# FibreQuik
# Fibre Channel Host Bus Adapter
# For AIX
# User Guide

**Cambex Corporation**
115 Flanders Road.
Westborough, MA  01581

Customer support
support@cambex.com

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## Description

The Cambex FibreQuik™ Fibre Channel host bus adapters provide attachment of Fibre Channel devices to PCI or Micro Channel based servers.  They support the SCSI-FCP protocol.

When used with the Cambex Alternate Channel Failover software, two adapters in a system provide greater throughput and total protection from failure of a fibre channel loop.

## Specifications

| Model | PC2000 | PC1000 | MC1000 | |
|---|---|---|---|---|
| Data rate (each dir.) | 200 | 100 | 100 | MB/s |
| Cable length - copper | 30 | 30 | 30 | m |
| - multimode optical | 500 | 500 | 500 | m |
| - single mode optical | 10 | 10 | 10 | Km |
| Voltage | 3.3 or 5 | 3.3 or 5 | 5 | V |
| Power | 7.2 | 6.5 | 12.5 | W |
| Max adapters / host | 16 | 16 | 16 | |
| Max devices / adapter (AL) | 126 | 126 | 126 | |
| (Fabric) | 254 | 254 | 254 | |
| Shipping weight | 10 | 10 | 15 | oz |

### Trademarks

Centurion and FibreQuik are trademarks of Cambex Corporation.

## AIX Driver Installation

### Command line driver installation

The name and revision level of a driver may be examined by issuing the command (as root):

```
installp -ld <device>
```

where <device> is replaced by **/dev/fd0** for the floppy drive, **/mnt/AIX/PC1000.image** for a CD-ROM mounted at **/mnt** or the name of a driver image file on the hard disk, typically **MC1000.image** for Micro Channel systems or **PC1000.image** for PCI systems. Example output would be:

```
Option Name           Level            I/U Q Content
 ===================================================
PC1000.driver.obj    01.05.22.00       I   N usr
  Cambex Fibre Channel Adapter Driver
```

Before installing a new version of the driver, delete the previous version of the driver. Note that any filesystems, volume groups and SCSI devices must be removed before removing the driver. Be sure to have a complete backup of all data before attempting to update the driver. The command to remove the driver is:

```
installp -u <name>.driver.obj
```

where name is one of MC1000, PC1000, q2100, q2100m, q2200 or q2200m depending on the type of card and previous driver version.

The new driver may be installed on the system with the command:

```
installp -acd <device> all
```

where <device> is as described above.
example:

```
installp -acd /dev/cd0 all
```

After installing the driver, see the README file for additional information

```
 more /usr/lpp/cbxfc/READ_ME
```

## SMIT Driver Installation

The smit path is
> Software Installation and Maintenance
> Install and Update Software
> Install and Update Software by Package Name

For the menu item " INPUT device / directory" use `/dev/cd0,` or the directory where the image file is located.  A list should pop up with the name of the driver.  Select it and press enter.

## Hardware Installation

Power down the system and install the adapter in a free slot. The PCI card will work in either 32 or 64-bit PCI card slots. Make sure that airflow is not blocked by cables.  Observe proper static precautions.  Detailed procedures for opening the case may be found in the *Operator Guide* for the specific RS/6000 model.

When using copper cable, it is extremely important that the building wiring present a low impedance ground path to the frame of the device and the host with which it will communicate.  Additional ground wiring may be added between the unit and the host to ensure that no electrical noise is impressed on the interconnecting data cables.  Noise due to copiers or large machinery sharing the electrical circuits is a common cause of signal integrity problems.

## AIX Configuration

During power-up initialization, AIX will find and configure the new adapter(s) and any supported devices using the driver's configuration method. Devices are assigned a SCSI ID as they are discovered starting with 0. SCSI ID is not related to loop ID or to SCSI ID assignment on other hosts.

Configuration may also be run from the command line:

```
cfgmgr
```

Once disks have been configured, the standard smit utilities may be used to build volume groups, logical volumes and file systems. See the *AIX System Management Guide* for a detailed explanation.

Find out the names of the installed adapters with the command:

```
lsdev -Cc adapter
```

In a loop, the ID of each device must be unique. For disk drives, the ID is typically set by switches on the drive enclosure. The adapter ID is soft assigned and may be examined after it is participating with the *mbtest* command. If the adapter name found by the *lsdev* command is *scsi1*, the command would be:

```
/usr/lpp/cbxfc/mbtest scsi1 id
```

The requested ID may be changed in the database to any non-conflicting value in the range 0 to 126 with the command:

```
chdev -l scsi1 -a id=6 -P
```

## Persistent Bindings

Persistent Bindings is the term used to indicate the mapping of SCSI ID to FC Worldwide Name (WWN). By keeping a persistent binding, the loop ID or port ID of a device may change and the device will still be properly addressed.

In the Cambex AIX driver, persistent binding is automatic. At configuration time, all devices that are found are automatically assigned to a SCSI ID and a persistent binding is created. Persistent bindings are by port name and are kept in the ODM database. They are preserved and restored at reboot for all FC devices.

To display the SCSI ID to WWN mapping for all adapters and devices, issue the command:

```
/usr/lpp/cbxfc/fctest
```

## SMIT commands

The commands available in SMIT are in the *devices* menu under *Cambex Fibre Channel Adapter*:

### List all Cambex FC adapters
This provides the name and location of each adapter.

### Change / Show Characteristics of an Adapter
Allows the user to display and modify attributes. Changeable attributes (with default values in parentheses) are described below. The defaults are chosen to give best performance in most applications..

Attributes used only in loop mode
Adapter fibre channel loop ID (0)

       Login after LIP (yes)

       Full duplex in loop mode (no)

Attributes used to limit data rate or resources used

       Execution throttle (256 simultaneous I/O)

       IOCB allocation (256)

       DMA window size (PCI only, 64MB)

       Max frame size (1024) or 512, 2048.

       Fibre channel rate in GHz for PC2000 (auto)

       SCSI device types to exclude (none)

       Topology list (P2P_LOOP)

Error recovery

       Delay after bus reset or other error (10 seconds)

       Maximum command timeout (300) in seconds

       Disconnect time before logging an error (60 sec)

### Generate Error Report

Accesses the AIX error logging facility.

### Trace Cambex FC Adapters

Runs the AIX trace facility, looking only for the entries specific to the adapter driver. The trace facility must be installed from fileset `bos.sysmgt.trace`

### Change / Show Device Status

Shows status of alternate paths to the device and allows manual unfail of paths.  (Available with Dynamic Path Failover driver only).

### Configure Path / Show Path Status

Shows path status and allows unconfigured paths to be added. (Available with Dynamic Path Failover driver only).

## AIX Troubleshooting

Use the *errpt* command to identify the cause of failure.  The *lsdev* command will provide the location of the component.  For

example, if *errpt* identifies a loose cable on device cda1, *lsdev* will give an address similar to:

```
cda1   Available 00-02-01-3,0   Cambex SCSI...
```

Which indicates that the adapter is in location 00-02, and the drive is at SCSI ID 3, LUN 0.

## Checklist for driver and HBA installation

The following commands may be used to isolate problems during installation of the fibre channel driver and card.  Type the command shown in **bold** and verify the output.

**whoami**         must be root

**uname -a**         must give 5 fields:
  'AIX'
  hostname where card is installed
  1 or higher as minor rev of AIX
  4 as version of AIX
  serial number of host

**lslpp -l PC1000.driver.obj**     must give:
  Fileset       Path: /usr/lib/objrepos   PC1000.driver.obj
  Level         01.05.00.00 (or greater)
  State         Committed
  Description   Cambex Fibre Channel Adapter Driver

**lsdev -Cc adapter** should print a line for each card:
  scsi<x>      <x> is a unique number for each SCSI card
  Available <SS-SS> <S> is the location in the machine where
            the card is installed
Check that the number of SCSI cards and their slots are correct
If 'Available' then card and driver are installed.
If 'Defined' or not listed then card was not found.

**`lscfg -vl scsi4`**   should print more information for a card:

```
 DEVICE              LOCATION            DESCRIPTION
 scsi4               20-58               Cambex ...

      Manufacturer................CAMBEX
      Machine Type and Model......PC1000F
      ROS Level and ID............V2.01.19
      Serial Number...............     579
      Displayable Message.........Cambex ...
      Network Address.............500502E010000243
      Device Specific.(Z0)........Build:TMFtL
      Device Specific.(Z1)........1.5.13.0
      Device Specific.(YL)........P1-I1/Z1
```

**`lsattr -El scsi4`**   should print the attributes for a card. These are also displayed by SMIT in *Change / Show Characteristics of an Adapter.*

```
bus_io_addr     Bus address of board I/O registers
bus_intr_lvl    Bus interrupt level
intr_priority   Interrupt priority
id              Adapter card loop ID
exec_throttle   Max commands per port
max_iocb        Max bufers per port
retry_delay     Delay amount after bus reset (sec)
login_on_lip    Login all devices after LIP
full_duplex     Use open full duplex (OPNyx)
topology_list   Prioritized topology list
frame_size      Max payload frame length
infinity        Command timeout infinity (sec)
dma_window      DMA window size for 64 bit PCI
GHz             Fibre channel rate in GHz
sw_fc_class     Class of service
devtype_exclude   SCSI device type exclude list
logout_delay    Delay amount after device logout
BDR_mask        Mask bus device resets
```

- ID may be used to set a hard card loop ID if required.
- Exec_throttle may be used to limit simultaneous I/Os to avoid "device busy" errors.
- Max_iocb is not used.

- Full_duplex enables higher performance in loop mode where all connected devices support it.  P2P is inherently full duplex.
- Fibre Channel topology is normally found automatically but may be forced to loop_only or P2P_only with this attribute.
- Frame_size defaults to 1K
- Infinity is the length of time that the driver will wait for a command before assuming that it has failed.
- DMA_window is used to map memory for DMA transfers on PCI bus, 64-bit systems.
- GHz is only 1GHz for PC1000 and MC1000 cards.  The PC2000 will normally auto-detect but may be forced to 1GHz operation with this attribute.
- Sw_fc_class is normally class 3 operation.  Contact customer support if class 2 operation is required.
- Devtype_exclude will prevent the driver from configuring specific SCSI device types (0 = disk, 1 = tape, etc.)  It is used when multiple adapters on the same fabric must not interfere.
- Logout_delay is used to specify an upper limit on port logged out responses before failing a command.
- BDR_mask is "all" or "none" to mask BDR ioctls. BDR should be masked to tape driver behind a router.


`cfgmgr -v >/tmp/cfg.log`
Should identify the card and configure it.
If  cfg.log contains the ID 77100021 and no driver is found, then the driver is not installed.

If an MCA card is present but not configured, then check for and remove the reset jumper on the card.

`/usr/lpp/cbxfc/mbtest scsi<x> id`
for each <x> adapter, should return a loop id or port name:

```
Topology: NL
AL_PA: 0xef
Adapter_ID: 0
```

or for fabric:
```
Topology: F
Port_name: 0x00011000
Adapter_ID: 255
```

Make sure that the id value doesn't conflict with any other host or device on the same fibre channel loop.  The other attributes will be different on each card.

During boot, the number displayed when configuring the adapter is hex 0x911 (FC adapter).

**/usr/lpp/cbxfc/mbtest scsi1**
This test code may be used to get fibre channel status from the adapter or from attached devices.

**/usr/lpp/cbxfc/sctest scsi1**
This test code may be used to get IOCINFO information from the adapter or to see the results of SCSI Inquiry or TestUnitReady commands to SCSI devices attached to the adapter.

**/usr/lpp/cbxfc/fctest**
This script will print a cross reference between AIX SCSI ID and LUN number and the Fibre Channel WWN and FC LUN as well as PORTID and an internal ID (l_id) used by the driver.

**/usr/lpp/cbxfc/runtrace**
This should be run to start a trace if Cambex support requests a trace of the card failure.  The AIX trace facility, **bos.sysmgt.trace,** must be installed.  To stop the trace and generate a trace report, type:
**trcstop; trcrpt > /tmp/trc.log**

## Appendix A

Map of SCSI ID to arbitrated loop physical address (ALPA).

| ID | ALPA | ID | ALPA | ID | ALPA | ID | ALPA |
|----|------|----|------|----|------|-----|------|
| 0 | EF | 32 | B2 | 64 | 72 | 96 | 3A |
| 1 | E8 | 33 | B1 | 65 | 71 | 97 | 39 |
| 2 | E4 | 34 | AE | 66 | 6E | 98 | 36 |
| 3 | E2 | 35 | AD | 67 | 6D | 99 | 35 |
| 4 | E1 | 36 | AC | 68 | 6C | 100 | 34 |
| 5 | E0 | 37 | AB | 69 | 6B | 101 | 33 |
| 6 | DC | 38 | AA | 70 | 6A | 102 | 32 |
| 7 | DA | 39 | A9 | 71 | 69 | 103 | 31 |
| 8 | D9 | 40 | A7 | 72 | 67 | 104 | 2E |
| 9 | D6 | 41 | A6 | 73 | 66 | 105 | 2D |
| 10 | D5 | 42 | A5 | 74 | 65 | 106 | 2C |
| 11 | D4 | 43 | A3 | 75 | 63 | 107 | 2B |
| 12 | D3 | 44 | 9F | 76 | 5C | 108 | 2A |
| 13 | D2 | 45 | 9E | 77 | 5A | 109 | 29 |
| 14 | D1 | 46 | 9D | 78 | 59 | 110 | 27 |
| 15 | CE | 47 | 9B | 79 | 56 | 111 | 26 |
| 16 | CD | 48 | 98 | 80 | 55 | 112 | 25 |
| 17 | CC | 49 | 97 | 81 | 54 | 113 | 23 |
| 18 | CB | 50 | 90 | 82 | 53 | 114 | 1F |
| 19 | CA | 51 | 8F | 83 | 52 | 115 | 1E |
| 20 | C9 | 52 | 88 | 84 | 51 | 116 | 1D |
| 21 | C7 | 53 | 84 | 85 | 4E | 117 | 1B |
| 22 | C6 | 54 | 82 | 86 | 4D | 118 | 18 |
| 23 | C5 | 55 | 81 | 87 | 4C | 119 | 17 |
| 24 | C3 | 56 | 80 | 88 | 4B | 120 | 10 |
| 25 | BC | 57 | 7C | 89 | 4A | 121 | 0F |
| 26 | BA | 58 | 7A | 90 | 49 | 122 | 08 |
| 27 | B9 | 59 | 79 | 91 | 47 | 123 | 04 |
| 28 | B6 | 60 | 76 | 92 | 46 | 124 | 02 |
| 29 | B5 | 61 | 75 | 93 | 45 | 125 | 01 |
| 30 | B4 | 62 | 74 | 94 | 43 | 126 | 00 |
| 31 | B3 | 63 | 73 | 95 | 3C | | |

## PC2000 LED Meanings

Top LED – Transceiver hardware is detecting a signal.
Middle LED – Firmware is being synchronized.
Bottom LED – Flashing amber when not synchronized.
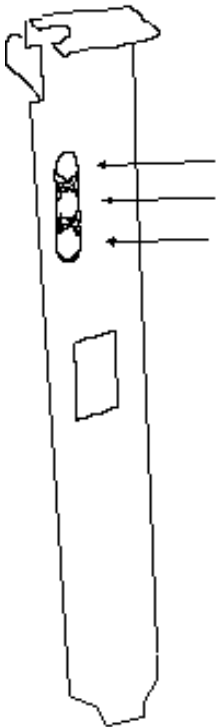
| LED | NORM | BAD CABLE | NO CONN |
|---|---|---|---|
| TOP | GREEN | GREEN | OFF |
| MIDDLE | GREEN | OFF | OFF |
| BOTTOM | OFF | FLASHING | FLASHING |

# Declaration of conformity

We Cambex Corporation of Waltham, Massachusetts, USA, declare under our sole responsibility, that the products PC-1000, PC-1000F, MC-1000 and MC-1000F are in conformity with the following standards:

EN 55022:1994/A1:1995/A2:1997 Class A ITE emissions requirements
EN 50082-1:1992 EMC residential, commercial and light industrial generic immunity standard

## Warning

This is a Class A product.  In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

## FCC Warning

This equipment has been tested and found to comply with the limits for a class A computing device pursuant to Part 15 of FCC rules which are designed to provide reasonable protection against interference when operating in a commercial environment.  This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual may cause interference to radio communications.  Operation of this equipment in a residential area is likely to cause interference in which case the users will be required to take whatever measures may be required to correct the interference at their own expense.  Changes or modifications of this device could affect the user's authority to operate this equipment.

## Trademarks
FibreQuik is a trademark of Cambex Corporation.

# Safety Notices

## Safety Notice

**Class 1 Laser Product**

Versions of  this product supplied with an optical transceiver meet the safety requirements of a class 1 laser as specified by the US Food and Drug Administration Center of Drug and Radiological Health (CDRH) 21 CFR 1040.10 & 1040.11 and by IEC 825-1.  The U.S. Department of Health and Human Services (DHHS) does not consider Class 1 lasers to be hazardous.  Customer supplied laser GBICs must meet the same requirements.  If in doubt, contact Cambex customer support before operating the product.

The International Electrotechnical Commission (IEC) 825 Laser Safety Standard requires labeling in English, German, Finnish, and French stating that the product uses Class 1 lasers.  Because it is impractical to label the transceiver, the following label is provided in this manual.

```
CLASS 1 LASER PRODUCT
LASER KLASSE 1
LUOKAN 1 LASERLAITE
APPAREIL A LASER DE CLASSE 1

TO IEC 825 (1984) + CENELEC HD 482 S1
```