



16V IntelliCHARGER

Microprocessor Controlled Multi-Stage 16V
Automatic Battery Charger

P/N 1004

USER GUIDE

XS Power 16V IntelliCHARGER

User Guide

About XS Power

XS Power designs and manufactures custom charging solutions for street rods, racing applications, and the mobile audio industry. These products include high performance batteries, chargers, and related accessories.

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The following conventions are used in this guide.

⚠ WARNING

Warnings identify conditions that could result in personal injury or loss of life.

⚠ CAUTION

Cautions identify conditions or practices that could result in damage to the charger or battery.

***Important*:** These notes describe an important item that you must pay attention to.

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Important Safety Instructions

The *Intelli*CHARGER generates a low DC voltage and high DC current to the battery being charged. Operating the *Intelli*CHARGER incorrectly or misusing it may damage the charger or create hazardous conditions for the user.

Save these instructions. This guide contains important safety and operating instructions.

WARNING: Explosion hazard

- The *Intelli*CHARGER is designed to charge 16V AGM (absorbed glass mat) and Gel Cel batteries. Do not attempt to use with batteries of other voltages.
- Do not use this product where there are flammable fumes or gases.
- Do not use this product in an enclosure containing lead-acid batteries. These batteries vent explosive hydrogen gas, which can be ignited by sparks from electrical connections.
- Never attempt to charge a frozen battery.
- Do not connect DC clamps to the carburetor, fuel lines, or sheet metal body parts.

WARNING: Shock hazard. Keep away from children.

- Do not expose the *Intelli*CHARGER to water or rain.
- Do not open the *Intelli*CHARGER. There are no user serviceable parts inside the unit. For service see the Returns policy in the back of this guide.

WARNING: Heated surface

- Ensure at least 2" (5 cm) air space is maintained on all sides of the *Intelli*CHARGER.

CAUTION

- An extension cord should not be used unless absolutely necessary. Use of an undersized extension cord will adversely affect the output of the product and could prove to be dangerous. If an extension cord must be used, make sure that pins on the plug of the extension cord are the same number, size and shape as those of the plug on the charger. We recommend a minimum of a 16AWG cord for lengths up to 50' and a minimum of a 14AWG cord for lengths up to 100'. We do not recommend cords over 100'. Do not use this product with an ungrounded extension cord.
- Do not expose the *Intelli*CHARGER to temperatures over 104 °F (40 °C).
- Be sure AC and DC cords are not pinched or otherwise damaged by hoods, doors, or other moving engine components.
- Observe battery polarity.

IMPORTANT

- If this charger is to be used with a portable generator, it should be equipped with automatic voltage regulation to ensure consistent output of the product.

Features of the XS Power *Intelli*CHARGER

The *Intelli*CHARGER is an advanced battery charger designed specifically for high performance lead-acid batteries. This charger combines the reliability of a transformer and MOSFET rectifier assembly with an advanced microprocessor control board to create a battery charger that can rapidly and safely recharge 16V gel-cell, and AGM (Absorbed Glass Mat) batteries in several sizes. The front panel switches, LED indicators, and charge meter make the *Intelli*CHARGER very easy to use.

Multi-Stage Charging

At the heart of the technology in the XS Power *Intelli*CHARGER are the three distinct charging stages. During the first stage, called “Bulk” charging, the current is fixed according to the charge rate switch on the front panel and the voltage is allowed to float. During this stage, 80% of the battery’s capacity is restored.

When the battery’s cell voltage comes up to the correct level, the second stage called “Absorption” charging is engaged. During this stage the voltage is fixed according to the battery type and voltage switches on the front panel and the current is allowed to float. The battery is brought to 100% during this stage and the cells are equalized.

The third stage is float charging. During this stage the voltage and current are reduced to a level that will maintain the battery indefinitely.

Several microprocessors are used to tightly control the entire process. This is the same technique that battery manufacturers recommend and use in the production of new batteries and it is the fastest and safest technique for battery charging.

Compatible With All 16V AGM and Gel-Cell Batteries

Lead-acid batteries have different charging requirements based on their specific design. Overcharging an AGM or gel-cell battery will cause permanent damage. If in doubt, contact the manufacturer of the battery being charged.

Charge Rate Ammeter

The Battery Charger features an ammeter allowing the user to monitor the charging progress.

Voltage Monitoring

The battery’s terminal voltage is measured every five minutes by the on-board microprocessors and this information is analyzed in addition to the elapsed time to dynamically control the Battery Charger for optimum charging performance.

Automatic Computer Analysis/Auto Shutdown

The microprocessors will analyze the battery when connected. If the battery’s voltage is below 4V or the battery will not come up to the correct voltage in a ten-hour period the charger will automatically shut off.

UL Approved Battery Cables

Six feet of durable battery cables are provided that are resistant to cuts and abrasion. The copper plated battery clamps are compact and custom designed easy connections. All clamp connections are soldered for maximum current flow.

Internal Cooling Fan

A cooling fan automatically operates during charging to keep the transformer and other internal components at a constant safe temperature.

Front and Rear Panel Switches and Indicators

- 1) **Charge Rate Ammeter:** Displays the amount of current flowing into the battery. During stage one or bulk charging this will be the selected charge rate. During stage two or absorption charging, this rate will naturally fall to zero as the battery percent of charge approaches 100%. During float charge, this will read close to zero.
- 2) **Charging indicator:** Illuminates when the charger is in stage one bulk charging or stage two absorption charging.
- 3) **Float Charge indicator:** Illuminates when the charger is in stage three or float charge mode.
- 4) **Power Switch:** Turns the charger on and off.

⚠ CAUTION: It is important to select the correct battery type.

Front Panel



Rear Panel



- 5) **Fuse holder:** Contains an 8A fuse in case of overload.
- 6) **AC cord:** Grounded 3-pin 110V cord for use with grounded outlets only.
- 7) **Battery clamps and cord:** Allow for connection to the battery.

Precautions Working With Lead-Acid Batteries

Follow all instructions published by the battery manufacturer and the manufacturer of the equipment in which the battery is installed.

- 1) Make sure the area around the battery is well ventilated.



- 2) Never smoke or allow a spark or flame near the battery(ies).



- 3) Use caution to reduce the risk of dropping a metal tool on the battery. It could spark or short circuit the battery or other electrical parts and thereby cause an explosion.

- 4) Remove all metal items, like rings, bracelets, and watches when working with lead-acid batteries. Lead-acid batteries produce a short circuit current high enough to cause a severe burn.



- 5) Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.



- 6) Wear complete eye protection and clothing protection. Avoid touching eyes while working near batteries.



- 7) If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters your eye, immediately flood it with running cold water for at least twenty minutes and get medical attention immediately.

- 8) If you need to remove a battery, always remove the ground terminal from the battery first. Make sure all accessories are off to minimize the potential of a spark.

- 9) Someone should be in the range of your voice or close enough to come to your aid when working with a lead-acid battery.



- 10) Do not attempt to remove the vent covers on sealed lead-acid batteries such as the XS Power 16V AGM battery. Sealed batteries operate on a slight positive cell pressure. Venting this pressure will ruin the battery.

Charging Lead-Acid Batteries

▲ WARNING: Before you start to charge batteries read the “Important Safety Instructions” on page (1) and take all safety precautions when working with batteries.

The IntelliCHARGER has been designed to provide fully automatic recharge of 16V AGM and gel-cell batteries.

To charge your 16V battery:

- 1) If possible, disconnect all loads from the battery, by removing battery cables, opening a disconnect switch, or switching loads off.

▲ CAUTION!

Although this is best, in a racing environment this may not be possible. Supplemental loads such as an electric water pump or cooling fans may be operated while charging during stage one. Please note though that supplemental loads will reduce the amount of amperage available to the battery. The charger detects that a battery is fully charged when its charging current drops below a preset limit in a specific elapsed time. The presence of electrical loads on the battery will interfere with this process. Therefore when the charger is in stage two-absorption charging it is necessary for the battery to be isolated from loads. The IntelliCHARGER is in stage-two when the charge rate is declining.

- 2) Connect the red positive (+) clip of the charger cables to the positive (+) terminal of the vehicle battery.
- 3) Connect the black negative (–) clip of the charger cables to a solid chassis ground. If this is not possible, connect it to the negative (–) battery terminal.
- 4) Flip the power switch on the front panel to ON.

The microprocessors will analyze the battery and then after a short delay, the “Charging Status” indicator on the front panel will illuminate beginning the three-stage charging sequence. During charging, the charging current can be reset to a different charge rate if necessary.

▲ CAUTION: Do not change the battery type during charging. Use the correct battery type at all times.

During stage one-bulk charging, the amperage will begin at 20A. During stage two-absorption charging, the amperage will start to fall to zero as the battery comes up to 100%. When the charging process is complete, the Charging indicator light will go out and the Float Charge indicator will come on. The cooling fan inside the charger will stop and the battery can be left in this state indefinitely.

*Note that the charger will automatically restart the charging sequence if the charge current rises above a factory preset threshold.

- 5) When complete, flip the power switch to OFF.
- 6) Remove the black negative (–) clip and the red positive (+) clip from the vehicle’s battery terminals.

Chapter 3 will help you identify and remedy the common problems than can occur with the *Intelli*CHARGER. Please read this chapter before calling Customer Service. If you cannot solve the problem with the *Intelli*CHARGER, record the information asked for on “Information About Your System” on the back page and then call Customer Service.

⚠ WARNING: Electric shock hazard

Do not disassemble the *Intelli*CHARGER. The *Intelli*CHARGER does not contain any internal user-serviceable parts and attempting to service the unit yourself could result in electrical shock or burn.

- **Fan does not come on when the power switch is flipped to ON:**
 - Check fuse.
 - Check cord and input power.
- **Charging LED will not illuminate if:**
 - The battery is not connected.
 - The battery is below 4.0V.
- **Charge rate does not come up to the selected charge rate initially:**
 - The battery charger has already moved into stage two charging.
 - Input voltage is below 120 VAC.
 - The battery may be defective and resisting the charge current.



Appendix A Specifications

Important: Specifications are subject to change without notice.

Physical Specifications

- Dimensions 7 1/8" W x 5 5/8" H x 9 5/8" D
- Weight 14 lbs (6.43 kg)
- AC Input Connections 5.0' (1.5 m) AWG 18
- DC Output Connections 6.0' (1.8 m) AWG 10

Electrical Specifications

- Absorption Voltage 16V 19.20 VDC
- Float Voltage at no Load 18.08 VDC
- Maximum Output Voltage ... 19.20 VDC

AC Input Specifications

- AC Input Voltage 120 VAC, 60 Hz
- AC Input Current 8A RMS fuse protected

Appendix B

Battery Charging

Appendix B describes battery charging in more detail.

The *Intelli*CHARGER charges batteries in a sequence known as multi-stage charging. The charging voltage delivered to the battery depends on the battery's depth of discharge.

The three automatic stages are:

- Stage One - Bulk
- Stage Two - Absorption/Equalization
- Stage Three - Float

Bulk Charge

In the first stage, known as “bulk” charging, the *Intelli*CHARGER delivers its full-rated output current. This constant current is delivered to the batteries until the battery voltage approaches its absorption voltage, either 2.425V per cell or 2.375V per cell depending on battery type selected. The bulk charge stage restores about 80% of the battery's charge and this stage completes very quickly unless the battery is deeply discharged. During this stage the charge rate current on the ammeter should read 20A, then cascade to 15A after a 10 min. time period.

Absorption/Equalize Charge

During the second stage, known as “absorption” charging, the charging voltage is held constant near the gassing voltage, and the charging current is allowed to diminish as the battery comes up to 100% charge. Complex algorithms considering the time, voltage level, and charging current determine when the charger exits this mode and goes to stage three, float charging. The length of time of this mode depends on the battery and is not fixed.

Float Charge

The third stage, called “Float” charging is a maintenance mode in which the output voltage of the charger is reduced to a lower level, typically about 2.26 V per cell to maintain the battery's charge without losing electrolyte through gassing. In the float mode, the charger will initiate a new charge cycle if:

- AC power is disconnected and reconnected
- The current demand on the *Intelli*CHARGER exceeds the battery recharge current setting.

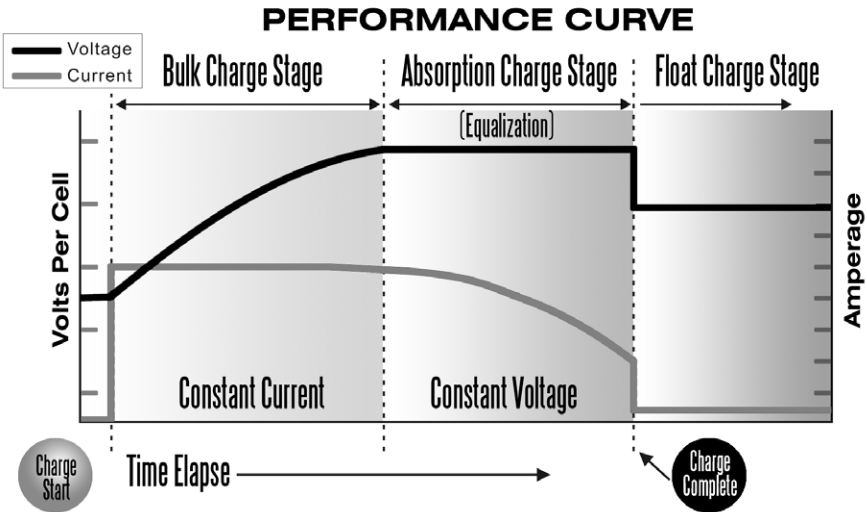


Figure B-1 Multi-stage charging profile

FAQ's

Can I change the clamps on the charger with quick disconnects?

Yes. We recommend soldering all electrical connections where possible.

Can I run my electric water pump and cooling fan while charging?

Yes with a word of caution. There are two issues. First the charger will only provide 20A maximum charge current. Any amperage being consumed by extra electrical loads (ie. electric water pumps, etc.) will take away from the amperage available for battery charging. The battery charge time will be increased. In addition, the battery charger monitors the battery voltage and time to determine when the battery is at 100% charge. Extra electrical loads on the system will give the charger false information and therefore will prevent the charger from properly completing stage two.

Second, some electrical items can be damaged by high voltages. Data loggers, computers, and other items may lose data or be seriously damaged if subjected to the 19.0~20.0VDC of charging voltage. We do not recommend retrieving this information while charging. If in doubt about a particular component, consult with its manufacturer concerning its maximum input voltage.

⚠ CAUTION: Data loggers, computers of all sorts, and light bulbs may be damaged by the 19.0~20.0VDC of input voltage during charging. Do not operate these items while charging. We recommend disconnecting the battery from the system while charging.

Can I run this charger from a portable generator?

Yes with a word of caution. Since the output of the battery charger is directly proportional with the input voltage, we recommend portable generators with automatic voltage regulation. The *IntelliCHARGER* is calibrated at the factory assuming 120VAC, 60Hz. Deviations from this voltage will cause deviations in the output voltage and overall performance.

How many batteries can I recharge at one time with the *IntelliCHARGER*?

This depends on the size of the batteries. All batteries in the bank must be of the same type and size. In addition, the *IntelliCHARGER* is expecting the battery bank to be at full charge in ten hours or less. Therefore the size of the batteries and their depth of discharge will play a role in the answer here. Given they were all XS Power 16V AGM batteries with a size of 45Ah at 100% discharged, you can charge up to four in parallel in ten hours.

Calculating External Battery Charging Time

Charging time will depend on the amp-hour capacity of your battery and on how deeply it is discharged. The following equation calculates an approximate charging time:

$$\text{Charging Time} = \frac{\text{CAP} \times \text{DOD}}{\text{CC} \times 80\%} \text{ where:}$$

Charging Time = Battery recharge time in hours
CAP = Battery capacity in amp-hours

DOD = Battery depth of discharge in percent.
A fully discharged battery has 100% DOD.

CC = Charge current. The rated current output of the charger in amps.

80% = Typical charging efficiency for lead-acid batteries.

Example:

An XS Power 16V AGM battery rated at 45 amp-hours is 60% discharged, that is, it has a DOD = 60%. Charging time with an *IntelliCHARGER* 15A unit is calculated as follows:

$$\text{Charging time} = \frac{45\text{Ah} \times 60\%}{15\text{A} \times 80\%} = 2.25 \text{ hours (2 hours, 15 minutes)}$$