

7SG14 Duobias-M

Transformer Protection

Document Release History

This document is issue 2010/02. The list of revisions up to and including this issue is:
Pre release

2010/02	Document reformat due to rebrand
10-11-2004	R4 Added IEC Measurand information
03-11-2004	R3 Added 3W Variant settings 87 Inhibit and 87HS Inhibit status inputs added Trip Cct Pickup Delay renamed to Trip Cct Fail Pickup delay to clarify its purpose.
07-05-2003	R2 Revision History added, page footers corrected, Reylogic Diagram added
13-08-2002	R1 First Version

Software Revision History

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1 Introduction

This relay settings section covers the following Duobias-M models:-

Model No	Cat No	Configuration No
Duobias-M-207-2W-STD-50Hz	DU3-207-**-50	2661H80041R12
Duobias-M-207-3W-STD-50Hz	DU3-307-**-50	2661H80057R12

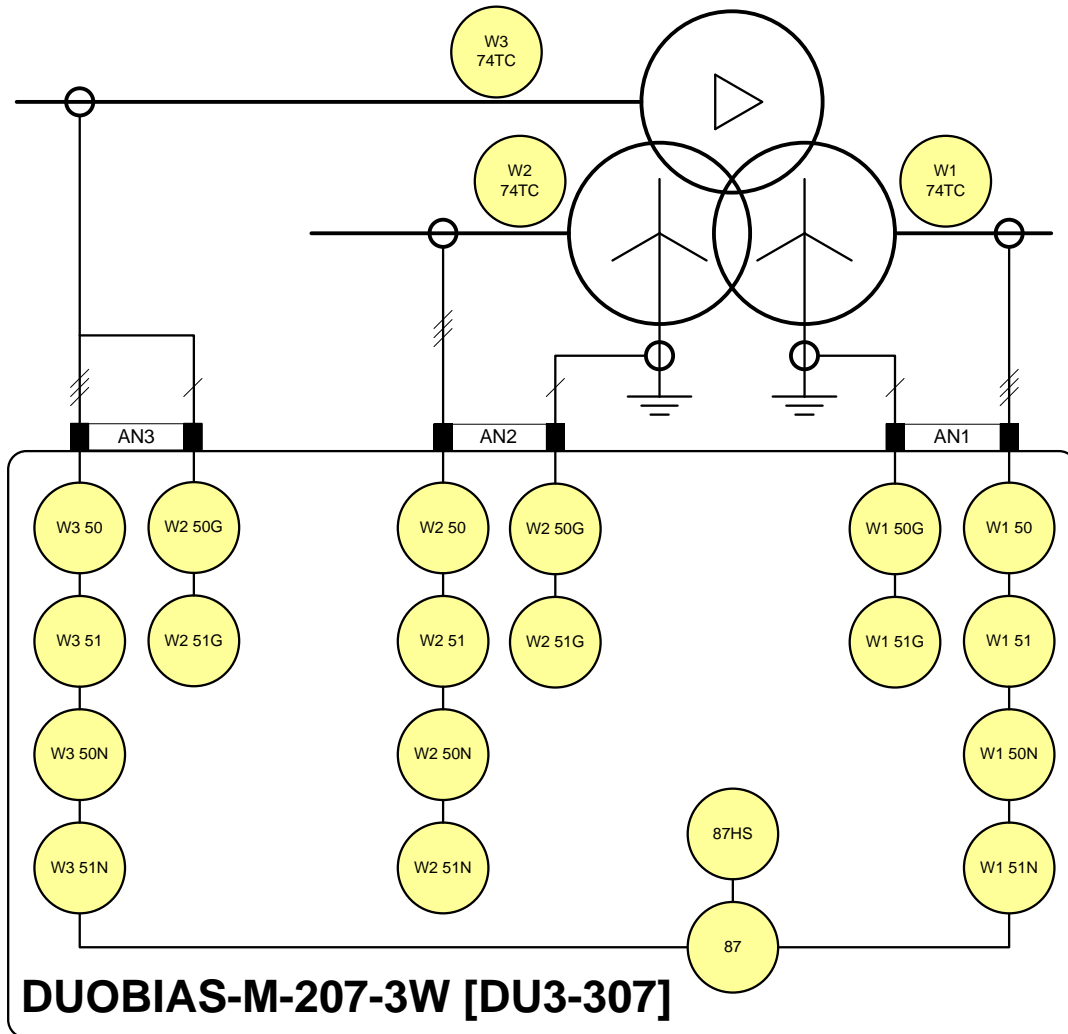


Figure 1 - Duobias-M-207-3W [DU3-307]

2 DUOBIAS-M-207-2W/3W Relay Setting List

2.1 System Config Menu

Description	Range	Default	Setting
Active Group <i>Selects which settings group is currently activated</i>	1,2...4	1	
View/Edit Group <i>Selects which settings group is currently being displayed</i>	1,2...4	1	
Default Screens Timer <i>Selects the time delay after which, if no key presses have been detected, the relay will begin to poll through any screens which have been selected as default instruments screens</i>	OFF, 1,2,5,10,15,30,60 min	60 min	
Backlight timer <i>Controls when the LCD backlight turns off</i>	OFF, 1,2,5,10,15,30,60 min	5 Min	
Date	Date	1/1/1980	
Time	Time	00:00:00	
Clock Sync. From Status <i>Real time clock may be synchronised using a status input (See Clock Sync. in Status Input Menu)</i>	Disabled, Seconds, Minutes	Minutes	
Operating Mode <i>To allow access to change configuration files using Reylogic Toolbox the relay must be placed Out Of Service.</i>	Local, Remote, Local Or Remote, Out Of Service	Local Or Remote	
Change Password <i>Allows a 4 character alphanumeric code to be entered as the password. Note that the display shows a password dependant encrypted code on the second line of the display</i>	AAAA...ZZZZ	"NONE" displayed as "NOT ACTIVE"	
Relay Identifier <i>An alphanumeric string shown on the LCD normally used to identifier the circuit the relay is attached to or the relays purpose</i>	Up to 16 characters	DUOBIAS-M-207-2W/3W	

2.2 CT/VT Config Menu

Description	Range	Default	Setting
W1 Input <i>Selects whether 1 or 5 Amp terminals are being used</i>	1,5 A	1 A	
W1 CT Ratio <i>CT ratio to scale primary current instruments</i>	5:0.2...5000:7	2000:1	
W1 E/F CT Ratio <i>CT ratio to scale primary current instruments</i>	5:0.2...5000:7	2000:1	
W2 Input <i>Selects whether 1 or 5 Amp terminals are being used</i>	1,5 A	1 A	
W2 CT Ratio <i>CT ratio to scale primary current instruments</i>	5:0.2...5000:7	2000:1	
W2 E/F CT Ratio <i>CT ratio to scale primary current instruments</i>	5:0.2...5000:7	2000:1	
W3 Input ¹	1,5 A	1 A	

Description	Range	Default	Setting
Selects whether 1 or 5 Amp terminals are being used			
W3 CT Ratio ¹ CT ratio to scale primary current instruments	5:0.2...5000:7	2000:1	
W3 E/F CT Ratio ¹ CT ratio to scale primary current instruments	5:0.2...5000:7	2000:1	

1) 3W Only

2.3 Biased Differential Menu

Description	Range	Default	Setting
W1 Interposing CT Multiplier Winding 1 scaling factor	0.25,0.26...3.00 x	1.00 x	
W1 Interposing CT Connection Winding 1 transformer vector group compensation and/or zero sequence filtering	Yy0, Yd1, Yy2, Yd3, Yy4, Yd5, Yy6, Yd7, Yy8, Yd9, Yy10, Yd11, Ydy0	Yy0, 0°	
W2 Interposing CT Multiplier Winding 2 scaling factor	0.25,0.26...3.00 x	1.00 x	
W2 Interposing CT Connection Winding 2 transformer vector group compensation and/or zero sequence filtering	Yy0, Yd1, Yy2, Yd3, Yy4, Yd5, Yy6, Yd7, Yy8, Yd9, Yy10, Yd11, Ydy0	Yy0, 0°	
W3 Interposing CT Multiplier ¹ Winding 3 scaling factor	0.25,0.26...3.00 x	1.00 x	
W3 Interposing CT Connection ¹ Winding 3 transformer vector group compensation and/or zero sequence filtering	Yy0, Yd1, Yy2, Yd3, Yy4, Yd5, Yy6, Yd7, Yy8, Yd9, Yy10, Yd11, Ydy0	Yy0, 0°	
87 Inrush Inhibit Selects whether the biased differential characteristic is inhibited from operating when magnetising inrush is detected	Disabled, Enabled	Enabled	
87 Inrush Bias Selects the bias method used for magnetising inrush Phase – Segregated, each phase blocks itself. Cross – Blocked, each phase can block the operation of other phases (Modular 1 method). Sum - Of Squares, each phase blocks itself using the square root of the sum of squares of the even harmonics. (Improves SOTF performance when REF not applied).	Phase, Cross, Sum	Cross	
87 Inrush Setting The magnetising inrush detector operates when the even harmonics in the differential operate current exceed a set percentage of the differential operate current	0.1,0.11...0.50 xId	0.20 xId	
87 Biased Differential Selects whether the transformer differential protection element is enabled	Disabled, Enabled	Disabled	
87 Initial Setting The initial unbiased pickup level	0.1,0.15...2.00 xIn	0.20 xIn	
87 Bias Slope The bias slope varies the pickup level to compensates for CT measuring errors and tap changer not mid tap errors as the through current (bias) increases	0,0.05...0.7 x	0.20 x	
87 Bias Slope Limit	1,2...20 xIn	4 xIn	

Description	Range	Default	Setting
<i>At this point in the characteristics the bias slope increases to provide increased security when additional measuring errors are introduced due to CT saturation effects.</i>			
87 Delay <i>The operation of the differential may be delayed to cater for special system conditions e.g. for use on cable circuits a delay of 5ms is recommended</i>	0.005,0.010...1 s	0.005 s	
87HS Differential Highset <i>Selects whether the differential Highset element is enabled. Note this element is never blocked by magnetising inrush</i>	Disabled, Enabled	Disabled	
87HS Setting <i>the differential setting pickup setting</i>	1,2...30 xIn	4 xIn	
87HS Delay <i>the operation of the differential may be delayed to cater for special system conditions e.g. for use on cable circuits a delay of 5ms is recommended</i>	0.005,0.010...1 s	0.005 s	

1) 3W Only

2.4 Winding 1 Menu

Description	Range	Default	Setting
Gn W1 51 Element <i>Selects whether the winding 1 IDMTL Overcurrent element is enabled</i>	Disabled, Enabled	Disabled	
Gn W1 51 Setting <i>Pickup level</i>	0.05, 0.10...2.5 xIn	1.5 xIn	
Gn W1 51 Char <i>Selects characteristic curve</i>	IEC-NI, IEC-VI, IEC-EI, IEC-LTI, ANSI-MI, ANSI-VI, ANSI-EI, DTL	IEC-NI	
Gn W1 51 Time Mult (IEC/ANSI) <i>Time multiplier (applicable to IEC and ANSI curves but not DTL selection)</i>	0.025, 0.050...1.600	1.000	
Gn W1 51 Delay (DTL) <i>Delay (applicable only when DTL is selected for characteristic)</i>	0, 0.01...20 s	5 s	
Gn W1 51 Reset <i>Selects between an ANSI decaying reset characteristic or a definite time reset</i>	(ANSI) Decaying, INST, 1,2,...60 s	INST	
Gn W1 50 Element <i>Selects whether the winding 1 DTL Overcurrent element is enabled</i>	Disabled, Enabled	Disabled	
Gn W1 50 Setting <i>Pickup level</i>	0.05, 0.10...25 xIn	20 xIn	
Gn W1 50 Delay <i>Pickup delay</i>	0,0.01...864000 s	0.01	
Gn W1 51N Element <i>Selects whether the winding 1 IDMTL derived Earth Fault element is enabled</i>	Disabled, Enabled	Disabled	
Gn W1 51N Setting <i>Pickup level</i>	0.10,0.15...2.5 xIn	1.0 xIn	
Gn W1 51N Char <i>Selects characteristic curve</i>	IEC-NI, IEC-VI, IEC-EI, IEC-LTI, ANSI-MI, ANSI-VI, ANSI-EI, DTL	IEC-NI	
Gn W1 51N Time Mult (IEC/ANSI) <i>Time multiplier (applicable to IEC and ANSI curves but not DTL selection)</i>	0.025, 0.050...1.600	1.000	
Gn W1 51N Delay (DTL) <i>Delay (applicable only when DTL is selected for characteristic)</i>	0, 0.01...20 s	5 s	
Gn W1 51N Reset	(ANSI) Decaying, INST,	INST	

Description	Range	Default	Setting
Selects between an ANSI decaying reset characteristic or a definite time reset	1,2...60 s		
Gn W1 50N Element Selects whether the winding 1 DTL derived Earth fault element is enabled	Disabled, Enabled	Disabled	
Gn W1 50N Setting Pickup level	0.25, 0.26...25 xIn	0.5 xIn	
Gn W1 50N Delay Pickup delay	0,0.01...864000 s	0.02	
Gn W1 51G Element Enables or disables IDMTL Earth fault element	Disabled, Enabled	Disabled	
Gn W1 51G Setting IDMTL Pickup level	0.25,0.26...2.5 xIn	1.0 xIn	
Gn W1 51G Char Selects IDMTL characteristic curve or DTL operation	IEC-NI, IEC-VI, IEC-EI, IEC-LTI, ANSI-MI, ANSI-VI, ANSI-EI, DTL	IEC-NI	
Gn W1 51G Time Mult (IEC/ANSI) Time multiplier (applicable to IEC and ANSI curves but not DTL selection)	0.025, 0.050...1.600	1.000	
Gn W1 51G Delay (DTL) Delay (applicable only when DTL is selected for characteristic)	0, 0.01...20 s	5 s	
Gn W1 51G Reset Selects between an ANSI decaying reset characteristic or a definite time reset	(ANSI) Decaying, INST, 1,2...60 s	INST	
Gn W1 50G Element Enables or disables INST/DTL Earth fault element	Disabled, Enabled	Disabled	
Gn W1 50G Setting INST/DTL Pickup level	0.25, 0.26...25 xIn	0.5 xIn	
Gn W1 50G Delay INST/DTL Pickup delay	0,0.01...864000 s	0.02	

2.5 Winding 2 Menu

Description	Range	Default	Setting
Gn W2 51 Element Selects whether the Winding 2 IDMTL Overcurrent element is enabled	Disabled, Enabled	Disabled	
Gn W2 51 Setting Pickup level	0.05, 0.10...2.5 xIn	1.5 xIn	
Gn W2 51 Char Selects characteristic curve	IEC-NI, IEC-VI, IEC-EI, IEC-LTI, ANSI-MI, ANSI-VI, ANSI-EI, DTL	IEC-NI	
Gn W2 51 Time Mult (IEC/ANSI) Time multiplier (applicable to IEC and ANSI curves but not DTL selection)	0.025, 0.050...1.600	1.000	
Gn W2 51 Delay (DTL) Delay (applicable only when DTL is selected for characteristic)	0, 0.01...20 s	5 s	
Gn W2 51 Reset Selects between an ANSI decaying reset characteristic or a definite time reset	(ANSI) Decaying, INST, 1,2,...60 s	INST	
Gn W2 50 Element Selects whether the Winding 2 DTL Overcurrent element is enabled	Disabled, Enabled	Disabled	
Gn W2 50 Setting Pickup level	0.05, 0.10...25 xIn	20 xIn	
Gn W2 50 Delay Pickup delay	0,0.01...864000 s	0.01	
Gn W2 51N Element Selects whether the Winding 2 IDMTL derived Earth Fault element is enabled	Disabled, Enabled	Disabled	
Gn W2 51N Setting	0.10,0.15...2.5 xIn	1.0 xIn	

Description	Range	Default	Setting
<i>Pickup level</i>			
Gn W2 51N Char <i>Selects characteristic curve</i>	IEC-NI, IEC-VI, IEC-EI, IEC-LTI, ANSI-MI, ANSI-VI, ANSI-EI, DTL	IEC-NI	
Gn W2 51N Time Mult (IEC/ANSI) <i>Time multiplier (applicable to IEC and ANSI curves but not DTL selection)</i>	0.025, 0.050...1.600	1.000	
Gn W2 51N Delay (DTL) <i>Delay (applicable only when DTL is selected for characteristic)</i>	0, 0.01...20 s	5 s	
Gn W2 51N Reset <i>Selects between an ANSI decaying reset characteristic or a definite time reset</i>	(ANSI) Decaying, INST, 1,2...60 s	INST	
Gn W2 50N Element <i>Selects whether the Winding 2 DTL derived Earth fault element is enabled</i>	Disabled, Enabled	Disabled	
Gn W2 50N Setting <i>Pickup level</i>	0.25, 0.26...25 xIn	0.5 xIn	
Gn W2 50N Delay <i>Pickup delay</i>	0,0.01...864000 s	0.02	
Gn W2 51G Element <i>Enables or disables IDMTL Earth fault element</i>	Disabled, Enabled	Disabled	
Gn W2 51G Setting <i>IDMTL Pickup level</i>	0.25,0.26...2.5 xIn	1.0 xIn	
Gn W2 51G Char <i>Selects IDMTL characteristic curve or DTL operation</i>	IEC-NI, IEC-VI, IEC-EI, IEC-LTI, ANSI-MI, ANSI-VI, ANSI-EI, DTL	IEC-NI	
Gn W2 51G Time Mult (IEC/ANSI) <i>Time multiplier (applicable to IEC and ANSI curves but not DTL selection)</i>	0.025, 0.050...1.600	1.000	
Gn W2 51G Delay (DTL) <i>Delay (applicable only when DTL is selected for characteristic)</i>	0, 0.01...20 s	5 s	
Gn W2 51G Reset <i>Selects between an ANSI decaying reset characteristic or a definite time reset</i>	(ANSI) Decaying, INST, 1,2...60 s	INST	
Gn W2 50G Element <i>Enables or disables INST/DTL Earth fault element</i>	Disabled, Enabled	Disabled	
Gn W2 50G Setting <i>INST/DTL Pickup level</i>	0.25, 0.26...25 xIn	0.5 xIn	
Gn W2 50G Delay <i>INST/DTL Pickup delay</i>	0,0.01...864000 s	0.02	

2.6 Winding 3 Menu³

Description	Range	Default	Setting
Gn W3 51 Element <i>Selects whether the Winding 3 IDMTL Overcurrent element is enabled</i>	Disabled, Enabled	Disabled	
Gn W3 51 Setting <i>Pickup level</i>	0.05, 0.10...2.5 xIn	1.5 xIn	
Gn W3 51 Char <i>Selects characteristic curve</i>	IEC-NI, IEC-VI, IEC-EI, IEC-LTI, ANSI-MI, ANSI-VI, ANSI-EI, DTL	IEC-NI	
Gn W3 51 Time Mult (IEC/ANSI) <i>Time multiplier (applicable to IEC and ANSI curves but not DTL selection)</i>	0.025, 0.050...1.600	1.000	
Gn W3 51 Delay (DTL) <i>Delay (applicable only when DTL is selected for characteristic)</i>	0, 0.01...20 s	5 s	
Gn W3 51 Reset <i>Selects between an ANSI decaying reset characteristic or a definite time reset</i>	(ANSI) Decaying, INST, 1,2...60 s	INST	

Description	Range	Default	Setting
Gn W3 50 Element <i>Selects whether the Winding 3 DTL Overcurrent element is enabled</i>	Disabled, Enabled	Disabled	
Gn W3 50 Setting <i>Pickup level</i>	0.05, 0.10...25 xIn	20 xIn	
Gn W3 50 Delay <i>Pickup delay</i>	0,0.01...864000 s	0.01	
Gn W3 51N Element <i>Selects whether the Winding 3 IDMTL derived Earth Fault element is enabled</i>	Disabled, Enabled	Disabled	
Gn W3 51N Setting <i>Pickup level</i>	0.10,0.15...2.5 xIn	1.0 xIn	
Gn W3 51N Char <i>Selects characteristic curve</i>	IEC-NI, IEC-VI, IEC-EI, IEC-LTI, ANSI-MI, ANSI-VI, ANSI-EI, DTL	IEC-NI	
Gn W3 51N Time Mult (IEC/ANSI) <i>Time multiplier (applicable to IEC and ANSI curves but not DTL selection)</i>	0.025, 0.050...1.600	1.000	
Gn W3 51N Delay (DTL) <i>Delay (applicable only when DTL is selected for characteristic)</i>	0, 0.01...20 s	5 s	
Gn W3 51N Reset <i>Selects between an ANSI decaying reset characteristic or a definite time reset</i>	(ANSI) Decaying, INST, 1,2...60 s	INST	
Gn W3 50N Element <i>Selects whether the Winding 3 DTL derived Earth fault element is enabled</i>	Disabled, Enabled	Disabled	
Gn W3 50N Setting <i>Pickup level</i>	0.25, 0.26...25 xIn	0.5 xIn	
Gn W3 50N Delay <i>Pickup delay</i>	0,0.01...864000 s	0.02	
Gn W3 51G Element <i>Enables or disables IDMTL Earth fault element</i>	Disabled, Enabled	Disabled	
Gn W3 51G Setting <i>IDMTL Pickup level</i>	0.25,0.26...2.5 xIn	1.0 xIn	
Gn W3 51G Char <i>Selects IDMTL characteristic curve or DTL operation</i>	IEC-NI, IEC-VI, IEC-EI, IEC-LTI, ANSI-MI, ANSI-VI, ANSI-EI, DTL	IEC-NI	
Gn W3 51G Time Mult (IEC/ANSI) <i>Time multiplier (applicable to IEC and ANSI curves but not DTL selection)</i>	0.025, 0.050...1.600	1.000	
Gn W3 51G Delay (DTL) <i>Delay (applicable only when DTL is selected for characteristic)</i>	0, 0.01...20 s	5 s	
Gn W3 51G Reset <i>Selects between an ANSI decaying reset characteristic or a definite time reset</i>	(ANSI) Decaying, INST, 1,2...60 s	INST	
Gn W3 50G Element <i>Enables or disables INST/DTL Earth fault element</i>	Disabled, Enabled	Disabled	
Gn W3 50G Setting <i>INST/DTL Pickup level</i>	0.25, 0.26...25 xIn	0.5 xIn	
Gn W3 50G Delay <i>INST/DTL Pickup delay</i>	0,0.01...864000 s	0.02	

1) 3W Only

2.7 Status Input Menu

Description	Range	Default	Setting
Aux I/P 1 Pickup Delay <i>Delay on pickup of DC Status input 1</i>	0.000,0.005...864000 s	0 s	
Aux I/P 2 Pickup Delay	0.000,0.005...864000 s	0 s	
Aux I/P 3 Pickup Delay	0.000,0.005...864000 s	0 s	

Description	Range	Default	Setting
Aux I/P 4 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Aux I/P 5 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Aux I/P 6 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Aux I/P 7 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Aux I/P 8 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Aux I/P 9 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Aux I/P 10 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Aux I/P 11 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Aux I/P 12 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Aux I/P 13 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Aux I/P 14 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Aux I/P 15 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Aux I/P 16 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Aux I/P 17 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Aux I/P 18 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Aux I/P 19 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Aux I/P 20 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Aux I/P 21 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Aux I/P 22 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Aux I/P 23 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Aux I/P 24 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Aux I/P 25 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Aux I/P 26 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Aux I/P 27 Pickup Delay ¹	0.000,0.005...864000 s	0 s	
Inhibit 87 <i>Selects which inputs inhibit the 87 element</i>	NONE, 1...27 ²	NONE	
Inhibit 87HS <i>Selects which inputs inhibit the 87HS element</i>	NONE, 1...27 ²	NONE	
Inhibit W1 51 <i>Selects which inputs inhibit the W1 51 element</i>	NONE, 1...27 ²	NONE	
Inhibit W1 50 <i>Selects which inputs inhibit the W1 50 element</i>	NONE, 1...27 ²	NONE	
Inhibit W1 51N <i>Selects which inputs inhibit the W1 51N element</i>	NONE, 1...27 ²	NONE	
Inhibit W1 50N <i>Selects which inputs inhibit the W1 50N element</i>	NONE, 1...27 ²	NONE	
Inhibit W1 51G <i>Selects which inputs inhibit the W1 51G element</i>	NONE, 1...27 ²	NONE	
Inhibit W1 50G <i>Selects which inputs inhibit the W1 50G element</i>	NONE, 1...27 ²	NONE	
Inhibit W2 51 <i>Selects which inputs inhibit the W2 51 element</i>	NONE, 1...27 ²	NONE	
Inhibit W2 50 <i>Selects which inputs inhibit the W2 50 element</i>	NONE, 1...27 ²	NONE	
Inhibit W2 51N <i>Selects which inputs inhibit the W2 51N element</i>	NONE, 1...27 ²	NONE	
Inhibit W2 50N <i>Selects which inputs inhibit the W2 50N element</i>	NONE, 1...27 ²	NONE	
Inhibit W2 51G <i>Selects which inputs inhibit the W2 51G element</i>	NONE, 1...27 ²	NONE	
Inhibit W2 50G	NONE, 1...27 ²	NONE	

Description	Range	Default	Setting
Selects which inputs inhibit the W2 50G element			
Inhibit W3 51 ³ Selects which inputs inhibit the W3 51 element	NONE, 1...27 ²	NONE	
Inhibit W3 50 ³ Selects which inputs inhibit the W3 50 element	NONE, 1...27 ²	NONE	
Inhibit W3 51N ³ Selects which inputs inhibit the W3 51N element	NONE, 1...27 ²	NONE	
Inhibit W3 50N ³ Selects which inputs inhibit the W3 50N element	NONE, 1...27 ²	NONE	
Inhibit W3 51G ³ Selects which inputs inhibit the W3 51G element	NONE, 1...27 ²	NONE	
Inhibit W3 50G ³ Selects which inputs inhibit the W3 50G element	NONE, 1...27 ²	NONE	
Trip Circuit Fail Selects which inputs are monitoring trip circuits, inputs should normally also be selected as Inverted Inputs (see below)	NONE, 1...27 ²	NONE	
Trigger Storage Selects which inputs can trigger a waveform record	NONE, 1...27 ²	NONE	
Clock Sync. Selects which input is used to synchronise the real time clock	NONE, 1...27 ²	NONE	
Inverted Inputs Selects which inputs pickup when voltage is removed, often used when monitoring trip circuits.	NONE, 1...27 ²	NONE	

1) Only when fitted.

2) 27 status inputs represents maximum configuration.

3) 3W Only

2.8 Reylogic Control Menu

Description	Range	Default	Setting
General Logic Selects whether the logic diagram is enabled, if disabled then no outputs will be driven.	Enable, Disable	Enable	

2.9 Reylogic Element Menu

Description	Range	Default	Setting
Inhibit 87 Drop Off Delay Delay before inhibit is removed from 87 element after Inhibit 87 is de-energised.	0,1...60000 ms	10 ms	
Inhibit 87HS Drop Off Delay Delay before inhibit is removed from 87HS element after Inhibit 87HS is de-energised.	0,1...60000 ms	10 ms	
Trip Cct Fail Pickup Delay Delay before trip circuit failure picks up. Used in conjunction with STATUS INPUT MENU/Trip Circuit Fail setting to configure how many trip circuits are being monitored.	0,1...60000 ms	400 ms	

2.10 Output Relay Menu

Description	Range	Default	Setting
87 <i>Biased Differential operated</i>	NONE, 1...29 ¹	4,5	
87HS <i>Differential Highset operated</i>	NONE, 1...29 ¹	4,5	
W1 51 <i>Winding 1 IDMTL Overcurrent operated</i>	NONE, 1...29 ¹	4,5	
W1 50 <i>Winding 1 INST/DTL Overcurrent operated</i>	NONE, 1...29 ¹	4,5	
W1 51N <i>Winding 1 IDMTL derived Earth Fault operated</i>	NONE, 1...29 ¹	4,5	
W1 50N <i>Winding 1 DTL derived Earth Fault operated</i>	NONE, 1...29 ¹	4,5	
W1 51G <i>Winding 1 IDMTL measured Earth Fault operated</i>	NONE, 1...29 ¹	4,5	
W1 50G <i>Winding 1 inst/DTL measured Earth Fault operated</i>	NONE, 1...29 ¹	4,5	
W2 51 <i>Winding 2 IDMTL Overcurrent operated</i>	NONE, 1...29 ¹	4,5	
W2 50 <i>Winding 2 INST/DTL Overcurrent operated</i>	NONE, 1...29 ¹	4,5	
W2 51N <i>Winding 2 IDMTL derived Earth Fault operated</i>	NONE, 1...29 ¹	4,5	
W2 50N <i>Winding 2 DTL derived Earth Fault operated</i>	NONE, 1...29 ¹	4,5	
W2 51G <i>Winding 2 IDMTL measured Earth Fault operated</i>	NONE, 1...29 ¹	4,5	
W2 50G <i>Winding 2 INST/DTL measured Earth Fault operated</i>	NONE, 1...29 ¹	4,5	
W3 51 ³ <i>Winding 3 IDMTL Overcurrent operated</i>	NONE, 1...29 ¹	4,5	
W3 50 ³ <i>Winding 3 DTL Overcurrent operated</i>	NONE, 1...29 ¹	4,5	
W3 51N ³ <i>Winding 3 IDMTL derived Earth Fault operated</i>	NONE, 1...29 ¹	4,5	
W3 50N ³ <i>Winding 3 DTL derived Earth Fault operated</i>	NONE, 1...29 ¹	4,5	
W3 51G ³ <i>Winding 3 IDMTL measured Earth Fault operated</i>	NONE, 1...29 ¹	4,5	
W3 50G ³ <i>Winding 3 DTL measured Earth Fault operated</i>	NONE, 1...29 ¹	4,5	
Phase A <i>A phase A element operated</i>	NONE, 1...29 ¹	NONE	
Phase B <i>A phase B element operated</i>	NONE, 1...29 ¹	NONE	
Phase C <i>A phase C element operated</i>	NONE, 1...29 ¹	NONE	
General Starter <i>A starter element is picked up</i>	NONE, 1...29 ¹	NONE	

Description	Range	Default	Setting
General Trip <i>An element has operated. Useful when testing individual functions!</i>	NONE, 1...29 ¹	NONE	
Trip Circuit Fail <i>A trip circuit has failed, look at status input Leads to find out which one</i>	NONE, 1...29 ¹	NONE	
New Data Stored <i>The waveform recorder has stored new information Note: this is a pulsed output</i>	NONE, 1...29 ¹	NONE	
Aux I/P 1 Operated <i>DC Status 1 has operated</i>	NONE, 1...29 ¹	NONE	
Aux I/P 2 Operated	NONE, 1...29 ¹	NONE	
Aux I/P 3 Operated	NONE, 1...29 ¹	NONE	
Aux I/P 4 Operated ²	NONE, 1...29 ¹	NONE	
Aux I/P 5 Operated ²	NONE, 1...29 ¹	NONE	
Aux I/P 6 Operated ²	NONE, 1...29 ¹	NONE	
Aux I/P 7 Operated ²	NONE, 1...29 ¹	NONE	
Aux I/P 8 Operated ²	NONE, 1...29 ¹	NONE	
Aux I/P 9 Operated ²	NONE, 1...29 ¹	NONE	
Aux I/P 10 Operated ²	NONE, 1...29 ¹	NONE	
Aux I/P 11 Operated ²	NONE, 1...29 ¹	NONE	
Aux I/P 12 Operated ²	NONE, 1...29 ¹	NONE	
Aux I/P 13 Operated ²	NONE, 1...29 ¹	NONE	
Aux I/P 14 Operated ²	NONE, 1...29 ¹	NONE	
Aux I/P 15 Operated ²	NONE, 1...29 ¹	NONE	
Aux I/P 16 Operated ²	NONE, 1...29 ¹	NONE	
Aux I/P 17 Operated ²	NONE, 1...29 ¹	NONE	
Aux I/P 18 Operated ²	NONE, 1...29 ¹	NONE	
Aux I/P 19 Operated ²	NONE, 1...29 ¹	NONE	
Aux I/P 20 Operated ²	NONE, 1...29 ¹	NONE	
Aux I/P 21 Operated ²	NONE, 1...29 ¹	NONE	
Aux I/P 22 Operated ²	NONE, 1...29 ¹	NONE	
Aux I/P 23 Operated ²	NONE, 1...29 ¹	NONE	
Aux I/P 24 Operated ²	NONE, 1...29 ¹	NONE	
Aux I/P 25 Operated ²	NONE, 1...29 ¹	NONE	
Aux I/P 26 Operated ²	NONE, 1...29 ¹	NONE	
Aux I/P 27 Operated ²	NONE, 1...29 ¹	NONE	
Hand Reset Outputs <i>Relays selected, as Hand Reset will remain latched until manually reset from front panel or via communications link or by removing DC Supply. By default relays are Self Resetting and will reset when the driving signal is removed.</i>	NONE, 1...29 ¹	NONE	
Protection Healthy <i>Relays selected are energised whilst relay self-monitoring does NOT detect any hardware or software errors and DC Supply is healthy. A changeover contact or normally closed contact may be used to generate Protection Defective from this output</i>	NONE, 1...29 ¹	1	

1) 29 output relays represents maximum configuration.

2) Only when fitted.

3) 3W Only

2.11 LED Menu

Description	Range	Default	Setting
87 <i>Biased Differential operated</i>	NONE, 1...32	17	
87HS <i>Differential Highset operated</i>	NONE, 1...32	18	
W1 51	NONE, 1...32	5,21	

Description	Range	Default	Setting
<i>Winding 1 IDMTL Overcurrent operated</i>			
W1 50 <i>Winding 1 INST/DTL Overcurrent operated</i>	NONE, 1...32	5,19	
W1 51N <i>Winding 1 IDMTL derived Earth Fault operated</i>	NONE, 1...32	5,22	
W1 50N <i>Winding 1 DTL derived Earth Fault operated</i>	NONE, 1...32	5,20	
W1 51G <i>Winding 1 IDMTL measured Earth Fault operated</i>	NONE, 1...32	5,22	
W1 50G <i>Winding 1 inst/DTL measured Earth Fault operated</i>	NONE, 1...32	5,20	
W2 51 <i>Winding 2 IDMTL Overcurrent operated</i>	NONE, 1...32	6,21	
W2 50 <i>Winding 2 INST/DTL Overcurrent operated</i>	NONE, 1...32	6,19	
W2 51N <i>Winding 2 IDMTL derived Earth Fault operated</i>	NONE, 1...32	6,22	
W2 50N <i>Winding 2 DTL derived Earth Fault operated</i>	NONE, 1...32	6,20	
W2 51G <i>Winding 2 IDMTL measured Earth Fault operated</i>	NONE, 1...32	6,22	
W2 50G <i>Winding 2 INST/DTL measured Earth Fault operated</i>	NONE, 1...32	6,20	
W3 51 ³ <i>Winding 3 IDMTL Overcurrent operated</i>	NONE, 1...32	7,21	
W3 50 ³ <i>Winding 3 DTL Overcurrent operated</i>	NONE, 1...32	7,19	
W3 51N ³ <i>Winding 3 IDMTL derived Earth Fault operated</i>	NONE, 1...32	7,22	
W3 50N ³ <i>Winding 3 DTL derived Earth Fault operated</i>	NONE, 1...32	7,20	
W3 51G ³ <i>Winding 3 IDMTL measured Earth Fault operated</i>	NONE, 1...32	7,22	
W3 50G ³ <i>Winding 3 DTL measured Earth Fault operated</i>	NONE, 1...32	7,20	
Phase A <i>A phase A element operated</i>	NONE, 1...32	2	
Phase B <i>A phase B element operated</i>	NONE, 1...32	3	
Phase C <i>A phase C element operated</i>	NONE, 1...32	4	
General Starter <i>A starter element is picked up. Useful when testing individual functions!</i>	NONE, 1...32	1	
General Trip <i>An element has operated. Useful when testing individual functions!</i>	NONE, 1...32	1	
Trip Circuit Fail <i>A trip circuit has failed, look at status inputs Leds to find out which one</i>	NONE, 1...32	23	
New Data Stored	NONE, 1...32	NONE	

Description	Range	Default	Setting
<i>The waveform recorder has stored new information</i>			
Aux I/P 1 Operated <i>DC Status 1 has operated</i>	NONE, 1...32	9	
Aux I/P 2 Operated	NONE, 1...32	10	
Aux I/P 3 Operated	NONE, 1...32	11	
Aux I/P 4 Operated	NONE, 1...32	12	
Aux I/P 5 Operated	NONE, 1...32	13	
Aux I/P 6 Operated	NONE, 1...32	14	
Aux I/P 7 Operated	NONE, 1...32	15	
Aux I/P 8 Operated	NONE, 1...32	16	
Aux I/P 9 Operated	NONE, 1...32	25	
Aux I/P 10 Operated	NONE, 1...32	26	
Aux I/P 11 Operated	NONE, 1...32	27	
Aux I/P 12 Operated	NONE, 1...32	NONE	
Aux I/P 13 Operated	NONE, 1...32	NONE	
Aux I/P 14 Operated	NONE, 1...32	NONE	
Aux I/P 15 Operated	NONE, 1...32	NONE	
Aux I/P 16 Operated	NONE, 1...32	NONE	
Aux I/P 17 Operated	NONE, 1...32	NONE	
Aux I/P 18 Operated	NONE, 1...32	NONE	
Aux I/P 19 Operated	NONE, 1...32	NONE	
Aux I/P 20 Operated	NONE, 1...32	NONE	
Aux I/P 21 Operated	NONE, 1...32	NONE	
Aux I/P 22 Operated	NONE, 1...32	NONE	
Aux I/P 23 Operated	NONE, 1...32	NONE	
Aux I/P 24 Operated	NONE, 1...32	NONE	
Aux I/P 25 Operated	NONE, 1...32	NONE	
Aux I/P 26 Operated	NONE, 1...32	NONE	
Aux I/P 27 Operated	NONE, 1...32	NONE	
Self Reset LEDs <i>LEDs selected, as Self Reset will automatically reset when the driving signal is removed. By default all LEDs are Hand Reset and must be manually reset either locally via the front fascia or remotely via communications.</i>	NONE, 1...32	1	

2.12 Data Storage Menu

Description	Range	Default	Setting
Pre-Trigger Storage	10...90 %	20 %	
Data Record Duration	4 Recs x 1 Seconds, 2 Recs x 2 Seconds, 1 Recs x 4 Seconds	4 Recs x 1 Second	

2.13 Communications Menu

Description	Range	Default	Setting
Station Address <i>IEC 60870-5-103 Station Address</i>	0...254	0	
IEC870 On Port <i>Selects which port to use for IEC 60870-5-103 communications</i>	None, Com1, Com2, Auto	Com1	
Line Switch Time <i>When IEC870 On Port is selected to Auto the communications ports are scanned for valid IEC 60870-5-103 communications frames. Once valid frames are detected the com port will remain selected. Subsequently if there are no valid frames received for the Line Switch Time period then the driver will assume the communications circuit has</i>	1,2,...60 s	30 s	

Description	Range	Default	Setting
<i>failed and will resume scanning the com ports. Only visible when set to Auto.</i>			
Com1 Baud Rate <i>Sets the communications baud rate for com port 1 (Rear upper Fibre optic port)</i>	75, 110, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200	19200	
Com1 Parity <i>Selects whether parity information is used</i>	Even, Odd, None	Even	
Com1 Line Idle <i>Selects the communications line idle sense</i>	Light Off, Light On	Light Off	
Com1 Data Echo <i>Enables echoing of data from RX port to TX port when operating relays in a Fibre Optic ring configuration</i>	Off, On	Off	
Com2 Baud Rate <i>Sets the communications baud rate for com port 2 (Rear lower Fibre optic port AND Front Fascia RS232 port)</i>	75, 110, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200	19200	
Com2 Parity <i>Selects whether parity information is used</i>	Even, Odd, None	None	
Com2 Line Idle <i>Selects the communications line idle sense</i>	Light Off, Light On	Light Off	
Com2 Data Echo <i>Enables echoing of data from RX port to TX port when operating relays in a Fibre Optic ring configuration</i>	Off, On	Off	
Com2 Direction <i>Selects how Com2 is shared between the front fascia port and the rear fibre optic port. This allows interlocking to prevent remote access whilst an engineer is attached locally on site if IEC870 is on Com2 and Auto-detect is enabled</i>	AUTO-DETECT, FRONT PORT, REAR PORT	AUTO-DETECT	

3 Instruments

INSTRUMENT	DESCRIPTION
[WINDING 1 METERS] --> press down <--	Start of Winding 1 meters
W1 Primary Currents 0.00 0.00 0.00 kA	Winding 1 primary currents
W1 Sec'y Currents 0.00 0.00 0.00 A	Winding 1 secondary currents
W1 Nom Currents 0.00 0.00 0.00 xIn	Winding 1 nominal currents
W1 Residual 0.00 xIn	Winding 1 nominal residual earth fault current
W1 51 Status 0 0 0 0 %	Operation progress meters for Winding 1 (51/51N) IDMTL elements, phases A, B, C and E/F
W1 Primary E/F 0.00 kA	Winding 1 primary earth fault current
W1 Secondary E/F 0.00 A	Winding 1 secondary earth fault current
W1 Nominal E/F 0.00 xIn	Winding 1 nominal earth fault current
W1 51G Status 0 %	Operation progress meters for Winding 1 (51G) IDMTL E/F element
[WINDING 2 METERS] --> press down <--	Start of Winding 2 meters
W2 Primary Currents 0.00 0.00 0.00 kA	Winding 2 primary currents
W2 Sec'y Currents 0.00 0.00 0.00 A	Winding 2 secondary currents
W2 Nom Currents 0.00 0.00 0.00 xIn	Winding 2 nominal currents
W2 Residual 0.00 xIn	Winding 2 nominal residual earth fault current
W2 51 Status 0 0 0 0 %	Operation progress meters for Winding 2 (51/51N) IDMTL elements, phases A, B, C and E/F
W2 Primary E/F 0.00 kA	Winding 2 primary earth fault current
W2 Secondary E/F 0.00 A	Winding 2 secondary earth fault current
W2 Nominal E/F 0.00 xIn	Winding 2 nominal earth fault current
W2 51G Status 0 %	Operation progress meters for Winding 2 (51G) IDMTL E/F element
[WINDING 3 METERS] --> press down <--	Start of Winding 3 meters ¹
W3 Primary Currents 0.00 0.00 0.00 kA	Winding 3 primary currents ¹
W3 Sec'y Currents 0.00 0.00 0.00 A	Winding 3 secondary currents ¹
W3 Nom Currents 0.00 0.00 0.00 xIn	Winding 3 nominal currents ¹
W3 Residual 0.00 xIn	Winding 3 nominal residual earth fault current ¹
W3 51 Status 0 0 0 0 %	Operation progress meters for Winding 3 (51/51N) IDMTL elements, phases A, B, C and E/F ¹
W3 Primary E/F 0.00 kA	Winding 3 primary earth fault current ¹
W3 Secondary E/F 0.00 A	Winding 3 secondary earth fault current ¹
W3 Nominal E/F 0.00 xIn	Winding 3 nominal earth fault current ¹
W3 51G Status 0 %	Operation progress meters for Winding 3 (51G) IDMTL E/F element ¹
[BIAS DIFF METERS] --> press down <--	Start of (87) Biased Differential meters

INSTRUMENT	DESCRIPTION
W1 Line Currents 0.00 0.00 0.00 xIn	Winding 1 measured currents
W2 Line Currents 0.00 0.00 0.00 xIn	Winding 2 measured currents
W3 Line Currents 0.00 0.00 0.00 xIn	Winding 3 measured currents ¹
W1 Relay Currents 0.00 0.00 0.00 xIn	Winding 1 currents after Interposing CT correction factors applied
W2 Relay Currents 0.00 0.00 0.00 xIn	Winding 2 currents after Interposing CT correction factors applied
W3 Relay Currents 0.00 0.00 0.00 xIn	Winding 3 currents after Interposing CT correction factors applied ¹
Operate Currents 0.00 0.00 0.00 xIn	Differential operate currents
Restrain Currents 0.00 0.00 0.00 xIn	Differential restrain currents
Mag Inrush Currents 0.00 0.00 0.00 xIn	Differential magnetising inrush currents (even harmonic content of operate currents but mainly 2 nd harmonic content)
[MISC METERS] --> press down <--	Start of miscellaneous meters
Status Inputs 1-16 -----	Displays the state of DC status inputs 1 to 16 ²
Status Inputs 17-19 ---	Displays the state of DC status inputs 17 to 19 ²
Output Relays 1-16 -----	Displays the state of output relays 1 to 16 ³
Output Relays 17-21 -----	Displays the state of output relays 17 to 21 ³
Time & Date 13/08/2002 10:16:11	Time and Date
Fault Records 0	Number of fault records stored
Event Records 0	Number of event records stored
Waveform Records 0	Number of waveform records stored

1) 3W Only

2) Display is different when fewer status inputs are fitted

3) Display is different when fewer output relays are fitted

4 IEC 60870-5-103 Communications Information

4.1 IEC 60870-5-103 Semantics in monitor direction

FUN	INF	Description	GI	TYP	COT
60	1	IEC870 Active Com1	x	1	1,9
60	2	IEC870 Active Com2	x	1	1,9
60	3	Front Port OverRide	x	1	1,9

FUN	INF	Description	GI	TYP	COT
176	0	GI End	-	8	10
176	0	Time Synchronisation	-	6	8
176	2	Reset FCB	-	2	3
176	3	Reset CU	-	2	4
176	4	Start/Restart	-	2	5
176	22	Settings changed	-	1	1
176	23	Setting G1 selected	x	1	1,9
176	24	Setting G2 selected	x	1	1,9
176	25	Setting G3 selected	x	1	1,9
176	26	Setting G4 selected	x	1	1,9
176	27	Status Input 1	x	1	1,9
176	28	Status Input 2	x	1	1,9
176	29	Status Input 3	x	1	1,9
176	30	Status Input 4	x	1	1,9
176	36	Trip Circuit Fail	x	1	1,9
176	64	Start/Pick-up L1	x	2	1,9
176	65	Start/Pick-up L2	x	2	1,9
176	66	Start/Pick-up L3	x	2	1,9
176	67	Start/Pick-up N	x	2	1,9
176	68	General Trip	-	2	1
176	69	Trip L1	-	2	1
176	70	Trip L2	-	2	1
176	71	Trip L3	-	2	1
176	84	General Start/Pick-up	x	2	1,9
178	7	Biased Differential	-	2	1
178	8	Differential Highset	-	2	1
178	16	W2 Phase Fault	-	2	1
178	18	W3 Phase Fault	-	2	1
178	34	W1 Phase Fault	-	2	1
178	35	W1 Residual Earth Fault	-	2	1
178	36	W1 Measured Earth Fault	-	2	1
178	48	W2 Residual Earth Fault	-	2	1
178	49	W2 Measured Earth Fault	-	2	1
178	79	W3 Residual Earth Fault	-	2	1
178	89	W3 Measured Earth Fault	-	2	1
178	128	Cold Start	-	1	1
178	129	Warm Start	-	1	1
178	130	Re-Start	-	1	1
178	135	Trigger Storage	-	1	1

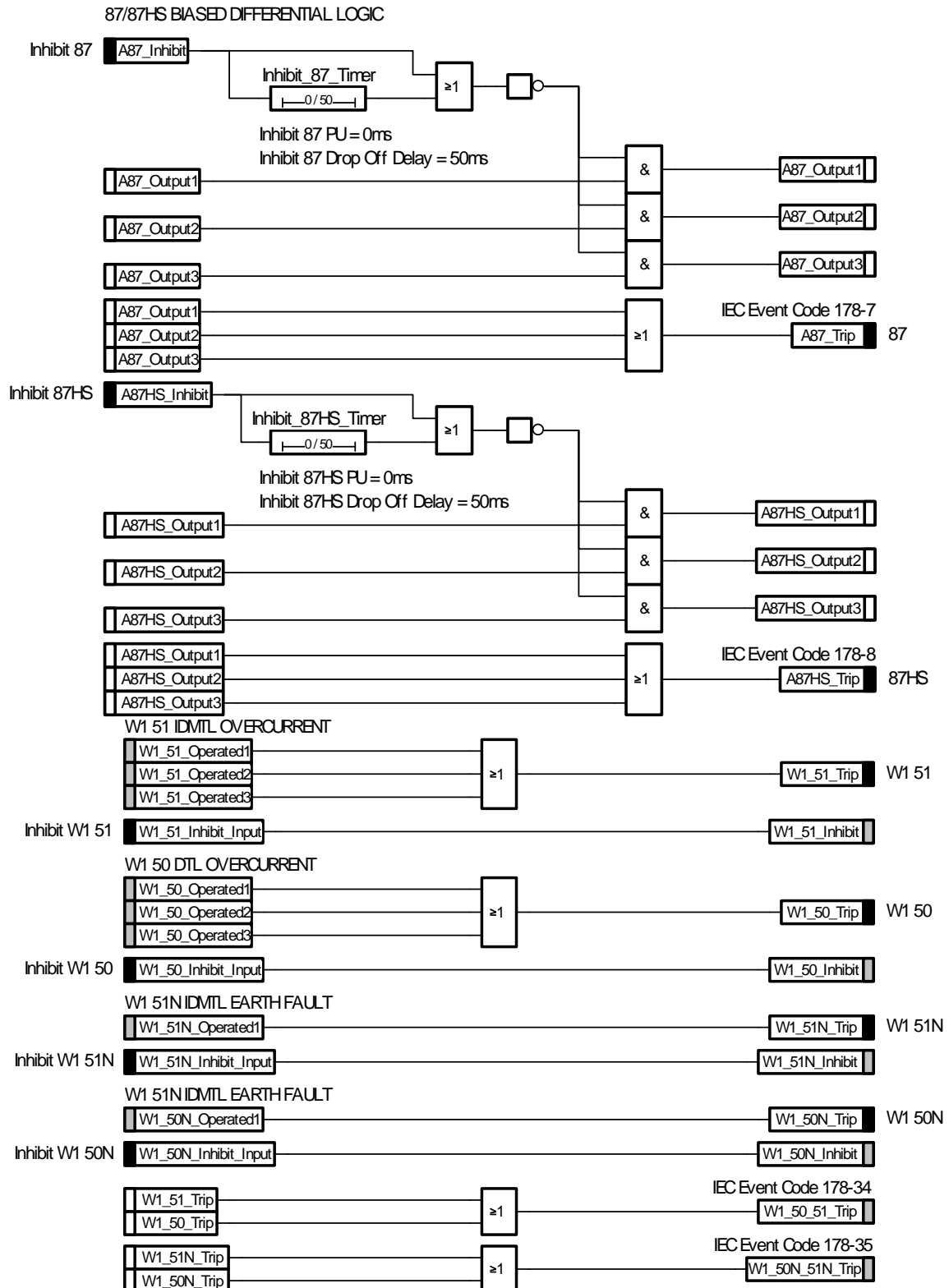
FUN	INF	Description	GI	TYP	COT
178	145	Status Input 5	x	1	1,9
178	146	Status Input 6	x	1	1,9
178	147	Status Input 7	x	1	1,9
178	148	Status Input 8	x	1	1,9
178	149	Status Input 9	x	1	1,9
178	150	Status Input 10	x	1	1,9
178	151	Status Input 11	x	1	1,9
178	152	Status Input 12	x	1	1,9
178	153	Status Input 13	x	1	1,9
178	154	Status Input 14	x	1	1,9
178	155	Status Input 15	x	1	1,9
178	156	Status Input 16	x	1	1,9
178	157	Status Input 17	x	1	1,9
178	158	Status Input 18	x	1	1,9
178	159	Status Input 19	x	1	1,9
178	160	Status Input 20	x	1	1,9
178	161	Status Input 21	x	1	1,9
178	162	Status Input 22	x	1	1,9
178	163	Status Input 23	x	1	1,9
178	164	Status Input 24	x	1	1,9
178	165	Status Input 25	x	1	1,9
178	166	Status Input 26	x	1	1,9
178	167	Status Input 27	x	1	1,9
178	181	Plant Control Relay 1	x	1	1,9
178	182	Plant Control Relay 2	x	1	1,9
178	183	Plant Control Relay 3	x	1	1,9
178	184	Plant Control Relay 4	x	1	1,9
178	185	Plant Control Relay 5	x	1	1,9
178	186	Plant Control Relay 6	x	1	1,9
178	187	Plant Control Relay 7	x	1	1,9
178	188	Plant Control Relay 8	x	1	1,9
178	189	Plant Control Relay 9	x	1	1,9
178	190	Plant Control Relay 10	x	1	1,9
178	191	Plant Control Relay 11	x	1	1,9
178	192	Plant Control Relay 12	x	1	1,9
178	193	Plant Control Relay 13	x	1	1,9
178	194	Plant Control Relay 14	x	1	1,9
178	195	Plant Control Relay 15	x	1	1,9
178	196	Plant Control Relay 16	x	1	1,9
178	197	Plant Control Relay 17	x	1	1,9
178	198	Plant Control Relay 18	x	1	1,9
178	199	Plant Control Relay 19	x	1	1,9
178	200	Plant Control Relay 20	x	1	1,9
178	201	Plant Control Relay 21	x	1	1,9
178	202	Plant Control Relay 22	x	1	1,9
178	203	Plant Control Relay 23	x	1	1,9
178	204	Plant Control Relay 24	x	1	1,9
178	205	Plant Control Relay 25	x	1	1,9

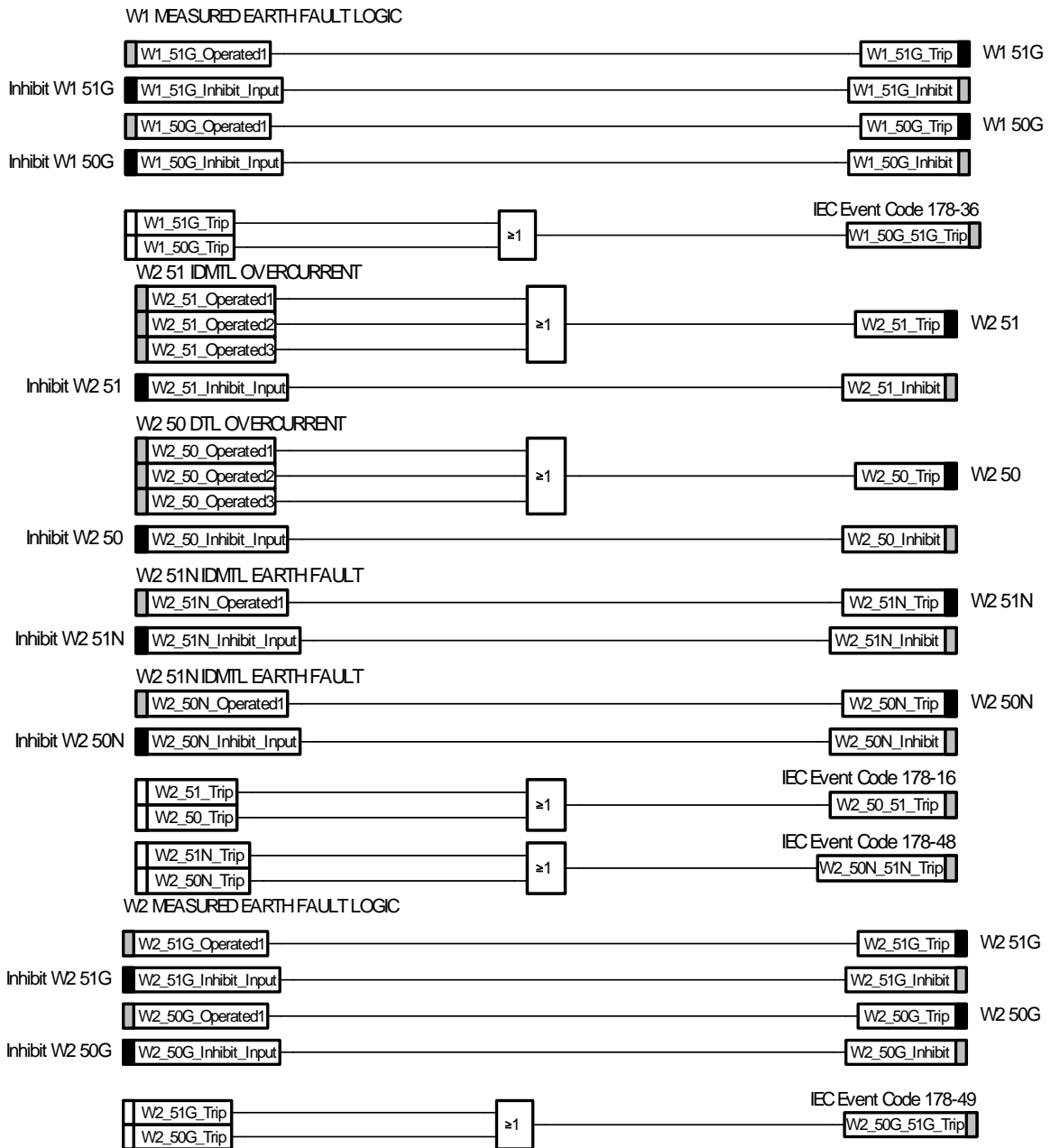
FUN	INF	Description	GI	TYP	COT
178	206	Plant Control Relay 26	x	1	1,9
178	207	Plant Control Relay 27	x	1	1,9
178	208	Plant Control Relay 28	x	1	1,9
178	209	Plant Control Relay 29	x	1	1,9
178	230	Measurand W1 I _{L1,2,3} OC1 I _{L1} (2.4 x) OC1 I _{L2} (2.4 x) OC1 I _{L3} (2.4 x)	-	9	2
178	231	Measurand W2 I _{L1,2,3} OC2 I _{L1} (2.4 x) OC2 I _{L2} (2.4 x) OC2 I _{L3} (2.4 x)	-	9	2
178	232	Measurand W3 I _{L1,2,3} OC3 I _{L1} (2.4 x) OC3 I _{L2} (2.4 x) OC3 I _{L3} (2.4 x)	-	9	2

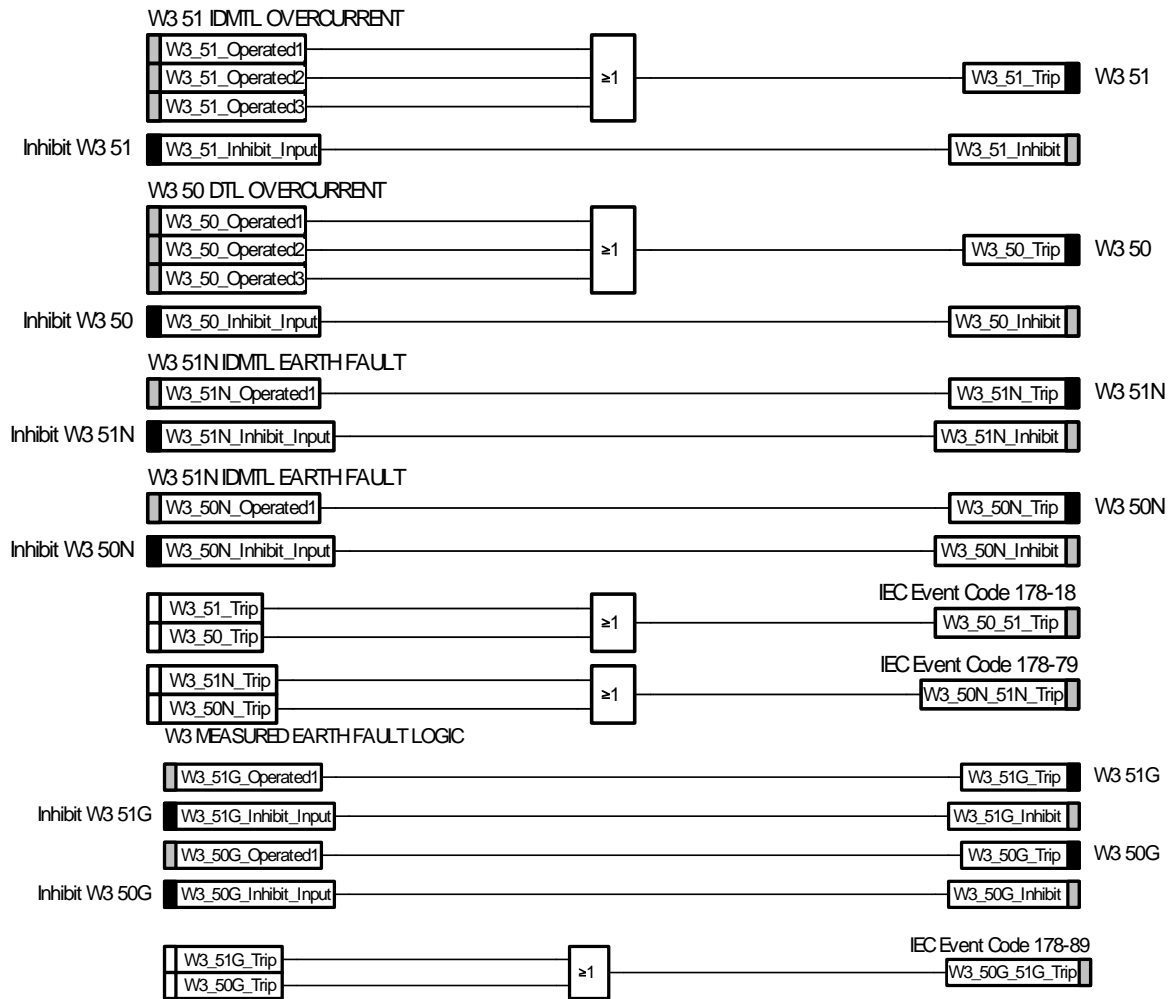
4.2 IEC 60870-5-103 Semantics in control direction

FUN	INF	Description	COM	TYP	COT
176	0	GI Initiation		7	9
176	0	Time Synchronisation		6	8
176	19	LED reset	ON	20	20

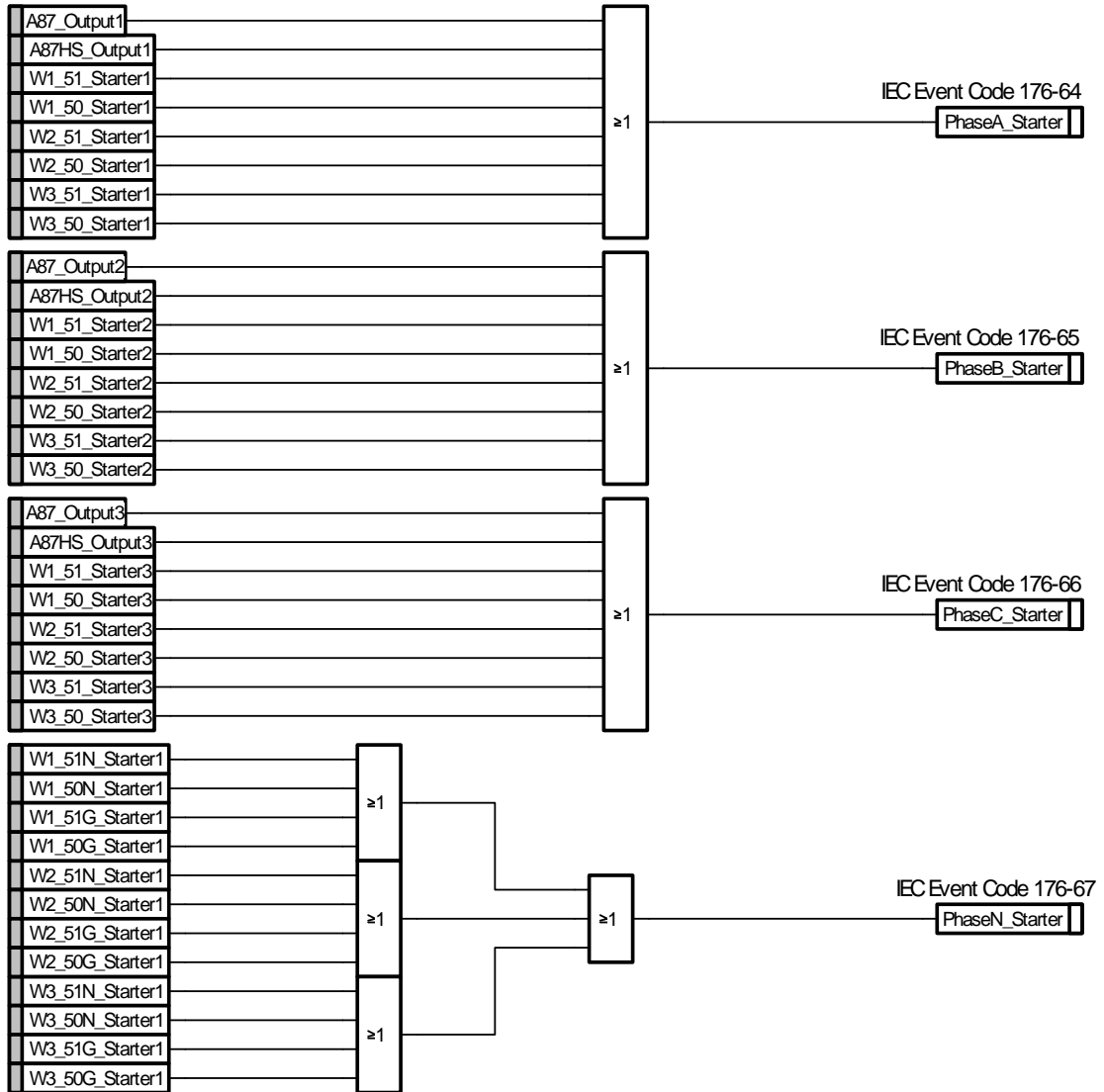
5 Reylogic Diagrams

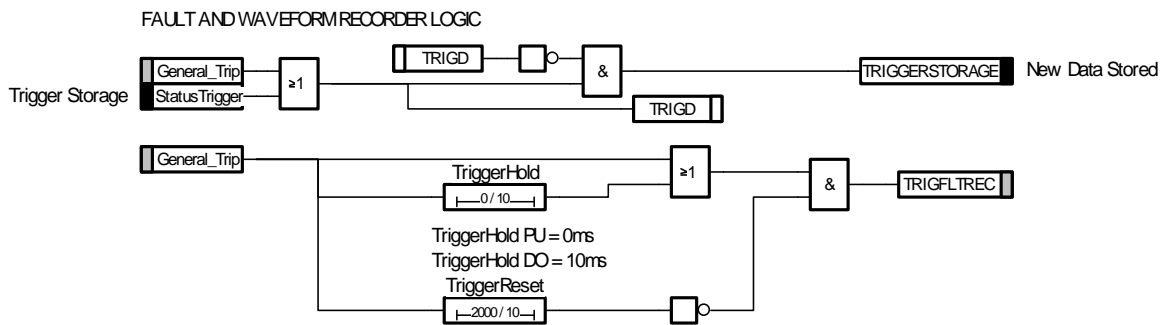
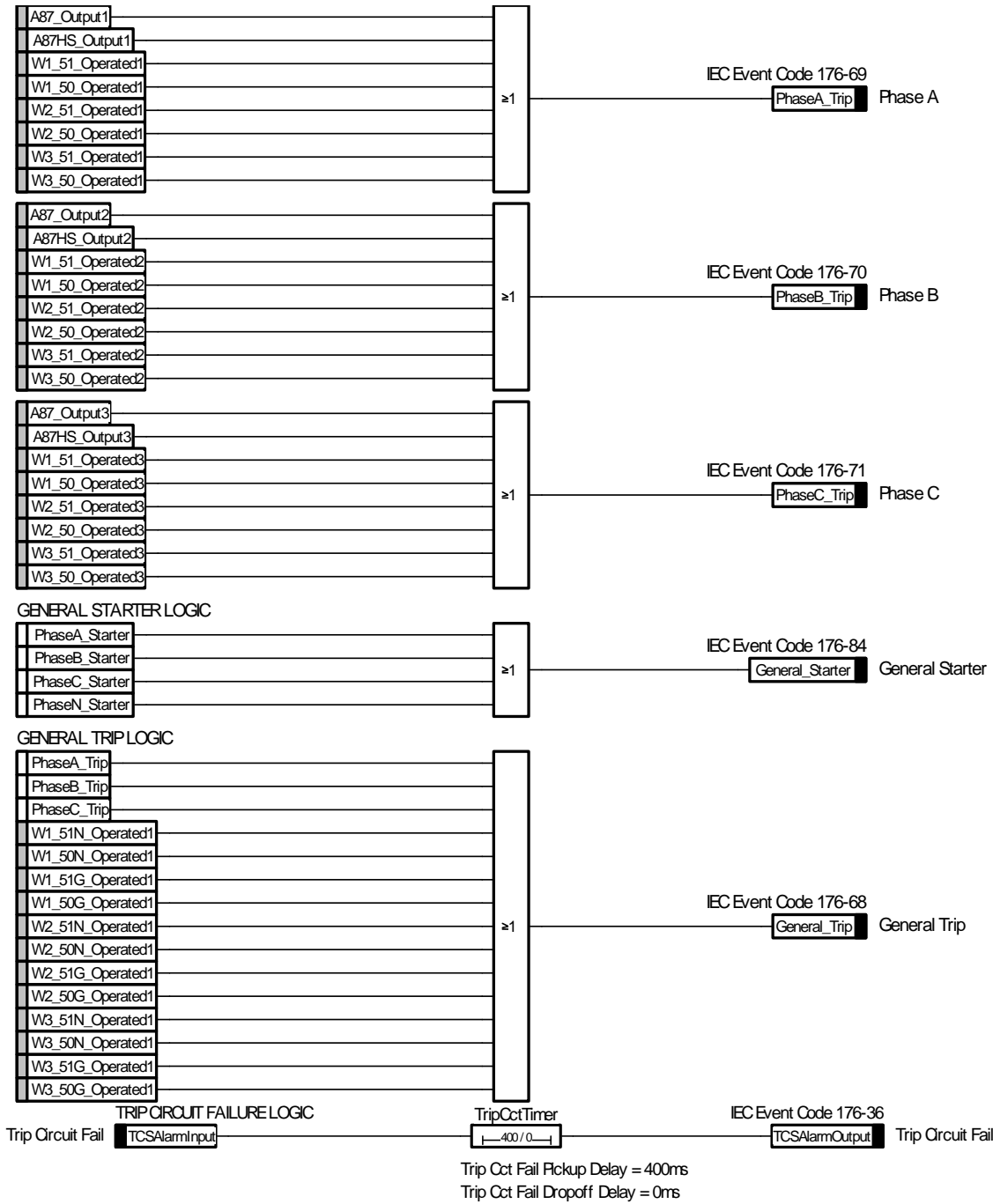






OVERALL PHASE SELECTION LOGIC





6 Label Inserts

	Duobias-M-207-2W-R12	Duobias-M-207-2W-R12	
	DU3-207-**	DU3-207-**	
	Left	Right	
	23.02.10	23.02.10	
1	GENERAL STARTER	(87) BIAS. DIFFERENTIAL	17
2	PHASE A	(87HS) DIFF. HIGHSET	18
3	PHASE B	(50) O/C	19
4	PHASE C	(50N/50G) E/F	20
5	W1	(51) O/C	21
6	W2	(50N/51G) E/F	22
7		(74TC) TRIP CIRCUIT FAIL	23
8			24
9	<i>AUX 1 I/P OPERATED</i>	<i>AUX 9 I/P OPERATED</i>	25
10	<i>AUX 2 I/P OPERATED</i>	<i>AUX 10 I/P OPERATED</i>	26
11	<i>AUX 3 I/P OPERATED</i>	<i>AUX 11 I/P OPERATED</i>	27
12	<i>AUX 4 I/P OPERATED</i>		28
13	<i>AUX 5 I/P OPERATED</i>		29
14	<i>AUX 6 I/P OPERATED</i>		30
15	<i>AUX 7 I/P OPERATED</i>		31
16	<i>AUX 8 I/P OPERATED</i>		32

	Duobias-M-207-3W-R12	Duobias-M-207-3W-R12	
	DU3-307-**	DU3-307-**	
	Left	Right	
	23.02.10	23.02.10	
1	GENERAL STARTER	(87) BIAS. DIFFERENTIAL	17
2	PHASE A	(87HS) DIFF. HIGHSET	18
3	PHASE B	(50) O/C	19
4	PHASE C	(50N/50G) E/F	20
5	W1	(51) O/C	21
6	W2	(51N/51G) E/F	22
7	W3	(74TC) TRIP CIRCUIT FAIL	23
8			24
9	<i>AUX 1 I/P OPERATED</i>	<i>AUX 9 I/P OPERATED</i>	25
10	<i>AUX 2 I/P OPERATED</i>	<i>AUX 10 I/P OPERATED</i>	26
11	<i>AUX 3 I/P OPERATED</i>	<i>AUX 11 I/P OPERATED</i>	27
12	<i>AUX 4 I/P OPERATED</i>		28
13	<i>AUX 5 I/P OPERATED</i>		29
14	<i>AUX 6 I/P OPERATED</i>		30
15	<i>AUX 7 I/P OPERATED</i>		31
16	<i>AUX 8 I/P OPERATED</i>		32