



Genesis

USER GUIDE

os-Boss dcx2 Dual DC-DC Converter

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Thank you for purchasing the Genesis os-Boss dcx2 Dual DC-DC Converter.

It is our goal always to provide quality products and service at a fair price, and treat every customer in a fair and forthright manner. We believe this is the only way to endure in the railroad industry marketplace over the long-term.

We ask for your suggestions, whether they be criticism, product or service improvement ideas, or praise. Your feedback will be taken seriously and in good faith. We will work hard to earn and deserve your business.

The Genesis Team

What's Included with the Genesis os-Boss dcx2 Dual DC-DC Converter

1	19062-000	os-Boss dcx2 Dual DC-DC Converter
1	19062-302	6-position Spring-Cage Mating Female Connector
1	19062-901	User Guide for os-Boss dcx2 Dual DC-DC Converter

User Guide

os-Boss dcx2 Dual DC-DC Converter

Orientation

Features Summary

- Two isolated 2.2 VDC, 2.5 Amp regulated outputs
 - User adjustable 0 to 5 Ohm track current limit resistor for each output
 - 9 VDC to 30 VDC battery input voltage
 - Designed using latest advanced technology
 - Lightning and surge protection on input and outputs
 - Self-resetting fuse protection on input and outputs
 - LED status indicator for battery input
 - LED status indicators for each 2.2 VDC output
 - Compact footprint - 4.4" x 2.4" x 1.6"
 - Sturdy aluminum powder coated enclosure
 - DIN-rail, B1 or P-150 type relay rack mounting base available
 - Plug-in connector with spring-cage wire retainers for wiring inputs and outputs
 - Low input voltage shutdown eliminates "on/off hunting" when input voltage is near operating threshold
 - Three-year limited warranty
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Why Use the os-Boss dcx2 Dual DC-DC Converter?

The Genesis os-Boss dcx2 Dual DC-DC Converter is designed for exceptional reliability using technology that enables efficient, cool operation. Because heat is a major contributor to electronic component failure, os-Boss dcx2 reliability is significantly improved.

Today's surge and lightning protection technology is substantially better than that of even a decade ago, and the os-Boss dcx2 uses conservative and industry proven design techniques to guard against damage caused by lightning and voltage surges. Circuit protection is further improved by self-resetting fuses that will limit input or output currents that could damage the internal electronic circuitry.

Most installations will realize a savings in parts and labor costs by using the os-Boss built-in track current limit resistors rather than installing external voltage dropping resistors in series with each of the outputs of a conventional DC-DC converter. This not only eliminates the expense and space required for two resistors, additional wiring and maintenance, but also reduces energy requirements and the load placed on batteries and battery chargers.

The exceptionally small footprint of the os-Boss dcx2 provides for easier installation and saves space. Although wall mounting is standard, optional mounting adapters are available for 35mm DIN-Rail or either the P-150 or B style relay rack.

Front Panel and Functional Description

LED Indicators

Operational status of the os-Boss dcx2 is provided by the following three LED indicators:

- On initial power-up, indicator LEDs are tested by sequentially illuminating each LED for

approximately 1 second. Upon completion of the test, normal indications and operation will commence.

- Input Power Status LED (blue) indicates the input voltage status. If within the specified operating voltage limits, the LED will be either on or flashing. When flashing, the input voltage is near the upper or lower boundary of the specified operating input voltage. See Table 1a for a description of indications and meanings.
- Track 1 and Track 2 Output Status LEDs (red) indicate the output current status for each of the track circuits. If the output is not in use or if the output load is less than approximately 0.1 amperes, the LED will not be illuminated.

If the output is connected to a track circuit requiring less than 2.5 amperes, the LED will be on continuously.

If the circuit resistance is such that it would require more than 2.5 amperes (os-Boss will limit output current to 2.5 amperes), the respective track LED will flash. See Table 1b for a description of indications and meanings.

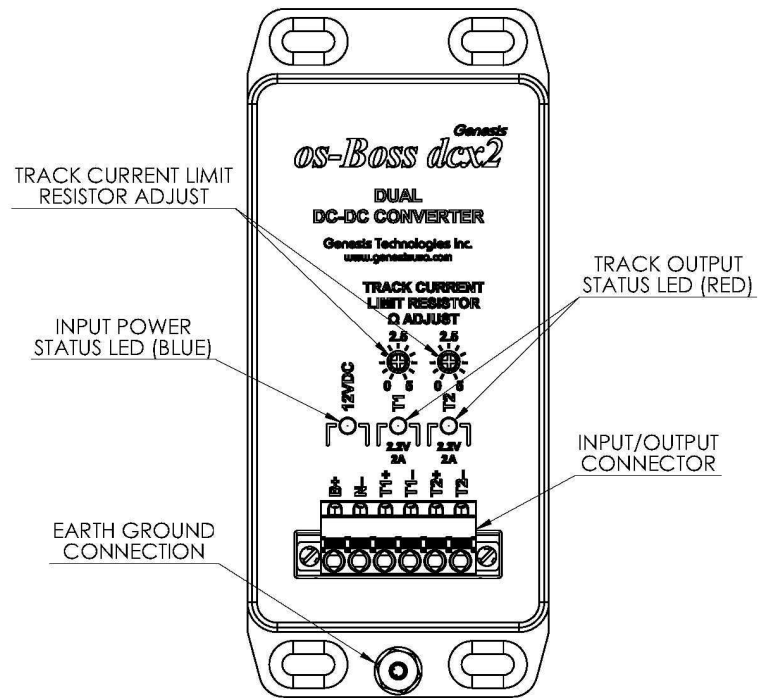


Figure 1 - os-Boss dcx2 Enclosure Front

	B - Input VDC				
	0 - 9.49	9.50 - 10.49	10.50 - 29.49	29.50 - 31.99	> 32.00
B LED (blue)	OFF ¹	FLASHING ¹	ON	FLASHING ²	OFF ²
Track 1 Output	DISABLED	ENABLED	ENABLED	ENABLED	DISABLED
Track 2 Output	DISABLED	ENABLED	ENABLED	ENABLED	DISABLED

¹Undervoltage
²Overvoltage

Table 1a - Input Power LED vs. Input Voltage and Output Operation

	Current Draw AMPS		
	0 - 0.09	0.1 - 2.49	2.50
Track 1 LED (red)	OFF	ON	FLASHING ¹
Track 2 LED (red)	OFF	ON	FLASHING ¹

¹Overcurrent (current limited at 2.5 Amps)

Table 1b - Track Status Indicators vs. Output Current

TRACK CURRENT LIMIT RESISTOR

Adjustment of the os-Boss dcx2 simulated 5-Ohm Track Current Limit Resistors is accomplished by rotating a single-turn potentiometer using a small common screwdriver through a hole in the front panel.

If the Track Current Limit Resistor is adjusted for 0 Ohms, the os-Boss dcx2 will output 2.2 VDC to the track/relay load at whatever amperage the load requires, however output current is limited to 2.5 Amps.

If the Track Current Limit Resistor is adjusted to more than 0 Ohms, the output voltage will vary with the load (typically track ballast) resistance. For example, if the os-Boss dcx2 Track Current Limit Resistor is adjusted to 2 Ohms and the resistance of the track ballast plus the relay and its current adjustment resistor is 2 Ohms, the os-Boss dcx2 output voltage will be 1.1 VDC.

If an external resistor is wired in series with the os-Boss dcx2 and the track ballast/relay load, the effective resistance of the track current limit resistance is the total of the os-Boss dcx2 Ohms setting and the resistance of the external resistor. For example, if the os-Boss dcx2 setting is 1 Ohm, the external series resistance is 1 Ohm, and the track ballast and relay resistance is 2 Ohms, the voltage at the output of the os-Boss dcx2 would be 1.65 VDC.

EARTH GROUND CONNECTION

An earth ground connection is mandatory in order to avoid damage to the os-Boss dcx2 caused by nearby lightning strikes or other voltage surges. All warranties are void if the earth ground connection is omitted or the ground buss is not properly connected to earth ground using AREMA recommended practice for signal equipment grounding.

Any of the following methods of grounding the os-Boss dcx2 are acceptable.

1. When using the 35mm DIN-rail method of mounting, the DIN-rail itself may be used as a suitable earth ground for one or more os-Boss dcx2s if it is connected to a nearby ground buss using an AWG #14 or larger wire that is no longer than 48 inches.
2. If a B1 or P-150 style relay rack mounting base is used to mount the os-Boss dcx2, the relay rack must also be grounded by connecting to a nearby ground buss using an AWG #14 or larger wire that is no longer than 48 inches.
3. If the os-Boss dcx2 is wall mounted on an ungrounded non-conductive surface, an AWG #14 wire or larger must be connected to the screw-terminal (see Figure 1) using a crimp type wire lug and routed directly to a nearby earth ground buss. This wire should not exceed 48 inches in length.

INPUT/OUTPUT CONNECTOR

A six-position plug-in connector provides input/output connections for 12 Volt battery input power and the 2.2 VDC track outputs. Each of the track outputs are electrically isolated from each other and from the 12 VDC battery input. A spring-cage (wire retainer) type mating connector is furnished with each os-Boss dcx2 which accommodates wire sizes as large as #AWG 12.

Installation

OVERVIEW

The DC Track Circuit - How it Works

The DC track circuit was patented in 1872 and has been the basis for many of the advancements made in train detection circuits in use today. For discussion purposes, a schematic for the conventional DC track circuit is shown in Figure 2a.

Referring to Figure 2a, the rails are used as electrical conductors and are part of the DC Track Circuit. Four insulated joints are required to isolate the track portion of each circuit from adjacent circuits or non-circuited track. Early DC track circuits used primary batteries for circuit power, but most modern installations use a DC-DC converter which converts nominal 12 VDC to around 2 VDC, which is then connected in series with an adjustable Track Circuit Limit Resistor to each of the rails of the track circuit.

On the opposite end of the track circuit, a track relay is connected in series with a Relay Current Adjustment Resistor.

When the two resistors are adjusted properly and the track is not occupied, the Track Circuit Relay will be “picked” or energized. If a train enters the track circuit, it shunts the track circuit and the Track Circuit relay will “drop” or be de-energized.

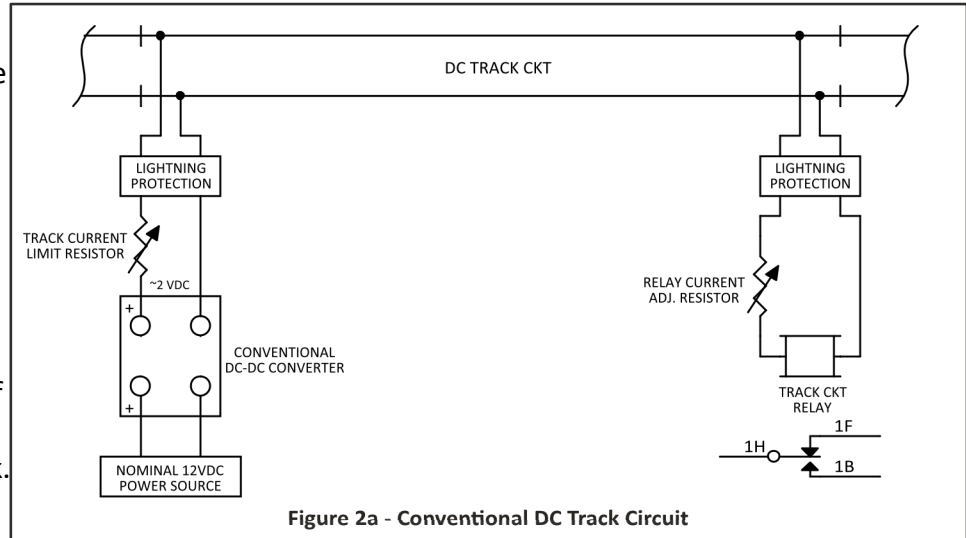


Figure 2a - Conventional DC Track Circuit

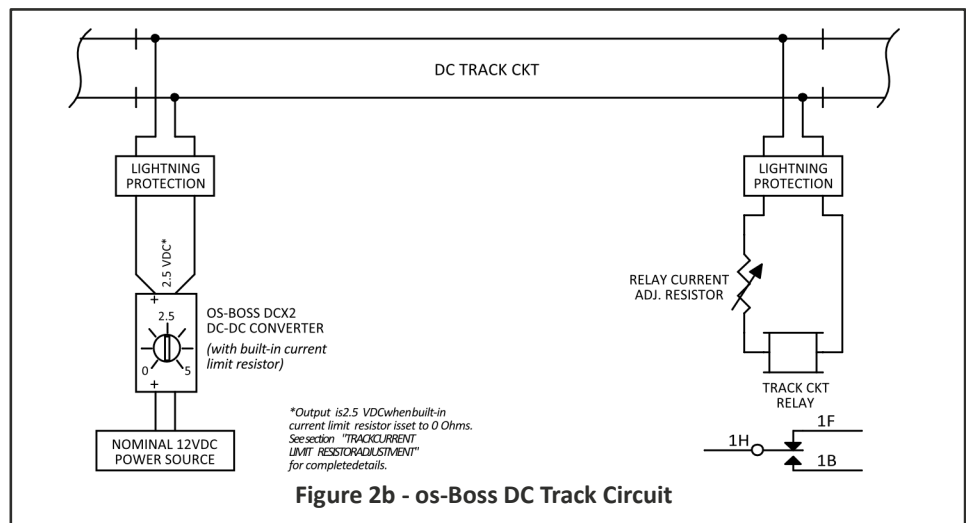


Figure 2b - os-Boss DC Track Circuit

The DC Track Circuit is made “vital” by the fact if the circuit is opened, say due to a bad rail-joint bond or broken rail, or is shunted, either by a train or failed insulation on a gauge rod, the Track Circuit Relay will “drop” and the circuit will appear to be occupied. Also, should the DC-DC converter fail, again the Track Circuit Relay will “drop.”

The os-Boss dcx2 is functionally similar to a conventional DC-DC converter with several exceptions:

- the Track Current Limit Resistor is built-in to the os-Boss dcx2;
- the output is regulated to 2.2 VDC and current limited to 2.5 Amps when built-in Track Current Limit Resistor is adjusted to 0 Ohms;

The built-in Track Current Limit Resistor is simulated in the os-Boss dcx2 and provides several advantages in installation and maintenance costs, power efficiency and space requirements.

Installation wiring is the same as with a conventional DC-DC converter except for the elimination of the physical Track Current Limit Resistor. The os-Boss dcx2 output is connected directly to the primary lightning protection which in turn is connected to the track rails.

Suggested wire sizes are AWG #12 or #14 within the equipment enclosure and AWG #6 between the enclosure and the rails. Wire lengths should be kept as short as practical to reduce losses in the field wiring.

Primary lightning protection should be air-gap or shunt type arresters and equalizers that meet AREMA recommended practice.

The os-Boss dcx2 Dual DC-DC converter is capable of "driving" two separate DC track circuits using nominal 12 Volt DC input power. Each output is capable of 2.2 VDC which is comparable to the voltage of primary batteries used in early track circuits.

Mounting the os-Boss dcx2

Four mounting methods are available for the os-Boss dcx2:

- Wall mounting (standard)
- 35mm DIN-Rail (optional)
- B-style relay rack (optional)
- P-150 style relay rack (optional)

Wall Mounting

Wall mounting is the standard method of mounting the os-Boss dcx2. Wall mounting is typical when mounting to plywood backboards and requires two to four #6 or #8 screws, preferably countersunk flat-head type. See Page 9 for a reference drawing with hole spacing and complete installation dimensions.

A wired connection between the os-Boss dcx2 earth-ground terminal and earth-ground is required for protection against lightning and other high-voltage surges. The AWG #14 (or larger) wired connection to the enclosure earth-ground buss must be 48 inches or less in length.

35mm DIN-Rail Mounting

An optional 35mm DIN-Rail base is required to mount the os-Boss dcx2 on DIN-Rail. The DIN-Rail base is available from Genesis and will be factory installed if ordered with the os-Boss dcx2. Two 6-32 machine screws (maximum length 1/4") are required if DIN-Rail base is user installed.

The required earth-ground connection to the os-Boss dcx2 may be accomplished by connecting the 35mm DIN-Rail to earth-ground using an AWG #14 (or larger) wire no longer than 48 inches in length to the enclosure earth-ground buss.

B-Style or P-150 Relay Rack Mounting

Bases for B-Style or P-150 relay rack mounting are available from Genesis and will be factory installed if ordered with the os-Boss dcx2. Two 6-32 machine screws (maximum length 1/4") are required if either relay rack type base is user installed.

The required earth-ground connection to the os-Boss dcx2 may be accomplished by connecting the relay rack to earth-ground using an AWG #14 (or larger) wire 48 inches or less in length to the enclosure earth-ground buss.

Os-Boss dcx2 B/N Power Source

The input operating power (B = battery positive and N = battery negative) source for the os-Boss dcx2 should be between 11.5 VDC and 24 VDC. Operation at voltages as low as 9.5 VDC and as high as 30 VDC are possible, but are not recommended for normal operation.

Current requirements can significantly vary with output load and input voltage. See the Specification Section for more information.

Wire Size and Connector Wiring

Suggested wire is AWG #12 to AWG #14 stranded. The mating female connector uses spring-cage type wire retainers and can accommodate one wire per position. Do NOT attempt to place more than one wire per position as only one wire can be reliably retained.

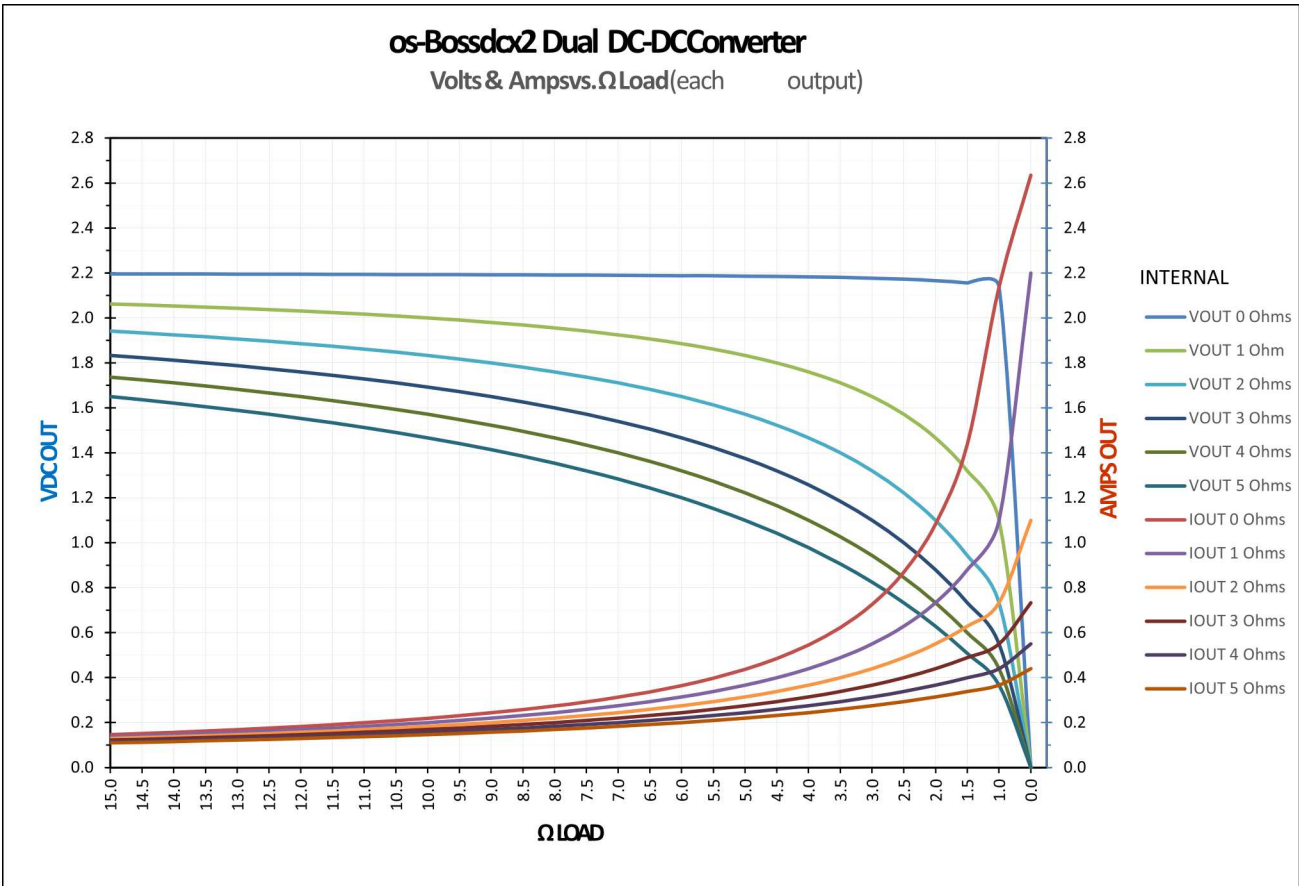
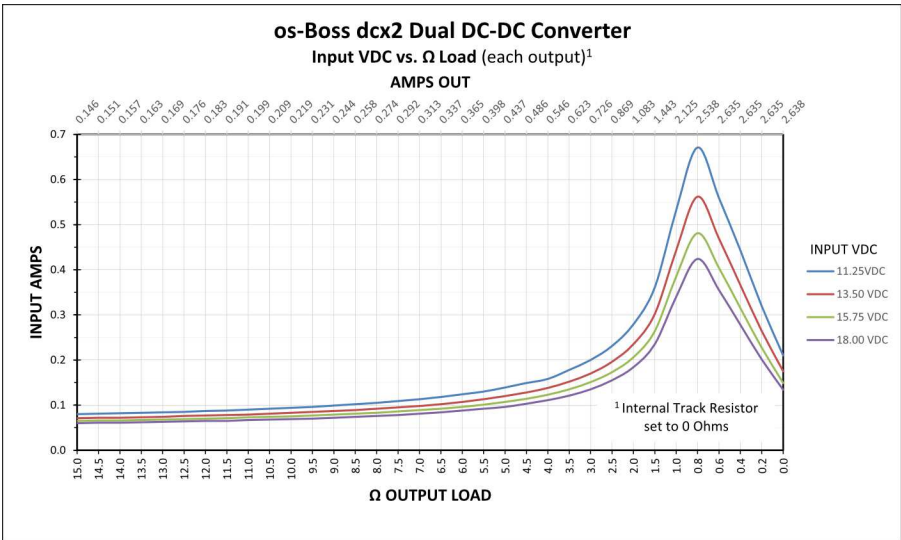
Do not wire the connector with power applied or when plugged-in to the os-Boss dcx2. Strip each wire of insulation approximately 3/8” or 10 mm. Open the cage-clamp by depressing the connector orange plunger using a small flat-blade screwdriver. Then push the wire into the appropriate receiver hole adjacent to the plunger and release the plunger. Make sure all wire strands are inside the receiver hole. No bare wire strands should be visible and only wire insulation should be exposed. Pull on the wire to make sure the cage clamp is firmly gripping the wire.

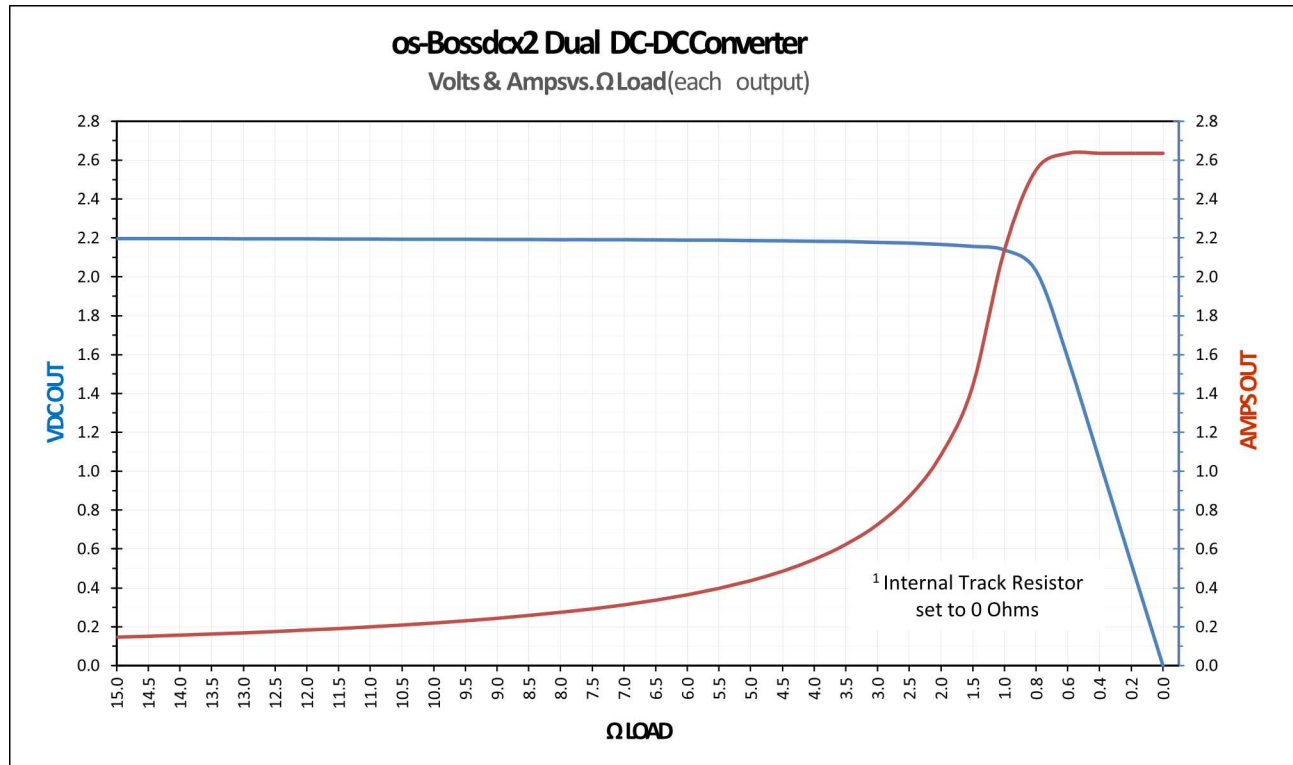
Double check your wiring for accuracy before plugging-in the connector and applying power. Damage caused by incorrect hookup is not covered by the warranty.

Specifications

<u>INPUTS</u>	Min.	Max.	Units
B/N	10.0	29.5	VDC
<u>OUTPUTS</u>			
T1+/T1-	0.20	2.2	VDC
T1+/T1-	0.20	2.2	VDC
<u>ENVIRONMENT</u>			
Operating Temperature Range	-40°	120°	°F
Humidity (non-condensing)		95%	Relative

For current requirements at various input voltages and output loads see following tables and graphs.





Three-Year Limited Warranty

Genesis warrants all new products for three-years against parts failure and workmanship unless the warranty terms are specifically stated otherwise on the invoice or packing slip for that product when shipped. Warranty is explicitly for parts and workmanship and not for design or function.

Any products we manufacture found to be faulty in any way may be returned for rework, shipping prepaid. If found to be in warranty, we will correct the fault or failure and return to you at no charge, shipping prepaid.

Warranty does not apply to damage caused by lightning, voltage surges, water, inappropriate storage, handling, misuse or if the product has been modified or repaired by others.

