

The IQ4 Charge Controller offers automatic charging control for DLS Battery Chargers, providing longer and safer use of your system's battery. The IQ4 Controller allows the DLS Charger to operate as an automatic 3-stage "smart charger" that gives the customer the benefit of Bulk, Absorption, and Float stage charging. Three-Stage Charging increases the charging capacity of the DLS charger and decreases the charge time while insuring proper and safe battery charging and minimizing the possibility of over-charging. The IQ4 monitors the battery at all times. If the DLS voltage remains in the Float stage for more than seven days, the IQ4 will automatically enter the Equalization stage for a predetermined time to help maintain the battery plates, and then resume float stage charging.

### INSTALLATION OF THE EXTERNAL IQ4

The IQ4 Charge Controller installs by simply plugging the IQ4 cord into the Dual Voltage jack located on the DLS\* (**Refer to Figure A**). The IQ4 circuitry is then automatically engaged.

### LED INDICATOR

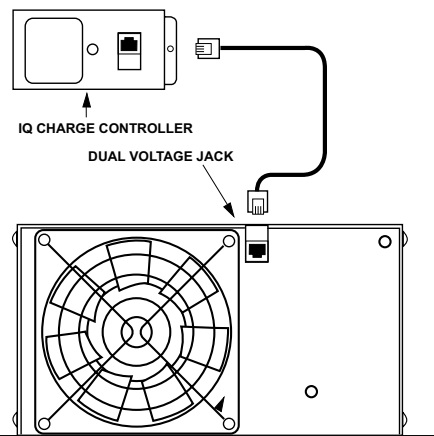
The LED Indicator on the IQ4 informs the user of the DLS charging state and the battery charge status. When first activated, the IQ4 will read the number of cells in the battery and indicate the voltage of the battery through a number of flashes. **Refer to Figure B**.

**LIT/FLASHING LED** - After reading the battery, the IQ4 will initiate either a Bulk Charge phase or Float Charge phase depending on the battery's charge status. When the IQ4 is in the Bulk Charge mode, the green LED indicator will flash rapidly (approx. 2 flashes per second). When the Bulk Charge is complete, the IQ4 begins the Absorption Charge and the LED indicator will flash at a slower rate (approx. 1 flash per second). If, when first activated, the battery is not in need of charging, the IQ4 will immediately begin the Float Charge phase and the LED will remain lit (no flashing). Refer to **Figure C** for Charge Stage descriptions.

The LED indicator will remain lit or flashing when the charger is unplugged or disconnected from the AC supply (de-energized). During this time, the IQ4 continues to monitor the battery voltage. If the battery voltage drops below a pre-determined voltage (Refer to **Figure D** for predetermined values), the IQ4 will automatically initiate the 3-Stage Charge (BULK, ABSORPTION, and FLOAT) once the AC input is re-connected.

**IRREGULAR FLASHING LED** - If the LED is flashing irregularly or intermittently, then the IQ4 has entered a FAULT state due to an over-voltage. When this occurs, the IQ4 must be re-set in order to resume normal operation. Refer to the FAULT STATE instructions on page 2 for re-setting procedures.

FIGURE A. IQ4 INSTALLATION



\*Location of the Dual Voltage Jack may vary depending on the DLS Model.

FIGURE B. LED INDICATOR CHART

LED CODE TABLE		
CELL INDICATION		
6 FLASHES	12V Battery (6 cells)	
12 FLASHES	24V Battery (12 cells)	
18 FLASHES	36V Battery (18 cells)	
24 FLASHES	48V Battery (24 cells)	
CHARGE PHASE	LED STATUS	VOLTAGE RATE
FLOAT	ON	2.26 PER CELL
ABSORPTION	SLOW FLASHING	2.36 PER CELL
BULK	RAPID FLASHING	2.46 PER CELL

FIGURE C. CHARGING STATE FUNCTIONS

<b>BULK</b>	The Bulk State charges the battery at the full-rated output of the charger, reducing the time it takes to charge the battery.
<b>ABSORPTION</b>	The Absorption State delivers a constant charge for a set period of time to ensure that the battery receives a full and complete charge.
<b>FLOAT</b>	Once the battery has been fully charged, the Float State maintains a full charge to the battery while minimizing "gassing."
<b>EQUALIZATION</b>	If the battery has remained in the Float State for seven days, the IQ4 automatically provides an equalization charge to dissolve any sulfate layer on the battery's plates and to avoid stratification.

## **OPERATION OF THE IQ4 IN THE 3-STATE MODE**

**BULK STAGE** - During this state, the charger will operate either at Full Current output or Constant Voltage output depending on the discharged state of the battery. A discharged battery will dictate the voltage and force the charger into constant-current operation. As the battery charges, the charger transitions to a constant-voltage operation. This BULK STAGE will continue for either 225 minutes or until the battery voltage reaches the “High Trigger” value (whichever occurs first). At this point, the BULK STAGE will operate for another 15 minutes before switching to the ABSORPTION STAGE.

**ABSORPTION STAGE** - This state is limited to 480 minutes (8 hours) during which the charger will operate either at Full Current output or Constant Voltage output depending on the discharged state of the battery. During Full Current output, the charger is providing its full current rating and will slowly increase the battery voltage to the “Absorption Stage” voltage. At the end of the 480 minutes, the charger will revert to the FLOAT STAGE.

**FLOAT STAGE** - This charge state holds the batteries at Constant Voltage for a period not longer than seven days. During this state, the charger not only floats the batteries, but it can also provide load current up its maximum rating for other loads without depleting the battery capacity. The FLOAT STAGE will end when either the battery voltage drops below the “Low Trigger” point or at the end of seven days when the IQ4 initiates an equalization stage to remove sulfate layers from the battery plates. In either situation, the unit exits the FLOAT STAGE and enters the BULK STAGE.

**FAULT STATE** - If the IQ4 is exposed to an “over voltage” condition by exceeding the “Over Voltage Trigger,” its circuitry is automatically disabled. In this state, the functionality of the IQ4 is completely disabled, the LED will flash irregularly, and the charger reverts to a stand-alone FLOAT STATE voltage. The unit will not exit this stand-alone FLOAT STATE, therefore the unit must be reset by following the steps below.

1. Unplug the charger from its AC source.
2. Disconnect the [+] positive cable from the battery.
3. Wait 30 seconds before reconnecting the input and output. To avoid arcing, it is recommended that the charger be connected to the AC input FIRST before connecting the output of the charger to the battery\*.

\*Note that the connection sequence of the input and output covered above is recommended every time an operator connects the charger to the batteries. However, as long as the charger remains connected to the battery, periodic unplugging of the AC input does not require this sequence

**FIGURE D. OPERATING VARIABLES**

PREDETERMINED VARIABLES FOR OPERATION						
Battery Voltage	BULK	ABSORPTION	FLOAT	LOW TRIGGER	HIGH TRIGGER	OVER VOLTAGE FAULT
12V	14.8V	14.2V	13.6V	12.8V	14.6V	15.2V
24V	29.6V	28.4V	27.2V	25.6V	29.2V	30.4V
36V	44.3V	42.6V	40.7V	38.4V	43.8V	45.6V
48V**	59.0V	56.6V	54.4V	51.2V	58.4V	60.8V

\*\*48V applications require the IQ4-54V Model