

Application Note

512-0030-01-01 Rev 2

Charging Deeply-Discharged Gelled Electrolyte Batteries Using the Heart Interface Freedom Inverter/Charger and the Freedom Remote Panel or Link 2000

Overview

The gelled electrolyte battery chemistry and construction may present a charging problem when some gelled batteries are discharged below 80% of their capacity. The problem is that the batteries recharge inefficiently when deeply discharged, and most of the charge current is used to produce heat rather than a chemical reaction necessary for recharging. This causes the batteries to overheat and go into a thermal runaway condition that can destroy the battery.

Gelled batteries

A gelled battery is at 80% discharge level when the open-circuit terminal voltage measures 11.80 Vdc to 12.00 Vdc, depending on the manufacturer. The open-circuit terminal voltage is measured after the batteries have been at rest for one to three hours with no load or charge source present.

If it is determined that the batteries have been discharged below 80%, there are methods using the Heart Interface Freedom inverter/chargers that can prevent an overheating condition during recharge by limiting the charge current. The goal is to limit the charge current to a percentage of battery capacity. Depending on the battery manufacturer, the current should be limited to between 4% and 25% of its capacity. If we assume a 400 amp hour bank, our charge current will be limited to 100 amps or less.

Methods for current limiting

The methods for current limiting require a standard remote panel or the Link 2000. On the back of the Freedom remote there is an 8 position dip switch.

We will be positioning switches 2 and 3 on the Freedom remote for setting the charge voltage for gel batteries. If a Link 2000 is used, ensure battery type 2 is selected in the setup mode.

Switch	Position	Charge voltage	Float voltage	Equalize voltage
2 off	3 on	14.4 Vdc	13.8 Vdc	14.4 Vdc
2 on	3 on	14.1 Vdc	13.8 Vdc	14.1 Vdc

The voltages are 14.4 Vdc for cool climate (lower than 80 F) and 14.1 Vdc for warm climate (higher than 80 F). Select the appropriate setting.

Once the voltages are set up, we can limit the current two ways. If the serial number of the unit is at or above the number listed below we can set the unit for equalize charge and accomplish an eight hour timed current limited charge at the equalize voltage.

Note: When the battery type is set for gel batteries, the equalize voltage is equal to the acceptance voltage.

Model	Serial number	Current limit
Freedom 10	122603	8 amps DC
Freedom 10	112809	6 amps DC
Freedom 20	127058	16 amps DC
Freedom 20	111965	6 amps DC
Freedom 25	111118	6 amps DC
Freedom 25	121252	24 amps DC

This method of current limiting using the "equalize feature" can be set by turning the dip switch number 1 to the "on" position and immediately back to the "off" position. Using a Link 2000 requires that equalize mode be activated through the setup button. The Link owner's manual covers this procedure in detail. When this method is used, the unit will return to the normal charge mode following the eight-hour equalization charge without any more user intervention.

The second method of charger current limiting can be set by dip switches 7 and 8, which set power sharing. This method limits the amount of AC current available for the charger to use. The limits are the same for the Freedom 10, Freedom 20, and differ slightly with the Freedom 25. Power sharing on a Link 2000 is changed through the setup button, please refer to the Link owner's manual.

Model	Switch setting	Power share	Charge current
Freedom 10,20,25	7 on, 8 on	5 amps	25 amps DC
Freedom 10	Any other	15,20 & 30 amps	50 amps DC
Freedom 20	7 off, 8 on	15 amps	75 amps DC

Model	Switch setting	Power share	Charge current
Freedom 20	7 on, 8 off	20 amps	90 amps DC
Freedom 20	7 off, 8 off	30 amps	100 amps DC
Freedom 25	7 off, 8 on	20 amps	90 amps DC
Freedom 25	7 on, 8 off	30 amps	130 amps DC
Freedom 25	7 off, 8 off	Unlimited	130 amps DC

If there is an AC load operating on the output of the inverter, the currents in the table will be further reduced.

In an application that employs two or more inverter/chargers, the battery banks are usually large enough that we can turn off one of the chargers and allow the remaining charger to charge at full current. The default mode of charger operation is for the charger to come "on" automatically without regard to the position of the on/off switch, either on the unit or on the Freedom remote.

Chargers controlled by a Link 2000 require that the charger be turned on using the "charge" button on the Link. To change the mode of charger operation to respond to the Freedom remote on/off switch, turn the dip switch number 4 to the "on" position.

Conclusion

In conclusion, the current limiting of the charger will increase the length of time it takes to recharge the batteries from a deep-discharge condition but will prevent overheating and therefore battery damage. The current limiting method used is based on the size of the battery bank and the recommendations of the battery manufacturer.

The most trouble-free current limit set up is the equalize mode. The charger will automatically reset to normal operation following the equalize cycle. The drawback of this mode is that the charge current is very low. Knowing the battery bank size, in amp hours, and the recommended charge current limit of the manufacturer is critical in recharging deeply-discharged gel electrolyte batteries.

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Technical Note: *Charging deeply-discharged gelled electrolyte batteries using the Heart Interface Freedom inverter/charger and the Freedom remote panel or Link 2000* © August 1996 Xantrex International

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