CONVEX Elite 3 Disc Drive Service Guide

First Edition

CONVEX COMPUTER CORPORATION

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CONVEX
Elite 3 Disc Drive
Service Guide

Order No. DHW-261

First Edition
April 1993

CONVEX Press
Richardson, Texas
United States of America

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Printed in the United States of America

Revision information for

CONVEX
Elite 3 Disc Drive
Service Guide

Edition	Document No.	Description
First	081-010230-000	Released April 1993.

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Preface

Purpose and audience

The *CONVEX Elite 3 Disc Drive Service Guide* provides a general overview of the Seagate Elite 3 disc drive and related equipment. This guide describes how to:

- Install the Elite 3 disc drive and related equipment
- Integrate the Elite 3 disc drive into the CONVEX operating system (ConvexOS)

This document is intended for:

- CONVEX customer support engineers and CONVEX manufacturing personnel
- CONVEX customers who install and maintain their own Elite 3 disc drives and related equipment

Notational conventions

This section discusses notational conventions used in this book.

`Bold monospace` In command examples, text shown in **`bold monospace`** identifies user input that must be typed exactly as shown.

`Monospace` In paragraph text, `monospace` identifies:

- Command names
- System calls
- Data structures and types

In command examples, `monospace` identifies command output, including error messages.

In command syntax diagrams, text shown in `monospace` must be typed exactly as shown.

Italic In paragraph text, *italic* identifies:

- New and important terms
- Titles of documents

In command syntax diagrams, *italic* identifies variables that must be supplied by the user.

Notes and cautions

This document presents notes and cautions in the following formats:

Note

A Note highlights supplemental information.

Caution

A Caution highlights information necessary to avoid damage to the system.

Associated documents

For more information on the ConvexOS operating system, you can order the following books from CONVEX Computer Corporation:

- *ConvexOS Primer* (DSW-133). This book introduces new users to the ConvexOS operating system.
- *ConvexOS Programmer's Reference* (DSW-332). This book is the standard reference for the ConvexOS operating system.
- *Managing ConvexOS Operations Guide* (DSW-031). This book is the standard reference for system operation.
- *Managing ConvexOS Configuration Guide* (DSW-030). This book describes the management of system resources.

Ordering documents

To order the current edition of this or any other CONVEX document, send requests to:

CONVEX Computer Corporation
Customer Service
P.O. Box 833851
Richardson TX 75083-3851 USA

Please include the order number (DSW or DHW number) or the exact title of the document.

Technical assistance

If you have questions that are not answered in this book, contact the CONVEX Technical Assistance Center (TAC) at the following locations:

- Within the continental U.S., call 1 (800) 952-0379.
- From Canada, call 1 (800) 345-2384.
- From all other locations, contact the local CONVEX office.

You may also use the `contact` utility to report any problems with ConvexOS or its associated documentation. For more information, refer to the contact(1) man page in *ConvexOS Man Pages for Users*, or the appendix "Reporting problems" in the *ConvexOS Primer* or *Managing ConvexOS: Operations Guide.*

FCC notice

This equipment generates, uses and can radiate radio frequency energy. If the equipment is not installed and used in strict accordance with the instruction manual, it may cause interference to radio communications.

This equipment has been tested and found to comply with limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when equipment is operated in a commercial environment.

When this equipment is operated in a residential area, it is likely to cause interference. In this case, the interference must be corrected at the operator's expense.

Do not connect external equipment to the utility outlets in CONVEX equipment cabinets. Unauthorized connection voids all agencies' emissions certification.

Electrostatic discharge protection

The Elite 3 and related assemblies are sensitive to static electricity. Although some devices such as metal-oxide semiconductors are extremely sensitive, all semiconductors, as well as some resistors and capacitors, may be damaged or degraded by exposure to static electricity.

Electrostatic damage to electronic devices may be caused by the direct discharge of a charged conductor or by exposure to the static fields surrounding charged objects.

Caution

To avoid electrostatic damage, service personnel must observe the following precautions when servicing equipment:

- Ground yourself to the peripheral cabinet or a grounded service area whenever working on the Elite 3 or related assemblies, or whenever electronics will be exposed. Connect yourself to ground with a wrist strap. Connection may be made to any grounded metal assembly in the peripheral cabinet. Remember that you and the electronic devices must both be grounded to avoid potentially damaging static discharges.
- Turn off power before removing or installing power cords.
- Shut down ConvexOS before cabling drives to the IDC bulkhead.
- Do not remove any circuit boards from the drive.
- Never use an ohmmeter on any Elite 3 circuit board.

Description and specifications

1

This chapter discusses the features, front panel functions, and electromechanical and physical specifications of the CONVEX Elite 3 disc drive (CONVEX model DKD-505). The Elite 3 disc drive and related hardware are designed to be used with the CONVEX Integrated Disc Channel (IDC).

Drive specifications

Table 1 contains the basic specifications for the Elite 3 disc drive.

Table 1 Drive specifications

Characteristics	Conditions	Specifications
Size	Width Height Length	146 mm (5.75 in.) 83 mm (3.25 in.) 218 mm (8.6 in.)
	Weight	4.1 kg (9.0 lb)
Interface		IPI—2E (intelligent peripheral interface)
Capacity (bytes)	Unformatted	3.1512019 Gbytes

Table 1 Drive specifications **(continued)**

Characteristics	Conditions	Specifications
Physical	Number of discs	11
	Number of data heads	20 (10 logical)
	Servo heads	1
	Cylinders per head/disc assembly (HDA)	2738 (0-2737 logical cylinder, 2737 reserved for defect map, cylinder 0 reserved for topology, and cylinders 2735 and 2736 reserved for diagnostics)
	Disc diameter	5-1/4 in.
Transfer rate	Disc speed at 5400 RPM	70—104 MHz (1.5—24.0 Mbytes/s)
Seek time (time required to move heads to a different track address)	Average	11.5 ms
	Full seek	23.5 ms
	One track	1.7 ms
Latency (time required to reach a particular track address after head positioning is complete)	Average	5.55 ms
	Maximum	11.17 ms (disc rotation at 5373 RPM)
Start time (following power sequence delay, dc is applied and start conditions are present)	Maximum	30 s
Stop time	Maximum	30 s
Environmental requirements	Operating temperature	10° C to 45° C (50° F to 113° F) with a maximum change of 20° C (36° F) per hour
	Operating humidity	5% to 95% relative Maximum wet bulb of 26° C (79° F)

dc power requirements

The Elite 3 disc drive uses +5 Vdc and +12 Vdc. Table 2 contains the dc power specifications for the Elite 3 disc drive.

Table 2 Elite 3 disc drive dc power requirements

Power requirements	Supply voltage	
Current	+5 V	+12 V
Maximum operating current	5.1 A	3.3 A
Average idle current	3.9 A	1.76 A
Maximum starting current	5.1 A	6.3 A
Maximum seek current	5.1 A	3.3 A
Voltage		
Regulation	± 5%	± 5%
Absolute maximum applied voltage	6.5 V	14.0 V

The Elite 3 disc drive, power supply, operator panel, and mechanical assemblies must be properly grounded to the peripheral cabinet to ensure error-free operation and conformance with regulatory agency requirements.

Front panel indicators and switches

The front panel contains four indicator LEDs, a write protect switch and indicator, and an address selection switch. Figure 1 shows the front panel components.

Figure 1 Front panel

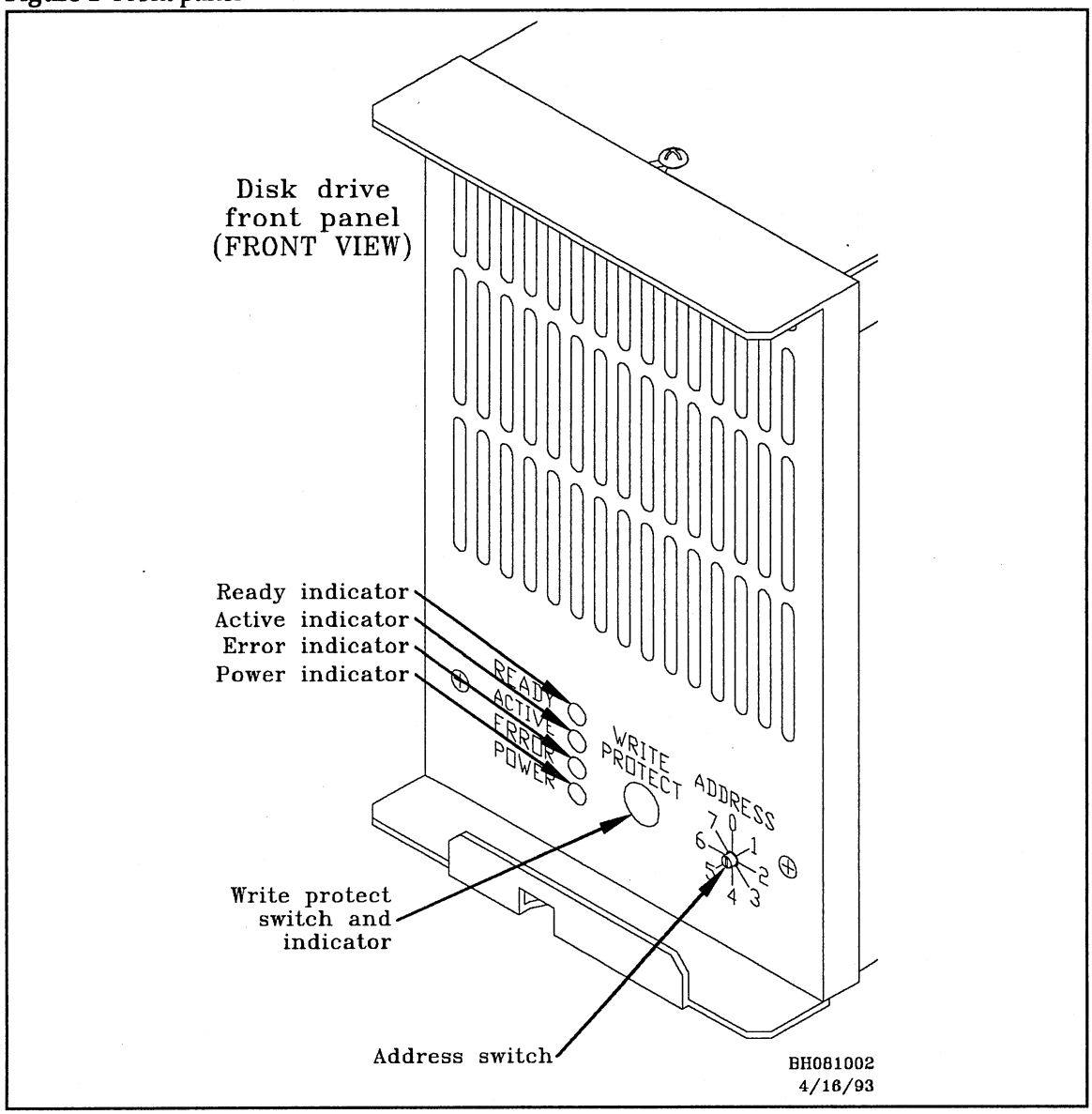


Table 3 contains descriptions of the front panel components.

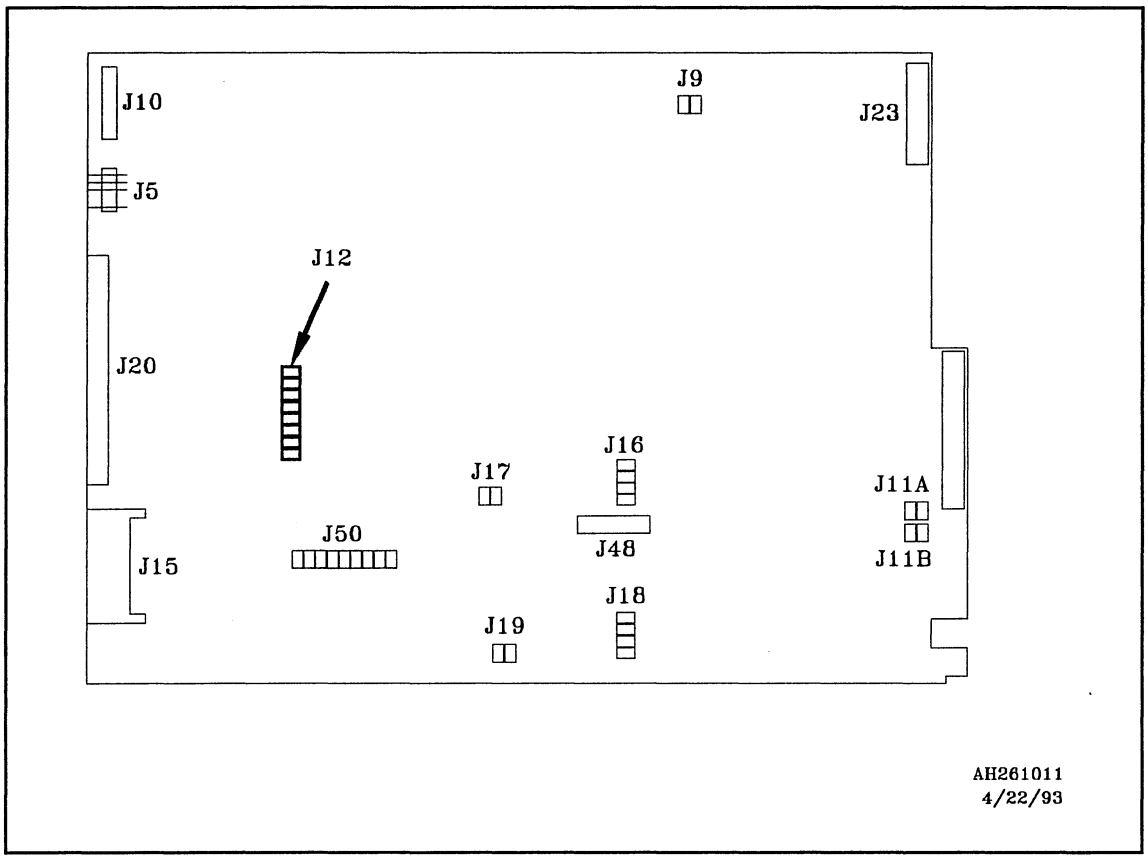
Table 3 Elite 3 front panel indicators and switches

Item	Description
Ready LED	Drive is ready when the LED is on. This indicates the drive is in the spin up state and is able to accept read/write data and head position commands.
Active LED	LED is on when the drive is selected on the IPI interface.
Error LED	A fault condition exists. Two digit error codes are displayed. Refer to Table 12 for a description of error codes and an explanation of how to read them. This light is on when power is applied to the drive until the drive becomes ready.
Power LED	LED is on when power is applied to the Elite 3 chassis.
Write protect switch/indicator	Used to enable and indicate write protect.
Address selection switch.	Used to select the binary logical IPI address (0-7).

Control board jumpers

The disc control board is located on the top of the disc enclosure. Jumpers J9, J11, J16-J19, and J50 are reserved for manufacturing use only. J12 controls drive configuration. Figure 2 shows the location of the control board jumpers.

Figure 2 Control board jumper location



Jumper block J12 is a vertical header located on the control board. Drive configuration is controlled by installing configuration jumpers between adjacent pins.

Table 4 describes the jumper block jumpers.

Table 4 Control board jumper block J12 pin assignments

Jumper	Pins	Description	Default[1] configuration
J12-1	1 & 2	Master Spindle Sync enable. When a jumper is installed, the drive will unconditionally remain in Master Spindle Sync Mode.	Not installed
J12-3	3 & 4	Local Spin Up Enable. When a jumper is installed, spindle rotation begins after dc power is applied and the sequencing delay is satisfied. When no jumper is installed rotation begins after the unit receives a spin-up command. (normally not installed)	Installed
J12-5	5 & 6	Sweep Enable (Normally not installed).	Not installed
J12-7	7 & 8	Manufacturing Test Mode Enable (jumper must be off).	Not installed
J12-9	9 & 10	Reserved (jumper must be off).	Not installed
J12-11	11 & 12	Manufacturing Test Mode Disable (jumper must be off).	Not installed
J12-13	13 & 14	Spare	Not installed
J12-15	15 & 16	Spare	Not installed

[1] Default configuration is subject to change. See Convex Elite 3 Configurator part number 204-000026-600.

I/O board jumpers

The I/O board has 4 jumper blocks (W1,W2,W3 and W4) for configuring the drive.

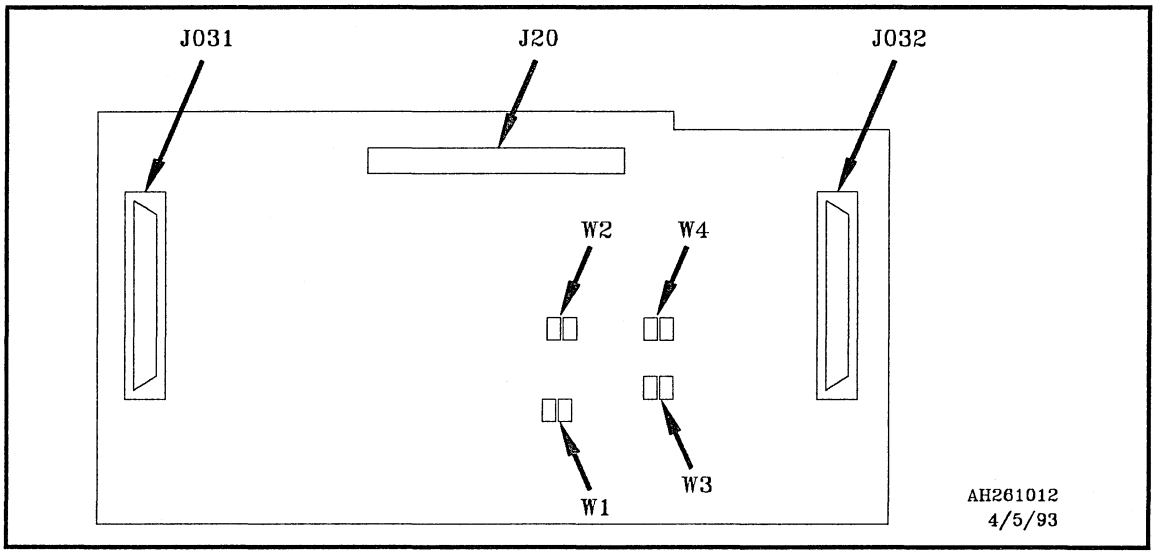
Table 5 I/O board jumper block pin assignments

Block	Jumper	Pins	Description	Default[1] configuration
W1	W1-1	1 & 3	Enable position calibrate on seek	Not installed
W1	W1-2	2 & 4	Enable short RPS	Not installed
W2	W2-1	1 & 3	Disable read/write diagnostics	Installed
W2	W2-2	2 & 4	Reserved	Not installed
W3	W3-1	1 & 3	Microcode configuration bit 2	Not installed
W3	W3-2	2 & 4	Microcode configuration bit 3	Installed
W4	W4-1	1 & 3	Microcode configuration bit 0	Not installed
W4	W4-2	2 & 4	Microcode configuration bit 1	Not installed

[1] Default configuration is subject to change. See Convex Elite 3 Configurator part number 204-000026-600.

Figure 3 shows the relative location of the I/O board jumpers.

Figure 3 I/O board jumper locations



Power supply specifications

Computer Products Power Conversion America manufactures the NFS110-7602P power supply used with the Elite 3 disc drive. Universal input voltage allows the supply to be powered in any country without changing jumpers or switch settings.

Table 6 contains the power supply characteristics and Table 7 contains the power supply voltage specifications.

Table 6 Power supply characteristics

Parameter	Condition	Limits
Input voltage		85 Vac to 264 Vac
Input frequency range		47 Hz to 440 Hz
Input surge current	Cold start 110 Vac Cold start 220 Vac	17 A maximum 34 A maximum
Output voltage adjustability	+5.1 V	± 3%
Over voltage protection threshold	+5.1 V output	6.25 V ± 0.75 V
Total output power @ 50° C ambient temperature	Convection cooled Peak (60 s)	0 W to 80 W 110 W
Operational environment	Operational altitude Nonoperational altitude	10,000 feet 40,000 feet
	Operational temperature Nonoperational temperature	0° C to +50° C -40° C to +85° C
	Relative humidity	5% to 95%
Weight		1.55 lb (0.70 kg)

Table 7 Power supply voltage specifications

Output voltage	+5.1 V	+24 V	+12 V	-12 V
Minimum current	0 A	0 A	0 A	0 A
Maximum current @ 80 W	8 A	3.5 A	4.5 A	0.5 A
Peak current	20 A	4.5 A	9 A	1.5 A
Ripple p-p @ 50 MHz	50 mV	240 mV	120 mV	120 mV
Total regulation	± 2%	+10/-5%	± 3%	± 3%

Figure 4 shows the component locations for the power supply.

Figure 4 Power supply component location

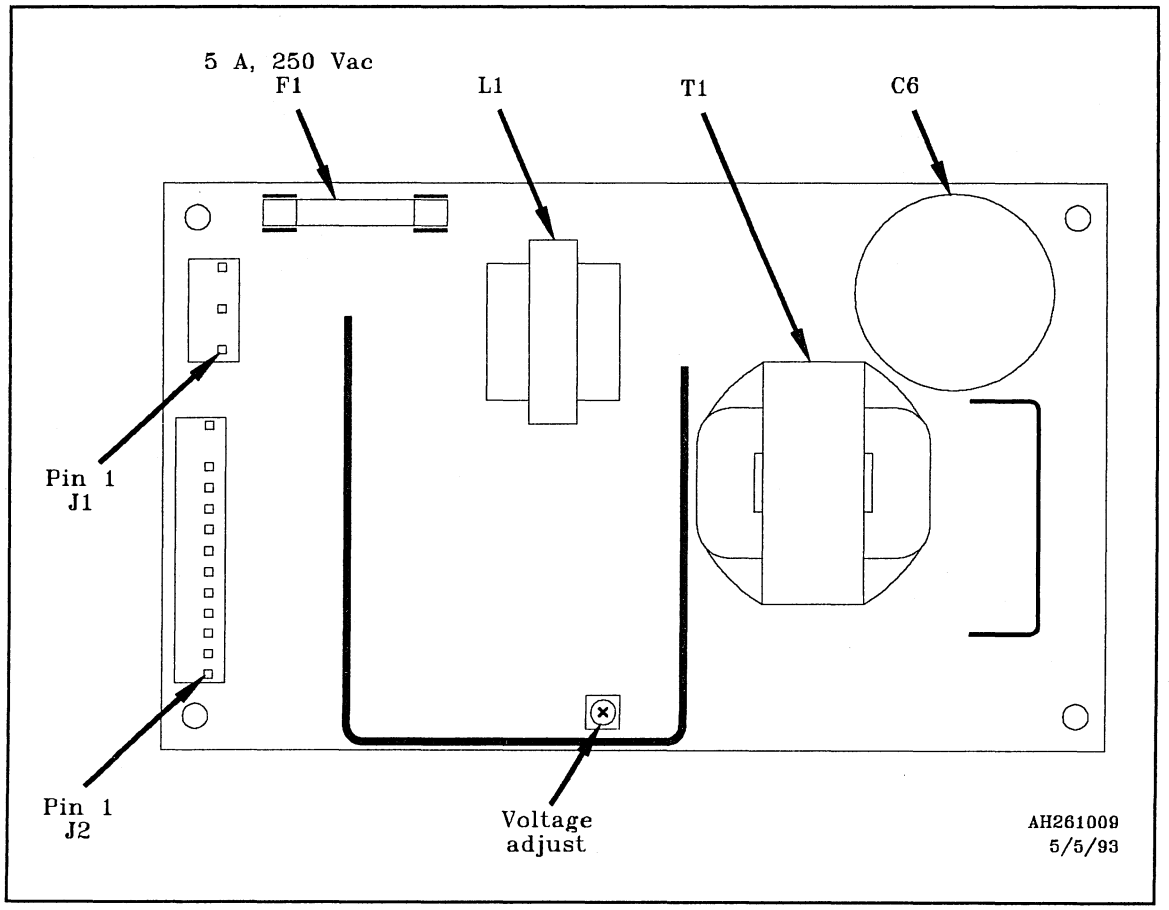


Table 8 contains the power supply connector pinout.

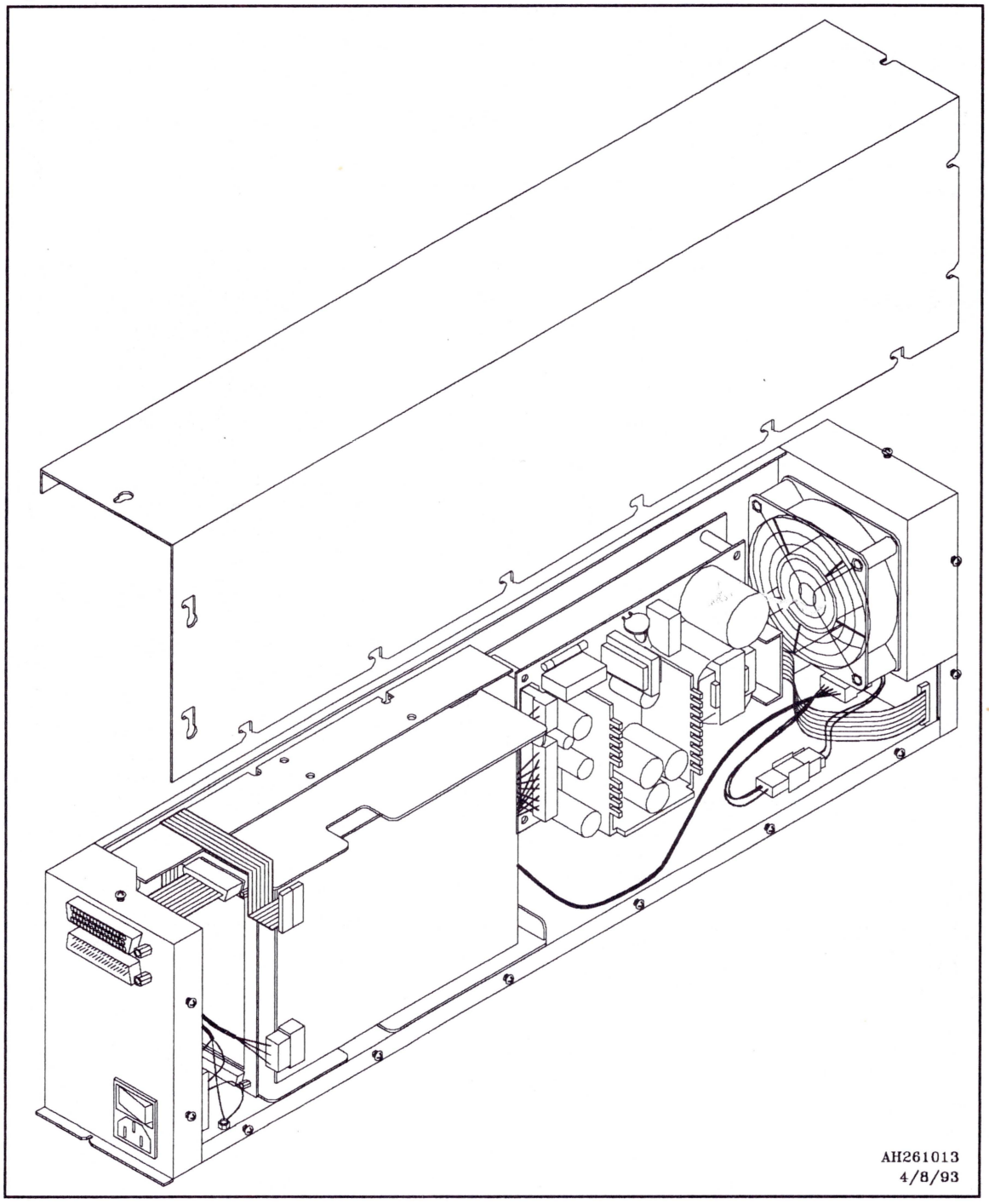
Table 8 Power supply pin chart

Connector	Location	Pin number	Signal
Molex 099-50-3051 with second and fourth pins removed	J1	Pin 1	ac ground
	J1	Pin 2	ac neutral
	J1	Pin 3	ac hot
Molex 09-50-3131	J2	Pin 1	+5.1 V
	J2	Pin 2	+5.1 V
	J2	Pin 3	+5.1 V
	J2	Pin 4	Return
	J2	Pin 5	Return
	J2	Pin 6	Return
	J2	Pin 7	Return
	J2	Pin 8	+12 V
	J2	Pin 9	+12 V
	J2	Pin 10	PFD
	J2	Pin 11	-12 V
	J2	Pin 12	Removed for key
	J2	Pin 13	-24 V

Elite 3 chassis

The Elite 3 chassis, shown in Figure 5, contains the Elite 3 disc drive, power supply, fan assembly, operator panel, air filter, interface cables, and power plug.

Figure 5 Elite 3 chassis



Unpacking and installation 2

This chapter describes unpacking and inspection, identifies major components of the Elite 3 disc drive and mechanical package, and provides installation procedures.

Unpacking and inspection

This section gives general guidelines for unpacking and inspecting the Elite 3 disc drive and related assemblies.

Inspection

All shipping containers are designed to protect their components under normal shipping conditions. Carefully inspect each carton for signs of shipping damage as it is unpacked. If damage is found after visual inspection, document the damage with photographs and contact the transport carrier immediately.

Unpacking

The customer's bill of materials lists all equipment shipped from CONVEX. It should be used as a checklist to ensure that all equipment has arrived. Use the following procedure to unpack the shipping container:

Step 1 Remove each item from its shipping container.

Step 2 Inspect each item for any signs of shipping damage as it is unpacked.

Step 3 If equipment damage is found, document the damage, and proceed to the next section.

Save all packing material until after operational checkout of the equipment. This enables equipment to be returned safely to CONVEX if required.

Damage claims

If the equipment is damaged, a damage claim form must be completed. Damage claims should be completed by the customer and given to the shipping representative. Claim forms are normally obtained from the shipping representative.This section describes the installation of the Elite 3 disc drive in a high performance peripheral cabinet (HPPC).

Installation

This section discusses the preparations for and installation of the Elite 3 disc drive.

Preparations

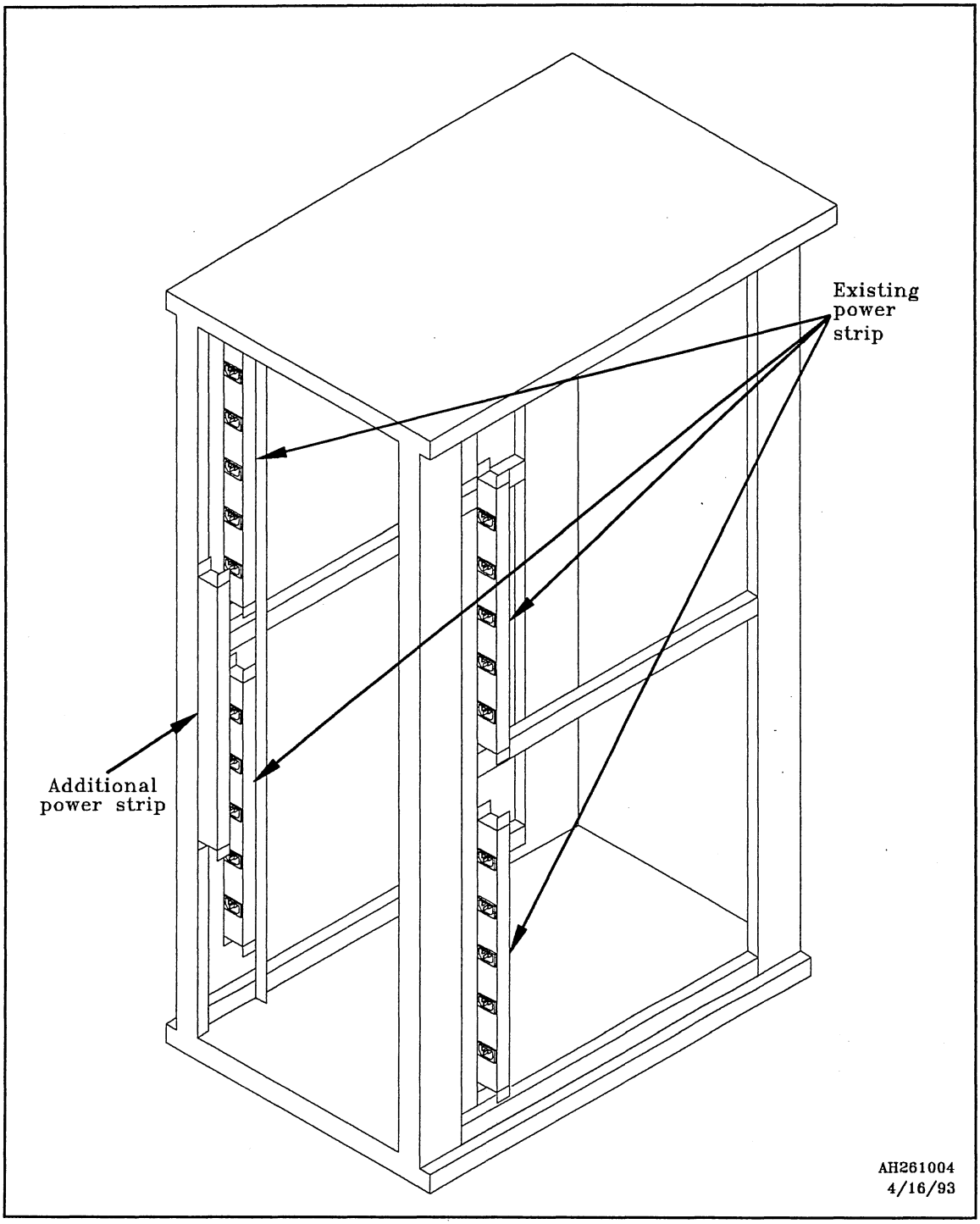
Observe the electrostatic discharge procedures described in the "Electrostatic discharge protection" section on page xiii, to prevent damage to the drive during installation.

Installing power strip and disc tray

An additional power strip must be added to the EXP-105 cabinet to support the maximum number of Elite 3 disc drives. A maximum of 24 drives may be installed.

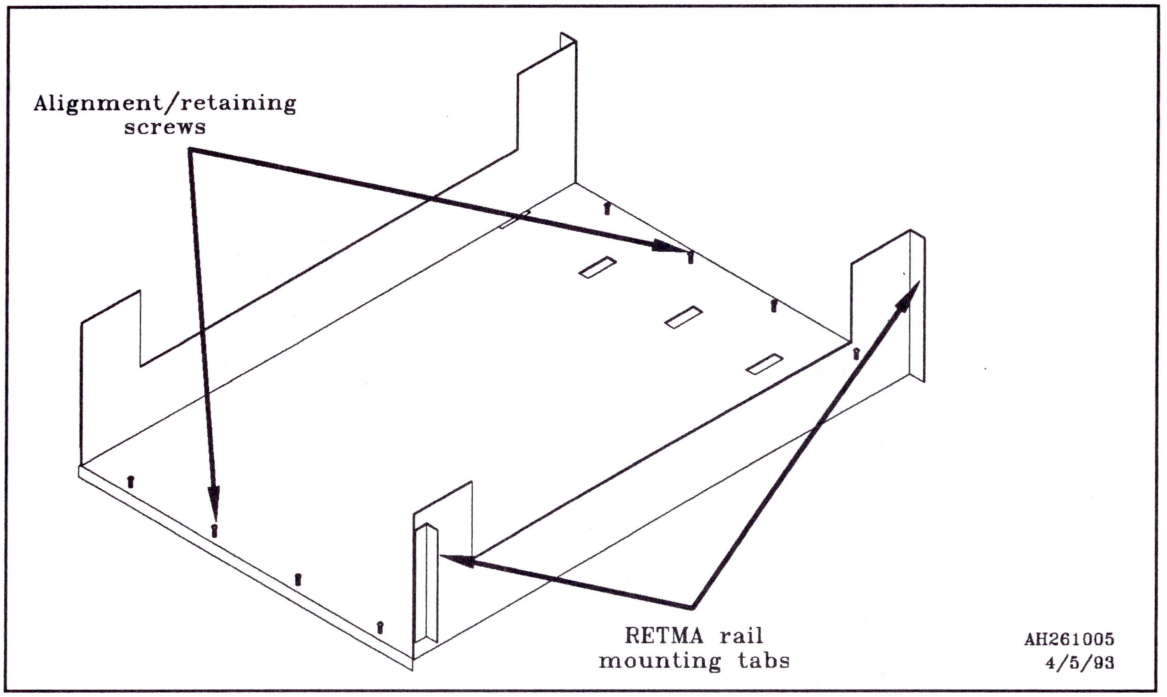
The additional power strip is attached to the rear RETMA rail centered between the existing power strips. Figure 6 shows the location of the additional power strip.

Figure 6 Additional power strip location



Six disc trays may be installed in an EXP-105 peripheral expansion cabinet. Each tray, shown in Figure 7, has four alignment/retaining screws in the front and rear of the tray for the installation of up to four Elite 3 disc drives.

Figure 7 Elite 3 disc tray



Installing the Elite 3 chassis

The Elite 3 chassis has an alignment slot located to the rear , and a mounting tab in front of the chassis. To install the chassis in a disc tray:

Step 1 Remove the front alignment/retaining screw from the disc tray and loosen the rear alignment/retaining screw.

Step 2 Slide the Elite 3 chassis into the tray, aligning the rear screw with the slot in the chassis.

Step 3 Install the front alignment/retaining screw and tighten the front and rear screws.

Step 4 Select the appropriate drive address with the address selection switch on the chassis front panel.

Connecting a single drive

Each Elite 3 disc chassis has 3 connectors at the rear of the assembly; an ac connector, an IPI input connector, and an IPI output connector.

Caution

As root, use the `/etc/shutdown` command to halt ConvexOS before connecting a disc to the IDC. Failure to do so may cause a system crash and loss of data.

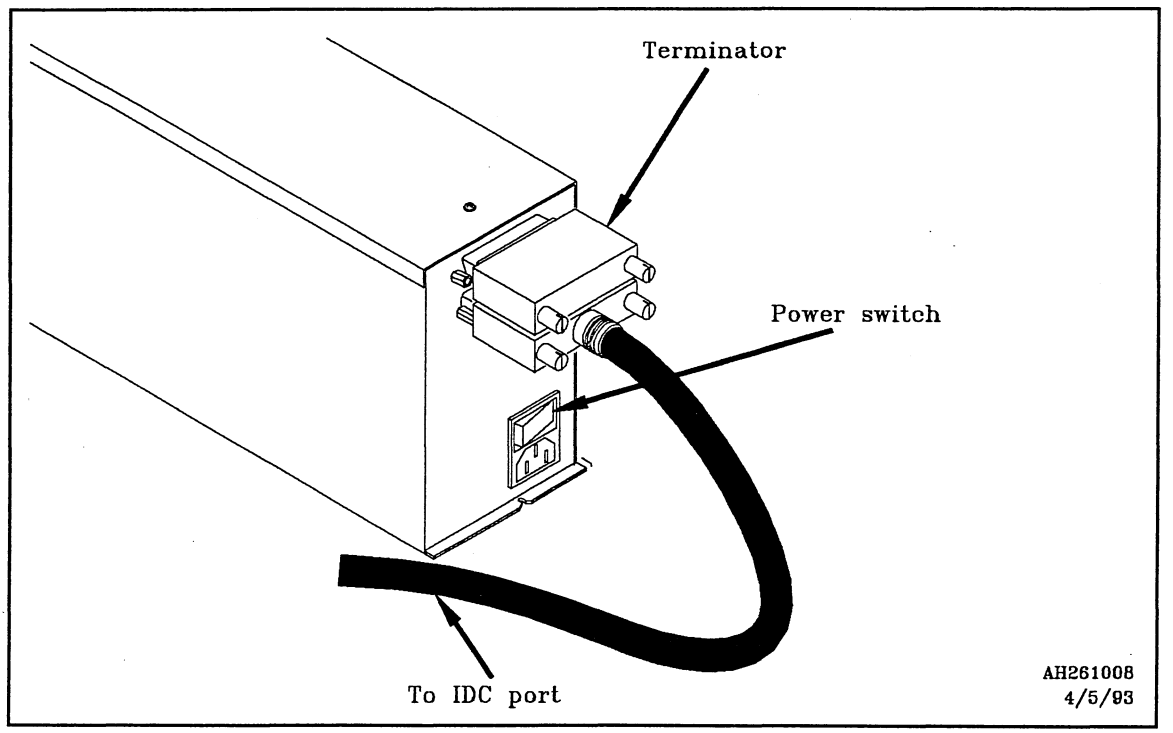
To connect a single drive to an IDC:

Step 1 Install the Elite 3 chassis in the peripheral cabinet.

Step 2 Ensure the ac power switch at the rear of the Elite 3 chassis is in the OFF position.

Step 3 Attach the IPI cable to the male connector on the rear of the Elite 3 chassis.

Figure 8 Connecting a single drive



Step 4 Attach the IPI cable to the appropriate IDC bulkhead connector. It is not necessary to remove power from the IDC when connecting disc drives to the IDC.

Step 5 Figure 9 shows the factory bulkhead port assignments for C3200/C3400. IDC ports are connected with port 3, located at the top of the bulkhead when assembled in the factory.

Figure 9 IDC bulkhead port assignments for C3200/C3400

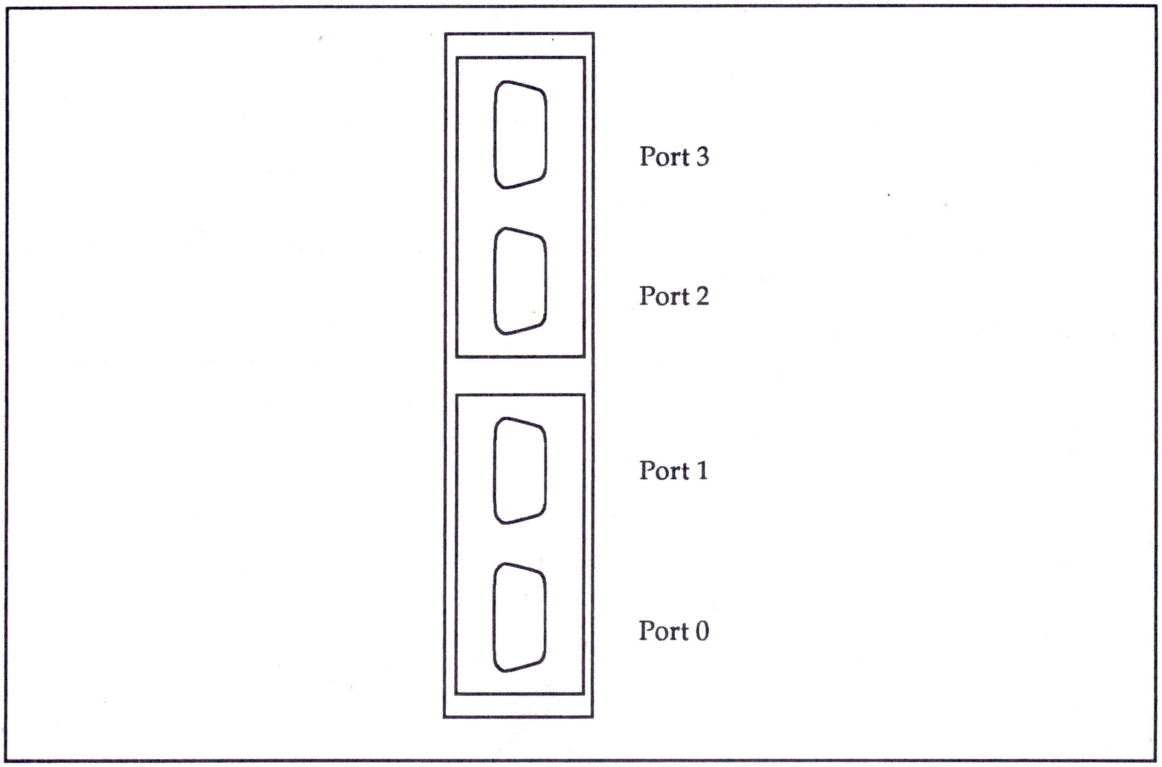
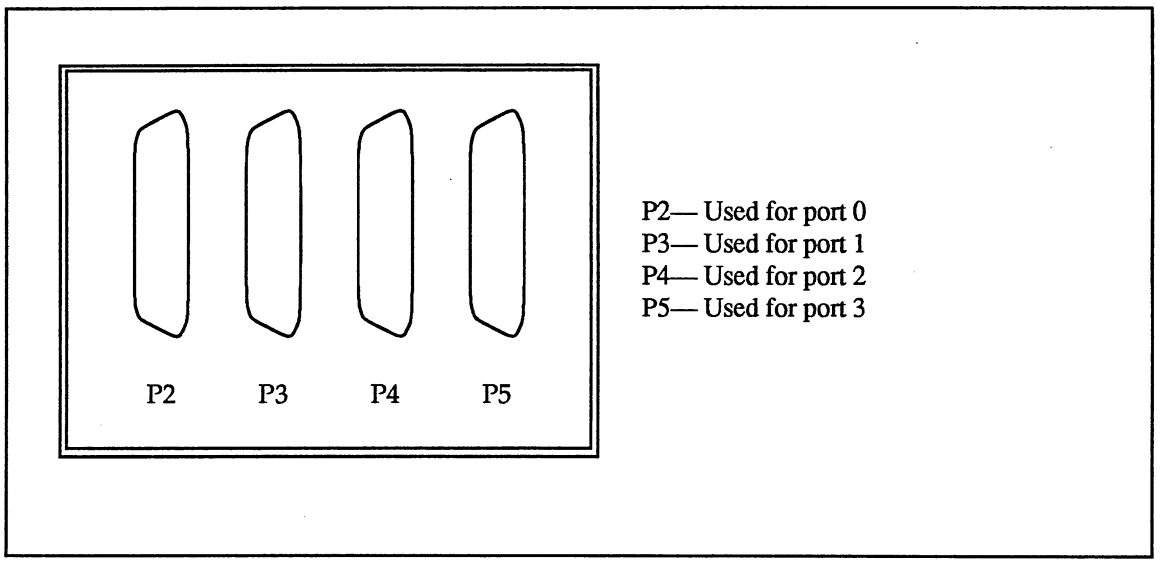


Figure 10 shows the relative port assignments for the IDC bulkhead in a C3800 system. IDC ports are connected with port 0, located to the left of the bulkhead when assembled in the factory.

Figure 10 IDC bulkhead port assignments for C3800



Step 6 Install the IPI terminator to the female connector at the rear of the chassis.

Step 7 Attach the ac power cord and plug into an available convenience outlet in the power strip. Careful planning will avoid relocating power cords when additional disc drives are added.

Step 8 Turn on the Elite 3 disc drive and integrate the drive into the system. Refer to Chapter 3, "Integration and testing," on page 27 for information about integration.

Connecting multiple disc drives

Each port on an IDC can support up to eight disc drives. These may be any combination of DKD-501, DKD-502, DKD-503, DKD-504, or DKD-505 disc drives.

Caution

As root, use the `/etc/shutdown` command to halt ConvexOS before connecting a disc to the IDC. Failure to do so may cause a system crash and loss of data.

To install multiple disc drives on an IDC:

Step 1 Install the Elite 3 chassis in the peripheral cabinet.

Step 2 Ensure the ac power switches at the rear of the chassis are in the off position.

Repeat Step 3 through Step 6 for each IDC port containing disc drives. Refer to Figure 11 on the following page.

Step 3 Attach the IPI cable to the IDC bulkhead port.

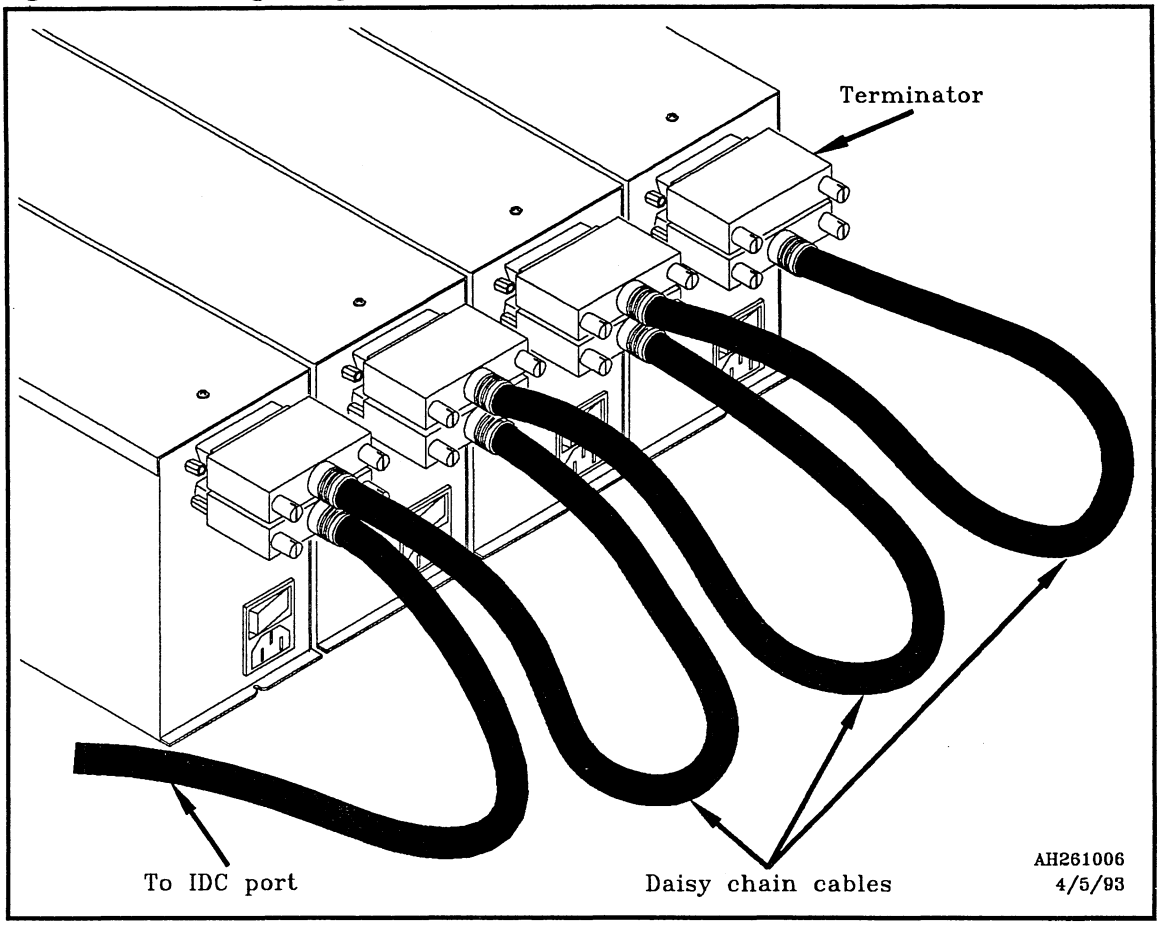
Step 4 Attach the IPI cable to the male connector at the rear of the first Elite 3 disc drive in the daisy chain.

Step 5 Install IPI daisy chain cables between additional drives in the daisy chain.

Step 6 Install the terminator plug on the last drive in the daisy chain.

Figure 11 shows the installation of multiple drives, daisy chain cables, and termination.

Figure 11 Connecting multiple drives



Step 7 Attach power cords and plug drives into available convenience outlets on the power strips.

Step 8 Turn on the drives and integrate the drives into the system. Refer to Chapter 3, "Integration and testing," on page 27 for more information about integration.

Physical configuration

A wide variety of configurations are possible when connecting DKD-501, DKD-502, DKD-503, DKD-504, or DKD-505 drives to an IDC. The Elite 3 drives may be added to systems that currently contain Sabre 7 or Sabre 5 disc drives.

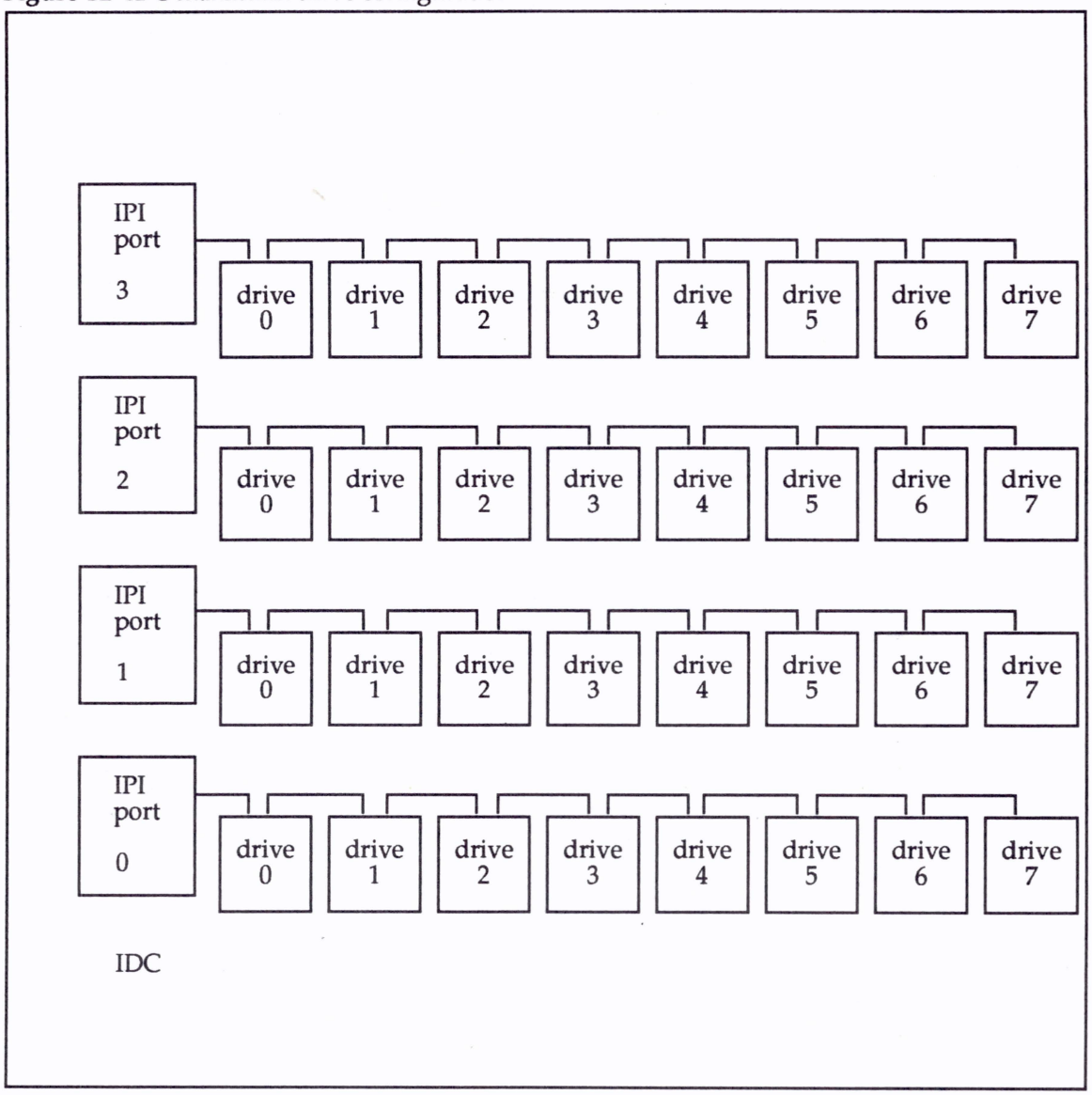
Each IDC can support up to 32 disc drives. The maximum cable length allowed between the IDC and the last disc drive is 100 ~~meters~~. feet! ≈ 25 metres.

When planning your installation, consider the following guidelines:

- Group disc drives attached to a single IDC port together.
- Address drives in a consistent manner, starting with unit 0 in the lower left-hand side of the cabinet, and incrementing unit addresses horizontally.
- Allow for service access when placing the peripheral cabinets.
- Generally, address switches determine drive numbers.

Figure 12 shows the connection of 32 disc drives to an IDC.

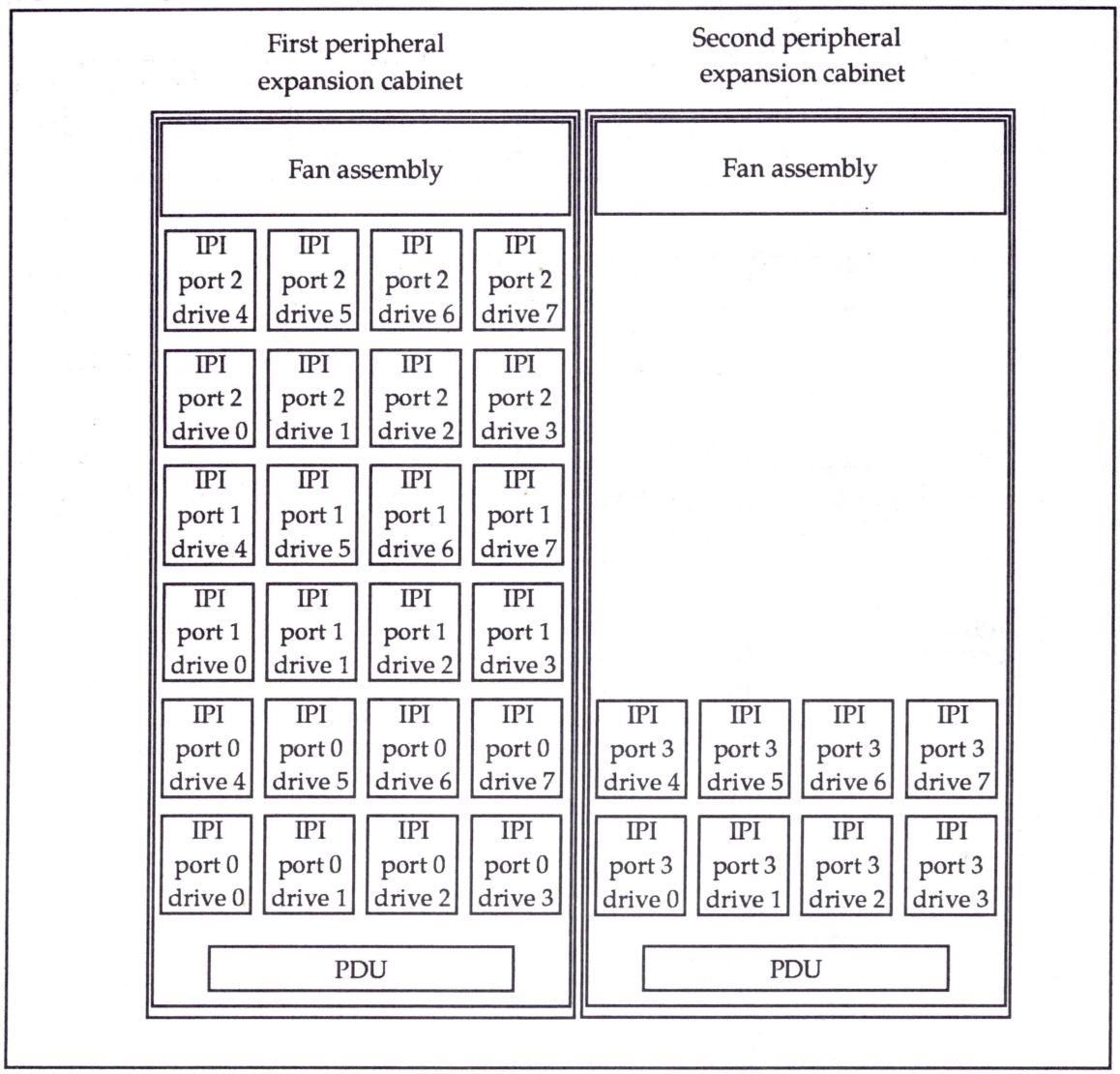
Figure 12 IDC maximum drive configuration



A single peripheral expansion cabinet can contain a maximum of 24 Elite 3 disc drives. When connecting disc drives to an IDC, disc drives attached to a single port should be grouped in horizontal rows to allow the use of the single hot spare cable.

Figure 13 shows the relative locations of 32 Elite 3 disc drives when installed in 2 peripheral expansion cabinets.

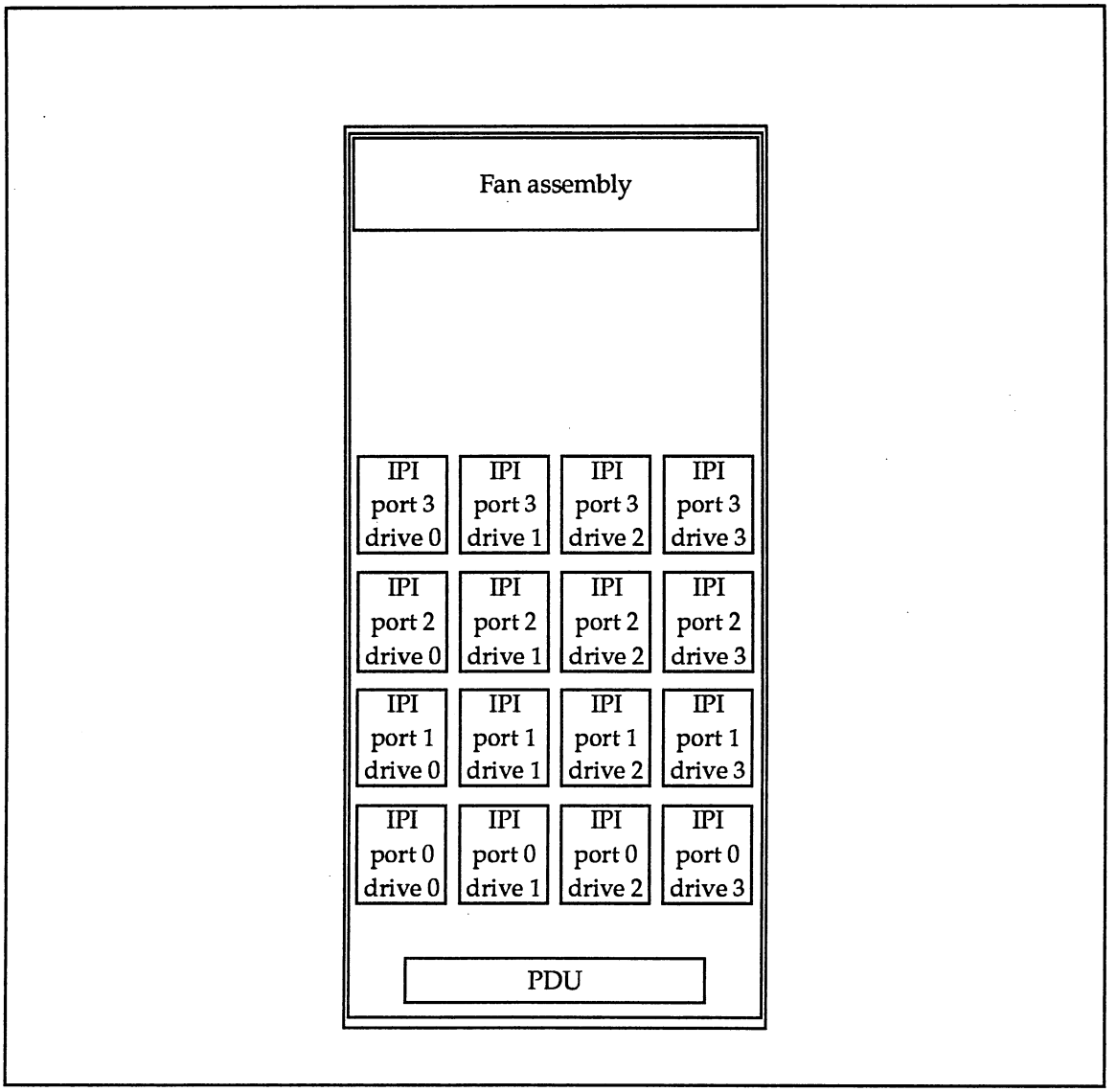
Figure 13 Expansion cabinet drive locations for 32 drives



Although it is possible for an IDC to support 32 Elite 3 disc drives, a typical configuration may attach 16 Elite 3 disc drives to an IDC.

Figure 14 shows the relative locations of 16 Elite 3 disc drives installed in a single peripheral expansion cabinet.

Figure 14 Expansion cabinet drive locations for 16 drives



Integration and testing 3

This chapter contains guidelines for integrating Elite 3 disc drives into ConvexOS and information about the CONVEX diagnostic tests.

Software integration

Managing ConvexOS Configuration Guide (DSW-030) describes device integration in detail. This section contains a summary of the procedures used to add an Elite 3 disc drive and descriptions of the system files that may require modification.

Note

The Elite 3 disc drive requires ConvexOS V10.1 or later. Until ConvexOS V11.0 is released, a sysgen will be required to support the Elite 3 disc drive.

General integration procedure

The following steps are used to add a disc drive to the system:

Step 1 Install the physical hardware.

Step 2 Edit the /ioconfig file.

Step 3 Use `idcfmt` to verify operation and format.

Step 4 Boot ConvexOS to single-user mode.

Step 5 Verify the entry in the /etc/disktab file.

Step 6 Create block and character special device files using `MAKEDEV`.

Step 7 Create mount points.

Step 8 Configure the partitions with `newfs` or `newst`.

Step 9 Edit /etc/fstab.

Step 10 Use `preen` to check disc integrity.

Step 11 Boot ConvexOS to multiuser mode.

/ioconfig file

ConvexOS uses a configuration file (/ioconfig) located on the service processor unit (SPU) disc to identify system level hardware. The /ioconfig file describes in hierarchical fashion the connections between the integrated disc channels (IDCs) and peripheral devices. ConvexOS uses this information to assign a logical number to a device of a given type.

Each type of device is identified to ConvexOS by mnemonic device code. The device and marketing code for the Elite 3 disc drive is:

DKD-505—Elite 3 disc drive

Elite 3 entries in the /ioconfig file on the SPU disc contain:

- IDC unit number—Determined by physical location of the IDC
- IPI port number—Determined by connecting to the IDC
- Driver number—Determined by device driver type
- Unit number—Determined by device address selection
- Type—Device code for the device
- Logical unit number—Used to create the desired file system structure (optional)

ConvexOS uses this information during `autoconf` to assign a logical device number of a given type. This determines which device files found in the /dev directory will be used for each disc drive identified in the /ioconfig file.

In the example /ioconfig file shown in Figure 15, four elite 3 disc drives are attached to an IDC located in CCU slot 0. Two of the Elite 3 disc drives are attached to IPI channel 0 and two Elite 3 disc drives are attached to IPI channel 1. In example 1, the logical assignments have been made sequentially.

Figure 15 /ioconfig example 1

```
idc 0
    ipi 0
        drvr DKC-IP2
            unit 0 type DKD-505 du0
            unit 1 type DKD-505 du1
    ipi 1
        drvr DKC-IP2
            unit 0 type DKD-505 du2
            unit 1 type DKD-505 du3
```

In the /ioconfig file shown in Figure 16, an additional drive is added to IPI 0, addressed as unit 2, and assigned a logical designation of du4. By adding an additional drive on IPI 0 and specifying the logical designation du4, the file system built on existing disc drives is not affected.

Figure 16 /ioconfig example 2

```
idc 0
    ipi 0
        drvr DKC-IP2
            unit 0 type DKD-505 du0
            unit 1 type DKD-505 du1
            unit 2 type DKD-505 du4
    ipi 1
        drvr DKC-IP2
            unit 0 type DKD-505 du2
            unit 1 type DKD-505 du3
```

/etc/disktab

The /etc/disktab file describes disc types, disc geometry, file system partition sizes, and default block and fragment sizes. Do not change /etc/disktab if an entry for the Elite 3 disc drive exists.

Figure 17 contains the /etc/disktab entry for an Elite 3 disc drive.

Figure 17 Example /etc/disktab

```
dkd-505|DKD-505|Elite3-2HP|Seagate ST43200K 3.05GB IPI-2 disk:\
        :ty=winchester:sp#15:se#2048:ns#53:nt#10:nc#2734:rm#5400\
        :pa#70180:ba#16384:fa#2048:\
        :pb#280555:bb#16384:fb#2048:\
        :pc#1402490:bc#65536:fc#8192:\
        :pd#70540:bd#32768:fd#4096:\
        :pe#420320:be#16384:fe#2048:\
        :pf#140285:bf#16384:ff#2048:\
        :pg#631145:bg#16384:fg#2048:\
        :ph#420610:bh#16384:fh#2048:
```

Table 9 shows /etc/disktab types and descriptions.

Table 9 /etc/disktab description

Name	Type/description
ty	Type of disc
se	Number of bytes per sector
sp	Number of spare sectors per cylinder
ns	Number of sectors per track
nt	Number of tracks per cylinder
nc	Number of cylinders per disc
rm	Disc speed (revolutions per minute)
p[a-h]	Partition sizes (sectors)
b[a-h]	Partition block sizes (bytes)
f[a-h]	Partition fragment sizes (bytes)

Testing the Elite 3 disc drive with `idcfmt`

The Elite 3 disc drives are tested by the `idcfmt` diagnostic program. There are two versions of `idcfmt`. The first version of `idcfmt` runs on the SPU when ConvexOS is not running. The second version of `idcfmt` is run under ConvexOS as root. Appendix A contains the `idcfmt` man page. The diagnostic program:

- Formats disc drives
- Verifies previously formatted disc drives
- Performs disc maintenance

Caution

Some subtests in `idcfmt` are data destructive. Refer to the idcfmt (1D) man page for a detailed description of `idcfmt`.

Verifying format

Elite 3 disc drives are formatted before shipping to the customer site. Use the `verify` option of `idcfmt` to ensure that the drive is correctly cabled to the system and has been formatted, and that each entry in the defect list points to a sector that has been slipped.

`idcfmt` is invoked by typing its name, a `-d`, followed by the CCU slot number, IPI port number, and drive unit of the drive to be used. A list of options may follow, then zero or more commands. If no commands are given on the command line, `idcfmt` displays a prompt and expects commands to be entered from standard input.

In the following example, `idcfmt` verifies the format of the drive attached to the IDC in slot 0, port 0, unit 2.

```
idcfmt -d 0 0 2 verify
```

No write operations occur when `idcfmt` is used with the `verify` option. To verify that the drive is formatted:

- Read one copy of all the data on the topology cylinder. Verify that the checksums and magic numbers are correct.
- Read the remaining copies of the topology data and verify that they match the data from the first step.
- Read all logical blocks on the disc and verify that there are no header CRC or data ECC errors. If any errors are found, they are listed.
- Read all the sector headers from the disc and verify that there is a one to one correspondence of entries in the defect list with sectors that are slipped.
- Verify that each entry in the defect list points to a slipped sector.

Formatting a drive

The `format` command option is used with `idcfmt` to format a drive that has never been formatted. If a partial format is found, the format resumes at the appropriate point, with the manufacturers and grown defect lists that were in effect when the format was interrupted. If the drive has no valid format on it, then the program reads the manufacturers defect data from the drive.

Under most circumstances a format is not required in the field.

Caution

Using the `format` option of the `idcfmt` command will destroy any existing files on the disc drive.

In the following example, `idcfmt` formats an Elite 3 disc drive attached to the IDC in slot 0, port 0 and addressed as unit 2:

```
idcfmt -d 0 0 2 format
```

Maintenance and IPB

4

This chapter contains maintenance precautions, removal and replacement procedures, and an illustrated parts breakdown (IPB).

Troubleshooting

This section contains information for interpreting the hardware errors originating from the disc drive and indicated through the error light message codes. Information about the fault symptom codes (FSC) associated with the disc subsystem is also provided.

Elite 3 disc drive error codes

The Elite 3 disc drive generates message codes for certain circumstances and presents these codes to the J10 connector. This connector is used to drive the error light on the front panel.

Message codes consist of two digits composed of the numbers 1-9. The message code starts with a long pause followed by short pulses for the first digit, a short pause, and then more short pulses for the second digit. The code can be determined by counting the short pulses that represent the two digits.

In addition to being presented to the error indicator on the front panel, FSCs associated with the drive messages are recorded in the /mnt/errlog file on the SPU disc.

Table 10 contains descriptions of the error codes generated by the Elite 3 disc drive.

Table 10 Elite 3 disc drive error codes

Error code	Description	Corrective action
11	Invalid micro code ID—Switch settings are incorrect	Check jumper installation on disc control board
21	Illegal condition—Master terminate indicated, but the hardware did not indicate the sending of 90 ending status	
22	External RAM failure	
23	Unexpected vectored interrupt/trap occurred	
24	CSAW failure detect in power up initialization	Cycle power; if failure continues, replace disc drive
25	Buffer memory failure detected in power up	
31	BIPIP IPC failure during power up	
32	BIPIP SFC failure during power up	
33	BIPIP BUF failure during power up	
34	BIPIP VIB failure during power up	
35	VIC failure during power up	
36	BIPIP ECC failure during power up	

Fault symptom code (FSC)

Fault symptom code (FSC) is a standardized method for reporting error conditions on the CONVEX IDC and attached IPI disc products.

The FSC is a hexadecimal code printed to the console and errlog upon detection of an error condition. The format of the FSC is:

```
FSC 0xNNNN idc N port N unit N
                    cyl 0xNNN trk 0xNNN sec 0xNNN p N cnt N
```

Table 11 contains a description of the FSC fields.

Table 11 FSC field descriptions

FSC field	Description
FSC 0xNNNN	Hexadecimal representation of the fault symptom code.
idc	The IDC channel number that reported the error.
port	The port on the IDC that reported the error.
unit	The address of the drive that reported the error.
cyl 0xNNN	The hexadecimal cylinder number associated with the reported error. This field is always reported even if the error was not a data or seek error.
trk 0xNNN	The hexadecimal track number associated with the reported error. This field is always reported even if the error was not a data or seek error.
sec 0xNNN	The hexadecimal sector number associated with the reported error. This field is always reported even if the error was not a data or seek error.
p	The partition number in which the error occurred. Partition 1 is a, 2 is b, 3 is c, and so on.
cnt	The number of times the operation was retried. Error threshold is 11. If the cnt field is less than 11 the retry succeeded.

Table 12 contains a list of fault symptom codes used in the disc subsystem, the definition of each fault symptom code, and an explanation of the condition that causes the code to generate.

Table 12 FSC descriptions

FSC code	Definition	Explanation
0x0000	Normal success status	No error condition. This should never appear in an FSC error message.
0x0006	Device driver not found	This error is returned if an invalid port number is specified in the CMI message dst_id field. The IDC supports ports 0-3. Any other number is invalid. Check /ioconfig for invalid IPI port numbers.
0x1001	Device not found	Not used by IDC.
0x1002	Unit not found	This error is returned if the unit specified cannot be selected or does not respond to a logical reset. Check connection and drive address setting.
0x1003	Unit already connected	An attempt was made to move from CMI boot level to physical level, but the unit was already at physical level.
0x1004	Unit disconnected	The unit was not connected at CMI physical level for an operation that is only valid at the physical level. This can occur while: • Attempting to disconnect the unit • Attempting to put the unit online • Attempting to slip a sector • Attempting to unslip a sector • Attempting physical level I/O operations
0x1005	Unit already online	An attempt was made to move from the CMI physical level to the logical level, but the unit was already at the logical level.
0x1006	Unit offline	An attempt was made to move from the CMI logical level to the physical level, but the unit was not at the logical level.
0x1007 to 0x100a		Not used by IDC.

Table 12 FSC descriptions **(continued)**

FSC code	Definition	Explanation
0x100b	Function time-out exceeded	The IDC timed out on a read or write operation, or an expected attention from a unit did not arrive prior to time-out.
0x100d	Function aborted by CCU	If the IDC receives a DEBUG_FLIMBS message, all pending operations on the specified device are aborted and the error is posted.
0x100f	Invalid CMI function code	An invalid CMI function code was passed to the IDC.
0x1012 to 0x1015		Not used by IDC.
0x1016	CMI revision unsupported by CCU	An invalid CMI revision level was passed in the CMI device class field. For the IDC, the revision level must be zero.
0x1017	Defective CMI message (badparms)	The CMI message was defective.
0x1019 to 0x101e		Not used by IDC.
0x101f	Controller not initialized	The unit was not initialized and an attempt was made to connect, disconnect, set geometry, transition offline, transition online, slip a sector, unslip a sector, perform physical or logical I/O, perform long read or write, or read the configuration.
0x1020 to 0x1027		Not used by IDC.
0x1028	Memory allocation (`memalloc`) failed	This code is never printed in an FSC error message. It is used with adb88 to indicate the breakpoint table is full.
0x1029		Not used by IDC.
0x102a	Unit not ready	The error is returned if the drive status cannot be read or if the device cannot be selected after reset.
0x102b	Could not seek to required location	A seek error occurred.
0x102c	Recoverable IDC ECC error	An ECC error occurred and the data was corrected.

Table 12 FSC descriptions **(continued)**

FSC code	Definition	Explanation
0x102d	Bad header (chksum)	This indicates a header CRC error.
0x102e to 0x102f		Not used by IDC.
0x1030	Bad device address	Not used during normal operation of the IDC.
0x1031	Bad parity of nonexistent memory	Used by `adb` to indicate attempt to access nonexistent memory.
0x1032 to 0x1049		Not used by IDC.
0x104a	IOS reset failed	A selective reset of the unit failed. If the CMI message can be examined, the status.extend field contains the DICE EXREG for the failed operation.
0x104b	Read format command failed	A read format command failed. If the CMI message can be examined, the status.extend field contains the DICE EXREG for the failed operation.
0x104c	Read configuration command failed	A read configuration command failed. If the CMI message can be examined, the status.extend field contains the DICE EXREG for the failed operation.
0x104d	Tried to slip bad sector	An attempt was made to slip a sector that is already marked bad.
0x104e	Tried to unslip a good sector	An attempt was made to unslip a sector that is already marked good.
0x104f	Missed sync byte	A missed sync byte data exception occurred. This will occasionally happen if the IDC software is not keeping up with the drive.
0x1050	Drive reported an error	General purpose error message from disc drive. Sync detected by one head but not both.
0x1051	Parity error	A parity error occurred on the IPI bus, in the B bus octet or in an external field.
0x1052	Disc format inconsistent	I/O was attempted on a disc that has not been formatted properly.
0x1053	Read status command failed	A read status command failed. If the CMI message can be examined, the status.extend field contains the DICE EXREG for the failed operation.

Table 12 FSC descriptions **(continued)**

FSC code	Definition	Explanation
0x1054	Recalibrate command failed	A drive recalibration command failed (load slave function, command 0x28).
0x1055 to 0x1057		Not used by IDC.
0x1058	Header parity error	A parity error occurred in the header field.
0x1059	Header miscompare error	The header on the disc did not match the header expected by the software. This will occasionally happen if the IDC software is not keeping up with the disc. If this error code is reported frequently, there may be a disc hardware problem.
0x1060	Drive verify header miscompare	This can be a data error or a true miscompare.
0x1061	Busy doing something else	General purpose error message from disc drive.
0x1062	Out of spare cylinders	General purpose error message from disc drive.
0x1063	Usually a warning, not fatal	General purpose error message from disc drive.
0x1066	Read specification command	A drive read disc specification values command failed.
0x1067	Read buffer control command failed	A read buffer control command failed.
0x1068	Read formatter parameters failed	A read slave formatter parameters command failed.
0x1069	Recoverable drive ECC error	The drive reported it detected and corrected a data error on the given sector.
0x106a	Drive sent wrong sector	The drive sent a different sector than the one the IDC expected. The expected location of the missed sector is printed and stored in the status.extend field of the CMI message. This becomes a fatal error after 11 retries.
0x106b	Drive buffer over/underflow	The drive data buffer is temporarily unavailable. This becomes a fatal error after 11 retries.

Table 12 FSC descriptions **(continued)**

FSC code	Definition	Explanation
0x2004	Geometry not set	The geometry has not been set, and a command that requires geometry has been issued.
0x2005	Unable to read topology map	This error should not occur during normal operation.
0x2006	Unable to read either ucode temp section	There are two sections reserved by the IDC for storing slip sector state information. If they cannot be read, this error is returned.
0x2007	Unable to read any headers on cylinder 0	An error occurred during the translation of a logical block to a physical cylinder, track, and sector.
0x4000	Select failed	A drive selection command failed.
0x4001	Deselect failed	A drive deselection command failed.
0x4002	Load drive format failed	A load format command failed.
0x4003	Section invalid	The checksum or magic number of a section is bad. If the CMI message can be examined, the status.extend field contains the DICE EXREG for the failed operation.
0x4004	PIGA failed	An unexpected interrupt occurred during a PIGA transfer between main memory and the data buffer. If the CMI message can be examined, the status.extend field contains the DICE EXREG for the failed operation.
0x4005	Load buffer control failed	A drive load buffer control command failed.
0x5000	Unable to disable class 2 interrupt	A disable class 2 interrupt attention command failed (load slave function 0x1A). If the CMI message can be examined, the status.extend field contains the DICE EXREG for the failed operation.
0x5001	Enable sync master failed	A enable sync command failed (load slave function, command 0x2f). If the CMI message can be examined, the status.extend field contains the DICE EXREG for the failed operation.
0x5002	Unit not correct type of device	The device connected to the IDC indicates it is not a disc. The device type reported by the read configuration command must be one (type 1 is disc).

Table 12 FSC descriptions **(continued)**

FSC code	Definition	Explanation
0x5003	Uncorrectable IDC ECC error	An uncorrectable ECC error occurred.
0x5004	Load head command failed	The load head address command failed.
0x5005	Load target command failed	The load RPS target sector address command failed.
0x5006	Enable alternate sync byte failed	An enable alternate sync byte command failed (load slave function command 0x35). If the CMI message can be examined, the status.extend field contains the DICE EXREG for the failed operation.
0x5007	Enable primary sync byte failed	An enable primary sync byte command failed (load slave function command 0x36). If the CMI message can be examined, the status.extend field contains the DICE EXREG for the failed operation.
0x5008	Uncorrectable drive ECC error	The drive reported a data error and was unable to correct it with ECC.
0x5009	Unable to enable class 2 interrupt	An enable class 2 interrupt attention command failed (load slave function command 0x1B). If the CMI message can be examined, the status.extend field contains the DICE EXREG for the failed operation.
0x500a	Unable to flush drive data buffer	A drive load end of write command failed. If the CMI message can be examined, the status.extend field contains the DICE EXREG for the failed operation.
0x500b	Unable to enable ECC correction	An enable slave ECC correction command failed (load slave function command 0x21). If the CMI message can be examined, the status.extend field contains the DICE EXREG for the failed operation.
0x500c	Unable to enable ECC reporting	An enable slave ECC/CRC reporting command failed (load slave function command 0x2D). If the CMI message can be examined, the status.extend field contains the DICE EXREG for the failed operation.
0x500d	Unable to load buffer interrupt delay	A drive load buffer available interrupt delay command failed. If the CMI message can be examined, the status.extend field contains the DICE EXREG for the failed operation.

Table 12 FSC descriptions **(continued)**

FSC code	Definition	Explanation
0x500e	Unable to turn off drive ECC	A disable slave ECC/CRC correction and reporting command failed (load slave function 0x2C). If the CMI message can be examined, the status.extend field contains the DICE EXREG for the failed operation.
0500f	Unable to enable single burst report	An enable single burst ECC/CRC reporting command failed (load slave function command 0x8C). If the CMI message can be examined, the status.extend field contains the DICE EXREG for the failed operation.
0x5010	Unable to disable single burst report	A disable single burst ECC/CRC reporting command failed (load slave function command 0x8D). If the CMI message can be examined, the status.extend field contains the DICE EXREG for the failed operation.
0x5011	Unable to disable auto thermal comp	A disable internal position calibration initiation command failed (load slave function command 0x39). If the CMI message can be examined, the status.extend field contains the DICE EXREG for the failed operation.
0xbadd	Used in send message	General purpose error message from disc drive.
0x6000	Buffer overrun or underrun error	General purpose IDC error message.
0x6001	CCU has detected a fatal error	If this error is returned the IDC has crashed. Only debug messages are accepted after a crash.
0x7000	Interface not initially idle	The DICE indicated an interface was not initially an idle error. The IDC software attempted a deselect operation and the interface did not return idle, or an invalid state transition has taken place.
0x7001	Interface not returned to idle	The DICE indicated an interface did not return to idle error. The IDC software attempted a deselect operation and the interface did not return idle, or an invalid state transition has taken place.
0x7002	Invalid command status	The operation failed due to an invalid DICE command status.
0x7003	Register filed CRC error	A CRC error was detected in the DICE register field.

Table 12 FSC descriptions **(continued)**

FSC code	Definition	Explanation
0x7004	Register field parity error	A parity error was detected in the DICE register field.
0x7005	Invalid transfer status	The operation failed due to an invalid DICE transfer status.
0x7100	Bus B parity error	General purpose IDC error message.
0x7101	Spontaneous drive deselection	General purpose IDC error message.
0x7102	DICE command time-out exceeded	General purpose IDC error message.
0x7103	DICE header parity error	General purpose IDC error message.
0x7104	DICE external parity error	General purpose IDC error message.
0x7105	IPI parity error	General purpose IDC error message.
0x7106	IPI bus control rejected	General purpose IDC error message.
0x7107	IPI odd transfer size	General purpose IDC error message.
0x7108	IPI 3 command exception	General purpose IDC error message.
0x7109	IPI 3 command time-out	General purpose IDC error message.
0x710a	IPI 3 machine exception	General purpose IDC error message.
0x710b	Invalid slave ending status	General purpose IDC error message.
0x710c	IPI 3 alternate port exception	General purpose IDC error message.
0x710d	IPI 3 intervention request exception	General purpose IDC error message.
0x710e	IPI 3 vendor exception	General purpose IDC error message.
0x710f	IPI sync error	General purpose IDC error message.

Table 12 FSC descriptions **(continued)**

FSC code	Definition	Explanation
0x7110	IPI 3 incomplete substatus	General purpose IDC error message.
0x7111	Failed due to bad spot on media	General purpose error message from disc drive.

Sector errors

The `slip` command in `idcfmt` is used to repair header CRC or data ECC errors. If a sector in the user data area of the disc is slipped, this should be done with exclusive access to the disc. Sectors in the topology and diagnostic areas require exclusive access to the disc. A description of the topology is included in the idcfmt (1D) man page in Appendix A.

When slipping a sector with `idcfmt` running from ConvexOS, `idcfmt` attempts to lock the disc during the slip operation. The file system containing the sector to be slipped should be unmounted.

Fault symptom codes (FSC) are printed to the console and the errlog upon detection of an error. The following list identifies some of the FSCs that indicate a sector or sectors should be slipped.

- 0x102c—Recoverable IDC ECC error
- 0x102d—Bad header (checksum)
- 0x1069—Recoverable drive ECC error
- 0x5003—Uncorrectable IDC ECC error
- 0x5008—Uncorrectable drive ECC error

Multiple occurrence of recoverable ECC errors on a single sector should be slipped before they become unrecoverable ECC errors.

In the following example, `idcfmt` is used to slip sector 6 of track 5 on cylinder 10 in the drive addressed as unit 2, which is attached to port 0 of the IDC in CCU slot 0.

```
idcfmt -d 0 0 2 slip 10 5 6
```

For additional information about the use of `idcfmt`, refer to the idcfmt(1D) man page in Appendix A.

FSC codes reported during `autoconf`

The `autoconf` routine is executed during the boot process. `autoconf` attempts a probe and attach on each device identified in the /ioconfig file on the SPU disc. During the probe and attach of an Elite 3 disc drive each sector in cylinder 0 is read. If an Elite 3 has not been formatted with `idcfmt`, multiple errors are reported. The FSC codes you may see include:

- 0x102d—Bad header CRC error
- 0x104f—Missed sync byte
- 0x2005—Unable to read topology map
- 0x4003—Section invalid
- 0x6000—Buffer overrun or underrun error

The FSC 0x102d is also reported when the Elite 3 drive has been formatted by the vendor with a format that is incompatible with the ConvexOS device driver.

VVM messages

When a disc in a redundant stripe fails, VVM checks to see if a hot spare is available for the affected partitions. If so, VVM reconstructs the data from that disc on the specified hot spare device and continues operations.

Figure 18 shows the message printed by VVM when a disc failure is detected.

Figure 18 VVM device failure message

```
Failure: device /dev/dxxx in stripe /dev/stx failed
```

After printing the device failure message to the console, VVM attempts to instruct the `vvmdaemon`, to begin the automatic reconstruction process. If VVM successfully contacts the daemon, and the daemon is able to perform the reconstruction, no human intervention is required.

Figure 19 show the message VVM prints upon reconstruction of data from a failed disc.

Figure 19 VVM completion message

```
failure: mvst (8) command completed successfully
```

If there is insufficient space in available hot spare disc, or VVM is unable to automatically reconstruct the data from the failed device, it may be possible to manually reconstruct the data. Refer to *Managing ConvexOS Operations Guide* (DSW-031), for more information on disc failure recovery.

Determining disc usage

ConvexOS provides a variety utilities for monitoring disc usage. For example, in Figure 20, `df` is used with `grep` to determine which files are mounted on the du10 disc drive.

Figure 20 Determining disc usage with `df |grep`

```
# df | grep du10
/dev/du10a 45978 39226 2154 95% /swi
/dev/du10g 413364 221690 150336 60% /master
/dev/du10h 263304 233736 3236 99% /cadstaff
```

However, `df` does not show partitions that are used as part of swap space. In Figure 21 `grep` is used to locate entries in /etc/fstab that define the usage of du10. In this case an entry is shown for partition b as swap space. When a partition on the failed drive is used for swap space, ConvexOS should be taken to single-user mode before attempting to replace the failed disc.

Figure 21 Determining disc usage from /etc/fstab

```
# grep du10 /etc/fstab
/dev/du10a /swi 4.2 rw 13 1
/dev/du10b swap swap rw 0 0
/dev/du10g /master 4.2 rw 13 3
/dev/du10h /cadstaff 4.2 rw 2 2
#
```

Removal and replacement procedures

Components in the Elite 3 chassis cannot be serviced while the chassis is installed in a peripheral cabinet.

Elite 3 chassis

To remove an Elite 3 chassis from a peripheral cabinet:

Use appropriate electrostatic discharge protections procedures as described in the Preface, "Electrostatic discharge protection."

Caution

As root, use the `/etc/shutdown` command to halt ConvexOS before removing power from an Elite 3 disc drive used in the ConvexOS file system. Failure to do so may cause a system crash and loss of data.

Step 1 Turn the power switch on the rear of the Elite 3 chassis off.

Step 2 Disconnect IPI cable(s) and terminator.

Step 3 Loosen rear alignment/retaining screw.

Step 4 Remove front alignment/retaining screw.

Step 5 Remove the Elite 3 chassis from the disc drive tray.

Reverse the procedure to install an Elite 3 chassis.

Disc drive

With the Elite 3 chassis on a grounded work area, perform the following steps to remove an Elite 3 disc drive from the Elite 3 chassis:

Step 1 Loosen screws on the Elite 3 chassis cover and remove the cover.

Step 2 Disconnect the IPI interface cable, operator panel cable, and power supply cable.

Step 3 Remove the two upper mounting screws on the top of the upper disc mounting bracket.

Step 4 Remove the two lower mounting screws from the lower disc mounting bracket. Lower bracket mounting screws are accessed through holes on the side of the Elite 3 chassis.

Reverse the procedure to install an Elite 3 disc drive in an Elite 3 chassis.

Power supply

With the Elite 3 chassis on a grounded work area, perform the following steps to remove the power supply from the Elite 3 chassis:

Step 1 Loosen screws on the Elite 3 chassis cover and remove the cover.

Step 2 Disconnect the ac cable from J1 on the power supply.

Step 3 Disconnect the dc power cable from J2 on the power supply.

Step 4 Remove the 4 mounting screws. Mounting screws are accessed through holes on the side of the Elite 3 chassis.

Reverse the procedure to install the power supply in an Elite 3 chassis.

Operator panel

With the Elite 3 chassis on a grounded work area, perform the following steps to remove the operator panel from the Elite 3 chassis:

Step 1 Loosen screws on the Elite 3 chassis cover and remove the cover.

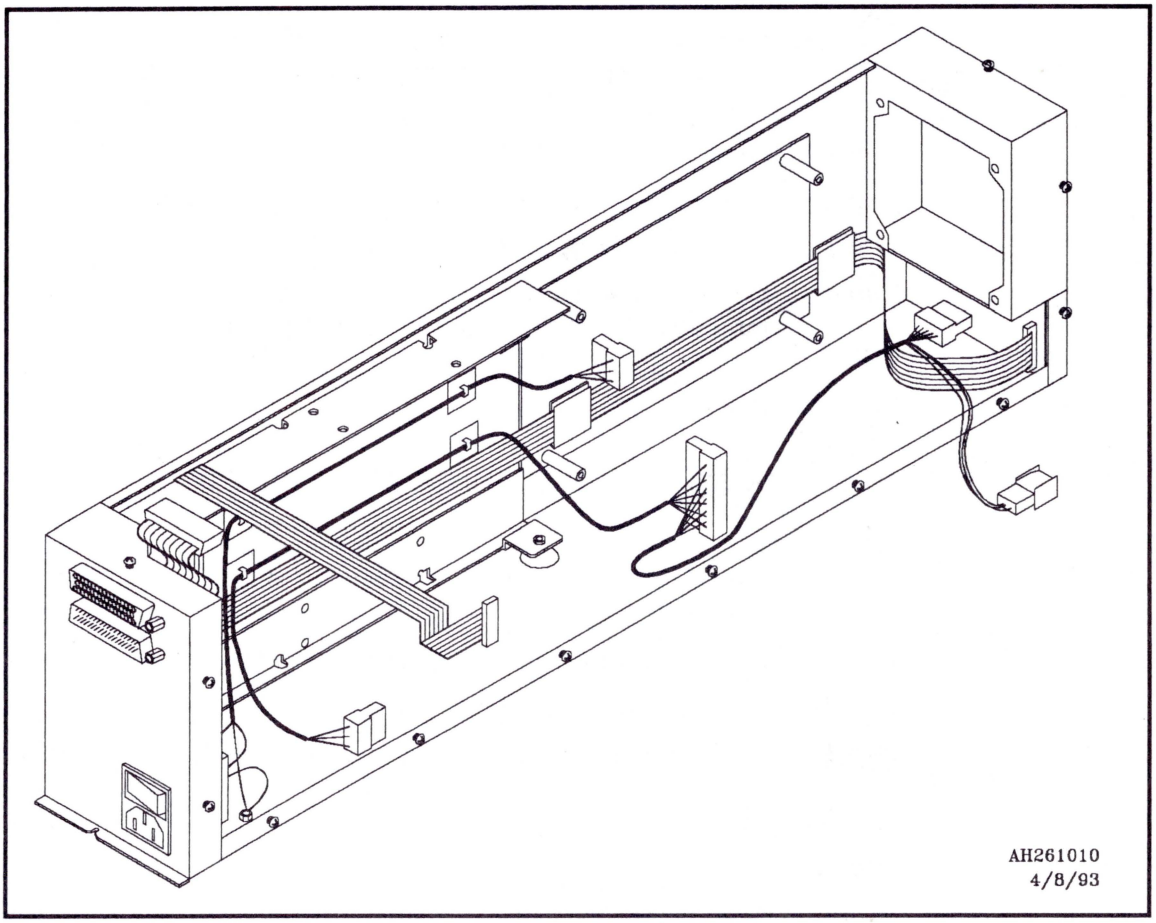
Step 2 Remove the power supply.

Step 3 Disconnect the operator panel cable from the Elite 3 disc drive. Make note of the cable routing for subsequent installation as shown in Figure 22.

Step 4 Remove mounting screws and operator panel.

Reverse the procedure to install an operator panel in the Elite 3 chassis.

Figure 22 Elite 3 operator panel cable routing



Fan assembly

With the Elite 3 chassis on a grounded work area, perform the following steps to remove the fan from the Elite 3 chassis:

Step 1 Loosen screws on the Elite 3 chassis cover and remove the cover.

Step 2 Remove the power supply.

Step 3 Remove the power cable from the fan assembly.

Step 4 Remove the mounting screws while holding the fan.

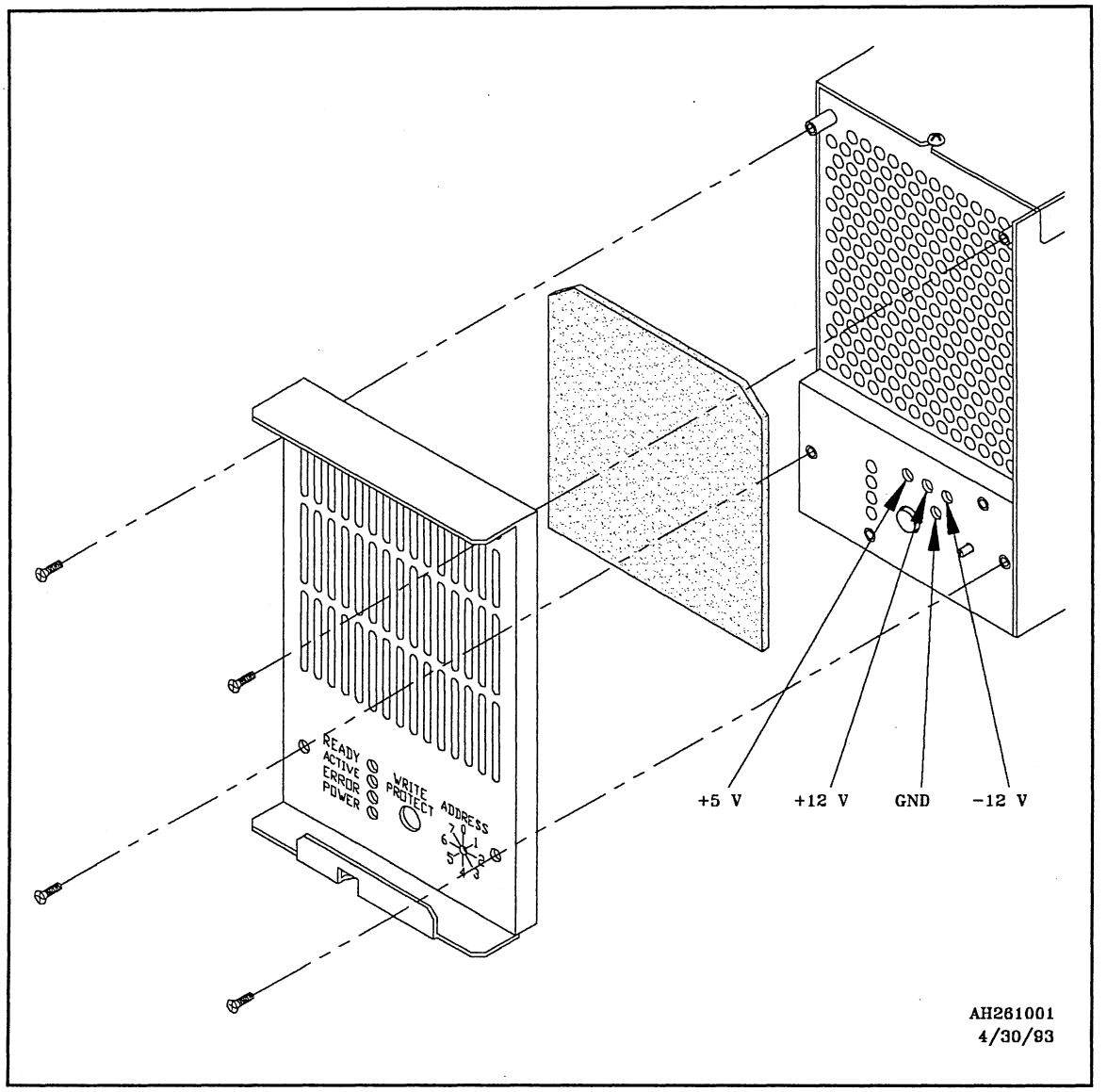
Reverse the procedure to install a fan in an Elite 3 chassis.

Air filter

The air filter can be accessed by removing the retaining screws and front cover on the Elite 3 chassis.

The air filter should be inspected once a month and cleaned as required. Figure 23 shows the location of the air filter and the front cover retaining screws that are removed to gain access to the air filter.

Figure 23 Air filter access



Illustrated parts breakdown (IPB)

Figure 24 shows the Elite 3 parts.

Figure 24 Illustrated parts breakdown (IPB)

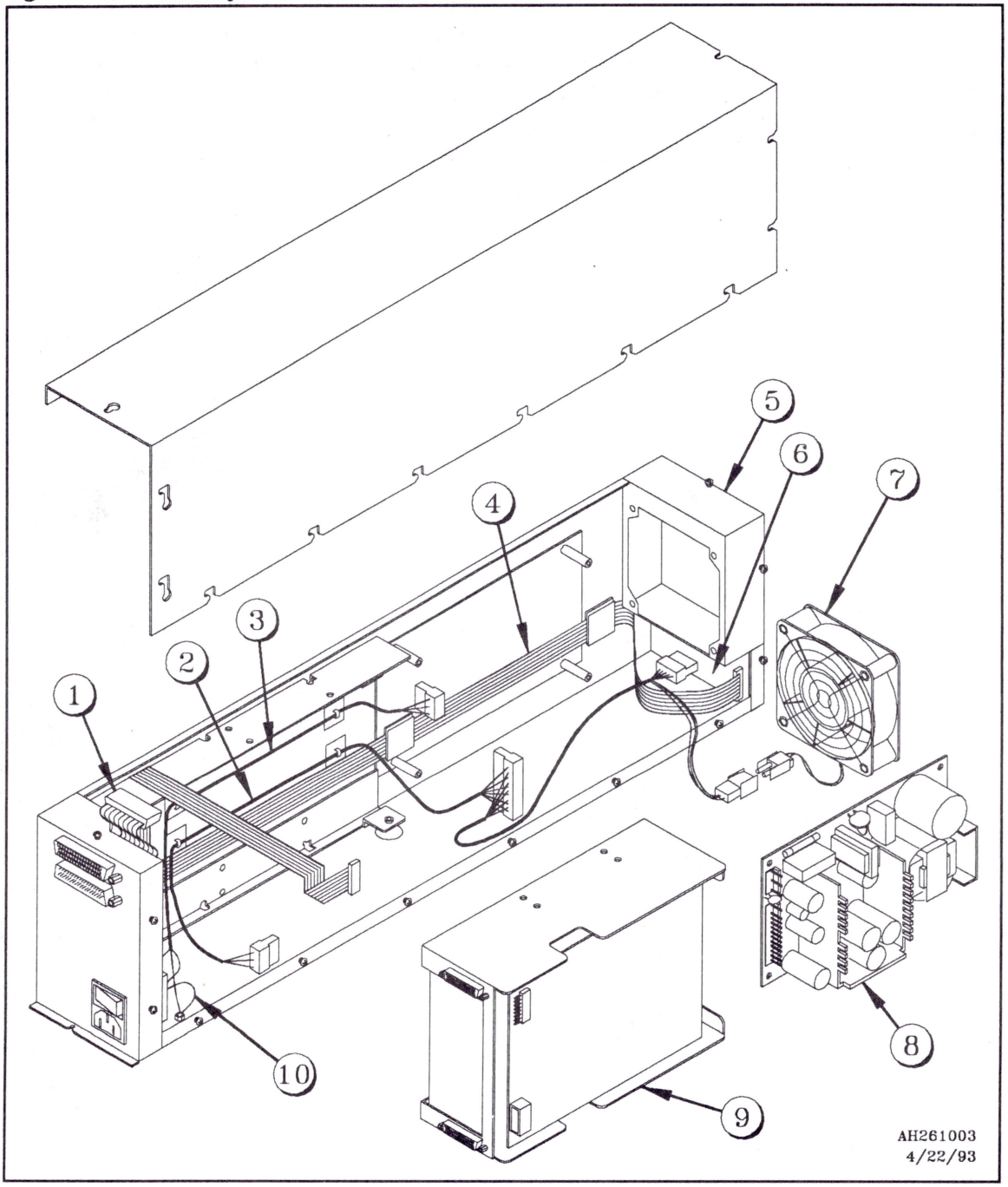


Table 13 contains the CONVEX part numbers for the FRUs found in an Elite 3 chassis. The CONVEX part number for the entire assembly is 550-002230-200.

Figure 25 IPB parts list

Item number	CONVEX part number	Description
1	601-500059-200	Internal data cable
2	603-070010-200	dc cable harness
3	603-030042-200	ac cable harness
4	601-160004-200	Drive to operator panel
5	312-000555-001	Air filter[1]
6	411-001385-200	Operator panel[2]
7	500-000544-200	Fan assembly
8	200-001046-200	Power supply
9	204-00026-200	Elite 3 2 HP 3.4 Gbyte disc drive
10	603-010029-200	Ground strap

[1] Item 5 in Figure 24 points to the general area where the air filter is located. The air filter is shown in Figure 23.

[2] Item 6 in Figure 24 points to the general area where the operator panel is located.

idcfmt (1D) man page

A

IDCFMT(1D) CONVEX Diagnostic Utilities Manual idcfmt IDCFMT(1D)

NAME

idcfmt - utility for IDC disk formatting, media repair, and data editing

SYNOPSIS

idcfmt -d ccu port unit [options] [commands]

or

idcfmt -d /dev/rdu*n*-ctl [options] [commands]

Idcfmt is a program used to prepare and repair an IDC disk for use under ConvexOS. There are two versions of **idcfmt**. The first version runs on the Service Processor while ConvexOS is not running. The second version runs on CONVEX C200/C3200/C3400/C3800 Series machines while ConvexOS is running. Both versions require the user invoking the program be the superuser.

Idcfmt is invoked by typing its name, a "-d", followed by the CCU slot number, IPI port number, and drive unit number of the drive to be used. The ConvexOS version allows a drive to be specified through its control name, such as */dev/rdu0-ctl* or */dev/rdu1-ctl*.

A list of options may follow the drive specification, then zero or more commands. If no commands are given on the command line, **idcfmt** displays a prompt and expects the commands to be entered from the standard input.

OPTIONS

With the exception of the -v option, the following options are not normally required. These options are intended for use under rare, exceptional conditions and then only by CONVEX personnel. The description for the following options make reference to various files used by **idcfmt**. A description of the layout of these files may be found at the end of this document.

-t dkd-999

The -t option overrides the automatic identification of the disk drive that **idcfmt** normally performs. If the -t option is not specified, **idcfmt** queries the target disk drive for its model number. This model number is then used as a search key in the file */mnt/usr/lib/DB_idc*. **Idcfmt** uses the matching entry in this file to

determine the geometry of the disk drive. If the -t option is specified, **idcfmt** uses the name provided by the user as the search key into the database. The model number obtained from the drive is then verified against the selected entry. If the model number does not match the one in the database, a warning is printed and **idcfmt** proceeds with the database entry selected by the user. This option is useful only in the unlikely event that there are two drives that return the same model number.

-m manufacturers_defects_pathname

The -m option specifies a pathname to a file which contains the manufacturers defect data. This option is useful in the event that an otherwise usable disk drive has an unreadable defect map. The user may then manually enter the defect data from the paper copy of the defects supplied with each drive into an asci file and use the -m option to specify the location of the file. Normally, **idcfmt** will read the defect map from the drive anytime it requires knowledge of the defect data. For information on the format of the manufacturers defect file refer to the FILES section within this manpage.

-g grown_defects_pathname

The -g option is used to specify a list of sectors that are known to be bad, but do not appear in the manufacturers defect list. It should be noted that the -g option is not the normal way to handle defects that occur after initial formatting (refer to the description of the "slip" command within this document). During initial formatting, **idcfmt** assumes there are no grown defects unless the user specifies the -g option.

-v volume_name

IDC disks contain a place for a volume name for each disk. The -v option allows the user to specify what name will be put on the disk during initial formatting. If the -v option is not used, a volume name of "NONE" is used. **Idcfmt** does not use the volume name for anything other than initializing the name field during formatting. The maximum length of the volume name is 32 characters.

-p pattern_file

Normally, during initial formatting, **idcfmt** pattern tests the drive using the set of patterns specified in the database. The normal patterns may be overridden by putting a set of patterns into ale, and using the -p option to tell **idcfmt** where the file is located.

-y

The -y option forces the answer to all yes/no prompts to be treated as if the user has responded with a "yes". The initial release of **idcfmt** has only one of these prompts. Refer to the following description of the FORMAT command. This option is useful if the user wants to format a drive in background, and the user does not wish to answer the yes/no prompt interactively. The prompt is there for the user's protection. Think carefully before using the -y option.

COMMANDS

The following commands perform various functions on IDC disks. Each command is listed along with any required arguments specific to that command. Some commands require exclusive access to the disk. The description for each command lists whether or not the command requires exclusive access. The version of **idcfmt** that runs on the Service Processor automatically assumes that it has exclusive access to the disk. The version of **idcfmt** that runs under the ConvexOS coordinates exclusive access to the disk through a diagnostic ioctl() call to the ConvexOS disk driver. Exclusive access to a disk is denied if the disk is currently in use under the ConvexOS file system, or if any process has opened any of the block or character special devices associated with the disk.

The description for some of the commands assume that the user has a basic knowledge of the layout of an IDC disk. A description of this layout follows below.

format

Formats the drive if it appears that the drive has not been previously formatted. If the drive appears to be partially formatted, the format resumes at the appropriate point. This command will destroy any previous data on the disk. Exclusive access to the disk is required before this command can execute. This command tries to determine whether or not the drive is formatted by attempting to read the topology map in the topology area. If successful in reading the topology map, the command prints a message and proceeds to the format verification step. The user may override this behavior by using the FORMAT command which is the next command described. If the topology map is unreadable, the program assumes that the drive has not been completely formatted. It then proceeds to check for a partial format of the disk by looking for checkpoint data in the topology and diagnostic areas. If a valid set of checkpoint data is found, the command resumes formatting at the point specified by the checkpoint data. If no

checkpoint data is found, the command assumes that the drive has never been formatted and proceeds to format the drive accordingly. The steps required to format a drive are:

o) Identify the type of drive being formatted by performing a read configuration command to the drive. The data returned by the read configuration command is used to search the data base file "DB_idc" for a match. The data base file contains information about the disk drive such as number of cylinders, number of tracks, encoding schemes, etc. The user may override this automatic identification of the drive by using the -t option on the command line.

o) Read the manufacturers defect data from the drive. The user may override this step by using the -m option described previously in the OPTIONS section.

o) Assume that there are no grown defects for the drive. The user may override this step by using the -g option described previously in the OPTIONS section.

o) Format the topology area with no spare sectors. The topology area is then pattern tested with a set of patterns that are specified in the data base file "DB_idc". The user may override the normal patterns by specifying the -p option

on the command line. Once pattern testing is complete, the topology area is re-formatted with the number of spare sectors specified in the data base file "DB_idc". A detailed description of pattern testing can be found in the FILES section of this manpage.

o) Format the user, diagnostic, and spare areas of the disk with no spares. The first checkpoint of the format is written this step is complete.

o) Pattern test the user, diagnostic, and spare areas of the disk with the patterns specified in the data base file "DB_idc". The user may override the normal patterns by use of the -p option described previously in the OPTIONS section. The process of pattern testing consists of writing each of the specified patterns to the area under test, and then reading each pattern to look for errors that might be attributed to disk media problems. These include data Error Correcting Code (ECC) errors, header Cyclical Redundancy Character (CRC) errors, and missing sector sync byte errors. If any of these errors are encountered, the manufacturers defect list is searched to see if the cylinder, track and sector where the error occurred is already listed. If the cylinder, track, and sector is not in the manufacturers defect list, the grown defect list is then searched. If the cylinder, track, and sector where the error occurred is not found in either defect list, the location is added to the grown defect list. After each pattern is completed, a checkpoint is written to the disk.

o) Format the user, diagnostic, and spare areas of the disk, reserving a number of sectors at the end of each cylinder for use as spare sectors. Any sector which is listed in either the manufacturers or grown defect lists is re-allocated from this pool of spare sectors. If the number of defective sectors in a cylinder exceeds the number of spare sectors allowed for each cylinder, the disk is not usable under ConvexOS. A checkpoint is written to the disk after this step.

o) Initialize the topology area by writing several copies of the topology data. This includes the topology area map, the defect lists for the disk, a copy of the disks geometries, the ConvexOS label, etc. The contents of the topology area is described below.

o) Clear the diagnostic cylinder.

o) Verify that the drive received a valid format. Refer to the verify command below for a description of what steps are taken to verify that a drive is formatted correctly.

The disk in now formatted and ready for use.

FORMAT

Formats the drive regardless of its current state. This command is the same as the format command listed above, except that if the disk is determined to have a valid, complete disk format, the user is prompted as to whether or not to continue. If the user answers in the affirmative, the format operation proceeds as if the drive had never been formatted. If no valid format is found on the drive, this command does not look for checkpoint data. The format starts from the

beginning. All the exclusive access requirements of the normal format command also apply to this command.

verify

This command verifies that the disk is properly formatted. This automatically takes place when the drive is initially formatted. This command does not write to the drive and may be used on a drive with user data. Exclusive access to the disk is not required. The following steps are taken to verify that the drive is formatted:

o) Reads one copy of all the data on the topology cylinder. Verifies that the checksums and magic numbers are correct.

o) Reads the remaining copies of the topology data and verifies that they match the data from the first step.

o) Reads all logical blocks on the disk and verifies that there are no header CRC or data ECC errors. If any errors are found they are listed. The user may then attempt to fix the error by using the slip command described below.

o) Reads all the sector headers from the disk and verifies that there is a one to one correspondence of entries in the defect lists with sectors that are slipped.

o) Verifies that each entry in the defect lists point to a sector that has been slipped.

slip cylinder track sector

This command is used to repair header CRC or data ECC errors. If a sector in the user data area of the disk is to be slipped, it can be done without having to have exclusive access to the disk. Sectors in the topology, and diagnostic areas require exclusive access to the disk.

The default radix used for cylinder track sector is decimal. If hexadecimal values are required, prefix the values with 0x.

If a sector in the user area of the disk is to be slipped, **idcfmt** issues a slip sector command to the IDC. This command is an atomic (indivisible) operation implemented in the IDC software in a fashion that guarantees data integrity at all times, even in the event of a power failure during the operation. If the slip operation is interrupted, the operation automatically completes the next time the IDC software accesses the disk.

The preferred procedure before slipping a sector is to first unmount the file system containing the sector to be slipped.

If the sector to be slipped is in the topology or diagnostic areas of the disk, the following steps are taken:

o) The topology data is read from the topology area, and the sector to be slipped is added to the memory copy of the grown defect list.

o) A flag is written to the topology area that keeps the idc software from allowing normal access to user data.

o) If the sector to be slipped is not in the topology area, then the cylinder that contains the sector is reformatted, causing the specified sector to be reallocated from the pool of spare sectors at the end of the cylinder.

o) If the sector to be slipped is in the topology area, then the diagnostic area is reformatted in order to ensure that the topology area data can be written to the disk.

o) If the sector to be slipped is in the topology area, a checkpoint containing the topology data is written to the diagnostic area.

o) If the sector to be slipped is in the topology area, the topology area is reformatted and the data is copied from the diagnostic area back to the topology area. The diagnostic area is then reformatted to remove the checkpoint data.

o) If the sector to be slipped is not in the topology area, the defect lists in the topology area are updated to show the new defect data.

o) The flag which keeps the IDC microcode from allowing access to user data is removed.

If a slip of a sector in the topology or diagnostic areas is interrupted, the user data on the disk is not accessible until the slip is completed. The completing of the slip is accomplished by re-issuing the slip command with the same parameters as before. If the parameters differ after an interruption, **idcfmt** prints out a message stating what sector was being slipped before the interruption.

unslip cylinder track sector

This command is the inverse of the slip command described above. It is provided in the event that user mistyped the cylinder track and sector number during a slip command, or to allow the user to slip and then unslip a sector in an attempt to fix a header CRC or data ECC error. As with the slip command, the unslip command does not require exclusive access to the disk if the sector to be unslipped is in the user data area. If the sector to be unslipped is in the topology or diagnostic areas, exclusive access to the disk is required. The algorithm used by the unslip command is identical to the one used for the slip command, except that the specified sector is removed from the defect list instead of being added to it.

WARNING!!!!

UNSLIPING A SECTOR FOR ANY REASON OTHER THAN THOSE DESCRIBED ABOVE MAY RESULT IN CATASTROPHIC AND UNRECOVERABLE LOSS OF DATA ON THE ENTIRE DISK.

EXAMPLES

idcfmt -d 2 0 1 format

THIS IS AN EXAMPLE OF HOW TO FORMAT 99% OF ALL DRIVES. Formats drive 1, on port 0, of ccu 2 if the drive has never been formatted. If a partial format is found, the format resumes at the appropriate point, with the manufacturers and grown defect lists that were in effect when the format was interrupted. If the drive has no valid format on it, then the program reads the manufacturers defect data from the drive.

The examples that follow are for drives with unreadable manufacturers defect lists or other peculiarities. If a drive develops additional defects after it has been formatted, they may be fixed with the slip command described above.

idcfmt -d /dev/rdu1-ctl format

Formats the drive pointed to by */dev/rdu1-ctl*. Everything else is the same as in the first example.

idcfmt -d 2 0 1 -m foo format

Formats the same as the first example, but the user specified defect list in the file "foo" is used instead of reading the manufacturers supplied list on the disk drive.

idcfmt -d 2 0 1 FORMAT

Forces a format operation to occur regardless of the current status of the drive. The manufacturers defect cylinder is read and no grown defect data is assumed.

idcfmt -d 2 0 1 -m foo FORMAT

Formats the same as the previous example, but the user specified defect list in the file "foo" is used instead of reading the manufacturers supplied list on the disk drive.

idcfmt -d 2 0 1 verify

Causes a verification of the format of the disk. The steps taken to verify the disk are described previously.

idcfmt -d 2 0 1 slip 10 5 6

Causes sector 6 of track 5 on cylinder 10 to be re-allocated from the pool of spare sectors at the end of the disk.

idcfmt -d 2 0 1 unslip 10 5 6

This command undoes the effects of the command described in the previous example. PLEASE read the description of the slip and unslip command before using the unslip command.

LAYOUT OF AN IDC DISK

An IDC disk has five distinct areas. They are:

1) The topology area

2) The user data area

3) The diagnostic area

4) A spare area

5) The manufacturers supplied defect data

Each area is immediately adjacent to each other and they occur in the order listed above. Each area must begin and end on a cylinder boundary. The size of each area is determined by **idcfmt** during the initial format of the disk from the data contained in the database. Refer to the section on FILES within this man page for more information.

The topology area contains various types of information about the disk. Each section in the topology area is recorded in triplicate. The topology area is recorded in the default geometry specified by the manufacturer. The other areas are recorded in a format specified by CONVEX.

The various sections in the topology area are:

a) A map of the rest of the topology area (always located at logical block 0)

b) A copy of the manufacturers defect data. This data is used to avoid reading or writing sectors with defects in them. The defect data is also used in calculating what the sector header each sector contains. The disk is unreadable if this data is not present.

c) The grown defect data. This list of defects performs the same function as the list in "b" above, except that it contains a record of defects that were not listed in the manufacturers list.

d) A copy of the CONVEX specified disk geometry used in the other areas of the disk.

e) A copy of the manufacturers default geometry.

f) The ConvexOS disk label. This disk label contains the type of the disk, e.g. DKD-502, the volume name, e.g. Volume_123, the date that the drive was formatted, the date the ConvexOS disk label was last changed, and a list of the logical partitions defined for the drive.

g) Two scratch areas used by the IDC software to keep track of the state of a sector slip operation in the user data area. These areas are interrogated when the IDC software is first booted. If the scratch areas indicate that a slip or unslip of a sector in the user area was in progress but was interrupted, then the operation automatically resumes at the interrupted point. If the scratch areas indicate that an exclusive access diagnostic operation was in progress, the IDC software will not allow access to the user data area until the operation is finished.

The user area is where user data is read and written under ConvexOS. Its size is the entire area of the disk, less the area allocated to the topology, diagnostic, spare, and manufacturers defect area.

The diagnostic area is a scratch area on the disk that is used for disk diagnostics, and to temporarily hold user data while a sector in the user area is being slipped or unslipped.

The spare area is an area that is not currently used, but is reserved for future use by CONVEX.

The manufacturers defect area is the area on which the disk drive manufacturer records the defects for the drive. A copy of this data is kept in the topology area. This area is never written by CONVEX, thus the original defect data is always present.

ERROR CODES

Idcfmt produces errors messages in the following format

Error: (0x123) message

: Additional information

where "0x123" and "message" are one of the codes and messages listed below. The "Additional information" is other useful information such as the cylinder, and track, sector where an error occurred, the name of the disk command that failed, the name of ale that **idcfmt** could not open, etc. The information on the "Error:" line is intended to help the user diagnose the problem. The "Additional information" lines are elaborations on the original error message. These lines also contain information to help the CONVEX development staff assist in isolating problems in both hardware and software.

Code **Message**

0x1 Error in byte count.

A read or write operation was initiated but not all of the data requested was transferred. This will not normally happen without one of the other errors listed below.

0x3 Various CMI (Common Message Interface) error messages

This error code will be followed by additional lines that describe the type of operation in progress when an error occurred, the number of times the operation was retried, and any extended status available.

0x4 Error from fwrite

Idcfmt tried to write to ale on the SPU or the CONVEX file system and an error occurred. This is most likely caused by ale system being full. This error code has nothing to do with the disk under test

0x5 Non numeric value found when expecting a number

It is most likely that a parameter was mistyped from the command line or that one of the files described in the FILES section contains an error.

0x8 spu window ioctl error

Idcfmt received an error when trying to get SPU UNIX to allocate or remap a service processor window. This may be caused by too many processes allocating too many windows on the SPU.

0x9 mbs error

An error was received from the Message Based System (MBS). This is usually indicative of a hardware malfunction on the SPU, the IDC, the PIA/PI2, or system memory. The user may wish to consult the system error log to see if it contains more information about the error. See the discussion on FILES within this document.

0xa timeout waiting for message

Idcfmt sent a message to the IDC, but the IDC failed to respond. This can occur if the IDC encounters a situation that it is not expecting, and it panics. It is possible that this message can result when running the online version and a loaded, slow system causes a timeout to occur.

0xb main memory too small. Requires 4MB + 2MB per disk drive

For operation on the SPU, **idcfmt** requires a 4MB overhead area plus 2MB per copy of **idcfmt**. If there are many copies of **idcfmt** in execution, and the memory configuration is very small, this error may occur.

0xc must set geometry before this operation

This indicates an internal software error in **idcfmt**.

0xd error on open of file

Idcfmt attempted to open a SPU UNIX or ConvexOS file, and received and error. The file name is displayed on a subsequent line. This error can occur if the user mistyped ale name, if the specified file is not present, or if the SPU or ConvexOS denied **idcfmt** access to the file.

0xe parsedb() error

Idcfmt attempted to extract information from the file */mnt/boot_db* on the SPU and the requested information was missing. The name of the missing piece of information is also listed. Be sure that .diaginit(1D) has successfully completed.

0x11 attempt to position outside of defect area boundary

The defect list on the selected disk drive is unreadable.

0x12 manufacturers defect list not in CONVEX compatible format

A defect list was encountered that is not in the format needed by CONVEX.

0x13 cannot malloc() memory

Idcfmt requested memory from SPU UNIX or the ConvexOS and received an error. This is most likely caused by too many processes in execution at the same time.

0x14,0x15

Set #1 missing from defect map

Last set in map does not have proper value in flag field These errors indicate that the defect map on the drive has been partially destroyed, and is not usable.

0x16 must read defects before this operation

This is an internal software error in **idcfmt**. Contact the CONVEX development staff to report a software error.

0x17 error from fseek()

Idcfmt tried to re-position ale and received an error.

0x18 defect file differs on pass2 during reading mfg defects.

0x19 data miscompare

Idcfmt was comparing data read from the disk with known good data and it encountered a discrepancy. The address of the data along with the expected and actual data is displayed.

0x1c topology area too small

The topology area is too small to hold the required data. Make sure that the correct diagnostic database is installed. This error is most likely caused by attempting to format a drive with the wrong parameter specified in the -t option on the command line.

0x1d magic number incorrect

0x1e topology check sum incorrect

These errors indicate corruption of the topology area.

0x2e Illegal ecc interleave

An unknown ECC interleave was specified in the database file. Make sure the correct version of system diagnostics and diagnostic database are installed.

0x2f error from fread

Idcfmt tried to read ale on the SPU UNIX or ConvexOS file system and received an error.

0x30 Bad format for manufacturers defect

The user specified the -m option and one of the entries in the file is incorrect. The line number of the entry in error is also displayed.

0x31 Manufacturers defect overlap. List not usable

The manufacturers defect data contains overlapping defect entries. This is not a normal occurrence and **idcfmt** can not handle this case.

0x37 Cmd line DKD entry not unique in DB file

The user specified -t on the command line, and the disk type specified has more than one entry in the database file. Make sure that the correct diagnostic database is installed.

0x38 Cmd line DKD entry not found in DB file

The user specified -t on the command line, and the disk type specified was not found in the database. Make sure that the correct diagnostic database is installed.

0x3b Crc incorrect on checkpoint data

An media error occurred when trying to read checkpoint data off the drive. If the operation in progress was a format command, the user can retry the operation by using the FORMAT variant of the command.

0x3c, 0x3d Version number incorrect on checkpoint data Magic number incorrect on checkpoint data

Checkpoint data was encountered that was written by an incompatible version of **idcfmt**. This error is not recoverable. Either reformat the disk using FORMAT or ensure that the disk was not previously interrupted while attempting to format with another version of **idcfmt**.

0x3e Sequence number incorrect on checkpoint data

An media error occurred when trying to read checkpoint data off the drive. If the operation in progress was a format command, the user can retry the operation by using the FORMAT variant of the command.

0x3f Ran out of room for checkpoint data

The diagnostic or topology are is too small to hold the checkpoint data. This is a fatal error and in most cases the drive is defective.

0x40 Unknown checkpoint state

Checkpoint data was encountered that was written by an incompatible version of **idcfmt**. This error is not recoverable. This error usually indicates that the **idcfmt** software contains errors. Please contact the CONVEX development staff to report this error.

0x43 topology version number incorrect

A topology area was encountered with a format incompatible with this version of **idcfmt**. This error can indicate that the **idcfmt** software contains an error or that the drive was previously formatted with a different version of **idcfmt**.

0x45 Non-hex digit in pattern

The user specified a alternate pattern file that contains a non-hex digit in the field. See the section on FILES within this document.

0x46 Sector header incorrect

A sector header was found with good CRC, but incorrect data. The expected and actual header are displayed. This error message usually indicates a faulty drive.

0x47 Header crc incorrect

A sector header was encountered with bad CRC. This error message usually indicates a fixable media problem.

0x48 non-media related cmi error

An error was encountered during pattern testing of the drive that does not appear to be related to media errors. The format of the message is the same as for error code 0x3.

0x49 can't read ucode fields to resume pending diagnostic operation

The IDC software reports that a diagnostic operation was in progress, but the ucode scratch areas cannot be read in order to resume the operation.

0x4a the following operation must be completed.

An exclusive access diagnostic operation was interrupted, and the user tried to start a different operation without completing the first one.

0x4b One or more sections in the topology area are unreadable

The user attempted an operation which requires that the topology area be read, but there is at least one topology section which is totally unreadable.

0x4c verification after write of diagnostic ucode temp field failed

The user attempted an operation which requires **idcfmt** to write a value to the topology area scratch sections, but the read after write failed to verify. **Idcfmt** will attempt to clear out the scratch areas and abort the operation.

0x4d disk address out of bound

The user attempted to specify a disk address that is outside the allowed range for the drive.

0x4f drive model number not unique in data base file

Idcfmt encountered more than one record in the database with the same model number. The user may override **idcfmt** by specifying the -t option.

0x50 drive model number not found in data base file

Idcfmt encountered a a disk model number that it could not found in the data base. Make sure that the correct diagnostic database is installed.

0x52 can't find MEMSTART in */mnt/boot_db*.

Make sure .diagint was executed

0x53 can't find PCM in */mnt/boot_db*.

Make sure .diagint was executed. The file */mnt/boot_db* appears to be incorrect. Make sure that .diagint(1d) completed execution.

0x54 can't acquire spu unix lock

0x55 can't get open count of spu unix lock

0x56 can't set spu unix variable

The wrong version of SPU UNIX appears to be installed. **Idcfmt** spu version for CONVEX C200/C3200/C3400 requires SPU UNIX 5.2 or greater.

0x57 initall failed to complete successfully

Idcfmt was attempting to initialize the system and initall(1D) reported an error. The output from initall can be found in */tmp/idcfmt.initall*.

0x58 can't get spu unix variable

The wrong version of SPU UNIX appears to be installed. **Idcfmt** spu version for CONVEX C200/C3200/C3400 requires SPU UNIX 5.2 or greater.

0x59 unknown main memory state. Make sure **idcfmt** is the only thing running

There appears to be a program running on the SPU that is using main memory in a fashion that is not compatible with **idcfmt**.

0x5a can't release spu unix lock

The wrong version of SPU UNIX appears to be installed. **Idcfmt** spu version for CONVEX C200/C3200/C3400 requires SPU UNIX 5.2 or greater.

0x5b the specified ccu is not logged as being an IDC in */mnt/boot_db*

The user specified a ccu number that is not listed and being an IDC in */mnt/boot_db*. Verify that then ccu number entered is correct, and then verify that .diaginit(1d) finished execution.

0x5c Grown defect entry in wrong format. Expecting cyl trk sec

Please read the section on FILES in this document.

0x5d Cannot open/*create* device control table. Verify that there is room in */tmp*

0x5e **idcfmt** already appears to be running on the specified device

0x5f unable to wire memory for program use

0x60 the specified drive is in use

0x61 unable to take drive offline

0x62 unable to re-attach drive

0x63 no such device

0x64 unable to determine status of drive from the du-driver

0x65 operation interrupted by SIGINT

0x66 command line dkd number does not match ioconfig

0x67 unable to obtain unit name from du_driver or

unable to obtain driver handle from du_driver

0x69 ConvexOS is running. Execute **idcfmt** from a system terminal

0x6a Slipped sector not written to top cyl defect list

0x6b Attempt to write topology cylinder grown defects section failed

0x6c None of the enabled drives were successfully initialized

FILES

Format of manufacturers defect file

When the user specifies the -m option on the command line, **idcfmt** expects the specified file pathname to point to an ascii file with the following data.

Cylinder track byte_count_from_index defect_length_in_bits

There should be one line in the file for each defect entry. All numbers are in decimal. Due the peculiarity of the way defect data is encoded for multiple heads per track disk drives, it is extremely difficult to guess what sector an error will occur for a given byte count from index. The -m option is provided so that the user can recover defect data from a paper copy. If the user wishes to force a sector to be treated as defective during the initial format of the drive, he should make an entry in the grown defect table.

Format of grown defect file

When the user specifies the -g option on the command line, **idcfmt** expects the argument after the -g to point to ale in the following format:

Cylinder track sector

There should be one line in the file for each defective sector. All numbers are in decimal.

Format of pattern

The -p option on the command line is used to change the default set of patterns used during pattern testing of a disk drive. The argument after the -p flag should point to ale that contains a set of hex digits that will be used to pattern test the drive. Thus, ale containing

1 4 c 9abdef01

will cause four patterns to be used for pattern testing. The first pattern will fill the disk with all 0x11111111, the second with all 0x44444444, the third with 0xccccccccc, and finally, 0x9abcdef01. It should be noted that entering a single hex digit of 1 is the same as entering it as 11, 1111, and 11111111. It is also possible to enter a pattern of 23456789a and then the pattern generated will be

23456789 a2345678 9a234567 89a23456 789a2345...

When the pattern is specified with a length of 1, 2, 4 or 8 hex digits, the initialization of the data buffer is much faster. Specifying a pattern as 111 instead of 1, 11, 1111, or 11111111 results in over 16x the amount of time needed to initialize the buffer.

Default pattern files

Entries in DB_idc specify the default pattern. The 4 pattern files are RLL_1_7, RLL_1_7.2hp, RLL_2_7 and RLL_2_7.2hp. The pattern files are kept in */usr/lib* in the ConvexOS file system, and in */mnt/usr/lib* on the Service Processor file system.

Default pattern files contents

RLL_1_7 :	f1 7 6 8f c7 e e3 7c
RLL_1_7.2hp :	f1 7 6 8f c7 e e3 7c
RLL_2_7 :	0 c 1 4 9abcdef0 5 d 789abcde
RLL_2_7.2hp :	0 c 1 4 9a9abcbcdedef0f0 5 d 78789a9abcbcdede

Output from prtlog during **idcfmt**

When **idcfmt** executes, it may cause error conditions that cause the IDC software to generate messages. These messages are normally put in*/mnt/errlog* on the Service Processor.

Format of DB_idc

Below is a sample of **idcfmt**'s database. This file is normally kept in */usr/lib/DB_idc* in the ConvexOS file system, and in */mnt/usr/lib/DB_idc* on the Service Processor file system. The numbers in this file have been carefully chosen to yield optimal performance and reliability. These numbers should not be changed by the user. Changing these numbers and formatting a drive will produce a disk drive that is not usable under the ConvexOS.

```
# DB_idc - IPI DISK DRIVE PARAMETER FILE
#
# Drive Name Description
# ---------- -----------
# DKD-501 Imprimis(CDC) 97209 Se 1.2 GB. IPI-2
# DKD-502 Imprimis(CDC) 97229 Se-5L2 1.153 GB. IPI-2 (2 head parallel)
# DKD-503 Imprimis(CDC) Se 7 3.0 GB. IPI-2 (Serial)
# DKD-504 Imprimis(CDC) Se 7 3.0 GB. IPI-2 (2 head parallel)
# DKD-505 Seagate Elite3 3.3 GB Enhanced IPI-2 (2 head parallel)
# Zone Bit Recording
#
#---------------------------- Regular IPI-2 drive --------------------------
#
# a b c d e f g h i j k l m n o p q r s
# ------- ----------- ---- ------ - ---- -- - -- -- - - - - - -- -- -- - --
# DKD-501 CDC_MPI_EMD5 1635 50400 P 2048 15 1 23 9 1 1 1 1 12 10 20 1 10
#
# t u v w
# ------- ---- -------- ---------------------------
# DKD-501 BYTE 3000000 usr/lib/idc_pat_rll_2-7
#
#--------------------------- Zone bit recording drive ----------------------
#
# a' b' c' d' e' f' g' h' i' j' k' l' m' n' o' p' q'
# ------- ------------ -- ---- ---- -- -- -- -- -- -- -- -- --- --- -- --
```

```
# DKD-505 SEAG2HD_E3L2 18 2738 2048 10 2 15 2 1 1 1 12 0 0 2 20
#
# r' s' t' u'
# ------- ---- -------- ------------------
# DKD-505 BYTE 16777200 usr/lib/RLL_1_7.2hp
#
# v' w' x' y' z' 0' 1'
# --- ------- ---- ---- ---- -- --
# 0 DKD-505 0 200 72799 P 62
#
#=============================================================================
1 DKD-501 CDC_MPI_EMD5 1635 50400 P 2048 15 1 23 9 1 1 1 1 12 10 20 1 10
2 DKD-501 BYTE 3000000 usr/lib/RLL_2_7
1 DKD-502 CDC_MPI_S5L2 1635 50400 P 2048 7 2 45 15 1 1 1 1 12 14 34 2 10
2 DKD-502 BYTE 6000000 usr/lib/RLL_2_7.2hp
1 DKD-501 SEAGMPI_EMD5 1635 50400 P 2048 15 1 23 9 1 1 1 1 12 10 20 1 10
2 DKD-501 BYTE 3000000 usr/lib/RLL_2_7
1 DKD-502 SEAGMPI_S5L2 1635 50400 P 2048 7 2 45 15 1 1 1 1 12 14 34 2 10
2 DKD-502 BYTE 6000000 usr/lib/RLL_2_7.2hp
1 DKD-503 SEAG1HD_S7K1 2655 63840 P 2048 19 1 29 15 1 1 1 1 12 11 40 1 20
2 DKD-503 BYTE 4644360 usr/lib/RLL_1_7
1 DKD-504 SEAG2HD_S7L2 2655 63840 P 2048 9 2 56 15 1 1 1 1 12 2 40 2 20
2 DKD-504 BYTE 9288720 usr/lib/RLL_1_7.2hp
#=============================================================================
3 DKD-505 SEAG2HD_E3L2 18 2738 2048 10 2 15 2 1 1 1 12 0 0 2 20
4 DKD-505 BYTE 16777200 usr/lib/RLL_1_7.2hp
5 0 DKD-505 0 200 72799 P 62
5 1 DKD-505 201 417 71399 P 61
5 2 DKD-505 418 628 69999 P 60
5 3 DKD-505 629 810 68599 P 59
5 4 DKD-505 811 973 67199 P 57
5 5 DKD-505 974 1131 65799 P 56
5 6 DKD-505 1132 1288 64399 P 55
5 7 DKD-505 1289 1425 62999 P 54
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5 10 DKD-505 1659 1769 58799 P 50
5 11 DKD-505 1770 1871 57399 P 49
5 12 DKD-505 1872 1968 55999 P 48
5 13 DKD-505 1969 2095 54599 P 47
5 14 DKD-505 2096 2299 53199 P 45
5 15 DKD-505 2300 2424 51799 P 44
5 16 DKD-505 2425 2561 50399 P 43
5 17 DKD-505 2562 2737 48999 P 42
#=============================================================================
#
# LEGEND for regular IPI-2 drives
# a - drive name - Must be an unique DKD-NNN number.
# b - mfg id/model number
#
# mfg id - 4 bytes obtained by read cog of drive, eg. "CDC_"
# model number - 8 bytes obtained by read cog of drive, eg. "MPI_S5L2"
#
```

```
# Note: See product speccation manual of IPI-2 drive for these info.
# Replace any spaces in the field with underscore characters.
#
# c - Total number of cylinders per unit
# d - Number of bytes per track (see e)
#
# e - P - ( deld is the physical bytes per track )
# L - ( deld is the logical bytes per track)
# The logical bytes per track is the physical bytes per track multiplied
# by the number of heads per logical track. eg. DKD-502 entry can have an
# alternate speccation of '100800' for the d field and 'L' for the
# eeld.
#
# f - Number of data bytes per sector
# g - Number of logical tracks per cylinder
# h - Number of heads per logical track
# i - Number of sectors per logical track
# j - Number of spare sectors per user cylinder
# k - Number of cylinders reserved for diagnostic use
# l - Number of cylinders reserved for manufacturers defect map
# m - Number of cylinders reserved for describing drive topology
# n - Number of cylinders reserved for spares.
#
# o - Header size
# p - Header gap
# q - Data gap
# r - Ecc interleave (options are 0, 1, 2 or 4)
# s - Number of spare sectors per topology cylinder
# t - This should have the same DKD name as line 1 of the entry.
# u - Data Interleave, applicable only to parallel heads (BIT, BYTE, WORD)
# v - Drive data transfer rate in bytes
# w - pathname of ascii hex patternle. If the pathname starts
# with a /, it will be used as is. If it does not, a "/mnt/"
# will be prepended to the pathname when on the spu, and a
# "/" will be prepended when on the JP.
#
#-------------------------------------------------------------------------
# LEGEND for enhanced IPI-2 (zone bit recording) drives
#
# a' - Drive name - Must be an unique DKD-NNN number.
# b' - Mfg id/model number
# c' - Number of zones in drive
# d' - Total number of cylinders per unit
# e' - Number of data bytes per sector (2K sector size)
# f' - Number of logical tracks per cylinder
# g' - Number of heads per logical track
# h' - Number of spare sectors per user cylinder
# i' - Number of cylinders reserved for diagnostic use
# j' - Number of cylinders reserved for manufacturers defect map
# k' - Number of cylinders reserved for describing drive topology
# l' - Number of cylinders reserved for spares.
# m' - Header size
# n' - Header gap (in 50 nanoseconds increments for buffered drive)
```

```
# * Use recommended MTD value of 0x100. 0x100 * 50 = 12.8 microseconds
# o' - Data gap (in 50 nanoseconds increments for buffered drive)
# * Use recommended MTD value of 0x100. 0x100 * 50 = 12.8 microseconds
# p' - Ecc interleave (options are 0, 1, 2 or 4)
# q' - Number of spare sectors per topology cylinder
# r' - This should have the same DKD name as line 1 of the entry.
# s' - Data Interleave, applicable only to parallel heads (BIT, BYTE, WORD)
# t' - Drive data transfer rate in bytes, assume 16M xfer rate
# u' - pathname of ascii hex patternle. If the pathname starts
# with a /, it will be used as is. If it does not, a "/mnt/"
# will be prepended to the pathname when on the spu, and a
# "/" will be prepended when on the JP.
# v' - Zone number, from 0 to (number of zones - 1)
# w' - This should have the same DKD name as previous entry.
# x' - Starting cylinder in this zone
# y' - Ending cylinder in this zone
# z' - number of bytes per track (see 0')
# 0' - P - ( z'eld is the physical bytes per track )
# L - ( z'eld is the logical bytes per track)
# 1' - Number of sectors per logical track
#-------------------------------------------------------------------------------
```

BUGS

No known bugs as of 04/93.

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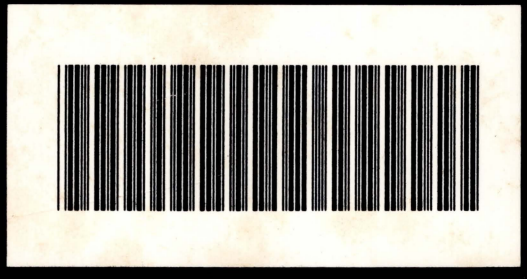
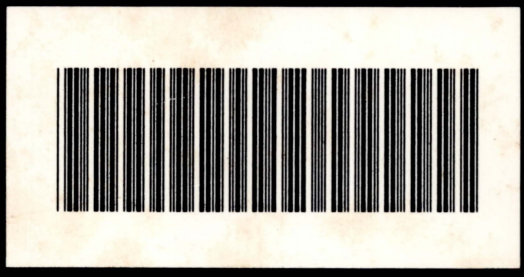


Order Number
DHW-261

Document Number
081-010230-000



Order Number
DHW-261

Document Number
081-010230-000