Stabiliti DC Port Wiring Options

Application Note 064

Stabiliti: a universal 3 ports converter for grounded and floating DC applications.

Introduction

The 30 kW Stabiliti power converter provides a variety of solutions based on its 3 phase AC port, its galvanic isolation, and its two DC ports. The DC ports have a number of wiring options and added protections that are not available in other power converters. Galvanic isolation, provided by the internal transformer, allows for floating or ground referenced DC connections. A floating connection is valuable for applications such as fast DC charging of electrical vehicles, including vehicle-to-grid applications.

Galvanic isolation benefits battery applications by eliminating the very high AC line fault currents that are possible with non-isolated converters due to line-ground faults on the battery. Galvanic isolation also allows for PV installations to be either positive or negative ground referenced. For legacy PV installations, the correct voltage orientation with respect to ground is important for maintaining full output against Potential Induced Degradation.

This app note explains the various options for floating or grounding on Stabiliti's DC ports.

The Stabiliti inverter has the following properties –

1. 30 kW maximum total power, 30 kW maximum each port
2. One 3 phase, 3 line, AC port (AC1); 2 DC ports (DC2 and DC3)
3. 480 VAC on the AC port, up to 1000 VDC on each DC port
4. Galvanic isolation between the AC and DC ports. DC ports share a common line which is at a lower potential as compared with the other DC lines, referred to as DC Common (DC-COM)

The galvanic isolation between AC and DC ports allows for the following configurations of the DC2 port –

1. Floating Monopole
2. Negative ground referenced Monopole
3. Positive ground referenced Monopole
4. 3-Wire ground referenced Bipolar
5. 4-Wire ground referenced Bipolar

The DC3 port, if used, is always connected such that the negative pole of the energy source attaches to DC-COM, and the positive pole of the energy source attaches to DC3.

A description of each –

1. **Floating Monopole - Figure 1**
   - Mono/Bi-Polar Jumper – set
   - Ground/Floating Jumper – not set
   - Positive pole of the energy source (PV, battery, etc.) attached to DC2
   - Negative pole of the energy source attached to DC-COM

An IMI circuit, either the internal IMI circuit or an external IMI such as the Bender isoEV425 with AGH420, is used to detect line-ground resistance that is less than some allowed amount.

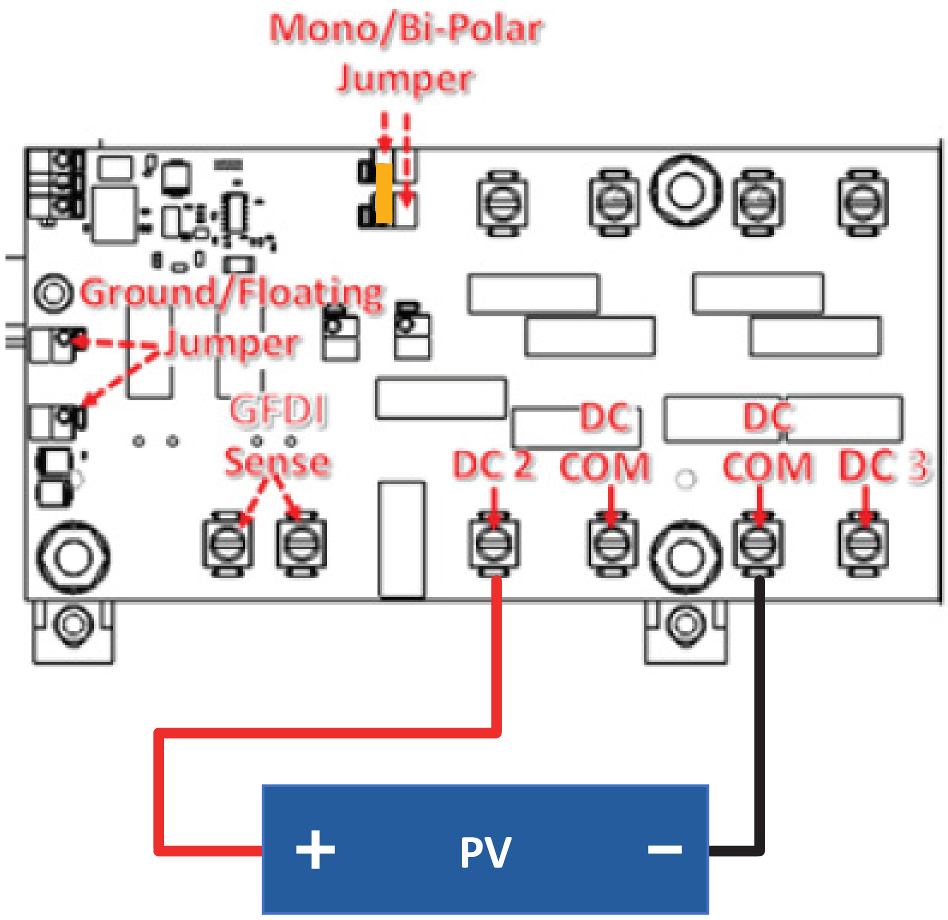

Figure 1. Floating Monopole

2. **Negative ground references Monopole - Figure 2**
   - Mono/Bi-Polar Jumper – set
   - Ground/Floating Jumper – set
   - Positive pole of the energy source (PV, battery, etc.) attached to DC2
   - Negative pole of the energy source attached to DC-COM

This is the configuration most often used for ground referencing PV arrays or batteries. The negative pole is referenced to ground via a 1A fuse. If a ground fault occurs on any portion of the array other than the negative pole, the PV current will flow through the fuse and open it. GFDI circuitry detects this and shuts down the inverter and sounds an alarm.

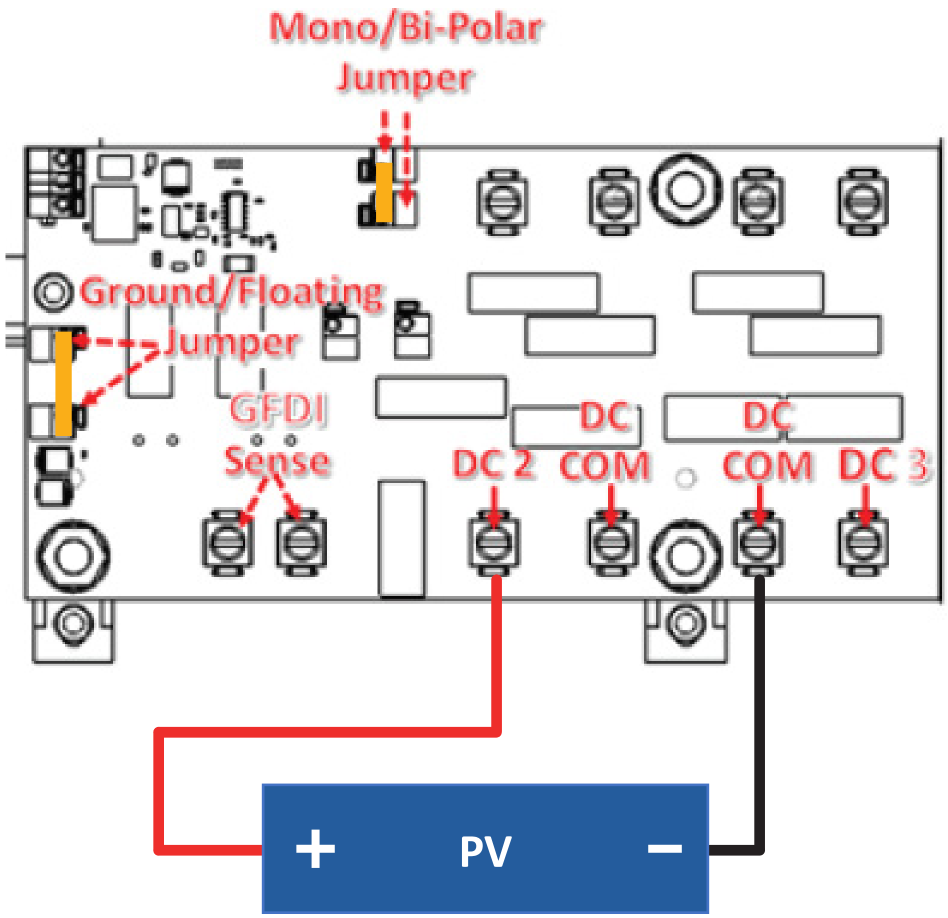

Figure 2. Negative ground referenced monopolar

3. **Positive ground Referenced Monopole - Figure 3**
   - Mono/Bi-Polar Jumper – not set
   - Ground/Floating Jumper – set
   - Positive pole of the energy source (PV, battery, etc.) attached to GFDI Sense
   - Negative pole of the energy source attached to DC-COM
   - GFDI Sense attached to DC2

This is the configuration used for positive ground referencing PV arrays or batteries. The positive pole is referenced to ground via a 1A fuse. If a ground fault occurs on any portion of the array other than the positive pole, the PV current will flow through the fuse and open it. GFDI circuitry detects this and shuts down the inverter and sounds an alarm.

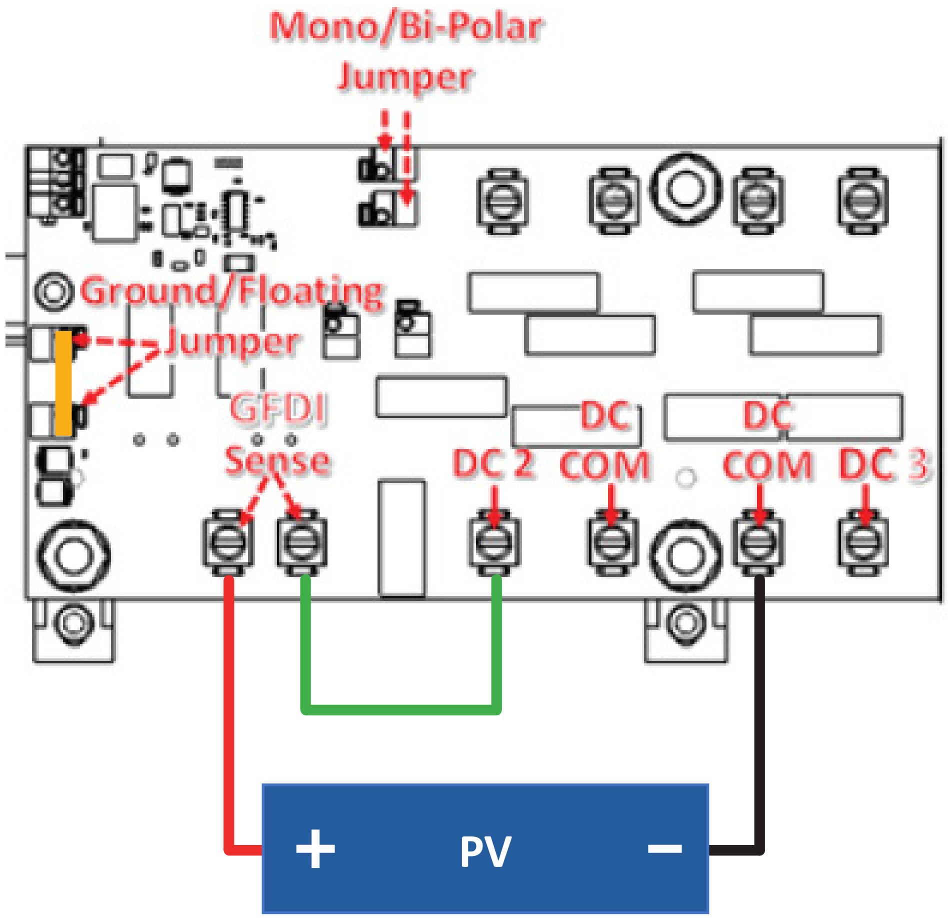

Figure 3. Positive Ground Referenced monopole

4. **3-Wire ground-referenced Bipolar - Figure 4**
   - Mono/Bi-Polar Jumper – not set
   - Ground/Floating Jumper – set
   - Positive pole of the 1st energy source (PV, battery, etc.) attached to DC2
   - Negative pole of the 1st energy source attached to Positive pole of the 2nd energy source and to GFDI sense
   - Negative pole of the 2nd energy source attached to DC-COM

This is the configuration used for positive ground referencing of bipolar PV arrays or batteries. The poles connected to GFDI Sense are referenced to ground via a 1A fuse. If a ground fault occurs on any portion of the array other than the poles connected to GFDI Sense, the PV current will flow through the fuse and open it. GFDI circuitry detects this and shuts down the inverter and sounds an alarm.

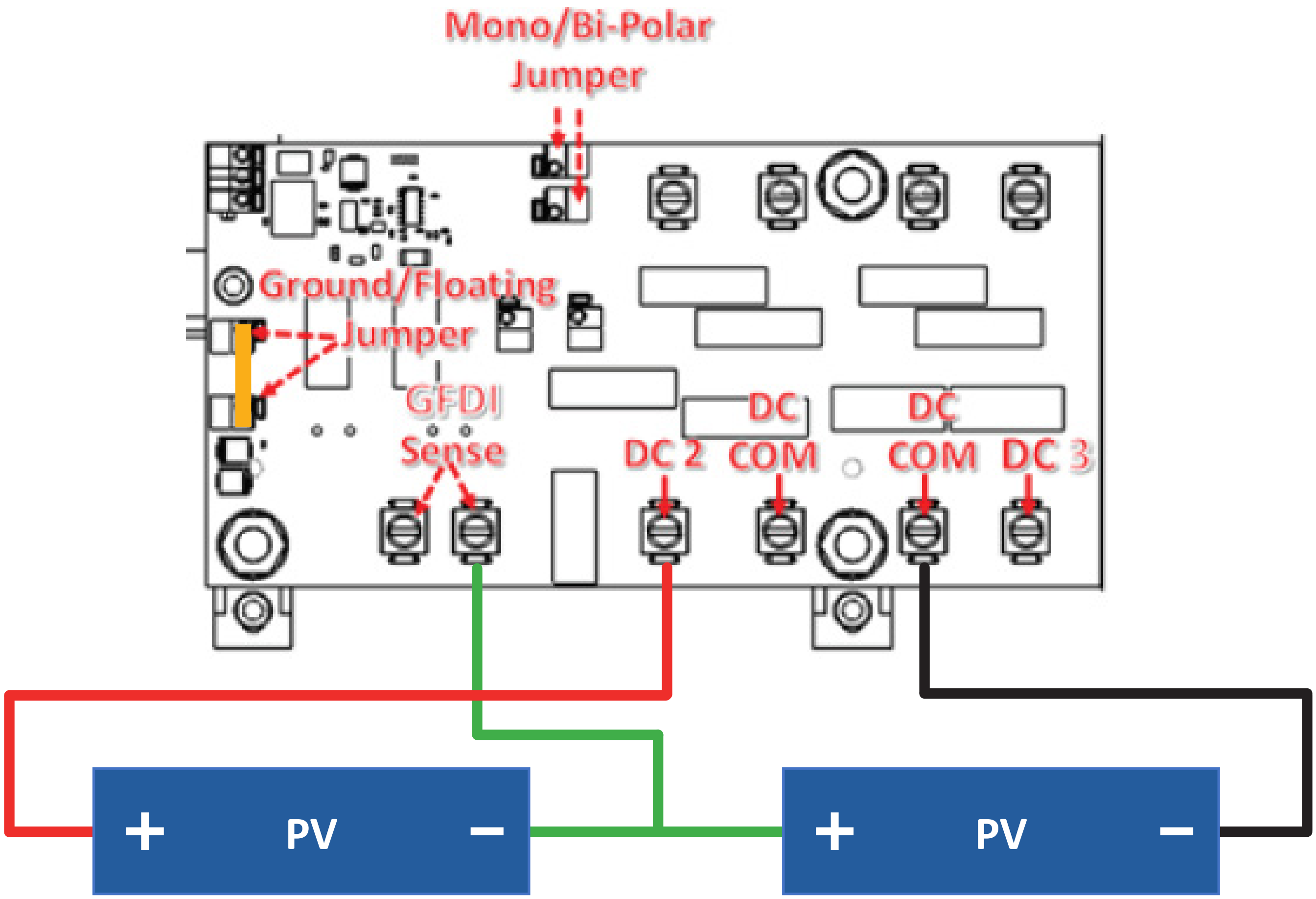

Figure 4. 3-Wire Bipolar

5. **4-Wire ground referenced Bipolar - Figure 5**
   - Mono/Bi-Polar Jumper – not set
   - Ground/Floating Jumper – set
   - Positive pole of the 1st energy source (PV, battery, etc.) attached to DC2
   - Negative pole of the 1st energy source attached to GFDI Sense
   - Positive pole of the 2nd energy source and to GFDI sense
   - Negative pole of the 2nd energy source attached to DC-COM

This configuration is electrically identical to 3-Wire ground referenced bipolar. Separate wires are used to connect the negative pole of the 1st energy source and the positive pole of the 2nd energy source to GFDI Sense.

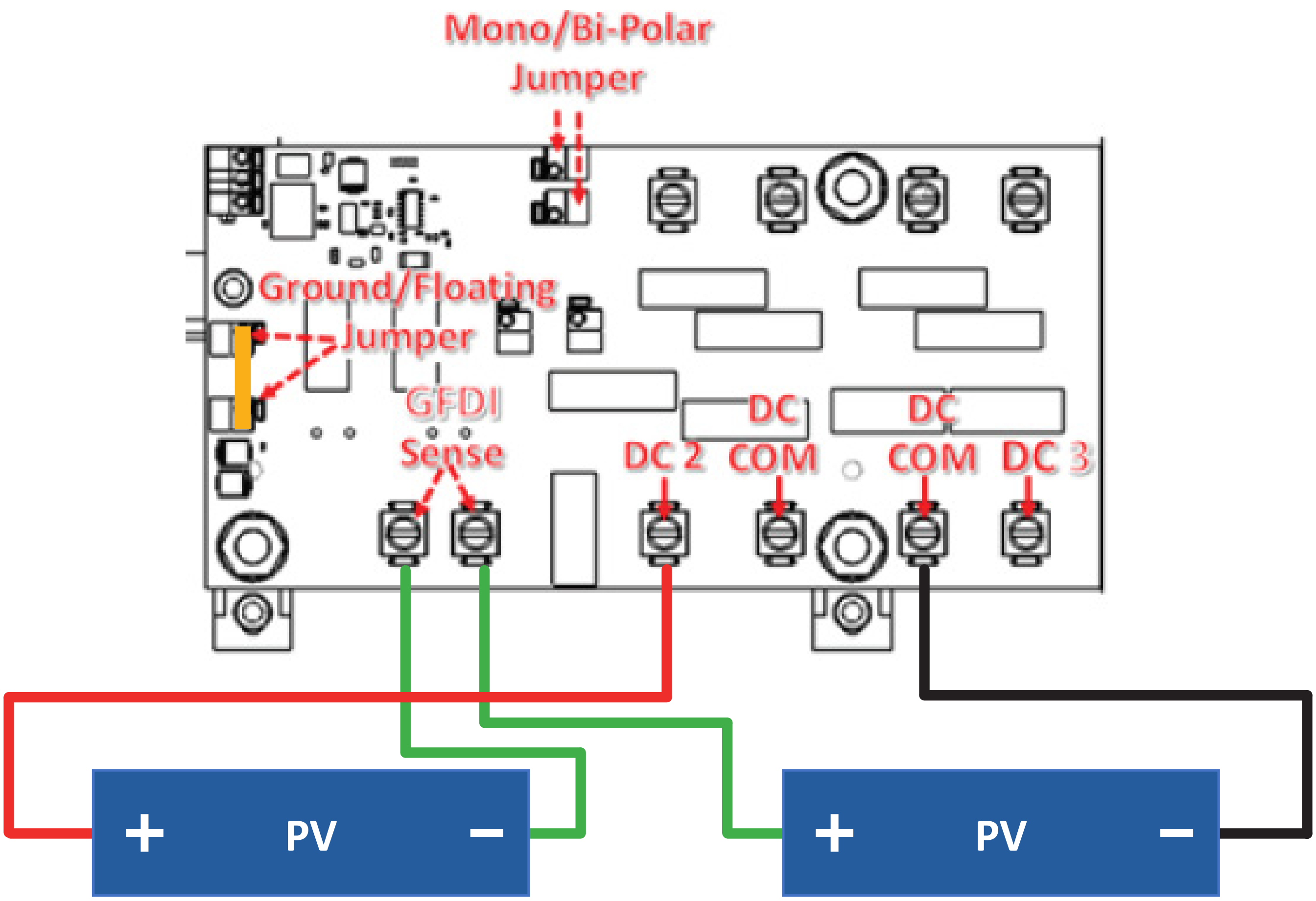

Figure 5. 4-Wire Bipolar

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