BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION PROJECTS ENGINEERING MANAGEMENT

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TYPE OF DOC.	**TECHNICAL SPECIFICATION**			**NAME**	**VSG**	**SS**	**AG**
TITLE				**SIGN**	-Sd-	-Sd-	-Sd-
SUBSTATION AUTOMATION SYSTEM				**DATE**	**24-06-19**	**24-06-19**	**24-06-19**
				GROUP	TBEM	**W.O. No**	
CUSTOMER	**Uttar Pradesh Transmission Corporation Ltd (UPPTCL)**						
PROJECTS	**765/400kV Substation Bara TPS (UP)** , **Project Code: 407**						

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SECTION I

SCOPE, SPECIFIC TECHNICAL REQUIREMENTS AND QUANTITIES

1.0 SCOPE

This technical specification covers the requirements of design, manufacture and assembly, testing at manufacturer's works, packing and dispatch of complete control & relay panels and Substation Automation system as per this specification for 765/400 kV BARA TPS Substation (U.P.) complete with accessories as listed in BOQ below. Testing and Commissioning of all SAS equipment's including Protective relays shall be done by the OEM Engineer along with on-site local training to Customer's engineers as specified in respective sections. The fitments offered shall be of UPPTCL approved make or its subsequent approval from UPPTCL shall be bidder's responsibility, with no commercial or delivery implications to BHEL. If any of the make offered by the bidder is not acceptable to M/s UPPTCL, the bidder has to supply alternate UPPTCL approved make, meeting the specification, with no commercial or delivery implications to BHEL. All auxiliary relays, timers, counters, aux CTs, switches etc required for completeness of the scheme & good engineering are deemed to be included in the offer and no claim whatsoever shall be entertained at contract stage.

In case of any conflict between the technical details mentioned in this section and the remaining sections of this document, then Section-1,2,3 shall prevail and is to be considered as binding requirement.

1.1 The equipment is required for the following Project.

Name of Customer: Uttar Pradesh Transmission Corporation Ltd (UPPTCL)

Name of the Project: 765/400KV SUBSTATION, BARA TPS (U.P.)

Refer Section - 3 for Project Details and General Specifications.

2.0 SPECIFIC TECHNICAL PARTICULARS

2.1 765/400 kV substation BARA (UP) :-

a) Augmentation of bays as specified in Spec with existing substation Automation system including hardware and software in the scope of bidder.

b) Make of existing substation automation system is M/s Schneider make. The scope of bidder shall include integration of IEDs under present scope of augmentation with existing substation automation (which is based on **IEC 61850**) and compatibility enhancement of same as required including hardware (if any required), updating of system database, displays, development of additional displays and reports as per requirement.

c) **765/400kV 1500 MVA Class Autotransformers** are being provided with RTCC (Applicable for Auto-transformer), optical temperature sensors, insulating oil drying system & online Dissolved Gas Analyzer (DGA) – multi gas.

This equipment's are IEC 61850 compliant & required to be integrated with Substation Automation System (SAS).

The Autotransformer is (being supplied in a separate package not in bidders scope) , shall be connected to managed Ethernet switch (not in bidders scope) compliant to IEC61850. This Ethernet switch shall be mounted in Common Marshalling Box (CMB) of the Transformer/Reactor. However, to connect this Ethernet switch to Bay Ethernet switch (mounted in relay panel), all accessories and Optical fiber cable from CMB to relay room shall be **in the scope of Bidder**. The signals from Optical sensors measuring unit and online DGA for transformer are as follows.

a) Temperature of optical sensors (8 probes for reactor & 16 probes for transformer)
b) H2, CH4, C2H6, C2H4, C2H2, CO, CO2, O2, and H2O gas content
c) Alarm, watchdog of the equipment

Approx. distance between CMB and Switchyard panel room is **600m**.

The Actual requirement of FO/Twisted cable for integration of Online DGA , Oil drying system, RTCC etc shall be finalised during detailed engineering.
The cable mentioned in BOQ is tentative. **The FO cable supply is in scope of bidder** as per actual site requirement.

d) The necessary interface equipment at BARA substation for transferring data to LDC if any , etc. through optical fiber based SDH communication link is also under present scope.

e) Complete relay and protection system as per section–II (Control and Relay panels). Existing Central unit of BUSBAR is **M/s Schncider make (P741) for 400kV and 765 kV.** The bus bar protection modules (peripheral units) for **765 kV** is **existing** however protection modules (peripheral units) **for 400kV** bays under present scope.

Necessary wiring for augmentation of busbar protection system for all bays is under present scope. The details of existing bus bar protection shall be furnished during detailed engineering.

f) The **CSD** for **(ICT-2)** are being procured separately. Details of CSD (make and scheme) shall be given to the successful bidder during detailed engineering.

The controller shall be mounted on the respective relay panel in control room. Necessary space shall be considered on the panel. The actual dimension of the controller shall be furnished to successful bidder during detailed engineering.

g) One panel **CB relay Panel** for 765 kV **bay (704)** already existing with peripheral bus bar units and BCU, bidder to supply one protection panel details of the existing panel is enclosed in **Annexure-B (section-V).**

h) Bidder to supply complete protection panels with peripheral bus bar units for 400kV bays.

i) Its bidder's responsibility to check PU units **(765 and 400kV both)** suitably matched with existing Bus bar unit for interfacing. the adequacy of centralized bus bar unit to integrate with the peripheral bus bar units. compatibility enhancement of same as required including hardware (if any required), updating of system, development as per project requirement.

j) Existing PUA/PUB is MICOM P743 make.

Please Note – The specific technical requirements mentioned under Clause 2.0 of Section I (above) shall be read in conjunction with Annexure –B which contains the amendments and clarifications to technical requirements as received from UPPTCL during pre bid.

In case of any conflict between the technical details mentioned in this section and the and the Annexure-B document , then Annexure-B shall prevail and is to be considered as binding requirement.

3.0 Technical Requirement:

A. OPERATIONAL EXPERIENCE

Offered equipment should have given three years proven trouble free operational service in tropical climate from date of bid opening **(02.03.2019)..** However, in case of equipment manufactured in India under valid foreign collaboration, operating experience in tropical climate of offered collaborator's equipment, shall also be acceptable provided copy of valid collaboration agreement for the offered equipment is submitted with the proposal. Further in case of offer of imported equipment, three year operating experience shall be considered in respect of those areas only which are similar to the tropical conditions prevailing in India.

B. MANUFACTURING EXPERINCE

The indigenous manufacturers or their foreign collaborator must have manufactured at least 20% of the specified quantities of each item of identical or similar equipment as on date of bid opening (02.03.2019).

C. TESTING FACILITIES:

The manufacturer must have all necessary facilities at their works for carrying out such routine and acceptance tests as prescribed in the relevant ISS/IEC and any other routine and acceptance test as specified in the specification. Documentary evidence of existence of such facilities will be submitted along with the proposal

4.0 BILL OF QUANTITY:

S. No.	Description	Unit	Total Quantity
	765/400 kV Substation BARA (UP)		
1	400kV Transformer bay protection panel (with automation)	SET	1
2	400kV Circuit Breaker Relay panel without auto reclose (with automation)	SET	1
3	400kV Tie bay Circuit Breaker Relay panel without auto reclose (with automation)**	SET	1
4	765kV Transformer bay protection panel (with automation) ##	SET	1
5	**Services for S/s**: Supervision of Testing and Commissioning of protection relays, Augmentation of Busbar system & Augmentation of Substation automation system at site. **Scope shall be as follows :** **a)** Testing & commissioning of main protection relays and Numerical Busbar protection including Relay parameterization and configuration. **b)** Testing & commissioning of SAS system including termination of network/optical cables (complete with all end connectors, tees etc as required). **c)** For network/optical cables which are in the bidder's scope of supply, its laying shall be in BHEL scope. However, Optical cable will be laid under bidder's supervision. **Splicing and termination shall be in bidder's scope.** **d)** Site acceptance Tests(SAT), Availability Test as per Section II. **e)** Arranging all necessary tools, tackles and equipment for protection and communication testing including **Three Phase automatic relay test kit shall be bidder's**	LOT	3

	responsibility. **f)** Maintenance services as per Section II. **g)** Site visits for collection of inputs for augmentation of SAS & Bus bar System. **h)** Sketch showing routing of F.O Cable & GI Conduit Pipe giving BOQ (as per Annexure -1 of Section1) **i)** Relay Setting Calculation, Application checks. **j)** Documentation as per Section –II. **k)** Incorporation of complete primary equipment interface in the CRP Schemes submitted by bidder **l)** Integration with RSCC, SLDC, NTAMC, as applicable. **m)** Interface with existing TSE, Disturbance recorder, Event logger , Bus-bar protection (as applicable)		

**** This panel covers the PUs (2 Nos) of Future Bay for Bus bar protection of Main Bus-I**
BCU and PUs are available in existing protection panel of Bay 704. Bidder to ensure complete interface with existing panels

NOTE- Items at SN 1,2 & 3 above cover all the items/requirements as per customer BOQ item which is as follows -

1	**Control and Relay Panels 400kV along with 06 nos. main relays+ aux. relays**	**Nos**	**2**

NOTE- Item at SN 4 above covers all the items/requirements as per customer BOQ item which is as follows -

2	**Control and Relay Panels 765kV along with 06 nos. main relays+ aux. relays; (One panel with 04 nos. main relay+ aux. relay exists)**	**No**	**1**

General Notes :

a) If any additional item/service other than that specified in the BOQ above, is required to meet technical specification requirement the same shall be clearly indicated in the offer. Otherwise the same shall be deemed to be included in the offer and no additional price implication will be entertained at later stages for the same.

b) BCUs shall be offered as part of respective protection panel.

c) Bidder shall estimate the actual requirement of FO cable during contract stage any additional quantity required in this regard for completion of SAS, Bus- Bar system shall be supplied by successful bidder free of cost.

d) During detailed engineering if any of the item supplied by bidder is found not meeting the technical specification requirement, the item shall be replaced without any price implication and the technical requirement shall be met.

e) Any communication or correspondence with customer or customer's sub vendor regarding the augmentation of existing SAS & Busbar protection system for substations shall be in the scope of bidder. **Any site visit if required for the same shall also be in scope of bidder**.

5.0 TYPE TESTS:

Bidder shall submit valid type test reports (as per relevant IEC/IS standard) for the tests carried out within last five years from the date of bid opening of Bara **(02.03.2019).** The reports should have been conducted on identical or similar equipment/components to those offered. The test certificates of proto type manufactured and tested by foreign
collaborators of the tenderers at their works shall not be acceptable for indigenously manufactured equipment.

In case type test reports are more than 5 years old (from 02.03.2019) or the reports of type tests are found to be technically unacceptable by BHEL/UPPCL, the type test shall be conducted by the vendor without cost and delivery implication to BHEL.

6.0 DEVIATIONS:

The bidder shall list all the deviation from the specification separately. Offers without specific deviation will be deemed to be totally in compliance with the specification and NO DEVIATION on any account will be entertained at a later date.

7.0 MANUFACTURING QUALITY PLAN:

The bidder shall carry out contract works in accordance with sound quality management principles which shall include such as controls which are necessary to ensure full compliance to all requirements of the specification & applicable international standards. These quality management requirements shall apply to all activities during design, procurement, manufacturing, inspection, testing, packaging, shipping, inland transportation, storage, site erection & commissioning. Bidder shall submit detailed Quality Plan for BHEL /customer's approval at contract stage.

8.0 SPECIAL TOOLS AND TACKLES:

Bidder shall supply all special tools and tackle free of cost which are specifically required for the Surge arresters and are proprietary in nature. List of such special tools and tackle should be clearly listed along with the technical offer. Any special tool which is not listed in the list but required during the erection/testing/commissioning of surge arresters shall also be supplied free of cost by the supplier.

9.0 DRAWINGS and SCHEME

The documentation requirements detailed under Section-III shall be submitted to BHEL at various stages of contract. Softcopy of the drawings and schemes are to be submitted at contract stage. Preparation of AS- BUILT drawings is also in the scope of the bidder.

10.0 DOCUMENTS REQUIRED WITH OFFER

a) Clause-wise confirmation/ comments.
b) Bill of Material.
c) Un-priced schedule as per BOQ
d) Catalogue and Technical Leaflets for the offered Equipments
e) Documentary proof against qualifying requirement.

SECTION-II

1 INTRODUCTION

This Specification describes the Technical Requirements applicable to the design, manufacturing and factory testing of the protection and metering systems, plus the interfaces to the switchyard Substation Automation System (SAS), which is specified more fully in the Sectional Specification, to be installed in the 765 kV Bara TPS Extension Project.

2 SCOPE OF WORK

2.1 General

The various Protection and Measurement Systems and the Substation Automation System (SAS) interfaces have been located, on a circuit by circuit basis, on panels which are placed in control relay building. These will be mainly interconnected via a Fibre Optics (FO) local area network (LAN) with the 765/400 kV switchyard control room. At Bara TPS, interface to existing 765 kV bus will be located in the existing 765 kV control/relay building.

All CT, VT and 220 V d.c. control and protection hard wired circuit cables in, or close to, the 765 kV switchyard will use double screened (shield and armour) cables, with the outer screen (armour) earthed at both ends while the inner screen (shield) will be earthed at one end only, usually in the relay/control panels. Any requirements or recommendations to deviate from this policy shall be detailed and justified in the bid or design briefs as appropriate.

The SAS LAN will be duplicated and shall comply with the IEC 61850 protocols for the interconnection of the protection and control devices within the switchyard Control System and at least the A Group of protections will interface directly to the LAN using the IEC 61850 protocol. The bay units will be used to integrate additional data and will include analogue data (measurand) gathering systems. Additional transducers, etc should only be provided for the auxiliary systems and standby DG set where digital data transfer is not available. The use of other protocols shall be kept to a minimum.

The switchyard SAS will communicate with a dispatch centre RTU either using a suitable data protocol or a back-to-back I/O system to transfer a subset of data from the 765 kV and 400 kV switchyards to the Lucknow Control Centre.

2.2 Control and Relay Building Locations

In Bara TPS, the control and interface equipment for the new 400kV breaker will be located in the existing 400kV switchyard control and relay room. Existing bus bar protection at 400kV substation Bara TPS is to be modified to accommodate the new 400kV transformer bay. The DC Voltage for 400kV switchyard shall be 220V.

The AC & DC supply will be available from 415V AC downstream switchgear board and 220V DC distribution board.

The main control room building will provide the central SAS control room for the whole site and will contain a dual operator work station conventional SAS computer control centre for the switchyards, including data server, record storage and printing facilities. In addition to the work stations, one engineering laptop and secure docking station will be provided equipped with software to access all of the protection, control, communication and power line control systems (including battery chargers, UPS etc. if so fitted) either remotely or directly at each equipment. Although the site will be configured for full remote control, either from the Lucknow dispatch centre or the Bara TPS substation control room, this control area will provide more detailed control access to support maintenance, commissioning or fault finding as required.

The building also provided offices, drawing storage, light and heavy current workshops and other administrative functions, including washroom and shower facilities (SF6 switchgear) and lunchroom facilities. This building has been situated outside the electrical fenced areas of both the 765 kV and 400 kV switchyards.

2.3 Panel Grouping

The basic reliability requirements for 765 kV and 400 kV system require fully separate dual, non-identical, protective systems for each protected zone together with circuit breaker fail, local backup and sufficient remote backup to be able to detect and update any primary system electrical fault with any one protection system and/or communication link failed, including the failure to trip of any circuit breaker. The protection panels shall be arranged to meet these requirements. Similarly, the control systems shall be dual (or ring) LAN type, using IEC 61850 protocols to directly interface to the various protection relays and the associated breakers' bay units in such a way that full control access and critical system data is available should any one of these intelligent electronic devices (IEDs) fail. The principles for the distribution of these IEDs into the required individual panels is given below noting that, in detailed design, the supplier may propose configurations which optimise their particular IED functionality subject to the Engineer's approval.

2.4 Quantity of Panels

The tables in the following sections indicate the number of panels and the configuration of the required control and protection devices in these panels. The Bidder may propose alternative number of panels, which would respect the requirements of the specifications.

2.5 Panel Configurations Bara TPS (765kV)

8120	**Protection and Control Room Existing Building Bara TPS substation**		
No.	**Panel Group**	**Protection**	**Function**
8121	**Interconnecting Transformer #2**	A	- Transformer differential protection relay (87T1/67/67N) - BB protection relay (PUA) - LBB protection relay (50 LBB) - Interface controller (SAS)
8122	**Interconnecting Transformer #2**	B	- Transformer differential protection relay (87T2) - Thermal and gas (Buchholz) protection relay - BB protection relay (PUB) - Bay Control Unit (BCUT)
8123	**ICT #2 Breaker**	A	- Breaker failure protection relay (50/62) - Check synchronizer and under/over-voltage protection relay (25SC/27/59) - Breaker over-current protection relay (50/51) - Breaker controller (SAS)

2.6 Panel Configuration Bara TPS (400kV)

8130	**Protection and Control Room Existing 400kV Building Bara TPS**		
No.	**Panel Group**	**Protection**	**Function**
8130	**ICT#2 400kV Breaker**	A	- Breaker failure protection relay (50/62) - Check synchronizer and under/over-voltage protection relay (25SC/27/59) - Breaker over-current protection relay (50/51) - Breaker controller (SAS)

8131	**Bay Unit**	A	- Overhead differential protection relay (87OHM1) - BB protection relay (PUA) - LBB protection relay (50 LBB) - Interface controller (SAS)
8132	**Bay Unit**	B	- Overhead differential protection relay (87OHM2) - Thermal and gas (Buchholz) protection relay - BB protection relay (PUB) - Bay Control Unit (BCUT)

Note: The control and relay panels for 400kV side of ICT#2 shall be placed in existing 400kV building. Any relay/panel required to match the existing protection scheme of ICT # 1 shall be provided by the contractor free of cost.

3 TECHNICAL DATA SCHEDULES

3.1 Control Panels

3.2 Component Characteristics

3.2.1 Control Device – Data Sheets

3.2.1.1 Synchronism Check Relay (25SC)

3.2.1.2 Control Switches

3.2.1.3 Protective Device Components, Test Switches and Terminal blocks

3.2.2 Metering Components – Data Sheets

3.2.2.1 Bidirectional Multifunction Digital Energy Meter

3.2.3 Protection Systems – Data Sheets

3.2.3.1 Group B Fibre Optic Line differential protection (87FO)

3.2.3.2 Group A and B Transformer Differential Protection (87T)

3.2.3.3 Group B Transformer Mechanical Protection

3.2.3.4 Group A and B Single Bus Differential Protection (87B-A and B)

3.2.3.5 Group A and B Differential Protection 87CC-A(TEE1) and 87CC-B (TEE2))

3.2.3.6 Group A Circuit Breaker Failure Protection (50/62)

3.2.3.7 Group A and B Over-current Protection (50/51 & 50/51N)

3.2.3.8 Line Over voltage Protection (59)

3.2.3.9 Line Under voltage Protection (27)

3.2.3.10 Self Reset Tripping Relay (94)

3.2.3.11 Lock-out Tripping Relay (86)

3.2.3.12 Auxiliary Relay

(Provide the following data for all type of auxiliary relays)

TECHNICAL DATA SCHEDULE AUXILIARY RELAY DATA CODE NO. 815M				
ITEM	**DESCRIPTION**	**UNITS**	**REQUIRED**	**GUARANTEED**
21.0	***Auxiliary relay***	-	-	
21.1	Manufacturer			
21.2	Type	-		
21.3	Coil rated voltage Un	V		
21.4	Duty range	% of Un		
21.5	Pick-up value	% of Un		
21.6	Drop-out value	% of Un		
21.7	Pick-up time make/break contact	ms/ms		
21.8	Drop-out time make/break contact	ms/ms		
21.9	Power Consumption at rated Un	W		
21.10	number of contacts NO/NC	-	-	
21.11	contact rating:			
	- voltage	Vdc	220	
	- current with L/R=40 ms	A	-	

3.2.3.13 Time Delay Relay

(Provide the following data for all type of time delay relays)

TECHNICAL DATA SCHEDULE AUXILIARY RELAY DATA CODE NO 815N				
ITEM	**DESCRIPTION**	**UNITS**	**REQUIRED**	**GUARANTEED**
22.0	***Time Delay relay***	-	-	
22.1	Manufacturer			
22.2	Type	-		
22.3	Coil rated voltage Un	V		
22.4	Duty range	% of Un		
22.5	Pick-up value	% of Un		
22.6	Drop-out value	% of Un		
22.7	Pick-up time make/break contact	ms/ms		
22.8	Drop-out time make/break contact	ms/ms		
22.9	Adjustable delay time range	-		
22.10	Adjustable delay time increments	-		
22.11	Power Consumption at rated Un	W		
22.12	Power Consumption at rated Un	W		
22.13	number of contacts NO/NC	-	-	
22.14	contact rating:			
	- voltage	Vdc	220	
	- current with L/R=40 ms	A	-	

Note: All the Technical parameters and data for Control, Metering & Relay should be as per existing scheme at 765/400kV Bara TPS Substation.

CODES AND STANDARDS

Design, material, fabrication and tests of all products supplied under this contract, must be according to the following standards:

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C39.1	Requirements for Electrical Analogue Indicating Instruments

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

IEC 60051-*	Direct Acting Indicating Analogue Electrical Measuring Instruments and their accessories (* all applicable parts)
IEC 60073	Basic and Safety Principles for Man-Machine Interface, Marking and Identification – Colour Principles for Indicators and Actuators
IEC 60211	Maximum Demand Indicators, Class 1.0
IEC 60255-*	Electric Relays (* all applicable parts)
IEC 60297-*	Dimensions of Mechanical Structures for Electronic Equipment (* all applicable parts)
IEC 60359	Electrical and Electronic Measurement Equipment - Expression of Performance
IEC 60447	Man-Machine Interface (MMI) – Actuating Principles
IEC 60485	Digital Electronic D.C. Voltmeters and D.C. Electronic Analogue to Digital Converters
IEC 60521	Class 0.5, 1 and 2 Alternating-Current Watt-hour Meters
IEC 60547	Modular Plug-In Unit and Standard 19-Inch Mounting Unit Based on NIM Standard (for Electronic Nuclear Instruments)
IEC 60687	Alternating Current Static Watt-hour Meters for Active Energy (classes 0.2S and 0.5S)
IEC 60870-6	Telecontrol Application Service Element.2 (TASE.2) (part of UCA International)
IEC 61000-*	Electromagnetic Compatibility (EMC) (* all applicable parts)
IEC 61810-*	Electromechanical all-or-nothing relays (* all applicable parts)
IEC 61811-*	Electromechanical Relays (* all applicable parts)
IEC 61850-*	Communication networks and systems in substations (part of UCA International)
IEC 61970-*	Common Information Model (CIM) (part of UCA International)

IEC 62246	Reed Contact Units
IEC 61131-3	Automation standard

INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE)

IEEE C37.20.1	Metal-enclosed Low-Voltage Power Circuit Breaker Switchgear
IEEE C37.20.2	Metal-clad Switchgear
IEEE C37.20.3	Metal-Enclosed Interrupter Switchgear
IEEE C37.90	Relays and Relay Systems associated with Electric Power Apparatus
IEEE C37.90.1	Surge Withstand Capability (SWC) Tests for protective Relays and Relay Systems
IEEE C37.90.2	Withstand Capability of Relay Systems to radiated Electromagnetic Interference from Transceivers
IEEE C37.93	Electrostatic Discharge Tests for protective Relays
IEEE 802.2	Local Area Network: Logic Link Control

INSTRUMENT SOCIETY OF AMERICA (ISA)

ISA 18.1	Annunciator Sequences and Specifications

INTERNATIONAL STANDARD ORGANIZATION (ISO)

ISO/IEC 8802-3	Information Technology – Telecommunications and Information Exchange Between Systems – Local and Metropolitan Area Networks – Specific Requirements – Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications

NATIONAL ELECTRICAL MANUFACTURERES ASSOCIATION (NEMA)

NEMA AB1	Molded-Case Circuit Breakers, Molded Case Switches, and Circuit-Breaker Enclosures
NEMA WC70	Non-Shielded Power Cables rated 2000 V or less for the Distribution of Electrical Energy
NEMA WC71	Non-Shielded Power Cables rated 2001-5000 V for the Distribution of Electrical Energy
NEMA WC74	5-46 kV Shielded Power Cables for use in the Transmission and Distribution of Electrical Energy

4 FUNCTIONAL REQUIREMENTS

4.1 General

The Protection Systems shall be provided for:

- 1500MVA ICT#2 Transformer Bay at 765kV and 400kV switchyards Bara TPS Substation and associated equipments;

Drawing of single line diagram for substation has been given with Tender documents.

4.1.1 Bara TPS Extn. substation

The new 765 kV sections will be composed of:

- One (1) 1500MVA, 765/400kV ICT Bank consisting of 03 single phase 500MVA units will interconnect the 765kV to the 400kV switchyard;

The Single line diagram (SLDs) of existing 765kV Bara TPS substation is illustrated on drawing nos. 012213-E-SY-SY-1L-0015, Rev.-C & 012213-E-SY-SY-1L-0010, Rev.-B ICT#2 bay which are to be constructed, are shown in clouded portion on SLD.

4.2 Control, Metering and Protection General Configuration

The control, metering and protection systems will be composed of intelligent equipment devices (IED) capable to communicate between themselves, with the local SAS and with the dispatch SCADA system.

The operation of the 765kV Bara TPS Extension Sub-station will be controlled from the existing main control room building but with standby local maintenance workstations in each segregated relay building.

Three types of panels are mainly considered for use:

- Protection panels;

- Breaker control and protection panels;

- Auxiliary control panels;

The breaker control and protection panels will collect and process all metering data, equipment status and alarms associated to the breakers; breaker failure and over-current protections, reclosers and synchronism check equipments, where separate from the line protection, plus the control synchronism and voltage check systems will be included in these panels.

The auxiliary control panels will collect and process all metering data, equipment status and alarms associated to the substation auxiliary services including fire alarm/detection system and emulsifier system. These panels will mainly consist of the substation auxiliary service controller.

The statistical metering will be exclusively to collect data of the energy flow on the 765 kV transmission lines and on the 765 kV and 400 kV side of the one (1) 1500MVA, 765/400 kV interconnecting auto transformer (ICT#2), 765 kV/400 kV at Bara TPS substation.

The protection panels will collect and process the metering data, including the revenue metering, the protection and alarms associated with the protection, for the 765 kV and 400 kV circuits, either

for a high voltage line, a transformer and for each 765 kV and/ or 400 kV common and feeder bus.

Each feeder, common busses and transformers will have their own protection panels divided into Group A and Group B as specified below.

4.2.1 Bara TPS - Control, Metering and Protection General Configuration

At Bara TPS substation, the panels will be located in existing control/ relay building.

4.3 Control Communications and Teleprotection

4.3.1 SAS

The Contractor shall install and connect the controllers, the communication interfaces and all the communication cables in the appropriate control and protection panels.

4.3.2 Synchronism Check

Each breaker shall be provided with synchronism and voltage check equipment for the supervision of the control system (SAS) outputs. A separate system shall be provided on the line bays with similarity, but with separately settable functions, for the line auto-reclose systems.

Three types of equipment shall be provided:

- Voltage check relay system;
- Synchro check relay system;
- System Synchronisers (Auto synchroniser type).

4.3.2.1 Voltage check relay system

The control scheme shall monitor the voltage on each side of each circuit breaker, either by direct voltage transformer or via voltage selection logic to monitor whether one or both sides of each circuit breaker are energised. If both sides are energised, the logic will transfer to the check sync phase. The scheme will be provided with selectable “live line - dead bus” or “dead line - live bus” closing features as associated with a 1 ½ switch breaker type switchyard.

Ensure that the Voltage check equipment inhibits breaker closure if both sides are dead unless the associated breaker disconnects are open (maintenance position).

4.3.2.2 Synchro check system

Synchro check relays shall be used for all circuit breakers for the control system outputs and on the line circuit breaker for the auto-reclose systems.

These systems are designed to connect two systems that have stable frequency and to block closing (or transfer closing to the system synchronism logic, as appropriate) if there is a significant slip (system split) across that particular circuit breaker.

Synchro check relays shall be provided for stable frequency closure with angle settings appropriate to the load angle of the paralleling line.

As the voltage will be permanently connected to the equipment, the synchronism check function shall be initiated only on request from an external input to ensure the output closing contact will not

be activated without a closing selection command being initiated from the SAS HMI. All close commands from the Dispatch SCADA will also function through the SAS control logic.

4.4 Metering

4.4.1 Statistical Metering Configuration

Provide dual (main and check) revenue meters, if required, at each of the following interconnecting points:

- For each 765 kV line bays;

- For the 400 kV side of each 765/400 kV Transformer.

Provide IED meters that can be interrogated by the SAS system as well as remotely via a separate communication link, if required, either via the site telephone system (Modem) or a direct link to the communication multiplexes. See Communication sectional specification.

4.4.2 Meters and Instrumentation

Provide bi-directional multifunction integrating meters (kWh and kVArh). Also provide meters that can be programmed, if required, to kQh or kVAh metering.

The meters shall be intelligent devices (IED type) with an HMI display for local reading and local access facilities to download stored data to a storage device, to be supplied at each site.

Provide meters with test sockets and draw out isolation facilities, which disconnect the input circuits and short the current transformer circuits in order to inject test voltage or currents in meters for testing purpose.

Provide meters with dust tight, removable covers with transparent windows and facilities to seal against tampering and/or digital password protection for configuration facilities.

Provide all meters with dual port of communication for the SAS dual redundant (or ring) LAN and with facilities for pulse outputs if required for measurement check purposes. The meters shall also integrate a dedicated modem for telephone or multiplexer connection.

4.5 Protection

4.5.1 Protection Configuration

4.5.1.1 Panels and Relays

Provide, for the substation, protection panels for each 765 kV and 400 kV transmission line, transformer and reactor circuits and for the common busses and the circuit breaker failure protective systems, accordingly to the appropriate configuration of the substation.

Provide sufficient panels to accommodate all specified protection systems including the fibre optic teleprotection units, the data acquisition for the distributed control system and associated interfaces, with a minimum of two panels, A and B, per circuit. Breaker failure and over-current breaker protections, automatic reclosing systems and synchronism check systems shall be grouped per line and/or unit breaker in a 1½ switch breaker 765/400 kV bay. These panels shall also contain the SAS “Bay Box” interface equipment (measurement, recloser priority and common systems) for that circuit breaker.

Provide fully programmable and digital relays with communication facilities for connection on the redundant SAS LAN allowing both real time alarm and /or sequence of event (SOE) data access and for stored event (events and oscillography) data access.

4.5.1.2 Fibre Optic and Power Line Carrier (PLCC) Teleprotection Units

The fibre optic and PLCC teleprotection units are not described in this sectional specification. These units are described and provided under the Teleprotection and PLCC Sectional Specifications.

4.5.2 Protection - General Requirements

Provide 2 sets of protection labelled Group A and Group B for the transmission lines, cables, transformer circuits and for the main busses, which can operate independently and simultaneously;

For Group A and Group B protection, the protection relays shall be provided from two separate protection manufacturer's design and production facilities;

Provide the protection systems in accordance with the station single line drawings and the typical protection single line and logic drawings;

Provide for independent and simultaneous operation, which includes duplicate breaker trip coils, duplicate 220 V dc supplies, and the use of separate CT and VT windings independently for each system. Separate metering windings are to be provided on each VT and CT used for digital metering systems, statistical in the main 765 kV grid and dual tariff class at the interface points to each line start. Design the separation between the Group A and Group B circuits to start at the associated miniature circuit breakers, at each VT and at each battery system distribution panel. These circuits will be provided by others but MCCB characteristics will need to be provided to confirm the design interface;

Provide, in one group, circuit breaker fail protection to directly detect the failure of a circuit breaker to trip on fault following a trip initiation and route the resultant tripping to all " next in line " circuit breakers;

Provide, in the other group, back up relaying in case of failure of both main measuring schemes. Scale this protection to ensure that final tripping is within the short-time thermal rating of the primary equipment;

Ensure that the protection is stable during system transients and will operate correctly during system faults for faults within the protected zones, for the ranges of fault levels, and for the fault current dc time constants relevant to the specified systems;

Provide a complete overall design for each protective system to include the definition of the current and voltage transformer requirements (CT and VT provided by others), the measuring relays, auxiliary relays and all wiring necessary for the detection of a fault and the issuing of a trip and reclose signal to the circuit breaker including the correct functioning of that circuit breaker. Coordinate this design with existing systems and with equipment provided by others;

Provide an overall scheme, which can be integrated into the existing protection schemes that interconnects the networks as a whole, and provide evidence of compatibility and equivalent performance;

Provide the necessary interface relays to send to, and to receive from, the protection signalling systems and differential protections, those signals required for cooperative operation of both line ends of the protection scheme.

4.5.2.1 Objective Fault Clearing Times

The objective fault clearing times required are based on the supply of 40 ms (two cycle at 50Hz) circuit breakers and a maximum of 15 ms for the protection signalling channels. The associated maximum intertrip (DTT) times are 30 ms. Appropriately faster times are expected for the digital systems. The required objective clearance times are as follows:

Circuit	Nature Of Fault	Time (ms)
EHV line or Cable	Fault close to one end of a line. Clearance of the end nearest the fault.	100
EHV line or Cable	Fault close to one end of a line. Clearance of the end remote from the fault using protection signalling: • single phase • three phase	 115 130
EHV line or Cable	High resistance line ground faults beyond the impedance measuring reach of the distance relays	150
EHV circuit	Breaker failure trip and faults between an EHV circuit breaker and its CT: • local • remote	 300 330
EHV line	Clearance from the remote end of an EHV line fault with a protection signalling failure (zone 2)	400
EHV bus or bus connections	All in zone faults, maximum	100
EHV transformer or reactor	All high level faults	130
General	Faults cleared by back-up protection at full fault level	1000 (1 sec)

Provide evidence that the fault clearing times are independent of system configuration and include CT and VT response characteristics.

Faster overall clearing times will be acceptable noting that direct fibre optic signalling channels will be used.

4.5.2.2 General HV Protection Requirements

Provide the following minimum output contacts per protective system:

- 2 breaker trip contacts. (One per circuit breaker for group A or B);

- 1 contact from the same relay that provides the circuit breaker trip contacts for connection to the distributed control system SOE I/O;

- 2 protection signalling send contacts, one for each functionally specified send channel, and one similar speed contact for connection to the distributed control system SOE I/O;

- 2 intertrip (DTT) send contacts where functionally specified and one DTT send indication contact for connection to the distributed control system SOE I/O;

- 1 auto-reclose start contact where functionally specified;

- 1 auto-reclose cancel contact where functionally specified;

- 1 breaker fail start contact;

- 1 alarm contact for each specified operational alarm within the relay *;

- 1 common alarm contact for relay system or relay power supply dc/dc converter failure*.

  *Note: these latter alarms may be transferred to the SAS via the dual LAN link with the appropriate time tag (time marker) for non-SOE events.

Provide suitable facilities on each measuring relay or system to disconnect trip outputs, then to short and disconnect the current transformers and to disconnect any potential transformer, alarm or critical dc circuit, without affecting any other device, prior to removing or testing the relay element or IED measurement;

Provide suitable injection test facilities, to enable the measuring relay element to be tested in-situ without affecting the external circuitry;

Provide target relays or suitably identified LED indicators to indicate the operation and stage of each protection measurement loop in each system. Provide means of resetting these targets without removing any covers. If electrically reset, provide an accessible panel mounted push button;

Provide repeat relays where necessary to provide contacts into the local and remote and distributed control equipment to provide alarms, indications, control automation and trip logic as specified. Shunt and/or diode logic type interfaces are preferred;

Provide all relays for use in the ambient and other external environmental factors specified, including the heating effect of other equipment provided under this or other previous contracts. Tropicalize where necessary;

Do not provide mechanical relays which use oil dashpots or whose calibration is appreciably affected by temperature;

Provide all measuring relays complete with any required external auxiliary equipment required for the proper operation of all systems, meeting the specified class, ratio of instrument transformers, and performance. Include and document all special internal configurations (program logic) required;

Design all relay systems to be immune to malfunction, should a 220 V dc system ground fault occur on any lead external to the relay panel (capacitance discharge risks);

For any case mounted static or digital relays, provide front withdrawable internal components in switchboard type, flush/semi-flush, rectangular, dust-tight, back connected cases. Provide these relay cases with removable covers or doors with glass windows, and provide means to seal the cover fasteners with wire to prevent tampering with the relay or its settings. Also provide external reset features;

Ensure all text display features (HMI/MMI access) are readable and accessible from normal standing position, with the preferred location on any panel to be between 1200 and 1700 mm from the floor with a maximum range of 800 to 1900 mm;

For all settable protection and control systems, provide individual sealable covers and/or password protected access buttons to secure re-setting capability while ensuring fault indication, record data and setting displays are available for general access;

Provide suitably protected power supply units to operate from the 220 V dc (nominal) protection supply. Provide these units with supply failure monitor alarm circuits;

Provide all necessary interface and barrier isolation circuits for each system to operate, as specified, in the environment specified and to meet the IEC 60255, IEC 61000 and ANSI C37.90 SWC, electromagnetic, electrostatic and radio interference levels and EMC Standards.

4.5.2.3 Division of the Protection

Divide the protection systems into Group A and Group B where specified, each fed from its own 220 V dc supply and tripping the associated A or B circuit breaker trip coil;

Derive all power supply requirements for the protection from the 220 V dc supply associated with the relay group, including panel by panel or equipment by equipment dc/dc converters or dc/ac inverters as required. The use of small individual batteries as power supplies to the electronic equipment is not permitted for the primary functions of the systems. Long life rechargeable batteries for long-term backup of non-critical event data would be considered;

Ensure that Group A and Group B protection dc supply systems are electrically separated. Contacts for Groups A and B fed from the A and B battery supplies are not permitted within the contact stack of the same physical output relay. The coil of a Group A relay may however close or open a Group B system contact located in a separate contact stack and vice-versa. Diode summation dual power feeds to critical loads may be permitted provided these are barriered and protected in a way to avoid any risk of the loss of both systems;

Physically divide the protection in the panels by circuits and by groups, generally as shown on the Drawings and be subject to approval, to give as much separation as physically possible. Label those areas of the panels by power supply group.

4.5.3 Transformer Protection

Provide for each transformer two primary protection systems separated into Group A and Group B as defined hereafter including the protection for the 33 kV tertiary. Also provide the specified connections protections between the transformers and the adjacent substation.

4.5.3.1 Auto-Transformer High Impedance Differential Protection - Group A or B,

Provide for each auto-transformer one protection system using a high impedance overall differential protection for each transformer connected in a circulating current mode or a full differential scheme, as defined in 5.5.4.2 below, supplied by another design office or supplier. For the high impedance scheme provide a phase by phase differential zone to include the primary HV, the secondary LV and the tertiary delta connections of the transformer using the HV and LV phase CT’s and the neutral connection current transformers.

4.5.3.2 Overall Biased Differential Protection - Group A and/or B

Provide, for the Auto-Transformers, three winding biased differential protection with harmonic restraint, suitable for the transformer connected, in a differential current mode and suitable to cover the high, low and, where equipped, the tertiary connections with internal ratio and vector correction facilities.

Provide a restricted earth fault relays integrated with the differential protection for the high, low and, where required, autotransformer tertiary windings and overfluxing protection.

The differential relays for the transformers shall be programmable with integrated features, based on microprocessors, with fast operating times and variable percentage restraint characteristics, suitable for 3 inputs from 3 different CT cores. The relays shall have appropriate harmonic filters to block the operation of the relay during magnetizing inrush of the transformer. For faults in the protected zone, the relays shall operate before the CTs saturate severely.

The operating time of the relays for differential current higher than 2 amps, secondary, shall be less than 3 cycles. The relays shall be intelligent electronic devices capable to adjust the settings values according the CT configuration.

4.5.3.3 Fast Gas and Winding Temperature Protection - Group B

Provide a trip logic, via other digital relays and/or target repeat relays to accept contacts from the Buchholz, Diaphragm Rupture and Load Compensated Winding Temperature relays as appropriate to the design of the transformers, provided by others. For bidding purposes, provide 4 such systems initially.

Provide a similar group of alarm stage monitor channels or relays to provide all the necessary SAS alarms and inputs via I/O (Bay box) and/or associated protective relays as appropriate.

Provide additional trip and alarm targets to monitor additional mechanical devices as provided by the transformer manufacturer. These additional features are provisionally: tap change Buchholz and pressure diaphragm trip and oil level alarms. These will be confirmed.

Provide series target relays, with suitable trip current extension time delay to ensure target operation, for the trip target relays.

4.5.3.4 Phase Over-current and Earth Fault Protection - Group B

Provide inverse time relays connected in the main transformer high, low and tertiary connections and, where provided, in the direct neutral connection of the tertiary winding zigzag earthing transformers.

Provide relays as specified below in 4.5.7 “Over-current and Earth Fault Protection – All circuits – Group B”.

4.5.3.5 Primary and Secondary Side Transformer Tee Bus Protections

This zone covers the connections between the transformer bushings and the circuit breakers in the 765 and 400 kV substation, where appropriate.

Provide a dual common high impedance connections (Group A and Group B) for the tee connections connected in a phase-by-phase circulating current mode.

Integrate the tripping logic into the trip circuits of the transformers with suitable interfaces to the circuit breaker trip and circuit breaker fail start circuits.

4.5.4 Void.

4.5.5 Common Bus Protection for 1½ Switch Breaker Station Configuration

Provide for each busbar two primary protection systems separated into Group A and Group B

operating from separate CT cores. 765kV and 400kV busbar protection each should be suitable for 16 bays (minimum).

For each group, provide a low impedance biased differential phase-by-phase measuring scheme with individual faulted phase indications. Design the scheme to have a through fault stability up to the circuit breaker rating while being capable of operation under the minimum bus fault current conditions specified and be appropriate for the substation.

Ensure that the current transformers provided do not compromise the protection's ability to be insensitive to CT saturation, and have a through fault stability level of up to the circuit breaker fault rating and co-operate with the substation equipment supplier to define the necessary CT characteristics. A unit to limit high CT secondary voltages during faults is to be provided if a high impedance type protection is provided. The protection is to be insensitive to transients and harmonics in the power system over the range of system voltage and frequency specified.

Provide sufficient trip relays and trip logic to accept circuit breaker fail trip logic signals in addition to the trip circuits for the bus relays.

Provide two schemes of different types or for different suppliers to ensure software redundancy.

4.5.6 Tee Bus Protection for the 1 ½ Switch Breaker Station Configuration

For all feeders (line, transformer, reactor, future feeder, etc.) connected to a 1 ½ breaker switch station, provide an overall protective system design to cover the section of bus between the bay circuit breakers and the CTs on the controlled circuits;

Provide for each circuit two primary protection systems separated into Group A and Group B, connected to separate CT cores;

For each group, provide a high impedance differential or low impedance biased differential phase-by-phase measuring scheme with individual faulted phase indications. Design the scheme to have a through fault stability up to the circuit breaker rating while being capable of operation under the minimum bus fault current conditions specified and be appropriate for the substation;

Ensure that the current transformers provided do not compromise the protection's ability to be insensitive to CT saturation, and have a through fault stability level of up to the circuit breaker fault rating and co-operate with the station supplier to define the necessary CT and VT characteristics. A unit to limit high CT secondary voltages during faults is to be provided if a high impedance type protection is provided. The protection is to be insensitive to transients and harmonics in the power system over the range of system voltage and frequency specified;

Provide sufficient trip relays and trip logic to accept circuit breaker fail trip logic signals in addition to the trip circuits for the bus relays;

Provide two schemes of different types or for different suppliers to ensure software redundancy.

Provide current transformer and trip selection in the bus disconnect, auxiliary switch and repeat relay design.

Modify the zone of the existing bus protection to cover the existing bus as far as the new bus

4.5.7 Over-current and Earth Fault Protection - Group B

Provide inverse time phase and earth fault over-current protection as conventional system backup.

Provide international standard inverse time curves to IEC 60255, these characteristics to be selectable via the setting logic. Typically use Normal Inverse for the line and bus backup protection and Very Inverse for the transformer backup protection.

Provide separately settable phase instantaneous over-current elements and ensure the instantaneous elements can be blocked separately for both the phase and earth fault elements.

Provide separate trip outputs for instantaneous and inverse time elements together with separate indicators for stage and phase. Connect these to the lockout and non-lockout trip circuits, respectively, as specified for the circuit concerned.

Provide means of changing settings which do not open-circuit the current transformers and which can be made on load. Where plugs are used to adjust settings, ensure that the setting reverts to the least sensitive (high) tap when the plug is withdrawn. For digital relays provide an equivalent re-initiation logic to avoid malfunction when changing settings on load.

4.5.8 Breaker Fail Relaying – Group A

Provide breaker fail relaying on each of the HV circuit breakers with the following features:

A current check and timer scheme initiated by all the protection that trips the protected circuit breaker. Ensure the scheme monitors the current separately in each breaker pole for the line breakers and identifies a failure to trip if the current flowing in the circuit breakers, that received a trip initiation, does not fall to zero in the set time. Ensure that the relay will function correctly during single pole open conditions for the line breaker or adjacent circuit;

A timing range of 100 ms to 500 ms and a current relay adjustable to below the minimum fault current infeed. Ensure the current measuring system has the same continuous and short time thermal current rating as the breaker, irrespective of setting;

A reset speed and level to give an acceptable safety margin for detecting circuit breaker operation, taking into account any resistor switching provided;

A separately isolable, “second attempt” trip output to the failed circuit breaker before the final time-out of the full failure scheme.

Provide an interconnection into busbar and adjacent circuit protection trip circuits to clear all “next in line” circuit breakers on the adjacent bus for bus side circuit breakers. Centre circuit breaker to trip adjacent circuits only.

For a line breaker, provide an intertrip (DTT) send output to the teleprotections to clear the remote end of the transmission line together with the necessary contacts for the initiation of the intertrip channels for that circuit. Also, for the transformer circuits, provide a trip to the other terminal or to the dc link protections as appropriate.

Provide isolation type test blocks, per breaker fail scheme, to isolate the intertrip send and bus trip outputs and the start input circuit.

4.5.9 Circuit Breaker Remote Backup Protection

Provide, for remote backup protection non-directional, adjustable inverse-time characteristic and instantaneous phase over-current relay and inverse-time characteristic and instantaneous ground over-current relay for uncleared ground faults. See section 5.5.8 “Over-current and Earth Fault Protection All circuits Group B” for detailed requirements.

4.5.10 Voltage Protections

Provide on each line entry definite time line under voltage and over voltage protection relays to protect the system from off-normal voltage conditions. Ensure these relays have pick-up/drop-off ratios better than 95% with a resetting time to ensure fast reset following transient voltage excursions. Provide Stage 1 and Stage 2 settings to respectively trip locally or remotely, via the DTT intertrip logic.

4.5.11 Protection Trip Circuits

Provide separate Group A and Group B high speed trip circuits to feed the A and B circuit breaker trip coils appropriate to the bus or line connected reactors. In addition, for the line connected reactors, provide transfer trip connections to both teleprotection systems and to the DTT input of the line differential protection. If the high speed relays to not have sufficient contact break capacity provide heavy-duty parallel shorting relays across the high-speed contacts.

4.5.12 Trip Circuit Supervision and Protection Supply Supervision Relaying

Provide trip circuit supervision relays to monitor each trip circuit for each circuit breaker with the circuit breaker in both the open and closed position. Connect the monitor circuit to monitor the whole of the circuit from the initiating contacts to the trip coil. Ensure that the monitor circuit functions correctly if the trip relay is held operated. Provide suitable time delays to prevent spurious alarms during break tripping.

Use a combination of under voltage relay and MCCB alarm contact to monitor each separately fused or protected 220 V dc supply used for protection.

Use protection alarm contacts for any VT secondary MCCB type protection units to initiate an alarm in both the manual open and the tripped condition. Where MCCB's are used for protection cores of any VT, these will be provided, by others, with 3 single-phase elements to ensure correct operation of the distance protection VT monitoring circuits.

Ensure all dc/dc converter fed protective relays also have dc fail monitor facilities. Connect these to the alarm circuits for each panel.

Supervision Facilities:

Provide continuous and periodic built-in supervision functions within the protection system to increase its reliability. Any defect shall initiate an alarm contact and indicate the trouble.

- The ac voltage inputs to the relay shall be continuously monitored for the loss of voltage (due to a defect in either the primary or the secondary winding of the VT or an open secondary VT circuit). This function shall select three-pole tripping and initiate an alarm. Other methods of VT supervision may also be considered. Provide details;

- The current inputs to the relay should also be continuously monitored to detect open circuits in the CT circuits. This function shall provide an alarm and should have a setting option to block tripping where required;

- Provision shall also be included to monitor the continuity of the trip circuits for each phase of one trip coil of each circuit breaker;

- Circuits shall be provided, as part of each relay terminal, to detect the failure and the restoration of the communication circuits. The circuits shall indicate which path, transmit path or receive path, has been disturbed. On detection of a communication failure the relay shall be blocked.

The following alarms and indications should also be given:

+ Local indication at the relay of the failure mode;

+ An external alarm by means of the closure of a set of voltage free (dry) contacts;

+ When recovery of the communications link is detected a time of at least 10 seconds should be allowed to elapse before unblocking the relay.

- The internal static protection auxiliary voltage shall be monitored continuously and loss of voltage shall close a contact and initiate an alarm.

4.5.13 Test Facilities and Trip Isolation

In addition to the test facilities provided on each relay and on the protection signalling equipment, provide, for each CT and VT system group, one ac type test block at the locations shown in the drawings.

Provide test facilities to enable complete isolation of the group of relays from the instrument transformers without affecting other devices on the same circuit. Also provide facilities to use test plugs either to inject test supplies into the relay group or to check the actual currents and voltages being supplied from the instrument transformers. Provide the necessary test plugs on a one per type per station basis and ship these with the panels.

Equip all CT disconnection points with shorting facilities on the CT side of the disconnection point. Provide CT earth links to earth the CT neutral on the CT side of this disconnection point. Ensure that each CT and/or VT circuit is normally earthed at one point only. Provide this earth at the VT for VT circuits and at the first panel in the control/relay building for CT circuits. In differential circuits, provide facilities to temporary earth the unearthed CT(s) if disconnected from the normal CT earth point.

Provide “Normal/Off/Test” and “Normal/Test” switches as indicated for the main protection and for the various Protection Signalling Channels. In addition, provide isolation links between each trip relay and the circuit breaker trip and circuit breaker fail start circuits. These are indicated as “-x-” on the trip logic diagrams. Provide appropriate labels.

Provide isolation type terminal blocks to isolate the auto-reclose scheme and all external alarms from the initiations on each panel. Also provide isolation type terminal blocks for the SAS bay units for the remote control and indication interface terminals.

4.5.14 Trip Logic

Provide trip logic systems to trip the respective circuit breakers and initiate automatic reclose as appropriate.

4.6 Communication between the Relays and the SAS

Relays designed with the 61850 Protocol shall be suitable to connection to the redundant (or ring) fibre optic LAN.

Relays designed with the other protocols shall be connected to the SAS via the SAS Bay Unit Controllers.

4.7 General requirements for Control, Metering and Protection Panels

4.7.1 Electrical Equipment

Unless specified otherwise in this Specification, the panels and electrical equipment shall be supplied according to the “Material, Equipment and Installation Common Requirements“ Specifications of which this document is part.

4.7.2 Power Supplies

Direct control and main control circuits of the interposing relay control schemes, from the synchronism check relays, from the trip and reclose circuits of the respective protection panels, shall be at 220 V dc. For lower voltage schemes, provide suitable dc/dc converter fed circuits with dc fail alarm features. Low voltage logic and contact wetting supplies are to be contained within the control and relay building.

4.7.3 Panels

Each control, metering and protection panel shall be designed for the connection of no more than 40 cables and limited to 500 external connections and be limited to using 80% of the available rack and terminal area space. For the circuit breaker panels, the Contractor shall provide for the connections of 50 conductors for each breaker including control and alarms.

Base the layout of the cubicles on a single line diagram with all the protection of one primary equipment located together. All arrangements are subject to the prior approval of the Engineer.

Provide, on a circuit-by-circuit basis, the main interface between the switchyard, the protective systems, the protection signalling systems and the control equipment in either the control or protection panels as appropriate. Locate all necessary 220 V dc alarm and control interposing and position repeat relays, all interposing CT’s and VT’s and all associated transducers consistently on either panel.

Provide space between the rows of panels such that safe access to operate test equipment and to add or remove relays, systems or complete panels is available. Rack mounted relay systems with front access, swing out, rack panels are acceptable.

4.8 Programming of electronic devices

The Contractor is responsible for the programming, setting and configuration of all the equipment he supplies. This will include provisional start-up settings for use during factory and/or site initial testing as appropriate.

For the internal logic and relay configuration, provide the principle logic diagrams for approval at the same time the dc scheme logics are provided for approval.

The Contractor shall be responsible of providing the protection setting report and to advise on the recommended settings and setting principles to be adopted for each system he supplies. He shall also be responsible to program all the protection relays accordantly to the parameters detailed in the protection report.

4.9 Factory Testing

Perform all type, routine and acceptance tests in accordance with ANSI and IEC Publications and as specified in this Specification and provide appropriate test reports and/or certified type test statements prior to the witnessed tests.

Provide type test reports for each relay system to ensure that the clearing times stated in this

Specification can be met. Where type test results are not available, make conjunctive short circuit tests with appropriate CTs and/or VTs, or appropriately simulated or recorded CT and VT signals, to confirm relay performance.

Functionally test each full scheme of protection, auto-reclose and trip logic as a total system. The tests shall include the temporary connection of sufficient equipment to simulate the functioning of the total scheme including relay models, circuit breakers together with associated auxiliary contacts (two position latched relays) and disconnects where appropriate. Include the teleprotection systems, the remote end panels and appropriate fibre optic interconnections. Take timing charts of critical operations.

Functionally test the control panels to all output and input contacts. Where feasible, cross wire to the relay panels as a combination functional test.

4.10 Programming Language

The application programs shall be written in a high-level function block language with graphic representation. The language shall be specially developed for process control and shall easily be understood by persons familiar with the process. Each function element shall be represented as a building block with inputs and outputs.

A comprehensive library of tested and well-documented function blocks shall be available for use by the Engineer for modification and expansion of application programs. Blocks with simple functions, such as a logic AND, as well as blocks with more advanced functions, such as loop control, shall be available.

Application programming shall be performed by connecting inputs and outputs of a function block to other function blocks or to process I/O. It shall be possible to print out graphic documentation of the application programs on a printer connected to the programming unit.

The structure of the Contractor's furnished application programs shall be based on the functional structure of the substation. Each part of the substation shall be allocated its own program modules. It shall be possible to give different program modules in one controller different cycle times and priorities.

The Engineer shall be able to modify and add application programs and still only come in contact with the high-level function block language and the definition of database parameters.

A system utilizing only ladder diagrams for the application programming is not acceptable.

4.11 Spare Parts

4.11.1 Mandatory Spare Parts

The Contractor shall provide a spare for each type of relay and equipment he supplies: protective relays, tripping relays, auxiliary relays, reclosers, synchronism check relays, system synchronizers, revenue energy meters, test switches, etc.

4.11.2 Recommended Spare Parts

The Contractor shall list all recommended spare parts and/or test equipment, over and above the required and mandatory spares listed above. These shall be priced separately and be optional on the Employer to purchase. These prices will be valid for the term of the contract up to the factory test of the panels using that equipment.

1 GENERAL

The present Specification outlines the standard Technical Requirements applicable for the design, manufacturing, testing, site installation and commissioning of a Substation Automation System (SAS) also known as substation automation system for the 765/400kV switchyards at Bara TPS.

The substation list, the Scope of Work and the Scope of Supply of major equipment covered by this Specification are described in the “Scope of Works”.

The supply, construction and installation of all the equipment covered in this Specification shall also be according to the “General Technical Requirement Specification”.

Code	Description
8301	Operator interface/SAS server station hardware and software
8302	Multiprotocol communication gateway and data concentrator hardware and software
8303	Engineering station hardware and software
8304	Dispatch SCADA terminal unit and software
8305	Controller with integrated HMI hardware and software
8306	Communication / Fibre optic cable
8307	Large Video Screen, Laptops and its accessories

2 SCOPE OF WORK

2.1 General

The various Protection and Measurement Systems and the Substation Automation System (SAS) will be located on circuit by circuit panels in existing control relay buildings at Bara TPS. These will be interconnected via a FO local area network (LAN) with the 765kV switchyard Control Building at site.

All CT, VT and 220V d.c. control wiring cabling in, or close to, the 765kV switchyard will be via double screened (shield and armour) cables, with the outer screen (armour) earthed at both ends while the inner screen (shield) will be earthed at one end only and usually in the relay/control panels.

The SAS LAN will be duplicated and will comply with the IEC 61850 protocols for the interconnection of the protection and control devices within the switchyard Control System and at least the A Group of protections will interface directly to the LAN using the IEC 61850 protocol. The bay units will be used to integrate additional data and will include analogue data (measurand) gathering systems. Additional transducers, etc should only be provided for the auxiliary systems and standby diesels where digital data transfer is not available. The use of other protocols shall be kept to a minimum. All auxiliary systems that do support digital data transfer, battery chargers, diesel start/stop logic etc., will be connected to the respective bay controller.

The switchyard SAS will communicate with a dispatch centre RTU either using a suitable data protocol or a back-to-back I/O system to transfer a subset of data from the 765kV and 400kV switchyards to the Lucknow Control Centre. At Bara TPS the SAS dispatch data will be transferred in to the existing 400kV station RTU.

2.2 Control and Relay Building Locations

Substation Automation System for this project is to be integrated/extended with existing SAS as per

requirement of Bara TPS substation.

In Bara TPS, the control and interface equipment for the new 400kV breaker will be located in the existing 400kV switchyard control and relay room. Existing bus bar protection at 400kV substation Bara TPS is to be modified to accommodate the new 400kV transformer bay. The DC Voltage for 400kV switchyard shall be 220V.

The AC & DC supply will be available from 415V AC downstream switchgear board and 220V DC distribution board.

The main control room building will provide the central SAS control room for the whole site and will contain a dual operator work station conventional SAS computer control centre for the switchyards, including data server, record storage and printing facilities. In addition to the work stations, one engineering laptop and secure docking station will be provided equipped with software to access all of the protection, control, communication and power line control systems (including battery chargers, UPS etc. if so fitted) either remotely or directly at each equipment. Although the site will be configured for full remote control, either from the Lucknow dispatch centre or the Bara TPS substation control room, this control area will provide more detailed control access to support maintenance, commissioning or fault finding as required.

The building also provided offices, drawing storage, light and heavy current workshops and other administrative functions, including washroom and shower facilities (SF6 switchgear) and lunchroom facilities. This building have been situated outside the electrical fenced areas of both the 765 kV and 400 kV switchyards.

2.3 Communication and LAN networks

The main communication and LAN systems for the switchyard and the interfaces with the adjacent switchyards and power houses will be by fibre optic cables, and for the power line interconnections, by OPGW links.

Within the switchyard, direct fibre optic cable pairs will be used to provide the switchyard SAS dual LANs and to interconnect the relays and SAS interface modules back to the SAS backbone. Similarly, between the local switchyards, differential and teleprotection systems will use separate dedicated fibre optic pairs and not multiplexed ties.

2.4 Panel Grouping

The basic reliability requirements for 765 kV and 400 kV system require fully separate dual, non-identical, protective systems for each protected zone together with circuit breaker fail, local backup and sufficient remote backup to be able to detect and update any primary system electrical fault with any one protection system and/or communication link failed, including the failure to trip of any circuit breaker. The protection panels have therefore been arranged to meet these requirements. Similarly, the control systems are to be dual LAN or ring type, using IEC 61850 protocols to directly interface to the various protection relays and the associated breakers' bay units in such a way that full control access and critical system data is available should any one of these intelligent electronic devices (IEDs) fail. The principles for the distribution of these IEDS into the required individual panels are given in the associated Protection and Communications sections of this specification.

The SAS panel distribution for the building is to be finalised at detailed engineering stage.

3 TECHNICAL DATA SCHEDULES

3.1 Operator Interface/ SAS Server Station Hardware and Software

3.2 Multiprotocol Communication Gateway Hardware and Software

3.3 Engineering Station Hardware and Software

3.4 Controller with Integrated HMI Hardware and Software

3.5 Dispatch SCADA remote terminal Unit

3.6 Communication/Fibre Optic Cable

Note:

All the Technical parameters and data for SAS should be as per existing scheme of Substation Automation System of M/s Schneider Electric at Bara TPS Substation. It should be extended/ Integrated by the contractor as per requirement of the 765/400kV Substation.

CODES AND STANDARDS

The design, fabrication and tests shall be performed in accordance with the following standards:

EUORPEAN STANDARDS

EN 55022	Conducted/Radiated emissions

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

IEC 60068	Environmental testing
IEC 60146	General requirements and line commutated converters
IEC 60255	Electrical relays
IEC 60529	Enclosure protection
IEC 60870	Telecontrol equipment and systems
IEC 60947	Low voltage switchgear and controlgear
IEC 61143	Electrical measuring instruments recorders
IEC 61000	AC Voltage dips & short interruptions /EM Immunity
IEC 61850	Communication networks and systems in substations
IEC 61970	Common Information Model
IEC 61131-3	Programmable Logic Controller programming language
IEEE	Bus architectures and microprocessors/microcomputers series of standards

INTERNATIONAL STANDARDS ORGANISATION (ISO)

ISO 9001	Quality systems - Model for quality assurance in design, development, production, installation and servicing

INTERNATIONAL TELECOMMUNICATION ORGANISATION

ITU-T	Recommendations of the G and V Series

AMERICAN NATIONAL STANDARDS INSTITUTE

ANSI C37.1	Standard definition, specification and analysis of systems used for supervisory control, data acquisition and automatic control
ANSI C37.90	Withstand capability (SWC) tests for protective relays and relay systems
ANSI/ISA S18-1	Annunciators – sequences and specifications

INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS

IEEE C37.1-1994	IEEE Standard Definition, Specification, and Analysis of Systems Used for Supervisory Control, Data Acquisition and Automatic Control.
IEEE C37.11-1997	IEEE Standard Requirements for Electrical Control for High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis.
IEEE 992-1992	IEEE Recommended Practice for Master/Remote Supervisory Control and Data Acquisition (SCADA) Communications.
IEEE 1397-1997	IEEE Trial-Use Recommended Practice for Data Communications Between Intelligent Electronic Devices and Remote Terminal Units in a Substation.

4 FUNCTIONAL REQUIREMENTS

4.1 General

In general, the substations are typically based on a breaker and half scheme with line or bus shunt reactors. The Contractor shall refer to the Protection and Control Panels Specification document number and typical substation single line diagrams enclosed with this tender document for reference purpose. The supply, construction and installation of all the equipment covered in this specification shall also be according to the “General Technical Requirement.

The SAS system shall be made of a series of standard controllers incorporated in bays panels, industrial, hardened, and laptop computers with specialized software, interconnected by an open communication protocol.

Unless otherwise specified, the SAS for the substation will be furthermore referred to as “the control system”.

The equipment to be interfaced with the SASis the following:

- Digital protective relays (Intelligent Electronic Devices, IEDs);
- Digital metering instruments (IEDs);
- Circuit breaker synchronized switching controllers;
- The switchyard disconnect and earthing switches and circuit breakers including all CTs and VTs;
- The Power Line Carrier and Teleprotection equipment (for alarm and event monitoring);
- The fibre optic multiplexer equipment (for alarm monitoring);
- The substation auxiliary support equipment (for alarm monitoring and control);
- Power House SAS/SCADA via communication gateways;
- Dispatch Centre SAS/SCADA RTU via direct I/Os or digital data links;
- The Lucknow Control Centre SCADA/EMS via the local RTUs;
- Other digital devices or controllers.

4.2 Control System Architecture

The control system shall be made of:

- Programmable controllers with dual (redundant) power supplies 220V dc, HMI displays incorporated in a series of standard bay panels interconnected by an open protocol. A standard bay panel will contain all the IEDs needed for the local control and protection of the bay. A bay is related to a line, a transformer, a shunt reactor, a bus bar or a series of breakers. Each bay has a local/remote switch (physical or via the HMI) enabling or disabling the local control;
- Two (redundant) communication/multiprotocol gateways, each provided by an industrial computer rack mount, 220V dc power supply, providing the interface between the substation control system and the Anpara-D Power House using protocol and for local communication with

existing Dispatch Centre RTU systems. Two (redundant) SCADA servers with client application (Operator Interface), each made of a desktop industrial type computer, 220 V dc power supply, one LED 22 inch (minimum) colour monitor (supplied with an inverter 220 V d.c. – 240 Va.c/50 Hz), mouse and keyboard, RAID disk system (dual hard drive), CD/DVD-RW, providing the local supervision and control of the substation, sequence of events, archiving, printing. The Operator Interface (OI) of the SAS shall have the capability to be duplicated locally or remotely. It shall have the optional capability to be accessed remotely from an Internet browser, with appropriate security features;

- Engineering station with client application (Operator interface), made of a laptop computer with docking station connected to a not less than 22 inches (minimum) LED colour display (supplied with an inverter 220V d.c. – 240 Va.c/50 Hz), mouse and keyboard, battery charger 240 Va.c/50 Hz and all accessories, for programming, engineering, maintenance and data analysis of the control system and all substation IEDs (relays, meters, controllers, PLCC, teleprotection, fibre optic multiplexers, etc.) including all required hardware and software to access the IEDs. The Contractor shall make provision for the other Contractor's software and all necessary hardware, if any for the engineering station;

- Large Video Screen (size 67 inch minimum with the facility to split screen to six parts);

- Programmable bridges and communication converters, 220V d.c. power supply for interfacing the various IEDs where required;

- Fast Ethernet local area fibre optic network switches, 220V d.c. redundant power supply (according to section 4.4.1) for interfacing the IEDs and control system equipment to the control network LAN (IEC61850);

- LAN routers to interconnect the LAN printers with the control network LAN (IEC61850);

- One LAN colour and one black and white laser printers;

- One GPS synchronizing clock with IRIGB output signal for the control system, SDH multiplexer and IEDs requiring synchronizing signal;

- Power supplies and power converters for redundant primary 220V d.c. supplies where required.

The communication protocol between the bay controllers, the communication gateways and the SAS clients/servers shall be IEC 61850 in order to permit 100 Mbps peer-to-peer communications. Within a bay, the IED devices shall use the IEC 61850 protocol and be connected directly to the substation network. The Contractor is responsible for integrating to any other existing communication protocols.

The control system shall be bay oriented, i.e.:

- Addition of a new feeder, transformer, shunt reactor, breaker section, shall be an easy operation from a configuration and manufacturing point of view. The system operational interlocking shall be done by the mean of a topological interlocking, using the topology and expert rules to authorize or inhibit the switchgear operation;

- Each bay shall be a stand-alone control system within a distributed architecture. It shall be connected to other bays by logical means for system wide functions, such as interlocking or busbar protection, but can have a downgraded mode with complete protection and control of the local bay, if the communication link is not available;

- If the IEC 61850 Ethernet network is used to connect with more than one device within a

bay, the bay shall have its own Ethernet switch.

4.2.1 Dependability

A single failure of any component of the control system shall not prevent the control of more than one bay.

As a consequence:

- Any central automation, such as voltage regulation of parallel transformers, sequences, etc. shall be redundant;
- There shall be no common point of failure between the SAS server and the bay controller with HMI, except the bay itself.

The control system shall enable accurate fault localization within the system. The information must be available on the operator interface.

The control system shall permit the local maintenance of one bay while controlling the substation remotely. In this case the bay can only be accessed from the substation bay controller HMI but the bay indications are still retrieved by the substation SAS and the remote Control Centre (this is if the bay controller doesn't require to be switched off or disconnected for maintenance purposes).

The control system shall be able to identify the version of the configuration database of each component (HMI, Operator Interface, Communication Gateway, Bay controller, Protection Relays). It shall inhibit the operational communication between component having non-compatible databases.

The control system shall have a dependability equal or greater than 99.995%.

4.2.2 Key Performances

Sequence of events point records shall have a 1 ms resolution at a device level and 2 ms at the SAS level.

Retrieval of status or measurement to the controller HMI or through the communication gateway shall be less than 2 s.

Manual control shall be executed within 1 s from the HMI or the Operator Interface to the process.

Peer-to peer communication shall be less than 30 ms, i.e. between the changing input on one bay and an output execution on any other bay.

Measurement accuracy shall be 0.2% for RMS current and voltage values up to harmonic 15, 0.5% for active and reactive powers.

Ethernet redundancy delay time shall be less than 1 ms.

Central automated redundancy (SAS servers) switchover delay time shall be less than 1 s.

Sequence of event storage at bay level in case of a failure of the communication to the central point shall be 1000 events. Upon return of communication, the missing events shall be automatically updated in the SAS event log. The IED event Log memory shall be maintained for one week without power supply.

4.3 Control System Interfaces

4.3.1 Control Interfaces

The control system shall be directly interfaced with the primary equipment with no interposing relays nor transducers for the CT/VT interface.

Interface with digital measurement such as transformer tap position shall be done in BCD or Gray code.

Interface with binary control such as the circuit breaker, the disconnect, etc., shall be done through a double pole switching with the following features:

- A make and carry of 5A continuous, 30 A for 500 ms, 250 A for 30 ms;
- A break DC of 50 W resistive, 25 W inductive (L/R = 40 ms), AC of 1250 VA resistive, 1250 VA inductive ($\cos\varphi = 0.7$).

4.3.1.1 List of Alarm Points

The following gives the main alarms to be registered by the SAS for each substation bay assembly. The list shall be considered as a minimum and shall be adjusted to match the equipments provided for the switchyards and other equipment to be interfaced with the control system. At least 20% spares shall be provided in each area to cover for detailed design. The split between software link (LAN), where available, and physical I/O shall be detailed by the Contractor at the design phase.

It is the responsibility of the Contractor to gather the final configuration and lists each supplied equipment's trip, status and alarm functions as well as the equipment supplied by others. This list shall be approved by the Engineer after contract award.

Internal alarms provided from SAS elements and peripherals shall be defined by the Contractor and shall be approved by the Engineer after contract award.

The following alarms are given here as a minimal requirement:

High Voltage Line Alarms:

- Distance protection (group A) trip, all phase combinations;
- Differential protection (group B) trip, all phase combinations;
- Distance accelerated trip (group B);
- Inter-trip (DTT) receive (A or B);
- Back-up protection operated;
- Auto-reclose operated;
- Auto-reclose lock out;
- Circuit breaker fail trip;
- Protection defective (A or B) (2);
- Trip supply supervision (A or B) (2);

- Communication fail, line differential protection;
- Teleprotection fail, PLCC;
- Teleprotection fail, fibre-optic.

Main Alarms for Each Transformer:

- Differential feeder protection operated;
- Backup protection operated;
- Protection defective;
- Power supply (dc) fail;
- Transformer Buchholz trip;
- Transformer winding temperature trip;
- Transformer pressure relief trip;
- Transformer winding temperature alarm;
- Transformer gas alarm;
- General transformer alarm;
- Other mechanical trip or alarm as per the transformer and reactor design.

Bus and Circuit Breaker Alarms:

- Bus protection operated;
- Bus protection defective;
- Backup protection operated;
- Auto reclose defective (2);
- Synchronism system failure;
- Circuit breaker synchro-close equipment failure;
- Circuit breaker blocked;
- Trip circuit supervision per trip coil (6);
- Trip circuit supply fail (3);
- DC supply fail A and B;
- VT protection MCCB open/tripped (Line CVT);

- Measurement MCCB open/tripped (Bus CVT).

Circuit Breaker Alarms:

- SF6 low;
- SF6 dangerously low.

Common Station Alarms:

- Transformer tertiary, or as off-side supply MV switchgear and transformer alarms as appropriate;
- Station service AC voltage fail bus 1, section 1 or 2;
- Station service AC voltage fail bus 2, section 1 or 2;
- DC supply fail A/breaker open;
- DC supply fail B/breaker open;
- DC system group A;
- DC system group B;
- Fire detection and alarm as per system design requirements;
- Fire protection operated (Emulsifier);
- Intruder alarm;
- Air conditioning failure for each building;
- Station section on local control;
- Multiplexer failure;
- Equipment room temperatures high, per building.

4.3.2 Communication Interfaces

Communication gateways:

The communication gateway shall be able to interface to up to three (3) separate systems, each with a possible link redundancy. It shall maintain a database per link.

In the initial control system configuration, there will be two (redundant configuration) communication gateways, each will have one link, Fast Ethernet 100 Mbps (using IEC-60870-5-104 protocol) to the station RTUs which will use IEC 101 standard protocol for communication with the Lucknow Dispatch Centre.

Serial interfaces:

The control system must be able to interface third party IEDs and integrate them into the standard bay. This communication shall be done through IEC 61850 (preferred) or IEC 60870-5-103. Other

internationally accepted protocols could be proposed subject to the Engineer approval.

Time synchronization interface:

The time synchronization of the control system shall be acquired from a GPS receiver IRIG-B network link. Two IRIG-B links (for redundancy) shall be received from two different controllers in the control system to synchronize all control system equipment and IEDs.

From these two “synchronizing controllers”, IEC 61850 shall be used for the time synchronization of all other equipment in the control system including all IEDs (for IEDs using IEC-60870-5-103, this protocol could also be used). Other protocol may be used for time synchronization following the explicit approval of the Engineer.

All devices, protection relays, controls, multiplexers and PLCC systems will be time synchronized to the GPS clock system. Auxiliary system components, battery chargers etc, will be synchronized where their digital control systems carry network clocks.

4.3.3 Operator Interfaces

The operator interfaces (OI) are located:

- At bay level, called HMI. This must be an LED with a sufficient resolution to display the single line diagram of the bay with associated alarm and measurements, make control and display local sequence of events. A touch screen or key pad for display selection, etc. shall be provided. Plus, at the bay level, an Ethernet connection port (RJ45, IEC-60850) shall be provided to plug a portable PC with the SCADA client application giving the full substation representation and sequence of events in order to help during the commissioning and maintenance tests;

- In each separate relay room maintenance or a stand by rack mounted work station, contained within a panel, with windows type graphical user interface (GUI) with a 22” (minimum) LED colour screen, keyboard and mouse tracking device.

- At station level, called Operator Interface. These are the two SCADA PCs and engineering laptops using Windows type graphical interface (GUI) on a 22” LED colour screen. This is used for the local substation monitoring and control. This operator interface provides single line mimic representation, local control, alarm management, data storage (only for the SCADA server PCs), disturbance record analysis etc.

4.3.4 Engineering Interfaces

The engineering tool shall provide XML interfaces to be able to exchange data with third party engineering tools. This station is able to add/delete and modify single line diagram representations, alarm labels, I/O connections, perform programming configuration and management, IED setting, etc.

The engineering station consists of one laptop computer with one docking station, one 22 inches (minimum) colour LED display, mouse and keyboard.

4.4 Communications Protocols inside the Substation

4.4.1 IEC 61850

IEC 61850 protocol is mandatory for the communications between the bay controllers, and at least one protection group in each protection system and the communication gateways, the Operator

Interfaces and the SAS servers. IEC 61850 is also preferred within a bay for communication with, and between the IEDs in order to minimize the external wiring.

IEC 61850 shall be used for the time synchronization, control, reports, peer-to-peer exchanges and disturbance records file transfers. No private protocol is allowed for such exchanges without the specific approval of the Engineer.

IEC 61850 is based on 100 Mbps Ethernet minimum. The communication between bays shall use fibre optic connection. The architecture shall be a redundant loop (ring) or two parallel networks so that the damage on one fibre will not affect the control system communication. The switching time from one network to the other shall be less than 5 ms in order to keep the peer-to-peer exchanges performances in case of a network failure. Where the IEC 61850 is used within a bay, there shall be one switch per bay so that the failure of one switch will not affect more than one bay. The switch shall preferably be a board integrated within the protection and control devices. The switch must have at least one (1) spare port reserve for future enhancement at the bay level and engineering station (temporary) operator interface connection.

If the control system network architecture uses a redundant fibre optic loop (ring) and the Ethernet switches are a common point in the loops (the main and backup loops go through the same switch), then, all Ethernet switches shall have a redundant DC power supply for A and B, 220V dc connection. If the control system network architecture uses two parallel independent network A and B, then the primary (main) network shall be powered from 220V dc power supply A and the secondary (backup) network shall be powered from 220V dc power supply B. All components will be hardened to protection (IEC 60255.4 or ANSI SWC) standards.

4.4.2 IEC60870-5-103

Where IEC 61850 protocol is not available from the IEDs, the IEC 60870-5-103 shall be used within a bay between the relays and the bay controller. Other internationally accepted protocols could be proposed within a bay, for IED communication, subject to the Engineer's approval.

In order to keep sufficient performance for the whole system, the master shall not be connected to more than eight (8) devices on the same physical link.

In addition the IED settings shall be supported on the same physical link and shall be made available on the control system network (IEC 61850) through the bay controller (using pass through or tunnelling techniques).

4.5 Telecommunication, Network Equipment and Cabling

4.5.1 Fibre Optic Networks

The Contractor shall supply all fibre optic cables, jumpers, connectors, splicing and termination kits, splicing and distribution boxes and installation tools required to interconnect the equipment supplied in this contract plus any additional cables specifically described in this section.

Both single mode and multi-mode fibre optic network shall be used inside and outside the substation building. Each type of fibre cable shall be clearly identified by its exterior jacket colour or by tagging at each connection point.

Single mode fibre optic shall be used for line differential relays, teleprotection, fibre optic multiplexer communication and any other equipment requiring this type of fibre.

Multi-mode or single mode fibre optic shall be used for the Ethernet networks and any other equipment requiring this type of fibre.

All fibre optic cable termination shall be in fibre optic splicing and distribution boxes, it is not allowed to terminate a multi-fibre optic cable directly on an equipment. All connection to the equipment shall be with flexible, factory terminated, fibre optic jumpers (patch cords). The same “ST” type of termination connectors shall be used for all equipment. Where this is not available, converter jumper cables to ST type shall be used to interconnect the equipment with the fibre optic distribution cabinet (or other IEDs).

Single mode and multimode fibre optic cable termination and splicing shall be made in separated splicing and distribution boxes.

Any jumpers used between the cabinets or panels shall be properly protected with steel or interior “fire rated low emission type” (rigid or flexible) conduits and identified along their paths outside the cabinets or panels.

The cables and jumpers outer jackets shall be flame-retardant, UV-Resistant, Low-Smoke, Zero-Halogen type.

4.5.2 Ethernet Copper Networks

Usage of Ethernet twisted pair copper network shall be minimal. Fast copper Ethernet network is only permitted for cabling inside a cabinet or in an office environment.

The Contractor shall provide the necessary Ethernet switches and twisted pair CAT5e cables with connectors and installation tools where required.

The cable’s outer jackets shall be flame-retardant, UV-Resistant, Low-Smoke, Zero-Halogen type.

4.5.3 Serial Copper Networks

Usage of serial (RS-232, RS-422 and RS485) twisted pair copper network is allowed between the IEDs inside the cabinets. For links outside the cabinets, fibre optic cables and converters are mandatory.

The Contractor shall provide all required network serial copper cables to interconnect the equipment supplied in this contract and interconnecting to the equipment supplied in other contracts for the substation.

The cable’s outer jackets shall be flame-retardant, UV-Resistant, Low-Smoke, Zero-Halogen type.

4.6 Control System Expansion and Enhancement

The control system must be able to have a 30% expansion in term of bays and 20% configurable I/Os within the bays.

The control system components (Controller/HMI, Telecommunication Gateway and SAS server) must have the capability to manage at least two (2) configuration databases, in order to enable fast and secure system extension. At a given instant, only one database shall be active on each component. The dual database shall be activated from the Controller/HMI or SAS servers when changing the system configuration.

4.7 Central Functions

The functions described below are supported by the SAS server and operator interface, some of the main functions shall also be available from the Lucknow Control Centre via the communication gateways and the Areva RTUs.

4.7.1 Substation Mode Management

Each device within the substation shall be able to be controlled from five different locations, listed here from the closest to the farthest; the bay controller/HMI, the individual relay room maintenance work station, the SAS operator work station in the control rooms and the Dispatch Centre.

From the first two locations (bay controller/HMI and SAS/SCADA operator interface), the control interface shall have a local mode and remote mode. This is done either by a physical switch or through the software.

Remote mode:

The remote mode is the normal mode and allows controls from all the control interfaces above and below (closer or farther) in the control architecture.

Local Control mode:

The local control mode shall always disable all the control functions from the control interfaces located above (farther) in the control architecture, however these will keep all monitoring and archive functions and will get an indication that the system is in the local mode. Display facilities shall be available at each level independent of the level being used for control.

Maintenance mode:

From the bay Controller/HMI only, it shall be possible to have a maintenance mode in order to improve the substation availability when doing maintenance work on one or several bays. This mode is similar to the local mode, but the information retrieved by the control interfaces located above (farther) in the control architecture will be frozen; these will also get an indication that the bay is in maintenance mode.

4.7.2 Operator Interface

The operator workstations are SAS client applications which shall be installed on a PC with MS-Windows platform (Windows latest version, NT based such as XP). It shall be installed on both SAS server desktop industrial computers with 22" (minimum) colour LED display with keyboard and mouse. The rack mounted individual relay room workstations and the laptop engineering station shall also have the operator interface installed. All operator interfaces and SAS server stations shall be connected to the redundant fast Ethernet SAS network (IEC 61850) and shall have the capability to print to a network colour (or Black& White) printer through the same SAS network via an Ethernet Switch (to isolate the printer LAN from the IEC 61850 LAN). The use of a separate network interface card for this function is also acceptable. Separate black and white rack mounted printers shall also be provided for the individual relay room maintenance systems.

4.7.2.1.1 General Display Features

The screen shall always display:

- The last three (3) alarms;
- The date and time, operator name, substation name;
- A tool banner to start hard copy, log off operator, stop klaxon, tool launch (such as setting or analysis tools);
- A navigation banner to go directly in the main alarm view, main system view, reports and

curves.

In all views with single line diagrams, busbar or line sections between all switching devices could be coloured.

Typical and uniform background, shapes, colours and animation shall be used to distinguish the different states of a busbar or line section for the following status:

- Energized section;
- De-energized section;
- Undefined section (in transition state or abnormal condition);
- Earthed section.

4.7.2.2 Main Functions

The operator interface shall provide supervision, control, archive and maintenance functions. The most important functions are further detailed in the specification.

Supervision:

- Display of the topological view of single line diagrams: general overview, voltage level view, detailed bay view. This shall include the position of the switching equipment, the measurement values, operation counters, graphical alarm representation, etc. Spontaneous changes of a state, typically opening of a circuit breaker from a protection, shall have a specific colour code;
- Display the alarm list and enable acknowledgement and clearance;
- Display the sequence of event list;
- Display curves, either real time or based on archived data. Invalid information shall be clearly marked. Curves shall manage the time shifts;
- Display disturbance file and power quality files;
- Printing of sequence of event list, hard copy and reports through a network printer. The reports shall be freely configurable using Crystal Report or other reporting application readily available on the market.

Control:

- Control of the primary devices, with dedicated pop-up windows enabling select before execute sequences, the use of synchro-check for circuit breaker and interlocking forcing for switchgear;
- Forcing, substitution or suppression of information in order to cope with incorrect sensor delivery;
- Control of the IED status: maintenance or run mode.

Archive:

- Storage of events, measurements, disturbance and power quality events;

- Storage of all the system databases and component documentation.

Maintenance:

- System database design and modification;
- IED setting;
- IED database download;
- Display of the system status, including the state of each high level component (Operator Interface, Communication Gateway, Bay Controller/HMI) and detail of it (bay content, IED content).

4.7.2.3 Control Procedure

A control shall be executed in “Select Before Operate” (SBO) or “Direct Execute”. A control acknowledgement pop-up is used to display negative control acknowledgement and to allow users with appropriate rights to by-pass the interlocking or manual lock control verification. For SBO operations, this shall initiate the synchronizing process and display into the control an acknowledgement logic. In this case, the user can visualize the interlocking equation and get the reason of the control rejection.

Several parameters, defined during the configuration process of the substation, shall filter the control:

- Inter-control delay (time between two sequence in the same device);
- Substation and bay modes;
- Topological interlocking;
- Automation running for the device;
- Synchro-check;
- Device locked;
- Uniqueness control: Only one control at a time for the control system with a configurable delay between control selections.

Where system synchronisers are used, a separate command to activate the synchroniser shall be provided followed either by a “reset” or SBO “close” command to activate the “synchronise and close” sequence.

4.7.2.4 Alarm Management

Alarms shall be generated by a change of state of a digital point, exceeding a measurement threshold or a system internal fault (e.g. loss of communication, IED faulty).

Alarms shall be defined as immediate or delayed (with an associated user-selectable delay) and can have an associated audible alarm. The audible alarm can be immediate or delayed.

Alarms shall be associated to each state of event (open, close, intermediate) or to each a measurement threshold (in case of violation) or to logical errors and may have a different gravity

level.

Four (4) types of alarm management shall be available and are user-selectable during configuration process:

- «State basis» alarm management: one alarm for each state is displayed;
- «gravity level basis» alarm management: only one alarm for each gravity level is displayed. The previous one is replaced by the current one with same gravity level;
- «data basis» alarm management: only the last alarm is displayed: the previous one is replaced by the current one;
- «spurious alarms» management: are defined for events, which appear but never disappear (control acknowledgement for example).

The alarms shall be displayed, using dedicated windows displaying;

- the chronologically sorted list of the alarms (with additional sorting criteria as geographic or functional);
- the last “N” alarms (“N” being user-selectable during configuration phase);
- different colours for each line of the previous lists, depending on the alarm state;
- graphic pictures defined during configuration phase, displayed in the different views, which can be associated to the presence and the states of alarms for a device, for a bay, for a voltage area, for the whole substation, etc.

An alarm shall be acknowledged by an operator. Independently of the alarm acknowledgement, the audible annunciation shall be acknowledged by an operator or automatically after a user-selectable delay.

An alarm shall be cleared only if the reason of its appearance disappear (becomes inactive) and was acknowledged by an operator. An alarm shall also be configured as «to be cleared automatically» when it becomes inactive and is acknowledged.

Alarm lists routed to the black and white printer shall be converted to grey scale to facilitate visibility.

4.7.2.5 User Rights

Five user rights shall be available from the SAS control system:

Viewer rights:

The user has the ability to navigate through the windows and view all operational status, including alarms and archives but cannot operate devices, acknowledge alarms and generate or print reports.

Operator rights:

The user has all the viewer rights plus the ability to operate devices, acknowledge alarms and generate or print reports.

Maintenance rights:

The user has all the operator rights plus the ability to lock and force any operational values and functions of the SAS. The maintenance rights also allow to create, modify or delete user profiles with viewer or operator rights.

Engineering rights:

The user has all the maintenance rights plus the ability to add, delete or modify functions, windows and tags (real or virtual I/Os) of the SAS. The engineering rights also allow to create, modify or delete user profiles with maintenance rights.

Administrator rights:

The user has all the rights, including the ability to upgrade, delete or replace the complete application and software.

The above user rights shall be assigned to user profiles. Up to 20 user profiles shall be defined during the configuration phase.

The user names and the associated password shall be created/ deleted on-line on the operator interface by a user with the proper rights.

The password shall be modified on-line by the user himself or a user with the proper rights.

4.7.3 Communication Gateway Functions

The data exchange through communication gateways shall provide to (or allow from) the Lucknow Control Centre and the substation SAS, via the compatible RTU, the following:

- Single point indication with time;
- Double point indication with time;
- Transformer tap position with time of change;
- Measurement value (MW, MVAR, Volt, Frequency) with time that threshold exceeded or continuous displays without time stamps;
- Integrated total (counters);
- Disturbance record files;
- Single control, either direct or as a select/execute sequence;
- Double control, either direct or as a select/execute sequence;
- Interrogation command on a group of data;
- Clock synchronization;
- Counter freeze.

Taking Control:

This feature allows a control interface located above (farther) in the control architecture to force the mode of a lower (closer) control interface from LOCAL mode to REMOTE mode and to define on which communication port the SAS controls can be accepted. It shall be possible to disable this feature selectively for each control interface

4.7.4 Sequence of Events and Data Logging

The control system sequence of events shall be printable on a network printer located in the substation near the Operator Interface and archived on the SAS servers (PC hard disk). It shall contain the following information:

- *Time Stamp* and synchronisation status (the synchronised / not synchronised);
- *Origin* - Substation name, voltage level name, bay name, module name;
- *Object Name* - Information name;
- *Object Message* - Information resulting state.

The time stamp shall record the time to the appropriate resolution of the time stamp (1 ms for SOE). The reporting, display and printouts of these time stamps shall also show only the decimals of recorded time resolution.

4.7.5 Archives

The measures and associated mean values shall be archived in the SAS server database in the following tables:

- Daily table for the mean values of the day. These tables shall be stored during 35 days;
- Monthly table for the minimum, maximum, mean and sum values, computed at a reference time (configurable) of a day. Monthly tables shall be stored during 15 months;
- Yearly table for the minimum, maximum, mean and sum values, computed at a reference time (configurable) of a month. Yearly tables shall be stored during 5 years.

Storage of disturbance files shall be done using COMTRADE 97 format. At least 10 files per bay shall be kept.

A backup on a CD medium of the SAS archive shall be made:

- On operator request;
- At a configured date / time.

4.7.6 Automation

4.7.6.1 System Interlocking

System interlocking shall first be done by topological interlocking. The topological interlocking shall analyze the position of all switching devices in the substation and allow or inhibit controls using predefined rules, i.e. according to the mechanical and electrical capabilities of the switching equipment. This function may be centralized or fully decentralized in the bay.

The topological interlocking function will apply for the following types of switching devices:

- Circuit breaker;
- Disconnect;
- Earthing switch.

Topological interlocking shall be possibly completed by boolean equations in order to satisfy specific maintenance interlocking needs.

Interlocking is defined for opening and closing switching equipment separately.

Interlocking can only be overridden by an engineer from the Engineering station.

4.7.6.2 Configurable Automation

The control system shall allow the user to configure specific control sequences or automations using the IEC 61131-3 standard.

The execution of the automation sequences shall insure that there is no data lost during the processing.

Automations can be triggered:

- By operator request;
- By events (digital or analogue input state changes);
- Other automation request;
- Cyclically (each day, each week or each month);
- At a specific date and time (e. g. 20. 12. at 10:00).

4.8 Bay Functions

4.8.1 Binary Inputs

The control system shall manage four types of binary inputs:

- Single Point (SP) derived from one (1) digital input acquired physically;
- Double Point (DP) derived from two (2) digital inputs acquired physically;
- System Input (SI) information related to the system or processed by the system;
- Group, logical combination of binary inputs.

The acquisition of binary inputs shall be made directly via the local bay controller, via the bay relays (IEDs) or via the control system communication network.

The following table show filtering applied to digital input according to its type.

	SP Input	DP Input
Toggling filtering[1]	X	X
Persistence filtering[2]	X	X
Motion filtering[3]		X

[1] A toggling filtering: applied in order to eliminate toggling transitions.

[2] Persistence filtering: Binary inputs must stay in the same state on a certain period of time otherwise are not taken in account.

[3] Motion filtering is applied to double points in order to avoid take in account transient states.

Binary input can be manually suppressed or substituted by another state. When a binary input becomes invalid, the user with maintenance or engineer rights can force it to a valid state. The binary input is automatically unforced when it becomes valid again.

4.8.2 Measurement

The following measurement values are provided using the CT/VT inputs acquisition:

- RMS currents and voltages;
- Frequency;
- Active power;
- Reactive power;
- Apparent power;
- Power factor;
- Phase angles;
- Total Harmonic Distortion (THD) and Total Demand Distortion (TDD) – Harmonics shall be evaluated up to the 15^{th} order;
- Magnitudes;
- Synchro-check information: ΔF, ΔV, $\Delta \varphi$;
- Rolling demand: average values over a sliding time window on the following data: Current, voltage, active power, reactive power, apparent power;
- Fixed demand: average values over a fixed time window on the following data: Current, voltage, active power, reactive power, apparent power;
- Peak demand: Maximum value in a sliding window on the following data: Current, voltage, active power, reactive power, apparent power;
- Active and reactive energy.

Configuration process allows to the user to define for each measurement up to 6 thresholds for which the detection caused by a measurement variation can create an event and alarm.

The acquisition of measurements values shall be made directly via the local bay controller, via the bay relays or via the control system communication network.

Measurements can be manually suppressed, or substituted by another value. When a measurement becomes invalid, the user with maintenance or engineer rights can force it by a valid value. The measurement is automatically unforced when it becomes valid again.

4.8.3 Controls

Controls can be made from the local Controller/HMI or from the communication network with similar level of security.

Each switching apparatus (switches and breakers) shall have a double pole control with independent voltage between switches, plus one select contact started during the manual select before operate sequence.

In addition dry contact shall be supplied to indicate alarms.

4.8.4 Primary Equipment Condition Monitoring

4.8.4.1 Circuit Breaker Performance Monitoring

The control system shall generate separately the following data:

- Count the number of circuit breaker operations
- Evaluate the electrical total duty based on ΣI^2t (Coulomb sum)
- Evaluate an excessive operating time or phase time scatter

Each of the measurement shall be compared to a pre-defined value to trigger an alarm.

The circuit breaker monitoring could be done via the IED relays or directly by the bay controller.

4.8.4.2 Fault Location

Fault location shall be automatically downloaded from the distance protection relays after each line fault event and be made available at the SAS operator interface.

4.8.5 Automation

4.8.5.1 Interlocking

Control made from the local panel shall use the system interlocking, if the bay is connected to the rest of the system. If the communication with the rest of the system is not working, or if part of the information is missing then a local interlocking shall be checked using information from the bay only. Safety interlocking will also be hard wired within the switchyard control logic.

4.8.5.2 Programmable Logic

Each bay shall have a freely programmable logic using information from the bay or from any other bay in order to minimize the physical wiring. The cycle time shall be less than 2 ms.

4.8.6 Recording

The bay controllers and IEDs shall store their own records, fault location and sequence of events for

a minimum of two events in a “first in - first out” method. This is to prevent the loss of information during a momentary communication failure to the SAS server.

Upon re-establishing communication with the SAS server, the missing events from the SAS server database shall be automatically uploaded from the IEDs and the controllers.

4.8.7 Controller HMI

The controller HMI (Human Machine Interface) shall be made from an integral LED. The information displayed in the bay panel shall be:

- The bay name
- The date and time
- The Local / Remote/Maintenance bay mode
- The auto-recloser function status (on / off)
- The synchro-check function status (on / off)
- The interlock function status (on / off)
- A list of measurements (in real value or in percentage)
- The bay graphical representation
- The bay events classified in a chronological order
- The bay alarms as specified in Section 4.3.1.1 of this document
- The list of disturbance records available

A serial communication port or Ethernet port shall be provided at each bay controller for communication with the engineering Laptop computer.

4.9 Engineering Tools

4.9.1 Configuration

The control system shall be provided with a configuration tool able to generate consistent databases for the different components (Operator Interface, Communication Gateway, Bay controllers and IEDs) of the system. The engineering tools shall be installed on the engineering laptop computer. The laptop computer will be used with the docking station (equipped with a 22 inches (minimum) LED colour monitor. keyboard and mouse) and locally near the control and protection panels.

The configuration tool shall be unique for the system, i.e. it shall be able to define in the same screen:

- The graphical part, such as circuit breaker display within the single line diagram representation,
- The electrical part, such as alarm label of the circuit breaker,
- The system part, such as the board to which the circuit breaker is connected,

- The automation part, such as the sequence that is using the circuit breaker position.

The configuration tool shall be able to create object-oriented templates, and use instance of them to define the real configuration. There shall be one template per bay containing all information (graphical, electrical, system, automation and communication) of the bay.

The configuration tool shall be able to maintain track of the version of the databases, and compare different versions of the databases.

The configuration tool shall be able to have an open XML interface in order to import data from third party tools. It shall generate reports on the content of the database.

4.9.2 Simulation

Simulation tools shall be provided with the system to emulate a missing equipment on the IEC61850 network.

The simulation tools shall be set up by the system configuration tool and be able to execute scenario defined by the user.

4.10 Language

As an addition to the General Technical Requirements, all man-machine interface screen pages and printout currently used for the operation of the substation shall be in English language. This also applies to the dedicated setup/maintenance/monitoring software of the protective relays, switchyard, transformers and reactor monitoring IEDs.

4.11 Required Spare Parts and Tools

The Supplier shall include the following spare parts and tools:

- One Engineering Laptops with docking station including monitor, keyboard and mouse
- One Bay controller fully configured with I/O, processor, power supplies and communication cards
- One GPS receiver with antenna and interface cards
- One of each LAN switches, cable length (including fibre optic) and accessories
- One Digital monitoring set
- One fibre optic link attenuation test equipment
- Lot of fibre optic and copper connectors including jumper cables (10 of each type)
- One set RTU cards (site replaceable)
- All required commissioning spare parts and consumables

4.12 Recommended Spare Parts and Tools

The Supplier shall recommend optional spares, including communication/fibre optic cables, which may be needed over a five (5) years period of normal operation and parts that, if not readily available, might result in a shutdown causing serious operation difficulties.

5 FACTORY TESTING

The test program shall be submitted for Employer's review as indicated in the General Technical Requirements.

As a general rule, the test program shall include all the tests necessary to verify the compliance of the equipment and the software with the specified characteristics indicated in this document and with the Contractor's bid offer.

The Contractor shall simulate the overall system operation interconnecting the new substation control system with the existing control system as well as the adjacent substations and the Dispatch Centre and Power House Control systems in a representative manner. The Employer will coordinate with the other contractors to allow for testing with the corresponding digital devices or communication interfaces.

The tests shall comprise (non-limitative) the following:

a) Parallel operation of Operator Interface computers.

b) Analogue and digital input state change simulation (IEDs).

c) Command simulation.

d) Analogue input simulation.

e) Analogue input value must be according to real value, precision class test.

f) LAN network test.

g) Resolution test of Sequence Event Recorder function.

h) Alarm function test.

i) Counter function test.

j) Data avalanche test

k) Communication protocol test.

l) Software test.

m) Others contractors software integration test.

n) Other tests according to system characteristics

Note: The tenderers are advised to visit the 765/400kV Bara TPS Substation site to access the details of Substation Automation System (SAS) of M/s Schneider Electric to extend / integrate the system as per requirement.

SECTION 3
GENERAL TECHNICAL REQUIREMENTS

1.0 GENERAL

This section stipulates the General Technical Requirements (GTR) under the Contract and will form an integral part of the Technical Specification. The provisions under this section are intended to supplement general requirements for the materials, equipments and services covered under respective equipment sections and are not exclusive. However, in case of conflict between the requirement specified in this section and requirements specified under respective equipment sections, the requirements specified under respective sections shall hold good.

It is not the intent to specify completely in technical specifications of equipments/materials all details of the design and construction of equipment. However, the equipment shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation. BHEL/UPPCL will interpret the meaning of drawing and specification and shall have the power to reject any work or material which in his judgement is not in accordance therewith. The equipment offered shall be complete with all components necessary for its effective and trouble free operation. Such components shall be deemed to be within the scope of Bidder's supply, irrespective of whether these are specifically brought out in this specification and/or commercial order or not.

UPTCL procures all the equipment and materials for substations, keeping into consideration the interchangeability and future extension of substation. All equipment and materials to be supplied shall conform to the UPTCL's current Bid specifications for similar equipment and materials.

2.0 COMPLETENESS OF EQUIPMENTS

2.1 Equipments furnished shall be complete in every respect with all mountings, fittings, fixtures and standard accessories specified &/or normally provided with such equipment and/ or needed for erection, completion and safe operation of the equipment as required by applicable codes though they may not have been specifically detailed in the Technical Specifications. Materials and components not specifically stated in the specification but which are necessary for commissioning and satisfactory operation of the substation unless specifically excluded shall be deemed to be included in the scope of the specification and shall be supplied without any extra cost All similar standard components/ parts of similar standard equipment provided, shall be interchangeable with one another.

2.2 The Bidder shall supply type tested (including special test as per technical specification) equipments and materials. The test reports/details shall be furnished by the Bidder in the bid. In the event of any discrepancy in the test reports i.e. any test report not acceptable due to any design/manufacturing changes or due to noncompliance with the requirement stipulated in the Technical Specification and/or IEC/136IS, same, shall be carried out without any additional cost implication to the Purchaser. The Purchaser reserves the right to get any or all type tests conducted/ repeated. The reports for all type tests and additional type tests as per technical specification furnished by the Bidder shall be of the tests conducted within last 05(five) years prior to the date of bid opening (02.03.19). The type tests conducted should have either been conducted in accredited laboratory (accredited based on ISO/ IEC Guide 25/ 17025 or EN 45001 by the national accreditation body of the country where laboratory is located) or witnessed by UPPTCL or representative authorized by UPPTCL or Utility or representative of accredited test lab or reputed consultant.

3.0 STANDARDS

3.1 Except as modified by this Bid specification, all material and equipment shall conform to the requirement of the latest editions of relevant ISS/ IEC and other applicable standards. The equipments/ works shall be designed, engineered, manufactured, built, tested and commissioned shall be carried out in accordance with the Acts, Rules, Laws and Regulations in force in India.

3.2 In addition to meeting the specific requirements called for in the respective sections of the Technical Specification, the equipment shall also conform to the general requirement of the relevant standards which shall form an integral part of the specification. When the specific requirements stipulated in the specifications exceed or differ than those required by the applicable standards, the stipulation of the specification shall take precedence.

3.3 In the event of the Bidder offering equipment conforming to standards other than ISS/ IES standards, which ensure equivalent or better performance than that specified in the standards, the salient point of comparison between the standards adopted and relevant ISS/ IEC standards shall be indicated clearly in the proposal, along with English language version of such standard or relevant extract of the same. The equipment conforming to standards other than IS/IEC shall be subject to Purchaser's approval.

3.4 The standards mentioned in the respective equipment specifications are not mutually exclusive or complete in themselves. The equipment &/or work shall also conform to any other applicable standard, even if not specifically mentioned in these specifications.

3.5 Should the Bidder wish to depart from the provisions of the specifications, either on accounts of manufacturing practices or for any other reason, he shall clearly mention the departure and submit complete justification supported by information, drawings etc. as will enable to assess the suitability of equipment(s) offered. In the event of the Bidder's specifications, drawings, forms and tables etc. being found to disagree with the requirement of the Bid specifications at any stage, Bid specifications shall be binding, unless the departures have been duly approved in writing by the Purchaser.

4.0 PROJECT DATA

i.	Location	UTTAR PRADESH
ii.	Altitude	not exceeding 1000 Meters
iii.	Climatic Conditions	
(a)	Design maximum ambient Air Temperature	50 deg. C
(b)	Minimum ambient air temperature in shade	0 deg. C
(c)	Relative Humidity	100%Max.
(d)	Wind Load	195 Kg./ Sq.m.
(e)	Seismic Level	0.3 g
(f) I	soceraunic Level	50days/ year
(g)	Average annual rain fall	1200 mm
(h)	Hot and humid tropical Climate conductive to rust and fungus growth	

5.0 SYSTEM PARTICULARS

(i)	Rated System voltage	800kV, 420 kV, 245kV, 145kV, 36kV
(ii)	System frequency	50 Hz, This may vary by ± 5%

(iii) Number of phases — Three
(iv) Neutral — Effectively Earthed
(v) **Auxiliary power supply:-**

Auxiliary electrical equipment shall be suitable for operation on the following supply system:

(a) Power device (Like drive motors) — 400V, 3Phase, 4Wire 50Hz Effectively earthed AC system.

(b) Lighting fixtures, space heaters, fractional Horse Power motors and control devices. — 250V, 2wire, 50Hz, AC supply with one point grounded.

(c) DC alarm, Control and Protective — 2wire ungrounded DC supplies

Devices from sub station batteries as under

(i) 765kV S/S : 220V DC
(ii) 400 kV S/S : 220V DC
(iii) 220/132kV S/S : 110V DC
(iv) Communication equipment : 48 V DC

The above supply voltage is subject to variation as follows:

All devices must be suitable for a continuous operation over the entire range of voltage variations :

(i) AC — Voltage may vary by ± 10%. Frequency by ± 5% Combined Voltage & frequency by ±10%.

(ii) DC

a) 220 V may vary between 187 & 242 V
b) 110 V may vary between 93 & 121 V
c) 48 V may vary between 41 & 53 V

6.0 SYSTEM PARAMETERS

The following system parameters shall prevail:

Sl. No.	**Description of Parameters**	**765 kV System**	**400 kV System**	**33 kV System**
1.	Nominal system voltage	765kV	400kV	33kV
2.	Maximum operating voltage of the system(rms)	800kV	420kV	36kV
3.	Rated frequency	50Hz	50Hz	50Hz
4.	No. of phase	3	3	3
5.	Rated short time current	40/50 kA for 1 Sec	40/50 kA for 1 Sec	25 kA for 3 sec
6.	Dry and wet one minute power frequency withstand voltage	830 kV	680 kV	70 kV
7.	Full wave impulse withstand voltage (1.2/50 microsec.)	2100 kVp	1550 kVp	170 kVp
8.	Corona extinction voltage	508kV	320 kV	--
9.	Max. Radio interference voltage for frequency between 0.5 MHz	2500 micro-volt at	1000	--

	and 2 MHz	508 kV rms	micro-volt at 266 kV rms	
10.	Minimum total creepage 25mm/kV	20000 mm	10500 mm	1300 mm
11.	Min. clearances			
	Phase to phase	7600mm (for Conductor configuration) 9400mm (for rod -Conductor configuration)	4000mm (for Conductor configuration) 4200mm (for rod - Conductor configuration)	320 mm
	Phase to earth	4900mm (for Conductor structure 6400mm (for rod- structure	3500 mm	320 mm
	Sectional clearances	10300 mm	6500 mm	3000 mm
12.	System neutral earthing	Effectively Earthed	Effectively Earthed	Effectively Earthed

7.0 SERVICES TO BE PERFORMED BY THE EQUIPMENT

All equipments shall perform satisfactorily under various electrical, electromechanical and meteorological conditions of the installation site. All equipment shall be able to withstand all external and internal mechanical thermal and electromechanical forces due to various factors like wind load temperature variation, ice & snow (wherever applicable) short circuit etc for the equipment. The Bidder shall design the various forces which the terminal connectors of the equipment are required to withstand. All outdoor EHV equipments except marshalling kiosks shall be suitable for hot line washing. To facilitate erection of equipment, all items to be assembled at site shall be "match marked".

8.0 CLAMPS AND CONNECTORS INCLUDING TERMINAL CONNECTORS

8.1 Each equipment shall be supplied with necessary terminals and connectors as required by the design for the particular installation. The terminal connector shall be suitable for the conductor used for particular installation, which are as under as per UPPTCL's practice:

8.2 Where copper to aluminum connections are required, bimetallic clamps shall be used, which shall be properly designed to ensure that any deterioration of the connection is kept to a minimum and restricted to part which are not current carrying or subjected to stress. The design details of the joint shall be furnished to the Purchaser by the Bidder.

8.3 Low voltage connectors, grounding connectors and accessories for grounding all equipment are also included in the scope of work.

8.4 No current carrying part of any clamp shall be less than 10 mm thick. All ferrous parts shall be hot dip galvanized. Copper alloy liner of minimum 2 mm thickness shall be used with aluminum body for Bimetallic clamps.

8.5 All casting shall be free from blow holes, surface blisters cracks and cavities. Sharp edges and corners shall be blurred and rounded off.

8.6 Flexible connectors, braids or laminated straps made for the terminal clamps for bus posts shall be suitable for both expansion or through (fixed/sliding) type connection of 4" IPS AL. tube as required. In both the cases the clamp height (top of the mounting pad to centre line of the tube) should be same.

8.7 The clamps/ connectors shall be designed to carry the same current as the conductor and the temperature rise shall be equal or less than that of the conductor at the specified ambient temperature. The rated current for which the clamp/ connector is designed with respect to specified reference ambient temperature, shall also be indelibly marked on each component of the clamp/connector, except on hardware.

8.8 All current carrying parts shall be designed and manufactured to have minimum contact resistant.
8.9 Clamps and connectors shall be designed to be corona controlled. Corona extinction voltage for 765kV, 400kV, 220kV and 132kV class clamps shall not be less than 508,320, 156 and 105kV (rms) respectively and R.I.V. level shall not be more than specified 1000, 1000, 1000 and 500 micro volts for 765kV, 420kV, 220kV and 132Kv system at the test voltage specified.

9.0 SUPPORT STRUCTURES

9.1 The base design of all the equipments, to be installed on auxiliary structures, shall conform to the standard auxiliary structure designs presently being used in UPPTCL at 765/400/ 220/132/33kVSubstations.

9.2 All equipment support structures shall be supplied along with brackets, angles, stools etc. for attaching the operating mechanism, control cabinets and marshalling box (wherever applicable) etc.

9.3 The support structures should be hot dip galvanised with minimum 610 gram/sq.m net of zinc.

10.0 COLOUR SCHEME AND CODES FOR PIPE SERVICE

The Bidder shall propose a colour scheme for the those equipments/ items for which the colour scheme has not been specified in the specification. For the approval of purchaser. The decision of Purchaser shall be final. The scheme shall include.

Finishing colour of Indoor equipment.
Finishing colour of Outdoor equipment.
Finish colour of all cubicles.
Finishing colour of various auxiliary system equipment including piping
Finishing colour of various building items.

All steel structures, plates etc. shall be painted with non-corrosive paint with a suitable primer. It may be noted that normally all electrical equipments in switchyard are painted with shade 631 of IS-5.

11.0 MATERIAL/ WORKMANSHIP

11.1 General Requirement

Where the specification does not contain references to workmanship, equipment, materials and components of the covered equipment, it is understood that the same must be new, of highest

grade of the best quality of their kind, conforming to best engineering practice and suitable for the purpose for which they are intended.

The design of the works shall be such that installation, future expansions, replacements and general maintenance may be undertaken with a minimum of time and expenses. Each component shall be designed to be consistent with its duty and suitable factors of safety, subject to mutual agreements. All joints and fastenings shall be devised, constructed and documented so that the component parts shall be accurately positioned and restrained to fulfill their required function. In general screw threads shall be standard metric threads. The use of other thread forms will only be permitted when prior approval has been obtained from the Purchaser.

Whenever possible, all similar part of the Works shall be made to gauge and shall also be made interchangeable with similar parts. All spare parts shall also be interchangeable and shall be made of the same materials and workmanship as the corresponding parts of the Equipment supplied under the Specification. Where feasible, common component units shall be employed in different pieces of equipment in order to minimize spare parts stocking requirements. All equipment of the same type and rating shall be physically and electrically interchangeable.

All materials and equipment shall be installed in strict accordance with the manufacturer's recommendation(s). Only first-class work in accordance with the best modern practices will be accepted. Installation shall be considered as being the erection of equipment at its permanent location. This, unless otherwise specified, shall include unpacking, cleaning and lifting into position, grouting, leveling, aligning,coupling of or bolting down to previously installed equipment bases/foundations, performing the alignment check and final adjustment prior to initial operation, testing and commissioning in accordance with the manufacturer's tolerances, instructions and the Specification. All factory assembled rotating machinery shall be checked for alignment and adjustments made as necessary to re-establish the manufacturer's limits. Suitable guards shall be provided for the protection of personnel on all exposed rotating and/ or moving machine parts and shall be designed for easy installation and removal for maintenance purposes. The spare equipment(s) shall be installed at designated locations and tested for healthiness.

The Bidder shall apply oil and grease of the proper specification to suit the machinery, as is necessary for the installation of the equipment. Lubricants used for installation purposes shall be drained out and the system flushed through where necessary for applying the lubricant required for operation. The Bidder shall apply all operational lubricants to the equipment installed by him.

All oil, grease and other consumables used in the Works/ Equipment shall be purchased in India unless the Bidder has any special requirement for the specific application of a type of oil or grease not available in India. In such is the case he shall declare in the proposal, where such oil or grease in available. He shall help Purchaser in establishing equivalent Indian make and Indian Bidder. The same shall be applicable to other consumables too.

A cast iron or welded steel base plate shall be provided for all rotating equipment which are to be installed on a concrete base unless otherwise agreed to by the Purchaser. Each base plate shall support the unit and its drive assembly, shall be of design with pads for anchoring the units and shall have a raised up all around and shall have threaded in air connections, of so required.

11.2 PROVISIONS FOR EXPOSURE TO HOT AND HUMID CLIMATE

Outdoor equipment supplied under the specification shall be suitable for service and storage under tropical conditions of high temperature, high humidity, heavy rainfall and environment favourable to the growth of fungi and mildew. The indoor equipments located in non-air conditioned areas shall also be of same type.

12.0 Void

13.0 FUNGI STATIC VARNISH

Besides the space heaters, special moisture and fungus resistant varnish shall be applied on parts which may be subjected or predisposed to the formation of fungi due to the presence or deposit of nutrient substances. The varnish shall not be applied to any surface of part where the treatment will interface with the operation or performance of the equipment. Such surfaces or parts shall be protected against the application of the varnish.

14.0 void

15.0 DEGREE OF PROTECTION

The enclosures of the Control Cabinets, junction boxes and Marshalling Boxes, panels etc. to be installed shall be provided with degree of protection as detailed here under:
b) Installed out door : IP-55
d) Installed indoor in air conditioned area : IP-31
f) Installed in covered area : IP -52
h) Installed indoor in non air-conditioned area where possibility of entry of water is limited: IP-41
j) For LT Switchgear (AC & DC distribution Boards): IP-52

The degree of protection shall be in accordance with :13947 (Part-I)/ IEC-60947 (Part-I)/ IS 12063 / IEC-60529. Type test report for degree of protection test, on each type of the box shall be submitted for approval.

16.0 RATING PLATES, NAME PLATES AND LABELS

Each main and auxiliary item of substation is to have permanently attached to it in a conspicuous position a rating plate of non-corrosive material upon which is to be engraved manufacturer's name, year of manufacture, equipment name, type or serial number together with details of the loading conditions under which the item of substation in question has been designed to operate, and such diagram plates as may be required by the Purchaser. The rating plate of each equipment shall be according to IEC requirement.

All such nameplates, instructions plates, rating plates CB, CT, VT, SA, Isolators and Relay & Protection panels equipments shall be bilingual with Hindi inscription first followed by English. Alternatively two separate plates one with Hindi and the other with English inscriptions may be provided.

17.0 FIRST FILL OF CONSUMABLES, OIL AND LUBRICANTS

All the first fill of consumables such as oils, lubricants, filling compounds, touch up paints, soldering/brazing material for all copper piping of circuit breakers and essential chemicals etc. which will be required to put the equipment, covered under the scope of the specifications, into successful operation, shall be furnished by the Bidder unless specifically excluded under the exclusions in these specifications and documents.

18.0 PACKAGING AND PROTECTION

All the equipments shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. The

Bidder shall also submit packing details/associated drawing for any equipment/material, to facilitate the Purchaser to repack any equipment/material at a later date. The Bidder shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. Any demurrage, wharfage and other such charges claimed by the transporters, railways etc. shall be to the account of the Bidder.

All coated surfaces shall be protected against abrasion, impact, discolouration and any other damages. All exposed threaded portions shall be suitably protected with either a metallic or a non-metallic protecting device. All ends of all valves and pipings and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage. The parts which are likely to get rusted, due to exposure to weather should also be properly treated and protected in a suitable manner.

19.0 SURFACE FINISH

All interiors and exteriors of tanks, control cubicles and other metal parts shall be thoroughly cleaned to remove all rust, scales, corrosion, greases or other adhering foreign matter. All steel surfaces in contact with insulating oil as far as accessible shall be painted with not less than two coats of heat resistant, oil insoluble, insulating paints. All metal surfaces exposed to atmosphere shall be given two primer coats of zinc chromate and two coats of epoxy paint with epoxy base thinner.

All metal parts not accessible for painting shall be made of corrosion resisting material. All machine finished or bright surfaces shall be coated with a suitable preventive compound and suitably wrapped or otherwise protected. All paints shall be carefully selected to withstand tropical heat and extremes of weather within the limit specified.

The paint shall not scale off or wrinkle or be removed by abrasion due to normal handling. All external painting shall be as per shade No. 631 of IS: 5.

20.0 HOT DIP GALVANISING

All ferrous parts including all sizes of nuts, bolts, plain and spring washers, support channels, structures, shall be hot dip galvanized conforming to latest version of IS: 2629 or any other equivalent authoritative standard. However, hardware less than M12 size shall be electro-galvanized. Minimum weight of zinc coating shall be 610 gm/ sq.mm and minimum thickness of coating shall be 85 microns for all items thicker than 6 mm. For items lower than 6mm thickness, requirement of coating shall be as per relevant ASTM. For surface which shall be embedded in concrete, the zinc coating shall be 610 gm/sq. m minimum.

The galvanized surfaces shall have a continuous and uniform thick coating of zinc, firmly adhering to the surface of steel. The finished surface shall be clean and smooth and shall be free from defects like discoloured patches, bare spots, unevenness of coating, spelter which is loosely attached to the steel globules, spiky deposits, blistered surface, flaking or peeling off, etc. The presence of any of these defects noticed on visual or microscopic inspection shall render the material liable to rejection. After galvanizing, no drilling or welding shall be performed on the galvanized parts of the equipment excepting that nuts may be threaded after galvanizing. Sodium dichromate treatment shall be provided to avoid formation of white rust after hot dip galvanization.

Galvanised material must be transported properly to ensure that galvanised surfaces are not damaged during transit. Application of zinc rich paint at site shall not be
allowed.

21.0 PROTECTIVE GUARDS

Suitable guards shall be provided for protection of personnel on all exposed rotation and/of moving machine parts. All such guards with necessary spares and accessories shall be designed for easy installation and removal for maintenance purpose.

22.0 TOOLS AND TACKLES

The Bidder shall supply with the equipment one complete set of all special tools and tackles for the erection, assembly, dis-assembly and maintenance of the equipment. However, these tools and tackles shall be separately packed and brought on to site.

23.0 CONTROL CABINETS, JUNCTION BOXES, TERMINAL BOXES AND MARSHALLING BOXES FOR OUTDOOR EQUIPMENT

23.1 All types of boxes, cabinets etc. shall generally conform to and be tested in accordance with IS-5039/ IS-8623, IEC-60439, as applicable, and the clauses given below.

23.2 Control cabinets, junction boxes, marshalling boxes and terminal boxes shall be made of sheet steel or aluminum enclosure and shall be dust, water and vermin proof. Sheet steel used shall be at least 2.0 mm thick cold rolled or 2.5 mm hot rolled. The box shall be properly braces to prevent wobbling. There shall be sufficient reinforcement to provide level surfaces, resistance to vibrations and rigidity during transportation and installation. In case of aluminum enclosed box, the thickness of aluminum shall be such that it provides adequate rigidity and long life as comparable with sheet steel of specified thickness.

23.3 Cabinet/boxes shall be free standing floor mounting type, wall mounting type or pedestal mounting type as per requirements. A canopy and sealing arrangements for operating rods shall be provided in marshalling boxes/ Control cabinets to prevent ingress of rain water.

23.4 Cabinet/boxes shall be provided with double hinged doors with padlocking arrangements. The distance between two hinges shall be adequate to ensure uniform sealing pressure against atmosphere. The quality of the gasket shall be such that it does not get damaged/cracked during the operation of the equipment.

23.5 All doors, removable covers and plates shall be provided gasket all around with suitably profiled EPDM/Neoprene gaskets. The gasket shall be tested in accordance with approved quality plan, IS:11149 and IS:3400. The quality of gasket shall be such that it does not get damaged/cracked during 10(ten) years of operation of the equipment or its major overhaul whichever is earlier. All gasketed surfaces shall be smooth straight and reinforced if necessary to minimize distortion and to make a tight seal. Ventilating Louvers, if provided, shall have screen and filters, the screen shall be fine wire mesh made of brass.

23.6 All boxes/ cabinets shall be designed for the entry of cables from bottom by means of weather proof and dust-proof connections. Boxes and cabinets shall be designed with generous clearances to avoid interference between the wiring entering from below and any terminal blocks or accessories mounted within the box or cabinet. Suitable cable gland plate projecting at least 150 mm above the base of the marshalling kiosk/box shall be provided for this purpose along with the proper blanking plates. Necessary number of cable glands shall be supplied and fitted on this gland plate. Gland plate shall have provision for some future glands to be provided later, if required.

23.7 A 240V, single phase, 50 Hz, 15 amp AC plug and socket shall be provided in the cabinet with ON-OFF switch for connection of hand lamps. Plug and socket shall be of industrial grade.

23.8 For illumination, a 20 Watts fluorescent tube or 15 watts CFL/LED bulb shall be provided. The switching of the fittings shall be controlled by the door switch. For junction boxes of smaller sizes such as lighting junction box, manual operated earth switch mechanism box etc., plug socket, heater and illumination is not required to be provided.

23.9 All control switches shall be of rotary type. Toggle piano switches shall not be accepted.

23.10 Positive earthing of the cabinet shall be ensured by providing two separate earthing pads. The earth wire/ strip shall be terminated on to the earthing pad and secured by the use of self etching washer. Earthing of hinged door shall be done by using a separate earth wire.

23.11 The bay marshalling kiosks shall be provided with danger plate and a diagram showing the numbering/connection/ feruling by pasting the same on the inside of the door.

23.12 a) The following routine tests along with the routine tests as per IS: 5039 shall also be conducted.
Check for wiring
Visual and dimension check

b) The enclosure of bay marshalling kiosk, junction box, terminal box shall be type tested for IP-55 as per IS: 13947. After IP-55 test, 2.5 kVrms for 1 (one) minute, insulation resistance and functional test should be conducted.

23.13 Auxiliary Switches

All the auxiliary switches shall be fully type tested as per relevant IS. The following type test reports on auxiliary switches shall be submitted:
(a) Electrical endurance test - A minimum of 2000 operation for 2A D. C. with a time constant greater than or equal to 20 millisecond with a subsequent examination of mV drop/visual defects/temperature rise test.
(b) Mechanical endurance test. A minimum of 1,00,000 operations with a subsequent checking of contact pressure test/visual examination.
(c) Heat run test on contacts.
(d) IR/HV test etc.

24.0 TERMINAL BLOCKS AND WIRING

24.1 Control and instrument leads form the switchboards or from other equipment will be brought to terminal boxes or control cabinets in conduits. All interphase and external connections to equipment or to control cubicles will be made through terminal blocks.

24.2 Terminal blocks shall be 1100 V grade and have continuous rating to carry the maximum expected current on the terminals. These shall be of moulded piece, complete with insulated/barriers stud type terminals, washers, nuts and lock nuts. Screw clamp, overall insulated, insertion type, rail mounted terminals can be used in place of stud type terminals. But preferably the terminal blocks shall be non disconnecting stud type of Elmex type CATM4, phoenix cage clamp type or equivalent. The insulating material of terminal block shall be nylon 6.6 which shall be free of halogens, fluorocarbons etc.

24.3 Terminal blocks for current transformer and voltage transformer secondary leads shall be provided with test links and isolating facilities. The current transformer secondary leads shall also be provided with short circuiting and earthing facilities.

24.4 The terminals shall be such that maximum contact area is achieved when a cable is terminated. The terminal shall have a locking characteristic to prevent cable form escaping from the terminal clamp unless it is done intentionally.

24.5 The conducting part in contact with cable shall preferably be tinned or silver plated, however Nickel plated copper or zinc plated steel shall also be acceptable.

24.6 The terminal blocks shall be of extensible design.

24.7 The terminal blocks shall have locking arrangement to prevent its escape from the mounting rails.

24.8 The terminal blocks shall be fully enclosed with removable covers of transparent, non-deterioration type plastic material. Insulating barriers shall be provided between the terminal blocks. These barriers shall not hinder the operator form carrying out the wiring without removing the barriers.

24.9 Unless otherwise specified terminal blocks shall be suitable for connecting the following conductors on each side.
a) All circuits except CT circuits Minimum of 2 nos. of 2.5 sq. mm copper flexible
b) All CT circuits Minimum of 4 nos. of 2.5 sq.mm copper flexible

24.10 The arrangements shall be in such a manner so that it is possible to safely connect or disconnect terminals on live circuits and replace fuse links when the cabinet is live.

24.11 At least 20% spare terminals shall be provided on each panel/cubicle/box and these spare terminals shall be uniformly distributed on all terminal rows.

24.12 There shall be minimum clearance of 250 mm between the first bottom row of terminal block and the associated cable gland plate. Also the clearance between two rows of terminal blocks shall be a minimum of 150 mm.

24.13 The Bidder shall furnish all wire, conduits and terminals for the necessary interphase electrical connections (where applicable) as well as between phases and common terminal boxes or control cabinets.

24.14 All input and output terminals of each control cubicle shall be tested for surge withstand capability in accordance with the relevant IEC Publications, in both longitudinal and transverse modes. The Bidder shall also provide necessary filtering, surge protection, interface relays and any other measures necessary to achieve an impulse withstand level at the cable interfaces of the equipment.

25.0 LAMPS AND SOCKETS

25.1 Lamps

All incandescent lamps shall use a socket base as per IS-1258, except in the case of signal lamps.

25.2 Sockets

All sockets (convenience outlets) shall be suitable to accept both 5 Amp & 15 Amp pin round Standard Indian plugs. They shall be switched sockets with shutters.

25.3 Hand Lamp
A 240 Volts, single Phase, 50 Hz AC plug point shall be provided in the interior of each cubicle with ON- OFF Switch for connection of hand lamps.

25.4 Switches and Fuses

Each panel shall be provided with necessary arrangements for receiving, distributing, isolating and fusing of DC and AC supplies for various control, signalling, lighting and space heater circuits. The incoming and sub-circuits shall be separately provided with miniature circuit breaker/ switchfuse units. Selection of the main and Subcircuit fuse ratings shall be such as to ensure selective clearance of sub-circuit faults. Potential circuits for relaying and metering shall be protected by HRC fuses.

All fuses shall be of HRC cartridge type conforming to IS-9228 mounted on plug-in type fuse bases. Miniature circuit breakers with thermal protection and alarm contacts will also be accepted. All accessible live connection to fuse bases shall be adequately shrouded. Fuses shall have operation indicators for indicating blown fuse condition. Fuse carrier base shall have imprints to the fuse rating and voltage. All control switches shall be of rotary type. Toggle piano switches shall not be accepted.

26.0 BUSHINGS, HOLLOW COLUMN INSULATORS, SUPPORT INSULATORS

26.1 Bushings shall be manufactured and tested in accordance with IS: 2099 & IEC-60137 while hollow column insulators shall be manufactured and tested in accordance with IEC-62155/IS:5621. The support insulators shall be manufactured and tested as per IS:2544/IEC-60168 and IEC-60273. The insulators shall also conform to IEC-60815 as applicable.
The bidder may also offer composite silicon rubber insulator, conforming to IEC- 61462.

26.2 Support insulators, bushings and hollow column insulators shall be manufactured from high quality porcelain. Porcelain used shall be homogeneous, free from laminations, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified tough and impervious to moisture.

26.3 Glazing of the porcelain shall be uniform brown in colour, free from blisters, burrs and similar other defects.

26.4 Support insulators/bushings/hollow column insulators shall be designed to have ample insulation, mechanical strength and rigidity for the conditions under which they will be used.

26.5 When operating at normal rated voltage there shall be no electric discharge between the conductors and bushing which would cause corrosion or injury to conductors, insulators or supports by the formation of substances produced by chemical action.
No radio interference shall be caused by the insulators/bushings when operating at the normal rated voltage.

26.6 Bushing porcelain shall be robust and capable of withstanding the internal pressures likely to occur in service. The design and location of clamps and the shape and the strength of the porcelain flange securing the bushing to the tank shall be such that there is no risk of fracture. All portions of the assembled porcelain enclosures and supports other than gaskets, which may in

any way be exposed to the atmosphere shall be composed of completely non hygroscopic material such as metal or glazed porcelain.

26.7 All iron parts shall be hot dip galvanised and all joints shall be air tight. Surface of joints shall be trued up porcelain parts by grinding and metal parts by machining. Insulator/bushing design shall be such as to ensure a uniform compressive pressure on the joints.

26.8 Tests
In bushing, hollow column insulators and support insulators shall conform to type tests and shall be subjected to routine tests in accordance with IS: 2099 & IS: 2544 & IS : 5621.

27.0 MOTORS
Motors shall be “Squirrel Cage” three phase induction motors of sufficient size capable of satisfactory operation for the application and duty as required for the driven equipment and shall be subjected to routine tests as per applicable standards. The motors shall be of approved make.

27.1 Enclosures
a b) Motors to be installed outdoor without enclosure shall have hose proof enclosure equivalent to IP-55 as per IS: 4691. For motors to be installed indoor i.e. inside a box, the motor enclosure, shall be dust proof equivalent to IP-44 as per IS: 4691.
b) Two independent earthing points shall be provided on opposite sides of the motor for bolted connection of earthing conductor.
c) Motors shall have drain plugs so located that they will drain water resulting from condensation or other causes from all pockets in the motor casing.
d) Motors weighing more than 25 Kg. shall be provided with eyebolts, lugs or other means to facilitate lifting.

27.2 Operational Features
a) Continuous motor rating (name plate rating) shall be at least ten (10) percent above the maximum load demand of the driven equipment at design duty point and the motor shall not be over loaded at any operating point of driven equipment that will rise in service.
b) Motor shall be capable at giving rated output without reduction in the expected life span when operated continuously in the system.

27.3 Starting Requirements
a) All induction motors shall be suitable for full voltage direct-on-line starting. These shall be capable of starting and accelerating to the rated speed alongwith the driven equipment without exceeding the acceptable winding temperature even when the supply voltage drops down to 80% of the rated voltage.
b) Motors shall be capable of withstanding the electrodynamic stresses and heating imposed if it is started at a voltage of 110% of the rated value.
c) The locked rotor current shall not exceed six (6) times the rated full load current for all motors, subject to tolerance as given in IS:325.
d) Motors when started with the driven equipment imposing full starting torque under the supply voltage conditions specified, shall be capable of withstanding at least two successive starts from cold condition at room temperature and one start from hot condition without injurious heating of winding. The motors shall also be suitable for three equally spread starts per hour under the above referred supply condition.
e) The locked rotor withstand time under hot condition at 110% of rated voltage shall be more than starting time with the driven equipment of minimum permissible voltage by at least two seconds or 15% of the accelerating time whichever is greater. In case it is not possible to meet the above requirement, the Bidder shall offer centrifugal type speed switch mounted on the motor shaft which shall remain closed for speed lower than 20% and open for speeds

above 20% of the rated speed. The speed switch shall be capable of withstanding 120% of the rated speed in either direction of rotation.

27.4 Running Requirements

a) The maximum permissible temperature rise over the ambient temperature of 50 degree C shall be within the limits specified in IS:325 (for 3 - phase induction motors) after adjustment due to increased ambient temperature specified.
b) The double amplitude of motor vibration shall be within the limits specified in IS: 4729. Vibration shall also be within the limits specified by the relevant standard for the driven equipment when measured at the motor bearings.
c) All the induction motors shall be capable of running at 80% of rated voltage for a period of 5 minutes with rated load commencing from hot condition.

27.5 TESTING AND COMMISSIONING

The Bidder shall conduct following tests along with list of instruments and calibration certificates to the Purchaser. If any additional test is required the same shall be conducted without any extra cost to the Purchaser.
(a) Insulation resistance.
(b) Phase sequence and proper direction of rotation.
(c) Any motor operating incorrectly shall be checked to determine the cause and the conditions corrected.

28 DOCUMENTATION

The successful Tenderer or Bidder shall provide the following technical information:
- General outline drawings of all major equipment
- Estimated works programme (Bar Chart)
- Completed technical data schedules
- Type Test Reports
- Quality assurance and quality control programme and organization
- Complete set of catalogues

The following additional information shall be provided before proceeding with the manufacturing, or during the manufacturing period:

- Schedule of engineering documents including drawings
- Assembly drawings, list of materials including spare parts and tools, cabling diagrams, etc.
- Instruction and service manuals
- Paint samples, if requested by UPTCL
- Test reports and certificates
- Shop inspection and testing program
- Packing drawings, if requested by UPTCL
- Marking models, if requested by UPTCL
- List of test required for commissioning
- Detailed procedure for installation
- Detailed procedure for commissioning
- Works programme and schedule (bar-chart)
- Progress report of manufacturing

The Bidder is responsible for any discrepancies, errors or omissions in the submittals whether these have been reviewed by the UPTCL or not, provided that such discrepancies, errors and omissions are not due to inaccurate information or particulars furnished in writing by the UPTCL to the Bidder. All reports or drawings must be provided in the SI unit system.

28.1 Drawings

The successful Tenderer or Bidder shall prepare and submit for review of the UPTCL, the drawings indicated in this document. The drawings must be A1 format (841 x 594 mm), A3 (420 x297 mm) or A4 (297 x 210 mm) format and include in the lower right-hand corner, a title block as indicated in section-1.

The successful Tenderer or Bidder shall submit, one (1) Autocad computer file on a CD-ROM Disk and by E-mail, plus four (4) paper copies of each of the drawings to the UPTCL. The copies marked by the UPTCL will be returned to the Bidder, at the latest, 30 days after presentation of these drawings. The corrected drawings will be submitted once more, following the same procedure, if necessary.

An updated Autocad computer file, plus six (6) paper copies of the final version of the drawings, must be submitted by the Bidder, at the latest one (1) month before delivery of the purchased equipment.

28.1.1 Outline and Foundation Drawings

Outline drawings must be provided to scale including dimensions, weight, reaction for design of foundations, centre of gravity for transportation and installation, in plan view, elevation, section and foundation plan including blockouts embedded parts.

Design briefs and detailed drawings must be presented for all metallic structures and supports of the substation equipment. Nameplates, to scale, must indicate test results from the factory, serial number, weight mass, etc. When available, catalogues references and codes must be indicated on the drawings.

28.1.2 Assembly Drawings

A bill of material must be provided with all assembly drawings.

Every device or apparatus must be identified using a numerical or alphanumerical system corresponding to the one used for the respective diagram. The identification will be in accordance with the ANSI C37.2 standards. The terminal blocks must be identified on the drawing as they are on the equipment itself. Every terminal block of a panel or cabinet must be identified with the number indicating the panel or cabinet it belongs to, the terminal strip identification followed by a number starting with 1 for the first terminal and finishing with the number of the last terminal from top to bottom or left to right. The Bidder shall arrange and identify the terminal blocks for exclusive use of Purchaser as show on enclosed drawing specific to each equipment. The Bidder must comply with this requirement.

The UPTCL will not accept any deviation nor will assume any cost resulting from drawing changes or modifications of wiring or cabling resulting from changes caused or originated by the Bidder. Wires originating from a device or terminal block shall be tagged at both ends with identification of remote end device terminal number using the symbols previously mentioned.
Every cabinet or panel will be provided with a wiring drawing where all the devices are shown.

28.2 Technical Data Schedules

The Tenderer must fill out completely and attach to his proposal the Technical Data Schedules included in the technical specification of the equipment. The data shall include the values

guaranteed by the Bidder. If any data cannot be furnished at tender stage, Bidder shall assign reasons and shall confirm to provide the same at engineering stage for approval.
The Bidder shall guarantee that the equipment and the works are in accordance with all the requirements of the present specification including the data from the Technical Data Schedules.
The Technical Specifications for equipment represent different types and/or ratings under a single data schedule. Bidder shall however submit the data schedule for each type and/or rating of the equipment required for the project.

28.3 Instruction Manuals

Service and maintenance manuals including sequence of operation manuals must describe in details, the procedures and the operation instructions for the equipment and the measuring devices. The assembly method, commissioning guide, adjustment, operation and disassembly of every component, system or machine, must be described and illustrated in details. The manuals must include as well a troubleshooting procedure to locate rapidly the defective part. For preventive maintenance purposes, a list of verification point visual marking and measurements will be included. The frequency of inspections and maintenance of every component shall be described in the manuals.

The Bidder shall submit manuals that are clear, fully detailed and easily understood to ensure the appropriate operation and maintenance of the equipment.

The manuals shall include a copy of the "as built" drawings, the list of spare parts and a list of all the pieces of every component or item that makes up the equipment. The latter must include the Bidder identification, the manufacturing codes and the instructions to order the pieces. The manual shall also include an updated copy of the Technical Data Schedules of the equipment, as supplied. The Bidder shall submit the instruction and service manual for UPTCL's review at least one month before shop testing.

The Bidder shall include in every manual a copy of the tests performed on the equipment and all the accessories, and the corresponding results.

The Bidder shall provide for every apparatus, six (6) technical manuals, two (2) of which shall be properly wrapped and placed inside the cabinets, panels or control kiosks at time of delivery.
In the case where there is no room for manuals, the two manuals shall be well placed and packed in a wooden crate.

28.4 Language

All technical documents such as: calculation schedules, curves, maintenance and service manuals, quality assurance control program report, plant tests and manufacturing schedule, drawings, nameplates and instructions manuals shall be presented by the Bidder to the UPTCL, shall be in the English language.

29 QUALITY CONTROL PROGRAMME

29.1 Programme

In general terms, the manufacturing quality programme shall be in compliance with ISO 9002 or later standards. The UPTCL reserves the right to verify the document pertaining to the manufacturer’s quality assurance programme, as well as the application of the same in the manufacturing plant.

In general, the assembly of all the equipment components shall be carried out in the manufacturer's workshops so that it shall possible to perform inspections, tests, etc. that will ensure a subsequent satisfactory operation. The exceptions to this rule will only be possible upon UPTCL's consent.

The UPTCL's authorized representatives shall have the right of access to the plant and to inspect and verify the quality of materials used in the manufacturing process.

The manufacturer of each major equipment shall submit Quality Assurance Programme (QAP) for the manufacturing and testing of equipment along with the drawings to UPTCL.

29.2 Plant Tests

The materials and all the equipment shall be tested as per the prescriptions of this specification. The tests shall be performed by the Bidder and certified by the authorized representative of the UPTCL.

All the required tests must be performed in order to confirm that the materials and the equipment comply with these specifications, and to allow the UPTCL to detect any material or manufacturing defects.

The results of all the tests shall be marked down in the reports containing all the necessary information to enable verification of compliance with the present specification. The test certificates shall be written in English and shall show the results and real conditions of the tests performed the circuits, oscillogrammes, environmental conditions, nameplate drawings with measured values, graphs, etc.

No later than two (2) weeks after having performed the tests, the Bidder shall submit to the UPTCL, four (4) copies of the report of all tests as a bound document. The test reports shall indicate the tests performed, instruments used, names of test personnel and provide the witness's signature as applicable. The report must also include a description of any failure that occurred while performing the plant tests, even if the test resumed after the failure.

The tests are meant to verify and determine the characteristics of the equipment. Normally, type tests shall be performed on one (1) apparatus of each type and with different technical characteristics. If type tests have been performed on identical apparatus, within a period not exceeding 5 years from 02.03.19, the results may be accepted. The routine tests are intended to reveal any defective material or manufacture non-conformity and shall be performed on all equipment supplied.

The units to be assembled in the plant (panels, cabinets, control cabinets) shall be assembled, wired, adjusted and tested in the plant, as much as possible, under the same service conditions that will prevail at the site of installation, to ensure the accuracy of the wiring and the correct operation of the equipment.

The UPTCL reserves the right to be present at any of the tests.

The equipment to be tested must be totally assembled for an inspection before the tests. The Bidder must submit to the UPTCL a detailed program of tests for review, at least one month before the tests take place. The Bidder shall inform the UPTCL in writing, at least 30 days in advance, of the date of the tests.

29.3 Stage Inspection Programme

UPTCL and/or his representative will conduct routine and/or periodic inspection of the works and material in the manufacturing of the major equipment and construction sites in various stages of the Project. The Bidder shall provide facilities and access to the UPTCL and/or his representative to inspect the workmanship and the quality of the material, manufacturing process and the installation. The Bidder shall advise the UPTCL in writing the schedule of any such routine and/or periodic inspection. The Bidder shall attach a copy of the completed inspection checklist or final/in-process inspection report by the Bidder's QA/QC UPTCL/inspector on every inspection request submitted to the UPTCL. The Bidder's QA/QC UPTCL/inspector shall ensure that the items for inspection covered by the Bidder's "Inspection Request" are ready prior to inspection by the UPTCL and/or his representative.

30 NAMEPLATES, LABELS AND RATING PLATES

The equipment shall be fitted with nameplates and indication plates, which must be manufactured of non-corrodible stainless steel or aluminium, with a minimum thickness of 1 mm engraved black letters on a light background, and shall be fixed to the apparatus with non-busting screws.
A rating plate shall be attached to each major and auxiliary item of equipment supplied. This plate shall be permanently engraved with the designed full load ratings, serial number, type number, date of manufacture, and other identification deemed necessary. Where required by the UPTCL, diagram plates shall also be supplied.

A nameplate shall be provided to identify the equipment supplied. The identifying inscription shall be approved by the UPTCL or conform to that designated in the appropriate sections of this Specification. Devices shall be identified by nameplates on both front and rear of all desks, panels, cubicles, etc.

Labels shall be manufactured of non-hygroscopic material with engraving of a contrasting colour or alternatively, for indoor use, of laminated plastic material with lettering engraved. The lettering should be black against white background. The materials used shall be non-fading, non-aging type, suitable for tropical conditions.

All apparatus, motors, control gear and all panels and the apparatus contained therein, shall be labelled, indicating where necessary, their purpose and the "ON" and "OFF" positions.
Upon request by the UPTCL during the approval of Nameplates and Labels, some inscriptions shall be in Hindi language.

ANNEXURE – A

CORONA AND RADIO INTERFERENCE VOLTAGE (RIV) TEST

1.0 General

Unless otherwise stipulated, all equipment together with its associated connectors, where applicable, shall be tested for external corona (for 765 kV & above) both by observing the voltage level for the extinction of visible corona under falling power frequency voltage and by measurement of radio interference voltage (RIV) for 220 kV above.

2.0 Test Levels

The test voltage levels for measurement of external RIV and for corona extinction voltage are listed under the relevant clauses of the specification.

3.0 Test Methods for RIV

3.1 RIV tests shall be made according to measuring circuit as per International Special-Committee
on Radio Interference (CISPR) Publication 16-1(1993) Part -1. The measuring circuit shall preferably be tuned to frequency with 10% of 0.5 MHz but other frequencies in the range of 0.5 MHz to 2 MHz may be used, the measuring frequency being recorded. The results shall be in microvolts.

3.2 Alternatively, RIV tests shall be in accordance with NEMA standard Publication No. 107-1964, except otherwise noted herein.

3.3 In measurement of, RIV, temporary additional external corona shielding may be provided. In measurements of RIV only standard fittings of identical type supplied with the equipment and a simulation of the connections as used in the actual installation will be permitted in the vicinity within 3.5 meters of terminals.

3.4 Ambient noise shall be measured before and after each series of tests to ensure that there is no variation in ambient noise level. If variation is present, the lowest ambient noise level will form basis for the measurements. RIV levels shall be measured at increasing and decreasing voltages of 85%, 100%, and 110% of the specified RIV test voltage for all equipment unless otherwise specified. The specified RIV test voltage for 765kV, 400kV, 220kV, 132kV is listed in the detailed specification together with maximum permissible RIV level in microvolts.

3.5 The metering instruments shall be as per CISPR recommendation or equivalent device so long as it has been used by other testing authorities.

3.6 The RIV measurement may be made with a noise meter. A calibration procedure of the frequency to which noise meter shall be tuned shall establish the ratio of voltage at the high voltage terminal to voltage read by noisel meter.

4.0 Test Methods for Visible Corona

The purpose of this test is to determine the corona extinction voltage of apparatus, connectors etc. The test shall be carried out in the same manner as RIV test described above with the exception that RIV measurements are not required during test and a search technique shall be used near the onset and extinction voltage, when the test voltage is raised and lowered to determine their precise values. The test voltage shall be raised to 110% of specified corona extinction voltage and maintained there for five minutes. In case corona inception does not take place at 110%, test shall be stopped, otherwise test shall be continued and the voltage will then be decreased slowly until all visible corona disappears. The procedure shall be repeated at least 4 times with corona inception and extinction voltage recorded each time. The corona extinction voltage for purposes of determining compliance with the specification shall be the lowest of the four values at which visible corona (negative or positive polarity) disappears. Photographs with laboratory in complete darkness shall be taken under test conditions, at all voltage steps i.e. 85%,

100%, and 110%. Additional photographs shall be taken at corona inception and extinction voltages. At least two views shall be photographed in each case using Panchromatic film with an ASA daylight rating of 400 with an exposure of two minutes at a lens aperture of f/5.6 or equivalent. The photographic process shall be such that prints are available for inspection and comparison with conditions as determined from direct observation. Photographs shall be taken from above and below the level of connector so as to show corona on bushing, insulators and all parts of energised connectors. The photographs shall be framed such that test objectessentially, fills the frame with no cut-off. For recording purpose, modern devices utilizing UV recording methods such as image intensifier may also be used.

4.1 The test shall be recorded on each photograph. Additional photograph shall be taken from each camera position with lights on to show the relative position of test object to facilitate precise corona location from the photographic evidence.

4.2 In addition to photographs of the test object preferably four photographs shall be taken of the complete test assembly showing relative positions of all the test equipment and test objects. These four photographs shall be taken from four points equally spaced around the test arrangement to show its features from all sides. Drawings of the laboratory and test set up locations shall be provided to indicate camera positions and angles. The precise location of camera shall be approved by Purchaser's inspector, after determining the best camera locations by trial energisation of test object at a voltage which results in corona.

4.3 The test to determine the visible corona extinction voltage need not be carried out simultaneously with test to determine RIV levels.

4.4 However, both test shall be carried out with the same test set up and as little time duration between tests as possible. No modification on treatment of the sample between tests will be allowed. Simultaneous RIV and visible corona extinction voltage testing may be permitted at the discretion of Purchaser's inspector if, in his opinion, it will not prejudice other test.

5.0 Test Records

In addition to the information previously mentioned and the requirements specified as per CISPR or NEMA 107-1964 the following data shall be included in test report:

a) Background noise before and after test.

b) Detailed procedure of application of test voltage.

c) Measurements of RIV levels expressed in micro volts at each level.

d) Results and observations with regard to location and type of interference sources detected at each step.

e) Test voltage shall be recorded when measured RIV passes through 100 microvolts in each direction.

k) Onset and extinction of visual corona for each of the four tests required shall be recorded.

ANNEXURE – B

SEISMIC WITHSTAND TEST PROCEDURE

The seismic withstanding test on the complete equipment (for 220kV and above) shall be carried out alongwith supporting structure. The Bidder shall arrange to transport the structure from his Bidder's premises/UPPTCL sites for the purpose of seismic withstand test only.
The seismic level specified shall be applied at the base of the structure. The accelerometers shall be provided at the Terminal Pad of the equipment and any other point as agreed by the Purchaser. The seismic test shall be carried out in all possible combinations of the equipment.
The seismic test procedure shall be furnished for approval of the Purchaser.

SECTION -4
TECHNICAL DATA REQUIREMENTS

Control and Relay panels

1 Name & country of Manufacture of panels

2 Manufacturer's type & and designation

3 Type of construction (Simplex / Duplex)

4 Thickness of sheet steel
(I) Front

(ii) Back

(iii) Sides

5 Degree of Protection

6 Name of the manufcaturer of relays

7 DC Voltage of the relays

8 Make and model of static (0.2 accuracy class type) energy meters

9 Confirm whether offered C&R panel manufacturer and protective relays have tested commissioned and they are in successful operation for at least two years in 400kV System

TRANSMISSION LINE PROTECTION

Numerical Distance protection Scheme

1 Name & country of Manufacture

2 Manufacturer type & designation

3 Switched or Non switched type (is it with separate measurement for single / three phase faults)

4 Setting range of offset feature

5 Whether relay is having self monitoring feature

6 Whether relay is compatible for PLCC equipment and can be used for permissive/ under reach/over reach/ Blocking scheme

7 Suitable for single & three phase trip

8 Type of shaped characteristic

9 No. of tripping contacts with making capacity of 30 amps for 0.2 seconds

10 In case 16 contacts as per above clause are not available with the distance relay offered, type of tripping relay being offered

11 Maximum operating time for at 50% of the reach setting of 2 ohms and 10/20 ohms (with CVT) including all trip relays, if any (Bidder is required to enclose isochronic curve with CVT on Line)
a) at SIR = 4
b) at SIR=15 (3 Phase faults)
c) at SIR =15 (other faults)

12 IDMT earth fault relay meeting Normal Inverse charcteristics as per IEC 60253 is being offered as built in feature for 400/220 kV Lines

13 If no type of IDMT relay being offered

14 Built in feature offered with the relay (Yes/No)
a) Disturbance Recorder
b) Fault Locator
c) Over voltage (one stage only)
d) Auto reclose relay along with dead line charging and check synchronising

STATIC Distance Protection Scheme

1 Name & country of Manufacture

2 Manufacturer type & designation

3 Switched or Non switched type (is it with separate measurement for single / three phase faults)

4 Setting range of offset feature

5 Whether relay is having self monitoring feature

6 Whether relay is compatible for PLCC equipment and can be used for permissive/ under reach/over reach/ Blocking scheme

7 Suitable for single & three phase trip

8 Type of shaped characteristic

9 No. of tripping contacts with making capacity of 30 amps for 0.2 seconds

10 In case 16 contacts as per above clause are not available with the distance relay offered, type of tripping relay being offered

11 Maximum operating time for at 50% of the reach setting of 2 ohms and 10/20 ohms (with CVT) including all trip relays, if any (Bidder is required to enclose isochronic curve with CVT on Line)
a) at SIR = 4
b) at SIR=15 (3 Phase faults)
c) at SIR =15 (other faults)

12 IDMT earth fault relay meeting Normal Inverse charcteristics as per IEC 60253 is being offered as built in feature for 400/220 kV Lines

13 If no type of IDMT relay being offered

14 Built in feature offered with the relay (Yes/No)
a) Disturbance Recorder
b) Fault Locator
c) Over voltage (one stage only)
d) Auto reclose relay along with check synchronising relay (for 132 kV Lines)

Directional O/C and E/F Relay

1 Name & country of Manufacture

2 Manufacturer type & designation

3 Three over current and one E/F element(s) are whether independent or composite units

4 Type of relay Electromechanical/ static/ Numerical

5 Whether charateristics will confirm to IEC255-3

6 Directional sensitivity

7 Overcurrent unit setting range

a) Inverse time

b) High set inst. Unit

8 Earth fault unit setting range

a) Inverse time

b) High set inst. Unit

9 VT fuse failure relay/ feature included for Alarm

Line Over voltage Protection relay

1 Name & country of Manufacture

2 Manufacturer type & designation

3 Type of Relay (Electromechanical/ Static Numerical)

4 Operating indicator provided

5 Operating time

6 Resetting time

7 Whether monitors all three phases ?

8 Built in feature of Main 1/Main 2 distance relay is offered. If so which stage is offered as built in

Distance to fault locator

1 Name & country of Manufacture

2 Manufacturer type & designation

3 Built in feature of Main 1/Main 2 distance relay is offered

4 Maximum registering time

5 Whether direct display unit provided

6 Whether both phase to phase fault & phase to earth fault measuring units included

7 Whether" On - Line" type

8 Accurcay for typical conditions defined under technical specifications

Disturbance Recorder
a. Acquisition unit

1 Name & country of Manufacture

2 Manufacturer's type & and designation

3 No. of Analogue Channels

4 No. of Digital recording Channels

5 Built in feature of Main 1 / Main 2 distance relay offered

6 Pre Fault memory (milli seconds)

7 Post Fault memory (seconds)

8 Total storage memory in seconds

9 Sampling Frequency

10 Resolution of event channels (msec)

11 Time display present?

12 Data output in COMTRADE is available

b. Evaluation Unit

1 Name & country of Manufacture

2 Manufacturer's type & and designation

3 No. of acquisition unit that can be connnected to one evaluation unit

4 Technical paramters of evaluation unit
a. Processor & Speed
b. RAM & Hard Disk Capacity
c. Additional facilities
d. Details of Printer

5 Details of Power supply arrangement for acquistion unit (including printer)

Auto Reclose Relay

1 Name & country of Manufacture

2 Manufacturer type & designation

3 Electromechanical / Static / Numerical

4 Auto Reclose relay along with dead line charging and check synchronising relay offered as part of distance relay

5 Suitable for single & three phase ?

6 Single phase dead time setting ranges

7 Three phase dead time range earth faults

8 Reclaim time seting range

Auto Reclose Relay (FOR NEW SUBSTATION ONLY)

1 Name & country of Manufacture

2 Manufacturer type & designation

3 Electromechanical / Static / Numerical

4 Auto Reclose relay along with dead line charging and check synchronising relay offered as part of distance relay

5 Suitable for single & three phase ?

6 Single phase dead time setting ranges

7 Three phase dead time range earth faults

8 Reclaim time seting range

TRANSFORMER PROTECTION

Differential relay

1 Name & country of Manufacture

2 Manufacturer type & designation

3 Second harmonic restraint feature provided ?

4 Whether three instantaneous units provided

5 Operating current setting range

6 Bias setting range

7 Operating time at 5x setting current

8 Resetting time

9 How ratio / phase angle corrections are being done (inter posing transformer / internal feature in the relay)

Restricted Earth Fault Relay

1 Name and country of Manufacturer

2 Manufacturer type and designation

3 Operating time at 2 x setting

Overfluxing relays

1 Name & country of Manufacture

2 Manufacturer type & designation

3 Whether inverse time operating charcateristics provided ?

4 Maximum operating time

5 Accuracy operating time

6 Resetting time

Directional O/C and E/F Relay

1 Name & country of Manufacture

2 Manufacturer type & designation

3 Whether charateristics will confirm to IEC255-3

4 Directional sensitivity

5 Overcurrent unit setting range

a) Inverse time

b) High set inst. Unit

6 Earth fault unit setting range

a) Inverse time

b) High set inst. Unit

REACTOR PROTECTION

Differential relay

1 Name & country of Manufacture

2 Manufacturer type & designation

3 Second harmonic restraint feature provided ?

4 Whether three instantaneous units provided

5 Operating current setting range

6 Bias setting range

7 Operating time at 5x setting current

8 Resetting time

9 How ratio / phase angle corrections are being done (inter posing transformer / internal feature in the relay)

Restricted Earth Fault Relay

1 Name and country of Manufacturer

2 Manufacturer type and designation

3 Operating time at 2 x setting

Back up Impedance Protection Relay

1 Name & country of Manufacture

2 Manufacturer type & designation

3 Whether charateristics will confirm to IEC255-3

4 Directional sensitivity

5 Overcurrent unit setting range

a) Inverse time

b) High set inst. Unit

6 Earth fault unit setting range

a) Inverse time

b) High set inst. Unit

SECTION -4
TECHNICAL DATA REQUIREMENTS

GENERAL PROTECTION / MONITORING EQUIPMEMT

Trip circuit supervision relay

1 Name & country of Manufacture

2 Manufacturer type & designation

3 Whether preclosing and post closing supervision provided ?

4 Time delay

High Speed Trip Relays

1 Name & country of Manufacture

2 Manufacturer type & designation

3 Contacts ratings
   a) Make & carry continously

   b) Make & carry for 0.5 sec

   c) Break
      I. Resistive load

      ii. Inductive load (With L/R = 40 msec)

4 Operating time at rated voltage (maximum)

5 Resetting time

6 Whether supervisory relays included

SECTION -4
TECHNICAL DATA REQUIREMENTS

Local Breaker Back - up protection

1 Name & country of Manufacture

2 Manufacturer type & designation

3 Operating time

4 Resetting time

5 Setting range
(I) Current
(ii) Time

Bus bar Protection (APPLICABLE FOR NEW STATION ONLY)

1 Name & country of Manufacture

2 Manufacturer type & designation

3 Type of relay

4 Principle of operation

5 Operating time

6 Resetting time

7 Setting ranges

(I) Current
(ii) Time

8 Whether it will cause tripping for the differential current below the load current of heavily loaded feeder (Bidder shall submit application check for the same)

SECTION –V (ATTACHMENTS)

A) SLD for 765/400kV Substation BARA
B) CLARIFICATIONS BY UPPTCL (ANNUXURE-B)
C) 765kV Bay no 704 Existing Scheme

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

DRAWING No. TB-2-407-510-001

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COMPUTER DRG. PATH NAME :

INVENTORY No. | SIGN. & DATE | REF. DRG. No.

BAY#17,18&19 — 765kV LINE (FUTURE) | LINE REACTOR (FUTURE)

BAY#14,15&16 — 765kV LINE (FUTURE) | LINE REACTOR (FUTURE)

BAY#13

BAY#10,11&12 — 765kV LINE | LINE REACTOR

BAY#7,8&9 — 765kV LINE | LINE REACTOR

BAY#4,5&6 — ICT-2

PRESENT BHEL SCOPE

BAY#1,2&3 — ICT-1

704-ICT
704-LA
704-89TE1
704-89T
704-89TE2

710-NCT, 710-LA, 710-NGR, 710-CVT, 710-NLA, 710-WT, 710-LR, 710-TCVT, 710-LAR, 710-TCT, 710-52R, 710-89LE1, 710-89L, 710-89LE2, 710-89RE, 710-89R

707-NCT, 707-LA, 707-NGR, 707-CVT, 707-NLA, 707-WT, 707-LR, 707-TCVT, 707-LAR, 707-TCT, 707-52R, 707-89LE1, 707-89L, 707-89LE2, 707-89RE, 707-89R

701-LA, 701-89TE1, 701-89T, 701-89TE2

MAIN BUS-2, 765kV, 50Hz, 3150A, 40kA FOR ISEC.

713-89BE1, 713-89B, 713-89BE2, 713-CVTB

710-89A, 710-89AE, 710-52, 710-CT, 710-89BE, 710-89B, 711-89B, 711-89BE, 711-CTB, 711-52, 711-CTA, 711-89AE, 711-89A, 712-89B, 712-89BE, 712-CT, 712-52, 712-89AE, 712-89A

707-89A, 707-89AE, 707-52, 707-CT, 707-89BE, 707-89B, 708-89B, 708-89BE, 708-CTB, 708-52, 708-CTA, 708-89AE, 708-89A, 709-89B, 709-89BE, 709-CT, 709-52, 709-89AE, 709-89A

704-89A, 704-89AE, 704-52, 704-CT, 704-89BE, 704-89B, 705-89B, 705-89BE, 705-CTB, 705-52, 705-CTA, 705-89AE, 705-89A, 706-89B, 706-89BE, 706-CT, 706-52, 706-89AE, 706-89A

701-89A, 701-89AE, 701-52, 701-CT, 701-89BE, 701-89B, 702-89B, 702-89BE, 702-CTB, 702-52, 702-CTA, 702-89AE, 702-89A, 703-89B, 703-89BE, 703-CT, 703-52, 703-89AE, 703-89A

MAIN BUS-1, 765kV, 50Hz, 3150A, 40kA FOR ISEC.

713-89AE1, 713-89A, 713-89AE2, 713-CVTA

712-LE1, 712-LE, 712-LE2, 712-CVT, 712-LA

709-LE1, 709-LE, 709-LE2, 709-CVT, 709-LA

706-LE1, 706-LE, 706-LE2, 706-CVT, 706-LA

703-LE1, 703-LE, 703-LE2, 703-CVT, 703-LA

GT-5 | GT-4 | GT-3 | BUS REACTOR 3X80MVAR | GT-2 | GT-1

NOTE:-

ELECTRICAL SYSTEM PARAMETERS	765kV
01. NOMINAL SYSTEM VOLTAGE.	765kV
02. HIGHEST SYSTEM VOLTAGE.	800kV
03. CURRENT RATING (EQUIPMENTS)	2000A
04. SHORT CIRCUIT CURRENT RATING	40 kA FOR 1 SEC.
05. FULL WAVE IMPULSE WITHSTAND VOLTAGE	2100 kVp
06. SWITCHING IMPULSE WITHSTAND VOLTAGE	1550 kVp
07. POWER FREQUENCY WITHSTAND VOLTAGE	830 kV
08. CREEPAGE	25mm/kV
09. SYSTEM EARTHING	EFFECTIVELY EARTHED

BILL OF QUANTITY - 765 kV

SL.	ITEM DESCRIPTION	QTY.	SYMBOL	LEGEND/LOCATION
1	DISCONNECTOR WITH TWO EARTH SWITCHES 765kV, 2000 A, 40 kA for 1 SEC, (3-PH)	01		704-89T, 704-89TE1, 704-89TE2
2	624kV SURGE ARRESTER WITH DISCHARGE COUNTER	03		704-LA
3	500MVA, 765/400/33kV SINGLE PHASE ICT	03		704-ICT

LEGENDS:-

PRESENT SCOPE

EXISTING/FUTURE SCOPE

REV.	DATE	ALTERED / CHECKED / APPROVED
ZONE		

LOI NO. — 121/ESD-765kV/13/Bara/Vol-I Dated 08.03.2019

REFERANCE DRG. NO. — TENDER DRAWING: 765/400kV SWITCHYARD-765kV SINGLE LINE DIAGRAM

ग्राहक/परियोजना का नाम / NAME OF CUSTOMER/PROJECT — EXTENSION OF 765/400kV S/S Bara TPS U.P. UTTAR PRADESH POWER TRANSMISSION CORPORATION LIMITED

STATUS OF DRAWING — DISTRIBUTION OF PRINTS

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BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION PROJECTS DIVISION

	द्वारा / NAME	हस्ताक्षर / SIGN.	दि. / DATE
तैयार DRAWN	PK		23.03.19
जाँचा CHECKED	NK		23.03.19
स्वीकृत APPROVED	SKS/AG		23.03.19

विभाग DEPT. TBEM | कोड CODE 422 | स्केल / SCALE 1:1000 | कार्ड कोड CARD CODE

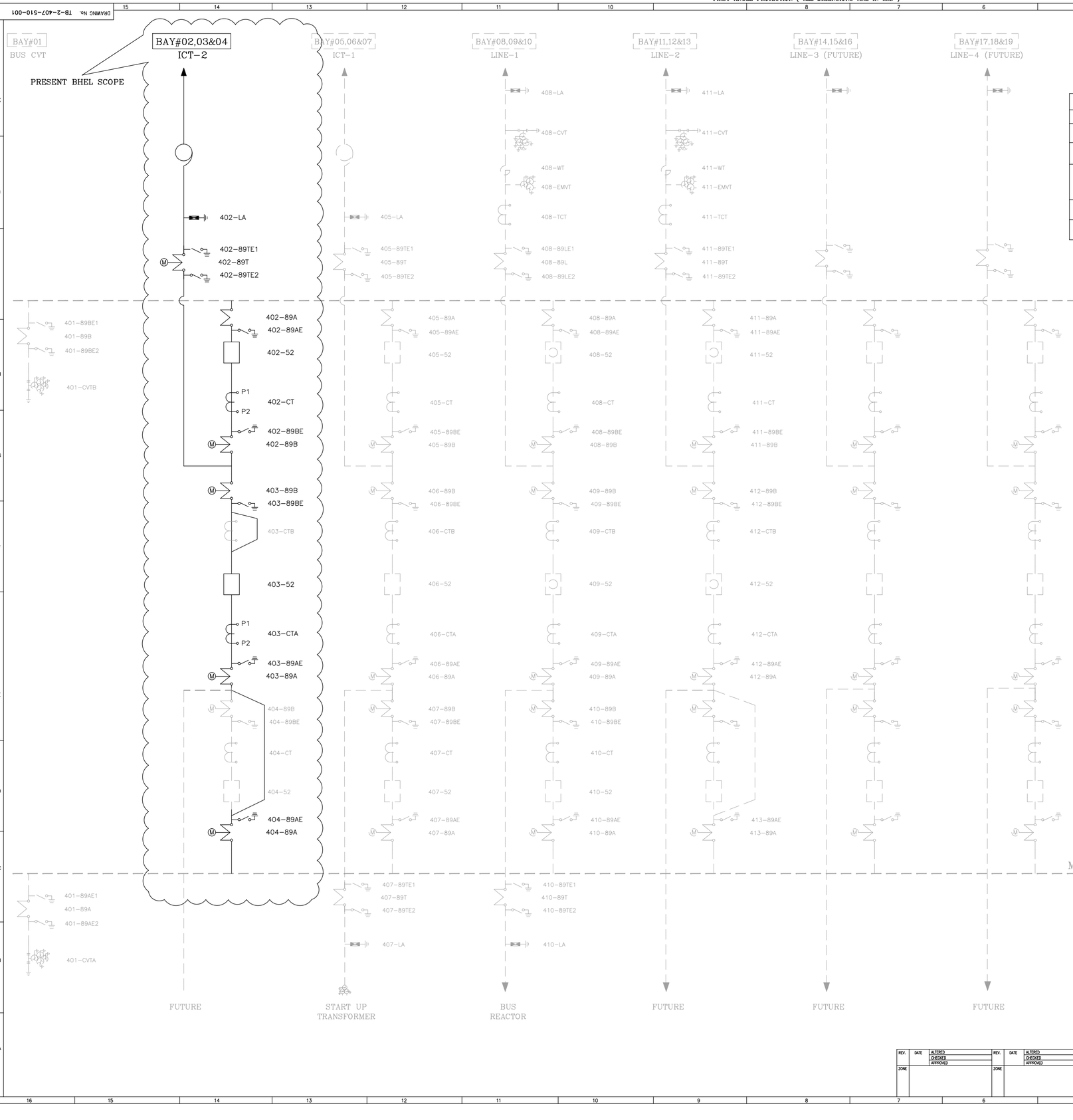
शीर्षक/TITLE: 765/400kV SWITCHYARD-765kV SINGLE LINE DIAGRAM

ड्राईंग सं./DRAWING NO. TB-2-407-510-001 | पुनरी./REV. 00

पृष्ठ सं./SHEET No. 01 | अगला पृष्ठ/NEXT SHEET 02

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

DRAWING No. TB-2-407-510-001



BILL OF QUANTITY – 400 kV				
SL.	ITEM DESCRIPTION	QTY.	SYMBOL	LEGEND/LOCATION
01	SF6 CIRCUIT BREAKER WITHOUT CR WITH CSD 400kV, 3-ph, 3150 A, 50 kA for 1 SEC.	02		402-52, 403-52
02	DISCONNECTOR WITH TWO EARTH SWITCHES 400kV, 3-ph, 2500 A, 50 kA for 1 SEC.	01		402-89T, 402-89TE1, 402-89TE2
03	DISCONNECTOR WITH ONE EARTH SWITCHES 400kV, 3-ph, 2500 A, 50 kA for 1 SEC.	05		402-89A, 402-89AE, 402-89B, 402-89BE, 403-89A, 403-89AE, 403-89B, 403-89BE, 404-89A, 404-89AE
04	CURRENT TRANSFORMER 400kV, 1-ph, 5-CORES	06		402-CT, 403-CTA
05	SURGE ARRESTER WITH DISCHARGE COUNTER 336 KV, 1-ph	03		402-LA

400kV CT (5 CORE)

CORE NO.	CURRENT RATIO (A)	ACCURACY CLASS	APPLICATION
1	2500-1250/1	PS	PROTECTION
2	2500-1250/1	PS	PROTECTION
3	2500-1250/1	0.2S	METERING
4	2500-1250/1	PS	PROTECTION
5	2500-1250/1	PS	PROTECTION

NOTE:-

ELECTRICAL SYSTEM PARAMETERS	400kV
01. NOMINAL SYSTEM VOLTAGE.	400kV
02. HIGHEST SYSTEM VOLTAGE.	420kV
03. CURRENT RATING	3000A
04. SHORT CIRCUIT CURRENT RATING	50 kA FOR 1 SEC.
05. FULL WAVE IMPULSE WITHSTAND VOLTAGE	1550 kVp
06. SWITCHING IMPULSE WITHSTAND VOLTAGE	1050 kVp
07. POWER FREQUENCY WITHSTAND VOLTAGE	630 kV
08. CREEPAGE	25mm/kV
09. SYSTEM EARTHING	EFFECTIVELY EARTHED

LEGENDS:-

PRESENT SCOPE

EXISTING/FUTURE SCOPE

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COMPUTER DRG. PATH NAME :

INVENTORY No.	SIGN. & DATE	REF. DRG. No.

LOI NO. 121/ESD-765kV/13/Bara/Vol-I Dated 08.03.2019

REFERANCE DRG. NO. TENDER DRAWING: 765/400kV SWITCHYARD-765kV SINGLE LINE DIAGRAM

ग्राहक/परियोजना का नाम NAME OF CUSTOMER/PROJECT: EXTENSION OF 765/400kV S/S Bara TPS U.P. UTTAR PRADESH POWER TRANSMISSION CORPORATION LIMITED

STATUS OF DRAWING

DISTRIBUTION OF PRINTS

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BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION PROJECTS DIVISION

	NAME	SIGN.	DATE
DESIGN	PK		23.03.19
CHECKED	NK		23.03.19
APPROVED	SRS/AG		23.03.19

DEPT. TBEM | CODE 422 | SCALE 1:1000 | CARD CODE

TITLE: 765/400kV SWITCHYARD-400kV SINGLE LINE DIAGRAM

DRAWING NO. TB-2-407-510-001

SHEET No. 02 | NEXT SHEET --- | REV. 00

REV.	DATE	ALTERED / CHECKED / APPROVED	ZONE

ANNUXURE-B

UPPTCL's tender for
INSTALLATION AND COMMISSIONING OF 1500MVA ICT-II ALONG WITH COMPLETION OF ASSOCIATED 765 & 400KV TRANSFORMER BAYS AT EXISTING 765/400KV SUBSTATION, BARA TPS (U.P.)

TECHNICAL & COMMERCIAL QUERIES/CLARIFICATIONS ON BID SPECIFICATION

A. TECHNICAL QUERIES/CLARIFICATIONS ON BID SPECIFICATION					
Sl No	ENQUIRY SPECIFICATION		Specification Requirement	Comment / Query	UPPTCL's reply
	SEC/ PART	CL NO./ SL NO./Page			
1	Schedule of Price Bara		-	We have not found any line item for 765kV Circuit Breaker and 765kV Current Transformer in price schedule. Kindly confirm that 765kV CB and CT are not in scope of bidder.	765kV CB & CT are already installed.
2	Schedule of Price Bara	7220P	HV Disconnect Switches Grounding switch 400kV, 50kA, 3Ø: 7 unit Grounding switch 765kV, 40kA, 3Ø: 2 Unit	As per price schedule, separate line item for ground switch. But ground switch shall be the part of disconnector switch. We propose to consider disconnector with one ground switch in one line item for both 400kV and 765KV. Kindly accept and accordingly revise the price schedule.	As per BoQ, One unit of 400kV Disconnector & 765kV disconnector require double grounding switch for the symmetry of already installed equipment.
3	Schedule of Price Bara	7382P	52kV power cables	Kindly clarify the requirement of 52kV Power cable. Also specify the length of 52kV Cable required.	BOQ is tentative. Requirement and quantity of 52kV cable will be finalised at the time of detailed engineering.
4	Schedule of Price Bara	7500P	(G). LV & MV Substation Switchgear 415/240Vac distribution panels for CB's, disconnectors, transformers etc.	Kindly clarify the scope of LV & MV Switchgear. We understand that spare 415V AC & 220V DC feeder are available in ACDB/DCDB for auxiliary supply of new bay. Accordingly this item is not required. Please confirm.	As per site requirement.

5	Schedule of Price Bara	8100P	(I). Control, Metering and Protection Panels	Kindly clarify the scope of control and protection system. Please provide the make and scheme of existing control and protection system. Also we assume that any busbar protection is not required. Please confirm.	Existing SAS is of M/s Schnider Electric, Protection relays are of Micom. For more details please visit the site.
6	Schedule of Price Bara	1300P	(A). Structures for HV AIS Equipment	Kindly provide the structure drawings of columns, girder and equipment support.	It will be provided to successful bidder.
7	Schedule of Price Bara	5100P	(B). Fire Fighting and Protection Equipment		
8	Technical Specification	(h) page 246	h) Each interconnecting transformer shall be equipped with an automatic fire detection and protection system based on high velocity water spray system (HVWS). The fire protection system shall include all pipe works, motors, pumps, sensors, water tanks and all associated equipment and material along with the dedicated self start diesel set. The fire protection system shall also include all the hydrants for 765kV and 400kV switchyard, control and annunciation panels, complete earthwork (i.e. excavation, backfilling, etc.) for the entire buried piping system, valve pits and pipe supports for buried, entrenched and over ground piping system;	i) Kindly provide the hydrant layout. Ii) We understand the fire protection system for new scope shall be extension of already existing hydrant line. Please confirm. Iii) Kindly confirm the tapoff hydrant point for HV spray line required for fire protection system of new ICT.	i) It will be provided to successful bidder. ii) Confirmed. Iii) It will be better to visit the site.
9	Technical Specification	Page 59	Single Line Diagram of 765/400 kV AIS Substation at Bara TPS, Prayagraj.	Single Line diagram enclosed with tender document is not legible. Kindly provide the legible SLD.	Provided SLD is enough to understand scope of work.
10	General			Kindly provide following drawings. i) Layout of Substation. Ii) Section Drawing of Substation. Iii) Earthmat drawing. Iv) Cable trench drawing vi) Foundation drawings	Drawings will be provided to successful bidder.
11	General			i) We understand that control & protection system for new proposed bays shall be placed in existing control room. Any extension of control room or new bay control room/kiosk is not in scope. Please confirm. II) Also any illumination, HVAC & fire fighting system for inddor area is not in Bidders scope.	i) Confirmed ii) Illumination in ICT-II and associated bays is in bidder's scope

12	Technical Specifications No. ESD-765KV/13 : Power Transformer	2.8.1 Page 465 & 466	Direct impedance at nominal voltage tap: - HV/IV: 13.66% - HV/LV: 198.42% - IV/LV: 180.32%	Please note that tolerance on the % impedance is not mentioned in technical specification. Kindly provide.	To be provided.
13	Technical Specifications No. ESD-765KV/13 : Power Transformer	4.3.11 Page 477	Grounding Connections: The core shall be grounded with a bushing located in a manhole on the bolted cover. Access shall be possible without lowering the oil level.	Please note that core shall be grounded through the 10kV earthing terminal board instead of bushing. Kindly accept.	According to existing system.
14	Technical Specifications No. ESD-765KV/13 : Power Transformer	4.3.13 (A1) Page 478	Interconnecting Power Autotransformers shall be fitted with three-stage cooling system capable of operating under full load without exceeding the winding hot-spot temperature of 115°C and in accordance with the applicable specifications. There shall be one spare radiator (n+1) with spare fans, allowing operation at rated power with one radiator out of service. In case of OFAF or ODAF cooling, each transformer shall be provided with two or more main motor-driven oil pumps and equal number of back-up pumps, to circulate the oil through the cooler radiators mounted on a separate pedestal than the main tank. As such each oil pump provided shall have 100% standby pump. In case of failure of the any pumps, its standby unit shall takeover automatically. The autotransformers shall be supplied complete with radiators, cooling fans, controls, etc.	It may be noted that no. of radiator bank and capacity of each radiator bank is not specified in the specification, whether it is 2X50% or anything else. Please provided the same.	As per existing system.

15	Technical Specifications No. ESD-765KV/13 : Power Transformer	4.3.13 (D) Page 479	Adequate number of optical temperature sensors of at least 16 numbers with the unit which is to be type tested and at least 8 numbers with each other units shall be fitted. This optical sensors measuring system shall be of direct measurement non-calibrating type. All the sensors shall be brought out to individual cooler control cabinet to facilitate measurement of temperature during service life. A temperature measuring system having at least 16 channels shall be mounted on one cooler control cabinet (preferably type tested unit) for each substation to measure the temperature from the optical sensors. In all cooler control cabinet of other units provision shall be kept to connect the same measuring unit in future.	It may be noted that as per our understanding a complete 16-channel fiber optic temperature monitoring system (that includes fiber optic probes, tank feed thru, external Fiber optic cable & display unit) required only in 1 transformer and in other 2 transformers only provision is required that includes only 8 no. fiber optic probes & tank feed though in each transformer (external fiber optic cable & display unit are not required). Kindly confirm	As per existing system.
16	Technical Specifications No. ESD-765KV/13 : Power Transformer	4.3.5 4.3.13.9 5.3	One set of jacks shall be supplied with each single-phase transformer. On line insulating oil drying system of adequate size. On line dissolved gases and moisture monitor. Oil Storage tank	As per technical specification, Set of jacks, On line insulating oil-drying system, On line dissolved gases and moisture monitor & Oil storage tank are required to supply but the same are not specified in BOQ. Kindly confirm whether bidders has to supply these items or not.	As per site requirement
17	Schedule of Price Bara	6011P	Mandatory Spare Parts and Maintenance Tools for Surge arrestors	Only mandatory spare of 765kV Surge arrester is found in price schedule. We understand that any other spares & tools are not required. Please confirm.	Confirmed
B. COMMERCIAL QUERIES/CLARIFICATIONS ON BID SPECIFICATION					
1	General		Funding	Please confirm the source of Funding for the project.	REC/PFC

2	Special Conditions of Specifications.	Clause 9.0, page-85 of 711	Clause 9.1.1: In case of supply- payment shall be made as detailed below: (a) 80% payment of supplied equipment after completion of the foundation of equipment. (b) 10% payment after erection of equipment. (c) Balance 10% amount to be released after satisfactory commissioning of entire substation, 100% completion of all electrical and civil works, adjustment of liquidated damaged if any and issuance of taking over certificate. Civil Work & Erection Work : i)90% of running bill subject to one bill per month. (ii) Balance 10% amount to be released after satisfactory commissioning of entire substation, 100% completion of all electrical and civil works, adjustment of liquidated damaged if any and issuance of taking over certificate.	The specified Payment terms do not cover the following: 1. Items/Equipments for which no foundation is required for eg. 1.Earthmat, Erection Hardwares, CRP, SAS etc. . 2. Mandatory Spares 3. Freight and insurance charges 4. Taxes and Duties. Hence we request M/s UPPTCL to kindly consider following payment terms which are being followed by POWERGRID and other major Customers: Supply: 10% Interest free advance Payment. 70% against dispatch of equipments/items. (after adjusting 10% advance) 10% on receipt of equipments on site. Balance 10% on successful commissioning. Mandatory Spares, Taxes & Duties and F&I : 100% on dispatch CIVIL and ETC. 10% Interest free advance Payment. 80% progressive Payment (after adjusting 10% advance) Balance 10% on successful commissioning.	As per specification. Please refer Cl .9.1.1 Note. V
3	Special Conditions of Specifications.	Clause 11.0, page-86 of 711	The substation has to be erected, tested and commissioned with in 12(Twelve) months from the date of letter of intent or from the date of handing over of land whichever is later.	Please confirm that the Project land shall be handed over to the successful bidder within one month from the date of LOI. If the handing over of the land is delayed by UPPTCL beyond one month from the date of LOI, the completion time shall be extended suitably covering such delayed period. Also the price variation for the delayed period shall be paid by UPPTCL based on IEEMA indices.	Space is already available

4	Special Conditions of Specifications	Clause 7.0, page-83 of 711	The Prices of all the items and services quoted in the Price Schedules shall be shall remain “Fixed and Firm” in all respects during the currency of the contract. The prices of spare parts shall remain ‘Firm’ and valid for a period of three years from the date of taking over of the substation by UPPTCL.	Keeping the frequent changing of price trend for various raw materials in view, it is suggested that "VARIABLE" prices may be considered in place of "FIRM" prices. Also we request M/s UPPTCL to consider providing at least 10% interest free advance for supply as well as for Civil & ETC Work so that smooth execution of work is ensured.	As per specfication.
5	Special Conditions of Specifications	Clause 3.4, page-80,81 of 711	QUANTITY VARIATION The quantities of individual items/works under any or all the above contracts may vary to any extent, however the total value of such variations shall not exceed the 10% of the aggregate contract value.	As per clause no. 3.4, no limit has been stipulated for negative quantity variation. M/s UPPTCL is requested to set a limit up to 10% for negative quantity variation also.	As per specfication.
6	Form-A.	Clause 28, page-199 of 711	Payment shall be due and payable by the Purchaser in accordance with the provisions of clause 25……. provided that the Purchaser shall not be bound to make any payment represents at least 8 percent of the total Contract value of the plant.	M/s UPPTCL is requested to remove this clause as this will adversely affect the cash inflow of contractor.	As per specfication.
7	Instructions to Bidders	Clause 1.1, page-64 of 711	The land for substation bays shall be made available to the Bidder on 'as is where is' basis. Further levelling and development of land shall be in the Bidder's scope.	We request UPPTCL to provide levelled land developed upto FGL, with security fencing , free of any encumbrance/encroachment and not on 'as is where is' basis for subject project.	As per specfication.
8	Form-A.	Clause 3, page-189 of 711	Further, if required by the Purchaser, the Contractor shall deposit with the Purchaser as security for the due and faithful performance of the Contract such sums not being less than one per cent of the total value of the Contract as may be fixed by the Purchaser either in case or in any other form approved by the Purchaser. The security deposit shall be refunded to the to the Contractor on the satisfactory completion of tests and the taking over of the plant by the Purchaser.	Since, Performance BG has to be submitted to UPPTCL. Kindly Confirm whether Security deposit has to be additionally provided to UPPTCL at contract stage.	Performance Bank Guarantee of 10% of contract value is to be submitted.
9	Terms of Payment - Mode of Payment			UPPTCL is requested to please consider payment mode through site L/C in addition to Direct payment	As per specfication.

10	General	UPPTCL is requsted to please inform about documents and timelines that may be required for Payment purpose	To be provided to successful bidder..
11	Bank Guarantee	UPPTCL is requsted to add following text in BG fomat: "BG is subject to Uniform Rules for Demand Guarantees 2010 Revision ICC Publication No. 758 (URDG)."	As per specfication.
12	Reply to Pre Bid clarifications - Reg	For ensuring transparency in bidding process and enabling uniformity among all participating bidders, UPPTCL is requested to please upload reply to Pre Bid clarification for **all bidders on eprocurement portal** (https://etender.up.nic.in/nicgep/app). The same practice is being followed by all Central/State Transmission utilities.	Confirmed

A. CLARIFICATIONS

S.No	Cl.No	Page No	As per Spec	Comments / Clarification	UPPTCL Reply
1	2.1 Sl No:2.2	3 of 32	Cooling ONAN/ONAF/OFAF or ODAF	We recommends to use ONAN/ONAF1/ONAF2 cooling instead of ONAN/ONAF/OFAF to reduce the maintenance related issues at site and also to reduce the complexity of transformer.We had already supplied similar transformers to POWERGRID and NLC with ONAN/ONAF1/ONAF2 cooling.Request to accept the same	As per specification.
2	2.13.2	4 of 32	Rated lightning impulse withstand level HV winding - line terminal - 2100kVp LV winding - line terminal - 1425kVp	The standard BIL levels of HV and LV windings for 765kV 500MVA Transformers for various utilities in india are 1950kVp and 1300kVp respectively.Request to review and confirm	Confirmed as per IEC.
3	2.17.1	5 of 32	Power frequency withstand for 1 minute for HV Bushings -1150kVrms	Maximum Power frequency withstand level voltage for 800kV bushings as per IEC60137 Table 3 is 1075kVrms.Request to review and confirm 1075kVrms for HV bushings	As per Applicable IEC
4	A1	16 of 32	Powe,Auto transformers shall be oil immersed,thermally upgraded insulation with conservator or external expansion tank,complete with accessories and spare parts and suitable for out door operation	Since limits for top oil and mean winding temperature rises are very low ,request to consider normal kraft paper for winding insulation instead of thermally upgraded insulation	As per specification.
5	4.3.13.2,C	23 of 32	Automatic Voltage control equipment	Please confirm whether Digital RTCC is required for this package.If required confirm the required number of Digital RTCC also.	As per existing Scheme of ICT-I
6	4.3.13.4	24 of 32	Provide each transformer with a digital thermometer and measuring system into the alarm and condition monitoring system together with historical and maximum temperature indication	We will provide Dial type conventional type oil temperature indicator.Fibre optic probes will be installed in the transformers for digital indication of Oil temperature indication.Separate Digital thermometer is not considered.Please confirm	Confirmed.
7	4.3.13.5	24 of 32	Digital winding temperature indicator	We will provide Dial type conventional type oil temperature indicator.Fibre optic probes will be installed in the transformers for digital indication of Oil temperature indication.Separate Digital thermometer is not cnsidered.Please confirm	Confirmed..
8	4.3.13.6	25 of 32	Provide a magnetic oil level detector to provide oil level alarms into the alarm and condition monitoring system and into the station SAS via the LAN interconnections	Please note that conventional oil level indicator is considered with potential free contacts for alarm and trip.Condition monitoring system is not included in our offer	As per specification.
9	4.3.13.8	25 of 32	Mount the alarm and condition monitoring system indication dispalys so that the displays are not more than 1600mm from ground level	Condition monitoring system is not included in our offer.If required please provide detailed specification for the same	As per specification.
10	4.3.13.10	27 of 32	Electrically operated air drying breather	The same is interpreted as Maintenance dree dehydrating breather.Please confirm	Confirmed.
11	4.3.13.9	27 of 32	On line Dissolved gases and moisture analyser	Please specify the gases to be monitored in Online DGA	As per specification.

S. No.	REFERENCE DOCUMENT Volume/ Clause No./ PAGE No.	EXISTING CLAUSE	CLARIFICATION/ CONFIRMATION REQUIRED	
CLARIFICATIONS REQUIRED WITH RESPECT TO COMMERCIAL TERMS AND CONDITIONS:				**UPPTCL Reply**
1.	SPECIAL CONDITIONS OF SPECIFICATIONS / Cl 6.7.4 /. Pg 83 of 711	**TYPE TEST FOR INDIGENOUS OR FULLY IMPORTED EQUPMENTS:** The offered equipments must have been fully type tested as per relevant ISS and/or any other specified international standards, during the last 5 years period to be reckoned from the date of opening of tender.	As the required equipment under present scope of work are standard in nature, we request M/s UPPTCL to accept Valid type test reports not older than 10 years from the date of bid submission. Further, we would like to inform you that, Type tests are carried out once to establish the design of the Equipments. Unless there are some design changes, there is no requirement of repetition of Type tests. Request you to please accept the same.	As per specification.
2.	General	**ORDER OF PRECEDENCE**	We request UPPTCL to confirm the order of precedence of various sections of tender documents, as the same is not mentioned in bid documents.	a) Special Condition of Specification b) General conditions for supply of Plants & execution of work, Form A c) Technical Specification
3.	INSTRUCTION TO BIDDER/ Pg. 102 of 711	**TRAINING OF ENGINEERS** The successful Bidder shall responsible to impart training to Purchaser's engineers in design, manufacture, testing, operation, and maintenance of GIS and Automation system being supplied including all type of major equipment/system, at no extra cost to the Purchaser i.e. free of cost for 50 man weeks. The duration of training for various equipments under this job is to be mutually agreed between the Bidder and the Purchaser. However, the travelling and stay expenses of the trainees shall be borne by the Purchaser. The Bidder shall make all suitable arrangements for stay of the trainees at their works/offices.	Request you to please confirm the number of participants and training duration along with details of factory training and Site training to plan the training schedule. Also we understand that all travel and stay expenses will be borne by the purchaser. Please confirm our understanding.	As per specification.
4.	SECTION V /Instruction to Bidders/Nature of Prices, Cl. 4.2.1/ Pg. 74 of 711and Cl. No. 7/ Special Conditions of Specifications/ Pg. 83 of 711.	The prices of all the items including ex-works prices, packing and forwarding, freight, insurance, erection, testing, & commissioning etc. shall remain **"Firm"** in all respects throughout the currency of the contract The Prices of all the items and services quoted in the Price Schedules shall be shall remain "Fixed and Firm" in all respects during the currency of the contract.	As you aware that commodity prices in present market are highly volatile, hence we request you to accept variable prices for Equipment's/ Material, Services and Civil works as per IEEMA formulae without any ceiling. Considering above and long Validity requirement of (6 months) & Completion period of (24 Months) for this tender, it is difficult to predict estimation of the cost escalation during tender validity/Contract execution period. We therefor request UPPTCL to allow bid on variable price basis for Cable, Structure, Erection	As per specification.

			and Civil works as per IEEMA PV Formula without any ceiling for the complete Contractual Period with the base date of 1 month prior to the date of bid submission. Kindly accept.	
5.	Cl. No. 5/ Section I / INVITATION FOR PREQUALIFICATION / Pg. 11 of 711	**Completion Period:** The completion period for Installation and commissioning of 01 no. 765/400kV 1500MVA Transformer along with completion of associated 765 and 400kV Transformer bays at existing 765/400 Substation, Bara ,TPS ,(U.P) shall be 12 months from the date of issue of LOI or from handing over of the land whichever is later.	We would like to inform you if the date of handing over of the site is delayed by customer, then the Contractor shall be entitled to claim cost in case of delay in handing over of the Site. Please confirm.	As per specification.
6.	SPECIAL CONDITIONS OF SPECIFICATIONS/ Cl. No. 3.4 / Pg81 of 711	**QUANTITY VARIATION** "…However if such variation is likely to exceed 10% of the contract value of any contract, the variation shall be allowed by concerned Engineer of Contract after taking prior concurrence of other Engineer of Contract in writing."	We request to modify this clause as suggested below. ""…However if such variation is likely to exceed 10% of the contract value of any contract, the variation shall be allowed by concerned Engineer of Contract ~~after taking prior concurrence of other Engineer of Contract~~ & **Contractor** in writing."	As per specification.
7.	SPECIAL CONDITIONS OF SPECIFICATIONS/ Cl. No. 3.5 / Pg. 81 of 711	**LIQUIDATED DAMAGES FOR DELAYS IN SUPPLY / COMPLETION PERIOD:** In case of delay in completion period/ handing over of the substation after successful operation, beyond agreed schedule, liquidated damages @ 0.5 % per week, subject to maximum of 10% of aggregate contract value shall be deducted from the bidder bills.	We request to modify this clause as suggested below. Liquidated damages for delay in completion: In case of delay in completion period/handing over of substation beyond agreed schedule, liquidated damages @ 0.5% per week subject to maximum of 5% of aggregate contract value shall be deducted from the Bidder's bills.	As per specification.
8.	Cl. No. 9/ special conditions of specifications/ Pg. 85 of 711	**PAYMENT:** (a) 80% payment of supplied equipment after completion of the foundation of equipment. (b) 10% payment after erection of equipment. (c) Balance 10% amount to be released after satisfactory commissioning of entire substation, 100% completion of all electrical and civil works, adjustment of liquidated damaged if any and issuance of taking over certificate.	We understand that 80 % payment shall be paid after equipment supply and completion of its respective foundation. Other items such as earthing material, lighting material, cabling material, testing equipments, conductors, busbar material, oil filtration plant Firefighting material, PLCC and FOTE equipments etc. which is not linked with civil foundations shall be paid by UPPTCL within 30 days from receipt of such material at site. Please confirm our understanding.	Please refer Cl. No. 9.1.1 Note V of the specification. In the items where foundation is not required, 80% payment shall be released subject to completion of pre-required works.
9.	General	**Taxes and Duties**	We understand that Labour Cess shall be reimbursed by the owner to Bidder on complete package.	UPPTCL shall be entitled to deduct Income tax, labor cess and other taxes at source in accordance with provisions of Income tax/ other taxation laws as applicable from time to time.
10.	Cl.3.1/ SPECIAL CONDITIONS OF SPECIFICATIONS / Pg 80 of 711and	The Contract for construction of above 1500MVA ICT and associated 765 & 400kV Transformer bays on the basis of single work contract on single source responsibility, on turnkey basis shall be awarded.	We would like to inform you that, tender specifications (Clause no. 3.1), mention nature of contract, as single work contract on single source responsibility, on turnkey basis shall be	As per specification.

	Cl.31.2/ SPECIAL CONDITIONS OF SPECIFICATIONS / Pg 101 of 711.	The titles of equipment and material, supplied by Bidder or Sub-Bidder to UPPTCL, shall pass on to UPPTCL on ex-works dispatch basis.	awarded. However, Cl. No 31.2 mention transfer of title shall passed on to UPPTCL on ex-works dispatch basis. We would like to clarify that, this shall be applicable only in case of divisible contract, i.e. wherein UPPTCL shall be issuing separate contract for supply portion and service portion. Accordingly, understand that, in line with clause no 3.1, as this contract is a Single work contract, the transfer of title shall pass on to UPPTCL on completion of works. Please confirm our understanding.	
11.	SPECIAL CONDITIONS OF SPECIFICATIONS/ Cl. No. 31.2 / Pg. 101 of 711	……The Bidder shall provide the Purchaser with a copy of all insurance policies and documents taken out by him in pursuance of the contract. Such copies of the documents shall be submitted to the Purchaser immediately after such insurance coverage is taken The Bidder shall also inform the Purchaser in writing at least sixty (60) days in advance, regarding the expiry, cancellation and/or change in any of such documents and insure revalidation/ renewal etc. as may be necessary well in time.	**We request to modify this clause as suggested below.** "The Bidder shall provide the Purchaser with a ~~copy~~ Certificate of all insurance policies and documents taken out by him in pursuance of the contract. Such ~~copies~~ certificates of the documents shall be submitted to the Purchaser immediately after such insurance coverage is taken The Bidder shall also inform the Purchaser in writing at least sixty (60) days in advance, regarding the expiry, cancellation and/or change in any of such documents and insure revalidation/ renewal etc. as may be necessary well in time.	As per specification.
12.	SPECIAL CONDITIONS OF SPECIFICATIONS/ Cl. No. 33.2 / Pg. 102 of 711	The Bidder shall further guarantee that, if he goes out of production of spare parts then he will make available blue prints, manufacturer's drawings of spare parts and specifications of materials and any other details sufficient for manufacture of such spare parts at no cost to the Purchaser, to enable the Purchaser to fabricate or procure spare parts from other sources. Such fabrication or procurement of spares shall not constitute any infringement to the patent rights of the Bidder/Sub-Bidder and shall not subject the Purchaser to payment of any royalty or other pecuniary benefits etc. The Bidder will adopt modern and efficient spare parts management system during the entire period since receipt of the spares at site.	With respect to the requirement of sharing all drawing and technical information of spares – However, we would like to inform you that, we can only share non-proprietary drawings. We request to please accept the same.	As per specification.
13.	SPECIAL CONDITIONS OF SPECIFICATIONS/ Cl. No. 41/ Pg. 105 of 711	**REPLACEMENT OF DEFECTIVE PARTS/ EQUIPMENTS/WORKS & RECTIFICATION OF DEFECTS:** In case any defect is discovered at site after taking over of the Substation by the Purchaser in the materials supplied or works done by Bidder, the Bidder at his own cost shall rectify the defect/ replace the equipment or	We would like to inform you that, the warranty period needs to be clearly specified. Please confirm if the warranty period will be as mentioned in clause 36 of the General Conditions for the Supply of Plant and the Execution of Works in Connection with the Schemes in the UPPTCL.	As per specification.

		material promptly as soon as informed by the Purchaser.		
14.	SPECIAL CONDITIONS OF SPECIFICATIONS/ Cl. No. 43.5/ Pg. 106 of 711	**DAMAGE OF EQUIPMENT DURING GUARANTEE PERIOD:** i) In case of damage of the equipment for which spare has been procured e.g. GIS modules and equipment such as CB, CTs, CVTs/PTs, isolators, LAs, SAS with relay and protection system etc., the damaged items shall be replaced by spare quantity already available with the contractor with the permission of Engineer of Contract. **The damaged equipment will be got replenished by the contractor on their own cost and the same shall be kept as spare after replenishment.** ii) In case of damage of the equipment for which spare has not been procured, the same shall be arranged by UPPTCL if available, to the contractors at site within a reasonable time on their demand. The same shall be installed by the contractors and the damaged equipment shall be got replenished from the manufacturer by the contractor. Such equipment shall be made available/ replenished to UPPTCL by contractor at a destination to be intimated by UPPTCL. It shall be the responsibility of the contractor to get the damaged equipment replenished within a reasonable period of time, failing which, the cost of equipment shall be deducted from pending liabilities/ bank guarantees.	We understand that if the equipment is damaged as a result of the negligence of the Purchaser, such replenishment shall be at the cost of the Purchaser. The warranties and remedies are conditioned upon (a) proper storage, installation (by properly certified installers or under the supervision of properly certified supervisors, if required), use, operation, and maintenance of Products, (b) Buyer keeping accurate and complete records of operation and maintenance during the warranty period and providing Seller access to those records, and (c) modification or repair of Products or Services only as authorized by Seller in writing. Failure to meet any such conditions renders the warranty null and void. Seller is not responsible for normal wear and tear.	As per specification.
15.	SPECIAL CONDITIONS OF SPECIFICATIONS/ Cl. No. 44/ Pg. 107 of 711	**WITHHOLDING OF PAYMENTS:** The Purchaser may withhold the whole or part of any payment due to the Bidder, for reasons including but not limited to the following : i) Non– furnishing of drawings, manuals, documents such as project implementation schedule, progress reports, dispatch intimations, packing lists, erection, testing, commissioning intimations, test reports etc. ii) Defective work not remedied or guarantees not met. iii) Claims filed against the Bidder. iv) Failure by the Bidder to make due payments for the material or labor employed by him. v) Damage to another Bidder directly employed by the Purchaser. vi) Insufficient progress. vii) Surplus material not returned. When the grounds for withholding payments are removed, payments of the amounts due to the Bidder shall be made by the Purchaser.	We request to modify this clause as suggested below. The Purchaser may withhold the whole or part of any payment due to the Bidder, for reasons including but not limited to the following : i) Non– furnishing of drawings, manuals, documents such as project implementation schedule, progress reports, dispatch intimations, packing lists, erection, testing, commissioning intimations, test reports etc. ii) Defective work not remedied or guarantees not met. iii) Claims **in relation to** –– filed against the Bidder. iv) Failure by the Bidder to make due payments for the material or labor employed by him. v) **Substantial** Damage to another Bidder directly employed by the Purchaser. vi) ~~Insufficient progress.~~ vii) Surplus material not returned. When the grounds for withholding payments are removed, payments of the amounts due to the Bidder shall be made by the Purchaser.	As per specification.
16.	FORM A / Clause 4/ Pg	**CONTRACT DRAWINGS**	We would like to inform you that, Purchaser shall	As per specification.

	189 of 711	Within a reasonable period of the notification by the Engineer to the Bidder of his approval of such drawings, three sets in ink on tracing cloth or ferrogalic prints mounted on cloth, of the drawings as approved shall be supplied to him by the Bidder and be signed by him and by the Bidder respectively and be thereafter deemed to be the "Contract Drawings". These drawings when so signed shall become the property of the Purchaser and be deposited with the Engineer, and shall not be departed from in any way whatso ever except by the written permission of the Engineer as hereinafter provided. During the execution of the works, one of the sets of drawings shall be available for reference on the site.	be given non-exclusive, non-transferable right to use the drawing under these Tender documents. The ownership in drawings, documents (all IP created or developed by contractor) shall remain vested with the Contractor. We request to please amend and confirm.	
17.	FORM A / Clause 7/ Pg 191 of 711	**Patent rights.** In the event of any claim or demand being made or action being brought against the Purchaser for infringement or alleged infringement of letters-patent n respect of any machine, plant, work or thing used or supplied by the Bidder under this Contract or in respect of any method of using or working by the Purchaser of such machine, plant, work or thing, the Bidder will indemnify the Purchaser against such claim or demand and all costs and expenses arising from or incurred by reasons of such claim or demand **PROVIDED THAT** the Purchaser shall notify that Bidder immediately any claim is made and that the Bidder shall be at liberty if he so desires with the assistance of the Purchaser if required but at the Bidder's own expenses, to conduct all negotiations for the settlement of the same or any litigation that may arise therefrom and **PROVIDED THAT** no such machine, plant, work or thing shall be used by Purchaser for any purpose or in any manner other than for which they have been supplied by the Bidder and specified under this Contract.	**We request UPPTCL to add below requested clause to clause 7:** Contractor shall have no obligation or liability with respect to any Claim based upon (a) Products or Services that have been modified, or revised, (b) the combination of any Products or Services with other products or services when such combination is a basis of the alleged infringement (c) failure of Purchaser to implement any update provided by Contractor that would have prevented the Claim, or (d) Products or Services made or performed to Purchaser's specifications. For avoidance of any doubt each party shall retain ownership of all intellectual property it had prior to the contract. All rights in and to products not expressly granted to Purchaser are reserved by contractor. All new intellectual property conceived or created by contractor in the performance of this contract, whether alone or with any contribution from Purchaser, shall be owned exclusively by contractor. Purchaser agrees to deliver assignment documentation as necessary to achieve that result.	As per specification.
18.	FORM A / Clause 12 / Pg 192 of 711	---------- The difference of cost, if any occasioned by any such variations, shall be added or deducted from Contract price as the case may require.	Request UPPTCL to Kindly make the suggested changes in said clause ---------- The difference of cost, if any occasioned by any such variations, shall be added or deducted from Contract price as the case may require **The Contractor shall be granted reasonable extension of time for effecting such variation.**	As per specification.
19.	FORM A / Clause 13 / Pg 193 of 711	**NEGLIGENCE** If the Bidder shall neglect to execute the work with due	We request to modify this clause as suggested below.	As per specification.

		diligence and expedition, or shall refuse or neglect to comply with any reasonable orders given him in writing by the Engineer in connexion with work,…… and the Purchaser shall be entitled to retain and apply any balance which may be otherwise due on the Contract by him to the Bidder such part thereof as may be necessary, to the payment of the cost of executing such work as aforesaid.	If the Bidder shall neglect to execute the work with due diligence and expedition, or shall refuse or neglect to comply with any reasonable orders given him in writing by the Engineer in connection with work, or shall contravene any provision of Contract the Purchaser may give ~~seven~~ 30 days' notice in writing to the Bidder, to make good the failure, neglect or contravention complained of and if the Bidder shall fail to comply with the notice within a reasonable time from the date of service thereof in the case of a failure, neglect, or contravention capable of being made good within that time, then and in such case the Purchaser shall be at liberty to employ other workmen and forth with perform such work as the Bidder may have neglected to do, or if the Purchaser shall think fit, it shall be lawful for him to take the work wholly, or in part out of the Bidder's hands and give it to another person on contract at a reasonable price or provided any other materials, tools, tackle or labour for the purpose of completing the work, or any part thereof, and in that event the Purchaser shall, ~~without~~ being responsible to the Bidder for fair **rental value** wear and tear of the same, ~~have the free use~~ of ~~all the~~ materials, tools, tackle, or other things which may be on the site, for use at any time in connection with the work ~~to the exclusion of any right of the Bidder over the same, and the Purchaser shall be entitled to retain and apply any balance which may be otherwise due on the Contract by him to the Bidder such part thereof as may be necessary, to the payment of the cost of executing such work as aforesaid.~~	
20.	FORM A / Clause 13 / Pg 193 of 711	**NEGLIGENCE** If the cost of executing the work as aforesaid shall exceed the balance due to the Bidder, and the Bidder fails to make good the deficiency the Purchaser may recover it from the Bidder in any lawful manner or the Purchaser may sell the said materials, tools, tackle or other things belonging to the Bidder, and the proceeds of such sale shall be applied towards the payment of such deficiency and the costs of and incidental to such sale and any balance remaining after crediting the same shall be paid to the Bidder on the certificate ofthe Engineer, provided that when all expenses, cost and charges incurred in the	We request to modify this clause as suggested below. If the cost of executing the work as aforesaid shall exceed the balance due to the Bidder, and the Bidder fails to make good the deficiency the Purchaser may recover it from the Bidder in any lawful manner ~~or the Purchaser may sell the said materials, tools, tackle or other things belonging to the Bidder, and the proceeds of such sale shall be applied towards the payment of such deficiency and the costs of and incidental to such sale and any balance remaining after crediting the same shall~~	As per specification.

		completion of the work are paid by the Bidder, all such materials, tools, tackle or other things remaining unsold shall be removed by the Bidder.	~~be paid to the Bidder on the certificate ofthe Engineer, provided that when all expenses, cost and charges incurred in the completion of the work are paid by the Bidder, all such materials, tools, tackle or other things remaining unsold shall be removed by the Bidder.~~ This clause implies lien on the Purchaser on the Equipments, material, tools and tackles brought by the Contractor at site for completing the Work. Lien cannot be agreed as the Contractor is giving Security Deposit, Guarantees, Warranty to safeguard the interest of the Purchaser in the Work.	
21.	FORM A / Clause 21 / Pg 190 of 711	**Liability for accidents and damage.** Until the plant is taken over is deemed to have been taken over as aforesaid, the Bidder shall also be liable for and shall indemnify the Purchaser in respect of all injury to person or damage to property resulting from the negligence of the Bidder or his workmen or sub Bidders or from defective design, or work, but not from other cause :	We request to modify this clause as suggested below. Until the plant is taken over is deemed to have been taken over as aforesaid, the Bidder shall also be liable for and shall indemnify the Purchaser in respect of all injury to **any third party** ~~person~~ or damage to **third party** property resulting from the negligence of the Bidder or his workmen or sub Bidders or from defective design, or work, but not from other cause. **Request you to please also add following clause in addition to above clause:** Purchaser (as an "Indemnifying Party") shall indemnify the Contractor (as an "Indemnified Party") from and against claims brought by a third party, on account of personal injury or damage to the third party's tangible property, to the extent caused by the negligence of the Indemnifying Party in connection with this Contract. In the event the injury or damage is caused by joint or concurrent negligence of Purchaser and Contractor, the loss or expense shall be borne by each party in proportion to its degree of negligence. For purposes of Contractor's indemnity obligation, no part of the Products or Site is considered third party property.	As per specification.
22.	FORM A / Clause 23 / Pg 197 of 711	**REPLACEMENT OF DEFECTIVE WORK OR MATERIALS.**	We request that, warranty for replaced items shall have a cut-off date beyond which all obligations of Contractor for warranty shall cease to exist. We cannot accept evergreen warranty clause under the agreement. The warranties and remedies are conditioned upon (a) proper storage, installation (by properly certified installers or under the supervision of properly certified	As per specification.

			supervisors, if required), use, operation, and maintenance of Products, (b) Buyer keeping accurate and complete records of operation and maintenance during the warranty period and providing Seller access to those records, and (c) modification or repair of Products or Services only as authorized by Seller in writing. Failure to meet any such conditions renders the warranty null and void. Seller is not responsible for normal wear and tear.	
23.	FORM A / Clause 24 / Pg 197 of 711	**DEDUCTIONS FROM CONTRACT PRICE.** Any sum of money due and payable, to the Bidder (including security deposit returnable to him) under this contract may be appropriated by the Purchaser and set off against any claim of the Purchaser for the payment of a sum of money arising out of or under any other contract made by the Bidder with the Purchaser.	We request, Recoveries of monies due should only be made/adjusted against/under the same contract. Please confirm.	As per specification.
24.	FORM A / Clause 30 / Pg 199 of 711	**Suspension of works.** The Purchaser shall pay to the Bidder all reasonable expenses incurred by the Bidder by reason of suspension of the works of delay in shipment by order in writing of the Purchaser or the Engineer unless such suspension shall be due to some default on the part of the Bidder or Sub-Bidder.	There is no recourse available to the Contractor for Suspension/ termination in case of non-payment or delayed payment. This is onerous. We request that the Contractor shall be entitled to suspend/ terminate the agreement for non-payment or delayed payment of amounts due to it under the Contract.	As per specification.
25.	FORM A / Clause 31 / Pg 199 of 711	**EXTENSION OF TIME FOR COMPLETION** The time given to the Bidder for despatch, delivery, erection or completion, as the case may be, shall be reckoned from the date of receipt by the Bidder of the order, together with all necessary information and drawings to enable the work to be put in hand In all cases in which progress shall be delayed by strikes, lockouts, fire, accident, defective materials, delay in approval of drawings or any cause whatsoever beyond the reasonable Control of the Bidder, and whether such delay or impediment shall occur before or after the time or extended time, for dispatch, erection or completion, a reasonable extension of time shall be granted.	We request that for delay attributable to the Purchaser, the contractor should also be granted reimbursement / adjustment of additional costs incurred due to such delay. Please confirm. Further to above request UPPTCL to add / modify the below clause as requested. In all cases in which progress shall be delayed by strikes, lockouts, fire, accident, defective materials, delay in approval of drawings or any cause whatsoever beyond the reasonable Control of the Bidder, **or any delay(s) not attributable to the Contractor, or any delay(s) due to the default by Purchaser** and whether such delay or impediment shall occur before or after the time or extended time, for dispatch, erection or completion, a reasonable extension of time shall be granted.	As per specification.
26.	FORM A / Clause 36 / Pg 201 of 711	**MAINTENANCE.** If it becomes necessary for the Bidder to replace or renew any defective parts of the plant under this clause, the provisions of the first paragraph of this clause shall apply the parts of the plant so replaced or renewed until the expiration of six months from the date of such replacement or renewal or until the end of	We request that warranty for replaced items shall have a cut-off date beyond which all obligations of Contractor for warranty shall cease to exist. We cannot accept evergreen warranty clause under the agreement. The warranties and remedies are conditioned upon (a) proper storage, installation (by properly certified installers or	As per specification.

		the above mentioned period of twelve months, whichever may be the later. If any defects be not remedied within a reasonable time the Purchaser may proceed to do the work at the Bidder's risk and expense, but without prejudice to any other rights which the Purchaser may have against the Bidder in respect of such defects	under the supervision of properly certified supervisors, if required), use, operation, and maintenance of Products, (b) Buyer keeping accurate and complete records of operation and maintenance during the warranty period and providing Seller access to those records, and (c) modification or repair of Products or Services only as authorized by Seller in writing. Failure to meet any such conditions renders the warranty null and void. Seller is not responsible for normal wear and tear.	
27.	FORM A / Clause 38 / Pg 202 of 711	**ARBITRATION**	As per the Arbitration Act the Arbitrator shall not be a related to either parties. We suggest that the sole Arbitrator be appointed by mutual consent of both the parties within 30 days of notice of such dispute, failing which the Arbitrator may be appointed as per the Arbitration and Conciliation Act. Kindly accept.	As per specification.
28.	Missing clauses	**SAFETY**	Contractor has no responsibility or liability for the pre-existing condition of Purchaser's equipment or the Site. Prior to Contractor starting any work at Site, Purchaser will provide documentation that identifies the presence and condition of any Hazardous Materials existing in or about Purchaser's equipment or the Site that Contractor may encounter while performing under this Contract. Purchaser shall disclose to Contractor industrial hygiene and environmental monitoring data regarding conditions that may affect Contractor's work or personnel at the Site. Purchaser shall keep Contractor informed of changes in any such conditions.	As per specification..
29.	Missing clauses	**Nuclear Use**	The Material/equipment/services sold by the Supplier are not intended for use in connection with any nuclear facility or activity, and the Purchaser warrants that it shall not use or permit other to use the material/equipment/services for such purpose, without advance written consent of Supplier. If in breach of this, any such use occurs, Supplier (and its parent, affiliate, suppliers and subcontracts) disclaims all liability for any nuclear or other damage, injury or contamination, and, in addition to any other rights of Supplier, Purchaser shall indemnify and hold Supplier (and its parent, affiliates and employees) harmless against all such liability. Consent of Supplier under this section to any	As per specification.

			nuclear use, if any, will be conditioned upon additional terms and conditions that Supplier determines acceptable for protection against nuclear liability.	
30.	Missing clauses	**GENERAL INDEMNITY**	Purchaser (as an "Indemnifying Party") shall indemnify the Contractor (as an "Indemnified Party") from and against claims brought by a third party, on account of personal injury or damage to the third party's tangible property, to the extent caused by the negligence of the Indemnifying Party in connection with this Contract. In the event the injury or damage is caused by joint or concurrent negligence of Purchaser and Contractor, the loss or expense shall be borne by each party in proportion to its degree of negligence. For purposes of Contractor's indemnity obligation, no part of the Products or Site is considered third party property.	As per specification.
31.	Missing Clause	**Limitation of Liability**	The total liability of Contractor for all claims of any kind arising from or related to the formation, performance or breach of this Contract, or any Products or Services, shall not exceed the Contract Price. Contractor shall not be liable for loss of profit or revenues, loss of use of equipment or systems, interruption of business, cost of replacement power, cost of capital, downtime costs, increased operating costs, any special, consequential, incidental, indirect, or punitive damages, or claims of Purchaser's customers for any of the foregoing types of damages. If Purchaser is supplying Products or Services to a third party, or using Products or Services at a facility owned by a third party, Purchaser shall either (i) indemnify and defend Contractor from and against any and all claims by, and liability to, any such third party in excess of the limitations set forth in this Clause, or (ii) require that the third party agree, for the benefit of and enforceable by Contractor, to be bound by all the limitations included in this Clause.	It should be read as below: SCC 47.0 LIMITATION OF LIABILITY The bidder shall take necessary insurance to indemnify third party risk arising out of the work and its operation to be done by him at his own cost. The bidder shall also take public liability and property damage liability insurance cover for the entire period of construction as well as operation and maintenance period. The aggregate liability of the Contractor to the Employer, whether under the Contract, in tort or otherwise, shall not exceed the total Contract price, provided that this limitation shall not apply to the cost of repairing or replacing defective equipment, or to any obligation of the Contractor to indemnify the Employer with respect to patent infringement.
32.	Missing Clause	**Termination**	Purchaser may terminate the Contract (or the portion affected) for cause if Contractor (i) becomes Insolvent/Bankrupt, or (ii) commits a fundamental breach of the Contract which does not otherwise have a specified contractual remedy, provided that: (a) Purchaser shall first	As per specification.

			provide Contractor with detailed written notice of the breach and of Purchaser's intention to terminate the Contract, and (b) Contractor shall have failed, within 30 days after receipt of the notice, to commence and diligently pursue cure of the breach. If Purchaser terminates the Contract pursuant to above mentioned clause, (i) Contractor shall reimburse Purchaser the difference between that portion of the Contract Price allocable to the terminated scope and the actual amounts reasonably incurred by Purchaser to complete that scope, and (ii) Purchaser shall pay to Contractor (a) the portion of the Contract Price allocable to Products completed, (b) lease fees incurred, and (c) amounts for Services performed before the effective date of termination. The amount due for Services shall be determined in accordance with the milestone schedule (for completed milestones) and rates set forth in the Contract (for work toward milestones not yet achieved and where there is no milestone schedule), as applicable or, where there are no milestones and/or rates in the Contract, at Contractor's then-current standard time and material rates. Contractor may suspend or terminate the Contract (or any affected portion thereof) immediately for cause if Purchaser (i) becomes Insolvent/Bankrupt, or (ii) materially breaches the Contract, including, but not limited to, failure or delay in Purchaser providing Payment Security, making any payment when due, or fulfilling any payment conditions.	
33.	Missing Clause	**Force Majeure**	Contractor shall not be liable or considered in breach of its obligations under this Contract to the extent that Contractor's performance is delayed or prevented, directly or indirectly, by any cause beyond its reasonable control, or by armed conflict, acts or threats of terrorism, epidemics, strikes or other labor disturbances, or acts or omissions of any governmental authority or of the Purchaser or Purchaser's contractors or suppliers. If a force majeure event occurs, the schedule for Contractor's performance shall be extended by the amount of time lost by reason of the event plus such additional time as may be needed to overcome the effect of the event. If	As per Form –A

			acts or omissions of the Purchaser or its contractors or suppliers cause the delay, Contractor shall also be entitled to an equitable price adjustment.	
COMMENTS WITH RESPECT TO TECHNICAL SPECIFICATION OF 500MVA ICT				
34.	General	1500MVA Transformer	In continuation to our endeavor for better tendering practices and to safeguard quality & reliability of Power Transformers and compliance to technical specification and offered performance parameters including losses, we as a manufacturer of Power Transformers having broad experience in the field would like to recommend the followings: a) We would also recommend to included clause for mandatory inspection by third party agency and testing of losses & other performance parameters at third party/ independent lab and /or testing in presence of third party agencies. b) We would also recommend to included clause for mandatory inspection by third party agency and testing of losses & other performance parameters at third party/ independent lab and /or testing in presence of third party agencies c) GTP for Transformers by definition means Guaranteed Technical Particulars and hence form part of Tech Guarantees to be given by a bidder. It does then have the same sanctity as that of Price schedule and thus as an extension to this understanding – we believe that incomplete GTP's submitted at tender stage would tantamount to a non-responsive bid and no further post bid clarifications shall be sought and bid would be hence summarily rejected. Requesting for your kindly confirmation on this	As per specification.
35.	General-Technical		Partial discharge level will be as per IEC:60076, Part-3. Requesting M/s UPPTCL to confirm the same.	As per applicable IEC.

36.	General		'GTP for Transformers means Guaranteed Technical Particulars and hence form part of Tech Guarantees to be given by a bidder. It does then have the same santity as that of Price schedule and thus as an extension to this understanding – we believe that incomplete GTP's submitted at tender stage would make bid to a non-responsive bid and no further post bid clarifications shall be sought and bid would be hence summarily rejected. Requesting M/s UPPTCL to confirm the same.	As per specification.
37.	2.2.1- Bara TPS Substation – Details of Bushing Current Transformers		We request M/s UPPTCL to please provide complete CT details.	Please visit the site. It will be decided at the time of detailed engineering as per requirement with the successful bidder.
38.	4.4- Transport		'Transformer oil shall be dispatch in oil tankers.	Please refer Cl. No. 4.3.9 at pg. 477.
39.	Schedule P	'1500MVA ICT-II & associated bays have to be erected, tested and commissioned within 12(twelve) months from the date of letter of intent or from the date of handing over of land whichever is later.	'Transformer requires 800kV bushings which is not locally made within india. Its lead time is 5-6 months, hence requesting M/s UPPTCL to extend the project completion time by 3-4 months.	As per specification.
40.	7.0 – prices	'The Prices of all the items and services quoted in the Price Schedules shall be shall remain "Fixed and Firm" in all respects during the currency of the contract.	'Please note that Transformers are cost intensive equipment dependent on the global rates of raw materials like CRGO, Copper, Oil, Insulation, etc.. As well as the exchange rates. Considering above and long Validity (6 months) & Completion period (>= 12Months) for this tender, it is impossible predict estimation of the cost escalation during tender validity/Contract execution period. We therefor request UPPTCL to allow bid on variable price basis as per IEEMA PV Formula without any ceiling for the complete Contractual Period with the base date of 1 month prior to the date of bid submission.	As per specification.
41.	General		'Kindly confirm, if there is any dimension restriction for transformers.	As per existing ICT-I..
COMMENTS WITH RESPECT TO TECHNICAL SPECIFICATION OF CRP and SAS				
42.	Page 662 of 711, Clause 2.2	In Bara TPS, the control and interface equipment for the new 400kV breaker will be located in the existing 400kV switchyard control and relay room. Existing bus bar protection at 400kV substation Bara TPS is to be modified to accommodate the new 400kV transformer bay	We understand the Bus-bar protection schme augmentation is required for 765kv & 400kV both the circuit breakers. Kindly confirm the make/model & type of existing bus-bar protection scheme.	765 & 400kV both side have One and a half breaker scheme. For more details please visit the site.
43.	Page 662 of 711, Clause 2.2	The main control room building will provide the central SAS control room for the whole site and will contain a dual operator work station conventional SAS computer control centre for the switchyards,	We understand the Sub-sation Automation system is already existing & augmentation of SAS is required for 765kv & 400kV both the circuit breakers.	Existing SAS is of M/s Schneider Electric.

		including data server, record storage and printing facilities. In addition to the work stations, one engineering laptop and secure docking station will be provided equipped with software to access all.	Kindly confirm the make/model & type of existing SAS.	
44.	Page 662 of 711, Clause 2.6	The control and relay panels for 400kV side of ICT#2 shall be placed in existing 400kV building. Any relay/panel required to match the existing protection scheme of ICT # 1 shall be provided by the contractor free of cost.	Kindly provide the existing protection Panel Construction, GA, Legend, Protection scheme of ICT # 1. Also please confirm if any CT switching scheme is required for ICT with existing bays/spare CT.	Please visit the site for details.
COMMENTS WITH RESPECT TO TECHNICAL SPECIFICATION OF Electrical				
45.	Section-IV, SLD	SLD	SLD is not legible properly. Kindly provide legible drg of SLD by showing present scope of bays.	Uploaded SLD is enough to understand scope of work.
46.	Section-V, Clause 32.0	Training	We understand Training is not envisaged, since it is not asked in price schedule. Please confirm.	BOQ is tentative. Training is the part of the Project.
47.	TS: Control, Metering and Protection. Clause 2.2	765kV Existing Busbar protection Augmentation.	We understand, 765kV existing Busbar protection augmentation is not envisaged in present bidder's scope since no new 765kV CB's are going to add. Please confirm.	765kV CBs are already erected. Commissioning of the same is to be done by the successful bidder.
48.	TS: Control, Metering and Protection. Clause 2.2	400kV Existing Busbar protection Augmentation.	Please confirm whether existing 400kV Bus bar protection scheme is single or duplicated.	Duplicated. Bus Bar Protection: PUA; Micom P743 Bus Bar Protection: PUB; Micom P743
49.	TS: Control, Metering and Protection. Clause 2.2	400kV Existing Busbar protection Augmentation.	Price schedule line item is missing for 400kV existing Busbar protection augmentation.	400kV line is not to be emanated. 400kV side of ICT-II is to be connected to 400kV Bus only.
50.	TS: Control, Metering and Protection. Clause 2.6	Any relay/panel required to match the existing protection scheme of ICT # 1 shall be provided by the contractor free of cost.	We understand, new ICT protection panel scheme shall be matched with existing ICT scheme. Whereas new panel relays can be of different make/model than existing panel relays, meeting the technical specification requirements. Please confirm.	Confirmed.
51.	TS: Control, Metering and Protection. Clause 4.4	Metering	Referred clause calls for energy meters for each 765kV Lines & 400kV side of ICT. We understand, since line bays are not in present scope, bidder to provide main & check meters only on 400kV side of ICT bay under present scope. Please confirm.	As per requirement & existing system.
52.	TS: Control, Metering and Protection. Clause 4.5.6	Tee Bus Protection for the 1 ½ Switch Breaker Station Configuration	We understand, Tee Bus protection for 765kV side is already available & not included in present bidder scope, Since 765kV complete dia is already existing. Please confirm.	On 765kV side only LA and disconnector are to be erected and connected & to be commissioned with already existing system.
53.	Supply Schedule (Q1) Sl no 8110P (a)	Control & relay panels 400kV along with 6 nos main relays+aux relays – 2 nos.	Relays quantity mentioned under this line item of price schedule is not clear. We understand, bidder to consider two nos of 400kV CB relay panels (one for main bay & another for tie bay). Please confirm.	Confirmed. Details of existing relays for ICT-I 400kV Side Bus Bar Protection: PUA ; Micom P743 Bus Bar Protection: PUB ; Micom P743 Overhead Diff. Prot.: 87 OHM 1; Micom P643

				Overhead Diff. Prot.: 87 OHM 2; Micom P643 Bay Control Unit: BCUT; Micom C264 LBB Protn. 50LBB; Micom P141
54.	Supply Schedule (Q1) Sl no 8110P (b)	Control & relay panels 765kV along with 6 nos main relays+aux relays; (one panel with 4 nos of main relays+aux relays exists) – 1 no.	Relays quantity mentioned under this line item of price schedule is not clear. We understand, bidder to consider one no of 765/400kV ICT protection panel(for HV+LV) panel. Further 765kV side CB relay panels are existing. Please confirm bidder's understanding is correct.	One panel is required and other panel with 4nos of main relay out of 6 + aux. relays exists. For more clarity please visit the site. Details of existing relays for ICT-I 765kV Side Main-1 BB Protn. PUA; Micom P743 Main-2 BB Protn. PUA; Micom P743 M-1 Transfo. Diff. Protn. 87T1/67/67N; Micom P643 M-2 Transfo. Diff. Protn. 87T2; Micom P643 Bay Control Unit BCUT; Micom C264 LBB Protn. 50LBB; Micom P141
55.	Annexure-1/A/4	Installation and commissioning of 01 no. 765/400kV 1500MVA Transformer alongwith completion of associated 765 & 400kV Transformer bays at existing 765/400kV Substation, Bara TPS, (U.P.)	Please furnish the existing substation plot layout, equipment layout of existing 765 kV and 400 kV substations.	It will be made available to successful bidder.
56.	Annexure-1/A /4	Installation and commissioning of 01 no. 765/400kV 1500MVA Transformer alongwith completion of associated 765 & 400kV Transformer bays at existing 765/400kV Substation, Bara TPS, (U.P.)	Please furnish the existing 765 and 400 kV substation equipment layout, plan and section drawings and conductor details for main bus, jack bus equipment connection etc.	It will be made available to successful bidder.
57.	Annexure-1/A /4	Installation and commissioning of 01 no. 765/400kV 1500MVA Transformer alongwith completion of associated 765 & 400kV Transformer bays at existing 765/400kV Substation, Bara TPS, (U.P.)	Please furnish the proposed plot layout for installation of new transformer bay.	Land for proposed bays are available.
58.	Annexure-1/A vii/4	Work Details Vii Fire protection system	Please furnish the existing 765 and 400 kV substation fire protection layout.	It will be made available to successful bidder.
59.	Annexure-1/A x/4	Work Details x. Junction boxes and lighting fixture	Please furnish the outdoor illumination layout including street lighting for existing 765 kV and 400 kV substation.	It will be made available to successful bidder.
60.	Annexure-1/A vi/4	Work Details Vi. Power and control cables	Please furnish the cable trench layout of existing 765 kV and 400 kV substation.	It will be made available to successful bidder.
61.	Annexure-1/A vi/4	Work Details Vi. Power and control cables	We understand for outdoor substation cable trench, power, control and instrumentation cables can be laid on angle supports. Please confirm our understanding.	As per site requirement and existing system.
62.	Annexure-1/A vi/4	Annexure-1/A vi/4	We understand main earth mat exists under the proposed area for new bays at 765 kV and 400 kV substation. Bidder's scope will be to extend the underground risers from main mat for equipment connection. Please confirm our understanding.	Confirmed
63.	Annexure-1/A/4	Work Details	Please furnish the existing 765 kV and 400 kV	It will be made available to successful bidder.

			substation earthing layout.	
64.	Annexure-1/A/4	Work Details Xi.Control, metering and protection	Please furnish the protection SLD of existing 765 kV S/S and 400 kV S/S.	It will be made available to successful bidder.
65.	Annexure-1/A vi/4	Work Details Vi. Power and control cables	Please furnish the existing control room layout of 765 kV and 400 kV substations.	It will be made available to successful bidder
66.	Annexure-1/A vi/4	Work Details Vi. Power and control cables	Please furnish the distance between existing control room of 765 kV and 400 kV substation and proposed new transformer bay.	Approx. 200-300m
67.	Annexure-1/A vi/4	Work Details Vi. Power and control cables	We understand adequate space is available in existing control room to accommodate the new bay equipment if any. No extension of existing control room is envisaged. Please confirm our understanding.	Confirmed.
68.	Annexure-1/A vi/4	Work Details Vi. Power and control cables	We understand the main cable trench and associated cable support system from outdoor bay to control room for 765 kV and 400 kV substations has adequate space to accommodate the new bay cables. Please confirm our understanding.	Cable trays are not available in 400kV S/s but angle supports and space are available in 400kV Cable trench.
69.	Annexure-1/A/4	Work Details xi. Control, metering and protection	We understand new AC kiosk (1no.) of adequate side to be considered for housing the control and protection panels of new half dia. of 400 kV S/S. Please confirm our understanding.	Confirmed. AC kiosk (BMK) for 400kV will be installed outside.
70.	Annexure-1/A/4	Work Details xi. Control, metering and protection	We understand existing AC kiosk of existing 765 kV GT-2 , tie , ICT-2 dia has sufficient space to accommodate the ICT-2 bay CRP equipment. Please confirm our understanding.	Confirmed
71.	Scope of work/3.2 ii/9	Foundation for lighting poles, panels, and control cubicles of equipment wherever required.	We understand the proposed new bay area in 400 kV and 765 kV substation is covered in existing lighting system and no separate lighting cum lightning mast to be envisaged. Please confirm our understanding.	Lighting in 765kV & 400kV Bay area will be in bidders scope.
72.	Scope of work/3.2 ii/9	Foundation for lighting poles, panels, and control cubicles of equipment wherever required.	We assume existing Bay marshalling kiosk for existing 765 kV GT-2, tie , ICT-2 dia has sufficient spare feeders of adequate rating to cater to the new bay AC power supply requirement and no separate Bay marshalling kiosk to be envisaged for same. Please confirm our understanding.	Confirmed.
73.	Scope of work/3.2 ii/9	Foundation for lighting poles, panels, and control cubicles of equipment wherever required.	Please furnish the existing 765 kV and 400 kV substation overall Direct stroke lightning protection layout. We understand the proposed new bay area at 765 kV and area for new transformer yard is covered under existing lightning protection arrangement. No separate lightning protection system is to be considered for same. Please confirm our understanding.	It will be made available to successful bidder. Separate lightning protection system is to be considered as per requirement and existing system.

74.	Scope of work/3.2 ii/9	Foundation for lighting poles, panels, and control cubicles of equipment wherever required.	We understand for 400 kV new half, direct stroke lightning protection of bay equipment and AC kiosk to be achieved through bay shield wires only. No separate lightning mast is to be considered for same. Please confirm our understanding.	Confirmed. Separate lightning mast is to be considered as per site requirement.
75.	Annexure-1/A/4	Design, Engineering, Erection, Testing & Commissioning of 01 no. 765/400kV 1500MVA Transformer	Please furnish the existing substation ICT transformer yard layout and existing single phase transformer neutral formation arrangement drawing.	It will be made available to successful bidder.
76.	Annexure-II/SLD	765 kV SLD	As per referred 765 kV SLD and bay demarcation shown therein, we understand the new transformer bay will get accommodated within the existing bays. So no bus work is to be envisaged for same. Please confirm our understanding.	Confirmed but connection to the main bus to be done as per requirement.
77.	Annexure-II/SLD	400 kV SLD	As per referred 400 kV SLD and bay demarcation shown therein, we understand the new transformer bay will be adjacent to the existing bays and hence no extension of main bus up to the proposed new bay to be envisaged. Please confirm our understanding.	Confirmed.
78.	Annexure-II/SLD	400 kV SLD	As per referred 400 kV SLD and bay demarcation shown therein, we understand the new transformer bay will be adjacent to the existing bays and the existing main bus towers are suitable for new bay bus bar extension. Please confirm our understanding.	Confirmed.
79.	Annexure-1/A/4	Work Details xi. Control, metering and protection	We understand existing 220 V DC system has sufficient capacity and feeders to accommodate the new bay and new dia requirement at 765 and 400 kV substation. Accodingly no new DC batteries and extension DCDB is envisaged. Accordingly the same is not reflected in price schedule and scope of work. Please confirm our understanding.	Confirmed.
80.	Annexure-1/A/4	Work Details LV and MV substation switchgear	We understand existing AC distribution system has adequate capacity and rating of feeders to accommodate the new transformer bay requirement. Hence no extension ACDB is to be envisaged. Only sub distribution boards as per requirement and bay marshalling kiosk for 400 kV half dia to be considered in present scope. Please confirm our understanding.	Confirmed.
COMMENTS WITH RESPECT TO CIRCUIT BREAKER				
81.	Clause No. 2.1.2.8	Circuit Breaker	Please confirm the actual applicable rated current.	3150A

82.	Clause No. 2.1.2.9 .(a), 2.1.2.9.(b)	Circuit Breaker	Please confirm the actual applicable short-time withstand current.	50kA
83.	Clause No. 2.1.2.17	Circuit Breaker	Radio interference voltage shall be less than 2500 µV which is acceptable as per IEC. Please Confirm	As per existing requirement & applicable IEC.
84.	Clause No. 2.1.4.1	Circuit Breaker	We provide contactors for anti-pumping function which are performance proven for the intended application which is in line with Cl. No. 4.6.1 of technical specifications. Please Confirm	As per existing requirement.
85.	Clause No. 2.1.4.4	Circuit Breaker	SF6 gas density monitor/pressure gauge has alarm & lockout contacts shall be wired up to terminal blocks for remote alarms/indications which is in line with Cl. No. 4.6.1 of technical specifications. Please Confirm	As per existing requirement.
86.	Clause No. 4.2	Circuit Breaker	We recommend pre-insertion resistor (instead of point-on-wave controller) for line switching function which is performance proven for the intended application. The offered point-on-wave controller shall be suitable for reactor & transformer switching functions only. Point-on-wave controller shall drive only 3 close coils & 3 trip coils. As per IEC, critical current does not exist for the offered Circuit Breakers and hence, not applicable.	As per existing scheme & requirement.
87.	Clause No. 4.3	Circuit Breaker	Trip circuit supervision relay shall be excluded from Circuit Breakers' scope of work. Please Confirm	As per existing scheme & requirement
88.	Clause No. 4.6.6 and 4.8	Circuit Breaker	We do not recommend mandatory maintenance equipment. Please Confirm	Confirmed.
89.	Clause No. 4.7.1	Circuit Breaker	Type test reports shall be less than 10 years old as on the date of opening of technical bids at UPPTCL. Please Confirm In addition to this Low & high temperature tests, static terminal load tests, critical current tests & humidity test are not applicable as per IEC. Please Confirm	As per specification and applicable IEC.
90.	Clause No. 4.9	Circuit Breaker	In addition to items listed in bid price schedule, we do not recommend spare parts & tools.. Please Confirm	Confirmed.
91.	Schedule of Price, Tender SLD	Circuit Breaker	Equipment quantities in Bid Price Schedule are not in line with those indicated in the Tender SLD. Please Confirm	It is as per SLD and existing scheme. For more clarity please please visit the site.
COMMENTS WITH RESPECT TO TECHNICAL SPECIFICATION OF CIVIL				
92.	bara_ts Page No :244 Clause No 2.1.4.f	Transformer and shunt reactor foundations, fire walls, oil recuperation basins and oil pits	We understand that, reactor foundation is not in scope. Please confirm.	Confirmed.

93.	bara_ts Page No :244 Clause No 2.1.4.h	Access and internal roads, for the shunt reactors/ transformers, Circuit Breakers and Control rooms inside switchyards and drainage ditches in the substation area and paved areas	We understand that, any kind of construction of approach / access road has been excluded from bidder's present scope. Please confirm	Confirmed.
94.	bara_ts Page No :244 Clause No 2.1.4.h	Access and internal roads, for the shunt reactors/ transformers, Circuit Breakers and Control rooms inside switchyards and drainage ditches in the substation area and paved areas	We understand that, any kind of construction of control room has been excluded from bidder's present scope. Customer will provide the space in the existing Control Room. Please confirm	Confirmed.
95.	bara_ts Page No :244 Clause No 2.1.4.l	Open storage area fully covered from all sides with one gate.	Kindly provide the specification of open store to be considered in scope..	To be provided to successful bidder.
96.	bara_ts Page No :293 Clause No 2.4.5	Telephone, fax and Internet connections (high speed wire-less modem and broadband at site office)	Kindly confirm the Capacity & duration i.e. for how many months or years the service is required or we have to provide "Telephone, fax and Internet connections (high speed wire-less modem and broadband at site office	Not required.
97.	bara_ts Page No :303 Clause No 4.1.4.e	Grating; Standards galvanized steel bar grating with bearing bars at 30 mm c/c cross bars at 100 mm c/c.	Kindly confirm the diameter of bars to be used at Gratings.	As per design.
98.	bara_ts Page No :303 Clause No 5.4.c Page No :326 to 331 – BPS	Design Mix M25 or M30 Cement concrete with design reinforcement only shall be used in top layer.	We haven't found any line item for M25 & M30 in the provided BPS form Page no 326 to 331 except M20 or 1:1.5:3. If M25 or M 30 need to be considered in scope, then request to amend the BPS accordingly	Only M 20
99.	bara_ts Page No :325 Clause No 8.1.5	The firewall shall be made of reinforced concrete (M-30 grade).	No line item is available in the BPS. Request to amend the BPS as construction of Firewall is under present scope of work .	Only M 20
100.	Page No :326 to 331 – BPS Part –II	1:1.5:3 Construction of wall	No line item is available for construction of 1:1.5:3 wall. Request you to amend the BPS.	Only M 20
101.	Page No :328 Item No 25, 28 & 32	Supply of 28 mm. diameter M.S. Anchor bolts Supply of 25 mm diameter.M.S. Anchor bolts	In BPS only 25 and 28 Diameter foundation Bolts have been specified , If any other dia Bolt shall be required as per design requirement i.e 16 mm, 42, 56 mm etc. we request upptcl to clarify the mode of measurement.	As per site requirement.
102.	General	RCC grade M 20 / 1:1.5:3	Please clarify, Codal provision recommends to use Concrete grade Minimum M 25 for 765 / 400 kV. However BPS calls only 1:1.5:3. If other grade is require then request you to kindly clarify method of measurement.	Only M 20
103.	General	Geotech Investigation Report	Since the site is existing site and carry out pre-bid stage investigation is difficult at existing Power plant, request you to provide the Geo tech investigation for ease of tender stage engineering.	Not required.
104.	General	Existing drawing:	Kindly provide the existing drawings:	It will be made available to successful bidder.

		1. Road Layout 2. Cable Trench Layout 3. Drainage System	1. Road Layout 2. Cable Trench Layout 3. Drainage System	
105.	General	Plot Plan Drawing	Kindly provide the existing Plot Plan drawing	Land for proposed bays is available. Drawings will be made available to successful bidder.
106.	General	Design & drawing	Since the scope work is existing, we understand all drawing and design of Civil related item will be made available by customer during execution stage. Please confirm.	Confirmed.
107.	Schedule_of_Price_bara	Erection (Q2) Drawing of 4fTB	Kindly provide the existing drawing of 4FTB gantry including the beam.	It will be made available to successful bidder.
108.	Schedule_of_Price_bara	Erection (Q2) Line item of 400 kV Tower & Gantry	Since no line item is available for 400 kV Gantry tower & Beam, we understand that the same work is excluded form Bidder's present scope.	As per requirement and existing system.

1.			Copy of Electrical Layout Plan and Section, Copy of Cable trench Layout, Details of Soil investigation report and pile details, Copy of SLD, Details of existing Earthmat, Details of existing CRP and SAS make, Copy of existing ICT foundation Drawing etc.	It will be made available to successful bidder.

Note: Further no time extension shall be given for submitting the tender Part-I and no further queries will be replied.

765KV ICT UNEQUIPED BAY CONTROL PANEL
(BAY #704)

LIST OF DOCUMENTS

DRG. NO	PPGCL DRG. NO	L&T DRG. NO	DESCRIPTION.	REVISION.	DATE	ISSUE
3269PN587-GL-14	PPGCL DRG. NO:	L&T DRG. NO:	GENERAL ARRANGEMENT & LEGEND	C	20-06-2014	FOR APPROVAL
3269PN587-S-14	PPGCL DRG. NO:	L&T DRG. NO:	SCHEMATIC DRAWINGS	C	20-06-2014	FOR APPROVAL

LIST REFERENCE DOCUMENTS:

SI.NO	CIRCUIT	REFERENCE
1	ISOLATOR	012213-E-SY-SY-VD-0051 REV-A
2	PLD	012213-E-SY-SY-1L-0140_REV A
3	CB	012213-E-SY-SY-VD-0047 REV-B
4	CT	IHYT90183_ 024/001 REV H
5	CVT	012213-E-SY-SY-VD-0060 REV-A

Schneider Electric Infrastructure Ltd
CHENNAI , INDIA

PANEL TYPES : +704AT

CUSTOMER: PRAYAGRAJ POWER GENERATION COMPANY LTD.

CONSULTANT: TATA CONSULTING ENGINEERS LTD.

CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION

PROJECT: PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA

PO. No & Date: L&T/PT&D/SS/JAYPEE-BARA/01
DATED :27.03.2013

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SHEET	DESCRIPTION
000	INDEX SHEET
001	GENERAL ARRANGEMENT: +704AT
002	BILL OF MATERIAL: +704AT
003	BILL OF MATERIAL: +704AT
004	BILL OF MATERIAL: +704AT
005	BILL OF MATERIAL: +704AT
006	BILL OF MATERIAL: +704AT
007	BILL OF MATERIAL: +704AT

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PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013

CONSULTANT: TATA CONSULTING ENGINEERS LTD.
CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION
PPGCL DRG. NO:
L&T DRG. NO:

Schneider Electric

TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) INDEX SHEET

PREPARED : GD
REVIEWED : THY
APPROVED : APS
REVISION: C
DATE: 20-06-2014
SHT :000
CONT: 001
DRG. NO.: 3269PN587-GL-14

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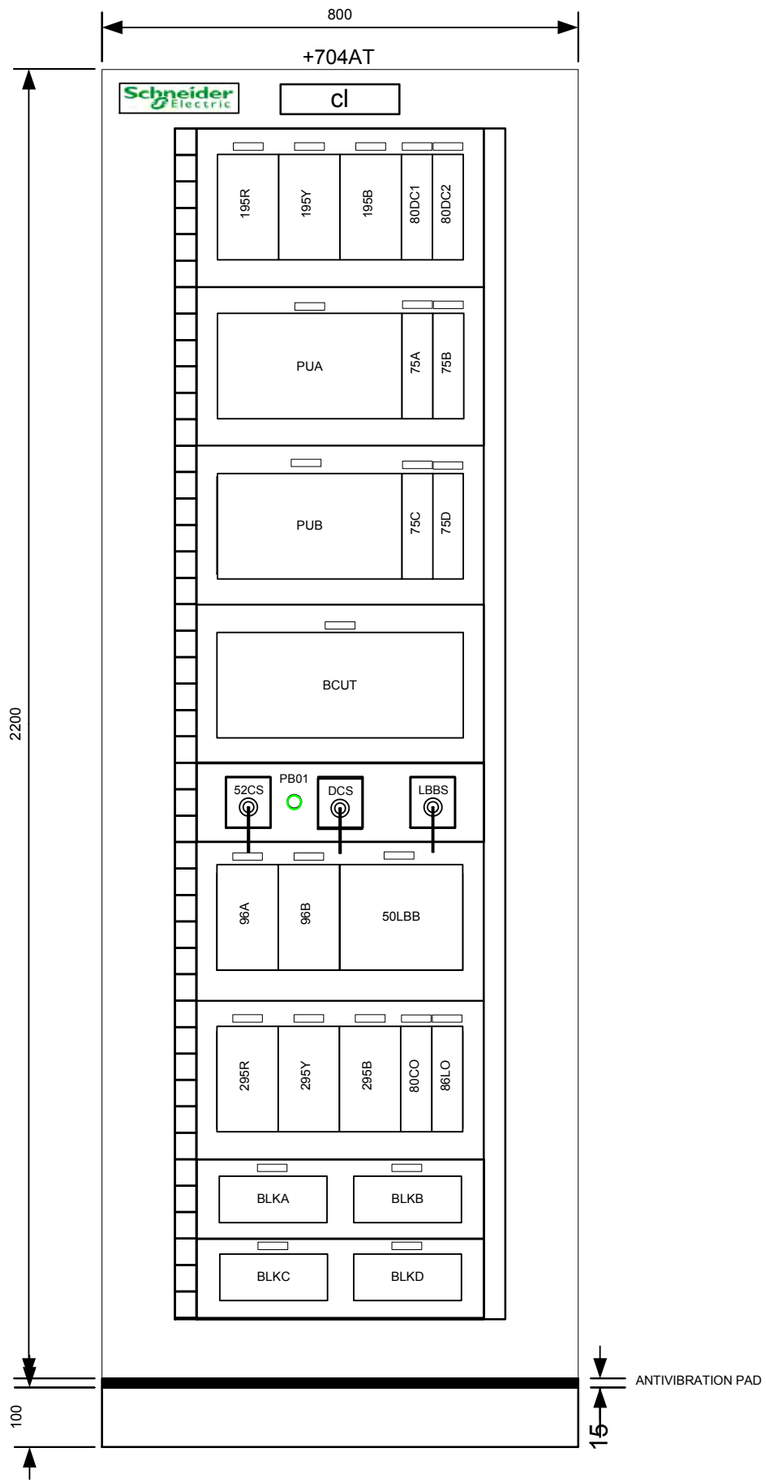

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704)** **GENERAL ARRANGEMENT: +704AT FRONT VIEW**	PREPARED : GD REVIEWED : THY APPROVED : APS DATE: 20-06-2014 REVISION: C SHT :001 CONT: 002
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**DRG. NO.: 3269PN587-GL-14**

FRONT VIEW EQUIPMENTS (+704AT) :

DESIGNATION	MANUFACTURER	MATERIAL	DESCRIPTION	COMMENT
BCUT	SCHNEIDER ELECTRIC	C264M11M691001340400003111 1N10	BAY CONTROL UNIT WITH CT/VT MODULE, AUX VOLT: 220V DC, DIGITAL INPUT MODULE: 4(TOTAL 64 INPUTS) , DIGITAL OUTPUT MODULE: 4 (TOTAL 40 OUTPUTS), ETHERNET BASED SWITCH:SW202 WITH TWO FO MULTIMODE (ST) & 4 RJ45,PROTOCOL: IEC61850,CASE: 80TE WIITH INBUILT FUNCTIONS OF AUTO RECLOSE & CHECK SYNCHRONOZING FEATURE	BAY CONTROL UNIT
PUA	SCHNEIDER ELECTRIC	P743311A1M0518K	BB PROTN. AUX VOTL: 110V-250V DC/100-240V AC, INOM:1A/5A, OPTO I/P: 24, O/P CONTACT: 16, PROTOCOL:COURIER (K-BUS), PROTN.COMM. B/W CU & PU IS THROUGH ETHERNET WITH SPEED OF 100Mbit/s , CASE: 60TE, MOUNTING: PANEL. (850nm MULTIMODE FO WITH ST CONNECTOR FOR CONNECTION B/W PU &CU)	B/B PROTN. PERIPHERAL UNIT
PUB	SCHNEIDER ELECTRIC	P743311A1M0518K	BB PROTN. AUX VOTL: 110V-250V DC/100-240V AC, INOM:1A/5A, OPTO I/P: 24, O/P CONTACT: 16, PROTOCOL:COURIER (K-BUS), PROTN.COMM. B/W CU & PU IS THROUGH ETHERNET WITH SPEED OF 100Mbit/s , CASE: 60TE, MOUNTING: PANEL. (850nm MULTIMODE FO WITH ST CONNECTOR FOR CONNECTION B/W PU &CU)	B/B PROTN. PERIPHERAL UNIT
50LBB	SCHNEIDER ELECTRIC	P14131LN6M0468J	LOCAL BREAKER BACKUP PROTN., AUX VOTL: 110-250V DC/100-240V AC, INOM:1A/5A, VNOM:100-120V AC, OPTO I/P: 8, O/P CONTACT: 8,PROTOCOL: IEC61850 OVER EHERNET AND COURIER VIA REAR K-BUS/RS485,HARDWARE:REDUNDANT ETHERNET DUAL-HOMMING STAR,2 MULTI-MODE FIBRE PORTS+MODULATED IRIG-B, CASE: 40TE, MOUNTING: PANEL	LOCAL BREAKER BACKUP PROTN
75A	ALSTOM	MVAJM14JB1000A	CONTACT MULTIPLICATION RELAY 10M ER : FLAG-YES : 220-250V DC WD:01MVAJM14001	VT SELECTION RELAY
75B	ALSTOM	MVAJM14JB1000A	CONTACT MULTIPLICATION RELAY 10M ER : FLAG-YES : 220-250V DC WD:01MVAJM14001	VT SELECTION RELAY
75C	ALSTOM	MVAJM14JB1000A	CONTACT MULTIPLICATION RELAY 10M ER : FLAG-YES : 220-250V DC WD:01MVAJM14001	VT SELECTION RELAY
75D	ALSTOM	MVAJM14JB1004A	VT SELECTION RELAY 6M 4B ER : FLAG-YES : 220-250V DC WD:01MVAJM14001	VT SELECTION RELAY
80CO	ALSTOM	MVAAM11B1BA2530A	AUXILIARY RELAY, 2M 2C SR : FLAG-YES : 110-125 / 220-250V DC WD:Z1MVAAM11001SHT1	DC CHANGE OVER RELAY
80DC1	ALSTOM	MVAAM11B1CJ5516A	DC SUPERVISION RELAY, 2M 2C FLAG-REV : 110-125 / 220-250V AC/DC SLUG: 100ms TDDO WD:Z1MVAAM11014	DC-1 SUPERVISION RELAY
80DC2	ALSTOM	MVAAM11B1CJ5516A	DC SUPERVISION RELAY, 2M 2C FLAG-REV : 110-125 / 220-250V AC/DC SLUG: 100ms TDDO WD:Z1MVAAM11014	DC-2 SUPERVISION RELAY
96A	ALSTOM	MVAJ205LA1002A	HIGH SPEED TRIP RELAY, HI BURDEN : FLAG-YES : 220/250V DC : 18M 2B ER/HR WD:01 MVAJ 205 01	GROUP-A BB TRIP RELAY
96B	ALSTOM	MVAJ205LA1002A	HIGH SPEED TRIP RELAY, HI BURDEN : FLAG-YES : 220/250V DC : 18M 2B ER/HR WD:01 MVAJ 205 01	GROUP-B BB TRIP RELAY
86LO	ALSTOM	MVAJ105JA1002A	HIGH SPEED TRIP RELAY, 220-250V DC: ELECTRICAL/HAND RESET: 8M + 2B CONTACT CONFIG: CASE SIZE:2	86LO TRIP RELAY
195R	ALSTOM	MVAXM31D1CE3005A	TRIP CIRCUIT SUPERVISION RELAY, 1M 2B SR : FLAG-REV : 220-250V DC WD:01MVAXM31001	TRIP CIRCUIT-1 "R" PH SUPERVISION.
195Y	ALSTOM	MVAXM31D1CE3005A	TRIP CIRCUIT SUPERVISION RELAY, 1M 2B SR : FLAG-REV : 220-250V DC WD:01MVAXM31001	TRIP CIRCUIT-1 "Y" PH SUPERVISION.
195B	ALSTOM	MVAXM31D1CE3005A	TRIP CIRCUIT SUPERVISION RELAY, 1M 2B SR : FLAG-REV : 220-250V DC WD:01MVAXM31001	TRIP CIRCUIT-1 "B" PH SUPERVISION.
295R	ALSTOM	MVAXM31D1CE3005A	TRIP CIRCUIT SUPERVISION RELAY, 1M 2B SR : FLAG-REV : 220-250V DC WD:01MVAXM31001	TRIP CIRCUIT-2 "R" PH SUPERVISION.
295Y	ALSTOM	MVAXM31D1CE3005A	TRIP CIRCUIT SUPERVISION RELAY, 1M 2B SR : FLAG-REV : 220-250V DC WD:01MVAXM31001	TRIP CIRCUIT-2 "Y" PH SUPERVISION.
295B	ALSTOM	MVAXM31D1CE3005A	TRIP CIRCUIT SUPERVISION RELAY, 1M 2B SR : FLAG-REV : 220-250V DC WD:01MVAXM31001	TRIP CIRCUIT-2 "B" PH SUPERVISION.

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION** **PPGCL DRG. NO:** **L&T DRG. NO:**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704)** **BILL OF MATERIAL: +704AT** **PANEL TYPE : +704AT**	PREPARED : GD REVIEWED : THY APPROVED : APS	REVISION: C DATE: 20-06-2014	SHT :002 CONT: 003 **DRG. NO.: 3269PN587-GL-14**

FRONT VIEW EQUIPMENTS (+704AT) :

DESIGNATION	MANUFACTURER	MATERIAL	DESCRIPTION	COMMENT
52CS	SWITRON	SS3NLSLAPGW00	CB CONTROL SWITCH 16 WAY 3 POSITION NON-LOCK SPRING RETURN`WITH LOST MOTION DEVICE DEVICE WITH PISTOL GRIP HANDLE	CB CONTROL SWITCH
DCS	SWITRON	SS3NLSPAPAW00	SELECTOR SWITCH 10 WAYS,3 POSITION,STAYPUT,NON LOCKABLE WITH PISTOL GRIP HANDLE	DC SELECTOR SWITCH
LBBS	SWITRON	SS2LBSPBP8W00	SELECTOR SWITCH 8 WAYS,2 POSITION,STAYPUT,LOCKABLE WITH PISTOL GRIP HANDLE	LBB IN / OUT SELECTOR SWITCH
PB01	TEKNIC	TK-PB-BLK-4NO	PUSH BUTTON BLACK, 4NO	86A/86B TRIP RELAY RESET
BLKA	NELSTER	GBRLYTESTBLKNEL	STANDARD TEST BLOCK	FOR PUA
BLKB	NELSTER	GBRLYTESTBLKNEL	STANDARD TEST BLOCK	FOR PUB
BLKC	NELSTER	GBRLYTESTBLKNEL	STANDARD TEST BLOCK	FOR 50LBB
BLKD	NELSTER		STANDARD TEST BLOCK- BCU	FOR BCU

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TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704)
BILL OF MATERIAL: +704AT
PANEL TYPE : +704AT

PREPARED : GD
REVIEWED : THY
APPROVED : APS
REVISION: C
DATE: 20-06-2014
SHT :003
CONT: 004
DRG. NO.: 3269PN587-GL-14

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REAR VIEW EQUIPMENTS (+704AT) :

DESIGNATION	MANUFACTURER	MATERIAL	DESCRIPTION	COMMENT
CIL	IMTECH/WIPRO/PHILIPS	CIL-11W-230VAC	COMPACT FLOURESCENT LAMP - 11W 230V AC	
DS	SALZER/KAYCEE	DS-230VAC	DOOR SWITCH	
HS	SWITRON	HS-230VAC	HEATER SWITCH	
HT	SOFIA/TELELEC/APT CTRLS	HT-60W-230AC	HEATER 230V AC 50HZ, 60W	
PS	ANCHOR	PS-5-15A-230VAC	POWER SOCKET 5/15A WITH SWITCH + 3PIN PLUG, 230V AC	
TH	MAVIS/ APT CTRLS/ANCO	TS-30-90DEG-230VAC	THERMOSTAT 230V AC, 30-90 DEG	
MCB1	SCHNEIDER ELECTRIC	-	DOUBLE POLE MCB WITH AUX CONTACT: 1 C/O, 110/250V DC, 16A, BREAKING CURRENT 20kA @220V	FOR CB TC-1 & CLSG CKT.
MCB2	SCHNEIDER ELECTRIC	-	DOUBLE POLE MCB WITH AUX CONTACT: 1 C/O, 110/250V DC, 16A,BREAKING CURRENT 20kA @220V	FOR CB TC-2 CKT.
MCB3	SCHNEIDER ELECTRIC	-	DOUBLE POLE MCB WITH AUX CONTACT: 1 C/O, 110/250V DC, 16A,BREAKING CURRENT 20kA @220V	FOR ISOL. CONTROL CKT.
MCB4	SCHNEIDER ELECTRIC		DOUBLE POLE MCB WITH AUX CONTACT: 1 C/O, 110/250V DC, 2A,BREAKING CURRENT 20kA @220V	FOR BCU CKT.
MCB5	SCHNEIDER ELECTRIC		DOUBLE POLE MCB WITH AUX CONTACT: 1 C/O, 110/250V DC, 4A,BREAKING CURRENT 20kA @220V	FOR LBB RELAY/VOLT. SEL CKT.
MCB6	SCHNEIDER ELECTRIC		DOUBLE POLE MCB WITH AUX CONTACT: 1 C/O, 110/250V DC, 4A,BREAKING CURRENT 20kA @220V	FOR 86LO CKT.
MCB7	SCHNEIDER ELECTRIC		DOUBLE POLE MCB WITH AUX CONTACT: 1 C/O, 110/250V DC, 2A,BREAKING CURRENT 20kA @220V	FOR BCU CKT.
MCB8	SCHNEIDER ELECTRIC		DOUBLE POLE MCB WITH AUX CONTACT: 1 C/O, 110/250V DC, 2A,BREAKING CURRENT 20kA @220V	FOR BCU CKT.
MCB91	SCHNEIDER ELECTRIC		DOUBLE POLE MCB WITH AUX CONTACT: 1 C/O, 240V AC, 16A, BREAKING CURRENT 10kA @415V	FOR AC SOURCE CKT
MCB101	SCHNEIDER ELECTRIC		DOUBLE POLE MCB WITH AUX CONTACT: 1 C/O, 110/250V DC, 25A, BREAKING CURRENT 20kA @220V	FOR DC SOURCE-1 ENTRY CKT
MCB201	SCHNEIDER ELECTRIC		DOUBLE POLE MCB WITH AUX CONTACT: 1 C/O, 110/250V DC, 10A, BREAKING CURRENT 20kA @220V	FOR DC SOURCE-2 ENTRY CKT
FS111	COOPER BUSSMANN/GE	FUSE - 4A, AC	FUSE - 4A, AC	
FS131	COOPER BUSSMANN/GE	FUSE - 4A, AC	FUSE - 4A, AC	
FS151	COOPER BUSSMANN/GE	FUSE - 4A, AC	FUSE - 4A, AC	

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION** **PPGCL DRG. NO:** **L&T DRG. NO:**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704)** **BILL OF MATERIAL: +704AT** **PANEL TYPE : +704AT**	PREPARED : GD REVIEWED : THY APPROVED : APS	REVISION: C DATE: 20-06-2014	SHT :004 CONT: 005 **DRG. NO.: 3269PN587-GL-14**

REAR VIEW EQUIPMENTS (+704AT) :

DESIGNATION	MANUFACTURER	MATERIAL	DESCRIPTION	COMMENT
FS233	COOPER BUSSMANN/GE/STS	FUSE - 4A, AC	FUSE - 4A, AC	
FS515	COOPER BUSSMANN/GE/STS	FUSE - 4A, AC	FUSE - 4A, AC	
FS535	COOPER BUSSMANN/GE/STS	FUSE - 4A, AC	FUSE - 4A, AC	
FS555	COOPER BUSSMANN/GE/STS	FUSE - 4A, AC	FUSE - 4A, AC	
EL1	COOPER BUSSMANN/STS	LINK	LINK	
EL2	COOPER BUSSMANN/STS	LINK	LINK	
EL3	COOPER BUSSMANN/STS	LINK	LINK	
EL4	COOPER BUSSMANN/STS	LINK	LINK	
LK1	COOPER BUSSMANN/STS	LINK	LINK	
LK2	COOPER BUSSMANN/STS	LINK	LINK	
LK3	COOPER BUSSMANN/STS	LINK	LINK	
LK4	COOPER BUSSMANN/STS	LINK	LINK	
LK5	COOPER BUSSMANN/STS	LINK	LINK	
LK6	COOPER BUSSMANN/STS	LINK	LINK	
LK7	COOPER BUSSMANN/STS	LINK	LINK	
LK8	COOPER BUSSMANN/STS	LINK	LINK	
LK171	COOPER BUSSMANN/STS	LINK	LINK	
LK273	COOPER BUSSMANN/STS	LINK	LINK	
LK575	COOPER BUSSMANN/STS	LINK	LINK	
LKT1	COOPER BUSSMANN/STS	LINK	LINK	

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013

CONSULTANT: TATA CONSULTING ENGINEERS LTD.
CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION
PPGCL DRG. NO:
L&T DRG. NO:

Schneider Electric

TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704)
BILL OF MATERIAL: +704AT
PANEL TYPE : +704AT

PREPARED : GD
REVIEWED : THY
APPROVED : APS
REVISION: C
DATE: 20-06-2014
SHT :005
CONT: 006
DRG. NO.: 3269PN587-GL-14

REAR VIEW EQUIPMENTS (+704AT) :

DESIGNATION	MANUFACTURER	MATERIAL	DESCRIPTION	COMMENT
LKT2	COOPER BUSSMANN/STS	LINK	LINK	
R96A	REPUTED	RES-3.3K-30W	RESISTOR, 3.3K-OHMS, 30W	GRP-A BB TRIP RELAY SUPVN.
R96B	REPUTED	RES-3.3K-30W	RESISTOR, 3.3K-OHMS, 30W	GRP-B BB TRIP RELAY SUPVN.
R86	REPUTED	RES-3.3K-30W	RESISTOR, 3.3K-OHMS, 30W	86LO TRIP RELAY SUPVN.
X1	CONNECTWELL	STH4	NON-DISCONNECTING TERMINAL BLOCK	
X2	CONNECTWELL	STH4DTSH	DISCONNECTING TERMINAL BLOCK	
X4	CONNECTWELL	STH4	NON-DISCONNECTING TERMINAL BLOCK	
X5	CONNECTWELL	STH4	NON-DISCONNECTING TERMINAL BLOCK	
X6	CONNECTWELL	STH4	NON-DISCONNECTING TERMINAL BLOCK	
X7	CONNECTWELL	STH4	NON-DISCONNECTING TERMINAL BLOCK	
X10	CONNECTWELL	STH4	NON-DISCONNECTING TERMINAL BLOCK	
X-BCUT-DIU-M	CONNECTWELL	CKT4U/CMC1-2	DISCONNECTING TERMINAL BLOCK	
X-BCUT-DIU-N	CONNECTWELL	CKT4U/CMC1-2	DISCONNECTING TERMINAL BLOCK	
X-BCUT-DIU-O	CONNECTWELL	CKT4U/CMC1-2	DISCONNECTING TERMINAL BLOCK	
X-BCUT-DIU-P	CONNECTWELL	CKT4U/CMC1-2	DISCONNECTING TERMINAL BLOCK	
X-BCUT-DOU-D	CONNECTWELL	CKT4U	DISCONNECTING TERMINAL BLOCK	
X-BCUT-DOU-E	CONNECTWELL	CKT4U	DISCONNECTING TERMINAL BLOCK	
X-BCUT-DOU-F	CONNECTWELL	CKT4U	DISCONNECTING TERMINAL BLOCK	
X-BCUT-DOU-G	CONNECTWELL	CKT4U	DISCONNECTING TERMINAL BLOCK	
X-BCUT-PS-A	CONNECTWELL	CSFL4U	NON-DISCONNECTING TERMINAL BLOCK	

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION** **PPGCL DRG. NO:** **L&T DRG. NO:**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704)** **BILL OF MATERIAL: +704AT** **PANEL TYPE : +704AT**	PREPARED : GD REVIEWED : THY APPROVED : APS	REVISION: C DATE: 20-06-2014	SHT :006 CONT: 007 **DRG. NO.: 3269PN587-GL-14**

REAR VIEW EQUIPMENTS (+704AT) :

DESIGNATION	MANUFACTURER	MATERIAL	DESCRIPTION	COMMENT
X200	CONNECTWELL	STH4	NON-DISCONNECTING TERMINAL BLOCK `	
X200A	CONNECTWELL	STH4	NON-DISCONNECTING TERMINAL BLOCK `	
X201	CONNECTWELL	STH4	NON-DISCONNECT TERMINAL `	
X201A	CONNECTWELL	STH4	NON-DISCONNECTING TERMINAL BLOCK `	
X201B	CONNECTWELL	STH4	NON-DISCONNECTING TERMINAL BLOCK `	
X201C	CONNECTWELL	STH4	NON-DISCONNECTING TERMINAL BLOCK `	
X202	CONNECTWELL	STH4	NON-DISCONNECT TERMINAL `	
X203	CONNECTWELL	STH4	NON-DISCONNECT TERMINAL `	

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704)** **BILL OF MATERIAL: +704AT**	PREPARED : GD REVIEWED : THY APPROVED : APS	REVISION: C DATE: 20-06-2014	SHT :007 CONT: NIL
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-GL-14**		

SHEET	DESCRIPTION
000	INDEX SHEET
001	LIST OF SYMBOLS
002	SINGLE LINE DIAGRAM
003	CT DETAILS
004	CVT MONITORING DETAILS
005	TRIP MATRIX
006	AC SUPPLY DISTRIBUTION
007	DC SUPPLY DISTRIBUTION
008	DC SUPPLY DISTRIBUTION
009	DC SUPPLY DISTRIBUTION
010	CT DISTRIBUTION CIRCUIT
011	CT DISTRIBUTION CIRCUIT
012	CT DISTRIBUTION CIRCUIT
013	CT DISTRIBUTION CIRCUIT
014	BUS CVT SELECTION CIRCUIT
015	BUS CVT SELECTION CIRCUIT
016	BUS CVT SELECTION CIRCUIT
017	BUS CVT SELECTION CIRCUIT
018	BUS CVT SELECTION CIRCUIT
019	GRP-A BB PROTN. AC CKT.
020	GRP-A BB PROTN. - OPTO INPUT CKT
021	GRP-A BB PROTN. - OPTO INPUT CKT
022	GRP-B BB PROTN. AC CKT.
023	GRP-B BB PROTN. - OPTO INPUT CKT
024	GRP-B BB PROTN. - OPTO INPUT CKT
025	50LBB PROTN.-AC CKT.
026	50LBB PROTN.-OPTO INPUT CKT
027	86LO TRIP RELAY CKT.
028	GROUP-A BUSBAR TRIP RELAY CKT.
029	GROUP-B BUSBAR TRIP RELAY CKT.
030	86LO TRIP RELAY CONTACTS DISTN.
030A	RELAY CONTACTS DISTN.
031	INTER TRIP CKT.
032	INTER TRIP CKT.
033	CB CLOSING & REMOTE TRIP-1 CKT.
034	CB REMOTE TRIP-2 & CB LOCAL CLOSING
035	CB TRIP COIL-1 CIRCUIT
036	CB TRIP COIL-1 CIRCUIT
037	CB TRIP COIL-2 CIRCUIT
038	CB TRIP COIL-2 CIRCUIT
039	BCU LOGIC
040	BCU LOGIC
041	BCU LOGIC

SHEET	DESCRIPTION
043	BCU LOGIC
044	BCU LOGIC
045	BCU CARD DETAIL
046	BCU AUX. SUPPLY CKT.
047	BCU CT/PT CKT.
048	BCU DIGITAL INPUT CARD
049	BCU DIGITAL INPUT CARD
050	BCU DIGITAL INPUT CARD
051	BCU DIGITAL INPUT CARD
052	BCU DIGITAL INPUT CARD
053	BCU DIGITAL INPUT CARD
054	BCU DIGITAL INPUT CARD
055	BCU DIGITAL INPUT CARD
056	BCU DIGITAL OUTPUT CARD
057	BCU DIGITAL OUTPUT CARD
058	BCU DIGITAL OUTPUT CARD
059	BCU DIGITAL OUTPUT CARD
060	SPARE CONTACT DISTRIBUTION
061	DEVICE REFERENCE
062	50LBB RELAY DEVICE REFERENCE
063	50LBB RELAY INPUT/OUTPUT LIST
064	PUA RELAY DEVICE REFERENCE
065	PUA RELAY INPUT/OUTPUT LIST
066	PUB RELAY DEVICE REFERENCE
067	PUB RELAY INPUT/OUTPUT LIST
068	GOOSE SIGNAL LIST
069	TERMINAL BLOCK ALLOCATION
070	BCU TERMINAL BLOCK ALLOCATION
071	BCU TERMINAL BLOCK ALLOCATION
072	TERMINAL BLOCK ALLOCATION
073	TERMINAL BLOCK ALLOCATION
074	CB CONTACT DISTRIBUTION
075	ISOLATOR CONTACT DISTRIBUTION
076	ISOLATOR CONTACT DISTRIBUTION
077	EARTHSWITCH CONTACT DISTRIBUTION
NO S…	

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013

CONSULTANT: TATA CONSULTING ENGINEERS LTD.
CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION
PPGCL DRG. NO:
L&T DRG. NO:

Schneider Electric

TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) INDEX SHEET
PANEL TYPE : +704AT

PREPARED : GD
REVIEWED : THY
APPROVED : APS
REVISION: C
DATE: 20-06-2014
SHT :000
CONT: 001
DRG. NO.: 3269PN587-S-14

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LIST OF STANDARD SYMBOLS

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	COMPACT FLOURESCENT LAMP		RESISTOR		NORMALLY OPEN CONTACT SELF RESET		NON-DISCONNETING TB FOR INTER PANEL BUS WIRING
	DOOR/HEATER SWITCH		CONTROL / SELECTOR SWITCH		NORMALLY CLOSE CONTACT SELF RESET		TB FOR SCADA/BCU
	HEATER		TEST BLOCK		CHANGEOVER CONTACT SELF RESET		NON-DISCONNETING TB
SW	POWER SOCKET WITH SWITCH		POTENTIO METER		NORMALLY OPEN CONTACT HAND RESET		TB PRIMARY EQUIPMENTS
	THERMOSTAT		POTENTIAL TRANSFORMER		NORMALLY CLOSE CONTACT HAND RESET		DIODE
	FUSE		CURRENT TRANSFORMER		CHANGEOVER CONTACT HAND RESET		SEMAPHORE
	LINK	+ -	POWER SUPPLY		DIGITAL OPTO INPUT		CLIO INPUT
	MCB						CLIO OUTPUT
	INDICATING LAMPS		SELF-RESET COIL WITH/WITHOUT FLAG		SELT-RESET SLOW OPERAING COIL WITH REVERSE/FORWARD FLAG		BUS WIRE REPRESENTATION SOURCE / TARGET
	PUSH BUTTON NC CONTACT						NORMAL WIRE REPRESENTATION SOURCE / TARGET
	PUSH BUTTON NO CONTACT		HAND-RESET COIL WITH/WITHOUT FLAG		ANNUNCIATOR WINDOW INPUT	TX1 RX1	COMMUNICATION PORT
	METROSIL				DISCONNETING TB		

NOTE: RELAY CONTACTS SHOWN WITH CONTACT DE ENERGIZED CONDITION.

TERMINAL GROUP STANDARDS

TB REF	FUNCTION
X1	AC/DC CIRCUITS
X2	CT CIRCUITS
X3	PT CIRCUITS
X4	CONTROL INPUTS (TO OPTO/CONT MUL. RELAY)
X5	CONTROL OUTPUTS (TO CB CONTROL)
X6	CONTROL OUTPUTS (TO ISOL./ESW. CONTROL)
X7	SPARE OUTPUTS
X8	TEMP SCANNER/SCADA/RTU/DCS CKTS
X9	INDICATION/ANNUNCIATON CKTS
X-BCU-DIU-SLOT	BCU DI INPUTS
X-BCU-DOU-SLOT	BCU DO INPUTS
X-BCU-AIU-SLOT	BCU AI INPUTS
X10	FOR INTER PANEL CABLES
X100	BUS WIRING CT/PT CKTS (INTRA-BAY)
X101-X109	BUS WIRING CONTROL CKTS (INTRA-BAY)
X200	BUS WIRING CT/PT CKTS (INTER-BAY)
X201-X209	BUS WIRING CONTROL CKTS (INTER-BAY)

FERRULE NUMBERING STANDARDS

FERRULE	CIRCUIT
"A"	CT CIRCUIT-MAIN PROTECTION
"B"	CT CIRCUIT-BUSBAR PROTECTION
"C"	CT CIRCUIT-BACKUP PROTECTION
"D"	CT CIRCUIT-METERING
"E"	VT CIRCUIT-PROTECTION/METERING
"G"	VT CIRCUIT-SYNCHRONISING
"H"	AUXILARY AC CIRCUIT
"J"	AUXILARY DC CIRCUIT
"K"	CONTROL CIRCUIT
"L"	INDICATION & ALARM CIRCUITS
"P"	DC CIRCUIT- BUSBAR PROTECTION CIRCUIT
"S"	SCADA/EVENT LOGGER/DAS CIRCUITS
"U"	SPARE CONTACTS

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013

CONSULTANT: TATA CONSULTING ENGINEERS LTD.
CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION
PPGCL DRG. NO:
L&T DRG. NO:

Schneider Electric

TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) LIST OF SYMBOLS
PANEL TYPE : +704AT

PREPARED : GD
REVIEWED : THY
APPROVED : APS
REVISION: C
DATE: 20-06-2014
SHT :001
CONT: 002
DRG. NO.: 3269PN587-S-14

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TO GENERATOR-2

GT-2
275MVA, (800/√3)/21KV

706-LA

706-89TE2

706-89T

706-89TE1

TO 400KV SIDE
(FUTURE)

SPARE

BCU (GT)/
METERS

GT SYN.

765KV MAIN BUS -I 3150A, 40kA FOR 1 SEC

706-89A | 706-89AE | 706-52 | 706-CT (P1, CORE-1, CORE-2, CORE-3, CORE-4, CORE-5, P2) | 706-89BE | 706-89B

705-89A | 705-89AE | 705-CTA (P1, CORE-1, CORE-2, CORE-3, CORE-4, CORE-5, P2) | 705-52 | 705-CTB (P2, CORE-5, CORE-4, CORE-3, CORE-2, CORE-1, P1) | 705-89BE | 705-89B

704-89B | 704-89BE | 704-CT (P2, CORE-5, CORE-4, CORE-3, CORE-2, CORE-1, P1) | 704-52 | 704-89AE | 704-89A

765KV MAIN BUS -II 3150A, 40kA FOR 1 SEC

SPARE | SPARE | SPARE | SPARE | SPARE

MICOM P645
(87OA)

FROM MAIN
PLANT CT'S

GT 50LBB (P141)

PU4A MiCOMP743

PU4B MiCOMP743

#

##

TIE 50LBB (P141)

ICT 50LBB (P141)

BUS-2/IV SIDE CVT

TIE SELECTED CVT

BCU (ICT)

MICOM P643
(87OH)

FROM GT HV SICE
BUSHING SIDE CT

PU6A MiCOMP743

PU6B MiCOMP743

COMMON STAND
BY METERING
PANEL
(PPGCL USE)

BACK UP
METERING PANEL
(PPGCL USE)

STANDBY ENERGY
METER

ENERGY METER

BCU (GT)

BCU (TIE)

BUS-1/GT SIDE CVT

BUS-2/IV SIDE CVT

SELECTED BUS-1/GT CVT

TIE SELECTED CVT

GT-2 CVT

NOTE :
- THIS CONNECTION TO BE MADE WHEN FUTURE BAY IS COMMISSIONED
#- THIS CONNECTION TO BE REMOVED AND TO BE USED FOR MAIN-1 & MAIN-2
ICT DIFF. PROTN. WHEN FUTUREBAY IS COMMISSIONED.

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) SINGLE LINE DIAGRAM**	PREPARED : GD REVIEWED : THY APPROVED : APS	REVISION: C DATE: 20-06-2014	SHT :002 CONT: 003
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**		**DRG. NO.: 3269PN587-S-14**	

704-CT	704-CT	704-CT	704-CT	704-CT
CORE-1	CORE-2	CORE-3	CORE-4	CORE-5
RATIO: 2000-1000-500/1A	RATIO: 2000-1000-500/1A	RATIO: 2000-1000-500/1A	RATIO: 2000-1000-500/1A	RATIO: 2000-1000-500/1A
CLASS: PS	CLASS: PS	CLASS: 0.2S	CLASS: PS	CLASS: PS
ADOPTED CT: 2000A	ADOPTED RATIO :2000A	BURDEN: 20VA	ADOPTED RATIO :2000A	ADOPTED RATIO :2000A
Vk>2000-1000-500V	Vk>2000-1000-500V	ISF<5	Vk>2000-1000-500V	Vk>2000-1000-500V
Ie < 30-60-120mA @Vk	Ie < 30-60-120mA @Vk	ADOPTED RATIO :2000A	Ie < 30-60-120mA @Vk	Ie < 30-60-120mA @Vk
Rct<10-5-2.5 Ohms	Rct<10-5-2.5 Ohms		Rct<10-5-2.5 Ohms	Rct<10-5-2.5 Ohms

705-CTA	705-CTA	705-CTA	705-CTA	705-CTA
CORE-1	CORE-2	CORE-3	CORE-4	CORE-5
RATIO: 2000-1000-500/1A	RATIO: 2000-1000-500/1A	RATIO: 2000-1000-500/1A	RATIO: 2000-1000-500/1A	RATIO: 2000-1000-500/1A
CLASS: PS	CLASS: PS	CLASS: 0.2S,	CLASS: PS	CLASS: PS
Vk> 3000-2000-1000V	Vk: 2000-1000-500V	BURDEN : 20VA	Vk: 2000-1000-500V	Vk: 2000-1000-500V
Ie < 30-60-120mA @Vk	Ie < 30-60-120mA @Vk	ISF≤5	Ie < 30-60-120mA @Vk	Ie < 30-60-120mA @Vk
Rct<15/10/5 Ohms	Rct<10/5/2.5 Ohms	ADOPTED RATIO : 2000A	Rct<10/5/2.5 Ohms	Rct<10/5/2.5 Ohms
ADOPTED RATIO : 2000A	ADOPTED RATIO : 2000A		ADOPTED CT: 2000A	ADOPTED CT: 2000A

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013

CONSULTANT: TATA CONSULTING ENGINEERS LTD.
CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION
PPGCL DRG. NO:
L&T DRG. NO:

Schneider Electric

TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) CT DETAILS
PANEL TYPE : +704AT

PREPARED : GD
REVIEWED : THY
APPROVED : APS
REVISION: C
DATE: 20-06-2014
SHT :003
CONT: 004
DRG. NO.: 3269PN587-S-14

LIST OF RELAYS USED FOR CVT FUSE FAIL MONITORING

CVT DETAILS	CIRCUIT	BAY NO	PANEL REF	PROTECTION RELAY
765KV LINE-1 CVT				
WINDING-1	765KV LINE-1 PROTECTION PANEL	710	+710LA	21M1
WINDING-2	765KV LINE-1 PROTECTION PANEL	710	+710LRB	50LBB
WINDING-3	765KV LINE-1 PROTECTION PANEL	710	+710LB	21M2
765KV LINE-2 CVT				
WINDING-1	765KV LINE-2 PROTECTION PANEL	707	+707LA	21M1
WINDING-2	765KV LINE-2 PROTECTION PANEL	707	+707LRB	50LBB
WINDING-3	765KV LINE-2 PROTECTION PANEL	707	+707LB	21M2
765KV BUS CVT-I				
WINDING-1	765/400KV ICT (UN EQUIPPED BAY)PROTECTION PANEL	704	+704A	50LBB
WINDING-2	765KV LINE-2 PROTECTION PANEL	707	+707LB	50LBB
WINDING-3	765KV LINE-1 PROTECTION PANEL	710	+710LB	50LBB
765KV BUS CVT-II				
WINDING-1	765/21KV GT-1 PROTECTION PANEL	703	+703GTB	50LBB
WINDING-2	765/21KV GT-2 PROTECTION PANEL	706	+706GTB	50LBB
WINDING-3	765/21KV GT-3 PROTECTION PANEL	712	+712GTB	50LBB

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013

CONSULTANT: TATA CONSULTING ENGINEERS LTD.
CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION
PPGCL DRG. NO:
L&T DRG. NO:

TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) CVT MONITORING DETAILS
PANEL TYPE : +704AT

PREPARED : GD
REVIEWED : THY
APPROVED : APS
REVISION: C
DATE: 20-06-2014
SHT : 004
CONT: 005
DRG. NO.: 3269PN587-S-14

		MiCOM (P141)	MiCOM (P743)	MiCOM (P743)	MiCOM (P141)	HV TRIP LOCKOUT RELAYS			CB MANUAL TRIP	
$-WHEN 765KV SIDE TIE CB OPEN #-WHEN 765KV SIDE MAIN CB OPEN		HV MAIN CB LBB PROTN.	HV MAIN CB BUSBAR-I PROTN.	HV MAIN CB BUSBAR-II PROTN.	HV TIE CB LBB PROTN.	MAIN CB LBB LOCKOUT RELAY	BB TRIP RELAY-GR-A (MAIN BAY)	BB TRIP RELAY-GR-B (MAIN BAY)	MANUAL TRIP (HV MAIN CB)	MANUAL TRIP (HV TIE CB)
RELAY CODE		50BF	87B	87B	50BF	86LO	96A	96B	-	-
PROTECTION TRIP		3-PH	3-PH	3-PH	3-PH	3-PH	3-PH	3-PH	-	-
MAIN CB	TO CB TRIP COIL-1						TP	TP	TP	
	TO CB TRIP COIL-2						TP	TP	TP	
	LBB INITIATION						IP	IP		
	CB CLOSE					RS	RS	RS		
BB TRIP RELAY GRP-A			IP	IP	IP*					
BB TRIP RELAY GRP-B			IP	IP	IP*					
BUSBAR INITIATION TO OTHER BAYS		IP								
86 LOCKOUT RELAY		IP								
INTER TRIPPING TO 400KV SIDE TRIP RELAY (FUTURE)		IP	IP$	IP$	IP				IP$	IP#
DR TRIGGER		IP	IP	IP	IP					
TIE CB	TO CB TRIP COIL-1					TP	IP*	IP*		TP
	TO CB TRIP COIL-2					TP	IP*	IP*		TP
	LBB INITIATION					IP	IP*	IP*		
	CB CLOSE					RS	RS*	RS*		
STATUS SCADA		IP	IP	IP	IP	IP	IP	IP	IP	IP

RS — INDICATES RESET STATUS FOR CB CLOSING

TP — INDICATES TRIP FROM PROTN. FUNCTION

IP — INDICATES INTICATION FROM PROTN. FUNCTION

NOTE:* THIS INITIATION SHALL BE REMOVED WHEN FUTURE BAY IS COMMISSIONED

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	CONSULTANT: TATA CONSULTING ENGINEERS LTD. CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION	TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) TRIP MATRIX	PREPARED : GD REVIEWED : THY APPROVED : APS	REVISION: C DATE: 20-06-2014	SHT :005 CONT: 006
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	PPGCL DRG. NO: L&T DRG. NO:	PANEL TYPE : +704AT	DRG. NO.: 3269PN587-S-14		

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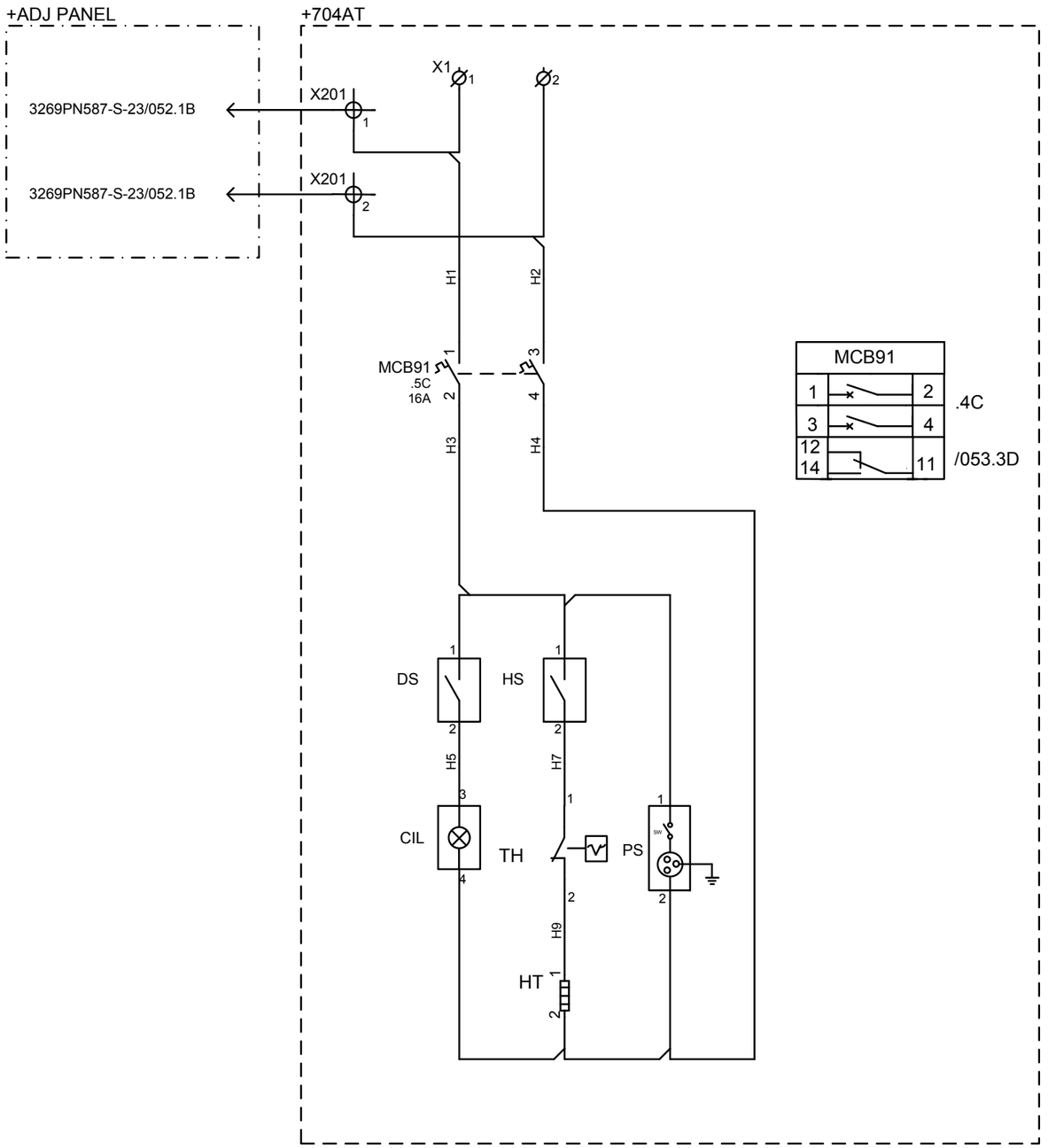

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION** **PPGCL DRG. NO:** **L&T DRG. NO:**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) AC SUPPLY DISTRIBUTION** **PANEL TYPE : +704AT**

PREPARED : GD	REVISION: C	SHT :006	
REVIEWED : THY	DATE: 20-06-2014	CONT: 007	
APPROVED : APS			
DRG. NO.: 3269PN587-S-14			

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+DCDB-1

220V DC SOURCE-1 SUPPLY

+Ve -Ve

+ADJ PANEL TO TIE PANEL

+DCDB-2

220V DC SOURCE-2 SUPPLY

+Ve -Ve

+ADJ PANEL TO TIE PANEL

+704AT

X1 3 X1 4 X201A 1 X201A 2

J101 J102

MCB101 .7D 25A 1 2 3 4

J103 J104

11 13

MVAAM11 80DC1 .7B COIL

14

X1 5 X1 6 X201A 3 X201A 4

J201 J202

MCB201 .7E 25A 1 2 3 4

J203 J204

11 13

MVAAM11 80DC2 .7C COIL

14

DCS

7	9	1	3	11	13	15	17
/061.2B	/061.2B	/061.2A	/061.2B SOURCE-1 IND SOURCE-2	/061.2B	/061.2B	/061.2B	/061.2C SOURCE-1 IND SOURCE-2
8	10	2	4	12	14	16	18

J11 /008.1A

J12 /008.1A

J21 /008.1B

J22 /008.1B

80DC1

11 13	COIL	14	.2C
5 1		3	/054.2D
6 2		4	
7		9	
8		10	/060.4D

TO BCU(DC-1 FAIL)

SPARE

80DC2

11 13	COIL	14	.5C
5 1		3	/054.3D
6 2		4	
7		9	
8		10	/060.4D

TO BCU(DC-2 FAIL)

SPARE

MCB101

1		2	.1B
3		4	
12 14		11	

MCB201

1		2	.3B
3		4	
12 14		11	

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.**		**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) DC SUPPLY DISTRIBUTION**	PREPARED : GD / REVIEWED : THY / APPROVED : APS; REVISION: C; DATE: 20-06-2014; SHT :007; CONT: 008
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**			
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**

+704AT

FROM DC SELECTION CIRCUIT

/007.6E J11 → J11 /009.2A
/007.6E J12 → J12 /009.2A
/007.6E J21 → J21 /009.2B
/007.6F J22 → J22 /009.2B

TO DC CHANGEOVER CIRCUIT

	MCB1	MCB2	MCB3	MCB7	MCB8
	.2E	.3E	.3E	.4E	.5E
	16A	16A	16A	4A	4A
1	K1	K51	K701	S201	S301
3	K2	K52	K702	S202	S302
	/033.1C	/034.1B	/057.1D	/046.6C	/046.6C
	/033.1C	/034.1C	/057.1D	/046.6D	/046.6C
	TO CB TC-1 & CLSG CKT.	TO CB TC-2 & CLSG CKT.	TO ISOLATOR CONTROL CIRCUIT	TO BCU CIRCUIT	TO BCU CIRCUIT

	1	2	3	4	11	12	14	
MCB1	1	2	3	4	11	12	14	.2C /053.4D
MCB2	1	2	3	4	11	12	14	.3C /053.4D
MCB3	1	2	3	4	11	12	14	.4C /053.4D
MCB7	1	2	3	4	11	12	14	.4C /053.3D
MCB8	1	2	3	4	11	12	14	.5C /053.5D

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CUSTOMER :	PRAYAGRAJ POWER GENERATION COMPANY LTD.
PROJECT :	PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA
PO. No.& Date:	L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013
CONSULTANT:	TATA CONSULTING ENGINEERS LTD.
CONTRACTOR:	L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION
PPGCL DRG. NO:	
L&T DRG. NO:	
TITLE :	765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) DC SUPPLY DISTRIBUTION
PANEL TYPE :	+704AT
PREPARED :	GD
REVIEWED :	THY
APPROVED :	APS
DATE:	20-06-2014
REVISION:	C
SHT :	008
CONT:	009
DRG. NO.:	3269PN587-S-14

+704AT

DC SOURCE-1

/008.6A J11

/008.6A J12

DC SOURCE-2

/008.6B J21

/008.6B J22

80CO

5 1 6 2 7 8

.7C .7C .7C .7C

3 4 9 10

11 13

MVAAM11

.7C COIL

14

J1

J2

MCB4 .7D 4A 1 3 2 4

MCB5 .7D 4A 1 3 2 4

MCB6 .7E 4A 1 3 2 4

S101 /016.1B

S102 /016.1E

K601 /026.1C

K602 /026.1F

K401 /027.2C

K402 /027.2F

TO BCU &VOLTAGE SEL. CIRCUIT

TO LBB RELAY CKT.

TO 86 LO RELAY CKT.

80CO

11 13	COIL	14	.4C
5 1		3	.2C
6 2		4	.3C
7		9	.3C
8		10	.3C

DC -2 CHANGE OVER CKT.

DC -2 CHANGE OVER CKT.

DC -1 CHANGE OVER CKT.

DC -1 CHANGE OVER CKT.

MCB4

1		2	.4E
3		4	
12 14		11	/046.3D

MCB5

1		2	.5E
3		4	
12 14		11	/053.7D

MCB6

1		2	.5E
3		4	
12 14		11	/053.5D

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) DC SUPPLY DISTRIBUTION**	PREPARED : GD REVIEWED : THY APPROVED : APS	REVISION: C DATE: 20-06-2014	SHT :009 CONT: 010
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**		

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704-CT

MAIN BUS-II SIDE

P1

CORE-1

RATIO: 2000-1000-500/1A
CLASS: PS
Vk>2000-1000-500V
Ie < 30-60-120mA @Vk
Rct<10-5-2.5 Ohms
ADOPTED CT: 2000A

1S1-R	TB1:1
1S2-R	TB1:2
1S3-R	TB1:4
1S4-R	TB1:6
1S1-Y	TB1:9
1S2-Y	TB1:10
1S3-Y	TB1:12
1S4-Y	TB1:14
1S1-B	TB1:17
1S2-B	TB1:18
1S3-B	TB1:20
1S4-B	TB1:22

SPARE

P2

ICT SIDE

+704-CT JB

+705TE

FROM TIE 705-CTA CORE-1

+704AT

X200A 13	R-PH	B211A	/022.1D
X200A 14	Y-PH	B231A	/022.1E
X200A 15	B-PH	B251A	/022.1E
X200A 16	N	B271A	/022.1E

TO MAIN-2 BB PROTN. PUB

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.**		**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) CT DISTRIBUTION CIRCUIT**	PREPARED : GD	REVISION: C	SHT :010
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**			REVIEWED : THY	DATE: 20-06-2014	CONT: 011
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**	APPROVED : APS	**DRG. NO.: 3269PN587-S-14**	

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704-CT

MAIN BUS-II SIDE

P1

CORE-2

RATIO: 2000-1000-500/1A
CLASS: PS
Vk>2000-1000-500V
Ie < 30-60-120mA @Vk
Rct<10-5-2.5 Ohms
ADOPTED RATIO :2000A

P2

ICT SIDE

2S1-R	TB2:1	
2S2-R	TB2:2	
2S3-R	TB2:4	
2S4-R	TB2:6	
2S1-Y	TB2:9	
2S2-Y	TB2:10	
2S3-Y	TB2:12	
2S4-Y	TB2:14	
2S1-B	TB2:17	
2S2-B	TB2:18	
2S3-B	TB2:20	
2S4-B	TB2:22	

+704-CT JB

+704AT

X2

R-PH	A511	/025.2B
Y-PH	A531	/025.2B
B-PH	A551	/025.2C
N	A571	/025.2C

A571S

EL1

TO LBB PROTECTION CIRCUIT

+705TE

FROM TIE 705-CTA CORE-2

X200A 17	R-PH	B111A	/019.2D
X200A 18	Y-PH	B131A	/019.2E
X200A 19	B-PH	B151A	/019.2E
X200A 20	N	B171A	/019.2E

TO MAIN-1 BB PROTN. PUA

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.	CONSULTANT: TATA CONSULTING ENGINEERS LTD.		TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) CT DISTRIBUTION CIRCUIT	PREPARED : GD	REVISION: C	SHT :011
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION			REVIEWED : THY	DATE: 20-06-2014	CONT:012
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	PPGCL DRG. NO: L&T DRG. NO:		PANEL TYPE : +704AT	APPROVED : APS	DRG. NO.: 3269PN587-S-14	

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704-CT

+704-CT JB

+704AT

MAIN BUS-II SIDE

P1

3S1-R — TB3:1

3S2-R — TB3:2

3S3-R — TB3:4

3S4-R — TB3:6

3S1-Y — TB3:9

3S2-Y — TB3:10

3S3-Y — TB3:12

3S4-Y — TB3:14

3S1-B — TB3:17

3S2-B — TB3:18

3S3-B — TB3:20

3S4-B — TB3:22

P2

ICT SIDE

CORE-3

RATIO: 2000-1000-500/1A
CLASS: 0.2S
BURDEN: 20VA
ISF<5
ADOPTED RATIO :2000A

X2

9 — R-PH — 1D215 — /047.1A

10

11 — Y-PH — 1D235 — /047.1B

12

13 — B-PH — 1D255 — /047.1B

14

15 — N — 1D275 — /047.1C

16 — D171S — EL2 (1, 2)

TO BCU CIRCUIT

+ADJACENT PANEL

FROM TIE 705-CTA CORE-3

X200A 9 — 1D215

X200A 10 — 1D235

X200A 11 — 1D255

X200A 12 — 1D275

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	CONSULTANT: TATA CONSULTING ENGINEERS LTD. CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION	Schneider Electric	TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) CT DISTRIBUTION CIRCUIT
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	PPGCL DRG. NO: L&T DRG. NO:		PANEL TYPE : +704AT

PREPARED : GD	REVISION: C	SHT :012	
REVIEWED : THY	DATE: 20-06-2014	CONT: 013	
APPROVED : APS			
DRG. NO.: 3269PN587-S-14			

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704-CT

+704-CT JB

+704AT

MAIN BUS-II SIDE

P1

CORE-4

RATIO: 2000-1000-500/1A
CLASS: PS
Vk>2000-1000-500V
Ie < 30-60-120mA @Vk
Rct<10-5-2.5 Ohms
ADOPTED RATIO :2000A

4S1-R → TB4:1
4S2-R → TB4:2
4S3-R → TB4:4
4S4-R → TB4:6
4S1-Y → TB4:9
4S2-Y → TB4:10
4S3-Y → TB4:12
4S4-Y → TB4:14
4S1-B → TB4:17
4S2-B → TB4:18
4S3-B → TB4:20
4S4-B → TB4:22

CORE-5

RATIO: 2000-1000-500/1A
CLASS: PS
Vk>2000-1000-500V
Ie < 30-60-120mA @Vk
Rct<10-5-2.5 Ohms
ADOPTED RATIO :2000A

5S1-R → TB5:1
5S2-R → TB5:2
5S3-R → TB5:4
5S4-R → TB5:6
5S1-Y → TB5:9
5S2-Y → TB5:10
5S3-Y → TB5:12
5S4-Y → TB5:14
5S1-B → TB5:17
5S2-B → TB5:18
5S3-B → TB5:20
5S4-B → TB5:22

P2

ICT SIDE

X2

17	B211	R-PH	B211	/022.2C
18				
19	B231	Y-PH	B231	/022.2C
20				
21	B251	B-PH	B251	/022.2C
22				
23	B271	N	B271	/022.2D
24	B127S	EL3 1–2		

TO MAIN-2 BUSBAR PROTN. CIRCUIT

X2

25	B111	R-PH	B111	/019.2C
26				
27	B131	Y-PH	B131	/019.2C
28				
29	B151	B-PH	B151	/019.2C
30				
31	B171	N	B171	/019.2D
32	B171S	EL4 1–2		

TO MAIN-1 BUSBAR PROTN.CIRCUIT

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.**	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) CT DISTRIBUTION CIRCUIT**	PREPARED : GD / REVIEWED : THY / APPROVED : APS / DATE: 20-06-2014 / REVISION: C / SHT :013 / CONT:014
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**		
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**	**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**

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+ADJ PANEL

+704AT

TO 765KV BUS-II CVT (WDG-1) PROTN. CORE

3269PN587-S-23/061.1C → X200 13 → R-PH E411 → /018.1B

3269PN587-S-23/061.1D → X200 14 → Y-PH E431 → /018.2B

3269PN587-S-23/061.1D → X200 15 → B-PH E451 → /018.2B

3269PN587-S-23/061.1D → X200 16 → N E471 → /018.2B

TO CVT SELECTION CIRCUIT

TO 765KV BUS-II CVT (WDG-2) METG. CORE

3269PN587-S-23/061.1D → X200 17 → R-PH E511 → /017.2A

3269PN587-S-23/061.1D → X200 18 → Y-PH E531 → /017.2A

3269PN587-S-23/061.1E → X200 19 → B-PH E551 → /017.2A

3269PN587-S-23/061.1E → X200 20 → N E571 → /017.3A

TO CVT SELECTION CIRCUIT

TO 765KV BUS-I1 CVT (WDG-1) PROTN. CORE

3269PN587-S-23/061.1A → X200 1 → E111 → FS111 (1, 2, 4A) → R-PH E113 → /025.2D

3269PN587-S-23/061.1A → X200 2 → E131 → FS131 (1, 2, 4A) → Y-PH E133 → /025.2E

3269PN587-S-23/061.1A → X200 3 → E151 → FS151 (1, 2, 4A) → B-PH E153 → /025.2E

3269PN587-S-23/061.1B → X200 4 → E171 → LK171 (1, 2) → N E173 → /025.2E

TO 50LBB RELAY CIRCUIT

TO 765KV BUS-I CVT (WDG-2) METG. CORE

3269PN587-S-23/061.1B → X200 5 → R-PH E211 → /017.3A

3269PN587-S-23/061.1B → X200 6 → Y-PH E231 → /017.4A

3269PN587-S-23/061.1B → X200 7 → B-PH E251 → /017.4A

3269PN587-S-23/061.1B → X200 8 → N E271 → /017.4A

TO CVT SELECTION CIRCUIT

Y-PH E231 → /047.1E

N E271 → /047.1E

TO BCU FOR SYNCH.

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	CONSULTANT: TATA CONSULTING ENGINEERS LTD. CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION	Schneider Electric	TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) BUS CVT SELECTION CIRCUIT	PREPARED : GD REVIEWED : THY APPROVED : APS REVISION: C DATE: 20-06-2014 SHT :014 CONT: 015
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	PPGCL DRG. NO: L&T DRG. NO:		PANEL TYPE : +704AT	DRG. NO.: 3269PN587-S-14

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FUTURE 400kV SIDE PANEL

400KV SELECTED BUS CVT

+704AT

X10

1 — R-PH — E711 — /017.5A

2 — Y-PH — E731 — /017.5A

3 — B-PH — E751 — /017.6A

4 — N — E771 — /017.6A

TO CVT SELECTION CIRCUIT

+ADJ PANEL

400KV SELECTED BUS CVT TO TIE BCU FOR SYNCHRO

X200A 1

X200A 2

X200A 3

X200A 4

TIE SELECTED CVT SUPPLY(BUS-1 CVT/GT CVT) PROTN. CORE

X200A 5 — R-PH — E111T — /018.3B

X200A 6 — Y-PH — E131T — /018.3B

X200A 7 — B-PH — E151T — /018.3B

X200A 8 — N — E171T — /018.3B

TO CVT SELECTION CIRCUIT

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION** **PPGCL DRG. NO:** **L&T DRG. NO:**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) BUS CVT SELECTION CIRCUIT** **PANEL TYPE : +704AT**

PREPARED : GD	REVISION: C	SHT :015	
REVIEWED : THY	DATE: 20-06-2014	CONT: 016	
APPROVED : APS			
DRG. NO.: 3269PN587-S-14			

765KV BUS-II CVT (WDG-2) SELECTED	765KV BUS-II CVT (WDG-2) DE-SELECTED	765KV TIE CVT SELECTED (BUS-1 CVT)	765KV TIE CVT DE-SELECTED (BUS-1 CVT)	400KV SIDE SELECTED BUS CVT SELECTED	400KV SIDE SELECTED BUS CVT DE-SELECTED	765KV TIE SELECTED CVT SUPPLY SELECTED	765KV BUS-II CVT SUPPLY SELECTED

+704AT

/009.4E S101 → S101 /048.1C

S101 /056.3C

S101 /059.2C

S101 /059.3C

S101 /059.5C

/056.4C	/056.4C	/059.2C	/059.3C	/059.4C	/059.4C	/059.5C	/059.6C
S621	S623	S625	S627	S629	S633	S631	S635
27	25	27	25	27	25	27	25
MVAJM14 75A /061.4A OP	MVAJM14 75A /061.4A RE	MVAJM14 75B /061.5A OP	MVAJM14 75B /061.5A RE	MVAJM14 75C /061.6A OP	MVAJM14 75C /061.6A RE	MVAJM14 75D /061.7A OP	MVAJM14 75D /061.7A RE
28	26	28	26	28	26	28	26

/009.4E S102 → S102 /048.1D

1	2	3	4	5	6	7	8

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) BUS CVT SELECTION CIRCUIT**	PREPARED : GD REVIEWED : THY APPROVED : APS DATE: 20-06-2014 REVISION: C SHT : 016 CONT: 017
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**

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765KV BUS-2 CVT (WDG-2) METG. CORE | 765KV BUS-1 CVT (WDG-2) METG. CORE | 400KV SIDE SELECTED BUS CVT SUPPLY

+704AT

E511 /014.7B
E531 /014.7B
E551 /014.7C
E571 /014.7C
E211 /014.7D
E231 /014.7E
E251 /014.7E
E271 /014.7E
E711 /015.6A
E731 /015.6A
E751 /015.6B
E771 /015.6B

TO BUS CVT VOLTAGE SELECTION RELAY CKT.

N	E271	/018.8B
B-PH	E251	/018.7B
Y-PH	E231	/018.7B
R-PH	E211	/018.6B
N	E571	/018.6B
B-PH	E551	/018.5B
Y-PH	E531	/018.5B
R-PH	E511	/018.5B

75A: 1 5 9 15 — /061.4A /061.4A /061.4A /061.4A — 3 7 11 13
75B: 1 5 9 15 — /061.5A /061.5A /061.5A /061.5A — 3 7 11 13
75C: 1 5 9 15 — /061.6A /061.6A /061.6A /061.6A — 3 7 11 13

TO BCUT FOR METERING

R-PH	E513	/047.1C
Y-PH	E533	/047.1D
B-PH	E553	/047.1D
N	E573	/047.1D

X10 Ø5 X10 Ø6 X10 Ø7 X10 Ø8

+FUTURE METERING PANEL

CVT SUPPLY TO METERING PANEL

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) BUS CVT SELECTION CIRCUIT**	PREPARED : GD / REVIEWED : THY / APPROVED : APS; REVISION: C; DATE: 20-06-2014; SHT :017; CONT:018
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**		**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013				

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765KV BUS-II CVT (WDG-1) PROTN. CORE | 765KV BUS-I CVT (WDG-1) PROTN. CORE | 765KV BUS-2 CVT (WDG-2) PROTN. CORE | 765KV BUS-I CVT (WDG-2) PROTN. CORE

+704AT

E411 /014.7A, E431 /014.7A, E451 /014.7B, E471 /014.7B, E111T /015.6D, E131T /015.6E, E151T /015.6E, E171T /015.6E

75D

1	5	2	6	9	15	17	10
/061.7A	/061.7A	/061.7A	/061.7A	/061.7A	/061.7A	/061.7A	/061.7A
3	7	4	8	11	13	19	12

R-PH
Y-PH
B-PH
N

E511 /017.7C, E531 /017.7C, E551 /017.7B, E571 /017.7B

75A

17	2	6	10
/061.4A	/061.4A	/061.4A	/061.4A
19	4	8	12

R-PH
Y-PH
B-PH
N

E211 /017.7B, E231 /017.7B, E251 /017.7B, E271 /017.7B

75B

17	6	10	14
/061.5A	/061.5A	/061.5A	/061.5A
19	8	12	16

R-PH
Y-PH
B-PH
N

E413, E433, E453, E473 → X10 9, 10, 11, 12

1E11, 1E31, 1E51, 1E71 → X10 17, 18, 19, 20

FUTURE 765kV PROTN. PANEL

TO MAIN-I DIFF. RELAY FOR O/F PROTN.

TO MAIN-II DIFF. RELAY FOR O/F PROTN.

FUTURE 400kV SIDE PANEL

TO IV SIDE VT SELECTION CIRCUIT

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) BUS CVT SELECTION CIRCUIT**	PREPARED : GD REVIEWED : THY APPROVED : APS	REVISION: C DATE: 20-06-2014	SHT :018 CONT: 019
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**		

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+704AT

FROM CT DISTRIBUTION CIRCUIT (704-CT CORE-5)

/013.6D B111 — ** — 41 42 — B111A — R PH — S3 /061.1D R3 — B113

/013.6E B131 — ** — 43 44 — B131A — Y PH — S4 /061.1D R4 — B133

/013.6E B151 — ** — 45 46 — B151A — B PH — S5 /061.1D R5 — B153

/013.6F B171 — ** — 47 48 — B171A — N — S6 /061.1D R6 — B173

BLKA

P743
PUA
/064.1B

A1 — 5A 1A — A2 — B175
A3
A4 — 5A 1A — A5
A6
A7 — 5A 1A — A8
A9
A10 — 5A 1A — A11
A12

FROM CT DISTRIBUTION CIRCUIT (705-CTA CORE-2)

/011.7D B111A
/011.7D B131A
/011.7D B151A
/011.7E B171A

**NOTE: SHORTING TO BE REMOVED WHEN FUTURE ICT BAY IS COMMISSIONED.

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) GRP-A BB PROTN. AC CKT.**	PREPARED : GD REVIEWED : THY APPROVED : APS	REVISION: C DATE: 20-06-2014	SHT :019 CONT: 020
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**		**DRG. NO.: 3269PN587-S-14**	

1	2	3	4	5	6	7	8
DC SOURCE-1 SUPPLY FROM BUSBAR PANEL	MAIN CB CLOSED: 'R' PH / 'Y' PH / 'B' PH	MAIN CB OPEN	BUS-II ISOLATOR OPEN	BUS-II ISOLATOR CLOSE	SPARE	SPARE	SPARE	SPARE

+7BB

3269PN587-S-23/054.7B (-VE)

3269PN587-S-23/054.7B (+VE)

704-52

X3-R:15 X3-Y:15 X3-B:15 X3-R:13 X3-Y:13 X3-B:13

X3-R:16 X3-Y:16 X3-B:16 X3-R:14 X3-Y:14 X3-B:14

704-89A

TB4-107 TB3-105

TB4-152 TB3-142

+704AT

X202 8 X202 7

X4 1 X4 2 X4 3 X4 4 X4 5 X4 6

P141 /028.1C

P142 /028.1F

TO 96A TRIP RELAY CKT.

P142 P141

1 S2

LK1 BLKA /061.1D

2 R2

P104 P103

P103 /021.1B

X4 7 X4 8 X4 9 X4 10 X4 11 X4 12

P105 P107 P109 P111 P113 P115 P117 P119

P743 PUA /064.4E

+ G2

- G1

P743 PUA /064.1D

B2 B4 B6 B8 B10 B12 B14 B16

B1 B3 B5 B7 B9 B11 B13 B15

P104 /021.1F

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.**		**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) GRP-A BB PROTN. - OPTO INPUT CKT**
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**PANEL TYPE : +704AT**
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**DRG. NO.: 3269PN587-S-14**

PREPARED : GD	REVISION: C	SHT :020
REVIEWED : THY	DATE: 20-06-2014	CONT: 021
APPROVED : APS		

1	2	3	4	5	6	7	8
	LBB PROTECTION OPERATED TO INITATIE BB PROTN.	CB CLOSE COMMAND FROM MAIN BCU/TIE BCU FOR END FAULT PROTECTION	PUB RELAY FAULTY	96A GRP-A BUSBAR TRIP RELAY OPTD.	96A GRP-A BB TRIP RELAY SUPERVISION	SPARE	SPARE	SPARE	

+ADJ PANEL

NOTE: THIS LINK TO REMOVED WHEN FUTURE BAY IS COMMISSIONED.

** NOTE: SHORTING TO BE DONE WHEN FUTURE ICT BAY IS COMMISSIONED.

+704AT

X201B 17 ##

X201B 18

/020.8D P103

X4 78

K901 /031.3C

P103 /056.5C

RL1 50LBB /062.3B E1 E2

K909 /031.3D

P121A

X4 79

P123 /056.5C

X4 74

** I

X4 75

P123A ##

WD1 PUB /066.4D G11 G12

96A /028.7C 1 3

P141 /028.3C

R96A 3.3K 1 2

X4 13

X4 16

X4 14

X4 15

X4 17

P125 P127 P129 P131 P133 P135

P743 PUA /064.3D

C2 C4 C6 C8 C10 C12 C14 C16

C1 C3 C5 C7 C9 C11 C13 C15

/020.8F P104

P139 /028.3E

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	CONSULTANT: TATA CONSULTING ENGINEERS LTD. CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION	Schneider Electric	TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) GRP-A BB PROTN. - OPTO INPUT CKT	PREPARED : GD REVIEWED : THY APPROVED : APS	REVISION: C DATE: 20-06-2014	SHT :021 CONT: 022
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	PPGCL DRG. NO: L&T DRG. NO:		PANEL TYPE : +704AT		DRG. NO.: 3269PN587-S-14	

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+704AT

FROM CT DISTRIBUTION CIRCUIT (704-CT CORE-4)

/013.6B B211 — ** — 49 — 50 — B211A — R-PH — S3 /061.2D R3 — B213 — A1
/013.6B B231 — ** — 51 — 52 — B231A — Y-PH — S4 /061.2D R4 — B233 — A4
/013.6C B251 — ** — 53 — 54 — B251A — B-PH — S5 /061.2D R5 — B253 — A7
/013.6C B271 — ** — 55 — 56 — B271A — N — S6 /061.2D R6 — B273 — A10 / A12

BLKB

P743
PUB
/066.1B

A1 — 5A — 1A — A2 — B275
A3
A4 — 5A — 1A — A5
A6
A7 — 5A — 1A — A8
A9
A10 — 5A — 1A — A11
A12

FROM CT DISTRIBUTION CIRCUIT (705-CTA CORE-1)

/010.6D B211A
/010.6D B231A
/010.6D B251A
/010.6E B271A

**NOTE: SHORTING TO BE REMOVED WHEN FUTURE ICT BAY IS COMMISSIONED.

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) GRP-B BB PROTN. AC CKT.**
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**

PREPARED : GD	REVISION: C	SHT :022	
REVIEWED : THY	DATE: 20-06-2014	CONT: 023	
APPROVED : APS			
DRG. NO.: 3269PN587-S-14			

1	2	3	4	5	6	7	8
DC SOURCE-2 SUPPLY FROM BUSBAR PANEL	MAIN CB CLOSED: 'R' PH / 'Y' PH / 'B' PH	MAIN CB OPEN	BUS-II ISOLATOR OPEN	BUS-II ISOLATOR CLOSE	SPARE	SPARE	SPARE	SPARE

+7BB

3269PN587-S-23/057.7B (-VE)

3269PN587-S-23/057.7B (+VE)

704-52

X3-R:19 X3-Y:19 X3-B:19 X3-R:17 X3-Y:17 X3-B:17

X3-R:20 X3-Y:20 X3-B:20 X3-R:18 X3-Y:18 X3-B:18

704-89A

TB4-111 TB4-153

TB3-109 TB3-143

+704AT

X203 8 (P442) X203 7 (P441)

P441 /029.2C

P442 /029.2F

TO 96B TRIP RELAY CKT.

1 LK2 2

S2 BLKB /061.2D R2

X4 18 X4 19 X4 20 X4 21 X4 22 X4 23 X4 24 X4 25 X4 26 X4 27 X4 28 X4 29

P203 /024.1B

P204 /024.1F

P204 P203 P205 P207 P209 P211 P213 P215 P217 P221

P743 PUB /066.4E: + G2, - G1

P743 PUB /066.1D: B2 B4 B6 B8 B10 B12 B14 B16 / B1 B3 B5 B7 B9 B11 B13 B15

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	CONSULTANT: TATA CONSULTING ENGINEERS LTD. CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION	Schneider Electric	TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) GRP-B BB PROTN. - OPTO INPUT CKT	PREPARED : GD REVIEWED : THY APPROVED : APS	REVISION: C DATE: 20-06-2014	SHT :023 CONT: 024
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	PPGCL DRG. NO: L&T DRG. NO:		PANEL TYPE : +704AT	DRG. NO.: 3269PN587-S-14		

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1	2	3	4	5	6	7	8
	LBB PROTECTION OPERATED TO INITIATE BB PROTN.	CB CLOSE COMMAND FROM MAIN BCU/TIE BCU FOR END FAULT PROTN.	PUA RELAY FAULTY	96B GRP-B BUSBAR TRIP RELAY OPTD.	96B GRP-B BB TRIP RELAY SUPERVISION	SPARE	SPARE	SPARE	

+ADJ PANEL

NOTE: THIS LINK TO REMOVED WHEN FUTURE BAY IS COMMISSIONED.

** NOTE: SHORTING TO BE DONE WHEN FUTURE ICT BAY IS COMMISSIONED.

+704AT

X201B 19 ##

X201B 20

/023.8D P203

X4 80

RL2 50LBB /062.3B E3 E4

K951 /032.3C

P203 /056.5C

G11 WD1 PUA /064.4D G12

1 96B /029.7C 3

P441 /029.4C

X4 30

X4 33

1 R96B 3.3K 2

X4 31

X4 32

X4 34

K959 /032.3D

P225 /056.6C

P223

X4 81

X4 72 **

X4 73

P225A

P227 P229 P231 P233 P235 P237

P743 PUB /066.3D

C2 C4 C6 C8 C10 C12 C14 C16

C1 C3 C5 C7 C9 C11 C13 C15

/023.8F P204

P497 /029.4D

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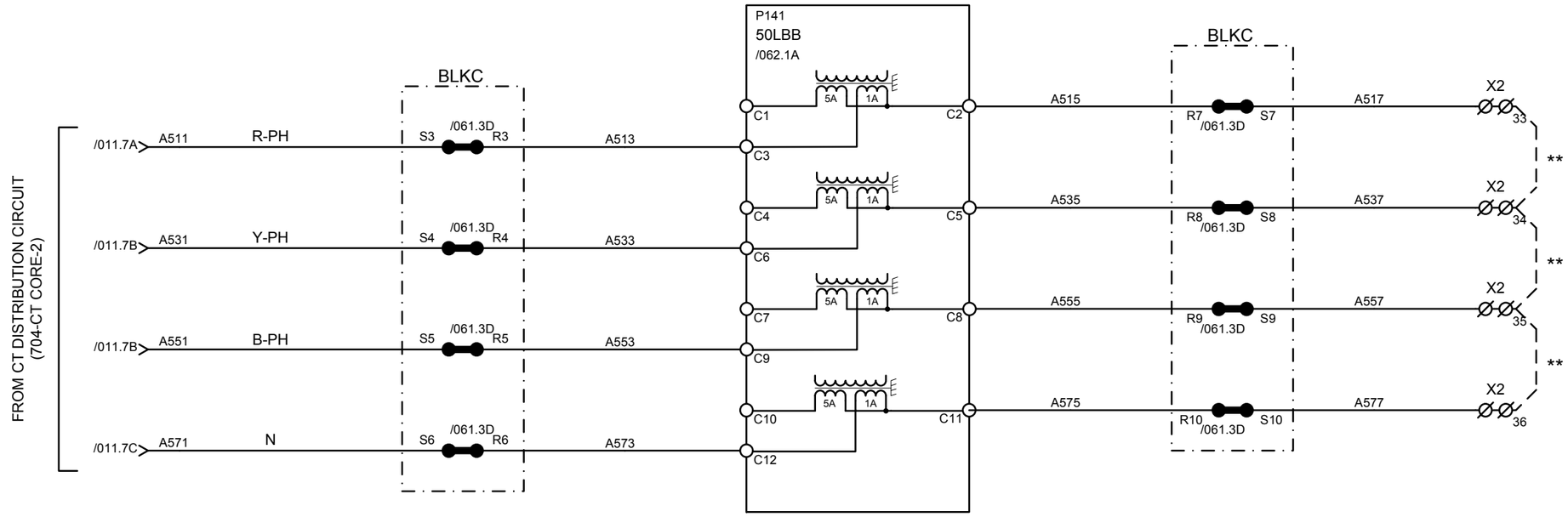
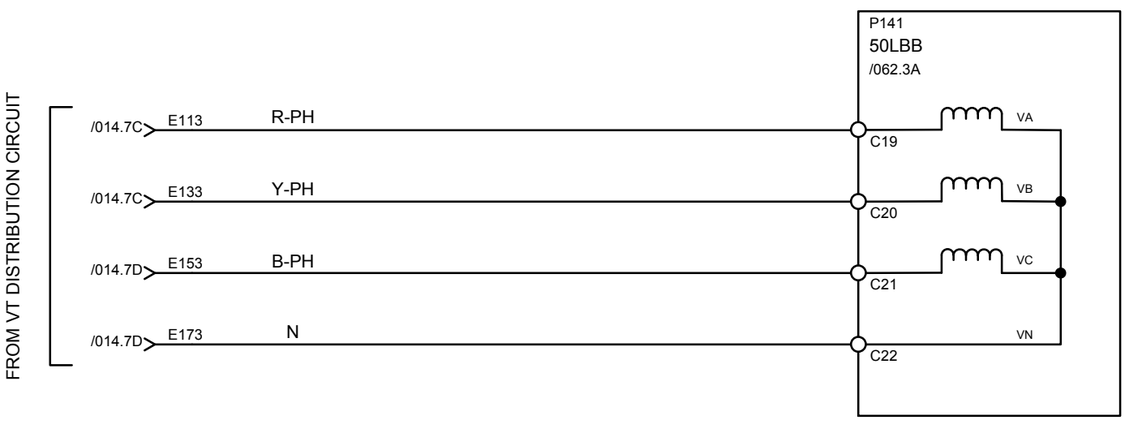
CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	CONSULTANT: TATA CONSULTING ENGINEERS LTD. CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION	Schneider Electric	TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) GRP-B BB PROTN. - OPTO INPUT CKT	PREPARED : GD REVIEWED : THY APPROVED : APS DATE: 20-06-2014 REVISION: C SHT :024 CONT: 025
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	PPGCL DRG. NO: L&T DRG. NO:		PANEL TYPE : +704AT	DRG. NO.: 3269PN587-S-14

+704AT





NOTE:** SHORTING TO BE REMOVED AND TO BE CONNECTED TO MAIN-II DIFF. PROTN RELAY WHEN FUTURE BAY IS COMMISSIONED.

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) 50LBB PROTN.-AC CKT.**	PREPARED : GD REVIEWED : THY APPROVED : APS REVISION: C DATE: 20-06-2014 SHT :025 CONT: 026
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**

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1	2	3	4	5	6	7	8
	3-PH LBB INITIATION	BCU FAULTY	86LO TRIP RELAY SUPERVISION	86LO TRIP RELAY OPTD.	SPARE	SPARE	LBB SELECTOR SWITCH 'IN' POSITION	LBB SELECTOR SWITCH 'OUT' POSITION

FUTURE 765kV PROTN. PANEL

+704AT

X4 76 X4 77

/009.5E K601

S2
BLKC
/061.3D
R2

K603

96A /028.7C 5 7
96B /029.7C 5 7

K605 K607

K603 /046.2C
/046.2C

K401 /027.3C
1
R86
3.3K
2
K409

86LO /027.7C 18 20
K611

X4 35

X4 36
K613

X4 37
K615

LBBS /061.3A 1 IN 2 OUT
K617

LBBS /061.3B 3 IN 4 OUT
K619

P141
50LBB
/062.1C

D2 D4 D6 D8 D10 D12 D14 D16
D1 D3 D5 D7 D9 D11 D13 D15

P141
50LBB
/062.1E

+ F2
- F1

K604

1
LK3
2

K405 /027.3E

/009.5E K602

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION** **PPGCL DRG. NO:** **L&T DRG. NO:**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) 50LBB PROTN.-OPTO INPUT CKT** **PANEL TYPE : +704AT**	PREPARED : GD REVIEWED : THY APPROVED : APS	REVISION: C DATE: 20-06-2014	SHT :026 CONT: 027	**DRG. NO.: 3269PN587-S-14**

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1	2	3	4	5	6	7	8
		LBB PROTN. OPTD.	TRIP RELAY SUPERVISION	CUSTOMER USE	TRIP RELAY RESET		

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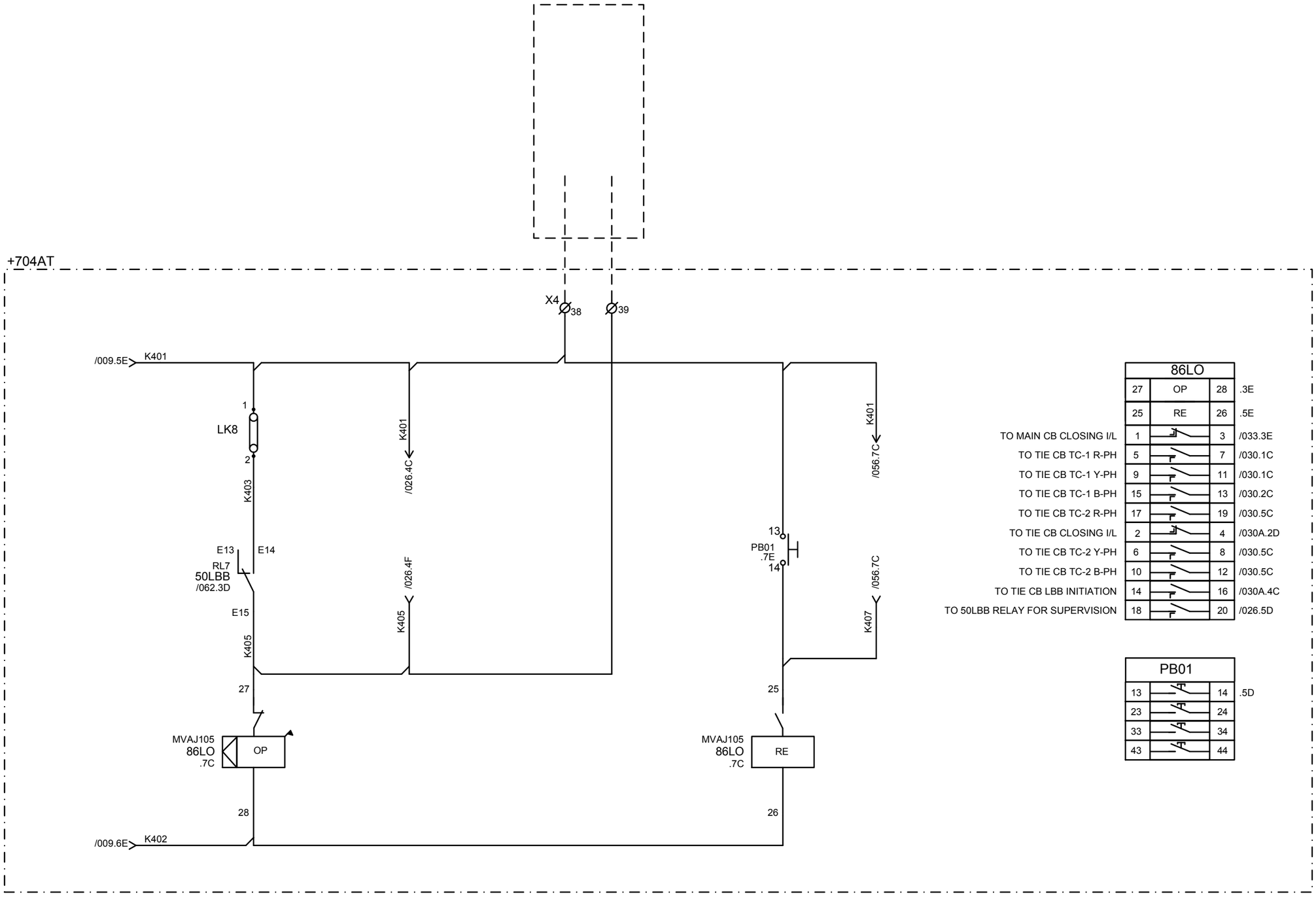

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) 86LO TRIP RELAY CKT.**	PREPARED : GD REVIEWED : THY APPROVED : APS DATE: 20-06-2014 REVISION: C SHT :027 CONT:028
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**

1	2	3	4	5	6	7	8

1	2	3	4	5	6	7	8
	BB PROTECTION OPERATED FROM PUA	BB PROTECTION OPERATED FROM PUB	BB TRIP RELAY SUPERVISION	TIE CB LBB PROTN. OPTD.	CUSTOMER USE	BUSBAR TRIP RELAY RESET	

+704AT

NOTE:* THIS STATUS TO BE DISCONNECTED AND SHALL BE CONNECTED TO 86A TRIP RELAY WHEN FUTURE BAY IS COMMISSIONED

X201B 1 * — K501 — X4 40
X201B 2 * — K539 — X4 41
X4 42
X4 43

/020.1C P141

S1 BLKA /061.1D R1 — P137 — E5 — RL11 PUA /064.4B — E6 — 27 — MVAJ205 96A .7C OP — 28 — /020.1C P142

1 LK4 2 — P143 — E5 — RL11 PUB /066.4B — E6

P141 — /021.5C

/021.5F — P139

E3 — RL10 PUA /064.4B — E4 — P147 — 25 — MVAJ205 96A .7C RE — 26

96A			
27	OP	28	.2E
25	RE	26	.6E
TO PUA OPTO I/P.	1	3	/021.4C
LBB INI. TO 50LBB RELAY	5	7	/026.2D
TO MAIN CB TC-1 R-PH	9	11	/035.2C
TO MAIN CB TC-1 Y-PH	15	13	/035.2C
TO MAIN CB TC-1 B-PH	17	19	/035.2C
TO MAIN CB TC-2 R-PH	2	4	/037.2D
TO MAIN CB TC-2 Y-PH	6	8	/037.2D
TO MAIN CB TC-2 B-PH	10	12	/037.2D
SPARE	14	16	/060.2D
TO BCU	18	20	/054.1D
TO MAIN CB CLOSING I/L	29	31	/033.3C
TO TIE CB TC-1 R-PH	33	35	/030.3C
TO TIE CB TC-1 Y-PH	39	37	/030.3C
TO TIE CB TC-1 B-PH	41	43	/030.3C
TO TIE CB LBB INITIATION	45	47	/030A.5C
TO TIE CB CLOSING I/L	30	32	/030A.2C
TO TIE CB TC-2 R-PH	34	36	/030.7C
TO TIE CB TC-2 Y-PH	38	40	/030.7C
TO TIE CB TC-2 B-PH	42	44	/030.7C
	46	48	

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) GROUP-A BUSBAR TRIP RELAY CKT.**	PREPARED : GD REVIEWED : THY APPROVED : APS REVISION: C DATE: 20-06-2014 SHT :028 CONT:029
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**

1	2	3	4	5	6	7	8

1	2	3	4	5	6	7	8
	BB PROTECTION OPERATED FROM PUA	BB PROTECTION OPERATED FROM PUB	BB TRIP RELAY SUPERVISION	TIE CB LBB PROTN. OPTD.	CUSTOMER USE	BUSBAR TRIP RELAY 96B RESET	

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+704AT

X201B 3 * — K301 — X4 ∅44

X201B 4 * — K339 — X4 ∅45

X4 ∅46

X4 ∅47

NOTE:* THIS STATUS TO BE DISCONNECTED AND SHALL BE CONNECTED TO 86A TRIP RELAY WHEN FUTURE BAY IS COMMISSIONED

/023.1C > P441

1 — LK5 — 2 — P493 — E7 — RL12 PUA /064.4B — E8 — P497 — 27 — MVAJ205 96B .7C OP — 28

S1 — BLKB /061.2D — R1 — P495 — E7 — RL12 PUB /066.4B — E8 — P497

P441 — /024.5C

/024.5F

E3 — RL10 PUB /066.4B — E4 — P499 — 25 — MVAJ205 96B .7C RE — 26

/023.1D > P442

96B

	27 OP 28		.2E
	25 RE 26		.6E
TO PUB OPTO I/P.	1	3	/024.4C
LBB INI. TO 50LBB RELAY	5	7	/026.3D
TO MAIN CB TC-1 R-PH	9	11	/035.4C
TO MAIN CB TC-1 Y-PH	15	13	/035.4C
TO MAIN CB TC-1 B-PH	17	19	/035.4C
TO MAIN CB TC-2 R-PH	2	4	/037.3D
TO MAIN CB TC-2 Y-PH	6	8	/037.4D
TO MAIN CB TC-2 B-PH	10	12	/037.4D
SPARE	14	16	/060.3D
TO BCU	18	20	/054.2D
TO MAIN CB CLOSING I/L	29	31	/033.3D
TO TIE CB TC-1 R-PH	33	35	/030.4C
TO TIE CB TC-1 Y-PH	39	37	/030.4C
TO TIE CB TC-1 B-PH	41	43	/030.4C
TO TIE CB LBB INITIATION	45	47	/030A.6C
TO TIE CB CLOSING I/L	30	32	/030A.3B
TO TIE CB TC-2 R-PH	34	36	/030.8C
TO TIE CB TC-2 Y-PH	38	40	/030.8C
TO TIE CB TC-2 B-PH	42	44	/030.8C
	46	48	

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.**		**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) GROUP-B BUSBAR TRIP RELAY CKT.**
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**

PREPARED : GD	REVISION: C	SHT :029
REVIEWED : THY	DATE: 20-06-2014	CONT:030
APPROVED : APS		
DRG. NO.: 3269PN587-S-14		

1	2	3	4	5	6	7	8

86LO,,96A & 96B & FUTURE 86A,86B TRIP RELAY OPERATED TO TIE BAY TC-1 CKT.

86LO,,96A & 96B & FUTURE 86A,86B TRIP RELAY OPERATED TO TIE BAY TC-2 CKT.

FUTURE 765kV PROTN. PANEL

+704AT

X4 64 65 66 67

X4 68 69 70 71

**

X4 52

X4 56

86LO

5 9 15 /027.7C /027.7C /027.7C 7 11 13

17 6 10 /027.7C /027.7C /027.7C 19 8 12

96A

33 39 41 /028.7C /028.7C /028.7C 35 37 43

34 38 42 /028.7C /028.7C /028.7C 36 40 44

96B

33 39 41 /029.7C /029.7C /029.7C 35 37 43

34 38 42 /029.7C /029.7C /029.7C 36 40 44

X4 53 54 55

X4 57 58 59

NOTE: ** CONTACTS TO BE REMOVED WHEN FUTURE ICT PROTN. PANEL IS COMMISSIONED.

NOTE: ** CONTACTS TO BE REMOVED WHEN FUTURE ICT PROTN. PANEL IS COMMISSIONED.

1K21 1K23 1K25 1K27

1K55 1K61 1K63 1K65

X201C 1 2 3 4

X201C 5 6 7 8

+ADJ PANEL

TO TIE CB TC-1 CIRCUIT

TO TIE CB TC-2 CIRCUIT

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.**	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) 86LO TRIP RELAY CONTACTS DISTN. TO TIE BAY**	PREPARED : GD / REVIEWED : THY / APPROVED : APS; REVISION: C; DATE: 20-06-2014; SHT :030; CONT: 030A
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO: L&T DRG. NO:**		

Schneider Electric

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86LO TRIP RELAY NOT OPERATED	86A,86B RELAY NOT OPERATED TO TIE BAY	86LO,86A& 86B TRIP RELAY OPERATED TO TIE BAY LBB INITIATION	DEAD ZONE PROTN OPTD. TO FUTURE TRIP RELAYS(86A&86B)

FUTURE 765kV PROTN. PANEL

+704AT

X4 96 X4 97 X4 98 X4 99 X10 47 X10 48 X10 49 X10 50

X4 60 — 1K15D — 30 — && 96B /029.7C — 32 — 1K15C — 30 — && 96A /028.7C — 32 — 1K15B — X4 61

— 1K15F — 1K15G

X4 94

— X4 95 — 1K15A — 2 — 86LO /027.7C — 4 — 1K15

1K11 — X201C 9

1K15 — X201C 11

14 — 86LO /027.7C — 16

X4 62 — 1K703A — 45 — && 96A /028.7C — 47 — && 96B /029.7C — 45 — 47 — 1K703B — X4 63

1K703 — X201C 12

1K761 — X201C 13

K411 — E9 — RL13 PUA /064.4C — E10

K413 — E9 — RL13 PUB /066.4C — E10

K415 — E11 — RL14 PUA /064.4C — E12

K417 — E11 — RL14 PUB /066.4C — E12

+ADJ PANEL

TRIP RELAYS NOT OPERATED TO TIE CB CLOSING I/L CIRCUIT

TO TIE CB LBB INITIATION CIRCUIT

NOTE:
1. && 96A & 96B CONTACT'S TO BE REMOVED AND SHORTING TO BE PROVIDED WHEN FUTURE ICT BAY IS COMMISSIONED
2.## SHORTING TO BE PROVIDED WHEN FUTURE ICT BAY IS COMMISSIONED

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	CONSULTANT: TATA CONSULTING ENGINEERS LTD. CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION	Schneider Electric	TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) RELAY CONTACTS DISTN. TO TIE BAY	PREPARED : GD REVIEWED : THY APPROVED : APS	REVISION: C DATE: 20-06-2014	SHT :030A CONT: 031
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	PPGCL DRG. NO: L&T DRG. NO:		PANEL TYPE : +704AT		DRG. NO.: 3269PN587-S-14	

1	2	3	4	5	6	7	8
DEAD ZONE PROTN. OPTD	MAIN BAY BB PROTN. OPTD.	TIE CB LBB OPERATED	TIE CB MANUAL TRIP	MAIN CB OPEN	TIE CB OPEN	MAIN CB MANUAL TRIP	50LBB PROTN. OPTD	MAIN-I/II DIFF./TRAFO TROUBLE/ REF/ O/C & E/F/O/F PROTN. OPTD.

+ADJ PANEL

704-52

X3-R:5 X3-Y:5 X3-B:5

X3-R:6 X3-Y:6 X3-B:6

+ADJ PANEL

FUTURE 765kV PROTN. PANEL

MAIN-I/II DIFF./TRAFO TROUBLE/ REF/ O/C & E/F/O/F PROTN. OPTD.

+704AT

X201B 7

X201A 6

X4 49

X4 50

X201B 5

X201B 6

X10 41

X10 42

X4 82

**

X4 83

K917

S7 BLKA /061.1D R7 K903 F7 RL4 PUA /064.6B F8 K901A

S7 BLKB /061.2D R7 K905 F7 RL4 PUB /066.6B F8 K909A

S8 BLKA /061.1D R8 K911 F9 RL5 PUA /064.6C F10 K913A

S8 BLKB /061.2D R8 K915 F9 RL5 PUB /066.6C F10

K901 /021.2C ##

/021.2D

K909 ##

K913

X4 84

X4 85

X4 86

X4 87

**

**

13 TRIP 14 52CS /061.1B AT AC CLOSE

K913A

/056.6C

K901A

/056.6C

K913A

1 LK6 2

K925

E5 RL3 50LBB /062.3C E6

X10 39

X10 40

FUTURE 400kV SIDE PANEL

** NOTE: SHORTING TO BE DONE WHEN FUTURE ICT BAY IS COMMISSIONED.

NOTE: THIS LINK TO REMOVED WHEN FUTURE BAY IS COMMISSIONED.

TO 400KV SIDE GRP-A TRIP RELAY

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.**		**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) INTER TRIP CKT.**	PREPARED : GD / REVIEWED : THY / APPROVED : APS; REVISION: C; DATE: 20-06-2014; SHT :031; CONT: 032
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric		
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**

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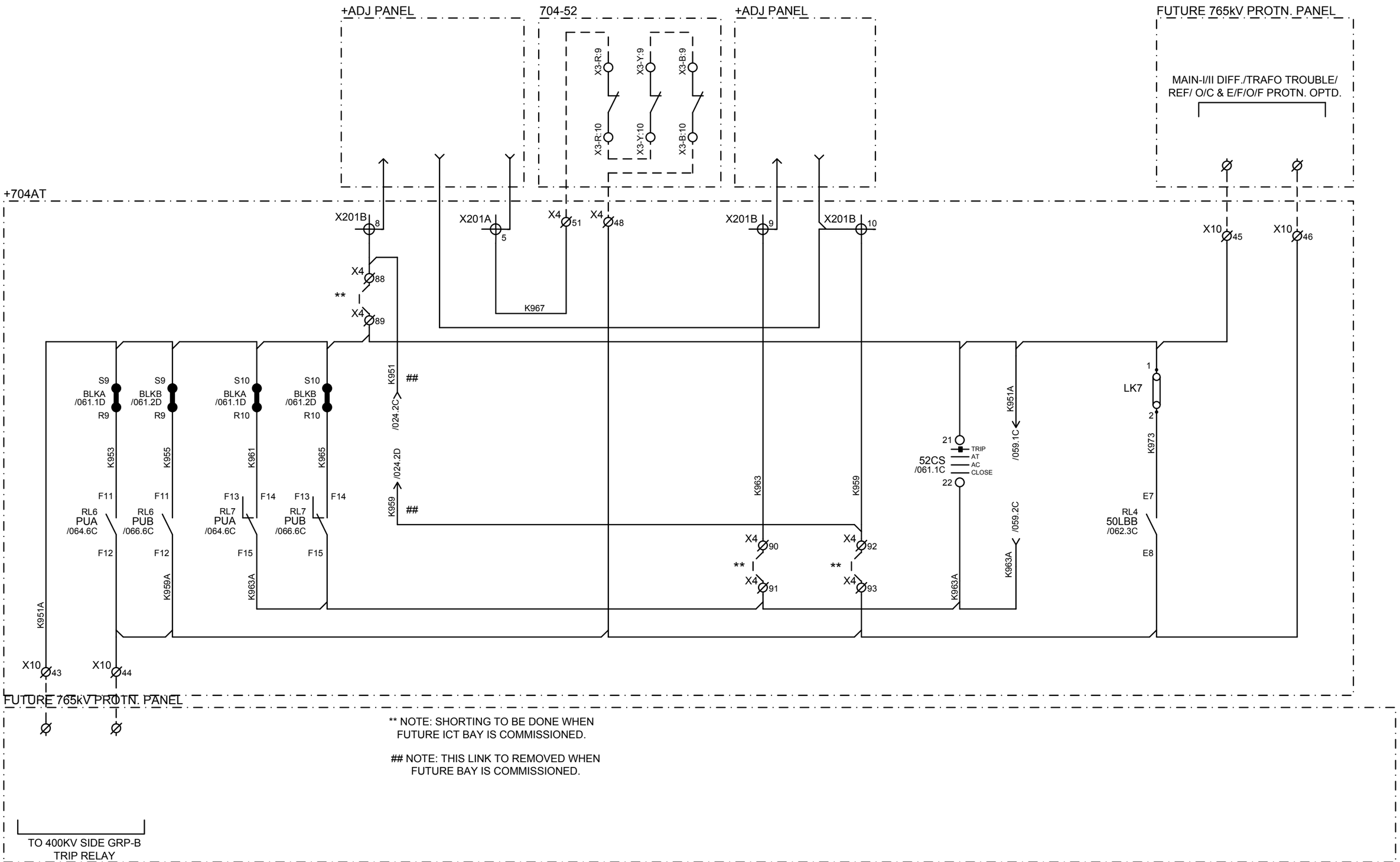
1	2	3	4	5	6	7	8
DEAD ZONE PROTN. OPTD	MAIN BAY BB PROTN. OPTD.	TIE CB LBB OPERATED	TIE CB MANUAL TRIP	MAIN CB OPEN	TIE CB OPEN	MAIN CB MANUAL TRIP	50LBB PROTN. OPTD	MAIN-I/II DIFF./TRAFO TROUBLE/ REF/ O/C & E/F/O/F PROTN. OPTD.



** NOTE: SHORTING TO BE DONE WHEN FUTURE ICT BAY IS COMMISSIONED.

NOTE: THIS LINK TO REMOVED WHEN FUTURE BAY IS COMMISSIONED.

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) INTER TRIP CKT.**	PREPARED : GD REVIEWED : THY APPROVED : APS REVISION: C DATE: 20-06-2014 SHT :032 CONT: 033
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**

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1	2	3	4	5	6	7	8
	CB TRIP CIRCUIT-1 DC SUPPLY	86LO,96A & 96B TRIP RELAYS NOT OPTD.	86A & 86B TRIP RELAYS NOT OPTD.	REMOTE CLOSE COMMAND FROM BCU	REMOTE TRIP-1		

FUTURE 765kV PROTN. PANEL

86A & 86B TRIP RELAYS NOT OPTD.

NOTE:** SHORTING TO BE REMOVED WHEN FUTURE BAY IS COMMISSIONED.

+704AT

X10 21 X10 22

**

/008.2C K1 K1 /036.4A

/008.2C K2 K2 /036.4A

K9 29 96A /028.7C 31 K7 29 96B /029.7C 31 K5 1 86LO /027.7C 3 K3

K9 /056.1C

K13 /056.2C

K3 1 LKT1 2 K21 /035.1B

TO CB TC-1 CKT.

K3 /056.2C K3 /058.5C K3 /058.5C

15 TRIP AT AC CLOSE 52CS /061.1B 16

17 TRIP AT AC CLOSE 52CS /061.1C 18

23 TRIP AT AC CLOSE 52CS /061.1C 24

K19A /056.2C K19A

K19B /058.5C

K19C /058.6C

X5 1 2 3 4 5 6 7 8

704-52

X1 1 +VE 2 -VE

X2 6 X2 2 X2 22 X2 24 X2 7 X2 8 X2 9

REMOTE CLOSE

REMOTE TRIP-1

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.	CONSULTANT: TATA CONSULTING ENGINEERS LTD.	TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) CB CLOSING & REMOTE TRIP-1 CKT.	PREPARED : GD / REVIEWED : THY / APPROVED : APS
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION		REVISION: C / DATE: 20-06-2014
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	PPGCL DRG. NO: L&T DRG. NO:	PANEL TYPE : +704AT	DRG. NO.: 3269PN587-S-14
			SHT :033 / CONT: 034

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1	2	3	4	5	6	7	8
	CB TRIP CIRCUIT-2 DC SUPPLY		REMOTE TRIP-2		CB LOCAL CLOSING I/L		

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+704AT

/008.3C K51 → K51 /038.4A

/008.3C K52 → K52 /038.4A

K53

11 TRIP AT AC CLOSE 12 — 52CS /061.1B

25 TRIP AT AC CLOSE 26 — 52CS /061.1C

27 TRIP AT AC CLOSE 28 — 52CS /061.1C

K53 /056.3C

K53 /058.6C

K53 /058.7C

/056.3C K57A

/058.6C K57B

/058.7C K57C

1 LKT2 2

K55 /037.1B

TO CB TC-2 CKT.

K53 X5 9 10 11

K57A X5 12

K57B X5 13

K57C X5 14

704-52

X1 5 +VE

6 -VE

X2 33 REMOTE +VE

X2 10 11 12 REMOTE TRIP-2

704-89BE

TB3-105

TB3-126

704-89AE

TB3-105

TB3-126

TB1 25

X1 * *

CB LOCAL CLOSING I/L

NOTE: * - TERMINALS TO BE IDENTIFIED AT SITE

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) CB REMOTE TRIP-2 & CB LOCAL CLOSING**	PREPARED : GD REVIEWED : THY APPROVED : APS REVISION: C DATE: 20-06-2014 SHT : 034 CONT: 035
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**

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96A TRIP RELAY OPTD. | 96B TRIP RELAY OPTD. | 86A & 86B TRIP RELAY OPTD.

FUTURE 765kV PROTN. PANEL

NOTE:** SHORTING TO BE REMOVED WHEN FUTURE TRIP HAS CONSIDERED

+704AT

X10 23 24 25 X10 26 27 28 29 30

**

/033.6D K21 → K21A /036.1B

96A: 9 15 17 / /028.7C /028.7C /028.7C / 11 13 19

96B: 9 15 17 / /029.7C /029.7C /029.7C / 11 13 19

K23 K25 K27

K23A /036.1C

K25A /036.1D

K27A /036.1D

X5 15 16 17

704-52

X2 87 88 89

PROTECTION TRIP & POST CLOSE SUPERVISION

'R' PH /036.4E

'Y' PH /036.4E

'B' PH /036.4F

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) CB TRIP COIL-1 CIRCUIT**
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**

PREPARED : GD | REVIEWED : THY | APPROVED : APS | DATE: 20-06-2014 | REVISION: C | SHT :035 | CONT: 036

DRG. NO.: 3269PN587-S-14

+704AT

X5 18 19 20 X5 21 22 23 24 25

** ** ** **

/033.2C K1

/033.2C K2

27 RLA RLB 28

MVAXM31 195R .7B COIL RLC

MVAXM31 195Y .7C COIL RLC

MVAXM31 195B .7D COIL RLC

195R			
21	COIL RLA	22	.5C
13	COIL RLB	14	.6D
27	COIL RLC	28	.5B
TO BCU 1		3	/053.1D
SPARE 5		7	/060.4B
2		4	

/035.8B K21A — K21S

21 COIL RLA 22

MVAXM31 195R .7B

MVAXM31 195Y .7C

MVAXM31 195B .7D

195Y			
21	COIL RLA	22	.6C
13	COIL RLB	14	.5D
27	COIL RLC	28	.6B
TO BCU 1		3	/053.1D
SPARE 5		7	/060.4B
2		4	

/035.8D K23A — K23S

/035.8D K25A — K25S

/035.8E K27A — K27S

195B			
21	COIL RLA	22	.6C
13	COIL RLB	14	.7D
27	COIL RLC	28	.6B
TO BCU 1		3	/053.2D
SPARE 5		7	/060.5B
2		4	

13 COIL RLB 14

MVAXM31 195Y .7C

MVAXM31 195R .7B

MVAXM31 195B .7D

K33 K35 K37 K39 K40 K41

X5 26 X5 27 28 29 30 31

NOTE:** SHORTING TO BE REMOVED WHEN FUTURE TRIP HAS CONSIDERED

704-52

/035.8E 'R' PH

/035.8E 'Y' PH

/035.8F 'B' PH

X2 * X2 13 X2 * X2 14 X2 * X2 15

NOTE: * - TERMINALS TO BE IDENTIFIED AT SITE

PRE-CLOSE SUPERVISION

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) CB TRIP COIL-1 CIRCUIT**	PREPARED : GD REVIEWED : THY APPROVED : APS	REVISION: C DATE: 20-06-2014	SHT :036 CONT: 037
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**		

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96A TRIP RELAY OPTD. | 96B TRIP RELAY OPTD. | 86A & 86B TRIP RELAY OPTD.

FUTURE 765kV PROTN. PANEL

NOTE:** SHORTING TO BE REMOVED WHEN FUTURE TRIP HAS CONSIDERED

+704AT

X10 31 32 33 X10 34 35 36 37 38 (** ** ** **)

/034.3D K55 → K55A /038.1B

96A: /028.7C (2, 6, 10 / 4, 8, 12)

96B: /029.7C (2, 6, 10 / 4, 8, 12)

K61 K63 K65

K61A /038.1C

K63A /038.1D

K65A /038.1D

X5 32 33 34

704-52

'R' PH /038.4E

'Y' PH /038.4E

'B' PH /038.4F

X2 90 91 92

PROTECTION TRIP & POST CLOSE SUPERVISION

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.**	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) CB TRIP COIL-2 CIRCUIT**	PREPARED : GD / REVIEWED : THY / APPROVED : APS; REVISION: C; DATE: 20-06-2014; SHT :037; CONT: 038
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**		
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**	**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**

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CUSTOMER USE

TRIP CIRCUIT-2 SUPERVISION

+704AT

/034.2B K51

/034.2C K52

27 RLA RLB 28

MVAXM31 295R .7B COIL RLC

MVAXM31 295Y .7C COIL RLC

MVAXM31 295B .7C COIL RLC

X5 35 36 37 X5 38 39 40 41 42

/037.8B K55A

** ** ** **

K55S

21 COIL RLA 22

MVAXM31 295R .7B COIL RLA

MVAXM31 295Y .7C COIL RLA

MVAXM31 295B .7C COIL RLA

/037.8D K61A

K61S

/037.8D K63A

K63S

/037.8E K65A

K65S

13 COIL RLB 14

MVAXM31 295R .7B COIL RLB

MVAXM31 295Y .7C COIL RLB

MVAXM31 295B .7C COIL RLB

K71 K73 K75 K77 K79 K81

X5 43 44 45 46 47 48

NOTE:** SHORTING TO BE REMOVED WHEN FUTURE TRIP HAS CONSIDERED

704-52

/037.8E 'R' PH

/037.8E 'Y' PH

/037.8F 'B' PH

X1 * X2 30 X1 * X2 31 X1 * X2 32

PRE-CLOSE SUPERVISION

NOTE: * - TERMINALS TO BE IDENTIFIED AT SITE

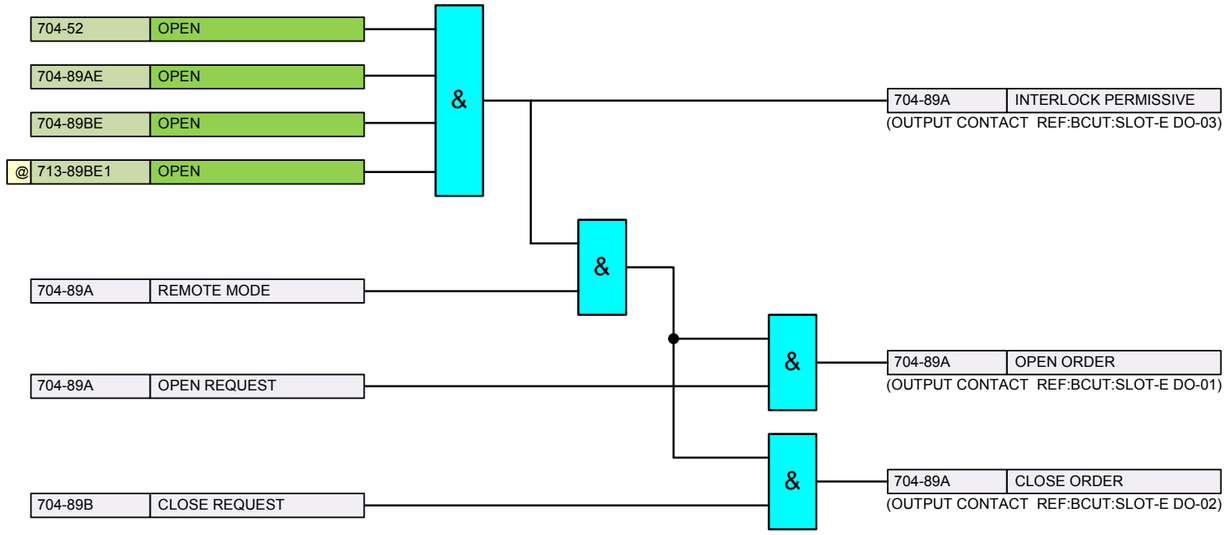
295R			
21	COIL RLA	22	.5C
13	COIL RLB	14	.5D
27	COIL RLC	28	.5B
TO BCU 1		3	/053.2D
SPARE 5		7	/060.6B
2		4	

295Y			
21	COIL RLA	22	.6C
13	COIL RLB	14	.6D
27	COIL RLC	28	.6B
TO BCU 1		3	/053.2D
SPARE 5		7	/060.7B
2		4	

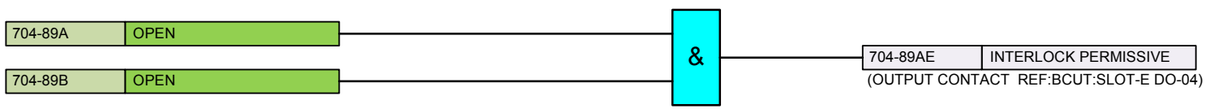
295B			
21	COIL RLA	22	.6C
13	COIL RLB	14	.7D
27	COIL RLC	28	.6B
TO BCU 1		3	/053.3D
SPARE 5		7	/060.7B
2		4	

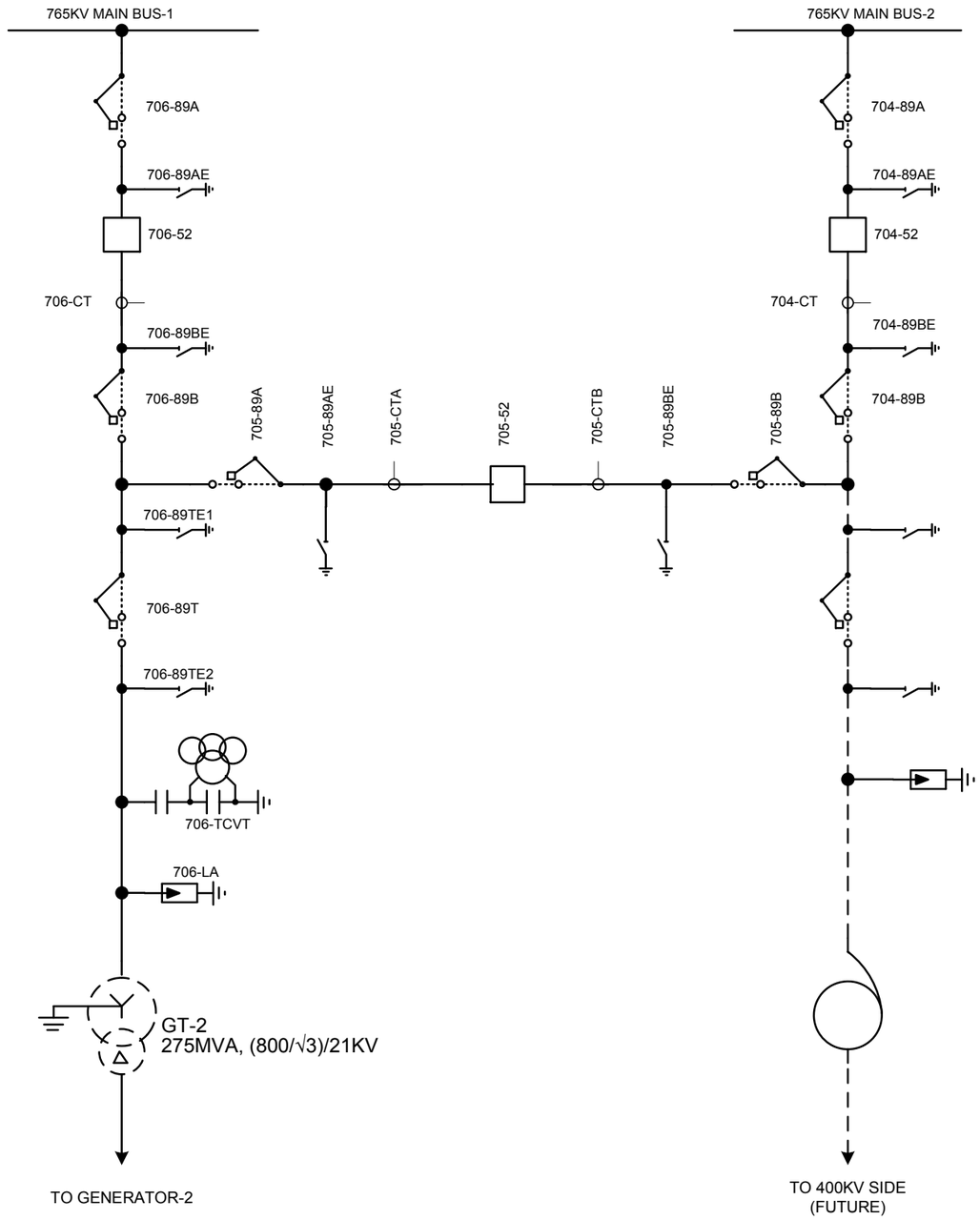
CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.	CONSULTANT: TATA CONSULTING ENGINEERS LTD.	TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) CB TRIP COIL-2 CIRCUIT	PREPARED : GD / REVIEWED : THY / APPROVED : APS; REVISION: C; DATE: 20-06-2014	SHT :038 / CONT:039
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION			
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	PPGCL DRG. NO: L&T DRG. NO:	PANEL TYPE : +704AT	DRG. NO.: 3269PN587-S-14	

ISOLATOR INTERLOCK: 704-89A



EARTH SWITCH INTERLOCK: 704-89AE





@- SIGNALS TO BE TAKEN THROUGH GOOSE

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION** **PPGCL DRG. NO:** **L&T DRG. NO:**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) BCU LOGIC** **PANEL TYPE : +704AT**

PREPARED : GD	REVISION: C	SHT :039	
REVIEWED : THY	DATE: 20-06-2014	CONT: 040	
APPROVED : APS			
DRG. NO.: 3269PN587-S-14			

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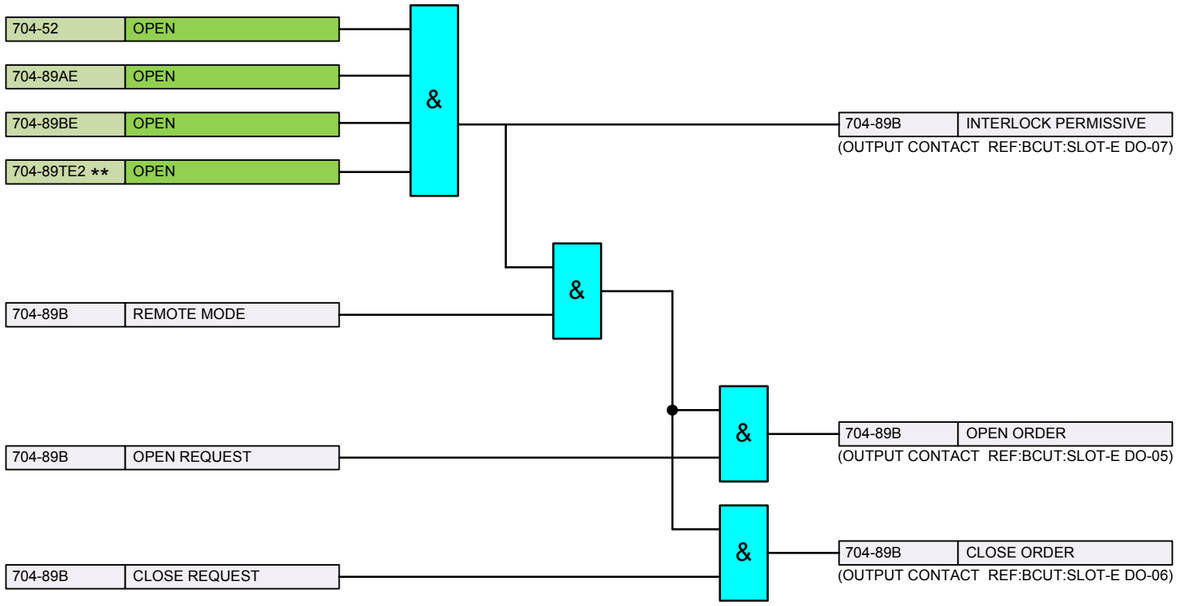
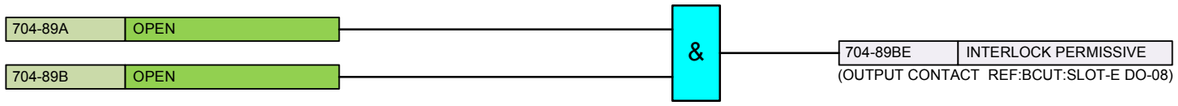
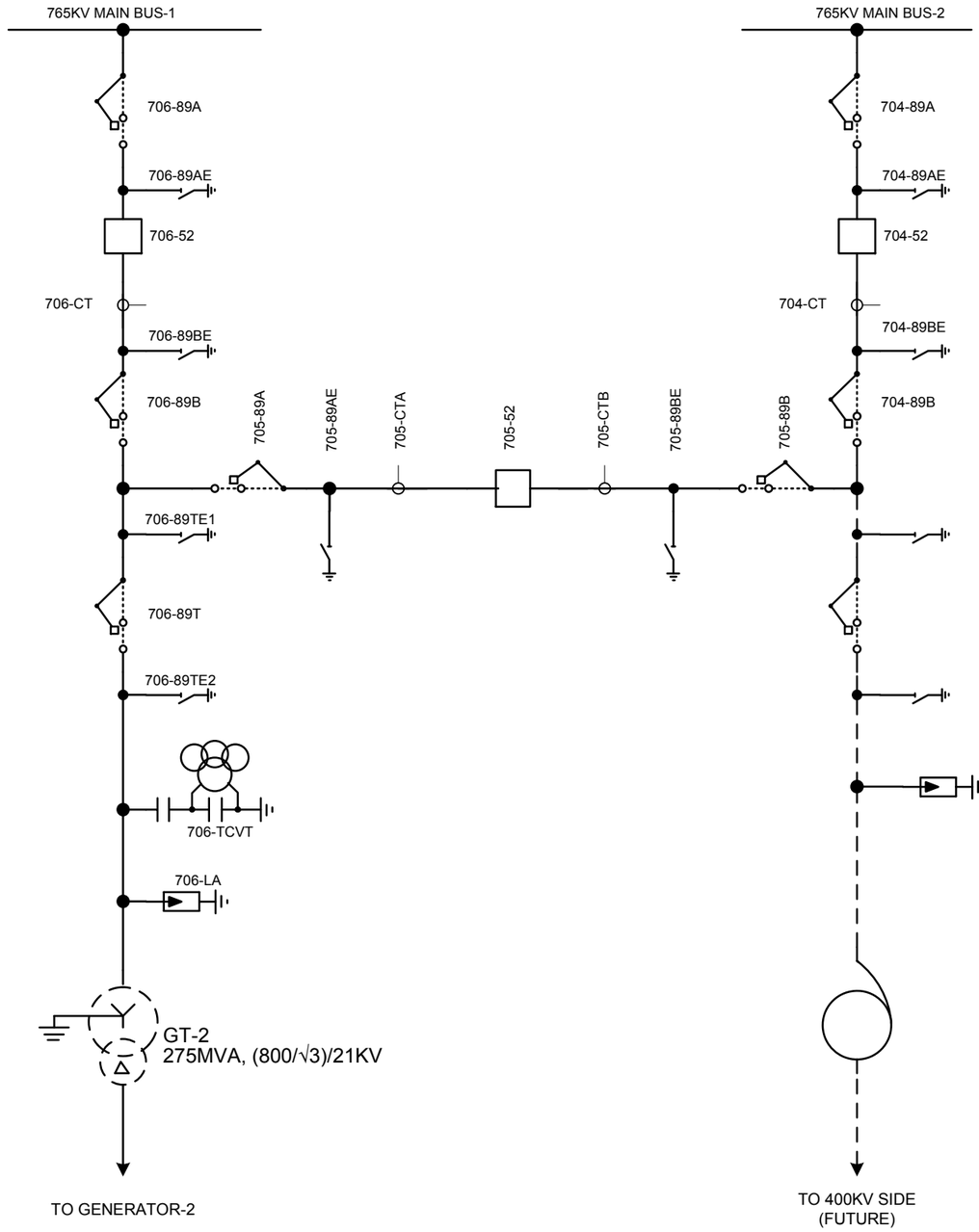
ISOLATOR INTERLOCK: 704-89B



EARTH SWITCH INTERLOCK: 704-89BE



NOTE:** THIS STATUS SHALL BE CONSIDERED WHEN FUTURE BAY IS COMMISSIONED.



CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) BCU LOGIC**	PREPARED : GD REVIEWED : THY APPROVED : APS	REVISION: C DATE: 20-06-2014	SHT :040 CONT: 041
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**		

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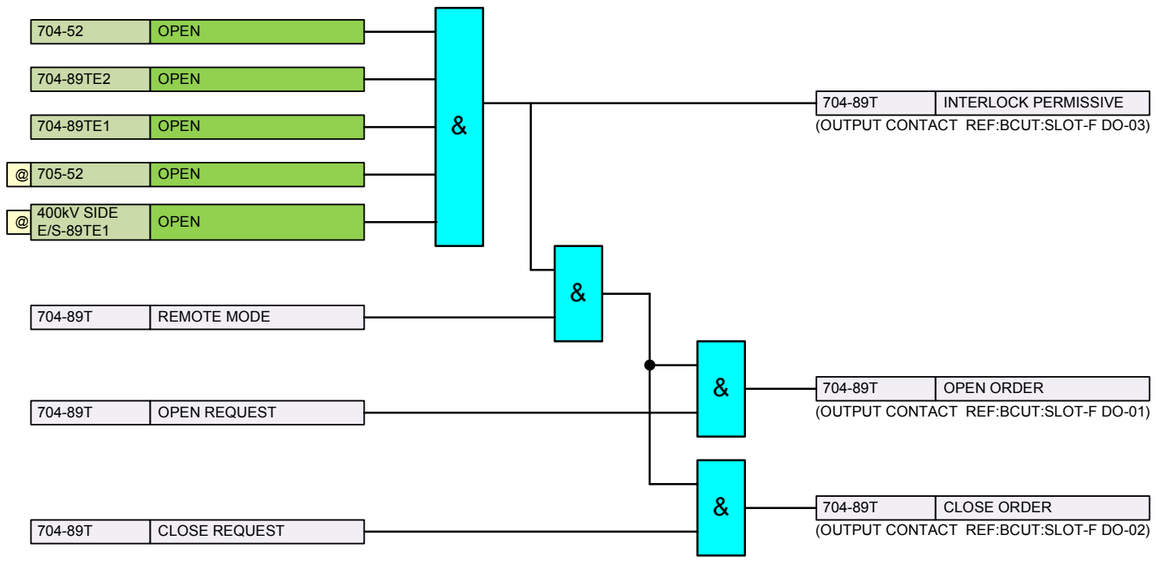
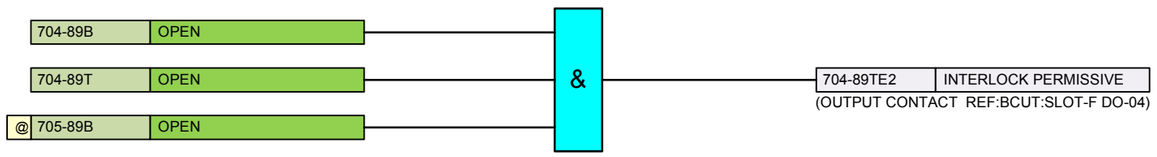
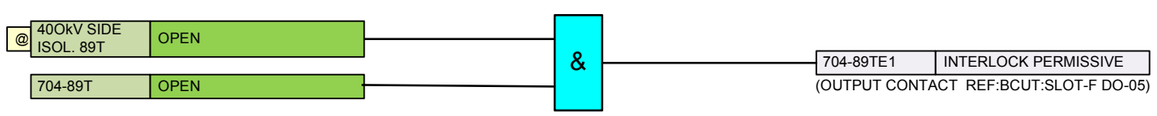
ISOLATOR INTERLOCK: 704-89T **



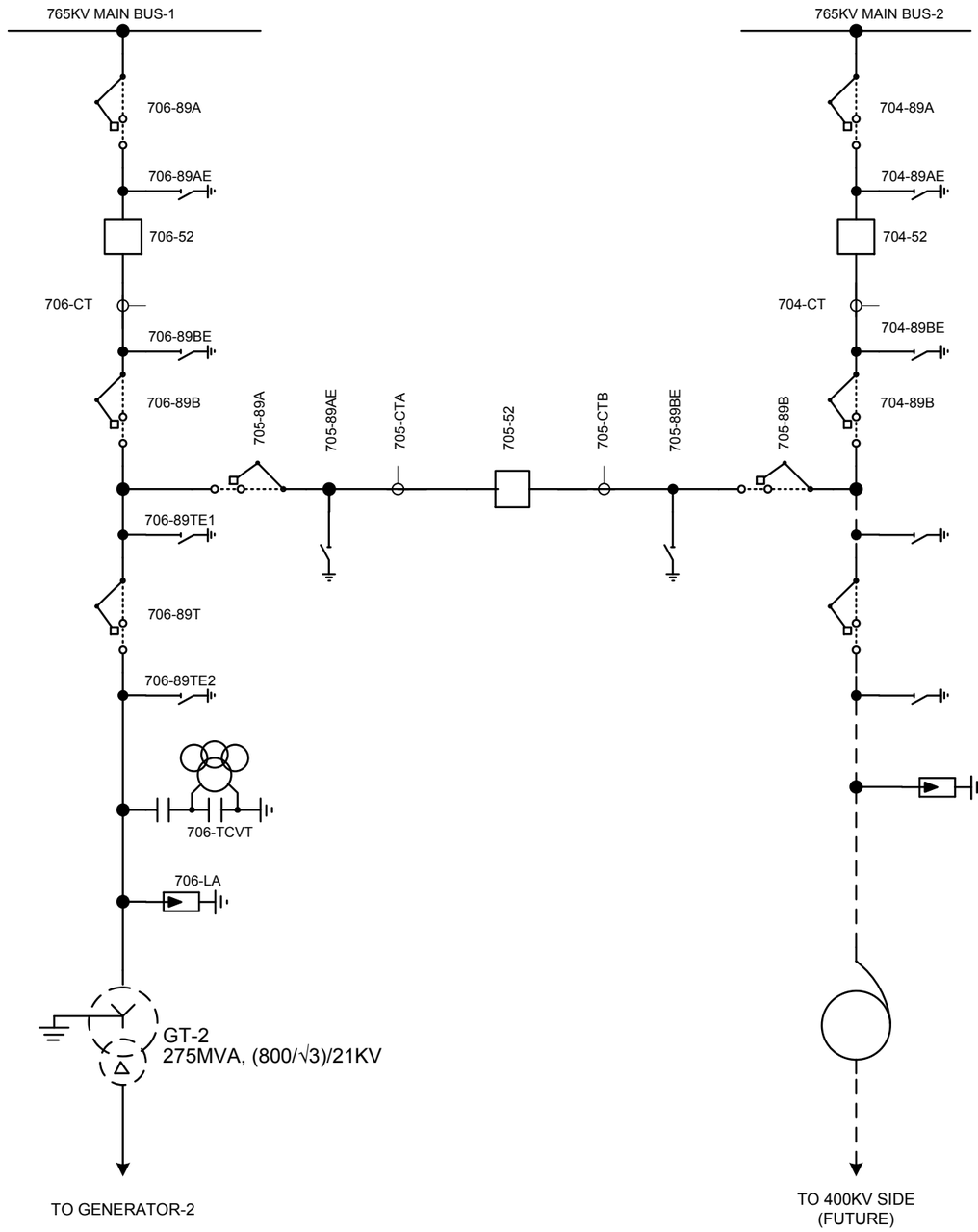
EARTH SWITCH INTERLOCK: 704-89TE2 **



EARTH SWITCH INTERLOCK: 704-89TE1 **



NOTE:** THIS LOGICS ARE APPLICABLE ONLY AFTER COMMISSIONING OF THE FUTURE BAY.



@- SIGNALS TO BE TAKEN THROUGH GOOSE

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) BCU LOGIC**	PREPARED : GD REVIEWED : THY APPROVED : APS DATE: 20-06-2014 REVISION: C SHT :041 CONT: 042
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**	**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**

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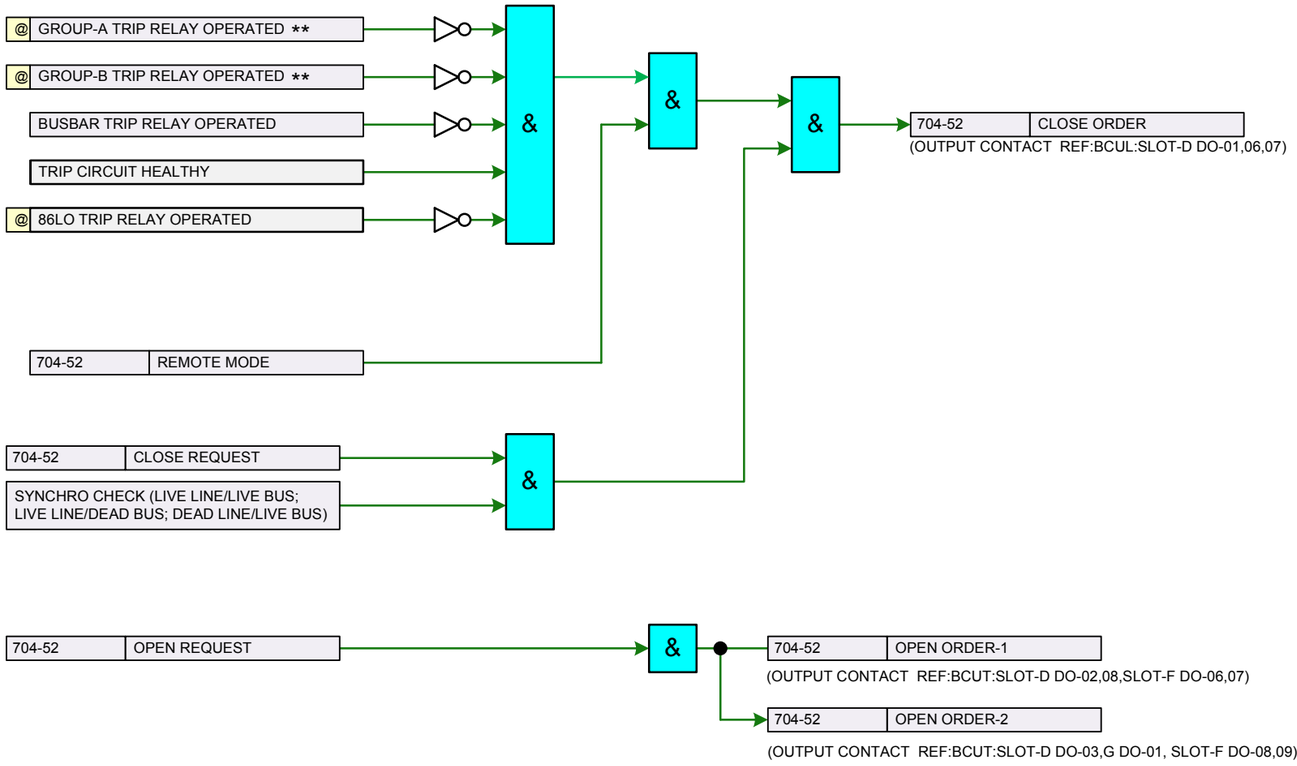
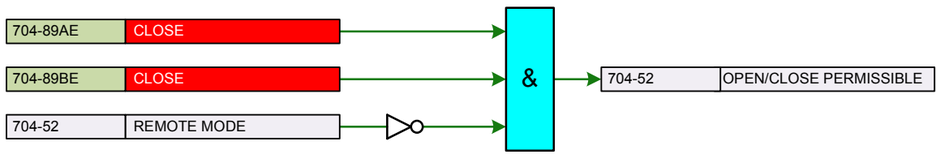
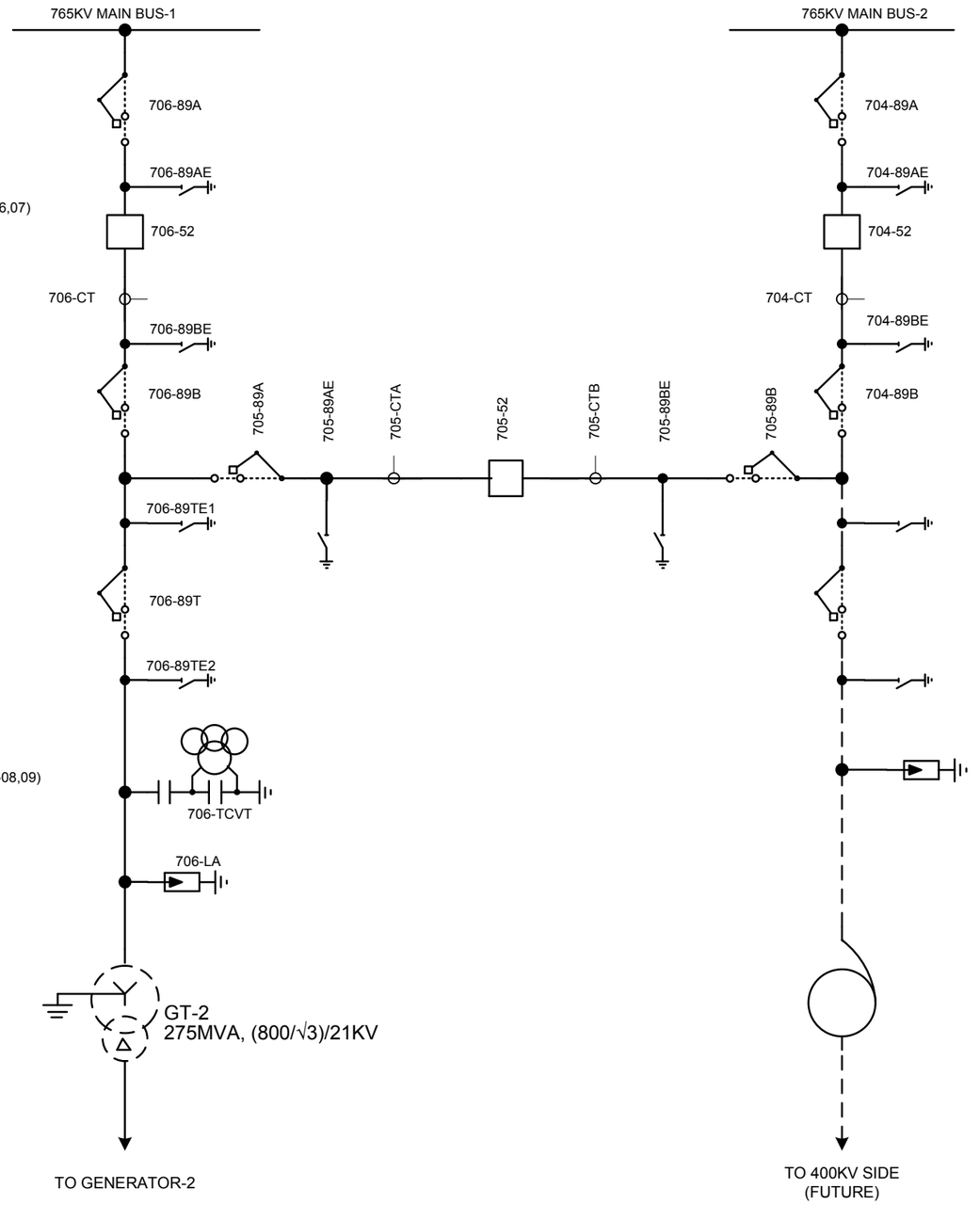
CIRCUIT BREAKER: 704-52



CIRCUIT BREAKER LOCAL OPERATION :704-52



NOTE:** THIS STATUS SHALL BE CONSIDERED WHEN FUTURE BAY IS COMMISSIONED.



@- SIGNALS TO BE TAKEN THROUGH GOOSE

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) BCU LOGIC**	PREPARED : GD REVIEWED : THY APPROVED : APS	REVISION: C DATE: 20-06-2014	SHT :042 CONT:043
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**		

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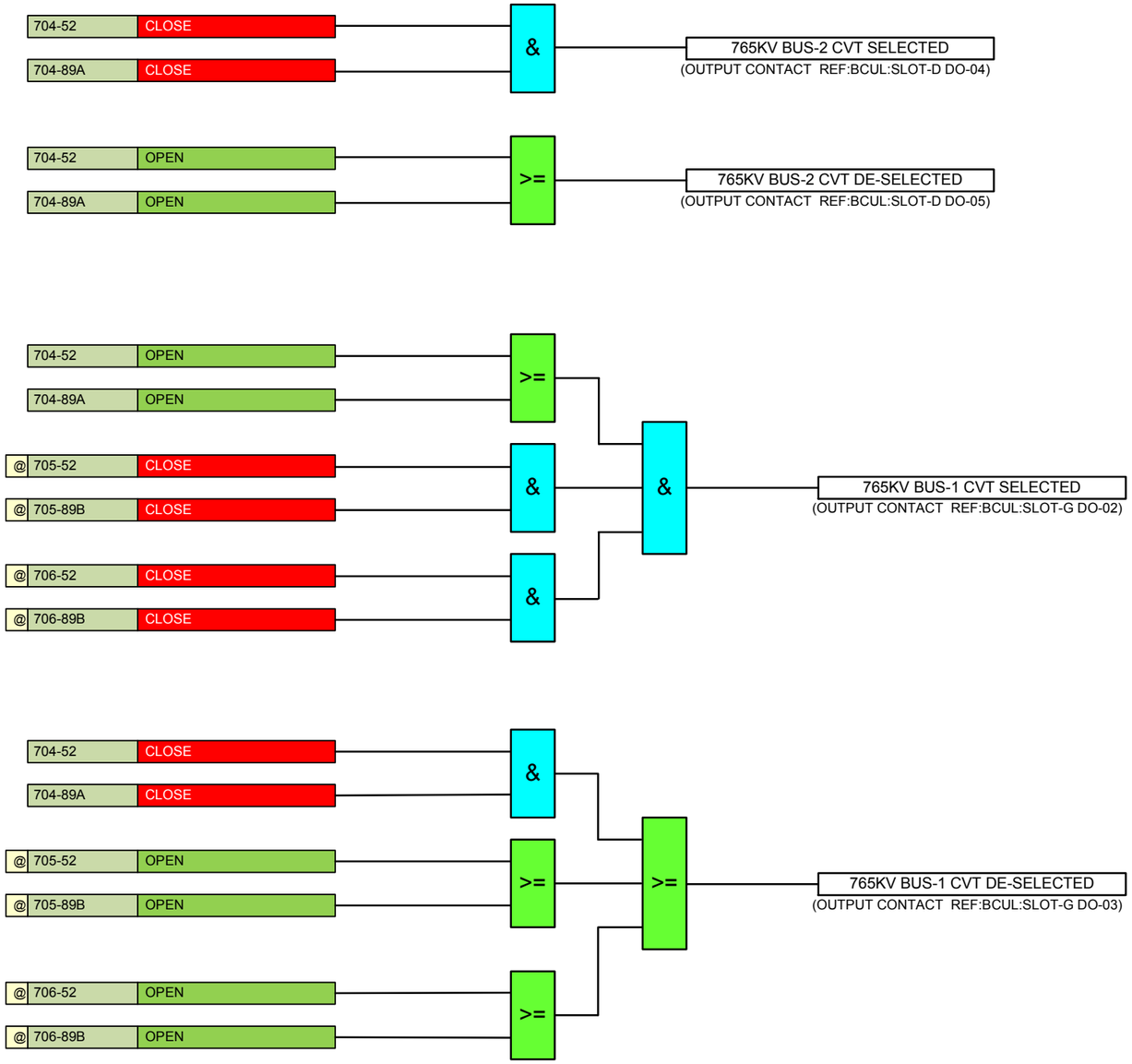
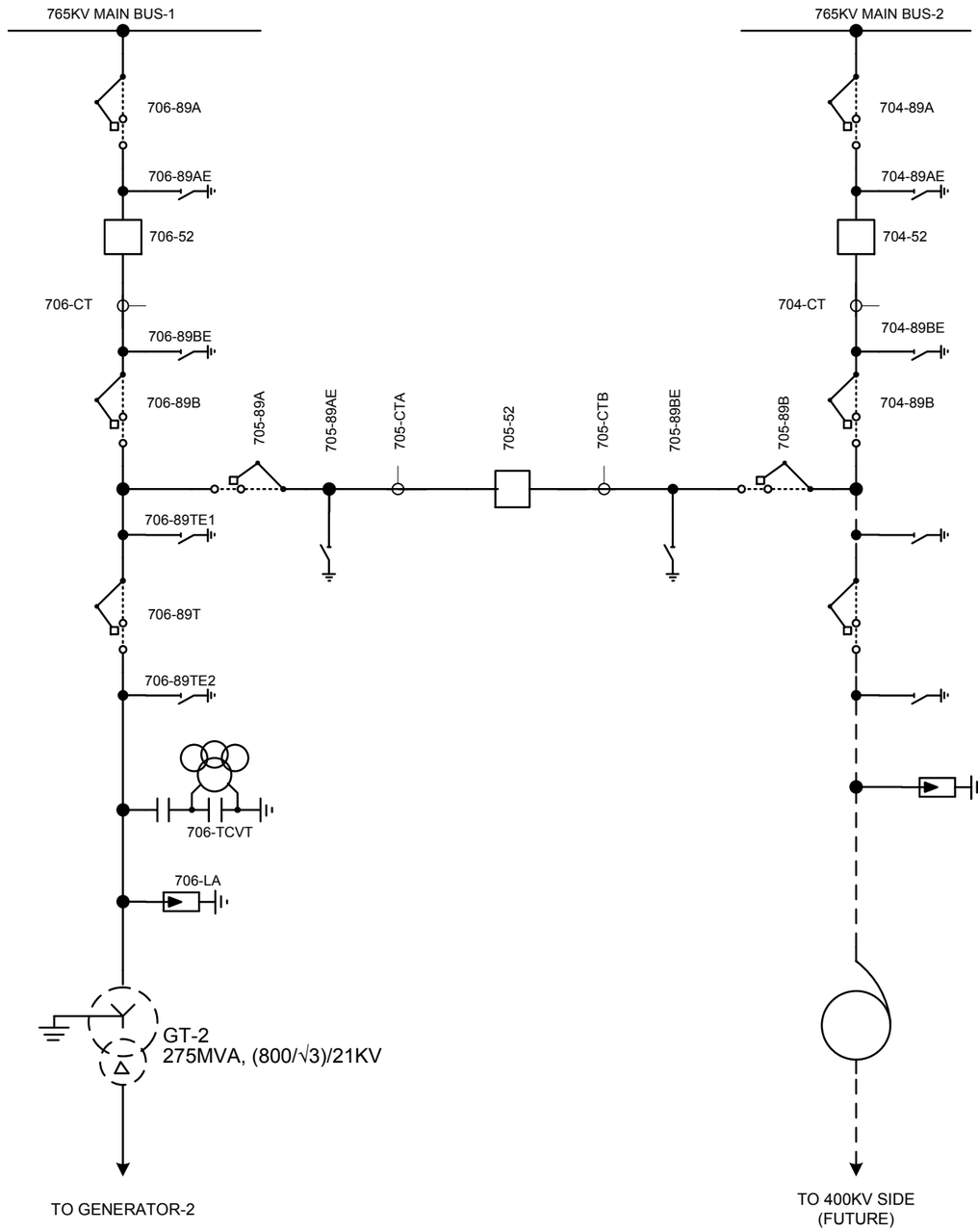
VOLTAGE SELECTION LOGIC:





@- SIGNALS TO BE TAKEN THROUGH GOOSE

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) BCU LOGIC**
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**

PREPARED : GD	REVISION: C	SHT :043	
REVIEWED : THY	DATE: 20-06-2014	CONT: 044	
APPROVED : APS			
DRG. NO.: 3269PN587-S-14			

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VOLTAGE SELECTION LOGIC: **

704-52 OPEN
704-89A OPEN
@ 705-52 OPEN
@ 705-89B OPEN
704-89T CLOSE
>= , >= , &
400KV BUS CVT SELECTED
(OUTPUT CONTACT REF:BCUL:SLOT-G DO-04)

704-52 CLOSE
704-89A CLOSE
@ 705-52 CLOSE
@ 705-89B CLOSE
@ 706-52 CLOSE
@ 706-89B CLOSE
704-89T OPEN
& , & , >=
400KV BUS CVT DE-SELECTED
(OUTPUT CONTACT REF:BCUL:SLOT-G DO-05)

VOLTAGE SELECTION LOGIC FOR O/F PROTN.: **

@ 705-52 CLOSE
704-52 OPEN
&
BUS-1/GT CVT CVT SELECTED
(OUTPUT CONTACT REF:BCUL:SLOT-G DO-06)

@ 705-52 OPEN
704-52 CLOSE
>=
BUS-1/GT CVT CVT DE-SELECTED
(BUS-2 CVT SELECTED)
(OUTPUT CONTACT REF:BCUL:SLOT-G DO-07)

CB DC SUPPLY FAIL LOGIC

CB DC SUPPLY-I/II FAIL
PROTN. PANEL DC SOURCE-1 FAIL
&
CB DC SUPPLY-I FAIL

PROTN. PANEL DC SOURCE-2 FAIL
&
CB DC SUPPLY-II FAIL

765KV MAIN BUS-1
706-89A
706-89AE
706-52
706-CT
706-89BE
706-89B
705-89A
705-89AE
705-CTA
705-52
705-CTB
705-89BE
705-89B
706-89TE1
706-89T
706-89TE2
706-TCVT
706-LA
GT-2
275MVA, (800/√3)/21KV
TO GENERATOR-2

765KV MAIN BUS-2
704-89A
704-89AE
704-52
704-CT
704-89BE
704-89B
TO 400KV SIDE
(FUTURE)

NOTE:** THIS LOGICS ARE APPLICABLE ONLY AFTER COMMISSIONING OF THE FUTURE BAY.

@- SIGNALS TO BE TAKEN THROUGH GOOSE

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) BCU LOGIC**
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**

PREPARED : GD	REVISION: C	SHT :044	
REVIEWED : THY	DATE: 20-06-2014	CONT: 045	
APPROVED : APS			
DRG. NO.: 3269PN587-S-14			

+704AT

BCUT

Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A
SLOT-Q TMU	SLOT-P DIGITAL INPUT CARD	SLOT-O DIGITAL INPUT CARD	SLOT-N DIGITAL INPUT CARD	SLOT-M DIGITAL INPUT CARD	SLOT-L SPARE	SLOT-K SPARE	SLOT-J SPARE	SLOT-I SPARE	SLOT-H SPARE	SLOT-G ANALOG INPUT CARD	SLOT-F ANALOG INPUT CARD	SLOT-E ANALOG INPUT CARD	SLOT-D ANALOG INPUT CARD	SLOT-C SWITCH CARD	SLOT-B CPU BOARD	SLOT-A POWER SUPPLY UNIT
TMU220	DIU211	DIU211	DIU211	DIU211						DOU201	DOU201	DOU201	DOU201	SWD202	CPU270	BIU261
/047.4A	/048.2E /049.2E	/050.2E /051.2E	/052.2E /053.2E	/054.2E /055.2E						/059.1A	/058.1A	/057.1A	/056.1A			/046.2E

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) BCU CARD DETAIL**	PREPARED : GD REVIEWED : THY APPROVED : APS	REVISION: C DATE: 20-06-2014	SHT : 045 CONT: 046
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**		

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+704AT

BCU FAIL
TO 50LBB RELAY

/026.3C K603

/026.3D K607

MCB4
/009.7D
12
14
11

FROM DC
SOURCE-2

/008.5C S301

/008.6C S302

FROM DC
SOURCE-1

/008.4C S201

/008.5C S202

X-BCUT-PS-A 5 6

X-BCUT-PS-A 1 2

X-BCUT-PS-A 3 4

K607A
K603A
S201A
S202A
S301A
S302A

C264
BCUT
SLOT-A
/045.6B

1 2 3 4 5 6 7 9 8 15 16 17 18 19 20 21 23 24 22 10 11

GND
CTS
RXD/T+
TXD/T-
RTS/R+
R-(RS422)
DCD

RS232/
RS422/
RS485

O2
O1
WATCH DOG
DI1
DI2
SERIAL LINK-1
POWER
SUPPLY-S1
POWER
SUPPLY-S2

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) BCU AUX. SUPPLY CKT.**	PREPARED : GD REVIEWED : THY APPROVED : APS REVISION: C DATE: 20-06-2014 SHT :046 CONT: 047
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**

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+704AT

+M1

C264
BCUT
SLOT-Q
/045.2B

BLKD

FROM CT DISTRIBUTION CIRCUIT

/012.6A	1D215	R-PH	S3	/061.4D	R3	1D217	15	16	1D219	X2 37
/012.6B	1D235	Y-PH	S4	/061.4D	R4	1D237	11	12	1D239	38
/012.6C	1D255	B-PH	S5	/061.4D	R5	1D257	7	8	1D259	39
/012.6C	1D275	N	S6	/061.4D	R6	1D277	3	4	1D279	40

CT SUPPLY TO METERING PANEL

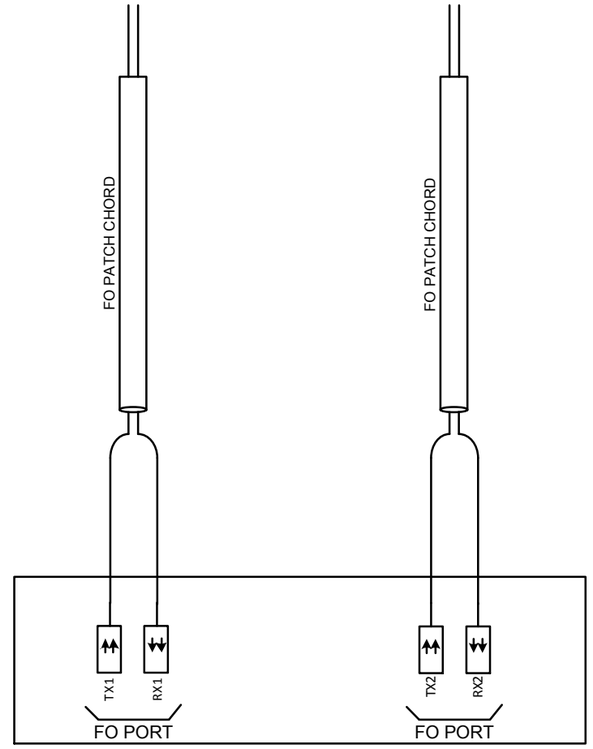
SELECTED CVT SUPPLY

/017.7D	E513	R-PH	FS515 1 2 4A	E515	S7	/061.4D	R7	E517	21	22
/017.7D	E533	Y-PH	FS535 1 2 4A	E535	S8	/061.4D	R8	E537	23	24
/017.7D	E553	B-PH	FS555 1 2 4A	E555	S9	/061.4D	R9	E557	25	26
/017.7D	E573	N	LK575 1 2	E575						

BUS-I CVT SUPPLY

/014.7E	E231	Y-PH	FS233 1 2 4A	E233	S1	/061.4D	R1	E235	27	28
/014.7F	E271	N	LK273 1 2	E273	S10	/061.4D	R10	E275	19	20

TO EFS FOR NETWORK CONNECTION



CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.	CONSULTANT: TATA CONSULTING ENGINEERS LTD.	TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) BCU CT/PT CKT.	PREPARED : GD / REVIEWED : THY / APPROVED : APS; REVISION: C; DATE: 20-06-2014; SHT :047; CONT: 048
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION		
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	PPGCL DRG. NO: L&T DRG. NO:	PANEL TYPE : +704AT	DRG. NO.: 3269PN587-S-14

CB 'R' PH OPEN	CB 'R' PH CLOSED	CB 'Y'PH OPEN	CB 'Y' PH CLOSED	CB 'B' PH OPEN	CB 'B' PH CLOSED	CB SPRING CHARGED R/Y/B-PH	CB IN REMOTE MODE

704-52

+VE /049.1A

X3-R:1 X3-R:2 X3-R:3 X3-R:4 X3-Y:1 X3-Y:2 X3-Y:3 X3-Y:4 X3-B:1 X3-B:2 X3-B:3 X3-B:4

X2:54 XR:54 XR:55 XY:54 XY:55 XB:54 XB:55 X2:55

X2:99 X2:100

+704AT

X-BCUT-DIU-P 25

/016.8B S101 S101 /049.1D

/016.8E S102 S102 /049.1D

X-BCUT-DIU-P 1 2 3 4 5 6 7 8 9 10 11 12

BCUT-DIU-SLOT-P

C264
BCUT
SLOT-P
/045.2B

1 2 3 4 5 6 7 8 9 10 11 12

DI1 DI2 DI3 DI4 DI5 DI6 DI7 DI8

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704)** **BCU DIGITAL INPUT CARD**	PREPARED : GD REVIEWED : THY APPROVED : APS DATE: 20-06-2014 REVISION: C SHT :048 CONT: 049
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**

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1	2	3	4	5	6	7	8
	POLE DISCREPANCY-I/II ALARM	CB DC SUPPLY-I/II FAIL	AC SUPPLY R/Y/B-PH FAIL	SF6 GAS PRESSURE BLOCK-I/II	SF6 GAS PRESSURE LOW ALARM	CB HEALTHY	SPARE	SPARE	

704-52

/048.8A +VE

X2:70 X2:68 X2:71 X2:69

X2:66 X2:76 X2:67 X2:77

XR:58 XY:58 XB:59 XR:59 XY:59 XB:58

X2:62 X2:72 X2:63 X2:73

X02:13 X02:14 X02:15 X02:16 X02:17 X02:18

** TERMINALS TO BE IDENTIFIED AT SITE

+704AT

X-BCUT-DIU-P 26 27

/048.7C S101

28 29 30 S101 /050.1C

/048.7D S102

S102 /050.1D

X-BCUT-DIU-P 13 14 15 16 17 18 19 20 21 22 23 24

BCUT-DIU-SLOT-P

C264P
BCUT
SLOT-P
/045.2B

13 14 15 16 17 18 19 20 21 22 23 24

DI9 DI10 DI11 DI12 DI13 DI14 DI15 DI16

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) BCU DIGITAL INPUT CARD**
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**

PREPARED : GD	REVISION: C	SHT :049	
REVIEWED : THY	DATE: 20-06-2014	CONT: 050	
APPROVED : APS			

DRG. NO.: 3269PN587-S-14

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1	2	3	4	5	6	7	8
	ISOLATOR OPEN	ISOLATOR CLOSED	ISOLATOR IN REMOTE MODE	EARTHSWITCH OPEN	EARTHSWITCH CLOSED	ISOLATOR OPEN	ISOLATOR CLOSED	ISOLATOR IN REMOTE MODE	

704-89A

TB4:103

TB4:151

TB3:101

TB3:141

LOCAL
REMOTE
MANUAL

704-89AE

COM1 → /052.3A

TB3:103

TB3:131

TB3:101

TB3:125

704-89B

COM1 → /051.1A

TB4:103

TB4:151

TB3:101

TB3:141

LOCAL
REMOTE
MANUAL

704-89A

TB1 35

TB1 36

NOTE: * - TERMINALS TO BE IDENTIFIED AT SITE

+704AT

X-BCUT-DIU-O 25

X-BCUT-DIU-O 26

X-BCUT-DIU-O 27

X-BCUT-DIU-O 28

/049.8D S101

S101 /051.1C

/049.8D S102

S102 /051.1D

X-BCUT-DIU-O 1 2 3 4 5 6 7 8 9 10 11 12

BCUT-DIU-SLOT-O

C264
BCUT
SLOT-O
/045.2B

1 2 3 4 5 6 7 8 9 10 11 12

DI1 DI2 DI3 DI4 DI5 DI6 DI7 DI8

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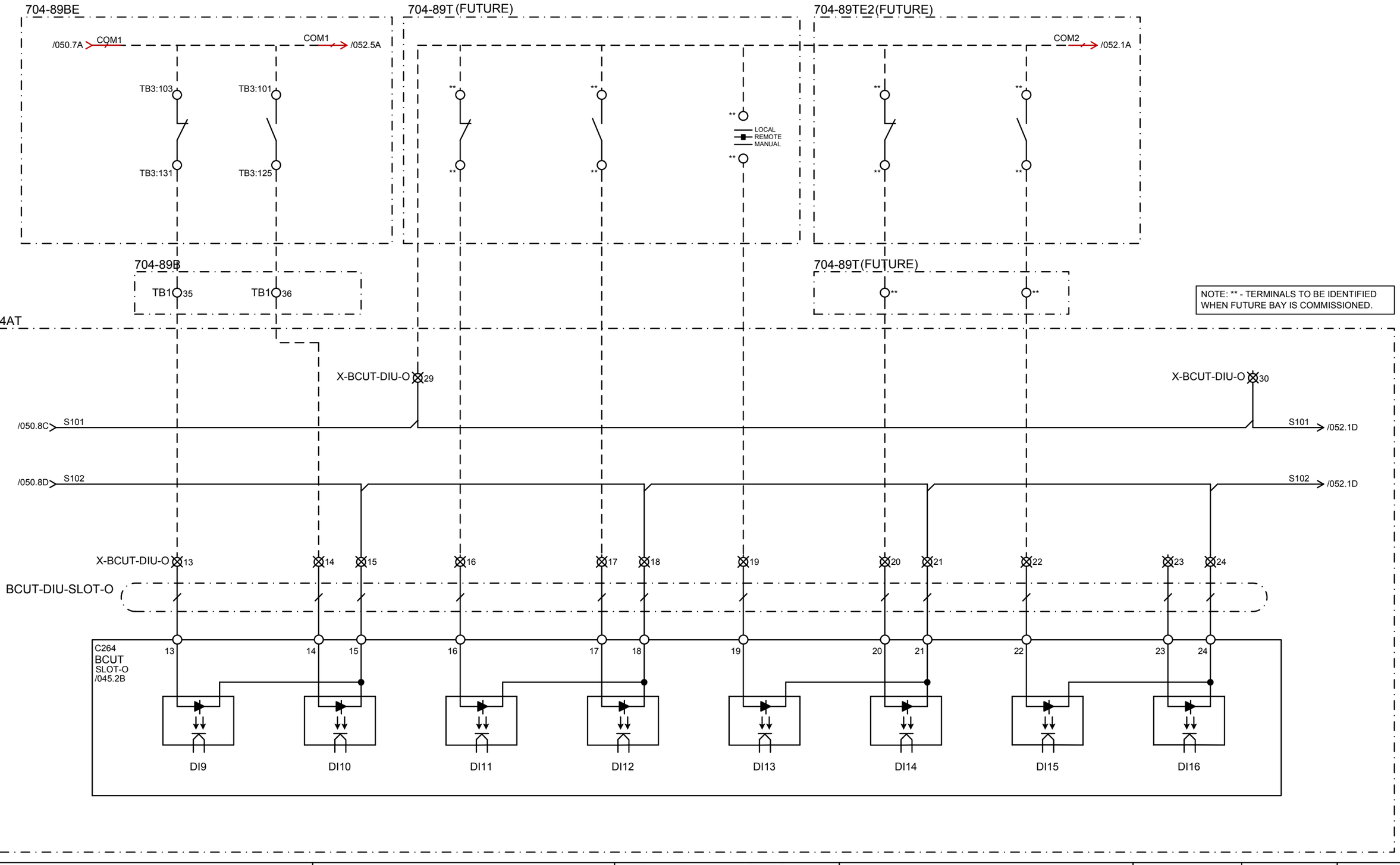
CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) BCU DIGITAL INPUT CARD**	PREPARED : GD REVIEWED : THY APPROVED : APS	REVISION: C DATE: 20-06-2014	SHT : 050 CONT: 051
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**		

1	2	3	4	5	6	7	8
	EARTHSWITCH OPEN	EARTHSWITCH CLOSED	ISOLATOR OPEN	ISOLATOR CLOSED	ISOLATOR IN REMOTE MODE	EARTHSWITCH OPEN	EARTHSWITCH CLOSED	SPARE	



CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) BCU DIGITAL INPUT CARD**
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**

PREPARED : GD	REVISION: C	SHT :051	
REVIEWED : THY	DATE: 20-06-2014	CONT: 052	
APPROVED : APS			
DRG. NO.: 3269PN587-S-14			

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	EARTHSWITCH OPEN	EARTHSWITCH CLOSED	POLE DISCREPANCY OPERATED	ISOLATOR DRIVE MOTOR OVERLOAD TRIP	POLE DISCREPANCY INDICATION	ISOLATOR DRIVE MOTOR OVERLOAD TRIP	POLE DISCREPANCY INDICATION	ISOLATOR DRIVE MOTOR OVERLOAD TRIP	

NOTE: ** - TERMINALS TO BE IDENTIFIED WHEN FUTURE BAY IS COMMISSIONED.

704-89TE1

/051.6A COM2 — COM2 .6A

704-89A

/050.5A COM1 — TB1:18 — TB1:19 — TB2:51 — TB2:52 — MASTER — TB2:46 — TB2:47 — FOLLOWER-1 — TB2:46 — TB2:47 — FOLLOWER-2

704-89B

/051.2A COM1 — TB1:18 — TB1:19 — TB2:51 — TB2:52 — MASTER — TB2:46 — TB2:47 — FOLLOWER-1 — TB2:46 — TB2:47 — FOLLOWER-2

704-89T

.2A COM2 — MASTER — FOLLOWER-1 — FOLLOWER-2

704-89T(FUTURE)

+704AT

X-BCUT-DIU-N 25 26 27

/051.8C S101 — S101 /053.1C

/051.8D S102 — S102 /053.1D

X-BCUT-DIU-N 1 2 3 4 5 6 7 8 9 10 11 12

BCUT-DIU-SLOT-N

C264
BCUT
SLOT-N
/045.2B

DI1 DI2 DI3 DI4 DI5 DI6 DI7 DI8

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) BCU DIGITAL INPUT CARD**
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**

PREPARED : GD	REVISION: C	SHT :052	
REVIEWED : THY	DATE: 20-06-2014	CONT: 053	
APPROVED : APS			
DRG. NO.: 3269PN587-S-14			

1	2	3	4	5	6	7	8
	CB TC-1 FAULTY	CB TC-2 FAULTY	ACMCB TRIPPED	DC SOURCE-1 MCB TRIPPED	DC SOURCE-2 MCB TRIPPED	CB MANUAL TRIP	50LBB RELAY FAULTY	CHANGE OVER DC SOURCE MCB TRIPPED	

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+704AT

X-BCUT-DIU-N 28 29 30

/052.7D S101 — S101 /054.1C

RLC-1 195R /036.7B
RLC-1 195Y /036.7C
RLC-1 195B /036.7D
RLC-1 295R /038.7B
RLC-1 295Y /038.7C
RLC-1 295B /038.7C
MCB91 /006.5C
MCB7 /008.4E
MCB1 /008.2E
MCB3 /008.3E
MCB2 /008.3E
MCB6 /009.7E
MCB8 /008.5E
52CS /061.1C (19 TRIP, AT, AC, CLOSE, 20)
WD1 50LBB /062.3D (F11 — F12)
MCB5 /009.7D

S107 S109 S111 S113 Signal S117 S119 S121

/052.7D S102 — S102 /054.1D

X-BCUT-DIU-N 13 14 15 16 17 18 19 20 21 22 23 24

BCUT-DIU-SLOT-N

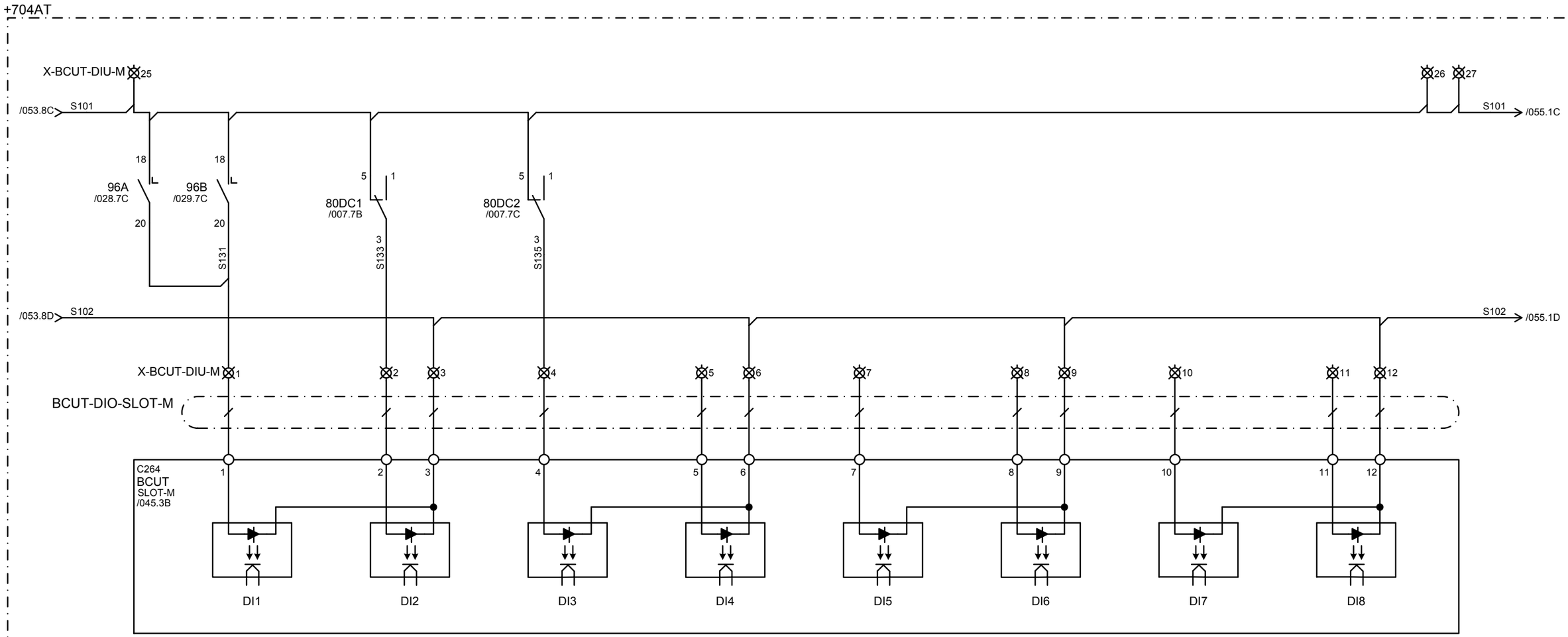
C264P BCUT SLOT-N /045.3B

DI9 DI10 DI11 DI12 DI13 DI14 DI15 DI16

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.**		**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) BCU DIGITAL INPUT CARD**
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**		
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**

PREPARED : GD	REVISION: C	SHT :053	**DRG. NO.: 3269PN587-S-14**
REVIEWED : THY	DATE: 20-06-2014	CONT: 054	
APPROVED : APS			

1	2	3	4	5	6	7	8
	BB TRIP RELAYS OPTD.	DC SOURCE-1 FAIL	DC SOURCE-2 FAIL	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	



CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704)** **BCU DIGITAL INPUT CARD**	PREPARED : GD REVIEWED : THY APPROVED : APS DATE: 20-06-2014 REVISION: C SHT :054 CONT: 055
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**	**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**

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SPARE

+704AT

X-BCUT-DIU-M 28 29 30

/054.8C > S101

/054.8D > S102

X-BCUT-DIU-M 13 14 15 16 17 18 19 20 21 22 23 24

BCUT-DIO-SLOT-M

C264P
BCUT
SLOT-M
/045.3B

13 14 15 16 17 18 19 20 21 22 23 24

DI9 DI10 DI11 DI12 DI13 DI14 DI15 DI16

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) BCU DIGITAL INPUT CARD**	PREPARED : GD REVIEWED : THY APPROVED : APS DATE: 20-06-2014 REVISION: C SHT : 055 CONT: 056
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**	**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**

	CB REMOTE CLOSE	REMOTE TRIP-1 R-PH	REMOTE TRIP-2 R-PH	765KV BUS-II CVT (WDG-2) SELECTED	765KV BUS-II CVT (WDG-2) DE-SELECTED	CB CLOSE COMMAND TO PUA FOR END FAULT PROTN.	CB CLOSE COMMAND TO PUB FOR END FAULT PROTN.	MANUAL TRIP TO IV GROUP-A TRIP RELAY	86LO TRIP RELAY RESET	SPARE

+704AT

C264P
BCUT
SLOT-D
/045.6B

DO1 DO2 DO3 DO4 DO5 DO6 DO7 DO8 DO9 DO10

BCUT-DIO-SLOT-D

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 19 20 21 22 23 24

X-BCUT-DOU-D

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 19 20 21 22 23 24

K9	K13	K3	K19A	K53	K57A	S101	S621	S623	P103	P123	P203	P225	K901A	K913A	K401	K407						
/033.4C	/033.4D	/033.6C	/033.6D	/034.4B	/034.4C	/016.2B	/016.2D	/016.2D	/021.3C	/021.3D	/024.3C	/024.3D	/031.6C	/031.6D	/027.6C	/027.6E						

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704)** **BCU DIGITAL OUTPUT CARD**
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**

PREPARED : GD	REVISION: C	SHT :056	
REVIEWED : THY	DATE: 20-06-2014	CONT: 057	
APPROVED : APS			
DRG. NO.: 3269PN587-S-14			

1	2	3	4	5	6	7	8
	ISOLATOR OPEN	ISOLATOR CLOSE	ISOLATOR I/L PERMISSIBLE	ISOLATOR I/L PERMISSIBLE	ISOLATOR OPEN	ISOLATOR CLOSE	ISOLATOR I/L PERMISSIBLE	ISOLATOR I/L PERMISSIBLE	SPARE	SPARE

+704AT

C264P
BCUT
SLOT-E
/045.5B

DO1 DO2 DO3 DO4 DO5 DO6 DO7 DO8 DO9 DO10

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 19 20 21 22 23 24

BCUT-DIO-SLOT-E

X-BCUT-DOU-E 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 19 20 21 22 23 24

/008.4C K701 — K701 /058.1D

/008.4C K702 — K702 /058.1D

X6 1 X6 2 X6 3 X6 4

704-89A

TB1 34

704-89B

TB1 34

704-89A

TB1 5 4 — REMOTE OPEN
1 — +VE
2 — -VE
3 — REMOTE CLOSE
24 — I/L PERMISSIBLE

704-89AE

TB1 15 — I/L PERMISSIBLE

704-89B

TB1 5 4 — REMOTE OPEN
1 — +VE
2 — -VE
3 — REMOTE CLOSE
24 — I/L PERMISSIBLE

704-89BE

TB1 15 — I/L PERMISSIBLE

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	CONSULTANT: TATA CONSULTING ENGINEERS LTD. CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION	Schneider Electric	TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) BCU DIGITAL OUTPUT CARD	PREPARED : GD REVIEWED : THY APPROVED : APS	REVISION: C DATE: 20-06-2014	SHT : 057 CONT: 058
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	PPGCL DRG. NO: L&T DRG. NO:		PANEL TYPE : +704AT	DRG. NO.: 3269PN587-S-14		

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ISOLATOR OPEN (FUTURE)	ISOLATOR CLOSE (FUTURE)	ISOLATOR I/L PERMISSIBLE (FUTURE)	EARTH SWITCH I/L PERMISSIBLE (FUTURE)	EARTH SWITCH I/L PERMISSIBLE (FUTURE)	REMOTE TRIP-1 Y-PH	REMOTE TRIP-1 B-PH	REMOTE TRIP-2 Y-PH	REMOTE TRIP-2 B-PH	SPARE

+704AT

C264
BCUT
SLOT-F
/045.5B

DO1 DO2 DO3 DO4 DO5 DO6 DO7 DO8 DO9 DO10

BCUT-DIO-SLOT-F

X-BCUT-DOU-F

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 19 20 21 22 23 24

K3 /033.7C
K19B /033.7D
K3 /033.8C
K19C /033.8D
K53 /034.5B
K57B /034.5C
K53 /034.5B
K57C /034.5C

/057.8D K701
/057.8D K702

X6 5
X6 6

704-89T (FUTURE)
REMOTE OPEN
-VE
+VE
REMOTE CLOSE
I/L PERMISSIBLE

704-89T (FUTURE)

704-89TE2 (FUTURE)
I/L PERMISSIBLE

704-89TE1 (FUTURE)
I/L PERMISSIBLE

NOTE: ** - TERMINALS TO BE IDENTIFIED WHEN FUTURE BAY IS COMMISSIONED.

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704)** **BCU DIGITAL OUTPUT CARD**	PREPARED : GD REVIEWED : THY APPROVED : APS DATE: 20-06-2014 REVISION: C SHT :058 CONT: 059
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**

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1	2	3	4	5	6	7	8
	MANUAL TRIP TO IV GROUP-B TRIP RELAY	765KV TIE CVT SELECTED (BUS-1 CVT)	765KV TIE CVT DE-SELECTED (BUS-1 CVT)	400KV SIDE BUS CVT SELECTED	400KV SIDE BUS CVT DE-SELECTED	765KV TIE SELECTED CVT SELECTED	765KV BUS-II CVT SELECTED	SPARE	

+704AT

C264
BCUT
SLOT-G
/045.5B

DO1 DO2 DO3 DO4 DO5 DO6 DO7 DO8 DO9 DO10

BCUT-DIO-SLOT-G: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 19 20 21 22 23 24

X-BCUT-DOU-G: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

K951A	K963A	S101	S625	S627	S101	S629	S633	S101	S631	S635			
/032.6C	/032.6D	/016.3B	/016.3D	/016.4D	/016.5B	/016.5D	/016.6D	/016.6B	/016.6D	/016.7D			

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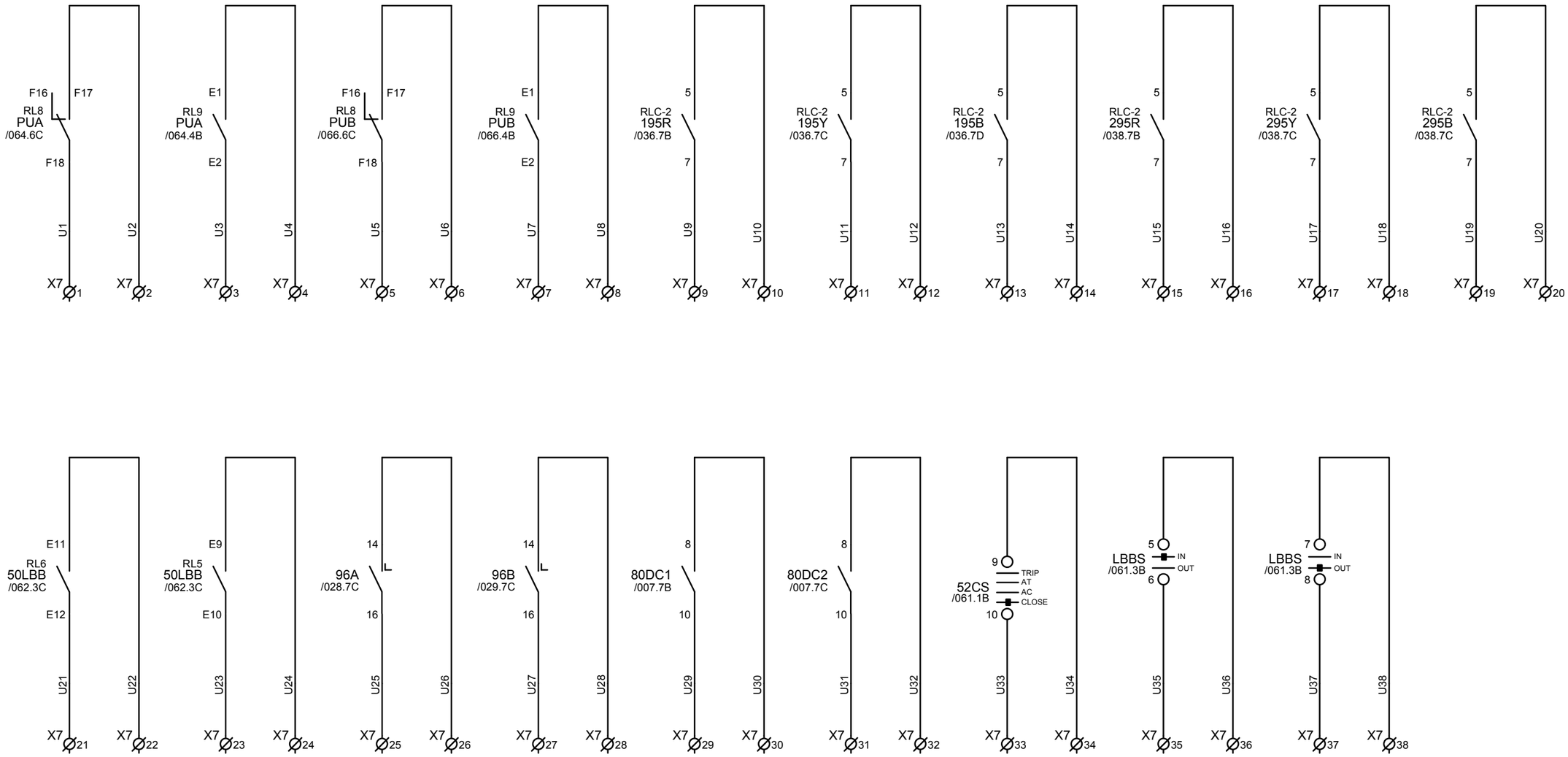
CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) BCU DIGITAL OUTPUT CARD**	PREPARED : GD REVIEWED : THY APPROVED : APS	REVISION: C DATE: 20-06-2014	SHT : 059 CONT: 060
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**		

+704AT



CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) SPARE CONTACT DISTRIBUTION**	PREPARED : GD REVIEWED : THY APPROVED : APS DATE: 20-06-2014 REVISION: C SHT :060 CONT: 061
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**	**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**

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+704AT

52CS

	TRIP	AT	AC	CLOSE	
1	○	|	|	○	2
3	○	|	|	○	4
5	○	|	|	○	6
7	○	|	|	○	8
9	○	|	|	○	10 /060.5D
11	○	|	|	○	12 /034.4C
13	○	|	|	○	14 /031.6C
15	○	|	|	○	16 /033.6D
17	○	|	|	○	18 /033.7D
19	○	|	|	○	20 /053.5C
21	○	|	|	○	22 /032.6C
23	○	|	|	○	24 /033.7D
25	○	|	|	○	26 /034.4C
27	○	|	|	○	28 /034.5C
29	○	‖	‖	○	30
31	○	|	|	○	32

DCS

	SOURCE-1	IND	SOURCE-2	
1	○	|	○	2 /007.2D
3	○	|	○	4 /007.3D
5	○	|	○	6
7	○	‖	○	8 /007.2D
9	○	‖	○	10 /007.2D
11	○	‖	○	12 /007.5D
13	○	‖	○	14 /007.5D
15	○	‖	○	16 /007.6D
17	○	|	○	18 /007.6D
19	○	|	○	20

LBBS

	IN		OUT	
1	○	|	○	2 /026.7D
3	○	|	○	4 /026.8D
5	○	|	○	6 /060.6D
7	○	‖	○	8 /060.7D
9	○	‖	○	10
11	○	‖	○	12
13	○	‖	○	14
16	○	‖	○	15

75A

27	OP	28	/016.2D
25	RE	26	/016.2D
1	⌐	3	/017.2C
5	⌐	7	/017.2C
9	⌐	11	/017.2C
15	⌐	13	/017.3C
17	⌐	19	/018.5B
2	⌐	4	/018.5B
6	⌐	8	/018.5B
10	⌐	12	/018.6B
14	⌐	16	
18	⌐	20	

75B

27	OP	28	/016.3D
25	RE	26	/016.4D
1	⌐	3	/017.3C
5	⌐	7	/017.4C
9	⌐	11	/017.4C
15	⌐	13	/017.4C
17	⌐	19	/018.6B
2	⌐	4	
6	⌐	8	/018.7B
10	⌐	12	/018.7B
14	⌐	16	/018.8B
18	⌐	20	

75C

27	OP	28	/016.5D
25	RE	26	/016.6D
1	⌐	3	/017.5C
5	⌐	7	/017.5C
9	⌐	11	/017.6C
15	⌐	13	/017.6C
17	⌐	19	
2	⌐	4	
6	⌐	8	
10	⌐	12	
14	⌐	16	
18	⌐	20	

75D

27	OP	28	/016.6D
25	RE	26	/016.7D
1	⌐	3	/018.1B
5	⌐	7	/018.2B
9	⌐	11	/018.3B
15	⌐	13	/018.3B
17	⌐	19	/018.3B
2	⌐	4	/018.2B
6	⌐	8	/018.2B
10	⌐	12	/018.3B
14	⌐	16	
18	⌐	20	

BLKA

S1	●	R1	/028.2C
S2	●	R2	/020.1D
S3	●	R3	/019.4C
S4	●	R4	/019.4C
S5	●	R5	/019.4C
S6	●	R6	/019.4D
S7	●	R7	/031.1C
S8	●	R8	/031.2C
S9	●	R9	/032.1C
S10	●	R10	/032.2C

BLKB

S1	●	R1	/029.3C
S2	●	R2	/023.1D
S3	●	R3	/022.4C
S4	●	R4	/022.4C
S5	●	R5	/022.4C
S6	●	R6	/022.4D
S7	●	R7	/031.2C
S8	●	R8	/031.2C
S9	●	R9	/032.2C
S10	●	R10	/032.2C

BLKC

S1	●	R1	
S2	●	R2	/026.1C
S3	●	R3	/025.3B
S4	●	R4	/025.3B
S5	●	R5	/025.3C
S6	●	R6	/025.3C
S7	●	R7	/025.6B
S8	●	R8	/025.6B
S9	●	R9	/025.6B
S10	●	R10	/025.6C

BLKD

S1	●	R1	/047.3E
S2	●	R2	
S3	●	R3	/047.3A
S4	●	R4	/047.3B
S5	●	R5	/047.3B
S6	●	R6	/047.3C
S7	●	R7	/047.3C
S8	●	R8	/047.3D
S9	●	R9	/047.3D
S10	●	R10	/047.3E

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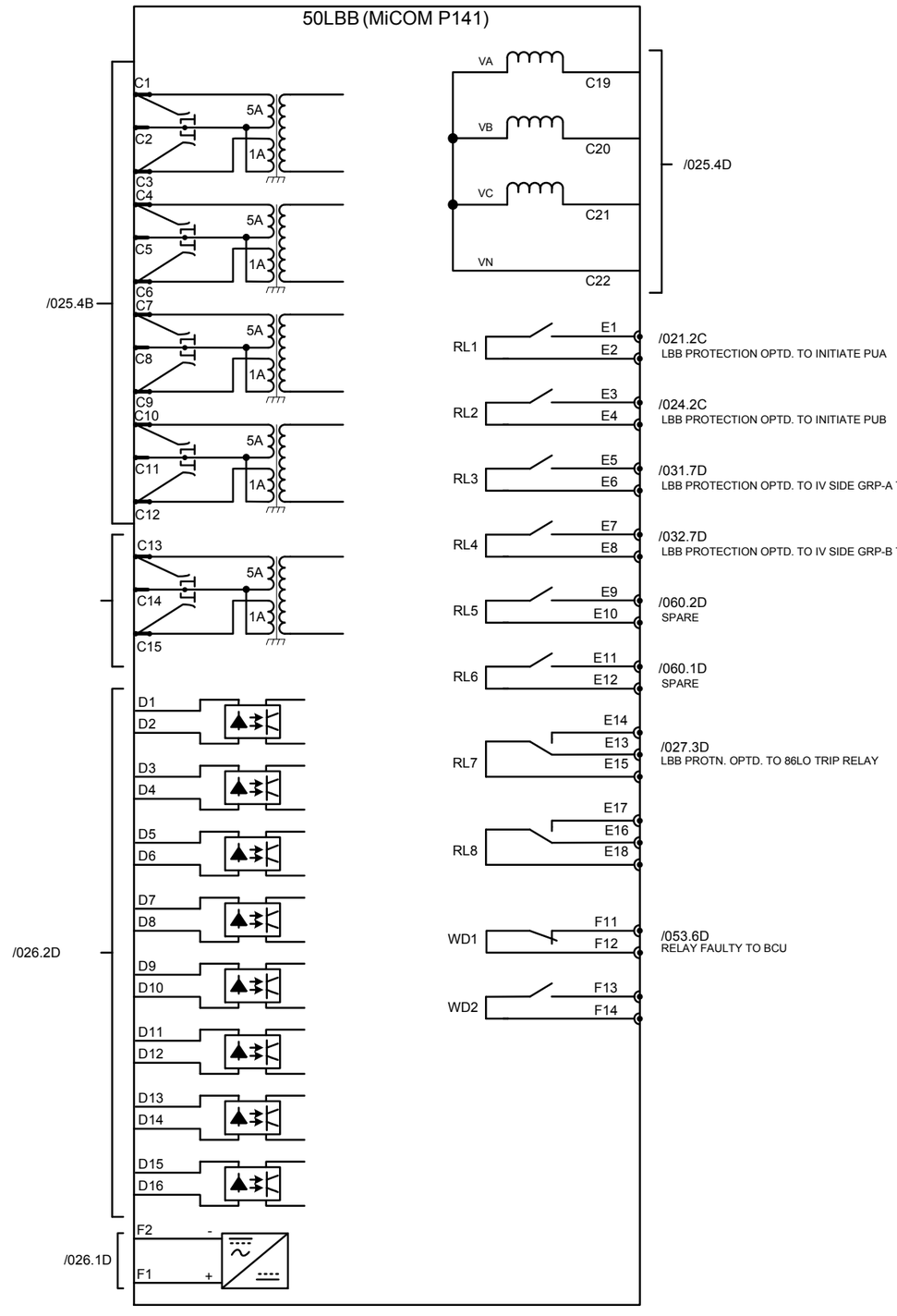
CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.	CONSULTANT: TATA CONSULTING ENGINEERS LTD.		TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) DEVICE REFERENCE	PREPARED : GD	REVISION: C	SHT :061
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION			REVIEWED : THY	DATE: 20-06-2014	CONT: 062
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	PPGCL DRG. NO: L&T DRG. NO:		PANEL TYPE : +704AT	APPROVED : APS	DRG. NO.: 3269PN587-S-14	

+704AT



MiCOM P141 LED CONFIGARATION
(DEDICATED LED's)

- TRIP
- ALARM
- OUT OF SERVICE
- HEALTHY

MiCOM P141 LED CONFIGARATION
(USER PROGRAMMABLE LED's)

- LBB PROTECTION OPTD.
- VT FUSE FAIL OPTD.
- SPARE
- SPARE
- SPARE
- SPARE
- SPARE
- SPARE

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	Schneider Electric	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704)** **50LBB RELAY DEVICE REFERENCE**	PREPARED : GD REVIEWED : THY APPROVED : APS	REVISION: C DATE: 20-06-2014	SHT : 062 CONT: 063
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**		**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**		

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SL.NO	STATUS (50LBB) - MiCOM P141	INPUTS							
		I/P-1	I/P-2	I/P-3	I/P-4	I/P-5	I/P-6	I/P-7	I/P-8
		FOR LBB PROTECTION	FOR STATUS	FOR SUPERVISION	FOR SUPERVISION/ STATUS	SPARE	SPARE	FOR LBB PROTECTION	FOR LBB PROTECTION
01	3-PH LBB INITIATION	✔							
02	LBB SELECTOR SWITCH IS "IN" POSITION							✔	
03	LBB SELECTOR SWITCH IS "OUT" POSITION								✔
04	86LO TRIP RELAY SUPERVISION			✔					
05	86LO TRIP RELAY OPTD.				✔				
04	BCU FAULTY		✔						
05	SPARE					✔	✔		

SL.NO	PROTECTION FUNCTIONS (50LBB) - MiCOM P141	OUTPUT RELAYS									
		RL1	RL2	RL3	RL4	RL5	RL6	RL7	RL8	WD1	WD2
		TO PUA FOR INI. BB PROTN.	TO PUB FOR INI. BB PROTN.	TO IV SIDE GROUP-A TRIP RELAY	TO IV SIDE GROUP-B TRIP RELAY	SPARE	SPARE	TO 86LO TRIP RELAY	SPARE	TO BCU FOR STATUS	SPARE
01	LBB PROTN. OPTD.	✔	✔	✔	✔			✔			
02	RELAY FAULTY									✔	
03	SPARE					✔	✔		✔		✔

SI.NO	NOTATION	DESCRIPTION
1	RL	RELAY OUTPUT CONTACT
2	WD	WATCHDOG CONTACT
3	I/P	DIGITAL OPTO INPUT

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013

CONSULTANT: TATA CONSULTING ENGINEERS LTD.
CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION
PPGCL DRG. NO:
L&T DRG. NO:

TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704)
50LBB RELAY INPUT/OUTPUT LIST
PANEL TYPE : +704AT

PREPARED : GD
REVIEWED : THY
APPROVED : APS
DATE: 20-06-2014
REVISION: C
SHT :063
CONT:064
DRG. NO.: 3269PN587-S-14

+704AT

PUA (MiCOM P743)

PUA
/019.6B

A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12 — 5A / 1A

RX
TX

B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12 B13 B14 B15 B16 — C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16

/020.2E

/021.2D

PUA (MiCOM P743)

/060.2B SPARE	E1 E2	RL9	RL1	F1 F2
/028.6D TO GRP-A BB TRIP RELAY RESET	E3 E4	RL10	RL2	F3 F4
/028.2D BB PROTECTION OPTD. TO 96A	E5 E6	RL11	RL3	F5 F6
/029.2D BB PROTECTION OPTD. TO 96B	E7 E8	RL12	RL4	F7 F8 — /031.1D DEAD ZONE PTROTN. OPTD. TO IV SIDE GROUP-A TRIP RELAY
/030A.7C DEAD ZONE PROTN. OPTD TO 86A TRIP RELAY	E9 E10	RL13	RL5	F9 F10 — /031.2D BB PTROTN. OPTD. TO IV SIDE GROUP-A TRIP RELAY
/030A.8C DEAD ZONE PROTN. OPTD TO 86B TRIP RELAY	E11 E12	RL14	RL6	F11 F12 — /032.1D DEAD ZONE PTROTN. OPTD. TO IV SIDE GROUP-B TRIP RELAY
	E14 E13 E15	RL15	RL7	F14 F13 F15 — /032.2D BB PROTN. OPTD. TO IV SIDE GROUP-B TRIP RELAY
	E17 E16 E18	RL16	RL8	F17 F16 F18 — /060.1B SPARE

/024.3C RELAY FAULTY TO PUB — G11 G12 — WD1

G13 G14 — WD2

/020.1E — G2 (-) G1 (+)

MiCOM P743 LED CONFIGARATION (DEDICATED LED's)

- TRIP
- ALARM
- OUT OF SERVICE
- HEALTHY

MiCOM P743 LED CONFIGARATION (USER PROGRAMMABLE LED's)

- 701-89A ISOL. CLOSED
- 701-52 CB CLOSED
- DEAD ZONE TRIP/RELAY HEALTHY
- CIRCUITRY FAULTY
- FIBRE COMM. ERROR
- SPARE
- SPARE
- SPARE

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.	CONSULTANT: TATA CONSULTING ENGINEERS LTD.	Schneider Electric	TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) PUA RELAY DEVICE REFERENCE
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION		PANEL TYPE : +704AT
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	PPGCL DRG. NO: L&T DRG. NO:		DRG. NO.: 3269PN587-S-14

PREPARED : GD	REVISION: C	SHT : 064	
REVIEWED : THY	DATE: 20-06-2014	CONT: 065	
APPROVED : APS			

SL.NO	STATUS (PUA) - MiCOM P743	OPTO INPUTS															
		I/P-1	I/P-2	I/P-3	I/P-4	I/P-5	I/P-6	I/P-7	I/P-8	I/P-9	I/P-10	I/P-11	I/P-12	I/P-13	I/P-14	I/P-15	I/P-16
		FOR BB PROTN.	FOR BB PROTN.	FOR BB PROTN.	FOR BB PROTN.	SPARE	SPARE	SPARE	SPARE	TO INITIATE BB PROTECTION	FOR END ZONE FAULT PROTN.	FOR STATUS	FOR SUPERVISION / STATUS	FOR SUPERVISION	SPARE	SPARE	SPARE
01	701-52 CB CLOSED	✔															
02	701-52 CB OPEN		✔														
03	701-89A ISOLATOR OPEN			✔													
04	701-89A ISOLATOR CLOSE				✔												
09	LBB PROTECTION OPERATED									✔							
10	CB CLOSE COMMAND FROM BCU										✔						
11	PUB RELAY FAULTY											✔					
12	GRP-A BUSBAR TRIP RELAY OPTD.												✔				
13	GRP-A BUSBAR TRIP RELAY SUPERVISION													✔			
14	SPARE					✔	✔	✔	✔						✔	✔	✔

SI.NO	NOTATION	DESCRIPTION
1	RL	RELAY OUTPUT CONTACT
2	WD	WATCHDOG CONTACT
3	I/P	DIGITAL OPTO INPUT

SL.NO	PROTECTION FUNCTIONS (PUA) - MiCOM P743	OUTPUT RELAYS																	
		RL1	RL2	RL3	RL4	RL5	RL6	RL7	RL8	RL9	RL10	RL11	RL12	RL13	RL14	RL15	RL16	WD1	WD2
		SPARE	SPARE	SPARE	TO LI SIDE GRP-A TRIP RELAY	TO IV SIDE GRP-A TRIP RELAY	TO IV SIDE GRP-B TRIP RELAY	TO IV SIDE GRP-B TRIP RELAY	SPARE	SPARE	TO GRP-A BB TRIP RELAY RESET	TO GRP-A BB TRIP RELAY	TO GRP-B BB TRIP RELAY	TO 86A TRIP RELAY	TO 86A TRIP RELAY	SPARE	SPARE	TO PUB RELAY FOR STATUS	SPARE
01	RESET COMMAND FROM REMOTE										✔								
02	BB PROTN. OPTD.					✔		✔				✔	✔						
03	DEAD ZONE PROTN. OPERATED				✔		✔							✔	✔				
04	SPARE	✔	✔	✔					✔	✔						✔	✔		✔
05	RELAY FAULTY																	✔	

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013

CONSULTANT: TATA CONSULTING ENGINEERS LTD.
CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION
PPGCL DRG. NO:
L&T DRG. NO:

TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704)
PUA RELAY INPUT/OUTPUT LIST
PANEL TYPE : +704AT

PREPARED : GD
REVIEWED : THY
APPROVED : APS
DATE: 20-06-2014
REVISION: C
SHT :065
CONT: 066
DRG. NO.: 3269PN587-S-14

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+704AT

PUB (MiCOM P743)

/022.5B

A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12 — 5A / 1A

RX

TX

/023.2D

B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12 B13 B14 B15 B16

C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16

/024.2D

PUB(MiCOM P743)

/060.3B SPARE	E1 E2	RL9	RL1	F1 F2	
/029.6D TO GRP-B BB TRIP RELAY RESET	E3 E4	RL10	RL2	F3 F4	
/028.3D BB PROTECTION OPTD. TO 96A	E5 E6	RL11	RL3	F5 F6	
/029.3D BB PROTECTION OPTD. TO 96B	E7 E8	RL12	RL4	F7 F8	/031.2D DEAD ZONE PTROTN. OPTD. TO IV SIDE GROUP-A TRIP RELAY
/030A.7C DEAD ZONE PROTN. OPTD TO 86A TRIP RELAY	E9 E10	RL13	RL5	F9 F10	/031.2D BB PROTN. OPTD. TO IV SIDE GROUP-A TRIP RELAY
/030A.8C DEAD ZONE PROTN. OPTD TO 86B TRIP RELAY	E11 E12	RL14	RL6	F11 F12	/032.2D DEAD ZONE PTROTN. OPTD. TO IV SIDE GROUP-B TRIP RELAY
	E14 E13 E15	RL15	RL7	F14 F13 F15	/032.2D BB PROTN. OPTD. TO IV SIDE GROUP-B TRIP RELAY
	E17 E16 E18	RL16	RL8	F17 F16 F18	/060.2B SPARE

/021.3C RELAY FAULTY TO PUA — G11 G12 — WD1

G13 G14 — WD2

/023.1D — G2 (-) G1 (+)

MiCOM P743 LED CONFIGARATION (DEDICATED LED's)

- TRIP
- ALARM
- OUT OF SERVICE
- HEALTHY

MiCOM P743 LED CONFIGARATION (USER PROGRAMMABLE LED's)

- 701-89A ISOL. CLOSED
- 701-52 CB CLOSED
- DEAD ZONE TRIP/RELAY HEALTHY
- CIRCUITRY FAULTY
- FIBRE COMM. ERROR
- SPARE
- SPARE
- SPARE

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	CONSULTANT: TATA CONSULTING ENGINEERS LTD. CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION	Schneider Electric	TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) PUB RELAY DEVICE REFERENCE	PREPARED : GD REVIEWED : THY APPROVED : APS DATE: 20-06-2014 REVISION: C SHT :066 CONT: 067
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	PPGCL DRG. NO: L&T DRG. NO:		PANEL TYPE : +704AT	DRG. NO.: 3269PN587-S-14

SL.NO	STATUS (PUB) - MiCOM P743	OPTO INPUTS															
		I/P-1	I/P-2	I/P-3	I/P-4	I/P-5	I/P-6	I/P-7	I/P-8	I/P-9	I/P-10	I/P-11	I/P-12	I/P-13	I/P-14	I/P-15	I/P-16
		FOR BB PROTN.	FOR BB PROTN.	FOR BB PROTN.	FOR BB PROTN.	SPARE	SPARE	SPARE	SPARE	TO INITIATE BB PROTECTION	FOR END ZONE FAULT PROTN.	FOR STATUS	FOR SUPERVISION / STATUS	FOR SUPERVISION	SPARE	SPARE	SPARE
01	701-52 CB CLOSED	✔															
02	701-52CB OPEN		✔														
03	701-89A ISOLATOR OPEN			✔													
04	701-89A ISOLATOR CLOSE				✔												
09	LBB PROTECTION OPERATED									✔							
10	CB CLOSE COMMAND FROM BCU										✔						
11	PUA RELAY FAULTY											✔					
12	GRP-B BUSBAR TRIP RELAY OPTD.												✔				
13	GRP-B BUSBAR TRIP RELAY SUPERVISION													✔			
14	SPARE					✔	✔	✔	✔						✔	✔	✔

SI.NO	NOTATION	DESCRIPTION
1	RL	RELAY OUTPUT CONTACT
2	WD	WATCHDOG CONTACT
3	I/P	DIGITAL OPTO INPUT

SL.NO	PROTECTION FUNCTIONS (PUB) - MiCOM P743	OUTPUT RELAYS																	
		RL1	RL2	RL3	RL4	RL5	RL6	RL7	RL8	RL9	RL10	RL11	RL12	RL13	RL14	RL15	RL16	WD1	WD2
		SPARE	SPARE	SPARE	TO IV SIDE GRP-A TRIP RELAY	TO IV SIDE GRP-A TRIP RELAY	TO IV SIDE GRP-B TRIP RELAY	TO IV SIDE GRP-B TRIP RELAY	SPARE	SPARE	TO GRP-B BB TRIP RELAY RESET	TO GRP-A BB TRIP RELAY	TO GRP-B BB TRIP RELAY	TO 86A TRIP RELAY	TO 86B TRIP RELAY	SPARE	SPARE	TO PUA RELAY FOR STATUS	SPARE
01	RESET COMMAND FROM REMOTE										✔								
02	BB PROTN. OPTD.					✔		✔				✔	✔						
03	DEAD ZONE PROTN. OPERATED				✔		✔							✔	✔				
04	SPARE	✔	✔	✔					✔	✔						✔	✔		✔
05	RELAY FAULTY																	✔	

CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	CONSULTANT: TATA CONSULTING ENGINEERS LTD. CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION		TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) PUB RELAY INPUT/OUTPUT LIST	PREPARED : GD REVIEWED : THY APPROVED : APS	REVISION: C DATE: 20-06-2014	SHT :067 CONT: 068
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	PPGCL DRG. NO: L&T DRG. NO:		PANEL TYPE : +704AT	DRG. NO.: 3269PN587-S-14		

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GOOSE SIGNAL LIST

SL.NO	SIGNALS	FROM SOURCE EQUIPMENTS	FROM PANEL REFERENCE	TO BCU	FROM PANEL REFERENCE	PURPOSE
01	713-89BE1 OPEN	BCU	+7BB	BCUT	+704AT	FOR I/L
02	702-52 OPEN	BCU	+702TE	BCUT	+704AT	FOR I/L
03	400kV SIDE E/S-89TE1	-	FUTURE	BCUT	+704AT	FOR I/L
04	400kV SIDE ISOL.-89T	-	FUTURE	BCUT	+704AT	FOR I/L
05	705-89B OPEN	BCU	+705TE	BCUT	+704AT	FOR I/L
06	705-52 CLOSE	BCU	+705TE	BCUT	+704AT	FOR I/L
07	705-89B CLOSE	BCU	+705TE	BCUT	+704AT	FOR I/L
08	706-52 CLOSE	BCU	+706GTB	BCUT	+704AT	FOR I/L
09	706-89B CLOSE	BCU	+706GTB	BCUT	+704AT	FOR I/L
10	705-52 OPEN	BCU	+705TE	BCUT	+704AT	FOR I/L
11	705-89B OPEN	BCU	+705TE	BCUT	+704AT	FOR I/L
12	706-52 OPEN	BCU	+706GTB	BCUT	+704AT	FOR I/L
13	706-89B OPEN	BCU	+706GTB	BCUT	+704AT	FOR I/L
14	GRP-A TRIP RELAY OPTD.	-	FUTURE	BCUT	+704AT	FOR I/L
15	GRP-B TRIP RELAY OPTD.	-	FUTURE	BCUT	+704AT	FOR I/L
16	86LO TRIP RELAY OPTD.	50LBB	+701AT	BCUT	+704AT	FOR I/L

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD. PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA	**CONSULTANT: TATA CONSULTING ENGINEERS LTD.** **CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION**	**TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) GOOSE SIGNAL LIST**	PREPARED : GD REVIEWED : THY APPROVED : APS	REVISION: C DATE: 20-06-2014	SHT :068 CONT: 069
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013	**PPGCL DRG. NO:** **L&T DRG. NO:**	**PANEL TYPE : +704AT**	**DRG. NO.: 3269PN587-S-14**		

+704AT

TAG	REF	TAG	REF	TAG	REF	TAG	REF	TAG	REF	TAG	REF	TAG	REF	TAG	REF	TAG	REF	
X1:1	/006.4B	X2:1	/011.5A	X2:51	/022.2C	X4:1	/020.2C	X4:54	/030.2D	X5:1	/033.1E	X6:1	/057.2D	X7:1	/060.1C	X10:1	/015.2A	
X1:2	/006.4B	X2:2	/011.5A	X2:52	/022.2C	X4:2	/020.2C	X4:55	/030.2D	X5:2	/033.2E	X6:2	/057.2D	X7:2	/060.1C	X10:2	/015.2A	
X1:3	/007.1B	X2:3	/011.5B	X2:53	/022.2C	X4:3	/020.3C	X4:56	/030.6B	X5:3	/033.3E	X6:3	/057.4D	X7:3	/060.2C	X10:3	/015.2B	
X1:4	/007.1B	X2:4	/011.5B	X2:54	/022.2C	X4:4	/020.4C	X4:57	/030.6C	X5:4	/033.4E	X6:4	/057.5D	X7:4	/060.2C	X10:4	/015.2B	
X1:5	/007.3B	X2:5	/011.5B	X2:55	/022.2D	X4:5	/020.4C	X4:58	/030.6D	X5:5	/033.5E	X6:5	/058.2D	X7:5	/060.2C	X10:5	/017.2D	
X1:6	/007.4B	X2:6	/011.5B	X2:56	/022.2D	X4:6	/020.5C	X4:59	/030.6D	X5:6	/033.6E	X6:6	/058.2D	X7:6	/060.3C	X10:6	/017.2D	
X1:7	SPARE	X2:7	/011.5C	X2:57	SPARE	X4:7	/020.6D	X4:60	/030A.2B	X5:7	/033.7E	X6:7	SPARE	X7:7	/060.3C	X10:7	/017.2D	
X1:8	SPARE	X2:8	/011.5C	X2:58	SPARE	X4:8	/020.5D	X4:61	/030A.2C	X5:8	/033.7E	X6:8	SPARE	X7:8	/060.3C	X10:8	/017.3D	
		X2:9	/012.3A	X2:59	SPARE	X4:9	/020.6D	X4:62	/030A.5B	X5:9	/034.2E	X6:9	SPARE	X7:9	/060.4C	X10:9	/018.1D	
		X2:10	/012.3A	X2:60	SPARE	X4:10	/020.7D	X4:63	/030A.5C	X5:10	/034.2E	X6:10	SPARE	X7:10	/060.4C	X10:10	/018.2D	
		X2:11	/012.3B	X2:61	SPARE	X4:11	/020.7D	X4:64	/030.2B	X5:11	/034.3E			X7:11	/060.4C	X10:11	/018.2D	
		X2:12	/012.3B	X2:62	SPARE	X4:12	/020.8D	X4:65	/030.2B	X5:12	/034.4E			X7:12	/060.5C	X10:12	/018.2D	
		X2:13	/012.3C	X2:63	SPARE	X4:13	/021.6C	X4:66	/030.2B	X5:13	/034.4E			X7:13	/060.5C	X10:13	/018.3D	
		X2:14	/012.3C	X2:64	SPARE	X4:14	/021.6C	X4:67	/030.2B	X5:14	/034.5E			X7:14	/060.5C	X10:14	/018.3D	
		X2:15	/012.3C	X2:65	SPARE	X4:15	/021.6C	X4:68	/030.6B	X5:15	/035.2E			X7:15	/060.6C	X10:15	/018.3D	
		X2:16	/012.3C			X4:16	/021.7C	X4:69	/030.6B	X5:16	/035.2E			X7:16	/060.6C	X10:16	/018.3D	
		X2:17	/013.5B			X4:17	/021.7C	X4:70	/030.6B	X5:17	/035.2E			X7:17	/060.7C	X10:17	/018.5D	
		X2:18	/013.5B			X4:18	/023.2C	X4:71	/030.6B	X5:18	/036.1B			X7:18	/060.7C	X10:18	/018.5D	
		X2:19	/013.5B			X4:19	/023.2C	X4:72	/024.3D	X5:19	/036.1B			X7:19	/060.7C	X10:19	/018.5D	
		X2:20	/013.5B			X4:20	/023.3C	X4:73	/024.3D	X5:20	/036.2B			X7:20	/060.8C	X10:20	/018.6D	
		X2:21	/013.5C			X4:21	/023.4C	X4:74	/021.3D	X5:21	/036.2B			X7:21	/060.1E	X10:21	/033.3B	
		X2:22	/013.5C			X4:22	/023.4C	X4:75	/021.3D	X5:22	/036.2B			X7:22	/060.1E	X10:22	/033.4B	
		X2:23	/013.5C			X4:23	/023.5C	X4:76	/026.2B	X5:23	/036.2B			X7:23	/060.2E	X10:23	/035.5B	
		X2:24	/013.5C			X4:24	/023.5D	X4:77	/026.3B	X5:24	/036.3B			X7:24	/060.2E	X10:24	/035.5B	
		X2:25	/013.5D			X4:25	/023.6D	X4:78	/021.2C	X5:25	/036.3B			X7:25	/060.2E	X10:25	/035.5B	
		X2:26	/013.5D			X4:26	/023.6D	X4:79	/021.2D	X5:26	/036.5E			X7:26	/060.3E	X10:26	/035.6B	
		X2:27	/013.5E			X4:27	/023.7D	X4:80	/024.2C	X5:27	/036.5E			X7:27	/060.3E	X10:27	/035.6B	
		X2:28	/013.5E			X4:28	/023.7D	X4:81	/024.2D	X5:28	/036.6E			X7:28	/060.3E	X10:28	/035.6B	
		X2:29	/013.5E			X4:29	/023.8D	X4:82	/031.2C	X5:29	/036.6E			X7:29	/060.4E	X10:29	/035.7B	
		X2:30	/013.5E			X4:30	/024.6C	X4:83	/031.2C	X5:30	/036.6E			X7:30	/060.4E	X10:30	/035.7B	
		X2:31	/013.5F			X4:31	/024.6C	X4:84	/031.5D	X5:31	/036.7E			X7:31	/060.4E	X10:31	/037.5B	
		X2:32	/013.5F			X4:32	/024.6C	X4:85	/031.5D	X5:32	/037.2E			X7:32	/060.5E	X10:32	/037.5B	
		X2:33	/025.7B			X4:33	/024.7C	X4:86	/031.5D	X5:33	/037.2E			X7:33	/060.5E	X10:33	/037.6B	
		X2:34	/025.7B			X4:34	/024.7C	X4:87	/031.5D	X5:34	/037.2E			X7:34	/060.5E	X10:34	/037.6B	
		X2:35	/025.7B			X4:35	/026.6C	X4:88	/032.3B	X5:35	/038.1B			X7:35	/060.6E	X10:35	/037.6B	
		X2:36	/025.7C			X4:36	/026.5D	X4:89	/032.3C	X5:36	/038.1B			X7:36	/060.6E	X10:36	/037.6B	
		X2:37	/047.5A			X4:37	/026.6D	X4:90	/032.5D	X5:37	/038.2B			X7:37	/060.7E	X10:37	/037.7B	
		X2:38	/047.5B			X4:38	/027.4C	X4:91	/032.5D	X5:38	/038.2B			X7:38	/060.7E	X10:38	/037.7B	
		X2:39	/047.5B			X4:39	/027.4C	X4:92	/032.5D	X5:39	/038.2B			X7:39	SPARE	X10:39	/031.1E	
		X2:40	/047.5C			X4:40	/028.4C	X4:93	/032.5D	X5:40	/038.2B			X7:40	SPARE	X10:40	/031.1E	
		X2:41	/019.2C			X4:41	/028.4C	X4:94	/030A.2C	X5:41	/038.3B			X7:41	SPARE	X10:41	/031.7B	
		X2:42	/019.3C			X4:42	/028.5C	X4:95	/030A.2D	X5:42	/038.3B			X7:42	SPARE	X10:42	/031.8B	
		X2:43	/019.2C			X4:43	/028.5C	X4:96	/030A.3B	X5:43	/038.5E			X7:43	SPARE	X10:43	/032.1E	
		X2:44	/019.3C			X4:44	/029.4C	X4:97	/030A.3B	X5:44	/038.5E			X7:44	SPARE	X10:44	/032.1E	
		X2:45	/019.2C			X4:45	/029.5C	X4:98	/030A.5B	X5:45	/038.6E			X7:45	SPARE	X10:45	/032.7B	
		X2:46	/019.3C			X4:46	/029.5C	X4:99	/030A.5B	X5:46	/038.6E			X7:46	SPARE	X10:46	/032.8B	
		X2:47	/019.2D			X4:47	/029.5C			X5:47	/038.6E					X10:47	/030A.6B	
		X2:48	/019.3D			X4:48	/032.4B			X5:48	/038.7E					X10:48	/030A.7B	
		X2:49	/022.2C			X4:49	/031.4B			X5:49	SPARE					X10:49	/030A.7B	
		X2:50	/022.2C			X4:50	/031.4B			X5:50	SPARE					X10:50	/030A.8B	
						X4:51	/032.4B			X5:51	SPARE					X10:51	SPARE	
						X4:52	/030.2B			X5:52	SPARE					X10:52	SPARE	
						X4:53	/030.2C			X5:53	SPARE							
										X5:54	SPARE							
										X5:55	SPARE							
										X5:56	SPARE							
										X5:57	SPARE							
										X5:58	SPARE							
										X5:59	SPARE							
										X5:60	SPARE							

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013

CONSULTANT: TATA CONSULTING ENGINEERS LTD.
CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION
PPGCL DRG. NO:
L&T DRG. NO:

Schneider Electric

TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) TERMINAL BLOCK ALLOCATION
PANEL TYPE : +704AT

PREPARED : GD
REVIEWED : THY
APPROVED : APS
REVISION: C
DATE: 20-06-2014
SHT :069
CONT: 070
DRG. NO.: 3269PN587-S-14

+704AT

TAG	REF	TAG	REF	TAG	REF	TAG	REF	TAG	REF	TAG	REF	TAG	REF	
X-BCUT-PS-A:1	/046.6D	X-BCUT-DIU-M:1	/054.2D	X-BCUT-DIU-N:1	/052.2D	X-BCUT-DIU-O:1	/050.2D	X-BCUT-DIU-P:1	/048.2D	X-BCUT-DOU-D:1	/056.1B	X-BCUT-DOU-E:1	/057.1B	
X-BCUT-PS-A:2	/046.6D	X-BCUT-DIU-M:2	/054.2D	X-BCUT-DIU-N:2	/052.2D	X-BCUT-DIU-O:2	/050.2D	X-BCUT-DIU-P:2	/048.2D	X-BCUT-DOU-D:2	/056.2B	X-BCUT-DOU-E:2	/057.2B	
X-BCUT-PS-A:3	/046.7D	X-BCUT-DIU-M:3	/054.3D	X-BCUT-DIU-N:3	/052.3D	X-BCUT-DIU-O:3	/050.3D	X-BCUT-DIU-P:3	/048.3D	X-BCUT-DOU-D:3	/056.2B	X-BCUT-DOU-E:3	/057.2B	
X-BCUT-PS-A:4	/046.7D	X-BCUT-DIU-M:4	/054.3D	X-BCUT-DIU-N:4	/052.3D	X-BCUT-DIU-O:4	/050.3D	X-BCUT-DIU-P:4	/048.3D	X-BCUT-DOU-D:4	/056.2B	X-BCUT-DOU-E:4	/057.2B	
X-BCUT-PS-A:5	/046.3D	X-BCUT-DIU-M:5	/054.4D	X-BCUT-DIU-N:5	/052.4D	X-BCUT-DIU-O:5	/050.4D	X-BCUT-DIU-P:5	/048.4D	X-BCUT-DOU-D:5	/056.3B	X-BCUT-DOU-E:5	/057.3B	
X-BCUT-PS-A:6	/046.3D	X-BCUT-DIU-M:6	/054.4D	X-BCUT-DIU-N:6	/052.4D	X-BCUT-DIU-O:6	/050.4D	X-BCUT-DIU-P:6	/048.4D	X-BCUT-DOU-D:6	/056.3B	X-BCUT-DOU-E:6	/057.3B	
X-BCUT-PS-A:7	SPARE	X-BCUT-DIU-M:7	/054.5D	X-BCUT-DIU-N:7	/052.5D	X-BCUT-DIU-O:7	/050.5D	X-BCUT-DIU-P:7	/048.5D	X-BCUT-DOU-D:7	/056.3B	X-BCUT-DOU-E:7	/057.3B	
X-BCUT-PS-A:8		X-BCUT-DIU-M:8	/054.5D	X-BCUT-DIU-N:8	/052.5D	X-BCUT-DIU-O:8	/050.5D	X-BCUT-DIU-P:8	/048.5D	X-BCUT-DOU-D:8	/056.4B	X-BCUT-DOU-E:8	/057.4B	
		X-BCUT-DIU-M:9	/054.6D	X-BCUT-DIU-N:9	/052.6D	X-BCUT-DIU-O:9	/050.6D	X-BCUT-DIU-P:9	/048.6D	X-BCUT-DOU-D:9	/056.4B	X-BCUT-DOU-E:9	/057.4B	
		X-BCUT-DIU-M:10	/054.6D	X-BCUT-DIU-N:10	/052.6D	X-BCUT-DIU-O:10	/050.6D	X-BCUT-DIU-P:10	/048.6D	X-BCUT-DOU-D:10	/056.4B	X-BCUT-DOU-E:10	/057.4B	
		X-BCUT-DIU-M:11	/054.7D	X-BCUT-DIU-N:11	/052.7D	X-BCUT-DIU-O:11	/050.7D	X-BCUT-DIU-P:11	/048.7D	X-BCUT-DOU-D:11	/056.5B	X-BCUT-DOU-E:11	/057.5B	
		X-BCUT-DIU-M:12	/054.7D	X-BCUT-DIU-N:12	/052.7D	X-BCUT-DIU-O:12	/050.7D	X-BCUT-DIU-P:12	/048.7D	X-BCUT-DOU-D:12	/056.5B	X-BCUT-DOU-E:12	/057.5B	
		X-BCUT-DIU-M:13	/055.2D	X-BCUT-DIU-N:13	/053.2E	X-BCUT-DIU-O:13	/051.2D	X-BCUT-DIU-P:13	/049.2D	X-BCUT-DOU-D:13	/056.5B	X-BCUT-DOU-E:13	/057.5B	
		X-BCUT-DIU-M:14	/055.2D	X-BCUT-DIU-N:14	/053.2E	X-BCUT-DIU-O:14	/051.2D	X-BCUT-DIU-P:14	/049.2D	X-BCUT-DOU-D:14	/056.6B	X-BCUT-DOU-E:14	/057.6B	
		X-BCUT-DIU-M:15	/055.3D	X-BCUT-DIU-N:15	/053.3E	X-BCUT-DIU-O:15	/051.3D	X-BCUT-DIU-P:15	/049.3D	X-BCUT-DOU-D:15	/056.6B	X-BCUT-DOU-E:15	/057.6B	
		X-BCUT-DIU-M:16	/055.3D	X-BCUT-DIU-N:16	/053.3E	X-BCUT-DIU-O:16	/051.3D	X-BCUT-DIU-P:16	/049.3D	X-BCUT-DOU-D:16	/056.6B	X-BCUT-DOU-E:16	/057.6B	
		X-BCUT-DIU-M:17	/055.4D	X-BCUT-DIU-N:17	/053.4E	X-BCUT-DIU-O:17	/051.4D	X-BCUT-DIU-P:17	/049.4D	X-BCUT-DOU-D:17	SPARE	X-BCUT-DOU-E:17	SPARE	
		X-BCUT-DIU-M:18	/055.4D	X-BCUT-DIU-N:18	/053.4E	X-BCUT-DIU-O:18	/051.4D	X-BCUT-DIU-P:18	/049.4D	X-BCUT-DOU-D:18	SPARE	X-BCUT-DOU-E:18	SPARE	
		X-BCUT-DIU-M:19	/055.5D	X-BCUT-DIU-N:19	/053.5E	X-BCUT-DIU-O:19	/051.5D	X-BCUT-DIU-P:19	/049.5D	X-BCUT-DOU-D:19	/056.7B	X-BCUT-DOU-E:19	/057.7B	
		X-BCUT-DIU-M:20	/055.5D	X-BCUT-DIU-N:20	/053.5E	X-BCUT-DIU-O:20	/051.5D	X-BCUT-DIU-P:20	/049.5D	X-BCUT-DOU-D:20	/056.7B	X-BCUT-DOU-E:20	/057.7B	
		X-BCUT-DIU-M:21	/055.6D	X-BCUT-DIU-N:21	/053.6E	X-BCUT-DIU-O:21	/051.6D	X-BCUT-DIU-P:21	/049.6D	X-BCUT-DOU-D:21	/056.7B	X-BCUT-DOU-E:21	/057.7B	
		X-BCUT-DIU-M:22	/055.6D	X-BCUT-DIU-N:22	/053.6E	X-BCUT-DIU-O:22	/051.6D	X-BCUT-DIU-P:22	/049.6D	X-BCUT-DOU-D:22	/056.7B	X-BCUT-DOU-E:22	/057.7B	
		X-BCUT-DIU-M:23	/055.7D	X-BCUT-DIU-N:23	/053.7E	X-BCUT-DIU-O:23	/051.7D	X-BCUT-DIU-P:23	/049.7D	X-BCUT-DOU-D:23	/056.8B	X-BCUT-DOU-E:23	/057.8B	
		X-BCUT-DIU-M:24	/055.7D	X-BCUT-DIU-N:24	/053.7E	X-BCUT-DIU-O:24	/051.7D	X-BCUT-DIU-P:24	/049.7D	X-BCUT-DOU-D:24	/056.8B	X-BCUT-DOU-E:24	/057.8B	
		X-BCUT-DIU-M:25	/054.1C	X-BCUT-DIU-N:25	/052.1C	X-BCUT-DIU-O:25	/050.1C	X-BCUT-DIU-P:25	/048.1C					
		X-BCUT-DIU-M:26	/054.7C	X-BCUT-DIU-N:26	/052.4C	X-BCUT-DIU-O:26	/050.3C	X-BCUT-DIU-P:26	/049.1C					
		X-BCUT-DIU-M:27	/054.8C	X-BCUT-DIU-N:27	/052.7C	X-BCUT-DIU-O:27	/050.5C	X-BCUT-DIU-P:27	/049.1C					
		X-BCUT-DIU-M:28	/055.1C	X-BCUT-DIU-N:28	/053.7C	X-BCUT-DIU-O:28	/050.6C	X-BCUT-DIU-P:28	/049.7C					
		X-BCUT-DIU-M:29	/055.7C	X-BCUT-DIU-N:29	/053.7C	X-BCUT-DIU-O:29	/051.3C	X-BCUT-DIU-P:29	/049.7C					
		X-BCUT-DIU-M:30	/055.7C	X-BCUT-DIU-N:30	/053.8C	X-BCUT-DIU-O:30	/051.7C	X-BCUT-DIU-P:30	/049.8C					

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013

CONSULTANT: TATA CONSULTING ENGINEERS LTD.
CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION
PPGCL DRG. NO:
L&T DRG. NO:

Schneider Electric

TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) BCU TERMINAL BLOCK ALLOCATION
PANEL TYPE : +704AT

PREPARED : GD
REVIEWED : THY
APPROVED : APS
REVISION: C
DATE: 20-06-2014
SHT :070
CONT: 071
DRG. NO.: 3269PN587-S-14

+704AT

TAG	REF	TAG	REF
X-BCUT-DOU-F:1	/058.1B	X-BCUT-DOU-G:1	/059.1B
X-BCUT-DOU-F:2	/058.2B	X-BCUT-DOU-G:2	/059.2B
X-BCUT-DOU-F:3	/058.2B	X-BCUT-DOU-G:3	/059.2B
X-BCUT-DOU-F:4	/058.2B	X-BCUT-DOU-G:4	/059.2B
X-BCUT-DOU-F:5	/058.3B	X-BCUT-DOU-G:5	/059.3B
X-BCUT-DOU-F:6	/058.3B	X-BCUT-DOU-G:6	/059.3B
X-BCUT-DOU-F:7	/058.3B	X-BCUT-DOU-G:7	/059.3B
X-BCUT-DOU-F:8	/058.4B	X-BCUT-DOU-G:8	/059.4B
X-BCUT-DOU-F:9	/058.4B	X-BCUT-DOU-G:9	/059.4B
X-BCUT-DOU-F:10	/058.4B	X-BCUT-DOU-G:10	/059.4B
X-BCUT-DOU-F:11	/058.5B	X-BCUT-DOU-G:11	/059.5B
X-BCUT-DOU-F:12	/058.5B	X-BCUT-DOU-G:12	/059.5B
X-BCUT-DOU-F:13	/058.5B	X-BCUT-DOU-G:13	/059.5B
X-BCUT-DOU-F:14	/058.6B	X-BCUT-DOU-G:14	/059.6B
X-BCUT-DOU-F:15	/058.6B	X-BCUT-DOU-G:15	/059.6B
X-BCUT-DOU-F:16	/058.6B	X-BCUT-DOU-G:16	/059.6B
X-BCUT-DOU-F:17	SPARE	X-BCUT-DOU-G:17	/059.7B
X-BCUT-DOU-F:18	SPARE	X-BCUT-DOU-G:18	/059.7B
X-BCUT-DOU-F:19	/058.7B	X-BCUT-DOU-G:19	/059.7B
X-BCUT-DOU-F:20	/058.7B	X-BCUT-DOU-G:20	/059.7B
X-BCUT-DOU-F:21	/058.7B	X-BCUT-DOU-G:21	/059.8B
X-BCUT-DOU-F:22	/058.7B	X-BCUT-DOU-G:22	/059.8B
X-BCUT-DOU-F:23	/058.8B	X-BCUT-DOU-G:23	SPARE
X-BCUT-DOU-F:24	/058.8B	X-BCUT-DOU-G:24	SPARE

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013

CONSULTANT: TATA CONSULTING ENGINEERS LTD.
CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION
PPGCL DRG. NO:
L&T DRG. NO:

Schneider Electric

TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704)
BCU TERMINAL BLOCK ALLOCATION

PANEL TYPE : +704AT

PREPARED : GD
REVIEWED : THY
APPROVED : APS
REVISION: C
DATE: 20-06-2014
SHT :071
CONT: 072

DRG. NO.: 3269PN587-S-14

+704AT

TAG	REF	TAG	REF	TAG	REF	TAG	REF	TAG	REF	
X200:1	/014.3C,3269PN587-S-23/061.1A	X200A:1	/015.2C	X201:1	3269PN587-S-23/052.1B,/006.3B	X201A:1	/007.2B	X201B:1	/028.4C	
X200:2	/014.3C,3269PN587-S-23/061.1A	X200A:2	/015.2C	X201:2	/006.3B,3269PN587-S-23/052.1B	X201A:2	/007.2B	X201B:2	/028.4C	
X200:3	/014.3D,3269PN587-S-23/061.1A	X200A:3	/015.2C	X201:3	3269PN587-S-23/052.1B	X201A:3	/007.4B	X201B:3	/029.4C	
X200:4	/014.3D,3269PN587-S-23/061.1B	X200A:4	/015.2D	X201:4	3269PN587-S-23/052.1B	X201A:4	/007.5B	X201B:4	/029.4C	
X200:5	/014.3D,3269PN587-S-23/061.1B	X200A:5	/015.2D	X201:5	3269PN587-S-23/052.1C	X201A:5	/032.3B	X201B:5	/031.5B	
X200:6	3269PN587-S-23/061.1B,/014.3E	X200A:6	/015.2E	X201:6	3269PN587-S-23/052.1C	X201A:6	/031.3B	X201B:6	/031.5B	
X200:7	/014.3E,3269PN587-S-23/061.1B	X200A:7	/015.2E					X201B:7	/031.2B	
X200:8	/014.3E,3269PN587-S-23/061.1B	X200A:8	/015.2E					X201B:8	/032.2B	
X200:9	3269PN587-S-23/061.1C	X200A:9	/012.3D					X201B:9	/032.5B	
X200:10	3269PN587-S-23/061.1C	X200A:10	/012.3D					X201B:10	/032.5B	
X200:11	3269PN587-S-23/061.1C	X200A:11	/012.3D					X201B:11	SPARE	
X200:12	3269PN587-S-23/061.1C	X200A:12	/012.3E					X201B:12	SPARE	
X200:13	/014.3A,3269PN587-S-23/061.1C	X200A:13	/010.5D					X201B:13	SPARE	
X200:14	3269PN587-S-23/061.1D,/014.3A	X200A:14	/010.5D					X201B:14	SPARE	
X200:15	/014.3A,3269PN587-S-23/061.1D	X200A:15	/010.5D					X201B:15	SPARE	
X200:16	/014.3B,3269PN587-S-23/061.1D	X200A:16	/010.5E					X201B:16	SPARE	
X200:17	/014.3B,3269PN587-S-23/061.1D	X200A:17	/011.5D					X201B:17	/021.3B	
X200:18	/014.3B,3269PN587-S-23/061.1D	X200A:18	/011.5D					X201B:18	/021.3B	
X200:19	/014.3C,3269PN587-S-23/061.1E	X200A:19	/011.5D					X201B:19	/024.3B	
X200:20	3269PN587-S-23/061.1E,/014.3C	X200A:20	/011.5E					X201B:20	/024.3B	
X200:21	3269PN587-S-23/061.1E							X201B:21		
X200:22	3269PN587-S-23/061.1E							X201B:22		
X200:23	3269PN587-S-23/061.1E									
X200:24	3269PN587-S-23/061.1F									

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013

CONSULTANT: TATA CONSULTING ENGINEERS LTD.
CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION
PPGCL DRG. NO:
L&T DRG. NO:

Schneider Electric

TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) TERMINAL BLOCK ALLOCATION
PANEL TYPE : +704AT

PREPARED : GD
REVIEWED : THY
APPROVED : APS
REVISION: C
DATE: 20-06-2014
SHT :072
CONT: 073
DRG. NO.: 3269PN587-S-14

+704AT

TAG	REF	TAG	REF	TAG	REF
X201C:1	/030.1E	X202:1	3269PN587-S-23/054.7A	X203:1	3269PN587-S-23/057.7A
X201C:2	/030.1E	X202:2	3269PN587-S-23/054.7A	X203:2	3269PN587-S-23/057.7A
X201C:3	/030.1E	X202:3	3269PN587-S-23/054.7A	X203:3	3269PN587-S-23/057.7A
X201C:4	/030.2E	X202:4	3269PN587-S-23/054.7B	X203:4	3269PN587-S-23/057.7B
X201C:5	/030.5E	X202:5	3269PN587-S-23/054.7B	X203:5	3269PN587-S-23/057.7B
X201C:6	/030.5E	X202:6	3269PN587-S-23/054.7B	X203:6	3269PN587-S-23/057.7B
X201C:7	/030.5E	X202:7	3269PN587-S-23/054.7B,/020.1C	X203:7	/023.1C,3269PN587-S-23/057.7B
X201C:8	/030.5E	X202:8	/020.1C,3269PN587-S-23/054.7B	X203:8	3269PN587-S-23/057.7B,/023.1C
X201C:9	/030A.1E	X202:9	3269PN587-S-23/054.7C	X203:9	3269PN587-S-23/057.7C
X201C:10	SPARE	X202:10	3269PN587-S-23/054.7C	X203:10	3269PN587-S-23/057.7C
X201C:11	/030A.2E	X202:11	3269PN587-S-23/054.7C	X203:11	3269PN587-S-23/057.7C
X201C:12	/030A.4E	X202:12	3269PN587-S-23/054.7C	X203:12	3269PN587-S-23/057.7C
X201C:13	/030A.4E	X202:13	3269PN587-S-23/054.7C	X203:13	3269PN587-S-23/057.7C
		X202:14	3269PN587-S-23/054.7D	X203:14	3269PN587-S-23/057.7D
		X202:15	3269PN587-S-23/054.7D	X203:15	3269PN587-S-23/057.7D
		X202:16	3269PN587-S-23/054.7D	X203:16	3269PN587-S-23/057.7D

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013

CONSULTANT: TATA CONSULTING ENGINEERS LTD.
CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION
PPGCL DRG. NO:
L&T DRG. NO:

Schneider Electric

TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) TERMINAL BLOCK ALLOCATION
PANEL TYPE : +704AT

PREPARED : GD
REVIEWED : THY
APPROVED : APS
REVISION: C
DATE: 20-06-2014
SHT :073
CONT: 074
DRG. NO.: 3269PN587-S-14

CIRCUIT BREAKER			704-52
X3-R:3 — X3-R:4	X3-Y:3 — X3-Y:4	X3-B:3 — X3-B:4	TO BCU /048.2B /048.4B /048.5B
X3-R:7 — X3-R:8	X3-Y:7 — X3-Y:8	X3-B:7 — X3-B:8	
X3-R:11 — X3-R:12	X3-Y:11 — X3-Y:12	X3-B:11 — X3-B:12	
X3-R:15 — X3-R:16	X3-Y:15 — X3-Y:16	X3-B:15 — X3-B:16	TO PUA RELAY /020.2B /020.2B /020.3B
X3-R:19 — X3-R:20	X3-Y:19 — X3-Y:20	X3-B:19 — X3-B:20	TO PUB RELAY /023.2B /023.2B /023.3B
X3-R:23 — X3-R:24	X3-Y:23 — X3-Y:24	X3-B:23 — X3-B:24	
X3-R:31 — X3-R:32	X3-Y:31 — X3-Y:32	X3-B:31 — X3-B:32	
X3-R:35 — X3-R:36	X3-Y:35 — X3-Y:36	X3-B:35 — X3-B:36	
X3-R:39 — X3-R:40	X3-Y:39 — X3-Y:40	X3-B:39 — X3-B:40	
X3-R:43 — X3-R:44	X3-Y:43 — X3-Y:44	X3-B:43 — X3-B:44	
X3-R:57 — X3-R:58	X3-Y:57 — X3-Y:58	X3-B:57 — X3-B:58	
X3-R:61 — X3-R:62	X3-Y:61 — X3-Y:62	X3-B:61 — X3-B:62	

CIRCUIT BREAKER			704-52
X3-R:1 — X3-R:2	X3-Y:1 — X3-Y:2	X3-B:1 — X3-B:2	TO BCU /048.2B /048.3B /048.5B
X3-R:5 — X3-R:6	X3-Y:5 — X3-Y:6	X3-B:5 — X3-B:6	TO INTER TRIP CKT. /031.4B /031.4B /031.4B
X3-R:9 — X3-R:10	X3-Y:9 — X3-Y:10	X3-B:9 — X3-B:10	TO INTERTRIP CKT. /032.4B /032.4B /032.4B
X3-R:13 — X3-R:14	X3-Y:13 — X3-Y:14	X3-B:13 — X3-B:14	TO PUA RELAY /020.3B /020.3B /020.3B
X3-R:17 — X3-R:18	X3-Y:17 — X3-Y:18	X3-B:17 — X3-B:18	TO PUB RELAY /023.3B /023.3B /023.3B
X3-R:21 — X3-R:22	X3-Y:21 — X3-Y:22	X3-B:21 — X3-B:22	
X3-R:29 — X3-R:30	X3-Y:29 — X3-Y:30	X3-B:29 — X3-B:30	
X3-R:33 — X3-R:34	X3-Y:33 — X3-Y:34	X3-B:33 — X3-B:34	
X3-R:37 — X3-R:38	X3-Y:37 — X3-Y:38	X3-B:37 — X3-B:38	
X3-R:41 — X3-R:42	X3-Y:41 — X3-Y:42	X3-B:41 — X3-B:42	
X3-R:55 — X3-R:56	X3-Y:55 — X3-Y:56	X3-B:55 — X3-B:56	
X3-R:59 — X3-R:60	X3-Y:59 — X3-Y:60	X3-B:59 — X3-B:60	

COND. MONITORING OF CONT.MOVEMENT

X3-R:25 — X3-R:26	X3-Y:25 — X3-Y:26	X3-B:25 — X3-B:26	
X3-R:27 — X3-R:28	X3-Y:27 — X3-Y:28	X3-B:27 — X3-B:28	

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013

CONSULTANT: TATA CONSULTING ENGINEERS LTD.
CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION
PPGCL DRG. NO:
L&T DRG. NO:

Schneider Electric

TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) CB CONTACT DISTRIBUTION
PANEL TYPE : +704AT

PREPARED : GD
REVIEWED : THY
APPROVED : APS
REVISION: C
DATE: 20-06-2014
SHT :074
CONT: 075
DRG. NO.: 3269PN587-S-14

MASTER ISOLATOR	FOLLOWER-1 ISOLATOR	FOLLOWER-2 ISOLATOR	MASTER	704-89A	704-89B	704-89T
TB3:101 — TB3:102	TB3:101 — TB3:102	TB3:101 — TB3:102	TB3:141	TO BCU /050.2B	TO BCU /050.6B	TO BCU /051.4B
TB3-105 — TB3-106	TB3-105 — TB3-106	TB3-105 — TB3-106	TB3:142	TO PUA RELAY /020.5B		
TB3-109 — TB3-110	TB3-109 — TB3-110	TB3-109 — TB3-110	TB3:143	TO PUB RELAY /023.5B		
TB3-113 — TB3-114	TB3-113 — TB3-114	TB3-113 — TB3-114	TB3:144			
TB3-117 — TB3-118	TB3-117 — TB3-118	TB3-117 — TB3-118	TB3:145			
TB3-121 — TB3-122	TB3-121 — TB3-122	TB3-121 — TB3-122	TB3:146			
TB3-125 — TB3-126	TB3-125 — TB3-126	TB3-125 — TB3-126	TB3:147			
TB3-129 — TB3-130	TB3-129 — TB3-130	TB3-129 — TB3-130	TB3:148			
TB3-133 — TB3-134	TB3-133 — TB3-134	TB3-133 — TB3-134	TB3:149			
TB3-137 — TB3-138	TB3-137 — TB3-138	TB3-137 — TB3-138	TB3:150			

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013

CONSULTANT: TATA CONSULTING ENGINEERS LTD.
CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION
PPGCL DRG. NO:
L&T DRG. NO:

Schneider Electric

TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) ISOLATOR CONTACT DISTRIBUTION
PANEL TYPE : +704AT

PREPARED : GD
REVIEWED : THY
APPROVED : APS
REVISION: C
DATE: 20-06-2014
SHT :075
CONT: 076
DRG. NO.: 3269PN587-S-14

MASTER ISOLATOR	FOLLOWER-1 ISOLATOR	FOLLOWER-2 ISOLATOR	MASTER	704-89A	704-89B	704-89T
TB4:103 — TB4:104	TB4:103 — TB4:104	TB4:103 — TB4:104	TB4:151	TO BCU /050.2B	TO BCU /050.5B	TO BCU /051.3B
TB4-107 — TB4-108	TB4-107 — TB4-108	TB4-107 — TB4-108	TB4:152	TO PUA RELAY /020.4B		
TB4-111 — TB4-112	TB4-111 — TB4-112	TB4-111 — TB4-112	TB4:153	TO PUB RELAY /023.4B		
TB4-115 — TB4-116	TB4-115 — TB4-116	TB4-115 — TB4-116	TB4:154			
TB4-119 — TB4-120	TB4-119 — TB4-120	TB4-119 — TB4-120	TB4:155			
TB4-123 — TB4-124	TB4-123 — TB4-124	TB4-123 — TB4-124	TB4:156			
TB4-127 — TB4-128	TB4-127 — TB4-128	TB4-127 — TB4-128	TB4:157			
TB4-131 — TB4-132	TB4-131 — TB4-132	TB4-131 — TB4-132	TB4:158			
TB4-135 — TB4-136	TB4-135 — TB4-136	TB4-135 — TB4-136	TB4:159			
TB4-139 — TB4-140	TB4-139 — TB4-140	TB4-139 — TB4-140	TB4:160			

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013

CONSULTANT: TATA CONSULTING ENGINEERS LTD.
CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION
PPGCL DRG. NO:
L&T DRG. NO:

Schneider Electric

TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) ISOLATOR CONTACT DISTRIBUTION
PANEL TYPE : +704AT

PREPARED : GD
REVIEWED : THY
APPROVED : APS
REVISION: C
DATE: 20-06-2014
SHT :076
CONT: 077
DRG. NO.: 3269PN587-S-14

MASTER EARTH SWITCH		FOLLOWER-1 EARTH SWITCH		FOLLOWER-2 EARTH SWITCH		MASTER	704-89AE	704-89BE	704-89TE2	704-89TE1
TB3:101	TB3:102	TB3:101	TB3:102	TB3:101	TB3:102	TB3:125	TO BCU /050.5B	TO BCU /051.2B	TO BCU /051.6B	TO BCU /052.2B
TB3-105	TB3-106	TB3-105	TB3-106	TB3-105	TB3-106	TB3:126	TO CB LOCAL CLOSING /034.6E	TO CB LOCAL CLOSING /034.6D		
TB3-109	TB3-110	TB3-109	TB3-110	TB3-109	TB3-110	TB3:127				
TB3-113	TB3-114	TB3-113	TB3-114	TB3-113	TB3-114	TB3:128				
TB3-117	TB3-118	TB3-117	TB3-118	TB3-117	TB3-118	TB3:129				
TB3-121	TB3-122	TB3-121	TB3-122	TB3-121	TB3-122	TB3:130				

MASTER EARTH SWITCH		FOLLOWER-1 EARTH SWITCH		FOLLOWER-2 EARTH SWITCH		MASTER	704-89AE	704-89BE	704-89TE2	704-89TE1
TB3:103	TB3:104	TB3:103	TB3:104	TB3:103	TB3:104	TB3:131	TO BCU /050.4B	TO BCU /051.2B	TO BCU /051.5B	TO BCU /052.2B
TB3-107	TB3-108	TB3-107	TB3-108	TB3-107	TB3-108	TB3:132				
TB3-111	TB3-112	TB3-111	TB3-112	TB3-111	TB3-112	TB3:133				
TB3-115	TB3-116	TB3-115	TB3-116	TB3-115	TB3-116	TB3:134				
TB3-119	TB3-120	TB3-119	TB3-120	TB3-119	TB3-120	TB3:135				
TB3-123	TB3-124	TB3-123	TB3-124	TB3-123	TB3-124	TB3:136				

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CUSTOMER : PRAYAGRAJ POWER GENERATION COMPANY LTD.
PROJECT : PRAYAGRAJ SUPER CRITICAL THERMAL POWER PROJECT(3X660MW) AT BARA
PO. No.& Date: L&T/PT&D/SS/JAYPEE-BARA/01 DATED :27.03.2013

CONSULTANT: TATA CONSULTING ENGINEERS LTD.
CONTRACTOR: L&T CONSTRUCTION POWER TRANSMISSION & DISTRIBUTION
PPGCL DRG. NO:
L&T DRG. NO:

Schneider Electric

TITLE : 765KV ICT UNEQUIPED BAY CONTROL PANEL (BAY #704) EARTHSWITCH CONTACT DISTRIBUTION
PANEL TYPE : +704AT

PREPARED : GD
REVIEWED : THY
APPROVED : APS
REVISION: C
DATE: 20-06-2014
SHT :077
CONT: NIL
DRG. NO.: 3269PN587-S-14