

# TriStar Positive Ground Technical Note

## Product Overview

The TriStar solar charge controller is an ideal product for telecomm applications. It has large current handling capability, can easily be paralleled for large systems and digital data output is standard. It also offers energy metering features (Ah and kWh), for Solar and load modes, that make it ideally suited for PV telecomm sites that need to measure performance and available power.

A common system characteristic of these telecom systems is that they often operate on a positive ground (PG) circuit. This is required because of the large amount of proprietary PG equipment used by this industry that needs to run on an off-grid power supply.

The TriStar is oriented towards use in a negative ground system since these are most typical. The negative terminals of the TriStar are electrically common and charge control switching is done in the positive leg of the circuit. The negative terminals can be grounded at various points in the system since the bus is common and it will operate as designed.

In addition to all combinations of negative ground systems, the TriStar can also be used on positive ground systems if it is wired in the proper way.

## A Single Point to Earth

In a PG system, the TriStar is wired the exact same way as in any system. The only change is in the system grounding. The main issue to keep in mind is that you cannot ground the + side of the circuit in 2 separate locations on either side of the TriStar.

This means if you ground the + leg of the battery, do not do so on the + leg of the PV module. The same goes for the load. If you ground the + terminal of the load, do not ground the battery + as well. Doing so will disable the TriStars ability to control PV charging (or load disconnect functions, depending on its mode) and lead to a system problem.

## Graphic Illustrations

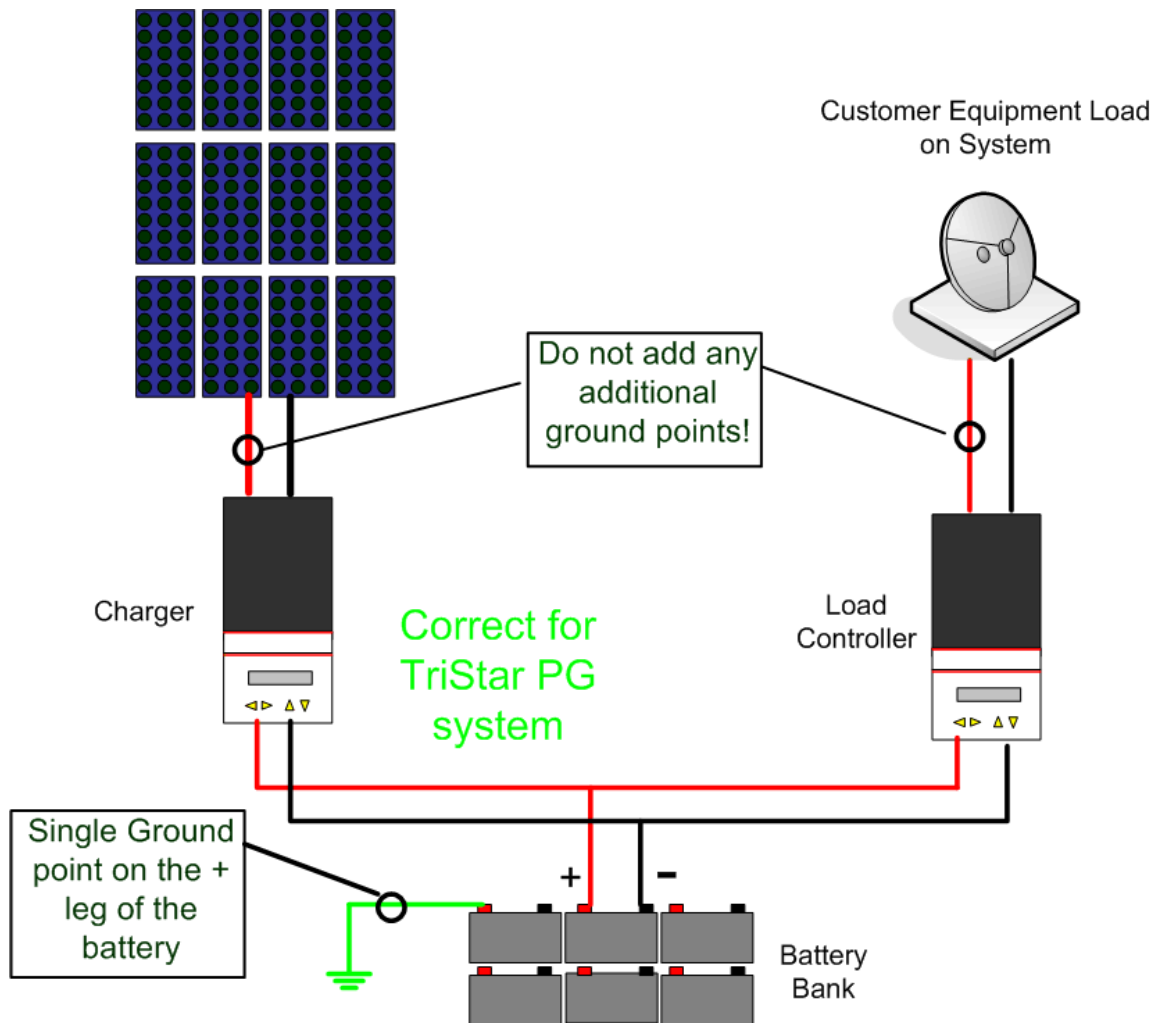


Fig. 1 – This system is grounded properly in only one location. It will properly control both charging and load control.

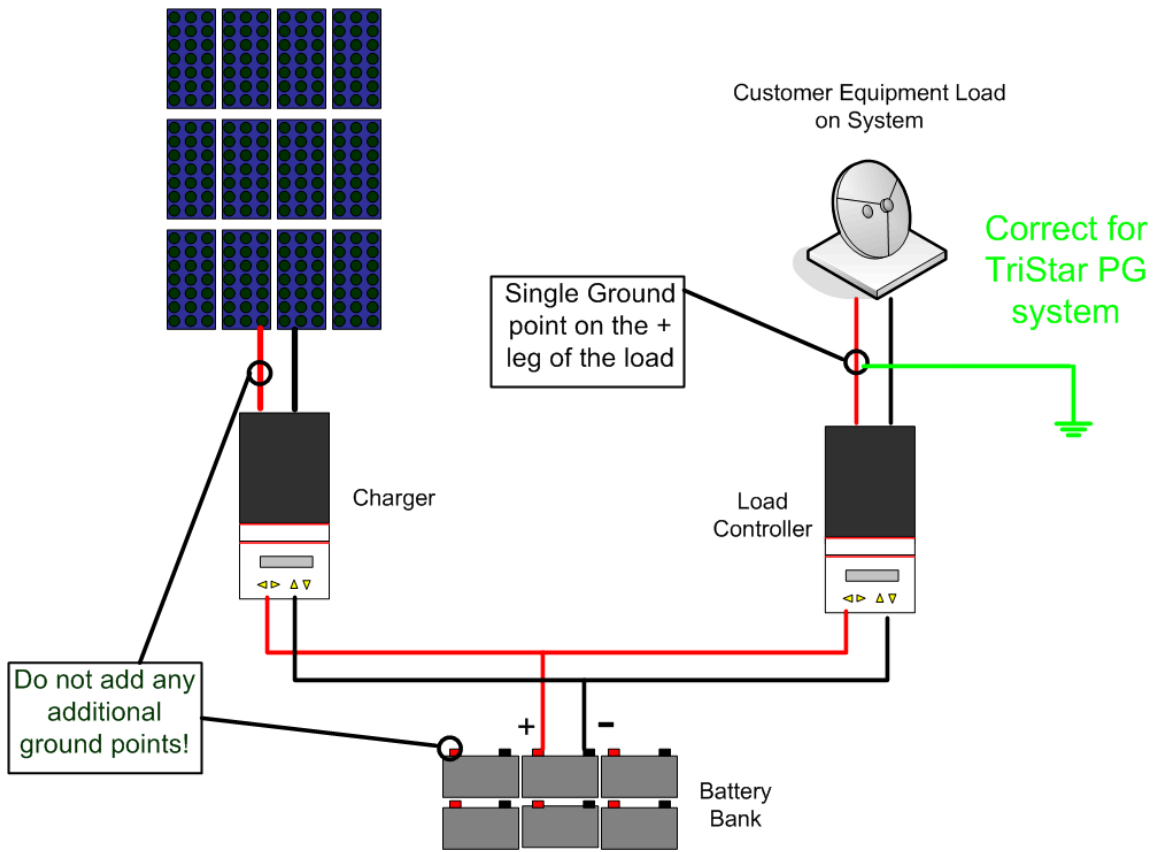


Fig. 2 – This is another example of a PG system that will function properly

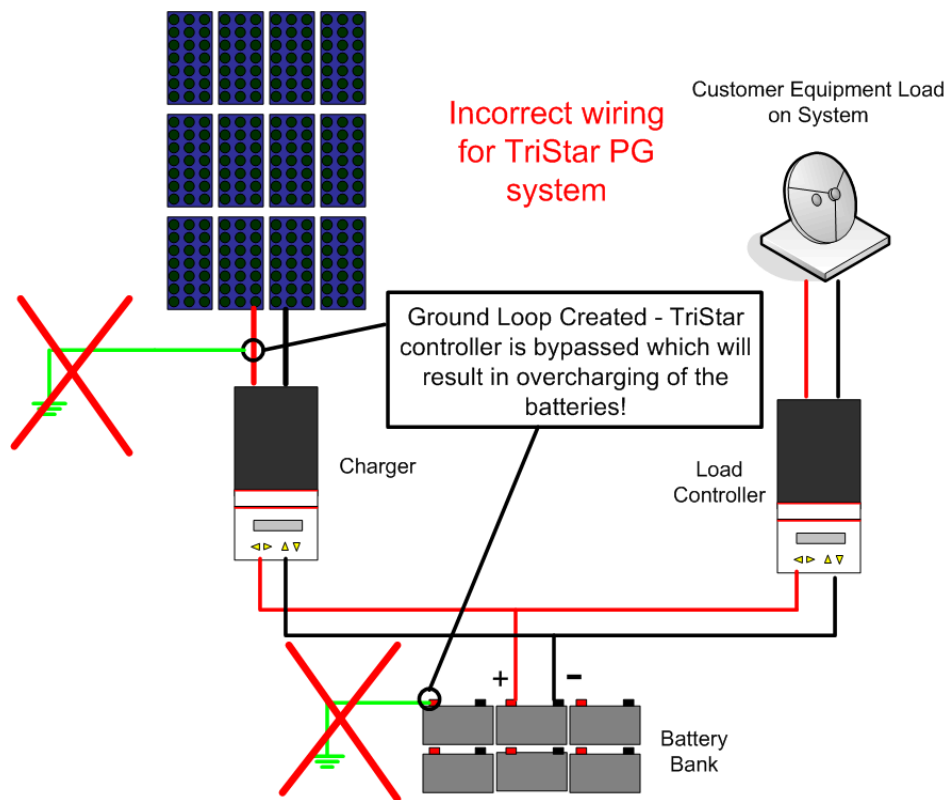


Fig. 3 – This system will not charge properly. It has been grounded in two locations and a ground loop will be created around the TriStar. The

controller will now no longer be able to properly control charging current since its circuit has been bypassed.

**NOTE: For Non-UL Systems Only**

The TriStar is certified to the UL 1741 standard. This is generally required for residential systems and is not often required for remote off-grid sites or telecom installations. Please note that wiring the controller in the PG configuration outlined in this document will allow it to operate, however, it is no longer technically compliant with the UL standard due to the change in system grounding.

**Chassis/Enclosure Ground**

In addition to grounding for proper potential, optimizing the system for lightning protection is also important. A separate earth path for the equipment chassis is still permitted in the above situations if it is isolated from the normal ground. There is a separate terminal for a chassis ground in the TriStar that is isolated from both the Positive and Negative terminals of the circuit. This can be wired to earth, along with the PV framework or other equipment, to direct lightning to pass through the support frame and away from the load circuit. This is a separate ground from the system and should be treated independently.

In addition to the above solutions, Morningstar offers two versions of our ProStar controller for Positive Ground systems. Since the ProStar controls both load and charging in one unit, it is specifically designed for PG systems. The ProStar Positive Ground is available in a 30Amp 12/24V model and a 15A 48V model. Both can be grounded at any points on the Positive (+) leg of the system since the controller makes all switching on the Negative (-) leg of the system.

Please contact Morningstar Corp. with any additional questions about using our products in Positive Ground systems.