

# Optimate6

amp/matic

**MODEL: TM180, TM181**  
~ **AC: 100 - 240VAC 50-60Hz**  
= **DC: 60W 5A @ 12V**  
**Thermally adjusted**

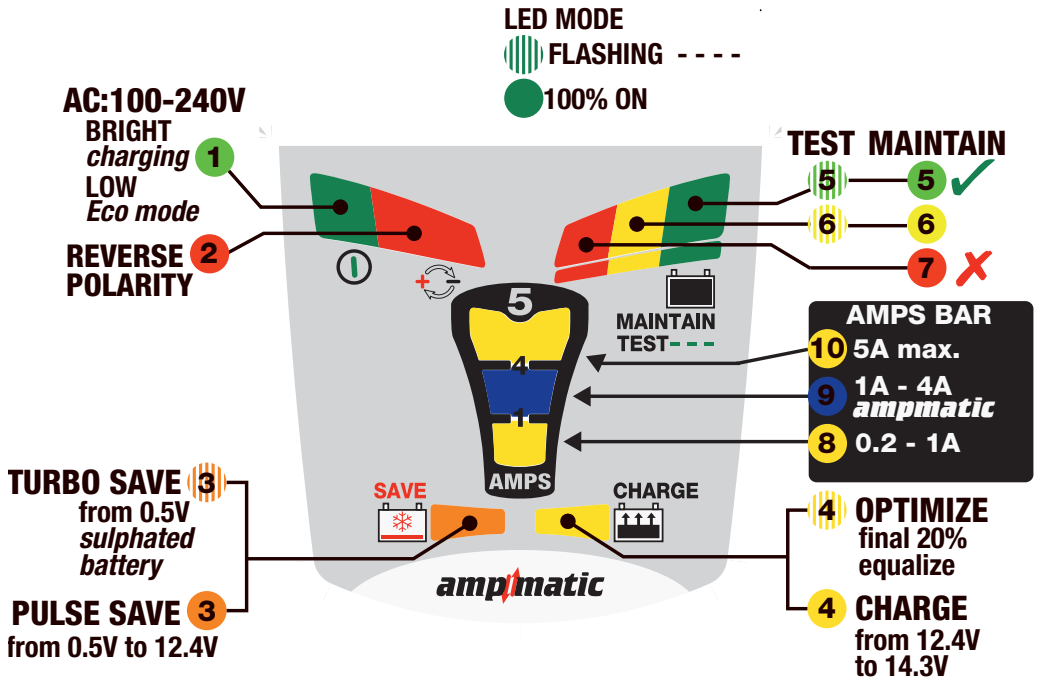
**INSTRUCTIONS FOR USE**  
**IMPORTANT:** Read completely  
before charging



 **1 x 12V**  
**STD / AGM-MF / GEL**  
**3 - 240Ah (charge within 48 hours)**

**Automatic charger for 12V lead/acid batteries**

# LED indications (illustration 1)



# Early warning of battery problems problèmes de batterie (illustration 2)

## TEST after charging - 5 possible results

TEST					
VOLTS	2V	12.2V	12.4V	12.5V	12.7V
STD	X	40-60%	61-80%	✓	✓
GEL	X	X	40-60%	61-80%	✓
AGM / MF	X	X	40-60%	61-80%	✓

**THIS PORTION OF THE MANUAL CONTAINS IMPORTANT SAFETY INSTRUCTIONS FOR THE OPTIMATE 6 BATTERY CHARGER. IT IS OF THE UTMOST IMPORTANCE THAT EACH TIME, BEFORE USING THE CHARGER, YOU READ AND EXACTLY FOLLOW THESE INSTRUCTIONS. SAVE THESE INSTRUCTIONS.**

### Automatic charger for 12V lead-acid batteries

**DO NOT USE FOR NiCd, NiMH, Li-Ion OR NON-RECHARGEABLE BATTERIES.**

1. CAUTION : CLASS II APPLIANCE. DO NOT CONNECT TO GROUND.
2. Do not expose charger to rain or snow.
3. 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.
4. To reduce risk of damage to electric plug and cord, pull by plug rather than cord when disconnecting charger.
5. An extension cord should not be used unless absolutely necessary. Use of improper extension cord could result in a risk of fire and electric shock. If extension cord must be used make sure that :
  - a) pins on plug of extension cord are the same number, size and shape as those of plug on charger.
  - b) the extension cord is properly wired and in good electrical condition, and
  - c) the conductor wire size is large enough for the AC ampere rating of the charger as specified in the table below.

AC INPUT RATING IN AMPERES Equal to or greater than But less than		LENGTH OF CORD, FEET (m)	AWG SIZE OF CORD
2A	3A	25 (7.6)	18
		50 (15.2)	18
		100 (30.5)	14

6. Do not operate charger with damaged cord or plug - replace the cord or plug immediately.
7. Do not operate charger if it has received a sharp blow, been dropped, or otherwise damaged in any way; take it to a qualified serviceman.
8. Do not disassemble charger; take it to a qualified serviceman when service or repair is required. Incorrect reassembly may result in a risk of electric shock or fire.
9. To reduce risk of electric shock, unplug the charger from outlet before attempting any maintenance or cleaning. Turning off controls will not reduce this risk. Clean only with slightly moist, not wet, cloth. Do not use solvents.
10. WARNING - RISK OF EXPLOSIVE GASES.
  - a) WORKING IN VICINITY OF A LEAD-ACID BATTERY IS DANGEROUS. BATTERIES GENERATE EXPLOSIVE GASES DURING NORMAL BATTERY OPERATION. FOR THIS REASON, IT IS OF UTMOST IMPORTANCE THAT YOU FOLLOW THE INSTRUCTIONS EACH TIME YOU USE THE CHARGER.
  - b) To reduce risk of battery explosion, follow these instructions and those published by the battery manufacturer and manufacturer of any equipment you intend to use in vicinity of the battery. Review cautionary marking on these products and on engine.

### 11. PERSONAL PRECAUTIONS.

- a) Someone should be within range of your voice OR close enough to come to your aid when you work near a lead-acid battery.
- b) Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing or eyes.
- c) Wear complete eye protection and clothing protection. Avoid touching eyes while working near battery.
- d) If battery acid contacts or enters eye, flood eye with cold running water for at least 10 minutes and get medical attention immediately. If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters an eye, immediately flood eye with running cold water for at least 10 minutes and get medical attention immediately.
- e) NEVER smoke or allow a spark or flame in vicinity of battery or engine.
- f) Be extra cautious to reduce risk of dropping a metal tool onto battery. It might spark or short-circuit battery or other electrical part that may cause explosion.
- g) Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a lead-acid battery. A lead-acid battery can produce a short-circuit current high enough to weld a ring or the like to metal, causing a severe burn.
- i) NEVER charge a frozen battery.

## 12. PREPARING TO CHARGE

- 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.
- 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.
- Clean battery terminals. Be careful to keep corrosion from coming in contact with eyes.
- 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 cell caps, such as valve regulated lead acid (VRLA) or absorbed glass mat (AGM) batteries, carefully follow manufacturer's recharging instructions.
- Study all battery manufacturer's specific precautions such as removing or not removing cell caps while charging and recommended rates of charge.
- Determine voltage of battery by referring to vehicle or other user's manual and BEFORE MAKING THE BATTERY CONNECTIONS, MAKE SURE THAT THE VOLTAGE OF THE BATTERY YOU ARE GOING TO CHARGE MATCHES THE OUTPUT VOLTAGE OF THE CHARGER.

### 13. CHARGER LOCATION.

- Locate charger as far away from battery as DC cables permit.
- Never place charger directly above battery being charged; gases from battery will corrode and damage the charger. c) Never allow battery acid to drip on charger when reading gravity or filling battery. Do not operate charger in a closed-in area or restrict ventilation in any way.
- Do not set a battery on top of charger. **IMPORTANT** : Place charger on a hard flat surface or mount onto a vertical surface. Do not place on plastic, leather or textile surface.

## 14. DC CONNECTION PRECAUTIONS

- Connect and disconnect DC output clips only after setting any charger switches to off position and removing AC cord from electric outlet. Never allow clips to touch each other, however should this happen no damage will result to the charger circuit & the automatic charging programme will just reset to «start».
- Attach clips to battery and chassis as indicated in 15(e), 15(f), and 16(b) through 16(d).

**NOTE** : This battery charger has an automatic safety feature that will prevent it from operating if the battery has been inversely connected. Set charger switches to off position and/or remove AC cord from electrical outlet, disconnect the battery clips, then reconnect correctly according to the instructions below.

### 15. FOLLOW THESE STEPS WHEN BATTERY IS INSTALLED IN VEHICLE. A SPARK NEAR A BATTERY MAY CAUSE BATTERY EXPLOSION. TO REDUCE RISK OF A SPARK NEAR BATTERY :

- Position AC and DC cords so as to reduce risk of damage by hood, door or moving engine part.
- Stay clear of fan -blades, belts, pulleys, and other parts that can cause injury to persons.
- Check polarity of battery posts. POSITIVE (POS, P, +) battery post usually has larger diameter than NEGATIVE (NEG, N, -) post.
- Determine which post of battery is grounded (connected) to the chassis. If negative post is grounded to chassis (as in most vehicles), see (e). If positive post is grounded to the chassis, see (f).
- For negative-grounded vehicle, connect POSITIVE (RED) clip from battery charger to POSITIVE (POS, P, +) ungrounded post of battery. Connect NEGATIVE (BLACK) clip to vehicle chassis or engine block away from battery. Do not connect clip to carburetor, fuel lines, or sheet-metal body parts. Connect to a heavy gage metal part of the frame or engine block.
- For positive-grounded vehicle, connect NEGATIVE (BLACK) clip from battery charger to NEGATIVE (NEG, N, -) ungrounded post of battery. Connect POSITIVE (RED) clip to vehicle chassis or engine block away from battery. Do not connect clip to carburetor, fuel lines, or sheet-metal body parts. Connect to a heavy gage metal part of the frame or engine block.
- When disconnecting charger, turn switches to off, disconnect AC cord, remove clip from vehicle chassis, and then remove clip from battery terminal.
- See operating instructions for length of charge information.

### 16. FOLLOW THESE STEPS WHEN BATTERY IS OUTSIDE VEHICLE. A SPARK NEAR THE BATTERY MAY CAUSE BATTERY EXPLOSION. TO REDUCE RISK OF A SPARK NEAR BATTERY :

- Check polarity of battery posts. POSITIVE (POS, P, +) battery post usually has a larger diameter than NEGATIVE (NEG, N, -) post.
- This battery charger has an automatic safety feature that will prevent it from operating if the battery has been inversely connected. The charger does allow charge current unless a voltage of at least 2V is sensed.
- Connect POSITIVE (RED) charger clip to POSITIVE (POS, P, +) post of battery.
- Connect NEGATIVE (BLACK) charger clip to NEGATIVE (NEG, N, -) battery post of the battery.
- Do not face battery when making final connection.
- When disconnecting charger, always do so in reverse sequence of connecting procedure & break first connection while as far away from battery as practical.
- A marine (boat) battery must be removed & charged on shore. To charge it on board requires equipment specially designed for marine use.

# Optimate 6

ampmatic

## AUTOMATIC DIAGNOSTIC CHARGER FOR 12V LEAD-ACID BATTERIES FROM 3Ah TO 240Ah.

### DO NOT USE FOR NiCd, NiMH, Li-Ion OR NON-RECHARGEABLE BATTERIES.

Charge rate: 5 Ah / hour, will recharge a 240Ah battery in 48 hours.

Input: 100-240V~ maximum 1.5A. The maximum output current is automatically adjusted according to the characteristics of the connected battery, in the range of 0.4A to 5A, by the ampmatic™ output control circuit .

### SAFETY WARNING AND NOTES: IF YOU HAVE NOT YET DONE SO, READ THE PRECEDING PAGES LABELLED "IMPORTANT SAFETY INSTRUCTIONS" BEFORE OPERATING THIS CHARGER.

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.

**SAFETY WARNING AND NOTES: Batteries emit EXPLOSIVE GASES - prevent flame or sparks near batteries.** Disconnect AC power supply before making or breaking DC/battery connections. Battery acid is highly corrosive. Wear protective clothing and eyewear and avoid contact. In case of accidental contact, wash immediately with soap and water. Check that the battery posts are not loose; if so, have the battery professionally assessed. If the battery posts are corroded, clean with a copper wire brush; if greasy or dirty clean with a rag damped in detergent. Use the charger only if the input and output leads and connectors are in good, undamaged condition. If the input cable is damaged, it is essential to have it replaced without delay by the manufacturer, his authorised service agent or a qualified workshop, to avoid danger. Protect your charger from acid and acid fumes and from damp and humid conditions both during use and in storage. Damage resulting from corrosion, oxidation or internal electrical short-circuiting is not covered by warranty. Distance the charger from the battery during charging to avoid contamination by or exposure to acid or acidic vapours. If using it in the horizontal orientation, place the charger on a hard, flat surface, but NOT on plastic, textile or leather. Use the fixing holes provided in the enclosure base to attach the charger to any convenient, sound vertical surface.

**EXPOSURE TO LIQUIDS:** This charger is designed to withstand exposure to liquids accidentally spilled or splashed onto the casing from above, or to light rainfall. Prolonged exposure to falling rain is inadvisable and longer service life will be obtained by minimizing such exposure. Failure of the charger due to oxidation resulting from the eventual penetration of liquid into the electronic components, connectors or plugs, is not covered by warranty.

### CONNECTING THE CHARGER TO THE BATTERY

1. Disconnect AC power supply before making or breaking DC / battery connections.
2. If charging a battery in the vehicle with the battery clips, before making connections, first check that the battery clips can be safely and securely positioned clear from surrounding wiring, metal tubing or the chassis. Make connections in the following order: First connect to the battery terminal not connected to the chassis (normally positive), then connect the other battery clip (normally negative) to the chassis well away from the battery and fuel line. Always disconnect in reverse sequence.
3. When charging a battery out of the vehicle with the battery clips, place it in a well ventilated area. Connect the charger to the battery: RED clamp to POSITIVE (POS, P or +) terminal and BLACK clamp to NEGATIVE (NEG, N or -) terminal. Make sure the connections are firm and secure. Good contact is important.
4. **If the battery is deeply discharged (and possibly sulphated), remove from the vehicle and inspect the battery before connecting the charger for a recovery attempt.** Visually check the battery for mechanical defects such as a bulging or cracked casing, or signs of electrolyte leakage. If the battery has filler caps and the plates within the cells can be seen from the outside, examine the battery carefully to try to determine if any cells seem different to the others (for example, with white matter between the plates, plates touching). If mechanical defects are apparent do not attempt to charge the battery, have the battery professionally assessed.
5. **If the battery is new,** before connecting the charger read the battery manufacturer's safety and operational instructions carefully. If applicable, carefully and exactly follow acid filling instructions.

# USING THE OPTIMATE 6

**VERY FLAT NEGLECTED BATTERIES:** If the battery is deeply discharged (and possibly sulfated), remove from the vehicle or equipment and inspect the battery before connecting the charger for a recovery attempt.

The charger's **TURBO recovery mode cannot engage if it senses that the battery is still connected to a circuit** which effectively offers a lower electrical resistance than the battery on its own. However, if the deep-discharged battery is not removed for recovery, neither battery nor vehicle or equipment electronics will be damaged. **Pay particularly close attention to the following** A battery left deep-discharged for an extended period may develop permanent damage in one or more cells. Such batteries may heat up excessively during high current charging.

Monitor the battery temperature during the first hour, then hourly there-after. Check for unusual signs, such as bubbling or leaking electrolyte, heightened activity in one cell compared to others, or hissing sounds. If at any time the battery is uncomfortably hot to touch or you notice any unusual signs, **DISCONNECT THE CHARGER IMMEDIATELY.**

## CHARGING TIME

Charge time on a flat but otherwise undamaged battery is slightly less than 25% of the battery's Ah rating, so a 100Ah battery should take no more than about 25 hours to progress to the self-discharge check (§ 5).

Deep-discharged batteries may take significantly longer.

If using the OptiMate 6 on a severely discharged battery of larger than 240Ah capacity, a full charge may not be achieved within the 72 hour charge safety limit. In this case follow the reset procedure below.

## RESETTING THE CHARGE & TEST CYCLE

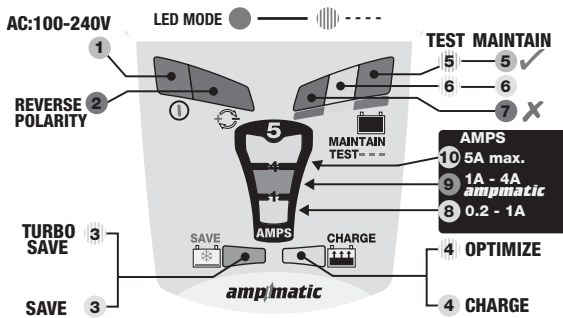
Disconnect from the AC mains. Wait for the **POWER ON LED #1** to go out. Upon reconnection to AC power LEDs #6, 7 and 8 will flash twice to confirm micro processor health, irrespective if the charger remains connected to a battery or not.

## ECO POWER SAVING MODE WHEN THE CHARGER IS CONNECTED TO AC SUPPLY:

The power converter switches to ECO mode when the charger is not connected to a battery resulting in a very low power draw of less than 1.7W, equivalent to power consumption of 0.042 kWh per day. When a battery is connected to the charger power consumption depends on the current demand of the battery and its connected vehicle / electronic circuitry. After the battery has been charged and the charger is in long term maintenance charge mode (to keep the battery at 100% charge) the total power consumption is estimated to be 0.060 kWh or less per day.

# PROCEEDING TO CHARGE

The LED indicators below are sequenced as they may come on through the course of the program.



**POWER ON: LED #1** - Confirms AC power supply to the charger.

HIGH and LOW intensity indication: The "POWER ON" LED #1 will indicate brightly when current is delivered to the battery.

The "POWER ON" LED #1 will reduce intensity to a low level to indicate low power "ECO" mode. This will occur if there is no battery connected, or when a battery is connected and the program finds itself in the voltage retention test mode or the 'rest' periods of Maintenance Charge mode.

**REVERSE POLARITY PROTECTION: LED #2** - Lights when the battery connections are incorrect. The charger is electronically protected so no damage will result, and the output will remain disabled until the connections are corrected.

**CHARGE CURRENT BAR: LED #8, 9, 10** - Lights when pulsed or continuous current is delivered to the battery.

Current level indications:

**LED #8:** 0.4A minimum current.

**LED#8 and 9:** 0.4A - 4.5A The ampmatic™ charge current program automatically determines the most efficient rate of charge current for the connected battery.

**LED #8, 9 and 10:** 5A maximum current.

### PRE-QUALIFICATION TEST: LED #5 / 6 / 7

**TEST LEDs #5/6/7 indicate the condition of the battery prior to charging. Charging commences after 10 seconds. The program will determine the correct charge mode.**

Consult the “**EARLY WARNING OF BATTERY PROBLEMS**” table on page 2 (illustration 2) for TEST LED indications.

**LED #7 (red) flashing:** The OptiMate 6 is injecting a test signal to see if the battery is recoverable. Once the indication becomes steady for up to 10 seconds charging will commence.



### SAVE / DESULPHATE: LED #3

**The SAVE mode engages if the battery was more than 60% discharged or is sulphated.**

Charge time: Minimum 15 minutes, maximum 2 hours.

**LED #3 steady on : STANDARD recovery for neglected batteries in the vehicle** - Up to 16V is applied with current limited to 0.4A. Batteries able to accept charge current will advance to PULSE recovery. If the battery is unable to accept a charge TURBO recovery will engage after 5 seconds only if no vehicle electronics have been detected.

**PULSE recovery - 15 minutes** - Current is delivered in pulses to prepare the battery to accept normal charge. *This mode is particularly effective for recovery of factory activated / “hi-performance” pure lead or cyclic cell AGM batteries.*

**LED #3 flashing : TURBO recovery for very badly neglected batteries** - Output voltage increases to a maximum of 22V with current limited to 0.4A.

**INTERPRETING THE CURRENT BAR DURING SAVE / DESULPHATE:** LED #8, 9, 10 only light when actual current enters the battery. If the current is below 0.4A or the battery is unable to accept current, no current LEDs will light.



### CHARGE: LED #4

**The CHARGE mode engages if the battery can accept current within the normal voltage range.**

**LED #4 steady on: BULK charge** - The ampmatic™ charge current monitoring and control mode automatically determines the most efficient rate of charge current for the connected battery, according to its state of charge, state of health, and electrical storage capacity. The delivered current may be anywhere from 0.4A to 5A.

**LED #4 flashing: OPTIMIZE charge** - The OPTIMIZE CHARGE mode starts when the voltage has reached 14.3V for the first time during BULK CHARGE stage. The ampmatic™ current control circuit now delivers pulses of current for 10 minutes to equalise the individual cells within the battery. The battery's charge level is verified. If the battery requires further charging the program will extend OPTIMIZE charge up to a maximum of 2 hours.

**INTERPRETING THE CURRENT BAR DURING CHARGING:** LED #8, 9, 10 only light when actual current enters the battery. If the current is below 0.4A or the program has interrupted charging, no current LEDs will light.

**NOTE:** For safety reasons there is an overall charge time limit of 72 hours.



### VOLTAGE RETENTION TEST: LED #5 / 6 FLASHING

**Delivery of current to the battery is interrupted for 12 hours to allow the program to determine the battery's ability to retain charge.**

For batteries with a good state of health LED #5 (green) should continue to flash for the full period (exception: STD wet cell batteries with filler caps have a lower fully charged voltage: : LED #6 flashes together with LED #5).

For any other result: The test will be interrupted and the program will progress to MAINTENANCE CHARGE mode. The voltage retention test will continue to repeat 24 hours after the start of the preceding test until the result improves to LED #5 (green) or LED #5 & 6 together (green & yellow).

A significant problem exists if the battery is unable to retain sufficient charge during the 12 hour test period. Consult the “**EARLY WARNING OF BATTERY PROBLEMS**” table on page 2 for LED indications other than LED #5 (green) / LED #5 and LED #6 together. Read the section NOTES ON TEST RESULTS on reasons for poor test results or how to test a battery that returns a good result but cannot deliver sufficient power once it is returned to service.



### MAINTENANCE CHARGE: LED #5 / 6 / 7 steady on

**The circuit offers current to the battery within a safe 13.6V voltage limit whilst the result of the voltage retention test is displayed. The maintenance charge mode continues until the charger is disconnected.**

For batteries with a good state of health LED #5 (green) will remain on. (exception: STD wet cell batteries with filler caps have a lower fully charged voltage: LED #6 remains on together with LED #5).

A more detailed description of the automatic maintenance cycle for long term battery storage can be found under the section AUTOMATIC BATTERY MAINTENANCE, including the LOW CURRENT PULSE DELIVERED TO PREVENT SULFATION, further extending battery power and life.

## NOTES ON TEST RESULTS:

1. For any test result other than green #5 (or green #5 and yellow #6 together if the battery is a STD type with filler caps), disconnect the battery from the electrical system it supports, and reconnect the OptiMate. If a better test result is now obtained, this suggests that the power losses are partly due to an electrical problem in the electrical system and not in the battery itself. If the poor result persists, you are advised to take the battery to a professional service workshop equipped with professional equipment for a more thorough investigation.

2. If the red LED #7 alone, or the yellow #6 and red LED #7 indicate together (or yellow LED alone for a sealed battery), a significant problem exists. The red / yellow+red LEDs mean that after being charged the battery's voltage is not being sustained or that despite recovery attempts the battery was irrecoverable. This may be due to a defect in the battery itself, such as a short-circuited cell or total sulphation, or, in the case of a battery still connected to the electrical system it supports, the red LED #7 may be signalling a loss of current through deteriorated wiring or a degraded switch or contact, or in-circuit current-consuming accessories. A sudden load being switched on while the charger is connected can also cause the battery voltage to dip significantly.

3. GOOD TEST RESULT, but the battery cannot deliver sufficient power: Permanent damage within the battery may be causing excessive self discharge that is not detected within the test period of 12 hours. Disconnect the battery from the OptiMate. After at least 48 hours reconnect and observe the TEST result during the PRE-QUALIFICATION TEST.

**AUTOMATIC BATTERY MAINTENANCE:** The MAINTENANCE CHARGE CYCLE consists of 30 minute float charge periods followed by and alternating with a 30 minute 'rest' periods, during which there is no charge current. This "50% duty cycle" prevents loss of electrolyte in sealed batteries and minimizes gradual loss of water from the electrolyte in batteries with filler caps, and thereby contributes significantly to optimizing the service life of irregularly or seasonally used batteries. The circuit offers current to the battery within a safe 13.6V voltage limit ("float charge"), allowing it to draw whatever small current is necessary to sustain it at full charge and compensate for any small electrical loads imposed by connected circuitry, or the natural gradual self-discharge of the battery itself.

During the 30 minute "float charge" periods a continuous *LOW CURRENT PULSE IS DELIVERED TO PREVENT SULFATION*, further extending battery power and life.

**For batteries that returned a result other than LED #5 (green) alone or LED #5 (green) and LED #6 (yellow) together during the voltage retention test:** The voltage retention test will continue to repeat 24 hours after the start of the preceding test until the result improves to LED #5 (green) or LED #5 & 6 together (green & yellow).

**For batteries that returned a good result:** A 12 hour MAINTENANCE CHARGE CYCLE period is followed by and alternating with a 12 hour rest period, during which the charger continues to monitor the battery in case it requires support and allowing the battery's electrolyte to fully settle before the next 12 hour MAINTENANCE CHARGE CYCLE resumes.

**MAINTAINING A BATTERY FOR EXTENDED PERIODS:** The OptiMate will maintain a battery whose basic condition is good, for months at a time. At least once every two weeks, check that the connections between the charger and battery are secure, and, in the case of batteries with filler caps on each cell, disconnect the battery from the charger, check the level of the electrolyte and if necessary, top up the cells (with distilled water, NOT acid), then reconnect. When handling batteries or in their vicinity, always take care to observe the SAFETY WARNINGS above.