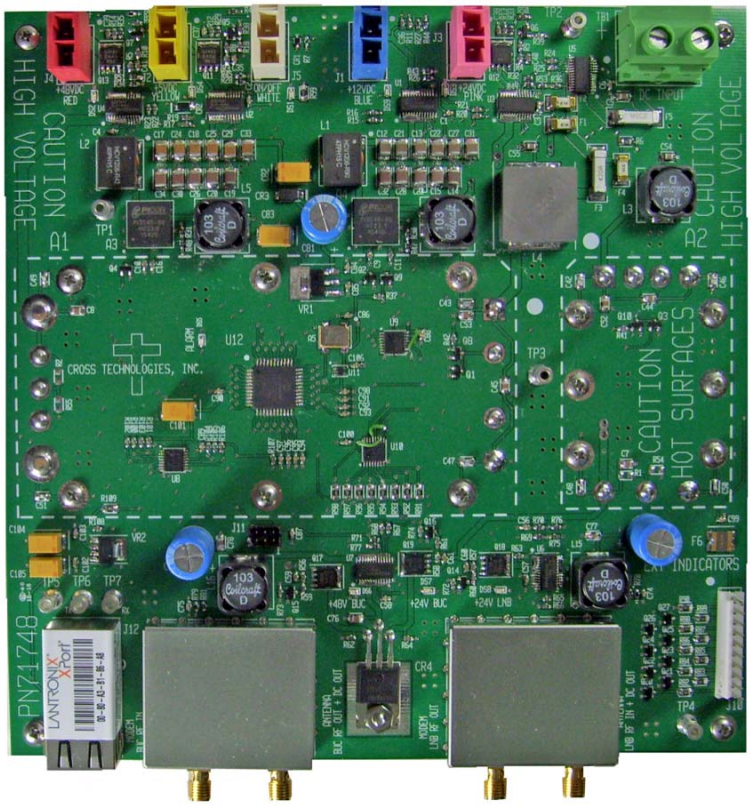
Instruction Manual

Model 2000-15-4848

Power Supply

January 2017, Rev. A



When ordering parts from Cross Technologies, Inc., be sure to include the equipment model number, equipment serial number, and a description of the part.

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INSTRUCTION MANUAL

MODEL 2000-15-4848 Power Supply

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MODEL 2000-15-4848 Power Supply

1.0 General

1.1 Equipment Description

The 2000-15-4848 Power Supply uses a +42VDC - +60VDC input to provide +48VDC @ 10A, +24VDC @ 6A and +5V @ 5A outputs. An optional +12VDC @ 4A output can be provided (Option W90) as well as two L-Band DC insertion SMA loop-through (Option W92). One loop through for BUC applications provides either +24VDC or +48VDC insertion @ 3A and another loop through provides +24VDC @ 1A for LNB applications. Voltage and Current monitoring as well as power switching are all accomplished via an Ethernet (RJ-45) webpage interface. Circuit board LEDs indicate power supply status and fault condition. The power supply assembly is packaged in a 7" X 7" X 1.50" printed circuit board assembly that is mounted to a customers aluminum enclosure using twelve 4-40 screws for the heat sink and four additional screws for additional mechanical stability.

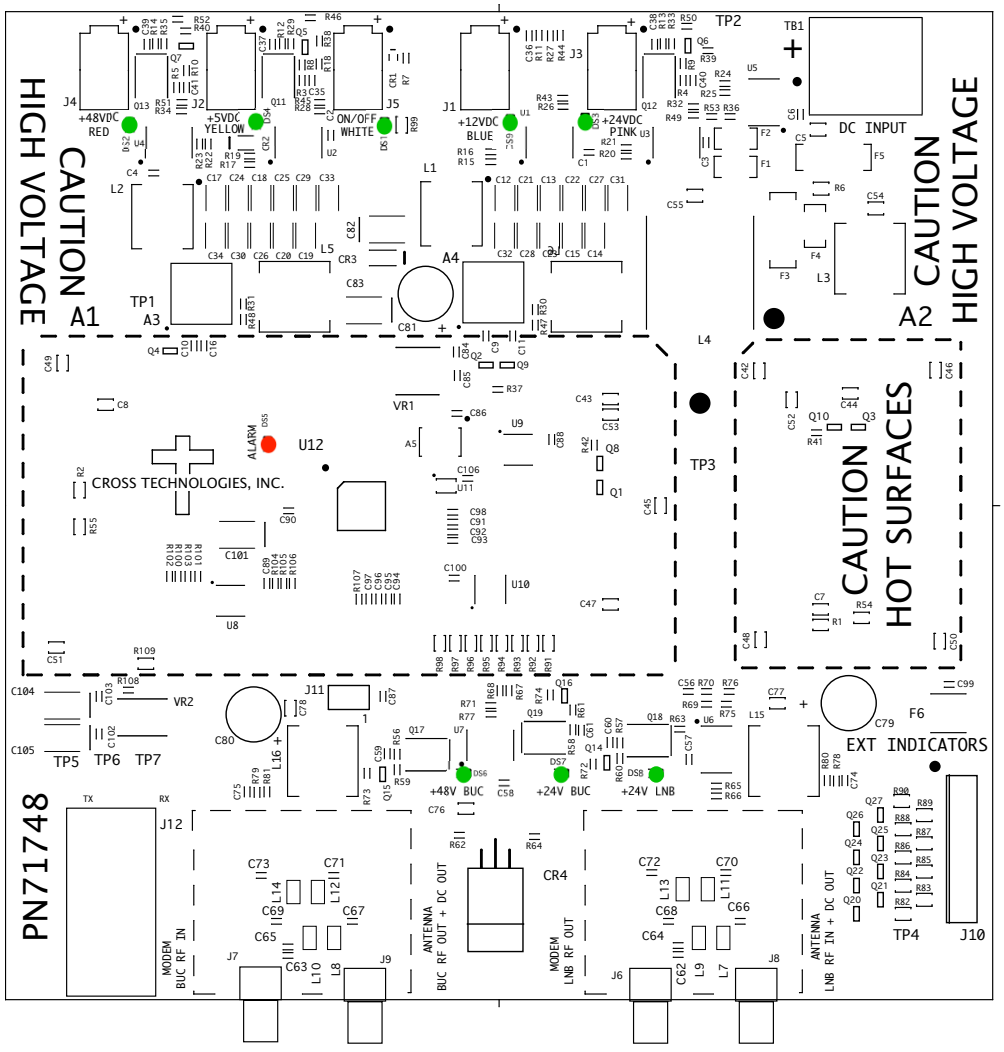


FIGURE 1.1 TOP VIEW - Showing Onboard Indicators (Shown with W90 and W92 Options)

1.1 Equipment Description Continued…

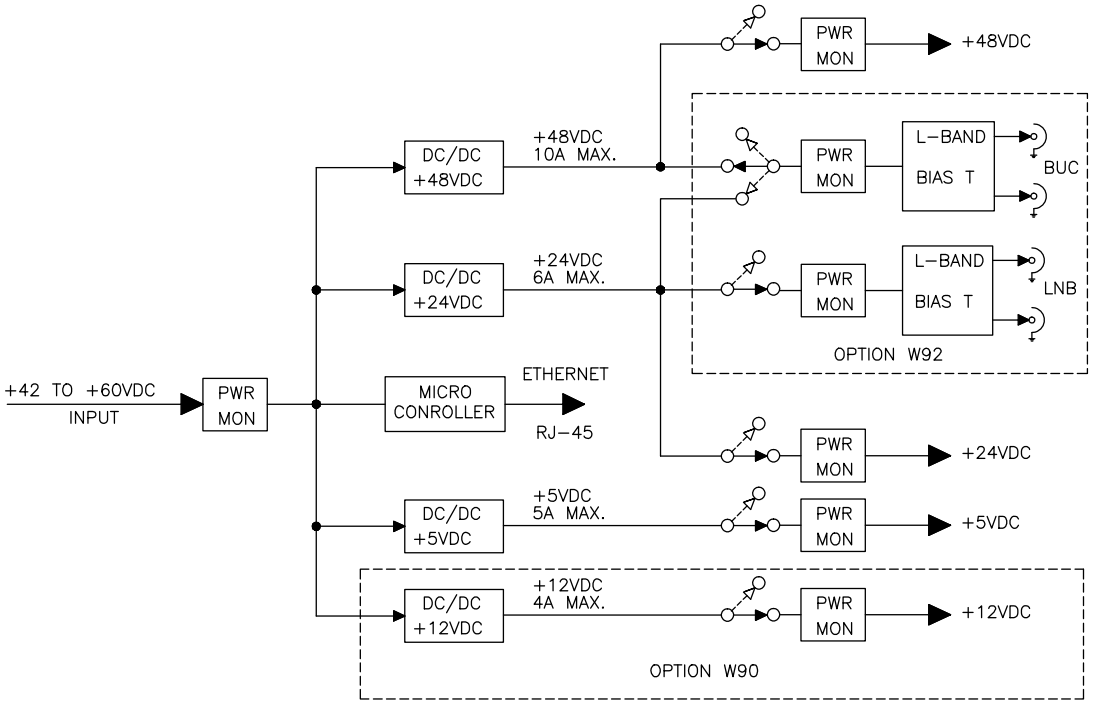


FIGURE 1.2 2000-15-4848 Power Supply

Block Diagram

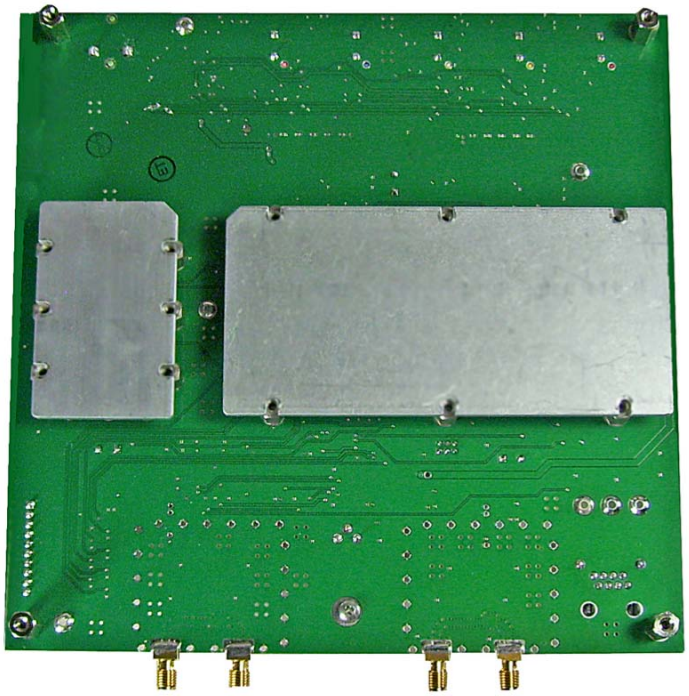


FIGURE 1.3 2000-15-4848 Power Supply

(Bottom View showing Heat sink area and mounting standoffs)

1.2 Technical Characteristics

TABLE 1.0 2000-15-4848 Power Supply Equipment Specifications*	
DC Input Characteristics	
Voltage	+42VDC to +60VDC
Input Power	800 Watts Maximum
DC Output Characteristics	
Voltage/Current	+48 VDC @ 10 Amps Maximum +24 VDC @ 6 Amps Maximum +5 VDC @ 5 Amps Maximum
Option W90, Additional Output	+12 VDC @ 4 Amps Maximum
Option W92, Dual Loop-throughs, BUC	+24/+48 VDC @ 4 Amps Maximum
& LNB	+24V @ 1 Amp Maximum
Load Regulation	+ / -5% Maximum
LED Indicators	
Power	Green
DC Outputs Enabled	Green (Quantity 4-6)
Alarm (Fuse/Fault)	Red
Ethernet Activity	Green & Amber (RJ-45)
L-Band Loop-Throughs	
Frequency Range	950-2150 MHz & 10 MHz
Return Loss	12 dB Typical, 10dB Minimum
Insertion Loss	1 dB Maximum
Frequency Response	±.5 dB Maximum (L-Band)
Physical Characteristics	
Size	7” Wide x 7” Long x 1.5” High
Weight	< 1.5 lbs.
Mounting	4-40 Screws (Quantity 16)
Environmental	
Temperature***	0˚C - +50˚C
Humidity	< 95%, Non-Condensing

* Specifications subject to change without notice.

** Consult Factory for different Input and Output Voltage Requirements.

*** Temperature specification assumes mounting to smooth aluminum surface ≥100 square inches exposed to open air for convection cooling.

Note: In order to minimize the possibility of making incorrect connections to the power supply, Outputs and Remote On/Off, each of the Molex 151048-12XX series connectors, are color coded and individually keyed. Each connector color only fits its same colored mate. Obviously it is important to use the proper connector when making wiring harnesses and to use the proper crimping tool for the Molex contacts (Molex Part Number 63819-7600 or equivalent).

1.2 Technical Characteristics Continued…

TABLE 1.1 2000-15-4848 Power Supply I/O Connectors	
I/O Connectors	**Mating Connectors**
DC Input Power - 2-Pos Terminal Block	10-14 AWG Wire (Wire gauge depends on loading and length of wire)
Remote On/Off - Molex 151048-1211	Molex (WH) 151049-2211 (Molex Contact 50597-8000 18AWG Wire)
+48VDC Output - Molex 151048-1209	Molex (RD) 151049-2209 (Molex Contact 50597-8000 18AWG Wire) †
+24VDC Output - Molex 151048-1205	Molex (PK) 151049-2205 (Molex Contact 50597-8000 18AWG Wire)
+5VDC Output - Molex 151048-1203	Molex (YL) 151049-2203 (Molex Contact 50597-8000 18AWG Wire)
+12VDC Output - Molex 151048-1201	Molex (BL)151049-2201 (Molex Contact 50597-8000 18AWG Wire)
Ethernet - RJ-45 Female	RJ-45 Male
Ext Indicators - TE Conn. 1-640456-0	TE Connectivity 4-640441-0 (24 AWG Wire)
BUC Loop Through - SMA Female (2)	SMA Male
LNB Loop Through - SMA Female (2)	SMA Male
	NOTE: Use Molex Contact Retainer PN 51143-0105 (One Per Contact) † 16AWG Wire is Required for Applications Requiring > 8 Amps

The 2000-15-4848 Power Supply provides for external LED indicators for a remote indication panel. All indicators correspond to the on-board indicators. Each LED will be driven with approximately 10mA typical (+5V minus LED voltage drop divided by 330 Ohms). For applications requiring lower indicator current an external resistor may be added in series with each LED. Table 1.2 shows the pin out of J10. The +5VDC on pin 1 is only sufficient to power the indicators shown.

TABLE 1.2 2000-15-4848 Power Supply External Indicator Connector Pinout	
External Indicators J10	**Description**
J10-1	+5VDC (Connect to the Annodes of all External LED Indicators)
J10-2	“Power ON” (Cathode of LED)
J10-3	“+48VDC ON” (Cathode of LED)
J10-4	“+24VDC ON” (Cathode of LED)
J10-5	“+5VDC ON” (Cathode of LED)
J10-6	“ALARM/FAULT” (Cathode of LED)
J10-7	“+48VDC BUC ON” (Cathode of LED)
J10-8	“+24VDC BUC ON” (Cathode of LED)
J10-9	“+24VDC LNB ON” (Cathode of LED)
J10-10	“+12VDC ON” (Cathode of LED)

2.0 Installation

2.1 Mechanical/Mounting

Figure 2.0 shows how the 2000-15-4848 is mounted. All sixteen screws are 4-40 thread. The power supply requires these screws to be tight for proper thermal conduction to the heat sinking plate. During mounting, the PWB screws may be loosened to allow for alignment to the plate. After mounting the power supply to its final location, retighten all screws.

Vicor Thermal Pads are required for proper thermal conduction. Part numbers are shown in Table 2.0 for the two sizes of thermal pads (one each required per power supply). The aluminum mounting surface must be a clean and smooth for proper heat transfer. The surface area of the aluminum plate must not be less than 100 square inches exposed to open air for convection cooling. Should a power supply need to be replaced, all residual thermal pad material must be removed from both surfaces and a new thermal pad must be installed. Improper installation will result in the power supply thermally shutting down under load conditions. **CAUTION: Under heavy loading the plate may become very hot!**

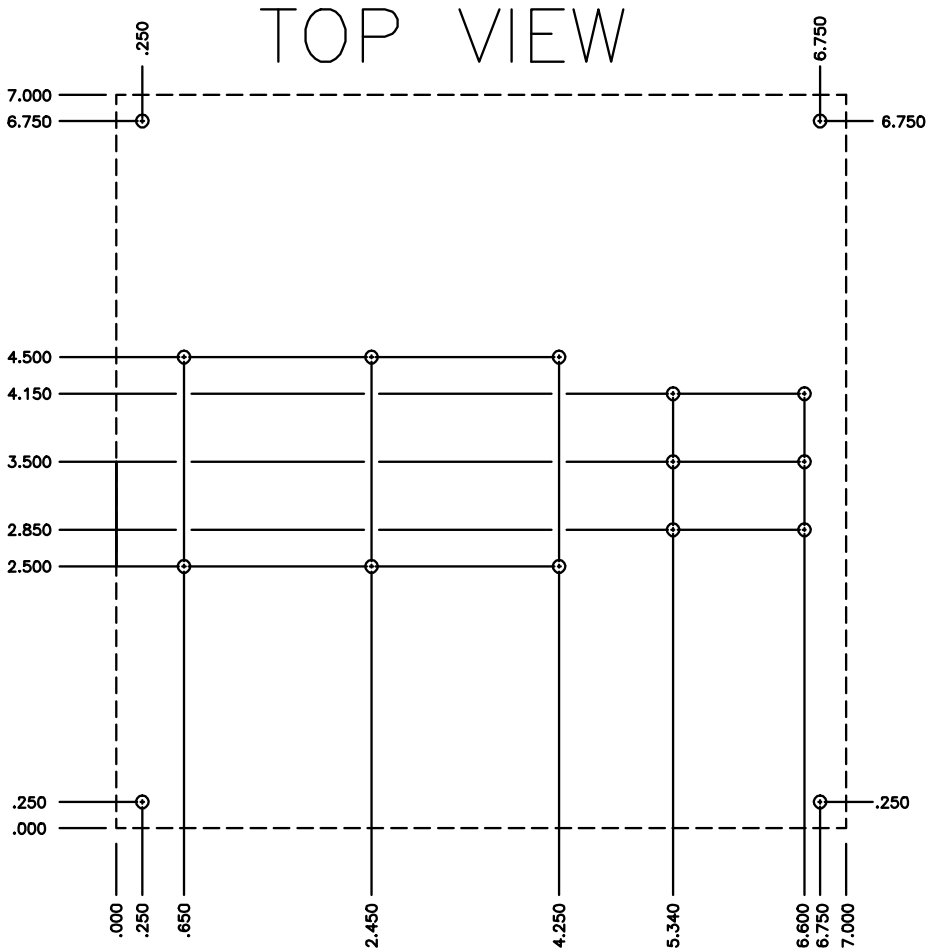


FIGURE 2.1 Power Supply Mounting Pattern
(From Power Supply Side)

TABLE 2.0 2000-15-4848 Power Supply Thermal Interface		
Thermal Pad - Vicor Part Numbers	**Digikey Part Number (Qty 1)**	**Digikey Part Number (10 Pack)**
Maxi - 16493 (Qty 1), 20263 (10 Pack)	1102-1558-ND	1102-1631-ND (10 Pack)
Micro - 16495 (Qty 1), 20265 (10 Pack)	1102-1560-ND	1102-1632-ND (10 Pack)

2.2 Environmental Use Information

A. Reduced Air Flow - Installation of the equipment in a manner that doesn't allow for convection cooling of the heat sink plate and the actual PWB Assembly will cause the unit to thermally shutdown under load. The power supply is designed to be operated at elevated temperatures but must be installed properly so that convection cooling will be adequate.

B. Circuit Overloading - Consideration should be given to the connection of the equipment to the output devices and the effect that overloading of these circuits could have on over current protection and supply wiring. All outputs have overload protection but continued operation in an overloaded state may damage the power supply. Should one or more of these outputs show a fault condition, check the wiring on the output for shorts, etc.

C. Condensation/Moisture - The Power Supply PWB Assembly cannot be exposed to condensation or moisture. Any moisture or condensation may impact the functionality and/or reliability of the unit.

2.3 Top Inputs and Outputs

Figure 2.2 shows the input and output signals on the top of the Power Supply Assembly.

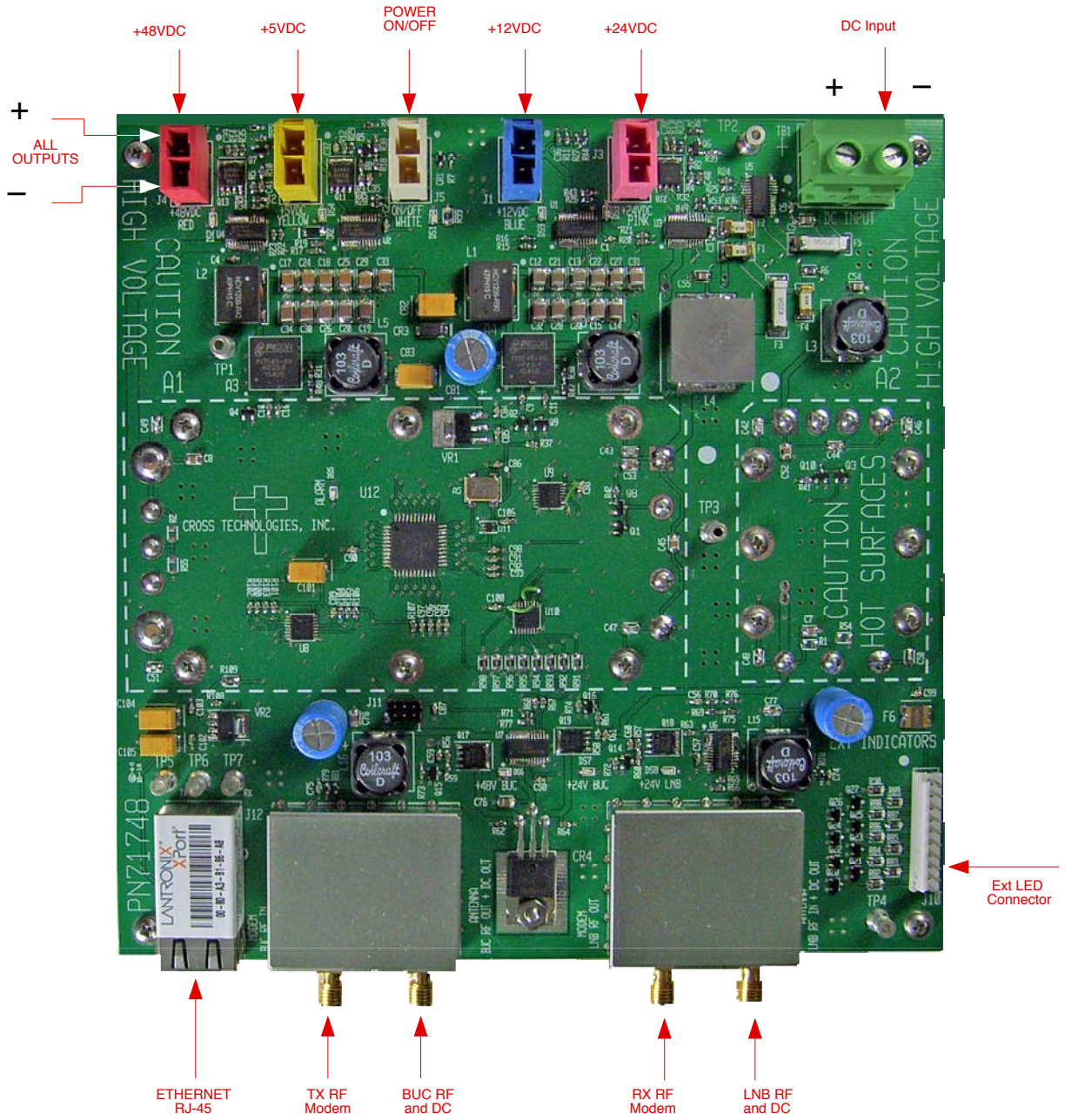


FIGURE 2.2 Top View Connections

2.4 Installation / Operation

2000-15-4848 Power Supply

1. Connect the DC Input to the Terminal Block with appropriate wire gauge. Make sure to size the input wire gauge appropriately for your application!
2. Connect the Ethernet cable to the RJ-45 Jack and to your network/computer interface.
3. If a remote power switch is desired, connect a remote power switch to the (J5) terminals (Open = Off, Closed = On). If a remote power switch is not needed, jumper the terminals on J5.
4. Power up the unit and verify all outputs are turned off. If they are not off, turn them off before proceeding.

   Remove the Power On/Off (J5) connector while making the following connections!

   Do not connect/disconnect connectors while output is enabled (arcing will damage connectors)!
5. Connect the +48V, +24V, +5V and +12VDC (Option W90) Outputs to respective devices as required.
6. Connect the BUC and LNB SMA connectors to the Modem and Antenna cables as required (Option W92).
7. Connect the external LED indicator cable if desired.
8. Apply power and insert ON/Off Switch jumper and/or turn remote power switch to the ON position.
9. Turn on the desired voltage outputs and monitor the voltages and currents for each enabled output. Verify there is no alarm indication and current measurements are as expected.
10. During operation monitor the temperature range and alarm indicator for possible system problems.
11. Should an alarm condition occur, check outputs for shorts or improper loading. An alarm condition will occur if any voltage is outside of its +/-10% window, any one current is in excess of its specification or if the unit temperature exceeds its operating range of ≤ 85°C (≤185°F). If one of these conditions occurs, refer to Table 2.1 for assistance.

TABLE 2.1 2000-15-4848 Troubleshooting

Alarm Description	Action
Temperature	Check heatsink attachment and verify there are no obstructions to convection cooling
A Single Voltage Error	*Remove corresponding load. If error clears, excessive loading or short
Current Overload	Load is drawing more than the power supply's specified output current
Multiple Voltage Errors	Check input voltage to make sure it is within the specified +42VDC - +60VDC

Note: The DC input and all four DC/DC Converters have input fuses. These fuses should not blow unless there has been a catastrophic failure of some sort. If any of these fuses appear to be blown, the unit must be returned to Cross Technologies, Inc. for repair.

3.0 Ethernet Interface Operation

2000-15-4848 Power Supply

3.1 ETHERNET Interface Installation and Operation

The 2000-15-4848 Power Supply is equipped with a 10/100 Base-T compatible Ethernet interface for control and monitoring of its operating parameters. An HTML script interface allows the user to monitor and control the converter using a standard web browser. SNMP (Simple Network Management Protocol) is also supported (Option W18). Contact Cross Technologies for the SNMP MIB file.

3.1.1 Methods of Connection

Directly Connected to a PC:
For control from a local PC, attach the 2000-15-4848's Ethernet port to the Ethernet network connector on the PC using a crossover RJ-45 cable or a standard RJ-45 cable for PC ports that have autosensing.

LAN Connection
For LAN connections, attach the 2000-15-4848 Ethernet port to the LAN using a normal RJ-45 cable.
Use any PC on the LAN to connect to the 2000-15-4848.

3.1.2 Ethernet Configuration

Each 2000-15-4848 must be configured with an appropriate IP address, Netmask, and Gateway assigned by your network manager. The 2000-15-4848 is set at the factory with a static address that is **192.168.123.2**. The device server in the unit has a built in HTTP based configuration manager that is used to configure network settings. To access the configuration manager open a web browser and enter the IP address of the 2000-15-4848 in the browser's address field. The window shown in Figure 3.0 will appear. As delivered, there is no password set. Choose your user name and password here or leave those fields blank and click OK to proceed to the configuration manager web page.

FIGURE 3.0 Password Screen

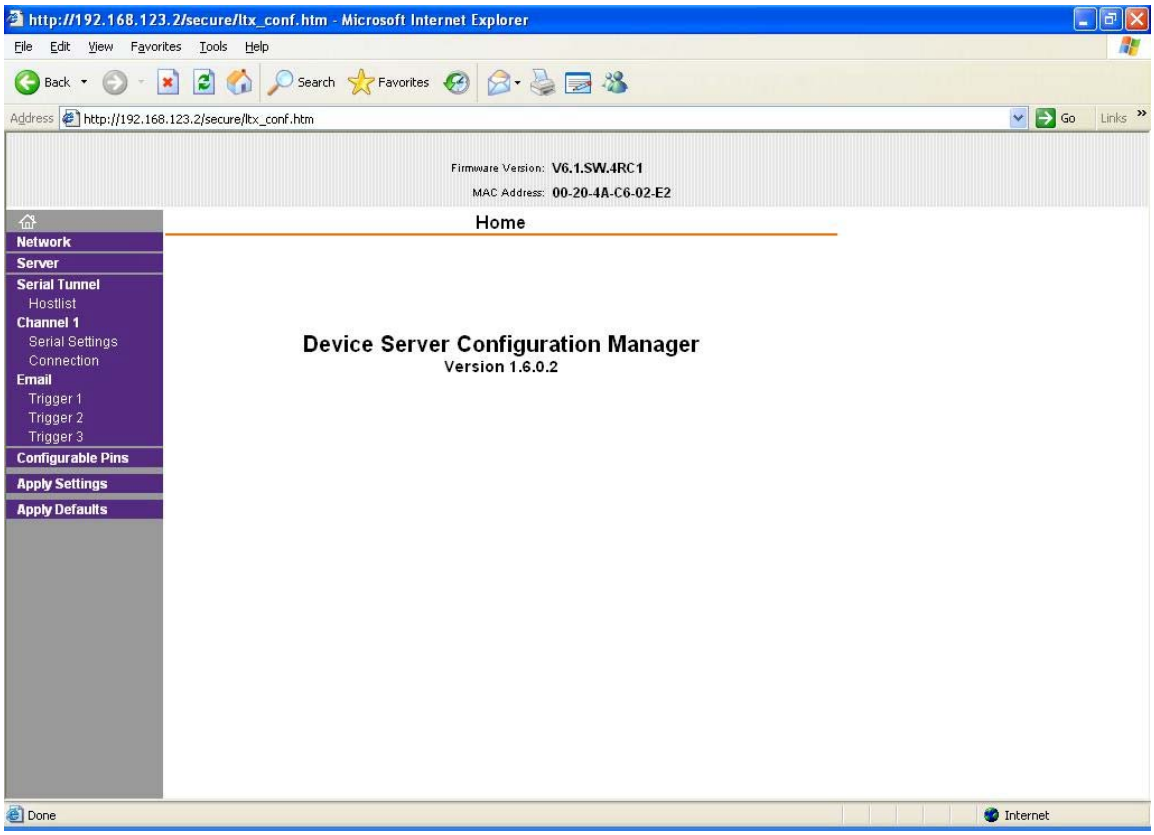


FIGURE 3.1 Configuration Manager Screen

In the left frame of the configuration manager click on Network to display the Network Settings screen. Enter the IP address, Subnet mask, and Gateway address with delimiter dots (example: 192.168.192.47). Click to apply settings in the left frame to apply the new settings in the network device.

3.1.3 Web Page M&C

Enter the following address in a web browser to access the M & C Web page: http://<ip address>/serial/0/setup.htm
Where <ip address> is the IP address of the unit. Figure 3.2 shows the web page from a model 2000-15-4848 Power Supply.

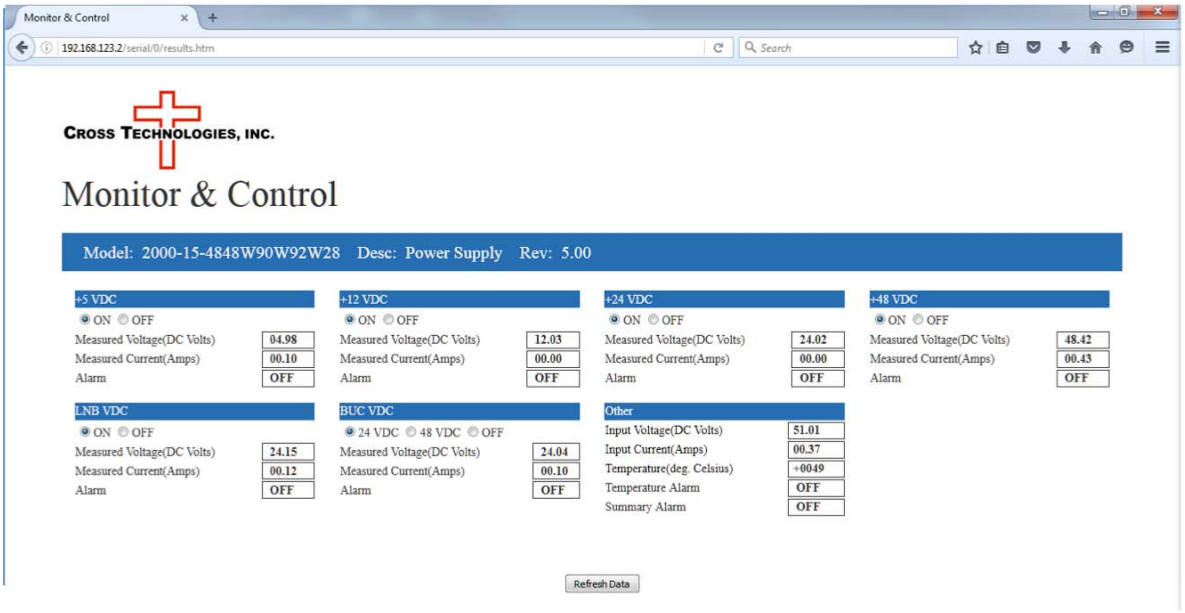


FIGURE 3.2 Model 2000-15-4848 M&C Web Page

3.2 M&C Telnet® Interface (W28 Option)

3.2.1 Product Control

The following example illustrates how to establish a telnet connection to port 10001 using Windows XP's HyperTerminal utility. Many other terminal emulator programs and operating systems may be used in a similar fashion. Any software program, including custom applications, may be used as long as they are capable of opening a communications socket to port 10001.

Start the Hyper Terminal application and select "New Connection" from the "File" drop down menu. The next screen is a "Connect To" dialog box. Select TCP/IP (Winsock) from the "Connect" drop down menu.

Enter the IP address of the product in the "Host address:" field and10001 in the "Port number" field.

Figure 1-E shows an example of the Hyper Terminal settings required to access the unit.

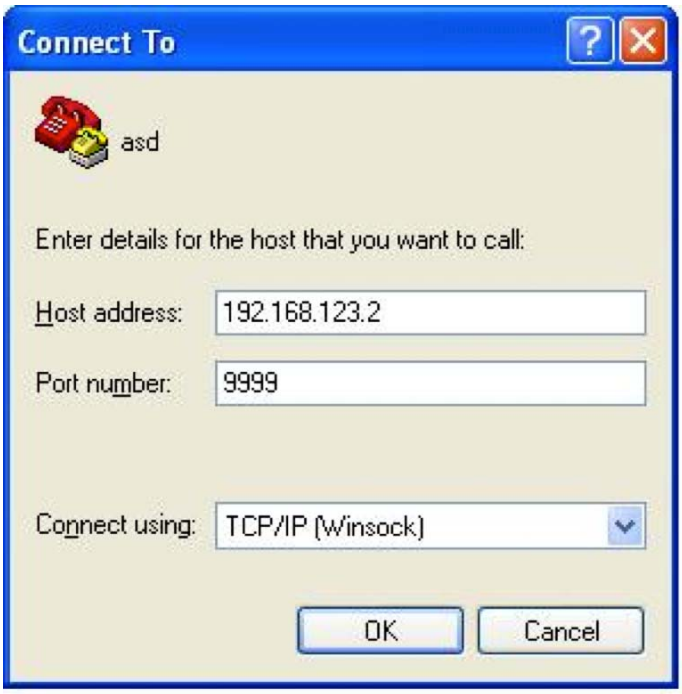


Figure 3.3 Telnet® Settings in Hyper Terminal

Once the *Telnet*® connection is established you can monitor and control your product with standard M&C commands as described in your specific product's manual. All commands begin with the open bracket character "{" and end with the close bracket character "}".

Table 3.0 lists the commands for the 2000-15-4848 Power Supply and briefly describes them. After a command is sent the 2000-15-4848 sends a return ">" indicating the command has been received and executed.

Table 3.0 M&C Commands for Model 2000-15-4848

Command Function	Syntax	Command Description
Enable 5 VDC Out	{C0x}	where:
		0 = command code (ascii zero)
		x = 1 to enable 5 VDC Out, x = 0 to disable 5 VDC Out
		example: {C01}
		Will enable the 5 VDC output.
		The unit will reply with the '>' character if the command is sucessfully processed.
		The unit will reply with the '<' character if the command is not processed.
Enable 12 VDC Out	{C1x}	where:
(Option W90 only)		1 = command code
		x = 1 to enable 12 VDC Out, x = 0 to disable 12 VDC Out
		example: {C11}
		Will enable the 12 VDC output.
		The unit will reply with the '>' character if the command is sucessfully processed.
		The unit will reply with the '<' character if the command is not processed (for example, if option W90 is not installed).
Enable 24 VDC Out	{C2x}	where:
		2 = command code
		x = 1 to enable 24 VDC Out, x = 0 to disable 24 VDC Out
		example: {C21}
		Will enable the 24 VDC output.
		The unit will reply with the '>' character if the command is sucessfully processed.
		The unit will reply with the '<' character if the command is not processed.
Enable 48 VDC Out	{C3x}	where:
		3 = command code
		x = 1 to enable 48 VDC Out, x = 0 to disable 48 VDC Out
		example: {C21}
		Will enable the 24 VDC output.
		The unit will reply with the '>' character if the command is sucessfully processed.
		The unit will reply with the '<' character if the command is not processed.
Enable LNB 24 VDC Out	{C4x}	where:
(Option W92 only)		4 = command code
		x = 1 to enable 24 VDC Out on the LNB loop through, x = 0 to disable24 VDC Out on the LNB loop through.
		example: {C41}
		Will enable the 24 VDC output on the LNB loop through.
		The unit will reply with the '>' character if the command is sucessfully processed.
		The unit will reply with the '<' character if the command is not processed (for example, if option W92 is not installed).
Enable and select BUC DC Out	{C5x}	where:
(Option W92 only)		5 = command code
		x = 1 to enable 24 VDC Out on the BUC loop through, x = 2 to enable 48 VDC Out on the BUC loop through, and
		x = 0 to disable DC insertion on the BUC loop through.
		example: {C52}
		Will enable the 48 VDC output on the BUC loop through.
		The unit will reply with the '>' character if the command is sucessfully processed.
		The unit will reply with the '<' character if the command is not processed (for example, if option W92 is not installed).
Disable all DC outputs	{C6}	where:
		6 = command code
		example: {C6}
		Will disable all DC outputs, including those inserted on the LNB and BUC loop throughs.
		The unit will reply with the '>' character if the command is sucessfully processed.
		The unit will reply with the '<' character if the command is not processed (for example, if option W92 is not installed).

3.2 M&C Telnet Interface (W28) (continued…)

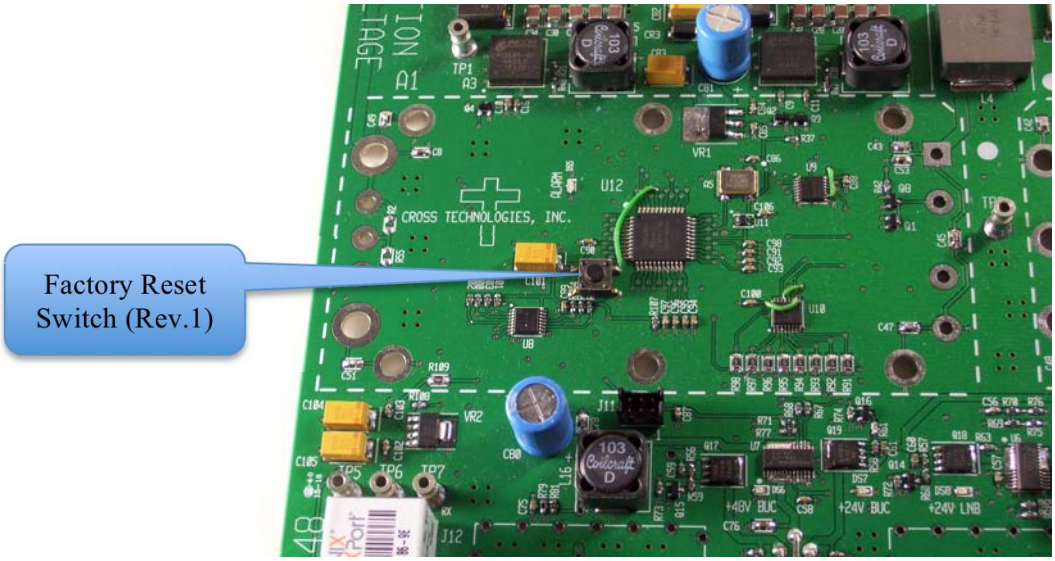
Table 3.1 M&C Status Requests/Inquiries for Model 2000-15-4848		
Status Requests/Inquiries		
Get 5 VDC Out status	{S0}	returns: {S0a:bb.bb,cc.cc}
		where:
		0 = command code (ascii zero)
		a = 1 if 5 VDC Out is enabled, a = 0 if 5 VDC Out is disabled.
		: = the ascii colon character, used as a delimiter.
		bb.bb = The measured voltage on the 5 VDC output in Volts DC.
		, = the ascii comma character, used as a delimiter.
		cc.cc = The measured current of the 5 VDC output in Amps.
		The unit will append the '>' character if the command is sucessfully processed.
		The unit will reply with the '<' character if the command is not processed.
Get 12 VDC Out status	{S1}	returns: {S1a:bb.bb,cc.cc}
(Option W90 only)		where:
		1 = command code
		a = 1 if 12 VDC Out is enabled, a = 0 if 12 VDC output is disabled.
		: = the ascii colon character, used as a delimiter.
		bb.bb = The measured voltage on the 12 VDC output in Volts DC.
		, = the ascii comma character, used as a delimiter.
		cc.cc = The measured current of the 12 VDC Out in Amps.
		The unit will append the '>' character if the command is sucessfully processed.
		The unit will reply with the '<' character if the command is not processed (for example, if option W90 is not installed).
Get 24 VDC Out status	{S2}	returns: {S2a:bb.bb,cc.cc}
		where:
		2 = command code
		a = 1 if 24 VDC Out is enabled, a = 0 if 24 VDC Out is disabled.
		: = the ascii colon character, used as a delimiter.
		bb.bb = The measured voltage on the 24 VDC output in Volts DC.
		, = the ascii comma character, used as a delimiter.
		cc.cc = The measured current of the 24 VDC output in Amps.
		The unit will append the '>' character if the command is sucessfully processed.
		The unit will reply with the '<' character if the command is not processed.
Get 48 VDC Out status	{S3}	returns: {S3a:bb.bb,cc.cc}
		where:
		3 = command code
		a = 1 if 48 VDC Out is enabled, a = 0 if 48 VDC Out is disabled.
		: = the ascii colon character, used as a delimiter.
		bb.bb = The measured voltage on the 48 VDC output in Volts DC.
		, = the ascii comma character, used as a delimiter.
		cc.cc = The measured current of the 48 VDC output in Amps.
		The unit will append the '>' character if the command is sucessfully processed.
		The unit will reply with the '<' character if the command is not processed.
Get LNB 24 VDC Insert Status	{S4}	returns: {S4a:bb.bb,cc.cc}
(Option W92 only)		where:
		4 = command code
		a = 1 if 24 VDC LNB insert is enabled, a = 0 if 24 VDC LNB DC Insert is disabled.
		: = the ascii colon character, used as a delimiter.
		bb.bb = The measured voltage on the 24 VDC LNB insert output in Volts DC.
		, = the ascii comma character, used as a delimiter.
		cc.cc = The measured current of the 24 VDC insert output in Amps.
		The unit will append the '>' character if the command is sucessfully processed.
		The unit will reply with the '<' character if the command is not processed (for example, if option W92 is not installed).

3.2 M&C Telnet Interface (W28) (continued…)

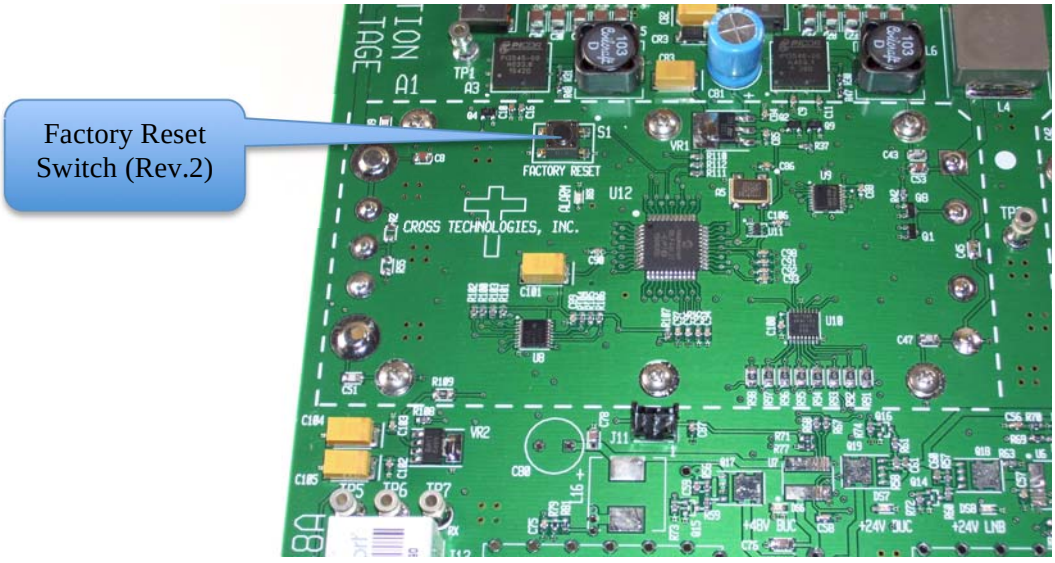
Table 3.1 M&C Status Requests/Inquiries for Model 2000-15-4848 (continued…)		
Get BUC VDC Insert Status	{S5}	returns: {S4a:bb.bb,cc.cc}
(Option W92 only)		where:
		4 = command code
		a = 1 if 24 VDC BUC insert is enabled, a = 2 if 48 VDC BUC insert is enabled, and
		a = 0 if BUC DC Insert is disabled.
		: = the ascii colon character, used as a delimiter.
		bb.bb = The measured voltage on the BUC insert output in Volts DC.
		, = the ascii comma character, used as a delimiter.
		cc.cc = The measured current of the BUC insert output in Amps.
		The unit will append the '>' character if the command is sucessfully processed.
		The unit will reply with the '<' character if the command is not processed (for example, if option W92 is not installed).
Get DC Input voltage and current	{SI}	returns: {SIbb.bb,cc.cc}
		where:
		I = command code (ascii capital I, 0x49)
		bb.bb = The measured voltage on the DC input in Volts DC.
		, = the ascii comma character, used as a delimiter.
		cc.cc = The measured current of the DC input in Amps.
		The unit will append the '>' character if the command is sucessfully processed.
		The unit will reply with the '<' character if the command is not processed.
Get PCB Temperature	{ST}	returns: {STaa}
		where:
		T = command code
		aa = measured PCB temperature in degrees Celsius.
		The unit will append the '>' character if the command is sucessfully processed.
		The unit will reply with the '<' character if the command is not processed.
Get Alarm Status	{SA}	returns: {SAabcdefghi}
		where:
		A = command code
		a = Summary Alarm: 0 if no alarms, a = 1 if an alarm condition exists.
		b = Input Voltage Alarm: 0 = no alarm, 1 = input voltage alarm
		The input voltage alarm is true if the input voltage drops below 40 VDC or exceeds 62 VDC.
		c = 5 VDC Output Alarm: 0 = no alarm, 1 = 5 VDC alarm
		The 5 VDC Output Alarm is true if the output voltage varies +/- 10 % or if the output current exceeds 5 Amps.
		d = 12 VDC Output Alarm: 0 = no alarm, 1 = 12 VDC alarm
		The 12 VDC Output Alarm is true if the output voltage varies +/- 10 % or if the output current exceeds 4 Amps.
		*Note: The 12 VDC Output only applies to units with option **W90,** all other units will reply with a 0 here.*
		e = 24 VDC Output Alarm: 0 = no alarm, 1 = 24 VDC alarm
		The 24 VDC Output Alarm is true if the output voltage varies +/- 10 % or if the output current exceeds 4 Amps.
		f = 48 VDC Output Alarm: 0 = no alarm, 1 = 48 VDC alarm
		The 48 VDC Output Alarm is true if the output voltage varies +/- 10 % or if the output current exceeds 4 Amps.
		g = LNB 24 VDC Output Alarm: 0 = no alarm, 1 = LNB 24 VDC alarm
		The LNB 24 VDC Output Alarm is true if the output voltage varies +/- 10 % or if the output current exceeds 1 Amp.
		*Note: The LNB 24 VDC Output only applies to units with option **W92,** all other units will reply with a 0 here.*
		h = BUC VDC Output Alarm: 0 = no alarm, 1 = BUC VDC Output alarm
		The BUC VDC Output Alarm is true if the output voltage varies +/- 10 % or if the output current exceeds 4 Amps.
		*Note: The BUC VDC Output only applies to units with option **W92,** all other units will reply with a 0 here.*
		i = PCB Temperature Alarm: 0 = no alarm, 1 = PCB Temperature alarm
		The PCB Temperature Alarm is true if the temperature exceeds 85 degrees celcius and remains true until the
		temperature falls below 80 degrees celcius.
		The unit will append the '>' character if the command is sucessfully processed.
		The unit will reply with the '<' character if the command is not processed.

3.3 Ethernet Settings Reset Procedure

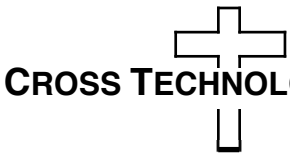
1. Power down the unit by removing the Power On/Off connector (J5).
2. Press and hold the Factory Reset switch S1 and power up the unit while continuing to hold the switch.
3. After about 10 seconds the alarm indicator will blink on and off indicating that the reset procedure has begun. The Factory Reset switch may be released at this point.
4. The alarm indicator will continue to blink for about 60 seconds during the Factory Reset process.
5. When the alarm indicator stops blinking the reset procedure is complete and the Ethernet device is reset to factory defaults. Please note that the IP address will be set to 192.168.123.2



2000-15-4848 Factory Reset Switch (Rev.1)



2000-15-4848 Factory Reset Switch (Later Version - Rev.2)



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