

TECHNICAL BULLETIN

T B - 003

JANUARY 26TH 1988

3480 DEBRIS PROBLEMS

If you have a possible media problem addressed by the Maintenance Package, Debris found, account performance or any other symptom, please proceed as follows:

- A) Inform your management
- B) Open a PMH and fill in Retain Format Insert 319. Do not wait to have all requested data available before queuing the PMH.
- C) ADDRESS PMH TO VALENCIA SP&S THRU COUNTRY HCS
- D) Prepare and send to Valencia a 3480 LOGREC tape thru IBTS (two months data is preferable). Use FI319 or contact Valencia Project Office for LOGREC data preparation and transmission if needed.
- E) Send Customer Tape Library Characterization to Valencia Project Office. Library Characterization means which VOLID range is IBM and which one OEM. For example: VOLID's AB0001 thru AB5000 is IBM , CD5000 thru CD7000 is BASF, AB5001 thru AB9000 is MEMOREX and so on.
- F) If High amount of debris is found, replace the cleaner block in one Drive without cleaning and keep it in the new cleaner block package. You could be requested to send the old cleaner block for debris analysis.
- G) Provide Valencia Project Office with a valid VNET ID for communications.
- H) Read carefully the rest of this document and follow its instructions.

GENERAL INFORMATION.

Debris is normally discovered by one of the following:

1. It is seen when the Drive is being worked on for another problem
2. The number of write ECC in EREP start to increase and when the drive is taken to be investigated Debris can be seen.
3. The number of Temporary Write Errors in EREP starts to increase and then as above Debris can be seen.

HARDWARE CHECKOUT.

1. Ensure that the Customers cleaning using the Cleaning Cartridge is good. Be aware that the 'Clean' Message can be overwritten by the System if a 'Mount' Message is required. If this happens the 'Clean' Message will reappear after the Rewind Unload of that Cartridge, but of course can be overwritten again before it is seen by the Operator if the System is heavily loaded. Every Drive should be cleaned at least once per week as per the Operators Manual (Form GA32-0066).
2. Check that the Compliant Guides are:
 - a. Ceramic not Stainless Steel. (White Ceramic Buttons, not Metal fingers)
 - b. Not Ceramic and Stainless Steel parts installed together on top of same Head&Guide ASM. This problem has been detected in some of the FRU'S returned to Valencia for Failure Analysis via RDS)
 - c. Not damaged , or bent.
3. Ensure that the Cleaner Blade is not damaged. Look particularly for bits chipped out of the Blade as this could be damaging the Tape and thus be the cause of the Debris.
4. Check the pressure pipe coming into the plenum from the Compressor for any signs of dirt inside the pipe. (see CARR-DR 410). If there is dirt in the pipe, it looks black inside, then check and replace as necessary, the Output Filter and the Compressor. Note if you have to change the Compressor in this context you must change the Output filter (Absorbent filter) as well.
5. Ensure the fans (or blower on Repack Drives) are working correctly. With some types of Media, heating it can cause Debris.
6. Ensure that the Lifter Solenoid is operating. Just make the preliminar check not the timing check. It can be done following the MD directions or without a cartridge in the machine checking that air flows from the head

and not flows jumpering pin C1E11 to B2D8. If the lifter is not operating at all, this can cause R/W Head wear and wear to the Tape itself and thus possible cause Debris.

7. Check that the decoupler is operating correctly and that the tape is not catching on it at all, thereby causing edge damage.
8. Check the File Reel Motor Clutch height with the special Tool P/N 74X6364 if wrong it will cause edge damage. Also look to the Customers Cleaning Cartridges. The Cleaning Cartridge Ribbon Tape is extremely sensitive to edge damage, if any File Reel Motor is or has been out of adjustment the Ribbon Tape will be wavy at the edge.
9. Check the Tape is passing round the Tension Transducer without catching on it in any way.
10. Check that the Tape is entering the Machine Reel without catching on the flange as this could also cause edge damage and thus Debris.

Remember that the objective is to find anything in the tape Path that could be damaging the tape and thus be a source of the Debris.

11. Once above steps have been followed, perform a functional hardware check out to make sure there is not an additional problem which might mask the original one. Proceed as follows:

11-A. Follow the conventional maintenance strategy for those errors which are not RD/WR related (ECC's, 74nn, etc).
At this point, it's assumed that those symptoms (ECC's, 74nn's...) are scattered along different Drive units.

11-B. Perform a WET CLEANING action on those units with the lower ECC ratio (MB-CORR in EREP) or lower MB-WTE ratio or having any RD/WR (74nn / 76nn) permanent error.

11-C. Get a GOOD KNOWN cartridge (not a Customer one).

11-D. Run PST EEA3 routine (see note 1), from both CU's in a dual subsystem, to those units identified on 11-B and using the good known tape. 256 blocks with varying length will be written onto the tape. Rerun the routine several times for those units. Routine might fail with a TM3082 Failure ID. Should BLKS CORR counters be 2 or less, the test can be considered satisfactory. Otherwise, perform hardware maintenance actions as directed by the MD.

11-E. You might use a CONCURRENT diagnostic in case of subsystem availability problems. In these cases, use:

* OLT 0200A (FRIEND) diagnosis on those specific units. Write a number of blocks (say one thousand 10K blocks), then do a RDBL (X'24') command. Sense byte 12 will contain the actual number of blocks corrected during the operation. Sense byte 19 multiplied by 256 will be the actual number of write blocks processed. Total amount of blocks corrected should be lower than 0.2% of total blocks processed (see note 3).

* Use PST Drive Command Exerciser and tailor your own testing program, similar as in FRIEND: Write X'1000' blocks (note 2) with X'0A' block size (you might use other values). Then perform a RBL command. Same as before, test is considered to fail if sense byte 3 equals 2A or amount of blocks corrected exceed 0.2% of total BLOCKS PROCESSED.

11-F. Maintenance actions must be carried out on those units failing above tests.

NOTES:

- 1.- The subsystem must be taken off-line and made unavailable for customer use.
 - 2.- X'1000' BLOCKS WILL TAKE ABOUT ONE HOUR. X'800' BLOCKS WOULD take some 30 minutes, etc.
12. In order to convince the Customer as to the Source of the Debris if there is more than one Media Vendor, ask the Customer to run one (or both) of the following tests:

EITHER:

- A. ALLOCATE A DRIVE (OR DRIVES) FOR EACH MEDIA BRAND THAT YOU want to test.
- b. 'Wet Clean' all the Drives concerned in the presence of the Customer.
- c. Run the Customers normal work for two or three weeks with the Drives only using their specifically allocated Media type, if possible. (It should be at least a week for average Customer usage).
- d. At the end of the test period, 'Wet Clean' the Drives again in the presence of the Customer and compare between the two Drives or groups of Drives, the ammount of Debris coming off the tape path.

OR:

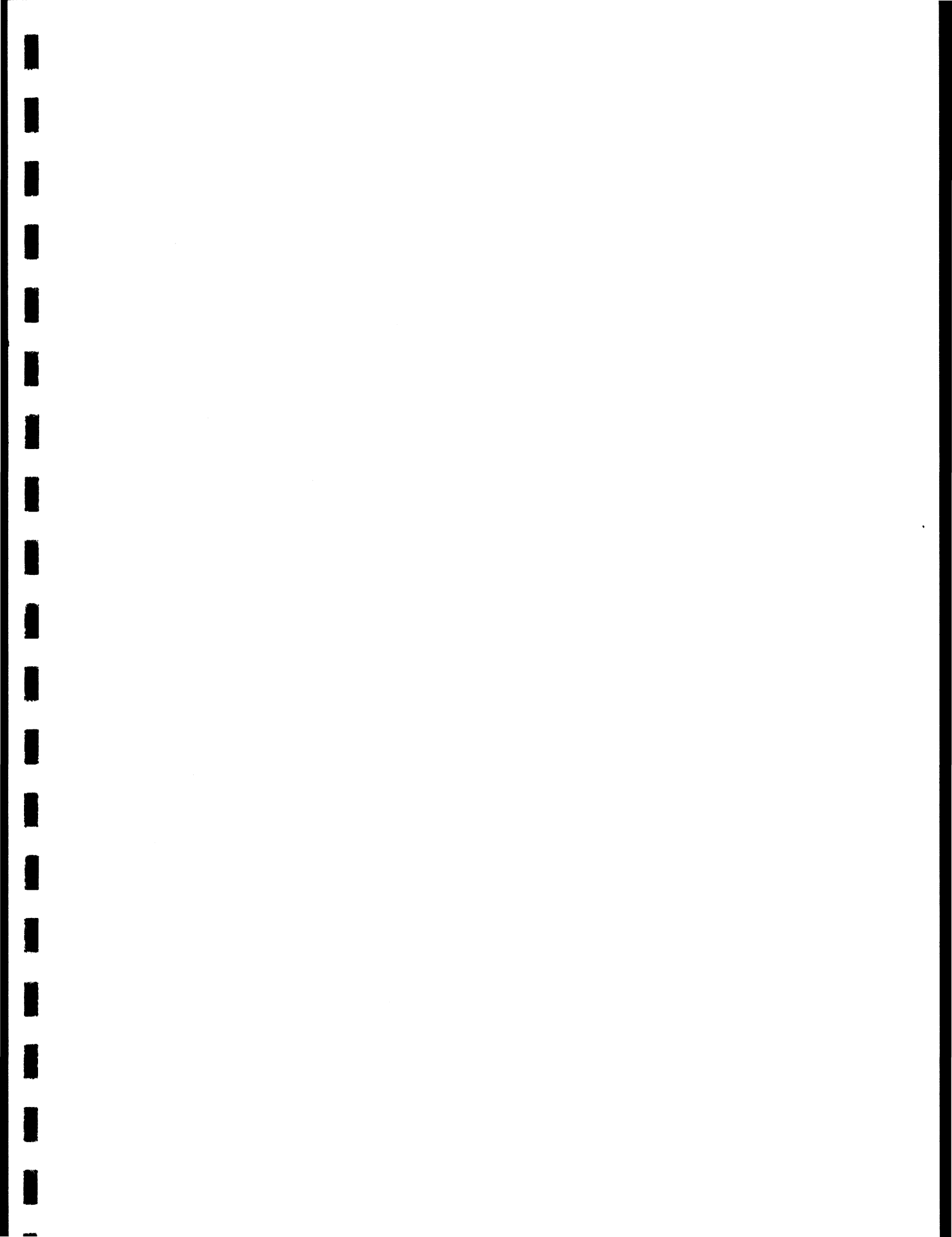
- A. ALLOCATE ONE DRIVE FOR EACH MEDIA BRAND YOU WANT TO TEST.
- b. 'Wet Clean' each Drive in the presence of the Customer.
- c. Run a job (or jobs) to each Drive that will keep them in use continuously. (for example Disk Dump/Restore). It is very important that they are used continuously otherwise there will not be enough debris to give a visible difference in the amount of it between the different types of Media. As this is a test job, it is quite acceptable to cycle say 10 tapes on each Drive.
- d. Run the jobs for about 16 hours continuously. If there have been breaks, waiting for mounts or whatever, then it will have to be for a longer time.

e. 'Wet Clean' again in the presence of the Customer and again as above there should be a visible difference in the amount of Debris removed from the Drives.

By involving the Customer in the tests so that he can see himself where the Debris is coming from, he should be convinced. It is also a good idea to let him choose which Drives which Media is tested on.

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Control Storage Tables and Logs

CST Table

The Command Status Table (CST) contains information about the command currently executing with a drive. The fields in the CST are set by microcode. This table is accessed by the drive address using the support diskette Subsystem Display/Alter program.

Word 0

| Bits | Field | Function | Detail |
|------|--------|---|---|
| 0-3 | ADSTAT | Provides initial status and interrupt condition indications generated by the channel adapter. | 0 - CCW accepted 1 - End of command chain 2 - Interface disconnect 3 - Selective reset 4 - Data path not available 5 - Invalid buffer conditions 6 - CCR Interrupt - CCR stacked, refused, or channel did not chain from the device end after a CCR. 7 - Subsystem error 8 - Command sequence invalid A - Reserved different group B - Command reject C - Bus out parity error D - Deferred unit check E - Device not ready F - Device file protected |
| 4-7 | DRIVE | Provides the drive address for which a channel command was received. | |

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| Bits | Field | Function | Detail |
|-------|---------|---|---|
| 8-12 | CMD | Indicates which 5-bit channel command code is to be executed. | <p>The 5-bit channel command codes accepted by the control unit are:</p> <p>SENSE COMMANDS:</p> <ul style="list-style-type: none"> '00' - Modesets other than 3480 '08' - Read block ID '10' - Sense '18' - Sense I/O device '20' - Sense path group ID '28' - Read buffered log <p>READ/WRITE COMMANDS:</p> <ul style="list-style-type: none"> '80' - No operation '88' - Locate block '90' - Synchronize buffer '98' - Write 'A0' - Read 'A8' - Read backward 'B0' - Test I/O 'B8' - Data security erase <p>CONTROL COMMANDS:</p> <ul style="list-style-type: none"> 'C0' - Rewind 'C8' - Rewind unload 'D0' - Erase gap 'D8' - Write tape mark 'E0' - Forward space block 'E8' - Backspace block 'F0' - Forward space file 'F8' - Backspace file <p>MISCELLANEOUS COMMANDS:</p> <ul style="list-style-type: none"> '40' - Control access '48' - Set path group ID '50' - Suspend multipath reconnection '58' - Read data buffer '60' - 3480 mode set '68' - Load display '70' - Assign '78' - Unassign |
| 13 | SPVRINH | Indicates that supervisor operations are inhibited. | |
| 14-15 | | Reserved | |

Control Storage Tables and Logs (Continued)

| Bits | Field | Function | Detail |
|------|---------|--|--|
| 0-3 | CHANNEL | Identifies which of this control unit's channel adapters received the command. | 1 0 0 0 = Channel adapter A 0 1 0 0 = Channel adapter B 0 0 1 0 = Channel adapter C 0 0 0 1 = Channel adapter D |
| 4 | RECCU | Receiving CU's bit indicates which control unit received the command. | 0 = Control unit 0 1 = Control unit 1 |
| 5 | PENDING | Command Pending bit indicates that a command is in progress for a drive. | |
| 6 | FIRST | 1st pass complete bit indicates that the first part of a given command is complete. | |
| 7 | RETRY | Command Retry bit indicates that the channel command retry status for the addressed drive has been accepted. | |
| 8 | RECERR | Record-In Error bit indicates that the read command has a permanent error, but must transfer any available read data to the channel before performing a unit check on the command. | |
| 9 | NODATA | Indicates that a read operation had to be performed (because no data was in the buffer for this drive) when a read command was sent from the channel. | |

Control Storage Tables and Logs (Continued) DF 95

| Bits | Field | Function | Detail |
|-------|---------|--|--|
| 10 | WRTMODE | Write Mode bit indicates whether the drive is operating in tape write or buffer write mode. | 0 - Buffer write mode 1 - Tape write mode |
| 11 | NOTIFY | Indicates that Continue Command execution is to be notified by scan when a drive operation has been marked complete. | |
| 12-15 | CCPARM | The Continue Command execution parameter is used by Continue Command execution when it has been notified by scan that a device operation has been marked complete. | <p>DEVICE PREPARATION CODES: 0 0 0 1 - Read ahead stopped 0 0 1 1 - Buffer write operation complete 0 0 1 0 - Repositioning complete 0 1 0 0 - Spare code 0 1 0 1 - Spare code 0 1 1 0 - Spare code</p> <p>BUFFER MANAGEMENT CODES: 0 1 1 1 - Buffer deallocation pending 1 0 0 0 - Device sending in progress 1 0 0 1 - Spare code 1 0 1 0 - Spare code 1 0 1 1 - Spare code</p> <p>SPECIAL EXECUTION CODES: 1 1 0 0 - Sector location complete 1 1 0 1 - Selective reset buffer write complete 1 1 1 0 - Repositioning because of off-line sequence 1 1 1 1 - Spare code</p> |

Control Storage Tables and Logs (Continued)

CST Table (Continued)

Word 2

| Bits | Field | Function | Detail |
|------|---------|---|---|
| 0 | LOCDIR | Indicates the search direction by the microprocessor for the Locate Block command. | 0 = Forward search in progress 1 = Backward search in progress |
| 1 | CHANGE | Indicates whether a change in search direction for the Locate Block command has occurred. Also indicates if the read direction has been changed to determine when to set the Inhibit ERPS in the Logical Device Table (LDT) and the Suppress Read Ahead bit 4 in the CST. | |
| 2 | NERP | Permanent Inhibit CU ERPS bit indicates that the Inhibit ERPS bit in the Logical Device Table (LDT) for this device should not be reset at the end of the command chain. | |
| 3 | INTDIS | Indicates that an interface disconnect has been detected and the channel adapter has not responded with device freed. This bit is set by OCSSPMOS and reset by OCSMDFOS when the device freed has occurred. | |
| 4 | SUPRDA | Suppress Read Ahead bit is set whenever a write type command has been received or whenever the read commands that have been received have changed direction twice. When set, this bit causes read ahead operations to be inhibited until a tape mark has been read or written, or that a Locate Block, Rewind Unload Device operation has been initiated. | |
| 5 | CONCONN | Contingent Connection bit indicates that the drive is connected to the channel that issued the command (which has unit checked) until the next SIO has been accepted by the control unit. | |
| 6 | DISCON | Indicates that an interface disconnect has been detected by the channel adapter and has been acknowledged by the microcode. | |

Control Storage Tables and Logs (Continued) DF 100

| bits | Field | Function | Detail |
|------|--------|--|--------|
| 7 | SELRST | Indicates that a 'Selective Reset' has been detected by the channel adapter and that the reset is in progress. | |
| 8 | CHEND | Indicates that a 'Channel End' status byte has been accepted by the channel and that a Device End has not been received from the addressed drive. | |
| 9 | PERROR | Indicates that a 'Permanent Error' has occurred with write data in the drive's buffer segment. All existing write data will be deleted from the buffer segment if a tape motion command is received. | |
| 10 | CCRINT | Indicates that the channel adapter has generated a Channel Command Retry Interrupt (CCR Interrupt) because a CCR was either stacked or refused by the channel. | |
| 11 | ADUCK | Indicates that the channel adapter generated a unit check during initial status and presented the status to the channel. | |
| 12 | PTRANS | Indicates that a 'Permanent Parameter Data Transfer Error' occurred and that the current command must be unit checked. | |
| 13 | SYSRES | Indicates that a 'System Reset' was detected by the channel adapter. | |
| 14 | LBBIT | The 'Load Balanced Requested Bit' indicates that the balancing algorithm has determined that the addressed drive can be connected to the remote control unit when conditions are appropriate. | |
| 15 | SENDEV | Indicates that a drive whose buffer is assigned to the local control unit will operate better with the remote control unit and should be connected to it when conditions are appropriate. | |

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Control Storage Tables and Logs (Continued)

CUT Table

The Control Unit Operations Table (CUT) contains information that only pertains to the control unit. It also contains flags that control the operation of the control unit.

Word 0

| Bits | Field | Function | Detail |
|------|----------|--|--------|
| 0 | INRDAHD | Inhibits read ahead operations on any drive connected to this control unit (Set by MD only). See Note 1. | |
| 1 | INBUFWR | Inhibits buffered write operations for any device connected to this control unit (Set by MD only). See Note 1. | |
| 2 | INLDBAL | Inhibits this control unit from load balancing a drive to the other control unit (Set by MD only). See Note 1. | |
| 3 | INERPS | Inhibits this control unit from performing any internal ERPS (Set by MD only). See Note 1. | |
| 4 | INRCNCT | Inhibits this control unit from using the reconnect algorithm and Reconnect Timer (ITC), (Set by MD only). See Note 1. | |
| 5 | OFFLBUFL | Indicates to the sending device to set Device Error. Causes the buffered log to be transferred to the host (Set by MD only). See Note 1. | |
| 6 | FORCELOG | Causes this control unit to be in forced logging mode. Sense data is logged at the host for all errors (Set by MD only). See Note 2. | |
| 7 | INELYST | Inhibits this control unit from using the early start algorithm and Early Start Timer (ITD), (Set by MD only). See Note 1. | |
| 8 | DEFERUC | Indicates a deferred unit check. Unit check will be presented to the next CCW processed by this control unit. | |

Notes:

1. These functions can be reset by:
 - a. Disconnecting the MD from the control unit.
 - b. Using the trace/match control reset function on the support diskette. See "Trace/Match Control-Select Control Options" on SDISK 1.
2. Forced logging mode can be reset by:
 - a. An IML.
 - b. Using the trace/match control reset function on the support diskette. See "Trace/Match Control-Select Control Options" on SDISK 1.

Control Storage Tables and Logs (Continued) DF 105

| Bits | Field | Function | Detail |
|------|----------|---|---|
| 9 | DIAGREAD | Indicates that this control unit is in LWR with ECC disabled. This bit is set at the same time that Bit 3 in the Read Diagnostic Control (RDC) register is set. | Setting this bit causes: All 18 tracks of data are read into the buffer from tape. No Block ID Errors will be flagged. All data read into the buffer will be transferred to the channel. |
| 10 | INITTIO | Indicates that Test I/O's are scheduled for all drives and are executing. | |
| 11 | INHSEL | Inhibits this control unit from selecting any drive. | |
| 12 | DISKIML | Indicates that this control unit has just been IML'ed from diskette device. This bit is only valid during initialization and resets later. | |
| 13 | NOPAIRS | Indicates that no buffer segments are available to join two segments to double the size of the buffer for a drive. | |
| 14 | INCRC | Indicates that Cyclic Redundancy Check (CRC) errors, from the read data flow, will not be flagged during read operations. | |
| 15 | INBLKID | Indicates that Block ID errors will not be flagged during read operations. | |

Control Storage Tables and Logs (Continued)

CUT Table (Continued)

Word 1

| Bits | Field | Function | Detail |
|------|---------|---|---|
| 0 | NUMOCU | Indicates that two CUs can communicate with each other. | 0 = One CU on status store communication is not active 1 = Two CUs and status store communication is active. |
| 1-5 | NUMDEV | Indicates the number of drives in the subsystem. | 0 0001 = 1 drive 1 0000 = 16 drives |
| 6 | OCUADDR | Indicates the setting of the CU0/CU1 toggle switch. | 0 = Control unit 0 1 = Control unit 1 |
| 7 | SSFEAT | Indicates that this control unit has the communicating status store installed. | |
| 8-15 | NUMSEG | Indicates the number of 32K byte buffer segments that are installed on this control unit. | |

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Word 2

| Bits | Field | Function | Detail |
|-------|----------|---|--|
| 0-3 | CAATCH | Bit mask that indicates which channel adapters are attached to this control unit. | 1 0 0 0 = Channel adapter A 0 1 0 0 = Channel adapter B 0 0 1 0 = Channel adapter C 0 0 0 1 = Channel adapter D 1 1 1 1 = All channel adapters |
| 4 | MBINUSE | Indicates that the message buffer in the status store is in use. | |
| 5 | FIRSTMSG | Flag that is set after the first message has been sent to the other control unit. | |
| 6 | UNEXP6 | Indicates that an attempt has been made to clear an unexpected level 6 interrupt by having the other control unit disconnect. | |
| 7 | CK1ERR | Indicates that a Check 1 error has occurred. | |
| 8 | NOSIX | Indicates that level 6 interrupts should not be re-enabled. | |
| 9 | CUOFF | Indicates that this control unit has completed offline processing. | |
| 10 | LPROOFF | Indicates that an offline request for the local control unit is being processed. | |
| 11 | RPROOFF | Indicates that an offline request for the remote control unit is being processed. | |
| 12-15 | OFFCNT | Contains the counter that indicates the number of drives that must be processed before offline processing will be completed. | |

Control Storage Tables and Logs (Continued)

CUT Table (Continued)

Word 3

| Bits | Field | Function | Detail |
|------|----------|--|--------|
| 0 | MBBUSY | Indicates that the Message Buffer In Use bit should be set on. | |
| 1 | CMPCTL | Indicates that Coordinate MP Assignments is in the process of buffer switch assignment and status should be stacked. | |
| 2 | OCUCONNT | Indicates that the other control unit has reconnected and asked for either a copy of control storage or all PGM and PGT tables. | |
| 3 | RMTCK 1 | Indicates that the other control unit is recovering from a check 1 error. | |
| 4 | MDCONNT | Indicates that the other control unit has reconnected for Maintenance Device purposes. | |
| 5 | CK1RECOV | Indicates that this control unit has successfully executed a remote check 1 recovery procedure. | |
| 6 | OFFMSGRS | Indicates that this control unit has either received or sent a 2 Control Unit Offline message. | |
| 7 | LDBLINIT | Indicates that load balance is in process and waiting for Fault Count from the other control unit. | |
| 8-15 | LDBALTH | Contains the threshold value for the load balance algorithm. If the difference between the total Fault Counts of the two control units is not greater than this threshold, the load balance algorithm will not be performed. | |

Control Storage Tables and Logs (Continued) DF 115

Word 4

| Bits | Field | Function | Detail |
|-------|--------|--|--------|
| 0-15 | FLTLIM | Contains the Fault Count for this control unit. If the Total Fault Count reaches the limit, the load balance algorithm is performed. | |
| 16-31 | TOTFLT | Contain the number of faults in this control unit. | |
| 32-39 | CUBL15 | Contains the Control Unit Equipment Checks. It is put into Format 21 sense by any drive, then reset. | |
| 40-47 | CUBL16 | Contains the count of the number of 16K byte buffer segments that have been de-marked. | |

Control Storage Tables and Logs (Continued)

DGHELO Log

The Diagnostic Hardware Error Log (DGHELO) contains data stored when a hardware error occurs. This data is the microcode error code, the hardware error code, and all readable error registers.

Table updates are under the control of the maintenance device. When the diagnostic overlay is enabled the table is updated each time the sense builder is called, unless the error is a read or write data flow error and the control unit ERP is doing recovery when the error occurs.

DGHELO entries are twelve words long and are separated by the contents of word zero (CDEF). The log is 560 words long and wraps to ensure that the last 18 words are saved.

DGHELO can be displayed by the MD support diskette function "Storage Display/Alter-Control/Unit Tables" (see SDISK 1). When DGHELO is entered, the latest error is shown in the top line of the MD display. Since DGHELO is a wrap log, the next entry on the MD display will be the oldest entry in the log. If you scroll the display forward or backward to see additional entries, record the microcode table address, so you will know when you have returned to the latest entry.

| Word | Bits | Definition |
|------------------|-------------|--|
| 0 | 0-15 | A four-character constant ('CDEF') to identify each entry. |
| 1 | 0-15 | The microcode error code. This error code is the same as the control unit error code stored in sense bytes 10 and 11, or 12 and 13, or 14 and 15 of Format 20 sense. |
| 2 | 0-7 8-15 | Drive address CU flag byte |
| 3 | 0-15 | The hardware error code. This is the same as the control unit error code stored in bytes 16 and 17 of Format 20 sense. |
| 4 (See Note) | 0-7 8-15 | Error register CER Error register PER |
| 5 (See Note) | 0-7 8-15 | Error register WSE Error register RSR |
| 6 (See Note) | 0-7 8-15 | Error register RER Error register DSE |
| 7 (See Note) | 0-7 8-15 | Error register RPR Error register MTI |
| 8 (See Note) | 0-7 8-15 | BCSE Group 0 BCSE Group 1 |
| 9 (See Note) | 0-7 8-15 | BCSE Group 2 BCSE Group 3 |
| 10 (See Note) | 0-7 8-15 | BDSE Group 0 BDSE Group 1 |
| 11 (See Note) | 0-7 8-15 | BDSE Group 2 BDSE Group 3 |

Note: See the DF section Table of Contents to find the location of external register detailed descriptions.

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Control Storage Tables and Logs (Continued)

DOT Table

The Device Operation Table (DOT) contains information about scheduled, active (selected), and completed drive operations. There is one entry for each drive. The table is accessed by the drive address.

Word 2

| Bits | Field | Function | Detail |
|-------|----------|---|---|
| 0-3 | | Not used. | |
| 4 | ERPSR | Indicates that ERP is active for this drive operation. | |
| 5 | VALID | When on, this bit indicates the service is waiting to execute an operation. When off, the other DOT fields are not valid. | |
| 6 | STARTED | Indicates that the drive operation has started. | |
| 7 | COMPLETE | Indicates that the drive operation has completed. | |
| 8 | INFOSEQ | Indicates information sequence operation (See Note). | Control unit to drive commands. For example: Drive test I/O, drive sense, read control storage, read LSRs, and read drive external registers. |
| 9 | CNTLSEQ | Indicates control sequence operation (See Note). | Operations that do not involve data transfer. |
| 10 | BUFRXFR | Indicates that data transferred is to be held in the buffer (Read only. See Note). | |
| 11-15 | DEVCMO | Drive command code to be issued (See Note). | Command codes are described in the OPER section. |

Note: Operational Modes:

| Bits: | 8 | 9 | 10 | 11-15 | |
|-------|---|---|----|-------|--------------------------|
| | 1 | 1 | 1 | X | Synchronous Command Mode |
| | 0 | 0 | 0 | 0 | Diagnostic Monitor |
| | 0 | 0 | X | X | Data Transfer |
| | 0 | 0 | 1 | X | Read Operation |
| | 0 | 0 | 0 | X | Space Operation |

Control Storage Tables and Logs (Continued)

LDT Table

The Logical Device Table (LDT) contains current information about each drive which is not directly related to a particular buffer segment.

Word 0

| Bits | Field | Function |
|------|---------|---|
| 0-7 | DEVFLT | Contains the fault count for this drive since the last reset of 'Fault Count'. |
| 8 | INHAUSP | Inhibits this control unit from issuing a forward or backward 'Auto Space' command to this drive. |
| 9 | INHRDAH | Inhibits performing read ahead operations. |
| 10 | INHREC | Inhibits using the Reconnect Timer (ITC). |
| 11 | INHSEST | Inhibits using the serial interconnection to start this drive. |
| 12 | INHERP | Inhibits performing internal ERPS. |
| 13 | MDDEV | Indicates that this drive is reserved to the MD. |
| 14 | ERPDEV | Indicates that this drive is reserved to the ERP. |
| 15 | CALLERP | Indicates to call the ERP after Gap Out processing, even if the record was read with no errors. |

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Word 1 LDT

| Bits | Field | Function |
|------|----------|--|
| 0 | INHWR0P | Inhibits this control unit from starting a Write operation, from the buffer to this drive. |
| 1 | IBGTOUT | Indicates that during Gap Out processing an IBG Time Out occurred on the last IBG. |
| 2 | ENDSYC | Indicates the 'Ending Sync' was detected during the read of the last record. |
| 3 | STRBC | Indicates that writing has started but the read-to-write head timer did not time out. |
| 4 | WR1REC | Indicates that the first record of a Write operation is ready to be written. |
| 5 | RD1REC | Indicates that writing has started but the first record has not been 'read back checked'. |
| 6-7 | TWOBITID | Is the modulo 4 count used to identify a Write operation with its 'read back check'. |
| 8 | BUFPIN | Indicates that this drive's buffer is pinned to this control unit. |
| 9 | PCUDA | Permits the control unit's deallocation of this drive. |
| 10 | TPMARK | Indicates that the last record was a tape mark. |
| 11 | SYNCMODE | Indicates that this drive is in Synchronous Data Transfer mode (blocksize is more than 64K). |
| 12 | RDAHOP | Indicates that the current Read operation is not scheduled (Read Ahead). |
| 13 | TINHWR0P | Indicates that a Read Data Buffer operation is in progress and Write operations are not to be scheduled. |
| 14 | DISERP | Indicates to disable the ERP flag for errors during channel data transfers. |

Control Storage Tables and Logs (Continued)

LDT Table (Continued)

Word 2

| Bits | Field | Function |
|------|-------|---|
| 0-15 | CHID1 | Contains the high order channel block ID. |

Word 3

| Bits | Field | Function |
|------|-------|--|
| 0-15 | CHID2 | Contains the low order channel block ID. |

Word 4

| Bits | Field | Function |
|------|--------|--|
| 0-15 | DEVID1 | Contains the high order device block ID. |

Word 5

| Bits | Field | Function |
|------|--------|---|
| 0-15 | DEVID2 | Contains the low order device block ID. |

Word 6

| Bits | Field | Function |
|------|---------|--|
| 0-15 | BLCKSIZ | Contains the blocksize/16 of the largest block in this file. |

Word 7

| Bits | Field | Function |
|------|--------|---|
| 0-15 | BSTPTR | Contains the buffer status table PTR under normal conditions. |

Word 8

| Bits | Field | Function |
|------|--------|--|
| 0-15 | ERPBST | Contains the buffer status table PTR under ERP conditions. |

Word :

| Bits |
|------|
| 0 |
| 1 |
| 2 |
| 3 |
| 4-15 |

Word

| Bits |
|-------|
| 0-7 |
| 8 |
| 9 |
| 10 |
| 11 |
| 12-15 |

Word :

| Bits |
|------|
| 0-15 |

Word :

| Bits |
|------|
| 0-15 |

Control Storage Tables and Logs (Continued)

Word 9

| Bits | Field | Function |
|------|----------|--|
| 0 | SCNALGOR | Indicates that Scan is needed to compute the reconnect time for this device. |
| 1 | SCNALGOE | Indicates that Scan is needed to compute the early start time for this device. |
| 2 | SCNREC | Indicates that when the ITC times out, Scan should call Reconnect for this device. |
| 3 | SCNFOREC | Indicates that Reconnect should be called in despite the ITC timer. |
| 4-15 | SCNRSVD | Reserved |

Word 10

| Bits | Field | Function |
|-------|----------|---|
| 0-7 | IBGTOCNT | Contains the counter for the number of erase gaps (IBGOUTS) that occurred during a write operation. |
| 8 | GLOC | Indicates that this is the first Gap-In after a Disconnected Locate operation. |
| 9 | NOBID | Indicates that not to check Bids for correct during Space Ops. |
| 10 | DBSDEV | Indicates that this device is assigned to the MP by buffer management for buffer deallocation purposes. |
| 11 | ALLNOREP | |
| 12-15 | FIROVRN | Contains the number of Device- Buffer Overruns that have occurred while writing a record from the buffer to tape. |

Word 11

| Bits | Field | Function |
|------|-------|------------------------------------|
| 0-15 | LOXNT | Contains the local transfer count. |

Word 12

| Bits | Field | Function |
|------|-------|-------------------------------------|
| 0-15 | REXNT | Contains the remote transfer count. |

Control Storage Tables and Logs (Continued)

PGT Table

The Path Group ID Table (PGT) contains the path group identification of each channel adapter interface for both control units. It also contains the Path Group Management byte that includes information about the path mode of the interface (single or multipath). There is one PGT for each channel.

The Path Group ID Table is affected by Set Path Group ID commands addressed to drives connected to both local and remote control units in a two control unit subsystem. This ensures that both control units will contain the same path group ID information after the execution of any Set Path Group ID commands.

There is an entry in this table for each control unit and adapter combination. (Up to eight entries in a maximum, dual control unit, eight channel subsystem.) The table is accessed by specifying the control unit number and channel adapter.

Byte 0

| Bits | Field | Function | Detail |
|------|----------|--|--|
| 0 | SYSERR | A system reset is being processed within the control unit. The reset may have been caused by the channel or control unit. | |
| 1-2 | Reserved | | |
| 3 | IDREC | The ID Received bit is set if a path group ID has been received for the channel interface since the last Power-On or system reset. | |
| 4 | PATHMODE | Set for channel interfaces in multipath mode. Reset for interfaces in single path mode. | 0 = Single path |
| 5-7 | GROUP | Identifies a path group ID that has been received by the control unit over this channel. These three bits are a shorthand identifier of the 11 byte Path Sweep GROUP ID. | 0 0 0 = Path group 0 0 0 1 = Path group 1 0 1 0 = Path group 2 0 1 1 = Path group 3 1 0 0 = Path group 4 1 0 1 = Path group 5 1 1 0 = Path group 6 1 1 1 = Path group 7 |

B)

| |
|---|
| B |
| 0 |
| 1 |
| 2 |
| 3 |
| 4 |
| 5 |
| 6 |
| 7 |
| 8 |
| 9 |

PS

The Dev

Control Storage Tables and Logs (Continued)

Bytes 13 and 14

control units. It also
multipath). There is

and remote control
information after the

control unit, eight

| Bits | Field | Function | Detail |
|------|----------|---|---|
| 0 | CADIS | Indicates that this channel adapter is disabled. | |
| 1 | PRODIS | Indicates that this channel adapter is processing a channel adapter disable sequence. | Disable sequence is initiated by moving the Disable switch to Disable or the Off-line/On-line switch to Off-line. |
| 2 | Reserved | | |
| 3 | Reserved | | |
| 4-7 | Reserved | | |
| 8 | PROSYS | Indicates that the system reset for this channel is in progress. | |
| 9-15 | Reserved | | |

PST Table

The Pattern Sequence Table (PST) contains 16 entries which indicates the sequence of written and read back check pattern Device Data Transfer operation.

Control Storage Tables and Logs (Continued)

SNERRH Table

The Sense Error History Table (SNERRH) contains the sense builder call entry parameters and the first four words of drive sense that result from a drive unit check. The table is updated each time the sense builder is called. It is 256 words long and wraps when filled so that the last 20 to 40 errors are saved.

SNERRH can be displayed by using the "Storage Display/Alter - Control Unit Tables" function, see SDISK 1. When SNERRH is entered, the latest error record is shown in the top line of the MD display. Since SNERRH is a wrap log, the next entry on the MD display will be the oldest entry in the log. If you scroll the display forward or backward to see additional entries, record the microcode table address so you know when you have returned to the latest entry.

- ABCD indicates that a control unit or channel error has occurred and is four words long (see Figure 1).
- EFAB indicates that a drive error has occurred and is five words long (see Figure 3).

| Word | Bits | Definition |
|------|--------------------|---|
| 0 | 0-15 | A four-character constant ('ABCD') to identify each entry. |
| 1 | 0-15 | Microcode error code - (Control unit sense bytes 10 and 11) |
| 2 | 0-3 4-7 8-15 | Log Request Code Indicates the drive address Contains sense byte 9 - (Control unit flag byte) |
| 3 | 0-7 8-15 | Microcode error recovery action code Reserved |

Figure 1. Control Unit or Channel Errors Table

SENSE BUILDER REQUEST LABELS

BUFLOG Present buffered log (format 21). Counter overflow or unload.
CHECK 1 Check 1 recovery started at this time.
CUERR Control unit error not attributable to a particular drive.
PERM Recovery unsuccessful, present unit check with the data now in the sense table.
POST Enter and error code and ERA code into the sense table.
POSTERA Enter and ERA code only into the sense table.
POSTPERM Single invocation yielding both POST and PERM.
RECOVER Recovery successful, clear the sense table.
SNSRESET Unequivocal clear (RESET) the sense tables.
SNSTRACE Entry only in SNERRH, not in sense tables.

These are microcode operations and will be used to report errors to your next level of support.

| Word 0 | Word 1 | Word 2 | Word 3 | Description |
|--------|--------|--------|--------|-----------------------|
| ABCD | vvvv | 1xyy | zz-- | Device side POSTPERM |
| ABCD | vvvv | 2xyy | zz-- | Device side POST |
| ABCD | 0000 | 2xyy | zz-- | Device side POSTERA |
| ABCD | 0000 | 3x00 | zz-- | Device side RECOVER |
| ABCD | 0000 | 4x00 | zz-- | Device side PERM |
| ABCD | 0000 | 5x00 | zz-- | BUFLOG |
| ABCD | vvvv | 6xyy | zz-- | Device side SNSTRACE |
| ABCD | 0000 | 7x00 | 00-- | Device side SNSRESET |
| ABCD | vvvv | 8xyy | zz-- | CHECK1 trace entry |
| ABCD | vvvv | 9xyy | zz-- | Channel side POSTPERM |
| ABCD | 0000 | Axyy | zz-- | Channel side POSTERA |
| ABCD | 0000 | Bx00 | 00-- | Channel side RECOVER |
| ABCD | 0000 | Cx00 | zz-- | Channel side PERM |
| ABCD | vvvv | D0yy | zz-- | CUERR |
| ABCD | vvvv | Exyy | zz-- | Channel side SNSTRACE |
| ABCD | 0000 | Fx00 | 00-- | Channel side SNSRESET |

Figure 2. Control Unit or Channel Errors Words

vvvv Bits 0-15 of WORD 1 (see Figure 1).

x Bits 4-7 of WORD 2 (see Figure 1).

yy Bits 8-15 of WORD 2 (see Figure 1).

zz Bits 0-7 of WORD 3 (see Figure 1).

| Word | Bits | Definition |
|------|-----------------|--|
| 0 | 0-15 | A four-character constant ('EFAB') to identify each entry. |
| 1 | 0-7 8-15 | Indicates the drive ERP code. Indicates drive address. |
| 2 | 0-7 8-15 | Device flag 1. The device flag is associated with the first error that was detected for the current command. Device flag 2. The device flag is associated with the last error that was detected. |
| 3 | 0-7 8-15 | Device Command Code 1. Indicates that the command was active or last issued at the time of the first error that is defined in Word 3 bits 8 through 15. Device error code 1. This code is associated with the first error detected for the current command. |
| 4 | 0-7 8-15 | Device Command Code 2. Indicates that the command was active or last issued at the time of the second or last error that is defined in Word 4 bits 8 through 15. Device error code 2. This code is associated with the second or last error detected. |

Figure 3. Drive Errors

Drive Status Bits 0-15

When Status In is active, the information on the bus from the drive is status bits 0-7 or 8-15 for the selected drive.

The status bits are sent to the control unit for the following conditions.

- At the end of any Initial Sequence
- During the Ending Sequence, of a Transfer Sequence

A status bit that is the result of a control unit initiated operation is sent only to that control unit. Status that is not associated with a control unit operation is sent to both control units.

| Bit | Label | Description/Detail |
|-----|-------------------------------------|--|
| 0 | Prep Move Executed | This bit is set when a Serial command execution begins. If the command cannot be completed, a Unit Check (UC) is set. The bit is reset after status is sent by the Parallel command. If the Parallel is a motion command, it must be the same command as the Serial command or UC is set, and no motion occurs. |
| 1 | Repositioning | This bit is set at the end of a motion command as the drive begins the repositioning operation. It stays set until the drive enters Stoplock. If a new command is received and the drive is at the wrong Stoplock position to execute the command, this bit is set and is in the initial status for that command. This bit is reset when the correct Stoplock is reached, or at Gap In time if the command stays connected and the command is in the opposite direction to the last command. |
| 2 | Not-Ready-To-Ready | Bit 2 is set when the drive goes into Stoplock after establishing tension and a radius during a load operation. If the drive Ready switch is active, or when placed in the active position, a CU Alert is sent to the control unit. Moving the Online/Offline switch to the online position on a loaded and ready drive will also set this bit. This bit is reset after status is sent during normal interface sequences by the first control unit to select the drive. |
| 3 | New Sector | Bit 3 is set when a Write command is in progress and a new sector number is detected from the drive table, as the command is executing. It is reset the next time status is sent to the control unit. The drive may find a new sector number after the control unit ends a Write operation. The ending status will not show the sector status but the initial status for the next command will. |
| 4 | Device End for Disconnected Command | This bit is set at the end of any disconnected command. A control unit Alert is sent on the interface that issued the command. UC may be active when this status is set. Bit 4 is reset after status is sent during normal interface operations. Enables Reg Funnel Parity checker after all LSR locations have been initialized to good parity before this bit is set. Microcode can change active conditions. |
| 5 | Device End | Bit 5 is set when the drive has completed any connected command. It is reset after status is sent during the ending sequence. |

Drive Status Bits 0-15 DF 150

| Bit | Label | Description/Detail |
|-----|--|--|
| 6 | Unit Check | Bit 6 is set when the drive has detected an error condition that it can not recover from by itself. If a command was in process, it is sent with Device End. If no command was in process, UC will be in the initial status of the next command. The bit is reset after status is sent. |
| 7 | Manual Rewind/Unload | Bit 7 is set when tape tension is up, the Ready/Not Ready switch is in the inactive position and the rewind/unload switch is pressed. |
| 8 | Address High | This bit is active during status presentation when the drive address switch is set to hexadecimal address 8-F. It is reset after status is presented. |
| 9 | Ready | This bit is set after a Load-Op operation when tension is set, the machine reel has rotated at least one revolution, and BOT status is detected (except a mid-tape-load). It is reset by a Rewind-Unload operation or any drive error condition that causes a loss of tension or requires the motor stopping. Bit 1 is also set when the drive Ready switch activated if it had been inactive during the load operation. |
| 10 | Patched | This bit is set after a successful Patch load to a drive. It stays on until a power down condition, power on reset, or a Reset command. |
| 11 | Load Point | This bit is set when the drive motion is backward and the BOT is sensed. Drive motion is stopped and no backwards commands are accepted until BOT is reset with the next forward operation. If a data error is received while moving the tape forward from BOT, and a backward command is executed for ERP, BOT will not be detected. |
| 12 | File Protected Cartridge | This bit is set when a cartridge is loaded if the tape is file protected. It stays active until the current cartridge is unloaded and reset during an unload operation. |
| 13 | Tape Indicate (EOT) or Logical End of Tape | This bit is set when the drive motion is forward and EOT is sensed. Drive motion is not stopped and the EOT status stays active until a backward operation moves the tape backward and passes EOT. |
| 14 | Physical End of Tape (PEOT) | This bit is set when the microcode senses the physical end of tape. Tape motion is stopped and UC is set. |
| 15 | Reserved | |

Drive External Registers

The following registers are drive external registers that can be accessed using the support diskette, "Register Display/Alter" option (SDISK 1).

Note: Bit positions marked 'x' may be on or off. Only the important drive external registers and bits are defined.

| REGISTER | BIT | | | | | | | |
|----------|----------------------|-----------------------|---------------------|--------------------------|--------------------------|--------------------------------|--------------------|------------------|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| X01 | x | x | High Addr Bit | x | Rewind Switch | x | x | x |
| X02 | x | x | Offline Switch | x | x | x | x | x |
| X03 | Air Loss Switch | x | Over Temp Sw | x | x | Cartridge Present Sensor | x | R/Unload Switch |
| X07 | x | x | LED Open Error | Message Display Error | Timer Error 1 | Timer Error 2 | Intf A Error | Intf B Error |
| X08 | File Protect Sensor | Loader Extract Sensor | Tape Path SNSR-A | Tape Path SNSR-B | Cartridge Latched Sensor | x | x | x |
| X09 | Rdy/Not Rdy Switch | x | Module Parity Error | Counter Parity Error | Module Parity Error | Gap CNT Parity Error | Timer Parity Error | x |
| X10 | Serial Command Error | x | x | x | x | x | x | x |
| X11 | Analog Cnvrter Error | File Motor Error | Machine Motor Error | x | Power Amp Error | Tension Loss | x | 24V dc Failure |
| X20 | x | x | x | x | x | Tag/Bus Parity Error | x | x |
| X25 | 0/8 | 1/9 | 2/A | Drive Address 3/B 4/C | | 5/D | 6/E | 7/F |
| X26 | (8) | Drive ID (4) (2) | | (1) | x | Logical Address (4) (2) (1) | | |
| X27 | x | x | x | x | x | x | INTFC A Selected | INTFC B Selected |

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