



## BFUPS5 UPS Hardware Manual



## About this Document

This guide provides insights into the diverse features of this product and the necessary steps for setup. It's designed for individuals who are:

In charge of setting up, managing, and addressing issues with this system, like IT experts.

Presumed to possess proficiency in computer equipment servicing, including seasoned system integrators and technical staff.

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## Technical Support

Besides reaching out to your distributor or sales agent, there are alternative avenues to seek support from Boingfire:

### Email

support@boingfire.com

Us

## Compliances and Certification

### CE

This product has passed the CE test for environmental specifications. Test conditions for passing included the equipment being operated within an industrial enclosure. To protect the product from being damaged by ESD (Electrostatic Discharge) and EMI leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

### FCC Class A

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. The operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

### EMC Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. The operation of this equipment in a

residential area is likely to cause harmful interference in which case users will be required to correct the interference at their own expense.

## **Safety Guidelines**

Adhere to these precautions for optimal safety:

- Ensure the chassis vicinity remains clean and devoid of dust during and post-installation.
- Avoid wearing garments or accessories that might entangle in the chassis. Secure ties or scarves and tuck in your sleeves.
- Employ protective eyewear if operating under conditions potentially harmful to your eyesight.
- Refrain from actions that pose risks to individuals or compromise the equipment's safety.
- Before installing, removing a chassis, or being near power sources, disconnect all electrical connections by switching off and unplugging the power cord.
- Avoid operating in potentially dangerous situations unaccompanied.
- Never presume a circuit is power-free; always conduct a thorough check.

## **Lithium Battery Caution**

- Risk of Explosion if Battery is replaced by an incorrect type. Dispose of used batteries according to the instructions.
- Installation only by a trained electrician or only by an electrically trained person who knows all English Installation and Device Specifications which are to be applied.
- Do not carry the handle of power supplies when moving to another place.
- The machine can only be used in a fixed location such as labs or computer facilities.

## **Operating Safety**

- Electrical equipment generates heat. Ambient air temperature may not be adequate to cool equipment to acceptable operating temperatures without adequate circulation. Be sure that the room in which you choose to operate your system has adequate air circulation.
- Ensure that the chassis cover is secure. The chassis design allows cooling air to circulate effectively. An open chassis permits air leaks, which may interrupt and redirect the flow of cooling air from internal components.
- Electrostatic discharge (ESD) can damage equipment and impair electrical circuitry. ESD damage occurs when electronic components are improperly handled and can result in complete or intermittent failures. Be sure to follow ESD-prevention procedures when removing and replacing components to avoid these problems.
- Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. If no wrist strap is FW-8894 User Manual available, ground yourself by touching the metal part of the chassis.
- Periodically check the resistance value of the antistatic strap, which should be between 1 and 10 megohms (Mohms).

## **Installation Precautions**

### **Environmental:**

- Do not install and/or operate this unit in any place that flammable objects are stored or used in.
- If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing

the equipment in an environment compatible with the maximum ambient temperature (T<sub>ma</sub>) specified by the manufacturer.

- Installation of the equipment (especially in a rack) should consider the ventilation of the system's intake (for taking chilled air) and exhaust (for emitting hot air) openings so that the amount of air flow required for safe operation of the equipment is not compromised.
- To avoid a hazardous load condition, be sure the mechanical loading is even when mounting.
- Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of the circuits might have on over-current protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.
- Reliable earthing should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g. use of power strips).
- Boingfire Systems shall not be held liable for any losses resulting from insufficient strength for supporting the unit or use of inappropriate installation components.

**Installation & Operation:**

- The installation of this product must be performed by trained specialists; otherwise, a non-specialist might create the risk of the system's falling to the ground or other damages.
- Boingfire Systems shall not be held liable for any losses resulting from insufficient strength for supporting the system or use of inappropriate installation components.

## 1. Introduction

The BFUPSN5 is a UPS module specifically designed for routers based on the BFN5 system. By integrating two 2600mAh batteries (with options for higher capacities), it provides at least 20 minutes of uninterrupted power to the BFN5 motherboard, ensuring protection for the operating system and user data during unexpected power failures.

As the value of user data continues to grow, it is often more valuable than the device itself. The BFUPSN5 allows the system sufficient time to safeguard data and initiate a proper shutdown, significantly enhancing system reliability and availability. Since the introduction of BFUPSN5, customers have reported improved data protection and system stability.

## 2. Specification:

Parameter	Specification
Battery voltage	18650 3~4.2V
Output voltage	11.2v Considering that the PSU needs to supply power to both UPS module and the motherboard, High quality 36~60W PSU is recommended.
Output current	3A Rated,3.4A Peak
Output Power	32W Rated,36W Peak
Capacity	21000 mwh (20wH) BFUPSN5-5K2
Battery lifetime	4~5 years
Compatible Motherboards	Boingfire BFN5 System Board
COM warning report	115200, TTL

## 3. Ordering information

Model	Description
BFUPSN5-5K2	2 x 2600mAh,21000mWh
BFUPSN5-7K0	2 x 3500mAh,29000mWh
BFUPSN5-10K	2 x 5000mAh,41500mWh

## 4. Battery Capacity and Power Supply Time

Theoretically, under identical load conditions, the power supply duration is directly proportional to the battery capacity. For example, if two 2600mAh batteries provide 20 minutes of power supply, increasing the capacity to two 3500mAh batteries will extend the power supply time by approximately 35%. This can be calculated as follows:

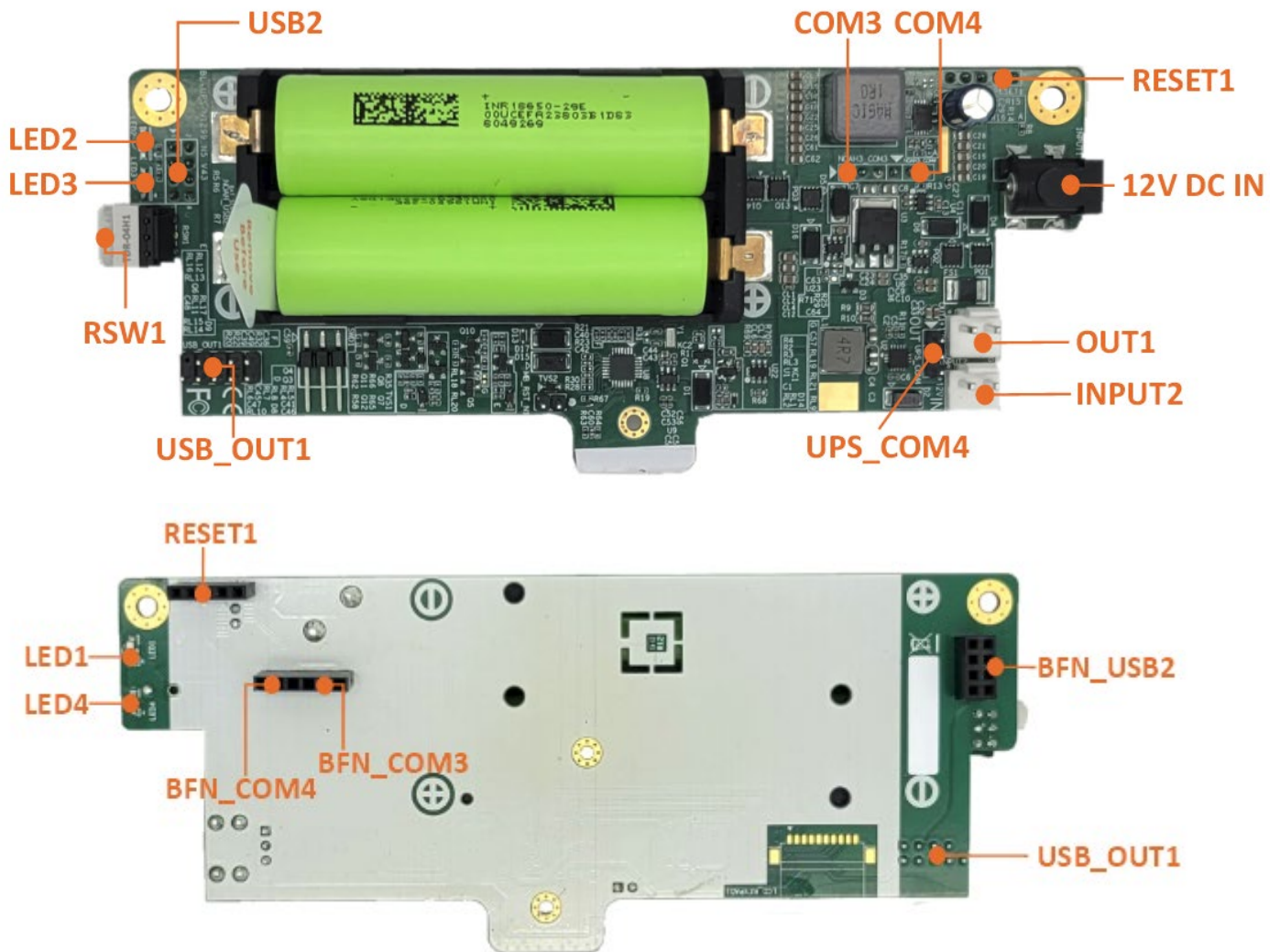
$$(2 \times 3500\text{mAh}) / (2 \times 2600\text{mAh}) = 1.35$$

Multiplying the original 20-minute duration by this factor:

$$20 \text{ minutes} \times 1.35 = 27 \text{ minutes}$$

Thus, the two 3500mAh batteries would provide approximately 27 minutes of power supply under the same load conditions.

## 5. Connectors layout



## 6. Connectors description

Header	Description
RESET1	This pin header needs to plug into RESET1 of BFN5.
INPUT1	DC JACK, 12V input, center pin is positive.
INPUT2	Wire and of INPUT1 12V input. Used for some customer to input 12V inside the appliance.
OUT1	BFUPS N5 11.2V output. Need to wire to motherboard DC input header.
BFN_COM3	This pin header needs to plug into COM3 of BFN5.

	BFUPSN5 will issue PSU voltage lost message to this port.
BFN_COM4	This pin header needs to plug into COM4 of BFN5. It is directly wired to UPS_COM4.
UPS_COM4	It is directly wired out from BFN_COM4.
BFN_USB2	This pin header needs to plug into USB2 (1~8pin) of BFN5.
USB_OUT1	It is directly wired out from BFN_USB2.

## 7. Hardware installation instructions

1. When assembling batteries in series on a PCB, it is crucial to follow these guidelines regarding positive (+) and negative (-) markings:
  - a. **Polarity Identification:** Ensure that the positive (+) and negative (-) markings on the PCB are clearly visible. The positive terminal of the first battery should connect to the negative terminal of the next battery, and so on, in a series connection.
  - b. **Connection Check:** Verify that the positive terminal of the final battery in the series connects to the positive terminal on the PCB, and the negative terminal of the first battery connects to the negative terminal on the PCB.
  - c. **PCB Design:** Check that the PCB traces are appropriately designed to handle the voltage increase from the batteries being in series.
  - d. **Battery Orientation:** Double-check battery orientation during installation to avoid reversing polarity, which can cause short circuits or damage the components.



2. To install spacers (also known as standoffs) on a motherboard, follow these steps:

### Tools you'll need:

- Screwdriver
- Motherboard spacers (standoffs)
- Screws that fit your case

### Instructions:

- a. **Turn Off and Unplug the System:** Ensure that the power is disconnected, and the case is opened.
- b. **Locate Standoff Holes in the Case:** Examine your computer case to find the standoff positions, which correspond to the holes in your motherboard. The standoff holes in the case are typically labeled in the image shown below.
- c. **Match the Holes with the Motherboard:** Align your motherboard with the case and note which standoff holes line up with the motherboard mounting points. The motherboard's holes should align with the case's standoff positions.
- d. **Install Standoffs:** Screw the standoffs into the case at the locations you've identified. Be sure to use only the required standoffs to prevent shorting out the motherboard.



- e. **Mount the Motherboard:** Once the standoffs are in place, align the motherboard's mounting holes with the standoffs and place it gently on top of the standoffs.
- f. **Secure the Motherboard:** Using screws, secure the motherboard to the standoffs by screwing each point where the motherboard has a corresponding hole.
- g. **Double-check for Proper Installation:** Ensure the motherboard is securely in place and no components are touching the metal case directly.

Now your motherboard should be properly spaced and installed, preventing electrical shorts while maintaining structural support.

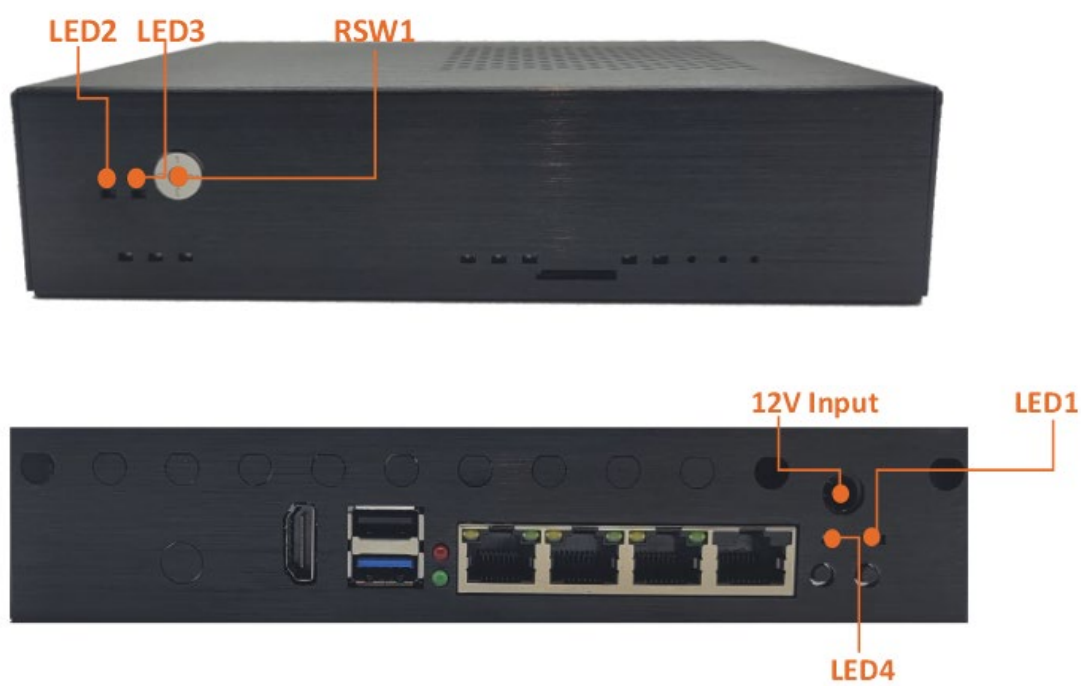


Plug the 12V power cable from the UPS module securely into the corresponding power socket on the motherboard.

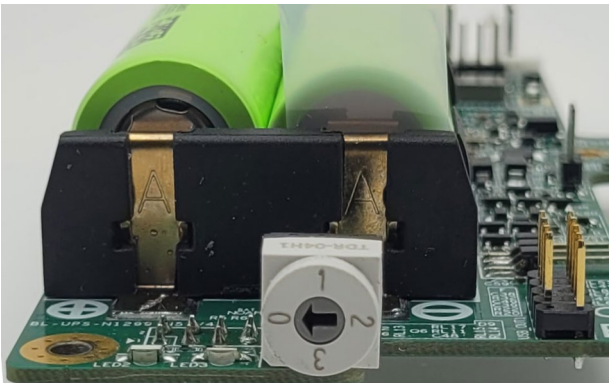


Verify that the UPS module is securely fastened and that the 12V cable is properly connected to the motherboard. Once all connections are made, power on the system to ensure that the UPS module is functioning correctly, and that the motherboard is receiving power. Don't power up unless you check the next section about the RSW1 Modes.





8. RSW1 settings



RSW1 Mode	Description
Mode 0	Shut down the motherboard legally and issue a warning message via BFN_COM3.
Mode 1	Issue a warning message via BFN_COM3 only, without a shutdown signal.
Mode 2 or 3	UPS batteries are isolated from the circuit, 12V supplied by PSU only. Mandatory for transportation and assembly/disassembly.

Make sure these mode settings are clearly documented in the shipping, user assembly, and operational procedures to ensure safety and proper system functionality.

Once mode is set as per your requirements, Power on system.

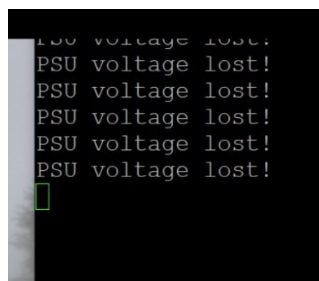
9. LEDs description

LED1, LED2 (AC LEDs)	Status
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<b>Red Flashing</b>	12V PSU input absent & Batteries powering system only
<b>Green ON</b>	12V PSU input present & PSU powering system
<b>Powered Off</b>	12V PSU input absent & Batteries voltage low or absent

<b>LED3, LED4 (Charging LEDs)</b>	<b>Status</b>
<b>Green ON</b>	In charging
<b>Powered Off</b>	End of charge or Batteries Thermal shutdown
<b>Green Flashing</b>	No battery in slot

## 10. TTL serial port BFN\_COM3



To handle the PSU power loss warning message, here's how you can approach the issue:

### Understanding the Warning Message:

- **Message:** "PSU voltage lost!\r\n" (ASCII)
- **Baud rate:** 115200 bps (bits per second)
- **Frequency:** 1 message per second until the battery voltage runs out.

### Implementation Guide:

1. **Hardware Setup:**
  - Follow the instructions in previous chapters to connect BFUPSN5 with BFN5 System Board.
2. **Monitoring via Serial Communication:**
  - Set up a serial port listener on your system to receive the warning messages. Configure the listener with the correct **baud rate** of 115200 bps and appropriate settings (e.g., 8 data bits, no parity, and 1 stop bit—commonly written as 8N1).
3. **Software Setup:**
  - Use a serial communication tool or a custom script to monitor the incoming messages. Here is an example script in Python using the *pySerial* library to read and display the warning messages:

```
import serial

# Set up serial connection
ser = serial.Serial(
    port='/dev/ttyUSB0', # Replace with the actual port
    baudrate=115200,
    timeout=1
)

# Monitor the port for messages
try:
    while True:
        message = ser.readline().decode('ascii').strip()
        if message:
            print(f"Received: {message}")
            if "PSU voltage lost!" in message:
                # Handle the PSU power loss scenario
                print("Warning: PSU power loss detected!")
except KeyboardInterrupt:
    print("Monitoring stopped.")
finally:
    ser.close()
```

#### 4. Handling the Message:

- The message "PSU voltage lost!\r\n" will be sent every second. This can be logged or trigger an alert in your system.
- You may want to set up an **alert system** to notify the operator via email, SMS, or an on-screen warning in the event of a PSU power loss.

#### 5. Stopping the Messages:

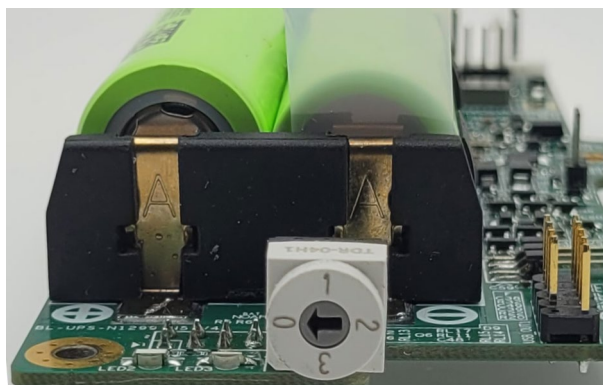
- The messages will stop once the battery voltage is lost, or the power restored. Ensure that your system handles this gracefully, perhaps with a final alert that the system has shut down.

#### 6. Log the Messages:

- Consider logging the messages into a file or database for auditing purposes or for troubleshooting later.

## 11. Safety Instructions

### a) Transportation risks



When assembling or disassembling the module, ensure RSW1 is in **Mode 2 or 3** to prevent short circuits and fire risk. For normal operation, set RSW1 to **Mode 0 or 1** to connect the batteries to the circuit.



#### Instructions for Removing Battery Insulation Film Before Use

1. **Locate the Battery Compartment:**
  - Open the enclosure or access panel where the UPS battery is located.
2. **Identify the Insulation Film:**
  - You will find a thin **insulation film** placed between the battery terminals and the corresponding connectors or contact points.
  - The insulation film prevents the battery from making electrical contact during transportation, preserving the charge and preventing accidental power flow.
3. **Remove the Insulation Film:**
  - Carefully **remove** the insulation film as indicated in the diagram (refer to the figure in your manual or on the equipment).
  - Ensure that the film is fully removed and no part of it is left obstructing the connection between the battery terminals and the circuit.
4. **Check for Proper Connection:**
  - After removing the insulation film, ensure that the battery terminals are securely connected to the circuit, and no other insulation material is left.
  - Double-check that the battery is now properly integrated into the system.
5. **Set RSW1 to the Correct Mode:**
  - For **normal operation**, ensure that **RSW1** is set to **Mode 0** (for automatic shutdown in case of power loss) or **Mode 1** (for warning-only operation).
  - This allows the battery to join the circuit and power the system as intended.
6. **Test the System:**
  - After removing the insulation film and ensuring proper connections, power on the system to confirm that everything is working correctly.

#### Important Notes:

- **Do not forget to remove the insulation film** before using the device, as leaving it in place will prevent the battery from providing power.
- Ensure that the **RSW1 switch** is in the correct mode for normal operation after removing the insulation.

This procedure is important to ensure that the UPS system operates correctly, and that the battery is fully integrated into the power circuit after shipping.

## b) Don't reverse batteries

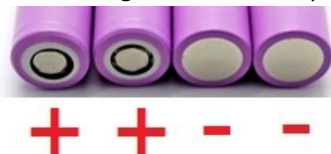
To ensure proper installation of the battery and avoid potential damage, it's critical to follow the correct polarity. Below is the detailed instruction for installing the battery correctly, even with a reverse protection circuit in place:

### Instructions for Identifying and Installing the Battery Correctly

1. **Identify the Positive and Negative Poles:**
  - **Positive (+) Pole:** Typically marked with a **plus (+)** sign, this is the terminal where the positive lead from the battery connects. It may also be indicated with **red** markings or connectors.
  - **Negative (-) Pole:** Typically marked with a **minus (-)** sign, this is where the negative lead from the battery connects. It may be indicated with **black** markings or connectors.
2. **Check the PCB for Markings:**
  - The PCB (Printed Circuit Board) should have clear **+ and - markings** near the battery connector terminals.
  - Ensure that the positive terminal of the battery is aligned with the **+** marking and the negative terminal is aligned with the **-** marking on the PCB.
3. **Follow the Manual Instructions:**
  - The user manual or the physical product may also have diagrams showing the correct orientation for the battery installation. **Always refer to the manual** before proceeding with installation to avoid mistakes.
4. **Avoid Reversing the Battery:**
  - Although the BFUPSN5 module is designed with a **reverse protection circuit**, installing the battery in reverse can still pose a risk. **Reversing the battery** could cause **unexpected damage** to the battery itself, potentially affecting its lifespan or performance.
5. **Installing the Battery:**
  - Once the positive and negative poles are clearly identified:
    - Connect the **positive terminal** of the battery to the **positive (+)** terminal on the PCB.
    - Connect the **negative terminal** of the battery to the **negative (-)** terminal on the PCB.
6. **Double-Check Connections:**
  - Before powering on the system, **double-check** the polarity to ensure the battery is installed correctly.
  - Ensure that the battery is securely connected, with no loose wires or contacts.

### Important Notes:

- **Never install the battery in reverse**, as it could damage the battery or reduce its efficiency, even with reverse protection.
- **Follow the + and - markings** carefully on both the battery and the PCB.
- Consult the **manual** for additional installation diagrams to ensure proper alignment and connection.



## 12. Operation mode

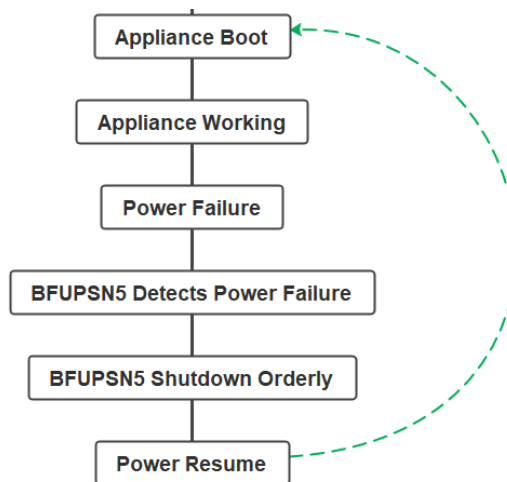
The BFUPSN5 helps reduce or eliminate the risk of system crashes due to unexpected power failures. It provides several options for built-in UPS systems, allowing customers to set up their UPS equipment flexibly based on their specific needs.

### a) Quick shutdown mode

Set RSW1 to 0 mode, BFUPSN5 issue a shutdown signal as soon as PSU voltage lost.

System will be powered off orderly, as soon as PSU 12v fails or power source disconnects.

BFN5 motherboard will boot automatically, as soon as PSU 12v resume.

**Example:**

Shutdown orderly in FreeBSD.

```

root@~ # Stopping cron.
Waiting for PIDS: 1578.
Stopping sshd.
Waiting for PIDS: 1568, 1568.
Stopping devd.
Waiting for PIDS: 1266.
Writing entropy file:.
Writing early boot entropy file:.
.
Terminated
Aug 25 14:09:26 syslogd: exiting on signal 15
Waiting (max 60 seconds) for system process 'vnlr' to stop... done
Waiting (max 60 seconds) for system process 'syncer' to stop...
Syncing disks, vnodes remaining... 2 1 0 0 0 done
Waiting (max 60 seconds) for system thread 'bufdaemon' to stop... done
Waiting (max 60 seconds) for system thread 'bufspacedaemon-0' to stop... done
Waiting (max 60 seconds) for system thread 'bufspacedaemon-1' to stop... done
All buffers synced.
Uptime: 1m33s
  
```

If a PSU power failure occurs during the OS entry phase, an orderly shutdown might not always complete successfully. However, in 95% of cases, data is still protected from forced power failure.

For users who need a custom PSU power failure detection mechanism—where more actions are required beyond an immediate orderly shutdown (e.g., reporting to the user, switching off certain devices)—please switch to **Mode 1**. This mode allows warning messages to be issued without triggering an automatic shutdown, enabling custom responses to the power failure event.

## b) User management mode.

Set RSW1 to 1 mode, BFUPSN5 will issue warning message only, instead of issue a shutdown signal directly.

Users need to establish a mechanism for detecting PSU voltage lost warning message (through COM3 of BFN5). By this warning message, the application program could be triggered to save data, other necessary operation, then issues a software shutdown command. In other words, System will be soft powered off by user application instead of BFUPSN5.

BFN5 boards will boot automatically, as soon as PSU 12v resume.



## TERMS AND CONDITIONS

### Warranty Policy

1. Products come with a one-year warranty from the purchase date, covering defects in materials and craftsmanship.
2. During the warranty period, the buyer covers the shipping costs for returning products for repairs, while the manufacturer pays for the return shipping post-repair.
3. Post-warranty, the buyer is responsible for all repair costs (including parts and labor) and both-way shipping charges.
4. Incomplete or incorrect RMA Service Request Forms will result in the return of items at the customer's expense.
5. Warranty does not cover:
  - Customer's failure to maintain the product properly.
  - Unauthorized alterations, misuse, or backward engineering.
  - Usage beyond the product's specified environmental conditions



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