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# IQ<sup>4</sup>

## Smart Charge Controller OWNER'S MANUAL

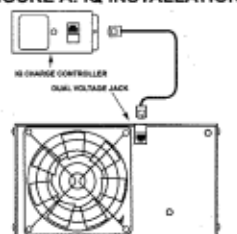
The IQ4 Charge Controller offers automatic charging control for DLS Battery Chargers, providing longer and safer use of your system's battery. The IQ4 Controller allows the DLS Charger to operate as an automatic multi-stage "smart charger" that gives the customer the benefit of Bulk, Absorption, and 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

The IOTA IQ4 Charge Controller installs by simply plugging the IQ cord into the Dual Voltage jack located on the DLS\* (Refer to Figure A). The IOTA IQ4 circuitry is then automatically engaged. Note: the cord provided is specifically designed for use with the IOTA IQ4. Do not use the IOTA IQ4 with any cord other than one supplied with the unit.

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

FIGURE A. IQ INSTALLATION



### OPERATION AND LED INDICATOR REFERENCE

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 C.

**LIT/FLASHING LED** - After detecting the battery, the IQ4 will initiate a Bulk Charge phase. When the IQ4 is in the Bulk Charge mode, the LED indicator will flash rapidly (approx. 2 flashes per second). When the Bulk Charge is complete, the IQ4 will begin the Float Charge phase and the LED will remain lit (no flashing). Refer to Figure B for Charge Stage descriptions.

#### Figure B: Charge Stage Descriptions

#### BULK

The Bulk State charges the battery at the full-rated output of the charger, reducing the time it takes to charge the battery.

#### FLOAT

Once the battery has been fully charged, the Float State maintains a full charge to the battery while minimizing "gassing".

#### ABSORPTION

The Absorption State delivers a constant charge for a set period of time to ensure that the battery receives a full and complete charge.

#### MAINTENANCE

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.

Figure C:  
LED Code Tables\*

**Manufacturer's Note:**  
 New versions of the IQ use a three-color LED indicator. New three-color LED IQ models can be recognized by the white appearance of the LED indicator while OFF (original IQ LED indicators will appear green when OFF.) Refer to the specific table for your IQ model.

#### THREE-COLOR LED TABLE

CELL INDICATION		
6 FLASHES (GREEN)	12V Battery (6 cells)	
12 FLASHES (GREEN)	24V Battery (12 cells)	
24 FLASHES (GREEN)	48V Battery (24 cells)	
CHARGE PHASE	LED STATUS	VOLTAGE RATE
FLOAT	ON (GREEN)	2.266 PER CELL
SOAK	FLASHING (AMBER)	2.366 PER CELL
BULK	FLASHING (RED)	2.466 PER CELL
FAULT	TRIPLE FLASH (RED) EVERY 2 SEC.	

#### SINGLE-COLOR LED 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	2.266 PER CELL
ABSORPTION	SLOW FLASHING	2.366 PER CELL
BULK	RAPID FLASHING	2.466 PER CELL
FAULT	SINGLE FLASH - INTERVAL > 1 SEC.	

\*IQ4 units with single color LED are not suitable for use with DLS 54V chargers. Use either the IQ4 54V or new IQ4 model with 3-color LED.

## OPERATION AND LED INDICATOR REFERENCE (cont.)

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 IQ continues to monitor the battery voltage. If the battery voltage drops below a pre-determined voltage (Refer to **Figure D** for predetermined values), the IQ will automatically initiate the smart-charging cycle once the AC input is re-connected.

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

### CHARGING STAGE DESCRIPTIONS

**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 IQ enters a FAULT state, its circuitry is automatically disabled. In this state, the functionality of the IQ 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: Predetermined Stage Trigger Values**

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**	59.2V	56.8V	54.4V	51.2V	58.4V	60.8V

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