



Relion® Protection and Control

650 series DNP3 Point List Manual

Document ID: 1MRK 511 225-UEN

Issued: July 2009

Revision: -

Product version: 1.0

© Copyright 2009 ABB. All rights reserved

Copyright

This document and parts thereof must not be reproduced or copied without written permission from ABB, and the contents thereof must not be imparted to a third party, nor used for any unauthorized purpose.

The software or hardware described in this document is furnished under a license and may be used, copied, or disclosed only in accordance with the terms of such license.

Trademarks

ABB and Relion are registered trademarks of ABB Group. All other brand or product names mentioned in this document may be trademarks or registered trademarks of their respective holders.

Guarantee

Please inquire about the terms of guarantee from your nearest ABB representative.

ABB AB

Substation Automation Products

SE-721 59 Västerås

Sweden

Telephone: +46 (0) 21 34 20 00

Facsimile: +46 (0) 21 14 69 18

<http://www.abb.com/substationautomation>

Disclaimer

The data, examples and diagrams in this manual are included solely for the concept or product description and are not to be deemed as a statement of guaranteed properties. All persons responsible for applying the equipment addressed in this manual must satisfy themselves that each intended application is suitable and acceptable, including that any applicable safety or other operational requirements are complied with. In particular, any risks in applications where a system failure and/or product failure would create a risk for harm to property or persons (including but not limited to personal injuries or death) shall be the sole responsibility of the person or entity applying the equipment, and those so responsible are hereby requested to ensure that all measures are taken to exclude or mitigate such risks.

This document has been carefully checked by ABB but deviations cannot be completely ruled out. In case any errors are detected, the reader is kindly requested to notify the manufacturer. Other than under explicit contractual commitments, in no event shall ABB be responsible or liable for any loss or damage resulting from the use of this manual or the application of the equipment.

Conformity

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 proved by tests conducted by ABB AB in accordance with the generic standard EN 50263 for the EMC directive, and with the standards EN 60255-5 and/or EN 50178 for the low voltage directive.

This product is designed and produced for industrial use.

Table of contents

Section 1	Introduction.....	3
	This manual.....	3
	Intended audience.....	3
	Product documentation.....	4
	Product documentation set.....	4
	Document revision history.....	5
	Related documents.....	6
	Document symbols and conventions.....	6
	Safety indication symbols.....	6
	Document conventions.....	7
	Functions, codes and symbols.....	7
Section 2	DNP3 data mappings.....	11
	Point list for 650 series IEDs.....	11
Section 3	DNP3 protocol implementation.....	37
	DNP3 device profile.....	37
	DNP3 implementation table.....	40
Section 4	Glossary.....	47

Section 1 Introduction

1.1 This manual

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

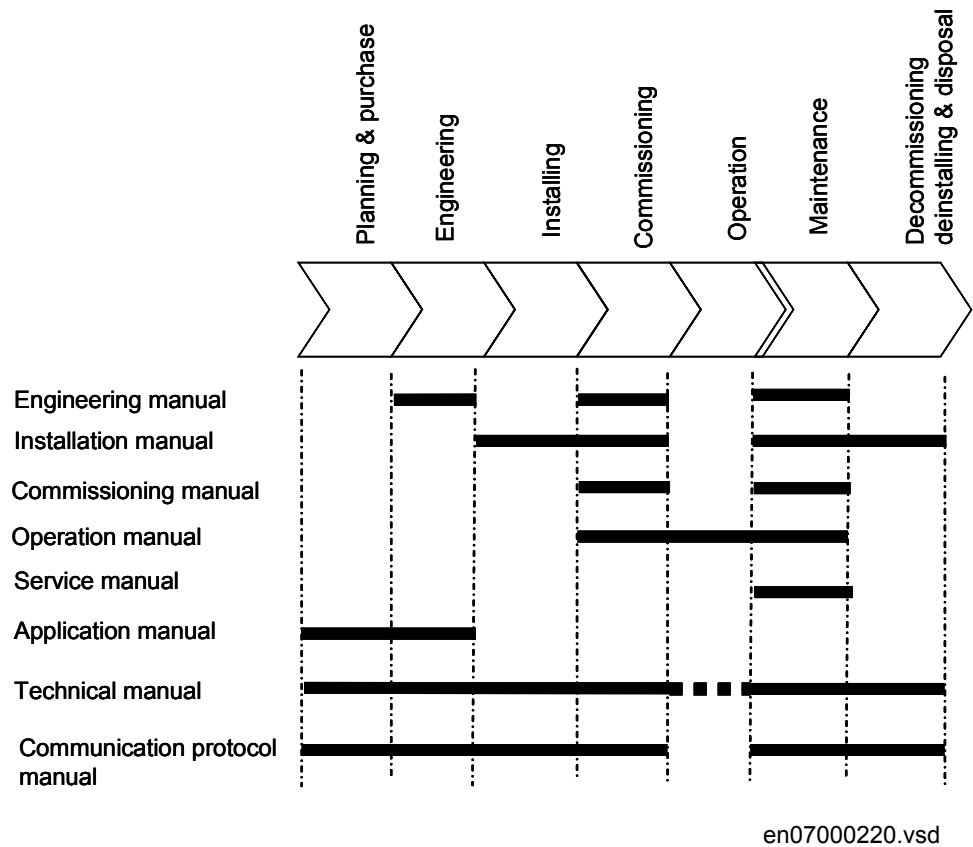


Figure 1: The intended use of manuals in different lifecycles

Engineering Manual contains instructions on how to engineer the IEDs. The manual provides instructions on how to use the different tools for IED engineering. It also includes instructions on how to handle the tool component available to read disturbance files from the IEDs on the basis of the IEC 61850 definitions. It further introduces the diagnostic tool components available for IEDs and the PCM600 tool.

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.

Commissioning Manual contains instructions on how to commission the IED. The manual can also be used as a reference during periodic testing. The manual provides procedures for energizing and checking of external circuitry, setting and configuration as well as verifying settings and performing directional tests. The

chapters are organized in chronological order in which the IED should be commissioned.

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 network data to determine the cause of a fault.

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.

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.

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.

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

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.



The Service Manual is not available yet.

1.3.2

Document revision history

Document revision/date	Product version	History
A/dd.mm.2009	1.0	First release



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

1.3.3

Related documents

Documents related to REC650REL650RET650	Identity number
Commissioning manual	1MRK 511 209-UEN 1MRK 506 307-UEN 1MRK 504 109-UEN
Technical manual	1MRK 511 204-UEN 1MRK 506 304-UEN 1MRK 504 106-UEN
Application manual	1MRK 511 203-UEN 1MRK 506 305-UEN 1MRK 504 107-UEN
Product Guide, configured	1MRK 511 211-BEN 1MRK 506 308-BEN 1MRK 504 110-BEN
Type test certificate	1MRK 511 211-TEN 1MRK 506 308-TEN 1MRK 504 110-TEN
Product series manuals	
Operation manual	1MRK 500 088-UEN
Communication protocol manual, DNP3	1MRK 511 224-UEN
Communication protocol manual, IEC61850	1MRK 511 205-UEN
Engineering manual	1MRK 511 206-UEN
Installation manual	1MRK 514 013-UEN
Point list manual, DNP3 650-series	1MRK 511 225-UEN
Latest versions of the described documentation can be found on www.abb.com/substationautomation	

1.4

Document symbols and conventions

1.4.1

Safety indication symbols

This publication includes icons that point out safety-related conditions or other important information.



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 to 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 should be understood that operation of damaged equipment could, under certain operational conditions, 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

- Abbreviations and acronyms in this manual are spelled out in Glossary. Glossary also contains definitions of important terms.
- HMI menu paths are presented in bold, for example:
Select **Main menu/Information**.
- Parameter names are shown in italics, for example:
The function can be enabled and disabled with the *Operation* setting.

1.4.3

Functions, codes and symbols

Table 1: *Functions included in 630 series IEDs*

Functionality	IEC 61850	IEC 60617	ANSI
Protection			
Three-phase non-directional overcurrent, low stage	PHLPTOC	3I>	51P-1
Three-phase non-directional overcurrent, high stage	PHHPTOC	3I>>	51P-2
Three-phase non-directional overcurrent, instantaneous stage	PHIPTOC	3I>>>	50P/51P
Three-phase directional overcurrent, low stage	DPHLPDOC	3I> ->	67-1
Three-phase directional overcurrent, high stage	DPHHPDOC	3I>> ->	67-2
Non-directional earth-fault, low stage	EFLPTOC	I0>	51N-1
Non-directional earth-fault, high stage	EFHPTOC	I0>>	51N-2
Non-directional earth-fault, instantaneous stage	EFIPTOC	I0>>>	50N/51N
Directional earth-fault, low stage	DEFLPDEF	I0> ->	67N-1
Directional earth-fault, high stage	DEFHPDEF	I0>> ->	67N-2
Transient/intermittent earth-fault	INTRPTEF	I0> -> IEF	67NIEF
Stabilised restricted earth-fault	LREFPNDP	dI0Lo>	87NL
High-impedance-based restricted earth-fault	HREFPDIF	dI0Hi>	87NH
Negative-sequence overcurrent	NSPTOC	I2>	46
Phase reversal	PREVPTOC	I2>>	46R
Table continues on next page			

Functionality	IEC 61850	IEC 60617	ANSI
Three-phase thermal overload for feeder	T1PTTR	3lth>F	49F
Three-phase thermal overload for transformers	T2PTTR	3lth>T	49T
Three-phase thermal overload for motors	MPTTR	3lth>M	49M
Loss-of-load supervision	LOFLPTUC	3l<	37
Motor stall protection	JAMPTOC	lst>	51LR
Emergency start	ESMGAPC	ESTART	ESTART
Motor start-up supervision	STTPMSU	ls2t n<	49,66,48,51LR
Negative phase-sequence time overcurrent protection	MNSPTOC	l2>M	46M
Three-phase overvoltage	PHPTOV	3U>	59
Three-phase undervoltage	PHPTUV	3U<	27
Positive-sequence overvoltage	PSPTOV	U1>	47O+
Positive-sequence undervoltage	PSPTUV	U1<	47U+
Negative-sequence overvoltage	NSPTOV	U2>	47O-
Residual overvoltage	ROVPTOV	U0>	59G
Frequency gradient	DAPFRC	df/dt>	81R
Overfrequency	DAPTOF	f>	81O
Underfrequency	DAPTUF	f<	81U
Load shedding	LSHDPFRQ	UFLS/R	81LSH
Transformer differential protection of 2-winding transformers	TR2PTDF	3dl>T	87T
Fault locator	SCEFRFLO	FLOC	21FL
Distance protection	DSTPDIS	Z<	21, 21P, 21N
Automatic switch-onto-fault logic	CVRSOFF	SOTF	SOTF
Phase discontinuity	PDNSPTOC	l2/l1>	46PD
Three-phase inrush current detector	INRPHAR	3l2f>	68
Circuit-breaker failure	CCBRBRF	3l>/lo>BF	51BF/51NBF
Protection-related functions			
Local acceleration logic	DSTPLAL	LAL	LAL
Communication logic for residual overcurrent	RESCPSCH	CLN	85N
Scheme communication logic	DSOCPSC	CL	85
Current reversal and WEI logic	CRWPSCH	CLCRW	85CRW
Current reversal and WEI logic for residual overcurrent	RCRWPSCH	CLCRWN	85NCRW
Control			
Bay control	QCCBAY	CBAY	CBAY
Interlocking (interface)	SCILO	3	3
Circuit-breaker/disconnector control	GNRLCSWI	I<->O CB/DC	I<->O CB/DC
Circuit breaker	DAXCBR	I<->O CB	I<->O CB
Table continues on next page			

Functionality	IEC 61850	IEC 60617	ANSI
Disconnecter	DAXSWI	I<->O DC	I<->O DC
Autorecloser	DARREC	O->I	79
Local/remote switch interface	LOCREM	R/L	R/L
Synchrocheck	SYNCRSYN	SYNC	25
Supervision and monitoring			
Circuit-breaker condition monitoring	SSCBR	CBCM	CBCM
Fuse failure supervision	SEQRFUF	FUSEF	60
Current-circuit supervision	CCRDIF	MCS 3I	MCS 3I
Trip-circuit supervision	TCSSCBR	TCS	TCM
Tripping logic	TRPPTRC	I->O	94
Generic measured values	MVGIO		
Measured value limit supervision	MVEXP		
Station battery supervision	SPVNZBAT	U<>	U<>
Tap position indication	TPOSSLTC	TPOSM	84M
Energy monitoring	EPDMMTR	E	E
Measurement			
Three-phase current	CMMXU	3I	3I
Three-phase voltage (phase-to-earth voltages) (RMS)	VPHMMXU	3U _{pe}	3U _{pe}
Three-phase voltage (phase-to-phase voltages) (RMS)	VPPMMXU	3U _{pp}	3U _{pp}
Residual current	RESCMMXU	I0	I0
Residual voltage	RESVMMXU	U0	V _n
Sequence current	CSMSQI	I1,I2	I1,I2
Sequence voltage	VSMSQI	U1,U2	V1,V2
Power monitoring function with P, Q, S, power factor	PWRMMXU	PQ _f	PQ _f
Metering			
Pulse counter for energy metering	PCGGIO		
Disturbance recorder function			
Disturbance recorder	DRRDRE	DREC	DREC
Analog channels 1-10 (samples)	A1RADR	ACH1	ACH1
Analog channel 11-20 (samples)	A2RADR	ACH2	ACH2
Analog channel 21-30 (samples)	A3RADR	ACH3	ACH3
Analog channel 31-40 (calc. val.)	A4RADR	ACH4	ACH4
Binary channel 1-16	B1RBDR	BCH1	BCH1
Binary channel 17-32	B2RBDR	BCH2	BCH2
Binary channel 33-48	B3RBDR	BCH3	BCH3
Binary channel 49-64	B4RBDR	BCH4	BCH4

Section 2 DNP3 data mappings

2.1 Point list for 650 series IEDs

Table 2: *Signal point list*

Function Name	Signal Name	Description
Hardware input and output monitoring		In CMT the 1st input signal for binary input and output card at slot 3 is shown as 'BIO_3;BIO_CPI.BI1'
BIO_CPI	Analog Inputs	
	Binary inputs	
	BIO_3; BIO_CPI.BI_ERROR	Binary input module error
	BIO_3; BIO_CPI.BI1	Binary input 1
	BIO_3; BIO_CPI.BI2	Binary input 2
	BIO_3; BIO_CPI.BI3	Binary input 3
	BIO_3; BIO_CPI.BI4	Binary input 4
	BIO_3; BIO_CPI.BI5	Binary input 5
	BIO_3; BIO_CPI.BI6	Binary input 6
	BIO_3; BIO_CPI.BI7	Binary input 7
	BIO_3; BIO_CPI.BI8	Binary input 8
	BIO_3; BIO_CPI.BI9	Binary input 9
	BIO_3; BIO_CPI.BO_ERROR	Binary output module error
	BIO_3; BIO_CPI.BO1_PO	Binary output status 1
	BIO_3; BIO_CPI.BO2_PO	Binary output status 2
	BIO_3; BIO_CPI.BO3_PO	Binary output status 3
	BIO_3; BIO_CPI.BO4_SO	Binary output status 4
	BIO_3; BIO_CPI.BO5_SO	Binary output status 5
	BIO_3; BIO_CPI.BO6_SO	Binary output status 6
	BIO_3; BIO_CPI.BO7_SO	Binary output status 7
	BIO_3; BIO_CPI.BO8_SO	Binary output status 8
	BIO_3; BIO_CPI.BO9_SO	Binary output status 9
	Binary outputs	
	Counters	
	Double bit indications	
COM_CPI	Analog Inputs	
	Binary inputs	
	COM_101; COM_CPI.BI1	Binary input 1
Table continues on next page		

Function Name	Signal Name	Description
	COM_101; COM_CPI.BI10	Binary input 10
	COM_101; COM_CPI.BI11	Binary input 11
	COM_101; COM_CPI.BI12	Binary input 12
	COM_101; COM_CPI.BI13	Binary input 13
	COM_101; COM_CPI.BI14	Binary input 14
	COM_101; COM_CPI.BI2	Binary input 2
	COM_101; COM_CPI.BI3	Binary input 3
	COM_101; COM_CPI.BI4	Binary input 4
	COM_101; COM_CPI.BI5	Binary input 5
	COM_101; COM_CPI.BI6	Binary input 6
	COM_101; COM_CPI.BI7	Binary input 7
	COM_101; COM_CPI.BI8	Binary input 8
	COM_101; COM_CPI.BI9	Binary input 9
	COM_101; COM_CPI.ERROR	Binary input module error
	Binary outputs	
	Counters	
	Double bit indications	
PSM02_CPI	Analog Inputs	
	Binary inputs	
	PSM_102; PSM02_CPI.BLOCK	Block binary outputs
	PSM_102; PSM02_CPI.BO1_PO_TCS	Binary output status 1
	PSM_102; PSM02_CPI.BO2_PO_TCS	Binary output status 2
	PSM_102; PSM02_CPI.BO3_PO_TCS	Binary output status 3
	PSM_102; PSM02_CPI.BO4_PO	Binary output status 4
	PSM_102; PSM02_CPI.BO5_PO	Binary output status 5
	PSM_102; PSM02_CPI.BO6_PO	Binary output status 6
	PSM_102; PSM02_CPI.BO7_SO	Binary output status 7
	PSM_102; PSM02_CPI.BO8_SO	Binary output status 8
	PSM_102; PSM02_CPI.BO9_SO	Binary output status 9
	Binary outputs	
	Counters	
	Double bit indications	
PSM03_CPI	Analog Inputs	
	Binary inputs	
	PSM_102; PSM03_CPI.BLOCK	Block binary outputs
	PSM_102; PSM03_CPI.BO1_PO_TCS	Binary output status 1
	PSM_102; PSM03_CPI.BO2_PO_TCS	Binary output status 2
	PSM_102; PSM03_CPI.BO3_PO_TCS	Binary output status 3
	PSM_102; PSM03_CPI.BO4_PO	Binary output status 4
Table continues on next page		

Function Name	Signal Name	Description
	PSM_102; PSM03_CPI.BO5_PO	Binary output status 5
	PSM_102; PSM03_CPI.BO6_PO	Binary output status 6
	PSM_102; PSM03_CPI.BO7_SO	Binary output status 7
	PSM_102; PSM03_CPI.BO8_SO	Binary output status 8
	PSM_102; PSM03_CPI.BO9_SO	Binary output status 9
	Binary outputs	
	Counters	
	Double bit indications	
General command handling from DNP master		In CMT the 1st binary command signal of instance 1 is shown as 'AUTOBITS: 1.CMDBIT1'. The signals can be connected to any binary input signal of any function
AUTOBITS	Analog Inputs	
	Binary inputs	
	Binary outputs	
	AUTOBITS: 1.CMDBIT1	Command out bit 1
	AUTOBITS: 1.CMDBIT2	Command out bit 2
	AUTOBITS: 1.CMDBIT3	Command out bit 3
	AUTOBITS: 1.CMDBIT4	Command out bit 4
	AUTOBITS: 1.CMDBIT5	Command out bit 5
	AUTOBITS: 1.CMDBIT6	Command out bit 6
	AUTOBITS: 1.CMDBIT7	Command out bit 7
	AUTOBITS: 1.CMDBIT8	Command out bit 8
	AUTOBITS: 1.CMDBIT9	Command out bit 9
	AUTOBITS: 1.CMDBIT10	Command out bit 10
	AUTOBITS: 1.CMDBIT11	Command out bit 11
	AUTOBITS: 1.CMDBIT12	Command out bit 12
	AUTOBITS: 1.CMDBIT13	Command out bit 13
	AUTOBITS: 1.CMDBIT14	Command out bit 14
	AUTOBITS: 1.CMDBIT15	Command out bit 15
	AUTOBITS: 1.CMDBIT16	Command out bit 16
	AUTOBITS: 1.CMDBIT17	Command out bit 17
	AUTOBITS: 1.CMDBIT18	Command out bit 18
	AUTOBITS: 1.CMDBIT19	Command out bit 19
	AUTOBITS: 1.CMDBIT20	Command out bit 20
	AUTOBITS: 1.CMDBIT21	Command out bit 21
	AUTOBITS: 1.CMDBIT22	Command out bit 22
	AUTOBITS: 1.CMDBIT23	Command out bit 23
	AUTOBITS: 1.CMDBIT24	Command out bit 24
	AUTOBITS: 1.CMDBIT25	Command out bit 25
Table continues on next page		

Function Name	Signal Name	Description
	AUTOBITS: 1.CMDBIT26	Command out bit 26
	AUTOBITS: 1.CMDBIT27	Command out bit 27
	AUTOBITS: 1.CMDBIT28	Command out bit 28
	AUTOBITS: 1.CMDBIT29	Command out bit 29
	AUTOBITS: 1.CMDBIT30	Command out bit 30
	AUTOBITS: 1.CMDBIT31	Command out bit 31
	AUTOBITS: 1.CMDBIT32	Command out bit 32
	Counters	
	Double bit indications	
General functions for showing signals for DNP master		In CMT the analog signal of instance 1 of MVGGIO is shown as 'MVGGIO: 1.VALUE'. The signals can be connected to any binary respectively analog output signal of any function
MVGGIO	Analog Inputs	
	MVGGIO: 1.VALUE	Magnitude of deadband value
	Binary inputs	
	Binary outputs	
	Counters	
	Double bit indications	
SP16GGIO	Analog Inputs	
	Binary inputs	
	SP16GGIO: 1.OUT1	Output 1 status
	SP16GGIO: 1.OUT10	Output 10 status
	SP16GGIO: 1.OUT11	Output 11 status
	SP16GGIO: 1.OUT12	Output 12 status
	SP16GGIO: 1.OUT13	Output 13 status
	SP16GGIO: 1.OUT14	Output 14 status
	SP16GGIO: 1.OUT15	Output 15 status
	SP16GGIO: 1.OUT16	Output 16 status
	SP16GGIO: 1.OUT2	Output 2 status
	SP16GGIO: 1.OUT3	Output 3 status
	SP16GGIO: 1.OUT4	Output 4 status
	SP16GGIO: 1.OUT5	Output 5 status
	SP16GGIO: 1.OUT6	Output 6 status
	SP16GGIO: 1.OUT7	Output 7 status
	SP16GGIO: 1.OUT8	Output 8 status
	SP16GGIO: 1.OUT9	Output 9 status
	SP16GGIO: 1.OTOR	Output status logic OR gate for input 1 to 16
	Binary outputs	
Table continues on next page		

Function Name	Signal Name	Description
	Counters	
	Double bit indications	
SPGGIO	Analog Inputs	
	Binary inputs	
	SPGGIO: 1.OUT	Output status
	Binary outputs	
	Counters	
	Double bit indications	
Directly linked signals		In CMT the analog signal of instance 1 of B16I is shown as 'B16I: 1.OUT'.
B16I	Analog Inputs	
	B16I: 1.OUT	Output value
	Binary inputs	
	Binary outputs	
	Counters	
	Double bit indications	
B16IFCVI	Analog Inputs	
	B16IFCVI: 1.OUT	Output value
	Binary inputs	
	Binary outputs	
	Counters	
	Double bit indications	
BRCPTOC	Analog Inputs	
	Binary inputs	
	BRCPTOC: 1.TRIP	Operate signal of the protection logic
	Binary outputs	
	Counters	
	Double bit indications	
CCRBFR	Analog Inputs	
	Binary inputs	
	CCRBFR: 1.TRBU	Back-up trip by breaker failure protection function
	CCRBFR: 1.TRRET	Retrip by breaker failure protection function
	Binary outputs	
	Counters	
	Double bit indications	
CCRPLD	Analog Inputs	
	Binary inputs	
	CCRPLD: 1.TRIP	Trip signal to CB
Table continues on next page		

Function Name	Signal Name	Description
	Binary outputs	
	Counters	
	Double bit indications	
CCSRDIF	Analog Inputs	
	Binary inputs	
	CCSRDIF: 1.FAIL	Detection of current circuit failure
	Binary outputs	
	Counters	
	Double bit indications	
CMMXU	Analog Inputs	
	CMMXU: 1.IL1	IL1 Amplitude
	CMMXU: 1.IL1ANGL	IL1 Angle
	CMMXU: 1.IL2	IL2 Amplitude
	CMMXU: 1.IL2ANGL	IL2 Angle
	CMMXU: 1.IL3	IL3 Amplitude
	CMMXU: 1.IL3ANGL	IL3 Angle
	Binary inputs	
	Binary outputs	
	Counters	
	Double bit indications	
	CMMXU: 1.3I0	3I0 Amplitude
	CMMXU: 1.3I0ANGL	3I0 Angle
CMSQI	Analog Inputs	
	CMSQI: 1.I1	I1 Amplitude
	CMSQI: 1.I1ANGL	I1 Angle
	CMSQI: 1.I2	I2 Amplitude
	CMSQI: 1.I2ANGL	I2Angle
	Binary inputs	
	Binary outputs	
	Counters	
	Double bit indications	
CNTGGIO	Analog Inputs	
	Binary inputs	
	Binary outputs	
	CNTGGIO: 1.VALUE1	Output of counter 1
	CNTGGIO: 1.VALUE2	Output of counter 2
	CNTGGIO: 1.VALUE3	Output of counter 3
	CNTGGIO: 1.VALUE4	Output of counter 4
	CNTGGIO: 1.VALUE5	Output of counter 5
Table continues on next page		

Function Name	Signal Name	Description
	CNTGGIO: 1.VALUE6	Output of counter 6
	Counters	
	Double bit indications	
CVMMXN	Analog Inputs	
	CVMMXN: 1.F	System frequency magnitude of deadband value
	CVMMXN: 1.I	Calculated current magnitude of deadband value
	CVMMXN: 1.P	Active power magnitude of deadband value
	CVMMXN: 1.PF	Power factor magnitude of deadband value
	CVMMXN: 1.Q	Reactive power magnitude of deadband value
	CVMMXN: 1.S	Apparent power magnitude of deadband value
	CVMMXN: 1.U	Calculated voltage magnitude of deadband value
	Binary inputs	
	CVMMXN: 1.ILAG	Current is lagging voltage
	CVMMXN: 1.ILEAD	Current is leading voltage
	Binary outputs	
	Counters	
	Double bit indications	
DNPFREC	Analog Inputs	
	DNPFREC: 1.ActSetGrp	Active setting group
	DNPFREC: 1.Ch10Ang	Prefault Angle
	DNPFREC: 1.Ch10FltAng	Fault Angle
	DNPFREC: 1.Ch10FltMag	Fault Magnitude
	DNPFREC: 1.Ch10Mag	Prefault Magnitude
	DNPFREC: 1.Ch11Ang	Prefault Angle
	DNPFREC: 1.Ch11FltAng	Fault Angle
	DNPFREC: 1.Ch11FltMag	Fault Magnitude
	DNPFREC: 1.Ch11Mag	Prefault Magnitude
	DNPFREC: 1.Ch12Ang	Prefault Angle
	DNPFREC: 1.Ch12FltAng	Fault Angle
	DNPFREC: 1.Ch12FltMag	Fault Magnitude
	DNPFREC: 1.Ch12Mag	Prefault Magnitude
	DNPFREC: 1.Ch13Ang	Prefault Angle
	DNPFREC: 1.Ch13FltAng	Fault Angle
	DNPFREC: 1.Ch13FltMag	Fault Magnitude
	DNPFREC: 1.Ch13Mag	Prefault Magnitude
Table continues on next page		

Function Name	Signal Name	Description
	DNPFREC: 1.Ch14Ang	Prefault Angle
	DNPFREC: 1.Ch14FltAng	Fault Angle
	DNPFREC: 1.Ch14FltMag	Fault Magnitude
	DNPFREC: 1.Ch14Mag	Prefault Magnitude
	DNPFREC: 1.Ch15Ang	Prefault Angle
	DNPFREC: 1.Ch15FltAng	Fault Angle
	DNPFREC: 1.Ch15FltMag	Fault Magnitude
	DNPFREC: 1.Ch15Mag	Prefault Magnitude
	DNPFREC: 1.Ch16Ang	Prefault Angle
	DNPFREC: 1.Ch16FltAng	Fault Angle
	DNPFREC: 1.Ch16FltMag	Fault Magnitude
	DNPFREC: 1.Ch16Mag	Prefault Magnitude
	DNPFREC: 1.Ch17Ang	Prefault Angle
	DNPFREC: 1.Ch17FltAng	Fault Angle
	DNPFREC: 1.Ch17FltMag	Fault Magnitude
	DNPFREC: 1.Ch17Mag	Prefault Magnitude
	DNPFREC: 1.Ch18Ang	Prefault Angle
	DNPFREC: 1.Ch18FltAng	Fault Angle
	DNPFREC: 1.Ch18FltMag	Fault Magnitude
	DNPFREC: 1.Ch18Mag	Prefault Magnitude
	DNPFREC: 1.Ch19Ang	Prefault Angle
	DNPFREC: 1.Ch19FltAng	Fault Angle
	DNPFREC: 1.Ch19FltMag	Fault Magnitude
	DNPFREC: 1.Ch19Mag	Prefault Magnitude
	DNPFREC: 1.Ch1Ang	Prefault Angle
	DNPFREC: 1.Ch1FltAng	Fault Angle
	DNPFREC: 1.Ch1FltMag	Fault Magnitude
	DNPFREC: 1.Ch1Mag	Prefault Magnitude
	DNPFREC: 1.Ch20Ang	Prefault Angle
	DNPFREC: 1.Ch20FltAng	Fault Angle
	DNPFREC: 1.Ch20FltMag	Fault Magnitude
	DNPFREC: 1.Ch20Mag	Prefault Magnitude
	DNPFREC: 1.Ch21Ang	Prefault Angle
	DNPFREC: 1.Ch21FltAng	Fault Angle
	DNPFREC: 1.Ch21FltMag	Fault Magnitude
	DNPFREC: 1.Ch21Mag	Prefault Magnitude
	DNPFREC: 1.Ch22Ang	Prefault Angle
	DNPFREC: 1.Ch22FltAng	Fault Angle
	DNPFREC: 1.Ch22FltMag	Fault Magnitude
Table continues on next page		

Function Name	Signal Name	Description
	DNPFREC: 1.Ch22Mag	Prefault Magnitude
	DNPFREC: 1.Ch23Ang	Prefault Angle
	DNPFREC: 1.Ch23FltAng	Fault Angle
	DNPFREC: 1.Ch23FltMag	Fault Magnitude
	DNPFREC: 1.Ch23Mag	Prefault Magnitude
	DNPFREC: 1.Ch24Ang	Prefault Angle
	DNPFREC: 1.Ch24FltAng	Fault Angle
	DNPFREC: 1.Ch24FltMag	Fault Magnitude
	DNPFREC: 1.Ch24Mag	Prefault Magnitude
	DNPFREC: 1.Ch25Ang	Prefault Angle
	DNPFREC: 1.Ch25FltAng	Fault Angle
	DNPFREC: 1.Ch25FltMag	Fault Magnitude
	DNPFREC: 1.Ch25Mag	Prefault Magnitude
	DNPFREC: 1.Ch26Ang	Prefault Angle
	DNPFREC: 1.Ch26FltAng	Fault Angle
	DNPFREC: 1.Ch26FltMag	Fault Magnitude
	DNPFREC: 1.Ch26Mag	Prefault Magnitude
	DNPFREC: 1.Ch27Ang	Prefault Angle
	DNPFREC: 1.Ch27FltAng	Fault Angle
	DNPFREC: 1.Ch27FltMag	Fault Magnitude
	DNPFREC: 1.Ch27Mag	Prefault Magnitude
	DNPFREC: 1.Ch28Ang	Prefault Angle
	DNPFREC: 1.Ch28FltAng	Fault Angle
	DNPFREC: 1.Ch28FltMag	Fault Magnitude
	DNPFREC: 1.Ch28Mag	Prefault Magnitude
	DNPFREC: 1.Ch29Ang	Prefault Angle
	DNPFREC: 1.Ch29FltAng	Fault Angle
	DNPFREC: 1.Ch29FltMag	Fault Magnitude
	DNPFREC: 1.Ch29Mag	Prefault Magnitude
	DNPFREC: 1.Ch2Ang	Prefault Angle
	DNPFREC: 1.Ch2FltAng	Fault Angle
	DNPFREC: 1.Ch2FltMag	Fault Magnitude
	DNPFREC: 1.Ch2Mag	Prefault Magnitude
	DNPFREC: 1.Ch30Ang	Prefault Angle
	DNPFREC: 1.Ch30FltAng	Fault Angle
	DNPFREC: 1.Ch30FltMag	Fault Magnitude
	DNPFREC: 1.Ch30Mag	Prefault Magnitude
	DNPFREC: 1.Ch31TrigMag	Magnitude at trig
	DNPFREC: 1.Ch32TrigMag	Magnitude at trig

Table continues on next page

Function Name	Signal Name	Description
	DNPFREC: 1.Ch33TrigMag	Magnitude at trig
	DNPFREC: 1.Ch34TrigMag	Magnitude at trig
	DNPFREC: 1.Ch35TrigMag	Magnitude at trig
	DNPFREC: 1.Ch36TrigMag	Magnitude at trig
	DNPFREC: 1.Ch37TrigMag	Magnitude at trig
	DNPFREC: 1.Ch38TrigMag	Magnitude at trig
	DNPFREC: 1.Ch39TrigMag	Magnitude at trig
	DNPFREC: 1.Ch3Ang	Prefault Angle
	DNPFREC: 1.Ch3FltAng	Fault Angle
	DNPFREC: 1.Ch3FltMag	Fault Magnitude
	DNPFREC: 1.Ch3Mag	Prefault Magnitude
	DNPFREC: 1.Ch40TrigMag	Magnitude at trig
	DNPFREC: 1.Ch4Ang	Prefault Angle
	DNPFREC: 1.Ch4FltAng	Fault Angle
	DNPFREC: 1.Ch4FltMag	Fault Magnitude
	DNPFREC: 1.Ch4Mag	Prefault Magnitude
	DNPFREC: 1.Ch5Ang	Prefault Angle
	DNPFREC: 1.Ch5FltAng	Fault Angle
	DNPFREC: 1.Ch5FltMag	Fault Magnitude
	DNPFREC: 1.Ch5Mag	Prefault Magnitude
	DNPFREC: 1.Ch6Ang	Prefault Angle
	DNPFREC: 1.Ch6FltAng	Fault Angle
	DNPFREC: 1.Ch6FltMag	Fault Magnitude
	DNPFREC: 1.Ch6Mag	Prefault Magnitude
	DNPFREC: 1.Ch7Ang	Prefault Angle
	DNPFREC: 1.Ch7FltAng	Fault Angle
	DNPFREC: 1.Ch7FltMag	Fault Magnitude
	DNPFREC: 1.Ch7Mag	Prefault Magnitude
	DNPFREC: 1.Ch8Ang	Prefault Angle
	DNPFREC: 1.Ch8FltAng	Fault Angle
	DNPFREC: 1.Ch8FltMag	Fault Magnitude
	DNPFREC: 1.Ch8Mag	Prefault Magnitude
	DNPFREC: 1.Ch9Ang	Prefault Angle
	DNPFREC: 1.Ch9FltAng	Fault Angle
	DNPFREC: 1.Ch9FltMag	Fault Magnitude
	DNPFREC: 1.Ch9Mag	Prefault Magnitude
	DNPFREC: 1.FaultFreq	Fault Freq
	DNPFREC: 1.FaultLoc	Fault Location
	DNPFREC: 1.FaultNumber	Fault Number
Table continues on next page		

Function Name	Signal Name	Description
	DNPFREC: 1.FaultType	Fault Type
	DNPFREC: 1.NoOfFaultIED	No of faults in IED
	DNPFREC: 1.TrigDay	Trigger Day
	DNPFREC: 1.TrigHour	Trigger Hour
	DNPFREC: 1.TrigMillisec	Trigger Millisecond
	DNPFREC: 1.TrigMin	Trigger Minute
	DNPFREC: 1.TrigMonth	Trigger Month
	DNPFREC: 1.TrigSec	Trigger Second
	DNPFREC: 1.TrigSigId	Channel number for trig signal
	DNPFREC: 1.TrigYear	Trigger Year
	Binary inputs	
	Binary outputs	
	DNPFREC: 1.GetFirstRec	Get first disturbance
	DNPFREC: 1.GetNextRec	Get next disturbance
	DNPFREC: 1.GetPrevRec	Get previous disturbance
	Counters	
	Double bit indications	
DNSPTOC	Analog Inputs	
	Binary inputs	
	DNSPTOC: 1.TRIP	General trip signal
	DNSPTOC: 1.TROC1	Trip signal from step 1 (OC1)
	DNSPTOC: 1.TROC2	Trip signal from step 2 (OC2)
	Binary outputs	
	Counters	
	Double bit indications	
DRPRDRE	Analog Inputs	
	DRPRDRE: 1.FaultNumber	Disturbance fault number
	Binary inputs	
	DRPRDRE: 1.RECMADE	Disturbance recording made
	Binary outputs	
	Counters	
	Double bit indications	
ECPSCH	Analog Inputs	
	Binary inputs	
	ECPSCH: 1.CS	Carrier Send by Communication Scheme Logic
	ECPSCH: 1.LCG	loss of carrier guard signal
	ECPSCH: 1.PRORX	Teleprotection signal received for a forward fault
	ECPSCH: 1.TRIP	Trip by Communication Scheme Logic
Table continues on next page		

Function Name	Signal Name	Description
	Binary outputs	
	Counters	
	Double bit indications	
ECRWPSCH	Analog Inputs	
	Binary inputs	
	ECRWPSCH: 1.CR	POR Carrier signal received from remote end
	ECRWPSCH: 1.ECHO	Carrier send by WEI logic
	ECRWPSCH: 1.TRWEI	Trip of WEI logic
	Binary outputs	
	Counters	
	Double bit indications	
EF4PTOC	Analog Inputs	
	Binary inputs	
	EF4PTOC: 1.STFW	Forward directional start signal
	EF4PTOC: 1.STRV	Reverse directional start signal
	EF4PTOC: 1.TRIN1	Trip signal from step 1
	EF4PTOC: 1.TRIN2	Trip signal from step 2
	EF4PTOC: 1.TRIN3	Trip signal from step 3
	EF4PTOC: 1.TRIN4	Trip signal from step 4
	EF4PTOC: 1.TRIP	General trip signal
	Binary outputs	
	Counters	
	Double bit indications	
EFPIOC	Analog Inputs	
	Binary inputs	
	EFPIOC: 1.TRIP	Trip signal
	Binary outputs	
	Counters	
	Double bit indications	
ETPMMTR	Analog Inputs	
	Binary inputs	
	ETPMMTR: 1.EAFALM	Alarm for active forward energy exceed limit in set interval
	ETPMMTR: 1.EARALM	Alarm for active reverse energy exceed limit in set interval
	ETPMMTR: 1.ERFALM	Alarm for reactive forward energy exceed limit in set interval
	ETPMMTR: 1.ERRALM	Alarm for reactive reverse energy exceed limit in set interval
	Binary outputs	
Table continues on next page		

Function Name	Signal Name	Description
	Counters	
	Double bit indications	
FDPSPDIS	Analog Inputs	
	Binary inputs	
	FDPSPDIS: 1.STFWL1	Fault detected in phase L1 - forward direction
	FDPSPDIS: 1.STFWL2	Fault detected in phase L2 - forward direction
	FDPSPDIS: 1.STFWL3	Fault detected in phase L3 - forward direction
	FDPSPDIS: 1.STFWPE	Earth fault detected in forward direction
	FDPSPDIS: 1.STNDL1	Non directional start in L1
	FDPSPDIS: 1.STNDL2	Non directional start in L2
	FDPSPDIS: 1.STNDL3	Non directional start in L3
	FDPSPDIS: 1.STNDPE	Non directional start, Phase-Earth
	FDPSPDIS: 1.STRVL1	Fault detected in phase L1 - reverse direction
	FDPSPDIS: 1.STRVL2	Fault detected in phase L2 - reverse direction
	FDPSPDIS: 1.STRVL3	Fault detected in phase L3 - reverse direction
	FDPSPDIS: 1.STRVPE	Earth fault detected in reverse direction
	FDPSPDIS: 1.TRIP	Trip output
	Binary outputs	
	Counters	
	Double bit indications	
FMPSPDIS	Analog Inputs	
	Binary inputs	
	FMPSPDIS: 1.START	General start signal
	FMPSPDIS: 1.STL1	Fault detected in phase L1
	FMPSPDIS: 1.STL2	Fault detected in phase L2
	FMPSPDIS: 1.STL3	Fault detected in phase L3
	FMPSPDIS: 1.STPE	Earth fault detected
	Binary outputs	
	Counters	
	Double bit indications	
GOPPDOP	Analog Inputs	
	Binary inputs	
	GOPPDOP: 1.TRIP	General trip signal
	GOPPDOP: 1.TRIP1	Trip signal from stage 1
	GOPPDOP: 1.TRIP2	Trip signal from stage 2
Table continues on next page		

Function Name	Signal Name	Description
	Binary outputs	
	Counters	
	Double bit indications	
GUPPDUP	Analog Inputs	
	Binary inputs	
	GUPPDUP: 1.TRIP	General trip signal
	GUPPDUP: 1.TRIP1	Trip signal from stage 1
	GUPPDUP: 1.TRIP2	Trip signal from stage 2
	Binary outputs	
	Counters	
	Double bit indications	
LMBRFLO	Analog Inputs	
	Binary inputs	
	LMBRFLO: 1.FltDistLngUnit	Distance to fault in line length unit
	Binary outputs	
	Counters	
	Double bit indications	
LOVPTUV	Analog Inputs	
	Binary inputs	
	LOVPTUV: 1.TRIP	Trip signal
	Binary outputs	
	Counters	
	Double bit indications	
LPTTR	Analog Inputs	
	Binary inputs	
	LPTTR: 1.ALARM	Alarm signal
	LPTTR: 1.LOCKOUT	Lockout signal
	LPTTR: 1.TRIP	General trip signal
	Binary outputs	
	Counters	
	Double bit indications	
OC4PTOC	Analog Inputs	
	Binary inputs	
	OC4PTOC: 1.TR1	Trip signal from step 1
	OC4PTOC: 1.TR2	Trip signal from step 2
	OC4PTOC: 1.TR3	Trip signal from step 3
	OC4PTOC: 1.TR4	Trip signal from step 4
	OC4PTOC: 1.TRIP	General trip signal
	Binary outputs	
Table continues on next page		

Function Name	Signal Name	Description
	Counters	
	Double bit indications	
OEXPVPH	Analog Inputs	
	OEXPVPH: 1.VPERHZ	Voltage to frequency ratio in per-unit
	Binary inputs	
	OEXPVPH: 1.ALARM	Overexcitation alarm signal
	OEXPVPH: 1.TRIP	General trip signal
	Binary outputs	
	Counters	
	Double bit indications	
OV2PTOV	Analog Inputs	
	Binary inputs	
	OV2PTOV: 1.TR1	Trip signal from step 1
	OV2PTOV: 1.TR2	Trip signal from step 2
	OV2PTOV: 1.TRIP	General trip signal
	Binary outputs	
	Counters	
	Double bit indications	
PHPIOC	Analog Inputs	
	Binary inputs	
	PHPIOC: 1.TRIP	General trip signal
	Binary outputs	
	Counters	
	Double bit indications	
QCBAY	Analog Inputs	
	Binary inputs	
	QCBAY: 1.CMD_BLKD	Function is blocked for commands
	QCBAY: 1.LOC	Local operation allowed
	QCBAY: 1.REM	Remote operation allowed
	QCBAY: 1.UPD_BLKD	Update of position is blocked
	Binary outputs	
	Counters	
	Double bit indications	
REFPDIF	Analog Inputs	
	Binary inputs	
	REFPDIF: 1.BLK2H	Block due to 2-nd harmonic
	REFPDIF: 1.DIROK	Directional criteria has operated for internal fault
	REFPDIF: 1.TRIP	General trip signal
	Binary outputs	
Table continues on next page		

Function Name	Signal Name	Description
	Counters	
	Double bit indications	
ROV2PTOV	Analog Inputs	
	Binary inputs	
	ROV2PTOV: 1.TR1	Trip signal from step 1
	ROV2PTOV: 1.TR2	Trip signal from step 2
	ROV2PTOV: 1.TRIP	General trip signal
	Binary outputs	
	Counters	
	Double bit indications	
SAPFRC	Analog Inputs	
	Binary inputs	
	SAPFRC: 1.BLKDMAGN	Blocking indication due to low amplitude
	SAPFRC: 1.TRIP	Operate/trip signal for frequency gradient
	Binary outputs	
	Counters	
	Double bit indications	
SAPTOF	Analog Inputs	
	Binary inputs	
	SAPTOF: 1.BLKDMAGN	Measurement blocked due to low amplitude
	SAPTOF: 1.TRIP	General trip signal
	Binary outputs	
	Counters	
	Double bit indications	
SAPTUF	Analog Inputs	
	Binary inputs	
	SAPTUF: 1.BLKDMAGN	Measurement blocked due to low voltage amplitude
	SAPTUF: 1.TRIP	General trip signal
	Binary outputs	
	Counters	
	Double bit indications	
SCILO	Analog Inputs	
	Binary inputs	
	SCILO: 1.EN_CLOSE	Close operation at open or intermediate or bad position is enabled
	SCILO: 1.EN_OPEN	Open operation at closed or intermediate or bad position is enabled
Table continues on next page		

Function Name	Signal Name	Description
	Binary outputs	
	Counters	
	Double bit indications	
SCSWI	Analog Inputs	
	SCSWI: 1.L_CAUSE	Latest value of the error indication during command
	Binary inputs	
	SCSWI: 1.CMD_BLK	Commands are blocked
	Binary outputs	
	SCSWI: 1.CLOSE_CMD	Close command parameter for DNP protocol
	SCSWI: 1.OPEN_CMD	Open command parameter for DNP protocol
	Counters	
	SCSWI: 1.POSITION	Position indication
	Double bit indications	
SDDRFUF	Analog Inputs	
	Binary inputs	
	SDDRFUF: 1.BLKU	General start of function
	Binary outputs	
	Counters	
	Double bit indications	
SDEPSDE	Analog Inputs	
	Binary inputs	
	SDEPSDE: 1.TRDIRIN	Trip of the directional residual overcurrent
	SDEPSDE: 1.TRIP	General trip signal
	SDEPSDE: 1.TRNDIN	Trip of non-directional residual overcurrent
	SDEPSDE: 1.TRUN	Trip of non-directional residual overvoltage
	Binary outputs	
	Counters	
	Double bit indications	
SESRSYN	Analog Inputs	
	SESRSYN: 1.FRDIFFME	Calculated difference in frequency
	SESRSYN: 1.PHDIFFME	Calculated difference of phase angle
	SESRSYN: 1.UDIFFME	Calculated difference in voltage
	Binary inputs	
	SESRSYN: 1.AUTOENOK	Automatic energizing check OK
	SESRSYN: 1.AUTOREL	Automatic release
	SESRSYN: 1.MANENOK	Manual energizing check OK
Table continues on next page		

Function Name	Signal Name	Description
	SESRSYN: 1.MANREL	Manual release
	SESRSYN: 1.SYNFAIL	Synchronizing failed
	SESRSYN: 1.SYNOK	Synchronizing OK output
	SESRSYN: 1.SYNPROGR	Synchronizing in progress
	Binary outputs	
	Counters	
	Double bit indications	
SLGGIO	Analog Inputs	
	SLGGIO: 1.SWPOSN	Switch position as integer value
	Binary inputs	
	Binary outputs	
	Counters	
	Double bit indications	
SMBRREC	Analog Inputs	
	SMBRREC: 1.3PT1	Three-phase reclosing in progress, shot 1
	SMBRREC: 1.3PT2	Three-phase reclosing in progress, shot 2
	SMBRREC: 1.3PT3	Three-phase reclosing in progress, shot 3
	SMBRREC: 1.3PT4	Three-phase reclosing in progress, shot 4
	SMBRREC: 1.3PT5	Three-phase reclosing in progress, shot 5
	Binary inputs	
	SMBRREC: 1.ACTIVE	Reclosing sequence in progress
	SMBRREC: 1.BLOCKED	AR is in blocked state
	SMBRREC: 1.CLOSECB	Closing command for CB
	SMBRREC: 1.READY	Indicates that AR is ready for a new sequence
	SMBRREC: 1.SETON	AR operation is switched on
	SMBRREC: 1.UNSUCCL	Reclosing unsuccessful, signal resets after the reclaim time
	Binary outputs	
	SMBRREC: 1.COUNT3P1	Counting the number of three-phase reclosing shot 1
	SMBRREC: 1.COUNT3P2	Counting the number of three-phase reclosing shot 2
	SMBRREC: 1.COUNT3P3	Counting the number of three-phase reclosing shot 3
	SMBRREC: 1.COUNT3P4	Counting the number of three-phase reclosing shot 4
	SMBRREC: 1.COUNT3P5	Counting the number of three-phase reclosing shot 5
Table continues on next page		

Function Name	Signal Name	Description
	SMBRREC: 1.COUNTAR	Counting total number of reclosing shots
	Counters	
	Double bit indications	
SMPPTRC	Analog Inputs	
	Binary inputs	
	SMPPTRC: 1.CLKOUT	Circuit breaker lockout output (set until reset)
	SMPPTRC: 1.TRIP	General trip signal
	Binary outputs	
	Counters	
	Double bit indications	
SPVNZBAT	Analog Inputs	
	Binary inputs	
	SPVNZBAT: 1.ST_UHI	Start signal when battery voltage exceeds upper limit
	SPVNZBAT: 1.ST_ULOW	Start signal when battery voltage drops below lower limit
	Binary outputs	
	Counters	
	Double bit indications	
SSCBR	Analog Inputs	
	Binary inputs	
	SSCBR: 1.CBLIFEAL	Remaining life of CB exceeded alarm limit
	SSCBR: 1.NO_OPR	Number of CB operation cycle
	SSCBR: 1.PRESALM	Pressure below alarm level
	SSCBR: 1.PRESLO	Pressure below lockout level
	SSCBR: 1.SPRCHRAL	Spring charging time has crossed the set value
	Binary outputs	
	Counters	
	Double bit indications	
SSIMG	Analog Inputs	
	Binary inputs	
	SSIMG: 1.PRES_ALM	Pressure below alarm level
	SSIMG: 1.PRES_LO	Pressure below lockout level
	SSIMG: 1.TEMP_ALM	Temperature above alarm level
	SSIMG: 1.TEMP_LO	Temperature above lockout level
	Binary outputs	
	Counters	
	Double bit indications	
Table continues on next page		

Function Name	Signal Name	Description
SSIML	Analog Inputs	
	Binary inputs	
	SSIML: 1.LVL_ALM	Level below alarm level
	SSIML: 1.LVL_LO	Level below lockout level
	SSIML: 1.TEMP_ALM	Temperature above alarm level
	SSIML: 1.TEMP_LO	Temperature above lockout level
	Binary outputs	
	Counters	
	Double bit indications	
STBPTOC	Analog Inputs	
	Binary inputs	
	STBPTOC: 1.TRIP	General trip signal
	Binary outputs	
	Counters	
	Double bit indications	
SXCBR	Analog Inputs	
	Binary inputs	
	SXCBR: 1.CLOSEPOS	Apparatus closed position
	SXCBR: 1.OPENPOS	Apparatus open position
	SXCBR: 1.UPD_BLKD	Update of position indication is blocked
	Binary outputs	
	SXCBR: 1.CNT_VAL	Operation counter value
	Counters	
	SXCBR: 1.POSITION	Apparatus position indication
	SXCBR: 1.TR_POS	Truck position indication
	Double bit indications	
SXSWI	Analog Inputs	
	Binary inputs	
	SXSWI: 1.CLOSEPOS	Apparatus closed position
	SXSWI: 1.OPENPOS	Apparatus open position
	SXSWI: 1.UPD_BLKD	Update of position indication is blocked
	Binary outputs	
	SXSWI: 1.CNT_VAL	Operation counter value
	Counters	
	SXSWI: 1.POSITION	Apparatus position indication
	Double bit indications	
T2WPDIF	Analog Inputs	
	Binary inputs	
Table continues on next page		

Function Name	Signal Name	Description
	T2WPDIF: 1.BLK2H	General second harmonic block signal
	T2WPDIF: 1.BLK5H	General fifth harmonic block signal
	T2WPDIF: 1.INTFAULT	Indication that internal fault has been detected
	T2WPDIF: 1.TRIP	General trip signal
	T2WPDIF: 1.TRIPRES	Trip signal from restrained differential protection
	T2WPDIF: 1.TRIPUNRE	Trip signal from unrestrained differential protection
	T2WPDIF: 1.TRNSSENS	Trip signal from sensitive negative sequence differential protection
	T2WPDIF: 1.TRNSUNR	Trip signal from unrestrained negative sequence differential protection
	Binary outputs	
	Counters	
	Double bit indications	
T3WPDIF	Analog Inputs	
	Binary inputs	
	T3WPDIF: 1.BLK2H	General second harmonic block signal
	T3WPDIF: 1.BLK5H	General fifth harmonic block signal
	T3WPDIF: 1.INTFAULT	Indication that internal fault has been detected
	T3WPDIF: 1.TRIP	General trip signal
	T3WPDIF: 1.TRIPRES	Trip signal from restrained differential protection
	T3WPDIF: 1.TRIPUNRE	Trip signal from unrestrained differential protection
	T3WPDIF: 1.TRNSSENS	Trip signal from sensitive negative sequence differential protection
	T3WPDIF: 1.TRNSUNR	Trip signal from unrestrained negative sequence differential protection
	Binary outputs	
	Counters	
	Double bit indications	
TCMYLTC	Analog Inputs	
	TCMYLTC: 1.TCPOS	Integer value corresponding to actual tap position
	Binary inputs	
	TCMYLTC: 1.CNT_VAL	Number of operations on tap changer
	TCMYLTC: 1.HIPOSAL	Alarm for tap in the highest volt position
Table continues on next page		

Function Name	Signal Name	Description
	TCMYLTC: 1.LOPOSAL	Alarm for tap in the lowest volt position
	TCMYLTC: 1.POSERRAL	Alarm that indicates a problem with the position indication
	Binary outputs	
	Counters	
	Double bit indications	
TMAGGIO	Analog Inputs	
	Binary inputs	
	Binary outputs	
	Counters	
	Double bit indications	
	TMAGGIO: 1.OUTPUT1	OR function between inputs 1 to 16
	TMAGGIO: 1.OUTPUT2	OR function between inputs 17 to 32
	TMAGGIO: 1.OUTPUT3	OR function between inputs 1 to 32
TR1ATCC	Analog Inputs	
	TR1ATCC: 1.BUSVOLT	Average of the measured busbar voltage (service value)
	TR1ATCC: 1.ILOAD	Magnitude of measured load current (service value)
	TR1ATCC: 1.TCPOS	Tap position
	TR1ATCC: 1.ULOAD	Calculated compensated voltage (service value)
	Binary inputs	
	TR1ATCC: 1.AUTO	Automatic control mode is active
	TR1ATCC: 1.AUTOBLK	Block of auto commands
	TR1ATCC: 1.MAN	Control is in manual mode
	TR1ATCC: 1.TOTBLK	Block of auto and manual commands
	Binary outputs	
	Counters	
	Double bit indications	
TR8ATCC	Analog Inputs	
	TR8ATCC: 1.BUSVOLT	Average of measured busbar voltage (service value)
	TR8ATCC: 1.ICIRCUL	Circulating current
	TR8ATCC: 1.ILOAD	Magnitude of measured load current (service value)
	TR8ATCC: 1.TCPOS	Tap position
	TR8ATCC: 1.ULOAD	Calculated compensated voltage (service value)
	Binary inputs	
	TR8ATCC: 1.AUTO	Automatic control mode is active
	TR8ATCC: 1.AUTOBLK	Block of auto commands
Table continues on next page		

Function Name	Signal Name	Description
	TR8ATCC: 1.COMMERR	Communication error
	TR8ATCC: 1.DISCONN	Transformer is disconnected
	TR8ATCC: 1.FOLLOWER	This transformer is follower
	TR8ATCC: 1.MAN	Manual control mode is active
	TR8ATCC: 1.MASTER	Transformer is master
	TR8ATCC: 1.MSTRSLV	Master slave is active
	TR8ATCC: 1.OUTOFPOS	Difference in tap positions exceeded the set limit
	TR8ATCC: 1.PARALLEL	Transformer operates in parallel mode
	TR8ATCC: 1.SINGLE	Transformer operates in single mode
	TR8ATCC: 1.TOTBLK	Block of auto and manual commands
	Binary outputs	
	Counters	
	Double bit indications	
TRPTTR	Analog Inputs	
	Binary inputs	
	TRPTTR: 1.ALARM1	First level alarm signal
	TRPTTR: 1.ALARM2	Second level alarm signal
	TRPTTR: 1.TRIP	Trip Signal
	Binary outputs	
	Counters	
	Double bit indications	
UC2PTUC	Analog Inputs	
	Binary inputs	
	UC2PTUC: 1.TR1	Operate signal for step 1
	UC2PTUC: 1.TR1L1	Operate signal for step 1 in L1
	UC2PTUC: 1.TR1L2	Operate signal for step 1 in L2
	UC2PTUC: 1.TR1L3	Operate signal for step 1 in L3
	UC2PTUC: 1.TR2	Operate signal for step 2
	UC2PTUC: 1.TR2L1	Operate signal for step 2 in L1
	UC2PTUC: 1.TR2L2	Operate signal for step 2 in L2
	UC2PTUC: 1.TR2L3	Operate signal for step 2 in L3
	UC2PTUC: 1.TRIP	General trip signal
	Binary outputs	
	Counters	
	Double bit indications	
UV2PTUV	Analog Inputs	
	Binary inputs	
	UV2PTUV: 1.TR1	Trip signal from step 1
Table continues on next page		

Function Name	Signal Name	Description
	UV2PTUV: 1.TR2	Trip signal from step 2
	UV2PTUV: 1.TRIP	General trip signal
	Binary outputs	
	Counters	
	Double bit indications	
VMMXU	Analog Inputs	
	VMMXU: 1.UL12	UL12 Amplitude
	VMMXU: 1.UL12ANGL	UL12 Angle
	VMMXU: 1.UL23	UL23 Amplitude
	VMMXU: 1.UL23ANGL	UL23 Angle
	VMMXU: 1.UL31	UL31 Amplitude
	VMMXU: 1.UL31ANGL	UL31 Angle
	Binary inputs	
	Binary outputs	
	Counters	
	Double bit indications	
	VMMXU: 1.3U0	3U0 Amplitude
	VMMXU: 1.3U0ANGL	3U0 Angle
VMSQI	Analog Inputs	
	VMSQI: 1.U1	U1 Amplitude
	VMSQI: 1.U1ANGL	U1 Angle
	VMSQI: 1.U2	U2 Amplitude
	VMSQI: 1.U2ANGL	U2 Angle
	Binary inputs	
	Binary outputs	
	Counters	
	Double bit indications	
VNMMXU	Analog Inputs	
	VNMMXU: 1.UL1	UL1 Amplitude, magnitude of reported value
	VNMMXU: 1.UL1ANGL	UL1 Angle, magnitude of reported value
	VNMMXU: 1.UL2	UL2 Amplitude, magnitude of reported value
	VNMMXU: 1.UL2ANGL	UL2 Angle, magnitude of reported value
	VNMMXU: 1.UL3	UL3 Amplitude, magnitude of reported value
	VNMMXU: 1.UL3ANGL	UL3 Angle, magnitude of reported value
	Binary inputs	
	Binary outputs	
Table continues on next page		

Function Name	Signal Name	Description
	Counters	
	Double bit indications	
VSGGIO	Analog Inputs	
	Binary inputs	
	VSGGIO: 1.POS1	Position 1 indication, logical signal
	VSGGIO: 1.POS2	Position 2 indication, logical signal
	VSGGIO: 1.POSITION	Position indication, integer
	Binary outputs	
	Counters	
	Double bit indications	
ZCLCPLAL	Analog Inputs	
	Binary inputs	
	ZCLCPLAL: 1.TRLL	Trip by loss of load
	ZCLCPLAL: 1.TRZE	Trip by zone extension
	Binary outputs	
	Counters	
	Double bit indications	
ZCPSCH	Analog Inputs	
	Binary inputs	
	ZCPSCH: 1.CS	Carrier Send signal
	ZCPSCH: 1.LCG	Loss of carrier guard signal
	ZCPSCH: 1.PRORX	Carrier signal received or missing carrier guard signal
	ZCPSCH: 1.TRIP	Trip output
	Binary outputs	
	Counters	
	Double bit indications	
ZCRWPSCH	Analog Inputs	
	Binary inputs	
	ZCRWPSCH: 1.CR	POR Carrier signal received from remote end
	ZCRWPSCH: 1.ECHO	Carrier send by WEI logic
	ZCRWPSCH: 1.TRWEI	Trip of WEI logic
	ZCRWPSCH: 1.TRWEIL1	Trip of WEI logic in phase L1
	ZCRWPSCH: 1.TRWEIL2	Trip of WEI logic in phase L2
	ZCRWPSCH: 1.TRWEIL3	Trip of WEI logic in phase L3
	Binary outputs	
	Counters	
	Double bit indications	
ZCVPSOF	Analog Inputs	
Table continues on next page		

Function Name	Signal Name	Description
	Binary inputs	
	ZCVPSOF: 1.TRIP	Trip output
	Binary outputs	
	Counters	
	Double bit indications	
ZMOPDIS	Analog Inputs	
	Binary inputs	
	ZMOPDIS: 1.TRIP	Trip general
	ZMOPDIS: 1.TRZ1	Trip zone 1
	ZMOPDIS: 1.TRZ2	Trip zone 2
	ZMOPDIS: 1.TRZ3	Trip zone 3
	ZMOPDIS: 1.TRZ4	Trip zone 4
	ZMOPDIS: 1.TRZ5	Trip zone 5
	Binary outputs	
	Counters	
	Double bit indications	
ZMRPSB	Analog Inputs	
	Binary inputs	
	ZMRPSB: 1.START	Power swing detected
	Binary outputs	
	Counters	
	Double bit indications	
ZQDPDIS	Analog Inputs	
	Binary inputs	
	ZQDPDIS: 1.TRIP	General trip signal
	ZQDPDIS: 1.TRZ1	Trip zone 1
	ZQDPDIS: 1.TRZ2	Trip zone 2
	ZQDPDIS: 1.TRZ3	Trip zone 3
	ZQDPDIS: 1.TRZ4	Trip zone 4
	ZQDPDIS: 1.TRZ5	Trip zone 5
	Binary outputs	
	Counters	
	Double bit indications	

Section 3 DNP3 protocol implementation

3.1 DNP3 device profile

The following table provides a device profile document in the standard format defined in the DNP3 Subset Definitions Document. While it is referred to in the DNP3 Subset Definitions as a document, it is in fact a table, and only a component of a total interoperability guide. The table, in combination with the Implementation table and the point list tables provides a complete configuration/interoperability guide for communicating with a device.

Table 3: *Device profile document*

DNP3 device profile document			
Vendor name:		ABB AB	
Device name:		REL650	
Highest DNP level supported:		Device function:	
For requests: Level 2		○ Master	
For responses: Level 2		● Slave	
<p>Notable objects, functions, and/or qualifiers supported in addition to the highest DNP levels supported (the complete list is described in the attached table):</p> <p>For static (non-change-event) object requests, request qualifier codes 07 and 08 (limited quantity), and 17 and 28 (index) are supported. Static object requests sent with qualifiers 07, or 08, will be responded with qualifiers 00 or 01.</p> <p>16-bit, 32-bit and Floating point analog change events with time may be requested.</p> <p>Floating point analog output status and output block objects 40 and 41 are not supported.</p> <p>Sequential file transfer, object 70, variations 2 through 7, are not supported.</p> <p>Octet string and string event objects 110 and 111 are not supported.</p> <p>Virtual terminal output and event objects 112 and 113 are not supported.</p> <p>Device attribute object 0 is not supported.</p> <p>Data set objects 85-88 are not supported.</p>			
Maximum data link frame size (octets):		Maximum application fragment size (octets):	
Transmitted: 292		Transmitted: Configurable up to 2048 (ApLayMaxTxSize for each master session)	
Received: 292		Received: Configurable up to 2048 (ApLayMaxRxSize for each Master session)	
Maximum data link re-tries:		Maximum application layer re-tries:	
○ None		● None	
○ Fixed		○ Configurable	
● Configurable (0...65535) (DLinkRetries for each channel)			
Requires data link layer confirmation:			
○ Never			
○ Always			
○ Sometimes			

Table continues on next page

DNP3 device profile document						
	<ul style="list-style-type: none">Configurable as: never, only for multi-frame messages, or always (DLinkConfirm for each channel)					
Requires application layer confirmation:						
	<ul style="list-style-type: none">NeverAlwaysWhen reporting event data (slave devices only)When sending multi-fragment responses (slave devices only)SometimesConfigurable as: "Only when reporting event data", or "When reporting event data or multi-fragment messages." (ConfMultiFrag for each master session)					
Timeouts while waiting for:						
Data link confirm: (tDLinkTimeout on DNP3Channel in PST)	<ul style="list-style-type: none">NoneFixed at ____VariableConfigurable					
Complete appl. fragment:	<ul style="list-style-type: none">NoneFixed at ____VariableConfigurable					
Application confirm: (tApplConfTimeout on DNP3Master in PST)	<ul style="list-style-type: none">NoneFixed at ____VariableConfigurable					
Complete appl. response:	<ul style="list-style-type: none">NoneFixed at ____VariableConfigurable					
Others:	<ul style="list-style-type: none">Transmission delay, configurable (tRxToTxMinDel for each channel).Select/Operate arm timeout, configurable (tSelectTimeout for each master session).Need time interval, configurable (tSynchTimeout for each master session).Unsolicited notification delay, configurable (tUREvBufTout1, tUREvBufTout2, tUREvBufTout3 for each master session).Unsolicited response retry delay, configurable (tURRetryDelay for each master session).Unsolicited offline interval, configurable (tUOffIRtryDel for each master session).					
<p>Change events in the IED670 are generated by the device's internal event system; they are not polled at a protocol-specific scan rate. The periodicity for each point depends on the point's data rate in the IED.</p> <p>Binary change event scan period – see above</p> <p>Double bit change event scan period – see above</p> <p>Analog change event scan period – see above</p> <p>Counter change event scan period – see above</p>						
Sends/Executes Control Operations:						
WRITE binary outputs	<ul style="list-style-type: none">NeverAlwaysSometimesConfigurable					
SELECT/ OPERATE	<ul style="list-style-type: none">NeverAlwaysSometimesConfigurable					
DIRECT OPERATE	<ul style="list-style-type: none">NeverAlwaysSometimesConfigurable					
DIRECT OPERATE - NO ACK	<ul style="list-style-type: none">NeverAlwaysSometimesConfigurable					
Table continues on next page						

DNP3 device profile document								
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
Explanation of 'Sometimes' above: Supported binary output control operations depend on the type of point. Please consult the binary output point list description.								
Reports binary input change events when no specific variation requested: <ul style="list-style-type: none">○ Never○ Only when time-tagged○ Only non-time-tagged● Configurable to send one or the other (Obj2DefVar on DNP3Master)				Reports time-tagged binary input change events when no specific variation requested: <ul style="list-style-type: none">○ Never○ Binary input change with time○ Binary input change with relative time● Configurable (Obj2DefVar on DNP3Master)				
Sends unsolicited responses: <ul style="list-style-type: none">○ Never● Configurable (UReEnable on DNP3Master)○ Only certain objects○ Sometimes (attach explanation)● ENABLE/DISABLE UNSOLICITED function codes supported				Sends static data in unsolicited responses: <ul style="list-style-type: none">● Never○ When device restarts○ When status flags change <p>No other options are permitted.</p>				
Default counter object/variation: <ul style="list-style-type: none">○ No counters reported● Configurable (obj20DefVar and obj22DefVar in DNP3Master)○ Default object Default variation:○ Point-by-point list attached				Counters roll over at: <ul style="list-style-type: none">○ No counters reported○ Configurable (attach explanation)● 16 bits● 32 bits○ Other value: _____○ Point-by-point list attached				
Sends multi-fragment responses: <ul style="list-style-type: none">○ Yes○ No● Configurable (ApplMultFrgRes on DNP3Master)								
Deadbanding is not performed in the DNP protocol stack. Any deadbanding is a property of the IED's underlying data, and is configured through the IED configuration tools.								
● = Selected, ○ = Not selected								

3.2 DNP3 implementation table

The following table identifies which object variations, function codes, and qualifiers the REX670 supports 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. 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.

Table 4: *Implementation table*

OBJECT			REQUEST (Slave will parse)		RESPONSE (Slave will respond with)	
Object number	Variation number	Description	Function codes (dec)	Qualifier codes (hex)	Function codes (dec)	Qualifier codes (hex)
1	0	Binary input – any variation	1 (read) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)		
1	1 (default) ¹⁾	Binary input	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) ²⁾
1	2	Binary input with status	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index)
2	0	Binary input change – any variation	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
2	1	Binary input change without time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
2	2	Binary input change with time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
2	3	Binary input change with relative time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
3	0	Double bit input – any variation	1 (read) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)		
3	1	Double bit output	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index)
3	2	Double bit input with status	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index)
4	0	Double bit input change – any variation	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
4	1	Double bit input change without time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)

Table continues on next page

OBJECT			REQUEST (Slave will parse)		RESPONSE (Slave will respond with)	
4	2	Double bit input change with time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
4	3	Double bit input change with relative time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
10	0	Binary output status — any variation	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)		
10	1	Binary output	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index)
10	2	Binary output status	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index)
12	0	Control blocks any variation				
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
12	2	Pattern block control	3 (select) 4 (operate) 5 (direct op) 6 (dir.op. noack)	07 (limited qty)	129 (response)	echo of request
12	3	Pattern mask	3 (select) 4 (operate) 5 (direct op) 6 (dir.op. noack)	00,01 (start-stop)	129 (response)	echo of request
20	0	Binary counter —any variation	1 (read) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)		
			7 (freeze) 8 (freeze noack) 9 (freeze clear) 6 frz cl. noack)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)		
20	1	32-bit binary counter (with flag)	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00,01 (start-stop) 17, 28 (index)
20	2	16-bit binary counter (with flag)	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00,01 (start-stop) 17, 28 (index)
20	3	32-bit delta counter				
20	4	16-bit delta counter				
20	5	32-bit binary counter without flag	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00,01 (start-stop) 17, 28 (index)

Table continues on next page

Section 3

DNP3 protocol implementation

1MRK 511 225-UEN -

OBJECT			REQUEST (Slave will parse)		RESPONSE (Slave will respond with)	
20	6	16-bit binary counter without flag	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00,01 (start-stop) 17, 28 (index)
21	0	Frozen counter — any variation				
21	1	32-bit frozen counter (with flag)				
21	2	16-bit frozen counter (with flag)				
21	5	32-bit frozen counter with time of freeze				
21	6	16-bit frozen counter with time of freeze				
21	9	32-bit frozen counter without flag				
21	10	16-bit frozen counter without flag				
22	0	Counter change event — any variation	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
22	1	32-bit counter change event without time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
22	2	16-bit counter change event without time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
22	3	32-bit delta counter change event without time				
22	4	16-bit delta counter change event without time				
22	5	32-bit counter change event with time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
22	6	16-bit counter change event with time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
30	0	Analog input — any variation	1 (read) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)		
30	1	32-bit analog input	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00,01 (start-stop) 17, 28 (index)
30	2	16-bit analog input	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00,01 (start-stop) 17, 28 (index)
30	3	32-bit analog input without flag	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00,01 (start-stop) 17, 28 (index)

Table continues on next page

OBJECT			REQUEST (Slave will parse)		RESPONSE (Slave will respond with)	
30	4	16-bit analog input without flag	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00,01 (start-stop) 17, 28 (index)
30	5	Short floating point	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00,01 (start-stop) 17, 28 (index)
30	6	Long floating point	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00,01 (start-stop) 17, 28 (index)
32	0	Analog change event — any variation	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
32	1	32-bit analog change event without time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	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) 130 (unsol. resp)	17, 28 (index)
32	3	32-bit analog change event with time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
32	4	16-bit analog change event with time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
32	5	Short floating point analog change event without time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
32	6	Long floating point analog change event without time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
32	7	Short floating point analog change event with time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
32	8	Long floating point analog change event with time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
			2 (write)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)		
34	0	Analog input deadband (variation 0 is used to request default variation)				
34	1	16 bit analog input deadband				
34	2	32 bit analog input deadband				
34	3	Short floating point analog input deadband				
40	0	Analog output status (variation 0 is used to request default variation)				

Table continues on next page

Section 3

DNP3 protocol implementation

1MRK 511 225-UEN -

OBJECT			REQUEST (Slave will parse)		RESPONSE (Slave will respond with)	
40	1	32-bit analog output status				
40	2	16-bit analog output status				
40	3	Short floating point analog output status				
40	4	Long floating point analog output status				
41	1	32-bit analog output block				
41	2	16-bit analog output block				
41	3	Short floating point analog output block				
41	4	Long floating point analog output block				
50	0	Time and date				
50	1	Time and date	1 (read)	07, (limited qty = 1)	129 (response)	07 (limited qty = 1)
			2 (write)	07, (limited qty = 1)		
50	2	Time and date with interval				
50	3	Time and date last recorded time	2 (write)	07 (limited qty)		
51	1	Time and date CTO			129 (response) 130 (unsol. resp)	07 (limited qty) (qty = 1)
51	2	Unsynchronized time and date CTO			129 (response) 130 (unsol. resp)	07 (limited qty) (qty = 1)
52	1	Time delay coarse			129 (response)	07 (limited qty) (qty = 1)
52	2	Time delay fine			129 (response)	07 (limited qty) (qty = 1)
60	0	Not defined				
60	1	Class 0 data	1 (read)	06 (no range, or all)		
60	2	Class 1 data	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
			20 (enbl. unsol.) 21 (dab.unsol.) 22 (assign class)	06 (no range, or all)		
60	3	Class 2 data	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
			20 (enbl. unsol.) 21 (dab.unsol.) 22 (assign class)	06 (no range, or all)		
60	4	Class 3 data	1 (read) 20 (enbl. unsol.) 21 (dab.unsol.) 22 (assign class)	06 (no range, or all) 06 (no range, or all) 07, 08 (limited qty)		
70	0	File event — any variation				

Table continues on next page

OBJECT			REQUEST (Slave will parse)		RESPONSE (Slave will respond with)	
70	2	File authentication				
70	3	File command				
70	4	File command status				
70	5	File transfer				
70	6	File transfer status				
70	7	File descriptor				
80	1	Internal indications	1 (read)	00, 01 (start-stop)	129 (response)	00,01 (start-stop)
			2 (write) ³⁾	00 (start-stop) index=7		
110	string length	Octet string object				
111	string length	Octet string event object				
112	string length	Virtual terminal output block				
113	string length	Virtual terminal event data				
No object (function code only)			13 (cold restart)			
No object (function code only)			14 (warm restart)			
No object (function code only)			23 (delay meas.)			
No object (function code only)			24 (record current time)			

- 1) A default variation refers to the variation responded when variation 0 is requested and/or in class 0, 1, 2, or 3 scans. Default variations are configurable; however, default settings for the configuration parameters are indicated in the table above.
- 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.)
- 3) Writes of internal indications are only supported for index 7 (Restart IIn1–7)

Section 4 Glossary

CMT	Communication Management Tool in PCM600
DNP3	A distributed network protocol originally developed by Westronic. The DNP3 Users Group has the ownership of the protocol and assumes responsibility for its evolution.
EMC	Electromagnetic compatibility
HMI	Human-machine interface
RMS	Root-mean-square (value)
WEI	Weak-end infeed logic

Contact us

ABB AB

Substation Automation Products

SE-721 59 Västerås, Sweden

Phone +48 (0) 21 34 20 00

Fax +48 (0) 21 14 69 18

www.abb.com/substationautomation