

Thank you for purchasing IOTA's DLS Series Power Converter/Battery Charger. When utilized properly, your DLS Power Converter/Battery Charger will provide years of dependable service. This Owner's Manual contains important safety and operating instructions. **READ ALL INSTRUCTIONS AND SAFETY PRECAUTIONS CAREFULLY BEFORE INSTALLING AND OPERATING THE UNIT.**

## WARNING

### Risk of SERIOUS INJURY OR DEATH

This unit is an electrical device. When working with this, or any electrical device, there exists the potential for **ELECTRICAL SHOCK, EXPLOSION and FIRE hazards.**

Before using this equipment, **READ AND UNDERSTAND** the instructions, warnings, and safety precautions in this Owner's Manual. Failure to read and understand these instructions could result in **SERIOUS INJURY** or **DEATH.**

**SAVE THESE INSTRUCTIONS**

## CAUTION

**When working with the DLS unit, always observe the following guidelines:**

- The DLS is designed for indoor use. Do not use outdoors.
- **DO NOT** expose the DLS unit to rain, snow, or other inclement weather.
- Do not mount the DLS in a zero clearance compartment or in compartments with flammable items such as gasoline or batteries.
- Do not mount the DLS in an area with the potential of dust, debris, or other foreign materials entering the vents of the DLS.
- Use of an attachment or device with the DLS not recommended by IOTA Engineering will void the warranty and may result in a risk of fire, electrical shock, or injury to persons.
- To reduce the risk of damage to the electric plug and cord, always pull by the plug and not the cord when disconnecting the unit.
- **DO NOT** operate the DLS with a damaged cord or plug.
- **DO NOT** operate the DLS if it has been dropped, received a sharp blow, or has been otherwise damaged in any way. Take the DLS unit to a qualified service location.
- **DO NOT** disassemble the DLS unit. Take the DLS to a qualified service location when service or repair is required.
- To reduce the risk of electric shock, **DISCONNECT** the DLS charger from **ALL** power sources before attempting any maintenance or cleaning. Turning off any electrical supply or load to the unit is not sufficient and will not reduce this risk.
- **DO NOT** use extension cords. Using an improper extension cord could result in a risk of fire and electric shock, and may result in property damage, personal injury or death.

## DANGER



**ELECTRICAL SHOCK HAZARD**  
**THIS CHARGER IS AN ELECTRICAL DEVICE THAT CAN SHOCK AND CAUSE SERIOUS INJURY.**

**DO NOT CUT POWER CORDS.**  
**DO NOT SUBMERGE IN WATER OR GET THE CHARGER WET.**



**EXPLOSION HAZARD**  
**UNSUPERVISED, INCOMPATIBLE, OR DAMAGED BATTERIES CAN EXPLODE IF USED WITH A CHARGER.**

**DO NOT ATTEMPT TO CHARGE DAMAGED OR FROZEN BATTERIES.**  
**USE THE CHARGER ONLY WITH BATTERIES OF RECOMMENDED VOLTAGE.**  
**OPERATE THE CHARGER IN WELL-VENTILATED AREAS ONLY.**

## WARNING



**FIRE HAZARD**  
**A CHARGER IS AN ELECTRICAL DEVICE THAT EMITS HEAT AND CAN BURN.**

**DO NOT COVER THE CHARGER.**  
**KEEP THE CHARGER AWAY FROM COMBUSTIBLE MATERIALS.**  
**DO NOT SMOKE OR USE ANY OTHER SOURCE OF ELECTRICAL SPARK OR FIRE WHEN OPERATING THE CHARGER.**



**RISK OF EXPLOSIVE GASES**  
**WORKING IN THE VICINITY OF LEAD-ACID BATTERIES IS DANGEROUS. BATTERIES GENERATE EXPLOSIVE GASES DURING NORMAL BATTERY OPERATION. FOR THIS REASON, IT IS OF UTMOST IMPORTANCE THAT YOU FOLLOW THE INSTRUCTIONS WHEN USING THE BATTERY CHARGER.**

To reduce the risk of battery explosion, follow these instructions and those published by the battery manufacturer and review all Cautions and Warnings associated with these products.

## PRODUCT DESCRIPTION

IOTA DLS-48-20 Power Converter and DLS-54-13 Battery Chargers convert 120 volts nominal A.C. to volts D.C. As a power supply, the DLS-48-20's tightly controlled regulation allows the user to operate any 12 volt nominal D.C. load up to the converter's rated output current. As a battery charger, the DLS-54-13 will maintain the battery, delivering its full-rated current when the battery capacity falls sufficiently low. The voltage is set to deliver its maximum current for the necessary period of time that minimizes undue stress to the battery caused by heating of its cells. This helps to ensure the longest possible life of the battery. Over time, as the battery nears its full capacity, the converter will float-charge the battery to prevent self-discharge of its cells.

## PROTECTION FEATURES

The IOTA Power Converters/Battery Chargers are designed with high quality components to help ensure years of continuous use. The unit is protected by multiple protection features for a long, trouble-free life.

1) *Reverse Battery Polarity Protection.* 2) *Brown-Out Input Protection.* 3) *Over-Current Protection* - cycle by cycle peak limiting as well as rated current limiting to maximize the life of the converter. 4) *Over-Temperature Protection.* In addition, it is designed with a unique "proportional" fan control circuit. Fan speed is directly proportional to the converter's internal ambient temperature. This enables the fan to turn on and off very slowly, minimizing unwanted fan-starting noise.

## WARRANTY

The IOTA Power Converters/Battery Chargers are warranted from defects in materials or workmanship for two years from date of retail purchase, and limits the remedies to repair or replacement. This warranty is valid only in the continental United States and Canada. For complete warranty details, contact Customer Service or visit [www.iotaengineering.com](http://www.iotaengineering.com).



## INSTALLATION GUIDELINES

### MOUNTING LOCATION

The IOTA Power Converter/Battery Charger can be mounted in any position within an enclosed or interior compartment. Provide sufficient air space to allow unrestricted airflow in and around the unit. Provide at least 4" around the fan of the DLS to allow for proper air intake.

**DO NOT** mount the unit in a zero clearance compartment. **DO NOT** mount the DLS in the same compartment with flammable items such as gasoline or batteries. There are no components within the DLS unit that, during normal operation, produce arcs or sparks. However, all electronic devices have some potential for generating sparks in the event of failure which can result in explosion or fire. **DO NOT** mount the DLS in an area that has the potential of dust, debris, or other foreign materials to enter in through the DLS vents. **DO NOT** place the DLS directly above the battery; the gases from the battery can corrode and damage the DLS.

### 120 VOLT A.C. INPUT

Plug the unit A.C. input cord into an appropriate 120-volt 3-wire grounded source. Refer to Illustration 2 for specifications of the cord provided with your DLS unit. See the Technical Specifications Chart on page 4 for maximum current draw and required input voltages.

**DO NOT USE EXTENSION CORDS** - Using an improper extension cord could result in a risk of fire and electric shock, and may result in property damage, personal injury or death.

**DO NOT OPERATE THE DLS WITH A DAMAGED CORD OR PLUG.** Have the cord or plug replaced immediately by qualified service personnel.

To minimize the possibility of arcing at the battery, connect the IOTA power cord to the AC input **BEFORE** connecting the battery. **Note: occasionally a small spark or arc may occur at the power outlet as the unit is plugged in.** This is a common occurrence due to the internal capacitors drawing power.

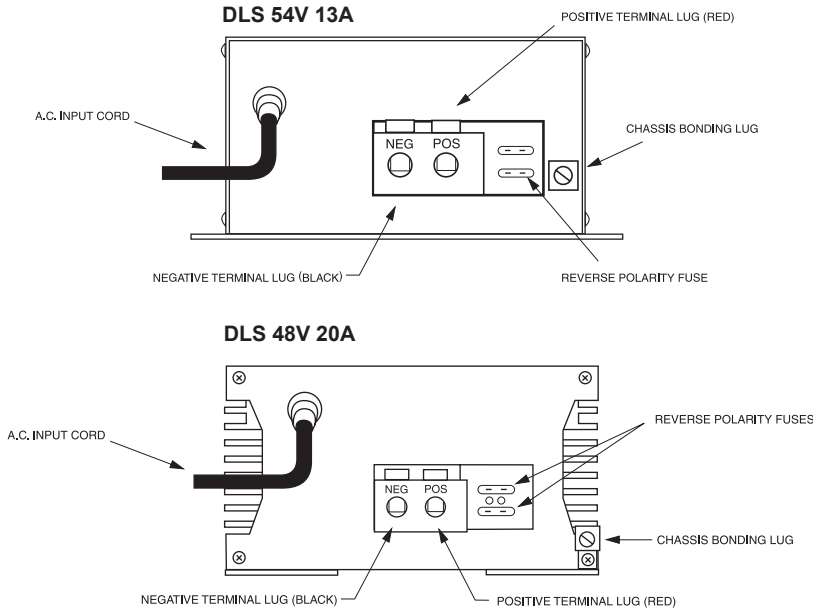
### BATTERY CONNECTION

Disconnect the positive side of the battery before installation. Connect the positive (red) and negative (black) terminal lugs to battery or load (*lugs require a #2 square drive*). Always use the proper size wire based on the amperage of the converter and the battery. When connecting to a battery, a breaker should be installed within 18" of the battery, connecting the battery positive to the line side of the breaker, and the IOTA unit to the load side. Connect "Chassis Bonding Lug" on the IOTA unit to vehicle chassis or other grounding source. Refer to Illustration 1.

### REVERSE POLARITY FUSES

The IOTA Battery Charger/Power Supply is protected against reverse polarity on the DC output. If a battery or the unit is hooked up incorrectly, the fuses will blow and can be easily replaced. Always use the same size and style fuse that came with the converter. To change the fuses, use a screwdriver to loosen the screws and remove the fuses. Always replace the fuses with the same type and rating. After inserting the new fuses, tighten the screws firmly. Apply 5 inch-pound maximum torque. **DO NOT OVERTIGHTEN.** *Note: some DLS models require only one fuse. For these units, a small fiberglass spacer may be used in the empty fuse slot to aid with tightening.*

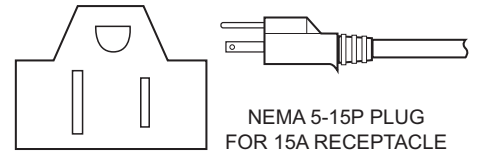
## ILLUSTRATION 1 - DLS CONNECTIONS\*



\*Actual component locations may vary depending on model.

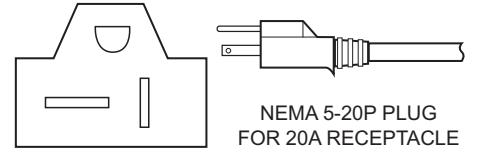
## ILLUSTRATION 2 - AC INPUT PLUG

### DLS 54V 13A



NEMA 5-15P PLUG  
FOR 15A RECEPTACLE

### DLS 48V 20A



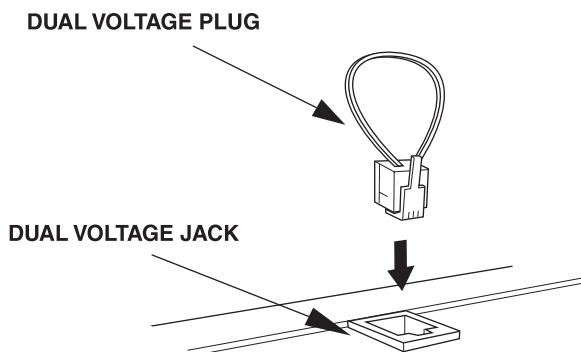
NEMA 5-20P PLUG  
FOR 20A RECEPTACLE

## CHARGE CONTROL FOR THE DLS-54-13

### TWO-STEP VOLTAGE JACK

The two-step voltage jack of the DLS-54-13 allows switching from a long-term float voltage of 54.4vdc to a 'high-stage' voltage of 56.8vdc. When the included dual voltage plug is inserted in the jack\*, the voltage rises to 56.8vdc for occasional fast charging. When the plug is removed, the voltage drops to 54.4vdc to reduce battery water loss. **WARNING: To avoid battery damage, remove the Dual Voltage Plug when quick-charging is complete.** NOTE: If the unit is equipped with an internal IQ4 smart charger, two-step charging is not needed and the Dual Voltage Jack is disabled.

### ILLUSTRATION 3 - DUAL VOLTAGE JACK



Location of the Dual Voltage Jack may vary depending on model.

### THE IQ4 LED INDICATOR

(ONLY ON IOTA MODELS WITH INTERNAL IQ4)

IOTA Models with an internal IQ4 smart-charger give the user the benefit of automatic Bulk, Absorption, and Float stage charging. This increases the charging capacity of the IOTA charger, decreases charge times and insures proper and safe battery charging without over-charging. The LED on the fan end of the unit will indicate which charging phase the IOTA unit is currently in. When the unit is first activated, the LED will flash as it reads the number of cells in the battery. The unit will then proceed directly to the Bulk charging or Float charging phase depending on the charge status of the battery. **Current DLS models utilize a three-color LED while earlier models feature a single-color green LED. Reference the appropriate LED CODE TABLES below for the LED codes pertaining to your particular unit.** Units that do not have an internal IQ4 smart-charger can easily install an external IQ4 that plugs into the available Dual Voltage Jack. Contact Customer Service for more information.

#### 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.	

Three-color LED Flashing code sequence intervals are 0.5 SEC on / 0.5 SEC off.

#### 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.	

# TECHNICAL SPECIFICATIONS CHART

RATINGS AND SPECIFICATIONS	DLS 48V 20A*	DLS 54V 13A* SERIES M
DC Output Voltage (No Load) approx.	48V (DC)	54.4V (DC)
Output Voltage Tolerance (No Load)	+ or - .5%	+ or - .5%
Output Amperage, Max Continuous	20Amps	13 Amps
Output Voltage (Full Load) approx.	>47.8V (DC)	>54V (DC)
Maximum Power Output, Continuous	950 Watts	700 Watts
Ripple and Noise	<100 mV rms	<100 mV rms
Input Voltage Range	108 - 132 AC	108 - 132 AC
Input Voltage Frequency	47-63	47-63
Maximum AC Current (@108Vac)	17.1 Amps	12.6 Amps
Typical Efficiency	>80%	>80%
Max Inrush Current, Single Cycle	40 Amps	30 Amps
Short Circuit Protection	Yes	Yes
Overload Protection	>100%	>100%
Line Regulation	100 mV rms	100 mV rms
Load Regulation	<1%	<1%
Fan Control	PROPORTIONAL	PROPORTIONAL
Thermal Protection	YES	YES
Working Temperature Range	0° - 40° C	0° - 40° C
Storage Temperature	-20° to 80° C	-20° to 80° C
Withstand Voltage (VDC)**	1700/1700/500	1700/1700/500
Approximate Dimensions	13" x 6.5" x 3.4"	9.7" x 6.7" x 3.4"
Weight	7.8 lbs	5.0 lbs

\*Unit is not UL Listed

\*\*Primary to Chassis/Primary to Secondary/Secondary to Chassis

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