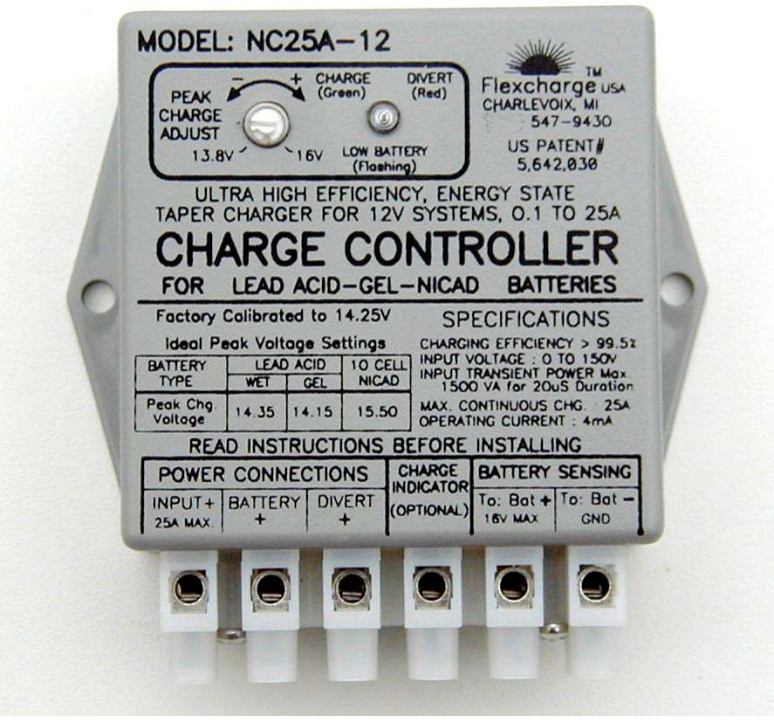
MANUAL

MODEL: NC25A-12(24, 36, 48)

Ultra High Efficiency
25 Ampere Alternative Energy Battery Charge Controller
For GEL, AGM, and Flooded Cell Lead Acid Batteries

12V Controller Shown Below



Patented

Rev 03, Ver1
DEC 2012

SES Flexcharge USA, 1217 State St., Charlevoix, MI 49720
Ph: 231-547-9430, *Web Site: www.flexcharge.com*

IMPORTANT INFORMATION

THE NC25 CONTROLLER IS AN "ON/OFF" REGULATOR NOT A CONSTANT VOLTAGE REGULATOR, AND THEREFORE IT CANNOT BE TESTED BY SIMPLY MEASURING THE OUTPUT VOLTAGE ON THE TERMINAL STRIP OF THE CONTROLLER. THE CONTROLLER MUST BE CONNECTED AS SHOWN IN ONE OF THE SCHEMATICS BEFORE IT WILL REGULATE.

READ ALL OF PAGES 5 through 8 OF THIS MANUAL TO LEARN HOW THE CONTROLLER REGULATES BEFORE CONCLUDING THAT YOUR CONTROLLER IS NOT REGULATING.

All wire to wire and crimp connections must be soldered for this, or any charge controller to operate dependably.

Do not solder on the controllers terminal block.
The terminals on the controller are coated with an anti corrosion coating.

Table Of Contents

Features

* **5 YEAR WARRANTY.**
* **COMPLETELY SEALED ELECTRONICS FOR MARINE OR OUTDOOR MOUNTING.**
* **LOW BATTERY VOLTAGE INDICATOR. (FLASHING RED LIGHT).**
* **Works with GEL, AGM, and Flooded Cell Lead Acid Batteries. Also for flooded Ni-Cad Batteries**
* **ARC REDUCTION CIRCUITRY TO ELIMINATE OR REDUCE RELAY CONTACT WEAR.**
* **CHARGING EFFICIENCY BETTER THAN 99.50% FROM 0.5A TO 30A OF CHARGING CURRENT.**
* **OPERATES EFFICIENTLY (98%) WITH AS LITTLE AS 0.1A OF SOLAR PANEL CHARGING CURRENT.**
* **EFFICIENTLY CHARGES BATTERIES FROM 0 VOLTS WITH FULL POWER.**
* **No RFI or EMI emissions to interfere with radio or data logging equipment**
* **25 AMP CHARGE CAPACITY. SPECIAL ORDER 24V, 36V, AND 48V MODELS, OR EXPANDED MODELS WITH CHARGING CURRENT CAPACITIES UP TO 2000A.**
* **25 AMP CHARGE DIVERT CIRCUIT. STABLE DIVERT CIRCUITRY PREVENTS ERATIC RELAY SWITCHING IF CHARGE SOURCE VOLTAGE DROPS.**
* **DIVERTS ONLY WHEN VOLTAGE AND CURRENT ARE AT USABLE LEVELS. PERFECT FOR MOTOR TYPE DIVERT LOADS (FANS, PUMPS, etc...)**
* **PEAK CHARGE VOLTAGE ADJUSTMENT WITH A RANGE OF 13.8V TO 15.9V (Multiply by 2,3,or 4 to determine voltages for 24V, 36V, or 48V versions).**
* **CHARGES WITH THE SAME HIGH ACCURACY VOLTAGE SENSING THROUGH BATTERY ISOLATORS.**
* **CONSUMES LESS THAN 5mA (0.005A) WHILE CHARGING AND AT NIGHT, 2mA IF YOU DO NOT USE THE CHARGE INDICATOR.**
* **CHARGES BATTERIES AT FULL POWER, BELOW THE PLATE SATURATION POINT, THIS CHARGES BATTERIES FASTER, AND REDUCES ELECTROLYTE DEPLETION BY UP TO 90% OVER CONVENTIONAL CONSTANT VOLTAGE, PWM, & HIGH FREQUENCY CHARGE REGULATORS.**
* **BATTERIES START CHARGING AT 0.005A OF CHARGE CURRENT.**
* **CONTROLLER CAN WITHSTAND OPEN CIRCUIT INPUT SPIKES OF 1500VA, & 140V CONTINOUS WITHOUT DAMAGE.**
* **REVERSE POLARITY AND TRANSIENT VOLTAGE PROTECTION ON THE BATTERY SENSE WIRES.**
* **NO POWER WASTING SAMPLE PERIODS.**
* **REMOTE BATTERY VOLTAGE SENSING SO THE CONTROLLER CAN BE MOUNTED ANYWHERE BETWEEN THE CHARGING SOURCE AND THE BATTERIES.**
* **EASY TO INSTALL USING THE LABELED CORROSION RESISTANT NICKEL / BRASS / STAINLESS STEEL CONNECTOR.**
* **U/L 94V-O RATED ENCLOSURE AND UL LISTED OR RECOGNIZED COMPONENTS.**

Use Flooded Cell Battery settings for all AGM type batteries.

Peak Charge Voltage Adjustment

Factory Calibrated for use with Lead acid and Gel and AGM Battery Technologies. Look for the small calibration dent in the case

Do not move this adjustment unless you have special battery voltage requirements.

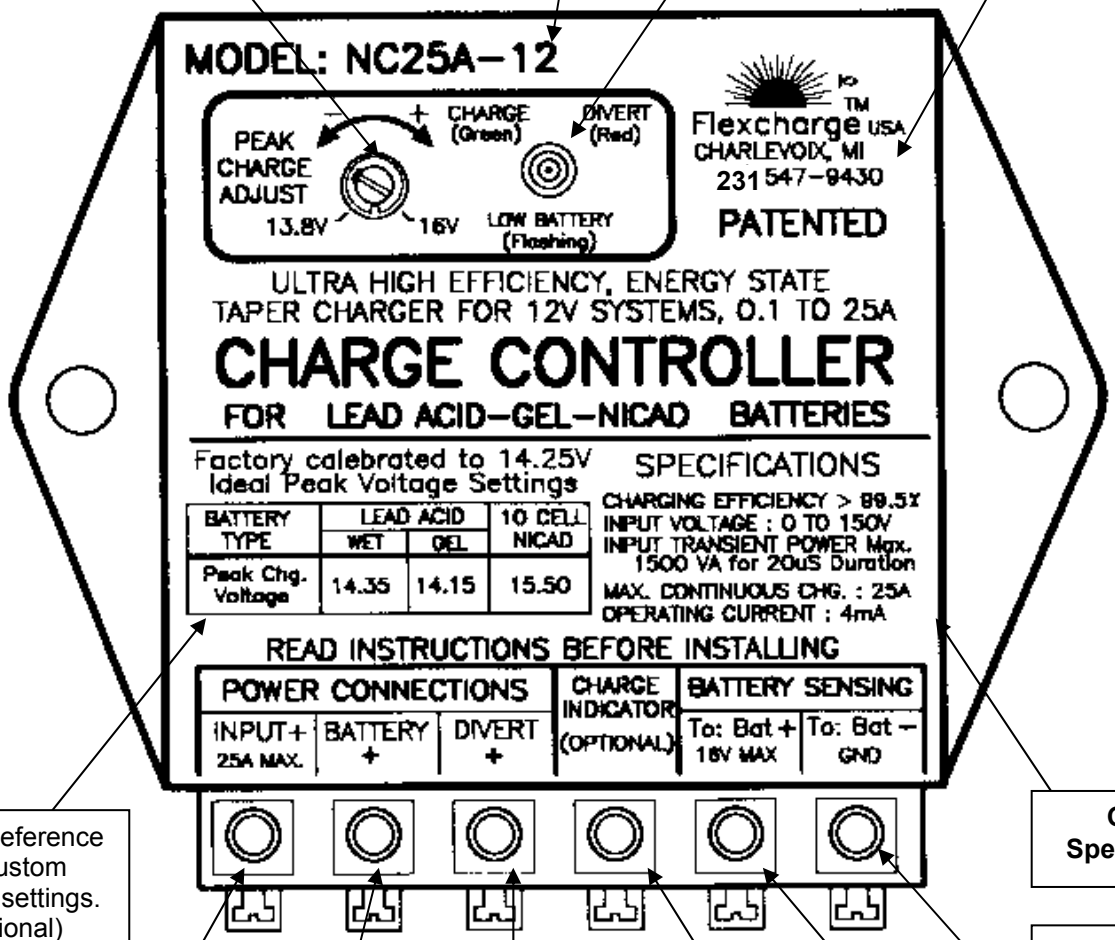
System Voltage

12= 12V, 24=24V, 36=36V, etc

Multi Function Indicator

See the table on page 7 for description of operation

Call Direct to the Manufacturer. Technical Questions, Warranty info, etc 231-547-9430



Quick Reference for custom voltage settings. (Optional)

General Specifications

CONNECT DIRECTLY TO THE BATTERY'S NEGATIVE (-) TERMINAL

Charging Input

Connect the Positive Wire from the Charging Source here.

Controller Output to Battery

Connect to Fuse then to Battery +

Divert Output

Connect to a Fuse then to Divert Load Positive (Optional)

See Installation Drawings.

Using the charge Indicator is optional

CONNECT DIRECTLY TO A FUSE THEN TO THE BATTERY'S POSITIVE (+) TERMINAL

INSTALLATION INSTRUCTIONS

Flexcharge™ USA NC25A
ULTRA HIGH EFFICIENCY CHARGE CONTROLLER

Congratulations, you will soon be using the most efficient controller available. Using this controller has the direct equivalency of increasing your solar panel capacity by up to 20% over any other controller *Flexcharge*™ USA has examined. This controller is available with capacities to 2000 amps with the same, or increased charging efficiencies.

NOTE: The NC25A does not contain any blocking diodes.
IMPORTANT: ***PLEASE READ THE SECTION "USING BLOCKING DIODES"*** Pg.10

1) Choose a good mounting location.
Even though the controller has been designed for mounting outside, mounting it in a more protected environment will help to extend it's operational life.

2) Install the NEGATIVE BATTERY SENSE WIRE from the controller's terminal block to the battery bank negative (-) terminal. ***You should use #16 to #14 awg black wire.***

3) Install the POSITIVE BATTERY SENSE WIRE from the controller's terminal block to a 1A or 2A fuse and then to the battery bank's positive (+) terminal. ***You should use #16 to #14 awg yellow or red wire.***

IMPROTANT
When installing the terminals on to the sense wires for connection to the battery, crimp then solder the terminals to the wire. Make absolutely sure these wires make very good electrical and mechanical connection with the battery's terminals. If either of this or the ground connections were to loosen, or corrode, the controller will have no way to sense battery voltage, causing it to switch to a non-regulating mode and overcharge the batteries. The sense wires may be extended up to 100 feet using #14 or larger wire. *All splice joints must be soldered*. If you are charging multiple isolated battery banks through a battery isolator, connect the SENSE wires to the primary (most used) battery bank. The other batteries will follow the primary battery's voltage, and will not be over or under charged.

IMPORTANT
For the next four steps, see the Wire Size Table on page 9 to select the correct size wire for your charging current and length of wire.

4) Connect the charging source negative (-) wire to the negative (-) terminal on the battery and/or the system's negative battery bus. If you are using a smart battery fuel meter that measurers total Input to Output Amp/Hours, it will usually have a shunt in the (-) connection to the battery. Connect the (-) wire from the charging source to the shunt as shown in the meter's manual.

5) Install the BATTERY POSITIVE (BAT. +) wire from the controller to the battery's positive terminal. A fuse rated at 1.5 times larger than your maximum charging current, but less than 30A, should be installed in this wire near the battery. Remember to solder all wire connectors even if they use crimped connectors.

6) **Connect the charging source (Solar, Wind, etc.) positive wire to the controller's INPUT+ terminal. CAUTION:** IF THE SOLAR PANELS ARE EXPOSED TO LIGHT, THEY WILL BE GENERATING POWER. WIND SYSTEMS SPINNING UNCONNECTED CAN HAVE VOLTAGES ABOVE 100V. It is preferred to stop the generator from turning before connecting the wires from it. There will be a spark when you attach this wire if the charging source is generating power, this may be OK if it is not turning very fast but be sure you are not near any flammable fumes. Turn off the source if possible.

7) **DIVERT Feature.** When installing a Divert Load, the following steps must also be followed.

You must use a properly sized Divert Load on wind and towed generator systems

a) Connect the Divert Load's negative (-) wire to the negative (-) terminal on the battery or the system's negative battery bus. If you are using a smart battery fuel meter that measurers total Input to Output Amp/Hours, it will usually have a shunt in the (-) connection to the battery. *Connect the (-) wire from the Divert Load to the battery (-)* ***not*** *to the shunt as shown in the meter's manual.*

b) Install a fuse rated at 1.5 times larger than your maximum charging current, but less than 30A, in the Divert wire near the controller's terminal block in the Divert Load's positive wire.

Choosing the right Divert Load

The Divert output from the controller is **unregulated**. This means that when the controller is in Divert mode, this terminal is directly connected to the charging source, just as if there were no controller installed. (i.e. The solar panels connected directly to the Divert Load) If the divert load draws less current than the maximum charging current of your system, the load could burn up. The best rule of thumb is; either use a Divert Load with a voltage rating twice that of your battery system, or one that has the same voltage rating as the batteries but has a current rating equal to the maximum your system can generate. See the Flexcharge Divert loads at www.flexcharge.com

8) **CHARGE INDICATOR LIGHT. It is not necessary to use the Charge Indicator Light**. If you wish to use it, connect the CHARGE INDICATOR TERMINAL on the controller's terminal block, to one of the charging source's diodes, at the source end. For example; on a solar panel it would connect to the solar panel end of the diode. See the wiring diagrams. In order to maintain the ultra high charging efficiencies in the NC25A, it may not be feasible to use the charge indicator while charging from outboard motors or on certain wind generators. If you have access to the blocking diode in the charging source or you are charging through a dual battery isolator, then you can use the charge indicator. A ***much*** more informative indication of charging is an amp meter installed into the Red BAT+ wire anywhere between the controller and the battery.

This concludes the installation section.

If the controller does not function as you think it should, first check the troubleshooting guide in this manual, then call your dealer, or Flexcharge USA at (231) 547-9430. Web Site www.flexcharge.com

For an explanation of the multi function indicator operation, see the Indicator Function Table on page 7.

Setting the Peak Charge Adjustment Voltage to a new value

WARNING: **Mis-adjustment of the controller could seriously damage your batteries over time.** NOTE: The PEAK CHARGE ADJUST was set at the factory to 2.375V per cell (14.25 volts for 12V systems). **All battery voltages are for batteries at 68 degrees F. Peak voltages should be set higher for colder temperatures and lower for warmer temperatures**. The Ideal voltage setting for Wet Cell Lead Acid and AGM Batteries is 2.39V per cell, (14.35V for 12V systems). The Ideal setting for Sealed Gel batteries is 2.35V per cell (14.15V for 12V systems). The 2.375V per cell position was marked with a small indent in-line with the slot in the adjuster. The 2.37V per cell voltage setting works well with Wet Cell Lead Acid, AGM and Gel battery Technologies. If you move the adjustment and want to put it back near the original setting, line up the slot as closely as possible with the small indent (dot) in the case. **You should recalibrate the controller if the adjustment is moved.**

1) **Setting a new regulated voltage, or checking the regulation voltage of your controller.**

NOTE: THE BATTERY BANK MUST BE FULLY CHARGED TO PERFORM THIS TEST, AND THE DIVERT LIGHT MUST BE *OFF* LONGER THAN 10 SECONDS AT A TIME. IF THE DIVERT LIGHT IS NOT OFF LESS THAN 10 SECONDS, COVER SOME OF THE SOLAR PANEL(S) WITH A BLANKET OR CARDBOARD TO SLOW THE CHARGE RATE. All Flexcharge controllers are 100% tested and calibrated at the factory.

a) Connect an accurate digital voltmeter on the terminals of the battery you are charging.

b) If you are only checking the unit, skip this step, and step "d". Turn the adjustment most of the way towards "+". The dot in the case near the adjustment is the factory setting of 2.375V per cell**.** Continued

c) Watch the voltmeter for the highest voltage you wish the batteries to charge to.

d) SLOWLY turn the adjustment towards "- " until the DIVERT indicator comes ON (steady red or orange).

e) Allow the controller to cycle a few times while watching the voltmeter, and fine tuning the adjustment for the exact upper switch voltage you desire. ***Remember the controller will switch ON and OFF (Charge to Divert then back to Charge) while you are performing this test, and if it is switching too fast your voltmeter readings will be inaccurate which could cause you to set the controller at the wrong voltage.***

Easier Calibration Method

Note: The peak voltage setting on the NC25A is set to 2.375V per cell (14.25V for 12V systems only) at the factory. This voltage setting is ideal for sealed gel batteries that recommend a 14.10V constant voltage setting (see the charge process graph). The factory setting will also work with vented lead acid and AGM batteries, however setting the peak voltage at 14.35V will give the batteries a more active charge. You may use the method described in step 6, or an easier way may be to start your engine, and allow the engine alternator to charge your batteries up to about 14.4 volts. Then simply turn the adjustment on the NC25A towards "+" until the DIVERT light turns OFF then slowly turn it back until the DIVERT light comes ON. The NC25 will now regulate the battery voltage at the same voltage as your engine alternator, which is usually about 14.4V

Coat the battery's terminals with battery terminal grease to prevent future problems caused by corrosion.

NC25A controllers are available for 12, 24, 36, 48 volt systems with charging capacities of, 60 & 100 amperes. Special order units with 60 ampere up to 2000 ampere charging capacities.

For more information call your dealer or *Flexcharge*™ USA at 231-547-9430

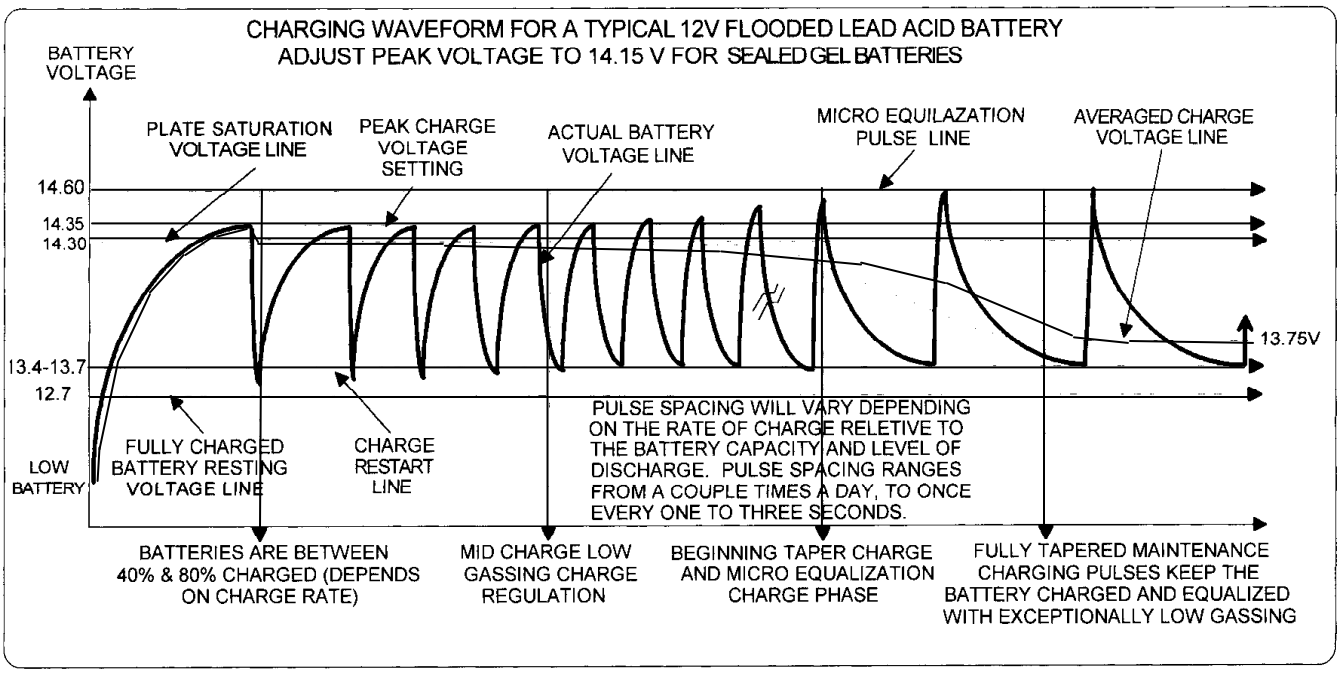
Visit our Web Site: www.flexcharge.com

Description of Multi Function Indicator Operation

Indicator Function Description	Charge Indicator *Not Used*	Charge Indicator *Used*
Charging (Battery Voltage Is Above 11V)	**none**	**STEADY Green**
Charging (Battery Voltage Is Below 11V)	**FLASHING Red**	**FLASHING- Green to Orange**
Not Charging (Battery Voltage Is Below 11V)	**FLASHING Red**	**FLASHING Red**
Charge Divert	**STEADY Red**	**STEADY Orange**
Not Charging (Charging Source is NOT Making Power & Battery is Above 11V)	**none**	**none**

The *Flexcharge*™ Energy State Taper Charge Method

The Energy State Taper Charge Process monitors the battery for the full charged resting voltage of the cells. There are tremendous advantages to this charge method.



* Zero overcharging
* Exceptionally low gassing (Up to 90% less)
* Non-Destructive Micro-Equalization at each full charge
* The battery's chemical processes actually control the charging.
* No RFI or EMI emissions to interfere with radio equipment.

The need for temperature compensation is greatly reduced because the plate voltage is not constantly held at the critical plate saturation point. Tapering is controlled by the battery's level of charge rather than a set timer and fixed voltage as in PWM and other constant voltage charge methods. The battery takes exactly what it needs rather than being forced to take a set voltage. With the ***Flexcharge*** method you can charge your battery bank indefinitely without any possibility of overcharging. The batteries will last longer, require less watering maintenance, and hold a better charge.

As charging begins the controller allows full charging current to pass directly to the battery. When the battery voltage rises slightly above the plate saturation point, the controller opens the charging circuit. The chemical charging process continues until the battery voltage floats down to a voltage slightly above 13.6V. At this point the battery is ready to accept another charge pulse. This charge regulation method is actually controlled by the battery's ability to accept energy. When the battery needs more energy, the controller applies it. Later in the charging cycle the controller will cycle ON and OFF sending full charge current pulses into the plates. A process which charges with very low gassing, and micro equalizes the cells at the same time. As the battery reaches a higher level of charge the amount of time the controller spends in charge is reduced, and the time in rest is increased. At full charge the controller will apply short duration pulses to maintain the battery at an average voltage of about 13.75 volts. This keeps gassing to a minimum while effectively trickle charging, and equalizing your battery bank.