

7SG1633 Ohmega 311

Protection Relay

Document Release History

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Pre release

2010/02	Document reformat due to rebrand

Software Revision History

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1 Menu settings

Software Version

2615H80026R9

50Hz

System Config Menu

Setting	Range	Default
Active Group	1, 2, ... 8	1
Alternate Setting Group	1, 2, ... 8	1
CT Ratio	0, 100, ..., 5000: 1,2,5	2000:1
VT Ratio	1000, 1100, ..., 10000, 11000, ..., 600000: 90, 95, ..., 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
View/Edit Group	1, 2, ... 8	1
Date		1/ 1/1980
Time		00:21:16
Change Password	AAAA ... ZZZZ	NONE
Relay Identifier	Up to 16 characters	OHMEGA-311-50

Distance Protection Menu

Setting	Range	Default
Active Scheme	PUR, POR1, POR2, Acceleration, Time Stepped	PUR
Carrier Guard	Disabled, Enabled	Enabled
CT Secondary	1, 2, 5 A	1 A
Line Angle	0, 5, ..., 90°	75 deg
EF Comp Z0/Z1 ratio	0, 0.01, ..., 10.00	2.50
EF Comp Z0 angle	0, 5, ..., 355°	75 deg
Z1 Extension	Enabled, Disabled	Enabled
Z1 Phase Fault	Enabled, Disabled	Enabled
Z1 PF Impedance	0.5, 0.51, ..., 9.99, 10.1, 10.2, ..., 100, 101,, 250 Ω	8.00 Ohms
Z1X PF Impedance	0.5, 0.51, ..., 9.99, 10.1, 10.2, ..., 100, 101,, 250 Ω	12.00 Ohms
Z1 PF Time Delay	0, 10, ..., 10000 ms	0 ms
Z1 Earth Fault	Enabled, Disabled	Enabled
Z1 EF Impedance	0.5, 0.51, ..., 9.99, 10.1, 10.2, ..., 100, 101,, 250 Ω	8.00 Ohms
Z1X EF Impedance	0.5, 0.51, ..., 9.99, 10.1, 10.2, ..., 100, 101,, 250 Ω	12.00 Ohms
Z1 EF Time Delay	0, 10, ..., 10000 ms	0 ms
Z2 Phase Fault	Enabled, Disabled	Enabled
Z2 PF Impedance	0.5, 0.51, ..., 9.99, 10.1, 10.2, ..., 100, 101,, 250 Ω	16.00 Ohms
Z2 PF Time Delay	0, 10, ..., 10000 ms	1000 ms
Z2 Earth Fault	Enabled, Disabled	Enabled
Z2 EF Impedance	0.5, 0.51, ..., 9.99, 10.1, 10.2, ..., 100, 101,, 250 Ω	16.00 Ohms
Z2 EF Time Delay	0, 10, ..., 10000 ms	1000 ms
Z3 Phase Fault	Enabled, Disabled	Enabled
Z3 PF Type	Fwd Mho, Rev Mho, Offset Mho	Offset Mho
Z3 PF Impedance (Fwd)	0.5, 0.51, ..., 9.99, 10.1, 10.2, ..., 100, 101,, 250 Ω	24.00 Ohms

Z3 PF Impedance (Rev)	0.5, 0.51, ..., 9.99, 10.1, 10.2, ..., 100, 101,, 250 Ω	8.00 Ohms
Z3 PF Time Delay	0, 10, ..., 10000 ms	2000 ms
Z3 Earth Fault	Enabled, Disabled	Enabled
Z3 EF Type	Fwd Mho, Rev Mho, Offset Mho	Offset Mho
Z3 EF Impedance (Fwd)	0.5, 0.51, ..., 9.99, 10.1, 10.2, ..., 100, 101,, 250 Ω	24.00 Ohms
Z3 EF Impedance (Rev)	0.5, 0.51, ..., 9.99, 10.1, 10.2, ..., 100, 101,, 250 Ω	8.00 Ohms
Z3 EF Time Delay	0, 10, ..., 10000 ms	2000 ms
POR Weak Infeed Tripping	Disabled, Enabled	Disabled
WI Voltage Level	5 – 85 V	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	Enabled, Disabled	ENABLE
PSD Zone blocking	Zone1 Zone 2 Zone 3	Zone2-3
PSD Shape	Circular, Rectangular	CIRCULAR
PSD Blinders	Enabled, Disabled	DISABLE
PSD Inner Fwd Impedance	0.1, 0.2, ... 250Ω	24.0 Ohms
PSD Inner Rev Impedance	0.1, 0.2, ... 250Ω	8.0 Ohms
PSD Inner Fwd Blinder	0.1, 0.2, ... 250Ω	16.0 Ohms
PSD Inner Rev Blinder	0.1, 0.2, ... 250Ω	16.0 Ohms
PSD Outer Multiplier	1.05, 1.06, ... 2.00x	1.50 x
PSD Transit Time	0, 5, ... 1000ms	50 ms

Aux Protection Menu

Setting	Range	Default
High Set	Enabled, Disabled	Enabled
HS Level	4, 4.25, ..., 35 xIn	4.00 xIn
HS Time Delay	0, 1, ..., 1000ms	0 ms
SOTF	Enabled, Disabled	Enabled
SOTF Mode	AC SOTF, DC SOTF	AC SOTF
SOTF O/C Operate Level	Enabled, Disabled	0.30 xIn
AC SOTF Pickup Delay	0, 1, ..., 1000, 1010, ..., 10000, 10100, ..., 60000ms	10000 ms
Min AUX DC SOTF Dead Time	0 – 60000 ms	10000ms
VT Supervision	Enabled, Disabled	Enabled
VTS Latched Operation	Enabled, Disabled	Enabled
VTS Mode	Alarm Only, Alarm & Inhibit	Alarm & Inhibit
VTS Phase Fault Inhibit	Enabled, Disabled	Enabled
VTS Input Source	RES I/V, NPS I/V	RES I/V
VTS Ires Level	0.05, 0.1, ..., 2 xIn	0.30 xIn
VTS Vop Level	1, 2, .., 100 V	20 V
VTS Alarm PU Delay	0, 1, ..., 1000, 1010, ..., 10000, 10100, ..., 60000ms	0 ms
VTS Latch PU Delay	0, 1, ..., 1000, 1010, ..., 10000, 10100, ..., 60000ms	1 ms
CBF	Enabled, Disabled	Enabled
CBF Setting	0.05, 0.055, ...2.000	0.2 xIn
CBF ReTrip Delay	0, 1, ..., 1000, 1010, ..., 10000, 10100, ..., 60000ms	60 ms
CBF Backtrip Delay	0, 1, ..., 1000, 1010, ..., 10000, 10100, ..., 60000ms	120 ms
DEF Protection	Enabled, Disabled	Enabled
DEF Active Scheme	DEF POR, DEF Direct Trip	DEF POR

DEF Char Angle	-15, -10, ... 95°	-45 deg
DEF Direction	Forward, Reverse	Forward
DEF IDMTL Setting	0.05, 0.10, ... 4.00 xIn	1.00 xIn
DEF IDMTL Char	IEC – NI, VI, EI, LTI : ANSI – MI, VI, EI DTL	IEC-NI
DEF IDMTL Time Mult (IEC/ANSI)	0.025 – 1.6	1
DEF IDMTL Delay (DTL)	INST, 0.01 – 20	5s
DEF IDMTL Reset	(ANSI) DECAIVING, 1-60	INST
DEF WI Res OV Setting	0,1, ... 20V	1 V
DEF Current Rev Reset	0, 1, ..., 1000, 1010, ..., 10000, 10100, ..., 60000ms	200 ms
CB Echo Pulse Width	0, 1, ..., 1000, 1010, ..., 10000, 10100, ..., 60000ms	250 ms
Trip Circuit Fail	Enabled, Disabled	Disabled
Broken Conductor	Enabled, Disabled	Disabled
BC Tripping	Enabled, Disabled	Enabled
BC Lower Setting	0.05, 0.1 ... 1.8	0.1 xIn
BC Upper Setting	0.05, 0.1 ... 1.8	0.5 xIn
BC Alarm Delay	0, 1, ..., 1000, 1010, ..., 10000, 10100, ..., 60000ms	100 ms
BC Trip Delay	0, 1, ..., 1000, 1010, ..., 10000, 10100, ..., 60000ms	10000 ms

Autoreclose Menu

Setting	Range	Default
A/R In Service	In, Out	Out
Dead Bar Charge	Enabled, Disabled	Disabled
Dead Line Charge	Enabled, Disabled	Disabled
Dead Line & Dead Bar Close	Enabled, Disabled	Disabled
Check Sync Close	Enabled, Disabled	Enabled
Unconditional Close	Enabled, Disabled	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	0.1, 0.2, ... 120.0, 121.0, ... 900.0s	5.0 s
Live Line Check	Disabled, Enabled	Enabled
Check Sync During Deadtime	Enabled, Disabled	Enabled
VT Fail Lockout	Disabled, Enabled	Disabled
CB Close Pulse	0.2, 0.3, ... 20.0s	2.0 s
Reclaim Time	OFF, 1, 2, ... 600s	5 s
Dead Line Charge Delay	0 – 60s	0s
Dead Bar Charge Delay	0 – 60s	0s
Reclose Blocked Delay	0, 1, ... 600s	60 s
Sync Close Delay	0, 1, ... 60s	30 s
Sequence Fail Timer	OFF, 1, 2, ... 200s	Off s
CB Fail To Open Delay	50, 60, ... 2000ms	100 ms
Minimum LO Timer	0, 1, ... 60s	2 s
Reset LO By Timer	Enabled, Disabled	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
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Sync Connection	Phase B-Earth, Phase A-Phase B	Phase B-Earth
Check Sync Vnom	63.5, 110V	63.5V
Bus : Dead Live	5, 6, ... 150% 10, 11, ... 155%	20% 90 %
Line: Dead Live	5, 6, ... 150% 10, 11, ... 155%	20% 90 %
Bus Undervolts	OFF, 5, 6, ... 150%	90 %
Line Undervolts	OFF, 5, 6, ... 150%	90 %
Voltage Differential	OFF, 1, 2, ... 100%	10 %
Split Angle	OFF, 95, 96, ... 175°	175 deg
MC Split Action	System Sync, Check Sync	System Sync
A/R Split Action	Lockout, System Sync	Lockout
Check Sync Angle	5, 6, ... 90°	20 deg
Check Sync Slip	OFF, 10, 15, ... 2000mHz	50 mHz
Check Sync Timer	OFF, 0.1, 0.2, ... 100.0s	OFF s
System Sync Angle	5, 6, ... 90°	10 deg
Sys Sync Slip Frequency	OFF, 10, 15, ... 2000mHz	125 mHz
System Sync Timer	OFF, 0.1, 0.2, ... 100.0s	OFF s

Reylogic Config Menu

Setting	Range	Default
SR Dropoff	0, 1, ..., 1000, 1010, ..., 10000, 10100, ..., 60000ms	1 ms
SS Dropoff	0, 1, ..., 1000, 1010, ..., 10000, 10100, ..., 60000ms	1 ms
SR2 Dropoff	0, 1, ..., 1000, 1010, ..., 10000, 10100, ..., 60000ms	1 ms
SS2 Dropoff	0, 1, ..., 1000, 1010, ..., 10000, 10100, ..., 60000ms	1 ms
Timer 1 Pickup Delay	0, 1, ..., 1000, 1010, ..., 10000, 10100, ..., 60000ms	0 ms
Timer 1 Dropoff Delay	0, 1, ..., 1000, 1010, ..., 10000, 10100, ..., 60000ms	0 ms
Timer 2 Pickup Delay	0, 1, ..., 1000, 1010, ..., 10000, 10100, ..., 60000ms	0 ms
Timer 2 Dropoff Delay	0, 1, ..., 1000, 1010, ..., 10000, 10100, ..., 60000ms	0 ms
Counter 1 Target	1, 2, ..., 60000	1
Counter 2 Target	1, 2, ..., 60000	1

Status Config Menu

Setting	Range	Default
Signal Receive 1	NONE, 1...27	1
Carrier Guard	NONE, 1...27	NONE
Block Reach Ext	NONE, 1...27	NONE
Signal Receive 2	NONE, 1...27	2
Block DEF	NONE, 1...27	NONE
DC SOTF Manual Close	NONE, 1...27	8
Start AUX DC SOTF	NONE, 1...27	NONE
VT Circuits Isolated	NONE, 1...27	NONE
Trigger Storage	NONE, 1...27	NONE
Increment Trip Count	NONE, 1...27	NONE
Reset Total Trip Cnt	NONE, 1...27	NONE
Reset Delta Trip Cnt	NONE, 1...27	NONE
Reset Total CB Close	NONE, 1...27	NONE
Use Alt Setting Grp	NONE, 1...27	NONE
Block Reclose	NONE, 1...27	7
A/R Out	NONE, 1...27	NONE

A/R In	NONE, 1...27	NONE
Go Direct To Lockout	NONE, 1...27	NONE
Trip And Reclose	NONE, 1...27	NONE
External A/R Start	NONE, 1...27	6
Reset Lockout	NONE, 1...27	5
Sync Override	NONE, 1...27	NONE
Manual Sync Override	NONE, 1...27	NONE
CB Phase A Closed	NONE, 1...27	3
CB Phase B Closed	NONE, 1...27	3
CB Phase C Closed	NONE, 1...27	3
CB Phase A Open	NONE, 1...27	4
CB Phase B Open	NONE, 1...27	4
CB Phase C Open	NONE, 1...27	4
Manual close	NONE, 1...27	NONE
Reset Delta CB Close	NONE, 1...27	NONE
Input 1	NONE, 1...27	1
Input 2	NONE, 1...27	2
Input 3	NONE, 1...27	3
Input 4	NONE, 1...27	4
Input 5a	NONE, 1...27	NONE
Input 5b	NONE, 1...27	NONE
Input 5c	NONE, 1...27	NONE
Input 5d	NONE, 1...27	NONE
Input 6a	NONE, 1...27	NONE
Input 6b	NONE, 1...27	NONE
Input 6c	NONE, 1...27	NONE
Input 6d	NONE, 1...27	NONE
Timer 1	NONE, 1...27	NONE
Timer 2	NONE, 1...27	NONE
Counter 1 Count	NONE, 1...27	NONE
Counter 1 Reset	NONE, 1...27	NONE
Counter 2 Count	NONE, 1...27	NONE
Counter 2 Reset	NONE, 1...27	NONE
Trip Circuit Fail	NONE, 1...27	NONE
CBF External Trip	NONE, 1...27	NONE
CBF Inhibit	NONE, 1...27	NONE
Clock Sync.	NONE, 1...27	NONE

Output Config Menu

Setting	Range	Default
Protection Healthy	NONE, 1...29	1
Signal Send 1	NONE, 1...29	6
POR Weak Infeed	NONE, 1...29	NONE
DEF Aided Trip	NONE, 1...29	NONE
Signal Send 2	NONE, 1...29	7
DEF Protection	NONE, 1...29	NONE
Sig Recvd 2 Flag	NONE, 1...29	NONE
SOTF Operated	NONE, 1...29	12
VTS Alarm	NONE, 1...29	11
Trip Output	NONE, 1...29	4
Phase A Fault	NONE, 1...29	NONE
Phase B Fault	NONE, 1...29	NONE
Phase C Fault	NONE, 1...29	NONE
Earth Fault	NONE, 1...29	NONE
Zone 1	NONE, 1...29	8
Zone 2	NONE, 1...29	9
Zone 3	NONE, 1...29	10
Aided Trip	NONE, 1...29	NONE

Sig Recvd 1 Flag	NONE, 1...29	NONE
Carrier Guard	NONE, 1...29	NONE
Power Swing Alarm	NONE, 1...29	NONE
Delta Trip Cnt Alarm	NONE, 1...29	NONE
Total Trip Cnt Alarm	NONE, 1...29	NONE
High Set	NONE, 1...29	13
Close Pulse	NONE, 1...29	5
Trip Relay Reset	NONE, 1...29	NONE
Lockout	NONE, 1...29	NONE
A/R Out of Service	NONE, 1...29	NONE
A/R In Service	NONE, 1...29	NONE
A/R In Progress	NONE, 1...29	NONE
Live Line	NONE, 1...29	NONE
Live Bus	NONE, 1...29	NONE
In Sync	NONE, 1...29	NONE
CB Open	NONE, 1...29	NONE
CB Closed	NONE, 1...29	NONE
CB Failed To Close	NONE, 1...29	NONE
System Split	NONE, 1...29	NONE
Successful Close	NONE, 1...29	NONE
CB Failed to Open	NONE, 1...29	NONE
Check Sync Start	NONE, 1...29	NONE
Sync In Prog Flag	NONE, 1...29	NONE
Close Onto Fault	NONE, 1...29	NONE
Delta CB Count Alarm	NONE, 1...29	NONE
Total CB Count Alarm	NONE, 1...29	NONE
CB Not In Ser Alarm	NONE, 1...29	NONE
CB Memory	NONE, 1...29	NONE
A/R Not Allowed	NONE, 1...29	NONE
Input 1 Operated	NONE, 1...29	NONE
Input 1 Not Operated	NONE, 1...29	NONE
Input 2 Operated	NONE, 1...29	NONE
Input 2 Not Operated	NONE, 1...29	NONE
Input 3 Operated	NONE, 1...29	NONE
Input 4 Operated	NONE, 1...29	NONE
Input 5 Operated	NONE, 1...29	NONE
Input 6 Operated	NONE, 1...29	NONE
Timer 1 Operated	NONE, 1...29	NONE
Timer 2 Operated	NONE, 1...29	NONE
Counter 1 Operated	NONE, 1...29	NONE
Counter 2 Operated	NONE, 1...29	NONE
BC Trip	NONE, 1...29	NONE
BC Phase A alarm	NONE, 1...29	NONE
BC Phase B alarm	NONE, 1...29	NONE
BC Phase C alarm	NONE, 1...29	NONE
Trip Circuit Fail	NONE, 1...29	NONE
CBF Retrip	NONE, 1...29	NONE
CBF Backtrip	NONE, 1...29	NONE
IRIG-B Synch	NONE, 1...29	NONE
Hand Reset Outputs	NONE, 1...29	NONE

Output Operate Time Menu

Setting	Range	Default
R1 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R2 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R3 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R4 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R5 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s

R6 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R7 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R8 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R9 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R10 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R11 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R12 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R13 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R14 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R15 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R16 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R17 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R18 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R19 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R20 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R21 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R22 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R23 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R24 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R25 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R26 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R27 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R28 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s
R29 Min Operate Time	0.1, 0.12, ..., 2, 2.1, ..., 20, 21, ..., 60s	0.10 s

Led Config Menu

Setting	Range	Default
Signal Send 1	NONE, 1...32	NONE
POR Weak Infeed	NONE, 1...32	NONE
DEF Aided Trip	NONE, 1...32	15
Signal Send 2	NONE, 1...32	NONE
DEF Protection	NONE, 1...32	12
Sig Recvd 2 Flag	NONE, 1...32	14
SOTF Operated	NONE, 1...32	17
VTs Alarm	NONE, 1...32	18
Trip Output	NONE, 1...32	NONE
Trip Reset	NONE, 1...32	NONE
Phase A Fault	NONE, 1...32	6
Phase B Fault	NONE, 1...32	7
Phase C Fault	NONE, 1...32	8
Earth Fault	NONE, 1...32	9
Zone 1	NONE, 1...32	1
Zone 2	NONE, 1...32	2
Zone 3	NONE, 1...32	3
Aided Trip	NONE, 1...32	11
Sig Recvd 1 Flag	NONE, 1...32	10
Carrier Guard	NONE, 1...32	NONE
Power Swing Alarm	NONE, 1...32	24
Delta Trip Cnt Alarm	NONE, 1...32	NONE
Total Trip Cnt Alarm	NONE, 1...32	NONE
High Set	NONE, 1...32	19
Trip Relay Reset	NONE, 1...32	NONE
Close Pulse	NONE, 1...32	NONE
Lockout	NONE, 1...32	31
A/R In Service	NONE, 1...32	NONE
A/R Out of Service	NONE, 1...32	NONE
A/R In Progress	NONE, 1...32	30
Live Line	NONE, 1...32	NONE

Live Bus	NONE, 1...32	NONE
In Sync	NONE, 1...32	NONE
CB Open	NONE, 1...32	32
CB Closed	NONE, 1...32	NONE
CB Failed To Close	NONE, 1...32	26
System Split	NONE, 1...32	28
Successful Close	NONE, 1...32	NONE
CB Failed to Open	NONE, 1...32	26
Check Sync Start	NONE, 1...32	NONE
Sync In Prog Flag	NONE, 1...32	27
Close Onto Fault	NONE, 1...32	NONE
Delta CB Count Alarm	NONE, 1...32	26
Total CB Count Alarm	NONE, 1...32	26
CB Not In Ser Alarm	NONE, 1...32	NONE
CB Memory	NONE, 1...32	NONE
A/R Not Allowed	NONE, 1...32	NONE
Input 1 Operated	NONE, 1...32	NONE
Input 1 Not Operated	NONE, 1...32	NONE
Input 2 Operated	NONE, 1...32	NONE
Input 2 Not Operated	NONE, 1...32	NONE
Input 3 Operated	NONE, 1...32	NONE
Input 4 Operated	NONE, 1...32	NONE
Input 5 Operated	NONE, 1...32	NONE
Input 6 Operated	NONE, 1...32	NONE
Timer 1 Operated	NONE, 1...32	NONE
Timer 2 Operated	NONE, 1...32	NONE
Counter 1 Operated	NONE, 1...32	NONE
Counter 2 Operated	NONE, 1...32	NONE
BC Trip	NONE, 1...32	NONE
BC Phase A alarm	NONE, 1...32	NONE
BC Phase B alarm	NONE, 1...32	NONE
BC Phase C alarm	NONE, 1...32	NONE
Trip Circuit Fail	NONE, 1...32	NONE
CBF Retrip	NONE, 1...32	NONE
CBF Backtrip	NONE, 1...32	NONE
IRIG-B Synch	NONE, 1...32	NONE
Self Reset LEDs	NONE, 1...32	10,14,18,20,22,24,

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

Communications Menu

Setting	Range	Default
Station Address	0, 1, ... 254	0
IEC870 on port	COM1, COM2	COM1
COM1 Baud Rate	75, 110, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200	19200
COM1 Parity	Even, Odd, None	EVEN
COM1 Line Idle	Light On, Light Off	LIGHT OFF
COM1 Data Echo	Off, On	OFF
COM2 Baud Rate	75, 110, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200	19200
COM2 Parity	Even, Odd, None	NONE

Setting	Range	Default
COM2 Line Idle	Light On, Light Off	LIGHT OFF
COM2 Data Echo	Off, On	OFF
COM2 Direction	Auto-Detect, Rear Port, Front Port	AUTO-DETECT

CB Maintenance Menu

Setting	Range	Default
Total CB Trip Count Alarm	OFF, 1, 2, ..., 9999	OFF
Delta CB Trip Count Alarm	OFF, 1, 2, ..., 9999	OFF
Total CB Close Count Alarm	1, 2, ... 999	100
Delta CB Close Count Alarm	1, 2, ... 999	20
Reset Total CB Trip Count		NO
Reset Delta CB Trip Count		NO
Reset Total CB Close Count		No
Reset Delta CB Close Count		No

Fault Locator Menu

Setting	Range	Default
Pos Seq Line Impedance	0.1, 0.11, ..., 10, 10.1, ..., 100, 101, ..., 250 Ω	10.00
Sec'y Z+ per unit distance	0.001, 0.002, ..., 5 Ω	0.500
Display distance as	Percent, Kilometres, Miles	Percent
Fault Locator	Enabled, Disabled	Enabled

2 APPENDIX A 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 \Rightarrow can be pressed to choose a different list ("**INSTRUMENTS MODE**" or "**FAULT DATA MODE**"). Press the down arrow key \Downarrow . The relay enters the settings list and displays "**SYSTEM CONFIG MENU**".

SYSTEM CONFIG MENU

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

Active Group

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

It is possible to cause the relay to switch from one setting group to another on application of a signal to a status input (Use Alt Setting Grp). When this status input is made high 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 setting group when the status input is de-energised.

CT Ratio

The protection CT ratio can be set. This will allow the meter display to show the correct primary current. This setting does not affect any protection functions.

VT Ratio

The protection VT ratio can be set. This will allow the meter display to show the correct primary voltage. This setting does not affect any protection functions.

CVT in Use

Specifies whether Capacitive Voltage Transformers are in use as oppose to traditional Electromagnetic VTs.

Clock Sync. From Status

The relay can synchronise its internal clock from pick-up of a status input. The relay can be set to synchronise the minutes or seconds.

Defaults Screens Timer

Time delay after which display will return to the top of the menu.

Backlight Timer

If no keys are pressed for this time delay, the relay will turn off the backlight.

View/Edit Group

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.

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

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. If the password has been lost then an authorised person must contact a Reyrolle Protection representative.

Relay Identifier

The relay is supplied with a default identifier usually the relay model. This can be changed to give any meaningful identification to the relay. eg feeder name or circuit number.

DISTANCE PROTECTION MENU

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

Active Scheme

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

Allows the carrier guard function of the active scheme to be disabled between settings groups.

CT Secondary

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

This is the positive sequence characteristic fault angle of the composite transmission line.

EF Comp Z0/Z1 ratio

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

This is the zero sequence characteristic fault angle for the earth fault component.

Z1 Extension

This setting is used to switch on/off the extended zone 1 used in the Reach Extension scheme.

Z1 Phase Fault

The zone 1 phase fault elements A-B, B-C, C-A, can be disabled from this setting. No other elements are affected.

Z1 PF Impedance

The zone 1 phase fault impedance values are applied using this setting. The values are in terms of secondary positive sequence impedance.

Z1X PF Impedance

The zone 1 extension phase fault impedance values are applied using this setting. The values are in terms of secondary positive sequence impedance.

Z1 PF Time Delay

An independent time delay from 0 – 10s can be applied to the zone 1 phase fault protection elements.

Z1 Earth Fault

The zone 1 earth fault elements A-E, B-E, C-E, can be disabled from this setting. No other elements are affected.

Z1 EF Impedance

The zone 1 earth fault impedance reach for the mho characteristic is applied using this setting. This allows a reach setting which is independent from the phase fault setting.

Z1X EF Impedance

The zone 1 earth extension fault impedance reach for the mho characteristic is applied using this setting. This allows a reach setting which is independent from the phase fault setting.

Z1 EF Time Delay

An independent time delay from 0 – 10s can be applied to the zone 1 earth fault protection elements.

Z2 Phase Fault

The zone 2 phase fault elements A-B, B-C, C-A, can be disabled from this setting. No other elements are affected.

Z2 PF Impedance

The zone 2 phase fault impedance values are applied using this setting. The values are in terms of secondary positive sequence impedance.

Z2 PF Time Delay

An independent time delay from 0 – 10s can be applied to the zone 2 phase fault protection elements.

Z2 Earth Fault

The zone 2 earth fault elements A-E, B-E, C-E, can be disabled from this setting. No other elements are affected.

Z2 EF Impedance

The zone 2 earth fault impedance values are applied using this setting. The values are in terms of secondary positive sequence impedance. This allows a reach setting which is independent from the phase fault setting.

Z2 EF Time Delay

An independent time delay from 0 – 10s can be applied to the zone 1 earth fault protection elements.

Z3 Phase Fault

The zone 3 phase fault elements A-B, B-C, C-A, can be disabled from this setting. No other elements are affected.

Z3 PF Type

There are three types of zone 3 characteristic, Offset Mho, Forward (Fwd) Mho, Reverse (Rev) Mho. If either forward or reverse is selected then these elements become a standard directional element and require a polarising voltage. If an offset Mho characteristic is selected, then operation can occur without polarising voltage.

Z3 PF Impedance (Fwd)

The zone 3 phase fault forward reach impedance values are applied using this setting. The values are 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)

The zone 3 phase fault reverse reach impedance values are applied using this setting. The values are 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

An independent time delay from 0 – 10s can be applied to the zone 3 phase fault protection elements.

Z3 Earth Fault

The zone 3 earth fault elements A-E, B-E, C-E, can be disabled from this setting. No other elements are affected.

Z3 EF Type

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

Z3 EF Impedance (Fwd)

The zone 3 earth fault forward reach impedance values are applied using this setting. The values are in terms of secondary positive sequence impedance. If the element is selected as a reverse element then this setting is ignored.

Z3 EF Impedance (Rev)

The zone 3 earth fault reverse reach impedance values are applied using this setting. The values are in terms of secondary positive sequence impedance. If the element is selected as a forward element then this setting is ignored.

Z3 EF Time Delay

An independent time delay from 0 – 10s can be applied to the zone 3 earth fault protection elements.

POR Weak Infeed Tripping

Allows the main trip contacts to operate for a weak infeed fault detection.

WI Voltage Level

Sets the phase-neutral voltage below which a Weak Infeed fault can be detected.

POR Current Rev Reset

Sets the time for which tripping is disabled during a current reversal to allow the permissive signal receive to drop off.

POR CB Echo Pulse

Length of pulse returned to sending end if local CB is open in POR scheme.

LOL Level

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, and the current in the remaining phase(s) is above the level, and there is a residual voltage on the system. The relay will detect a loss of load condition (i.e the remote end breaker has opened) and allow instantaneous tripping of the zone 2 element, for a fixed time window.

LOL CB Op Delay

This delay allows for pole scatter between phases when the breaker opens.

LOL Time Limit

Maximum time after a loss of load condition is detected for which the Zone2 time delay will be removed.

Power Swing Detector

This setting allows the power swing detector to be enabled or disabled

PSD Zone Blocking

This defines which zones of protection tripping would be blocked for in the event of a power swing.

PSD Shape

Allows setting of the power swing zone characteristics as either rectangular or circular.

PSD Blinders

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

Sets the inner impedance reach in the forward direction (on the line angle) for the PSD characteristic. This must be set equal to or greater than the Zone three reach.

PSD Inner Rev Impedance

Sets the inner impedance reach in the reverse direction (on the line angle) for the PSD characteristic. This must be set equal to or greater than the Zone three reverse reach.

PSD Inner FWD Blinder

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.

PSD Inner FWD Blinder

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.

PSD Outer Multiplier

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

This is the length of time for which the impedance characteristic must be between the inner and out zone of the Power Swing Detector for a Power Swing to be detected.

AUX PROTECTION MENU

Any additional protection elements are programmed in this section.

High Set

Overcurrent high set elements can be enabled or disabled using this setting.

HS Level

The overcurrent setting is applied here. It is set in multiples of I_n which is set in the DISTANCE PROTECTION MENU under the CT Secondary setting.

HS Time Delay

A time delay from 0 – 1s can be added to the instantaneous operating time of the high set elements.

SOTF

This setting determines whether the DEF Protection is enabled or not.

SOTF Mode

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. The AC SOTF function can be used if the VT is on the bus bar side of the relay.

SOTF O/C Operate Level

The Switch On To Fault feature has two modes of operation.

AC SOTF Pickup Delay

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

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

This checks for the security of the VT circuit. It can be enabled or disabled.

VTS Latched Operation

Specifies if the VTS is Latched-in or will reset if the sequence current increases to a level above the applied VTS setting.

VTS Mode

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

During a fault condition the VTS is reset when the 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. This setting allows VTS to be disabled for phase faults. NPS will be generated during a phase fault, so if the VTS mode is set to NPS, Phase Fault Inhibit can always be enabled.

VTS Input Source

The method of operation of the VTS function can be based on Negative Sequence components or Zero Sequence components.

VTS Ires Level

During an earth fault condition the zero sequence current is used to reset the VTS element and allow tripping. The current setting is in terms of I_n .

VTS Vop Level

The VTS feature operated by measuring the summated voltages of the healthy system. If a fuse blows then the resultant voltage is used to operate the VTS function. A nominal 20 volts is used but this can be changed to make the function more or less sensitive.

VTS Alarm Op Delay

If the VTS operates a time delay for the alarm can be set to prevent unwanted alarm signals during temporary system voltage unbalances.

VTS Latch PU Delay

This setting specifies the time allowed after a VTS detection within which VTS will reset if the sequence current increases above the setting. After expiry of this time, the VTS condition will be latched.

CBF

This setting allows the Circuit Breaker Fail function to be turned off and on.

CBF Setting

This sets the current level, as a multiple of I_n , above which it is considered that the Circuit Breaker must be closed.

CBF ReTrip Delay

This is the time after the trip output at which the CB Fail Re-Trip is issued if the current is still above the CBF Setting.

CBF Backtrip Delay

This is the time after the trip output at which the CB Fail Back-Trip is issued if the current is still above the CBF Setting.

DEF Protection

This setting determines whether the DEF Protection is enabled or not.

DEF Active Scheme.

There are two active schemes for the relay.

The first is DEF POR (permissive overreach). This is designed to be used in conjunction with a signalling channel. When the DEF element operates it sends a permissive signal to the remote end. In order to trip instantaneously on DEF the relay must detect a DEF and have received a signal from the remote end.

In the other mode, DEF Direct Trip, the relay will trip on detecting an earth fault in the set direction. This mode is intended for used mainly to simplify commissioning.

DEF Char Angle.

This represents the maximum torque angle of the directional relay. Operation will occur for angles in the range $\pm 85^\circ$ of this setting. This should be set to the zero sequence impedance angle of the protected feeder.

DEF Direction.

The directionality of the relay can be set to either forward or reverse. With the relay set to forward operation will occur for fault current occurring within the forward operating zone. With the relay set to reverse operation will occur for fault current occurring within the reverse operating zone.

DEF IDMTL Setting.

This is the level of residual current at which the DEF element picks up.

DEF IDMTL Char

Allows selection of the DEF characteristic as various ANSI or IEC curves.

DEF IDMTL Time Mult (IEC/ANSI)

Setting for the IDMTL Time Multiplier.

DEF Time Delay (DTL)

This setting provides a time delay on pick-up which is applied to an Aided DEF trip (in DEF POR mode), or Direct DEF trip (in DEF direct mode).

DEF IDMTL Reset

This allows a ANSI reset characteristic to be selected to replace the default instantaneous setting.

DEF WI Res OV Level.

This checks the residual voltage to determine whether or not a Weak Infeed DEF fault is present.

DEF Current Rev Reset.

This determines the length of time after a current reversal for which the current reversal logic is active.

CB Echo Pulse Width.

This determine the length of signal which is echoed back to the send end when the remote end is open.

Trip Circuit Fail

Allows the Trip Circuit Supervision function to be disabled.

Broken Conductor

This setting allows the Broken Conductor function to be turned on and off.

BC Tripping

This setting allows the Broken Conductor Alarm to be used without a Broken Conductor Trip ever being issued. When the Tripping is disabled, the Alarm will still operate correctly.

BC Lower Setting

This is the current level below which a phase is considered OFF or Broken.

BC Upper Setting

This is the current level above which a phase is considered ON or Unbroken.

BC Alarm delay

This is the DTL for which the Broken Conductor function must be operated before an Alarm is issued.

BC Trip delay

This is the DTL for which the Broken Conductor function must be operated before a trip is issued.

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 considered 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.

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 Ohmegs 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, **175Deg**)

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 is being used in conjunction with older recloser systems (i.e. 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.

REYLOGIC CONFIG MENU

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

SR Dropoff

The signal received can be extended using this timer to provide a variable pulse length.

SS Dropoff

The send signal can be delayed using this timer to provide a variable pulse length.

SR2 Dropoff

The signal received can be extended using this timer to provide a variable pulse length.

SS2 Dropoff

The send signal can be delayed using this timer to provide a variable pulse length.

Timer 1 (or 2) Pickup Delay

The relay contains 2 timers which are started on energisation of the relevant status input (TIMER 1/2). A delay can be added to the pickup of either of these two timers.

Timer 1 (or 2) Dropoff Delay

As above this sets a delay on dropoff of the timers.

Counter 1 (or 2) Target

The relay contains 2 counters which increment on the application of a pulse to a status input, and can be reset on receipt of a pulse to another status input. Once the counter reaches the target level set here, it will operate an output (counter 1 (or 2) operated).

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. The default is status input 1.

Carrier Guard

This input is used to disable the effect of the Signal Receive input within a protection scheme if the signalling channel is detected as unreliable by the signalling equipment.

Block Reach Ext

Energising this input will block the operation of the reach extension scheme.

Signal Receive 2

This is the received signal from the remote end of a DEF protection scheme. The default is status input 1.

Block DEF

The block DEF input can be used to inhibit tripping of the DEF element.

DC SOTF Manual Close

This input is used in conjunction with the Switch On To Fault feature. It is the signal which is required for use with the DC scheme. A fleeting contact is required from the circuit breaker closing handle. This function can be mapped to any of the status inputs. This is disabled by default.

Start Aux DC SOTF

This input is used to allow DC Switch On To Fault to be driven from a circuit breaker auxiliary contact.

VT Circuit 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.

Trigger Storage

An external device can be used to trigger the waveform storage through this input

Increment Trip Count

Input used to increment the trip counter from an external source.

Reset Total Trip Cnt

Input used to reset the Total Trip Counter to zero

Reset delta Trip Cnt

Input used to reset the Delta Trip Counter to zero

Reset Total CB Close

Input used to reset the Total CB Close Counter to zero

Use Alt Settings Grp

When this input is energised, the relay will use the settings specified in the System Config as the Alternate Settings Group.

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..4 . Inputs 1 and 2 can be used as inverters (output contacts for input 1 (2) operated and input 1 (2) not operated are available)

Input 5 a,b,c,d.

These four inputs form the input to a four input AND gate, the output of which is taken from output 5 operated.

Input 6 a,b,c,d.

These four inputs form the input to a four input AND gate, the output of which is taken from output 6 operated.

Timer 1 (or 2)

This input will cause the output Timer 1(2) Operated to raise if the input is energised for the Timer 1(2) setting.

Counter 1 (or 2) Count

Energising this input will cause the counter 1 (2) to increment. Once the counter reaches the target set in the Reylogic menu it will operate an output contact.

Counter 1 (or 2) Reset

Energising this input will cause the counter 1 (2) to Reset.

Trip Circuit Fail

This input is used to monitor for presence of voltage across a low impedance section of a trip circuit.

CBF External Trip

This input can be connected to an external trip initiation as a source to start the relays internal CB Fail logic.

CBF Inhibit

This input can be used to block the CB Fail function

Clock Sync

Energising this input will cause the clock to synchronise to the nearest time interval specified in the System Config Menu as Clock Sync from Status.

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 to the relay. This must be mapped to one of the outputs which have a 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

End to end scheme signal initiated indication of distance aided trip.

These signals are gated with the designated trip relays(s) and only indicate when a trip signal is initiated.

POR Weak Infeed

This indicates that a Weak Infeed Trip has been issued by the POR scheme logic

DEF Aided Trip

This indicates that an aided DEF trip has occurred. Both the local and remote ends have detected a DEF condition.

Signal Send 2

End to end scheme signal initiated indication of DEF aided trip.

These signals are gated with the designated trip relays(s) and only indicate when a trip signal is initiated.

DEF Protection

This indicates that either an aided DEF trip or a DEF backup trip has occurred.

Signal Received 2 Flag

In an end to end signalling scheme (DEF) this signal can be used to indicate the signal has been received.

SOTF Operated

This can be used to give an alarm signal when the relay has generated a trip command from the Switch On To Fault logic.

VTs Alarm

This can be used to give an alarm signal when the relay has detected a VT fuse failure.

Trip Output

This signal is the main trip output and can be directed to any one or more of the contacts.

Phase A Fault

This signal indicates any operation of a phase A impedance protection element.

Phase B Fault

This signal indicates any operation of a phase B impedance protection element.

Phase C Fault

This signal indicates any operation of a phase C impedance protection element.

Earth Fault

This signal indicates any operation of an earth impedance protection element.

Zone 1

This signal indicates any operation of a zone 1 impedance protection element.

Zone 2

This signal indicates any operation of a zone 2 impedance protection element.

Zone 3

This signal indicates any operation of a zone 3 impedance protection element.

Aided Trip

This signal indicates that a trip has occurred as a result of an external signal received which may have been gated with an internal function.

Signal Received 1 Flag

In an end to end signalling scheme (distance) this signal can be used to indicate the signal has been received.

Carrier Guard

This signal is used in conjunction with end to end signaling equipment where a guard signal is available. If the communicating link fails this can be used to generate an output from this signal.

Power Swing Alarm.

Indicates that the impedance characteristic has entered the PSD zone of protection and remained there for longer than the set PSD Transit time. Thus, a power swing is in progress.

Delta Trip Count Alarm

This contact will give an output when the delta trip count reaches the setting.

Total Trip Cnt Alarm

This contact will give an output when the Total trip count reaches the setting.

High Set

This signal indicates a trip caused by operation of a high set element.

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..4

This indicates operation of inputs 1 to 4.

Input 1..2 Not Operated

This indicates non-operation of inputs 1 to 2. (This can be used as an inverter of digital signals)

Input 5 Operated

This indicates operation of one of the relays two AND gates (energised by operation of inputs 5a, b, c, AND d).

Input 6 Operated

This indicates operation of one of the relays two AND gates (energised by operation of inputs 6a, b, c, AND d).

Timer 1..2 Operated

Indicates the operation of timer 1 or 2.

Counter 1..2 Operated

Indicates that the Target of Counter 1 or 2 has been reached.

BC Trip

Main output of the Broken Conductor protection element.

BC Phase A,B,C Alarm

Phase segregated Broken Conductor alarm outputs

Trip Circuit Fail

Alarm output from the tRip Circuit Supervision function.

CBF Retrip

CB Fail output which operates after the CBF Alarm delay

CBF Backtrip

CB Fail output which operates after the CBF Trip delay

Hand Reset Outputs

Any output contact selected here will latch once operated and can be reset via the fascia or the IEC comms interface.

OUTPUT DO CONFIG MENU

This menu allows delays on drop off to be applied to any of the output relays included in the relay.

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 here will reset when the stimulus is removed and therefore will not latch.

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