

# 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
25/09/2006	R11 Reformatted to match other manual sections
19/08/2004	R10 Added new inrush bias settings Added additional information describing Trip Cct Fail Pickup Delay. Corrected settings group select command numbering.
29/10/2003	R9 Increased interposing multiplier range to 0.25 - 3.00 to 0.05 – 3.00
31/07/2003	R8 Corrected 51/50/51N/50N order in menus
28/07/2003	R72W and 3W versions now available
16/07/2003	R6 Status input inhibits added to voltage functions V/f Voltage meters added
18/06/2003	R5 Reylogic Diagrams updated
03/06/2003	R4 First modularised version
26/02/2003	R3 Standardise on Prim, Sec'y and Nom meters wherever sensible
25/02/2003	R2Settings list brought up to date to match R9 firmware Trip Cct Dropoff delay setting removed Clock sync from status inputs added Local & Remote operating added Some time delay ranges changed Order of some settings changed in Differential Menu, Output Menu, Led Menu
6/11/2002	R1 First Version

## Software Revision History

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## 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-210-2W-E8-50Hz	DU3-220-*A-50	2661H80029R12
Duobias-M-210-2W-STD-50Hz	DU3-220-**-50	2661H80025R12
Duobias-M-210-3W-STD-50Hz	DU3-220-**-50	2661H80048R12

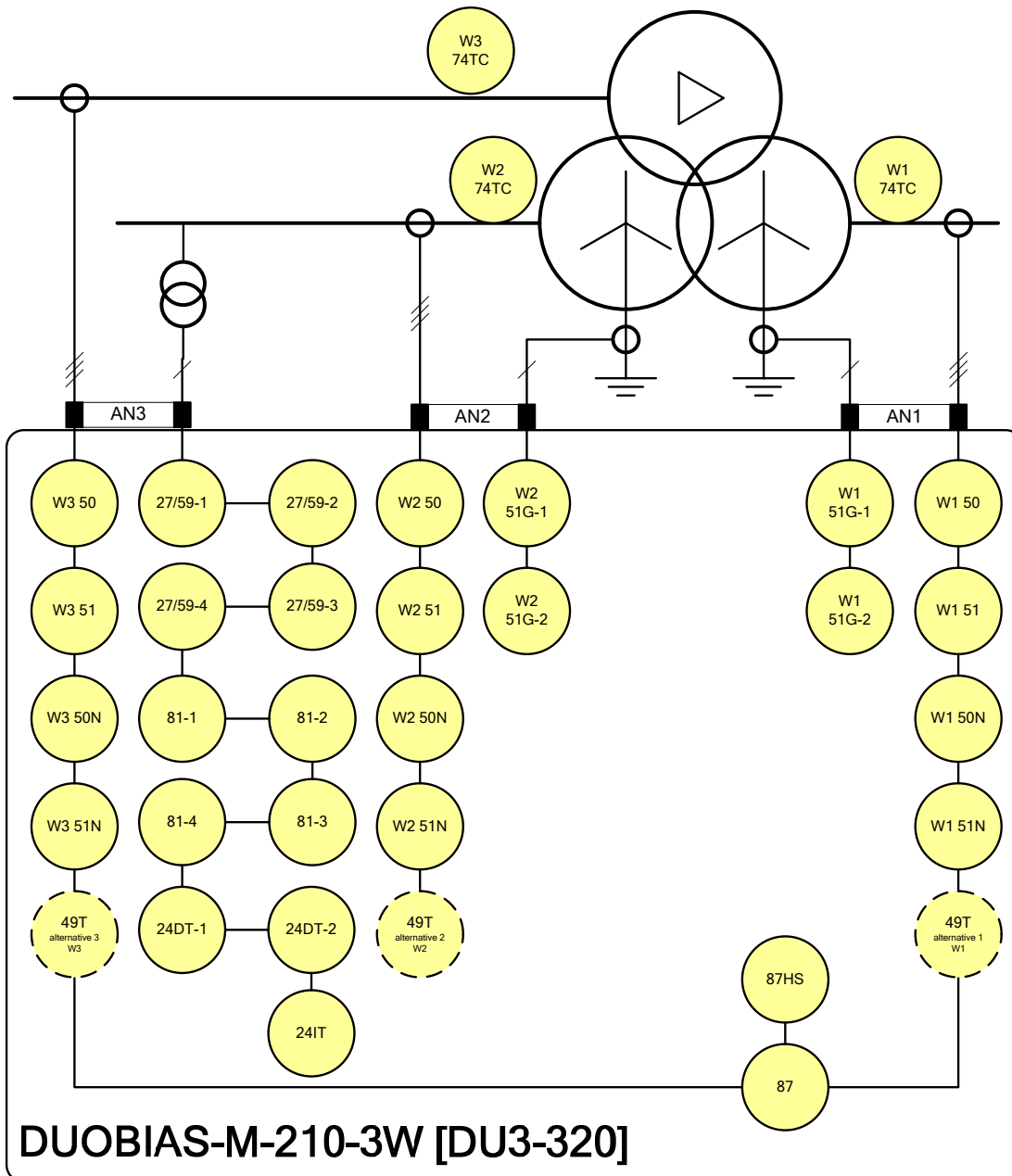


Figure 1 - Duobias-M-210-3W [DU3-320]

## 2 DUOBIAS-M-210-2W/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...8	1	
View/Edit Group <i>Selects which settings group is currently being displayed</i>	1,2...8	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	
Back light off after <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 alpha 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-210-2W/3W	

### 2.2 CT/VT Config Menu

Description	Range	Default	Setting
W1 Input <i>Selects whether 1 or 5 Amp terminals are being used for winding 1</i>	1,5 A	1 A	
W1 CT Ratio <i>Winding 1 CT ratio to scale primary current instruments</i>	5:0.2...5000:7	2000:1	
W1 E/F Input <sup>1</sup> <i>Selects whether 1 or 5 Amp terminals are being used for the Winding 1 standby earth fault input</i>	1,5 A	1 A	
W1 E/F CT Ratio <sup>1</sup> <i>Winding 1 Earth fault 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 for winding 2</i>	1,5 A	1 A	
W2 CT Ratio <i>Winding 1 CT ratio to scale primary current instruments</i>	5:0.2...5000:7	2000:1	

Description	Range	Default	Setting
W2 E/F Input <sup>1</sup> <i>Selects whether 1 or 5 Amp terminals are being used for the Winding 2 standby earth fault input</i>	1,5 A	1 A	
W2 E/F CT Ratio <sup>1</sup> <i>Winding 2 Earth fault CT ratio to scale primary current instruments</i>	5:0.2...5000:7	2000:1	
E/F Input <sup>2</sup> <i>Selects whether 1 or 5 Amp terminals are being used for the standby earth fault input</i>	1,5 A	1 A	
E/F CT Ratio <sup>2</sup> <i>Earth fault CT ratio to scale primary current instruments</i>	5:0.2...5000:7	2000:1	
W3 Input <sup>1</sup> <i>Selects whether 1 or 5 Amp terminals are being used for winding 3</i>	1,5 A	1 A	
W3 CT Ratio <sup>1</sup> <i>Winding 3 CT ratio to scale primary current instruments</i>	5:0.2...5000:7	2000:1	
Nominal Voltage Vn <i>Selects the nominal voltage setting of the voltage input</i>	40,40.1...160 V	63.5 V	
VT Ratio <i>VT ratio to scale primary voltage instrument</i>	3300:40...1000000:160	132000:110	
VT Connection <i>Selects whether phase to neutral or phase to phase voltages are connected to the relay voltage input to scale the primary voltage instrument</i>	Vpn, Vpp	Vpn	

1) 3W Only

2) 2W Only.

## 2.3 Biased Differential Menu

Description	Range	Default	Setting
W1 Interposing CT Multiplier <i>Winding 1 scaling factor</i>	0.05,0.06...3.00 x	1.00 x	
W1 Interposing CT Connection <i>Winding 1 transformer vector group compensation and/or zero sequence filtering</i>	Yy0, Yd1, Yy2, Yd3, Yy4, Yd5, Yy6, Yd7, Yy8, Yd9, Yy10, Yd11, Ydy0	Yy0, 0°	
W2 Interposing CT Multiplier <i>Winding 2 scaling factor</i>	0.05,0.06...3.00 x	1.00 x	
W2 Interposing CT Connection <i>Winding 2 transformer vector group compensation and/or zero sequence filtering</i>	Yy0, Yd1, Yy2, Yd3, Yy4, Yd5, Yy6, Yd7, Yy8, Yd9, Yy10, Yd11, Ydy0	Yy0, 0°	
W3 Interposing CT Multiplier <sup>1</sup> <i>Winding 3 scaling factor</i>	0.05,0.06...3.00 x	1.00 x	
W3 Interposing CT Connection <sup>1</sup> <i>Winding 3 transformer vector group compensation and/or zero sequence filtering</i>	Yy0, Yd1, Yy2, Yd3, Yy4, Yd5, Yy6, Yd7, Yy8, Yd9, Yy10, Yd11, Ydy0	Yy0, 0°	
87 Inrush Inhibit <i>Selects whether the biased differential characteristic is inhibited from operating when magnetising inrush is detected</i>	Disabled, Enabled	Enabled	
87 Inrush Bias <i>Selects the bias method used for magnetising inrush</i> <i>Phase – Segregated, each phase blocks itself.</i> <i>Cross – Blocked, each phase can block</i>	Phase, Cross, Sum	Cross	

Description	Range	Default	Setting
<i>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 Switch On To Fault performance when REF not applied).</i>			
87 Inrush Setting <i>The magnetising inrush detector operates when the even harmonics in the differential operate current exceed a set percentage of the differential operate current</i>	0.1,0.11...0.50 xld	0.20 xld	
87 Bias Differential <i>Selects whether the transformer differential protection element is enabled</i>	Disabled, Enabled	Enabled	
87 Initial Setting <i>The initial unbiased pickup level</i>	0.1,0.15...2.00 xln	0.2 xln	
87 Bias Slope <i>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</i>	0,0.05...0.7 x	0.2 x	
87 Bias Slope Limit <i>At this point in the characteristics the bias slope increases tot provide increased security when additional measuring errors are introduced due to CT saturation effects.</i>	1,2...20 xln	4 xln	
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>	0,0.005...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 xln	4 xln	
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>	0,0.005...1 s	0.005 s	

1) 3W Only

## 2.4 Winding 1 Protection 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>	0.10,0.15...2.5 xln	1.5 xln	
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 <u>s</u>	<u>5 s</u>	
Gn W1 51 Reset <i>Selects between an ANSI decaying reset</i>	(ANSI) Decaying, INST, 1,2,...60 s	INST	

Description	Range	Default	Setting
<i>characteristic or a definite time reset</i>			
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>	0.01, 0.02...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>	0.25,0.26...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 <i>Selects between an ANSI decaying reset characteristic or a definite time reset</i>	(ANSI) Decaying, INST, 1,2...60 s	INST	
Gn W1 50N Element <i>Selects whether the winding 1 DTL derived Earth fault element is enabled</i>	Disabled, Enabled	Disabled	
Gn W1 50N Setting <i>Pickup level</i>	0.25, 0.26...25 xIn	0.5 xIn	
Gn W1 50N Delay <i>Pickup delay</i>	0,0.01...864000 s	0.02	
Gn W1 51G-1 Element <sup>1</sup> <i>Selects whether the IDMTL Standby Earth Fault Stage 1 element is enabled</i>	Disabled, Enabled	Disabled	
Gn W1 51G-1 Setting <sup>1</sup> <i>Pickup level</i>	0.10,0.15...2.5 xIn	0.5 xIn	
Gn W1 51G-1 Char <sup>1</sup> <i>Selects characteristic curve</i>	IEC-NI, IEC-VI, IEC-EI, IEC-LTI, ANSI-MI, ANSI-VI, ANSI-EI, DTL	IEC-NI	
Gn W1 51G-1 Time Mult(IEC/ANSI) <sup>1</sup> <i>Time multiplier (applicable to IEC and ANSI curves but not DTL selection)</i>	0.025, 0.050...1.600	1.000	
Gn W1 51G-1 Delay (DTL) <sup>1</sup> <i>Delay (applicable only when DTL is selected for characteristic)</i>	0, 0.01...20 s	5 s	
Gn W1 51G-1 Reset <sup>1</sup> <i>Selects between an ANSI decaying reset characteristic or a definite time reset</i>	(ANSI) Decaying, INST, 1,2...60 s	INST	
Gn W1 51G-2 Element <sup>1</sup> <i>Selects whether the IDMTL Standby Earth Fault Stage 2 element is enabled</i>	Disabled, Enabled	Disabled	
Gn W1 51G-2 Setting <sup>1</sup> <i>Pickup level</i>	0.10,0.15...2.5 xIn	0.6 xIn	
Gn W1 51G-2 Char <sup>1</sup> <i>Selects characteristic curve</i>	IEC-NI, IEC-VI, IEC-EI, IEC-LTI, ANSI-MI, ANSI-VI, ANSI-EI, DTL	IEC-NI	
Gn W1 51G-2 Time Mult (IEC/ANSI) <sup>1</sup> <i>Time multiplier (applicable to IEC and ANSI curves but not DTL selection)</i>	0.025, 0.050...1.600	1.000	
Gn W1 51G-2 Delay (DTL) <sup>1</sup> <i>Delay (applicable only when DTL is selected for characteristic)</i>	0, 0.01...20 s	5 s	
Gn W1 51G-2 Reset <sup>1</sup> <i>Selects between an ANSI decaying reset characteristic or a definite time reset</i>	(ANSI) Decaying, INST, 1,2...60 s	INST	

1) 3W Only.

## 2.5 Winding 2 Protection Menu

Description	Range	Default	Setting
Gn W2 51 Element <i>Selects whether the winding 2 IDMTL Overcurrent element is enabled</i>	Disabled, Enabled	Disabled	
Gn W2 51 Setting <i>Pickup level</i>	0.10,0.15...2.5 xIn	1.5 xIn	
Gn W2 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 W2 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 W2 51 Delay (DTL) <i>Delay (applicable only when DTL is selected for characteristic)</i>	0, 0.01...20 s	5 s	
Gn W2 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 W2 50 Element <i>Selects whether the winding 2 DTL Overcurrent element is enabled</i>	Disabled, Enabled	Disabled	
Gn W2 50 Setting <i>Pickup level</i>	0.01, 0.02...25 xIn	20 xIn	
Gn W2 50 Delay <i>Pickup delay</i>	0,0.01...864000 s	0.01	
Gn W2 51N Element <i>Selects whether the winding 2 IDMTL derived Earth Fault element is enabled</i>	Disabled, Enabled	Disabled	
Gn W2 51N Setting <i>Pickup level</i>	0.25,0.26...2.5 xIn	1.0 xIn	
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-1 Element <sup>1</sup> <i>Selects whether the IDMTL Standby Earth Fault Stage 1 element is enabled</i>	Disabled, Enabled	Disabled	
Gn W2 51G-1 Setting <sup>1</sup> <i>Pickup level</i>	0.10,0.15...2.5 xIn	0.5 xIn	
Gn W2 51G-1 Char <sup>1</sup> <i>Selects characteristic curve</i>	IEC-NI, IEC-VI, IEC-EI, IEC-LTI, ANSI-MI, ANSI-VI, ANSI-EI, DTL	IEC-NI	
Gn W2 51G-1 Time Mult(IEC/ANSI) <sup>1</sup> <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-1 Delay (DTL) <sup>1</sup> <i>Delay (applicable only when DTL is selected for characteristic)</i>	0, 0.01...20 s	5 s	
Gn W2 51G-1 Reset <sup>1</sup> <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 W2 51G-2 Element <sup>1</sup> <i>Selects whether the IDMTL Standby Earth Fault Stage 2 element is enabled</i>	Disabled, Enabled	Disabled	
Gn W2 51G-2 Setting <sup>1</sup> <i>Pickup level</i>	0.10,0.15...2.5 xIn	0.6 xIn	
Gn W2 51G-2 Char <sup>1</sup> <i>Selects characteristic curve</i>	IEC-NI, IEC-VI, IEC-EI, IEC-LTI, ANSI-MI, ANSI-VI, ANSI-EI, DTL	IEC-NI	
Gn W2 51G-2 Time Mult (IEC/ANSI) <sup>1</sup> <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-2 Delay (DTL) <sup>1</sup> <i>Delay (applicable only when DTL is selected for characteristic)</i>	0, 0.01...20 s	5 s	
Gn W2 51G-2 Reset <sup>1</sup> <i>Selects between an ANSI decaying reset characteristic or a definite time reset</i>	(ANSI) Decaying, INST, 1,2...60 s	INST	

1) 3W Only.

## 2.6 Winding 3 Protection Menu<sup>1</sup>

Description	Range	Default	Setting
Gn W3 51 Element <sup>1</sup> <i>Selects whether the winding 3 IDMTL Overcurrent element is enabled</i>	Disabled, Enabled	Disabled	
Gn W3 51 Setting <sup>1</sup> <i>Pickup level</i>	0.10,0.15...2.5 xIn	1.5 xIn	
Gn W3 51 Char <sup>1</sup> <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) <sup>1</sup> <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) <sup>1</sup> <i>Delay (applicable only when DTL is selected for characteristic)</i>	0, 0.01...20 <u>s</u>	<u>5 s</u>	
Gn W3 51 Reset <sup>1</sup> <i>Selects between an ANSI decaying reset characteristic or a definite time reset</i>	(ANSI) Decaying, INST, 1,2...60 s	INST	
Gn W3 50 Element <sup>1</sup> <i>Selects whether the winding 3 DTL Overcurrent element is enabled</i>	Disabled, Enabled	Disabled	
Gn W3 50 Setting <sup>1</sup> <i>Pickup level</i>	0.01, 0.02...25 xIn	20 xIn	
Gn W3 50 Delay <sup>1</sup> <i>Pickup delay</i>	0,0.01...864000 s	0.01	
Gn W3 51N Element <sup>1</sup> <i>Selects whether the winding 3 IDMTL derived Earth Fault element is enabled</i>	Disabled, Enabled	Disabled	
Gn W3 51N Setting <sup>1</sup> <i>Pickup level</i>	0.25,0.26...2.5 xIn	1.0 xIn	
Gn W3 51N Char <sup>1</sup> <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) <sup>1</sup> <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) <sup>1</sup> <i>Delay (applicable only when DTL is selected for characteristic)</i>	0, 0.01...20 s	5 s	
Gn W3 51N Reset <sup>1</sup> <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 <sup>1</sup> <i>Selects whether the winding 3 DTL derived Earth fault element is enabled</i>	Disabled, Enabled	Disabled	
Gn W3 50N Setting <sup>1</sup> <i>Pickup level</i>	0.25, 0.26...25 xIn	0.5 xIn	

Description	Range	Default	Setting
Gn W3 50N Delay <sup>1</sup> <i>Pickup delay</i>	0,0.01...864000 s	0.02	

1) 3W Only

## 2.7 Standby Earth Fault Menu<sup>1</sup>

Description	Range	Default	Setting
Gn 51G-1 Element <sup>1</sup> <i>Selects whether the IDMTL Standby Earth Fault Stage 1 element is enabled</i>	Disabled, Enabled	Disabled	
Gn 51G-1 Setting <sup>1</sup> <i>Pickup level</i>	0.10,0.15...2.5 xIn	0.5 xIn	
Gn 51G-1 Char <sup>1</sup> <i>Selects characteristic curve</i>	IEC-NI, IEC-VI, IEC-EI, IEC-LTI, ANSI-MI, ANSI-VI, ANSI-EI, DTL	IEC-NI	
Gn 51G-1 Time Mult (IEC/ANSI) <sup>1</sup> <i>Time multiplier (applicable to IEC and ANSI curves but not DTL selection)</i>	0.025, 0.050...1.600	1.000	
Gn 51G-1 Delay (DTL) <sup>1</sup> <i>Delay (applicable only when DTL is selected for characteristic)</i>	0, 0.01...20 s	5 s	
Gn 51G-1 Reset <sup>1</sup> <i>Selects between an ANSI decaying reset characteristic or a definite time reset</i>	(ANSI) Decaying, INST, 1,2...60 s	INST	
Gn 51G-2 Element <sup>1</sup> <i>Selects whether the IDMTL Standby Earth Fault Stage 2 element is enabled</i>	Disabled, Enabled	Disabled	
Gn 51G-2 Setting <sup>1</sup> <i>Pickup level</i>	0.10,0.15...2.5 xIn	0.6 xIn	
Gn 51G-2 Char <sup>1</sup> <i>Selects characteristic curve</i>	IEC-NI, IEC-VI, IEC-EI, IEC-LTI, ANSI-MI, ANSI-VI, ANSI-EI, DTL	IEC-NI	
Gn 51G-2 Time Mult (IEC/ANSI) <sup>1</sup> <i>Time multiplier (applicable to IEC and ANSI curves but not DTL selection)</i>	0.025, 0.050...1.600	1.000	
Gn 51G-2 Delay (DTL) <sup>1</sup> <i>Delay (applicable only when DTL is selected for characteristic)</i>	0, 0.01...20 s	5 s	
Gn 51G-2 Reset <sup>1</sup> <i>Selects between an ANSI decaying reset characteristic or a definite time reset</i>	(ANSI) Decaying, INST, 1,2...60 s	INST	

1) 2W Only.

## 2.8 Voltage Menu

Description	Range	Default	Setting
Gn U/V Guard Element <i>Selects whether the under voltage guard element which can be applied to both the voltage and frequency elements is enabled</i>	Disabled, Enabled	Enabled	
Gn U/V Guard Setting <i>When the voltage drops below this level the element operates to provide a guard to prevent other elements operating due to the Circuit breaker opening</i>	0.01,0.02...2.5 xVn	0.1 xVn	
Gn U/V Guard Delay <i>Pickup delay</i>	0,0.01...864000 s	0 s	
Gn 27/59-1 Element <i>Selects whether the Under/Over voltage element stage 1 is enabled</i>	Disabled, Enabled	Disabled	
Gn 27/59-1 Operation <i>Selects between Undervoltage and Overvoltage pickup for this element</i>	Under, Over	Over	
Gn 27/59-1 Setting <i>Under or over voltage pickup level</i>	0.01,0.02...2.5 xVn	1.15 xVn	

Description	Range	Default	Setting
Gn 27/59-1 Hysteresis <i>Sets the pickup to dropoff thresholds e.g. 3% on Overlevel picks up above pickup setting and drops off below 97% of setting, 3% on Underlevel picks up below setting and drops off above 103% of setting</i>	0,0.1...80 %	0.1 %	
Gn 27/59-1 Delay <i>Pickup delay</i>	0,0.01...864000 s	0.1 s	
Gn 27/59-1 U/V Guarded <i>Selects whether U/V Guard element can block the operation of this element</i>	No, Yes	Yes	
Gn 27/59-2 Element <i>Selects whether the Under/Over voltage element stage 2 is enabled</i>	Disabled, Enabled	Disabled	
Gn 27/59-2 Operation <i>Selects between Undervoltage and Overvoltage pickup for this element</i>	Under, Over	Over	
Gn 27/59-2 Setting <i>Under or over voltage pickup level</i>	0.01,0.02...2.5 xVn	1.10 xVn	
Gn 27/59-2 Hysteresis <i>Sets the pickup to dropoff thresholds e.g. 3% on Overlevel picks up above pickup setting and drops off below 97% of setting, 3% on Underlevel picks up below setting and drops off above 103% of setting</i>	0,0.1...80 %	0.1 %	
Gn 27/59-2 Delay <i>Pickup delay</i>	0.1,0.2...864000 s	0.2 s	
Gn 27/59-2 U/V Guarded <i>Selects whether U/V Guard element can block the operation of this element</i>	No, Yes	Yes	
Gn 27/59-3 Element <i>Selects whether the Under/Over voltage element stage 1 is enabled</i>	Disabled, Enabled	Disabled	
Gn 27/59-3 Operation <i>Selects between Undervoltage and Overvoltage pickup for this element</i>	Under, Over	Under	
Gn 27/59-3 Setting <i>Under or over voltage pickup level</i>	0.01,0.02...2.5 xVn	0.80 xVn	
Gn 27/59-3 Hysteresis <i>Sets the pickup to dropoff thresholds e.g. 3% on Overlevel picks up above pickup setting and drops off below 97% of setting, 3% on Underlevel picks up below setting and drops off above 103% of setting</i>	0,0.1...80 %	0.1 %	
Gn 27/59-3 Delay <i>Pickup delay</i>	0.1,0.2...864000 s	1 s	
Gn 27/59-3 U/V Guarded <i>Selects whether U/V Guard element can block the operation of this element</i>	No, Yes	Yes	
Gn 27/59-4 Element <i>Selects whether the Under/Over voltage element stage 1 is enabled</i>	Disabled, Enabled	Disabled	
Gn 27/59-4 Operation <i>Selects between Undervoltage and Overvoltage pickup for this element</i>	Under, Over	Over	
Gn 27/59-4 Setting <i>Under or over voltage pickup level</i>	0.01,0.02...2.5 xVn	0.70 xVn	
Gn 27/59-4 Hysteresis <i>Sets the pickup to dropoff thresholds e.g. 3% on Overlevel picks up above pickup setting and drops off below 97% of setting, 3% on Underlevel picks up below setting and drops off above 103% of setting</i>	0,0.1...80 %	0.1 %	
Gn 27/59-4 Delay <i>Pickup delay</i>	0,0.01...864000 s	1 s	

Description	Range	Default	Setting
Gn 27/59-4 U/V Guarded <i>Selects whether U/V Guard element can block the operation of this element</i>	No, Yes	Yes	

## 2.9 Frequency Menu

Description	Range	Default	Setting
Gn 81-1 Element <i>Selects whether the Under/Over frequency element stage 1 is enabled</i>	Disabled, Enabled	Disabled	
Gn 81-1 Operation <i>Selects between Underfrequency and Overfrequency pickup for this element</i>	Under, Over	Under	
Gn 81-1 Setting <i>Under or over frequency pickup level</i>	40.00,40.01...70.00 Hz	49.50 Hz	
Gn 81-1 Hysteresis <i>Sets the pickup to dropoff thresholds e.g. 3% on Overlevel picks up above pickup setting and drops off below 97% of setting, 3% on Underlevel picks up below setting and drops off above 103% of setting</i>	0,0.1...80 %	0.1 %	
Gn 81-1 Delay <i>Pickup delay</i>	0.1,0.2...864000 s	1 s	
Gn 81-1 U/V Guarded <i>Selects whether U/V Guard element can block the operation of this element</i>	No, Yes	Yes	
Gn 81-2 Element <i>Selects whether the Under/Over frequency element stage 2 is enabled</i>	Disabled, Enabled	Disabled	
Gn 81-2 Operation <i>Selects between Underfrequency and Overfrequency pickup for this element</i>	Under, Over	Under	
Gn 81-2 Setting <i>Under or over frequency pickup level</i>	40.00,40.01...70.00 Hz	49.00 Hz	
Gn 81-2 Hysteresis <i>Sets the pickup to dropoff thresholds e.g. 3% on Overlevel picks up above pickup setting and drops off below 97% of setting, 3% on Underlevel picks up below setting and drops off above 103% of setting</i>	0,0.1...80 %	0.1 %	
Gn 81-2 Delay <i>Pickup delay</i>	0.1,0.2...864000 s	0.8 s	
Gn 81-2 U/V Guarded <i>Selects whether U/V Guard element can block the operation of this element</i>	No, Yes	Yes	
Gn 81-3 Element <i>Selects whether the Under/Over frequency element stage 3 is enabled</i>	Disabled, Enabled	Disabled	
Gn 81-3 Operation <i>Selects between Underfrequency and Overfrequency pickup for this element</i>	Under, Over	Under	
Gn 81-3 Setting <i>Under or over frequency pickup level</i>	40.00,40.01...70.00 Hz	48.00 Hz	
Gn 81-3 Hysteresis <i>Sets the pickup to dropoff thresholds e.g. 3% on Overlevel picks up above pickup setting and drops off below 97% of setting, 3% on Underlevel picks up below setting and drops off above 103% of setting</i>	0,0.1...80 %	0.1 %	
Gn 81-3 Delay <i>Pickup delay</i>	0.1,0.2...864000 s	0.6 s	

Description	Range	Default	Setting
Gn 81-3 U/V Guarded <i>Selects whether U/V Guard element can block the operation of this element</i>	No, Yes	Yes	
Gn 81-4 Element <i>Selects whether the Under/Over frequency element stage 1 is enabled</i>	Disabled, Enabled	Disabled	
Gn 81-4 Operation <i>Selects between Underfrequency and Overfrequency pickup for this element</i>	Under, Over	Under	
Gn 81-4 Setting <i>Under or over frequency pickup level</i>	40.00,40.01...70.00 Hz	47.50 Hz	
Gn 81-1 Hysteresis <i>Sets the pickup to dropoff thresholds e.g. 3% on Overlevel picks up above pickup setting and drops off below 97% of setting, 3% on Underlevel picks up below setting and drops off above 103% of setting</i>	0,0.1...80 %	0.1 %	
Gn 81-4 Delay <i>Pickup delay</i>	0.1,0.2...864000 s	0.4 s	
Gn 81-4 U/V Guarded <i>Selects whether U/V Guard element can block the operation of this element</i>	No, Yes	Yes	

## 2.10 Overfluxing Menu

Description	Range	Default	Setting
Gn Voltage Multiplier <i>Voltage scaling factor to compensate for any voltage measuring errors</i>	0.500,0.501...1.5 x	1 x	
Gn 24DT-1 Element <i>Selects whether the definite time Overfluxing element stage 1 is enabled</i>	Disabled, Enabled	Disabled	
Gn 24DT-1 Setting <i>Pickup level</i>	0.1,0.11...2.00	1.10 x	
Gn 24DT-1 Hysteresis <i>Sets the pickup to dropoff thresholds e.g. 3% on Overlevel picks up above pickup setting and drops off below 97% of setting, 3% on Underlevel picks up below setting and drops off above 103% of setting</i>	0,0.1...80 %	0.1 %	
Gn 24DT-1 Delay <i>Pickup delay</i>	0.1,0.2...864000 s	6 s	
Gn 24DT-2 Element <i>Selects whether the definite time Overfluxing element stage 2 is enabled</i>	Disabled, Enabled	Disabled	
Gn 24DT-2 Setting <i>Pickup level</i>	0.1,0.11...2.00	1.15 x	
Gn 24DT-2 Hysteresis <i>Sets the pickup to dropoff thresholds e.g. 3% on Overlevel picks up above pickup setting and drops off below 97% of setting, 3% on Underlevel picks up below setting and drops off above 103% of setting</i>	0,0.1...80 %	0.1 %	
Gn 24DT-2 Delay <i>Pickup delay</i>	0.1,0.2...864000 s	6 s	
Gn 24IT Char <i>Selects whether the inverse time Overfluxing element is enabled</i>	Disabled, Enabled	Disabled	
Gn 24IT Reset <i>Selects between an INSTantaneous reset characteristic or a definite time reset</i>	INST, 1,2, ...1000 s	INST	

Description	Range	Default	Setting
Gn 24IT X0 Pickup Setting <i>Initial user defined pickup level</i>	1.00,1.01...2.00	1.10 x	
Gn 24IT Y0 Point Setting <i>Initial user defined pickup delay</i>	0.1,0.2...20000 s	20000 s	
Gn 24IT X1 Point Setting <i>Next user defined pickup level</i>	1.00,1.01...2.00	1.14 x	
Gn 24IT Y1 Point Setting <i>Next user defined pickup delay</i>	0.1,0.2...20000 s	1200 s	
Gn 24IT X2 Point Setting <i>Next user defined pickup level</i>	1.00,1.01...2.00	1.16 x	
Gn 24IT Y2 Point Setting <i>Next user defined pickup delay</i>	0.1,0.2...20000 s	540 s	
Gn 24IT X3 Point Setting <i>Next user defined pickup level</i>	1.00,1.01...2.00	1.21 x	
Gn 24IT Y3 Point Setting <i>Next user defined pickup delay</i>	0.1,0.2...20000 s	240 s	
Gn 24IT X4 Point Setting <i>Next user defined pickup level</i>	1.00,1.01...2.00	1.24 x	
Gn 24IT Y4 Point Setting <i>Next user defined pickup delay</i>	0.1,0.2...20000 s	120 s	
Gn 24IT X5 Point Setting <i>Next user defined pickup level</i>	1.00,1.01...2.00	1.28 x	
Gn 24IT Y5 Point Setting <i>Next user defined pickup delay</i>	0.1,0.2...20000 s	60 s	
Gn 24IT X6 Point Setting <i>Next user defined pickup level</i>	1.00,1.01...2.00	1.40 x	
Gn 24IT Y6 Point Setting <i>Next user defined pickup delay</i>	0.1,0.2...20000 s	20 s	

## 2.11 Thermal Menu

Description	Range	Default	Setting
Gn 49 Winding Group Select <i>Selects which winding the thermal element is applied</i>	W1, W2, W3 <sup>1</sup>	W1	
Gn 49 Thermal Overload <i>Selects whether the thermal overload protection element is enabled</i>	Disabled, Enabled	Disabled	
Gn 49 Overload Setting <i>Pickup level</i>	0.1,0.2...10 xIn	3 xIn	
Gn 49 Time Constant <i>Thermal time constant</i>	1.0,1.5...1000 min	10 min	
Gn 49 Capacity Alarm <i>Selects whether thermal capacity alarm enabled</i>	Disabled, 50,51...100 %	Disabled	
49 Reset Therm State <i>Control that allows thermal state to be manually reset</i>	NO, YES	NO	

1) 3W Only

## 2.12 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	
Aux I/P 4 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	
Aux I/P 5 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	
Aux I/P 6 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	
Aux I/P 7 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	
Aux I/P 8 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	
Aux I/P 9 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	
Aux I/P 10 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	

Description	Range	Default	Setting
Aux I/P 11 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	
Aux I/P 12 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	
Aux I/P 13 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	
Aux I/P 14 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	
Aux I/P 15 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	
Aux I/P 16 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	
Aux I/P 17 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	
Aux I/P 18 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	
Aux I/P 19 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	
Aux I/P 20 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	
Aux I/P 21 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	
Aux I/P 22 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	
Aux I/P 23 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	
Aux I/P 24 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	
Aux I/P 25 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	
Aux I/P 26 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	
Aux I/P 27 Pickup Delay <sup>1</sup>	0.000,0.005...864000 s	0 s	
Inhibit W1 51 <i>Selects which inputs inhibit the W1 51 element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit W1 50 <i>Selects which inputs inhibit the W1 50 element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit W1 51N <i>Selects which inputs inhibit the W1 51N element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit W1 50N <i>Selects which inputs inhibit the W1 50N element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit W1 51G-1 <sup>3</sup> <i>Selects which inputs inhibit the W1 51G-1 element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit W1 51G-2 <sup>3</sup> <i>Selects which inputs inhibit the W1 51G-2 element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit W2 51 <i>Selects which inputs inhibit the W2 51 element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit W2 50 <i>Selects which inputs inhibit the W2 50 element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit W2 51N <i>Selects which inputs inhibit the W2 51N element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit W2 50N <i>Selects which inputs inhibit the W2 50N element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit W2 51G-1 <sup>3</sup> <i>Selects which inputs inhibit the W2 51G-1 element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit W2 51G-2 <sup>3</sup> <i>Selects which inputs inhibit the W2 51G-2 element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit W3 51 <sup>3</sup> <i>Selects which inputs inhibit the W3 51 element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit W3 50 <sup>3</sup> <i>Selects which inputs inhibit the W3 50 element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit W3 51N <sup>3</sup> <i>Selects which inputs inhibit the W3 51N element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit W3 50N <sup>3</sup> <i>Selects which inputs inhibit the W3 50N element</i>	NONE, 1...27 <sup>2</sup>	NONE	

<b>Description</b>	<b>Range</b>	<b>Default</b>	<b>Setting</b>
<i>element</i>			
Inhibit 51G-1 <sup>4</sup> <i>Selects which inputs inhibit the 51G-1 element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit 51G-2 <sup>4</sup> <i>Selects which inputs inhibit the 51G-2 element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit 49 <i>Selects which inputs inhibit the 49 thermal element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Reset 49 <i>Selects which inputs resets the 49 thermal model element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit 27/59-1 <i>Selects which inputs inhibit the 27/59-1 element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit 27/59-2 <i>Selects which inputs inhibit the 27/59-1 element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit 27/59-3 <i>Selects which inputs inhibit the 27/59-1 element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit 27/59-4 <i>Selects which inputs inhibit the 27/59-1 element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit 81-1 <i>Selects which inputs inhibit the 81-1 element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit 81-2 <i>Selects which inputs inhibit the 81-2 element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit 81-3 <i>Selects which inputs inhibit the 81-3 element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit 81-4 <i>Selects which inputs inhibit the 81-4 element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit 24DT-1 <i>Selects which inputs inhibit the 24DT-1 element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit 24DT-2 <i>Selects which inputs inhibit the 24DT-2 element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inhibit 24IT <i>Selects which inputs inhibit the 24IT element</i>	NONE, 1...27 <sup>2</sup>	NONE	
Trip Circuit Fail <i>Selects which inputs are monitoring trip circuits, inputs should normally also be selected as Inverted Inputs (see below)</i>	NONE, 1...27 <sup>2</sup>	NONE	
Trigger Storage <i>Selects which inputs can trigger a waveform record</i>	NONE, 1...27 <sup>2</sup>	NONE	
Clock Sync. <i>Selects which input is used to synchronise the real time clock</i>	NONE, 1...27 <sup>2</sup>	NONE	
Inverted Inputs <i>Selects which inputs pickup when voltage is removed, often used when monitoring trip circuits.</i>	NONE, 1...27 <sup>2</sup>	NONE	

1) Only when fitted.

2) 27 status inputs represents maximum configuration.

3) 3W Only

4) 2W Only.



## 2.13 Reylogic Control Menu

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

## 2.14 Reylogic Element Menu

Description	Range	Default	Setting
Trip Cct Fail Pickup Delay <i>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.</i>	0,1...60000 ms	400 ms	

## 2.15 Output Relay Menu

Description	Range	Default	Setting
87 <i>Biased Differential operated</i>	NONE, 1...29 <sup>1</sup>	4,5	
87 HS <i>Differential Highset operated</i>	NONE, 1...29 <sup>1</sup>	4,5	
W1 51 <i>Winding 1 IDMTL Overcurrent operated</i>	NONE, 1...29 <sup>1</sup>	4,5	
W1 50 <i>Winding 1 DTL Overcurrent operated</i>	NONE, 1...29 <sup>1</sup>	4,5	
W1 51N <i>Winding 1 IDMTL derived Earth Fault operated</i>	NONE, 1...29 <sup>1</sup>	4,5	
W1 50N <i>Winding 1 DTL derived Earth Fault operated</i>	NONE, 1...29 <sup>1</sup>	4,5	
W1 51G-1 <sup>3</sup> <i>Winding 1 IDMTL Standby Earth Fault operated</i>	NONE, 1...29 <sup>1</sup>	4,5	
W1 51G-2 <sup>3</sup> <i>Winding 1 IDMTL Standby Earth Fault operated</i>	NONE, 1...29 <sup>1</sup>	4,5	
W2 51 <i>Winding 2 IDMTL Overcurrent operated</i>	NONE, 1...29 <sup>1</sup>	4,5	
W2 50 <i>Winding 2 DTL Overcurrent operated</i>	NONE, 1...29 <sup>1</sup>	4,5	
W2 51N <i>Winding 2 IDMTL derived Earth Fault operated</i>	NONE, 1...29 <sup>1</sup>	4,5	
W2 50N <i>Winding 2 DTL derived Earth Fault operated</i>	NONE, 1...29 <sup>1</sup>	4,5	
W2 51G-1 <sup>3</sup> <i>Winding 2 IDMTL Standby Earth Fault operated</i>	NONE, 1...29 <sup>1</sup>	4,5	
W2 51G-2 <sup>3</sup> <i>Winding 2 IDMTL Standby Earth Fault operated</i>	NONE, 1...29 <sup>1</sup>	4,5	
W3 51 <sup>3</sup> <i>Winding 3 IDMTL Overcurrent operated</i>	NONE, 1...29 <sup>1</sup>	4,5	
W3 50 <sup>3</sup> <i>Winding 3 DTL Overcurrent operated</i>	NONE, 1...29 <sup>1</sup>	4,5	
W3 51N <sup>3</sup> <i>Winding 3 IDMTL derived Earth Fault operated</i>	NONE, 1...29 <sup>1</sup>	4,5	
W3 50N <sup>3</sup> <i>Winding 3 DTL derived Earth Fault</i>	NONE, 1...29 <sup>1</sup>	4,5	

Description	Range	Default	Setting
<i>operated</i>			
51G-1 <sup>4</sup> <i>IDMTL Standby Earth Fault Stage 1 operated</i>	NONE, 1...29 <sup>1</sup>	4,5	
51G-2 <sup>4</sup> <i>IDMTL Standby Earth Fault Stage 2 operated</i>	NONE, 1...29 <sup>1</sup>	4,5	
49 Alarm <i>Thermal capacity alarm operated</i>	NONE, 1...29 <sup>1</sup>	NONE	
49 Trip <i>Thermal capacity trip operated</i>	NONE, 1...29 <sup>1</sup>	NONE	
27/59-1 <i>Under/Overtension stage 1 operated</i>	NONE, 1...29 <sup>1</sup>	NONE	
27/59-2 <i>Under/Overtension stage 2 operated</i>	NONE, 1...29 <sup>1</sup>	NONE	
27/59-3 <i>Under/Overtension stage 3 operated</i>	NONE, 1...29 <sup>1</sup>	NONE	
27/59-4 <i>Under/Overtension stage 4 operated</i>	NONE, 1...29 <sup>1</sup>	NONE	
81-1 <i>Under/Over frequency stage 1 operated</i>	NONE, 1...29 <sup>1</sup>	NONE	
81-2 <i>Under/Over frequency stage 2 operated</i>	NONE, 1...29 <sup>1</sup>	NONE	
81-3 <i>Under/Over frequency stage 3 operated</i>	NONE, 1...29 <sup>1</sup>	NONE	
81-4 <i>Under/Over frequency stage 4 operated</i>	NONE, 1...29 <sup>1</sup>	NONE	
24DT-1 <i>DTL Overfluxing element stage 1 operated</i>	NONE, 1...29 <sup>1</sup>	NONE	
24DT-2 <i>DTL Overfluxing element stage 2 operated</i>	NONE, 1...29 <sup>1</sup>	NONE	
24IT <i>Inverse Time Overfluxing element operated</i>	NONE, 1...29 <sup>1</sup>	NONE	
Phase A <i>A phase A element operated</i>	NONE, 1...29 <sup>1</sup>	NONE	
Phase B <i>A phase B element operated</i>	NONE, 1...29 <sup>1</sup>	NONE	
Phase C <i>A phase C element operated</i>	NONE, 1...29 <sup>1</sup>	NONE	
General Starter <i>A starter element is picked up</i>	NONE, 1...29 <sup>1</sup>	NONE	
General Trip <i>An element has operated. Useful when testing individual functions!</i>	NONE, 1...29 <sup>1</sup>	NONE	
Trip Circuit Fail <i>A trip circuit has failed, look at status input Leds to find out which one</i>	NONE, 1...29 <sup>1</sup>	NONE	
New Data Stored <i>The waveform recorder has stored new information Note: this is a pulsed output</i>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 1 Operated <i>DC Status 1 has operated</i>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 2 Operated	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 3 Operated	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 4 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 5 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 6 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 7 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 8 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 9 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 10 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	NONE	

Description	Range	Default	Setting
Aux I/P 11 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 12 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 13 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 14 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 15 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 16 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 17 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 18 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 19 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 20 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 21 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 22 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 23 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 24 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 25 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 26 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	NONE	
Aux I/P 27 Operated <sup>2</sup>	NONE, 1...29 <sup>1</sup>	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 <sup>1</sup>	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 <sup>1</sup>	1	

1) 29 output relays represents maximum configuration.

2) Only when fitted.

3) 3W Only

4) 2W Only.

## 2.16 LED Menu

Description	Range	Default	Setting
87 <i>Biased Differential operated</i>	NONE, 1...32	18	
87 HS <i>Differential Highset operated</i>	NONE, 1...32	18	
W1 51 <i>Winding 1 IDMTL Overcurrent operated</i>	NONE, 1...32	5,19	
W1 50 <i>Winding 1 DTL Overcurrent operated</i>	NONE, 1...32	5,19	
W1 51N <i>Winding 1 IDMTL derived Earth Fault operated</i>	NONE, 1...32	5,17	
W1 50N <i>Winding 1 DTL derived Earth Fault operated</i>	NONE, 1...32	5,17	
W1 51G-1 <sup>2</sup> <i>Winding 1 IDMTL Standby Earth Fault operated</i>	NONE, 1...32	5,17	
W1 51G-2 <sup>2</sup> <i>Winding 1 IDMTL Standby Earth Fault operated</i>	NONE, 1...32	5,17	
W2 51 <i>Winding 2 IDMTL Overcurrent operated</i>	NONE, 1...32	6,19	
W2 50 <i>Winding 2 DTL Overcurrent operated</i>	NONE, 1...32	6,19	

<b>Description</b>	<b>Range</b>	<b>Default</b>	<b>Setting</b>
W2 51N <i>Winding 2 IDMTL derived Earth Fault operated</i>	NONE, 1...32	6,17	
W2 50N <i>Winding 2 DTL derived Earth Fault operated</i>	NONE, 1...32	6,17	
W2 51G-1 <sup>2</sup> <i>Winding 2 IDMTL Standby Earth Fault operated</i>	NONE, 1...32	5,17	
W2 51G-2 <sup>2</sup> <i>Winding 2 IDMTL Standby Earth Fault operated</i>	NONE, 1...32	5,17	
W3 51 <sup>2</sup> <i>Winding 2 IDMTL Overcurrent operated</i>	NONE, 1...32	7,19	
W3 50 <sup>2</sup> <i>Winding 2 DTL Overcurrent operated</i>	NONE, 1...32	7,19	
W3 51N <sup>2</sup> <i>Winding 2 IDMTL derived Earth Fault operated</i>	NONE, 1...32	7,17	
W3 50N <sup>2</sup> <i>Winding 2 DTL derived Earth Fault operated</i>	NONE, 1...32	7,17	
51G-1 <sup>3</sup> <i>IDMTL Standby Earth Fault Stage 1 operated</i>	NONE, 1...32	17	
51G-2 <sup>3</sup> <i>IDMTL Standby Earth Fault Stage 2 operated</i>	NONE, 1...32	17	
49 Alarm <i>Thermal capacity alarm operated</i>	NONE, 1...32	20	
49 Trip <i>Thermal capacity trip operated</i>	NONE, 1...32	20	
27/59-1 <i>Under/Overtension stage 1 operated</i>	NONE, 1...32	21	
27/59-2 <i>Under/Overtension stage 2 operated</i>	NONE, 1...32	21	
27/59-3 <i>Under/Overtension stage 3 operated</i>	NONE, 1...32	21	
27/59-4 <i>Under/Overtension stage 4 operated</i>	NONE, 1...32	21	
81-1 <i>Under/Over frequency stage 1 operated</i>	NONE, 1...32	22	
81-2 <i>Under/Over frequency stage 2 operated</i>	NONE, 1...32	22	
81-3 <i>Under/Over frequency stage 3 operated</i>	NONE, 1...32	22	
81-4 <i>Under/Over frequency stage 4 operated</i>	NONE, 1...32	22	
24DT-1 <i>DTL Overfluxing element stage 1 operated</i>	NONE, 1...32	23	
24DT-2 <i>DTL Overfluxing element stage 2 operated</i>	NONE, 1...32	23	
24IT <i>Inverse Time Overfluxing element operated</i>	NONE, 1...32	23	
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	NONE, 1...32	1	

Description	Range	Default	Setting
<i>A starter element is picked up. Useful when testing individual functions!</i>			
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	24	
New Data Stored <i>The waveform recorder has stored new information</i>	NONE, 1...32	NONE	
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 <sup>1</sup>	NONE, 1...32	12	
Aux I/P 5 Operated <sup>1</sup>	NONE, 1...32	13	
Aux I/P 6 Operated <sup>1</sup>	NONE, 1...32	14	
Aux I/P 7 Operated <sup>1</sup>	NONE, 1...32	15	
Aux I/P 8 Operated <sup>1</sup>	NONE, 1...32	16	
Aux I/P 9 Operated <sup>1</sup>	NONE, 1...32	25	
Aux I/P 10 Operated <sup>1</sup>	NONE, 1...32	26	
Aux I/P 11 Operated <sup>1</sup>	NONE, 1...32	27	
Aux I/P 12 Operated <sup>1</sup>	NONE, 1...32	NONE	
Aux I/P 13 Operated <sup>1</sup>	NONE, 1...32	NONE	
Aux I/P 14 Operated <sup>1</sup>	NONE, 1...32	NONE	
Aux I/P 15 Operated <sup>1</sup>	NONE, 1...32	NONE	
Aux I/P 16 Operated <sup>1</sup>	NONE, 1...32	NONE	
Aux I/P 17 Operated <sup>1</sup>	NONE, 1...32	NONE	
Aux I/P 18 Operated <sup>1</sup>	NONE, 1...32	NONE	
Aux I/P 19 Operated <sup>1</sup>	NONE, 1...32	NONE	
Aux I/P 20 Operated <sup>1</sup>	NONE, 1...32	NONE	
Aux I/P 21 Operated <sup>1</sup>	NONE, 1...32	NONE	
Aux I/P 22 Operated <sup>1</sup>	NONE, 1...32	NONE	
Aux I/P 23 Operated <sup>1</sup>	NONE, 1...32	NONE	
Aux I/P 24 Operated <sup>1</sup>	NONE, 1...32	NONE	
Aux I/P 25 Operated <sup>1</sup>	NONE, 1...32	NONE	
Aux I/P 26 Operated <sup>1</sup>	NONE, 1...32	NONE	
Aux I/P 27 Operated <sup>1</sup>	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	

1) Only when fitted.

2) 3W Only

3) 2W Only.

## 2.17 Data Storage Menu

Description	Range	Default	Setting
Clear Faults <i>Clears the Fault Records, useful after routine testing.</i>	NO, YES	NO	
Clear Events <i>Clears the Event Records, useful after routine testing.</i>	NO, YES	NO	
Pre-Trigger Storage <i>Specifies the amount of pre fault data for the waveform records.</i>	10...90 %	20 %	
Data Record Duration <sup>1</sup> <i>Specifies the duration of the waveform</i>	5 Recs x 1 Seconds, 2 Recs x 2 Seconds, 1 Recs	5 Recs x 1 Second	

records and the number of records available.	x 5 Seconds		
Trigger Waveform <i>Triggers a waveform record.</i>	NO, YES	NO	
Clear Waveforms <i>Clears the Waveform Records, useful after routine testing.</i>	NO, YES	NO	

1) Number of records and duration available is dependent upon relay model

## 2.18 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 failed and will resume scanning the com ports.</i>	1,2,...60 s	30 s	
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
[ WINDING1 METERS ] --> press down <--	Start of Winding 1 meters
W1 Primary Currents 0.0 0.0 0.0 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 Current 0.00 xIn	Winding 1 residual nominal 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 <sup>3</sup> 0.0 kA	Winding 1 Standby E/F primary current
W1 Secondary E/F <sup>3</sup> 0.00 A	Winding 1 Standby E/F secondary current
W1 Nominal E/F <sup>3</sup> 0.00 xIn	Winding 1 Standby E/F nominal current
W1 51G Status <sup>3</sup> 0 0 %	Operation progress meters for winding 1 standby E/F (W1 51G-1/W1 51G-2) IDMTL elements
[ 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 Current 0.00 xIn	Winding 2 residual nominal 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 <sup>3</sup> 0.0 kA	Winding 2 Standby E/F primary current
W2 Secondary E/F <sup>3</sup> 0.00 A	Winding 2 Standby E/F secondary current
W2 Nominal E/F <sup>3</sup> 0.00 xIn	Winding 2 Standby E/F nominal current
W2 51G Status <sup>3</sup> 0 0 %	Operation progress meters for winding 2 standby E/F (W1 51G-1/W1 51G-2) IDMTL elements
[ WINDING 3 METERS ] <sup>3</sup> --> press down <--	Start of Winding 3 meters
W3 Primary Currents <sup>3</sup> 0.00 0.00 0.00 kA	Winding 3 primary currents
W3 Sec'y Currents <sup>3</sup> 0.00 0.00 0.00 A	Winding 3 secondary currents
W3 Nom Currents <sup>3</sup> 0.00 0.00 0.00 xIn	Winding 3 nominal currents
W3 Residual Current <sup>3</sup> 0.00 xIn	Winding 3 residual nominal current
W3 51 Status <sup>3</sup> 0 0 0 0 %	Operation progress meters for Winding 3 (51/51N) IDMTL elements, phases A, B, C and E/F
[STANDBY E/F METERS] <sup>4</sup> --> press down <--	Start of Standby E/F meters
E/F Primary Current <sup>4</sup> 0.0 kA	Standby E/F primary current
E/F Sec'y Current <sup>4</sup> 0.00 A	Standby E/F secondary current
E/F Nom Current <sup>4</sup> 0.00 xIn	Standby E/F nominal current
51G Status <sup>4</sup> 0 0 %	Operation progress meters for standby E/F (51G-1/51G-2) IDMTL elements

INSTRUMENT	DESCRIPTION
[ VOLTAGE METERS ] --> press down <--	Start of Voltage meters
Primary Voltage 0.0 kV	Primary voltage
Secondary Voltage 0.00 kV	Secondary voltage
Nominal Voltage 0.00 xVn	Nominal voltage
Frequency 0.000 Hz	Voltage frequency
Nominal Frequency 0.000 xfn	Nominal Voltage frequency
[OVERFLUXING METERS] --> press down <--	Start of V/f meters
V/f Voltage 0.000 xVn	Nominal V/f voltage after multiplier correction
V/f Value 0.000 xVn/fn	Nominal V/f value
V/f IDMTL Status 0.0 %	Operation progress meter for V/f (24IT) IDMTL element
[ THERMAL METERS ] --> press down <--	Start of thermal meters
Thermal Nom Current 0.00 xIn	Thermal Nominal Current
Thermal Status 0.0 %	Thermal Status
[ BIAS DIFF METERS ] --> press down <--	Start of (87) Biased Differential meters
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 <sup>3</sup> 0.00 0.00 0.00 xIn	Winding 3 measured currents
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 <sup>3</sup> 0.00 0.00 0.00 xIn	Winding 3 currents after Interposing CT correction factors applied
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 <sup>nd</sup> harmonic content)
[ MISC METERS ] --> press down <--	Start of miscellaneous meters
Status Inputs 1-16 -----	Displays the state of DC status inputs 1 to 16 <sup>1</sup>
Status Inputs 17-27 -----	Displays the state of DC status inputs 17 to 27 <sup>1</sup>
Output Relays 1-16 -----	Displays the state of output relays 1 to 16 <sup>2</sup>
Output Relays 17-29 -----	Displays the state of output relays 17 to 29 <sup>2</sup>
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) Display is different when fewer status inputs are fitted



- 2) Display is different when fewer output relays are fitted
- 3) 3 Winding only
- 4) 2 Winding only

## 4 IEC 60870-5-103 Communications Information

### 4.1 IEC 60870-5-103 Semantics in monitor direction

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	34	W1 Phase Fault	-	2	1
178	35	W1 Residual Earth Fault	-	2	1
178	48	W2 Residual Earth Fault	-	2	1
178	70	Voltage Stage 1	-	2	1
178	71	Voltage Stage 2	-	2	1
178	72	Voltage Stage 3	-	2	1
178	73	Voltage Stage 4	-	2	1
178	74	Overfluxing Dtl Stage 1	-	2	1
178	75	Overfluxing Dtl Stage 2	-	2	1
178	76	Overfluxing Idmtl	-	2	1
178	80	Thermal Alarm	-	2	1
178	81	Thermal Trip	-	2	1
178	85	Standby E/F Stage 1	-	2	1
178	86	Standby E/F Stage 2	-	2	1
178	90	Frequency Stage 1	-	2	1
178	91	Frequency Stage 2	-	2	1
178	92	Frequency Stage 3	-	2	1

FUN	INF	Description	GI	TYP	COT
178	93	Frequency Stage 4	-	2	1
178	94	W1 Standby E/F Stage 1	-	2	1
178	95	W1 Standby E/F Stage 2	-	2	1
178	96	W2 Standby E/F Stage 1	-	2	1
178	97	W2 Standby E/F Stage 2	-	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
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

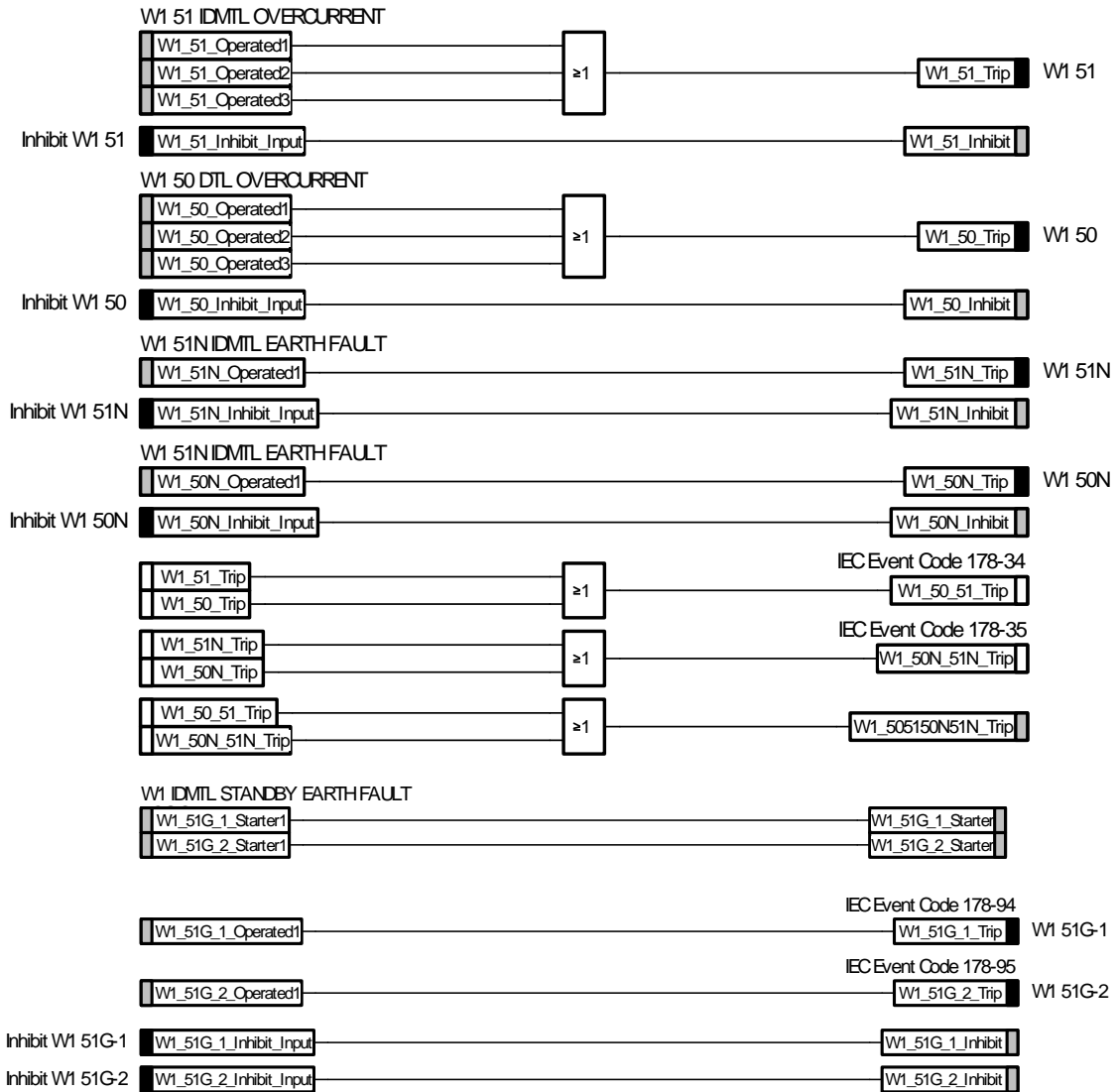
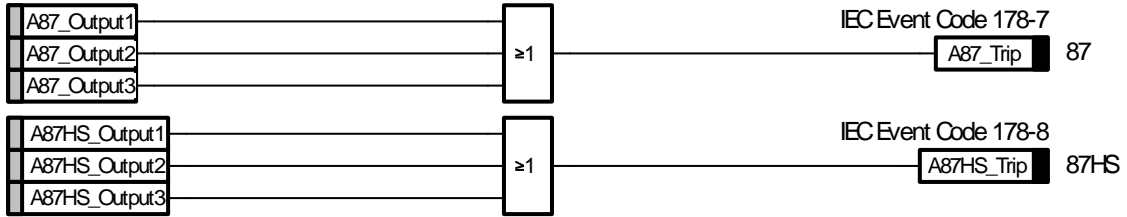
FUN	INF	Description	GI	TYP	COT
178	197	Plant Control Relay 17	x	1	1,9
178	198	Plant Control Relay 18	x	1	1,9
178	199	Plant Control Relay 19	x	1	1,9
178	200	Plant Control Relay 20	x	1	1,9
178	201	Plant Control Relay 21	x	1	1,9
178	202	Plant Control Relay 22	x	1	1,9
178	203	Plant Control Relay 23	x	1	1,9
178	204	Plant Control Relay 24	x	1	1,9
178	205	Plant Control Relay 25	x	1	1,9
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

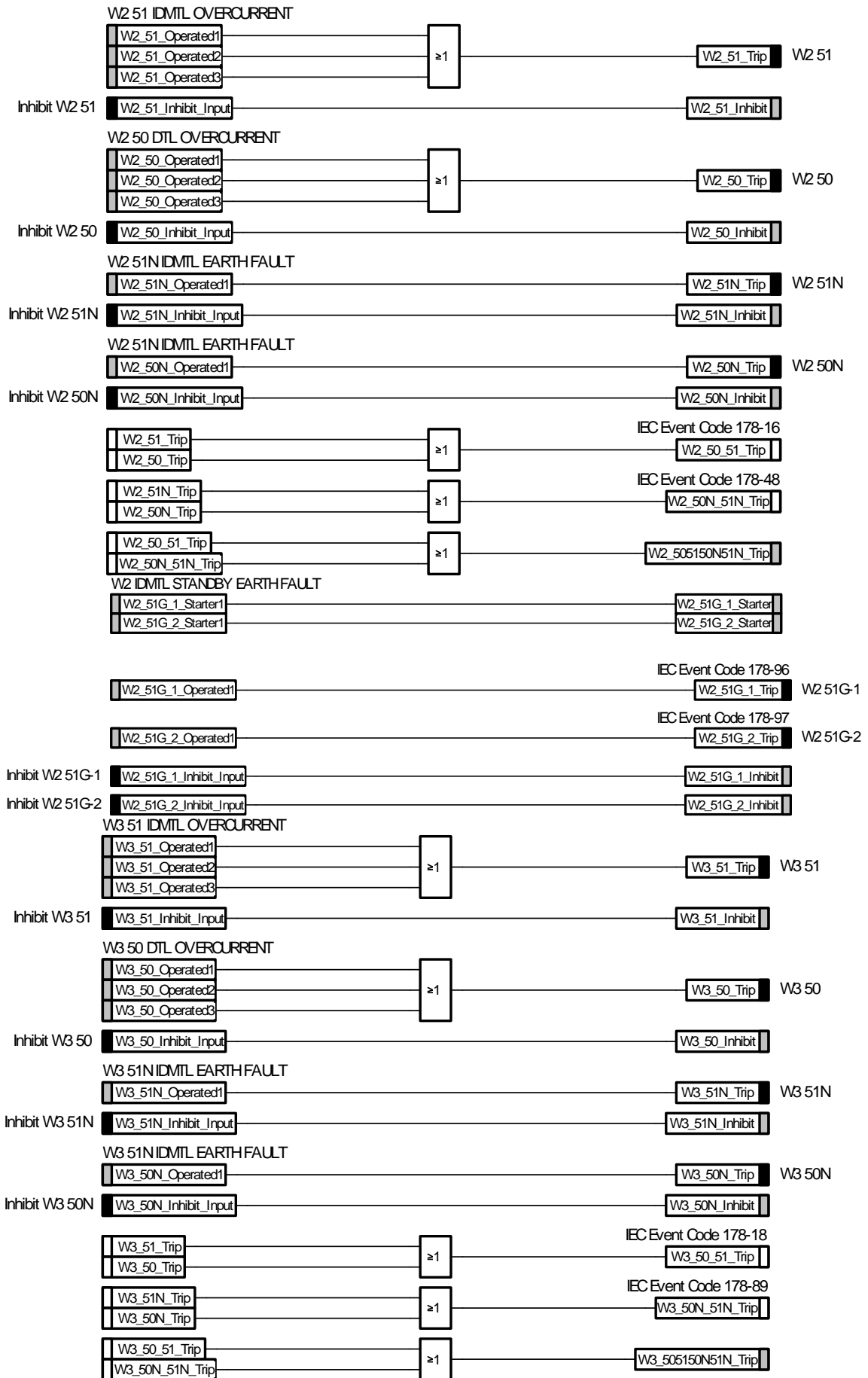
## 4.2 IEC 60870-5-103 Semantics in control direction

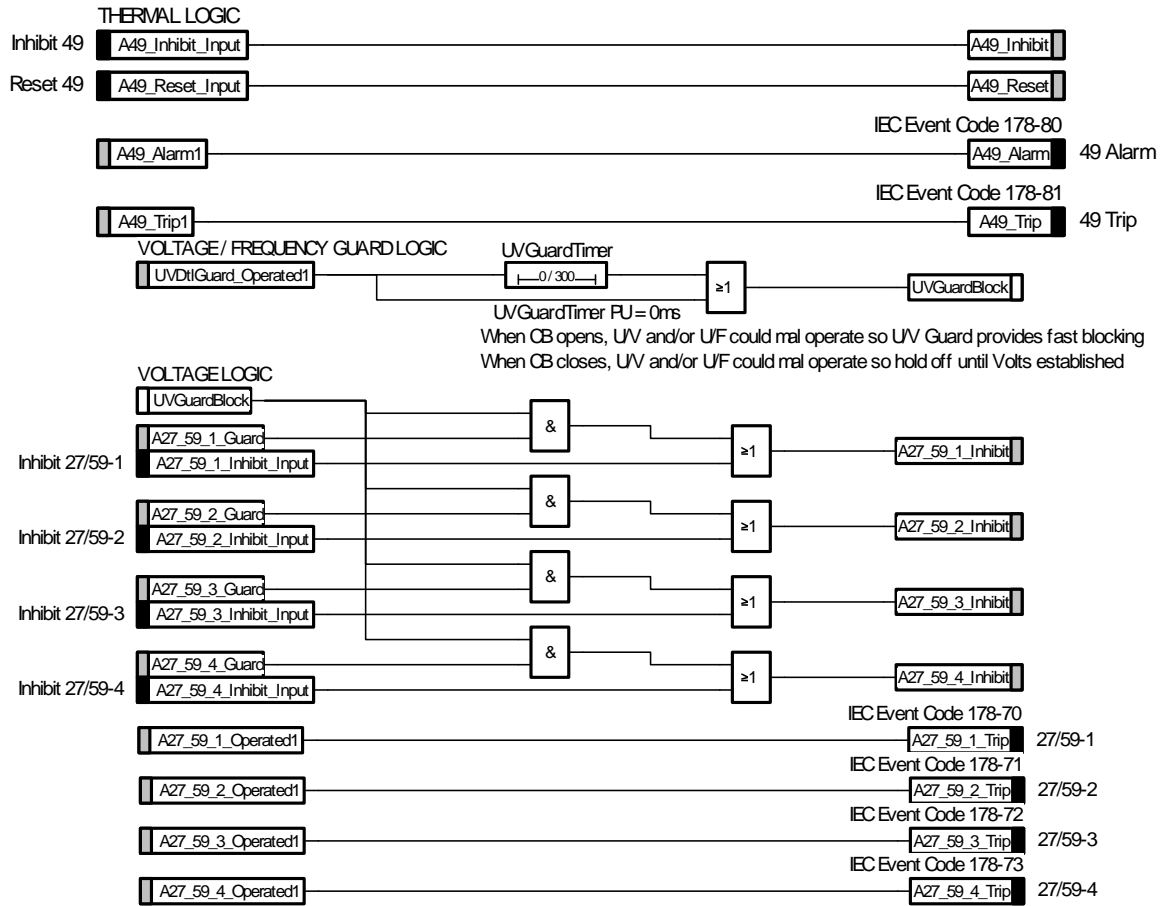
FUN	INF	Description	COM	TYP	COT
176	0	GI Initiation		7	9
176	0	Time Synchronisation		6	8
176	19	LED reset	ON	20	20
176	23	Settings Group 1 Select	ON	20	20
176	24	Settings Group 2 Select	ON	20	20
176	25	Settings Group 3 Select	ON	20	20
176	26	Settings Group 4 Select	ON	20	20
178	110	Settings Group 5 Select	ON	20	20
178	111	Settings Group 6 Select	ON	20	20
178	112	Settings Group 7 Select	ON	20	20
178	113	Settings Group 8 Select	ON	20	20

## 5 Reylogic Diagrams

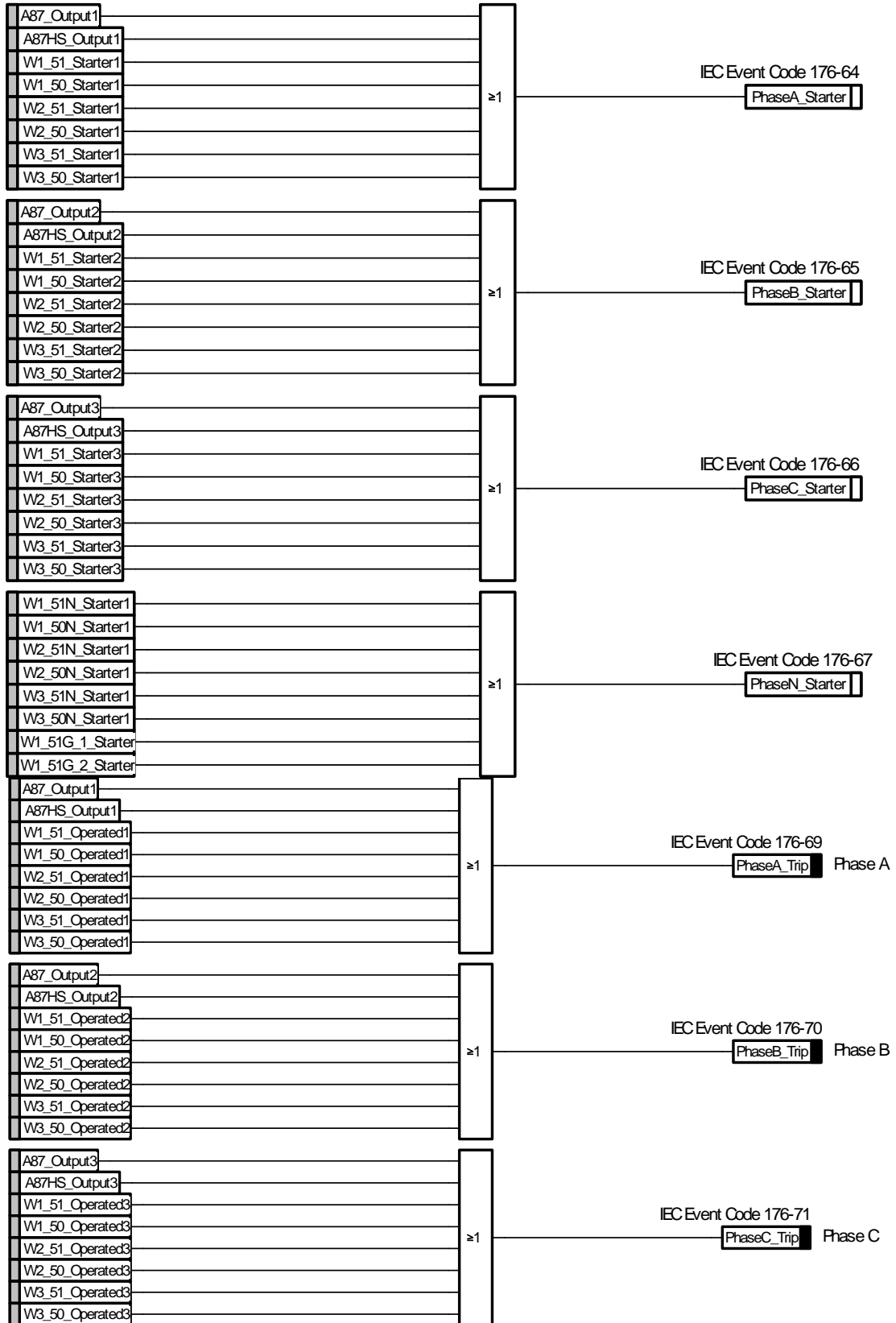
### 87/87HS BIASED DIFFERENTIAL LOGIC



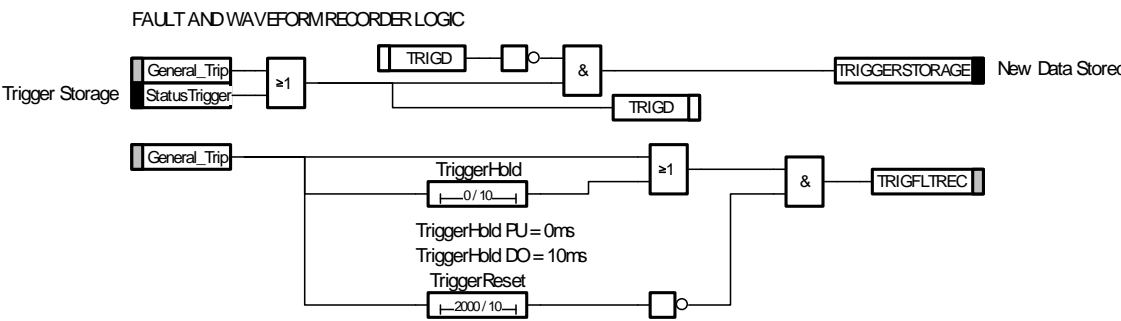
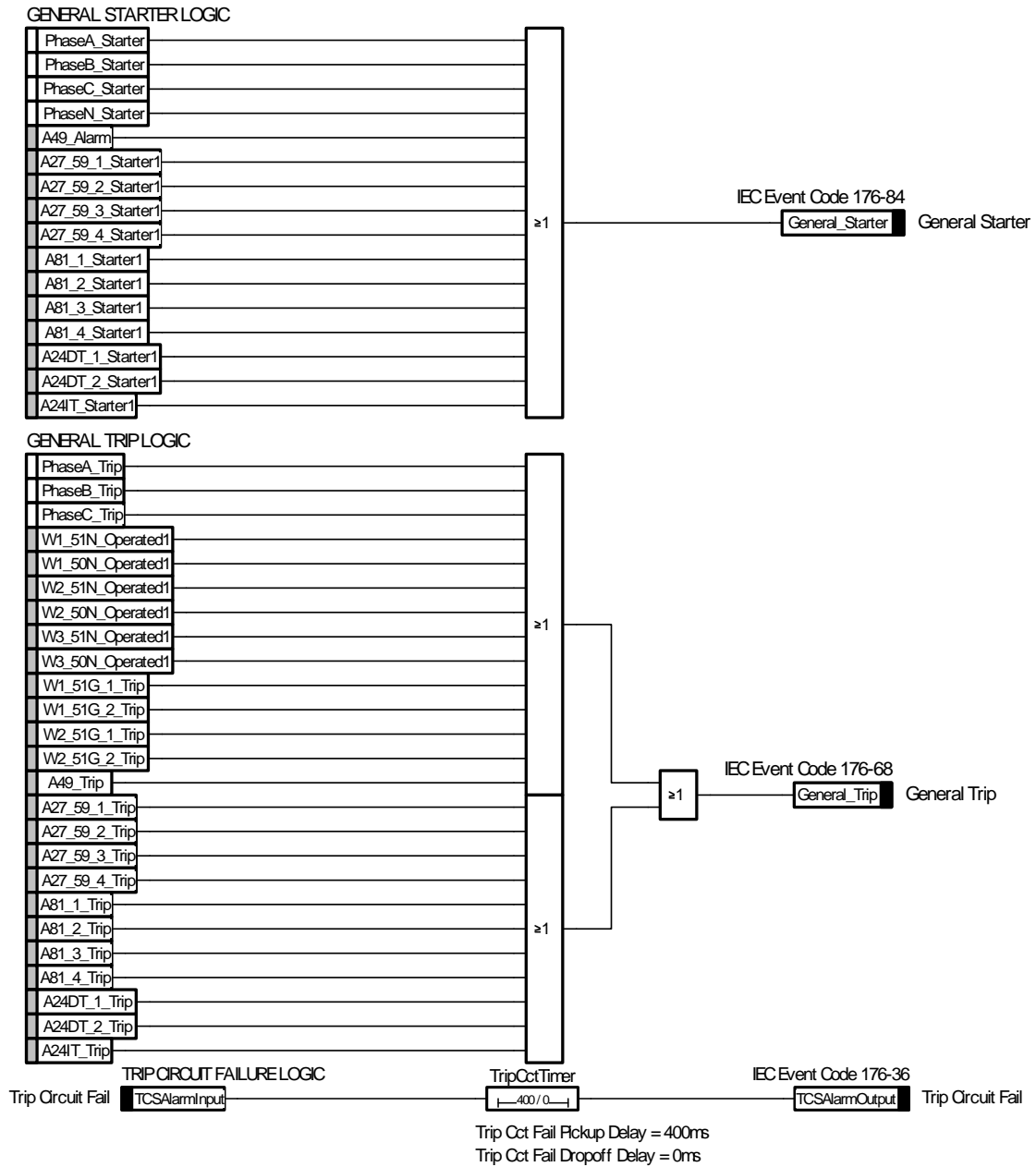




OVERALL PHASE SELECTION LOGIC







## 6 Label Inserts

	DUOBIAS-M-210-2W-R12
	3i5o in E8 Case
	DU3-220-*A
	09/02/2010 09:20:00
1	PHASE A
2	PHASE B
3	PHASE C
4	(50/50N/51G) E/F
5	WDG1
6	WDG2
7	(87/87HS) BIAS. DIFF.
8	(50/51) O/C
9	(49) THERMAL O/L
10	(27/59) VOLTAGE
11	(81) FREQUENCY
12	(24) OVERFLUXING
13	(74TC) TRIP CIRCUIT FAIL
14	<i>AUX 6 I/P OPERATED</i>
15	<i>AUX 7 I/P OPERATED</i>
16	<i>AUX 8 I/P OPERATED</i>

	DUOBIAS-M-210-2W-R12	DUOBIAS-M-210-2W-R12	
	DU3-220-**	DU3-220-**	
	Left	Right	
	09/02/2010 09:20:00	09/02/2010 09:20:00	
1	GENERAL STARTER	(50N/51N/51G) E/F	17
2	PHASE A	(87/87HS) BIAS. DIFF.	18
3	PHASE B	(50/51) O/C	19
4	PHASE C	(49) THERMAL O/L	20
5	WDG1	(27/59) VOLTAGE	21
6	WDG2	(81) FREQUENCY	22
7		(24) OVERFLUXING	23
8		TRIP CIRCUIT FAIL	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-210-3W-R12	DUOBIAS-M-210-3W-R12	
	DU3-320-**	DU3-320-**	
	Left	Right	
	09/02/2010 09:20:00	09/02/2010 09:20:00	
1	GENERAL STARTER	(50N/51N/51G) E/F	17
2	PHASE A	(87/87HS) BIAS. DIFF.	18
3	PHASE B	(50/51) O/C	19
4	PHASE C	(49) THERMAL O/L	20
5	WDG1	(27/59) VOLTAGE	21
6	WDG2	(81) FREQUENCY	22
7	WDG3	(24) OVERFLUXING	23
8		TRIP CIRCUIT FAIL	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