaning of the event	Type	MODBUS address
132	Blocking tIN_1 active	F101↑↓	0032h (bit 4)
133	Blocking tIN_2 active	F101↑↓	0032h (bit 5)
134	Blocking tIN_3 active	F101↑↓	0032h (bit 6)
135	Reserved		
136	Blocking tI2> active	F101↑↓	0032h (bit 8)
137	Blocking tBrkn. Conductor active	F101↑↓	0032h (bit 9)
138	Blocking ltherm. Active	F101↑↓	0032h (bit 11)
139	Blocking tAUX1 active	F102↑↓	0033h (bit 5)
140	Blocking tAUX2 active	F102↑↓	0033h (bit 6)
141	Blocking tAUX3 active	F102↑↓	0033h (bit 7)
142	Blocking CB Fail active	F101↑↓	0032h (bit 10)
143	Blocking [79] active	F102↑↓	0033h (bit 0)
144	Sel1 tI>> active	F103↑↓	0034h (bit 0)
145	Sel1 tI>>> active	F103↑↓	0034h (bit 1)
146	Sel1 tIN_2 active	F103↑↓	0034h (bit 2)
147	Sel1 tIN_3 active	F103↑↓	0034h (bit 3)
148	reserved		
149	Sel2 tI>> ACTIVE	F103↑↓	0034h (bit 4)
150	Sel2 tI>>> ACTIVE	F103↑↓	0034h (bit 5)
151	Sel2 tIN_2 ACTIVE	F103↑↓	0034h (bit 6)
152	Sel2 tIN_3 ACTIVE	F103↑↓	0034h (bit 7)
153	reserved		
154	Cold Load PU active	F104↑↓	0035h (bit 3)
155	Manual Close via Input	↑	-
156	Manual Close via Function Key	↑	-
157	Manual Trip via Input	↑	-
158	Manual trip via Function Key	↑	-
159	TC Supervision alarm	F31A↑↓	001Ah (bit 11)
160	Theta Reset via Input	F104↑↓	0035h (bit 12)
161	Start Disturbance recorder via Input	↑	-
162	Changing CTRL mode via Input	F104↑	0035h (bit 14)
163	Changing CTRL mode (Remote/menu HMI)	F38↑	0400h (bit 4)
164	Active [79] in Progress	F59↑↓	001Ch (bit 1)
165	[79] Final trip	F59↑↓	001Ch (bit 4)
166	[79] Lockout	F59↑↓	001Ch (bit 6)
167	[79] Blocked	F59↑↓	001Ch (bit 0)
168	[79] Successful	F59↑↓	001Ch (bit 5)
169	[79] tD1 counting	F59↑↓	001Ch (bit 8)
170	[79] tD2 counting	F59↑↓	001Ch (bit 9)

Code	Meaning of the event	Type	MODBUS address
171	[79] tD3 counting	F59↑↓	001Ch (bit 10)
172	[79] tD4 counting	F59↑↓	001Ch (bit 11)
173	[79] tR counting	F59↑↓	001Ch (bit 12)
174	Fast O/C trip Delay Elapsed	F59↑	001Ch (bit 13)
175	Fast E/GND Trip Delay Elapsed	F59↑	001Ch (bit 14)
176	[79] Reclose order	F59↑	001Ch (bit 3)
177	[79] Inhibit Trip tI> active	↑	-
178	[79] Inhibit Trip tI>> active	↑	-
179	[79] Inhibit Trip tI>>> active	↑	-
180	[79] Inhibit Trip tIN_1 active	↑	-
181	[79] Inhibit Trip tIN_2 active	↑	-
182	[79] Inhibit Trip tIN_3 active	↑	-
183	[79] Inhibit Trip tAUX1 active	↑	-
184	[79] Inhibit Trip tAUX2 active	↑	-
185	[79] Rolling demand blocking active	↑	-
186	[79] Inhibit time on close counting	F60↑↓	001Dh (bit 2)
187	Autoreclose : T-C	↑	-
188	Autoreclose : T-C-T	↑	-
189	Autoreclose : T-C-T-C	↑	-
190	Autoreclose : T-C-T-C-T	↑	-
191	Autoreclose : T-C-T-C-T-C	↑	-
192	Autoreclose : T-C-T-C-T-C-T	↑	-
193	Autoreclose : T-C-T-C-T-C-T-C	↑	-
194	Autoreclose : T-C-T-C-T-C-T-C-T	↑	-
195	Reserved	↑	-
196	HD Warning Alarm	F31A↑↓	001Ah (bit 15)
197	CB Time Supervision Alarm	F31A↑↓	001Ah (bit 12)
198	Unblock SOTF active	↑↓	-
199	tReset I> active	F37↑↓	0021h (bit 5)
200-399	Reserved		
400	tReset I>> active	F37↑↓	0022h (bit 5)
401	tReset IN_1 active	F50 ↑↓	0024h (bit 5)
402	tReset I2> active	F50 ↑↓	002Dh (bit 5)
403	Administrator password entered	↑	-
404	Protection password entered	↑	-
405	Control password entered	↑	-
406	Reset signaling and latched outputs via C clear key	↑	-
407	Reset signalling via Input	F104↑	0035h (bit 1)
408	Reset latched outputs via Input	F104↑	0035h (bit 2)

CT

Code	Meaning of the event	Type	MODBUS address
409	Inrush threshold active	F28A ↑↓	0016h (bit 4)
410	Inrush unblock active	↑↓	-
411	Reset Signalling via Close command	↑	
412	State of CB Alarm	F31A↑↓	001Ah (bit 2)
413	[79] Rolling demand Alarm	F31A↑↓	001Ah (bit 9)
414	CB current diagnostic Alarm	F31A↑↓	001Ah (bit 0)
415	CB number diagnostic Alarm	F31A↑↓	001Ah (bit 1)
416	Settings change	↑	-

Note: The double arrow ↑↓ means the event is generated on event occurrence (↑) and on event disappearance (↓).

On event occurrence, the corresponding bit of the associated format is set to « 1 ».

On event disappearance, the corresponding bit of the associated format is set to « 0 ».

2.4.14 Page 36h

Most older event data

Access in word reading (**function 03**)

Address	Contents
3600h	Most older event data

2.4.15 Page 37h : fault record value data

Access in word reading (**function 03**)

Address	Contents
3700h	Fault value record n°1
3701h	Fault value record n°2
3702h	Fault value record n°3
3703h	Fault value record n°4
3704h	Fault value record n°5
3705h	Fault value record n°6
3706h	Fault value record n°7
3707h	Fault value record n°8
3708h	Fault value record n°9
3709h	Fault value record n°10
3710h	Fault value record n°11
3711h	Fault value record n°12
3712h	Fault value record n°13
3713h	Fault value record n°14
3714h	Fault value record n°15
3715h	Fault value record n°16
3716h	Fault value record n°17

Address	Contents
3717h	Fault value record n°18
3718h	Fault value record n°19
3719h	Fault value record n°20

Word n° 1 : Fault number

Words n° 2 & 3 & 4 & 5: see table below (Inverted IEC 870-5-4 CP56Time2a)

Timer	Address (hex)	Nb bytes	Mask (hex)	Values range	Unit
	Word n° 2	1 (Hi)			
Year		1 (Lo)	7F	0 – 99 (2000-2093)	Year
Month	Word n° 3	1 (Hi)	0F	1 - 12	month
Day of week		1 (Lo)	E0	Not used in P111Enh	
day of month		1 (Lo)	1F	1 – 31	Day
Season	Word n° 4	1 (Hi)	80	0 – 1 (summer-winter) Not used	
Hour		1 (Hi)	1F	0-23	Hour
Invalidity		1 (Lo)	80	0 -1 (valid – invalid)	
Minute		1 (Lo)	3F	0-59	Minute
Millisecond pF+pf	Word n° 5	2	FFFF	0 – 59999	ms (included s)

Word n° 6 : Reserved

Word n° 7 : Active setting group during the fault (1 or 2)

Word n° 8 : Fault origin

0= none
 1= phase A
 2= phase B
 3= phase C
 4= phases A-B
 5= phases A-C
 6= phases B-C
 7= phases A-B-C
 8= earth

Word n° 9: Fault recording starting origin

Fault nature code meaning

Code	Fault origin
00	Null event
01	Reserved
02	Thermal Overload
03	tI> trip
04	tI>> trip

Code	Fault origin
05	tl>>> trip
06	tlN>_1 trip
07	tlN_2 trip
08	tlN_3 trip
09	Reserved
10	tBrkn Cond
11	t Aux 1 trip
12	t Aux 2 trip
13	tl2> trip
14	Reserved
15	t Aux 3 trip
16	t Aux 4 trip
17	CB Fail trip
18	tSOTF
19	Reserved
20	CBext trip

Word n° 10: Fault value current (nominal value)

Word n° 11: Phase A current value (nominal value)

Word n° 12: Phase B current value (nominal value)

Word n° 13: Phase C current value (nominal value)

Word n° 14: Earth current value (nominal value)

Word n° 15: Acknowledge of fault 0 : fault non-acknowledged
1 : fault acknowledged

2.4.15.1 Calculation formula for phase current values

Line phase current value (primary value) = phase sampled value (e.g. word 10, 11, 12 or 13)
 * {line primary CT ratio (address 0120h)/Line CT sec (address 0121h)} A/10

2.4.15.2 Calculation formula for earth current values

The formula depends of nominal earth current :

0.01 to 2 len and 0.05-10len range

Line earth current value (primary value) = earth sampled value (e.g. word 10 or 14) * {line primary CT ratio (address 0122h)/Line CT sec (address 0123h)} A/1000

0.1 to 40 len range

Line earth current value (primary value) = earth sampled value (e.g. word 10 or 14) * {line primary CT ratio (address 0122h)/Line CT sec (address 0123h)} A/10

2.4.16 Page 3Eh : most older Fault record value data

Access in word reading (**function 03**)

Address	Contents
3E00h	Most older Fault record

CT

2.4.17 Page 38h to 3Ch: Disturbance recorder

Selection of the disturbance record and channel (36 bytes are uploaded for each address reading)

Access in word reading (**function 03**)

Address	Disturbance record number	Format
3800h	1	IA
3801h	1	IB
3802h	1	IC
3803h	1	IN
3804h	1	Frequency
3805h	1	Logic input and outputs
3900h	2	IA
3901h	2	IB
3902h	2	IC
3903h	2	IN
3904h	2	Frequency
3905h	2	Logic input and outputs
3A00h	3	IA
3A01h	3	IB
3A02h	3	IC
3A03h	3	I _E
3A04h	3	Frequency
3A05h	3	Logic input and outputs
3B00h	4	IA
3B01h	4	IB
3B02h	4	IC
3B03h	4	IN
3B04h	4	Frequency
3B05h	4	Logic input and outputs
3C00h	1	IA
3C01h	1	IB
3C02h	1	IC
3C03h	1	IN
3C04h	1	Frequency
3C05h	1	Logic input and outputs

CT

Word n° 1 :

Number of samples included in the mapping

Word n° 2 :

Sample number in pre-time

Word n° 3 :	Sample number in post-time
Word n° 4 :	Line CT primary nominal current (Phase_Primary_CT_In)
Word n° 5 :	Line CT secondary nominal current (Phase_Secondary_CT_In)
Word n° 6 :	E/GND CT primary nominal current (Earth_Primary_CT_Ien)
Word n° 7 :	E/GND CT secondary nominal current (Earth_Secondary_CT_Ien)
Float ¹⁾ n° 1 :	Phase A Internal PhA ratio (Internal_PhA)
Float ¹⁾ n° 2 :	Phase B internal PhB ratio (Internal_PhB)
Float ¹⁾ n° 3 :	Phase C internal PhC ratio (Internal_PhC)
Float ¹⁾ n° 4 :	Earth internal ratio (Internal_N)
Word n° 8 :	Mapping last page number
Word n° 9 :	Number of words in the mapping last page

¹⁾ Float – 4 bytes floating point number

2.4.17.1 Calculation formula for phase current values

Values in Amps can be calculated in following way:

$$\text{Value IA} = \sqrt{2} \cdot \frac{\text{sample_IA(e.g.3800h)} \cdot \text{Internal_PhA} \cdot \text{Phase_Primary_CT_In}}{\text{Phase_Secondary_CT_In} \cdot 2000}$$
$$\text{Value IB} = \sqrt{2} \cdot \frac{\text{sample_IB(e.g.3801h)} \cdot \text{Internal_PhB} \cdot \text{Phase_Primary_CT_In}}{\text{Phase_Secondary_CT_In} \cdot 2000}$$
$$\text{Value IC} = \sqrt{2} \cdot \frac{\text{sample_IC(e.g.3802h)} \cdot \text{Internal_PhC} \cdot \text{Phase_Primary_CT_In}}{\text{Phase_Secondary_CT_In} \cdot 2000}$$

2.4.17.2 Calculation formula for earth current values

Value in Amps can be calculated in following way:

$$\text{Value IN} = \sqrt{2} \cdot \frac{\text{sample_IN(e.g.3803h)} \cdot \text{Internal_N} \cdot \text{Earth_Primary_CT_Ien}}{\text{Earth_Secondary_CT_Ien} \cdot 2000}$$

2.4.18 Pages 3Dh : number of disturbance records available

Access in word reading (function 03)

Address	Contents
3D00h	Number of disturbance records available

Word n° 1 :	Number of disturbance records available
Word n° 2:	Oldest disturbance record number (n)
Words n° 3 & 4 :	Oldest disturbance record date (second)
Words n° 5 & 6 :	Oldest disturbance record date (millisecond)
Word n° 7 :	Disturbance record starting origin 1= Protection trip 2= instantaneous threshold 3= remote command 4= logic input
Word n° 8 :	Acknowledge
Word n° 9 :	Disturbance record previous number (n+1)
Words n° 10 & 11:	Previous disturbance record date (second)
Words n° 12 & 13:	Previous disturbance record date (millisecond)



Word n° 14 :	Disturbance record starting origin 1= Protection trip 2= instantaneous threshold 3= remote command 4= logic input
Word n° 15 :	Acknowledge
Word n° 16 :	Disturbance record previous number (n+2)
Words n° 17 & 18:	Previous disturbance record date (second)
Words n° 19 & 20:	Previous disturbance record date (millisecond)
Word n° 21 :	Disturbance record starting origin 1= Protection trip 2= instantaneous threshold 3= remote command 4= logic input
Word n° 22 :	Acknowledge
Word n° 23 :	Disturbance record previous number (n+3)
Words n° 24 & 25:	Previous disturbance record date (second)
Words n° 26 & 27:	Previous disturbance record date (millisecond)
Word n° 28 :	Disturbance record starting origin 1= Protection trip 2= instantaneous threshold 3= remote command 4= logic input
Word n° 29 :	Acknowledge
Word n° 30 :	Disturbance record previous number (n+4)
Words n° 31 & 32:	Previous disturbance record date (second)
Words n° 33 & 34:	Previous disturbance record date (millisecond)
Word n° 35 :	Disturbance record starting origin 1= Protection trip 2= instantaneous threshold 3= remote command 4= logic input
Word n° 36 :	Acknowledge

2.4.19 Description of the mapping format, MiCOM P111Enh Dual-powered

CODE	DESCRIPTION
F1	Unsigned integer – numerical data : 1 – 65535
F10	Characters ASCII byte 1 : ASCII character 32-127 byte 2 : ASCII character 32-127
F11	Unsigned integer -Binary input status bit 0 : logic input 1 bit 1 : logic input 2 bit 2 : logic input 3 bit 3 : logic input 4 bit 4 : logic input 5 bit 5 : logic input 6 bit: 6-15 reserved
F12	Unsigned integer – Current Protection disable status bit 0 : I> disabled bit 1 : I>> disabled bit 2 : I>>> disabled bit 3 : SOTF disabled bit 4 : IN_1 disabled bit 5 : IN_2 disabled bit 6 : IN_3 disabled bit 7 : reserved bit 8 : I2> disabled bit 9 : Brkn Cond. disabled bit 10 : CB Fail disabled bit 11 : Thermal OL disabled bit 12 to 15 : reserved
F12A	Unsigned integer –Protection Function disable status bit 0 : 79 Autoreclose disabled bit 1 : SEL1 disabled bit 2 : SEL2 disabled bit 3 : Cold Load PU disabled bit 4 : Blocking Inrush disabled bit 5 : AUX1 disabled bit 6 : AUX2 disabled bit 7 : AUX3 disabled bit 8 : AUX4 disabled bit 9 to 15 : reserved
F13	Unsigned integer – numerical data : 1 – 65535
F15	Two-digit decimal number - Firmware version 1st digit - major version 2nd digit - minor version 10: 1A 11: 1B 12: 1C 13: 1D etc
F16	Unsigned integer – Configuration 0 : disabled 1 : enable Trip 2 : enable Alarm 3 : enable Trip with Inrush Blocking 4 : enable Trip with Latching
F16A	Unsigned integer – Configuration 0 : disabled 1 : enable Trip 2 : enable Alarm 3 : enable Trip with Inrush Blocking 4 : enable Trip with Latching 1 : enable Trip-Phase A 1 : enable Trip-Phase B

CODE	DESCRIPTION
	1 : enable Trip-Phase C
F17	Unsigned integer - Hardware version 00: A 11: B
F18	Unsigned integer – curves type 0: DTM 1 : SI IEC 2 : VI IEC 3 : EI IEC 4 : LTI (IEC) 5: STI (IEC) 6 : RC Rectifier curve 7: RI curve 8: MI IEEE 9 : VI IEEE 10 : EI IEEE 11: STI (US C02-P20) 12: LTI (US C08) 13: RXIDG 14: BPN EDF 15: STI (US C02-P40)
F19	Unsigned integer - Baud rate value 0 : 4800 baud 1 : 9600 baud 2 : 19200 baud 3 : 38400 baud 4 : 57600 baud 5 : 115200 baud
F20	Unsigned integer – Parity 0 : NONE 1 : ODD 2 : EVEN
F22	Unsigned integer – Stop 0 : 1 stop 1 : 2 stop
F23	Unsigned integer - Line CT Sec 9: $I_n = 1A/5A$; 0.1-40 I_n
F23A	Unsigned integer - E/GND Sec 4: 0.01-12 I_n
F24	Unsigned integer - Logical output status bit 0 : logic output RL1 bit 1 : logic output RL2 bit 2 : logic output RL3 bit 3 : logic output RL4 bit 4 : logic output RL5 bit 5 : logic output RL6 bit 6 : Reserved bit 7-15: reserved
F25	Unsigned integer - Logical LED status bit 0: Trip bit 1 : Alarm bit 2 : LED3 bit 3 : LED4 bit 4 : LED5 bit 5 : LED6 bit 6: LED7 bit 7: Healthy bit 8-15: reserved

CODE	DESCRIPTION
F26	Unsigned integer - Logical healthy status bit 0 to 3 reserved bit 4 : Healthy bit10-15: reserved
F27	Unsigned Integer
F28	Unsigned integer - Protection start status bit 0 : I> bit 1 : I>> bit 2 : I>>> bit 3 : SOTF bit 4 : IN_1 bit 5 : IN_2 bit 6 : IN_3 bit 7 : reserved bit 8 : I2> bit 9 : Brkn Cond. bit 10 : tCB Fail Start bit 11 : ltherm Start bit 12 : starting in phase A bit 13 : starting in phase B bit 14: starting in phase C bit 15 : starting in N
F28A	Unsigned integer - Protection start status bit 0 : Reserved bit 1 : Reserved bit 2 : Reserved bit 3 : Cold Load PU active bit 4 : Blocking Inrush active bit 5 : AUX1 bit 6 : AUX2 bit 7 : AUX3 bit 8 : AUX4 bit 9-15 : Reserved
F29	Unsigned integer – Current Protection trip status bit 0 : tI> bit 1 : tI>> bit 2 : tI>>> bit 3 : tSOTF bit 4 : tIN_1 bit 5 : tIN_2 bit 6 : tIN_3 bit 7 : reserved bit 8 : tI2> bit 9 : tBrkn Conductor bit 10 : CB Fail bit 11 : Thermal Overload bit 12 : starting in phase A bit 13 : starting in phase B bit 14 : starting in phase C bit 15 : starting in N

CODE	DESCRIPTION
F29A	Unsigned integer - Protection Function trip status bit 0 : Reserved bit 1 : reserved bit 2 : reserved bit 3 : reserved bit 4 : reserved bit 5 : tAUX1 bit 6 : tAUX2 bit 7 : tAUX3 bit 8 : tAUX4 bit 9 : Reserved bit 10 : reserved bit 11 : reserved bit 12 : reserved bit 13 : reserved bit 14 : reserved bit 15 : reserved
F30	Unsigned integer - CB status (decimal value) 0 : CB opened 1 : CB closed 2 : reserved 3 : CB position faulty 4 : CB position undefined 5:-15: reserved
F31	Unsigned integer (bit)- Protection Alarm status bit 0 : tI> bit 1 : tI>> bit 2 : tI>>> bit 3 : tSOTF bit 4 : tIN_1 bit 5 : tIN_2 bit 6 : tIN_3 bit 7 : reserved bit 8 : tI2> bit 9 : tBrkn Conductor bit 10 : tCB Fail bit 11 : Thermal Overload bit 12 : reserved bit 13 : reserved bit 14 : reserved bit 15 : reserved
F31A	Unsigned integer - Alarm Function status bit 0 : CB current Diagnostic (Square Amps sum overreach) bit 1 : CB number Diagnostic (operation number overreach) bit 2 : Reserved bit 3 : reserved bit 4 : reserved bit 5 : tAUX1 bit 6 : tAUX2 bit 7 : tAUX3 bit 8 : tAUX4 bit 9 : Reserved bit 10 : t CB Faulty ext sign bit 11 : TC Supervision (Trip circuit self-test) bit 12 : CB Time Supervision (time overreach) bit 13 : Reserved bit 14 : Reserved bit 15 : Hardware Warning
F32	Unsigned integer - Setting group 0: Setting group 1 1: Setting group 2

CT

CODE	DESCRIPTION
F33	Unsigned integer -Output configuration bit 0: RL1 bit 1: RL2 bit 2: RL3 bit 3: RL4 bit 4: RL5 bit 5: RL6 bit 6: RL7 bit 7: WD bit 5-15: reserved
F35	Unsigned integer -Input configuration bit 0: Input L1 bit 1: Input L2 bit 2: Input L3 bit 3: Input L4 bit 4: Input L5 bit 5: Input L6 bit 6: Input L7 bit 7: Input L8 bit 8-15: reserved
F36	Unsigned integer -Output configuration bit 0: RL1 bit 1: RL2 bit 2: RL3 bit 3: RL4 bit 4: RL5 bit 5: RL6 bit 6: RL7 bit 7-15: reserved
F37	Unsigned integer: I> or I>> or I>>> or SOTF threshold phase information status: bit 0: information threshold exceeded bit 1: Instantaneous IA bit 2: Instantaneous IB bit 3: Instantaneous IC bit 4: Blocking signal active bit 5: tReset active bit 6: Time delay elapsed bit 7 to 15: reserved
F38	Unsigned integer - Remote control word 0: Warm restart 1: Reset LEDs 2: Reset Outputs 3: Reset LEDs and Outputs 4: Local Mode 5: Reset latched Alarms 6: Setting change to Group 1 7: Remote or HMI CB open order 8: Remote or HMI [79] Autoreclose blocking 9: Remote or HMI [79] Autoreclose unblocking 10: Remote Mode 11: Setting change to Group 2 12: Disable automatic acknowledgement of events 13: Oldest event acknowledge 14: Oldest fault acknowledge 15: Remote or via HMI CB close order

CODE	DESCRIPTION
F38A	Unsigned integer - Remote control word 0: Clear Recorders 1: Clear Events 2: reserved 3: Thermal state reset 4: Reserved 5: Disturbance record remote start 6: Maintenance mode 7: End of maintenance mode 8: Acknowledgement of the oldest disturbance record 9: Acknowledgment of the hardware RAM alarm 10: Recloser reset counters 11: Reserved 12: Reset Fault counters 13: Reset control counters 14: Communication Order 1 15: Communication Order 2
F38B	Unsigned integer - Remote control word 0 : [79] Unlockout 1: Enable automatic acknowledgement of events bit 1-15: reserved
F39A	Unsigned integer - LED function bit 0 : reserved bit 1 : LED3 bit 2 : LED4 bit 3 : LED5 bit 4: LED6 bit 5: LED7 bit 6-15: reserved
F39	Unsigned integer - LED function bit 0 : LED2 bit 1 : LED3 bit 2 : LED4 bit 3 : LED5 bit 4: LED6 bit 5: LED7 bit 6-15: reserved
F40	Unsigned integer -Output configuration (bit fields) bit 0 : RL1 bit 1 : RL2 bit 2 : RL3 bit 3 : RL4 bit 4 : RL5 bit 5 : RL6 bit 6 : RL7 bit 7-15: reserved
F41	Unsigned integer - Curve Type 0 : DT 1 : IDMT
F49	Unsigned integer - relay status bit 0 : Relay status (major alarms) bit 1: Minor hardware alarm bit 2: Presence of non-acknowledged event bit 3: Synchronisation state bit 4: Presence of non-acknowledged disturbance record bit 5: Presence of non-acknowledged fault record bit 6: Local Maintance Ack state bit 7-15: reserved

CODE	DESCRIPTION
F50	Unsigned integer: current protection IN_1, IN_2, IN_3, I2>, SOTF, Brkn Cond, ltheta> information status: bit 0: information threshold exceeded bit 1: reserved bit 2: reserved bit 3: reserved bit 4: Blocking signal active bit 5: tReset active bit 6: Time delay elapsed bit 7: Alarm information - Therm OL only bit 8 to 15: reserved
F51	Unsigned integer: information status about additional protection AUX1 or AUX2 or CB Fail or CB Fail ext. sign. status: bit 0: start bit 1: reserved bit 2: reserved bit 3: reserved bit 4: reserved bit 5: Reserved bit 6: Time delay elapsed bit 7 to 15: reserved
F52	Unsigned integer: information about language in menu 0: English; 1 : German; 2 : French; 3 : Spanish 4: Russian 5: Turkish 6 : Language 7
F53	Unsigned integer: information about language in menu 0: Measurements refered to In or Ien 1: Measurements refered to A 2: CB CTRL window 3: 79 CTRL window 4: CTRL Mode (Local/Remote)
F54	Unsigned integer 0: Manual only 1: Start Protection 2: Close command
F55	Unsigned integer - Alarm Display Reset 0: Self-Reset 1: Manual Reset
F56	Unsigned integer - Protocol 0: Modbus 1: IEC103
F57	Unsigned integer – Nominal Frequency 0: 50Hz 1: 60Hz

CODE	DESCRIPTION
F59	Unsigned integer - [79] status bit 0: Recloser blocked bit 1: Recloser in progress bit 2: reserved bit 3: Closing command executed via Autorecloser bit 4: Recloser final trip bit 5: Recloser successful bit 6: Recloser lockout bit 7: Trip locked via Recloser (inhibit of protection stage) bit 8: Dead Time tD1 counting bit 9: Dead Time tD2 counting bit 10: Dead Time tD3 counting bit 11: Dead Time tD4 counting bit 12: Reclaim Time tR counting bit 13: Fast O/C Trip Delay elapsed bit 14: Fast E/GND Trip Delay elapsed bit 15: reserved
F60	Unsigned integer - [79] blocking status 0: Ready 1: In progress 2: Temporary blocked (after close signal) 3: Lockout 4: Blocked via CTRL (HMI+RS485) 5: Blocked via input 6: Disabled
F61	Unsigned integer - Local/Remote Mode 0: Local and Remote 1: Remote only 2: Local only
F62	Unsigned integer –Maintenance Mode 0: No 1: Yes 2: Yes- BI.Outputs
F63	Unsigned integer –Configuration 0: No 1: Yes
F64	Unsigned integer – 79 dead time configuration 0: Protection reset 1: CB trips
F65	Unsigned integer – Disturbance recorder configuration 0: On Instantenous 1: On Trip
F66	Unsigned integer –Configuration 0: Disabled 1: Current+Input 2: Input only
F67	Unsigned integer (bit) - Close Shot bit 0: First Reclose Shot bit 1: Second Reclose Shot bit 2 : Third Reclose shot bit 3 : Fourth Reclose shot bit 4-15: reserved
F71	Unsigned integer - Number of setting groups: 0 : One Group 1 :Two Groups

CODE	DESCRIPTION
F72	Unsigned integer - AR trips cycle bit 0: First trip shot bit 1: Second trip shot bit 2: Third trip shot bit 3: Fourth trip shot bit 4: Fifth trip shot bit 5-15: reserved
F73	Unsigned integer - Remote Mode configuration 0 : Remote Only 1 :Remote + Local
F74	Unsigned integer - Inrush Blocking configuration 0 : No 1: Yes 2: Closing
F75	Unsigned integer 0 : No operation 1: Apply Test
F76	bit 0 : tI> bit 1 : tI>> bit 2 : tI>>> bit 3 : tSOTF bit 4 : tIN_1 bit 5 : tIN_2 bit 6 : tIN_3 bit 7 : tI2> bit 8 : tBrkn Conductor bit 9 : Reserved bit 10 : Thermal OL Trip bit 11 : CB Fail bit 12 : reserved bit 14 : reserved bit 15 : reserved
F77	Unsigned integer - Functional Test End 0: CB Trip 1: Time elapsed
F82	Unsigned integer – Control key confirmation 0: No 1: Yes 2-15: reserved
F84	Unsigned integer - Configuration: 0: disable 1: IN_x Trip 2: IN_x Alarm 3: IN_x Trip with Inrush Blocking 4: IN_x Trip with Latching 5-15: reserved
F88	Unsigned integer – IDMT Interlock by DMT 0: No 1: Yes
F90	Unsigned Integer - Software Version Number: numeric Data 0-99
F91	Unsigned integer - Line CT Sec. 0: In=1A 1: In=5A
F92	Unsigned integer – E/GND CT Sec. 0: In=1A 1: In=5A
F94	Unsigned integer - TC Supervision 0: No 1: Yes 2: Yes-52A

CODE	DESCRIPTION
F101	Input Protection Blocking 1 (bits) bit 0 : tI> bit 1 : tI>> bit 2 : tI>>> bit 3 : tSOTF bit 4 : tIN_1 bit 5 : tIN_2 bit 6 : tIN_3 bit 7 : reserved bit 8 : tIs2> bit 9 : tBCond bit 10 : tCB Fail bit 11 : Thermal OL bit 12-15: reserved
F102	Input Protection Blocking 2 (bits) bit 0: blocking [79] Autoreclose bit 1-4: reserved bit 5 : AUX1 bit 6 : AUX2 bit 7 : AUX3 bit 8 : Reserved bit 9-15: Reserved
F103	Input Selective Logic (bits) bit 0 : SEL1 tI>> bit 1 : SEL1 tI>>> bit 2 : SEL1 tIN_2 bit 3 : SEL1 tIN_3 bit 4 : SEL2 tI>> bit 5 : SEL2 tI>>> bit 6 : SEL2 tIN_2 bit 7 : SEL2 tIN_3 bit 8-15: Reserved
F104	Input Logic Data (bits) bit 0: Maintenance Mode bit 1: Reset Latched Signalling bit 2: Reset Latched Outputs bit 3: Cold Load PU bit 4: reserved bit 5: CB status 52a bit 6: CB status 52b bit 7: CB FLT External Signal bit 8: Setting Group 2 bit 9: Manual Close bit 10: Manual Trip bit 11: Trip Circuit Supervision bit 12: Reset Theta value bit 13: Start Disturbance Recorder bit 14: Local CTRL Mode bit 15: reserved
F105	Internal Logic Data (bits) bit 0: Reserved bit 1-15: reserved
F107	Unsigned integer – TC supervision? 0 : No 1: Yes 2: Yes-52a bit 3-15: reserved
F109	Unsigned integer –Configuration 0: Disabled 1: Enabled

CT

CODE	DESCRIPTION
F110	Unsigned integer –Configuration 0: Disabled 1 : enable Trip 2 : enable Alarm 3 : enable Trip with Inrush Blocking 4 : enable Trip with Latching 5: Load shedding 6: AR after LS Hi 7: AR after LS Lo bit 8-15: reserved
F111	Unsigned integer –Configuration 0: Disabled 1: Retrip 2: Alarm 3: Retrip-Inrush 4: Retrip-Latch
F113	Modicon Modbus Coil Address Lo (hex): 00: Warm restart 01: Reset LEDs 02: Reset Outputs 03: Reset LEDs and Outputs 04: Local Mode 05: Reset latched Alarms 06: Setting change to Group 1 07: Remote CB open order 08: Remote [79] Autoreclose blocking 09: Remote [79] Autoreclose unblocking 0A: Remote Mode 0B: Setting change to Group 2 0C: Disable automatic acknowledgement of events 0D: Oldest event acknowledge 0E: Oldest fault acknowledge 0F: Remote CB close order 10: Clear Recorders 11: Clear Events 12: reserved 13: Thermal state reset 14: Reserved 15: Disturbance record remote start 16: Maintenance mode 17: End of maintenance mode 18: Acknowledgement of the oldest disturbance record 19: Acknowledgment of the hardware RAM alarm 1A: Recloser reset counters 1B: Reserved 1C: Reset Fault counters 1D: Reset control counters 1E: Communication Order 1 1F: Communication Order 2 20: [79] Unlockout 21: Enable automatic acknowledgement of events

2.4.20 Request to retrieve the oldest non-acknowledge event

Slave number	Function code	Word address	Word number	CRC
xx	03h	36h 00	00 09h	xx xx

This event request may be answered an error message with the error code :

EVT_EN_COURS_ECRIT (5) : An event is being written into the saved FRAM.

Note : On event retrieval, two possibilities exist regarding the event record acknowledgement :

- Automatic event record acknowledgement on event retrieval.
- Non automatic event record acknowledgement on event retrieval.

a) Automatic event record acknowledgement on event retrieval :

The bit12 of the remote order frame (format F38 – mapping address 0400h) shall be set to 0. On event retrieval, this event record is acknowledged.

b) Non automatic event record acknowledgement on event retrieval :

The bit12 of the remote order frame (format F38 – mapping address 0400h) shall be set to 1. On event retrieval, this event record is not acknowledged. To acknowledge this event, an other remote order shall be sent to the relay. The bit 13 of this frame (format F38 – mapping address 0400h) shall be set to 1.

2.4.21 Request to retrieve a dedicated event

Slave number	Function code	Word address	Word number	CRC
xx	03h	Refer to mapping	00 09h	xx xx

This event request may be answered an error message with the error code :

EVT_EN_COURS_ECRIT (5) : An event is being written into the saved FRAM.

Note : This event retrieval does not acknowledge this event.

2.4.22 Modbus request definition used to retrieve the fault records

Two ways can be followed to retrieve a fault record :

- Send a request to retrieve the oldest non-acknowledge fault record.
- Send a request to retrieve a dedicated fault record.

2.4.22.1 Request to retrieve the oldest non-acknowledge fault record

Slave number	Function code	Word address	Word number	CRC
xx	03h	3Eh 00	00 0Fh	xx xx

Note : On fault retrieval, two possibilities exist regarding the fault record acknowledgement:

- Automatic fault record acknowledgement on event retrieval.
- Non automatic fault record acknowledgement on event retrieval.

a) Automatic fault record acknowledgement on fault retrieval :

The bit12 of the remote order frame (format F38 – mapping address 0400h) shall be set to 0. On fault retrieval, this fault record is acknowledged.

b) Non automatic fault record acknowledgement on fault retrieval :

The bit12 of the remote order frame (format F38 – mapping address 0400h) shall be set to 1. On fault retrieval, this fault record is not acknowledged.

To acknowledge this fault, an other remote order shall be sent to the relay. The bit 14 of this frame (format F38 – mapping address 0400h) shall be set to 1.

2.4.22.2 Request to retrieve a dedicated fault record

Slave number	Function code	Word address	Word number	CRC
xx	03h	Refer to mapping	00 0Fh	xx xx

Note : This fault value retrieval does not acknowledge this fault record.