



Innovative Thinking for Power Control

OZip DC-DC Converter

Hardware User's Manual

UM-0065

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Contact Information

USA

Telephone: 603-546-0090

Email techsupport@oztekcorp.com

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1. Introduction

This document is intended to provide detailed specifications and instructions on how to properly install and operate the OZip DC-DC Converter. To provide for safe installation and operation of the equipment, please read the safety guidelines at the beginning of this manual and follow the procedures outlined before connecting power to the converter. The converter can be configured in several variations. One of the more common configurations is that of a boost circuit, as illustrated in the block diagram of Figure 1. The mirror image of this is the buck configuration. In both cases, the product may be equipped with the following boost (buck) features according to the model ordered:

- Integrated output (input) discharge resistor
- Input (output) contactor
- Opto-Isolated Interlock input
- Opto-Isolated Fault status output
- Isolated RS-485, Modbus or CAN Serial Interface
- Optional Integrated Pre-Charge (Load Equalizing) circuitry
- Optional cooling fan drives

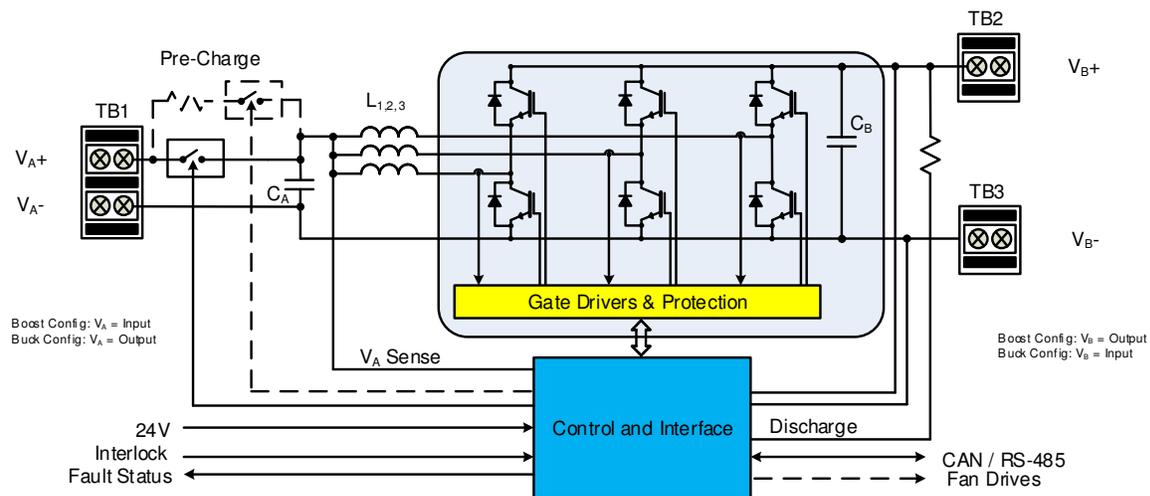


Figure 1 – System Block Diagram

1.1 Referenced Documents

Document	Owner	Description
UM-0052	Oztek	Oztek Power Studio™ User's Manual
UM-0055	Oztek	OZip-R Intelligent Power Module Hardware User's Manual
UM-0060	Oztek	Oztek DC/DC Converter User's Manual

1.2 General Information

Throughout this document, acronyms may be employed for brevity and readability. These are summarized in Table 1.

Table 1 – Document Acronyms

Acronym	Full Text Equivalent
AC	Alternating Current
AWG	American Wire Gauge
CAN	Controller Area Network
DC	Direct Current
ESD	Electro Static Discharge
GUI	Graphical User Interface
I/O	Input/Output
IPM	Intelligent Power Module
Max	Maximum
Min	Minimum
PWM	Pulse Width Modulation
RH	Relative Humidity

1.3 Safety Notices

The following safety notices are provided for your safety and as a means of preventing damage to the product or components in the application. Specific Dangers, Warnings, and Cautions that apply to particular activities are listed at the beginning of the relevant sections and are repeated or supplemented at critical points throughout these sections. Please read the information carefully, since it is provided for your personal safety and will also help prolong the service life of your DC/DC converter and the equipment you connect to it.

1.3.1 Definitions and Symbols

 DANGER	<p><i>This symbol indicates high voltage. It calls your attention to items or operations that could be dangerous to you and other persons operating this equipment. Read the message and follow the instructions carefully.</i></p>
 WARNING	<p>Indicates a potentially hazardous situation which, if not avoided, can result in serious injury or death.</p>

 CAUTION	<p>Indicates a potentially hazardous situation which, if not avoided, can result in minor to moderate injury, or serious damage to the product. The situation described in the CAUTION may, if not avoided, lead to serious results. Important safety measures are described in CAUTION (as well as WARNING).</p>
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1.3.2 Electrical Safety



DANGER

Power converters, such as the OZip DC-DC Converter, are typically connected to hazardous voltages. When servicing the converter, there may be exposed terminals at high DC potential, as well as residual charge in place for some time after the removal of the input source. Extreme care should be taken to protect against shock.

1. *Before startup, observe the warnings and safety instructions provided throughout this manual. All power terminals should be considered to be at high DC potential unless verified to be otherwise. These voltages are extremely dangerous and may cause death or severe injury if contacted.*
2. *All power terminals should be considered live with the application of input voltage regardless of operating mode of the load.*
3. *Do not make any connections when the OZip DC-DC Converter is connected to its power source.*
4. *Never work on the OZip DC-DC Converter, power wires, or load when input power is applied.*



WARNING

1. **The OZip DC-DC Converter is designed to discharge its inherent DC link capacitance to approximately 40 V_{DC} in approximately 1 minute from either the issuance of a discharge command or the loss of bias power. This discharge is contingent upon proper system conditions that disconnect the OZip DC-DC Converter from any power source, such as turbine generators, or storage devices, such as ultracapacitors, which might otherwise work to keep this node energized beyond the duration of time expected for discharge. It is the customer's responsibility to assure that system configuration is designed to ensure that no external source inhibits this link discharge. Regardless, qualified personnel must always verify that no DC link voltage remains present on the system before any service can occur.**

2. Do not make any insulation or voltage withstand tests on the OZip DC-DC Converter.
3. Before servicing the unit, always ensure by measuring with a multimeter that
 - a. There is no voltage at either side of the DC relay between the AC terminals (A, B, & C) and the base plate of the OZip Module, considered chassis ground.
 - b. There is no voltage between the DC interface terminals (+ & -), nor between either DC terminal and the base plate, considered chassis ground.

**CAUTION**

1. The converter operates on several electrical reference points, whether these be earth ground, communication ground, signal ground, etc. Proper system design with regard to equipotential bonding must be employed so that all simultaneously accessible conductive parts are electrically connected to prevent hazardous voltages appearing between them. This is accomplished by a proper factory grounding. See section 5.2 for details pertaining to the attachment of earth ground connections of the OZip-R heatsink and the switchgear plate as earth, safety ground points.
2. Ensure sufficient cooling for safe operation of the converter. Even so, power range capabilities will allow numerous sub-assemblies or portions thereof to reach and maintain temperatures high enough to burn skin on contact. Allow adequate time for cooling before attempting to service the unit.
3. Remove any external enabling signals before resetting system faults to prevent an unintentional restart of the converter, which could result in personal injury or equipment damage.
4. The converter is not field repairable. Never attempt to repair a malfunctioning unit; contact Oztek for a replacement.
5. The OZip-R Intelligent Power Module found in each converter is sealed with a warranty void sticker across the top cover which will tear if the cover is removed. A torn warranty void sticker shall be interpreted as unauthorized access to the internal contents of the OZip-R Intelligent Power Module, in violation of warranty terms, thereby terminating any remaining warranty otherwise in effect for the OZip – DC-DC Intelligent Power Solution.

2. OZip – DC-DC Converter Model Identifier

Use Figure 2 to identify the model of OZip – DC-DC Converter in question. As shown, the model would be OZip-DC105AESMP850, a system based on the OZip-R Intelligent Power Module platform, on an extruded heatsink without Oztek provided cooling. This solution would be capable of sourcing 105 Amps from its input and boosting to a maximum voltage of 850 V_{DC}, configured as a split plate solution with integrated pre-charge and controlled via an RS-485 interface.

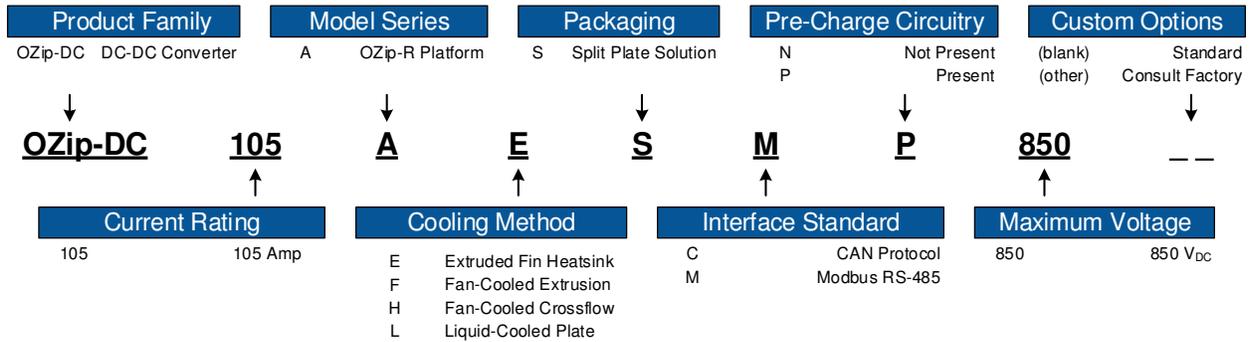


Figure 2 – OZip – DC-DC Converter Part Number Identifier

3. Shipping Information

3.1 Packaged Weights

Subassembly	Description	Weight kg (lbs)
OZip-R	Bracketed OZip-R Intelligent Power Module	20 (44)
11456-01	Open Frame Switchgear Assembly	10 (22)
11456-02 & 11472-01	Open Frame Switchgear Assembly & Fan Plenum	12 (26)
11456-03 & 11472-01	Open Frame Switchgear Assembly & Fan Plenum	14 (31)

3.2 Packaged Dimensions

Subassembly	Description	Length mm (in)	Width mm (in)	Height mm (in)
OZip-R	Bracketed OZip-R IPM	610 (24)	450 (18)	300 (12)
11456-01	Open Frame Switchgear Assembly	610 (24)	450 (18)	300 (12)
11456-02 & 11472-01	Open Frame Switchgear Assembly & Fan Plenum	610 (24)	450 (18)	300 (12)
11456-03 & 11472-01	Open Frame Switchgear Assembly & Fan Plenum	610 (24)	450 (18)	300 (12)

3.3 Unpacking and Inspection



CAUTION

1. Using the provided packing list and marking on the product itself, verify that the model received corresponds to that ordered.
2. Inspect packaging for any signs of shipping damage. Immediately seek assistance from the freight carrier for any visible signs that the packaging or product has been compromised.
3. The OZip DC-DC Converter is a sensitive electronic product. While it has been designed to mitigate risks of ESD damage under normal circumstances, care should be taken not to handle electrical interfaces unnecessarily.
4. The converter is equipped with handles for hoisting and movement. Lift only by these handles.

4. Specifications

4.1 Electrical Specifications

Note that the bi-directional nature of the hardware allows the DC-DC Converter to be configured in either a boost or buck configuration, provided that the appropriate software code and operational configuration parameters are likewise aligned. Therefore, the concept of “input” and “output” are highly dependent upon application. For the purposes of specification in the table to follow, “input” and “output” assumes a boost orientation, similar to that shown in Figure 1. These limits hold, but apply to “output” and “input” if the application is as a buck. Similarly, a boost’s pre-charge is essentially a buck’s load equalizer.

Orderable Part Number	<u>11445-01</u>	<u>11445-02</u>	<u>11445-03</u>
General			
Power Rating	5 kW	25 kW	25 kW
Inrush Current, Pre-Charge	< 1.2 A	< 0.72 A	< 0.53 A
DC Input			
Max Operating Voltage	54 V _{DC}	400 V _{DC}	750 V _{DC}
Min Operating Voltage	42 V _{DC}	280 V _{DC}	280 V _{DC}
Maximum Rated Current	105 A @ 48 V _{DC}	89 A @ 280 V _{DC}	89 A @ 280 V _{DC}
DC Output			
Max Operating Voltage	850 V _{DC}	850 V _{DC}	850 V _{DC}

Circuit Isolation			
Signal Terminals	1000 V	1000 V	1000 V
	Communications and I/O with respect to DC terminals		
DC Terminals	1000 V	1000 V	1000 V
	DC power terminals with respect to Chassis		
Bias Power			
Voltage (min)	18 V _{DC}	18 V _{DC}	18 V _{DC}
Voltage (max)	36 V _{DC}	30 V _{DC}	30 V _{DC}
Current (max)	1.5 A	3.7 A	3.7 A
Fan Drive			
Supply Voltage	Not used	Bias Power Voltage	Bias Power Voltage
Nominal Current Draw	None	0.54 A (per fan)	0.54 A (per fan)
PWM High Output	Not applicable	> 4.5 V	> 4.5 V
PWM Low Output	Not applicable	< 0.4 V	< 0.4 V
Discrete Outputs			
Voltage (max)	45 V _{DC}	45 V _{DC}	45 V _{DC}
Current (max)	50 mA	50 mA	50 mA
Discrete Inputs (Using Bias)			
Voltage (min)	18 V _{DC}	18 V _{DC}	18 V _{DC}
Voltage (max)	36 V _{DC}	30 V _{DC}	30 V _{DC}
Current (max)	7 mA	6 mA	6 mA
Isolated Supply			
Voltage (min)	5 V _{DC}	5 V _{DC}	5 V _{DC}
Voltage (max)	36 V _{DC}	36 V _{DC}	36 V _{DC}
Current (max)	7 mA	7 mA	7 mA

4.2 Environmental Specifications

Operating Temperature Range	-40 to 65°C
Storage Temperature Range	-55 to 65°C
Operating Humidity Range	0 – 95% RH (no condensation)
Storage Humidity Range	0 – 95% RH (no condensation)
Pollution Degree	OZip-R – Pollution Degree 3 11456-**- Pollution Degree 2
Ingress Protection Rating	n/a
Required Air Flow at Full Rating	5.7 m ³ / minute

4.3 Mechanical Specifications

Cooling	Forced air.
Weight	OZip-R – 18 kg (40 lb) 11456-01 – 8 kg (18 lb) 11456-02 – 8 kg (18 lb) 11456-03 – 10 kg (23lb) 11472-01 – 1 kg (2 lb)

4.4 Mechanical Dimensions

Perspective views of the various OZip DC-DC Converter models are illustrated in Figure 3 through Figure 5. Note that wiring and mounting hardware are omitted for the sake of clarity. The corresponding product dimensions, as installed, are likewise provided in Figure 6 through Figure 8, respectively.

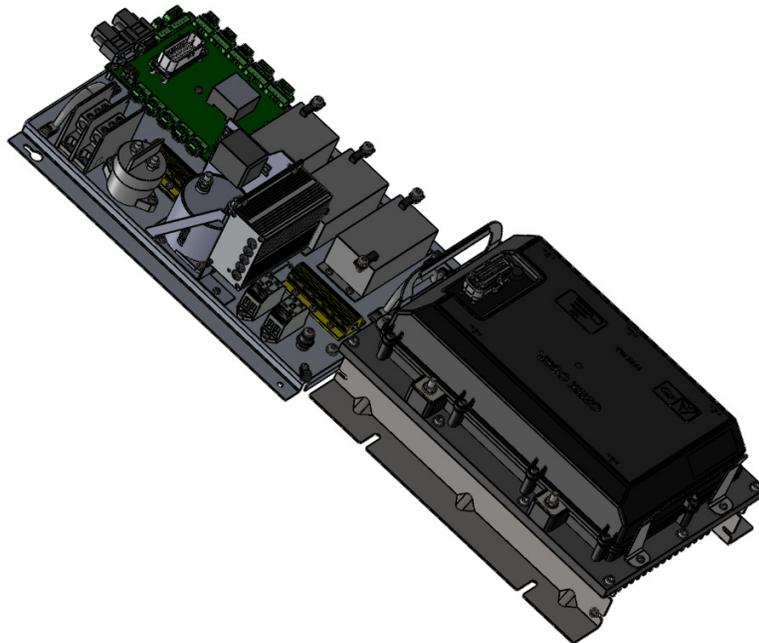


Figure 3 – Perspective View of 11445-01

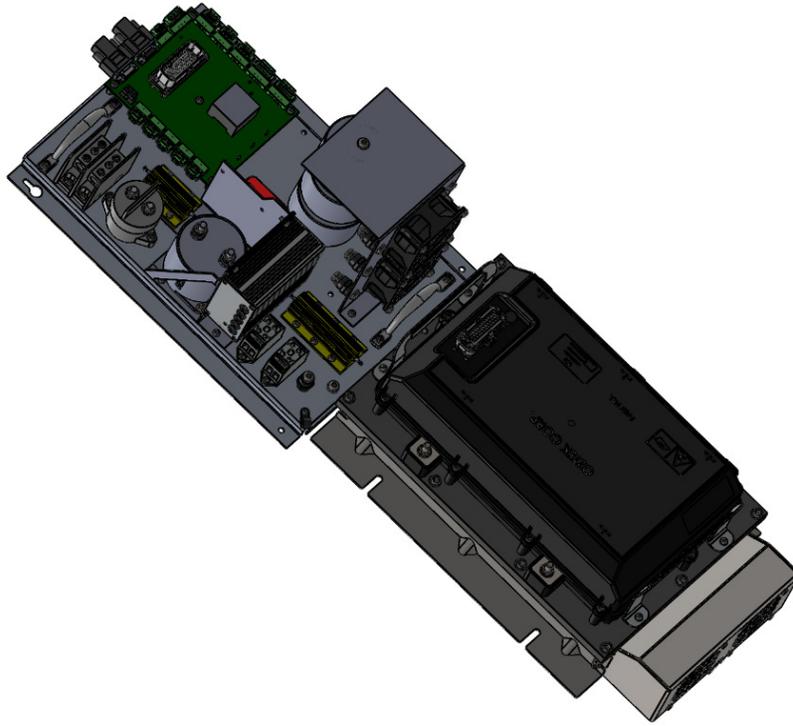


Figure 4 – Perspective View of 11445-02

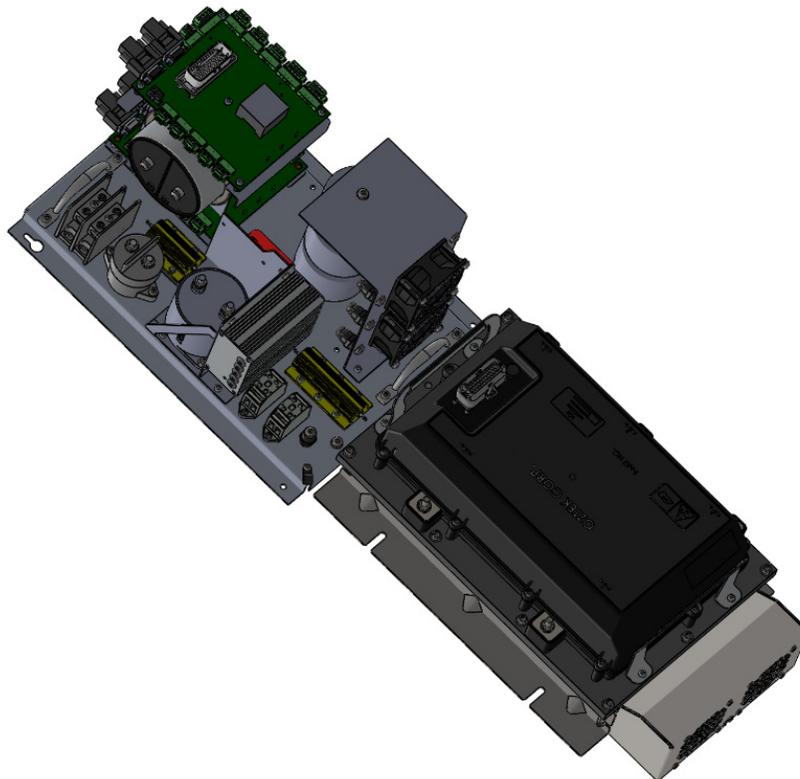


Figure 5 – Perspective View of 11445-03

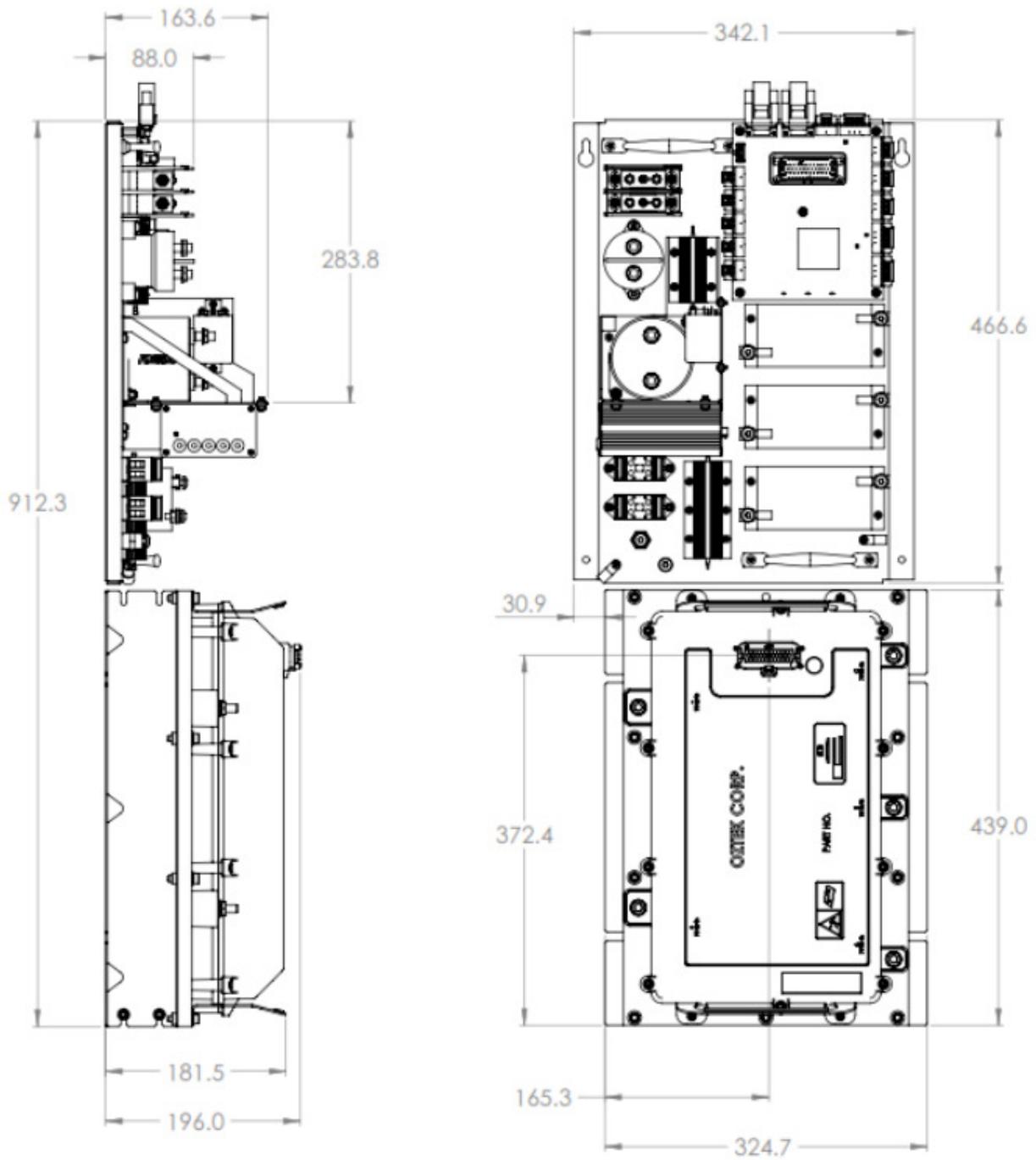


Figure 6 – 11445-01 Product Dimensions (in millimeters)

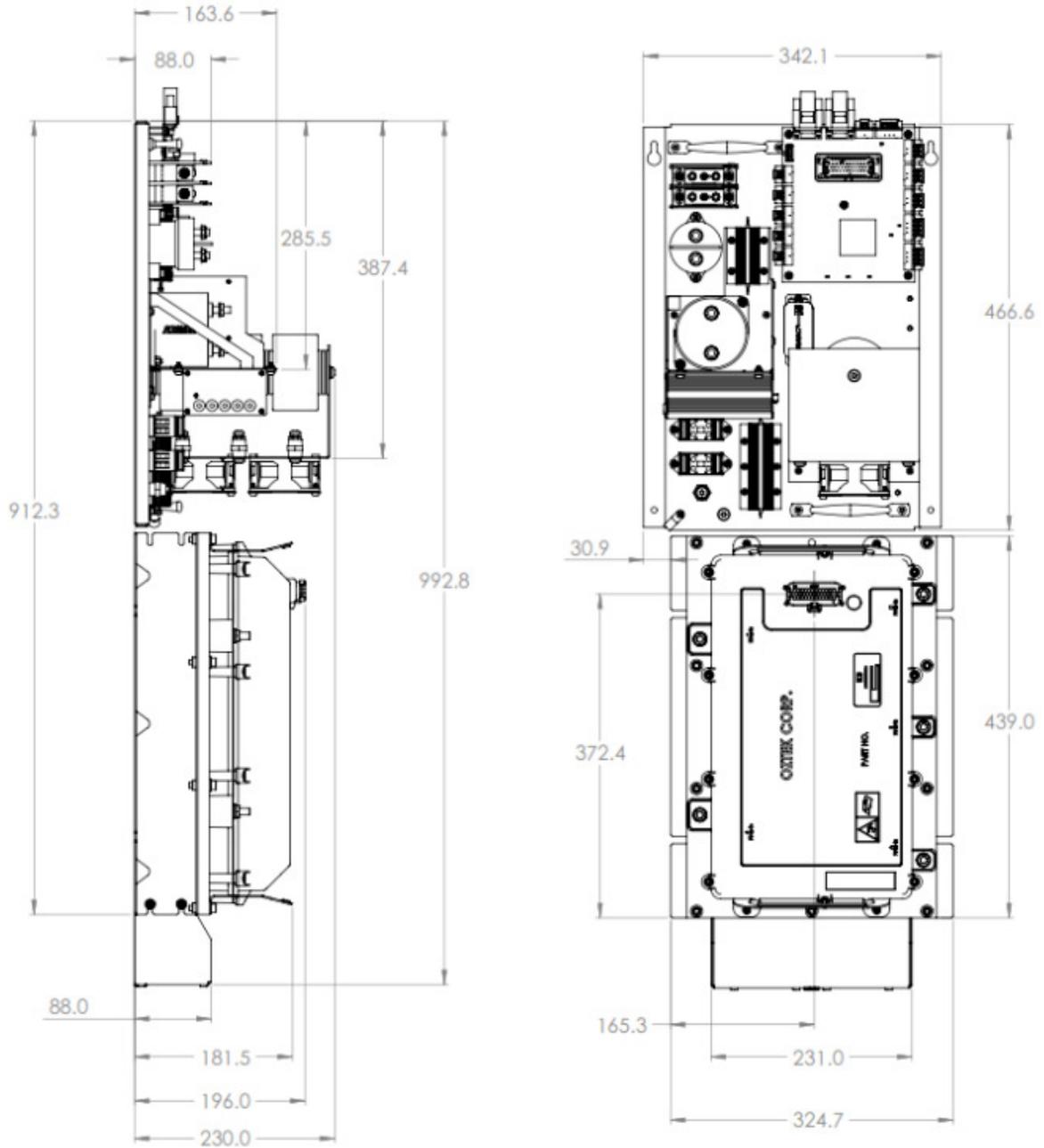


Figure 7 – 11445-02 Product Dimensions (in millimeters)

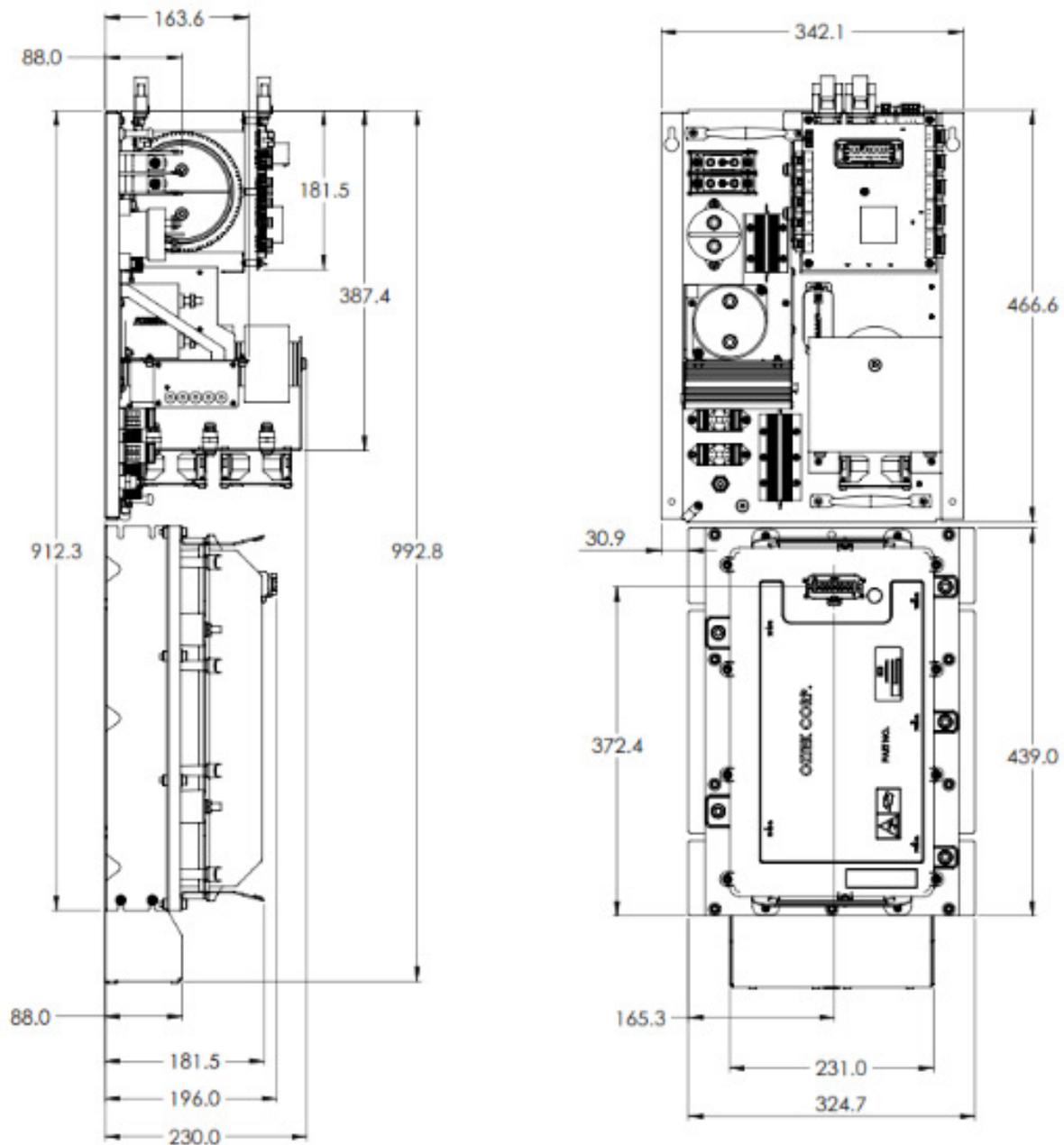


Figure 8 – 11445-03 Product Dimensions (in millimeters)

5. Assembly and Installation

5.1 Mechanical Mounting

The OZip DC-DC Converter, as configured in the split-plate solution, is provided as two sub-assemblies to allow for more convenient manual handling for lift and installation. In both

cases, the units should only be lifted and moved using the two handles found on opposite sides of each assembly. Handling otherwise risks damage to the assemblies and voids warranty protection.

5.1.1 Mounting the Fan Plenum Brackets to the OZip-R

Integrate the fan plenum brackets onto the OZip-R IPM using the provided fasteners, as illustrated in Figure 9. Note that nine hardware sets are provided loose, though only eight are required to attach the brackets. The ninth set is provided for the customer supplied grounding cable that is required to earth ground the heatsink. If equipped with a fan plenum 11472-01, attach as shown in Figure 10.

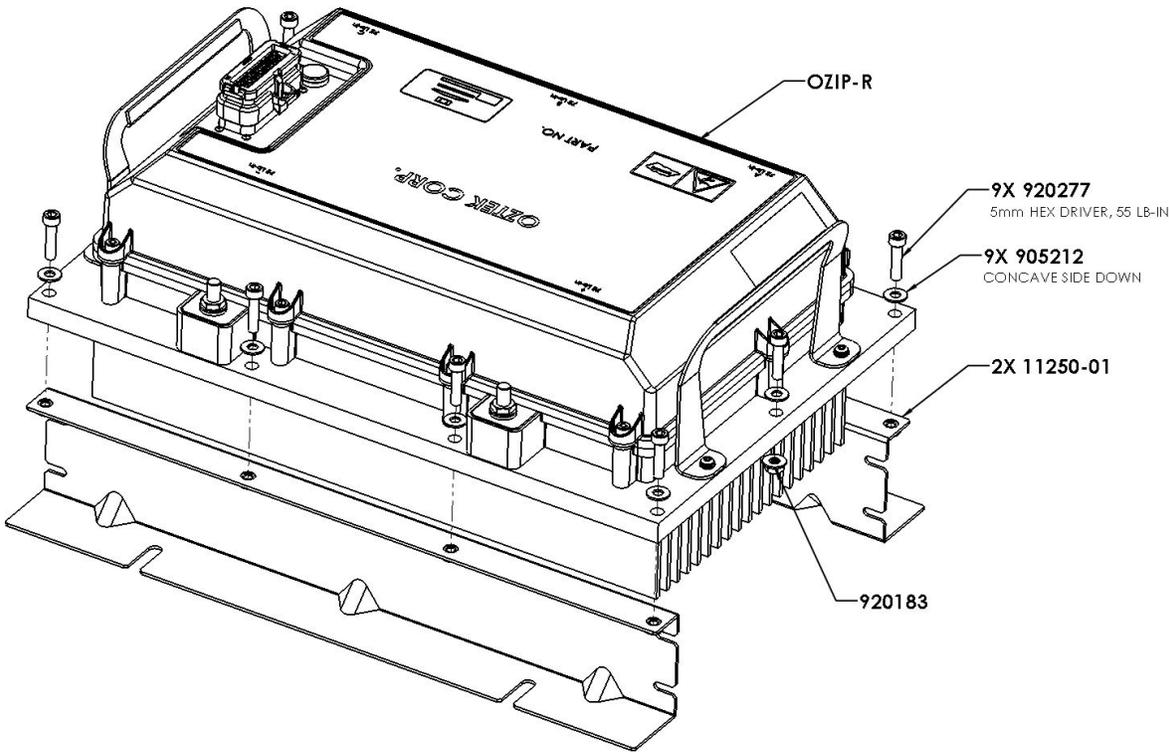


Figure 9 – Bracket Attachment for the OZip-R

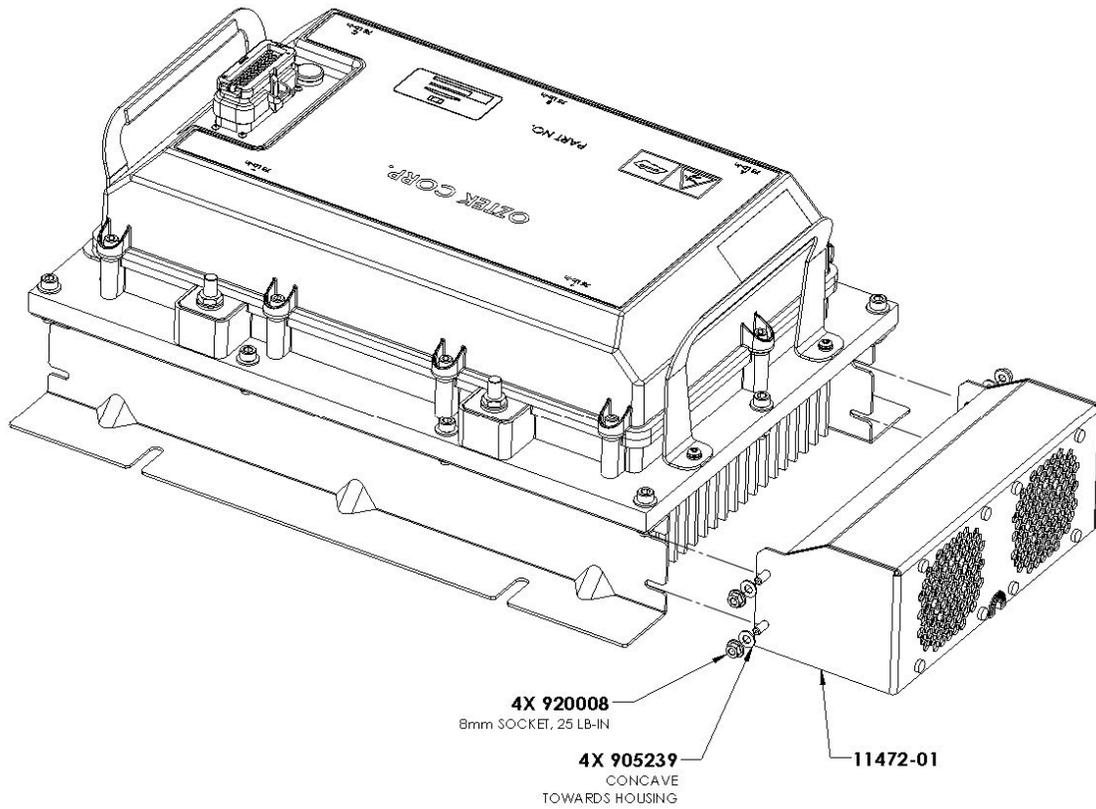


Figure 10 – Fan Plenum Attachment for the OZip-R

5.1.2 Mounting the OZip DC-DC Converter to a Base Plate

The mounting requirements for the OZip DC-DC Converter are shown in Figure 11.

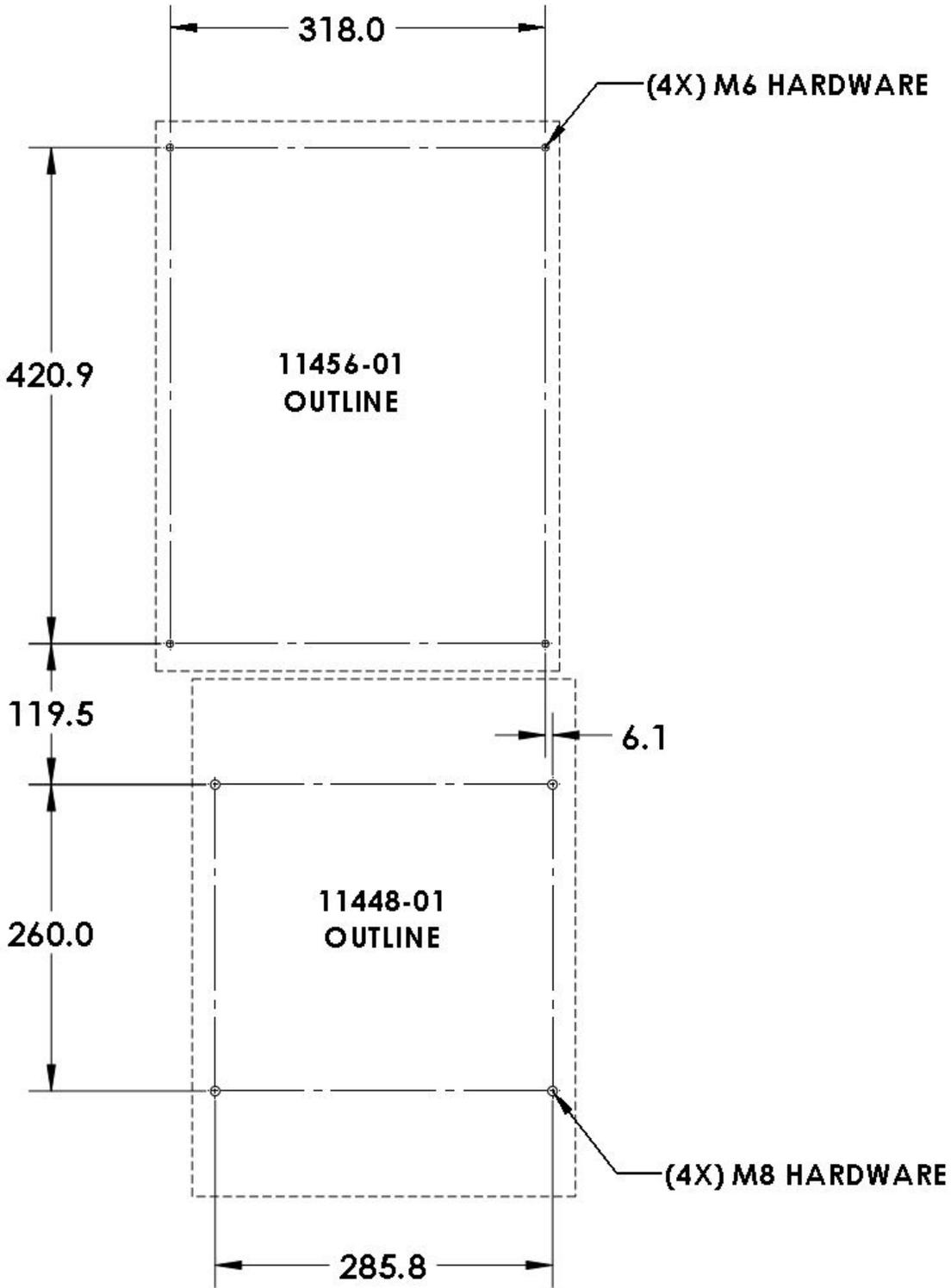


Figure 11 – Mounting Pattern for OZip DC-DC Converter (in millimeters)

5.2 Subassembly Interconnect

Using the hardware stack up convention defined by Figure 12, connect the OZip-R and 11456-** subassemblies electrically. The system subassemblies should be connected using the provided cables and terminating hardware as illustrated in Figure 13, if there is no fan present, or as illustrated in Figure 14, if there is. Note that not all models require or include the fan assembly. Torque values shall be as specified +0 / -5%.



Figure 12 – Power Terminal Hardware Stack Up

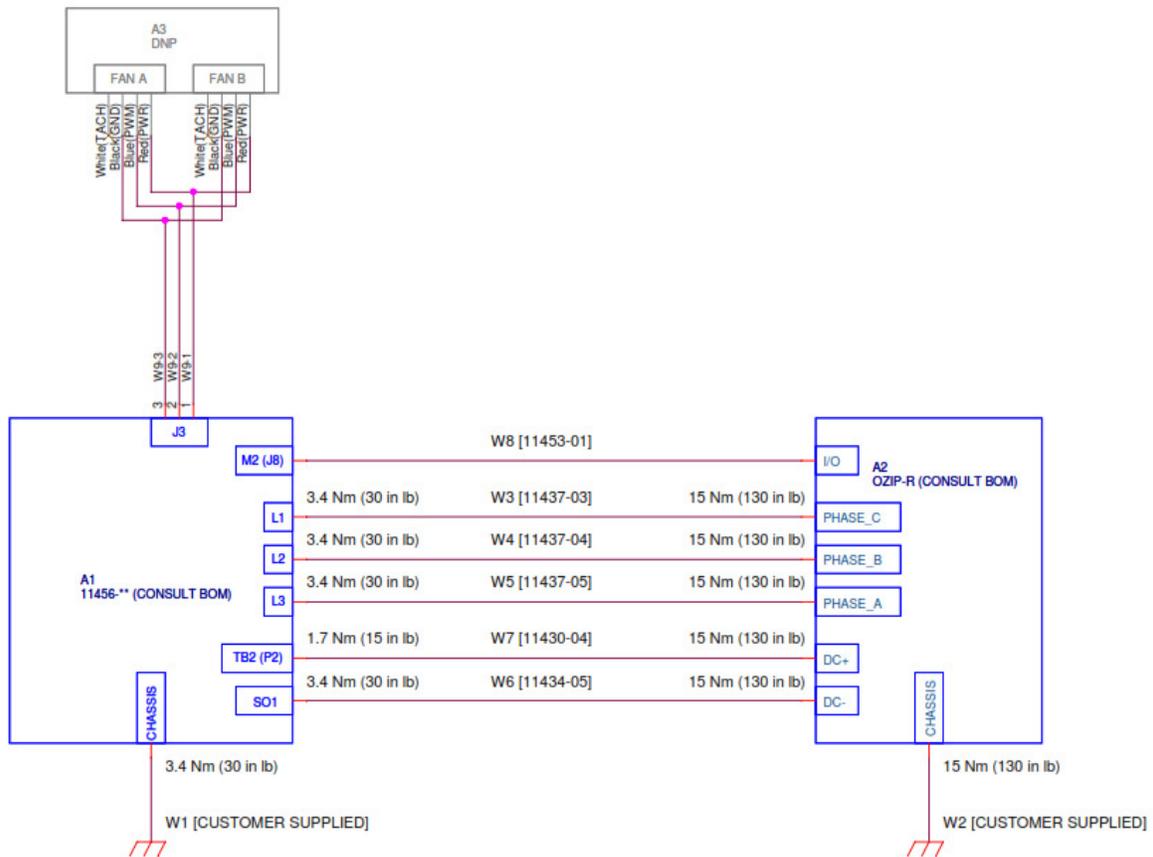


Figure 13 – OZip DC-DC Converter Interconnection Wiring Diagram without Fans

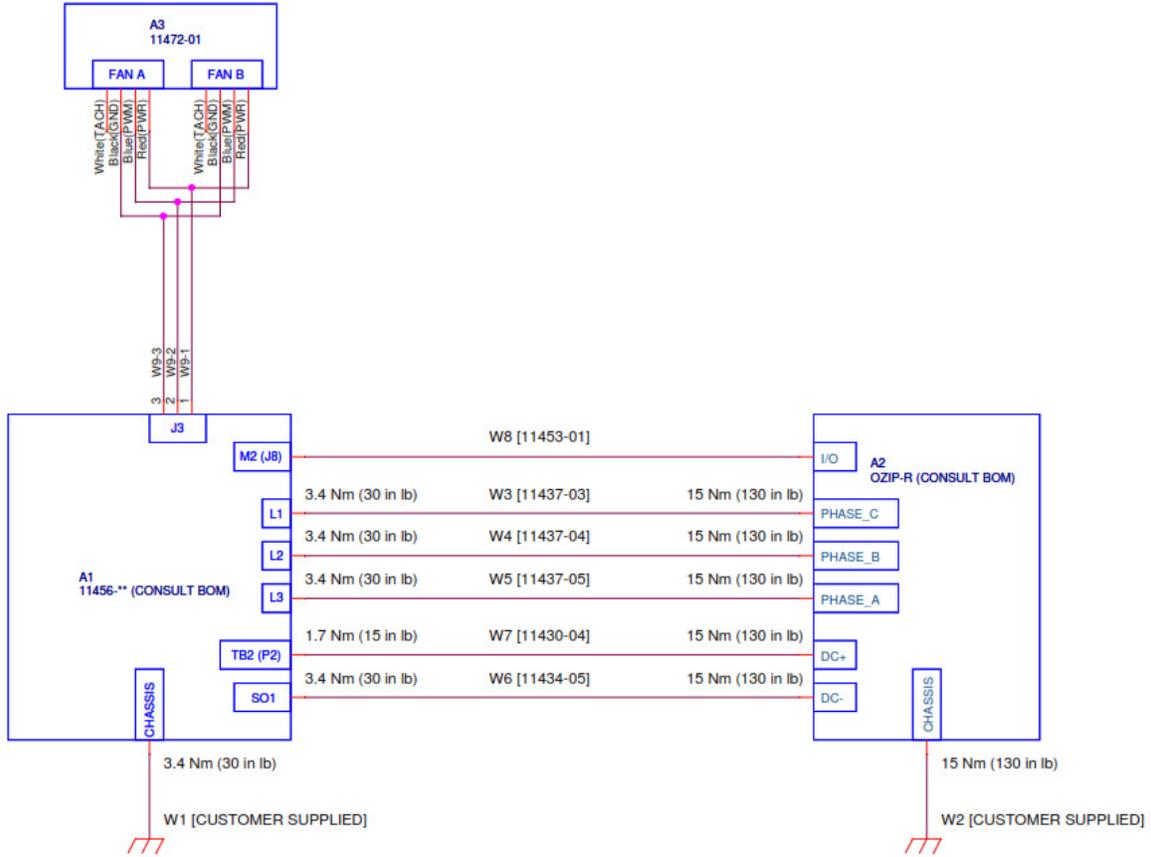


Figure 14 – OZip DC-DC Converter Interconnection Wiring Diagram with Fans

The mounting plate of the 11456-** Open Frame Switchgear Assembly and the heatsink of the OZip-R IPM have been designated as chassis potential and shall require proper earth grounding in accordance with standards of the local electrical code.

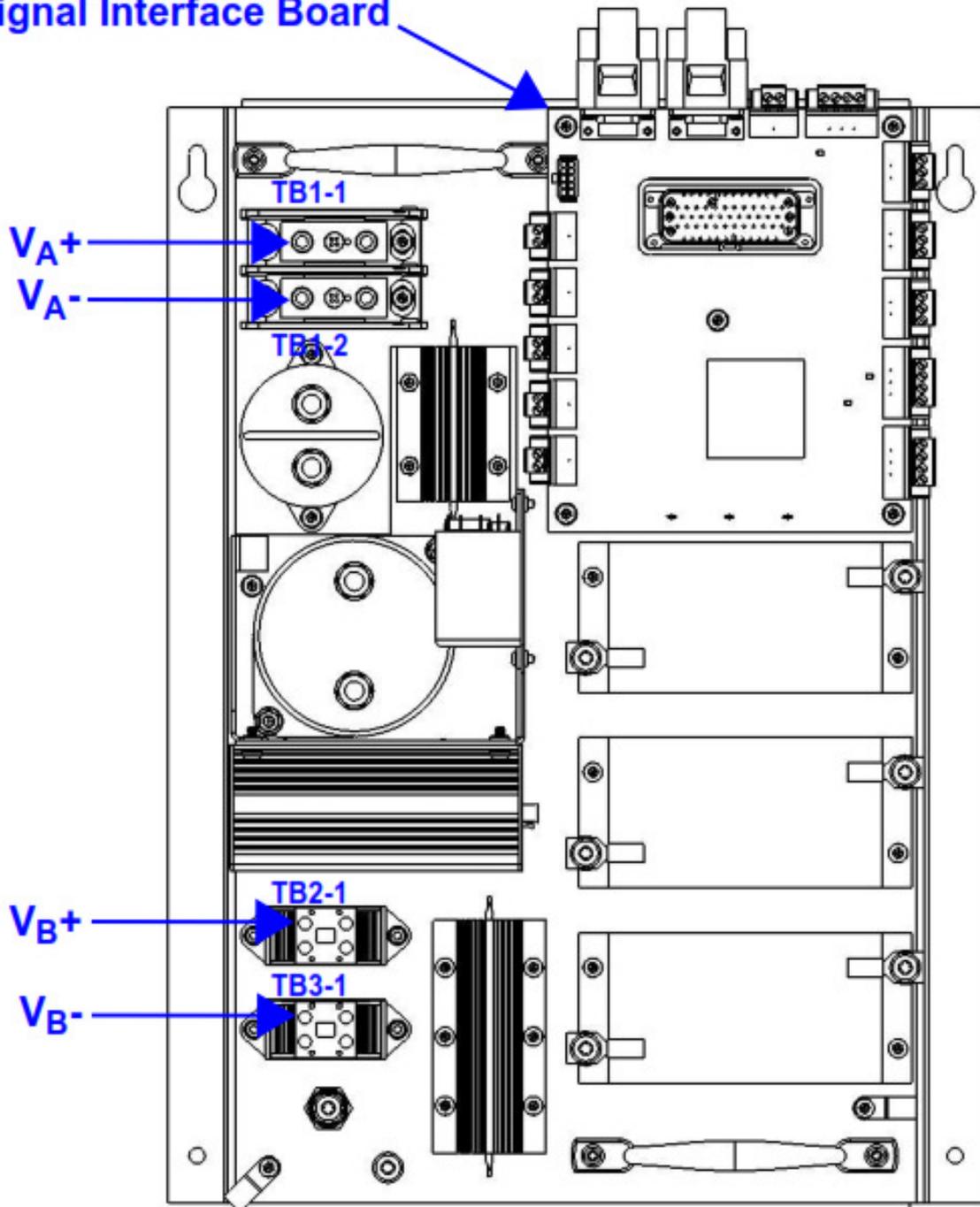
The 11472-01 Fan Plenum, if applicable, is grounded through the mechanical attachment to the mounting bracketry of the OZip-R Intelligent Power Module.



Observe proper polarity when connecting the DC link terminals. Reversing polarity will result in damage to the OZip – DC-DC IPM. It is highly recommended that contact lubricant be applied to the terminal lugs prior to installation to extend cable interface longevity and that the terminals themselves be properly greased to reduce the risk of galling with the tightening of the nuts.

6. Interface

Signal Interface Board



6.1 Power Connections

DC power connections are made at terminal blocks 1, 2, and 3, as defined in Table 2.

Table 2 – External Power Connections

Terminal Block Designator	Pole	Signal	Min Wiring Voltage Insulation	Recommended Minimum Wire Size	Torque +/- 5%
TB1	1	V _{A+}	11445-01: 300 V 11445-02: 600V 11445-03: 1000 V	11445-01: 4 AWG 11445-02: 6 AWG 11445-03: 6 AWG	5.1 Nm (45 in lb)
TB1	2	V _{A-}	11445-01: 300 V 11445-02: 600V 11445-03: 1000 V	11445-01: 4 AWG 11445-02: 6 AWG 11445-03: 6 AWG	5.1 Nm (45 in lb)
TB2	1	V _{B+}	11445-01: 1000 V 11445-02: 1000V 11445-03: 1000V	11445-01: 18 AWG 11445-02: 10 AWG 11445-03: 10 AWG	1.7 Nm (15 in lb)
TB3	1	V _{B-}	11445-01: 1000 V 11445-02: 1000V 11445-03: 1000V	11445-01: 18 AWG 11445-02: 10 AWG 11445-03: 10 AWG	1.7 Nm (15 in lb)

6.2 Signal Interfaces

All customer control signal interfaces are made through the 11237-02 Interface Board found on the Open Frame Switchgear Assembly, 11456-**, shown in Figure 15.

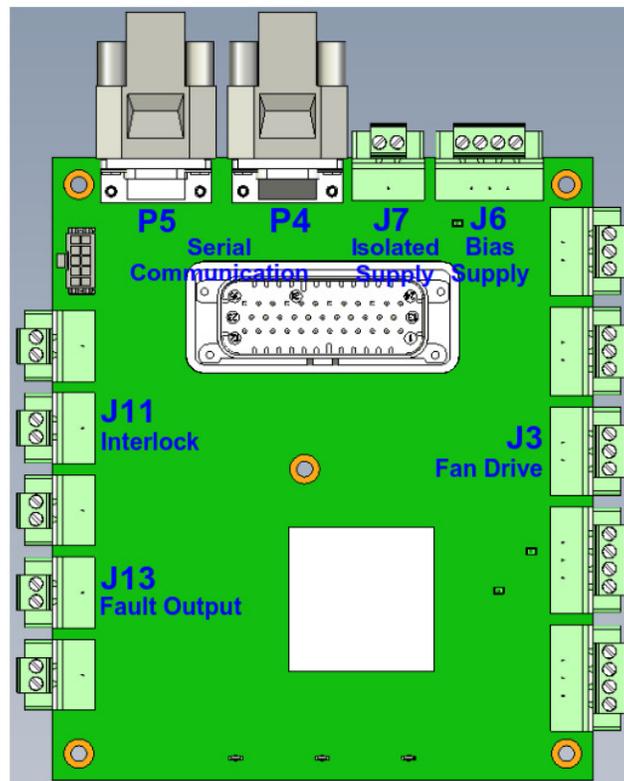
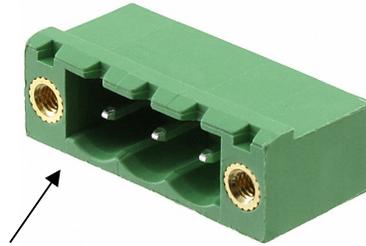


Figure 15 – Interface Board (11237-02) Interface Drawing

6.2.1 Fan Drive Interface – J3

The DC/DC converter distributes the bias power of the system to cooling fans, if equipped, through the pluggable terminal block connector J3, as shown in Figure 16. Connector part information and pin assignments are provided in Table 3.



PIN 1

Figure 16 – Connector J3 Pin Orientation and Circuit Interface

Table 3 – J3 Connector Specification and Pin Assignment

Manufacturer:	Phoenix Contact	
Manufacturer P/N:	1776511	
Mating P/N:	1777992 or equivalent	
Pin #	Signal Name	Minimum Wire Gauge
1	PWR+	24 AWG
2	FAN_PWM	24 AWG
3	GND	24 AWG

6.2.2 Bias Supply Interface – J6

The DC/DC converter requires 24V bias power be provided on the pluggable terminal block connector J6, shown in Figure 17. Connector part information and pin assignments are provided in Table 4.

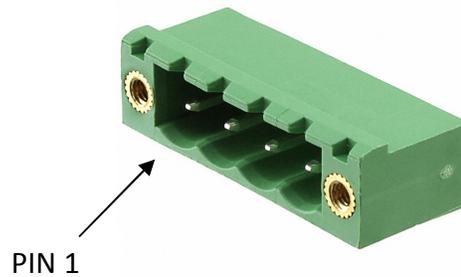


Figure 17 – Connector J6 Pin Orientation

Table 4 – J6 Connector Specification and Pin Assignment

Manufacturer:	Phoenix Contact		
Manufacturer P/N:	1776524		
Mating P/N:	1778001 or equivalent		
Pin #	Signal Name	Minimum Wire Gauge	Notes
1	PWR+	24 AWG	
2	PWR+	24 AWG	Factory jumpered to J7-1
3	GND	24 AWG	
4	GND	24 AWG	Factory jumpered to J7-2

6.2.3 Isolated Supply Interface – J7

The DC/DC converter offers isolated discrete input control, if desired, through the interface at J7, shown in Figure 18. In addition to isolation, this allows a wider voltage range than limitations on the bias needs of the system would otherwise permit. For convenience, the system is factory shipped with the isolated supply interface tied to the system bias input. To use this feature, simply remove the jumpers connecting the isolated input to the bias supply lines. Connector part information and pin assignments are provided in Table 5.

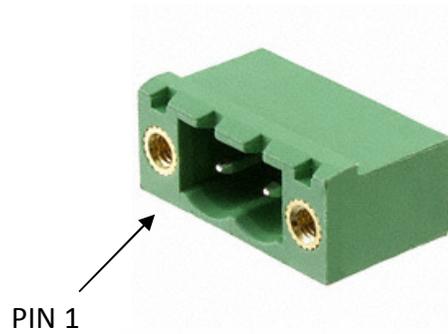


Figure 18 – Connector J7 Pin Orientation

Table 5 – J7 Connector Specification and Pin Assignment

Manufacturer:	Phoenix Contact		
Manufacturer P/N:	1776508		
Mating P/N:	1777989 or equivalent		
Pin #	Signal Name	Minimum Wire Gauge	Notes
1	OPTO+	24 AWG	Factory jumpered to J6-2
2	OPTO-	24 AWG	Factory jumpered to J6-4

6.2.4 Interlock Input – J11

The DC/DC converter provides an opto-isolated interlock input on the pluggable terminal block connector J11. This input is intended to be wired in series with an emergency shut-off, as illustrated in Figure 19, and must be driven for the DC/DC to operate. **Note: If an emergency shutoff is not implemented, pins 1 and 2 should be jumpered together.** Connector part information and pin assignments are provided in Table 6.

As factory set for customer convenience, this input utilizes the bias supply required for powering the controller. To employ the isolation feature, remove the jumpers connecting J6 to J7 and provide an additional isolated supply to the parameters defined herein.

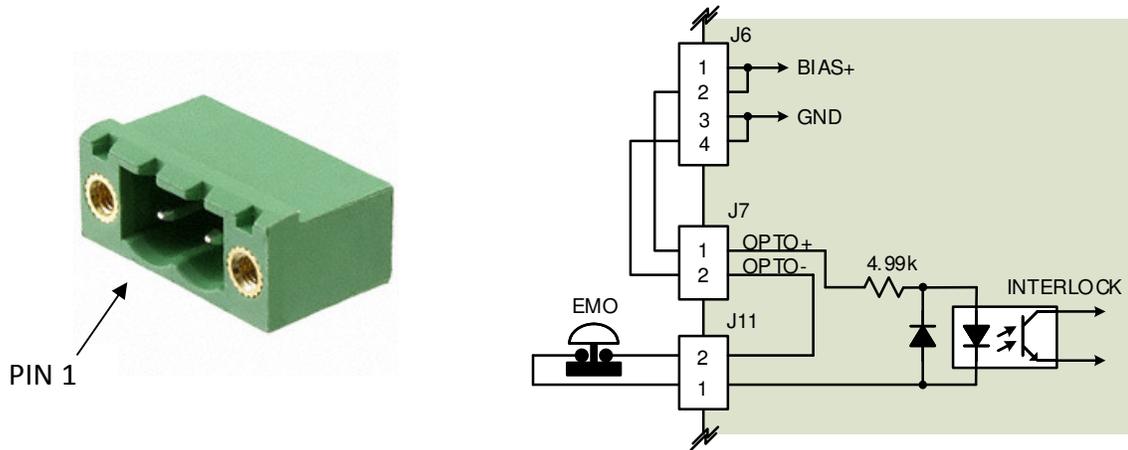


Figure 19 – Connector J11 Pin Orientation and Circuit Interface

Table 6 – J11 Connector Specification and Pin Assignment

Manufacturer:	Phoenix Contact	
Manufacturer P/N:	1776508	
Mating P/N:	1777989 or equivalent	
Pin #	Signal Name	Minimum Wire Gauge
1	ILOCK_RTN	24 AWG
2	OPTO-	24 AWG

6.2.5 Fault Output – J13

The DC/DC converter provides an opto-isolated fault output indicator on the pluggable terminal block connector J13. As shown in Figure 20, this output is driven anytime the DC/DC converter is in the Fault state. Connector part information and pin assignments are provided in Table 7.

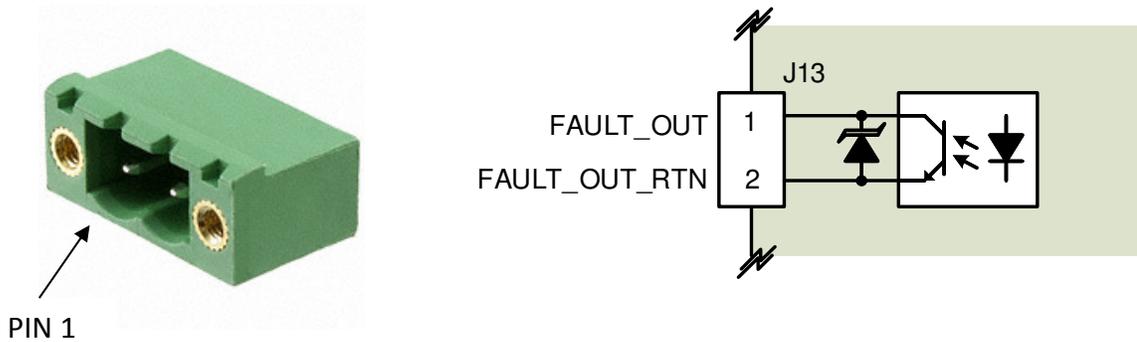


Figure 20 – Connector J13 Pin Orientation and Circuit Interface

Table 7 – J13 Connector Specification and Pin Assignment

Manufacturer:	Phoenix Contact	
Manufacturer P/N:	1776508	
Mating P/N:	1777989 or equivalent	
Pin #	Signal Name	Minimum Wire Gauge
1	FAULT_OUT	24 AWG
2	FAULT_OUT_RTN	24 AWG

6.2.6 Serial Communication Interface – P4 & P5

The serial communication interface connectors are standard 9-pin, subminiature D-style connectors with 4-40 threaded screw locks for mating cable attachment. There are two connectors available, denoted as P4 and P5, so that the converter can be easily daisy-chained within a system's network. Connector part information and contact assignments are provided in Figure 21 and Table 8, respectively.

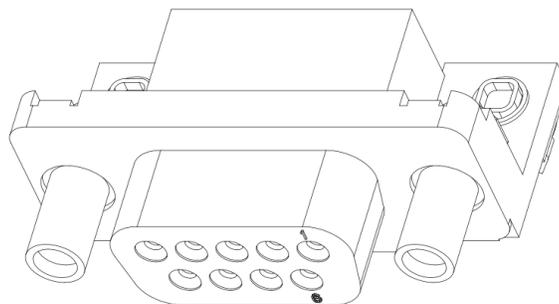


Figure 21 – Connector P4 & P5 Orientation

Table 8 – P4/P5 Connector Specification and Socket Assignment

Manufacturer:	Amphenol
Manufacturer P/N:	5747844-5
Mating P/N:	5-747904-2 or equivalent
Socket #	Signal Name
2	RS-485 B
3	ISO_GND
7	RS-485 A
Backshell	Shield Termination

Whether RS-485 or CAN, the serial interface requires three signals: A/H(+), B/L(-), and Ground. Each is a multi-drop data bus; i.e. multiple devices can all tie directly onto the same physical signals. For proper signal integrity, the data bus must be terminated at both ends. A terminating resistor is provided on the interface board for this purpose. Switch 1 can be used to insert or remove the terminating resistor. Place switch 1 of SW1 in the ON position to include the termination (switches 2 and 3 of SW1 are no connects and have no effect). The relative location of SW1 on the layout of the 11237-02 Interface Board is indicated in Figure 22.

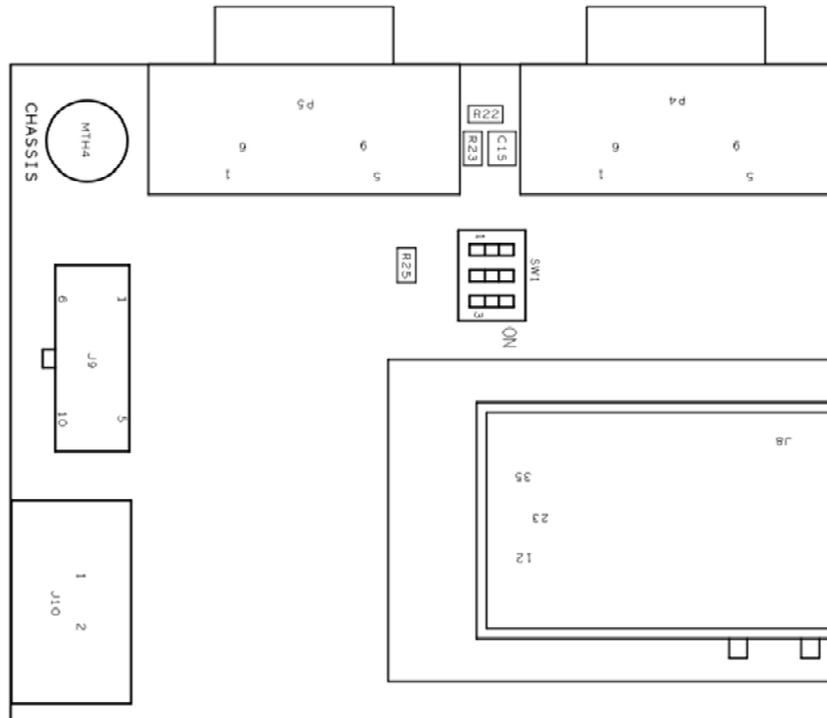
**Figure 22 – Location of SW1 within 11237-02 Interface Board**

Figure 23 illustrates how to correctly wire the serial data bus when paralleling multiple devices. Please note the following:

- **All three signal wires, as well as the ground reference, should be connected.**
- **The last device on the bus must have a terminating resistor.**



CAUTION

The serial data bus must be terminated for reliable communications. Do NOT terminate every device on the bus, as this will degrade the signals and overload the transceivers. Only the devices physically located at the end of the wires should have termination.

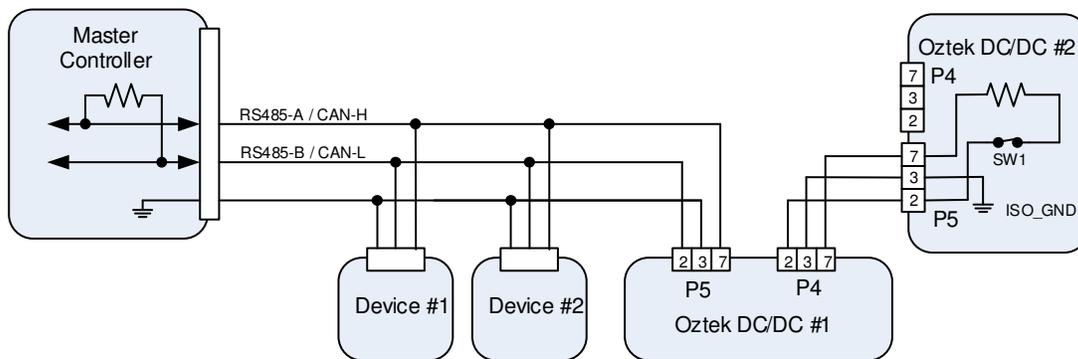


Figure 23 – Multi-Drop Serial Interface Wiring

7. Servicing the Unit

The OZip DC-DC Converter is not field serviceable. Consult the Return Material Authorization Policy at the end of this document for instructions in the event that the unit needs to be returned to Oztek for evaluation and possible repair. In removing the OZip DC-DC Converter from system installation, consult and follow the Electrical Safety precautions of Section 1.3.2.

8. Maintenance and Upgrade

Electrical connections should be regularly checked for mechanical integrity and thermal degradation. Airflow must be maintained unobstructed for maximum performance as specified.

9. Oztek Power Studio™ Tool

The Oztek Power Studio™ tool is a Microsoft Windows based Graphical User Interface (GUI), as shown in Figure 24, which can be used to easily configure and control the OZip-R IPM. The tool

communicates with the unit over the RS-485 or CAN serial port and provides a simple, intuitive user interface. Some of the features provided by Power Studio™ include:

- Simple tabbed interfaces:
 - Dashboard
 - Configuration
 - Instrumentation
- Dashboard for inverter control and monitoring
- Inverter configuration control, including:
 - Editing configurations
 - Downloading/uploading configurations
 - Archiving multiple configuration files
- Firmware Update Utility

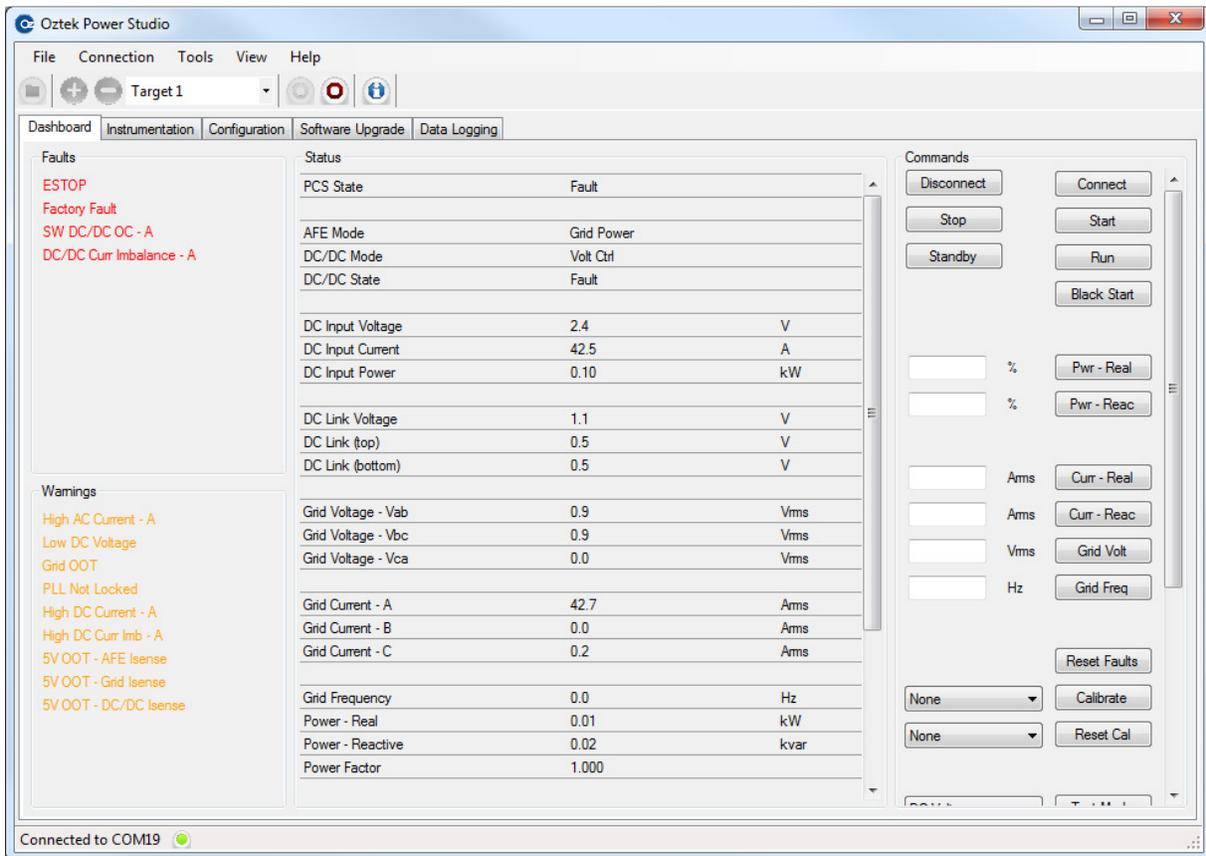


Figure 24 – Oztek Power Studio™ GUI

For detailed information and operating instructions, please refer to UM-0052 Oztek Power Studio™ User's Manual.

Warranty and Product Information

Limited Warranty

What does this warranty cover and how long does it last? This Limited Warranty is provided by Oztek Corp. ("Oztek") and covers defects in workmanship and materials in your OZip DC-DC Converter. This Warranty Period lasts for 18 months from the date of purchase at the point of sale to you, the original end user customer, unless otherwise agreed in writing. You will be required to demonstrate proof of purchase to make warranty claims. This Limited Warranty is transferable to subsequent owners but only for the unexpired portion of the Warranty Period. Subsequent owners also require original proof of purchase as described in "What proof of purchase is required?"

What will Oztek do? During the Warranty Period Oztek will, at its option, repair the product (if economically feasible) or replace the defective product free of charge, provided that you notify Oztek of the product defect within the Warranty Period, and provided that through inspection Oztek establishes the existence of such a defect and that it is covered by this Limited Warranty.

Oztek will, at its option, use new and/or reconditioned parts in performing warranty repair and building replacement products. Oztek reserves the right to use parts or products of original or improved design in the repair or replacement. If Oztek repairs or replaces a product, its warranty continues for the remaining portion of the original Warranty Period or 90 days from the date of the return shipment to the customer, whichever is greater. All replaced products and all parts removed from repaired products become the property of Oztek.

Oztek covers both parts and labor necessary to repair the product, and return shipment to the customer via an Oztek-selected non-expedited surface freight within the contiguous United States and Canada. Alaska, Hawaii and locations outside of the United States and Canada are excluded. Contact Oztek Customer Service for details on freight policy for return shipments from excluded areas.

How do you get service? If your product requires troubleshooting or warranty service, contact your merchant. If you are unable to contact your merchant, or the merchant is unable to provide service, contact Oztek directly at:

USA
Telephone: 603-546-0090
Email techsupport@oztekc corp.com

Direct returns may be performed according to the Oztek Return Material Authorization Policy described in your product manual.

What proof of purchase is required? In any warranty claim, dated proof of purchase must accompany the product and the product must not have been disassembled or modified without prior written authorization by Oztek. Proof of purchase may be in any one of the following forms:

- The dated purchase receipt from the original purchase of the product at point of sale to the end user
- The dated dealer invoice or purchase receipt showing original equipment manufacturer (OEM) status
- The dated invoice or purchase receipt showing the product exchanged under warranty

What does this warranty not cover? Claims are limited to repair and replacement, or if in Oztek's discretion that is not possible, reimbursement up to the purchase price paid for the product. Oztek will be liable to you only for direct damages suffered by you and only up to a maximum amount equal to the purchase price of the product.

This Limited Warranty does not warrant uninterrupted or error-free operation of the product or cover normal wear and tear of the product or costs related to the removal, installation, or troubleshooting of the customer's electrical systems. This warranty does not apply to and Oztek will not be responsible for any defect in or damage to:

- a) The product if it has been misused, neglected, improperly installed, physically damaged or altered, either internally or externally, or damaged from improper use or use in an unsuitable environment
- b) The product if it has been subjected to fire, water, generalized corrosion, biological infestations, or input voltage that creates operating conditions beyond the maximum or minimum limits listed in the Oztek product specifications including high input voltage from generators and lightning strikes
- c) The product if repairs have been done to it other than by Oztek or its authorized service centers (hereafter "ASCs")
- d) The product if it is used as a component part of a product expressly warranted by another manufacturer
- e) The product if its original identification (trade-mark, serial number) markings have been defaced, altered, or removed
- f) The product if it is located outside of the country where it was purchased
- g) Any consequential losses that are attributable to the product losing power whether by product malfunction, installation error or misuse.

Disclaimer

Product

THIS LIMITED WARRANTY IS THE SOLE AND EXCLUSIVE WARRANTY PROVIDED BY OZTEK IN CONNECTION WITH YOUR OZTEK PRODUCT AND IS, WHERE PERMITTED BY LAW, IN LIEU OF ALL OTHER WARRANTIES, CONDITIONS, GUARANTEES, REPRESENTATIONS, OBLIGATIONS AND LIABILITIES, EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE IN CONNECTION WITH THE PRODUCT, HOWEVER ARISING (WHETHER BY CONTRACT, TORT, NEGLIGENCE, PRINCIPLES OF MANUFACTURER'S LIABILITY, OPERATION OF LAW, CONDUCT, STATEMENT OR OTHERWISE), INCLUDING WITHOUT RESTRICTION ANY IMPLIED WARRANTY OR CONDITION OF QUALITY, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE TO THE EXTENT REQUIRED UNDER APPLICABLE LAW TO APPLY TO THE PRODUCT SHALL BE LIMITED IN DURATION TO THE PERIOD STIPULATED UNDER THIS LIMITED WARRANTY. IN NO EVENT WILL OZTEK BE LIABLE FOR: (a) ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING LOST PROFITS, LOST REVENUES, FAILURE TO REALIZE EXPECTED SAVINGS, OR OTHER COMMERCIAL OR ECONOMIC LOSSES OF ANY KIND, EVEN IF OZTEK HAS BEEN ADVISED, OR HAD REASON TO KNOW, OF THE POSSIBILITY OF SUCH DAMAGE, (b) ANY LIABILITY ARISING IN TORT, WHETHER OR NOT ARISING OUT OF OZTEK'S NEGLIGENCE, AND ALL LOSSES OR DAMAGES TO ANY PROPERTY OR FOR ANY PERSONAL INJURY OR ECONOMIC LOSS OR DAMAGE CAUSED BY THE CONNECTION OF A PRODUCT TO ANY OTHER DEVICE OR SYSTEM, AND (c) ANY DAMAGE OR INJURY ARISING FROM OR AS A RESULT OF MISUSE OR ABUSE, OR THE INCORRECT INSTALLATION, INTEGRATION OR OPERATION OF THE PRODUCT. IF YOU ARE A CONSUMER (RATHER THAN A PURCHASER OF THE PRODUCT IN THE COURSE OF A BUSINESS) AND PURCHASED THE PRODUCT IN A MEMBER STATE OF THE EUROPEAN UNION, THIS LIMITED WARRANTY SHALL BE SUBJECT TO YOUR STATUTORY RIGHTS AS A CONSUMER UNDER THE EUROPEAN UNION PRODUCT WARRANTY DIRECTIVE 1999/44/EC AND AS SUCH DIRECTIVE HAS BEEN IMPLEMENTED IN THE EUROPEAN UNION MEMBER STATE WHERE YOU PURCHASED THE PRODUCT. FURTHER, WHILE THIS LIMITED WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, YOU MAY HAVE OTHER RIGHTS WHICH MAY VARY FROM EU MEMBER STATE TO EU MEMBER STATE OR, IF YOU DID NOT PURCHASE THE PRODUCT IN AN EU MEMBER STATE, IN THE COUNTRY YOU PURCHASED THE PRODUCT WHICH MAY VARY FROM COUNTRY TO COUNTRY AND JURISDICTION TO JURISDICTION.

Return Material Authorization Policy

Before returning a product directly to Oztek you must obtain a Return Material Authorization (RMA) number and the correct factory "Ship To" address. Products must also be shipped prepaid. Product shipments will be refused and returned at your expense if they are unauthorized, returned without an RMA number clearly marked on the outside of the shipping box, if they are shipped collect, or if they are shipped to the wrong location. When you contact Oztek to obtain service, please have your instruction manual ready for reference and be prepared to supply:

- The serial number of your product
- Information about the installation and use of the unit
- Information about the failure and/or reason for the return
- A copy of your dated proof of purchase

Return Procedure

Package the unit safely, preferably using the original box and packing materials. Please ensure that your product is shipped fully insured in the original packaging or equivalent. This warranty will not apply where the product is damaged due to improper packaging. Include the following:

- The RMA number supplied by Oztek clearly marked on the outside of the box.
- A return address where the unit can be shipped. Post office boxes are not acceptable.
- A contact telephone number where you can be reached during work hours.
- A brief description of the problem.

Ship the unit prepaid to the address provided by your Oztek customer service representative.

If you are returning a product from outside of the USA or Canada - In addition to the above, you **MUST** include return freight funds and you are fully responsible for all documents, duties, tariffs, and deposits.

Out of Warranty Service

If the warranty period for your product has expired, if the unit was damaged by misuse or incorrect installation, if other conditions of the warranty have not been met, or if no dated proof of purchase is available, your unit may be serviced or replaced for a flat fee. If a unit cannot be serviced due to damage beyond salvation or because the repair is not economically feasible, a labor fee may still be incurred for the time spent making this determination.

To return your product for out of warranty service, contact Oztek Customer Service for a Return Material Authorization (RMA) number and follow the other steps outlined in "Return Procedure".

Payment options such as credit card or money order will be explained by the Customer Service Representative. In cases where the minimum flat fee does not apply, as with incomplete units or units with excessive damage, an additional fee will be charged. If applicable, you will be contacted by Customer Service once your unit has been received.