iTrust RT 系列 1～3kVA UPS 用户手册

iTrust RT Series 1~3kVA UPS User Manual

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安 全 注 意 事 项

1．电源内部有高压，非本公司或本公司授权的技术人员，请勿擅自打开UPS，否则会有触电的危险！且由此导致的设备故障不属保修范围。

2．应用于下述负载设备前，请务必事先与经销商讨论，其应用、设置、管理和维护等等必须有特别的考虑和设计：

- 与病人生命有直接关联的医疗仪器；
- 电梯等有可能危及人身安全的设备；
- 类似于上述的设备；

3．电池严禁置于火中，以免爆炸，危及人身安全。

4．禁止带纯感性负载。

5．该电源设备可由电池组单独供电，所以即使在切断交流市电的情况下，其输出端仍可能会有电压存在。

6．当 UPS 需要移动或重新接线时，必须切断输入，并保证 UPS 完全停机，否则输出仍可能有电，有触电的危险。

7．为确保用户的人身安全，保证产品的正常使用，在使用之前设备要可靠接地。

8．使用环境及保存方法对本产品的使用寿命及可靠性有一定影响，因此，请注意避免长期在下列工作环境中使用：

- 超出技术指标规定（温度 0℃～40℃，相对湿度 5%～95%）的高、低温和潮湿场所；
- 有振动、易受撞的场所；

- 有粉尘、腐蚀性物质、盐份和可燃性气体的场所。

9．上电前，确认接线和电池极性正确。

10．外接电池必须装备合适的过流保护装置。

11．必须安装固定牢靠。给 UPS 输入供电的插座应装在 UPS 附近，而且应便于触及到。

12．该 UPS 可由用户自己操作。

13. 万一周围起火，请使用干粉灭火器，若使用液体灭火器会有触电危险。

14．电池的寿命随环境温度的升高而缩短。定期更换电池可保证 UPS 工作正常，且可维持足够的后备时间。更换电池必须由授权技术人员执行。更换时，必须使用同型号、同数量的电池或者电池模块。只有在 UPS 的交流输入端与市电完全断开，同时 UPS 完全关机（UPS 所有指示灯灭，UPS 的风扇停转）的情况下，才能更换电池。

15．如果长时间放置不使用，必须将 UPS 存放在干燥的环境中，存贮温度范围: －25℃～＋55℃（不带电池）。

16．勿将电池盖打开或破坏电池，电解液对皮肤和眼睛都会造成伤害，如果不小心接触到电解液，应立即用大量的清水进行清洗并去医院检查。

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第一章　产品介绍

iTrust RT 系列 1～3kVA UPS 是艾默生网络能源有限公司推出的一种智能在线式正弦波输出的不间断电源系统。产品具备高效率和高可靠性，为您的精密仪器设备提供可靠、优质的交流电源。

iTrust RT 系列 1～3kVA UPS 采用模块化设计，可以根据用户需求装配成塔式或机架式，方便用户使用；特别适合通讯局站、数据机房以及其他对安装空间有较高要求的应用场合。

1.1　特点

产品主要具有如下特点：

- 2U 厚度。
- 具有优异的电气性能，在线效率达 88%。
- 运用先进的 DSP 全数字控制技术，系统稳定度高，具备自我保护和故障诊断能力。
- 系统采用高频链双变换拓扑结构，输入功率因数高达 0.99，大大降低了对电网的污染。
- 宽输入电压范围，输出不受电网干扰，适应恶劣的电网环境，是理想的绿色环保电源。
- 宽输入频率范围，良好的油机输入适应能力。
- 提供内置大电流充电器，满足长延时需求。

1.2　主要部件

iTrust RT 系列的基本组成部件包括功率模块和电池模块。功率模块实现功率变换、输出交流电源和电池充电功能，电池模块为 UPS 提供直流电源。

1.2.1　功率模块

分类与型号

功率模块分为标准型和长延时型两大类。标准型和长延时型功率模块都分别包括 1kVA、2kVA 和 3kVA 功率模块。

功率模块的分类与型号见表 1-1。用户可从功率模块机箱上的铭牌来确认模块的型号。

表 1-1　功率模块分类与型号

分类	模块名称	型号	备注
标准型	1kVA 标准型功率模块	US11R-0010	带 1A 内置充电器 内置有 3 节 12V/7.2Ah 电池
	2kVA 标准型功率模块	US11R-0020	带 1A 内置充电器
	3kVA 标准型功率模块	US11R-0030	带 1A 内置充电器
长延时型	1kVA 长延时型功率模块	US11R-0010L	带 7A 内置充电器
	2kVA 长延时型功率模块	US11R-0020L	带 8A 内置充电器
	3kVA 长延时型功率模块	US11R-0030L	带 8A 内置充电器

前面板外观图

各型号功率模块的前面板外观一致，都提供开机/消音键、关机键和 LED 显示，如图 1-1 所示。

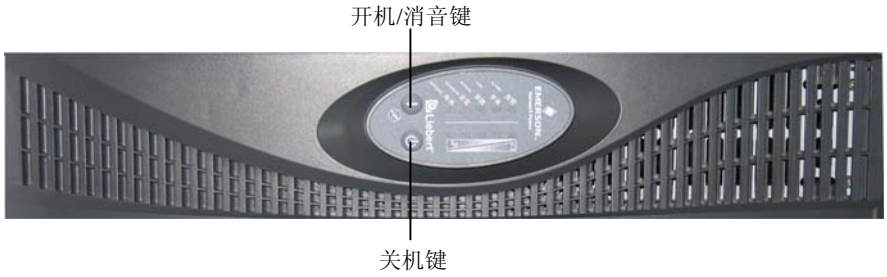


图 1-1　功率模块前面板

后面板外观图

各型号功率模块的后面板外观各不相同，分别如图 1-2 至图 1-6 所示。后面板上提供交流输入插座、交流输入过流保护开关、输出插座、输出保险丝和输出端子排（仅 3kVA 功率模块有），外接电池插座（仅 1kVA 标准型功率模块无），以及 DB9 通讯接口和 SNMP 卡通讯插槽。

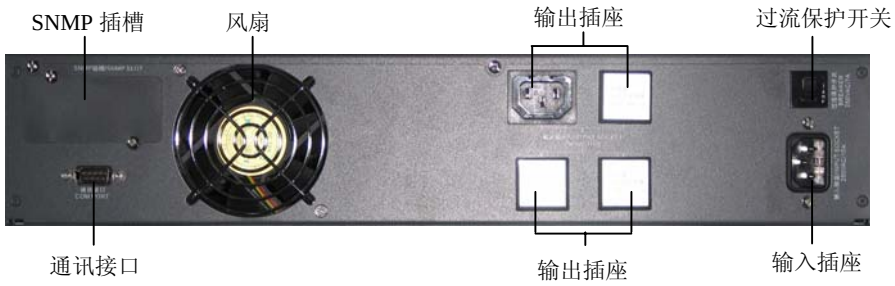


图 1-2　1kVA 标准型功率模块后面板

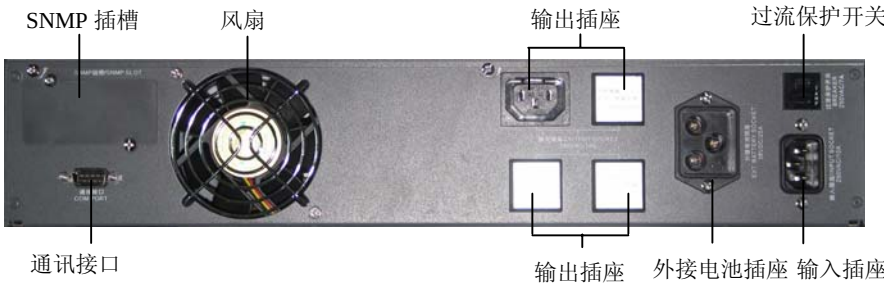


图 1-3　1kVA 长延时型功率模块后面板



图 1-4　2kVA 标准型功率模块后面板



图 1-5　2kVA 长延时型功率模块后面板



图 1-6　3kVA 标准型及长延时型功率模块后面板

1.2.2　电池模块

型号

电池模块有两种型号：UF-B0007-06 和 UF-B0009-06，见表 1-2。用户可从电池模块机箱上的铭牌来确认模块的型号。

表 1-2　电池模块型号

模块名称	型号	备注
72V/7.2Ah 电池模块	UF-B0007-06	电压 72V，内置 6 节 12V/7.2Ah 电池
72V/9.0Ah 电池模块	UF-B0009-06	电压 72V，内置 6 节 12V/9Ah 电池

前面板和后面板外观图

UF-B0007-06 和 UF-B0009-06 两种型号电池模块的前面板和后面板外观一致，分别如图 1-7 和图 1-8 所示。



图 1-7　电池模块前面板



图 1-8　电池模块后面板

1.3　系统分类与配置

各型号功率模块和电池模块可组成两大类型的 UPS，即标准型和长延时型。标准型和长延时型 UPS 又都分别包括 1kVA、2kVA 和 3kVA UPS。

UPS 的具体分类与配置见表 1-3。

表 1-3　UPS 系统分类与配置表

UPS 分类		配置			
		模块	型号	数量	备注
标准型	1kVA 标准型 UPS	功率模块	US11R-0010	1	UPS 为单功率模块系统
	2kVA 标准型 UPS	功率模块	US11R-0020	1	UPS 由功率模块和电池模块组成
		电池模块	UF-B0007-06	1	
	3kVA 标准型 UPS	功率模块	US11R-0030	1	
		电池模块	UF-B0009-06	1	
长延时型	1kVA 长延时型 UPS	功率模块	US11R-0010L	1	用户需另配外接电池，建议选配艾默生电池和电池柜
	2kVA 长延时型 UPS	功率模块	US11R-0020L	1	
	3kVA 长延时型 UPS	功率模块	US11R-0030L	1	

1.4　工作原理

UPS 工作原理如图 1-9 所示。

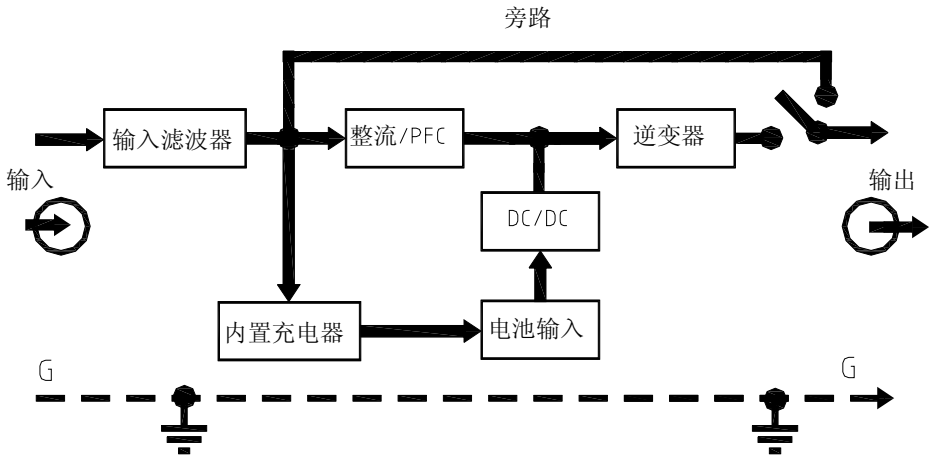


图 1-9　UPS 工作原理框图

UPS 由市电输入、输入滤波器（EMI 和 D 级防雷）、整流/PFC、DC/DC 升压、逆变器、旁路、内置充电器、电池和 UPS 输出等功能模块组成。控制是采用 DSP 来完成，主要的功率器件是高效率的 IGBT，在保证 UPS 产品性能指标的同时，提高了产品的可靠性。

市电输入：包含了市电输入插座和输入过流保护开关。

输入滤波器：包含了 EMI 抑制滤波器和 D 级防雷器，给 UPS 提供经过滤处理的干净电源。

整流/PFC：是 UPS 重要的前处理功能模块，在市电逆变供电模式时进行功率因数校正和整流处理。

DC/DC 升压：UPS 工作于电池供电模式时进行直流升压处理。

逆变器：是 UPS 重要的后处理功能模块，将经过整流处理或升压处理的直流电转换成稳定的交流输出。

旁路：是提高 UPS 系统可靠性重要的组成部分。当 UPS 发生非关机故障时，如过温保护、整流器故障、逆变器故障，UPS 将自动切换到旁路供电模式给负载供电，同时，LED 显示故障的类型，并通过通讯接口上报故障信息。

内置充电器：标准型功率模块 US11R-0010、US11R-0020、US11R-0030 的内置充电器能够提供 1A 的充电电流，长延时型功率模块 US11R-0010L 的内置充电器能够提供 7A 的充电电流，长延时型功率模块 US11R-0020L 和 US11R-0030L 的内置充电器能够提供 8A 的充电电流。

电池：适用电池类型为密封式免维护铅酸蓄电池。

UPS 输出：UPS 输出功能模块包括输出 EMI 滤波器，并提供多路负载输出。

1.5　通讯功能

UPS 在功率模块后面板提供 DB9 通讯接口和 SNMP 卡通讯插槽（位置参见图 1-2～图 1-6）。

DB9 通讯接口

DB9 通讯接口复合了 RS232 串行通讯和干接点通讯两个功能。用户可使用发货附件中的 UPS 监控软件，通过 DB9 通讯接口对 UPS 进行监控。

SNMP 卡通讯插槽

UPS 提供 SNMP 卡选件，安装于功率模块后面板的 SNMP 卡通讯插槽。当 UPS 安装上 SNMP 卡后，可以通过 SNMP 卡上网与后台监控计算机通信，实现对 UPS 的监控。

第二章　安装

2.1　开箱检查

1．拆开各模块包装，目测各模块外观，检查其是否在运输中有碰撞损坏。

2．对照发货附件清单检查功率模块和电池模块的随机附件是否齐全（见表 2-1 和表 2-2）。

3．如发现运输损坏现象或随机附件缺少，请立即联系经销商。

表 2-1　功率模块发货附件清单

附件名称	数量	单位
塔式安装配件——塑胶支撑座	4	个
机架式安装配件——挂耳	1	对
皇冠组合螺钉	4 或 8	颗
市电输入电缆	1	根
电池连接电缆	1	根
RS232 电缆	1	根
用户手册	1	本
UPS 电源单机版软件（UPSite Plus）光盘	1	张
保修单——UPS 电源保修单	1	份

注:

1. 市电输入电缆：US11R-0010、US11R-0010L、US11R-0020 的电缆额定电流为 10A; US11R-0020L、US11R-0030、US11R-0030L 的电缆额定电流为 16A。

2. 电池连接电缆：为 1.8m 长电缆，电缆一端为插头,另一端为 OT 端子;仅长延时功率模块配有；US11R-0010L 的电缆插头为 3 芯头，US11R-0020L 和 US11R-0030L 的电缆插头为 5 芯头。

3. 皇冠组合螺钉：US11R-0010，US11R-0010L，US11R-0020L，US11R-0030L 分别配 4 颗; US11R-0020，US11R-0030 分别配 8 颗.

表 2-2　电池模块发货附件清单

附件名称	数量	单位
塔式安装配件——塑胶中间座	2	个
机架式安装配件——挂耳	1	对
5 芯头双头电池电缆	1	根

2.2　安装注意事项

1．选择 UPS 安装环境时，注意 UPS 周围不能有危险物品，安装环境应符合产品规格要求（参见 5.5 节）。

2．UPS 主要通过安装于功率模块后部的内置风扇散热，安装时功率模块后面板与障碍物之间必须保持至少 300mm 的空间。

3．采用机架式安装时，UPS 必须安装在标准 19 英寸机柜中，机柜深度大于等于 400mm，机柜中机架配件由用户准备。

2.3　塔式安装

2.3.1　安装单功率模块

以下安装步骤适应于只含一个功率模块不含电池模块的 UPS 系统的安装，这些功率模块是 US11R-0010，US11R-0010L，US11R-0020L 和 US11R-0030L。

1．从附件中取出一对支撑座，按图 2-1 中左图所示方向扣压成为底座，平置于安装台面上，如图 2-1 右图所示；按同样的方法，将另一对支撑座安装成为底座，平置于安装台面上。

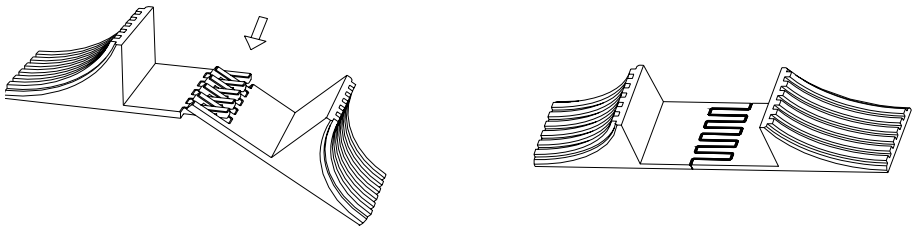


图 2-1　安装底座

2．如图 2-2 左所示，将安装好的两个底座调整到适当的位置，抱起模块，轻轻将其在底座上放平；然后如图 2-2 右所示方向左右轻推模块，使模块均匀放置在前后的两个底座上。

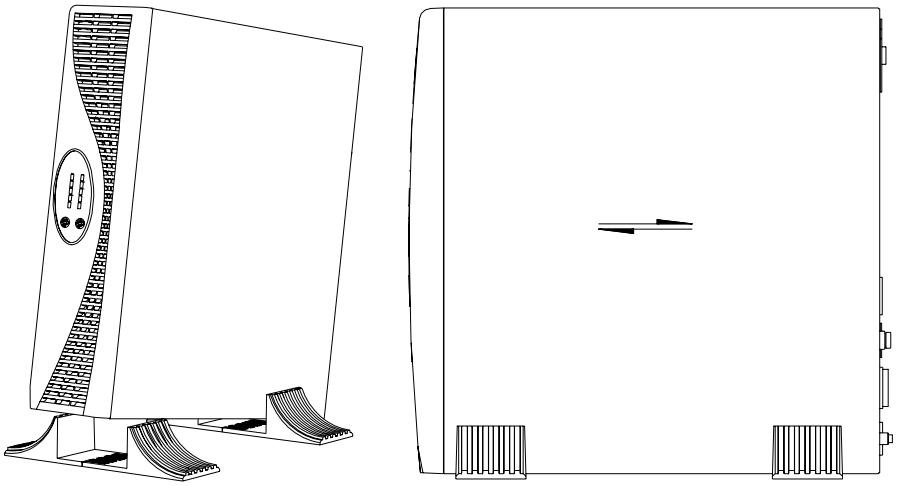


图 2-2　放置功率模块

2.3.2　安装功率模块和电池模块组合

以下安装步骤适应于标机系统中的功率模块和电池模块组合系统（即 US11R-0020 与 UF-B0007-06 组合，US11R-0030 与 UF-B0009-06 组合）的安装。

1．从功率模块附件中取出支撑座 2 个，从电池模块附件中取出中间座 1 个，按 2.3.1 的步骤 1 所述方法逐一将上述零件组装成底座，平置于安装台面上，如图 2-3 所示。按同样的方法，组装另外一个底座，平置于安装台面上。

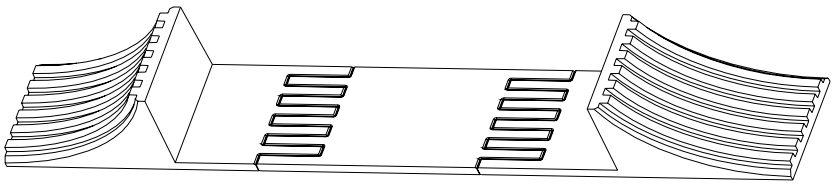


图 2-3　组装底座

2．按照 2.3.1 的步骤 2 所述方法将电池模块和功率模块逐一放置在底座上。如图 2-4（从正面看）所示。请将功率模块放在右边，以方便接线。

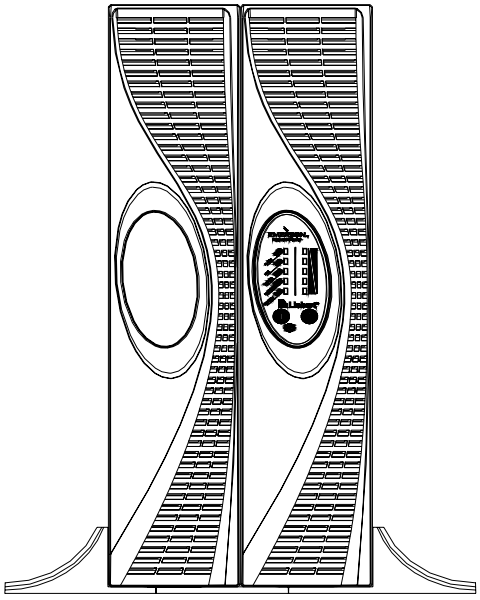


图 2-4　放置模块

2.4　机架式安装

2.4.1　安装单功率模块

以下安装步骤适应于只含一个功率模块不含电池模块的 UPS 系统的安装，这些功率模块是 US11R-0010，US11R-0010L，US11R-0020L 和 US11R-0030L。

1．从附件中取出挂耳 1 对；如图 2-5 示，从模块两侧面板上分别取出 M4*8 平头螺钉 4 颗；如图 2-6 所示，用螺钉将挂耳紧固在模块的两侧。

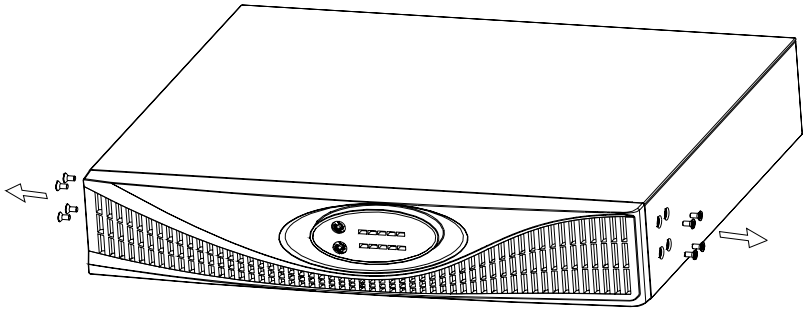


图 2-5　取出平头螺钉

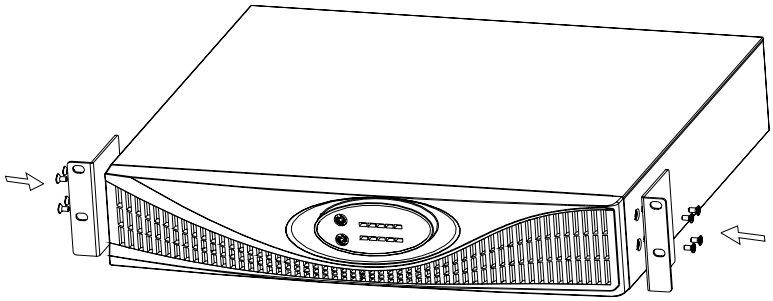


图 2-6　安装挂耳

2．抱起模块，按下图所示方向将模块放入机架的滑道上，推入模块直到推不进去为止。从附件中取出 4 颗皇冠螺钉，如下图所示，将模块紧固在机架上。

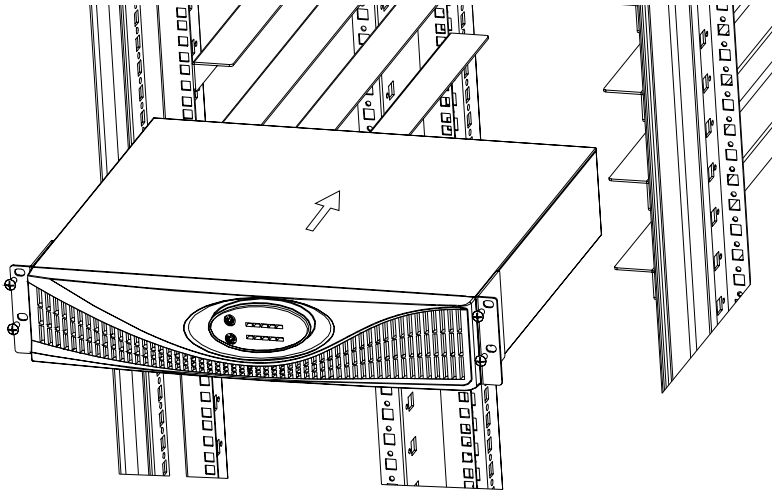


图 2-7　安装功率模块

2.4.2　安装功率模块和电池模块组合

以下安装步骤适应于标机系统中的功率模块和电池模块组合系统（即 US11R-0020 与 UF-B0007-06 组合，US11R-0030 与 UF-B0009-06 组合）的安装。

1．从功率模块和电池模块附件中分别取出挂耳一对，按 2.4.1 的步骤 1 所述方法用螺钉将挂耳分别紧固在两模块的两侧。

2．从功率模块附件中取出 8 颗皇冠螺钉，按 2.4.1 的步骤 2 所述方法将两个模块逐一紧固在机架中，推荐将功率模块放在下面，以便接线，如图 2-8 所示。

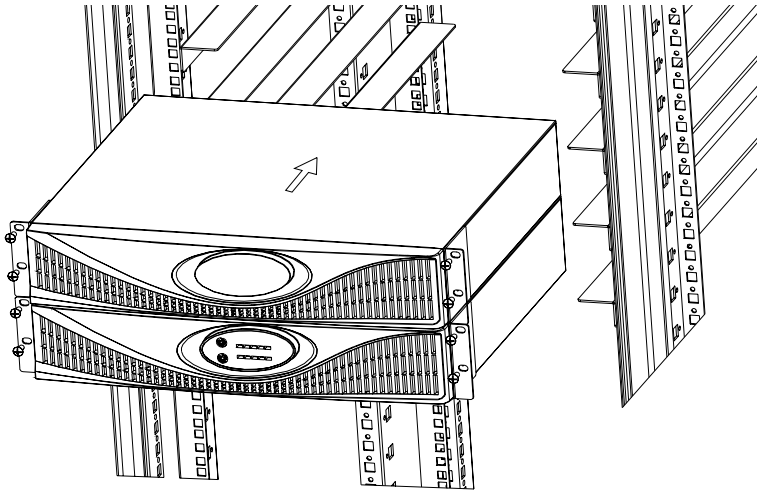


图 2-8　安装模块

2.5　接线

2.5.1　连接电池电缆

对于长延时系统和标机系统中的功率模块和电池模块组合系统，应进行电池电缆连接。

功率模块和电池模块组合系统

从电池模块附件中取出电池连接电缆，将电缆的一头插入功率模块后面板的外接电池插座，另一头插入电池模块后面板的任一电池插座即可。

长延时系统

⚠警告

1. 电池具有能量危险，仅专业人员才可进行长延时系统的电池电缆连接。
2. 外接电池电压必须符合 UPS 功率模块的外接电池电压要求（参见 5.2 节）。

长延时系统的电池电缆连接步骤如下：

1．断开电池开关。

2．取出功率模块附件中的电池连接电缆。该电缆一端为插头，另一端为三个 OT 端子。

3．对于 1kVA 功率模块电池电缆，将与红线、黑线、黄绿线相连的三个 OT 端子分别与电池开关的正极端子、负极端子和电池柜接地端子（位置参见电池柜用户手册）连接。对于 2kVA 和 3kVA 功率模块电池电缆，将标示为“+”、“—”和“G”的三个 OT 端子分别与电池开关的正极端子、负极端子和电池柜接地端子连接。

如果电池电缆 OT 端子尺寸大于电池开关的接线端子，剪去电池电缆的 OT 端子，将电池电缆剥出适当长的铜芯后，将电池电缆铜芯与电池开关连接端子连接。

4．将电池连接电缆插头插入功率模块后面板上的外接电池插座。

注意

长延时功率模块的附件外接电池电缆为 1.8m 长，如果用户需要更长的电池电缆，请咨询经销商。电池电缆不可以无限加长，否则会影响 UPS 的正常使用。

2.5.2　连接输入输出电缆

输入输出电缆通过功率模块后面板的输入插座、输出插座、输出端子排进行连接。各型号功率模块的输入插座、输出插座和输出端子排位置参见图 1-2～图 1-6。

注意事项

1．应使用与功率模块输入插座和输出插座分别匹配的电源插头和负载插头。

US11R-0010、US11R-0010L、US11R-0020、US11R-0020L 功率模块提供 1 个 IEC320-C13 输出插座、3 个 250VAC/10A 国标输出插座；US11R-0030、US11R-0030L 功率模块提供 1 个 IEC320-C13 输出插座、1 个 250VAC/10A 国标输出插座和 1 个 250VAC/16A 输出端子排。国标输出插座上贴有标签，撕去标签后即可使用。US11R-0010、US11R-0010L、US11R-0020 的交流输入插座为 IEC320-C14 插座，US11R-0020L、US11R-0030、US11R-0030L 的交流输入插座为 IEC320-C20 插座。

2．每路最大输出电流不能超过输出插座和输出端子排的额定电流，总输出功率不得超过 1kVA/0.7kW，2kVA/1.4kW，3kVA/2.1kW。

3．非专业人员不得使用 3kVA 功率模块后面板的输出端子排给负载配电。

4．使用输出端子排给负载配电时，请确认零火线，避免接反。

连接方法

将市电输入电缆一端插入用户市电输入插座，另一端插入功率模块的输入插座；将用户负载插头插入功率模块的输出插座即可。

2.5.3　连接通讯电缆

DB9 通讯接口（公头）

如使用随机附送的单机版监控软件对 UPS 进行监控，进行通讯连接时，只需取出功率模块附件 RS232 电缆，将电缆的两头分别插入计算机的 RS232 接口和功率模块后面板的 DB9 通讯口即可。

DB9 通讯接口复合了 RS232 串行通讯和干接点通讯两个功能。其引脚分布见图 2-9，引脚定义见表 2-3，干接点接口原理见图 2-10。

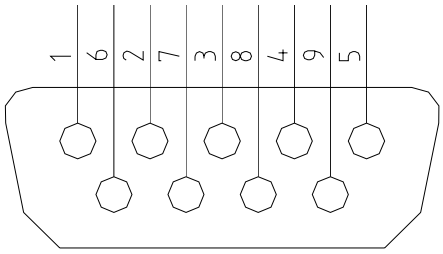


图 2-9　DB9 通讯接口引脚分布图

表 2-3　DB9 通讯接口引脚定义

引脚号	定义	备注
1、7	电池电压低(输出干接点)	1．Pin1、Pin7 干接点输出：开路表示电池电压正常；短路表示电池电压低。 2．Pin9、Pin8 干接点输出：开路表示非电池模式，短路表示电池模式。 3．Pin4 干接点输入（对 Pin5）：电池模式下，高电平时（5～12Vdc，20 秒以上）UPS 关机；开路或者低电平输入时，UPS 保持原来的状态。
2	UPS RxD（RS232 标准）	
3	UPS TxD（RS232 标准）	
4	电池模式下远程关机控制	
5	公共地	
6	NC	
8、9	电池模式（输出干接点）	

注意

输入的信号电流不能超过 10mA，输出干接点间电压不要超过 30Vdc。

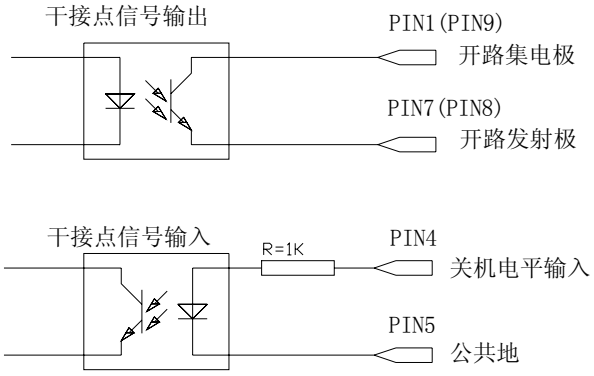


图 2-10　干接点接口原理图

SNMP 卡插槽

对于使用 SNMP 卡对 UPS 进行监控的用户，SNMP 卡的安装及通讯连接请参见 SNMP 卡用户手册。

第三章　运行操作

3.1　操作显示面板

图 3-1 所示为 UPS 功率模块的操作显示面板。操作显示面板上提供功能操作键：开机/消音键、关机键；以及 10 个 LED 指示灯。

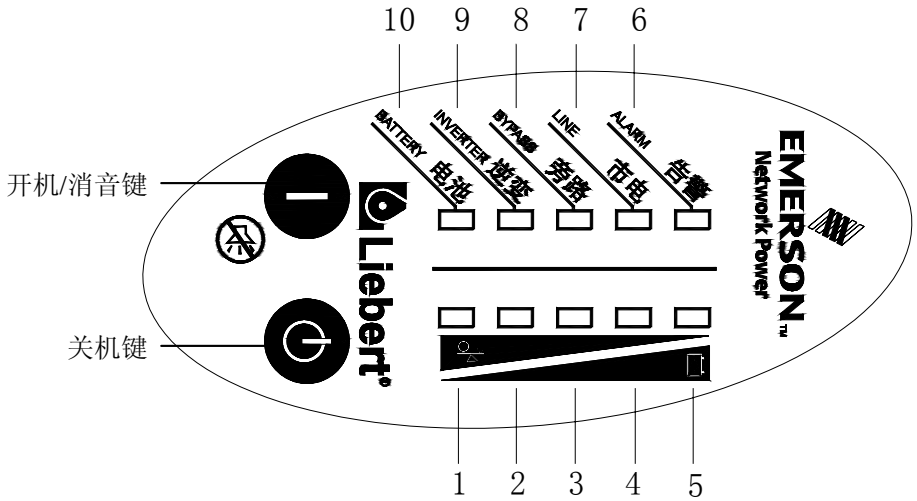


图 3-1　功率模块操作显示面板

功能操作键

1．开机/消音键

开机/消音键有三个功能：

1）启动逆变器：按开机/消音键 1 秒可开启逆变器。

2)电池供电模式告警消音：电池供电模式下发生每 3.3s 鸣 1 声的声音告警时，按开机/消音键 1 秒可消除该声音告警。

3）启动电池自检：在市电逆变供电模式下，按开机/消音键 1 秒可启动电池自检。

> 📖 **注意**
>
> 开机/消音键的消音功能只能消除电池供电模式下发生的每 3.3s 鸣 1 声的声音告警，对于 UPS 的其它所有故障声告警的消除无效。

2．关机键

关机键有两个功能：

1）关闭逆变器：UPS 处于市电逆变供电模式或电池供电模式时，按关机键 1 秒可关闭逆变器。

2）使 UPS 进入待机状态：UPS 处于旁路供电模式时，按关机键 1 秒可关闭 UPS 的旁路输出，使 UPS 进入待机状态。

LED 指示灯

电池指示灯、逆变指示灯、旁路指示灯、市电指示灯和告警指示灯显示的含义归纳见表 3-1。

表 3-1　LED 指示灯显示意义归纳表

电池指示灯（绿）	电池供电且电池电压不过高时常亮；电池故障或充电电压过高时闪烁
逆变指示灯（绿）	逆变器正常工作时亮；逆变器故障时闪烁
旁路指示灯（绿）	旁路供电时亮
市电指示灯（绿）	市电正常时亮；市电掉电时灭；市电输入异常时闪烁
告警指示灯（红）	UPS 发生故障时亮，无故障时灭

蜂鸣声和 10 个 LED 指示灯联合指示 UPS 的工作状态和故障类型，见表 3-2：

表 3-2　告警声和 LED 联合指示 UPS 工作状态和故障类型归纳表

序号	工作状态		面板灯号（如图 3-1 排列）										告警声
			1	2	3	4	5	6	7	8	9	10	
1	市电逆变供电模式	0～25%负载容量					●		●		●		无
2		26～50%负载容量				●	●		●		●		无
3		51～75%负载容量			●	●	●		●		●		无
4		76～100%负载容量		●	●	●	●		●		●		无
5		101～105%负载容量	●	●	●	●	●		●		●		无
6		>105%负载容量	●	●	●	●	●		●		●		每 1 秒鸣 2 声
7	电池供电模式	0～25%电池容量	●								●	●	每 1 秒鸣 1 声
8		26～50%电池容量	●	●							●	●	每 3.3 秒鸣 1 声
9		51～75%电池容量	●	●	●						●	●	每 3.3 秒鸣 1 声
10		76～95%电池容量	●	●	●	●					●	●	每 3.3 秒鸣 1 声
11		>96%电池容量	●	●	●	●	●				●	●	每 3.3 秒鸣 1 声
12		>105%负载容量	◎	◎	◎	◎	◎				●	●	每 1 秒鸣 2 声
13	短路故障		●					●	◎	◎			持续鸣叫
14	充电器故障			●				●	◎	◎			持续鸣叫
15	过温故障				●			●	◎	◎			持续鸣叫
16	风扇故障					●		●	◎	◎	◎	◎	每 1 秒鸣 1 声
17	整流器故障						●	●	◎	◎			持续鸣叫
18	逆变器故障							●	◎	◎	¤		持续鸣叫
19	逆变过载故障		●	●	●	●	●	●	◎	◎			持续鸣叫
20	电池过充（市电逆变供电模式下）		◎	◎	◎	◎	◎		●		●	¤	无
21	电池过充（待机状态下）		◎	◎	◎	◎	◎		◎			¤	无
22	电池未接		◎	◎	◎	◎	◎		●		◎	¤	鸣叫 6 声

● 持续亮；◎ 根据其它状态确定；¤ 闪烁。

注意

1 号灯为黄色灯，6 号灯为红色灯，其余均为绿色灯。

3.2　运行模式

UPS 的运行模式可分为市电逆变供电模式、旁路供电模式和电池供电模式三种。

市电逆变供电模式

市电输入正常时，市电经过 UPS 整流、逆变转换后给负载提供稳压稳频电源，同时充电器对电池进行充电的工作模式就是市电逆变供电模式。市电逆变供电模式下，控制面板上的市电指示灯和逆变指示灯均亮。

旁路供电模式

当 UPS 工作在市电逆变供电模式时，如出现超时过载、逆变器故障、过温故障或整流器故障，UPS 将切换至旁路供电模式，即负载所需电源由市电输入直接经旁路提供，且充电器继续对电池进行充电。旁路供电模式时，控制面板上的市电指示灯和旁路指示灯均亮，但逆变指示灯不亮。

注意

1. 若 20 分钟内连续三次因过载转旁路供电模式，之后不管负载是否恢复正常，UPS 将一直维持在旁路供电模式下工作。
2. 旁路供电模式时，若出现市电断电或市电电压频率超限，则 UPS 关机，输出中断。

电池供电模式

当 UPS 工作在市电逆变供电模式时，如出现市电掉电、市电电压或频率超限，UPS 将切换至电池供电模式，即整流器和充电器停止运行，电池组放电，通过逆变器向负载提供电源。电池供电模式时，电池指示灯和逆变指示灯亮。

> 注意
>
> 在电池供电模式下，若出现逆变器故障、机内温度过高等，则 UPS 关机。

3.3 操作

3.3.1 开关机操作

> 注意
>
> 虽然电池在出厂时已充满电，但经过运输、存储，电量会有所损失，建议在第一次使用 UPS 前应先对电池充电 8 小时，以保证有足够的备用时间。

开机操作

可使用以下两种方法开启 UPS：

1．接通市电，手动开机，UPS 进入市电逆变供电模式

接通市电，按开机键 1 秒，听到“嘀”的一声响后松开按键，UPS 开始自检。数秒后，UPS 进入市电逆变供电模式，此时市电指示灯、逆变指示灯、负载/电池容量指示灯（指示灯 1～5）亮。

> 注意
>
> UPS 提供自动重启功能，即 UPS 因市电停电转电池供电模式，由于电池放空导致 UPS 关机后，当市电恢复时，无需按开机键，UPS 可自动重新启动逆变器，工作于市电逆变供电模式，对负载供电。该功能可以通过后台监控软件设置，出厂设置为开启。

2．不接市电，手动开机，UPS 进入电池供电模式

不接市电，按开机键 1 秒，听到“嘀”的一声响后松开按键，逆变器开启，UPS 进入电池供电模式。此时电池指示灯、逆变指示灯、负载/电池容量指示

灯（指示灯 1～5）亮。

关机操作

UPS 关机操作可分为三种情况：市电逆变供电模式下关机、电池供电模式下关机和旁路供电模式下关机。操作方法如下：

1．市电逆变供电模式下关机

按关机键 1 秒，直至听到“嘀”的一声响，逆变器关机，UPS 停止输出，进入待机状态。此时，市电指示灯、指示灯 5 亮。待机状态下，UPS 未完全断电。如需给 UPS 完全断电，必须断开 UPS 的市电输入。

2．电池供电模式下关机

按关机键 1 秒，UPS 关机，无输出。

3．旁路供电模式下关机

按关机键 1 秒，UPS 停止输出，进入待机状态。待机模式下，UPS 未完全断电。如需给 UPS 完全断电，必须断开 UPS 的市电输入。

3.3.2　电池自检操作

UPS 运行期间，用户可通过手动启动电池自检来检查电池状态，有两种方法：

1．通过开机/消音键

在市电逆变供电模式下，按开机/消音键 1 秒，直至听到蜂鸣器“嘀”的一声响，指示灯 6～10 循环闪烁，UPS 转电池供电模式，进行电池自检。电池自检持续时间 5 秒钟。

电池自检期间，如果发生电池故障，UPS 将自动转市电逆变供电模式。

2．通过后台监控软件

用户也可通过后台监控软件启动电池自检。操作方法见监控软件用户手册。

第四章　维护

4.1　电池维护

电池是 UPS 系统的核心组成部分。电池的使用寿命取决于环境温度和充放电次数。高温下使用或深度放电会缩短电池的使用寿命。

1．尽量保持环境温度在 15℃到 25℃之间。

2．防止电池小电流放电，UPS 电池持续放电时间应不超过 48 小时。

3．当 UPS 长期不用，电池连续三个月未充电时，需充电一次，每次不得少于 12 小时。在高温环境下，连续两个月未充电时就需充电一次，每次不得少于 12 小时。

4.2　更换输出保险丝

⚠警告

1．在更换输出保险丝前，必须完全断开 UPS 的交流输入，并且关闭 UPS 的输出。

2．只能用同样型号的保险丝进行更换。

仅 3kVA 功率模块提供输出保险丝（位置参见图 1-6）。该输出保险丝是为 IEC 输出插座配备的。国标输出插座和输出端子排没有配备保险丝。

更换保险丝的步骤如下：

1．使用一字螺丝刀按逆时针方向旋转拧开并取出功率模块后面板上的保险丝座；

2．将保险丝座中的旧保险丝取出，将新的保险丝装入保险丝座中；

3．使用一字螺丝刀按顺时针方向旋转将保险丝座装回原位。

4.3　UPS 功能检查

每次现场维护时，均应对 UPS 进行常规功能检查，主要包括以下几个方面：

1．检查 UPS 的工作状况

如市电正常，UPS 应工作在市电逆变供电模式；如市电异常，UPS 应工作在电池供电模式。且两种工作状态下均无故障显示。

2．检查 UPS 的运行模式切换

断开市电输入模拟市电掉电，UPS 应切换到电池供电模式并正常运行；然后再接通市电输入，UPS 应切换回市电逆变供电模式并正常运行。

3．检查 UPS 的指示灯显示

以上两项检查过程中，检查 UPS 的指示灯显示是否与其实际运行模式一致。

4.4　故障处理

当您的 UPS 出现异常情况时，请先按下表进行检查和排除故障。如果问题仍然存在，请与艾默生当地客户服务中心联系。

表 4-1　UPS 故障检查和处理表

序号	现象	可能原因	解决措施
1	按开机键，UPS 不启动	按开机键时间过短	按开机键 1 秒钟以上，听到蜂鸣器“嘀”一声后，UPS 将开启
		UPS 未接电池	接上电池
		电池电压过低	先充电，后开机
		电池坏	请立即由专业人员更换电池
		UPS 存在内部故障	请联系当地客户服务中心
2	市电正常，UPS 没有市电输入	功率模块后面板上的交流输入过流保护开关在输入过流的情况下切断了市电输入	按下交流输入过流保护开关按钮，使交流输入过流保护开关重新接通 UPS 与市电输入的连接。
3	市电指示灯闪烁或熄灭	市电电压或频率超出规格要求	检查输入电压和频率，以及交流输入过流保护开关，同时建议及时卸负载，避免电池放完电后关机造成损失
4	告警指示灯常亮，蜂鸣声常鸣，指示灯 1～5 常亮	负载过载	建议关闭非关键负载
5	输出过载，输出关闭，没有转旁路供电	旁路过载关闭输出；旁路电压或频率超出工作范围	关闭非关键负载，检查输入电压和频率
6	电池备电时间短	电池未充饱	持续充电 8 小时以上
7	电池供电模式下指示灯 1～5 中仅有指示灯 1 常亮	电池电压太低	及时卸负载，避免电池放完电造成断电损失
8	指示灯 4 常亮，蜂鸣器每秒鸣 1 声，告警指示灯常亮	风扇故障	确保风扇出风口通畅，无灰尘异物阻塞。如果采取上述措施仍不能解决，请联系当地客户服务中心
9	指示灯 3 常亮，蜂鸣声常鸣，告警指示灯常亮	UPS 过热	确定是否过载，通风是否畅通，环境温度是否超过 40℃。UPS 完全断电，等待冷却 10 分钟后再开机，如果仍出现异常，请联系当地客户服务中心
10	指示灯 1 常亮，蜂鸣声常鸣，告警指示灯常亮	UPS 因输出短路而关闭输出	将 UPS 完全断电，检查负载是否有短路现象，如去除负载，故障仍然不能排除，请联系当地客户服务中心
11	逆变指示灯闪烁，蜂鸣器常鸣，告警指示灯常亮	逆变器故障	请联系当地客户服务中心

序号	现象	可能原因	解决措施
12	指示灯 5 常亮，蜂鸣声常鸣，告警指示灯常亮	整流器故障	请联系当地客户服务中心
13	指示灯 2 常亮，蜂鸣声常鸣，告警指示灯常亮	功率模块的内置电池充电器发生故障	请联系当地客户服务中心
14	3kVA UPS IEC 输出插座无输出	负载过载，保险丝烧断。	断电关机，更换保险丝，断开负载，重新上电开机，检查输出电压是否正常。如果故障依然存在，请联系当地客户服务中心

当您需要向艾默生当地客户服务中心反映故障情况时，请务必记录并告知设备型号和设备编码（机器铭牌上）。

第五章　产品规格和性能

5.1　外形尺寸与重量

模块	宽×高×深（mm）	重量（kg）
功率模块 US11R-0010	440×87×400	17.5
功率模块 US11R-0010L	440×87×400	7.8
功率模块 US11R-0020	440×87×400	8.6
功率模块 US11R-0020L	440×87×400	9.6
功率模块 US11R-0030	440×87×400	9.0
功率模块 US11R-0030L	440×87×400	10.0
电池模块 UF-B0007-06	440×87×400	20.5
电池模块 UF-B0009-06	440×87×400	21.5

5.2　基本电气性能

型号		US11R-0010	US11R-0010L	US11R-0020	US11R-0020L	US11R-0030	US11R-0030L
额定容量		1kVA/700W		2kVA/1400W		3kVA/2100W	
输入	输入方式	单相+PE					
	额定电压	220Vac					
	电压范围	1．176Vac～288Vac 范围内，满载工作； 2．120Vac～176Vac，输出按输入电压线性递减； 3．电压 120Vac 时，可输出 50％负载					
	频率	50Hz±10％					
	功率因数	0.99（条件：额定电压、纯阻性负载满载、电池充满）					

型号		US11R-0010	US11R-0010L	US11R-0020	US11R-0020L	US11R-0030	US11R-0030L
额定容量		1kVA/700W		2kVA/1400W		3kVA/2100W	
输出	输出方式	单相+PE					
	功率因数	0.7					
	电压	220Vac±2%					
	电网调整率	≤2%（0～100%线性负载）					
	负载调整率	≤2%（0～100%线性负载）					
	电压失真度（额定输入电压，额定输入频率）	≤3%（0～100%线性负载） ≤5%（0～100%非线性负载）					
	动态响应瞬变范围	满足 IEC62040-3					
	动态响应恢复时间	满足 IEC62040-3 （60ms）					
	频率	旁路频率在 50Hz±10%范围内时，输出跟踪旁路频率，相位差小于 3 度； 旁路频率超限或旁路电压小于 120Vac，输出频率固定为 50Hz					
	频率跟踪速率	≤1 Hz/s					
	逆变器过载能力（市电，25℃）	<105%　连续工作 105%～125%　5 分钟 125%～150%　1 分钟 150%～200%　10 秒 >200%　0.25 秒					
	逆变器过载能力（电池，25℃）	<105%　连续工作 >105%～125%　60 秒～30 秒递减 >125%　0.25 秒					
	旁路过载能力	100%～150%　5 分钟 151%～200%　1 分钟					
	峰值因数	3：1					
	旁路工作电压	121Vac～253Vac					
	转换时间	市电逆变<—>电池：0ms					
	直流分量	≤200mV					
	效率	电池模式： ≥83%（额定电池电压，线性满载） 市电逆变模式：≥88%（额定市电电压，线性满载，电池充满）					

型号		US11R-0010	US11R-0010L	US11R-0020	US11R-0020L	US11R-0030	US11R-0030L
额定容量		1kVA/700W		2kVA/1400W		3kVA/2100W	
外接电池电压		36Vdc		72Vdc			
充电电流		1A	7A	1A	8A	1A	8A
电池	数量×电压×容量	3×12V×7.2Ah	-	6×12V×7.2Ah	-	6×12V×9Ah	-
	厂家/型号	CSB/GP1272F2 或者 Panasonic 同类电池	-	CSB/GP1272F2 或者 Panasonic 同类电池	-	CSB/HRL1234WF2 或者 Panasonic 同类电池	-
	备电时间（25℃）	满载下，≥5 分钟（标准型）					
	充电时间	在 5 小时可充电到 90%的电池容量（标准型）					
噪声（距离 1m 处）		US11R-0010（L）：43dB US11R-0020（L）、US11R-0030（L）：45dB					
防护等级		IP21（静态）					

5.3 EMS

项目	满足标准	满足标准等级
静电放电抗扰性	IEC61000-4-2	Level 3 判据 B
辐射电磁场抗扰性	IEC61000-4-3	Level 3 判据 A
快速瞬变电脉冲群抗扰性	IEC61000-4-4	Level 4 判据 A
浪涌抗扰性	IEC61000-4-5	Level 4 判据 B
防雷	YD/T 944	Level I 6kV/3kA

5.4 EMI

项目	满足标准	满足标准等级
输入谐波电流发射要求	EN61000-3-2	-
电压波动和闪烁的限值要求	EN61000-3-3	-
传导骚扰发射要求	EN50091-2，GB7260.2	B 级
辐射骚扰发射要求	EN50091-2，GB7260.2	B 级

5.5　使用环境

项目	范围
环境温度	0℃～40℃
相对湿度	5%～95%
海拔高度	小于 1500m 不降额， 1500m～3000m 每升高 100m 输出降额 1%
存储温度	-25℃～55℃（不含电池）

5.6　安规

满足 GB4943-2001，EN62040-1-1；符合 CE 要求。

Safety Instructions

1. As dangerous voltages are present within the UPS, only an Emerson technician or an Emerson-authorized technician is permitted to open it. Failure to observe this could result in electric shock risk and invalidation of any implied warranty.

2. When the UPS is purchased to deliver power to the equipment listed below, please discuss with the distributor in advance about the applicability, settings, management and maintenance of the UPS, as these need special considerations in design and development.

- Life-supporting medical apparatus;
- Facilities such as lifts/elevators where adequate care has to be taken to avoid any fatal eventuality endangering human life;
- Any other mission-critical equipment like the above.

3. Never dispose of the battery in a fire, as it may explode when exposed to flame.

4. It is inhibited to apply pure inductive load to the UPS.

5. The UPS has its own energy source, i.e., a, battery, therefore, the output terminal of the UPS may carry live voltage even when the UPS is not connected to the AC mains.

6. Before moving or re-wiring the UPS, please disconnect the mains source and make sure the UPS is completely shut down. Or else, the output terminal may carry live voltage, thus presenting electric shock risk.

7. To ensure human safety and normal operation, the UPS must be solidly and adequately grounded before use.

8. The operating environment and storage method are two main factors affecting the lifetime and reliability of the UPS. Hence, it is advisable not to use the UPS for longer periods in the following environments:

- Places where the temperature and relative humidity are outside the specifications (specified temperature: 0°C~40°C, specified relative humidity: 5%~95%);
- Places where vibrations or shocks are existing;
- Places which are dusty, strewn with corrosive substances or salts or where flammable gases are present.

9. Verify that the cabling and battery cable polarity are correct before switching on the UPS.

10. The external battery must be fitted with an appropriate overcurrent protection device.

11. The UPS installation must be firm and solid. The AC input socket that feeds the UPS should be located near the UPS, and easy to access.

12. The UPS can be operated by the user.

13. In case of fire, use dry chemical fire extinguisher to put out the fire. Using foam fire extinguisher may cause electric shock.

14. High ambient temperature shortens the battery's lifetime, so the battery should be replaced periodically to ensure normal UPS operation and for adequate autonomy time. Only an Emerson-authorized technician is permitted to replace the battery. In replacement of battery or battery module, please use the same model and number of battery or battery module. Batteries can be replaced only when the UPS's input terminals are disconnected from the AC mains and the UPS is completely shut down (all LEDs are off and no fan moves).

15. If the UPS will remain idle for a long period, it must be stored in a dry environment. The storage temperature should range between -25°C and +55°C (without battery).

16. Do not open or damage the battery, as the battery electrolyte is harmful to human skin and eye. If electrolyte comes into contact with the skin, wash the affected area with plenty of clean water immediately and go to the hospital for a check.

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Chapter 1 Product Description

iTrust RT series 1~3kVA UPS, a kind of intelligent online UPS with a sine wave output, is developed by Emerson Network Power Co., Ltd. With high efficiency and reliability, it provides reliable and high quality AC power to your sensitive equipment.

iTrust RT series 1~3kVA UPS adopts modular design. Rack installation and tower installation can be used to install it depending on the user's requirements. It is an ideal product for applications that require small footprint, like communication stations, data machine room, and so on.

1.1 Features

Product features include:

- 2U thick.
- Exceptional electrical performance, with an on-line efficiency up to 88%.
- High system reliability, self-protection and fault diagnosis are achieved by using the advanced DSP-based full digital control technology.
- The system adopts a high-frequency, double conversion topology structure to achieve a high input power factor up to 0.99, greatly reducing its contamination to the power grids.
- With a wide range of input voltages, and an output immune to the mains interference, the product is suitable for even areas with unstable mains power supply. It is an ideal green energy source.
- With a wide range of input frequencies, the product can be well connected to generator output.
- Internal large current charger is available to satisfy users' demand for extended battery back-up time.

1.2 System Components

Power module and battery module are the basic components of iTrust RT series UPS. The former performs power conversion, provides AC output for load and charges the battery, while the latter provides DC power for the UPS.

1.2.1 Power Module

Types and models

There are two types of power module: standard type and extended back-up time type, each available in the following ratings: 1kVA, 2kVA and 3kVA.

The power module types and models appear from Table 1-1. Users can confirm the module model by checking the nameplate on the enclosure.

Table 1-1 Power module types and models

Type	Module name	Model	Remark
Standard	1kVA standard power module	US11R-0010	With a 1A internal charger and a 3*12V/7.2Ah internal battery
	2kVA standard power module	US11R-0020	With a 1A internal charger
	3kVA standard power module	US11R-0030	With a 1A internal charger
Extended back-up time	1kVA extended back-up time power module	US11R-0010L	With a 7A internal charger
	2kVA extended back-up time power module	US11R-0020L	With an 8A internal charger
	3kVA extended back-up time power module	US11R-0030L	With an 8A internal charger

Front panel appearance

All models of power modules have the same front panel, which provides ON/Alarm silence button, OFF button and LED indication, as shown in Figure 1-1.

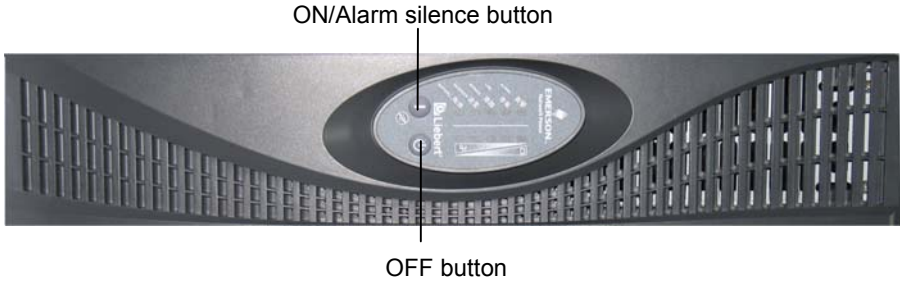


Figure 1-1 Front panel of power module

Rear panel appearance

The power module's rear panel differs with the model, as shown in figures from 1-2 to 1-6. The rear panel provides AC input socket, AC input overcurrent protection switch, output socket, output fuse and output terminal block (3kVA power modules only), external battery socket (except for 1kVA standard power module), DB9 communication port and SNMP card slot.

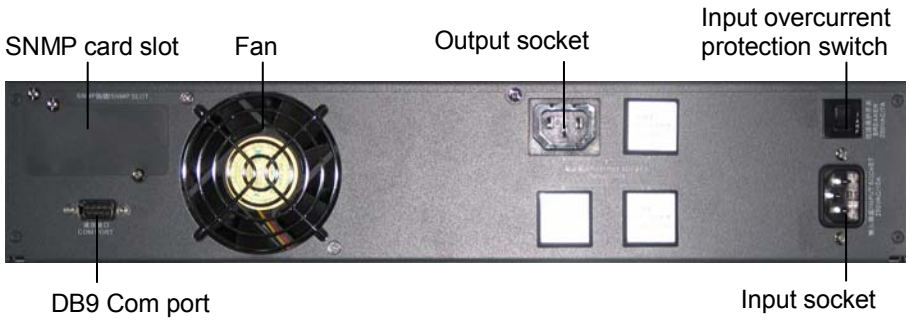


Figure 1-2 Rear panel of 1kVA standard power module

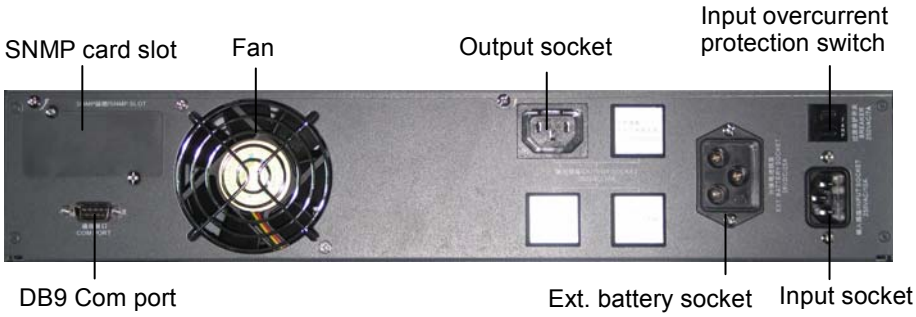


Figure 1-3 Rear panel of 1kVA extended back-up time power module

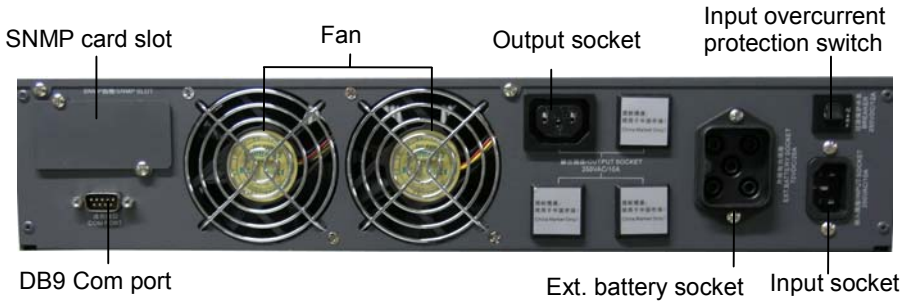


Figure 1-4 Rear panel of 2kVA standard power module

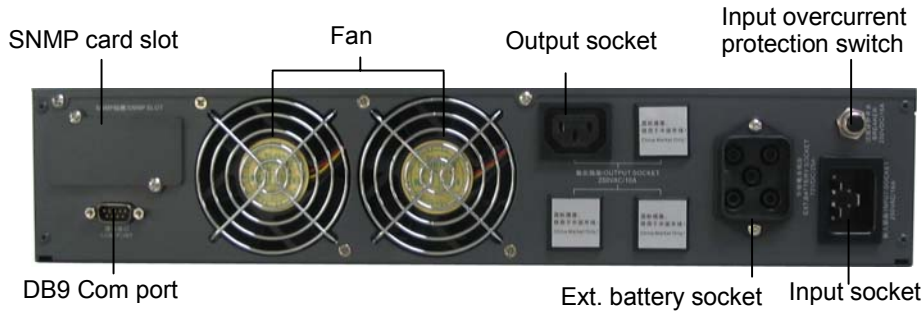


Figure 1-5 Rear panel of 2kVA extended back-up time power module

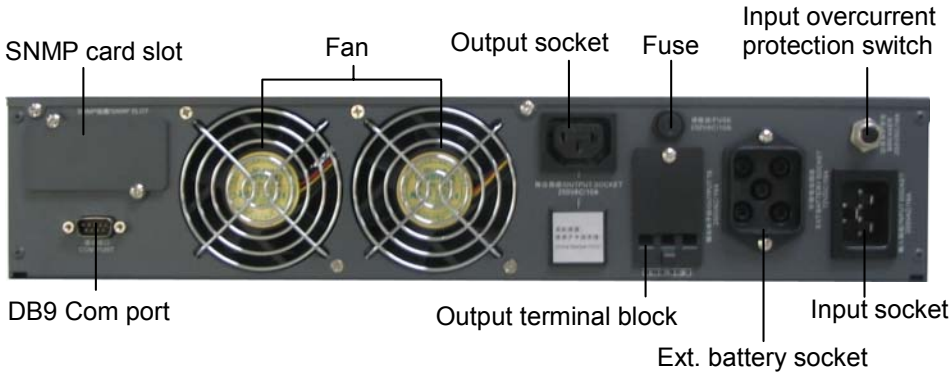


Figure 1-6 Rear panel of 3kVA power modules

1.2.2 Battery Module

Model

The battery module is available in two modules: UF-B0007-06 and UF-B0009-06, as shown in Table 1-2. Users can confirm the module model by checking the nameplate on the enclosure.

Table 1-2 Battery module models

Module name	Model	Remark
72V/7.2Ah battery module	UF-B0007-06	72V, with a 6*12V/7.2Ah internal battery
72V/9.0Ah battery module	UF-B0009-06	72V, with a 6*12V/9Ah internal battery

Front panel and rear panel appearances

The UF-B0007-06 and UF-B0009-06 battery modules have the same front panel and rear panel, as respectively shown in Figure 1-7 and Figure 1-8.



Figure 1-7 Front panel of battery module

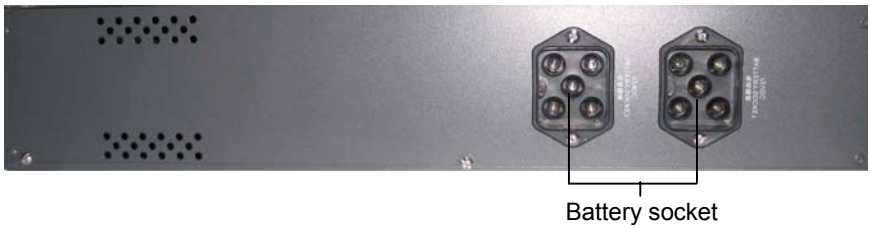


Figure 1-8 Rear panel of battery module

1.3 System Type And Configuration

The above-said power modules and battery modules can comprise two types of UPS system: standard type and extended back-up time type, each available in the following ratings: 1kVA, 2kVA and 3kVA UPS.

The UPS types and configurations appear from Table 1-3.

Table 1-3 UPS types and configurations

UPS type		Configuration			
		Module	Model	Qty.	Remark
Standard	1kVA standard UPS	Power module	US11R-0010	1	The UPS has only one power module
	2kVA standard UPS	Power module	US11R-0020	1	The UPS consists of a power module and a battery module
		Battery module	UF-B0007-06	1	
	3kVA standard UPS	Power module	US11R-0030	1	
		Battery module	UF-B0009-06	1	
Extended backup time	1kVA extended back-up time UPS	Power module	US11R-0010L	1	External battery is needed and should be provided by users. Emerson battery and battery cabinet are recommended
	2kVA extended back-up time UPS	Power module	US11R-0020L	1	
	3kVA extended back-up time UPS	Power module	US11R-0030L	1	

1.4 Operating Principle

The UPS operating principle is shown in Figure 1-9.

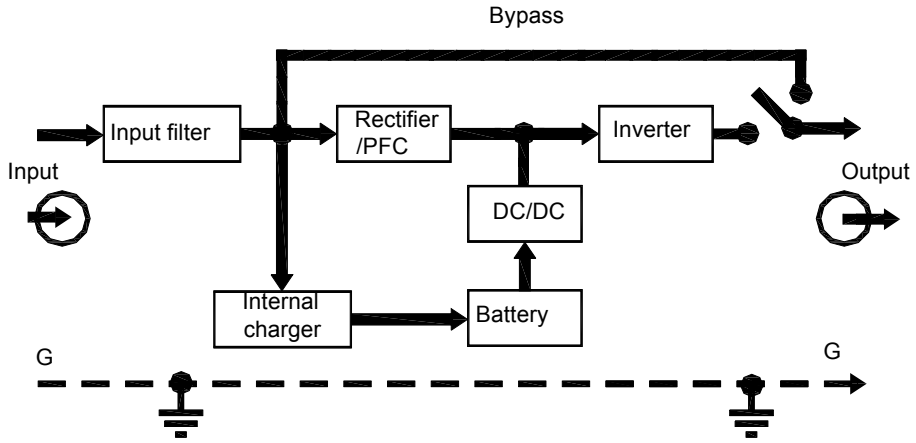


Figure 1-9 UPS schematic block diagram

The UPS comprises AC input, input filter (EMI and Class D SPD), rectifier/PFC (power factor correction), DC/DC converter, inverter, bypass, internal charger, battery and UPS output functional modules. The UPS uses DSP (digital signal processor) and IGBT (insulated gate bipolar transistor) to ensure satisfactory performance and increase the product reliability.

AC input: contains AC input socket and input overcurrent protection switch.

Input filter: contains EMI suppression filter and Class D SPD. It provides clean AC power to the UPS.

Rectifier/PFC: an important front-end processing functional module of the UPS. In Normal mode, the rectifier/PFC circuit converts the AC input power to regulated DC power, while ensuring that the wave shape of the input current used by the UPS is near ideal.

DC/DC converter: it raises the DC voltage from the battery system to the optimum operating voltage for the inverter when the UPS operates in Battery mode.

Inverter: an important back-end processing functional module of the UPS. In Normal mode, the inverter utilizes the DC output of the PFC circuit and inverts it into precise, regulated sinewave AC power. In Battery mode, the inverter receives its required energy from the battery through the DC/DC converter.

Bypass: this module plays a very important role in enhancing the UPS reliability. In the event of an UPS fault that will not lead to UPS shutdown, such as an over-temperature condition, rectifier fault, inverter fault, the load will be automatically transferred to the bypass. In the meantime, the LED indicators will indicate the fault type, and the fault information will be reported through the communication ports.

Internal charger: the internal charger of US11R-0010, US11R-0020 and US11R-0030 standard power modules provides 1A charging current; that of US11R-0010L extended back-up time power module provides 7A charging current; and that of US11R-0020L and US11R-0030L extended back-up time power modules provides 8A charging current.

Battery: sealed maintenance-free lead-acid battery can be used as the DC source of the UPS.

UPS output: this module contains output EMI suppression filter and provides multiple AC outputs for load.

1.5 Communication

The UPS provides a DB9 port and an SNMP card slot located on the rear panel of the power module (see figures from 1-2 to 1-6).

DB9 port

The DB9 can be used for RS232 serial communication and dry contact communication. Users can use the accessory UPS monitoring software to monitor the UPS through the DB9 port.

SNMP card slot

The SNMP card slot is designed for installing the SNMP card option, which enables users to monitor the UPS over network.

Chapter 2 Installation

2.1 Unpacking Inspection

1. Open the packing box of each module and take out the modules, visually examine the modules for transit damage.

2. Check against the accessory lists (see tables 2-1 to 2-2) that the accessories of the power module and battery module are present.

3. If the UPS arrives damaged, or there is any missing accessory, please contact the distributor immediately.

Table 2-1 Power module accessory list

Accessory	Quantity	Unit
Tower installation fittings —— plastic support base	4	Pcs
Rack installation fittings —— bracket	1	Pair
Panel fastener	4 or 8	Pcs
AC input cable	1	Pcs
Battery connection cable	1	Pcs
RS232 cable	1	Pcs
User manual	1	Pcs
Single UPS monitoring software (UPSite Plus) CD	1	Pcs
UPS warranty card	1	Pcs

Note:

1. The rated current of the AC input cable of US11R-0010, US11R-0010L and US11R-0020 power modules is 10A, that of US11R-0020L, US11R-0030 and US11R-0030L power modules is 16A.

2. Only long back-up time power modules are delivered with a battery connection cable--a 1.8m long cable with OT terminals attached to one end and a connector attached to the other, which is a 3-pin one for US11R-0010L module and a 5-pin one for US11R-0020L and US11R-0030L modules.

3. 4 panel fasteners are delivered with US11R-0010, US11R-0010L, US11R-0020L, and US11R-0030L; 8 are delivered with US11R-0020, and US11R-0030.

Table 2-2 Battery module accessory list

Accessory	Quantity	Unit
Tower installation fittings —— plastic middle base	2	Pcs
Rack installation fittings —— bracket	1	Pair
Battery cable with a 5-pin connector attached to each end	1	Pcs

2.2 Installation Notes

1. When locating the UPS, make sure there is no hazardous objects around the UPS, and that the installation environment meets the specifications (see section 5.5).

2. The UPS is cooled with the aid of the internal fan fitted in the back of the power module. A clearance of at least 300mm should be maintained behind the power module to facilitate adequate ventilation and heat dissipation.

3. When adopting rack installation, the UPS must be installed in a standard 19-inch equipment rack at least 400mm deep. The user should provide the installation fittings in the rack.

2.3 Tower Installation

2.3.1 Installing Single Power Module

Use the following steps to install the UPS systems that contain only one power module and no battery module. These power modules include US11R-0010, US11R-0010L, US11R-0020L and US11R-0030L.

1. Take out a pair of support bases delivered with the power module, snap it up in the direction shown in the left figure below to make a base, and put it down on the installation surface flatwise, as shown in the right figure below; likewise, make another base using another pair of support bases, and put it down on the installation surface flatwise.

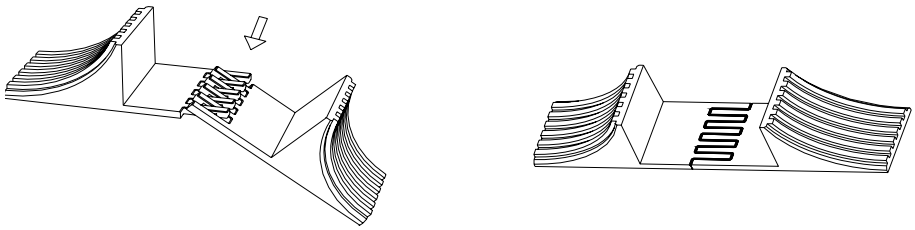


Figure 2-1 Making base

2. As shown in the left figure below, move the two bases to appropriate positions, and put the power module gently down on the bases; then push the power module gently in the directions shown in the right figure below to position it evenly on the two bases.

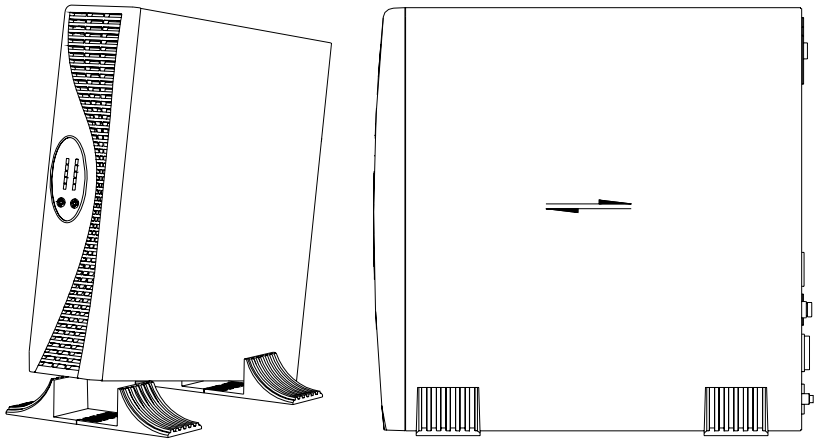


Figure 2-2 Positioning power module

2.3.2 Installing Power Module Plus Battery Module

Use the following steps to install the standard UPS systems that contain a power module and a battery module (i.e., US11R-0020 plus UF-B0007-06; and US11R-0030 plus UF-B0009-06).

1. Take out a pair of support bases delivered with the power module, and a support base extension delivered with the battery module, use step 1 in section 2.3.1 to fit them together to make a base, and put it down on the

installation surface flatwise, as shown in Figure 2-3; likewise, make another base and put it down on the installation surface flatwise.

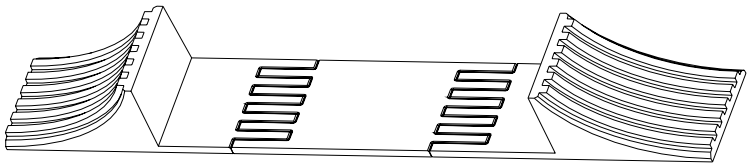


Figure 2-3 Making base

2. Use step 2 in section 2.3.1 to put the power module and battery module on the bases, with the power module in the right position to facilitate cable connection, as shown in Figure 2-4.

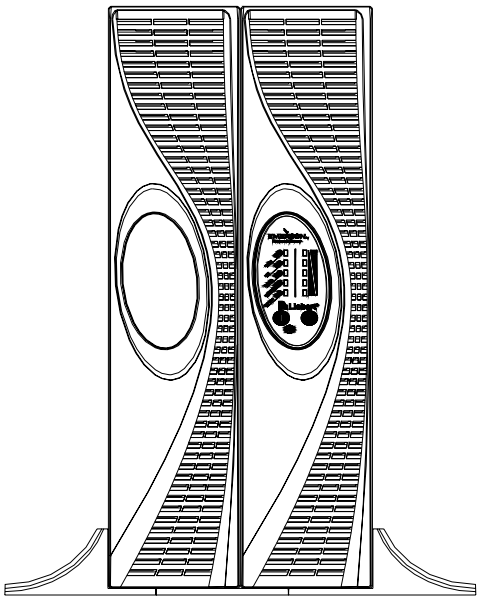


Figure 2-4 Positioning modules

2.4 Rack Installation

2.4.1 Installing Single Power Module

Use the following steps to install the UPS systems that contain only one power module and no battery module. These power modules include US11R-0010, US11R-0010L, US11R-0020L and US11R-0030L.

1. Take out the pair of brackets delivered with the power module; remove the four flat screws M4*8 on both sides of the module, as shown in Figure 2-5; and fix the brackets onto both sides of the module using the flat screws, as shown in Figure 2-6.

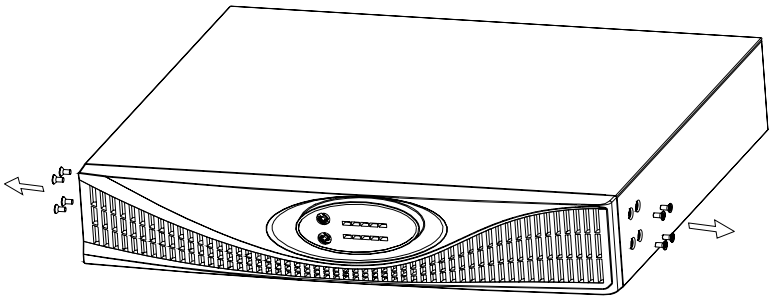


Figure 2-5 Removing flat screws

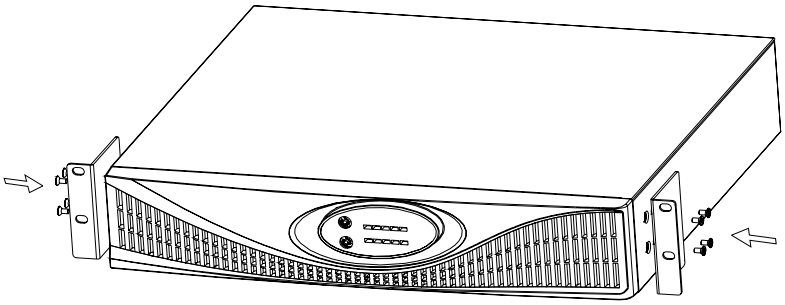


Figure 2-6 Installing brackets

2. Place the power module onto the slide rail in the rack in the direction shown in the following figure, and push it into place along the slide rail.

Take out the four panel fasteners delivered with the module, and fix the module onto the rack using the screws, as shown in the figure below.

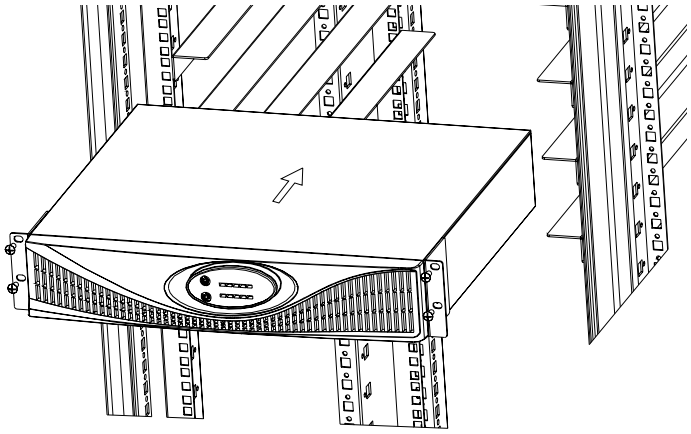


Figure 2-7 Installing power module

2.4.2 Installing Power Module Plus Battery Module

Use the following steps to install the standard UPS systems that contain a power module and a battery module (i.e., US11R-0020 plus UF-B0007-06; and US11R-0030 plus UF-B0009-06).

1. Take out a pair of brackets respectively delivered with the power module and battery module, use step 1 in section 2.4.1 to fit the brackets onto both sides of the two modules.

2. Take out the 8 panel fasteners delivered with the power module, use step 2 in section 2.4.1 to install the power module and battery module on the rack one by one, advisably, with the power module in the lower position to facilitate cable connection, as shown in Figure 2-8.

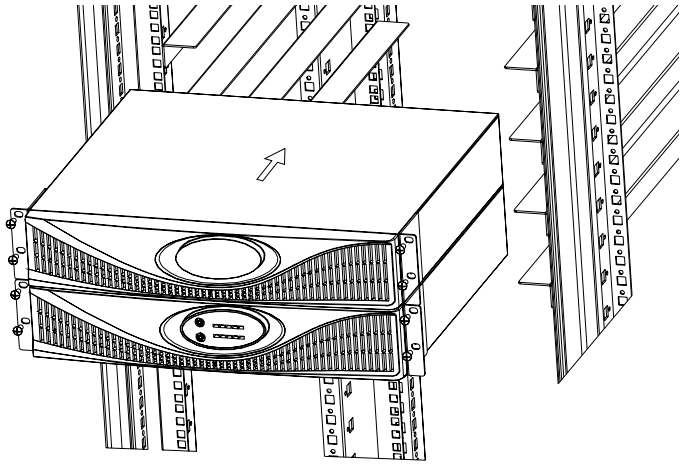


Figure 2-8 Installing modules

2.5 Cable Connection

2.5.1 Connecting Battery Cable

Battery cable connection is required for long back-up time UPS systems and standard UPS systems that contain a power module and a battery module.

Power module plus battery module system

Take out the battery connection cable delivered with the battery module, plug one end of the cable into the external battery socket on the rear panel of the power module, and the other end into any battery socket on the rear panel of the battery module.

Long back-up time system

⚠Warning

1. Batteries have dangerous energy, only professionals shall make battery cable connection for long back-up time UPS systems.

2. The external battery voltage must comply with the power module's requirements on external battery voltage (see section 5.2).

Use the following steps to connect the battery cable for the long back-up time UPS.

1. Open the battery breaker.

2. Take out the battery cable delivered with the power module, a plug at one end and three OT terminals at the other.

3. For the battery cable of 1kVA power module, connect the three OT terminals of the red line, black line, yellow and green line respectively to the battery breaker's positive terminal, negative terminal and the PE terminal of the battery cabinet (refer to the Battery Cabinet User Manual). For the battery cables of 2kVA and 3kVA power modules, connect the three OT terminals respectively labeled "+", "-" and "G" respectively to the battery breaker's positive terminal, negative terminal and the PE terminal of the battery cabinet.

If the battery cable's OT terminals are bigger than the battery breaker's terminals, remove the battery cable's OT terminals, peel off the battery cable to expose proper length of copper core, and connect the copper core to the battery breaker terminals.

4. Plug the battery cable into the external battery socket on the rear panel of the power module.

Note

The external battery cable delivered with the long back-up time power module is 1.8m long. If users need a longer one, please consult the distributor. There is a limit to the length of the external battery cable to ensure normal operation of the UPS.

2.5.2 Connecting Input And Output Cables

The input and output cables are connected through the input socket, output socket, output terminal block at the rear panel of the power module. Refer to Figures 1-2 to 1-6.

Notes

1. Make sure that the input plug and load plug match the power module's input socket and output socket respectively. The power module in every model provides an IEC320-C13 output socket. US11R-0030 and US11R-0030L provide an additional 16A output terminal block. The AC input socket of US11R-0010, US11R-0010L, US11R-0020 is IEC320-C14 complied. That of US11R-0020L, US11R-0030, US11R-0030L is IEC320-C20 complied.

2. The max output current of each load output shall not exceed the rated current of output sockets and output terminal block, the total output power shall not exceed 0.7kW for 1kVA UPS, 1.4kW for 2kVA UPS, and 2.1kW for 3kVA UPS.

3. Non-professionals shall not make cable connection to the output terminal block at the rear panel of the 3kVA power module.

4. When connecting load cable to the output terminal block, make sure that the neutral line and live line are not reversed connected.

Connection method

Connect the input cable between the user's mains socket and the input socket of the power module, and insert the load plug into the output socket of the power module.

2.5.3 Connecting Communication Cable

DB9 communication port (male)

Where users need to use the single UPS monitoring software delivered with the power module to monitor the UPS, in communication cable connection, just locate the RS232 cable delivered with the power module, and insert the two cable plugs respectively into the RS232 port of the computer and the DB9 port at the rear panel of the power module.

The DB9 port can be used for dry contact communication as well as RS232 serial communication. Its pin assignment is shown in Figure 2-9, the pin description appears from Table 2-3, and its dry contact port principle is shown in Figure 2-10.

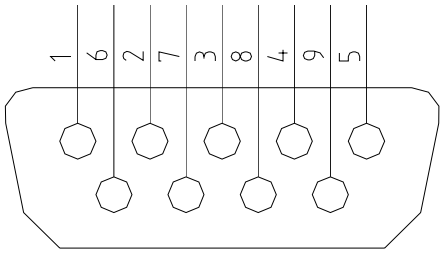


Figure 2-9 DB9 port's pin assignment

Table 2-3 DB9 port's pin description

Pin	Description	Remark
1, 7	Low Battery (output dry contact)	1. Pin1, Pin7 dry contact output: open when the battery voltage is normal, shorted when the battery voltage is low. 2. Pin9, Pin8 dry contact output: open when the UPS is not on battery, shorted when the UPS is on battery. 3. Pin4 dry contact input (to Pin5): in Battery mode, when at high level (5~12Vdc, for more than 20s), the UPS is turned off; when open or at low level input, the UPS maintains the original state.
2	UPS RxD (RS232 standard)	
3	UPS TxD (RS232 standard)	
4	Remote Inverter Off in Battery Mode	
5	Common GND	
6	NC	
8, 9	On Battery (output dry contact)	

Note

The input signal current shall not exceed 10mA, the output dry contact voltage shall not exceed 30Vdc.

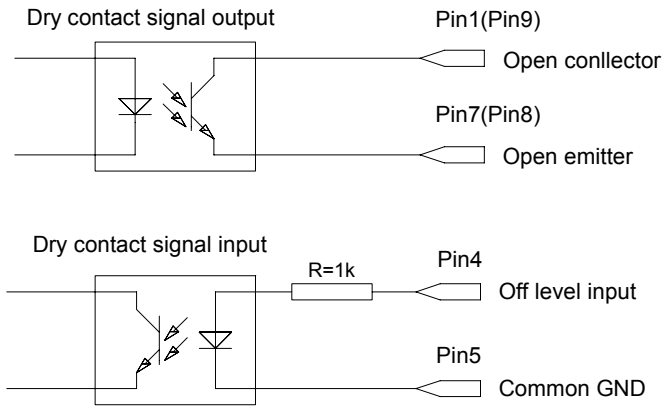


Figure 2-10 Dry contact port schematic diagram

SNMP card slot

For users that use the SNMP card to monitor the UPS, please refer to the *SNMP Card User Manual* for the SNMP card installation.

Chapter 3 Operation

3.1 Operator Control And Display Panel

Figure 3-1 shows the operator control and display panel of the power module, which provides ten LED indicators and two control buttons: ON/Alarm silence button and OFF button.

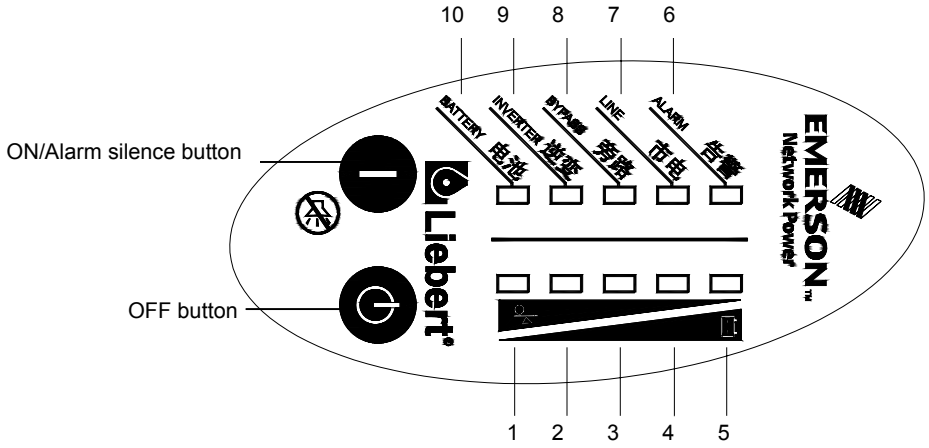


Figure 3-1 Operator control and display panel of power module

Control buttons

1. ON/Alarm silence button

The ON/Alarm silence button provides the following three functions:

1) Turn on the inverter: Pressing and holding the ON/Alarm silence button for one second can turn on the inverter.

2) Silence the audible alarm in Battery mode: In Battery mode, when the buzzer beeps every 3.3s, pressing and holding the ON/Alarm silence button for one second can silence the buzzer.

3) Initiate battery test: In Normal mode, pressing and holding the ON/Alarm silence button for one second can initiate the battery test.

Note

The alarm silencing function of the ON/Alarm silence button is valid only for the one beep per 3.3s audible alarm in Battery mode, and invalid for any other UPS audible alarms.

2. OFF button

The OFF button provides the following two functions:

1) Turn off the inverter: in Normal mode or Battery mode, pressing and holding the OFF button for one second can turn off the inverter.

2) Transfer the UPS to Standby state: in Bypass mode, pressing and holding the OFF button for one second can turn off the bypass output and transfer the UPS to Standby state.

LED indicators

The indications of the BATTERY indicator, INVERTER indicator, BYPASS indicator, LINE indicator and ALARM indicator are described in Table 3-1.

Table 3-1 LED indication

BATTERY indicator (green)	It illuminates when the UPS is on battery and the battery voltage is not too high, flashes when the battery is faulty or the charging voltage is too high
INVERTER indicator (green)	It illuminates when the inverter is in normal operation, flashes when the inverter is faulty
BYPASS indicator (green)	It illuminates when the UPS is on bypass.
LINE indicator (green)	It illuminates when the mains input is normal, flashes when abnormal, and goes off when it fails
ALARM indicator (red)	It is on in the event of a UPS fault, off otherwise.

The buzzer and the ten indicators combine to indicate the UPS operating status and faults, as illustrated in Table 3-2:

Table 3-2 Audible alarm&LED indication of UPS operation status/faults

S/N	Operating status		LED number (identified in Figure 3-1)										Audible alarm
			1	2	3	4	5	6	7	8	9	10	
1	Normal mode	0%~25% load					●		●		●		None
2		26%~50% load				●	●		●		●		None
3		51%~75% load			●	●	●		●		●		None
4		76%~100% load		●	●	●	●		●		●		None
5		101%~105% load	●	●	●	●	●		●		●		None
6		>105% load	●	●	●	●	●		●		●		Twice every 1s
7	Battery mode	0%~25% battery capacity	●								●	●	Once every 1s
8		26%~50% battery capacity	●	●							●	●	Once every 3.3s
9		51%~75% battery capacity	●	●	●						●	●	Once every 3.3s
10		76%~95% battery capacity	●	●	●	●					●	●	Once every 3.3s
11		>96% battery capacity	●	●	●	●	●				●	●	Once every 3.3s
12		>105% load	◎	◎	◎	◎	◎				●	●	Twice every 1s
13	Shortcircuit fault		●					●	◎	◎			Continuous
14	Charger fault			●				●	◎	◎			Continuous
15	Overheating fault				●			●	◎	◎			Continuous
16	Fan failure					●		●	◎	◎	◎	◎	Once every 1s
17	Rectifier fault						●	●	◎	◎			Continuous
18	Inverter fault							●	◎	◎	¤		Continuous
19	Inverter overload		●	●	●	●	●	●	◎	◎			Continuous
20	Battery overcharge (in Normal mode)		◎	◎	◎	◎	◎		●		●	¤	None
21	Battery overcharge (in Standby state)		◎	◎	◎	◎	◎		◎			¤	None
22	No battery		◎	◎	◎	◎	◎		●		◎	¤	6 times

● ON; ◎ depending on other conditions; ¤ Flash

Note

LED 1 is yellow, LED 6 is red, others are green.

3.2 Operation Mode

The UPS can be considered to be in the following operation modes:

Normal mode

When the input mains voltage is within the specifications, the load is supplied by the inverter, which draws power from the rectifier; meanwhile, the charger charges the battery. When in Normal mode, the LINE indicator and INVERTER indicator on the operator panel are on.

Bypass mode

In the event of an overload, inverter fault, overheating or rectifier fault condition during Normal mode, the UPS will transfer to Bypass mode. In Bypass mode, the load is supplied by the bypass AC source, which comes directly from the AC mains input; meanwhile, the charger charges the battery. When the UPS works in Bypass mode, the LINE indicator and BYPASS indicator are on, the INVERTER indicator is off.

Note

1. If the UPS transfers from Normal mode to Bypass mode three times within twenty minutes due to overload, afterwards, it will remain in Bypass mode no matter whether the overload condition is removed or not.

2. In the event of a mains failure or mains voltage or frequency outside the specifications when the UPS is in Bypass mode, the UPS will shut down and cease supplying power to the load.

Battery mode

In the event of a mains failure, or mains voltage or frequency outside the specifications when the UPS is in Normal mode, the rectifier and charger will become inoperative, and the battery will begin to discharge and supply the load through the inverter. When the UPS is in Battery mode, the BATTERY indicator and the INVERTER indicator are on.

Note

In the event of an inverter fault, internal overheating or other fault conditions in Battery mode, the inverter will become inoperative.

3.3 Operating Instructions

3.3.1 Turning On And Completely Powering Down The UPS

Note

The battery is fully charged before delivery. However, storage and transportation will inevitably cause some charge loss. Therefore, it is advisable to charge the battery for 8 hours before using it, so as to ensure adequate battery autonomy.

Turning on the UPS

Users can use the following two methods to turn on the UPS:

1. Connect the mains input to the UPS, and manually turn on the UPS into Normal mode

Connect the mains input to the UPS, press and hold the ON button for one second until the buzzer beeps. At this point, the UPS begins to conduct self-test. Seconds later, the UPS will begin to operate in Normal mode; meanwhile, the LINE indicator, INVERTER indicator, load/battery capacity indicators (LEDs 1~5) will turn on.

Note

The UPS provides automatic restart function, i.e., the inverter will restart automatically to allow the UPS to operate in Normal mode when the mains power recovers after the UPS shuts down due to battery full discharge following a mains failure. This function can be enabled through the background monitoring software, and it is enabled by default.

2. With no mains input fed to the UPS, turn on the UPS manually into Battery mode

With no mains input fed to the UPS, hold and press the ON button for one second until the buzzer beeps. At this point, the inverter turns on, and the UPS will begin to operate in Battery mode. Meanwhile, the BATTERY indicator, INVERTER indicator, load/battery capacity indicators (LEDs 1~5) will turn on.

Completely powering down the UPS

The UPS can be powered down completely from Normal mode, Battery mode, and Bypass mode. The procedures are as follows:

1. Completely power down the UPS from Normal mode

Hold and press the OFF button for one second until the buzzer beeps. At this point, the UPS inverter turns off, the UPS ceases output and transfers to standby state, the LINE indicator and LED 5 are on. In standby state, the UPS is not completely powered down. To completely power down the UPS, disconnect the mains input to the UPS.

2. Completely power down the UPS from Battery mode

Just hold and press the OFF button for one second, and the UPS will shut down and cease output.

3. Completely power down the UPS from Bypass mode

Hold and press the OFF button for one second, and the UPS will cease output and transfer to standby state. In standby state, the UPS is not completely powered down. To completely power down the UPS, disconnect the mains input to the UPS.

3.3.2 Conducting Battery Test

In UPS operation, users can manually initiate battery test to check the battery conditions. There are two methods to initiate the battery test:

1. Through the ON/Alarm silence button

In Normal mode, press and hold the ON/Alarm silence button for one second until the buzzer beeps. At this point the LEDs 6~10 will flash cyclically, indicating the battery test has started. The battery test will last for five seconds. In the event of a battery fault during battery test, the UPS will transfer to Normal mode automatically.

2. Through the background monitoring software

Users can also initiate battery test through the background monitoring software. For details, please refer to the UPS Monitoring Software User Manual.

Chapter 4 Maintenance

4.1 Battery Maintenance

The battery is a key component of the UPS system. The battery life depends on the ambient temperature, charge and discharge times. High ambient temperature and deep discharge will shorten the battery life.

1. Keep the ambient temperature between 15°C and 25°C.

2. To prevent small current discharge, the battery discharge duration should not exceed 48 hours.

3. If the UPS hasn't been used for a long time, and the battery hasn't been charged for 3 months at specified ambient temperature, or 2 months at high ambient temperature, please charge it for at least 12 hours.

4.2 Replacing Output Fuse

⚠Warning

1. Before replacing the output fuse, please disconnect the UPS input and switch off the UPS output.

2. Only the same model of fuse can be used to replace the old one.

Only 3kVA power modules provide an output fuse (see Figure 1-6), which is provided for the IEC output socket. No fuse is provided for the output terminal block.

Procedures for replacing the fuse are as follows:

1. Remove the fuse holder from the rear panel of the power module by turning a flat head screwdriver counter-clockwise;

2. Take out the fuse from the fuse holder, and put a new one in it;

3. Replace the fuse holder by turning the flat head screwdriver clockwise.

4.3 Checking UPS Functions

Every time when conducting field maintenance, please check the regular functions of the UPS, including:

1. The UPS operating status

If the mains voltage is within the specifications, the UPS should operate in Normal mode; if the mains voltage is abnormal, the UPS should operate in Battery mode. In both cases, there should be no fault indication.

2. The transfer between the UPS operation modes:

Disconnect the mains input to simulate a mains failure, the UPS should transfer to Battery mode and operate normally; then recover the mains input, the UPS should transfer back to Normal mode and operate normally.

3. The LED indication of the UPS

During the check processes stated above, check that the LED indication of the UPS agrees with the UPS operation mode.

4.4 Troubleshooting

In the event of an UPS fault, shoot the trouble according to Table 4-1. If the fault persists, seek immediate assistance from the local Emerson customer service office.

Table 4-1 UPS troubleshooting table

S/N.	Fault conditions	Possible cause	Actions to take
1	Pressing the ON button cannot turn on the UPS	The button holding time is not long enough	Press and hold the ON button for one second until the buzzer beeps, and the UPS will start
		No battery is connected to the UPS	Connect battery to the UPS
		The battery voltage is too low	Charge the battery first, and then turn on the inverter
		Battery damaged	Request professional to replace the battery
		UPS internal fault exists	Seek technical assistance from local Emerson customer service office

S/N.	Fault conditions	Possible cause	Actions to take
2	The AC mains is normal, but the UPS has no input power	The AC input overcurrent protection switch at the rear panel of the power module cut off the mains input upon input overcurrent fault conditions	Press the AC input overcurrent protection switch button to reconnect the mains input to the UPS
3	The LINE LED flashes or is off	The mains voltage or frequency is outside the specifications	Check the input voltage, frequency, the AC input overcurrent protection switch and, advisably, disconnect the load to prevent UPS shut down from causing any damage when the battery voltage reaches the end-of-discharge point
4	The ALARM LED and LEDs 1~5 illuminate, the buzzer beeps	Overload	Turn off non-critical load
5	Output overload, no output, no transfer to Bypass mode	The UPS ceased output due to bypass overload; the bypass voltage or frequency is outside the specifications	Turn off non-critical load, and check the input voltage and frequency
6	Battery autonomy time is short	Battery not fully charged	Charge the battery for 8 hrs on end
7	In Battery mode, only LED 1 illuminates among LEDs 1~5	The battery voltage is too low	Disconnect the load immediately to prevent UPS shut down from causing any damage when the battery voltage reaches the end-of-discharge point
8	The ALARM LED and LED 4 illuminate, the buzzer beeps every second	Fan failure	Check the air exhaust is not obstructed, and ensure free air flow there. If the fault persists, please seek technical assistance from local Emerson customer service office
9	The ALARM LED and LED 1 illuminate, the buzzer beeps	UPS has no output due to output shortcircuit	Completely power down the UPS and check the load for shortcircuit. If the fault persists after removing the load, please seek technical assistance from local Emerson customer service office.

S/N.	Fault conditions	Possible cause	Actions to take
10	The ALARM LED and LED 3 illuminate, the buzzer beeps	UPS overheating	Check the UPS for overload and fan obstruction conditions, check that the ambient temperature does not exceed 40°C. Completely power down the UPS, wait 10min for it to cool down, and turn it on afterwards. If the fault persists, please seek technical assistance from local Emerson customer service office
11	The INVERTER LED flashes, the ALARM LED illuminates, the buzzer beeps	Inverter fault	Seek technical assistance from local Emerson customer service office
12	The ALARM LED and LED 5 illuminate, the buzzer beeps	Rectifier fault	Seek technical assistance from local Emerson customer service office
13	The ALARM LED and LED 2 illuminate, the buzzer beeps	The battery charger in the power module fails	Seek technical assistance from local Emerson customer service office
14	3kVA UPS IEC output socket has no output	The fuse is blown out due to overload	Power down and turn off the UPS, replace the fuse, disconnect the load, turn on the UPS again, and check whether the output voltage is normal. If the fault persists, seek technical assistance from local Emerson customer service office

When reporting UPS fault, please provide the machine model and machine serial No. (provided on the nameplate).

Chapter 5 Specifications

5.1 Mechanical

Module	W×H×D (mm)	Weight (kg)
Power module US11R-0010	440×87×400	17.5
Power module US11R-0010L	440×87×400	7.8
Power module US11R-0020	440×87×400	8.6
Power module US11R-0020L	440×87×400	9.6
Power module US11R-0030	440×87×400	9.0
Power module US11R-0030L	440×87×400	10.0
Battery module UF-B0007-06	440×87×400	20.5
Battery module UF-B0009-06	440×87×400	21.5

5.2 Electrical

Model		US11R -0010	US11R -0010L	US11R -0020	US11R -0020L	US11R -0030	US11R -0030L
Rating		1kVA/700W		2kVA/1400W		3kVA/2100W	
Input	Input system	1-phase, plus PE					
	Rated voltage	220Vac					
	Voltage range	1. 176~288Vac, full load 2. <176Vac, linear derating 3. 120Vac, half load					
	Frequency	50Hz±10%					
	Power factor	0.99 (conditions: rated voltage, full pure resistive load, fully charged battery)					
Output	Output system	1-phase, plus PE					
	Power factor	0.7					
	Voltage	220Vac±2%					
	Line regulation	≤2%(0~100% linear load)					
	Load regulation	≤2%(0~100% linear load)					

Model		US11R-0010	US11R-0010L	US11R-0020	US11R-0020L	US11R-0030	US11R-0030L
Rating		1kVA/700W		2kVA/1400W		3kVA/2100W	
Output	Voltage harmonic distortion (rated input voltage, rated input frequency)	≤3%(0 ~100% linear load) ≤5%(0 ~100% non-linear load)					
	Dynamic transient response	IEC62040-3					
	Dynamic response recovery	IEC62040-3 (60ms)					
	Frequency	The output frequency synchronizes with the bypass frequency when the bypass frequency is in the range of 50Hz±10%, with the phase difference less than 3 degrees; the output frequency is 50Hz when the bypass frequency is outside specifications or the bypass voltage is lower than 120Vac					
	Frequency synchronization speed	≤1 Hz/s					
	Inverter overload capability (in Normal mode, 25°C)	<105% continuous operation 105%~125% 5min 125%~150% 1min 150%~200% 10s >200% 0.25s					
	Inverter overload capability (in Battery mode, 25°C)	<105% continuous operation >105%~125% degression from 60s~30s >125% 0.25s					
	Bypass overload capability	100%~150% 5min 151%~200% 1min					
	Crest factor	3:1					
	Bypass operating voltage	121Vac~253Vac					
	Transfer time	Normal<—>Battery: 0ms					
	DC component	≤200mV					
	Efficiency	Battery mode: ≥83% (rated battery voltage, full linear load) Normal mode: ≥88% (rated mains voltage, full linear load, battery fully charged)					

Model		US11R -0010	US11R -0010L	US11R -0020	US11R -0020L	US11R -0030	US11R -0030L
Rating		1kVA/700W		2kVA/1400W		3kVA/2100W	
External battery voltage		36Vdc		72Vdc			
Charging current		1A	7A	1A	8A	1A	8A
Battery	Qty. ×Volts. ×Capacity	3×12V×7.2 Ah	-	6×12V×7.2 Ah	-	6×12V×9Ah	-
	Manufacturer / model	CSB/GP1272F2 or Panasonic equivalent	-	CSB/GP1272F2 or Panasonic equivalent	-	CSB/HRL1234WF2 or Panasonic equivalent	-
	Autonomy time (25°C)	≥5min at full load (standard type)					
	Charging duration	90% of battery capacity in 5 hrs (standard type)					
Noise (within 1m)		US11R-0010(L): 43dB US11R-0020(L), US11R-0030(L): 45dB					
Protection		IP21 (static state)					

5.3 EMS

Item	Standard	Level
ESD immunity	IEC61000-4-2	Level 3, criterion B
REF immunity	IEC61000-4-3	Level 3, criterion A
EFTB immunity	IEC61000-4-4	Level 4, criterion A
Surge immunity	IEC61000-4-5	Level 4, criterion B
Lightening protection	YD/T 944	Level I, 6kV/3kA

5.4 EMI

Item	Standard	Level
Limitation of emission of input harmonic currents	EN61000-3-2	-
Limitation of voltage changes, voltage fluctuations and flicker	EN61000-3-3	-
Conduction	EN50091-2 GB7260.2	Class B
Emission	EN50091-2 GB7260.2	Class B

5.5 Environmental

Item	Normal range
Ambient temperature	0°C~40°C
Relative humidity	5%~95%
Altitude	Lower than 1500m: no derating; 1500m~3000m: 1% derating for every 100m rise
Storage temperature	-25°C~55°C (excluding battery)

5.6 Safety

Comply with GB4943-2001, EN62040-1-1 and CE requirements.