

7SG11Argus

Overcurrent Protection Relays

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
2006/03	Third issue: Editorial modifications, software revision histories updated
2004/05	Second issue: Modification of CBF feature, software release updated, Modbus protocol included, connection diagram for new models
2002/12	First issue

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Software Release History

The software listed below is used in one of more types Argus relay. The list of software revisions applying to Argus 1, up to and including this document issue is:

Nov 2005	2434H80023 R10	Highset and Lowset setting steps revised between 2.5xIn and 3.0xIn
July 2005	2434H80023 R9	ACD bit in IEC 60870 library corrected
Mar 2005	2434h80023 R8	CBF logic modified, timer will run while trip is being issued and I > ICBF
Aug 2004	2434H80023 R7	Modification to "checking settings" screen at switch on. Corrected "CT Failure" setting display when configured to show PRIMARY/SECONDARY Amps. ASDU4 measurands return value 0 correctly.
April 2004	2434H80023 R6	Minimum setting for P/F – E/F elements now 0.05 xIn
Jan 2004	2434H80023 R5	Additional features: Modbus added Additional features: CT Failure function added Minor change: IEC60870 Class 2 measurands
Sep 2003	2434H80023 R4	Additional features: CBF Level detectors added Minor change: DTL timers extended to 5 minutes
Mar 2003	2434H80023 R3	Minor change: Time synch via IEC870
Nov 2002	2434H80023 R2	Minor change: communications with Reydisp
Jun 2002	2434H80023 R1	Minor change: power on alarm added
Feb 2002	2434H80022 R3	Additional features: CB fail (all models).
Oct 2001	2434H80022 R2	Additional features: external trip via status input. Minor change: SEF 2 nd stage can be disabled.
Feb 2001	2434H80022 R1	Additional features: general alarms, status input inversion, resettable instruments, output relay pulse length setting, 10 second delay on trip test. Additional features: CB fail, trip circuit supervision (single-pole models).
Jan 2000	2434H80021 R5	Minor change: current meter averaging.
Jul 1999	2434H80021 R4	Minor change: status group select
May 1999	2434H80021 R3	Additional features: default instruments
Mar 1998	2434H80020 R1	Additional features: new expansion board (8SI). Additional features: clock synchronisation using status input
Sep 1997	2434H80019 R4	Minor change: settings displayed in ReyDisp
Jul 1997	2434H80019 R3	Additional features: status input pick-up and drop-off delays added. Additional features: CB fail, trip circuit supervision (all expanded I/O models). Minor change: separate settings for P/F, E/F and SEF current ratings. Minor change: sum of I ² setting range.
Apr 1997	2434H80018 R2	Additional features: CB fail, trip circuit supervision (some models). Additional features: reset of latched output relays by status input.
Jan 1997	2434H80024...7 R2	Minor change: event numbers.
Oct 1996	2434H80024...7 R1	Additional features: new status input functions: setting group select, all algorithms can be inhibited. Additional features: first version with I/O expansion card (4SI+4OR).
Mar 2000	2434H80002...7 R17	Minor change: current meter averaging.
Mar 1998	2434H80002...7 R16	Minor change: real time clock.
Jan 1997	2434H80002...7 R15	Minor change: settings group changes delayed until no protection elements are operating.

Oct 1996	2434H80002...7 R13	Minor change:	communications parity setting added.
Jul 1996	2434H80002...7 R12	Minor change:	user must press enter after factory defaults applied.
Jun 1996	2434H80002...7 R10	Minor change:	sum of I ² setting range.
		Minor change:	output relay minimum energise time reduced from 200 to 100 ms.
		Minor change:	'factory defaults' display.
Apr 1996	2434H80002...7 R8	Minor change:	fault record text for characteristic element.
		Minor change:	copy group setting default.
		Minor change:	fault record text for characteristic element.
Apr 1996	2434H80002...7 R7	Minor change:	relay information provided in communications.
		Minor change:	communication baud rates.
Apr 1996	2434H80002...7 R6	Minor change:	IDMTL starter drop-off, and relay reset timer.
		First release	

Hardware Release History

The Argus hardware is used in many different relays. The list of hardware revisions applying to Argus 1, up to and including this document issue is:

Feb 2004	Additional model:	4 pole variant with 3 status inputs and 5 output relays
Mar 2002	Appearance change:	modification to grey fascia design – logo, dark grey band, buttons and label.
Jan 2002	External change:	SMA fibre-optic connectors replaced by ST TM (BFOC/2.5) by default.
Jul 1999	Appearance change:	introduction of grey fascia design to replace existing black fascia.
Jul 1999	External change:	introduction of Epsilon case and terminal blocks
Mar 1998	Additional features:	introduction of new expansion board (8SI).
Apr 1997	Internal change:	introduction of additional memory
Oct 1996	Additional features:	introduction of I/O expansion card (4SI+4OR).
Nov 1995	First release	

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Section 1: Variants

This document applies to the Argus relays listed in the following MLFB Structure & table.

The MLFB Structure references the complete number for each relay:

- 7SG11nn-nxxnn-nxA0

where n is a digit and x is a letter.

The table uses two references for most relays, each of which is valid:

- an 'Order code' of the form AGn-nnn, and
- a 'Type' of the form DCDnnnX

where n is a digit and X is a letter.

Protection	Application Diagram	I/O	Order code / Type				
			30/48 aux.		110/220 aux.		
			30V status	48V status	48V status	110V status	220V status
Single phase-fault or earth-fault	Figure 4-1	1 SI 7 OR	DCD111A	AG1-101 DCD113A	AG1-102 DCD114A	DCD115A	DCD116A
Sensitive earth-fault	Figure 4-2	1 SI 7 OR	DCD121A	AG1-103 DCD123A	AG1-104 DCD124A	DCD125A	DCD126A
3 phase-fault, or 2 phase-fault and earth-fault	Figure 4-3	1 SI 7 OR	DCD311A	AG1-301 DCD313A	AG1-302 DCD314A	DCD315A	DCD316A
	Figure 4-4	5 SI 11 OR	DCD311B	AG1-311 DCD313B	AG1-312 DCD314B	DCD315B	DCD316B
		9 SI 7 OR	DCD311C	AG1-321 DCD313C	AG1-322 DCD314C		DCD315C
2 phase-fault and SEF	Figure 4-5	1 SI 7 OR	DCD321A	AG1-303 DCD323A	AG1-304 DCD324A		DCD325A
		5 SI 11 OR	DCD321B	AG1-313 DCD323B	AG1-314 DCD324B		
		9 SI 7 OR	DCD321C	AG1-323 DCD323C	AG1-324 DCD324C		
3 phase-fault and earth-fault	Figure 4-6	1 SI 7 OR	DCD411A	AG1-401 DCD413A	AG1-402 DCD414A	DCD415A	DCD416A
		5 SI 11 OR	DCD411B	AG1-411 DCD413B	AG1-412 DCD414B	DCD415B	DCD416B
		9 SI 7 OR	DCD411C	AG1-421 DCD413C	AG1-422 DCD414C	DCD415C	DCD416C
3 phase-fault and earth-fault 1A		3 SI 5 OR		AG1-431	AG1-433		
3 phase-fault and earth-fault 5A		3 SI 5 OR		AG1-432	AG1-434		
3 phase-fault and SEF, or 2 phase-fault, earth-fault and SEF	Figure 4-8	1 SI 7 OR	DCD421A	AG1-403 DCD423A	AG1-404 DCD424A	DCD425A	DCD426A
	Figure 4-7	5 SI 11 OR	DCD421B	AG1-413 DCD423B	AG1-414 DCD424B	DCD425B	DCD426B
		9 SI 7 OR	DCD421C	AG1-423 DCD423C	AG1-424 DCD424C	DCD425C	DCD426C

Ordering Information – 7SG111 Argus 1

Product description	Variants	Order No.
<p>Nondirectional O/C relay</p> <p>Over current and earth fault protection for radial feeders, capacitor banks and industrial and commercial plant.</p>	<p><u>Number of elements</u> Single pole relay</p> <p><u>Auxiliary supply /binary input voltage</u> 24/30/48 V DC auxiliary, 30 V binary input 110/220 V DC auxiliary, 30 V binary input 24/30/48 V DC auxiliary, 48 V binary input 110/220 V DC auxiliary, 48 V binary input ¹⁾ 110/220 V DC auxiliary, 110 V low burden binary input 110/220 V DC auxiliary, 220 V low burden binary input</p> <p><u>Type of elements</u> Single pole phase-fault or single pole earth-fault Single pole sensitive/restricted earth-fault (SEF/REF)</p> <p><u>Nominal current</u> 1/ 5 A</p> <p><u>I/O range</u> 1 Binary Inputs / 7 Binary Outputs (incl. 3 changeover)</p> <p><u>Communication interface</u> Fibre optic (ST-connector) / IEC 60870-5-103 or Modbus RTU RS485 interface / IEC 60870-5-103 or Modbus RTU</p> <p><u>Housing size</u> Case size E4 (4U high)</p>	<p>7 S G 1 1 1 □ - □ □ □ □ - 0 □ A 0</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>↑</p> <p>1</p> </div> <div style="text-align: center;"> <p>↑</p> <p>0</p> </div> <div style="text-align: center;"> <p>↑</p> <p>1</p> </div> <div style="text-align: center;"> <p>↑</p> <p>2</p> </div> <div style="text-align: center;"> <p>↑</p> <p>3</p> </div> <div style="text-align: center;"> <p>↑</p> <p>4</p> </div> <div style="text-align: center;"> <p>↑</p> <p>5</p> </div> <div style="text-align: center;"> <p>↑</p> <p>A</p> </div> <div style="text-align: center;"> <p>↑</p> <p>B</p> </div> <div style="text-align: center;"> <p>↑</p> <p>A</p> </div> <div style="text-align: center;"> <p>↑</p> <p>0</p> </div> <div style="text-align: center;"> <p>↑</p> <p>1</p> </div> <div style="text-align: center;"> <p>↑</p> <p>2</p> </div> <div style="text-align: center;"> <p>↑</p> <p>C</p> </div> </div>

¹⁾ High burden 110V & 220V binary inputs compliant with ESI48-4 ESI 1 available via external dropper resistors with 48V binary input version for 1 binary input and 110 V application, order resistor box VCE:2512H10066 in addition for 1 binary input and 220 V application, order resistor box VCE:2512H10068 in addition Refer to website for application note about ESI48-4 compliance.

Ordering Information – 7SG113 Argus 1

Product description	Variants	Order No.
<p>Nondirectional O/C relay</p> <p>Over current and earth fault protection for radial feeders, capacitor banks and industrial and commercial plant.</p>	<p><u>Number of elements</u> Three pole relay</p> <p><u>Auxiliary supply /binary input voltage</u> 24/30/48 V DC auxiliary, 30 V binary input 110/220 V DC auxiliary, 30 V binary input 24/30/48 V DC auxiliary, 48 V binary input 110/220 V DC auxiliary, 48 V binary input ¹⁾ 110/220 V DC auxiliary, 110 V low burden binary input 110/220 V DC auxiliary, 220 V low burden binary input</p> <p><u>Type of elements</u> 3 pole phase-fault or 2 pole phase-fault and earth-fault 2 pole phase-fault and sensitive/restricted earth-fault (SEF/REF)</p> <p><u>Nominal current</u> 1/ 5 A</p> <p><u>I/O range</u> 1 Binary Input / 7 Binary Outputs (incl. 3 changeover) 5 Binary Inputs / 11 Binary Outputs (incl. 3 changeover) 9 Binary Inputs / 7 Binary Outputs (incl. 3 changeover)</p> <p><u>Communication interface</u> Fibre optic (ST-connector) / IEC 60870-5-103 or Modbus RTU RS485 interface / IEC 60870-5-103 or Modbus RTU</p> <p><u>Housing size</u> Case size E6 (4U high)</p>	<p>7 S G 1 1 1 □ - □ □ □ □ - 0 □ A 0</p>

¹⁾ High burden 110V & 220V binary inputs compliant with ESI48-4 ESI 1 available via external dropper resistors with 48V binary input version for 1 binary input and 110 V application, order resistor box VCE:2512H10066 in addition for 5 binary inputs and 110 V application, order resistor box VCE:2512H10065 in addition for 9 binary inputs and 110 V application, order resistor box VCE:2512H10064 in addition for 1 binary input and 220 V application, order resistor box VCE:2512H10068 in addition for 5 binary inputs and 220 V application, order resistor box VCE:2512H10067 in addition for 9 binary inputs and 220 V application, order two resistor boxes VCE:2512H10067 in addition Refer to website for application note about ESI48-4 compliance.

Ordering Information – 7SG114 Argus 1

Product description	Variants	Order No.
<p>Nondirectional O/C relay</p> <p>Over current and earth fault protection for radial feeders, capacitor banks and industrial and commercial plant.</p> <p><u>Number of elements</u> Four pole relay</p> <p><u>Auxiliary supply /binary input voltage</u> 24/30/48 V DC auxiliary, 30 V binary input 110/220 V DC auxiliary, 30 V binary input 24/30/48 V DC auxiliary, 48 V binary input 110/220 V DC auxiliary, 48 V binary input ¹⁾ 110/220 V DC auxiliary, 110 V low burden binary input 110/220 V DC auxiliary, 220 V low burden binary input</p> <p><u>Type of elements</u> 3 pole phase-fault and earth-fault 3 pole phase-fault and sensitive/restricted earth-fault (SEF/REF) or 2 pole phase-fault and earth fault and sensitive/restricted earth-fault (SEF/REF)</p> <p><u>Nominal current</u> 1/ 5 A</p> <p><u>I/O range</u> 1 Binary Input / 7 Binary Outputs (incl. 3 changeover) 5 Binary Inputs / 11 Binary Outputs (incl. 3 changeover) 9 Binary Inputs / 7 Binary Outputs (incl. 3 changeover)</p> <p><u>Communication interface</u> Fibre optic (ST-connector) / IEC 60870-5-103 or Modbus RTU RS485 interface / IEC 60870-5-103 or Modbus RTU</p> <p><u>Housing size</u> Case size E6 (4U high)</p>	<p>7 S G 1 1 1 □ - □ □ □ □ - 0 □ A 0</p> <p>↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑</p> <p>4</p> <p>0 1 2 3 4 5</p> <p>E F</p> <p>A</p> <p>0 1 2</p> <p>1 2</p> <p>D</p>	

¹⁾ High burden 110V & 220V binary inputs compliant with ESI48-4 ESI 1 available via external dropper resistors with 48V binary input version
for 1 binary input and 110 V application, order resistor box VCE:2512H10066 in addition
for 5 binary inputs and 110 V application, order resistor box VCE:2512H10065 in addition
for 9 binary inputs and 110 V application, order resistor box VCE:2512H10064 in addition
for 1 binary input and 220 V application, order resistor box VCE:2512H10068 in addition
for 5 binary inputs and 220 V application, order resistor box VCE:2512H10067 in addition
for 9 binary inputs and 220 V application, order two resistor boxes VCE:2512H10067 in addition
Refer to website for application note about ESI48-4 compliance

Ordering Information – 7SG115 Argus 1

Product description	Variants	Order No.
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Nondirectional O/C relay

Over current and earth fault protection for radial feeders, capacitor banks and industrial and commercial plant.

Number of elements
Four pole relay (fixed I/O)

Auxiliary supply /binary input voltage
 24/30/48 V DC auxiliary, 30 V binary input
 110/220 V DC auxiliary, 30 V binary input
 24/30/48 V DC auxiliary, 48 V binary input
 110/220 V DC auxiliary, 48 V binary input ¹⁾
 110/220 V DC auxiliary, 110 V low burden binary input
 110/220 V DC auxiliary, 220 V low burden binary input

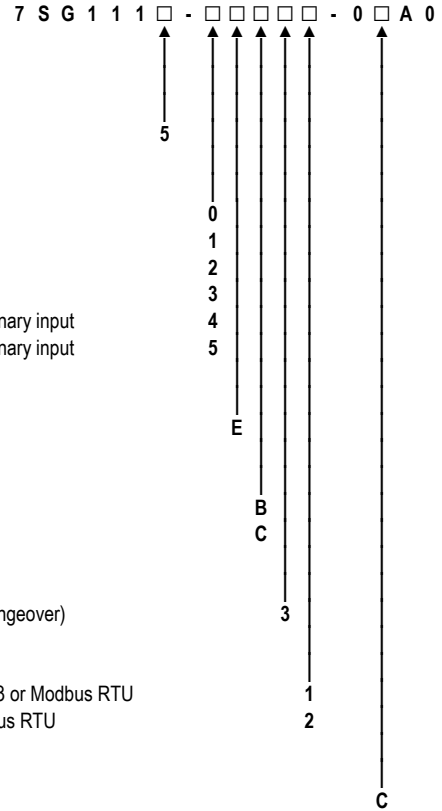
Type of elements
3 pole phase-fault and earth-fault

Nominal current
1A
5A

I/O range
3 Binary Input / 5 Binary Outputs (incl. 2 changeover)

Communication interface
 Fibre optic (ST-connector) / IEC 60870-5-103 or Modbus RTU
 RS485 interface / IEC 60870-5-103 or Modbus RTU

Housing size
Case size E4 (4U high)



¹⁾ High burden 110V & 220V binary inputs compliant with ESI48-4 ESI 1 available via external dropper resistors with 48V binary input version for 5 binary inputs and 110 V application, order resistor box VCE:2512H10065 in addition for 5 binary inputs and 220 V application, order resistor box VCE:2512H10067 in addition Refer to website for application note about ESI48-4 compliance

Section 2: Settings

Relay Type _____

Serial Number _____

Substation _____

Feeder Identity _____

Notes on Tables

All settings found in the Argus 1 relay types are listed below. Within the list some settings (indicated with greyed cells) are not always visible, for the following reasons:

- Depending on the version of the relay, a particular function and hence its related settings may not be present, e.g. on a 2 phase-fault and SEF relay any settings related to earth-fault will not be present.
- Depending on the value of some settings, other settings will be hidden, e.g. if the main characteristic is set to DTL, rather than an IDMT characteristic, the time multiplier setting will be hidden and replaced by a time delay setting.

Some settings in the tables show text in square brackets, e.g. '[SEF/REF] Current Setting'. This indicates different text that may be displayed, depending on the value of other settings, i.e. 'SEF Current Setting' or 'REF Current Setting' dependent on the value of the 'Earth Fault Mode Select' setting.

The second column in the tables ('Ref') provides a reference to the section in the Technical Reference (publication P20007 issue 2004/02) that describes the setting.

The third column is left blank to allow users to complete the table with applied settings.

System Config. Menu

Setting name	Ref	Applied value
Active Settings Group	2.2.1	
Settings Group Edit/View	2.2.1	
Copy Group	2.2.1	
Power System Frequency	2.2.2	Hz
Set Pole B Type	2.2.3	
Earth Fault Mode Select	2.2.3	
P/F Rating (In)	2.2.3	A
E/F Rating (In)	2.2.3	A
[SEF/REF] Rating (In)	2.2.3	A
P/F CT Ratio	2.2.3	
E/F CT Ratio	2.2.3	
[SEF/REF] CT Ratio	2.2.3	
Current Display	2.2.3	
Set Identifier	2.2.4	
Set Alarm 1	2.2.5	
Set Alarm 2	2.2.5	
Set Alarm 3	2.2.5	

Setting name	Ref	Applied value
Set Alarm 4	2.2.5	
Set Alarm 5	2.2.5	
Calendar – Set Date	2.2.7	
Clock - Set Time	2.2.7	
Clock Sync. From Status	2.2.7	
Default Screen Timer	2.2.8	
Change Password	2.2.9	

Protection Menu

Setting name	Ref	Applied value
Gn P/F Charact. Setting	2.3.1	xIn
Gn P/F Charact.	2.3.1	
Gn P/F Charact. Time Mult	2.3.1	
Gn P/F Charact. Delay	2.3.1	sec
Gn P/F Lowset Setting	2.3.2	xIn
Gn P/F Lowset Delay	2.3.2	sec
Gn P/F Highset1 Setting	2.3.2	xIn
Gn P/F Highset1 Delay	2.3.2	sec

Setting name	Ref	Applied value
Gn P/F Highset2 Setting	2.3.2	xIn
Gn P/F Highset2 Delay	2.3.2	sec
Gn E/F Charact. Setting	2.3.1	xIn
Gn E/F Charact.	2.3.1	
Gn E/F Charact. Time Mult	2.3.1	
Gn E/F Charact. Delay	2.3.1	sec
Gn E/F Lowset Setting	2.3.2	xIn
Gn E/F Lowset Delay	2.3.2	sec
Gn E/F Highset1 Setting	2.3.2	xIn
Gn E/F Highset1 Delay	2.3.2	sec
Gn E/F Highset2 Setting	2.3.2	xIn
Gn E/F Highset2 Delay	2.3.2	sec
Gn [SEF/REF] Current Setting	2.4	
Gn [SEF/REF] 1st Time Delay	2.4	sec
Gn [SEF/REF] 2nd Time Delay	2.4	sec
Gn [SEF/REF] Lowset Delay	2.4	sec
Gn CB Fail Time Delay1	2.5	sec
Gn CB Fail Time Delay2	2.5	sec
Gn P/F CB Fail Setting	2.5	xIn
Gn E/F CB Fail Setting	2.5	xIn
Gn SEF CB Fail Setting	2.5	xIn
Gn CT Failure Setting	2.5.3	xIn
Gn CT Failure Delay	2.5.3	sec
Gn Relay Reset Delay	2.3.3	sec

Output Relay Configuration Menu

See also Figure 2-1 on page 15 for the programming matrix.

Setting name	Ref	Applied value
Gn Prot. Healthy	2.14.3	
Gn P/F Starter	2.3.1	
Gn P/F Charact.	2.3.1	
Gn P/F Lowset	2.3.2	
Gn P/F Highset1	2.3.2	
Gn P/F Highset2	2.3.2	

Setting name	Ref	Applied value
Gn E/F Starter	2.3.1	
Gn E/F Charact.	2.3.1	
Gn E/F Lowset	2.3.2	
Gn E/F Highset1	2.3.2	
Gn E/F Highset2	2.3.2	
Gn [SEF/REF] Starter	2.4	
Gn [SEF/REF] Delay1	2.4	
Gn [SEF/REF] Delay2	2.4	
Gn [SEF/REF] Lowset	2.4	
Gn Status 1	2.11	
Gn Status 2	2.11	
Gn Status 3	2.11	
Gn Status 4	2.11	
Gn Status 5	2.11	
Gn Status 6	2.11	
Gn Status 7	2.11	
Gn Status 8	2.11	
Gn Status 9	2.11	
Gn CB Fail 1	2.5	
Gn CB Fail 2	2.5	
Gn CT Failure	2.5.3	
Gn Counter Alarm	2.14.1	
Gn ΣI^2 Alarm	2.14.1	
Gn Power On Count	2.14.3	
Gn Hand Reset	2.11	
Min O/P Energise Time	2.11	ms

Status Configuration Menu

See also Figure 2-1 on page 15 for the programming matrix.

Setting name	Ref	Applied value
Settings Group Select	2.2.1	
Inverted Inputs	2.11	
Gn P/F Charact. Inhibit	2.3.1	
Gn P/F Lowset Inhibit	2.3.2	

Setting name	Ref	Applied value
Gn P/F Highset1 Inhibit	2.3.2	
Gn P/F Highset2 Inhibit	2.3.2	
Gn E/F Charact. Inhibit	2.3.1	
Gn E/F Lowset Inhibit	2.3.2	
Gn E/F HighSet 1 Inhibit	2.3.2	
Gn E/F HighSet 2 Inhibit	2.3.2	
Gn [SEF/REF] Delay1 Inhibit	2.4	
Gn [SEF/REF] Delay2 Inhibit	2.4	
Gn [SEF/REF] Lowset Inhibit	2.4	
Gn Trip Circuit Fail	2.10	
Gn Waveform Trig	2.13.3	
Gn ΣI^2 Update	2.14.1	
Gn Reset Flag & Outputs	2.11	
Gn Clock Sync.	2.2.7	
Gn Status 1 P/U Delay	2.11	sec
Gn Status 1 D/O Delay	2.11	sec
Gn Status 2 P/U Delay	2.11	sec
Gn Status 2 D/O Delay	2.11	sec
Gn Status 3 P/U Delay	2.11	sec
Gn Status 3 D/O Delay	2.11	sec
Gn Status 4 P/U Delay	2.11	sec
Gn Status 4 D/O Delay	2.11	sec
Gn Status 5 P/U Delay	2.11	sec
Gn Status 5 D/O Delay	2.11	sec
Gn Status 6 P/U Delay	2.11	sec
Gn Status 6 D/O Delay	2.11	sec
Gn Status 7 P/U Delay	2.11	sec
Gn Status 7 D/O Delay	2.11	sec
Gn Status 8 P/U Delay	2.11	sec
Gn Status 8 D/O Delay	2.11	sec
Gn Status 9 P/U Delay	2.11	sec
Gn Status 9 D/O Delay	2.11	sec
Gn Alarm 1 * see note below	2.2.5	

Setting name	Ref	Applied value
Gn Alarm 2 * see note below	2.2.5	
Gn Alarm 3 * see note below	2.2.5	
Gn Alarm 4 * see note below	2.2.5	
Gn Alarm 5 * see note below	2.2.5	

* The text of these setting names reflects the value applied to the 'Set Alarm *n*' settings in the 'System Config.' menu.

Comms Interface Menu

Setting name	Ref	Applied value
Comms Protocol	4.1.1	
IEC Class 2 Measurand	4.2.6	
Class 2 Update Period	4.2.7	sec
IEC Class 2 Scaling	4.2.8	
Comms Baud Rate	4.2.9	baud
Comms Parity	4.2.10	
Relay Address	4.2.11	
Line Idle	4.2.12	
Data Echo	4.2.13	

Data Storage Menu

Setting name	Ref	Applied value
Gn Fault Trigger	2.13.2	
Gn Waveform Trig	2.13.3	
Gn Waveform Pre-trigger	2.13.3	%
Clear All Waveforms	2.13.3	
Clear All Events	2.13.1	
Clear All Faults	2.13.2	
Demand Window Type	2.13.4	
Demand Window	2.13.4	
Maximum Demand Reset	2.13.4	

CB Maintenance Menu

<u>Setting name</u>	<u>Ref</u>	<u>Applied value</u>
Trip Counter Reset	2.14.1	
Trip Counter Alarm	2.14.1	
ΣI^2 Reset	2.14.1	
ΣI^2 Alarm	2.14.1	
Power On Count Reset	2.14.3	
Power On Count Alarm	2.14.3	
O/P Relay Test	2.14.2	

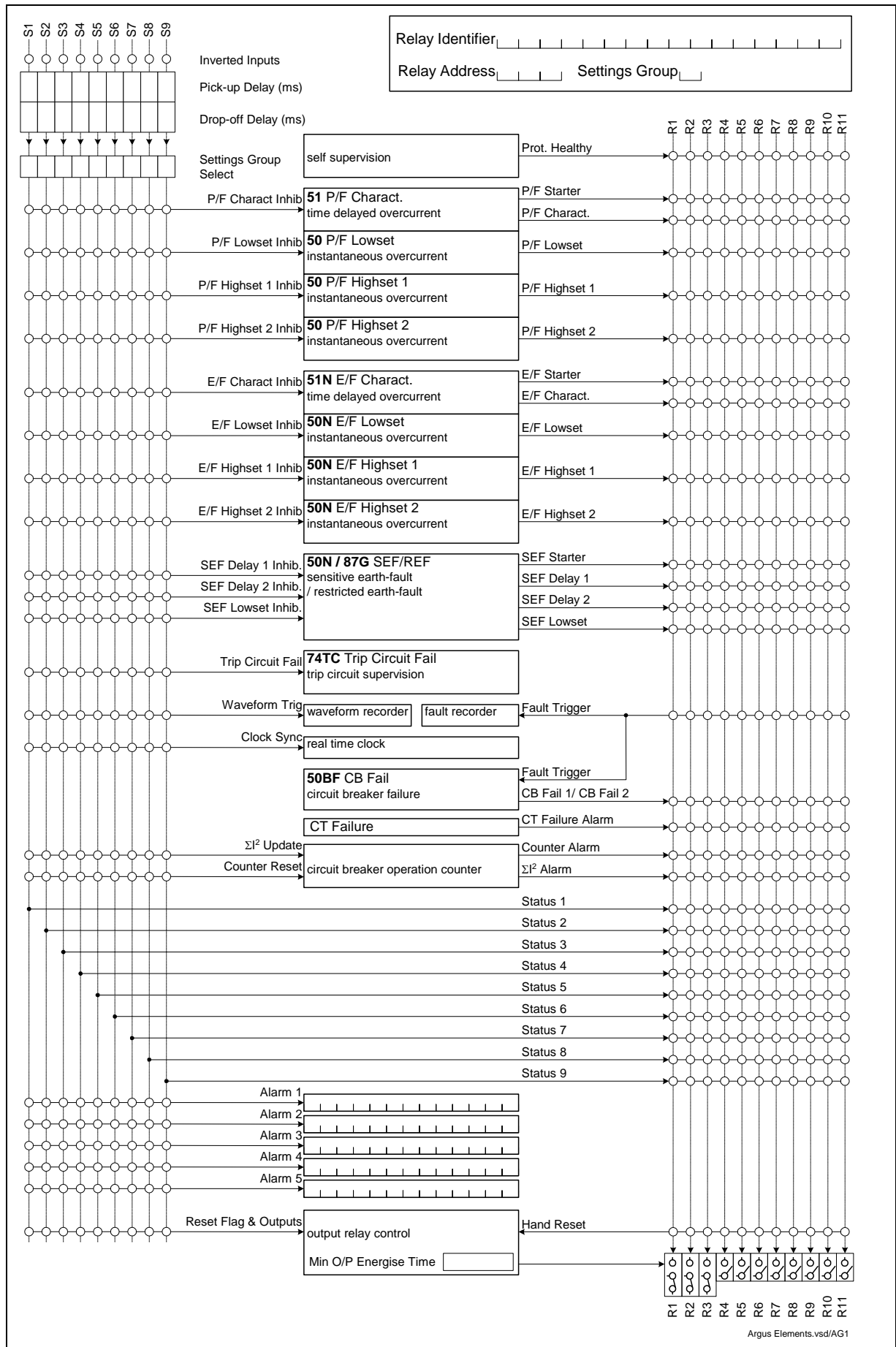


Figure 2-1 Status Input and Output Relay Programming Matrix

Section 3: IEC 60870-5-103 & Modbus RTU Definitions

3.1 IEC 60870-5-103 Definitions

The following tables give information on the IEC 60870-5-103 protocol. A detailed description of all protocol information is available in report no 434/TM/5/13 which can be accessed on the www.siemens.com/energy in publications section under technical reports, "communications interface manual".

Table Showing Function Type Numbers Used

Function Type	Description
160	IEC Overcurrent Protection
164	Reyrolle Overcurrent Protection
254	IEC Generic
255	IEC Global

Cause of Transmission

The cause of transmission (COT) column of the 'Information Number and Function' table lists possible causes of transmission for these frames. The following abbreviations are used:

Table Showing Permitted Cause of Transmission Numbers

Cause of Transmission (COT)	Description
1	Spontaneous Events
2	Cyclic
3	Reset Frame Count Bit (FCB)
4	Reset Communication Unit (CU)
5	Start Restart
6	Power On
7	Test Mode
8	Time Synchronisation
9	General Interrogation
10	Termination of General Interrogation
11	Local Operation
12	Remote Operation
20	Positive Command Acknowledge
21	Negative Command Acknowledge
31	Transmission of Disturbance Data

Information Number and Function

The following tables list information number and function definitions together with a description of the message and function type and cause of transmission that can result in that message. Not all definitions are available on all relay types – this is dependent on functionality.

KEY	FUN	Function Type (defined in IEC60870-5-103 section 7.2.5.1)
	INF	Information Number (defined in IEC60870-5-103 section 7.2.5.2)
	TYP	ASDU Type (defined in IEC60870-5-103 sections 7.3.1 and 7.3.2)
	GI	Event supports General Interrogation x = supported (defined in IEC60870-5-103 section 7.2.5.2)
	COM	Type of command single (ON only) or double (ON/OFF) (defined in IEC60870-5-103 section 7.2.5.2)
	COT	Cause of Transmission (defined in IEC60870-5-103 section 7.2.3, table 5)
	DIR	Direction of event - Raised Only (RO), Raised/Cleared (RC) or Double Point Travelling, Cleared, Raised or Unknown (DBI)
	x	Supported, - Not supported.

Table Showing Command Information (INF) Numbers

FUN	INF	Description	GI	TYP	COT	DIR	Argus 1
160	2	Reset FCB	-	5	3	RO	x
160	3	Reset CU	-	5	4	RO	x
160	4	Start/Restart	-	5	5	RO	x
160	5	Power On	-	5	6	RO	x
160	16	ARC in progress	x	1	1, 9, 12, 20, 21	RC	
160	19	LEDs reset	-	1	1, 7, 11, 12, 20, 21	RO	x
160	21	Trip Test	x	1	1, 9	RC	x
160	22	Settings changed	x	1	1, 9, 11, 12	RC	x
160	23	Setting G1 selected	x	1	1, 9, 11, 12, 20, 21	RC	x
160	24	Setting G2 selected	x	1	1, 9, 11, 12, 20, 21	RC	x
160	25	Setting G3 selected	x	1	1, 9, 11, 12, 20, 21	RC	x
160	26	Setting G4 selected	x	1	1, 9, 11, 12, 20, 21	RC	x
160	27	Input 1	x	1	1, 9	RC	x
160	28	Input 2	x	1	1, 9	RC	x
160	29	Input 3	x	1	1, 9	RC	x
160	30	Input 4	x	1	1, 9	RC	x
160	36	Trip circuit fail	x	1	1, 9	RC	x
160	46	Group Warning	x	1	1, 9	RC	
160	47	Alarm	x	1	1, 9	RO	
160	64	A-starter	x	2	1, 9	RC	x
160	65	B-starter	x	2	1, 9	RC	x
160	66	C-starter	x	2	1, 9	RC	x
160	67	E-starter	x	2	1, 9	RC	x
160	68	General trip	-	2	1	RO	x
160	69	A-general trip	-	2	1	RO	x
160	70	B-general trip	-	2	1	RO	x
160	71	C-general trip	-	2	1	RO	x
160	84	General starter	x	2	1, 9	RC	x
160	85	Circuit breaker fail 1	-	2	1	RO	x
160	91	P/F-general HS trip	-	2	1	RO	x
160	92	E/F-general trip	-	2	1	RO	x

FUN	INF	Description	GI	TYP	COT	DIR	Argus 1
160	93	E/F-general HS trip	-	2	1	RO	x
160	128	CB on by auto reclose	-	1	1	DP	
160	130	Reclose blocked	x	1	1, 9	RC	
160	144	Measurand I ¹	-	3.1	2,7	-	x
160	148	Measurand I _{L1,2,3} , V _{L1,2,3} , P, Q	-	9	2,7	-	x
164	0	Data lost	-	1	1	RO	x
164	1	A-lowset starter	-	2	1	RC	x
164	2	B-lowset starter	-	2	1	RC	x
164	3	C-lowset starter	-	2	1	RC	x
164	4	E-lowset starter	-	2	1	RC	x
164	5	A-lowset trip	-	2	1	RO	x
164	6	B-lowset trip	-	2	1	RO	x
164	7	C-lowset trip	-	2	1	RO	x
164	8	E-lowset trip	-	2	1	RO	x
164	9	A-delayed trip	-	2	1	RO	x
164	10	B-delayed trip	-	2	1	RO	x
164	11	C-delayed trip	-	2	1	RO	x
164	12	E-delayed trip	-	2	1	RO	x
164	13	A-HS1 trip	-	2	1	RO	x
164	14	B-HS1 trip	-	2	1	RO	x
164	15	C-HS1 trip	-	2	1	RO	x
164	16	E-HS1 trip	-	2	1	RO	x
164	17	A-HS2 trip	-	2	1	RO	x
164	18	B-HS2 trip	-	2	1	RO	x
164	19	C-HS2 trip	-	2	1	RO	x
164	20	E-HS2 trip	-	2	1	RO	x
164	21	SEF/REF starter	x	2	1, 9	RC	x
164	23	SEF/REF lowset trip	-	2	1	RC	x
164	24	SEF/REF stage 1 trip	-	2	1	RC	x
164	25	SEF/REF stage 2 trip	-	2	1	RC	x
164	26	A-HS1 starter	-	2	1	RC	x
164	27	B-HS1 starter	-	2	1	RC	x
164	28	C-HS1 starter	-	2	1	RC	x

¹ One of Ia, Ib, Ic, Id depending on relay type

FUN	INF	Description	GI	TYP	COT	DIR	Argus 1
164	29	E-HS1 starter	-	2	1	RC	x
164	30	A-HS2 starter	-	2	1	RC	x
164	31	B-HS2 starter	-	2	1	RC	x
164	32	C-HS2 starter	-	2	1	RC	x
164	33	E-HS2 starter	-	2	1	RC	x
164	34	Circuit breaker open	x	1	1, 9	RO	
164	35	Setting G5 selected	x	1	1, 9, 11, 12, 20, 21	RC	x
164	36	Setting G6 selected	x	1	1, 9, 11, 12, 20, 21	RC	x
164	37	Setting G7 selected	x	1	1, 9, 11, 12, 20, 21	RC	x
164	38	Setting G8 selected	x	1	1, 9, 11, 12, 20, 21	RC	x
164	39	Circuit breaker fail 2	-	2	1	RO	x
164	41	CB close fail	x	1	1, 9	RO	
164	43	CB DBI state	x	1	1, 9	RO	
164	44	External Trip	-	2	1	RO	x
164	45	Input 5	x	1	1, 9	RC	x
164	46	Input 6	x	1	1, 9	RC	x
164	47	Input 7	x	1	1, 9	RC	x
164	48	Input 8	x	1	1, 9	RC	x
164	49	Input 9	x	1	1, 9	RC	x
164	51	Output 1	x	1	1, 9, 12, 20, 21	RC	x
164	52	Output 2	x	1	1, 9, 12, 20, 21	RC	x
164	53	Output 3	x	1	1, 9, 12, 20, 21	RC	x
164	54	Output 4	x	1	1, 9, 12, 20, 21	RC	x
164	55	Output 5	x	1	1, 9, 12, 20, 21	RC	x
164	56	Output 6	x	1	1, 9, 12, 20, 21	RC	x
164	57	Output 7	x	1	1, 9, 12, 20, 21	RC	x
164	58	Output 8	x	1	1, 9, 12, 20, 21	RC	x
164	59	Output 9	x	1	1, 9, 12, 20, 21	RC	x
164	60	Output 10	x	1	1, 9, 12, 20, 21	RC	x
164	61	Output 11	x	1	1, 9, 12, 20, 21	RC	x
164	62	Forward A	x	2	1, 9	RC	
164	63	Reverse A	x	2	1, 9	RC	
164	64	Forward B	x	2	1, 9	RC	
164	65	Reverse B	x	2	1, 9	RC	
164	66	Forward C	x	2	1, 9	RC	
164	67	Reverse C	x	2	1, 9	RC	
164	68	Forward E	x	2	1, 9	RC	
164	69	Reverse E	x	2	1, 9	RC	

FUN	INF	Description	GI	TYP	COT	DIR	Argus 1
164	70	Trip count alarm	x	1	1, 9	RC	x
164	70	Trip count alarm	x	4	1, 9	-	x
164	71	CB maintenance alarm	x	1	1, 9	RC	x
164	71	CB maintenance alarm	x	4	1, 9	-	x
164	72	Frequent operations exceeded	x	1	1, 9	RC	
164	73	Delta Trip Counter Alarm	x	1	1, 9	RC	
164	79	Voltage Block	x	1	1, 9	RC	
164	80	Waveform stored	-	1	1, 12, 20, 21	RO	x
164	81	Remote control interrupted	-	1	1	RO	x
164	82	Trip and Lockout	-	1	1, 12, 20, 21	RO	
164	83	Close and Reclaim	-	1	1, 12, 20, 21	RO	
164	84	Trip And Reclose	-	1	1, 12, 20, 21	RO	
164	85	Circuit breaker closed	x	1	1, 9	RO	
164	86	Close And Lockin	-	1	1, 12, 20, 21	RO	
164	87	Reclose delay	x	1	1, 9	RC	
164	88	Reclaim	x	1	1, 9	RC	
164	89	Lockout	x	1	1, 9	RC	
164	90	Forward SEF	x	2	1, 9	RC	
164	91	Reverse SEF	x	2	1, 9	RC	
164	92	Power On Counter Alarm	x	1	1, 9	RC	x
164	97	CT Failure	x	1	1, 9	RC	x
164	100	Cold load pickup	x	1	1, 9, 12, 20, 21	RC	
164	101	Cold load trip	-	2	1	RO	
164	102	Line check trip	-	2	1	RO	
164	103	ARC start A	x	1	1, 9	RC	
164	104	A backup time	-	1	1	RC	
164	105	A backup trip	-	1	1	RC	
164	106	External trip block	x	1	1, 9	RC	
164	110	SEF off	x	1	1, 9, 12, 20, 21	RC	
164	111	All ARC off	x	1	1, 9	RC	
164	112	P/F ARC off	x	1	1, 9, 12, 20, 21	RC	
164	113	E/F ARC off	x	1	1, 9, 12, 20, 21	RC	
164	114	SEF ARC off	x	1	1, 9, 12, 20, 21	RC	
164	115	All inst off	x	1	1, 9, 12, 20, 21	RC	
164	116	P/F inst off	x	1	1, 9, 12, 20, 21	RC	
164	117	E/F inst off	x	1	1, 9, 12, 20, 21	RC	

FUN	INF	Description	GI	TYP	COT	DIR	Argus 1
164	118	SEF inst off	x	1	1, 9, 12, 20, 21	RC	
164	119	Hot line working	x	1	1, 9, 12, 20, 21	RC	
164	120	Scada Control	x	1	1, 9	RC	
164	121	General alarm 1	x	1	1, 9	RC	x
164	122	General alarm 2	x	1	1, 9	RC	x
164	123	General alarm 3	x	1	1, 9	RC	x
164	124	General alarm 4	x	1	1, 9	RC	x
164	125	General alarm 5	x	1	1, 9	RC	x
164	131	Va/Vab starter	x	2	1, 9	RC	
164	132	Vb/Vbc starter	x	2	1, 9	RC	
164	133	Vc/Vca starter	x	2	1, 9	RC	
164	170	V starter	x	2	1, 9	RC	
164	182	V trip	-	2	1	RO	
164	190	Voltage Memory A	x	1	1, 9	RC	
164	191	Voltage Memory B	x	1	1, 9	RC	
164	192	Voltage Memory C	x	1	1, 9	RC	
164	240	Ia Fault Current	x	4	1, 9	-	x
164	241	Ib Fault Current	x	4	1, 9	-	x
164	242	Ic Fault Current	x	4	1, 9	-	x
164	243	Ie Fault Current	x	4	1, 9	-	x
164	244	Isef Fault Current	x	4	1, 9	-	x
164	245	Va Fault Voltage	x	4	1, 9	-	
164	246	Vb Fault Voltage	x	4	1, 9	-	
164	247	Vc Fault Voltage	x	4	1, 9	-	
164	248	Vn Fault Voltage	x	4	1, 9	-	
255	0	Time Synchronisation	-	6	8	-	x
255	0	End of General Interrogation	-	8	10	-	x

Table Showing Command Information (INF) Numbers

FUN	INF	Description	COM	TYP	COT	Argus 1
160	16	Auto-recloser ON/OFF	ON/OFF	20	20	
160	19	Reset Flag & Outputs	ON	20	20	x

FUN	INF	Description	COM	TYP	COT		Argus 1
160	23	Settings Group 1 Select	ON	20	20		x
160	24	Settings Group 2 Select	ON	20	20		x
160	25	Settings Group 3 Select	ON	20	20		x
160	26	Settings Group 4 Select	ON	20	20		x
164	35	Settings Group 5 Select	ON	20	20		x
164	36	Settings Group 6 Select	ON	20	20		x
164	37	Settings Group 7 Select	ON	20	20		x
164	38	Settings Group 8 Select	ON	20	20		x
164	51	Energise Output 1	ON	20	20		x
164	52	Energise Output 2	ON	20	20		x
164	53	Energise Output 3	ON	20	20		x
164	54	Energise Output 4	ON	20	20		x
164	55	Energise Output 5	ON	20	20		x
164	56	Energise Output 6	ON	20	20		x
164	57	Energise Output 7	ON	20	20		x
164	58	Energise Output 8	ON	20	20		x
164	59	Energise Output 9	ON	20	20		x
164	60	Energise Output 10	ON	20	20		x
164	61	Energise Output 11	ON	20	20		x
164	80	Trigger Waveform Storage	ON	20	20		x
164	82	Trip and Lockout	ON	20	20		
164	83	Close and Reclaim	ON	20	20		
164	84	Trip And Reclose	ON	20	20		
164	86	Close And Lockin	ON/OFF	20	20		
164	100	Cold load pickup	ON/OFF	20	20		
164	110	SEF	ON/OFF	20	20		
164	112	P/F ARC Inhibit	ON/OFF	20	20		
164	113	E/F ARC Inhibit	ON/OFF	20	20		
164	114	SEF ARC Inhibit	ON/OFF	20	20		
164	115	Instantaneous	ON/OFF	20	20		
164	116	P/F Instantaneous	ON/OFF	20	20		
164	117	E/F Instantaneous	ON/OFF	20	20		
164	118	SEF Instantaneous	ON/OFF	20	20		

FUN	INF	Description	COM	TYP	COT		Argus 1
164	119	Hot line working	ON/OFF	20	20		
164	129	Reset Energy Meters	ON/OFF	20	20		
164	130	Reset Maximum Demand	ON/OFF	20	20		x
255	0	Initiate General Interrogation	-	7	9	-	x
255	0	Time Synchronisation	-	6	8		x

Note: Events listing a GI cause of transmission can be raised and cleared; other events are raised only.

3.2 Modbus RTU Definitions

The following tables give information for MODBUS RTU access to IEC 60870-5-103 protocol data. A detailed description of all protocol information is available in report no 434/TM/5/13 which can be accessed on the www.reyrolle-protection.com in publications section under technical reports, "communications interface manual".

The tables below detail the MODBUS address map, listing data points that are available and the functions supported for access. **Please note, not all addresses will apply to all models.**

To configure MODBUS a new setting has been added to the communications sub-menu to select the protocol to use, either IEC60870-5-103 or MODBUS-RTU. After selecting MODBUS, set the remaining parameters, baud rate, parity, station (slave) address, line idle and data echo as appropriate.

When an electrical RS485 module is connected to the Argus relay, the **Line Idle** and **Data Echo** settings must both be set to **OFF**.

Table showing Coil Addresses

MODBUS Address	IEC FUN	IEC INF	Description	COM	AG 1
00016	160	16	Autoreclose	ON/OFF	
00019	160	19	Reset Flag & Outputs *	ON	x
00023	160	23	Settings Group 1 Select	ON	x
00024	160	24	Settings Group 2 Select	ON	x
00025	160	25	Settings Group 3 Select	ON	x
00026	160	26	Settings Group 4 Select	ON	x
01059	164	35	Settings Group 5 Select	ON	x
01060	164	36	Settings Group 6 Select	ON	x
01061	164	37	Settings Group 7 Select	ON	x
01062	164	38	Settings Group 8 Select	ON	x
01075	164	51	Energise Output 1	ON	x
01076	164	52	Energise Output 2	ON	x
01077	164	53	Energise Output 3	ON	x
01078	164	54	Energise Output 4	ON	x

MODBUS Address	IEC FUN	IEC INF	Description	COM	AG 1
01079	164	55	Energise Output 5	ON	x
01080	164	56	Energise Output 6	ON	x
01081	164	57	Energise Output 7	ON	x
01082	164	58	Energise Output 8	ON	x
01083	164	59	Energise Output 9	ON	x
01084	164	60	Energise Output 10	ON	x
01085	164	61	Energise Output 11	ON	x
01104	164	80	Trigger Waveform Storage *	ON	x
01106	164	82	Trip and Lockout*	ON	
01107	164	83	Close and Reclaim*	ON	
01108	164	84	Trip and Reclose*	ON	
01110	164	86	Close and Lockin*	ON/OFF	
01124	164	100	Cold Load Pickup	ON/OFF	
01134	164	110	SEF	ON/OFF	
01136	164	112	PF ARC Inhibit	ON/OFF	
01137	164	113	EF ARC Inhibit	ON/OFF	
01138	164	114	SEF ARC Inhibit	ON/OFF	
01139	164	115	Instantaneous	ON/OFF	
01140	164	116	P/F Instantaneous	ON/OFF	
01141	164	117	E/F Instantaneous	ON/OFF	
01142	164	118	SEF Instantaneous	ON/OFF	
01143	164	119	Hot Line Working	ON/OFF	
01154	164	130	Reset Maximum Demand *	ON	

Table Showing Inputs

MODBUS Address	FUN	INF	Description	AG 1
10016	160	16	Auto Reclose Active	
10021	160	21	Trip Test	x
10022	160	22	Settings changed	x
10023	160	23	Setting G1 selected	x
10024	160	24	Setting G2 selected	x
10025	160	25	Setting G3 selected	x
10026	160	26	Setting G4 selected	x
10027	160	27	Input 1	x
10028	160	28	Input 2	x
10029	160	29	Input 3	x
10030	160	30	Input 4	x

MODBUS Address	FUN	INF	Description	AG 1
10036	160	36	Trip circuit fail	x
10046	160	46	Group Warning	
10047	160	47	Alarm	
10064	160	64	A-starter	x
10065	160	65	B-starter	x
10066	160	66	C-starter	x
10067	160	67	E-starter	x
10084	160	84	General starter	x
10128	160	128	CB on by auto recluse	
10130	160	130	Reclose blocked	
11045	164	21	SEF/REF starter	x
11058	164	34	Circuit breaker open	
11059	164	35	Setting G5 selected	x
11060	164	36	Setting G6 selected	x
11061	164	37	Setting G7 selected	x
11062	164	38	Setting G8 selected	x
11065	164	41	CB close fail	
11067	164	43	CB DBI state	
11069	164	45	Input 5	x
11070	164	46	Input 6	x
11071	164	47	Input 7	x
11072	164	48	Input 8	x
11073	164	49	Input 9	x
11075	164	51	Output1	x
11076	164	52	Output2	x
11077	164	53	Output3	x
11078	164	54	Output4	x
11079	164	55	Output5	x
11080	164	56	Output6	x
11081	164	57	Output7	x
11082	164	58	Output8	x
11083	164	59	Output9	x
11084	164	60	Output10	x
11085	164	61	Output11	x
11086	164	62	Forward A	
11087	164	63	Reverse A	
11088	164	64	Forward B	
11089	164	65	Reverse B	
11090	164	66	Forward C	

MODBUS Address	FUN	INF	Description	AG 1
11091	164	67	Reverse C	
11092	164	68	Forward E	
11093	164	69	Reverse E	
11094	164	70	Trip count alarm	x
11095	164	71	CB maintenance alarm	x
11096	164	72	Frequent operations exceeded	
11097	164	73	Delta Trip Counter Alarm	
11103	164	79	Voltage Block	
11109	164	85	Circuit breaker closed	
11111	164	87	Reclose Delay	
11112	164	88	Reclaim	
11113	164	89	Lockout	
11114	164	90	Forward SEF	
11115	164	91	Reverse SEF	
11116	164	92	Power On Counter Alarm	x
11121	164	97	CT Failure	x
11124	164	100	Cold load pickup	
11127	164	103	ARC start A	
11130	164	106	External trip block	
11134	164	110	SEF off	
11135	164	111	All ARC off	
11136	164	112	P/F ARC off	
11137	164	113	E/F ARC off	
11138	164	114	SEF ARC off	
11139	164	115	All inst off	
11140	164	116	P/F inst off	
11141	164	117	E/F inst off	
11142	164	118	SEF inst off	
11143	164	119	Hot line working	
11144	164	120	Scada Control	
11145	164	121	General alarm 1	x
11146	164	122	General alarm 2	x
11147	164	123	General alarm 3	x
11148	164	124	General alarm 4	x
11149	164	125	General alarm 5	x
11155	164	131	Va/Vab starter	
11156	164	132	Vb/Vbc starter	
11157	164	133	Vc/Vca starter	
11194	164	170	V starter	

MODBUS Address	FUN	INF	Description	AG 1
11214	164	190	Voltage Memory A	
11215	164	191	Voltage Memory B	
11216	164	192	Voltage Memory C	

Table Showing Input Registers

MODBUS Address	Description	Size (Words)	Scaling	Units Scaled	AG 1
30001	Number Of Events In Store	1	1	-	x
30002	Latest Event Record	8	-	-	x
30101	IA (PRIMARY)	2	1000	A	x
30103	IB (PRIMARY)	2	1000	A	x
30105	IC (PRIMARY)	2	1000	A	x
30107	IE (PRIMARY)	2	1000	A	x
30109	ISEF/REF (PRIMARY)	2	1000	A	x
30111	Ia (SECONDARY)	2	1000	A	x
30113	Ib (SECONDARY)	2	1000	A	x
30115	Ic (SECONDARY)	2	1000	A	x
30117	Ie (SECONDARY)	2	1000	A	x
30119	Isef/ref (SECONDARY)	2	1000	A	x
30121	Ia (xIn)	2	1000	xIn	x
30123	Ib (xIn)	2	1000	xIn	x
30125	Ic (xIn)	2	1000	xIn	x
30127	Ie (xIn)	2	1000	xIn	x
30129	Isef/ref (xIn)	2	1000	xIn	x
30131	A Direction	8	-	-	
30139	B Direction	8	-	-	
30147	C Direction	8	-	-	
30155	E Direction	8	-	-	
30163	Relay Status	8	-	-	x
30171	Status Inputs	8	-	-	x
30179	Trip Circuit Fail	8	-	-	x
30187	Trip Counter	2	1	-	x
30189	Delta Trip Count	2	1	-	
30191	Frequent Operation Counter	2	1	-	
30193	Sum of I ²	2	100	MA ²	x
30195	Number of Waveforms	2	1	-	x
30197	Number of Events	2	1	-	x
30199	Number of Faults	2	1	-	x
30201	Time	8	-	-	x
30209	Date	8	-	-	x
30217	Starters	8	-	-	x
30257	General Alarms	8	-	-	x
30265	Power On/Resets	8	-	-	x
30273	ARC Status	8	-	-	
30281	ARC Inhibits	8	-	-	

Section 4: Application Diagrams

The following pages contain example application diagrams for a variety of connections, showing various hardware options.

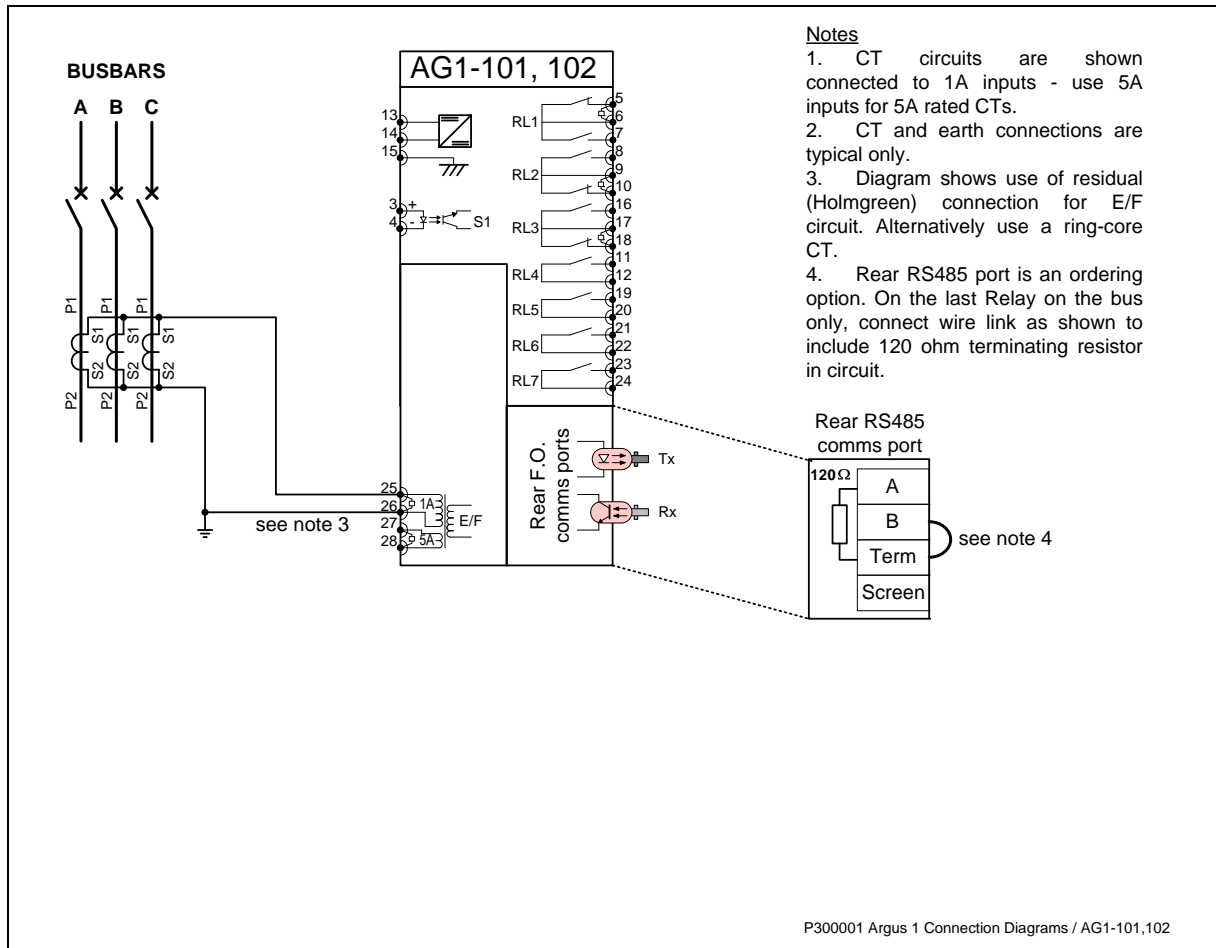


Figure 4-1 Typical Connection for Earth-fault Protection

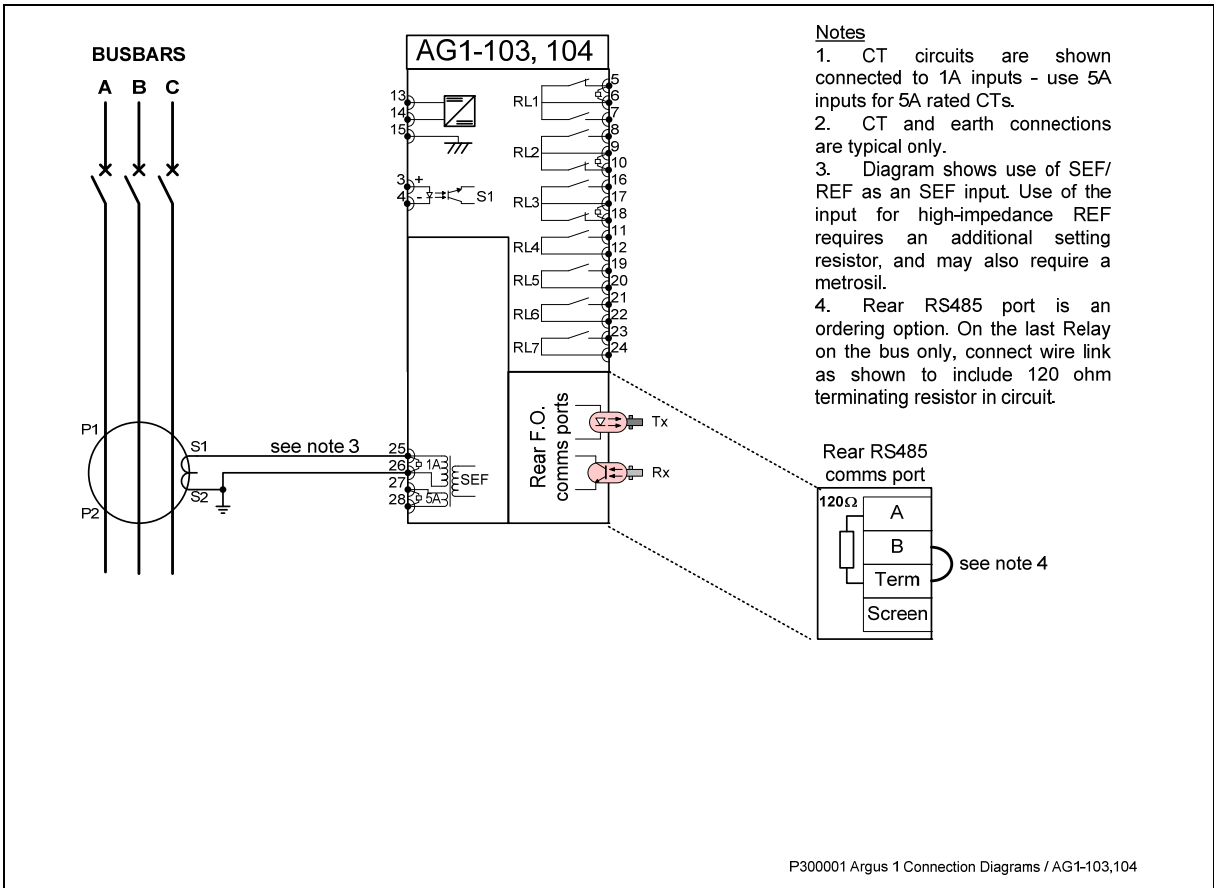


Figure 4-2 Typical Connection for Sensitive Earth-fault Protection

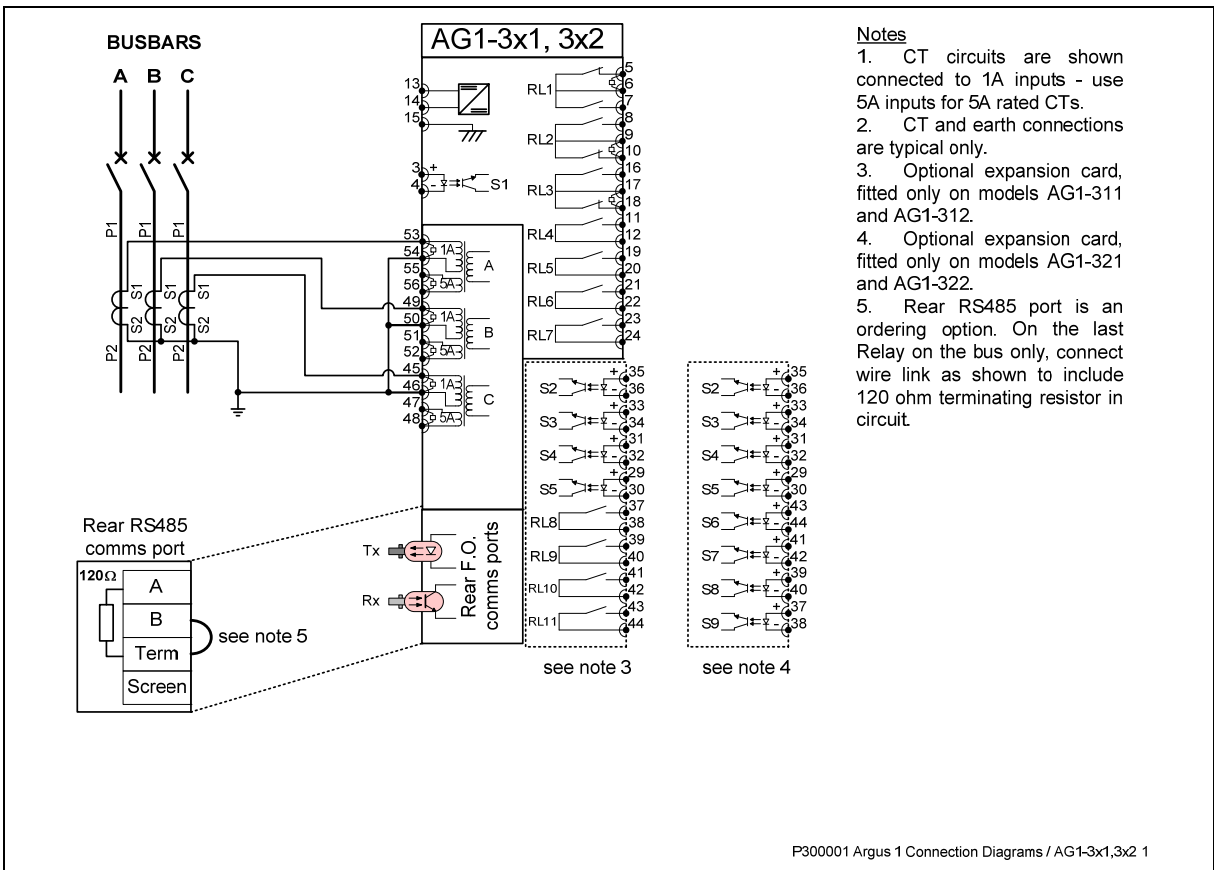


Figure 4-3 Typical Connection for 3 Phase-fault Protection

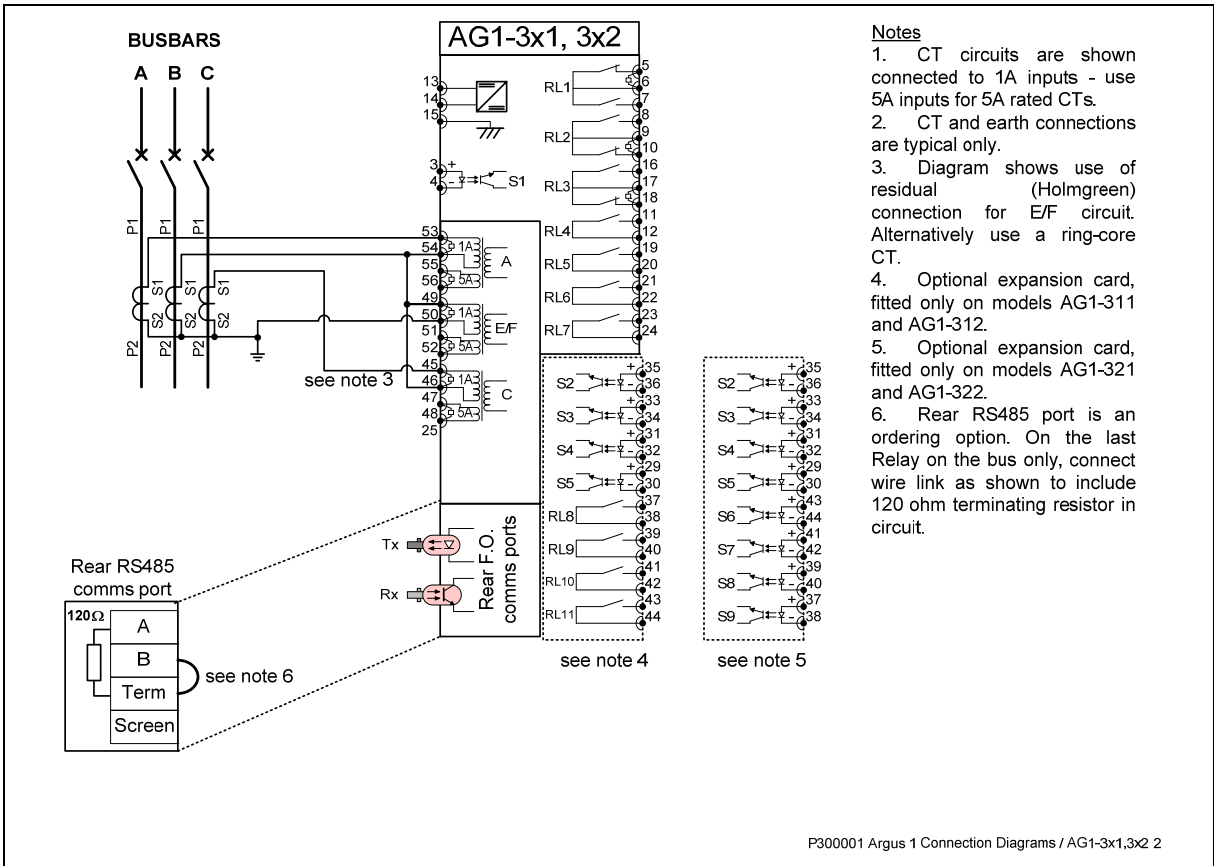


Figure 4-4 Typical Connection for 2 Phase-fault and Earth-fault Protection

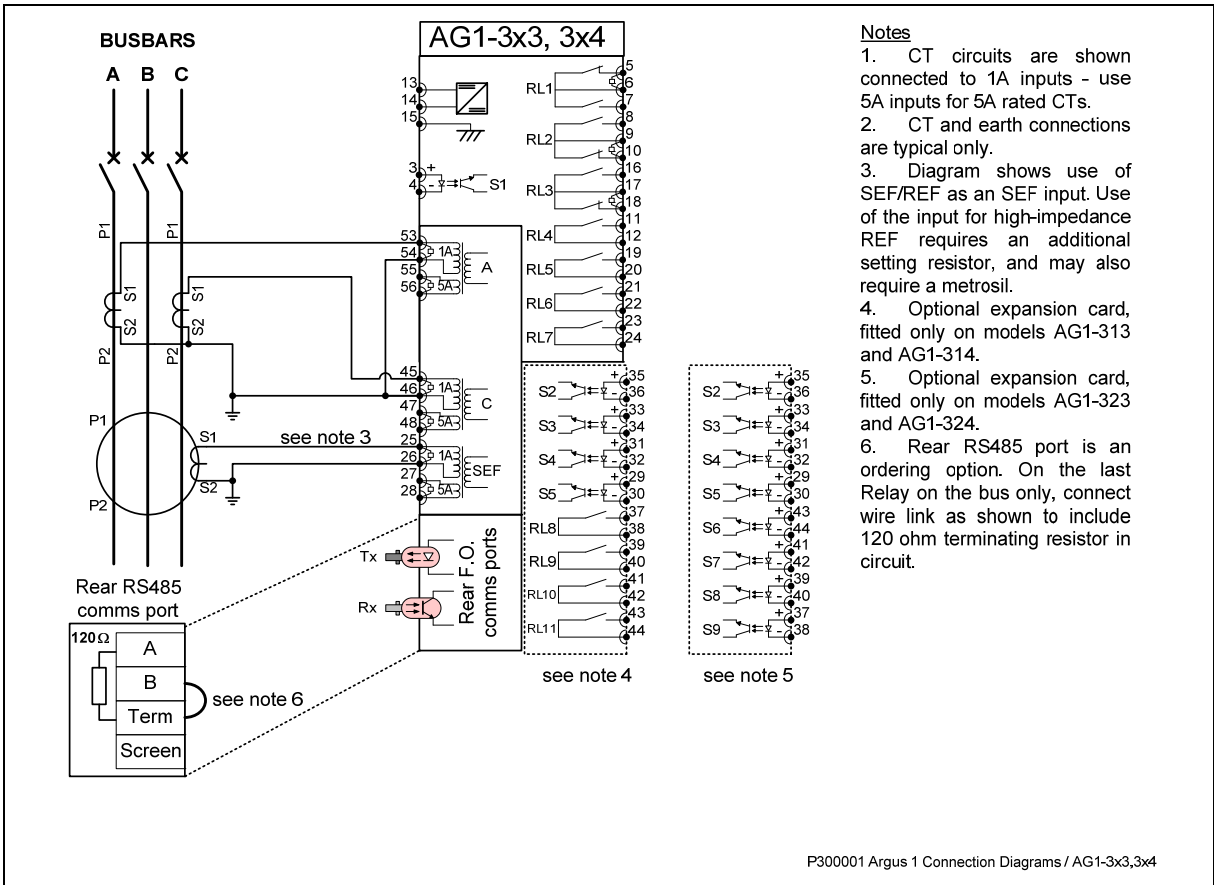


Figure 4-5 Typical Connection for 2 Phase-fault and Sensitive Earth-fault Protection

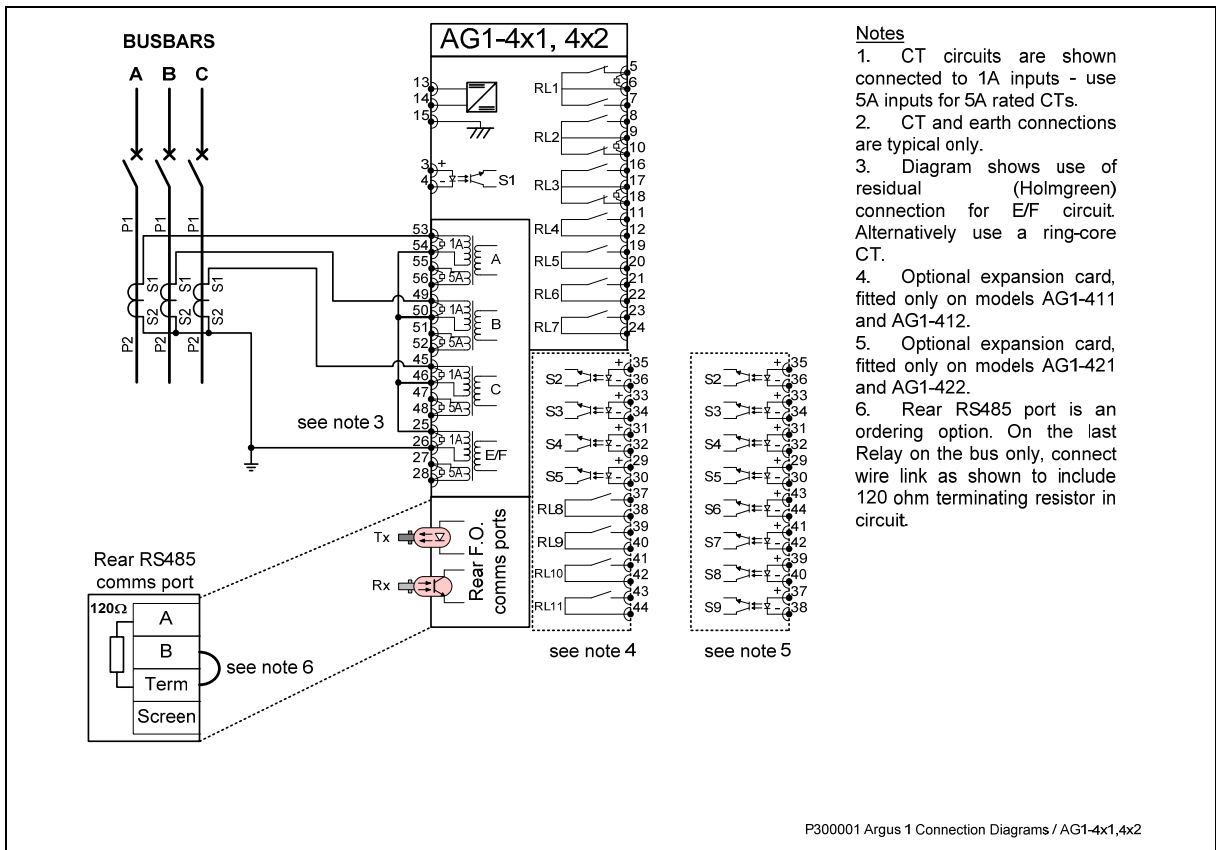


Figure 4-6 Typical Connection for 3 Phase-fault and Earth-fault Protection

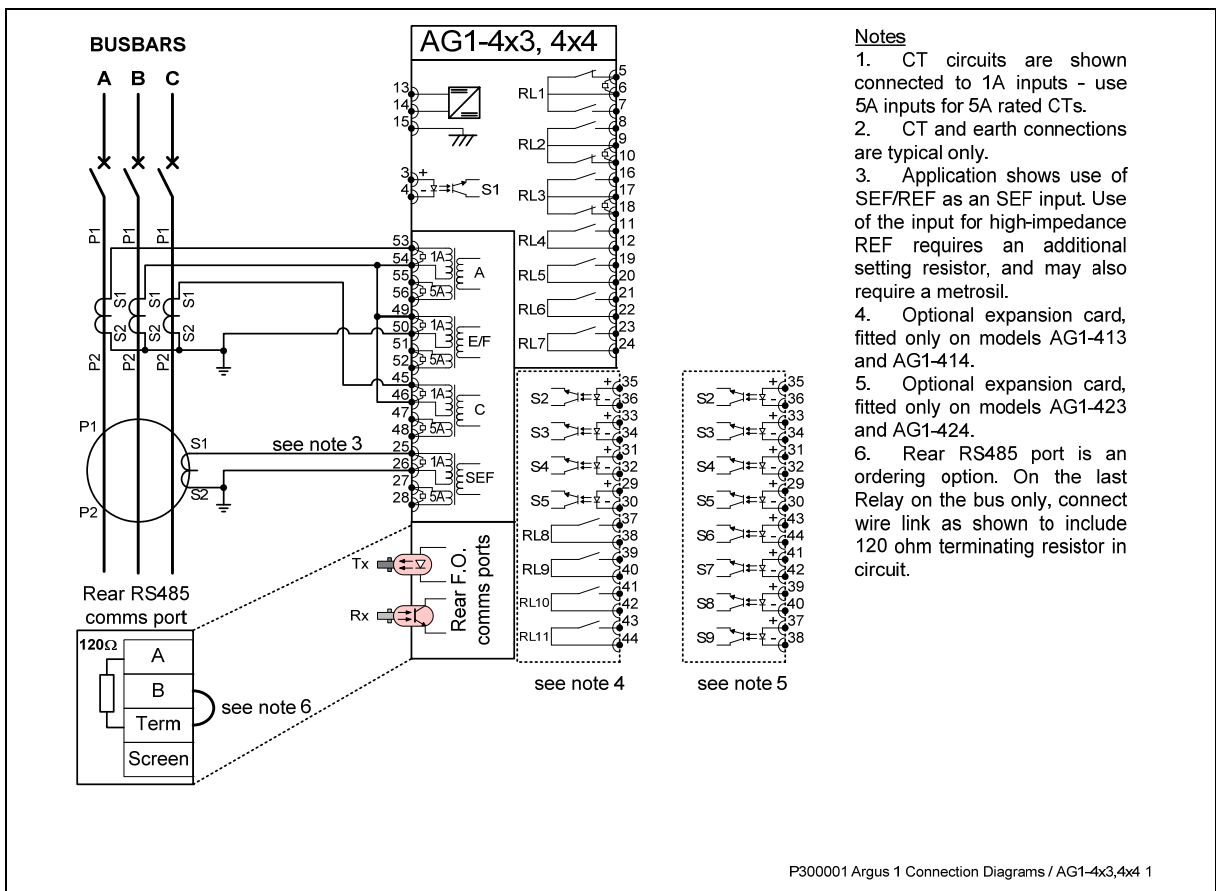


Figure 4-7 Typical Connection for 2 Phase-fault, Earth-fault and Sensitive Earth-fault Protection

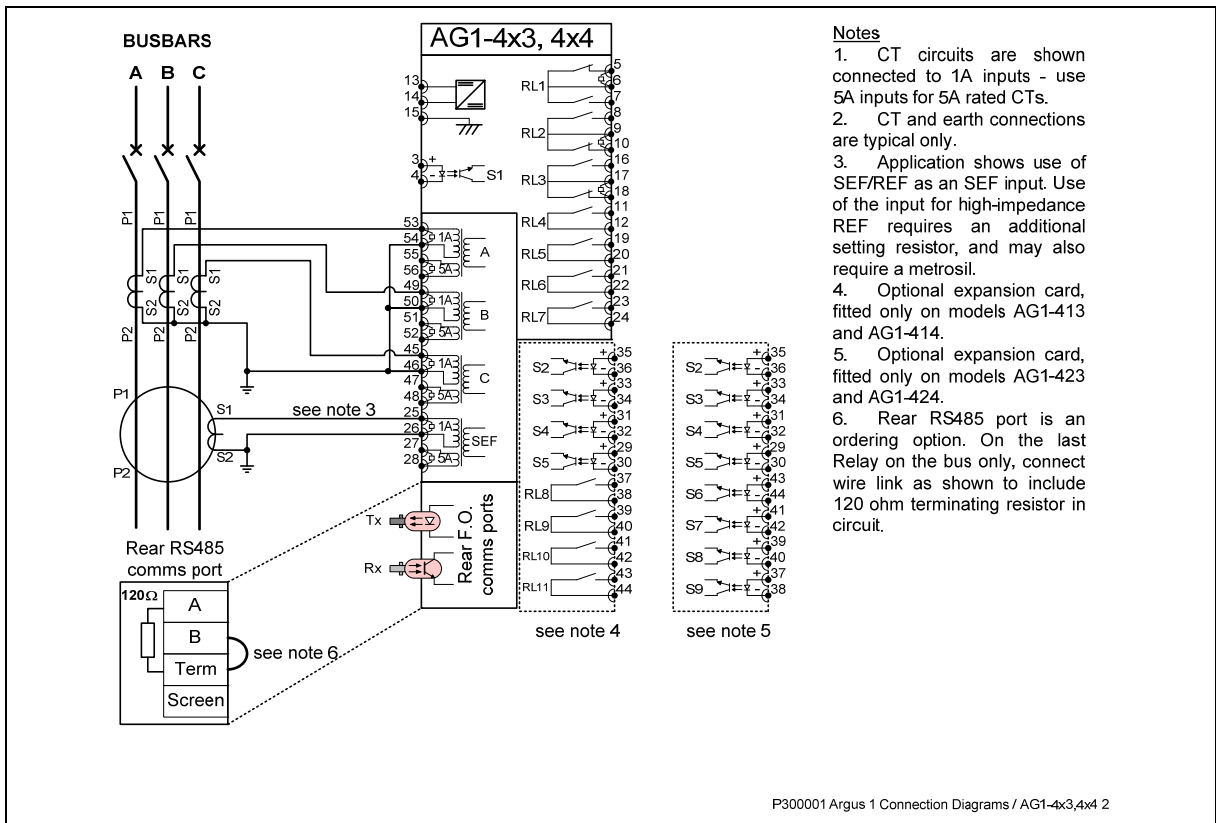


Figure 4-8 Typical Connection for 3 Phase-fault and Sensitive Earth-fault Protection

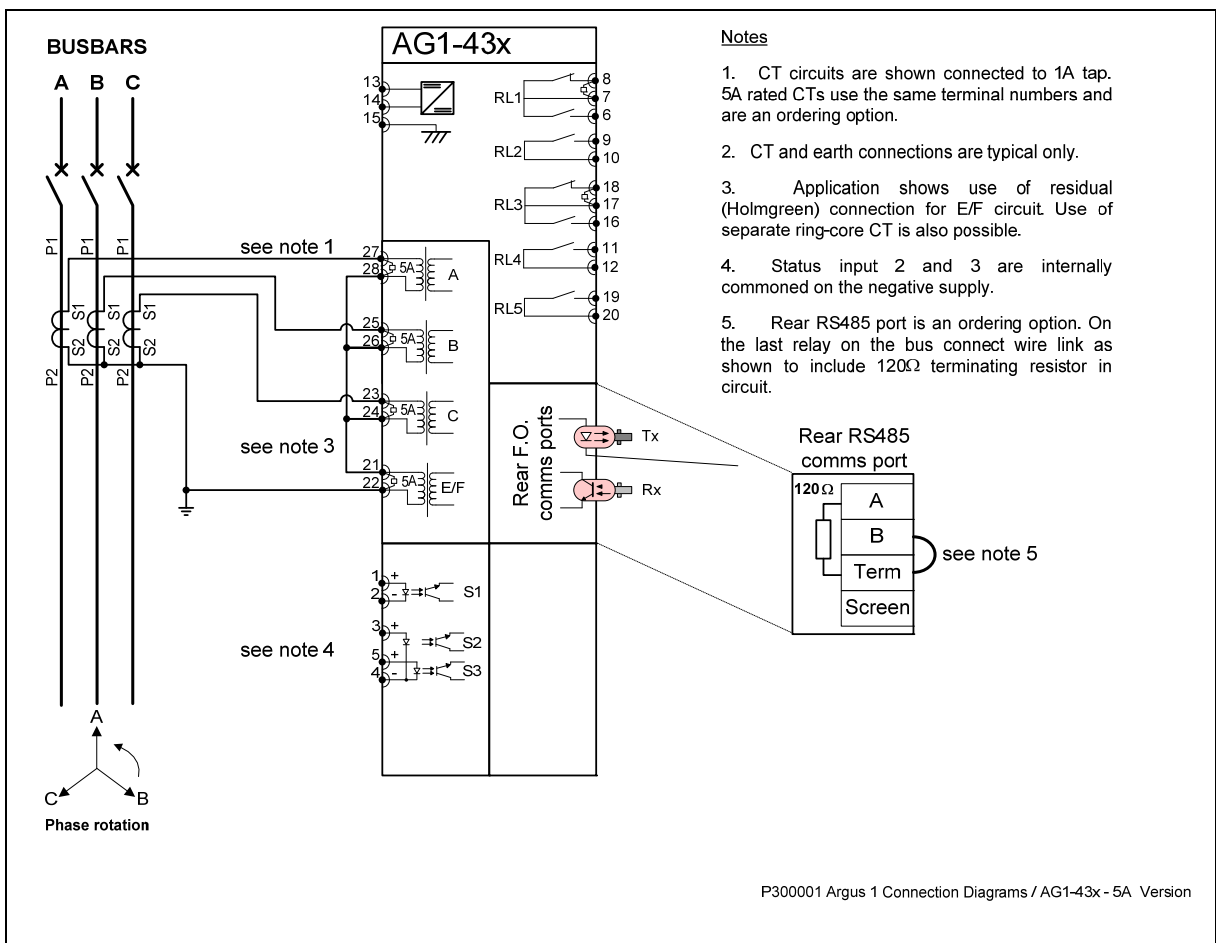


Figure 4-9 Typical Connection for 3 Phase-fault and Earth-fault Protection – 1A or 5A Version