Planar Battery System

Model BAT24SI

OPERATIONS MANUAL

www.planar.com

DOCUMENT HISTORY

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Product Information

Safety guidelines

The Planar battery system is designed to ensure both the highest level of product quality and safety for the user. To maintain both quality and safety, follow the guidelines and instructions in this manual.

- Use the battery system only as intended.
- Do not place the battery system near a window. Exposing the system to rain, water, moisture or constant direct sunlight can severely damage it.
- Do not cover or obstruct any venting holes on the battery system.
- Store the battery system within –20 to +65 degrees Celsius. Storing the system outside that temperature range could result in permanent damage.
- If any cord or cable is frayed or damaged, replace it immediately with another of the same type and rating as supplied by Planar. The safety and regulatory listing and certifications are based on cables supplied by Planar.
- Use and maintain the safety ground plug set (power cord) included with the unit.
- After battery system installation, secure all electrical cords to prevent accidental damage.
- To clean the exterior chassis of the battery system, follow the IEC 60601 standard for use in a hospital environment. See cleaning guidelines for more information.
- Before cleaning the chassis, disconnect the unit from its power source.
- Be careful when moving the battery system to a different location. Use original packaging whenever possible.

Warning

- Equipment is not suitable for use in the presence of a flammable anesthetic mixture with air, oxygen, or nitrous oxide.
- The Planar battery system may be energized or operational even when disconnected from the AC power source.
- If the Planar battery system has been exposed to liquid, has been dropped, or if its base has been damaged, it may pose a shock or fire hazard. Immediately unplug it and contact customer service for assistance.
- Use care in handling the battery if any leakage is observed. Avoid skin contact and wash any areas that come in contact with this material immediately.
- Plug the battery system only into a grounded power outlet.

Cleaning guidelines

The Planar battery system continues to operate normally while being cleaned in a fashion normal for a hospital environment. Use a damp, mildly soapy cloth to clean the exterior chassis. Drip protection is provided in accordance with the IPX1 rating, defined in the IEC/EN60529 standard.

Service support

Other than battery installation and replacement, the Planar battery system requires no routine maintenance. Should your battery system require repair, return the unit to Planar Systems for servicing to maintain product warranty. See the warranty for more information.

About the Planar Battery System

The Planar Battery System, model BAT24SI, is designed specifically for point-of care use. It is modular, compact, and ergonomically suited for effective utilization in the medical environment.

The battery system supplies a regulated +12 VDC. It contains two sealed lead acid batteries, a medically certified universal input power supply, universal charging control module, an AC line filter, a cooling fan, and appropriate cabling. All components are mounted within a sheet metal enclosure, which provides mechanical strength as well as EMI/EMC protection and shielding.

The Planar battery system is classified as follows:

- Protection against electric shock: Class I and Internally Powered Equipment
- Degree of protection against electric shock: No Applied Part
- Degree of protection against water ingress: IPX1, Drip-Proof Equipment

The charging and monitoring electronics control the charge rate of the battery as well as the maximum discharge level. This ensures safe operation of the battery and prevents damage from high charge rates and low discharge levels.

All battery technologies lose their energy storage potential through use. For more information about the battery cells used in the Planar Battery System, see page 17 to consult the manufacturer specifications.

The output voltage regulator provides a regulated +12 VDC at a power level up to 72 watts. No external regulators are required for 12-volt applications.

Externally accessible fuses are provided on the charging controller module to electrically isolate the battery from all electronic components during transportation.

See the technical specification for more information.

Certification

The Planar Battery System is a recognized UL 60601-1 component. Planar does not certify it for use with any other system.

Battery Components

The Planar Battery System ships with all the components you need to make it operational.

Battery unit, model BAT24SI

Input power cord

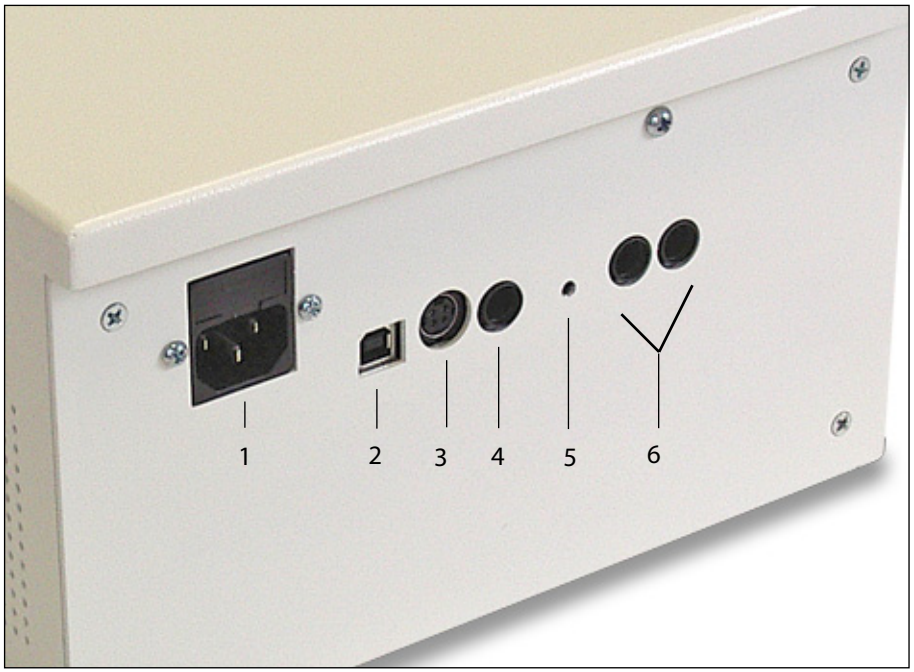
USB cable

Output power cord

Three 6 A fuses (size 0.25 in. x1.25 in.; F type) and three fuse holders

Identify the Connector Ports

All external connections to the battery unit are located on the rear of the enclosure. The design of the enclosure minimizes liquid ingress.



Legend

1 Standard IEC 120–250 VAC input power
2 A, 250 V replaceable

2 USB serial port
Communication channel between the power supply and its host computer

3 12V DC 6 A output power
Mini-DIN 4-pin device; requires an external power cable

4 Output power fuse
(size 0.25x1.25; F type)
6 A replaceable

5 LED indicator

6 Battery fuse
(size 0.25x1.25; F type)
6 A replaceable

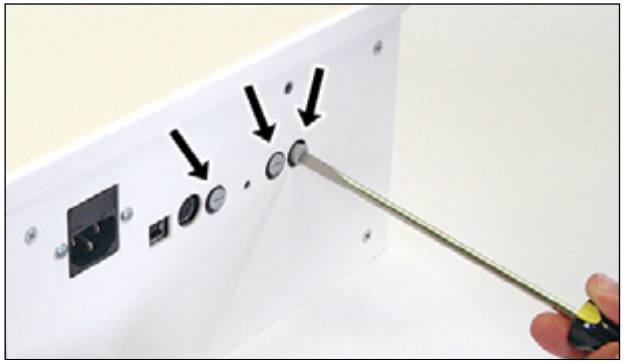
Install the Fuses

You need the three fuses and a #2 flathead screwdriver for this installation.

To install the fuses

1 Insert the two fuses for the battery into the ports on the rear of the enclosure. Push the fuses in until you feel the connection. Repeat to install the fuse for the output power.

2 Use a flathead screwdriver to secure each connection. Do not overtighten.



About the battery fuses

The Planar Battery System requires two 6 A fuses (size 0.25 in. x1.25 in.; F type). These are available from any hardware store.

Securing the fuse connection

Use the screwdriver to turn the fuse holder approximately a quarter to the right, or until you feel it lock. Do not overtighten.

Charge the Battery

Sealed lead-acid batteries are cost-effective and can provide a sizable amount of energy per battery weight. However, the energy storage potential of the batteries does decay over time.

Refer to these web sites for more information on sealed lead-acid batteries:
http://www.houseofbatteries.com/HowTo/SLA.htm
http://www.devicelink.com/mem/archive/03/10/003.html

Battery charging

Plug the battery system into an AC power source for charging. The LED turn yellow during the charging phase. Also, the LED turns green at 80% of total charge capacity.

See specifications on battery modes and power consumption efficiency for more information.

Charge time

The charging controller board is capable of independently charging the batteries while powering the attached system. This ensures that the charge rate of the batteries is the same whether a load is connected or not. Charge time varies depending on the age and usage of the battery. Typically, as a battery ages, it tends to accept less charge; that is, the charge time decreases. Consequently, as the battery accepts less charge, the battery usage time decreases.

Charge Time	Capacity of Charge
3 hours	80%
4 hours	90%
6 hours	100%

Periodically, charge the battery for 10 hours. This assures that the maximum charge capacity of the battery is maintained. The charger enters the trickle charging cycle after the current supplied to the batteries drops below .5 amps. Charge the batteries for 10 hours for every eight charges to 100%.

Battery discharging

You discharge the battery by (1) disconnecting the battery system from the AC power source and (2) powering the load.

When the battery has been discharged for a long period of time, it reaches a point at which it needs to cut off power to its load. The battery system communicates to the host computer and requests a safe shutdown or hibernation.

Thermal protection

The universal power supply is thermally protected and self-resetting. The battery enclosure contains a cooling fan that is activated whenever the system is plugged into an AC power source.

Depth of discharge protection

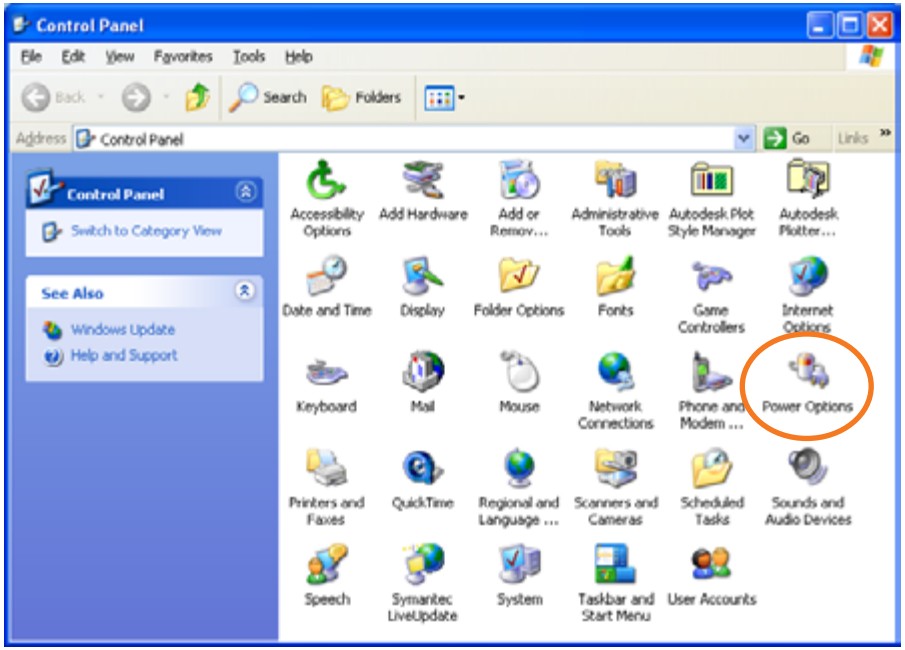
After the power to the load is cutoff, the internal circuitry goes into sleep mode to prevent further battery discharging. The sleep mode is intended to prevent the batteries from deep discharge.

Set Up the Power Management System

All communications occur through the USB serial interface. These are displayed through the Windows Power Options Properties dialog on the host computer.

To set up power management

1 Open the Control Panel and click the Power Options tool.



Easier power management

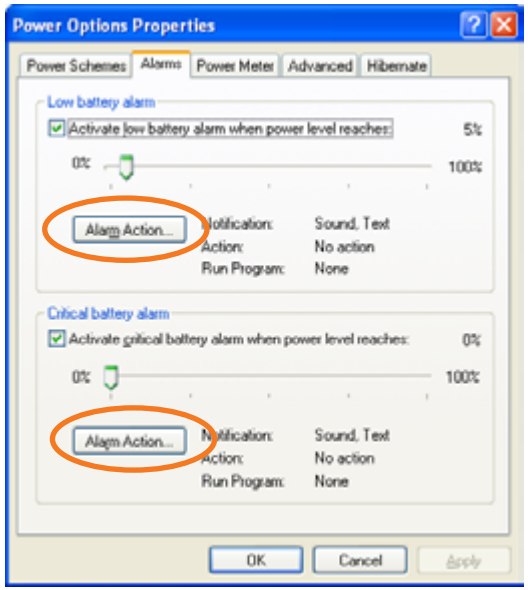
The charge level indicator is software-driven, complying with the Microsoft Windows HID Power Device Specification.

You manage power consumption using the Power Options tool in the Windows Control Panel.

Operating system

- Windows XP
- Windows 2000

2 Click the Alarms tab on the Power Options Properties dialog.



3 To set either the low battery alarm or critical battery alarm, or both alarms:

- Click the check box to activate alarm mode.
- Move the slider to the point at which you want the alarm to trigger.
- Click the Alarm Action button to do one or more of the following: select the type of notification, set a computer action, run a specific program.

Recommended alarm settings

- Low battery alarm – activate at 3%

  The alarm is triggered when the battery charge level reaches its low battery limit.

- Critical battery alarm – activate at 0%

  The alarm is triggered when the battery charge level reaches its depth of discharge limit.

Hibernation/shut down action

If a hibernation or shut down action is enabled, the low or critical battery alarm limit should not be greater than 5% to ensure proper operation.

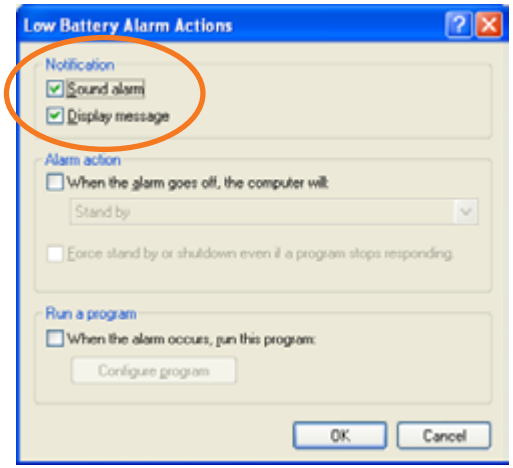
Hibernation and power loss

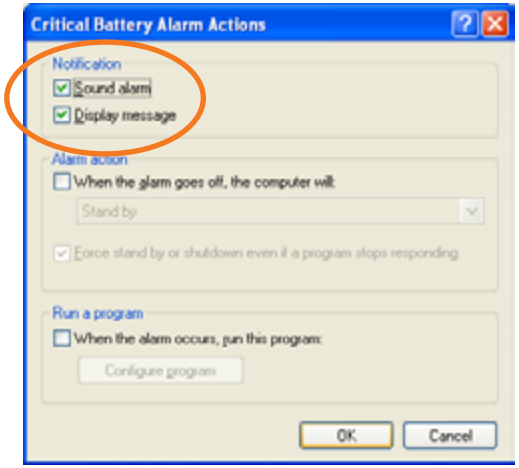
The battery system has a built-in safety feature that prevents power loss during hibernation. When the battery reaches 0% power, it does not turn off. The battery system puts the computer into hibernation before cutting off power to the computer.

Alarm disabled

Deselect the check box to disable the low battery or critical battery alarm.

4 Select the notification you want, one of the two types or both. Click OK.





Recommended alarm notification

- Low battery alarm
  Notification: Sound, Text
  Action: No action
  Run Program: None
- Critical battery alarm
  Notification: None
  Action: Hibernate
  Run Program: None

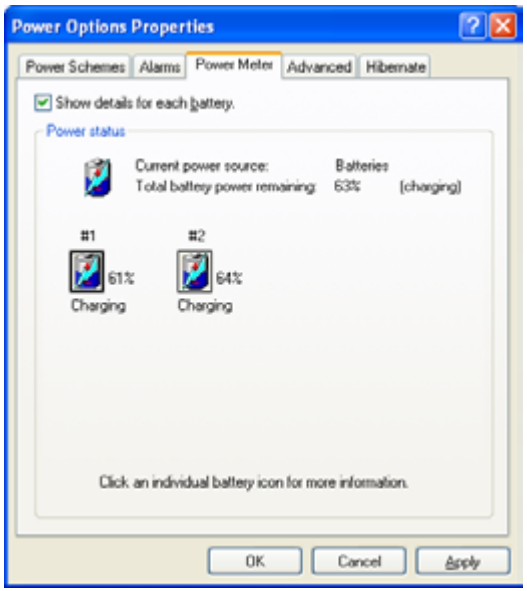
To set an alarm action:

1 Click the check box to activate a notification action.

2 For an alarm action, select an option from the pull-down list.

5 Open the Power Meter tab to check the power status of each battery.

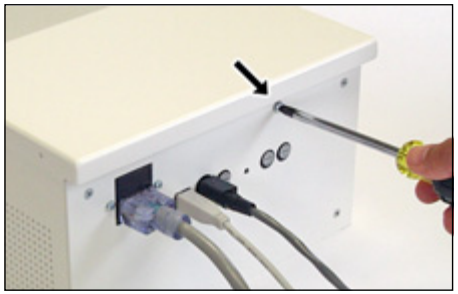
- Click the check box to see the details on a battery.
- Click a battery icon for more information.



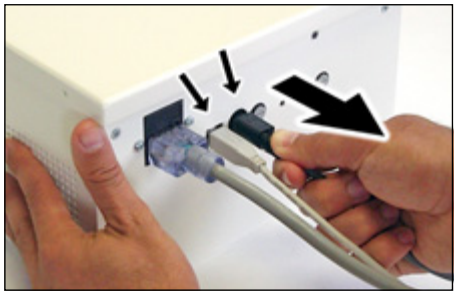
Replace the Battery

You need a #2 Phillips screwdriver and a #2 flathead screwdriver for this installation.

To remove the battery tray

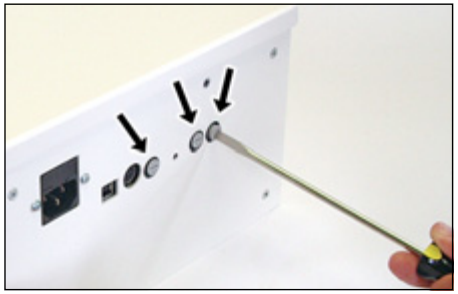


1 Use the Phillips screwdriver to remove the two screws from the front of the enclosure. Then remove the screw (top center) from the back, as shown.

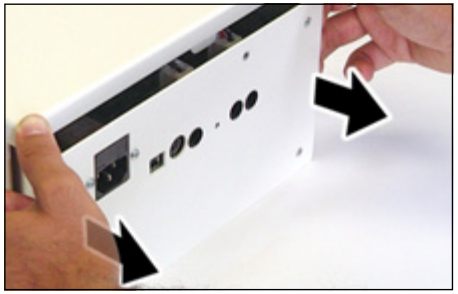


2 Unplug the USB cable and the output power cable.

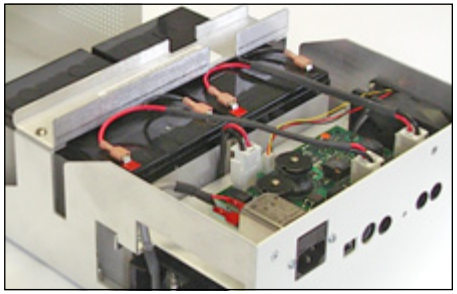
3 Unplug the power cord.



4 Use the flathead screwdriver to remove the three fuses. Make a quarter turn counterclockwise.

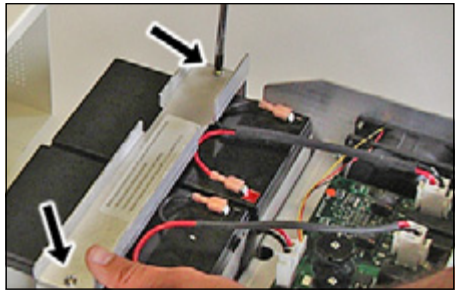


5 Pull out the battery tray carefully. Note: The battery cables may catch on the sheet metal lip during removal.

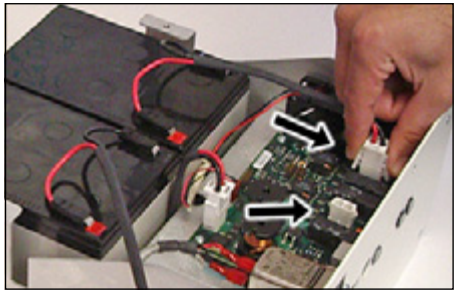


6 Make sure the battery tray is seated on a flat and stable surface.

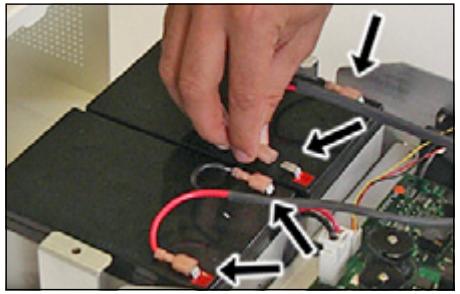
To remove the used batteries



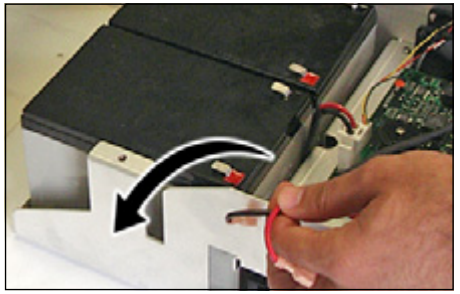
1 Remove the two Phillips screws on the retaining bracket and lift the bracket off.



2 Detach the battery cables from the controller board.



3 Detach the battery cables from the four battery terminals.



4 Place the battery cables to the side and remove the used batteries.

Replacement tips

Never insert fuses into or remove them from the battery with the load plugged in. Doing so can cause permanent damage to the system.

The battery system weighs about 25 pounds and is heavily weighted toward the front. Handle it carefully.

Once the unit is completely out of the enclosure, move it to a flat and stable work surface to replace the batteries.

Do not mix old and new batteries. Replace both batteries during the same maintenance session.

When reconnecting the battery cables to the battery terminals, be sure the connections match RED-to-RED and BLACK-to-BLACK.

The battery system is a self-aligning unit. When you return it to the enclosure, push it all the way in. The alignment occurs automatically.

Use only Yuasa NP 12-12 or B&B EP 12-12 batteries.

To reinstall the battery system

1. Install new batteries into the tray. Replace both batteries at the same time. Do not mix old and new batteries
2. Reconnect the battery cables to the controller board and to the four battery terminals. Be sure that cable and terminal connections match RED-to-RED and BLACK-to-BLACK. Push in each connector until you feel the connection click.
3. Reattach the retaining bracket with the two Phillips screws.
4. Push the battery tray all the way into the enclosure.
5. Reinsert the fuses. Use the flathead screwdriver to make a quarter turn clockwise to secure each connection. Do not overtighten.
6. Plug in the power cord, USB cable, and power output cable.
7. Reinsert the Phillips screws on the back and front of the enclosure.

Troubleshooting

Problem	Possible Cause	Possible Solution
The battery system not functioning, no output power, does not charge when connected to AC power.	AC power is not connected.	Make sure power cord is connected properly.
	Input fuse needs to be replaced.	Replace fuse in the input AC connector. Replace with UL-recognized fuse 2 A, 250 VAC, fast acting, size 5 mm x 20 mm.
	Over-temperature protection is activated.	Contact Planar.
No power supplied to the load.	Output power cord not connected properly.	Make sure that output power cord is connected correctly.
	Power switch is off.	Turn on the power switch on your device.
	Output fuse needs to be replaced.	Replace the output power fuse located next to output power connector. Replace with UL-recognized fuse 6 A, 125 VDC, fast acting, size 0.25 in. x 1.25 in., type F.
	Batteries not connected correctly.	Check battery connections.
System run time is too short.	Battery not completely charged.	Connect AC power and let battery charge completely. Charge status is conveyed through the Power Meter tab on the Power Options Properties dialog Note that the LED turns green at 80% of total charge capacity.
	Battery capacity is low.	Replace battery.

Battery Disposal

Industrial batteries contain lead and sulfuric acid, which are both considered “hazardous substances.” If batteries are improperly disposed of, for example, thrown in the trash or illegally dumped, these substances can eventually leak out and contaminate the surrounding soil and groundwater supply.

It is a federal law to properly dispose of lead-acid batteries once they can no longer be used. Once a battery is purchased, full liability and responsibility lies on the owner to dispose of the battery.

The law says that responsibility is still on the owner if the battery is disposed of improperly by dumping in a landfill, or shipping to a scrap dealer who does not handle it properly and in which environmental damage occurs.

It is illegal to dispose of batteries in any way other than ”thermal recovery” or recycling of the hazardous substances in batteries according to the Environmental Protection Agency (EPA).

The Department of Transportation (DOT) has strict guidelines for the shipping of hazardous materials, which result in large fines if they are not followed.

Check with your local ordinances for proper disposal procedures.

Battery System Specification

Technical summary

The battery system is a self-contained regulated power supply, battery, and charger unit, packaged in a sheet metal enclosure.

Features

- Universal AC input
- Regulated 12V DC output
- Fast charging
- Intelligent communications (USB host)
- Cooling fan
- Externally accessible fuses
- LED

Electrical specifications

Input	Input voltage	85 to 265 VAC
	Input frequency	47 to 63 Hz
	Inrush current limiting	<50A peak
	Input protection	2A, 250V replaceable fuse
	Power factor	0.95 (150 W, 230 VAC)
Output	Output voltage	12 VDC ±5%
	Output current	6.0 A maximum
	Output power	72 watts maximum
	Overload recovery	Automatic upon fault removal
	Overload protection	6A replaceable fuse (size 0.25 in. x1.25 in.; type F)
	Output efficiency	>88%

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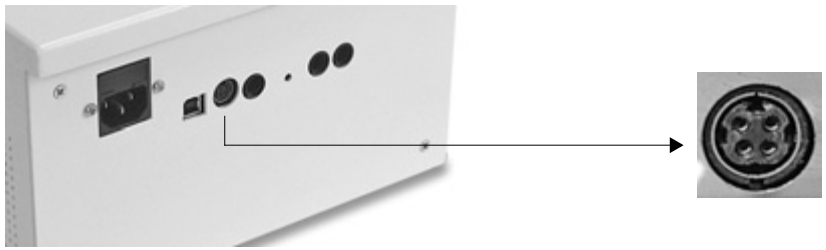
Battery requirements	
Battery type	Sealed lead acid; quantity – 2 Yuasa NP12-12 or B and B EP12-12 Refer to the attached specification.
Connectors/cables	
Input power connector	Standard IEC power connector
USB port connector	Standard USB cable (A male to B male)
Output power connector	Mini-DIN 4-pin device (female), Kycon KPJ-4S-S
Output power mating connector Suggested manufacturer – Power Dynamics Part number – DP-003	4-pin male power plug



Detail of output power connector

Charging	
Charge time (new battery)	3 hours to 80% 4 hours to 90% 6 hours to 100%

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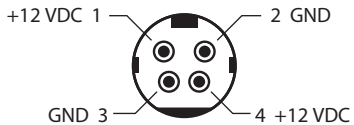
Manufacturer specification

Click this icon to open the PDF file showing Yuasa battery specification.

Pin assignment

Assignment of the 4-pin DIN output power connector (female) on the battery unit.



Four modes of the battery system	
Charging mode	The battery system is plugged into an AC power source. During charging mode, the attached load to the battery system is operational. The batteries charge. The cooling fan runs only when the unit is plugged into an AC power source.
Running mode	The batteries have some level of charge and the battery system is not plugged into an AC power source. During running mode, the attached load to the battery system is operational. The batteries discharge. The cooling fan is off. The load to the battery system is active.
Standby mode	The batteries have some level of charge, the battery system is not plugged into an AC power source, and the load is either disconnected or off. The cooling fan is off. The load is powered when the system is either turned on or reconnected.
Off mode	The batteries have no charge and the battery system is not plugged into an AC power source. During off mode, the attached load to the battery system is not operational, whether connected or turned on. The controller board is in sleep mode. The cooling fan is off. Plug the battery system into an AC power source to leave off mode.

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Power consumption efficiency

The charging controller board has four levels of power consumption: charging, running, standby, and off.

Charging mode	The batteries are charged using a constant current/constant voltage algorithm. A constant current of 3.0 amps max is applied to each battery until the voltage on the battery reaches 14.4 V. The current exponentially decreases to maintain 14.4 V on the battery. The cooling fan is on during this cycle. The +12 VDC regulator circuitry is powered by the power supply, and the communication system reports the charge status of the batteries to the host.
Running mode	The board consumes power at a rate proportional to the power consumed by the load during its running mode. The board proves to be 88% efficient when connected to a 4.5 amp load.
Standby mode	The board consumes about 8.5 mA of current when in stand-by mode. A fully charged and new battery lasts about 3 months in the battery system before it needs to be charged.
Off mode	The board consumes about 350 µA of current when in the stand-by mode. A fully charged and new battery lasts about 3 months in the battery system before it needs to be charged. The battery continues to drain at a rate of 350 µA. Batteries that are not connected to the controller board have a shelf life of 1 month 97%, 3 months 91%, 6 months 85%, at 68° F.

Index

Overview of Standard Warranty

Summary

- Standard 1-year “repair and return” warranty
- Typical repair turnaround time of 10 business days
- Repair facilities and technical support in the United States and in Europe

Standard Warranty Return Procedure

As a Planar Standard Warranty customer, you must follow the procedure below if you have a non-functioning Planar Battery System. Planar customer service staff will attempt to correct any minor issues that may be causing the problem. Once Planar has determined that you have a non-functioning product, Planar will arrange for return and repair of the non-functioning product.

1. Contact Planar via the web at http://www.planar.com/support. In North America, call (866) PLANAR1 (866.752.6271) and select Option 4. In Europe, call +358 9 420 01 or send your info by fax to +358 9 420 0200. You must have the model number, serial number, and proof-of-purchase available.
2. Planar customer service staff will attempt to correct any minor issues that may be causing the problem. If we are unable to correct the problem to your satisfaction, we will issue a Return Material Authorization (RMA).
3. You must return the product, as specified, to Planar Systems. Do not return the battery cell or cart to planar Systems unless directed by Planar customer service.
4. Planar will validate the defect, repair the unit, and return the unit to you. The typical turnaround time is 10 business days.

At its sole discretion, Planar may charge you the customer for returned units deemed functional or for returned units with only customer-caused damage. It is the responsibility of the customer to properly package the hardware, include all appropriate materials, and return it to the location specified by Planar customer service.

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Summary Limitations and Exclusions

1. Warranty is valid only for the first consumer purchaser (non-transferable).
2. Warranty does not cover the battery cells. Battery cells are consumable items.
3. The customer must provide original proofs of purchase.
4. Warranty is void on any product with a defaced, modified, or removed serial number.
5. Warranty is void on any product with damage, deterioration, or malfunction resulting from the following:
   a) Accident, misuse, neglect, fire, water, lightning, or other acts of nature, unauthorized product modification, or failure to follow instructions supplied with the product.
   b) Repair or attempted repair by anyone not authorized by Planar.
   c) Any damage of the product due to shipment.
   d) Removal or installation of the product.
   e) Causes external to the product, such as electric power fluctuations or failure.
   f) Use of supplies or parts not meeting Planar specifications.
   g) Normal wear and tear, including backlights dimming over time.
   h) Any other cause which does not relate to a product defect.
6. Warranty excludes removal, installation, and setup service charges.

Limitation of Implied Warranties

THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED, WHICH EXTEND BEYOND THE DESCRIPTION CONTAINED HEREIN INCLUDING THE IMPLIED WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

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Customer support

In North America, call 1 (866) PLANAR1 and select Option 4 between 8 A.M. and 5 P.M. Pacific time, Monday through Friday, or send a description of your technical issues and e-mail address to medicalsupport@planar.com.

In Europe, call +358 9 420 01 between 8 A.M. and 4 P.M. Finnish time (Eastern European time), Monday through Friday, or send a description of your technical issues and e-mail address to medicalsupport@planar.com.

Exclusion of Damages

THE LIABILITY OF PLANAR IS LIMITED TO THE COST OF REPAIR OR REPLACEMENT OF THE PRODUCT. PLANAR SHALL NOT BE LIABLE FOR THE FOLLOWING:

1. DAMAGE TO OTHER PROPERTY CAUSED BY ANY DEFECTS IN THE PRODUCT, DAMAGES BASED UPON INCONVENIENCE, LOSS OF USE OF THE PRODUCT, LOSS OF TIME, LOSS OF PROFITS, LOSS OF BUSINESS OPPORTUNITY, LOSS OF GOODWILL, INTERFERENCE WITH BUSINESS RELATIONSHIPS, OR OTHER COMMERCIAL LOSS, EVEN IF ADVISED OF THEIR POSSIBILITY OF SUCH DAMAGES.
2. ANY OTHER DAMAGES, WHETHER INCIDENTAL, INDIRECT, CONSEQUENTIAL, OR OTHERWISE.
3. ANY CLAIM AGAINST THE CUSTOMER BY ANY OTHER PARTY.

Effect of Local Law

This warranty gives you specific legal rights, and you may have other rights, which vary from locality to locality. Some localities do not allow limitations on implied warranties and/or do not allow the exclusion of incidental or consequential damages, so the above limitations and exclusions may not apply to you.

Regulatory Compliance

U.S. Federal Communications Compliance Statement

The Planar Battery System (model BAT24SI) has been tested and found to comply within the limits of a Class B digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against interference in a residential installation.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception (which can be determined by turning the equipment on and off), the user is encouraged to try to correct the interference by using one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technical for help.

Canadian DOC Notice

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the Radio Interference Regulation of the Canadian Department of Communications.

"Le present appareil numerique n'emet pas de bruits radioelecinques depassant les limires applicables aux appareils numeriques de la class B prescrites dans le Reglement sure le brouiliage radioelectrique edicte par le minstere des Communications du Canada."

–MORE–

Caution

To comply with the limits for an FCC Class B computing device, always use the cords supplied with the unit. The FCC warns that changes or modification of the unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Regulatory Compliance

This system has been tested and found to comply with IEC/CSA 601-1, UL 60601-1 and CAN/CSA C22.2 No. 601.1 medical standards by CSA.

Because many medical offices are located in residential areas, the Planar battery system, in addition to meeting medical requirements, has also been tested and found to comply with the limits for Federal Communications Commission (FCC) Class B computing devices in a typically configured system. It is the responsibility of the system integrator or configurer to test and ensure that the entire system complies with applicable electromagnetic compatibility (EMC) laws. Planar Systems, Inc. has made great efforts to support the medical device industry, in particular medical device manufacturers and medical device system integrators. We offer state-of-the-art systems that are compliant with worldwide accepted medical device safety standards, and for the European market, EC-marked displays based on compliance with counsel directive 93/42/EEC — commonly referred to as the Medical Device Directive (MDD). The following summarizes our qualification of these displays as it relates to compliance with the MDD.

–MORE–

Symbol explanations

Following are explanations of the symbols found on the Planar Battery System, model BAT24SI.

Product has been tested and certified with respect to electric shock, fire, mechanical and other specified hazards only in accordance with US 2601-1 and CAN/CSA C22.2 No. 601.1 and IEC 60601-1 for medical equipment. If this mark appears with the indicators "C" and "US", the product is certified for Canadian and U.S. markets, meeting the applicable Canadian and U.S. standards.

Product has been tested to comply with FCC Class B standards.

Consult accompanying documents.

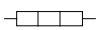
Indoor use only.

IPX1

Drip-Proof rating per IEC/EN60529.

DC (direct current) voltage.

AC (alternating current) voltage.



Fuse.