IBMIBM

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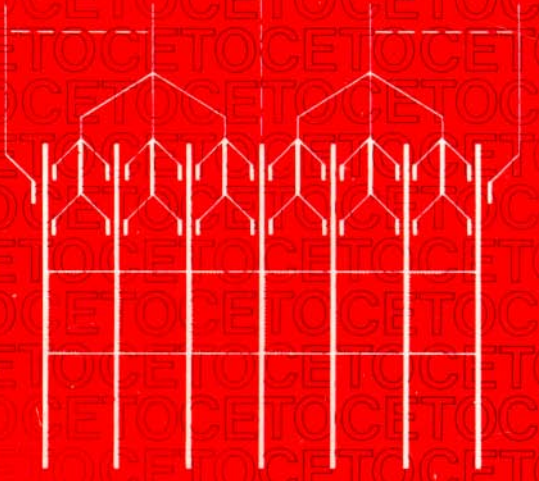

A 3370HDA 3370HDA

Reference Guide Failure Isolation Reference Guide

3370
HDA

6 DATA SURFACES.
1 SERVO " · PER ACTUAT
12 R/W. HEADS
1 SERVO HEAD PER ACTUATOR
750 DATA CYLINDERS
2 CE CYLINDERS
2 SURF. ANAL. CYLIND.
12 TRACKS/CYLINDER
744 PRIM. BLOCKS/CYLIND.
24 ALT. BLOCKS/CYLIND.
64 BLOCKS/TRACK
4 SECTORS/BLOCK
17056. (744×24) ALT. BLOCKS.

Arm 1

DATA BLOCKS 000 - 243 = 244 *

EN 12 ALTERN = 12

256

ARM 2

DATA BLOCKS ONLY VAN

244 - 499 = 256 *

ARM 3

DATA BLOCKS 500 - 743 = 244 *

EN 12 ALTERN. = 12

256

* DUS 744 DATA BLOCKS / CYL.

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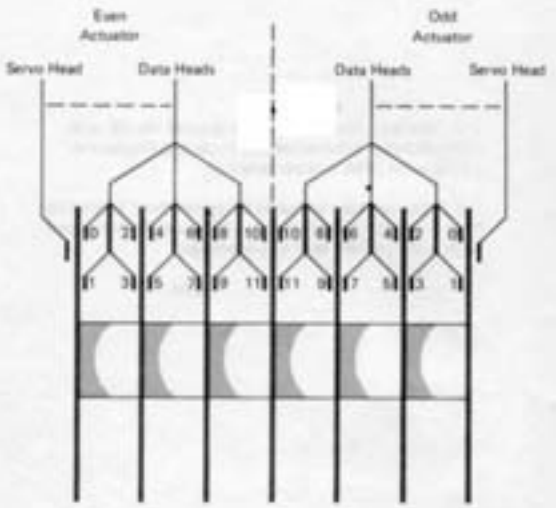
This Reference Guide intends to provide the CE with comprehensive information on Tools and Procedures available for HDA Failure Isolation.

The Guide has been prepared by experienced Specialists from European Field Support, CETO and PE Mainz and reflects the current level of knowledge.

August, 1981

Head and Disk Assembly



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750 DATA CYLINDERS
12 TRACKS/CYLINDER

744 BLOCKS/CYLINDER
24 ALTERN BLOCKS/CYLINDER
BLOCK NOS = 0 → 557999
PER ACTUATOR

± 18000 ALTERNATE BLOCKS
AVAILABLE

List of Tools

1. Msg's and Codes

Operator Console Messages
DOS/VSE Messages GC33-5379 or
VSE/AF Messages SC33-6098
IBM VM Facility/370 System, Msg's GC20-1808

A brief description of the message format is in
Ref.: 3370 MIM "MSG" section.

2. Erep 1

Customer is responsible to run and keep EREP updated.
CE is responsible for analysing EREP-Data.

For error record description use 3370 MIM "MSG" section.
For run procedures refer to "Environmental Recording Edition and Printing Program".
Ref.: GC28-0772

3. Utilities

Customer is responsible to run and keep the utilities updated.

DSF ANALYZE Comand tests drive functions, stains all ID's and customer data for readability.
Runs online and standalone.
See running procedures. (Page ~~8.0~~ 16.0
Minimum level Standalone Rel. 3.0
Online Rel. 2.0
Ref.: 3370 MIM "PROG" section
SRL GC35-0033

AP1 Equivalent to DSF for DOS/VSE Rel. 1
Runs online. See running procedures. (Page ~~8.0~~
Ref.: GC26-3855 15.0
Prefer DSF stand alone

ALTBLK Flags a defective block, assigns alternate and rewrites customer data in the alternate block.
Rewrites ID's if unconditional option used. 15.0
Runs only online. See running procedures. (Page ~~8.0~~
Ref.: SRL SC33-6100 (VSE/AF)
GC33-5381 (VSE)

If ID is defective perform the move ID (Ref MIM OPER 38).

INTDK Writes Volume ID and VTOC
Option (IQ) erases all customer data (and formats 512 byte data fields)
Use always IQ option on new machines or new HDA.
Runs online and standalone.

Ref.: SRL SC33-6100 VSE/AF
GC33-5381 DOS/VSE
GC20-1806 V/M

SURFANAL Reclaims all blocks, analyses the surface (ID and data fields), flags defective blocks and assigns alternates. Factory flagged blocks not affected.
- Should only be used to repair a HDA and not to verify a HDA after replacement or installation
- Customer data overwritten ←
- Must be followed by INTDK
- Run time varies, minimum 35 minutes
- Runs standalone, or under control of VM.

See running procedures. (Page ~~16.0~~ 16.0
Minimum level: Rel. 2.2
Ref.: SRL SC33-6100 VSE/AF
GC33-5381 DOS/VSE
GC20-1806 VM plus TNL

FASTCOPY Dumps all data from logical volume to alternative storage media.
Should run prior to SURFANAL in order to save disk-content
Runs online and standalone.
Ref.: SRL SC33-6100 VSE/AF (standalone)
GC33-5381 DOS/VSE (online and standalone)
SC33-6062 5746-AM4 (online fastcopy licenced progr. VSE/AF Rel. 2&3)

BACKUP Dumps volumes containing system and private libraries from disk to tape.
Runs only online.
Ref.: SRL SC33-6100 VSE/AF (Rel. 1)
GC33-5381 DOS/VSE (Rel. 2 & 3)

RESTORE Restores volumes dumped using BACKUP.
Runs online and standalone.
Ref.: SRL SC33-6100 VSE/AF (Rel. 1)
GC33-5381 DOS/VSE (Rel. 2 & 3)

FOR VM/370 USER

FORMAT/ALLOCATE Formats labels and allocates space on a volume.
Ref.: SRL GC20-1801 VM/370
SC19-6201 VM/SP

DDR Dump/Restore data between disk and tape
Ref.: SRL GC20-1801 VM/370
SC19-1601 VM/SP

4. CE AIDS

DUMPCECYL 4331 FBA/FTA only.
Collects error information stored on CE cylinder under 23XX/33XX emulation.
Run before DSF or drive testing with MD.
Ref.: 4331 MI "APP" section, Vol. 23-6300
Runs only online.
Friend provides alternatives.

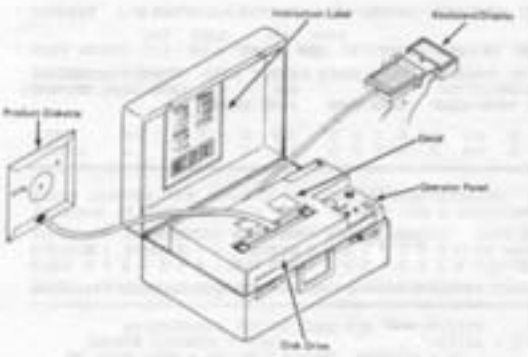
E-FRIEND Predefined CCW chains to analyse HDA
– **$$**511 scans all ID's and data blocks for readability. (sample page 21.0)

– **$$**51V writes F1 to F8 in all data blocks without verification. (sample page 21.0)
(Overwrites customer data)

See also E-FRIEND ROUTINES
pages 12.0 – 21.0
Runs only standalone.
Ref.: 43XX Vol. 17, "FRIEND" section.

QUICK HDA ANALYSIS

Using the Maintenance Device



The MDC is used during fault symptom code analysis of certain error types. During the fault symptom code analysis MAP, the MD asks the CE to enter an MDC. The MAP uses the MDC to further analyze the failure. (See MIM – MSG 34)

Quick Data Check Analysis Using the FSC and MDC Codes

It is possible to evaluate the Fault Symptom Code and Maintenance Device Code and determine whether to replace the HDA, or assign an alternate block. Find your FSC in the left column in the chart below, then evaluate bits within the MDC code column, top to bottom until a match is found (X means don't care). If no match is found, continue analysis with the MD Option 3.

HDA Failure – Replace the HDA

FSC		MDC TYPE = R/W			
		XXXX	XXXX	0010	XXXX
1AXX	A	XXXX	XXXX	0100	XXXX
or	N	XXXX	XXXX	XXXX	0010
1BXX	D	XXXX	XXXX	XXXX	0100

Single Block Failure – Assign an Alternate Block

FSC		MDC TYPE = DC/DCE			
494X	A	XXX0	X010	XXXX	XXXX
or	N	XXX0	X011	XXXX	XXXX
5XXX	D	XXX0	XXXX	X010	XXXX
		XXX0	XXXX	X011	XXXX
		XXX0	XXXX	XXXX	XX10
		XXX0	XXXX	XXXX	XX11

Single Head Failure – Determine Number of Failing Blocks

FSC		MDC TYPE = DC/DCE			
494X	A	XXX0	X100	XXXX	XXXX
or	N	XXX0	X110	XXXX	XXXX
5XXX	D	XXX0	XXXX	X100	XXXX
		XXX0	XXXX	X110	XXXX
		XXX0	XXXX	XXXX	X100
		XXX0	XXXX	XXXX	X110

Determine the number of failing blocks by checking the number of different FSC entries in the EREP Summary report. And count of MDC samples.

– If less than 10 blocks fail, the disk surface may have received a small radial scratch. Have the customer try to assign alternate blocks to the failing blocks.

EREP STATISTICAL AND ERROR DATA SUMMARY

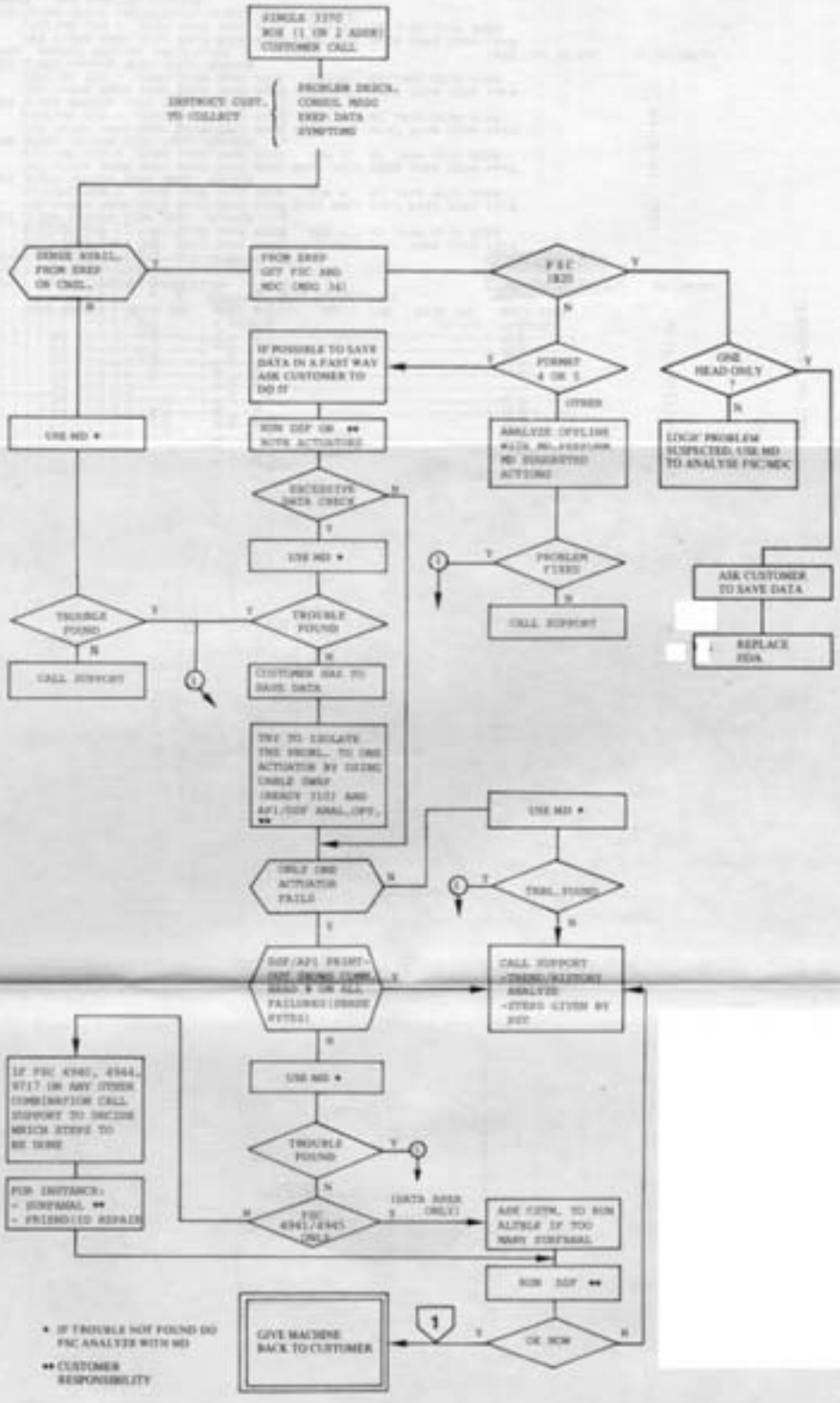
```
SUMMARY  I/O RECORDS  TYPE OBR/MDR  SOURCE-OUTBOARD  DEVICE TYPE 2A60  MODEL-3031  SERIAL NO. 010014

          DAY  YEAR    DAY  YEAR
DATE RANGE- 114  80   TO 114  80    TOTAL NUMBER OF RECORDS  36  OBR COUNT  36  MDR COUNT  0

PHYSICAL  Type-   BUS      OVER    EQUIPMENT     CHECKS        DATA CHECK      SEEK CHECK    CHECK DATA   OTHER  STATISTICAL
ADDRESS   Device  OUT      RUN                   DRIVE         UNCORR.                                    OBRS   (NO OF MDRS)
                  PARITY          PERM TEMP   PERM TEMP   PERM TEMP CORR   PERM TEMP     PERM TEMP

02A0      3370    0        0       0    0      0    0      36   0    0      0    0        0    0        0      0
TOTALS            0        0       0    0      0    0      36   0    0      0    0        0    0        0      0
*****************************************************************************************************************

FAULT SYMPTOM CODE SUMMARY  TYPE OBR SOURCE-OUTBOARD
SEQUENCE BY FAULT SYMPTOM CODE, PRIMARY CUA & SECONDARY CUA

FAULT     PHYSICAL   LOGICAL      OCCURRENCES   DATE & TIME          SENSE FROM LAST OCCURRENCE
SYMPTOM   ADDRESS    ADDRESS                    OF LAST              0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 2 2 2 2
CODE                 LAST PATH                  OCCURRENCE           0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3

4945      02A0       02A0            36   80/114  10:28:18:37  0880000020A040045000000000000000000000084A844945
*****************************************************************************************************************

          MAINTENANCE DEVICE CODE FOR DEVICE TYPE   3370
     DEVICE ADDRESS = 02A0              SERIAL = 010014
  MD CODE TYPE = DC  MDC = 0002  SAMPLES = 36

ECC CORRECTABLE          UNCORRECTABLE              NO SYNC BYTE FOUND
    N/A                      N/A                    PRIME DATA BLOCK
                                                    CCC = 730  HH = 4  RR = 0

                  MAINTENANCE DEVICE CODE
```

EQUIPMENT CHECK (HDA) FSC/MDC →		XXHH WHERE H = 2/4	011X SINGLE ARM MODULE	012X INCORRECT ARM SELECT	01HX H ≠ 1/2 RANDOM	10XX SINGLE DRIVE	H0XX H = 2/3 MULTI DRIVES
191A OR 191E	SEEK VERIFICATION CHECK UNRESOLVED ID MISCOMPARE	NOT APPLICABLE	BAD ID RE-WRITE WITH FRIEND OR SURFANAL IF UNCESSFUL REPLACE HDA	REPLACE HDA	DRIVE CARDS C2 F2 HDA CABLES	REPLACE HDA	CTLR H2 CARD DEV-I CABLES M4 TERMINATOR
1B20	A WRITE OVERRUN OCCURED.	REPLACE HDA NOTIFY FIELD SUPPORT	N/A	N/A	N/A	N/A	N/A
1AXX 1BXX	R/W CHECK R/W CHECK	REPLACE HDA	N/A	N/A	N/A	N/A	N/A

KEY: ϕ = MUST BE ZERO; H = ANY POSITION WITH VALUE EQUAL TO H; X = DON'T CARE VALUE

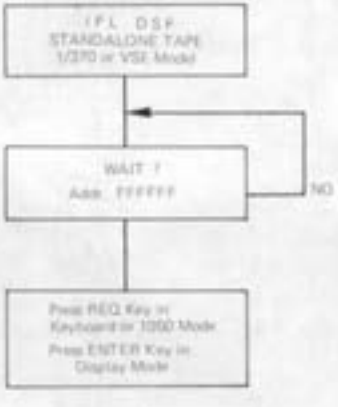
DATA CHECK FSC/MDC → ↓		0HHH WHERE H = 2/3 ONE BLOCK	0HHH H = 4 R/W HEAD	0HHH H = 6 ARM/SEL PROBLEM	0000 SINGLE DRIVE FAILING	3XXX MULTIPLE DRIVES FAILING	1XXX BOTH ACTUATORS FAILING
4944 AND 4945	ID FIELD NO SYNC BYTE FOUND DATA FIELD NO SYNC BYTE FOUND	FRIEND ASSIGN ALTERNATE BLOCK OR SURFANAL	OPEN R/W HEAD REPLACE HDA	BAD ARM REPLACE HDA	MISSING R/W DATA SIGNALS CHECK HDA CABLES	MISSING R/W DATA SIGNALS TO CONTROLLER OR SERDES	MISSING R/W DATA SIGNALS TO DRIVE OR CONTROLLER
4940 OR 4944	ID FIELD DATA CHECK ID FIELD NO SYNC BYTE FOUND	FRIEND - ASSIGN ALTERNATE BLOCK OR SURFANAL	SURFANAL OR FRIEND	REPLACE HDA	SWAP HDA CABLES AND SCAN	LOGIC CARD PROBLEM CONTROLLER	LOGIC CARD PROBLEM (DRIVE)
4941 4945 4949 494D	DATA FIELD ECC UNCORRECTABLE DATA FIELD NO SYNC BYTE FOUND DATA FIELD ECC UNCORRECTABLE DURING CHECK DATA DATA FIELD NO SYNC BYTE FOUND DURING CHECK DATA	HAVE CUSTOMER USE ALT BLK TO ASSIGN AN ALTERNATE? MDC MODIFIES ARE DECIMAL PHYSICAL LOCATION CCC - HH - BB CCC = CYLINDER HH = HEAD BB = SECTOR	IF INCIDENTS 2 TO 10 USE ALT BLK IF > 10 USE SURFANAL	REPLACE HDA	SWAP HDA CABLES AND SCAN TO DETERMINATE IF HDA OR LOGIC CARDS	LOGIC CARD PROBLEM CONTROLLER	LOGIC CARD PROBLEM (DRIVE)
5XXX	DATA FIELD ECC CORRECTABLE	TAKE NO ACTION	TAKE NO ACTION	TAKE NO ACTION	CHECK GROUNDS	CHECK DC VOLTAGES	CHECK DC VOLTAGES

KEY: 0 = MUST BE ZERO, H = ANY POSITION WITH VALUE EQUAL TO H, X = DON'T CARE VALUE


SINGLE 3370
BOX (1 OR 2 ADDR)
CUSTOMER CALL
INSTRUCT CUST. TO COLLECT
PROBLEM DESCR.
CONSOL MSGS
ERRP DATA
SYMPTOMS
SERVICE AVAIL. FROM ERRP OR CNSL.
FROM ERRP GET FIC AND MDC (MDC 34)
FEC (E2)
IF POSSIBLE TO SAVE DATA IN A FAST WAY ASK CUSTOMER TO DO IT
FORMAT 4 OR 5
OTHER
ONE HEAD-ONLY ?
USE MD *
RUN DSF ON ** WITH ACTUATOR2
ANALYZE OFFLINE WITH MD SUGGESTED ACTIONS
LOGIC PROBLEM SUSPECTED. USE MD TO ANALYSE FSCMDC
EXCESSIVE DATA CHECK
USE MD *
PROBLEM FIXED
ASK CUSTOMER TO SAVE DATA
TROUBLE FOUND
TROUBLE FOUND
CALL SUPPORT
REPLACE HDA
CUSTOMER HAS TO SAVE DATA
TRY TO ISOLATE THE PROBL. TO ONE ACTUATOR BY USING UNABLE CMND (READY 3333 AND API/DSF ANAL.OFF, **
USE MD *
ONLY ONE ACTUATOR FAILS
TROU. FOUND
DSF/API PRINT-OUT SHOWS FAILURES ON ALL HEADS OF ONE ACTUATOR
CALL SUPPORT -TRENDS/HISTORY ANALYSIS -STEPS GIVEN BY DSF
IF FSC 4940, 4944, 9717 OR ANY OTHER COMBINATION CALL SUPPORT TO DECIDE WHICH STEPS TO BE DONE
USE MD *
TROUBLE FOUND
RUN INSTANCE: - SURFANAL ** - FRIENDLY REPAIR
FSC 4941/4945 ONLY
DATA AREA ONLY
ASK CSTM. TO RUN ALTBLK IF TOO MANY SURFANAL
RUN DSF **
GIVE MACHINE BACK TO CUSTOMER
OK NOW
* IF TROUBLE NOT FOUND DO FSC ANALYSIS WITH MD
** CUSTOMER RESPONSIBILITY

DEVICE SUPPORT FACILITY (DSF)

Operating Procedures to analyze a volume,
see also GC35-0033



1. Example: No Error

```
ICK005E DEFINE INPUT DEVICE, REPLY 'DDDD,CUU' OR 'CONSOLE'
ENTER INPUT/COMMAND CONSOLE
CONSOLE
ICK006E DEFINE OUTPUT DEVICE, REPLY 'DDDD,CUU' OR 'CONSOLE'
ENTER INPUT/COMMAND CONSOLE
CONSOLE
ICK015E SUPPLY TODAY'S DATE, REPLY 'MM/DD/YY'
ENTER INPUT/COMMAND 04/30/81
04/30/81
ICK016E SUPPLY TIME OF DAY, REPLY 'HH.MM.SS'
ENTER INPUT/COMMAND 14.30.00
14.30.00
ENTER INPUT/COMMAND ANALYZE UNIT(340) DEVTYPE(3330) 2CAN
ICK03F  DEVICE SUPPORT FACILITIES       3.0                          TIME  14.30.00

  ANALYZE UNIT(340) DEVTYPE(3370) 2CAN
ICK01400I 340 ANALYZE STARTED
IEX400I   340 ANALYZE STARTED
ICK0140.I 340 NO DRIVE PROBLEMS FOUND
ICK407I   340 NO DRIVE PROBLEMS FOUND
ICK01408I 340 DATA VERIFICATION TEST STARTED
ICK402I   340 DATA VERIFICATION TEST STARTED
ICK01505I 340 ALL DATA 'MACHINE READABLE' WITHOUT ERRORS
ICK505I   340 ALL DATA 'MACHINE READABLE' WITHOUT ERRORS
ICK01404I 340 ANALYZE ENDED
ICK406I   340 ANALYZE ENDED
```

2. Example: Data Check

```
 ANALYZE UNIT(340) DEVTYP(3370) 2CAN
ICK01406I 340 ANALYZE STARTED
ICK400I   340 ANALYZE STARTED
ICK01407I 340 NO DRIVE PROBLEMS FOUND
ICK407I   340 NO DRIVE PROBLEMS FOUND
ICK01408I 340 DATA VERIFICATION TEST STARTED
ICK402I   340 DATA VERIFICATION TEST STARTED
DATAVER PERMANENT ERROR ADDR = 0000 2A01
ICK03F  DEVICE SUPPORT FACILITIES       3.0                          TIME  12.39.00        04/30/81
      FAILING CCW =  4203 7F00 3000 0208   CSW =  03 7400 0E00 0204
      2H2 =0001 0000 0E35 3441 0660 049F 0000 2A01 0459 0000 2A01 4941
DATAVER TEST
      FAILING CCW =  4205 7F00 3000 0208   CSW =  03 7400 0E00 0000
      2H2 =0001 0000 0E37 0000 0660 049B 0000 2A25 0981 0000 0020 0F00
ICK31401I 340 SUSPECTED DRIVE PROBLEM
ICK401I   340 SUSPECTED DRIVE PROBLEM
ICK03F  DEVICE SUPPORT FACILITIES       3.0                          TIME  12.39.00        04/30/81
                        MOVEABLE HEAD ERROR TABLE
      HEAD NUMBER   DATA CHK   ZERO VERIFY   WRITE CHK   DATA CHK   DATA COMP
                               CHECK                     CE CTL     ERROR
          00 |-----|----------|----------|----------|----------|----------|
          01 |-----|----------|----------|----------|----------|----------|
          02 |-----|----------|----------|----------|----------|----------|
          03 |-----|----------|----------|----------|----------|----------|
          04 |-----|----------|----------|----------|----------|----------|
          05 |-----|----------|----------|----------|----------|----------|
          06 |-----|----------|----------|----------|----------|----------|
          07 |-----|----------|----------|----------|----------|----------|
          08 |-----|----------|----------|----------|----------|----------|
          09 |-----|----------|----------|----------|----------|----------|
          10 |-----|----------|----------|----------|----------|----------|
          11 |-----|----------|----------|----------|----------|----------|
          12 |-----|----------|----------|----------|----------|----------|
```

```
ENTER INPUT/COMMAND:ANALYZE UNIT(340) DEVTYP(3370) ICAN

 ANALYZE UNIT(340) DEVTYP(3370) ICAN
ICK01400I 340 ANALYZE STARTED
ICK4002I  340 ANALYZE STARTED
FIXED BLOCK WRITE PREDELECTED BLOCK2 TEST: 8WRWFF
      FAILING CCW =  4100 44E0 4000 0000   CSW =  03 7600 0E40 0000
      INS =1400 0002 EE01 001A 02EE 0000 0000 00FF 0A0D 0000 3F00 191A
ICK03F  DEVICE SUPPORT FACILITIES       2.0                        TIME: 12:30:00       86/30/01
FIXED BLOCK RANDOM SEEK TEST: BRANDM
      FAILING CCW =  4203 7F88 5000 0200   CSW =  03*7d00 0E40 0200
      INS =1400 0000 0001 001A 0000 0000 0000 00FF 0A0D 0000 7E00 191A
FIXED BLOCK RANDOM SEEK TEST: BRANDM
      FAILING CCW =  4203 7F88 5000 0200   CSW =  03 7610 0E40 0200
      INS =1400 0000 0001 001A 0000 0000 0000 00FF 0A0D 0000 2200 191A
FIXED BLOCK RANDOM SEEK TEST: BRANDM
      FAILING CCW =  4203 7F88 5000 0200   CSW =  03 7600 0E40 0200
      INS =1400 0000 0003 001A 0000 0200 0000 00FF 0A0D 0000 8800 191A
FIXED BLOCK RANDOM SEEK TEST: BRANDM
      FAILING CCW =  4203 7F88 5000 0200   CSW =  03 7610 0E40 0200
      INS =1400 0000 0003 001A 0000 0200 0000 00FF 0A0D 0000 2C00 191A
FIXED BLOCK RANDOM SEEK TEST: BRANDM
      FAILING CCW =  4203 7F88 5000 0200   CSW =  03 7600 0E40 0200
      INS =1400 0000 0001 001A 0000 0000 0000 00FF 0A0D 0000 9200 191A
ICK31401I 340 SUSPECTED DRIVE PROBLEM
ICK4011I  340 SUSPECTED DRIVE PROBLEM
ICK03F  DEVICE SUPPORT FACILITIES       2.0                        TIME: 12:30:00       86/30/01
                        MOVEABLE HEAD ERROR TABLE
     HEAD NUMBER -  DATA CHK    SEEK VERIFY CHECK    WRITE CHK    DATA CHK DE CYL    DATA COMP ERROR
          00 -----|----------|----------|----------|----------|----------|
          01 -----|----------|----------|----------|----------|----------|
          02 -----|----------|----------|----------|----------|----------|
          03 -----|----------|----------|----------|----------|----------|
          04 -----|----------|----------|----------|----------|----------|
          05 -----|----------|----------|----------|----------|----------|
          06 -----|----------|----------|----------|----------|----------|
```

ALTBLK ONLINE

Don't use conditional option, run only unconditional.

```
// JOB jobname
// ASSGN SYSOOO,CUU
// EXEC ALTBLK
   PBN = nnnnnn VOLID = XXXXXX UNCONDITIONAL
            └─Insert block#br. (decimal) from
              console msg. (hex)
/*
/&
```

Running Time: Few seconds

Note: For block calculation see General Hints page 22.0 (How to find the block/number).

AP 1 ONLINE

```
// JOB jobname
// ASSGN SYSOOO,CUU
// EXEC AP1,SIZE=23K
/*
/&
```

Running Time: 0.5 Hrs

DSF ONLINE

```
// JOB jobname
// ASSGN SYSOOO,CUU
// EXEC ICKDSF,SIZE=256K
   ANALYZE SYSNAME(SYSOOO) SCAN SPEED
/*
/&
```

Running Time: Varies from 4 min. to 20 min.

Surfanal

Example of 3370 dialog:

```
*** Stand alone programs loaded ***
If you want a listing, specify CUU of printer
If not, press EOB.
Press EOB also, if buffer not or incorrectly loaded
                                   (operator presses END/ENTER)
Specify date MM/DD/YY
03/30/78                           (operator reply)
Specify one of the following commands:
FASTCOPY, INITDISK, RESTORE, INITEM, SURFANAL, END
surfanal                           (operator reply)
Specify address of output device CUU
2 c1                               (operator reply)
Specify type of output device XXXXYY
fba                                (operator reply)
6X71D  Specify FBA volume ID.
       Reply volume ID., cancel or press ENTER
000144                             (operator reply)
SS15I  Surface analysis for 3370 version X.X is active (at least 2.2)
SS02I  Start of reclamation routine
SS17I  Block identifier reformated, CCHS = 00010831  Flag = 80
  .
  .
  .
SS17I  Block identifier reformatted, CCHS = 01C40108 Flag=01
SS17I  Block identifier reformatted, CCHS = 01C50831 Flag=80
SS17I  Block identifier reformatted, CCHS = 01C50108 Flag=01
SS17I  Block identifier reformatted, CCHS = 01C60831 Flag=80
SS17I  Block identifier reformatted, CCHS = 01C60108 Flag=C1
SS17I  Block identifier reformatted, CCHS = 01C70108 Flag=C0
SS17I  Block identifier reformatted, CCHS = 01C80108 Flag=C0
SS17I  Block identifier reformatted, CCHS = 01C90108 Flag=C0
                                                      Note 1+4
  .
  .
SS07I  For factory flagged block 548717 an alternate
       has been assigned
SS07I  For factory flagged block 5[illegible] an alternate   Note 1
       has been assigned                                     Note 2
SS07I  For factory flagged block 5[illegible]565 an alternate
       has been assigned
SS04I  Start of surface analysis routine
SS16I  Analysis completed for blocks 0 to 9599
SS16I  Analysis completed for blocks 0 to 19199
  .
  .
  .
```

```
SS07I  For block 519208 an alternate has been assigned.
SS07I  For block 521493 an alternate has been assigned.   Note 3
SS16I  Analysis complete for blocks 0 to 527999
SS16I  Analysis complete for blocks 0 to 537599
SS16I  Analysis complete for blocks 0 to 547199
SS16I  Analysis complete for blocks 0 to 556799
SS06I  End of surface analysis
Specify one of the following commands:
FASTCOPY, INITDISK, RESTORE, INITEM, SURFANAL, END
```

Note 1: Message on printer only.

Note 2: Blocks have been flagged in the factory.

Note 3: Blocks have been flagged during the current run of Surface Analysis.

Note 4:
FLAG = xx
00 good primary block
01 good primary block, identifier written in moved position
80 good alternate block
C0 bad alternate block (surface defective)
C1 bad alternate block, identifier written in moved position
C2 bad alternate block, identifier written in extended moved position

E - FRIEND ROUTINES

Refer to section System Test, Vol. 17 of 4341 Documentation for loading E - FRIEND and for command syntax.

Refer to 3880 Storage Control Manual, Vol. 20 of 3880 Documentation for FBA command set description.

Samples:

1. Read block
2. Write block — data = your name or equiv.
3. Read ID block — for analysis refer to OPER 34 – 35, Vol. 20 of 3370 Documentation.
4. Flag defective block — and assign alternate block
5. Read ID of alternate block
6. Write original ID of alternate block
7. Write original ID of block
8. Write Scan — predefined chain $$51V (see note)
9. Read Scan — predefined chain $$511

Note: Should only be used as directed by support


```
4300 - F R I E N D - 07/29/80 - 09.93 EMH
*WARNING* WRITE COMMANDS MAY DESTROY DATA
ON A CUSTOMER DISK PACK OR LN CE-TRACKS
-----------------------------------------

STORAGE SIZE# 1FF7FF
MODEL # 4341
ID# 0002000543410000
MODE REC/BCE# EC
EC-MODE SET, NO RESET POSSIBLE
4300-FRIEND STANDARD OPTIONS SET
   8MPX,NO TIME DELAY,NO HALT,NO ALARM,INT
**********************************
DEV# DEVICE ADDRESS#
   RESET
```

```
DEV# 3E1
I/O# 388001-337000
CHAR# 60082102020000000003E000002E8000883800000000000000500000000000000
ENTER CCW LIST IN ENGLISH
 DX
 MASK BYTE# 00
 PHY.START#
 LOG.START#
 LOG. END #
 L
 OP. BYTE # 06
 REPL. CNT#
 BLCK. CNT# 1
 BL. CFFS.# 500000
 RF
 DL# 12
 LP 1
 GO
START
01*LOOP IS FINISHED ON UNIT 03E1
HALT
 CCW
 1-004000  63 000000 4000 0010 -
 2-004008  43 000010 4000 0008 -
 3-004010  42 000018 2000 000C -
 F
```

1. Read Block 500 000

```
DX = DEFINE EXTENT      (63)
 L = LOCATE             (43)
RF = READ FIXED BLOCK   (42)
WFB = WRITE FIXED BLOCK (41)
DC = DIAGNOSTIC CONTROL (F3)
DS = DIAGNOSTIC SENSE   (C4)
```

```
0000000000000000000000000000883AF
0600000100007A120
F1F2F3F4F5F6F7F8F9F00000
```

Decimal 500 000

```
DEV# 3E1
I/O# 388001-337000
CHAR# 60082102020000000003E000002E8000883800000000000000500000000000000
ENTER CCW LIST IN ENGLISH
 DX
 MASK BYTE# C0
 PHY.START#
 LOG.START#
 LOG. END #
 L
 OP. BYTE # 05
 REPL. CNT#
 BLCK. CNT# 1
 BL. CFFS.# 500000
 WFB
 DATA# XCOFFEE AFFE
 FLAG3,20 <---------- CCW3 FLAGS = 20
 LP 1
 GO
START
01*LOOP IS FINISHED ON UNIT 03E1
HALT
 CCW
 1-00A000  63 000000 4000 0010 -
 2-00A008  43 000010 4000 0008 -
 3-00A010  41 000018 2000 0005 -
 F
```

2. Write Block 500 000

```
C0000000000000000000000000883AF
0500000100007A120
COFFEE9AFF
```

```
DEV# 3E1
I/O# 388001-337000
CHAR# 6008210202000000003E000002E80008838000000000000005000000000000000
ENTER CCW LIST IN ENGLISH
 DX
 MASK BYTE# C4
 PHY.START#
 LOG.START#
 LOG. END #
 DC
 DATA# X0A000080001000002A00037
 DS
 DL# 5
 LP 1
 GO
START
01*LOOP IS FINISHED ON UNIT 03E1*
HALT
 CCW
 1-00A000  63 000000 4000 0010 -
 2-00A008  F3 000010 4000 000C -
 3-00A010  C4 00001C 2000 0005 -
 F
```

3. Read ID Block 500 000

BLOCK
HEAD
CYLINDER

```
C4000000000000000000000000883A
0A000308000100003 2A00037
C4800C0000
```

OFFSET
HEAD 00

```
DEV# 3E1
I/O# 388001-337000
CHAR# 6008210202000000003E000002E80008838000000000000005000000000000000
ENTER CCW LIST IN ENGLISH
 DX
 MASK BYTE# C0
 PHY.START#
 LOG.START#
 LOG. END #
 L
 CP. BYTE # 04
 REPL. CNT#
 BLCK. CNT#
 BL. OFFS.# 500000
 LP 1
 GO
 CCW
 1-00A000  63 000000 4000 0010 -
 2-00A008  43 000010 4000 0008 -
 F
```

4. Assign Alternate Block To Block 500 000

```
C000300000000000000000000883AF
0400000100037A120
```

```
DEV# 3E1
I/O# 388001-337000
CHAR# 60082102020000000003E000002E8000883800000000000000350000000000000
ENTER CCW LIST IN ENGLISH
 DX
 MASK BYTE# C4
 PHY.START#
 LOG.START#
 LOG. END #
 DC
 DATA# X0A0C0008000180000C2A00831
 DS
 DL# 5
 LP 1
 GC
START
01*LCOP IS FINISHED ON UNIT 03E1
HALT
 CCW
 1-00A000  63 000000 4000 0010 -          C4000000000300000000000000883AF
 2-00A008  F3 000010 4000 000C -          0A0C0008000180000C2A00831
 3-00A010  C4 00001C 2000 0005 -          6A82A0800C
 F
```

5. Read ID Alternate Block

```
DEV# 3E1
I/O# 388001-337000
CHAR# 60082102020000000003E000002E8000883800000000000000350000000000000
ENTER CCW LIST IN ENGLISH
 DX
 MASK BYTE# C4
 PHY.START#
 LOG.START#
 LOG. END #
 DC
 DATA# X040000080001800002A00831
 DS
 DL# 5
 LP 1
 GC
START
01*LCOP IS FINISHED ON UNIT 03E1
HALT
 CCW
 1-00A000  63 000000 4000 0010 -          C4000000000000030000000000000883AF
 2-00A008  F3 000010 4000 000C -          0400000800018000002A00831
 3-00A010  C4 00001C 2000 0005 -          0000000000
 F
```

6. Format ID Alternate Block

```
DEV# 3E1
I/O# 388001-337000
CHAR# 40082102020000000003E000002E800C983E0000000000090005D0000000000000
ENTER CCW LIST IN ENGLISH
 DX
 MASK BYTE# C4
 PHY.START#
 LOG.START#
 LOG. END #
 GC
 DATA# X04000008000100000 2A00037
 DS
 DL# 5
 LP 1
 GO
START
01*LOOP IS FINISHED ON UNIT 03E1
HALT
 CCW
 1-00A000  63 000000 4000 0010 -          C400000000000000000000000000883AF
 2-00A008  F3 000010 4000 000C -          0400000800100000 2A00037
 3-00A010  C4 00001C 2000 0005 -          0000000000
 F
```

7. Format ID Block 500 000

```
DEV# 3E1
I/O# 388001-337000
CHAR# 600821020200000003E0000026800000380000000000000500000000000000
ENTER CCW LIST IN ENGLISH
 $$SIV
GO                                        8. Write Scan
START
*UNIT#03E1 - I/O INTRPT,UNIT CHECK
CSW 10 00A018 0E 40 8800
SNS 1000000006 0800E0E03 0008000000 FF0A008000 C0001916
LOOP 00041
*UNIT#03E1 - I/O INTRPT,UNIT CHECK
CSW 10 00A018 0E 40 4800
SNS 1000000008 0800E0E03 0008000000 FF0A008000 C0001916
LOOP 00052
*UNIT#03E1 - I/O INTRPT,UNIT CHECK
CSW 10 00A018 0E 40 8600
SNS 1000000012 0800E0E03 0008000000 FF0A008000 C0001916
LOOP 01004
*UNIT#03E1 - I/O INTRPT,UNIT CHECK
EXI-INTRPT,PSW # 01 0C 0F00 00 004998/0040 E
CSW 10 00A018 0E 40 4E00
SNS 100000004C 0800E0E03 0008000000 FF0A008000 C0001916
LOOP 01034
EXI-INTRPT,PSW # 03 0E 0F00 00 00EA00/0340 E
EXT-INTRPT BRCKE CHAIN
 RST
DEV# 3E1
I/O# 388001-337000
CHAR# 600821020200000003E0000026800000380000000000000500000000000000
ENTER CCW LIST IN ENGLISH
 $$SII
GO                                        9. Read Scan
START
*UNIT#03E1 - I/O INTRPT,UNIT CHECK
CSW 10 00A018 0E 00 8800
SNS 1000000006 0800E0E03 0008000000 FF0A008000 C0001916
LOOP 00041
*UNIT#03E1 - I/O INTRPT,UNIT CHECK
CSW 10 00A018 0E 00 4800
SNS 1000000008 0800E0E03 0008000000 FF0A008000 C0001916
LOOP 00052
*UNIT#03E1 - I/O INTRPT,UNIT CHECK
CSW 10 00A018 0E 00 8600
SNS 1000000012 0800E0E03 0008000000 FF0A008000 C0001916
LOOP 00112
*UNIT#03E1 - I/O INTRPT,UNIT CHECK
CSW 10 00A018 0E 00 7400
SNS 1000000018 0800E0E03 0008000000 FF0A058000 C0001916
LOOP 00165
*UNIT#03E1 - I/O INTRPT,UNIT CHECK
CSW 10 00A018 0E 00 1A00
EXI-INTRPT,PSW # 01 0C 0F00 00 004998/0040 E
SNS 100000001C 0800E0E03 0008000000 FF0A008000 C0001916
LOOP 00174
*UNIT#03E1 - I/O INTRPT,UNIT CHECK
EXI-INTRPT,PSW # 01 0C 1F00 00 004998/0040 E
CSW 10 00A018 0E 00 8E00
EXT-INTRPT BRCKE CHAIN
 RST
```

GENERAL HINTS

For quick analysis you can use FASTCOPY printout with failing blockaddresses (HEX) for further alternate block assignment.

DOS/VSE stand–alone utilities supply SURFANAL, INITDISK, INITEM, FASTCOPY, and RESTORE functions.

If programs like EREP, UTILITIES etc. are missing as well as documentation this must be ordered by sales

If FSC 4945 on new HDA caused by incorrectly formatted data fields, run E - FRIEND **$$**51V followed by **$$**511.

After HDA replacement you should always perform an AIR MOVEMENT CHECK
Verify the air movement in HDA.
Refer to 3370 MLM volume R10 section INST - 12.
Flapper arm must be in raised position.

HDA PURGE CYCLE

HDA removal and replacement (READY 700)
When replacing a HDA after switching on the drive/fan motor ensure that the motor is running. Before removing the carriage rods (step 10) and reinstalling the connectors P170/P171 (step 12) allow the drive/fan motor to clean the air in the HDA for 1 minute.

DIAGNOSTIC COMMANDS
Ref.: IBM 3880 Storage Controll Discription GA 26-1661

HOW TO FIND THE BLOCKNUMBER:

A. From console msg.

(BLK = XXXXXX) given in hex, mutt be converted to decimal for ALTBLK

B. From format 4 or 5 sense bytes

- Take the physical CYL from sense bytes 3 + 4 and convert to decimal
- Go to OPER 53 and find the "Starting Blocknumber"
- Take the physical head- and blocknumber for sense bytes 5 + 6 and convert to decimal
- Go to OPER 36 and find the "Relative Block"
- Add "Relative Blocknumber" to "Starting Blocknumber" to get final failing blocknumber.

E. G.

CC HH B

Sense bytes 3 – 6 = 01 72 09 3

(370 x 744) =

- 01 72 = CYL 370 dec.
- Starting blocknumber on cylinder 370 = 275 280
- Head = 9
  physical block X'31' = 49 dec
- According to OPER 36 Head 9 and physical block 49 correspond to relative blocknumber 639
- Relative blocknumber 693
  Starting blocknumber + 275280
  Defective blocknumber = 275973

DISK UTILITIES DOS/VSE					
FUNCTION	DISK TYPE	ONLINE VSE R.1	ONLINE VSE R.2	ONLINE VSE R.3	STAND ALONE
BACKUP Disk to Tape PROGR.: 5745SCUTL	CKD	BACKUP	BACKUP	BACKUP	N/A
	FBA	BACKUP	BACKUP	BACKUP	N/A
RESTORE Tape to Disk PROGR.: 5745SCUTL	CKD	RESTORE	RESTORE	RESTORE	RESTORE
	FBA	RESTORE	RESTORE	RESTORE	RESTORE
FASTCOPY PROGR.: 5745SCUTL	CKD	FCOPY	N/A	N/A	FASTCOPY
	FBA	N/A	N/A	N/A	FASTCOPY
PROGR.: 5746-AM4 (LICENSED PROGR.)	CKD	FCOPY	FCOPY	FCOPY	N/A
	FBA	FCOPY	FCOPY	FCOPY	N/A
INIT DISK PROGR.: PROGR.: 5745SCUTL	CKD	INTDK	DSF-CMD: INIT 5745SCDSF	DSF-CMD: INIT 5745SCDSF	DSF-CMD: INIT 5745SCDSF
	FBA	INTDK	INTDK	INTDK	INITDISK
SURFACE ANALYSIS RD -Checks all rec./blocks - Lists error table and Sensebytes PROGR.:	CKD	AF-1	DSF-CMD: ANALYSE	DSF-CMD: ANALYSE	DSF-CMD: ANALYSE
	FBA	AF-1 5745SCAAC	DSF-CMD: ANALYSE 5745SCDSF	DSF-CMD: ANALYSE 5745SCDSF	DSF-CMD: ANALYSE 5747-DS7
SURFACE ANALYSIS RD/WR PROGR.: [illegible]	CKD	N/A	DSF-CMD: INSPECT	DSF-CMD: INSPECT	DSF-CMD: INSPECT
-RD/WR all records -Assign alternate track -Reclaims					
SURFACE ANALYSIS RD/WR PROGR.: 5745SCUTL	FBA	N/A	N/A	N/A	SURFANAL
-RD/WR all blocks -Assign alternate block -Reclaims					
ASSIGN SINGLE ALTERNATE TRACK/BLOCK	CKD	ALTDK	DSF-CMD: INSPECT	DSF-CMD: INSPECT	DSF-CMD: INSPECT
PROGR.: PROGR.: 5745SCUTL		5745SCUTL	5745SCDSF	5745SCDSF	5745SCDSF
	FBA	ALTBLK	ALTBLK	ALTBLK	N/A
CLEAR DISK Should always be used before HDA-replacement or discontinuance of equipment for return to IBM	CKD	CLRDK	CLRDK	CLRDK	DSF-CMD: INIT
PROGR.:		5745SCUTL	5745SCUTL	5745SCUTL	5745SCDSF
PROGR.: 5745SCUTL	FBA	INTDK	INTDK	INTDK	INITDISK

REFERENCES: VSE REL.1 UTILITIES SC33- 5381
VSE REL.2 UTILITIES SC33- 6305
DEVICE SUPPORT FACILITIES (DSF) SC33- 6033
ANALYSIS PROGRAM-1 (AF-1) SC26- 3851
FASTCOPY LICENCED PROGRAM (5746-AM4) SC33- 6382

N/A= Not applicable

DISK UTILITIES VM/370					
FUNCTION	DISK TYPE	VM PROGRAM 5749-010	VM SP PROGRAM 5664-167	VM BSEP PROGRAM 5748-XE8	VM SEP PROGRAM 5748-XE1
BACKUP disk to tape	CKD FBA	DUMP N/A	DUMP DUMP	DUMP DUMP	DUMP DUMP
RESTORE tape to disk	CKD FBA	RESTORE N/A	RESTORE RESTORE	RESTORE RESTORE	RESTORE RESTORE
COPY Copy data from one device to another device of the same or equivalent type Note: You cannot copy between FB-512 and CKD-devices	CKD FBA	COPY N/A	COPY COPY	COPY COPY	COPY COPY
INIT DISK PROG. INITASSI DOS/VSE USER MAY RUN INITDISK	CKD FBA	COMMAND: DADEF N/A N/A	COMMAND: DADEF N/A	COMMAND: DADEF N/A	COMMAND: DADEF N/A
SURFACE ANALYSIS RD	CKD FBA	DEF-CMD: ANALYSE N/A	DEF-CMD: ANALYSE DEF-CMD: ANALYSE	DEF-CMD: ANALYSE DEF-CMD: ANALYSE	DEF-CMD: ANALYSE DEF-CMD: ANALYSE
SURFACE ANALYSIS RD/WR	CKD	DEF-CMD: INSPECT	DEF-CMD: INSPECT	DEF-CMD: INSPECT	DEF-CMD: INSPECT
SURFACE ANALYSIS RD/WR DOS/VSE USER MAY RUN SURFANAL	FBA	N/A N/A	N/A	N/A	N/A
ASSIGN SINGLE ALTERNATE TRACK/BLOCK DOS/VSE USER MAY RUN ALTBLK	CKD FBA	COMMAND: GETALT N/A N/A	COMMAND: GETALT N/A	COMMAND: GETALT N/A	COMMAND: GETALT N/A
CLEAR DISK	CKD FBA	COMMAND: FORMAT N/A	COMMAND: FORMAT COMMAND: FORMAT	COMMAND: FORMAT COMMAND: FORMAT	COMMAND: FORMAT COMMAND: FORMAT

Reference: VM/370 OPERATORS GUIDE GC20-1804

NOTE: Newsletters to GC20-1804 are dependent on VM-SP's.

N/A= Not applicable

Code	Meaning and Comments	Most Probable Cause
122X	A servo off-track was detected during a rezero.	DRV E2,J2/G2,P2,PWR AMP ACC 110
124X	An overshoot was detected during a rezero.	same as 122X
128X	An access timeout occurred during a rezero.	same as 122X
131X	An invalid location was detected during a seek.	DRV J2/G2,D2,E2, Power Amp H4,H2
132X	A servo off-track was detected during a seek.	DRV E2,D2,J2/G2
134X	An overshoot was detected during a seek.	same as 132X
138X	An access timeout occurred during a seek.	same as 132X
141X	An invalid location was detected during the Servo settling time.	DRV J2/G2,E2,D2
142X	A servo off-track was detected during the servo settling time.	same as 141X
144X	An overshoot was detected during the servo settling time.	same as 141X
148X	An access timeout occurred during the Servo settling time.	DRV E2,J2/G2,D2,PWR Amp
151X	An invalid location was detected during a servo offset.	DRV E2,D2,J2/G2
152X	A servo off-track was detected during a servo offset.	same as 151X

IBM internal use only

SEE 3880 MSM SNS 13-14

0F00 READ ONLY MODE
0F01 INVALID COMMAND
0F02 INVAL. COMM. SEQ.
0F03 CCW CNT < THAN REQU.
0F04 INVALID ARGUM. IN CCW
0F05 DIAGN. CONTR COMND FAILED
0F06 CHNL DISCONTINUED RETRY
0F07 " RETRY CCW. INCORRECT
0F0C ALTERNATE SPACE EXHAUSTED
0F0D DATA OVERRUN

Code	Meaning and Comments	Most Probable Cause
154X	An overshoot was detected during a servo offset.	DRV E2, Pwr Amp, J2/G2
156X	An access timeout occurred during a servo offset.	same as 1480
161X	An invalid location was detected during track following.	same as 1480
162X	A servo off-track was detected during track following.	same as 1480
164X	An overshoot was detected during track following.	same as 1480
166X	An access timeout occurred during track following.	same as 1480
17XX	A false drive (Access) check occurred.	DRV E2,B2
18XX	A sector compare check occurred.	HDA ck out R/W 990, DRV C2,F2,D2
	Format 1 is indicated with intervention required.	
	No error conditions.	
	1. No microcontroller check.	
	2. No controller check.	
1910	3. No storage control microcode detected errors.	
	4. No device interface check.	
	(sense byte 11, Bit 1=1).	
	5. No device control interface check.	CTL E2/D2,K2 DRV C2,B2,G2/J2
	6. No drive (access) check.	Sec-DRV K2,H2,F2,E2,H4
		cables,Term,casters
	7. No read/write safety check.	

Code	Meaning and Comments	Most Probable Cause
1911	A transmit target error occurred.	DRV C2,E2,D2,B2
1913	A transmit difference high error occurred.	DRV D2,E2,B2,C2
1914	A sync out timing error occurred.	CTL H2,E2,D2,K2,SCU CTL-I
1915	Drive status during initial selection was not as expected.	Tag Drivers & Rec CTL E2,D2,H2,K2
1916	A transmit CAR error occurred.	DRV C2,E2,D2,B2
1917	A transmit head error occurred.	DRV F2,C2,E2,D2
1918	A transmit difference/offset error occurred.	DRV D2,E2,B2,C2
1919	Drive status during a read IPL or a retry was not as expected.	DRV E2,B2,C2,D2
191A	A seek verification check occurred.	DRV D2,62/J2,E2 (R/W110)
191B	A seek incomplete on read occurred.	same as 191A
191C	No interrupt was received from the drive.	DRV E2,C2 CTL K2
191D	No unrecovered microcontroller check occurred.	Look to other iface
191E	An unresolved ID miscompare error occurred.	CTL E2/D2
1A01	A transition detection check occurred.	DRV B2,K4,CTL K2 (R/W110)
1A02	An HDA read check occurred.	DRV B2,C2,K4,CTL K2 (R/W110)

Code	Meaning and Comments	Most Probable Cause
1A04	No select error occurred.	same as 1A02
1A0X	Any combination of the above 1A error series.	same as 1A02
1A81	A transition detection check occurred.	DRV B2,K4,CTL K2
1A82	An HDA read check occurred.	DRV B2,C2,K4,CTL K2, Sec DRV F2 HDA cables R/W110 HDA
1A84	A no select error occurred.	same as 1A82
1A8X	Any combination of the above 1A8 error series.	same as 1A82
1B01	A decode check occurred.	DRV B2,C2,F2,K4 CTRL H2, (R/W110) HDA – same as 1B01
1B02	An HDA write check occurred.	same as 1B01
1B04	A select error occurred.	DRV F2,B2,C2,E2
1B08	A control check occurred.	DRV B2,D2,J2/G2,HDA
1B10	An index check occurred.	DRV B2,C2,F2,H4,CTL K2 or HDA, most probable
1B20	A write overrun occurred.	DRV B2,E2,J2/G2,F2, CTL K2 (R/W110) OP Panel R/WSW R/W120,HDA
1B40	A capable/enable check occurred.	DRV B2,C2,K4, CTL K2, HDA (R/W110) same as (1B40)
1B80	A write mode check occurred.	DRV C2,D2,E2,B2,K2,H4
1BXX	Any combination of the above 1B error series.	
1CXX	A device interface bus in error occurred. One or more bits are active.	

Code	Meaning and Comments	Most Probable Cause
1EXX	A false drive (access) check occurred.	DRV E2,B2,C2,CTL K2
1FXX	A false read/write check occurred.	DRV B2,CTL K2
2020	A control interface check occurred (Format 2 FSC).	CTL E2/D2, DRV J2/G2 bus & tag cables, tailgate cables,
4940	An ID field data check occurred.	(CTL R 10&20) DRV&CTL voltages, DRV mtr brake, HDA,
4941	A data field ECC uncorrectable read error occurred.	SEC DRV K4,C3,D2,F2, J2/G2,H4,B2,K2, HDA Cables
4944	An ID field no sync byte found occurred.	same as 4940
4945	A data field no sync byte found occurred.	same as 4940
4949	A data field ECC uncorrectable error occurred during a Check Data operation.	same as 4940
494D	A data field no sync byte found error occurred during a Check Data operation.	same as 4940
9001	Tag valid was missing on Read/Write operation.	DRV F2,C2,H4, CTL K2, (DEV110)
9002	No Normal End or Check End was received after a read or write.	DRV C2,F2,CTL K2,G2

5X5X FSC 21E 3370-MSG 32.

Code	Meaning and Comments	Most Probable Cause
9408	A device bus in parity check occurred.	CTRL K2, DRV 82 (in any module) Term DEV110
940X	Any combination at the above 940 error series. Bit 5 indicates which interface failed.	CTRL K2, MIM Start 990
9502	A transfer check (Program Error) occurred on interface A.	CTRL E2,H2,G2 MIM Start 990
9506	A transfer check (Program Error)occurred on interface B.	CTRL D2,H2,G2 MIM Start 990
951X	A buffer or control register 16/17 parity check occurred.	CTRL H2,E2,D2,G2 MIM Start 990
952X	An any device register parity check occurred.	CTL K2,G2
968X	A control register 3/4/5 parity check occurred.	CTL H2,G2
96XX	Any combination of the above 96 error series.	same as 968X
9710	A VFO not sync error occurred.	CTL H2,DRV B2,C2,H4, (K4 any module) Cables (DEV110) M4 Term
971X	A VFO not sync occurred (will not occur by itself).	CTL H2,E2/D2,K2
9720	An ECC hardware check occurred.	CTL J2/H2
972X	An ECC hardware check occurred.	same as 9720
9740	A counter parity check occurred.	CTL K2,H2
974X	A counter parity check occurred.	same as 9740

Code	Meaning and Comments	Most Probable Cause
9780	A SERDES data funnel parity check occurred.	CTL H2,J2,E2/D2
978X	A SERDES data funnel parity check occurred.	same as 9780
97X1	A sync out timing error occurred.	CTL H2,E2/D2,K2 SCU
97X2	A write data check occurred.	CTL H2,J2
97X4	A SERDES data parity check occurred.	same as 97X2
97X8	A SERDES error occurred.	CTL H2,DRV B2,C2,H4, DRV (K4 any module) DEV110), M4 Term
97XX	Any combination of the above 97 error series.	same 97X8
98XX	A device selection error occurred.	DRV K2, CTL K2, MIM (Dev 110), M4 Term
9901	A branch to an unused storage location occurred.	CTL G2,F2
9910	An execute instruction was returned to the program counter+1 on TRAP 2.	same as 9901
9911	TRAP 6 was entered, but no errors were found.	CTL G2,F2,H2,J2,K2,G2/02
9912	An execute instruction returned to program +1 on TRAP 3.	same as 9901
9913	An execute instruction returned to program control +1 on TRAP 4.	same as 9901
9914	An unexpected counter trap occurred.	CTL K2,G2,F2
9916	Tag execution took too long, microcode hang condition occurred.	same as 9901

Code	Meaning and Comments	Most Probable Cause
9918	Sync out timing error occurred while not in data transfer mode.	CTL H2,G2,F2
9919	An executive instruction was returned to the program counter +1 on bus out decode of Tag 09.	same as 9901
9920	An execute instruction failed on select device tag processing.	same as 9901
9921	The register immediate command failed in the ECC routine.	CTL G2,F2,J2 crossovers
9924	Device response was active with all the select lines not active.	DRV K2, CTL K2, Cables (DEV110) (N3, M4 Term)
9928	Two select device tags occurred with no deselection.	CTL D2/E2,H2,G2,F2
9932	The device did not return tag valid to set read/write tag.	DRV F2,C2,H4 CTL K2, (R/W110, DEV110)
9933	Tag valid dropped during a Read/Write operation.	DRV K4,K2,B2, CTL K2 (R/W 110, DEV 110)
9934	The device counter failed during execution of transmit ID tag.	CTL K2,G2,F2
9936	Transmit ID timed out while waiting for sync out.	CTL E2/D2, H2,K2 DRV C2,F2
9937	Did not get a sync out timing error for second sync in or out pair during calculation of sync in lead time.	CTL H2,E2/D2

Code	Meaning and Comments	Most Probable Cause
9938	A second sync out was returned during either bit ring 0 or 7.	same as 9937
9942	A read tag was received, but it was not a read ID or a read ID buffer.	CTL E2/D2,H2,G2,F2
9946	The data check indicator was not reset after executing an ECC preset.	CTL J2,K2
9947	The data check indicator was not set after an ECC read transfer.	same as 9946
994A	The tag gate did not drop soon enough to allow the data field transfer to begin.	CTL E2/D2 SCU
9950	The first read or write tag was not preceeded by transmit ID or by clock ID.	CTL E2/D2, H2,G2,F2
9952	The next read or write tag was not preceeded by transmit ID or by clock ID.	same as 9950
995B	Sync in selection was not calculated for write data.	CTL H2,G2,F2
995C	Sync in lead time was not calculated for write data.	same as 995B
995D	Sync in lead time was not calculated for oriented transmit ID.	not valid for 3370

Code	Meaning and Comments	Most Probable Cause
9962	The ECC signaled data checks, but all nine bytes were zero.	CTL J2,K2
9972	A write ID was entered before executing prerequisite functions.	same as 9928
9974	A write ID was entered before executing a valid verify ID.	same as 9928
9975	A tag overrun occurred on a Write ID operation.	same as 9928
9980	A set level command did not change the program counter.	CTL K2,G2,F2
9982	No sync out latches were set after a sync out was detected in a Transmit ID operation.	CTL H2,G2,F2
99F4	The ECC indicated a miscompare, but the displacement was zero.	CTL J2,K2
99F5	An ID compare on a move ID operation was detected.	CTL E2/D2,H2,G2,F2
99F6	A sync in selection was not calculated for a Read ID operation.	CTL H2,G2,F2
99F7	A sync in lead time was not calculated for Read ID operation.	same as 99F6
99F8	The clock ID was not followed by read data.	same as (99F5)

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