7SG18 Solkor N

Numeric Differential Protection

Document Release History

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

2010/02	Document reformat due to rebrand

Software Revision History

19/04/2005	2646H80006R5	

Contents

1 System Config Menu

SETTING	RANGE	DEFAULT
Active Settings Group *selects the settings group that the relay will act upon*	G1-G8	G1
Settings Group Edit/View *selects the settings group to be displayed on the LCD*	G1-G8	G1
Copy Group *allows the contents of one settings group to be copied completely to another group. Note that Copy Group will not allow the copying of a group onto the currently active group*	From G1-G8 to G1-G8	From G1-G2
Local P/F Rating *sets the local relay's phase fault current CT rating*	1A, 5A	1A
Local E/F Rating *sets the local relay's earth fault current CT rating*	1A, 5A	1A
Local P/F CT Ratio *sets the local relay's phase input CT ratio so that local primary currents can be displayed*	5 to 10000 step 5 : 1 or 5	300:1
Local E/F CT Ratio *sets the local relay's earth input CT ratio so that local primary currents can be displayed*	5 to 10000 step 5 : 1 or 5	300:1
Remote P/F Rating *sets the remote relay's phase fault current CT rating*	1A, 5A	1A
Remote P/F CT Ratio *sets the remote relay's phase input CT ratio so that remote primary currents can be displayed*	5 to 10000 step 5 : 1 or 5	300:1
Current Display *sets the display mode to use for the relay*	xIn, PRIMARY, SECONDARY	xIn
Set Identifier *allows a 16 character alphanumeric code or unique identification reference to be entered for the relay*	Up to 16 alphanumeric characters	SOLKOR N
Set Alarm 1 *allows a 13 character alphanumeric string to be entered for the General Alarm screen. It will be displayed on energisation of the ALARM 1 status input*	Up to 13 alphanumeric characters	ALARM 1
Set Alarm ..n *as Alarm 1. There are a maximum of 9 alarms available in the relay*	Up to 13 alphanumeric characters	ALARM n
Calendar – Set Date *sets the current date in DD/MM/YY format*	DD/MM/YY	01/01/00
Clock - Set Time *sets the current time in HH/MM/SS format. Note that only hours and minutes can be set. The seconds default to zero on pressing the ENTER key*	HH:MM:SS	00:00:00
Clock Sync. From Status *sets the period of synchronisation of the clock to the nearest second or minute. The synchronisation occurs on energisation of the Clock Sync. status input*	Seconds or Minutes	Minutes
Default Screen Timer *sets the time delay after which, if no key presses have been detected, the relay will begin to poll through any screens which have been selected as default instrument screens*	10sec, 60sec, 5min, 1hour	5 min
Change Password *allows a 4 character alphanumeric code to be entered as the password. Note that the display shows a password dependent encrypted code on the second line of the display*	4 alphanumeric characters	NONE

2 Diff. Protection Menu

SETTING	RANGE	DEFAULT
Gn P/F Diff. Setting* *sets the current setting for the differential element*	0.10 – 2.50xIn step 0.05xIn	0.30xIn
Gn P/F Bias Slope 1* *sets the first bias slope for the differential element*	20%, 30%, 50%, 70%	30%
Gn P/F Bias Slope 2* *sets the second bias slope for the differential element*	50%, 100%, 150%	150%
Gn Bias Break Point* *sets the bias slope break point identifying the point where the characteristic changes from bias slope 1 to bias slope 2*	0.50xIn – 20.00xIn step 0.10xIn	2.00xIn
Gn Differential Delay *sets the trip time for the differential element and the internal intertrip*	0.000s – 0.200s step 0.005s 0.210s – 1.000s step 0.010s 1.100s – 10.000s step 0.100s	0.0s
P/F CT Ratio Correction *enables a CT ratio correction to be set when the local and remote relays are connected to different CTs.*	0.50 – 1.00 step 0.01	1.00
Remote P/F Ratio Correction *enables a CT ratio correction to be set when the local and remote relays are connected to different CTs.*	0.50 – 1.00 step 0.01	1.00
Gn Internal Intertrip *enables / disables internal intertrips*	ON, OFF	OFF
Gn Int Intertrip Delay *Sets the trip time for the internal intertrip elements*	0.000s – 0.05s step 0.005s	0.000s
Gn External Intertrip *enables / disables external intertrips*	ON, OFF	ON
Gn Ext Intertrip Delay *Sets the trip time for the external intertrip elements*	0.000s – 0.200s step 0.005s 0.210s – 1.000s step 0.010s 1.100s – 10.000s step 0.100s	0.000s

3 O/C Protection Menu

SETTING	RANGE	DEFAULT
Gn P/F Charact. Setting *sets the phase fault overcurrent characteristic protection pick-up level*	OFF 0.10xIn – 2.50xIn step 0.05xIn	1.00xIn
Gn P/F Charact. *sets the phase fault overcurrent characteristic*	NI, VI, EI, LTI, DTL	NI
Gn P/F Charact. Time Mult *sets the phase fault time multiplier to use for the characteristics NI, VI, EI, LTI*	0.025 – 1.600 step 0.025	1.000
Gn P/F Charact. Delay *sets the phase fault time delay to use for the characteristic DTL*	0.00s – 20.00s step 0.01s	5.00s
Gn P/F Lowset Setting *sets phase fault lowset pick-up level*	OFF 0.10xIn – 2.50xIn step 0.05xIn 3.0xIn – 52.5xIn step 0.5xIn	1.00xIn
Gn P/F Lowset Delay *sets phase fault lowset time delay*	0.00s – 20.00s step 0.01s	0.00s
Gn P/F Highset1 Setting *sets phase fault highset 1 pick-up level*	OFF 0.10xIn – 2.50xIn step 0.05xIn 3.0xIn – 52.5xIn step 0.5xIn	10.00xIn
Gn P/F Highset1 Delay *sets phase fault highset 1 time delay*	0.00s – 20.00s step 0.01s	0.00s
Gn P/F Highset2 Setting *sets phase fault highset 2 pick-up level*	OFF 0.10xIn – 2.50xIn step 0.05xIn 3.0xIn – 52.5xIn step 0.5xIn	OFF

*These settings are fixed at the default values shown above on the fixed differential setting relay. Variable differential settings type relays are normally ordered. The differential settings on a pair of relay protecting a feeder MUST be identical at all times.

SETTING	RANGE	DEFAULT
Gn P/F Highset2 Delay *sets phase fault highset 2 time delay*	0.00s – 20.00s step 0.01s	0.00s
Gn E/F Charact. Setting *sets the earth fault overcurrent characteristic protection pick-up level*	OFF 0.10xIn – 2.50xIn step 0.05xIn	1.00xIn
Gn E/F Charact. *sets the earth fault overcurrent characteristic*	NI, VI, EI, LTI, DTL	NI
Gn E/F Charact. Time Mult *sets the earth fault time multiplier to use for the characteristics NI, VI, EI, LTI*	0.025 – 1.600 step 0.025	1.000
Gn E/F Charact. Delay *sets the earth fault time delay to use for the characteristic DTL*	0.00s – 20.00s step 0.01s	5.00s
Gn E/F Lowset Setting *sets earth fault lowset pick-up level*	OFF 0.10xIn – 2.50xIn step 0.05xIn 3.0xIn – 52.5xIn step 0.5xIn	1.00xIn
Gn E/F Lowset Delay *sets earth fault lowset time delay*	0.00s – 20.00s step 0.01s	0.00s
Gn E/F Highset1 Setting *sets earth fault highset 1 pick-up level*	OFF 0.10xIn – 2.50xIn step 0.05xIn 3.0xIn – 52.5xIn step 0.5xIn	10.00xIn
Gn E/F Highset1 Delay *sets earth fault highset 1 time delay*	0.00s – 20.00s step 0.01s	0.00s
Gn E/F Highset2 Setting *sets earth fault highset 2 pick-up level*	OFF 0.10xIn – 2.50xIn step 0.05xIn 3.0xIn – 52.5xIn step 0.5xIn	OFF
Gn E/F Highset2 Delay *sets earth fault highset 2 time delay*	0.00s – 20.00s step 0.01s	0.00s
Gn CB Fail Time Delay1 *sets the first time delay for Circuit Breaker fail*	OFF 0.01s – 20.00s step 0.01s	OFF
Gn CB Fail Time Delay2 *sets the second time delay for Circuit Breaker fail*	OFF 0.01s – 20.00s step 0.01s	OFF
Gn P/F CB Fail Setting *sets over current CB Fail level*	OFF 0.10xIn – 1.00xIn step 0.05xIn	OFF
Gn E/F CB Fail Setting *sets earth fault CB Fail level*	OFF 0.10xIn – 1.00xIn step 0.05xIn	OFF
Gn CT Failure Setting *sets CT Failure level*	OFF 0.10xIn – 1.00xIn step 0.05xIn	OFF
Gn CT Failure Delay *sets delay for CT Failure*	0.00s – 20.00s step 0.01s	1 sec
Gn Relay Reset Delay *sets the overcurrent reset characteristic*	INST 1s – 60s step 1s	INST

4 O/P Relay Config Menu

SETTING	RANGE	DEFAULT
Gn Prot. Healthy *sets the output relay operated by the relay(s) watchdog monitor. An output relay with a changeover or normally closed contact should be used for this function (contact open when healthy)*	RL1..RL7	RL1
Gn P/F Diff. *sets the output relay(s) operated by the phase fault differential protection*	RL1..RL7	RL4
Gn P/F Starter *sets the output relay(s) operated by the phase fault overcurrent characteristic starter*	RL1..RL7, GPF[1]	None
Gn P/F Charact. *sets the output relay(s) operated by the phase fault overcurrent characteristic*	RL1..RL7, GPF[1]	None
Gn P/F Lowset *sets the output relay(s) operated by the phase fault lowset*	RL1..RL7, GPF[1]	None
Gn P/F Highset1 *sets the output relay(s) operated by the phase fault highset 1*	RL1..RL7, GPF[1]	None

[1] **GPF** – **G**uard for **P**hase **F**ault differential. This is a virtual output relay that is used as a guard for the phase fault differential protection. See section 1 – Description of Operation for more information regarding this functionality.

SETTING	RANGE	DEFAULT
Gn P/F Highset2 *sets the output relay(s) operated by the phase fault highset 2*	RL1..RL7, GPF[1]	None
Gn E/F Starter *sets the output relay(s) operated by the earth fault overcurrent characteristic starter*	RL1..RL7, GPF[1]	None
Gn E/F Charact. *sets the output relay(s) operated by the earth fault overcurrent characteristic*	RL1..RL7, GPF[1]	None
Gn E/F Lowset *sets the output relay(s) operated by the earth fault lowset*	RL1..RL7, GPF[1]	None
Gn E/F Highset1 *sets the output relay(s) operated by the earth fault highset 1*	RL1..RL7, GPF[1]	None
Gn E/F Highset2 *sets the output relay(s) operated by the earth fault highset 2*	RL1..RL7, GPF[1]	None
Gn Remote Int. iTrip *sets the output relay(s) operated by a remote internal intertrip*	RL1..RL7, GPF[1]	None
Gn Remote Ext. iTrip1 *sets the output relay(s) operated by a remote external intertrip 1*	RL1..RL7, GPF[1]	None
Gn Remote Ext. iTrip2 *sets the output relay(s) operated by a remote external intertrip 2*	RL1..RL7, GPF[1]	None
Gn Status 1 *sets the output relay(s) operated by Status Input 1 energisation*	RL1..RL7, GPF[1]	None
Gn Status ..n *Sets the output relays operated by the other status inputs (if fitted)*	RL1..RL7, GPF[1]	None
Gn CB Fail 1 *sets the output relay(s) operated by the first circuit breaker failure delay*	RL1..RL7, GPF[1]	None
Gn CB Fail 2 *sets the output relay(s) operated by the second circuit breaker failure delay*	RL1..RL7, GPF[1]	None
Gn CT Failure *sets the output relay(s) operated by the CT failure delay*	RL1..RL7, GPF[1]	None
Gn Counter Alarm *sets the output relay(s) operated by the Trip Counter Alarm function*	RL1..RL7, GPF[1]	None
Gn Sum of I^2 Alarm *sets the output relay(s) operated by the Sum of I^2 CB Alarm function*	RL1..RL7, GPF[1]	None
Gn Power On Count. *sets the output relay(s) operated by a Power On Counter*	RL1..RL7	None
Gn Signal Dist. *sets the output relay(s) operated by a signalling disturbance*	RL1..RL7	None
Gn Signal Alarm *sets the output relay(s) operated by the signalling alarm*	RL1..RL7	None
Gn Signal Test *sets the output relay(s) operated when in either Loop Test or Line Test modes*	RL1..RL7	None
Gn Hand Reset *sets the output relay(s) which are to stay latched after operation. These can be reset via the fascia, a status input, or a communications command*	RL1..RL7, GPF[1]	None
Gn Min O/P Energise Time *sets the minimum length of time any output relay can be energised for*	100ms – 500ms step 50ms	100ms

5 Status Config Menu

SETTING	RANGE	DEFAULT
Settings Group Select *sets the status input(s) required to select a settings group to become the active settings group. Note that the lower the number of status input, the higher precedence that it has e.g. Status 1 will take precedence over all the rest*	S1..Sn (each status can be set from 1-8 to select active group 1-8)	None
Inverted Inputs *sets the status input(s) required to be inverted. Any function assigned to an inverted input becomes active when the input is de-energised*	S1..Sn	None
Gn P/F Diff. Inhibit *sets the status input(s) which will inhibit the phase fault differential characteristic*	S1..Sn	None

[1] **GPF** – **G**uard for **P**hase **F**ault differential. This is a virtual output relay that is used as a guard for the phase fault differential protection. See section 1 – Description of Operation for more information regarding this functionality.

SETTING	RANGE	DEFAULT
Gn P/F Charac. Inhibit *sets the status input(s) which will inhibit the phase fault overcurrent characteristic*	S1..Sn, SIG[1]	None
Gn P/F Lowset Inhibit *sets the status input(s) which will inhibit the phase fault lowset*	S1..Sn, SIG[1]	None
Gn P/F Highset1 Inhibit *sets the status input(s) which will inhibit the phase fault highset 1*	S1..Sn, SIG[1]	None
Gn P/F Highset2 Inhibit *sets the status input(s) which will inhibit the phase fault highset 2*	S1..Sn, SIG[1]	None
Gn E/F Charac. Inhibit *sets the status input(s) which will inhibit the earth fault overcurrent characteristic*	S1..Sn, SIG[1]	None
Gn E/F Lowset Inhibit *sets the status input(s) which will inhibit the earth fault lowset*	S1..Sn, SIG[1]	None
Gn E/F Highset1 Inhibit *sets the status input(s) which will inhibit the earth fault highset 1*	S1..Sn, SIG[1]	None
Gn E/F Highset2 Inhibit *sets the status input(s) which will inhibit the earth fault highset 2*	S1..Sn, SIG[1]	None
Gn External iTrip1 *sets the status input(s) which will send an external intertrip 1 to the remote relay*	S1..Sn	None
Gn External iTrip2 *sets the status input(s) which will send an external intertrip 2 to the remote relay*	S1..Sn	None
Gn Receive iTrip Inhibit *sets the status input(s) which will inhibit the receival of intertrip commands*	S1..Sn	None
Gn Send iTrip Inhibit *sets the status input(s) which will inhibit the transmission of intertrip commands*	S1..Sn	None
Gn CB Open *sets the status input(s) for detecting if the circuit break is open*	S1..Sn	None
Gn CB Closed *sets the status input(s) for detecting if the circuit break is closed*	S1..Sn	None
Gn Trip Circuit Fail *sets the status input(s) which will be used within the Trip Circuit Monitoring scheme*	S1..Sn	None
Gn Waveform Trig *sets the status input(s) which, on energisation, will cause a waveform record to be stored*	S1..Sn	None
Gn Sum of I^2 Update *sets the output relay(s) which, on energistaion, will update the ΣI^2 counter*	S1..Sn	None
Gn Reset Flag & Outputs *sets the status input(s) which, on energisation, will reset the Trip LEDs and any latched output relays*	S1..Sn	None
Gn Clock Sync. *sets the status input(s) which, on energisation, will synchronise the real time clock to the nearest second or minute*	S1..Sn	None
Gn ALARM 1 *sets the status input(s) which, on energisation, will cause the Alarm 1 message to be displayed on the LCD*	S1..Sn	None
Gn ALARM ..n	S1..Sn	None
Gn Status 1 P/U Delay *sets the delay period to be applied to the pick-up of Status Input 1*	0.00s – 2.00s step 0.01s 2.10s – 20.00s step 0.10s 21s – 300s step 1s 360s – 3600s step 60s 3900s – 14400s step 300s	0.02s
Gn Status 1 D/O Delay *sets the delay period to be applied to the drop-off of Status Input 1*	As above	0.00s
Gn Status n P/U Delay	As Status 1	0.02s
Gn Status n D/O Delay	As Status 1	0.00s

[1] **SIG** – **SIG**nalling healthy. This is a virtual status input that is used for inhibiting elements if the signalling channel is healthy. See section 1 – Description of Operation for more information regarding this functionality.

6 Prot. Signalling Menu

SETTING	RANGE	DEFAULT
Local Address *sets the local address for the signalling channel. This setting will indicate what the remote relay's address should be set to.*	0 – 31 step 1	0
Baud Rate *sets the signalling channel baud rate*	19200, 38400	38400
Signalling Delay *sets the signalling channel delay. This is used to compensate for delays in the transmit and received paths for the signalling channel*	0.000ms – 9.375ms 9.375ms – 18.750ms 18.750ms – 28.125ms 28.125ms – 37.500ms	0 – 9.375ms
Signal Alarm Timeout *sets a time delay the signalling channel has to be unhealthy before issuing a permanent alarm*	1s – 60s step 1s	5s
Signal Test Mode *puts the relay(s) into test mode to help aid commissioning.* *Loop test mode is used to test one relay and requires the Rx to be looped backed into the Tx of the same relay.* *Line test mode is used to test the signalling channel between two relays. When line test mode is entered the remote relay will echo all data back and will not function as a differential relay.*	OFF LOOP TEST LINE TEST	OFF
Signalling Port *enables or disables the protection signalling channel. Before the two relays will communicate this setting must be enabled.*	DISABLED, ENABLED	DISABLED

7 Comms Interface Menu

SETTING	RANGE	DEFAULT
Comms Protocol *Sets the communications protocol to be used.*	IEC60870-5-103, MODBUS-RTU	IEC60870-5-103
Class 2 Update Period *Sets the time interval between successive updates of Class 2 Measurands.*	0s – 60s step 1s	15s
IEC Class 2 Scaling *Sets the level as a multiple of nominal current at which a Class 2 measurand is automatically generated.*	1.2x, 2.4x	1.2x
Comms Baud Rate *sets the required communications Baud Rate for IEC60870-5-103 and MODBUS-RTU*	75, 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200	19200
Comms Parity *selects whether a parity check is transmitted with the comms data for IEC60870-5-103 and MODBUS-RTU*	NONE, EVEN	EVEN
Relay Address *sets the required address of a particular relay within a network for IEC60870-5-103 and MODBUS-RTU*	0 – 254	0
Line Idle *sets the required communications line idle sense for fibre optic sytems. RS485 requires that this setting is set to OFF.*	LIGHT ON, LIGHT OFF	LIGHT OFF
Data Echo *enables Data Echo which is necessary for use with relays connected in a ring for IEC60870-5-103. RS485 or MODBUS-RTU requires that this setting is set to OFF.*	OFF / ON	OFF

8 Data Storage Menu

SETTING	RANGE	DEFAULT
Gn Fault Trigger *sets the output relay(s) which are connected as trip outputs for the purpose of giving trip information and storing fault records*	RL1..RLn	4
Gn Waveform Trig *selects which functions trigger a waveform record (STA = status input)*	STA, DIF, O/C, iTp, SIG	STA + DIF + O/C + iTp
Gn Waveform Pre-trigger *selects which functions trigger a waveform record*	OFF, 10%-100% step 10%	70%
Demand Window Type *selects how the maximum demand is measured*	OFF, ROLLING, FIXED	OFF

SETTING	RANGE	DEFAULT
Demand Window *selects the period over which the maximum demand is measured*	5-50 mins, step 5 mins. 90–300 mins, step 30 mins. 360-1440 mins., step 60 mins.	15 minutes
Clear All Waveforms *clears all the waveform records stored. Note that this can also be done at the instruments display*	NO, YES (Confirmation required)	NO
Clear All Events *clears all the event records stored. Note that this can also be done at the instruments display*	NO, YES (Confirmation required)	NO
Clear All Faults *clears all the fault data records stored*	NO, YES (Confirmation required)	NO

9 CB Maintenance Menu

SETTING	RANGE	DEFAULT
Trip Counter Reset *resets the Trip Counter to zero*	NO, YES (Confirmation required)	NO
Trip Counter Alarm *sets a target value for which an alarm output will be given when the value is reached*	OFF 1 – 999 step 1	OFF
Sum I^2 Reset *resets the CB Duty ΣI^2 to zero*	NO, YES (Confirmation required)	NO
ΣI^2 Alarm *sets a target value for which an alarm output will be given when theCB Duty Sum ΣI^2 value is reached*	OFF 10 – 100 step $1MA^2$ 200 – 20000 step $100MA^2$ 21000 – 100000 step $1000MA^2$	OFF
Power on Count Alarm *Allows a set number of relay power ups to produce an alarm*	OFF, 999	OFF
Phase A Reversal *allows phase A current input to be reversed. This is equivalent to swapping the wiring connected to the phase A current input*	OFF, ON	OFF
Phase B Reversal *allows phase B current input to be reversed. This is equivalent to swapping the wiring connected to the phase B current input*	OFF, ON	OFF
Phase C Reversal *allows phase C current input to be reversed. This is equivalent to swapping the wiring connected to the phase C current input*	OFF, ON	OFF
Earth Reversal *allows the earth current input to be reversed. This is equivalent to swapping the wiring connected to the earth fault current input*	OFF, ON	OFF
Manual Intertrip *allows a manual intertrip to be sent to the remote relay*	OFF, Internal iTrip, External iTrip1, External iTrip2	OFF
O/P Test *allows any combination of output relays to be energised. This is achieved by selecting one of the output settings defined in the O/P Relay Config Menu. Note that the relay is energised after 10 seconds have elapsed and is energised for the minimum output relay energise time*	Any output relay option	OFF