

BSNL seeks comments on Draft GR for UPS from UPS/Invertors vendors

BSNL INVITES COMMENTS FROM UPS / INVERTOR VENDORS ON **DRAFT GR FOR UPS** PREPARED BY BSNL. COMMENTS MAY BE GIVEN TO BSNL CORPORATE OFFICE, NETWORK OPERATION CELL OF CFA VERTICAL (VIA EMAIL TO nwocfa@gmail.com or nwocfa@bsnl.co.in WITHIN 15 DAYS OF ISSUE OF THIS NOTICE IN ENCLOSED FORMAT.

NAME OF (VENDOR/MANUFACTURER)

COMMENTS ON REVISED DRAFT GR FOR UNINTERRUPTED POWER SUPPLY SYSTEM (April 2014)

Clause No.	Clause Description	Comments, if any	Remarks, if any



भारत संचार निगम लिमिटेड
(भारत सरकार का उपक्रम)
BHARAT SANCHAR NIGAM LIMITED
(A Govt. of India Enterprise)

**UNINTERRUPTED POWER
SUPPLY (UPS) SYSTEM
ISSUE - I: April 2014 (Draft)**

SPECIFICATION ON UNINTERRUPTED POWER SUPPLY (UPS) SYSTEM

No. : BSNL/Specification/UPS – 001/01/April.2014

BHARAT SANCHAR NIGAM LIMITED

(A Government of India Enterprise),

Bharat Sanchar Bhawan, Janpath,

Website: www.bsnl.co.in

NEW DELHI – 110 001, INDIA

All Rights Reserved and no part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or means, electronic or mechanical, photocopied, recorded, scanned, without written permission from the Bharat Sanchar Nigam Ltd., New Delhi (A Government of India Enterprise), Bharat Sanchar Bhawan, Janpath, New Delhi – 110 001.
Website: www.bsnl.co.in

CONTENTS

Clause No.	Description Of Items	Page No.
INTRODUCTION		
1.0	Scope	3
1.1	UPS System Concept	3
1.2	UPS System Requirement	3
1.3	UPS System Configuration	4
1.4	UPS System Rating	4 - 5
1.5	TECHNICAL REQUIREMENTS OF UPS SYSTEM	5 - 12
	Table – 1 Operating Noise	13
	Table – 2 Correction Factor for Operating Noise	13
	Table – 3 UPS System Configuration	14 - 15
	Block Schematic of Standalone UPS or Standalone (1+1) UPS System - Fig.1	16
	Block Schematic of Modular UPS System - Fig.2	17

Introduction

1.0 Scope:

This document contains the Generic Requirements of UPS (Uninterrupted Power Supply) Systems based on Switch Mode Power Supply (SMPS) techniques for providing uninterrupted AC power to the equipment associated with various telecom systems.

1.1 UPS System Concept:

UPS system used for telecom application, envisaged in this specification, works on “ON LINE” concept. In this concept, under normal operating conditions, the AC load is fed by the inverter unit of the UPS system, which in turn derives its DC power from Rectifier unit, while the battery remains floated across the output of the Rectifier unit. The Rectifier unit draws AC power from the commercial AC mains or stand by DG set.

In the event of interruption in the AC input to the UPS, the DC power to the inverter unit gets instantly transferred to battery, so that AC output of the inverter unit remains uninterrupted. Under this condition the battery gets discharged.

When the commercial AC mains is restored or the Engine Alternator is switched 'ON', the DC power to the inverter unit, again, gets instantly transferred back (without any interruption to the load) to the Rectifier unit. On restoration of AC mains, Rectifier unit always operates in “Charge Mode”.

It enables the Rectifier to give higher current to the battery to recoup its lost capacity faster. When the battery gets fully recouped the Rectifier unit reverts back to the float mode, automatically.

1.2 UPS system requirements:

UPS system consists mainly of the following building blocks:

- 1. Distribution, Switching, Control & Alarm (DSCA) unit:** Provides for Distribution, Switching, Monitoring, Control and alarm of the UPS unit / System.
- 2. Rectifier:** Rectifier unit is used for conversion of AC into regulated DC.
- 3. Battery Bank:** Battery of suitable capacity for providing power to the inverter when Rectifier unit is not working due to any reason.
- 4. Inverter Unit:** Inverter unit shall be capable of providing uninterrupted AC power to the Telecom Equipment.
- 5. Static Transfer Switch:** Static Transfer Switch is for transferring the load, automatically to AC mains (regulated or unregulated). Transfer of load back to UPS shall be **auto/ manual** but it shall take place, only after the inverter output has stabilized and is within the specified limits.
- 6. Manual Transfer Switch:** Manual transfer switch is for the transfer of load from inverter to Stand by power and back to Inverter unit, manually without the interruption of power to the load. The interlocking inverter operation should be prevented from unsynchronized switches.
- 7. Voltage Regulator:** Voltage Regulator (VR) is for providing Standby regulated AC power (as per the purchaser's requirement) to the telecom equipment.

1.3 UPS System Configurations:

UPS systems envisaged in this specification may be:

- a) A Standalone UPS OR
- b) Standalone (1+1) UPS System OR
- c) Modular UPS System.

1.3.1 Standalone UPS or Standalone (1+1) UPS Systems:

This type of system shall be a single unit of required capacity without redundancy or two similar units in (1+1) configuration with redundancy capable of sharing load with other UPS unit of same rating and make, in synchronous load sharing mode. This type of system shall have the components as inverter unit, rectifier unit and DSCA, Static Transfer Switch, and Manual Transfer Switch, all housed in a single cabinet. The system shall have the battery of the desired rating as per backup requirements. Refer Block Diagram Fig. 1. In case of Standalone (1+1) UPS System, separate AC input shall be made available from the LT Panel for each UPS.

Note: The stand alone UPS system of given capacity shall be a single unit. Paralleling of smaller capacity UPS systems to achieve the required capacity is not allowed.

1.3.2 Modular UPS Systems:

In these types of systems, UPS is composed of the basic modules and each module has the building block as: One rectifier unit, One inverter unit and DSCA unit. The battery shall be as per the desired rating of the UPS. The battery AH capacity will be according to the battery backup requirement. DSCA unit provides for all the control, monitoring, alarm functions and necessary terminations/switches as per the specification. In addition to this, the DSCA shall also have the capability of operating its inverter unit in synchronous mode with the inverter units of other UPS units of same make and rating. Static Transfer Switch and Manual Transfer switch in this concept will be common for the ultimate system capacity (as envisaged by the user) proposed to be constituted by paralleling of these UPS units. This type of UPS unit shall be capable of sharing load with other UPS units of same rating and make, in synchronous load sharing mode. Refer Block Diagram Fig. 2. The AC input to the rack shall be separate for each rack from LT Panel, if more than one rack is used.

1.3.3 Redundancy criteria for Modular UPS System:

The maximum number of UPS modules in a system shall be N, where N is the number of basic UPS units decided as per the load requirement of the user / purchaser, and 1 is redundant unit.

1.4 UPS System Rating: Specified ratings of UPS systems are:

Type of UPS	Stand alone UPS or Standalone (1+1) UPS Systems			Modular UPS Systems	
	1Ph/1Ph	3Ph/1Ph OR 3Ph/3Ph	3Ph/3Ph	3Ph/3Ph	3Ph/3Ph
UPS ratings	1KVA, 2KVA, 3KVA, 5KVA, 6KVA & 10KVA	10KVA, 15KVA, 20KVA & 30KVA	40KVA, 60KVA, 80KVA, 100KVA, 120KVA, 160KVA	40KVA, 60VA & 80KVA with basic UPS module rating of 10KVA/20KVA	100KVA, 160KVA, 200KVA, 250KVA & 300KVA with basic UPS module rating of 20KVA/25KVA

			& 200KVA		
--	--	--	-------------	--	--

Note: The rating of Charger (Rectifier unit) shall be as per back-up and battery ordered capacity. The Static Transfer Switch and Manual Transfer switch shall be rated at 1.2 times of the UPS rating (i.e 120% of Load). The rating of the battery shall be as per back-up requirement.

1.5 Technical Requirements of UPS System:

Sl. No.	Technical Requirements	Single Phase output	Three Phase output
[A]	AC Input Operating Range & Frequency	170V to 270V (Nom.230V) 48 to 52Hz	320V to 480V (Nom. 400V) 48 to 52Hz
[B]	Charger (FR/FC)	SMPS Technique using Switching Frequencies 10KHz and above.	SMPS Technique using Switching Frequencies 10KHz and above.
1	Operation	Auto Float-cum-Charge mode.	Auto Float-cum-Charge mode.
2	Charger Voltage (Float /Charge)	Depending upon the number of Cells used and Cell Voltage (2.25V /2.3V per cell or 13.5V/ 13.8V per mono-block).	Depending upon the number of Cells used and Cell Voltage (2.25V /2.3V per cell or 13.5V/ 13.8V per mono-block).
3	Charger Efficiency i). At nominal input, output and load between 75% to 100% ii). For other specified Input, output conditions & load between 50% to 100%.	Better than 89% Better than 85%	Better than 90% Better than 87%
4	Psophometric Noise (e.m.f weighted at 800Hz) at full rated load and nominal input	<u>Clause is Deleted</u>	<u>Clause is Deleted</u>
5	Peak to Peak Ripple	<1% of DC Bus Voltage	<1% of DC Bus Voltage
6	Battery	The Battery shall be Sealed Maintenance Free VRLA Battery. In case of 12V (6 cells) mono-block VRLA Battery maximum permissible capacity is - 200AH . For batteries of capacity higher than 200AH , only 2V cells shall be used. Paralleling of 2V cells of AH capacity up to 1500 AH is not permitted. In case of Mono-block VRLA Battery paralleling of two Banks (maximum) is permitted.	The Battery shall be Sealed Maintenance Free VRLA Battery. In case of 12V (6 cells) mono-block VRLA Battery maximum permissible capacity is - 200AH . For batteries of capacity higher than 200AH , only 2V cells shall be used. Paralleling of 2V cells of AH capacity up to 1500 AH is not permitted. In case of Mono-block VRLA Battery paralleling of two Banks (maximum) is permitted.

Sl. No.	Technical Requirements	Single Phase output	Three Phase output
7	No. of Cells & Cell voltage	<i>Clause is Deleted</i>	<i>Clause is Deleted</i>
8	Battery Back up.	Shall be as mentioned in the Ordering Information.	Shall be as mentioned in the Ordering Information.
9	Battery monitoring Feature	Battery monitoring Feature shall be provided for - i). Battery Under Voltage ii). Battery Current Limiting iii). Battery Temperature compensation.	Battery monitoring Feature shall be provided for - i). Battery Under Voltage ii). Battery Current Limiting iii). Battery Temperature compensation.
[C]	Output Characteristics (Inverter) :		
10	Inverter Output Power Capacity	(i) Standalone UPS System or Stand alone (1+1) UPS System: a). 1KVA to 10KVA - Single Phase input and Single Phase output. b). 10KVA to 30KVA - Three Phase input and Single Phase output. Details of UPS Configuration and ratings are given in Table - 3 of Specification. Note: In case of Standalone (1+1) UPS System, separate AC input shall be made available from LT Panel.	(i) Standalone UPS System or Stand alone (1+1) UPS System: a). 10KVA to 30KVA - Three Phase input and Three Phase output. b). 40KVA to 200KVA - Three Phase input and Three Phase output. (ii). Modular UPS System : 40KVA to 300KVA with Basic Module rating of 10KVA; 10KVA/20KVA & 20KVA/25KVA in (N+1) configuration. Three Phase input and Three Phase Output. Details of UPS Configuration and ratings are given in Table - 3 of Specification. Note: In case of Modular UPS System, separate AC input shall be made available from LT Panel, for individual racks if more than one rack is used.
11	Output Voltage of Inverter	Shall deliver continuous uninterrupted single phase pure sine wave output at 230V/50Hz.	Shall deliver continuous uninterrupted three phase pure sine wave output at 400V/50Hz.
12	Output Voltage Settable	Shall be settable in steps of 210/220/230/240V	Shall be settable in steps of 380/400/415
13	Output Voltage Stability	Output Voltage Stability: ± 2% of the Set Voltage for - 1. Input voltage variation in the range specified. 2. Load current variations from zero	Output Voltage Stability: ± 2% of the Set Voltage for - 1. Input voltage variation in the range specified. 2. Load current variations from zero

		to 100% (full load) 3. Load power factor Better than 0.8	to 100% (full load) 3. Load power factor Better than 0.8
--	--	--	--

Sl. No.	Technical Requirements	Single Phase output	Three Phase output
14	Output Frequency	50Hz \pm 0.5Hz For all specified Input; Output and Load conditions. To get the stabilized frequency Crystal controlled oscillators shall only be used.	50Hz \pm 0.5Hz For all specified Input; Output and Load conditions. To get the stabilized frequency Crystal controlled oscillators shall only be used.
15	Load Power Factor	Better than 0.8	Better than 0.8
16	Inverter Efficiency (i). For Load between 75% to 100% and Input DC Voltage of 2.15V/Cell to 2.3V/Cell or 12.9V/mono-block to 13.8V/mono-block and Output voltage of 230V. (ii). For other Input, Output and Load Conditions.	Not less than 85% Not less than 80%	Not less than 85% Not less than 80%
17	Transient Response	The transient overshoot shall not exceed 10% with battery floated under the following conditions, provided it gets restored within regulating range within 100ms : 1. Switch ON 2.Step change of input voltage specified and vice-versa 3.Load change from 100% to 10% and vice-versa Note : For test purposes, Transient overshoot at the output can be up to 30% when the battery not floated at the input, provided it is restored within the limit of 10% under two cycles (40ms) and regulating range within 100ms.	The transient overshoot shall not exceed 10% with battery floated under the following conditions, provided it gets restored within regulating range within 100ms : 1. Switch ON 2.Step change of input voltage specified and vice-versa 3.Load change from 100% to 10% and vice-versa Note : For test purposes, Transient overshoot at the output can be up to 30% when the battery not floated at the input, provided it is restored within the limit of 10% under two cycles (40ms) and regulating range within 100ms.
18	Total Harmonic Distortion	The total line harmonic voltage distortion shall not be more than 3% in conformity with CIGREs (International Conference on Large High Voltage Electric Systems) limits.	The total line harmonic voltage distortion shall not be more than 3% in conformity with CIGREs (International Conference on Large High Voltage Electric Systems) limits.

Sl. No.	Technical Requirements	Single Phase output	Three Phase output
19	Static Transfer Switch	<p>Static Transfer Switch, capable of handling 120% Load of the rated system capacity shall be provided to transfer the load automatically within 5 mS to AC Commercial /Stand-by Mains through isolation arrangement, in case the inverter fails to take load due to any reason. The transfer of Load back to Inverter shall be automatic in case the inverter has tripped momentarily due to sudden Over Load or transients. The transfer time in this case shall also be within 5ms.</p> <p>It shall take place, only after the inverter output has stabilized and is within the specified limits.</p> <p>However transfer of load back to inverter shall be Manual in case the Inverter has developed a Fault.</p>	<p>Static Transfer Switch, capable of handling 120% Load of the rated system capacity shall be provided to transfer the load automatically within 5 mS to AC Commercial /Stand-by Mains through isolation arrangement, in case the inverter fails to take load due to any reason. The transfer of Load back to Inverter shall be automatic in case the inverter has tripped momentarily due to sudden Over Load or transients. The transfer time in this case shall also be within 5ms.</p> <p>It shall take place, only after the inverter output has stabilized and is within the specified limits.</p> <p>However transfer of load back to inverter shall be Manual in case the Inverter has developed a Fault.</p>
20	Manual Transfer Switch <i>New Clause added</i>	Manual transfer switch, capable of handling 120% Load of the rated system capacity shall be provided to transfer the load to AC Commercial / Stand-by Mains and back to UPS without the interruption of power to the load.	Manual transfer switch, capable of handling 120% Load of the rated system capacity shall be provided to transfer the load to AC Commercial / Stand-by Mains and back to UPS without the interruption of power to the load.
21	Operating Noise UPS System up to : 10KVA < 50dBA 10KVA to 40KVA <55dBA 40KVA to 100KVA <60dBA 100KVA to 200KVA < 65dBA 200KVA and above <70dBA For Modular UPS System: 20 KVA to 60 KVA <70dBA Up to 120 KVA <73dBA	<p>The fully equipped UPS system at full load shall not contribute noise (weighted) as per the limits mentioned in the Table - 1.</p> <p>The reference ambient noise level is taken as 45dBA. The noise level shall be measured at a distance of 1 metre from the unit and 1.25m above the floor level in the Acoustic Range.</p> <p>The correction factor for Total Noise when the ambient noise level is more than 45dBA shall be as given in the Table - 2.</p> <p>Note: Correction Factor shall</p>	<p>The fully equipped UPS system at full load shall not contribute noise (weighted) as per the limits mentioned in the Table - 1.</p> <p>The reference ambient noise level is taken as 45dBA. The noise level shall be measured at a distance of 1 metre from the unit and 1.25m above the floor level in the Acoustic Range.</p> <p>The correction factor for Total Noise when the ambient noise level is more than 45dBA shall be as given in the Table - 2.</p> <p>Note: Correction Factor shall</p>

		be added to the limit specified to arrive at the limit when the Ambient Noise is greater than 45dBA.	be added to the limit specified to arrive at the limit when the Ambient Noise is greater than 45dBA.
--	--	--	--

Sl. No.	Technical Requirements	Single Phase output	Three Phase output
22	Cooling Arrangement	<p>Natural Convention Cooling or Forced Cooling.</p> <p>Fans can only be used on the front and rear of the unit.</p> <p>Use of fans on the sides of the unit or rack is not permitted.</p> <p>Manufacturer shall also ensure that the failure of the fan does not cause any fire hazard.</p> <p>Failure of fan shall draw Immediate attention of the maintenance staff.</p> <p>Fan shall be switched off when output of the unit fails due to any reason and shall start automatically on the restoration of their output.</p>	<p>Forced Cooling</p> <p>Fans can only be used on the front and rear of the unit.</p> <p>Use of fans on the sides of the unit or rack is not permitted.</p> <p>Manufacturer shall also ensure that the failure of the fan does not cause any fire hazard.</p> <p>Failure of fan shall draw immediate attention of the maintenance staff.</p> <p>Fan shall be switched off when output of the unit fails due to any reason and shall start automatically on the restoration of their output.</p>
23	Metering	<p>There shall be provision on UPS level to monitor the following:</p> <p>i) AC Input Voltage to UPS</p> <p>ii). AC Output Voltage & Current of UPS</p> <p>iii). Output frequency</p> <p>iv). Output Power of UPS in Watts / K. Watts (above 5 KVA)</p> <p>v). DC Voltage to Inverter</p> <p>vi). Battery Current (charge / discharge).</p> <p>The above arrangement shall be made through a Digital meter with LED/LCD display.</p> <p>The Digital meter's display/ Resolution should be such that it is clearly and unambiguously readable from a distance of 1 metre.</p> <p>The display unit shall be provided at a convenient height for easy Readout.</p>	<p>There shall be provision on UPS level to monitor the following:</p> <p>i). AC Input Voltage to UPS</p> <p>ii). AC Output Voltage & Current of UPS</p> <p>iii). Output frequency</p> <p>iv). Output Power of UPS in Watts / K. Watts</p> <p>v). DC Voltage to Inverter</p> <p>vi). Battery Current (charge / discharge).</p> <p>The above arrangement shall be made through a Digital meter LED/LCD display.</p> <p>The Digital meter's Display/ Resolution should be such that it is clearly and unambiguously readable from a distance of 1 metre.</p> <p>The display unit shall be provided at a convenient height for easy Readout.</p>
24	Protections	<p>Adequate Protections shall be provided for :</p> <p>1. DC Reverse Polarity at input (Through Fuse).</p> <p>2. DC Under Voltage</p>	<p>Adequate Protections shall be provided for :</p> <p>1. Reverse Polarity at input (Through Fuse)</p> <p>2. DC Under Voltage</p>

		3. DC Over Voltage 4. Output Voltage High 5. Output Voltage Low	3. DC Over Voltage 4. Output Voltage High 5. Output Voltage Low
--	--	---	---

Sl. No	Technical Requirements	Single Phase output	Three Phase output
25	Over Load	Shall be capable of taking 110% of its full rated load for one hour. In case of excessive over load or short circuit at the output the Inverter shall trip.	Shall be capable of taking 110% of its full rated load for one hour. In case of excessive over load or short circuit at the output the Inverter shall trip.
26	Functional & Alarm Indications	Functional & Alarm Indications shall be provided by means of visual display (LED/LCD) : A).Functional Indications: 1. Mains available 2. Charger on (Boost / Float) 3. Load on Inverter 4. Load on Standby Power B) Alarm Indications: 1) AC Mains Input out of range or AC Mains Fail 2) Charger (FR/FC) Fail 3) Inverter Fail 4) Fan Fail 5) Battery Low or No Battery (separate for each Battery) 6) System Over Load 7) Temp. Sensor Fail/Open 8) Lightning Protection Stage - 2 Device fail. (through PFC)	Functional & Alarm Indications shall be provided by means of visual display (LED/LCD): A) Functional Indications: 1.Mains available (R/Y/B) 2. Charger on (Boost / Float) 3. Load on Inverter 4. Load on Standby Power B) Alarm Indications : 1) AC Mains Input out of range or AC Mains Fail 2) Charger (FR/FC) Fail 3) Inverter Fail 4) Fan Fail 5) Battery Low or No Battery (separate for each Battery) 6) System Over Load 7) Temp. Sensor Fail/Open 8) Lightning Protection Stage - 2 Device fail (through PFC)
27	Audio alarm	Every Alarm condition shall be accompanied with an Audio alarm, with a non locking type Key or push button having audio cut-off facility.	Every Alarm condition shall be accompanied with an Audio alarm, with a non locking type Key or push button having audio cut-off facility.
28	Operating Temperature & RH	0 to 50 Deg C & RH 95% Non condensing	0 to 50 Deg C & RH 95% Non condensing
29	Elevated Burn-in Test <i><u>New Clause added</u></i>	The complete UPS system shall be capable of withstanding a Burn-in test of 50°C for 72 Hours during TSEC and 24 Hours during Bulk QA testing. This test may be performed in a temperature controlled room with free air flow.	The complete UPS system shall be capable of withstanding a Burn-in test of 50°C for 72 Hours during TSEC and 24 Hours during Bulk QA testing. This test may be performed in a temperature controlled room with free air flow.

Sl. No.	Technical Requirements	Single Phase output	Three Phase output												
30	Lightning & Surge Protection: Co-ordinated Stage – 1 & Stage – 2 Protection.	For the protection of Telecom Site against the lightening and high voltage surges Co-ordinated Stage – 1 & Stage – 2 Protection shall be as per GR of Lightening and Surge Protection of Telecom Site (GR No. TEC/GR/FLA/ LSP -001/01/June 2010). Note: This protection will be provided separately at the site at the entry level of the equipment as per the requirement.	For the protection of Telecom Site against the lightening and high voltage surges Co-ordinated Stage – 1 & Stage – 2 Protection shall be as per GR of Lightening and Surge Protection of Telecom Site (GR No. TEC/GR/FLA/ LSP -001/01/June 2010). Note: This protection will be provided separately at the site at the entry level of the equipment as per the requirement.												
31	Stage –2 Protection <u>New Clause added</u>	This protection against, low voltage surges of up to 1.5 KV, shall be provided at the UPS system level. This protection shall be equipped with thermal disconnection and potential free contact for arrestor(s) connected between live & neutral and neutral & earth. This protection shall be in compliance of IEC 62305 & 60364-5-53 for the following values of current:	This protection against, low voltage surges of up to 1.5 KV, shall be provided at the UPS system level. This protection shall be equipped with thermal disconnection and potential free contact for arrestor(s) connected between live & neutral and neutral & earth. This protection shall be in compliance of IEC 62305 & 60364-5-53 for the following values of current:												
		<table border="1"> <thead> <tr> <th>Between</th> <th>Protection Requirement</th> </tr> </thead> <tbody> <tr> <td>R, Y, B & N</td> <td>\geq In: 10KA, 8/20μS for each phase.</td> </tr> <tr> <td>N & PE</td> <td>\geq In: 20KA, 8/20μS.</td> </tr> </tbody> </table>	Between	Protection Requirement	R, Y, B & N	\geq In: 10KA, 8/20 μ S for each phase.	N & PE	\geq In: 20KA, 8/20 μ S.	<table border="1"> <thead> <tr> <th>Between</th> <th>Protection Requirement</th> </tr> </thead> <tbody> <tr> <td>R, Y, B & N</td> <td>\geq In: 10KA, 8/20μS for each phase.</td> </tr> <tr> <td>N & PE</td> <td>\geq In: 20KA, 8/20μS.</td> </tr> </tbody> </table>	Between	Protection Requirement	R, Y, B & N	\geq In: 10KA, 8/20 μ S for each phase.	N & PE	\geq In: 20KA, 8/20 μ S.
Between	Protection Requirement														
R, Y, B & N	\geq In: 10KA, 8/20 μ S for each phase.														
N & PE	\geq In: 20KA, 8/20 μ S.														
Between	Protection Requirement														
R, Y, B & N	\geq In: 10KA, 8/20 μ S for each phase.														
N & PE	\geq In: 20KA, 8/20 μ S.														
		Where In: Value of nominal discharge current 8/20 μ S. Note: Voltage rating of MOVs shall be 320V minimum.	Where In: Value of nominal discharge current 8/20 μ S. Note: Voltage rating of MOVs shall be 320V minimum.												
		Response time of the Stage II device shall be \leq 25 nano seconds.	Response time of the Stage II device shall be \leq 25 nano seconds.												
		The Stage - 2 Protection Device shall be CACT approved.	The Stage - 2 Protection Device shall be CACT approved.												

Sl. No.	Technical Requirements	Single Phase output	Three Phase output
32	Dimensions <u><i>New Clause added</i></u>	The depth of rack/unit shall not be more than 1000 mm from front door (when provided) to rear with door fitted. The width shall not be more than 1000 mm (max) and height shall not be more than 2200mm (max).	The depth of rack/unit shall not be more than 1000 mm from front door (when provided) to rear with door fitted. The width shall not be more than 1000 mm (max) and height shall not be more than 2200mm (max).

Table - 1: Operating Noise

UPS System	Equipment Noise	Permissible Max Noise (weighted) w.r.t Ambient Noise level of 45dBA
Up to 10KVA	<50dBA	5dB
10KVA to 40KVA	<55dBA	10dB
40KVA to 100KVA	<60dBA	15dB
100KVA to 200KVA	< 65dBA	20dB
200KVA and above	<70dBA	25dB
For Modular UPS System		
i). 20KVA to 60 KVA	<70dBA	25dB
ii). Up to 120KVA	< 73dBA	28dB

Table - 2: Correction Factor (C.F) for Total Noise

AMBT. NOISE	C.F	AMBT. NOISE	C.F	AMBT. NOISE	C.F	AMBT. NOISE	C.F
45dBA	0 dB	49dBA	0.86dB	53dBA	2.07dB	57dBA	3.69dB
46dBA	0.18dB	50dBA	1.12dB	54dBA	2.47dB	58dBA	4.17dB
47dBA	0.39dB	51dBA	1.41dB	55dBA	2.82dB	59dBA	4.68dB
48dBA	0.61dB	52dBA	1.73dB	56dBA	3.25dB	60dBA	5.21dB

Note: The correction Factor shall be added to the limit specified of 60dBA to arrive at the limit when the ambient is greater than 45dBA.

Table - 3

UPS System configurations

The following UPS System configurations are proposed:

(i) STANDALONE UPS or STANDALONE (1+1) UPS SYSTEM Configuration:

Category No.	Type of System	Ratings					
		System (Ultimate)	Basic Inverter	Basic rectifier	Static Transfer Switch	Manual Transfer Switch	Battery Capacity
1a	1Ph/1Ph	1 KVA	1KVA	*Inverter + battery requirement	1.2 KVA	1.2 KVA	As per back-up
1b	1Ph/1Ph	2 KVA	2KVA	-do-	2.4 KVA	2.4 KVA	As per back-up
1c	1Ph/1Ph	3 KVA	3KVA	-do-	3.6KVA	3.6 KVA	As per back-up
2a	1Ph/1Ph	5 KVA	5KVA	-do-	6KVA	6 KVA	As per back-up
2b	1Ph/1Ph	6KVA	6KVA	-do-	7.2KVA	7.2KVA	As per back-up
2c	1Ph/1Ph	10KVA	10KVA	-do-	12KVA	12KVA	As per back-up
3a	3Ph/1Ph or 3Ph/3Ph	10KVA	10KVA	-do-	12KVA	12KVA	As per back-up
		15KVA	15KVA	-do-	14.4KVA	14.4KVA	As per back-up
		20KVA	15KVA	-do-	18KVA	18KVA	As per back-up
		30KVA	20KVA	-do-	24KVA	24KVA	As per back-up
3b	3Ph/3Ph -do-	40/60/80/100 120/160/ 200 KVA	40KVA	-do-	120%	120%	As per back-up

(ii) MODULAR UPS SYSTEM Configuration:

Category No.	Type of System	Ratings					
		System Configuration **(N+1)	Basic UPS	Basic Rectifier	Static Transfer Switch	Manual Transfer Switch	Battery Capacity
1a	Three Phase	40KVA (N+1)	10/20KVA	*Inverter + battery requirement	48KVA	48 KVA	As per backup
1b	Three Phase	60KVA (N+1)	10/20KVA		72KVA	72KVA	As per backup
1c	Three Phase	80KVA (N+1)	10/20KVA	-do-	96KVA	96 KVA	As per backup
2a	Three Phase	100 KVA (N+1)	20/25KVA	-do-	120 KVA	KVA	As per backup
2b	Three Phase	160KVA (N+1) (max 2 Racks)	20/25KVA	-do-	192KVA	192KVA	As per backup
2c	Three Phase	200KVA (*N+1) (max 2 Racks)	20/25KVA	-do-	240KVA	240KVA	As per backup
3a	Three Phase	250 KVA (N+1) (max 3 Racks)	20/25KVA	-do-	300KVA	300KVA	As per backup
3b	Three Phase	300KVA (N+1) (max 3 Racks)	20/25KVA	-do-	360KVA	360KVA	As per backup

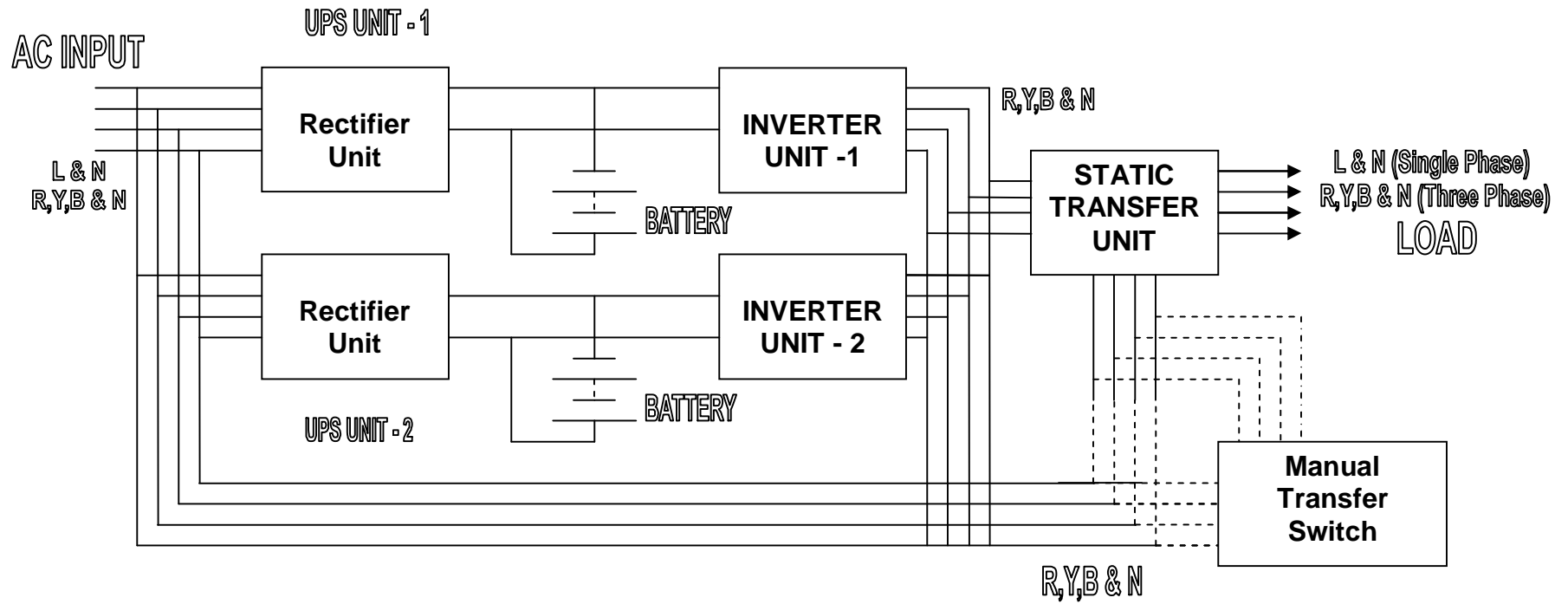
* The rating of **rectifier** shall be sufficient to take care of 1.1 times the Inverter DC load and battery load as per back-up and rate of charging.

** In this configuration **N** is the **desired rating of Basic UPS units** for load as decided by **purchaser**, and 1 is redundant.

Note:

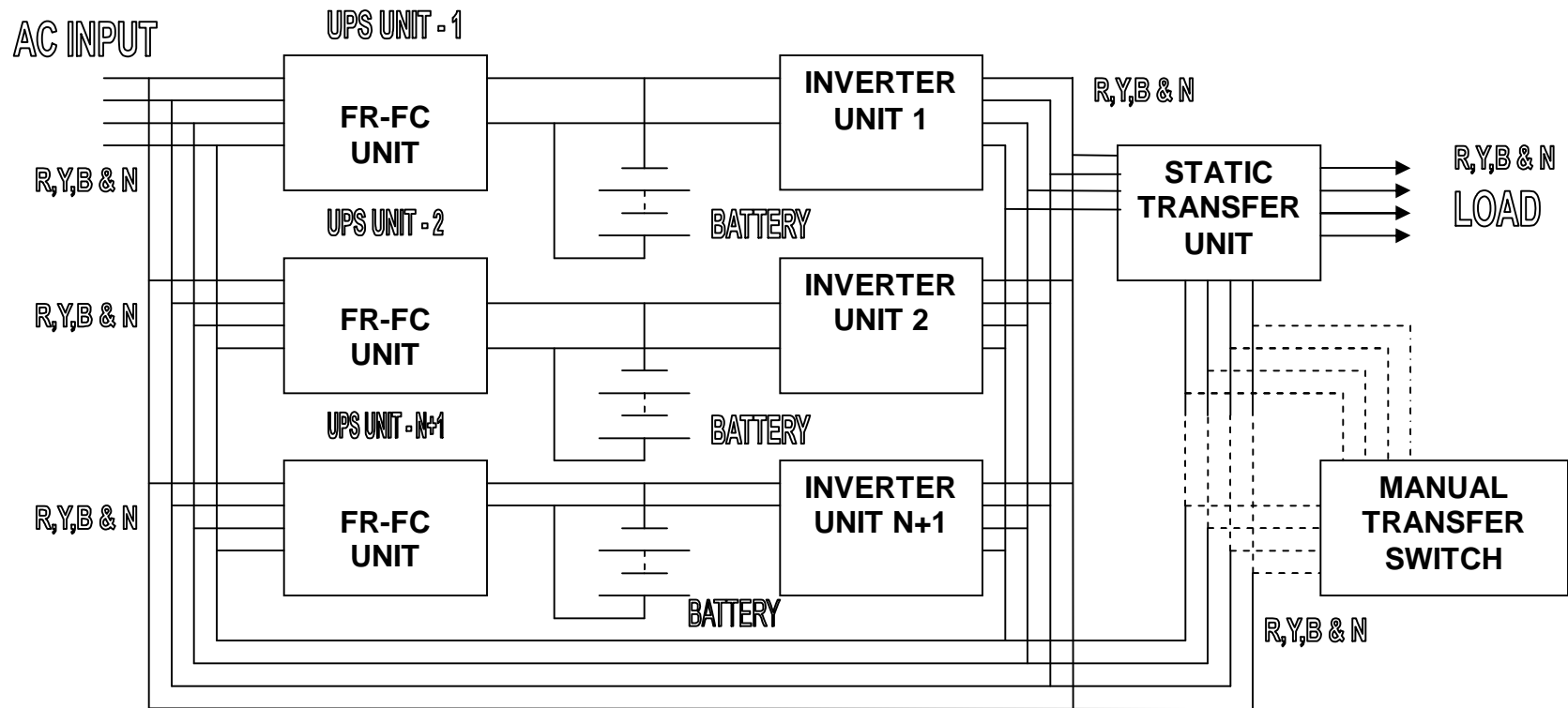
1. TSEC approval shall be accorded for ultimate capacity only. The version of the microprocessor soft-ware shall be indicated in TSEC along with the model number and category.
2. Tendering authority may choose any of the above categories (ultimate capacity) as per load requirements. Load shall include the equipment load and any other load. While choosing the UPS it may also be ensured that the redundancy requirement has been taken care of.
3. Tendering authority shall give the capacity of the battery to be used and battery back up in hours.
4. Tendering authority shall specify Standalone UPS System or 1+1 configuration UPS System or Modular UPS System while Ordering the System.

BLOCK DIAGRAM OF Stand alone or Standalone (1+1) UPS SYSTEM (Fig - 1)



Note: Circuit diagram is indicative for reference.

BLOCK DIAGRAM OF MODULAR UPS SYSTEM
(Fig -2)



Note: Circuit diagram is indicative for reference.