VERTIV™

DC-DC Converter System

Installation and User Instructions (Section 6035), Revision D

Specification Number: 584622000
Model Number: DCS4830

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ADMONISHMENTS USED IN THIS DOCUMENT

DANGER! Warns of a hazard the reader ***will*** be exposed to that will ***likely*** result in death or serious injury if not avoided. (ANSI, OSHA)

WARNING! Warns of a potential hazard the reader ***may*** be exposed to that ***could*** result in death or serious injury if not avoided. This admonition is not used for situations that pose a risk only to equipment, software, data, or service. (ANSI)

CAUTION! Warns of a potential hazard the reader ***may*** be exposed to that ***could*** result in minor or moderate injury if not avoided. (ANSI, OSHA) This admonition is not used for situations that pose a risk only to equipment, data, or service, even if such use appears to be permitted in some of the applicable standards. (OSHA)

ALERT! Alerts the reader to an action that ***must be avoided*** in order to protect equipment, software, data, or service. (ISO)

ALERT! Alerts the reader to an action that ***must be performed*** in order to prevent equipment damage, software corruption, data loss, or service interruption. (ISO)

FIRE SAFETY! Informs the reader of fire safety information, reminders, precautions, or policies, or of the locations of fire-fighting and fire-safety equipment. (ISO)

SAFETY! Informs the reader of general safety information, reminders, precautions, or policies not related to a particular source of hazard or to fire safety. (ISO, ANSI, OSHA)

IMPORTANT SAFETY INSTRUCTIONS

General Safety

DANGER! YOU MUST FOLLOW APPROVED SAFETY PROCEDURES.
Performing the following procedures may expose you to hazards. These procedures should be performed by qualified technicians familiar with the hazards associated with this type of equipment. These hazards may include shock, energy, and/or burns. To avoid these hazards:

a) The tasks should be performed in the order indicated.

b) Remove watches, rings, and other metal objects.

c) Prior to contacting any uninsulated surface or termination, use a voltmeter to verify that no voltage or the expected voltage is present. Check for voltage with both AC and DC voltmeters prior to making contact.

d) Wear eye protection.

e) Use certified and well maintained insulated tools. Use double insulated tools appropriately rated for the work to be performed.

Voltages

DC Output and Battery Voltages

DANGER! This system produces DC power and may have a battery source connected to it. Although the DC voltage is not hazardously high, the rectifiers and/or battery can deliver large amounts of current. Exercise extreme caution not to inadvertently contact or have any tool inadvertently contact an output terminal or battery terminal or exposed wire connected to an output terminal or battery terminal. NEVER allow a metal object, such as a tool, to contact more than one termination or battery terminal at a time, or to simultaneously contact a termination or battery terminal and a grounded object. Even a momentary short circuit can cause sparking, explosion, and injury.

DANGER! Follow local lockout/tagout procedures to ensure DC branch circuit protection devices remain de-energized during installation at loads, as required.

Personal Protective Equipment (PPE)

DANGER! ARC FLASH AND SHOCK HAZARD.
Appropriate PPE and tools required when working on this equipment. An appropriate flash protection boundary analysis should be done determine the “hazard/risk” category, and to select proper PPE.

This product is intended only for installation in a Restricted Access Location.

Only authorized and properly trained personnel should be allowed to install, inspect, operate, or maintain the equipment.

Do not work on LIVE parts. If required to work or operate live parts, obtain appropriate Energized Work Permits as required by the local authority, per NFPA 70E “Standard for Electrical Safety in the Workplace”.

Hazardous Voltage

DANGER! HAZARD OF ELECTRICAL SHOCK.
More than one disconnect may be required to de-energize the system before servicing.

Handling Equipment Containing Static Sensitive Components

ALERT! Installation or removal of equipment containing static sensitive components requires careful handling. Before handling any equipment containing static sensitive components, read and follow the instructions contained on the Static Warning Page.

Maintenance and Replacement Procedures

CAUTION! When performing any step in procedures that requires removal or installation of hardware, use caution to ensure no hardware is dropped and left inside the unit; otherwise service interruption or equipment damage may occur.

NOTE! *When performing any step in procedures that requires removal of existing hardware, retain all hardware for use in subsequent steps, unless otherwise directed.*

STATIC WARNING

This equipment contains static sensitive components. The warnings listed below must be observed to prevent damage to these components. Disregarding any of these warnings may result in personal injury or damage to the equipment.

1. Strictly adhere to the procedures provided in this document.
2. Before touching any equipment containing static sensitive components, discharge all static electricity from yourself by wearing a wrist strap grounded through a one megohm resistor. Some wrist straps have a built-in one megohm resistor; no external resistor is necessary. Read and follow wrist strap manufacturer's instructions outlining use of a specific wrist strap.
3. Do not touch traces or components on equipment containing static sensitive components. Handle equipment containing static sensitive components only by the edges that do not have connector pads.
4. After removing equipment containing static sensitive components, place the equipment only on conductive or anti-static material such as conductive foam, conductive plastic, or aluminum foil. Do not use ordinary Styrofoam™ or ordinary plastic.
5. Store and ship equipment containing static sensitive components only in static shielding containers.
6. If necessary to repair equipment containing static sensitive components, wear an appropriately grounded wrist strap, work on a conductive surface, use a grounded soldering iron, and use grounded test equipment.

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DESCRIPTION

This document provides information specific to the following equipment:

- Model DCS4830 DC-DC Converter Module Mounting Shelf (Spec. No. 584622000)
- Model MHSA10B DC-DC Converter Module (Spec. No. 486800127)

Model DCS4830 is a DC-DC Converter Module Mounting Shelf designed to mount in a 19" or 23" (nominal) relay rack or equipment mounting rack (configured for 19" mounting unless otherwise specified). The Converter Module Mounting Shelf, when equipped with up to three separately ordered Converter Modules (Spec. No. 486800127), provides a DC-DC Converter System that operates from +24VDC to provide 48VDC load power.

Refer to System Application Guide SAG584622000 for additional information.

INSTALLING THE SHELF

General Requirements

- This product is intended only for installation in a Restricted Access Location on or above a non-combustible surface.
- This product must be located in a Controlled Environment with access to Craftspersons only.
- This product is intended for installation in Network Telecommunication Facilities (CO, vault, hut, or other environmentally controlled electronic equipment enclosure).
- This product is intended to be connected to the common bonding network in a Network Telecommunication Facility (CO, vault, hut, or other environmentally controlled electronic equipment enclosure).
- The installer should be familiar with the installation requirements and techniques to be used in securing the Converter Shelf to a relay rack or frame.
- Converter Module and mounting shelf ventilating openings must not be blocked and temperature of air entering Converter Modules must not exceed rated Operating Ambient Temperature Range found in SAG584622000.

Securing the Shelf to a Relay Rack or Frame

The Converter Module Mounting Shelf is designed for mounting in a standard 19" or 23" relay rack or cabinet frame having 1" or 1-3/4" multiple drillings. The shelf is shipped with the 19" mounting angles attached. The 23" mounting angles are shipped loose. The mounting angles can be positioned for 5" or 6" front-projection mounting. Refer to System Application Guide SAG584622000 for overall dimensions.

NOTE! *Refer to "General Requirements" at the beginning of this section for Ventilation Requirements.*

Procedure

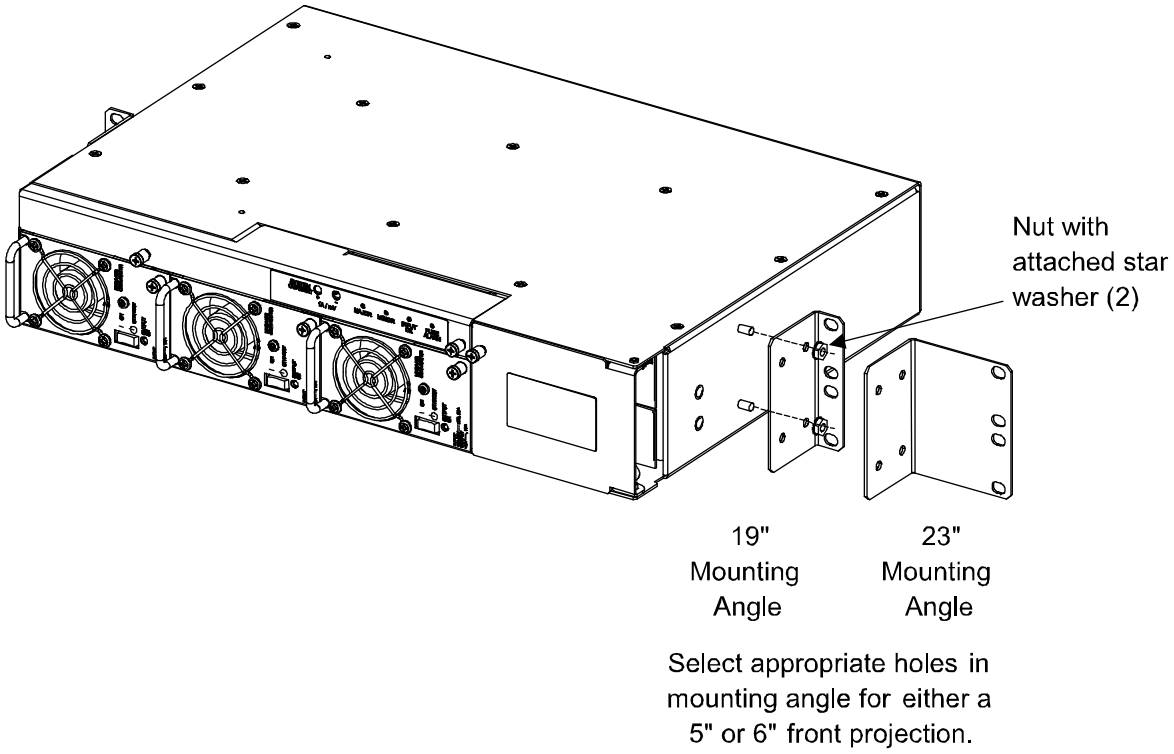
1. The 19" mounting angles are factory installed and factory positioned for a 5" front projection. Reposition the 19" mounting angles for a 6" front projection, if required. If mounting in a 23" wide relay rack or frame, replace the 19" mounting angles with the supplied 23" mounting angles. Torque to 23 in-lbs. Refer to **Figure 1**.

2. Secure the shelf mounting angles to the relay rack or frame at two (2) locations per side. Use grounding washers at one (1) location per side. Ensure the grounding washers are oriented properly to enable the teeth to dig into the paint for a secure ground connection. Torque connections to 70 in-lbs.

ALERT! Compliance with Telcordia GR-1089-CORE requires that prior to mounting the Converter Shelf to the equipment rack:

- All paint must be removed from the front surface of each equipment rack rail where it mates with a shelf-mounting bracket, so that good metal-to-metal contact can be established between the shelf and rack.
- The shelf-to-rack mating surfaces must be cleaned.
- Electrical anti-oxidizing compound must be applied to the shelf-to-rack mating surfaces.

Figure 1: *Installing Mounting Angles*



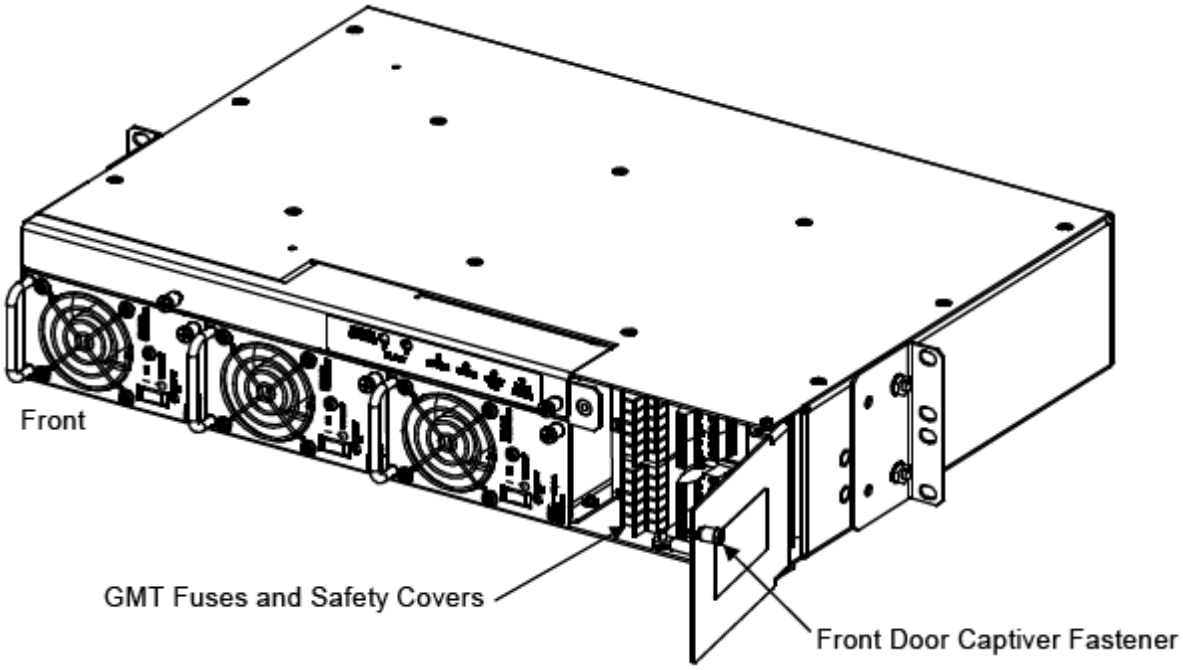
Installing GMT Load Distribution Fuses

Procedure

NOTE! *Refer to* ***Figure 2****.*

1. Open the front right access door by loosening the captive fastener.
2. Install correctly sized GMT fuses into the fuseholders located inside the shelf, as required. If dummy fuses are installed, first remove the dummy fuse. Install a safety fuse cover over each GMT fuse.
3. Secure the front right access door by tightening the captive fastener.

Figure 2: *Installing GMT Load Distribution Fuses*



MAKING ELECTRICAL CONNECTIONS

Admonishments

DANGER! INSTALLERS MUST FOLLOW APPROVED SAFETY PROCEDURES.

All DC power sources must be completely disconnected from the branch circuit wiring used to provide power to this DC-DC Converter System before DC input connections are made.

Wiring Considerations

All electrical connections can be accessed from the front of the DC-DC Converter Module Mounting Shelf.

For recommended wire sizes, crimp lugs, alarm relay contact ratings, and general wiring information and restrictions; refer to System Application Guide SAG584622000.

Refer to drawing 031110100 for lug crimping information. Refer to drawings 031110200 and 031110300 for additional lug information.

All wiring should follow the current edition of the American National Standards Institute (ANSI) approved National Fire Protection Association's (NPFA) National Electrical Code (NEC), and applicable local codes. For operation in countries where the NEC is not recognized, follow applicable codes.

Shelf Frame Grounding Connection

NOTE! *The DC return connection to this system can remain isolated from system frame and chassis (DC-I).*

For shelf grounding requirements, refer to the current edition of the American National Standards Institute (ANSI) approved National Fire Protection Association's (NPFA) National Electrical Code (NEC), applicable local codes, and your specific site requirements.

Procedure

1. The frame grounding connection to the shelf is made by using grounding washers with the mounting hardware used to secure the shelf to the relay rack or frame. Refer to the procedure "Securing the Shelf to a Relay Rack or Frame". Ensure that the relay rack or frame is properly grounded.

DC Input Connections (+24V)

Follow the Admonishments listed at the beginning of this section when connecting DC input cables.

Front accessed 1/4-20 x 5/8" studs on 5/8" centers are provided for installation of customer provided DC input leads terminated in 2-hole lugs.

Procedure

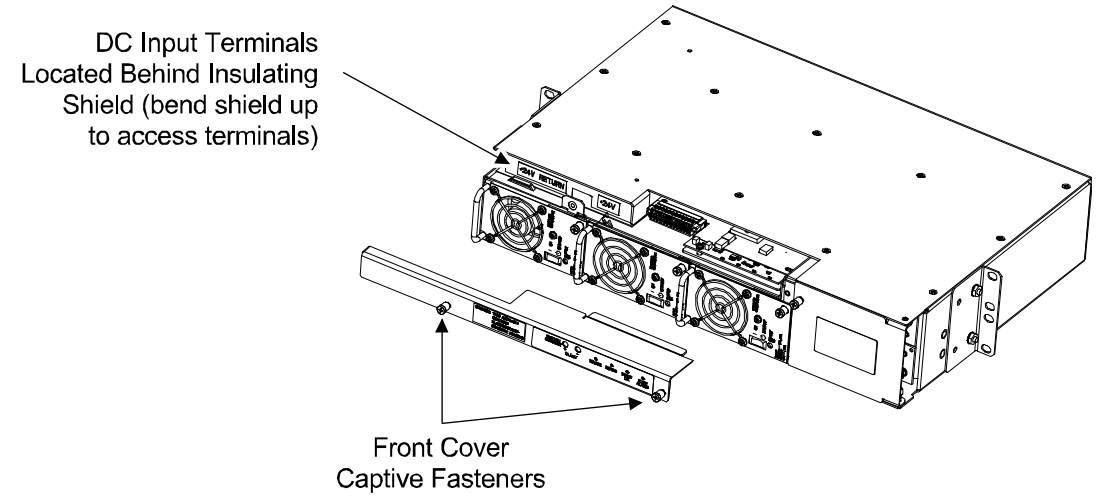
ALERT! Observe correct polarity when making connections. Otherwise equipment damage will occur.

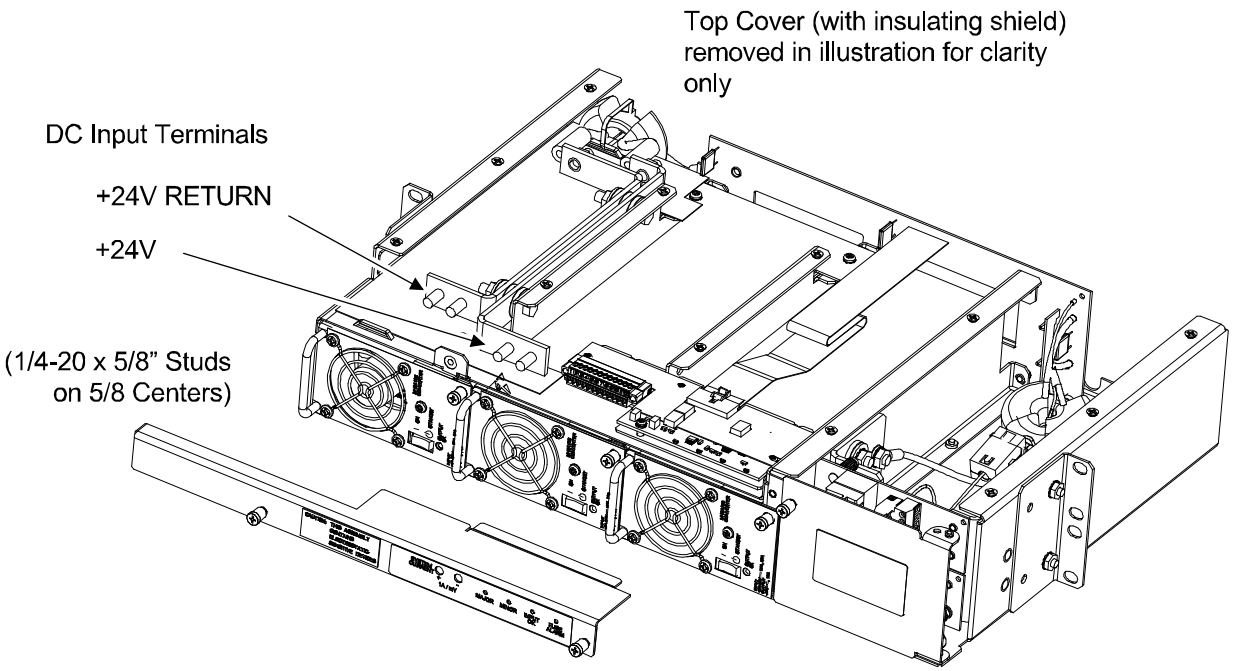
NOTE! *Typically the DC return bus is connected to a master earth ground. Refer to your internal guidelines or GR-1275 for industry standards.*

NOTE! *Connect the negative input to the system grounded conductor.*

1. Refer to Figure 3 and remove the front cover to access the DC input terminals. Remove the cover by loosening the captive fasteners.
2. Connect the return lead (Negative) to the busbar labeled +24V RETURN. Refer to **Figure 3**. Torque to 84 in-lbs.
3. Connect the +24V supply lead (Positive) to the busbar labeled +24V. Refer to **Figure 3**. Torque to 84 in-lbs.
4. Replace and secure the front cover by tightening the captive fasteners.

Figure 3: *DC Input Connections (+24V)*





Central Office Ground Connection

A landing point is provided on the output return bus for a central office ground lead (see Figure 4). For central office grounding requirements, refer to the current edition of the American National Standards Institute (ANSI) approved National Fire Protection Association's (NFPA) National Electrical Code (NEC), applicable local codes, and your specific site requirements.

DC Output Connections (-48V)

Load and load return leads are connected to screw-type terminal blocks located on the front of the Fuse Modules factory installed in the shelf.

Procedure

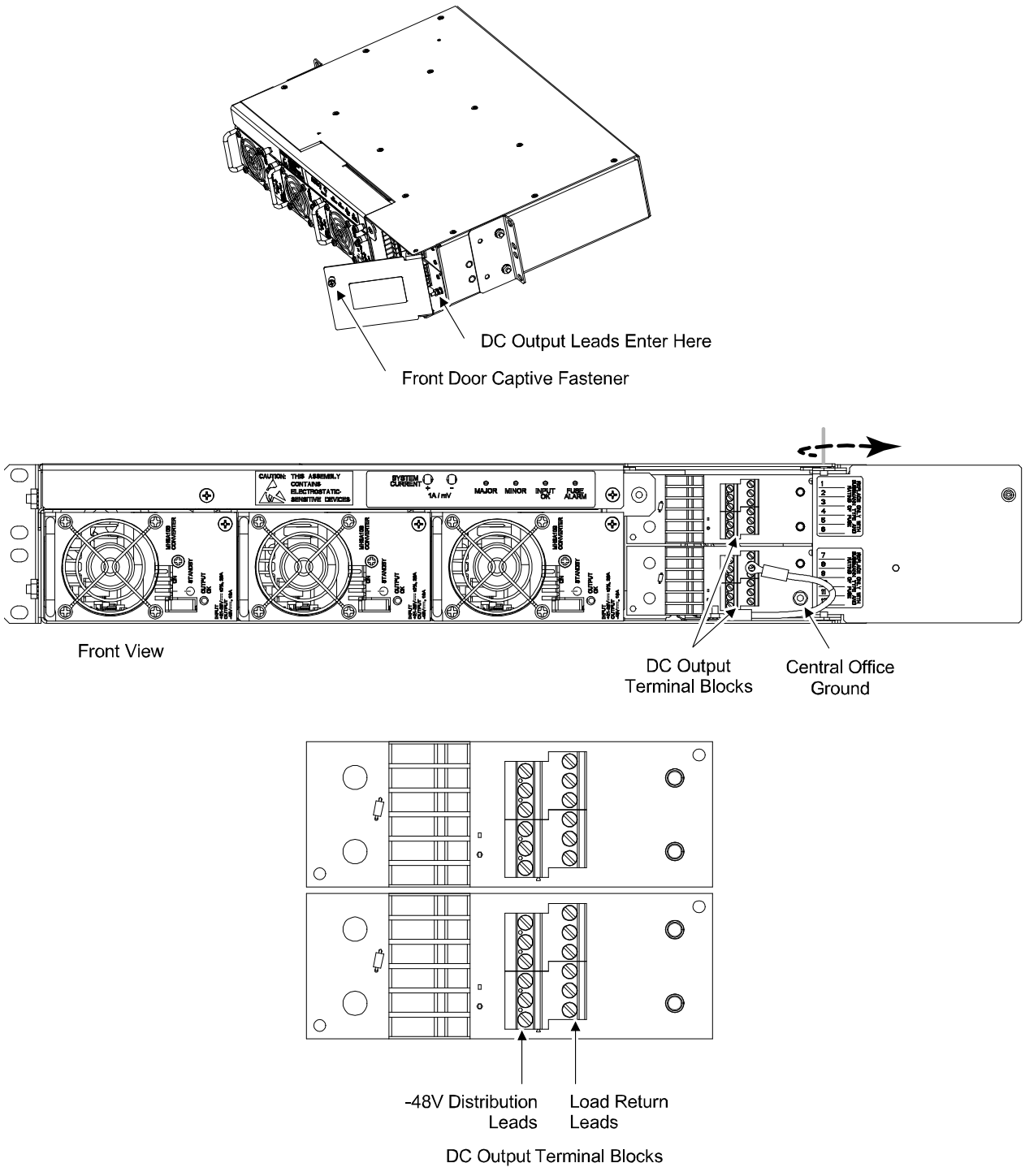
ALERT! Observe correct polarity when making connections. Otherwise equipment damage will occur.

NOTE! *Typically the DC return bus is connected to a master earth ground. Refer to your internal guidelines or GR-1275 for industry standards.*

NOTE! *Connect the positive output to the system grounded conductor.*

1. Open the front right access door by loosening the captive fastener.
2. Connect load and load return leads as shown in **Figure 4**. Torque to 5 in-lbs.
3. Secure the front right access door by tightening the captive fastener.

Figure 4: *DC Output Connections (-48V)*



Torque to 5 in-lbs.

External Control and Alarm Connections

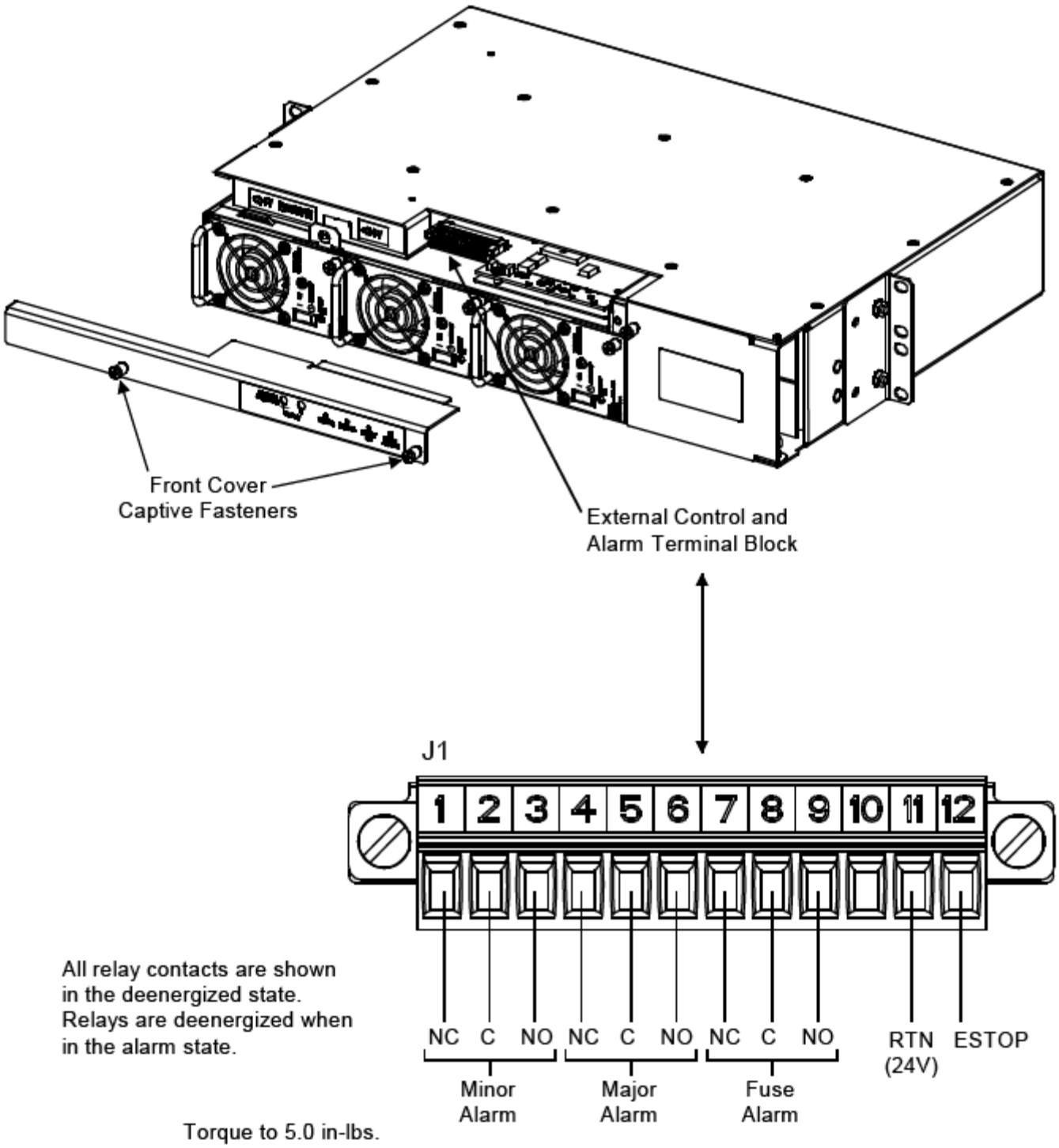
An external control and alarm circuit card is located behind the shelf's top front access panel. This circuit card provides three sets of Form C relay contacts for external alarms, plus an ESTOP input. A terminal block (J1) is provided on the circuit card for customer connections.

Refer to **Figure 5** for location of J1. Recommended torque is 5.0 in-lbs.

Procedure

1. Refer to **Figure 5** and remove the front cover to access the External Control and Alarm Terminal Block. Remove the cover by loosening the captive fasteners.
2. Connect control and alarm wiring as follows.
    a) Converter Fail Minor Alarm: A close loop circuit is provided between terminals 1 and 2 of J1 and an open loop circuit is provided between terminals 2 and 3 of J1 during an alarm condition (failure in one or more Converter Modules). Refer to the Operating Procedures section for alarm conditions.
    b) Converter Fail Major Alarm: A close loop circuit is provided between terminals 4 and 5 of J1 and an open loop circuit is provided between terminals 5 and 6 of J1 during an alarm condition (failure in more than one Converter Module). Refer to the Operating Procedures section for alarm conditions.
    c) Fuse Alarm: A close loop circuit is provided between terminals 7 and 8 of J1 and an open loop circuit is provided between terminals 8 and 9 of J1 if any GMT load fuse opens.
    d) ESTOP Input: Customer furnished system ground [RTN (24V)] applied to terminal 12 of J1 inhibits all Converter Modules. Converter Modules automatically restart upon removal of the ground signal.
    e) Note that RTN (24V) is supplied to terminal 11 of J1 for connection into customer's alarm circuits, if required.
3. Replace and secure the front cover by tightening the captive fasteners.

Figure 5: *External Control and Alarm Connections*



INSTALLING CONVERTER MODULES AND INITIALLY STARTING THE SYSTEM

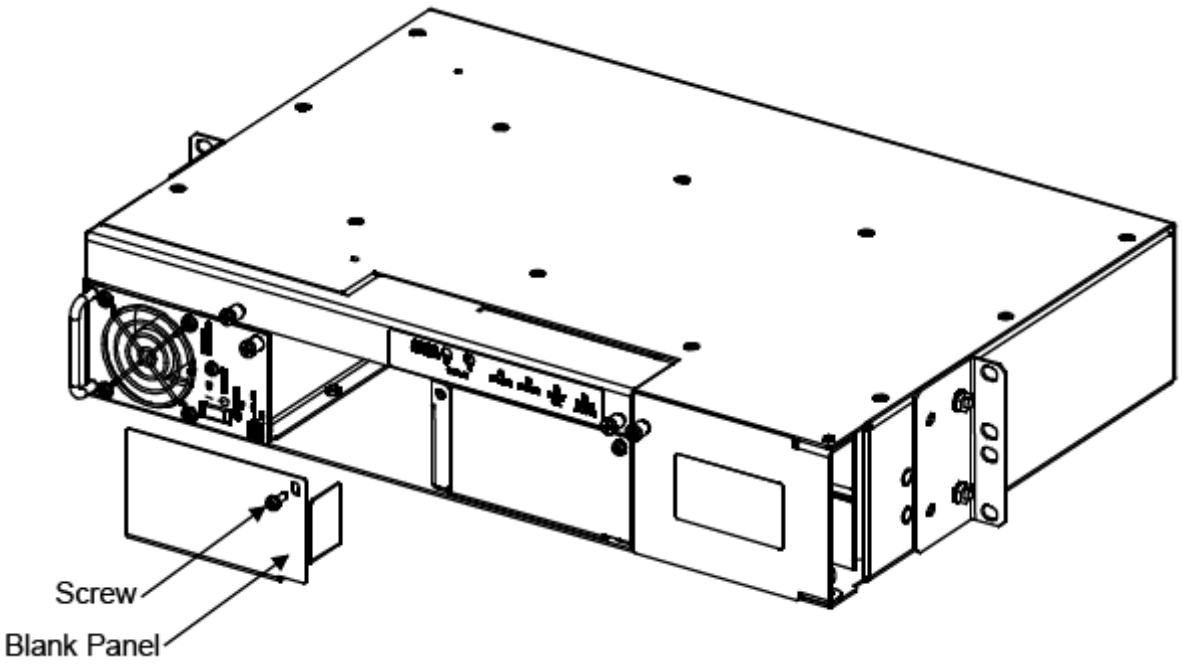
Installing Converter Modules

ALERT! Each Converter Module contains static-sensitive devices. Read the Static Statement at the front of this manual before performing this procedure.

Procedure

1. If not already done, remove blank panels from any mounting position into which a Converter Module will be installed. See **Figure 6**.
2. It is recommended to place the ON / STANDBY switch on the each Converter Module in the STANDBY (⏻) position.
3. Slide each Converter Module into a mounting position in the shelf. Secure by tightening the captive fastener located on the front panel.
4. Ensure that all mounting positions are occupied, by either a Converter Module or a blank module.

Figure 6: *Blank Module Mounting Position Cover Panel*



Initial Startup and Checkout

Procedure

1. Ensure no objects block the ventilation openings at the front and rear of the Converter Module Mounting Shelf.

2. Close the disconnect/protective device(s) that supply input power to the Converter Module Mounting Shelf.
3. Place the ON / STANDBY (I / ⏻) switch on each Converter Module to the ON (I) position.
4. After approximately 15 seconds, verify the following:
   a) The red MAJOR indicator on the Converter Module Mounting Shelf is extinguished.
   b) The yellow MINOR indicator on the Converter Module Mounting Shelf is extinguished.
   c) The green INPUT OK indicator on the Converter Module Mounting Shelf is illuminated.
   d) The red FUSE ALARM indicator on the Converter Module Mounting Shelf is extinguished.
   e) The green OUTPUT OK indicator on each Converter Module is illuminated.
   f) No external alarms are active.

OPERATING PROCEDURES

Local Controls, Indicators, and Test Points

Converter Module Control and Indicator

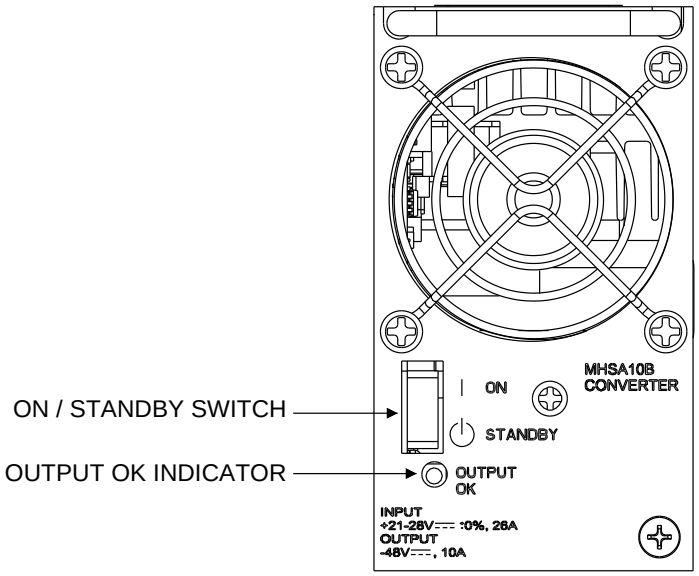
Refer to **Figure 7** for location.

- **ON / STANDBY (I / ⏻) Switch:** Placing this switch in the ON (I) position enables the Converter Module to provide output power. Placing the switch in the STANDBY (⏻) position inhibits Converter Module output.
- **OUTPUT OK Indicator:** Illuminates green to indicate the Converter Module is operating normally. A failure condition is indicated by an extinguished indicator. Failure conditions include:

  a) Converter output increases above 52 volts DC or decreases below 44 volts DC for any reason, including converter failure, High Voltage Shutdown, input voltage below 21 volts DC (low input inhibit) or an overload condition.

  b) Cooling fan slows or stops due to fan failure or blocked rotor.

Figure 7: *Converter Module Control and Indicator*

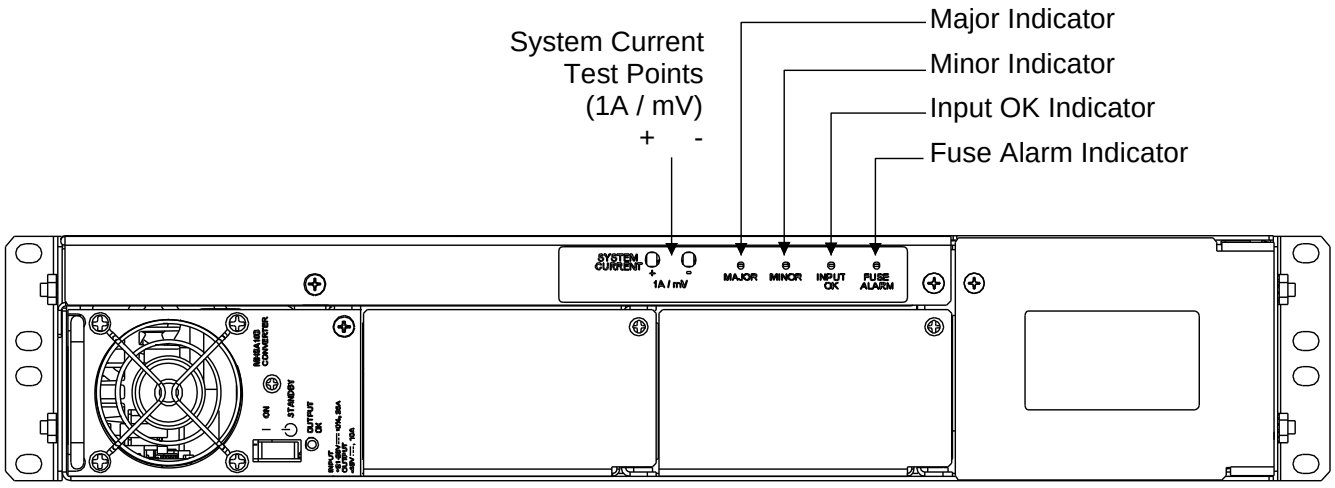


Converter Module Mounting Shelf Test Points and Indicators

Refer to **Figure 8** for location.

- **SYSTEM CURRENT TEST POINTS (1A / mV):** Connect a multimeter between the test points to measure the System Current.
- **MAJOR Indicator:** Illuminates red if a failure condition in more than one Converter Module is detected. Also, external major alarm circuits are activated, if connected. See "OUTPUT OK Indicator" above for a list of failure conditions.
- **MINOR Indicator:** Illuminates yellow if a failure condition in one or more Converter Modules is detected. Also, external minor alarm circuits are activated, if connected. See "OUTPUT OK Indicator" above for a list of failure conditions. The LED remains illuminated in the event of a major alarm condition.
- **INPUT OK Indicator:** Illuminates green to indicate that DC power applied to the shelf is above the low input voltage inhibit level of the Converter Modules.
- **FUSE ALARM Indicator:** Illuminates red if one or more GMT load fuses open. Also, external fuse alarm circuits are activated, if connected.

Figure 8: *Converter Module Mounting Shelf Test Points and Indicators*



Starting and Stopping

Procedure

- To start Converter Module operation, place the ON / STANDBY (I / ⏻) switch in the ON (I) position.
- To stop Converter Module operation, place the ON / STANDBY switch in the STANDBY (⏻) position.

Restarting Following a High Voltage Shutdown

Procedure

To restart a Converter Module following a high voltage shutdown:

1. Place the ON / STANDBY (I / ⏻) switch in the STANDBY ( ) position.
2. Return the ON / STANDBY (I / ⏻) switch to the ON (I) position.

If the Converter Module fails to start or immediately shuts down a second time, a fault condition is indicated, and replacement may be necessary. Refer to the Troubleshooting and Repair section for Converter Module replacement information.

ADJUSTMENTS

There are no user adjustments on this DC-DC Converter System.

MAINTENANCE

Ensure front and rear ventilation openings do not become blocked. Otherwise, no special maintenance is required for this DC-DC Converter System.

TROUBLESHOOTING AND REPAIR

Refer to Section 4154 (provided with your customer documentation) for support contact information.

Admonishments

DANGER! SERVICE PERSONNEL MUST FOLLOW APPROVED SAFETY PROCEDURES.

Performing the following procedures may expose service personnel to hazards. These procedures should be performed by qualified service personnel familiar with the hazards associated with this type of equipment. These hazards may include shock, energy, and/or burns. To avoid these hazards:

a) The tasks should be performed in the order indicated.
b) Remove watches, rings, and other jewelry.
c) Prior to contacting any uninsulated surface or termination, use a voltmeter to verify that no voltage or the expected voltage is present.
d) Wear eye protection, and use recommended tools.
e) Use insulated tools.

Troubleshooting Information

The DC-DC Converter System is designed for ease in troubleshooting and repair. The various local indicators are designed to isolate failure to a specific assembly. Once the faulty element has been identified, refer to the next sections, Replacement Information and Replacement Procedures.

Replacement Information

Replacement Assemblies

When a trouble symptom is localized to a faulty Converter Module, that particular assembly should be replaced in its entirety. Other than a Converter Module fan replacement, no attempt should be made to troubleshoot or repair individual components on any Converter Module.

Refer to SAG584622000 for replacement part numbers.

Replacement Procedures

Converter Module Replacement

A failed Converter Module can be replaced without interrupting operation of other Converter Modules present in the Converter Module Mounting Shelf.

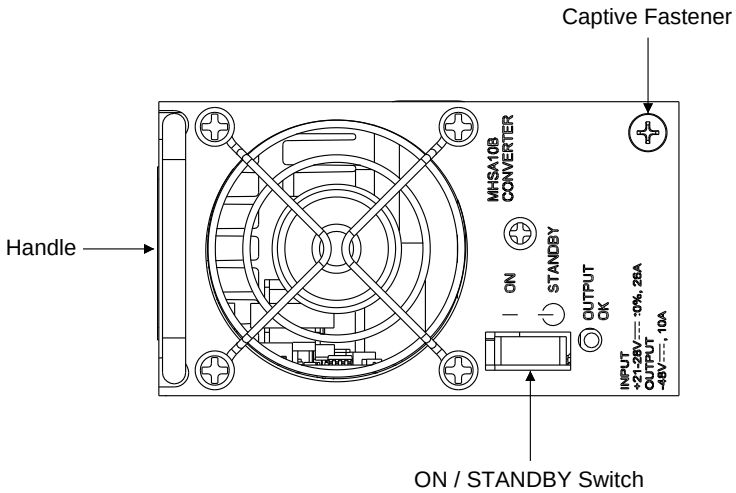
ALERT! Each Converter Module contains static-sensitive devices. Read the Static Statement at the front of this manual before performing this procedure.

Refer to **Figure 9** as this procedure is performed.

Procedure

1. Performing this procedure may activate external alarms. Do one of the following. If possible, disable these alarms. If these alarms cannot be easily disabled, notify the appropriate personnel to disregard any future alarms associated with this system.
2. On the Converter Module to be removed, place the ON / STANDBY (I / ⏻) switch to the STANDBY (⏻) position.
3. Loosen the captive fastener on the front of the Converter Module to be removed. Using the handle provided on the front of the module, pull the module from the DC-DC Converter Mounting Shelf.
4. Ensure that the ON / STANDBY (I / ⏻) switch on the replacement Converter Module is in the STANDBY (⏻) position.
5. Slide the replacement Converter Module into its mounting position in the Converter Mounting Shelf. Secure it to the shelf by tightening the captive fastener located on the front panel.
6. Place the ON / STANDBY (I / ⏻) switch on this Converter Module to the ON (I) position.
7. Enable the external alarms, or notify appropriate personnel that this procedure is finished.
8. Ensure that there are no local or remote alarms active on the system.
9. This completes the replacement procedure.

Figure 9: *DC-DC Converter Module Replacement*



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