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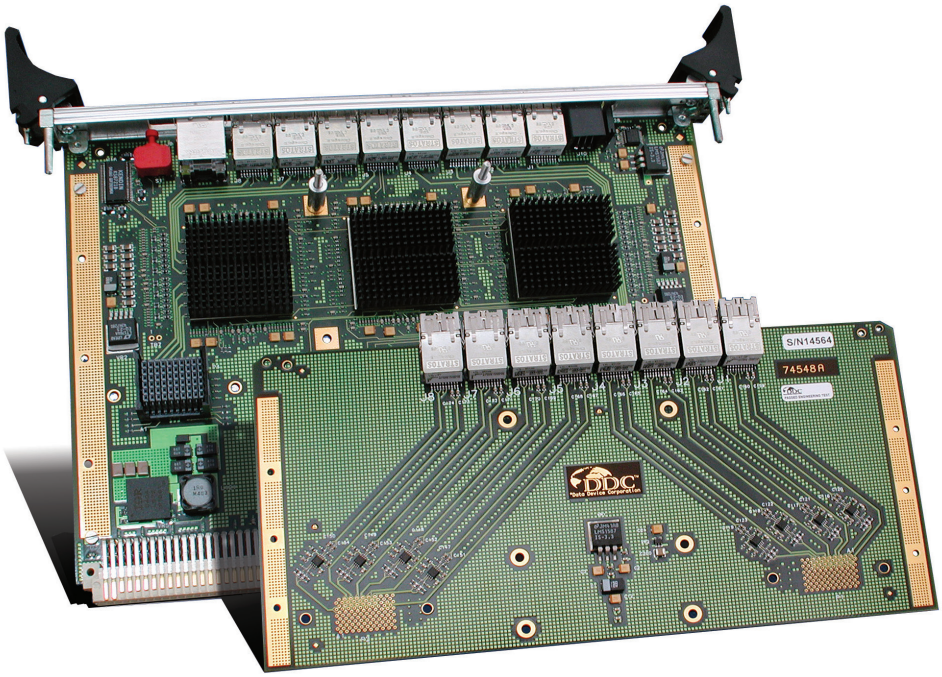
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FibreMATRIX™
Fibre Channel Switch

©Data Device Corporation

Model: FC-76000



Manual

The FC-76000 FibreMATRIX™ series are 16-port VME Fibre Channel fabric switches optimized to meet the performance, reliability, and demanding environmental requirements of embedded, real time, military and aerospace applications. FibreMATRIX fibre Channel VME switches operate at either 1 Gb/s or 2 Gb/s data rates, provide cut-through and store-and-forward routing with 127 priority levels, multicast, and broadcast. The switches provide optical media interfaces on a conduction- or air-cooled VME64x form factor.

Applications

- Military Programs
- Aerospace Programs
- Sensor Interfaces
- High Speed Networking
- Storage Networks
- Test Labs



For more information: www.ddc-web.com/FC-76000

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DDC's Data Networking Solutions

MIL-STD-1553 | ARINC 429 | Fibre Channel

As the leading global supplier of data bus components, cards, and software solutions for the military, commercial, and aerospace markets, DDC's data bus networking solutions encompass the full range of data interface protocols from MIL-STD-1553 and ARINC 429 to USB, and Fibre Channel, for applications utilizing a spectrum of form-factors including PMC, PCI, Compact PCI, PC/104, ISA, and VME/VXI.

DDC has developed its line of high-speed Fibre Channel and Extended 1553 products to support the real-time processing of field-critical data networking netween sensors, compute notes, data storage displays, and weapons for air, sea, and ground military vehicles.

Whether employed in increased bandwidth, high-speed serial communications, or traditional avionics and ground support applications, DDC's data solutions fufill the expanse of military requirements including reliability, determinism, low CPU utilization, real-time performance, and ruggedness within harsh environments. Out use of in-house intellectual property ensures superior mutli-generational support, independent of the life cycles of commercial devices. Moreover, we maintain software compatibility between product generations to protect our customers' investments in software development, system testing, and end-product qualification.

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ARINC 429

DDC also has a wide assortment of quality ARINC-429 commercial, military, and COTS grade cards and components, which will meet your data conversion and data interface needs. DDC supplies ARINC-429 board level products in a variety of form factors including AMC, USB, PCI, PMC, PCI-104, PC/104 Plus, and PCMCIA boards. DDC's ARINC 429 components ensure the accurate and reliable transfer of flight-critical data. Our 429 interfaces support data bus development, validation, and the transfer of flight-critical data aboard commercial aerospace platforms.

Fibre Channel

DDC has developed its line of high-speed Fibre Channel network access controllers and switches to support the real-time processing demands of field-critical data networking between sensors, computer nodes, data storage, displays, and weapons, for air, sea, and ground military vehicles. Fibre Channel's architecture is optimized to meet the performance,reliability, and demanding environmental requirements of embedded, real time, military applications, and designed to endure the multi-decade life cycle demands of military/aerospace programs.



FC-76000 FIBREMATRIX FIBRE CHANNEL SWITCH HARDWARE MANUAL

MN-76000XX-001

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1 PREFACE

This manual uses typographical conventions to assist the reader in understanding the content. This section will define the text formatting used in the rest of the manual

1.1 Text Usage

- **BOLD**–indicates important information and table, figure, and chapter references.
- ***BOLD ITALIC***–designates DDC Part Numbers.
- `Courier New`–indicates code examples.
- <…> - indicates user-entered text or commands.

1.2 Special Handling and Cautions

The ***FC-76000*** uses state-of-the-art components, and proper care should be used to ensure that the device will not be damaged by Electrical Static Discharge (ESD), physical shock, or improper power surges and that precautions are taken to avoid electrocution.



Warnings: Turn off power to the computer hardware and unplug from wall.

NEVER insert or remove card with power turned on.

Ensure that standard ESD precautions are followed. As a minimum, one hand should be grounded to the power supply in order to equalize the static potential.

Do not store disks in environments exposed to excessive heat, magnetic fields or radiation.

1.3 Trademarks

All trademarks are the property of their respective owners.

1.4 What is included in this manual?

This manual contains a complete description of hardware installation and use.

1.5 Technical Support

In the event that problems arise beyond the scope of this manual, you can contact DDC by the following:

US Toll Free Technical Support:
1-800-DDC-5757, ext. 7771

Outside of the US Technical Support:
1-631-567-5600, ext. 7771

Fax:
1-631-567-5758 to the attention of DATA BUS Applications

DDC Website:
www.ddc-web.com/ContactUs/TechSupport.aspx

Please note that the latest revisions of Software and Documentation are available for download at DDC's Web Site, www.ddc-web.com.

2 OVERVIEW

The FC-76000 FibreMatrix series cards are VME64X form factor Fibre channel switches optimized for use in military/aerospace applications. The FibreMatrix switches operate at either 1 Gb/s or 2 Gb/s data rates in switched fabric topologies. There are versions of the switch that have either 8 or 16 ports, and are either conduction or fan-forced (convection) cooled.

The FibreMatrix switch is based on DDC's own Fibre Channel technology. FibreMatrix's base architecture is optimized to meet the highly deterministic performance, high reliability, and demanding environmental requirements of embedded, real time military applications. Its flexible FPGA-based architecture can be tailored to meet a wide range of specific system requirements. Moreover, FibreMatrix is not subject to rapidly changing commercial market forces that can result in shortened life cycles. Instead, DDC's FibreMatrix technology has been designed to meet the multi-decade life cycle demands of military/aerospace programs, continuing DDC's demonstrated commitment as a long-term military COTS supplier of digital interface devices.

The FibreMatrix switch supports Class 2 acknowledged and Class 3 unacknowledged Fibre Channel service.

To support the unique requirements of military aerospace applications, the FibreMatrix includes a number of advanced architectural features. Features include implicit Fibre Channel login, Fibre Channel priority and ELS clock synchronization.

The FibreMatrix is designed to operate in harsh environments at temperatures from -40°C to +70°C, and withstand mechanical shock and vibration typically found in military/aerospace environments.

The FibreMatrix switch is suitable for a wide variety of applications for embedded avionics and vetronics systems. These include sensor interfacing, multi-processor and DSP arrays, radar systems, display systems, serial backplanes, and storage.

2.1 Features

- Up to 8 ports in one 6U VME64X slot
- Up to 16 ports in two 6U VME64X slot
- 1.0625 or 2.125 Gbps operation in banks of 8 ports
- 850 nm Optical media, LC connectors
- Management through Ethernet or serial port
- Non-blocking Crosspoint Architecture

- Conduction OR convection cooled
- Commercial or extended temperature range
- 1024-Entry Routing Table
- Fibre Channel Features
  - Class 2 or Class 3 service
  - Explicit or implicit log-in
  - ELS clock sync, 56 bit resolution of a 64 bit counter
  - ELS client and server
  - 8 receive buffers
  - 127 priority levels

2.2 System Requirements

Table 1. System Requirements

System Parameter	Minimum Requirement
VME 64X Requirements	+3.3 volt and +5 volt power supplies One slot for 8 port, 2 slots for 16 port
Rack thermal requirements	See Table X for details
Power requirements	5.0 V and 3.3 V. See Table X for details

2.3 Tested Inoperable Products

- DDC FC-750XX Fibre Channel NAC cards
- Qlogic ISP231X based HBAs
- Various FC analyzers such as AAI, Ixia, etc.

2.4 What is Included

The FC-76000 FibreMatrix® switch ships with the following items:

- FC-76000 series Fibre Channel Switch
- CD containing manual
- 6-conductor modular jack cable, crossover
- 6-pin modular jack-to-female DB9 adapter

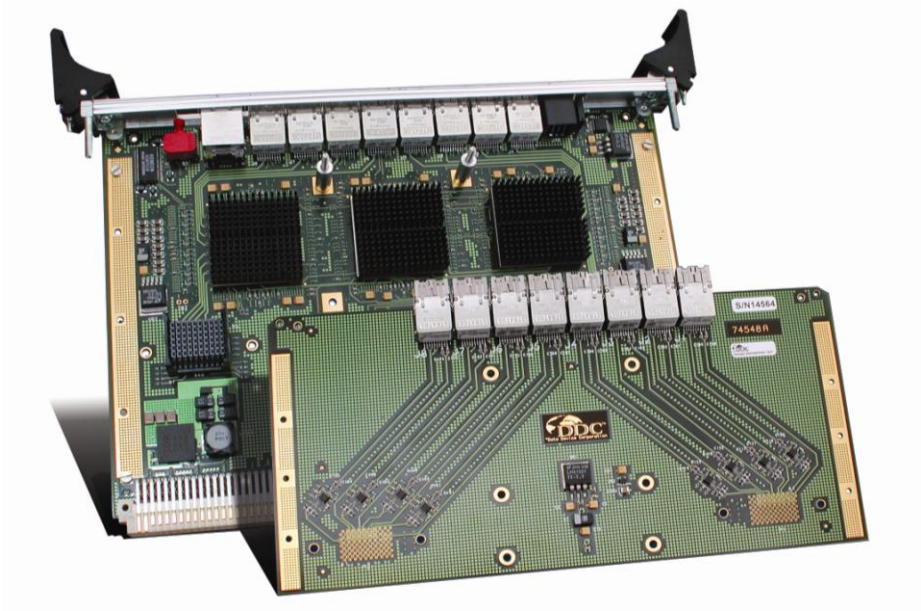


Figure 1. FC-76000 FibreMatrix Switch

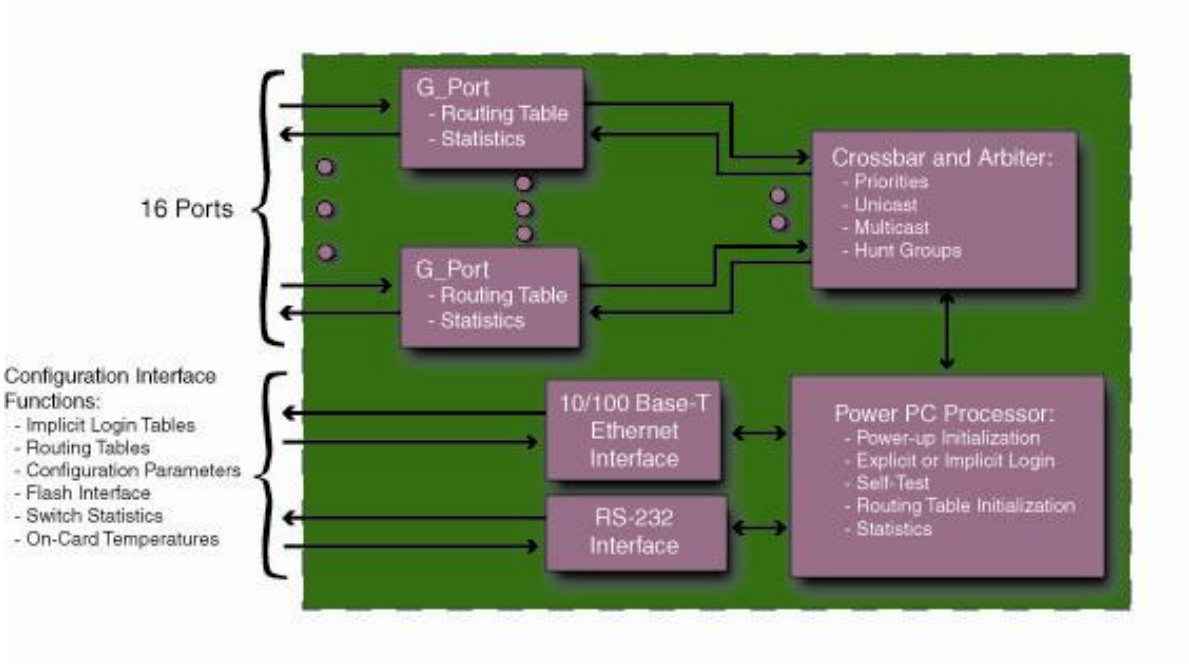


Figure 2. FC-76000 FibreMatrix Switch Block Diagram

Note that the 16 port switch is a two board implementation. The implementation consists of a base card, which contains 8 fiber optic ports, and a mezzanine card, which contains another 8 fiber optic ports. When a unit is shipped as a 16 port, it is recommended that the mezzanine card never be separated from the base card.

Table 2. FC-76000 Specification Table				
PARAMETER	**MIN**	**TYP**	**MAX**	**UNITS**
ABSOLUTE MAXIMUM RATING				
+3.3 V Supply Voltage	-0.3		3.6	V
+5V Supply Voltage	-0.3		5.5	V
POWER SUPPLY REQUIREMENTS (Note 1)				
Voltages/Tolerances				
+3.3 V	3.25	3.3	3.45	V
+5 V	4.875	5.0	5.25	V
Current Drain (Note 2)				
+3.3 V		1.1	2.85	A
+5 V		7.8	8.60	A
FIBRE CHANNEL PHYSICAL INTERFACE				
Optical Interface				
1 Gb/s (FC-PI 100-M6-SN-I)				
Maximum Link Distance	0.5		300	M
2 Gb/s (FC-PI 100-M6-SN-I)				
Maximum Link Distance	0.5		150	M
PERFORMANCE CHARACTERISTICS				
Port-to-Port Latency				
1 Gb/s		1.6	2	µS
2 Gb/s		1.1	2	µS
THERMAL				
Power Dissipation			12	W
Operating Temperature (measured at thermal interface)				
-C00	-40		+71	°C
-300	0		+55	°C
Storage Temperature	-55		+85	°C
ENVIRONMENTAL CHARACTERISTICS (as per ANSI/VITA 47-2005)				
C-76161V2-300 (Forced Air Cooling)				
VITA 47 Environmental Class EAC1				
Operating Temp (inlet air): AC1		0 - +55		°C
Minimum Required Air Volume Flow Rate (sea level) at maximum inlet temperature		25		CFM
Non-Operating Temp: C1		-40 - +85		°C
Temperature Cycling: C1		-40 - +85, 500 cycles		°C

Table 2. FC-76000 Specification Table				
PARAMETER	**MIN**	**TYP**	**MAX**	**UNITS**
ENVIRONMENTAL CHARACTERISTICS (as per ANSI/VITA 47-2005) (cont'd.)				
C-76161V2-300 (Forced Air Cooling) (cont'd.)				
Vibration Class: V1		5 Hz to 100 Hz (PSD) = 0.04 g²/Hz, 1 hr per axis		Hz
Humidity		95% relative humidity for five 48 hr cycles		
C-76161V2-200 (Forced Air Cooling) VITA 47 Environmental Class EAC6				
Operating Temp (inlet air): AC3		-40 - +70		°C
Minimum Required Air Volume Flow Rate (sea level) at maximum inlet temperature		25		CFM
Non-Operating Temp: C3		-50 - +100		°C
Temperature Cycling: C3		-50 - +100, 500 cycles		°C
Vibration Class: V2		5 Hz to 100 Hz PSD increasing at 3 dB/octave, 1 hr per axis		Hz
		100 Hz to 1000 Hz PSD = 0.04 g^2/Hz, 1 hr per axis		Hz
		1000 Hz to 2000 Hz PSD decreasing at 6 dB/octave, 1 hr per axis		Hz
Humidity		95% relative humidity for five 48 hour cycles		
Shock Class		20g, 11 millisecond, half-sine shock pulses in all three axes		g/ms
C-76161V2-C00 (Conduction Cooling) VITA 47 Environmental Class ECC3				
Operating Temp (alloable edge temp): CC3		-40 - +70		°C
Non-Operating Temp: C3		-50 - +100		°C
Temperature Cycling: C3		-50 - +100, 500 cycles		°C
Vibration Class: V3		5 Hz to 100 Hz PSD increasing at 3 dB/octave, 1 hr per axis		Hz
		100 Hz to 1000 Hz PSD = 0.1 g^2/Hz, 1 hr per axis		Hz
		1000 Hz to 2000 Hz PSD decreasing at 6 dB/octave, 1 hr per axis		Hz
Humidity		95% relative humidity for five 48 hour cycles		
Shock Class		40g, 11 millisecond, half-sine shock pulses, all three axes		g/ms

Table 2. FC-76000 Specification Table				
PARAMETER	**MIN**	**TYP**	**MAX**	**UNITS**
PHYSICAL CHARACTERISTICS				
Form Factor	VME Double Height Board per ANSI/VITA 1.1-1997 (R2003) Single-board construction for 8 ports Two-board construction for 16 ports 16 port version has VME connectors on base card only Conduction-cooled version IAW IEEE 1101.2 (front panel I/O)			
PHYSICAL CHARACTERISTICS (cont'd)				
Size		160 x 233.35 (6.299 x 9.181)		mm (in)
Weight (convection cooled)		28.8 (816.0)		oz (g)

Table 2 Notes:

1. VME 64 spec defines +5V as +4.875 to + 5.25 V. VME 64X spec defines +3.3V as +3.25 to +3.45V.
2. Power consumption numbers are preliminary, based upon a small sampling of switch cards.

3 HARDWARE INSTALLATION

3.1 VME 64X Interface

- Requires 3.3 volt and 5V power supplies
- Does not connect to any VME signals other than 5V, 3.3V and ground
- Does not have a P0 connector
- The fan-forced convection cooled version of the switch requires airflow. Please see thermal specs. The conduction cooled version of the switch requires it's thermal rail be held between –40 deg C and +70 deg C.

3.2 Electrical and Mechanical Information

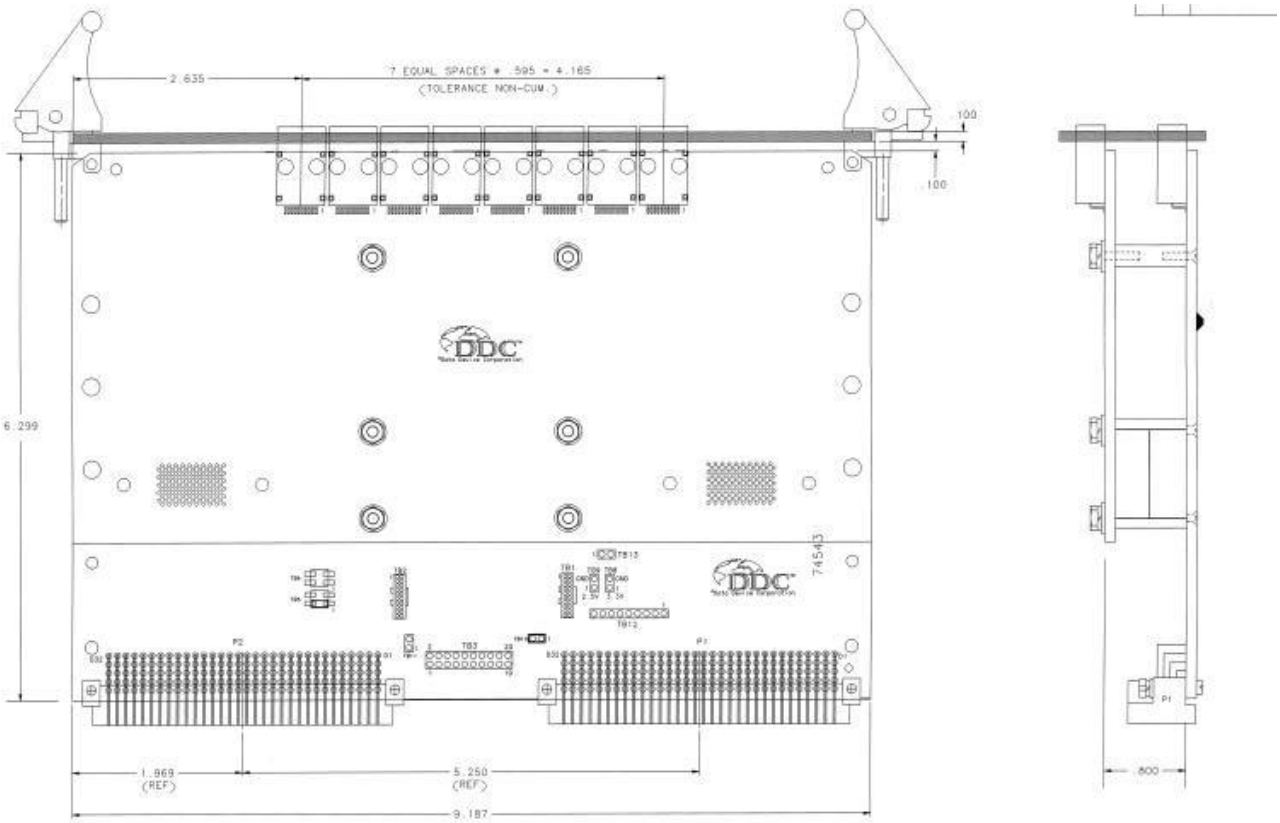


Figure 3. FC-76000 Outline Drawing

3.2.1 Front Panel

All customer I/O is done via the front panel. The front panel contains, starting from the top:

- Power LED (green)
- Heartbeat LED (orange)
- Serial port, RS-232 levels: 6 pin modular jack
- Either 8 or 16 FC ports, which are LC fiber optic connectors
- 10/100 Ethernet connector: 8 pin modular jack w/ 2 embedded LEDs
- Recessed Reset pushbutton switch

3.2.2 Serial Port

The management serial port is a front panel mounted 6-pin modular jack connector. See Table 3 for the serial port pinouts.

Table 3. Serial Port pinout

Serial port pin	Signal Name
1	-
2	Rx_Data (into switch)
3	GROUND
4	-
5	Tx_Data (out of switch)
6	-

3.2.3 Switch Serial Port to PC Connection

A 6-conductor modular jack cable and modular jack-to-female DB9 adapter is shipped with each switch. The modular jack cable that ships with the switch is a crossover cable. The table below shows how the modular jack-to-DB9 adapter must be wired to allow communication with a standard DB9 serial port on a PC. Note that only the 3 pins shown should be populated in the adapter.

Table 4. Wiring diagram for switch serial port to female DB9				
Switch serial port pin	Direction/ Signal Name on crossover cable, switch perspective	Modular jack-to-DB9 adapter		"RS-232" direction/ signal name, DTE ("PC") perspective
		Modular jack pin	Female DB9 pin	
1	-	6	-	
2	← Data in	5	3	← Tx_Data
3	GROUND	4	5	Ground
4	-	3	-	
5	→Data out	2	2	→ Rx_Data
6	-	1	-	

Table 4 Notes:

1. Column 2 signal names are from the switch perspective.
2. Column 5 signal names are from the EI/TIA-574 specification ("RS-232 on a DB-9"). In the typical application the terminal emulator program runs on a PC, which has a MALE DB-9 connector, which by definition is DTE. From the DTE (PC) perspective Rx_Data is INTO the PC, Tx_Data is OUT of the PC.

3.2.4 Ethernet Port

The Ethernet port is wired as a standard MDI jack. A straight-through Ethernet cable (not supplied) is used to connect the Ethernet port to an Ethernet switch or a hub. The Ethernet port will auto-negotiate between 10Base-T and 100 BaseTx.

The jack also includes 2 LEDs. The LED to the left of the jack's latch indicates 100Mbps operation, the LED to the right is Link/Activity. The Link/Activity will illuminate when the Ethernet link is up and it will blink when packets are flowing across the Ethernet cable.

Table 5. Ethernet port pinout	
RJ-45 pin	Signal Name
1	TD+
2	TD-
3	RD+
4	-
5	-
6	RD-
7	-
8	-

3.2.5 LC Fibre Optic Connectors

The front view of the LC connectors is shown in Figure 4. The orientation shown is with the switch vertically mounted, front panel text right-side up, which means the LC connector latches are on the right side of the connector. Note that the TX port is “out” (photo emitter) from the switch and the Rx port is “into” (photo detector) the switch.

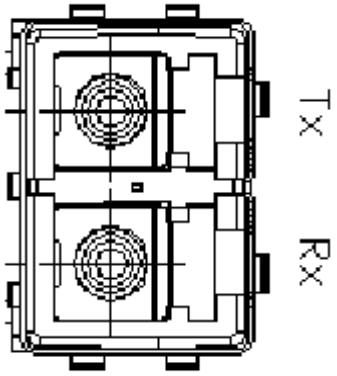


Figure 4. LC Connector (front view)

3.2.6 Rear-Panel Pinout

The VME64X P1 and P2 connectors on the switch are used only for power (5V, 3.3V) and ground.

Table 6. VME64X P1/P2 pinout

Voltage/Gnd	P1	P2
5V	A32, B32, C32,	B1, B13, B32
3.3V	D12, D14, D16, D18, D20, D22, D24, D26, D28, D30	
GND	A9, A11, A15, A17, A19, B20, B23, C9, D2, D31, Z2, Z4, Z6, Z8, Z10, Z12, Z14, Z16, Z18, Z20, Z22, Z24, Z26, Z28, Z30, Z32	B2, B12, B22, B31, D31, Z2, Z4, Z6, Z8, Z10, Z12, Z14, Z16, Z18, Z20, Z22, Z24, Z26, Z28, Z30, Z32

3.2.7 Mating Cables

3.2.7.1 Ethernet Cable

The Ethernet port mates with standard 8-pin modular jack Cat5e cables. Use straight-through cables to connect the Ethernet management port to an Ethernet switch.

3.2.7.2 Serial Port Cable

The serial port will mate with 6-pin modular jack cables. Use the information in Table 4 for reference to adapt it to a specific far-end mating connector.

3.2.7.3 Fibre Optic Cables

The fiber optic ports will mate with standard LC multi-mode cables. Either 50/125 or 62.5/125 cable can be used, though the distance will be affected by the core diameter, see Table 2.

3.2.8 Jumpers

Table 7 provides a listing of all user configurable jumper blocks on the FC-76000 card. Please note that as described below, the only three user jumpers are TB5-1,2 and TB5-3,4 and TB10-1,2. All other jumper positions are listed as “RESERVED” and are for factory use only. Users must **not** install jumpers in any of these positions.

Jumper location is shown in Figure 5 which shows a “top” view of the base card in the area between P1 and P2.

Table 7. TB5 Jumpers

Jumper Pair	Description
1-2	FLASH Write Enable, SW interlock Jumper installed = FLASH can be re-written Jumper Not installed = FLASH can not be changed
3-4	Jumper Not Installed = Normal Operation Jumper Installed = Backup Flash Enable. Allows for card boot from the back-up portion of FLASH, thus restoring board functionality to the factory delivered configuration. Useful if writable portion of FLASH becomes corrupted during on-card firmware FLASH upgrade. Back-up reconfiguration occurs following the next board power-up. Factory support highly recommended.

Table 8. TB10 Jumpers	
Jumper Pair	**Description**
1-2	FLASH Write Enable, HW interlock Jumper installed = FLASH can be re-written Jumper Not installed = FLASH can not be changed

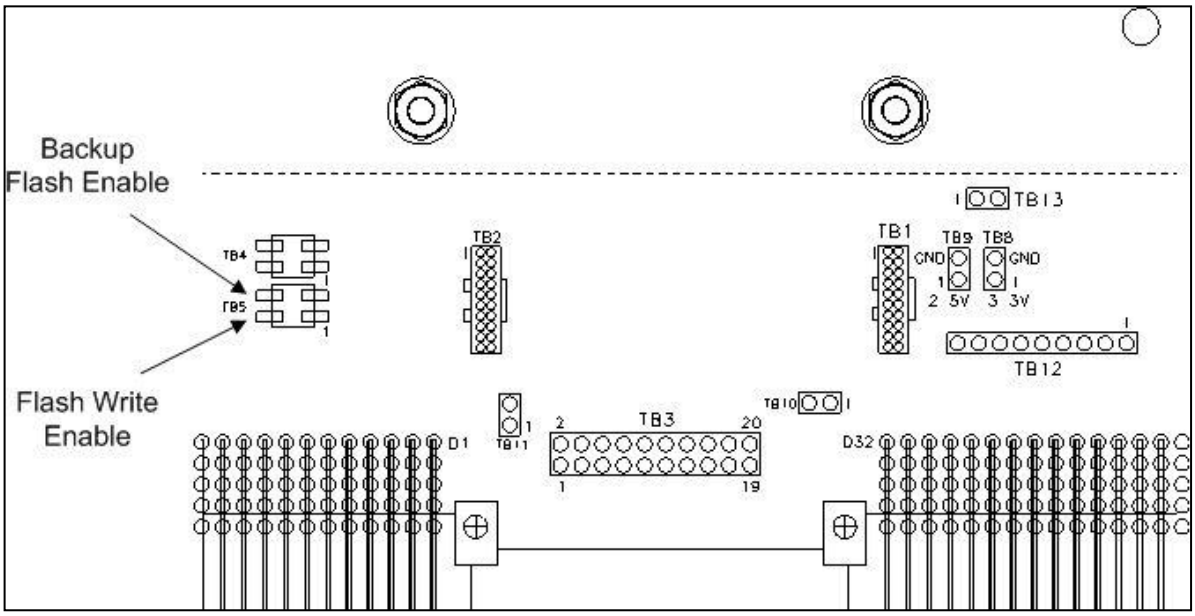


Figure 5. Jumper Locations

4 MANAGEMENT CONSOLE

The switch is configurable from any terminal emulator program. A widely available example of such a program is HyperTerminal from Microsoft. The computer on which the terminal emulator is running must have a compatible physical interface, either an RS-232 port or an Ethernet port. If the computer's Ethernet port will be used the IP address/subnet mask has to be set so that both the computer and FC-76000 switch IP addresses are on the same subnet.

4.1 Terminal Emulator Configuration

4.1.1 ASCII Setup

The terminal emulator has to be set to send line ends with line feeds. Note that this setting is NOT the default in HyperTerminal.

4.1.2 Serial Port Connection Configuration

The Serial port connection should be setup as follows:

115 kbaud, 8 bits per character, parity none, stop bits 1, No flow control

4.1.3 Ethernet Setup

The terminal emulator's host address must be set to be the same as the switch IP address along with the port number. The switch's default TCP port number is 7777.

4.2 Configuration Options

The FC-76000 has several user configurable options. The switch is configured via the menu system, which is accessible via the front panel serial port or the front panel 10/100 Ethernet port. In addition, the menu system allows configuration files to be downloaded. These configuration files are ASCII-text format, allowing creation with any text editor, and the download configuration files allow configuration of most of the switch options.

Note: *The Ethernet port has a static IP address. The Ethernet port must be configured via the serial port before it can be plugged into a network.*

The menu system can also be used to upgrade the hardware and software of the switch by downloading new configuration files for the flash memory.

4.2.1 Overview of Menu Tree

A “quick guide’ to the switch’s menu tree is shown in Figure 6. The arrows from the numbered circles represent sub menus that are available from the main menu screen. For example, entering “1” from the Main Menu brings you to the Configuration Menu, entering “2” brings you to the Status Menu, etc.

4.2.2 FC-76000 User Interface Menu Quick Guide

Note: *The user must be logged in to access these menus.*

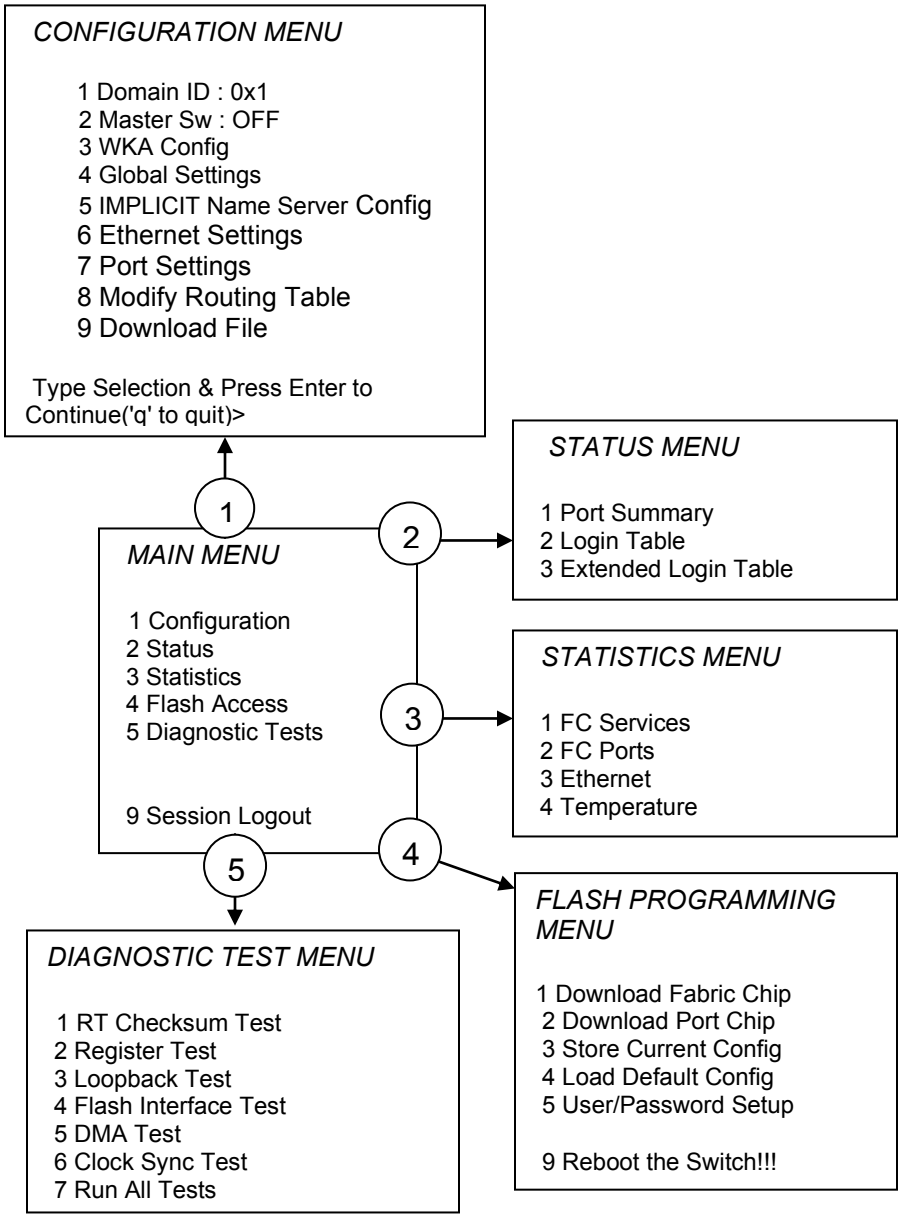


Figure 6. Menu Quick Guide

4.2.3 User Interface Log-in

Before the switch menu system can be accessed the user has to log into the switch. The switch will NOT display a menu at startup of the serial port. Press the enter key after the switch is turned on to start the login dialog.

The default user name and password is shown in bold in Figure 7. The user name and password can be changed from the “Flash access” menu. The switch has TWO user IDs: the default user name and password is the same for both user IDs.

The same user interface/menu system is available through the serial port OR the Ethernet port, but not at the same time. If a user switches from one management port to the other port, the user must select the Session Logout BEFORE switching to the other port. Otherwise, the switch will hold the original session active and not respond on the other port. If this situation occurs, the user can go back to the port whose session is still open and logout OR the front panel reset button can be pushed OR the power to the switch can be cycled. The last two choices will interrupt FC data flow through the switch.



Figure 7. Login Screen

4.2.4 Main Menu

The Main Menu is the first menu that is displayed after a user logs into the switch. The Main Menu is the “top” of the menu tree. It can always be reached from wherever a user is in the menu tree by entering the “q” (Quit) and “Enter” keys repeatedly until the Main Menu appears.

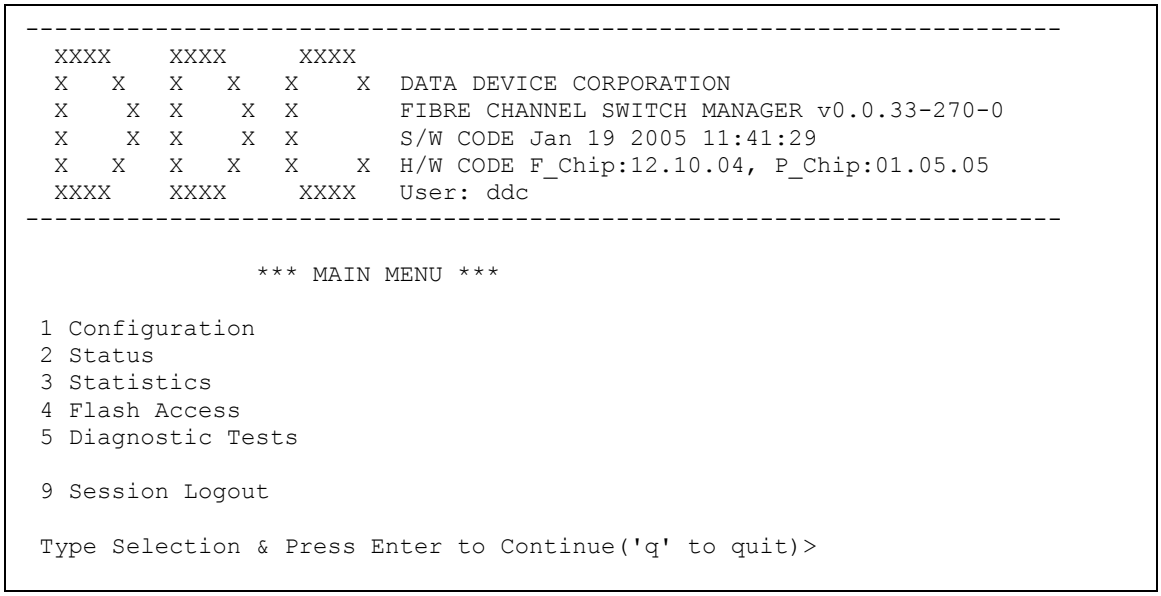


Figure 8. Main Menu

The main menu is fairly self-explanatory. The upper portion contains switch Hardware (HW) / Software (SW) build information along with the user name that was used to log in. The HW "codes" are the revisions of the Fabric FPGA and the Switch FPGA. The lower portion contains the sub menu choices that can be reached from the Main Menu.

4.2.5 Configuration Menu

The configuration menu contains sub-menus for configuring important switch options such as 1G/2G operation (sub menu 4, Global Settings), FC time out values (sub menu 4, Global Settings), and IP settings for the Ethernet port (sub menu 7, Ethernet Settings), etc. The following sections will show and explain the various configuration options.

Warning: *To retain ANY of the configuration options that are modified through a power cycle, be sure to SAVE them from the Flash Access menu. In addition, the Flash Write Enable jumpers MUST be in place for the Flash to be written.*

```
*** CONFIGURATION MENU ***

 Switch...0x100000a0 550005d7   Mstr Switch...0x00000000 00000000

 Board Rev: 1,   S/N: 14934,  Control #: 0,   Source: Flash


      1 Domain ID : 0x1
      2 Master Sw : OFF
      3 WKA Config
      4 Global Settings
      5 IMPLICIT Name Server Config
      6 Ethernet Settings
      7 Port Settings
      8 Modify Routing Table
      9 Download File

Type Selection & Press Enter to Continue('q' to quit)>
```

Figure 9. Configuration Menu

Note: *You can always return to the Main Menu from any sub-menu by entering a succession of "q" and "<return>". This feature allows the user a fast and easy way to get back to the top menu from any sub-menu.*

4.2.5.1 Domain ID Sub-menu

This configuration sub menu allows you to configure the lower 2 bits of the Domain ID. A unique Domain ID identifies each switch in a multi-switch fabric. This screen is straightforward and is shown in Figure 10. The user entry "1" is shown in bold.

```
      *** SET DOMAIN ID ***

Enter ID(0-3) ('q' to quit): 0x1
```

Figure 10. Domain ID

4.2.5.2 Master Switch Selection Sub-menu

This configuration sub menu allows you to configure the switch as the master switch, or not. This screen is straightforward and is shown in Figure 11. The user entry "1" is shown in bold.

```
*** MASTER SWITCH SELECTION ***

 Enter Master(1-YES,0-NO)? ('q' to quit):1
```

Figure 11. Master Switch Selection

The Master Switch is useful when implementing a multi-switch system. It allows for one switch to assume the role of fabric “master”, whereas all other switches would potentially be slaved to the master. Only one switch per multi-switch fabric should be designated to be the master switch.

If only one switch is being used in the system, then this bit should be set to „1’ (YES).

4.2.5.3 WKA Sub-menu

This configuration sub menu allows you to configure the WKA (Well Known Address) servers in the switch. This screen is shown in Figure 12. Servers without number prefixes are not implemented. The screen does not show the dialog for the implemented servers, but the dialog choice for implemented servers is to enable the server (1) or disable the server (0).

```
        *** WKA SERVER CONFIGURATION ***

1 MULTICAST Server:Disabled    2 CLK SYNC  Server:Disabled
3 ALIAS     Server:Disabled    4 MANAGEMNT Server:Disabled
5 DIRECTORY Server:Enabled     6 FAB CTRLR Server:Enabled
7 FAB LOGI  Server:Enabled     8 BROADCAST Server:Enabled
  TIME      Server:Disabled      QoS FAC   Server:Disabled
  KEY DIST  Server:Disabled      RESVD0    Server:Disabled
  RESVD1    Server:Disabled      RESVD2    Server:Disabled
  RESVD3    Server:Disabled      RESVD4    Server:Disabled

 Enter Server To Modify ('q' to quit):
```

Figure 12. WKA Server Configuration

4.2.5.4 Global Settings Sub-menu

This configuration sub menu allows you to configure the switch’s port speeds (two banks of 8 ports each), enable or disable the address mask 0 bit check, select one of the four address masks and set the E_D_TOV value. The screen in Figure 13 shows the current global settings for the switch. Note that these settings can also be downloaded (see section 4.2.5.9.3)

```
        *** SET GLOBAL PARAMETERS ***

1 Port 0-7 Speed:               1.0625 Gbit
2 Port 8-15 Speed:              1.0625 Gbit
3 Address Mask 0 bit Check:     Enable
4 Lookup Mask Select:           0
5 E_D_TOV:                      2000ms

 Type Selection & Press Enter to Continue('q' to quit)>
```

Figure 13. Global Settings

4.2.5.4.1 Port Speed Select

The port speed selections 1 and 2 are self explanatory and allow the two banks to be independently configured for either 1G (1.0625 Gbps) or 2G (2.125 Gbps) speed. The selected speed must match that of the FC equipment connected to the switch.

4.2.5.4.2 Address Mask 0 Bit Check

Selection 3 (Address Mask 0 bit Check) enables or disables the switch from checking that the masked off bits of the DID field of a received frame are zero. If this check is enabled the switch will NOT route frames whose masked off bits are non-zero. If this check is disabled the switch will ignore the state of masked off DID bits. For example, the DID bits that are 0 in Table 9 below must also be zero in a received FC frame IF the “Address mask 0 bit check” is enabled; if “Address mask 0 bit check” is disabled these same bit are don’t cares.

4.2.5.4.3 Lookup Mask Select

Selection 4 (Lookup Mask Select) selects which one of the four fixed lookup masks will be applied to the DID field in the received frame. DID refers to the D_ID (Destination Address) field in the header section of a fibre channel frame. Ten bits of the 24 bit DID field are used as an index into the 1024 entry routing table(s). The switch has four predefined lookup masks for selecting which 10 bits of the DID are looked at for routing the received frame. The four lookup masks are listed in Table 9. The bits in the DID whose corresponding mask are 1 will be used to create an index into the routing table IF the remaining DID bits are zero (Address Mask 0 bit Check ENABLED) or “don’t cares” (Address Mask 0 bit Check DISABLED).

For example, if the LU mask is 0 and “Address Mask 0 bit Check” is ENABLED and the DID of a received frame is 0x030804, the frame will NOT be routed because the Port field is non-zero (last byte of DID = 4). However, if the LU mask is 0 and “Address Mask 0 bit Check” is DISABLED for the same received frame (DID = 0x030804), 0x308 will be extracted from the DID and used as an index into the routing table. If the routing table has a valid entry at 0x308 the switch will attempt to transmit that frame out the port(s) specified in the entry. The phrase “attempt” is used because the destination port might be unconnected, the link might be down temporarily, the buffer credits might have dropped to zero (flow control), etc..

Table 9. Look Up Mask/DID fields

LU mask	Destination Mask	DID of received frame			
		Domain	Area	Port	
0	DID_MASK0	00000011	11111111	00000000	2/8/0
1	DID_MASK1	00000000	00000011	11111111	0/2/8

Table 9. Look Up Mask/DID fields					
LU mask	Destination Mask	DID of received frame			
		Domain	Area	Port	
2	DID_MASK2	00000011	00001111	00001111	2/4/4
3	DID_MASK3	00000001	11111111	00000001	1/8/1

4.2.5.4.4 E_D_TOV Selection

Line item 5 (E_D_TOV) allows configuration of the E-D_TOV (Error Detect Timeout Value) timer. The E_D_TOV value times events and responses at the sequence level. The standard defines a default value of 10 seconds, but mil/aero FC networks will probably use a smaller time out value. This screen is shown in Figure 14.

```
Enter E_D_TOV(1-8000 mS) ('q' to quit):
```

Figure 14. E_D_TOV Selection

4.2.5.5 Implicit Login Sub-menu

This configuration sub menu allows you to configure the switch's ports for implicit login. This screen is shown in Figure 15.

```
        *** IMPLICIT LOGIN TABLE ***

-Indx- -Port_ID-  -----Port_Name----  ----FPort_Name----  -Log-  -ClassOfServ-
   0
   1
   2
   3
   4
   5
   6
   7
   8
   9
  10
  11
  12
  13
  14
  15
        Insert('i'),Delete ('d'), quit('q')>
```

Figure 15. Implicit Login Table

4.2.5.6 Ethernet Sub-menu

This configuration sub menu allows you to configure the switch's Ethernet port IP address, subnet mask, gateway and TCP port number. The Ethernet port only has to be configured if the user will use the management interface through the Ethernet port. The terminal emulator used to communicate to the switch Ethernet port must also be configured for a matching IP address and TCP port number.

After the Ethernet port is configured, save the configuration to flash and then cycle power to the switch for the configuration change to take effect.

Note: Both the serial and Ethernet management ports cannot be active at the same time. For example, if after configuring the Ethernet port you log into the switch via the serial port to check the Ethernet settings, the Ethernet port will not respond (even to pings). The user connected via the serial port has to log out via the Main Menu's Session Logout choice and then the Ethernet port will respond.

```
      *** ETHERNET CONFIGURATION MENU ***

1 IP Address:          192.168.100.100
2 SubNet Mask:         255.255.255.0
3 Gateway:             192.168.100.1
4 Port Number:         7777
  MAC Address:         00:a0:55:00:05:d8

To make changes take effect, save configuration to flash
then reboot the system

Type Selection & Press Enter to Continue('q' to quit)>
```

Figure 16. Ethernet Sub-menu

4.2.5.7 Port Sub-menu

This configuration sub menu allows you to enable individual ports, set the IMPLICIT login buffer-to-buffer credit value for each port, and set the RT_TOV of individual ports

Note: The screen shown in Figure 17 is NOT how the switch ports would normally be set-up, but is meant to illustrate what settings can be changed.

```
Port    ON/OFF  BB Credit   RT_TOV
 0        ON       8         100us
 1       OFF       8         100ms
 2        ON      15         100us
 3        ON       1         100ms
 4        ON       8         100ms
 5        ON       8         100ms
 6        ON       8         100ms
 7        ON       8         100ms
 8        ON       8         100ms
 9        ON       8         100ms
10        ON       8         100ms
11        ON       8         100ms
12        ON       8         100ms
13        ON       8         100ms
14        ON       8         100ms
15        ON       8         100ms

 Enter Port Number (0-15) ('q' to quit):
```

Figure 17. Port Sub-menu

Figure 18 illustrates the screen dialog that occurs when a port is selected for configuration. User entries are in bold.

Turning an unused port OFF will reduce the power consumption of the switch. Turning a port off also disables the fiber-optic transmitter; no light will be emitted from the Tx connector.

The B-B credit configures how many outstanding R_RDYs the switch will delay before it stops transmitting frames out the specified port. The value selected here is overridden by the explicit log-in value.

RT_TOV is the receiver-transmitter time out value (in milliseconds) and is used to time events on the link such as Loss-of-Synchronization and expected responses to link-level protocols. The value specified by the standard is 100 ms.

```
Enter Port Number (0-15) ('q' to quit): 0

Enter ON(1)/OFF(0) ('q' to quit): 1

Enter B-B Credit (0-15) ('q' to quit): 8

Enter RT_TOV mS(0) or uS(1) ('q' to quit): 0
```

Figure 18. Set Port Dialog Screen

4.2.5.8 Routing Table Sub-menu

This configuration sub menu allows you to configure the switch's routing table. A user might wish to configure a non-default routing table for forwarding frames to another switch, diagnostics purposes, monitoring, etc.

This menu is the interactive equivalent of the routing table command lines that can be downloaded via a configuration file, which are explained in section 4.2.5.9.

```
                *** ROUTING TABLE ACCESS MENU ***

 1 Index    : 0x000
 2 End Index: 0x000 (for Route Range only)
 3 Mask     : 0x0000
 4 Type     : UNICAST
 5 WKA Set  : CLR
 6 Write Route
 7 Write Route Range

 Type Selection & Press Enter to Continue('q' to quit)>
```

Figure 19. Routing Table

User configuration of the routing table provides support for multicasting, implicit switch-to-switch connections, and implicit logins that match a user's overall port numbering scheme, amongst other features.

The *Index* and *End Index* entries define the range of routing table indexes we want the switch to operate on. Note that the default Look Up Mask (LU mask =0, see Table 9) forms the three hex digits for *Index* and *End Index* from the lower 2 bits of the Domain ID and both nibbles of the Area ID of the Destination ID. The three hex digits of the *Index* and *End Index* represent a right justified 10 bit field so the upper hex digit's range is 0 through 3.

In the example shown in the figures below, we show a single index being setup. Figure 20 shows the index "31E" being entered which maps to a destination ID of 0x031E00. Since we're not routing a range, we leave the *End Index* entry at 0x000.

```
Enter Routing Table Hex Index ('q' to quit): 0x31E
```

Figure 20. Routing Table Index Entry Screen

The *Mask* parameter identifies which port(s) to send the received frame out on. This field is a 16-bit field in which each bit is a destination PHYSICAL port number. For example, 0x0001 is PHYSICAL port 0, 0x0002 is PHYSICAL port 1, etc. The received frame can be transmitted out multiple output ports, by setting more than a single bit of the *Mask* and selecting MULTICAST for the TYPE field. In the example

shown in Figure 21, we are entering a UNICAST route out PHYSICAL port 15 so we leave the *Type* as Unicast. Note that the *Mask* parameter in the Figure 21 dialog is the same as the PTE field in the routing table entry of a configuration download file.

Note: *In order to configure the same routing table on all 16 ports simultaneously, a value of 0xFFFF should be entered.*

```
Enter Route Mask ('q' to quit): 0x8000
```

Figure 21. Routing Table Mask Entry Screen

The *TYPE* parameter identifies if the frame will be transmitted out one port (unicast), multiple ports (multicast), clock sync or to a hunt group.

Selecting "hunt" allows the user to select a form of multipathing. The switch will transmit the received frame out of the first available port in the hunt group (hunt group egress ports are specified via the *Mask* parameter). The specific port selected by the switch is determined round robin, with the lowest port number in the hunt group checked first, if that one is blocked the next lowest one is checked, etc.. When an unblocked port is found the frame is transmitted out that port. An example of a blocked egress port is a port in the hunt group that is experiencing Loss of Synchronization.

```
Enter Route Type(0=ClkSync 1=Uni 2=Multi 3=Hunt) ('q' to quit):
```

Figure 22. Routing Table Index Entry Screen

The *WKA* (Well Known Address) parameter determines if the frame is routed to the microprocessor on board the switch.

To actually update the routing table we select choice 6 (Write Route) and the screen in Figure 23 will appear: the route we created is now setup in the switch. The new route will take ANY frame received on ANY port whose Destination ID is 0x031EXX (where the large Xs must be zero unless the "ALPA Disable" bit is set) and transmit that frame out PHYSICAL port 15.

```
Route Update written to all ports.
Press ENTER to continue.
```

Figure 23. Routing Table Write Route Screen

Using the *End Index* entry and then selecting the "Write Route Range" choice 7 allows implicit switch-to-switch port configuration. For example, if the overall system requires more than 16 ports, received frames that have DIDs for ports that are not on

the local switch can be “forwarded” out a specific port. This “forwarding” port is acting as an implicit switch-to-switch port.

Let’s assume we have two switches that are interconnected by PHYSICAL port 15. Nodes with SIDs in the range 0x010000-0x010E00 are on switch #1, nodes with SIDs in the range 0x011000-0x011E00 are on switch #2. These values are picked to make the example easy to understand. To forward FC frames with DID 0x011000-0x011E00 from switch #1 to switch #2, configure switch #1:

Index = 0x110
End Index = 0x11E
Type = Unicast
Mask = 0x8000
And then “Write Route Range”.

A complementary configuration has to be done at switch #2 to forward frames with DID 0x010000-0x000E00 from switch #2 to switch #1:

Index = 0x100
End Index = 0x10E
Type = Unicast
Mask = 0x8000.
And then “Write Route Range”.

In addition, the routing table has to be configured at switch #2 so that DIDs with 0x011000 (*Index* 0x110) are sent to *Mask* 0x0001 (PHYSICAL Port 0), DIDs = 0x011100 (*Index* 0x111) use *Mask* 0x0002 (PHYSICAL port 1), etc. This example assumes that the lowest nibble of the nodes’ SID Area matches the PHYSICAL port number to make the example easy to understand.

4.2.5.9 Download File Sub-menu

This configuration sub menu allows you to download a file via the Xmodem protocol. Select “Send File” (“Upload File”, etc.) from your terminal emulator once the Xmodem handshake start characters start appearing on the screen.

If you get to this sub-menu inadvertently, you can wait for the Xmodem protocol in the switch to time out, or you can press “q””enter” to abort it before the time out. The time out period is approximately 40 seconds. The rectangles below the 1st line of Figure 24 are Xmodem control characters and may display differently on the terminal emulator screen, depending upon the terminal emulator’s character mapping.

The command interpreter in the switch processes the file that is downloaded and the interpreted command will be used to configure the switch. Downloading the

configuration is a fast and repeatable method of configuring the switch. The switch table download file format is explained in the following sections.

The screen in Figure 24 shows the results of a configuration file download. Note that the screen displays the results of parsing the command lines (entries): Good Entries = 3, Bad Entries = 0. This feature is useful for checking if the downloaded commands are syntactically correct. The file that was downloaded contains 4 lines that start with #, all the lines are syntactically correct and the 4th line is the #EF command, which is NOT counted. Lines that do not start with # are comment lines and are not counted either.

The results of the file download should be checked via the menu configuration screens to verify that the configuration download produced the desired results. For example, a typo in the file might set the speed for ports 0-7 to 2G as opposed to the desired 1G, which will be visible when the "configuration, global settings" menu is displayed.

```
Call Terminal Xmodem Function

 Call Terminal Xmodem Function


 Transfer Complete
 Good Entries: 3   Bad Entries: 0
 SUCCESS..Press Enter>
```

Figure 24. Download File Screen

4.2.5.9.1 Download Switch Configuration File Format

The Download Switch Configuration File format has 5 commands that the switch management processor will parse. These commands allow a downloadable file to configure most of the switch options that can be configured via the menu system. The format of these commands is explained in the following sections.

The „# character must precede each command. The recognized commands are:

- #RT - write Routing Table entry
- #GC - Global Configuration
- #PC - Port Configuration
- #LT - write Login Table entry
- #EF - end of file

Each recognized command line must be terminated by an END identifier, followed by *end of line/carriage return.*

Note: *Any entry that does not have the # character is unrecognized, and therefore can be used as a comment within the command file.*

4.2.5.9.2 Routing Table Entry Command Format

An example of a Routing Table Entry command is shown below:
#RT004 TYP 2 WKA 0 PTE 0E34 PTM FFFF END\r\n

The fields that make up this command are defined as follows. Note that the example is a multicast route to numerous destination ports:

#RTXXX

Route Index field: Identifies the index location to place this entry – no space between command and numeric identifier.

Range: RT000 – RT3FF (Note that there is NO space between command and number)

Format: Hexadecimal

This field is the equivalent of the *Index* and *End Index* entries in the interactive routing table configuration menu (section 4.2.5.8).

TYPE X

Route Type field: there is a space between command and value

Range: 0-ClkSync, 1-Unicast, 2-Multicast, 3-Hunt Group

Format: Hexadecimal

This field is the equivalent of the *Type* entry in the interactive routing table configuration menu (section 4.2.5.8).

WKA X

Well Known Address field: Identifies if this route is a WKA

Range: 0-No, 1-Yes

Format: Hexadecimal

This field is the equivalent of the *WKA* entry in the interactive routing table configuration menu (section 4.2.5.8).

PTE XXXX

Port Enable Bit Mask field: each bit corresponds to a physical port, with the LSB being port #0, etc. Frames mapped to this route will be sent out each port whose bit is set in this mask. The Type field must be set to 2 (multicast) if multiple bits are set in this field or the WKA =1. There is a space between the command and value.

Range: 0x0000 – 0xFFFF

Format: Hexadecimal

This field is the equivalent of the *MASK* entry in the interactive routing table configuration menu (section 4.2.5.8).

PTM XXXX

Port Mask Select field: each bit corresponds to a port. This routing entry will be written to each port whose bit is set in this mask. Writing the routing entry to SPECIFIC port is useful for debugging, but for normal operation set this field to 0xFFFF (see last sentence). Simultaneously, this route will be written into the master Routing Table. If the routing table is subsequently written to Flash, this route will be loaded into ALL ports after reset or power cycling has occurred.

Range: 0x0000 – 0xFFFF

Format: Hexadecimal

This field has no equivalent in the interactive routing table configuration menu (section 4.2.5.8) and is automatically set to all ones when the routing table entry is written.

END\R\N

Command terminator. The end of line sequence is \r\n, ASCII codes 13 10.

4.2.5.9.3 Global Configuration Download Command

Note: *The function of the GC command has NOT been verified in this release.*

This command is used to configure global switch settings. Please see section 4.2.5.4 for an explanation of the global configuration options. An example of the Global Configuration command is shown below:

#GC S07 1 S8F 2 AM0 1 LUM 0 EDT 1F4 END

The fields that make up this command are defined as follows:

#GC

Global Command field: Identifies the Global Configuration command

S07 X

Speed-Ports 0-7: there is a space between command and value

Range: 1 - 1G, 2 - 2G

Format: Hexadecimal

S8F X

Speed-Ports 8-15: there is a space between command and value

Range: 1 - 1G, 2 - 2G

Format: Hexadecimal

AM0 X

Address Mask 0 Bit Check: there is a space between command and value

Range: 1 - ENABLE, 0 - DISABLE

Format: Hexadecimal

LUM X

Look Up Mask: there is a space between command and value

Range: 0-3

Format: Hexadecimal

EDT X

E_D_TOV setting: there is a space between command and value

Range: 1 - 0x1F40 (1 - 8000ms)

Format: Hexadecimal

END\R\N

Command terminator. The end of line sequence is \r\n, ASCII codes 13 10.

4.2.5.9.4 Port Configuration Download Command

Note: *the function of the PC command has NOT been verified in this release.*

This command is used to configure port-specific settings. Please see section 4.2.5.7 for an explanation of the port configuration options. An example of the Port Configuration command is shown below:

#PC2 PWR OFF BBC 3 RTT mS END

The fields that make up this command are defined as follows:

#PCX

Port Config #: Identifies the port to configure - no space between command and numeric identifier.

Range: PC0 - PCF (there is NO space between command and number)

Format: Hexadecimal

PWR "XX"

Turn Port On/Off: there is a space between command and value

Range: "ON", "OFF"

Format: Character string

BBC X

Buffer-to-Buffer Credit: there is a space between command and value

Range: 0 - 0xF

Format: Hexadecimal

RTT "XX"

R_T_TOV Resolution: there is a space between command and value

Range: "ms" (milliseconds), "µs" (microseconds)

Format: Character string

END\R\N

Command terminator. The end of line sequence is \r\n, ASCII codes 13 10.

4.2.6 Status Main Menu

This menu allows you to select one of 3 choices to monitor. Selecting “Port Summary” will display the “Switch Status” screen, “Login table” will display the “Name Server Login Table” and “Extended Login”.

```
    *** STATUS MENU ***

1 Port Summary
2 Login Table
3 Extended Login Table

Type Selection & Press Enter to Continue ('q' to quit)>
```

Figure 25. Status Menu

4.2.6.1 Port Summary

This screen displays if a port has synchronization with a node plugged into it (ACTIVE = YES). It also displays the number of frames that have been received from the “far end” node and how many frames the switch port has transmitted to the “far end” node.

```
                *** SWITCH STATUS ***

Port    Power  Active        RxFrame         TxFrame     Others
-------------------------------------------------------------------------
 0       ON      NO               0               0        0
 1       ON      NO               0               0        0
 2       ON      NO               0               0        0
 3       ON      NO               0               0        0
 4       ON      NO               0               0        0
 5       ON      NO               0               0        0
 6       ON      NO               0               0        0
 7       ON      NO               0               0        0
 8       ON      NO               0               0        0
 9       ON      NO               0               0        0
10       ON      NO               0               0        0
11       ON      NO               0               0        0
12       ON      NO               0               0        0
13       ON      NO               0               0        0
14       ON      NO               0               0        0
15       ON      NO               0               0        0

 Clk Sync: 0x00006d95 0x64756500    Offset : 0x0000004e

Press 'q' to quit:
```

Figure 26. Port Summary (switch status)

4.2.6.2 Name Server Login Table

This screen displays various data accumulated by the switch's Name Server. This information is accumulated during the exchanges between the switch and explicitly logged in HBAs.

```
              *** NAME SERVER LOGIN TABLE ***

-Indx- -Port_ID-  -----Port_Name----  ----FPort_Name----  -Log-  -ClassOfServ-
   0
   1
   2
   3
   4
   5
   6
   7
   8
   9
  10
  11
  12
  13
  14
  15

Press 'q' to quit:
```

Figure 27. Name Server Login Table

4.2.6.3 Extended Login Table

This screen displays the extension of the Name Server Login Table (see Figure 27).

```
       *** EXTENDED NAME SERVER LOGIN TABLE ***

-Indx- -Port_ID-  -----Port_Name----  ----FPort_Name----  -Log-  -ClassOfServ-
  16
  17
  18
  19
  20
  21
  22
  23
  24
  25
  26
  27
  28
  29
  30
  31

Press 'q' to quit:
```

Figure 28. Extended Name Server Login Table

4.2.7 Statistics Main Menu

This menu allows you to select one of 4 choices to monitor.

```
      *** STATISTICS MENU ***

1 FC Services
2 FC Ports
3 Ethernet
4 Temperature

Type Selection & Press Enter to Continue('q' to quit)>
```

Figure 29. Statistics Menu

4.2.7.1 FC Services Statistics Screen

This screen allows you only one choice: let it auto-refresh every 5 seconds. Press “q” and then “Enter” to return to the main Statistics menu. The FC services indicated are the WKA servers that are currently implemented in the switch, which are listed in Figure 12. FC nodes will access these services as required, which will increment the respective request count. For example, a node connected to the switch that does explicit login will increment the Login counter when the node logins with the switch.

```
       *** FC SERVICES STATISTICS ***

               # Requests
               ----------
Directory           0
Login               0
FabricCtrl          0
Management          0
Broadcast           0
ClockSync           0
Alias               0
Multicast           0
Invalid             0


 Press 'q' to quit:
```

Figure 30. FC Services Statistics Screen

4.2.7.2 FC Ports (Port Summary) Sub-menu

This menu allows you only three choices: let it auto-refresh every ~5 seconds, press “q” “Enter” to return to the main Statistics menu, press “f” ”Enter” to reset the Rx and Tx frame counters or “r” ”Enter” to reset the error counters.

RxFrame: the number of frames received at the port

TxFrame: the number of frames transmitted from the port

LAIC: Lookup Address Invalid Counter, D_ID from incoming frame caused an invalid output from the Port Lookup Ram, i.e. no destination port bits set (or bad parity at that location). Counts 1 for each occurrence.

BFC: Busy Frame Counter, the destination port was busy longer than the allowed timeout period and caused the frame buffer to be released (Class 3) or a busy reject frame to be sent to the source port (Class 2). Counts 1 for each occurrence.

Note: *The Busy Frame Counter will increment for any unicast, multicast or broadcast frame who's D_ID indicates a destination that is an unconnected port. (For multicast and broadcast, all destinations must be satisfied.). For example, this counter will increment if the attached node sends an IP ARP message (broadcast D_ID) if ANY of the other ports on the switch are unconnected.*

ICFC: Invalid Class Frame Counter, the port received a frame containing a Class not supported by this port. Counts 1 for each occurrence.

LOS: Loss of Synchronization, the receive section of the SERDES could not maintain synchronization with the incoming bit stream. Counts 1 for each occurrence.

CRCEC: CRC Error Counter, the receive section of the SERDES reported a CRC error on the incoming frame. Counts 1 for each occurrence.

SOFAEC: Start Of Frame Address Error Counter, the port currently has all buffers in use and received another SOF thereby loosing the incoming frame. Counts 1 for each occurrence.

```
        *** PORT STATISTICS ***

Port        RxFrame          TxFrame    LAIC     BFC    ICFC     LOS   CRCEC   SOFAEC
-------------------------------------------------------------------------------------
 0                0                0      0       0       0       0       0       0
 1                0                0      0       0       0       0       0       0
 2                0                0      0       0       0       0       0       0
 3                0                0      0       0       0       0       0       0
 4                0                0      0       0       0       0       0       0
 5                0                0      0       0       0       0       0       0
 6                0                0      0       0       0       0       0       0
 7                0                0      0       0       0       0       0       0
 8                0                0      0       0       0       0       0       0
 9                0                0      0       0       0       0       0       0
10                0                0      0       0       0       0       0       0
11                0                0      0       0       0       0       0       0
12                0                0      0       0       0       0       0       0
13                0                0      0       0       0       0       0       0
14                0                0      0       0       0       0       0       0
15                0                0      0       0       0       0       0       0
Press 'q' to quit, 'f' to reset frame counters, or 'r' to reset error counters:
```

Figure 31. Port Statistics Screen

4.2.7.3 Ethernet Sub-menu

This screen allows you only one choice: let it auto-refresh every 5 seconds. Press “q” and then “Enter” to return to the main Statistics menu. This screen shows Ethernet statistics, both at the Ethernet layer and at the TCP layer.

```
        *** PORT STATISTICS ***

        *** ETHERNET STATISTICS ***

        Frames       Errors    Missed Fr   Ints     Fifo Errs
      ----------- ------------ ---------- ---------- ----------
TX:           0            0          0          0          0
RX:           0            0          0          0          0

EMAC:         0            0          0          0          0

EMAC Started:NO

TCP Stats: Connects: 0, DroppedConnects: 0
TCP Tx:  Sent:          0      ReXmt:          0
TCP Rx: Recvd:          0 OutOfOrder:          0 Dups: 0

Press 'q' to quit:
```

Figure 32. Ethernet Screen

4.2.7.4 Temperature Sub-menu

This screen allows you only one choice: let it auto-refresh every 5 seconds. Press “q” and then “Enter” to return to the main Statistics menu. This screen displays the temperature at various points in the switch. The chip temperatures displayed are from monitor diodes in the FPGA dies, so they are ACTUAL die temperatures. The board ambient is from a temperature sensor located approximately in the middle of the base board. This temperature sensor is located to the right of the middle FPGA, when the switch is held with the front panel on the left and P1/P2 connectors on the right.

```
*** PORT STATISTICS ***

    *** Temperature Sensor Readings in degree C ***

                        Current         Minimum         Maximum

    Board Ambient :         31              31              32

    Fabric Chip   :         45              45              46

    Portchip A    :         57              57              58

    Portchip B    :         42              42              43



    Press 'q' to quit:
```

Figure 33. Temperature

4.2.8 Flash Programming Main Menu

This menu allows you to select one of six choices. All choices except for items 4 and 9 require the Flash Write Enable jumpers TB5 1-2 and TB10 1-2 to be on the main switch card, otherwise the Flash will NOT be reprogrammed. Selection 9 can reboot the switch so that downloads of new fabric and/or port chip code can take effect.

Caution: Choice 3 will start storing the current configuration as soon as you select it, it does NOT have a “Are you sure Y/N” dialog choice after you select choice 3!

```
               *** FLASH PROGRAMMING MENU ***

1 Download Fabric Chip
2 Download Port Chip
3 Store Current Config
4 Load Default Config
5 User/Password Setup


9 Reboot the Switch!!!

  (WARNING! These selections will erase part
  of switch nonvolatile memory)

Type Selection & Press Enter to Continue('q' to quit)>
```

Figure 34. Flash Programming Main Menu

4.2.8.1 Fabric Chip

The screen in Figure 35 displays after the Download Fabric Chip choice is selected from the main Flash Programming menu. If the user enters “Y” the fabric chip portion of the flash is erased and then the screen prompts the user to start the Xmodem upload at the terminal emulator.

Note: *The switch’s software is contained in the fabric chip, so an update of the fabric chip FPGA code will also update the software.*

Warning: *Do not turn off power to the switch after the Flash section has been erased. If power is lost after the flash section is erased and before the new code is downloaded, the switch will have to jumpered to use its back-up flash area to recover.*

```
       *** PROGRAM FLASH - FABRIC CHIP FILE ***

This function ERASES Flash memory...continue(Y/N)?
```

Figure 35. Fabric Chip Erase Prompt

The screen in Figure 36 shows the results of a successful Xmodem transfer. The switch initiated the transfer handshake when the user pressed the “enter” key after the “Press Enter to continue>” prompt. The multiple lines of the rectangular control characters indicate the transfer handshake start. The user then started the Xmodem upload from the terminal emulator: this took a number of seconds which is inferred from the amount of the rectangular control characters shown on the screen. Once the download to the switch starts, the control characters stop. Note that the download will take approximately 10 minutes through the serial port but a much shorter period of time through the Ethernet port.

```
      *** PROGRAM FLASH - FABRIC CHIP FILE ***

This function ERASES Flash memory...continue(Y/N)?y


Erasing Flash Sectors
.....................................Done
Press Enter to continue>


Calling Xmodem function....Please select a .bin file
to send using the 1K Xmodem protocol
```

Figure 36. Fabric Chip Flash Programming Screen

4.2.8.2 Port Chip

The screen in Figure 37 displays after the Download Port Chip choice is selected from the main Flash Programming menu. If the user enters "Y" the port chip portion of the flash is erased and then the screen prompts the user to start the Xmodem upload at the terminal emulator. Note that both port chips use the port chip flash area, so this procedure is only done once to update both port chips.

Warning: *Do not turn off power to the switch after the Flash section has been erased. If power is lost after the flash section is erased and before the new code is downloaded, the switch will have to be jumpered to use its back-up flash area to recover.*

```
      *** PROGRAM FLASH - PORT CHIP FILE ***

This function ERASES Flash memory...continue(Y/N)?
```

Figure 37. Port Chip Erase Prompt

The screen in Figure 38 shows the results of a successful Xmodem transfer. The transfer handshake start was initiated by the switch when the user pressed the "Enter" key after the "Press Enter to continue>" prompt. The transfer handshake start is indicated by the multiple lines of the rectangular control characters. The user then started the Xmodem upload from the terminal emulator: this took a number of seconds which is inferred from the amount of the rectangular control characters shown on the screen.

Once the download to the switch starts, the control characters stop. Note that the download will take approximately 10 minutes through the serial port but a much shorter period of time through the Ethernet port.

```
      *** PROGRAM FLASH - PORT CHIP FILE ***

This function ERASES Flash memory...continue(Y/N)?y


Erasing Flash Sectors
.....................................Done
Press Enter to continue>


Calling Xmodem function....Please select a .bin file
to send using the 1K Xmodem protocol
```

Figure 38. Port Chip Flash Programming Screen

4.2.8.3 Store Current Config Screen

The screen shown in Figure 39 displays after the current configuration is written to the flash. Storage of the current configuration, and display of the top 2 lines in the screen example, occurs as soon as “Store Current Config” is selected from the Flash Programming menu. The bottom 2 lines appear after the configuration is written to the flash.

Note: *At present, changes made to the configuration by downloading a file (section 4.2.5.9) do NOT get stored to flash.*

```
      *** PROGRAM FLASH - CONFIG FILE ***
Writing Switch Configuration to Flash....
Done
Press Enter to continue>
```

Figure 39. Store Current Config Screen

4.2.8.4 User/Password Setup Screen

This menu allows you to change either of the two User IDs and their passwords. An example dialog screen is shown in Figure 40. User entries are in bold. In this example, user ID 1 is changed to “user1” with password “pwd1”. Even though an access level of 1 was entered, the access levels currently have no effect. Default factory configuration is ddc/3548 for BOTH user ID/passwords, so both should be changed if a user wants to prevent access to the switch with the documented User name/password.

```
User ID to edit (1 - 2): 1

Are you sure? (y/n) y

Username: user1

Confirm password: pwd1

Access level (1 - 5): 1

Save to flash? (y/n) y

Saved  successfully! Press a key to continue...
```

Figure 40. Store Current Configuration Screen

4.2.8.5 Reboot Switch

This menu choice allows a user to reset the switch without cycling power or pressing the front panel reset button. A switch reset is required after port or fabric chip flash reprogramming for the new flash image to be loaded into the FPGAs. The screen dialog is self explanatory, as shown in Figure 41. Note that if the user presses “y” and then the “enter” key, the screen will NOT indicate that the switch has rebooted. Pressing the “Enter” key again will cause the switch to display the login user name prompt.

```
Switch will reboot. Are you sure (y/n) ?
```

Figure 41. Reboot Switch

4.2.9 Diagnostic Test menu

This menu allows you to select one (or all) of the diagnostic tests to be run. Please note that some of the tests execute as soon as they are selected from the main menu.

```
                *** DIAGNOSTIC TEST MENU ***

1 RT Checksum Test
2 Register Test
3 Loopback Test
4 Flash Interface Test
5 DMA Test
6 Clock Sync Test
7 Run All Tests

NOTE: These tests are destructive.  Press 9 to reset the switch.
Type Selection & Press Enter to Continue('q' to quit)>
```

Figure 42. Diagnostic Test Main Menu

4.2.9.1 Routing Table Test

The screen in Figure 43 shows the results of running the Routing Table test. The test was initiated by the user pressing “y””Enter”: user entries are in bold. This test checks the routing table by writing four different data patterns to it.

```
During the test, all the routing tables will be changed ...continue(Y/N)?y

Routing Table Checksum Test

Routing Table 1: (All 0s)Port 0-15:     P P P P P P P P P P P P P P P P
Routing Table 2: (All 5s)Port 0-15:     P P P P P P P P P P P P P P P P
Routing Table 3: (All As)Port 0-15:     P P P P P P P P P P P P P P P P
Routing Table 4: (All Fs)Port 0-15:     P P P P P P P P P P P P P P P P
 Press Enter to continue>
```

Figure 43. Routing Table Test

4.2.9.2 Register Test

The screen in Figure 44 shows the results of selecting the Register Test from the Diagnostic main menu. Note that this test runs as soon as the user select register test from the Diagnostic menu.

```
PortTop register R/W test PASSED

 Press Enter to continue>
```

Figure 44. Register Test

4.2.9.3 Loopback Test

The screen in Figure 45 shows the results of selecting the “Loopback Test” from the Diagnostic main menu. Note that this test runs as soon as the user selects “Loopback Test”. The test puts the ports into internal loopback and transmits and verifies a test pattern through the ports, at both port speeds, 1G and 2G.

```
Internal Lpbk Test-1G #Tx=   32, #Passed=   32, #Failed=    0 *PASS*
Internal Lpbk Test-2G #Tx=   32, #Passed=   32, #Failed=    0 *PASS*

Press Enter to continue>
```

Figure 45. Loopback Test

4.2.9.4 Flash Interface Test

The screen in Figure 46 shows the results of selecting the “Flash Interface Test” from the Diagnostic main menu. Note that this test runs as soon as the user selects “Flash Interface Test”.

Note that jumpers TB5 1-2 and TB10 1-2 must be in for this test to pass.

```
Perform Flash Interface test .... PASSED

Press Enter to continue>
```

Figure 46. Flash Interface Test

4.2.9.5 DMA Test

The screen in Figure 47 shows the results of selecting the “DMA Test” from the Diagnostic main menu. Note that this test runs as soon as the user selects “DMA Test”.

```
DMA Test PASSED

Press Enter to continue>
```

Figure 47. DMA Test

4.2.9.6 Clock Sync Test

The screen in Figure 48 shows the results of selecting the “Clock Sync Test” from the Diagnostic main menu. Note that this test runs as soon as the user selects “Clock Sync Test”.

```
ClkSync Test PASSED

Press Enter to continue>
```

Figure 48. Clock Sync Test

4.2.9.7 Run all Tests

The screen in Figure 49 shows the results of selecting “Run All Tests” from the Diagnostic main menu. Note that this test runs as soon as the user selects “Run All Tests”.

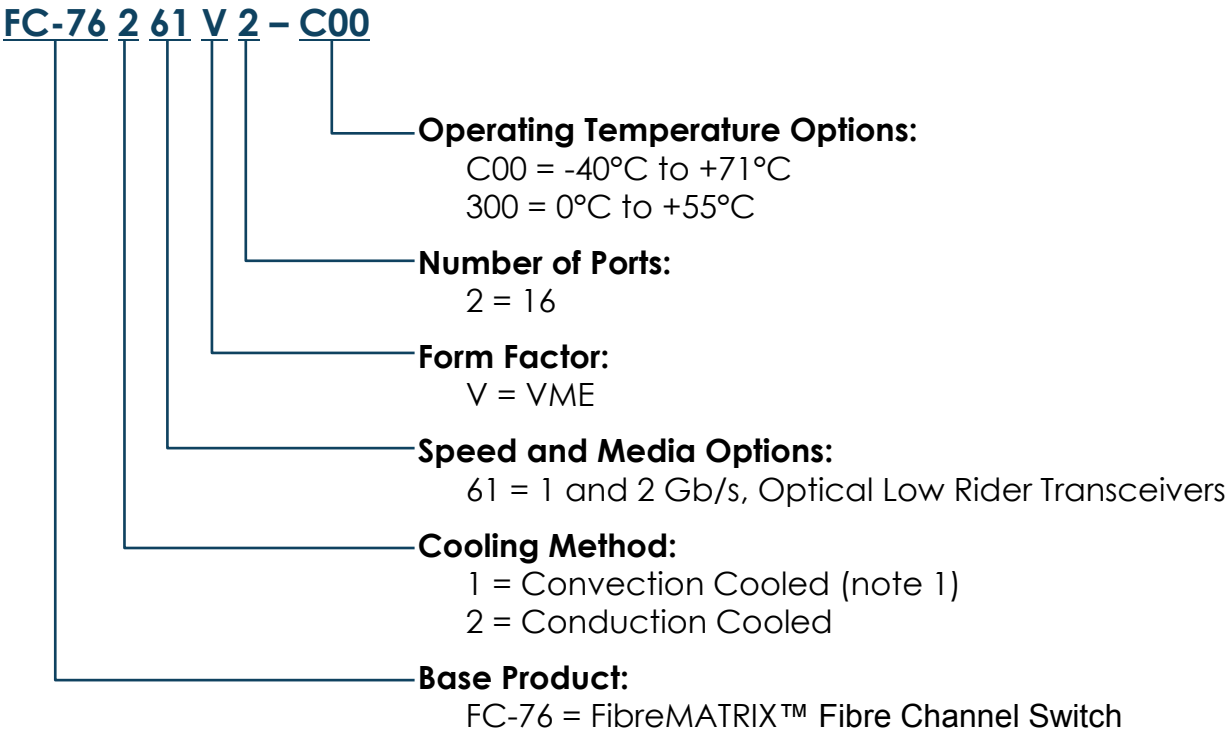
```
It is recommended that the Switch be reset after running these tests

ClkSync Test PASSED
DMA Test PASSED
Perform Flash Interface test .... PASSED
Internal Lpbk Test-1G #Tx=   32, #Passed=   32, #Failed=    0 *PASS*
Internal Lpbk Test-2G #Tx=   32, #Passed=   32, #Failed=    0 *PASS*
Routing table load test PASSED
PortTop register R/W test PASSED

Press Enter to continue>
```

Figure 49. Run All Test

5 ORDERING INFORMATION



Notes:

1. *300 (0°C to +55°C temperature range) is only available for convection cooled card.
2. Please contact factory for availability of –C00 temperature range convection cooled model.
3. These product contain tin-lead solder.

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