VPRS-4175E
POWER SUPPLY SYSTEM
OPERATION MANUAL

220V AC 1Phase Input

-54.5VDC Output

175Amps per Shelf

35Amps per Module
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Safety Tips

**For Your Safe Operation…**

- Before starting the installation, operation, test and repair work, please read carefully all of the directions specified in this manual for your safe operation of the system.
- This product has been manufactured under strict quality management. If there are any potential damages to human life or assets, please contact Dongahelecomm.
- This document deals with safety directions with the following symbols.
WARNING
If you deal with this system without observing this symbol, it may cause death or critical injury.

CAUTION
If you deal with this system without observing this symbol, it may cause an injury or damage to assets.

〈Check of Contained Materials〉

- Make sure that the delivered product is the same one that you ordered.
- Check first the quantity of the delivered articles as specified in the enclosed sheet. Then, make sure that there are any missing parts, deformation, damage, peeled out paints, unscrews or damage of cables.

〈Directions in Storage〉
• Do not put this product package in a place where water or rain drops, there are any harmful gas or liquids or direct lay of light reaches.
• Do not store this product under high temperature and humidity conditions.

Directions in Operation

Injury, Electric Shock, Fire

• Do not run this system in a place with flammable or corrosive gases, dewdrops or humidity. (It may cause an electric shock or fire.)
• Do not try to modify this product. (It may cause an electric burn or fire.)
• Operate this system under the environmental conditions specified in this manual. Take particular attention to voltage, frequency, temperature, humidity and vibrations. (Violating the environmental requirements may cause an electric shock or fire.)
• Before connecting the battery wire, load and grounding wire, pay attention not to reverse the polarity of them. (Polarity reversal may cause fire.)
• While the system is on, do not touch the battery wire, load or grounding wire ports. It may cause an electric shock or short circuit.
• Pay attention not to reverse polarity of signaling cables and detection cables when connected. (It may cause a fire.)
• Do not leave alien materials such as sheathes of electric wires, screws and so on inside the product. (It may cause an electric shock or fire.)
• DC output is connected to the battery before the system starts to be driven. Pay close attention not to cause an electric shock or short circuit.
• When the rectifier units are added, pay close attention as AC input voltage is fed to the Connector in the Shelf side. (It may cause an
<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
</table>
| electric shock.)
| • When you take apart or insert a rectifier unit from/to the Shelf, pay close attention not to have a burn as the part has been heated. (It may cause an injury.)
| • Do not put your finger or other things to the rectifier unit fan. (It may cause an injury.)
| • When you extend units, pay close attention not to arise an accident of short circuit. (It may cause an electric shock.)

<table>
<thead>
<tr>
<th>IMPORTANT</th>
</tr>
</thead>
</table>
| • When cables are connected, battery should be separated from the rectifier system except one point of the conductor at each cell.
| • Start operation after the connections of battery wire, load, and grounding wire are taken apart from NFB and fuses.
| • Connect the battery wire, load and grounding wire while the load side has been unloaded.
| • External transmission signal should be used at 60V or lower of input voltage and 0.5A or lower of circuit current.
| • Before you take apart or insert the RS232C and RS485 ports of the control module, turn off the control module switch.
| • When you take apart or insert the rectifier unit from/to the rectifier system, turn off the rectifier unit switch.
| • Rectifier unit should be inserted and taken apart in line with the guide rail of the rectifier system.
| • Tightly join the unit fixing screws, and then, turn on the input switch of the rectifier unit.
| • As AC input may be fed to turned on system while power is failed, special care should be paid to check and maintain the AC input.
《Test & Repair》

Electric Shock, Fire

- Qualified labor should perform test and repair work periodically with designated methods. (Violating this direction may cause an electric shock or fire.)
- Only qualified labor with due knowledge and experience should repair this product. (Violating this direction may cause an electric shock or fire.)
- As AC input and DC voltage are applied, take particular attention not to have electric shock or short circuit when the system is tested or repaired.

《Disposal》

- This product should be disposed under the ordinary industrial wastes disposition procedure.
1. System Specifications

1.1 Electric Characteristics

1.1.1 Input Characteristics

1) Rated input voltage : 1Φ 3W 220Vac
2) Input voltage : 90V ~ 280V
3) Input frequency : 45Hz ~ 65Hz
4) Input rush current : 50Apeak or less (per rectifier module)
5) Efficiency : 90% or greater (at 10% ~ 100% load)
6) Power factor : 98% or greater (at 10% ~ 100% load)

1.1.2 Output Characteristics

1) Rated output voltage : -54.5V ±0.545V
2) Operating voltage : -40.0V ~ -59.0V

3) Output current  : max. 100A (35A × 5 Modules:N+2)

4) Output distribution circuit : Refer to Table 1)

Table 1) Output Distribution

<table>
<thead>
<tr>
<th>NO</th>
<th>Output Port</th>
<th>Class</th>
<th>Cap.</th>
<th>Volt.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>L1~4</td>
<td>DC</td>
<td>32A : 4PORT</td>
<td>-54.5V</td>
<td>Load voltage supply #1 ~#4</td>
</tr>
<tr>
<td>2</td>
<td>L5~8</td>
<td>DC</td>
<td>20A : 4PORT</td>
<td>-54.5V</td>
<td>Load voltage supply #5 ~#8</td>
</tr>
<tr>
<td>3</td>
<td>L9~10</td>
<td>DC</td>
<td>10A : 2PORT</td>
<td>-54.5V</td>
<td>Load voltage supply #9 ~#10</td>
</tr>
<tr>
<td>4</td>
<td>BATTERY#1</td>
<td>DC</td>
<td>150A : 1PORT</td>
<td>-48V</td>
<td>#1 Battery power supply</td>
</tr>
<tr>
<td>5</td>
<td>BATTERY#2</td>
<td>DC</td>
<td>150A : 1PORT</td>
<td></td>
<td>#2 Battery power supply</td>
</tr>
</tbody>
</table>

5) Stability of input and load : ±0.5% (±0.27V) or less

6) Output current limitation : at 105% ~ 130% (40% during derating)

7) Output over voltage protection : Suspend rectifier module at 59.0V ~ 60.0V.

8) Battery over discharge protection : Suspend battery at 42.0V ±0.2V.

9) Output Ripple / Noise : 100mV or less at peak point

1.2 Safety Specifications
1.2.1 Electro Magnetic Interference (EMI)
→ FCC PART 15 SUBPART B, CLASS A
- 450kHz≤ f ≤ 1.6MHz : 1mV (60dB μV) or lower
- 1.6MHz≤ f ≤ 30MHz : 3mV (69.5dB μV) or lower

1.2.2 Surge Voltage of Power Cable
→ Voltage → 6kV (1.2 ×50 μs), Current → 3kA (8 × 20 μs)

1.2.3 Leaked Current
→ 10mA or lower

1.3 Environmental Characteristics

1.3.1 Operating Temperature & Humidity
-10°C ~ +55°C, 10% ~ 95%

1.3.2 Storage Temperature & Humidity
-40°C ~ +80°C, 5% ~ 95%

1.4 Physical Specifications

1.4.1 Dimension
VPRS-4175E Rectifier Shelf ⇒ 310.3(H) X 482.6(W) X 421.7(D) (mm)
VPRM5435 Rectifier Module ⇒ 122.5(H) X 85(W) X 405.5(D) (mm)
1.4.2 Weight

VPRS-4175E Shelf ⇒ 20 Kg (w/o 5 rectifier modules)

VPRM5435 Rectifier Module ⇒ 3.6 Kg

2 Rectifier System Configuration

2.1 Configuration

The VPRS-4175E rectifier system accommodates max. 5 rectifier units (VPRM5435). The rectifier system contains control panel (VPRC-175E) and DC distribution panel. (See Figure 1 Exterior View). The control panel is located at the front panel of the distribution frame at the rectifier Shelf top. DC distribution frame contains 10 circuits for load supply and 2 circuit for battery connection. This rectifier has been designed to charge the battery with positive ground, and can be used for the system without any battery installed or connected. Rectifier capacity can easily be built up by adding modules.

2.2 Front View

Figures 1 shows the exterior view of the rectifier.

2.3 Functions

Table 2) Rectifier System Functions

<table>
<thead>
<tr>
<th>Classification</th>
<th>No. of Modules</th>
<th>Function</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectifier Module</td>
<td>5</td>
<td>Receives AC 110V/220VAC, and feeds DC-48V to load and charges the battery.</td>
<td>Basically 3ea</td>
</tr>
<tr>
<td>[VPRM5435]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control Panel</td>
<td>1</td>
<td>Controls up to 5 rectifiers, sends out alarms.</td>
<td></td>
</tr>
<tr>
<td>[VPRC-175E]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC distribution frame</td>
<td>1</td>
<td>Receives 1Φ 3W 220Vac.</td>
<td></td>
</tr>
</tbody>
</table>
DC distribution frame

1

Distributes output power, and connects battery.

Figure 1  Exterior View of VPRS-4175E
2.4 Rectifier System Block Diagram
3 Initialization & Check Points

3.1 Installation Check List

To check installation of the system, take the following procedure:
1) Check if the Shelf has been fixed to the floor.
2) Check if the battery charge temperature compensation probe has been fixed.
3) Check if NFB has been installed in the DC distribution frame.
4) Check if the battery has been correctly connected.
   If the battery polarity is reversed, relay will not work when power is fed.
5) Check if the battery C/B is in the ON Position.
6) Check if the Shelf frame ground has been connected to the main ground busbar.
7) Check if the AC input ground has been connected to the main ground busbar.
8) Check if the I/O cable has been correctly connected.
9) Check if the rectifier modules have been fully inserted.

Once all of the cabling and installation procedures are finished, initialize the system and carry out the function test in the following order.

1) Check if all of the power switches have been turned off, and check polarity and cable connection status of batteries using DVM.
2) Check if the input power has been correctly connected and check the input voltage using DVM.
3) Check if the output cables have been correctly connected, and check polarity.
4) Turn on the AC power switch at the right side of each shelf.
5) Check if the STB LED at the rectifier module is turned to yellow. Then, turn on the module switch.
6) Check if the POWER LED at the rectifier module is green. Then, turn on the power switch of the control panel, and check error status on the display window.

3.2 Rectifier Module Insertion & Deletion

3.2.1 Rectifier Module Insertion

Rectifier module should be inserted from the left top side of the Shelf. So insertion should made from left to right and from top to bottom. Turn off the power switch of each module. Then, insert it until it reaches the end of the Shelf. Then, tighten the captive screws at the front panel and turn on the power switch.

Keep the switch ON while the rectifier is in operation.

3.2.2 Rectifier Module Deletion

Turn off the power switch of the module. Then, loosen the captive screws on it. Pull out the module seizing the handle on it. Before starting the action, wait for about 1 minute until the LED is turned off.

Caution: Turn off power switch when taking apart a module.

3.3 Normal Operation

Default setting of the output voltage of this rectifier is BTC-FL MODE. NORMAL LED and DCV LED at the control panel are turned on. The LCD window provides information on the rectifier. Using the push button switches [F1(▼), F2(EDIT), F3(ENT), F4(▲)] at the LCD window, user may query or modify setup values. (See Figure 3.)
3.4 Abnormal Actions/Corrective Measures

If FAIL LED is turned on while the rectifier system is driven, that means the rectifier system is abnormal in operation. Alarm status is displayed on the LCD window of the control panel. Check the alarm status and take proper actions.
Figure 4. Control Panel Front Status Indication (Error)

Table 4) Corrective Actions per Alarm

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Corrective Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>MF</td>
<td>If rectifier unit communication is failed,</td>
</tr>
<tr>
<td></td>
<td>⇒ Insert the module to the rectifier system until it reaches the end.</td>
</tr>
<tr>
<td></td>
<td>If rectifier unit is off,</td>
</tr>
<tr>
<td></td>
<td>⇒ Turn on the power switch of the unit.</td>
</tr>
<tr>
<td>DCOV, DCUV</td>
<td>Check default setting of output voltage.</td>
</tr>
<tr>
<td></td>
<td>Check output UV and OV alarm settings.</td>
</tr>
<tr>
<td>ACUV, ACOV</td>
<td>Measure actual input voltage using DVM.</td>
</tr>
<tr>
<td>LVD</td>
<td>Check if the battery disconnector switch is in Normal.</td>
</tr>
<tr>
<td></td>
<td>Check if the battery has been normally connected.</td>
</tr>
<tr>
<td>B-NFB</td>
<td>Check if battery(#1,#2) C/B OFF Position.</td>
</tr>
<tr>
<td>OCA</td>
<td>Check the input voltage, and check if the output is open.</td>
</tr>
<tr>
<td></td>
<td>(See How to Operate Control Unit.)</td>
</tr>
</tbody>
</table>

☞ If the listed problem is not solved after the recommended actions are taken, or if other problems occur, contact A/S center.

4 Rectifier Module Configuration

Voltage Adjustment Resistor

Power on LED
4.1 Standby/Operating Switch

During the operation, the module should be in Operating Mode. If the switch is in Standby mode, output is not fed. *Caution: Even though the switch is in Standby mode, AC power will be fed to the module, and the STB LED on the rectifier module will be turned on.*

4.2 POWER ON LED

This LED is turned on (green) when the module is normal.
4.3 STB LED

The rectifier module is in standby mode, and does not feed output.

*Caution: Even though the STB LED is turned on (yellow), AC power will be fed to the module.*

☞ While AC power is input, rectifier unit turns on POWER ON LED. When communication with the control panel is failed or when rectifier module output OC alarm (OCA) is driven, STB LED (yellow) and POWER ON LED are turned on simultaneously.

4.4 ALARM LED

In one of the following conditions, ALARM LED(RED) will be turned on:

* When AC power exceeds UV/OV limits (UV limit : 90V, OV limit: 280V);
* When the module is shut down due to output OV protection circuit driving;
* When the module is shut down due to internal high temperature protection circuit driving;
* When the voltage falls below UV limit due to current limit circuit driving;
* When internal fan is failed;
* When the module is shut down due to an external signal (Green, yellow and red LEDs are blinking.)
* When output is not made due to other problems, or when the voltage falls below UV limit.

4.5 ADJUSTMENT VR

This function enables to calibrate output voltage of the rectifier module. Turn the
VR to the right to add voltage. Turn it to the left to decrease voltage. Output voltage has been set to 54.5V. It is recommended not to touch the setting. Load sharing deviation among units may be adjusted.

5  Control Panel Operation

5.1 DISPLAY

![Control Panel Front View](image)

Figure 6. Control Panel Front View

5.2 Control Panel Functions


Table 5) Adjustments Menu Defaults
### CLASSIFICATION

<table>
<thead>
<tr>
<th>CLASSIFICATION</th>
<th>AVAILABLE RANGE</th>
<th>DEFAULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL Voltage</td>
<td>-44.0 ~ -59.0V</td>
<td>-54.5V</td>
</tr>
<tr>
<td>EQ Voltage</td>
<td>-44.0 ~ -59.0V</td>
<td>-56.0V</td>
</tr>
<tr>
<td>AC INPUT OV/UV ALARM</td>
<td>Fixed Value</td>
<td>291Vac / 89Vac</td>
</tr>
<tr>
<td>AC INPUT OV/UV S/D</td>
<td>Fixed Value</td>
<td>296Vac / 84Vac</td>
</tr>
<tr>
<td>DC OUTPUT OV/UV</td>
<td>-48.0 ~ -59.0V, -42.0 ~ -52.0V</td>
<td>-57.0V / -43.0V</td>
</tr>
<tr>
<td>Output Current Limit</td>
<td>40% (when input voltage is 180V or less)</td>
<td>40% or 105%</td>
</tr>
<tr>
<td>105% (when input voltage is 190V or higher)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Battery Charge Current Limit</td>
<td>OFF/ 10A ~ 200A</td>
<td>60A</td>
</tr>
<tr>
<td>Battery Charge Current</td>
<td>10A ~ 200A</td>
<td>50A</td>
</tr>
<tr>
<td>Battery Charge End Current</td>
<td>2A ~ 100A</td>
<td>5A</td>
</tr>
<tr>
<td>Temp Mode</td>
<td>ON/OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Battery Charge Slect</td>
<td>Auto</td>
<td>Auto</td>
</tr>
<tr>
<td></td>
<td>Manual (FL MODE/EQ MODE)</td>
<td></td>
</tr>
<tr>
<td>Battery Emergency Voltage</td>
<td>-42.0V ~ -48.0V</td>
<td>-44.0V</td>
</tr>
</tbody>
</table>

5.3 Control Panel Operation

*See Control Panel Operation Manual.*

6 Manual Battery Disconnect

Manual BATTERY DISCONNECT switch : C/B(Circuit Breaker) type located at the rear side of the front panel. When the C/B is in ON position, it connects the battery to the rectifier and the system. (Rectifier is normal and output voltage is 46V or higher.)

Normal operation state.

When it is in OFF position, it separates the battery from the rectifier and the system. (When battery is repaired or replaced.)
7 Rectifier System Operation & Stop Operation

7.1 Rectifier System Operation

① Turn on the AC power switches at the rectifier unit top.

② Yellow LED on each rectifier unit will be turned on.

③ Turn on the switch of each rectifier unit.
④ Turn on the power switch of the control unit.

⑤ Check if the rectifier system name displayed at the LCD of the control unit matches the actual rectifier Shelf installed.

⑥ Check if the STATUS LED indicates normal.

7.2 Rectifier System Stopping (LOCAL)

① Turn off the switch of each rectifier unit.

② Yellow LED on each rectifier unit is turned on.

③ Turn off the main breaker at the distribution panel.

④ Turn off the power switch of the control unit.

7.3 Battery Temperature Compensation (BTC mode in TEMP ON)

As shown in the Rectifier Installation Manual, install the Battery Temperature Compensating Probe near the battery Shelf. Once the temperature probe is connected, and set to BTC mode, the system will operate in temperature compensation mode. If the Temp saner probe is taken out, TEMP OUT is displayed and temperature compensation will not operate. Then, the system will return to the operator defined mode (FL/EQ).
* FL Charge Mode

![Diagram of FL Charge Mode]

```
<table>
<thead>
<tr>
<th>Actual Temperature</th>
<th>Corrected Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>32°C (90°F) or above</td>
<td>2.20V/Cell</td>
</tr>
<tr>
<td>25°C (77°F)</td>
<td>2.24V/Cell</td>
</tr>
<tr>
<td>15°C (59°F)</td>
<td>2.30V/Cell</td>
</tr>
<tr>
<td>5°C (40°F) or below</td>
<td>2.35V/Cell</td>
</tr>
</tbody>
</table>
```

Figure 8. BTC-FL MODE

* EQ Charge Mode
Figure 9. BTC-EQ MODE

7.4 Output Voltage FL Chage Mode Select (TEMP OFF)

☞ Default is AUTO FLOAT MODE.
1) Manual – FL
   Output voltage is maintained constantly at –54.5V.

2) Auto - FL
   Auto-FL mode is maintained while the Auto-EQ Mode condition is not met.

7.5 Output Voltage EQ Charge Mode Select (TEMP OFF)

☞ Do not charge the battery too much in EQ mode. Due to high charge voltage,
   battery cell may be over-charged shortening the life of the battery.

1) Manual - EQ
   Output voltage is maintained at –56.0V.

2) Auto - EQ (Time, Cycle, etc)
   • When the rectifier is initialized, it will operate up to 32 hours at AUTO-EQ
     mode automatically. That is because the battery may have been discharged in
     the storage process.
   • If AUTO-EQ is selected, EQ charge is started, and auto-EQ mode is
     maintained until 10 minutes pass after current falls below battery end current
     limit.
   • EQ state is maintained for up to 32 hours after EQ charge gets started.
   • If EQ charge period exceeds 90 days, the mode will automatically be changed
     to Auto-EQ mode.

* In TEMP ON mode, the system will operate at BTC-EQ and BTC-FL mode.
  Output voltage will change depending on the temperature in the battery
  Shelf. (For output voltage depending on temperature change, see 7.4 or
  Control Panel Operation Manual.)
7.6 Rectifier Module Restart

7.6.1 When Module is Shut Down by Over Voltage

If output voltage is suspended due to OV, and then fully shut down due to regeneration in 5 minutes, manually set off the switch on the front panel to standby location, and then set on the switch to ON location.

7.6.2 Rectifier Unit Thermal Shut Down

If internal temperature of the unit hikes, the unit will be shut down by its protection circuit. To restore the module, push the switch at the rectifier unit front to OFF and then push the switch again to ON manually.

7.7 Battery Charge Current Limitation

This function enables user to set ON or OFF. Default is OFF. In that case, the maximum value of charge current equals the output current limit of rectifier, which means max current limit of the installed rectifier modules. (See Table 5.)

7.8 Control Panel Power Drop

If power of the rectifier system falls below 42.0V due to commercial power failure, all of the control panel functions will be suspended. However, all of set values will be maintained.

8 Control Panel Setup & Measurement
8.1 Control Panel Setup & Functions

User may edit the alarm and operating voltage of the control panel using the FUNCTION keys. If any further information is provided, every value should be set with default value.

8.1.1 Float voltage setting
8.1.2 Equalize voltage setting
8.1.3 Output OV alarm setting
8.1.4 Output UV alarm setting
8.1.5 New password setting
8.1.6 Battery charge current limitation setting
8.1.7 Battery charge end current setting
8.1.8 Battery charge start current setting
8.1.9 Temp ON/OFF setting
8.1.10 Battery charge mode setting
8.1.11 Battery emergency voltage setting
8.1.12 Alarm History Clear
8.1.13 Alarm Sound Setting


8.2 Control Panel Measurement

Control panel displays various measurements related with the operation of the rectifier system at the front LCD window and the meter window, and displays alarm and operation status indications.
8.2.1 Input voltage measurement
8.2.2 Output voltage/current measurement
8.2.3 Battery charge/discharge current measurement
8.2.4 Current measurement per unit
8.2.5 Rectifier system alarm monitoring


9 Rectifier Test & Maintenance

9.1 Overview

The purpose of this document is to provide guidelines to test the system, setup measures to restore the system within a shortest possible time when any fault occurs to the system. In addition, this manual enables to restore any problem in the system in a short time to normal state. Enough amounts of spare parts must be prepared to repair fault units. Even though the fault location and reason are detected under the guidelines of this Manual, if field repair work is not possible, or long period of time is needed for repair, the fault units should be replaced with spare ones reserved. Then, the fault units can be repaired with enough amount of time.

Note : As this rectifier uses AC voltage, it may cause electric shock. As battery voltage is fed to the system, safety measures should be taken to repair and maintain the system. As the battery generate a large amount of DC current, worker should take off watch, ring or other metallic accessories.

9.2 Periodic Inspection

To guarantee effective operation of the system, periodic inspection is required. Periodic inspection should be carried out one time per 6 months.
1) Take care not to block the air ventilation holes with dusts or other alien materials.
2) Check the connection and tightening state of cables.
3) Check if internal temperature of the site is maintained in rated level.
4) Check rectifier operation state and alarm state with naked eye.
5) Check fixing on the floor and water leakage on the installation site for the rectifier system.

9.3 Adding Rectifier Module

To expand the system capacity, rectifier modules may be inserted to vacant slots.

1) Check if the Standby/Operate switch of the module is set to ‘Standby’.
2) Insert a rectifier module to a corresponding slot, and tighten the captive screw on it.
3) Set Standby/Operate switch of the module to ‘Operate’.
4) Control panel will automatically set current limit of rectifier.
   As current limit is set to 50% or 110%, current limitation is made considering the number of rectifier modules within this range.
5) Verify the voltage and current set on the LCD screen.
   * Check load share of each rectifier unit. For details, see Control Panel Operation Manual.
6) If total current does not increase after a new module is inserted, check if the module has any problem on it, and check the ID setting of the rectifier module.
7) Check if the rectifier generates any alarm or has any errors on it.
10 Problem Solving & Fault Fixing

* Repairing or problem fixing of the rectifier should be necessarily carried out by experienced workers observing safety directions.
  * Jobs should be carried out in due order.
  * Workers should not wear rings, watches or metallic accessories.
  * If non-insulated conductors are used, check using DVM if voltage is fed to them.

- Battery capacity may not be enough to complete the maintenance work of the system.
- Circuits and boards should be protected from EMI.
10.1 Problem Solving

This rectifier has been designed for users to solve problems easily. The LCD window of the control panel displays details of faults.

10.2 Replacing Parts

If a fault is suspected on a particular point, circuit board of that point should be replaced. Replacing or replacement of individual circuits should not be made in fields. Field replaceable units are limited to fan on a rectifier module, distribution panel fuse and NFB.

10.3 Order of Replacement

10.3.1 Replacement of Rectifier Module (VPRM5435)

1) When a rectifier module is replaced, alarm will be driven. Turn off the rectifier module from the control panel, or notify this fact to the person in charge.
2) Set the switch of the rectifier module to ‘STB’.
3) Turn the captive screw of the module counter clockwise. Then, take out the module from the shelf seizing the handle on it.
4) Check if the switch of the new module is set to ‘STB’. Then, push it to the end of the shelf along the slide.
5) Turn the captive screw of the module clockwise. Then, fix it to the shelf.
6) Set the switch of the rectifier to ON position.
7) Check if the module operates normally, and if any alarm is driven on it.

10.3.2 FAN Replacement of Rectifier Module

FAN should be replaced in the following order:
1) When a rectifier module is replaced, alarm will be driven. Turn off the rectifier module from the control panel, or notify this fact to the person in charge.

2) Set the switch of the rectifier module to ‘STB’.

3) Turn the captive screw of the module counter clockwise. Then, take out the module from the shelf seizing the handle on it.

4) Loosen the 4 screws at the both sides of the rectifier module, and separate them from the module.

5) Take apart the FAN connector of the separated front panel and power switch connector from the rectifier module.

6) Loosen the 4 nuts fixing the front panel to the fan.

7) Separate the fan, front panel and fan grill.

8) Replace the fan, and then take the opposite direction from 7) to 4). For fan assembly, make the arrow mark on the fan facing inner side of the module. Fan connector cable should face downward, and then assemble it.

9) Check if the switch of the module to be replace is set to “o” position (STB state), and then push it to the shelf along the slide until it reaches the end.

10) Turn the captive screw of the module clockwise to fix it.

11) Operate the module pushing down the switch.

12) Check if the module operates normally, and if there are any alarms on it.
10.3.3 Replacement of Surge Protector

① Get rid of the rear cover from the rectifier system rear.
② Pull out with a hand the part to be replaced from the SURGE PROTECTOR at the rear.
③ Insert the new part in the opposite order.

Caution: As power is directly applied to the surge protector while input power is fed, particular care must be paid.

11 Acronyms

GSM: Global Standard [System] for Mobile
NFB : No Fuse Breaker

C/B : Circuit Breaker

S/W : Switch

RMS : Root Mean Square

LVD : LOW VOLTAGE DISCONNECT