*** H R G ***

HARDWARE REFERENCE GUIDE

FORTUNE SYSTEMS

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CHAPTER 1

SYSTEMS

SUPPORTED SYSTEMS: 32:16 (5, 10, 20), PS10, PS20, XP30, XP45, SX45, SX70, SX45T, SX70T.

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When the system is booted up, it normally displays the digits 1 through 9. Each digit is displayed after the computer has completed a distinct task. These tasks are listed below according to the number;

Screen Display	Meaning
1	No errors in initial hardware diagnostics. (Momrom prints out 1)
1 2	Boot file found on device specified in EAROM. (Momrom prints out 2)
1 2 3	Boot file loaded into memory and successfully initiated. (Boot program prints out 3)
1 2 3 4	Boot program has found kernel and that file is being loaded into memory (/hd02/unix). (Boot program prints out 4)
1 2 3 4 5	The kernel (the part of FOR:PRO that is always resident in main memory) has loaded and executed auto configuration. (Kernel prints out 5)
1 2 3 4 5 6	The kernel is ready to execute /etc/init program. (Kernel prints out 6)
1 2 3 4 5 6 7	The /etc/init program has started successfully. (/etc/init prints out 7)
1 2 3 4 5 6 7 8	The shell has started the /etc/rc file. (/etc/rc prints out 8)
1 2 3 4 5 6 7 8 9	Mkdevs and other device configuration programs have finished and start to execute pstat, fsck, and login programs. (/etc/rc prints out 9)

General Information Needed:

When having problems with a Fortune System, it may be a good idea to know the answers to the following questions:

1) When was this problem first noticed? Was something major just changed, added or updated? If an identical problem occurred previously, how was it solved?

2) How long has the system been in use?

3) What is current operating system revision or level?

4) Is this a single-user or multi-user system?

5) Is system a "Alternate Console" system?

6) What make of power supply (zenith, western electric or digipower)?

7) What type of hard disk (C20, J20, J30, M45 OR N70)?

8) How much memory does the system have (512, 1024, 1536 OR 2048)?

9) Is the system fully loaded? (Are all slots filled?) (what is the configuration?)

```
ECC =============     ||    ||    ||    ||    ||
PM1     =========   PE||  PD||  PC||  PB||  PA||
PM2     =========     ||    ||    ||    ||    ||
PM3     =========     ||    ||    ||    ||    ||
PM4     =========     ||    ||    ||    ||    ||
                      ||    ||    ||    ||    ||
```
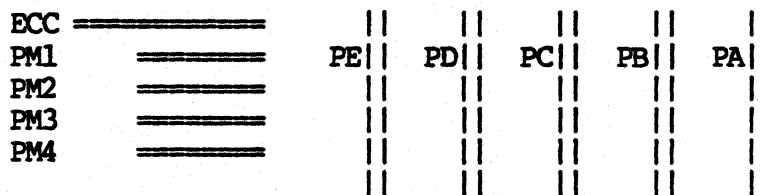
10) How many users is the system configured for? How many people normally use the system? How many people are using each application at any one time?

11) Is this an intermittent problem, does it occur regularly or is it a solid failure? Can problem be reproduced?

12) What software is loaded on system?

13) Are any communications packages being used?

14) What has been done to resolve the problem?

```
_____| IMPORTANT |_____
|   Before swapping any part always:         |
|                                            |
|      1) Reseat all boards and cables       |
|      2) Test the power supply voltages     |
|_____|
```

If the system hangs immediately after displaying any digit we have an indication of what problem is occurring. The following list suggests solutions for problems which may occur at each point of power up:

HANGS AT

1   Booting up diagnostics, if successful run all tests. If unsuccessful modify system to run with minimum system components.

                                     ****

2 or 3   Indicates the conf. block or the boot program is damaged and must be rebuilt. (refer to Appendix B)

                                     Make sure the hard drive is spinning up to speed. Do this by listening to the whining noise coming from drive upon power-up. If no whining sound is heard drive is not spinning up. In this case the drive is the problem and must be swapped out.

                                     May also happen if another Comm A was installed and defined but number of users wasn't increased.

                                     If the above procedures do not allow the system to proceed past 3, run hdtest. If when loading hdtest the drive is found but cannot read configuration block then the conf. block must be rebuilt. If the drive is not found then reseat the WD controller and ribbon cables. If still unable to find the problem, start swapping or checking parts in this order:

                                     1. WD Controller
                                     2. HD Ribbon Cables
                                     3. Hard Disk
                                     4. Memory Boards
                                     5. Power Supply
                                     6. IC's at Motherboard locations 9F, 19E, 22J.

HANGS AT

4

This may mean that unix is corrupt. Boot up off Cold Boot Set vol. 1 going into the maintenance mode (refer to Appendix A). Mount the hard disk to /h and copy /unix to /h

If not fixed, run hdtest and memtest. Then try swapping in the following order:

1. Memory Boards
2. WD Controller
3. Hard Disk
4. Floppy Controller (9F Mother Bd.)
5. IC's at Motherboard locations 19E, 22J.

****

5 or 6

If message "init died" or "software error 18 or 22" is displayed (refer to Appendix A). Mount the hard disk to /h and copy /etc/init to /h/etc

This may happen if the multi-user init program was previously installed on another system.

A bad memory board or any defective board in the DMA slots can cause system to hang here. Always suspect memory first.

If system won't boot from floppy, EAROM (Motherbrd D-15, Chip # KD2212) is probably bad.

****

7

If message "can't find /bin/sh" is displayed, boot up off of 1st volume of cold boot set (refer to Appendix A) and copy /bin/sh to /h/bin

7   /etc/rc and/or /bin/test may be damaged, if so than copy from 1st volume of cold boot set.

If the above doesn't fix then run diagnostics on all hardware.

****

8   Boot up off vol 1 of Cold Boot set and get into maintenance mode. Mount the hard disk to /h and copy /etc/rc.real to /h/etc/rc. You may also want to copy /etc/init to /h/etc.

A mount or umount file may cause this problem. Recopy [u]mount to /h/etc.

****

9   Have never seen a system hang at this point. If system does hang here suspect the rc file.

The following is a list of problems and solutions that may arise once the system is up and running.

Problem | Solution

System silent hang. This is when a system hangs inter- mitently for no apparent reason.

Check to see how much memory is being recognized.

Make sure you are getting proper readings from power supply.

You may want to backup and do a cold boot after system is warm.

****

System hangs during shutdown when Tape Streamer is attached.

Tape Streamer must be shutdown before CPU. Enter shell and type the following
     # st shutdown <cr>
     # shutdown <cr>

You may get this problem also if tape software is installed but no tape hardware exists.

****

Turn on system, goes to 2 and straight into the maintenance menu. But after resetting the system a couple of times it boots up fine.

If this happens, the drive is trying to send a signal to the WD controller but is not succeeding. This could be caused by either the WD controller, ribbon cables, or the drive itself. Swap out Swap out WD controller if this doesn't fix the problem then try swapping out the ribbon cables and then the hard drive.

****

Message "Something wrong start over".

Drive not coming ready or bad WD controller. This message may mean that there is a bad configuration block or boot program. Verify problem by running hdtest of the diagnostics.

Problem	Solution
When going into the maintenance menu, there is a message flashing at bottom of screen "EAROM MAY NOT WORK".	This problem can usually be fixed by making a change to the menu and then saving it by pressing the F9 key. At this point the flashing message should disappear.

****

System goes through file system check successfully but loops back to date and time or just hangs.

This may mean that the /etc/devtype file is missing or corrupted. Boot up off of vol. 1 of cold boot set and get into maintenance mode (Appendix A). Now type;

```
# cd /etc
# mount /dev/hd02 /h
# cd /h/m/fos1/flop3/etc
# cp devtype /h/etc
# /h/bin/sync; /h/bin/sync
# cd /
# umount /dev/hd02
```
Now reset and check for proper boot operation.

****

System runs very slow and may even hang.

Check to make sure that ports aren't defined for an absent commA board (eg.tty06 if only 1 CommA). Also check to make sure that unused ports on the CommA are not defined as login (i.e. terminals). If so, disable the ports.

Do a vmstat to check for interrupts.

Problem	Solution
During the cold boot of 1.8 system loops endlessly between the question "Is floppy #1 replaced with #2 yet (y or N)? You have inserted the wrong volume. Please insert floppy #2.	From the message: "Is floppy #1 replaced with etc....... type: single The system will respond with... Going into maintenance mode. type: cp /etc/rc.hd /etc/rc <RETURN> ed /etc/rc.pass2 <RETURN> The editor will respond with ... 2803 (number may differ) type: 11,41d <RETURN> w /etc/rc.pass2.run <RETURN> The editor will respond with... 1994 (number may differ) type: q <RETURN> The editor will return to the Bourne shell. At the '#' prompt, type: sync <RETURN> sync <RETURN>
If sync is not found then proceed to the next step.	Wait 30 seconds and reset the system (or power off and back on). After power up sequence number 9, the system will immediately display the prompt: Is floppy #1 replaced with #2 yet (y/n)? type: y <RETURN> The system should respond with the following message: copying files from floppy #2 . . . . Complete the cold boot procedure. If the same error message occurs, contact Technical Support.

Error messages are presented in different formats depending on who issues the errors. Thus a kernel error is different in format from a driver error. It is intended that each error be described as it is, not as it should be.

Kernel Error Message Format
        Each error is ordered by its error code number in parentheses , followed by its corresponding mnemonic. Other descriptions following the mnemonic are;
- a. message string as it appears on the monitor.
- b. source routine that reports this error.
- c. cause of the error.
- d. comments and recommended user action. If no user action is specified, reboot the system.

Kernel Error List

    (1)   BLKDEV
- a. blkdev
- b. bio.c
- c. Invalid block device is specified. This error happens when device number is too big.
- d. This error is usually caused by the illegal device number in devctl() call. The kernel checks the major device number and gives this message if it is too big. Check reconfiguration table and verify all information.

    (2)   DEVTAB
- a. devtab
- b. bio.c
- c. Invalid device table entry is specified. This error happens when buffer header pointer for this block device table is not properly initialized.
- d. This error is usually caused by the illegal device number in devctl() call. If autoconfig did not initialize the table entry for this device, this error comes out. It is possible to hang the system without error message if minor device number is wrong. User should be very careful in using devctl() routine.

    (3)   EIOSWAP
- a. I/O error in swap
- b. bio.c
- c. I/O error occurs during swapping
- d. Most likely a disk error, run hdtest.

    (4)   IOCCOM
- a. ioccom
- b. tty.c or ttynew.c
- c. In raw or cbreak mode, the count for canonical input is not zero. This error also could happen when an impossible rub character is used.
- d. Kernel has caught a bug in itself, reset system.

(5) NOFS
      a.   nofs
      b.   alloc.c
      c.   Device name not found in the mount table.
      d.   Kernel has caught a bug in itself, reset system.

(6) TTOF
      a.   timeout table overflow
      b.   clock.c
      c.   Too many timeouts are specified, so run callout structure.
      d.   Run with fewer terminals at one time.

(7) NOIMT
      a.   noimt
      b.   iget.c
      c.   Mount table error. No corresponding inode entry is found in the mount table.
      d.   Kernel has caught a bug in itself, reset.

(8) IINIT
      a.   iinit
      b.   main.c
      c.   Cannot read superblock during initialization.
      d.   Disk error - run hdtest.

(9) RDPROC
      a.   Run dead proc
      b.   slp.c
      c.   Trying to run a process (or dead) structure. Possibly process table becomes bad.
      d.   Kernel has caught a bug in itself, reset.

(10) NOPROCS
      a.   no processes
      b.   slp.c
      c.   Trying to create a new process, but process table is full.
      d.   Kernel has caught a bug in itself, reset.

(12) NOSWAP2
      a.   Out of swap2 or out of swap3
      b.   trap.c
      c.   No more swap space. Swap2 comes from xswap and swap3 from xalloc.
      d.   Not enough disk space is allocated for swap area. Run with fewer users or fewer background processes, or re-cold boot with more swap space.

(13) ETRAP
- a. At PC Øx_____ trap
- b. trap.c
- c. Unexpected trap received.
- d. The system detected an interrupt which should not have occurred. It could be caused by electrical interference or by hardware malfunction or kernel bug.

(14) KBAERR
- a. AT PC Øx_____ Kernel bus/addr error
- b. trap.c
- c. Bus or address error occurred within the kernel.
- d. This is most likely a software problem. Please carefully record what was happening at the time the problem occurred. Kernel may have caught a bug in itself, reset.

(16) DBLPARY
- a. At PC Øx_____ double parity
- b. trap.c
- c. A memory parity error was detected while processing a parity error. This means that some portion of memory has gone bad.
- d. Try powering the system off and then back on again. This may make the problem go away. If not, it is possible that the power-on memory diagnostics will find the problem and allow you to operate with a reduced amount of memory.

(17) REFTIMO
- a. At PC Øx_____ Refresh time out
- b. trap.c
- c. Refresh time out (RTO) error indicates a problem with the memory refresh circuitry. The system may not have been well serviced.
- d. Power on and off.

(18) INITNX
- a. Can't exec init
- b. sysl.c
- c. This indicates a problem when the kernel is trying to start up /etc/init at power-up time. The most likely cause is that /etc/init program is gone bad or that a multi-user version of /etc/init is incorrectly installed.
- d. Boot from cold boot floppy #1 and copy init file from the floppy to the /etc/directory in the hard disk. Then reboot from the disk.

(19) MFREE
- a. map table overflow
- b. malloc.c
- c. Memory map has overrun during mfree.
- d. Run with fewer processes.

(20) ZWCHAN
- a. zero wchan
- b. slp.c
- c. A process is sleeping for nothing.
- d. Kernel has caught a bug in itself, reset.

(22) INITD
- a. init died
- b. sysl.c
- c. Init died after being executed from icode.
- d. same as (18).

(24) IALLOC
- a. ialloc
- b. alloc.c
- c. File system data structure (filsys) error detected while allocating inodes.
- d. Kernel has caught a bug in itself.

(25) TIMNOTING
- a. deltimeout not in queue
- b. clock.c
- c. Timeout structure not found in the queue while deleting.
- d. Kernel has caught a bug in itself (driver).

(26) BADSCPAL
- a. failure in machine ID PAL
- b. (omitted on purpose)
- c. Bad checksum in security pal.
- d. Protected software is installed on the wrong machine or PAL is bad.

(120) PARITY
- a. parity
- b. trap.c
- c. A memory parity error was detected.
- d. same as (16).

(128) ODDERR
- a. odd error
- b. bio.c
- c. Odd address, odd count or wraparound count error detected in raw mode I/O (physio).
- d. To recover, try powering off and rebooting.

(129) ENFLE
- a. no file
- b. fio.c
- c. File table full while allocating a user file descriptor and temporarily no more opens can be accepted.
- d. Too many I/O-intensive programs are running at one time.

(130) INTOF
- a. Inode table O/F
- b. iget.c
- c. Inode table in the kernel is full.
- d. Too many I/O-intensive programs are running at one time.

(131) BADIADD
- a. iaddr > 2^24
- b. iget.c
- c. Disk addresses of plain files and directories are kept in the array (di_addr) packed into 3 bytes each. Non-zero in the 4th byte error is detected while updating inode structure on a disk block.
- d. Disk may be corrupted, try rebooting without doing an "orderly shutdown" by waiting 45 seconds and then powering off and back on.

(132) NEGQF
- a. neg queue flush
- b. prim.c
- c. Clist counter becomes negative while flushing.
- d. Kernel has caught a bug in itself.

(133) ESTUFF
- a. STUFF
- b. sig.c
- c. Error detected in writing user instruction area. The requester must be an exclusive user on the file to write on.
- d. Make sure the parameters in ptrace() call are correct and also check if the text is not shared among users.

(134) USRACC
- a. usracc 0x_____
- b. sig.c
- c. Error detected in writing user instruction area. The requester does not have the access permit for the file.
- d. Make sure the parameters in ptrace() call are correct and also check if the text is writable by the current user.

(135) ESUIWD
    a.   sui word failed
    b.   sig.c
    c.   Error detected in writing user instruction area. Writing can not be performed due to the reasons other than (133) or (134).
    d.   Make sure the parameters in ptrace() call are correct.

(137) ENTXT
    a.   Out of text
    b.   text.c
    c.   Not enough slots in the kernel shared text table. There are too many programs with the save-text bit set, or the text table is just too small for the number of distinct shared-text programs you are trying to run at one time.
    d.   Reboot and possibly you should increase size of process table.

(138) RANDOM
    a.   Random interrupt
    b.   trap.c
    c.   Unused trap vector generates a trap.
    d.   Probably a hardware problem. Run diagnostics to determine the bad part.

(139) BADFREE
    a.   bad free count
    b.   alloc.c
    c.   File system error (superblock). The free count in a superblock exceeds the system limit (NIOFREE) while allocating disk blocks.
    d.   Try running fsck on hard disk.

(140) NOSPACE
    a.   file system full
    b.   alloc.c
    c.   You have run out of space on one of your file systems.
    d.   Recover by deleting some files (possibly archiving them to floppy first).

(141) BADBLK
    a.   bad block
    b.   alloc.c
    c.   Block number is out of range, i.e., it is less than the first block or greater than the last block in the volume.
    d.   Bad file system on the mounted device. Run fsck.

(142) NOINO
- a. file system full (out of inodes)
- b. alloc.c
- c. Inodes in the mounted device ran out while creating a file.
- d. Delete files or remake the file system specifying more inodes than normal.

(143) BADCNT
- a. bad free block count
- b. alloc,c
- c. File system error (superblock). The free block counter is too big(> NICAREE) or the inode counter is too big (>NICINOD).
- d. File system is corrupted. Run fsck.

(144) OVERR
- a. error
- b. prf.c
- c. Ran out of spare blocks in the hard disk while saving a bad block.
- d. The system may have a bad hard disk. Run hdtest.

MomRom Error Format

MomRom error message codes are presented in the lower left hand corner of the Fortune Systems CPU icon display (see below).
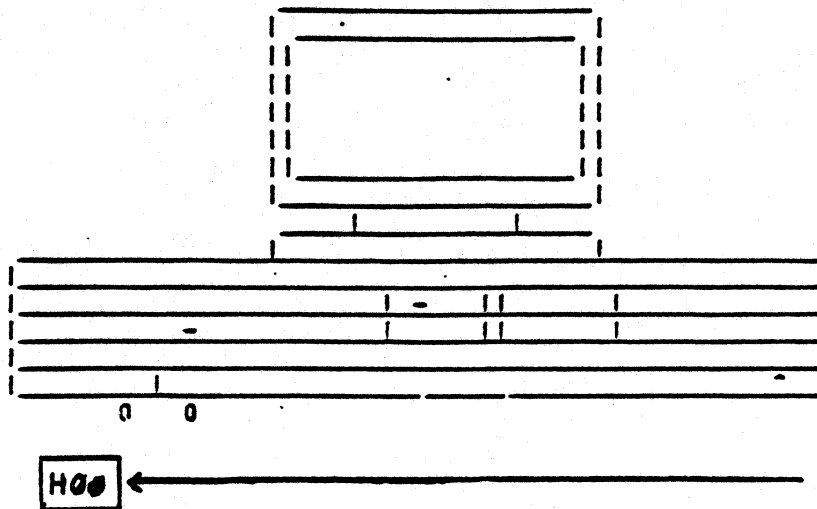
The above is only an example. 'H' is the error prefix indicating the general category of the problem encountered, and the number identifies the specific problem.

Category prefixes are:

E - EAROM	M - Memory
F - Flexible disk	T - Traps/Exceptions
H - Hard disk	U - User error

NOTE: Error codes may be cleared by changing the menu icon or by using the <CTRL>L to redraw the icon.

E00   Several unsuccessful attempts have been made to verify the EAROM. Bring up your system and run program hd02/sa/reconf (see uconf(8) in FOR:PRO Programmer's Manual). Verify that the fields are correct. This error should not prevent you from powering up or using your system. Nevertheless, report this error to your Fortune Representative.

E01   The EAROM has the Console Location set to "CRT", but there is no CRT controller in any of the five DMA slots. TTY01 is used as the console. If a CRT controller is indeed in a slot, reseat the controller, or try another slot. If reseating or trying another slot also fails, the controller is most likely damaged. If no CRT is present, run the hd02/sa/reconf program and change the Console Location to "TTY01".

E02   The EAROM has the Console Location set to an incorrect value. Bring up your system and run the hd02/sa/reconf program and change the Console Location to either "CRT" or "TTY01".

E03   The EAROM has the boot device set to an incorrect value. Bring up your system and run the **hd02/sa/reconf** program and change the boot device to a valid selection. Selection is made by placing the cursor on the boot device field and pressing the <**space bar**> until the correct device is displayed.

E04   The EAROM's boot device is set to "TTY01" and the Console Location is also "TTY01." This conflict for the device is not permitted. Bring up your system and run the **hd02/sa/reconf** program and correct the discrepancy.

E05   The EAROM's boot device field is set to a slot on the bus that does not have a valid boot device. The last valid boot device located will be used. Bring up your system and run the **hd02/sa/reconf** program to determine which slot is in question. If a valid boot device is present, reseat the card, or try another slot. If this fails, the card is most likely damaged. If the slot does not have a valid boot device (e.g., WD controller), correct the EAROM's boot device using the **hd02/sa/reconf** program.

E06   Cannot use terminal mode unless console location is set to "CRT." Bring up your system and run the **hd02/sa/reconf** program and change the Console Location field.

E07   Function key F2, used to write changes to the System Configuration menu, was initiated without any changes made.

F01   The MomRom, instructed to boot up using the diskette drive, could not communicate to the selected drive, or the diskette is not formatted or cannot be read. Try removing and reinserting the diskette into the drive. If that fails, try using a backup cold boot diskette or contact your authorized Fortune Representative.

F02   The configuration block identification number on the diskette is incorrect. Verify that a valid Fortune Systems cold boot diskette, Volume 1, is present in the drive and retry.

F03   The selected boot program has a length of zero. Verify that Volume 1 of the cold boot set is inserted in the diskette drive. Check that the boot number displayed with the cold boot icon (number on the right hand side, beneath the drive) is set to zero, or if using the boot menu, verify that entered values are correct.

F04   The selected boot program is not in the proper format. Verify that Volume 1 of the cold boot set is inserted in your diskette drive and try again. If problems still persist, use a backup copy of cold boot Volume 1.

F05   The selected boot program has an illegal start address.
Verify that Volume 1 of the cold boot set is inserted in the
diskette drive and try again. If problems still persist,
use a backup copy of cold boot Volume 1.

F06   The diskette drive has failed to locate the instructed block
number. Verify that Volume 1 of the cold boot set is being
used and that it is not damaged (see NOTE below). Put the
disk back into the drive and make sure that the drive door
is completely closed, retry the procedure. If the problem
still persists, try using a backup copy of cold boot Volume
1.

The diskette has a bad block and cannot be read. Verify
that Volume 1 of the cold boot set is being used and that it
is not damaged. Reinsert the diskette into the drive and
make sure that the drive door is completely closed, retry
the procedure. If the problem still persists, try using a
backup copy of cold boot Volume 1.

H00   No Boot Device

H01   Boot Routine Error

M00   This message is accompanied by repeated beeping of both the
TTY01 (alternate console) and TTY00 keyboards. This message
means that your system has less than the mandatory 4KB of
memory or memory was not found.

M02   A hole in RAM has been detected. Memory locations are not
contiguous after the first 256KB of memory. Check that the
memory boards are seated properly into their slots and retry
the procedure.

T00   Power failure. Check power supply outlet and connections to
the CPU.

T01   Unexpected error trap. This is a general message that is
displayed if an error condition does not meet one of the
above criteria. Power off your system, wait a few seconds
and turn the power back on. Run diagnostics, if the
condition still persists contact your authorized Fortune
Representative.

NOTE

Remove diskette. Center diskette within envelope without touching the magnetic
surface of the diskette, rotate the diskette within the envelope. The diskette
should move freely. Check that the envelope is not damaged or creased. The
diskette surface, as viewed through the access slot should show no signs of
wear. Check the center hole for any sign of deformation.

Software Release Levels

To determine the current release levels of software on your system, the what command will have to be used. Login as root and at the # prompt type the following command for the appropriate product you are trying to verify;

Command	Product
what /etc/init	Operating System
what /bin/od	Development Utilities
what /m/wp2/wp	Fortune Word
what /m/mp/mp	Multiplan
what /usr/bin/gw	Graphwriter
what /usr/bin/makedb	Rubix
what /b/basic.psd	Basic
what /usr/bin/cc	C compiler
what /usr/bin/cbas	CBasic
what /usr/lib/fcoml	Fortran77
what /usr/lib/cobol/rts5	Micro-Focus Cobol
what /usr/bin/pc	Pascal
what /usr/bin/rmcobol	RM Cobol
what /usr/bin/ld	Language Dev. Tools
what /bin/cu	ITE
what /usr/lib/uucp/uucico	FFCP
what /usr/bin/vte	VTE
what /m/WPS/WPS.rbte	Doc. Conversion
what /b/BAS/CAP/CAPDA0	Accounts Payable
what /b/BAS/CAR/CARDA0	Accounts Receivable
what /b/BAS/CGL/CGLDA0	General Ledger
what /b/BAS/CGL/CGLUDO	Fixed Assets
what /b/BAS/CPO/CPODA0	Purchase Orders
what /b/BAS/CBI/CBIDA0	Order processing
what /b/BAS/CPR/CRPDB0	Payroll
what /b/IDOL/CUT/CUTUJB	IDOL

CHAPTER 2

EXPANSION CABINET

Supported Expansion Cabinets: Expansion Cabinet with 30meg, 45meg and 70meg hard disk. Expansion Cabinets with 20meg or 60meg tape streamer (drives and tapes are optional in either type of Expansion Cabinet).

Any Fortune System running FOR:PRO (1.7 or later) which has at least one open I/O slot can be upgraded to support the Tape Streamer.

Problem	Solution
Adding expansion cab. to cpu and now system goes straight to maintenance menu.	Check all cables making sure they are placed in properly and are secure. If that doesn't fix it, disconnect cables and try to boot cpu as a stand alone system. If still down, try to rebuild configuration block. If this isn't possible, run hdtest. Then try swapping in the following order: 1. WD controller 2. Ribbon cables and external cables 3. Hard Disk

****

Problem	Solution
Running Diagnostics on the PIO Board.	There is already a diagnostic test on the Diagnostic disk labeled 4.0. To access test type fd02/pio. This test resembles the CommA test. Make sure that PIO external cable is disconnected from cpu. This will cause complications if connected.

****

Problem	Solution
System hangs at 5 during boot up with PIO board in system;	Remove PIO board to verify that it is causing system to hang. If not PIO board then maybe CommA, WD controller or video controller board. May actually be any board in the DMA slots

CHAPTER 3
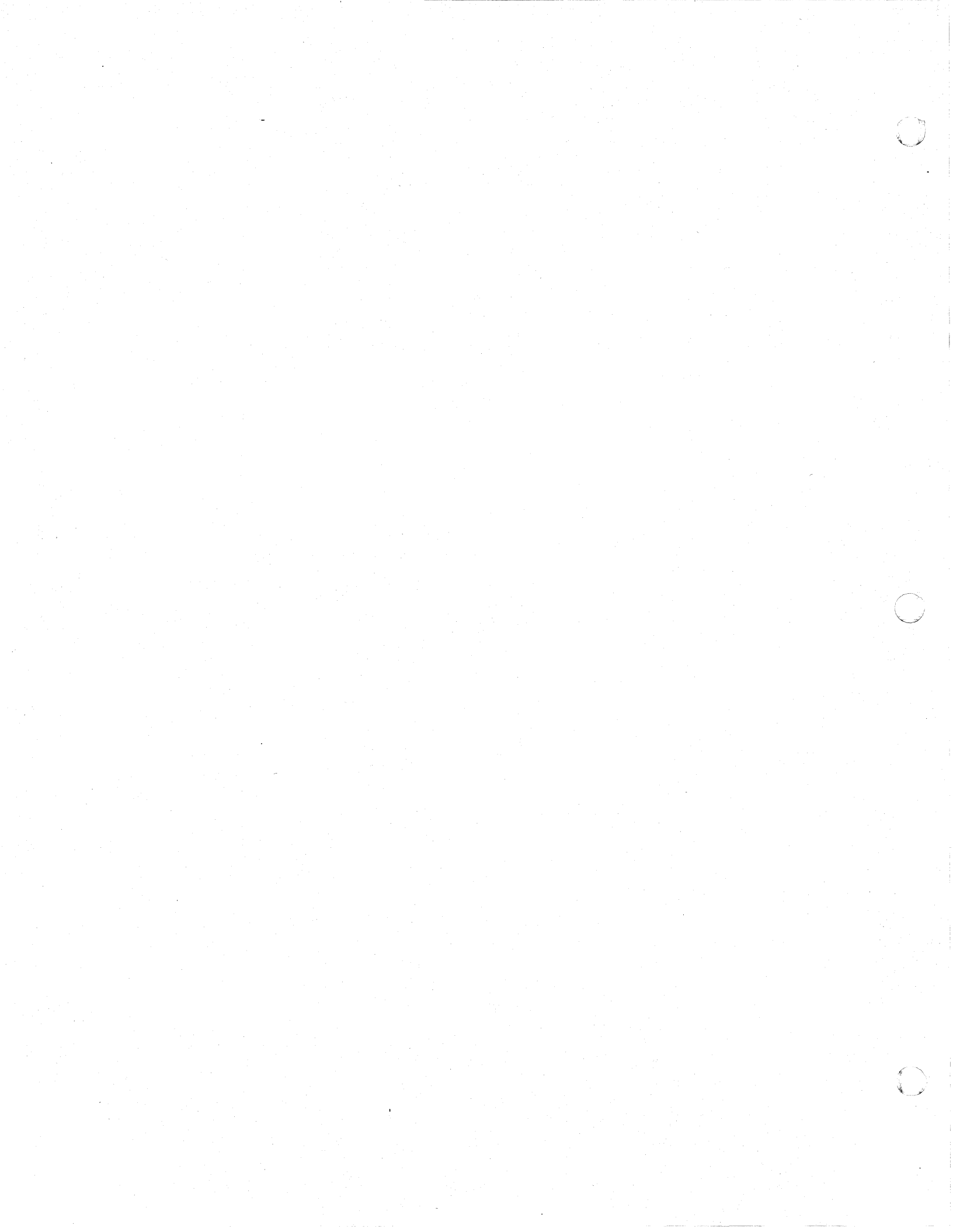
CENTRAL LOGIC ASSEMBLY
(MOTHERBOARD)

The Central Logic Assembly (CLA) data bus consists of 16 data paths, and additional bus control paths. The CLA data bus is connected to all major system devices and is used to transfer data between the microprocessor, memory and system devices.

The Central Logic Assembly address bus consists of 23 address lines, and additional bus control paths. The CLA data address bus is connected to all system devices, and is the means by which system devices are addressed.

Problem	Solution
Security Pal Location	On most 32:16 models - D-7. On PS, XP, SX, and SXT systems, Motherboard location A-14.

****

Security Pal Chip damaged or defective will generate an Hardware #26.	To order pal chip call PDC with the systems serial number.

****

Problems with resetting can be caused by;	1. Video controller (Same screen appears after a reset) 2. Power supply (High pitched whine, lines on screen) 3. WD controller 4. Hard disk (Spun down) 5. Reset switch stuck 6. Memory bd. in 1st slot (same symptom as number 2)

****

On maintenance menu Boot device (F4) does not recognize the WD Boot, drive #0. On ICON screen this may show the error HD00.	This can be caused by a defective mother bd or a bad WD controller. Try moving the WD Controller to another slot. If that fixes it check slot E connector on the mother board (where WD used to be) for bent pins. If no change, replace WD controller.
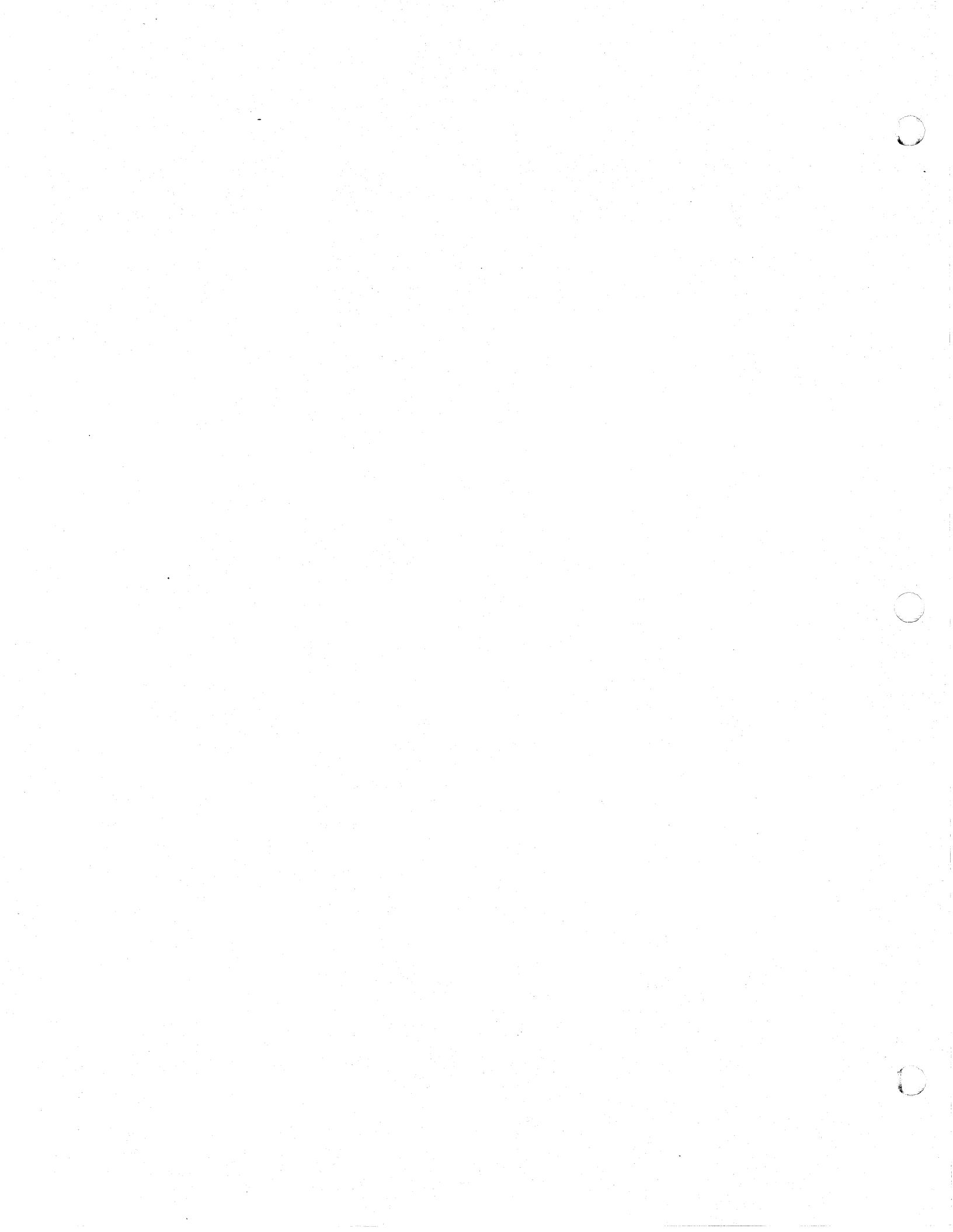
CHAPTER 4
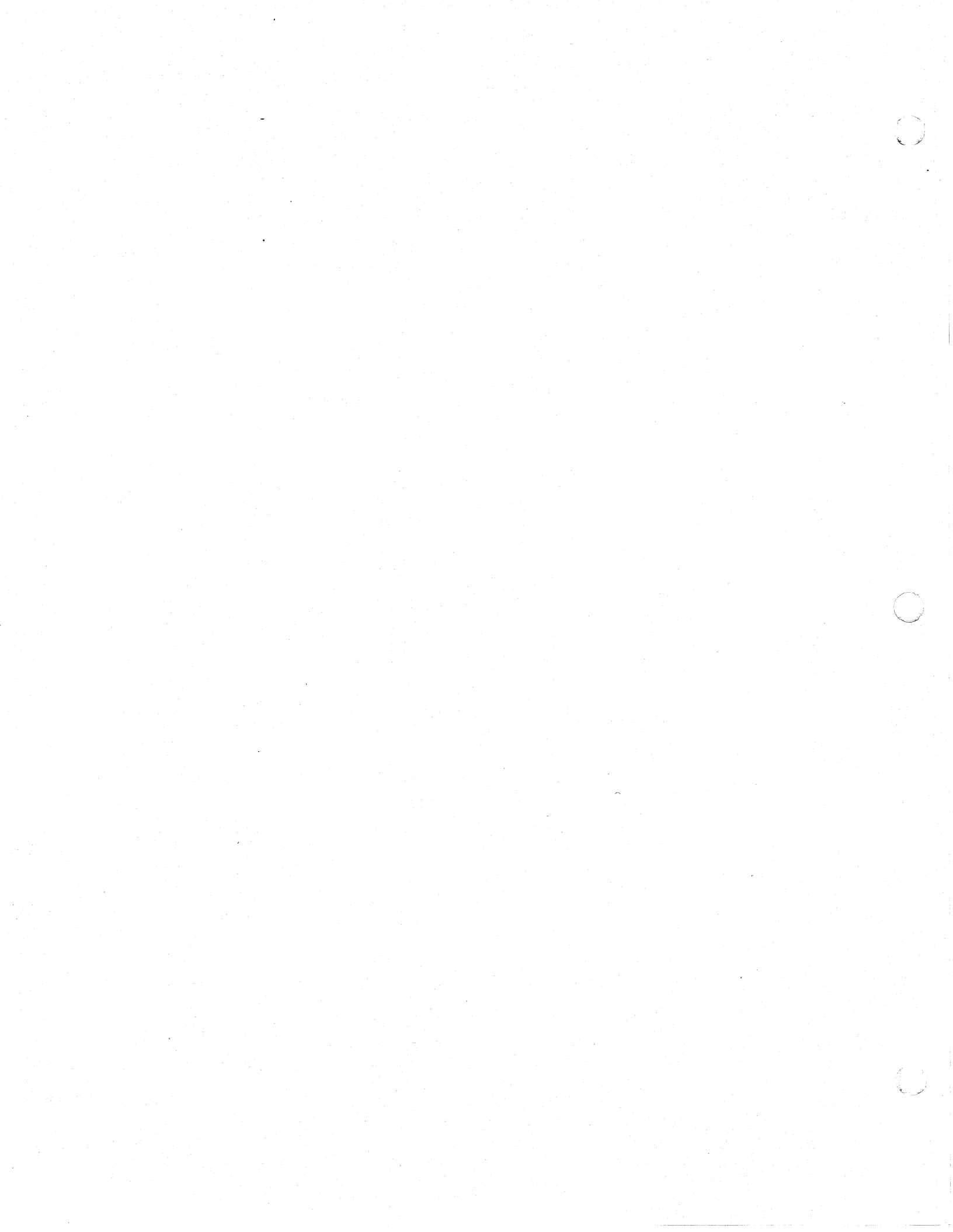
The hard disk subsystem provides the system with large capacity on-line storage for system software and data files. The subsystem consists of a microprocessor controlled DMA disk (WD) controller or a SCSI controller.

Supported Hard Drives in /etc/disktab and /etc/sdisktab:

ST506 Interface Type Drives

Manufact.	Model	Name	Sec/Trk.	Hds	Cyls	Wrcc	Wpc	Size	A/A/T
Seagate	ST412	A10	17	4	306	306	128	10 MB	85ms
Seagate	ST506	Z5	17	4	153	128	128	5 MB	85ms
Miniscribe	2012	B10	17	4	306	306	0	10 MB	85ms
Miniscribe	6085	B70	17	8	1024	512	512	70 MB	28ms
Ampex	PYXIS27	C20	17	8	320	132	132	20 MB	90ms
CDC	94155	C45	17	6	925	0	0	45 MB	35ms
Disctron	D-526	I20	17	8	308	128	128	20 MB	85ms
CDC	Spec9415-5	J20	16	5	500	500	0	20 MB	35ms
CDC	9415-5	J30	16	5	697	697	0	28.5 MB	35ms
Micropolis	1304	M45	17	6	830	831	831	45 MB	30ms
Micropolis	1323	N30	17	4	1024	1025	1025	30 MB	28ms
Micropolis	1325	N70	17	8	1024	1025	1025	70 MB	28ms
Rodime	R0204	R20	17	8	320	132	132	20 MB	90ms
NEC	D5126	N20	17	4	615	625	128	20 MB	85ms
NEC	D5146	N40	17	8	615	625	128	40 MB	85ms
ESCSI	145MB	M145	35	8	1018	1019	1019	145 MB	28ms
ESCSI	145MB	C145	34	9	967	1000	1000	145 MB	20ms

NOTE: The WD controller does not support disk drives with more than 8 heads.

Hard Disk Errors

Hard errors can be caused by power glitches or improper shutdown procedure. Hard errors which cannot be corrected by reformatting the drive indicate media defects. Media defects must be spared out.

Hard Disk Error Message Format

The error messages from the disk driver are printed on the console in case of a disk related error. The error message format is as follows:

*** hd error <msg> or drive <n> in state <state>

where
<state> is an internal state. Generally you will see MOVE, (during reading or writing data)
<n> is the drive number on which the error occurred.
<msg> is one or more of the following:

Command was aborted

The controller will only send a command to the drive if the drive is ready to accept it. This message is seen when the drive did not become ready for a long time.

CRC error in ID field

The computed checksum for the ID does not match the stored checksum. The driver will attempt to spare the sector. This is a soft error and may also be seen the in case of a power supply glitch.

DAM not found

Data address mark not found. Could have been destroyed due to an earlier power failure or due to a hardware error. The driver will attempt to spare the track.

ECC error in data field

An incorrectable ECC error. The controller applies an error correcting code (ECC) to every sector it reads. If the controller can not correct an error this message is given. This is a hard error.

ID not found

Sector id not found. A sector is identified by its id. If the id cannot be found it generally means the track was not formatted or that the track was destroyed due to power failure. The driver will attempt to spare the track.

Parity error

The controller detected memory read error. If you see this, it means the memory could be defective. Run memory diagnostics (memtest).

Track 00 error

The drive could not find the very first track. The drive is unusable if this happens. Run hard disk diagnostics (hdtest).

Drives are usually con-
figured for 3 partitions,
but can be configured for
up to 8 (0-7).

Partition 0 = Boot and conf. block
         1 = Swap space
         2 = File System

****

Hard Disk Error:

hd error: <msg> on drive <#>
in state <state> (see below
for meaning of message in < >)
  <msg> message given
  <#> is the drive number
by
  on which the error occurred
  <state> is an internal state

This error is usually a bad block
indication and needs to be spared out.
To spare out bad block refer to Appendix
B (page 64). If sparing the block does
  not cure the problem, further diagnose

running hdtest.

Drive 0 has gone bad, will
not accept anymore requests
Hd drive status selected,
seek complete flushing queue.

This error is caused by drive ready
signal turning false, whether it be in
the drive or WD controller. Turn system
power off wait 1 minute, power back up.
System should boot correctly. If it
doesn't, check to see if hard disk is
spinning (J20, J30 and C45 drives LED
will constantly flash if a problem
exists). If the drive does not become
ready when power is applied, this could
be caused by: 1) a power failure, or
brown out; 2) too much static around the
system; 3) an undedicated wall socket; 4)
a bad WD controller or 5) a bad hard
disk. First, check to make sure that WD
controller is part number 100079-06,
older revision controllers are the most
common reason for this error to occur.
Second, check cables and the static
electricity situation. If all looks
fine, then go into maintenance mode
(refer to Appendix A) and try to read
the hard disk configuration block
(rdconf /dev/hd02). If unable to read
the configuration block then try
rebuilding it and the boot program
(refer to Appendix B). If still getting
errors, run hdtest and check for psoft
and hard errors. If any, spare them
out.

Rodime/Ampex (C20) Disk Drives that experience intermittent hard disk errors or system locks for no apparent reason (drive actually spins down).

Drive may have wrong revision programmable microprocessor. These drives require a hardware modification. The proper Microprocessor will have to be installed. The correct levels of firmware are as follows:

Old Style Stepper Motor (Thick Black Band) is; 6052-13B

New Style Stepper Motor (Thin Black Band) is; 6109-2. Refer to Field Service Notice 74 for further information.

BAD BLOCK - DATA SALVATION

When a bad block is encountered, (by either an error message or by running diagnostics) the block must be spared out. Before sparing out bad blocks you may want to either backup the entire system or find out what files reside in the bad block. The only way this is possible is to have Development Utilities loaded on your system. Then do the following:

1. Convert disk physical block number (DPB, the number that shows up in error message or hdtest) to the file system physical block (FSPB) number. To do this subtract the beginning number of the partition that the DPB number resides in from DPB number . The answer will give you the FSPB number.

2. Now take the FSPB number and convert it to the file system logical block number (FSLB). To do this divide the FSPB number by two. The answer will give you the FSLB number.

3. Login as root and type in the highlighted commands:

   # /etc/icheck -b [FSLB number] /dev/hd02 <cr> (hd02 may be different, be sure to check original error message). This command will give you an INODE NUMBER!

   # /etc/ncheck -i [inode number] [file system]
   The result will give you file name.

This procedure is done so you can determine what files did reside in the bad block. Now restore files (after sparing block) from backups. You may also want to do a manual file system check.

****

If the block is going bad (psoft error), but can still be read, you can retain the data on the block with the following procedure:

1. Convert the DPB number to the FSPB number by subtracting the beginning number of the partition that the DPB number resides in from the DPB number.
   Now do the following logged in as root:

   # dd if=/dev/rhd02 of=/tmp/[FSPB number] count=1 bs=512 iseek=[FSPB#]
   The result will be something like;
            1+0 records in
            1+0 records out

2. Now spare out the block, (refer to Appendix B). Next enter:

   # dd if=/tmp/[FSPB number] of=/dev/rhd02 count=1 bs=512 oseek=[FSPB#]
            1+0 records in
            1+0 records out

   At this point the data is restored!! You can now remove /tmp/[FSPB#] after process is done.

NOTE: This procedure may take several tries if the block is marginal.

Adding partitions can be done through expansion disk software or by doing the following procedure.

PROCEDURE: Power the system up in maintenance mode, login as root.
From the prompt (#) enter:

        cd /etc <RETURN>

This will cause the system to change the working directory to /etc and return with the # prompt. Now check to see that no other file systems are mounted during the procedure.
Enter:
        mount <RETURN>   (if any file systems are mounted,
                                          unmount them before proceeding)

Making Configuration Block

Enter:

        mkconf -i /dev/hd1# /dev/hd1# <RETURN>

The configuration block will now begin to appear on the CRT with '?' prompts.
Press the <RETURN> to enter the default value until you get the question,

Number of partitions = 3?

Enter the number of partitions you would like for this drive, and press return.
        NOTE: Partition 0 is for your conf block, partitions 1 thru 7 may be
        used for file systems.

Press <RETURN> until you get the question,

Size of partition 1 = (some#)?

Now you begin to enter the value for the size of the partitions.

        NOTE: Partitions must break on even cylinder boundaries. To
                   compute for even boundaries, the partition size should be
                   made evenly divisible by (Sectors/track times Number of
                   heads). See the example for location of values assigned to
                   Sectors/track and Number of heads. When complete, the total
                   of the partitions should be equal to Capacity in blocks.

Now enter starting block for this partition.
        NOTE: This value is previous partition size + previous starting
                   block.
Continue entering partition sizes and starting blocks for each partition.

Press <RETURN> until you get the question,   Spare 0 (block 3) = diag ?
Now enter:
        done <RETURN>

(Continue on next page)

Making a file system

When the prompt (#) returns, make a file system on each partition.
For partition 2 on drive 1 enter:

        mkfs -a /dev/hd12

For partition 3 enter:

        mkfs -a /dev/hd13

and so on for each additional partition.

Making lost+found

You must make a lost+found directory for each partition.
Enter:
        mount /dev/hd1x /h
        sh mklost+found /h   (where x is partition number)
        umount /dev/hd1x
Repeat for each partition.

Making a directory

You must make a directory for each partition to be mounted on, or use existing
directories such as /u or /b.
To make a directory use the mkdir command. (ie. mkdir /u1)

If you intend to use either /u or /b, make a full backup of the directory.

Example if you intend to use existing /u or /b directories:

NOTE: Check integrity of /u (perform an fsck on /dev/hd02) before continuing.

        mount /dev/hd12 /h   (HIGHLY RECOMMENDED THAT /u OR
        cp -rost /u/. /h   /b BE BACKED UP TO TAPE OR
        umount /dev/hd12   FLOPPY DISK BEFORE CONTINUING.)

NOTE: Check integrity of /h (perform an fsck on /dev/hd12) before continuing.

Now enter:
        rm -rf /u
        mkdir /u

Repeat, starting at Making a directory for each partition.

(Continue on next page)

Editing /etc/fstab

If you want the operating system to automatically mount the file systems, you need to edit the /etc/fstab file and enter similar lines of text as this, one line per partition:

/dev/hdlx:dir:rw:1:#

(for more information see fstab(5) in the For:Pro Programmers Manual)

Replace **x** with partition number.
Replace **dir** with the full path name of the directory it is to be mounted on.
Replace **#** with a unique number, file systems on same drive must have distinct numbers.

PROCEDURE IS NOW COMPLETE

The following is an example on how to add additional partitions to a second drive. You must first get into maintenance mode (refer to Appendix A).

The highlighted commands are the commands to be concerned with;

```
# cd /etc
# mkconf -i /dev/hd1Ø /dev/hd1Ø
Sysid = Ø
Volume ID = 474728192
Modification date = Wed Jan 16 Ø4:56:32 1985
Media type = 2?
Sectors/track = 16?
Number of heads = 5?
Number of cylinders = 697?
Capacity in blocks = 5576Ø    <-- Capacity in blocks
Write reduce = 697?
Write precomp = Ø?
Drive attributes = Ø?
Block size = 512?
Software interlace = 1?
Hardware interlace = 2?
System interlace = 3?
Disk identification = "J3Ø - 28.5 Mega byte"?
Disk type = "J3Ø"?
Number of partitions = 3? 5                    Sizes
   Size of partition Ø = 24Ø?                  <--
      Starting block = Ø?
      Read only (no)?
   Size of partition 1 = 192Ø?                 <--                      24Ø
      Starting block = 24Ø?                                        192Ø
      Read only (no)?                                        1344Ø
   Size of partition 2 = 536ØØ? 1344Ø          <--                    1336Ø
      Starting block = 216Ø?                                     268ØØ
      Read only (no)?                                        ------
   Size of partition 3 = Ø? 1336Ø              <--                    5576Ø
      Starting block = Ø? 156ØØ
      Read only (no)?                          (total sizes of partitions
   Size of partition 4 = Ø? 268ØØ              <--          = Capacity in blocks)
      Starting block = Ø? 2896Ø
      Read only (no)?
Number of boots = Ø?
Number of spare blocks = 46?
Enter map for spares (#, bad, Ø or free, or done):
   Spare Ø (block 3) = diag ? done
#
```

CHAPTER 5

WD CONTROLLER:

The WD Controller will support all 32:16, PS's, XP's, SX's and Expansion
Cabinets. WD Controller must be part #1000079-06 on all Fortune Systems.

When the system needs data files or software loaded into memory, the 68000
microprocessor transfers the address of the file it wants and the location in
memory where the file is to be stored to the WD controller. The WD controller,
through commands from its own microprocessor, finds the data on the disk, loads
it into the designated memory location via a DMA transfer, and notifies the
system when the transfer is completed.

If a defective controller writes garbage to the disk, it usually overwrites the
I.D. fields on one whole track. A good WD will still report these blocks as
being hard errors. The only way to restore the I.D. fields is to do a format
track (ft) using diagnostics, passing the first block in the list of successive
bad blocks (I.D. not found) as the address to start. Any data in these blocks
is gone.

CHAPTER 6

FLEXIBLE DISK DRIVE

The flexible disk stores data and programs on removable magnetic media (floppy disk) so that information in the system can be more easily safeguarded and transported. The flexible disk subsystem is the means used to enter the initial system software, and to backup and archive both system software and data files.

<u>Description</u>

The flexible disk subsystem consists of a flexible disk controller chip, associated timing and control logic, a 2K buffer RAM, and one 800K byte flexible disk drive. Data is transferred to and from the subsystem in 1K byte blocks, one byte at a time.

Fortune Systems has used drives manufactured by Tandon, Shugart and Tec. Most Fortune Systems contain Shugart drives which can be distinguished by the tongue which hangs from the top of the drive door. The exception to that is the XP30, XP45, SX45, SXT45, SX70, and SXT70 systems which use a TEC half-height floppy.

****

Drive transfer rate;   250 kilobytes per second
Average access time ;   120 milliseconds

****

Flexible disk requirements;   Double sided/Double density
                                        Soft sectored
                                        77/80 tracks per side
                                        100/96 tracks per inch

****

To Format floppy Disk enter;

        # /etc/format -c /etc/disk/flop.conf /dev/fd00 <cr>
        # /etc/mkfs /dev/fd02 790 2 10
                    OR
        # /m/sysutil/bin/format

****

To check floppy disk for I/O status or bad blocks, enter the following;

        # dd if=/dev/fd02 of=/dev/null bs=1k <cr>

Result should be: read I/O error
                    790 records in
                    790 records out

NOTE: MOST FLOPPY DRIVE PROBLEMS ARE CAUSED BY LOW QUALITY MEDIA OR MIS
        HANDLING

Floppy Disk Errors

The floppy driver error messages are shown on the monitor only if a user sets the system debug flag using the chlog command. Each message starts with the upper case identifier (except "Floppy drivers") message followed by a colon. The first id is the procedure name in the floppy driver, which should be ignored by users. Most of the error messages also print out the unit number, cylinder number, track and sector numbers whenever appropriate.

Supported Floppy Drives
    Tandon, Shugart, Qume, CDC, Tec, Other B or Other C. If the floppy driver can not figure out the type, it will print "*****"

CHKSPARES: out of spare blocks for unit_____
    Tried to spare a bad block, but ran out of spare blocks

CMDONE: pending C 0
    An interrupt is received from the currently executing command, but the driver does not know what the command was.

FDICMD: failed after three tries
    Failure in sending a command to the FDC chip even after 3 tries.

FDICMD: timeout on RQM = ____ and DIG = ____
    Timeout error in reading from the FDC chip.

FDBEGIN: impossible state ____ for unit ____
    The floppy driver is in a unknown state. Probably the floppy driver has a bug.

FDINIT: unit ____ recalibrated
    This informative message comes out when the driver check if a drive is attached to the syst--. If successful, it prints "and exits". If not, _ prints "and failed, no track zero".

FDINTR: Recalibrate error on ____ (unit)
    Recalibrating on the floppy failed after 2 tries.

FDINTR: error formatting track on unit ____, cyl=____ sec=____
    Formatting a track failed. The message shows the unit number, cylinder number and sector number where formatting fails.

FDINTR: fatal seek error on ____, cyl = ____
    If the seek failed try doing a recalibrate once and then reseeking to the correct track. If it fails a second time this error comes out.

FDINTR: spurious floppy interrupt, unit ____
    The driver is interrupted while it is idle.

FDINTR: unit ____ interrupted, but does not exist
          An interrupt is caused by an attached drive. Please
          ignore this message.

FDINTR: unknown state:____
          The driver has a bug.

FDSTAT: timeout on RQM
          Reading from the FDC chip failed within a giver time.

FINDBAD: no more spares
          Find the next available spare block in the
          configuration block, but none was found.

FLOPPY DEBUGGING DISABLED:
          Chlog debug flag enabled for floppy error message
          printing.

NEWBAD: block ____, spared to ____ on unit
          This message is just for your information. A new bad
          block is entered in the bad block map table.

NEWBAD: table full, no room for ____, spared to ____
          A new bad block is being entered in the bad block map
          table, but no entry is available in the table. This
          message must follow the previous message.

SOFTERR: hard error on ____, cyl = ____, sec ____
          Retries have failed after soft error. The driver will
          try to spare the hard error blocks.

SOFTERR: off of cylinder on unit ____
          Soft error detected. The driver will retry to correct
          the soft errors.

SOFTERR: no more spares on unit ____
          Tried to spare the block which has a hard error, but it
          cannot be spared since the error was in the critical
          area (configuration block, spare block area) or run out
          of spare blocks.

CHAPTER 7

The memory is used to store the system programs and data for use by the microprocessor. The information stored in memory is organized in 16-bit words; each word is divided into two 8-bit bytes. Each byte has an individual 24-bit address associated with it, starting with location 0 and continuing through the last location in memory. Each byte of data stored in memory has a parity bit for error detection.

The 32:16 has a minimum memory capacity of 512KB expandable in 256KB increments to a maximum capacity of 3.5 megabytes.

MEMORY BOARDS: Date code (located on top of chips).

Memory cycle time   4 cycles at 180 nanoseconds for a total
                                            of 720 N/S

Symptoms	Solutions
Panic Parity err. mesg. At PC 0x____double parity	When this error is detected refer to PC# To determine what memory board is bad. (Refer to Field Service Manual page 7-10). Run memtest of diagnostics.
Pre-1.7.4.2, various kernel error messages (such as parity and double parity) may be errors in user's program	If swapping memory bd. does not resolve problems then refer to the number in the brackets ([]). If the number is [0xA,1 or 2] then more than likely the problem is a memory board. If number is [0x3] then the problem is coming from I/O ports. If number is [0x4 or 5] then the motherboard may be bad. Running diagnostics will help pinpoint problem.
Falsely reported as crashes.	As you can see, this error can be caused by many things and will take diagnosing as well as troubleshooting.

****

Single user system is running very slow. Also lots of processes running simultaneously.	Suspect a bad memory board. Run memory diagnostic and replace defective memory board if defective.

****

No boot: High pitched noise, screen full of green lines.	Possible bad memory in slot 1. Run memory diagnostic.

CHAPTER 8

VIDEO CONTROLLER BOARD

Video controller is usually located in slot A of DMA slots.

Contrast adjustment is a blue trim potentiometer on the top of video controller.

****

<u>Symptom</u>   <u>Solutions</u>

Hangs intermittently. After   Try swapping out video controller
reset same screen appears.   board, may be defective.
No keyboard input.

CHAPTER 9

C o m m A   B O A R D

CommA without proms (located at A7 and A9) must always go in DMA slot PB on mother board.

CommA with proms can go in any DMA slot.

Comm6 may also go in any DMA slot.

****

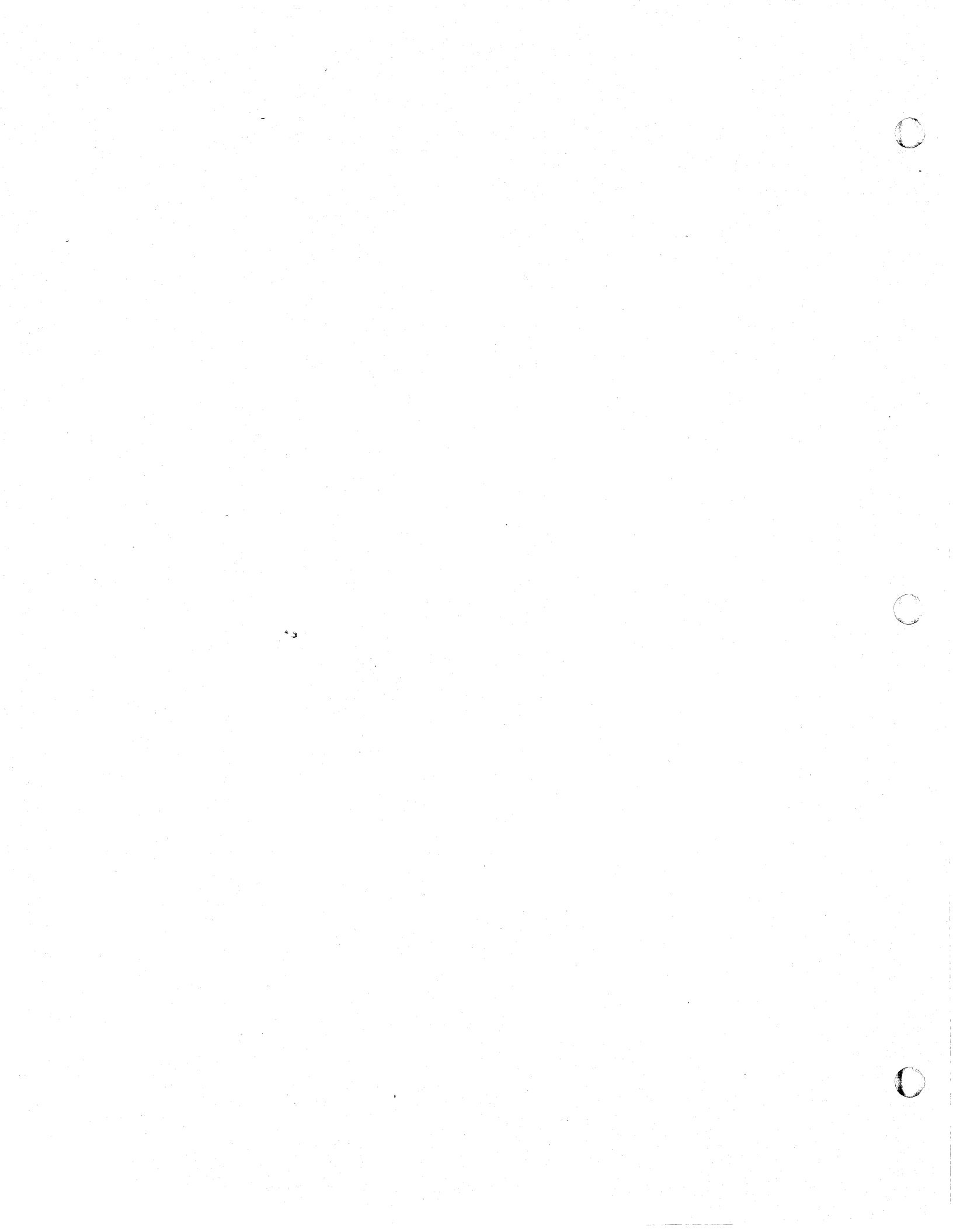| Symptom	Solutions
Will not run 4.0 diagnostics.	External loopback connector is required for port under test. 'External jumper' refers to jumpering pintwo to pin three of the port(s) to be tested. Any type of jumper may be used, and allows the data driver and receiver to be tested.

CHAPTER 10

P R I N T E R S

Fortune Supported Printer:

NEC 7710 tractor feed
NEC 7710 with single bin sheet feeder
NEC 7710 with dual bin sheet feeder

NEC 3510 tractor feed
NEC 3510 with single bin sheet feeder
NEC 3510 with dual bin sheet feeder

NEC 3510R tractor feed
NEC 3510R with single bin sheet feeder
NEC 3510R with dual bin sheet feeder

IDS PRISM 132
IDS PRISM 80

DIABLO 630 HPR05 tractor feed
DIABLO 630 HPR05 with single bin sheet feeder

HP LASER JET (interface software only)

Fortune Compatible Printers (not supported)

EPSON
TOSHIBA 1350
PRIMAGE (emulates DIABLO 630)
OKIDATA PACEMARK 2410
GENICOM 3404
MANNESMAN TALLY

CHAPTER 11

ASCII AND CONSOLE

Zenith and Elston CRT's

****

Current drawn from ascii;   24 amps. or 120 watts

****

Baud rates are designated by letters   i = 1200
when setting up the device table;   j = 2400
                                              k = 4600
                                              l = 4800
                                              m = 9600
                                              n = 19200

****

When hooking up terminal   It is advised to use a short haul modem
or printer over 50 feet.   or a signal booster every 50 feet. You
                                  may also adjust the baud rate to match
                                  the length of cable (see below).

Cable	Baud Rate
50'	19200
100'	9600
150'	4800

```
[=- _
[=  -_      yoke
[=   -_       | coil
[=    -_      | /
[=     -_     |/        *   *
[=      -I===I-[-]****#__#_____
[=       I===I [ ]     #   #          }}
[=      I===I-[-]****#__#_____
[=     -       /      *   *
[=    -      /
[=   -_    /          \___Screen
[=- _                     Control
        Rotating Adj.
           /
```
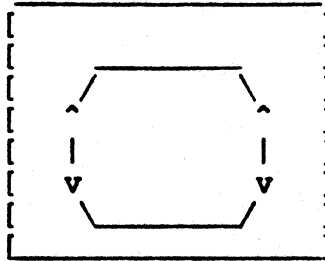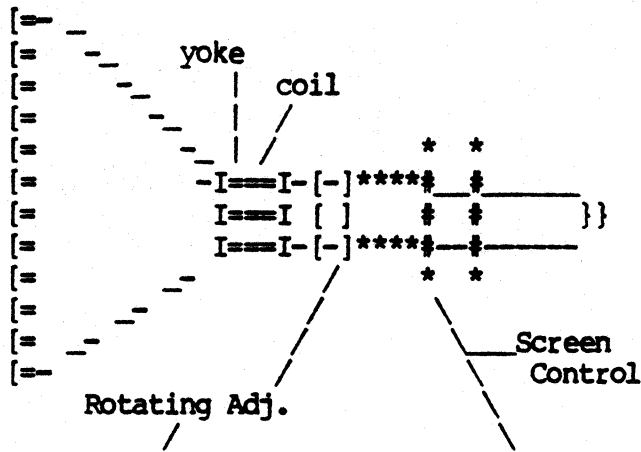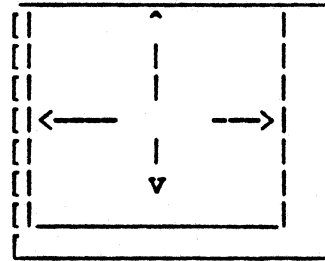
```
   [              ]    [|        ^        | ]
   [              ]    [|        |        | ]
   [    / ‾‾‾ \   ]    [|        |        | ]
   [   ^       ^  ]    [|<———    |    ——>| ]
   [   |       |  ]    [|        |        | ]
   [   v       v  ]    [|        v        | ]
   [   \ ___ /    ]    [|                 | ]
   [              ]    [                   ]

        (A)                    (B)
```

(A)   If screen is slanted and out of alignment, you would make an
      adjustment here. When turning adjustment knob, screen moves
      in the same direction that you are twisting!

(B)   If screen seems to be out of alignment, and off in one
      direction, you would use this adjustment. This is done by
      moving the two levers towards each other or in opposition to
      each other. If there is another set of levers, they are for
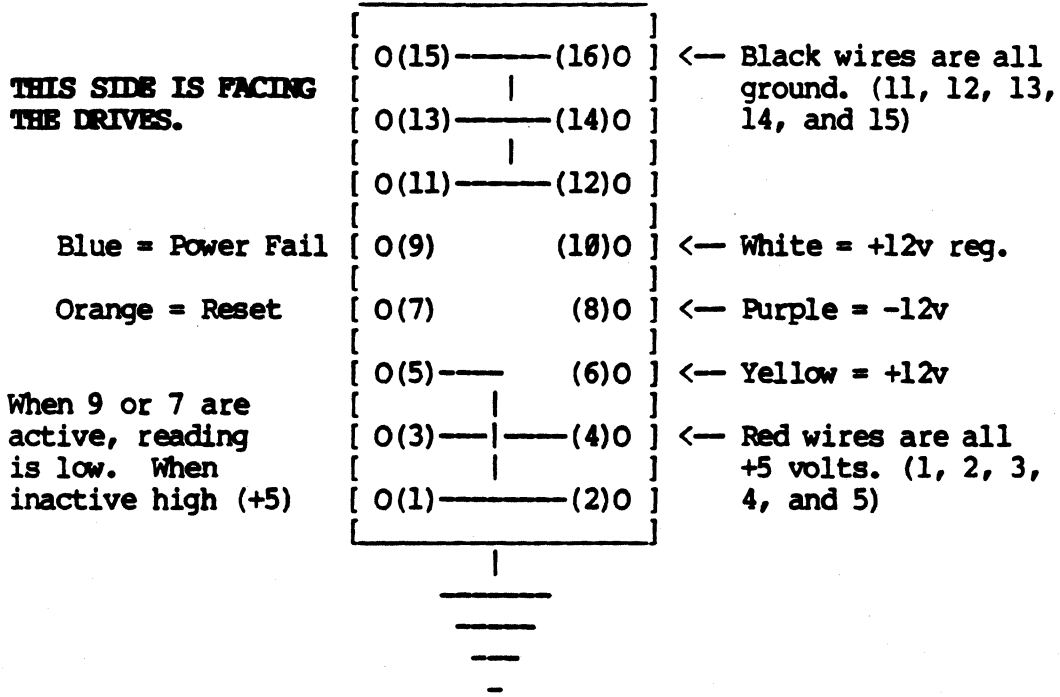   finer tuning of alignment!

CAUTION HIGH VOLTAGE!!

CHAPTER 12

Zenith and Western Electric Pin Identification for Mother Board Connector

```
                              Top View
                    _____
                   [                         ]
                   [ O(15)------(16)O ]  <-- Black wires are all
THIS SIDE IS FACING[          |              ]     ground. (11, 12, 13,
THE DRIVES.        [ O(13)------(14)O ]          14, and 15)
                   [          |              ]
                   [ O(11)------(12)O ]
                   [                         ]
        Blue = Power Fail [ O(9)     (10)O ]  <-- White = +12v reg.
                   [                         ]
        Orange = Reset    [ O(7)      (8)O ]  <-- Purple = -12v
                   [                         ]
                   [ O(5)----    (6)O ]  <-- Yellow = +12v
When 9 or 7 are    [        |          ]
active, reading    [ O(3)--|----(4)O ]  <-- Red wires are all
is low.  When      [        |          ]     +5 volts. (1, 2, 3,
inactive high  (+5)[ O(1)------(2)O ]       4, and 5)
                   [_____]
                              |
                       _____
                        _____
                         ___
                          _
```

When the system is turned on, the AC current drawn may exceed the normal operating current. The surge current entry in column nine of chart below, gives the typical power-on current requirements for common system components.

UNIT	LINE VOLTAGE (VAC)			LINE FREQUENCY (HZ)			CURRENT (AMPS)	
	LOW	/NOMINAL/	HIGH	LOW	/NOMINAL/	HIGH	NORMAL	/ SURGE
CPU	90	120	130	47	60	63	4.0	30
EXPANSION CABINET	90	120	130	47	60	63	1.5	30
FIS	90	120	130	47	60	63	0.5	1.5
NEC 3510	90.75	120	132.25	45/48	50/60	75/90	2.5	
NEC 7710	97.75	120	132.25	45/48	50/60	75/90	3.5	
GE 3404	97.78	120	132.25	48	60	65	2.0	

Surge, or in-rush, currents can exceed maximum ratings by a factor of ten or more. The time rate of change of in-rush current is the quantity of importance here. For example, some circuit breakers are more sensitive to in-rush rates than others, so that one installation may find circuit breaker tripping when two CPUs are turned on simultaneously, while another site with equivalent equipment may not.

Update

The forward edge of the Western Electric Power Supply was covered with a plastic solution to protect the 12 volt line. The front end of top cover made contact with the power supply.

Caution

The power supply must be checked with a sufficient load. All connectors should be connected to the device (motherboard, hard drive and floppy) before voltage checks are made at the connector end or power supply.

POWER SUPPLY REQUIREMENTS

POWER SUPPLY VENDOR/MODEL NUMBER	POWER SUPPLY PART NUMBER	POWER (WATTS)	CURRENT AVAILABLE (AMP)			
			+5V	+12V	-12V	+12VR
DIGIPOWER MODEL	1003922-01 &-02	300	35.0	7.0	1.0	1.5
WESTERN ELECTRIC MODEL CS 720A	1001851-01 &-02	250	32.0	5.0	1.0	1.5
ZENITH MODEL 12-1	1000050-03 &-04	218	28.0	4.0	1.0	1.5
ZENITH MODEL 12	1000050-01 &-02	188	22.0	4.0	1.0	1.5

POWER SUPPLY (Western Electric or Zenith)

Current shutdown (5 volt line) occurs at 32 amps in a running state.

Shutdown (5 volt line) occurs if DC voltage is greater than or equal to 5.75 - 6.0 volts DC in a running state.

Zenith Power supply only- PFL will catch a missing cycle or low level AC voltage.

Minimum Holdup Time:

@ 115 VAC - approximately 20 MSEC from the time power went off.

@ 90 VAC - 5 MSEC.

AC inrush current will no exceed 30 amps AC for two cycles or less.

CURRENT REQUIREMENTS AND HEAT DISSIPATION
OF POWER SUPPLIES

A ITEM	B SUBASSEMBLY	C I/O SLOT USED	D CURRENT +5V	E HEAT BTU/HR
1.	Mother Board			
	PS or XP	- - -	8.65 A	225
	SX	- - -	8.45 A	220
2.	R A M Board Memory	- - -	- - -	
	Size	- - -	- - -	
a.	256K	- - -	1.70 A	45
b.	512K	- - -	.70 A	20
c.	1MEG	- - -	.90 A	23
3.	Video Monitor	- - -	.25 A	62
4.	Key Board	- - -	.20 A	5
5.	Hard Disk Dr. Vendor Dr.Type	- - -	- - -	
	Seagate A5/A10	- - -	1.20 A	126
	Miniscribe B5/10/20	- - -	1.23 A	126
	Ampex C5/10/20	- - -	1.06 A	145
	Disctron I20	- - -	1.06 A	159
	CDC J20/30	- - -	.60 A	120
	Micropolis M45/N70	- - -	.75 A	167
	Rodime R5/10/20	- - -	1.06 A	145
6.	Floppy Disk Drive			
	Tandon (Full Height)	- - -	.65 A	64
	Shugart (Full Height)	- - -	.65 A	64
	TEC (Half Height)	- - -	.40 A	41
7.	Tape Unit (Half Height)	- - -	2.05	151
8.	Comm-A Controller	1	.75 A	20
9.	Intl. Async. Controller (6 port)	1	1.85 A	120
10.	Comm B Controler (Bisync)	1	2.65 A	60
11.	Monochrome Graphics Controller	1	5.00 A	185
12.	Video Controller	1	1.80 A	46
13.	Local Area Network Controller	1	2.50 A	55
14.	PI/O Controller (Tape Expansion)	1	2.95 A	76
15.	Hard Disk Controller (WD)	1	3.45 A	89
16.	SCSI H/A Controller	1	3.20 A	N/A
17.	SCSI ST506 Controller		1.35 A	N/A
18.	SCSI OIC36 Controller		1.85 A	N/A

U P S

Output rating: 350 watts or 350 VA (System capacity; minimal)
Backup time: 10 minutes
Transfer time from line to backup battery: < 8 MSEC. (must not trip Power Fail).
Output voltage: 120 VAC

NOTE: Output Rating- The watts are for the CPU only, the ASCII terminals and printers are not included.

Backup Time- This is a minimum period of time.

Transfer Time- Naturally, the faster the UPS kicks in, the better. The time here is within a 1/2 cycle (Zenith) 1 cycle (Western Electric).

LINE CONDITIONER

Load Rating	5 amps minute
Output Voltage	120 VAC
Load & Line Regulator	1090
Minimum Line Input	85 VAC

It is advised when hooking up an uninterruptible power supply that it be a certain voltage.

Must be between 500 and 600 watts. Kilo-volt amps. .5

****

SURGE SUPPRESSOR

Clamping level, 200 volts, peak energy dissipation, 13.5 peak pulse power typical switching time, ≤ 5 nanoseconds. U.L. listed.

CHAPTER 13

MEASUREMENTS

Unit	Length (inches)	Width (inches)	Height (inches)	Weight (pounds)
HTS CPU	23	14	7	30
STS CPU	22	14	6	30
Expansion	22	14	6	30
High Profile Keyboard	22	6	2	6
Low Profile Keyboard	22	8	2	-
Monitor	12	14	13	12
FIS	12	14	13	15
NEC 3510	24	16	9	38
NEC 7710	25	19	9	46
GENICOM 3404	24	16	5	45
HP Laser	19	28	12	71

Notes: Table entries are rounded up to nearest inches and pounds.

Unit	Temperature (operating)	Temperature (storage)	Humidity (%relative)	Maximum Alt.(feet) above sea level (oper.)	(stor.)
CPU	50 to 104 F	14 to 140 F	20 to 80	10,000	39,000
EXPANSION CABINET	50 to 104	14 to 140 F	20 to 80	10,000	39,000
MONITOR	50 to 104 F	14 to 140 F	20 to 80	10,000	39,000
FIS	50 to 104 F	14 to 140 F	20 to 80	10,000	39,000
NEC 3510	40 TO 100 F	-22 to 158 F	20 to 80	10,000	25,000
NEC 7710	40 to 100 F	-22 to 158 F	10 to 85	10,000	25,000
GENICOM 3404	40 to 100 F	-40 to 71 F	20 to 80	10,000	25,000

CHAPTER 14

DEFINITIONS

ABSOLUTE LOADER
A program that contains the instructions necessary to allow the system processor to load the operating system into memory.

ACCESS TIME
The time required to retrieve information from the computer.

ADDRESS
A number specifying where a unit of information is stored in the computer's memory.

BAUD
A unit of signaling speed equal to the number of code elements per second. For practical purposes it is now used interchangeably with "bits per second" as the unit of measure of data flow.

BIT
An abbreviation of binary digit. The smallest unit of information that the computer recognizes, a bit is represented by the presence or absence of an electronic pulse, 0 or 1.

BLOCK .
Is a data grouping whose size varies depending on the usage. A program may arbitrarily choose a block size. In reference to a disk device the block size will usually be a multiple of the physical sector length.

Use care when referencing to block number, that everyone uses the same definition. Do not confuse block numbers reported by higher layers of program (kernel for example), they may not be the same.

BOOTSTRAP LOADER
Contains the instructions necessary for the system to access and read the absolute loader from permanent storage media. Also contains diagnostic routines executed during IPL.

BUFFER
An area reserved for the temporary storage of data.

BUG
Any mechanical, electrical, or electronic defect that interferes with the operation of the computer. May also be a defect in the coding of a program.

BYTE
A group of adjacent bits, such as 4, 6 or 8 bits, operating as a unit. For example, a six-bit byte may be used to specify a letter of the alphabet, and and eight-bit byte may be used to specify an instruction or an address. Normally shorter than a word. Unless otherwise indicated a byte is normally assumed to be 8 bits long.

CABLE
A collection of wires bound together in a protective sheath with a connector at each end used to carry a signal from one place to another.

CHARACTER
The term "character" refers to the signals that a terminal keyboard can produce. Blanks or numbers or special symbols are all "characters". Shifted and unshifted keys and control keys are all different characters, e.g., H, h, and ^H are three different characters produced using the H key. Characters are also commonly referred to as "bytes".

CHARACTERS PER SECOND (CPS)
Used as a rating speed for printers.

CHIP
A thin silicon wafer on which electronic components are deposited in the form of **integrated circuits**. Technologically, the key to the microelectronic revolution in computers.

COMPILER
A program that translates the high-level-language statements of a program into machine-readable form.

COMPUTER SYSTEM
A computer system is an arrangement of hardware and software designed to do a particular job or set of jobs. Computer systems are "configured" (component parts are selected and arranged) to serve a particular set of users' needs. Some computer systems are designed to serve hundreds of people simultaneously. What services are provided by a particular computer system depends on what features the designer decided were necessary.

CONFIGURATION BLOCK
The layout of hardware that makes up any particular computer system. Also the area defining the type of disk drive being accessed and spares available.

CONTROL UNIT
Includes system logic, memory device interfaces, and storage capability in the form of hard disk or flexible disk drives.

CONTROLLER BOARD
A printed circuit board (found in option slots on motherboard) responsible for decoding and transmitting commands from the system to I/O devices as well as reporting status of the I/O device to the system.

CPU (Central Processing Unit)
The part of the computer that controls the interpretation and execution of the processing instructions.

CRASH
Sometimes called a head crash. This is when the read/write head that "floats" above the surface of the hard disk comes into physical contact with the disk due to some electrical or physical disturbance.

CRT
Often used as a short form of "CRT terminal". CRT stands for "cathode ray tube", and refers to the television-like screen used to display typed characters. CRT-type terminals are very fast and very quiet compared to printer terminals.

DAM NOT FOUND
The I.D. field is followed by a user (Fortune) supplied data field. A typical track format is based on 16 or 17 sectors per track, each having 512 bytes of user data. The data address mark is a unique MFM (Modified Frequency Modulation) encoded data pattern to signify the start of a data field, plus establish byte synchronization.

DATA
The raw information within a computer system.

DATA BASE
A collection of interrelated data that is organized for ease of update and retrieval. For example, a personnel database would include information such as employee names and Social Security numbers.

DATA SEPARATION
The I.D. plo sync fields of all zeros required by Fortune's WD controller. Phase locked oscillator/data separator to become phase and frequency synchronized with MFM (Modified Frequency Modulation) recorded data (flux referrals on the media).

DEBUG
To locate and correct any errors in a computer program, and/or to detect and correct malfunctions in the computer itself.

DIAGNOSTICS
Programs for detecting and isolating a malfunction or mistake in the computer system; features that allow systems or equipment to self-test for flaws.

DIRECTORY
"Directory" is a UNIX term referring to a file that contains other files. It is used to cluster files that belong together for some reason.

DISK (or: Magnetic Disk)
A "disk" is a storage place for files. Disks rotate like a phonograph records and store files (streams of characters) as magnetic patterns on the disk surface. Storing a file on a disk is called "writing the file to disk".

DISK DRIVE
A piece of hardware that houses several magnetic disks and keeps them spinning so that information can be read from or stored on the disks.

DISKETTE (Floppy Disk)
A removable magnetic media that stores data and programs so that information in the system can be more easily safeguarded and transported.

DOWNTIME
The period during which a computer is not operating or is malfunctioning because of a machine fault or failure. Downtime consists of repair delay time, repair time, and machine-spoiled work time, as opposed to available, idle, or standby time, in which the system is functional.

DYNAMIC SPARING
The controller sends the status register to the host indicating the bad block bit is on. The operating system records the bad block to the configuration block, moves the data to another block, and returns status to the controller indicating the new block number of the data. This is transparent to the user. The Fortune system does this only if configuration table is set to free (we suggest that you spare a block manually) since there are 16 or 17 sectors per track, Fortune can spare a sector and/or all the entire track; each sector has 512 bytes per.

EAPROM
Electrically alterable programmable read only memory. Often used as a synonym for EPROM.

EAROM
Electrically alterable read only memory. Often used as a synonym for EEROM.

ECC ERROR (Error Correction Code)
Although the implementation of error detection and correction is quite complex, the concept is simple. According to F. Beruekamp "error correcting codes enable a system to achieve a high degree of reliability despite the presence of noise." Correction bytes are calculated and appended to each data field written to hard disk. An ECC Error indicates that an incorrectable ECC Error was encountered in a data field during a read sector command.

ECHO
The system usually "echos" typed characters on your terminal screen, so you can see what you typed. In certain cases, however (e.g., when you type your password), the system may judiciously refuse to echo the characters you type.

EEROM
Electrically erasable read only memory. Read only memory which can be erased by passing an electrical current through it and then reused, ie new data entered. Often used as a synonym for EAROM.

EPROM
Erasable programmable read-only memory. PROM which can be erased for reprogramming.

EXECUTE (or Executing)
The term "execute" is used in the computer community to mean "perform" or "make it happen". The phrase "the currently executing program" means "the program that is currently in operation". When you issue a command to UNIX, you request the execution of a program whose name is the first word you gave. For example, if you issue a "cal" command to obtain a calendar, you are "executing the cal program".

FACILITY
A program or set of routines loaded into memory to assist the operating system during certain functions. An example of a facility is the COBOL interpreter.

FIELD
A specified area of a record used for a particular category of data, e.g., an area of a format designated for wages.

FILE
A "file" is an arbitrarily long sequence of characters. A file on a computer system is equivalent to a file-folder in a manual filing system, and like a file folder, a file can be empty or it can contain enormous quantities of text. Files are often stored on magnetic disks.

FILE CONTROL BLOCK (FCB)

An area of memory set aside for the storage of FID information while a file is being accessed.

FILE IDENTIFIER (FID)

The 64-byte disk file directory entry for individual disk or disk or diskette files. The FID contains the filename, its beginning and ending addresses, the locations of various file pointers, the format and length of records, and other information to control use of the file.

FIRMWARE

A chip or group of chips containing nonvolatile program instructions and/or routines that are extended by a processor.

FLOATING POINT

Refers to the position of the decimal point in numbers stored in a computer. For example, instead of storing 111.23 and 1112.3 in this form, they may be stored as 1.1123x10 and 1.1123x10.

HARDWARE CONFIGURATION

That collection of hardware that makes up any particular system.

HARD DISK

The 5 1/4" Winchester disk drive. The hard drive is a rotating memory, mass storage unit with non-removable media.

HARD ERROR

When reading a block of data, if the data cannot be read on the very first try, a bit is posted into the status/error registers. The disk will attempt to read the data again and again for a total of 16 times. If unsuccessful, the disk will recalibrate its heads to track position, by homing to track 0 and then returning to the track it just came from to then attempt another 16 read operations on the problem block of data. If still unsuccessful, the WD controller will post an additional bit to its status/error registers (bad block bit to the kernel) and no further attempts will be made to read the data. This is the extreme case of complete failure to read data and will result in a hard error. This will cause the Fortune System to halt.

I.D. Not Found

The disk storage format is of a soft sectored type, which means that the beginning of each sector is defined by a pre-written identification (I.D.) field, which contains the logical sector address, plus cylinder and head information. I.D. Not Found is the error that occurs when the I. D. field is not readable.

INITIALIZE
The process of establishing hard disk and flexible disk parameters according to a specific format.

INTEGRATED CIRCUIT
A macroscopic multi-layered silicon construction which duplicates the function of several to several hundred components, encased in a protective shell with wire connectors for mounting in a printed circuit board.

INTELLIGENT CONTROLLER
A controller board which contains a microprocessor capable of executing firmware programs contained in integrated circuits on the same printed circuit board.

INTERFACE
The juncture at which two computer entities meet and interact with each other; the process of causing two computer entities to intersect.

I/O
Abbreviation for input/output. The process of transferring information from an external source to the computer or from the computer to an external source.

I/O BUFFER
An area used for temporary storage of data being transferred between disk and peripheral devices and memory.

K
Computerese for the quantity 1,024.

KERNEL
That part of other operating system that is always available for use by any program and is in memory at all times.

LOGICAL BLOCK
Data organized the same as a block but referenced differently.

LOGICAL MEMORY
That portion of memory that at any one particular moment can be accessed by the processor.

LOGICAL SECTOR
The same as a physical sector but references the physical start of the track, and may be interleaved in relation to the physical sector.

MACHINE CODE
The symbols that designate a basic computer operation to be performed.

MAGNETIC TAPE DRIVE
The mechanism that moves magnetic tape past sensing and recording heads and associated electronic and electrical equipment. Most tape drives provide for tape to be wound and stored on reels.

MAINFRAME
A large computer, as opposed to minicomputers and microcomputers.

MAPPING
Procedure used to specify logical memory area partition for each job out of the available physical memory.

MEGABYTE
Abbreviated mb; represents 1 million bytes of data.

MEMORY
The section of the computer where instructions and data are stored.

MEMORY CAPACITY
The maximum number of storage positions in a computer's memory. Typically, a microcomputer can have up to 64K bytes of memory.

MICROCOMPUTER
A small computer in which the CPU is an integrated circuit deposited on a silicon chip.

MICROPROCESSOR
A single integrated circuit containing timing, instruction decoding, interrupt decoding, several accumulators, arithmetic logic unit, and data and address bus connections. Functions in a manner similar to a discrete component computer.

MINICOMPUTER
A computer that is usually larger, more powerful, and costlier than a microcomputer but is not comparable to a mainframe in terms of productivity and range of functions.

MODEM
A telephone hookup device that converts computer signals so that they can be sent over telephone lines; this allows microcomputers to communicate with larger systems, such as time-sharing networks.

MOTHERBOARD

A printed circuit board with mounted connectors that serves as a connection point for several other printed circuit boards.

MULTI-USER SYSTEM

A computer system designed to be used by more than one person at a time. Contrast with: "single-user systems" or "personal computer".

MULTI-TASKING

A system running more than one process at any given time. For example Fortune Windows runs multi-tasking.

OPERATING SYSTEM

A series of programs, generally provided by the computer manufacturer as part of the computer system that controls the physical operations of the computer, such as printing and accepting input from the keyboard.

OUTPUT

Output is a general term applying to any situation in which the computer system supplies text or information to you (a user). Paper printout produced by a line printer is called "output"; the display resulting from a CAL (calendar) command is also called "output".

OUTPUT DEVICE

Any device capable of receiving information from a central processor. It may be some form of backing storage, or a peripheral unit which 'translates' information into another medium , eg a line printer or VDU.

PAL

Phase Alternate Line. This refers to one of two European standards for colour television broadcasting (the other is SECAM). It is also used in Australia and South Africa.

PARTITION

A collection of blocks of physical memory.

PASSWORD

A secret code associated with each username on a computer system. Usually only the user and one other person (the system owner or account manager) know the password for a particular account.

PERIPHERAL
A device, such as a video display screen, a printer used for displaying data, or for entering data into or retrieving it from the computer system.

PERMANENTLY ADDRESSABLE MEMORY
The portion of memory that is addressable at all times.

PHYSICAL ADDRESS
The drive is organized into physical groups of data:

> 1. Byte: Byte refers to an 8-bit data representation. A disk cannot usually address this small an element directly but manufacturer can specify a byte count, usually referenced from the start of index or start of a sector.
>
> 2. Sector: smallest uniquely addressable data group.
>
> 3. Track: A string of sectors on one surface which rotate under a single head.
>
> 4. Cylinder: A group of tracks. The maximum amount of data which can be accessed without seeking.
>
> 5. Head: Each surface has a dedicated device called a head, which is used to write and read the recorded data.

PHYSICAL MEMORY
The memory that is available to the system via the use of mapping techniques.

PHYSICAL MEMORY BLOCK
An area of physical memory that is 2K in length. The smallest area of memory that can be "mapped in".

PORT
The entry channel to a processor through which one or more devices capable of communication with the processor may be physically attached.

PORTABLE
This describes software that can be moved from one computer to another. Usually refers to source compatibility.

PRINTED CIRCUIT BOARD
A nonconductive construction that usually has conductive runs or wire attached to it or laminated on it, which may be drilled to facilitate the mounting of various electronic components.

PRINTER
Peripheral device available for output; produces "hardcopy" (printed paper copy) of information.

PROCESSOR
A device capable of receiving and manipulating data according to an externally or internally stored program.

PROM (Programmable Read-Only Memory)
Used to store program instruction routines that are used repeatedly by the processor (i.e., do not change).

PSOFT ERROR
A correctable error was found in the sector indicated during the first read. The test aborts and goes immediately to the next sector.

RAM (Random Access Memory)
An integrated circuit device capable of storing data or instructions.

REALTIME
A term referring to a system in which data is processed as soon as it is entered into the computer.

REGISTER
A term used to describe a unit of memory available for storing a group of bits or characters.

ROM (Read-Only Memory)
An integrated circuit that permanently stores program instructions.

RMA
Returned Materials Authorization. A form which allows a replacement for a damaged part or system to be sent before the customer has returned any merchandise.

SECTOR
Represents an area on the hard disk or flexible disk.

SEMICONDUCTOR
A material with a conductivity between that of a metal and an insulator; for example, silicon. It is used in the manufacture of solid-state devices such as diodes, transistors, and the complex integrated circuits that make up computer logic circuits.

SESSION (or On-line Session)
The term "session" is used to refer to any period of time spent interacting with a computer system.

SHELL (or The Shell)
"The Shell" is the name of the UNIX "command interpreter". The shell is a program that accepts commands from you and tries to act on them (interpret them).

STAND-ALONE
This describes software that can perform a certain function without the support of another program. For example, a payroll package may be described as stand-alone when it runs independently of a general-ledger package.

SOFT ERROR
Arrived at by the Fortune diagnostics (hd test). This means the WD controller recovered the data with ECC. This is actually a hard but recoverable error.

TERMINAL
A peripheral device through which information is entered into or extracted from the computer.

TERMINATOR
A 220/330 ohm resistor pack or 1k for drives w/expansion cabinet. The last drive in a daisy chain must be terminated with a 220/330 ohm resistor pack.

TRACK ZERO
The driver will always attempt to maintain the heads over the recording zone of the media (i.e., at or between track 0 and maximum track) in Fortune's case, track 0.

THROUGHPUT
A measure of the amount of work that can be accomplished by the computer during a given period of time.

TIMESHARING
A method for more than one person to use the computer simultaneously at separate terminals within a given period of time.

TRACK
An area on the hard disk or flexible disk, divided into sectors.

TRAILER BYTES
Two-byte overhead applied to the end of each record, used in conjunction with a two-byte header to indicate record length, delete, and lock status, and other record information. In order for the system to successfully read a record the header and trailer bytes must correspond.

TSOFT
A "True" soft error as defined by industry usage ie. The error did not occur upon retry.

TURNAROUND TIME
The measure of time between the initiation of a job and its completion by the computer.

WORKAROUND
An acceptable patch to an individual subassembly to ensure system reliability or a procedure to alleviate an error (i.e. Don't Do...)

WRITE CURRENT (CDC)
A logical 1 of the write gate signal enables the write driver and initiates recording of the contents of the write data lines onto the media.

APPENDIX A

This procedure details the steps required to enter maintenance mode on volume 1 of the Single User FOR:PRO floppy disk set. This procedure assumes the hardware is functioning properly and that Volume 1 of the Single User FOR:PRO floppy disk set is not damaged.

This procedure is identical to the cold boot procedure up the step where the Cold Boot Menu (Press <F1> to erase the hard disk, etc.) is displayed.

The primary reason for booting into maintenance mode on the floppy disk is because the system is unable to boot up normally on the hard disk. In maintenance mode, many software problems preventing normal boot up can be diagnosed and overcome without cold booting, which can save time and data.

Procedure: There are two types of Maintenance Menus. The type in the machine you will be working with is determined by the level of MOMROMs installed in the 32:16. If the 32:16 has MOMROMs prior to the 1.8 level you will be presented with the old text style Menu (do all Section 1). If the computer has 1.8 or greater MOMROMs installed, you will see the new ICON Menu (do all Section 2).

Section 1

1.   Insert Volume 1 of the Single User FOR:PRO floppy disk set into the floppy disk drive, and close the door. Make sure a write protect tab is not present.

2.   While holding down the <CANCEL/DEL> key, turn the power on or press the recessed hardware reset button on the front of the CPU. Continue to hold down the <CANCEL/DEL> key until the Maintenance Menu appears, then release the key. If the power-up count reaches the number 2, the Maintenance Menu has been passed, and this step must be repeated.

3.   Once in Maintenance Menu, depress F4 and press the space bar four times or until "Floppy, Drive #0" is displayed, then press F7 and type in "fd02/sa/reconf", press <RETURN> then <EXECUTE>. The system will resume counting (1 2 3) for a few seconds, and then display the Configuration Menu.

4. The Configuration Menu consists of fields and their related values. An incorrect entry in the following fields could cause problems with the operating system. They should be set as follows:

    Max process size: 256

    Set params auto?:   YES

    Appx. # of users: This field must be set to the number of terminals (including the console) that are connected to the system. A modem used for outside users to dial up the system is the same as a terminal.

    If these settings are acceptable then proceed to step 5. Otherwise, press <RETURN> until the cursor is in the proper field and make the appropriate changes. Once the settings are correct, press the <F1> function key to permanently store these changes and continue on with the rest of this procedure.

5. Press <RETURN> to move the cursor down to the **Root device** field, and type:

    fd02 <RETURN>

6. Press <RETURN> to move the cursor down to the **Swap device** field, and type:

    fd01 <RETURN>

7. Press <RETURN> until the cursor is in the **Appx. # of users** field. You must temporarily set this field to '1'. This will speed up the execution of this procedure.

8. Press <F3>. This will make the system power-up with the screen values without altering the desired normal settings which reside in the EAROM.

9. The screen will clear, and display the prompt "boot:" (or something similar) in the upper left hand corner. Type:

    fd02/unix <RETURN>

10. The power-up count sequence will resume, until the Cold Boot Menu appears (see below). This is where this procedure deviates from the normal Cold Boot procedure.

    Cold boot Release 1.8
    Select a function key:

    <F1>   To completely erase and reload you disk

    <F3>   To retry starting up the system as specified in
             Maintenance Screen

    ....   (Anything typed in will be executed as a
             maintenance mode command)
    Select:

    <u>*NOTE*</u>
    <u>DO NOT PRESS THE <F1>KEY</u>

11. Pressing the <F1> key will completely erase the hard disk. Instead, type:

    cd /etc <RETURN>

    This will drop you into Maintenance Mode, running the Bourne shell, which will prompt you with a '#'. You now reside in the directory which contains the 'mount' and 'umount' commands, used for accessing information on a floppy disk.

    It is further suggested that no maintenance mode commands be entered until a hard disk file system check has been performed. Refer to Appendix D, for explanation of the 'fsck' command used to perform the file system check.

    At this point, a variety of diagnostic and corrective procedures can be done.

    After completion of your work, proceed to next step.

12. Be sure to unmount any filesystems that you may have mounted. For example, /dev/hd02 on /h. Then type:

    sync <RETURN>
    sync <RETURN>

    This command will write any recently updated information to the hard disk. Wait 10 seconds and reset system. Be sure that you reset before you remove floppy disk. If everything went well the system will proceed normally, booting off the hard disk.

    Procedure is now complete!

Section 2

1. Insert Volume 1 of the Single User FOR:PRO floppy disk set into the floppy disk drive, and close the door. Make sure a write protect tab is not present.

2. While holding down the <CANCEL/DEL> key, turn the power on or press the recessed hardware reset button on the front of the CPU. Continue to hold down the <CANCEL/DEL> key until the ICON Menu appears, then release the key. If the power-up count reaches the number 2, the ICON Menu has been passed, and this step must be repeated.

3. Once in ICON Maintenance Menu, press <RETURN> twice until the two zero's are located underneath the diskette drive portion of the ICON. Press <EXECUTE> and "fd02/sa/reconf" will appear on ICON screen. If for some reason "fd02/sa/reconf" is not shown, type "fd02/sa/reconf" and press <EXECUTE>. The system will resume counting (1 2 3) for a few seconds, and then display the Configuration Menu.

4. The Configuration Menu consists of fields and their related values. An incorrect entry in the following fields could cause problems with the operating system. They should be set as follows:

   Max process size: 256

   Set params auto?:   YES

   Appx. # of users: This field must be set to the number of terminals (including the console) that are connected to the system. A modem used for outside users to dial up the system is the same as a terminal.

   If these settings are acceptable, press the <F5> function key. This will set the Configuration Menu to boot from the flexible disk. Otherwise, press <RETURN> until the cursor is in the proper field and make the appropriate changes. Once the settings are correct, press the <F1> function key to permanently store these changes, then press the <F5> function key.

5. The power-up count sequence will resume, until the Cold Boot Menu appears (see below). This is where this procedure deviates from the normal Cold Boot procedure.

    Cold boot Release 1.8
    Select a function key:

          <F1>   To completely erase and reload you disk

          <F3>   To retry starting up the system as specified in Maintenance Screen

          ....   (Anything typed in will be executed as a maintenance mode command)

    Select:

    > ***NOTE***
    > <u>DO NOT PRESS THE <F1>KEY</u>

6. Pressing the <F1> key will completely erase the hard disk. Instead, type:

    cd /etc <RETURN>

    This will drop you into Maintenance Mode, running the Bourne shell, which will prompt you with a '#'. You now reside in the directory which contains the 'mount' and 'umount' commands, used for accessing information on a floppy disk.

    It is further suggested that no maintenance mode commands be entered until a hard disk file system check has been performed. Refer to Appendix D, for explanation of the 'fsck' command used to perform the file system check.

    At this point, a variety of diagnostic and corrective procedures can be done.

    After completion of your work, proceed to next step.

7. Be sure to leave filesystem mounted and type full path name from hard disk. For example type:

    /h/bin/sync <RETURN>
    /h/bin/sync <RETURN>

    This command will write any recently updated information to the hard disk. Now unmount the filesystem, wait 10 seconds and reset system. Be sure that you reset, before you remove floppy disk. If everything went well the system will proceed normally, booting off the hard disk.

    Procedure is now complete!

APPENDIX B

There are two things you need to know before rebuilding the 'Conf Block'. The number of swap units the system was set up for and any 'Bad Blocks' that were spared in the original 'Conf Block'. It is advised that on any systems you sell or do service on, you do the command rdconf /dev/hd00 and record the information concerning bad blocks that are spared and the size of the partitions BEFORE ANY PROBLEMS OCCUR, so that if the following procedures are required you will have all the information you need.

Only proceed to rebuild the configuration block if you had recorded the bad blocks and number of swap units.

NOTE
In the following write-up, all references to 'disk type' will
be 'XYY'. You should now substitute the correct value for the disk
type you are working with (i.e. C20, J20, J30, M45, etc....).

PROCEDURE: Start a normal 'Cold Boot' (see Appendix A), bringing the system all the way to the menu that asks you to select F1, F2, or F3 to reload the system. You will note that the last message says that anything else will be treated as a 'maintenance mode' command. At this point enter:
cd /etc <return>

This will cause the system to change the working directory to /etc and return with the # prompt. At this time enter:
dskselect XYY <return> Example: Use C20 for XYY if you have a 20meg system.

A menu will appear asking you to select a disk type. Enter the number that corresponds to the drive type in your system. Example: 10 <return> for a C20 system.
You will now enter:
mkconf -i XYY /dev/hd00 <return>

The 'Configuration Block' will now begin to appear on the CRT with '?' prompts. Press the <return> to enter the default value until you get the question 'Number of Spare Blocks = 0'?, at this point enter:
46 <return>

The system will respond with:
Enter map for spares (#, bad, diag, free or done):
        Spare 0 (block 3) = diag?
        Spare 1 (block 4) = diag?
        Spare 2 (block 5) = diag?
        Spare 3 (block 6) = bad?

The system will now be set to spare any known bad blocks, and will return the message 'Spare 0 (Block 3)= free ?' At this point enter **diag** for the first three entries (Spare 0, 1, 2). If you have any known bad blocks you would enter the first bad block number at 'Spare 3 (block 6) =   ?' and hit <return>. You would continue to do this for all bad blocks. If there are no bad blocks or when you have entered all known bad blocks, you will enter '**bad**' for the remainder of the spares entries. When you make the last entry, the system will automatically write the new 'Conf Block' to the rigid disk. The disk now has a 'Conf Block' for a one (1) user system.

If the system was formatted for a 3 or 5 user system, do the following command:
mkconf -U * /dev/hd00 <return>

Where * is the number of swap units (i.e. 3 or 5). You should now check the 'Conf Block' by doing the following command:
rdconf /dev/hd00 <return>

If all went well, you should have a working hard disk at this point. Do a file system check to verify system file integrity, enter:
fsck /dev/hd02 <return>

The file system check should run error free. If not, you have file damage and a cold boot may be in order. Enter the following commands to prevent writing on the floppy:
sync <return>   If sync is not found then wait 30 seconds before
sync <return>   you continue.

Next rebuild the Boot Program. This should be done to insure proper boot up.

NOTE: **THE FOLLOWING COMMAND IS DONE TWO DIFFERENT WAYS DEPENDING ON THE OPERATING SYSTEM BEING USED. THE FIRST WILL BE FOR PRE-1.8.1.1 O.S. AND THE SECOND WILL BE FOR 1.8.1.1 AND UP.**

PROCEDURE: Start by typing in the following commands:
bootcp /sa/boot /dev/rhd00 0 <return>   (PRE-1.8)
            or
bootcp /dev/rfd00 /dev/rhd00 0 <return>(1.8 and Up)

The system will now write the 'Boot' program from floppy to the hard disk and return the # prompt. You will then enter:
sync <return>   If sync is not found, wait 30 second before you
sync <return>

Now you may turn off the system, wait 10 seconds, then power up in the normal fashion or push the reset button.

NOTE
If when you entered **bootcp......** the system returned the message **bootcp; not found**, enter the following command:
dd if=/sa/boot of=/dev/hd00 bs=512 seek=* <return>
Then proceed as above. For the * parameter use the starting block number of the boot 0 program. This information is available in the configuration block. The "Boot 0 begins at" message gives the starting block number that should be used for this parameter. To see the configuration block enter:
rdconf /dev/hd00 <return>

APPENDIX C

PROCEDURE: Start a normal 'Cold Boot' bringing the system all the way to the menu that asks you to select F1, F2, or F3 to reload the system. You will note that the last message says that anything else will be treated as a 'maintenance mode' command. At this point enter:
cd /etc <return>

This will cause the system to change the working directory to /etc and return with the # prompt. At this time enter:
mkconf -i /dev/hd00 /dev/hd00 <return>

The 'Configuration Block' will now begin to appear on the CRT with '?' prompts. Press the <return> to enter the default value until you get the question 'Number of Spare Blocks = 46'?, at this point enter:
46 <return>

The system will respond with:
Enter map for spares (#, bad, diag, free or done):
        Spare 0 (block 3) = diag?
        Spare 1 (block 4) = diag?
        Spare 2 (block 5) = diag?
        Spare 3 (block 6) = bad?

At this point we can start sparing bad blocks. Enter the bad block number followed by <return> at the first spare entry that ends in 'Bad?'. Repeat this for all known bad blocks. After entering all bad block numbers enter:
done <return> at the next spare entry.

Now do rdconf /dev/hd00 <return> and check the configuration block. It should now show the bad block as being spared out. Enter:
sync <return>   If sync is not found then wait 30 seconds before
sync <return>   you continue.

NOTE
You can also spare bad block using hdtest of diagnostics.

APPENDIX D

CONVENTIONS

Fsck is a multi-pass file system check program. Each file system pass invokes a different phase of the fsck program. After the initial setup, fsck performs successive phases over each file system, checking blocks and sizes, path-names, connectivity, reference counts, and the free-block list (possibly rebuilding it), and performs some cleanup.

When an inconsistency is detected, fsck reports the error condition to the operator. If a response is required, fsck prints a prompt message and waits for a response. This document explains the meaning of each error condition, the possible responses, and the related error conditions.

The error conditions are organized by the phase of the fsck program in which they can occur. The error conditions that may occur in more than one phase will be discussed in initialization.

INITIALIZATION

Before a file system check can be performed, certain tables have to be set up and certain files opened. This section concerns itself with the opening of files and the initialization of tables. This section lists error conditions resulting from command line options, memory requests, opening of files, status of files, file system size checks, and creation of the scratch file.

C option ?

C is not a legal option to fsck; legal options are -y, -n, -s, -S, and -t. Fsck terminates on this error condition.

Bad -t option

The -t option is not followed by a file name. Fsck terminates on this error condition.

Invalid -s argument, defaults assumed

The -s option is not suffixed by 3, 4, or blocks-per-cylinder and blocks-to skip. Fsck assumes a default value of 400 blocks-per cylinder and 9 blocks-to-skip.

Incompatible options -n and -s

It is not possible to salvage the free-block list without modifying the file system. Fsck terminates on this error condition.

Can't get memory

Fsck's request for memory, for its virtual memory tables failed. This should never happen. Fsck terminates on this error condition.

Can't open checklist file: F

The default file system checklist, file F (usually /etc/checklist) cannot be opened for reading. Fsck terminates on this error condition. Check access modes of F.

Can't stat root

Fsck's request for statistics about the root directory "/" failed. This should never happen. Fsck terminates on this error condition.

Can't stat F

Fsck's request for statistics about the file system F failed. It ignores this file system and continues checking the next file system given. Check access modes of F.

F is not a block or character device; (OK)

You have given fsck a regular file name by mistake. It ignores this file system and continues checking the next file system given. Check the file type of F.

Can't open F

The file system F cannot be opened for reading. It ignores this file system and continues checking the next file system given. Check access modes of F.

Size check: fsize X isize Y

More blocks are used for the inode list Y than there are blocks in the file system X, or there are more than 65,535 inodes in the file system. It ignores this file system and continues checking the next file system given.

Can't create F

Fsck's request to create a scratch file F failed. It ignores this file system and continues checking the next file system given. Check access modes of F.

CAN NOT SEEK: BLK B (CONTINUE)

Fscks's request for moving to a specified block number B in the file
system failed. This should never happen.

Possible responses to the CONTINUE prompt are:

<F1> = YES   Attempt to continue to run the file system check. Often,
however the problem will persist. This error condition will not
allow a complete check of the file system. A second run of fsck
should be made to recheck this file system. If the block was
part of the virtual memory buffer cache, fsck will terminate with
the message "Fatal I/O error".

<F2> = YES   Terminate the program.

CAN NOT READ: BLK B (CONTINUE)

Fscks's request for reading a specified block number B in the file
system failed. This should never happen.

Possible responses to the CONTINUE prompt are:

<F1> = YES   Attempt to continue to run the file system check. Often,
however the problem will persist. This error condition will not
allow a complete check of the file system. A second run of fsck
should be made to recheck this file system. If the block was
part of the virtual memory buffer cache, fsck will terminate with
the message "Fatal I/O error".

<F2> = NO   Terminate the program.

CAN NOT WRITE: BLK B (CONTINUE)

Fscks's request for writing a specified block number B in the file
system failed. The disk may be write-protected.

Possible responses to the CONTINUE prompt are:

<F1> = YES   Attempt to continue to run the file system check. Often,
however the problem will persist. This error condition will not
allow a complete check of the file system. A second run of fsck
should be made to recheck this file system. If the block was
part of the virtual memory buffer cache, fsck will terminate with
the message "Fatal I/O error".

<F2> = NO   Terminate the program.

PHASE 1: CHECK BLOCKS AND SIZES

This phase concerns itself with the inode list. This section lists error conditions resulting from checking inode types, setting up the zero-link-count table, examining inode block numbers for bad or duplicate blocks, checking inode size, and checking inode format.

UNKNOWN FILE TYPE I=I (CLEAR)

The mode word of the inode I indicates that the inode is not a special block inode, special character inode, regular inode, or directory inode.

Possible responses to the CLEAR prompt are:

<F1> = YES   De-allocate inode I by zeroing its contents. This will always invoke the UNALLOCATED error condition in phase 2 for each directory entry pointing to this inode.

<F2> = NO   Ignore this error condition.

LINK COUNT TABLE OVERFLOW (CONTINUE)

An internal table for fsck containing allocated inodes with a link count of zero has no more room.

Possible responses to the CONTINUE prompt are:

<F1> = YES   Continue with the program. This error condition will not allow a complete check of the file system. A second run of fsck should be made to recheck this file system. If another allocated inode with a zero link count is found, this error condition is repeated.

<F2> = NO   Terminate the program.

B BAD I=I

Inode I contains block number B with a number lower than the number of the first data block in the system or greater than the number of the last block in the file system. This error condition may invoke the EXCESSIVE BAD BLKS error condition in phase 1 if inode I has too many block numbers outside the file system range. This error condition will always invoke the BAD/DUP error condition in phase 2 and phase 4.

EXCESSIVE BAD BLKS I=I (CONTINUE)

There is more than a tolerable number (usually 10) of blocks with a number lower than the number of the first data block in the system or greater than the number of the last block in the file system associated with inode I.

Possible responses to the CONTINUE prompt are:

<F1> = YES   Ignore the rest of the blocks in this inode and continue checking with the next inode in the file system. This error condition will not allow a complete check of the file system. A second run of fsck should be made to recheck this file system.
<F2> = NO   Terminate the program.

B DUP I=I

Inode I contains block number B which is already claimed by another inode. This error condition may invoke th EXCESSIVE DUP BLKS error condition in Phase 1 if inode I has too many block numbers claimed by other invokes. This error condition will always invoke Phase 1b and the BAD/DUP error condition in Phase 2 and Phase 4.

EXCESSIVE DUP BLKS I=I (CONTINUE)

There is more than a tolerable number (usually 10) of blocks claimed by other inodes.

Possible responses to the CONTINUE prompt are:

<F1> = YES   Ignore the rest of the blocks in this inode and continue checking with the next inode in the file system. This error condition will not allow a complete check of the file system. A second run of fsck should be made to recheck this file system.
<F2> = NO   Terminate the program.

DUP TABLE OVERFLOW (CONTINUE)

An internal table in fsck containing duplicate block numbers has no more room.

Possible responses to the CONTINUE prompt are:

<F1> = YES   Continue with the program. This error condition will not allow a complete check of the file system. A second run of fsck should be make to recheck this file system. If another allocated inode with a zero link count is found, this error condition is repeated.
<F2> = NO   Terminate the program.

POSSIBLE FILE SIZE ERROR I=I

The inode I size does not match the actual number of blocks used by the inode. This is only a warning.

DIRECTORY MISALIGNED I=I

The size of a directory inode is not a multiple of the size of a directory entry (usually 16). This is only a warning.

PARTIALLY ALLOCATED INODE I=I (CLEAR)

Inode I is neither allocated nor unallocated.

Possible responses to the CLEAR prompt are:

<F1> = YES   De-allocate inode I by zeroing its contents.
<F2> = NO   Ignore this error condition.

PHASE 1B: RESCAN FOR MORE DUPS

When a duplicate block is found in the file system, the file system is rescanned to find the inode which previously claimed that block. This section lists the error condition when the duplicate block is found.

B DUP I=I

Inode I contains block number B which is already claimed by another inode. This error condition will always invoke the BAD/DUP error condition in phase 2. You can determine which inodes have overlapping blocks by examining this error condition and the DUP error condition in phase 1.

PHASE 2: CHECK PATH NAMES

This phase concerns itself with removing directory entries pointing to error conditioned inodes from phase 1 and phase 1b. This section lists error conditions resulting from root inode mode status, directory inode pointers in range, and directory entries pointing to bad inodes.

ROOT INODE UNALLOCATED. TERMINATING.

The root inode (usually inode number 2) has no allocate mode bits. This should never happen. The program will terminate.

ROOT INODE NOT DIRECTORY (FIX)

The root inode (usually inode number 2) is not directory inode type.

Possible responses to the FIX prompt are:

\<F1\> = YES   Replace the root inode's type to be directory blocks. If the root inode's data blocks are not directory blocks, a very large number of error conditions will be produced.
\<F2\> = NO   Terminate the program.

DUPS/BAD IN ROOT INODE (CONTINUE)

Phase 1 or phase 1b have found duplicate blocks or bad blocks in the root inode (usually inode number 2) for the file system.
Possible responses to the CONTINUE prompt are:

\<F1\> = YES   Ignore the DUPS/BAD error condition in the root inode and attempt to continue to run the file system check. If the root inode is not correct, then this may result in a large number of other error conditions.
\<F2\> = NO   Terminate the program.

I OUT OF RANGE I=I NAME=F (REMOVE)

A directory entry F has an inode number I which is greater than the end of the inode list.

Possible responses to the REMOVE prompt are:

\<F1\> = YES   The directory entry F in removed.
\<F2\> = NO   Ignore this error condition.

UNALLOCATED I=I OWNER=O MODE=M SIZE=S MTIME=T NAME=F (REMOVE)

A directory entry F has an inode I without allocate mode bits. The owner O, mode M, size S, modify time T, and file name F are printed.

Possible responses to the REMOVE prompt are:

\<F1\> = YES   The directory entry F in removed.
\<F2\> = NO   Ignore this error condition.

DUP/BAD I=I OWNER=O MODE=M SIZE=S MTIME=T DIR=F (REMOVE)

Phase 1 or phase 1b have found duplicate blocks or bad blocks associated with directory entry F, directory inode I. The owner O, mode M, size S, modify time T, and directory name F are printed.

Possible responses to the REMOVE prompt are:

<F1> = YES   The directory entry F in removed.
<F2> = NO   Ignore this error condition.

DUP/BAD I=I OWNER=O MODE=M SIZE=S MTIME=T FILE=F (REMOVE)

Phase 1 or phase 1b have found duplicate blocks or bad blocks associated with directory entry F, inode I. The owner O, mode M, size S, modify time T, and file name F are printed.

Possible responses to the REMOVE prompt are:

<F1> = YES   The directory entry F in removed.
<F2> = NO   Ignore this error condition.

PHASE 3: CHECK CONNECTIVITY

This phase concerns itself with the directory connectivity seen in phase 2. The section lists error conditions resulting from unreferenced directories, and missing or full lost+found directories.

UNREF DIR I=I OWNER=O MODE=M SIZE=S MTIME=T (RECONNECT)

The directory inode I was not connected to a directory entry when the file system was traversed. The owner O, mode M, size S, and modify time T of directory inode I are printed.

Possible responses to the RECONNECT prompt are:

<F1> = YES   Reconnect directory inode I to the file system in the directory for lost files (usually lost+found). This may invoke the connecting directory inode I to lost+found. This may also invoke the CONNECTED error condition in phase 3 if the link was successful.
<F2> = NO   Ignore this error condition. This will always invoke the UNREF error condition in Phase 4.

SORRY. NO lost+found DIRECTORY

There is no lost+found directory in the root directory of the file system. Fsck ignores the request to link a directory in lost+found. This will always invoke the UNREF error condition in phase 4. Check access modes of lost+found.

SORRY. NO SPACE IN lost+found DIRECTORY

There is no space to add another entry to the lost+found directory in the root directory of the file system; fsck ignores the request to link a directory in lost+found. This will always invoke the UNREF error condition in Phase 4. Clean out unnecessary entries in lost+found directory.

DIR I=I1 CONNECTED. PARENT WAS I=I2

This is an advisory message indicating a directory inode I1 was successfully connected to the lost+found directory. The parent inode I2 of the directory inode I1 is replaced by the inode number of the lost+found directory.

PHASE 4:CHECK REFERENCE COUNTS

This phase concerns itself with the link count information seen in phase 2 and Phase 3. This section lists error conditions resulting from unreferenced files, missing or full lost+found directory, incorrect link count for files, directories or special files, unreferenced files and directories, bad and duplicate blocks in files and directories, and incorrect total free-inode counts.

UNREF FILE I=I OWNER=O MODE=M SIZE=S MTIME=T (RECONNECT)

Inode I was not connected to a directory entry when the file system was traversed. The owner O, mode M, size S, modify time T of inode I are printed.

Possible responses to the RECONNECT prompt are:

<F1> = YES   Reconnect inode I to the file system in the directory for lost files (usually lost+found). This may invoke the lost+found error condition in phase 4 if there are problems connecting inode I to lost+found.

<F2> = NO   Ignore this error condition. This will always invoke the CLEAR error condition in phase 4.

SORRY. NO lost+found DIRECTORY

There is no lost+found directory in the root directory of the file system. Fsck ignores the request to link a directory in lost+found. This will always invoke the UNREF error condition in phase 4. Check access modes of lost+found.

SORRY. NO SPACE IN lost+found DIRECTORY

There is no space to add another entry to the lost+found directory in the root directory of the file system; fsck ignores the request to link a file in lost+found. This will always invoke the CLEAR error condition in Phase 4. Check size and contents of lost+found.

(CLEAR)

The inode mentioned in the immediately previous error condition can not be reconnected.

Possible responses to the CLEAR prompt are:

<F1> = YES   De-allocate the inode mentioned in the immediately previous error
              condition by zeroing its contents.
<F2> = NO   Ignore this error condition.

LINK COUNT FILE I=I OWNER=O MODE=M SIZE=S MTIME=T COUNT=X SHOULD BE Y (ADJUST)

The link count for inode I which is a file, is X but should be Y. The owner O, mode M, size S, and modify time T are printed.

Possible responses to the ADJUST prompt are:

<F1> = YES   Replace the link count of file inode I with Y.
<F2> = No   Ignore this error condition.

LINK COUNT DIR I=I OWNER=O MODE=M SIZE=S MTIME=T COUNT=X SHOULD BE Y (ADJUST)

The link count for inode I which is a directory, is X but should be Y. The owner O, mode M, size S, and modify time T are printed.

Possible responses to the ADJUST prompt are:

<F1> = YES   Replace the link count of directory inode I with Y.
<F2> = No   Ignore this error condition.

LINK COUNT F I=I OWNER=O MODE=M SIZE=S MTIME=T COUNT=X SHOULD BE Y (ADJUST)

The link count for F inode I which is X but should be Y. The name F, owner O, mode M, size S, and modify time T are printed.

Possible responses to the ADJUST prompt are:

<F1> = YES   Replace the link count of directory inode I with Y.
<F2> = No   Ignore this error condition.

UNREF FILE I=I OWNER=O MODE=M SIZE=S MTIME=T (CLEAR)

Inode I which is a file, was not connected to a directory entry when the file system was traversed. The owner O, mode M, size S, and modify time T of inode I are printed.

Possible responses to the CLEAR prompt are:

<F1> = YES   De-allocate inode I by zeroing its contents
<F2> = No   Ignore this error condition.

UNREF DIR I=I OWNER=O MODE=M SIZE=S MTIME=T (CLEAR)

Inode I which is a directory, was not connected to a directory entry when the file system was traversed. The owner O, mode M, size S, and modify time T of inode I are printed.

Possible responses to the CLEAR prompt are:

<F1> = YES   De-allocate inode I by zeroing its contents
<F2> = No   Ignore this error condition.

BAD/DUP FILE I=I OWNER=O MODE=M SIZE=S MTIME=T (CLEAR)

Phase 1 or phase 1b have found duplicate blocks or bad blocks associated with file inode I. The owner O, mode M, size S, and modify time T of inode I are printed.

Possible responses to the CLEAR prompt are:

<F1> = YES   De-allocate inode I by zeroing its contents
<F2> = No   Ignore this error condition.

BAD/DUP DIR I=I OWNER=O MODE=M SIZE=S MTIME=T (CLEAR)

Phase 1 or phase 1b have found duplicate blocks or bad blocks associated with directory inode I. The owner O, mode M, size S, and modify time T of inode I are printed.

Possible responses to the CLEAR prompt are:

<F1> = YES   De-allocate inode I by zeroing its contents
<F2> = No   Ignore this error condition.

FREE INODE COUNT WRONG IN SUPERBLOCK (FIX)

The actual count of free inodes does not match the count in the super-block of the file system.

Possible responses to the FIX prompt are:

<F1> = YES   Replace the count in the super-block by the actual count.
<F2> = NO   Ignore this error condition.

PHASE 5: CHECK FREE LIST

This phase concerns itself with the free-block list. This section lists error conditions resulting from bad blocks in the free-block list, bad free-blocks count, duplicate blocks in the free-block list, unused blocks from the file system not in the free-block list, and the total free-block count incorrect.

EXCESSIVE BAD BLKS IN FREE LIST (CONTINUE)

The free-block list contains more than a tolerable number (usually 10) of blocks with a value less than the first data block in the file system or greater than the last block in the file system.

Possible responses to the CONTINUE prompt are:

<F1> = YES   Ignore the rest of the free-block list and continue the execution of fsck. This error condition will always invoke the BAD BLKS IN FREE LIST error condition in Phase 5.
<F2> = NO   Terminate the program.

EXCESSIVE DUP BLKS IN FREE LIST (CONTINUE)

The free-block list contains more than a tolerable number (usually 10) of blocks claimed by inodes or earlier parts of the free-block list.

Possible responses to the CONTINUE prompt are:

<F1> = YES   Ignore the rest of the free-block list and continue the execution of fsck. This error condition will always invoke the DUP BLKS IN FREE LIST error condition in Phase 5.

<F2> = NO   Terminate the program.

BAD FREEBLK COUNT

The count of free blocks in a free-list block is greater than 50 or less than zero. This error condition will always invoke the BAD FREE LIST condition in Phase 5.

X BAD BLKS IN FREE LIST

X blocks in the free-block list have a block number lower than the first data block in the file system or greater than the last block in the file system. This error condition will always invoke the BAD FREE LIST condition in Phase 5.

X DUP BLKS IN FREE LIST

X blocks claimed by inodes or earlier parts of the free-list block were found in the free- block list. This error condition will always invoke the DUP FREE LIST CONDITION IN PHASE 5.

X BLK(S) MISSING

X blocks unused by the file system were not found in the free-block list. This error condition will always invoke the BAD FREE LIST condition in Phase 5.

FREE BLK COUNT WRONG IN SUPERBLOCK (FIX)

The actual count of free blocks does not match the count in the super-block of the file system.

Possible responses to the FIX prompt are:

<F1> = YES   Replace the count in the super-block by the actual count.

<F2> = NO   Ignore this error condition.

BAD FREE LIST (SALVAGE)

Phase 5 has found bad blocks in the free-block list, duplicate blocks in the free-block list, or blocks missing from the file system.

Possible responses to the SALVAGE prompt are:

<F1> = YES   Replace the actual free-block list with a new free-block list. The new free-block list will be ordered to reduce time spent by the disk waiting for the disk to rotate into position.

<F2> = NO   Ignore this error condition.

PHASE 6: SALVAGE FREE LIST

This phase concerns itself with the free-block list reconstruction. This section lists error conditions resulting from the blocks-to-skip and blocks-per-cylinder values.

Default free-block list spacing assumed

This is an advisory message indicating the blocks-to-skip is greater than the blocks-per-cylinder, the blocks-to-skip is less than one, the blocks-per-cylinder is less than one, or the blocks-per-cylinder is greater then 500. The default values of 9 blocks-to-skip and 400 blocks-per-cylinder are used.

CLEANUP

Once a file system has been checked, a few cleanup functions are performed. This section lists advisory messages about the file system and modify status of the file system.

X files Y blocks Z free

This is an advisory message indicating that the file system checked contained X files using Y blocks leaving Z blocks free in the file system.

***** BOOT UNIX (NO SYNC!) *****

This is an advisory message indicating that a mounted file system or the root file system has been modified by fsck. If UNIX is not rebooted immediately, the work done by fsck may be undone by the in-core copies of tables UNIX keeps.

***** FILE SYSTEM WAS MODIFIED *****

This is an advisory message indicating that the current file system was modified by fsck. If this file system is mounted or is the current root file system, fsck should be halted and UNIX rebooted immediately, the work done by fsck may be undone by the in-core copies of tables UNIX keeps.