CONVEX

Field Support Tech Tip

Product: C-1
Tech Tip Number: Disc-001
Date: Dec. 8, 1986 (Rev. 12/15/87)
Subject: Xylogics Controller Info
Submitted By: Brad Jones

There are three (3) basic models of the Xylogics Disc Controller. The characteristics of each are defined in the table below.

XYLOGICS PART NUMBER	CHARACTERISTICS & OTHER INFORMATION
900-450-904	1. **Should no longer be used in the field.** 2. Only supports one (1) Fujitsu Eagle **or** one (1) CDC 9766 (SMD) Drive. 3. Contains a 2 KB Data Buffer. 4. Location J8 PROM is Part Number 180-001-954. 5. Location J9 PROM is Part Number 180-001-956. 6. Replaced by Xylogics Controller Part Number 900-450-905. 7. Will **not** support NEC D2352, NEC D2363, or CDC 9715 Discs.
900-450-905	1. Replacement for Xylogics Controller Part Number 900-450-904. 2. Supports **multiple** (1-4) Fujitsu Eagle, NEC D2352, or CDC 9766 (SMD) Discs. 3. Contains an 8 KB Data Buffer. 4. Location J8 PROM is Part Number 180-001-963. 5. Location J9 PROM is, **either**, Part Number 180-001-964 or Part Number 180-001-956. 6. Will **not** support the CDC 9715 (FSD) or NEC D2363 Disc Drives. 7. If Revision **E** or later, different disc types can be intermixed if their **ID**'s are different (Reference Tech Tip *Disc-009*). **STRAPPING WARNING:** The 8 KB Data Buffer requires straps from JT1 to JT2 and from JV1 to JV2. If strapped incorrectly (e.g., JT1 to JT2 and JV2 to JV3), Data **destruction**, Unrecoverable Errors, and *fsck* errors will occur. Therefore, **always** check these straps (as well as the others) prior to use.
900-451-905	1. Supports **multiple** (1-4) Fujitsu **Eagle**, CDC 9766 (SMD), CDC 9715 (FSD), NEC D2352, and NEC D2363 Disc Drives. 2. Different disc types can be intermixed so long as the Drive Type **ID**'s are different (Reference Tech Tip *Disc-009*). 3. Contains an 8 KB Data Buffer. 4. Location D10 PROM is Part Number 180-002-085. 5. Location E12 PROM is Part Number 180-002-083. 6. Location E04 EPROM is Part Number 180-002-079. 7. Location C01 PAL is Part Number 180-001-012. 8. Location B10 Disc Sequencer is Part Number 180-002-084. 9. Location E12 Disc Sequencer is Part Number 180-002-086.

CONVEX

Field Support Tech Tip

Product: C-1
Tech Tip Number: Disc-002
Date: Dec. 19, 1986 (Rev. 02/10/89)
Subject: Disc Partitions
Submitted By: TAC-hw

DISC PARTITIONING INFORMATION

NAME OF PARTITION	*DISC TYPE	CYLINDERS USED		PHYSICAL SECTORS	DISKTAB SECTORS
		IN DECIMAL	IN HEXADECIMAL		
	FUJI	000 thru 041	000 thru 029	37,800	37,800
	NEC*	000 thru 037	000 thru 025	42,598	42,496
A	NEC#	000 thru 050	000 thru 032	92,259	92,160
5%	FSD	000 thru 035	000 thru 023	42,336	42,336
	SMD	000 thru 040	000 thru 028	24,149	24,149
	RDD	000 thru 044	000 thru 02C	31,500	31,488
	FUJI	042 thru 209	030 thru 0D1	151,200	151,200
	NEC*	038 thru 189	026 thru 0BD	170,392	170,368
B	NEC#	051 thru 255	033 thru 0FF	370,845	369,024
20%	FSD	036 thru 177	024 thru 0B1	166,992	166,992
	SMD	041 thru 205	029 thru 0CD	97,185	97,185
	RDD	045 thru 224	02D thru 0E0	126,000	125,952
	FUJI	000 thru 839	000 thru 347	756,000	756,000
	NEC*	000 thru 757	000 thru 2F5	849,664	849,664
C	NEC#	000 thru 1020	000 thru 3FC	1,846,989	1,837,824
100%	FSD	000 thru 708	000 thru 2C4	833,784	833,784
	SMD	000 thru 819	000 thru 333	482,980	482,980
	RDD	000 thru 899	000 thru 383	630,000	626,432
	FUJI	210 thru 251	0D2 thru 0FB	37,800	37,800
	NEC*	190 thru 227	0BE thru 0E3	42,598	42,496
D	NEC#	256 thru 306	100 thru 132	92,259	92,160
5%	FSD	178 thru 213	0B2 thru 0D5	42,336	42,336
	SMD	206 thru 246	0CE thru 0F6	24,149	24,149
	RDD	225 thru 269	0E1 thru 10D	31,500	31,488

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Field Support Tech Tip

Tech Tip Number: Disc-002

DISC PARTITIONING INFORMATION

NAME OF PARTITION	*DISC TYPE	CYLINDERS USED IN DECIMAL	CYLINDERS USED IN HEXADECIMAL	PHYSICAL SECTORS	DISKTAB SECTORS
	FUJI	252 thru 504	0FC thru 1F8	227,700	227,700
	NEC*	228 thru 455	0E4 thru 1C7	255,588	255,488
E	NEC#	307 thru 613	133 thru 265	555,363	555,264
30%	FSD	214 thru 426	0D6 thru 1AA	250,488	250,488
	SMD	247 thru 493	0F7 thru 1ED	145,483	145,483
	RDD	270 thru 539	10E thru 21B	189,000	188,928
	FUJI	505 thru 588	1F9 thru 24C	75,600	75,600
	NEC*	456 thru 531	1C8 thru 213	85,196	85,120
F	NEC#	614 thru 715	266 thru 2CB	184,518	186,240
10%	FSD	427 thru 497	1AB thru 1F1	83,496	83,496
	SMD	494 thru 575	1EE thru 23F	48,298	75,600
	RDD	540 thru 629	21C thru 275	63,00	62,976
	FUJI	210 thru 588	0D2 thru 24C	341,100	341,100
	NEC*	190 thru 531	0BE thru 213	383,382	383,360
G	NEC#	256 thru 715	100 thru 2CB	832,140	833,920
45%	FSD	178 thru 497	0B2 thru 1F1	376,320	376,320
	SMD	206 thru 575	0CE thru 23F	217,930	217,930
	RDD	225 thru 629	0E1 thru 275	283,500	283,392
	FUJI	589 thru 839	24D thru 347	225,900	225,900
	NEC*	532 thru 757	214 thru 2F5	253,346	253,312
H	NEC#	716 thru 1020	2CC thru 1020	551,745	551,680
30%	FSD	498 thru 708	1F2 thru 2C4	248,136	248,136
	SMD	576 thru 819	240 thru 333	143,716	143,716
	RDD	630 thru 899	276 thru 383	189,000	185,472

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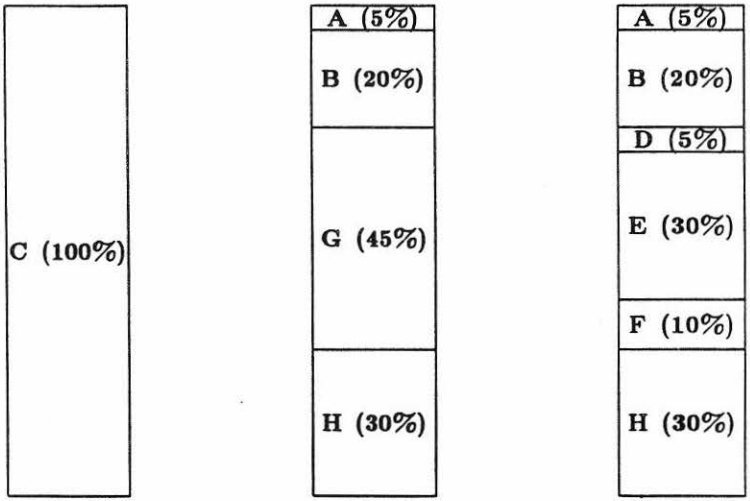
DISC PARTITION LAYOUTS



DISC TYPES

FUJI	**M2351A (474 MB Eagle)**	**(UNIX ID DKD-001)**
NEC*	**NEC D2352 (520 MB)**	**(UNIX ID DKD-005)**
NEC#	**NEC D2363 (1.1 GB)**	**(UNIX ID DKD-008)**
FSD	**CDC 9715 (515 MB FSD)**	**(UNIX ID DKD-003)**
SMD	**CDC 9766 (300 MB SMD)**	**(UNIX ID DKD-002)**
RDD	**HITACHI DK514 (382 MB)**	**(UNIX ID DKD-214)**

CONVEX

Field Support Tech Tip

Product: C-1
Tech Tip Number: Disc-003
Date: December 19, 1986
Subject: Disc Error Messages
Submitted By: Brad Jones

NOTE: **This Tech Tip is a replacement for the present Tech Tip Number Disc-003, entitled, "Xylogics Disk Controllers" and dated March 27, 1986. Therefore, discard the old version of Disc-003 as that information is presently contained in Tech Tip Number GEN-004, December 15, 1986, entitled, "Peripheral Configurators" and Tech Tip Number Disc-001, December 8, 1986, entitled, "Xylogics Controller Info".**

Disc Error Message formats and interpretations are:

ERROR FORMAT 1 - **[IOP#@Time] aaa: bbb:ccc [ddd]**
- OR -
[IOP#@Time] aaa: ccc [ddd]

Where:

- **aaa:** = The Disc Drive addressed when the error was detected (e.g., da0, da2, etc.).
- **bbb:** = If applicable, the type of operation (e.g., Read, Write, etc.).
- ccc = The type of error (e.g., Soft ECC Error, Drive Not Ready, etc.). This information is an interpretation of the Controller's Status information that was in the CSR and Status Bytes 1, 2, and A (see pages 4 thru 7).
- [ddd] = The **starting** Cylinder, Head, and Sector addresses **and** the number of sectors (i.e., **sect-cnt** or **cnt**) to be transferred.

Examples:

- da1: Read:Soft ECC Error [cyl=713 hd=14 sect=32 cnt=6]
- da3: Read:Disk Sequencer Error [head=14 sect=34 cyl=154 sect-cnt=8]
- da1: Drive Not Ready [head=15 sect=33 cyl=71 sect-cnt=30]
- da0: Write Protect Error [head=16 sect=8 cyl=292 sect-cnt=8]
- da5: Slave ACK Error [head=0 sect=15 cyl=214 sect-cnt=16]

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ERROR FORMAT 2 - [IOP#@Time] daxxx: dev=yy stat=zz
- OR -
[IOP#@Time] da: xxx (cntlr_dev=yy)

Where:

- **da** = Indicates that the type of error is Controller-related rather than caused by a specific Disc Drive.
- **xxx:** = The type of error (e.g., Timeout, Double Error, etc.). This information is an interpretation of the Controller's Status information that was in the CSR (see page 4) or, if the Controller failed to complete an operation in the specified period of time, a **timeout** message to indicate that condition.
- **yy** = The Controller (**not** Disc Drive) that the error is related to. The value of **yy** is obtained by the **decimal** formula:

  (8 X Multibus Number) + Controller Interrupt Level = **dev** OR **cntlr_dev**

  For example, if the Disc Controller in Multibus 1 is strapped for an Interrupt Level of 2; **dev** OR **cntlr_dev** will be **"10"**. If a Disc Controller is strapped for Interrupt Level 1 and located in Multibus 0, **dev** OR **cntlr_dev** will then be **"1"**. As can be seen, if an IOP is restricted to supporting only a Multibus 0 and/or 1 **and** if Interrupt Levels must be in the range of 0 thru 7, the **decimal** value of **dev** OR **cntlr_dev** must always be **0** thru **15**.
- **zz** = The **hexadecimal** status obtained from the CSR of the Controller identified by **dev** OR **cntlr_dev**. See page 4 for CSR information.

Examples:

- da: double error (cntlr_dev=2)
- datimeout: dev=10 stat=01

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Retry Count:

Depending on the type of error, the driver will attempt a disc operation a given number of times (the initial plus retries, if any) before aborting. Therefore, an Error Message does not necessarily mean that the operation failed; it may only be advising as to the number of attempts required to successfully perform an operation.

An operation that was, ultimately, **unsuccessful** can be identified by the final message, "*unrecoverable disk error*" as shown in the examples below:

```
[CCU7@09:32:02] da0: Write Protect Error [head=7 sect=22 cyl=407 sect-cnt=8]
                da0: unrecoverable disk error

[CCU6@14:07:18] da2: Hard ECC Error [head=12 sect=37 cyl=123 sect-cnt=128]
[CCU6@14:07:21] da2: Hard ECC Error [head=12 sect=37 cyl=123 sect-cnt=128]
[CCU6@14:07:21] da2: Hard ECC Error [head=12 sect=37 cyl=123 sect-cnt=128]
[CCU6@14:07:22] da2: Hard ECC Error [head=12 sect=37 cyl=123 sect-cnt=128]
[CCU6@14:07:22] da2: Hard ECC Error [head=12 sect=37 cyl=123 sect-cnt=128]
[CCU6@14:07:24] da2: Hard ECC Error [head=12 sect=48 cyl=123 sect-cnt=117]
                da2: unrecoverable disk error
```

ECC Errors (*with Convex UNIX V6.0 and later*):

A Hard or Soft ECC Error is announced on the System Console and written to the SPU file */mnt/errlog* when it first occurs. Soft ECC errors are then **quietly** retried up to nine (9) times. If none of the retries are successful, the ECC correction is done and the program moves on. Hard ECC errors are retried as for any other error and an ***unrecoverable disk error*** is announced if the retry count is exhausted.

An example of the reporting method for a Soft ECC error is shown below:

```
[CCU7@03:21:07] da4: Read:Soft ECC Error [cyl=368 head=10 sect=32 cnt=6]
```

With Convex UNIX V6.0 and later, the *sect* (sector) number shown is the **actual** one with the error and the *cnt* (count) is the number of sectors remaining to be read after the one in error. Therefore, in the example above, the Soft ECC Error actually occurred at Cylinder 368, Head 10, Sector 32 and the sector count (6) is "don't care".

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Controller Status Bytes:

Disc Errors that are reported to the System Console and to the Error Log are the result of the completion status received from the Xylogics 450 or 451 Disc Controller. The Disc Controller status is contained in the Control and Status Register (**CSR**) and in Bytes 2, 3 and A of the Input/Output Parameter Block (**IOPB**). Byte 2 of the IOPB contains Status Byte 1, Byte 3 of the IOPB contains Status Byte 2 and Byte A of the IOPB contains the Drive Status. The possible contents of IOPB Byte 2, IOPB Byte 3, IOPB Byte A, and the CSR Byte are detailed below and in the following pages.

CONTROL AND STATUS REGISTER (CSR) BYTE
(NOTE: Bit 0 is Least Significant)

BIT	MNEMONIC	DIRECTION	DESCRIPTION
7	GBSY	Read/Write	**GO/BUSY**. When **set**, the Controller is busy executing a command. When **reset**, the controller is idle.
6	ERR	Read/Write	**GENERAL ERROR**. When **set**, command execution has been terminated due to a hard error (see IOPB Byte 3 for more details regarding the error condition). When **reset**, the last operation did not end in a hard error.
5	DERR	Read	**DOUBLE ERROR**. When **set**, an error condition occurred before a previous error condition was cleared. This indicates that the Controller could not pass status to host memory due to a previous error condition.
4	IPND	Read/Write	**INTERRUPT PENDING**. When **set**, an operation has completed, the Controller has interrupted, **and** the interrupt has not been serviced.
3	ADRM	Read	**ADDRESSING MODE**. When **set**, the Controller is in 24-bit addressing mode. **Reset** indicates 20-bit mode.
2	AREQ	Read/Write	**ATTENTION REQUEST**. Host software **sets** this bit to gain the attention of the Controller. The Controller reponds by **setting** AACK (CSR Bit 1).
1	AACK	Read	**ATTENTION ACKNOWLEDGE**. **Set** to acknowledge an AREQ (CSR Bit 2). The Controller **resets** this bit after the host software **resets** AREQ.
0	DRDY	Read	**DRIVE READY**. **Set** when the last drive selected is Ready and On Cylinder.

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IOPB BYTE 2 (STATUS BYTE 1)
(NOTE: Bit 0 is Least Significant)

BIT(S)	MNEMONIC	DESCRIPTION
7	ERRS	**ERROR SUMMARY**. **Set** when a hard error occurred during an operation. **Reset** indicates successful completion. Does **not** get set on a Soft Error or on an ECC Mode 3 Hard Error.
6,5		**RESERVED (NOT USED).**
4,3,2	CTYP	**CONTROLLER TYPE**. Valid combinations of Bits 4, 3, and 2 are: **Bit 4** **Bit 3** **Bit 2** **Controller Type** 0 0 0 440 0 0 1 450, 451 0 1 0 472
1		**RESERVED (NOT USED).**
0	DONE	**DONE.** When **set**, the command is complete. IOPB Byte 3 (Status Byte 2) contains the Completion Code.

IOPB BYTE A (DRIVE STATUS)
(NOTE: Bit 0 is Least Significant)

BIT(S)	MNEMONIC	DESCRIPTION
7	ONCL	**ON CYLINDER**. If **reset**, the selected drive is On Cylinder.
6	DRDY	**DISC READY**. If **reset**, the selected drive is Ready.
5	WRPT	**DISC WRITE PROTECT**. If **set**, the selected drive is Write Protected.
4	DBP	**DUAL PORT BUSY**. If **set**, the Controller attempted to select a Dual Ported Drive that was reserved by another Controller.
3	SKER	**HARD SEEK ERROR**. If **set**, the selected drive has a Seek Error condition.
2	DFLT	**DISC FAULT**. If **set**, the selected drive has a Fault condition.
1,0		**RESERVED (NOT USED).**

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IOPB BYTE 3 (STATUS BYTE 2)

Once the Controller completes an operation, IOPB Byte 3 (Status Byte 2) contains the Completion Code. The Byte is interpreted as a Hexadecimal value ranging from '00' thru '25'. The definitions of all valid values are shown below.

VALUE	DESCRIPTION
00	**SUCCESSFUL COMPLETION.** No errors during operation.
01	**INTERRUPT PENDING.** The Controller attempted an operation with a previous interrupt (IPND - CSR Bit 4) still pending.
02	**RESERVED (NOT USED).**
03	**BUSY CONFLICT.** A register write was attempted while GBSY (CSR Bit 7) was set.
04	**OPERATION TIMEOUT.** The Controller did not complete an operation within two (2) seconds.
05	**HEADER NOT FOUND.** The Controller cannot find the requested sector.
06	**HARD ECC ERROR.** If ECC is **enabled**, the Controller detected a data error greater than eleven (11) bits in length **or**, if ECC is **disabled**, a data error, regardless of length, was detected.
07	**ILLEGAL CYLINDER ADDRESS.** Host software specified a cylinder address that was greater than the maximum value available.
08,09	**RESERVED (NOT USED).**
0A	**ILLEGAL SECTOR ADDRESS.** Host software specified a sector address that was greater than the maximum value available.
0B,0C	**RESERVED (NOT USED).**
0D	**LAST SECTOR TOO SMALL.** The very last (runt) sector **or** all the sectors are too small to contain a complete header.
0E	**SLAVE ACKNOWLEDGE ERROR.** The host memory addressed by the Controller is non-existent **or** failed to respond.
0F,10,11	**RESERVED (NOT USED).**
12	**CYLINDER & HEAD ERROR.** The Cylinder or Head Address read from the Disc does not match the Controller's Cylinder and Head Address information.
13	**SEEK RETRY REQUIRED.** In response to a Seek Error, the Controller recalibrated (RTZ) the Disc Drive, cleared the Seek Error indication, and re-performed the Seek Operation.

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IOPB BYTE 3 (STATUS BYTE 2)

NOTE: THIS TABLE IS CONTINUED FROM THE PREVIOUS PAGE.	
VALUE	DESCRIPTION
14	**WRITE PROTECT ERROR.** The Controller attempted a Write Operation to a Write Protected Drive.
15	**RESERVED (NOT USED)**
16	**DRIVE NOT READY.** The selected Disc Drive is Not Ready or, possibly, in a Fault condition.
17	**SECTOR COUNT ZERO.** Host software specified a Sector count of zero (0) which is illegal.
18	**DRIVE FAULTED.** The selected Disc Drive is in a Fault condition.
19	**ILLEGAL SECTOR SIZE.** The selected Drive's sectoring method does not allow enough room for the Controller to write the Header and Data fields.
1A	**SELF TEST A FAILURE.** The Controller's Microprocessor or Internal RAM failed diagnostics.
1B	**SELF TEST B FAILURE.** The Controller's Microprocessor or Header Shift Register failed diagnostics.
1C	**SELF TEST C FAILURE.** The Controller's Buffer RAM failed diagnostics.
1D	**RESERVED (NOT USED).**
1E	**SOFT ECC ERROR.** During a Read operation in ECC Mode 0, the Controller detected, but did not fix, a **correctable** (11 Bits or less) Data Error.
1F	**SOFT ECC RECOVERED ERROR.** During a Read operation in ECC Mode 2, the Controller corrected one or more ECC errors during the transfer.
20	**ILLEGAL HEAD ADDRESS.** Host software specified a head address that was greater than the maximum value available.
21	**DISC SEQUENCER ERROR.** The disc sequencer was unable to finish a Read or Write operation within the allotted time. Possible causes are loss of Read Data or Servo Clock from the Drive or failure of the Controller to gain access to the Multibus.
22,23,24	**RESERVED (NOT USED).**
25	**SEEK ERROR.** Host software specified a cylinder or head address that was greater than the maximum value available.

CONVEX

Field Support Tech Tip

Product: C-1
Tech Tip Number: Disc-004
Date: Dec. 22, 1986 (Rev 09/15/87)
Subject: Disc Diagnostic **dev4110**
Submitted By: Brad Jones

The Disc Diagnostic program **dev4110** should be in System Diagnostics, Versions 6.2 and later. The purpose of this Tech Tip is to provide information and cautions relative to the usage of **dev4110**.

Highlights of dev4110 are:

- Concurrently formats 1 to 12 Disc Drives.
- Allows interactive exercise of 1 Disc Drive at a time.
- Obsoletes the SPU **diskfmt** Utility program.

Cautions for dev4110 are:

- The interactive function, **slip_sectors**, will *attempt* to perform in a non-destructive manner. That is the data will be read from the selected track, *if possible*, and saved prior to slipping the sector(s). Then, once the sector has been slipped, the data will be restored. If a sector cannot be read error-free, the user has the option of skipping, aborting or retrying the operation. It should be noted that the saved data is held in **memory**, not on disc. Therefore, should a power failure or program problem occur, the saved data could be lost. To protect against loss of the customer's data, a full **dump** of the affected partition(s)* **must** be done prior to invoking the **slip_sectors** function.
- The interactive function, **save_track_data**, holds the contents of the specified track in **memory**, not on disc. If, prior to restoring the saved data from memory to disc, any writes are to be done to the saved track, a full **dump** of the appropriate partition* must be done. Should a power fail or abnormal program termination occur, the data in memory will be **lost**, but the contents of the dump tape will save the day.
- Only one (1) track of data can be saved in memory at any time. Therefore, second and subsequent **save_track_data** commands will destroy the previous contents of the buffer. Always remember to do a **restore_track_data** prior to saving another track's contents or there is a risk of losing valid data.

* = Reference Tech Tip Number Disc-002 for Disc Address-to-Partition information.

CONVEX

Field Support Tech Tip

Product: C-1
Tech Tip Number: Disc-005
Date: Dec. 22, 1986 (Rev. 12/15/87)
Subject: Disc Format Program
Submitted By: Brad Jones

The purpose of this Tech Tip is to document problems with and instructions for using the SPU program '**diskfmt**' (**NOTE**: *NEVER* use '**diskfmt**' if '**dev4110**' is available).

- The SPU program, '**diskfmt**' *cannot* properly format the NEC 1.1 GB (DKD-008) drive for system use. '**diskfmt**' is only capable of properly formatting drive types in use prior to the release of the DKD-008; which are DKD-001, DKD-002, DKD-003, and DKD-005 (Reference Tech Tip Disc-011 for additional information).
- '**diskfmt**' can slip only one (1) sector per track. If the program is run properly, bad sectors that cannot be slipped will be entered into the '**Bad Block Table**'. Any sectors located in the Bad Block Table will be pointing to an alternate area of the Disc for use by UNIX. So, while UNIX is up and running, the Bad Block Table is referred to as the '**Forwarded Sector Table**'.
- If the '**diskfmt**' *verify_format* function cannot locate a sector on a particular track, a '**Header Not Found**' Error Message is displayed even if the sector is in the Bad Block Table. If a 'Header Not Found' condition is seen, look in the Bad Block Table (via the **display bbt** command) for the address that was displayed. If the address is found in the Bad Block Table, there is no problem.
- SPU program '**diskfmt**' contained in System Diagnostics Releases 5.0 and later has been modified. The interactive mode of operation was once invoked by the option '**-c -**'. In Releases 5.0 and later, the option for interactive mode is '**-interactive -**'.
- To **reliably** slip a defective sector, the following sequence **must** be followed **after** the affected disc partition has been dumped to tape. Reference Tech Tip Disc-002 for Disc Partitioning information.

STEP	*COMMAND*	
1.	(spu)> *diskfmt -winteractive -*	(5.0 or later)
	- OR -	
	(spu)> *diskfmt -wc -*	(4.1 or earlier)
2.	When prompted, select the desired Disc Number, answer '**y**' when asked if you wish to continue, and wait for the '>' prompt.	
3.	> *get bbt*	(Reads Bad Block Table from Disc to Memory)
4.	> *display bbt*	(Displays contents of Bad Block Table)
5.	Examine the contents of the Bad Block Table (BBT) for any entries. If *none* are seen (i.e., BBT is empty), continue at Step 5.B.a. If there are *any* entries, perform the following:	
	A. Check for any BBT entries that are on the same Cylinder and Head as the new one that is to be slipped. If *none* are seen, continue at Step 5.B.a. If *any* match, continue at Step 5.B.	

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(Continuation of Step 5)

STEP	*COMMAND*
5.	B. If BBT entries are found that are on the same Cylinder and Head as the new one that is to be slipped, the following steps are necessary to properly slip another sector on that Cylinder and Head. A single sector in the BBT for the Cylinder and Head in question means that there are already two (2) flawed areas on that surface; one of which has been slipped and the second of which has been placed in the BBT. (NOTE: In the following steps, the Cylinder and Head numbers input must be identical to those where the sector is to be slipped. If any others are used, data will be lost that may not have been dumped to tape)

a. **Note:** The following steps must be performed in all cases, *not* just for those situations where two (2) or more sectors have previously been slipped. One (1) sector may have already been slipped which would be transparent. If a second sector is then slipped, the result would be a different problem (i.e., the original one would reappear).

b. > *format logical ccc hh 00 to ccc hh zz* **(This is data destructive!)** Where *ccc* = the Cylinder number, *hh* = the Head number, and *zz* = the last logical sector on the track (e.g.; '45' for a Fujitsu Eagle and '59' for an NEC D2352). Since only the track where the sector is to be slipped must be formatted, the values input for both *ccc* fields must be identical. The same is true for both *hh* fields.

c. > *pattern_test logical ccc hh 00 to ccc hh zz with 0xpppppppp* Where *ccc* = the Cylinder number, *hh* = the Head number, *zz* = the last logical sector on the track (e.g., '45' for a Fujitsu Eagle and '59' for an NEC D2352), and *pppppppp* = the hex data pattern to use ('6db66db6' for a Fujitsu Eagle and '9abcdef0' for an NEC D2352). Since the pattern test is only to be run on the track where the sector is to be slipped, the values input for both *ccc* fields must be identical.
The same is true for both *hh* fields.

d. > *verify_format ccc hh 00 to ccc hh zz* Where *ccc* = the Cylinder number, *hh* = the Head number, and *zz* the last logical sector on the track (e.g., '45' for a Fujitsu Eagle and '59' for an NEC D2352). Since only one track is to be verified, the values input for both *ccc* fields must be identical. The same is true for both *hh* fields.

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(continuation of Step 5)

STEP *COMMAND*

e. Repeat the *verify_format* (d, above) as many times as is necessary (10 passes, minimum) to determine what the addresses of the original slipped sectors (if any) are. Once identified, write it/them down and exit **diskfmt** (via the *quit* command). Then repeat Steps 1 and 2 **only** before proceeding to Step 6. *Do not* repeat Steps 3, 4, or 5 thru 5.B.e.

6. > *make_bad ccc hh ss* Where *ccc* = the Cylinder address, *hh* = the Head address, and *ss* = the Sector address that is to be slipped. Repeat this command once for each sector that is to be slipped as determined in the previous steps. (NOTE: If the track where the slip is to take place already had one or more slipped sectors, the address of the new one to be slipped may have to be modified accordingly. For example, if sector 25 is to be slipped and sector 3 was previously slipped, you would want to slip sectors 3 and 26 since, prior to the *logical format*, log ical sector 25 was resident at *physical* sector 26. If you have any questions or problems computing the actual sector(s) that need(s) to be slipped, **call** someone for help).

7. > *display bbt* Examine the output of this command and verify that the correct Cylinder, Head, and Sector address(es) to be slipped is/are now in the BBT. If any entry is incorrect, do a *make_good ccc hh ss* to remove it from the BBT prior to re-inputting the correct address with the *make_bad* command.

8. > *slip_sectors* **(This is data destructive on the Cylinder and Head addresses found in the BBT!)**

9. > *display_bbt* Examine the output of this command to determine if any addresses are still in the BBT. If **any** are, continue at Step 10. If **none** are, continue at Step 11.

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STEP *COMMAND*

10. You should be at this Step **only** if your answer to Step 9 above was affirmative. If so, write down the address(es) shown to be in the BBT. Then, do the following:

    A. > ***get bbt***

    B. > ***display bbt*** Examine the output of this command to determine if the address(es) recorded in Step 10, above, are present. If **all** are, continue at Step 11. Otherwise, continue at Step 10.C., below.

    C. > ***make_bad ccc hh ss*** Where *ccc* = the Cylinder address, *hh* = the Head address, and *ss* = the Sector address. Use this command to add any Disc address(es) written down in Step 10, above, to the BBT, but ***do not*** duplicate any address(es) found in Step 10.B, above.

    D. > ***put bbt*** This will update the BBT on Disc to include the latest one(s) found.

11. > ***verify_format 0 0 0 to end_of_disk*** Verifies entire disc surface.

12. > ***quit*** Exit **diskfmt**. *If* Step 11 was successful, reload customer's data. If Step 11 was unsuccessful, take corrective action prior to reloading data.

CONVEX

Field Support Tech Tip

Product: DKD Devices
Tech Tip Number: Disc-006
Date: Oct. 27, 1986 (Rev. 02/21/91)
Subject: Disc Drive Specifications
Submitted By: Brad Jones

FEATURE DESCRIPTION	DISC DRIVE MODEL AND SPECIFICATIONS			
	FUJITSU M2351A	CDC 9715	NEC D2352	CDC 9766
Interface Type	SMD	SMD	SMD	SMD
Advertised Unformatted Drive Capacity	474 MB	515 MB	520 MB	300 MB
Actual Unformatted Drive Capacity	474.214 MB	516.015 MB	523.999 MB	315.242 MB
Actual Usable Formatted Drive Capacity (Megabytes)	387.072 MB (18.3761% loss)	426.897 MB (17.2704% loss)	435.056 MB (16.974% loss)	247.286 MB (21.5568% loss)
Actual Usable Formatted Drive Capacity (Sectors)	756,000	833,784	849,718	482,980
Cylinder Capacity (Unformatted)	563.2 KB	725.76 KB	689.47 KB	383.04 KB
Cylinder Capacity (Formatted)	460.8 KB	599.7 KB	573.95 KB	301.57 KB
Track Capacity (Unformatted)	28.16 KB	30.24 KB	36.29 KB	20.16 KB
Track Capacity (Formatted)	23.04 KB	24.99 KB	30.21 KB	15.87 KB
Spindle Speed	3,961 RPM	3,600 RPM	3,070 RPM	3,600 RPM
Number of Data Heads	20	24	19	19
Total Number of Cylinders	842	711	760	823
Usable Number of Cylinders	840	709	758	820
Available Sectors Per Track	45	49	59	31
Data Transfer Rate	1.859 MB/SEC	1.814 MB/SEC	1.86 MB/SEC	1.21 MB/SEC
Tracks Per Inch	880	950	1,000	384
Bits Per Inch	12,800	15,159	18,600	6038
Recording Method	MFM	2-7 RLL	2-7 RLL	MFM
Average Seek Time	18 MS	20 MS	15 MS	30 MS
Average Latency	7.5 MS	8.33 MS	9.8 MS	8.33 MS
Height	10.5"	10.2"	10.2"	36"
Width	19"	8.5"	8.5"	24"
Depth	27.5"	30.6"	29"	36"
AC Power and Frequency Requirements	100 VAC 50/60 HZ 120 VAC 60 HZ 220 VAC 50/60 HZ 240 VAC 50/60 HZ	100-120 VAC 200-240 VAC 50/60 HZ	100-120 VAC 208-240 VAC 50/60 HZ	208 VAC 60 HZ 230 VAC 60 HZ 220 VAC 50 HZ 240 VAC 50 HZ
AC Start/Run Current	5.3 A / 4.6 A (@120 V/60 HZ)	7.5 A / 3.4 A (@120 V/60 HZ)	4.7 A / 3.5 A (@120 V/60 HZ)	20 A / 8 A (@208 V/60 HZ)
Power Consumption	550 VA (@120 V/60 HZ)	408 VA (@120 V/60 HZ)	420 VA (@120 V/60 HZ)	1.2 KVA (@208 V/60 HZ)

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FEATURE DESCRIPTION	DISC DRIVE MODEL AND SPECIFICATIONS			
	NEC D2363	PRIAM 638	MICROPOLIS 1558	HITACHI DK514-38
Interface Type	SMD	SMD	SMD	ESDI
Advertised Unformatted Drive Capacity	1.1 GB	382.4 MB	382 MB	382 MB
Actual Unformatted Drive Capacity	1.133 GB	382.788 MB	382.476 MB	382.294 MB
Actual Usable Formatted Drive Capacity (Megabytes)	945.648 MB (16.535% loss)	318.566 MB (16.777% loss)	318.305 MB (16.778% loss)	322.560 MB (15.626% loss)
Actual Usable Formatted Drive Capacity (Sectors)	1,846,989	622,220	621,690	630,000
Cylinder Capacity (Unformatted)	1.106 MB	312.5 KB	312.5 KB	423.4 KB
Cylinder Capacity (Formatted)	926.21 KB	261.12 KB	261.12 KB	358.40 KB
Track Capacity (Unformatted)	40.96 KB	20.832 KB	20.832 KB	30.240 KB
Track Capacity (Formatted)	34.30 KB	17.41 KB	17.41 KB	25.60 KB
Spindle Speed	3,600 RPM	3,600 RPM	3,600 RPM	3,600 RPM
Number of Data Heads	27	15	15	14
Total Number of Cylinders	1024	1225	1224	903
Usable Number of Cylinders	1021	1222	1221	900
Available Sectors Per Track	67	34	34	50
Data Transfer Rate	2.458 MB/SEC	1.25 MB/SEC	1.25 MB/SEC	1.875 MB/SEC
Tracks Per Inch	1,290	1,070	1,070	1,033
Bits Per Inch	21,400	21,848	21,848	26,000
Recording Method	2-7 RLL	2-7 RLL	2-7 RLL	2-7 RLL
Average Seek Time	15 MS	20 MS	18 MS	16 MS
Average Latency	8.3 MS	8.3 MS	8.3 MS	8.3 MS
Height	10.2"	3.25"	3.25"	3.25"
Width	8.5"	5.75"	5.75"	5.75"
Depth	29"	8.0"	8.0"	8.0"
DC Power OR AC Power and Frequency Requirements	100-120 VAC 200-240 VAC 50/60 HZ	+ 12VDC(± 5%) + 5VDC(± 5%)	+ 12VDC(± 5%) + 5VDC(± 5%)	+ 12VDC(± 5%) + 5VDC(± 5%)
AC OR DC Start/Run Current	3.9 A / 3.4 A (@120 V/60 HZ)	+ 12=4.5A/2.2A + 5=2.1A/1.8A	+ 12=4.3A/2.0A + 5=1.5A Max.	+ 12=4.5A/2.0A + 5=1.2A Max.
Power Consumption	408 VA (@120 V/60 HZ)			

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FEATURE DESCRIPTION	DISC DRIVE MODEL AND SPECIFICATIONS			
	HITACHI DK515C-78	SEAGATE 97229-2HP	SEAGATE 97209	SEAGATE ST81236J
Interface Type	ESDI	IPI	IPI	SMD-E
Advertised Unformatted Drive Capacity	780 MB	1153 MB	1236 MB	1236 MB
Actual Unformatted Drive Capacity	780.5 MB	1153.65 MB	1236.06 MB	1236.06 MB
Actual Usable Formatted Drive Capacity (Megabytes)	659.423	1002.086	1123.024	970 MB
Actual Usable Formatted Drive Capacity (Sectors)	1287936 512byt/sec	489300 2048byt/sec	548352 2048byt/sec	1952528 512byt/sec
Cylinder Capacity (Unformatted)	573.1 KB	705.6 KB	757.8 KB	756 KB
Cylinder Capacity (Formatted)	487.424 KB	614.4 KB	688.5 KB	637.4 KB
Track Capacity (Unformatted)	40.962 KB	50.4 KB	50.4 KB	50.4 KB
Track Capacity (Formatted)	34.816 KB	43.885 KB	43.885 KB	42.496 KB
Spindle Speed	3,600 RPM	3,600 RPM	3,600 RPM	3,600 RPM
Number of Data Heads	14	14	15	15
Total Number of Cylinders	1361	1635	1635	1635
Usable Number of Cylinders	1353	1631	1631	1625
Available Sectors Per Track	58	45	23	83
Data Transfer Rate	2.458 MB/Sec	6.0 MB/SEC	3.0 MB/Sec	3.0 MB/Sec
Tracks Per Inch	1296	1289	1289	1289
Bits Per Inch	40,210	N/A	N/A	N/A
Recording Method	2-7 RLL	2-7 RLL	2-7 RLL	2-7 RLL
Average Seek Time	16msec	16 msec	16 msec	16 msec
Average Latency	8.3 msec	8.3 msec	8.3 msec	8.3 msec
Height	3.25"	4.75"	4.75"	4.75"
Width	5.75"	8.50"	8.50"	8.50"
Depth	8.00"	22.6"	22.6"	22.6"
DC Power OR AC Power and Frequency Requirements	+ 12VDC(± 5%) + 5VDC(± 5%)	100-120 VAC 200-240 VAC 50/60 HZ	100-120 VAC 200-240 VAC 50/60 HZ	100-120 VAC 200-240 VAC 50/60 HZ
AC OR DC Start/Run Current	+ 12=4.5/2.0 A + 5=1.2 A Max	1.40 A Avg. (@220 V/60 HZ)	1.45 A Avg (@220 V/60 HZ)	1.45 A Avg (@220 V/60 HZ)
Power Consumption		.151KW (@220 V/60HZ)	.145KW (@220 V/60HZ)	.145KW (@220 V/60HZ)

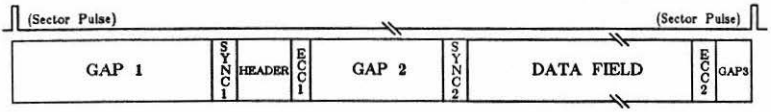
CONVEX

Field Support Tech Tip

Product: C-1
Tech Tip Number: Disc-007
Date: April 30, 1987 (Rev. 09/15/87)
Subject: Disc Sectors
Submitted By: Brad Jones

The purpose of this Tech Tip is to provide information about the Disc Sector Format created and used by the Xylogics 450 and 451 Disc Controllers and the physical location of sectors on the disc.

- **SECTOR FORMAT**



SECTOR FIELD DEFINITIONS

FIELD	*LENGTH*
GAP 1	27.25 Bytes
SYNC 1	1.00 Byte
HEADER	4.00 Bytes
ECC 1	4.00 Bytes
GAP 2	20.00 Bytes
SYNC 2	1.00 Byte
DATA	512.00 Bytes
ECC 2	4.00 Bytes
GAP 3	26.75 Bytes (Minimum)
TOTAL	600.00 Bytes (Minimum)

- **SECTORS-PER-TRACK**
  - *Fujitsu Eagle*: 47 Sectors per Track; 45 available, 1 reserved for slip, and 1 "Runt" (too short to use).
    From Index, *Physical* Sectors 0 thru 45 = 600 Bytes each and The "Runt" = 560 Bytes for a total of 28,160 Bytes per Track.
  - *NEC D2352*: 60 Sectors per Track; 59 available and 1 reserved for slip.
    From Index, *Physical* Sectors 0 thru 58 = 604 Bytes each and *Physical* Sector 59 = 652 Bytes for a total of 36,288 Bytes per Track.
  - *NEC D2368*: 68 Sectors per Track; 67 available and 1 reserved for slip.
    From Index, *Physical* Sectors 0 thru 66 = 602 Bytes each and *Physical* Sector 67 = 626 Bytes for a total of 40,960 Bytes per Track.

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• LOGICAL SECTOR LAYOUT RELATIVE TO INDEX

The Xylogics 450 and 451 Disc Controllers "skew" the *physical* location (in relation to Index) of the *logical* sectors as it proceeds down a Cylinder from Head 0 to the end of the Cylinder. At Head 0 of every Cylinder, *logical* Sector 0 will be located at *physical* sector 0.

For example, *logical* Sector 5 under Head 3 of any Cylinder will be at the location (relative to index) of *physical* Sector 8. This *physical* location of the *logical* sectors is shown below and on the following pages. The numbers shown are the *logical* sector numbers starting at Index and the "S" represents the *physical* location of the *Spare* Sector reserved for slipping.

HEAD NUMBER: 0

- NEC D2352 - 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
  32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 S
- NEC D2363 - 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
  32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
  61 62 63 64 65 66 S
- FUJI Eagle - 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
  32 33 34 35 36 37 38 39 40 41 42 43 44 S

HEAD NUMBER: 1

- NEC D2352 - S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
  32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58
- NEC D2363 - S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
  32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
  61 62 63 64 65 66
- FUJI Eagle - S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
  32 33 34 35 36 37 38 39 40 41 42 43 44

HEAD NUMBER: 2

- NEC D2352 - 58 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
  31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57
- NEC D2363 - 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
  31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59
  60 61 62 63 64 65
- FUJI Eagle - 44 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
  31 32 33 34 35 36 37 38 39 40 41 42 43

HEAD NUMBER: 3

- NEC D2352 - 57 58 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29
  30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56
- NEC D2363 - 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29
  30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58
  59 60 61 62 63 64
- FUJI Eagle - 43 44 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29
  30 31 32 33 34 35 36 37 38 39 40 41 42

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- **LOGICAL SECTOR LAYOUT RELATIVE TO INDEX**

HEAD NUMBER: 4

- NEC D2352 - 56 57 58 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55
- NEC D2363 - 64 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
- FUJI Eagle - 42 43 44 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41

HEAD NUMBER: 5

- NEC D2352 - 55 56 57 58 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
- NEC D2363 - 63 64 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62
- FUJI Eagle - 41 42 43 44 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

HEAD NUMBER: 6

- NEC D2352 - 54 55 56 57 58 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53
- NEC D2363 - 62 63 64 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61
- FUJI Eagle - 40 41 42 43 44 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39

HEAD NUMBER: 7

- NEC D2352 - 53 54 55 56 57 58 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
- NEC D2363 - 61 62 63 64 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
- FUJI Eagle - 39 40 41 42 43 44 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38

HEAD NUMBER: 8

- NEC D2352 - 52 53 54 55 56 57 58 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51
- NEC D2363 - 60 61 62 63 64 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59
- FUJI Eagle - 38 39 40 41 42 43 44 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37

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- LOGICAL SECTOR LAYOUT RELATIVE TO INDEX

HEAD NUMBER: 9

- NEC D2352 - 51 52 53 54 55 56 57 58 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
  24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
- NEC D2363 - 59 60 61 62 63 64 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
  24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
  53 54 55 56 57 58
- FUJI Eagle - 37 38 39 40 41 42 43 44 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
  24 25 26 27 28 29 30 31 32 33 34 35 36

HEAD NUMBER: 10

- NEC D2352 - 50 51 52 53 54 55 56 57 58 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
  23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49
- NEC D2363 - 58 59 60 61 62 63 64 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
  23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51
  52 53 54 55 56 57
- FUJI Eagle - 36 37 38 39 40 41 42 43 44 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
  23 24 25 26 27 28 29 30 31 32 33 34 35

HEAD NUMBER: 11

- NEC D2352 - 49 50 51 52 53 54 55 56 57 58 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
  22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
- NEC D2363 - 57 58 59 60 61 62 63 64 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
  22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
  51 52 53 54 55 56
- FUJI Eagle - 35 36 37 38 39 40 41 42 43 44 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
  22 23 24 25 26 27 28 29 30 31 32 33 34

HEAD NUMBER: 12

- NEC D2352 - 48 49 50 51 52 53 54 55 56 57 58 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
  21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
- NEC D2363 - 56 57 58 59 60 61 62 63 64 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
  21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49
  50 51 52 53 54 55
- FUJI Eagle - 34 35 36 37 38 39 40 41 42 43 44 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
  21 22 23 24 25 26 27 28 29 30 31 32 33

HEAD NUMBER: 13

- NEC D2352 - 47 48 49 50 51 52 53 54 55 56 57 58 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
  20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
- NEC D2363 - 55 56 57 58 59 60 61 62 63 64 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
  20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
  49 50 51 52 53 54
- FUJI Eagle - 33 34 35 36 37 38 39 40 41 42 43 44 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
  20 21 22 23 24 25 26 27 28 29 30 31 32

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- **LOGICAL SECTOR LAYOUT RELATIVE TO INDEX**

HEAD NUMBER: 14

- NEC D2352 - 46 47 48 49 50 51 52 53 54 55 56 57 58 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45
- NEC D2363 - 54 55 56 57 58 59 60 61 62 63 64 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53
- FUJI Eagle - 32 33 34 35 36 37 38 39 40 41 42 43 44 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

HEAD NUMBER: 15

- NEC D2352 - 45 46 47 48 49 50 51 52 53 54 55 56 57 58 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44
- NEC D2363 - 53 54 55 56 57 58 59 60 61 62 63 64 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
- FUJI Eagle - 31 32 33 34 35 36 37 38 39 40 41 42 43 44 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

HEAD NUMBER: 16

- NEC D2352 - 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43
- NEC D2363 - 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51
- FUJI Eagle - 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29

HEAD NUMBER: 17

- NEC D2352 - 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42
- NEC D2363 - 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
- FUJI Eagle - 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

HEAD NUMBER: 18

- NEC D2352 - 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41
- NEC D2363 - 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49
- FUJI Eagle - 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27

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- **LOGICAL SECTOR LAYOUT RELATIVE TO INDEX**

HEAD NUMBER: 19

- NEC D2352 - NOT APPLICABLE
- NEC D2363 - 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
- FUJI Eagle - 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

HEAD NUMBER: 20

- NEC D2352 - NOT APPLICABLE
- NEC D2363 - 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
- FUJI Eagle - NOT APPLICABLE

HEAD NUMBER: 21

- NEC D2352 - NOT APPLICABLE
- NEC D2363 - 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
- FUJI Eagle - NOT APPLICABLE

HEAD NUMBER: 22

- NEC D2352 - NOT APPLICABLE
- NEC D2363 - 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45
- FUJI Eagle - NOT APPLICABLE

HEAD NUMBER: 23

- NEC D2352 - NOT APPLICABLE
- NEC D2363 - 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44
- FUJI Eagle - NOT APPLICABLE

HEAD NUMBER: 24

- NEC D2352 - NOT APPLICABLE
- NEC D2363 - 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43
- FUJI Eagle - NOT APPLICABLE

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- **LOGICAL SECTOR LAYOUT RELATIVE TO INDEX**

HEAD NUMBER: 25

- NEC D2352 - NOT APPLICABLE
- NEC D2363 - 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42
- FUJI Eagle - NOT APPLICABLE

HEAD NUMBER: 26

- NEC D2352 - NOT APPLICABLE
- NEC D2363 - 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 S 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41
- FUJI Eagle - NOT APPLICABLE

CONVEX

Field Support Tech Tip

Product: C-1
Tech Tip Number: Disc-008
Date: April 30, 1987 (Rev. 09/15/87)
Subject: Disc Flaw Map Usage
Submitted By: Brad Jones

Each Disc Drive is normally accompanied by a **flaw map** that has been generated by the vendor. The flaw map details those areas of the recording surfaces that fail to meet their standards. The flaw map is recorded on the drive itself and a printed copy is also provided. Once the drive has been formatted, the flaw information is gone. Therefore, a copy of the flaw map should be kept **on-site** with a ***duplicate*** at another location.

The typical flaw map will contain the following information:

CYL	HD	DEF1		DEF2		DEF3	DEF4
26	14	3556-	12				
27	14	3556-	36	21895-	12		
449	17	9628-	12				
...and so forth							

Where:
- **CYL** is the Cylinder Number.
- **HD** is the Head Number.
- **DEF1, DEF2, DEF3,** and **DEF4** are the starting points of any defects on that surface expressed in **Bytes** from *Index* (e.g., 3556-, 9628-, and 21895-, above) and the *length* of the flaw expressed in **Bits** (e.g., 12 and 36, above).

Using the flaw map information shown above for Cylinder 27, Head 14 and assuming an NEC Disc Drive, the following example shows the conversion of the flaw map information to actual locations on the disc.

1. The first flaw is 3556 Bytes from Index and 4.5 Bytes (36 Bits) in length. Using the table on the next page, it can be seen that the flaw is totally within the range of physical sector number 5.
2. The second flaw on the track is 21,895 Bytes from Index and 1.5 Bytes (12 Bits) in length. The table on the next page shows this flaw to be totally within the range of physical sector number 36.

(**Note:** Also reference Tech Tip Number *Disc-007* for the following steps)

3. In the case of the first flaw, *physical* sector number 5 equates to *logical* sector number 51 on Head 14 (Disc-007, page 5 of 7). To compute the exact location of the flaw *within* the sector, use the formula: Starting Byte of flaw (3556) - Starting Byte of Sector (3020) = Starting Byte within the Sector (536). Then, to determine where the flaw ends, use the formula: Starting Byte within the sector (536) + Flaw Length (4.5 Bytes) = End of Flaw (540.5 Bytes). Therefore, it can be seen tha t this flaw is totally in the *Data Field* of *logical* sector **51** (Disc-007, page 1 of 7).
4. Use the procedures in Step 3, above, to compute the actual location of *DEF2* on Cylinder 27, Head 14. If done correctly, the flaw will be found to reside totally within the *Data Field* of *logical* sector number 22.

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BYTES FROM INDEX CONVERTED TO SECTOR NUMBER

NEC D2352				FUJITSU EAGLE			
BYTES FROM INDEX	PHYSICAL SECTOR NUMBER	BYTES FROM INDEX	PHYSICAL SECTOR NUMBER	BYTES FROM INDEX	PHYSICAL SECTOR NUMBER	BYTES FROM INDEX	PHYSICAL SECTOR NUMBER
0	0	18,120	30	0	0	18,000	30
604	1	18,724	31	600	1	18,600	31
1,208	2	19,328	32	1,200	2	19,200	32
1,812	3	19,932	33	1,800	3	19,800	33
2,416	4	20,536	34	2,400	4	20,400	34
3,020	5	21,140	35	3,000	5	21,000	35
3,624	6	21,744	36	3,600	6	21,600	36
4,228	7	22,348	37	4,200	7	22,200	37
4,832	8	22,952	38	4,800	8	22,800	38
5,436	9	23,556	39	5,400	9	23,400	39
6,040	10	24,160	40	6,000	10	24,000	40
6,644	11	24,764	41	6,600	11	24,600	41
7,248	12	25,368	42	7,200	12	25,200	42
7,852	13	25,972	43	7,800	13	25,800	43
8,456	14	26,576	44	8,400	14	26,400	44
9,060	15	27,180	45	9,000	15	27,000	45
9,664	16	27,784	46	9,600	16	27,600	NOT
10,268	17	28,388	47	10,200	17	TO	USED
10,872	18	28,992	48	10,800	18	28,160	(RUNT)
11,476	19	29,596	49	11,400	19		
12,080	20	30,200	50	12,000	20		
12,684	21	30,804	51	12,600	21		
13,288	22	31,408	52	13,200	22		
13,892	23	32,012	53	13,800	23		
14,496	24	32,616	54	14,400	24		
15,100	25	33,220	55	15,000	25		
15,704	26	33,824	56	15,600	26		
16,308	27	34,428	57	16,200	27		
16,912	28	35,032	58	16,800	28		
17,516	29	35,636	59	17,400	29		

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BYTES FROM INDEX CONVERTED TO SECTOR NUMBER

NEC D2363

BYTES FROM INDEX	PHYSICAL SECTOR NUMBER	BYTES FROM INDEX	PHYSICAL SECTOR NUMBER	BYTES FROM INDEX	PHYSICAL SECTOR NUMBER
0	0	13,846	23	27,692	46
602	1	14,448	24	28,294	47
1,204	2	15,050	25	28,896	48
1,806	3	15,652	26	29,498	49
2,408	4	16,254	27	30,100	50
3,010	5	16,856	28	30,702	51
3,612	6	17,458	29	31,304	52
4,214	7	18,060	30	31,906	53
4,816	8	18,662	31	32,508	54
5,418	9	19,264	32	33,110	55
6,020	10	19,866	33	33,712	56
6,622	11	20,468	34	34,314	57
7,224	12	21,070	35	34,916	58
7,826	13	21,672	36	35,518	59
8,428	14	22,274	37	36,120	60
9,030	15	22,876	38	36,722	61
9,632	16	23,478	39	37,324	62
10,234	17	24,080	40	37,926	63
10,836	18	24,682	41	38,528	64
11,438	19	25,284	42	39,130	65
12,040	20	25,886	43	39,732	66
12,642	21	26,488	44	40,334	67
13,244	22	27,090	45	End of Table	

CONVEX

Field Support Tech Tip

Product: C-1
Tech Tip Number: Disc-009
Date: July 15, 1987 (Rev. 12/15/87)
Subject: Disc Drive Intermixing
Submitted By: Brad Jones

This is to describe the conditions under which different type disc drives can and cannot be intermixed (daisy-chained) on the same *Xylogics 450 and 451* Disc Controller. As of this date, supported disc drives and their Identification Numbers are:

- 300 MB CDC SMD (ID Number is '0')
- 474 MB Fujitsu Eagle (ID Number is '2')
- 520 MB NEC (ID Number is '0')
- 1.1 GB NEC (ID Number is '1')
- 515 MB CDC FSD (ID Number is '3')

As a general rule, different type disc drives can be intermixed on the same *Xylogics* Disc Controller *if* their Identification Numbers are **different**. As can be seen, this allows the following disc drive types to be intermixed:

- 300 MB CDC SMD *and/or* 474 MB Fujitsu Eagle *and/or* 515 MB CDC FSD *and/or* 1.1 GB NEC
- 520 MB NEC *and/or* 474 MB Fujitsu Eagle *and/or* 515 MB CDC FSD *and/or* 1.1 GB NEC

NOTES:

1. The Xylogics 451 Controller will **always** support intermixing of disc types.
2. The Xylogics 450 Controller will support intermixing of disc types **if** the controller Revision is **E** or later.
3. Due to identical Identification Numbers, the 300 MB CDC SMD and the 520 MB NEC disc drives **cannot** be intermixed.
4. The 515 MB CDC FSD **always** requires that a Xylogics 451 Controller be used as the Xylogics 450 Controller will not support this disc drive due to the sectoring method used by the FSD.
5. The 1.1 GB NEC D2363 **always** requires that a Xylogics 451 Controller be used as the Xylogics 450 Controller will not support this disc drive due to the data transfer rate being in excess of 2 MB/sec.

CONVEX

Field Support Tech Tip

Product: C-1
Tech Tip Number: Disc-010
Date: August 3, 1987
Subject: Xylogics Power Requirements
Submitted By: Brad Jones

When the power supplied to the Xylogics Disc Controller is marginal, problems have been seen such as *Hard ECC Error, Soft ECC Error, Header Not Found,* etc..

To protect the integrity of data on the system discs, it is **imperative** that **all** Multibus voltages are verified (at the Multibus Backplane) during installation, *every* scheduled P.M. and upon any occurrence of a disc drive and/or controller problem. This applies to both the 10-Slot Split Multibus Backplane (P/N 411-000112-200) and 9-Slot Non-Split Multibus Backplane (P/N 411-000113-200).

- **Voltage Requirements and Test Points are:**

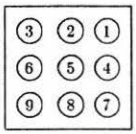
VOLTAGE (Note 1)	*MEASURE AT* (Note 2)	*ADJUST FOR* (Note 3)
+5	**TB1-1 (+) to TB1-8 (-)**	+5.10
-12	**J1-1 (+) to J1-2 (-)**	-12.10
+12	**J1-9 (+) to J1-6 (-)**	+12.10
-5	**J1-7 (+) to J1-8 (-)**	-5.10

Note 1 - Voltage Sources Are:

VOLTAGE	*SOURCE*
+5	V1 of CPU PS3 **or** V1 of Expansion Multibus PS1
-5	V2 of CPU PS2 **or** V2 of Expansion Multibus PS1
+12	V3 of CPU PS2 **or** V4 of Expansion Multibus PS1
-12	V4 of CPU PS2 **or** V3 of Expansion Multibus PS1

Note 2 - Color Codes Are:

TB1-1	Red	TB1-8	Black
J1-1	Yellow	J1-2	Black
J1-9	White	J1-6	Black
J1-7	Orange	J1-8	Black



(right bottom of Mbus backplane)

Note 3 - Ripple should not exceed 1% peak-to-peak or 50mv, whichever is greater.

CONVEX

Field Support Tech Tip

Product: C-1
Tech Tip Number: Disc-011
Date: Sept. 15, 1987 (Rev. 04/15/88)
Subject: File '/mnt/usr/lib/DB_diskfmt'
Submitted By: Brad Jones

The disc format programs *diskfmt*, *dev4100*, and *dev4110* obtain disc drive parameters by referencing the SPU file */mnt/usr/lib/DB_diskfmt*. These parameters are required to properly format each of the different disc types. The following is a description of the past and present formats of the file *DB_diskfmt* and rules that govern usage of the different formats.

Note: */mnt/usr/lib/DB_diskfmt* is included on the Diagnostic Data Base (DDB) Tape, but is now released on the Systems Diagnostics tape.

Format of */mnt/usr/lib/DB_diskfmt* (DDB Revision 2.4 and earlier **or** 1.13 and earlier). This format is compatible with and usable by *dev4100*, *dev4110*, **and** *diskfmt**.

#				sectors		
# name	type	cylinders	heads	physical	logical	
#						
DKD-001	2	842	20	46	45	#Fuji 2351 (eagle)
DKD-002	0	823	19	7 32	31	#CDC 9766
DKD-003	3	711	24	50	49	#CDC FSD
DKD-005	0	760	19	60	59	#NEC 2352
DKD-008	1	1023	27	68	67	#NEC 2363

* = The **only** disc drives that **diskfmt** is capable of correctly formatting for system use are DKD-001, DKD-002, DKD-003, and DKD-005. Starting with the release of DKD-008 **and** all future drives that are released as a Convex product, *diskfmt* is **not** to be used.

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Shown below is the format of */mnt/usr/lib/DB_diskfmt* (DDB Revision 2.5 and later or 1.14 and later). This format is compatible with and usable by *dev4100, dev4110, dev4120* and *diskfmt* (Note: *diskfmt* cannot format a VME drive and should not be used for MBUS drives if *dev4110* is available).

```
# DB_diskfmt - file of disk parameters
#
# >>>> WARNING - DO NOT USE 'diskfmt' to FORMAT!  It is no longer compatible
# >>>>           with the CONVEX FORMAT!  Instead, format MBUS-attached drives
# >>>>           with 'dev4110' and VME-attached drives with 'dev4120'.  Note
# >>>>           that the DKD-008 and any future SMD drives that are attached to
# >>>>           a Xylogics 450 or 451 controller will be specified as having one
# >>>>           less than the actual number of cylinders.  This prevents erasure
# >>>>           of the defect cylinder if 'diskfmt' is accidentally used to re-
# >>>>           format a drive.  DKD-001, DKD-002, DKD-005 on the Xylogics
# >>>>           450 or 451 controllers and all drives used on other controllers
# >>>>           will have the actual number of cylinders as specified below.
#
# The column 'reloc cyls' applies to all controllers that allow track reallocation.
# Number of reloc cyls = .5% of the # of cyls rounded up to the next whole cyl.
#
#
# KEY FOR DRIVE NAMES:
#
#  Name          Description                    Name          Description
# DKD-001       Fujitsu Eagle (452MB SMD)  DKD-008,208 NEC 2363 (1080MB SMD)
# DKD-002       CDC 9766 (300MB SMD)       DKD-214     Hitachi DK514-38 (365MB ESDI)
# DKD-005,206 NEC 2352 (500MB SMD)
#
#
#--------------------------- XYLOGICS 450/451 (MBUS) ----------------------------
#               # of   # of    phys   log    bits/  bytes/       reloc        gap1  gap2
# name    type  cyls   heads   secs   secs    sec    trk   skew  cyls  intlv  size  size
DKD-001   2     842    20      46     45      4800   28160 -     -     -      -     -
DKD-002   0     823    19      32     31      5040   20160 -     -     -      -     -
DKD-005   0     760    19      60     59      4832   36288 -     -     -      -     -
DKD-008   1     1023   27      68     67      4816   40960 -     -     -      -     -
#
#--------------------------- INTERPHASE 4201 (VME) ------------------------------
#               # of   # of    phys   log    bits/  bytes/       reloc        gap1  gap2
# name    type  cyls   heads   secs   secs    sec    trk   skew  cyls  intlv  size  size
DKD-214   0     903    14      53     52      4736   30240 0     5     1      8     8
#
#--------------------------- INTERPHASE 4200 (VME) ------------------------------
#               # of   # of    phys   log    bits/  bytes/       reloc        gap1  gap2
# name    type  cyls   heads   secs   secs    sec    trk   skew  cyls  intlv  size  size
DKD-206   0     760    19      60     59      4832   36288 0     4     1      16    16
DKD-208   0     1024   27      68     67      4816   40960 0     6     1      16    16
```

CONVEX

Field Support Tech Tip

Product: C-1
Tech Tip Number: Disc-012
Date: Sept. 15, 1987 (Rev. 12/15/87)
Subject: Disc Bad Block Table
Submitted By: Brad Jones

When one sector on a track is bad it can be "slipped" by using a *spare* location on that same track. If there are two or more defective sectors on a given track, one of them will still be slipped, but the second and subsequent defective sectors will be entered into the *Bad Block Table (BBT)* which, as will be seen, is a misnomer of sorts. If the *spare* sector is defective, all other defective sectors on that track will be entered into the BBT.

So far as UNIX is concerned, the BBT is actually a *Forwarded Sector Table.* That is to say, a defective sector is *not* lost to the system; it has been *relocated* to a specific location on a cylinder reserved for this situation and is still accessible and available for use by UNIX.

The BBT consists of a 5-sector directory (of which there are 5 copies) and 638 sectors reserved for any relocations. The location of the BBT depends on the disc drive type as is shown in the table below (Note: addresses shown in the table are in the format '*cylinder,head,sector*').

DISC DRIVE TYPE AND DESCRIPTION	XYLOGICS 450 & 451 BBT DIRECTORY					RESERVED RELOCATION SECTORS
	1st COPY	2nd COPY	3rd COPY	4th COPY	5th COPY	
DKD-001 Fujitsu M2351 474 MB Eagle	841,19,20 thru 841,19,24	841,19,25 thru 841,19,29	841,19,30 thru 841,19,34	841,19,35 thru 841,19,39	841,19,40 thru 841,19,44	841,5,12 thru 841,19,19
DKD-002 CDC 9766 300 MB SMD	822,18,6 thru 822,18,10	822,18,11 thru 822,18,15	822,18,16 thru 822,18,20	822,18,21 thru 822,18,25	822,18,26 thru 822,18,30	821,16,19 thru 822,18,5
DKD-003 CDC 9715 515 MB FSD	710,23,24 thru 710,23,28	710,23,29 thru 710,23,33	710,23,34 thru 710,23,38	710,23,39 thru 710,23,43	710,23,44 thru 710,23,48	710,10,22 thru 710,23,23
DKD-005 NEC D2352 520 MB	759,18,34 thru 759,18,38	759,18,39 thru 759,18,43	759,18,44 thru 759,18,48	759,18,49 thru 759,18,53	759,18,54 thru 759,18,58	759,7,45 thru 759,18,33
DKD-008 NEC D2363 1.1 GB	1022,26,42 thru 1022,26,46	1022,26,47 thru 1022,26,51	1022,26,52 thru 1022,26,56	1022,26,57 thru 1022,26,61	1022,26,62 thru 1022,26,66	1022,17,7 thru 1022,26,41

Should the 1st copy of the BBT Directory be unreadable (ECC error status, etc.) UNIX will attempt to read the 2nd copy and, should it also be unreadable, the 3rd, and so forth until forced to give up the effort if the final (5th) copy is also not recoverable.

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An example of a BBT Directory and its usage by UNIX follows. For this example and discussion, an NEC D2352 Disc Drive is used.

HEX DUMP - NEC D2352 BBT DIRECTORY (1st COPY)

(copies 2 thru 5 are identical)

- **Cylinder 759, Head 18, Sector 34:**

```
00000004 ffff0000 008b0712 ffff0000 ffff0000 ffff0000 0007121f ffff0000
ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000
ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000
ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000
ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000
00671038 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000
ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000
ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000
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ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000
ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000
```

- **Cylinder 759, Head 18, Sector 35:**

```
ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000
ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000
ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000
ffff0000 ffff0000 017c0122 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000
ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000
ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000
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ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000
```

- **Cylinder 759, Head 18, Sector 36:**

```
ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000
ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000 ffff0000
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- **Cylinder 759, Head 18, Sector 37:**

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- **Cylinder 759, Head 18, Sector 38:**

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BBT DIRECTORY INTERPRETATION

The BBT Directory is made up of 640 32-bit (4-byte) ***words***, the first of which is bytes 0 thru 3 of the first sector of the directory and the last of which is bytes 508 thru 511 of the fifth (last) sector of the directory. The definition of the words that make up the BBT Directory is shown below:

SECTOR	WORD	DESCRIPTION
First	0 (first)	Total number of entries in this directory.
First	1 (second)	Reserved (not used) - must always be 'ffff0000'.
First	2 thru 127	Slots for 126 relocated sector addresses.
Second	0 thru 127	Slots for 128 relocated sector addresses.
Third	0 thru 127	Slots for 128 relocated sector addresses.
Fourth	0 thru 127	Slots for 128 relocated sector addresses.
Fifth	0 thru 127	Slots for 128 relocated sector addresses.

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BBT DIRECTORY INTERPRETATION (continued)

UNIX uses the BBT as follows. Whenever a *Header Not Found* status is returned from the disc controller, the UNIX Disc Driver will check Word 0 of the BBT Directory to see if there are any entries. If not, a *Header Not Found* error message will be announced. If there are entries, the driver will determine if one of them is the desired sector address by going through the BBT Directory, word-by-word, ignoring the '`ffff0000`' pattern and decrementing the value of Word 0 each time a valid address is found and, should it be the desired address, using its *physical* offset in the BBT Directory as an index value to the sector's actual location in the BBT. If the last valid address in the BBT Directory is ever found and determination made that it is not the one desired, the driver will return a *Header Not Found* message.

Using the example BBT (pages 2 and 3), it can be seen that there are 4 entries, three of them in the first sector, Words 2, 6, and 40 and the fourth is in the second sector, Word 26. Since Word 1 of sector 0 is reserved (not used) these four entries are considered to be *physically* offset in BBT Directory Slots 1, 5, 39, and 153, respectively. No matter what type of disc drive is being discussed, this physical offset value is subtracted from the *starting* address of the first sector of the first BBT Directory to determine the actual location of the forwarded (aka relocated) sector.

Therefore, using this example, if the driver needs to read or write at sector address '`08b,07,12`' (decimal '139,07,18'), it would find the desired address in Slot 1 of the BBT Directory, subtract '1' from the starting address of the first copy of the BBT Directory ('759,18,34' decimal), and, as a result, perform the desired operation at sector address '759,18,33' (decimal). Other addresses in the table would be translated in like fashion (according to *physical* slot location) to determine which sector is to be addressed.

Field Support Tech Tip

Product: C Series
Tech Tip Number: Disc-013
Date: September 15, 1987
Subject: NEC Disc Repair Tips
Submitted By: Brad Jones

It normally takes 10-20 seconds for the NEC D2352 and D2363 to come up to speed and go ready. A problem may be seen where the unit will spin up and, after about 20-30 seconds, shut back down with the red "Fault" LED lit. The following is a description of a possible cause for this situation.

The Stator Assembly (D2352 and D2363 NEC P/N 134-530360-0) contains six (6) Hall-Effect Sensors. Should one of them fail while the disc drive is in use it will not be apparent. This is the case because, so long as the spindle remains in motion, its momentum is sufficient to enable the Power Amp (D2352, G9WBR board, NEC P/N 134-530336-001 or D2363, G9XLR board, NEC P/N 134-530761-001) to keep it up to the required speed.. However, during this period the Power Amp board is being over-stressed. Once the spindle is allowed to come to a stop (e.g., power down, etc.) the drive will be incapable of coming up to speed again due to a combination of factors: 1. output will be missing from one of the Stator Assembly's sensors and, 2. the Power Amp board will be incapable of providing sufficient current due to having been overstressed. Therefore, in most cases, whenever the Stator Assembly requires repair or replacement due to a failed Hall-Effect Sensor, it will also be necessary to replace the Power Amp board.

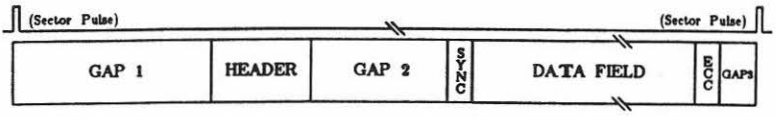
CONVEX

Field Support Tech Tip

Product: C-1
Tech Tip Number: Disc-014
Date: 10/15/87 Rev.4/15/90
Subject: Interphase 4200
Submitted By: TAC-HW

The purpose of this Tech Tip is to provide general information about the Interphase Model 4200 (Cheetah) VME Disc Controller which supports *HSMD* and *SMD-E* compatible Disc Drives.

• SECTOR FORMAT



SECTOR FIELD DEFINITIONS

FIELD	*LENGTH*
GAP 1	24 Bytes (NEC D2363 is 32 bytes.)
HEADER	8 Bytes
GAP 2	24 Bytes
SYNC	2 Bytes
DATA	512 Bytes
ECC	4 Bytes
GAP 3	8 Bytes (Minimum)
TOTAL	582 Bytes (Minimum)

• SUPPORTED DISC TYPES

- *NEC D2352*: 60 Sectors per Track; 59 available and 1 reserved for slip. From Index, *Physical* Sectors 0 thru 58 = 604 Bytes each and *Physical* Sector 59 = 652 Bytes for a total of 36,288 Bytes per Track.

- *NEC D2363*: 68 Sectors per Track; 67 available and 1 reserved for slip. From Index, *Physical* Sectors 0 thru 66 = 602 Bytes each and *Physical* Sector 67 = 626 Bytes for a total of 40,960 Bytes per Track.

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The *Unit Initialization Block* (**UIB**) must be written to the controller after each power-up. The purpose of the UIB is to define the parameters for each of the disc drives that are connected to the controller. One UIB is required for each disc drive connected to the controller and each disc drive can be separated into two (2) volumes.

- **UIB Format:**

BYTE	*DESCRIPTION/CONTENTS*
0	Volume 0 starting head number.
1	Volume 0 - Number of heads.
2	Volume 1 starting head number.
3	Volume 1 - Number of heads.
4	Number of sectors per track (excluding spare and runt).
5	Spiral skewing factor.
6	Number of *data* bytes per sector (most significant).
7	Number of *data* bytes per sector (least significant).
8	Number of *words* (2 bytes = 1 word) in GAP 1.
9	Number of *words* (2 bytes = 1 word) in GAP 2.
A	Sector interleave factor.
B	Number of retries on data error.
C	Number of cylinders (most significant).
D	Number of cylinders (least significant).
E	Attributes: Bit 7 (M.S.) - If set (1), Runt Sector ($\geq 120\mu s$) Enable. Bit 6 - If set (1), Spare Sector Enable. Bit 5 - If set (1), Sector Caching Enable. Bit 4 - If set (1), Status Change Interrupt Enable. Bit 3 - If set (1), Dual Port Protocol Enable. Bit 2 - If set (1), Increment by Head, *not* Cylinder. Bit 1 - If set (1), Move Bad Data Enable. Bit 0 (L.S.) - If set (1), Auto-Reseek on Data Error.
F	The contents of this byte determines if *Extended SMD (SMD-E) Addressing* will be used **and** whether the controller will support up to 2 *or* up to 4 disc drives. If bit 7 is set (1), *SMD-E* addressing will be used, which allows support of disc drives with more than 1024 cylinders. If bit 6 is set (1), up to four (4) disc drives will be supported on the controller.
10	Status change interrupt level. Can be any number from 1 to 7. If bit 7 is set (1), the optional Status Change Register (Controller Base Address +1FE) will be used instead of the *Command/Status Register* (Controller Base Address +02).
11	Status change interrupt vector. This is the data that is returned during the VME interrupt acknowledge cycle. Any value is acceptable.

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- **I/O REGISTERS & IOPB** (*INPUT/OUTPUT PARAMETER BLOCK*)

The following table shows the location and contents of the two (2) I/O Registers and the IOPB that reside on the Interphase 4200 Controller. The *HEX OFFSET* value is relative to the Controller's Base Address.

HEX OFFSET	*CONTENTS*	*DECIMAL IOPB BYTE*
+00	Drive 1 Status Register (*Note 1*)	N/A
+01	Drive 0 Status Register (*Note 1*)	N/A
+02	Command/Status Register (*Note 1*)	N/A
+04	IOPB Command Codes	00
+05	IOPB Command Options	01
+06	IOPB Status Codes (*Note 1*)	02
+07	IOPB Error Codes (*Note 1*)	03
+08	Cylinder Address (High)	04
+09	Cylinder Address (Low)	05
+0A	Head Address	06
+0B	Sector Address	07
+0C	Sector Count (High)	08
+0D	Sector Count (Low)	09
+0E	Buffer Address (24-31)	10
+0F	Buffer Address (16-23)	11
+10	Buffer Address (08-15)	12
+11	Buffer Address (00-07)	13
+12	Memory Type	14
+13	Address Modifier Codes	15
+14	Optional Drive Numbers (2,3)	16
+15	Interrupt Level & Vector	17
+16	DMA Transfer Count	18
+17	Error Interrupt Vector	19
+18	IOPB Pointer (24-31)	20
+19	IOPB Pointer (16-23)	21
+1A	IOPB Pointer (08-15)	22
+1B	IOPB Pointer (00-07)	23
+1C	IOPB Memory Type	24
+1D	IOPB Address Modifier Code	25
+1E	Absolute Skew Factor	26
+1F	Scatter/Gather Entry Count	27
+20	User Defined	N/A
•	•	•
•	•	•
•	•	•
+1F9	User Defined	N/A
+1FA	Drive 3 Status (4-Unit Only)	N/A
+1FB	Drive 2 Status (4-Unit Only)	N/A
+1FC	Drive 1 Status (4-Unit Only)	N/A
+1FD	Drive 0 Status (4-Unit Only)	N/A
+1FE	Optional Status Change Register	N/A

Note 1: Further defined on following pages.

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- **Drive Status Registers:**

The format of the Drive Status Registers is shown below. If the four-unit option is used, the format will remain the same, but the Status Bytes will be found starting at the Controller's Base Address + 1FA (reference table on page 3).

Disc Unit 1 (Offset +00)								Disc Unit 0 (Offset +01)							
15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
UR	UP	SE	OC	F	DB	WP	DR	UR	UP	SE	OC	F	DP	WP	DR

- **Definitions:**

BITS	*MNEMONIC*	*INTERPRETATION*
15,07	UR	*Unit Ready.* If set (1), the selected unit is ready, on cylinder, and no fault conditions or seek errors exist.
14,06	UP	*Unit Present.* If set (1), the disc unit has responded to a select sequence.
13,05	SE	*Seek Error.* If set (1), the selected unit has reported a seek error to the controller.
12,04	OC	*On Cylinder.* If set (1), the selected unit has reported it is on cylinder.
11,03	F	*Fault.* If set (1), the selected unit has reported that it is in a fault condition (e.g., multiple head select, loss of write current, attempt to read or write when not on cylinder, etc.).
10,02	DP	*Drive Busy.* If set (1), the selected unit is busy with another controller (dual port drives only).
09,01	WP	*Write Protect.* If set (1), the selected unit is write protected.
08,00	DR	*Drive Ready.* If set (1), the selected unit has reported it is up-to-speed, ready, and on cylinder.

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- **Command/Status Register:**

The format of the Command/Status Register is shown below.

Command/Status Register (Offset +02)

15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
SLED	BOK	SFEN*	BDCLR	ABORT	RES	RES	BERR	GO/ BUSY	DONE	CHG	ERR	CHG SRC	RES	RES	RES

- **Definitions:**

BIT	*MNEMONIC*	*INTERPRETATION*
15	SLED	*Status LED.* When reset (0), the on-board LED indicator will be "red" unless the controller is accessing a disc unit, in which case it will be "green". When set (1), the LED will be "green" so long as *BOK* (Bit 14) is set (1). This bit is controlled by the host, only.
14	BOK	*Board Okay.* When set (1), the controller's power-up diagnostics completed successfully. If reset (0), a diagnostic failure has occurred. This bit is only valid if *GO/BUSY* (Bit 07) is reset (0).
13	SFEN*	*Sysfail Enable.* If reset (0) and *BOK* (Bit 14) is also reset (0), this bit enables *BOK* to assert *Sysfail* on the bus. If set (1), *Sysfail* is disabled. This bit is controlled by the host, only.
12	BDCLR	*Board Clear.* When this bit is set (1) by the host and held set for at least one microsecond before it is reset (0), a hardware reset of the controller will occur. Following the reset, the power-up diagnostics will be run and *GO/BUSY* (Bit 07) will be set. If the power-up diagnostics are successfully run, *BOK* (Bit 14) will be reset (0) and *GO/BUSY* (Bit 07) will be set (1). If the power-up diagnostics fail, *BOK* (Bit 14) and *GO/BUSY* (Bit 07) will both be reset (0). The contents of the *Command/Status Register* will not be valid for 100 microseconds after the assertion of the *Board Clear* bit. This bit is controlled by the host, only.
11	ABORT	*Abort.* When set (1), any IOPB (except sector write) will immediately terminate and the controller will set (1) *DONE* (Bit 06) and *ERR* (Bit 04). This bit is set (1) by the host and reset (0) by the controller.
10	RES	*Reserved* (must be zero).
09	RES	*Reserved* (must be zero).

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- **Definitions** (*continued*):

BIT	*MNEMONIC*	*INTERPRETATION*
08	BERR	*Bus Error.* If set (1) a Bus Error has occurred. If a Bus Error occurs, the host must reset (0) this bit.
07	GO/BUSY	*Go/Busy.* The host sets (1) this bit to initiate the command defined in the IOPB. Upon completion of the IOPB, the controller will reset (0) this bit, set (1) *DONE* (Bit 06), update *ERR* (Bit 04), and interrupt the host if enabled. The host will then reset (0) *DONE* (Bit 06).
06	DONE	*Operation Done.* The controller sets (1) this bit upon completion of an IOPB. The host must clear this bit.
05	CHG	*Status Change.* When enabled, the controller will set (1) this bit if, as the result of a *Seek* command, any of the following Drive Status Bits change from an inactive to an active state: *Drive Ready, Fault, On Cylinder, Seek Error.*
04	ERR	*Error Last Command.* The controller will set (1) this bit if an error occurred during the last command or reset (0) it if no error occurred.
03	CHG SRC	*Status Change Source.* This bit indicates which disc drive (unit 0 or 1) generated the *CHG* (Bit 05) interrupt. If reset (0); Unit 0. If set (1); Unit 1. If the *Optional Status Change Register* is used, this bit will always be reset (0).
02	RES	*Reserved* (must be zero).
01	RES	*Reserved* (must be zero).
00	RES	*Reserved* (must be zero).

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- **IOPB Status Codes:**

The *IOPB Status Codes* are located at the Base Address of the controller +06 and are defined as shown below.

CODE	*DEFINITION*
80	*Command Completed With No Error.* Self-explanatory. Also, the *Command/Status Register* will have *DONE* (Bit 06) set (1), *ERR* (Bit 04) reset (0), and *GO/BUSY* reset (0).
81	*Command in Progress.* Self-explanatory. Also, *Command/Status Register* Bit 07 (*GO/BUSY*) will be set (1).
82	*Command Completed With Error.* Further definition of the error can be found in the *IOPB Error Codes* (IOPB Byte 03). Possible error codes are described on the following pages. In the *Command/Status Register*, *DONE* will be set (1) and *GO/BUSY* will be reset (0).
83	*Command Completed With Exception.* This code indicates that the command was successfully completed, but error recovery was required. Error information is found in the *IOPB Error Codes* (IOPB Byte 03) and descriptions of possible codes are shown below.

- **IOPB Status Code 83 Description** (*contents of IOPB Byte 03*)**:**

BITS	*DEFINITION*
7	If set (1), data error correction was required. If reset (0), correction was not required or was disabled.
6	If set (1), data transferred to host memory may be erroneous.
5	Reserved. Must be reset (0).
4	If set (1), a *Restore* and *Reseek* was performed.
3-0	These bits will contain a hexadecimal representation (0 thru F; bit 3 is most significant) that indicates the number of rotational retries attempted. The maximum value is 'F', but a greater number may have been attempted.

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- **IOPB Status Code '82' Description:**

Whenever an *IOPB Status Code* of '**82**' is seen, IOPB Byte 03 (*IOPB Error Codes*) will contain a hex value that more-precisely defines the error. Possible codes are shown in the following table.

CODE	DESCRIPTION
10	**Disc Not Ready**.
11	**Not used**.
12	**Seek Error**. Disc drive is at the wrong cylinder (disc drive did not report a seek error, but the header's cylinder number is incorrect).
13	**ECC Error**. Reported when the data is in error and no error correction is allowed or attempted.
14	**Invalid Command Code**. The Command Code in IOPB Byte 0 is not valid.
15	**Illegal Fetch and Execute Command**. A *Fetch and Execute* command was encountered in external memory. The *Fetch and Execute* command is only valid when it occurs in the on-board short I/O space.
16	**Invalid Sector in Command**. The Sector Address in IOPB Byte 07 is greater than the capacity of the disc drive.
17	**Illegal Memory Type**. The value in IOPB Byte 14 is invalid.
18	**Bus Timeout**. The VME Bus was not acquired within 100 milliseconds after a request. Can be caused by attempting to access a non-existent memory address.
19	**Header Checksum Error**. Error in the sector's header field.
1A	**Disc Write Protected**. Issued when a write is attempted to a write protected disc.
1B	**Unit Not Selected**. The disc failed to respond to *Unit Select*.
1C	**Seek Error Timeout**. Seen if a *Clear Fault* or *Restore* command fails to correct a seek error within 3 seconds.
1D	**Fault Timeout**. Seen if a *Clear Fault* or *Restore* command fails to correct a drive fault within 3 seconds.
1E	**Drive Faulted**. A fault condition exists in the selected drive.
1F	**Ready Timeout**. Seen if a *Clear Fault* or *Restore* command fails to bring the drive ready within 3 seconds.

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- IOPB Status Code '82' Description (*continued*):

CODE	DESCRIPTION
20	**End of Medium.** A multi-sector transfer exceeded the end of the medium.
21	**Translation Fault.** The volume specified in the IOPB contains zero (0) heads in the UIB.
22	**Invalid Header Pad.** An improper post-header pad byte was encountered.
23	**Uncorrectable Error.** Error correction was attempted on the data field, but the data was found to be uncorrectable.
24	**Translation Error, Cylinder.** The translation of a logical sector resulted in a bad cylinder number.
25	**Translation Error, Head.** The translation of a logical sector resulted in a bad head number.
26	**Translation Error, Sector.** The translation of a logical sector resulted in a bad physical sector number.
27	**Data Overrun.** A data timeout error has occurred. Generally, this can be caused by lack of Write or Read Clock. Can also be caused if the UIB sectors/track is set to zero (0).
28	**No Index Pulse on Format.** During a *Format* operation, the index pulse was not detected within 65 milliseconds.
29	**Sector Not Found.** The target sector could not be found during a *Read* or *Write* operation.
2A	**ID Field Wrong-Wrong Head.** The head number read from the header field is wrong.
2B	**Invalid Sync in Data Field.** The first word (2-bytes) read from the data field was not a valid sync character.
2C	**No Valid Header Found.** During the *Read Header* command, every sector was found to be invalid due to erroneous sync character, checksum, and/or data pad. Normally, this error will occur on a disc drive that has not been formatted by the Interphase 4200.
2D	**Seek Timeout Error.** A *Seek* command was issued and the disc drive did not indicate completion within 500 milliseconds.
2E	**Busy Timeout.** *Busy* has been active on a dual-ported disc drive for more than 500 milliseconds.
2F	**Not on Cylinder.** Disc drive has failed to report *On Cylinder* within 3 seconds after being selected.

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- **IOPB Status Code '82' Description** (*continued*):

CODE	DESCRIPTION
30	**RTZ Timeout**. A *Restore* command was executed, but normal completion did not occur within 3 seconds.
31	**Invalid Sync in Header**. Sync character in header is invalid.
32-3E	**Not Used**.
3F	**No Heads Specified**. No heads have been specified in the UIB.
40	**Unit Not Initialized**. A *Write* or *Format* command was attempted on a unit that has not been initialized.
41	**Not Used**.
42	**Gap Specification Error**. The value specified for Gap 1 or Gap 2 is less than 10 Bytes.
43-4A	**Not Used**.
4B	**Seek Error**. The disc drive has reported a seek error.
4C-4F	**Not Used**.
50	**Sectors per Track Error**. The number of sectors per track in the UIB is zero (0) or greater than 160.
51	**Bytes per Sector Specification Error**. The number of bytes per sector specification in the UIB is less than 256 or greater than 2048.
52	**Interleave Specification Error**. The interleave factor in the UIB is set to zero (0) or greater than the number of sectors per track.
53	**Invalid Head Address**. The requested head address was greater than the drive's capacity.
54	**Invalid Cylinder Address**. The requested cylinder address was grater than the drive's capacity.
55-5C	**Not Used**.
5D	**Invalid DMA Transfer Count**. An odd number of bytes was specified.
5E-5F	**Not Used**.
60	**IOPB Failed**. A Bus Error occurred during the DMA transfer of an IOPB.
61	**DMA Failed**. A Bus Error occurred during the DMA transfer of data to or from the buffer or bus.
62	**Illegal VME Address**. If an 8 or 16-bit data transfer, the starting buffer address was not an even multiple of 2 (i.e, 0, 2, 4, etc.). If a 32-bit data transfer, the starting buffer address was not an even multiple of 4 (i.e., 0, 4, 8, C, etc.).

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- **IOPB Status Code '82' Description** (*continued*):

CODE	DESCRIPTION
63-69	**Not Used.**
6A	**Unrecognized Header Field.** During a *Read* or *Verify* command, one or more of the requested headers was not found. This error differs from *Error 29* because one or more headers were ignored due to invalid sync, checksum, or post header pad fields.
6B	**Mapped Header Error.** The sync field of a header appeared to be a valid mapped field, but the remainder of the header was unrecognizable.
6C-6E	**Not Used.**
6F	**No Spare Sector Enabled.** A *Map Sector* command was issued, but the UIB did not specify spare sector mapping.
70-76	**Not Used.**
77	**Command Aborted.** The *Abort* bit (Command/Status Register Bit 11) was observed and serviced.
78	**AC Fail Detected.** The VME *ACFAIL* control signal was detected.
79-9F	**Not Used.**
A0	**S/G Sector Size Too Large.** The Scatter/Gather list size exceeds the sector size.
A1	**Illegal Element Byte Count.** When doing a *Scatter/Gather* command the element byte count was not an even multiple of the bytes/sector parameter.
A2-AA	**Not Used.**
AB	**Illegal Element Size.** A Scatter/Gather element contained an odd number of bytes.
AC	**Illegal List Byte Count.** The total byte count specified by the Scatter/Gather list was an odd number.
AD	**Illegal IOPB Sector Count.** The IOPB sector count is not in agreement with the total number of bytes specified in the Scatter/Gather list.
AE-BF	**Unspecified Error Trap.**
C0	**Both Bits Set.** Both the *Spare Sector Enable* and *Multiple Spare Enable* bits are set which is illegal.
C1	**MSE Without Init Long.** The *Multiple Spare Enable* Bit is set, but the drive was not initialized with the *Initialize Long* command.
C2-FE	**Unspecified Error Trap.**
FF	**Command Not Implemented.**

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CONVEX

Field Support Tech Tip

Product: C-1
Tech Tip Number: Disc-015
Date: July 10, 1989
Subject: Disc Flaw Correction on Line
Submitted By: Dick Baker

There has been some confusion about flaws on disk media. In an attempt to clarify these flaws and an approach to alleviating problems caused by these defects the following tip has been produced.

In most instances a flaw will affect only one file. This can usually be handled without having to format and restore the data, which can be quite time consuming and result in a large amount of system down time. In order to accomplish this the damaged file must be identified. To identify this file depends on whether the media flaw is a hard or soft error.

There are two different procedures for "hard" or "soft" errors. The first method is for hard errors and consists of a tar of the partition containing the bad sector to /dev/null. At the same time redirecting the output to another file. It is then possible to edit the created file and find the error reported during the tar operation. The error will be an incorrect length error and the error message will be embedded in the verbose output of the tar. An example of this procedure should clear up any misunders tanding:

```
tar cvf /dev/null >& (file name)
vi (filename)
:v/^a/                  #this will locate the error
```

After locating the bad file it is now possible to remove it. It must not be removed until just prior to taking the system down as new data will be written to this sector if left up for long. It will then be possible to slip the sector using dev4110. For a temporary fix it will be possible to rename the file to some other name such as garbage, which will never be used. Renaming the file is easily done by the use of the mv command. This will result in a new name for the file, but leaves the location of the f ile as is.

Soft errors are handled slightly different as an error will not be generated during the tar. For this procedure it will be necessary to be using the console as you will be looking for the error message sent to the console as it occurs. This error can be captured by hitting the "no scroll" key as the errors are scrolling down the screen. It will be necessary to capture the names of the last five or six files just before the error occurs. This may take multiple attempts to get all of the file names. After c ollecting these file names it will be necessary to tar each of the files to locate the one with the bad sector. The command line to accomplish this is "tar cvf /dev/null (filename).

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Correcting the soft error, again, will be more complex as the dev4110 utility will not correct soft ecc errors. To correct this error it will be necessay to copy the offending file to another file (cp file file.sav). Then remove the original file and take the system down immediately. You can then slip the sector using the force option of 4110 and restore the track. After this reboot the system and rename the saved file, again by using the mv command.

> *NOTE* It is very important to remember that while slipping sectors, it is a good idea to do a dump of the partition being worked on.

The utility dev5130 does have a known problem as it will report a hard error as a soft error. If the slip utility will not save the track without using the force option the error can be considered hard. If the error is soft then 5130 will have no problems.

Field Support Tech Tip

Product: DISK
Tech Tip Number: Disc-016
Date: July 31, 1989
Subject: Disk Termination
Submitted By: Al Budriunas

It's possible to double terminate a both the 1 gbyte and 1/2 gbyte NEC disk drives without being aware that this was done. Both Nec model disk drives have internal and external termination available. It is possible to use either/or type of termination, but it is never permissable to use both.

If the disk should become terminated at both points it will be possible to receive read/write errors from the disk. These errors will occur across all partitions and will develop almost immediately after installation. This will make it appear as though the disk has been received in a DOA condition, when in reality there is nothing wrong with it.

As CONVEX inspects and tests drives as they are purchased, it is unlikely that the problem will arise on one of these drives. But, it is very possible to occur on drives purchased by the customer and installed by CONVEX.

The method of termination by CONVEX is the external resistor card that is inserted into connector P4 in the rear of the disk drive.

The internal termination is located on the "Logic and Servo" PCB near the front of the board. There are four resistor packs and are located near the rear of the drive at locations 1G, 1H, 1J and 1K. For more information on this the NEC maintenance manual can be consulted. The diagram is located in figure 2-2.

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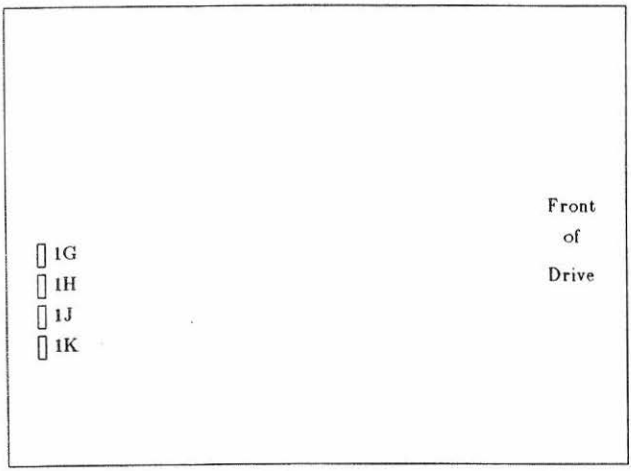
LOGIC AND SERVO PCB



It is easy to locate the internal terminators as they are white ceramic dips with a resistor value printed on the case.

CONVEX

Field Support Tech Tip

Product: Seagate Disk
Tech Tip Number: Disc-017
Date: Rev. 2/21/91
Subject: Internal Disk Diagnostics
Submitted By: Dan Schoner

The Seagate Disk Drive have an optional Diagnostic Tester. The CONVEX Part Number for this Status/Control Panel is 900-000341-001. The following will show how to call up these tests and execute. With the Status/Control Panel you also have the capability to check the last eight(8) status codes of the drive.

STATUS/CONTROL PANEL

1. Press DIAG MODE switch to enter diagnostic mode.

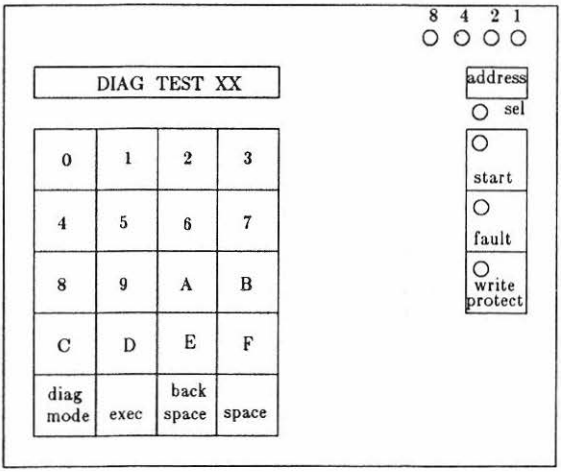
2. Observe that LCD reads DIAG TEST XX.

3. ENTER a two hexadecimal character test number on the keyboard and press EXEC switch to select the first test.

4. Pressing the EXEC switch one more time ends the test. The LCD again reads DIAG TEST XX.

5. You now have two choices:
   A. ENTER another two hexadecimal character test and press the EXEC to select, or
   B. Press DIAG switch to leave Diagnostic mode.

6. After leaving Diagnostic Mode the Drive will display the drive operating status.



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Disk Drive Tests :

TEST 00 - Display Drive Operating Status Log

This test displays the eight most recently generated drive status codes. After test selection, the display provides a hexadecimal status code. This code is preceeded by a character (0-7) which shows its position within the log.

TEST 01 - Display Fault Log

This test displays the eight most recently stored fault codes. This code is preceeded by a character (0-7) which shows its postion within the log.

TEST 04 - Calculate Three Most Likely Field Replaceable Units

This test uses the fault status and the drive operating status history (Test 00 and 01) to predict the mostly cause of drive failure.

TEST 05 - Servo Test

This test clears the drive status log and fault log. Also the drive performs a series of servo seek tests.

TEST 06 - Clear Drive Operating Status Log

This test clears the drive status log in the program ram.

TEST 07 - Clear Fault Log

This test clears the fault log.

TEST 08 - Direct or Continuous Seeks

This test performs direct or continuous seeks between cylinders 0 and the desired cylinder address.

TEST 09 - Random Seeks

This test performs random seek between cylinder 0 and the max. cylinder address.

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Disk Drive Tests :

TEST 0C - Display Eprom Part Number

This test displays the eight digit part number of the control microprocessor EPROM.

TEST 0E - Return to Zero

This test starts a Return to Zero command.

Test Execution :

For Test 00 and 01: Enter Test 00 (or 01) and press EXEC switch. Press SPACE switch until a code appears, preceded by an asterisk. This will be the most recent code. Pressing the SPACE will allow you to step through the remaining codes.

For Test 04 : Enter Test 04 and press EXEC switch. The LCD displays FRUS: XX XX XX. The FRU Codes are:

Controller	Displayed	FRU
80	00	No FRU
81	01	Replace Control Bd.
82	02	Replace Module
83	03	Replace Pwr Supply
84	04	Replace I/O Bd.
85	05	Replace Control Bd.
86	06	Replace Module

For Test 05 : Enter Test 05 and press EXEC switch. If the test is successful the LCD displays OK, CYL : 000 If a failure occurs the LCD displays SERVO ERROR: XX (see status codes)

For Test 06 and 07: Enter Test 06 (or 07) and press EXEC switch. The LCD will display; DRIVE LOG CLEAR (for test 06) or FAULT LOG CLEAR (for test 07)

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Test Execution :

For Test 08 : Enter Test 08 and press EXEC switch.
The Display will request a valid
hex cylinder,(between 0 and 663)
Enter three characters and press SPACE.
Next the LCD will request:
DIR or CONT? D/C
Enter 'D' for direct or 'C' for continuous.
If a 'D' was entered, and the test passed
it will display; OK, CYL: XXX.
If an error occurs under 'C' or 'D'
the SERVO ERROR: XX is displayed.
(see status codes for value of XX)
If a 'C' was entered; press EXEC switch
to end the test.

For Test 09 : Enter Test 09 and press EXEC switch.
LCD displays OK, CYL: XXX if successful.
If an error occurs the the LCD will display
SERVO ERROR: XX
(see status codes for value of XX)

For Test 0C : Enter Test 0C and press EXEC switch.
The LCD will display the eight digit
EPROM part number; EPROM# = 12345678

For Test 0E : Enter Test 0E and press EXEC switch.
If test successful LCD displays;
OK, CYL: XXX. If the test fails the LCD
displays; SERVO ERROR: XX.
(see status codes for value of XX)

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Drive Status Codes:

Code Fault log/Drive Status	Title	Description
NORMAL	START / STOP	STATUS
80/00	Ready & on Cyl	The drive is Ready and On Cyl, Normal Status.
82/02	Motor Stopping	Motor is slowing or that motor braking is on.
83/03	Motor Stopped	Motor is stopped
84/04	First Load/Calibrate	The heads are moving from the landing zone to track 0 and servo calibration is being preformed.
85/05	Sequence Delay	This code appears in remote mode during power on sequence delay. Delay is Address assigned (delay = address x 5 seconds). Changes next to 87/07 after delay.
86/06	Start pressed and waiting for power sequence signal	In remote mode, START switch was pressed and drive is awaiting for power sequencing control signals.
87/07	Starting Motor	Start conditions were satisfied. Code remains until motor reaches full speed.
88/08	Motor up to Speed	Spindle motor has reached full speed.
I/O BOARD	NORMAL	STATUS
89/09	I/O self test passed	I/O MPU successfully ran its power on self-test.
SWEEP	CYCLE	STATUS
8A/0A	Drive in sweep cycle	Drive is seeking as part of sweep cycle. On cylinder is inactive at this time.
8B/0B	Heads left on last cylinder of sweep	Current heads postion determined by last sweep cycle. On cylinder is inactive.
SEEK	ERROR	STATUS
C6/46	Seek Timeout	The drive took longer than 100 milliseconds to reach on-cylinder.

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Drive Status Codes:

Code Fault log/Drive Status	Title	Description
SEEK	ERROR	STATUS
CB/4B	Off Track Seek error	Drived failed to stay on-cylinder or cylinder pules were detected during track-following.
CD/4D	Illegal cylinder address	Controller issued too high a cylinder address during a normal seek.
CF/4F	Seek error on settle in	Drive could not settle on the destination cylinder.
FIRST	SEEK FAULT	STATUS
D4/54	First seek fault on retract	The drive failed to complete the retract portion of the first seek.
D5/55	First seek fault on load	The drive failed to load the heads.
D6/56	First seek fault on RTZ	The drive failed to complete the return to zero portion of the first seek.
D7/57	First seek fault on calibrate	The drive did not complete the velocity calibration operation.
ERROR	CONDITION	STATUS
D8/58	Speed loss	Spindal speed fell below 3564 r/min. The motor MPU inactivates the speed OK code to the control MPU. The control MPU activates the write protect line, drops Ready signal and performs a retract operation.
D9/59	Motor can't start due to error	A problem in the motor control circuits.
DA/5A	Emergency Retract	The heads retracted to the landing zone due to a power loss or that servo-controlled retract failed.

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Drive Status Codes:

Code Fault log/Drive Status	Title	Description
MOTOR AND	SERVO	ERRORS
E0/60	Motor MPU failure	The control MPU was unable to communicate with the motor MPU.
E1/61	Servo MPU failure	The control MPU was unable to communicate with the servo MPU.
I/O BOARD	ERROR	STATUS
E2/62	I/O board status failed	I/O MPU failed to transfer status successfully to the control MPU during a diagnostic test.
EE/6E	I/O self test failed	Failed I/O read/write diagnostic self-test.

Power ON Self Tests

During a normal DC power on sequence the Disk Drive will go through a self test procedure. The Address Lights (8 4 2 1) will indicate any errors during the power on sequence. The following chart will show these errors:

Lights Hex Value	Test Failed	Action
F	RAM-test	Replace control board.
E	ROM-test	Replace control board.
D	I/O Chip	Replace I/O or control board
C	Peripheral	Replace control board
B	Peripheral	Replace control board
A	Motor MPU	Replace control board.

NOTE: The Status/Control Panel will not be part of the Disk Drive, but can be ordered through Convex Logistics. The Convex part number is: 900-000341-001.

To use the Status/Control Panel you 'MUST' disable the I/O ports using the port disable switches (DA-DB) on the I/O Board.

CONVEX

Field Support Tech Tip
Product: DKD-50X
Tech Tip Number: Disc-018
Date: April 3, 1992
Subject: IDC Fault Symptom Codes
Submitted By: TAC-HW

IDC & IPI DISC FAULT SYMPTOM CODES

The purpose of this Tech Tip is to provide specific information pertaining to a standardized method of reporting error conditions on the CONVEX Integrated Disk Channel (IDC) and attached IPI Disc products.

The vehicle for communicating these error conditions is the

Fault Symptom Code (FSC),

a hexadecimal code which allows the Field Engineer or other maintenance personnel a convenient method for determining the nature of the error.

As stated above, the **FSC** will be the standard message printed to the console and the errlog in the event of a disc failure. Any future disc products will also use this same **FSC** format.

The format of the **FSC** console error message is as follows:

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

The **FSC** field is derived from the file sys/cmi/status.h. The various error codes are explained following the field descriptions.

The **idc, port,** and **unit** fields describe the offending CCU slot, port number on the IDC, and disc drive.

The **cyl, trk,** and **sec** fields are always printed, even if the error reported is not a data or seek error. For example, if there is a problem selecting a drive, these fields are reported anyway.

The **p** field is the partition number in which the error occurred. Partition **1** is 'a', 2 is 'b', etc.

The **cnt** field is the number of times the operation was retried. Error threshold is 11. If the **cnt** field is a number less than 11 then the operation succeeded.

See the following pages for specific **FSC's** and their explanations.

FSC CODES

FSC CODE	EXPLANATION
0x0000	*** normal success status *** No error condition. This code 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 four ports, 0 through 3. Any other number is invalid, and results in this error. 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 doesn't respond to a logical reset. Check the cabling and drive addressing DIP switches.
0x1003	*** unit already connected *** An attempt was made to transition from CMI boot level to physical level, but the unit was already at physical level. This error should never occur during normal operation.
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: 1. Attempting to disconnect the unit 2. Attempting to put the unit online 3. Attempting to slip a sector. 4. Attempting to unslip a sector. 5. Attempting physical level I/O.
0x1005	*** unit already online *** An attempt was made to transition from the CMI physical level to logical level, but the unit was already at the logical level. This error should never occur during normal operation.
0x1006	*** unit offline *** An attempt was made to transition from the CMI logical level to physical level, but the unit was not at the logical level. This error should never occur during normal operation.
0x1007	*** unit already mounted *** Not used by IDC.
0x1008	*** unit unmounted *** Not used by IDC.
0x1009	*** no memory for initialization *** Not used by IDC.

FSC CODES

FSC CODE	EXPLANATION
0x100a	*** out of CCU windows *** Not used by IDC.
0x100b	*** function timeout exceeded *** The IDC timed out on a read or write operation, or an expected attention from a unit did not arrive prior to timeout.
0x100d	*** function aborted by ccu *** This code is never returned during normal operation. If the IDC receives a DEBUG_FLUSH MBS message, all pending operations on the specified device are aborted and this error is posted.
0x100f	*** invalid cmi function code *** An invalid CMI function code or invalid command specific code was passed to the IDC. This error should never occur during normal operation.
0x1012	*** dev_name value is unsupported *** Not used by IDC.
0x1013	*** unit_name value is unsupported *** Not used by IDC.
0x1014	*** dev_class value is unsupported *** Not used by IDC.
0x1015	*** dev_type value is unsupported *** 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. This error should never occur during normal operation.
0x1017	*** Defective CMI message (badparms)*** The CMI message was defective. This error should never occur during normal operation.
0x1019	*** CMI message is required(not MBS)*** Not used by IDC.
0x101d	*** Unsupported comand *** Not used by IDC.
0x101e	*** controller already initialized *** Not used by IDC.
0x101f	*** controller not initialized *** The unit has not been 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. This error should never occur during normal operation.

FSC CODES

FSC CODE	EXPLANATION
0x1020	*** unable to initialze device queues *** Not used by IDC.
0x1021	*** h/w failure on controller *** Not used by IDC.
0x1022	*** bad seq. no. on FW load record *** Not used by IDC.
0x1023	*** option only valid on first rec. *** Not used by IDC.
0x1024	*** option only valid on last rec. *** Not used by IDC.
0x1025	*** unable to start firmware *** Not used by IDC.
0x1026	*** unable to load firmware rec. *** Not used by IDC.
0x1027	*** memory alloc failed *** This code is never printed in a FSC error message, although it is used with adb88 to indicate the breakpoint table is full.
0x1028	*** wrt on wrt protected unit tried *** During initialization, this code is returned if the unit is write protected (warning level). If a write is attempted, this code is returned and the write fails (fatal level).
0x1029	*** retries required to complete cmd *** Not used by IDC.
0x102a	*** unit not ready *** This error is returned if the drive status cannot be read or if the device cannot be selected after a reset.
0x102b	*** could not seek to required loc *** A seek error occurred. In early versions of IDC, this code is also used when a recalibrate operation fails.
0x102c	*** recoverable ecc error *** An ECC error occurred, and the data was corrected.
0x102d	*** bad header (chksum) *** In early versions of IDC, this could mean a header CRC error, a header miscompare, or a header parity error. In IDC versions 3.13 and later, this indicates a header CRC error.
0x102e	*** multi-block operation would run beyond last block *** Not used by IDC
0x102f	*** function cancelled by cpu *** Not used by IDC.

FSC CODES

FSC CODE	EXPLANATION
0x1030	*** bad device address *** Not used during normal operation of the IDC.
0x1031	*** bad parity or non-existent memory *** Not used during normal operation of the IDC. Used by adb to indicate an attempt to access non-existent memory.
0x1032	*** unrecoverable memory error *** Not used by IDC.
0x1033	*** PROC_DEV reply if stopped at bkpt *** Not used by IDC.
0x1040	*** ccu-detectable IO_PHYSICAL error *** Not used by IDC.
0x1041	*** function invalid for subqueue *** Not used by IDC.
0x1042	*** read/write data request too large *** Not used by IDC.
0x1043	*** requested data not available *** Not used by IDC.
0x1044	*** IOS wrong device *** Not used by IDC.
0x1045	*** CMI names for MBS_ERROR *** Not used by IDC.
0x1046	*** MBS_NO_MSG *** Not used by IDC.
0x1047	*** too many drivers in /ioconfig *** Not used by IDC.
0x1048	*** see 'extend' for real status *** Not used by IDC.
0x1049	*** diagnostic attempt failed *** 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.

FSC CODES

FSC CODE	EXPLANATION
0x104d	*** tried to slip bad sector *** An attempt was made to slip a sector that is already marked bad.
0x104e	*** tried to unslip good sec *** An attempt was made to slip 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 *** Either the drive spontaneously deselected itself, an operation exception occurred, or some other unexpected slave ending status was reported by the drive.
0x1051	*** parity error *** A parity error occurred on the IPI bus, in the bus B octet, or in an external field.
0x1052	*** disk format inconsistent *** I/O was attempted on a disk 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.
0x1054	***recalibrate command failed *** A drive recalibration command failed ("load slave function" command 0x28).
0x1055	*** read completed with CRC error *** Not used by IDC.
0x1056	*** data transfer was truncated *** Not used by IDC.
0x1057	*** lost connection to remote device *** Not used by IDC.
0x1058	*** header parity error *** A parity error occurred in the header field.
0x1059	*** header miscompare error *** The header on the disk did not match the header expected by the software. This will occasionally happen if the IDC software is not keeping up with the disk. If this error code is reported often, either the gaps are too small or there is a disk hardware problem.

FSC CODES

FSC CODE	EXPLANATION
0x1060	*** drive verify header miscompare *** This can be either a data error or a true miscompare (the drive does not tell us which)
0x1061	*** busy doing something else ***
0x1062	*** out of spares on cylinder ***
0x1063	*** usually a warning, not fatal ***
0x2004	*** geometry not set *** The geometry has not been set, and a command has been issued that requires the geometry. This error should not occur during normal operation.
0x2005	*** unable to read topology map *** 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. This error is returned if they cannot be read.
0x2007	*** unable to read any hdrs on cyl 0 *** An error occurred during 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 drive "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 expected magic number for the section.
0x4004	*** PIGA failed *** A 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 interrupt received.
0x5000	*** unable to disable rps interrupt *** A "disable RPS interrupt attention" command failed ("load slave function" command 0x1A). If the CMI message can be examined, the **status.extend** field contains the DICE EXREG for the failed operation.

FSC CODES

FSC CODE	EXPLANATION
0x5001	*** enable sync master failed *** A "enable master 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 type reported by the read configuration command must be one (type one is 'disk'). The device connected to the IDC claims it is NOT a disk.
0x5003	*** uncorrectable ecc error*** An uncorrectable ECC error occurred. The offending sector should be slipped.
0x5004	*** load head command failed *** A "load head address" command failed.
0x5005	*** load target command failed *** A "load RPS target sector address" command failed.
0x6000	*** buffer over run/under run error *** The DPED indicated a IDC buffer over/under run error.
0xbadd	*** used in message to send ***
0x6001	*** CCU has detected a fatal error *** If this error is returned, then the IDC has crashed. Only debug messages are accepted after a crash.
0x7000	*** interface not initially idle *** The DICE indicated a "interface not initially idle" error. The IDC software attempted a select operation when the interface was not idle, or an invalid state transition has taken place.
0x7001	*** interface not returned to idle *** The DICE indicated a "interface not returned to idle" error. The IDC software attempted a deselect operation and the interface did not return to idle, or an invalid state transition has taken place.
0x7002	*** invalid command status *** The operation failed due to a invalid DICE command status.
0x7003	*** register field CRC error *** A CRC error was detected in the DICE register field.

FSC CODES

FSC CODE	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 a invalid DICE transfer status.
0x7100	* Bus B parity error *
0x7101	* spontaneous drive deselection *
0x7102	* DICE command timeout exceeded *
0x7103	* DICE header parity error *
0x7104	* DICE external parity error *
0x7105	* IPI (cable?) parity error *
0x7106	* IPI bus control rejected *
0x7107	* IPI odd transfer size *
0x7108	* IPI3 command exception *
0x7109	* IPI3 command timeout *
0x710a	* IPI3 machine exception *
0x710b	* invalid slave ending status *
0x710c	* IPI3 alt port exception *
0x710d	* IPI3 intervention req. exception *
0x710e	* IPI3 vendor exception *
0x710f	* IPI sync error *
0x7110	* IPI3 incomplete substatus *
0x7111	* failed due to bad spot on media *

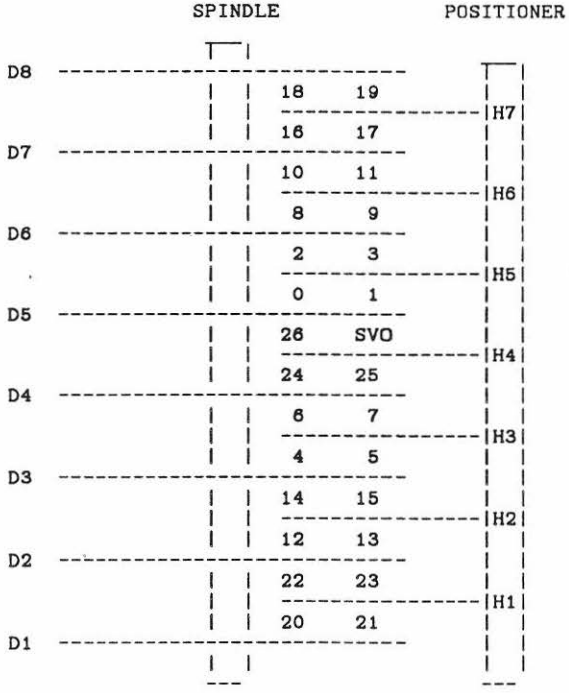
CONVEX

Field Support Tech Tip

Product: DKD-X08
Tech Tip Number: Disc-019
Date: July 25, 1990
Subject: Head/Platter Diagram
Submitted By: Dan Schoner

Figure 2-1 in the **NEC D2363 Disc Drive Product Description** Manual (**CONVEX p/n 900-000304-001**) is incorrect.

Brad Jones has provided the corrected diagram as follows:



Please note:

H1 = Head/Arm 1

D1 = Disk 1

Field Support Tech Tip

Product: VME Disc
Tech Tip Number: Disc-020
Date: Revised May 29, 1991
Subject: Re-Format Disc
Submitted By: Al Haddix

It has been discovered that when trying to reformat a VME formatted disk that has previously been formatted for VME, dev5130 will not allow pattern tests to run. So when running dev5130 -c 3 the pattern test will be skipped.

This problem is not considered a bug as the formatter is doing exactly as it was designed. Dev5130 first goes out and determines if the defect list exists. If the defect list is present, the diagnostic assumes the drive has been pattern tested and therefore does not rerun the pattern tests.

There are 2(two) work-arounds for this problem. I will discuss the easiest and recommended solution first:

1) If it is really necessary to pattern test a drive for some reason then the interactive pattern test can be used.
   The command to accomplish this is:
   a) test dev5130 -s 400
   b) patt <n times> 0 0 0 to end with pat1 pat2 pat3 (etc)
      It is recommended that the last pattern be 6DB66DB6 as this is the last pattern that the format runs. Up to 15 patterns can be entered.

******WARNING******

Method number 1 is the preferred solution to this problem.

2) If this method will not suffice for some reason and it is necessary to run the class C format with pattern tests included then you can follow the next solution:
   a) test dev5130 -s 300
   b) format setup (D1;Sector) -> list
      This will list the defect list.
   c) Make hard copy of Defect list
   d) format setup (D1;Sector) -> fo
      This will then prompt you to delete the defect lists. Answer yes and exit formatter.
   e) Create a file on the spu and transfer info into this file. The first line of this file must contain the disk type (i.e. DKD-208). The file should list cyl hd bcai len in that order. An example of this can be viewed on page 27 VMEbus SMD/ESDI Disk Test and Formatter Manual.
   f) test dev5130 -c 3
   g) format setup (D1;Sector) -> f filename
      This will read in the file that you created and allow the pattern test to run.

Now the formatter should run like normal. If problems are still evident, perform the additional steps on the following page.

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*****NOTE*****

Method 2 may not remove all copies of the media defect list and additional steps may be required on some drives. This is detailed below.

In case option 2 does not work then it may be necessary to overwrite the last cylinder. This can be done by the following:

1) Perform steps a-d of method 2
2) Add 1 to value 'c' - # of cylinders in **/mnt/bin/lib/DB_diskfmt** (see example below)
3) run initialize format of diag cylinder with subtest 303
4) Return to standard # of cylinders in **/mnt/bin/lib/DB_diskfmt**
5) Return to step e of method 2

****EXAMPLE****

For a NEC 1.1 VME disk, field c must be incremented to 1025 so that in the next step of the procedure to format the diag track using subtest 303, you actually format the bad block table track.

```
#------- INTERPHASE 4200 SMD CONTROLLER (VME) ---------
#  a    b    c   d  e  f    g     h    i j k  l  m    n   o  p
DKD-206 0  760 19 60 59 4832 36288 5 4 1 12 12  smd 2-7 n
DKD-208 0 1024 27 68 67 4816 40960 5 6 1 16 12  smd 2-7 n
          ^^^^
```

WARNING

Don't forget to return the /mnt/bin/lib/DB_diskfmt entry back to 1024 before formatting the disk (step 4).

P.S.

Thanks to Jay Birdsong (Houston F.E.) for clarifying the above.

Field Support Tech Tip

Product: Disk
Tech Tip Number: Disc-021
Date: October 30, 1990
Subject: NEC Status Display
Submitted By: David Muir

NEC D2363 (1.1gb) status information.

The following is a brief description of the status information on the 1.1gb NEC disk drive status panel. The status is comprised of a state field and a error field. Both digits are used to display normal operation status as well as fault status.

Display Codes - Normal Operation

State	Fault	
0	0	Power on reset
1	0	Power on initialize--+This sequence of states
		|takes place rapidly
2	0	Stop |and may not be seen.
3	0	Start wait----------+
4	0	Motor start----------+This sequence of states
5	0	Motor speed up |takes 20 to 30
6	0	Motor speed ok-------+seconds
7	0	Lock servo PLO-------+This sequence of states
8	0	Recalibrate out |takes place very rapidly
9	0	Recalibrate in-------+and may not be seen
A	0	Ready
B	0	Move out-------------+These codes are displayed
		|during seeks and may
C	0	Move in--------------+not be seen.

Fault codes displayed - Drive detected error

State	Fault	Description	Comment/POSSIBLE CAUSE
0	0	CPU Fault	LOGIC & SERVO
1	1	Voltage Fault	POWER SUPPLY
1	2	ROM fault	ROM - Logic and Servo PCB
1	4	Fault latch	LOGIC & SERVO
2	1	Voltage Fault	POWER SUPPLY
3	1	Voltage Fault	POWER SUPPLY
4	1	Voltage Fault	POWER SUPPLY
4	3	Motor Speed	Motor not up to 90% of speed POWER AMP
4	4	Motor Speed	Motor not rotating - POWER AMP
5	1	Voltage Fault	POWER SUPPLY
5	2	Motor Speed	Motor not up to 97% - POWER SUPPLY, POWER AMP, SERVO & LOGIC, HDA
5	3	Motor Speed	Motor speed over 102% - Same as fault 52
6	1	Voltage Fault	POWER SUPPLY
6	2	Motor Speed	Motor dropped below 90%. Restart, if fault 43 or 44 - POWER AMP, SERVO & LOGIC, HDA

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NEC D2363 (1.1gb) status information.

State	Fault	Description	Comment/POSSIBLE CAUSE
6	3	Motor Speed	Motor speed over 110% - Same as fault 52
7	1	Voltage Fault	POWER SUPPLY
7	2	Motor Speed	Motor speed dropped below 90% - Same as fault 52
7	4	Lost Index	No index detected - LOGIC & SERVO HDA
7	5	No IGB Found	Did not find Inner Guard Band - LOGIC & SERVO, HDA
8	1	Voltage Fault	POWER SUPPLY
8	4	Lost Index	No index pulses - LOGIC & SERVO, HDA
8	5	OGB Not Found	Did not find Outer Guard Band - LOGIC & SERVO, HDA
8	6	No N Linearity	N Linearity = 1 not obtained - LOGIC & SERVO, HDA
8	7	No Half Track	Half Track = 1 not obtained - LOGIC & SERVO, HDA
8	8	No Q Linearity	Q Linearity = 1 not obtained - LOGIC & SERVO
8	9	No Diff=0	Difference register not 0 - LOGIC & SERVO, HDA
8	A	No Target Vel	Head carriage servo target velocity not obtained - LOGIC & SERVO
8	B	Too Slow	Servo circuit not following LOGIC & SERVO
8	C	Over Shoot	+/- 1 cylinder range exceeded in position mode - LOGIC & SERVO
8	D	Over Shoot	Timeout, heads not in position - LOGIC & SERVO
9	1	Voltage Fault	POWER SUPPLY
9	4	Lost Index	Index not found - LOGIC & SERVO, HDA
9	5	OGB Found	Detected Outer Guard Band unexpectedly - LOGIC & SERVO, HDA
9	9	No N Linearity	N Linearity = 1 not found - LOGIC & SERVO, HDA
9	C	Over Shoot	+/- 1 cylinder range exceeded in position mode - LOGIC & SERVO
9	D	Over Shoot	Timeout, heads not in position - LOGIC & SERVO
A	1	Voltage Fault	POWER SUPPLY
A	2	Motor Speed	Loss of motor speed below 90% - POWER AMP, LOGIC & SERVO, HDA

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NEC D2363 (1.1gb) status information.

State	Fault	Description	Comment/POSSIBLE CAUSE
A	3	Motor Speed	Motor speed over 110% - Restart drive if fault 58 or 63 occur - POWER AMP, LOGIC & SERVO, HDA
A	4	Lost Index	Lost index pulses - LOGIC & SERVO, HDA
A	C	Off Track	Positioner moved over 1/2 track whil On Cylinder - LOGIC & SERVO, HDA
B	1	Voltage Fault	POWER SUPPLY
B	4	Lost Index	Lost index pulses - LOGIC & SERVO, HDA
B	9	No Diff=0	Difference count not zero - LOGIC & SERVO
B	C	Over Shoot	+/- cylinder range exceeded in position mode - LOGIC & SERVO
B	D	Over Shoot	Timeout, heads not in position - LOGIC & SERVO
B	E	Over Travel	Outer Guard Band detected during a seek - LOGIC & SERVO
B	F	Over Travel	Inner Guard Band detedted during a seek - LOGIC & SERVO
C	1	Over Cylinder	Seek command to greater than max cylinder - LOGIC & SERVO, CONTROLLER
C	3	TAG 1 while not ready	Recieved a TAG 1 while the drive was not in a ready state - CONTROLLER, LOGIC & SERVO
D	1	Voltage Fault	POWER SUPPLY
D	4	Lost Index	LOGIC & SERVO, HDA
D	9	No Diff=0	Difference register not = 0 - LOGIC & SERVO
D	C	Over Shoot	+/- cylinder range exceeded in position mode - LOGIC & SERVO
D	D	Over Shoot	Heads not in position for in time - LOGIC & SERVO
D	E	Over Travel	Outer Guard Band detected during a seek - LOGIC & SERVO
D	F	Over Travel	Inner Guard Band detected during a seek - LOGIC & SERVO
E	1	Seek Failed	Seek failed at minimum speed - LOGIC & SERVO
E	2	Seek Speed	Seek speed too high - LOGIC & SERVO
E	3	Seek Speed	Seek speed too low - LOGIC & SERVO
E	4	PLO not good	PLO not good in seek offset - LOGIC & SERVO

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NEC D2363 (1.1gb) status information.

State	Fault	Description	Comment/POSSIBLE CAUSE
E	5	Off Track	Off Track in offset seek - LOGIC & SERVO
E	6	Offset Cmd	Offset command while not on Error cylinder and ready - LOGIC & SERVO
E	7	RTZ failed	Speed adjust failed after Return To Zero Command - LOGIC & SERVO
F	1	Protect Violation	Write gate detected when write protected - CONTROLLER, LOGIC & SERVO
F	2	Write Fault	Write gate while not on cylinder or not ready - LOGIC & SERVO, HDA
F	3	Write Clock	Write Clock Fault - LOGIC & SERVO HDA
F	4	Off Trk Write	Off track detected during a write - LOGIC & SERVO
F	5	Write MARS	Write failure - ENDEC & R/W, LOGIC & SERVO, HDA
F	6	Read MARS	Write current detected during read - ENDEC & RW, LOGIC & SERVO, HDA

CONVEX

Field Support Tech Tip

Product: VME Disk
Tech Tip Number: Disc-022
Date: November 21, 1990
Subject: Re-Formatting Bad Headers
Submitted By: Dan Schoner

PROCEDURE TO REFORMAT 'CORRUPTED' TRACKS

Steps 1 thru 3 verify that no sector(s) can be read at Cylinder 637, Head 6 of a Hitachi DK515-78 (780 MB) Disc Drive using the interactive mode (Class 4) of dev5130. Therefore, the 'format' command fails since the track headers cannot be read. The drive in use is "D1". Steps 4 thru 9 provide a procedure to work around this problem and re-format the affected track without replacing the disk drive.

1. (D1;Save)-> **toggle**
   Track data save is no longer automatic during 'format', 'slip_sectors', 'pattern_test' and 'data_verify'.

2. (D1;Nosave)-> **v 637 6 15** <<--Selection of sector 15 is strictly arbitrary
   verify_format: pass # 1
   dev5130 drv 1 29(cntlr) Sector not found
   Cyl: 637 Hd: 6 Sect: 15 # Seeks:1
   IOPB: (2 lines of IOPB data shown here)

3. (D1;Nosave)-> **fo 637 6**

   TRACK HEADERS BEFORE FORMAT:
   dev5130 drv 1 RSI 27(cntlr) Data overrun
   Cyl: 637 Hd: 6
   IOPB: (2 lines of IOPB data shown here)
   1 attempts to report sector IDs failed
   what to do [# of retries/skip] (1) -> **skip**

NOTE

At this point, the 'slip' command is used to accomplish some sort of format that can be later used by the 'format' command.

4. (D1;Nosave)-> **slip**
   Type 'h' for help with slip commands
   Logical sector input mode selected.
   slip (D1;Nosave;Sector)-> **637 6 15**
   slip (D1;Nosave;Sector)-> **e**

   Summary of new flaws on drive 1 serial number 09449:

CYL	HD	SEC	BCAI	LEN	TYPE	ERR	SRC
637	6	15	0	4737		NONE	NEW

   Are you sure inputs are ready for slipping? [yn] -> y

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```
Number of spares per track: 1

cyl     hd   sec   bcai        len      action      additional information
---     --   ---   ----        ---      ------      ----------------------
637     6    15    0           4737     slipped

5. slip (D1;Nosave;Sector)-> quit

6. (D1;Nosave)-> tr 637 6
    cylinder = 637   head = 6
   *B 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
   39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
   64 65 66 67  0  1  2  3  4  5  6  7  8  9 10 11 12 13 14

7. (D1;Nosave)-> format 637 6

    TRACK HEADERS BEFORE FORMAT:
    cylinder = 637   head = 6
   *B 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
   39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
   64 65 66 67  0  1  2  3  4  5  6  7  8  9 10 11 12 13 14

          About to format cylinder 637 head 6
          Flawed sectors associated with this track:
               Manufacturer's Defect list: none
               Grown Defect list:          15
               Enter sectors from GD list you want reslipped
                    separated by spaces:
          Format complete.

8. (D1;Nosave)-> tr 637 6
    cylinder = 637   head = 6
   15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39
   40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64
   65 66 67 *S  0  1  2  3  4  5  6  7  8  9 10 11 12 13 14

9.  (D1;Nosave)-> quit
```