

## **FACTORY ACCEPTANCE TEST PROCEDURE (FAT)**

### **DC POWER SUPPLY**

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## 1. Mechanical & Visual Check Test (DCPS/MODULE)

Sr. No.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
1	<b>MECHANICAL &amp; VISUAL CHECK TEST</b>			
1.1	Visual Inspection of Rack Mechanical, Rack should have good finish all Nut & Bolts Must be secured.	Good Finish & Secured		
1.2	Ensure all PCBs in the rack are marked with a signed Test label & are secured properly in cabinet.	Good workmanship		
1.3	All electrical/ electronic components are secured properly in cabinet.	Good workmanship		
1.4	Ensure all cabling is neat and secure. Proper lugs with heat shrinkable sleeves, labeling have been used.	Good workmanship		
1.5	Ensure Bus Bars are cleaned without burs and fixed properly.	Good workmanship		
1.6	Ensure all electrical components are of specified valued as per work order BOM/DRS schematic diagram/GA Drawing.			
1.7	Ensure Controller module is tested and labeled.			
MODULE				
1.8	Check the fitment of Rectifier module in Rack.	Proper Fitment		
1.9	Visual check for physically damage.	No damage shall be observed		

## 2. Insulation Test. (DCPS)

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
2	<b>Insulation Test.</b>			
2.1	Remove Rectifier Modules, Controller Module and all PCB Cards			
2.2	Remove/ Disconnect Surge Protector and capacitors			
2.3	Perform Insulation test with 500V DC Meggar			
	a) Between AC Input & Earth	>2 Meg Ohm		
	b) Between Output & Earth	>1 Meg Ohm		
	c) AC Input & DC Output	>5 Meg Ohm		

### 3. High Voltage Withstand Test (DCPS)

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
3	High Voltage withstand Test			
3.1	Remove Rectifier Modules, Controller Module and all PCB Cards			
3.2	Remove/ Disconnect Surge Protector and capacitors			
3.3	Perform High Voltage Test as under			
	Between Test Voltage			
	O/P & Earth 0.5KV	should pass for 1 minute		
	O/P & I/P 3.0 KV			
	I/P & Earth 1.5KV			

### 4. Switch On Test (DCPS/Module)

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
4	Switch On Test			
4.1	Make all external connections to the system			
4.2	Switch on the system with or without Dummy Battery (dummy battery may be 48-volt power supply) if required.			
4.3	Insert Rectifier modules and turn on the system's main MCB.	System should turn ON and shows float Voltage on display		
4.4	System shall turn ON; Controller Module shall also turn ON and read the System voltage on display.			

### 5. DCPS Low Voltage/Pre-Alarm Test and High Voltage Limit Test. (DCPS)

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
5	DCPS Low Voltage & High voltage limit test			
5.1	Shut off the system. Connect aux. adjustable. power supply to the battery terminals. Adjust aux. power supply voltage to 52 Volts			
5.2	Slowly reduce power supply voltage and check alarm for DC low/Pre alarm voltage setting.	~45 +/- .5V		
5.3	Check for potential free contact status at the PFC terminal.			
5.4	Now increase voltage of aux power supply voltage to normal value (52V) slowly, DC LOW alarm /Pre alarm shall go off automatically.			

S.NO	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS		REMARK
DC High Voltage Test (DCPS/Module)			DCPS	Module	
5.5	Shut off the system. Connect aux. adjustable power supply to the battery terminals. Adjust aux. power supply voltage to 52 Volts.				
5.6	Slowly increase the power supply voltage and check alarm for DC high voltage setting.	58 +/-0.5V			
5.7	Check for potential free contact status at the PFC terminal.				
5.8	Now decrease voltage of aux power supply voltage to normal value (52V) slowly, DC High alarms, shall go off automatically.				

#### 6. Battery Low Voltage Disconnect Level Test. (DCPS)

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
6	<b>Battery Low Voltage Disconnect Level Test</b>			
6.1	Shut off the system. Adjust aux power supply voltage to 52 Volts			
6.2	Slowly reduce power supply voltage and check LVBD status. Low Voltage contactor shall turn off. The controller shall become off at this point	42+/-0.5V		
6.3	Now turn on the system, the Controller would turn ON and the Low Voltage contactor shall close, and system will become normal			

#### 7. AC Input High and Low Voltage Test (DCPS/ Module)

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
7.	<b>AC Input High &amp; Low Voltage Test</b>			
7.1	Ensure the system is switch ON and input voltage is within limit			
7.2	Increase AC mains slowly through variac. Main Fail alarm shall come around at the Set value. (HV Alarm)	265V+/-10V		
7.3	Now decrease AC mains slowly, alarm reset with in 10V.	265V+/-10V		
7.4	Now Decrease AC mains slowly through variac. Main Fail alarm shall come around at the Set. (LV Alarm)	160V+/-10V		
7.5	Now Increase AC mains slowly, alarm reset with in 10V.	160V+/-10V		

## 8. Rectifier Fail Alarm Test. (DCPS)

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
8	<b>Rectifier Fail Alarm Test</b>			
8.1	Ensure the system is switched ON and normal. Switch off rectifier input MCB and observe the alarm for rectifier fail/major/minor	Rectifier Fail LED shall glow		
8.2	Switch on rectifier input MCB, Rectifier fail alarm disappears.			

## 9. Voltage Regulation Test (DCPS/ Module)

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
9	<b>Voltage Regulation Test</b>			
9.1	Insert all the modules and turn on all AC MCBs.			
9.2	Ensure input AC supply is within range.			
9.3	Put Load on Exchange bus so as equipment is loaded at its 50% capacity and adjust output voltage 53.5V $\pm$ 0.5V			
9.4	Increase the load to 100% capacity and note down the DC voltage.			
9.5	Now decrease the load to 10% capacity and note down the DC voltage.			
9.6	Calculate voltage regulation DCPS/ Module	better than $\pm$ 1%		

## 10. Current sharing Test (DCPS)

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
10	<b>Current Sharing Test</b>			
10.1	Insert all the modules and turn on all AC MCBs.			
10.2	Ensure input voltage is within limit and output voltage is 53.5V $\pm$ 0.5volt.			
10.3	Put the load equal to no of modules (N) x capacity of each module			
10.4	Note down the current given by each module			
10.5	Put the 75% Load on the system and remove one module from the system.	The load shall be taken by other modules		
10.6	Calculate Current sharing of modules	Within $\pm$ 5%		

### 11. Total Output Power Test (DCPS/Module)

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
11	Total output Power Test			
11.1	Ensure input voltage is within limit and adjust output voltage to float voltage i.e., 53.5V.			
11.2	Put the load equal to no of modules (N) x capacity of each module.	TPO = 53.5 X Idc PORM = TPO/no. of module		
11.3	Calculate Total Power output (TPO) and Power output for DCPS and for per rectifier module (PORM)			

### 12. Output Ripple Test (Module)

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
12.1	Ensure the system is running with normal input voltage and load is 100%.			
12.2	Measure the output ripple using CRO and it should be within the defined limit	< 200mv RMS		

### 13. Power Factor Measurement (Module)

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
13.1	Ensure the system is running with normal input voltage and load is 100%.			
13.2	Measure Input AC power factor, through Power meter.	Power Factor Shall be >0.9%		
13.3	Repeat Test at 50% Load.			

### 14. Input Current Limit (Module)

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
14.1	Ensure the system is running with normal input voltage and load is 100%.			
14.2	Measure Input AC Current, through Power meter.	Shall be less. ≤ 18.6A		

### 15. Efficiency Test (Module)

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
15.1	Ensure the system is running with normal input voltage and load is 100%.			
15.2	Refer the readings taken for rectifier total power output in watts, and measure the input power in watts			
15.3	Calculate the Efficiency = $\text{eff} (P_o/P_i) \times 100$	Should > 90%		
15.4	Repeat test at 50% Load.	Should > 88 %		

### 16. Hot Plug-In Test (DCPS)

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
<b>16</b>	<b>HOT PLUG IN TEST</b>			
16.1	Switch on all the rectifier and pull-out rectifier no. 1 in live condition again			
16.2	Plug in inside rack. The module shall become alive.			
16.3	No damage/ drift shall occur.	No Damage/ Drift		

### 17. Calibration & Parameter setting test. (DCPS)

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
<b>17</b>	<b>Calibration Test</b>			
17.1	DC Voltage: Note the DC voltage displayed on Controller display, Measure DC output Voltage with a standard Digital multimeter.			
17.2	Calculate the accuracy	+/-1.5%		
17.3	Put 100% load on system. Partly on load side and partly on Battery Side. Measure the shunt mv using standard multimeter and calculate the battery current & Rectifier Current.			
17.4	Calculate the accuracy.	+/-1.5%		



**18. Automatic Mode change over Float to charge (Boost) mode Test. (DCPS)**

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
<b>18</b>	<b>Automatic Mode change over Float to charge (Boost) mode</b>			
18.1	For testing purpose, Set the discharge AH threshold for charge as 1AH or Set the Voltage threshold i.e., low voltage at which boost transfer need to be activated			
18.2	Discharge the battery for some time till battery is discharged blow for 1AH or discharge blow set value of Voltage threshold.			
18.3	Switch ON the mains when desired AH or discharge voltage is reached and observe that controller goes to boost mode.			
18.4	Charge (Boost) to Float mode transfer			
18.5	Set charge factor 90% and 1 minutes.			
18.6	Allow to battery recharge after switch on the mains.			
18.7	Observe the boost to float mode transfer. It should take place on reaching time period (max duration) or upon charge factor (%)			

**19. Battery Path Current Limiting Test. (DCPS)**

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
<b>19</b>	<b>Battery path Current Limiting Test</b>			
19.1	Connect a variable load on battery terminals. See the battery current limit setting from the controller/ connecting the controller to PC.			
19.2	Switch on the system and increase the load beyond set point and observe the output voltage. Note down the set point and actual current value at which voltage start dropping.	When load exceed the set value, the output voltage will start decreasing.		

**20. Battery Charging and Full Load Current/Voltage drop Test. (DCPS)**

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
<b>20</b>	<b>Battery Charging &amp; Full Load Current Test</b>			
20.1	Battery Charging test: Same as that of SI no 19 above.			
20.2	<u>Full Load/Voltage drop Test</u> Remove the load from Battery terminal and now put the load-on-load terminals to the system rating and observe the overload alarm. The alarm should appear on display as overload alarm.	System Overload alarm shall come at >100% of system capacity.		
20.3	Remove the excess load and make the system normal.			

**21. Total Harmonic Distortion Test (THD) (DCPS)**

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
<b>21</b>	<b>THD Test (Voltage)</b>			
21.1	Put nominal load at the output of the system at nominal input AC voltage.	THD should not be more than 5 %		
21.2	With power analyzer measures the voltage THD & record.			

**22. Burn in Test (DCPS)**

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
<b>22</b>	<b>Burn in test (This test shall be conducted on only one sample)</b>			
22.1	Load the system with the nominal load at nominal input AC Voltage at temperature of 50 degree for 8 hours.	There should not be any failure of components in the system.		
22.2	Let the system run for 8 hr. under above condition.	If failure is observed, same component must be replaced, and system should again go for burn in		
22.3	Observe the system during the test. No failure of component / drop in output voltage should take place			

### 23. Psophometric Noise Test (On Module)

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
<b>23</b>	<b>Psophometric Noise test</b>			
23.1	Set Input voltage at within limit			
23.2	Put 100% load at the output.			
23.3	Read psophometric noise at DC output by using psophometer.	shall be less than 2 mV		

### 24. Input AC Frequency Range Test (On Module)

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
<b>24</b>	<b>INPUT AC FREQUENCY RANGE TEST</b>			
24.1	Adjust the input voltage to nominal and put the load less than module rating.			
24.2	Decrease input frequency to 48 Hz keeping load same. Measure Output voltage.	Output voltage shall be in +/-1% reg. Limit. Output voltage shall be in +/-1% reg. Limit		
24.3	Increase input frequency to 51.5 Hz keeping load same. Measure Output voltage.			

### 25. Rectifier Dynamic Response Test (On Module)

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
<b>25</b>	<b>Rectifier Dynamic Response</b>			
25.1	Ensure input voltage is nominal within limit			
25.2	Adjust output voltage at 53.5V +/- 0.5 Volt at full load.			
25.3	Vary the load from 90% to 10% and observe the change in output voltage. The output voltage should not vary more than 5% of set value and should recover within 50msec.	The o/p voltage should increase beyond $\pm 5\%$ and should recover within 50msec		
25.4	Vary the load from 10% to 90% and observe the change in output voltage. The output voltage should not vary more than 5% of set value and should recover within 50msec	The o/p voltage should increase beyond $\pm 5\%$ and should recover within 50msec		

**26. Output Short Circuit Test (On Module)**

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
26	Output short circuit test			
26.1	Switch Off the module and short circuit the output terminal by solid conductor/ bus bar. This is to avoid any flash over during the testing.			
26.2	Switch ON the module	O/p shall droop & recover after removing short circuit.		
26.3	The controller will remain OFF due to short circuit and zero output voltage. RED LED will glow on rectifier module.			
26.4	Switch OFF the module and remove short circuit.			
26.5	The module should get ON and output voltage should be normal to float voltage.			

**27. Hold-up Time Test (On Module)**

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
27.	Hold up time test			
27.1	Switch on the module at nominal input at no load condition.			
27.2	Let module develop nominal output voltage. 53.5V and switch off the mains.			
27.3	Measure the time taken to have the output voltage dropped to 42 volts using oscilloscope to measure the time to reach 42 v from 53.5. +/- 0.5V steady state. It should not reach less than 20msec.	> 20 mSec		

**28. Source -1 & Source -2 Interlocking Test**

SR.NO.	TEST & PROCEDURE	SPECIFICATION	OBSERVATIONS	REMARK
27.	Source -1 & Source -2 Interlocking Test			
28.1	If any source (Source -1 & Source-2) out of two available in charger.	Rectifier is on & charge the Battery & take care the load.		

## Standard FAT procedure-DC POWER SUPPLY

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### Remarks

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Tested By \_\_\_\_\_  
(MANUFACTURER)

Witnessed By \_\_\_\_\_  
PrKTCL

Date \_\_\_\_\_

Date \_\_\_\_\_

## 29. BURNIN TEST REPORT

Unit :
Owner:
Main Contactor :
Manufacture :
DCPS Sr. No :
Test Start on :

Float Cum Boost Charger At full load.

S.no	Time	DC Amp	Room Ambient Temp	Rectifier Temp	Inside Cabinet Temp	O/P Voltage	Remark

### Remarks

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Tested By \_\_\_\_\_  
(MANUFACTURER)

Witnessed By \_\_\_\_\_  
PrKTCL

Date \_\_\_\_\_

Date \_\_\_\_\_