



Relion® 611 series

Feeder Protection and Control REF611 Modbus Point List Manual



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This product complies with the directive of the Council of the European Communities on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive 2004/108/EC) and concerning electrical equipment for use within specified voltage limits (Low-voltage directive 2006/95/EC). This conformity is the result of tests conducted by ABB in accordance with the product standards EN 50263 and EN 60255-26 for the EMC directive, and with the product standards EN 60255-1 and EN 60255-27 for the low voltage directive. The product is designed in accordance with the international standards of the IEC 60255 series.

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Section 1 Introduction

1.1 This manual

The point list manual describes the outlook and properties of the data points specific to the IED. The manual should be used in conjunction with the corresponding communication protocol manual.

1.2 Intended audience

This manual addresses the communication system engineer or system integrator responsible for pre-engineering and engineering for communication setup in a substation from an IED perspective.

The system engineer or system integrator must have a basic knowledge of communication in protection and control systems and thorough knowledge of the specific communication protocol.

1.3

Product documentation

1.3.1

Product documentation set

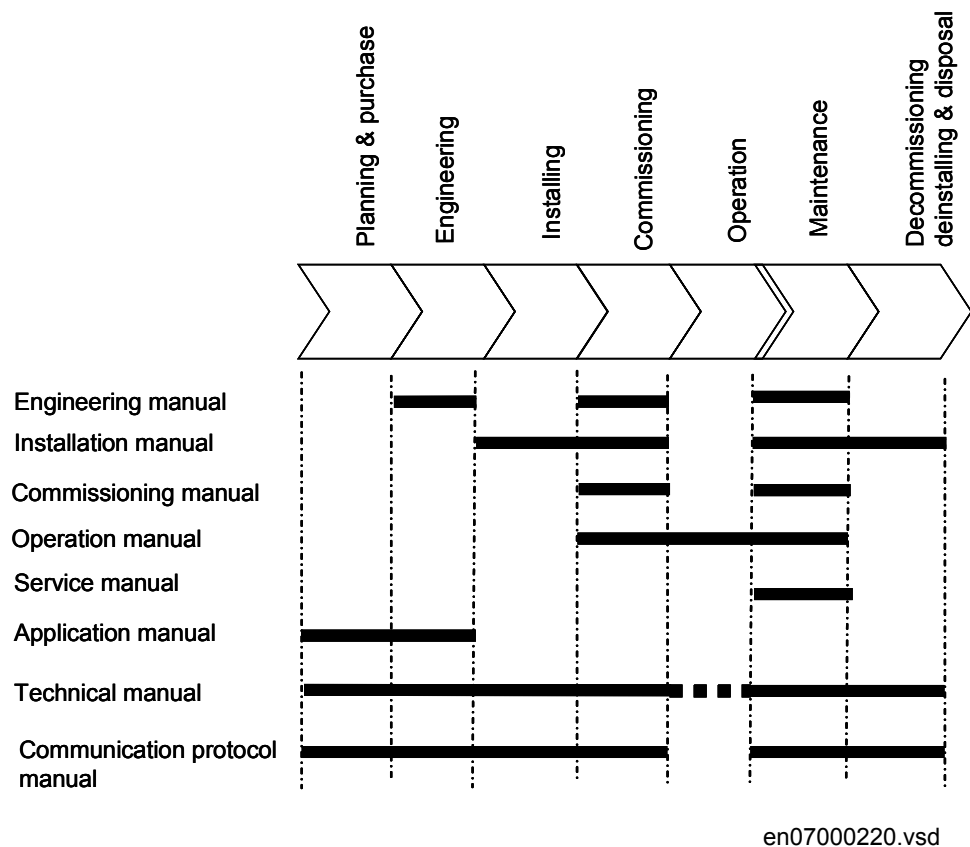


Figure 1: The intended use of manuals in different lifecycles

The engineering manual contains instructions on how to engineer the IEDs using the different tools in PCM600. The manual provides instructions on how to set up a PCM600 project and insert IEDs to the project structure. The manual also recommends a sequence for engineering of protection and control functions, LHMI functions as well as communication engineering for IEC 61850 and other supported protocols.

The installation manual contains instructions on how to install the IED. The manual provides procedures for mechanical and electrical installation. The chapters are organized in chronological order in which the IED should be installed.

The commissioning manual contains instructions on how to commission the IED. The manual can also be used by system engineers and maintenance personnel for assistance during the testing phase. The manual provides procedures for checking of external circuitry and energizing the IED, parameter setting and configuration as

well as verifying settings by secondary injection. The manual describes the process of testing an IED in a substation which is not in service. The chapters are organized in chronological order in which the IED should be commissioned.

The operation manual contains instructions on how to operate the IED once it has been commissioned. The manual provides instructions for monitoring, controlling and setting the IED. The manual also describes how to identify disturbances and how to view calculated and measured power grid data to determine the cause of a fault.

The service manual contains instructions on how to service and maintain the IED. The manual also provides procedures for de-energizing, de-commissioning and disposal of the IED.

The application manual contains application descriptions and setting guidelines sorted per function. The manual can be used to find out when and for what purpose a typical protection function can be used. The manual can also be used when calculating settings.

The technical manual contains application and functionality descriptions and lists function blocks, logic diagrams, input and output signals, setting parameters and technical data sorted per function. The manual can be used as a technical reference during the engineering phase, installation and commissioning phase, and during normal service.

The communication protocol manual describes a communication protocol supported by the IED. The manual concentrates on vendor-specific implementations.

The point list manual describes the outlook and properties of the data points specific to the IED. The manual should be used in conjunction with the corresponding communication protocol manual.



Some of the manuals are not available yet.

1.3.2

Document revision history

Document revision/date	Product series version	History
A/2011-11-18	1.0	First release



Download the latest documents from the ABB Web site
<http://www.abb.com/substationautomation>.

1.3.3 Related documentation

Name of the document	Document ID
Modbus Communication Protocol Manual	1MRS757461

1.4 Symbols and conventions

1.4.1 Symbols



The caution icon indicates important information or warning related to the concept discussed in the text. It might indicate the presence of a hazard which could result in corruption of software or damage to equipment or property.



The information icon alerts the reader of important facts and conditions.



The tip icon indicates advice on, for example, how to design your project or how to use a certain function.

Although warning hazards are related to personal injury, it is necessary to understand that under certain operational conditions, operation of damaged equipment may result in degraded process performance leading to personal injury or death. Therefore, comply fully with all warning and caution notices.

1.4.2 Document conventions

A particular convention may not be used in this manual.

- Abbreviations and acronyms in this manual are spelled out in the glossary. The glossary also contains definitions of important terms.
- Push-button navigation in the LHMI menu structure is presented by using the push-button icons.
To navigate between the options, use  and .
- HMI menu paths are presented in bold.
Select **Main menu/Settings**.
- LHMI messages are shown in Courier font.
To save the changes in non-volatile memory, select Yes and press .
- Parameter names are shown in italics.
The function can be enabled and disabled with the *Operation* setting.
- Parameter values are indicated with quotation marks.

The corresponding parameter values are "On" and "Off".

- IED input/output messages and monitored data names are shown in Courier font.
When the function starts, the START output is set to TRUE.

1.4.3

Functions, codes and symbols

Table 1: REF611 functions, codes and symbols

Function	IEC 61850	IEC 60617	IEC-ANSI
Protection			
Three-phase non-directional overcurrent protection, low stage, instance 1	PHLPTOC1	3I> (1)	51P-1 (1)
Three-phase non-directional overcurrent protection, high stage, instance 1	PHHPTOC1	3I>> (1)	51P-2 (1)
Three-phase non-directional overcurrent protection, high stage, instance 2	PHHPTOC2	3I>> (2)	51P-2 (2)
Three-phase non-directional overcurrent protection, instantaneous stage, instance 1	PHIPTOC1	3I>>> (1)	50P/51P (1)
Non-directional earth-fault protection, low stage, instance 1	EFLPTOC1	Io> (1)	51N-1 (1)
Non-directional earth-fault protection, low stage, instance 2	EFLPTOC2	Io> (2)	51N-1 (2)
Non-directional earth-fault protection, high stage, instance 1	EFHPTOC1	Io>> (1)	51N-2 (1)
Non-directional earth-fault protection, instantaneous stage	EFIPTOC1	Io>>>	50N/51N
Directional earth-fault protection, low stage, instance 1	DEFLPDEF1	Io> -> (1)	67N-1 (1)
Directional earth-fault protection, low stage, instance 2	DEFLPDEF2	Io> -> (2)	67N-1 (2)
Directional earth-fault protection, high stage	DEFHPDEF1	Io>> ->	67N-2
Transient / intermittent earth-fault protection	INTRPTEF1	Io> -> IEF	67NIEF
Non-directional (cross-country) earth-fault protection, using calculated Io	EFHPTOC1	Io>> (1)	51N-2 (1)
Negative-sequence overcurrent protection, instance 1	NSPTOC1	I2> (1)	46 (1)
Negative-sequence overcurrent protection, instance 2	NSPTOC2	I2> (2)	46 (2)
Phase discontinuity protection	PDNSPTOC1	I2/I1>	46PD
Residual overvoltage protection, instance 1	ROVPTOV1	Uo> (1)	59G (1)
Residual overvoltage protection, instance 2	ROVPTOV2	Uo> (2)	59G (2)
Table continues on next page			

Function	IEC 61850	IEC 60617	IEC-ANSI
Residual overvoltage protection, instance 3	ROVPTOV3	Uo> (3)	59G (3)
Three-phase thermal protection for feeders, cables and distribution transformers	T1PTTR1	3Ith>F	49F
Circuit breaker failure protection	CCBRBRF1	3I>/Io>BF	51BF/51NBF
Three-phase inrush detector	INRPHAR1	3I2f>	68
Master trip, instance 1	TRPPTRC1	Master Trip (1)	94/86 (1)
Master trip, instance 2	TRPPTRC2	Master Trip (2)	94/86 (2)
Switch groups			
Input switch group ¹⁾	ISWGAPC	ISWGAPC	ISWGAPC
Output switch group ²⁾	OSWGAPC	OSWGAPC	OSWGAPC
Selector switch group ³⁾	SELGAPC	SELGAPC	SELGAPC
Configurable timer			
Minimum pulse timer (2 pcs) ⁴⁾	TPGAPC	TP	TP
Control			
Circuit-breaker control	CBXCBR1	I <-> O CB	I <-> O CB
Auto-reclosing	DARREC1	O -> I	79
Supervision			
Trip circuit supervision, instance 1	TCSSCBR1	TCS (1)	TCM (1)
Trip circuit supervision, instance 2	TCSSCBR2	TCS (2)	TCM (2)
Measurement			
Disturbance recorder	RDRE1	-	-
Three-phase current measurement, instance 1	CMMXU1	3I	3I
Sequence current measurement	CSMSQI1	I1, I2, I0	I1, I2, I0
Residual current measurement, instance 1	RESCMMXU1	Io	In
Residual voltage measurement	RESVMMXU1	Uo	Vn

1) 10 instances

2) 20 instances

3) 6 instances

4) 10 instances

Section 2 Modbus data mappings

2.1 Overview

This document describes the Modbus data points and structures available in REF611 Ver. 1.0. The point lists describe a superset of all data available through the standard configurations A and B including the optional functionalities. The names of the standard configurations are FE101 and FE102 respectively.

The majority of the Modbus data points are valid for all standard configurations. Some data points are standard configuration or optional application dependent and thus not available in each IED. The unavailable, that means unused, data points always return value 0 when they are read. The configuration dependent and optional data do not overlap.

Point list table columns

0x addr	Coil (0X) PLC address, base address = 1
Addr.	Signal address
AFL-Common SA name	AFL name of the corresponding data signal
Bit addr	Bit (1X and 0X) PLC address, base address = 1
Ctrl bit	Control bit (0..15) within control structure
Ctrl struct	Control structure number
Description	Signal description
Ds	Object resides as default in some IEC 61850 data set (Y = yes, N = no)
Identification	IED's internal IEC 61850 signal name
IEC 61850 name	IEC 61850 signal description
Mode	Control object mode: unsecured or secured
Reg addr	Modbus register address (3X or 4X). PLC address, base address = 1
Reg.bit	Register PLC address (3X and 4X) and bit within register (0..15)
Scale	Scale factor, default setting
Type	Register type and value interpretation: signed or unsigned
Value range	Value range of the signal

2.2 Point list for REF611 Ver. 1.0

Table 2: Registers

Reg addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range
User definable registers							
1							
...							
127							
System status registers							
128						System status register 1	See Modbus CPM
129						System status register 2	See Modbus CPM
130						System status register 3	See Modbus CPM
131						System status register 4	See Modbus CPM
132						System status register 5	See Modbus CPM
133						System status register 6	See Modbus CPM
134						(reserved)	0
Frequently updated registers							
135	i16	1	LD0.DARREC1.AutoRecStVal	DARREC1.STATUS		Autoreclosing status[.stVal] -	-2...4 (see documentation)
136	u16	1	LD0.DARREC1.ShotPntr.stVal	DARREC1.SHOT_PTR		AR shot pointer value[.stVal] -	0...6
137	u16	1	LD0.DARREC1.OpCntRs.stVal	DARREC1.COUNTER		AR resettable operation counter (all shots) [stVal] -	0...2147483647
138	u16	1000	LD0.CMMXU1.A.phsA.instCVal.mag	CMMXU1.I.INST_A		Phase current A amplitude [phsA.instCVal.mag] -	0...40.00 [xIn]
139	u16	1000	LD0.CMMXU1.A.phsB.instCVal.mag	CMMXU1.I.INST_B		Phase current B amplitude [phsB.instCVal.mag] -	0...40.00 [xIn]
140	u16	1000	LD0.CMMXU1.A.phsC.instCVal.mag	CMMXU1.I.INST_C		Phase current C amplitude [phsC.instCVal.mag] -	0...40.00 [xIn]
141	u16	1000	LD0.RESCMMXU1.A.res.instCVal.mag	RESCMMXU1.I0_INST		Residual current amplitude [res.instCVal.mag] -	0...40.00 [xIn]
142	u16	1000	LD0.RESCMMXU1.Phv.res.instCVal.mag	RESCMMXU1.U0_INST		Residual voltage amplitude [res.instCVal.mag] -	0...4.00 [xUn]
143	u16	1000	LD0.CSMSQ11.SeqA.c1.instCVal.mag	CMSQ11.I1_INST		Positive sequence current amplitude [c1.instCVal.mag] -	0...40.00 [xIn]
144	u16	1000	LD0.CSMSQ11.SeqA.c2.instCVal.mag	CMSQ11.I2_INST		Negative sequence current amplitude [c2.instCVal.mag] -	0...40.00 [xIn]
145	u16	1000	LD0.CSMSQ11.SeqA.c3.instCVal.mag	CMSQ11.I3_INST		Zero sequence current amplitude [c3.instCVal.mag] -	0...40.00 [xIn]
146	i16	1	LD0.T1PTTR1.Tmp.mag	T1PTTR1.TEMP		Protected object temperature [mag] -	-100.0...9999.9 [Celsius]
147	i16	1	LD0.T1PTTR1.TmpRl.mag	T1PTTR1.TEMP_RL		Relative temperature [mag] -	0.00...99.99 [Celsius]
148	i16	1	LD0.T1PTTR1.TmpUsed.mag	T1PTTR1.TEMP_AMB		Ambient temperature used in calculations [mag] -	-99...999.99 [Celsius]
149	i16	0.001	LD0.T1PTTR1.TmmsOp.stVal	T1PTTR1.THERMLEV_S T		Estimated time to operate[.stVal] -	0...600000 [ms]
150	i16	0.001	LD0.T1PTTR1.TmmsRecEna.stVal	T1PTTR1.THERMLEV_E ND		Estimated time to deactivate BLK_CLOSE[.stVal] -	0...600000 [ms]
151						(reserved)	0

Table continues on next page

Section 2

Modbus data mappings

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Reg addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range
170						Indication bits mirrored and packed in registers 170 onwards	See 'Indications' table
...							
1989	u16	1000	LD0.RESCMSTA1.AvAmps.mag	RESCMSTA1.DMD_RES	N	Demand value of residual current	0.00 40.00 [xIn] Time structure (see Modbus CPM)
1990							
1991							
1992							
1993							
1994							
1995	u16	1000	LD0.RESCMSTA1.AvAmps.mag	RESCMMXU.Max demand Io	N	Max. demand value for residual current	0.00 40.00 [xIn] Time structure (see Modbus CPM)
1996							
1997							
1998							
1999							
2000							
Phase current demand values (latest values)							
2001	u16	1000	LD0.CMSTA1.AvAmpsA.mag	CMMXU1.I.DMD_A		Demand value of phase A current[.mag] -	0...40.00 [xIn]
2002	u16	1000	LD0.CMSTA1.AvAmpsB.mag	CMMXU1.I.DMD_B		Demand value of phase B current[.mag] -	0...40.00 [xIn]
2003	u16	1000	LD0.CMSTA1.AvAmpsC.mag	CMMXU1.I.DMD_C		Demand value of phase C current[.mag] -	0...40.00 [xIn]
2004							Time structure (see Modbus CPM)
2005							
2006							
2007							
2008							
Maximum phase current demand values							
2009	u16	1000	LD0.CMSTA1.MaxAmpsA.mag	CMMXU1.Max demand IL1		Maximum demand value for phase A[.mag] -	0...40.00 [xIn] Time structure (see Modbus CPM)
2010			Time structure			Update time of phase A max value -reg 1	
2011						Update time of phase A max value -reg 2	
2012						Update time of phase A max value -reg 3	
2013						Update time of phase A max value -reg 4	
2014						Update time of phase A max value -reg 5	
2015	u16	1000	LD0.CMSTA1.MaxAmpsB.mag	CMMXU1.Max demand IL2		Maximum demand value for phase B[.mag] -	0...40.00 [xIn] Time structure (see Modbus CPM)
2016			Time structure			Update time of phase A max value -reg 1	
2017						Update time of phase A max value -reg 2	
2018						Update time of phase A max value -reg 3	

Table continues on next page

Reg addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range
2019						Update time of phase A max value -reg 4	
2020						Update time of phase A max value -reg 5	
2021	u16	1000	LD0.CMSTA1.MaxAmpsC.mag	CMMXU1.Max demand IL3		Maximum demand value for phase C[.mag] -	0...40.00 [xIn]
2022			Time structure	-		Update time of phase A max value -reg 1	Time structure (see Modbus CPM)
2023						Update time of phase A max value -reg 2	
2024						Update time of phase A max value -reg 3	
2025						Update time of phase A max value -reg 4	
2026						Update time of phase A max value -reg 5	
Counters - Circuit breaker, autorecloser							
2027	u16	1	CTRL.CBCSW11.OpCntRs.stVal	CBXCBR1.Operation counter		Circuit breaker operation counter[.stVal] -	0...65535
2028						(reserved)	0
2029						(reserved)	0
2030						(reserved)	0
2031	u16	1	LD0.DARREC1.OpCnt1.stVal	DARREC1.CNT_SHOT1		Auto recloser operation counter (1st shot) [stVal] -	0...65535
2032	u16	1	LD0.DARREC1.OpCnt2.stVal	DARREC1.CNT_SHOT2		Autorecloser operation counter (2nd shot) [stVal] -	0...65535
2033	u16	1	LD0.DARREC1.OpCnt3.stVal	DARREC1.CNT_SHOT3		Autorecloser operation counter (3rd shot) [stVal] -	0...65535
2034	u16	1	LD0.DARREC1.OpCnt4.stVal	DARREC1.CNT_SHOT4		Autorecloser operation counter (4th shot) [stVal] -	0...65535
2035	u16	1	LD0.DARREC1.OpCnt5.stVal	DARREC1.CNT_SHOT5		Autorecloser operation counter (5th shot) [stVal] -	0...65535
2036	u16	1	LD0.DARREC1.FrqOpCnt.stVal	DARREC1.FRQ_OPR_CN T		Autorecloser frequent operation counter[.stVal] -	0...65535
2037						(reserved)	0
...							
2047						(reserved)	0
Diagnostics							
2050	u16	1	LD0.LPHD1.PhyHealth1.stVal	Warning		Physical device - Warning[.stVal] -	See documentation
2051	u16	1	LD0.LPHD1.PhyHealth2.stVal	Internal Fault		Physical device - Internal Fault[.stVal] -	See documentation
2052	u16	1	DR.RDRE1.FltNum.stVal			Disturbance recorder - Number of recordings[.stVal] -	0...N
2053	u16	1	DR.RDRE1.MemUsed.stVal			Disturbance recorder - Rec. memory used[.stVal] -	0...100 [%]
2054	u16	1	LD0.LPHD1.NumPwrUp.stVal			Physical device - Number of Power ups[.stVal] -	0...65535
2055	u16	1	LD0.LPHD1.WrmStr.stVal			Physical device - Number of Warm starts[.stVal] -	0...65535
2056	u16	1	LD0.LPHD1.WacTrg.stVal			Physical device - Number of watchdog device resets detected[.stVal] -	0...65535
2057	u16	1	LD0.LPHD1.NumCmpChg.stVal			Number of composition changes	0...65535
2058						(reserved)	0

Table continues on next page

Reg addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range
2059						(reserved)	0
2070						(reserved)	0
...							
8000						(reserved)	0
Control structure 1							
8001	u16		For information on control structure 1 bit definitions, see Modbus controls table.			Control Struct 1 - Execute register	Control structure (see Modbus CPM)
8002	u16					Control Struct 1 - Password 1	
8003	u16					Control Struct 1 - Password 2	
8004	u16					Control Struct 1 - Control register	
8005	u16					Control Struct 1 - Confirm register	
Control structure 2							
8006	u16		For information on control structure 2 bit definitions, see Modbus controls table.			Control Struct 2 - Execute register	Control structure (see Modbus CPM)
8007	u16					Control Struct 2 - Password 1	
8008	u16					Control Struct 2 - Password 2	
8009	u16					Control Struct 2 - Control register	
8010	u16					Control Struct 2 - Confirm register	
Control structure 3							
8011	u16		For information on control structure 3 bit definitions, see Modbus controls table.			Control Struct 3 - Execute register	Control structure (see Modbus CPM)
8012	u16					Control Struct 3 - Password 1	
8013	u16					Control Struct 3 - Password 2	
8014	u16					Control Struct 3 - Control register	
8015	u16					Control Struct 3 - Confirm register	
Control structure 4							
8016	u16		For information on control structure 4 bit definitions, see Modbus controls table.			Control Struct 4 - Execute register	Control structure (see Modbus CPM)
8017	u16					Control Struct 4 - Password 1	
8018	u16					Control Struct 4 - Password 2	
8019	u16					Control Struct 4 - Control register	
8020	u16					Control Struct 4 - Confirm register	
Control structure 5							
8021	u16		For information on control structure 5 bit definitions, see Modbus controls table.			Control Struct 5 - Execute register	Control structure (see Modbus CPM)
8022	u16					Control Struct 5 - Password 1	
8023	u16					Control Struct 5 - Password 2	
8024	u16					Control Struct 5 - Control register	
8025	u16					Control Struct 5 - Confirm register	
8026						(reserved)	0

Table continues on next page

Reg addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range
...							
9000						(reserved)	0
Device ID string							
9001						Max length of device ID string may be 128 registers	Device ID string (see Modbus CPM)
9002						(reserved)	0
...							
9128						(reserved)	0
Device real-time clock in local time							
9201	u16					Real-time struct - Control register (0..2)	
9202	u16					Real-time struct - Year (2000..2999)	
9203	u16					Real-time struct - Month (1..12)	
9204	u16					Real-time struct - Day (1..31)	
9205	u16					Real-time struct - Hour (0..23)	
9206	u16					Real-time struct - Minute (0..59)	
9207	u16					Real-time struct - Seconds (0..59)	
9208	u16					Real-time struct - Milliseconds (0..999)	
9209						(reserved)	0
9210						(reserved)	0
Device real-time clock in UTC time							
9211	u16					Real-time struct UTC - Control register (0..2)	
9212	u16					Real-time struct UTC - Year (2000..2999)	
9213	u16					Real-time struct UTC - Month (1..12)	
9214	u16					Real-time struct UTC - Day (1..31)	
9215	u16					Real-time struct UTC - Hour (0..23)	
9216	u16					Real-time struct UTC - Minute (0..59)	
9217	u16					Real-time struct UTC - Seconds (0..59)	
9218	u16					Real-time struct UTC - Milliseconds (0..999)	
9219						(reserved)	0
9220						(reserved)	0
Timestamp of last device reset							
9221	u16					Reset time struct - Year (2000..2999)	
9222	u16					Reset time struct - Month (1..12)	
9223	u16					Reset time struct - Day (1..31)	
9224	u16					Reset time struct - Hour (0..23)	
9225	u16					Reset time struct - Minute (0..59)	
9226	u16					Reset time struct - Seconds (0..59)	
9227	u16					Reset time struct - Milliseconds (0..999)	
9228	u16					Reset time struct - Reason	1 = Cold reset

Table continues on next page

Reg addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range
9229						(reserved)	2 = Watchdog reset 4 = Warm reset
9230						(reserved)	0
Active parameter setting group							
9231	u16					Setting group in use	1...6
9232						(reserved)	0
...							
9249						(reserved)	0
Event record structure							
9250	u16	0	Event read selection			Number of events records in multiple event reading	1...10
9251	i16	0				Event read operation selection	-499...3
9252	u16	0	Event record 1 (11 registers)			Event record struct - Sequence number	Event record structure (see Modbus CPM)
9253	u16	0				Event record struct - Unread records left	
9254	u16	0				Event record struct - TimeStamp (Year, Month)	
9255	u16	0				Event record struct - TimeStamp (Day, Hour)	
9256	u16	0				Event record struct - TimeStamp (Min, Sec)	
9257	u16	0				Event record struct - TimeStamp (Milliseconds)	
9258	u16	0				Event record struct - Event identification	
9259	u16	0				Event record struct - Data object ID 1	
9260	u16	0				Event record struct - Data object ID 2	
9261	u16	0				Event record struct - Data value	
9262	u16	0				Event record struct - Data value	
9263			Event record 2 (11 registers)			Event record structure	Event record structure (see Modbus CPM)
...							
9273							
9274			Event record 3 (11 registers)			Event record structure	Event record structure (see Modbus CPM)
...							
9284							
9285			Event record 4 (11 registers)			Event record structure	Event record structure (see Modbus CPM)
...							
9295							
9296			Event record 5 (11 registers)			Event record structure	Event record structure (see Modbus CPM)
...							
9306							
9307			Event record 6 (11 registers)			Event record structure	Event record structure (see Modbus CPM)
...							
9317							
9318			Event record 7 (11 registers)			Event record structure	Event record structure (see Modbus CPM)
...							
9328							

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Section 2

Modbus data mappings

1MRS757463 A

Reg addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range
9426	u16	1000	LD0.FLTMSTA1.AmpsA.mag		Y	Phase A current at moment of trip	0.00 50.00 [xIn]
9427	u16	1000	LD0.FLTMSTA1.AmpsB.mag		Y	Phase B current at moment of trip	0.00 50.00 [xIn]
9428	u16	1000	LD0.FLTMSTA1.AmpsC.mag		Y	Phase C current at moment of trip	0.00 50.00 [xIn]
9429	u16	1000	LD0.FLTMSTA1.AmpsN.mag		Y	Residual current at moment of trip	0.00 50.00 [xIn]
9430	u16	1000	LD0.FLTMSTA1.AmpsNCic.mag		Y	Residual C1c current at moment of trip	0.00 50.00 [xIn]
9431	u16	1000	LD0.FLTMSTA1.AmpsPsSeq.mag		Y	Positive sequence current at moment of trip	0.00 50.00 [xIn]
9432	u16	1000	LD0.FLTMSTA1.AmpsNgSeq.mag		Y	Negative sequence current at moment of trip	0.00 50.00 [xIn]
9433	u16	1000	LD0.FLTMSTA1.VoltsN.mag		Y	Residual voltage at moment of trip	0..4.00 [xUn]
9434	u16	100	LD0.FLTMSTA1.MaxTmpRI.mag		Y	Max relative temperature	0.00 99.99 [deg Celsius]
9435	u16	100	LD0.FLTMSTA1.PDNS1MxRat.mag		Y	PDNSPTOC1 ratio I2/I1	0.00...999.99 [%]
9436	i16	10	LD0.FLTMSTA1.DifNAngN.mag		Y	Angle residual voltage - residual current	-180.00...180.00 [degrees]
9437	i16	10	LD0.FLTMSTA1.DifCAngAB.mag		Y	Angle phase A to phase B voltage - phase C current	-180.00...180.00 [degrees]

Table 3: Indications

Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range
2720	170.00	CTRL.LLN0.Loc.stVal	-	Y	Local/Remote state - mom	0 = Remote, 1 = Local (or Off)
2721	170.01				(reserved)	0
2722	170.02	DR.RDRE1.RcdMade.stVal	-		Disturbance recorder file ready	1=DR file captured
2723	170.03	DR.RDRE1.RcdMade.stVal			Disturbance recorder file ready - MCD	
2724	170.04	LD0.DARREC1.AROn.stVal	DARREC1.AR_ON		Autorecloser state	0=AR Off, 1=AR On
2725	170.05				(reserved)	0
2726	170.06				(reserved)	0
2727	170.07				(reserved)	0
2728	170.08				(reserved)	0
2729	170.09				(reserved)	0
...	...					
2735	170.15				(reserved)	0
Global conditioning						
2736	171.00	LD0.LEDPTRC1.Str.general	-	Y	Start (.general)- mom	1=Start (LEDPTRC)
2737	171.01	LD0.LEDPTRC1.Str.general			Start (.general) - MCD	
2738	171.02	LD0.LEDPTRC1.Op.general	-	Y	Operate (.general) - mom	1=Operate (LEDPTRC)
2739	171.03	LD0.LEDPTRC1.Op.general			Operate(.general) - MCD	
Protection trip conditioning (1)						
2740	171.04	LD0.TRPPTRC1.Op.general	-	Y	Input signal (.general)- mom	1=Input signal ON
2741	171.05	LD0.TRPPTRC1.Op.general			Input signal (.general) - MCD	
2742	171.06	LD0.TRPPTRC1.Tr.general	-	Y	Trip output signal (.general) - mom	1=Trip output signal ON
2743	171.07	LD0.TRPPTRC1.Tr.general			Trip output signal (.general) - MCD	
Protection trip conditioning (2)						
2744	171.08	LD0.TRPPTRC2.Op.general	-	Y	Input signal (.general) - mom	1=Input signal ON
2745	171.09	LD0.TRPPTRC2.Op.general			Input signal (.general) - MCD	
2746	171.10	LD0.TRPPTRC2.Tr.general	-	Y	Trip output signal [.general] - mom	1=Trip output signal ON
2747	171.11	LD0.TRPPTRC2.Tr.general			Trip output signal [.general] - MCD	
2748	171.12				(reserved)	0
2749	171.13				(reserved)	0
2750	171.14				(reserved)	0
2751	171.15				(reserved)	0
Phase current value limit supervision						
2752	172.00	LD0.CMMXU1.HiAlm.stVal	CMMXU1.HIGH_ALARM	Y	High alarm[stVal] - mom	1=High alarm
2753	172.01	LD0.CMMXU1.HiAlm.stVal			High alarm[stVal] - MCD	
2754	172.02	LD0.CMMXU1.HiWrm.stVal	CMMXU1.HIGH_WARN	Y	High warning[stVal] - mom	1=High warning
2755	172.03	LD0.CMMXU1.HiWrm.stVal			High warning[stVal] - MCD	
2756	172.04	LD0.CMMXU1.LoWrm.stVal	CMMXU1.LOW_WARN	Y	Low warning[stVal] - mom	1=Low warning
2757	172.05	LD0.CMMXU1.LoWrm.stVal			Low warning[stVal] - MCD	
Table continues on next page						

Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range
2758	172.06	LD0.CMMXU1.LoAlm.stVal	CMMXU1.LOW_ALARM	Y	Low alarm[.stVal] - mom	1=Low alarm
2759	172.07	LD0.CMMXU1.LoAlm.stVal			Low alarm[.stVal] - MCD	
Residual current value limit supervision						
2760	172.08	LD0.RESCMMXU1.HiAlm.stVal	RESCMMXU1.HIGH_ALARM	Y	High alarm[.stVal] - mom	1= High alarm
2761	172.09	LD0.RESCMMXU1.HiAlm.stVal			High alarm[.stVal] - MCD	
2762	172.10	LD0.RESCMMXU1.HiWrm.stVal	RESCMMXU1.HIGH_WARN	Y	High warning[.stVal] - mom	1=High warning
2763	172.11	LD0.RESCMMXU1.HiWrm.stVal			High warning[.stVal] - MCD	
Residual voltage value limit supervision						
2764	172.12	LD0.RESVMMXU1.HiAlm.stVal	RESVMMXU1.HIGH_ALARM	Y	High alarm[.stVal] - mom	1=High alarm
2765	172.13	LD0.RESVMMXU1.HiAlm.stVal			High alarm[.stVal] - MCD	
2766	172.14	LD0.RESVMMXU1.HiWrm.stVal	RESVMMXU1.HIGH_WARN	Y	High warning[.stVal] - mom	1=High warning
2767	172.15	LD0.RESVMMXU1.HiWrm.stVal			High warning[.stVal] - MCD	
Indication LED states						
2768	173.00	LD0.LEDGGIO1.SPCSO1.stVal	-	Y	LED 1[.stVal] - mom	1=LED ON
2769	173.01	LD0.LEDGGIO1.SPCSO2.stVal	-	Y	LED 2[.stVal] - mom	1=LED ON
2770	173.02	LD0.LEDGGIO1.SPCSO3.stVal	-	Y	LED 3[.stVal] - mom	1=LED ON
2771	173.03	LD0.LEDGGIO1.SPCSO4.stVal	-	Y	LED 4[.stVal] - mom	1=LED ON
2772	173.04	LD0.LEDGGIO1.SPCSO5.stVal	-	Y	LED 5[.stVal] - mom	1=LED ON
2773	173.05	LD0.LEDGGIO1.SPCSO6.stVal	-	Y	LED 6[.stVal] - mom	1=LED ON
2774	173.06	LD0.LEDGGIO1.SPCSO7.stVal	-	Y	LED 7[.stVal] - mom	1=LED ON
2775	173.07	LD0.LEDGGIO1.SPCSO8.stVal	-	Y	LED 8[.stVal] - mom	1=LED ON
2776	173.08				(reserved)	0
2777	173.09				(reserved)	0
2778	173.10				(reserved)	0
2779	173.11				(reserved)	0
Trip circuit supervision (1)						
2780	173.12	LD0.TCSCS1.CirAlm.stVal	TCSCS1.ALARM	Y	Alarm[.stVal] - mom	1=TCSCS1 Alarm
2781	173.13	LD0.TCSCS1.CirAlm.stVal			Alarm[.stVal] - MCD	
Trip circuit supervision (2)						
2782	173.14	LD0.TCSCS2.CirAlm.stVal	TCSCS2.ALARM	Y	Alarm[.stVal] - mom	1=TCSCS2 Alarm
2783	173.15	LD0.TCSCS2.CirAlm.stVal			Alarm[.stVal] - MCD	
Circuit breaker position						
2804	175.04	CTRL.CBCSW1.Pos.stVal.Close	CBXCBR1.POSITION	Y	close mom	1=Close
2805	175.05	CTRL.CBCSW1.Pos.stVal.Open	-	Y	open mom	1=Open
2806	175.06	CTRL.CBCSW1.Pos.stVal.Fault	-		error position	1=Faulty or Intermediate
2807	175.07				(reserved)	0
2808	175.08				(reserved)	0
2809	175.09				(reserved)	0
2810	175.10				(reserved)	0

Table continues on next page

Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range
2811	175.11				(reserved)	0
2812	175.12				(reserved)	0
2813	175.13				(reserved)	0
2814	175.14				(reserved)	0
2815	175.15				(reserved)	0
Circuit breaker position + momentary change detect						
2816	176.00	CTRL.CBCSW11.Pos.stVal	CBXCBR1.POSITION	Y	close mom	1=Close
2817	176.01	CTRL.CBCSW11.Pos.stVal			close MCD	
2818	176.02	CTRL.CBCSW11.Pos.stVal	-	Y	open mom	1=Open
2819	176.03	CTRL.CBCSW11.Pos.stVal			open MCD	
2820	176.04				(reserved)	0
2821	176.05				(reserved)	0
Circuit breaker selected for control operation						
2822	176.06	CTRL.CBCSW11.Pos.stSeld	CBXCBR1.SELECTED	Y	Selected (.stSeld) - mom	1=Selected
2823	176.07	CTRL.CBCSW11.Pos.stSeld			Selected [.stSeld] - MCD	
Circuit breaker control enable signals						
2824	176.08	CTRL.CBCILO1.EnaOpn.stVal	CBXCBR1.ENA_OPEN	Y	Open enabled (.stVal) - mom	1=Open enabled
2825	176.09	CTRL.CBCILO1.EnaCls.stVal	CBXCBR1.ENA_CLOSE	Y	Close enabled (.stVal) - mom	1=Close enabled
2826	176.10	LD0.CBCILO1.ItlByPss.stVal	CBXCBR1.ITL_BYPASS		Interlocking bypass [.stVal] - mom	1=Bypassed
Circuit breaker failure detection and -protection						
2827	176.11				(reserved)	0
2828	176.12	CTRL.CCBRBRF1.Str.general	CCBRBRF1.CB_FAULT_AL	Y	Start, timer running[.general] - mom	1=Start, timer running
2829	176.13	CTRL.CCBRBRF1.Str.general			Start, timer running[.general] - MCD	
2830	176.14	CTRL.CCBRBRF1.OpEx.general	CCBRBRF1.TRBUI	Y	Failure, external trip [.general] - mom	1=Failure, external trip
2831	176.15	CTRL.CCBRBRF1.OpEx.general			Failure, external trip [.general] - MCD	
2832	177.00	CTRL.CCBRBRF1.Opln.general	CCBRBRF1.TRRET	Y	Operate, internal retrip (.general) - mom	1=Operate, internal re-trip
2833	177.01	CTRL.CCBRBRF1.Opln.general			Operate, internal retrip (.general) - MCD	
2834	177.02				(reserved)	0
2835	177.03				(reserved)	0
2836	177.04	CTRL.CBXCBR1.BlkOpn.stVal	CBXCBR1.BLK_OPEN	Y	Open blocked [.stVal] - mom	1 = Open blocked
2837	177.05	CTRL.CBXCBR1.BlkOpn.stVal			Open blocked [.stVal] - MCD	
2838	177.06	CTRL.CBXCBR1.BlkCls.stVal	CBXCBR1.BLK_CLOSE	Y	Close blocked [.stVal] - mom	1 = Close blocked
2839	177.07	CTRL.CBXCBR1.BlkCls.stVal			Close blocked [.stVal] - MCD	
Phase overcurrent protection signals (3 stages)						
2880	180.00	LD0.PHLPTOC1.Str.general	PHLPTOC1.START	Y	Low stage Start[.general] - mom	1=Low stage start
2881	180.01	LD0.PHLPTOC1.Str.general			Low stage Start[.general] - MCD	
2882	180.02	LD0.PHLPTOC1.Str.phsA	-	Y	Low stage Start[.phsA] - mom	1=Low stage phsA start
2883	180.03	LD0.PHLPTOC1.Str.phsA			Low stage Start[.phsA] - MCD	
2884	180.04	LD0.PHLPTOC1.Str.phsB	-	Y	Low stage Start[.phsB] - mom	1=Low stage phsB start

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Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range
2885	180.05	LD0.PHLPTOC1.Str.phsB			Low stage Start[.phsB] - MCD	
2886	180.06	LD0.PHLPTOC1.Str.phsC	-	Y	Low stage Start[.phsC] - mom	1=Low stage phsC start
2887	180.07	LD0.PHLPTOC1.Str.phsC			Low stage Start[.phsC] - MCD	
2888	180.08	LD0.PHLPTOC1.Op.general	PHLPTOC1.OPERATE	Y	Low stage Operate[.general] - mom	1=Low stage operate
2889	180.09	LD0.PHLPTOC1.Op.general			Low stage Operate[.general] - MCD	
2890	180.10	LD0.PHIPTOC1.Str.general	PHIPTOC1.START	Y	High(1) stage Start[.general] - mom	1=High(1) stage start
2891	180.11	LD0.PHIPTOC1.Str.general			High(1) stage Start[.general] - MCD	
2892	180.12	LD0.PHIPTOC1.Str.phsA	-	Y	High(1) stage Start[.phsA] - mom	1=High(1) stage phsA start
2893	180.13	LD0.PHIPTOC1.Str.phsA			High(1) stage Start[.phsA] - MCD	
2894	180.14	LD0.PHIPTOC1.Str.phsB	-	Y	High(1) stage Start[.phsB] - mom	1=High(1) stage phsB start
2895	180.15	LD0.PHIPTOC1.Str.phsB			High(1) stage Start[.phsB] - MCD	
2896	181.00	LD0.PHIPTOC1.Str.phsC	-	Y	High(1) stage Start[.phsC] - mom	1=High(1) stage phsC start
2897	181.01	LD0.PHIPTOC1.Str.phsC			High(1) stage Start[.phsC] - MCD	
2898	181.02	LD0.PHIPTOC1.Op.general	PHIPTOC1.OPERATE	Y	High(1) stage Operate[.general] - mom	1=High(1) stage operate
2899	181.03	LD0.PHIPTOC1.Op.general			High(1) stage Operate[.general] - MCD	
2900	181.04	LD0.PHIPTOC2.Str.general	PHIPTOC2.START	Y	High(2) stage Start[.general] - mom	1=High(2) stage start
2901	181.05	LD0.PHIPTOC2.Str.general			High(2) stage Start[.general] - MCD	
2902	181.06	LD0.PHIPTOC2.Str.phsA	-	Y	High(2) stage Start[.phsA] - mom	1=High(2) stage phsA start
2903	181.07	LD0.PHIPTOC2.Str.phsA			High(2) stage Start[.phsA] - MCD	
2904	181.08	LD0.PHIPTOC2.Str.phsB	-	Y	High(2) stage Start[.phsB] - mom	1=High(2) stage phsB start
2905	181.09	LD0.PHIPTOC2.Str.phsB			High(2) stage Start[.phsB] - MCD	
2906	181.10	LD0.PHIPTOC2.Str.phsC	-	Y	High(2) stage Start[.phsC] - mom	1=High(2) stage phsC start
2907	181.11	LD0.PHIPTOC2.Str.phsC			High(2) stage Start[.phsC] - MCD	
2908	181.12	LD0.PHIPTOC2.Op.general	PHIPTOC2.OPERATE	Y	High(2) stage Operate[.general] - mom	1=High(2) stage operate
2909	181.13	LD0.PHIPTOC2.Op.general			High(2) stage Operate[.general] - MCD	
Phase overcurrent protection signals (1 stage)						
2910	181.14	LD0.PHIPTOC1.Str.general	PHIPTOC1.START	Y	Instantaneous stage Start[.general] - mom	1=Instantaneous stage start
2911	181.15	LD0.PHIPTOC1.Str.general			Instantaneous stage Start[.general] - MCD	
2912	182.00	LD0.PHIPTOC1.Str.phsA	-	Y	Instantaneous stage Start[.phsA] - mom	1=Inst. stage phsA start
2913	182.01	LD0.PHIPTOC1.Str.phsA			Instantaneous stage Start[.phsA] - MCD	
2914	182.02	LD0.PHIPTOC1.Str.phsB	-	Y	Instantaneous stage Start[.phsB] - mom	1=Inst. stage phsB start
2915	182.03	LD0.PHIPTOC1.Str.phsB			Instantaneous stage Start[.phsB] - MCD	
2916	182.04	LD0.PHIPTOC1.Str.phsC	-	Y	Instantaneous stage Start[.phsC] - mom	1=Inst. stage phsC start
2917	182.05	LD0.PHIPTOC1.Str.phsC			Instantaneous stage Start[.phsC] - MCD	
2918	182.06	LD0.PHIPTOC1.Op.general	PHIPTOC1.OPERATE	Y	Instantaneous stage Operate[.general] - mom	1=Instantaneous stage operate
2919	182.07	LD0.PHIPTOC1.Op.general			Instantaneous stage Operate[.general] - MCD	
Directional earth-fault protection signals (3 stages)						
2920	182.08	LD0.DEFLPTOC1.Str.general	DEFLPTOC1.START	Y	Low(1) stage Start[.general] - mom	1=Low(1) stage start
2921	182.09	LD0.DEFLPTOC1.Str.general			Low(1) stage Start[.general] - MCD	

Table continues on next page

Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range
2922	182.10	LD0.DEFLPTOC1.Op.general	DEFLPTOC1.OPERATE	Y	Low(1) stage Operate[.general] - mom	1=Low(1) stage operate
2923	182.11	LD0.DEFLPTOC1.Op.general			Low(1) stage Operate[.general] - MCD	
2924	182.12	LD0.DEFLPTOC2.Str.general	DEFLPTOC2.START	Y	Low(2) stage Start[.general] - mom	1=Low(2) stage start
2925	182.13	LD0.DEFLPTOC2.Str.general			Low(2) stage Start[.general] - MCD	
2926	182.14	LD0.DEFLPTOC2.Op.general	DEFLPTOC2.OPERATE	Y	Low(2) stage Operate[.general] - mom	1=Low(2) stage operate
2927	182.15	LD0.DEFLPTOC2.Op.general			Low(2) stage Operate[.general] - MCD	
2928	183.00	LD0.DEFHPTOC1.Str.general	DEFHPTOC1.START	Y	High stage Start[.general] - mom	1=High stage start
2929	183.01	LD0.DEFHPTOC1.Str.general			High stage Start[.general] - MCD	
2930	183.02	LD0.DEFHPTOC1.Op.general	DEFHPTOC1.OPERATE	Y	High stage Operate[.general] - mom	1=High stage operate
2931	183.03	LD0.DEFHPTOC1.Op.general			High stage Operate[.general] - MCD	
Non-directional earth-fault and sensitive earth-fault protection signals (4 stages)						
2932	183.04	LD0.EFLPTOC1.Str.general	EFLPTOC1.START	Y	Low(1) stage Start[.general] - mom	1=Low(1) stage start
2933	183.05	LD0.EFLPTOC1.Str.general			Low(1) stage Start[.general] - MCD	
2934	183.06	LD0.EFLPTOC1.Op.general	EFLPTOC1.OPERATE	Y	Low(1) stage Operate[.general] - mom	1=Low(1) stage operate
2935	183.07	LD0.EFLPTOC1.Op.general			Low(1) stage Operate[.general] - MCD	
2936	183.08	LD0.EFLPTOC2.Str.general	EFLPTOC2.START	Y	Low(2) stage Start[.general] - mom	1=Low(2) stage start
2937	183.09	LD0.EFLPTOC2.Str.general			Low(2) stage Start[.general] - MCD	
2938	183.10	LD0.EFLPTOC2.Op.general	EFLPTOC2.OPERATE	Y	Low(2) stage Operate[.general] - mom	1=Low(2) stage operate
2939	183.11	LD0.EFLPTOC2.Op.general			Low(2) stage Operate[.general] - MCD	
2940	183.12	LD0.EFHPTOC1.Str.general	EFHPTOC1.START	Y	High stage Start[.general] - mom	1=High stage start
2941	183.13	LD0.EFHPTOC1.Str.general			High stage Start[.general] - MCD	
2942	183.14	LD0.EFHPTOC1.Op.general	EFHPTOC1.OPERATE	Y	High stage Operate[.general] - mom	1=High stage operate
2943	183.15	LD0.EFHPTOC1.Op.general			High stage Operate[.general] - MCD	
2944	184.00	LD0.EFIPTOC1.Str.general	EFIPTOC1.START	Y	Instantaneous stage Start[.general] - mom	1=Instantaneous stage start
2945	184.01	LD0.EFIPTOC1.Str.general			Instantaneous stage Start[.general] - MCD	
2946	184.02	LD0.EFIPTOC1.Op.general	EFIPTOC1.OPERATE	Y	Instantaneous stage Operate[.general] - mom	1=Instantaneous stage operate
2947	184.03	LD0.EFIPTOC1.Op.general			Instantaneous stage Operate[.general] - MCD	
Transient/intermittent earth-fault protection signals (1 stage)						
2948	184.04	LD0.INTRPTEF1.Str.general	INTRPTEF1.START	Y	Start[.general] - mom	1=Stage start
2949	184.05	LD0.INTRPTEF1.Str.general			Start[.general] - MCD	
2950	184.06	LD0.INTRPTEF1.Op.general	INTRPTEF1.OPERATE	Y	Operate[.general] - mom	1=Stage operate
2951	184.07	LD0.INTRPTEF1.Op.general			Operate[.general] - MCD	
Phase discontinuity protection signals (1 stage)						
2952	184.08	LD0.PDNSPTOC1.Str.general	PDNSPTOC1.START	Y	Start[.general] - mom	1=Stage start
2953	184.09	LD0.PDNSPTOC1.Str.general			Start[.general] - MCD	
2954	184.10	LD0.PDNSPTOC1.Op.general	PDNSPTOC1.OPERATE	Y	Operate[.general] - mom	1=Stage operate
2955	184.11	LD0.PDNSPTOC1.Op.general			Operate[.general] - MCD	
Negative sequence overcurrent protection signals (2 stages)						
2956	184.12	LD0.NSPPTOC1.Str.general	NSPTOC1.START	Y	Stage1 Start[.general] - mom	1=Stage1 start
Table continues on next page						

Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range
2957	184.13	LD0.NSPTOC1.Str.general			Stage1 Start[.general] - MCD	
2958	184.14	LD0.NSPTOC1.Op.general	NSPTOC1.OPERATE	Y	Stage1 Operate[.general] - mom	1=Stage1 operate
2959	184.15	LD0.NSPTOC1.Op.general			Stage1 Operate[.general] - MCD	
2960	185.00	LD0.NSPTOC2.Str.general	NSPTOC2.START	Y	Stage2 Start[.general] - mom	1=Stage2 start
2961	185.01	LD0.NSPTOC2.Str.general			Stage2 Start[.general] - MCD	
2962	185.02	LD0.NSPTOC2.Op.general	NSPTOC2.OPERATE	Y	Stage2 Operate[.general] - mom	1=Stage2 operate
2963	185.03	LD0.NSPTOC2.Op.general			Stage2 Operate[.general] - MCD	
Three-phase inrush detection signals						
2964	185.04	LD0.INRPHAR1.Str.general	INRPHAR1.BLK2H	Y	Start[.general] - mom	1=Start general
2965	185.05	LD0.INRPHAR1.Str.general			Start[.general] - MCD	
2966	185.06	LD0.INRPHAR1.Str.phsA	-	Y	Start[.phsA] - mom	1=Start phsA
2967	185.07	LD0.INRPHAR1.Str.phsA			Start[.phsA] - MCD	
2968	185.08	LD0.INRPHAR1.Str.phsB	-	Y	Start[.phsB] - mom	1=Start phsB
2969	185.09	LD0.INRPHAR1.Str.phsB			Start[.phsB] - MCD	
2970	185.10	LD0.INRPHAR1.Str.phsC	-	Y	Start[.phsC] - mom	1=Start phsC
2971	185.11	LD0.INRPHAR1.Str.phsC			Start[.phsC] - MCD	
Thermal overload protection signals (1 stage)						
2972	185.12	LD0.T1PTTR1.Str.general	T1PTTR1.START	Y	Start[.general] - mom	1=Start
2973	185.13	LD0.T1PTTR1.Str.general			Start[.general] - MCD	
2974	185.14	LD0.T1PTTR1.AlmThm.general	T1PTTR1.ALARM	Y	Thermal Alarm[.general] - mom	1=Thermal alarm
2975	185.15	LD0.T1PTTR1.AlmThm.general			Thermal Alarm[.general] - MCD	
2976	186.00	LD0.T1PTTR1.Op.general	T1PTTR1.OPERATE	Y	Operate[.general] - mom	1=Operate
2977	186.01	LD0.T1PTTR1.Op.general			Operate[.general] - MCD	
Autorecloser detailed signals, optional						
3040	190.00	LD0.DARREC1.PrgRec.stVal	DARREC1.INPRO	Y	AR in progress [.stVal] - mom	1=In progress
3041	190.01	LD0.DARREC1.PrgRec.stVal			AR in progress [.stVal] - MCD	
3042	190.02	LD0.DARREC1.PrgRec1.stVal	DARREC1.INPRO_1	Y	AR in progress 1st reclose[.stVal] - mom	1=In progress
3043	190.03	LD0.DARREC1.PrgRec1.stVal			AR in progress 1st reclose[.stVal] - MCD	
3044	190.04	LD0.DARREC1.PrgRec2.stVal	DARREC1.INPRO_2	Y	AR in progress 2nd reclose[.stVal] - mom	1=In progress
3045	190.05	LD0.DARREC1.PrgRec2.stVal			AR in progress 2nd reclose[.stVal] - MCD	
3046	190.06	LD0.DARREC1.PrgRec3.stVal	DARREC1.INPRO_3	Y	AR in progress 3rd reclose[.stVal] - mom	1=In progress
3047	190.07	LD0.DARREC1.PrgRec3.stVal			AR in progress 3rd reclose[.stVal] - MCD	
3048	190.08	LD0.DARREC1.PrgRec4.stVal	DARREC1.INPRO_4	Y	AR in progress 4th reclose[.stVal] - mom	1=In progress
3049	190.09	LD0.DARREC1.PrgRec4.stVal			AR in progress 4th reclose[.stVal] - MCD	
3050	190.10	LD0.DARREC1.PrgRec5.stVal	DARREC1.INPRO_5	Y	AR in progress 5th reclose[.stVal] - mom	1=In progress
3051	190.11	LD0.DARREC1.PrgRec5.stVal			AR in progress 5th reclose[.stVal] - MCD	
3052	190.12	LD0.DARREC1.SucRec.stVal	DARREC1.SUC_RECL	Y	Successful reclose status[.stVal] - mom	1=Successful reclose
3053	190.13	LD0.DARREC1.SucRec.stVal			Successful reclose status[.stVal] - MCD	
3054	190.14	LD0.DARREC1.UnsRec.stVal	DARREC1.UNSUC_RECL	Y	Unsuccessful reclose status[.stVal] - mom	1=Unsuccessful reclose

Table continues on next page

Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range
3055	190.15	LD0.DARREC1.UnsRec.stVal			Unsuccessful reclose status[.stVal] - MCD	
3056	191.00	LD0.DARREC1.InlnhRec.stVal	-	Y	Inhibit reclose (status)[.stVal] - mom	1=Reclose inhibit
3057	191.01	LD0.DARREC1.InlnhRec.stVal			Inhibit reclose (status)[.stVal] - MCD	
3058	191.02	LD0.DARREC1.InBlkThrm.stVal	-	Y	Thermal block (status)[.stVal] - mom	1=Thermal block
3059	191.03	LD0.DARREC1.InBlkThrm.stVal			Thermal block (status)[.stVal] - MCD	
3060	191.04	LD0.DARREC1.LO.stVal	DARREC1.LOCKED	Y	Lockout status[.stVal] - mom	1=Lockout
3061	191.05	LD0.DARREC1.LO.stVal			Lockout status[.stVal] - MCD	
3062	191.06	LD0.DARREC1.RdyRec.stVal	DARREC1.READY	Y	Ready reclose status[.stVal] - mom	1=Reclose ready
3063	191.07	LD0.DARREC1.RdyRec.stVal			Ready reclose status[.stVal] - MCD	
3064	191.08	LD0.DARREC1.ActRec.stVal	DAAREC1.ACTIVE	Y	Active reclose status[.stVal] - mom	1=Reclose active
3065	191.09	LD0.DARREC1.ActRec.stVal			Active reclose status[.stVal] - MCD	
3066	191.10	LD0.DARREC1.PrgDsr.stVal	DARREC1.DISCR_INPRO	Y	Discrimination time in progress[.stVal] - mom	1=Discrimination time in progress
3067	191.11	LD0.DARREC1.PrgDsr.stVal			Discrimination time in progress[.stVal] - MCD	
3068	191.12	LD0.DARREC1.PrgCutOut.stVal	DARREC1.CUTOOUT_INPRO	Y	Cutout time in progress[.stVal] - mom	1=Cutout time in progress
3069	191.13	LD0.DARREC1.PrgCutOut.stVal			Cutout time in progress[.stVal] - MCD	
3070	191.14	LD0.DARREC1.FrqOpAlm.stVal	DARREC1.FRQ_OP_ALM	Y	Frequent operation counter alarm[.stVal] - mom	1=Frequent operation alarm
3071	191.15	LD0.DARREC1.FrqOpAlm.stVal			Frequent operation counter alarm[.stVal] - MCD	
3072	192.00	LD0.DARREC1.RclTmStr.stVal	-	Y	Reclaim time started[.stVal] - mom	1=Reclaim time started
3073	192.01	LD0.DARREC1.RclTmStr.stVal			Reclaim time started[.stVal] - MCD	
3074	192.02	LD0.DARREC1.ProOrd.stVal	-	Y	Protection coordination[.stVal] - mom	1=Protection coordination
3075	192.03	LD0.DARREC1.ProOrd.stVal			Protection coordination[.stVal] - MCD	
3076	192.04	LD0.DARREC1.CBManCls.stVal	DARREC1.MAN_CB_CL	Y	CB manually closed[.stVal] - mom	1=CB manually closed
3077	192.05	LD0.DARREC1.CBManCls.stVal			CB manually closed[.stVal] - MCD	
3078	192.06	LD0.DARREC1.Op.general	DARREC1.CLOSE_CB	Y	Operate (close command to XCBR)[.general] - mom	1=Close command to CB
3079	192.07	LD0.DARREC1.Op.general			Operate (close command to XCBR)[.general] - MCD	
3080	192.08	LD0.DARREC1.OpOpn.general	DARREC1.OPEN_CB	Y	Operate (open command to XCBR)[.general] - mom	1=Open command to CB
3081	192.09	LD0.DARREC1.OpOpn.general			Operate (open command to XCBR)[.general] - MCD	
3082	192.10	LD0.DARREC1.UnsCBCls.stVal	DARREC1.UNSUC_CB	Y	Unsuccessful CB closing status[.stVal] - mom	1=Unsuccessful CB closing
3083	192.11	LD0.DARREC1.UnsCBCls.stVal			Unsuccessful CB closing status[.stVal] - MCD	
3084	192.12	LD0.DARREC1.WtMstr.stVal	DARREC1.CMD_WAIT	Y	Master signal to follower[.stVal] - mom	1=Master signal to follower
3085	192.13	LD0.DARREC1.WtMstr.stVal			Master signal to follower[.stVal] - MCD	
3086	192.14				(reserved)	0
3087	192.15				(reserved)	0
Residual overvoltage protection (3 stages)						
3168	198.00	LD0.ROVPTOV1.Str.general	ROVPTOV1.START	Y	Stage 1 Start[.general] - mom	1=Stage1 start
3169	198.01	LD0.ROVPTOV1.Str.general			LD0.ROVPTOV1.Str.general	
3170	198.02	D0.ROVPTOV1.Op.general	ROVPTOV1.OPERATE	Y	Stage 1 Operate[.general] - mom	1=Stage1 operate
3171	198.03	LD0.ROVPTOV1.Op.general			Stage 1 Operate[.general] - MCD	
3172	198.04	LD0.ROVPTOV2.Str.general	ROVPTOV2.START	Y	Stage 2 Start[.general] - mom	1=Stage2 start

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Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range
3173	198.05	LD0.ROVPTOV2.Str.general			Stage 2 Start[.general] - MCD	
3174	198.06	LD0.ROVPTOV2.Op.general	ROVPTOV2.OPERATE	Y	Stage 2 Operate[.general] - mom	1=Stage2 operate
3175	198.07	LD0.ROVPTOV2.Op.general			Stage 2 Operate[.general] - MCD	
3176	198.08	LD0.ROVPTOV3.Str.general	ROVPTOV3.START	Y	Stage 3 Start[.general] - mom	1=Stage3 start
3177	198.09	LD0.ROVPTOV3.Str.general			Stage 3 Start[.general] - MCD	
3178	198.10	LD0.ROVPTOV3.Op.general	ROVPTOV3.OPERATE	Y	Stage 3 Operate[.general] - mom	1=Stage3 operate
3179	198.11	LD0.ROVPTOV3.Op.general			Stage 3 Operate[.general] - MCD	
Physical I/O signals						
Physical I/O signal states (BIO-card X130)						
3184	199.00	199.00 LD0.XGGIO130.Ind1.stVal	-	Y	X130-Input 1[.stVal] - mom	1=ON, 0=OFF
3185	199.01	LD0.XGGIO130.Ind1.stVal			X130-Input 1[.stVal] - MCD	
3186	199.02	LD0.XGGIO130.Ind2.stVal	-	Y	X130-Input 2[.stVal] - mom	1=ON, 0=OFF
3187	199.03	LD0.XGGIO130.Ind2.stVal			X130-Input 2[.stVal] - MCD	
3188	199.04	LD0.XGGIO130.Ind3.stVal	-	Y	X130-Input 3[.stVal] - mom	1=ON, 0=OFF
3189	199.05	LD0.XGGIO130.Ind3.stVal			X130-Input 3[.stVal] - MCD	
3190	199.06	199.06 LD0.XGGIO130.Ind4.stVal	-	Y	X130-Input 4[.stVal] - mom	1=ON, 0=OFF
3191	199.07	LD0.XGGIO130.Ind4.stVal			X130-Input 4[.stVal] - MCD	
3192	199.08	LD0.XGGIO130.Ind5.stVal	-	Y	X130-Input 5[.stVal] - mom	1=ON, 0=OFF
3193	199.09	LD0.XGGIO130.Ind5.stVal			X130-Input 5[.stVal] - MCD	
3194	199.10	LD0.XGGIO130.Ind6.stVal	-	Y	X130-Input 6[.stVal] - mom	1=ON, 0=OFF
3195	199.11	199.11 LD0.XGGIO130.Ind6.stVal			X130-Input 6[.stVal] - MCD	
3196	199.12				(reserved)	0
3197	199.13				(reserved)	0
3198	199.14				(reserved)	0
3199	199.15				(reserved)	0
Physical I/O signal states (AIM-card X120)						
3200	200.00	LD0.XGGIO120.Ind1.stVal	-	Y	X120-Input 1[.stVal] - mom	1=ON, 0=OFF
3201	200.01	LD0.XGGIO120.Ind1.stVal			X120-Input 1[.stVal] - MCD	
3202	200.02	LD0.XGGIO120.Ind2.stVal	-	Y	X120-Input 2[.stVal] - mom	1=ON, 0=OFF
3203	200.03	LD0.XGGIO120.Ind2.stVal			X120-Input 2[.stVal] - MCD	
3204	200.04	LD0.XGGIO120.Ind3.stVal	-	Y	X120-Input 3[.stVal] - mom	1=ON, 0=OFF
3205	200.05	LD0.XGGIO120.Ind3.stVal			X120-Input 3[.stVal] - MCD	
3206	200.06	LD0.XGGIO120.Ind4.stVal	-	Y	X120-Input 4[.stVal] - mom	1=ON, 0=OFF
3207	200.07	LD0.XGGIO120.Ind4.stVal			X120-Input 4[.stVal] - MCD	
3208	200.08				(reserved)	0
3209	200.09				(reserved)	0
3210	200.10				(reserved)	0
3211	200.11				(reserved)	0
3212	200.12				(reserved)	0

Table continues on next page

Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range
3213	200.13				(reserved)	0
3214	200.14				(reserved)	0
3215	200.15				(reserved)	0
Physical I/O signal states (PSM-card X100)						
3248	203.00	LD0.XGGIO100.SPCSO1.stVal	-	Y	X100-Output 1[.stVal] - mom	1=ON, 0=OFF
3249	203.01	LD0.XGGIO100.SPCSO1.stVal			X100-Output 1[.stVal] - MCD	
3250	203.02	LD0.XGGIO100.SPCSO2.stVal	-	Y	X100-Output 2[.stVal] - mom	1=ON, 0=OFF
3251	203.03	LD0.XGGIO100.SPCSO2.stVal			X100-Output 2[.stVal] - MCD	
3252	203.04	LD0.XGGIO100.SPCSO3.stVal	-	Y	X100-Output 3[.stVal] - mom	1=ON, 0=OFF
3253	203.05	LD0.XGGIO100.SPCSO3.stVal			X100-Output 3[.stVal] - MCD	
3254	203.06	LD0.XGGIO100.SPCSO4.stVal	-	Y	X100-Output 4[.stVal] - mom	1=ON, 0=OFF
3255	203.07	LD0.XGGIO100.SPCSO4.stVal			X100-Output 4[.stVal] - MCD	
3256	203.08	LD0.XGGIO100.SPCSO5.stVal	-	Y	X100-Output 5[.stVal] - mom	1=ON, 0=OFF
3257	203.09	LD0.XGGIO100.SPCSO5.stVal			X100-Output 5[.stVal] - MCD	
3258	203.10	LD0.XGGIO100.SPCSO6.stVal	-	Y	X100-Output 6[.stVal] - mom	1=ON, 0=OFF
3259	203.11	LD0.XGGIO100.SPCSO6.stVal			X100-Output 6[.stVal] - MCD	

Table 4: Controls

Ox addr	Ctrl struct	Ctrl bit	Mode	Identification	Description
2052	1	4	Uns	CTRL.CBCSW11.Pos.ctiVal	CBXCBBR1 - Switch, general - Direct open
2053	1	5	Uns	CTRL.CBCSW11.Pos.ctiVal	CBXCBBR1 - Switch, general - Direct close
2060	2	0	Uns	LD0.LLN0.LEDRs1.ctiVal	General - Indications and LEDs - 1=Activate
2061	2	1	Uns	LD0.LLN0.LEDRs2.ctiVal	General - Alarm LEDs - 1=Activate
2062	2	2	Uns	LD0.LLN0.RecRs.ctiVal	General - All data - 1=Activate
2063	2	3	Uns	LD0.DARREC1.RsRec.ctiVal	Reset reclosing - 1=Activate
2064	2	4	Uns	LD0.DARREC1.RsOnt.ctiVal	Reset reclosing counters - 1=Activate
2065	2	5	Uns	LD0.SSCBBR1.RsAccAPwr.ctiVal	Reset accumulation energy - 1=Activate
2066	2	6	Uns	LD0.SSCBBR1.RsCBWear.ctiVal	Reset input for CB remaining life and operation counter - 1=Activate
2067	2	7	Uns	DR.RDRE1.RcdTrg.ctiVal	Disturbance recorder - Trig recording - 1=Activate
2068	2	8	Uns	DR.RDRE1.MemClr.ctiVal	Disturbance recorder - Disturbance records - 1=Activate
2069	2	9	Uns	LD0.CMSTA1.RecRs.ctiVal	CMMXU1 - CMMXU1 max demands - 1=Reset
2073					(reserved)
2074					(reserved)
2075					(reserved)
2076					(reserved)
2077					(reserved)
2078					(reserved)
2079					(reserved)
2080	3	0	Uns	LD0.LPHD1.RsDev.ctiVal	Physical device - Reset device - 1=Activate

Section 3 Glossary

AFL	Application function block library
AR	Autoreclosing
BIO	Binary input and output
CB	Circuit breaker
CPM	Communication protocol manual
DR	Disturbance recorder
EMC	Electromagnetic compatibility
HMI	Human-machine interface
I/O	Input/output
IEC	International Electrotechnical Commission
IEC 61850	International standard for substation communication and modeling
IED	Intelligent electronic device
LED	Light-emitting diode
LHMI	Local human-machine interface
MCD	Momentary change detect
Modbus	A serial communication protocol developed by the Modicon company in 1979. Originally used for communication in PLCs and RTU devices.
PCM600	Protection and Control IED Manager
PLC	Programmable logic controller
PSM	Power supply module
TCS	Trip-circuit supervision
UTC	Coordinated universal time

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