

Appendix A

Pre-Commissioning Form

PCF Pre-Commissioning Form

Electricity North West Reference No

To: Electricity North West Ltd
Design and Construction Manager
Connections Department
Frederick Road
Salford
Manchester
M6 6QH

From: Name

Company

Tel:

Substation Name / Location*

Substation / Plant File Number

Date commissioning is required *

NO.	ITEM	(Y/N or N/A)	DATE	COMMENT
1	Nameplate fitted*			
2	Danger of Death signs fitted*			
3	HV Switchgear labels fitted*			
4	LV labels fitted*			
5	Switchgear Locks fitted			
6	Fence complete*			
7	Building Complete*			
8	Lighting Complete*			
9	Paint chips on plant made good*			
10	Trench work filled in*			
11	Gates / Locks			
12	Earthing (visible)*			
13	LV neutral earth link*			
14	Operating Handles*			
15	Test / Earth Device*			
16	Access route*			
17	Cable protection in place*			
18	Operator position*			
19	CDM Handover file provided*			
20	"As Constructed" drawings*			
21	Asset Details provided*			
22	Manufacturer's test data*			
23	EFI fitted & tested*			
24	HV protection to ENW CP331*			
25	LV fuses to ENW CP331*			
26	Test results provided*			

27	Jointing schedule provided*			
28	Legal Consents obtained*			
29	Metering arranged*			
30	No Smoking sign fitted*			
31	DNA Marking sign fitted*			

I certify that the above substation has been inspected and tested as indicated above and confirm that it complies with the current requirements and specifications of Electricity North West Ltd.

Name (PRINT)*

Signature*

Date*

Being a person duly authorised by my employer to sign this form.

Appendix B

Test Result Sheets

NOTE: The appropriate MICOM P116 SET Files for Precommissioning are available from the Electricity North West Library under the files named Default 200 & 400, where they haven't been uploaded to the relay for despatch to site during Depot Testing, these SET files have minimum settings applied. The correct site settings shall be applied during the commissioning process.

The appropriate Siemens 7SR45 SET Files for Precommissioning are available from the Electricity North West Library under the files named 7SR45 Test 100 and 200. The correct site settings shall be applied during the commissioning process including the SITE SET file named 7SR45 Prot ENW.

Pre-Commissioning Test Result Sheets for HV Installations (Sheet 1 of 12)

Project No.* System Voltage*

Substation* Location*

Description of Equipment under Test

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.....

CABLE TEST RESULTS (HV)*

IR TEST WITH 5kV MEGGER

PHASES	INITIAL IR (MΩ)	FINAL IR (MΩ)
RY - B		
RB - Y		
RYB - E		

CABLE TEST RESULTS (LV)*

IR TEST WITH 500V MEGGER

	LV SINGLES		LV NETWORK	
PHASES	INITIAL IR (MΩ)	FINAL IR (MΩ)	INITIAL IR (MΩ)	FINAL IR (MΩ)
RY - B				
RB - Y				
RYB - N				
RYB - E				

Tests carried out by:

Name (Print):		Signature:	
Company:		Date:	

Pre-Commissioning Test Result Sheet for HV Installations (Sheet 2 of 12)

EARTH MAT TEST RESULTS*

	RESISTANCE VALUES (Ω)			
TYPE 'A' EARTH MAT				
TYPE 'B' EARTH MAT	HV MAT		LV MAT	

Tests carried out by:

Name (Print):		Signature:	
Company:		Date:	

Pre-Commissioning Test Result Sheet for HV Installations (Sheet 3 of 12)

SWITCHGEAR TEST RESULTS*

HV Pressure Test - Main contacts closed

PHASES	VOLTAGE (SEE NOTE BELOW) APPLIED FOR 1 MINUTE	LEAKAGE CURRENT (MA)
RY - B		
RB - Y		
RYB - E		

HV pressure Test - Main contacts open

PHASES	VOLTAGE (SEE NOTE BELOW) APPLIED FOR 1 MINUTE	LEAKAGE CURRENT (MA)
RYB - RYB Across Open Contacts With One Side Earthed		
RYB - RYB Across Open Contacts With The Other Side Earthed		

NOTE:

11kV switchgear - 22kV AC or 17kV DC
6.6kV switchgear - 16kV AC or 10kV DC

March
2025

Extensible equipment only - Ducter test after assembly

PHASE	RESISTANCE ($\mu\Omega$)
R	
Y	
B	

Tests carried out by:

Name (Print):		Signature:	
Company:		Date:	

Pre-Commissioning Test Result Sheet for HV Installations (Sheet 4 of 12)

TRANSFORMER TEST RESULTS*

HV Pressure Test

PHASES	TEST VOLTAGE (SEE NOTES BELOW) APPLIED FOR 1 MINUTE
PRIMARY RYB - SECONDARY ryb (CONNECTED TO THE TANK AND EARTH)	

NOTE:

Ground mounted units

11kV units - 5kV Megger or 10kV DC

6.6kV units - 5kV Megger or 6kV DC

Pole mounted units

All units - 1kV Megger

March
2025

Tests carried out by:

Name (Print):		Signature:	
Company:		Date:	

Pre-Commissioning Test Result Sheet for HV Installations (Sheet 5 of 12)

TLF PROTECTION TEST RESULTS*

Circuit:

AC Wiring Insulation Resistance	Ω
CT Wiring Continuity Tests completed (tick)	
CT Star Point Earth Link Resistance	Ω
CT Ratio in use (tick)	100/5 50/5

SECONDARY INJECTION

SECONDARY INJECTION	CURRENT TO TRIP (A)
R-Y	
Y-B	
Y-E	

TLF VOLT DROP

SECONDARY INJECTION AT 80% OF CURRENT TO TRIP	CURRENT INJECTED (A)	VOLT DROP TLFS OUT (V)		VOLT DROP TLFS IN (V)	
		R	B	R	B
R-B					

TLF rating fitted: _____ A

CHECKS (tick):

CT terminal block connections checked	
CT Shorting Links disconnected	
Ratio Changeover Link fitted securely	
Earth Link and Test Link fitted securely	
TLFs fitted in Overcurrent elements	
No TLF in Earth Fault element	

Tests carried out by:

Name (Print):		Signature:	
Company:		Date:	

Pre-Commissioning Test Result Sheet for HV Installations (Sheet 5 of 12)

RELAY PROTECTION TEST RESULTS (excluding RN2D and RN6D with MICOM P116 and Lucy Sabre VRN2a with 7SR45 – See separate sheets)*

Circuit:.....

AC Wiring Insulation Resistance		Ω
CT Wiring Continuity Tests completed (tick)		
CT Star Point Earth Link Resistance		Ω
CT Ratio in use (tick)	100/5 50/5	200/1 100/1 600/1 800/1

SECONDARY INJECTION – minimum current operation

ELEMENT	MINIMUM CURRENT TO TRIP (A)
Overcurrent R-Y	
Overcurrent Y-B	
Earth Fault Y-E	

SECONDARY INJECTION – timing test

ELEMENT	CURRENT MULTIPLIER	TIME MULTIPLIER	INJECTED CURRENT (A)	OPERATING TIME (S)
Overcurrent R-Y	4x			
Overcurrent R-Y	High Set			
Earth Fault Y-E	4x			
Earth Fault Y-E	High Set			

RELAY LEFT SET AT:

ELEMENT	NORMAL SETTING			HIGH SET SETTINGS	
	Current	Curve	Time Multiplier	Current Multiple	Time Multiplier
Overcurrent					
Earth Fault					

CHECKS (tick):

CT terminal block connections checked	
CT Shorting Links disconnected	
Earth Link and Test Link fitted securely	

Tests carried out by:

Name (Print):		Signature:	
Company:		Date:	

Site Commissioning Test Sheet (Sheet 7 of 12)

RELAY PROTECTION TEST RESULTS – RN2D with MICOM P116*

Site	-	Circuit	-
Unit Type	Schneider RN2D-M-N4/21	Relay Type	Micom P116A1N2N14111111N
Unit Serial No.		Relay Serial No.	-
CT Ratio	200/1	Prot CT Serial No.	L1.
			L2.
Confirm depot commissioning completed and test sheet available as per ES320 (tick)			L3.

Insulation Resistance Test @1kV

Prot CTs C70		Ω
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DC Resistance Tests

	MEASURED VALUE Ω	MEASURING CIRCUIT Ω	TRUE VALUE Ω
Prot CT Earth Link			
Inst CT Earth Link			
L1 CT C11-C70			
L2 CT C31-C70			
L3 CT C51-C70			

Settings Applied

Overcurrent	I>Threshold		Curve (Delay Type)		I>TMS	
Earth Fault	IN_1Threshold		Curve (Delay Type)		IN_1TMS	
High Set OC	I>>Threshold		Curve (Delay Type)	DMT	TI>>time delay	

Phase Overcurrent Element Tests

MINIMUM OPERATION				TIMING TEST AT 2 X I>			TIMING TEST AT 4 X I>		
Element	Injection Point	Expected Current (A)	Actual Current (A)	Current Inj (A)	Expected Time (S)	Actual Time (S)	Current Inj (A)	Expected Time (S)	Actual Time (S)
I>IA-IB	C12-C32								
I>IB-IC	C32-C52								
I>IC-IA	C52-C12								

Earth Fault Element Tests

MINIMUM OPERATION				TIMING TEST AT 2 X IN_1			TIMING TEST AT 4 X UN_1		
Element	Injection Point	Expected Current (A)	Actual Current (A)	Current Inj (A)	Expected Tie (S)	Actual Time (S)	Current Inj (A)	Expected Time (S)	Actual Time (S)
IN_1 IA-E	C12-C70								
IN_1 IB-E	C32-C70								
IN_1 IC-E	C52-C70								

High Set Tests (if required)

TIMING TESTS					
Element	Injection Point	Current Inj (A) 90% I>>	Actual Time (s)	Current Inj (A) 110% I>>	Actual Time (s)
I>>IA-IB	C12-C32				
I>>IB-IC	C32-C52				
I>>IC-IA	C52-C12				

Tests carried out by:

Name (Print):		Signature:	
Company:		Date:	

Site Commissioning Test Sheet (Sheet 8 of 12)

Schneider RN6d with Micom P116 Commissioning

Site			Circuit		
Unit Type	Schneider RN6d-M-N4/21			Relay Type	Micom P116A1N2N14111111 N
Unit Serial No.				Relay Serial No.	
CT Ratio	800/400/1			Prot CT Serial No.	L1.
					L2.
Confirm depot commissioning completed and test sheet available as per ES320 (tick)					L3.

CT Ratio Required (tick)	400/1	
	800/1	

CT Ratio selection bar set correctly (tick)

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Insulation Resistance Tests @1kV

Prot CTs C70		Ω
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DC Resistance Tests

	MEASURED VALUE Ω	MEASURING CIRCUIT Ω	TRUE VALUE Ω
Prot CT Earth Link			
L1 CT C11-C70			
L2 CT C31-C70			
L3 CT C51-C70			

Settings Applied

Overcurrent	I>Threshold		Curve (Delay Type)		I>TMS	
Earth Fault	IN_1Threshold		Curve (Delay Type)		IN_1TMS	
High Set OC	I>>Threshold		Curve (Delay Type)	DMT	TI>>time delay	

Metering Tests

ELEMENT	INJECTION	CURRENT	RELAY DISPLAY			
	Point	Injected (A)	IA	IB	IC	IN
IA-IB	C12-C32	0.1				
IA-IC	C12-C52	0.1				
IA-E	C12-C70	0.1				

Phase Overcurrent Element Tests

MINIMUM OPERATION				TIMING TEST AT 2 X I>			TIMING TEST AT 4 X I>		
Element	Injection	Expected	Actual	Current	Expected	Actual	Current	Expected	Actual
	Point	Current (A)	Current (A)	Inj (A)	Time (s)	Time (s)	Inj (A)	Time (s)	Time (s)
I> IA-IB	C12-C32								
I> IB-IC	C32-C52								
I> IC-IA	C52-C12								

Earth Fault Element Tests

MINIMUM OPERATION				TIMING TEST AT 2 X IN_1			TIMING TEST AT 4 X IN_1		
Element	Injection	Expected	Actual	Current	Expected	Actual	Current	Expected	Actual
	Point	Current (A)	Current (A)	Inj (A)	Time (s)	Time (s)	Inj (A)	Time (s)	Time (s)
IN_1 IA-E	C12-C70								
IN_1 IB-E	C32-C70								
IN_1 IC-E	C52-C70								

High Set Tests (if required)

TIMING TESTS					
Element	Injection	Current	Actual	Current	Actual
	Point	Inj (A)	Time (s)	Inj (A)	Time (s)
		90% I>>		110% I>>	
I>> IA-IB	C12-C32				
I>> IB-IC	C32-C52				
I>> IC-IA	C52-C12				

Tests carried out by:

Name (Print):		Signature:	
Company:		Date:	

Pre-Commissioning Test Result Sheet for HV Installations (Sheet 9 of 12)

RELAY PROTECTION TEST RESULTS – VRN2a with Siemens 7SR45*

Site	-	Circuit	-
Unit Type	Lucy Sabre VRN2a	Relay Type	Siemens 7SR4504-1HB20-1AA0/HH
Unit Serial No.		Relay Serial No.	-
CT Ratio	<u>200/100/1</u>		
Confirm depot commissioning completed and test sheet available as per ES320 (tick)			

CT Ratio Required (tick)	<u>100/1</u>	
	<u>200/1</u>	
CT Ratio selection bar set correctly (tick)		

Insulation Resistance Test @1kV

Prot CTs C70		Ω
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DC Resistance Tests

	MEASURED VALUE Ω	MEASURING CIRCUIT Ω	TRUE VALUE Ω
Prot CT Earth Link			
L1 CT C11-C110 or C210			
L2 CT C31-C130 or C230			
L3 CT C51-C150 or C250			

Settings Applied

Overcurrent	51-1 Setting		51-1 Char		51-1 Time Mult	
Earth Fault	51G-1 Setting		51G-1 Char		51G-1 Time Mult	
High Set OC	50-1 Setting				50-1 Delay	

Phase CT Ratio selection in relay menu set correctly (tick)

Earth CT Ratio selection in relay menu set correctly (tick)

Ammeter Tests

Element	Injection Point	Current Injected (A)	Relay Display				
			Ia	Ib	Ic	Ig	In
IL1-IL2	C11-C31	1					
IL1-IL3	C11-C51	1					
IL1-IE	C11-C70	1					

Phase Overcurrent Element Tests

MINIMUM OPERATION				TIMING TEST AT 2 x 51-1 SETTING			TIMING TEST AT 4 x 51-1 SETTING		
Element	Injection Point	Expected Current (A)	Actual Current (A)	Current Inj (A)	Expected Time (S)	Actual Time (S)	Current Inj (A)	Expected Time (S)	Actual Time (S)
51-1 IL1-IL2	C11-C31								
51-1 IL2-IL3	C31-C51								
51-1 IL3-IL1	C51-C11								

Earth Fault Element Tests

MINIMUM OPERATION				TIMING TEST AT 2 x 51G-1 SETTING			TIMING TEST AT 4 x 51G-1 SETTING		
Element	Injection Point	Expected Current (A)	Actual Current (A)	Current Inj (A)	Expected Tie (S)	Actual Time (S)	Current Inj (A)	Expected Time (S)	Actual Time (S)
51G-1 IL1-IE	C11-C70								
51G-1 IL2-IE	C31-C70								
51G-1 IL3-IE	C51-C70								

High Set Tests (if required)

TIMING TESTS					
Element	Injection Point	Current Inj (A) 90% 50-1	Actual Time (s)	Current Inj (A) 110% 50-1	Actual Time (s)
50-1 IL1-IL2	C11-C31				
50-1 IL2-IL3	C31-C51				
50-1 IL3-IL1	C51-C11				

Tests carried out by:

Name (Print):		Signature:	
Company:		Date:	

Pre-Commissioning Test Result Sheet for HV Installations (Sheet 10 of 12)

HV/LV METERING CT/VT & MULTICORE TEST RESULTS*

Circuit:.....

AC Wiring Insulation Resistance	Ω
CT & VT Wiring Continuity Tests Completed (Tick)	
CT Star Point Earth Link Resistance	Ω
VT Yellow Phase Earth Link Resistance	Ω
CT Ratio In Use	
VT Ratio In Use	

CHECKS (tick):

CT & VT Terminal Block Connections Checked	
Multicore Ferruling Correct At Both Ends	
Confirm Correct Cores Doubled Up On Multicore As Appropriate (HV)	
CT Shorting Links Disconnected	
Test Terminal Block Connections Checked	
Earth Link(S) Securely Fitted To Correct Ratio	
Confirm VT Star Point NOT Connected To Earth (I.E. Shorting Out VT Yellow Phase)	

CT/VT Commissioning Forms from CP510 (tick):

Confirm Appropriate HV/LV Commissioning Form Completed	
Confirm Completed Form Attached	
Confirm Completed Form Sent To Data Management (Per CP510)	

Tests carried out by:

Name (Print):		Signature:	
Company:		Date:	

Site Commissioning Test Sheet (Sheet 11 of 12)

Schneider CE2 with Micom P116 Commissioning

Site			Circuit		
Unit Type	Schneider CE2-N121/21		Relay Type	Micom P116A1N2N14111111N	
Unit Serial No.			Relay Serial No.		
CT Ratio	200/1		Prot CT Serial No.	L1.	
			L2.		
				L3.	
Confirm depot commissioning completed and test sheet available as per ES320 (tick)					

Insulation Resistance Tests @1kV

Prot CTs C70		Ω
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DC Resistance Tests

	MEASURED VALUE Ω	MEASURING CIRCUIT Ω	TRUE VALUE Ω
Prot CT Earth Link			
L1 CT C11-C70			
L2 CT C31-C70			
L3 CT C51-C70			

Settings Applied

Overcurrent	I>Threshold		Curve (Delay Type)		I>TMS	
Earth Fault	IN_1Threshold		Curve (Delay Type)		IN_1TMS	
High Set OC	I>>Threshold		Curve (Delay Type)	DMT	TI>>time delay	

Phase Overcurrent Element Tests

MINIMUM OPERATION				TIMING TEST AT 2 X I>			TIMING TEST AT 4 X I>		
Element	Injection	Expected	Actual	Current	Expected	Actual	Current	Expected	Actual
	Point	Current (A)	Current (A)	Inj (A)	Time (s)	Time (s)	Inj (A)	Time (s)	Time (s)
I> IA-IB	C12-C32								
I> IB-IC	C32-C52								
I> IC-IA	C52-C12								

Earth Fault Element Tests

MINIMUM OPERATION				TIMING TEST AT 2 X IN_1			TIMING TEST AT 4 X IN_1		
Element	Injection	Expected	Actual	Current	Expected	Actual	Current	Expected	Actual
	Point	Current (A)	Current (A)	Inj (A)	Time (s)	Time (s)	Inj (A)	Time (s)	Time (s)
IN_1 IA-E	C12-C70								
IN_1 IB-E	C32-C70								
IN_1 IC-E	C52-C70								

High Set Tests (if required)

TIMING TESTS					
Element	Injection	Current	Actual	Current	Actual
	Point	Inj (A)	Time (s)	Inj (A)	Time (s)
		90% I>>		110% I>>	
I>> IA-IB	C12-C32				
I>> IB-IC	C32-C52				
I>> IC-IA	C52-C12				

Tests carried out by:

Name (Print):		Signature:	
Company:		Date:	

Site Commissioning Test Sheet (Sheet 12 of 12)

Schneider CE6 with Micom P116 Commissioning

Site			Circuit		
Unit Type	Schneider CE6-N213/21		Relay Type	Micom P116A1N2N14111111N	
Unit Serial No.			Relay Serial No.		
CT Ratio	800/400/1		Prot CT Serial No.	L1.	
				L2.	
Confirm depot commissioning completed and test sheet available as per ES320 (tick)				L3.	

CT Ratio Required (tick)	400/1	
	800/1	

CT Ratio selection bar set correctly (tick)

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Insulation Resistance Tests @1kV

Prot CTs C70		Ω
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DC Resistance Tests

	MEASURED VALUE Ω	MEASURING CIRCUIT Ω	TRUE VALUE Ω
Prot CT Earth Link			
L1 CT C11-C70			
L2 CT C31-C70			
L3 CT C51-C70			

Settings Applied

Overcurrent	I>Threshold		Curve (Delay Type)		I>TMS	
Earth Fault	IN_1Threshold		Curve (Delay Type)		IN_1TMS	
High Set OC	I>>Threshold		Curve (Delay Type)	DMT	TI>>time delay	

Line CT Ratio selection in relay menu set correctly (tick)	
E/Gnd CT Ratio selection in relay menu set correctly (tick)	

Metering Tests

ELEMENT	INJECTION	CURRENT	RELAY DISPLAY			
	Point	Injected (A)	IA	IB	IC	IN
IA-IB	C12-C32	0.1				
IA-IC	C12-C52	0.1				
IA-E	C12-C70	0.1				

Phase Overcurrent Element Tests

MINIMUM OPERATION				TIMING TEST AT 2 X I>			TIMING TEST AT 4 X I>		
Element	Injection	Expected	Actual	Current	Expected	Actual	Current	Expected	Actual
	Point	Current (A)	Current (A)	Inj (A)	Time (s)	Time (s)	Inj (A)	Time (s)	Time (s)
I> IA-IB	C12-C32								
I> IB-IC	C32-C52								
I> IC-IA	C52-C12								

Earth Fault Element Tests

MINIMUM OPERATION				TIMING TEST AT 2 X IN_1			TIMING TEST AT 4 X IN_1		
Element	Injection	Expected	Actual	Current	Expected	Actual	Current	Expected	Actual
	Point	Current (A)	Current (A)	Inj (A)	Time (s)	Time (s)	Inj (A)	Time (s)	Time (s)
IN_1 IA-E	C12-C70								
IN_1 IB-E	C32-C70								
IN_1 IC-E	C52-C70								

High Set Tests (if required)

TIMING TESTS					
Element	Injection	Current	Actual	Current	Actual
	Point	Inj (A)	Time (s)	Inj (A)	Time (s)
		90% I>>		110% I>>	
I>> IA-IB	C12-C32				
I>> IB-IC	C32-C52				
I>> IC-IA	C52-C12				

Tests carried out by:

Name (Print):		Signature:	
Company:		Date:	