

2005 Snowmobile Technical Update

TECH TIPS — *Subject: 8 Battery Myth Busters and Some OptiMate FAQs*
Model: All Models

Myth #1: The OptiMate's high voltage desulfation mode can damage vehicle electronics if connected to an installed battery.

FACT #1: The OptiMate's high voltage desulfation mode cannot engage if vehicle electronics / wiring is sensed.

Upon connection to a battery the desulfation mode can only engage if **no current enters the battery at a charge voltage of up to 14V**. A sulfated battery's voltage will initially be typically in the 2 to 6V range. Vehicle electronics require a higher voltage than this to function so if a battery in this condition is still connected to the vehicle no electronics can be active. Even a LCD display circuit will draw a few milli-amperes if a voltage is applied and upon sensing this the OptiMate will engage its normal charge mode with maximum charge voltage 14,3V.

IMPORTANT!

To effectively desulfate a battery it must be disconnected from the vehicle wiring before connecting to the OptiMate.

Myth #2: Once sulfated, a battery is useless and should be replaced.

FACT #2: This is not always true!

Batteries develop a high resistance to charging which the average (so-called) smart charger cannot overcome. Usually one is told that the battery has died and needs replacing and that is how this myth is kept alive.

Over-discharged (i.e. sulfated) VRLA / (including MF type) sealed batteries often develop internal resistance too high to overcome at normal charge voltages which requires an initial high voltage charge rate (up to 25V), under supervised conditions, to reverse the high internal resistance caused by sulfation on the plates.

The OptiMate's unique automatic desulfation mode works like this: Once the OptiMate determines that the battery is sulfated it applies a voltage of up to about 20V at a controlled low current for a maximum period of 2 hours, to recover the battery to the extent that it can again accept a charge using the more normal charging algorithm. As part of this, the recovery continues with the subsequent unique charge & check stage which removes remaining

sulfate crystals from the plates. The charge retention test which follows this stage confirms whether the battery has been adequately recovered before the long term maintenance "floating charge mode cycle" engages.

The OptiMate battery charger has a unique ability to desulfate and permanently recover batteries that have been neglected or deeply discharged.

However, not every 'dead' battery can be desulfated and neither can a desulfated battery be recovered to 100% of its previous ability.

When a battery becomes sulfated it will suffer some damage / wear to the plates. The extent of the damage depends on how deeply the battery was discharged, how long it was left like that, and in which average temperature.

Heat is a big killer of lead-acid batteries. When a battery is discharged the electrolyte changes from a sulphuric acid state to lead sulfate and water. Whereas normal battery acid freezes at well below freezing point of water, the water which results from a discharged battery freezes at temperatures below 32°F / 0°C and expands, resulting in bent & buckled plates or at worst, a cracked casing.

At temperatures exceeding 95°F / 35°C water will evaporate and the more water which evaporates, the higher the concentration of lead sulfate and the lower the chance of effective recovery.

So, the degree of effectiveness of the recovery depends on how soon after the battery became sulphated that it is desulfated & recharged. Even so, we have received letters from a number of OptiMate users testifying to effective recovery of batteries left discharged (and believed to be dead) for as long as two years.

Myth #3: The vehicle's charging system will recharge a deeply discharged battery.

FACT #3: A vehicle's charging system has been designed to supply power to the electrical system at a voltage not exceeding 14,5VDC. The voltage is the set parameter, and does not necessarily imply any current, as this depends on the resistance of the battery. The vehicle's charging system will therefore not deliver sufficient charge to effectively reverse sulfation in a deeply discharged battery that

has developed high resistance due to a degree of sulfation. This means that the battery is always going to present starting problems, usually at the most inconvenient times. Sulfation is like a virus, if left unchecked, it spreads, so a battery left in this state is destined to live a short life.

Myth #4: Just add the acid to a new battery and it is ready to go.

FACT #4: Sure, if you want a battery that will only ever deliver 70 to 80% of its capacity and experience a short service life.

Batteries that have not been properly prepared before installation on a vehicle typically fail early, often just after the warranty has expired, or result in vehicle starting problems just when you are nowhere near help.

Before being installed in the vehicle a new battery should be filled with clean battery acid (dilute sulphuric acid of the correct density for the battery - battery acid for "MF" sealed motorcycle batteries has a higher density than standard battery acid), and left to stand for at least 30 minutes (the larger the battery the longer it should stand) and then fully charged to the recommended voltage. The initial activation of the battery determines how well and how long it will continue to perform.

Myth #5: Factory filled and charged batteries need no charging and are always good to go.

FACT #5: ALL batteries self discharge, faster in adverse temperature conditions (below 32°F / 0°C, above 95°F / 35°C) and the more the battery discharges the more lead sulfate is created. If this is left to float freely in the electrolyte, crystals are formed that attach to the plates, causing further discharge which in turns creates more lead sulfate.

NOTE: Fact is, stored batteries should be maintained at full charge or at least periodically recharged to remain 100% effective.

Myth #6: The larger the battery the higher the current rating the charger has to be, otherwise it will not maintain the battery.

FACT #6: To maintain a battery without causing damage or loss of electrolyte, voltage is the critical factor, not current. Once the battery is fully charged it requires a few milli-amps to overcome its own resistance (which causes self-discharge). Connected devices such as an alarm, trip computer etc. may add to the current draw, but it should still

remain in the low milli-amp range.

Myth #7: Any "maintenance" charger will do; they all maintain batteries just as well as the next.

FACT #7: There are a number of smart chargers on the market with a controlled maintenance mode which will probably do the job if you have a filler cap battery (a battery that can be topped up with distilled water).

However, automatic smart chargers are typically designed not to overcharge batteries for which the lowest maintenance charge voltage setting is appropriate, meaning filler cap batteries, which require long term maintenance voltages of between 13.1 and 13.6V (depending mostly on storage temperature). This is why most smart chargers have their maintenance voltage set at 13.2V. However, sealed AGM/VRLA (including MF type) batteries require maintenance voltages of 13.5V minimum to remain at 100%. This means that sealed AGM /VRLA (including MF type) batteries are undercharged by most smart chargers during long term maintenance. This eventually results in a discharged battery.

Any chronically undercharged battery will slowly develop sulfation resulting in a shorter service life.

The OptiMate is specifically designed to provide good care for all types of batteries. Its maintenance mode float voltage is set at 13.6V to adequately maintain modern sealed batteries, but is not excessive for traditional filler cap types. Furthermore, the OptiMate's limited duty (30 minute on, 30 minute off) maintenance cycle allows filler cap batteries to cool during half the time and thereby significantly reduces water loss. During the 30 minute off period, the OptiMate circuit checks for current loss due to parasitic loads such as alarms, aged wiring, worn contacts, etc. If any such loss is drawing the battery down below 12.3V, the OptiMate's WEAK LED will warn of this while the circuit will continue recharge and maintain the battery.

Myth #8: Once a battery is fully charged it should not be charged again until the voltage drops below a certain level.

FACT #8: Lead-acid batteries last longest if maintained at the fully charged level, especially when not in use. So, the key to how long it lasts mostly depends on how the battery is treated when it is not used. A fully charged battery will generally maintain an adequate charge for a month, if it is not

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to warm and if no external current draining devices are connected, or if the current draw due to vehicle alarm, computer etc. is normal. However, it is recommended that the battery of any vehicle fitted with an alarm, computer etc., and left to stand for a long period of time should be supported by a good maintenance charger.

Batteries have a finite life. If a charger allows the battery to cycle between discharged and fully charged, it reduces the overall life of the battery. Some smart chargers provide only a very low current (as low as 10mA) which is often insufficient to cope with parasitic loads (alarms, aged wiring, flashing light, bike computer) in modern vehicles. Some smart chargers will only revert from maintenance to high current charging once the voltage has reduced to below 12.5V, or even 12.2V in some cases. At 12.5V a sealed AGM/VRLA (including MF type) battery is only at 60% charge.

The OptiMate provides up to 600mA at 13.6V for 30 minutes in maintenance mode, then during the following 30 minutes checks whether the battery can maintain its charge. This period is followed in turn by the next 30 minute period during which charging is again offered to the battery. This cycle ensures that the current drawn by an alarm, computer and/or the parasitic current loss through aged wiring will never cause a good battery to drop below 95% of full charge.

FAQs

Q #1: Can the OptiMate be left permanently connected to a battery when the vehicle is stored?

A #1: Yes, we recommend it. However, the environment the vehicle is stored in should be at room temperature.

In a consistently high temperature environment (above 86°F / 30°C) all batteries can either be left permanently connected to the OptiMate, or connected and recharged on a weekly basis. If the OptiMate is left permanently connected, the level of the electrolyte in filler cap batteries should be regularly checked and topped up, and sealed batteries should be checked for signs of a loss of electrolyte (these are typically condensation on the battery or within the vehicle's battery compartment, or a bubbling or hissing noise).

For temperatures below 86°F / 30°C all batteries can be left connected, but again, the electrolyte level in filler cap batteries should be periodically checked and topped up with distilled water if necessary.

Q #2: The battery in a vehicle was deeply discharged, but the OptiMate did not recharge it. What should I do?

A #2: If the battery is deeply discharged, the battery must be removed from the vehicle, or, be disconnected from the vehicle circuitry. The OptiMate's high voltage desulfation mode can only engage if no vehicle circuitry or connected devices are detected by the OptiMate's circuit.

Q #3: A battery is deeply discharged and I tried to recharge it with the OptiMate, but only the green POWER LED remains on, no other LEDs light up.

A #3: The OptiMate assesses recoverability of the battery by measuring the initial battery voltage. If it is not at 2V or above, it will not start charging. Usually such batteries have a very limited chance of being successfully recovered.

TIP: Make sure the battery is disconnected and removed from the vehicle to ensure there is absolutely no current being drawn from the battery. Sometimes there is a hidden load (example, a small fault in the vehicle wiring) that keeps the voltage below 2V. Allow the battery to stand for a few hours to recover some voltage and then reconnect the OptiMate.