



BIHAR STATE POWER TRANSMISSION COMPANY LTD., PATNA
A subsidiary company of Bihar State Power. (Holding) Company Ltd., Patna
CIN – U74110BR2012SGC018889

[SAVE ENERGY FOR BENEFIT OF SELF AND NATION]

Head Office, Vidyut Bhawan, Bailey Road, Patna – 800021

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Website - www.bsptcl.in

Letter No. C.E. (P&E) 172/2023 33 / BSPTCL, Patna

Dated 18/1/24

From,

Kumar Prasant
Chief Engineer (P&E)

To,

JV of M/s ABN Tower & Transmission Pvt. Ltd.(Lead partner)
and M/s BinodConstruction(JV partner)
Godrej Genesis Building, Unit No.609, Plot No.XI,
6th Floor, Block EP & GP, Sector-V, Salt Lake
Kolkata-700091

Email:- info@abntower.com

Sub.:- Adoption of vendor of M/s Amara Raja Power Systems Ltd, Tirupati Andhra Pradesh for supply of 220V/50A & 48V/50A Dual Float Cum Boost Charger and 220V/300AH & 48V/300AH VRLA Battery along with adoption of GTP & drawing for Construction of 2x50MVA, 132/33KV GSS Bhorey (Dist.Gopalganj) including residential quarter with construction of associated 02 nos. 132KV Line bays at GSS Hathua & Construction of its associated 132KV D/C Bhorey-Hathua Tr. Line with ACSR Panther Conductor (Line length-60RKM) on turnkey basis under state plan against NIT-10/PR/BSPTCL/2023 .

Ref.:- 1. NIT No.- 10/PR/BSPTCL/2023.
2. NOA No.- 13(service), Dated-01.09.23 & 12(supply), Dated-01.09.23
3. Your Letter no.- ABN/23-24/10/BSPTCL/RL-1423, Dated-09.01.2024
4. This office Letter no.- 324, Dated-08.04.2022

Sir,

With reference to subject noted above, your request for adoption of vendor of M/s Amara Raja Power Systems Ltd, Tirupati Andhra Pradesh for supply of 220V/50A & 48V/50A Dual Float Cum Boost Charger and 220V/300AH & 48V/300AH VRLA Battery along with adoption of GTP & drawing from NIT- 10/PR/BSPTCL/2021 against NIT-10/PR/BSPTCL/2023 is hereby considered with modifications on the risk and responsibility of **M/s ABN Tower & Transmission Pvt. Ltd.(Lead partner) JV with M/s Binod Construction(JV partner).**

Please note that this approval and issue of this letter does not absolve you from any contractual responsibility in terms of quality and correctness of the material and should be strictly in accordance with the tender specifications/ISS/IEC. If at any time, any abnormality is observed, BSPTCL reserves the right to withdraw this approval with immediate effect without any pre- intimation.

Encl: As above.

Yours faithfully

(Kumar Prasant)

Chief Engineer (P&E)



Amara Raja Power Systems Limited, Tirupati



**TECHNICAL PACKAGE OF
220VDC/50A DUAL FLOAT CUM BOOST CHARGER
(STANDBY LOGIC)
(Suitable for 220V/300AH VRLA/NVRLA Battery of 110
Cells)**

**CUSTOMER : GUPTA POWER INFRASTRUCTURE
LIMITED**

PROJECT : BSPTCL-NIT No:10/PR/BSPTCL/20-21

**P. O. NO. : GPIL/BSPTCL/ARPSL/LOI/21-22/09,
DATED: 22.02.2022**

S. O. NO. : 5200005229

LINE NO. : 10, 50 & 90

REV.0

**AMARA RAJA POWER SYSTEMS LIMITED
RENIGUNTA – KADAPA ROAD
KARAKAMBADI – 517 520
TIRUPATI, ANDHRA PRADESH
Tel: +91 877 2265000
Fax: +91 877 2285551**

APPROVED
Subject to the condition that you are not absolved of
the responsibility for correctness of the materials
supplied as per specification

APL-5200005229, REV.0, DATED: 04.03.2022

**Electrical Superintending Engineer
(Planning and Engineering)
Bihar State Power Transmission Company Limited
Vidyut Bhawan, Patna-800021**
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*Adopted for
MST No- 10/PR/BSPTCL/20-21
18/1/24*

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Adopted for NIT No.
 - 10/P2/BSPTCL/2023.

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SPECIAL NOTE

**DRAWINGS/DOCUMENTS MAY UNDERGO FEW CHANGES/
 MODIFICATIONS DURING DETAILED ENGINEERING STAGE
 WHICH DOESN'T AFFECT THE CUSTOMER REQUIREMENT**

GENERAL DESCRIPTION

The Battery Charger System basically consists of Two Float Cum Boost Chargers with an Interlocking Circuit called Smart Switch (Common Circuit for FCBC-1 & FCBC-2). Each Float cum Boost Charger is capable to supply the Load and Battery Charging requirements. In normal mode of operation, FCBC-1 will float charge the battery and feeds the load and FCBC-2 will be in OFF condition. When FCBC-1 fails, the other Charger, FCBC-2 comes into operation automatically and supplies to the Load and Battery Bank.

Smart Switch is the main circuit which controls entire charger system by communicating with FCBC-1 & FCBC-2 and activating them as per the requirement. It performs the operations like when FCBC-1 has to work; when FCBC-2 has to work and in which mode; when both FCBC-1 & FCBC-2 has to work etc. Also, smart switch measures the load and battery parameters like load voltage, load current, battery voltage, battery charge/discharge currents etc. It also generates annunciations like DC Under Voltage, DC Over Voltage, Battery Under Voltage, Battery Over Voltage, Battery Earth Fault, Battery Fuse Fail etc.

Each Float cum Boost Charger is a rectifier unit which works on 3-phase AC input power supply and gives required DC voltage as output, delivering certain amount of power as demanded by the application. Conventionally this kind of rectifier unit is controlled manually and is analog control. However the analog portion of the control circuit has been replaced here in this charger with a microcontroller. Advanced microcontroller has been selected for this application. This controller section not only provides accuracy of operations but also adds the ability of communication. Block diagram of one such rectifier unit is shown below in Fig.1.

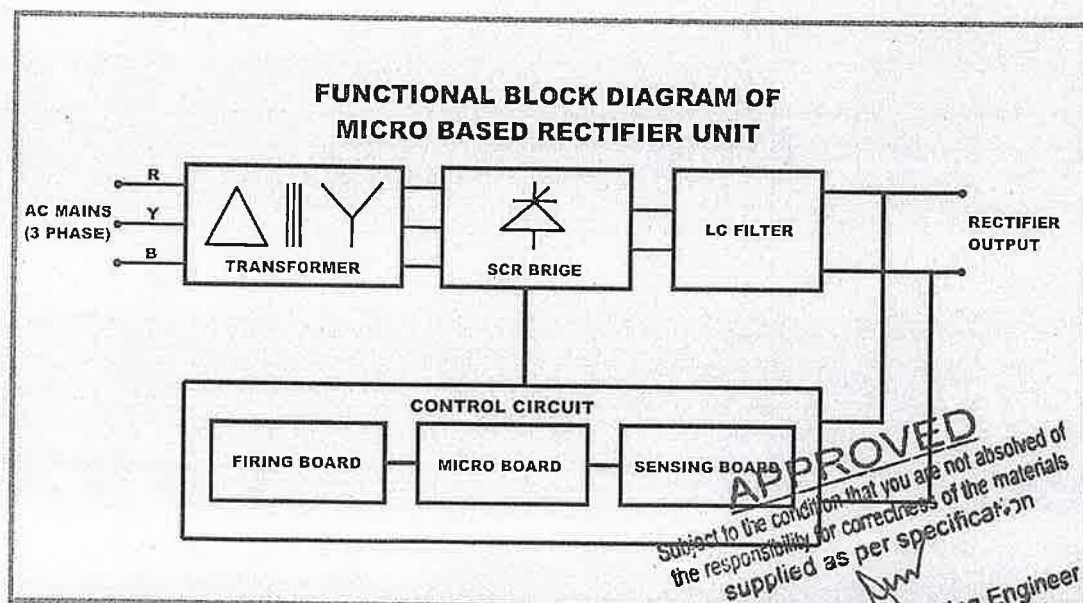


Fig. 1

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10/PR/BSPTA/2022

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Also, Single Line Diagram of Total Battery Charger System is shown below in Fig. 2.

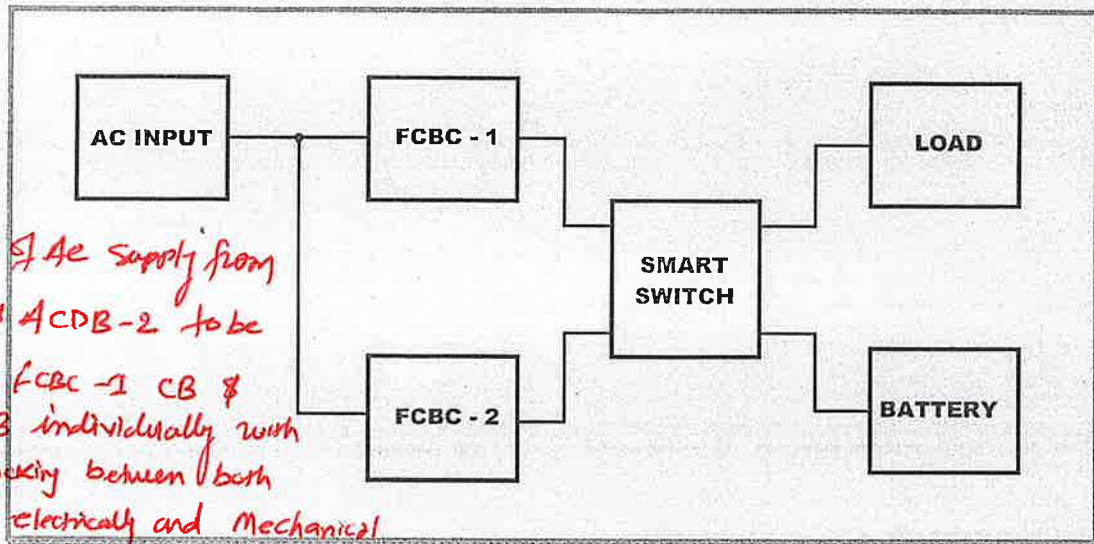


Fig. 2

Rectifier unit consists of a transformer to bring the input voltage to a required level and also to provide isolation between input and output. The secondary of the isolation transformer is fed to SCR Bridge. Initially SCRs will be fired slowly for DC soft start and controls the phase angle depending upon the output voltage of the charger. The rectified DC is connected to filter section which in turn filters out all harmonics and provide DC voltage with low ripple content.

Charger mode of operation can be selected through LCD. The charger will work in FLOAT, BOOST and AUTO modes. In any mode, monitoring and controlling happens through micro board. Charger feedback signals are fed to micro board based on which it generates reference signal. Micro board is provided at front panel to display charger parameters, load parameters and battery parameters in LCD. Micro board is having LED indicators for different operating conditions like **MAINS ON, CHARGER ON, AC MAINS FAIL, CHARGER FAIL, SCR FUSE FAIL, FLOAT ON, BOOST ON, CHARGER OVER VOLTAGE, CHARGER UNDER VOLTAGE, BATTERY OVER VOTLAGE, BATTERY UNDER VOLTAGE, LOAD OVER VOLTAGE, LOAD UNDER VOLTAGE, BATTERY EARTH FAULT, GROUP ALARM** etc. Based on faulty condition, appropriate LED glows & activates audio alarm. This audio alarm can be disabled or silenced by setting buzzer in LCD set parameters menu. However, indicating LED will be glowing continuously until the fault is rectified.

The firing board receives the voltage and current reference signals from micro board. It generates SCR firing signals based on reference and feedback signals.

Sensing board senses different faulty condition like RECTIFIER FUSE FAIL, EARTH FAULT etc. and send it to micro board for alarms generation. Sensing board is also having potential free contacts for alarm conditions.

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*As corrected
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-10/12/2022
12/1/24*

11/12

The Battery Chargers FCBC-1, FCBC-2 & Smart Switch (Common Circuit for both FCBC-1 & FCBC-2) are housed in a single cabinet of free standing sheet steel construction. The cabinet is provided with front & rear doors for easy accessibility. All AC input and DC output switchgear of FCBC-1, FCBC-2 & Smart Switch (Common Circuit for FCBC-1 & FCBC-2) are provided inside the cabinet at appropriate place for easy accessibility and maintenance. Cable entry is provided at the front bottom of the cabinet. By opening the front door, one can reach the termination easily.

PRINCIPLE OF OPERATION

The Charger Unit is designed in such a way that Float cum Boost Charger-1 (FCBC-1) will be in ON condition taking care of load and battery charging requirements and Float cum Boost Charger-2 (FCBC-2) will be in OFF condition. If FCBC-1 fails for any reason, FCBC-2 will cut into the circuit automatically and takes care of both load and battery. Provision is available to select any of the two chargers manually.

During Normal Operation, the FCBC-1 supplies Load Current as well as Trickle Charges the Battery. The common Mode Selection in Logic box is kept in Auto to select the Battery Charging Mode (Float or Boost) automatically based on Battery condition.

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-10/PR/BSPTCL/2023*

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TECHNICAL SPECIFICATION OF THE BATTERY CHARGER

SCHEME : 220VDC/50A DUAL FLOAT CUM BOOST CHARGER (STANDBY LOGIC)
 TYPE : FULL WAVE FULL CONTROLLED
 TYPE OF BATTERY : 220V/300AH VRLA/NVRLA BATTERY OF 110 CELLS

INPUT

a) Three phase Input : 415V AC $\pm 10\%$ (Three Phase, Four Wire)
 b) Frequency : 50Hz $\pm 5\%$

OUTPUT

a) Output Current : 50A
 b) Ripple : 2% RMS (Without Battery connected)
 c) Efficiency : $> 80\%$
 d) Operating Voltage Ranges :

TYPE OF BATTERY	VRLA	NVRLA
No. of Cells	110 Nos.	110 Nos.
Float Voltage (2.25 VPC x 110 Cells)	247.5V DC	247.5V DC
Boost Voltage (2.3VPC for VRLA Battery & 2.65VPC for NVRLA x 110 Cells)	253V DC	291.5V DC
Equalizing Voltage (2.75 VPC x 110 Cells)	---	302.5V DC
Load Voltage (Voltage applied on Load)	247.5VDC when Charger operates in Float Mode 253VDC when Charger operates in Boost Mode	247.5VDC when Charger operates in Float Mode 291.5VDC when Charger operates in Boost Mode

VOLTAGE REGULATION

Charger output is $\pm 1\%$ of the set value in the following conditions in set mode (FLOAT /BOOST/AUTO)

Load variation : 10-100%
 Line variation : $\pm 10\%$
 Frequency Variations : $\pm 5\%$
 Temperature Variations : 0 °C to +50 °C

INDICATIONS

Cluster LED Lamps will be provided for "AC Mains ON (R, Y, B)" condition.

The following indications will be indicated by 5mm LEDs in FCBC-1 & FCBC-2:

a) AC Mains ON : Green LED
 b) Charger ON : Green LED
 c) Float ON : Green LED
 d) Boost ON : Amber LED
 e) AC Mains Fail : Red LED
 f) Charger OV : Red LED
 g) Charger UV : Red LED
 h) SCR Fuse Fail : Red LED
 i) Charger Fail : Red LED
 j) Group Alarm : Red LED

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The following indications will be indicated by 5mm LEDs in Smart Switch (Common Circuit for FCBC-1 & FCBC-2):

- | | | |
|-----------------------------|---|---|
| a) Battery Fuse Fail | : | Red LED |
| b) Battery Earth Fault | : | Red LED |
| c) Load Under Voltage | : | Red LED |
| d) Load Over Voltage | : | Red LED |
| e) Battery Under Voltage | : | Red LED |
| f) Battery Over Voltage | : | Red LED |
| g) Battery Reverse Polarity | : | Red LED (provided at Battery Termination) |

DISPLAY

The following parameters will be displayed on LCD of FCBC-1 & FCBC-2:

- AC Input Voltage either Line to Line or Line to Neutral
- AC Input Current in each phase
- Charger Output Voltage
- Charger Output Current
- Charger ON/OFF
- Alarms

The following parameters will be displayed on LCD of Smart Switch (Common Circuit for FCBC-1 & FCBC-2):

- Battery Voltage
- Battery Charging Current / Discharging Current
- Load Voltage
- Load Current
- Alarms

ALARMS WITH BUZZER

The following Alarms will be displayed on FCBC-1 & FCBC-2:

- | | | |
|-------------------------------|---|-----------------------------|
| a) AC Mains Fail/Out of Limit | : | Both LCD and LED indication |
| b) SCR Fuse Fail | : | Both LCD and LED indication |
| c) Charger Fail | : | Both LCD and LED indication |
| d) Charger Under Voltage | : | Both LCD and LED indication |
| e) Charger Over Voltage | : | Both LCD and LED indication |
| f) AC Input CB Trip/OFF | : | LCD only |
| g) DC Output CB Trip/OFF | : | LCD only |
| h) Filter Fuse Fail | : | LCD only |
| i) Charger Over Temperature | : | LCD only |
| j) DC Overload | : | LCD only |
| k) Group Alarm | : | LED indication only |

The following Alarms will be displayed on Smart Switch (Common Circuit for FCBC-1 & FCBC-2):

- | | | |
|------------------------|---|-----------------------------|
| a) Battery Fuse Fail | : | Both LCD and LED indication |
| b) Battery Earth Fault | : | Both LCD and LED indication |
| c) Load Under Voltage | : | Both LCD and LED indication |

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Bihar State Bhawan, Patna-800021

- | | | |
|--------------------------|---|-----------------------------|
| d) Load Over Voltage | : | Both LCD and LED indication |
| e) Battery Under Voltage | : | Both LCD and LED indication |
| f) Battery Over Voltage | : | Both LCD and LED indication |

POTENTIAL FREE CONTACTS

The following Potential Free Contacts will be available on FCBC-1 & FCBC-2:

- Float ON
- Boost ON
- SCR Fuse Fail
- Charger Fail
- Charger Under Voltage
- Charger Over Voltage
- Group Alarm

The following Potential Free Contacts will be available on Smart Switch (Common Circuit for FCBC-1 & FCBC-2):

- Battery Earth Fault
- Battery Fuse Fail
- Load Under Voltage
- Load Over Voltage
- Battery Under Voltage
- Battery Over Voltage
- Group Alarm

PROTECTIONS

The following protections are provided:

- AC Input Circuit Breaker
- Fast acting Semiconductor Fuses for SCR Bridge
- DC Over Voltage Cutback / Shut Down
- DC Overload
- DC Output Circuit Breaker
- Battery Input Fuses
- Battery Current Limit
- Charger Current Limit
- Blocking Diode

CONTROLS & SWITCHES

- AC Input ON/OFF Circuit Breaker
- DC Output ON/OFF Circuit Breaker
- Battery Input Fuses
- Socket ON/OFF Switch
- Space Heater ON/OFF Switch
- Door Lamp ON/OFF Push Button
- Push Buttons: Menu; Increment; Decrement; Enter & Back

ANALOGUE MEASURING METER: 100-0-100mA DC Ammeter
(DC Earth Leakage Ammeter)

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10/11/24

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ENVIRONMENTAL STABILITY

Operating Temperature	:	-5 °C to +50 °C
Storage	:	25 °C to +70 °C
Relative Humidity	:	0-95% (Non-condensing)
Noise Level	:	< 75 dB (A)

SPECIAL FEATURES

- a) Auto Phase Reversal Operation
 - b) Soft Start on DC side
 - c) Class-F Insulation with Class-F Temperature Limits for all Magnetics
 - d) Automatic Voltage Regulation using Microcontroller
 - e) Filter Circuit to Limit Ripple
 - f) Charger Current Limiting
 - g) Battery Current Limiting
 - h) Automatic Float to Boost changeover based on current drawn by Battery
 - i) Automatic Boost to Float changeover based on Current or Voltage.
 - j) Anti-condensation Heater with Thermostat Control
 - k) RS-485, 4-Wire Communication with MODBUS Protocol (communication cable from Battery Charger System to user equipment like SCADA is not in Amara Raja scope)
- Remote shutdown facility from SCADA

GENERAL

Cabinet	:	Freestanding Cabinet; Floor Mounting Type, Sheet Steel Construction; Easy for Installation and Maintenance; Components are accessible from Front & Rear; Cable entry at Front Bottom of the Cabinet
Protection	:	IP – 42
Paint Shade	:	631 of IS-5
CRCA Sheet Thickness	:	Load bearing sections – 2.0mm Non-load bearing sections – 1.5mm Undrilled Cable Gland Plate – 3.0mm
Nature of Cooling	:	Natural Air Cooling
Dimensions in mm	:	As per the Dimensional Drawings enclosed

Adopted for AIFT No
-10/PR/BSPTCL/2023.

18/1/24

(as corrected)

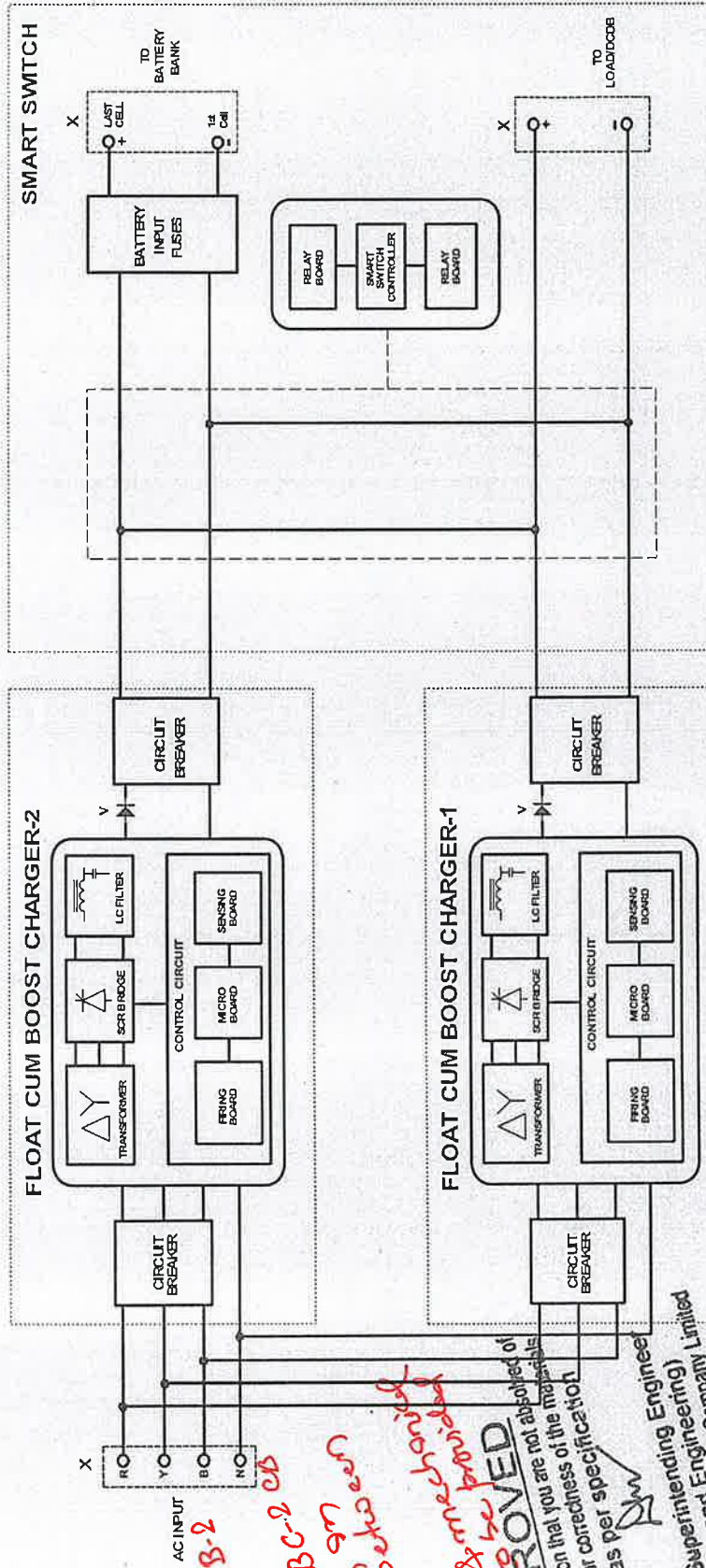
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Bihar State Power Transmission Company Limited
Vijay Bhawan, Patna-800021

System Condition	Mode Selection	FCBC - 1	FCBC - 2	Battery	Load
AC Mains Available	AUTO	ON	OFF	Supplied by FCBC-1 (FCBC-1 Float or Boost Charges the Battery based on the Battery Charging Current)	Supplied by FCBC-1 (Load will see either Float Voltage or Boost Voltage based on the Battery Charging Current)
AC Mains Available	MANUAL FLOAT	ON	OFF	Supplied by FCBC-1 (FCBC-1 Float Charges the Battery)	Supplied by FCBC-1 (Load will see Float Voltage)
AC Mains Available	MANUAL BOOST	ON	OFF	Supplied by FCBC-1 (FCBC-1 Boost Charges the Battery)	Supplied by FCBC-1 (Load will see Boost Voltage)
AC Mains Available	AUTO	FAIL / OFF	ON	Supplied by FCBC-2 (FCBC-2 Float or Boost Charges the Battery based on the Battery Charging Current)	Supplied by FCBC-2 (Load will see either Float Voltage or Boost Voltage based on the Battery Charging Current)
AC Mains Available	MANUAL FLOAT	FAIL / OFF	ON	Supplied by FCBC-2 (FCBC-2 Float Charges the Battery)	Supplied by FCBC-2 (Load will see Float Voltage)
AC Mains Available	MANUAL BOOST	FAIL / OFF	ON	Supplied by FCBC-2 (FCBC-2 Boost Charges the Battery)	Supplied by FCBC-2 (Load will see Boost Voltage)
AC Mains Fail	ANY POSITION	OFF	OFF	Discharges to Load	Supplied by Battery

10/09/2023
 Approved
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 Electrical Engineering Company Limited
 (Planning and Engineering)
 Panna Road, Panna-490021
 M.P.
 State Power Transmission
 Vikram Bhawan, Panna-490021
 C Mains Fall
 2023



FUNCTIONAL BLOCK DIAGRAM OF DCBC-STANDBY LOGIC

02 nos. of AC supply from ACDB-1 & ACDB-2 to be provided to PCB-1 CB & PCB-2 CB individually with an interlocking & mechanical interlocking to be provided both electrical & mechanical interlocking. **PROVED**

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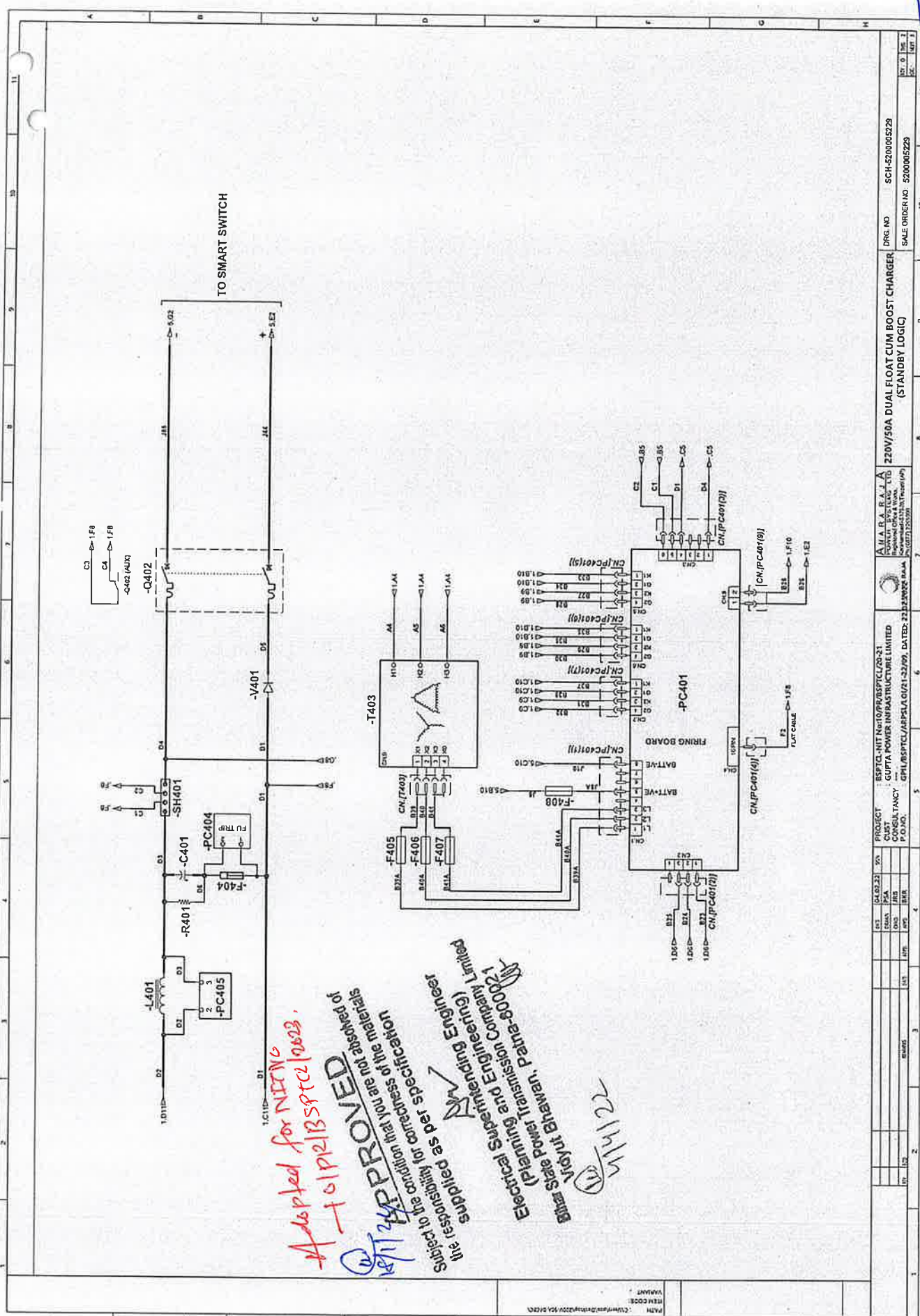
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Planning and Engineering Company Limited
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Bihar State Power Transmission, Patna-800021

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- 10/PR/BS/PTCL/0023

15/11/22

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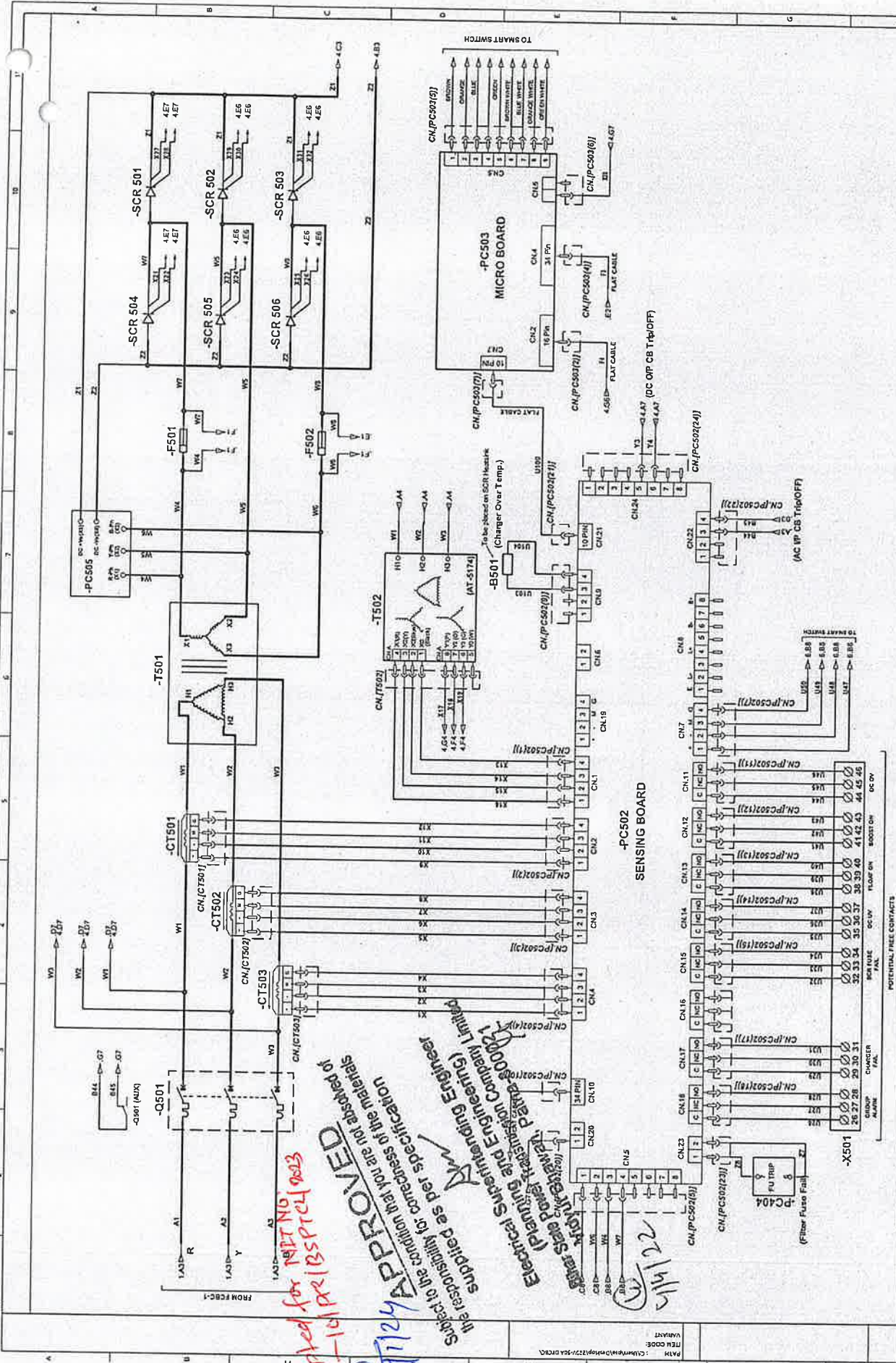


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 Gujaraat Power Transmission Company Limited
 Vidyut Bhawan, Patna-800021
 11/11/22

1	2	3	4	5	6	7	8	9	10	11
DATE	15.02.23	NO.	50	PROJECT	ESPTCL-NITNG/PA/BSPTCL/20-21	PRODUCT	ESPTCL-NITNG/PA/BSPTCL/20-21	220V/50A DUAL FLOAT CUM BOOST CHARGER (STANDBY LOGIC)	DRG NO.	SCH-520005229
BY	11/11/22	CHKD	11/11/22	DESIGN	11/11/22	REVISION	11/11/22	11/11/22	SALE ORDER NO.	520005229
DATE	15.02.23	NO.	50	PROJECT	ESPTCL-NITNG/PA/BSPTCL/20-21	PRODUCT	ESPTCL-NITNG/PA/BSPTCL/20-21	220V/50A DUAL FLOAT CUM BOOST CHARGER (STANDBY LOGIC)	DRG NO.	SCH-520005229
BY	11/11/22	CHKD	11/11/22	DESIGN	11/11/22	REVISION	11/11/22	11/11/22	SALE ORDER NO.	520005229

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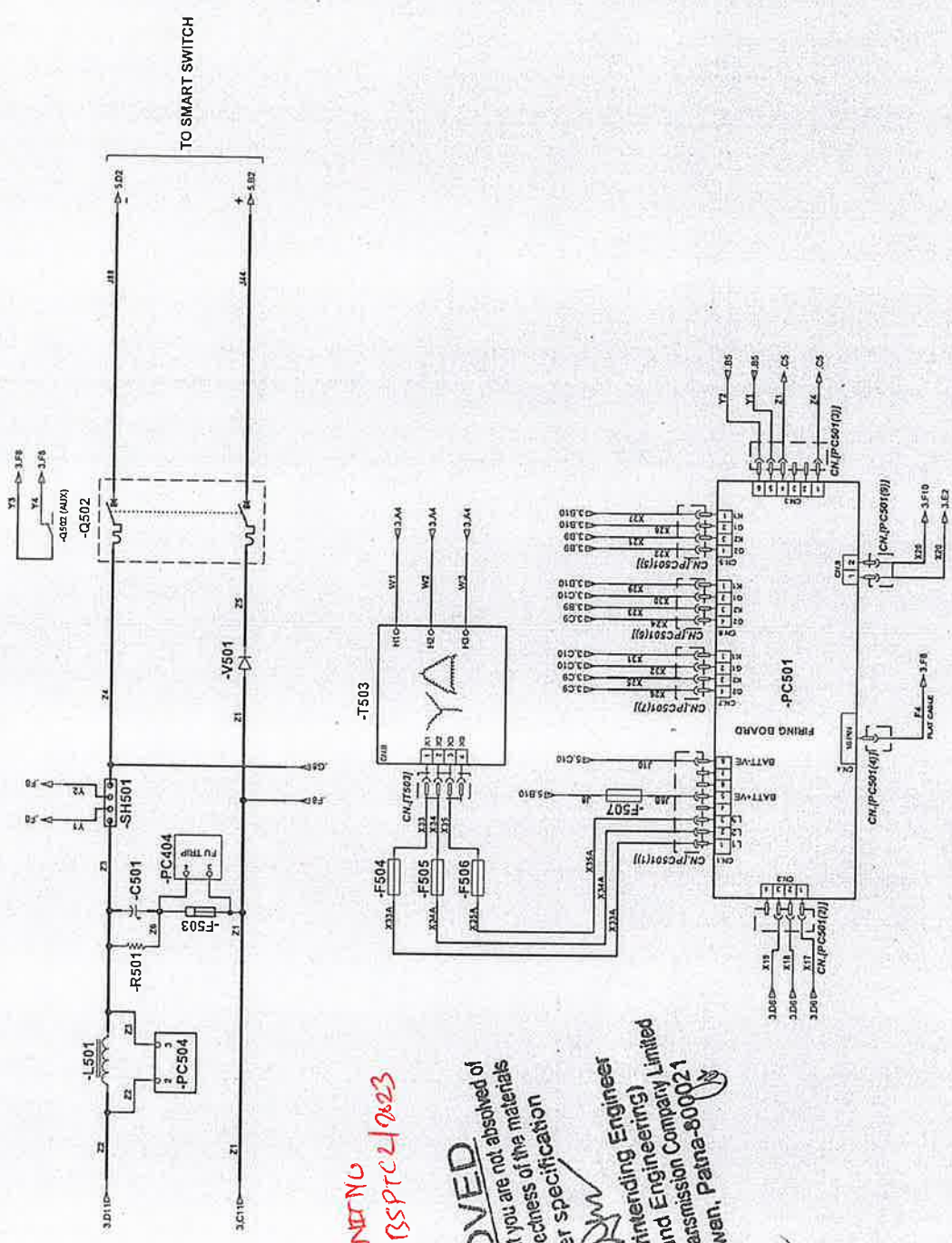
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Electrical Supervising Engineer
(Panting and Engineering) Company Limited
10/12/2024
Adapted for RIT No. 1012/BSPTCL 0003

PROJECT: 220V/50A DUAL FLOAT CUM BOOST CHARGER (STANDBY LOGIC)		DIB. NO. SCH-450005229	
CUST. CONSULTANCY: GUPTA POWER INFRASTRUCTURE LIMITED		SALE ORDER NO. 500005229	
P.O. NO. GPL/ASPTCL/ARPLA/0021-22/09, DATED: 22/09/2022		REV. 0	
POTENTIAL FREE CONTACTS		REV. 1	
GROUP NAME		REV. 2	
CHARGER FAL		REV. 3	
DC-1V		REV. 4	
FLOW ON		REV. 5	
BOOST ON		REV. 6	
DC-0V		REV. 7	
4.0V		REV. 8	
4.2V		REV. 9	
4.4V		REV. 10	
4.6V		REV. 11	
4.8V		REV. 12	
5.0V		REV. 13	
5.2V		REV. 14	
5.4V		REV. 15	
5.6V		REV. 16	
5.8V		REV. 17	
6.0V		REV. 18	
6.2V		REV. 19	
6.4V		REV. 20	
6.6V		REV. 21	
6.8V		REV. 22	
7.0V		REV. 23	
7.2V		REV. 24	
7.4V		REV. 25	
7.6V		REV. 26	
7.8V		REV. 27	
8.0V		REV. 28	
8.2V		REV. 29	
8.4V		REV. 30	
8.6V		REV. 31	
8.8V		REV. 32	
9.0V		REV. 33	
9.2V		REV. 34	
9.4V		REV. 35	
9.6V		REV. 36	
9.8V		REV. 37	
10.0V		REV. 38	
10.2V		REV. 39	
10.4V		REV. 40	
10.6V		REV. 41	
10.8V		REV. 42	
11.0V		REV. 43	
11.2V		REV. 44	
11.4V		REV. 45	
11.6V		REV. 46	
11.8V		REV. 47	
12.0V		REV. 48	
12.2V		REV. 49	
12.4V		REV. 50	
12.6V		REV. 51	
12.8V		REV. 52	
13.0V		REV. 53	
13.2V		REV. 54	
13.4V		REV. 55	
13.6V		REV. 56	
13.8V		REV. 57	
14.0V		REV. 58	
14.2V		REV. 59	
14.4V		REV. 60	
14.6V		REV. 61	
14.8V		REV. 62	
15.0V		REV. 63	
15.2V		REV. 64	
15.4V		REV. 65	
15.6V		REV. 66	
15.8V		REV. 67	
16.0V		REV. 68	
16.2V		REV. 69	
16.4V		REV. 70	
16.6V		REV. 71	
16.8V		REV. 72	
17.0V		REV. 73	
17.2V		REV. 74	
17.4V		REV. 75	
17.6V		REV. 76	
17.8V		REV. 77	
18.0V		REV. 78	
18.2V		REV. 79	
18.4V		REV. 80	
18.6V		REV. 81	
18.8V		REV. 82	
19.0V		REV. 83	
19.2V		REV. 84	
19.4V		REV. 85	
19.6V		REV. 86	
19.8V		REV. 87	
20.0V		REV. 88	
20.2V		REV. 89	
20.4V		REV. 90	
20.6V		REV. 91	
20.8V		REV. 92	
21.0V		REV. 93	
21.2V		REV. 94	
21.4V		REV. 95	
21.6V		REV. 96	
21.8V		REV. 97	
22.0V		REV. 98	
22.2V		REV. 99	
22.4V		REV. 100	
22.6V		REV. 101	
22.8V		REV. 102	
23.0V		REV. 103	
23.2V		REV. 104	
23.4V		REV. 105	
23.6V		REV. 106	
23.8V		REV. 107	
24.0V		REV. 108	
24.2V		REV. 109	
24.4V		REV. 110	
24.6V		REV. 111	
24.8V		REV. 112	
25.0V		REV. 113	
25.2V		REV. 114	
25.4V		REV. 115	
25.6V		REV. 116	
25.8V		REV. 117	
26.0V		REV. 118	
26.2V		REV. 119	
26.4V		REV. 120	
26.6V		REV. 121	
26.8V		REV. 122	
27.0V		REV. 123	
27.2V		REV. 124	
27.4V		REV. 125	
27.6V		REV. 126	
27.8V		REV. 127	
28.0V		REV. 128	
28.2V		REV. 129	
28.4V		REV. 130	
28.6V		REV. 131	
28.8V		REV. 132	
29.0V		REV. 133	
29.2V		REV. 134	
29.4V		REV. 135	
29.6V		REV. 136	
29.8V		REV. 137	
30.0V		REV. 138	
30.2V		REV. 139	
30.4V		REV. 140	
30.6V		REV. 141	
30.8V		REV. 142	
31.0V		REV. 143	
31.2V		REV. 144	
31.4V		REV. 145	
31.6V		REV. 146	
31.8V		REV. 147	
32.0V		REV. 148	
32.2V		REV. 149	
32.4V		REV. 150	
32.6V		REV. 151	
32.8V		REV. 152	
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33.2V		REV. 154	
33.4V		REV. 155	
33.6V		REV. 156	
33.8V		REV. 157	
34.0V		REV. 158	
34.2V		REV. 159	
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34.6V		REV. 161	
34.8V		REV. 162	
35.0V		REV. 163	
35.2V		REV. 164	
35.4V		REV. 165	
35.6V		REV. 166	
35.8V		REV. 167	
36.0V		REV. 168	
36.2V		REV. 169	
36.4V		REV. 170	
36.6V		REV. 171	
36.8V		REV. 172	
37.0V		REV. 173	
37.2V		REV. 174	
37.4V		REV. 175	
37.6V		REV. 176	
37.8V		REV. 177	
38.0V		REV. 178	
38.2V		REV. 179	
38.4V		REV. 180	
38.6V		REV. 181	
38.8V		REV. 182	
39.0V		REV. 183	
39.2V		REV. 184	
39.4V		REV. 185	
39.6V		REV. 186	
39.8V		REV. 187	
40.0V		REV. 188	
40.2V		REV. 189	
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40.6V		REV. 191	
40.8V		REV. 192	
41.0V		REV. 193	
41.2V		REV. 194	
41.4V		REV. 195	
41.6V		REV. 196	
41.8V		REV. 197	
42.0V		REV. 198	
42.2V		REV. 199	
42.4V		REV. 200	
42.6V		REV. 201	
42.8V		REV. 202	
43.0V		REV. 203	
43.2V		REV. 204	
43.4V		REV. 205	
43.6V		REV. 206	
43.8V		REV. 207	
44.0V		REV. 208	
44.2V		REV. 209	
44.4V		REV. 210	
44.6V		REV. 211	
44.8V		REV. 212	
45.0V		REV. 213	
45.2V		REV. 214	
45.4V		REV. 215	
45.6V		REV. 216	
45.8V		REV. 217	
46.0V		REV. 218	
46.2V		REV. 219	
46.4V		REV. 220	
46.6V		REV. 221	
46.8V		REV. 222	
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47.4V		REV. 225	
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47.8V		REV. 227	
48.0V		REV. 228	
48.2V		REV. 229	
48.4V		REV. 230	
48.6V		REV. 231	
48.8V		REV. 232	
49.0V		REV. 233	
49.2V		REV. 234	
49.4V		REV. 235	
49.6V		REV. 236	
49.8V		REV. 237	
50.0V		REV. 238	
50.2V		REV. 239	
50.4V		REV. 240	
50.6V		REV. 241	
50.8V		REV. 242	
51.0V		REV. 243	
51.2V		REV. 244	
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51.6V		REV. 246	
51.8V		REV. 247	
52.0V		REV. 248	
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53.0V		REV. 253	
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53.4V		REV. 255	
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53.8V		REV. 257	
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54.6V		REV. 261	
54.8V		REV. 262	
55.0V		REV. 263	
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56.6V		REV. 271	
56.8V		REV. 272	
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60.8V		REV. 292	
61.0V		REV. 293	
61.2V		REV. 294	
61.4V		REV. 295	
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196



Adopted for NITMU
-10/12/18SPFC2/2023

APPROVED
18/12/24
Subject to the condition that you are not absolved of the responsibility for correctness of the materials supplied as per specification

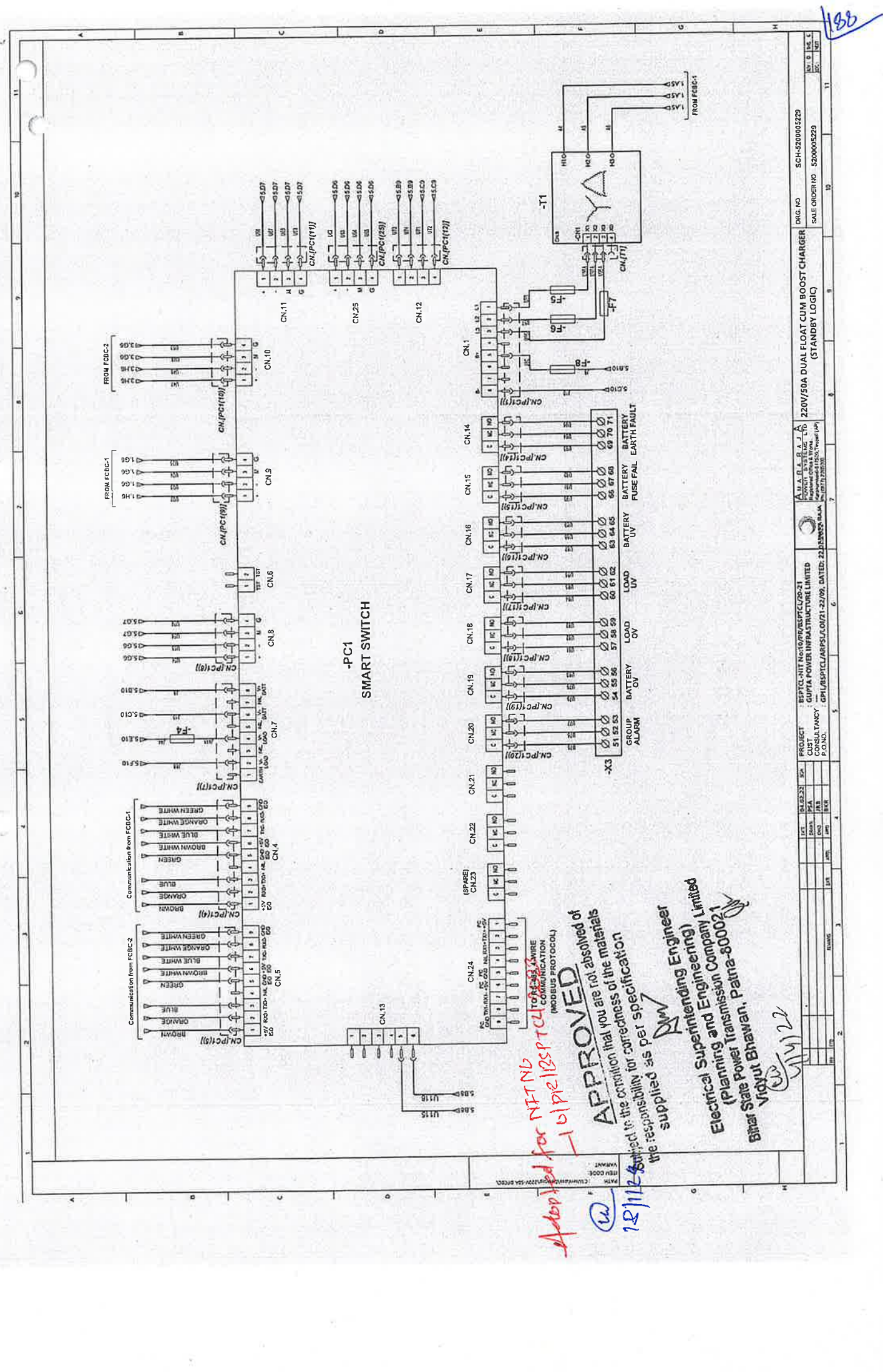
Electrical Superintending Engineer
(Planning and Engineering)
Bihar State Power Transmission Company Limited
Vidhyut Bhawan, Patna-800021

11/12/22

DATE	18/12/24	BY	196
REVISION			
NO.	1	DATE	18/12/24
NO.	2	DATE	18/12/24
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NO.	99	DATE	18/12/24
NO.	100	DATE	18/12/24

PROJECT: BDPFC-NITMU-10/12/24/SPFC2/2023
 PRODUCT: BDPFC-NITMU-10/12/24/SPFC2/2023
 DRAWING NO: 10/12/24/SPFC2/2023
 DATE: 18/12/24
 BY: 196
 CHECKED: 196
 APPROVED: 196
 PROJECT: BDPFC-NITMU-10/12/24/SPFC2/2023
 PRODUCT: BDPFC-NITMU-10/12/24/SPFC2/2023
 DRAWING NO: 10/12/24/SPFC2/2023
 DATE: 18/12/24
 BY: 196
 CHECKED: 196
 APPROVED: 196





**-PC1
SMART SWITCH**

APPROVED
 I hereby certify that you are not absolved of
 the responsibility for correctness of the materials
 supplied as per specification

Electrical Superintending Engineer
 (Planning and Engineering Company Limited)
 Bihar State Power Transmission, Patna-800021

18/11/22

REV CODE	DATE	BY	CHKD	APPD	REMARKS
01	18/11/22	SAHA	SAHA	SAHA	
02	18/11/22	SAHA	SAHA	SAHA	
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DRG. NO. SCH-520005229
 SALE ORDER NO. 520005229
 (STANDBY LOGIC)

220V/50A DUAL FLOAT CUM BOOST CHARGER
 (STANDBY LOGIC)

GUPTA POWER INFRASTRUCTURE LIMITED
 12/12/2021

PROJECT: BEPTCL-NIT-NOT/TRANS/CL/20-21
 CUST: GUPTA POWER INFRASTRUCTURE LIMITED
 CONSULTANCY: 12/12/2021
 P.O. NO.: 12/12/2021

DATE: 12/12/2021
 BY: SAHA
 CHKD: SAHA
 APPD: SAHA

REMARKS: 12/12/2021

12/12/2021

12/12/2021

AMARA RAJA POWER SYSTEMS LIMITED					BILL OF MATERIALS		REV.0, DATED: 04.03.2022	
SAP SO No. 5200005229								
CHARGER RATING: 220VDC/50A DUAL FLOAT CUM BOOST CHARGER - STANDBY LOGIC (i-SWIFT) SUITABLE FOR VRLA/NVRLA BATTERY								
Line No.	CKT Designation	I/P Item Description	Qty.	UOM	Variant Description			
1	-B401	THERMAL SW-SET AT65°C-NC	1	NOS	UTILITY APPLIACES			
2	-B402,-B501	Thermistor-10K-2%-25D With Clip term	2	NOS	NILA TECH			
3	-C401(1),-C501(1)	Cap-Elec-3300mfd-350VDC	2	NOS	ALCON			
4	-CT1,-CT2,-CT3	Hall effect current sensor-100A/0-4V	3	NOS	ELECTROHMS			
5	-CT(401-403),-CT(501-503)	Hall effect current sensor-50A/0-4V	6	NOS	ELECTROHMS			
6	-DL401,-DL402	5W Lumeno CDL 6500K Wall Light- LHXACP7	2	NOS	HAVELL'S/PHILIPS/WIPRO/BAUJ			
7	-DS401,-DS402	PB-door lamp-NC-(Refrig switch)	2	NOS	STD Vendor			
8	-E401	Space Heater-100W-240VAC with Gland	1	NOS	ENCORE/PYRO			
9	-F(4-8)*,-F403*,F(405-408)*,-F(504-507)*	Fuse base-1A-6.3A-600V W/O fuse	14	NOS	CONNECTWELL			
10	-F(4-8),F403,-F(405-408),-F(504-507)	Glass Fuse-fast-6A-250VAC-20mm	14	NOS	PROTECTOR			
11	-F1 AUX,-F2 AUX	FUSE TRIP - 1C/O	2	NOS	STDVendor			
12	-F1*,-F2*	Fuse base-160A-500/690V AC-size-0	2	NOS	BUSSMANN (EATON)			
13	-F1,-F2	HRC fuse-slow-100A-500VAC-size000-din ty	2	NOS	BUSSMANN (EATON)			
14	-F401,-F402,-F501,-F502	Semiconductor fuse-fast-56A-690V AC	4	NOS	BUSSMANN (EATON)			
15	-F404*,F503*	Fuse base-32A-415/500V AC	2	NOS	BUSSMANN (EATON)			
16	-F404,-F503	HRC fuse-slow-20A-415/550VAC-clip on	2	NOS	BUSSMANN (EATON)			
17	-GANG BOX (S401, S402, SC401)	Gang Box Domestic-2Sw+1Socket	1	NOS	ANCHOR			
18	-H401	Clustered LED-220-240VAC-22.5mm-red	1	NOS	ESBEE (L&T)/SECO/C&S			
19	-H402	Clustered LED-220-240VAC-22.5mm-yellow	1	NOS	ESBEE (L&T)/SECO/C&S			
20	-H403	Clustered LED-220-240VAC-22.5mm-Blue	1	NOS	ESBEE (L&T)/SECO/C&S			
21	-L401,-L402	Filter choke-3.5mH-0050253	2	NOS	AMARA RAJA			
22	-LED1	LED-RED-ROUND-5mm	1	NOS	SANKEN/KWALITY			
23	-LED2	LED Holder-5mm round-press fit-white	1	NOS	LALWANI			
24	-P1	DC ammeter-100-0-100mA-1.5-90D	1	NOS	BEEMET/RISHABH/AE/NIPPEN			
25	-PC1	PCB-SMART SWITCH-220V-Modbus-RTU	1	NOS	AMARA RAJA			
26	-PC2	EFD Module-220V	1	NOS	AMARA RAJA			

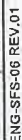
Adopted for N₂⁺ 12C⁺ 13C⁺ 14C⁺ 15C⁺ 16C⁺ 17C⁺

APPROVED

REV.0, DATED: 04.03.2022

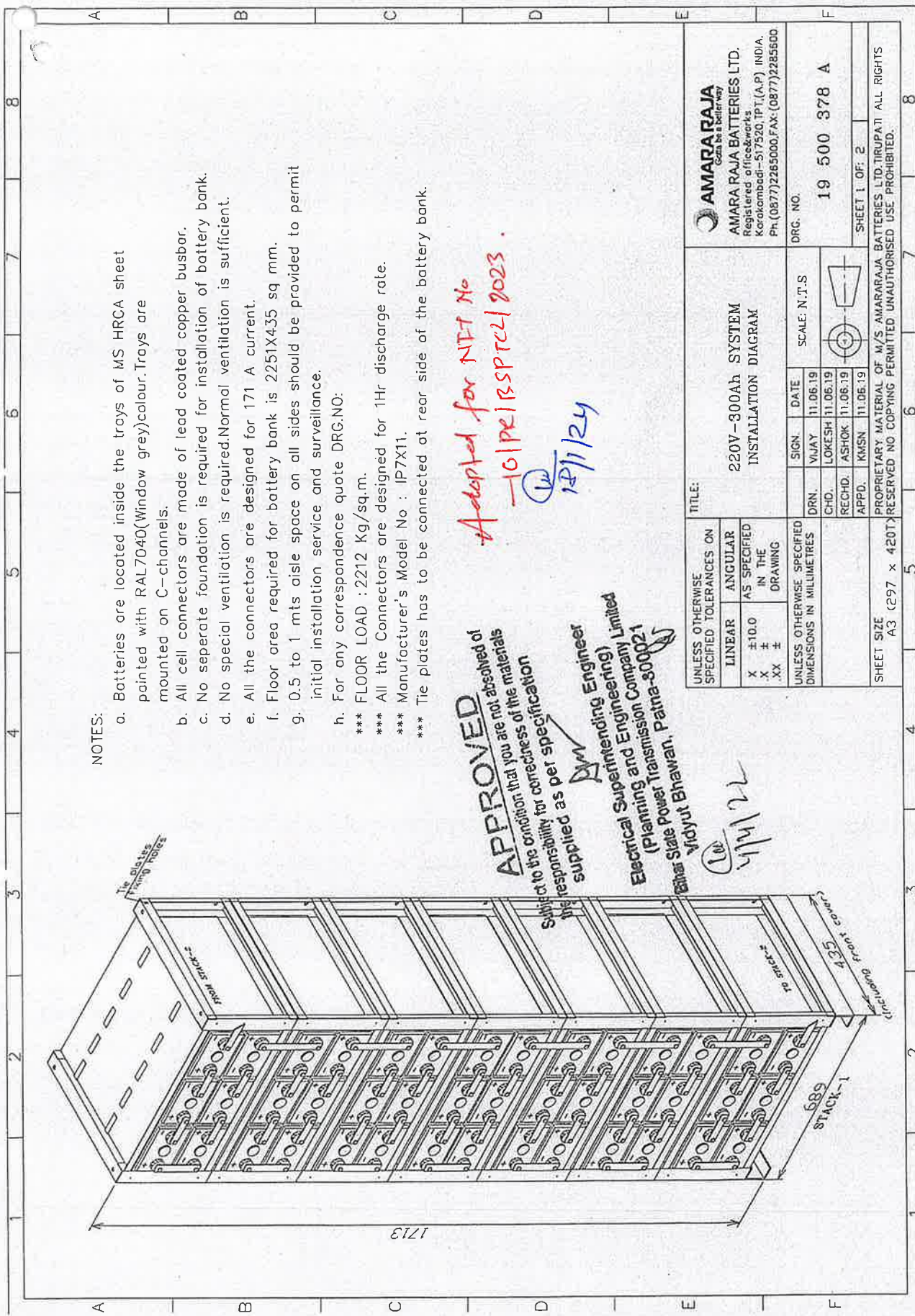
CHARGER RATING: 220VDC/50A DUAL FLOAT CUM BOOST CHARGER - STANDBY LOGIC (i-SWIFT) SUITABLE FOR VRLA/NVRLA BATTERY

Adopted for NITING
-16122135PTCL 2023
161
18/1/24



SPARES BILL OF MATERIALS					
AMARA RAJA POWER SYSTEMS LIMITED					
REV.0, DATED: 04.03.2022					
SAP SO No. 5200005229					
CHARGER RATING: 220VDC/50A BATTERY CHARGER SPARES					
Line No.	CKT Designation	I/P Item Description	Qty.	UOM	Variant Description
1	1-Set of control cards (All PCB cards)	PCB-SMART SWITCH-220V-Modbus-RTU	1	NOS	AMARA RAJA
2	1-Set of control cards (All PCB cards)	EFD Module-220V	1	NOS	AMARA RAJA
3	1-Set of control cards (All PCB cards)	Firing Bd.- 220V Micro Based FCBC Ver.2	1	NOS	AMARA RAJA
4	1-Set of control cards (All PCB cards)	Sensing Bd.- 220V Micro Based FCBC Ver.2	1	NOS	AMARA RAJA
5	1-Set of control cards (All PCB cards)	PCB-Micro Bd- 220V Micro Based FCBC Ver.2	1	NOS	AMARA RAJA
6	1-Set of control cards (All PCB cards)	PCB-FUSE FAIL-DUAL DPSS	1	NOS	AMARA RAJA
7	1-Set of control cards (All PCB cards)	PCB-FILTER-1 MFD-10K-10W	1	NOS	AMARA RAJA
8	1-Set of control cards (All PCB cards)	PCB-Snubber bd for I-C/D	1	NOS	AMARA RAJA
Not Applicable					
Not Applicable					
Not Applicable					
Not Applicable					
Cap-Elec-3300mfd-350VDC					
Dual SCR Block-Slow-27A-1600V					
Resistor-68K-2W-5%-wire wound					
Resistor-10K-10W-5%-wire wound					
Resistor-1K-2W-5%-Wire wound					
Not Applicable					
Not Applicable					
Not Applicable					
Semiconductor fuse-fast-56A-690V AC					
Fuse Trip indicator					
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NOTES:

- a. Batteries are located inside the trays of MS HRCA sheet painted with RAL7040(Window grey)colour.Trays are mounted on C-channels.
 - b. All cell connectors are made of lead coated copper busbar.
 - c. No separate foundation is required for installation of battery bank.
 - d. No special ventilation is required.Normal ventilation is sufficient.
 - e. All the connectors are designed for 171 A current.
 - f. Floor area required for battery bank is 2251X435 sq mm.
 - g. 0.5 to 1 mts aisle space on all sides should be provided to permit initial installation service and surveillance.
 - h. For any correspondence quote DRG.NO:
- *** FLOOR LOAD : 2212 Kg/sq.m.
*** All the Connectors are designed for 1Hr discharge rate.
*** Manufacturer's Model No : IP7X11.
*** Tie plates has to be connected at rear side of the battery bank.

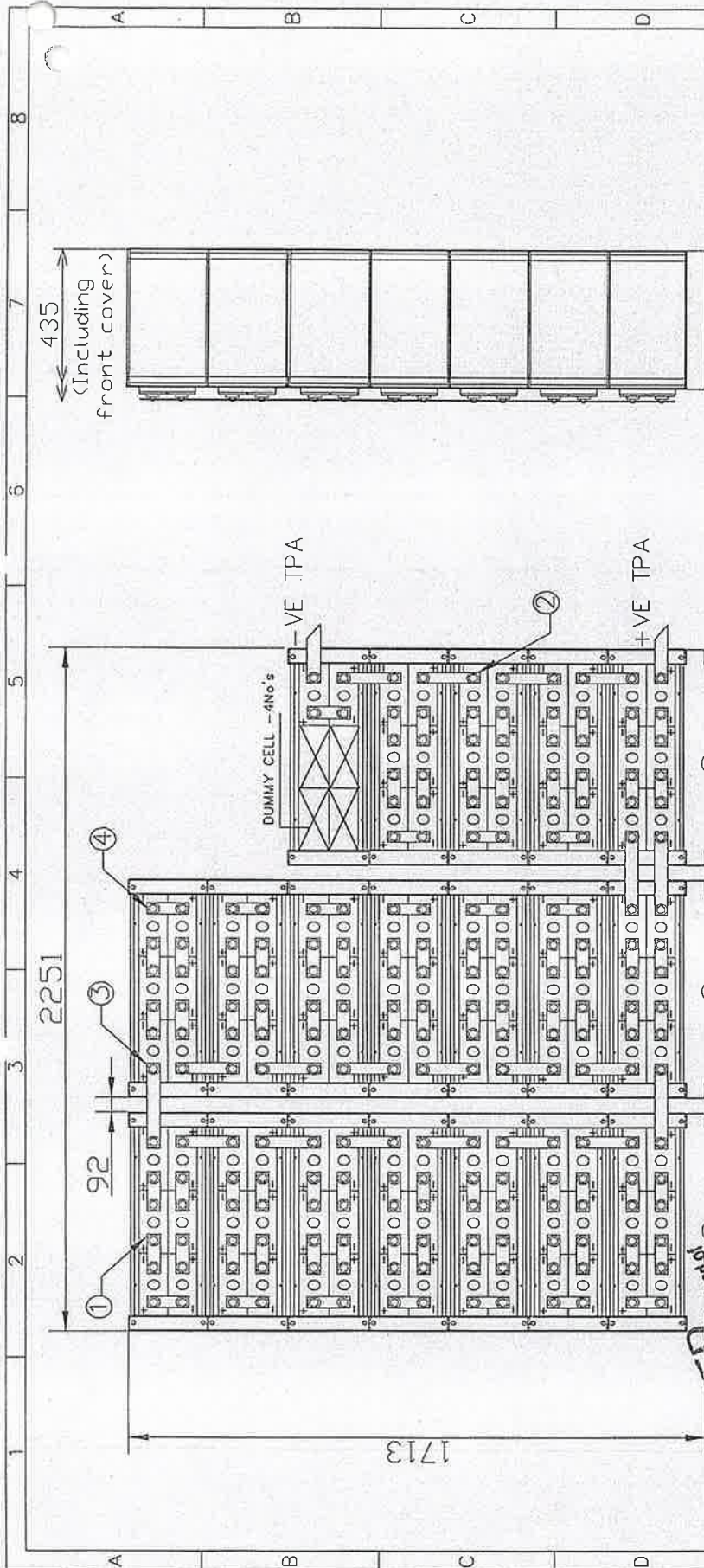
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Subject to the condition that you are not absolved of the responsibility for correctness of the materials supplied as per specification

Vidhyut Bhawan
Electrical Superintending Engineer
(Planning and Engineering Company Limited)
Patna-800021
Bihar State Power Transmission, Patna-800021

*Adapted for NDT No
-101P13SP2C12023.
12/1/24*

UNLESS OTHERWISE SPECIFIED TOLERANCES ON		TITLE:		220V-300Ah SYSTEM INSTALLATION DIAGRAM		AMARARAJA GATE NO. 8 BATTERY WAY AMARA RAJA BATTERIES LTD. Registered office & works Karokombadi-517520, T.P.1.(A.P) INDIA. Ph.(0877)2285000.FAX:(0877)2285600.	
LINEAR	ANGULAR	AS SPECIFIED IN THE DRAWING	DRN.	DATE	SIGN.	SCALE: N.T.S	DRG. NO.
X ±10.0	X ±	X ±	CHD.	11.06.19	VJAY	11.06.19	19 500 378 A
XX ±			RECHD.	11.06.19	ASHOK	11.06.19	
			APPD.	11.06.19	KMSN	11.06.19	
UNLESS OTHERWISE SPECIFIED DIMENSIONS IN MILLIMETRES			SHEET 1 OF 2				
SHEET SIZE A3 (297 x 420)			PROPRIETARY MATERIAL OF M/S AMARARAJA BATTERIES LTD.TIRUPATI ALL RIGHTS RESERVED NO COPYING PERMITTED UNAUTHORISED USE PROHIBITED.				

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SIDE VIEW

CONNECTION DIAGRAM FRONT VIEW

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supplied as per specification

Electrical Superintending Engineer
Planning and Engineering Company Limited
Pune-400021

ITEM NO.	DESCRIPTION	DIMENSIONS	QTY/CON	QTY/STS
1	Inter module connector	118X25X3	1	17
2	Inter module connector	280X25X3	1	04
3	Inter module connector	154X25X3	1	16
4	Inter module connector	110X25X3	1	72

TITLE:

220V-300Ah SYSTEM
CONNECTION DIAGRAM



AMARA RAJA BATTERIES LTD.
Registered office & works
Kerakombodi-517520, P.T.(A.P.) INDIA.
Ph. (0877) 2285000, FAX: (0877) 2285600.

DRG. NO.

19 500 378 A

SHEET 2 OF: 2

SCALE: N.T.S

SIGN.

DATE

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APPD.

Guaranteed Technical Particulars

DOCREF: IAE/ GTP - PS/ 2019-20; Rev : 00

Battery Particulars

- Battery Type : Maintenance Free Valve Regulated Lead Acid (MF-VRLA)
- Battery Rating : 220 V - 300 AH to 1.75 ECV @ C10 at 27°C
- Manufacturers Cell Designation : IP7X11
- No. of cells : 110 No.s
- Cell dimensions : (198.5 x 369.6 x 92.8) mm Approx.
- Single cell weight : 17.2 kg. Approx
- Battery bank dimensions : (2251 x 435 x 1713) mm Approx.
- Battery bank weight : 2166 Kg. Approx.

Charge Regime

- Float Charging Voltage : 2.23 - 2.25 Volts per Cell @ 27°C
- Boost charging voltage : 2.30 - 2.32 Volts per Cell @ 27°C
- Current Limit : 30 Amps minimum to 60 Amps maximum.
- Recommended Voltage Compensation : For every 1°C rise in temperature reduce the float voltage by 0.003VPC & Vice versa, ensure the extension of temperature sensor upto battery.

Product Details

- AH efficiency : Above 95%
- WH efficiency : Above 85%
- Self Discharge/Week @ 27°C : < 1% of rated capacity
- Max. allowable Ambient Temp. at which cell can safely operate : 60°C continuous and 70°C short time.
- Recommended Max Period of Storage : 6 months from the date of dispatch before first use and battery should be stored in a covered area at 27°C.
- Material of Container : Fire-Retardant Polypropylene co-polymer.
- Type of separator : Highly absorbent Micro porous spun glass matrix.(AGM)
- Type of +ve & -ve plates : Flat pasted
- Material of tray & color : Mild steel coated with acid resistant powder coating.
- Method of connection between cells : Bolted
- Voltage ripple allowable : <2% of the RMS. Value
- Type of connectors : Lead coated Heavy duty copper strips
- Cycle Life of battery at 27°C : 4000 cycles at 20% Depth of Discharge(DOD) (or) 2000 cycles at 50% DOD (or) 1200 cycles at 80% DOD
- Time required for Boost charge at 2.30 VPC @ 20%CL at 27°C : 8 Hrs from 0-90% State of Charge (SOC)(or) 16 Hrs from 0-100% State of Charge

Applicable Standards

- Batteries generally conforms to
 - (i) IS15549:2005
 - (ii) IEEE1188 & 1189
 - (iii) BS-6290, PART-IV.
 - (iv) IEC 60896-21&22:2004, PART-II.

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**Due to on going improvement the specifications are subjected to modification without prior notice

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Am
Electrical Superintending Engineer
(Planning and Engineering)
Bihar State Power Transmission Company Limited
Vidyut Bhawan, Patna-800021

Authorized signature
COM-SFS-00

(Kc)
414122

Adopted for NDT No. -
101PR/BSPTCL/2023
18/11/24

AMARA RAJA POWER SYSTEMS LIMITED				SPARES BILL OF MATERIALS				REV.0, DATED: 04.03.2022			
SAP SO No. 5200005229											
BATTERY RATING: 220V/300AH BATTERY SPARES											
Line No.	CKT Designation	I/P Item Description		Qty.	UOM	Variant Description					
1	IP7X11001	2V/300Ah VRLA BATTERY		10	NOS	AMARA RAJA					
2	139-000-10110	110 x 20 x 2 ICCconnector(H)		10	NOS	AMARA RAJA					
3	862-050-08025	M8X25mm Hex Head bolt SS 304-passi		10	NOS	AMARA RAJA					
4	862-310-08901	M8 Flat Washer SS 304 (8.5 x 19 x 3mm)		10	NOS	AMARA RAJA					
5	862-550-08000	M8 Spring Washer SS304(8.2x14.8x2.0mm)		10	NOS	AMARA RAJA					

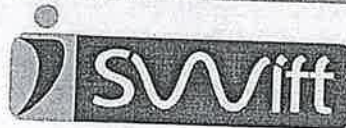
Adopted for NITM
 10/02/2023
 18/12/24

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 (Planning and Engineering) Company Limited
 Bhat State Power Transmission, Para-80021
 Vidyut Bhawan, Para-80021

18/12/24



Amara Raja Power Systems Limited, Tirupati



**TECHNICAL PACKAGE OF
48VDC/50A DUAL FLOAT CUM BOOST CHARGER
(STANDBY LOGIC)
(Suitable for 48V/300AH VRLA/NVRLA Battery of 24 Cells)**

**CUSTOMER : GUPTA POWER INFRASTRUCTURE
LIMITED**

PROJECT : BSPTCL-NIT No:10/PR/BSPTCL/20-21

**P. O. NO. : GPIL/BSPTCL/ARPSL/LOI/21-22/09,
DATED: 22.02.2022**

S. O. NO. : 5200005229

LINE NO. : 20, 60 & 100

*Adopted for NIT No
-10/PR/BSPTCL/2023*

*(W)
18/11/24*

REV.0

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supplied as per specification

Electrical Sub-Intending Engineer
(Planning and Engineering)
Bihar State Power Transmission Company Limited
Vijay Bhawan, Patna-800021

**AMARA RAJA POWER SYSTEMS LIMITED
RENIGUNTA - KADAPA ROAD
KARAKAMBADI - 517 520
TIRUPATI, ANDHRA PRADESH
Tel: +91 877 2265000
Fax: +91 877 2285551**

APL-5200005229, REV.0, DATED: 04.03.2022

CONTENTS

SL.NO	DESCRIPTION
1.	GENERAL DESCRIPTION
2.	TECHNICAL SPECIFICATION OF THE BATTERY CHARGER
3.	LOGIC SHEET OF THE BATTERY CHARGER
4.	FUNCTIONAL BLOCK DIAGRAM
5.	SCHEMATIC DRAWINGS
6.	BILL OF MATERIALS
7.	DIMENSIONAL DRAWINGS
8.	BATTERY CHARGER SPARES
9.	BATTERY DRAWINGS
10.	BATTERY SPARES

Adopted for NIT No.
-101/PR/BSP/CL/2023

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Bihar State Power Transmission Company Limited
Vidya Bhawan, Patna-600021

SPECIAL NOTE

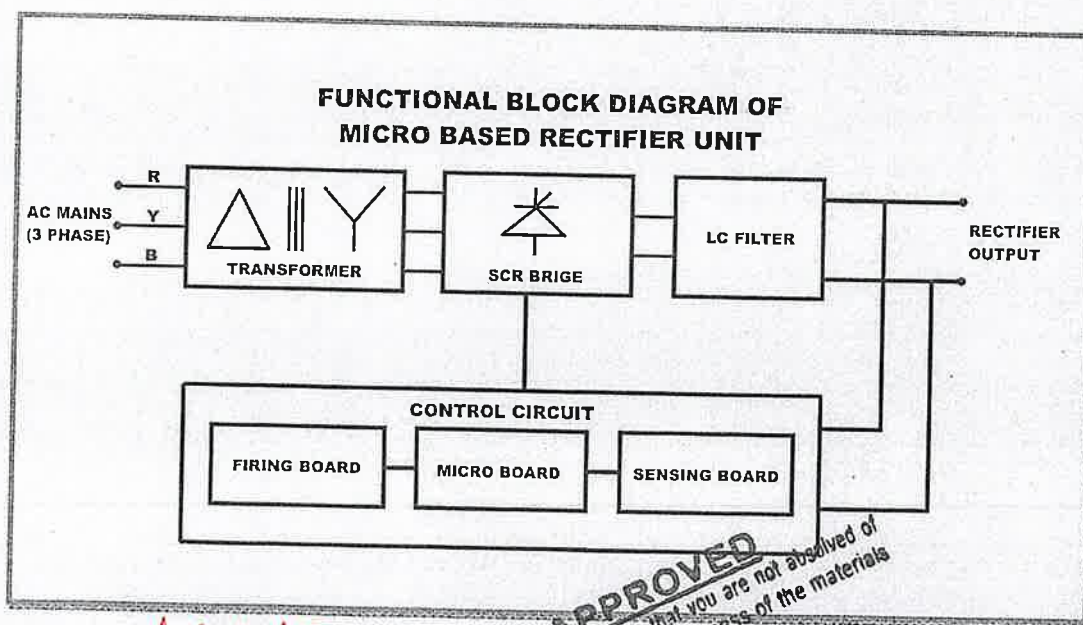
**DRAWINGS/DOCUMENTS MAY UNDERGO FEW CHANGES/
MODIFICATIONS DURING DETAILED ENGINEERING STAGE
WHICH DOESN'T AFFECT THE CUSTOMER REQUIREMENT**

GENERAL DESCRIPTION

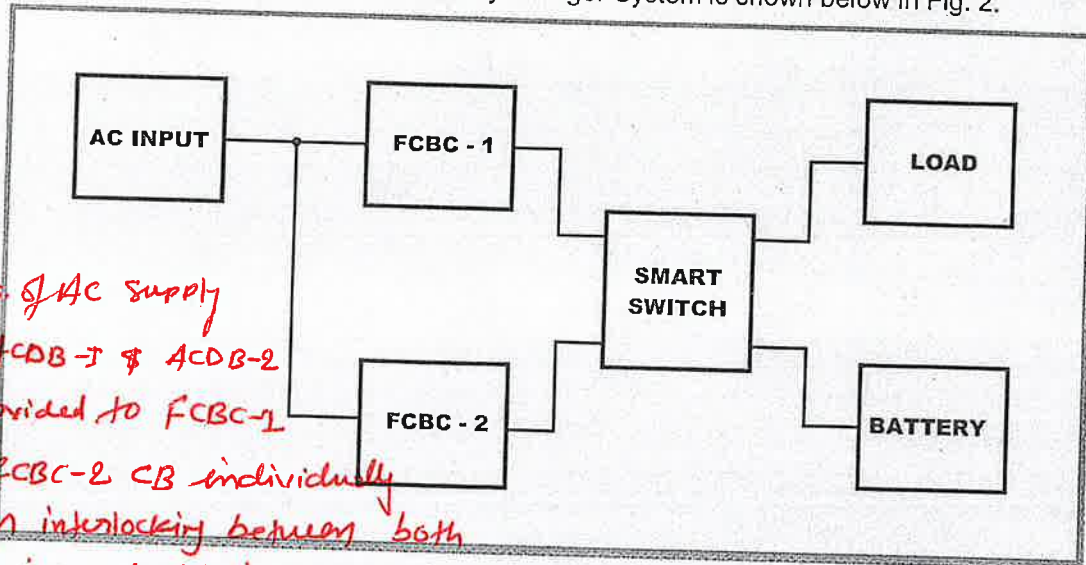
The Battery Charger System basically consists of Two Float Cum Boost Chargers with an Interlocking Circuit called Smart Switch (Common Circuit for FCBC-1 & FCBC-2). Each Float cum Boost Charger is capable to supply the Load and Battery Charging requirements. In normal mode of operation, FCBC-1 will float charge the battery and feeds the load and FCBC-2 will be in OFF condition. When FCBC-1 fails, the other Charger, FCBC-2 comes into operation automatically and supplies to the Load and Battery Bank.

Smart Switch is the main circuit which controls entire charger system by communicating with FCBC-1 & FCBC-2 and activating them as per the requirement. It performs the operations like when FCBC-1 has to work; when FCBC-2 has to work and in which mode; when both FCBC-1 & FCBC-2 has to work etc. Also, smart switch measures the load and battery parameters like load voltage, load current, battery voltage, battery charge/discharge currents etc. It also generates annunciations like DC Under Voltage, DC Over Voltage, Battery Under Voltage, Battery Over Voltage, Battery Earth Fault, Battery Fuse Fail etc.

Each Float cum Boost Charger is a rectifier unit which works on 3-phase AC input power supply and gives required DC voltage as output, delivering certain amount of power as demanded by the application. Conventionally this kind of rectifier unit is controlled manually and is analog control. However the analog portion of the control circuit has been replaced here in this charger with a microcontroller. Advanced microcontroller has been selected for this application. This controller section not only provides accuracy of operations but also adds the ability of communication. Block diagram of one such rectifier unit is shown below in Fig.1.



Also, Single Line Diagram of Total Battery Charger System is shown below in Fig. 2.



02 nos. of AC supply
from ACDB-1 & ACDB-2
to be provided to FCBC-1
CB & FCBC-2 CB individually
with an interlocking between both

CBS i.e. electrical & mechanical
interlocking to be provided.

Fig. 2

Rectifier unit consists of a transformer to bring the input voltage to a required level and also to provide isolation between input and output. The secondary of the isolation transformer is fed to SCR Bridge. Initially SCRs will be fired slowly for DC soft start and controls the phase angle depending upon the output voltage of the charger. The rectified DC is connected to filter section which in turn filters out all harmonics and provide DC voltage with low ripple content.

Charger mode of operation can be selected through LCD. The charger will work in FLOAT, BOOST and AUTO modes. In any mode, monitoring and controlling happens through micro board. Charger feedback signals are fed to micro board based on which it generates reference signal. Micro board is provided at front panel to display charger parameters, load parameters and battery parameters in LCD. Micro board is having LED indicators for different operating conditions like MAINS ON, CHARGER ON, AC MAINS FAIL, CHARGER FAIL, SCR FUSE FAIL, FLOAT ON, BOOST ON, CHARGER OVER VOLTAGE, CHARGER UNDER VOLTAGE, BATTERY OVER VOLTAGE, BATTERY UNDER VOLTAGE, LOAD OVER VOLTAGE, LOAD UNDER VOLTAGE, BATTERY EARTH FAULT, GROUP ALARM etc. Based on faulty condition, appropriate LED glows & activates audio alarm. This audio alarm can be disabled or silenced by setting buzzer in LCD set parameters menu. However, indicating LED will be glowing continuously until the fault is rectified.

The firing board receives the voltage and current reference signals from micro board. It generates SCR firing signals based on reference and feedback signals.

Sensing board senses different faulty condition like RECTIFIER FUSE FAIL, EARTH FAULT etc. and send it to micro board for alarms generation. Sensing board is also having potential free contacts for alarm conditions.

(As corrected).

Adopted for NER
- 10/11/2022

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APL-5200005229, REV 0, DATED: 04.03.2022

Electrical Engineering
(Planning and Engineering)
Bihar State Power Transmission Company Limited
Vidyut Bhawan, Patna-800021

Page 4 of 11

The Battery Chargers FCBC-1, FCBC-2 & Smart Switch (Common Circuit for both FCBC-1 & FCBC-2) are housed in a single cabinet of free standing sheet steel construction. The cabinet

is provided with front & rear doors for easy accessibility. All AC input and DC output switchgear of FCBC-1, FCBC-2 & Smart Switch (Common Circuit for FCBC-1 & FCBC-2) are provided inside the cabinet at appropriate place for easy accessibility and maintenance. Cable entry is provided at the front bottom of the cabinet. By opening the front door, one can reach the termination easily.

PRINCIPLE OF OPERATION

The Charger Unit is designed in such a way that Float cum Boost Charger-1 (FCBC-1) will be in ON condition taking care of load and battery charging requirements and Float cum Boost Charger-2 (FCBC-2) will be in OFF condition. If FCBC-1 fails for any reason, FCBC-2 will cut into the circuit automatically and takes care of both load and battery. Provision is available to select any of the two chargers manually.

During Normal Operation, the FCBC-1 supplies Load Current as well as Trickle Charges the Battery. The common Mode Selection in Logic box is kept in Auto to select the Battery Charging Mode (Float or Boost) automatically based on Battery condition.

Adopted for NIT No
-101PR/135 PTC/2023

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18/11/24

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Electrical Superintending Engineer
(Planning and Engineering)
Bihar State Power Transmission Company Limited
Vidyut Bhawan, Patna-200021

10
11/12/22

TECHNICAL SPECIFICATION OF THE BATTERY CHARGER

SCHEME : 48VDC/50A DUAL FLOAT CUM BOOST CHARGER (STANDBY LOGIC)
 TYPE : FULL WAVE FULL CONTROLLED
 TYPE OF BATTERY : 48V/300AH VRLA/NVRLA BATTERY OF 24 CELLS

INPUT

a) Three phase Input : 415V AC $\pm 10\%$ (Three Phase, Four Wire) ✓
 b) Frequency : 50Hz $\pm 5\%$ ✓

OUTPUT

a) Output Current : 50A
 b) Ripple : 2% RMS (Without Battery connected)
 c) Efficiency : $> 80\%$
 d) Operating Voltage Ranges :

TYPE OF BATTERY	VRLA	NVRLA
No. of Cells	24 Nos.	24 Nos.
Float Voltage (2.25 VPC x 24 Cells) ✓	54.0V DC ✓	54.0V DC ✓
Boost Voltage (2.3VPC for VRLA Battery & 2.65VPC for NVRLA x 24 Cells)	55.2V DC ✓	63.6V DC ✓
Equalizing Voltage (2.75 VPC x 24 Cells)	---	66.0V DC
Load Voltage (Voltage applied on Load)	54.0VDC when Charger operates in Float Mode 55.2VDC when Charger operates in Boost Mode	54.0VDC when Charger operates in Float Mode 63.6VDC when Charger operates in Boost Mode

VOLTAGE REGULATION

Charger output is $\pm 1\%$ of the set value in the following conditions (FLOAT / BOOST / AUTO)

Load variation : 10-100%
 Line variation : $\pm 10\%$
 Frequency Variations : $\pm 5\%$
 Temperature Variations : 0 °C to +50 °C

INDICATIONS

Cluster LED Lamps will be provided for "AC Mains ON (R, Y, B)" condition.

The following indications will be indicated by 5mm LEDs in FCBC-1 & FCBC-2:

a) AC Mains ON : Green LED ✓
 b) Charger ON : Green LED ✓
 c) Float ON : Green LED ✓
 d) Boost ON : Amber LED ✓
 e) AC Mains Fail : Red LED
 f) Charger OV : Red LED
 g) Charger UV : Red LED
 h) SCR Fuse Fail : Red LED
 i) Charger Fail : Red LED
 j) Group Alarm : Red LED

APPROVED
 Subject to the condition that you are not absolved of the responsibility for correctness of the materials supplied as per specification

Electrical Superintending Engineer
 (Planning and Engineering)
 Bihar State Power Transmission Company Limited
 Vidut Bhawan, Patna-800021

* Charger shall be multivoltmeter
 * 20% spare terminals shall be provided for control etc.

The following indications will be indicated by 5mm LEDs in Smart Switch (Common Circuit for FCBC-1 & FCBC-2):

- | | | |
|-----------------------------|---|---|
| a) Battery Fuse Fail | : | Red LED |
| b) Battery Earth Fault | : | Red LED |
| c) Load Under Voltage | : | Red LED |
| d) Load Over Voltage | : | Red LED |
| e) Battery Under Voltage | : | Red LED |
| f) Battery Over Voltage | : | Red LED |
| g) Battery Reverse Polarity | : | Red LED (provided at Battery Termination) |

DISPLAY

The following parameters will be displayed on LCD of FCBC-1 & FCBC-2:

- a) AC Input Voltage either Line to Line or Line to Neutral
- b) AC Input Current in each phase
- c) Charger Output Voltage ✓
- d) Charger Output Current ✓
- e) Charger ON/OFF ✓
- f) Alarms ✓

The following parameters will be displayed on LCD of Smart Switch (Common Circuit for FCBC-1 & FCBC-2):

- a) Battery Voltage ✓
- b) Battery Charging Current / Discharging Current ✓
- c) Load Voltage ✓
- d) Load Current ✓
- e) Alarms ✓

ALARMS WITH BUZZER

The following Alarms will be displayed on FCBC-1 & FCBC-2:

- | | |
|---------------------------------|-------------------------------|
| a) AC Mains Fail/Out of Limit : | Both LCD and LED indication ✓ |
| b) SCR Fuse Fail ✓ : | Both LCD and LED indication ✓ |
| c) Charger Fail ✓ : | Both LCD and LED indication |
| d) Charger Under Voltage ✓ : | Both LCD and LED indication |
| e) Charger Over Voltage ✓ : | Both LCD and LED indication |
| f) AC Input CB Trip/OFF ✓ : | LCD only |
| g) DC Output CB Trip/OFF ✓ : | LCD only |
| h) Filter Fuse Fail ✓ : | LCD only |
| i) Charger Over Temperature ✓ : | LCD only |
| j) DC Overload : | LCD only |
| k) Group Alarm ✓ : | LED indication only |

The following Alarms will be displayed on Smart Switch (Common Circuit for FCBC-1 & FCBC-2):

- | | |
|----------------------------|-----------------------------|
| a) Battery Fuse Fail ✓ : | Both LCD and LED indication |
| b) Battery Earth Fault ✓ : | Both LCD and LED indication |
| c) Load Under Voltage ✓ : | Both LCD and LED indication |

Adopted for NITNO
-10/PR/135 PTEL/2023

15/1/24

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(Planning and Engineering)
Bihar State Power Transmission Company Limited
Vidyut Bhawan, Patna-800021

7/1/22

- | | | |
|--------------------------|---|-----------------------------|
| d) Load Over Voltage | : | Both LCD and LED indication |
| e) Battery Under Voltage | : | Both LCD and LED indication |
| f) Battery Over Voltage | : | Both LCD and LED indication |

POTENTIAL FREE CONTACTS

The following Potential Free Contacts will be available on FCBC-1 & FCBC-2:

- Float ON
- Boost ON
- SCR Fuse Fail
- Charger Fail
- Charger Under Voltage
- Charger Over Voltage
- Group Alarm

The following Potential Free Contacts will be available on Smart Switch (Common Circuit for FCBC-1 & FCBC-2):

- Battery Earth Fault
- Battery Fuse Fail
- Load Under Voltage
- Load Over Voltage
- Battery Under Voltage
- Battery Over Voltage
- Group Alarm

PROTECTIONS

The following protections are provided:

- AC Input Circuit Breaker
- Fast acting Semiconductor Fuses for SCR Bridge
- DC Over Voltage Cutback / Shut Down
- DC Overload
- DC Output Circuit Breaker
- Battery Input Fuses
- Battery Current Limit
- Charger Current Limit
- Blocking Diode

CONTROLS & SWITCHES

- AC Input ON/OFF Circuit Breaker
- DC Output ON/OFF Circuit Breaker
- Battery Input Fuses
- Socket ON/OFF Switch
- Space Heater ON/OFF Switch
- Door Lamp ON/OFF Push Button
- Push Buttons: Menu; Increment; Decrement; Enter & Back

ANALOGUE MEASURING METER: 100-0-100mA DC Ammeter
(DC Earth Leakage Ammeter)

*Adopted for NITNG
-10/PRIBS PTC/2023.*

18/12/24
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the responsibility for correctness of the materials
supplied as per specification

AM
Electrical Superintending Engineer
(Planning and Engineering)
Bihar State Power Transmission Company Limited
Vidyut Bhawan, Patna-800021
4/4/22

ENVIRONMENTAL STABILITY

Operating Temperature	:	-5 °C to +50 °C
Storage	:	25 °C to +70 °C
Relative Humidity	:	0-95% (Non-condensing)
Noise Level	:	< 75 dB (A)

SPECIAL FEATURES

- Auto Phase Reversal Operation ✓
- Soft Start on DC side ✓
- Class-F Insulation with Class-F Temperature Limits for all Magnetics
- Automatic Voltage Regulation using Microcontroller ✓
- Filter Circuit to Limit Ripple
- Charger Current Limiting
- Battery Current Limiting
- Automatic Float to Boost changeover based on current drawn by Battery
- Automatic Boost to Float changeover based on Current or Voltage.
- Anti-condensation Heater with Thermostat Control
- RS-485, 4-Wire Communication with MODBUS Protocol (communication cable from Battery Charger System to user equipment like SCADA is not in Amara Raja scope)

Remote Shutdown facility from SCADA

GENERAL

Cabinet	:	Freestanding Cabinet; Floor Mounting Type, Sheet Steel Construction; Easy for Installation and Maintenance; Components are accessible from Front & Rear; Cable entry at Front Bottom of the Cabinet
Protection	:	IP – 42
Paint Shade	:	631 of IS-5
CRCA Sheet Thickness	:	Load bearing sections – 2.0mm Non-load bearing sections – 1.5mm Undrilled Cable Gland Plate – 3.0mm
Nature of Cooling	:	Natural Air Cooling
Dimensions in mm	:	As per the Dimensional Drawings enclosed

Adopted for NRI No
— 10/PR/BS/PR/2023

18/11/24

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Electrical Superintending Engineer
(Planning and Engineering)
Bihar State Power Transmission Company Limited
Vidyut Bhawan, Patna-800021

LOGIC SHEET

System Condition	Mode Selection	FCBC - 1	FCBC - 2	Battery	Load
AC Mains Available	AUTO	ON	OFF	Supplied by FCBC-1 (FCBC-1 Float or Boost Charges the Battery based on the Battery Charging Current)	Supplied by FCBC-1 (Load will see either Float Voltage or Boost Voltage based on the Battery Charging Current)
AC Mains Available	MANUAL FLOAT	ON	OFF	Supplied by FCBC-1 (FCBC-1 Float Charges the Battery)	Supplied by FCBC-1 (Load will see Float Voltage)
AC Mains Available	MANUAL BOOST	ON	OFF	Supplied by FCBC-1 (FCBC-1 Boost Charges the Battery)	Supplied by FCBC-1 (Load will see Boost Voltage)
AC Mains Available	AUTO	FAIL / OFF	ON	Supplied by FCBC-2 (FCBC-2 Float or Boost Charges the Battery based on the Battery Charging Current)	Supplied by FCBC-2 (Load will see either Float Voltage or Boost Voltage based on the Battery Charging Current)
AC Mains Available	MANUAL FLOAT	FAIL / OFF	ON	Supplied by FCBC-2 (FCBC-2 Float Charges the Battery)	Supplied by FCBC-2 (Load will see Float Voltage)
AC Mains Available	MANUAL BOOST	FAIL / OFF	ON	Supplied by FCBC-2 (FCBC-2 Boost Charges the Battery)	Supplied by FCBC-2 (Load will see Boost Voltage)
AC Mains Available	ANY POSITION	OFF	OFF	Discharges to Load	Supplied by Battery

APPROVED
 For the condition you are not advised of
 the condition of the materials
 supplied by the contractor
 (Signature)
 Project Engineer
 Amara Raja Power Systems Limited
 Bangalore

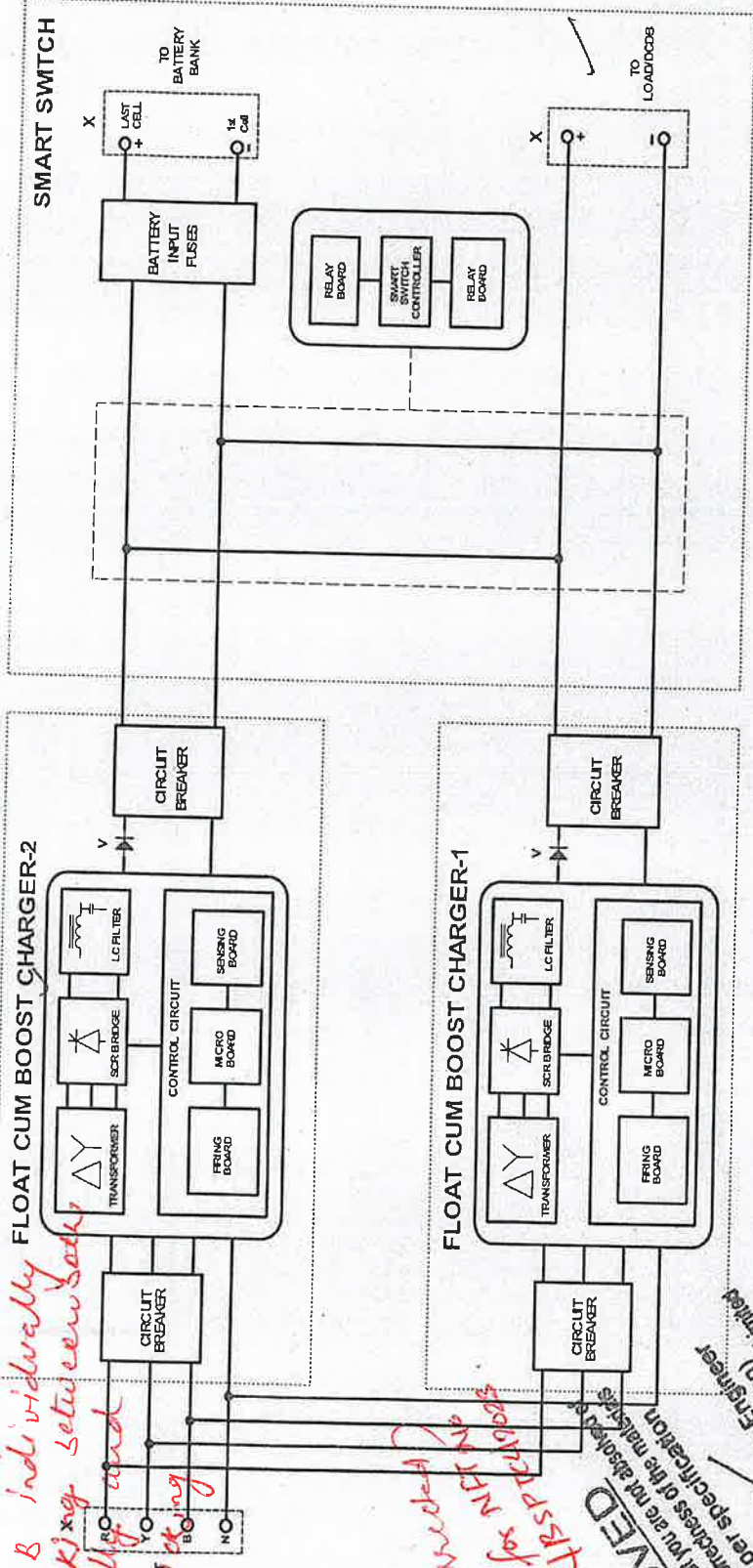
Electric & Mechanical
 (Signature)
 Project Engineer
 Amara Raja Power Systems Limited
 Bangalore

Applied for NITNU
 -101 PRIBSPTEC40023

APL-5200005229, REV.0, DATED: 04.03.2022

18/11/24
 (Signature)

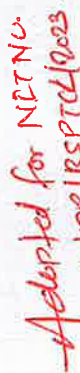
02 nos. of AC supply from ACBB-1 and ACBB-2 to be provided to FCBC-1 CB and FCBC-2 CB individually with an interlocking between both CBs i.e. electrically and mechanical interlocking to be provided



FUNCTIONAL BLOCK DIAGRAM OF DFBCB-STANDBY LOGIC

APPROVED
 Submitted to the condition that you are not absolved of responsibility for correctness of the materials supplied as per specification.
 Electrical Superintending Engineer
 (Planning and Engineering)
 Amara Raja Power Transmission Company Limited
 Amar Sagar Bhawan, Patna-800021
 27/12/22

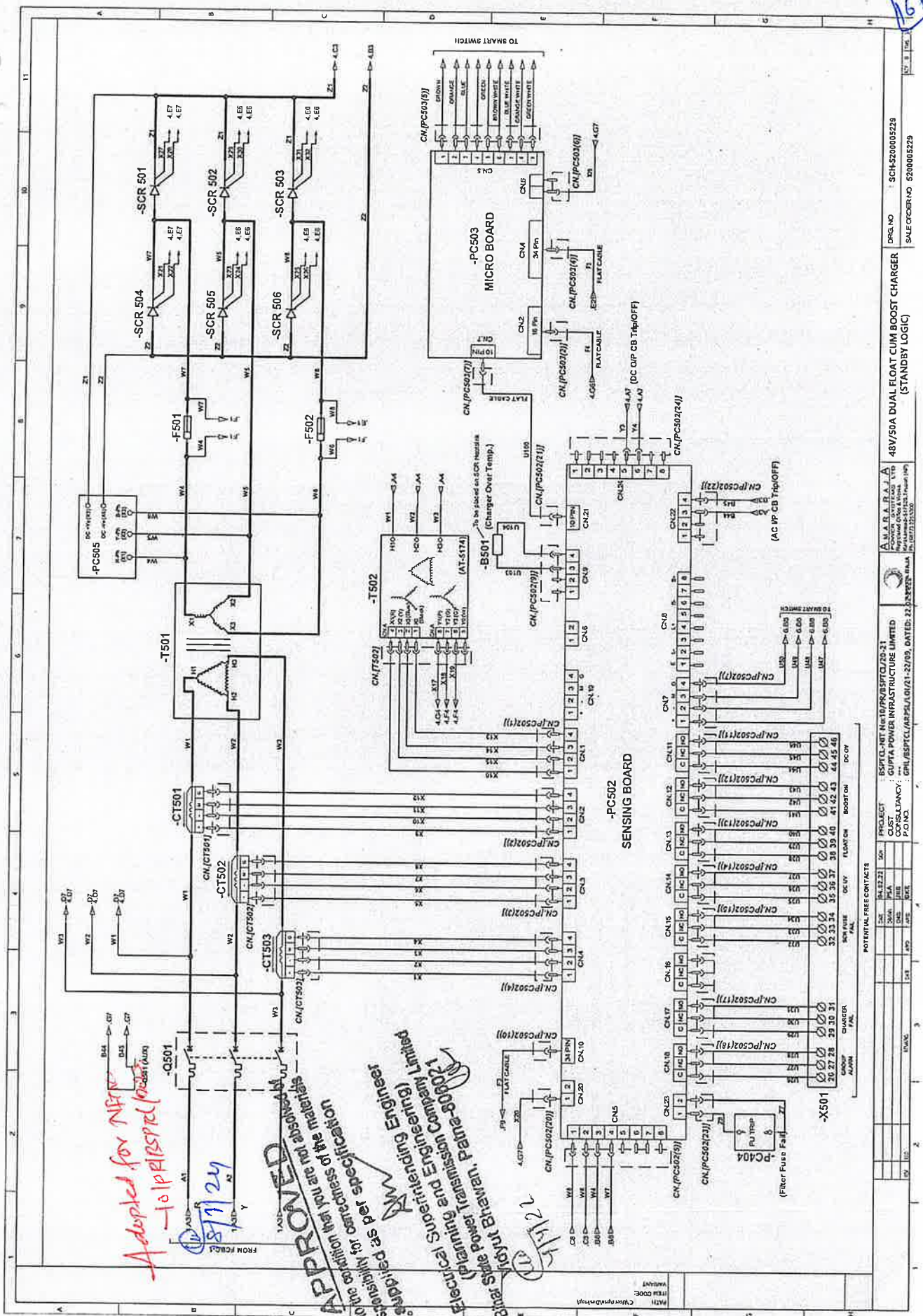
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APPROVED
to the condition that you are not absorbed of
responsibility as per specification

Electrical Superintendent Engineering
(Planning and Engineering Company)
10021
State Road 10021
Bldg. 10021
Bldg. 10021

4/11/22



DRUG NO	SCH-5200005229
SALE ORDER NO	5200005229

**AL FLOAT CUM BOOST CHARGER
(STANDBY LOGIC)**

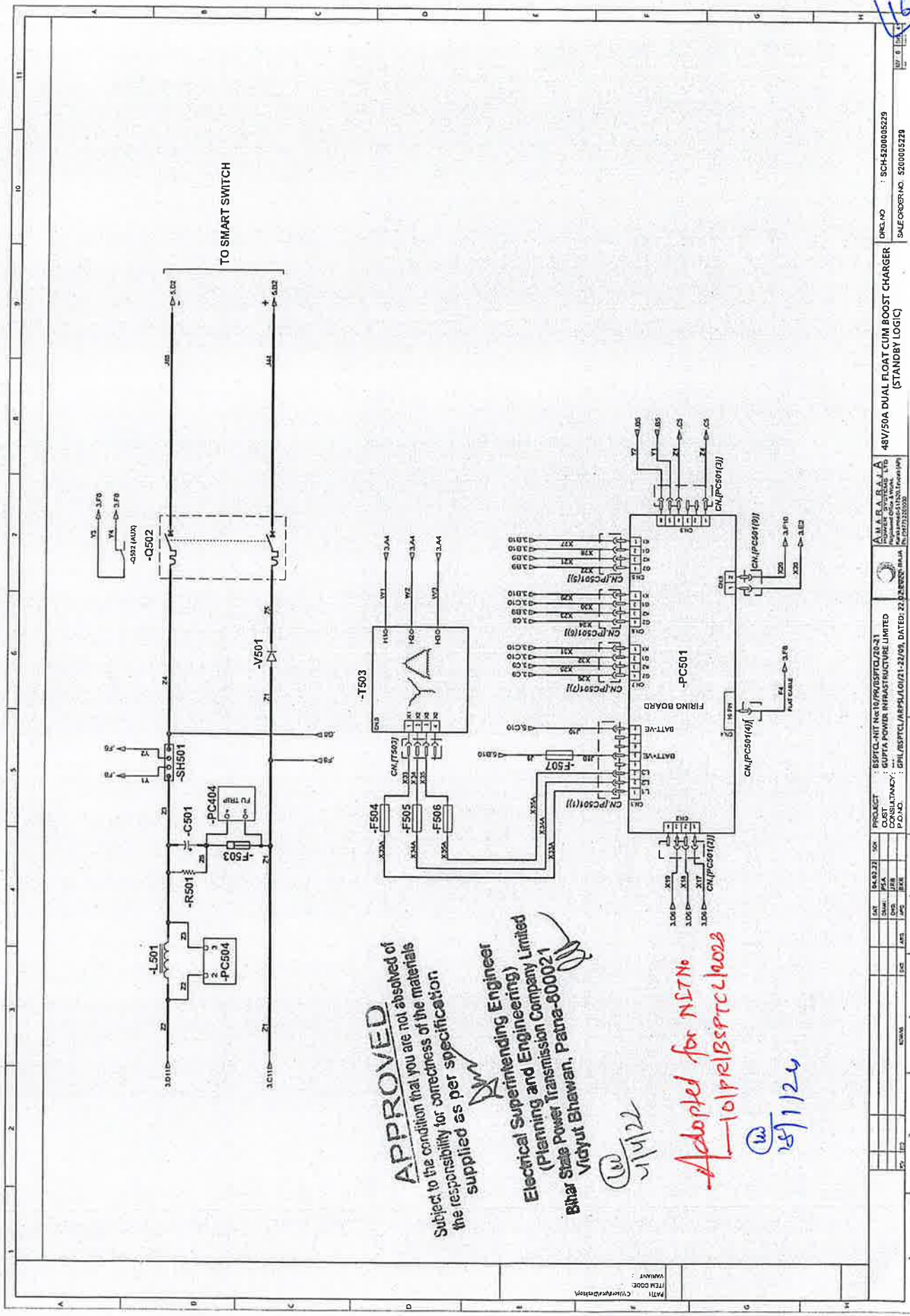
POWER SYSTEMS LTD
P.O. Box 100, Victoria
Tel: (0177) 221,5200

8722270

CONSULTANCY : ***
P.O NO. : GPL/BSPTCL/ARPSL/LOI/21-22/09, DATED: 22/09/2021

YTD	SLY	CAR
1997	END	
1998	END	

[illegible]



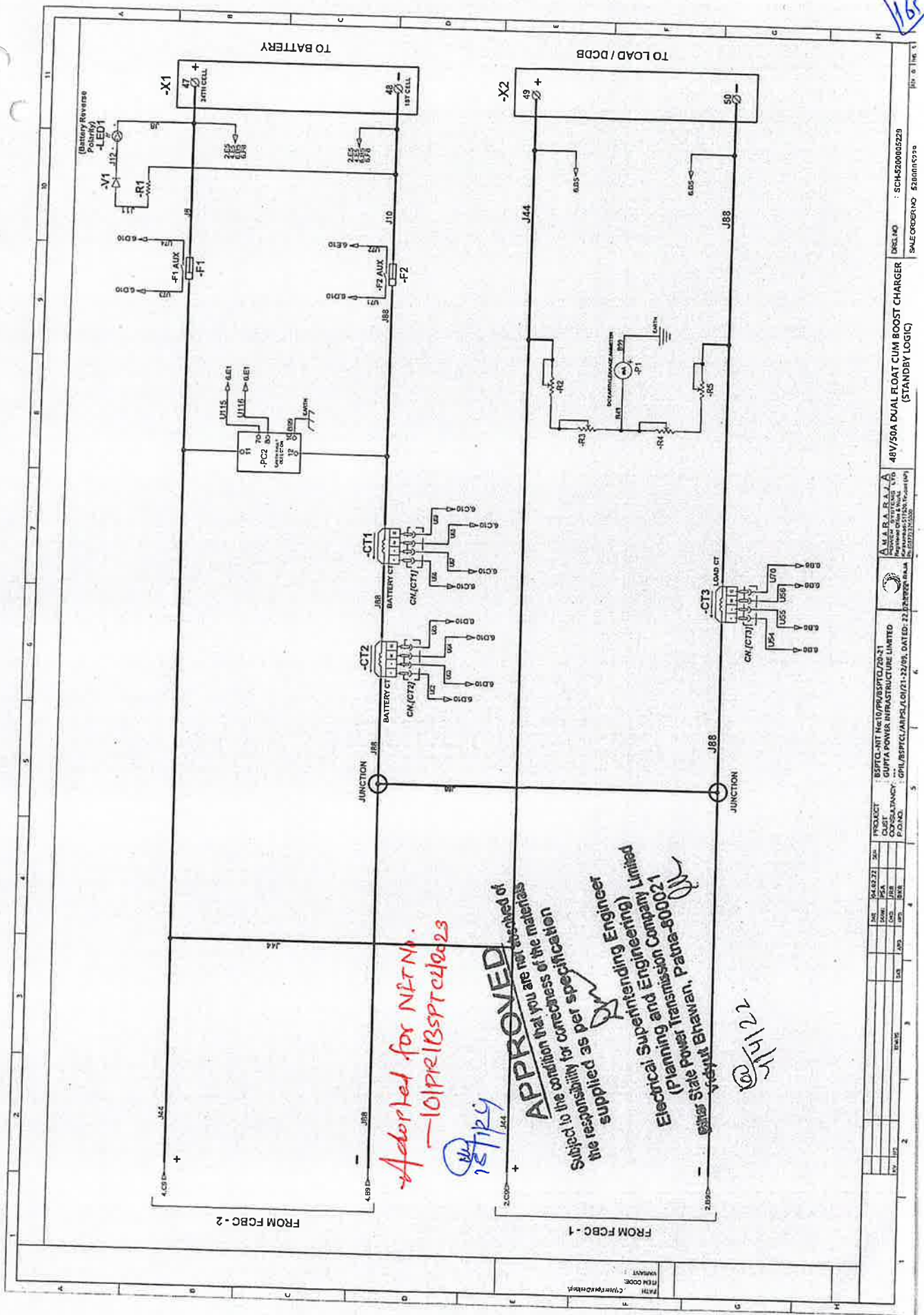
APPROVED
 Subject to the condition that you are not absolved of
 the responsibility for correctness of the materials
 supplied as per specification

(Signature)
Electrical Superintending Engineer
(Planning and Engineering Company Limited)
Bihar State Power Transmission, Patna-800021
Vidhyut Bhawan, Patna-800021

(Signature)
 21/4/22

Adopted for NLTN
101PR/BSPTCL/0002

(Signature)
 25/1/24



BILL OF MATERIALS					REV.0, DATED: 04.03.2022	
AMARA RAJA POWER SYSTEMS LIMITED						
SAP SO No. 5200005229						
CHARGER RATING: 48VDC/50A DUAL FLOAT CUM BOOST CHARGER - STANDBY LOGIC (i-SWIFT) SUITABLE FOR VRLA/NVRLA BATTERY						
Line No.	CKT Designation	I/P Item Description	Qty.	UOM	Variant Description	
1	-B401	THERMAL SW-SET AT65°C-NC	1	NOS	UTILITY APPLIACES	
2	-B402,-B501	Thermistor-10K-2%-25D With Clip term	2	NOS	NILA TECH	
3	-C401(1),-C501(1)	Capacitor-electrolytic-10000mfd-100VDC	2	NOS	ALCON	
4	-CT1,-CT2,-CT3	Hall effect current sensor-100A/0-4V	3	NOS	ELECTROHMS	
5	-CT(401-403),-CT(501-503)	Hall effect current sensor-50A/0-4V	6	NOS	ELECTROHMS	
6	-DL401,-DL402	5W Lumeno CDL 6500K Wall Light- LH6XACP7	2	NOS	HAVELL'S/PHILIPS/WIPRO/BAJAJ	
7	-DS401,-DS402	PB-door lamp-NC-(Refrig switch)	2	NOS	STD Vendor	
8	-E401	Space Heater-100W-240VAC with Gland	1	NOS	ENCORE/PYRO	
9	-F(4-8)*,-F403*,-F(405-408)*,-F(504-507)*	Fuse base-1A-6.3A-600V W/O fuse	14	NOS	CONNECTWELL	
10	-F(4-8),-F403,-F(405-408),-F(504-507)	Glass Fuse-fast-6A-250VAC-20mm	14	NOS	PROTECTOR	
11	-F1 AUX,-F2 AUX	FUSE TRIP - 1C/O	2	NOS	STDVendor	
12	-F1*,-F2*	Fuse base-160A-500/690V AC-size-0	2	NOS	BUSSMANN (EATON)	
13	-F1,-F2	HRC fuse-slow-100A-500VAC-size000-din ty	2	NOS	BUSSMANN (EATON)	
14	-F401,-F402,-F501,-F502	Semiconductor fuse-fast-50A-240/250V AC	4	NOS	BUSSMANN (EATON)	
15	-F404*,-F503*	Fuse base-32A-415/500V AC	2	NOS	BUSSMANN (EATON)	
16	-F404,-F503	HRC fuse-slow-16A-415/550V AC-clip on	2	NOS	BUSSMANN (EATON)	
17	-GANG BOX (S401, S402, SC401)	Gang Box Domestic-25W+1Socket	1	NOS	ANCHOR	
18	-H401	Clustered LED-220-240VAC-22.5mm-red	1	NOS	ESBEE (L&T)/SECO/C&S	
19	-H402	Clustered LED-220-240VAC-22.5mm-yellow	1	NOS	ESBEE (L&T)/SECO/C&S	
20	-H403	Clustered LED-220-240VAC-22.5mm-Blue	1	NOS	ESBEE (L&T)/SECO/C&S	
21	-L401,-L501	Filter Choke-1mH-0050068	2	NOS	AMARA RAJA	
22	-LED1	LED-RED-ROUND-5mm	1	NOS	SANKEN/KWALITY	
23	-LED1*	LED Holder-5mm round-press fit-white	1	NOS	LALWANI	
24	-P1	1000mA DC ammeter-100-0-100mA-1.5-90D	1	NOS	BEEMET/RISHABH/AE/NIPPEN	
25	-PC1	PCB-SMART SWITCH-48V-Modbus-RTU	1	NOS	AMARA RAJA	
26	-PC2	EFD Module-48V	1	NOS	AMARA RAJA	

Adopted for
NIP-TH
10/PR/BSPTC/2023
15/1/24

17/1/24

BILL OF MATERIALS						
AMARA RAJA POWER SYSTEMS LIMITED				REV.0, DATED: 04.03.2022		
SAP SO No. 5200005229						
CHARGER RATING: 48VDC/50A DUAL FLOAT CUM BOOST CHARGER - STANDBY LOGIC (i-SWIFT) SUITABLE FOR VRLA/NVRLA BATTERY						
Line No.	CKT Designation	I/P Item Description	Qty.	UOM	Variant Description	
27	-PC401,-PC501	Firing Bd.- 48V Micro Based FCBC Ver.2	2	NOS	AMARA RAJA	
28	-PC402,-PC502	Sensing Bd.-48V Micro Based FCBC Ver.2	2	NOS	AMARA RAJA	
29	-PC403,-PC503	PCB-Micro Bd- 48V Micro Based FCBC Ver.2	2	NOS	AMARA RAJA	
30	-PC404	PCB-FUSE FAIL-DUAL DPSS	1	NOS	AMARA RAJA	
31	-PC404 (Fuse Trip Indicators)	Fuse Trip indicator	2	NOS	BUSSMANN (EATON)	
32	-PC405,-PC504	PCB-FILTER-RC-2MFD-400V-220R	2	NOS	AMARA RAJA	
33	-PC406,-PC505	PCB-Snubber bd for i-C/D	2	NOS	AMARA RAJA	
34	-Q401,-Q501	MCB-25A-3P-10KA-AC-D curve	2	NOS	LEGRAND/SIEMENS/SCHNEIDER/ABB/C&S	
35	-Q401,-Q501,-Q402,-Q502 (Auxiliaries)	MCB Auxiliary	4	NOS	LEGRAND/SIEMENS/SCHNEIDER/ABB/C&S	
36	-Q402,-Q502	MCB-63A-2P-DC	2	NOS	LEGRAND/SIEMENS/SCHNEIDER/ABB/C&S	
37	-R1	Resistor-5K-2W-5%-wire wound	1	NOS	DIAGRAM/PEC/VEPL/WATTS	
38	-R401(1),-R501(1)	Resistor-2.5K-5W-5%-wire wound	2	NOS	DIAGRAM/PEC/VEPL/WATTS	
39	-R402,-R403,-R404	Resistor-1K-2W-5%-Wire wound	3	NOS	DIAGRAM/PEC/VEPL/WATTS	
40	-SCR(401-406)*,-SCR(501-506)*	Heat sink-PI-80AD-300mm	2	NOS	GLOBAL/MAHASAI/PERFECT MACHINE	
41	-SCR(401-406),-SCR(501-506)	Thermal SCR Block-Slow-27A-1600V	6	NOS	SEMIKRON/HIRECT/RIR/NAINA	
42	-SH401,-SH501	Thermal Sink Unit-100A/75mV±0.5%	2	NOS	BEEMET/RISHABH/AE/NIPPEN	
43	-T1,-T403,-T503	Control Xformer -415V/25V-1A	3	NOS	AMARA RAJA	
44	-T401,-T501	Charger I/P Xfr-415V/35.43V 4.34KVA	2	NOS	AMARA RAJA	
45	-T402,-T502	Charger I/P PS-415V/2x10V(500mA)	2	NOS	AMARA RAJA	
46	-V1	Charger-3PH-PS-415V/2x10V(500mA)	1	NOS	VISHAY/KHEL/MIC/PHILIPS	
47	-V401*,-V501*	Charger-3PH-PS-415V/2x10V(500mA)	2	NOS	GLOBAL/MAHASAI/PERFECT MACHINE	
48	-V401,-V501	Charger-3PH-PS-415V/2x10V(500mA)	2	NOS	SEMIKRON/HIRECT/RIR/NAINA	
49	-X1,-X2,-X401	Terminal block-power-170A-single	8	NOS	ELMEX	
50	-X3,-X402,-X501	Terminal Block-Power-32A-Single	63	NOS	ELMEX	

Adopted for
 15/11/24
 15/11/24

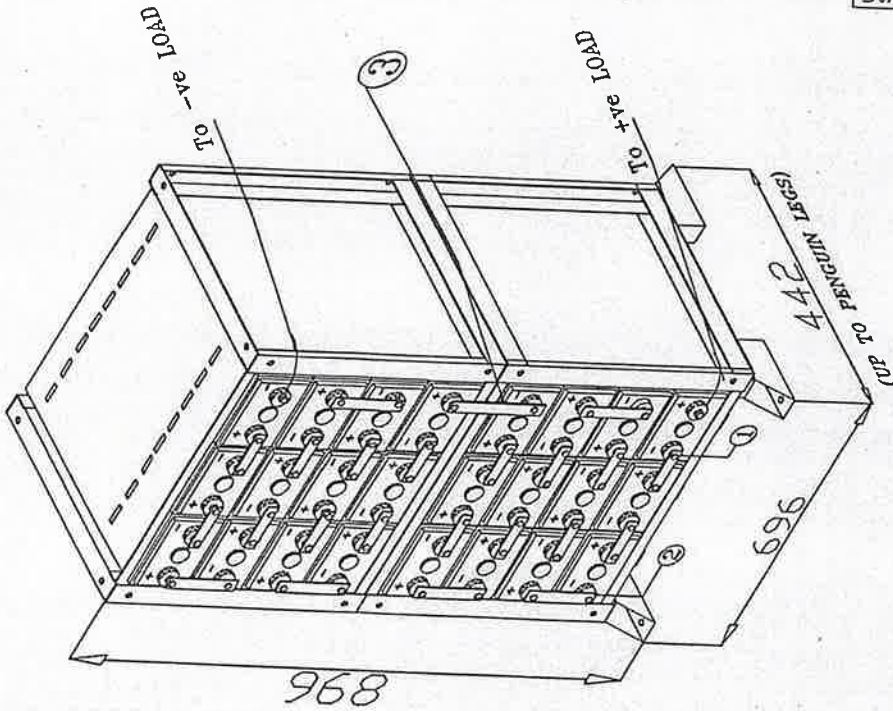
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SPARES BILL OF MATERIALS					
AMARA RAJA POWER SYSTEMS LIMITED			REV.0, DATED: 04.03.2022		
SAP SO No. 5200005229					
CHARGER RATING: 48VDC/50A BATTERY CHARGER SPARES					
Line No.	CKT Designation	I/P Item Description	Qty.	UOM	Variant Description
1	1-Set of control cards (All PCB cards)	PCB-SMART SWITCH-48V-Modbus-RTU	1	NOS	AMARA RAJA
2	1-Set of control cards (All PCB cards)	EFD Module-48V	1	NOS	AMARA RAJA
3	1-Set of control cards (All PCB cards)	Firing Bd.- 48V Micro Based FCBC Ver.2	1	NOS	AMARA RAJA
4	1-Set of control cards (All PCB cards)	Sensing Bd.-48V Micro Based FCBC Ver.2	1	NOS	AMARA RAJA
5	1-Set of control cards (All PCB cards)	PCB-Micro Bd- 48V Micro Based FCBC Ver.2	1	NOS	AMARA RAJA
6	1-Set of control cards (All PCB cards)	PCB-FUSE FAIL-DUAL DPSS	1	NOS	AMARA RAJA
7	1-Set of control cards (All PCB cards)	PCB-FILTER-RC-2MFD-400V-220R	1	NOS	AMARA RAJA
8	1-Set of control cards (All PCB cards)	PCB-Snubber bd for I-C/D	1	NOS	AMARA RAJA
9	1-Set of relays (1 no. of each type)	Not Applicable			
10	1-Set of contactors (1 no. of each type)	Not Applicable			
11	4-Micro switches (if applicable)	Not Applicable			
12	1-Set of capacitors (10000mfd-100VDC)	Capacitor-electrolytic-10000mfd-100VDC	1	NOS	ALCON
13	1-Set of SCR Block-Slow-27A-1600V	Dual SCR Block-Slow-27A-1600V	1	NOS	SEMIKRON/HIRECT/RIR/NAINA
14	1-Set of Resistor-5K-2W-5%-wire wound	Resistor-5K-2W-5%-wire wound	1	NOS	DIAGRAM/PEC/VEPL/WATTS
15	1-Set of Resistor-2.5K-5W-5%-wire wound	Resistor-2.5K-5W-5%-wire wound	1	NOS	DIAGRAM/PEC/VEPL/WATTS
16	1-Set of Resistor-1K-2W-5%-Wire wound	Resistor-1K-2W-5%-Wire wound	1	NOS	DIAGRAM/PEC/VEPL/WATTS
17	9-Potentiometer	Not Applicable			
18	10-Fuses of thyristor with indicator	Not Applicable			
19	10-Fuses of thyristor with indicator	Semiconductor fuse-fast-50A-240/250V AC	6	NOS	BUSSMANN (EATON)
20		Fuse Trip indicator	6	NOS	BUSSMANN (EATON)

Adopted for 18/11/24

APPROVED

Subject to the contract that you are responsible for the charges of the relays and contactors.



NOTES:

- Batteries are located inside the trays of MS HRCA sheet painted with RAL7040(Window grey) colour. Trays are mounted on Penguin legs.
- All cell connectors are made of lead coated copper busbar.
- No separate foundation is required for installation of battery bank.
- No special ventilation is required. Normal ventilation is sufficient.
- All the connectors are designed for 81 A current.
- Floor area required for battery bank is 696X442 sq mm
- 0.5 to 1 mts aisle space on all sides should be provided to permit initial installation service and surveillance.
- For any correspondence quote DRG.NO:
 - *** FLOOR LOAD : 1531 Kg/sq.m.
 - *** Manufacturer's Model No : IP7X11.
- All the connectors are designed for 3 Hrs discharge rate.

APPROVED

Subject to the condition that you are not absolved of the responsibility for correctness of the materials supplied as per specification

[Signature]
 Electrical Superintending Engineer
 (Planning and Engineering)
 Bihar State Power Transmission Company Limited
 Bihari State Power Bhawan, Patna-800021

Adopted for NTP No. 101PR/BSPTC/4002
15/1/24

UNLESS OTHERWISE SPECIFIED TOLERANCES IN TITLE:

LINEAR	ANGULAR
X ±10.0	AS SPECIFIED
X ±	IN THE
XX ±	DRAWING

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN MILLIMETRES

WEIGHT TOLERANCE	± 5%
DRN.	11.06.19
CHD.	11.06.19
RECHD.	11.06.19
APPD.	11.06.19

SHEET SIZE A3 (297 x 420)

RESERVED NO COPYING PERMITTED UNAUTHORISED USE PROHIBITED.

SYSTEM DETAILS	
Type of cell	2V-300Ah
Total no. of cells	24
Volts per cell	2V
No. of modules	02
Total system weight	47Kgs (Approx)

ITEM NO	DESCRIPTION	DIMENSIONS	QTY/PCS
3	Inter module connector	164X20X2	1
2	Inter cell connector(V)	118X20X2	1
1	Inter cell connector(H)	110X20X2	1
16			

CONNECTOR DETAILS

48V-300Ah SYSTEM INSTALLATION DIAGRAM

SIGN.	DATE	SCALE	N.T.S
MJAY	11.06.19		
LOKESH	11.06.19		
ASHOK	11.06.19		
KMSN	11.06.19		



AMARARAJA
 Gotita be a better way

AMARA RAJA BATTERIES LTD.
 Registered office & works
 Karakambadi-517520, T.P.T., (A.P.) INDIA.
 Ph. (0877) 2265000, FAX: (0877) 2265600.

DRG. NO.

19 500 369 A

SHEET 1 OF 1

PROPRIETARY MATERIAL OF M/S AMARARAJA BATTERIES LTD. TIRUPATI. ALL RIGHTS RESERVED NO COPYING PERMITTED UNAUTHORISED USE PROHIBITED.

IAE-SFS-05.

Guaranteed Technical Particulars

DOCREF: IAE/ GTP - PS/ 2019-20; Rev : 00



Battery Particulars

- Battery Type : Maintenance Free Valve Regulated Lead Acid (MF-VRLA)
- Battery Rating : 48 V - 300 AH to 1.75 ECV @ C10 at 27°C
- Manufacturers Cell Designation : IP7X11
- No. of cells : 24 No.s
- Cell dimensions : (198.5 x 369.6 x 92.8) mm Approx.
- Single cell weight : 17.2 kg. Approx
- Battery bank dimensions : (696 x 442 x 896) mm Approx.
- Battery bank weight : 471 Kg. Approx.

Charge Regime

- Float Charging Voltage : 2.23 - 2.25 Volts per Cell @ 27°C ✓
- Boost charging voltage : 2.30 - 2.32 Volts per Cell @ 27°C ✓
- Current Limit : 30 Amps minimum to 60 Amps maximum.
- Recommended Voltage Compensation : For every 1°C rise in temperature reduce the float voltage by 0.003VPC & Vice versa, ensure the extension of temperature sensor upto battery.

Product Details

- AH efficiency : Above 95%
- WH efficiency : Above 85%
- Self Discharge/Week @ 27°C : < 1% of rated capacity
- Max. allowable Ambient Temp. at which cell can safely operate : 60°C continuous and 70°C short time.
- Recommended Max Period of Storage : 6 months from the date of dispatch before first use and battery should be stored in a covered area at 27°C.
- Material of Container : Fire-Retardant Polypropylene co-polymer.
- Type of separator : Highly absorbent Micro porous spun glass matrix.(AGM)
- Type of +ve & -ve plates : Flat pasted
- Material of tray & color : Mild steel coated with acid resistant powder coating.
- Method of connection between cells : Bolted
- Voltage ripple allowable : <2% of the RMS. Value
- Type of connectors : Lead coated Heavy duty copper strips
- Cycle Life of battery at 27°C : 4000 cycles at 20% Depth of Discharge(DOD) (or)
2000 cycles at 50% DOD (or)
1200 cycles at 80% DOD
- Time required for Boost charge at 2.30 VPC @ 20%CL at 27°C : 8 Hrs from 0-90% State of Charge (SOC)(or)
16 Hrs from 0-100% State of Charge

Applicable Standards

- Batteries generally conforms to
 - (i) IS15549:2005
 - (ii) IEEE1188 & 1189
 - (iii) BS-6290, PART-IV.
 - (iv) IEC 60896-21&22:2004, PART-II.

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**Due to on going improvement the specifications are subjected to modification without prior notice

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Subject to the condition that you are not absolved of
the responsibility for correctness of the materials
supplied as per specification

Electrical Superintending Engineer
(Planning and Engineering)
Bihar State Power Transmission Company Limited
Vidyut Bhawan, Patna-800021

Authorized signature
COM-SFS-00

Adopted for NLT No.
-101PR/BSPTC/4/2023

18/11/24

4/11/22

AMARA RAJA POWER SYSTEMS LIMITED					SPARES BILL OF MATERIALS					REV.0, DATED: 04.03.2022				
SAP SO No. 5200005229														
BATTERY RATING: 48V/300AH BATTERY SPARES														
Line No.	CKT Designation	I/P Item Description			Qty.	UOM	Variant Description							
1	IP7X11001	2V/300Ah VRLA BATTERY			5	NOS	AMARA RAJA							
2	139-000-10110	110 x 20 x 2 ICCconnector(H)			10	NOS	AMARA RAJA							
3	862-050-08025	M8X25mm Hex Head bolt SS 304-passi			10	NOS	AMARA RAJA							
4	862-310-08901	M8 Flat Washer SS 304 (8.5 x 19 x 3mm)			10	NOS	AMARA RAJA							
5	862-550-08000	M8 Spring Washer SS304(8.2x14.8x2.0mm)			10	NOS	AMARA RAJA							

Adopted for NITR No.

10/10/2023

15/1/24

APPROVED

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Electrical Superintending Engineer
(Planning and Engineering) Limited
Bihar State Power Transmission Company Limited
Vidhyut Bhawan, Patna-800021

15/1/24