



Factory Acceptance Test (FAT) Procedures & Formats -Control Protection System



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 पावरग्रिड POWERGRID	Factory Acceptance Test (FAT) Procedures & Formats Control Protection System	Doc: PG/CC/CRP/FAT, Rev01
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DOC: PG/CC/CRP/FAT, Rev01				
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POWERGRID Representative	Manufacturer Representative
Signature:	Signature:
Name:	Name:
Date:	Date:

About This Document

Purpose of this document

This document shall be used as a standard for conducting all tests during the Factory Acceptance Test (FAT) for the Control & Protection system of every substation as per POWERGRID requirements and specifications.

The aim of the Factory Acceptance Test (FAT) is to demonstrate equipment functionalities as well as the approval process of the system-parameterization by POWERGRID to reduce the change requests during commissioning at site. The general philosophy shall be to deliver a system to site only after it has been thoroughly tested and its specified performance has been verified, as far as site conditions can be simulated in a test lab.

During FAT the entire Sub-station Control and Protection system to be supplied shall be tested for complete functionality and configuration in the factory itself. The extensive testing shall be carried out during FAT. The purpose of Factory Acceptance Testing is to ensure defect free installation at site. No major change in configuration/setting of system is envisaged at site.

This document details the equipment and functions under test and the corresponding test methods as well as the test documentation.

Who should use this document

This document to be used by the Vendor representatives (Q&I, Engg, Factory) for Factory acceptance test as per the project requirement. This approved document will be followed by the Vendor Representatives (Q&I, Engg, Testing) and POWERGRID representatives to test and evaluate the complete system.

POWERGRID Representative	Manufacturer Representative
Signature:	Signature:
Name:	Name:
Date:	Date:

1. GENERAL

1.1. Introduction

The purpose of this document is to define the Factory Acceptance Test procedures of Substation Control & Protection system supplied by the Vendor to POWERGRID.

The tests are performed by Vendor and each test, or set of tests as appropriate, is covered by an approval stage, which will be signed off upon completion by Vendor and POWERGRID representatives.

Comments are noted in separate Incident and correction reports (snag list) attached as annexure.

2. CONTROL & PROTECTION SYSTEM

2.1. FAT test methodology

FAT testing will be performed for Control & relay panels for ensuring the manufacturing as per the approved CAT-I drawings. Pre-FAT test sheets will be used as a reference for the tests to be performed during the FAT.

These test sheets will indicate the specific units that were tested during pre-FAT tests.

2.2. List of Control & Protection Panels

Feeder / Panel	Feeder Specification	Description	Drawing CSD No.	Rev. No.
401	400kV Meerut-Moradabad Line-1	LINE	CPD KZ5J SC43	CAT-I
402	TIE	TIE	CPD KZ5J SC44	CAT-I
403	ICT-500MVA-1	ICT	CPD KZ5J SC45	CAT-I
BB	Busbar Protection panel	BB	CPD KZ5J SC55	CAT-I
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POWERGRID Representative	Manufacturer Representative
Signature:	Signature:
Name:	Name:
Date:	Date:

2.3. Test report overview

FAT Test	Description	Line	Auto/Power Transf.	Bus/Line Reactor	Busbar	Tie	BC/TBC
FAT001	Visual Inspection	X	X	X	X	X	X
FAT002	Hardware Verification	X	X	X	X	X	X
FAT003	AC Scheme Check	X	X	X	X	X	X
FAT004	DC Scheme Check	X	X	X	X	X	X
FAT005	Auxiliary Report	X	X	X	X	X	X

POWERGRID Representative	Manufacturer Representative
Signature:	Signature:
Name:	Name:
Date:	Date:

2.4. Document verification

2.4.1. Document verification test

Purpose:

This test verifies that the correct manufacturing drawings and documentation for the equipment/system under the test will be used during the Factory Acceptance Test.

Procedure:

1. Verify that approved drawings (printed and soft copies) of all assembled equipment are present.
2. Verify all required hardware and software manuals are present.
3. Guaranteed Technical Parameters (GTPs) as approved by POWERGRID.
4. A copy of Customer Technical Specification for reference is made available in the FAT room.
5. Availability of the approved Drawing list in the FAT room.

Document Verification Log:

Sl No.	Description	Drg No.	Checked
1	Approved Standard MQP		☐
2	Standard FAT Procedure		☐
3	Approved GTP-Guaranteed Technical Particulars		☐
4	Approved Hardware specification & BOM		
5	Latest Approved Protection Logic diagram (Line/Transformer/Reactor/BB/etc) (Refer POWERGRID Intranet) *		☐
6	Latest Approved settings/configuration template (pdf) (Refer POWERGRID Intranet)		☐
7	Approved GA & Schematic CRP Drawings (Line/Transformer/Reactor/BB/etc)		☐
8	Product Manuals (Installation, Configuration, maintenance, Troubleshooting, detailed diagnostics etc.)		☐
9	Approved Bill of Quantity spares		☐
10	Operation and Technical Guide of IED configuration softwares.		☐
11	Operation and Technical Guide of Ethernet Switch		
12	Other applicable drawings (not listed above)	Attach the list as annexure	☐

Note:- *if there is a variation between the approved protection scheme and the latest approved protection logic diagram uploaded on POWERGRID intranet, later shall prevail.

POWERGRID Representative	Manufacturer Representative
Signature:	Signature:
Name:	Name:
Date:	Date:

2.5. Pre-acceptance test

2.5.1. Visual inspection

Purpose: This test will be carried out on the panels before commencing any testing on the panels. This test verifies the cleanliness, physical damages, dimensions, color of the panel and its thickness, mounting arrangements and proper ferruling and labeling etc.

Procedure:

1. Record the name and reference number of the panel to be tested in the test sheet.
2. Verify the check list detailed in the test sheet and ensure that the panel under test is in line with the base document.
3. Record if any comments in the Indication and Correction Report (snag list) attached as to this document.
4. Repeat step 1 to 3 for the other control & protection panels.

Test Document:

Refer Protection FAT Test Sheet in unit 7 (Annexure)

➤ FAT001: Visual Inspection

Note: Copy of this Visual Inspection test sheets will be used for other panels under test

2.5.2. Hardware verification test

Purpose: This test verifies the list, identification data and the quantities of the equipment mounted in each protection panels.

Procedure:

1. Select one of the typical bays.
2. Verify the test sheet selected for the Hardware Verification Test, belongs to the selected typical panel under test.
3. Record the reference number of the selected typical panel to be tested in the test sheet.
4. Verify the list of equipment and its quantities, as specified in the test sheet and it is in line with the base documents.
5. Record if any comments in the Indication and Correction Report (snag list) attached as to this document.
6. Repeat step 3 to 5 for the other panels of the same type.
7. Repeat step 1 to 6 for the other control & protection panels.

Test Documents:

POWERGRID Representative	Manufacturer Representative
Signature:	Signature:
Name:	Name:
Date:	Date:

Refer Protection FAT Test Sheet in unit 7 (Annexure)

➤ FAT002: Hardware Verification Test

Note: Copy of the respective Hardware Verification test sheets will be used for more than one panel of the same type under test.

2.6. Power scheme verification

2.6.1. AC scheme check

Purpose: This test verifies the AC power circuit of the panel under test. In brief, the test verifies the AC power to the MCBs, heating and lighting circuits and to the power sockets and ensures their operation is correct.

Procedure:

1. Select any of the typical bays.
2. Record the name and reference number of the panel to be tested in the test sheet.
3. Verify the check list detailed in the test sheet and ensure AC circuit is as per the scheme and AC devices are working properly.
4. Record if any comments in the Indication and Correction Report (snag list) attached as to this document.

Test Document:

Refer Protection FAT Test Sheet in unit 7 (Annexure)

➤ FAT003: AC Power Verification

Note: Copy of the same test sheets will be used for the other Control & protection panels

2.6.2. DC scheme check

Purpose: This test verifies the DC power circuit of the panel under test. In brief, the test verifies the DC1 and DC2 to the MCBs, DC changeovers and DCs to the various equipment in the panel.

Procedure:

1. Record the name and reference number of the panel to be tested in the test sheet.
2. Verify the check list detailed in the test sheet and ensure the DC circuit of the panel works properly.
3. Perform a DC change over and ensure for no power failures in any equipment
4. Record if any comments in the Indication and Correction Report (snag list) attached as to this document.
5. Check complete cubicle wiring as per schematic diagram.

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Signature:	Signature:
Name:	Name:
Date:	Date:

6. Repeat step 1 to 6 for the other Control & protection panels.

Test Documents:

Refer Protection FAT Test Sheet in unit 7 (Annexure)

➤ FAT004: DC Scheme Check

Note: Copy of the same test sheets will be used other protection panels

2.6.3. Auxiliary relay test

Purpose: This test verifies the functionality and properties of Auxiliary Relay under test.

Procedure:

1. Select a Trip Relay/Lockout Relay from any one of the protection panels
2. Record the panel reference in the test sheet
3. Perform the following routine tests which is applicable for this relay
 - Name plate rating details
 - General inspection
 - Resistance check
 - Secondary injection test
 - Pick-Up / Drop-Off test (operating and resetting coil)
4. Record if any comments in the indication and correction report (snag list) attached as to this document.
5. Repeat step 1 to 5 for the same type of relays for the other panels.

Test Documents:

Refer Protection FAT Test Sheet in unit 7 (Annexure)

➤ FAT005: Routine Test – Auxiliary Relay

Note: Copy of FAT005 test sheet will be used for more than one relay of the same type under test

POWERGRID Representative	Manufacturer Representative
Signature:	Signature:
Name:	Name:
Date:	Date:

2.7. Relay configuration & setting

The configuration of each IED in the system shall be adopted as per the approved scheme by POWERGRID. This configuration must be verified for each feeder (Line, Transformer, Reactor, Busbar & etc) as per the POWERGRID standard setting/configuration template (in pdf format).

The POWERGRID standard setting/configuration template must be referred to finalise the configuration. For any clarifications or corrections on the configurations changes if required the same has to be recorded in the observation & compliance report.

Note:

1. However, if the approved setting is not available during FAT, standard setting may be used to complete the FAT.
2. The Final setting/configuration project file must be submitted as part of the FAT documentation.

Following important points must be considered during configuration to ensure the proper Configuration & settings.

1. Defined functionality should be available in the configuration as per POWERGRID TS/Standard drawing.
2. Defining the proper input & output variables as per the approved drawings.
3. Tripping & signal assignment as per the approved Trip matrix.
4. Proper Flow of configuration as per the OEM (Ex. Proper instance of function block to avoid any delay or creating loop)
5. Only inbuilt logical functions should be used until otherwise specified.
6. Proper naming of Each section like Binary input, Protection functions, Binary output, LED, DR, SCADA & etc.
7. Naming of the IED should be proper (Ex SS_Name, Feeder Name).
8. Proper SNTP time setting (DST disabled, NTP ip address, SNTP selected).
9. DR channel configuration shall be done as per POWERGRID standard list.
10. Aesthetic alignment of the configuration in a proper readable format.

2.8. Protection relay - FAT

In addition to the standard routine tests as per the manufacturer OEM recommendations, it's important to verify the functioning and operation of Intelligent Electronic Devices (IEDs) according to specified logic required as per POWERGRID during the Factory Acceptance Testing (FAT) period.

For the demonstration of the following tests, the required simulation tools should be available during FAT.

For each feeder, the FAT reports has to be submitted along with the routine test report of the manufacturer.

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Signature:	Signature:
Name:	Name:
Date:	Date:

Line Feeder (Distance/Auto-reclose/LBB):

SI No.	Description	Checked
1	Configuration Check as per the approved drawing & Setting/ Configuration.	☐
2	Correct operation of Tripping relays and associated auxiliary relays.	☐
3	Carrier aided Permissive Scheme in Main-1 & Main-2.	☐
4	Current Reversal & Weak infeed in Main-1 & Main-2.	☐
5	Fault location for each type of faults.	☐
6	AR logic for the One and half breaker system (Both Main & Tie with priority logic) with Main-1 & Main-2 (For Auto reclose logic refer “Pre-Commissioning Procedures and Formats for Substation Equipment & Protection System, section- Circuit Breaker Panel” , DOC ref: D-2-01-03-01-XX)	☐
7	AR 3 Ph trip logic as per standard setting template	☐
8	DT circuit checking with all possible condition for 1 ½, DM, DMT busbar scheme.	☐
9	DT & Carrier send/receive logic with Carrier switch out & Carrier fail.	☐
10	Single phase initiation to LBB relay.	☐
11	Simulation of Cross-country fault in Distance function.	☐
12	3Ph trip initiation to LBB relay.	☐
13	LBB Retrip assignment & Backup assignment for one and half CB, DM & DMT scheme	☐
14	Ensure the timing for both the LBB Retrip and Backtrip Should start only after the current pickup alongwith LBB Initiation. Resetting the current should also reset the LBB function.	☐
15	Metering function (V, I, P, Q, Hz, PF).	☐
16	DR Standardization as per the POWERGRID Standard. Apart from the DR standardization if the channel available required signals may be configured for better analysis.	☐
17	Red Ferruling in the Tripping circuit	☐

POWERGRID Representative	Manufacturer Representative
Signature:	Signature:
Name:	Name:
Date:	Date:

Line Feeder (Differential/Distance/Autoreclose/LBB):

SI No.	Description	Checked
1	Configuration Check as per the approved drawing & Setting/ Configuration.	☐
2	Correct operation of Tripping relays and associated auxiliary relays.	☐
3	Communication failure of Differential enabling the Distance Z-1 function.	☐
4	Carrier aided Permissive Scheme in Main-1 & Main-2.	☐
5	Current Reversal & Weak infeed in Main-1 & Main-2.	☐
6	Fault locator & Mutual compensation Fault location (If applicable).	☐
7	AR logic for the One and half breaker system (Both Main & Tie with priority logic) with Main-1 & Main-2 (For Auto reclose logic refer “Pre-Commissioning Procedures and Formats for Substation Equipment & Protection System, section- Circuit Breaker Panel” , DOC ref: D-2-01-03-01-XX)	☐
8	AR 3 Ph trip logic as per POWERGRID standard protection logic diagram.	☐
9	DT circuit checking with all possible condition for 1 ½, DM, DMT busbar scheme.	☐
10	DT & Carrier send/receive logic with Carrier switch out & Carrier fail.	☐
11	Simulation of Cross-country fault in Distance function.	☐
12	Single phase initiation to LBB relay.	☐
13	3Ph trip initiation to LBB relay.	☐
14	Ensure the timing for both the LBB Retrip and Backtrip Should start only after the current pickup alongwith LBB Initiation. Resetting the current should also reset the LBB function.	☐
15	LBB Retrip assignment & Backup assignment for one and half CB, DM & DMT scheme	☐
16	Metering function (V, I, P, Q, Hz, PF).	☐
17	DR Standardization as per the POWERGRID Standard. Apart from the DR standardization if the channel available required signals may be configured for better analysis	☐
18	Red Ferruling in the Tripping circuit	☐

POWERGRID Representative	Manufacturer Representative
Signature:	Signature:
Name:	Name:
Date:	Date:

Transformer Feeder (Differential/REF/Backup OC&EF/Backup Impedance):

SI No.	Description	Checked
1	Configuration Check as per the approved drawing & Setting/ Configuration .	☐
2	Correct operation of Tripping relays and associated auxiliary relays.	☐
3	Differential & HV Overflux operation	☐
4	REF & LV Overflux operation	☐
5	HV OC&EF operation.	☐
6	IV/LV OC&EF operation	☐
7	Backup impedance operation	☐
8	Blocking logic for Backup impedance as per the POWERGRID requirement.	☐
9	Configuration check of 33kV Protection to the Utility feeder & Tertiary feeder availability.	☐
10	Mechanical protection logic has to be implemented as per POWERGRID standard protection logic diagram.	☐
11	Mechanical protection operation extended to Master trip operation.	☐
12	Simulation of the VT Selection logic as per the POWERGRID requirement. VT selection output stability should be checked during / after BCU restart and intermediate state of associated BCU binary inputs.	☐
13	3Ph trip initiation to LBB relay.	☐
14	Ensure the timing for both the LBB Retrip and Backtrip Should start only after the current pickup alongwith LBB Initiation. Resetting the current should also reset the LBB function.	☐
15	LBB Retrip assignment & Backup assignment for one and half CB, DM & DMT scheme	☐
16	Metering function (V, I, P, Q, Hz, PF).	☐
17	DR Standardization as per the POWERGRID Standard. Apart from the DR standardization if the channel available required signals may be configured for better analysis.	☐
18	Simulation of Spare selection logic the CT switching & Tripping scheme. Spare selection output stability should be checked during / after BCU restart and intermediate state of associated BCU binary inputs.	☐
19	Red Ferruling in the Tripping circuit	☐

POWERGRID Representative	Manufacturer Representative
Signature:	Signature:
Name:	Name:
Date:	Date:

Bus/Line Reactor Feeder (Differential/REF/Backup Impedance):

SI No.	Description	Checked
1	Configuration Check as per the approved drawing & Setting/ Configuration.	☐
2	Correct operation of Tripping relays and associated auxiliary relays.	☐
3	Differential operation	☐
4	REF operation	☐
5	Backup impedance operation.	☐
6	Blocking logic for Backup impedance as per the POWERGRID requirement.	☐
7	Mechanical protection logic has to be implemented as per POWERGRID standard protection logic diagram.	☐
8	NGR Bypass operation, NGR equipment alarms such as CB alarms, Closing coil alarms & output configuration as per POWERGRID requirement.	☐
9	Simulation of the VT Selection logic as per the POWERGRID requirement. VT selection output stability should be checked during / after BCU restart and intermediate state of associated BCU binary inputs.	☐
10	3Ph trip initiation to LBB relay.	☐
11	Ensure the timing for both the LBB Retrip and Backtrip Should start only after the current pickup alongwith LBB Initiation. Resetting the current should also reset the LBB function.	☐
12	LBB Retrip assignment & Backup assignment for one and half CB, DM & DMT scheme	☐
13	Metering function (V, I, P, Q, Hz, PF).	☐
14	DR Standardization as per the POWERGRID Standard. Apart from the DR standardization if the channel available required signals may be configured for better analysis.	☐
15	Simulation of Spare selection logic the CT switching & Tripping scheme. Spare selection output stability should be checked during / after BCU restart and intermediate state of associated BCU binary inputs.	☐
16	Red Ferruling in the Tripping circuit	☐

POWERGRID Representative	Manufacturer Representative
Signature:	Signature:
Name:	Name:
Date:	Date:

Centralized busbar differential relay

SI No.	Description	Checked
1	Configuration Check as per the approved drawing & Setting/ Configuration	☐
2	Correct operation of Tripping relays and associated auxiliary relays.	☐
3	For the status of the switchgear Double point type to be considered	☐
4	For Centralized Busbar testing refer “Pre-Commissioning Procedures and Formats for Substation Equipment & Protection System,”, DOC ref: D-2-01-03-01-XX) and simulate all logic as per the 1 ½, DM, DMT busbar scheme.	☐
5	The report for the centralized busbar scheme has to be submitted as per the Point no 4.	☐
6	DR Standardization as per the POWERGRID Standard. Apart from the DR standardization if the channel available required signals may be configured for better analysis.	☐
7	Red Ferruling in the Tripping circuit	

De-Centralized busbar differential relay

SI No.	Description	Checked
1	Configuration Check as per the approved drawing & Setting/ Configuration.	☐
2	Correct operation of Tripping relays and associated auxiliary relays.	☐
3	For the status of the switchgear Double point type considered	☐
4	For De-centralized Busbar testing refer “Pre-Commissioning Procedures and Formats for Substation Equipment & Protection System, , DOC ref: D-2-01-03-01-XX) and simulate all logic as per the 1 ½, DM, DMT busbar scheme.	☐
5	The report for the de-centralized busbar scheme has to be submitted as per the Point no 4.	☐
6	DR Standardization as per the POWERGRID Standard. Apart from the DR standardization if the channel available required signals may be configured for better analysis.	☐
7	Red Ferruling in the Tripping circuit	☐

POWERGRID Representative	Manufacturer Representative
Signature:	Signature:
Name:	Name:
Date:	Date:

Bay control Unit(BCU) – Feeders

SI No.	Description	Checked
1	Interlock for the respective bays.	☐
2	Metering function (V, I, P, Q, Hz, PF).	☐
3	Graphical display of HMI page in BCU as per the SLD & their control	☐
4	Measurement of bay in HMI page as per the SLD (if Menu not available)	☐

Ethernet Switch & DR PC

Note:- If Ethernet Switch & DR PC only supplied as a part of Project without SAS, then SAS FAT procedure (DOC ref: D-2-03-20-05-XX) to be referred for checking the Performance, Document & configuration.

3.STATEMENT OF SYSTEM ACCEPTANCE

Upon successful completion of all applicable tests and the proper disposition of all documented and witnessed discrepancies resulting from tests specified in the procedure, the system, tested and witnessed by the POWERGRID, is accepted.

Note:- The approved corrected copies of the scheme drawings based on the FAT shall be submitted before SAT.

Documents Verification during FAT:

SI No.	Description	Doc No.	Submitted
1	Visual Inspection report for each feeder		☐
2	Hardware Verification report for each feeder		☐
3	AC Scheme Check Report for each feeder		☐
4	DC Scheme Check Report for each feeder		☐
5	Auxiliary Relay Report for each feeder		☐
6	Typical configuration for each feeder verified (Line, Transformer, Bus reactor, Line reactor, Busbar)		☐
7	Specified Logic Verification-Line Feeder (Distance/Auto-reclose/LBB) Report		☐
8	Specified Logic Verification-Line Feeder (Differential/Distance/Auto reclose/LBB) Report		☐

POWERGRID Representative	Manufacturer Representative
Signature:	Signature:
Name:	Name:
Date:	Date:

SI No.	Description	Doc No.	Submitted
9	Specified Logic Verification-Transformer Feeder (Differential/REF/Backup OC&EF/Backup Impedance) Report		☐
10	Specified Logic verification-Bus/Line Reactor Feeder (Differential/REF/Backup Impedance) Report		☐
11	Centralised Busbar protection Report		☐
12	De-Centralised Busbar Protection Report		☐
13	Project Backup after complete FAT for all feeder configuration for all Relays involved in the FAT		☐
14	Operation and Technical Guide for Protection IEDs		☐
15	Operation and Technical Guide for BCU & other IEDs supplied		☐
16	Operation and Technical Guide IED configuration softwares		☐
17	Operation and Technical Guide Ethernet Switch		☐
18	Other applicable equipment Operational & Technical Guide		☐

Softwares/License details Backup:

Software/License	Doc. No.	Checked
Protection & Control each type Software & license		☐
CSD, FOTS, RTCC & Other Devices Software & license		☐
Antivirus software & license		☐
Other applicable equipment Operational & Technical Guide		☐

POWERGRID Representative	Manufacturer Representative
Signature:	Signature:
Name:	Name:
Date:	Date:

4. OBSERVATION AND COMPLIANCE REPORT

Observations during FAT & its compliance shall be recorded in “log sheets”.

OBSERVATION AND COMPLIANCE REPORT

LOG SHEET:

Sr. No.	Observations	Compliance	Remarks

POWERGRID Representative	Manufacturer Representative
Signature:	Signature:
Name:	Name:
Date:	Date:

5. GLOSSARY

BCU: Bay Control Unit
 DR: Disturbance Recorder
 EWS: Engineering Workstation
 FAT: Factory Acceptance Test
 FPT: Functional Performance Test
 FST: Factory Simulation Test
 GTW: Gateway
 GPS: Global Positioning System
 IED: Intelligent Electronic Device
 NMS: Network Management (Monitoring) System
 OWS: Operator Workstation
 RCC: Remote Control Centre
 RSCC: Regional System Co-ordination Centre
 SAS: Sub-station Automation System
 SAT: Site Acceptance Test
 SCADA: System Control & Monitoring System

POWERGRID Representative	Manufacturer Representative
Signature:	Signature:
Name:	Name:
Date:	Date:

6. ANNEXURE

Annexure -PreFAT Formats

POWERGRID Representative	Manufacturer Representative
Signature:	Signature:
Name:	Name:
Date:	Date:

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 पावरग्रिड POWERGRID	Factory Acceptance Test - Protection System Visual Inspection		
Manufacturer:		Equipment:	
Contractor:		Feeder/Circuit:	

VISUAL INSPECTION

Ref: FAT001

Name of the Panel:

Actions: Verify the check list and ensure that the panel under test is in line with the base document.

Sr.No.	Description	Passed	Failed
1	Ensure all the equipment are free of all foreign materials (dust, solder, droppings, etc)	☐	☐
2	Visually inspect the units and individual modules for cleanliness, healthiness and ensure that they are free from damage	☐	☐
3	Verify that the dimension of the panel as per GA	☐	☐
4	Visually inspect that the equipment are arranged as per the GA drawing of the panel (drawing pocket inside panel is available)	☐	☐
5	Verify the panel outside color and inside color is as per approved drawing	☐	☐
6	Verify the cabinet type is SWING FRAME	☐	☐
7	Verify the locker system of the panel is provided	☐	☐
8	Verify the size of the earthing bar is as per approved drawing	☐	☐
9	Verify the panel name plate and the equipment labels are correct and visible	☐	☐
10	Verify proper labeling is done for all the cables	☐	☐
11	Check for the arrangement of terminal blocks as per the drawing	☐	☐
12	Check the shorting and isolating accessories of CT terminals	☐	☐
13	Verify whether proper ferruling is done or not	☐	☐
14	Check if earth shield connections are provided	☐	☐
15	Check ventilation is provided as per the drawings	☐	☐
16	Check for proper panel door earthing	☐	☐
17	Verify paint thickness as specified in GA drawing	☐	☐
18	Check comprehensiveness of painting against external scratches, rusting, dents/damages etc.	☐	☐
19	Minimum spare TBs should be available as per TS & Truff size should be as accommodate with sufficient space for Field Cable.	☐	☐

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Name:	Name:
Date:	Date:

 पावरग्रिड POWERGRID	Factory Acceptance Test (FAT) Procedures & Formats Control Protection System	Doc: PG/CC/CRP/FAT, Rev01
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 पावरग्रिड POWERGRID	Factory Acceptance Test - Protection System Hardware verification		
Manufacturer:		Equipment:	
Contractor:		Feeder/Circuit:	
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HARDWARE VERIFICATION TEST

Ref: FAT002

Name of the Panel:

Actions: Verify the list of equipment and ensure the identification data, manufacturer and quantities are correct.

Sr.No.	Description	Passed	Failed
1	Verify the list of equipment of the scheme drawing as per GA with the existing cubicle layout & record any non-availability of equipment	☐	☐

POWERGRID Representative		Manufacturer Representative	
Signature:		Signature:	
Name:		Name:	
Date:		Date:	

 पावरग्रिड POWERGRID		Factory Acceptance Test - Protection System	
Hardware verification			
Manufacturer:		Equipment:	
Contractor:		Feeder/Circuit:	
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AC POWER VERIFICATION

Ref: FAT003

Name of the Panel:

Actions: Verify the check list and ensure that the AC circuit of the panel is correct and the devices are working properly.

Sr.No.	Description	Passed	Failed
1	Ensure that rated AC supply is given to panel at the incoming terminals	☐	☐
2	Verify the equipment under test are rated for proper AC supply	☐	☐
3	Verify the supply at the 1phase AC supply in OFF condition	☐	☐
4	Switch ON the supply and verify the ON/OFF operation of LAMP of the cubicle by operating the miniature position switch	☐	☐
5	Verify the power supply at the socket DS is correct	☐	☐
6	Verify the power supply at the power socket is correct	☐	☐
7	Switch ON the supply and verify the operation of thermostat, heater and indicator lamp. Adjusting the thermostat settings to 25°C for heater ON and ensure the Heater circuit placement doesn't affect any cable entry.	☐	☐
8	AC circuit wiring checked according to corresponding drawing	☐	☐

POWERGRID Representative	Manufacturer Representative
Signature:	Signature:
Name:	Name:
Date:	Date:

	Factory Acceptance Test (FAT) Procedures & Formats Control Protection System	Doc: PG/CC/CRP/FAT, Rev01
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	Factory Acceptance Test - Protection System		
	Hardware verification		
Manufacturer:		Equipment:	
Contractor:		Feeder/Circuit:	
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DC SCHEME CHECK

Ref: FAT004

Name of the Panel:

Actions: Verify the check list and ensure that the DC circuit of the panel is correct, and the devices are working properly.

S.No	Description	Passed	Failed
1	Ensure that rated DC supplies DC1 and DC2 are given to panel at the incoming terminals	☐	☐
2	Verify the equipment under test are rated for proper DC supply	☐	☐
3	Check continuity for DC circuit as per the drawing to ensure proper polarity before power ON	☐	☐
4	Check the Proper Co-ordination of the DC Fuse rating from the source -1 & 2 to till downstream circuit Fuse rating	☐	☐
5	Verify DC1 and DC2 at the main supply is in OFF condition. Now switch on DC Source-1. Check DC voltage at Fuse of DC Source-2. No DC voltage should be present. Switch off DC Source-1.	☐	☐
6	Verify DC1 and DC2 at the main supply is in OFF condition. Now switch on DC Source-2. Check DC voltage at Fuse of DC Source-1. No DC voltage should be present. Switch off DC Source-1.	☐	☐
7	Switch ON the DC1 and DC2 main MCBs and verify the supply at all other supply in the OFF condition	☐	☐
8	Switch ON all the supply in the panels and verify that all equipment rated for DC voltage is working properly	☐	☐
9	Perform a DC change over and ensure that no power failure happened in any of the equipment in the panel	☐	☐
10	Ensure that there is no mixing of DC1 and DC2 supply in the panel	☐	☐
11	Cubicle scheme checked according to corresponding drawing	☐	☐

POWERGRID Representative	Manufacturer Representative
Signature:	Signature:
Name:	Name:
Date:	Date:

 पावरग्रिड POWERGRID		Factory Acceptance Test - Protection System	
Hardware verification			
Manufacturer:		Equipment:	
Contractor:		Feeder/Circuit:	
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Auxiliary Relay – xxxx

Ref: FAT005

Feeder Reference:

1. Name Plate Rating Details of the Equipment

Record the following details of the relay.

Relay Make	
Relay Model	
Order Number	
Serial Number	
Rated Voltage	
Contacts Details	

2. General Inspection of Relay

Sr.No.	Description	Passed	Failed
1	Installation and correct wiring as per drawing	☐	☐
2	Terminal tightness	☐	☐
3	Relay earth connected to local earth bar	☐	☐

3. Secondary Injection Test

Pick-up / Drop-off Test

Inject the relay via the front panel test sockets (if possible) and record the pick-up and drop-off values in the table below.

Operating Coil

Pick-Up		Drop-Off		Result
V	mA	V	mA	

POWERGRID Representative	Manufacturer Representative
Signature:	Signature:
Name:	Name:
Date:	Date: