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DLT Event Log Troubleshooting Guide

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A.0 How to Use this Document

This manual supports the DLT™8000, DLT™ 7000, DLT™4000, DLT™2000XT, and DLT™2000.

The manual is in numerical order of the EVENT LOGS Documented, followed by the SCSI common SCSI sense keys. The definition of the information is based on the most current versions of firmware but are still subject to change for each future version of firmware.

The description of the fields may be defined as a Hex value in which the value is a code. Or the field may be described as bit dependent in which there are multiple definitions for the byte, depending on the number of bits set or cleared in that byte field.

If the data field is a Hex value the document will indicate that by documenting the Hex value followed by the description of what the value means.

Example: 2Ah = Directory Complete.

If the field is defined by which bits are set for multiple indications the description of each bit will be defined separately and the reader will need to imply the multiple status indications by developing the sums of the definitions based on which bits are set or cleared.

Example: A field in Event A402 labeled Drive status uses multiple bits to indicate the status of the drive when the event occurred. If the field were to have bit 15 set to a 1 and all others equal to 0 this field would indicate the drive was in the process of using a cleaning tape at the time of the event.

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B.0 Recommendations for improvement

If there are requests for additional data to assist in the use of this document please forward them to your DLT engineering contacts who will share them with their Quantum account teams for consideration in the next release of this manual. You may also send email to Randy.Elmer@Quantum.Com.

If there are ways to make this document easier to read please provide those recommendations as we are always looking for ways to improve.

Not all codes for the events have been documented. The ones documented are the ones most valuable in determining if the event is related to drive issues, media issues, or some external concern. If others need to be added make your request as recommended above. The intent was to make this document easy to use and does not contain information that is not useful. We want to save the trees and the hours required documenting information that is of little or no value to the user. If we missed items let us know.

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C.0 Packet Interpretation

C.1 Purpose of the Event Log is to record;

- Firmware Resets, labeled as Bugchecks
- Key Events that may impact performance
- PO/ST Failures (Power-On-Self Test)
- DLT Drive Diagnostic Results
- Firmware Changes
- Key SCSI Check Conditions (hardware and media related)

C.2 Event Log Break Down

Each packet is broken down into several different fields that will aid in understanding what and when it occurred. The following is a description of the common packet information that each Event Log Packet will contain and must be considered to fully understand the relationship of an event to the possible failure mode experienced by the application. The other fields described in each Event Packet section will color code the fields that will be of value in defining that event. Please use the below example to understand the common information for all Event Packets.

```
Packet # 26 - Event: A401  [V80-0   4-AUG-1998]  000:03:52.153  POH/PC= 340/16
       110013B9 571E0101 00400000 00130000 02D10000 00440000 00000000 220024CA
       00000000 04720000 00000000 00000000 00000000 00000000 00000000 00000000
       00000000 00000000 00000000 00000000
```

Packet Number is a sequence number to indicate the order in which the event was logged, in the example above this was the 26th event packet recorded in Log Page 7 of the DLT tape drive. The log page contains only the last few events and prior ones will be rotated out of the log and lost. If there are multiple events related to the same condition the sequence in which they occurred may be reversed in which case you need to use the time stamps to confirm the order of occurrence, where possible.

Event Number is a code to indicate the type of event being logged. In the case of this example it is a hex code of "A401" indicating a write error. An Event is just an occurrence of something happening and does not indicate the drive has failed. The Events with system/application information will aid in determining the real cause of the customer concern and aid in defining what was the root cause, media, drive, or other external source from the drive.

V Number and Date is the version of firmware the drive was using when the event was logged. The date is a reference date for when the firmware was created by Quantum.

The field described as **000:03:52.153** is the total time in which the DLT tape drive has had power applied to the tape drive, since the last power cycle. This is hours, minutes, seconds, and milliseconds. There is no date associated with the power up time.

POH/PC is tracking information for how many power-on-hours (POH) the drive has had since it was shipped from Quantum. This is how many hours the drive has had power applied regardless of the number of times it is turned on and off. POH is incremented once every 60 minutes the drive has had power applied to the drive with no interruptions. Power cycles (PC) is how many times the drive has experienced a power on cycle. Also note that each time a drive logs a Bugcheck it will increment this count as well.

The remaining information is detailed data that further describes the event and will be covered under the section of the event type.

One other packet type is similar to **Packet 27**, below, in which it is a log entry of a SCSI event that may have been sent to the host in response to a command not completing successfully. POH, POC are the same for all packet types. These same packet or SCSI check conditions are logged in Log Page 33, if your DLT tape drives supports that log page. These packets may also be related to the events logged prior to this entry as an indicator that the event created a check condition that the host should know about.

```
Packet # 27 - SCSI Event:
POH/PC/MID/SK/ASC/ASCQ/AddErr=340/16/13B9571E/1/80/02/00
```

MID is Media ID which is an internal identification number, written to the media the first time the media is used, to aid in tracking media to the different events. This ID does not correlate to any media ID used by application software.

SK/ASC/ASCQ are the SCSI equivalents of Sense Key (SK), Additional Sense Code (ASC), and the Additional Sense Code Qualifier as defined by the SCSI Standards. See SCSI Events section for a description of some common events that may be logged.

C.3 PO/ST Failures

These log entries are indicators that the DLT tape drive detected a failure when power was applied. The Power-On-Self test that failed may have been with a reset and retry. This entry is only indicating each time the test ran and experienced the error condition. The packet number and POH/POC are the same as all other packets. The important part of this packet is the Last Fail section. Last Fail will describe the type of failure that was experienced. Please look at the PO/ST section of this document for explanation of that data.

```
Packet # 135 - PO/ST Error - Last Fail: 88021950  POH/PC= 527/71
    70000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
    00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

C.4 DLT Diagnostic Results

Each time the DLT tape drive runs an internal diagnostic it will log the results of that test. If a SCSI Send Diagnostic command was issued to the drive the results of the test would be seen in both the SCSI response to the command as well as an entry in Log Page 7. The below is an example of a DLT8000 entry after running an internal diagnostic test. The packet number, POH/PC will have the same meaning as the other packets. The results of the test will have information about the test run and the results. See the section on DLT Diagnostics Packets for further explanation of this Packet.

```
Packet # 0 - Diag ILOG:    POH/PC= 6/3
 Test: IWR_RD Time: 6:07, Sts-Miscompare
DLT8000 Ent. Wr/Rd: 299545/169
Compare ON ErrRate Wr: 1.4145/Mb , Rd: 357.14/Gb
pHWE: 0 pHRE: 0
4-Chan. Wr Metrics
 Wr-CRC:    69091,  21  22   9  36 /  1   6   1   4
 Wr-DO:       297,   9  13  12  10 / 12  17  14  12
4-Chan. Rd Metrics
 Rd-CRC:      394,  24  15   6  34 /  4   9   1   6
 Rd-DO:        22,  27  23  14  23 /  5   5   0   5
 Rd-MissingBlks:       10, ReRds:        0
Temp 46 C
```

C.5 DLT Firmware Changes

Each time the DLT tape drive is requested to change the firmware version, either by following the procedure for updating firmware by tape or SCSI there will be three possible entries that may be logged. The below are examples of those entries. The first entry is a Event Packet indicating an attempt to enter the code update routine was entered and may not have been successful. The second entry is a successful code update entry. The last entry is a sample update in which it was successful and being reported to the host system through a SCSI check condition. Refer to the section on DLT Firmware Changes for detailed explanation of these entries.

```
Packet # 6 - Event: CA02  [V60-0  14-AUG-1997]  000:00:04.455  POH/PC= 0/7
       00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
       00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
       00000000 00000000 00000000 00000000

    ----------------------------

Packet # 7 - CUP Event:  POH/PC= 0/8
  Drv CUP status: Complete
  Drv Old: 03-18/FD5C
  Drv New: 03-21/DFF7
  Cnt CUP status: Complete
  Cnt Old: V060/2C5CE36E (14-AUG-1997 16:30:40)   Pers: (21-1)
  Cnt New: V080/03CBD1BE ( 4-AUG-1998 13:48:33)   Pers: (28-1)

    ----------------------------

Packet # 8 - SCSI Event: POH/PC/MID/SK/ASC/ASCQ/AddErr=0/8/00000000/9/21/50/00
```

C.6 Format of the Packet

Each Event packet will consist of multiple Long words. The Long words are labeled from left to right. Using the above example, Packet #26, the first Long Word is the top left word containing the data 11013B90. The eighth Long Word is on the top line located to the far right side containing the data 220024CA. The ninth Long Word will start again on the left at the second line and long words will continue to increment from left to right and back again to the left for the third line for a total of 20 long words, in this example. Each Packet type may have a different number of Long Words as an example, Packet for a Event of A400 may have 17 Long Words while a Packet for a Event of A404 may have 20 Long Words. The number of Long Words will depend on the Packet Type and firmware version. When it is important to note the differences the Packets definitions will include the appropriate note.

```
Packet # 26 - Event: A401  [V80-0   4-AUG-1998]  000:03:52.153  POH/PC= 340/16
       110013B9 571E0101 00400000 00130000 02D10000 00440000 00000000 220024CA
       00000000 04720000 00000000 00000000 00000000 00000000 00000000 00000000
       00000000 00000000 00000000 00000000
```

Using Long Word 1 of the above packet as an example of a long word we can further break down that word into smaller segments called words, bytes, and bits. A bit being the ones or zeros making up each binary location of a long word that consists of 32 bits. A byte is 8 bits, a word being two bytes long, and finally a long word being 2 words or 4 bytes. The difference is that words and bytes are counted from 0 to 3 for bytes or 0 to 1 for words in each Long Word. Long Words as explained earlier count from 1 to 20. An example of a long word broken into bytes is displayed below.

Examples of a Long Word

(Long Word may consist of two hex grouped numbers representing words)

Word 01	Word 00
1100	13B9

(Long Word may consist of 4 hex grouped numbers representing bytes)

Byte 03	Byte 02	Byte 01	Byte 00
11	00	13	B9

Data may span from one long word to another in order to capture the entire information required. An example would be from Packet #26 in which the media ID consists of Word 0 in Long Word 1 and Word 1 of Long Word 2. In this case the Media ID would be 13B9571E hex.

Long Words, Words, and Bytes may also be broken down into bits. Each bit representing a register would have a unique meaning. To fully understand the entire status or information provided by the Long word, Word, or Byte the reader will need to know which bits are set and which ones are not to fully understand the information being provided by that register data. All bits are labeled from right to left regardless of the bit being part of a Long Word, Word or Byte. An example of a byte (8 bits) broken into bits is provided below. Long Words, and Words would be equivalent to this example expect with the addition of more bits to make up the entire Word (16 bits) or Long Word (32 bits). The below example is from Packet # 26 Long Word 1, Byte 0 with the contents of B9 hex.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1	0	1	1	1	0	0	1

C.7 Packet Correlation

Typically the event log packets are related to one occurrence of an issue, but there are instances in which there may be multiple packets related to one problem with more than one entry that led up to the final entry. In theses cases the first event may be the cause of the other related events. Refer to the POH/PC to confirm the events are within the same power on hours and power cycle, then refer to the Power-Up-Time to verify multiple events are with in one second or less. The events that occur in one second or less may then be related, but they may get logged in the reverse order of occurrence. In the below example there are three events. The event packet #64 is an event A404 indicating the drive had a problem doing calibration. Packet #63 is actually an event in which the drive logged a second event after doing a retry from the failure logged with packet #64. Packet #62 event A407 is a directory read failure which was because the drive failed calibration. The actual problem would be the A404 failure logged at packet #63 even though the power-up-time is less then packet #64 and the directory failure for packet #62 can only occur after calibration, which would be after both Packet #63 and #64 would have already occurred. We also know these are related because the media Id for all three entries are the same.

```
Packet # 62 - Event: A407  [V85-0  23-DEC-1998]  001:54:41.019  POH/PC=
1572/26
       0F200F01 00000210 02011500 00000000 1460D699 00111418 00000000 00000000
       00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
       00000000 00000000 00000000 00000000

Packet # 63 - Event: A404  [V85-0  23-DEC-1998]  001:54:41.019  POH/PC=
1572/26
       42001460 D6990101 00000002 00000000 00000000 00000000 00000000 00000000
       00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
       00000000 00000000 00000000 00000000
```

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```
Packet # 64 - Event: A404  [V85-0  23-DEC-1998]  001:54:42.925  POH/PC=
1572/26
       42001460 D6990101 00000002 00000000 00000000 00000000 00000000 00000000
       00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
       00000000 00000000 00000000 00000000
```

The additional example below shows that packet number 32 is a drive error. Packet number 33 is a write error and Packet number 34 is the SCSI event reporting the write error. The SCSI Event was logged as a result of the drive issuing a SCSI check condition for the A401 write error. The A401 Write Error was due to the A402 drive Error.

Packet # 32 - **Event: A402** [V85-0 23-DEC-1998] 006:11:20.072 **POH/PC= 86/9**
2000**4F9D 02D7**0101 00000000 00000000 00000000 00000000 00000000 00000000
00000001 15040000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000

Packet # 33 - **Event: A401** [V85-0 23-DEC-1998] 006:11:20.072 **POH/PC= 86/9**
1100**4F9D 02D7**0101 00100000 80000000 00000114 00010024 3B800000 00000000
00000000 0127052A 00003400 00000000 00000000 00560000 00000000 00000000
00000000 00000000 00000000 00000000

Packet # 34 - **SCSI Event**: POH/PC/MID/SK/ASC/ASCQ/AddErr=**86/9/4F9D02D7**/3/80/01/00

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1. 0 Event A400 - Read Error Log

Read Error is a recorded event indicating the tape drive detected a condition in which the drive was not successfully able to read the data from a particular location on the media. This could be due to several possibilities. For example; a bad spot on the media, a failure of the drive to determine the data read from the tape was good due to bad CRC, other indicators used by the drive to insure data integrity, or the data originally written was not written correctly.

These events should be used to verify if multiple events on the same media occur, or multiple events on different media allowing you to determine if the failure really is media caused or drive caused. Caution should be used to insure the event is not due to media being written badly by some other drive. Look for A401 events with the same media ID on this drive and others this media may have been written in to confirm it was not written incorrectly. Note if the drive logs this error the cleaning light may be turned on recommending a cleaning as well

```
Packet # 135 - Event: A400 [V60-0 05-Jun-1996] 000:05:20.780 POH/PC= 527/71
    110035D6 1F980101 01100000 80000000 0003020E 00010037 38080000 00000000
    00020000 00F0053A 00002800 10300000 00000000 00750000 00000000 00000000
    00000000
```

		(MSB) Media ID		1
Media ID (LSB)				2
	Media Format			3
		,	Track	4
Physical Block Number on Track				5
				6
				7
				8
				9
				10
				11
				12
				13
				14
				15
				16
				17

1.1 Field Descriptions A400

Media ID = Identifier placed on the media when the calibration tracks are written. This is used to help track which piece of media was in the drive at the time of the event.

Media Format = The value of this field defines the Format or Density the media is written.

4 – DLT™260	10 – DLT™2000/2000XT	40 – DLT™7000
8 – DLT™600	20 – DLT™4000	80 - DLT™8000

Track = Logical Track Number the Heads are on at the time of the event. The DLT tape drive is a linear recording device With multiple tracks. The Read/Write Head Assembly has more than one head such that multiple physical tracks of data are read or written at the same time. These multiple tracks are referred to a one logical track.

Physical Block Number on Track = A physical location on the media based on distance from the end-of-track depending on which direction the tape is moving. Tape moving from BOT side of tape to EOT side is distance from BOT. In the opposite direction it is the location from the EOT side of the tape. This data with the track number can be used to help identify if repeated failures always occur at the same spot, meaning data written wrong, or bad spot on media.

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2.0 Event A401 - Write Error Log

Write Error is an event in which the tape drive detected a condition that the drive was not successfully able to write data to the media. This could be due to conditions like a bad spot on the media or a failure of the drive to determine the data written was good during the read after write. Multiple Media ID's may indicate the drive while similar media ID may indicate the media. Recommend using a cleaning tape and trying the same or different media again before indicating the drive as the failure. Note if the drive logs this error the cleaning light may be turned on recommending a cleaning as well.

```
Packet # 135 - Event: A401 [V60-0 05-Jun-1996] 000:05:20.780 POH/PC= 527/71
    110035D6 1F980101 01100000 80000000 0003020E 00010037 38080000 00000000
    00020000 00F0053A 00002800 10300000 00000000 00750000 00000000 00000000
    00000000
```

		(MSB) Media ID	1
Media ID (LSB)			2
	Media Format		3
		Track	4
Physical Block Number on Track			5
			6
			7
			8
			9
			10
			11
			12
			13
			14
			15
			16
			17

2.1 Field Descriptions A401

Media ID = Identifier placed on the media when the calibration tracks are written. Used to help track which piece of media was in the drive at the time of a failure. A new, unused, piece of media will have the media ID written on the first write command from BOT. If the drive failed during calibration and a write command from BOT was issued the drive will rewrite the calibration tracks changing the media ID at that time.

Media Format = Format/Density the media is written.

4 – DLT™260	10 – DLT™2000/2000XT	40 – DLT™7000
8 – DLT™600	20 – DLT™4000	80 - DLT™8000

Track = Logical Track Number the Heads are on at the time of the event. The DLT tape drive is a linear recording device with multiple tracks. The Read/Write Head Assembly has more than one head such that multiple physical tracks of data are read or written at the same time. These multiple tracks are referred to a one logical track.

Physical Block Number on Track = A physical location on the media based on distance from the end-of-track depending on which direction the tape is moving. Tape moving from BOT side of tape to EOT side is distance from BOT. In the opposite direction it is the location from the EOT side of the tape. This data with the track number can be used to help identify if repeated failures always occur at the same spot, meaning data written wrong, or bad spot on media.

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3.0 Event A402 - Drive Error Log

This event indicates the drive has detected something out of the ordinary during normal operations. This could be items such as a dropped leader, or an error internal to the drive. If this is a hard error the drive will not be functional for reading, writing, or successfully loading or unloading the media. This event may be a recoverable event indicating something at that time was not correct. Multiple events of this type would be a better indicator that there may be a problem with the drive or the piece of media being used. Look for how frequent the events are being logged and how they relate to the media ID.

```
Packet # 135 - Event: A402 [V60-0 05-Jun-1996] 000:05:20.780 POH/PC= 527/71
    200035D6 1F980101 00010001 00000000 00000001 00010000 00000000 00000000
    00000001 15040000 006C0000 00000000 005A6000 00000000 00000000 00000000
    00000000
```

	(MSB) Media ID	1
Media ID (LSB)		2
Drive Error Code	Drive Status on Error	3
		4
		5
		6
		7
		8
	ASCQ	9
ASC / Sense Key		10
		11
		12
	POST Flags	13
POST Flags		14
		15
		16
		17

3.1 Field Descriptions A402

Media ID = Identifier placed on the media when the calibration tracks are written. Used to help track which piece of media was in the drive at the time of failure.

Drive Error Code - Drive Error Codes listed are listed only as major codes indicating a category of drive error types rather than listing all possible error codes. The individual error codes are not important for determining if the event is hardware, media, or some other source of the error.

Major Error Code	Description	Possible Action
0000h-001Fh	Power on Self Test Errors	Check Power
		Check Post Flags
0020h-003Fh	Initialization Errors	Check Power
		If Repeating insure no media loaded.
		No Media and repeat drive replacement
0040h-004Fh	Cartridge Insertion Errors	Check Cartridge
0050-005F	Cartridge Load Errors	Check Cartridge/Leaders
0060h-006F	Cartridge Unload Errors	Check Cartridge/Leaders
0070h-007F	Cartridge Extraction Errors	Check Cartridge/Leaders
0080h-009Fh	Servo Errors	Possible drive, try multiple media
00A0h-00Afh	Miscellaneous Tape Motion Errors	Possible drive, try multiple media
00B0h-00BFh	Hardware Errors	Possible Drive
00C0h-00DFh	Internal Software Errors	Possible drive, try multiple media
00E0h-00EFh	Interrupt Trap Errors	Possible Drive
00F0h-00FFh	Miscellaneous Errors	

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Drive Status (on Error)

bit 15 – Drive is in the Process of using a Cleaning Tape
bit 14 – Drive has a Cartridge Inserted
bit 13 – Drive has No Tape Tension
bit 12 – Drive is in the Process of Calibrating after loading a tape cartridge
bit 11 – Drive is in the Process of Rewinding the tape to BOT
bit 10 – Drive is at a End of Track
bit 09 – Drive is on the Correct Track and physical location of the media
bit 08 – Drive is Moving the Tape and Seeking to a Track location
bit 07 – Drive is Stopped on Tape
bit 06 – Drive is at EOT
bit 05 – Drive is at BOT
bit 04 – Drive is Unloaded with No Cartridge
bit 03 – Drive is Unloaded with a Cartridge
bit 02 – Drive is in the Process of Unloading the tape
bit 01 – Drive is in the Process of Loading a tape but has not entered the calibration phase of the load
bit 00 – Drive is in the Process of Initializing (typical after power on or a total drive reset)

POST Flags – 32 bit register to indicate the POST failure that failed.

31	30	29	28	27	26 – 24	23 – 16	15 – 8	7 – 0
FE	RE	LF	MF	UI	Unused	Failing Section	Failing Subsection	Detected Error

FE – Fatal Error Was Detected

RE – Reportable Error was Detected (Error can be reported via SCSI Bus)
LF – Last Fail Packet Contains Valid Information
MF – Multiple Failures Were Detected
UI – Unexpected Interrupt was Detected

Failing Section Not equal to 0 return drive for repair

Failing Subsection (follow guidelines listed for Failing Section)

Detected Error (follow guidelines listed for Failing Section)

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4.0 History Packet - A403 - Loader Error Log

This Event log entry is used by drive loader/Library OEM suppliers in which the library/loader supplier should provide additional details.

```
Packet # 135 - Event: A403 [V80-0 11-Mar-1997] 000:05:20.780 POH/PC= 527/71
    30000000 00000000 02051040 000006C1 C4000100 00000101 00FF0100 80808080
    8080808B 80000000 00000000 00000000 00000000 00000000 00000000 00000000
    00000000
```

	(MSB) Media Loader Identifier		1
Media Loader Identifier			2
Media Loader Identifier (LSB)			3
(MSB) Media Loader Unit Number (LSB)	Loader Error	Loader Command Status	4
Loader Command			5
	Event Reference Number		6
			7
			8
			9
			10
			11
			12
			13
			14
			15
			16
			17

Contact your Loader/Library Supplier for details of this packet information. It will vary depending on the Loader/Library configuration.

Media Loader Identifier – Code to identify loader type
Media Loader Unit Number – Code to identify loader unit number
Loader Error – Loader error type
Loader Command Status – Status of the loader command that executed
Loader Command – Loader command that was to be executed
Event Reference Number – Number being used to count the number of events that have occurred

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5.0 History Packet - A404 - Calibration #1

This Event log packets contain 20 long words. The data in the Cal Fail are is critical to determine if the drive failed calibration and why. If the drive does a write from BOT this failure is no longer important as the calibration information is over written with new data. Note the Media ID is invalid if the calibration failed. This event can be used to help understand why a drive may be getting multiple cleaning lights and are the cleaning lights all related to calibration errors. A cleaning light will come on if a drive gets a Hard Read or Write Error as well. To verify if this is all due to the same piece of media the use of the system/application logs we need to be correlated to when these events occurred. If it is the same media replace it or try a write from BOT to see if it will clear.

```
Packet # 5 - Event: A404 [V40-0 21-FEB-1997] 003:35:03.744 POH/PC= 21/5
   42004E9B 4FEB0103 000007F6 007401E6 015601DB 01611E1E 00000000 00001B1B
   1B1BCCCC FEF43A44 766C02EE 20161515 4A3F9DC2 9EBA849A 849C3436 2ES2574E
   50512723 232078E6 78E983C9 83CC0000
```

	(MSB) Media ID	1
Media ID (LSB)		2
Cal Fail	Cal Info Flags	3
		4
		5
		6
		7
		8
		9
		10
		11
		12
		13
		14
		15
		16
		17
		18
		19
		20

5.1 Field Descriptions A404

Media ID = Identifier placed on the media when the calibration tracks are written. This is used to help track which piece of media was in the drive at the time of failure. A new, unused, piece of media will have this happen on the first write command from BOT or if the drive has failed during calibration and a write command from BOT will rewrite the calibration tracks changing the media ID at that time.
Note: If the calibration failed the Media ID will not be valid

Cal Fail – Status of the Calibration (Reason for calibration failure) Try cleaning tape and different media.

bit 15 = Calibration Track was Not Found in the Correct Location
(there are multiple Calibration tracks on a tape)
bit 14 = Forward and Backward Offset of Calibration Tracks too Far Apart
bit 13 = Backward Offset of Calibration Tracks too Far Apart
bit 12 =Forward Offset of Calibration Tracks too Far Apart
bit 11 = Bottom Edge of Tape Found too Far From Bottom head Stop location
bit 10 = Amplitude Calibration low
bit 09 = No Write Gate
bit 08 = 2F Amplitude Out of Specification
bit 07 = Write Current Out of Specification
bit 06 = Resolution Calculation Failed
bit 05 = Tension Calculation Failed
bit 04 = Bottom Edge of Tape Not Found
bit 03 = Bottom Edge of Tape too Close to Bottom head Stop location.
bit 02 = Width of a Calibration Track Out of Specification (any one of the calibration tracks)
bit 01 = Media type Unknown
bit 00 = Number of Calibration Tracks Inconsistent with Media Type

Cal Info Flags – Used to help verify the media type and the format of that media that was inserted as to what the user had expected to use. This is another verification to determine if it is media or a user induced failure.

bit 15 = Unused (DLT2000/4000 only)
Current Calibration is in Azimuth Mode (DLT7000/8000 only)
bit 14 = Calibration Failed (DLT2000/4000 only)
Vertical R/W Offset Okay (DLT7000/8000 only)
bit 13 = Calibration Successful, but a Cleaning Limit exceeded (DLT2000/4000 only)
Azimuth R/W Offset is Okay (DLLT7000/8000 only)
bit 12 = Desperation Read Mode (Drive not calibrated to write but will attempt to read only)
bit 11 = Tilt Position Okay (DLT7000/8000 only)
bit 10 = Calibration Tracks Written
bit 09 = Tape Edge Found
bit 08 = Write Current Okay
bit 07 = Signal-to-Noise Okay
bit 06 = Resolution Okay
bit 05 = 2F Amplitude Okay
bit 04 = Tape Tension Okay
bit 03 = No Calibration Tracks Found
bit 02 = Calibration Tracks Successfully Found
bit 01 = Head Stepper Position Okay
bit 00 = Cleaning Light Turned On

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6. 0 History Packet - A405 - Calibration #2

This event log packet is a continuation of the A404 Event and does not add value to the trouble shooting of the tape drive. Not all DLT tape drives report this packet.

```
Packet # 2 - Event: A405  [V40-0  21-FEB-1997]  000:00:54.365  POH/PC= 0/4
   43000000 1F200203 01F101EF 01D001CF 01E00020 01AA0221 FFDD1F20 01F101EF
   01CF01CF 01E00021 01AA0221 FFC61F20 01770176 01560155 01660021 0118018F
   FFBE1F20 01770177 01560155 01660021
```

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7.0 History Packet - A407 - Directory Read

This Event log packet contains 20 Longwords. The directory referenced in this packet is DLT unique. This directory contains information the drive uses to allow for fast location of data on the tape. Without the directory a space command to end-of-data on a full tape could take as much as 6 hours. The DLT tape drive maintains this directory to reduces the space to a location on tape time to less than a few minutes depending on tape speed of the drive. The host or application software does not have access to this directory information. This information can be used to determine if the application may be timing out due to the DLT needing to rebuild the directory or a Space/Locate command may be taking too long. Check to insure the previous drive that used this media did not have a A408 Event indicating it could not write the directory successfully. A partial directory may be the result from a drive that lost power while the media was still loaded. Please confirm this or confirm that the last drive to use this media did not have a directory write problem.

```
Packet # 5 - Event: A407 [V40-0  21-Feb-1997] 003:35:03.744 POH/PC= 21/5
0F200F01 02100210 2F032A00 000B0000 96C6E8EF 00127D40 00000000 00000000
00000121 4CEF4DE0 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000
```

			Called Mode	1
		Format		2
Flags	Status	Status 2	Status 3	3
				4
Media ID				5
				6
				7
				8
				9
				10
				11
				12
				13
				14
				15
				16
				17
				18
				19
				20

7.1 A407 Definition fields

Called Mode – What function was being performed when the event was logged.

1 = Read of the Directory when Loading the Tape
2 = Write of the Directory while Unloading the tape
3= Write of Directory from BOT. This is the step in which the drive erases the directory when loading the media. This occurs after the directory was read during the tape load process.

Media Format = Format/Density the media is written.

204 – DLT™260
208 – DLT™600
210 – DLT™2000/2000XT
220 – DLT™4000
240 – DLT™7000
280 - DLT™8000

Flags – Information DLT drive uses to determine further action if any take in rebuilding this information and a possible reason why the directory event was logged..

bit 0 = Read on Load Complete
bit 1 = Inhibit Directory Write
bit 2 =LBN 0 Found
bit 3 = DIR Write Failed
bit 4 = Tape Format Mismatch
bit 5 = Event Log Generated
bit 6 = Tape Format Unknown
bit 7 = Non-Zero First Track (DLT 4000 Reserved)

Status – Results of the directory read from the media during the load of media. Status is also displayed in byte 18 of Request Sense Response.

0 = Directory Unknown
1 = No Directory Found
2 = Media Contained Only a Partial Directory
3 = Directory Read was Complete

Status 2 – Status of the Directory located on the media at BOT. Reason for the directory event if due to the BOT directory. DLT keeps the master copy of the directory near BOT. Other directory information is maintained in EEPROM and at the EOT side of the media as back up if the BOT directory is lost.

01h = TK50/70 – No Directory
0Ah = Inconsistent Formats
0Bh = Wrong Format
0Ch = The Reserved fields in the Directory were not equal to 0
0Dh = This is a Partitioned Tape
14h = No Directory Blocks Read
15h = No Directory Blocks read
16h = Not all Directory Blocks were Present
1Eh = SyncLock Failure Trying to Read the Directory
1Fh = Revision Level Mismatch (revision of directory format and expected revision)
20h = Verify Failed
21h = Init on Write-From-BOT
22h = Truncated due to a Tape-Marker EDC
28h = Good Initialized directory read
29h = Good Directory Read (Has Partial EOD)
2Ah = Complete directory

Status 3 – Directory Recovery Status (EEPROM directory status used for recovery)

01h = Recovered Directory, but pending validation
0Ah = No LBN 0
0Bh = Media ID of media and EEPROM directory do not match
0Ch = On Tape directory not empty
0Dh = Sync lock Mismatch
14h = Bugcheck during directory update

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8.0 History Packet - A408 - Directory Write

This Event log packet contains 20 Longwords. And provides information as to why the DLT tape drive was not successful in writing a directory to the media. If a drive fails to write a good directory the next drive to load the tape may log an A407 Event, and it may have excessively long response times to a space or locate SCSI command.

```
Packet # 5 - Event: A408 [V40-0  21-Feb-1996] 003:35:03.744 POH/PC= 21/5
0F200F01 02100210 23011500 0B0B0000 96C6E8EF 001273E4 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000
```

			Called Mode	1
Format				2
Flags	Status	Status 2	Status 3	3
				4
Media ID				5
				6
				7
				8
				9
				10
				11
				12
				13
				14
				15
				16
				17
				18
				19
				20

8.1 A408 Definition fields

Called Mode – What function was being performed when the event was logged.

1 = Read of DIR on Load of Tape
2 = Write of DIR during Unload of tape
3= Write of DIR from BOT. This is the invalidate of the DIR during the load of media.

Media Format = Format/Density the media is written.

204 – DLT™260
208 – DLT™600
210 – DLT™2000/2000XT
220 – DLT™4000
240 – DLT™7000
280 - DLT™8000

Flags – Information DLT drive uses to determine further action if any. After the Event was logged.

bit 0 = Read on Load Complete
bit 1 = Inhibit Directory Write
bit 2 = LBN 0 Found
bit 3 = DIR Write Failed
bit 4 = Tape Format Mismatch
bit 5 = Event Log Generated
bit 6 = Tape Format Unknown
bit 7 = Non-Zero First Track (DLT 4000 Reserved)

Status – Results of the directory read from the media during the load of media. Status is also displayed in byte 18 of Request Sense Response.

0 = Directory Unknown
1 = No Directory Found
2 = Media Contained Only a Partial Directory
3 = Directory Read was Complete

Status 2 – Status of the Directory located on the media at BOT. Reason for the directory event.

01h = TK50/70 – No Directory
0Ah = Inconsistent Formats
0Bh = Wrong Format
0Ch = The Reserved fields in the Directory were not equal to 0
0Dh = This is a Partitioned Tape
14h = No Directory Blocks Read
15h = No Directory Blocks read
16h = Not all Directory Blocks were Present
1Eh = SyncLock Failure Trying to Read the Directory
1Fh = Revision Level Mismatch (revision of directory format and expected revision)
20h = Verify Failed
21h = Init on Write-From-BOT
22h = Truncated due to a Tape-Marker EDC
28h = Good Initialized directory read
29h = Good Directory Read (Has Partial EOD)
2Ah = Complete directory

Status 3 – Directory Recovery Status (EEPROM directory status used for recovery)

01h = Recovered Directory, but pending validation
0Ah = No LBN 0
0Bh = Media ID of media and EEPROM directory do not match
0Ch = On Tape directory not empty
0Dh = Sync lock Mismatch
14h = Bugcheck during directory update

9.0 Other Directory Events

A40B – Media Quality Log

A40D – Directory Write on Unload retries failed Event Log

Event occurs during the writing of the directory when unloading the media and the DLT has exhausted the number of allowable retries.

Format similar to A408 information. Use the A408 Event descriptions to understand this event packet.

A40E – Directory Write after Read Reties Event Log

Event occurs when writing or erasing the directory after reading the directory during a load of media and the DLT has exhausted the number of allowable retries.

Format similar to A408 information. Use the A408 Event descriptions to understand this event packet.

A40F – Directory Read retries Event Log

Event occurs while trying to read the directory during a load of media and the DLT has exhausted the number of retries allowable.

Format similar to A407 information. Use the A407 Event descriptions to understand this event packet.

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10.0 History Packet - PO/ST - Power On Self Test

This is a description of Event Log Packet PO/ST. This packet is logging the results of a Power-On-Self Test error condition. The data that provides the most value is contained in the Last Fail information.

Packet # 135 - PO/ST Error - Last Fail: 88021950 POH/PC= 527/71
70000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000

Last Fail – 32 bit register to indicate the POST failure that occurred.

31	30	29	28	27	26 24	23 16	15 8	7 0
FE	RE	LF	MF	UI	Unused	Failing Section	Failing Subsection	Detected Error

FE – Fatal Error Was Detected
RE – Reportable Error was Detected (Error can be reported via SCSI Bus)
LF – Last Fail Packet Contains Valid Information
MF – Multiple Failures Were Detected
UI – Unexpected Interrupt was Detected

Failing Section Not equal to 0 return drive for repair

11.0 Diagnostics

A Diagnostic packet is the recording of the results of a drive internal diagnostic. This diagnostic is run by executing the Send Diagnostic SCSI command, or being executed by Quantum Manufacturing. The result of the test is recorded in the section labeled STS for status. In the below example the status is failure due to data miscompare. Note the last line in which a temperature is recorded, this is DLT8000 only and it the reading if the internal temperature sensor of the drive. The status may be one of the following:

Pass – The test completed successfully
Abort – The test was aborted by a user
HDRead – Hard Read Error
HDWrt – Hard Write Error
Soft Error Exceeded – The internal soft error rate was exceeded. This is a internal limit being used by the test and is
not to be construed as a limit to be used externally.

```
Packet # 0 - Diag ILOG:    POH/PC= 6/3
 Test: IWR_RD Time: 6:07, Sts-Miscompare
DLT8000 Ent. Wr/Rd: 299545/169
Compare ON ErrRate Wr: 1.4145/Mb , Rd: 357.14/Gb
pHWE: 0 pHRE: 0
4-Chan. Wr Metrics
 Wr-CRC:    69091,  21  22   9  36 /  1   6   1   4
 Wr-DO:       297,   9  13  12  10 / 12  17  14  12
4-Chan. Rd Metrics
 Rd-CRC:      394,  24  15   6  34 /  4   9   1   6
 Rd-DO:        22,  27  23  14  23 /  5   5   0   5
 Rd-MissingBlks:       10, ReRds:        0
Temp 46 C
```

12.0 Firmware Updates

When the DLT tape drive enters the firmware update mode it will either log an entry to indicate it did try to the firmware upgrade and failed or it will indicate it passed. The below entries Packet # 3 is the event packet indicating the DLT tape drive entered the update process. Packet #4 shows the results of the upgrade. In this case the firmware went did not happen and it shows what firmware revision (9) it was going from and to (12). It shows the personality type, which is used to indicate what firmware characteristics are being loaded based on that particular OEM customer request. Packet #5 is the SCSI check condition that would be sent to the host indicating the upgrade. The SCSI sense key is 09 for firmware upgrade and the ASC shows the old firmware version and the ASCQ shows the new firmware version.

```
Packet # 3 - Event: CA02  [V9-0  10-JUL-1999]  000:47:37.803  POH/PC= 1/22
       00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
       00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
       00000000 00000000 00000000 00000000
Temp 37 C

----------------------------

Packet # 4 - CUP Event:  POH/PC= 0/23
  Drv CUP status: Error (28)
  Drv Old: 07-01/7201
  Drv New: 07-01/D78E
  Cnt CUP status: Complete
  Cnt Old: V009/D4B73EB4 (10-JUL-1999 19:33:15)   Pers: (15-3)
  Cnt New: V012/29B6A671 (18-AUG-1999 19:35:12)   Pers: (15-3)
Temp  0 C

----------------------------

Packet # 5 - SCSI Event: POH/PC/MID/SK/ASC/ASCQ/AddErr=0/8/00000000/9/01/0C/00
Temp  0 C
```

13.0 Bug Checks

This is a description of Bugcheck Log Entries. A bugcheck is typically an indication that the DLT firmware has reached a point in the decision process that requires a drive reset. There are many bugchecks and many things that may cause the bugcheck, for example; they may be due to hardware error, media error, power supply problem, something external (shock, vibe, hot, cold, etc), or a firmware problem. Typically firmware problems are not the cause and you should check for other sources. If it is assumed to be a firmware issue contact your DLT support group or your DLT Account team for assistance. Some common bugchecks that may be seen are.

BugCheck Code (in hex)	Descriptions and possible cause
B810	Indicator that there may be Library Port communications problems – Library or Drive Problem
E204	Unexpected Timer 2 interrupt – Drive problem
EE01	Spurious Non-Maskable Interrupt – Drive problem
EE02	Spurious Timer Interrupt – Drive problem
EE03	Spurious level 5 interrupts – Drive problem
EE04	Spurious drive comm interrupt – Drive problem
EE05	Spurious loader comm interrupt – Drive problem or Loader problem
EE06	Spurious diagnostic comm interrupt – Drive problem
EE08	Watch Dog Timer Expired – SCSI Bus problem, Host controller problem, Drive problem
EE09	Spurious Power Fail – Power supply, power cables
EE0D	Spurious level 6 interrupts – Drive problem
F202	Loader time-out – Loader failure

The below is an example of a Bugcheck Entry from a DLT8000.

```
Packet # 4 - BugCheck Error: B810   [T9-9  14-JUN-1999]
 PC= 0005738E  SR= 2500  Cntxt= Intrp  041:40:08.100  POH/PC= 78/16
  MSP = 0011A4C0  ISRret = 0000E960 (IDLE )
      00002000 0000B828 0000EE78 0006E9DC 0006E984 00000000 00000013 001241F8
      00230100 001052C0 00111C78 00111CB8 00117F74 0011A1D0 0011A4D0 0011AA90
Temp 37 C
```

14.0 SCSI Events

14.1 Sense Key Definitions

0h – No Sense, this is a indicator that the drive did not have an error but that the host system may have sent an incorrect command or a field in the information for changing parameters in the command was not correct. This is also an indicator that a request to move tape past a End-of-Data, or a read of a Filemark may have been attempted.

1h – Recovered Error, this is a indicator that the drive had a recoverable error. This is one in which the drive detected something may not be correct but it is not a problem that would prevent the drive from functioning correctly. It may be just an indicator that an event that the drive was able to correct. A cleaning Requested status in one of these in which the drive is asking to have a cleaning tape used but not using it will not prevent the drive from writing or reading the current tape. This sense key will only be recorded in the logs if it is a Cleaning requested condition.

2h – Not Ready, This is just an indicator that the drive is not ready for tape functionality. This is not reported in the drive log pages.

3h – Medium Error, This is an unrecoverable error indication in which the drive was not able to read or write successfully to the tape. To understand why you should look at the Event Logs and correlate the events with media and system logs to determine if this is due to media or the drive. This sense key is recorded in the drive logs.

4h – Hardware Error, This is an indication that the drive has detected an error condition related to the hardware. You will need to refer to the sense Key and Qualifier, along with other log event to best understand the error. Based on the log information replace the appropriate component. This sense key does get logged each time it is reported.

5h – Illegal Request, This is a indicator that the requested command had an incorrect parameter defined and you will need to review the actual command and parameter to determine what was wrong. This is not logged in the drive logs.

6h – Unit Attention, This sense key will be reported each time a condition exists that impacts the drive's functionality. A SCSI Bus reset, or a transition from ready to not ready are examples. A reset is required because Mode Page setting may change after a reset and the host will need to know that. This sense key is not logged in the drive logs.

7h – Data Protected, This sense key is used to flag the host that the media currently in the drive is write protected. This can be a hardware write protect of software. This sense key is not logged in the drive logs.

8h – Blank Check, This is a sense key that notifies the host system that while reading, writing, or doing a search on the media that the drive encountered a EOD (End-Of-Data) mark or a long gap was detected. A long gap may be the result of a drive stopping the write command without doing the proper command termination. This sense key is not reported in the drive logs.

9h – Code Update, This sense key is a means to notify the host that the firmware in a drive has been changed. The ASC and ASCQ will indicate what the new revision of the drive firmware has been changed to. This is logged in the drive logs to track any firmware changes that may have occurred.

Bh – Command Aborted, This sense key is use to notify the host system that the tape drive has aborted a drive
command. Check the sense code and qualifier to better understand why. This sense key is not reported in the drive logs.

Dh – Volume overflow, This is a sense key to notify the host system that the tape drive has reached the physical
End-of-Tape and can no longer write data to the tape. This sense key is not reported in the drive logs.

Eh – Miscompare, This sense key is used during the drive self tests to indicate that the drive has detected a data
miscompare while executing the internal test. This error would be a indicator that the drive should be returned for repair.

14.2 Common ASC/ASCQs

ASC/ ASCQ	Description	Action
0C/00	Write Error, Drive was not able to successfully write the customer data to the tape.	Problem may be the tape cartridge or the drive. Check logs to correlate A401 events with media type and ID system logs.
11/00	Unrecoverable Read Error, After exhausting the read recovery algorithms the drive was not able to read the data correctly.	Problem may be the tape cartridge or the drive. Check logs to correlate A400 events with media type and ID with system logs. Look for write errors to this media from this drive or others as that may be the result of this read error.
40/8x	POST Error, The drive during power on self test has detected an error.	Errors of this type indicate a drive problem. Verify the SCSI bus is terminated correctly and if this continues replace the drive.
14/00	Entity Not Found, a logical block that was written on the tape was not found while trying to read the data.	Problem may be the tape cartridge or the drive. Check drive logs to correlate events that may have led up to this condition.
47/00	SCSI Parity Error, SCSI bus communications problem.	Check SCSI Cables, Terminators, all devices attached to SCSI bus.
80/00	Calibration Error, the drive failed calibration.	Recommend using a cleaning tape or try a different piece of media. If this persists it may be a drive problem. Look at the other drive logs to understand the failure action. Cleaning light should be on when this is reported.
80/01	Cleaning Required, the drive has detected a condition in which a cleaning tape must be used.	Use a cleaning tape and/or different media. Check drive logs to review related events. If this persists with multiple media after cleaning replace the drive. If all related to one piece of media replace that tape cartridge.
80/02	Cleaning Requested, the drive has detected that using a cleaning tape would prevent possible failures due to debris on the head.	Cleaning light should be on when this is reported. Use a cleaning tape. If this persists verify if this is with the same media or different media and frequency. Different media at a high frequency indicates drive is failing and should be replaced. Infrequent reports of this event will indicate media and/or environmental conditions should be checked.
80/03	Soft Error Exceeds Threshold, The drive has detected that a high soft error rate has occurred which may lead to a hard error.	Use a cleaning tape to insure the drive heads are clean. If this persists use the drive logs to correlate this condition with other events and replace the drive if this is frequent with multiple media. The same media ID with multiple entries indicate a media problem.