7SG1635 Ohmega 315

Protection Relays

Document Release History

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Pre release

2010/02	Document reformat due to rebrand

Software Revision History

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Contents

1 Menu Settings 3
2 Settings Walkthrough 13
2.1 System Config Menu 13
2.2 Distance Protection Menu 14
2.3 Aux Protection Menu 18
2.4 Auto Reclose Menu 21
2.5 Sync Menu 23
2.6 Reylogic Config Menu 24
2.7 Status Config Menu 25
2.8 Output Config Menu 27
2.9 Output Operate Time Menu 31
2.10 LED Configuration Menu 31
2.11 Communications Menu 31
2.12 CB Maintenance Menu 32
2.13 Data Storage Menu 32
2.14 Fault Locator Menu 33

1 Menu Settings

Software Version 2615H80034R5

SYSTEM CONFIG MENU

Setting	Range	Default	
Alternate Setting Group	1 – 8	1	
CT Ratio	0:1..5000:5	2000¦1	
VT Ratio	1000:90..600000:130	132000¦110	
CVT in use	NO, YES	NO	
Clock Sync. From Status	Disabled, Seconds, Minutes	Minutes	
Default Screens Timer	Off, 1, 2, 5, 10, 15, 30, 60 mins	60 min	
Backlight timer	Off, 1, 2, 5, 10, 15, 30, 60 mins	5 min	
Change Password	4-Digit Password	NONE	
Relay Identifier	16 Character String	OHMEGA-315-50	

DISTANCE PROTECTION MENU

Setting	Range	Default	
Active Scheme	*Time stepped*, PUR, POR1, POR2, Reach Extension, Loss Of Load, Acceleration, BOR	PUR	
Carrier Guard	Disabled, Enabled	Enabled	
CT Secondary	1A, 2A, 5A	1A	
Line Angle	0 – 90˚ in steps of 5˚	75 deg	
EF Comp Z0/Z1 ratio	0 – 10	2.5	
EF Comp Z0 angle	0-355˚ in steps of 5˚	75 deg	
Reactive Drop Angle	-20˚ .. 20˚ in steps of 1˚	-3 deg	
Z1 Extension	Disabled, Enabled	Enabled	
Z1 Phase Fault	Disabled, Enabled	Enabled	
Z1 PF Impedance	0.1 – 250 Ω	8 Ω	
Z1X PF Impedance	0.1 – 250 Ω	12 Ω	
Z1 PF Time Delay	0 – 10000 ms	0ms	
Z1 Earth Fault	Disabled, Enabled	Enabled	
Z1 EF Type	Fwd Mho, Fwd Quad	Fwd Mho	
Z1 EF Impedance	0.1 – 250 Ω	8 Ω	
Z1 EF Resistance	0.1 – 250 Ω	4 Ω	
Z1 EF Reactance	0.1 – 250 Ω	8 Ω	
Z1X EF Impedance	0.1 – 250 Ω	12 Ω	
Z1X EF Resistance	0.1 – 250 Ω	6 Ω	
Z1X EF Reactance	0.1 – 250 Ω	12 Ω	
Z1 EF Time Delay	0 –10000 ms	0ms	
Z2 Phase Fault	Disabled, Enabled	Enabled	
Z2 PF Impedance	0.1 – 250 Ω	16 Ω	
Z2 PF Time Delay	0 –10000 ms	1000ms	
Z2 Earth Fault	Disabled, Enabled	Enabled	
Z2 EF Type	Fwd Mho, Fwd Quad	Fwd Mho	
Z2 EF Impedance	0.1 – 250 Ω	16 Ω	
Z2 EF Resistance	0.1 – 250 Ω	8 Ω	
Z2 EF Reactance	0.1 – 250 Ω	16 Ω	
Z2 EF Time Delay	0 – 10000ms	1000ms	
Z3 Phase Fault	Disabled, Enabled	Enabled	
Z3 PF Type	Fwd Mho, Rev Mho, Offset Mho	Offset Mho	
Z3 PF Impedance (Fwd)	0.1 – 250 Ω	24Ω	

Z3 PF Impedance (Rev)	0.1 – 250 Ω	8Ω	
Z3 PF Time Delay	0 – 10000ms	2000ms	
Z3 Earth Fault	Disabled, Enabled	Enabled	
Z3 EF Type	Fwd Mho, Rev Mho, Offset Mho Fwd Quad, Rev Quad, Offset Quad	Offset Mho	
Z3 EF Impedance (Fwd)	0.1 – 250 Ω	24 Ω	
Z3 EF Resistance (Fwd)	0.1 – 250 Ω	12 Ω	
Z3 EF Reactance (Fwd)	0.1 – 250 Ω	24 Ω	
Z3 EF Impedance (Rev)	0.1 – 250 Ω	8 Ω	
Z3 EF Resistance (Rev)	0.1 – 250 Ω	4 Ω	
Z3 EF Reactance (Rev)	0.1 – 250 Ω	8 Ω	
Z3 EF Time Delay	0 – 10000ms	2000ms	
Z4 Phase Fault	Disabled, Enabled	Enabled	
Z4 PF Impedance	0.1 – 250 Ω	8 Ω	
Z4 PF Time Delay	0 – 10000ms	0ms	
Z4 Earth Fault	Disabled, Enabled	Enabled	
Z4 EF Type	Rev Mho, Rev Quad	Rev Mho	
Z4 EF Impedance	0.1 – 250 Ω	8 Ω	
Z4 EF Resistance	0.1 – 250 Ω	4 Ω	
Z4 EF Reactance	0.1 – 250 Ω	8 Ω	
Z4 EF Time Delay	0 – 10000ms	0ms	
POR Weak Infeed Tripping	Disabled, Enabled	Disabled	
WI Voltage Level	5-85v	54v	
POR Current Rev Reset	0 – 60000 ms	200ms	
POR CB Echo Pulse	0 – 60000 ms	250ms	
LOL Level	0.1 – 0.9	0.5x In	
LOL CB Op Delay	0 – 60000 ms	20ms	
LOL Time Limit	0 – 60000 ms	40ms	
Power Swing Detector	Disabled, Enabled	ENABLE	
PSD Zone blocking	4 Bit Binary	-111	
PSD Shape	Circular, Rectangular	CIRCULAR	
PSD Blinders	Disabled, Enabled	DISABLE	
PSD Inner Fwd Impedance	0.1 – 250 Ω	24 Ω	
PSD Inner Rev Impedance	0.1 – 250 Ω	8 Ω	
PSD Inner Fwd Blinder	0.1 – 250 Ω	16 Ω	
PSD Inner Rev Blinder	0.1 – 250 Ω	16 Ω	
PSD Outer Multiplier	1.05 – 2	1.5 x	
PSD Transit Time	0 – 1000 ms	50ms	

AUX PROTECTION MENU

Setting	**Range**	**Default**	
High Set	Disabled, Enabled	Enabled	
HS Level	0.1 – 35	4x In	
HS Time Delay	0 – 1000	0ms	
SEF Protection	Disabled, Enabled	Enabled	
SEF Current Setting	0.02 – 0.95	0.1x In	
SEF Alarm Delay	0.0 – 60s	1s	
SEF Trip Delay	0.0 – 60s	1s	
Overvoltage Prot.	Disabled, Enabled	Enabled	
OV Alarm Level	1.00 – 1.50xV_N	1.07 x Vn	
OV Alarm Time Delay	0 – 1000 ms	0ms	
OV Trip Level	1.00 – 1.50xV_N	1.15 x Vn	
OV Trip Time Delay	0 – 1000 ms	0ms	
Undervoltage Prot.	Disabled, Enabled	Enabled	

UV Block Level	Disabled, 1 – 60.0 V	3V	
UV1 Level	5.0 – 80.0 V	55V	
UV1 Time Delay	0.00 – 60s	5s	
UV1 Hysteresis	1 – 90 %	2%	
UV1 O/P Phases	(Any 1All)	Any 1	
UV1 Tripping	Disabled, Enabled	Disabled	
UV2 Level	5.0 – 80.0 V	55V	
UV2 Time Delay	0.00 – 60s	10s	
UV2 Hysteresis	1 – 90 %	2%	
UV2 O/P Phases	Any 1, All	Any 1	
UV2 Tripping	Disabled, Enabled	Disabled	
SOTF	Disabled, Enabled	Enabled	
SOTF Mode	AC SOTF, DC SOTF	AC SOTF	
SOTF O/C Operate Level	0.3 – 4 x In	0.3 x In	
AC SOTF Pickup Delay	0 – 60000 ms	10000ms	
Min AUX DC SOTF Dead Time	0 – 60000 ms	10000ms	
VT Supervision	Disabled, Enabled	Enabled	
VTS Latched Operation	Disabled, Enabled	Enabled	
VTS Mode	Alarm Only, Alarm & Inhibit	Alarm & Inhibit	
VTS Phase Fault Inhibit	Disabled, Enabled	Enabled	
VTS Input Source	RES I/V, NPS I/V	RES I/V	
VTS Ires Level	0.05 – 4 x In	0.3x In	
VTS Vop Level	1 – 100V	20V	
VTS Alarm Op. Delay	0 – 60000 ms	100ms	
VTS Latch Op. Delay	0 – 60000 ms	5000ms	
OC Guard	Disabled, Enabled	Enabled	
OC Guard Setting	0.01-25	1.5xIn	
OC Guard Delay	0-864000s	1s	
OC Guard Z1	OCG Z1 Disabled, OCG Z1 Enabled	OCG Z1 Disabled	
OC Guard Z2	OCG Z2 Disabled, OCG Z2 Enabled	OCG Z1 Disabled	
OC Guard Z3	OCG Z3 Disabled, OCG Z3 Enabled	OCG Z1 Disabled	
OC Guard Z4	OCG Z2 Disabled, OCG Z2 Enabled	OCG Z1 Disabled	
Fwd DEF Protection	Disabled, Enabled	Enabled	
DEF Active Scheme	DEF POR, DEF BOR, DEF Direct Trip	DEF POR	
Fwd DEF Char Angle	-95˚ ..95˚	-45deg	
Fwd DEF Setting	0.1 – 2.5	1x In	
Fwd DEF Char	IEC – NI, VI, EI, LTI : ANSI – MI, VI, EI DTL	IEC-NI	
Fwd DEF Time Mult (IEC/ANSI)	0.025 – 1.6	1	
Fwd DEF Delay (DTL)	INST, 0.01 – 20	5s	
Fwd DEF Reset	(ANSI) DECAYING, 1-60	INST	
Rev DEF Protection	Disabled, Enabled	Enabled	
Rev DEF Char Angle	-95˚ ..95˚	-45deg	
Rev DEF Setting	0.1– 2.5	1x In	
Rev DEF Char	IEC – NI, VI, EI, LTI : ANSI – MI, VI, EI DTL	IEC-NI	
Rev DEF Time Mult (IEC/ANSI)	0.025 – 1.6	1	
Rev DEF Delay (DTL)	INST, 0.01 – 20	5s	
Rev DEF Reset	(ANSI) DECAYING, 1-60	INST	
DEF WI Res OV Setting	0 – 20	1V	
DEF Current Rev Reset	0 – 60000	200ms	
CB Echo Pulse Width	0 – 60000	250ms	
Trip Circuit Fail	Disabled, Enabled	Disabled	

AUTORECLOSE MENU

Setting	Range	Default	
A/R In Service	In, Out	Out	
Dead Bar Charge	Disabled, Enabled	Disabled	
Dead Line Charge	Disabled, Enabled	Disabled	
Dead Line & Dead Bar Close	Disabled, Enabled	Disabled	
Check Sync Close	Disabled, Enabled	Enabled	
Unconditional Close	Disabled, Enabled	Disabled	
Manual Close DBC	Disabled, Enabled	Disabled	
Manual Close DLC	Disabled, Enabled	Disabled	
Manual Close DLDB	Disabled, Enabled	Disabled	
Manual Close CS	Disabled, Enabled	Enabled	
Deadtime	0 – 900	5s	
Live Line Check	Disabled, Enabled	Enabled	
Check Sync During Deadtime	Disabled, Enabled	Enabled	
VT Fail Lockout	Disabled, Enabled	Disabled	
CB Close Pulse	0.2 – 20s	2s	
Reclaim Time	OFF, 1 – 600	5s	
Dead Line Charge Delay	0 – 60s	0s	
Dead Bar Charge Delay	0 – 60s	0s	
Reclose Blocked Delay	0 – 600s	60s	
Sync Close Delay	0 – 60s	30s	
Sequence Fail Timer	Off, 1 – 600	Off	
CB Fail To Open Delay	50 – 2000	100ms	
Minimum LO Timer	0 – 60	2s	
Reset LO By Timer	Disabled, Enabled	Disabled	
Z2 AR Start	Disabled, Enabled	Disabled	
Z3 AR Start	Disabled, Enabled	Disabled	
DEF AR Start	Disabled, Enabled	Disabled	
DEF Aided AR Start	Disabled, Enabled	Disabled	
Fault Type AR Start	2P/1P, All	2P/1P	

SYNC MENU

Setting	Range	Default	
Sync Connection	Phase B-Earth, Phase A-Phase B	Phase B-Earth	
Check Sync Vnom	63.5, 110V	63.5V	
Bus : Dead | Live	5-150:10-155	20:90%	
Line: Dead | Live	5-150:10-155	20:90%	
Bus Undervolts	OFF, 5 – 150	90%	
Line Undervolts	OFF, 5 – 150	90%	
Voltage Differential	OFF, 1 – 100	10%	
Split Angle	OFF, 95 – 175	175deg	
MC Split Action	System Sync, Check Sync	System Sync	
ARC Split Action	System Sync, Lockout	Lockout	
Check Sync Angle	5 – 90	20deg	
Check Sync Slip	OFF, 10 – 2000	50mHz	
Check Sync Timer	OFF, 0.1 – 100	OFF	
System Sync Angle	5 – 90	10deg	
Sys Sync Slip Frequency	OFF, 10 – 2000	125mHz	
System Sync Timer	OFF, 0.1 – 100	OFF	

REYLOGIC CONFIG MENU

Setting	Range	Default	
SR Dropoff	0 – 60000ms	1 ms	
SS Dropoff	0 – 60000ms	1 ms	
Permissive Trip Time	0 – 60000ms	20 ms	
SR2 Dropoff	0 – 60000ms	1 ms	
SS2 Dropoff	0 – 60000ms	1 ms	
DEF Perm Trip Time	0 – 60000ms	20 ms	
Timer 1 Pickup Delay	0 – 60000ms	1 ms	
Timer 1 Dropoff Delay	0 – 60000ms	0 ms	
Timer 2 Pickup Delay	0 – 60000ms	1 ms	
Timer 2 Dropoff Delay	0 – 60000ms	0 ms	
Counter 1 Target	0 – 60000	1	
Counter 2 Target	0 – 60000	1	

STATUS CONFIG MENU

Setting	Range	Default	
Signal Receive 1	(39 Character String)	1	
Carrier Guard	(39 Character String)	NONE··	
Unstabilise Relay	(39 Character String)	NONE··	
Block Mode Inhibit	(39 Character String)	NONE··	
Block Reach Ext	(39 Character String)	NONE··	
Signal Receive 2	(39 Character String)	2	
Block DEF	(39 Character String)	16····	
DEF Block Mode Inhib	(39 Character String)	NONE··	
DC SOTF Manual Close	(39 Character String)	8	
Start AUX DC SOTF	(39 Character String)	NONE··	
VT Circuits Isolated	(39 Character String)	NONE··	
Trigger Storage	(39 Character String)	NONE··	
Increment Trip Count	(39 Character String)	NONE··	
Reset Total Trip Cnt	(39 Character String)	NONE··	
Reset Delta Trip Cnt	(39 Character String)	NONE··	
Reset Total CB Close	(39 Character String)	NONE··	
Use Alt Setting Grp	(39 Character String)	NONE··	
Block Reclose	(39 Character String)	7	
A/R Out	(39 Character String)	13····	
A/R In	(39 Character String)	12····	
Go Direct To Lockout	(39 Character String)	15····	
Trip And Reclose	(39 Character String)	14····	
External A/R Start	(39 Character String)	6	
Reset Lockout	(39 Character String)	5	
Sync Override	(39 Character String)	NONE··	
Manual Sync Override	(39 Character String)	NONE··	
CB Phase A Closed	(39 Character String)	3	
CB Phase B Closed	(39 Character String)	3	
CB Phase C Closed	(39 Character String)	3	
CB Phase A Open	(39 Character String)	4	
CB Phase B Open	(39 Character String)	4	
CB Phase C Open	(39 Character String)	4	
Manual Close	(39 Character String)	NONE··	
Reset Delta CB Close	(39 Character String)	NONE··	
Input 1	(39 Character String)	1	
Input 2	(39 Character String)	2	

Input 3	(39 Character String)	3	
Input 4	(39 Character String)	4	
Input 5a	(39 Character String)	NONE··	
Input 5b	(39 Character String)	NONE··	
Input 5c	(39 Character String)	NONE··	
Input 5d	(39 Character String)	NONE··	
Input 6a	(39 Character String)	NONE··	
Input 6b	(39 Character String)	NONE··	
Input 6c	(39 Character String)	NONE··	
Input 6d	(39 Character String)	NONE··	
Timer 1	(39 Character String)	NONE··	
Timer 2	(39 Character String)	NONE··	
Counter 1 Count	(39 Character String)	NONE··	
Counter 1 Reset	(39 Character String)	NONE··	
Counter 2 Count	(39 Character String)	NONE··	
Counter 2 Reset	(39 Character String)	NONE··	
Trip Circuit Fail	(39 Character String)	NONE··	
Clock Sync.	(39 Character String)	NONE··	

OUTPUT CONFIG MENU

Setting	**Range**	**Default**	
Protection Healthy	(39 Character String)	1	
Signal Send 1	(39 Character String)	6	
POR Weak Infeed	(39 Character String)	NONE··	
DEF POR Weak Infeed	(39 Character String)	NONE··	
DEF Aided Trip	(39 Character String)	NONE··	
Signal Send 2	(39 Character String)	7	
DEF Protection	(39 Character String)	17····	
DEF Rev Protection	(39 Character String)	NONE··	
Sig Recvd 2 Flag	(39 Character String)	NONE··	
UV1 Alarm	(39 Character String)	NONE··	
UV2 Alarm	(39 Character String)	NONE··	
UV Trip	(39 Character String)	NONE··	
SOTF Operated	(39 Character String)	12····	
VTS Alarm	(39 Character String)	11····	
Trip Output	(39 Character String)	4,14	
Trip Reset	(39 Character String)	NONE··	
Phase A Fault	(39 Character String)	NONE··	
Phase B Fault	(39 Character String)	NONE··	
Phase C Fault	(39 Character String)	NONE··	
Earth Fault	(39 Character String)	NONE··	
Zone 1	(39 Character String)	8	
Zone 2	(39 Character String)	9	
Zone 3	(39 Character String)	10····	
Zone 4	(39 Character String)	NONE··	
Aided Trip	(39 Character String)	NONE··	
Sig Recvd 1 Flag	(39 Character String)	NONE··	
Carrier Guard	(39 Character String)	NONE··	
Power Swing Alarm	(39 Character String)	15····	
Delta Trip Cnt Alarm	(39 Character String)	NONE··	
Total Trip Cnt Alarm	(39 Character String)	NONE··	
High Set	(39 Character String)	13····	
Overvoltage Alarm	(39 Character String)	NONE··	

Overvoltage	(39 Character String)	20····	
SEF Alarm	(39 Character String)	NONE··	
SEF Protection	(39 Character String)	19····	
Close Pulse	(39 Character String)	5	
Trip Relay Reset	(39 Character String)	NONE··	
Lockout	(39 Character String)	16····	
A/R Out of Service	(39 Character String)	NONE··	
A/R In Service	(39 Character String)	NONE··	
A/R In Progress	(39 Character String)	18····	
Live Line	(39 Character String)	NONE··	
Live Bus	(39 Character String)	NONE··	
In Sync	(39 Character String)	NONE··	
CB Open	(39 Character String)	NONE··	
CB Closed	(39 Character String)	NONE··	
CB Failed To Close	(39 Character String)	NONE··	
System Split	(39 Character String)	NONE··	
Successful Close	(39 Character String)	NONE··	
CB Failed to Open	(39 Character String)	NONE··	
Check Sync Start	(39 Character String)	NONE··	
Sync In Prog Flag	(39 Character String)	NONE··	
Close Onto Fault	(39 Character String)	NONE··	
Delta CB Count Alarm	(39 Character String)	NONE··	
Total CB Count Alarm	(39 Character String)	NONE··	
CB Not In Ser Alarm	(39 Character String)	NONE··	
CB Memory	(39 Character String)	NONE··	
A/R Not Allowed	(39 Character String)	NONE··	
Input 1 Operated	(39 Character String)	NONE··	
Input 1 Not Operated	(39 Character String)	NONE··	
Input 2 Operated	(39 Character String)	NONE··	
Input 2 Not Operated	(39 Character String)	NONE··	
Input 3 Operated	(39 Character String)	NONE··	
Input 4 Operated	(39 Character String)	NONE··	
Input 5 Operated	(39 Character String)	NONE··	
Input 6 Operated	(39 Character String)	NONE··	
Timer 1 Operated	(39 Character String)	NONE··	
Timer 2 Operated	(39 Character String)	NONE··	
Counter 1 Operated	(39 Character String)	NONE··	
Counter 2 Operated	(39 Character String)	NONE··	
Trip Circuit Fail	(39 Character String)	NONE··	
OC Guard	(39 Character String)	NONE··	
IRIG-B Synch'	(39 Character String)	NONE··	
Hand Reset Outputs	(39 Character String)	NONE··	

OUTPUT OPERATE TIME MENU

Setting	**Range**	**Default**	
R1 Min Operate Time	0.1 – 60s	0.1s	
R2 Min Operate Time	0.1 – 60s	0.1s	
R3 Min Operate Time	0.1 – 60s	0.1s	
R4 Min Operate Time	0.1 – 60s	0.1s	
R5 Min Operate Time	0.1 – 60s	0.1s	
R6 Min Operate Time	0.1 – 60s	0.1s	
R7 Min Operate Time	0.1 – 60s	0.1s	
R8 Min Operate Time	0.1 – 60s	0.1s	

R9 Min Operate Time	0.1 – 60s	0.1s	
R10 Min Operate Time	0.1 – 60s	0.1s	
R11 Min Operate Time	0.1 – 60s	0.1s	
R12 Min Operate Time	0.1 – 60s	0.1s	
R13 Min Operate Time	0.1 – 60s	0.1s	
R14 Min Operate Time	0.1 – 60s	0.1s	
R15 Min Operate Time	0.1 – 60s	0.1s	
R16 Min Operate Time	0.1 – 60s	0.1s	
R17 Min Operate Time	0.1 – 60s	0.1s	
R18 Min Operate Time	0.1 – 60s	0.1s	
R19 Min Operate Time	0.1 – 60s	0.1s	
R20 Min Operate Time	0.1 – 60s	0.1s	
R21 Min Operate Time	0.1 – 60s	0.1s	
R22 Min Operate Time	0.1 – 60s	0.1s	
R23 Min Operate Time	0.1 – 60s	0.1s	
R24 Min Operate Time	0.1 – 60s	0.1s	
R25 Min Operate Time	0.1 – 60s	0.1s	
R26 Min Operate Time	0.1 – 60s	0.1s	
R27 Min Operate Time	0.1 – 60s	0.1s	
R28 Min Operate Time	0.1 – 60s	0.1s	
R29 Min Operate Time	0.1 – 60s	0.1s	

LED CONFIG MENU

Setting	**Range**	**Default**	
Signal Send 1	(39 Character String)	NONE··	
POR Weak Infeed	(39 Character String)	27····	
DEF POR Weak Infeed	(39 Character String)	27····	
DEF Aided Trip	(39 Character String)	13····	
Signal Send 2	(39 Character String)	NONE··	
DEF Protection	(39 Character String)	11····	
DEF Rev Protection	(39 Character String)	NONE··	
Sig Recvd 2 Flag	(39 Character String)	12····	
UV1 Alarm	(39 Character String)	22····	
UV2 Alarm	(39 Character String)	22····	
UV Trip	(39 Character String)	23····	
SOTF Operated	(39 Character String)	17····	
VTS Alarm	(39 Character String)	18····	
Trip Output	(39 Character String)	NONE··	
Trip Reset	(39 Character String)	NONE··	
Phase A Fault	(39 Character String)	5	
Phase B Fault	(39 Character String)	6	
Phase C Fault	(39 Character String)	7	
Earth Fault	(39 Character String)	8	
Zone 1	(39 Character String)	1	
Zone 2	(39 Character String)	2	
Zone 3	(39 Character String)	3	
Zone 4	(39 Character String)	4	
Aided Trip	(39 Character String)	10····	
Sig Recvd 1 Flag	(39 Character String)	9	
Carrier Guard	(39 Character String)	NONE··	
Power Swing Alarm	(39 Character String)	26····	
Delta Trip Cnt Alarm	(39 Character String)	NONE··	
Total Trip Cnt Alarm	(39 Character String)	NONE··	

High Set	(39 Character String)	19····	
Overvoltage Alarm	(39 Character String)	20····	
Overvoltage	(39 Character String)	21····	
SEF Alarm	(39 Character String)	24····	
SEF Protection	(39 Character String)	25····	
Close Pulse	(39 Character String)	NONE··	
Trip Relay Reset	(39 Character String)	NONE··	
Lockout	(39 Character String)	15····	
A/R Out of Service	(39 Character String)	NONE··	
A/R In Service	(39 Character String)	NONE··	
A/R In Progress	(39 Character String)	14····	
Live Line	(39 Character String)	NONE··	
Live Bus	(39 Character String)	NONE··	
In Sync	(39 Character String)	NONE··	
CB Open	(39 Character String)	16····	
CB Closed	(39 Character String)	NONE··	
CB Failed To Close	(39 Character String)	30····	
System Split	(39 Character String)	32-32·	
Successful Close	(39 Character String)	NONE··	
CB Failed to Open	(39 Character String)	30····	
Check Sync Start	(39 Character String)	NONE··	
Sync In Prog Flag	(39 Character String)	31····	
Close Onto Fault	(39 Character String)	NONE··	
Delta CB Count Alarm	(39 Character String)	30····	
Total CB Count Alarm	(39 Character String)	30····	
CB Not In Ser Alarm	(39 Character String)	NONE··	
CB Memory	(39 Character String)	NONE··	
A/R Not Allowed	(39 Character String)	NONE··	
Input 1 Operated	(39 Character String)	NONE··	
Input 1 Not Operated	(39 Character String)	NONE··	
Input 2 Operated	(39 Character String)	NONE··	
Input 2 Not Operated	(39 Character String)	NONE··	
Input 3 Operated	(39 Character String)	NONE··	
Input 4 Operated	(39 Character String)	NONE··	
Input 5 Operated	(39 Character String)	NONE··	
Input 6 Operated	(39 Character String)	NONE··	
Timer 1 Operated	(39 Character String)	NONE··	
Timer 2 Operated	(39 Character String)	NONE··	
Counter 1 Operated	(39 Character String)	NONE··	
Counter 2 Operated	(39 Character String)	NONE··	
Trip Circuit Fail	(39 Character String)	NONE··	
OC Guard	(39 Character String)	NONE··	
IRIG-B Synch'	(39 Character String)	NONE··	
Self Reset LEDs	(39 Character String)	9,12,14-16, 18,20,22,24,26,29,31-32	

CB MAINTENANCE MENU

Setting	**Range**	**Default**	
Total CB Trip Count Alarm	OFF, 1 – 9999	OFF	
Delta CB Trip Count Alarm	OFF, 1 – 9999	OFF	
Total CB Close Count Alarm	1-1999	100	
Delta CB Close Count Alarm	1-1999	20	

DATA STORAGE MENU

Setting	**Range**	**Default**	
Pre-trigger Storage	10 – 90%	20%	
Record Duration	10 Rec x 1 Sec 5 Rec x 2 Sec 2 Rec x 5 Sec 1 Rec x 10 Sec	10 Rec x 1 Sec	

FAULT LOCATOR MENU

Setting	**Range**	**Default**	
Pos Seq Line Impedance	-0.125	10 Ω	
Sec'y Z+ per unit distance	-0.0015	0.5 Ω	
Display distance as	Percent, km, Miles	Percent	
Fault Locator	Disabled, Enabled	ENABLED	

2 Settings Walkthrough

The relay displays are organised into three lists:-

A list of settings
A list of meters (instruments)
A list of fault records

This walkthrough describes the settings and is intended to be read in front of a powered-up relay.
The starting point is the relay identifier screen. This is the screen the relay displays when it is first powered-up and can be reached from any display by pressing **CANCEL** a few times.

From this position press the down arrow key once, the relay will display **"SETTINGS MODE".**
From this display the down arrow key can be pressed again to enter the setting list, or the right arrow key ⇨ can be pressed to choose a different list ("**INSTRUMENTS MODE" or "FAULT DATA MODE**").
Press the down arrow key ⇩. The relay enters the settings list and displays "**SYSTEM CONFIG MENU**".

In the following section the default values are shown in bold either in the setting range or just after it.
Where reference is made to relay inputs or outputs these are shown in italics.

2.1 System Config Menu

This menu contains general settings which allows the relay to be configured. Press ⇨ to open the menu and display the settings.

Active Group (**1**..8)
There are 8 setting groups in the relay. Some settings can have different values in each group while others have the same value in all groups. This setting controls which group of values is applied to the relay. When it is changed all the settings which can have different values in each group are changed.

Alternate Setting Group (**1**..8)
It is possible to cause the relay to switch from one setting group to another on application of a signal to the Status Input *Use Alt Setting Grp*. When this status input is energised, the relay will switch from whichever group is currently active to the alternate group defined in this setting. The relay will revert to the previous active setting group when the *Use Alt Setting Grp* Status Input is de-energised.

CT Ratio (0:1..5000:5) **1:2000**
This setting defines the turns ratio of the protection CT. This will allow the meter display to show the correct primary current. This setting does not affect any protection functions.

VT Ratio (1000:90..600000:130) **33000:110**
This setting defines the ratio of the protection VT. This will allow the meter display to show the correct primary voltage. This setting does not affect any protection functions.

CVT in use (**NO**, YES)
If Capacitive Voltage Transformers are used then this setting should be set to YES. This will give extra security to the protection during the case of severe CVT transients.

Clock Sync from Status (Disabled, Seconds, **Minutes**)
When the Status input defined as Clock Sync is energised, the relay's real time clock will be set to the nearest second or nearest minute according to the setting made here.

View/Edit Group (**1**..8)
Each setting group can be viewed and edited without making it active. Settings that can be different in each group indicate which group the displayed value belongs to with the letter "G" and the group number in front of the setting description. This setting controls which group is displayed.
IMPORTANT: whichever group of settings are visible may NOT be the settings the relay is using. The relay will only operate on the Active Group regardless of the displayed settings.

Default Screens Timer (Off, 1, 2, 5, 10, 15, 30, **60** mins)
Defines the length of time that the relay will remain on the selected screen before returning to the top of the menu tree. When the relay returns to the default screen, this is indicated by a small inverted D in the top right corner of the LCD screen.
Unless otherwise specified, the default screen is the relay identifier (i.e. the top level of the menu structure).

Backlight Timer (Off, 1, 2, **5**, 10, 15, 30, 60 mins)

Defines the length of time for which the backlight for the LCD screen will remain illuminated after the last keypress.

Date
The current date is set in this menu. The format is DD,MM,YYYY

Time
The current time is set. In this menu only minutes and hours are set. The format is HH,MM the 24 hour clock is used.

Change Password **(NONE)**
The relay is provided with a password feature. If set it will prevent any un-authorised changes to any of the relay settings. The password is a four character word once set it can be disabled by entering the new password "NONE". Once a password has been set, the relay will display a 10 digit code in the Change Password setting. If the password has been lost then an authorised person should contact a Siemens representative, quoting this 10-digit code. This can be used to obtain the current password.
The password must be entered in order to alter any of the relay settings. Once the password has been entered, the relay will remain "logged-in" for 1 hour. After this time, the relay password must be entered again before settings can be changed.

Relay Identifier
The relay is supplied with a default identifier usually the relay type. This can be changed to any 16-digit identifier to give any meaningful identification to the relay. e.g. feeder name or circuit number.

2.2 Distance Protection Menu

The settings for the impedance elements are located in this menu.

Active Scheme
(**Time stepped**, PUR, POR1, POR2, Reach Extension, Loss Of Load, Acceleration)
There are a number of different protection schemes available in the relay depending upon the model. These can be chosen at this setting. Only one scheme can be active at a time. The schemes are described in Section 3 of this manual.

Carrier Guard (Disable, **Enable**)
This allows the carrier guard feature to be enabled or disabled. Where an output contact is available from the protection signalling equipment, which can indicate that there is a problem with the signalling channel, this can be used to energise a status input defined as *Carrier Guard*.
When enabled, if the status input assigned as *Carrier Guard* is energised, the relay will carry out time delayed trips only – it will not carry out an aided trip under any circumstances, regardless of the condition of the *Signal Received 1* and *Signal Received 2* status inputs.

CT Secondary (**1A**, 2A, 5A)
The relay can operate from 1, 2 or 5 Amp CT secondary circuits. The value MUST be programmed for the correct CT. This will affect the impedance measurements if not programmed correctly.

Line Angle (0-90˚ in steps of 5˚) **75˚**
This is the angle of the positive sequence impedance of the composite transmission line.

EF Comp Z0/Z1 ratio (0-10) **2.5**
This is the ratio between the magnitudes of the zero sequence and positive sequence impedances of the system. The ratio of Z0/Z1 is used in an internal calculation for earth-fault compensation. This is common for all Zones.

EF Comp Z0 angle (0-355˚ in steps of 5˚) **75˚**
This is the angle of the zero sequence impedance of the system.

Reactive Drop Angle (-20˚ .. 20˚ in steps of 1˚) **-3˚**
Defines the angle at which the reactance line for the Quadrilateral characteristic is inclined to the horizontal. The default setting of –3º is suitable for most applications.

Z1 Extension (Disable, **Enable**)
Operation of the Zone 1 Extension, can be enabled or disabled from this setting. Zone 1 Extension is only active if the *Active Scheme* is set to *Reach Extension*.

Z1 Phase-fault (Disable, **Enable**)
Operation of the Zone 1 phase-fault elements A-B, B-C & C-A, can be enabled or disabled from this setting.

Z1 PF Impedance (0.1 – 250) **8Ω**

Defines the Zone 1 phase-fault impedance reach in terms of the secondary positive sequence impedance.

Z1X PF Impedance (0.1 – 250) **12Ω**
When the Zone 1 extension scheme is active, this defines the extended Zone 1 phase-fault reach used for the first trip. When the breaker is reclosed, the normal Zone 1 reach is applied for the reclaim time.
If the active scheme is not “Reach Extension”, this setting is ignored. See Section 3 of this manual for more detail on relay schemes.

Z1 PF Time Delay (**0** – 10000ms)
An independent time delay from 0 – 10s can be applied to the Zone 1 phase-fault protection elements.

Z1 Earth-fault (Disable, **Enable**)
Operation of the Zone 1 earth-fault elements A-E, B-E & C-E, can be enabled or disabled from this setting.

Z1 EF Type (**FWD MHO**, FWD QUAD)
Selects the shape of the Zone 1 element as either Mho or Quad.

Z1 EF Impedance (0.1 – 250) **8Ω**
Defines the Zone 1 earth-fault impedance reach (in terms of secondary positive sequence impedance) for the mho characteristic. If Quad characteristics are used, this setting is ignored.

Z1 EF Resistance (0.1 – 250) **4Ω**
Defines the Zone 1 earth-fault reach along the resistive axis for the quad characteristic. If Mho characteristics are used, this setting is ignored.
NOTE: Residual compensation is not applied to the resistance comparators of the quad characteristics.

Z1X EF Impedance (0.1 – 250) **12Ω**
When the Zone 1 extension scheme is active, this defines the extended Zone 1 earth-fault reach used for the first trip. After the breaker is reclosed, the normal Zone 1 reach is applied during the reclaim time.
If Quad characteristics are used, or the active scheme is not “Reach Extension”, this setting is ignored. See Section 3 of this manual for more detail on relay schemes.

Z1X EF Resistance (0.1 – 250) **4Ω**
When the Zone 1 extension scheme is active, this defines the extended Zone 1 earth-fault reach along the resistive axis for the quad characteristic used for the first trip. After the breaker is reclosed, the normal zone 1 reach is applied for the reclaim time.
If Mho characteristics are used, or the active scheme is not “Reach Extension”, this setting is ignored. See Section 3 of this manual for more detail on relay schemes.

Z1 EF Time Delay (0 – 10000) **0ms**
An independent time delay from 0 – 10s can be applied to the Zone 1 earth-fault protection elements.

Z2 Phase-fault (Disable, **Enable**)
Operation of the Zone 2 phase-fault elements A-B, B-C & C-A, can be enabled or disabled from this setting.

Z2 PF Impedance (0.1 – 250) **16Ω**
Defines the Zone 2 phase-fault impedance reach in terms of the secondary positive sequence impedance.

Z2 PF Time Delay (0 – 10000) **1000ms**
An independent time delay from 0 – 10s can be applied to the Zone 2 phase-fault protection elements.

Z2 Earth-fault (Disable, **Enable**)
Operation of the Zone 2 earth-fault elements A-E, B-E & C-E, can be enabled or disabled from this setting.

Z2 EF Type (**FWD MHO**, FWD QUAD)
Selects the shape of the Zone 2 element as either Mho or Quad.

Z2 EF Impedance (0.1 – 250) **16Ω**
Defines the Zone 2 earth-fault impedance reach (in terms of secondary positive sequence impedance) for the mho characteristic. If Quad characteristics are used, this setting is ignored.

Z2 EF Resistance (0.1 – 250) **8Ω**
Defines the Zone 2 earth-fault reach along the resistive axis for the quad characteristic. If Mho characteristics are used, this setting is ignored.
NOTE: Residual compensation is not applied to the resistance comparators of the quad characteristics.

Z2 EF Time Delay (0 – 10000) **1000ms**
An independent time delay from 0 – 10s can be applied to the Zone 2 earth-fault protection elements.

Z3 Phase-fault (Disable, **Enable**)
Operation of the Zone 3 phase-fault elements A-B, B-C & C-A, can be enabled or disabled from this setting.

Z3 PF Type (Fwd Mho, Rev Mho, **Offset Mho**)
There are three types of Zone 3 characteristic for phase-faults: Forward (Fwd) Mho, Reverse (Rev) Mho or Offset Mho. If either forward or reverse is selected then these elements become a standard directional element and require a polarising voltage. If an offset characteristic is selected, then operation can occur without polarising voltage.

Z3 PF Impedance (Fwd) (0.1 – 250) **24Ω**
The Zone 3 phase-fault forward impedance reach is defined by this setting, in terms of secondary positive sequence impedance. If the element is selected as a reverse element then this setting is ignored.

Z3 PF Impedance (Rev) (0.1 – 250) **8Ω**
The Zone 3 phase-fault reverse impedance reach is defined by this setting, in terms of secondary positive sequence impedance. If the element is selected as a forward element then this setting is ignored.

Z3 PF Time Delay (0 – 10000) **2000ms**
An independent time delay from 0 – 10s can be applied to the Zone 3 phase-fault protection elements.

Z3 Earth-fault (Disable, **Enable**)
Operation of the Zone 3 earth-fault elements A-E, B-E & C-E can be enabled or disabled from this setting.

Z3 EF Type (Fwd Mho, Rev Mho, **Offset Mho**, Fwd Quad, Rev Quad, Offset Quad).
There are six types of Zone 3 characteristic; Forward (Fwd) Mho, Reverse (Rev) Mho, Offset Mho, Forward (Fwd) Quad, Reverse (Rev) Quad, Offset Quad. If either forward or reverse is selected then these elements become a standard directional element and require a polarising voltage. If an Offset characteristic is selected, then operation can occur without polarising voltage.

Z3 EF Impedance (Fwd) (0.1 – 250) **24Ω**
The Zone 3 earth-fault forward reach impedance values are defined using this setting, in terms of secondary positive sequence impedance. If quad characteristics are used or the element is set as a reverse-looking element, this setting is ignored.

Z3 EF Resistance (Fwd) (0.1 – 250) **12Ω**
Defines the Zone 3 earth-fault forward reach along the resistive axis for the quad characteristic. If Mho characteristics are used or the element is selected as a reverse-looking element, this setting is ignored.
NOTE: Residual compensation is not applied to the resistance comparators of the quad characteristics.

Z3 EF Impedance (Rev) (0.1 – 250) **8Ω**
The Zone 3 earth-fault reverse reach impedance values are defined using this setting, in terms of secondary positive sequence impedance. If quad characteristics are used or the element is set as a forward-looking element, this setting is ignored.

Z3 EF Resistance (Rev) (0.1 – 250) **4Ω**
Defines the Zone 3 earth-fault reverse reach along the resistive axis for the quad characteristic. If Mho characteristics are used or the element is set as a forward-looking element, this setting is ignored.
NOTE: Residual compensation is not applied to the resistance comparators of the quad characteristics.

Z3 EF Time Delay (0 – 10000) **2000ms**
An independent time delay from 0 – 10s can be applied to the Zone 3 earth-fault protection elements.

Z4 Phase-fault (**Disable**, Enable)
The reverse Zone 4 phase-fault elements A-B, B-C & C-A, can be enabled or disabled from this setting.
Zone 4 is used for Blocking Schemes and does not cause the Trip output to be raised.

Z4 PF Impedance (0.1 – 250) **16Ω**
Defines the Zone 4 phase-fault impedance reach (in terms of secondary positive sequence impedance) for the mho characteristic.

Z4 PF Time Delay (0 – 10000) **0ms**
An independent time delay from 0 – 10s can be applied to the Zone 4 phase-fault protection elements.

Z4 Earth-fault (**Disabled**, Enabled)
Operation of the Zone 4 earth-fault elements A-E, B-E & C-E, can be disabled from this setting.
Zone 4 is used for Blocking Schemes and does not cause the Trip output to be raised.

Z4 EF Impedance (0.1 – 250) **16Ω**
Defines the Zone 4 earth-fault impedance reach (in terms of secondary positive sequence impedance) for the mho characteristic. If Quad characteristics are used, this setting is ignored.

Z4 EF Resistance (0.1 – 250) **16Ω**
Defines the Zone 4 earth-fault reach along the resistive axis for the quad characteristic. If Mho characteristics are used, this setting is ignored.
NOTE: Residual compensation is not applied to the resistance comparators of the quad characteristics.

Z4 EF Time Delay (0 – 10000) **0ms**
An independent time delay from 0 – 10s can be applied to the Zone 4 earth-fault protection elements.

POR Weak Infeed Tripping (**Disabled**, Enabled)
Allows the weak infeed tripping features to be turned on or off, where the Permissive overreach scheme is being applied. See Section 3 of this manual for a full description of the Weak Infeed tripping feature.

WI Voltage Level (5-85) **54v**
Specifies the phase-neutral voltage below which a Weak Infeed fault can be assumed. See Section 3 of this manual for a full description of the Weak Infeed tripping feature

POR Current Rev Reset (0 – 60000) **200ms**
When there is a change indirection of the flow of current (due to circuit breakers opening), the relay will restrain for this time delay to prevent race conditions between the drop-off of the remote end signal send and the drop off of the local measuring element. Used only with Permissive Overreach schemes. See Section 3 of this manual for a full description of the Current Reversal Guard feature.

POR CB Echo Pulse (0 – 60000) **250ms**
This is the length of pulse “Echoed” back to the remote end when a signal is received from the remote end distance protection and the local breaker is open. Used only with POR scheme. See Section 3 of this manual for a full description of the CB Echo Pulse feature.

LOL Level (0.1 – 0.9) **0.5 x I_N**
Where the Loss of Load scheme is used, a LOL condition occurs if the current level in one or two phases drops below this level, but the current in the remaining phase(s) is above this level. When this occurs, the relay will remove the time delay from Zone 2 for the *LOL Time Limit* (see below). Thus, the relay will allow tripping for 100% of the line upon detection of a loss of load (i.e. a fault outside of the local zone 1 for which the remote end breaker has tripped). See Section 3 of this manual for a full description of the Loss of Load feature.

LOL CB Op Delay (0 – 60000) **20ms**
This delay allows for pole scatter between phases. A short delay is placed on the operation of the LOL detector to allow for slight differences in the opening time between poles of the circuit breaker, thus preventing nuisance alarms. The standard value of 20ms will be suitable for most cases.

LOL Time Limit (0 – 60000) **40ms**
Maximum time after the loss of load condition is detected for which the Zone 2 time delay will be removed. The standard value of 40ms will be suitable for most applications.

Power Swing Detector (**Disable**, Enable)
This setting allows the Power Swing detector to be enabled or disabled.

PSD Zone Blocking (Zone 1, **Zone 2, Zone 3, Zone 4**)
This defines which Zones of protection tripping would be blocked for in the event of a Power Swing.

PSD Shape (**Circular**, Rectangular)
Allows setting of the Power Swing Zone characteristics as either circular or rectangular.

PSD Blinders (**Disable**, Enable)
This allows blinders to be applied to the Power Swing Zone to prevent load encroachment. These are applied parallel to the line angle when enabled.

PSD Inner Fwd Impedance (0.1 – 250) **24Ω**
Sets the inner impedance reach in the forward direction (on the line angle) for the PSD characteristic. This is usually set equal to, or greater than, the Zone 3 reach.

PSD Inner Rev Impedance (0.1 – 250) **8Ω**
Sets the inner impedance reach in the reverse direction (on the line angle) for the PSD characteristic. This is usually set equal to, or greater than, the Zone 3 reverse reach.

PSD Inner FWD Blinder (0.1 – 250) **16Ω**
This is the impedance (perpendicular to the line angle) between the line impedance and the blinder applied to the PSD Zone, to the right of the line characteristic. The blinder is applied parallel to the line angle.

PSD Inner REV Blinder (0.1 – 250) **16Ω**
This is the impedance (perpendicular to the line angle) between the line impedance and the blinder applied to the PSD Zone, to the left of the characteristic. The blinder is applied parallel to the line angle.

PSD Outer Multiplier (1.05 – 2) **1.5 x**
The outer reach of the Power Swing detector is set as a multiple of the inner reach, normally 1.5 times the inner reach.

PSD Transit Time (0 – 1000) **50ms**
This is the length of time for which the impedance characteristic must be between the inner and outer Zones of the Power Swing Detector for a Power Swing to be detected. The default setting of 50ms should be suitable for most applications.

2.3 Aux Protection Menu

Any additional protection elements are programmed in this section.

High Set (**Disabled**, Enabled)
Overcurrent high set elements can be enabled or disabled using this setting.

HS Level (0.1 – 35) **4 x I_N**
The overcurrent setting is applied here. It is set in multiples of the nominal current, I_n which is set in the DISTANCE PROTECTION MENU under the *CT Secondary* setting.

HS Time Delay (0.00 – 60s) **1.00s**
A definite time delay from 0 – 1s can be added to the instantaneous operating time of the high set elements.

SEF Protection (**Disabled**, Enabled)
The Sensitive Earth-fault Protection can be enabled or disabled using this setting.

SEF Current Setting (0.02 – 0.95) **0.10 x I_N**
The level of residual current at which the Sensitive Earth-fault Element will operate. The SEF element has two sequential time delays, one of which can be used to give an alarm, the other a trip. The *SEF TRIP* delay timer is only started after operation of the SEF Alarm.

SEF Alarm Delay (0.00 – 60s) **1.00s**
Time delay after which the *SEF Alarm* output will operate, if the residual current remains above the SEF Current Setting.

SEF Trip Delay (0.00 – 60s) **1.00s**
After the operation of the *SEF Alarm*, if the residual current remains above the SEF Current Setting for this delay, the relay will trip, and operate the *SEF Trip* output.

Overvoltage Prot (**Enabled**, Disabled)
The Overvoltage elements can be enabled or disabled using this setting.

OV Alarm Level (1.00 – 1.50xV_N) **1.07 x V_N**
The level of Overvoltage at which the *OV Alarm* timer will start.

OV Alarm Time Delay (**0** – 1000ms)
Time delay after which the *OV Alarm* output will operate, if the system voltage on any phase remains above the OV alarm level.

OV Trip Level (1.00 – 1.50xV_N) **1.15 x V_N**
The level of Overvoltage at which the *OV Trip* timer will start.

OV Trip Time Delay (**0**, 1, … 1000ms)
Time delay after which the *OV Trip* output will operate, if the system voltage on any phase remains above the OV trip level.

Undervoltage Prot. (**Enabled**, Disabled)
The Undervoltage elements can be enabled or disabled using this setting.

UV Block Level (Disabled, 1 – 60.0 V) **3.0 V**

If the system voltage drops below this level, the Undervoltage elements will be blocked. This may be used to prevent nuisance alarms when the system is dead.

UV1 Level (5.0 – 80.0 V) **55.0 V**
This sets the pick-up level of the first Undervoltage element. This may be used as either the alarm or the trip output.

UV1 Time Delay (0.00 – 60s) **1.00s**
Time delay after which the *UV1* output will operate, if the voltage remains below the *UV1* trip level.

UV1 Hysteresis (1, **2**, …, 90 %),
Percentage difference between pick-up and drop off of the *UV1* element.

UV1 O/P Phases (**Any 1**, All)
Determines whether the *UV1* element will operate for Undervoltage on all three phases or any one phase.

UV1 Tripping (Enabled, **Disabled**)
Determines whether operation of the *UV1* element will cause the relay's *Trip Output* to operate.

UV2 Level (5.0 – 80.0 V) **55.0 V**
This sets the pick-up level of the *UV2* element. This may be used as either the alarm or the trip output.

UV2 Time Delay (0.00 – 60s) **10.00s**
Time delay after which the *UV2* output will operate, if the voltage remains below the *UV2* trip level.

UV2 Hysteresis (1 – 90%) **2 %**
Percentage difference between pick-up and drop off of the *UV2* element.

UV2 O/P Phases (**Any 1**, All)
Determines whether the UV2 element will operate for Undervoltage on all three phases or any one phase.

UV2 Tripping (Enabled, **Disabled**)
Determines whether operation of the UV2 element will cause the relay's *Trip Output* to operate.

SOTF (Enabled, **Disabled**)
This setting determines whether the Switch On To Fault protection is enabled or not.

SOTF Mode (**AC SOTF**, DC SOTF)
The Switch On To Fault feature has two modes of operation. It can be energised from an AC function or a DC function. The DC SOTF function is energised by the operation of a status input from the CB manual close handle (i.e. a D.C. signal). The AC SOTF function monitors the line current and voltage (i.e. the AC signals) and thus cannot be used if the VT is on the busbar side of the relay.

SOTF O/C Operate Level (**0.3** – 4 x I_N)
This current setting is used as a minimum value to cause operation of the SOTF function after 25ms of fault current on all three phases.

AC SOTF Pickup Delay (0-60000ms) **10000ms**
The AC line check time delay which is used to reset the function has a nominal setting of 10s this can be adjusted from 0 – 60s.

Min AUX DC SOTF Dead Time (0-60000ms) **10000ms**
The minimum DC line check time delay for use with CB auxiliary contacts which is used to reset the function has a nominal setting of 10s this can be adjusted from 0 – 60s.

VT Supervision (Enabled, **Disabled**)
This checks for the security of the VT circuit. It can be enabled or disabled.

VTS Latched Operation **(Enabled,** Disabled**)**
If residual/NPS current is detected above the VTS Ires level, the VTS protection blocking will reset unless this setting is enabled. If Enabled the current will only reset the VTS if it is detected before the VTS Latch Op. Delay expires.

VTS Mode (**Alarm Only**, Alarm & Inhibit)
If the VTS operates it can be selected to give an alarm only or it can inhibit the operation of the impedance elements.

VTS Phase-fault Inhibit (Enabled, **Disabled**)

During a fault condition the VTS is reset when the zero sequence current exceeds the setting. For a phase-fault there is no zero sequence current therefore the relay may be inhibited during a phase-fault.
With this setting disabled, the relay will trip for a two-phase VT failure.
With this setting enabled, the relay will remain stable for a two-phase VT failure but will not trip if a phase-fault occurs during such a failure.

VTS Input Source (**Res.I/V**, NPS I/V)
This selects to use either Residual voltage and current or Negative Phase Sequence voltage and current to detect VT failure.

VTS Ires Level (0.05 – 4 x I_N) **0.3 x I_N**
VTS Vop Level (1 – 100V) **20V**
The VTS feature operates by measuring the summated (residual) or Negative Phase Sequence voltages of the healthy system, and comparing this with the measured residual or Negative Phase Sequence current. The VTS will operate if the relay detects the relevant voltage without detecting a corresponding sequence current.
These settings define the levels of current and voltage used. They are set in the form of residual quantities which is equal to 3x the Zero Sequence level therefore the setting should be set to 3x the actual Negative Phase Sequence level required when NPS is selected.
The default residual voltage setting of 20 volts is suitable for most applications, but this can be changed to make the function more or less sensitive. The current setting is made in terms of the nominal current, and the default setting is 30%. The default settings used here are suitable for most applications.
A 1P earth fault will have equal levels of ZPS and NPS current and voltage. A pure P-P fault will contain significant levels of NPS V&I but no ZPS/Residual V&I.

VTS Alarm PU Delay (0 – 60000ms) **100ms**
This is the minimum time for which the VT fail conditions must remain on the system before the VT alarm is operated. It is usually set to 100ms to avoid nuisance alarms.

VTS Latch PU Delay (0 – 60000ms) **5000ms**
When latch is enabled this setting selects the duration after a VTS is detected within which the VTS will reset for an current increase above the VTS Ires Level.

OC Guard (Enabled, **Disabled**)
Enables or disables the overall operation of the Overcurrent Guard function which can be used to set the minimum current level for which a Distance element operation can occur.

OC Guard Setting (0.01-25 xIn) **1.5xIn**
Sets the current level as a multiple of rated current which must be exceeded for a Distance protection operation to occur.

OC Guard Delay (0-864000s) **1s**
Sets the delay for which current must exceed the OC Guard level before a Distance protection can occur.

OC Guard Z1 (OCG Z1 Enabled, **OCG Z1 Disabled**)
OC Guard Z2 (OCG Z2 Enabled, **OCG Z2 Disabled**)
OC Guard Z3 (OCG Z3 Enabled, **OCG Z3 Disabled**)
OC Guard Z4 (OCG Z4 Enabled, **OCG Z4 Disabled**)
The zones upon which the OC Guard block is applied are individually selected using these settings. When Disabled the zone will operate for an impedance inside it regardless of the current level.

Fwd DEF Protection (**Enabled**, Disabled)
Enables or disables the operation of the forward – looking DEF element.

DEF Active Scheme (**DEF POR**, DEF BOR, DEF Direct Trip)
The DEF protection can be applied either as a direct tripping time graded element or using a signalling channel in either a permissive scheme or a blocking scheme, with time graded operation as a back-up.

Fwd DEF Char Angle (-15, -10, … 95º) **-45 deg**
This is the angle between the residual current and the residual voltage for the forward-looking DEF element. The residual voltage is taken as the reference, so for an inductive circuit the angle will be negative.

Fwd DEF Setting (0.05, 0.10, … 4.00 xIn) **1.00 xIn**
This setting defines the current Multiplier Setting for the forward-looking DEF element if set as an IDMTL characteristic, or the pickup level if set as a DTL.

Fwd DEF Char (**IEC-NI**, IEC-VI, IEC-EI, IEC-LTI, ANSI-MI, ANSI-VI, ANSI-EI, DTL)
Defines the operating characteristics of the relay.

Fwd DEF Time Mult (IEC/ANSI) (0.025, 0.050, ..., 1.600) **1.000**
Defines the time multiplier setting applied to the IDMTL characteristics.

Fwd DEF Delay (DTL) (INST, 0.01, 0.02, ..., 20.00s) **5.00 s**
If the forward-looking DEF element uses the DTL Overcurrent characteristic, this defines the time delay.

Fwd DEF Reset ((ANSI) DECAYING, INST, 1, 2, ..., 60s) **INST s**
This setting defines the reset characteristics for the forward-looking DEF Element. May be set as Instantaneous, decaying or as a DTL.

Rev DEF Protection (**Enabled**, Disabled)
Enables or disables the operation of the reverse-looking DEF element.

Rev DEF Char Angle (-15, -10, … 95º) **-45 deg**
This is the angle between the residual current and the residual voltage for the reverse-looking DEF element. The residual voltage is taken as the reference, so for an inductive circuit the angle will be negative.

Rev DEF Setting (0.05, 0.10, … 4.00 xIn) **1.00 xIn**
This setting defines the current Multiplier Setting for the forward-looking DEF element if set as an IDMTL characteristic.

Rev DEF Char (**IEC-NI**, IEC-VI, IEC-EI, IEC-LTI, ANSI-MI, ANSI-VI, ANSI-EI, DTL)
Defines the operating characteristics of the relay.

Rev DEF Time Mult (IEC/ANSI) (0.025, 0.050, ..., 1.600) **1.000**
Defines the time multiplier setting applied to the IDMTL characteristics.

Rev DEF Delay (DTL) (INST, 0.01, 0.02, ..., 20.00s) **5.00 s**
If the forward-looking DEF element uses the DTL Overcurrent characteristic, this defines the time delay.

Rev DEF Reset ((ANSI) DECAYING, INST, 1, 2, ..., 60s) **INST**
This setting defines the reset characteristics for the forward-looking DEF Element. May be set as Instantaneous, decaying or as a DTL.

DEF WI Res OV Setting (0, **1**, …, 20V)
Determines a minimum level of residual voltage, which must be present on the system for the relay to carry out a Weak Infeed trip when using the DEF POR scheme. See Section 12 of this manual for more detail on DEF Schemes.

DEF Current Rev Reset (0-60000) **200 ms**
A delay imposed on the DEF protection in the case of a current reversal. This will give the remote end signal send a chance to drop-off, and prevent mal-trips due to race condition on parallel feeders. See Section 12 of this manual for more detail on DEF Schemes.

CB Echo Pulse Width (0-60000) **250ms**
If a DEF signal is received from the remote end and the local breaker is open, the relay will close it's Signal Send 2 output. In conjunction with the DEF at the remote end, this will cause the remote end breaker to trip. The length if the signal "echoed" back to the other end is defined here. See Section 12 of this manual for more detail on DEF Schemes.

Trip Circuit Fail (**Disabled**, Enabled)
Allows the trip circuit to be monitored by a status input. If this status input is de-energised it will indicate that the Trip Circuit is faulty and operate the *Trip Circuit Fail* relay output.

2.4 Auto Reclose Menu

A/R In Service (**In**, Out)
This setting allows the AR to be switched in and out of service directly. The autorecloser can also be switched in and out of service using a pair of Status Inputs (*AR In, AR Out*).

Dead Bar Charge (Enabled, **Disabled**)
Allows a close pulse to be issued to the breaker if the Busbar voltage is less than the Bus Dead voltage level and the Line voltage is greater than the Line Live voltage level during an Autoreclose sequence.

Dead Line Charge (Enabled, **Disabled**)
Allows a close pulse to be issued to the breaker if the Line voltage is less than the Line Dead voltage level and the Bus voltage is greater than the Bus Live voltage level during an Autoreclose sequence.

Dead Line & Dead Bar Close (Enabled, **Disabled**)
Allows a close pulse to be issued to the breaker if both the Line and Busbar voltages are less than the Dead voltage levels.

Check Sync Close (Enabled, **Disabled**)
Allows a close pulse to be issued to the breaker if both the Line and Busbar voltages are greater than the Live voltage levels during an Autoreclose sequence if synchronising conditions between the Line and Busbar voltages are also met.

Unconditional Close (**Enabled**, Disabled)
Allows closing of the breaker under any system conditions during an Autoreclose sequence.

Manual Close DBC (Enabled, **Disabled**)
Checks that the Busbar voltage is less than the Bus Dead voltage level before a close pulse is issued to the breaker following a Manual Close request.

Manual Close DLC (Enabled, **Disabled**)
Checks that the Line voltage is less than the Line Dead voltage level before a close pulse is issued to the breaker following a Manual Close request.

Manual Close DLDB (Enabled, **Disabled**)
Checks that both the Line and Busbar voltages are less than the Dead voltage levels before a close pulse is issued to the breaker following a Manual Close request.

Manual Close CS (Enabled, **Disabled**)
Checks synchronism between the Line and Busbar voltages, before a close pulse is issued to the breaker following a Manual Close request.

Deadtime (0 – 900s) **15s**
The Deadtime is started when the trip initiation drops off and the circuit breaker has opened. This delay allows the fault conditions on the system to decay before a close pulse is issued to the breaker.

Live Line Check (Enabled, **Disabled**)
If the Line voltage is “dead” for 2 seconds before the trip, a maintenance condition is assumed and no ARC is attempted. Where VTs are mounted on the busbar side of the circuit breaker this feature should be disabled. This function also initiates an additional check that the line is dead before the Deadtime will start.

Check Sync During Deadtime (Enabled, **Disabled**)
With this setting disabled the relay will wait until the end of the deadtime before it checks the synchronism of the line and bus voltages. With it enabled, if the line and bus voltages come into synchronism during the deadtime a close pulse will be issued to the breaker.

VT Fail Lockout (Enabled, **Disabled**)
If the CB is closed and either Line or Bus is considered Live whilst the other is consider dead, this indicates that there is a VT Fail (blown fuse) on the “dead” side. This condition will drive the Autoreclose to Lockout if this setting is set to Enabled.

CB Close Pulse (0.2..20) **2s**
This is the length of the close pulse. If the circuit breaker has not closed within this time, the relay will operate the *CB fail to Close* output and the autorecloser will lockout.

Reclaim Time (OFF..600) **20s**
This is the time after the close pulse has been issued before the Autoreclose cycle resets itself. If a fault occurs during the reclaim time, the relay will lockout the autorecloser.

Dead Line Charge Delay (0 – 60) **0s**
Dead Bar Charge Delay (0 – 60) **0s**
These settings allow different Deadtimes to be used for DBC and DLC. These times are in addition to the standard Deadtime setting.

Reclose Blocked Delay
If the status input assigned to *Block Autoreclose* remains energised for longer than this time delay the relay will lockout the autorecloser.

Sync Close Delay (0 – 60) **1s**
This is the maximum length of time allowed between the end of the *Deadtime* and the line and bus voltages coming into synchronism. If synchronism is not achieved within this time, the relay will lockout.

Sequence Fail Timer (**Off** – 600)
This setting defines the maximum time that the relay will wait for the Trip conditions to be cleared – trip reset, breaker open and that the line is dead if Live Line Check is enabled – before it locks out the autorecloser.

CB Fail To Open Delay (50 – 2000) **200ms**
Once a trip signal has been issued, if the breaker fails to open before the Open Delay has elapsed the *CB Fail to Open* alarm will be given.

Reset LO By Timer (Enabled, **Disabled**)
Normally, the AR lockout will be reset automatically when the Breaker is successfully re-closed. Alternatively, it is possible to reset the Lockout after a time delay.

Minimum LO Timer (0 – 60) **2s**
If the *Reset LO by Timer* setting is enabled, the lockout will reset after this time delay.

Z2 AR Start (Enabled, **Disabled**)
Z3 AR Start (Enabled, **Disabled**)
DEF AR Start (Enabled, **Disabled**)
DEF AIDED AR Start (Enabled, **Disabled**)
These settings individually select which protection elements cause an autoreclose sequence to start or lockout.

Fault Type AR Start (**2P/1P**, All)
This selects which type of fault will start an autoreclose. If *2P/1P* is selected, a 3-Phase fault will cause the autorecloser to lockout.

2.5 Sync Menu

Sync Connection (**Phase B-Earth** / Phase A-Phase B)
This defines the connection of the busbar VT used to provide the sync voltage.

Check Sync Vnom (**63.5v**, 110v)
This specifies the nominal voltage upon which the voltage percentage settings are based.. This should be set to 63.5v on Ohmega relays.

Bus: Dead | Live (5:10..150:155) **20¦90%**
These settings define the “live” and “dead” conditions of the Busbar voltage. Once the voltage goes below the “dead” level, the relay will treat the line as dead, until the voltage rises above the “live” level. Similarly when the voltage goes above the live level, the relay will treat the line as live until it goes below the “dead” level.

Line: Dead | Live (5:10..150:155) **20¦90%**
These settings define the “live” and “dead” conditions of the Line voltage. Once the voltage goes below the “dead” level, the relay will treat the line as dead, until the voltage rises above the “live” level. Similarly when the voltage goes above the live level, the relay will treat the line as live until it goes below the “dead” level.

Bus Undervolts (OFF, 150) **90%**
This sets the maximum allowable undervoltage on the bus for a check sync close.

Line Undervolts (OFF, 150) **90%**
This sets the maximum allowable undervoltage on the line for a check sync close.

Voltage Differential (OFF, 100) **10%**
This is the maximum allowable difference in magnitude between the line voltage and the busbar voltage for a check sync close.

Split Angle (OFF, **175**Deg)
This is the angle at which the relay will switch from check sync mode to system sync mode.

MC Split Action (**System Sync**, Check Sync)
This is the action that will be carried out, if a manual close is attempted, when a system split condition is detected

ARC Split Action (System Sync, **Lockout**)
This defines the relay operation when the angle between line and bus voltage reaches the Split angle during an auto-reclose operation.

Check Sync Angle (5 – 90) **20 deg**

These are the conditions that must exist for the relay to indicate that the voltages are In Sync, during a **Check Sync** operation. These conditions must exist for longer than the Check Sync Timer setting.

Check Sync Slip (OFF..2000) **50 mHz**
This is the maximum frequency difference between the bus and line voltages.

Check Sync Timer (**OFF** – 100)
This is the minimum time that the bus and line voltage signals must remain in synchronism before a close pulse is issued. Older auto-reclose systems used this time to ensure that the slip frequency between voltages was below a chosen level. Normally it will be set to off, and the maximum slip frequency can be set as the check sync slip set. However, if the auto-reclose system s being used in conjunction with older recloser systems (e.g. the Reyrolle GAD), this setting is included to ensure that equivalent settings can be made on the relay.

System Sync Angle (5..90) **10 deg**
These are the conditions that must exist for the relay to indicate that the voltages are In Sync, during a System Sync operation. Also the angle between the two signals must be decreasing. The conditions are more onerous than for a check sync condition.

System Sync Slip (OFF..2000) **125mHz**
This defines the maximum slip frequency for a System Sync closure to occur.
System Sync Timer (**OFF**..100)
This is the minimum time that the bus and line voltage signals must remain in synchronism before a close pulse is issued.

2.6 Reylogic Config Menu

Elements of functions that have had the logic configured in REYLOGIC are found in this menu.

SR Dropoff (0..60000) **1ms**
The Distance signal received can be extended using this timer to provide a variable pulse length.

SS Dropoff (0..60000) **1ms**
The Distance send signal can be delayed using this timer to provide a variable pulse length.

Permissive Trip Time Delay (0..60000) **20ms**
This is used for the distance blocked overreach scheme (BOR). This is the time for which the relay will wait for a blocking signal from the remote end before a carrier-aided trip is carried out.

SR2 Dropoff (0..60000) **1ms**
The DEF signal received can be extended using this timer to provide a variable pulse length.

SS2 Dropoff (0..60000) **1ms**
The DEF signal send can be delayed using this timer to provide a variable pulse length.

DEF Perm Trip Time (0..60000) **20ms**
This is used for the DEF BOR scheme. This time delay is used to delay the signal from the remote end before it is gated with the local DEF element. In other words, this is the time delay that the relay will wait for a blocking signal from the remote end before a carrier-aided trip is carried out.

Timer 1 Pickup Delay (0..60000) **1ms**
This is a time for which the Status Input *Timer 1* must be energised before the *Timer 1 Operated* output is operated.

Timer 1 Dropoff Delay (0..60000) **0ms**
This is a time for which the *Timer 1 Operated* output remains operated, once the Status Input *Timer 1* has been de-energised.

Timer 2 Pickup Delay (0..60000) **1ms**
This is a time for which the Status Input *Timer 2* must be energised before the *Timer 2 Operated* output is operated.

Timer 2 Dropoff Delay (0..60000) **0ms**
This is a time for which the Status Input *Timer 2* must be energised before the *Timer 2 Operated* output is operated.

Counter 1 Target (1..60000) **1**
This is the number of pulses which must be applied to the Status Input *Counter 1* before the *Counter 1 Operated* output is operated.

Counter 2 Target (1..60000) **1**
This is the number of pulses which must be applied to the Status Input *Counter 2* before the *Counter 2 Operated* output is operated.

2.7 Status Config Menu

The number of status inputs can vary with the relay model type. Each of the status inputs can be mapped to any one or more of the relay functions. The following list shows the purpose of the function.

Signal Receive 1
This is the received signal from the remote end of a distance protection scheme.

Carrier Guard
Energisation of this status input will revert the distance protection to a time stepped distance scheme. Can be used if the signalling channel fails. As soon as this status input is de-energised, the relay will revert to the Active Scheme.

Unstabilise Relay
This input is used in the Blocked Overreach (BOR) scheme to force the signal send logic of the scheme into the state required to allow the remote relay to perform an aided trip when a fault is applied.

Block Mode Inhibit
This input is used in conjunction with the distance protection Blocking Scheme. When active, this signal prevents aided tripping caused by the removal of the block signal by the remote relay.

Block Reach Extension
When the reach extension scheme is enabled and this status input is energised, the relay will use the normal zone 1 reach instead of the extended reach for the first trip of an auto-reclose sequence.

Signal Receive 2
This is status input used to receive the signal from the remote end of a DEF protection scheme.

Block DEF
Energisation of this status input will prevent all DEF operations (both aided and backup trips).

DEF Block Mode Inhibit
When this Status Input is energised the relay will not carry out an aided trip. The back-up trip function will still operate.

DC SOTF Manual Close
This status input must be used if the *Switch On To Fault mode* is set to *DC SOTF* started by a contact from the circuit breaker closing handle. It is disabled by default. For 400ms after this element is first energised, the relay will remove the time delay from Zone 3. See Section 2 of this manual for a full description of the *Switch On To Fault* feature.

Start Aux DC SOTF
This status input must be used if the *Switch On To Fault mode* is set to *DC SOTF* started from a CB auxiliary contact. If the aux contact has indicated that the CB has been open for greater than the Min AUX DC SOTF Dead Time, SOTF will allow fast fault clearance for 400ms by the removal of the time delay from Zone 3. See Section 2 of this manual for a full description of the *Switch On To Fault* feature.

VT Circuits Isolated
This input is used to detect a three-phase VT failure, and should be connected to an auxiliary contact from a three-phase MCB. The relay will indicate a VTS condition whenever this status input is energised.

Trigger Storage
An external device can be used to trigger the waveform storage whenever this status input is energised.

Increment Trip Count.
The relay records the number of trip operations carried out. If the circuit breaker is tripped by another protection device, this status input can be used to increment the trip counter. This means that the relay will record the total number of trips carried out by the breaker, regardless of which device carried out the tripping.
One example of the use of this would be for a single switch substation where two distance relays control the same circuit breaker. By connecting the trip contact of one relay to this status input on the other relay (and vice versa) the trip counter on each relay will record the total number of trips for that breaker.

Reset Total Trip Cnt
Energising this Status Input will reset the Total trip count. The number of trips recorded by the Total Trip Counter carried out by the relay can be viewed in the INSTRUMENTS mode of the relay.

Reset Delta Trip Cnt
Energising this Status Input will reset the Delta trip count. The number of trips recorded by the Delta Trip Counter carried out by the relay can be viewed in the INSTRUMENTS mode of the relay.

Reset Total CB Close
Energising this Status Input will reset the Total CB close counter. The number of trips recorded by the Total CB Close Counter carried out by the relay can be viewed in the INSTRUMENTS mode of the relay.

Reset Delta CB Close
Energising this Status Input will reset the Total CB close count. The number of trips recorded by the Delta Trip Counter carried out by the relay can be viewed in the INSTRUMENTS mode of the relay.

Use Alt Settings Grp
This input when energised will cause the relay to switch to the alternative setting group defined in the system configuration menu. The relay will revert to the original setting group when this status input is de-energised.

Block Reclose
Energising this status input will cause a temporary auto-reclose inhibit. This will pause the autorecloser at whatever point it is at. All timers will stop until this Status Input is de-energised. If this status input is energised for longer than the *Reclose Blocked Delay*, the relay will lockout.

A/R Out
A/R In These switch the autorecloser In and Out. A pulse to the “AR in” status input will switch it into service, one to the “AR out” will switch it out of service. If both are high simultaneously, the autorecloser will be switched out of service.

Go Direct To Lockout
Energising this status input will cause the autorecloser to go immediately to lockout. While this input is kept high, the autorecloser will not leave lockout even if an attempt is made to reset it.

Trip And Reclose
Energising this status input will cause the relay to trip and initiate an autoreclose. All conditions for autoreclosing must still be met. This is designed as a test function.

External A/R Start
Energising this status input will cause the relay to start an autoreclose sequence. All conditions for autoreclosing must still be met. This is used where an external device has caused the trip but this relay is required to control the autoreclose sequence.

Reset Lockout
Energising this status input will reset the relay from a lockout condition. This is not normally required because the lockout condition will be reset when the breaker is successfully reclosed.

Sync Override
When this status input is energised during an Autoreclose sequence, the synchroniser is overridden and a close pulse is issued to the breaker regardless of the synchronising conditions. All other Autoreclose conditions must still be met. This would be used where an external Synchronising device is in use.

Manual Sync Override
When this status input is energised during a Manual Close sequence, the synchroniser is overridden and a close pulse is issued to the breaker regardless of the synchronising conditions. All other manual close conditions must still be met. This would be used where a manual Synchronising override panel switch is applied for manual closing.

CB Phase A Closed
This status input should be energised to indicate that Phase A of the Circuit Breaker is closed.

CB Phase B Closed
This status input should be energised to indicate that Phase B of the Circuit Breaker is closed.

CB Phase C Closed
This status input should be energised to indicate that Phase C of the Circuit Breaker is closed.

CB Phase A Open
This status input should be energised to indicate that Phase A of the Circuit Breaker is open.

CB Phase B Open
This status input should be energised to indicate that Phase B of the Circuit Breaker is open.

CB Phase C Open
This status input should be energised to indicate that Phase C of the Circuit Breaker is open.

Manual Close
This input will cause a Manual Closing sequence to commence.

Input 1 ... 4
In order to utilise the status inputs and output relay matrix a number of connections have been created. These are named as Input 1..n where n is a maximum of 4. This will depend upon the relay model type.

Input 5a, 5b, 5c, 5d
When all four of these status inputs are energised the relay will operate the *Input 5 Operated* relay output. This acts as a four input AND gate. By assigning more than one of these labels to the same relay input, a 3 or a 2 input AND gate can be created.

Input 6a, 6b, 6c, 6d
When all four of these status inputs are energised the relay will operate the *Input 5 Operated* relay output. This acts as a four input AND gate. By assigning more than one of these labels to the same relay input, a 3 or a 2 input AND gate can be created.

Timer 1
When this is energised, timer 1 will start. If the Status Input remains energised for longer than the *Timer 1 pick-up delay* (see Reylogic Config) this will operate the *Timer 1 Operated* Output. When de-energised the output will drop-off after the Timer 1 Drop Off Delay. If the timer is de-energised before the *Timer 1 pick-up delay* it will reset to zero.

Timer 2
As above.

Counter 1 Count
Energising this SI will increment Counter 1 by 1. When the counter reaches the target set as *Counter 1 Target* (Reylogic Configuration) the output assigned to *Counter 1 Operated* will operate.

Counter 1 Reset
Energising this will reset *Counter 1* to Zero.

Counter 2 Count
Energising this SI will increment Counter 2 by 1. When the counter reaches the target set as *Counter 2 Target* (Reylogic Configuration) the output assigned to *Counter 2 Operated* will operate.

Counter 2 Reset
Energising this will reset *Counter 2* to Zero.

Trip Circuit Fail
This input is used to monitor the trip circuit for open circuit

Clock Sync
Energising this Status Input will cause the relay to reset to either the nearest minute or nearest second depending on the setting made in the System Config menu.

2.8 Output Config Menu

Depending upon the configuration of the relay there are a large number of signals which can be mapped to output contacts.

Protection Healthy
This output monitors the condition of the relay and dc power supply to the relay. This is usually mapped to one of the changeover outputs, and connected to the normally closed contact (by default relay 1). When this function is selected it will permanently operate the selected relay. By using a normally closed contact if there is any failure then this contact will close giving a fail-safe alarm condition.

Signal Send 1

Depending on the active scheme for Distance Protection, this output is used for Distance Protection Signalling. See Section 3 of this manual for a full description of this feature.

POR Weak Infeed
Indicates that the Weak Infeed logic for the distance protection POR scheme has operated.

DEF POR Weak Infeed
Indicates that the Weak Infeed logic for the DEF scheme has operated.

DEF Aided Trip
Operates when the operation of the DEF element has been “aided“ by the active DEF scheme (either permissive overreach [DEF POR], or blocked underreach [DEF BOR].

Signal Send 2
Operates when the DEF sends either a permissive or blocking signal to the remote end (depending on the selected scheme)

DEF Protection
Indicates operation of the forward DEF element, either as a back-up trip or a DEF Aided Trip

DEF Rev Protection
Indicates operation of the reverse DEF element.

Sig Recvd 2 Flag
Operates on receipt of a DEF signal from the remote end.

UV1 Alarm
Indicates that the Level 1 Undervoltage element (UV1) has operated.

UV 2 Alarm
Indicates that the Level 2 Undervoltage element (UV2) has operated.

UV Trip
If the Undervoltage tripping is Enabled, this output will operate when the relay carries out an undervoltage trip. The Trip Output will also operate.

SOTF Operated
Indicates that a Switch-onto-fault Operation has occurred.

VTS Alarm
Operates when one or more phases of the Voltage Transformer fails.

Trip Output
This is used as the initiation for the tripping of the local circuit breaker. Depending on the settings of the relay I may be operated by any of the distance elements, Highset Overcurrent, Directional Earth Fault, Sensitive Earth Fault, energisation of the *Trip and Auto-Reclose* Status Input, Under/Overvoltage tripping.

Trip Reset
This output gives a reset pulse immediately after the trip output has dropped off internally. The pulse will remain high for either 100ms or the minimum relay operating time (if set higher).

Phase A Fault / Phase B Fault / Phase C Fault
Indicates the phase(s) involved in the fault condition

Earth-fault
Operates when the fault involved an earth-fault comparator.

Zone 1 / Zone 2 / Zone 3 /Zone 4
Indicates the Zone (s) which operated. Note these outputs are not starters – they will have the same time-delayed operation as the zones themselves.

Aided Trip
Operates when the relay operation was aided by the active distance scheme, i.e. indicates whether it was a simple time stepped distance trip or not.

Sig Recvd 1 Flag
Operates on receipt of a signal from the remote end distance protection. It will mirror the operation of the Status Input.

Carrier Guard
Operates when the *Carrier Guard* Status Input is energised because of a faulty signalling channel.

Power Swing Alarm
Operates when the System impedance characteristic has entered the Power Swing Detection Zone and remained there for longer than the *PSD Transit time*.

Delta Trip Cnt Alarm
Operate when the Delta trip counter has reached the target set in the CB Maintenance menu.

Total Trip Cnt Alarm
Operate when the Total trip counter has reached the target set in the CB Maintenance menu.

High Set
Operates when the relay has tripped due to operation of the Highset Overcurrent Element.

Overvoltage Alarm
Operates when the Overvoltage Alarm Element has picked up.

Overvoltage
Operates when the Overvoltage Trip Element has picked up.

SEF Alarm
Operates when the measured residual current has been greater than the SEF current setting for longer than the SEF Alarm Delay.

SEF Protection
Operates that the measured residual current has been greater than the SEF current setting for longer than the SEF Trip Delay. This will operate the main *Trip Output.*

Close Pulse
The output operated when a Close Pulse is issued to the breaker. This contact is wired to the CB close coil.

Trip Relay Reset
This output will give a pulse when the deadtime starts - i.e. once the breaker has opened and the trip initiation has disappeared. This is wired to the reset coils of the electrically reset trip relays.

Lockout
Operates when the autorecloser has locked out

A/R Out of Service
Operates whenever the autorecloser is “Out of service”.

A/R In Service
Operates whenever the autorecloser is “in service”.

A/R In Progress
This remains operated from the time the relay issues a trip until the end of the reclaim time. If the autorecloser locks out, this output will remain operated until the lockout condition is reset.

Live Line
Operates when the Line is considered to be Live, determined by the Line Live/Dead setting. See section 12 for application of these settings.

Live Bus
Operates when the Busbar is considered to be Live, determined by the Bus Live/Dead setting. See section 12 for application of these settings.

In Sync
Operates whenever the Busbar and Line voltages are in synchronism. Note that this output will be energised whenever the voltages are in synchronism, not just during a check sync operation.

CB Open
Operates when all 3 breaker Open status inputs (phases A, B and C) are high.

CB Closed
Operates when all 3 breaker Closed status inputs (phases A, B and C) are high.

CB Failed To Close
Operates if the breaker has not closed by the end of the Close Pulse.

System Split
Operates when a System Split occurs, i.e. when the phase angle difference between the Busbar and Line voltages becomes greater than the Split Angle setting.

Successful Close
This is a fleeting contact which operates at the end of the reclaim time.

CB Failed to Open
Operates if the breaker has not opened by the end of the *CB Failed to Open Delay* setting. The status (open or closed) of the breaker is determined from the breaker auxiliary contacts.

Check Sync Start
Operates at the start of the dead time and drops off at the end of the close pulse.

Sync In Prog Flag
Operates when the Busbar and Line voltages are live and the relay is checking the synchronising conditions. This drops off when the breaker closes.

Close Onto Fault
Operates if the relay re-trips during the close pulse.

Delta CB Count Alarm
The Delta CB Close counter is incremented every time the relay carries out a close operation. This output will operate when the Delta close counter reaches the target set in the CB maintenance Menu.

Total CB Count Alarm
The Total CB Close counter is incremented every time the relay carries out a close operation. This output operates when the Total CB Close counter reaches the target set in the CB maintenance Menu.

CB Not In Ser Alarm
The CB is Not In service if it is closed and the line is dead.
This Alarm operates if the breaker is undergoing maintenance work, as determined by the Live Line Check feature. While the breaker is Not In Service the relay will not initiate an autoreclose sequence.

CB Memory
This output is active if the CB is closed and the line is live. This output has a 2 second drop off delay and will still be active for 2 seconds after the opening of an 'In Service' CB. This output must be active for an Autoreclose sequence to start.
If the Line voltage was dead for 2 seconds (the CB memory time) prior to the breaker opening, the breaker is determined as being Not In Service. This output indicates that the condition of the Line voltage is being checked. It will drop off after a trip signal is sent to the breaker and the CB memory time has elapsed.

A/R Not Allowed
Operates if the breaker is tripped while it is Not In Service.

Input 1 Operated
Operates when the Status Input assigned to *Input 1* is energised.

Input 1 Not Operated
Operates when the Status Input assigned to *Input 1* is de-energised. This can be used as an inverter.

Input 2 Operated
Operates when the Status Input assigned to *Input 2* is energised.

Input 2 Not Operated
Operates when the Status Input assigned to *Input 2* is de-energised. This can be used as an inverter.

Input 3 Operated
Operates when the Status Input assigned to *Input 3* is energised.

Input 4 Operated
Operates when the Status Input assigned to *Input 4* is energised.

Input 5 Operated
Operates when the inputs assigned to *Input 5a, Input 5b, Input 5c* and *Input 5d* are all energised

Input 6 Operated
Operates when the inputs assigned to *Input 6a, Input 6b, Input 6c* and *Input 6d* are all energised

Timer 1 Operated
Operates when the *Timer 1* SI is energised for longer than the *Timer 1 Pickup Delay*. Remains operated until that initiating status input is de-energised.

Timer 2 Operated
This will operate when the *Timer 2* SI is energised for longer than the *Timer 2 Pickup Delay*. Remains operated until that initiating status input is de-energised.

Counter 1 Operated
This will operate when Counter 1 has received a set number of pulse inputs. The operating point for counter 1 is set as *Counter 1 Target* in the Reylogic Config menu.

Counter 2 Operated (as above)
This will operate when Counter 2 has received a set number of pulse inputs. The operating point for counter 1 is set as *Counter 2 Target* in the Reylogic Config menu.

Trip Circuit Fail
Operates when the SI assigned to Trip Circuit Fail operates.

OC Guard
Operates when the Over-current Guard picks up - i.e. when the current is below the OC Guard setting on all phases - and a block is being applied to the Distance protection. This output will be operated during normal load conditions and is therefore used mainly for test purposes.

Hand Reset Outputs
Output contacts can be programmed to latch in once they have operated. This feature allows the user to select the contacts to be latched. They can subsequently be re-set by operation of the re-set button or a control signal.

2.9 Output Operate Time Menu

R1-27 Min Operate Time (0.1-60s) 0.10 s
Allows a minimum dwell time for the relay contact to be closed for. Nominally set to the minimum operating time of 100ms

2.10 LED Configuration Menu

With the exception of the “Protection Healthy” item, this menu has the same relay outputs as the output Configuration menu and these can be used to energise any of the LED flags.
Self Reset LEDs
Any LED selected her will reset when the stimulus is removed and therefore will not latch.

2.11 Communications Menu

Station Address (0, 1, … 254) **0**
Defines the relay address number. When set to zero, the relay will not communicate.

IEC870 on port (*COM1*, COM2)
Defines the port which uses IEC 870 Communication protocol. The front port and the top rear fibre Optic ports are denoted COM2. When using a PC to communicate locally with the relay, this should be set to COM2.
Note that this should not be confused with the comms port on the PC.

COM1 Baud Rate (75, 110, 300, 600, 1200, 2400, 4800, 9600, *19200*, 38400, 57600, 115200)
Defines the Baud rate used by the COM 1 of the relay to communicate with an external device. The relay and the external device must both be using the same baud rate in order for communications to be established.

COM1 Parity (Even, Odd, *None*)
Defines the type of Parity used by the COM 1 of the relay when communicating with an external device. The relay and the external device must both be using the parity in order for communications to be established.

COM1 Line Idle (Light On, **Light Off**)

For the Fibre Optic port. Defines whether the fibre optic light will be ON or OFF when the line is idle.

COM1 Data Echo (**Off**, On)
This setting must be switched on, to enable the relay to pass data around a ring system. If a number of relays are connected together, the data echo feature must be switched on to allow data transfer. When communicating with a single relay it may be easier to switch this setting to OFF.

COM2 Baud Rate (75, 110, 300, 600, 1200, 2400, 4800, 9600, **19200**, 38400, 57600, 115200)
Defines the Baud rate used by the COM 1 of the relay to communicate with an external device. The relay and the external device must both be using the same baud rate in order for communications to be established.

COM2 Parity (Even, Odd, **None**)
Defines the type of Parity used by the COM 2 of the relay when communicating with an external device. The relay and the external device must both be using the parity in order for communications to be established.

COM2 Line Idle (Light On, **Light Off**)
For the Fibre Optic port. Defines whether the fibre optic light will be ON or OFF when the line is idle.

COM2 Data Echo (**Off**, On)
This setting must be switched on, to enable the relay to pass data around a ring system. If a number of relays are connected together, the data echo feature must be switched on to allow data transfer. When communicating with a single relay it may be easier to switch this setting to OFF.

COM2 Direction (**Auto-Detect**, Rear Port, Front Port)
The relay has two external connections to COM port 2 – via the rear fibre optic connection or via the front RS232 connection. This defines which port is used. When set as auto-detect it will switch between ports depending on the connected devices.

2.12 CB Maintenance Menu

Total CB Trip Count Alarm (*OFF*, 1 – 9999)
Sets the number of trip operations after which the *Total CB Trip Cnt* output will operate.

Delta CB Trip Count Alarm (*OFF*, 1 – 9999)
Sets the number of trip operations after which the *Delta CB Trip Cnt* output will operate.

Total CB Close Count Alarm (1, 2, … 999) 100
Sets the number of close operations after which the *Total CB Close Cnt* output will operate.

Delta CB Close Count Alarm (1, 2, … 999) 20
Sets the number of close operations after which the *Delta CB Close Cnt* output will operate.

Reset Total CB Trip Count NO
Selecting this setting to YES will reset the counter. It will automatically reset to NO.

Reset Delta CB Trip Count NO
Selecting this setting to YES will reset the counter. It will automatically reset to NO.

Reset Total CB Close Count NO
Selecting this setting to YES will reset the counter. It will automatically reset to NO.

Reset Delta CB Close Count NO
Selecting this setting to YES will reset the counter. It will automatically reset to NO.

2.13 Data Storage Menu

Pre-trigger Storage (10 … 90%) 20 %
Sets the proportion of pre and post fault which will be stored in the waveform record.

Record Duration (10x1, 5x2, 2x5, 1x10) 10 Rec x 1 Sec
The relay can record 10 seconds of data. Normally the relay is arranged to store 1 a total of ten 1-second records. The size of those records can be changed, though the total length of data stored will not be changed. Thus the relay can store either ten 1-second records, five 2-second records, two 5-second records or one tens second record. Whenever a trip occurs the relay will trigger waveform storage and the oldest record in the memory will be overwritten.

2.14 Fault Locator Menu

Pos Seq Line Impedance (0.1 – 250 Ω) 10 Ω
This is the positive sequence impedance of 100% of the line.

Sec'y Z+ per unit distance (0.1 – 250Ω) 0.500 Ω
Defines the secondary positive sequence impedance per mile or kilometre.

Display distance as (*Percent*, Kilometres, Miles)
Defines whether the distance is displayed as a distance or as a percentage of the Pos Seq Line Impedance setting.

Fault Locator (*Enabled*, Disabled)
Allows the fault locator to be enabled or disabled.

Menu Structure