

# IMPORTANT: READ AND SAVE THIS SAFETY AND INSTRUCTION MANUAL. KEEP IT WITH OR NEAR CHARGER AT ALL TIMES.

**SPECIFICATIONS:**      **Safety Timer: 16.5 Hours**      **Manual P/N: MNL032 Rev.2**

## 1. **WARNING - RISK OF EXPLOSIVE GASES.**

WORKING IN THE VICINITY OF A LEAD-ACID BATTERY IS DANGEROUS. EXPLOSIVE GASES DEVELOP DURING NORMAL BATTERY OPERATION. IT IS IMPORTANT THAT EACH TIME BEFORE USING YOUR CHARGER, YOU READ THIS MANUAL AND MAKE CERTAIN YOU FULLY UNDERSTAND IT AND FOLLOW THE SAFETY AND OPERATING INSTRUCTIONS EXACTLY.

- 1.1 To reduce risk of battery explosion, follow all safety instructions below and those published by the battery manufacturer and review cautionary markings on vehicle or equipment containing the battery.
- 1.2 Use of an attachment not recommended or sold by the battery charger manufacturer may result in a risk of fire, electric shock, or injury to persons.
- 1.3 Do not operate or disassemble charger if it has received a sharp blow, been dropped, or otherwise damaged in any way.
- 1.4 Charger contains no serviceable parts. If it fails during its warranty period, contact your Dealer for a warranty replacement.
- 1.5 To reduce risk of electric shock, unplug charger from AC outlet before attempting any maintenance or cleaning.
- 1.6 Do not expose charger to splashed liquids, rain or snow.

## 2. **PERSONAL PRECAUTIONS**

- 2.1 Someone should be within range of your voice or close enough to come to your aid when you work near a lead-acid battery.
- 2.2 Have plenty of fresh water and soap nearby in case battery acid contacts your skin, clothing or eyes. Wear eye and clothing protection and avoid touching eyes while working near battery.
- 2.3 If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters eye, immediately flush eye with running cold water for at least 10 minutes. Get medical attention immediately.
- 2.4 NEVER smoke or allow a spark or flame in vicinity of battery.
- 2.5 Be extra cautious not to drop a metal tool onto battery. It might spark or short-circuit battery or other electrical part that may cause an explosion.
- 2.6 Before working with lead-acid battery, remove personal metal items such as rings, bracelets, necklaces, watches, etc. A lead-acid battery can produce a short-circuit current high enough to weld such items causing a severe burn.
- 2.7 NEVER charge a frozen battery - thaw it out first. Charging will then be safer and more efficient.

## 3. **When using extension cord, it must be a UL and/or CSA approved cord.**

Connect charger to the cord before plugging cord into a power outlet that is rated at 120Vac, 60Hz (1-24012-04 Model only), or 230Vac, 50Hz (2-24012-04 Model only). Use of improper extension cord could result in fire and/or electric shock. Before using extension cord, make sure

that it is properly wired and in good electrical condition; and that the wire size is large enough for AC amp rating of charger as specified in the following Table:

### RECOMMENDED MINIMUM AWG SIZE FOR EXTENSION CORDS FOR BATTERY CHARGERS

Length of cord (feet):	25	50	100	150
AWG size of cord:	16	14	10	8

## 4. **PREPARING TO CHARGE**

- 4.1 If necessary to remove battery from vehicle to charge, always remove grounded terminal from battery first. Make sure all accessories in the vehicle are off, so as not to cause an arc.
- 4.2 Be sure area around battery is well ventilated while battery is being charged. Gas can be forcefully blown away by using a piece of cardboard or other non-metallic material as a fan.
- 4.3 Clean battery terminals. Be careful to keep corrosion from coming into contact with eyes.
- 4.4 Add distilled water in each cell until battery acid reaches level specified by battery manufacturer. This helps purge excessive gas from cells. Do not overfill. For a battery without caps, carefully follow manufacturer's recharging instructions.
- 4.5 Study all battery manufacturer's specific precautions such as removing or not removing cell caps while charging and recommended rates of charge.
- 4.6 Determine voltage of battery by referring to vehicle owner manual and make sure it matches output rating of battery charger.
- 4.7 Never allow battery acid to drip on charger when reading gravity or filling battery.
- 4.8 Do not operate charger in a closed-in area or restrict ventilation in any way.

## 5. **OPERATING INSTRUCTIONS**

After proper connection of charger to battery terminals and A.C. Power, the charger waits 3 seconds before starting its 5-stage charging process as described below. If the charger is equipped with an AC POWER ON/OFF Switch, use it to switch the power on to the charger.

### 5.1 **PRE-QUALIFICATION TEST STAGE ONE**

Yellow, Light Emitting Diode (L.E.D.), flashes on and off SLOWLY at a rate of once every 2 seconds during this stage. Pre-Qualification Test applies three tests to the battery. Further charging is prohibited if charger discovers a fault. If you already suspect a faulty battery, test the battery with a Load Tester. The duration of this stage is dependent on the condition of your battery and is approximately 40 seconds to 5 hours.

### 5.2 **CONSTANT CURRENT CHARGE STAGE TWO**

Yellow L.E.D. illuminates continuously indicating that the charger is charging the battery at the full rated output.

### 5.3 **CONSTANT VOLTAGE CHARGE STAGE THREE**

Yellow L.E.D. is still illuminated continuously and is waiting for the individual cells to become equalized. When the battery has reached approximately 90% state of charge, the Yellow and Green L.E.D.s will both illuminate. This stage ends when the battery has reached 100% state of charge.

### 5.4 **FLOAT CHARGE STAGE FOUR**

Green Charged L.E.D. on. Charger will maintain battery until A.C. Power disconnected and can be left connected indefinitely; limited only by the service life of battery.

### 5.5 **RECYCLE CHARGE STAGE FIVE**

If the charger is left connected to battery for storage charging, the charger will automatically reinitiate a new charge cycle routine, once every 28 days.

## 6. L.E.D. DISPLAY

6.1 Upon application of A.C. Power, all 5 L.E.D.s flash on/off, once. If any of the Red L.E.D.s Flash, charging has terminated due to a Charge Error Condition. Refer to the Charge Error Table for a description of failure and contact Technical Support.

<b>Power On</b>	Illuminates continuously when AC power is present.
<b>Shutdown</b>	This Red L.E.D. used in conjunction with the 1st and 3rd Red L.E.D. to display an error code.
<b>Det. Fault</b>	Illuminates continuously if charger not connected to battery, or battery voltage is less than 3.0Vdc

### CHARGE ERROR TABLE

Flashing L.E.D.s

	Power	Abnormal	Detection
Over Volt / Blown Fuse Error	Off	Off	Flash
Reverse Battery Connection	Off	Flash	Off
Output Over Current	Off	Flash	Flash
Thermal Runaway Condition	Flash	Off	Off
Charge Time Monitor	Flash	Off	Flash
Pre-Qualification Test 1,3 Fail	Flash	Flash	Off
Pre-Qualification Test 2 Fail	Flash	Flash	Flash

### 6.1 DESCRIPTION CHARGE ERROR TABLE

#### OVER VOLT / BLOWN FUSE ERROR

Charger connected to battery whose voltage rated higher than charger. Internal Fuses opened due to unknown condition.

#### REVERSE BATTERY CONNECTION

Check and remake connections to battery.

#### OUTPUT OVER CURRENT

Under severe motor or load loading, charger may shut down

#### THERMAL RUNAWAY CONDITION

Caused by unbalance battery condition - may require replacement of batteries.

#### CHARGE TIME MONITOR

Occurs when charging took too long. Possible causes include: use of a battery load while charging, aged batteries etc.

#### FAILED PRE-QUALIFICATION TEST

A failure of these tests indicate that the batteries may need replacing. Test 1 and 3 check for shorted cells and Test 2 checks for excessive sulfation.

## 7. PROTECTION DEVICES OPERATION

### 7.1 SOFTWARE TIME DEPENDENT CHARGING

Timer terminates bulk charging if the charging process takes too long generating a 'Charge Time Monitor Error'. Large capacity battery may also affect timer; apply the following formula to determine if the Timer may run out:

$$\text{Charge Time} = \frac{\text{Battery Capacity (AH)}}{\text{Charger Output Amps}} \times 1.25$$

Charge Time is in Hours. The resulting value must be less than the Safety Timer Specification, printed at the top of the 1st page. Output Amps and Battery Capacity (AH - Ampere-hour) is listed on your battery or contact the individual who sold you the battery.

Example 1: Charge time to charge a fully discharged 100 AH battery:  $100\text{AH}/12\text{Amps} \times 1.25 = 10.42$  Hrs which is less than the Safety Timer Specification.

## 8. TECHNICAL NOTES

Since the charger analyzes the battery's condition, it is not recommended that you charge more than one battery pack at a time because the battery's characteristics differ from one battery to another.

Storage charging to maintain batteries in seasonal storage or not used within two days is highly recommended to prevent

battery plate sulfation (similar to iron rusting) and self discharge - rate is proportional to ambient temperature.

**!!WARNING!!:** For your own protection, when using ANY 24,36,42,48v or other type of charger, always ensure, that the batteries, that you have put in a series connection to make the 'Battery Pack' for your system, ARE ALL at the same state of charge, same condition, same size, rating and age. NEVER, MIX OLD BATTERIES WITH NEW, OR DIFFERING SIZES OR TYPES. NEVER FORCE BATTERIES TO BECOME UNBALANCED BY TAPPING OFF ONE OR MORE OF THE BATTERIES TO SUPPLY A DIFFERENT LOAD OR CIRCUIT, WHILE CHARGING OR DISCHARGING. The more fully charged battery(s), in the series, may become very hot and may rupture, OR MAY BECOME REVERSED POLARITY resulting in personal injury, death or property damage. Never use charger for any purpose contrary to its intended purpose of charging lead acid batteries in accordance with ALL conditions printed in this manual.

## 9. TWO YEAR LIMITED WARRANTY

Diversified Power International LLC (DPI) warrants exclusively to the original purchaser that this product will be replaced or repaired, at DPI's option, if it fails during the first 2 years after date of purchase due to a defect in material or workmanship. In order for a claim to be processed the product must be returned to DPI (i) with all transportation charges prepaid, (ii) accompanied by an acceptable proof of purchase, and with a Return Material Authorization (RMA) number, previously obtained from DPI, printed and clearly visible on the outside of the shipping container. This warranty does not apply if the product has been modified, abused, or damaged or improperly or negligently used, connected, maintained, or operated in any manner contrary to the instructions stated in this manual or affixed to the product's enclosure. Repair or replacement as provided under this warranty is the exclusive remedy of the purchaser, and the purchaser shall have no claim against DPI except for the breach of an express warranty stated herein. DPI shall not be liable for any incidental, consequential, or special damages for breach of any expressed or implied warranty. Except to the extent required by applicable law any implied warranty of merchantability or fitness for a particular purpose is limited in duration to the first two (2) years after the date of purchase. Some states do not allow the exclusion or limitation of incidental or consequential damages or allow limitations on how long an implied warranty lasts, so the above limitations or exclusion may not apply to you. This limited warranty gives you specific legal rights, and you may also have other rights which vary from state to state. APART FROM THE WARRANTIES SET FORTH ABOVE, DPI MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, WITH RESPECT TO THE SUITABILITY OR MERCHANTABILITY OF THIS PRODUCT, THE FITNESS OR THIS PRODUCT FOR ANY SPECIFIC USE OR PURPOSE, OR ANY OTHER MATTER PERTAINING TO THIS PRODUCT.

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For further information, product updates, technical information, or general inquiries, also, please visit our web site at:

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