1.4 DISK DRIVES

"A" enclosures will always house a minimum of two
drives, one removable cartridge drive and one
Winchester drive. "B" enclosures will house between 0
and four Winchester drives.

"A" ENCLOSURE (REAR VIEW)

     D0   D1

     D3   D2

FIRST "B" ENCLOSURE WITH AN FP (REAR VIEW)

     D4   D5

     D7   D6

Even if there are drives missing in the "A" enclosure,
the first drive in the next "B" enclosure will be D4.

* DRIVE CABLING

The disk drives are connected to the FP board by a
daisy chained control cable and four data cables, one
for each drive The plugs on the FP board are clearly
marked to indicate which data cable should be
connected.

* DRIVE STRAPPING

ALL drives are strapped with ALL drive selections
jumpered. The selection takes place in the cable. This
allows any Winchester drive to be moved to any other
slot without changing the jumpers.

* DRIVE TERMINATION

In the "A" enclosure, the termination pack should be
present on D1, the first Winchester drive after the
Syquest and absent from all the other drives in that
cabinet. In a "B" enclosure, the termination pack will
always be on D(nX4), e.g. D4, D8, etc. and absent from
all other drives.

The Maxtor XT-1000 Family

Recording Media
- Metallic film plated on a 130 mm diameter aluminum substrate.
- 9.57 megabytes of data per disk surface.
- 918 tracks per disk surface.

Read/Write Heads
- Whitney type (IBM 3380) ferrite heads.
- Low mass/low load force.
- Reliable contact start/stop.
- Dedicated landing/shipping zone at power off.

Air Filtration System
- Disks, heads and actuator fully sealed in clean air chamber.
- Recirculation air system with absolute filter.
- Absolute breather air filter permits pressure equalization with ambient air without contamination.

Rotary Voice Coil Actuator
- Highly efficient rotary voice coil actuator allows for low power consumption.

- Average access time several times faster than stepper motor drives.
- Simple, reliable construction:
  - —Two-bearing structures
  - —Low-cost magnet assembly
  - —Highly efficient coil configuration
- Pre-programmed acceleration profile allows high performance for all length seeks.
- Statically balanced structure for high mechanical stability and maximum vibration resistance.
- Fully-automatic, positive actuator latch.

Closed Loop Track Following Servo System
- Provides precise thermal compensation and "on-track" stability.
- "Index" and "Track Zero" indicators recorded on the servo track eliminate the need for transducers and their adjustments.
- New high-volume servo track-writing techniques maximize manufacturability and repeatability.

Automatic Actuator Lock
Rotary Voice Coil Actuator
Arm
Head
Spindle/Motor
5¼-inch disk
Air filter
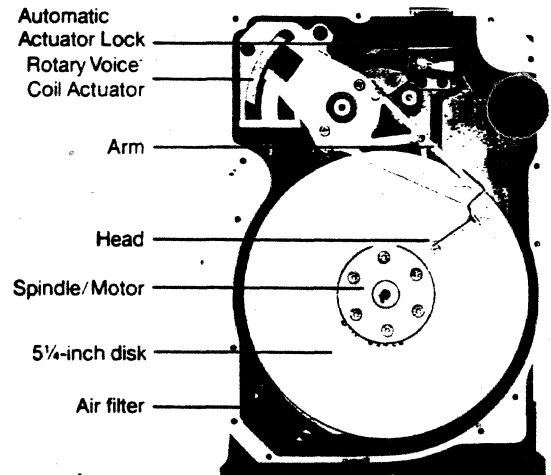
SPECIFICATIONS

Performance Specifications

Capacity, unformatted	XT-1065	XT-1105	XT-1140
Per drive (MB)	66.99	105.27	143.55
Per Surface (MB)	9.57	9.57	9.57
Per Track (Bytes)	10,416	10,416	10,416
Capacity, formatted**			
Per drive (MB)	52.6	82.7	112.8
Per surface (MB)	7.5	7.5	7.5
Per track (Bytes)	8192	8192	8192
Per sector (Bytes)	256	256	256
Sectors/track	32	32	32
Transfer rate, Mbits/sec		5.0	
Access Time, msec			
Average*		30	
Track-to-track*		5	
Maximum*		48	

Functional Specifications

	XT-1065	XT-1105	XT-1140
Rotational Speed (rpm)		3600	
Average latency (ms)		8.33	
Recording density (bpi)		9875	
Flux density (fci)		9875	
Track density (tpi)		980	
Cylinders		918	
Tracks	6426	10,098	13,770
Sectors**	205,632	323,136	440,640
Data heads	7	11	15
Servo heads	1	1	1
Disks	4	6	8

*Includes settling   **Formatted with ST506/412 compatible format (32 sectors/track)

Physical Specifications
Environmental limits (operating)
 Ambient temperature = 40° to 122° F (4° to 50° C)
 Relative humidity = 8% to 95% non-condensing
 Maximum wet bulb = 78.8° F (26° C)
DC voltage requirements
 +12 VDC ± 5% 1.4A typical, 4.5A maximum (at power-on)
 +5 VDC ± 5% 1.7A typical, 1.9A maximum
Mechanical dimensions
 Height = 3.25 in. (82.55 mm)
 Width = 5.75 in. (146.05 mm)
 Depth = 8.00 in. (203.20 mm)
 Weight = 6.3 lbs. (2.8 Kg)
Heat dissipation = 25 watts typical, 28 watts maximum

Reliability Specifications
MTBF: 11,000 POH, typical usage
PM: not required
MTTR: 30 minutes
Component design life: 5 years
Error Rates:
 Soft read errors: 1 per 10^{10} bits read
 Hard read errors: 1 per 10^{12} bits read
 Seek errors: 1 per 10^{6} seeks

1.19

*XT-1000, MAXTORQ and MAXPAK are trademarks of Maxtor Corporation.

DISK MODULE POWER SUPPLY

The disk module power supply receives 115 VAC from the main power
supply, even if the main power supply is connected to a 230 VAC
source.

AC INPUTS ON CONNECTOR J1

PIN	VOLTAGE
1	CHASSIS GROUND
2	AC LINE 47 - 63 Hz at 85 - 130 VAC
3	AC NEUTRAL

VOLTAGE	TOLERANCE	RIPPLE	IMIN	IMAX
+5VDC	4.75 - 5.25	50MV	.5ADC	2ADC
+12VDC	11.4 - 12.6	50MV	.5ADC	5ADC

TEST POINTS ON J2

PIN	VOLTAGE
1	+12V
2	+12V (RETURN)
3	+5V (RETURN)
4	+5V

MODULE II

SOFTWARE OVERVIEW

2.1 Overview

2.2 Bootstrapping

2.3 Initialization

2.4 Running

OBJECTIVE:

Upon completion of this topic, the student will be able
to describe the operating systems useed with the
Megaframe and the three classes of board operation.

TRAINING MATERIALS:

Student Handbook

Megaframe System

2.1 OVERVIEW

The Megaframe is capable of running multiple operating systems at the same time. The various 80186 based boards each boot and run special versions of CTOS and the Applications Processor boots and runs CTIX.

CTIX communicates with disks and peripherals by sending request messages to the appropriate CTOS board.

With CTIX and CTOS both installed, the Megaframe can communicate with workstations as well as CTIX terminals. A user at a CTIX terminal can also access some commands and all files available to CTOS users at workstations. CTOS users do not have direct access to CTIX files and cannot execute any CTIX commands.

2.2 BOOTSTRAPPING

* Master FP board boots from first disk containing a system image. The file containing the OS is <sys>sysimage.sys and can be on any disk drive.

* 80186 boards bootstrap a file specified in the <sys>master.cnf file which is the file used by all boards in the system.

* AP's boot the file specified in master.cnf and boots last.

* LEDs on processor boards shift circularly when a board is waiting to bootstrap. (walking the dog)

* The master FP reads a location in each processor's memory to determine which type of board it is and whether it requires bootstrap service.

2.3 INITIALIZATION

* Subsequent to bootstrapping, each board runs an initialization program. If this program detects any hardware failures, entries will be made in the system error log.

* When CTOS is loaded and initialized, a 20 will be displayed on the front panel.

* If an AP is present and configured in master.cnf, the display will indicate an 11 and will progress toward 20.

* If the AP board does not initialize, a 15 will be left in the display. This is generally caused by an incorrect configuration file.

* If the AP initializes properly, a 20 will be displayed.

2.4 RUNNING

* When the system is running, display = 20.

* Bottom LED on processor boards blink about once per second when the board is running.

III   MEGAFRAME HARDWARE INSTALLATION MODULE

3.1 Overview

3.2 "A" Enclosure Installation

3.3 "B" Enclosure Installation

OBJECTIVE

       Upon completion of this topic, the student will be able
       to install a Megaframe system.

TRAINING MATERIALS

       Megaframe Installation Manual

       Visuals

       Megaframe System

3.1 OVERVIEW

Megaframe systems always consist of one "A" enclosure and zero to five "B" enclosures. "A" enclosures differ from "B" enclosures in that they have an operator's panel and one Syquest removable disk drive; the "B" enclosures have neither.

Enclosures are added by extending the system bus via bus repeater boards and flexible cables. The connection is made inside the Megaframe plastic housing. The enclosures are bolted together side by side. The Megaframe system grows from left to right and the "A" enclosure is always at the extreme left.

3.2 "A" ENCLOSURE INSTALLATION

* Unpack system (page 2-1 Megaframe installation Manual).

* Check for any physical damage.

* Check Syquest drive for any shipping inserts.

* Check receptacle for proper wiring.

* Ensure power switch is in the off position.

* Plug in power cord.

* Turn on power switch.

* Boot system and check for a 20 on front panel.

* Turn off power.

* Attach peripheral cables and route them beneath cable guide.

* Cable guide is secured by two knurled screws.

3.3 "B" ENCLOSURE INSTALLATION

* Unpack system. (page 6-1 of Megaframe Installation manual)

* Install bus repeater board in leftmost (looking from the back) slot of "A" cabinet. File processor must be removed to gain access to slot.

* Remove the right side panel from the "A" enclosure and install it on the right side of the "B" enclosure.

* Attach the "B" enclosure to the right side of the "A" enclosure, using the hardware provided.

* Install the two flexprint cables between the bus repeaters in the "A" enclosure and the "B" enclosure.

* Check receptacle for proper wiring

* Energize system.

MODULE 4

CONFIGURATION FILES

4.1 OVERVIEW

4.2 MASTER CONFIGURATION FILE

4.3 BOARD CONFIGURATION FILES

4.4 DISK CONFIGURATION FILES

4.5 PROCESSOR BOARD JOB FILES

OBJECTIVE

Upon completion of this topic, the participant will be able to modify configuration files to support a requested system configuration.

TRAINING MATERIALS

Student Handbook

Visuals

Megaframe system

4.1 Master Configuration file

* This file is [sys]<sys>Master.cnf .

* Read by the master FP to determine which OS a requesting board should be bootstrapped with.

* Indicates which hardware configuration file the various processor boards should use.

* If this file is modified, the system must be re-booted before it will actually affect system operation.

See sample on the next page.

```
NoWatchDog
AP          [sys]<sys>Unix.sys
CP          [sys]<sys>CpCtos.sys
Include     [sys]<sys>Cp00.cnf
CP          [sys]<sys>CpCtos.sys
Include     [sys]<sys>Cp01.cnf
TP          [sys]<sys>TpCtos.sys
Include     [sys]<sys>Tp00.cnf
DP          [sys]<sys>DpCtos.sys
Include     [sys]<sys>Dp00.cnf
```

* The file shown above is for a system with 1 FP, 1 AP,
  2 CPs, 1 TP, and a DP.

* NoWatchdog indicates that the watchdog process is not
  to be installed and executed on the master FP.

* Each processor board in the system, except the master
  FP, must have an entry if it is going to be used.

* The "include" line indicates which file a specific
  board will read for configuration information.

* When there are multiple occurrences of the same
  processor type in a system, there must be an entry
  for each occurence.

* Processor boards will receive boot service in the
  order that they occur in master.cnf.

* The lowest numbered RS-232 channel on the first CP or
  TP on the master.cnf must be connected to the CTIX
  console.

* This file has a tendency to be case sensitive. Match
  up the OS name (CpCtos.sys for example) with the
  actual file name. Use the FILES command- with the
  parameter for filename(s) being ??????.sys - this
  will give you the actual file name.

* With 3.0 Megaframe CTOS and higher, you can have
  three different versions of Master.cnf depending on
  which position your keyswitch was in when you
  bootstrapped. If your key was in the manual position,
  your FP will look at Master.cnf.M first. If that file
  does not exist, then it will look at plain old
  Master.cnf. The same goes for the other two key
  positions- Master.cnf.R for REMOTE and MASTER.CNF.M
  for MANUAL   4.3

4.2 BOARD CONFIGURATION FILES

* The file names listed alongside the INCLUDE statement
  in the Master.cnf file are of specific formats and
  must be editted to indicate the operating parameters
  used by that board's hardware.

* The AP does not use a configuration file because it
  doesn't communicate directly with any I/O channels.

SAMPLE CP BOARD CONFIGURATION FILE

```
async 1, speed=9600 , parity=none , stopbits=1 , charbits=8
async 2, speed=9600 , parity=none , stopbits=1 , charbits=8
async 3, speed=9600 , parity=none , stopbits=1 , charbits=8
PT=2
line 1,clock=307k
line 2,clock=2M
```

* This file is pointed to by Master.cnf.

* The three RS-232C channel parameters are defined by
  the first three lines.

* The first two lines can be made synchronous by
  deleting the complete line.

* Async line 3 must never be deleted.

* The fourth line indicates that a total of two PT
  terminals will be connected to the cluster ports.
  This information will be used by CTIX to assign TTY
  numbers.

* The last two lines define the cluster baud rates.

* Ngen workstations are the only type of workstation
  that can be connected to a 2M cluster line.

SAMPLE FILE PROCESSOR CONFIGURATION FILE

```
DISK Ø     DEVICE=dØ,  PASSWORD=dØ
DISK 1     DEVICE=d1,  PASSWORD=d1
DISK 2     DEVICE=d2,  PASSWORD=d2
DISK 3     DEVICE=d3,  PASSWORD=d3
```

* Example given would be used for FPØØ.

* Generally, the FP configuration file does not need to
  be changed.

SAMPLE DP CONFIGURATION FILE

```
DISK Ø     DEVICE=sØ,  PASSWORD=sØ
DISK 1     DEVICE=s1,  PASSWORD=s1
DISK 2     DEVICE=s2,  PASSWORD=s2
DISK 3     DEVICE=s3,  PASSWORD=s3
```

* Pointed to by Master.cnf

* Supplies device names and passwords for 4 SMD drives.

SAMPLE TP BOARD CONFIGURATION FILE

```
async 1,  speed=9600 , parity=none , stopbits=1 , charbits=8
async 2,  speed=9600 , parity=none , stopbits=1 , charbits=8
async 3,  speed=9600 , parity=none , stopbits=1 , charbits=8
async 4,  speed=9600 , parity=none , stopbits=1 , charbits=8
async 5,  speed=9600 , parity=none , stopbits=1 , charbits=8
async 6,  speed=9600 , parity=none , stopbits=1 , charbits=8
async 7,  speed=9600 , parity=none , stopbits=1 , charbits=8
async 8,  speed=9600 , parity=none , stopbits=1 , charbits=8
async 9,  speed=9600 , parity=none , stopbits=1 , charbits=8
async 10, speed=9600 , parity=none , stopbits=1 , charbits=8
                      connect=ctos
```

* Pointed to by Master.cnf

* Defines the operation of the 10 RS-232C channels

* Connect=ctos indicates that the CTOS debugger can be
  used on async channel 10.

4.4 DISK CONFIGURATION FILES

OVERVIEW

Due to the numerous disk drives presently available and those just over the horizon, the Megaframe software allows drives with varying head/cylinder organizations to be used with the FP board.

Each drive has to have a configuration file so that the MIVOLUME program will know how to format it. After the drive is formatted, the head/cylinder information is written into the VOLUME HOME BLOCK (Track 0, Head 0, Sector0) so that any time the system is shut down and turned back on, the software can read the VHB and adjust its device dependant routines to properly utilize the disk drive.

Drive Configuration Files

* A drive configuration file must exist for each different type of drive in the system.

* The files are found on the sytem disk.

* Files contain information about the media organization and the rate at which the drive can step.

* Information in the files will be used by the MIVOLUME command when formatting the disk (Device type).

* The information in the files will be written into the Volume Home Block when the MIVOLUME writes the volume control structures on the disk.

SAMPLE DRIVE CONFIGURATION FILE

```
;THIS IS FOR AN ATASI DRIVE
CYLINDERS=645
TRACKS=7
SECTORS=16
BYTES=512
STEP=0
SEEK=100
SETTLE=100
REMOVABLE=no
```

* The file above is named [sys]<sys>IVAtasi46.cnf .

* Tracks means heads.

* Seek time is a maximum measured in tenths of a millisecond.

* Settle time is a maximum measured in tenths of a
  millisecond.

* Step rate of Ø = maximum rate of 2Ø microseconds.

   STEP RATE TABLE

Ø = 2Ø MICROSECONDS
1 = .5 MILLISECONDS
2 = 1.Ø MILLISECONDS
3 = 1.5 MILLISECONDS
4 = 2.Ø MILLISECONDS
5 = 2.5 MILLISECONDS
6 = 3.Ø MILLISECONDS
7 = 3.5 MILLISECONDS
8 = 4.Ø MILLISECONDS
9 = 4.5 MILLISECONDS
1Ø= 5.Ø MILLISECONDS
11= 5.5 MILLISECONDS
12= 6.Ø MILLISECONDS
13= 6.5 MILLISECONDS
14= 7.Ø MILLISECONDS
15= 7.5 MILLISECONDS

NOTE: All drives used with the Megaframe use a step rate code of
zero because the drives are intelligent enough to buffer the step
pulses issued by the controller.

4.4 PROCESSOR BOARD INITIALIZATION FILES

OVERVIEW

After a board bootstraps its operating system, it then executes
the job list in its JCL (Job Control Language) file. Each board
has its own JCL file which is executed only once.

* JCL FILE NAMING CONVENTION

    [sys]<sys>initBTxx.jcl

    BT = Board type

    xx= Board sequence number

    EXAMPLES:

    First FP executes [sys]<sys>initfp00.jcl

    Second CP executes [sys]<sys>initcp01.jcl

* JCL FILE SYNTAX

    $run runfilename,parameter1,parameter2,...parameterN

    Sample Entry:

    $run [sys]<sys>mtapeserver.run,8,10

* JCL FILE APPLICATIONS

    If the system administrator wanted the queue manager
to be automatically installed on FP00 and the spooler to be
installed on CP00, the JCL files for those two boards would be
edited to appear as follows:

    File name: [sys]<sys>initfp00.jcl

    Contents:

    $run [sys]<sys>minstallqmgr.run

    File name: [sys]<sys>initcp00.jcl

    Contents:

    $run [sys]<sys>mspoolermgr.run

    With the JCL files shown above, the FP would install
the queue manager immediately after bootstrapping and the CP
would install the spooler after booting.

* MEGAFRAME ADMINISTRATOR AGENT

    A common use of a JCL file would be to install the
Megaframe administrator agent on a board. The administrator agent
allows the megaframe to execute 'M' commands which are usually
executed to perform system administrator functions (tape backup
for example). When an M command is issued the corresponding run
file will execute on the board that is running the administrator
agent. Only one workstation can execute M commands at a time.

    File name: [sys]<sys>initfp00.jcl

    Contents:

    $run [sys]<sys>MfAdminAgent.run

    NOTE: If the entry shown above is placed in a JCL file,
          it must be the **LAST** entry in that file.

4.10

5.1 QUEUE.INDEX

5.2 SPOOLER CONFIGURATION FILES

5.3 PRINTER CONFIGURATION FILES

5.4 SYS.PRINTERS- THE UTILITY PROGRAM MENU FILE

6.1 X, Y, AND Z BLOCK ALLOCATION

7.1 TEMPORARY DIRECTORIES - <$>

8.1 OPERATING SYSTEM SYSGENS

MODULE 9

ERROR CODE INTERPRETATION MODULE

9.1 ERROR CODE LEVELS

9.2 BOOTSTRAP ERRORS

9.3 INITIALIZATION ERRORS

9.4 CRASH STATUS ERRORS

9.5 STATUS CODES

OBJECTIVE

Upon completion of this topic, the student will·be able to
interpret error codes reported by the boot roms, CTOS
initialization procedures, CTOS device managers, and the CTOS
crash routine.

TRAINING MATERIALS

        STUDENT HANDBOOK

        MEGAFRAME SYSTEM

OVERVIEW

Error codes reported by the Megaframe are often helpful
when isolating a hardware problem. Error codes and messages can
come from various sources; so there are different error code
listings for each of the sources of error codes. The discussion
that follows intends to explain the various sources of error
codes and which error code listing to use when interpreting the
error code.

9.1 ERROR CODE LEVELS

BOOT - Bootstrap errors are errors by tests burnt into
a bootstrap rom. The error code is displayed in hex on the board-
edge LEDs.

INITIALIZATION- These errors are reported by the CTOS
initialization routines and are recorded in plain English on the
system log. *use mplay*

CRASH ERRORS- These are serious errors detected by CTOS
interrupt handlers and are recorded in the system log. Crashes
cause an auto re-boot to occur if the keyswitch is in normal.

STATUS ERRORS- These errors are not as severe as crash
errors. CTOS logs status errors related to possible hardware
malfunctions.

If a board, other than the FP, does not progress to the point where it is "walking the dog" (rotating leds), the board will display a !!! *** BOOTSTRAP *** !!! error code on its board edge L.E.D 's.

The designated file processor is a special case in that it never "walks the dog". If the file processor never reaches a value of 7 in the front panel it has found a bootstrap error and this error can be read on the board edge L.E.D's.

The designated FP also reports status codes on the front panel. These codes can be interpreted by using the FRONT PANEL SYSTEM STATUS AND ERROR CODES list on the pages that follow.

Once it has been determined that a board is reporting a boot error, the next step is to read the board edge lamps. The 8 board edge lamps form a 2 digit hexi-decimal number that corresponds to an error code explanation in the bootstrap error code listings.

The top lamp represents bit 2 (7) and the bottom lamp represents bit 2 (0).

             EXAMPLE OF BOOT ERROR ON AN 80186 BASED BOARD

                  Top lamp Off = 0
                           Off = 0   = 0
                           Off = 0
                           Off = 0

                           On = 1
                           Off = 0
                           On = 1   = B
               Bottom lamp On = 1 .

        Error Code = 0B   Meaning - Bad I/O ports

·2

INITIALIZATION ERRORS

When the operating system loads into a board, certain
initialiation routines are run. The routines initialize and
test, if possible and applicable, the following:

1. Memory above the operating system
2. Interrupt controller(s)
3. Timers
4. The boards ability to detect a bus time-out
5. The boards ability to detect a parity error
6. Communications controllers

If any of these routines detect an error, the error will be
logged and the operating system will not be executed on that
board. Initialization errors are logged in plain English.
Use the MPLOG command to check for initialization errors.

3

Certain hideous hardware errors can be detected by CTOS and are
reported as crash status errors. These errors are recorded in
the system log and can be viewed by using the MPLOG command. If
a crash occurs, the bottom led on the board will stop blinking.
If the WATCHDOG process is enabled and the key switch is in
normal, the system will automatically reboot. Rebooting can be
inhibited by placing the key switch in the manual position; this
action can be useful when isolating a failing board.

Crash Errors

ERC 21 - Non-existent memory location.

        A processor board tried to write its own memory
        via the system bus.

ERC 22 - Bus time-out.

        A processor board attempted to make a transfer
        involving a non-existent memory location or I/O
        port. (software problem)

        A processor board attempted to make a transfer to
        an existing I/O port or memory location but an
        acknowledge was not received due to a circuitry
        failure. (hardware problem)

ERC 23 - An uncorrectable memory error has occurred.

ERC 24 - Power failed and returned in time to log it.

ERC 25 - A non-maskable interrupt was received but the
        value in the NMI status register does not indicate
        that any of the NMI conditions occurred.

ERC 26 - A maskable interrupt was received but the vector
        sent by the interrupt controller is illegal.

        The 80186 microprocessor fetched an illegal
        instruction.

ERC 27 - Divide overflow. A number was divided by zero.

ERC 28 - Double bit error occurred when a transfer involving
        another boards memory was taking place. The double
        bit error was in the other boards memory.

4

When ERC 21 - 28 occur, the error log entry also contains (8) hex words that further describe the error.

Field 1 - Hex equivalent of the decimal ERC.

Field 2 - Process number of the process that was running when the error occurred. This information is of little use when a hardware error has occurred.

Field 3 - Contents of the General Status Register. This register is loaded when a non-maskable interrupt occurs. The contents of this register can be decoded to determine specifics about the crash status that was reported. The bits in the General Status Register are described below.

Field 4 - Contents of the memory location that was read when a double bit error occured.

Field 5 - Contents of the remote slot register.

Field 6 - Contents of base register 0. Base register 0 holds bits 16 - 31 of the off-board memory address. In the case of ERC 23, this field contains the contents of the ECC syndrome register.

Field 7 - Contents of the CS register following the execution of the instruction that caused the crash.

Field 8 - Contents of the IP register following the execution of the instruction that caused the crash.

5

GENERAL STATUS REGISTER

This register's contents are reported in field 3 of the crash status codes.

BIT		MEANING
15	ME	0 = Memory exansion is installed.
14	SE	0 = At least one board in the system is driving the system error line on the system bus.
13	LR	0 = Last reset by power up or reset switch.
		1 = Last reset by software.
12	NEM	0 = If NMI was caused by a reference to a non-existence memory location. The reference could have been initiated locally or by a processor or DMA controller on another board.

11	PF	0 = Powerfail.
10	TO	0 = Bus time out. No acknowledge was received from a memory or I/O timing circuit.
9	BE	0 = Bus error. A remote double bit error or or a nonexistent memory location.
8	DBE	0 = Double bit error.

7	REM	0 = The trapped address was generated by another board.
6	CAD	0 = The trapped address was generated by the CPU.
5	DMA	0 = The trapped address was generated by the local DMA controller.
4	DFP	1 = This board is the designated file processor.

3	REM	1 = Panel switch is in remote. Only applicable on the designated FP.
2	NOR	1 = Panel switch is in normal. Only applicable on the designated FP.
1	A19	Bit 19 of the trapped address.
0	A18	Bit 18 of the trapped address.

A19	A18	
0	0	Base Memory
0	1	Expansion Memory
1	0	Expansion Memory
1	1	Memory on another Processor Board

6

9.7

SAMPLE CRASH STATUS IN SYSTEM LOG

ERC 22   Bus time-out   CP in slot 74

```
                (1)    (2)    (3)    (4)    (5)    (6)    (7)    (8)
Status words   0016H  0008H  DBA3H  0000H  0075H  0000H  0301H  0009H
```

(1) 16 hexidecimal = 22 decimal.

(2) Failure occurred in process 8.

(3) Bit 10 - Time out.
    Bit 6 - Cpu address.
    Bit 1,0 - Address greater than or equal to C0000h.

(4) Only applies to ERC 23.

(5) Board in slot 75 was being referenced.

(6) Memory lower than address FFFFh (64K) was being
    referenced.

(7)/(8) Instruction proceeding the instruction at
        address 03010:0009 was being executed when
        the time-out occurred.

POSSIBLE CAUSES:

    1. Board in slot 75

    2. Board in slot 74

    3. Programming error

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STATUS CODES

Errors reported on the screen and the system log other than crash errors are simply referred to as status codes. Status codes can be caused by either hardware or software problems. To decipher an error code found in the system error log or reported on the screen, use the status code listing provided in this manual.

Status errors in the 3xx range apply to disk. These errors have plain english descriptions and often status and command bytes. The interpretation of these bytes exceeds the scope of this level of service training. If one were to interpret the bytes by using the various IC data sheets required, it would soon be realized that you have not gained any more insight than was given in the plain english description of the error.

Error codes in the range of 8xxxx relate to problems with cluster communications. These errors messages are also accompanied by status bytes and a plain english description of the error. The status bytes are read from the internal registers of the 2652 communications controller.

ERC 301 IS A DISK READ ERROR. THIS ERROR CAN CAUSE A CRASH IF IT IT IS IN A RUN FILE.

STATUS CODES IN LEDS

If a board crashes, the switch is in manual, and the watchdog process is activated; the 80186 board LEDS will indicate a status code. This code can not alway be trusted because the lamps are not capable of indicating a code greater than 255. The information in the lamps can be useful at times, some common errors to look for in the lamps are:

```
301 decimal -- 2D hex   - Disk I/O error
203 decimal -- CB hex   - No Such File
```

Error 203 is most commonly encountered when there is an error in a JCL or .cnf file. Other missing files can also cause this error to be reported and consequently a system crash.

8

OBJECTIVE

Upon completion of this module, the participant will be able to
isolate and repair MegaFrame and programmable terminals at the
board level.

OVERVIEW

The MegaFrame has built in software features and indicators which
will assist the troubleshooter in locating the failing logic
board, disk drive, or power supply. Familiarity with software
operation and configurabitily will facilitate expedient isolation
of problems.

SOFTWARE CONFIGURATION PROBLEMS

Due to the numerous software configuration files used by the
MegaFrame system, it is always a good idea to suspect a software
configuration problem when something in the system was changed
and it suddenly stopped working. Leaving blank lines in JCL files
and forgetting to place carriage return after each line are the
most common cause of errors. These mistakes will often prevent
the system from successfully booting.

HUMAN INDUCED PROBLEMS

1. Trying to use disk drives in an "A" enclosure with the
   cartridge drive removed. This would most likely cause
   intermittent read errors (error 301) on the Winchester drives.

2. Failing to place the jumper in the correct plug on a memory
   expansion board.

3. Forgetting to install the private bus jumper between a board
   and its expansion memory.

4. Installing boards in a non-contiguous manner.

5. Installing a Winchester drive that has not had the termination
   resistor pack removed.

7. "B" enclosures must have terminator in the first drive.

7. Installing a Winchester drive that does not have all four drive selection straps jumpered.

8. Pulling out a cartridge disk before the indicator stops blinking.

9. Failing to terminate cluster lines properly.

10. Using a cluster cable on a fast cluster line that does not meet the required specifications.

11. Running the cluster test on a PT that is still connected to the MegaFrame. This can seriously confuse the MegaFrame and other stations connected to the line. This problem can be resolved by re-bootstrapping the MegaFrame and associated workstations and terminals.

12. Plugging an RS-232 cable into the printer port when an energized peripheral is connected to the other end. This can destroy the ICs that drive the printer channel. It is also possible to punch through the ICs and contaminate the main data bus.

13. Configuration file does not match printer characteristics.

14. Neglecting to connect an SC board to an SP board at J3 by using a private bus jumper.

ISOLATION TECHNIQUES

SIMPLIFICATION TECHNIQUE

Malfunctions are best isolated by using the simplification
technique. In other words, a malfunctioning system should be
reduced to the bare minimum and add boards and drives back to it
until a failure occurs, thus indicating that the part re-
introduced to the system is at fault.

JCL FILE PROBLEMS

Connect an RS-232 terminal to channel 3 of a CP or Channel 9 of
a TP. The connect = ctos entry must be in the corresponding
.cnf file. The JCL entries being processed by that board will
be written on the screen. This information is often useful for
finding problems because any error encountered during the
execution of the JCL entries will also be reported on the screen.

DISK AND FILE PROCESSOR ISOLATION

The FP Board won't boot from Dl !!!

        Is the FP malfunctioning ?
        Is the Winchester drive malfunctioning ?
        Are the Cables bad ?
        Is the power supply producing the correct voltages?
        Has the software on the hard disk been destroyed?
        Wish I had some parts to swap.

The situation described above offers many questions. The fastest
solution to the problem is to exchange parts until the problem
subsides. But parts may not be readily available.

A bootstrappable cartridge could be used to determine with a
reasonable degree of certainty whether the FP or the Winchester
drive is bad. If the system bootstraps the cartridge then the
problem has a very high probability of being the Winchester
drive.

BEFORE SIGNING A WINCHESTER'S DEATH CERTIFICATE, ONE SHOULD
ATTEMPT TO RE-INITIALIZE AND RE-INSTALL SOFTWARE. IN MANY CASES,
THIS ACTION WILL RESOLVE THE PROBLEM. BE SURE TO ENTER THE
INFORMATION FROM THE BAD SPOTS CARD ATTACHED TO THE DRIVE.

If the FP has a serious malfunction, it will report a bootstrap error code in its board edge light emitting diodes, thus indicating that the FP is faulty.

As mentioned above, the system should be reduced to its minimum required configuration to allow deductive isolation of another failing part.

INTERMITTENT PROBLEMS

The information recorded in the system log is often helpful when isolating an intermittent error. For example, the ERC 22 (bus time out) error logs the slot number of the processor board being referenced. With this information, the trouble could be isolated to one of two boards.

SYSTEM LOG

Using the MPLOG command and the error listings provided is the most expedient technique for finding a problem.

MEGAFRAME TROUBLE ISOLATION

#1
SYPTOMS

Power on indicator does not glow but fans blow.

POSSIBLE CAUSES

1. Blown fuse in main power supply.
2. Disconnected power indicator cable.
3. Bad power indicator.

#2
SYMPTOMS

Power indicator off and fans do not blow.

POSSIBLE CAUSES

1. System not plugged in.
2. Circuit breaker tripped.
3. Main AC fuse blown.

#3
SYMPTOMS

Power indicator is on but fans do not blow.

POSSIBLE CAUSES

1. AC plug on top of power supply is loose or bad.
2. Wires at fan are disconnected.

#4
SYMPTOMS

Display panel does not display 00 when the key switch is in the
stop position.

POSSIBLE CAUSES

1. FP board is not installed.
2. Display cable connector is loose.
3. Display assembly is malfunctioning.

#5
SYMPTOMS

FP will boot from D0 but not from D1.

POSSIBLE CAUSES

1. D1 does not contain a bootable operating system.
2. Cables on D1 are loose or bad.
3. D1 disk module is bad.
4. FP board is bad.

#6
SYMPTOMS

FP board boots from D1 but will not boot from D0.

POSSIBLE CAUSES

1. Cartridge has never been initialized.
2. Cartridge does not contain a bootstrappable file.
3. Cartridge is bad.
4. Cables are loose on D0.
5. D0 disk module is bad.
6. FP board is bad.

#7
SYMPTOMS

FP boots and blinks bottom LED but no other boards will boot.

POSSIBLE CAUSES

1. [sys]<sys>master.cnf file contains incorrect text.
2. The operation systems for the other boards are not on the
   disk.
3. The slot adjacent to the FP is empty.
4. One of the boards has a bus logic failure, remove one board
   at a time.
5. Bent or loose pin on one of system bus connectors.
6. Master FP is bad.

#8
SYMPTOM
Boards in a slot beyond a certain board will not boot.

POSSIBLE CAUSES

1. Board next to last successfully bootstrapped board is bad.
2. The boards are not listed in [sys]<sys>master.cnf.
2. Bent pin is system bus connector.
3. Bad board seating.

#9
SYMPTOM
Boards in a certain enclosure will not boot.

POSSIBLE CAUSES

1. Boards are not listed in [sys]<sys>master.cnf.
2. Loose flexible print connectors.
3. Loose or bad BUS REPEATER BOARD
4. Boards are not in contiguos slots on the right side of
   the machine (front view).

#10
SYMPTOM
Display panel indicates 15.

POSSIBLE CAUSE

1. [sys]<sys>initfp00.jcl does not contain the entry that
   inidicates that ufs.run should be executed on the FP board.

#11
SYMPTOM
Display panel indicates 21.

POSSIBLE CAUSES

1. None of the disks contain <sys>sysimage.sys.
2. AC power cable between the power supply and the
   disk power supplies is loose or disconnected.
3. Bad FILE PROCESSOR BOARD.
4. Improper disk drive termination.

#12
SYMPTOM

A board never tries to boot (does not shift LED's) .

POSSIBLE CAUSES .

1. The board is bad.
2. Bent pin on system bus connector.
3. Private bus jumper is incorrectly installed.

#13
SYMPTOM

Checking volume status on a drive causes an ERROR 300.

POSSIBLE CAUSES

1. Loose drive cables.
2. Loose connection between disk power supply and the drive.
3. Disk power supply fuse is blown.
4. Disk power supply AC connector is loose or bad.
5. Disk module is bad.
6. FP board is bad.

#14
SYMPTOM

Checking volume status on drive causes an ERROR 216.

POSSIBLE CAUSES

1. Loose or bad cables.
2. Drive has never been initialized by using the MIVOLUME
   command.
3. Diagnostics have been run on drive but the drive has not been
   re-initialized by using the MIVOLUME command.
4. Disk module is bad.
5. FP board is bad.

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#15
SYMPTOM
 !!!! INTERMITTENT ERROR 301 !!!!!

PROBABLE CAUSES

1. Bad spot information was not entered when the drive was
   initialized using the MIVOLUME command.
2. Loose drive cables.
3. Disk drives are not terminated properly.
4. Disk module is bad.
5. FP board is bad.

#16
SYMPTOM
Cartridge drive will only read cartridges created on that drive.

POSSIBLE CAUSE

1. Cartridge drive module is bad.

#17
SYMPTOM
Cartridge or system drive only boots when another drive is
disconnected.

POSSIBLE CAUSES

1. The drive that was disconnected is bad.
2. Drive cabling is loose or bad.
3. FP board is bad in that it is selecting more
   than one drive at a time.

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Architecture