MODBUS DATABASE
COURIER DATABASE
IEC 60870-5-103
DNP 3.0 DATABASE
MiCOM P120 - P121 - P122 - P123
VERSION V6.G

MODBUS DATABASE

MiCOM P120 - P121 - P122 - P123

VERSION V6

CONTENT

1. INTRODUCTION

1.1 Purpose of this document

This document describes the characteristics of the MODBUS, K-Bus/COURIER and IEC 60870-5-103 communication protocol of **MiCOM P120, P121, P122** and **P123** relays.

1.2 Glossary

Ir, Is, It : currents measured on the concerned phases (r, s, t)

I_E : 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 P120, P121, P122 and **P123** relays can communicate by a RS 485 link behind the unit following the MODBUS RTU protocol.

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 line protocol in RTU mode
- Communication speed can be configured by an operator dialog in the front panel of the relay:

Baud rate
300
600
1200
2400
4800
9600
19200
38400

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 binary = A001h

2.1.4 Address of the MiCOM relays

The address of the MiCOM relay on a same MODBUS network is situated between 1 and 255. 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 1 or 2: Reading of n bits

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 8: Reading of the diagnostics counter

Function 11: Reading of the Event counter

Function 15: Writing of n 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 P120, P121, P122** and **P123** relays

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 255.

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 relays

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 255.

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 P120, P121, P122** and **P123** relays receive a master query, it validates the frame:

If the CRC is false, the frame is invalid. **MiCOM P120, P121, P122** and **P123** relays 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 P120, P121, P122** and **P123** relays 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 255.

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.

3. MiCOM P120, P121, P122 AND P123 RELAY DATABASE ORGANISATION

3.1 Description of the application mapping

3.1.1 Settings

MiCOM P122 and P123 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 (only for P122, P123)

3.1.2 Disturbance records (P122, P123)

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:

1. Numbers of samples (pre and post time)
2. Phase CT ratio
3. Earth CT ratio
4. Internal phase and earth ratios
5. Number of the last disturbance mapping page
6. 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 à 09FAh:	250 disturbance data words
0A00 à 0AFAh:	250 disturbance data words
0B00 à 0BFAh:	250 disturbance data words
2100 à 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 à 3Ch: Selection of the disturbance record and channel

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

3.1.3 Event records (P122, P123)

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

.....

354Ah: EVENT 75

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)

3.1.4 Fault records (P122, P123)

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)

3.1.5 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 (P122, P123 only).

They are describe more precisely in the following chapters.

3.2 Page 0h (Read access only)

Address	Group	Description	Values range	Step	Unit	Format	Fault Value	Range
0000	Product Information	Relay description characters 1 and 2	32-127	1	-	F10		P120 to P123
0001		Relay description characters 3 and 4	32-127	1	-	F10	P1	P120 to P123
0002		Relay description characters 5 and 6	32-127	1	-	F10	23	P120 to P123
0003		Unit reference characters 1 and 2	32-127	1	-	F10	AL	P120 to P123
0004		Unit reference characters 3 and 4	32-127	1	-	F10	ST	P120 to P123
0005		Software version	10-xx	1	-	F21		P120 to P123
0006		Front communication	0-3	1	-	F41		P122-P123
0007		Internal phase ratio			-	F1		P122-P123
0008		Internal earth ratio			-	F1		P122-P123
0009		General start info.	0-1	1	-	F1		P120 to P123
000A to 000C		Reserved						P120 to P123
000D		Real Active Setting Group (after taking into account the protection flags)	1-2			F1		P122-P123
000E		Password active*			-	F24	0	P120 to P123
000F		Relay status			-	F45		P120 to P123
0010	Remote signalling	Logical inputs	0 to 7 or to 31	1	-	F12		P120 to P123
0011		Logical data	0 to FFFF	2^n	-	F20		P120 to P123
0012		Internal Logic	0 to FFFF	2^n	-	F22		P120 to P123
0013		Output contacts	0 to 127 or to 511	1	-	F13		P120 to P123
0014		Output information: I>	0 to FFFF	1	-	F17		P121-P122-P123
0015		Output information: I>>	0 to FFFF	1	-	F17		P121-P122-P123
0016		Output information: I>>>	0 to FFFF	1	-	F17		P121-P122-P123
0017		Output information: I_E>	0 to FFFF	1	-	F16		P120 to P123
0018		Output information: I_E>>	0 to FFFF	1	-	F16		P120 to P123
0019		Output information: I_E>>>	0 to FFFF	1	-	F16		P120 to P123

* From the V3.A Software
Does not exist for previous versions.

Address	Group	Description	Values range	Step	Unit	Format	Fault Value	Range
001A		I> memorisation	0 to FFFF	1	-	F17		P121-P122-P123
001B		I>> memorisation	0 to FFFF	1	-	F17		P121-P122-P123
001C		I>>> memorisation	0 to FFFF	1	-	F17		P121-P122-P123
001D		tI> memorisation	0 to FFFF	1	-	F17		P121-P122-P123
001E		tI>> memorisation	0 to FFFF	1	-	F17		P121-P122-P123
001F		tI>>> memorisation	0 to FFFF	1	-	F17		P121-P122-P123
0020		Thermal state information	0 to 1	1	-	F37		P122-P123
0021		Output information: I<	0 to FFFF	1	-	F17		P122-P123
0022		Output information: I2>	0 to FFFF	1	-	F16		P122-P123
0023		Output information: broken conductor / CB failure / CB alarm	0 to FFFF	1	-	F38		P122-P123
0024		tI< memorisation	0 to FFFF	1	-	F17		P122-P123
0025		Memorised flag for non acknowledged alarms			-	F36		P122-P123
0026		Number of disturbance records available	0 to 5	1	-	F31		P122-P123
0027		Tripping output (RL1) status	0 to 1	1	-	F1		P122-P123
0028		CB supervision flag			-	F43		P122-P123
0029		memorised flag 2 for non acknowledged alarms			-	F44		P122-P123
002A		Reserved	Logical data	0 to FFFF	2^n	-	F20 bis	P120 to P123
002B		Threshold information: Iinv>>	0 to FFFF	1	-	F16		P122-P123
002C to 002F		Reserved						P120 to P123

Address	Group	Description	Values range	Step	Unit	Format	Fault Value	Range
0030	Remote measurements	Phase A current RMS value	0 to 600 000	1	A/100	F18		P121-P122-P123
0032		Phase B current RMS value	0 to 600 000	1	A/100	F18		P121-P122-P123
0034		Phase C current RMS value	0 to 600 000	1	A/100	F18		P121-P122-P123
0036		Earth current RMS value	0 to 120 000	1	A/100	F18		P120 to P123
0038 to 0039		Reserved						P120 to P123
003A		Thermal state (saved)			%	F1		P122-P123
003B		Frequency	4500 to 6500	1	1/100 Hz	F1		P120 to P123
003C		Max RMS value phase A	0 to 600 000	1	A/100	F18		P122-P123
003E		Max RMS value phase B	0 to 600 000	1	A/100	F18		P122-P123
0040		Max RMS value phase C	0 to 600 000	1	A/100	F18		P122-P123
0042		Average RMS value Phase A	0 to 600 000	1	A/100	F18		P122-P123
0044		Average RMS value Phase B	0 to 600 000	1	A/100	F18		P122-P123
0046		Average RMS value Phase C	0 to 600 000	1	A/100	F18		P122-P123
0048		Harmonic I_o*	0 to 600 000	1	A/100	F18		P122-P123
004A		Inverse Current (fundamental)		1	A/100	F18		P122-P123
004C		Direct current		1	A/100	F18		P122-P123
004E		I2/I1 ratio			%	F1		P122-P123
004F		Reserved						P120 to P123
0050	Fourier Module	Module IA			-	F1		P121-P122-P123
0051		Module IB			-	F1		P121-P122-P123
0052		Module IC			-	F1		P121-P122-P123
0053		Module I_E			-	F1		P120 to P123

* From V3.A Software only

Address	Group	Description	Values range	Step	Unit	Format	Fault Value	Range
0118		CB Closing time			1/100 sec	F1		P122-P123
0119 to 011D		Reserved						P120 to P123
011E		Maintenance mode						P122-P123
011F		Relays Latching				F14		P121-P122-P123
0120	Ratio	Primary phase CT value	1 to 50000*	1	-	F1	1000	P121-P122-P123
0121		Secondary phase CT value	1 to 5	4	-	F1	1	P121-P122-P123
0122		Primary earth CT value	1 to 50000*	1	-	F1	1000	P120 to P123
0123		Secondary earth CT value	1 to 5	4	-	F1	1	P120 to P123
0124 to 012E		Reserved						P120 to P123
012F		Rotation phase sequence	0 to 1	1	-	F51	0	P121-P122-P123
0130	Communication	Speed	0 to 7	1	-	F4	6 = 19200 bds	P120 to P123
0131		Parity	0 to 2	1	-	F5	0 = without	P120 to P123
0132		Data bits	0 to 1	1	-	F28	1 = 8 bits	P120 to P123
0133		Stop bit	0 to 1	1	-	F29	0 = 1 stop bit	P120 to P123
0134		COM available	0 to 1	1	-	F30	1=COM available	P120 to P123
0135		Date Format	0 to 1	1	-	F48	0= Private	P122-P123
0136 to 013F		Reserved					0	P120 to P123
0140	Configuration	Setting group	1 to 2	1	-	F1	1	P122-P123
0141		Validation of instantaneous alarms auto reset	0 to 1	1	-	F1	0	P122-P123
0142		Configuration of change of group selection	0 to 1	1	-	F47	1	P122-P123
0143		Battery alarm and RAM error configuration	0 to 1	1	-	F1	0	P122-P123
0144		Configuration of LED reset on fault	0 to 1	1		F1	0	P122-P123
0145 to 0149		Reserved					0	P120 to P123

Address	Group	Description	Values range	Step	Unit	Format	Fault Value	Range
014A	Output Relay allocation	Max I2>>	0 to 31	1	-	F14	0	P122-P123
014B to 014F		Reserved						P120 to P123
0150	LEDs allocation	Led 5		1	-	F19	4	P120 to P123
0151		Led 6		1	-	F19	16	P120 to P123
0152		Led 7		1	-	F19	32	P120 to P123
0153		Led 8		1		F19	64	P120 to P123
0154		Led PF 5		1		F19'	0	P122-P123
0155		Led PF 6		1		F19'	0	P122-P123
0156		Led PF 7		1		F19'	0	P122-P123
0157		Led PF 8		1		F19'	0	P122-P123
0158 to 015A		Reserved						P122-P123
015B	Logic input allocation	Logic input 1	VTA		-	F15 Bis	0	P122-P123
015C		Logic input 2	VTA		-	F15 Bis	0	P122-P123
015D		Logic input 3	VTA		-	F15 Bis	0	P122-P123
015E		Logic input 4	VTA		-	F15 Bis	0	P122-P123
015F		Logic input 5	VTA		-	F15 Bis	0	P122-P123

* From the V6.E Software
From the V3.A Software to V6.E: 1 to 9999.
For the previous versions: 1 to 3000.

** For addresses n°0105, 0106, 0107: for P121, these information are available until the V2.X software. For the following versions, they are suppressed

*** For addresses n°0108 and 0109: for P120, P121, these information are available until the V2.X software. For the following versions, they are suppressed.

Address	Group	Description	Values range	Step	Unit	Format	Fault Value	Range
0160	Logic input allocation	Logic input 1	VTA		-	F15	0	P120 to P123
0161		Logic input 2	VTA		-	F15	0	P120 to P123
0162		Logic input 3	VTA		-	F15	0	P122-P123
0163		Logic input 4	VTA		-	F15	0	P123
0164		Logic input 5	VTA		-	F15	0	P123
0165	Output relay allocation	Broken conductor detection	0-31	1	-	F14	0	P122-P123
0166		CB failure	0 - 31	1	-	F14	0	P122-P123
0167		I<	0 - 31	1	-	F14	0	P122-P123
0168		I2>	0 - 31	1	-	F14	0	P122-P123
0169		Thermal overload alarm	0 - 31	1	-	F14	0	P122-P123
016A		Thermal overload trip	0-31	1	-	F14	0	P122-P123
016B		CB close	0-31	1	-	F14	0	P121-P122-P123
016C		tAUX1	0-31	1	-	F14	0	P122-P123
016D		tAUX2	0-31	1	-	F14	0	P122-P123
016E		CB alarms	0-31	1	-	F14	0	P122-P123
016F		Trip circuit	0-31	1	-	F14	0	P123
0170		Active setting group If active group =2 than output =1	0 - 31	1	-	F14	0	P122-P123
0171		Trip	0 - 31	1	-	F14	1	P120 to P123
0172		tI>	0 - 31	1	-	F14	0	P121-P122-P123
0173		tI>>	0 - 31	1	-	F14	0	P121-P122-P123
0174		tI>>>	0 - 31	1	-	F14	0	P121-P122-P123
0175		tI_E>	0 - 31	1	-	F14	0	P120 to P123
0176		tI_E>>	0 - 31	1	-	F14	0	P120 to P123
0177		tI_E>>>	0 - 31	1	-	F14	0	P120 to P123
0178		I>	0 - 31	1	-	F14	0	P121-P122-P123
0179		I>>	0 - 31	1	-	F14	0	P121-P122-P123
017A		I>>>	0 - 31	1	-	F14	0	P121-P122-P123

Address	Group	Description	Values range	Step	Unit	Format	Fault Value	Range
017B		I_E>	0 - 31	1	-	F14	0	P120 to P123
017C		I_E>>	0 - 31	1	-	F14	0	P120 to P123
017D		I_E>>>	0 - 31	1	-	F14	0	P120 to P123
017E		Recloser running	0 - 31	1	-	F14	0	P123
017F		Recloser final trip	0 - 31	1	-	F14	0	P123
0180	Automation	Trip	0 to 63	1	-	F6	1	P120 to P123
0181		Relay latching	0 to 63	1	-	F8	0	P120 to P123
0182		Blocking logic 1	0 to 63	1	-	F8'	0	P120 to P123
0183		Blocking logic 2	0 to 63	1	-	F8'	0	P122-P123
0184		Broken conductor detection	0 - 1	1	-	F24	0	P122-P123
0185		tBC	0 to 14400	1	-	F1	0	P122-P123
0186		Cold load start	0 - 1	1	-	F24	0	P122-P123
0187		Cold load start thresholds	0 to 255	1	-	F33	0	P122-P123
0188		Cold load start %	100 to 500	1		F1	50	P122-P123
0189		Cold load start delay	1 to 36000*	1	1/10 s	F1	10	P122-P123
018A		CB failure	0 - 1	1		F24	0	P122-P123
018B		tBF	0 to 1000	1	1/100 s	F1	10	P122-P123
018C		Logic Selectivity1	0 to 15	1	-	F40	0	P122-P123
018D		tSEL1	0 to 15000	1	1/100 s	F1	0	P122-P123
018E		Logic Selectivity2	0 to 15	1	-	F40	0	P122-P123
018F		tSEL2	0 to 15000	1	1/100 s	F1	0	P122-P123
0190	Disturbance	Pre-time	1 to 30	1	-	F1	1	P122-P123
0191		Post-time	1 to 30	1	-	F1	1	P122-P123
0192		Disturbance starting condition	0 - 1	1	-	F32	0	P122-P123

* From the V3.A Software
For the previous versions: 10 to 360, Step 5, unit 1/100s.

Address	Group	Description	Values range	Step	Unit	Format	Fault Value	Range
0193	CB monitoring	Operating time	0 - 1	1	-	F24	0	P122-P123
0194		Operating time threshold	5 to 100	5	1/100 s	F1	5	P122-P123
0195		Operation number	0 - 1	1	-	F24	0	P122-P123
0196		Operation number threshold	0 - 50000	1	-	F1	0	P122-P123
0197		CB switched Amps sum (Power n)	0 - 1	1	-	F24	0	P122-P123
0198		CB switched Amps sum threshold		0 to 4000	10^E6 A^n	F3		P122-P123
0199		Amps or square Amps	1 - 2	1		F1	1	P122-P123
019A		Closing time threshold	5 to 100	5	1/100 s	F1	0	P122-P123
019B		Auxiliary timer 1	0 to 20000	1	1/100 s	F1	0	P122-P123
019C		Auxiliary timer 2	0 to 20000	1	1/100 s	F1	0	P122-P123
019D		Peak value	5 to 60	VTA	min	F42	5	P122-P123
019E		I2/I1 threshold	20 to 100	1	%	F1	20	P122-P123
019F		Tripping time	10 to 500	5	1/100 s	F1	10	P122-P123
01A0		Closing time	10 to 500	5	1/100 s	F1	10	P122-P123
01A1		Closing time threshold validation	0 - 1	1		F24	0	P122-P123
01A2		Trip circuit supervision validation	0 - 1	1		F24	0	P122-P123
01A3		t SUP	10 to 1000	5	1/100 s	F1	10	P122-P123
01A4		I< threshold CB failure	10 - 100	1	%In	F1	10	P122-P123
01A5		Instantaneous phase blocking if CB failure	0 – 1	1	-	F24	0	P122-P123
01A6		Instantaneous earth blocking if CB failure	0 – 1	1	-	F24	0	P122-P123
01A7	Rolling Demand	Sub period	0 – 60	1	min	F1		P122-P123
01A8		Sub period number	0 – 24	1	-	F1		P122-P123
01A9	Output relay allocation	Communication Order 1*	0 - 31	1	-	F14	0	P122-P123
01AA		Communication Order 2*	0 - 31	1	-	F14	0	P122-P123
01AB		Communication Order 3*	0 - 31	1	-	F14	0	P122-P123
01AC		Communication Order 4*	0 - 31	1	-	F14	0	P122-P123
01AD		T comm 1*	10 – 500	5	1/100s	F1	10	P122-P123
01AE		T comm 2*	10 – 500	5	1/100s	F1	10	P122-P123
01AF		T comm 3*	10 – 500	5	1/100s	F1	10	P122-P123
01B0		T comm 4*	10 – 500	5	1/100s	F1	10	P122-P123
01B1		tEXT 3	0 – 31	1	-	F14	0	P122-P123
01B2		tEXT 4	0 – 31	1	-	F14	0	P123
01B3		Auxiliary timer3	0 – 20000	1	1/100s	F1	0	P122-P123

Address	Group	Description	Values range	Step	Unit	Format	Fault Value	Range
01B4		Auxiliary timer4	0 – 20000	1	1/100s	F1	0	P123
01B5 to 01BF		Reserved						P120 to P123
01C0 to 01F5		Reserved **						P123
01F6		Remote trip**	0 – 31	1	-	F14	0	P123
01F7		Remote close**	0 – 31	1	-	F14	0	P123
01F8		SOFT function**	0 – 1	1	-	F52	0	P123
01F9		SOFT timer**	0 - 500	1	1/1000s	F1	0	P123
01FA		SOFT parameter I>> or I>>>**	0 - 1	1	-	F53	0	P123
01FB		Trip bis**	0 to 63	1	-	F6'	0	P123
01FC		Relay latching bis**	0 to 63	1	-	F7	0	P123
01FD	Output relay allocation	SOFT**	0 - 31	1	-	F14	0	P123
01FE	Output relay allocation	Locked recloser ***	0 - 31	1	-	F14	0	P123

* From V5.D

** From V6.C

*** From V6.G

3.4 Page 2h (Access in reading and in writing)

Address	Group	Description	Values range	Step	Unit	Format	Fault Value	Range
0200	Setting group 1	I>	0-1	1	-	F24	0	P121-P122-P123
0201		I> threshold	10 to 2500	1	In/100	F1	10	P121-P122-P123
0202		I> time delay type	0 to 2	1	-	F27	0	P121-P122-P123
0203		I> IDMT Curve Type	0 to 10	1	-	F3	1	P121-P122-P123
0204		I> TMS value	25 to 1500	25	1/1000	F1	25	P121-P122-P123
0205		I> K value (RI curve)	100 to 10000	5	1/1000	F1	100	P121-P122-P123
0206		tI> value	0 to 15000	1	1/100 s	F1	4	P121-P122-P123
0207		I> Reset type	0 - 1	1		F27	0	P122-P123
0208		I> RTMS value	25 to 3200	25	1/1000	F1	25	P122-P123
0209		I> tRESET value	4 to 10000	1	1/100 s	F1	4	P122-P123
020A to 020F		Reserved					0	P120 to P123
0210		I>>	0-1	1	-	F24	0	P121-P122-P123
0211		I>> Threshold	50 to 4000	5	In/100	F1	50	P121-P122-P123
0212		tI>> value	0 to 15000	1	1/100 s	F1	1	P121-P122-P123
0213		I>> time delay type	0 – 2	1	-	F27	0	P122-P123
0214		I>> IDMT curve type	0 – 10	1	-	F3	1	P122-P123
0215		I>> TMS value	25 – 1500	25	1/1000	F1	25	P122-P123
0216		K value (RI curve)	100 – 10000	5	1/1000	F1	100	P122-P123
0217		I>> Reset Type	0 – 1	1	-	F27	0	P122-P123
0218		I>> RTMS value	25 – 3200	25	1/1000	F1	25	P122-P123
0219		I>> tRESET value	4 – 10000	1	1/100 s	F1	4	P122-P123
021A to 021F		Reserved					0	P120 to P123
0220		I>>>	0-1	1	-	F24	0	P121-P122-P123
0221		I>>> Threshold	50 to 4000	5	In/100	F1	50	P121-P122-P123
0222		tI>>> value	0 to 15000	1	1/100 s	F1	1	P121-P122-P123
0223		I>>> on sample	0 – 1	1	-	F24	0	P122-P123
0223 to 022F		Reserved					0	P120 to P123

Address	Group	Description	Values range	Step	Unit	Format	Fault Value	Range
0230		I_E>	0-1	1	-	F24	0	P120 to P123
0231		I_E> Threshold	10 to 1000	5	1/1000 I0n	F1	10	P120 to P123
0232		I_E> time delay type	0 to 3	1	-	F27'	0	P120 to P123
0233		I_E> IDMT curve type	0 to 10	1	-	F3	1	P120 to P123
0234		I_E> TMS value	25 to 1500	25	1/1000	F1	25	P120 to P123
0235		I_E> K value (RI curve)	100 to 10000	5	1/1000	F1	100	P120 to P123
0236		tI_E> value	0 to 15000	1	1/100 s	F1	4	P120 to P123
0237		I_E> reset type	0 - 1	1		F27	0	P122-P123
0238		I_E> RTMS value	25 to 3200	25	1/1000	F1	25	P122-P123
0239		I_E> tRESET value	4 to 10000	1	1/100 s	F1	4	P122-P123
023A		I_E> Curve type (Belgium)	0 – 2	0	1	F3'	0	P122-P123
023B to 023F		Reserved						P120 to P123
0240		I_E>>	0-1	1	-	F24	0	P120 to P123
0241		I_E>> Threshold	10 to 8000	5	1/1000 I0n	F1	10	P120 to P123
0242		tI_E>> value	0 to 15000	1	1/100 s	F1	1	P120 to P123
0243		I_E>> time delay type	0 to 3	1	-	F27'	0	P122-P123
0244		I_E>> IDMT curve type	0 to 10	1	-	F3	1	P122-P123
0245		I_E>> TMS value	25 to 1500	25	1/1000	F1	25	P122-P123
0246		I_E>> K value (RI curve)	100 to 10000	5	1/1000	F1	100	P122-P123
0247		TReset Type	0 – 1	1	-	F27	0	P122-P123
0248		Time Multiplier TDMS	25 – 3200	25	1/1000	F1	25	P122-P123
0249		TReset	4 – 10000	1	1/100 s	F1	4	P122-P123
024A		Curve Type (Belgium)	0 – 2	0	1	F3'	0	P122-P123
024B to 024E		Reserved					0	P120 to P123
024F		I_E>> on sample	0 – 1	1	-	F24	0	P122-P123
0250		I_E>>>	0-1	1	-	F24	0	P120 to P123
0251		I_E>>> Threshold	10 to 8000	5	1/1000 I0n	F1	10	P120 to P123

Address	Group	Description	Values range	Step	Unit	Format	Fault Value	Range
0252		tI_E>>>value	0 to 15000	1	1/100 s	F1	1	P120 to P123
0253		Ith>	0 - 1	1		F24	0	P122-P123
0254		Ith> Threshold	10 to 320	5	1/100	F1	8	P122-P123
0255		Ith> k value	100 to 150	1	1/100	F1	105	P122-P123
0256		Ith> trip threshold	50 to 200	1	%	F1	100	P122-P123
0257		Ith> alarm	0 - 1	1		F24	0	P122-P123
0258		Ith> alarm threshold	50 to 200	1	%	F1	90	P122-P123
0259		Thermal overload time constant	1 to 200	1	mn	F1	1	P122-P123
025A		I<	0-1	1	-	F24	0	P122-P123
025B		I< threshold	0 to 100	1	% In	F1	20	P122-P123
025C		I2>	0-1	1	-	F24	0	P122-P123
025D		I2> threshold	10 to 4000	1	In/100	F1	10	P122-P123
025E		I2> time delay type	0 to 2	1	-	F27	0	P122-P123
025F		I2> IDMT type	0 to 9	1	-	F3	1	P122-P123
0260		I2> TMS value	25 to 1500	25	1/1000	F1	25	P122-P123
0261		I2> K value (RI)	100 to 10000	5	1/1000	F1	100	P122-P123
0262		tI2> value	0 to 15000	1	1/100 s	F1		P122-P123
0263		I2> Reset type	0 - 1	1		F27	0	P122-P123
0264		I2> RTMS value	25 to 3200	25	1/1000	F1	25	P122-P123
0265		I2> tRESET value	4 to 10000	1	1/100 s	F1	4	P122-P123
0266		Iinv>>	0 – 1	1	-	F24	0	P122-P123
0267		Iinv>> Threshold	10 – 4000	1	1/100 In	F24	10	P122-P123
0268		tIinv>> value	0 to 15000	1	1/100 s	F1		P122-P123
0269 to 026E		Reserved					0	P120 to P123
026F		tI< value	0 to 15000	1	1/100 s	F1		P122-P123
0270	AR	Recloser valid	0 - 1	1		F24	0	P123
0271		CB position active	0 - 1	1		F1	0	P123
0272-0273		Supervision window	1 to 60000	1	1/100 s	F18	1	P123
0274		External blocking input	0 – 1	1		F24	0	P123
0275 to 0276		Reserved						P120 to P123
0277		Dead time 1	0 to 30000	1	1/100 s	F1	1	P123
0278		Dead time 2	0 to 30000	1	1/100 s	F1	1	P123
0279-027A		Dead time 3	0 to 60000	1	1/100 s	F18	1	P123
027B-027C		Dead time 4	0 to 60000	1	1/100 s	F18	1	P123

Address	Group	Description	Values range	Step	Unit	Format	Fault Value	Range
027D-027E		Reclaim time	2 to 60000	1	1/100 s	F18	2	P123
027F-0280		Inhibit time	2 to 60000	1	1/100 s	F18	2	P123
0281		Recloser cycles for phase faults	0 to 4	1		F1	0	P123
0282		Recloser cycles for earth faults	0 to 4	1		F1	0	P123
0283		I> Phase cycle configuration	0 – 2222	1		F49	0	P123
0284		I>> Phase cycle configuration	0 – 2222	1		F49	0	P123
0285		I>>> Phase cycle configuration	0 – 2222	1		F49	0	P123
0286		I_E> Phase cycle configuration	0 – 2222	1		F49	0	P123
0287		I_E>> Phase cycle configuration	0 – 2222	1		F49	0	P123
0288		I_E>>> Phase cycle configuration	0 – 2222	1		F49	0	P123
0289		TAUX1 cycle configuration	0 – 2222	1		F49	0	P123
028A		TAUX2 cycle configuration	0 – 2222	1		F49	0	P123

3.5 Page 3h (Access in reading and in writing)

Address	Group	Description	Values range	Step	Unit	Format	Fault Value	Range
0300	Setting group 2	I>	0-1	1	-	F24	0	P121-P122-P123
0301		I> threshold	10 to 2500	1	In/100	F1	10	P121-P122-P123
0302		I> time delay type	0 to 2	1	-	F27	0	P121-P122-P123
0303		I> IDMT Curve Type	0 to 10	1	-	F3	1	P121-P122-P123
0304		I> TMS value	25 to 1500	25	1/1000	F1	25	P121-P122-P123
0305		I> K value (RI curve)	100 to 10000	5	1/1000	F1	100	P121-P122-P123
0306		tI> value	0 to 15000	1	1/100 s	F1	4	P121-P122-P123
0307		I> Reset type	0 - 1	1		F27	0	P122-P123
0308		I> RTMS value	25 to 3200	25	1/1000	F1	25	P122-P123
0309		I> tRESET value	4 to 10000	1	1/100 s	F1	4	P122-P123
030A to 030F		Reserved					0	P120 to P123
0310		I>>	0-1	1	-	F24	0	P121-P122-P123
0311		I>> Threshold	50 to 4000	5	In/100	F1	50	P121-P122-P123
0312		tI>> value	0 to 15000	1	1/100 s	F1	1	P121-P122-P123
0313		I>> time delay type	0 – 2	1	-	F27	0	P122-P123
0314		I>> IDMT curve type	0 – 10	1	-	F3	1	P122-P123
0315		I>> TMS value	25 – 1500	25	1/1000	F1	25	P122-P123
0316		K value (RI curve)	100 – 10000	5	1/1000	F1	100	P122-P123
0317		I>> Reset Type	0 – 1	1	-	F27	0	P122-P123
0318		I>> RTMS value	25 – 3200	25	1/1000	F1	25	P122-P123
0319		I>> tRESET value	4 – 10000	1	1/100 s	F1	4	P122-P123
031A to 031F		Reserved					0	P120 to P123
0320		I>>>	0-1	1	-	F24	0	P121-P122-P123
0321		I>>> Threshold	50 to 4000	5	In/100	F1	50	P121-P122-P123
0322		tI>>> value	0 to 15000	1	1/100 s	F1	1	P121-P122-P123
0323 to 032F		Reserved					0	P120 to P123

Address	Group	Description	Values range	Step	Unit	Format	Fault Value	Range
0330		I_E>	0-1	1	-	F24	0	P120 to P123
0331		I_E> Threshold	10 to 1000	5	1/1000 I0n	F1	10	P120 to P123
0332		I_E> time delay type	0 to 3	1	-	F27'	0	P120 to P123
0333		I_E> IDMT curve type	0 to 10	1	-	F3	1	P120 to P123
0334		I_E> TMS value	25 to 1500	25	1/1000	F1	25	P120 to P123
0335		I_E> K value (RI curve)	100 to 10000	5	1/1000	F1	100	P120 to P123
0336		tI_E> value	0 to 15000	1	1/100 s	F1	4	P120 to P123
0337		I_E> reset type	0 - 1	1		F27	0	P122-P123
0338		I_E> RTMS value	25 to 3200	25	1/1000	F1	25	P122-P123
0339		I_E> tRESET value	4 to 10000	1	1/100 s	F1	4	P122-P123
033A		I_E> Curve type (Belgium)	0 – 2	0	1	F3'	0	P122-P123
033B to 033F		Reserved						P120 to P123
0340		I_E>>	0-1	1	-	F24	0	P120 to P123
0341		I_E>> Threshold	10 to 8000	5	1/1000 I0n	F1	10	P120 to P123
0342		tI_E>> value	0 to 15000	1	1/100 s	F1	1	P120 to P123
0343		I_E>> time delay type	0 to 3	1	-	F27'	0	P122-P123
0344		I_E>> IDMT curve type	0 to 10	1	-	F3	1	P122-P123
0345		I_E>> TMS value	25 to 1500	25	1/1000	F1	25	P122-P123
0346		I_E>> K value (RI curve)	100 to 10000	5	1/1000	F1	100	P122-P123
0347		TReset Type	0 – 1	1	-	F27	0	P122-P123
0348		Time Multiplier TDMS	25 – 3200	25	1/1000	F1	25	P122-P123
0349		TReset	4 – 10000	1	1/100 sec	F1	4	P122-P123
034A		Curve Type (Belgium)	0 – 2	0	1	F3'	0	P122-P123
034B to 034F		Reserved					0	P120 to P123
0350		I_E>>>	0-1	1	-	F24	0	P120 to P123
0351		I_E>>> Threshold	10 to 8000	5	1/1000 I0n	F1	10	P120 to P123

Address	Group	Description	Values range	Step	Unit	Format	Fault Value	Range
0352		tI_E>>>value	0 to 15000	1	1/100 s	F1	1	P120 to P123
0353		Ith>	0 - 1	1		F24	0	P122-P123
0354		Ith> Threshold	10 to 320	5	1/100	F1	8	P122-P123
0355		Ith> k value	100 to 150	1	1/100	F1	105	P122-P123
0356		Ith> trip threshold	50 to 200	1	%	F1	100	P122-P123
0357		Ith> alarm	0 - 1	1		F24	0	P122-P123
0358		Ith> alarm threshold	50 to 200	1	%	F1	90	P122-P123
0359		Thermal overload time constant	1 to 200	1	mn	F1	1	P122-P123
035A		I<	0-1	1	-	F24	0	P122-P123
035B		I< threshold	0 to 100	1	% In	F1	20	P122-P123
035C		I2>	0-1	1	-	F24	0	P122-P123
035D		I2> threshold	10 to 4000	1	In/100	F1	10	P122-P123
035E		I2> time delay type	0 to 2	1	-	F27	0	P122-P123
035F		I2> IDMT type	0 to 9	1	-	F3	1	P122-P123
0360		I2> TMS value	25 to 1500	25	1/1000	F1	25	P122-P123
0361		I2> K value (RI)	100 to 10000	5	1/1000	F1	100	P122-P123
0362		tI2> value	0 to 15000	1	1/100 s	F1		P122-P123
0363		I2> Reset type	0 - 1	1		F27	0	P122-P123
0364		I2> RTMS value	25 to 3200	25	1/1000	F1	25	P122-P123
0365		I2> tRESET value	4 to 10000	1	1/100 s	F1	4	P122-P123
0366		Iinv>>	0 – 1	1	-	F24	0	P122-P123
0367		Iinv>> Threshold	10 – 4000	1	1/100 In	F24	10	P122-P123
0368		tIinv>> value	0 to 15000	1	1/100 s	F1		P122-P123
0369 to 036E		Reserved					0	P120 to P123
036F		tI< value	0 to 15000	1	1/100 s	F1		P122-P123
0370	AR	Recloser valid	0 - 1	1		F24	0	P123
0371		CB position active	0 - 1	1		F1	0	P123
0372-0373		Supervision window	1 to 60000	1	1/100 s	F18	1	P123
0374		External blocking input	0 – 1	1		F24	0	P123
0375 to 0376		Reserved						P120 to P123
0377		Dead time 1	0 to 30000	1	1/100 s	F1	1	P123
0378		Dead time 2	0 to 30000	1	1/100 s	F1	1	P123
0379-037A		Dead time 3	0 to 60000	1	1/100 s	F18	1	P123

Address	Group	Description	Values range	Step	Unit	Format	Fault Value	Range
037B-037C		Dead time 4	0 to 60000	1	1/100 s	F18	1	P123
037D-037E		Reclaim time	2 to 60000	1	1/100 s	F18	2	P123
037F-0380		Inhibit time	2 to 60000	1	1/100 s	F18	2	P123
0381		Recloser cycles for phase faults	0 to 4	1		F1	0	P123
0382		Recloser cycles for earth faults	0 to 4	1		F1	0	P123
0383		I> Phase cycle configuration	0 – 2222	1		F49	0	P123
0384		I>> Phase cycle configuration	0 – 2222	1		F49	0	P123
0385		I>>> Phase cycle configuration	0 – 2222	1		F49	0	P123
0386		I_E> Phase cycle configuration	0 – 2222	1		F49	0	P123
0387		I_E>> Phase cycle configuration	0 – 2222	1		F49	0	P123
0388		I_E>>> Phase cycle configuration	0 – 2222	1		F49	0	P123
0389		TAUX1 cycle configuration	0 – 2222	1		F49	0	P123
038A		TAUX2 cycle configuration	0 – 2222	1		F49	0	P123

3.6 Page 4h

Access in writing

Address	Group	Description	Values range	Step	Unit	Format	Fault Value	Range
0400	Remote control	Remote control word 1	0 to 31	1	-	F9	0	P120 to P123
0401		Reserved					0	P120 to P123
0402		Remote control word 2 (single output command)	0 to 511	1	-	F39	0	P122-P123
0403		Remote control word 3	0 to 1	1	-	F46	0	P122-P123

3.7 Pages 5h/6h

These pages are reserved

3.8 Page 7h

Access in quick reading only (MODBUS 07 function)

Address	Group	Description	Values range	Step	Unit	Format	Fault Value
0700	**Quick reading byte**	Description of the protection autocontrol		1	-	F23	0

3.9 Page 8h (P122, P123)

Time synchronisation: access in writing for n words (function 16). The time synchronisation format is based on 8 bits (4 words).

If date Format (0135h) is private date then format is:

Timer	@page	Nb bits	Values range	Unit
Year pF+pf	8	2		Year
Month	8	1	1 - 12	Month
Day	8	1	1 - 31	Day
Hour	8	1	0 - 23	Hour
Minute	8	1	0 - 59	Minute
Millisecond pF+pf	8	2	0 - 59999	Ms

Else format is (Inverted IEC 870-5-4 CP56Time2a):

Timer	@page	Nb bits	Values range	Unit
	8	1	0	
Year	8	1	0 – 99	Year
Month	8	1	1 – 12	Month
Day of Week / Day of Month	8	1	1 – 12 1 – 31	Day
Summer time / 00/ Hour	8	1	0 –1 / 00 / 0 – 23	Hour
Invalidity/ Minute	8	1	0-1 / 0 / 0 – 59	Minute
Millisecond pF+pf	8	2	0 – 59999	Ms

3.10 Mapping Access Characteristics

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

P121

PAGE 00h 0000h to 006Fh	PAGE 01h 0100h to 0190h	PAGE 02h 0200h to 025Fh
PAGE 03h 0300h to 035Fh	PAGE 05h 0500h to 052Ah	

P122, P123

PAGE 00h 0000h to 006Fh	PAGE 01h 0100h to 01BFh	PAGE 02h 0200h to 028Ah
PAGE 03h 0300h to 038Ah	PAGE 05h 0500h to 052Ch	

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

P121

PAGE 01h 0100h to 0190h	PAGE 02h 0200h to 025Fh	PAGE 03h 0300h to 035Fh
PAGE 04h 0400h to 0403h	PAGE 05h 0500h to 052Ah	

P122, P123

PAGE 01h 0100h to 01BFh	PAGE 02h 0200h to 028Ah	PAGE 03h 0300h to 038Ah
PAGE 04h 0400h to 0403h	PAGE 05h 0500h to 052Ch	

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

P121

PAGE 01h 0100h to 0190h	PAGE 02h 0200h to 025Fh	
PAGE 03h 0300h to 035Fh	PAGE 05h 0500h to 052Ah	

P122, P123

PAGE 01h 0100h to 01BFh	PAGE 02h 0200h to 028Ah	PAGE 03h 0300h to 038Ah
PAGE 05h 0500h to 052Ch	PAGE 08h 0800h to 0803h	

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

WARNING: THE BITS NUMBER MUST NOT BE HIGHER THAN16. ADDRESSES ARE GIVEN IN BIT ADDRESSES.

P121:

PAGE 00h 0100h to 01F0h	PAGE 01h 1500h to 1830h

P122, P123:

PAGE 00h 0100h to 0250h	PAGE 01h 1500h to 1830h

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

WARNING: THE BITS NUMBER MUST NOT BE HIGHER THAN 16.
P121, P122, P123:
PAGE 04h
4000h to 4002h

- Description of accessible addresses in writing of n bits (**function 15**).

WARNING: THE BITS NUMBER MUST NOT BE HIGHER THAN 16.
P121, P122, P123:
PAGE 01h
1500h to 1830h

PAGE 04h
4000h to 400Fh and
4030h to 403Fh (only P122, P123)

3.11 Pages 9h to 21h

Disturbance record data (25 pages). Access in words writing (**function 03**)

Each disturbance mapping page contain 250 words.

Addresses	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.

3.11.1 Meaning of each value channel

- IA, IB, IC and I_o channels:

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

3.11.2 Calculation formula for phase current values

Line phase current value (primary value) = phase sampled value (e.g. word 10, 11, 12 or 13) * phase primary CT / phase internal CT ratio (mapping address 0007) *√2

3.11.3 Calculation formula for earth current values

The formula depends of nominal earth current:

0.1 to 40 Ion range

Line earth current value (primary value) = earth sampled value (e.g. word 10 or 14) * earth primary CT / earth internal CT ratio (mapping address 0008=800) *√2

0.01 to 8 Ion range

Line earth current value (primary value) = earth sampled value (e.g. word 10 or 14) * earth primary CT / earth internal CT ratio (mapping address 0008=3277) *√2

0.002 to 1 Ion range

Line earth current value (primary value) = earth sampled value (e.g. word 10 or 14) * earth primary CT / earth internal CT ratio (mapping address 0008=32700) *√2

- Frequency channel:

Time between two samples in microseconds

- Logic channels:

Logic channel	Contents
Bit 0	Trip relay (RL1)
Bit 1	Output relay 2 (RL2)
Bit 2	Output relay 3 (RL3)
Bit 3	Output relay 4 (RL4)
Bit 4	Watch-dog relay (RL0)
Bit 5	Output relay 5 (RL5)
Bit 6	Output relay 6 (RL6)
Bit 7	Output relay 7 (RL7)
Bit 8	Output relay 8 (RL8)
Bit 9	Reserved
Bit 10	Logic input 1 (EL1)
Bit 11	Logic input 2 (EL2)
Bit 12	Logic input 3 (EL3)
Bit 13	Logic input 4 (EL4)
Bit 14	Logic input 5 (EL5)
Bit 15	Reserved

3.12 Page 22h

Disturbance record index frame (7 to 9 Words)

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

Addresses	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 command (RL1) 2: instantaneous 3: remote command 4: logic input
n° 7	Frequency at the post-time beginning
n° 8	(=0) Optional
n° 9	(=0) Optional

3.13 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: COURIER Cell address

Words n° 5 & 6 if data format is private:

Event date (second) number of seconds since 01/01/94

Words n° 7 & 8 if data format is private:

Event date (millisecond)

Words N°5, 6, 7, 8, if data format is Inverted IEC 870-5-4 CP56Time2a:

See format § 3.9 Page 8h (P122, P123)

Word n° 9: Acknowledge

0=event non acknowledged
1= event acknowledged

Code	Meaning of the event	Type	MODBUS address	COURIER Cell
00	No event	-		-
01	Remote closing	F9	013h	021
02	Remote tripping	F9	013h	021
03	Disturbance recording start	F9		-
04	Trip output delatch	F9	013h	021
05	Setting change	Address		-
06	Remote thermal reset	F9		-
07	Maintenance Mode	F9 ↑ ↓	0400h	-
08	Control relay in maintenance mode	F39 ↑ ↓	013h	-
09	I>	F17 ↑ ↓	014h	023
10	I>>	F17 ↑ ↓	015h	023
11	I>>>	F17 ↑ ↓	016h	023
12	I_E>	F16 ↑ ↓	017h	023
13	I_E>>	F16 ↑ ↓	018h	023
14	I_E>>>	F16 ↑ ↓	019h	023
15	Thermal overload alarm	F37 ↑ ↓	020h	023
16	Thermal overload threshold	F37 ↑ ↓	020h	023
17	tI>	F17 ↑ ↓	014h	023
18	tI>>	F17 ↑ ↓	015h	023
19	tI>>>	F17 ↑ ↓	016h	023
20	tI_E>	F16 ↑ ↓	017h	023
21	tI_E>>	F16 ↑ ↓	018h	023
22	tI_E>>>	F16 ↑ ↓	019h	023
23	tI<	F16 ↑ ↓	021h	023
24	Broken conductor	F38 ↑ ↓	023h	024
25	t Aux 1	F38 ↑ ↓	023h	024
26	t Aux 2	F38 ↑ ↓	023h	024
27	CB failure	F38 ↑ ↓	023h	024
28	Selective scheme logic 1	F20 ↑ ↓	011h	020
29	Selective scheme logic 2	F20 ↑ ↓	011h	020
30	Blocking logic 1	F20 ↑ ↓	011h	020
31	Blocking logic 2	F20 ↑ ↓	011h	020
32	Setting group change	F20	011h	020
33	52a	F20 ↑ ↓	011h	020
34	52b	F20 ↑ ↓	011h	020
35	Acknowledgement of the output relay latched, by logic input,	F20 ↑ ↓	011h	020

Code	Meaning of the event	Type	MODBUS address	COURIER Cell
36	SF6	F20 ↑ ↓	011h	020
37	Cold load start	F20 ↑ ↓	011h	020
38	Change of input logic state	F12 ↑ ↓	010h	020
39	Thermal overload trip	F37	013h	021
40	tI> trip	F13	013h	021
41	tI>> trip	F13	013h	021
42	tI>>> trip	F13	013h	021
43	tI_E> trip	F13	013h	021
44	tI_E>> trip	F13	013h	021
45	tI_E>>> trip	F13	013h	021
46	tI< trip	F13	013h	021
47	Broken conductor trip	F13	013h	021
48	tAUX 1 trip	F13	013h	021
49	tAUX 2 trip	F13	013h	021
50	Output relays command	F39 ↑ ↓	013h	021
51	Front panel single alarm acknowl.	-		-
52	Front panel all alarms acknowledge	-		-
53	Remote single alarm acknowledge	-		-
54	Remote all alarms acknowledge	-		-
55	Major material alarm	F45 ↑ ↓	00Fh	022
56	Minor material alarm	F45 ↑ ↓	00Fh	022
57	I2>	F16 ↑ ↓	022h	024
58	tI2>	F16 ↑ ↓	022h	024
59	Operation time	F43 ↑ ↓	028h	024
60	Operation numbers	F43 ↑ ↓	028h	024
61	Sum of switched square amps	F43 ↑ ↓	028h	024
62	Trip circuit supervision	F43 ↑ ↓	028h	024
63	Closing time	F43 ↑ ↓	028h	024
64	Reclose successful	F43 ↑ ↓	028h	024
65	Recloser final trip	F43 ↑ ↓	028h	025
66	Recloser settings error or configuration error	F43 ↑ ↓	028h	024
67	I2> trip	F16 ↑ ↓	013h	021
68	General Starting (IEC103)	F1 ↑ ↓	009h	-
69	Recloser active (IEC103)	F43 ↑ ↓	028h	-
70	CB Closed by autoreclosure (IEC103)			-
71	Relays latching	F13	02Eh	-

Code	Meaning of the event	Type	MODBUS address	COURIER Cell
72	External CB failure	F20 bis ↑ ↓	02Ah	020
73	I<	F16 ↑ ↓	021h	023
74	I2>>	F16 ↑ ↓	022h	024
75	tI2>>	F16 ↑ ↓	022h	024
76	I2>> Trip	F16 ↑ ↓	013h	021
77	Reserved			
78	Latching Trip Relay (RL1)	-	-	-
79	t AUX3	F38	023h	025
80	t AUX3 TRIP	F13	013h	021
81	t AUX4	F38	023h	025
82	t AUX4 TRIP	F13	013h	021
83	t Reset I>	F17 ↑ ↓	014h	025
84	t Reset I>>	F17 ↑ ↓	015h	025
85	t Reset Ie>	F16 ↑ ↓	017h	025
86	t Reset Ie>>	F16 ↑ ↓	018h	025
87	t Reset I2>	F16 ↑ ↓	022h	025
88	TRIP Breaker Failure	F13	013h	021
89	t BF / Ext. Breaker Failure	F38	023h	025
90	Manual Close (input)	F20 bis ↑ ↓	02Ah	020
91	t SOTF	F54	070h	025
92	TRIP t SOTF	F13	013h	021
93	Local Mode (IEC 103)	F20 bis ↑ ↓	02Ah	020
94	Reset leds (IEC103)			
95	Recloser locked	F43 ↑ ↓	028h	024
96	Recloser in progress	F43 ↑ ↓	028h	025

NOTA: 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 ».

3.14 Page 36h

Most older event data

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

Addresses	Contents
3600h	Most older event data

3.15 Page 37h

Fault record value data

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

Addresses	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

Word n° 1: Fault number

Words n° 2 & 3 if data format is private:

Event date (second) number of seconds since 01/01/94

Words n° 4 & 5 if data format is private:

Event date (millisecond)

Word n° 6 if data format is private:

Fault date (season)
0= winter
1= summer
2= undefined

Words n° 5, 6, 7, 8, if data format is Inverted IEC 870-5-4 CP56Time2a:

See format § 3.9 Page 8h (P122, P123)

Word n° 6 if data format is Inverted IEC 870-5-4 CP56Time2a:

Null value

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

3.15.1 Fault nature code meaning

Code	Fault origin
00	Null event
01	Remote trip
02	Thermal overload trip
03	tI> trip
04	tI>> trip
05	tI>>> trip
06	tI_E> trip
07	tI_E>> trip
08	tI_E>>> trip
09	tI< trip
10	Broken conductor trip
11	t Aux 1 trip
12	t Aux 2 trip
13	tI2> trip
14	tI2>> trip
15	t Aux 3 trip
16	t Aux 4 trip
17	Breaker Failure Trip
18	SOTF

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

Word n° 11: Phase A current value (True RMS value)

Word n° 12: Phase B current value (True RMS value)

Word n° 13: Phase C current value (True RMS value)

Word n° 14: Earth current value (True RMS value)

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

3.15.2 Calculation formula for phase current values

Line phase current value (primary value) = phase sampled value (e.g. word 10, 11, 12 or 13) * phase primary CT / phase internal CT ratio (mapping address 0007)

3.15.3 Calculation formula for earth current values

The formula depends of nominal earth current:

0.1 to 40 Ion range

Line earth current value (primary value) = earth sampled value (e.g. word 10 or 14) * earth primary CT ratio/ earth internal CT ratio (mapping address 0008=800)

0.01 to 8 Ion range

Line earth current value (primary value) = earth sampled value (e.g. word 10 or 14) * earth primary CT ratio/ earth internal CT ratio (mapping address 0008=3277)

0.002 to 1 Ion range

Line earth current value (primary value) = earth sampled value (e.g. word 10 or 14) * earth primary CT ratio/ earth internal CT ratio (mapping address 0008=32700)

3.16 Page 3Eh

Most older Fault record value data

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

Addresses	Contents
3E00h	Most older Fault record

3.17 Pages 38h to 3Ch

Selection of the disturbance record and channel (11 to 13 words 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	I_E
3804h	1	Frequency
3805h	1	Logic input and outputs
3900h	2	IA
3901h	2	IB
3902h	2	IC
3903h	2	I_E
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	I_E
3B04h	4	Frequency
3B05h	4	Logic input and outputs
3C00h	1	IA
3C01h	1	IB
3C02h	1	IC
3C03h	1	I_E
3C04h	1	Frequency
3C05h	1	Logic input and outputs

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:	Phase primary CT ratio
Word n° 5:	Phase secondary CT ratio
Word n° 6:	Earth primary CT ratio
Word n° 7:	Earth secondary CT ratio
Word n° 8:	Phase internal CT ratio
Word n° 9:	Earth internal CT ratio
Word n° 10:	Mapping last page number
Word n° 11:	Number of words in the mapping last page
Word n° 12:	Coefficient of samples conversion (=1) (Optional)
Word n° 13:	Reference of samples conversion (=1) (Optional)

3.17.1 Calculation formula for phase current values

Line phase current value (primary value) = phase sampled value (e.g. address 3800h, 3801h or 3802h) * phase primary CT * (1 / internal phase ratio) * √2

3.17.2 Calculation formula for earth current values

Line earth current value (primary value) = earth sampled value (e.g. address 3803h) * earth primary CT * (1 / internal earth ratio) * √2

3.18 Pages 3Dh

Number of disturbance records available

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

Addresses	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= trip relay (RL1) 2= instantaneous threshold 3= remote command 4= logic input
Word n° 8:	Acknowledge
Word n° 9:	Number of Previous Disturbance record (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= trip relay (RL1) 2= instantaneous threshold 3= remote command 4= logic input
Word n° 15:	Acknowledge

Word n° 16:	Number of Previous Disturbance record (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= trip relay (RL1) 2= instantaneous threshold 3= remote command 4= logic input
Word n° 22:	Acknowledge
Word n° 23:	Number of Previous Disturbance record (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= trip relay (RL1) 2= instantaneous threshold 3= remote command 4= logic input
Word n° 29:	Acknowledge
Word n° 30:	Number of Previous Disturbance record (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= trip relay (RL1) 2= instantaneous threshold 3= remote command 4= logic input
Word n° 36:	Acknowledge

4. DESCRIPTION OF THE MAPPING FORMAT, MiCOM P122 AND P123

CODE	DESCRIPTION
F1	Unsigned integer – numerical data: 65535
F2	Signed integer – numerical data: -32768 – 32767
F3	Unsigned integer – curves type 0: STI (IEC) 1: SI (IEC) 2: VI (IEC) 3: EI (IEC) 4: LTI (IEC) 5: STI (C02) 6: MI (ANSI) 7: LTI (CO8) 8: VI (ANSI) 9: EI (ANSI) 10: RC (IEC) Rectifier curve
F3'	Unsigned integer –Belgium curves type for Earth sensitive version 0: Network 1 (Laborellec) 1: Network 2 (Laborellec) 2: source 3 (Laborellec)
F4	Unsigned integer: MODBUS speed 0: 300 1: 600 2: 1200 3: 2400 4: 4800 5: 9600 6: 19200 7: 38400
F5	Unsigned integer: parity 0: without 1: even 2: odd
F6	Unsigned integer: Tripping configuration bit 0: tI> bit 1: tI>> bit 2: tI>>> bit 3: tI_E> bit 4: tI_E>> bit 5: tI_E>>> bit 6: I< bit 7: tIth> bit 8: Broken conductor detection bit 9: t Aux 1 bit 10: t Aux 2 bit 11: tI2> bit 12: tI2>> bit 13: t Aux 3 bit 14: t Aux 4 bit 15: Breaker Failure
F6'	Unsigned integer: Tripping configuration bit 0: SOFT bit 1: Remote Trip bit 2 to 15: Reserved

CODE	DESCRIPTION
F7	Unsigned integer: Latching configuration bit 0: SOFT bit 1 to 15: Reserved
F8	Unsigned integer: Latching configuration bit 0: I> latching bit 1: I>> bit 2: I>>> bit 3: I_E> bit 4: I_E>> bit 5: I_E>>> bit 6: I< bit 7: tIth> bit 8: Broken conductor detection bit 9: t Aux 1 bit 10: t Aux 2 bit 11: tI2> bit 12: tI2>> bit 13: t Aux 3 bit 14: t Aux 4 bit 15: Breaker Failure
F8'	Unsigned integer: Blocking logic configuration bit 0: I> blocking bit 1: I>> bit 2: I>>> bit 3: I_E> bit 4: I_E>> bit 5: I_E>>> bit 6: reserved bit 7: tIth> bit 8: Broken conductor detection bit 9: t Aux 1 bit 10: t Aux 2 bit 11: tI2> bit 12: tI2>> bit 13: t Aux 3 bit 14: t Aux 4 bit 15: reserved
F9	Unsigned integer: Remote control 1 bit 0: Tripping contact delatched bit 1: 1st alarm acknowledge bit 2: All alarms acknowledge bit 3: Remote tripping bit 4: Remote closing bit 5: Setting group change bit 6: Thermal state reset bit 7: Peak and rolling value reset bit 8: Disturbance record remote start bit 9: Maintenance mode bit 10: Recloser counter reset bit 11: Recloser reset bit 12: Local manual acknowledge bit 13: Oldest event acknowledge bit 14: Oldest fault acknowledge bit 15: Hardware RAM alarm acknowledge
F10	2 characters ASCII 32 –127 = ASCII character1 32 – 127 = ASCII character 2
F11	Reserved

CODE	DESCRIPTION
F12	Unsigned integer: Logic input status bit 0: logic input number 1 bit 1: logic input number 2 bit 2: logic input number 3 bit 3: logic input number 4 bit 4: logic input number 5 bits 5 to 15: reserved
F13	Unsigned integer: logic outputs status bit 0: logic output number RL1 (tripping) bit 1: logic output number RL2 bit 2: logic output number RL3 bit 3: logic output number RL4 bit 4: logic output number RL0 (watchdog) bit 5: logic output number RL5 bit 6: logic output number RL6 bit 7: logic output number RL7 bit 8: logic output number RL8 bits 9 to 15: reserved
F14	Unsigned integer: logic outputs configuration bit 0: selection logic output number RL2 bit 1: selection logic output number RL3 bit 2: selection logic output number RL4 bit 3: selection logic output number RL5 bit 4: selection logic output number RL6 bit 5: selection logic output number RL7 bit 6: selection logic output number RL8
F15	Unsigned integer: logical input allocation bit 0: delatch allocation bit 1: allocation 52 a bit 2: allocation 52 b bit 3: allocation Lack of SF6 bit 4: allocation external input 1 bit 5: allocation external input 2 bit 6: allocation logic blocking 1 bit 7: allocation logic blocking 2 bit 8: allocation disturbance start bit 9: allocation cold load start bit 10: allocation selective scheme logic 1 bit 11 allocation selective scheme logic 2 bit 12: allocation change of setting group bit 13: allocation recloser locked bit 14: allocation thermal state reset bit 15: allocation trip circuit supervision
F15bis	bit 0: allocation Circuit Breaker Failure bit 1: Reset of LEDs alarms bit 2: Maintenance mode bit 3: allocation external input 3 bit 4: allocation external input 4 bit 5: SOFT/TOR (from V6.C) bit 6: Local/remote (from V6.C)

CODE	DESCRIPTION
F16	Unsigned integer: threshold earth information status bit 0: information threshold exceeded (I_E> or I_E>> or I_E>>>) bit 1: reserved bit 2: reserved bit 3: reserved bit 4: reserved bit 5: Instantaneous information I_E> or I_E>> or I_E>>>> bit 6: Tripping information tI_E> or tI_E>> or tI_E>>> bits 7 to 15: reserved
F17	Unsigned integer: threshold phase information status bit 0: information thresold exceeded (I>, I>>, I>>>) bit 1: Instantaneous IA bit 2: Instantaneous IB bit 3: Instantaneous IC bit 4: reserved bit 5: Instantaneous information I> or I>> or I>>> bit 6: Tripping information tI> or tI>> or tI>>> bits 7 to 15: reserved
F18	Long integer
F19	Unsigned integer: LEDs allocation bit 0: I> bit 1: tI> bit 2: I>> bit 3: tI>> bit 4: I>>> bit 5: tI>>> bit 6: I_E> bit 7: tI_E> bit 8: I_E>> bit 9: tI_E>> bit 10: I_E>>> bit 11: tI_E>>> bit 12: Thermal overload trip bit 13: tI2> bit 14: Broken conductor trip bit 15: CB failure bit 16: Logic input 1 bit 17: Logic input 2 bit 18: Logic input 3 bit 19: Logic input 4 bit 20: Logic input 5 bit 21: Recloser running bit 22: Recloser locked bit 23: tAUX1 bit 24: tAUX2 bit 25: tI2>> bit 26: SOFT (from V6.C)

CODE	DESCRIPTION
F20	Unsigned integer: logic input data status bit 0: Selective scheme logic 1 bit 1: Selective scheme logic 2 bit 2: Relay delatch bit 3: CB position (52 a) bit 4: CB position (52 b) bit 5: Lack of SF6 bit 6: External 1 bit 7: External 2 bit 8: Blocking logic 1 bit 9: Blocking logic 2 bit 10: Disturbance record start bit 11: Cold load start bit 12: Setting group change bit 13: Recloser locked bit 14: Thermal state reset bit 15: Trip circuit supervision
F20 bis	bit 0: CB Failure by external signalisation bit 1: LEDs alarms reset bit 2: maintenance mode bit 3: External 3 bit 4: External 4 bit 5: Manual Close (SOFT/TOR) bit 6: Local Mode
F21	Unsigned integer: software version 10: Version 1.A 11: Version 1.B 20: Version 2.A
F22	Unsigned integer: internal logic data bit 0: Latching bit 1: reserved
F23	Unsigned integer: relay status bit 0: Relay status bit 1: Minor material 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: reserved bit 7: reserved
F24	Status of the relay functions 0: Disabled 1: Enabled
F25	2 ASCII characters
F26	1: IA measurement display (True RMS) 2: IB measurement display (True RMS) 3: IC measurement display (True RMS) 4: IN measurement display (True RMS)
F27	0: DMT time delay 1: IDMT time delay 2: RI time delay
F27'	0: DMT time delay 1: IDMT time delay 2: RI time delay 3: Belgium curves

CODE	DESCRIPTION
F28	0: 7 data bits 1: 8 data bits
F29	0: 1 stop bit 1: 2 stop bits
F30	0: Communication non-available 1: Communication available
F31	Unsigned integer: Number of available event records 0: None 1: 1 event record available 2: 2 event records available 3: 3 event records available 4: 4 event records available 5: 5 event records available
F32	Unsigned integer: 0: Disturbance record start condition on INSTANTANEOUS 1: Disturbance record start condition on TRIPPING
F33	Cold load start thresholds bit 0: tI> bit 1: tI>> bit 2: tI>>> bit 3: tI_E> bit 4: tI_E>> bit 5: tI_E>>> bit 6: Thermal overload trip bit 7: tI2> bit 8: tI2>> bit 9 to 15: reserved
F34	Reserved
F35	0: No disturbance record uploaded 1: Disturbance record upload running
F36	Memorised flags of non acknowledged alarms: bit 0: I_E> bit 1: tI_E> bit 2: I_E>> bit 3: tI_E>> bit 4: I_E>>> bit 5: tI_E>>> bit 6: Thermal overload alarm bit 7: Thermal overload trip bit 8: Broken conductor bit 9: CB failure bit 10: I2>> bit 11: I2> bit 12: tI2> bit 13: t Aux 1 bit 14: t Aux 2 bit 15: tI2>>
F37	Unsigned integer: Thermal overload information bit 0: Thermal overload alarm bit 1: Thermal overload trip

CODE	DESCRIPTION
F38	Unsigned integer: bit 0: reserved bit 1: CB failure bit 2: Pole A opening bit 3: Pole B opening bit 4: Pole C opening bit 5: Broken conductor bit 6: t Aux 1 bit 7: t Aux 2 bit 8: Broken conductor time delay bit 9: CB failure time delay bit 10: Cold load pick up time delay bit 11: CB alarms or bits 0,1,2,4 of F43 bit 12: t Aux 3 bit 13: t Aux 4
F39	Unsigned integer: output relay remote word in maintenance mode bit 0: RL1 (trip) bit 1: RL2 bit 2: RL3 bit 3: RL0 (watch-dog) bit 4: RL4 bit 5: RL5 bit 6: RL6 bit 7: RL7 bit 8: RL8
F40	Unsigned integer: selective scheme logic configuration bit 0: tI>> bit 1: tI>>> bit 2: tI_E>> bit 3: tI_E>>>
F41	0: Front and rear MODBUS communication 1: Front MODBUS and rear Courier communication 2: Front MODBUS and rear IEC103 communication 3: Front MODBUS and rear DNP3 communication
F42	5, 10, 15, 30 or 60 minutes
F43	bit 0: CB operating time overreach bit 1: CB operation number overreach bit 2: Square Amps sum overreach bit 3: Trip circuit self-test bit 4: CB closing time overreach bit 5: Recloser locked bit 6: Recloser successful bit 7: Recloser in progress bit 8: Closing command issued from recloser cycle bit 9: Recloser configuration error bit 10: Recloser in service bit 11: Recloser final trip
F44	bit 0: CB, operating time overreach, memorised alarm bit 1: CB operation number overreach, memorised alarm bit 2: Square Amps sum overreach, memorised alarm bit 3: Trip circuit self-test, memorised alarm bit 4: CB closing time overreach, memorised alarm Bit 5: t Aux 3, Memorised alarm Bit 6: t Aux 4, Memorised alarm Bit 7: reserved bit 8: SOFT

CODE	DESCRIPTION
F45	Unsigned integer: relay status bit 0: Watchdog bit 1: Communication failure bit 2: EEPROM data failure bit 3: Analogue failure bit 4: Datation failure bit 5: EEPROM calibration failure bit 6: SRAM failure bit 7: Battery failure bit 8: Reserved bit 9: Default settings alarm bit 10 to 15: reserved
F46	bit 0: Launching I_o harmonic calculation bit 1: internally reserved for delatching of tripping relay only (RL1), and not like bit 0 in F9. bit 2: Acknowledgement of the oldest disturbance record bit 3: End of maintenance mode bit 4: Reset of Rolling Demands Data (average avlues and timers) bit 5: Reset of maximum values of the averages in sub period bit 6: LEDs reset bit 7: Internal reset of non latched tripping LED bit 8: communication Order 1 bit 9: communication Order 2 bit 10: communication Order 3 bit 11: communication Order 4
F47	0: user wishes working on EDGE (Rising or Falling) of the logic inputs (configuration can be done by communication or by the front panel) 1: user wishes working on LEVEL (High or Low) of the logic inputs
F48	0: Private Format Date 1: IEC Format Date
F49	bit 0: Cycle 1 configuration (trip and initialise the reclosure) bit 1: Cycle 1 configuration (block the tripping on cycle) bit 2, 3: reserved bit 4: Cycle 2 configuration (trip and initialise the reclosure) bit 5: Cycle 2 configuration (block the tripping on cycle) bit 6, 7: reserved bit 8: Cycle 3 configuration (trip and initialise the reclosure) bit 9: Cycle 3 configuration (block the tripping on cycle) bit 10, 11: reserved bit 12: Cycle 4 configuration (trip and initialise the reclosure) bit 13: Cycle 4 configuration (block the tripping on cycle)
F50	0: DC Voltage 1: AC Voltage
F51	0: Direct phase rotation ABC 1: Inverse phase rotation ACB
F52	Status of SOFT functions (Switch On To Fault) 0: Disabled 1: Enabled
F53	SOFT parameters 0: Start I>> 1: Start I>>>
F54	Bit 0: SOFT in progress Bit 1: Instantaneous information Bit 2: Tripping information

4.1 Disturbance record additional information

4.1.1 MODBUS request definition used for disturbance record

To upload a disturbance record, the following requests must be done in the exact given order:

1. (optional): Send a request to know the number of disturbance records available in SRAM.
2. (compulsory): Send a request with the record number and the channel number.
3. (compulsory): Send one or several requests to upload the disturbance record data. It depends of the number of samples.
4. (compulsory): Send a request to upload the index frame.

4.1.2 Request to know the number of disturbance records in SRAM

Slave number	Function code	Word address	Word number	CRC
xx	03h	3Dh 00	00 24h	xx xx

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

EVT_NOK(OF): No record available

NOTA: If there is less than 5 records available, the answer will contains zero in the non-used words.

4.1.3 Service requests

This request must be send before uploading the disturbance record channel samples. It allows to know the record number and the channel number to upload. It allows also to know the number of samples in the channel.

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

This request may be answered an error message with two different error codes:

CODE_DEF_RAM(02): SRAM failure

CODE_EVT_NOK(03): No disturbance record available in SRAM

4.1.4 Disturbance record upload request

Slave number	Function code	Word address	Word number	CRC
xx	03h	Refer to mapping	01 to 7Dh	xx xx

This request may be answered an error message with two different error codes:

CODE_DEP_DATA(04): The required disturbance data number is greater than the memorised number.

CODE_SERV_NOK(05): The service request for disturbance record and channel number has not been send.

4.1.5 Index frame upload request

Slave number	Function code	Word address	Word number	CRC
xx	03h	22h 00	00 07h	xx xx

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

CODE_SERV_NOK(05): The service request for disturbance record and channel number has not been send.

Two ways can be followed to retrieve an event record:

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

4.1.6 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 RAM.

NOTE: On event retrieval, two possibilities exist regarding the event record acknowledgement:
a) Automatic event record acknowledgement on event retrieval.
b) Non automatic event record acknowledgement on event retrieval.

a) Automatic event record acknowledgement on event retrieval:

The bit12 of the remote order frame (format F9 – 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 F9 – 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 F9 – mapping address 0400h) shall be set to 1.

4.1.7 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 RAM.

NOTA: This event retrieval does not acknowledge this event.

4.1.8 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.

4.1.9 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

NOTA: On fault retrieval, two possibilities exist regarding the fault record acknowledgement:
a) Automatic fault record acknowledgement on event retrieval.
b) Non automatic fault record acknowledgement on event retrieval.

a) Automatic fault record acknowledgement on fault retrieval:

The bit12 of the remote order frame (format F9 – 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 F9 – 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 F9 – mapping address 0400h) shall be set to 1.

4.1.10 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

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

COURIER DATABASE

MiCOM P120 - P121 - P122 - P123

VERSION V6.E

CONTENT

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1. K-BUS PROTOCOL AND COURIER LANGUAGE

The serial communications are transmitted on K-Bus, a multi-drop network proposing an instantaneous interface with IEC 870 - 5 - FT1.2 standards. The language and the communication protocol used are Courier. This concept permits especially to the generic programmes of the principal units to access to a high number of different relay types without need to change permanently the principal unit program for each relay type. The relays forms a distributed database in which the principal workstation proceeds to a selective call of the slave relays in order to know all necessary information.

Courier has a concept for the functions with a selective call system which allows not a slave periphery to communicate directly with the central unit when one shall informs another about a particular event. The slave workstation has to wait that the principal workstation asks for the information. With Courier each information is given into a box with a code of the length and the database type. In knowing the database format the reception periphery can read them.

1.1 K-BUS

K-Bus is a communication system developed for connecting the slave peripheries in remoting on the central unit, permitting them to execute all remote monitoring and remote control functions using the appropriated communication language. K-Bus is not able to permit a direct communication between the slave peripheries. Only a communication between the central unit and the slave peripheries can be established. The principal characteristics of the K-Bus are his profitability, his high security level, his installation facility and his user friendliness.

1.1.1 K-Bus transmission layer

The communication port is supported on the reception levels and the voltage transmission RS485 with galvanic isolation assured by a transformer. A selective call protocol is used. No relay unit is allowed to transmit before having received a validation message without any error detection. The transmission is synchronous on a pair of isolated waves. The data are coded FM0 with a clock signal for eliminate all CC-component, allows the signal to cross the transformers.

With the exception of the central units, each network node is passive. No defective unit from the system can interfere with the communications established with the other units. The message format is HDLC. The data transmission speed is 64 kbits/s.

1.1.2 K-Bus connection

The connection on the K-Bus port is realised by screwed terminals of 4 mm of MIDOS standards or by FASTON-connectors. A cabled pair is sufficient to realise the connection, knowing that the polarity is not important. It is recommended to use an external screen earth linked at the end of the principal workstation only. The screen has to be fixed with a M4 screw following the wiring scheme (cf. TG: P12X/EN T). The functioning of the K-BUS network is guaranteed for 32 units connected on 1000 meters of cables. Thanks to the data code method, the polarity of the Bus cable connection is not important.

NOTE: The K-Bus network has to finish with a 150 ohms resistance on each end of the Bus. The principal workstation can be placed anywhere on the network. This command point has to be unique.

1.1.3 Auxiliary equipment

For communication with the relay it is necessary to have at least one converter case K-Bus/IEC870-5 of the type KITZ and a computer suitable software, an interconnection cable RS232 for connecting the KITZ to the computer and a software conform to the specification of the Courier protocol.

1.2 Relay courier database

The Courier database is two dimensional structure with each cell in the database being referenced by a row and column address. Both the column and the row can take a range from 0 to 255. Addresses in the database are specified as hexadecimal values, eg 0A02 is column 0A (10 decimal) row 02. Associated settings/data will be part of the same column, row zero of the column contains a text string to identify the contents of the column.

This data base is given in paragraph 1, 4, 5.

1.3 Setting changes

This uses a combination of three commands to perform a settings change:

Enter Setting Mode - checks that the cell is settable and returns the limits

Pre-load Setting - Places a new value in the cell, this value is echoed to ensure that setting corruption has not taken place, the validity of the setting is not checked by this action.

Execute Setting - Confirms the setting change, if the change is valid then a positive response will be returned, if the setting change fails then an error response will be returned.

Abort Setting - This command can be used to abandon the setting change.

This is the most secure method and is ideally suitable for on-line editors as the setting limits are taken from the relay before the setting change is made. However this method can be slow if many settings are to be changed as three commands are required for each change.

1.4 Systems integration data

1.4.1 Address of the relay

The relays can have any address between 1 and 254 included. The address 255 corresponds to the global address to which all relays and all the other slave peripheries are responding. The Courier protocol specifies that no response can be resent from a slave periphery to a global message. This permits to avoid that all peripheries respond at the same time creating by this way user conflict on the Bus.

Each relay has an address settled on 255 in order to guarantee that in case of his connection to the operating network, its address cannot create any conflict with the address of another periphery already running. In order to permit to a new periphery to get entirely operational, its address has to be settled. The address can be modified manually by capturing the password, than by following the method of the setting change through the user interface on the front plate of the relay.

The same, if the network functioning on a computer takes in charge the auto-addressing, the relay address can be settled on 0 to active the characteristic of auto-addressing of the computer software. The relay receives then the next valid address on the Bus.

If the address is 255 or it is unknown, it can be modified by sending a new address, with a global message, to a periphery possessing a particular serial number. This method is used for those peripheries which do not have any user interface for reading or for changing the address in process.

1.4.2 Measured values

Each measured value can be periodically extracted by a selective call of **MiCOM P120, P121, P122** and **P123** relays.

1.4.3 Status word

Each response of a slave periphery contains an octet of status. This octet is resent by the relay at the beginning of each message for signalling important data. The principal workstation can be design for responding automatically to these important data.

The contained indications are the following:

Bit 0 - 1 = Recording of disturbance available for retrieval
Bit 1 - 1 = Change of the Unit status word
Bit 2 - 1 = Change of the control status word
Bit 3 - 1 = Relay busy, no response possible in time
Bit 4 - 1 = Relay out of service
Bit 5 - 1 = Recording of events available for retrieval
Bit 6 - 1 = Switched alarm indicator
Bit 7 - 1 = Switched tripping indicator

Only the bit 3 is used for versions **P120 & P121**.

1.4.4 Unit status word

The unit status word is located in the menu **000C**.
Each bits pair of the Unit status word serves to indicate the status (position) of the unit elements checked through the relay.

This functionality is not supported on **MiCOM P120, P121, P122** and **P123** relays.

1.4.5 Control status word

The Control status word is located in the cell of the menu **000D**.
It is used for transmitting the control information of the slave periphery to the central unit.
Nevertheless, the relays described in this manual are protection relays, which are not using this control characteristic.

1.4.6 Logic input status word

The logic control input status can be observed in proceeding to a selective call from the cell of menu **0020**. The 2 bits inferior of the returned value indicating the status of each of the 2 logic inputs. This cell is accessible only in reading.

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

1.4.7 Output relay status word

The output relay status can be observed in proceeding to a selective call from the cell of menu **0021**. The 8 bits inferior of the returned value indicating the status of each of the 5 output relays. This cell is accessible only in reading.

Bit 0: relay 1 (TRIP)
Bit 1,2,3: programmable relays n° 2,3,4
Bit 4: Watchdog
Bit 5,6,7,8: programmable relays n° 5,6,7,8

1.4.8 Control information

The status of internal controls triggered by the auto-control program of the relays can be observed in proceeding to a selective call of the cell of menu **0022**.

The bits 0 to 6 indicate the material controls of the product.

Bit 0	Analogue Output error
Bit 1	Communication error
Bit 2	EEPROM data error
Bit 3	Analogue fault
Bit 4	Clock error
Bit 5	EEPROM calibration error
Bit 6	RAM error
Bit 7	Battery error
Bit 8	Reserved
Bit 9	Default settings
Bit 10 to 15	Reserved

1.4.9 Protection Indication

The protection indications gives the status of different protection elements in the relay. The fault indications are generated with these indications.
They are transmitted in the events recordings, in case of a fault recording.
This is the only way to access to these indications.

The status of internal protection indication of the relays can be observed in proceeding to a selective call of the cell of menu **0023** and **0024**.

The following table presents the list of the protection indications of the cell 0023:

Bit position	Function of the protection
0	I>
1	I>>
2	I>>>
3	Ie>
4	Ie>>
5	Ie>>>
6	tI>
7	tI>>
8	tI>>>
9	tIe>
10	tIe>>
11	tIe>>>
12	Thermal alarm
13	Thermal overload
14	tI<
15	reserved

The following table presents the list of the protection indications of the cell 0024:

Bit position	Function of the protection
0	Broken conductor
1	t Aux 1
2	t Aux 2
3	Breaker failure
4	I2>
5	tI2>
6	Open operating time
7	Trip operation number
8	SA 2n
9	Trip circuit Supervision
10	Close operating time
11	Successful autoreclose
12	Locked autorecloser
13	Autorecloser configuration fail
14	I2>>
15	tI2>>

The following table presents the list of the protection indications of the cell 0025:

Bit position	Function of the protection
0	t Aux 3
1	t Aux 4
2	t Reset I>
3	t Reset I>>
4	t Reset I0>
5	t Reset I0>>
6	t Reset I2>
7	t BF
8	t SOTF
9	Final Trip
10	Autoreclos. In progress
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	Reserved

1.4.10 Measurement control

The control functions through a relay of the **MiCOM P12x** range can be executed on a serial link. These functions are supported in particular on the changes of the individual relay

settings, on the changes of the setting groups, on the remote control of the circuit breaker, as well as on the functions and the locking of the selected output relays.

The remote control is limited in the control functions selected in the table of the relays menu. The CRC and the controls of the message length are used on each received message. No response is given for messages received with an error detection. The principal unit can be re-initialised in order to resent an order as often as wanted if he is not receiving any response or if he receives a response with an error detection.

NOTE: The control commands are generally materialised by the change of the cell value. They dispose the same inherent security. No response is allowed for the global orders to avoid any user conflict of the Bus. For this type of order, a double start is used for the verification of the message by the relay.
The relay transmits then a confirmation indicating that the control order or the change of setting has been accepted.
If this is not the case, the relay is sending an error message.

1.4.11 Change of remote measurements

The relay is only responding to the orders of a setting change through the serial port if the SD0 link = 1 is selected. The selection of the SD0 link = 1 is blocking all the changes of remote setting with the exception of the SC logical links and the password capture. When the SD0 link = 0 is selected, the remote setting are protected by the password.

For changing the remote links, the password has to be first remote captured and the SD and SD0 function links have to be settled on 1.

1.5 Event extraction

Events can be extracted either automatically or manually. For automatic extraction all events are extracted in sequential order using the standard Courier mechanism, this includes fault. The manual approach allows the user to select randomly an event, or a fault from the stored records.

1.5.1 Automatic event extraction

This method is intended for continuous extraction of event and fault information as it is produced via the rear port.

When new event information is created the Event bit is set within the Status byte, this indicates to the Master device that event information is available. The oldest, unextracted event can be extracted from the relay using the Send Event command. The relay will respond with the event data, which will be either a Courier Type 0 or Type 3 event. The Type 3 event is used for fault records.

Once an event is extracted from the relay the Accept Event can be used to confirm that the event has been successfully extracted. If all events have been extracted then the event bit will reset, if there are more events still to be extracted the next event can be accessed using the Send Event command as before.

1.5.2 Event types

Events will be created by the relay under the following circumstances:

- Change of state of output contact
- Change of state of opto input
- Protection element operation
- Alarm condition
- Setting Change
- Fault Record (Type 3 Courier Event)

1.5.3 Event format

The Send Event command results in the following fields being returned by the relay:

- Cell Reference
- Timestamp
- Cell Text
- Cell Value

Paragraph 2 contains a table of the events created by the relay and indicates how the contents of the above fields are interpreted. Fault records will return a Courier Type 3 event which contains the above fields together with two additional fields:

- Event extraction column
- Event number

These events contain additional information which is extracted from the relay using the referenced extraction column. Row 01 of the extraction column contains a setting which allows the fault record to be selected. This setting should be set to the event number value returned within the record, the extended data can be extracted from the relay by uploading the text and data from the column.

1.5.4 Manual record extraction

Column 02 of the database can be used for manual viewing fault records. The contents of this column will depend of the nature of the record selected. It is possible to select directly a fault record.

Fault Record Selection (Row 01) - This cell can be used to directly select a fault record using a value between 0 and 4 to select one of up to five stored fault records (0 will be the most recent fault and 4 will be the oldest). The column will then contain the details of the fault record selected (row 02 to 0A)

It should be noted that if this column is used to extract event information from the relay the number associated with a particular record will change when a new fault occurs.

1.6 Disturbance record extraction (P122, P123 only)

The stored disturbance records within the relay are accessible via the Courier interface.

Select Record Number (Row 01) - This cell can be used to select the record to be extracted. Record 0 will be the oldest un-extracted record, older records will be assigned positive values, and negative values will be used for more recent records. To facilitate automatic extraction via the rear port the Disturbance bit of the Status byte is set by the relay whenever there are un-extracted disturbance records.

Once a record has been selected, using the above cell, the time and date of the record can be read from cell 02. The disturbance record itself can be extracted using the block transfer mechanism from cell B00B.

As has been stated the rear Courier port can be used to automatically extract disturbance records as they occur. This operates using the standard Courier mechanism defined in Chapter 8 of the Courier User Guide.

2. LIST OF EVENTS CREATED BY THE RELAY

Code	Cell text	Cell reference
00	UNKNOWN EVENT	-
01	REMOTE CB CLOSING	0
02	CB TRIP	0
03	DIST TRIG	0
04	UNLOCK TRIP	0
05	SET. CHANGE	0
06	RESET THERM	0
07	SET MAINT MODE	0
08	SET RELAY MAINT MODE	0021
09	I>	0023
10	I>>	0023
11	I>>>	0023
12	I_E>	0023
13	I_E>>	0023
14	I_E>>>	0023
15	TH. ALARM	0023
16	TH OVERLOAD	0023
17	tI>	0023
18	tI>>	0023
19	tI>>>	0023
20	tI_E>	0023
21	tI_E>>	0023
22	tI_E>>>	0023
23	tI<	0023
24	BROKEN CONDUCTOR	0024
25	t Aux1	0024
26	t Aux2	0024
27	BREAKER FAILURE	0024
28	Logic Sel. 1	0020
29	Logic Sel. 2	0020
30	Blocking Logic 1	0020
31	Blocking Logic 2	0020
32	Setting change	0020
33	52 a	0020
34	52 b	0020
35	ACK ALL ALAR	0020
36	SF6	0020
37	COLD LOAD PICKUP	0020

Code	Cell text	Cell reference
38	TS Change	0020
39	TRIP: TH OVERLOAD	0
40	TRIP: tI>	0
41	TRIP: tI>>	0
42	TRIP: tI>>>	0
43	TRIP: tI_E>	0
44	TRIP: tI_E>>	0
45	TRIP: tI_E>>>	0
46	TRIP: tI<	0
47	TRIP: BROKEN CONDUCTOR	0
48	TRIP: t Aux 1	0
49	TRIP: t Aux 2	0
50	AUX Relays	0021
51	ACK 1 AL (FRONT)	0
52	ACK ALAR (FRONT)	0
53	ACK 1 ALARM (COM)	0
54	ACK ALAR (COM)	0
55	Hard Maj Alarm	0022
56	Hard min Alarm	0022
57	I2 >	0024
58	t 2 >	0024
59	OPEN OPERATING TIME	0024
60	TRIP OPERATION Nb	0024
61	SA2N	0024
62	SW TRIP CIRCUIT	0024
63	CLOSE OPERATING TIME	0024
64	SUCCESS AUTORECLOSE	0024
65	AUTORECLOSER FINAL TRIP	0025
66	AUTORECLOSER CONF. FAIL	0024
67	TRIP: t I2 >	0021
68	Reserved	
69	Reserved	
70	Reserved	
71	LATCHED RELAYS	-
72	EXT BREAKER FAILURE	0020
73	I<	0023
74	I2>>	0024
75	tI2>>	0024
76	TRIP: tI2>>	0021

Code	Cell text	Cell reference
77	Reserved	
78	LATCHED RELAY TRIP	
79	t AUX3	0025
80	TRIP: t AUX3	0021
81	t AUX4	0025
82	TRIP: t AUX4	0021
83	t Reset I>	0025
84	t Reset I>>	0025
85	t Reset I0>	0025
86	t Reset I0>>	0025
87	t Reset I2>	0025
88	TRIP Breaker Failure	0021
89	t BF /Ext. Breaker Failure	0025
90	MANUAL CLOSE (Inp)	0020
91	t SOTF	0025
92	TRIP t SOTF	0021
93	LOCAL MODE	0020
94	Reserved	
95	LOCKED AUTORECLOSER	0024
96	AUTORECLOS. IN PROGRESS	0025
	GEN. SET. CHANGE	

NOTA: When the cell reference is different of zero this means that the event is generated on event occurrence and another is generated on event disappearance.

When the cell reference is equal to zero, only the event on edging edge is generated.

Twelve bits are available in the string of characters to describe the contain of the Courier cell:

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 ».

3. COURIER DATABASE ORGANISATION P120

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
00	00	SYSTEM DATA						
	01	Language	Ver>: Indexed String	0 1 2 3	Lang1 (French) Lang2 (English) * Lang3 (German) Lang4 (Spanish)		Setting	0/3/1
	02	Password	ASCII Password(4 bytes)		AAAA		Setting	32/127/1
	03	*Fnlinks: NOT IMPLEMENTED*						
	04	Description	ASCII Text (6 bytes)		" P120 "*		Setting	32/127/1
	05	Plant Reference	ASCII Text (4 bytes)		" Pref "		Setting	32/127/1
	06	Model Number	ASCII Text (16 bytes)		" Model Number "		Data	
	07	Firmware Number	ASCII Text (16 bytes)		" Firmware Number "		Data	
	08	Serial Number	ASCII Text (16 bytes)		" Serial Number "		Data	
	09	Frequency	Unsigned Integer (2 bytes)		XXXX Hz		Setting	50/60/10
	0A	Communication Level	Unsigned Integer (2 bytes)		1		Data	
	0B	Address	Unsigned Integer (2 bytes)		1*		Setting	1/255/1
	0C	*Plant Status Word: NOT IMPLEMENTED*						
	0D	*Control Status Word: NOT IMPLEMENTED*						
	0E	Setting Group	Unsigned Integer				Data	Always = 1
	0F	*Load shed Stage: NOT IMPLEMENTED*						

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	10	Circuit Breaker Control	Binary flag (3 bits)		0: No operation 1: Trip 2: Close		Data	
	11	Software Reference	ASCII Text (16 characters)				Data	
	12-1F	*Unused, reserved*						
	20	Logic Input Status	Binary flag (3 bits)		0: log input 1 1: log input 2		Data	
	21	Relay Output Status	Binary flag (5 bits)		0: relay 1 (trip) 1: relay 2 2: relay 3 3: relay 4 4: watchdog relay		Data	
	22	Alarm	Binary flag (16 bits)		0: Ana output err 1: Comm err 2: Eeprom err data 3: Ct error 4: reserved 5: Eeprom err calib 6: reserved 7: reserved 8: reserved 9: Default settings 10 to 15: reserved		Data	
	23	Pseudo Logic Input Status group 1	Binary flag (12 bits)		3: I0> 4: I0>> 5: I0>>> 9: t I0> 10: t I0>> 11: t I0>>>		Data	

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
01	**00**	**USER CONTROL**						
	01	Remote control 1	Binary flag (5 bits)		0: Unlock trip cont.* 1: Ack first alarm 2: Ack all alarms 3: TRIP 4: CLOSE 5 to 15: Reserved		Setting	0/ 31/1
03	**00**	**MEASUREMENTS**						
	01	I0 RMS	Courier floating point number				Data	
	09	FREQUENCY	Courier floating point number				Data	Starting from V5.F
0E	**00**	**CT RATIOS**						
	01	CT Primary	Unsigned Integer (2 bytes)		1000 *		Setting	1/3000/1
	02	CT Secondary	Unsigned Integer (2 bytes)		1 *		Setting	1/5/4
		Protection Group n° 1						
21	**00**	**EARTH FAULT**						
	01	Stage 1 Overcurrent	(Sub Heading)					
	02	Max I>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	03	Threshold I>	Courier floating point number		0.01 I0n*	2102=1	Setting	0.01/1.0/0.005
	04	Tempo Type I>	Indexed String	0 1 2 3	0: definite time * 1: inverse time 2: RI curve 3: Laborelec curves	2102=1	Setting	0/3/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	05	Curve Type I>	Indexed String	0 1 2 3 4 5 6 7 8 9 10	STI (CEI) * SI (CEI) VI (CEI) EI (CEI) LTI (CEI) STI (CO2) MI (ANSI) LTI (CO8) VI (ANSI) EI (ANSI) RC (CEI)	2104=1	Setting	0/10/1
	07	TMS I>	Courier floating point number		0.025 *	2104=1	Setting	0.025/1.5/0.025
	08	K I>	Courier floating point number		0.1 *	2104=2	Setting	0.1/10.0/0.005
	09	Tempo I>	Courier floating point number		0.01 s *	2104=0	Setting	0 /150.0/0.01
	0C-0F	*Reserved*						
	10	Stage 2 Overcurrent	(Sub Heading)					
	11	Max I>>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	12	Threshold I>>	Courier floating point number		0.01 I0n*	2111=1	Setting	0.01/8.0/0.005
	18	Tempo I>>	Courier floating point number		0.01 s *	2113=0	Setting	0 /150.0/0.01
	1C-1F	*Reserved*						
	20	Stage 3 Overcurrent	(Sub Heading)					
	21	Max I>>>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	22	Threshold I>>>	Courier floating point number		0.01 I0n *	2121=1	Setting	0.01/8.0/0.005

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	23	Tempo I>>>	Courier floating point number		0.01 s *	2121=1	Setting	0 /150.0/0.01
60	**00**	**AUTOMATISM**						
	01	Trip Configuration	Binary (16 bits)		0: t I> * 1: t I>> 2: t I>>> 6 to 15: reserved		Setting	0 / 65535 / 1
	02	Latched Configuration	Binary (16 bits)		0: Latch I> * 1: Latch I>> 2: Latch I>>> 6 to 15: reserved		Setting	0 / 65535 / 1
	03	Blocking 1 Configuration	Binary (16 bits)		0: Blocking t I> * 1: Blocking t I>> 2: Blocking t I>>> 6 to 15: reserved		Setting	0 / 65535 / 1
61	**00**	**TS SETTINGS**						
	01	Logical input allocation 1	Indexed String	0 1 2 3 4 5 6 7	0: *nothing* * 1: delatch 2: 52 a 3: 52 b 4: CB failure 5: External input 1 6: External input 2 7: Logic blocking		Setting	0/7/1
	02	Logical input allocation 2	Indexed String	0 1 2 3 4 5 6 7	0: *nothing* * 1: delatch 2: 52 a 3: 52 b 4: CB failure 5: External input 1 6: External input 2 7: Logic blocking		Setting	0/7/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
62	**00**	**TC SETTINGS**						
	01	GENERAL TRIP	Binary (3 bits)		000 *		Setting	0/7/1
	02	I>	Binary (3 bits)		000 *		Setting	0/7/1
	03	tI>	Binary (3 bits)		000 *		Setting	0/7/1
	04	I>>	Binary (3 bits)		000 *		Setting	0/7/1
	05	t I>>	Binary (3 bits)		000 *		Setting	0/7/1
	06	I>>>	Binary (3 bits)		000 *		Setting	0/7/1
	07	t I>>>	Binary (3 bits)		000 *		Setting	0/7/1
63	**00**	**LEDS SETTINGS**						
	01	Led 5	Binary (16 bits)		0: I> 1: t I> 2: I>> * 3: t I>> 4: I>>> 5: t I>>> 12 to 15: Reserved		Setting	0/65535/1
	02	Led 6	Binary (16 bits)		0: I> 1: t I> 2: I>> 3: t I>> 4: I>>> * 5: t I>>> 12 to 15: Reserved		Setting	0/65535/1
	03	Led 7	Binary (16 bits)		0: I> 1: t I> 2: I>> 3: t I>> 4: I>>> 5: t I>>> * 12 to 15: Reserved		Setting	0/65535/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	04	Led 8	Binary (16 bits)		0: I> 1: t I> 2: I>> 3: t I>> 4: I>>> 5: t I>>> 12 to 15: Reserved		Setting	0/65535/1
BF	**00**	**COMM SYSTEM DATA**						
	03	Setting Transfert					Setting	0/1/1
	04	*Reset Demand Timers*	*NOT IMPLEMENTED*					
	05	*Reset Event Report*	*NOT IMPLEMENTED*					

4. COURIER DATABASE ORGANISATION P121

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
00	00	SYSTEM DATA						
	01	Language	Ver>: Indexed String	0 1 2 3	Lang1 (French) Lang2 (English) * Lang3 (German) Lang4 (Spanish)		Setting	0/3/1
	02	Password	ASCII Password (4 bytes)		AAAA		Setting	32/127/1
	03	*Fnlinks: NOT IMPLEMENTED*						
	04	Description	ASCII Text (6 bytes)		" P121 "*		Setting	32/127/1
	05	Plant Reference	ASCII Text (4 bytes)		" Pref "		Setting	32/127/1
	06	Model Number	ASCII Text (16 bytes)		" Model Number "		Data	
	07	Firmware Number	ASCII Text (16 bytes)		" Firmware Number "		Data	
	08	Serial Number	ASCII Text (16 bytes)		" Serial Number "		Data	
	09	Frequency	Unsigned Integer (2 bytes)		XXXX Hz		Setting	50/60/10
	0A	Communication Level	Unsigned Integer (2 bytes)		1		Data	
	0B	Address	Unsigned Integer (2 bytes)		1*		Setting	1/255/1
	0C	*Plant Status Word: NOT IMPLEMENTED*						
	0D	*Control Status Word: NOT IMPLEMENTED*						
	0E	Setting Group	Unsigned Integer				Data	
	0F	*Load shed Stage: NOT IMPLEMENTED*						

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	10	Circuit Breaker Control	Binary flag (3 bits)		0: No operation 1: Trip 2: Close		Data	
	11	Software Reference	ASCII Text (16 characters)				Data	
	12-1F	*Unused, reserved*						
	20	Logic Input Status	Binary flag (3 bits)		0: log input 1 1: log input 2 2: log input 3		Data	
	21	Relay Output Status	Binary flag (5 bits)		0: relay 1 (trip) 1: relay 2 2: relay 3 3: relay 4 4: watchdog relay		Data	
	22	Alarm	Binary flag (16 bits)		0: Ana output err 1: Comm err 2: Eeprom err data 3: Ct error 4: reserved 5: Eeprom err calib 6: reserved 7: reserved 8: reserved 9: Default settings 10 to 15: reserved		Data	

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	23	Pseudo Logic Input Status group 1	Binary flag (12 bits)		0: I> 1: I>> 2: I>>> 3: I0> 4: I0>> 5: I0>>> 6: t I> 7: t I>> 8: t I>>> 9: t I0> 10: t I0>> 11: t I0>>>		Data	
01	**00**	**USER CONTROL**						
	01	Remote control 1	Binary flag (5 bits)		0: Unlock trip cont.* 1: Ack first alarm 2: Ack all alarms 3: TRIP 4: CLOSE 5 to 15: Reserved		Setting	0/ 31/1
03	**00**	**MEASUREMENTS**						
	01	IA RMS	Courier floating point number				Data	
	02	IB RMS	Courier floating point number				Data	
	03	IC RMS	Courier floating point number				Data	
	04	I0 RMS	Courier floating point number				Data	
	09	FREQUENCY	Courier floating point number				Data	

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
0D	**00**	**GENERAL SETTING**						
	01	Phase rotation sense	Indexed string		0: Direct (A/B/C) 1: Inverse (A/B/C)		Setting	0 (A/B/C) 1 (A/B/C)
0E	**00**	**CT RATIOS**						
	01	Phase CT Primary	Unsigned Integer (2 bytes)		1000 *		Setting	1/3000/1
	02	Phase CT Secondary	Unsigned Integer (2 bytes)		1 *		Setting	1/5/4
	03	Neutral CT Primary	Unsigned Integer (2 bytes)		1000 *		Setting	1/3000/1
	04	Neutral CT Secondary	Unsigned Integer (2 bytes)		1 *		Setting	1/5/4
		Protection Group n° 1						
20	**00**	**PHASE OVERCURRENT**						
	01	Stage 1 Overcurrent	(Sub Heading)					
	02	Max I>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	03	Threshold I>	Courier floating point number		0.1 In *	2002=1	Setting	0.1/25.0/0.1
	04	Temporisation Type I>	Indexed String	0 1 2	0: definite time * 1: inverse time 2: RI curve	2002=1	Setting	0/2/1
	05	Curve type I>	Indexed String	0 1 2 3 4 5 6 7 8 9 10	STI (CEI) * SI (CEI) VI (CEI) EI (CEI) LTI (CEI) STI (CO2) MI (ANSI) LTI (CO8) VI (ANSI) EI (ANSI) RC (CEI)	2004=1	Setting	0/10/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	06	TMS I>	Courier floating point number		0.025 *	2004=1	Setting	0.025/1.5/0.025
	07	K I>	Courier floating point number		0.1 *	2004=2	Setting	0.1/10.0/0.005
	08	Tempo I>	Courier floating point number		0.01 s *	2004=0	Setting	0 /150.0/0.01
	0C-0F	*Reserved*						
	10	Stage 2 Overcurrent	(Sub Heading)					
	11	Max I>>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	12	Threshold I>>	Courier floating point number		0.50 In *	2011=1	Setting	0.5/40.0/0.05
	13	Temporisation Type I>>	Indexed String	0 1 2	0: definite time * 1: inverse time 2: RI curve	2011=1	Setting	0/2/1
	14	Curve type I>>	Indexed String	0 1 2 3 4 5 6 7 8 9 10	STI (CEI) * SI (CEI) VI (CEI) EI (CEI) LTI (CEI) STI (CO2) MI (ANSI) LTI (CO8) VI (ANSI) EI (ANSI) RC (CEI)	2013=1	Setting	0/10/1
	15	TMS I>>	Courier floating point number		0.025 *	2013=1	Setting	0.025/1.5/0.025
	16	K I>>	Courier floating point number		0.1 *	2013=2	Setting	0.1/10.0/0.005

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	17	Tempo I>>	Courier floating point number		0.01 s *	2013=0	Setting	0 /150/0.01
	1B-1F	*Reserved*						
	20	Stage 3 Overcurrent	(Sub Heading)					
	21	Max I>>>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	22	Threshold I>>>	Courier floating point number		0.50 In *	2021=1	Setting	0.5/40.0/0.05
	23	Tempo I>>>	Courier floating point number		0.01 s *	2021=1	Setting	0 /150/0.01
21	**00**	**EARTH FAULT**						
	01	Stage 1 Overcurrent	(Sub Heading)					
	02	Max I0>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	03	Threshold I0>	Courier floating point number		0.01 I0n*	2102=1	Setting	0.01/1.0/0.005
	04	Tempo Type I0>	Indexed String	0 1 2 3	0: definite time * 1: inverse time 2: RI curve 3: Laborelec curves	2102=1	Setting	0/3/1
	05	Curve Type I0>	Indexed String	0 1 2 3 4 5 6 7 8 9 10	STI (CEI) * SI (CEI) VI (CEI) EI (CEI) LTI (CEI) STI (CO2) MI (ANSI) LTI (CO8) VI (ANSI) EI (ANSI) RC (CEI)	2104=1	Setting	0/10/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	06	Curve Type 2 (Laborelec) I0>	Indexed String	0 1 2	Curve type 1 * Curve type 2 Curve type 3	2104=3	Setting	0/2/1
	07	TMS I0>	Courier floating point number		0.025 *	2104=1	Setting	0.025/1.5/0.025
	08	K I0>	Courier floating point number		0.1 *	2104=2	Setting	0.1/10.0/0.005
	09	Tempo I0>	Courier floating point number		0.01 s *	2104=0	Setting	0 /150.0/0.01
	0C-0F	*Reserved*						
	10	Stage 2 Overcurrent	(Sub Heading)					
	11	Max I0>>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	12	Threshold I0>>	Courier floating point number		0.01 I0n*	2111=1	Setting	0.01/8.0/0.005
	13	Tempo Type I0>>	Indexed String	0 1 2 3	0: definite time * 1: inverse time 2: RI curve 3: Laborelec curves	2111=1	Setting	0/3/1
	14	Curve Type I0>>	Indexed String	0 1 2 3 4 5 6 7 8 9 10	STI (CEI) * SI (CEI) VI (CEI) EI (CEI) LTI (CEI) STI (CO2) MI (ANSI) LTI (CO8) VI (ANSI) EI (ANSI) RC (CEI)	2113=1	Setting	0/10/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	15	Curve Type 2 (Laborelec) I0>>	Indexed String	0 1 2	Curve type 1 * Curve type 2 Curve type 3	2113=3	Setting	0/2/1
	16	TMS I0>>	Courier floating point number		0.025 *	2113=1	Setting	0.025/1.5/0.025
	17	K I0>>	Courier floating point number		0.1 *	2113=2	Setting	0.1/10.0/0.005
	18	Tempo I0>>	Courier floating point number		0.01 s *	2113=0	Setting	0 /150.0/0.01
	1C-1F	*Reserved*						
	20	Stage 3 Overcurrent	(Sub Heading)					
	21	Max I0>>>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	22	Threshold I0>>>	Courier floating point number		0.01 I0n *	2121=1	Setting	0.01/8.0/0.005
	23	Tempo I0>>>	Courier floating point number		0.01 s *	2121=1	Setting	0 /150.0/0.01
60	**00**	**AUTOMATISM**						
	01	Trip Configuration	Binary (16 bits)		0: t I> * 1: t I>> 2: t I>>> 3: t I0> 4: t I0>> 5: t I0>>> 6 to 15: reserved		Setting	0 / 65535 / 1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	02	Latched Configuration	Binary (16 bits)		0: Latch I> * 1: Latch I>> 2: Latch I>>> 3: Latch I0> 4: Latch I0>> 5: Latch I0>>> 6 to 15: reserved		Setting	0 / 65535 / 1
	03	Blocking 1 Configuration	Binary (16 bits)		0: Blocking t I> * 1: Blocking t I>> 2: Blocking t I>>> 3: Blocking t I0> 4: Blocking t I0>> 5: Blocking t I0>>> 6 to 15: reserved		Setting	0 / 65535 / 1
61	**00**	**TS SETTINGS**						
	01	Logical input allocation 1	Indexed String	0 1 2 3 4 5 6 7	0: *nothing* * 1: delatch 2: 52 a 3: 52 b 4: CB failure 5: External input 1 6: External input 2 7: Logic blocking		Setting	0/7/1
	02	Logical input allocation 2	Indexed String	0 1 2 3 4 5 6 7	0: *nothing* * 1: delatch 2: 52 a 3: 52 b 4: CB failure 5: External input 1 6: External input 2 7: Logic blocking		Setting	0/7/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
62	00	TC SETTINGS						
	01	GENERAL TRIP	Binary (3 bits)		000 *		Setting	0/7/1
	02	I>	Binary (3 bits)		000 *		Setting	0/7/1
	03	tI>	Binary (3 bits)		000 *		Setting	0/7/1
	04	I>>	Binary (3 bits)		000 *		Setting	0/7/1
	05	t I>>	Binary (3 bits)		000 *		Setting	0/7/1
	06	I>>>	Binary (3 bits)		000 *		Setting	0/7/1
	07	t I>>>	Binary (3 bits)		000 *		Setting	0/7/1
	08	I0>	Binary (3 bits)		000 *		Setting	0/7/1
	09	t I0>	Binary (3 bits)		000 *		Setting	0/7/1
	0A	I0>>	Binary (3 bits)		000 *		Setting	0/7/1
	0B	t I0>>	Binary (3 bits)		000 *		Setting	0/7/1
	0C	I0>>>	Binary (3 bits)		000 *		Setting	0/7/1
	0D	t I0>>>	Binary (3 bits)		000 *		Setting	0/7/1
	15	Reclosing	Binary (3 bits)		000 *		Setting	0/7/1
	1D	TC lock setting	Binary (3 bits)		000 * bit 0 to 2 =1: TC Locked		Setting	0/7/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
63	00	LEDS SETTINGS						
	01	Led 5	Binary (16 bits)		0: I> 1: t I> 2: I>> * 3: t I>> 4: I>>> 5: t I>>> 6: I0> 7: t I0> 8: I0>> 9: t I0>> 10: I0>>> 11: t I0>>> 12 to 15: Reserved		Setting	0/65535/1
	02	Led 6	Binary (16 bits)		0: I> 1: t I> 2: I>> 3: t I>> 4: I>>> * 5: t I>>> 6: I0> 7: t I0> 8: I0>> 9: t I0>> 10: I0>>> 11: t I0>>> 12 to 15: Reserved		Setting	0/65535/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	03	Led 7	Binary (16 bits)		0: I> 1: t I> 2: I>> 3: t I>> 4: I>>> 5: t I>>> * 6: I0> 7: t I0> 8: I0>> 9: t I0>> 10: I0>>> 11: t I0>>> 12 to 15: Reserved		Setting	0/65535/1
	04	Led 8	Binary (16 bits)		0: I> 1: t I> 2: I>> 3: t I>> 4: I>>> 5: t I>>> 6: I0> * 7: t I0> 8: I0>> 9: t I0>> 10: I0>>> 11: t I0>>> 12 to 15: Reserved		Setting	0/65535/1
BF	**00**	**COMM SYSTEM DATA**						
	03	Setting Transfert						
	04	*Reset Demand Timers*	*NOT IMPLEMENTED*					
	05	*Reset Event Report*	*NOT IMPLEMENTED*					

5. COURIER DATABASE ORGANISATION P122, P123

This Database organisation is common for both products, except for the Autorecloser function, the SOTF function (with Control Trip and Control Close outputs).

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
00	00	SYSTEM DATA						
	01	Language	Ver>: Indexed String	0 1 2 3	Lang1 (French) Lang2 (English)* Lang3 (German) Lang4 (Spanish)		Setting	0/3/1
	02	Password	ASCII Password (4 bytes)		AAAA		Setting	32/127/1
	03	Fnlinks: NOT IMPLEMENTED						
	04	Description	ASCII Text (6 bytes)		" P123 "*		Setting	32/127/1
	05	Plant Reference	ASCII Text (4 bytes)		" Pref "		Setting	32/127/1
	06	Model Number	ASCII Text (16 bytes)		" Model Number "		Data	
	07	Firmware Number	ASCII Text (16 bytes)		" Firmware Number "		Data	
	08	Serial Number	ASCII Text (16 bytes)		" Serial Number "		Data	
	09	Frequency	Unsigned Integer (2 bytes)		XXXX Hz		Setting	50/60/10
	0A	Communication Level	Unsigned Integer (2 bytes)		1		Data	
	0B	Address	Unsigned Integer (2 bytes)		1*		Setting	1/255/1
	0C	Plant Status Word: NOT IMPLEMENTED						
	0D	Control Status Word: NOT IMPLEMENTED						
	0E	Setting Group	Unsigned Integer				Data	
	0F	Load shed Stage: NOT IMPLEMENTED						

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	10	Circuit Breaker Control	Indexed String		0*: No operation 1: Trip 2: Close		Setting	0/2/1
	11	Software Reference	ASCII Text (16 characters)				Data	
	12-1F	Unused, reserved						
	20	Logic Input Status	Binary flag (5 bits)		0: log input 1 1: log input 2 2: log input 3 3: log input 4 4: log input 5		Data	
	21	Relay Output Status	Binary flag (9 bits)		0: relay 1 (trip) 1: relay 2 2: relay 3 3: relay 4 4: watchdog relay 5: relay 5 6: relay 6 7: relay 7 8: relay 8		Data	
	22	Alarm	Binary flag (16 bits)		0: Ana output err 1: Comm err 2: Eeprom err data 3: Ct error 4: Clock error 5: Eeprom err calib 6: Ram error 7: Battery error 8: reserved 9: Default settings 10 to 15: reserved		Data	

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	23	Pseudo Logic Input Status group 1	Binary flag (16 bits)		0: I> 1: I>> 2: I>>> 3: I0> 4: I0>> 5: I0>>> 6: t I> 7: t I>> 8: t I>>> 9: t I0> 10: t I0>> 11: t I0>>> 12: Thermal Alarm 13: Therm. Overload 14: t I< 15: I<		Data	
	24	Pseudo Logic Input Status group 2	Binary flag (16 bits)		0: Broken Conductor 1: t Aux 1 2: t Aux 2 3: Breaker Fail. 4: Iinv > 5: t Iinv> 6: Open operating time 7: Trip operation Nb 8: SA 2 n 9: SW Trip Circuit 10: Close operating time 11: Successful autoreclose 12: Locked autorecloser 13: Autorecloser conf. fail 14: Iinv>> 15: t Iinv>>		Data	

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	25	Pseudo Logic Input Status group 3	Binary flag (16 bits)		0: t Aux 3 1: t Aux 4 2: t Reset I> 3: t Reset I>> 4: t Reset I0> 5: t Reset I0>> 6: t Reset I2> 7: t BF 8: t SOTF 9: Final Trip 10: Autoreclos. in progress 11 à 15: reserved		Data	
01	00	USER CONTROL						
	01	Remote control 1	Binary flag (16 bits)		0: Unlock trip cont.* 1: Ack first alarm 2: Ack all alarms 3: TRIP 4: CLOSE 5: Setting Change 6: Th. State Reset 7: RMS aver&max Reset 8: Dist. Rec. Trig 9: Maintenance Start 10: Recloser timer Reset 11: Recloser Reset 12: Reserved 13: Reserved 14: Reserved 15: SRAM def . ack		Setting	0/65535/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	02	Remote control 2	Binary flag (9 bits)		0: Relay 0: TRIP* 1: Relay 1 2: Relay 2 3: Relay 3 4: Watchdog Relay 5: Relay 4 6: Relay 5 7: Relay 6 8: Relay 7		Setting	0/511/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	03	Remote control 3	Binary flag (6 bits)		0: Reset I0 Harmonic 1: Reserved 2: Reserved 3: Maintenance stop 4: Reset rolling averages 5: Reset sub-period average peaks.		Setting	0/63/1
02	00	VIEW RECORDS						
	01	Record number	Unsigned Integer (2 bytes)			5 *	Setting	1/5/1
	02	Occur date	Unsigned Integer (2 bytes)					
	03	Active set group	Unsigned Integer (2 bytes)					
	04	Phase in fault	ASCII Text					
	05	Fault Id	ASCII Text					
	06	Magnitude	Courier floating point number					
	07	Ia magnitude	Courier floating point number					
	08	Ib magnitude	Courier floating point number					
	09	Ic magnitude	Courier floating point number					
	0A	In magnitude	Courier floating point number					

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
03	00	MEASUREMENTS						
	01	IA RMS	Courier floating point number				Data	
	02	IB RMS	Courier floating point number				Data	
	03	IC RMS	Courier floating point number				Data	
	04	I0 RMS	Courier floating point number				Data	
	05	Idirect	Courier floating point number				Data	
	06	IINV	Courier floating point number				Data	
	07	Ratio Idir / Iinv	Courier floating point number				Data	
	08	THERMAL STATE (Rst)	Unsigned Integer (2 bytes) (%)				Data	
	09	FREQUENCY	Courier floating point number				Data	
	0A	RST RMS MAX & AVERAGE						
	0B	MAX RMS IA	Courier floating point number				Data	
	0C	MAX RMS IB	Courier floating point number				Data	
	0D	MAX RMS IC	Courier floating point number				Data	

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	0E	IA RMS AVERAGE	Courier floating point number				Data	
	0F	IB RMS AVERAGE	Courier floating point number				Data	
	10	IC RMS AVERAGE	Courier floating point number				Data	
	11	IN – Fn (Rst)	Courier floating point number				Data	
	20	RST Sub-period average Peaks						
	21	IA RMS Sub-period average Peak	Courier floating point number				Data	
	22	IB RMS Sub-period average Peak	Courier floating point number				Data	
	23	IC RMS Sub-period average Peak	Courier floating point number				Data	
	24	RST Rolling Averages						
	25	IA RMS Rolling Average	Courier floating point number				Data	
	26	IB RMS Rolling Average	Courier floating point number				Data	
	27	IC RMS Rolling Average	Courier floating point number				Data	

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
04	00	RECLOSER STATISTICS (Rst)						
	01	TOTAL CYCLE NUMBER	Unsigned Integer (2 bytes)				Data	
	02	CYCLE 1 NUMBER	Unsigned Integer (2 bytes)				Data	
	03	CYCLE 2 NUMBER	Unsigned Integer (2 bytes)				Data	
	04	CYCLE 3 NUMBER	Unsigned Integer (2 bytes)				Data	
	05	CYCLE 4 NUMBER	Unsigned Integer (2 bytes)				Data	
	06	DEFINITIVE TRIP NUMBER	Unsigned Integer (2 bytes)				Data	
	07	RECLOSE ORDER NUMBER	Unsigned Integer (2 bytes)				Data	
05	00	PROCESS: in versions >						
06	00	SW MONITORING						
	01	RST SAn Ix						
	02	SAn IA	Courier floating point number				Data	
	03	SAn IB	Courier floating point number				Data	
	04	SAn IC	Courier floating point number				Data	
	05	SW operation nb (Rst)	Unsigned Integer (2 bytes)				Data	
	06	SW operation time	Courier floating point number		0.0 s		Data	
	07	SW Closing time	Courier floating point number				Data	

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
08	00	TIME:						
	01	Date/Time	IEC870 Time & Date				Data	
	02	Date Format (IEC/no)	Indexed String		0: Private * 1: IEC		Setting	0 (Private) / 1 (IEC)
0D	00	GENERAL SETTING						
	01	Phase Rotation sense	Indexed String		0: Direct (A/B/C) * 1: Inverse (A/C/B)		Setting	0 (A/B/C) / 1 (A/C/B)
0E	00	CT RATIOS						
	01	Phase CT Primary	Unsigned Integer (2 bytes)		1000 *		Setting	1/50000/1
	02	Phase CT Secondary	Unsigned Integer (2 bytes)		1 *		Setting	1/5/4
	03	Neutral CT Primary	Unsigned Integer (2 bytes)		1000 *		Setting	1/50000/1
	04	Neutral CT Secondary	Unsigned Integer (2 bytes)		1 *		Setting	1/5/4
0F	00	SETTING GROUPS						
	01	Setting group toggle	Indexed String		0: Edge * 1: Level		Setting	0 (Edge) / 1 (Level)
	02	Select setting group	Unsigned Integer (2 bytes)		1*	0F01=0	Setting	1/2
	03	Group 1 visible	Indexed String		0: YES * 1: NO		Setting	0 (YES) / 1 (NO)
	04	Group 2 visible	Indexed String		0: YES 1: NO *		Setting	0 (YES) / 1 (NO)

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
		Protection Group n° 1						
20	00	PHASE OVERCURRENT						
	01	Stage 1 Overcurrent	(Sub Heading)					
	02	Max I>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	03	Threshold I>	Courier floating point number		0.1 In *	2002=1	Setting	0.1/25.0/0.1
	04	Temporisation Type I>	Indexed String	0 1 2	0: definite time * 1: inverse time 2: RI curve	2002=1	Setting	0/2/1
	05	Curve type I>	Indexed String	0 1 2 3 4 5 6 7 8 9 10	STI (CEI) * SI (CEI) VI (CEI) EI (CEI) LTI (CEI) STI (CO2) MI (ANSI) LTI (CO8) VI (ANSI) EI (ANSI) RC (CEI)	2004=1	Setting	0/10/1
	06	TMS I>	Courier floating point number		0.025 *	2004=1	Setting	0.025/1.5/0.025
	07	K I>	Courier floating point number		0.1 *	2004=2	Setting	0.1/10.0/0.005
	08	Tempo I>	Courier floating point number		0.01 s *	2004=0	Setting	0 /150.0/0.01
	09	Tempo reset type I>	Indexed String		0: definite time 1: inverse time	2004=1 & 2005>= 5 & 2005 <=9	Setting	0/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	0A	RTMS I>	Courier floating point number		0.025	2009 = 1	Setting	0.025/3.2/0.025
	0B	T RESET I>	Courier floating point number		0.04	2009 = 0 or 2004 =0 or 2004 =2 or (2004=1 & 2005 < 5 & 2005 > 9)	Setting	0/600.0/0.01
	0C-0F	Reserved						
	10	Stage 2 Overcurrent	(Sub Heading)					
	11	Max I>>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	12	Threshold I>>	Courier floating point number		0.50 In *	2011=1	Setting	0.5/40.0/0.05
	13	Temporisation Type I>>	Indexed String	0 1 2	0: definite time * 1: inverse time 2: RI curve	2011=1	Setting	0/2/1
	14	Curve type I>>	Indexed String	0 1 2 3 4 5 6 7 8 9 10	STI (CEI) * SI (CEI) VI (CEI) EI (CEI) LTI (CEI) STI (CO2) MI (ANSI) LTI (CO8) VI (ANSI) EI (ANSI) RC (CEI)	2013=1	Setting	0/10/1
	15	TMS I>>	Courier floating point number		0.025 *	2013=1	Setting	0.025/1.5/0.025

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	16	K I>>	Courier floating point number		0.1 *	2013=2	Setting	0.1/10.0/0.005
	17	Tempo I>>	Courier floating point number		0.01 s *	2013=0	Setting	0 /150/0.01
	18	Tempo reset type I>>	Indexed String		0: definite time 1: inverse time	2013=1 & 2014>= 5 & 2014 <=9	Setting	0/1
	19	RTMS I>>	Courier floating point number		0.025	2018 = 1	Setting	0.025/3.2/0.025
	1A	T RESET I>>	Courier floating point number		0.04	2018 = 0 or 2013 = 0 or 2013 =2 or (2013=1 & 2014 < 5 & 2014 > 9)	Setting	0/600.0/0.01
	1B-1F	Reserved						
	20	Stage 3 Overcurrent	(Sub Heading)					
	21	Max I>>>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	22	Threshold I>>>	Courier floating point number		0.50 In *	2021=1	Setting	0.5/40.0/0.05
	23	Tempo I>>>	Courier floating point number		0.01 s *	2021=1	Setting	0 /150/0.01
	24	Sample I>>>	Binary (1 bit)	0	Disabled * / Enabled	2021=1	Setting	0/1/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
21	00	EARTH FAULT						
	01	Stage 1 Overcurrent	(Sub Heading)					
	02	Max I0>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	03	Threshold I0>	Courier floating point number		0.01 I0n* or 0.002 I0n* if great sensivity	2102=1	Setting	0.01/1.0/0.005 or 0.1/25.0/0.01 if normal sensitivity or 0.002/1.0/0.001 if great sensivity
	04	Tempo Type I0>	Indexed String	0 1 2 3	0: definite time * 1: inverse time 2: RI curve 3: Laborelec curves	2102=1	Setting	0/3/1
	05	Curve Type I0>	Indexed String	0 1 2 3 4 5 6 7 8 9 10	STI (CEI) * SI (CEI) VI (CEI) EI (CEI) LTI (CEI) STI (CO2) MI (ANSI) LTI (CO8) VI (ANSI) EI (ANSI) RC (CEI)	2104=1	Setting	0/10/1
	06	Curve Type 2 (Laborelec) I0>	Indexed String	0 1 2	Curve type 1 * Curve type 2 Curve type 3	2104=3	Setting	0/2/1
	07	TMS I0>	Courier floating point number		0.025 *	2104=1	Setting	0.025/1.5/0.025
	08	K I0>	Courier floating point number		0.1 *	2104=2	Setting	0.1/10.0/0.005

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	09	Tempo I0>	Courier floating point number		0.01 s *	2104=0	Setting	0 /150.0/0.01
	0A	Tempo reset Type I0>	Indexed String		0: definite time 1: inverse time	2104=1 & 2105>= 5 & 2105 <=9	Setting	0/1
	0B	RTMS I0>	Courier floating point number		0.025	210A = 1	Setting	0.025/3.2/0.025
	0C	T RESET I0>	Courier floating point number		0.04	210A = 0 or 2104 = 0 or 2104 =2 or 2104 =3 or (2104=1 & 2105 < 5 & 2105 > 9)	Setting	0/600.0/0.01
	0D-0F	Reserved						
	10	Stage 2 Overcurrent	(Sub Heading)					
	11	Max I0>>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	12	Threshold I0>>	Courier floating point number		I0n* or 0.50 I0n* if normal sensitivity or 0.002 I0n* if great sensivity	2111=1	Setting	0.01/8.0/0.005 or 0.50/40.0/0.01 if normal sensitivity or 0.002/1.0/0.001 if great sensivity
	13	Tempo Type I0>>	Indexed String	0 1 2 3	0: definite time * 1: inverse time 2: RI curve 3: Laborelec curves	2111=1	Setting	0/3/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	14	Curve Type I0>>	Indexed String	0 1 2 3 4 5 6 7 8 9 10	STI (CEI) * SI (CEI) VI (CEI) EI (CEI) LTI (CEI) STI (CO2) MI (ANSI) LTI (CO8) VI (ANSI) EI (ANSI) RC (CEI)	2113=1	Setting	0/10/1
	15	Curve Type 2 (Laborelec) I0>>	Indexed String	0 1 2	Curve type 1 * Curve type 2 Curve type 3	2113=3	Setting	0/2/1
	16	TMS I0>>	Courier floating point number		0.025 *	2113=1	Setting	0.025/1.5/0.025
	17	K I0>>	Courier floating point number		0.1 *	2113=2	Setting	0.1/10.0/0.005
	18	Tempo I0>>	Courier floating point number		0.01 s *	2113=0	Setting	0 /150.0/0.01
	19	Tempo reset Type I0>>	Indexed String		0: definite time 1: inverse time	2113=1 & 2114>= 5 & 2114 <=9	Setting	0/1
	1A	RTMS I0>>	Courier floating point number		0.025	2119 = 1	Setting	0.025/3.2/0.025
	1B	T RESET I0>>	Courier floating point number		0.04	2119 = 0 or 2113 = 0 or 2113 =2 or 2113 =3 or (2113=1 & 2114 < 5 & 2114 > 9)	Setting	0/600.0/0.01

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	1C-1F	Reserved						
	20	Stage 3 Overcurrent	(Sub Heading)					
	21	Max I0>>>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	22	Threshold I0>>>	Courier floating point number		I0n* or 0.50 I0n* if normal sensitivity or 0.002 I0n* if great sensivity	2121=1	Setting	0.01/8.0/0.005 or 0.50/40.0/0.01 if normal sensitivity or 0.002/1.0/0.001 if great sensivity
	23	Tempo I0>>>	Courier floating point number		0.01 s *	2121=1	Setting	0 /150.0/0.01
	24	Sample I0>>>	Binary (1 bit)	0	Disabled * / Enabled	2121=1	Setting	0/1/1
22	00	THERMAL OVERLOAD						
	01	Ith>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	02	Threshold Ith>	Courier floating point number		0.10 Ith*	2201=1	Setting	0.01/3.2/0.01
	03	K Ith>	Courier floating point number		1.05 *	2201=1	Setting	1.0/1.50/0.01 In
	04	θ TRIP	Unsigned Integer (2 bytes)		100 % *	2201=1	Setting	50 / 200/ 1 %
	05	θ ALARM ?	Binary (1 bit)	0	Disabled * / Enabled	2201=1	Setting	0/1/1
	06	θ ALARM	Unsigned Integer (2 bytes)		90 % *	2205 =1	Setting	50 / 200/ 1 %
	07	Thermal constant	Unsigned Integer (2 bytes)		1 *	2201=1	Setting	1/ 200 / 1 mn
23	00	MIN I<						
	01	I<	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	02	Threshold I<	Unsigned Integer (2 bytes)		20 %In *	2301=1	Setting	2 / 100 / 1 %In
	03	Tempo I <	Courier floating point number		0.01 s *	2301=1	Setting	0 /150.0/0.01

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
24	00	NEGATIVE CURRENT						
	01	Iinv>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	02	Threshold Iinv>	Courier floating point number		0.1 In *	2401 = 1	Setting	0.1/40.0/0.01 In
	03	Temporisation Type	Indexed String	0 1 2	0: definite time * 1: inverse time 2: RI curve	2401 = 1	Setting	0/2/1
	04	Curve type	Indexed String	0 1 2 3 4 5 6 7 8 9	STI (CEI) * SI (CEI) VI (CEI) EI (CEI) LTI (CEI) STI (CO2) MI (ANSI) LTI (CO8) VI (ANSI) EI (ANSI)	2403 = 1	Setting	0/9/1
	05	TMS	Courier floating point number		0.025 *	2403=1	Setting	0.025/1.5/0.025
	06	K (RI)	Courier floating point number		0.1 *	2403=2	Setting	0.1/10.0/0.005
	07	Tempo Iinv>	Courier floating point number		0.01 s *	2403=0	Setting	0 /150.0/1.0
	08	Reset tempo type	Indexed String		0: definite time 1: inverse time	2403=1 & 2404>= 5 & 2404 <=9	Setting	0/1/1
	09	RTMS	Courier floating point number		0.025 *	2408 = 1	Setting	0.025/3.2/0.025

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	0A	T RESET	Courier floating point number		0.04 *	2408 = 0 or 2403 =2 or (2403=1 & 2404 < 5 & 2404 > 9)	Setting	0.04/100/0.01
	10	Iinv>>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	11	Threshold Iinv>>	Courier floating point number		0.1 In *	2410 = 1	Setting	0.1/40.0/0.01 In
	12	Tempo Iinv>>	Courier floating point number		0.01 s *	2410 = 1	Setting	0 /150.0/1.0
25	00	AUTORECLOSER						
	01	Autorecloser	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	02	State circuit breaker	Binary (1 bit)		Disabled * / Enabled	2501 = 1	Setting	0/1/1
	03	Control window	Courier floating point number		0.01 s *	2502 = 1	Setting	0.01 / 600.00 / 0.01 s
	04	External blocking	Binary (1 bit)		Disabled * / Enabled	2501 = 1	Setting	0/1/1
	07	Temporisation cycle 1	Courier floating point number		0.05 s *	2501 = 1	Setting	0.05 / 300.00 / 0.01 s
	08	Temporisation cycle 2	Courier floating point number		0.05 s *	2501 = 1	Setting	0.05 / 300.00 / 0.01 s
	09	Temporisation cycle 3	Courier floating point number		0.05 s *	2501 = 1	Setting	0.05 / 600.00 / 0.01 s
	0A	Temporisation cycle 4	Courier floating point number		0.05 s *	2501 = 1	Setting	0.05 / 600.00 / 0.01 s
	0B	Reclaim TIME	Courier floating point number		0.02 s *	2501 = 1	Setting	0.02 / 600.00 / 0.01 s
	0C	Inhibition time	Courier floating point number		0.02 s *	2501 = 1	Setting	0.02 / 600.00 / 0.01 s

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	0D	Number of short circuit cycle	Unsigned Integer (2 bytes)		0 *	2501 = 1	Setting	0 / 4 / 1
	0E	Number of earth fault cycle	Unsigned Integer (2 bytes)		0 *	2501 = 1	Setting	0 / 4 / 1
	0F	Cycles tI> configuration	Unsigned Integer (2 bytes)		0x1111 *	2501 = 1	Setting	0/2/1 on each 4 bit group
	10	Cycles tI>> configuration	Unsigned Integer (2 bytes)		0x1111 *	2501 = 1	Setting	0/2/1 on each 4 bit group
	11	Cycles tI>>> configuration	Unsigned Integer (2 bytes)		0x1111 *	2501 = 1	Setting	0/2/1 on each 4 bit group
	12	Cycles tI0> configuration	Unsigned Integer (2 bytes)		0x1111 *	2501 = 1	Setting	0/2/1 on each 4 bit group
	13	Cycles tI0>> configuration	Unsigned Integer (2 bytes)		0x1111 *	2501 = 1	Setting	0/2/1 on each 4 bit group
	14	Cycles tI0>>> configuration	Unsigned Integer (2 bytes)		0x1111 *	2501 = 1	Setting	0/2/1 on each 4 bit group
	15	Cycles tAux1> configuration	Unsigned Integer (2 bytes)		0x1111 *	2501 = 1	Setting	0/2/1 on each 4 bit group
	16	Cycles tAux2> configuration	Unsigned Integer (2 bytes)		0x1111 *	2501 = 1	Setting	0/2/1 on each 4 bit group

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
		Protection Group n° 2						
40	00	PHASE OVERCURRENT						
	01	Stage 1 Overcurrent	(Sub Heading)					
	02	Max I>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	03	Threshold I>	Courier floating point number		0.1 In *	4002=1	Setting	0.1/25.0/0.1
	04	Tempo Type I>	Indexed String	0 1 2	0: definite time * 1: inverse time 2: RI curve	4002=1	Setting	0/2/1
	05	Curve Type I>	Indexed String	0 1 2 3 4 5 6 7 8 9 10	STI (CEI) * SI (CEI) VI (CEI) EI (CEI) LTI (CEI) STI (CO2) MI (ANSI) LTI (CO8) VI (ANSI) EI (ANSI) RC (CEI)	4004=1	Setting	0/10/1
	06	TMS I>	Courier floating point number		0.025 *	4004=1	Setting	0.025/1.5/0.025
	07	K I>	Courier floating point number		0.1 *	4004=2	Setting	0.1/10.0/0.005
	08	Tempo I>	Courier floating point number		0.01 s *	4004=0	Setting	0.01/150.0/1.0
	09	Reset tempo type I>	Indexed String		0: definite time 1: inverse time	4004=1 & 4005>= 5 & 4005 <=9	Setting	0/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	0A	RTMS I>	Courier floating point number		0.025	4009 = 1	Setting	0.025/3.2/0.025
	0B	T RESET I>	Courier floating point number		0.04	4009 = 0 or 4004 =0 or 4004 =2 or (4004=1 & 4005 < 5 & 4005 > 9)	Setting	0/600.0/0.01
	0C-0F	Reserved						
	10	Stage 2 Overcurrent	(Sub Heading)					
	11	Max I>>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	12	Threshold I>>	Courier floating point number		0.50 In *	4011=1	Setting	0.5/40.0/0.05
	13	Tempo Type I>>	Indexed String	0 1 2	0: definite time * 1: inverse time 2: RI curve	4011=1	Setting	0/2/1
	14	Curve Type I>>	Indexed String	0 1 2 3 4 5 6 7 8 9 10	STI (CEI) * SI (CEI) VI (CEI) EI (CEI) LTI (CEI) STI (CO2) MI (ANSI) LTI (CO8) VI (ANSI) EI (ANSI) RC (CEI)	4013=1	Setting	0/10/1
	15	TMS I>>	Courier floating point number		0.025 *	4013=1	Setting	0.025/1.5/0.025
	16	K I>>	Courier floating point number		0.1 *	4013=2	Setting	0.1/10.0/0.005

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	17	Tempo I>>	Courier floating point number		0.01 s *	4013=0	Setting	0 /150/0.01
	18	Reset tempo type I>>	Indexed String		0: definite time 1: inverse time	4013=1 & 4014>= 5 & 4014 <=9	Setting	0/1
	19	RTMS I>>	Courier floating point number		0.025	4018 = 1	Setting	0.025/3.2/0.025
	1A	T RESET I>>	Courier floating point number		0.04	4018 = 0 or 4013 =0 or 4013 =2 or (4013=1 & 4014 < 5 & 4014 > 9)	Setting	0/600.0/0.01
	1B-1F	Reserved						
	20	Stage 3 Overcurrent	(Sub Heading)					
	21	Max I>>>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	22	Threshold I>>>	Courier floating point number		0.50 In *	4021=1	Setting	0.5/40.0/0.05
	23	Tempo I>>>	Courier floating point number		0.01 s *	4021=1	Setting	0 /150/0.01
	24	Sample I>>>	Binary (1 bit)	0	Disabled * / Enabled	4021=1	Setting	0/1/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
41	00	EARTH FAULT						
	01	Stage 1 Overcurrent	(Sub Heading)					
	02	Max I0>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	03	Threshold I0>	Courier floating point number		0.01 I0n* or 0.002 I0n* if great sensivity	4102=1	Setting	0.01/1.0/0.005 or 0.1/25.0/0.01if normal sensitivity or 0.002/1.0/0.001 if great sensivity
	04	Temporisation Type I0>	Indexed String	0 1 2 3	0: definite time * 1: inverse time 2: RI curve 3: Laborelec curve	4102=1	Setting	0/3/1
	05	Curve type I0>	Indexed String	0 1 2 3 4 5 6 7 8 9 10	STI (CEI) * SI (CEI) VI (CEI) EI (CEI) LTI (CEI) STI (CO2) MI (ANSI) LTI (CO8) VI (ANSI) EI (ANSI) RC (CEI)	4104=1	Setting	0/10/1
	06	Curve Type 2 (Laborelec) I0>	Indexed String	0 1 2	Curve type 1 * Curve type 2 Curve type 3	4104=3	Setting	0/2/1
	07	TMS I0>	Courier floating point number		0.025 *	4104=1	Setting	0.025/1.5/0.025
	08	K I0>	Courier floating point number		0.1 *	4104=2	Setting	0.1/10.0/0.005

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	09	Tempo I0>	Courier floating point number		0.01 s *	4104=0	Setting	0 /150.0/0.01
	0A	Tempo reset Type I0>	Indexed String		0: definite time 1: inverse time	4104=1 & 4105>= 5 & 4105 <=9	Setting	0/1
	0B	RTMS I0>	Courier floating point number		0.025	4109 = 1	Setting	0.025/3.2/0.025
	0C	T RESET I0>	Courier floating point number		0.04	4109 = 0 or 4104 =0 or 4104 =2 or 4104 =3 or (4104=1 & 4105 < 5 & 4105 > 9)	Setting	0/600.0/0.01
	0D-0F	Reserved						
	10	Stage 2 Overcurrent	(Sub Heading)					
	11	Max I0>>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	12	Threshold I0>>	Courier floating point number		I0n* or 0.50 I0n* if normal sensitivity or 0.002 I0n* if great sensivity	4111=1	Setting	0.01/8.0/0.005 or 0.50/40.0/0.01 if normal sensitivity or 0.002/1.0/0.001 if great sensivity
	13	Temporisation Type I0>>	Indexed String	0 1 2 3	0: definite time * 1: inverse time 2: RI curve 3: Laborelec curve	4111=1	Setting	0/3/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	14	Curve type I0>>	Indexed String	0 1 2 3 4 5 6 7 8 9 10	STI (CEI) * SI (CEI) VI (CEI) EI (CEI) LTI (CEI) STI (CO2) MI (ANSI) LTI (CO8) VI (ANSI) EI (ANSI) RC (CEI)	4113=1	Setting	0/10/1
	15	Curve Type 2 (Laborelec) I0>>	Indexed String	0 1 2	Curve type 1 * Curve type 2 Curve type 3	4113=3	Setting	0/2/1
	16	TMS I0>>	Courier floating point number		0.025 *	4113=1	Setting	0.025/1.5/0.025
	17	K I0>>	Courier floating point number		0.1 *	4113=2	Setting	0.1/10.0/0.005
	18	Tempo I0>>	Courier floating point number		0.01 s *	4113=0	Setting	0 /150.0/0.01
	19	Tempo reset Type I0>>	Indexed String		0: definite time 1: inverse time	4113=1 & 4114 >= 5 & 4114 <=9	Setting	0/1
	1A	RTMS I0>>	Courier floating point number		0.025	4119 = 1	Setting	0.025/3.2/0.025
	1B	T RESET I0>>	Courier floating point number		0.04	4119 = 0 or 4113 =0 or 4113 =2 or 4113 =3 or (4113=1 & 4114 < 5 & 4114 > 9)	Setting	0/600.0/0.01

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	1C-1F	Reserved						
	20	Stage 3 Overcurrent	(Sub Heading)					
	21	Max I0>>>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	22	Threshold I0>>>	Courier floating point number		I0n* or 0.50 I0n* if normal sensitivity or 0.002 I0n* if great sensivity	4121=1	Setting	0.01/8.0/0.005 or 0.50/40.0/0.01 if normal sensitivity or 0.002/1.0/0.001 if great sensivity
	23	Tempo I0>>>	Courier floating point number		0.01 s *	4121=1	Setting	0 /150.0/0.01
	24	Sample I0>>>	Binary (1 bit)	0	Disabled * / Enabled	4121=1	Setting	0/1/1
42	00	THERMAL OVERLOAD						
	01	Ith>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	02	Threshold Ith>	Courier floating point number		0.10 Ith*	4201=1	Setting	0.01/3.2/0.01
	03	K Ith>	Courier floating point number		1.05 *	4201=1	Setting	1.0/1.50/0.01 In
	04	θ TRIP	Unsigned Integer (2 bytes)		100 % *	4201=1	Setting	50 / 200/ 1 %
	05	θ ALARM ?	Binary (1 bit)	0	Disabled * / Enabled	4201=1	Setting	0/1/1
	06	θ ALARM	Unsigned Integer (2 bytes)		90 % *	4205 =1	Setting	50 / 200/ 1 %
	07	Thermal constant	Unsigned Integer (2 bytes)		1 *	4201=1	Setting	1/ 200 / 1 mn
43	00	MIN I<						
	01	I<	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	02	Threshold I<	Unsigned Integer (2 bytes)		20 %In *	4301=1	Setting	2 / 100 / 1 %In
	03	Tempo I <	Courier floating point number		0.01 s *	4301=1	Setting	0 /150.0/0.01

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
44	00	NEGATIVE CURRENT						
	01	Iinv>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	02	Threshold Iinv>	Courier floating point number		0.1 In *	4401 = 1	Setting	0.1/40.0/0.01 In
	03	Temporisation type		0 1 2	0: definite time * 1: inverse time 2: RI curve	4401 = 1	Setting	0/2/1
	04	Curve Type	Indexed String	0 1 2 3 4 5 6 7 8 9	STI (CEI) * SI (CEI) VI (CEI) EI (CEI) LTI (CEI) STI (CO2) MI (ANSI) LTI (CO8) VI (ANSI) EI (ANSI)	4401 = 1	Setting	0/9/1
	05	TMS	Courier floating point number		0.025 *	4403=1	Setting	0.025/1.5/0.025
	06	K (RI)	Courier floating point number		0.1 *	4403=2	Setting	0.1/10.0/0.005
	07	Tempo Iinv>	Courier floating point number		0.01 s *	4403=0	Setting	0 /150.0/1.0
	08	Temporisation reset type	Indexed String		0: definite time 1: inverse time	4403=1 & 4404>= 5 & 4404 <=9	Setting	0/1/1
	09	RTMS	Courier floating point number		0.025 *	4408 = 1	Setting	0.025/3.2/0.025

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	0A	T RESET	Courier floating point number		0.04 *	4408 = 0 or 4403 =2 or (4403=1 & 4404 < 5 & 4404 > 9)	Setting	0.04/100/0.01
	10	Iinv>>	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	11	Threshold Iinv>>	Courier floating point number		0.1 In *	4410 = 1	Setting	0.1/40.0/0.01 In
	12	Tempo Iinv>>	Courier floating point number		0.01 s *	4410 = 1	Setting	0 /150.0/1.0
45	00	AUTORECLOSER						
	01	Autorecloser	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	02	State circuit breaker	Binary (1 bit)		Disabled * / Enabled	4501 = 1	Setting	0/1/1
	03	Control window	Courier floating point number		0.01 s *	4502 = 1	Setting	0.01 / 600.00 / 0.01 s
	04	External blocking	Binary (1 bit)		Disabled * / Enabled	4501 = 1	Setting	0/1/1
	07	Temporisation cycle 1	Courier floating point number		0.05 s *	4501 = 1	Setting	0.05 / 300.00 / 0.01 s
	08	Temporisation cycle 2	Courier floating point number		0.05 s *	4501 = 1	Setting	0.05 / 300.00 / 0.01 s
	09	Temporisation cycle 3	Courier floating point number		0.05 s *	4501 = 1	Setting	0.05 / 600.00 / 0.01 s
	0A	Temporisation cycle 4	Courier floating point number		0.05 s *	4501 = 1	Setting	0.05 / 600.00 / 0.01 s
	0B	Reclaim TIME	Courier floating point number		0.02 s *	4501 = 1	Setting	0.02 / 600.00 / 0.01 s
	0C	Inhibition time	Courier floating point number		0.02 s *	4501 = 1	Setting	0.02 / 600.00 / 0.01 s

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	0D	Number of short circuit cycle	Unsigned Integer (2 bytes)		0 *	4501 = 1	Setting	0 / 4 / 1
	0E	Number of earth fault cycle	Unsigned Integer (2 bytes)		0 *	4501 = 1	Setting	0 / 4 / 1
	0F	Cycles tI> configuration	Unsigned Integer (2 bytes)		0x1111 *	4501 = 1	Setting	0/2/1 on each 4 bit group
	10	Cycles tI>> configuration	Unsigned Integer (2 bytes)		0x1111 *	4501 = 1	Setting	0/2/1 on each 4 bit group
	11	Cycles tI>>> configuration	Unsigned Integer (2 bytes)		0x1111 *	4501 = 1	Setting	0/2/1 on each 4 bit group
	12	Cycles tI0> configuration	Unsigned Integer (2 bytes)		0x1111 *	4501 = 1	Setting	0/2/1 on each 4 bit group
	13	Cycles tI0>> configuration	Unsigned Integer (2 bytes)		0x1111 *	4501 = 1	Setting	0/2/1 on each 4 bit group
	14	Cycles tI0>>> configuration	Unsigned Integer (2 bytes)		0x1111 *	4501 = 1	Setting	0/2/1 on each 4 bit group
	15	Cycles tAux1> configuration	Unsigned Integer (2 bytes)		0x1111 *	4501 = 1	Setting	0/2/1 on each 4 bit group
	16	Cycles tAux2> configuration	Unsigned Integer (2 bytes)		0x1111 *	4501 = 1	Setting	0/2/1 on each 4 bit group

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
60	00	AUTOMATISM						
	01	Trip Configuration	Binary (15 bits)	1 *	0: t I> * 1: t I>> 2: t I>>> 3: t I0> 4: t I0>> 5: t I0>>> 6: t I< 7: t Therm 8: Broken Conductor 9: t Aux1 10: t Aux2 11: t I2> 12: t I2>> 13: t Aux3 *14: t Aux4* 15: reserved		Setting	0 / 65535 / 1
	02	Latch Configuration	Binary (15 bits)	0 *	0: Latch I> 1: Latch I>> 2: Latch I>>> 3: Latch I0> 4: Latch I0>> 5: Latch I0>>> 6: Latch I< 7: Latch Therm. Ov. 8: Latch Broken Conductor 9: Latch Aux1 10: Latch Aux2 11: Latch I2> 12: Latch I2>> 13: Latch Aux3 *14: Latch Aux* 15: reserved		Setting	0 / 65535 / 1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	03	Blocking 1 Configuration	Binary (16 bits)	0 *	0: Blocking t I> * 1: Blocking t I>> 2: Blocking t I>>> 3: Blocking t I0> 4: Blocking t I0>> 5: Blocking t I0>>> 6: Blocking t I< 7: Blocking t Therm 8: Blocking Broken Conductor 9: Blocking t Aux1 10: Blocking t Aux2 11: Blocking t I2> 12: Blocking t I2>> 13: Blocking t Aux3 14: Blocking t Aux4 15: reserved		Setting	0 / 65535 / 1
	04	Blocking 2 Configuration	Binary (16 bits)	0 *	0: Blocking t I> * 1: Blocking t I>> 2: Blocking t I>>> 3: Blocking t I0> 4: Blocking t I0>> 5: Blocking t I0>>> 6: Blocking t I< 7: Blocking t Therm 8: Blocking Broken Conductor 9: Blocking t Aux1 10: Blocking t Aux2 11: Blocking t I2> 12: Blocking t I2>> 13: Blocking t Aux3 14: Blocking t Aux4 15: reserved		Setting	0 / 65535 / 1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	05	Broken conductor detection	Binary (1 bit)		Disabled * / Enabled		Setting	0 / 1 / 1
	06	Tempo tBC	Unsigned Integer (2 bytes)		0 *	6005 = 1	Setting	0 / 144.0 / 0.01 s
	07	Threshold mod iinv/idirect in %	Courier floating point number		20 % *	6005 = 1	Setting	20 / 100 / 1 %
	08	Cold load start	Binary (1 bit)		Disabled * / Enabled		Setting	0 / 1 / 1
	09	Threshold of cold load start	Binary (8 bits)		0 *	6008 = 1	Setting	0 / 255 / 1
	0A	% of cold load start	Unsigned Integer (2 bytes)		50 % *	6008 = 1	Setting	100 / 500 / 1
	0B	Cold load start Tempo	Courier floating point number		1.0 s *	6008 = 1	Setting	0.1 / 3600.0 / 0.1 s
	0C	Breaker failure	Binary (1 bit)		Disabled * / Enabled		Setting	0 / 1 / 1
	0D	I< Threshold for Breaker failure	Courier floating point number		10 % *	600C = 1	Setting	2 / 100/ 1 %
	0E	Tempo tBF	Unsigned Integer (2 bytes)		0.1 s *	600C = 1	Setting	0.03 / 10.0 / 0.01 s
	0F	Phase instant blocking	Binary (1 bit)		Disabled * / Enabled	600C = 1	Setting	0 / 1/ 1
	10	Earth instant blocking	Binary (1 bit)		Disabled * / Enabled	600C = 1	Setting	0 / 1/ 1
	11	Logic selectivity 1	Binary (4 bits)				Setting	0 / 15/ 1
	12	Tempo selectivity1	Courier floating point number			6011 = 1	Setting	0 / 150.0 / 0.01 s
	13	Logic selectivity 2	Binary (4 bits)				Setting	0 / 15 / 1
	14	Tempo selectivity 2	Courier floating point number			6013 = 1	Setting	0 / 150.0 / 0.01 s
	15	Trip Configuration 2/2	Binary (2 bits)	0 *	0: Trip SOTF 1: Control TRIP		Setting	0 / 3 / 1
	16	Latch Configuration 2/2	Binary (2 bits)	0 *	0: Latch SOTF 1: Reserved		Setting	0 / 3 / 1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
61	00	TS SETTINGS						
	01	Logical input allocation 1	Indexed String	0	0: nothing *		Setting	0 / 23 / 1
				1	1: delatch			
				2	2: 52 a			
				3	3: 52 b			
				4	4: CB failure			
				5	5: External input 1			
				6	6: External input 2			
				7	7: Logic blocking 1			
				8	8: Logic blocking 2			
				9	9: Disturbance start			
				10	10: Cold load start			
				11	11: Log Selectivity 1			
				12	12: Log Selectivity 2			
				13	13: Change of group			
				14	14: Recloser locked			
				15	15: Thermal reset			
				16	16: Trip circuit supervision			
				17	17: external CB failure			
				18	18: Leds reset			
				19	19: Maintenance mode			
				20	20: External input 3			
				21	21: External input 4			
				22	22: Manual Close			
				23	23: Local Mode			

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	02	Logical input allocation 2	Indexed String	0	0: nothing *		Setting	0 / 23 / 1
				1	1: delatch			
				2	2: 52 a			
				3	3: 52 b			
				4	4: CB failure			
				5	5: External input 1			
				6	6: External input 2			
				7	7: Logic blocking 1			
				8	8: Logic blocking 2			
				9	9: Disturbance start			
				10	10: Cold load start			
				11	11: Log Selectivity 1			
				12	12: Log Selectivity 2			
				13	13: Change of group			
				14	14: Recloser locked			
				15	15: Thermal reset			
				16	16: Trip circuit supervision			
				17	17: external CB failure			
				18	18: Leds reset			
				19	19: Maintenance mode			
				20	20: External input 3			
				21	21: External input 4			
				22	22: Manual Close			
				23	23: Local Mode			

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	03	Logical input allocation 3	Indexed String	0	0: nothing *		Setting	0 / 23 / 1
				1	1: delatch			
				2	2: 52 a			
				3	3: 52 b			
				4	4: CB failure			
				5	5: External input 1			
				6	6: External input 2			
				7	7: Logic blocking 1			
				8	8: Logic blocking 2			
				9	9: Disturbance start			
				10	10: Cold load start			
				11	11: Log Selectivity 1			
				12	12: Log Selectivity 2			
				13	13: Change of group			
				14	14: Recloser locked			
				15	15: Thermal reset			
				16	16: Trip circuit supervision			
				17	17: external CB failure			
				18	18: Leds reset			
				19	19: Maintenance mode			
				20	20: External input 3			
				21	21: External input 4			
				22	22: Manual Close			
				23	23: Local Mode			

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	04	Logical input allocation 4	Indexed String	0	0: nothing *		Setting	0 / 23 / 1
				1	1: delatch			
				2	2: 52 a			
				3	3: 52 b			
				4	4: CB failure			
				5	5: External input 1			
				6	6: External input 2			
				7	7: Logic blocking 1			
				8	8: Logic blocking 2			
				9	9: Disturbance start			
				10	10: Cold load start			
				11	11: Log Selectivity 1			
				12	12: Log Selectivity 2			
				13	13: Change of group			
				14	14: Recloser locked			
				15	15: Thermal reset			
				16	16: Trip circuit supervision			
				17	17: external CB failure			
				18	18: Leds reset			
				19	19: Maintenance mode			
				20	20: External input 3			
				21	21: External input 4			
				22	22: Manual Close			
				23	23: Local Mode			

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	05	Logical input allocation 5	Indexed String	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	0: nothing * 1: delatch 2: 52 a 3: 52 b 4: CB failure 5: External input 1 6: External input 2 7: Logic blocking 1 8: Logic blocking 2 9: Disturbance start 10: Cold load start 11: Log Selectivity 1 12: Log Selectivity 2 13: Change of group 14: Recloser locked 15: Thermal reset 16: Trip circuit supervision 17: external CB failure 18: Leds reset 19: Maintenance mode 20: External input 3 21: External input 4 22: Manual Close 23: Local Mode		Setting	0 / 23 / 1
	06	Timer aux 1	Courier floating point number		0 *		Setting	0 / 200.0 / 0.01
	07	Timer aux 2	Courier floating point number		0 *		Setting	0 / 200.0 / 0.01
	08	TS setting (Edge type)	Binary (5 bits)		Bit 0 to 4 = 0: Rising edge Bit 0 to 4 = 1: Falling edge		Setting	0 / 31 / 1
	09	TS voltage	Indexed String		0 * = DC 1 = AC		Setting	0 / 1 / 1
	0A	Timer aux 3	Courier floating point number		0 *		Setting	0 / 200.0 / 0.01
	0B	Timer aux 4	Courier floating point number		0 *		Setting	0 / 200.0 / 0.01

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
62	00	TC SETTINGS						
	01	GENERAL TRIP	Binary (7 bits)		0000000 *		Setting	0/127/1
	02	I>	Binary (7 bits)		0000000 *		Setting	0/127/1
	03	tI>	Binary (7 bits)		0000000 *		Setting	0/127/1
	04	I>>	Binary (7 bits)		0000000 *		Setting	0/127/1
	05	t I>>	Binary (7 bits)		0000000 *		Setting	0/127/1
	06	I>>>	Binary (7 bits)		0000000 *		Setting	0/127/1
	07	t I>>>	Binary (7 bits)		0000000 *		Setting	0/127/1
	08	I0>	Binary (7 bits)		0000000 *		Setting	0/127/1
	09	t I0>	Binary (7 bits)		0000000 *		Setting	0/127/1
	0A	I0>>	Binary (7 bits)		0000000 *		Setting	0/127/1
	0B	t I0>>	Binary (7 bits)		0000000 *		Setting	0/127/1
	0C	I0>>>	Binary (7 bits)		0000000 *		Setting	0/127/1
	0D	t I0>>>	Binary (7 bits)		0000000 *		Setting	0/127/1
	0E	Broken conductor	Binary (7 bits)		0000000 *		Setting	0/127/1
	0F	Breaker failure	Binary (7 bits)		0000000 *		Setting	0/127/1
	10	t I<	Binary (7 bits)		0000000 *		Setting	0/127/1
	11	t Iinv>	Binary (7 bits)		0000000 *		Setting	0/127/1
	12	t Iinv>>	Binary (7 bits)		0000000 *		Setting	0/127/1
	13	Thermal alarm	Binary (7 bits)		0000000 *		Setting	0/127/1
	14	Thermal trip	Binary (7 bits)		0000000 *		Setting	0/127/1
	15	Reclosing	Binary (7 bits)		0000000 *		Setting	0/127/1
	16	tAux 1	Binary (7 bits)		0000000 *		Setting	0/127/1
	17	tAux 2	Binary (7 bits)		0000000 *		Setting	0/127/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	18	Breaker alarm	Binary (7 bits)		0000000 *		Setting	0/127/1
	19	Trip circuit alarm	Binary (7 bits)		0000000 *		Setting	0/127/1
	1A	Autoreclose in progress	Binary (7 bits)		0000000 *		Setting	0/127/1
	1B	Definitive trip	Binary (7 bits)		0000000 *		Setting	0/127/1
	1C	TC Active Setting Group	Binary (7 bits)		0000000 * bit 0 to 6 =0: Group 1 bit 0 to 6 =1: Group 2		Setting	0/127/1
	1D	TC lock setting	Binary (7 bits)		0000000 * bit 0 to 6 =1: TC Locked		Setting	0/127/1
	1E	tAux 3	Binary (7 bits)		0000000 *		Setting	0/127/1
	1F	tAux 4	Binary (7 bits)		0000000 *		Setting	0/127/1
	20	tCOMM1	Binary (7 bits)		0000000 *		Setting	0/127/1
	21	tCOMM2	Binary (7 bits)		0000000 *		Setting	0/127/1
	22	tCOMM3	Binary (7 bits)		0000000 *		Setting	0/127/1
	23	tCOMM4	Binary (7 bits)		0000000 *		Setting	0/127/1
	24	SOTF	Binary (7 bits)		0000000 *		Setting	0/127/1
	25	CONTROL TRIP	Binary (7 bits)		0000000 *		Setting	0/127/1
	26	CONTROL CLOSE	Binary (7 bits)		0000000 *		Setting	0/127/1
	27	Locked Autorecloser	Binary (7 bits)		0000000 *		Setting	0/127/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
63	00	LEDS SETTINGS						
	01	Led 5	Binary (16 bits)	4 *	0: I> 1: t I> 2: I>> * 3: t I>> 4: I>>> 5: t I>>> 6: I0> 7: t I0> 8: I0>> 9: t I0>> 10: I0>>> 11: t I0>>> 12: Thermal Overload 13: t I2> 14: Broken Conductor 15: Breaker Failure		Setting	0/65535/1
	02	Led 6	Binary (16 bits)	16 *	0: I> 1: t I> 2: I>> 3: t I>> 4: I>>> * 5: t I>>> 6: I0> 7: t I0> 8: I0>> 9: t I0>> 10: I0>>> 11: t I0>>> 12: Thermal Overload 13: t I2> 14: Broken Conductor 15: Breaker Failure		Setting	0/65535/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	03	Led 7	Binary (16 bits)	32 *	0: I> 1: t I> 2: I>> 3: t I>> 4: I>>> 5: t I>>> * 6: I0> 7: t I0> 8: I0>> 9: t I0>> 10: I0>>> 11: t I0>>> 12: Thermal Overload 13: t I2> 14: Broken Conductor 15: Breaker Failure		Setting	0/65535/1
	04	Led 8	Binary (16 bits)	64 *	0: I> 1: t I> 2: I>> 3: t I>> 4: I>>> 5: t I>>> 6: I0> * 7: t I0> 8: I0>> 9: t I0>> 10: I0>>> 11: t I0>>> 12: Thermal Overload 13: t I2> 14: Broken Conductor 15: Breaker Failure		Setting	0/65535/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	05	Led PF5	Binary (9 bits)	0 *	0: Input 1 1: Input 2 2: Input 3 *3: Input 4* *4: Input 5* 5: Locked Autorecloser *6:Autorecloser in progress* 7: t Aux1 8: t Aux2 9: t I2>> 10: SOTF		Setting	0/2047/1
	06	Led PF6	Binary (9 bits)	0 *	0: Input 1 1: Input 2 2: Input 3 *3: Input 4* *4: Input 5* 5: Locked Autorecloser *6:Autorecloser in progress* 7: t Aux1 8: t Aux2 9: t I2>> 10: SOTF		Setting	0/2047/1
	07	Led PF7	Binary (9 bits)	0 *	0: Input 1 1: Input 2 2: Input 3 *3: Input 4* *4: Input 5* 5: Locked Autorecloser *6:Autorecloser in progress* 7: t Aux1 8: t Aux2 9: t I2>> 10: SOTF		Setting	0/2047/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	08	Led PF8	Binary (9 bits)	0 *	0: Input 1 1: Input 2 2: Input 3 *3: Input 4* *4: Input 5* 5: Locked Autorecloser *6:Autorecloser in progress* 7: t Aux1 8: t Aux2 9: t I2>> 10: SOTF		Setting	0/2047/1
64	00	ALARMS						
	01	Instant. alarm self-reset	Binary (1 bits)		Disabled * / Enabled		Setting	0/1/1
	02	Reset leds on Fault	Binary (1 bits)		Disabled * / Enabled		Setting	0/1/1
	03	Battery alarm	Binary (1 bits)		Disabled * / Enabled		Setting	0/1/1
69	00	SW SUPERVISION						
	01	Trip circuit supervision ?	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	02	Trip circuit time ?	Courier floating point number		0.1 s *	6901 = 1	Setting	0.1/10.0/0.05 s
	03	SW Operating time?	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	04	SW Operating time	Courier floating point number		0.05 s*	6903 = 1	Setting	0.05/1.0/0.05 s
	05	SW Operating number?	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	06	SW Closing time ?	Courier floating point number		0.05 s*	6905 = 1	Setting	0.05/1.0/0.05 s
	07	SW Closing time	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	08	SW Operating number	Unsigned Integer (2 bytes)		0 *	6907 = 1	Setting	0/50000/1
	09	SA2n?	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	0A	SA2n	Courier floating point number		0 exp+06 A² *	6909 = 1	Setting	0/4000/1 (*exp+06)
	0B	N	Unsigned Integer (2 bytes)		1 *		Setting	1/2/1
	0C	TRIP t	Courier floating point number		0.1 s*		Setting	0.1/5.0/0.05 s
	0D	CLOSE t	Courier floating point number		0.1 s*		Setting	0.1/5.0/0.05 s
6A	00	COMM ORDER LATCH TIMES						
	01	t COMM1	Courier floating point number		0.1 s*	6220 != 0	Setting	0.1/5.0/0.05 s
	02	t COMM2	Courier floating point number		0.1 s*	6221 != 0	Setting	0.1/5.0/0.05 s
	03	t COMM3	Courier floating point number		0.1 s*	6222 != 0	Setting	0.1/5.0/0.05 s
	04	t COMM4	Courier floating point number		0.1 s*	6223 != 0	Setting	0.1/5.0/0.05 s
6B	00	SWITCH ON TO FAULT						
	01	SOTF function ?	Binary (1 bit)	0	Disabled * / Enabled		Setting	0/1/1
	02	TManual close	Courier floating point number		0.1 s*	6B01 = 1	Setting	0/0.50/0.01 s
	03	Start I>> / I>>>	Binary (2 bit)	0 1	0*: Start I>> 1: Start I>>>	6B01 = 1	Setting	0/3/1

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
70	00	RECORDER CONTROL	VERSION P122 & P123					
	01	Start/Trigger recorder	Indexed String	0 1 2	Stopped Trigerred Running *		Setting	1/2/1
	02	Recorder Source	Indexed String	0	Samples *		Data	
	20	Pretemps	Courier floating point number		0.1 secondes		Setting	0.1/3.0/0.1
	21	Postemps	Courier floating point number		0.1 secondes		Setting	0.1/3.0/0.1
	22	Trigger	Indexed String	0	On Inst* / On Trig		Setting	0/1/1
	30	Measurement period	Indexed String	0	5* / 10 / 15 / 30 / 60 min		Setting	0/4/1
	40	Rolling Demands						
	41	Rolling sub-period	Courier floating point number		1 min*		Setting	1/60/1
	42	Rolling sub-period number	Courier floating point number		1*		Setting	1/24/1
80	00	DISTURBANCE REC						
	01	Record Number	Unsigned integer (1 byte)		0*		Setting	0/5/1 (selon contexte)
	02	Trigger Time	IEC870 Time & Date		dd/mm/yy hh:mm		Data	
	03	Available Channel Bit Mask	Binary Flag Indexed String	 0 1 2 3 4	11111 " Ia " " Ib " " Ic " " I0 " " Inputs/Outputs "		Data	
	04	Channel Types	Binary Flag 0: digital, 1: analogue		01111		Data	

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	05	Channel Offsets	Repeated group of Courier numbers		Upload Offsets		Data	
	06	Scaling Factors	Repeated group of Courier numbers		Upload Scal. Factors		Data	
	07-0F	NOT IMPLEMENTED – reserved						
	10	Record Length	Integer (2 bytes)				Data	
	11	Trigger position	Integer (2 bytes)				Data	
	12	Time Base	Courier floating point number				Data	
	13	NOT IMPLEMENTED – reserved						
	14	Upload Timer	Repeated group of Integers				Data	
	15-1F	NOT IMPLEMENTED – reserved						
	20	Upload Channel 0	Repeated group of Integers				Data	
	21	Upload Channel 1	Repeated group of Integers				Data	
	22	Upload Channel 2	Repeated group of Integers				Data	
	23	Upload Channel 3	Repeated group of Integers				Data	
	24	Upload Channel Inputs/Outputs	Repeated group of Integer/Bin. flags				Data	
90	00	AUTOMAT. FLT						
	01	Record number	Unsigned Integer (2 bytes)				Setting (automatic)	
	02	Occur fault date	Unsigned Integer (2 bytes)				Data	
	03	Active set group	Unsigned Integer (2 bytes)		1		Data	

Col	Row	Menu Text	Data Type	Ind	Values (*: default)	Depend	Cell Type	Min/Max/Step
	04	Phase in fault	ASCII Text (10 bytes)		" PHASE A "		Data	
	05	Fault Id	ASCII Text (18 bytes)		" I >> "		Data	
	06	Magnitude	Courier floating point number		12.34 A		Data	
	07	Ia Magnitude	Courier floating point number		12.34 A		Data	
	08	Ib Magnitude	Courier floating point number		12.34 A		Data	
	09	Ic Magnitude	Courier floating point number		12.34 A		Data	
	0A	In Magnitude	Courier floating point number		12.34 A		Data	
BF	00	COMM SYSTEM DATA						
	01	Dist Record Cntrl Ref	Menu Cell (2)		0x7000		Data	
	02	Dist Record Extract Ref	Menu Cell (2)		0x8000		Data	
	03	Setting Transfert						
	04	Reset Demand Timers	NOT IMPLEMENTED					
	05	Reset Event Report	NOT IMPLEMENTED					

IEC 60870-5-103

MiCOM P120 - P121 - P122- P123

VERSION V5

CONTENTS

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1. IEC60870-5-103 INTERFACE

The IEC60870-5-103 interface is a master/slave interface with the relay as the slave device. This protocol is based on the VDEW communication protocol. The relay conforms to compatibility level 2, compatibility level 3 is not supported.

The following IEC60870-5-103 facilities are supported by this interface:

- Initialisation (Reset)
- Time Synchronisation
- Event Record Extraction
- General Interrogation
- Cyclic Measurements
- General Commands

1.1 Physical connection and link layer

Connection is available for IEC60870-5-103 through the rear RS485 port. It is possible to select both the relay address and baud rate using the front panel interface. Following a change, a reset command is required to re-establish communications.

The parameters of the communication are the following:

- Even Parity
- 8 Data bits
- 1 stop bit
- Data rate 9600 or 19200 bauds

1.2 Initialisation

Whenever the relay has been powered up, or if the communication parameters have been changed a reset command is required to initialise the communications. The relay will respond to either of the two reset commands (Reset CU or Reset FCB), the difference being that the Reset CU will clear any unsent messages in the relay's transmit buffer.

The relay will respond to the reset command with an identification message ASDU 5, the Cause Of Transmission COT of this response will be either Reset CU or Reset FCB depending on the nature of the reset command. The following information will be contained in the data section of this ASDU:

Manufacturer Name: **AREVA**

The Software Identification Section will contain the first four characters of the relay model number to identify the type of relay, e.g. P123.

In addition to the above identification message, if the relay has been powered up it will also produce a power up event.

1.3 Time synchronisation (P122 & P123 only)

The relay time and date can be set using the time synchronisation feature of the IEC60870-5-103 protocol. The relay will correct for the transmission delay as specified in IEC60870-5-103. If the time synchronisation message is sent as a send/confirm message then the relay will respond with a confirm. Whether the time synchronisation message is sent as a send confirm or a broadcast (send/no reply) message, a time synchronisation message will be returned as Class 1 data.

1.4 Spontaneous events (P122 & P123 only)

The events created by the relay will be passed using the standard function type/information numbers to the IEC60870-5-103 master station. Private codes are not used, thus any events that cannot be passed using the standardised messages will not be sent.

Events are categorised using the following information:

- Common Address
- Function Type
- Information number

APPENDIX 1 contains a complete listing of all events produced by the relay. The common address is used to differentiate in circumstances where the relay produces more events of a certain type than can be passed using the standardised messages. For example if the relay produces starts and trips for three stages of overcurrent only two stages can be passed using the standardised messages.

Using the different common address for two of the overcurrent stages allows each stage to be indicated. The table in APPENDIX 1 shows the common address as an offset value. The common address offset will be added to the station address in order to pass these events.

1.5 General interrogation

The GI request can be used to read the status of the relay, the function numbers, information numbers and common address offsets that will be returned during the GI cycle are indicated in APPENDIX 1.

1.6 Cyclic measurements

The relay will produce measured values using ASDU 9 on a cyclical basis, this can be read from the relay using a Class 2 poll (note ADSU 3 is not used).

It should be noted that the measurands transmitted by the relay are sent as a proportion of either 1.2 or 2.4 times the rated value of the analogue value. The selection of either 1.2 or 2.4 for a particular value is indicated in APPENDIX 1.

1.7 Commands

A list of the supported commands is contained in APPENDIX 1. The relay will respond to other commands with an ASDU 1, with a cause of transmission (COT) of negative acknowledgement of a command.

1.8 Disturbance records (P122 & P123 only)

The disturbance records stored by the relay cannot be extracted using the mechanism defined in the IEC60870-5-103 standard. The relay maintains compatibility with the VDEW control system by transmitting an ASDU 23 with no disturbance records at the start of every GI cycle.

1.9 Blocking of monitor direction

The relay does not support a facility to block messages in the Monitor direction.IEC 60870-5-103 DATABASES

2. APPENDIX 1

2.1 Spontaneous messages managed by MiCOM P12x

These messages includes a sub-assembly of events which are generated on the relay, because some generated events are not registered in VDEW. They are the most priority messages.

An event is always generated on the rising edge of the information.

Some events can be generated on the rising or lowering edge.

In the list below, events only generated on rising edge will be tagged with a '*'.

Two types of ASDU can be generated for events: ASDU 1 (time-tagged message) or ASDU 2 (time-tagged message with relative time).

The following list of processed events is the list **with the private messages option active**, for all Overcurrent protection functions, with the associated FUNCTION Type, INFORMATION NUMBER, ASDU TYPE, CAUSE OF TRANSMISSION and COMMON ADDRESS OF ASDU (The corresponding numbers with **private messages option inactive** are given just below).

FUN <160>: Function type in Public range for Overcurrent Protections (compatible).

FUN <168>: Function type in Private range (Reserved for Overcurrent Protections).

Status indications in monitor direction:		Availability
– Autorecloser active:	FUN<160>;INF <16>; TYP <1>;COT<1> ,<ADDR> ↑↓	P123
– LEDs reset:	FUN<160>;INF <19>; TYP <1>; COT<1>; <ADDR>,*	P122-P123
– Local parameter Setting active:	FUN<160>;INF <22>; TYP <1>; COT<1>,<ADDR>↑↓	P120 to P123
– Setting Group number 1 active:	FUN<160>;INF <23>; TYP <1>; COT<1>,<ADDR>↑↓	P122-P123
– Setting Group number 2 active:	FUN<160>;INF <24>; TYP <1>; COT<1>,<ADDR>↑↓	P122-P123
– Auxiliary input 1:	FUN<160>;INF <27>; TYP <1>; COT<1>,<ADDR>↑↓	P120 to P123
– Auxiliary input 2:	FUN<160>;INF <28>; TYP <1>; COT<1>,<ADDR>↑↓	P120 to P123
– Auxiliary input 3:	FUN<160>;INF <29>; TYP <1>; COT<1>,<ADDR>↑↓	P122-P123
– Auxiliary input 4:	FUN<160>;INF <30>; TYP <1>; COT<1>,<ADDR>↑↓	P123
– Logical input 1:	FUN<168>;INF <160>; TYP <1>; COT<1>,<ADDR>↑↓	P120 to P123
with private option inactive:	FUN<160>,INF <161>; TYP <1>; COT<1>,<ADDR>↑↓	
– Logical input 2:	FUN<168>;INF <161>; TYP <1>; COT<1>,<ADDR>↑↓	P120 to P123
with private option inactive:	FUN<160>,INF <162>; TYP <1>; COT<1>,<ADDR>↑↓	
– Logical input 3:	FUN<168>;INF <162>; TYP <1>; COT<1>,<ADDR>↑↓	P122-P123
with private option inactive:	FUN<160>,INF <163>; TYP <1>; COT<1>,<ADDR>↑↓	
– Logical input 4:	FUN<168>;INF <163>; TYP <1>; COT<1>,<ADDR>↑↓	P123
with private option inactive:	FUN<160>,INF <164>; TYP <1>; COT<1>,<ADDR>↑↓	
– Logical input 5:	FUN<168>;INF <164>; TYP <1>; COT<1>,<ADDR>↑↓	P123
with private option inactive:	FUN<160>,INF <165>; TYP <1>; COT<1>,<ADDR>↑↓	
– Logical output 1:	FUN<168>;INF <176>; TYP <1>; COT<1>,<ADDR>↑↓	P120 to P123
with private option inactive:	FUN<160>,INF <176>; TYP <1>; COT<1>,<ADDR>↑↓	
– Logical output 2:	FUN<168>;INF <177>; TYP <1>; COT<1>,<ADDR>↑↓	P120 to P123

with private option inactive:	FUN<160>,INF <177>; TYP <1>; COT<1>,<ADDR>↑↓	
– Logical output 3:	FUN<168>;INF <178>; TYP <1>; COT<1>,<ADDR>↑↓	P120 to P123
with private option inactive:	FUN<160>,INF <178>; TYP <1>; COT<1>,<ADDR>↑↓	
– Logical output 4:	FUN<168>;INF <179>; TYP <1>; COT<1>,<ADDR>↑↓	P120 to P123
with private option inactive:	FUN<160>,INF <179>; TYP <1>; COT<1>,<ADDR>↑↓	
– Logical output 5:	FUN<168>;INF <180>; TYP <1>; COT<1>,<ADDR>↑↓	P122-P123
with private option inactive:	FUN<160>,INF <180>; TYP <1>; COT<1>,<ADDR>↑↓	
– Logical output 6:	FUN<168>;INF <181>; TYP <1>; COT<1>,<ADDR>↑↓	P122-P123
with private option inactive:	FUN<160>,INF <181>; TYP <1>; COT<1>,<ADDR>↑↓	
– Logical output 7:	FUN<168>;INF <182>; TYP <1>; COT<1>,<ADDR>↑↓	P123
with private option inactive:	FUN<160>,INF <182>; TYP <1>; COT<1>,<ADDR>↑↓	
– Logical output 8:	FUN<168>;INF <183>; TYP <1>; COT<1>,<ADDR>↑↓	P123
with private option inactive:	FUN<160>,INF <183>; TYP <1>; COT<1>,<ADDR>↑↓	
Supervision Indications in monitor direction:		Availability
– Trip Circuit Supervision:	FUN<160>;INF <36>; TYP <1>; COT<1>,<ADDR>↑↓	P122-P123
Fault Indications in monitor direction:		Availability
– Start / pick-up I>:	FUN<168>;INF <9>; TYP <2>; COT<1>,<ADDR>↑↓	P121 to P123
with private option inactive:	FUN<160>;INF <64>; TYP <2>; COT<1>,<ADDR>↑↓	
– Start / pick-up I>>:	FUN<168>;INF <10>; TYP <2>; COT<1>,<ADDR>↑↓	P121 to P123
with private option inactive:	FUN<160>;INF <65>; TYP <2>; COT<1>,<ADDR>↑↓	
– Start / pick-up I>>>:	FUN<168>;INF <11>; TYP <2>; COT<1>,<ADDR>↑↓	P121 to P123
with private option inactive:	FUN<160>;INF <66>; TYP <2>; COT<1>,<ADDR>↑↓	
– Start / pick-up IN>:	FUN<168>;INF <12>; TYP <2>; COT<1>,<ADDR>↑↓	P120 to P123

with private option inactive:	FUN<160>;INF <96>; TYP <2>; COT<1>,<ADDR>↑↓	
– Start / pick-up IN>>:	FUN<168>;INF <13>; TYP <2>; COT<1>,<ADDR>↑↓	P120 to P123
with private option inactive:	FUN<160>;INF <97>; TYP <2>; COT<1>,<ADDR>↑↓	
– Start / pick-up IN>>>:	FUN<168>;INF <14>; TYP <2>; COT<1>,<ADDR>↑↓	P120 to P123
with private option inactive:	FUN<160>;INF <98>; TYP <2>; COT<1>,<ADDR>↑↓	
– Start / pick-up N:	FUN<160>;INF <67>; TYP <2>; COT<1>,<ADDR>↑↓	P120 to P123
– Start / pick-up I<:	FUN<168>;INF <100>; TYP <2>; COT<1>,<ADDR>↑↓	P122-P123
with private option inactive:	FUN<160>;INF <73>; TYP <2>; COT<1>,<ADDR>↑↓	
– Start / pick-up I2>:	FUN<168>;INF <104>; TYP <2>; COT<1>,<ADDR>↑↓	P122-P123
with private option inactive:	FUN<160>;INF <57>; TYP <2>; COT<1>,<ADDR>↑↓	
– Start / pick-up I2>>:	FUN<168>;INF <106>; TYP <2>; COT<1>,<ADDR>↑↓	P122-P123
with private option inactive:	FUN<160>;INF <74>; TYP <2>; COT<1>,<ADDR>↑↓	
– General Trip:	FUN<160>;INF <68>; TYP <2>; COT<1>,<ADDR>,*	P120 to P123
– Trip L1:	FUN<160>;INF <69>; TYP <2>; COT<1>,<ADDR>,*	P120 to P123
– Trip L2:	FUN<160>;INF <70>; TYP <2>; COT<1>,<ADDR>,*	P120 to P123
– Trip L3:	FUN<160>;INF <71>; TYP <2>; COT<1>,<ADDR>,*	P120 to P123
– General Start / pick-up:	FUN<160>;INF <84>; TYP <2>; COT<1>,<ADDR>↑↓	P120 to P123
– Breaker failure:	FUN<160>;INF <85>; TYP <2>; COT<1>,<ADDR>,*	P122-P123
– Trip I>:	FUN<160>;INF <90>; TYP <2>; COT<1>,<ADDR>,*	P120 to P123
– Trip I>>:	FUN<160>;INF <91>; TYP <2>; COT<1>,<ADDR>,*	P120 to P123
– Trip I>>>:	FUN<168>;INF <19>; TYP <2>; COT<1>,<ADDR>,*	P120 to P123

with private option inactive:	FUN<160>;INF <94>; TYP <2>; COT<1>,<ADDR+1>,*	
– Trip IN>:	FUN<160>;INF <92>; TYP <2>; COT<1>,<ADDR>,*	P120 to P123
– Trip IN>>:	FUN<160>;INF <93>; TYP <2>; COT<1>,<ADDR>,*	P120 to P123
– Trip IN>>>:	FUN<168>;INF <22>; TYP <2>; COT<1>,<ADDR>,*	P120 to P123
with private option inactive:	FUN<160>;INF <95>; TYP <2>; COT<1>,<ADDR+1>,*	
– Trip I<:	FUN<168>;INF <23>; TYP <2>;COT<1>,<ADDR>,*	P122-P123
with private option inactive:	FUN<160>;INF <101>; TYP <2>; COT<1>,<ADDR>,*	
– Trip I2>:	FUN<168>;INF <58>; TYP <2>;COT<1>,<ADDR>,*	P122-P123
with private option inactive:	FUN<160>;INF <105>; TYP <2>; COT<1>,<ADDR>,*	
– Trip I2>>:	FUN<168>;INF <75>; TYP <2>;COT<1>,<ADDR>,*	P122-P123
with private option inactive:	FUN<160>;INF <107>; TYP <2>; COT<1>,<ADDR>,*	
– Thermal Alarm	FUN<168>;INF <15>; TYP <2>; COT<1>,<ADDR>	P122-P123
with private option inactive:	FUN<160>;INF <110>; TYP <2>; COT<1>,<ADDR>	
– Thermal Overload	FUN<168>;INF <16>; TYP <2>;COT<1>,<ADDR>,*	P122-P123
with private option inactive:	FUN<160>;INF <111>; TYP <2>; COT<1>,<ADDR>,*	
– Trip Broken conductor	FUN<168>;INF <39>; TYP <2>;COT<1>,<ADDR>,*	P122-P123
with private option inactive:	FUN<160>;INF <114>; TYP <2>; COT<1>,<ADDR>,*	
Auto-recloser Indications (monitor direction):		Availability
– Circuit Breaker 'ON' by short-time autorecloser:	FUN<160>;INF <128>; TYP <1>; COT<1>,<ADDR>,*	P123
– Circuit Breaker 'ON' by long-time autorecloser:	FUN<160>;INF <129>; TYP <1>; COT<1>*,<ADDR>	P123
– Autorecloser blocked:	FUN<160>;INF <130>; TYP <1>; COT<1>,<ADDR>↑↓	P123
– Autorecloser configuration in error :	FUN<168>;INF <65>; TYP <1>;COT<1>,<ADDR>↑↓	P121 to P123

– Final Trip :	FUN<168>;INF <66>; TYP <1>;COT<1>,<ADDR>↑↓	P121 to P123
– Autorecloser in progress :	FUN<168>;INF <67>; TYP <1>;COT<1>,<ADDR>↑↓	P121 to P123
– CB in O/O (« closed ») position:	FUN<168>;INF <33>; TYP <1>;COT<1>,<ADDR>↑↓	P121 to P123
with private option inactive:	FUN<160>;INF <140>; TYP <1>; COT<1>,<ADDR>↑↓	
– CB in F/O (« open ») position:	FUN<168>;INF <34>; TYP <1>;COT<1>,<ADDR>↑↓	P121 to P123
with private option inactive:	FUN<160>;INF <141>; TYP <1>; COT<1>,<ADDR>↑↓	
– Trip TC:	FUN<168>;INF <1>; TYP <1>; COT<1>,<ADDR>↑↓	P120 to P123
with private option inactive:	FUN<160>;INF <142>; TYP <1>; COT<1>,<ADDR>↑↓	
– Close TC:	FUN<168>;INF <2>; TYP <1>; COT<1>,<ADDR>↑↓	P120 to P123
with private option inactive:	FUN<160>;INF <143>; TYP <1>; COT<1>,<ADDR>↑↓	

NOTE: The double arrow ↑↓ means that the event generated on event occurrence and another event is generated on event disappearing.

2.2 List of data contained in General Interrogation

It is given in the answer to the General Interrogation (GI).

Relay state information are Class 1 data, they are systematically sent to the master station, during a General Interrogation.

The list of processed data, following a General Interrogation, is given below: it is a sub-assembly of the spontaneous message list, so like spontaneous messages, these data are generated on rising and lowering edge.

Status indications (monitor direction):		Availability
– Auto-recloser active:	FUN<160>;INF <16>; TYP <1>;COT<9>,<ADDR>	123
– Leds reset:	FUN<160>;INF <19>; TYP <1>; COT<9>,<ADDR>,*	120 to P123
– Local parameter Setting active:	FUN<160>;INF <22>; TYP <1>; COT<9>,<ADDR>	P120 to P123
– Setting Group number 1 active:	FUN<160>;INF <23>; TYP <1>; COT<9>,<ADDR>	P122-P123
– Setting Group number 2 active:	FUN<160>;INF <24>; TYP <1>; COT<9>,<ADDR>	P122-P123

– Auxiliary input 1:	FUN<160>;INF <27>; TYP <1>; COT<9>,<ADDR>	P120 to P123
– Auxiliary input 2:	FUN<160>;INF <28>; TYP <1>; COT<9>,<ADDR>	P120 to P123
– Logical input 1:	FUN<168>;INF <160>; TYP <1>; COT<9>,<ADDR>	P120 to P123
with private option inactive:	FUN<160>;INF <161>; TYP <1>; COT<9>,<ADDR>	
– Logical input 2:	FUN<168>;INF <161>; TYP <1>; COT<9>,<ADDR>	P120 to P123
with private option inactive:	FUN<160>;INF <162>; TYP <1>; COT<9>,<ADDR>	
– Logical input 3:	FUN<168>;INF <162>; TYP <1>; COT<9>,<ADDR>	P122-P123
with private option inactive:	FUN<160>;INF <163>; TYP <1>; COT<9>,<ADDR>	
– Logical input 4:	FUN<168>;INF <163>; TYP <1>; COT<9>,<ADDR>	P123
with private option inactive:	FUN<160>;INF <164>; TYP <1>; COT<9>,<ADDR>	
– Logical input 5:	FUN<168>;INF <164>; TYP <1>; COT<9>,<ADDR>	P123
with private option inactive:	FUN<160>;INF <165>; TYP <1>; COT<9>,<ADDR>	
– Logical output 1:	FUN<168>;INF <176>; TYP <1>; COT<9>,<ADDR>	P120 to P123
with private option inactive:	FUN<160>;INF <176>; TYP <1>; COT<9>,<ADDR>	
– Logical output 2:	FUN<168>;INF <177>; TYP <1>; COT<9>,<ADDR>	P120 to P123
with private option inactive:	FUN<160>;INF <177>; TYP <1>; COT<9>,<ADDR>	
– Logical output 3:	FUN<168>;INF <178>; TYP <1>; COT<9>,<ADDR>	P120 to P123
with private option inactive:	FUN<160>;INF <178>; TYP <1>; COT<9>,<ADDR>	
– Logical output 4:	FUN<168>;INF <179>; TYP <1>; COT<9>,<ADDR>	P120 to P123
with private option inactive:	FUN<160>;INF <179>; TYP <1>; COT<9>,<ADDR>	
– Logical output 5:	FUN<168>;INF <180>; TYP <1>; COT<9>,<ADDR>	P122-P123
with private option inactive:	FUN<160>;INF <180>; TYP <1>; COT<9>,<ADDR>	
– Logical output 6:	FUN<168>;INF <181>; TYP <1>; COT<9>,<ADDR>	P122-P123

with private option inactive:	FUN<160>;INF <181>; TYP <1>; COT<9>,<ADDR>	
– Logical output 7:	FUN<168>;INF <182>; TYP <1>; COT<9>,<ADDR>	P123
with private option inactive:	FUN<160>;INF <182>; TYP <1>; COT<9>,<ADDR>	
– Logical output 8:	FUN<168>;INF <183>; TYP <1>; COT<9>,<ADDR>	P123
with private option inactive:	FUN<160>;INF <183>; TYP <1>; COT<9>,<ADDR>	
Supervision Indications in monitor direction:		Availability
– Trip Circuit Supervision:	FUN<160>;INF <36>; TYP <1>; COT<9>,<ADDR>	P122-P123
Fault Indications in monitor direction:		Availability
– Start / pick-up N:	FUN<160>;INF <67>; TYP <2>; COT<9>,<ADDR>	P120 to P123
– General Start / pick-up:	FUN<160>;INF <84>; TYP <2>; COT<9>,<ADDR>	P120 to P123
Auto-recloser Indications in monitor direction:		Availability
– Autorecloser blocked:	FUN<160>;INF <130>; TYP <1>; COT<9>,<ADDR>	P123
– CB in O/O (« closed ») position:	FUN<168>;INF <33>; TYP <1>; COT<9>,<ADDR>	P121 to P123
with private option inactive:	FUN<160>;INF <140>; TYP <1>; COT<9>,<ADDR>	
– CB in F/O (« open ») position:	FUN<168>;INF <34>; TYP <1>; COT<9>,<ADDR>	P121 to P123
with private option inactive:	FUN<160>;INF <141>; TYP <1>; COT<9>,<ADDR>	

2.3 Processed Commands

System Commands:		Availability
– Synchronization Command (ASDU 6):	FUN<255>,INF <0>; TYP <6>;COT<8>	P122-P123

This command can be sent to a specific relay, or global. The time sent by master is the time of the first bit of the frame. The relay synchronizes with this time, corrected by the frame transmission delay. After updating its time, the relay send back an acknowledge to the master, by giving its new current time. This acknowledge message will be an event of ASDU 6 type.

– General Interrogation Initialization command (ASDU 7):
FUN<255>;INF <0>;TYP <7>; COT<9> — P120 to P123

This command starts the relay interrogation:

The relay then sends a list of data containing the relay state (see list described above).
The GI command contains a scan number which will be included in the answers of the GI cycle generated by the GI command.

If a data has just changed before extracted by the GI, the new state is sent to the master station.

When an event is generated during the GI cycle, the event is sent in priority, and the GI cycle is temporarily interrupted. The end of the GI consists in sending an ASDU 8 to the master station.

If, during a General Interrogation cycle, another GI Initialization command is received, the precedent answer is stopped, and the new GI cycle started.

General Commands (ASDU 20) (Control direction):		Availability
– Auto-recloser On / Off: only on MiCOM P123: FUN<160>;INF<16>, TYP<20>, COT <20>		P123
– LEDs Reset: This command acknowledge all alarms on Front Panel on MiCOM P12x products:	FUN<160>;INF<19>, TYP<20>, COT <20>,<ADDR>	P120 to P123
– Setting group number 1:	FUN<160>;INF<23>, TYP<20>, COT <20>,<ADDR>	P122-P123
– Setting group number 2:	FUN<160>;INF<24>, TYP<20>, COT <20>,<ADDR>	P122-P123
– Order TC COMM1:	FUN<168>;INF <234>; TYP <20>; COT<20>,<ADDR>	P122-P123
with private option inactive:	FUN<160>;INF <136>; TYP <1>; COT<20>,<ADDR>	
– Order TC COMM2:	FUN<168>;INF <235>; TYP <20>; COT<20>,<ADDR>	P122-P123
with private option inactive:	FUN<160>;INF <137>; TYP <1>; COT<20>,<ADDR>	
– Order TC COMM3:	FUN<168>;INF <238>; TYP <20>; COT<20>,<ADDR>	P122-P123
with private option inactive:	FUN<160>;INF <138>; TYP <1>; COT<20>,<ADDR>	
– Order TC COMM4:	FUN<168>;INF <239>; TYP <20>; COT<20>,<ADDR>	P122-P123
with private option inactive:	FUN<160>;INF <139>; TYP <1>; COT<20>,<ADDR>	
– Trip TC:	FUN<168>;INF <1>; TYP <20>; COT<20>,<ADDR>	P120 to P123

with private option inactive: FUN<160>;INF <142>; TYP <1>; COT<20>,<ADDR>

– Close TC: FUN<168>;INF <2>; TYP <20>; COT<20>,<ADDR> P120 to P123

with private option inactive: FUN<160>;INF <143>; TYP <1>; COT<20>,<ADDR>

After executing one of these commands, the relay sends an acknowledge message, which contains the result of command execution.

If a state change is the consequence of the command, it must be sent in a ASDU 1 with COT 12 (remote operation).

If the relay receive another command message from the master station before sending the acknowledge message, it will be discarded.

Commands which are not processed by the relay are rejected with a negative acknowledge message.

2.4 Relay re initialization

In case of relay re initialization, the relay send to the master station:		Availability
– A message indicating relay start/restart	(FUN<160>;INF <5>; TYP <5> COT <5>)	P120 to P123
– or a message indicating Reset CU	(FUN<160>;INF <5>; TYP <3> COT <4>)	P120 to P123
– or a message indicating Reset FCB	(FUN<160>;INF <5>; TYP <2> COT <3>)	P120 to P123

Each identification message of the relay (ASDU 5) contains the manufacturer name in 8 ASCII characters et 4 free characters containing: « P122 » or « P123 ».

2.5 Cyclic Messages (ASDU9 and ASDU 77)

Only measurands can be stored in these messages.

The measurands values are stored in lower levels of communication, before polling by master station.

Several of the fields in the ASDU 9 (FUN<160>,INF <148>) are unused in the P122/P123 relay (Voltage and Power values), so they are set to 0: Only RMS Ia, Ib, Ic values and frequency are stored (with a rate such as: 2,4 * nominal value = 4096).

The second ASDU is ASDU3.4 (FUN<160>,INF<147>), which contains in first position In earth current value in rated format (with a rate such as: 2,4 * nominal value = 4096). Vn value does not exist, so the second position value in ASDU3.4 is set to « unused ».

Another ASDU, ASDU 77 (FUN<168>,INF <209>), which is a private ASDU, contains 4 other measurands: Iinverse and Idirect values, Thermal state (in %), in «short floating-point » format (IEEE 32 bits floating-point format). These values are not rated.

with private option inactive: FUN<160>,INF <149>

2.6 IEC870-5-103 messages for Disturbance record extraction

The disturbance extraction procedure with IEC870-5-103 in MICOM Px2x relays is in conformance with IEC870-5-103 standard definition.
The maximum disturbance record number stored in a P122/P123 is 5.

The disturbance record mapping for P122 and P123 is the following:

- Number of analog channels transmitted: 4, which are:

  Channel 1: Ia current (Phase L1).

  Channel 2: Ib current (Phase L2).

  Channel 3: Ic current (Phase L3).

  Channel 4: IN current (Earth).

- Identifiers of tags (13) transmitted in ASDU 29 (logical informations) for P122:

  - Tag number 1: IN>: FUN <160> INF <67>
  - Tag number 2: General start: FUN <160> INF <84>
  - Tag number 3: CB Failure: FUN <160> INF <85>
  - Tag number 4: General Trip: FUN <160> INF <68>
  - Tag number 5: tI>: FUN <160> INF <90>
  - Tag number 6: tI>>: FUN <160> INF <91>
  - Tag number 7: tI>>>: FUN <168> INF <19>

with private option inactive: FUN <160>,INF <94>

  - Tag number 8: tIN> (Earth): FUN <160> INF <92>
  - Tag number 9: tIN>> (Earth): FUN <160> INF <93>
  - Tag number 10: tIN>>> (Earth): FUN <168> INF <22>

with private option inactive: FUN <160>,INF <95>

  - Tag number 11: Log input 1: FUN <168> INF <160>

with private option inactive: FUN <160>,INF <161>

- Tag number 12: Log input 2: FUN <168> INF <161>

with private option inactive: FUN <160>,INF <162>

- Tag number 13: Log input 3: FUN <168> INF <162>

with private option inactive: FUN <160>,INF <163>

For a P123, there are 15 identifiers of tags, so the two following tags in addition to the precedents:

- Tag number 14: Log input 4: FUN <168> INF <163>

with private option inactive: FUN <160>,INF <164>

- Tag number 15: Log input 5: FUN <168> INF <164>

with private option inactive: FUN <160>,INF <165>

DNP 3.0 DATABASE

MiCOM P120-P121-P122-P123

VERSION V5

CONTENTS

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1. INTRODUCTION

1.1 Purpose of this document

The purpose of this document is to describe the specific implementation of the Distributed Network Protocol (DNP) 3.0 within P12x MiCOM relays.

P12x uses the Triangle MicroWorks, Inc. DNP 3.0 Slave Source Code Library Version 2.18.

This document, in conjunction with the DNP 3.0 Basic 4 Document Set, and the DNP Subset Definitions Document, provides complete information on how to communicate with P12x via the DNP 3.0 protocol.

This implementation of DNP 3.0 is fully compliant with DNP 3.0 Subset Definition Level 2, contains many Subset Level 3 features, and contains some functionality even beyond Subset Level 3.

1.2 DNP V3.00 device Profile

The following table provides a "Device Profile Document" in the standard format defined in the DNP 3.0 Subset Definitions Document. While it is referred to in the DNP 3.0 Subset Definitions as a "Document," it is only a component of a total interoperability guide. This table, in combination with the following should provide a complete interoperability/configuration guide for P12x:

- the Implementation Table provided in Section 1.3 (beginning on page 6),
- the Point List Tables provided in Section 1.4 (beginning on page 8),
- and a description of configuration methods and user-interface in Sections

DNP V3.00 DEVICE PROFILE DOCUMENT (ALSO SEE THE IMPLEMENTATION TABLE IN SECTION 1.3, BEGINNING ON PAGE 6).	
Vendor Name: **AREVA T&D Antomation & Information**	
Device Name: **SERIAL 20 Platform using the Triangle MicroWorks, Inc. DNP 3.0 Slave Source Code Library, Version 2.18.**	
Highest DNP Level Supported: For Requests: **Level 2** For Responses: **Level 2**	Device Function: . Master √ **Slave**
Notable objects, functions, and/or qualifiers supported in addition to the Highest DNP Levels Supported (the complete list is described in the attached table): **For static (non-change-event) object requests, request qualifier codes 00 and 01 (start-stop), 07 and 08 (limited quantity), and 17 and 28 (index) are supported in addition to request qualifier code 06 (no range – or all points).** **Static object requests received with qualifiers 00, 01, 06, 07, or 08, will be responded with qualifiers 00 or 01. Static object requests received with qualifiers 17 or 28 will be responded with qualifiers 17 or 28.** **For change-event object requests, qualifiers 17 or 28 are always responded.** **16-bit and 32-bit Analog Change Events with Time may be requested.** **The read function code for Object 50 (Time and Date), variation 1, is supported.**	
Maximum Data Link Frame Size (octets): Transmitted: **292** Received **292**	Maximum Application Fragment Size (octets): Transmitted: **2048** Received: **2048**
Maximum Data Link Re-tries: . None √ **Fixed at 2** . Configurable	Maximum Application Layer Re-tries: √ **None** . Configurable

DNP V3.00

DEVICE PROFILE DOCUMENT

(ALSO SEE THE IMPLEMENTATION TABLE IN SECTION 1.3, BEGINNING ON PAGE 6).

Requires Data Link Layer Confirmation:

- √ **Never**
- Always
- Sometimes
- Configurable

Requires Application Layer Confirmation:

- Never
- Always
- √ **When reporting Event Data**
- √ **When sending multi-fragment responses**
- Sometimes
- Configurable

Timeouts while waiting for:

Data Link Confirm:		None	√**Fixed at 100 ms**	Variable	Configurable.
Complete Appl. Fragment:	√	**None**	Fixed at ____	Variable	Configurable
Application Confirm:		None	√**Fixed at 1s**	Variable	Configurable
Complete Appl. Response:	√	**None**	Fixed at ____	Variable	Configurable

Others:

- Binary input change scanning period: 5ms
- Analog input change scanning period: 1s

Sends/Executes Control Operations:

WRITE Binary Outputs	√	**Never**	Always	Sometimes	Configurable
SELECT/OPERATE		Never	√ **Always**	Sometimes	Configurable
DIRECT OPERATE		Never	√ **Always**	Sometimes	Configurable
DIRECT OPERATE – NO ACK		Never	√ **Always**	Sometimes	Configurable
Count > 1	√	**Never**	Always	Sometimes	Configurable
Pulse On		Never	√ **Always**	Sometimes	Configurable
Pulse Off	√	**Never**	Always	Sometimes	Configurable
Latch On	√	**Never**	Always	Sometimes	Configurable
Latch Off	√	**Never**	Always	Sometimes	Configurable
Queue	√	**Never**	Always	Sometimes	Configurable
Clear Queue	√	**Never**	Always	Sometimes	Configurable

Reports Binary Input Change Events when no specific variation requested:

- Never
- √ **Only time-tagged for P122 and P123**
- √ **Only non-time-tagged for P121**
- Configurable

Reports time-tagged Binary Input Change Events when no specific variation requested:

- √ **Never for P121**
- √ **Binary Input Change With Time for P122 and P123**
- Binary Input Change With Relative Time
- Configurable (attach explanation)

Sends Unsolicited Responses:

- √ **Never**
- Configurable
- Only certain objects
- Sometimes (attach explanation)
- ENABLE/DISABLE UNSOLICITED Function codes supported

Sends Static Data in Unsolicited Responses:

- √ **Never**
- When Device Restarts
- When Status Flags Change

No other options are permitted.

DNP V3.00

DEVICE PROFILE DOCUMENT

(ALSO SEE THE IMPLEMENTATION TABLE IN SECTION 1.3, BEGINNING ON PAGE 6).

Default Counter Object/Variation:	Counters Roll Over at:
No Counters Reported Configurable √ **Default Object: 20** **Default Variation: 5** Point-by-point list attached	No Counters Reported Configurable (attach explanation) √ **16 Bits** √ **32 Bits** Other Value: _____ √ **Point-by-point list attached**

Sends Multi-Fragment Responses:

√ **Yes**

No

1.3 Implementation Table

The following table identifies the variations, function codes, and qualifiers supported by the P12x in both request messages and in response messages.

For static (non-change-event) objects, requests sent with qualifiers 00, 01, 06, 07, or 08, will be responded with qualifiers 00 or 01. Static object requests sent with qualifiers 17 or 28 will be responded with qualifiers 17 or 28. For change-event objects, qualifiers 17 or 28 are always responded.

In the table below the text shaded as indicates Subset Level 3 functionality

(beyond Subset Level 2), and text shaded as

beyond Subset Level 3.

Subset Level 3

beyond Subset Level 3

indicates functionality

OBJECT			REQUEST (Library will parse)		RESPONSE (Library will respond with)	
Object Number	Variation Number	Description	Function Codes (dec)	Qualifier Codes (hex)	Function Codes (dec)	Qualifier Codes (hex)
1	0	Binary Input (Variation 0 is used to request default variation)	1 (read)	00, 01 (start-stop) 06 (no range, or all)		
1	1 (default – see note 1)	Binary Input	1 (read) 22	00, 01 (start-stop) 06 (no range, or all)	129 (response)	00, 01 (start-stop)
1	2	Binary Input with Status	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index – see note 2)
2	0	Binary Input Change (Variation 0 is used to request default variation)	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
2	1 (default – see note 1 for P120 - P121)	Binary Input Change without Time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response)	17, 28 (index)
2 (only P122-P123)	2 (default – see note 1)	Binary Input Change with Time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response)	17, 28 (index)
10	0	Binary Output Status (Variation 0 is used to request default variation)	1 (read)	00, 01 (start-stop) 06 (no range, or all)		
10	2 (default – see note 1)	Binary Output Status	1 (read)	00, 01 (start-stop) 06 (no range, or all)	129 (response)	00, 01 (start-stop)
12	1	Control Relay Output Block	3 (select) 4 (operate) 5 (direct op) 6 (dir. op, noack)	17, 28 (index)	129 (response)	echo of request
20 (only P122-P123)	0	Binary Counter (Variation 0 is used to request default variation)	1 (read) 7 (freeze) 8 (freeze noack) 9 (freeze clear) 10 (frz. cl. Noack)	00, 01 (start-stop) 06 (no range, or all)		
20 (only P122-P123)	1	32-Bit Binary Counter	1 (read) 7 (freeze) 8 (freeze noack) 9 (freeze clear) 10 (frz. cl. Noack)	00, 01 (start-stop) 06 (no range, or all)	129 (response)	00, 01 (start-stop)
20 (only P122-P123)	2	16-Bit Binary Counter	1 (read) 7 (freeze) 8 (freeze noack) 9 (freeze clear) 10 (frz. cl. Noack)	00, 01 (start-stop) 06 (no range, or all)	129 (response)	00, 01 (start-stop)
20 (only P122-P123)	5	32-Bit Binary Counter without Flag	1 (read) 7 (freeze) 8 (freeze noack) 9 (freeze clear) 10 (frz. cl. Noack)	00, 01 (start-stop) 06 (no range, or all)	129 (response)	00, 01 (start-stop)
20 (only P122-P123)	6	16-Bit Binary Counter without Flag	1 (read) 7 (freeze) 8 (freeze noack) 9 (freeze clear) 10 (frz. cl. Noack)	00, 01 (start-stop) 06 (no range, or all)	129 (response)	00, 01 (start-stop)
21 (only P122-P123)	0	Frozen Counter (Variation 0 is used to request default variation)	1 (read)	00, 01 (start-stop) 06 (no range, or all)		
21 (only P122-P123)	1	32-Bit Frozen Counter	1 (read)	00, 01 (start-stop) 06 (no range, or all)	129 (response)	00, 01 (start-stop)

OBJECT			REQUEST (Library will parse)		RESPONSE (Library will respond with)	
Object Number	Variation Number	Description	Function Codes (dec)	Qualifier Codes (hex)	Function Codes (dec)	Qualifier Codes (hex)
21 (only P122-P123)	2	16-Bit Frozen Counter	1 (read)	00, 01 (start-stop) 06 (no range, or all)	129 (response)	00, 01 (start-stop)
21 (only P122-P123)	9	32-Bit Frozen Counter without Flag	1 (read)	00, 01 (start-stop) 06 (no range, or all)	129 (response)	00, 01 (start-stop)
21 (only P122-P123)	10	16-Bit Frozen Counter without Flag	1 (read)	00, 01 (start-stop) 06 (no range, or all)	129 (response)	00, 01 (start-stop)
30	0	Analog Input (Variation 0 is used to request default variation)	1 (read)	00, 01 (start-stop) 06 (no range, or all)		
30	1 (default – see note 1	32-Bit Analog Input	1 (read)	00, 01 (start-stop) 06 (no range, or all)	129 (response)	00, 01 (start-stop)
30	2	16-Bit Analog Input	1 (read)	00, 01 (start-stop) 06 (no range, or all)	129 (response)	00, 01 (start-stop)
30	3	32-Bit Analog Input without Flag	1 (read)	00, 01 (start-stop) 06 (no range, or all)	129 (response)	00, 01 (start-stop)
30	4	16-Bit Analog Input without Flag	1 (read)	00, 01 (start-stop) 06 (no range, or all)	129 (response)	00, 01 (start-stop)
32	0	Analog Change Event (Variation 0 is used to request default variation)	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
32	1 (default – see note 1)	32-Bit Analog Change Event without Time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response)	17, 28 (index)
32	2	16-Bit Analog Change Event without Time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response)	17, 28 (index)
32 (only P122-P123)	3	32-Bit Analog Change Event with Time				
32 (only P122-P123)	4	16-Bit Analog Change Event with Time				
50 (only P122-P123)	0	Time and Date				
50 (only P122-P123)	1 (default – see note 1)	Time and Date	1 (read) 2 (write)	07 (limited qty=1)		
52	2	Time Delay Fine			129 (response)	07 (limited qty) (qty = 1)
60	0	Class 0, 1, 2, and 3 Data				
60	1	Class 0 Data	1 (read)	06 (no range, or all)	129	17,28
60	2	Class 1 Data	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129	17,28
60	3	Class 2 Data	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129	17,28
60	4	Class 3 Data	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129	17,28
80	1	Internal Indications	2 (write)	00 (start-stop) (index must =7)		
		No Object (function code only) –See Note 3	13 (cold restart)			
		No Object (function code only)	14 (warm restart)			
		No Object (function code only)	23 (delay meas.)			

Note 1: A Default variation refers to the variation responded when variation 0 is requested and/or in class 0, 1, 2, or 3 scans.

Note 2: For static (non-change-event) objects, qualifiers 17 or 28 are only responded when a request is sent with qualifiers 17 or 28, respectively. Otherwise, static object requests sent with qualifiers 00, 01, 06, 07, or 08, will be responded with qualifiers 00 or 01. (For change-event objects, qualifiers 17 or 28 are always responded.)

Note 3: For P12x, a cold restart is implemented as a warm restart – the executable is not restarted, but the DNP process is restarted.

1.4 Point List

The tables in the following sections identify all the individual data points provided by this implementation of DNP 3.0. uses the database protection.

1.4.1 Binary Input Points

Every Binary Input Status points are included in class 0 polls, because they are included in one of classes 1, 2 or 3.

Binary Input Points
Static (Steady-State) Object Number: **1**
Change Event Object Number: **2**
Request Function Codes supported: **1 (read)**
Static Variation reported when variation 0 requested: **1 (Binary Input without status)**
Change Event Variation reported when variation 0 requested: **1 for P120 et P121 and 2 (Binary Input Change with Time) for P122 and P123**

P120 Point Index	P121 Point Index	P122 Point Index	P123 Point Index	Name/Description	init val.	Change Event Class (1, 2, 3 or none)
0	0	0	0	Output relay 1 (trip)	0	1
1	1	1	1	Output relay 2	0	2
2	2	2	2	Output relay 3	0	2
3	3	3	3	Output relay 4	0	2
4	4	4	4	Output relay 0 (watch dog)	0	2
		5	5	Output relay 5	0	2
		6	6	Output relay 6	0	2
			7	Output relay 7	0	2
			8	Output relay 8	0	2
5	5	7	9	Opto isolator 1	0	2
6	6	8	10	Opto isolator 2	0	2
		9	11	Opto isolator 3	0	2
			12	Opto isolator 4	0	2
			13	Opto isolator 5	0	2
	7	10	14	Phase overcurrent stage 1 start	0	1
	8	11	15	Phase overcurrent stage 1 trip	0	1
	9	12	16	Phase overcurrent stage 2 start	0	1
	10	13	17	Phase overcurrent stage 2 trip	0	1
	11	14	18	Phase overcurrent stage 3 start	0	1
	12	15	19	Phase overcurrent stage 3 trip	0	1
7	13	16	20	Earth overcurrent stage 1 start	0	1
8	14	17	21	Earth overcurrent stage 1 trip	0	1
9	15	18	22	Earth overcurrent stage 2 start	0	1
10	16	19	23	Earth overcurrent stage 2 trip	0	1
11	17	20	24	Earth overcurrent stage 3 start	0	1
12	18	21	25	Earth overcurrent stage 3 trip	0	1
		22	26	tI<	0	1
		23	27	Thermal start	0	1
		24	28	Thermal trip	0	1
		25	29	Taux1	0	1
		26	30	Taux2	0	1
		27	31	Broken conductor	0	1
		28	32	cb failure	0	1
		29	33	I2> start	0	1
		30	34	tI2> trip	0	1
		31	35	Number of cb operation	0	1
		32	36	Cb operation time alarm	0	1
		33	37	sa2n	0	1
		34	38	trip circuit alarm	0	1

Binary Input Points
Static (Steady-State) Object Number: **1**
Change Event Object Number: **2**
Request Function Codes supported: **1 (read)**
Static Variation reported when variation 0 requested: **1 (Binary Input without status)**
Change Event Variation reported when variation 0 requested: **1 for P120 et P121 and 2 (Binary Input Change with Time) for P122 and P123**

P120 Point Index	P121 Point Index	P122 Point Index	P123 Point Index	Name/Description	init val.	Change Event Class (1, 2, 3 or none)
		35	39	cb close time alarm	0	1
			40	Blocking autoreclosure	0	1
			41	Successful autoreclosure	0	1
			42	In Progress autoreclosure	0	1
		36	43	logic Selectivity 1	0	1
		37	44	logic Selectivity 2	0	1
13	19	38	45	Blocking logic 1	0	1
		39	46	Blocking logic 2	0	1
14	20	40	47	52a	0	1
15	21	41	48	52b	0	1
16	22	42	49	Lack of SF6	0	1
		43	50	Cold load Pick up	0	1
17	23	44	51	De latching by a logic input	0	1
18	24	45	52	De latching of the Tripping output relay by a logic input	0	1
19	25	46	53	Closing order by a logic input	0	1
20	26	47	54	Tripping order by a logic input	0	1
		48	55	Thermal Resetting by communication	0	1
		49	56	Shifting to maintenance mode	0	1
21	27	50	57	Major material Alarms	0	1
22	28	51	58	Minor material Alarms	0	1
	29	52	59	Phase overcurrent stage 1 trip alarm (latched)	0	3
	30	53	60	Phase overcurrent stage 2 trip alarm (latched)	0	3
	31	54	61	Phase overcurrent stage 3 trip alarm (latched)	0	3
23	32	55	62	Earth overcurrent stage 1 trip alarm (latched)	0	3
24	33	56	63	Earth overcurrent stage 2 trip alarm (latched)	0	3
25	34	57	64	Earth overcurrent stage 3 trip alarm (latched)	0	3
		58	65	tI< alarm (latched)	0	3
		59	66	Thermal start alarm (latched)	0	3
		60	67	Thermal trip alarm (latched)	0	3
		61	68	Taux1 alarm (latched)	0	3
		62	69	Taux2 alarm (latched)	0	3
		63	70	Broken conductor alarm (latched)	0	3
		64	71	cb failure alarm (latched)	0	3
		65	72	tI2> alarm (latched)	0	3
		66	73	Cb operation time alarm(latched)	0	3
		67	74	Number of cb operation (latched)	0	3
		68	75	sa2n alarm (latched)	0	3
		69	76	trip circuit alarm(latched)	0	3
		70	77	cb close time alarm (latched)	0	3
			78	Fault Configuration of autoreclosure	0	3
		71	79	I min Start	0	1
		72	80	External CB Failure	0	1
		73	81	Latching of Relay	0	2
		74	82	I2>> start	0	1
		75	83	tI2>> trip	0	1
		76	84	tI2>> alarm (latched)	0	3
		77	85	taux3	0	1

Binary Input Points
Static (Steady-State) Object Number: **1**
Change Event Object Number: **2**
Request Function Codes supported: **1 (read)**
Static Variation reported when variation 0 requested: **1 (Binary Input without status)**
Change Event Variation reported when variation 0 requested: **1 for P120 et P121 and 2 (Binary Input Change with Time) for P122 and P123**

P120 Point Index	P121 Point Index	P122 Point Index	P123 Point Index	Name/Description	init val.	Change Event Class (1, 2, 3 or none)
		78	86	taux3 alarm(latched)	0	3
			87	taux4	0	1
			88	taux4 alarm(latched)	0	3
			89	Final trip (autorecloser)	0	1

1.4.2 Binary Output Status Points and Control Relay Output Blocks

The following table lists both the Binary Output Status Points (Object 10) and the Control Relay Output Blocks (Object 12). Binary Output Status points are not included in class 0 polls.

Binary Output Status Points
Object Number: **10**
Request Function Codes supported: **1 (read)**
Default Variation reported when variation 0 requested: **2 (Binary Output Status)**
Control Relay Output Blocks
Object Number: **12**
Request Function Codes supported: **3 (select), 4 (operate), 5 (direct operate), 6 (direct operate, noack)**

P120 Point Index	P121 Point Index	P122 Point Index	P123 Point Index	Name/Description	Initial Status Value	Supported Control Relay Output Block Fields
0	0	0	0	De Latch of relays	0	Unpaired Pulse On, Paired Trip/Pulse On, Paired Close/Pulse On
1	1	1	1	Acknowledgement of the 1st alarm	0	Unpaired Pulse On, Paired Trip/Pulse On, Paired Close/Pulse On
2	2	2	2	Acknowledgement of all the alarms	0	Unpaired Pulse On, Paired Trip/Pulse On, Paired Close/Pulse On
3	3	3	3	Remote control Triping	0	Unpaired Pulse On, Paired Trip/Pulse On,
4	4	4	4	Remote control Closing	0	Unpaired Pulse On, Paired Close/Pulse On
		5	5	Change of Active Group	0	Unpaired Pulse On, Paired Trip/Pulse On, Paired Close/Pulse On
		6	6	Thermal State Resetting	0	Unpaired Pulse On, Paired Trip/Pulse On, Paired Close/Pulse On
		7	7	Average and Max rms values resetting	0	Unpaired Pulse On, Paired Trip/Pulse On, Paired Close/Pulse On
		8	8	Acknowledgement of RAMs material alarms	0	Unpaired Pulse On, Paired Trip/Pulse On, Paired Close/Pulse On
			9	Counters initialization of the autorelosure	0	Unpaired Pulse On, Paired Trip/Pulse On, Paired Close/Pulse On
		9	10	Initialization of rolling demand (average)	0	Unpaired Pulse On, Paired Trip/Pulse On, Paired Close/Pulse On
		10	11	Initialization of Maximum	0	Unpaired Pulse On, Paired Trip/Pulse On, Paired Close/Pulse On
			12	Re initialization of autoreclosure	0	Unpaired Pulse On, Paired Trip/Pulse On, Paired Close/Pulse On
		11	13	tc com1	0	Unpaired Pulse On, Paired Trip/Pulse On, Paired Close/Pulse On
		12	14	tc com2	0	Unpaired Pulse On, Paired Trip/Pulse On, Paired Close/Pulse On
		13	15	tc com3	0	Unpaired Pulse On, Paired Trip/Pulse On, Paired Close/Pulse On
		14	16	tc com4	0	Unpaired Pulse On, Paired Trip/Pulse On, Paired Close/Pulse On

1.4.3 Counters

The following table lists both Binary Counters (Object 20) and Frozen Counters (Object 21). When a freeze function is performed on a Binary Counter point, the frozen value is available in the corresponding Frozen Counter point.

Binary Counters and Frozen Counters are not included in class 0 polls.

P120 and P121 do not support binary Counters and Frozen Counters.

Binary Counters
Static (Steady-State) Object Number: **20**
Change Event Object Number: not supported
Request Function Codes supported: **1 (read), 7 (freeze), 8 (freeze noack)**
9 (freeze and clear), 10 (freeze and clear, noack)
Static Variation reported when variation 0 requested: **5 (32-Bit Binary Counter without Flag**
Change Event Variation reported when variation 0 requested: none-not supported
Frozen Counters
Static (Steady-State) Object Number: **21**
Change Event Object Number: not supported
Request Function Codes supported: **1 (read)**
Static Variation reported when variation 0 requested: **9 (32-Bit Frozen Binary without Flag)**
Change Event Variation reported when variation 0 requested: none-not supported

P122 Point Index	P123 Point Index	Name/Description	Data type
0	0	Max RMS current phase A	D1
1	1	Max RMS current phase B	D1
2	2	Max RMS current phase C	D1
3	3	Average RMS current phase A	D1
4	4	Average RMS current phase B	D1
5	5	Average RMS current phase C	D1
6	6	CB operation number	D2
7	7	sa2n ia	D3
8	8	sa2n ib	D3
9	9	sa2n ic	D3
	10	Total number of autoreclosure cycle	D2
	11	Number of cycles 1	D2
	12	Number of cycles 2	D2
	13	Number of cycles 3	D2
	14	Number of cycles 4	D2
	15	Definitive Tripping number	D2
	16	Number of closing order	D2
10	17	Rolling demand(average) RMS phase A	D1
11	18	Rolling demand(average) RMS phase B	D1
12	19	Rolling demand(average) RMS phase C	D1
13	20	Maximum RMS phase A (after a new initialization)	D1
14	21	Maximum RMS phase B (after a new initialization)	D1
15	22	Maximum RMS phase C (after a new initialization)	D1

1.4.4 Analog Inputs

The following table lists Analog Inputs (Object 30). It is important to note that 16-bit and 32-bit variations of Analog Inputs, Analog Output Control Blocks, and Analog Output Statuses are transmitted through DNP as signed numbers. Even for analog input points that are not valid as negative values, the maximum positive representation is 32767. For each point, the "Scaling and Units" column indicates the value of a transmitted 32767. This also implies the value of a transmitted –32767. The entry in the column *does not* imply a valid value for the point.

Always indicating the representation of 32767 in the tables below is a consistent method for representing scale, applicable to all scaling possibilities.

The "Default Deadband," and the "Default Change Event Assigned Class" columns are used to represent the absolute amount by which the point must change before an analog change event will be generated, and once generated in which class poll (1, 2, 3) will the change event be reported. Only the default values for these columns are documented here because the values may change in operation due to either local (user-interface) or remote (through DNP) control.

Every Analog Inputs points are included in class 0 polls, because they are included in one of classes 1, 2 or 3.

Analog Inputs
Static (Steady-State) Object Number: **30**
Change Event Object Number: **32**
Request Function Codes supported: **1 (read)**
Static Variation reported when variation 0 requested: **1 (32-Bit Analog Input)**
Change Event Variation reported when variation 0 requested: **1 (32-Bit Analog Change Event w/o Time)**
Change Event Scan Rate: **The scan rate for analog input change events is fixed at 1s**

P120 Point Index	P121 Point Index	P122 Point Index	P123 Point Index	Name/Description	Initial Value	Scaling and Units (representation of 32767 – see above)	Valid Range	Change Event Dead-band	Initial Change Event Class (1, 2, 3 or none)
		0	0	Active Group	1	32767	1 à 2	1	1
	0	1	1	Magnitude IA	0	40 In	0 to 40 In	0.02 In	3
	1	2	2	Magnitude IB	0	40 In	0 to 40 In	0.02 In	3
	2	3	3	Magnitude IC	0	40 In	0 to 40 In	0.02 In	3
0	3	4	4	Magnitude IN	0	40 I0n	0 to 40 I0n	0.02 I0n	3
	4	5	5	rms IA	0A	327.67A	0 to 40000000 A/100	2%	3
	5	6	6	rms IB	0A	327.67A	0 to 40000000 A/100	2%	3
	6	7	7	rms IC	0A	327.67A	0 to 40000000 A/100	2%	3
1	7	8	8	rms IN	0A	327.67A	0 to 40000000 A/100	2%	3
		9	9	Thermal State	0%	32767%	0 to 65535	10	3
		10	10	Frequency	0	327,67 Hz	45Hz to 65 Hz and 99.99Hz == ERROR	1Hz	3
		11	11	Magnitude I2	0	40 In	0 to 40 In	0.1 In	3
		12	12	Magnitude I1	0	40 In	0 to 40 In	0.1 In	3
		13	13	Tripping Time	0	327.67s	0 to 10.00s	10 ms	3
		14	14	Closing Time	0	327.67s	0 to 10.00s	10 ms	3
		15	15	Fault number	0	32767	0 to 65535	1	2
		16	16	group	0	32767	1 to 2	each new fault	2
		17	17	phase fault	0	32767	0 to 8 (F1)	each new fault	2

Analog Inputs
Static (Steady-State) Object Number: **30**
Change Event Object Number: **32**
Request Function Codes supported: **1 (read)**
Static Variation reported when variation 0 requested: **1 (32-Bit Analog Input)**
Change Event Variation reported when variation 0 requested: **1 (32-Bit Analog Change Event w/o Time)**
Change Event Scan Rate: **The scan rate for analog input change events is fixed at 1s**

P120 Point Index	P121 Point Index	P122 Point Index	P123 Point Index	Name/Description	Initial Value	Scaling and Units (representation of 32767 – see above)	Valid Range	Change Event Dead-band	Initial Change Event Class (1, 2, 3 or none)
		18	18	origin fault	0	32767	0 to 16 (P122) 17 (P123) (F2)	each new fault	2
		19	19	Fault magnitude	0	40 In	0 to 40 In	each new fault	2
		20	20	Fault magnitude IA	0	40 In	0 to 40 In	each new fault	2
		21	21	Fault magnitude IB	0	40 In	0 to 40 In	each new fault	2
		22	22	Fault magnitude IC	0	40 In	0 to 40 In	each new fault	2
		23	23	Fault magnitude IN	0	40 I0n	0 to 40 I0n	each new fault	2

Format:

F1:
0: None, 1: Phase A, 2: Phase B, 3: Phase C, 4: Phase AB, 5: Phase AC, 6: Phase BC, 7: Phase A B C, 8: Terre

F2:
0: Null, 1: Remote trip, 2: thermal overload, 3: tI>, 4: tI>>, 5: tI>>>, 6: tIN>, 7: tIN>>, 8: tIN>>>, 9: tI<, 10: broken conductor, 11: taux1, 12: taux2, 13: tIinv>, 14: tIinv>>, 15:taux2, 16: taux3(only p123), 17:breaker failure, 18: SOFT (only P123)..