



Model 3000 3RU Rack Chassis and Power Supplies

Installation Guide and User Manual

IOM3000C
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Technical Support

If you encounter any kind of problem after reading this manual, contact your local distributor or an Applications Engineer. To reach technical support:

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By Phone (Monday through Friday 8:00 am to 5:00 pm EST):	USA (800) 732-5252 TEL (540) 961-1945
By Fax:	(540) 961-1900

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2020 Kraft Drive, Suite 1000, Blacksburg, VA 24060
USA (800) 732-5252 • TEL (540) 961-1945 • FAX (540) 961-1900
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Product Specifications

Electrical Characteristics (Note 1)

	Min.	Typ.	Max.	Units	Notes
Power Supply Voltage (AC)	120		240	Volts AC	2
Power Supply Voltage (DC)		-48		Volts DC	2
Power Supply Frequency	50		60	Hz	
AC Fuse Rating (Slow Blow)		2.0		A	3
DC Fuse Rating (Slow Blow)		7.5		A	3

Physical Characteristics

	Min.	Typ.	Max.	Units	Notes
Power Supply Weight		2.5		lbs.	
		1.1		kg	
Chassis Weight (empty)		6.0		lbs.	
		2.7		kg	
Rack Adapter Card Weight		3.8		oz.	
		108		g	
Power Supply Dimensions	5.06 x 2.80 x 12.00			in.	
	129 x 71 x 305			mm	
Chassis Dimensions	5.25 x 19.00 x 12.00			in.	
	133 x 483 x 305			mm	
Rack Adapter Card Dimensions	10.4 x 3.94			in.	
	264 x 100			mm	

Environmental Characteristics

	Min.	Typ.	Max.	Units	Notes
Operating Temperature Range	-10		+55	°C	
Storage Temperature Range	-40		+60	°C	
Humidity (RH, non-condensing)	5		95	%	

Specification Notes

- 1) This product conforms to the Electromagnetic Compatibility Requirements in accordance with European Community Directive #89-336-EEC.
- 2) The power supplies comply with UL requirements. When using redundant power supplies, apply power to the power supply before installation into the rack chassis. If power is not at the power supply at installation, an alarm condition will be reported to the DB-25 connector located at the rear of the rack chassis.

CAUTION

Multiple power sources may be present. Disconnect all power sources before servicing the unit.

- 3) The power supplies have a fuse rating T. Replacement fuses are available from any electronics store.

CAUTION

Risk of fire. Replace fuses only with same type and rating as marked.

Installation and Operation

General Installation Instructions

Installation of the Model 3000 normally requires only verification of power and module connections. The equipment should be located in an area that provides adequate lighting and is relatively free from dust. The 3RU chassis requires rear access for installation and maintenance. **Do not install the equipment near sources of excessive heat, such as furnace outlets or above heat producing units, such as large power supplies and tube-type equipment. Slots and openings in the rear panel are provided for ventilation. To protect from overheating, these openings must not be blocked or covered. Observe temperature and relative humidity requirements specified in the Environmental Characteristics on page 3.**

WARNING

This unit is intended for Restricted Access Use only.

3RU Chassis Overview

The chassis can house one or two power supplies and up to eight hot-swappable 3000 Series or 3753 modules. Figure 1 depicts the front and rear of a fully loaded chassis, as well as the location of the DB-25 fault monitoring connector.

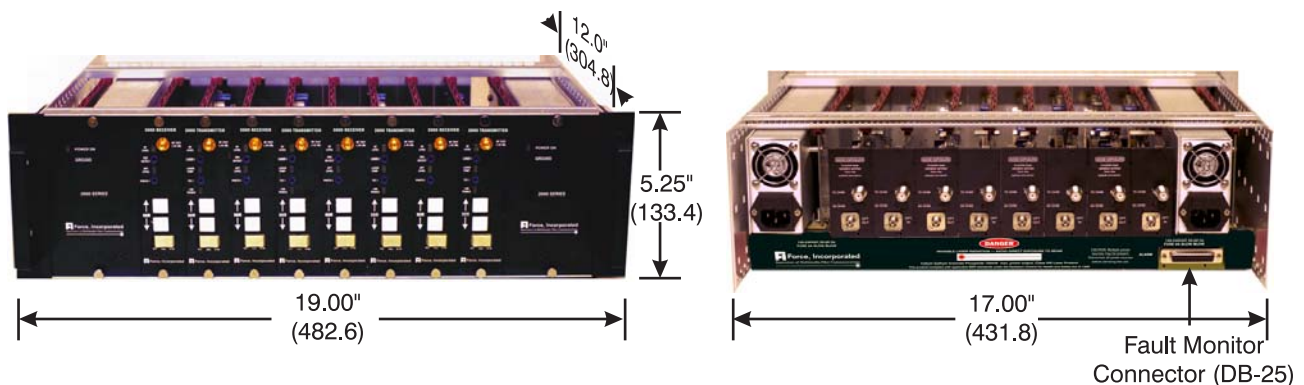


Figure 1 Fully Loaded Model 3000 3RU Chassis
(Dimensions in parentheses are in millimeters.)

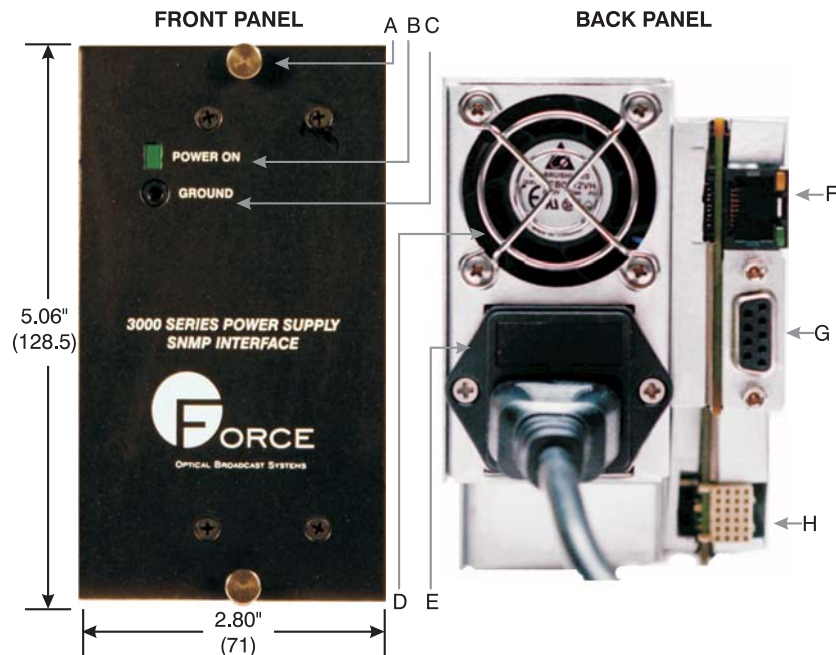
Chassis Fault Monitoring (DB-25 Connector)

The summary fault line (DB-25 Connector, Pin 1) implements a normally closed solid state relay. The relay is opened when there are no detected faults. The relay is capable of continuous currents not to exceed 100 mA,

input voltage not to exceed ± 100 Volts, and maximum power not to exceed 300 mW. See page 12 for a complete description of the DB-25 connector. The conditions that will trigger a summary fault vary depending on the transport module. See the module IOM for exact summary faults. A power failure will trigger a summary fault on all models of the power supply.

3000UB Power Supply Description

The Model 3000UB-NN power supply provides universal AC power along with the latest technology in network monitoring. Using a state-of-the-art SNMP (Simple Network Management Protocol) management tool, the 3000UB allows the user to create a simple network link between the components of the 3000 Series Teleport system and any Internet connection. Depending on the module being networked, the user may view optical power levels, RF power levels, unit or laser temperature, data activity, and signal path activity. Some modules offer user system setting adjustments via the SNMP. This allows remote systems to be monitored, and in some cases, controlled, from any place that has an Ethernet connection. When connecting the SNMP power supply to a laptop computer, use a “cross-over” Ethernet cable. A ground point on the front panel provides a common ground for all the modules installed in the chassis. Refer to SNMP manager MIB browser for more information.



- A. Thumbscrews (2 Places): Used to secure the power supply to the chassis.
- B. Power On LED (Green): When lit, indicates that the power supply module is on and working properly.
- C. Ground: A common ground point between all modules.
- D. Ventilation Fan: Cools the power supply when in operation. Be sure to keep the fan output free from any blockage.
- E. AC Adapter and Fuse Holder: Provides AC power to the power supply. A standard IEC cord is provided with each power supply. The power supply meets UL and CE requirements.
- F. Internet Connection (RJ-45 Connector): Allows the user to connect the power supply to the SNMP management tool.
- G. PC Connection and Network Configuration (DB-9 Connector): Connects the power supply to the PC via a standard 9-pin serial cable. Allows the user to locally set the IP address and other network parameters necessary for SNMP monitoring and control. See “Configuring the SNMP Power Supply” on page 13 for details.
- H. Backplane Connection: Inserts into the backplane of the rack chassis, allowing the power supply to provide power the the entire chassis.

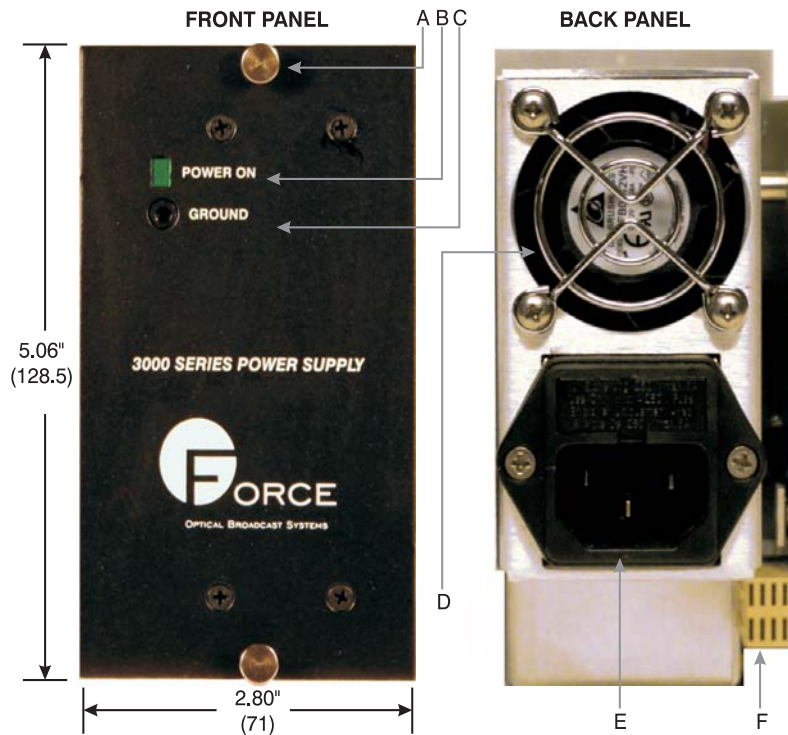
CAUTION

CAUTION: Risk of fire. Replace fuses only with same type and rating as marked. Replacement fuses are available from any electronics store.

Figure 2 3000UB Power Supply Front and Rear Panels
(Dimensions in parentheses are in millimeters.)

3000UC Power Supply Description

The Model 3000UC-NN power supply provides universal 120-240 Volts AC at 50-60 Hz. The power supply is hot-swappable for reduced system downtime. A ground point on the front panel provides common ground for all the modules installed in the chassis.



- A. Thumbscrews (2 Places): Used to secure the power supply to the chassis.
- B. Power On LED (Green): When lit, indicates that the power supply module is on and working properly.
- C. Ground: Common ground point among all modules.
- D. Ventilation Fan: Cools the power supply when in operation. Be sure to keep the fan output free from any blockage.
- E. AC Adapter and Fuse Holder: Provides AC power to the power supply. A standard IEC cord is provided with each power supply. The power supply meets UL and CE requirements.

CAUTION

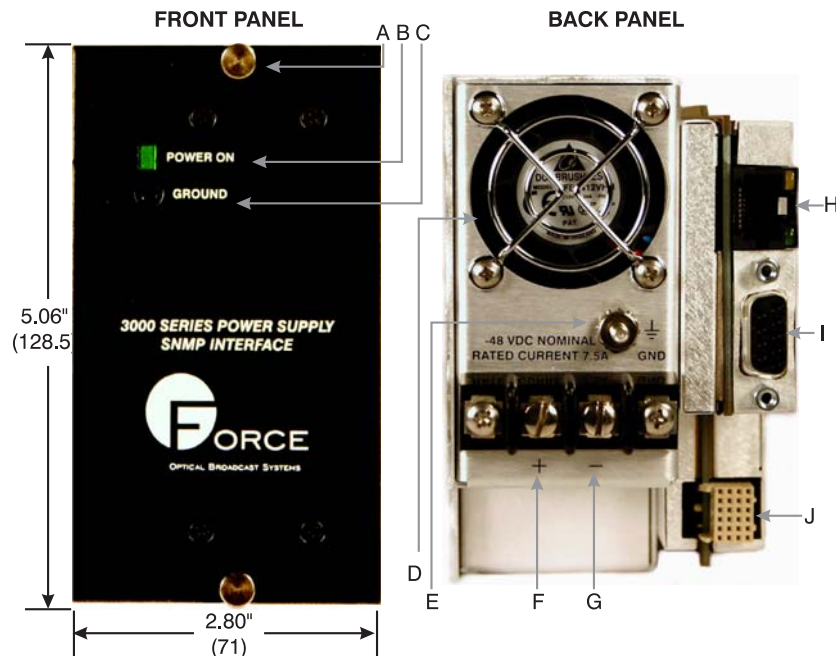
CAUTION: Risk of fire. Replace fuses only with same type and rating as marked. Replacement fuses are available from any electronics store.

- F. Backplane Connection: Inserts into the backplane of the rack chassis, allowing the power supply to provide power the the entire chassis.

Figure 3 3000UC Power Supply Front and Rear Panels
(Dimensions in parentheses are in millimeters.)

3000UD Power Supply Description

The Model 3000UD-NN power supply provides -48 Volts DC power as well as the RJ-45 interface for SNMP monitoring and control. As with the Model 3000UB-NN, this allows remote systems to be monitored, and in some cases, controlled, from any place that has an Ethernet connection. When connecting the SNMP power supply to a laptop computer, use a “cross-over” Ethernet cable. A ground point on the front panel provides a common ground for all the modules installed in the chassis. Refer to SNMP manager MIB browser for more information.

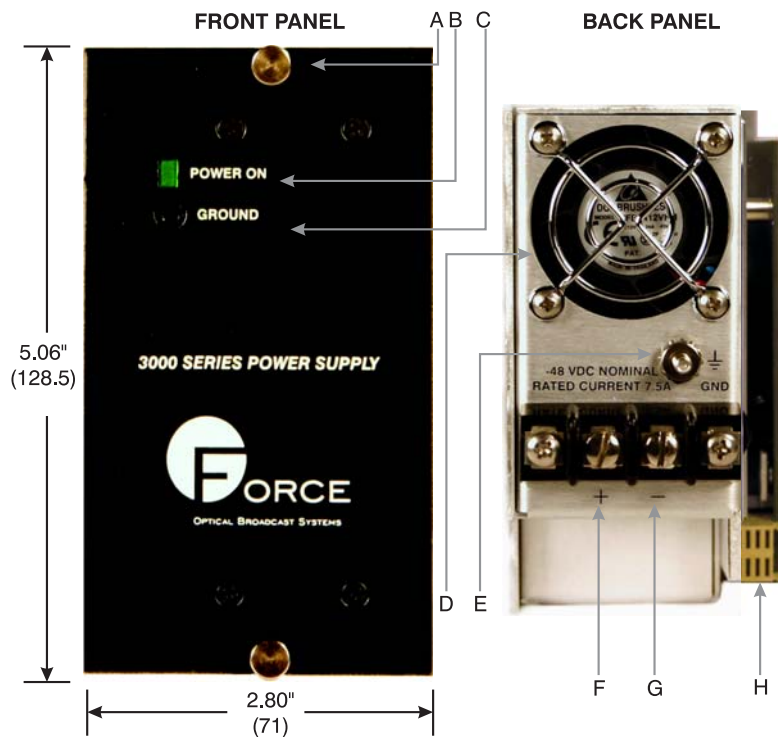


- A. Thumbscrews (2 Places): Used to secure the power supply to the chassis.
- B. Power On LED (Green): When lit, indicates that the power supply module is on and working properly.
- C. Ground: A common ground point between all modules.
- D. Ventilation Fan: Cools the power supply when in operation. Be sure to keep the fan output free from any blockage.
- E. Safety Ground Connection (GND): Threaded screw with nut and starwasher allows the user to connect the power supply to a system safety ground lead.
- F. DC Voltage Line Positive Connection: Thread screw with nut and star washer for securing the positive lead. This connection should be made using 14 AWG copper stranded wire (UL 1061, 300V, 80°C). The power supply meets UL and CE requirements.
- G. DC Voltage Line Negative Connection: Thread screw with nut and star washer for securing the negative lead. This connection should be made using 14 AWG copper stranded wire (UL 1061, 300V, 80°C). The power supply meets UL and CE requirements.
- H. Internet Connection (RJ-45 Connector): Allows the user to connect the power supply to the SNMP management tool for monitoring and control of the system.
- I. PC Connection and Network Configuration (DB-9 Connector): Connects the power supply to the PC via a standard 9-pin serial cable. Allows the user to locally set the IP address and other network parameters necessary for SNMP monitoring and control. See “Configuring the SNMP Power Supply” on page 13 for details.
- J. Backplane Connection: Inserts into the backplane of the rack chassis, allowing the power supply to provide power the the entire chassis.

Figure 4 3000UD Power Supply Front and Rear Panels
(Dimensions in parentheses are in millimeters.)

3000UE Power Supply Description

The Model 3000UE-NN power supply provides -48 Volts DC. The power supply is hot-swappable for reduced system downtime. A ground point on the front panel provides common ground for all the modules installed in the chassis.



- A. Thumbscrews (2 Places): Used to secure the power supply to the chassis.
- B. Power On LED (Green): When lit, indicates that the power supply module is on and working properly.
- C. Ground: A common ground point between all modules.
- D. Ventilation Fan: Cools the power supply when in operation. Be sure to keep the fan output free from any blockage.
- E. Safety Ground Connection (GND): Threaded screw with nut and starwasher allows the user to connect the power supply to a system safety ground lead.
- F. DC Voltage Line Positive Connection: Thread screw with nut and

- star washer for securing the positive lead. This connection should be made using 14 AWG copper stranded wire (UL 1061, 300V, 80°C).The power supply meets UL and CE requirements.
- G. DC Voltage Line Negative Connection: Thread screw with nut and star washer for securing the negative lead. This connection should be made using 14 AWG copper stranded wire (UL 1061, 300V, 80°C). The power supply meets UL and CE requirements.
- H. Backplane Connection: Inserts into the backplane of the rack chassis, allowing the power supply to provide power the the entire chassis.

Figure 5 3000UE Power Supply Front and Rear Panels
(Dimensions in parentheses are in millimeters.)

Rack Adapter Card Installation

CAUTION

NEVER INSTALL OR REMOVE RACK ADAPTER CARDS WITH THE POWER ON.

Items Provided with the Rack Adapter Card

The following is a list of items provided with each 3000A-NN-1 rack adapter card.

Qty.	Mfr.	P/N	Description
1	Emcore	3000.201	3RU Rack Adapter Card PCB Assembly
4	Emcore	9410-0169	Phillips Panhead Screw, 4-40 x 3/8"
4	Emcore	9430-0067	Washer, #4 Lock, Internal Tooth
4	Emcore	9430-0109	Nut, 4-40, SS
1	Emcore	3000.501	2-Pin to 4-Pin Power Rack Adapter Cable

Items Required for the Rack Adapter Cards

Qty.	Mfr.	P/N	Description
1	Any	Any	Phillips Head Screwdriver
1	Any	Any	1/4" Crescent Wrench

Mounting Modules on the Rack Adapter Card

- 1) Locate the supplied rack adapter card parts as indicated above.
- 2) Figure 6 shows the general directions for installing all mountable modules to the rack adapter card.

NOTE:

Mounting will vary according to the unit being installed. See the IOM for the unit being installed for detailed mounting instructions.

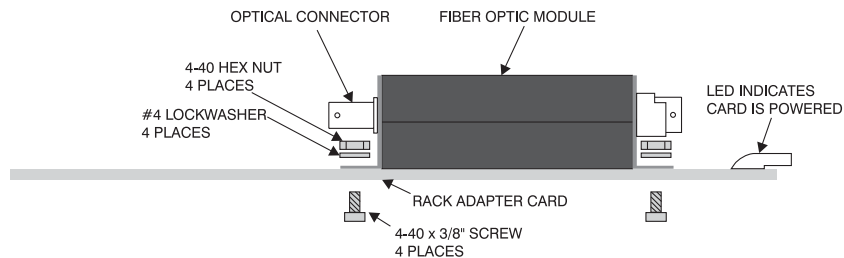


Figure 6 Mounting Modules on the Rack Adapter Card

- 3) Assemble the power rack adapter cable. This is done by attaching the 2-pin cable assembly (3000.501) to the power connector on the unit and the 4-pin to be mounted on the rack adapter card at J1.
- 4) The rack adapter card is now ready to install in the rack chassis.

Items Provided

The following is a list of items provided with each Model 3000 3RU Rack Chassis, Power Supplies, and Card:

Qty.	Mfr.	P/N	Description
AR	Emcore	3000CB-NN	3RU Rack Chassis
1 or 2 per chassis	Emcore	3000UX-NN	3RU Power Supply, SNMP monitoring and control option available, Universal AC or -48 Volts DC options available.
AR	Emcore	3000EA-NN	Optional 3RU Blank Panel for unused module slots.
AR	Emcore	3000EB-NN	Optional 3RU Blank Panel for unused power supply slot.
AR	Emcore	3000A-NN-1	Rack Adapter Card Kit for Mounting One Unit to the Card
1 per power supply	Any	Any	Three-wire Ground IEC Power Cable (AC Versions)
AR	Any	Any	Active Device Receptacle Caps

Items Required

Qty.	Mfr.	P/N	Description
4 per unit	Any	Any	4-40 or 6-32 Panhead Mounting Screws with Lock Washers and Nuts
1	Any	Any	Straight Screwdriver
AR	Any	Any	Standard EIA 19" Rack with Earth Ground (rack-mount configuration only)
AR	AR	Any	14 AWG Stranded Copper Wire (UL 1061, 300V, 80°C) For DC Power Connections (DC Version)

Inspection

Remove the units from their shipping container. Any in-shipment damage that may have occurred should be visually apparent. Look for bent or damaged connectors or mounting brackets. Claims for damage incurred in shipment should be made directly to the transportation company in accordance with their instructions. Save the shipping cartons until installation and performance verification are completed.

3RU Equipment Rack Configuration

Carefully unpack the chassis, and install it in your earth grounded equipment rack. Make sure to load the heaviest equipment near the bottom of the rack and the lightest equipment at the top of the rack. The surface of the equipment rack that mates to the chassis mounting ears should be conductive. The unit should be located in an area that provides adequate lighting and is relatively free from dust. The units are each housed in a single EIA standard 3RU (5.25 inch) rack-mount chassis. To ensure the unit does not overheat, leave 1RU of space above and below each installed 3000 chassis. When connecting power to the 3000 chassis, take care as to not overload the branch circuit supplying power to whatever is already connected. Also, make sure there are no obstructions in the fan exhaust or inlet paths.

NOTE

When using redundant power supplies, apply power to the power supply before installation into the rack chassis. If power is not at the power supply at installation, an alarm condition will be reported to the DB-25 connector located at the rear of the rack chassis. See Connections, page 11-12 for a list of faults that may be reported.

Connections

Connector Name/Location	Connector Type	Function
Power/Rear of Power Supply	Three-wire Ground AC Connection or -48 Volts DC terminal	Power Input

Connector Name/Location	Connector Type	Function	
Rear of 3000UB or 3000UD	RJ-45	SNMP Connection	
Rear of 3000UB or 3000UD	DB-9	Connection to PC and Local Configuration of Network Parameters	
Pin	Name	Direction	Description
Pin 1	CD	<<--	Carrier Detect
Pin 2	RXD	<<--	Receive Data
Pin 3	TXD	-->>	Transmit Data
Pin 4	DTR	-->>	Data Terminal Ready
Pin 5	GND		System Ground
Pin 6	DSR	<<--	Data Set Ready
Pin 7	RTS	-->>	Request to Send
Pin 8	CTS	<<--	Clear to Send
Pin 9	RI	<<--	Ring Indicator
Alarm/Rear of Chassis	DB-25	Remote Alarm Output	Remote Alarm Output
		Pin 1	Summary Fault
		Pin 2	Ground
		Pins 3-10	Reserved for Future Use
		Pins 11, 13, 14, 23, 25	Ground
		Pins 12, 15-22, 24	Reserved for Future Use

AC Power Connections

AC versions of this product are equipped with a three-wire grounding type plug which should be connected to the proper outlet on the back of the unit. This plug will only fit into the proper grounding type power outlet. If you are unable to insert the plug into the outlet, contact your electrician. *Do not defeat the safety purpose of the grounding type plug at the risk of fire or personal safety.*

AC-powered models may be connected to a variety of single phase power sources between the range of 120 V_{AC} to 240 V_{AC} having a frequency of 50-60 Hz.

DC Power Connections

DC versions of this product are equipped with a safety (frame) ground stud on the rear panel near the terminal barrier strip. Connect safety earth ground to this point. Do not connect any DC power leads to the provided safety ground stud. All DC-powered units must be powered through a customer-provided 10A slow blow fuse and alarm panel.

Connect the positive (+) and negative (-) leads from a reliably grounded -48 Volt DC power source and fuse panel to the appropriate voltage screws on the barrier strip. These wire leads must be a minimum of 14 AWG stranded copper, of the proper color to distinguish between positive (+) and negative (-) elements, and terminated using a ring lug. The connections are made using a screw and a star washer. With a straight screwdriver, remove the screws and place the lug between the terminal block and the star washer. After the lug is inserted between the terminal block and the star washer, tighten the screws to secure the leads. Figure 7 illustrates these connections.

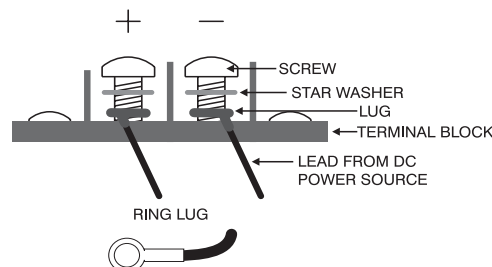


Figure 7 DC Power Connections

General Rules for Supplying Power to DC-powered Units

The following guidelines will be helpful in making a safe and proper power installation for DC-powered units.

- 1) All primary -48 V_{DC} supply power cabling shall be a minimum of 14 AWG stranded copper (UL 1061, 300V, 80°C), of the proper color to distinguish between positive (+) and negative (-) elements.
- 2) The power cabling color must be consistent for all applications within the installation site and as specified by any local or national jurisdictions.
- 3) An “earth grounding” wire (typically green color with a yellow trace) must also be provided. The color must be consistent for all applications within the installation site and as specified by any local or national jurisdictions.
- 4) The “earth grounding” conductor must not be smaller than the circuit conductors supplying the equipment. (Ref.: NEC 250-95).
- 5) At the unit, the earth grounding conductor must be terminated with an appropriate ring terminal to fit a #6 grounding stud. The terminal is to be firmly secured as follows: In mounting, an external tooth (“star”) lock washer must be present against both surfaces of the earth grounding conductor’s ring terminal.
- 6) The other end of the earth grounding conductor is to be stripped and then soldered (bonded) to the equipment rack’s grounding bus.
- 7) For the supply wiring, observe the polarity when connecting the wiring to the power input terminal block.
- 8) It is recommended to use SPC Technology part number CRS-TV-1806 or equivalent ring type terminal for primary supply wiring, and grounding must be sized for both the specific wire size and the stud size.
- 9) The power cabling must be secured to the rack standard within eight (8) inches of the input terminal block at the rear of the unit.
- 10) All primary power wiring from the source panel is to be secured with UL recognized plastic ties or lacing at least every eight (8) inches of cable.
- 11) The wires running from the rack standard to the input power terminal block of the unit shall be secured every two (2) inches.
- 12) See page 3 for the exact fuse rating for the DC power supply. The supply circuit wiring must be sized for the length of the run and the rated current requirement of the unit.
- 13) Follow the wiring recommendations from the manufacturer of the fuse and alarm panel.
- 14) Follow the wiring recommendations from the manufacturer of the fuse and alarm panel.
- 15) A readily accessible disconnect device must be incorporated into the building installation wiring.
- 16) Install the unit in a restricted access location.

Initial Power-up

1. Locate the chassis and units in the proper environment as described on page 11.
2. Connect the installed transmitter and receiver optical ports to the optical cable.
3. Connect the companion Teleport equipment as required.
4. When all cable connections have been made, apply power to the unit. The green “Power” LED on the power supply front panel should light.

Troubleshooting

The Model 3000 3RU Rack Chassis, Power Supplies, and Card are rarely a point of failure. The power supplies contain a “Power On” LED to indicate that the chassis is receiving power. In the case that this LED does not light, verify that power connections are firmly made to the chassis, and verify the integrity of the power cord or terminal barrier contacts. Also make sure that primary power has not inadvertently been turned off and that no fuse have blown in the power source or the units installed in the chassis. See the IOMs for the installed transport modules for additional troubleshooting information.

Configuring the SNMP Power Supplies

The SNMP power supplies are configured using the power supply’s command line interface. When using the SNMP monitoring and control option, the user must set up communication between the power supplies and the system, configure the power supply IP address and other network settings, and configure the SNMP agent to collect the information being monitored in the system.

Serial Port Settings

The SNMP compatible power supply is connected to a PC with a standard 9-pin serial cable. The PC communicates with the power supply using a hyperterminal or some other terminal emulation program. Serial port settings are as follows:

- 19200 bps
- No Parity
- 8 Data Bits
- 1 Stop Bit
- No Flow Control

IP and SNMP Config Files

The configuration program will create the IP and SNMP configuration files located on the FLASH file system at mnt/forceinc. Existing files will be overwrite. Table 1, “SNMP Configuration Utility,” on page 14 shows a sample session of the SNMP configuration utility. Follow the steps to configure the SNMP power supplies to communicate with the rest of the 3000 Series system. At the command prompt (/>) type:

```
forceconfig.
```

Table 1 SNMP Configuration Utility

Sample Command Line	Comments
Force, Inc SNMP Configuration Utility, Copyright 2004	
[1] IP Address Configuration	
[2] SNMP Configuration	
[0] Quit	
Enter command (0, 1, 2): => 1	Enter 1 to configure the IP address.
Configuring SNMP IP Address	
DHCP [N/y]	If Y is entered, no additional configuration is required.
DHCP disabled	
IP Address => 10.10.10.146	Enter the IP address for the power supply being configured.
Netmask => 255.255.255.0	Enter the Netmask for the power supply being configured
Default Gateway IP Address => 10.10.10.210	Enter the Default Gateway IP Address for the power supply being configured.
[1] IP Address Configuration	
[2] SNMP Configuration	
[0] quit	
Enter command (0, 1, 2): => 2	Enter 2 to configure the SNMP agent.
Configuring SNMP Agent	
syslocation	The [typically physical] location of the system. Note that setting this value here means that when trying to perform an snmp SET operation to the sysLocation.0 variable will make the agent return the 'notWritable' error code. IE, including this token in the snmpd.conf file will disable write access to the variable. arguments: location_string
	Type in the physical location of the system.

Table 1 SNMP Configuration Utility

Sample Command Line	Comments
<code>syscontact</code>	The contact information for the administrator. Note that setting this value here means that when trying to perform an snmp SET operation to the sysContact.0 variable will make the agent return the 'notWritable' error code. IE, including this token in the snmpd.conf file will disable write access to the variable. arguments: contact_string
<code>syssservices [76]</code>	Type in the name of the system contact. The proper value for the sysServices object. # arguments: syssservices_number
The following section controls who is allowed to the running SNMP agent.	
<code>rocommunity [public] => read</code>	rocommunity: a SNMPv1/SNMPv2c read-only access community name arguments: community [default hostname network/bits] [oid]
<code>rwcommunity [private] => write</code>	rocommunity: a SNMPv1/SNMPv2c read-write access community name arguments: community [default hostname network/bits] [oid]
The following section defines a single trap destination.	
<code>trapcommunity [public] =></code>	Default trap sink community to use arguments: community string
<code>Enable traps [Y/n] y</code>	If N is entered, no additional trap configuration is required.
<code>Trapsink IP Address => 10.10.10.231</code>	add trap destination here trapsink ip-address trapcommunity port-number
<code>Trapsink Port Number [162] =></code>	Additional trap destinations can be added using the VI editor.
[1] IP Address Configuration	
[2] SNMP Configuration	
[0] quit	
Enter command (0, 1, 2): => 0	

Whether the config files are newly created or edited with vi, once configured, the power supply must be rebooted in order for the files to take effect. At the command prompt, type:

```
reboot
```

Editing the Configuration Files

The files `snmpd.conf` and `cat ipconfig` are created by the configuration program. Once these files have been created they can be edited using the vi (visual) editor on the SNMP compatible power supply.

NOTE: If the forceconfig utility is run again, the file will not save the contents of the previous session.

Basic vi Commands

The vi editor is a common editor for unix systems in that it makes use of a regular keyboard with an escape key. The vi editor has two modes of operation, command mode which causes an action to be taken on the file, and insert mode which allows text to be inserted into the file. In the command mode, every character typed is a command that does something to the text file being edited; a character typed in command mode will even cause the vi editor to enter insert mode. In insert mode, every character typed is added to the text in the file. Pressing the "Esc" (escape) key turns off the insert mode. NOTE: vi commands are case-sensitive. Be sure not to use a capital letter in place of a lowercase letter. Table 2, "vi commands," on page 16 lists the most common vi commands

Table 2 vi commands

Command Line	Comments
Start or Recover an Editing Session	
<code>vi filename</code>	Edit <i>filename</i> starting at line 1.
Undo Command	
<code>u</code>	Undo the last command.
Screen Commands	
<code>CTL/I</code>	Reprints the current screen.
<code>CTL/F</code>	Pages forward one screen.
<code>CTL/B</code>	Pages back one screen.
<code>CTL/D</code>	Pages down half screen.
<code>CTL/U</code>	Pages up half screen.
Cursor Positioning Commands	
<code>j</code>	Moves the cursor down one line, same column.
<code>k</code>	Moves cursor up one line, same column.
<code>h</code>	Moves cursor back one character.
<code>l</code>	Moves cursor forward one character.
<code>RET</code>	Moves cursor to beginning of next line.
<code>\$</code>	Moves cursor to end of current line.
<code>SPACE</code>	Moves cursor forward one character.
<code>nG</code>	Moves cursor to beginning of line <i>n</i> . Default is last line of file.
<code>:n</code>	Moves cursor to beginning of line <i>n</i> .
<code>b</code>	Move cursor backward to the beginning of the previous word.
<code>e</code>	Moves cursor backward to the end of the previous word.
<code>w</code>	Moves cursor forward to the next word.
<code>/pattern</code>	Moves cursor forward to the next occurrence of <i>pattern</i> .
<code>?pattern</code>	Moves cursor backward to the next occurrence of <i>pattern</i> .
<code>n</code>	Repeats last / or? pattern search.
Text Insertion Commands	
<code>a</code>	Appends text after cursor. Terminated by the escape key.
<code>A</code>	Appends text at the end of the line. Terminated by the escape key.
<code>i</code>	Inserts text before the cursor. Terminated by the escape key.
<code>I</code>	Inserts text at the beginning of the line. Terminated by the escape key.
<code>o</code>	Opens a new line below the current line for text insertion. Terminated by the escape key.
<code>O</code>	Opens a new line above the current line for text insertion. Terminated by the escape key.
<code>ESC</code>	Stops text insertion.
Text Deletion Commands	
<code>x</code>	Deletes current character.
<code>dd</code>	Deletes current line.
<code>dw</code>	Deletes current word.
<code>d)</code>	Deletes the rest of the current sentence.
<code>D, d\$</code>	Deletes from the cursor to the end of the line.
<code>P</code>	Puts back text from the previous delete.
Changing Commands	

Table 2 vi commands

Command Line	Comments
<code>cw</code>	Changes characters of current word until stopped with the escape key.
<code>c\$</code>	Changes text up to the end of the line.
<code>C, cc</code>	Changes remaining text on the current line until stopped by pressing the escape key.
<code>~</code>	Changes case of current character.
<code>xp</code>	Transposes current and following characters.
<code>J</code>	Joins the current line with the next line.
<code>s</code>	Deletes the current character and goes into the insertion mode.
<code>rx</code>	Replaces current character with <i>x</i> .
<code>R</code>	Replaces the following characters until terminated with the escape key.
Cut and Paste Commands	
<code>YY</code>	Puts the cursor line in a buffer. Does not delete the line from its current position.
<code>p</code>	Places the line in the buffer after the current position of the cursor.
Appending Files into the Current File	
<code>:w<Return></code>	Writes the current contents to file named in original vi call.
<code>:w <i>newfile</i><Return></code>	Writes the current contents to a new file named <i>newfile</i> .
<code>:w! <i>prevfile</i><Return></code>	Writes the current contents over a pre-existing file named <i>prevfile</i> .
Exiting vi	
<code>ZZ</code>	Exits vi and saves changes.
<code>:wq</code>	Writes changes to the current file and quits the editing session.
<code>:q!</code>	Quits the editing session without making changes.

Cleaning

If the chassis needs to be cleaned, avoid the use of all solvents and use low-pressure clean air to remove loose dirt. Use low-pressure clean air to clear the connectors of any debris. In the optical transmitters and receivers used with the chassis, dirty or scratched connector end faces will greatly reduce the unit's performance. Do not try to use fluids or high-pressure air to clean out the optical ports. Foam-tipped swabs such as the 2.5 mm Mini Foam Swab offered by Fiber Instrument Sales (P/N F1-0005) may be saturated with denatured alcohol* and inserted into the optical port for cleaning. **DO NOT INSERT A DRY SWAB INTO THE OPTICAL PORT AS THIS MAY DAMAGE THE FIBER END FACE.** Many fiber optic installations experience degraded performance due to dirty optical connector end faces. For complete connector cleaning instructions, download <http://www.forceinc.com/techbull/optical-connector-cleaning.pdf> from Force's web site.

Warranty and Product Return Policy

Warranty

Force, Incorporated standard products are warranted to be free from defects in materials and workmanship, meeting or exceeding factory specified performance standards for a period of three (3) years from date of purchase.

Force Obligations

Force will, at its discretion and expense, repair any defect in materials or workmanship or replace the product with a new product. Force will, upon receipt of the return, evaluate the product and communicate to the customer the nature of the problem, and determine if the claim falls under warranty coverage.

If during the warranty period, Force is unable to repair the product to the original warranted state within a reasonable time, or if subcomponents of the unit have been obsoleted or discontinued, then Force has the option to provide an equivalent unit.

Exclusions

This warranty does not extend to any product that has been damaged due to acts of God, accident, misuse, abuse, neglect, improper system design or application, improper installation, improper operation or maintenance, or connection to an improper voltage supply.

The Force warranty does not cover fuses, batteries, and lamps. Modifications or alterations of Force products (including but not limited to installation of non-Force equipment or computer programs), except as authorized by Force, will void this warranty. Removal or breaking of the seals on the product will also void the warranty. In addition, cost of repair by unauthorized persons within the warranty period of the product will not be covered by Force, Incorporated. Such repairs will void the warranty.

Force, Incorporated makes no other representation or warranty of any other kind, express or implied, with respect to the goods, whether as to merchantability, fitness for a particular purpose, or any other matter. Force, Incorporated's liability shall not include liability for any special, indirect or consequential damages, or for any damages arising from or attributable to loss of use, loss of data, loss of goodwill, or loss of anticipated or actual revenue or profit, or failure to realize expected savings, even if Force, Incorporated has been advised of the possibility of such damages. This warranty constitutes Force, Incorporated's entire liability and the customer's sole remedy for defects in material and workmanship.

Product Return Policy

Customers will be permitted to return products for credit, repair, or replacement only after receiving authorization from the Customer Service Manager (CSM) and only with a valid Return Material Authorization (RMA) number. The criteria determining whether a product is covered under this policy are described below and RMA numbers will be issued only under these guidelines. For Return Requests that do not comply with the following criteria, the CSM must have approval from the VP Operations, or designee prior to issuing an RMA number.

Products Returned for Credit - Non Distributor

Customers will be allowed to return product for credit only under the following conditions:

- Products are current standard Force products as per the price list.
- Products are in new, unused, and undamaged condition and are in the original packaging.
- Products were originally shipped to the customer requesting Return Authorization.
- Request for return is for a valid reason as determined by Force, Inc.
- Products were shipped to the customer less than 3 months prior to return request.
- Customer receives proper Return Material Authorization prior to returning the product.
- Customer pays return freight and insurance if requested by Force, Inc.

Customers will be issued a credit for the original selling price of the product less a 20% restocking charge after verification that the product meets the criteria as stated above. Payment to customers with no outstanding balance will be made 30 days after requested by customer.

Products Returned for Repair or Replacement

Force's response to a customer product return request will be based upon whether or not the product is still part of Force's standard product offering and whether or not the product is still under warranty. A product will be considered active if it is currently part of Force's standard product offering. Active products are denoted in Force's current price list. Obsolete products are not considered active. A product is considered under warranty in accordance with "Force, Inc. Product Warranty"

Prior to receiving an RMA number, the customer will be asked to discuss the reason for the return with Technical Support to try to resolve the problem. This discussion will be documented to aid with troubleshooting and repair of the product. Any detail the customer can provide will expedite the process once the product is received.

The criteria denoted above will cause any incoming returns to fall into one of the following categories:

- A. The product is currently active and is under warranty.
- B. The product is currently obsolete, but is still under warranty.
- C. The product is active, but out of warranty.
- D. The product is obsolete and out of warranty.

Active Product Under Warranty

Force will honor the warranty for these products. As a result, product(s) should be accepted upon return for rework or repair in accordance with Force's warranty policy.

Obsolete Product Under Warranty

Force will honor the warranty for these products. As a result, product(s) should be accepted upon return for rework or repair in accordance with Force's warranty policy.

Active Out of Warranty

Force will accept return of product under this category as long as the sale of the product occurred less than five (5) years prior to the return request. The product serial number should aid in determining the age in cases where information is not in the data base. Rework or repair will be in accordance with Force's warranty policy and will include an evaluation charge, which will be quoted to the customer prior to the return of the product.

The evaluation charge is 20% of the current list price of the product or a minimum of \$250 whichever is greater. The customer will either need to provide a purchase order number (with approved credit) or a credit card number before receiving an RMA number. Force cannot guarantee its ability to repair or rework the product. If costs to repair the product exceed the evaluation charge, the customer will be notified of such charges and instruction to proceed with repairs will be indicated either by a P.O. number or credit card authorization.

Obsolete Product Out of Warranty

Force is not obligated to accept requests for product under this category. The CSM, with prior approval from Operations will be responsible for approving return requests for products falling under this category.

Receiving an RMA for Returns

Customers requesting RMA numbers for any reason will be instructed as to how and where to ship the products being returned, and will be directed to show the RMA number on all external packaging and documentation. The CSM is responsible for providing any necessary instructions to the customer to ensure proper handling of the returned material. Upon receipt of the product, all Force personnel are to process the return as per SP002, "Handling of Customer Returns". Contact the factory at USA (800) 732-5252 or TEL (540) 961-1945 to request an RMA.

Repair Service

For equipment repair or technical assistance, contact Customer Service (800) 732-5252 (USA) or (540) 961-1945. A Returned Material Authorization (RMA) number must be issued by Customer Service before the return of a failed unit. Units should be returned in their original shipping carton, if available. Always include a complete description of the failure or observed anomalies, and include the unit's model number and serial number, which are located on the product label.

Shipping and Handling Precautions

The units are, in general, very rugged and can withstand the stresses of most shipping and handling circumstances. However, the following precautions should be taken:

- 1) When the units are shipped they should be wrapped in a protective material, such as bubble wrap, to protect against excessive jarring and to prevent damage to the external finish of the units. Always use packing material to separate multiple units that are packaged together.
- 2) Care should be taken not to drop or strike the units in any way, especially around the optical connectors.
- 3) The units should never be submersed in any liquid. **SEVERE SHOCK HAZARD!**

Storing the Unit

If a unit is to be out of use for an extended period of time, the following steps should be taken to ensure the preservation of the unit:

- 1) The storage temperature range is -40°C to +60°C. Allow time for unit to restore to room temperature (and dry out) before power is applied.
- 2) A low humidity environment is preferable for long term storage.
- 3) All connectors should be covered with active device receptacle caps.