



Standard, DB, TR, and TR with GFDP versions shown with optional display meters

TRISTAR MPPT™ 600V

HIGH VOLTAGE CHARGE CONTROLLER

- High Voltage Capacity
- Extremely High Reliability
- Very High Efficiency
- Maximizes Energy Harvest
- Communications Capabilities

The **“breakthrough in charge controller design”**, TriStar MPPT 600V is the high-voltage controller solar system designers and installers have been looking for. Because it enables them to build systems with longer and fewer individual strings, wiring, cable and breaker costs are reduced, and installations go faster and easier.

Morningstar is able to deliver this performance with no cooling fans required— a remarkable technical achievement in a high-voltage controller. The secret is more agile control software combined with over-spec'd components, optimized through advanced thermal

KEY FEATURES AND BENEFITS

High Voltage Capacity

- Maximum input voltage of 600V
- Operates with PV array Voc voltages up to 525 Voc
- Hydro operating voltages up to 500 Vdc*
- Pre-set for 48 Vdc battery systems
- Programmable for 24V, 36V and 60V battery systems
- Allows long wire runs from the array to the controller
- Higher voltage reduces voltage drop and wire costs
- No combiner boxes required for single or two string systems
- Better enables grid-tie PV systems with battery back-up
- Enables easier PV array expansion than lower voltage systems and accommodates increasing loads

Extremely High Reliability

- Robust thermal design and no cooling fans
- No moving parts
- Superior lightning protection from nearby lightning-induced voltage/current spikes
- Extensive electronic protections
- Epoxy encapsulated inductors and conformally coated printed circuit boards

Very High Efficiency

- 97.9% peak efficiency
- Proprietary tracking algorithm minimizes power losses
- Low self-consumption easy mounting by a single person
- Continuous operation at full power to 45°C ambient temperatures without need to de-rate
- Electronic devices with higher ratings to minimize losses from heating

and electronic engineering. Fanless design improves service life, increases reliability, and raises efficiency. The TriStar 600V controller (TS-MPPT-600V) accepts PV array input up to 600 Voc with 97.9% peak efficiency. In addition to solar charge controlling, the TriStar 600V with DC transfer switch is uniquely suited for retrofitting existing grid-tied solar installations with energy storage for back-up power in a DC-coupled configuration connected to batteries.

Maximizes Energy Harvest

Our TrakStar™ MPPT Technology features:

- Better peak power point tracking than other MPPT charge controllers
- Very fast sweeping of the entire PV array
- Recognition of multiple power points during shading or mixed PV arrays
- Low input voltage operation
- Excellent performance at sunrise and low solar insolation levels

Communications Capabilities

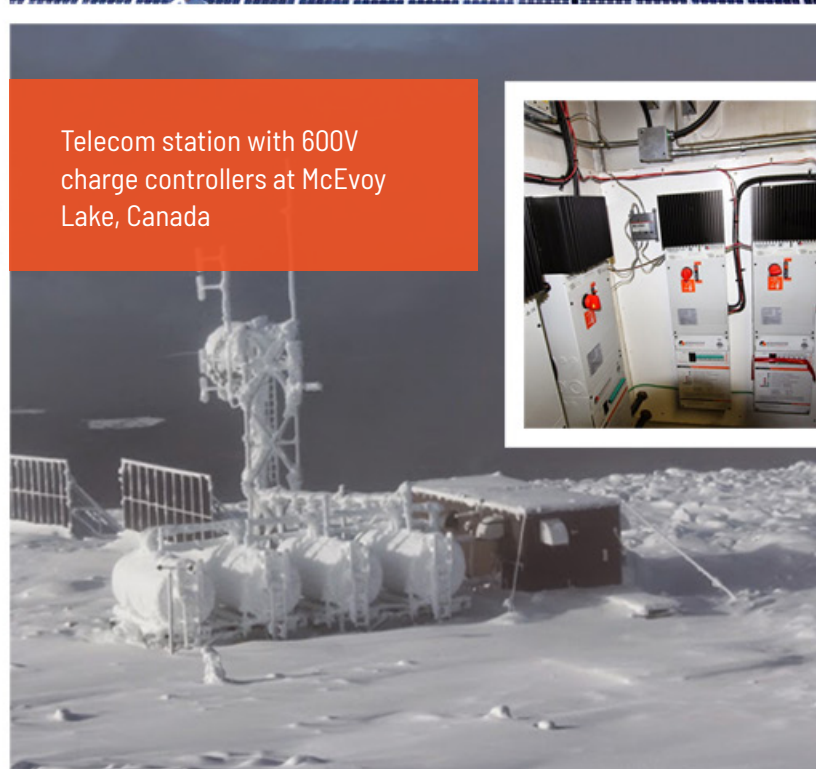
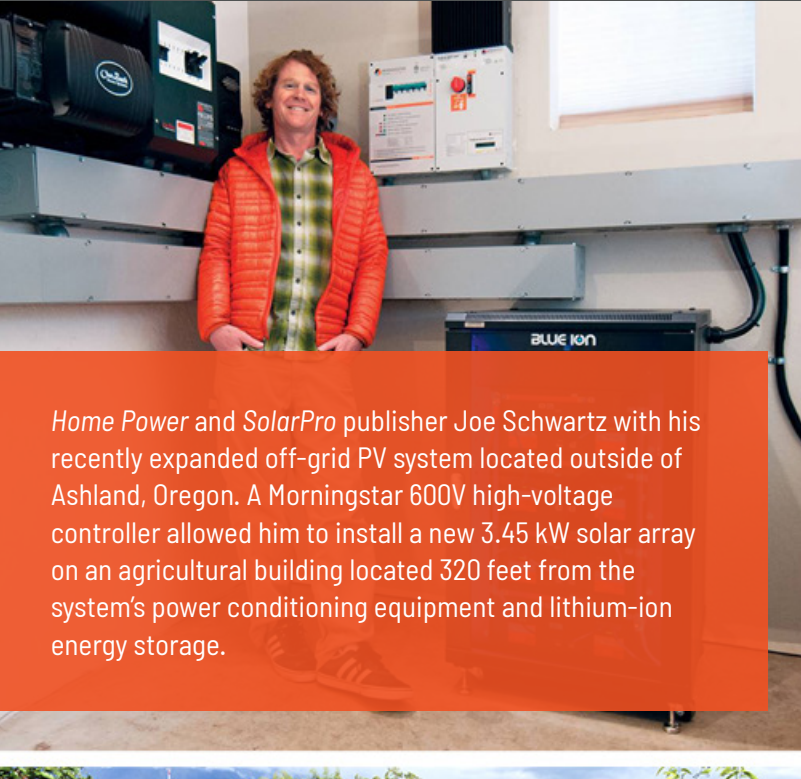
- Enables system monitoring, data logging and adjustability. Uses open standard MODBUS™ protocol and Morningstar's MS View software
- Meterbus: Communications between compatible Morningstar products
- Serial RS-232 and EIA-485 serial connectivity
- Ethernet: fully web-enabled interface to a local network or internet; view from a web browser or send email
- EMC-1: IP based network and internet connectivity, including SNMP



Other Features

- High-Low voltage barrier improves safety
- Available with optional Disconnect Box: 600V PV disconnect switch, battery breaker and prewired input/output bus bars
- Available with DC Transfer Switch option for switching from a GT string inverter to battery backup charging during a utility outage. Multiple controllers and GFDPs may be added later, on an as-needed basis

*To avoid product/system failure, please contact Morningstar for the latest hydro information.



Available in four versions:

- TS-MPPT-60-600V-48: Standard
- TS-MPPT-60-600V-48-DB: with Disconnect Box
- TS-MPPT-60-600V-48-DB-TR*: with DC Transfer Switch
- TS-MPPT-60-600V-48-DB-TR-GFPD**: Pre-wired with Ground Fault Protection Device

Noteworthy features:

- Accommodates PV systems > 150 Voc with long wire runs from the array to the controller
- Uses Morningstar's patented 4-stage charging algorithm to optimize battery health
- Features extensive system networking, monitoring and communications
- Optimized for harsh environments and equipped with electronic protections
- Enables battery back-up for grid-tied systems using more efficient DC-coupling system topology (as opposed to AC-coupling typical from other brands)

Technical Specifications

| Electrical | |
|-------------------------------------|--|
| Peak Efficiency | 97.9% |
| Maximum Battery Current | 60A |
| Maximum Input Operating Current | 15A (self limiting) |
| Maximum Solar Open Circuit Voltage | 600V |
| Nominal Maximum Operating Power *** | 3200Wp, 48 Volt |
| Nominal System Voltage | 48 Vdc custom programmable to 24V, 36V and 60V |
| Battery Operating Voltage Range | 16-72Vdc |
| PV Input Operating Voltage Range | 100V to Voc = 525V |
| Hydro Input Operating Voltage Range | Battery Voltage to 500V |
| Self-Consumption | 1.75 - 2.50W |
| Transient Surge Protection | 4500 Watts/port |

| Electrical Protections | |
|------------------------|---|
| Input | Overload, high voltage |
| Battery | High voltage, battery sense disconnected, remote temperature sense disconnected |
| General Operation | High temperature, reverse current at night, lightning and transient surges |

| Mechanical | |
|-------------------|--|
| Dimensions | Standard Version: 39.2 x 22.1 x 14.9 cm / 15.4 x 8.7 x 5.9 in DB & TR Version: 54.2 x 22.1 x 14.9 cm / 21.4 x 8.7 x 5.9 in |
| Unit Weight | Standard Version: 9.0 kg / 19.8 lbs DB & TR Version: 12.8 kg / 28.1 lbs |
| Maximum Wire Size | Power Terminals: 2.5 mm ² - 35 mm ² / 14 AWG - 2 AWG RT/Sense Terminals: 0.25 mm ² - 1.0 mm ² / 24 AWG - 16 AWG |
| Conduit Knockouts | M20; 0.50, 1.00, 1.25 inches |
| Enclosure Rating | Type 1 (indoor and vented), IP20 |

| Environmental | |
|---------------------|--|
| Ambient Temperature | -40 °C to +45 °C |
| Storage Temperature | -55 °C to +85 °C |
| Humidity | 100% non-condensing |
| Tropicalization | Epoxy encapsulation, conformal coating, marine-rated terminals |

| Battery Charging | |
|--|--|
| Charging Stages | MPPT, absorption, float, equalize |
| Temperature Compensation | Coefficient: 5mV/°C/cell (25° ref) Range: 30 °C to +80 °C / -22 °F to +176 °F Set points: Absorption, Float, Equalize, HVD |
| Note: Remote Temperature Sensor is included. | |

| Communication | |
|---------------------|---|
| Ports | Ethernet, EIA-485, RS-232, MeterBus, EMC-1 (optional) |
| Supported Protocols | MeterBus, MODBUS RTU, MODBUS TCP/IP, HTTP, SNMPv2c (optional), SMTP |

Options:

- TriStar 600V Meter (TS-M-2-600V)
- TriStar Remote Meter (TS-RM-2)
- Meter Hub (HUB-1)
- Relay Driver (RD-1)
- 600V Ground Fault Protection Device (GPD-600V)

Certifications:

- CE, RoHS, NEC Compliant
- ETL Listed: UL-1741 and Canadian CSA C22.2 No. 107.1.01
- FCC Class B Part 15 Compliant

Warranty: 5 year warranty period. Contact Morningstar or your authorized distributor for complete terms.

* Can be used as 2-pole version of the disconnect box. ** See GFPD -600V datasheet for additional specifications. *** Input power can exceed Nominal Maximum Operating Power, but controller will limit and provide its rated continuous maximum output current into batteries. This will not harm the controller.

Due to Morningstar's policy of continuous improvement, product availability, features and specifications are subject to change without notice.

TriStar^{TS-MPPT-600V}

Maybe on a **COLD** day here,
the other charge controllers
will catch up.



But for now, there's only one high-voltage charge controller that doesn't need fans to keep its cool: the Morningstar TriStar TS-MPPT-600V.

Solar designers and installers have long sought the benefits provided by a high-voltage charge controller. By allowing longer and fewer strings, they reduce wire, cable and breaker costs, and make installations go faster and easier.

But higher voltages come with the penalty of higher operating temperatures. The short-cut other brands take, of using fans to deal with extreme heat, can shorten the operational life of the controller by sucking in dirt and debris and adding moving parts that can fail in the field. Worse, powered fans are a parasitic load that reduces efficiency in solar harvesting. For these reasons, even achieving medium voltage is a struggle for conventional designs. Morningstar's high-voltage 600V is a true technical breakthrough.

Advanced digital processing responds much more quickly and accurately on both input and output sides, avoiding the transient "swings" of ordinary controllers. The internal architecture is laid out for maximum performance and thermal management rather than economy, with critical parts located where they make the most engineering sense. And finally, the controller is built with high quality, "over spec" components used throughout.

This may go way beyond the standard industry approach, but it's business as usual at our employee-owned brand. With 25 years of experience and well over three million products made, installers know they can bet their reputation on ours.

When it's time to push the design envelope on your next system, our revolutionary 600V TriStar is ready when you are. Contact your Morningstar distributor for complete information or visit us at www.morningstarcorp.com