

# 7PG2113/4/5/6

Feeder protection

## Document Release History

This document is issue 2010/08. The list of revisions up to and including this issue is:

2010/08	First issue

## Software Revision History

2009/04	2436H80003R1g-1c 7PG2113/5 2436H80004R1g-1c 7PG2114/6	First Release
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## Contents

Section 1: Introduction .....	3
Section 2: Physical Connection.....	4
2.1 Communication ports .....	4
2.1.1 USB Interface.....	4
2.1.2 RS485 Interface .....	4
Section 3: IEC 60870-5-103 Definitions .....	6
3.1 Introduction .....	6
Section 4: Modbus Definitions .....	15
4.1 Introduction .....	15
Section 5: DNP3.0 Definitions.....	20
5.1 Device Profile .....	20
5.2 Implementation Table.....	23
5.3 Point List .....	30
5.4 Binary Output Status Points and Control Relay Output Blocks .....	33
5.5 Analogue Inputs .....	34
Section 6: Configuration.....	37
Section 7: Glossary.....	38

## List of Figures

Figure 7.1-1 Communication to Front USB Port .....	4
Figure 1.1-2 Communication to Multiple Devices from Control System using RS485 .....	5

## Section 1: Introduction

The relay data communication facility is compatible with control and automation systems, PCs running Reydisp software, can provide operational information, post-fault analysis, settings interrogation and editing facilities. This section describes how to use the Communication Interface with a control system or interrogating computer. Appropriate software within the control system or on the interrogating computer (e.g. Reydisp Evolution) is required to access the interface.

This section specifies connection details and lists the events, commands and measurands available. For further information regarding the IEC60870-5-103 interface, reference should be made to the separate Informative Communications Interface manual.

The Communications Interface for dialogue communications by the Protection Engineer is provided by the Reydisp Evolution software package, also available from the website, using the IEC60870-5-103 protocol.

## Section 2: Physical Connection

The relay range provides one 'Front' USB communication interface (Com2) located on the fascia and one RS485 (Com1) located on the 'Rear'. Access to the communication settings for the USB port is only available from the relay front fascia via the key pad setting menu **COMMUNICATIONS MENU**. The communication settings for the RS485 port are available from the relay front fascia via the key pad setting menu or through Reydisp via the USB connection.

1. Com2-USB: this port is used for IEC60870-5-103 (default setting) communication with the Reydisp software. An ASCII protocol, the main use of which is to allow firmware to be updated from the front connection, is also available through this port.
2. Com1-RS485: this port can be used for IEC60870-5-103 or MODBUS RTU or DNP 3.0 communications to a substation SCADA or integrated control system or engineer remote access.

The ports can be independently mapped to the IEC60870-5-103 or MODBUS RTU or DNP3.0 protocol or switched OFF in the relay settings.. The same protocol can be used simultaneously on both ports.

SPDL. can provide a range of interface devices, please refer to product portfolio catalogue.

Full details of the interface devices can be found by referring to the website [www.siemens.com/energy](http://www.siemens.com/energy).

### 2.1 Communication ports

#### 2.1.1 USB Interface

The USB communication port is connected using a standard USB cable with a type B connection to the relay and type A to the PC.

The PC will require a suitable USB driver to be installed, this will be carried out automatically when the Reydisp software is installed. When the Reydisp software is running with the USB cable connected to a device an additional connection is shown in the Reydisp connection window, connections to the USB port are not shown when they are not connected.

The USB communication interface on the relay is labelled Com 2 and its associated settings are located in the Data communications menu. When connecting to Reydisp using this connection the default settings can be used without the need to first change any settings, otherwise the Com 2 port must be set to IEC60870-5-103 (the relay address and baud rate do not need to be set).

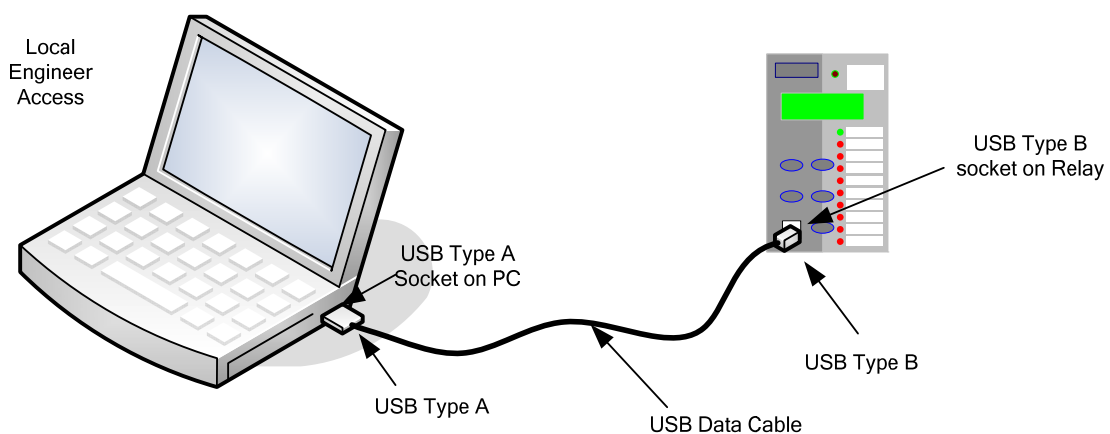


Figure 7.1-1 Communication to Front USB Port

#### 2.1.2 RS485 Interface

The RS485 communication port is located on the rear of the relay and can be connected using a suitable RS485 120 ohm screened twisted pair cable.

The RS485 electrical connection can be used in a single or multi-drop configuration. The RS485 master must support and use the Auto Device Enable (ADE) feature. The last device in the connection must be terminated correctly in accordance with the master device driving the connection. The relays are fitted with an internal terminating resistor which can be connected between A and B by fitting an external wire loop between terminals 18 and 20 on the power supply module.

The maximum number of relays that can be connected to the bus is 64.

The following settings must be configured via the relay fascia when using the RS485 interface. The shaded settings are only visible when DNP3.0 is selected.

Setting name	Range	Default	Setting	Notes
<b>Station Address</b>	0 ... 254 (IEC60870-5-103) 0 ... 247 (MODBUS) 0 ... 65534 (DNP3)	0	1...	An address must be given to identify the relay. Each relay must have a unique address.
<b>COM1-RS485 Protocol</b>	OFF, IEC60870-5-103, MODBUS-RTU, DNP3.0	IEC60870-5-103	As Required	Sets the protocol used to communicate on the RS485 connection.
<b>COM1-RS485 Baud Rate</b>	75 110 150 300 600 1200 2400 4800 9600 19200 38400	19200	As Required	The baud rate set on all of the relays connected to the same RS485 bus must be the same as the one set on the master device.
<b>COM1-RS485 Parity</b>	NONE, ODD, EVEN	EVEN	As Required	The parity set on all of the relays connected to the same RS485 bus must be the same and in accordance with the master device.
<b>Unsolicited Mode</b>	DISABLED ENABLED	DISABLED	As Required	Setting is only visible when COM1 Protocol is set to DNP3
<b>Destination Address</b>	0 ... 65534	0	As Required	Setting is only visible when COM1 Protocol is set to DNP3

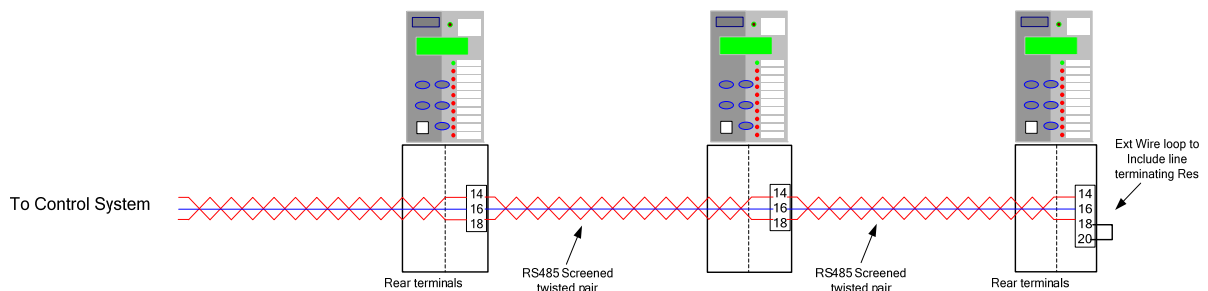


Figure 1.1-2 Communication to Multiple Devices from Control System using RS485

## Section 3: IEC 60870-5-103 Definitions

### 3.1 Introduction

This section describes the IEC 60870-5-103 protocol implementation in the relays. This protocol is used for the communication with Reydisp software and can also be used for communication with a suitable control system. The control system or local PC acts as the master in the system with the relay operating as a slave responding to the master's commands. The implementation provides event information, time synchronising, commands and measurands and also supports the transfer of disturbance records.

This protocol can be set to use any or all of the relays hardware interfaces and is the standard protocol used by the USB port. The relay can communicate simultaneously on all ports regardless of protocol used.

Each relay must be given an address to enable communication and can be set by the *Communication Interface:Relay Address*. A relay with the default address of **0** will not be able to communicate.

#### Cause of Transmission

The cause of transmission (COT) column of the 'Information Number and Function' table lists possible causes of transmission for these frames. The following abbreviations are used:

Abbreviation	Description
SE	spontaneous event
T	test mode
GI	general interrogation
Loc	local operation
Rem	remote operation
Ack	command acknowledge
Nak	Negative command acknowledge

Note: Events listing a GI cause of transmission can be raised and cleared; other events are raised only.

#### Function Type

Abbreviation	Description
1	Time tagged message (monitor direction)
2	Time tagged message (relative time) (monitor direction)
3.1	Measurands I
4	Time-tagged measurands with relative time
5	Identification message
6	Time synchronisation
7	General Interrogation Initialization
9	Measurands II
20	General command

#### Information Number and Function

The following table lists information number and function definitions together with a description of the message and function type and cause of transmission that can result in that message. The table shows all events available from the relay range.

Function	Information Number	Description	Function Type	Cause of Transmission
60	4	Remote Mode	1	SE, GI,
60	5	Service Mode	1	SE, GI,
60	6	Local Mode	1	SE, GI,
60	7	Local & Remote Mode	1	SE, GI,
60	12	Control Received	1	SE
60	13	Command Received	1	SE
60	128	Cold Start	1	SE
60	129	Warm Start	1	SE
60	130	Re-start	1	SE
60	135	Trigger Storage	1	SE
60	136	Clear Waveform Records	1	SE
60	137	Clear Fault Records	1	SE
60	138	Clear Event Records	1	SE
60	140	Demand Metering Reset	1	SE
70	5	Binary Input 5	1	SE, GI
70	6	Binary Input 6	1	SE, GI
80	1	Binary Output 1	1	SE, GI,
			20	Ack, Nak
80	2	Binary Output 2	1	SE, GI,
			20	Ack, Nak
80	3	Binary Output 3	1	SE, GI,
			20	Ack, Nak
80	4	Binary Output 4	1	SE, GI,
			20	Ack, Nak
80	5	Binary Output 5	1	SE, GI,
			20	Ack, Nak
80	6	Binary Output 6	1	SE, GI,
			20	Ack, Nak
80	7	Binary Output 7	1	SE, GI,
			20	Ack, Nak
80	8	Binary Output 8	1	SE, GI,
			20	Ack, Nak
160	2	Reset FCB	5	Reset FCB
160	3	Reset CU	5	Reset CU
160	4	Start/Restart	5	Start/Restart
160	5	Power On	5	SE
160	16	Auto-reclose active (In/Out)	1	SE, GI
			20	Ack, Nak
160	19	LEDs reset (Reset Flag & Outputs)	1	SE
			20	Ack, Nak
160	22	Settings changed	1	SE
160	23	Settings Group 1 Select	1	SE, GI
			20	Ack, Nak
160	24	Settings Group 2 Select	1	SE, GI
			20	Ack, Nak
160	25	Settings Group 3 Select	1	SE, GI
			20	Ack, Nak
160	26	Settings Group 4 Select	1	SE, GI
			20	Ack, Nak

Function	Information Number	Description	Function Type	Cause of Transmission
160	27	Binary Input 1	1	SE, GI
160	28	Binary Input 2	1	SE, GI
160	29	Binary Input 3	1	SE, GI
160	30	Binary Input 4	1	SE, GI
160	36	Trip circuit fail	1	SE, GI
160	38	VT Fuse Failure	1	SE, GI
160	51	Earth Fault Forward/Line	1	SE, GI
160	52	Earth Fault Reverse/Busbar	1	SE, GI
160	64	Starter/Pick Up L1	1	SE, GI
160	65	Starter/Pick Up L2	1	SE, GI
160	66	Starter/Pick Up L3	1	SE, GI
160	67	Starter/Pick Up N	1	SE, GI
160	68	General Trip	2	SE
160	69	Trip L1	2	SE
160	70	Trip L2	2	SE
160	71	Trip L3	2	SE
160	74	Fault Forward/Line	1	SE, GI
160	75	Fault Reverse/Busbar	1	SE, GI
160	84	General Starter/Pick Up	1	SE, GI
160	85	Circuit breaker fail	2	SE
160	90	Trip l>	2	SE
160	91	Trip l>>	2	SE
160	92	Trip ln>	2	SE
160	93	Trip ln>>	2	SE
160	128	CB on by auto reclose	1	SE
183	0	Data lost	1	SE
183	10	51-1	2	SE, GI
183	11	50-1	2	SE, GI
183	12	51N-1	2	SE, GI
183	13	50N-1	2	SE, GI
183	14	51G-1	2	SE, GI
183	15	50G-1	2	SE, GI
183	16	51-2	2	SE, GI
183	17	50-2	2	SE, GI
183	18	51N-2	2	SE, GI
183	19	50N-2	2	SE, GI
183	20	51G-2	2	SE, GI
183	21	50G-2	2	SE, GI
183	22	51-3	2	SE, GI
183	23	50-3	2	SE, GI
183	24	51N-3	2	SE, GI
183	25	50N-3	2	SE, GI
183	26	51G-3	2	SE, GI
183	27	50G-3	2	SE, GI
183	28	51-4	2	SE, GI
183	29	50-4	2	SE, GI
183	30	51N-4	2	SE, GI
183	31	50N-4	2	SE, GI
183	32	51G-4	2	SE, GI
183	33	50G-4	2	SE, GI



Function	Information Number	Description	Function Type	Cause of Transmission
183	34	50BF Stage 2	2	SE, GI
183	35	49 Alarm	2	SE, GI
183	36	49 Trip	2	SE, GI
183	40	60CTS	2	SE, GI
183	41	51SEF-1	2	SE, GI
183	42	50SEF-1	2	SE, GI
183	43	51SEF-2	2	SE, GI
183	44	50SEF-2	2	SE, GI
183	45	51SEF-3	2	SE, GI
183	46	50SEF-3	2	SE, GI
183	47	51SEF-4	2	SE, GI
183	48	50SEF-4	2	SE, GI
183	49	SEF Out/In	1	SE, GI
			20	Ack, Nak
183	50	46IT	2	SE, GI
183	51	46DT	2	SE, GI
183	52	64H	2	SE, GI
183	53	EF Out/In	1	SE, GI
			20	Ack, Nak
183	54	SEF Forward/Line	2	SE, GI
183	55	SEF Reverse/Bus	2	SE, GI
183	60	47-1	2	SE, GI
183	61	47-2	2	SE, GI
183	62	37-1	2	SE, GI
183	63	37-2	2	SE, GI
183	70	46BC	2	SE, GI
183	81	27/59-1	2	SE, GI
183	82	27/59-2	2	SE, GI
183	83	27/59-3	2	SE, GI
183	84	27/59-4	2	SE, GI
183	85	59NIT	2	SE, GI
183	86	59NDT	2	SE, GI
183	101	Trip Circuit Fail 1	1	SE, GI
183	102	Trip Circuit Fail 2	1	SE, GI
183	103	Trip Circuit Fail 3	1	SE, GI
183	114	Close CB Failed	1	SE
183	115	Open CB Failed	1	SE
183	116	Reclaim	1	SE, GI
183	117	Lockout	1	SE, GI
183	119	Successful DAR Close	1	SE
183	120	Successful Man Close	1	SE
183	121	Hotline Working	1	SE, GI
			20	Ack, Nak
183	122	Inst Protection Out	1	SE, GI
			20	Ack, Nak
183	123	CB Trip Count Maintenance	1	SE, GI
183	124	CB Trip Count Delta	1	SE, GI
183	125	CB Trip Count Lockout	1	SE, GI
183	126	Reset CB Trip Count	1	SE
			20	Ack, Nak

Function	Information Number	Description	Function Type	Cause of Transmission
183	127	Reset CB Trip Count Delta	1	SE
			20	Ack, Nak
183	128	Reset CB Trip Count Lockout	1	SE
			20	Ack, Nak
183	129	I <sup>Δ</sup> 2t CB Wear	1	SE, GI
183	130	Reset I <sup>Δ</sup> 2t CB Wear	1	SE
			20	Ack, Nak
183	131	79 AR In Progress	1	SE, GI
183	132	CB Frequent Ops Count	1	SE
183	133	Reset CB Frequent Ops Count	1	SE
			20	Ack, Nak
183	140	Cold Load Active	1	SE, GI
183	141	P/F Inst Protection Inhibited	1	SE
183	142	E/F Inst Protection Inhibited	1	SE
183	143	SEF Inst Protection Inhibited	1	SE
183	144	Ext Inst Protection Inhibited	1	SE
183	163	Trip Time Alarm	1	SE
183	164	Close Circuit Fail 1	1	SE
183	165	Close Circuit Fail 2	1	SE
183	166	Close Circuit Fail 3	1	SE
183	167	Close Circuit Fail	1	SE
200	1	CB 1	1	SE, GI
			20	Ack, Nak
200	200	Trip & Reclose	1	SE
			20	Ack, Nak
200	201	Trip & Lockout	1	SE
			20	Ack, Nak
200	255	Blocked by Interlocking	1	SE, GI
255	0	Time Synchronisation	6	Time Synchronisation
255	0	GI Initiation	7	End of GI
255	0	End of GI	8	End of GI

**Measurand**

Function	Information Number	Description	Function Type	Cause of Transmission
183	148	Measurand $I_{L1,2,3}$ , $V_{L1,2,3}$ , P, Q, f, $I_{L1}$ (2.4 x) $I_{L2}$ (2.4 x) $I_{L3}$ (2.4 x) $V_{L1}$ (1.2 x) (7PG2114/6 only) $V_{L2}$ (1.2 x) (7PG2114/6 only) $V_{L3}$ (1.2 x) (7PG2114/6 only) P (2.4 x) (7PG2114/6 only) Q (2.4 x) (7PG2114/6 only) F (1.2 x) (7PG2114/6 only)	9	Cyclic – Refresh rate 5 seconds or value change greater than 1%

**Disturbance Recorder Actual Channel (ACC) Numbers**

Function	ACC Number	Description
182	0	Global
182	1	Va (7PG2114/6 only)
182	2	Vb (7PG2114/6 only)
182	3	Vc (7PG2114/6 only)
182	4	Not Used
182	5	Ia
182	6	Ib
182	7	Ic
182	8	Ig1

## Events List by Relay Model – 7PG2113/4/5/6

FUN	INF	Event	7PG2113-xxA12-xCx0	7PG2113-xxA12-xDx0	7PG2115-xxA12-xCx0	7PG2115-xxA12-xDx0	7PG2114-xxA12-xCx0	7PG2114-xxA12-xDx0	7PG2116-xxA12-xCx0	7PG2116-xxA12-xDx0
60	4	Remote Mode	•	•	•	•	•	•	•	•
60	5	Service Mode	•	•	•	•	•	•	•	•
60	6	Local Mode	•	•	•	•	•	•	•	•
60	7	Local & Remote	•	•	•	•	•	•	•	•
60	12	Control Received	•	•	•	•	•	•	•	•
60	13	Command Received	•	•	•	•	•	•	•	•
60	128	Cold Start	•	•	•	•	•	•	•	•
60	129	Warm Start	•	•	•	•	•	•	•	•
60	130	Re-Start	•	•	•	•	•	•	•	•
60	135	Trigger Storage	•	•	•	•	•	•	•	•
60	136	Clear Waveform Records	•	•	•	•	•	•	•	•
60	137	Clear Fault Records	•	•	•	•	•	•	•	•
60	138	Clear Event Records	•	•	•	•	•	•	•	•
60	140	Demand metering reset	•	•	•	•	•	•	•	•
70	5	Binary Input 5			•	•			•	•
70	6	Binary Input 6			•	•			•	•
80	1	Binary Output 1	•	•	•	•	•	•	•	•
80	2	Binary Output 2	•	•	•	•	•	•	•	•
80	3	Binary Output 3	•	•	•	•	•	•	•	•
80	4	Binary Output 4	•	•	•	•	•	•	•	•
80	5	Binary Output 5	•	•	•	•	•	•	•	•
80	6	Binary Output 6							•	•
80	7	Binary Output 7			•	•			•	•
80	8	Binary Output 8			•	•			•	•
183	0	Data Lost	•	•	•	•	•	•	•	•
160	2	Reset FCB	•	•	•	•	•	•	•	•
160	3	Reset CU	•	•	•	•	•	•	•	•
160	4	Start/Restart	•	•	•	•	•	•	•	•
160	5	Power On	•	•	•	•	•	•	•	•
160	16	Auto-reclose active		•		•		•		•
160	19	LED Reset	•	•	•	•	•	•	•	•
160	22	Settings changed	•	•	•	•	•	•	•	•
160	23	Setting G1 selected	•	•	•	•	•	•	•	•
160	24	Setting G2 selected	•	•	•	•	•	•	•	•
160	25	Setting G3 selected	•	•	•	•	•	•	•	•
160	26	Setting G4 selected	•	•	•	•	•	•	•	•
160	27	Binary Input 1	•	•	•	•	•	•	•	•
160	28	Binary Input 2	•	•	•	•	•	•	•	•
160	29	Binary Input 3	•	•	•	•	•	•	•	•
160	30	Binary Input 4			•	•			•	•
160	36	Trip Circuit Fail	•	•	•	•	•	•	•	•
160	64	Start/Pick-up L1	•	•	•	•	•	•	•	•
160	65	Start/Pick-up L2	•	•	•	•	•	•	•	•
160	66	Start/Pick-up L3	•	•	•	•	•	•	•	•
160	67	Start/Pick-up N	•	•	•	•	•	•	•	•
160	68	General Trip	•	•	•	•	•	•	•	•
160	69	Trip L1	•	•	•	•	•	•	•	•
160	70	Trip L2	•	•	•	•	•	•	•	•
160	71	Trip L3	•	•	•	•	•	•	•	•

FUN	INF	Event								
			7PG2113-xxA12-xCx0	7PG2113-xxA12-xDx0	7PG2115-xxA12-xCx0	7PG2115-xxA12-xDx0	7PG2114-xxA12-xCx0	7PG2114-xxA12-xDx0	7PG2116-xxA12-xCx0	7PG2116-xxA12-xDx0
160	84	General Start/Pick-up	•	•	•	•	•	•	•	•
160	85	Breaker Failure	•	•	•	•	•	•	•	•
160	90	Trip I>	•	•	•	•	•	•	•	•
160	91	Trip I>>	•	•	•	•	•	•	•	•
160	92	Trip In>	•	•	•	•	•	•	•	•
160	93	Trip In>>	•	•	•	•	•	•	•	•
160	128	CB on by auto reclose		•		•		•		•
183	10	51-1	•	•	•	•	•	•	•	•
183	11	50-1	•	•	•	•	•	•	•	•
183	12	51N-1	•	•	•	•	•	•	•	•
183	13	50N-1	•	•	•	•	•	•	•	•
183	14	51G-1	•	•	•	•	•	•	•	•
183	15	50G-1	•	•	•	•	•	•	•	•
183	16	51-2	•	•	•	•	•	•	•	•
183	17	50-2	•	•	•	•	•	•	•	•
183	18	51N-2	•	•	•	•	•	•	•	•
183	19	50N-2	•	•	•	•	•	•	•	•
183	20	51G-2	•	•	•	•	•	•	•	•
183	21	50G-2	•	•	•	•	•	•	•	•
183	34	50BF Stage 2	•	•	•	•	•	•	•	•
183	35	49-Alarm	•	•	•	•	•	•	•	•
183	36	49-Trip	•	•	•	•	•	•	•	•
183	40	60 CTS	•	•	•	•	•	•	•	•
183	41									
183	42									
183	43									
183	44									
183	49									
183	50	46IT	•	•	•	•	•	•	•	•
183	51	46DT	•	•	•	•	•	•	•	•
183	52	64H	•	•	•	•	•	•	•	•
183	53	E/F Out	•	•	•	•	•	•	•	•
183	62	37-1	•	•	•	•	•	•	•	•
183	63	37-2	•	•	•	•	•	•	•	•
183	70	46BC	•	•	•	•	•	•	•	•
183	101	Trip Circuit Fail 1	•	•	•	•	•	•	•	•
183	102	Trip Circuit Fail 2	•	•	•	•	•	•	•	•
183	103	Trip Circuit Fail 3	•	•	•	•	•	•	•	•
183	114	Close CB Failed	•	•	•	•	•	•	•	•
183	115	Open CB Failed	•	•	•	•	•	•	•	•
183	116	Reclaim	•	•	•	•	•	•	•	•
183	117	Lockout	•	•	•	•	•	•	•	•
183	119	Successful DAR Close		•		•		•		•
183	120	Successful Man Close	•	•	•	•	•	•	•	•
183	121	HotLine Working		•		•		•		•
183	122	Inst Protection Out		•		•		•		•
183	123	CB Total Trip Count	•	•	•	•	•	•	•	•
183	124	CB Delta Trip Count	•	•	•	•	•	•	•	•
183	125	CB Count To AR Block		•		•		•		•
183	126	Reset CB Total Trip Count	•	•	•	•	•	•	•	•
183	127	Reset CB Delta Trip Count	•	•	•	•	•	•	•	•

FUN	INF	Event									
			7PG2113-xxA12-xCx0	7PG2113-xxA12-xDx0	7PG2115-xxA12-xCx0	7PG2115-xxA12-xDx0	7PG2114-xxA12-xCx0	7PG2114-xxA12-xDx0	7PG2116-xxA12-xCx0	7PG2116-xxA12-xDx0	
183	128	Reset CB Count To AR Block		•							
183	129	I <sup>^</sup> 2t CB Wear	•	•	•	•	•	•	•	•	•
183	130	Reset I <sup>^</sup> 2t CB Wear	•	•	•	•	•	•	•	•	•
183	131	79 AR In progress		•							
183	132	CB Frequent Ops Count		•							
183	133	Reset CB Frequent Ops Count		•							
183	140	Cold Load Active	•	•	•	•	•	•	•	•	•
183	141	P/F Inst Protection Inhibited		•			•		•		•
183	142	E/F Inst Protection Inhibited		•					•		•
183	143	SEF Inst Protection Inhibited									
183	144	Ext Inst Protection Inhibited		•					•		•
183	163	Trip Time Alarm	•	•	•	•	•	•	•	•	•
183	164	Close Circuit Fail 1	•	•	•	•	•	•	•	•	•
183	165	Close Circuit Fail 2	•	•	•	•	•	•	•	•	•
183	166	Close Circuit Fail 3	•	•	•	•	•	•	•	•	•
183	167	Close Circuit Fail	•	•	•	•	•	•	•	•	•
200	1	CB 1	•	•	•	•	•	•	•	•	•
200	200	CB 1 Trip & Reclose		•			•		•		•
200	201	CB 1 Trip & Lockout		•			•		•		•
200	255	Blocked By Interlocking	•	•	•	•	•	•	•	•	•
255	0	Time Synchronisation	•	•	•	•	•	•	•	•	•
255	0	GI Initiation	•	•	•	•	•	•	•	•	•
255	0	End of GI	•	•	•	•	•	•	•	•	•

## Section 4: Modbus Definitions

### 4.1 Introduction

This section describes the MODBUS-RTU protocol implementation in the relays. This protocol is used for communication with a suitable control system.

This protocol can be set to use the RS485 port. The relay can communicate simultaneously on all ports regardless of protocol used.

Each relay must be given an address to enable communication and can be set by the *Communication Interface: Relay Address*.

Definitions with shaded area are not available on all relay models.

#### Coils (Read Write Binary values)

Address	Description
00001	Binary Output 1
00002	Binary Output 2
00003	Binary Output 3
00004	Binary Output 4
00005	Binary Output 5
00006	Binary Output 6
00007	Binary Output 7
00008	Binary Output 8
00100	LED Reset (Write only location)
00101	Settings Group 1
00102	Settings Group 2
00103	Settings Group 3
00104	Settings Group 4
00109	CB 1
00110	CB 1 Trip & Reclose
00111	CB 1 Trip & Lockout
00112	Auto-reclose on/off
00113	Hot Line Working on/off
00114	E/F off/on
00115	
00116	Inst Protection off/on
00118	Reset CB Total Trip Count
00119	Reset CB Delta Trip Count
00120	Reset CB Count To AR Block
00121	Reset CB Frequent Ops Count
00123	Reset I <sup>2</sup> t CB Wear

**Inputs (Read Only Binary values)**

10001	Binary Input 1
10002	Binary Input 2
10003	Binary Input 3
10004	Binary Input 4
10005	Binary Input 5
10006	Binary Input 6
10102	Remote mode
10103	Service mode
10104	Local mode
10105	Local & Remote mode
10111	Trip Circuit Fail
10112	A-Starter
10113	B-Starter
10114	C-Starter
10115	General Starter
10116	VTS Alarm
10117	Earth Fault Forward/Line
10118	Earth Fault Reverse/Busbar
10119	Start/Pick Up N
10120	Fault Forward/Line
10121	Fault Reverse/Busbar
10122	51-1
10123	50-1
10126	51G-1
10127	50G-1
10128	51-2
10129	50-2
10132	51G-2
10133	50G-2
10134	51-3
10135	50-3
10138	51G-3
10139	50G-3
10140	51-4
10141	50-4
10144	51G-4
10145	50G-4
10146	50BF Stage 2
10147	49 Alarm
10148	49 Trip
10149	60 CTS
10150	46IT
10151	46DT
10152	47-1
10153	47-2
10154	46BC
10155	27/59-1
10156	27/59-2
10157	27/59-3
10158	27/59-4
10159	59NIT
10160	59NDT
10167	64H
10168	37-1
10169	37-2
10171	AR Active
10172	CB on by AR
10173	Reclaim
10174	Lockout
10175	Hot Line Working
10176	Inst Protection Out
10177	CB Trip Count Maint
10178	CB Trip Count Delta



10179	CB Trip Count Lockout
10180	I <sup>2</sup> t CB Wear
10181	79 AR In Progress
10182	Cold Load Active
10183	E/F Protection Out
10184	P/F Inst Protection Inhibited
10185	E/F Inst Protection Inhibited
10186	SEF Inst Protection Inhibited
10187	Ext Inst Protection Inhibited
10202	51SEF-1
10203	50SEF-1
10204	51SEF-2
10205	50SEF-2
10207	50SEF-3
10209	50SEF-4
10210	SEF Out
10211	Trip Circuit Fail 1
10212	Trip Circuit Fail 2
10213	Trip Circuit Fail 3
10214	CB Total Trip Count
10215	CB Delta Trip Count
10216	CB Count to AR Block
10217	CB Frequent Ops Count
10218	I <sup>2</sup> t CB Wear
10219	CB Open
10220	CB Closed
10283	Close Circuit Fail 1
10284	Close Circuit Fail 2
10285	Close Circuit Fail 3
10286	Close Circuit Fail
10287	Trip Time Alarm

## Registers

Address	Name	Format	Description
30001	No.of Events In Store	1 Register	
30002	Event Record	8 Registers <sup>3</sup>	
30010	Vab Primary	FP 32BITS 3DP <sup>1</sup>	Vab kV
30012	Vbc Primary	FP 32BITS 3DP <sup>1</sup>	Vbc kV
30014	Vca Primary	FP 32BITS 3DP <sup>1</sup>	Vca kV
30016	Phase A Primary Volt	FP 32BITS 3DP <sup>1</sup>	Va kV
30018	Phase B Primary Volt	FP 32BITS 3DP <sup>1</sup>	Vb kV
30020	Phase C Primary Volt	FP 32BITS 3DP <sup>1</sup>	Vc kV
30022	Phase a Secondary Volt	FP 32BITS 3DP <sup>1</sup>	Va V
30024	Phase b Secondary Volt	FP 32BITS 3DP <sup>1</sup>	Vb V
30026	Phase c Secondary Volt	FP 32BITS 3DP <sup>1</sup>	Vc V
30034	Phase ab Nominal Volt	FP 32BITS 3DP <sup>1</sup>	Vab Degrees
30036	Phase bc Nominal Volt	FP 32BITS 3DP <sup>1</sup>	Vbc Degrees
30038	Phase ca Nominal Volt	FP 32BITS 3DP <sup>1</sup>	Vca Degrees
30040	Phase a Nominal Volt	FP 32BITS 3DP <sup>1</sup>	Va Degrees
30042	Phase b Nominal Volt	FP 32BITS 3DP <sup>1</sup>	Vb Degrees
30044	Phase c Nominal Volt	FP 32BITS 3DP <sup>1</sup>	Vc Degrees
30048	Vzps	FP 32BITS 3DP <sup>1</sup>	Vzps xVnom
30050	Vpps	FP 32BITS 3DP <sup>1</sup>	Vpps xVnom
30052	Vnps	FP 32BITS 3DP <sup>1</sup>	Vnps xVnom
30054	Vzps	FP 32BITS 3DP <sup>1</sup>	Vzps Degrees
30056	Vpps	FP 32BITS 3DP <sup>1</sup>	Vpps Degrees
30058	Vnps	FP 32BITS 3DP <sup>1</sup>	Vnps Degrees
30060	Frequency	FP 32BITS 3DP <sup>1</sup>	Hz
30064	Phase A Primary Curr	FP 32BITS 3DP <sup>1</sup>	Ia kA
30066	Phase B Primary Curr	FP 32BITS 3DP <sup>1</sup>	Ib kA
30068	Phase C Primary Curr	FP 32BITS 3DP <sup>1</sup>	Ic kA
30070	Phase a Secondary Curr	FP 32BITS 3DP <sup>1</sup>	Ia A

Address	Name	Format	Description
30072	Phase b Secondary Curr	FP_32BITS_3DP <sup>1</sup>	Ib A
30074	Phase c Secondary Curr	FP_32BITS_3DP <sup>1</sup>	Ic A
30076	Phase A Nominal	FP_32BITS_3DP <sup>1</sup>	Ia x Inom
30078	Phase B Nominal	FP_32BITS_3DP <sup>1</sup>	Ib x Inom
30080	Phase C Nominal	FP_32BITS_3DP <sup>1</sup>	Ic x Inom
30082	Phase A Nominal	FP_32BITS_3DP <sup>1</sup>	Ia Degrees
30084	Phase B Nominal	FP_32BITS_3DP <sup>1</sup>	Ib Degrees
30086	Phase C Nominal	FP_32BITS_3DP <sup>1</sup>	Ic Degrees
30088	Earth Primary Curr	FP_32BITS_3DP <sup>1</sup>	IN kA
30090	IN Secondary	FP_32BITS_3DP <sup>1</sup>	IN A
30092	IN Nominal	FP_32BITS_3DP <sup>1</sup>	IN xInom
30094	IG Primary	FP_32BITS_3DP <sup>1</sup>	IG kA
30096	IG Secondary	FP_32BITS_3DP <sup>1</sup>	IG A
30098	IG Nominal	FP_32BITS_3DP <sup>1</sup>	IG xInom
30100	Izps Nominal	FP_32BITS_3DP <sup>1</sup>	Izps xIn
30102	Ipps Nominal	FP_32BITS_3DP <sup>1</sup>	Ipps xIn
30104	Inps Nominal	FP_32BITS_3DP <sup>1</sup>	Inps xIn
30106	Izps Nominal	FP_32BITS_3DP <sup>1</sup>	Izps Degrees
30108	Ipps Nominal	FP_32BITS_3DP <sup>1</sup>	Ipps Degrees
30110	Inps Nominal	FP_32BITS_3DP <sup>1</sup>	Inps Degrees
30112	Active Power A	FP_32BITS_3DP <sup>1</sup>	A Phase MW
30114	Active Power B	FP_32BITS_3DP <sup>1</sup>	B Phase MW
30116	Active Power C	FP_32BITS_3DP <sup>1</sup>	C Phase MW
30118	3P Power	FP_32BITS_3DP <sup>1</sup>	3 Phase MW
30120	Reactive Power A	FP_32BITS_3DP <sup>1</sup>	A Phase MVar
30122	Reactive Power B	FP_32BITS_3DP <sup>1</sup>	B Phase MVar
30124	Reactive Power C	FP_32BITS_3DP <sup>1</sup>	C Phase MVar
30126	3P Reactive Power Q	FP_32BITS_3DP <sup>1</sup>	3 Phase MVar
30128	Apparent Power A	FP_32BITS_3DP <sup>1</sup>	A Phase MVA
30130	Apparent Power B	FP_32BITS_3DP <sup>1</sup>	B Phase MVA
30132	Apparent Power C	FP_32BITS_3DP <sup>1</sup>	C Phase MVA
30134	3P Apparent Power	FP_32BITS_3DP <sup>1</sup>	3 Phase MVA
30136	Power Factor A	FP_32BITS_3DP <sup>1</sup>	Phase A
30138	Power Factor B	FP_32BITS_3DP <sup>1</sup>	Phase B
30140	Power Factor C	FP_32BITS_3DP <sup>1</sup>	Phase C
30142	3P Power Factor	FP_32BITS_3DP <sup>1</sup>	3 Phase
30144	Active Energy Export	FP_32BITS_3DP <sup>1</sup>	3 Phase MWh
30146	Active Energy Import	FP_32BITS_3DP <sup>1</sup>	3 Phase MWh
30148	Reactive Energy Export	FP_32BITS_3DP <sup>1</sup>	3 Phase MWh
30150	Reactive Energy Import	FP_32BITS_3DP <sup>1</sup>	3 Phase MWh
30152	Thermal Status Ph A	UINT16 <sup>2</sup>	%
30153	Thermal Status Ph B	UINT16 <sup>2</sup>	%
30154	Thermal Status Ph C	UINT16 <sup>2</sup>	%
30167	Waveform Records	UINT16 <sup>2</sup>	
30168	Event Records	UINT16 <sup>2</sup>	
30169	Waveform Records	UINT16 <sup>2</sup>	
30170	Vab Secondary Volt	FP_32BITS_3DP <sup>1</sup>	Vab V
30172	Vbc Secondary Volt	FP_32BITS_3DP <sup>1</sup>	Vbc V
30174	Vca Secondary Volt	FP_32BITS_3DP <sup>1</sup>	Vca V
30176	VN Primary	FP_32BITS_3DP <sup>1</sup>	VN kV
30178	VN Secondary	FP_32BITS_3DP <sup>1</sup>	VN V
30180	VN Secondary	FP_32BITS_3DP <sup>1</sup>	VN Degrees
30193	I Phase A Max	FP_32BITS_3DP <sup>1</sup>	Ia Max Demand
30194	I Phase B Max	FP_32BITS_3DP <sup>1</sup>	Ib Max Demand
30195	I Phase C Max	FP_32BITS_3DP <sup>1</sup>	Ic Max Demand
30196	P 3P Max	FP_32BITS_3DP <sup>1</sup>	Power Max Demand
30197	Q 3P Max	FP_32BITS_3DP <sup>1</sup>	VARs Max Demand

1) FP\_32BITS\_3DP: 2 registers - 32 bit fixed point, a 32 bit integer containing a value to 3 decimal places e.g. 50000 sent = 50.000

2) UINT16: 1 register - standard 16 bit unsigned integer

3) Sequence of 8 registers containing an event record. Read address 30002 for 8 registers (16 bytes), each read returns the earliest event record and removes it from the internal store. Repeat this process for the number of events in the register 30001, or until no more events are returned. (the error condition exception code 2)

**Holding Registers (Read Write values)**

Address	Description
40001	Time Meter

**Event Record**

MODBUS does not define a method for extracting events; therefore a private method has been defined based on that defined by [4] IEC60870-5-103.

Register 30001 contains the current number of events in the relays event buffer. Register 30002 contains the earliest event record available. The event record is 8 registers (16 bytes) of information, whose format is described below. When this record has been read it will be replaced by the next available record. Event records must be read completely; therefore the quantity value must be set to 8 before reading. Failing to do this will result in an exception code 2. If no event record is present the exception code 2 will be returned. The event address should be polled regularly by the master for events.

**Event Format**

The format of the event record is defined by the zero byte. It signifies the type of record which is used to decode the event information. The zero byte can be one of the following.

Type	Description
1	Event
2	Event with Relative Time
4	Measurand Event with Relative Time

## Section 5: DNP3.0 Definitions

### 5.1 Device Profile

The following table provides a “Device Profile Document” in the standard format defined in the DNP 3.0 Subset Definitions Document. While it is referred to in the DNP 3.0 Subset Definitions as a “Document,” it is in fact a table, and only a component of a total interoperability guide. The table, in combination with the Implementation Table in Section 5.2 and the Point List Tables provided in Section 5.3 should provide a complete configuration/interoperability guide for communicating with a device implementing the Triangle MicroWorks, Inc. DNP 3.0 Slave Source Code Library.

<b>DNP V3.0</b> DEVICE PROFILE DOCUMENT (Also see the DNP 3.0 Implementation Table Section 5.2.)	
Vendor Name: <b>Siemens Protection Devices Ltd.</b>	
Device Name: <b>7PG2113/4/5/6 , using the Triangle MicroWorks, Inc. DNP3 Slave Source Code Library, Version 3.</b>	
Highest DNP Level Supported:  For Requests: <b>Level 2</b> For Responses: <b>Level 2</b>	Device Function:  <input type="checkbox"/> Master <input checked="" type="checkbox"/> <b>Slave</b>
Notable objects, functions, and/or qualifiers supported in addition to the Highest DNP Levels Supported (the complete list is described in the attached table):  For static (non-change-event) object requests, request qualifier codes 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.  <b>Output Event Object 11 is supported.</b>	
Maximum Data Link Frame Size (octets):  Transmitted: <b>256</b> Received <b>256</b>	Maximum Application Fragment Size (octets):  Transmitted: <b>2048</b> Received <b>2048</b>
Maximum Data Link Re-tries:  <input type="checkbox"/> None <input checked="" type="checkbox"/> <b>Fixed (3)</b> <input type="checkbox"/> Configurable from 0 to 65535	Maximum Application Layer Re-tries:  <input checked="" type="checkbox"/> <b>None</b> <input type="checkbox"/> Configurable
Requires Data Link Layer Confirmation:  <input checked="" type="checkbox"/> <b>Never</b> <input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Configurable as: Never, Only for multi-frame messages, or Always	
Requires Application Layer Confirmation:  <input type="checkbox"/> Never <input type="checkbox"/> Always <input checked="" type="checkbox"/> <b>When reporting Event Data (Slave devices only)</b> <input checked="" type="checkbox"/> <b>When sending multi-fragment responses (Slave devices only)</b> <input type="checkbox"/> Sometimes <input type="checkbox"/> Configurable as: “Only when reporting event data”, or “When reporting event data or multi-fragment messages.”	

<b>DNP V3.0</b> DEVICE PROFILE DOCUMENT (Also see the DNP 3.0 Implementation Table Section 5.2.)																																																								
Timeouts while waiting for: <table style="width: 100%; border: none;"> <tr> <td>Data Link Confirm:</td> <td><input type="checkbox"/> None</td> <td><input checked="" type="checkbox"/> Fixed at 2sec</td> <td><input type="checkbox"/> Variable</td> <td><input type="checkbox"/> Configurable.</td> </tr> <tr> <td>Complete Appl. Fragment:</td> <td><input checked="" type="checkbox"/> <b>None</b></td> <td><input type="checkbox"/> Fixed at _____</td> <td><input type="checkbox"/> Variable</td> <td><input type="checkbox"/> Configurable</td> </tr> <tr> <td>Application Confirm:</td> <td><input type="checkbox"/> None</td> <td><input checked="" type="checkbox"/> Fixed at 10sec</td> <td><input type="checkbox"/> Variable</td> <td><input type="checkbox"/> Configurable.</td> </tr> <tr> <td>Complete Appl. Response:</td> <td><input checked="" type="checkbox"/> <b>None</b></td> <td><input type="checkbox"/> Fixed at _____</td> <td><input type="checkbox"/> Variable</td> <td><input type="checkbox"/> Configurable</td> </tr> </table> <p>Others: <b>Transmission Delay, (0 sec)</b>  <b>Select/Operate Arm Timeout, (5 sec)</b>  <b>Need Time Interval, (30 minutes)</b>  <b>Application File Timeout, (60 sec)</b>  <b>Unsolicited Notification Delay, (5 seconds)</b>  <b>Unsolicited Response Retry Delay, (between 3 – 9 seconds)</b>  <b>Unsolicited Offline Interval, (30 seconds)</b>  <b>Binary Change Event Scan Period, (Polled, Not Applicable)</b>  <b>Double Bit Change Event Scan Period, (Unsupported - Not Applicable)</b>  <b>Analog Change Event Scan Period, (Unsupported - Not Applicable)</b>  <b>Counter Change Event Scan Period, (Unsupported - Not Applicable)</b>  <b>Frozen Counter Change Event Scan Period, (Unsupported - Not Applicable)</b>  <b>String Change Event Scan Period, (Unsupported - Not Applicable)</b>  <b>Virtual Terminal Event Scan Period, (Unsupported - Not Applicable)</b></p>		Data Link Confirm:	<input type="checkbox"/> None	<input checked="" type="checkbox"/> Fixed at 2sec	<input type="checkbox"/> Variable	<input type="checkbox"/> Configurable.	Complete Appl. Fragment:	<input checked="" type="checkbox"/> <b>None</b>	<input type="checkbox"/> Fixed at _____	<input type="checkbox"/> Variable	<input type="checkbox"/> Configurable	Application Confirm:	<input type="checkbox"/> None	<input checked="" type="checkbox"/> Fixed at 10sec	<input type="checkbox"/> Variable	<input type="checkbox"/> Configurable.	Complete Appl. Response:	<input checked="" type="checkbox"/> <b>None</b>	<input type="checkbox"/> Fixed at _____	<input type="checkbox"/> Variable	<input type="checkbox"/> Configurable																																			
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Sends/Executes Control Operations: <table style="width: 100%; border: none;"> <tr> <td>WRITE Binary Outputs</td> <td><input checked="" type="checkbox"/> <b>Never</b></td> <td><input type="checkbox"/> Always</td> <td><input type="checkbox"/> Sometimes</td> <td><input type="checkbox"/> Configurable</td> </tr> <tr> <td>SELECT/OPERATE</td> <td><input type="checkbox"/> Never</td> <td><input checked="" type="checkbox"/> <b>Always</b></td> <td><input type="checkbox"/> Sometimes</td> <td><input type="checkbox"/> Configurable</td> </tr> <tr> <td>DIRECT OPERATE</td> <td><input type="checkbox"/> Never</td> <td><input checked="" type="checkbox"/> <b>Always</b></td> <td><input type="checkbox"/> Sometimes</td> <td><input type="checkbox"/> Configurable</td> </tr> <tr> <td>DIRECT OPERATE – NO ACK</td> <td><input type="checkbox"/> Never</td> <td><input checked="" type="checkbox"/> <b>Always</b></td> <td><input type="checkbox"/> Sometimes</td> <td><input type="checkbox"/> Configurable</td> </tr> <tr> <td>Count &gt; 1</td> <td><input checked="" type="checkbox"/> <b>Never</b></td> <td><input type="checkbox"/> Always</td> <td><input type="checkbox"/> Sometimes</td> <td><input type="checkbox"/> Configurable</td> </tr> <tr> <td>Pulse On</td> <td><input type="checkbox"/> Never</td> <td><input type="checkbox"/> Always</td> <td><input checked="" type="checkbox"/> <b>Sometimes</b></td> <td><input type="checkbox"/> Configurable</td> </tr> <tr> <td>Pulse Off</td> <td><input type="checkbox"/> Never</td> <td><input type="checkbox"/> Always</td> <td><input checked="" type="checkbox"/> <b>Sometimes</b></td> <td><input type="checkbox"/> Configurable</td> </tr> <tr> <td>Latch On</td> <td><input type="checkbox"/> Never</td> <td><input type="checkbox"/> Always</td> <td><input checked="" type="checkbox"/> <b>Sometimes</b></td> <td><input type="checkbox"/> Configurable</td> </tr> <tr> <td>Latch Off</td> <td><input type="checkbox"/> Never</td> <td><input type="checkbox"/> Always</td> <td><input checked="" type="checkbox"/> <b>Sometimes</b></td> <td><input type="checkbox"/> Configurable</td> </tr> <tr> <td>Queue</td> <td><input checked="" type="checkbox"/> <b>Never</b></td> <td><input type="checkbox"/> Always</td> <td><input type="checkbox"/> Sometimes</td> <td><input type="checkbox"/> Configurable</td> </tr> <tr> <td>Clear Queue</td> <td><input checked="" type="checkbox"/> <b>Never</b></td> <td><input type="checkbox"/> Always</td> <td><input type="checkbox"/> Sometimes</td> <td><input type="checkbox"/> Configurable</td> </tr> </table> <p>Attach explanation if 'Sometimes' or 'Configurable' was checked for any operation.</p>		WRITE Binary Outputs	<input checked="" type="checkbox"/> <b>Never</b>	<input type="checkbox"/> Always	<input type="checkbox"/> Sometimes	<input type="checkbox"/> Configurable	SELECT/OPERATE	<input type="checkbox"/> Never	<input checked="" type="checkbox"/> <b>Always</b>	<input type="checkbox"/> Sometimes	<input type="checkbox"/> Configurable	DIRECT OPERATE	<input type="checkbox"/> Never	<input checked="" type="checkbox"/> <b>Always</b>	<input type="checkbox"/> Sometimes	<input type="checkbox"/> Configurable	DIRECT OPERATE – NO ACK	<input type="checkbox"/> Never	<input checked="" type="checkbox"/> <b>Always</b>	<input type="checkbox"/> Sometimes	<input type="checkbox"/> Configurable	Count > 1	<input checked="" type="checkbox"/> <b>Never</b>	<input type="checkbox"/> Always	<input type="checkbox"/> Sometimes	<input type="checkbox"/> Configurable	Pulse On	<input type="checkbox"/> Never	<input type="checkbox"/> Always	<input checked="" type="checkbox"/> <b>Sometimes</b>	<input type="checkbox"/> Configurable	Pulse Off	<input type="checkbox"/> Never	<input type="checkbox"/> Always	<input checked="" type="checkbox"/> <b>Sometimes</b>	<input type="checkbox"/> Configurable	Latch On	<input type="checkbox"/> Never	<input type="checkbox"/> Always	<input checked="" type="checkbox"/> <b>Sometimes</b>	<input type="checkbox"/> Configurable	Latch Off	<input type="checkbox"/> Never	<input type="checkbox"/> Always	<input checked="" type="checkbox"/> <b>Sometimes</b>	<input type="checkbox"/> Configurable	Queue	<input checked="" type="checkbox"/> <b>Never</b>	<input type="checkbox"/> Always	<input type="checkbox"/> Sometimes	<input type="checkbox"/> Configurable	Clear Queue	<input checked="" type="checkbox"/> <b>Never</b>	<input type="checkbox"/> Always	<input type="checkbox"/> Sometimes	<input type="checkbox"/> Configurable
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Count > 1	<input checked="" type="checkbox"/> <b>Never</b>	<input type="checkbox"/> Always	<input type="checkbox"/> Sometimes	<input type="checkbox"/> Configurable																																																				
Pulse On	<input type="checkbox"/> Never	<input type="checkbox"/> Always	<input checked="" type="checkbox"/> <b>Sometimes</b>	<input type="checkbox"/> Configurable																																																				
Pulse Off	<input type="checkbox"/> Never	<input type="checkbox"/> Always	<input checked="" type="checkbox"/> <b>Sometimes</b>	<input type="checkbox"/> Configurable																																																				
Latch On	<input type="checkbox"/> Never	<input type="checkbox"/> Always	<input checked="" type="checkbox"/> <b>Sometimes</b>	<input type="checkbox"/> Configurable																																																				
Latch Off	<input type="checkbox"/> Never	<input type="checkbox"/> Always	<input checked="" type="checkbox"/> <b>Sometimes</b>	<input type="checkbox"/> Configurable																																																				
Queue	<input checked="" type="checkbox"/> <b>Never</b>	<input type="checkbox"/> Always	<input type="checkbox"/> Sometimes	<input type="checkbox"/> Configurable																																																				
Clear Queue	<input checked="" type="checkbox"/> <b>Never</b>	<input type="checkbox"/> Always	<input type="checkbox"/> Sometimes	<input type="checkbox"/> Configurable																																																				
Reports Binary Input Change Events when no specific variation requested: <ul style="list-style-type: none"> <li><input type="checkbox"/> Never</li> <li><input type="checkbox"/> Only time-tagged</li> <li><input type="checkbox"/> Only non-time-tagged</li> <li><input checked="" type="checkbox"/> <b>Configurable to send one or the other</b></li> </ul>	Reports time-tagged Binary Input Change Events when no specific variation requested: <ul style="list-style-type: none"> <li><input type="checkbox"/> Never</li> <li><input type="checkbox"/> Binary Input Change With Time</li> <li><input type="checkbox"/> Binary Input Change With Relative Time</li> <li><input checked="" type="checkbox"/> <b>Configurable</b></li> </ul>																																																							
Sends Unsolicited Responses: <ul style="list-style-type: none"> <li><input type="checkbox"/> Never</li> <li><input checked="" type="checkbox"/> <b>Configurable</b></li> <li><input type="checkbox"/> Only certain objects</li> <li><input type="checkbox"/> Sometimes (attach explanation)</li> <li><input checked="" type="checkbox"/> <b>ENABLE/DISABLE UNSOLICITED Function codes supported</b></li> </ul>	Sends Static Data in Unsolicited Responses: <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> <b>Never</b></li> <li><input type="checkbox"/> When Device Restarts</li> <li><input type="checkbox"/> When Status Flags Change</li> </ul> <p>No other options are permitted.</p>																																																							
Default Counter Object/Variation: <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> <b>No Counters Reported</b></li> <li><input type="checkbox"/> Configurable</li> <li><input type="checkbox"/> Default Object</li> <li>Default Variation:             <ul style="list-style-type: none"> <li><input type="checkbox"/> Point-by-point list attached</li> </ul> </li> </ul>	Counters Roll Over at: <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> <b>No Counters Reported</b></li> <li><input type="checkbox"/> Configurable (attach explanation)</li> <li><input type="checkbox"/> 16 Bits</li> <li><input type="checkbox"/> 32 Bits</li> <li><input type="checkbox"/> Other Value: _____</li> <li><input type="checkbox"/> Point-by-point list attached</li> </ul>																																																							

**DNP V3.0**

## DEVICE PROFILE DOCUMENT

(Also see the DNP 3.0 Implementation Table Section 5.2.)

## Sends Multi-Fragment Responses:

- Yes  
 No  
 Configurable

## Sequential File Transfer Support:

File Transfer Support	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> <b>No</b>
Append File Mode	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> <b>No</b>
Custom Status Code Strings	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> <b>No</b>
Permissions Field	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> <b>No</b>
File Events Assigned to Class	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> <b>No</b>
File Events Send Immediately	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> <b>No</b>
Multiple Blocks in a Fragment	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> <b>No</b>
Max Number of Files Open	<b>0</b>	

## 5.2 Implementation Table

The following table identifies which object variations, function codes, and qualifiers the Triangle MicroWorks, Inc. DNP 3.0 Slave Source Code Library 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.

In the table below, text shaded as **00, 01 (start stop)** indicates Subset Level 3 functionality (beyond Subset Level 2).

In the table below, text shaded as **07, 08 (limited qty)** indicates functionality beyond Subset Level 3.

OBJECT			REQUEST (Library will parse)		RESPONSE (Library will respond with)	
Object Number	Variation Number	Description	Function Codes (dec)	Qualifier Codes (hex)	Function Codes (dec)	Qualifier Codes (hex)
1	0	Binary Input – Any Variation	1 (read) 22 (assign class)	<b>00, 01</b> <b>(start-stop)</b> 06 (no range, or all) <b>07, 08</b> <b>(limited qty)</b> <b>17, 27, 28(index)</b>		
1	1 (default – see note 1)	Binary Input	<b>1 (read)</b>	<b>00, 01</b> <b>(start-stop)</b> <b>06</b> <b>(no range, or all)</b> <b>07, 08 (limited qty)</b> <b>17, 27, 28(index)</b>	129 (response)	00, 01 (start-stop) <b>17, 28</b> <b>(index – see note 2)</b>
1	2	Binary Input with Status	<b>1 (read)</b>	<b>00, 01</b> <b>(start-stop)</b> <b>06 (no range, or all)</b> <b>07, 08 (limited qty)</b> <b>17, 27, 28</b> <b>(index)</b>	129 (response)	00, 01(start-stop) <b>17, 28</b> <b>(index – see note 2)</b>
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)

OBJECT			REQUEST (Library will parse)		RESPONSE (Library will respond with)	
Object Number	Variation Number	Description	Function Codes (dec)	Qualifier Codes (hex)	Function Codes (dec)	Qualifier Codes (hex)
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 (default – see note 1)	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)
10	0	Binary Output – Any Variation	1 (read) 22 (assign class)	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 – see note 1)
			1 (write)	00, 01 (start-stop)		
10	2 (default – see note 1)	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 – see note 2)
11	0	Binary Output Change – Any Variation	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
11	1 (default – see note 1)	Binary Output Change without Time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28(index)



OBJECT			REQUEST (Library will parse)		RESPONSE (Library will respond with)	
Object Number	Variation Number	Description	Function Codes (dec)	Qualifier Codes (hex)	Function Codes (dec)	Qualifier Codes (hex)
11	2	Binary Output Change with Time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28(index)
12	0	Control Relay Output Block	22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28(index)		
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 Control Block	3 (select) 4 (operate) 5 (direct op) 6 (dir. op, noack)	7 (limited quantity)	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
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)		

OBJECT			REQUEST (Library will parse)		RESPONSE (Library will respond with)	
Object Number	Variation Number	Description	Function Codes (dec)	Qualifier Codes (hex)	Function Codes (dec)	Qualifier Codes (hex)
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 – see note 2)
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 – see note 2)
30	3 (default – see note 1)	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 – see note 2)
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 – see note 2)
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 – see note 2)

OBJECT			REQUEST (Library will parse)		RESPONSE (Library will respond with)	
Object Number	Variation Number	Description	Function Codes (dec)	Qualifier Codes (hex)	Function Codes (dec)	Qualifier Codes (hex)
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 – see note 1)
32	0	Analog Change Event – Any Variation	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
32	1 (default – see note 1)	32-Bit Analog Change Event without Time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129(response) 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)

OBJECT			REQUEST (Library will parse)		RESPONSE (Library will respond with)	
Object Number	Variation Number	Description	Function Codes (dec)	Qualifier Codes (hex)	Function Codes (dec)	Qualifier Codes (hex)
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)
50	0	Time and Date				
50	1 (default – see note 1)	Time and Date	1 (read)	07, (limited qty = 1)	129 (response)	07 (limited qty = 1)
			2 (write)	07 (limited qty = 1)		
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.)	06 (no range, or all)		
			21 (dab. unsol.) 22 (assign class)			

OBJECT			REQUEST (Library will parse)		RESPONSE (Library will respond with)	
Object Number	Variation Number	Description	Function Codes (dec)	Qualifier Codes (hex)	Function Codes (dec)	Qualifier Codes (hex)
60	3	Class 2 Data	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
			20 (enbl. unsol.)	06 (no range, or all)		
			21 (dab. unsol.) 22 (assign class)			
60	4	Class 3 Data	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
			20 (enbl. unsol.)	06 (no range, or all)		
			21 (dab. unsol.) 22 (assign class)			
80	1	Internal Indications	1 (read)	00, 01 (start-stop)	129 (response)	00, 01 (start-stop)
			2 (write) (see note 3)	00 (start-stop) index=7		
		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)			

Note 1: A Default variation refers to the variation responded when variation 0 is requested and/or in class 0, 1, 2, or 3 scans. Default variations are configurable; however, default settings for the configuration parameters are indicated in the table above.

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

Note 3: Writes of Internal Indications are only supported for index 7 (Restart IIN1-7)

## 5.3 Point List

The tables below identify all the default data points provided by the implementation of the Triangle MicroWorks, Inc. DNP 3.0 Slave Source Code Library.

The default binary input event buffer size is set to allow 100 events.

Note, not all points listed here apply to all builds of devices.

<b>Binary Input Points</b> Static (Steady-State) Object Number: <b>1</b> Change Event Object Number: <b>2</b> Default Static Variation reported when variation 0 requested: <b>2 (Binary Input with flags)</b> Default Change Event Variation reported when variation 0 requested: <b>2 (Binary Input with absolute time)</b>		
<b>Point Index</b>	<b>Name/Description</b>	<b>Default Change Event Assigned Class (1, 2, 3 or none)</b>
1	Binary Input 1	2
2	Binary Input 2	2
3	Binary Input 3	2
4	Binary Input 4	2
5	Binary Input 5	2
6	Binary Input 6	2
35	Remote mode	2
36	Service mode	2
37	Local mode	2
38	Local & Remote	2
41	Trip Circuit Fail	2
42	A-Starter	2
43	B-Starter	2
44	C-Starter	2
45	General Starter	2
46	VTS Alarm	2
47	Earth Fault Forward/Line	2
48	Earth Fault Reverse/Busbar	2
49	Start/Pick-up N	2
50	Fault Forward/Line	2
51	Fault Reverse/Busbar	2
52	51-1	2
53	50-1	2
56	51G-1	2
57	50G-1	2
58	51-2	2
59	50-2	2
60	51N-2	2
61	50N-2	2

<b>Binary Input Points</b>		
Static (Steady-State) Object Number: <b>1</b>		
Change Event Object Number: <b>2</b>		
Default Static Variation reported when variation 0 requested: <b>2 (Binary Input with flags)</b>		
Default Change Event Variation reported when variation 0 requested: <b>2 (Binary Input with absolute time)</b>		
<b>Point Index</b>	<b>Name/Description</b>	<b>Default Change Event Assigned Class (1, 2, 3 or none)</b>
62	51G-2	2
63	50G-2	2
64	CTS Alarm	2
65	46IT	2
66	46DT	2
67	47-1	2
68	47-2	2
69	46BC	2
70	27/59-1	2
71	27/59-2	2
72	27/59-3	2
73	27/59-4	2
74	59NIT	2
75	59NDT	2
80	Auto-reclose active	2
81	CB on by auto reclose	2
82	Reclaim	2
83	Lockout	2
86	51-3	2
87	50-3	2
88	51N-3	2
89	50N-3	2
90	51G-3	2
91	50G-3	2
92	51-4	2
93	50-4	2
94	51N-4	2
95	50N-4	2
96	51G-4	2
97	50G-4	2
98	Cold Load Active	2
99	E/F Protection Out	2
100	P/F Inst Protection Inhibited	2
101	E/F Inst Protection Inhibited	2

<b>Binary Input Points</b>		
Static (Steady-State) Object Number: <b>1</b>		
Change Event Object Number: <b>2</b>		
Default Static Variation reported when variation 0 requested: <b>2 (Binary Input with flags)</b>		
Default Change Event Variation reported when variation 0 requested: <b>2 (Binary Input with absolute time)</b>		
<b>Point Index</b>	<b>Name/Description</b>	<b>Default Change Event Assigned Class (1, 2, 3 or none)</b>
102	SEF Inst Protection Inhibited	2
103	Ext Inst Protection Inhibited	2
117	51SEF-1	2
118	50SEF-1	2
119	51SEF-2	2
120	50SEF-2	2
121	51SEF-3	2
122	50SEF-3	2
123	51SEF-4	2
124	51SEF-4	2
125	SEF Out	2
126	Trip Circuit Fail 1	2
127	Trip Circuit Fail 2	2
128	Trip Circuit Fail 3	2
129	CB Total Trip Count	2
130	CB Delta Trip Count	2
131	CB Count to AR Block	2
132	CB Frequent Ops Count	2
133	I <sup>2</sup> t CB Wear	2
207	Close Circuit Fail 1	2
208	Close Circuit Fail 2	2
209	Close Circuit Fail 3	2
210	Close Circuit Fail	2
211	50BF-1	2
212	50BF-2	2
213	49 Alarm	2
214	49 Trip	2
215	64H	2
217	37-1	2
218	37-2	2
222	Trip Time Alarm	2



## 5.4 Binary Output Status Points and Control Relay Output Blocks

The following table lists both the Binary Output Status Points (Object 10) and the Control Relay Output Blocks (Object 12).

While Binary Output Status Points are included here for completeness, they are not often polled by DNP 3.0 Masters. It is recommended that Binary Output Status points represent the most recent DNP “commanded” value for the corresponding Control Relay Output Block point. Because many, if not most, Control Relay Output Block points are controlled through pulse mechanisms, the value of the output status may in fact be meaningless. Binary Output Status points are not recommended to be included in class 0 polls.

As an alternative, it is recommended that “actual” status values of Control Relay Output Block points be looped around and mapped as Binary Inputs. (The “actual” status value, as opposed to the “commanded” status value, is the value of the actuated control. For example, a DNP control command may be blocked through hardware or software mechanisms; in this case, the actual status value would indicate the control failed because of the blocking). Looping Control Relay Output Block actual status values as Binary Inputs has several advantages:

- it allows actual statuses to be included in class 0 polls,
- it allows change event reporting of the actual statuses, which is a more efficient and time-accurate method of communicating control values,
- and it allows reporting of time-based information associated with controls, including any delays before controls are actuated, and any durations if the controls are pulsed.

The default select/control buffer size is large enough to hold 10 of the largest select requests possible.

<b>Binary Output Status Points</b> Static Object Number: <b>10</b> Change Event Object Number: <b>11</b> Default Variation reported when variation 0 requested: <b>2 (Binary Output with flags)</b> Default Change Event variation 0 requested: <b>2 (Binary Output absolute time)</b> <b>Control Relay Output Blocks</b> Object Number: <b>12</b>			
Point Index	Name/Description	Default Change Event Assigned Class	Supported Control Relay Output Block Fields
1	Binary Output 1	1	Pulse On/Latch Off
2	Binary Output 2	1	Pulse On/Latch Off
3	Binary Output 3	1	Pulse On/Latch Off
4	Binary Output 4	1	Pulse On/Latch Off
5	Binary Output 5	1	Pulse On/Latch Off
6	Binary Output 6	1	Pulse On/Latch Off
7	Binary Output 7	1	Pulse On/Latch Off
8	Binary Output 8	1	Pulse On/Latch Off
33	LED Reset	1	Pulse On/Latch Off
34	Settings Group 1	1	Pulse On/Latch Off
35	Settings Group 2	1	Pulse On/Latch Off
36	Settings Group 3	1	Pulse On/Latch Off
37	Settings Group 4	1	Pulse On/Latch Off
42	Auto-reclose on/off	1	Pulse On/Pulse Off/Latch On/Latch Off

<b>Binary Output Status Points</b> Static Object Number: <b>10</b> Change Event Object Number: <b>11</b> Default Variation reported when variation 0 requested: <b>2 (Binary Output with flags)</b> Default Change Event variation 0 requested: <b>2 (Binary Output absolute time)</b> <b>Control Relay Output Blocks</b> Object Number: <b>12</b>			
Point Index	Name/Description	Default Change Event Assigned Class	Supported Control Relay Output Block Fields
43	Hot line working on/off	1	Pulse On/Pulse Off/Latch On/Latch Off
44	E/F off/on	1	Pulse On/Pulse Off/Latch On/Latch Off
45	SEF off/on	1	Pulse On/Pulse Off/Latch On/Latch Off
46	Inst Protection off/on	1	Pulse On/Pulse Off/Latch On/Latch Off
48	Reset CB Total Trip Count	1	Pulse On/Latch Off
49	Reset CB Delta Trip Count	1	Pulse On/Latch Off
50	Reset CB Count to AR Block	1	Pulse On/Latch Off
51	Reset Frequent Ops Count	1	Pulse On/Latch Off
53	Reset I <sup>2</sup> t CB Wear	1	Pulse On/Latch Off
54	CB 1	1	Pulse On/Pulse Off/Latch On/Latch Off
55	CB 1 Trip & Reclose	1	Pulse On/Latch Off
56	CB 1 Trip & Lockout	1	Pulse On/Latch Off

## 5.5 Analogue Inputs

The following table lists Analog Inputs (Object 30). It is important to note that 16-bit and 32-bit variations of Analog Inputs, Analog Output Control Blocks, and Analog Output Statuses are transmitted through DNP as signed numbers.

The “Default Deadband,” and the “Default Change Event Assigned Class” columns are used to represent the absolute amount by which the point must change before an analog change event will be generated, and once generated in which class poll (1, 2, 3, or none) will the change event be reported.

The default analog input event buffer size is set 30.

**Analog Inputs**Static (Steady-State) Object Number: **30**Change Event Object Number: **32**Default Static Variation reported when variation 0 requested: **2 (16-Bit Analog Input with Flag)**Default Change Event Variation reported when variation 0 requested: **4 (16-Bit Analog Change Event with Time)**

Point #	Def Class	Def Static Object	Def Event Object	Name	Scaling Factor	Deadband
0	3	2	3	Frequency	100.0	1
1	3	2	3	Vab Primary	0.001	1000
2	3	2	3	Vbc Primary	0.001	1000
3	3	2	3	Vca Primary	0.001	1000
4	3	2	3	Va Primary	0.001	1000
5	3	2	3	Vb Primary	0.001	1000
6	3	2	3	Vc Primary	0.001	1000
7	3	2	3	Va Secondary	100.0	1
8	3	2	3	Vb Secondary	100.0	1
9	3	2	3	Vc Secondary	100.0	1
10	3	2	3	Va Nominal	1.0	5
11	3	2	3	Vb Nominal	1.0	5
12	3	2	3	Vc Nominal	1.0	5
13	3	2	3	Vn Nominal	1.0	5
14	3	2	3	Va Secondary	1.0	5
15	3	2	3	Vb Secondary	1.0	5
16	3	2	3	Vc Secondary	1.0	5
17	3	2	3	Vab Secondary	1.0	5
18	3	2	3	Vbc Secondary	1.0	5
19	3	2	3	Vab Secondary	1.0	5
21	3	2	3	Vzps	100.0	1
22	3	2	3	Vpps	100.0	1
23	3	2	3	Vnps	100.0	1
24	3	2	3	Vzps	1.0	5
25	3	2	3	Vpps	1.0	5
26	3	2	3	Vnps	1.0	5
31	3	2	3	Ia Primary	0.001	1000
32	3	2	3	Ib Primary	0.001	1000
33	3	2	3	Ic Primary	0.001	1000
34	3	2	3	Ia Secondary	100.0	1
35	3	2	3	Ib Secondary	100.0	1
36	3	2	3	Ic Secondary	100.0	1
37	3	2	3	Ia Nominal	100.0	1
38	3	2	3	Ib Nominal	100.0	1
39	3	2	3	Ic Nominal	100.0	1
40	3	2	3	Ia Nominal	1.0	5
41	3	2	3	Ib Nominal	1.0	5
42	3	2	3	Ic Nominal	1.0	5
43	3	2	3	In Primary	0.001	1000
44	3	2	3	In Secondary	100.0	1
45	3	2	3	In Nominal	100.0	1
46	3	2	3	Ig Primary	0.001	1000
47	3	2	3	Ig Secondary	100.0	1
48	3	2	3	Ig Nominal	100.0	1
51	3	2	3	Izps Nominal	100.0	1
52	3	2	3	Ipps Nominal	100.0	1
53	3	2	3	Inps Nominal	100.0	1
54	3	2	3	Izps Nominal	1.0	5
55	3	2	3	Ipps Nominal	1.0	5
56	3	2	3	Inps Nominal	1.0	5
57	3	2	3	Active Power A	0.001	1000
58	3	2	3	Active Power B	0.001	1000
59	3	2	3	Active Power C	0.001	1000
60	3	2	3	P (3P)	0.000001	100000

**Analog Inputs**Static (Steady-State) Object Number: **30**Change Event Object Number: **32**Default Static Variation reported when variation 0 requested: **2 (16-Bit Analog Input with Flag)**Default Change Event Variation reported when variation 0 requested: **4 (16-Bit Analog Change Event with Time)**

Point #	Def Class	Def Static Object	Def Event Object	Name	Scaling Factor	Deadband
61	3	2	3	Reactive Power A	1.0	5
62	3	2	3	Reactive Power B	1.0	5
63	3	2	3	Reactive Power C	1.0	5
64	3	2	3	Q (3P)	0.000001	10000
65	3	2	3	Apparent Power A	1.0	5
66	3	2	3	Apparent Power B	1.0	5
67	3	2	3	Apparent Power C	1.0	5
68	3	2	3	S (3P)	0.000001	10000
71	3	2	3	Power Factor A	1.0	5
72	3	2	3	Power Factor B	1.0	5
73	3	2	3	Power Factor C	1.0	5
74	3	2	3	Power Factor(3P)	1.0	5
75	3	2	3	Act Energy Exp	0.001	1000
76	3	2	3	Act Energy Imp	0.001	1000
77	3	2	3	React Energy Exp	0.001	1000
78	3	2	3	React Energy Imp	0.001	1000
81	3	2	3	Thermal Status Ph A	100.0	1
82	3	2	3	Thermal Status Ph B	100.0	1
83	3	2	3	Thermal Status Ph C	100.0	1
96	3	2	3	Fault Records	1	1
97	3	2	3	Event Records	1	1
98	3	2	3	Waveform Records	1	1
99	3	2	3	Vab Secondary	100.0	1
100	3	2	3	Vbc Secondary	100.0	1
101	3	2	3	Vca Secondary	100.0	1
102	3	2	3	Vn Primary	0.001	1000
103	3	2	3	Vn Secondary	100.0	1
104	3	2	3	Vn Secondary	100.0	1
105	3	2	3	Vx Primary	0.001	1000
106	3	2	3	Vx Secondary	100.0	1
107	3	2	3	Vx Secondary	100.0	1
108	3	2	3	I Phase A Max	100.0	1
109	3	2	3	I Phase B Max	100.0	1
110	3	2	3	I Phase C Max	100.0	1
111	3	2	3	P 3P Max	100.0	1
112	3	2	3	Q 3P Max	100.0	1
113	3	2	3	Ig Max	100.0	1
114	3	2	3	Isef Max	100.0	1
115	3	2	3	Isef Primary	0.001	1000
116	3	2	3	Isef Secondary	100.0	1
117	3	2	3	Isef Nominal	100.0	1

## Section 6: Configuration

The data points and control features which are possible within the relay is fixed and can be transmitted over the communication channel(s) protocols in the default format described earlier in this section. The default data transmitted is not always directly compatible with the needs of the substation control system and will require some tailoring, this can be done by the user with the Reydisp software comms editor tool.

The Comms Editor is provided to allow its users to configure the Communications Files Protocols in Reyrolle brand Relays manufactured by Siemens Protection Devices Limited (SPDL).

The editor supports configuring DNP3, IEC60870-5-103 and MODBUS protocols.

The editor allows configuration files to be retrieved from the relay, edited, then uploaded back to the relay. Files may also be saved/loaded from disc to work offline. The protocols will be stored in a Reyrolle Protection Device Comms file (RPDC), which will be stored locally, so that the editor can be used when the relay is not connected.

### DNP3

The tool will allow:

- Data Points to be enabled or disabled.
- Changing the point numbers for the Binary Inputs, Binary Outputs and Analogue Inputs.
- Changing their assigned class and object variants.
- Setting Binary points to be inverted before transmission.
- Setting the Control Relay Output Block (CROB) commands that can be used with a Binary Output.
- Specifying a dead-band outside which Analogue Events will be generated.
- Specifying a multiplier that will be applied to an analogue value before transmission.

### IEC60870-5-103

The tool will allow:

- Data Points to be enabled or disabled.
- Changing the point numbers Function Type (FUN) and Information (INF), returned by each point.
- Changing the text returned to Reydisp for display in its event viewer.

### MODBUS-RTU

The tool will allow:

- Changing the Addresses for the Coils, Inputs and Registers.
- Changing the format of the instrument returned in a register, e.g. 16 or 32 bit.

Note, as MODBUS points are polled they do not need to be enabled or disabled

The user can check if the relay contains user configured communication files via a meter in the relay menus. Pressing the Enter and down arrow buttons on the fascia, then scrolling down, the number of files stored in the relay is displayed. The file name can also be viewed by pressing the Cancel and Test/Reset buttons together when in the relay Instruments menu. The user must ensure when naming the file, they use a unique file name including the version number.

Please refer to the Comms Editor Technical Manual for further guidance.

## Section 7: Glossary

**Baud Rate**

Data transmission speed.

**Bit**

The smallest measure of computer data.

**Bits Per Second (bps)**

Measurement of data transmission speed.

**Data Bits**

A number of bits containing the data. Sent after the start bit.

**Data Echo**

When connecting relays in an optical ring architecture, the data must be passed from one relay to the next, therefore when connecting in this method all relays must have the Data Echo ON.

**Half-Duplex Asynchronous Communications**

Communications in two directions, but only one at a time.

**Hayes 'AT'**

Modem command set developed by Hayes Microcomputer products, Inc.

**Line Idle**

Determines when the device is not communicating if the idle state transmits light.

**Parity**

Method of error checking by counting the value of the bits in a sequence, and adding a parity bit to make the outcome, for example, even.

**Parity Bit**

Bit used for implementing parity checking. Sent after the data bits.

**RS232C**

Serial Communications Standard Electronic Industries Association Recommended Standard Number 232, Revision C.

**RS485**

Serial Communications Standard Electronic Industries Association Recommended Standard Number 485.

**Start Bit**

Bit (logical 0) sent to signify the start of a byte during data transmission.

**Stop Bit**

Bit (logical 1) sent to signify the end

**USB**

Universal Serial Bus standard for the transfer of data.