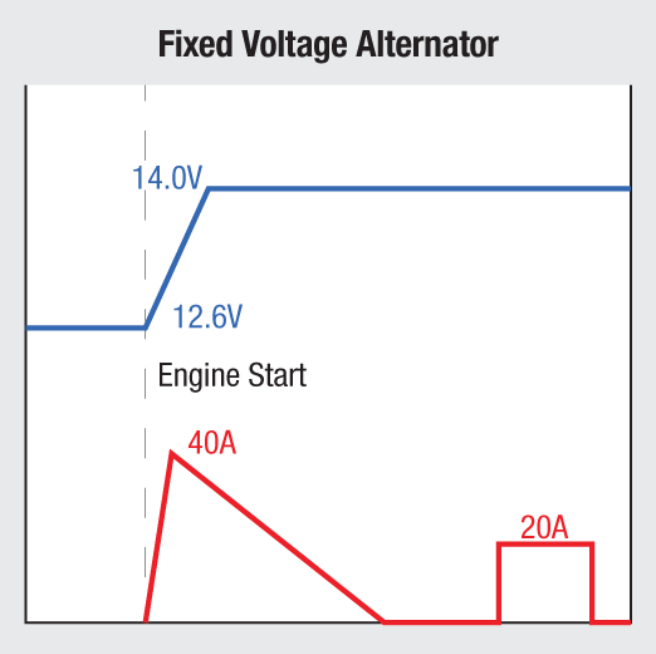
Smart Alternator vs Fixed Alternator

The alternator is the power supply for the vehicle for recovering the start battery from engine start and provide power to vehicle electrical consumers while running. There are two main types of alternators commonly used in todays vehicles, the traditional fixed voltage alternator and the modern smart alternator.

Fixed voltage alternators are becoming less common on new vehicles as reduced fuel consumption targets and more stringent emissions standards are adopted by manufacturers. A fixed voltage alternator has a high enough voltage to successfully charge a secondary battery in the vehicle to a usable level for leisure or auxiliary use.

The smart alternator system allows the vehicle to control the output voltage from the alternator based on vehicle operating conditions to reduce electrical load and in turn mechanical load on the engine by the alternator, this renders it unsuccessful at charging a secondary battery system to a usable level.



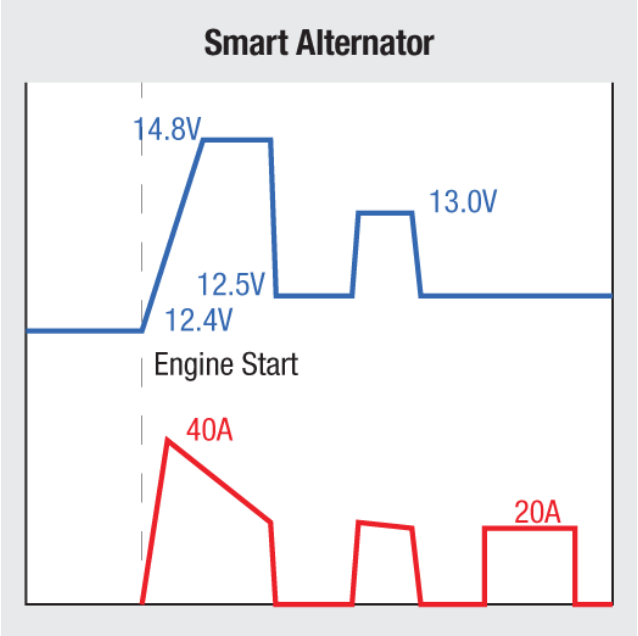
A. Engine is not running, relatively full open circuit voltage of the start battery approx. 12.6V

B. Engine is started, alternator produces current to raise system voltage. Current level will depend on alternator capacity, design, battery current acceptance, and engine speed at the time.

C. The alternator regulator will aim to hold the target voltage, generally around 14V. Whilst not a full charging voltage, this selected voltage will be appropriate for maintaining the start battery and is not excessive for long term running at this voltage level.

D. Current will flow into the start battery to recover it from the engine starting consumption and run loads that are on at the time. This current will decrease as the battery comes up in charge, generally this will occur within the first few minutes of run time.

E. The current will be regulated from the alternator to maintain the target voltage, and can increase and decrease as loads are switched on and off.



A. Engine is not running, relatively low open circuit voltage of the start battery approx. 12.4V, as the system does not aim to achieve a full state of charge in the start battery. Specific battery types are used in this application in order to achieve good performance and service life when operating at partial charge for starter operation.

B. Engine is started, alternator produces current to raise system voltage. This voltage level can be very high to produce fast inrush of current into the battery to reduce start battery recovery time. Current level will depend on alternator capacity, design, battery current acceptance, and engine speed at the time.

C. The alternator regulator will aim to achieve the target voltage, generally upwards of 14.5V.

D. Current will flow into the start battery to recover it from the engine starting consumption and run loads that are on at the time. This current will decrease as the battery comes up in charge, generally this will occur within the first few minutes of run time. The voltage will be decreased when current flow into the start battery falls below a predetermined level, generally below 30A, meaning that the start battery is only partially charged, well enough for repeated starting.

E. The current will be regulated from the alternator to maintain the target voltage, and can increase and decrease as loads are switched on and off. The target voltage will change on factors such as temperature, electrical consumers, start battery state of charge, and engine load.

F. During acceleration and cruise the target voltage will be low, around the open circuit voltage of the start battery.

G. During deceleration the target voltage may be lifted to replenish any discharge of the start battery that may have occurred during acceleration and cruise.

Note: the output voltage and current levels from different alternator systems and vehicles will have varying characteristics. The descriptions here give a general view of the output types.

For many years the fixed voltage alternator has worked fairly well as a system to recharge secondary battery systems in addition to the vehicle start battery. This has commonly been achieved through systems which simply parallel the start and secondary battery during engine running, and then separate them from each other once the engine is stopped.&

Due to the implementation of smart alternators however, this type of parallel charging is no longer effective for the secondary battery. The alternator has never been a designated battery charger, so even fixed voltage alternator secondary battery charging methods can be improved.

The smart alternator does not consider the secondary batteries state of charge, chemistry type, or location in the vehicle, which are all determining factors for how it functions, being specifically tailored for the vehicle start battery.

The solution to providing the correct charge to the secondary battery is a REDARC BCDC In-Vehicle Battery Charger. The BCDC will fully charge the secondary battery in a vehicle that has a fixed voltage or smart alternator without the need for any parallel connections between the start and secondary battery.

It will provide a tailored multi stage charge process specific to the battery chemistry type, state of charge, in any location in the vehicle.