

Technical Note

TDL BOOSTER™ PV Motor Driver



Thermo Dynamics Ltd.
101 Frazee Avenue
Dartmouth, Nova Scotia
Canada, B3B-1Z4
Tel: (902) 468-1001 Fax: (902) 468-1002
Email: solarinfo@thermo-dynamics.com
www.thermo-dynamics.com

1.0 General

The TDL Booster™ is an electronic device that acts as a DC-DC transformer in a direct-drive PV-powered DC motor system.

2.0 Linear Current Booster Operation

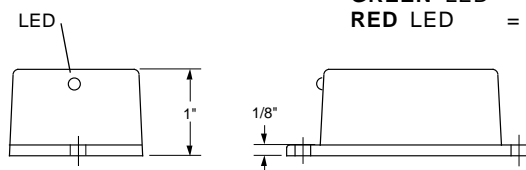
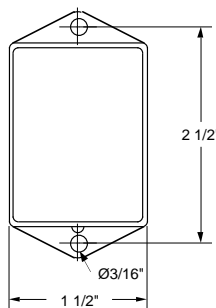
A linear current booster (LCB) is employed with a DC motor powered directly by a photovoltaic (PV) module to increase the efficiency of operation. The LCB maintains constant voltage on the PV module, while allowing motor voltage to vary. A PV module operates as a constant voltage power supply. However, as the intensity of the sunlight varies, the current and power supplied by the PV module varies.

As the power from the PV module to the motor varies, motor RPM and voltage varies. A DC motor acts as an approximately constant current device with variable voltage. The LCB acts as a DC-DC transformer, allowing the motor to operate at variable voltage while the PV module operates at a fixed voltage.

The LCB reduces PV voltage to motor voltage, while boosting PV current. For example, at low sun light conditions, a 20-W_p PV module might produce only 0.15 amps of current, which is insufficient to start most DC motors, even if they are very small. The LCB will boost the current, perhaps to as much as 0.6 amps at 3 VDC to the motor. The 0.6 amps should be sufficient to start the DC motor. Depending on the current, and the difference between PV and motor voltage, the efficiency the Booster™ ranges from 80 - 97%.

3.0 TDL Booster™ Operation

The TDL Solar Pump™, and other PV-direct motors, are powered by a PV module. An electronic LCB, the Booster™, is wired between the PV module and the DC motor. The Booster™ maintains PV voltage at 15 VDC, when operating with a 12 VDC (nominal) PV system. At 15 VDC the PV module delivers maximum



Specifications

Red PV + spade connector
Black* PV - spade connector
Orange Motor + female connector
Blue Motor - male connector

*Older LCB's may use a white wire for PV -.

Voltage (nominal): 12 or 24 V
Voltage (maximum): 21 or 42 V
Voltage (operating): 15 or 30 V
Current (maximum): 3.0 amperes

The two values for voltages are for the 12 VDC and 24 VDC models of the Booster™.

Maximum PV wattages

12 VDC 50 Wp
24 VDC 100 Wp

Warnings

Connect the Booster™ to the motor, before connecting the Booster™ to the PV module.

Do not connect the Booster™ to a battery, or any other power sources, such as a battery charger.

Connect the Booster™ only to a PV module, or, for testing purposes, to a current controlled DC power supply set to a maximum voltage of 20 VDC.

The line to the DC motor should be fused at 3 amperes.

GREEN LED = 12 VDC TDL Booster™
RED LED = 24 VDC TDL Booster™

power to the motor. If motor voltage rises above 15 VDC, then the Booster™ allows the PV voltage to rise with the motor voltage.

PV voltage will be 15 VDC, except in the early morning as the sun rises above the horizon, and in late day as the sun sets. At sunrise, PV voltage will climb from 0 to 15 VDC. At sunset, PV voltage will decrease from 15 to 0 VDC.

When the Booster™ is employed with a 24 VDC PV system (e.g., two 12 VDC PV modules in series, or a single 24 VDC PV module), the PV module(s) are held at 30 VDC. This is the maximum power point

for a 24 VDC PV system.

3.1 TDL Booster™ LED

The Booster™ is equipped with one light emitting diode (LED). When the LED is illuminated, the Booster™ should be delivering current from the PV module to the motor.

3.2 TDL Booster™ Models

The TDL Booster™ is available in two models which are distinguishable by the color of the LED:

GREEN LED = 12 VDC
RED LED = 24VDC