Operator's Manual
Model BMC24

10-Amp 24-Volt Aviation Battery Maintenance Charger
Optional Accessory for the *Smart*GPU™

PLEASE READ AND SAVE THESE INSTRUCTIONS.

This charger is designed only for general aviation **LEAD-ACID BATTERIES ONLY**.
Never use it for any other purpose, including powering a low voltage electrical system.

The BMC24 incorporates proprietary BatteryMINDer® operating logic by VDC Electronics. The BatteryMINDer trademark is used with permission and registered to VDC Electronics, Inc., 155 W Carver St, Suite 2, Huntington, NY 11743 USA web: www.batteryminders.com email: techsupport@vdcelectronics.com

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The SmartGPU Battery Maintenance Charger

The BMC24 is a highly specialized multi-stage battery charger calibrated specifically for the unique characteristics of lead-acid aircraft batteries. It is not approved for any other use. It incorporates award-winning BatteryMINDer technology and is offered as a convenient option for our SmartGPU Series of Ground Power Units for general aviation aircraft. It can be ordered factory-installed but is also designed to be easily field-installed/upgraded with minimal tools and technical experience. A separate installation manual and video tutorials are available to assist with installation.

INSTALLATION VIDEO

Why the BMC24 is Better

Do not confuse the BMC24 Battery Maintenance Charger with trickle chargers or battery “tenders.” It is completely different. It is designed to gently charge aircraft batteries as completely as possible and then continuously maintain them at their maximum charge without overcharging. While in this maintenance or float mode, the BatteryMINDer employs proprietary technology to modulate high-frequency pulses into the battery to break up and dissolve lead sulfate crystals that naturally form on the battery plates. Accumulated sulfation increases the battery’s internal resistance and reduces battery capacity. It is made worse by extended periods of inactivity, high heat, and poor maintenance. To be airworthy, legal for service, aviation batteries must maintain a minimum of 85% of their rated capacity.

Double Your Battery’s Life

Over time, the BMC24’s continuous desulfation can actually reverse sulfation and the normal battery aging process. It will restore lost capacity and significantly extend the useful life of aircraft batteries. The BatteryMINDer is designed and intended for full-time continuous-duty use. It is recommended that it be kept connected whenever the aircraft is in hangar storage to maintain and condition the battery.

Convenient Airframe Connection

The BMC24 is supplied with a Model BM-AIK10A Airframe Interface Kit which contains the aviation-grade parts and instructions necessary for a FAA-licensed mechanic to install a simple wiring harness to conveniently access and charge the battery on a certified aircraft. This harness provides a mating polarized plug for quick connection to the aircraft battery. It is eligible as a minor alteration and the mechanic’s airframe maintenance logbook entry is all that is required to return the aircraft to service – no STC, Form 337, or field approval is required.

Set It and Forget It

Consistent use of the Battery Maintenance Charger will provide extended battery life, maximum starting power (especially important for cool turbine engine starts) and full emergency power for every flight. Once charging is initiated, the BMC24’s design requires no input from the operator and automatically resumes operations should a power failure occur. Operation is completely automatic. To prevent over or undercharging, the aviation BatteryMINDer automatically adjusts its output in response to variations in ambient temperature. There are user configurable settings if initial charging delay or scheduled charging is desired.

These instructions assume you are familiar with operating the SmartGPU and provide only the additional instructions for using the BMC24 charger option. Refer to the SmartGPU Operator’s Manual if you have general questions about its use.

IMPORTANT SAFETY PRECAUTIONS

TO REDUCE THE RISK OF FIRE, ELECTRIC SHOCK, OR PERSONAL INJURY, OBSERVE THE FOLLOWING:

1) Do not expose the charger to moisture or precipitation. It is designed to operate ONLY INDOORS.
2) The charger contains no serviceable parts. If it fails for any reason, return it to Audio Authority Corp for repair or replacement.
3) **WARNING - RISK OF EXPLOSIVE GASES**. Whenever you work near a lead-acid battery, there are inherent risks and dangers that the operator must manage and mitigate. Batteries can generate explosive gases during charging; therefore, it is of utmost importance that the operator be familiar with, refer to, and follow the instructions in this manual exactly to avoid any danger of battery explosion. Additionally, follow the instructions published by the battery and aircraft manufacturer. Review and abide by all safety & cautionary product markings.
4) **PERSONAL PRECAUTIONS** when working with or near a lead acid battery:
    a) Do not work in seclusion. Someone should be able to hear you or be close enough to aid you when working near a lead acid battery.
    b) Have fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes. Wear complete eye protection and cover clothing. Avoid touching eyes while working near the battery.
    c) If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters the eye, immediately flood the eye with running water for at least 10 minutes and get medical treatment immediately.
    d) NEVER smoke or allow a spark or flame near battery, fuel or engine.
    e) Be careful not to drop a metal tool onto the battery, as it might create a spark that could ignite explosive gases.
    f) Remove all personal metal items such as rings, bracelets, necklaces, and watches that could possibly come in contact with a lead acid battery or related wiring. A lead acid battery can produce a short-circuit current sufficient to weld a ring or the like to metal, causing a severe burn.

Preparing Your Battery for Charging

1) Ambient air and battery temperature must be 40° to 115° F. **NEVER CHARGE A FROZEN BATTERY OR ONE ABOVE 115°F.**
2) If the battery manufacturer requires the battery to be removed from the aircraft before charging; always remove the ground terminal first. Turn off the aircraft Battery Master Switch and disconnect external power to avoid causing a spark. **NOTE:** According to the manufacturer, Concorde sealed AGM batteries do not need to be removed from aircraft for maintenance charging purposes.
3) Be sure the area around the battery is well ventilated while the battery is being charged to dissipate and avoid any concentration of explosive gases.
4) Battery terminals should be kept clean. Avoid any battery terminal corrosion from contacting eyes.
5) For flooded cell batteries, add only distilled water to fill each cell until battery electrolyte reaches the level specified by the manufacturer. This helps purge excessive gas from cells. Do not overfill. For a battery without caps, follow the manufacturer's recharging instructions.
6) Study all battery manufacturer’s specific instructions such as removing cell caps while charging and recommended charge rates.
7) Determine condition of battery by referring to instructions herein before attempting to charge or de-sulfate any battery. If the BMC24 reads a voltage of less than 4 while qualifying the battery, it reads as zero volts, and displays the message BATTERY NOT CONNECTED.

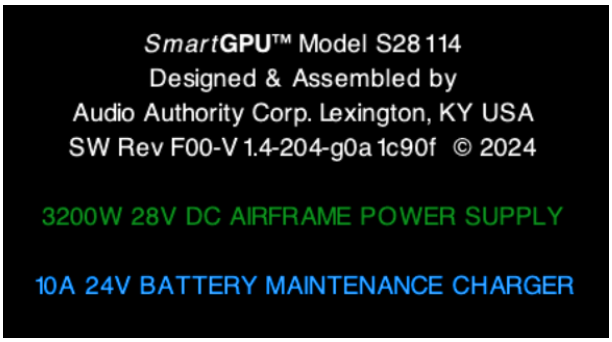
Items Included with the SmartGPU BMC24 Option

The following additional items are included with your GPU when equipped with the BMC24 option:

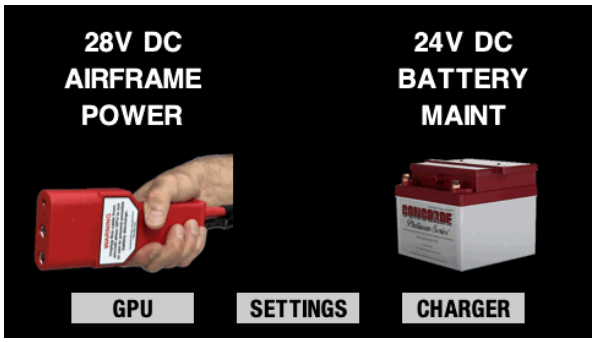
- Circuit board assembly, either factory-installed or easily customer-installed if purchased later. Installation instructions are provided separately, not part of this Operator's Manual.
- 8 ft. output cable with handles and red SB50 plugs – Connects between the charger output and the mating plug on Model BM-AIK10A airframe battery harness below.
- Airframe Interface Kit (Model BM-AIK10A) – Provides all the aviation-grade parts needed to fabricate and install a fuse-protected battery maintenance charger harness on FAA certified aircraft. Just hand the kit to your licensed mechanic to install as a minor alteration and return your aircraft to service with a simple airframe logbook entry – no STC, field approval, or Form 337 required.

Startup and Configuration

SmartGPUs with the BMC24 option will display a hardware configuration screen at startup, the bottom line of which is blue and shows that the battery maintenance charger (BMC) is installed.



Blue line of text is confirmation that the charger option is installed and ready for use.

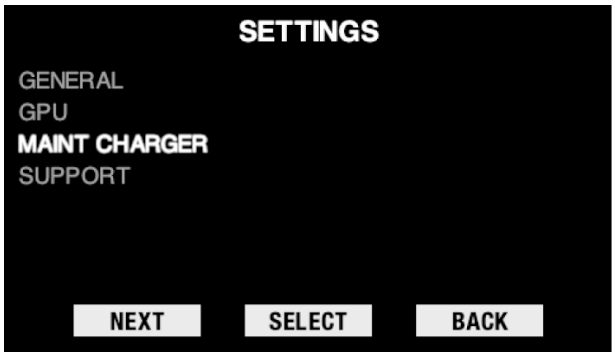


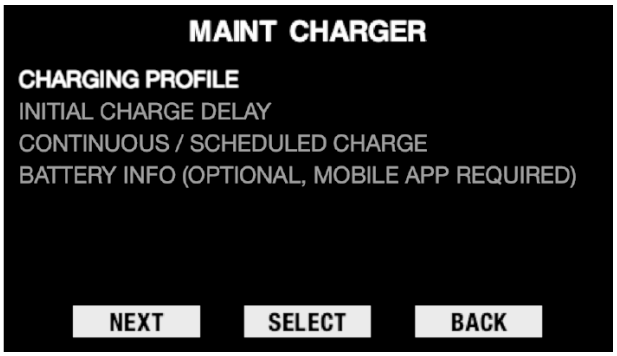
After confirming the Conditions for Use, an operating mode selection screen is displayed.

Charger operation can be selected immediately. However, the BMC features a number of configuration settings that customize its operation. We recommend that you take the time to do this before proceeding to get the best results.

Configuration Settings

Press the **SETTINGS** key to display the following screen with 4 options. Use the **NEXT** key to scroll down and select **MAINT CHARGER**. Four options will be displayed.





CHARGING PROFILE – Use the **NEXT** key to select the battery type installed in aircraft.

S2 – FLOODED CELL, GILL

S3 – GILL LT 7000

S5 – CONCORDE RG/AGM (default value)

LI – LITHIUM IRON SULFATE ($LiFePO_4$)

NOTE: S2-S5 profiles are for lead-acid chemistry batteries. The LI profile is only for lithium iron sulfate batteries that include an integral Battery Management System (BMS) to protect from over or under temperature and charging. Desulfation features of the BMC are not relevant or enabled for the lithium charging profile.

INITIAL CHARGE DELAY – This option allows a specified time delay before initial battery charging will begin to allow internal battery temperature to acclimate to ambient temperature. This is useful for aircraft where the battery may be subject to a heat source in flight or after shutdown. Select the desired hours of delay before charging begins. 0 – 9 HOURS (0 = DEFAULT, NO DELAY)

CONTINUOUS / SCHEDULED CHARGE – BMC default operation is for continuous, full-time battery maintenance charging. This option provides the alternative to perform maintenance charging on a selected schedule instead. Select the number of days between charging, 0 to 30 days. 0 is the default value which provides continuous operation. Select the desired number of days between charge cycles.

Note: If the battery voltage drops below 25 during scheduled or delayed charging, the BMC24 interrupts the schedule and starts a charging cycle.

BATTERY INFO (optional, requires alphanumeric input via mobile app) – This setting allows the operator to store information about the battery that is installed in the aircraft. This is reference information only and does not affect the operation of the charger. It is included in the SmartGPU event log and may be useful for technical support or future feature implementation. Use the mobile device app to input information.

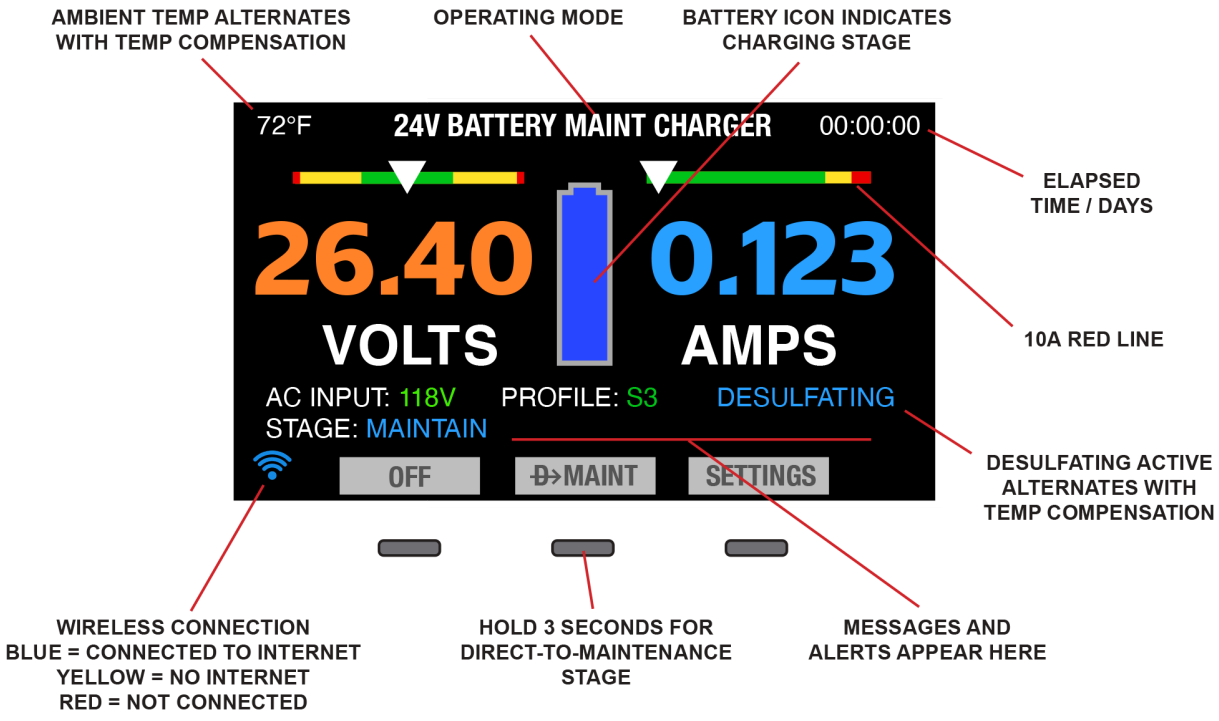
Configure Wi-Fi Using the App

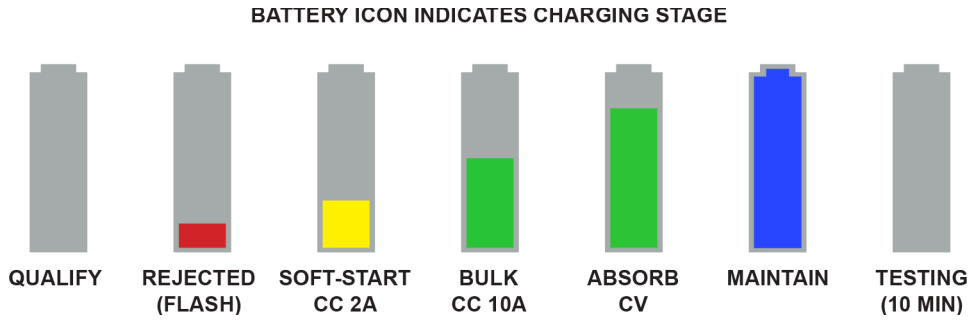
The easiest network setup involves the SmartGPU app. The SmartGPU app allows you to monitor and control both charging and GPU functions via Bluetooth or Wi-Fi.

1. Join a 802.11 b/g/n compatible Wi-Fi network on your mobile device. Make sure your network's SSID is not hidden, and is broadcasting in 2.4 GHz (not 5GHz).
2. Download the SmartGPU app from the Apple App Store. (An android version of the app is in development.)
3. Open the app; it displays SmartGPUs within range to pair via Bluetooth. Choose a GPU and pair with it.
4. On the GPU, navigate to Wi-Fi setup: Settings >General >Wi-Fi. In the app, touch Settings > Configure Wi-Fi. Enter your credentials, and connect. Confirm Wi-Fi connection on the GPU.
5. Your mobile device will now remember this GPU and connect with a single touch, via Bluetooth or Wi-Fi. You may bond with multiple SmartGPUs, and multiple mobile devices may bond with the same SmartGPU.

Maintenance Charging Indications

The SmartGPU screen displays operational status and information while charging.





Operation

The BMC24 Battery Maintenance Charger may be used immediately without custom configuring its settings and features. Doing so will assume commonly used default values that are safe and effective. However, the procedures above for tailoring the BMC settings to your preferences are quick, easy and recommended for optimum performance and convenience. Your custom settings can be programmed and/or changed at any time.

1) Install the included Model BM-AIK10A Airframe Interface Kit on your aircraft.

   Your FAA licensed aircraft mechanic can install the kit and make a return-to-service airframe maintenance log entry as a minor alteration. An FAA Form 337 is NOT required for minor alterations. See examples: www.audioauthority.com/bmaik

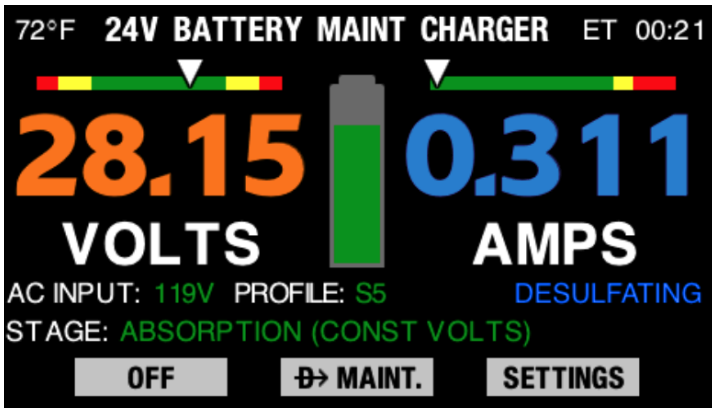
2) Disconnect the 28V AIRFRAME POWER cable from the aircraft and the GPU before proceeding. A lock-out feature prevents battery charging if the GPU cable is attached. This is a safety feature.

3) Attach AC line cord and connect to AC power receptacle. A heavy-gauge (12-3) extension cord may be used; the shorter the better.

4) Attach charger output cable to the smaller BatteryMINDer MAINT CHARGER connector on the GPU and to mating SB50 plug installed on aircraft.

5) Power ON the GPU, confirm conditions for use, then select the 24V MAINT CHARGER mode.

6) The GPU screen will display voltage and current, input voltage, charging profile, charging stage (see diagram below), and any special messages, alerts, or warnings.



7) Leave the charger connected continuously when the aircraft is in hangar storage to maintain optimum charge and continuously desulfate to recover full battery capacity and extend battery life. The charger incorporates proprietary BatteryMINDer technology and will not overcharge or damage the battery.

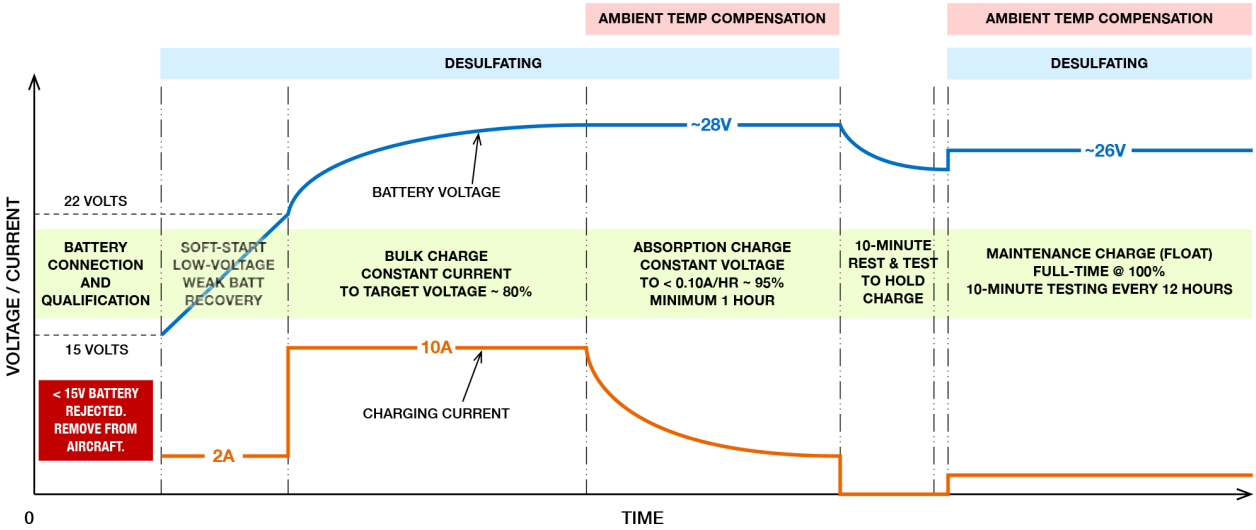
   NOTE: If you have selected a charging schedule in SETTINGS, operation will not be continuous, but according to the schedule.

   The BMC24 automatically resumes its normal charging cycle after an AC power interruption, without any user input or adjustment.

   Do not expect to completely eliminate sulfate in a few days. Long established sulfate will require several weeks or longer to be fully dissolved and battery recovered. Be patient and you will be rewarded with a “sulfate-free” battery.

8) Before your next flight, turn off the GPU/Charger and disconnect the output cables from the aircraft. Store the GPU and all cords, accessories, extension cords, etc. where they will not interfere with aircraft flight operations.

Understanding the 7 Stages of Charging



The BMC24 annunciates its active charging stage, temperature compensation, and desulfation status during operation. The chart above summarizes this unique approach to battery optimization and maintenance.

- **Qualification** begins the charging cycle by determining if the battery is correctly connected and has adequate voltage to attempt charging. The battery will be rejected if its voltage is not 15-volts or higher and should be removed from the aircraft to determine its airworthiness.
- **Soft-Start** is used if a battery's voltage is under 21V when charging begins. It uses a low constant current to slowly bring up voltage. This prepares a weak or neglected battery for the Constant Current stage.
- **Constant Current** (Bulk) is the main charging stage. The charger outputs a constant current of 10 amps, its full power. Battery voltage rises until the battery reaches the optimal charging voltage.
- **Constant Voltage** (Absorption) is the second charging stage. The charger regulates the current given to the battery to maintain a constant voltage. As the battery nears a full charge, the current needed to maintain this voltage decreases. Once the current falls below a 0.10A change per hour, the stage is complete. It will be in this stage for a minimum of one hour.
- **Rest & Testing** is performed by monitoring your battery's voltage while resting for 10 minutes to determine its ability to hold a charge. A voltage of under 25.0V indicates a weak battery. Under 23.0V suggests a shorted cell defect. The battery is tested at completion of the Constant Voltage stage, and every 12 hours during the Maintain stage**.**
- **Maintain** (Float) is the charger's long-term stage. The charger can and should be left connected indefinitely. This will keep the battery fully charged ensuring no sulfate can form. The charger maintains float voltage using very little power as it actively monitors the battery and adjusts its output several times a second.

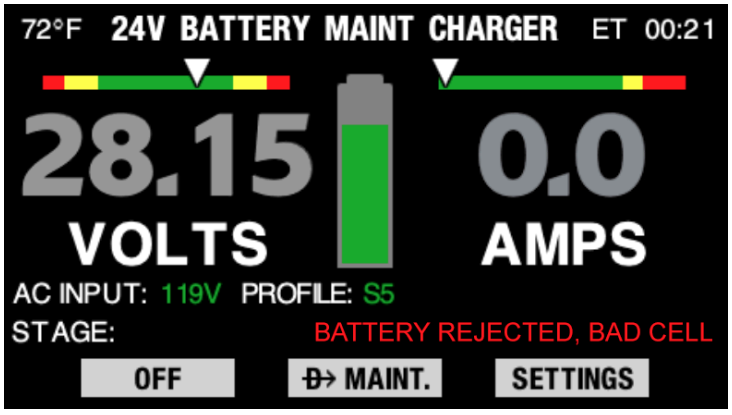
The SmartGPU Mobile App

The SmartGPU App mirrors the indications and controls of the SmartGPU display on your mobile device to monitor and control maintenance charging from anywhere with an internet connection. Wi-Fi is used for unattended, remote operation. Alternatively, Bluetooth connectivity is available for attended, local operation up to 100-feet. Download the app to your device and follow the GPUs on-screen prompts in the Settings menu.

Troubleshooting, Alerts and Warnings

The second text line on the display is used to convey important operational alerts, warnings, and limitations to the operator. Yellow alerts are advisory and do not stop charger operation. Red warnings advise of problems that prevent the charger from operating.

Condition	Message
Fully charged, resting battery less than 25V	WEAK BATTERY
Parasitic load detected, check aircraft	LOAD DETECTED
Battery polarity reversed	BATTERY POLARITY ERROR
No battery voltage detected by BMC	BATTERY NOT CONNECTED
Battery voltage less than 15V	BATTERY REJECTED, LOW VOLTAGE
Fully charged resting battery less than 23V	BATTERY REJECTED, BAD CELL
Ambient temperature too cold or too hot	AMBIENT TEMP EXCEEDANCE
Internal failure, contact support	INTERNAL ERROR



NOTE: Battery voltage measured by the Maintenance Charger is from the aircraft's battery relay or solenoid. Battery voltage displayed in the aircraft's flight deck instrumentation is typically lower, with the equipment load, by a volt or more. This discrepancy is normal and should be taken into account by your aircraft's POH (Pilot Operating Handbook) or AFM (Aircraft Flight Manual).

SPECIFICATIONS

Model No. BMC24
Battery Maintenance Charger for 24V General Aviation Lead-Acid Batteries

FCC Part 15 Certification: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, 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 off and on, the user is encouraged to try to correct the interference by one of more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.

Electrical Parameters:

Input voltage:	90 – 250V AC, 47-63 Hz
Unloaded input current:	0.50 W
Loaded Input current:	approximately 1.8 Amp 120VAC consumption full output (UL1236)
Output:	approximately 26-28VDC, max 10 amps, varies with charging stage

Physical Parameters

Weight:	approximately 2 lbs. added to weight of GPU
Operating temperature:	-20° to 50°C (-4° to 122°F)
Storage temperature:	-40° to 85°C
Operating Humidity:	0 to 95% RH (non-condensing)

One-Year Limited Warranty

Audio Authority Corp warrants this product for ONE year from date of retail purchase against defective material or workmanship and will be repaired or replaced at no charge. We make no warranty other than this limited warranty and expressly exclude any implied warranty including any warranty for consequential damages. This limited warranty is not transferable. To obtain warranty repair service, *the unit must be returned freight prepaid together with Proof of Purchase directly to Audio Authority Corp,* ***NOT TO THE DEALER FROM WHICH IT WAS PURCHASED****.*

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