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## Smart Charge Controller OWNER'S MANUAL

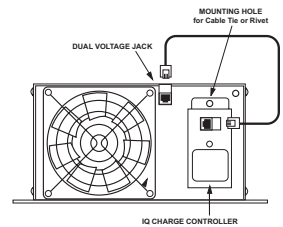
The **IOTA IQ-TURBO** Charge Controller is designed for rapid automatic charging control for DLS Battery Chargers with flooded lead acid battery applications, providing enhanced battery charging and maintenance. The IOTA IQ-TURBO allows the DLS Charger to deliver an enhanced Bulk charge to replenish batteries quickly, in addition to providing Absorption, Float, and Maintenance cycles. Multi-stage charging with the IQ-TURBO increases the charging capacity of the DLS charger, decreases the charge time, and ensures a maintained and full battery charge. The IOTA IQ-TURBO monitors the battery at all times. If the DLS voltage remains in the Float stage for seven days, the IOTA IQ-TURBO will automatically initiate the Maintenance Cycle for a predetermined time to help maintain the battery, and then resume float stage charging. **ATTENTION: While the IQ-TURBO is designed to accommodate most flooded lead acid batteries, always refer to the manufacturer's specifications for your battery's allowable charging parameters.**

### INSTALLATION

The IOTA IQ-TURBO Charge Controller installs by plugging the IQ cord into the Dual Voltage jack located on the DLS\* (Refer to Figure A). The IOTA IQ-TURBO circuitry is then automatically engaged. Secure the IQ unit to the side of the DLS with a cable tie or by using a rivet (not provided) in the available mounting hole. Note: the cord provided is specifically designed for use with the IOTA IQ-TURBO. Do not use the IOTA IQ-TURBO 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 IQ informs the user of the DLS charging state and the battery charge status. When first activated, the IQ 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 IQ-TURBO will initiate a Bulk Charge phase. When the IQ-TURBO is in the Bulk Charge mode, the three-color LED indicator will flash RED rapidly (approx. 2 flashes per second). When the Bulk Charge is complete, the IQ-TURBO 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

<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>MAINTENANCE</b>	If the battery has remained in the Float State for seven days, the IQ automatically provides an equalization charge to dissolve any sulfate layer on the battery's plates and to avoid stratification.

Figure C: LED Code Table

LED CODE TABLE		
CELL INDICATION		
6 FLASHES	12V Battery (6 cells)	
12 FLASHES	24V Battery (12 cells)	
24 FLASHES	48V Battery* (24 cells)	
CHARGE PHASE	LED STATUS	VOLTAGE 12V / 24V / 48V*
FLOAT	SOLID GREEN	13.6 / 27.2 / 54.4
ABSORPTION	FLASHING AMBER	14.51 / 29.02 / 58.04
BULK	FLASHING RED	14.78 / 29.56 / 59.12

\*Note: IQ devices are not UL certified for 48V applications.

**\*Manufacturer's Note:** New versions of the IQ TURBO use a three-color LED indicator. For previous versions of the IQ TURBO, the LED indicator will only flash GREEN during the Absorption and Bulk stages. 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.)

**ATTENTION:** Original versions of the IQ TURBO (Green-only LED indicator) are not suitable for use with DLS 54V chargers.

## 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 240 minutes. At this point, the BULK STAGE will switch to the ABSORPTION STAGE.

**ABSORPTION STAGE** - This state is limited to 120 minutes (2 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 120 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 to 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 7 days when the IQ-TURBO initiates the MAINTENANCE stage to ensure a complete charged condition. 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	14.78V	14.51V	13.6V	12.8V	14.6V	15.2V
24V	29.56V	29.02V	27.2V	25.6V	29.2V	30.4V
48V*	59.12	58.04V	54.4V	51.2V	58.4V	60.8V

\*NOTE: IQ Devices are not UL Certified for use in 48VDC applications.

