Radio Shack®

TECHNICAL INFORMATION SERIES

TRS-80®

XENIX INFORMATION

0220 TECHNICAL SUPPORT SERVICES

Revision History

Field
Ø4/Ø2/1984
kjb

Field
Ø2/17/1986
vrs

For qat, technoid, and kjb, who *really* did the work.

This manual is divided into several sections. The first section will deal primarily with what you need to know in order to transfer the XENIX Core System from the floppy diskettes provided in the User's Manual to the customer's primary hard drive.

Section Two will discuss the hardware aspects of the system. Proper jumpering, card order, and mandatory modifications to the system will be explored.

Section Three deals with some software and control aspects of Xenix. The importance of the file **/usr/adm/messages**, media error map regeneration, and setting terminal options are discussed. The editor is described briefly, the software and hardware aspects of the multi-terminal interface are delved into, and file systems are explored.

Section Four is devoted to "hints and kinks" about the system. Current DOS versions are discussed here.

Section Five contains advanced system information. This information is presented primarily for reference; it is not recommended that you try the material presented here unless you are very familiar with Xenix.

Section Six addresses the topics of backing up data and upgrading systems. Again, this information is presented mainly as reference, although the odds are fairly good that at one time or another you will have cause to use it.

The appendices contain a variety of things ranging from error messages to command syntax summaries.

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Before proceeding with the installation of the XENIX Core System, it is MANDATORY that you refer to Section Two and verify that ALL hardware modifications have been properly implemented.

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Some Important Things You Need to Know

BEFORE STARTING

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1) When running TRS-XENIX, the hard disks are numbered hd0 - hd3, where Drive hd0 is the primary hard disk.

2) The hard drives must not be write protected and the floppy diskettes must have a write enable tab. Approximately every 30 seconds XENIX will access the drives to update its files and directories. This will occur even when the system is idle.

3) TRS-XENIX utilizes the Media Error Map located on the bottom of the hard drive. Copy the contents of this map for each drive in the system and then replace the map into its sleeve on the bottom of its drive. Do this for all hard drives before beginning to initialize XENIX.

   If the Media Error Map is missing from the bottom of the unit, remove the cover and check for the map inside. If it still cannot be located, the bubble may need be checked with HDREL. Refer to Section Three for information about how to reconstruct an error map.

4) All commands except those specifically stipulated must be entered in **lower case** only.

5) If the hard drive to be initialized has been used previously for other data, operating systems, and etc., ensure that all needed programs and data files have been saved off, as diskutil will wipe all information.

6) **root** is the superuser. When logged into the system under this name, the user has unlimited access to all user, system, data, and program files. In addition, only the superuser may add or delete users on the system. He has complete control. When you log in on a customer installation as root, exercise extreme caution because you could inadvertently obliterate something... two months worth of payroll, a 60,000 name mailing list, the company president's password, the.....

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The Superuser has unlimited access to the system.
Be careful not to accidentally nebulize any
customer data when logged in as root.
The life you save could be your own!

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DO NOT ASSUME ANYTHING!

(Really. I kid you not.)

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Table of Contents

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SECTION ONE

An Update on Installing the Core System Without Pain

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For the most part, the process of installing System 3 (Xenix 3.x) is very similar to installing Version 7 (Xenix 1.3.x). There are a few cosmetic differences which may be a little confusing, and those are what we'll mention here.

***** NOTE *****: System 3 uses a different format than that used by Version 7, so it is an absolute necessity to format the hard drive with the System 3 Boot Disk.

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All commands should be entered in lower case unless otherwise stated.

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1) Power up the computer, hard drive/s, and all connected peripherals. (If you are using a cartridge system, you need to power it up, too; leaving it connected and off may confuse things a bit). Hold the <BREAK> and <REPEAT> keys until the "Insert Diskette" messages appears on the screen.

   NOTE: Make certain you allow at least a half hour for the hard drive to arrive at a constant operating temperature.

2) Insert the System 3 **Boot Disk** into floppy drive Ø and allow the system to boot. Make sure the hard drives aren't write protected.

3) When the boot message appears, type **diskutil** after ">" and press the <ENTER> key.

   Xenix Boot> **diskutil** <ENTER>

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If you got an error message saying "BUGHLT: NewPal", then you are missing hardware modifications that are necessary to run System 3.

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4) Answer the following prompts:

NOTE: Anything you see which refers to cartridge drives is only going to appear in Xenix 3.1 or later.

Diskutil: format or copy floppy diskettes
format hard disks
format or copy disk cartridges
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Diskutil: Hard, floppy, or cartridge (h, f, or c)?
Type <h> to format a hard drive.
Hard disk unit number (Ø..3)?
Answer Ø to indicate the primary hard drive.

Destructive or Non-destructive format (d or n)?
Answer d to ensure proper verification. (Use the non-destructive option only under special circumstances -- more on that later).

5) The next prompts will ask how many heads and cylinders are to be formatted.

Eight Meg Hard Drives:

How many cylinders (tracks)?
Answer 256.

How many heads?
Answer 4.

Twelve Meg Hard Drives:

How many cylinders (tracks)?
Answer 23Ø.

How many heads?
Answer 6.

Fifteen Meg Hard Drives:

How many cylinders (tracks)?
Answer **3Ø6**.

How many heads?
Answer **6**.

Thirty-Five Meg Hard Drives (Quantum):

How many cylinders (tracks)?
Answer **512**.

How many heads?
Answer **8**.

Seventy Meg Hard Drives (Micropolis):

How many cylinders (tracks)?
Answer **1Ø24**.

How many heads?
Answer **8**.

6) The next question will be:

Desired interleave factor (<ENTER> for default)?
Answer **<ENTER>**. (Xenix sets the optimum value automatically, so you really aren't going to help matters by not using the default).

For more information on what exactly this "interleave" is, please look at the end of this section....

7) In this step you will enter the flaws on the primary media error map. This is identical to the way you enter errors in the older versions of Xenix; enter the cylinder-head pairs one at a time and type **done <ENTER>** when you are finished.

8) After you type "done", the system will ask:

Full, partial, or no verify (f, p, n)?
Answer f. (There are times and places to use partial or no verify, but we'll cover those later).

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With **Drives Up to 15 Meg**, You May
Enter Up to **24 Flaws.**

With **35 and 7Ø Meg Drives**, You May
Enter Up to **96 Flaws.**

<BREAK> may be used to abort the process at any time should you make a mistake.

.....

9) The system should now display the message:

About to format hard disk drive Ø.
This will take about xx minutes.

Type <enter> to proceed or <break> to abort:

"xx" is approximately how long this process will take. Just like in Version 7 Xenix, you can bail out of this process at any time, but the drive will remain unusable until the process has run to completion. The cylinder number and the head number currently being formatted will be displayed.

1Ø) When the formatting is complete, the following will appear on the screen:

Hard disk successfully formatted.
Drive parameters and MEDIA ERROR MAP successfully written.
Your hard disk is ready for the XENIX initialization.

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Now that the format is complete,
the system is ready to be installed.

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Just like Version 7, System 3 uses a program called **hdinit** to initialize your hard drive. It does several neat things for you:

* Copy the boot track to the hard disk.
* Create a file system on the hard disk.

(Note: System 3 uses a different file system structure than Version 7 -- beware!)

* Copy the contents of the Boot Disk to the hard disk.

* Performs a system shutdown after the initialization.

11) With the Boot Disk still installed in floppy drive Ø, press the RESET button while holding the <BREAK> and <REPEAT> keys. The boot prompt will appear. Press <ENTER>.

Xenix Boot> **<ENTER>**

12) The screen will now show:

System loaded . . .
Change root disk if desired;
type <enter> to proceed or <break> to abort

Press <ENTER>.

13) The system will ask you the following questions:

Do you wish to initialize your hard disk?
Answer <**y**> for yes.

Has your hard disk been formatted with diskutil?
Answer <**y**> for yes.

Is this a Model II? [y or n]
If you are installing Xenix on an upgraded Model II, answer <**y**>, otherwise answer <**n**>.

.....

If you answer "Model II", your boot disk will continue to work on Model II's.

If you say "no", this boot disk will freak Shugart and TPI drives out, because the floppy drive rates will be set for thinline drives.

The simplest solution is to use two different sets of disks: one for thinline drives, and one for Model II's.

.....

Do you want the standard size swap area? [y or n]
Answer <y> for yes. (There are reasons to say no, but they'll be covered later).

14) At this point, the system will proceed to initialize itself. One of the major departures from Version 7 installations procedures is that the program will determine for itself how many heads and cylinders the drive has (by reading the media error map you entered during diskutil).

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DO NOT TOUCH THE SYSTEM UNTIL YOU SEE THE MESSAGE:

**** Normal System Shutdown ****

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NOTE: If for some reason you are repeating this procedure, you may be warned, while the filesystem is being created, that **"mkfs contains data"**. You will be asked whether to "overwrite". Answer <y> to finish installing the system.

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Home Stretch....
After the ***Normal System Shutdown*** message,
RESET the computer and boot from the hard drive.

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15) This part, copying the remaining Xenix floppy diskettes onto the hard drive, is just like it was under Version 7. Reboot the system from the hard disk if you have not already done so.

16) As before, press <ENTER> after you see the "Xenix Boot>" prompt. The system will display information on inserting and removing the Install floppy diskettes.

17) You are prompted with the message:

First Floppy? [y or n]

Insert the **Install 1** floppy diskette into Drive Ø. Press <**y**> and then <ENTER>.

When the data is transferred to your hard drive, you will be prompted with:

Next Floppy? [y or n]

Insert **Install 2** and answer the prompt with <**y**> and <ENTER>. Repeat for Install 3, if you have one.

18) When the Install floppies have all been transferred to the hard drive, answer the prompt with <**n**> and <ENTER>.

You will see the message:

Setting up directories and permissions.

19) The system will ask you for information concerning your location and timezone.

.....

Answering the "timezone" question with "Yukon" will not make your customer very happy (unless you're in Alaska...)

.....

Congratulations... the primary hard drive now contains a complete XENIX core system and the installation is complete.... **UNLESS** you're using Xenix 3.1, in which case you may want to install the Help files. But I'll get to that in just a minute. Meanwhile, the screen should now say:

Installation complete.

Type CONTROL-d to proceed with normal startup,
(or give root password for system maintenance):

This last is the normal XENIX boot prompt you may expect whenever you boot from the hard drive.

At this point, you are ready to try this System 3 stuff out.

Type **<CTRL> <d>**.

This tells the system to engage a normal startup procedure. As usual, the system will prompt you to enter the correct date and time. Although you can bypass this with <ENTER>, it is recommended that you actually go ahead and give the correct information.

The screen will clear and in the upper left corner of the screen a login prompt will be displayed. Type in **root** and press **<ENTER>**.

login: root <ENTER>

Now, those of you using Xenix 3.1 who want to install the Help files, pay attention. The rest of you can kick back and relax for a while.

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Installing Xenix 3.1 Help Files
(Nice if you've got them).

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As it turns out, installing the Xenix 3.1 Help files teaches you how to do other applications installations as well. At the root prompt (which is a pound sign # just like it was in Version 7) type **install <ENTER>**. You will get the following menu:

Installation Menu
1. to install
q. to quit

Please select :

Type 1 **<ENTER>** to select the Install option. The screen will say:

Insert diskette in Drive Ø and press <ENTER>

Insert the Help files diskette in floppy drive Ø, close the drive door, and press <ENTER>. Various grinding noises will emerge from your floppy drive, but eventually you should see:

Installation complete -- Remove the diskette, then press <ENTER>.

Remove the Help floppy diskette and press <ENTER>. The Installation Menu will reappear. Type **q <ENTER>** to quit.

Simple, eh? As it turns out, that's how most of the applications packages (things like Profile-16, Scripsit-16, Multiplan, the Development System, and the like) get installed, not to mention the Xenix Tools Diskette. In any case, now you can type

help [subject name]

and get help on that command.

*** **NOTE** ***: For those of you who aren't using Xenix 3.1, fear not. There are some help files available to you, too, and we'll cover getting to them fairly soon.

Well, those of you who weren't paying attention earlier should wake up now, since we're going to struggle into learning about System 3 checkout procedures.

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Checking out the system
or
It still takes guts, gang!

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If you are not already logged in as root, do so. If you are the technician who did the installation, the system will not prompt you for a password. If it is an up and running customer system, you will need to ask the customer for their root password.

Once you have logged in, you will see a message stating "Welcome to TRS-XENIX" (or something similar) and some seconds later the root prompt " # " will be displayed. Time to dive in.

A great many of the things you were familiar with in Version 7 Xenix will still work in System 3. Here are a few simple commands which will allow you to try the basics out on the system.

1) **l <ENTER>** (l = lower case L)
   This command produces the same long version directory listing that it did under Version 7 Xenix.

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<CTRL> <S> Hold video output (X-OFF)
<CTRL> <Q> Restart video output (X-ON)

These still work, and the <HOLD> key still works at the console.

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2) **ps -elf <ENTER>** (You **HAVE** to use the minus sign!)
   This is the command which gives you the current process status on the system. Syntax for this one is different than that on Version 7; if you type "ps lax" by accident you will get a nasty little message which instructs you on usage.

3) **who am i**
   This tells you who you logged in as (in case you forget).

4) **<CTRL> <D>**
   This command logs you off the system.

To shut the system down, log in again as root. When the root prompt "#" appears, type:

shutdown

The system will ask you "how many minutes to shutdown"?. Enter a **0** for an immediate shutdown. This is pretty much the same semi-graceful technique one uses to shut Version 7 systems down; once you get the **** Normal System Shutdown **** on the screen it is safe to boot the system up on a diagnostic or whatever else you want to do to it.

For those of you who are feeling adventurous, the **tsh** exists on System 3 (and it has Help available). It is a good way to introduce yourself to Xenix, and the Version 7 Xenix Information Bulletin covers the basics in it fairly well.

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Never turn the system off without first performing shutdown.

(Some things don't change...)

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To install additional hard drives, you will format them with **diskutil**. However, the name of the utility you will use to make a file system on the new drive has changed... it is now called **makefs**. There will be more discussion on this in Section 3.

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Some Notes On the Mysterious Subject
of
Interleave
and
The Various Types Thereof

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I told you earlier that I would try to explain what this thing "interleave" is. Well, here goes... although by the end of the explanation you may wish that you had never asked the question!

When formatting a hard drive using **diskutil**, you are asked for an interleave value. It turns out that **diskutil** uses something called **physical interleave**; this is to help get data to and from the hard drive as quickly as possible. The whole thing revolves around the fact that a hard drive rotates at a rate of speed which is higher than the rate at which we can read or write it... yet we don't want to waste any more time than we have to waiting for the next bit of data to come around once we are ready for it. What do we do now? I mean, if we lay data down in sectors one right after another, it goes by too quickly for us to read it sequentially, and we have to wait to read the sector(s) we missed until it comes around to us on the next revolution. This is obviously going to waste lots of time, so we get around the problem by numbering the sectors as we can pick them up. It goes like this:

Physical Sector Numbers:	1	2	3	4	5	6	7	8	9	10	11	12	13
diskutil Sector Numbers:	1			2			3			4			5

See what's happening? **diskutil**'s numbering the sectors with spaces between them so that by the time the controller is ready to grab another sector's worth of data, the next sector is right there to be picked up. Actually, this is a bit of an oversimplification: to see how a track would really be numbered by **diskutil** see the next diagram... incidentally, Xenix configures hard drives for **17 sectors per track.**

Physical:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
diskutil:	1	7	13	2	8	14	3	9	15	4	10	16	5	11	17	6	12

Ok, now the above discussion is based on a physical interleave of three -- which is coincidentally what Xenix 3.1 **diskutil** uses, and brings us down to one of the reasons that you <u>have</u> to reformat the hard drive when doing an upgrade from Xenix 3.Ø to Xenix 3.1. The 3.Ø **diskutil** uses an interleave of five. "So what," you say, being quick on the uptake, "this should only mean that your I/O will go kind of slowly compared to what it could be doing." True as far as it goes, but unfortunately there is more to this story.

It turns out that this physical interleave that **diskutil** uses also has a large effect on a logical interleave that **mkfs** uses. (**mkfs** is the utility that is used to create Xenix file systems). This logical interleave determines how the free blocks in a file system are referenced with regard to one another; if the wrong physical interleave is matched with a logical interleave, the drive will essentially become unreadable (except for the boot track).

See where this is going now? If you leave your Xenix 3.Ø **diskutil**ed disk as it sits and use the Xenix 3.1 **mkfs** on the drive, the drive will never get past the information on the boot track. Instead, it will sit there and mumble to itself, and you will become extremely frustrated. The same thing in essence goes for the upgrade from Xenix 1.3.5 to Xenix 3.x, so the best thing to do in the case of an upgrade is reformat. Even if it's not necessary, it's a good idea in any event.

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SECTION TWO

Care and Feeding
of
Xenix Support Hardware

(Yes, it will bite the hand which feeds it!)

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Things have gotten rather more complicated with the advent of System 3 and the fast 68ØØØ hardware. There are also a couple more hard drives to contend with, and a new form of disk storage with the disk cartridge system. All of this combines to make System 3 even more sensitive to hardware than Version 7 was... so hold on to your hats, there's lots of stuff to check.

When looking at the modifications for the various CPU's, I will note a basic division in what to look for. Essentially, there will be a breakdown between the systems running the older 6 MHz 68ØØØ hardware, and the newer 8 MHz 68ØØØ hardware.

So much for introductions -- here's what you need to look for!

Computer Hardware

Model II and 16:

1) Card Order (right to left, as viewed from rear):

Z-8Ø CPU
FDC
Arcnet (if installed)
Hard Disk Interface
Multi-terminal board (if installed)
Disk Cartridge Interface (if installed) *
VDG
Z-8Ø memory
68ØØØ cards

*** NOTE: The disk cartridge interface is a terminated interface. If it is installed, it must be the last interrupt driven device.**

2) Technical Bulletins to check for:

II:4	Zener diode on old style FDC board
II:5	Motorola video monitor board modification
II:9	Old style FDC board modification and alignment
II:1Ø	Trace cut on early design FDC for use with Xenix
II:13	Early design FDC has C17 installed backwards
II:16	Boot Errors on Shugart Drive (LSI only)
II:18	Correct dual addressing problem on early VDG card
II:2Ø	Boot Errors on Shugart Drive (Discrete only)
II:21	Wire jumper on early design FDC board and -Ø2 FDC chip
II:23	System lockup or wierd keyboard entries
II:26	Enhanced DMA modification
II:28	Cut and jump to correct head load termination
II:31	Missing jumpers on 64K RAM board and HD interface board
II:32	Missing jumpers on CPU board
16:3	Improve Z-8Ø clock on REV D CPU board
16:5	C41 on Z-8Ø CPU board installed backwards
16:8	Tandon motor speed modification
16:1Ø	Incorrect power supply fuse
16:15	Low 5 volts in card cage

For machines running System 3 on the 6 MHz 68ØØØ boards:

16:18 Correct memory buffer problems on 6 MHz 68ØØØ memory PCB
16:23 Modifications to allow Xenix 3.Ø to run on 6 MHz boards
16:24 Reliability modifications to 6 MHz 68ØØØ CPU board

For machines running System 3 on the 8 MHz 68ØØØ boards:

16:21 8 MHz upgrade procedure
16:19 Correct ground connections on 8 MHz 68ØØØ CPU board
16:2Ø Correct data setup to 8 MHz 68ØØØ memory board
6ØØØ:2 Correct timing error on 8 MHz 68ØØØ CPU board
6ØØØ:4 Inverter incompatibility on VDG
6ØØØ:6 Reliability modifications to 8 MHz CPU board
6ØØØ:8 Reliability modifications to 8 MHz memory board
6ØØØ:9 Reliability modifications on VDG
6ØØØ:13 Reduce occurrence of Supervisor Trap 2 problems

3) Proper Board Jumpering:

Reference Notes and Jumpers

Model 12, Model 16B, Model 16B+, and Tandy 6ØØØ:

1) Card Order (bottom to top when viewing rear of card cage):

Hard Disk Interface
Arcnet (if installed)
Multi-terminal card (if installed)
Disk Cartridge Interface (if installed) *
VDG
68ØØØ memory
68ØØØ CPU

* **NOTE: If the Disk Cartridge Interface is installed, it must be the last interrupt driven device in the chain.**

2) Technical Bulletins to check for:

12/16B:2	Increase reset drive on main logic board
12/16B:3	Power up problems - U81, main logic board
12/16B:5	Card Cage Interrupt modification (**verify that this one is correct**)
12/16B:6	DMA modification, main logic board
12/16B:9	Proper main logic board jumpering
12/16B:1Ø	Cooling enhancement kit
12/16B:11	Change in SIO control signals
12/16B:12	Video Ram access timing change
12/16B:13	Change in type of tuning cap in FDC VCO circuit
12/16B:14	Add pullup to PSEL line for printer interface
12/16B:17	Card cage guide change
12/16B:21	Problems with Xenix and floppy drives
12/16B:23	Correct low 5 volt problem
12/16B:25	Missing components on AX-9432 controller board
12/16B:26	Power supply problems
12/16B:27	Internal hard drive supply may be jumpered for 23ØV
12/16B:31	Improve reliability of RCLOCK on VDG card
12/16B:39	Faulty "AS" type chips on main logic board
12/16B:4Ø	Correct card cage artwork errors.

For machines running System 3 on the 6 MHz 68ØØØ boards:

12/16B:19	68K memory board switch settings
12/16B:24	correct memory buffer problems on 68k memory PCB
12/16B:34	defective decoding chips, 68k CPU board
12/16B:41	increase reliability of 68k CPU board
12/16B:44	describe System 3 modifications

For machines running System 3 on the 8 MHz 68ØØØ boards:

12/16B:38	Outline 8 MHz upgrade procedure
6ØØØ:1	Correct data setup time to memory board
6ØØØ:2	Correct timing error on 68ØØØ CPU board
6ØØØ:3	Correct ground connections on 68ØØØ CPU board
6ØØØ:4	Inverter incompatibility on VDG card
6ØØØ:6	Reliability modifications, 68k CPU
6ØØØ:8	Reliability modifications, 68k memory board
6ØØØ:9	Reliability modifications, VDG card
6ØØØ:11	Correct "BOOT ERROR MF"
6ØØØ:13	Reduce occurrence of Supervisor Trap 2 in Xenix

NOTE: **The above Technical Bulletins must be verified to ensure proper operation of a Xenix system.** Don't just look; verify these mods! **System 3 is even more sensitive to hardware than Version 7.**

68ØØØ Memory Boards

Everything that has been said about the touchiness of 68ØØØ memory boards is true in spades with the advent of the faster board set. As if the standard concerns weren't sufficient, you now get to worry about the possible permutations of CPU and memory boards as well. First things first.... these are the combinations which are supported (as of this writing) to run System 3.

6MHz CPU board (modified) with 128k/256k memory board(s)
6MHz CPU board (modified) with 512k/1meg memory board
8MHz CPU board with 512k/1meg memory

NOTE: **The "dog-eared" or "long" 6MHz 68ØØØ is not supported for use with Xenix 3.x.**

Correct switch settings and jumpers, a good +5 VDC (**at least +5.ØØ VDC while system is fully loaded, measured on the 68ØØØ memory board**), and correct ventilation are essential for the health and well-being of a Xenix system.

Hard Drive Hardware:

12/15/35/70 Megabyte Hard Disk Interface Card (AX-9367)
And 12 Megabyte Hard Drives

The 12 meg hard disk interface PCB will need to be jumpered differently depending upon whether it is installed within a Model 12 or 16B/6000. This is due to a difference of internal memory configurations, as supplied from the factory, between the Model 12 and 16B/6000.

The Model 12, as shipped, will contain internal memory mapped at page 15 with a mirror image appearing at page 14. For this reason, it is necessary to remap the memory included on the 12 meg interface PCB to another location, customarily pages 8 and 9.

The Model 16B/6000 is supplied with no internal memory mapped at pages 14 and 15; thus the interface card must supply this memory. Be aware that these differences apply not only to Xenix but to the 4.x TRSDOS operating systems as well.

Jumpering:

Model 12	AG - AL	selects pages 8 and 9
Model II/16/16B/6000	AK - AP	selects pages 14 and 15

Additional Jumpers (same for all computers):

A-B
A-B (cloverleaf next to CTC chip)
V-W

.....

*** * * NOTE: * * ***

All 12/15/35/70 meg interface boards
must be modified to comply with
Technical Bulletin HD:12.

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There is a modification to the hard drive interface board outlined in HD:12 which must be performed whether or not the interface board is being used with an 8X300 controller board or a WD1010 controller board. In addition to the interface modification, there is also a modification which needs to be made to the 8X300 controller board. If you have a problem getting your interface board to talk to your controller board, refer to **Technical Bulletin HD:12** for

a more in depth description of the modifications involved.

There exist several possiblities:

1) An unmodified interface will work (mostly) with an unmodified 8X3ØØ controller, and again mostly with a WD1Ø1Ø controller.

2) A modified interface will **NOT** function with an unmodified 8X3ØØ controller.

3) A modified 8X3ØØ controller will **NOT** function with an unmodified interface card.

Termination and Drive Select:

It is mandatory that proper hard drive termination and drive select jumpering be followed to the letter. Despite this fact, a great many people really don't understand how termination works.

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Termination is simple.

Always terminate the last drive on a cable.

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Always terminate the last drive on a cable. This means that if you have an internal WD1Ø1Ø controller, the primary and the secondary both are terminated (because they are on separate cable runs). Ok? If you have an external WD1Ø1Ø controller or an 8X3ØØ controller, then only the last secondary gets terminated because there is only one cable run.

If you don't terminate drives correctly, you can expect to see anything from various random system errors to smoke. **Don't expect any secondary hard drive to be shipped properly jumpered or terminated.**

The 8 Megabyte Hard Drive and Its Associated Interface Card

Did you read the previous section on 12/15/35/7Ø meg hard drives? If not, you should now, because the considerations for the 8 meg hard drive are very similar.

1) Possible Memory Conflicts:

As with the 5.25 inch drives, the 8 meg Interface card will need to be jumpered according to the machine in which it finds itself. The reasons are the same; possible memory contention at pages 14 and 15. The following is a good rule of thumb.

Model 12	AG - AL	selects pages 8 and 9
Model II/16/16B/6ØØØ	AK - AP	selects pages 14 and 15

Additional Interface Card Switch Settings:

S1	1, 3, 5, and 7 ON
S2	1, 3, 5, and 7 ON
S3	3 and 4 ON

Additional Interface Card Jumpers:

A - B
W - V

2) Drive Select Jumpering and Proper Termination:

The drive select jumpering and the placement of the resistor pack terminator are handled almost identically to the 12 meg. The only major difference is that **pin 6 of the terminating resistor pack MUST be lifted.** Refer to HD:5 for modification when pin 6 is lifted.

3) Potential 8 Meg Hard Drive Lockup Problems:

Unfortunately, one of the most unpleasant things about this drive is the tendency for 8 meg hard drives to be subject to disturbances created by RF fields. These problems show up in all kinds of freaky ways; however, the most common problem by far is the evil system lockup.

To minimize future agonies, you should therefore when working on any installation prcedure involving an 8 meg hard drive keep your eyes peeled for any potential sources of RF. Radio transmitters, x-ray machines, close proximity to telephone switching equipment and other computers may cause problems to system integrity.

.....

Don't blame Mr. Marconi for everything;
RF is not to be used as a catch-all
scapegoat for hardware problems.

.....

Be aware, though, that this potential problem and its cure is not all encompassing or to be used as a panacea for other hardware faults. Suspect RF interference only when all other methods of troubleshooting have failed. In other words, do the alignments, check for correct implementation of the applicable Technical Bulletins, and when all else fails consider RF as a possible culprit.

4) Magnetic Media Retention Problems:

This is as much a problem with System 3 as it was with Version 7, and the same basic truths about this ugly situation are true: it has high nuisance value, it can be rather difficult to diagnose, and it drives even the most pleasant customer off the deep end. Even though the System 3 (and Xenix 1.3.5) formatters are more rigorous, they will still miss many problems of this nature, since formatters only catch immediate problems and media retention difficulties may take weeks to manifest themselves. If you suspect this type of catastrophe, contact Technical Support for advice.

IMPORTANT HARD DRIVE TECHNICAL BULLETINS:

Technical Bulletins Associated with the AX-9282
Controller Board and AX-9367 Interface PCB
12 and 15 Meg External Primary Drives

HD:9	Loose cables on drive logic board
HD:1Ø	Resistor packs installed backwards on AX-9282
HD:12	Controller board circuit change (AX-9282)
HD:15	Capacitor change for VCO
HD:18	Missing jumpers on interface board (AX-9367)
HD:2Ø	Circuit change for the VCO (AX-9282)
HD:23	Write data pulse is not in center of timing window reducing data reliability (8X3ØØ AX-9282)
HD:24	Power supply current limiting modification
HD:28	Reduce occurrence of "Active Drive Not Ready"
HD:33	Correct error in artwork on "No Revision" boards

Technical Bulletins Associated With the AX-9432
Controller Board
Model 16B+ and 6ØØØHD with Internal 15 Meg

HD:16	Alignment procedure
HD:19	Improve interface signal integrity
HD:21	Acceptable WD1Ø1Ø and WD11ØØ combinations
HD:27	Correct drive select problems with external secondary on early revision rev PP2 boards
12/16B:25	To eliminate Boot Error HN and blown boot track on internal hard drives
6ØØØ:14	Correct long reset pulse

Technical Bulletins Associated with the AX-9Ø36
Controller Board, AX-9ØØØ Shugart Bubble PCB
and the AX-9Ø35 Interface PCB
8 Meg External Hard Drives

HD:2	R3 is incorrect value
HD:4	Modification of the controller board
HD:5	Write gate termination
HD:6	Filter on +5 volt line
II:31	Missing jumpers on HD interface board

Technical Bulletins Associated with the AX-9454
External Controller Board (WD-1Ø1Ø)

HD:12 Proper termination of drive interface signals
HD:21 Acceptable WD1Ø1Ø and WD11ØØ combinations
HD:34 WAIT* modification
HD:35 Modification to allow secondary drives to power on
HD:36 PAL change for Western Digital controller

Xenix is hard disk intensive. This means that the hard drives have to be operating correctly to insure the peaceful survival of a Xenix system. Make sure that you understand what you're doing when you check Xenix drives out... if you aren't sure, ask! You'll save yourself a lot of extra work.

****

SECTION THREE

Media Error Map Regeneration,
Multi-terminal PCB's and Terminals,
The Editor, and
Other Pearls of Useful Wisdom.

****

So you've got a system with a history of intermittent errors, and the customer isn't exactly sure that they remember quite what the problems were? Fear not. Xenix takes care of that (up to a point) with a history table of its own. The name of this useful file is:

/usr/adm/messages

and it can be a real boon to the technician under a lot of circumstances.

This file contains a record of most console error messages, although you will find that they consist primarily of disk-related errors and initial boot messages. There is a reason for this; the file is only updated every ten minutes and if the error is serious enough to crash the system then the odds are good that said error will not be recorded in the history table. However, most disk-related errors will not (at least, not immediately) crash the system, so they will usually wind up in /usr/adm/messages.

By reading this file, you can save yourself a lot of strain. Frequently a recurring error will point you in the direction of the problem subsystem. To read this file, type:

cat /usr/adm/messages

and the file will be displayed on the CRT. To hold the output so you can read it, you may use either the **<HOLD>** on the console or the **<CTRL>** **<S>** and **<CTRL>** **<Q>** keys from a terminal. If the file is lengthy or if you prefer working from hardcopy, you may print the file out on the system printer by typing either

cat /usr/adm/messages | lpr (where | is produced by typing **<CTRL>** **<Ø>** on the console)

or

lpr /usr/adm/messages

This will send the file to the printer. Be aware that it may be a few moments before the printer activates. This is normal.

.....

If you take the trouble to read
/usr/adm/messages
before you go tearing into a system,
you will often save yourself a lot
of detective work.

.....

To see an example of what reading this file can do for you, let's suppose that you had a situation where the customer complained of intermittent secondary hard drive problems. The /usr/adm/messages file contained, among other things, the following:

```
Jul 31 11:14
...
sure are subject
to the terms stated in the customer Non-Disclosure Agreement.

System 132k User 892k
Root 14356k Swap 1Ø28k

Jul 31 12:Ø1
HARD DRIVE 1: hard err 4Ø59 on rd of cyl 214 head 4 sect 14
HARD DRIVE 1: hard err 4Ø59 on rd of cyl 214 head 4 sect 14

Aug 1 Ø9:36
HARD DRIVE 1: hard err 4Ø59 on rd of cyl 214 head 4 sect 14
HARD DRIVE 1: hard err 4Ø59 on rd of cyl 214 head 4 sect 14
```

Given the above, it would be a fairly safe assumption that cylinder 214, head 4 should be added to the media error map for this particular drive 1, and that you should go back to diskutil and reformat the drive to lock out the flaw... **BEFORE** doing this, of course, assuring yourself that the customer has at least one and preferably two backups of the current information on hard drive 1.

.....

Although they are few and far between,
there are a few nice surprises about
System 3.

One of them is
diskstat.

.....

One of the nice things that System 3 throws your way which simplifies matters is a utility called **diskstat.** This utility makes it very simple to check drives to see if all the tracks on the media error map which came with the drive were locked out. It also lists interesting information like the number of heads and cylinders the drive has, the size of the filesystem, the number of sectors per track, and so forth. To use it, all you do is type:

diskstat [drive number]

where [drive number] is Ø, 1, 2, or 3.

The default is drive Ø, which is in fact what it will look at if you just type "diskstat."

"Very nice," you say, "but so what?" Well, what this does is make your life considerably easier if you should ever have to regenerate a hard drive media error map, which brings us rather nicely to the next subject of discussion.

Media Error Map Regeneration

At some point in time, you may find it necessary to regenerate the Media Error Map for a particular hard drive. Possibly the map has been lost by the customer, or the map does not match the bubble. The following procedure will allow you to generate a "quasi" error map, although you should bear in mind that **this process will not be 1ØØ% accurate.** If at all possible, find the real map!

This procedure is valid for all hard drives currently available from Radio Shack.

1) If the drive is currently formatted under System 3, use the **diskstat** utility to determine the tracks which are currently locked out on the drive.

2) Select the appropriate Diagnostic Program (refer to your hard disk diagnostic literature) that will allow you to sequentially read and verify all tracks.

3) Save all data on the hard drive if the customer desires and has not already done so. **If in doubt... CHECK!**

4) **DO NOT format the hard drive.**

5) Load and run the diagnostic selected in step 1. You do not want to do any writes, only sequential reads. **For this procedure to be effective, the diagnostic must run for a substantial period of time.** The longer you can let it run, the better; if possible allow it to run overnight.

6) Select the history table option under the diagnostic and all errors will be displayed. From this information (and the information provided by **diskstat**) you should be able to gain a fairly good idea where the flaws are on the media. Remember, Xenix is only interested in the cylinder and head number.

TERMINALS:

Setting Terminal Options:

A Xenix system does not automatically power up with the terminals enabled. The baud rates must be set to match that of the data terminals and the serial channels must be enabled at least once.

For example:

> You have just installed the Xenix Core System. From this point forward whenever you boot Xenix, the serial channels will not be enabled (i.e. your Xenix system will not talk to any terminals).
>
> However, if you configure the serial channels once, enable them, and leave them turned on, from then on whenever you boot the system the serial ports WILL BE ENABLED. Xenix remembers how you last left the system.

Unfortunately, setting the baud rates with Xenix is not the easiest thing in the world. Mind you, it's not terribly difficult... just not easy the first couple of times. Consider the following chart:

```
19console
13ttyØ1
Ø9ttyØ2
||  |
||  |_____________ Port Name
||
||_______________ Speed
|                       Ø = 3ØØ/12ØØ/15Ø/11Ø baud
|                       - = intended for online Model 33 teletype
|                       1 = Model 37 teletype (15Ø baud)
|                       2 = 96ØØ (for online terminals which require delays)
|                       3 = 12ØØ/3ØØ baud
|                       4 = LA36
|                       5 = 3ØØ/12ØØ baud
|                       6 = 24ØØ baud
|                       9 = 96ØØ baud (use with Radio Shack online terminals)
|
|_________________ Status (set by enable/disable)
                        1 = enabled
                        Ø = disabled
```

As far as the speed setting goes, there are yet more choices. The ones listed above are special purpose; the next table gives a complete listing of the

documented baud rates on Xenix (as of Xenix 3.1):
Baud Rate Settings:

Special Purpose:

Ø = 3ØØ/12ØØ/15Ø/11Ø baud
- = intended for online Model 33 teletype
1 = Model 37 teletype (15Ø baud)
2 = 96ØØ baud (for online terminals which require delays like Tektronix 41Ø4)
3 = 12ØØ/3ØØ
4 = LA36
5 = 3ØØ/12ØØ
6 = 24ØØ
9 = 96ØØ

General Purpose:

a = 5Ø baud
b = 75 baud
c = 11Ø baud
d = 134.5 baud, usually with two stop bits
e = 15Ø baud
f = 2ØØ baud
g = 3ØØ baud
h = 6ØØ baud
i = 12ØØ baud
j = 18ØØ baud
k = 24ØØ baud
l = 48ØØ baud
m = 96ØØ baud
n = external baud rate "A", usually 192ØØ baud
o = external baud rate "B", often either 36ØØ or 72ØØ baud

The information:

```
19console
13ttyØ1
Ø9ttyØ2
```

is contained within a file called **/etc/ttys**. If you were to **cat** (short for concatenate) this file to the screen, you could see at a glance just how your communication channels were configured.

You will notice that the console setting looks different in System 3 than in Version 7. The baud rate for the console is now "9" instead of "h", which is good since "h" as a baud rate in System 3 is 6ØØ baud. In any case, "19console" means that the console is enabled (19console), it is communicating at 96ØØ baud (19console), and that the device name is console (19console).

"13ttyØ1" decodes to enabled (13ttyØ1), the system will check for 12ØØ or 3ØØ baud (13ttyØ1), and a device name of ttyØ1 (13ttyØ1).

"Ø9ttyØ2" decodes to disabled (Ø9ttyØ2), when enabled it will communicate at 96ØØ baud (Ø9ttyØ2), and a device name of ttyØ9 (Ø9ttyØ2).

To enable a channel, enter the following command:

enable ttyØn <ENTER>

where **n** is the channel number. For example, to enable channel 2 (otherwise known as serial port B) type: **enable ttyØ2 <ENTER>**.

.....

Serial Channel A is **ttyØ1.**
Serial Channel B is **ttyØ2.**
The computer's keyboard is **console.**

.....

Conversely, to disable a channel enter:

disable ttyØn <ENTER>

where **n** is the channel number. **disable ttyØ1** would disable serial port B.

.....

Unless You're Specifically Looking For Trouble

DO NOT DISABLE THE CONSOLE
(or change its baud rate).

.....

****

OK Guys, haul out the stale Twinkies.
You Are Now About To Learn (or relearn)

The Editor.

(lots of coffee, smokes if you do,
pain reliever of your choice optional.)

****

In order to change the baud rates of the serial channels, you must modify the file **/etc/ttys** to correspond to what you want. In order to make these changes, the file must be edited. This means that you must know how to use the Xenix editor. This editor is called **ed.**

ed is a fairly versatile, if somewhat moronic program designed to edit files. He will do exactly (and I do mean "exactly") what you tell him to with a minimum (really!) of cockpit error checking. This means that you should be careful. Understand what you're doing **before** you do it. **Never Assume Anything!** Read this section carefully before doing anything with ed or you may find yourself in (to say the least) an embarrassing situation. One way to minimize your chances of catastrophe is to make a "safety" copy of the file you intend to edit before you start! e.g.

cp /etc/ttys /etc/ttys.old <ENTER>

Also, to (very nearly) guarantee that you have permission to rewrite the file after changes have been made, you should be logged in as root, and be proceeding with the same EXTREME CAUTION you would apply to handling an armed grenade.

.....

ed is a versatile, if somewhat moronic program
designed to edit files. He will do exactly what you
tell him with a minimum of cockpit error checking.

.....

To invoke **ed** and edit the **/etc/ttys** file, type:

ed /etc/ttys <ENTER>

After a moment of thinking about it, the system will respond with a number roughly corresponding to the number of bytes contained within the file, and an asterisk (*) as a prompt (a change from the Version 7 editor). To see the file in its entirety, type:

1,$p <ENTER>

This command instructs the editor to print the file beginning with line one to its end. The **$** signifies the last line number, and the **p** tells ed to print these lines on the screen. As an example, you should now see something like the following on your screen:

```
# ed /etc/ttys
5Ø
*1,$p
19console
Ø3ttyØ1
Ø3ttyØ2
Ø9ttyØ4
Ø9ttyØ5
Ø9ttyØ6
*
```

You will notice that the System 3 **/etc/ttys** file looks a little different than the Version 7 equivalent. System 3 comes pre-configured for six terminals instead of the three in the Version 7 file.

Let's assume (dangerously) that our sample customer has two DT-1 terminals. One DT-1 is to be run from a remote location over telephone lines. It will have a modem, but because of situations beyond the customer's control, it may at times be a 12ØØ baud modem and at other times it may be a 3ØØ baud device. The other DT-1 will be in the office and will run at a baud rate of 96ØØ.

We will configure ttyØ1 for 96ØØ baud and ttyØ2 to search for 3ØØ or 12ØØ baud. **It should be noted here that ttyØ1 and ttyØ2 can be configured to search a range of baud rates and select the one that matches the incoming data.** Reference the baud rate chart.

What we need to do, then, is to change the **/etc/ttys** file as shown below:

FROM	TO
19console	19console
Ø3ttyØ1	Ø9ttyØ1
Ø3ttyØ2	Ø3ttyØ2
Ø9ttyØ4	Ø9ttyØ4
Ø9ttyØ5	Ø9ttyØ5
Ø9ttyØ6	Ø9ttyØ6

NOTE: It is not wise to edit the /etc/ttys file if the file shows a "1" in the first position for the ttys implying that one or more terminals are enabled. It is wiser to quit, disable the ttys, then edit the file. Don't expect to be able to change the first character (enable or disable flag e.g. Ø or 1) and have this work. Use the **enable** or **disable** command at the system prompt instead. This forces Xenix to read the file.

In ed, every line has a number. Ed is a line oriented text editor and as such we must give him every line number we wish to change. The tricky part arises because the line numbers are not displayed so you must count them yourself. In addition to this, we must also tell ed what to do to that line.

Type the following command:

2p <ENTER>

You should see displayed on the screen the second line of the file. It's always a good idea to print the line you are about to change before you change it... just to make sure that you are going to change the correct line.

With the next command we will change the second line. Type in:

2s/Ø3/Ø9/p <ENTER>

You should now see on your screen:

Ø9ttyØ1

The above command instructed ed to get line 2 (2s/Ø3/Ø9/p), search it for the first occurrence of Ø3 (2s/Ø3/Ø9/p), change the Ø3 to a Ø9 (2s/Ø3/Ø9/p), and finally to print the line as changed (2s/Ø3/Ø9/p).

The / character is used as a delimiter between arguments of the command. If you omit one, ed will probably do something a bit strange and most likely not at all what you had intended.

Now, to make sure that the changes are absolutely correct, list the entire file again:

1,$p <ENTER>

If it is correct, then you must write the file back out with the **w** command:

w <ENTER>

Again, the system will respond with a number to signify that the file has now been written.

To leave the editor, type **q**:

q <ENTER>

The root prompt # will be displayed.

The above information about the editor should be sufficient to enable you to alter the /etc/ttys file if you need to. However, for more detailed information about the editor in general you should refer to The System Administrator's Guide to Xenix, chapter 11. In addition, Xenix 3.1 has a help file on **ed** which also contains useful information. To use it (provided it has been installed; see Section 1 for more information on the installation procedure), type:

help ed <ENTER>

and the on-line manual page will appear on the CRT.

Multi-Terminal Boards:

HARDWARE:

The multi-terminal interface board (AX-7981) will allow the user to add three additional serial ports to his computer with each PCB. Up to two multi-term boards are now supported under Xenix 3.Ø and 3.1, giving the user a maximum of 8 serial channels plus the console.

There are, naturally, several important points to be aware of when installing or servicing a Xenix system with multi-terminal interfaces. These are outlined below:

1) Card Order:

The multi-terminal board is interrupt driven and interfaces to the Z8Ø side of the machine. Due to Z8Ø interrupt chaining, the position of this board in the scheme of things becomes important. Refer to Section 2 for proper card order.

2) Switch Setting:

There is one switch on the multi-terminal board that must be set prior to use. This switch determines which ports a particular board will be responsible for.

Board 1

Switch position one in the on condition (closed). All other positions are in the off (open) condition.
This board will provide ports ttyØ4, ttyØ5, and ttyØ6.

Board 2

Switch position two in the on condition (closed). All other positions are in the off (open) condition.
This board will provide ports ttyØ7, ttyØ8, and ttyØ9.

3) Technical Bulletins:

Refer to the following Technical Bulletin:

I/O:62	To correct intermittent operation and to increase reliability.

SOFTWARE:

Xenix 3.Ø and 3.1 come equipped to deal with the ports on one multi-term board. If you wish to run two in a system, simply setting the switches and putting the board in the proper slot is not sufficient. **Xenix has to be told that the boards are there!**

To tell the system to look for the additional ports, follow the steps outlined below:

1) You must be logged in as **root** to effect these changes.

2) Change to the **/dev** directory:

    cd /dev <ENTER>

3) Output a directory listing to the screen of the current TTY's:

    l tty* <ENTER> list only files beginning with "tty"

4) You will see listed **ttyØ1** and **ttyØ2.** For one interface board look for **ttyØ4, ttyØ5,** and **ttyØ6.** In System 3, these five should be present automatically. For the second interface board, look for **ttyØ7, ttyØ8,** and **ttyØ9.** If Ø4, Ø5 and Ø6 appear (one board) and Ø4, Ø5, Ø6, Ø7, Ø8, and Ø9 appear for two boards then skip to step 6; otherwise, continue with step 5.

5) You will need to 'make the nodes' for these tty's. Essentially this means telling Xenix that these devices are available and linking said devices to their drivers. Enter the following:

    One Multi-Terminal Board:

    mknod ttyØ4 c Ø 4 <ENTER>
    mknod ttyØ5 c Ø 5 <ENTER>
    mknod ttyØ6 c Ø 6 <ENTER>
    chmod 666 ttyØ4 ttyØ5 ttyØ6 <ENTER>

    NOTE: These ports should already be in the system; this is provided primarily for reference purposes.

    Two Multi-Terminal Boards:

    mknod ttyØ7 c Ø 7 <ENTER>
    mknod ttyØ8 c Ø 8 <ENTER>
    mknod ttyØ9 c Ø 9 <ENTER>
    chmod 666 ttyØ7 ttyØ8 ttyØ9 <ENTER>

6) The 'nodes' being installed, two other files must be updated. These are the **/etc/ttys** file and the **/etc/ttytype** file.

To update these files, an editor will need to be used. Remember **ed**? If not, flip back a few pages and re-read the discussion of how to edit the **/etc/ttys** file. Once you feel confident enough to edit these files, come back to step 7.

7) Enter the command:

cat /etc/ttys <ENTER>

You should see **at least** the following in the file:

```
19console
ØXttyØ1
ØXttyØ2
```

With one multi-terminal interface the file must contain:

```
19console
ØXttyØ1
ØXttyØ2
ØXttyØ4  ------------\
ØXttyØ5               |---- Add these lines if not there.
ØXttyØ6  ------------/
```

With two multi-terminal interfaces, the file must contain:

```
19console
ØXttyØ1
ØXttyØ2
ØXttyØ4  ------------\
ØXttyØ5               |
ØXttyØ6               \_____ Add these lines if not there.
ØXttyØ7               /
ØXttyØ8               |
ØXttyØ9  ------------/
||
||_____________________________ Set the baud rate here.
|
|_____________________________ Ø or 1 (enabled = 1, disabled = Ø)
```

8) The second file to edit is the **/etc/ttytype** file. This file contains information as to the terminal type of the device connected to a particular TTY port.

Enter the following command:

cat /etc/ttytype <ENTER>

You will probably see the following:

```
trs16 console
adds25 ttyØ1
adds25 ttyØ2
adds25 ttyØ4
adds25 ttyØ5
adds25 ttyØ6
```

The file will need to be changed as follows:

```
trs16 console
adds25 ttyØ1
adds25 ttyØ2
adds25 ttyØ4 --------------\
adds25 ttyØ5                |----- add for first board if not present
adds25 ttyØ6 --------------/
adds25 ttyØ7 --------------\
adds25 ttyØ8                |----- add for second board
adds25 ttyØ9 --------------/
  |
  |_____________________________ This field may change depending upon
                                 the terminal type connected to its
                                 respective port.
```

NOTE: In System 3, for the last terminal (ttyØ6 or ttyØ9) to reinitialize correctly after logging out (i.e. clear the screen and put the login message back up), there needs to be a **blank line** at the end of both the /etc/ttys and the /etc/ttytype file.

****

"Funny, that's not what Profile's
supposed to look like...."
or
How To Tell Xenix What Type of
Terminal You Are Using.

****

So, your customer just hauled himself down to the neighborhood Computer Center and, while he was laying down the bucks for his new System 3 software, decided that he would buy a brand-new terminal to boot... so he put forth some more hard cold cash and purchased a shiny new DT1ØØ. Roaring back into his office with single-minded enthusiasm, he rips open the box with the insane zest of a toy poodle destroying a pair of slippers. A veritable blizzard of packing material results, including -- Guess What??! -- the owner's manual. Well, really... you're only supposed to read the manual when the thing breaks, right?

Spending no time in reflection, our stalwart customer goes boldly forth and connects his new prize to the system. Striding purposefully across the room, he logs into the console and configures the baud rate of the channel with the editor of his choice, and then enables the port. Leaping back to his newest acquisition as though his life was threatened by Darth Vader himself, or at least a Storm Trooper, he breathlessly logs in and invokes his favorite application package. A pregnant pause, then, "Funny, that's not what Profile's supposed to look like...."

Not really surprising, except perhaps to the customer, and although the screen does look rather funny, he's not laughing about it.

What Went Wrong:

Remember reading just a page or two ago about a file named **/etc/ttytype**? Unless the customer remembered to change this file, the port in question is probably still configured to talk to an **adds25**. This means that whenever you log in on, say for example ttyØ2, Xenix is going to configure its output to be compatible with an Adds-25 terminal, or one emulating an Adds-25 terminal.

Actually this is something of an oversimplification. In point of fact, Xenix just doesn't care what terminal type you have, but some application packages (Scripsit-16, Profile-16, Xview, etc.) will check this table (/etc/ttytype) and in conjunction with another file, **/etc/termcap**, configure their output to look proper on the terminal in question. The Xenix utility **more** is another example of a program that will check these two files.

By working together with **/etc/ttytype** and **/etc/termcap** these programs will configure THEIR output to match that of the terminal. Codes like reverse video and cursor positioning can, and generally do, change from terminal type to terminal type.

Now, what does this mean to this rather befuddled customer? Profile-16 thinks he's using an Adds-25 terminal when he's really using a DT1ØØ. The codes are different so his screen isn't going to look the way it should.

How Does He Fix It?

He determines the tty number that he has the DT1ØØ hooked to and then edits the **/etc/ttytype** file to say **dt1ØØ** instead of **adds25.**

We decided that in the example the customer is using tty02. Let's look at the file **/etc/ttytype.**

```
trs16 console
adds25 ttyØ1
adds25 ttyØ2
adds25 ttyØ4
adds25 ttyØ5
etc. ....
```

The file needs to be edited, again using the editor of choice, to look like:

```
trs16 console
adds25 ttyØ1
dt1ØØ ttyØ2
adds25 ttyØ4
adds25 ttyØ5
etc. ....
```

Now, whenever anyone logs in on ttyØ2, Xenix and the application packages will know to configure their output, when necessary, to correctly "speak dt1ØØ".

There's Another Small Problem...

The file **/etc/termcap** is a table that contains all the control codes, escape sequences, and various other attributes like number of columns that a particular terminal will understand. If there is no entry in the **/etc/termcap** file for the dt1ØØ, the terminal output will still look funny, and nobody will be laughing.

In short, the file **/etc/ttytype** really "points" to an entry in the **/etc/termcap** file for Xenix, or more properly put, the application/utility program to look up before sending any data out the port.

An "install" diskette should be provided by the computer center with the DT1ØØ to make these additions to the **/etc/termcap** file. Some application programs; Profile-16, Scripsit-16, Unify, and MultiPlan as examples, will have their own **termcap** file. This install diskette will take care of them also.

A detailed explanation of the termcap files is more than this manual is intended for. However, the **termcap** entry in the "help" files on the Development System is fairly clear, and if you are really curious I would refer you to it.

An Easy Way To Check For The Problem

Assuming that the DT1ØØ "Install" diskette has indeed been installed correctly (I'll explain what I mean by "correctly" in just a moment) but the output still looks funny, try the following command:

TERM=dt1ØØ; export TERM <ENTER>

Now try Profile, or Scripsit, or **more** and see if the output looks correct. If it does, then the **/etc/ttytype** file has not been modified or has been modified incorrectly.

And Finally, The Exception....

The **root** user. For every user on the system there is a **.profile** file that is loaded in. Without getting too descriptive, special system variables may be set here and these variables will take precedence over variables set in different system tables. The **root .profile** may set the ttytype variable to trs16 regardless of the tty in use. In this case the customer may change the **.profile** file or use the above command (TERM=.....) to set the terminal type. In this case, the terminal type will be correct only until the user logs out.

****

A Confusing Compendium of
Application Packages
and
How To Install Them

****

Since we just finished a discussion of DT1ØØ's and why they might occasionally look funny, let's go on ahead and add to the confusion by discussing some of the commonly used applications software and their relationship with System 3 and terminals.

To begin with, let's do a quick review of how to install an applications package:

1) At the root prompt, type:

   install <ENTER>

2) The screen should show the following:

   Installation Menu
   1. to install
   q. to quit

   Please select :

3) Type **1 <ENTER>** to select the Install option. The screen shows:

   Insert diskette in Drive Ø and press <ENTER>

4) Insert the first installation diskette in Drive Ø, close the drive door, and press **<ENTER>**. If the application is complete on one diskette, the screen shows:

   Installation complete -- Remove the diskette, then
   press <ENTER>

   If the application is contained on more than 1 diskette, Xenix tells you when to insert the remaining diskettes and then displays the above message when the installation is complete.

5) After you press **<ENTER>**, the screen shows the Installation Menu again. If you want to install another application package, type **1** again; otherwise, type **q <ENTER>** to quit. You should get the root prompt # back.

```
.........................................

install must be run by root at the console.
.........................................
```

Now, as if matters weren't already complicated enough, there are specific applications packages and versions of same which have interesting quirks waiting to grab you regarding DT1ØØ's.

Multiplan, Unify, and Scripsit-16 with DT1ØØ's

If you are using DT1ØØ's and the following versions of these applications, you must install a special DT1ØØ file after you install the application. (Nothing is ever easy!) The versions are:

Multiplan Version Ø1.Ø6.ØØ (Cat. No. 26-648Ø)
Unify Version Ø1.ØØ.ØØ (Cat. No. 26-6415)
Scripsit-16 Version Ø1.ØØ.ØØ and Ø1.ØØ.Ø1 (Cat. No. 26-6431)

After you install the application, at the root prompt, type:

dt1ØØ-install <ENTER>

The screen shows:

```
        DT1ØØ Terminal
     Installation Menu
        1.  to install
        q.  to quit

   Please select :
```

Now, type 1 **<ENTER>**. When prompted, insert the DT1ØØ installation diskette into Drive Ø and type **<ENTER>**.

All later versions of these particular applications packages do not require any modification.

Profile-16

With System 3, you must use Version Ø1.Ø1.ØØ (or later) of Profile-16 (Cat. No. 26-6412).

Accounting Applications (GL, AR, AP, etc.)

Apparently, the Version 7 and System 3 versions will both work on Xenix 3.Ø and 3.1, but beware of mixing versions... the programs work best if you use all new versions or all old versions.

Hopefully, you should never have to deal with the nuts and bolts of mismatched applications packages; it really is going somewhat above and beyond the call... but this should give you enough information to spot the obvious pitfalls.

****

Accessing Additional Hard Drives
With Xenix
and
Neat Things About Cartridge Drives

****

Before you can access any additional secondary hard drives with Xenix, several steps must be taken... and these steps pretty much equally apply to cartridge and floppy drives as well. Briefly, the drive(s) must have been formatted with **diskutil**, a file system must have been created on each additional hard drive (and, in some instances, on floppy/cartridge drives) with **/etc/makefs**, and the drive(s) must be **mounted**. This procedure is really much easier than it sounds, and the steps will be discussed below.

Formatting:

To format anything under Xenix, be it hard, floppy or cartridge drive, the program **diskutil** must be used. The system is booted from the floppy **Boot diskette** or the hard drive and at the boot prompt the program **diskutil** is called. This procedure is the same as when formatting the primary hard drive with the exception that the drive number will change to correspond to whichever secondary you may wish. You are directed to Section One of this document for formatting instructions.

Creating the File System:

Once all secondary hard drives are formatted and the system has been booted from the primary hard drive, you are ready to begin creating file systems. Follow the steps below:

NOTE: Since we're at this, I'll also cover here how to make a file system on both floppy and cartridge disks. If all you ever plan to do with floppy or cartridge drives is backup your hard drive(s), you can skip this information; if you plan to use either floppy or hard drives as **mount**able file systems, you have to perform the steps outlined below.

Creating Hard Disk Secondary File Systems:

1) At the root prompt, type:

/etc/makefs <ENTER>

2) The screen shows the following menu:

```
                Make a File System on . . .
      Type      1 a single-sided floppy
                2 a double-sided floppy
                3 a hard disk
                4 a disk cartridge
                q to quit

      > Enter Number:
```

For those of you who remember Version 7 Xenix, this is a pretty radical departure... menu-driven file system manufacture is, in fact, new to System 3.

3) Type **3 <ENTER>**. The screen shows:

```
On which hard drive (Ø-3)?
```

4) Type **1 <ENTER>** for the first secondary drive (drive 1). The screen shows the following:

```
Disk has xxx cylinders.
Disk has x heads.
Disk has xx tracks reserved for bad track mapping.
Making a file system of xxxxx blocks on /dev/hd1.
```

5) When the file system is created, the screen shows:

```
Press <ENTER> to continue.
```

6) Type **<ENTER>**, and the menu returns to the screen. At the menu, type **q <ENTER>** and the root prompt will be displayed.

Creating File Systems on Cartridge:

1) At the root prompt, type:

/etc/makefs <ENTER>

2) At the menu, type **4 <ENTER>**. This is the option to make a file system on a disk cartridge. The screen will display:

```
On which cartridge Drive ( Ø or 1 )?
```

3) Type **Ø <ENTER>**. The screen shows:

    Insert formatted cartridge in Drive Ø and press
    <ENTER>

4) When the file system is created, the screen will display:

    Press <ENTER> to continues

    The menu reappears on your screen. If you are finished creating file systems, press **q <ENTER>** and the root prompt will reappear.

Creating File Systems on Floppy:

1) At the root prompt, type:

    /etc/makefs <ENTER>

2) At the menu, select either option **1** or **2**, depending on whether you wish to make a file system on a single or a double sided disk. The screen will then show:

    On which floppy Drive (Ø - 3)?

3) Type **Ø <ENTER>**. The screen shows:

    Insert formatted disk in Drive Ø and press <ENTER>

4) When the file system is created, the screen shows:

    Press <ENTER> to continue

    The menu reappears on the screen. Type **q <ENTER>** to quit.

Mounting File Systems:

In order to access files located within a secondary hard drive, a mountable floppy disk, or a mountable cartridge disk (i.e. drives which have file systems), the drive in question must first be **mount**ed on the root file system. Although Xenix provides empty directories for this purpose (with names like **/mnt**, **/mnt1**, **/mnt2**, and so on) it is usually easier to remember where things are if you create a special empty directory within the root directory on which to mount your new file system. To do this, do the following:

cd / <ENTER>
mkdir hl <ENTER> (for the first secondary hard drive)

The first command (**cd /**) moves you to the root directory. The second tells Xenix to create a directory entry called **hl**. If you also wanted to mount a third hard drive and your first disk cartridge, then you would want to use **mkdir** to make a directory for each of these file systems (calling them perhaps **h2** and cdØ). In truth, you can call these directories pretty much anything you want, but hl, h2, h3, etc. are fairly standard.

We're only halfway finished with this process, though... now that you know where you want to put your new file systems, you have to actually put them there. This has to be done for every secondary file system. Use the following commands as appropriate:

/etc/mount /dev/hdl /hl <ENTER> (first secondary hard drive)

/etc/mount /dev/hd2 /h2 <ENTER> (second secondary hard drive)

/etc/mount /dev/hdl /h3 <ENTER> (third secondary hard drive)

/etc/mount /dev/cdØ /cdØ <ENTER> (first cartridge drive)

/etc/mount /dev/cdl /cdl <ENTER> (second cartridge drive)

Unmounting:

If you need to remove or turn off a mounted secondary file system, you must first unmount it. The **shutdown** command automatically unmounts all drives so when utilizing that command it is not necessary to do any unmounts. The correct syntax to unmount a drive otherwise is:

/etc/umount /dev/hdl <ENTER>

I really do mean you to type "/etc/umount"; that's the way the command is spelled.

If additional hard drives are on the system, or cartridge or floppy drives, substitute for **hdl** in the above command from the following list as needed:

hd2, hd3, cdØ, cdl, fdØ, fdl, fd2, fd3

A Note About Disk Cartridges:

Xenix locks disk cartridge drives when they are in use. This is to prevent anyone from removing a disk while it is in motion. When the drive is no longer in use, Xenix unlocks the drive so the cartridge can be removed.

If the cartridge is being used as a mountable filesystem, Xenix locks the drive until the filesystem is unmounted. **NOTE: If you improperly shutdown the system, or if it crashes with the cartridge file system in place and mounted, Xenix does not unlock the drive.** The cartridge drive will remain locked until you press the reset switch and see the "Xenix Boot>" prompt. At that point, Xenix will unlock the drive for you.

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SECTION FOUR

Hints and Kinks
or
How to overcome various system anomolies
in your spare time.

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"Space, the final frontier..."

.....

Periodically (just to keep you on your toes), the system you find yourself involved with may transport you into places where you are sure no technician has ever gone before. This new frontier may hit you with illogical hardware failures, dazzling displays of software prestidigitation totally unlike that which was intended, or, if things are really going well, both. When you find yourself in such a confrontation, take heart. There are frequently reasons, and sometimes even solutions, for such problems. Below are listed a cross-section of the more exotic software bugs, operational problems, cures, and fixes.

File Structure Cleaning:

Before Xenix can utilize or mount a device (primary or secondary hard drives, floppy drives, and cartridge drives) that device must be "clean". By "clean" I mean that the file system on that particular device must have been shut down correctly. Look at it like this: the difference between a "clean" and an "unclean" filesystem is kind of like the difference between a file cabinet with every folder filed away in an orderly fashion, and one that someone tore through in a panic looking for their 1979 income tax records... the first one is obviously going to be the one where you'll actually maybe be able to find something later. In Xenix, before you can hope to find anything, you have to start with a neat system.

Sometimes, for a plethora of reasons, a file system on a device may become corrupted, or unclean. When booting, Xenix will check the primary hard drive to insure that the file structure is intact and if not, the system will ask for permission to clean it. The "gotcha" is that the system will not automatically clean the secondaries (if installed) and this is what frequently causes some customer/technician confusion. Consider the following example.

> A particular Xenix installation contains two twelve meg hard drives, one primary and one secondary. Upon booting the system the secondary is automatically mounted by way of the /etc/rc.user file. The customer, under normal operating conditions, should never need to manually mount the secondary.
>
> Upon booting the system one day, the customer is confronted with a forbidding message asking if the file structure should be cleaned. He responds in the affirmative and several minutes later, when the cleaning has been completed, boots the system.

> Later, the customer tries to access the information resident on the secondary only to find an empty directory. He panics. His secretary panics. The customer calls you spitting sparks out both ears. "My system is doing something WIERD!!" he bellows. Plaster falls from the ceiling, the phone receiver cracks in your hand, and the neighborhood Xenix guru is on vacation in Tibet this week... congratulations! You have just entered that "Xenix Zone" you've heard about....

The problem is that only the primary hard drive was cleaned, not the secondary. Fortunately this is an easy problem to cure. Follow the steps listed below:

1) **fsck /dev/hd1 <ENTER>**
   hd1 is for the first secondary hard drive
   hd2 is for the second secondary
   hd3 is for the third secondary

2) mount the secondary manually using the **mount** command.

The most common reason for a device to need cleaning is improper shutdown of the system. Simply hitting reset or the power switch without first performing the **shutdown** command will almost always corrupt the file systems. Removing **mount**ed floppies or cartridges without first **umount**ing them is just as bad.

To clean a floppy diskette or a cartridge the procedure is much the same:

1) **fsck /dev/fdØ <ENTER>**
   fdØ is for floppy drive Ø
   fd1 is for floppy drive 1
   ... etc.
   cdØ is for cartridge drive Ø
   cd1 is for cartridge drive 1

2) Mount or install the floppy or cartridge as normal.

Various Line Printer Problems:

Underneath this heading resides two major categories of potential problems:

Line Printers That Will Not Print
and
Line Printers That Will Not Stop Printing

Both are equally taxing if you haven't been up against them before. We will take the first problem first and for the sake of argument assume that the hardware is flawless.

Normally all line printer jobs are spooled into a holding area as separate files to await their turn to be printed. This holding area is in the **/usr/spool/lpd** directory. If there is ever a printer fault the system will add another file to this directory called **lock** to inhibit spooling any further jobs to a dead line printer. (Actually, **lock** is also present when the system is printing normally, it just doesn't do anything, but that adds to the confusion...). Anyway, to check for this problem, consider the following steps:

1) Log in as root.
2) **cd /usr/spool/lpd <ENTER>**
3) **l <ENTER>**
4) Look for a file named **lock.** If it is there continue otherwise you may have a hardware problem.
5) **ps -elf <ENTER>**
6) Look for a pathname in the column labeled "CMD" containing "lpd". Once you have found it, look to the left under the column labeled "PID" and note the number. This is the process ID.
7) **kill -9 PID <ENTER>**
   This command kills the line printer process.
8) **rm /usr/spool/lpd/lock <ENTER>**
   This command removes the lock file.
9) **/usr/lib/lpd <ENTER>**
   This command reinitializes the printer.
10) **cd / <ENTER>**
    l | lpr <ENTER>
    Step 9 should print a listing of the root (/) directory on the line printer. If it doesn't there may be a hardware problem. Do a shutdown and boot with TRSDOS and try the printer again. If it still doesn't work... you **definitely** have a hardware problem.

Once in a while a user will queue up a massive printer job that he really doesn't want. To abort the process:

1) Follow steps 5, 6, and 7 above.
2) **cd /usr/spool/lpd <ENTER>**
3) **pwd <ENTER>**
   Make sure the system displays **/usr/spool/lpd** before step 4.
4) **rm * <ENTER>**
   This command removes all files in the line printer queue.
5) **/usr/lib/lpd <ENTER>**

Failure to Reinstall an Application Package:

If, for some reason, you or the customer attempt to reinstall an application package onto the Xenix system... and it won't go in, there may be a reason. There is a file, **/etc/logbook**, which contains information on the application programs and their current version numbers. During the **install** procedure, this file is updated to reflect the current version number of the installed package. By **cat**ting this file, the user will see at a glance all of the current packages in place, the date of installation, and their respective version numbers.

.....

During the install,
if the version number of the package in question
matches an entry in /etc/logbook,
the procedure will frequently abort.

.....

To get around this problem, it will be necessary to **edit** the **/etc/logbook** file. Use the editor to remove the complete line that contains reference to the application package and its version number. Remember, the version number of the floppy package and the version number of the logbook entry must be the same.

After the edit is complete and the modified file written with the **w** command, reinstall the package as normal.

To **park** or not to park... some answers to the question.

System 3, like Version 7, provides a rather nice utility called **park. park** does just that -- upon system shutdown, it positions the head assembly over the innermost cylinder on the drive. It has changed a little bit since its inception; whereas the early **park** utility had to be asserted every time the system was rebooted, the current Xenix 3.1 **park** command modifies the file **/xenix** so that it remembers which way **park** was toggled last. In other words,

park -on <ENTER>	turns the **park** utility **on** until root turns it off
park -off <ENTER>	turns the **park** utility **off** until root turns it on
park <ENTER>	tells you what the current state of **park** is.

park is a good thing to use, whether or not you are moving the hard drive

around. It provides a little extra insurance against the possibility of glitching the boot track... and any help in that area is welcome. There is one instance where **park** is contraindicated: **park should not be used with 8 meg drives.**

.....

Don't use **park** with 8 meg drives....
They'll hurt themselves!

.....

As of Xenix 3.1, the way the **park** command works is not destined to prolong the life of 8 meg hard drives, so you should not use it. This may change with later versions, but if in doubt, ask. On a brighter note, **park** does work fine with 12, 15, 35, and 7Ø meg hard drives, both primary and secondary... bear in mind that when **park** is on, the last secondary on the chain is going to be the drive whose activity light is left on after you shut the system down. This is normal!

Losing the Screen Display:

You may find yourself getting a call sometime from a panic-stricken customer who whimpers, "Profile dumped me out... and now I don't get anything on my screen! What do I do?" You start chewing your nails and worrying about video problems... but before you leap into monitor theory, try this. This problem is not uncommon if a program terminates abnormally. You may be able to restore the screen display as follows (provided, of course, that the hardware really is ok):

1) Type **<CTL><Q>**. This restarts transmission from the computer if you accidentally typed <CTL><S>.
2) Now, press **<ENTER>** and **<REPEAT>** simultaneously. (If the keyboard doesn't have a <REPEAT> key, hit <ENTER> a few times instead).

If the screen is still blank, continue with these steps.

3) Type **<CTL><J>**. You may get an error message on the screen; if you do, ignore it.
4) Now type:

stty sane <CTL><J> <ENTER>

Your screen display should return.

If this **still** doesn't do it, your best bet is to go to another terminal and kill the process attached to the terminal and log in again on the affected terminal.

The above discussion brings us rather nicely to the next in the list of possible problems:

Runaway Processes and What to Do About Them:

A runaway process is a lot like a runaway horse: sometimes the only thing that will stop it is shooting it down. The equivalent of a gun in Xenix is the **kill -9** command.

.....

kill -9 terminates processes with extreme prejudice.
(Who needs ØØ7?)

.....

If you find yourself facing a process that you just can't stop, try the following:

1) Press **<BREAK>**. Probably you've already tried that at this point, but one more time will rarely hurt.
2) If the process hasn't terminated, go to another terminal on the system and log in as root, and look at the processes currently running by typing:

   ps -elf <ENTER>

   Look for the process id number of the runaway.
3) Try a subtle approach first. Type:

   kill -2 PID <ENTER>

   Wait a few seconds, then do a **ps -elf <ENTER>** again to see if the process has gone away. If it hasn't, type:

   kill -1 PID <ENTER>

   Wait a few more seconds, and see if the process has stopped. If not, type:

   kill -9 PID <ENTER>

   This will kill it... but it isn't very subtle, and some application packages get a little irate about abnormal termination, so you may have to do a little repair work like removing lock files to get things back to normal.

A final note on the subject of runaway processes: if you have something like

this occur when you are running Xenix on a system which only has a console and no terminals, you may have to press the reset switch to get things to come back. This is obviously a last resort, inasmuch as it closes the system down in a decidedly incorrect fashion. You will at the very least have to clean the system before bringing it back up, and you may have other problems to contend with as well. Try to avoid this if possible!

The Dreaded System Slowdown -- Some Possible Causes and Fixes:

System 3, even more than Version 7, will sometimes seem to seem to slow the pace of its operations down to the point of being nearly unusable. This would be understandable if there were 8 users on the system all busily typing away in Scripsit, but sometimes it happens when there is nearly no one on the system. A couple of things to look for when this happens are:

1) Make sure that the users are logging in on separate user names. If you have 4 people all logged in at the same time as "clerk", for example, the system will run a lot slower than it would if the same 4 users were logged in as "tom", "dick", "jane", and "dumbo".

2) If a serial port is enabled (whether or not it is a multi-terminal board or serial A or B), it should have a terminal which is powered up connected to it... or, more exactly, it should have something connected to it which will allow it to establish communications.

.....

If a port is **enabled**,
the terminal connected to it should be **on**.

(You'll save yourself a lot of grief.)

.....

Paying attention to those two items will make a lot of "system slowdowns" go away.

Local Printing Problems:

Local printing is a nice feature offered by Xenix... it means that you can avoid having to run over to the console printer every time you want to see a rough draft of a memo. However, there are a lot of things which will cause it not to work, or to work in a rather brain-damaged fashion. Here are a few of the things to look for when you've got a system with this difficulty:

1) First thing to check for is the modifications to allow successful local printing on both the DT1 and the DT1ØØ:

   I/O:66 Allow local printing on DT1
   I/O:76 Correct local printing problem on DT1ØØ
   I/O:98 Correct DT1 holding printers in RESET

2) Make sure that Xenix is aware of the correct terminal type on the ports where local printing is to be used.

   .....

   If you think screen output looks funny
   when you give Xenix the wrong terminal type,
   wait until you try local printing!

   .....

3) It is possible for Xenix to spew out information faster than some of our printers can keep up with. This causes funny looking results like dropped characters, misunderstood characters, and the like. There are a couple of ways around this problem:

   a) Slow the rate at which the terminal is talking to the Xenix system -- for example, if you are communicating at 96ØØ baud, try 48ØØ or even 24ØØ baud instead.

   b) Add a "printer buffer" (like our PTC-64 printer controller) to the system between the terminal and its associated printer. What this will do is allow you to communicate at 96ØØ baud without overrunning the local printer... the printer buffer will feed information out to the printer at the rate it can cope with.

Terminals Not Clearing the Screen After Logoff:

At times you may hear complaints from customers saying plaintively that one terminal on their system just won't clear the screen when they log out... yet when you look at the hardware everything checks out fine. Typically the problem will be exhibited on tty06 on systems with one multi-terminal board, and on tty09 on systems with two multi-terminal boards. If this is the case, you need to check the files **/etc/ttys** and **/etc/ttytype** for the presence of a blank line at the end of the file. For the terminal initialization process to work correctly on the last terminal entry in those files, there must be a blank line at the end of said file. If there is no blank line there, use **ed** to add one... your problem should vanish once those two files have been modified.

****

DOS STUFF

How to tell which version you've got
and what they do... or don't!

****

Xenix Ø3.ØØ.ØØ -- was the first release of System 3 Xenix. There were a few items that didn't work quite like Version 7 that caused some confusion.... when printing, for example, you got an extra form feed which was a bit of a nuisance. The manual wasn't horribly helpful, and the DC2212 support was also a bit confused. The file system structure was radically different than that on Version 7 which necessitated a somewhat complicated upgrade procedure, not to mention the hardware modifications which are necessary to run System 3 on 6 MHz hardware.

Xenix Ø3.ØØ.Ø1 -- never officially released, this was an upgrade which came with the System 3 development system which only applied if you had Version Ø3.ØØ.ØØ installed.

Xenix Ø3.Ø1.ØØ -- second official release of System 3, this version has a file system structure which is yet again different, meaning another involved upgrade procedure. This version has increased the speed of disk I/O, comes with online HELP pages for Bourne shell as well as the tsh, supports Hayes modems, and has the drivers necessary to run the disk cartridge system. In addition, the minor problems encountered in Xenix Ø3.ØØ.ØØ were corrected.

There is a printer bug with this version which crops up most frequently when printing long reports... it manifests itself as the printer either dropping offline or going not ready, or the spooler locking up. Typically, the problem is fixed by putting the printer back on line or shutting the system down and bringing it back up, causing the printer to continue with the job it stalled on. There will be a patched version which will fix this, but when it will appear is unknown.

Fortunately, since System 3 hasn't been around very long, keeping track of the versions isn't nearly as complicated as it is for Version 7!

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When **shutdown** Won't Work

or

In Times of Extreme Frustration,
How to Pull The Plug on Xenix
Gracefully

.....

Sometimes the **shutdown** command just won't work. You enter the command, see the "broadcast message" displayed on the console, hear various whirrs, clicks, and moans from the hardware -- and then the system seemingly plays dead. What now?

Generally, when this occurs, the **<BREAK>** key or a **<CTL><_>** will return the root prompt. If it does, make sure that all users are logged off and then type the following to gracefully halt the system:

sync;sync;/etc/haltsys <ENTER>

Although not as neat and tidy as **shutdown**, this will be more than sufficient to shut the system down cleanly and keep the filesystems intact for the next boot.

What is happening is that the process status command **ps** is freaking out and never returning from talking to the little Xenix gremlins... since **shutdown** uses the **ps** command to invoke a search and destroy mission on some of the active processes, when this command flames out, the **shutdown** process will sit and wait forever for something to happen. If you can recover, it will be the **<BREAK>** or the **<CTL><_>** that will do it for you.

What if this doesn't work? If you can't get the root prompt back, truck on over to another still functioning terminal, log in as root and perform the **sync;sync;/etc/haltsys** command. If this still doesn't work... all you can do is reset.

As a footnote to the above discussion, if when performing the **ps** command the terminal you are using locks up, **do not try to shut the system down using the shutdown command.** It will fail! Use the **sync;sync;/etc/haltsys** command instead.

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SECTION FIVE

Advanced System Information

and

Restoring Blown Xenix File Systems

or

How to Really Mung Things Up

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.....

Read This
BEFORE
Reading This Section

.....

This section is provided mainly as reference material for persons already familiar with the Xenix operating system. In this section, I will not walk you through step by step -- I am operating under the assumption that you will follow what I'm talking about. What I will give you is rather sketchy outlines of things which may need to be done under certain circumstances. The material in this section is optional and if you are not very familiar with this operating system, I would suggest that you browse this section, but NOT implement any of it until you are well grounded in Xenix.

That having been said, I should also warn those who are familiar (or think they are) with Xenix that the information contained herein may help you out in some instances. It may also make matters worse. The standard operating procedure for these situations should be **extreme caution.** When in doubt, don't try it -- make sure you understand fully what you are doing before you do it. With this stuff, discretion is frequently the better part of valor.

A final note: the information in this section is not guaranteed to be accurate or to work with all versions and all hardware implementations all the time. Some of it you will simply not be able to do without access to the Development System software. If it sounds like I'm trying to throw some healthy trepidation at you, you're quite right -- I am. Tread lightly.

For those of you who are curious, I will be picking apart a bit of the Xenix Tools disk in this section and will tell you how to do some of the particularly useful things in their inconvenient form. This may prove helpful to those of you who are in a bind on a system without a double-sided floppy drive.

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An Introductory Note About
The Xenix Tools Disk

****

This disk was prepared for use on Xenix 1.3.5 systems. As such, it will **not** work properly as it stands on System 3 systems. In order to get it to work on Xenix 3.Ø or 3.1, you will need to regenerate the disk. This turns out to be fairly simple.

Log in as root on a system running the desired version, and use **install** to install the Tools on the hard disk. Then, log in as "tandy" with a password of "support" to bring up the hard disk menu. The "k" option of the menu can then be used to produce another Tools disk with the Xenix version which is resident on the hard drive. This isn't totally fool-proof, but it should allow you to use most of the tests available to you on the Tools diskette.

.....

Flaw Maps

Was it entered? Was it entered correctly?
How can you tell?

.....

Flaw maps are pretty important to Xenix. These maps tell the system where it probably can't write and hope to have a chance of reading the data back at some future time. Sure, **diskutil** will do a verify on all of the tracks it formats (provided it was told to), but some flaws will just not be picked up by a formatter. A media retention problem generally will not be found by a formatter. However, difficulties of this nature usually will be included on the flaw map.

Remember the System 3 utility **diskstat**? That's a good way (available on all System 3 systems) to check to see that the flaw map has been correctly entered. It is, in fact, exactly the program being used to do this on the Xenix Tools Diskette (floppy menu option "k", hard disk menu option "p"). To use it, type:

diskstat drive number
optional, will default to "Ø"
may use Ø, 1, 2, or 3

If you have access to the Development System, and are curious about where the information that **diskstat** finds is stored, read on... you will not be able to try this without the Development System.

Figure 1 shows a decimal dump of a file called **/dev/hdbtØ**. This is the boot device for the primary hard drive. It contains information on the size of your hard drive and what errors have been locked out, among other things. If, for argument's sake, you were interested in the flaw map on the first secondary, the file would be **/dev/hdbt1**. Naturally all this junk is going to be meaningless to the non-initiates, but hang in there -- you'll be initiated.

Log in as root and type the following command:

od -d /dev/hdbtØ | more <ENTER>

You'll only get one screenful, but that's plenty for our purposes. What you should see is something similiar to what appears in Figure 1, although it obviously won't be identical.

Now, check out Figure 1. Looks impressive, eh? The big question is, "What does it mean?" Figure 2 is the flaw map that corresponds to the bubble that this file was dumped off of. Take a look at Figures 1 and 2 and see if you find a relationship between the two -- if you don't, not to worry, I'll explain it anyway.

```
.........................................

ØØØØØØØ 11888 3Ø312 ØØØ16 ØØ512 ØØØØ8 ØØØ17 ØØ512 ØØ256
ØØØØØ2Ø ØØØØØ ØØØØØ ØØØØØ ØØØØØ ØØØØØ ØØØØØ ØØØØØ ØØØØØ
*
ØØØ2ØØØ 11874 24932 ØØØ96 ØØØ18 ØØØ14 ØØØØ3 ØØØ23 ØØØØ1
ØØØ2Ø2Ø ØØØ5Ø ØØØØ5 ØØØ52 ØØØØ1 ØØØ54 ØØØØØ ØØØ54 ØØØØ1
ØØØ2Ø4Ø ØØ148 ØØØØ7 ØØ149 ØØØØ3 ØØ266 ØØØØØ ØØ291 ØØØØ7
ØØØ2Ø6Ø ØØ337 ØØØØ1 ØØ358 ØØØØ1 ØØ416 ØØØØ1 ØØ462 ØØØØ6
ØØØ21ØØ ØØ466 ØØØØØ ØØ49Ø ØØØØ5 ØØ493 ØØØØ5 ØØØ22 ØØØØØ
ØØØ212Ø ØØØØØ ØØØØØ ØØØØØ ØØØØØ ØØØØØ ØØØØØ ØØØØØ ØØØØØ
*
```

Figure 1.

.....

.....

Flaws Entered Into Flaw Map on HDØ (35 meg hd)

Cylinder	Head
14	3
23	1
5Ø	5
52	1
54	Ø
54	1
148	7
149	3
266	Ø
291	7
337	1
358	1
416	1
462	6
466	Ø
49Ø	5
493	5
22	Ø

Figure 2.

.....

Figure it out? Well, first off, what is the command **od -d**? This command is an **octal dump** of whatever file you specify as an argument. Frankly, I don't much enjoy working in octal, I much prefer working in hex or decimal. By adding an argument to the **od** command, we can tell it what radix we want to see the file dumped out in. A **-x** will force a hex dump. A **-d** will force a decimal "short" (16 bit) dump. So essentially what we did was to do a decimal dump of a file called /dev/hdbtØ.

Now let's pick this dump apart.

```
ØØØØØØØ 11888 3Ø312 ØØØ16 ØØ512 ØØØØ8 ØØØ17 ØØ512 ØØ256
ØØØØØ2Ø ØØØØØ ØØØØØ ØØØØØ ØØØØØ ØØØØØ ØØØØØ ØØØØØ ØØØØØ
*
ØØØ2ØØØ 11874 24932 ØØØ96 ØØØ18 ØØØ14 ØØØØ3 ØØØ23 ØØØØ1
ØØØ2Ø2Ø ØØØ5Ø ØØØØ5 ØØØ52 ØØØØ1 ØØØ54 ØØØØØ ØØØ54 ØØØØ1
ØØØ2Ø4Ø ØØ148 ØØØØ7 ØØ149 ØØØØ3 ØØ266 ØØØØØ ØØ291 ØØØØ7
ØØØ2Ø6Ø ØØ337 ØØØØ1 ØØ358 ØØØØ1 ØØ416 ØØØØ1 ØØ462 ØØØØ6
ØØØ21ØØ ØØ466 ØØØØØ ØØ49Ø ØØØØ5 ØØ493 ØØØØ5 ØØØ22 ØØØØØ
ØØØ212Ø ØØØØØ ØØØØØ ØØØØØ ØØØØØ ØØØØØ ØØØØØ ØØØØØ ØØØØØ
*
```

The things that matter to us in the above mess are the lines with boldfacing and boldfacing/underlining. Ignore the rest.

The first group of 7 digits on the left of each line is an octal representation of the position in the file. 2Ø Octal is equivalent to 16 decimal. Each five digit decimal number will take two hex bytes to store resulting in a total of 16 bytes per line. You'll notice that the line numbers increment in this example by 2Ø octal, or 16 decimal, so it works out.

But we really don't care about the file position, although the first piece of interesting information -- the number of cylinders and heads (i.e. the drive size) will occur at relative byte ØØØØØØ6 Octal (remember Octal counts Ø, 1, 2, 3, 4, 5, 6, 7, 1Ø, 11, ...). If you're not into Octal, just go to line ØØØØØØØ (the first line) and count over to the fourth number (ØØ512) and start there. In this example, the cylinder/head counts are shown in boldface.

Look at the first line:

```
ØØØØØØØ 11888 3Ø312 ØØØ16 ØØ512 ØØØØ8 ØØØ17 ØØ512 ØØ256
                          |      |
number of cylinders is 512 __|   |
                                 |
number of heads is 8 ____________|
```

The next interesting bit of information is the flaw map. From that file, we can determine the maximum number of errors the system can lock out on the drive, how many have been locked out, and what those flaws are. The maximum number of bad tracks starts at relative byte ØØØ2ØØ4 Octal, the number of tracks actually locked out at relative byte ØØØ2ØØ6 Octal, and the flaw map itself at relative byte ØØØ2Ø1Ø Octal. Let's take a look:

```
ØØØ2ØØØ 11874 24932 ØØØ96 ØØØ18 ØØØ14 ØØØØ3 ØØØ23 ØØØØ1
                 |     |     |     |     |     |
maximum bad tracks _____|     |     |     |     |     |
                       |     |     |     |     |
number of tracks locked out ___|     |     |     |     |
                             |     |     |     |
1st flaw entered is cyl 14, hd 3 _____|_____|     |     |
                                         |     |
2nd flaw entered is cyl 23, hd 1 _______________|_____|
```

Your flaw map may be bigger, or smaller, depending upon the number of flaws that were entered. All you have to do is to compare each five digit decimal number pair with your hard drive flaw map. The flaws in the dump are shown as cylinder-head. When you start seeing a lot of zeros, or the second asterisk (*), you're done.

A couple of things to bear in mind are that for 8, 12, and 15 meg drives, the maximum number of bad tracks allowed is 24. For 35 and 7Ø meg drives, the maximum number of bad tracks allowed is 96.

Of course, you can find all this information just as correctly and rather more simply using **diskstat**, but this is a good thing to remember should you ever find yourself troubleshooting a system with outdated software. A further note: **diskstat** works fine on Version 7 systems, too.

.....

RESTORING A BLOWN BOOT TRACK ON
THE
PRIMARY HARD DRIVE

or

Desperate situations call for
desperate solutions (sometimes...)

.....

You've got a Xenix system with a serious problem on your hands. The computer side of the house (the Z8Ø and 68ØØØ subsystems) is o.k., but the primary hard drive is suspect. The controller board and its alignment are good, the bubble logic board is good, the power supply is good, you don't see any gross read errors under HDREL... but the boot track is blown. Normally, the thing to do in this situation would be to re-diskutil, reinstall the Xenix core and have the customer restore all of his programs and data. One problem: the customer has nineteen months of data on the hard drive and no saves. Now, if we reformat, he loses all that data. He will not be very happy about that; in fact, he's likely to become pretty upset. Is there anything we can do for this guy? Well... maybe.

.....

**... if the format is what's blown, you're gonna'
have a rat's chance of success.**

.....

Since for all practical purposes we've got a doomed system anyway; we can tinker a little bit and maybe get the system up long enough to save his data. **Be aware that this procedure may, or may not, work; you should explain this fact to the customer before any attempt is made to restore the boot track.** Actually, the initial attempt will be to restore just part of the boot track, and if the format is what's blown, you're gonna' have a rat's chance of success.

We'll first examine the possibility that this is a situation where you can use the Xenix Tools Disk -- this implies that the floppy drives are double-sided, and that you have a copy of the Tools Disk with the **same version of Xenix as that on the hard drive.** If these criteria are met, follow the following steps:

1) Boot the Xenix Tools Disk. When you reach the floppy menu, select menu option "1".
2) Shut the system down. Remove the Tools Disk and attempt to **boot off of the hard drive. If the system boots, go immediately and do a save.** Don't wait; there is absolutely no guarantee that this will keep the system running for any length of time. Once a successful save has been performed, shut the system down and reformat and reinstall.

If you **can't** use a Tools Disk, try this:

Step One:

You'll need a floppy copy of a Xenix Boot Diskette, of the **same version Xenix that is resident on the hard drive.** With this in hand, install it in drive Ø and boot the system on floppy.

At the prompt, press <ENTER> to boot into floppy Xenix. Answer "n" to "Do you want to initialize your hard disk?"; this should put you into a standard single-user shell.

Step Two:

Now that you're booted into Xenix, you should have the root prompt(#). If you don't, you did something wrong. If you do, then proceed with the following. Enter the following commands:

1) **dd if=/hdboot of=/dev/hdbtØ bs=1b seek=3 <ENTER>**
This command recopies some of the boot information back onto the primary hard drive.

2) **sync;sync;/etc/haltsys <ENTER>**
This command will halt the floppy-based Xenix system.

3) You should now see the "**Normal System Shutdown**" message.

4) Press **RESET** to boot from the primary hard drive.

If the copy was successful, Xenix should boot from the hard drive. If it does, **go immediately and do the save.** If it doesn't... well, you gave it your best shot. There is one more desperation maneuver you can try in this instance, although the odds of its success are virtually nil. Boot up on

floppy, go into **diskutil** and try a non-destructive format with no verify. Assuming the format takes (large assumption, that!) you can proceed to try to reinstall the boot track. As I say, the odds are against you on this, but since you've nothing to lose anyway, it may be worth a shot.

A footnote to this is that if you try the non-destructive, no verify format option, make sure you are using the version of **diskutil** which is appropriate for the drive in question. Due to the different interleaves in Xenix 3.Ø and 3.1 (see Section 1 for more information), using the wrong version is worse than doing nothing at all.

.....

BEEFING UP THE SWAPPER

or

How to increase swap space on the primary
(is more really better?)

.....

Normally installed, the Xenix Core System will provide the user with 2Ø48 blocks of swap space on the primary. Knowing that a block is equal to 512 bytes, this works out to 1Ø24K or 1,Ø48,576 bytes or what we would call one megabyte of swap space. For most normal applications, this should be plenty.

Sometimes, however, it may be necessary to increase the swap space on the hard drive to allow numerous huge application packages to run a wee bit faster. The reasons why or when we might want to increase this space is really beyond the scope of this paper; this is provided solely as reference material. It is easy, though, to tell when you **don't** need to increase swap space, and the way to make that determination is included here.

Why Swap?

Just what does this swapper thing do, anyway? Look at it like this. You've got two gallons of Kool-Aid -- one gallon of blue, and one gallon of red, and there is a one-gallon-sized cup to drink from (a gallon of Kool-Aid is a lot, but this is Texas). In order to drink some of the blue, you first have to pour a gallon into the cup; then you can swill it down... but don't drink yet; we need it all. Your buddy wants some red, and you, being such a nice person, decide to let him have his share first. In order to do this, you pour your blue Kool-aid back into the blue gallon container and then pour a gallon of red Kool-Aid into the cup. What have you just done besides being so nice? You swapped blue Kool-Aid for red. Ok, but how does this apply to Xenix?

The two one gallon containers of Kool-Aid represent, we'll say, two 512K programs and the one gallon cup will represent 512K of 68ØØØ RAM. There is no way you're going to get 512K of RAM to hold two 512K programs at the same time, unless you change the universe, but if you could why would you be fixing Xenix systems.... but enough philosophy, back to pertinent matters. To run the red program (drink it) you first have to get it into the cup, but the cup is full of the blue program and there is no room. How do you do it? Easy -- just pour the blue Kool-Aid (program) back into its container (part of the swap space on the hard drive) and then pour the red Kool-Aid from its container (part of the swap space) into the cup (RAM). Now you can drink the red (run the red program).

The swap space is just a holding area on the hard drive for programs to be "swapped" into and out of RAM depending upon what we're running. This is necessary because Xenix is a multi-user environment and there will always be several programs in RAM belonging to different users at the same time. If the programs are too big to all fit into RAM, then we have to swap some of them out onto the hard drive. If the programs are really big, and the amount of RAM is fairly small, then the system may overflow the swap space. This is when we might want to increase the size of the swap area.

If there is a lot of time shown on the swapper, then you will probably want to increase the swap area. You can tell the swap time by doing a **ps -elf** and noting the amount of swap time shown under the **TIME** heading that corresponds to the process labelled **swapper**.

How To Do It

Xenix 3.x makes it easy for you to increase the swap space. However, it does require reformatting the drive with **diskutil** and reinstalling the operating system.

NOTE: If you do a save of what is currently on the system, do a **tar**type save. If you use **sysadmin**, you will wind up with the same size swap space that you had before.

When you reinstall the core system, when it asks you for the amount of swap you want, give it the desired amount **in blocks.** For example, if you want 2 meg worth of swap space, type **4Ø96.** When it creates the file system on the primary, you will wind up with one meg less on the file system, but Xenix will make the necessary adjustments automatically.

****

SECTION SIX

Saving Data and Upgrading Systems
or
How to Win Friends and Influence
Irate Customers

****

Sooner or later, almost every one of you will encounter a situation where the system you are working on will have to be reformatted -- which implies that all the data on said system is going to be sent to that great bit bucket in the sky. Being the savvy technician that you are, you say to yourself, "Hmm-mm... better call the customer and ensure that he has a full current save of his system!" So you place the call.

.....

If the world were a perfect place,
all customers would have current backups
of their systems...
but they usually don't.

.....

If the world were a perfect place, and if all system administrators were part of the subset of humanity that believes firmly in wearing both a belt and suspenders, the answer would of course be, "Yes, I've not only got one save, I've got **two**!" Unfortunately, things don't usually work out that way, and the answer one receives is frequently more along the lines of, "You want to reformat my system! I've got **SIX MONTHS** of Profile records (or Scripsit, or General Ledger, ad nauseaum) on there!! My business will collapse!!!" Great wailing, pounding of chests, and weeping generally ensues, and you the unfortunate technician on the spot may find yourself needing to either back this system up, or instruct the customer in the in's and out's of the process. (Yes, I know that in the perfect world the software support personnel are set up to do this, but this is the worst imaginable world we're examining here!)

The only problem with this situation is that you don't have the foggiest notion of where to begin... so, a little discussion of "how to do Xenix backups" seems in order.

First, A Little Background...

Despite all appearances to the contrary, there are two basic ways to back up a Xenix system. These two utilities are called **tar** and **dump** (also known as **backup** in System 3). **Tar** is used in the **tsh "save"** command, and is also frequently used in utility menus in application packages. It is a good choice for situations where you only want to save certain parts of a system, and can also be used to back up an entire system. One of the idiosyncrasies of **tar** is that it cannot save devices. Take my word for it, you don't want to try it! I will note that Xenix 3.1 is intelligent enough to only give you a bunch of nasty error messages if you try this, but this wasn't always the case... you are best off just remembering not to do this.

Dump (or **backup**) is what the utility script **/etc/sysadmin** is built around. **Sysadmin** is very useful for doing full system backups, and incremental system

backups on systems with more than one floppy drive, or, in the case of Xenix 3.1, on systems with at least one floppy and one cartridge drive. The reason for this is as follows: **sysadmin** restores only work quickly on inactive file systems, by this I mean file systems that you didn't boot off of initially. If you boot off of the File Maintenance diskette, and restore to the primary hard drive from either an additional floppy drive or a cartridge drive, the process works very quickly. If you boot off the hard drive and try to restore the entire system, you are looking at possibly a 24 to 48 hour long process -- not too good!

.....

Rule of Thumb:

For **systems with more than one floppy, or a floppy and cartridge system,** use **sysadmin** for full system saves.

For **systems with only one floppy drive,** use **tar** or **tsh "save"** for full system saves.

.....

Clear as mud, eh? The thing to keep in mind is that if the customer can boot off of floppy, and still has a backup device (i.e. cartridge/floppy drive) free, he can use **sysadmin** and get reasonable speed on system restores. Otherwise, he would be best advised to do a **tar**-type save.

All of which brings us to the real meat of the question: how do you actually perform a save? We'll start with a **sysadmin** save first, and look at situations where the customer has (a) two floppy drives and (b) a floppy and a hard drive.

/etc/sysadmin save procedure:

For systems with two (or more) floppy drives:

1) Format all the diskettes you are going to need **before** you start the system up. To format diskettes, use **diskutil. Make sure that you have all the formatted diskettes you will possibly use before you start; otherwise you'll have to start over from scratch after formatting more diskettes!**

.....

In round numbers,

Double-sided diskettes hold **1 meg** of data,
Single-sided diskettes hold **1/2 meg** of data.

Disk cartridges hold **1Ø meg** of data.

.....

2) Once you have finished formatting your backup media, reset the machine. At the "Xenix Boot>" prompt type **<ENTER>** to boot Xenix.

3) At the point where the machine says:

    Type CONTROL-d to proceed with normal startup, (or
    give root password for system maintenance):

enter the root password. This will put you into System Maintenance (single-user) mode. It is best to do backups when the system is in System Maintenance Mode -- the process will go a lot faster and files are less likely to change while in the process of being saved.

4) At the " # " prompt, type

    /etc/sysadmin

5) The following menu will appear on your screen:

    File System Maintenance
Type 1 to do daily backup,
    2 to backup all files,
    3 to get a backup listing,
    4 to restore a file,
    5 to restore a hard disk,
    6 to check a file system,
    q to quit

> Enter Number:

6) Type 2 **<ENTER>** to back up the entire system. The screen shows:

    FULL SYSTEM BACKUP
    Backup which hard drive (Ø-3)?

5) In our case, we are assuming that this system only has one hard drive, so type **Ø <ENTER>**. The screen shows:

    Backup to C)artridge or F)loppy drive?

6) Type **f <ENTER>**. The screen shows:

    Backup to which floppy drive (Ø-3)?

7) Type **Ø <ENTER>**. Now the screen shows:

    Type 1 for single sided, 2 for double sided:

8) Depending on what type of floppy disks you are using, type either **1** or **2** followed by an **<ENTER>**.

    NOTE: You **cannot** change between single and double sided disks during the course of a given backup! Once you've decided, you're stuck (unless you bail out and start over).

    The screen should now show:

    Insert volume in drive Ø, then press <ENTER>

9) When the diskette is full, the screen shows:

    Change volumes and press <ENTER> to continue.

1Ø) Insert a new formatted diskette. The cursor stays at the end of the prompt until you press <ENTER>.

    NOTE: Make sure you label volume numbers in order! I know this sounds obvious, but if you get them out of order you'll have a real problem on your hands.

    When the entire file system is backed up, the screen shows:

    DONE

    and gives you information on how much information you actually saved off.

11) The File Maintenance Menu should now be back on the screen. Type **q <ENTER>** to quit, and the root prompt will appear. To shut the system down, type

sync;sync;/etc/haltsys <ENTER>

and the screen will come back with

** Normal System Shutdown **

For systems with cartridge and floppy drives:

1) Format your cartridges using **diskutil.** Reset the system, and at the "Xenix Boot>" prompt type **<ENTER>.** Enter System Maintenance Mode at the prompt by entering the root password.

2) At the " # " prompt, type:

/etc/sysadmin <ENTER>

3) At the File Maintenance Menu, type **2 <ENTER>** to do a full system backup.

4) The screen will show:

FULL SYSTEM BACKUP
Backup which hard drive (Ø-3)?

Type **Ø <ENTER>.** The screen will then show:

Backup to C)artridge or F)loppy drive?

5) Type **c <ENTER>.** The screen shows:

Backup to which cartridge (Ø-1)?

6) Type **Ø <ENTER>.** Now the screen shows:

Insert volume in drive Ø, then press <ENTER>

7) When the cartridge is full, the screen will show:

Change volumes and press <ENTER> to continue.

8) Insert a new formatted cartridge. The cursor will stay at the end of the prompt until you hit <ENTER>.

9) When the backup is complete, the screen will say:

DONE

followed by some information on how much data was actually saved.

NOTE: If you are using a cartridge system, remember that Xenix locks the drives until it is finished accessing the cartridge!

Pretty simple, eh? It really only has one bad problem -- it's tedious, which is why system administrators frequently don't keep good backups.

Now, for those of you out there with only one floppy drive, this **sysadmin** stuff isn't going to work real well. The save will be fine; the only trouble is that the restore is going to take forever! For these situations, knowing how to do at least one type of **tar**-type save is going to be very useful, and that's what we'll look at next.

A Sample "**tar**" type Save:

For systems with only **one** floppy drive:

1) Format your floppy disks under **diskutil.** Reset the system, and boot Xenix.

2) At the prompt, enter the root password to put the system into System Maintenance Mode.

3) At the root prompt " **#** " type **tsh <ENTER>**. This will put you into the "trs-shell". This shell is relatively user friendly and supports TRSDOS-like syntax. You will get a prompt that looks like:

tsh-#>

4) At the "**tsh-#>**" prompt, type one of the two following commands. The one you type will depend on whether you are using single or double sided floppy diskettes to do the save.

Single-sided Floppies:

save :Ø -ss -all

Double-sided Floppies:

save :Ø -ds -all

5) When you are instructed to, mount new volumes as necessary. Make sure you label the volumes sequentially! Although it is less of a problem with a **tar**-type save than with a **sysadmin** save, it is still a good habit to get into.

6) When the save is finished, the "**tsh-#>**" prompt will return. Type **<CTL><D>** to return to the "**#**" prompt, and

sync;sync;/etc/haltsys <ENTER>

to shut the system down.

The "tsh" **save** command can also be used to save off individual files or directories; in fact, it is very good as a way to backup just small portions of a system.

.....

"Now that I've reformatted the drive,
how do I restore the system?"

or

Step 2 in the "save and restore" process.

.....

To put the data that you've saved back on the drive, go with the utility that you used to make the save. For example, your "tsh" **save** disks won't be restorable using **sysadmin**, and vice-versa. On that note, turn to the next groups of instructions, match your system configuration, and find out how to restore your data.

.....

Relax....

If you've made it this far,
the rest is easy.

.....

/etc/sysadmin restores:

For systems with two or more floppy drives or a cartridge:

1) Find the diskette in your Xenix package labeled "File Maintenance Diskette." Insert the File Maintenance Diskette in Drive Ø. Press the reset switch, and press **<BREAK>** and **<REPEAT>** simultaneously until the system boots off floppy and you see the "Xenix Boot>" prompt on the screen.

2) Press **<ENTER>**. The screen shows:

```
System loaded
Change root if desired
type <enter> to proceed or <break> to abort
```

3) Press **<ENTER>** and the following menu will appear (after a certain amount of noise from the floppy drive):

```
                File System Maintenance
Type    1 to get a backup listing,
        2 to restore an entire backup,
        3 to restore a daily backup,
        4 to check a file system,
        q to quit
```

4) Type 1 **<ENTER>** to verify that you are restoring the latest backup. Answer the prompts, and insert your first backup diskette/cartridge into the appropriate drive when asked to do so.

5) When the backup listing is complete, press **<ENTER>** to return to the File System Maintenance menu. Now type 2 **<ENTER>**, and the screen shows:

```
RESTORE AN ENTIRE BACKUP SET TO A HARD DISK

Restore to which hard drive (Ø-3)?
```

6) Type Ø **<ENTER>**, and Xenix asks for information about your hard disk. Use the same information you used when you formatted the hard disk! After you enter the information, your screen shows:

```
About to erase any data on drive Ø
Press ENTER to continue or BREAK to abort:
```

NOTE: Any existing information really **will** be overwritten at this point, so be sure that you've got a good backup or you could be acutely embarrassed!

7) Press **<ENTER>** if you really are ready to continue, and then answer the prompts as they appear on the screen. During the process of restoring, you may see the following message on your screen:

    "/dev/rhdØ" contains data; press <ENTER> to continue
    or <BREAK> to abort:

8) Press **<ENTER>** and continue restoring. When all the information on your backup diskettes/cartridges has been restored to your hard disk, your screen shows:

    End of Dump

9) The File System Maintenance menu reappears on your screen. Type **q <ENTER>** to quit. Wait until your screen shows

    [ZØ Control System Halted]

    You may then press the reset switch to boot Xenix.

tsh save restores:

For systems with one floppy drive:

1) Find the Boot Disk in your distribution set. Insert the disk in drive Ø, and press **<BREAK>** and **<REPEAT>** simultaneously until the "Xenix Boot>" prompt appears on your screen.

2) At the prompt, press **<ENTER>**. Various whirring and grinding noises will commence, and the screen will eventually show:

    System loaded . . .
    Change root disk if desired;
    type <enter> to proceed or <break> to abort

3) Press **<ENTER>**. Further noises will emerge, and after a while the screen will eventually show:

    Do you wish to initialize your hard disk?

    Since we wish to do so, type **y <ENTER>**. The program now asks:

    Has your hard disk been formatted with diskutil?

    Presumably, the answer is yes to this too, so type **y <ENTER>**. The screen shows the following message:

```
Is this a Model II? [y or n]
```

4) Type the appropriate answer for the machine you are using. The screen shows:

```
Do you want the standard size swap area? [y or n]
```

We will assume for the moment that the answer is yes... it might not be, but we'll address that possibility elsewhere.

5) Whirs, clicks and groans emanate from the floppy drive, and the screen shows that initialization is proceeding. This process takes a few minutes, so be patient.... When initialization is complete, the screen shows:

```
Please reboot from the hard disk after the system
shuts itself down.

Halting system . . .
** Normal System Shutdown **

[Z8Ø Control System Halted]
```

6) Now, remove the Boot Disk from drive Ø. Reset the system, and at the "Xenix Boot>" prompt, press **<ENTER>** to boot Xenix.

7) Your screen will show a long message about distribution floppies, but this is where your **tar** save floppies will be used. You should eventually see a prompt which says:

```
First Floppy? [y,n]
```

8) Insert your first save diskette and type **y <ENTER>**. When the data is transferred to your hard disk, the screen shows:

```
Next Floppy? [y,n]
```

9) Continue until your save disks have all been restored. At that point, at the "Next Floppy? [y,n]" prompt, type **n <ENTER>**. The system will prompt you for some additional information, and eventually come up with the standard boot message. You may now boot the system... you've completed the restoration process.

You may well ask at this point, "Well, this is great, but what am I suppossed to do with this information?" Good question, actually... in theory, we technicians are set up to fix hardware problems and the software hackers are there to answer the software questions. In practice, the technician is frequently the one on the spot when it decides to hit the fan. Knowing how to do saves and restores (as well as the other things addressed in this manual)

will often save you a long wait for software support to arrive at your location and may even help to placate an angry customer. Besides, it's rather closely related to the next subject I'll mention, which is the dreaded system upgrade.

Since Xenix 3.1 will be the only version of Xenix that the software support folks will recognize (for support purposes) after February 1, 1986, you may be getting a lot of questions about how to upgrade systems from Version 7 to the newest system. Since the directions given are a little on the sketchy side, and since doing upgrades right will often save a lot of effort later, I'll cover how to do both a 1.3.5 to 3.1 and a 3.Ø to 3.1 upgrade here.

.....

Upgrading Xenix systems is a lot like doing backups... but the two processes are not identical.

.....

All the stuff about backups is going to come in handy now, because in a lot of ways a system upgrade is similar to a system backup. Still, there are differences -- instead of putting everything back on the system, just as it was, you are selectively restoring only certain things like data and custom files. This could be fairly complicated if you had to do it all by hand. Instead, the process is automated to a certain extent by the programs contained on the upgrade disk.

Xenix 1.3.5 to Xenix 3.1 Upgrade Procedure:

1) We will assume that the customer's hardware has been upgraded to support System 3... this means that they either have the 8 MHz 68ØØØ hardware, or their 6 MHz boards have had the necessary modifications performed.

2) Make sure that you have enough diskettes to back up all the hard drives in the system **twice**. Since this is a system upgrade, you need to do this complete backup twice to make sure you've covered all possibility of error.

3) Backup all your hard drives in the manner best suited to the system configuration (see the **Backup** instructions above).

.....

The above steps are in case of accident...
The next steps describe the upgrade.

.....

4) Format enough diskettes to back up all the drives in the system **once.**

5) Log in as **root** on the console. Use the **who** command to make sure that all users (other than root) are logged out.

6) Be sure that all secondary drives are mounted in their usual places on the system. To do this, type:

/etc/mount <ENTER>

This displays a list of mounted secondary drives and where they are mounted. **Write this information down**; we're going to need it later!

7) Type:

install <ENTER>

The Installation Menu will appear on the screen. (We looked at this in Section 1, remember?) Type:

1 <ENTER>

to begin the upgrade procedure.

8) The screen should say:

Insert diskette in Drive Ø and press <ENTER>

Insert the Xenix 3.1 Upgrade Disk in Drive Ø and press **<ENTER>**.

9) When the installation is complete, Xenix prompts you to remove the diskette and press **<ENTER>**. Your screen shows:

Constructing list of directories and permissions...
Creating list of files to save...
This is going to take a while...

Your hard drive(s) will probably start to make lots of official sounding noises. Don't worry -- that's normal.

1Ø) Xenix will eventually ask you:

Type 1 for single-sided, 2 for double-sided floppy disks:

Enter the number which corresponds to the type of diskette you are using.

11) Xenix now prompts you to insert a diskette. Insert a formatted diskette in Drive Ø and press **<ENTER>**. Xenix then uses the **tar** command to start saving the files to floppy disk. As it fills each diskette, **tar** prompts for another formatted diskette. **Be sure to number the diskettes in the order they are made.**

NOTE: If **tar** returns an error during this procedure, you had better stay on the safe side and start over, even though the system may try to convince you not to.

12) When the procedure is complete, Xenix warns you to ignore the message "umount: invalid argument." Remove your last diskette and press **<ENTER>**.

13) At the Installation Menu, type **q <ENTER>**.

14) At the root prompt, type **shutdown Ø <ENTER>** to shut the system down.

15) At this point, you will need to format and initialize your system under Xenix 3.1 as outlined in Section 1. **You have to reformat the drives!**

.....

Xenix 1.3.5 format and file system structure
is **different** from Xenix 3.1....

This means you **have** to reformat.
(No one ever said it would be easy!)

.....

16) Once you have your Xenix 3.1 core system installed on the primary hard drive, shut the system down and format any secondary drives according to the procedure outlined in Section 3.

17) Boot the system, and log in as root. You will need to use the **mkdir** (make directory) command to make the directories needed to mount the secondaries. **In order for the restore process to work, you must create the same directories as used previously for the secondary drives.**

18) Use **makefs** (Section 3 again) to create file systems on all the secondary drives. Use the **mount** command (also outlined in Section 3) to mount the secondary drives on the system in the same positions they were when the backup was made. For example, if **hard drive 3** was mounted on **/hd3** on the Xenix 1.3.5 system, it must also be mounted there for the upgrade to Xenix 3.1 to finish up properly.

.....

Almost finished...
just got to restore the data!

.....

19) At the root prompt, type:

/firsttime <ENTER>

2Ø) When prompted to insert the "distribution" diskettes, insert the first of the **tar** disks created earlier. Type **y <ENTER>**. Continue to insert the disks in the same sequence as they were made. When there are no more disks left, type **n <ENTER>** at the prompt.

21) Type the following command:

1 /usr/bin/save <ENTER>

If Xenix lists the file, type:

rm /usr/bin/save <ENTER>
ln /usr/bin/SAVE /usr/bin/save <ENTER>

If Xenix says the file does not exist, no action is necessary.

Well, that's it... you've finished the upgrade to Xenix 3.1. The procedure for upgrading to Xenix 3.1 from Xenix 3.Ø is essentially identical, although it is pretty obvious that the hardware modifications should already be present since Xenix 3.Ø wouldn't have run without them. **It is important to note that when upgrading from 3.Ø to 3.1, you have to reformat the drive(s)!**

****

Differences Between Version 7
And System 3

****

The following is a list of some of the differences between good old Version 7 and its newer sibling System 3. This is not an exhaustive list! Undoubtedly there will be commands not listed here which are different, but hopefully this will cover most of the ones that you will encounter while working on a system.

cd -- change directory

They made this a little more idiot-proof; if you **cd** to a file instead of a directory, Xenix asks if you want to move to the next highest directory. In some quarters this is called the "do what I think, not what I say" option. For example, if "test.c" is a file and you try typing:

```
cd /usr/jim/test.c
```

The system prompts:

```
cd /usr/jim ?
Answer "y" or "n".
```

chdir -- change directory

No longer exists. Use **cd** instead.

chown -- change file owner

Under System 3, if you own a file, you can change its owner to someone else. You could only use this command as root under Version 7. Be careful when you're doing it, because once it's changed, you won't be able to change it back without the help of root or the new owner.

date -- current date

The format for entering the date has changed a bit... you can no longer enter seconds on boot (no great loss).

df -- disk free

The output format has changed a lot on this one; also, it runs a lot faster. If a customer wrote a shell script using output from this command, they will have to rewrite it due to the differences.

diskutil -- format disks

A non-destructive format option has been added which can sometimes be useful. You can also specify full, partial, or no verify during format, and interleave factor. **Under Xenix 3.1 (and later)**, there is also support for cartridge drives.

dump -- dump files to save media	This command (used in **/etc/sysadmin**) is also now called **backup**.
help -- manual pages	**Under Xenix 3.1**, help files (similar to the **man** command in Version 7) are available for optional use with the Core System.
login -- log in to system	You can no longer invoke this command while you are logged in... you have to logout first.
ls -l -- long form of directory listing	For those of you really into system details, this displays the setuid, setgid, and sticky bit permissions differently than it did on Version 7.
makefs -- make a file system	Use this menu-driven utility to make additional file systems. **mkfs** is still in the operating system, but it expects slightly different numbers than it used to and **makefs** is simpler to use. **Under Xenix 3.1,** there is support for cartridge drives.
mkuser -- create new users	This command has been enhanced to make assigning users to different groups easier (sometimes helpful for security reasons). There are additional prompts, so if a customer has written a shell script to automate this even further, they will need to allow for the additional prompts. As if this weren't enough, the default files given to users (like .profile) are now stored in /usr/lib/mkuser, not /usr/lib.
mount -- mount secondary file systems	You can now only use this command as root or in System Maintenance Mode. In addition, the output format has changed rather radically so if (again!) a customer is running a shell script depending on output from this command, he will have to rewrite it to account for the differences.
ps -- process status	There are hordes of new options, and the old ones don't mean the same thing. (Gotcha!) For example, the equivalent of Version 7's "ps lax" is now "ps -elf". You **have** to use the minus sign now. In addition, the output format has changed slightly. In case you have a customer who asks, the Version 7 and System 3 **ps** commands are <u>not</u> interchangable.

restore, restor -- restore save set

In Version 7, it was **restor**; in System 3, it is **restore**. Don't ask me why... I don't know either!

sh -- command interpreter

Again, for those of you into nit-picking detail (or who have customers who are), the command-line parsing is a little different. Most of the time, you'll never notice, but some shell scripts may be affected by it.

stty -- configure terminal parameters

Names for lots of the options have changed. Even worse, some things which were one-word options are now combinations of options (ugh). Here are a few samples for comparison:

Version 7	System 3
cbreak	time Ø min 1 brkint ignpar istrip ixon ixany opost isig -icanon
echo	echo echok echoe
-echo	-echo -echok -echoe
intrc 'c'	intr 'c'
quitc 'c'	quit 'c'
eofc 'c'	eof 'c'
brkc 'c'	eol 'c'

Note: 'c' in the above means 'character of your choice'.

tar -- tape archival

There is a new option that lets you use abbreviations to save data off on floppy. The option is a single digit:

Ø-3 specifies single-sided floppy drives Ø-3.

4-7 specifies double-sided floppy drives 4-7 where 4 is drive Ø, 5 is drive 1, and so on.

What this means is that you may use either one of the following syntaxes in System 3:

single-sided:

tar -cvfbk /dev/rfdØ 16 6Ø8 files
tar -cvØ files

double-sided:

tar -cvfbk /dev/rfdØ 16 1224 files
tar -cv4 /dev/rfdØ files

.....

There are also certain files in
System 3 which look different.

.....

Files in System 3 which have some obvious differences are listed below. Again, this list is by no means exhaustive, but it will point to some of the more obvious pitfalls along your way.

/etc/passwd — There are entries present for "uucp" and "sysinfo" which are new to the core system.

/etc/group — Entries were added for "uucp" and "cron".

/etc/ttys — The entry for the console has a "9" instead of an "h" for its baud rate.

/etc/rc — There are loads of differences here, but the biggest ones are that if you wish to customize the **/etc/rc** file, you must put the modifications into a file called **/etc/rc.user**. In addition, if the user adds any applications packages which require modification of the **/etc/rc** file, those mods are to be put in a file called **/etc/rc.appl**.

****

A Quick Reference to the
Most Commonly Used
Xenix Commands

****

This is meant to be a quick guide to commonly used commands in Xenix. It is by no means (and I do mean that!) complete, but it should contain enough information to let you do just about everything that you would need to do on site or in the shop with a troublesome system.

When you try these commands, type boldface text exactly as I have it here. Plain text indicates a variable or an option.

cat concatenate, or display, text on the screen

cat filename
displays the contents of the file on the screen

cd change directory

cd
returns you to your "home" directory

cd directory-name
changes your working directory to directory-name

chmod change mode

chmod who operation-code permissions filename
changes the permissions mode for file

who

a	all (user, group, others)
g	group
o	others
u	user (login owner)

operation-code

+	add permission
-	remove permissions
=	assign all permissions (read, write, and execute)

permissions

r	read
w	write
x	execute

chmod can also be used by using an octal number to determine what permissions you want set. For example:

chmod 666 zeppo

would set the following permissions for the file "zeppo":

```
-rw-rw-rw-  1 bob     group   85  Nov 18 1Ø:14  zeppo
 || || ||
 || || ||_____ write permission for others  = 2
 || || |______ read permission for others   = 4
 || ||
 || ||________ write permission for group   = 2
 || |_________ read permission for group    = 4
 ||
 ||____________ write permission for owner   = 2
 |_____________ read permission for owner    = 4
```

If you add the results for each set together, you come up with the number that you gave **chmod**.

cp copy file

cp filename1 filename2
makes a copy of filename1 and names it filename2.

cp filename1 filename2 directoryname
copies 2 files into the specified directory.

date displays the current date and time on the screen

df disk space free

df
displays the number of blocks free on your root file system

df /dev/hdx (where x = 1 to 3)
displays the number of blocks free on the specified disk

du disk usage

du directory
displays the number of blocks in use on the specified directory and in what files

kill terminate a process

kill number
terminates the process number

lc list, or display, the contents of a directory and information on files in that directory

lc directory-name
displays the contents of the specified directory

lpr printer spooler

lpr filename
prints the file on the printer

ls list, or display, the contents of a directory and information on files in that directory

ls directory-name
displays the contents of the directory

ls -l directory-name
displays the contents of the directory, including the names of all subdirectories and files, size, date created, and permissions.

mkdir make directory

mkdir directory-name
makes a directory

more display text on the screen, 1 screen at a time

more filename
displays the contents of filename on the screen, 1 screen at a time.

mv move or rename files and directories

mv filename1 filename2
changes the name of filename1 to filename2

mv filename1 directory-name
moves filename1 to the specified directory

mv directory-name new-directory-name
changes the name of the specified directory

passwd change your login password

park park, or position, the read/write head assembly of the hard drive(s)

park -on
positions the heads on the last cylinder of the drive(s) upon shutdown

park -off
does not park the heads upon shutdown

ps process status

ps -e
displays information about all active processes

pwd print working directory

quot summarize file system ownership

quot -f filesystem
displays the number of blocks and the number of files owned by each user in the specified file system

rm remove files or directories

rm filename
removes the specified file

rmdir empty-directory-name
removes the specified empty directory

rmuser user-name
removes the specified user

wall write to all users on the system

who who is on the system

For commands which aren't listed here, try consulting either the online **help** pages or The System Administrator's Guide to Xenix.

****

Using the TRS-shell
or
"My friends call me 'tsh'..."

****

The TRS-shell (**tsh** -- pronounced "tee-shell") is a special command interpreter in Xenix that uses commands similiar to those found in TRSDOS. For those of you who want to get more familiar with Xenix, but don't know where to start, it presents a more familiar face. As you get more familiar with the system, you can wean yourself off and gradually start using the standard Xenix command interpreter (which incidentally is called the Bourne shell).

In order to use the **tsh**, you first have to invoke it. That turns out to be simple; at either a user prompt or a root prompt, type:

tsh <ENTER>

The screen will show one of the two following prompts:

```
tsh>          (if you logged in as a user)
tsh-#>        (if you logged in as root)
```

At this prompt, you can use any **tsh** or Bourne shell (**sh**) command.

Before you can log out of Xenix, you have to exit the **tsh**. To do this, type either:

exit <ENTER>

or

<CTL><D>

The screen will then show either the root prompt (#) or user prompt ($).

NOTE: If you want, you can even set things up so that your "login shell" (the command interpreter that interprets the commands you type in) is the **tsh**, but you keep a certain amount of flexibility if you don't.

.....

A Brief Compendium of **tsh** Commands....

Despite all appearances to the contrary,
it's not the ol' Model II.

.....

Here follows a (mostly) alphabetized list of the commands specific to the **tsh**. Anything in boldface is a required part of the command; things in normal print on the command line are optional.

again string | history-number

Executes a previously executed command. You can specify the command by a search string or ("|" in the command line means "or" -- a convenient shorthand) a history number. If you type **again** without any options, **tsh** executes the last command entered.

alias command command-line
unalias command

Maps a command name to another command line. This lets you give shorter or easier names to commands that you use often. If you omit command-line, **alias** displays the command line for that command. If you omit both command and command-line, **alias** displays the current lists of aliases. Use **unalias** to remove an alias.

auto command-line

Creates or removes an automatic command that executes when you enter **tsh**. The command-line is stored in the **.tshrc** file. This file executes when **tsh** starts up. If the file doesn't already exist, it is created.

To cancel the **auto** function, type:

auto <ENTER>

The automatic command line is removed from the **.tshrc** file.

chdir directory

Changes the current working directory to the specified directory. If you do not specify a directory, your home directory becomes the current working directory.

cls

Clears the screen and places the cursor beside the **tsh** prompt.

copy file1 file2

Copies file1 to file2. If file2 is an existing file, the permissions and ownership do not change. If file2 is being created, the permissions and ownership are the same as the file being copied.

NOTE: The **copy** command will not copy a file onto itself.

copy file1 file2 ... directory

Copies multiple files into a directory. The filenames do not change.

NOTE: Suppose we have two files named **bozo** and **zeppo**, and a directory named **ouch**. The following examples may be instructive.

```
copy bozo clown  -- gives you a file named "clown" with the same
                    contents as bozo.
copy bozo zeppo ouch -- gives you two files in the directory "ouch"
                    named bozo and zeppo with the same contents as
                    their counterparts.
```

device

Displays a list of devices that **tsh** recognizes and their descriptions. You use the device names with the **dismount**, **mount**, **restore**, and **save** commands.

dir

Displays an alphabetic list of the contents of the current directory

dir filename

Displays, in long format, the specified file. You can specify multiple files.

dir directory-name

Displays an alphabetic list of the contents of the specified directory. You can specify multiple directories

dir filename directory-name

Displays an alphabetic list of filenames and directory names; the list of filenames precedes the list of directory names. You can specify multiple filenames and directory names.

dir option filename
dir option directory-name

You can use the following options with the **dir** command.

-a Displays a list of all files. If you are logged in as root, Xenix assumes the -a option even if you do not specify it.

-b Displays invisible character in octal notation.

-c Sorts or prints while creating files.

-d Displays only the directory name, not its contents, if you specify a directory name.

-g Displays the group ID instead of the owner ID in the listing.

-r Reverses the order of the sort, depending on the options you specify. For example, you may wish oldest date first or inverse alphabetic order.

-s Displays size in blocks, including indirect blocks, for each entry.

-t Sorts by time you modified the file or directory unless you specify the **-c** or **-u** options.

-u Sorts or prints according to last access time.

-A Displays a list of all files except for . and ..

NOTE: "." and ".." are current directory and parent directory respectively.

-R Displays the contents of all subdirectories for the specified directory.

dismount drivenumber -device

Tells Xenix that you are removing a mounted file system on the specified drive and device. You should execute the **dismount** command (if you are running only in the **tsh**) before removing a **mounted** disk.

display filename

Displays a full screen of text of the specified file. If the file contains more lines of text than the screen can show at one time, the following prompt appears at the bottom of the screen:

--more--

If you are reading a file, and not a pipe, a percent sign appears after the "more". This is the percentage of the file (in characters, not lines) read thus far.

To see the next line of text, press **<ENTER>**. To see the next full screen of text, press **<SPACEBAR>**.

Below are the options available for use with the **display** command. You use them in the following form:

display options filename

-n specifies the number of lines the screen displays, or the window size. If you do not specify **n**, Xenix uses the entire screen. (On a 24 line screen, the default is 22 lines).

-s "squeezes" extra blank lines from the screen, i.e. if you have inserted more than one blank line between lines of text that space is reduced to only one blank line. This option lets you display more useful information at a time.

-r displays control characters on the screen. For example, if you typed **<CTL><C>**, the screen would show:

^C

If you don't specify the **-r** option, this won't happen.

-w waits to exit at the end of a file until you press **<SPACEBAR>**. If you do not specify **-w**, Xenix exits immediately.

+ linenumber displays the file, starting at the specified line number.

There are even more options available, but for more information, you should refer to **appendix a** of The System Administrator's Guide to Xenix.

do filename

Executes the commands stored in filename as if they had been entered from the keyboard. You may nest do commands as deep as necessary or as the system memory allows.

files directory-name

Lists in columns in alphabetical order all files in the specified directory. If you do not specify a directory, Xenix uses the current directory. You can specify multiple directories. When you do so, the screen shows the filenames first and then the directories.

The options available for use with this command are listed below. You use them in the following form:

files options directory-name

-a displays a list of all files. If you are logged in as root, all files are listed even if you do not specify the **-a** option.

-b displays invisible characters as /nnn (octal).

-c sorts and displays while a file is being created.

-d lists only the directory name and not its contents if you specified a directory.

-q lists group ID and not owner ID.

-r reverses the order of the sort, depending on the options you specify. For example, you can sort in reverse alphabetical order or by oldest date first.

-s lists size in blocks, including indirect blocks, for each entry.

-t sorts by time modified unless you specify the **-c** or **-u** option.

-u sorts and displays according to last access time instead of last modification.

-x displays in columnar format. Sorted material is displayed across rather than down.

-1 forces a one-entry-per-line output format.

-A displays a list of all files except those that have . and ..

-C forces multi-column output.

-R displays the contents of all subdirectories for the specified directory.

free filesystem

Displays the number of free blocks on the specified file system. If you do not specify a file system, the screen shows the amount of free space on all mounted file systems.

help

Displays an explanation of the help text and the notations used. To see a list of available subjects, type **help * <ENTER>**. To see the help text for a particular subject, type **help** subject **<ENTER>**.

To halt the display of the help text file, type **q**.

history

Displays a list of the previously executed commands. **history** assigns each command a number which can be used to re-execute it using the **again** command. **history** is set to display the last 20 commands. (See also **again** and **set**).

kill filename

Kills (removes) the specified file from a directory. The file is destroyed. You must have write permission for a directory to delete files from it. You do not, however, need read or write permission for the file to be able to delete it.

You may specify multiple filenames. If you do so, Xenix prompts you for each file before the file is removed. Type **y <ENTER>** in response to the prompt.

To delete a directory, type **kill -r** directory-name. This deletes the contents of the directory and the directory itself. If you attempt to delete a file that is actually a directory, the screen shows an error message.

NOTE: You cannot remove the file ".." from a directory.

lib

Displays a list of the **tsh** commands.

mount drive number-device
dismount drive number-device

Tells Xenix that a file system is now present on the specified drive and device. The file system's contents are made available in the **/mnt**drive-number directory. **device** specifies the type of device you are mounting (ss, ds, c1Ø). See **device** for more information. If you omit **device**, **tsh** assumes floppy diskette.

For example, if you place a floppy diskette containing a file system in floppy drive Ø, you can mount the disk by typing **mount Ø <ENTER>**. The contents of the disk will be accessable in the directory /mntØ. You tell Xenix that you are removing the diskette from the drive by typing **dismount Ø <ENTER>**.

The **mount** and **dismount** commands keep track of mounted devices. If you do not specify a drive number, the screen shows a table of currently mounted file systems.

NOTE: You can only mount disks that contain Xenix file systems. If you attempt to mount a diskette that contains an alien file system (for example, TRSDOS) you will at least get error messages and the possibility even exists that the system will crash.

move -i file1 file2
move -i file1 file2 ... directory-name

Copies file1 to file2. If file2 already exists, the existing permissions and ownership are retained. If it does not exist, the permissions and ownership of the source file become those of file2.

-i is optional. If you specify -i, Xenix lets you know if the destination file already exists. You can then choose to keep or overwrite the existing file.

You can copy multiple files into a directory with the second command line above. The filenames are not changed.

NOTE: You cannot copy a file onto itself with the move command.

print filename

Queues the file for printing on the printer. You can place multiple filenames on the command line.

Listed below are the options you can use with the print command. To use the options, follow this format:

print option(s) filename(s)

-T local	sends output to local printer regardless of how PRINTER was set.
-T spooler	sends output to the print spooler for printing.
-r	removes the file after it is queued.
-c	copies the file so that no changes are made before it is printed.
-m	reports by **mail** when printing is complete.
-n	does not report by **mail** when printing is complete. This is the default.

rename old.file new.filename

Changes old.file's name to new.filename.

restore drivenumber -d -device
restore drivenumber -device filename ...

Restores files that were saved on diskette/cartridge to where they were originally. With the **restore** command, you may use multiple filenames or directory names. If you specify a directory name, the directory and its subdirectories, files, and their contents are restored.

Device specifiesthe type of device from which you are restoring (ss, ds, cl0). See **device** for more information.

-d is optional. If you specify -d, the screen shows a list of files on the diskette/cartridge.

save drive-number -device filename | -all

Saves files or directories and their contents to the disk in the specified drive. You may use multiple filenames or directory names. If you specify a directory, the directory and its subdirectories, files, and their contnets are saved.

Specify the -all option if you want to save the entire filesystem, including all mounted filesystems.

Device specifies the type of device to which you are saving (ss, ds, cl0). See **device** for more information.

-ss tells Xenix that you are using single-sided diskettes. -ds specifies double-sided diskettes. -cl0 specifies cartridge drive. You must tell Xenix one of the above.

set

Displays a list of the internal option settings of **tsh**.

set option

Changes an internal option. The following options are available.

verbose on | off If verbose is off, **tsh** does not inform you of a command's success or failure.

retry on | off Enables or disables retry. If retry is on, the command line is converted to lower case if **tsh** is unable to execute a command. **tsh** then tries to execute the lower case command line.

prompt string Set the **tsh** prompt to string. For example, to set the prompt to:

cue>

type:

set prompt cue> <ENTER>

term terminal-type Sets the user's terminal type by setting the environment variable TERM.

history number Sets the number of commands that **history** remembers to number.

showhistory on | off If showhistory is on, **tsh** displays each command and its history number as soon as you enter it.

showstatus on | off If showstatus is on, **tsh** displays the exit code if a command fails.

showdir

Displays the pathname of the current working directory.

source file

Reads the command to execute from the specified file. **source** reads and executes the commands as if you had typed them from the keyboard. **source** differs from **do** in that the commands are executed from the current shell. **tsh** does not display the commands or record them in the history list.

time

Displays the current time and date.

version

Displays the name of the shell and its current version.

****

FILE GUIDE

****

In this appendix, I'll give you a cursory look at frequently used files and directories on the Xenix system. There is a pretty fair number of things which cannot be removed if Xenix is to run correctly, and I'll try to point most of them out as I go.

Directory: **root (/)**

Purpose: Acts as the "root" directory of the "tree". Contains many subdirectories and files which cannot be deleted if the system is to operate properly -- they are:

/bin	Xenix commands directory
/dev	device special directory
/etc	additional program and data file directory
/lost+found	storage area for orphaned files recovered by the file system cleaning program
/mnt	mount directory (reserved for mounted file systems)
/usr	user home directories
/tmp	temporary directory (reserved for temporary files created by programs)
/lib	directory containing system date utility
/diskutil	disk formatter program
/xenix	xenix system object code
/z8Øctl	z8Ø control program
/z8Ødiags	exists in 3.1, not in 3.Ø... additional z8Ø programming

Directory: **/bin**

Purpose: Contains the commands which are most frequently used. All commands in this directory are required for correct system operation and should not be removed. Some things you would find are:

cp	login	sh	tar
date	mv	stty	test
echo	passwd	su	
fsck	rm	sync	

Directory: **/dev**

Purpose: Contains special files that control access to peripheral devices, such as disks, printers, and terminals. All files in this directory are required and must not be removed.

/dev/console	system console
/dev/lp	line printer
/dev/mem	physical memory
/dev/null	null device (the bit bucket)
/dev/fd**x**	floppy disk drives
/dev/hd**x**	hard disk drives
/dev/cd**x**	cartridge drives (Xenix 3.1)
/dev/r**xx**	unbuffered interface to corresponding device name
/dev/root	root file structure
/dev/swap	swap area
/dev/tty**x**	terminals

Directory: **/etc**

Purpose: Contains miscellaneous system program and data files. All files are required, but you may modify some of them.

The following files must not be removed or modified:

/etc/mtab	mounted device table
/etc/mount	for mounting a file structure
/etc/mkfs	for creating a file structure
/etc/init	first process after boot

The following files may be modified but not removed:

/etc/passwd	password file
/etc/rc	bootup shell script (actually, you should put local mods in /etc/rc.user)
/etc/ttys	terminal setup
/etc/termcap	terminal capability map
/etc/motd	message of the day

The following directory contains files that may be modified but not removed:

/etc/default	defaults for various programs

Directory: **/mnt**

Purpose: This is an empty directory reserved for mounting removable file systems.

Directory: **/tmp**

Purpose: Contains temporary files created by running programs. Normally, the files are present while the program is running. If the program terminates abnormally or prematurely, these files may be left in /tmp. You may remove any temporary file that does not belong to a running program.

Directory: **/usr**

Purpose: Contains the home directories of all users on the system. It also contains several other directories that provide additional Xenix commands and data files.

/usr/bin	contains more Xenix commands, which are less frequently used or are not essential for system operation
/usr/lib	contains more libraries and data files used by various Xenix commands
/usr/spool	contains directories for storing files to be printed
/usr/tmp	more temporary files. You may remove any temp file which does not belong to a running program.
/usr/adm	contains data files associated with system administration and accounting

File: **/etc/group**

Purpose: To designate group 'names'

Sample File:

```
other:x:1:
sys:x:2:sys
bin:x:3:bin
uucp:x:4:
group::5Ø:
payroll:sV23xdf:53:mark,tom,dave,fred
```

- `payroll` — group name
- `sV23xdf` — group password (encrypted)
- `53` — group number
- `mark,tom,dave,fred` — login names of persons allowed in this group

File: **/etc/logbook**

Purpose: To show what Radio Shack programs and updates have been installed on a customer's system

Changes: None. Do NOT change this file unless absolutely necessary.

Sample File:

```
Ø1.Ø2.ØØ 7ØØ-2Ø52  TRS-XENIX Core System
Ø1.Ø3.ØØ 7ØØ-2Ø52  TRS-XENIX Core System
Ø1.Ø3.Ø2 7ØØ-2Ø52  TRS-XENIX Core System
Ø1.Ø3.Ø3 7ØØ-2Ø52  TRS-XENIX Core System
Ø1.Ø3.Ø4 7ØØ-2Ø52  TRS-XENIX Core System
Ø3.ØØ.ØØ 7ØØ-3Ø3Ø  XENIX Multi-User O/S
Ø2.Ø2.ØØ TERMCAP   XENIX Terminal capabilities    Wed Jul 18 17:ØØ:ØØ CDT 1985
Ø3.Ø1.ØØ 7ØØ-3Ø3Ø  XENIX Multi-User O/S           Mon May 15 17:ØØ:ØØ CDT 1985
Ø3.Ø1.ØØ HELP      On-Line Help Pages (Core)      Wed Jul 31 11:52:32 CDT 1985
Ø1.Ø1.ØØ 26Ø-6431  Scripsit 16                    Thu Sep 12 Ø9:39:12 CDT 1985
```

- `Ø1.Ø1.ØØ` — Product version number
- `26Ø-6431` — Product name and catalog number
- `Thu Sep 12 Ø9:39:12 CDT 1985` — Date/time of installation

File: **/etc/passwd**

Purpose: To define system users, their passwords, group membership, home directory and execution program

Typical Changes: Change group number as necessary
Change password to nothing
Correct spelling errors in login name
Rename user directory
Redefine execution program

Sample File:

```
root::Ø:Ø::/:
daemon:x:1:5Ø::/:
cron:x:1:5Ø::/:
sys:x:2:2::/usr/sys:
bin:x:3:3::/bin:
sysinfo:x:12:12::/:
who::18:18::/bin:who
bob::2Ø1:5Ø:bob davis:/usr/bob:/bin/sh
tom::2Ø2:5Ø:tom smith:/usr/tom:/bin/sh
rick:jk34j33nhz2:2Ø3:5Ø:roger hays:/usr/rick:runap
 |       |       |   |       |        |       |    |
 a       b       c   d       e        f       g    h
```

a	login name
b	password if any (encrypted)
c	user id number
d	group number
e	full name (general comment field)
f	home directory
g	restrict access to one program (Accounts Payable)
h	allow access to the command interpreter (shell)

File: **/etc/rc, /etc/rc.user, /etc/rc.appl**

Purpose: Execution files on system startup.

Typical Changes: Usually, items specific to the system (like required "mounts" of secondary file systems) are placed in /etc/rc.user; applications modifications are located in /etc/rc.appl. If you want to change the boot message, you might edit /etc/rc.

Sample Files:

/etc/rc

```
PATH=/etc:/bin:/usr/bin
echo "^L
Tandy 68ØØØ/XENIX version `cat /etc/version`
Microsoft XENIX-68ØØØ  V3.Ø

Copyright Microsoft Corporation, 1983.  All rights reserved.,
Licensed to TANDY CORPORATION.
Restricted rights: Use, duplication, and disclosure are subject
to the terms stated in the customer Non-Disclosure Agreement.

\"tsh\" and \"tx\" Copyright 1983 TANDY CORPORATION.  All rights reserved.
" > /dev/console
TZ=CST6CDT
export TZ                                                              a
HZ=3Ø
export HZ
/etc/verify -f y
/etc/verify -h y                                                       b
cp /dev/null /etc/mnttab; chmod 644 /etc/mnttab
/etc/setmnt <<!
root /
!
cp /dev/null /etc/utmp; chmod 644 /etc/utmp
/etc/asktime </dev/console >/dev/console 2>&1                          c
/etc/update                                                            d
> /usr/adm/msgbuf
/etc/dmesg - >> /usr/adm/messages
/usr/lib/ex3.7preserve -
/usr/lib/xmail_recover
if test -f /etc/rc.user
then
        sh /etc/rc.user < /dev/console > /dev/console 2>&1             e
fi
if test -f /etc/rc.appl
then
```

```
        sh /etc/rc.appl ____________________________________________ f
fi
rm -f /usr/spool/lpd/lock; /usr/lib/lpd ____________________________ g
rm -f /tmp/* /usr/tmp/* ____________________________________________ h
/etc/cron __________________________________________________________ d
mv /usr/adm/wtmp /usr/adm/owtmp
cp /dev/null /usr/adm/wtmp; chmod 644 /usr/adm/wtmp
rm -f /usr/spool/micnet/remote/pids
rm -f /usr/spool/uucp/LCK.*
```

/etc/rc.user

```
mount /dev/hd1 /h1 _____
mount /dev/hd2 /h2 _____|_____________________________________________ i
```

a	System startup message
b	Turn floppy and hard drive verify on
c	Time prompt
d	Start additional background processes
e	Execute instructions in /etc/rc.user if it exists
f	Execute instructions in /etc/rc.appl if it exists
g	Remove printer lock; start printer daemon
h	Clear out temporary directories
i	Mount secondary filesystems

File: **/etc/systemid**

Purpose: To define system name during UUCP (Unix to Unix Communications Programs) operations

Typical Changes: During UUCP each machine must have a unique name.

Sample File:

trs16

File: **/etc/termcap**

Purpose: To define standard terminals and their control codes

Typical Changes: Add new terminal types

Sample File: **cat** the file **/etc/termcap** on your Xenix system

File: **/etc/ttys**

Purpose: To define port status, characteristics, and name

Typical Changes: Change default terminal baud rate

Sample File:

```
19console
13tty01
19tty02
09tty04
09tty05
09tty06
||  |
||  |_________port name
||____________baud rate
|_____________status (set by enable/disable command)
                    (0 = disabled, 1 = enabled)
```

Note: See Section Three for baud rate information.

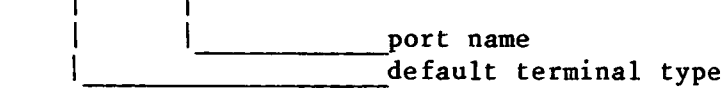
File: **/etc/ttytype**

Purpose: To define default terminal type

Typical Changes: If a customer has other terminal types that he will be using exclusively

Sample File:

```
trs16 console
adds25 tty01
dt100 tty02
adds25 tty04
adds25 tty05
adds25 tty06
```



File: **/etc/motd**

Purpose: Message for users upon login

Typical Changes: To notify users of important information
System to be down for repair
Reports due today
Posting will be done at 7:00 pm

Sample File:

```
****************************************
*                                      *
*          Welcome to TRS-XENIX        *
*                                      *
****************************************
```

File: **/etc/default/dump, /etc/default/backup**

Purpose: Default drive number and directory for "dumps"

Typical Changes: Change if drive Ø fails and you need to do a "dump"

Sample File:

```
tape=/dev/rfdØ
disk=/dev/rroot
```

File: **/etc/default/cron**

Purpose: To enable or disable **cron** loggings in /usr/lib/cronlog.

Typical Changes: Change to "CRONLOG=YES" if cron logging is to be enabled; this has the capacity to eat disk space in a profound manner so if it is to be used, free disk space must be closely monitored and the file truncated regularly.

Sample File:

```
CRONLOG=NO
```

File: **/etc/default/dumpdir**

Purpose: To specify the default **dumpdir** device

Typical Changes: Change default device in case of failure of primary device

Sample File:

```
tape=/dev/rfdØ
```

File: **/etc/default/login**

Purpose: Specifies default environmental variables for **login**

Typical Changes: Change default umask or paths

Sample File:

```
TIMEZONE=CST6CDT
HZ=3Ø
ALTSHELL=YES
UMASK=Ø22
PATH=:/bin:/usr/bin:/usr/local
SUPATH=:/bin:/usr/bin:/usr/local
```

File: **/etc/default/lpd**

Purpose: Contains banners on/off information, also printer mode information

Typical Changes: Turn banners off

Sample File:

```
BANNERS=1 ____________________ (1=on, Ø=off)
FILTER=NO
```

File: **/etc/default/micnet**

Purpose: Command file for Micnet system

Typical Changes: Restrict or increase remote command privileges

Sample File:

```
executeall
execpath=PATH=/bin:/usr/bin
```

File: **/etc/default/mkuser**

Purpose: Used by **mkuser** to define root directory of user's directory path

Typical Changes: Relocate position of user directory (for example, if all user directories were on a secondary hard disk, you might specify "/mntl/usr" instead of "/usr").

Sample File:

```
HOME=/usr
```

File: **/etc/default/passwd**

Purpose: Contains variables used to invoke password aging and minimum length

Typical Changes: Make minimum length of password a number greater than zero, define the minimum and maximum number of weeks between password changes.

Sample File:

```
MINWEEKS=Ø
MAXWEEKS=999
PASSLENGTH=Ø
```

File: **/etc/default/restor**

Purpose: Contains default device used for **restore**

Typical Changes: Change if original restore default device fails.

Sample File:

```
archive=/dev/rfdØ
```

File: **/etc/default/su**

Purpose: Contains information which allows the use of the **su** command to be logged on the console and/or in a log file; sets default PATHs.

Typical Changes: Invoke accounting on **su**; change default paths.

Sample File:

```
#SULOG=/usr/adm/sulog _____________________________________ a
#CONSOLE=/dev/console _____________________________________ b
PATH=.:/bin:/usr/bin:/usr/local
SUPATH=.:/bin:/usr/bin:/etc:/usr/local
```

a when pound sign (#) removed, invokes **su** accounting with destination file of /usr/adm/sulog. Destination file may be renamed.

b when pound sign (#) removed, invokes monitoring of all **su** usage by echoing to system console.

File: **/etc/default/tar**

Purpose: Contains default settings for numeric arguments to **tar**

Typical Changes: If customer has a cartridge drive, the file may be edited and device, block, and archive size changed to reflect this.

Sample File:

```
#          device     block    size
archive0=/dev/rfd0      16      608
archive1=/dev/rfd1      16      608
archive2=/dev/rfd2      16      608
archive3=/dev/rfd3      16      608
archive4=/dev/rfd0      16      1224
archive5=/dev/rfd1      16      1224
archive6=/dev/rfd2      16      1224
archive7=/dev/rfd3      16      1224
archivef=/dev/null      1       0
```

File: **/etc/default/tsh**

Purpose: Contains device information for tsh "save" command

Sample File:

```
# Option        Dev     Block   Output-Volume-size (in K)
c1Ø:            cd      16      976Ø
```

File: **/usr/lib/crontab**

Purpose: To define times and dates for automatic program execution

Typical Changes: Clean out administrative files on a given date
Start posting procedures during weekend

Sample File:

```
5,15,25,35,45,55 *      *       *       /etc/dmesg - >>/usr/adm/messages
Ø,3Ø    *       *       *       *       /usr/lib/atrun
2Ø      1       *       *       *       /usr/bin/calendar -
|       |       |       |       |               |
|       |       |       |       |               |_________ command to execute
|       |       |       |       |                          (use full pathname)
|       |       |       |       |_____________________________ day of the week
|       |       |       |                                      (Ø-6)
|       |       |       |_____________________________________ Month of the year
|       |       |                                              (1-12)
|       |       |_____________________________________________ Day of the month
|       |                                                      (1-31)
|       |_____________________________________________________ Hour (Ø-23)
|_____________________________________________________________ Minutes (Ø-59)
```

Xenix Communications

DTl Baud Rate Codes:

Note: You must also change the /etc/ttys file to the appropriate code.

Ø Ø Ø 1	75
Ø Ø 1 Ø	11Ø
Ø Ø 1 1	15Ø
Ø 1 Ø Ø	3ØØ
Ø 1 Ø 1	6ØØ
Ø 1 1 Ø	12ØØ
Ø 1 1 1	24ØØ
1 Ø Ø Ø	48ØØ
1 Ø Ø 1	96ØØ

Word Length: 8
Parity: None
Stop Bits: 1

****

XENIX ERRORS

A Compendium of Common and Uncommon
Xenix Errors Messages
(And a Brief Explanation of Each)

****

Supervisor Traps and What They Mean:

Below you will find listed 68ØØØ Trap Errors and some explanation of their meaning.

Trap #	Assignment
2	Bus Error
3	Address Error
4	Illegal Instruction
5	Zero Divide
6	CHK Instruction
7	TRAPV Instruction
8	Privilege Violation
9	Trace
1Ø	Line 1Ø1Ø Emulator
11	Line 1111 Emulator
12-14	Unassigned, Reserved
15	Uninitialized Interrupt Vector
16-23	Unassigned, Reserved
24	Spurious Interrupt
25	Level 1 Interrupt Autovector
26	Level 2 Interrupt Autovector
27	Level 3 Interrupt Autovector
28	Level 4 Interrupt Autovector
29	Level 5 Interrupt Autovector
3Ø	Level 6 Interrupt Autovector
31	Level 7 Interrupt Autovector
32-47	Trap Instruction Autovectors
48-63	Unassigned, Reserved.

I can't promise that I'll explain all of the above; however, I should touch at least lightly on most of the frequently seen ones.

First, a little explanation of what Supervisor Traps are might be in order. "Traps are exceptions caused by instructions" -- that's a quote directly from the Motorola data. They are caused either by the 68ØØØ recognizing an abnormal condition during instruction or execution, or by use of instructions whose normal behavior is trapping (for example, instructions which allow you to trace program progress... kind of like "TRON" and "TROFF" in BASIC).

One class of Trap might be called the **Instruction Trap**. This class includes things like Supervisor Traps 5, 6, and 7 (Zero Divide, CHK Instruction, and TRAPV Instruction respectively). These are fairly self-explanatory; if you try dividing by zero, you'll provoke a trap, and the CHK and TRAPV instructions provoke traps if the user program detects a runtime error like an arithmetic overflow or a subscript out of bounds. These errors can be created by bad software, or by addled hardware.

Another type of trap is that which treats with **Illegal and Unimplemented Errors.** An illegal instruction is one in which the first word bit pattern is not the first word bit pattern of a legal instruction. Supervisor Traps 4, 1Ø, and 11 (Illegal Instruction, Line 1Ø1Ø Emulator, and Line 1111 Emulator) fall into this category. Traps 1Ø and 11 (the emulator traps) are very specific; they deal exclusively with word patterns with bits 15 through 12 equaling 1Ø1Ø or 1111. These words are distinguished as unimplemented instructions, and separate exception vectors are provided for these to increase efficiency. These are typically signatures of freaked memory, although you can write software which will provoke this.

A **Privilege Violation** is caused when an attempt is made to execute one of the so-called "privileged instructions" while in the user state. Essentially, you're trying to do something which you aren't authorized to do, and the 68ØØØ is letting you know in no uncertain terms. This error is rare, and shows up as Supervisor Trap 8.

Supervisor Trap 9 (**Trace**) is a programming aid provided by the 68ØØØ. You should almost never see this one... and if you do, I'd suggest a good hard look at the 68ØØØ CPU board.

Supervisor Trap 2 (**Bus Error**) is a commonly seen problem. What is actually happening is that the external logic connected to the 68ØØØ has detected a bus error. It will then request the 68ØØØ to process said bus error by generating an exception (a.k.a. trap). This can be caused by a lot of things, ranging from bad cables between the 68ØØØ CPU and memory boards to something on the Z8Ø side of the machine grabbing the bus and refusing to let go. The one consistent thread is the fact that it is almost always a hardware problem.

Supervisor Trap 3 (**Address Error**) occurs when the 68ØØØ attempts to access a word or a long word operand or instruction at an odd address (the 68ØØØ runs on even address boundaries). This is usually a sign of a confused 68ØØØ or flaky memory, although other portions of the 68ØØØ circuitry can be suspect as well.

System 3 Kernal Error Messages

Here follows a description of the warning and error messages put out by various parts of the 68ØØØ/Xenix 3.Ø kernal, and what they mean. The error messages put out by the Z8Ø Control Program are not in this list; they will be listed seperately later in this document. Included with the description of each message and its format are possible causes and their locations.

This information is only totally accurate for kernal versions 3.1(13) and later. For any later versions of Xenix System 3 which may come along the information presented here may be incomplete, but it will generally be correct.

Kernal error messages may be categorized as follows:

fatal
: Recovery is impossible, and Xenix ceases execution.

System Inconsistency
: A contradictory situation (a "this can't happen" situation) exists in the kernal.

Abnormal
: A probably legitimate but extreme situation exists.

Hardware
: Indicates a hardware problem exists.

User Error
: The user has caused the problem.

Fatal system messages begin with "panic:" and indicate hardware problems or kernel inconsistencies that are too severe for continued operation. After displaying a fatal message, the system will stop. Rebooting is required.

System Inconsistency messages indicate problems usually traceable to hardware malfunction, such as memory failure. These messages rarely occur since associated hardware problems are generally detected before such an inconsistency can occur.

Abnormal messages represent kernal operation problems, such as the overflow of critical tables. It takes extreme situations to bring these problems about, so they should never occur in normal system use.

User Errors are situations caused by the user doing something contradictory, eg, write-protecting a hard drive and trying to mount it for write.

System Startup Messages

The following text is diplayed every time the system is booted:

```
Tandy 68ØØØ/XENIX version 3.n(ee)

Microsoft  XENIX  v3.Ø

Copyright Microsoft Corporation, 1984.  All rights reserved.
Licensed to Tandy Corporation.
Portions copyright 1985 Tandy Corporation.  All rights reserved.
Restricted rights:  Use, duplication, and disclosure are subject
to the terms stated in the customer Non-Disclosure Agreement.

System nnnk User nnnk
Root nnnnk Swap nnnnk
```

The first line tells you what version of the kernel you are running. The **3.n(ee)** tells you that you are running release n of 3.Ø Xenix. The number in parenthesis is the edit number of the kernel. In this way, you may tell the difference between various versions of the same release (not that you should ever need to, but... neat to know anyway).

After the copyright warning, the system displays how much memory it is using, how much memory is available for users, how big the disk it is booted on is, and how much swap area is available.

Device Driver Messages

Device drivers display error messages in four different formats (two of which are special and related to cartridge disk operation only):

```
device DRIVE n: specific error message
device DRIVE n: type err hhhh on rd/wrt of cyl cyl hd head sect sector
CART DRIVE n: type err hhhh on rd/wrt of blk block
CART DRIVE n: type err hhhh on format
```

device **DRIVE** n: specific error message

This format is used for general errors from the driver which affect all operations. For example, the message "HARD DRIVE Ø: active drive not ready" is displayed when the driver tried some hard disk I/O operation on an already active (open) drive, and the controller reported the drive as busy or not ready.

The following messages are possible from each type of drive:

Further I/O aborted until device closes
Device closed; error cleared
active disk changed
active drive not ready
active drive write protected
bad format
bad sector size
drive not ready
write protected

Further I/O aborted until device closed
Device closed; error cleared
These messages are seen when an unrecoverable error has occurred on a drive and the driver is refusing to do any more I/O until the device is closed (or until Xenix shuts down). The first usually appears after the error messages describing the unrecoverable error, and the second after the device driver is closed. Hardware or User Error.

active disk changed
This error occurs when a disk is changed while Xenix was doing I/O on it (ie, it was mounted). This message is normally seen on floppy drives. It cannot occur on hard drives, and is very difficult to cause on cartridge drives. User Error.

active drive not ready
This error occurs when Xenix tried some I/O operation on an already active (open) drive, and the controller reported the drive busy or not ready. Hardware.

active drive write protected
This error occurs when, after the drive was opened for I/O, the user write-protects the media. This error most often occurs on a hard disk, where the error is ignored until the problem is corrected (ie, the user removes the write-protection). It is very difficult to create this error on a floppy or cartridge disk as the write-protection devices on these are inaccessable while they are in their drives. User Error.

bad format
This error indicates that when Xenix first looked at a disk to open it for I/O, the media format was incorrect. This usually indicates that the user did not format the media with **diskutil** before attempting to use it. User error.

bad sector size

This is a very unusual error. It indicates that when Xenix looked at a disk to open it for I/O, it had an unusual (ie, non-standard) sector size. This error is unusual because for raw I/O, Xenix will handle most sector sizes supported by the controller. This error usually indicates something is wrong with the Z8Ø hardware. Hardware.

drive not ready

This error is displayed when Xenix first looks at a drive to do I/O and the controller says the drive is not ready. This is a common error when, for example, the user tries to read a floppy or cartridge drive with no disk in it. This error is more serious on a hard drive, and usually indicates hardware problems. User Error or Hardware.

write protected

This error is diplayed when Xenix first looks ar a drive to do I/O and the user wants to write to the drive and the media is write-protected. User error.

device **DRIVE** n: type **err** hhhh **on rd/wrt of cyl** cyl **hd** head **sect** sector
CART DRIVE n: type **err** hhhh **on rd/wrt of blk** block
CART DRIVE n: type **err** hhhh **on format**

This format is used for errors which occur during I/O of some sort. You are shown the type of error, some hardware-related status, what type of I/O it occurred on (read, write, or format for disk cartridge), and where it occurred. The type of error can be one of the following:

hard
soft
mailbox
unclassified

A hard error indicates that the driver retried the operation and was unable to complete the requested I/O.

A soft error indicates that an error occurred, the driver retried the operation and it succeeded. The data is valid. These are usually indications that the media is aging.

A mailbox error is a rare error indicating that Xenix handed the Z8Ø control program an invalid request of some sort. This usually indicates a bug in the 68ØØØ software, or, in extreme cases, a 68ØØØ hardware problem.

An unclassified error is an extremely rare error type indicating that the Z8Ø control program returned an undefined error type and Xenix was unable to determine what the problem was. This usually indicates a Z8Ø hardware

problem, or, in some cases, a bug in the Z8Ø control program.

The status displayed (hhhh) is data that might be useful from the controller or drive. For the hard drive, the data displayed is the error register and the control/status register from the controller. For example, you might see a **4Ø5B**. If you look these numbers up in the Western Digital WD1Ø1Ø book, or decode them for yourself as I will describe later, you will see that the **4Ø** means "ID not found" and the **5B** means "Ready, seek complete, Data Request, Command-in-Progress, Error." For the floppy drive, the data displayed is the drive select port and the FDC status port. For the cartridge drive, the data displayed is the sense key, class, code, and address valid bit. Lastly, where the error occurred is displayed. For the floppy and hard disk, the cylinder, head, and sector are displayed. For the cartridge drive, the block number is displayed.

Specific or Specialized Device Driver Error Messages

dkustart: GO set on device drive n
panic: GO set at dkustart
These two messages are produced by the disk driver when Xenix asks for some I/O and it discovers that the Z8Ø already claims to be busy doing something which Xenix doesn't think it asked for. This usually indicates a bug in the 68ØØØ software. System Inconsistency, Fatal.

panic: disk major number
This message will only be seen when Xenix is put together improperly, or there is an unusual 68ØØØ hardware problem. It indicates that when Xenix started up, it was unable to find the disk driver listed in the driver tables. System Inconsistency, Fatal.

Miscellaneous Hardware-Related Messages

Supervisor Trap d
Access address=dddddddd **Instr wd=**iiii
&dØ=dddddddd **mmu=**dddddddd **sr=**dddddddd **pc=**dddddddd **usp=**dddddddd
aØ-a7 dddddddd dddddddd dddddddd dddddddd dddddddd dddddddd dddddddd dddddddd
dØ-d7 dddddddd dddddddd dddddddd dddddddd dddddddd dddddddd dddddddd dddddddd

panic: trap in sys

This message indicates that 68ØØØ Trap Number d occurred in supervisor mode (ie, while the processor was running Xenix code and not user code). For specifics on the trap, consult the first pages of this section.

This error can be caused by a vast menagerie of problems, ranging from bugs in Xenix to 68ØØØ hardware problems. The data presented is a nearly complete dump of the processor's registers and may be used to find where the 68ØØØ was executing when the trap occurred. Hardware or System Inconsistency, Fatal.

panic: memory parity

This message occurs when a 68ØØØ board set equipped with parity chips gives a parity trap. There is nothing that can be done to correct the error, so Xenix ceases processing. Hardware or System Inconsistency, Fatal.

panic: mmusub: chk

This message indicates that, while trying to allocate space for a user program, Xenix discovered that a previously checked and "ok" program has an illegal or impossible size or illegal segments (separate I/D or stack segments). System Inconsistency, Fatal.

interrupt from unknown device, vec=d
panic: unknown interrupt

This message indicates that an unknown, unused interrupt (number d) occurred on the 68ØØØ. This usually indicates a 68ØØØ, or, more rarely, a Z8Ø hardware problem. Hardware, Fatal.

Other System Messages

**** ABNORMAL System Shutdown ****
This message appears when errors occur during system shutdown. It is usually accompanied by other system messages. System Inconsistency, Fatal.

bad block on dev nn/mm
A nonexistent disk block was found on, or is being inserted in, the structure's free list. System Inconsistency.

bad count on dev nn/mm
A structural inconsistency in the superblock of a file system. The system attempts a repair, but this message will probably be followed by more complaints about this file system. System Inconsistency.

Bad free count on dev nn/mm
A structural inconsistency in the superblock of a file system. The system attempts a repair, but this message will probably be followed by more complaints about this file system. System Inconsistency.

error on dev name(nn/mm)
This is a way that device driver diagnostic messages can start. In reality, none of Tandy's drivers use this format. This style of message is almost never seen. The message will indicate the specific driver and complaint. The name is a word indentifying the device. (See above section on device drivers).

iaddress>2^24
This indicates an attempted reference to an illegal block number, one so large that it could only occur on a file system larger than 8 billion bytes. Abnormal.

Inode table overflow
Each open file requires an inode entry to be kept in memory. When this table overflows the specific request is refused. Although not fatal to the system, this event may damage the operation of various spoolers, daemons, the mailer (if present) and other important utilities. Anomalous results and missing data files are a common result. Abnormal.

no file
There are too many open files, and the system has run out of entries in its "open file" table. The warnings given for the message "inode table overflow" apply here. Abnormal.

no space on dev nn/mm

This message means that the specified file system has run out of free blocks. Although not normally as serious, the warnings discussed for "inode table overflow" apply: often user programs are written casually and ignore the error code returned when they tried to write to the disk; this results in missing data and "holes" in data files. The system administrator should keep close watch on the amount of free disk space and take steps to avoid this situation. Abnormal.

**** Normal System Shutdown ****
[Z8Ø Control System Halted] ++

This message appears when the system has been shut down properly. It indicates that the machine may now be rebooted or powered down.

Out of inodes on dev nn/mm

The indicated file system has run out of free inodes. The number of inodes available on a file system is determined when the file system is created (using mkfs). The default number is quite generous; this message should be very rare. The only recourse is to remove some worthless files from that file system, or dump the entire file system to a backup device, run mkfs with more inodes specified, and restore the files from backup. Abnormal.

out of text

When shared text programs are run, a table entry is made so that only one copy of the pure text will be in memory even if there are multiple copies of the program running. This message appears when this table is full. The system refuses to run the program which caused the overflow. Note that there is only one entry in this table for each different pure text program. Multiple copies of one program will not require multiple table entries. Each "sticky" program (ie, those programs which have the sticky bit set -- for more information, read the help page on chmod) requires a permanent entry in this table; nonsticky pure text programs require an entry only when there is at least one copy being executed. Abnormal.

panic: blkdev

An internal disk I/O request, already verified as valid, is discovered to be referring to a nonexistent disk. System Inconsistency, Fatal.

panic: devtab

An internal disk I/O request, already verified as valid, is discovered to be referring to a nonexistent disk. System Inconsistency, Fatal.

panic: iinit

The super-block of the root file system could not be read. This message occurs only at boot time. Hardware, Fatal.

++ See also the portion of this document addressing /z8Øctl error messages.

panic: IO err in swap
A hard++ I/O error occurred while reading or writing the swap area. Hardware, Fatal.

panic: no fs
A file system descriptor has disappeared from its table. System Inconsistency, Fatal.

panic: no imt
A mounted file system has disappeared from the mount table. System Inconsistency, Fatal.

panic: no procs
Each user is limited in the amount of simultaneous processes he can have; an attempt to create a new process when none is available or when the user's limit is exceeded is refused. That is an occassional event and produces no console messages; this panic occurs when the kernel has certified that a free process table entry is available and yet can't find one when it goes to get it. System Inconsistency, Fatal.

panic: Out of swap
There is insufficient space on the swap disk to hold a task that is scheduled to be swapped. The system refuses to create tasks when it feels there is insufficient disk space, but it is possible to create situations to fool this mechanism. Abnormal, fatal.

panic: Timeout table overflow
The timeout table is full. Timeout requests are generated by device drivers; there should usually be room for one entry per system serial line plus ten more for other usages. This is usually caused by a bug in a device driver. Abnormal, Fatal.

proc on q
The system attempts to queue a process already on the process ready-to-run queue. System Inconsistency, Fatal.

++ See the above section on device driver messages.

System 3 /z8Øctl Error Messages

The following information is a rather complete overview of the error messages that the Z8Ø control program (Version 3(56)) will produce. They are only guaranteed to be accurate for that version, although most of this will be fairly applicable for other System 3 releases.

Having said that...

.....

Everything You Ever Wanted To Know
About Z8Ø Error Messages
But Were Too Freaked Out To Ask

or

"Shut 'er down, Scotty, she's sucking mud again."

.....

The **z8Øctl** program (found in /z8Øctl) is a piece of code that is loaded into Z8Ø memory when the boot track loads Xenix into the 68ØØØ memory. This code resides in the lower 32K of Z8Ø RAM. In addition, over 1ØK of additional Z8Ø RAM is used for buffers, control blocks, and interrupt vectors. The purpose of **z8Øctl** is to perform I/O related operations for Xenix, since the 68ØØØ (as we use it) is unable to access the hardware itself. Therefore, **ALL** I/O, including disk, terminal, console, and various peripherals is performed by the Z8Ø, acting on a command packet from the 68ØØØ.

Since **z8Øctl** is really a collection of drivers and a scheduler, it only displays error messages of its own when there is no reasonable way to inform the user under Xenix of the problem. Xenix provides a limited number of errors to return to the user (and you just saw them all in the preceeding portion of this appendix), so the nature of an error could be hidden. When **z8Øctl** displays an error message, it always goes to the console, and is preceded by one of the following:

Buginf:	-- Bug Information
Bugchk:	-- Bug Check
Bughlt:	-- Bug Halt

Buginf is used to inform the user of a non-normal situation that arises which the driver will attempt to handle using some pre-coded default. An example of this is booting off of a hard disk that has no bad track map. This will generate a **Buginf** and the boot will try to start the system anyway. In this case, the boot makes the assumption that there are no bad tracks at all on the drive. This assumption may be a bad one, so the message is displayed to warn you that problems may occur. **Buginf** does not occur in Xenix 3.1; this will

only show up in earlier versions (as of this writing).

Bugchk indicates that either some synchronization problem arose that should not happen or an unusual hardware error occurred. In the case of a synchronization problem, the request is usually ignored. This may cause any further reference to the device to hang, but this is usually preferable to what **z8Øctl** refused to do. For hardware problems, the request is aborted and an error returned to the 68ØØØ, who usually retries the operation.

Bughlt means that an error was detected that is so serious that a recovery should not even be attempted. For example, when the 68ØØØ makes a disk request, two copies of the request are passed to the Z8Ø. One is inverted. When the Z8Ø detects the request, it compares the copy to the main request. If the two do not agree, then some problem has occurred, the error message is displayed, and the system halted to avoid damage to existing data. When a **Bughlt** occurs, the system goes into a halt state, and halts the 68ØØØ as well. No drive park is performed (if it has been invoked).

If an error message that is displayed on the console does not start with "**Bugxxx**", then it is likely that it came from Xenix. Only a few **z8Øctl** messages in Xenix 3.Ø do not start with one of the bug headers; all of them do in Xenix 3.1.

When **z8Øctl** is loaded, it is executed and after initializing its drivers it displays a message like:

[Z8Ø Control System Version 3(56) 28-Jun-85] [Model xxxx]

This is the version and the date code for the version of **z8Øctl** which you are presently running. The [Model xxxx] will display "II" or "6ØØØ/16", based on the results of a test done with one of the onboard CTCs. All Model 12/16B/6ØØØ units will display "6ØØØ/16". On Model II/16[A]'s, the "II" will be displayed if the Z8Ø CPU board revision is Revision A, B, or C. Revision D boards (and later) allowed the 68ØØØ to interrupt the Z8Ø. **z8Øctl** determines if the interrupt is available and if it is it honors it. If the CPU board does not have that circuit, the Z8Ø polls a location in 68ØØØ memory to determine if it is being requested to do something.

After the above message is displayed, the 68ØØØ is reset and then started. If no other messages appear, then the 68ØØØ has not started or is not communicating with the Z8Ø -- a useful thing to know when you are trying to troubleshoot a problem system.

The error messages presented by **z8Øctl** can basically be divided into 3 groups. Group I consists of messages which are directly related to problems with the Z8Ø or I/O devices connected to the Z8Ø. Usually the 68ØØØ does not cause these errors and can be ignored when trying to diagnose the problem.

Group II errors are caused by some handshaking problem between the Z8Ø and the 68ØØØ. I'll amplify on this when we get to that section.

Boot errors are those which occur during the boot sequence. Again, I'll expound further on these when we get there.

Group I Errors

These messages are directly related to problems with the Z8Ø or I/O devices connected to the Z8Ø. The 68ØØØ usually does not cause these errors and can usually be ignored when isolating the problem.

```
                          A F  B C  D E  H L  IX   IY   SP
Bughlt: Rst7 Additional:  xxxx xxxx xxxx xxxx xxxx xxxx xxxx
                          xxxx xxxx xxxx xxxx xxxx xxxx xxxx
                          PC   (SP) (Previous Stack contents)
```

or

Bugchk: Rst7 Fetch xxxx

The Z8Ø fetched a ØxFF in an M1 cycle from memory and executed an RST 38H, also known as RST 7. There are no RST 7 instructions in **z8Øctl**, so memory has been corrupted or the program counter has been set to a memory location beyond the bounds of the **z8Øctl** program area. (**z8Øctl** sets all unused memory to ØxFF). It has been noted that sometimes a machine that is haveing power or other problems would cause an M1 cycle to be botched and the Z8Ø would read a floating buss instead of the intended memory location. On our systems, the Z8Ø buss floats high, producing a ØxFF, which is an RST 38H instruction. When an RST 38H is detected, **z8Øctl** reads the memory location that caused the RST 38H to make sure that the location really contains a ØxFF. If it doesn't, a "Bugchk: Rst7" is generated, and **z8Øctl** resumes execution at the failed location. The memory location that had the bad M1 cycle is displayed. If the memory location contains a ØxFF on the second read, then a "**Bughlt: Rst7**" message is generated. When the Bughlt occurs, all non-alternate registers on the Z8Ø are dumped as well as the last several stack locations. **The first number on the second line is the memory location that caused the error.** This last is a useful piece of information; with a little effort you may spot a bad RAM chip this way.

Action: o Check all cards for proper seating, particularly the FDC, CPU, disk cartridge and memory cards.

- o Make sure all socketed chips are firmly seated.
- o Check power supply for correct voltages at the cards.

```
                    A F  B C  D E  H L  IX   IY   SP
Bughlt: Wnd7 Additional: xxxx xxxx xxxx xxxx xxxx xxxx xxxx
                         xxxx xxxx xxxx xxxx xxxx xxxx xxxx
                         PC   (SP) (Previous Stack contents)
```

This message was added starting with Xenix 3.1 to discern between RST 38H instructions being fetched and other Z8Ø problems. At memory location Øx35 is a jump instruction to the Wnd7 halt code. No location below Øx35 is used by **z8Øctl**, and if the program counter ever gets here, it is due to an error. This is routinely seen when an external primary hard disk or cartridge system loses power. Both of these devices tend to garbage the Z8Ø data buss for a moment on power transistion, and the Z8Ø can accidentally call, jump, or RST into one of the lower memory locations.

Action:
- o Check all power connections to all devices connected to the system.
- o Check for reversed ground and neutral on any device connected to the system, including terminals. (This usually also causes a lot of physical damage).
- o Make sure all cards are firmly seated.
- o On the Model 12/6ØØØ, make sure the card cage is bolted down and that its card edge has a good connection with the motherboard.
- o Check power levels at the extreme end of the card cage (ie, on the 68ØØØ boards).

Bugchk: UNKINT - Code: ....

An interrupt was received from one of the CTC's but nothing is connected to that channel and no interrupt should occur.

Action:
- o If the unit has a Multi-terminal interface, make sure all required Technical Bulletins have been installed, then place it in the LOWEST possible card slot in a Model 12/6ØØØ, (right above the hard disk interface), and if the unit is a Model II/16A, put it in front of the video and Z8Ø memory cards.
- o Run all CTC related diagnostics.

Bughlt: Unexpected Floppy Interrupt

The Z8Ø received an interrupt from the FDC at a time when no interrupt should be generated and could not safely recover from it.

Action:
- o Check the Z8Ø interrupt chain, and on ALL units, make sure that there is no empty card slot between any of the Z8Ø cards. (There may be a gap between the Z8Ø and the 68ØØØ cards).
- o Run all CTC diagnostics.
- o Swap disk controller and CTC chips.
- o See **"Bugchk: UNKINT"** too.

Bugchk: SckMud

In **z8Øctl**, there is a loop which calls all of the drivers, including a driver that picks up requests from the 68ØØØ and informs the various I/O drivers that there is work to do. When a driver is finished with what it was doing, it returns to the "idle loop" and gives time to the next driver.

At the bottom of the "idle loop", the system stack pointer is compared against the value it had when this code ran on the previous cycle. If the value is not the same, then a serious Z8Ø problem has occured and the stack pointer has been altered improperly. This condition is also called a stack imbalance. The system should be shut down and rebooted as soon as possible.

An additional message may appear beneath the "Bugchk: SckMud". The message will read something like, "Shut 'er down, Scotty, she's sucking mud again". Fortunately, the conditions which provoke this error are vanishingly rare, so the vast majority of you should not have to explain THAT one to your customers!

Action:
- o Check all Z8Ø buss connections and card edges.
- o Check seating of all socketed parts on the CPU board, particularly the Z8Ø and the DMA.
- o Run Z8Ø memory tests.
- o Check power supply for out-of-tolerance voltages at the Z8Ø and its memory.
- o Check for correct wait state jumpering.
- o Swap Z8Ø CPU and/or support logic if repeatable.

Bugchk: xHDNRDY
The hard disk controller reports that the drive to be used in this command is not ready, and remained not ready after several reset and retry operations were performed. Software cannot tell the difference between a non-existant bubble and one that is not ready. The "x" indicates the drive number.

Action:
- o Make sure the user is referencing a drive they actually have connected to the system.
- o Check hard drive controller cables and interface card seating.
- o Check hard disk drives' fan filters for excessive dirt (overheating).
- o Check controller alignment; run all diagnostics.
- o Check for correct applications of Technical Bulletins.

Bugchk: ØHDCTC
When initializing the drive, a test value was written to the Sector Count register on the hard drive controller board and the value read back does not match.

Action:
- o Check cables and interface card seating.
- o Check alignments; run hard disk diagnostics.
- o Check filters and Technical Bulletins as applicable.

Bughlt: Z8ØHDW - Z8Ø Hardware Fault
If the hard disk drive was ready and mounted and suddenly went non-ready, the **HDETIME** error usually occurs and the drive is reset and re-initialized. If after this fresh start the drive is still acting up, the above message is displayed. This was a common error for early internal hard drive controllers on 16B+/6ØØØHD systems.

Actions: See those listed above.

Bugchk: HDETIME
A command was issued to the hard drive controller and no completion interrupt was ever received. After 1Ø seconds, the command is aborted and the above message is displayed. The 68ØØØ is informed of the failure and usually will retry the operation. In the meantime, the hard disk controller is reset and reinitialized by the Z8Ø.

Actions: See those listed above.

Bughlt: HDSTAT

In versions of **z8Øctl** up to Xenix 3.1 the hard disk controller uses a state machine driven by a table to handle mounting of hard disks. If the state machine reaches an "impossible" state, this error occurs.

Note: A "state machine" is an algorithm which is driven by a set of conditions. In the above case, the illegal state is one which does not fit the set of conditions the state machine was designed to keep track of.

Action:
- o Run all Z8Ø diagnostics, including memory tests.
- o Check hard drive cables.

Bugchk: IOFAKE

The Z8Ø received an interrupt that appeared to come from the cartridge device at a time when no interrupt should be generated.

Action: See "UNKINT".

Bugchk: SCSIFI

The Z8Ø received an interrupt that appears to come from the Iomega device at a time when an interrup was expected, but a check of the Iomega status port indicates that it did not generate the interrupt.

Action: See "UNKINT".

Bugchk: USCSIE Sense xx xx

The SCSI Buss reported an error, but the error code was not known to the driver. The sense key, class, and code are displayed. The error is treated as a hard error and the command is aborted.

Bugchk: DbLock

The Z8Ø has several devices that use the DMA. These include the floppy disk driver, hard disk driver, SCSI driver and some memory-to-memory operations. Because of the fact that only one DMA is present in the machine, a software routine allocates the DMA for drivers that request it and the code forces others to wait until the DMA is available. This error occurs if a driver requests the DMA and already has it. The command is completed successfully, but it indicates that memory is failing or a hardware problem, since a driver managed to exit without releasing the DMA.

Bugchk: I1U1Rq

A driver attempted to "give back" the DMA so that other drivers could use it and it was determined that this driver did not currently own the DMA. This internal request is ignored and the system may continue to run normally, but this is an indication of failing Z8Ø memory or hardware since a driver became convinced that it owned the DMA when it had never acquired it.

Group II Errors

These errors are caused by some handshaking problem between the 68ØØØ and the Z8Ø. All requests are validated by the 68ØØØ before the Z8Ø is interrupted. Then the Z8Ø makes sure the request is valid as well. When the Z8Ø reports a problem, it means that:

(1) The data (stored in 68ØØØ RAM) has been damaged since the 68ØØØ checked it or was misread by the Z8Ø.
(2) The validation code on the 68ØØØ has become corrupted.
(3) The validation code on the Z8Ø has become corrupted.

If after rebooting the machine the problem persists, the **/xenix** and **/z8Øctl** files may be suspect. In order to rule out case (2) and (3), reinstall them. If the problem still persists, Case (1) is the probable difficulty, which is a shame -- it's the toughie. It could be one (or more) of the following:

(a) Boards not up to date on modifications, particularly the bad "AS" type parts mods.
(b) Problem in arbitration.
(c) Problem with memory on Z8Ø and/or 68ØØØ.
(d) Problem with Z8Ø DMA.
(e) Excessive noise on 68ØØØ ribbon cables, particularly RAS and CAS.
(f) Incorrect bank selection in Z8Ø memory.
(g) Overheating and/or power problems.
(h) Card cage modifications not correct.

... ad nauseam, ad infinitum.

Since so many things can cause these errors, the above items and any others which come to mind should be used to start any attack on these errors.

Bughlt: BADMAJ
The 68ØØØ creates and maintains a queue of requests for the Z8Ø to perform. This queue is kept in 68ØØØ memory and has a pointer indicating where the next item should be added (by the 68ØØØ) and a pointer indicating what item is currently being examined by the Z8Ø. This error indicates that a request in this table had an invalid major number. At this time, major numbers are in the range Ø to 6.

Bughlt: BADCMD
As in **BADMAJ**, this indicates that a request read from the 68ØØØ is invalid and the Z8Ø halts to avoid destroying data. This value must be in the range Ø-3.

Bughlt: QOVFLW
The 68ØØØ request queue is filled beyond capacity. Since Xenix is supposed to only have one request per device pending on the Z8Ø at any instant, the queue cannot fill since it is larger than the maximum number of devices.

Bugchk: BD68RQ - Code: xx
This message occurs when a request is fetched from the 68ØØØ queue, and it has a valid major and minor number, but the action requested is not possible for that device. For example, setting status on the floppy drive (such as setting the baud rate) is not legal and will generate this message. The codes are:

A1 -- Attempt to set status on the CPU device
D2 -- Attempt to set status on the FDC
D4 -- Attempt to set status on the Hard Disk Controller
CØ -- Attempt to do I/O to the clock
B1 -- Attempt to set status on the console screen device
AØ -- Attempt to set status on the Disk Cartridge device

The request is ignored. This means the 68ØØØ will block all further I/O to that device and you may have to crash the system to get out of this deadlock.

Bugchk: ØFDBSY
Bugchk: ØHDBSY
The Z8Ø received a request from the 68ØØØ to perform some operation with a disk drive. Upon checking, it found that the given driver was already working on a request for this device. The 68ØØØ is not supposed to hand more than one request per device to the Z8Ø at a time, and the next request is sent only once the Z8Ø marks the previous operation as completed. When this happens, the second request is discarded. If this was a real request, further I/O to this device will usually block and eventually hang the system.

Bugchk: ØFDNGO
Bugchk: ØHDNGO
Bugchk: SCZNGO
Bugchk: SRNGO
The Z8Ø received a request from the 68ØØØ via the request queue, and when validating the command "mailbox" it found that the mailbox was still marked unavailable. The command is ignored. If it was a real disk request, further I/O to this device will usually block and eventually hang the system.

Bughlt: ØFDCMD
A disk request was received and when checked against the inverted check-copy, the two commands did not match. This will also occur if the two copies do match but the request code is not known. To avoid destroying existing data, the system is halted.

Bughlt: SRBADDR
The screen device was passed an address that does not exist in the Z8Ø video RAM. The system is halted.

Bughlt: SRXCSR
The check-copy of the screen device request did not match the master copy. The system is halted.

Bugchk: IOBOZO
An I/O request was made to the cartridge driver, but the command bits were invalid. The command is aborted.

Bughlt: 68k crashed
The Z8Ø interrupts the 68ØØØ once every 16.67 msec (2Ø msec in 5Øhz mode). If the 68ØØØ fails to acknowledge any of these interrupts over a 6 second period, the Z8Ø assumes the 68ØØØ has halted or gone into a loop with interrupts disabled. The 68ØØØ must miss at least 36Ø clock interrupts in a row (3ØØ in 5Øhz mode) to generate this error. Once an interrupt is serviced, another 6 seconds of missed interrupts is required for a halt of this type.

[Z8Ø Control System Halted]
The Z8Ø has received a HALT signal from the 68ØØØ. **z8Øctl** parks the hard disk drives (if requested), halts the 68ØØØ processor, displays the halt message and goes into an IDLE state. The Z8Ø will still allow its background operations to take place and this causes any active floppy drives to deselect.

If this occurs at any time other than a shutdown or Bughlt, treat it as a problem.

A Quick Look at The Xenix Boot Track
or
What Happens When You Hit "RESET"

The Xenix boot track allows the user to start either a Z8Ø-based utility like **diskutil** or **z8Ødiags**, or boot the Xenix operating system. The process of booting Xenix involves locating the files **/xenix** and **/z8Øctl** on the booting device, loading the 68ØØØ code into 68ØØØ memory from **/xenix**, and loading the Z8Ø code into Z8Ø memory from **/z8Øctl**. The 68ØØØ memory is loaded first. Once the Z8Ø memory is loaded, control is transferred to **/z8Øctl**. When the screen clears, **z8Øctl** is now running.

The boot ROM in the Model II/12/16A/16B/6ØØØ reads the boot track in from floppy drive Ø or hard drive Ø. Once loaded, the Xenix boot track displays something similar to this:

Tandy 68ØØØ/Xenix Boot Version is 3(24) 29-Oct-85 [xØhz]
Copyright 1985 Tandy Corporation. All Rights Reserved.

Xenix Boot>

will be displayed. Any messages displayed before this point have been generated by the boot ROM.

At the prompt you may press:

"?"	-- for brief help
<ENTER>	-- to boot **/xenix** if it exists on the boot device
"diskutil <ENTER>"	-- to run **diskutil**
"z8Ødiags <ENTER>"	-- to run the old Z8Ø diagnostics
"<F2>"	-- to specify an alternate Z8Ø driver
"name <ENTER>"	-- to run a kernal (ie, like /xenix) with an alternate name. This is useful for system protection; if you want to boot off a file named "bozo", it is possible to do so.

The "[xØhz]" indicates the system clock speed that is indicated by the boot ROM. Since the NMI clock is generated by the CRTC, this will indicate the correct system clock interval. In the USA, you should see [6Øhz] at all times. If the 5Øhz ROM is installed, [5Øhz] is displayed. If a reverse video '6' is displayed in the [6Øhz] message, it means that the boot code was unable to determine what speed was being programmed by the ROM and has assumed 6Øhz. The ROM should be replaced if that occurs. The speed information is passed to System 3 Xenix via a fixed memory location so that it will know how many interrupts represent a second.

Boot Track Error Messages

Boot track messages tend to be a bit terse due to the limited amount of code space allowed by the boot ROM. The descriptions below should help to fill out the information given by the error alone.

Program not found

The program name specified at the "Xenix Boot>", "Kernel>", or "Z8Ø Driver>" prompts was not found in the root directory "/" on the boot disk. The files are either missing or the name(s) you typed are not spelled correctly.

Actions:

- If you just pressed <ENTER>, then either **/xenix** or **/z8Øctl** or both have been deleted from the disk. This could have happened during an **fsck** of a dirty system or via a disk problem. Try booting on floppy or another floppy. Then mount the failing disk with the **/etc/mount** command and make sure that the **/xenix** and **/z8Øctl** files are in the root "/" directory. If they are missing, copy the CORRECT versions of these files to the failing disk. Then **umount** and bring the system down and try to boot on the problem disk.
- If you typed one or more characters at the boot prompt, then check the spelling of the file you entered. (The boot ignores all non-printable characters including blank). If the program you specify (like **diskutil**) still cannot be found, try booting Xenix and make sure the file hasn't been deleted.

Badctl

The Z8Ø Control System file **/z8Øctl** was located, but it did not contain the correct code. This may indicate a corrupted system or the customer has copied something over this file.

Action:

- Boot up the system using a floppy (if trying to boot the hard disk) or another floppy (if trying to boot from floppy) and mount the failing disk. Copy the correct version of the file off the installation floppy. Umount the system and halt the system. Then try to reboot.

NoPVH

While booting the system, it was noted that an area that **diskutil** writes to the drive was missing. This is known as the PVH. It contains information about the hard drive. If this is not found, the system no longer knows what size the hard disk is. Older versions of Xenix assumed an 8 meg hard drive in this case. Newer versions don't make this assumption as it only makes things worse if it is not an 8 meg drive.

NoBadT

While booting the system, it was noted that the bad track table is not present on the disk. The boot code will try to load Xenix anyway, and may or may not be successful. If Xenix starts running, it may or may not stay running since tracks that used to contain data are now empty. If an important track, part of the root directory for instance, was missing, then the system would likely crash right away.

In most cases, the best action to take is to boot off floppy and save the data files off the system. You should then reformat, reinstall the system, and reinstall your files. There is no real guarantee that the data will be absolutely sound, so you may want to compare it to an older backup and watch for erratic behavior from the restored system.

NewPal - Hardware Change Required

NewPal

The new PAL that is required for burst mode DMA operations on the 68ØØØ has not been installed on this system.

Iocyc7

The unit is a Model II/16A and has an old video/keyboard card. Rev. A or B boards will answer at ports in the ØxFn and Øx7n range, which conflicts with the multi-terminal boards. **/z8Øctl** is unable to tell the difference between bad mapping and an unprogrammed multi-terminal board. You should perform the relevant Technical Bulletins on the video board to get rid of this error.

BadCyl

In loading **/xenix** or **/diskutil**, a bad directory record was found or calculated.

Reset the machine and try again. If the problem persists, try booting on floppy and running **fsck** on the problem device. If this still does not help, try swapping the Z8Ø memory boards. The memory diagnostics do not check low memory (ie, below Øx4ØØØ) and the boot track resides in memory below this address. **/z8Øctl** uses all memory from ØxØØØØ to Øx7FFF.

As of Xenix 3.1, **BadCyl** can also indicate that the hard disk is formatted for 3.Ø but has the 3.1 boot track present, or is formatted for 3.1 and has the 3.Ø boot track. Boot up on floppy and place the correct boot track on the system.

HdIoEr Info: Cyl=xx HDS=xx Status=xx Error=xx

In loading **/xenix** or **/diskutil**, a hard disk error occurred.

Reset and try again. If you are using a hard disk, power down and check all cable connections. Check for correct terminator placement and correct connections to all secondary drives. If you still can't get the system started, boot off of floppy and try to mount the hard drive. If you can, the problem is in all likelihood located in **/xenix, /z8Øctl** or the boot track. You can try the kernal refresh option on the Tools Disk, or you can just save the data files off the hard disk and reinstall. In either case, you should save the data off and reinstall as soon as possible, since the integrity of the system is somewhat questionable at best even if you can get it running again.

HRDIOE - Can't load Xenix

This message indicates that the boot was unable to load and start Xenix. Other messages may have preceeded this one. This message is a general "catch-all" message which usually indicates some hardware problem.

68kMem - Memory Error

This messages will appear if any part of Xenix written to the 68ØØØ memory could not be read back correctly. This can also appear if there is insufficient memory to run Xenix.

Reset and try again. Also check for the following: clean filters, good ventilation, card cage modifications, bad RAM, refresh or decoding circuitry on the 68ØØØ, bad seating on U36 burst mode PAL on 68ØØØ CPU or bad jumper connection to that PAL.

No68k

This error will appear if the Z8Ø is unable to write a test value to 68ØØØ memory and read it back. You will have to RESET to try again. This is an indication of:

- o No 68ØØØ set.
- o Bad 68ØØØ boards or cables.
- o Z8Ø bus decoding problems.

UnkInt

Indicates that some device generated an interrupt when it was not supposed to. Check all interrupt-driven devices and replace the offending part.

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