

AMOS 1.4C RELEASE NOTES PR2/94

These release notes describe the differences between AMOS[®]1.4C and the earlier AMOS[®]1.4A release. The following topics are discussed:

- Enhancements in AMOS 1.4C
- New installation instructions

For descriptions of the features introduced in AMOS 1.4 and AMOS[®]1.4A, see the appropriate release notes:

AMOS 1.4 Release Notes, DSS-10367-00
AMOS 1.4A Release Notes, DSS-10458-00

NEW DOCUMENTATION

No new manuals or change page packets for existing manuals have been released for AMOS 1.4C.

NEW FEATURES INFORMATION

There are three different sections in this document that discuss new features incorporated into AMOS 1.4C. The main section, which immediately follows, deals with new features applicable to all AMOS 680X0 based computers. Appendix A contains release note information specific to AM-4000 AM-190 based computers. Appendix B includes specific information for installing and configuring AMOS 1.4C onto computers upgraded with Roadrunner hardware.

NEW FEATURES APPLICABLE TO ALL AMOS 680X0 COMPUTERS

The following section deals with new features applicable to all 680X0 computers.

New AMOS Monitor

In previous AMOS 1.4 releases, you had a large number of AMOS monitors for an equally large number of system configurations—e.g., AMOSLC, AMOSL, and AMOS32. To simplify things, AMOS 1.4C includes only one version of the monitor, which is available in seven different user breaks. The user breaks are as small as four and as large as unlimited. All the monitors have the same AMS prefix followed by a suffix indicating the user break—e.g., AMS4 is a four user monitor and AMSUNL is an unlimited user monitor.

As part of the procedure for installing AMOS 1.4C, you will be instructed to use MONGEN to create a monitor called TEST.MON. Once you have verified TEST.MON, using the MONTST program, you will create the correct boot monitor name for your computer using one of the following commands:

```
COPY AMOS32.MON=TEST.MONRETURN
```

or

```
COPY AMOSL.MON=TEST.MONRETURN
```



Do not enter either AMOSL or AMOS32 as the new monitor name in the MONGEN program. It's always best to create a test monitor first, and then verify the test monitor using the MONTST program. This will allow you to be sure the new monitor is working before over-writing the old monitor.

New SCSI Program

Included in AMOS 1.4C is a program called SCSI.LIT. By entering the SCSI command at the AMOS prompt, a complete inventory of the SCSI devices attached to the computer will be displayed on your terminal. The information includes not only what SCSI IDs are free or in use, but also includes the type of device (i.e., disk or tape), manufacturer's model number, and firmware revision.

An example of a SCSI.LIT display is shown below. The example is from an AM-4000 computer that supports up to seven SCSI disk or tape devices:

```
SCSIRETURN
```

```
Dispatched SCSI port:
```

```
SCSI id 7: (reserved) SCSI bus host adaptor
SCSI id 6: SCSI-2 (tape) TANDBERG TDC 4100 =05:10CREATED121592
SCSI id 5: No device or unable to report
SCSI id 4: No device or unable to report
SCSI id 3: No device or unable to report
SCSI id 2: No device or unable to report
SCSI id 1: No device or unable to report
SCSI id 0: SCSI-2 (disk) MAXTOR MXT-1240S H6F+AAA
```



SCSI.LIT can be executed from any account on your computer.

CDROM Drive Support

The files ACD.LIT and ACD.DVR have been added to AMOS 1.4C to support the SCSI-2 compatible CDROM drive sold by Alpha Micro. While these files have appeared in a previous patch release of the operating system, they were not part of AMOS 1.4A and therefore appear here in the new feature section.

The ACD.LIT program makes the logical units on the CDROM disc available for reading without having to re-boot your system. The device driver, ACD.DVR, handles communication with the CD-ROM drive and de-blocks 2KB blocks read from the CD-ROM drive into the 512 byte blocks AMOS expects. These programs allow you to access the AlphaCD disc without having to define the device in your system initialization command file.



For more information about ACD.LIT and ACD.DVR, see the *AlphaCD Installation Instructions*, packaged inside the jewel case containing the software distribution CDROM disc (AlphaCD).

Audio for Your CDROM Drive

AMOS 1.4C includes a new file called PLAYCD.LIT. This file allows you to place an audio CD into your CDROM drive and listen to music (or other audio information recorded on the CD) through headphones. While this program may work with any SCSI-2 compatible CDROM drive, it has only been tested using Toshiba's Model TXM3401E1 Portable CD-ROM drive, which is the drive sold and supported by Alpha Micro.

To run the program, type:

PLAYCD (RETURN)

A menu will appear on the screen allowing you to control the CDROM drive. You can make the CDROM drive play, stop, eject, jump to the next track, return to a previous track, pause, or exit by simply pressing the appropriate key as indicated in the menu. The PLAYCD menu is shown below:

```

CURRENT
-----

TOTAL
-----

<-  previous track
->  next track
s    stop
p    play
E    eject disk
space pause
^C   exit

TRACKS
-----
01  00:02
02  00:42
03  05:14
04  08:26
05  12:32
06  15:49
07  20:18
08  25:12
09  29:43
10  34:10
11  38:07
12  42:32
13  46:06

```



Once the program is running, you may want to run some other program from your terminal while still listening to music. By simply pressing `CTRL/C`, you will be returned to the AMOS prompt and the CDROM drive will continue to play music. You can re-enter the `PLAYCD` command at anytime, allowing you to change tracks, eject the disc, stop the audio, etc.

New TCRT Codes

Alpha Micro has defined several new TCRT codes to take advantage of the capabilities of new terminals and terminal emulators. These are documented below:



For general information about TCRT codes and how to use them, please see the *AMOS Terminal system Programmer's Manual*.

1. `TCRT -1,185` Select 8-bit Character Display

For terminals which support both 8-bit character sets (such as ISO Latin-1) and 7-bit National Replacement Character (NRC) sets, this call selects the 8-bit character set for all subsequent character displays.

2. `TCRT -1,186` Select 7-bit Character Display

For terminals which support both 8-bit character set (such as ISO Latin-1) and 7-bit National Replacement Character (NRC) sets, this call selects the 7-bit character NRC set for all subsequent character displays.

3. TCRT -1,187 Select 8-bit Keyboard Mode

For terminals which support both 8-bit character set (such as ISO Latin-1) and 7-bit National Replacement Character (NRC) sets, this call causes the keyboard to generate the 8-bit character set for all subsequent keystrokes.

4. TCRT -1,188 Select 7-bit Keyboard Mode

For terminals which support both 8-bit character set (such as ISO Latin-1) and 7-bit National Replacement Character (NRC) sets, this call causes the keyboard to generate the 7-bit character set for all subsequent keystrokes.

5. TCRT -1,189 Select Primary Printer Port

When using a workstation as a terminal emulator, this call selects the first printer port (e.g., LPT1:) as the port to receive all output from terminal printer port commands.

6. TCRT -1,190 Select Secondary Printer Port

When using a workstation as a terminal emulator, this call selects the second printer port (e.g., LPT2:) as the port to receive all output from terminal printer port commands.

7. TCRT -1,191 Select 161-column Display Mode

This call selects 161-column display mode. To determine if this call is available, you must first retrieve the terminal features bitmap (not TC.FLG) and test the appropriate bit for the presence of this specific TCRT call.



Please note that some versions of the terminal driver for the AM-75, which supports 161-column mode, erroneously assigned this function to a different TCRT number. This has been corrected in the version supplied with 1.4C.

PREPARING FOR A SOFTWARE UPGRADE

The following AMOS 1.4C software installation instructions supersede any installation instructions appearing in the release notes for AMOS[®]1.4 and AMOS[®]1.4A.

Before installing the operating system, carefully read the information outlined in this section:

1. **Protect Your Data!** When doing a major upgrade to your computer, you want to be absolutely sure you have a recent and complete system backup. While it is very unlikely data stored on your hard disk drive would be corrupted when upgrading your computer—you should be prepared for anything. **Before you download any new software, make sure all your data is copied onto some form of backup media.** Make sure you are able to read the data on your backup media; be absolutely sure the data on your backup media is both readable and restorable.
2. **Create A Warm Boot Tape!** A warm boot tape allows you to access the computer in situations where you are not able to boot from the hard disk drive. When doing an upgrade, you'll be configuring new drivers for your peripheral devices and using the MONGEN program to embed a new driver in your AMOS monitor. Either of these two operations, if done incorrectly, could result in a computer that won't boot. If you have a warm boot tape, you will be able to access your hard disk drive and correct the situation which prevented you from booting. Without a warm boot tape, it will be much more difficult to access the computer and correct the problem. See the *Systems Commands Reference Manual* for information on how to create a warm boot monitor and a bootable tape.

DOWNLOADING AMOS 1.4C

Once you begin this procedure, **do not press the computer's reset button** until you are instructed to do so.



If DSK0: on your computer is close to maximum capacity, you should keep in mind that AMOS 1.4C is 2300 blocks larger than the earlier 1.4A release of AMOS. Make sure you have enough disk space to download the release.

There are several different methods of downloading your AMOS 1.4C operating system and corresponding hardware support tape. You may choose to download the software from Alpha Micro's software distribution CDROM disc (AlphaCD) or based on the availability of CDROM drive, you may end up downloading the software using some form of magnetic tape media (e.g., VCR or streaming tape).

If you are downloading the software using a CDROM drive, you will use commands similar to this:

```
LOG OPR:   
COPY=ACDn: * . * [ 
```

where "n" is the CDROM logical device containing AMOS 1.4C.



In order to use a CDROM drive, the files ACD.LIT and ACD.DVR must be installed on your hard disk drive. The instruction booklet inserted inside the CDROM jewel case contains information on how to connect the CDROM drive to your computer, as well as information on how to use the ACD program.

If you are downloading from VCR tape, you will use a command like this:

```
LOG OPR:   
VCRRES *.* [ ]=ALL: *.* [ ] 
```

If you are downloading from a streaming tape drive (i.e., AM-62x, AM-640, or AM-645), you'll use a command similar to this:

```
LOG OPR:   
MTURES *.* [ ]=ALL: *.* [ ] 
```

Allow all the files to copy onto your hard disk drive. Once the copy is complete, use this command to verify all the files transferred correctly:

```
VERIFY AMOS.DIR 
```

This program will compare all the files transferred to the hard disk drive with the master list in the AMOS.DIR file. If any files transferred incorrectly, they will be displayed as mismatched files by the VERIFY program.

Downloading the Hardware Support Tape

Along with your AMOS 1.4C operating system, you will also receive a new version of the hardware support release. The hardware support software comes with its own set of release notes and includes instructions on how to download the software.

To verify all hardware support files transferred correctly, enter the following command:

```
VERIFY HW.DIR 
```

Just as with the main release, VERIFY will make a file by file comparison between the files listed in HW.DIR and the files copied to the hard disk drive.

Making a Bootable 1.4C Test Monitor

To create a bootable AMOS 1.4C monitor, you will use the MONGEN program to embed the appropriate driver into the monitor. The hardware support tape you just downloaded includes the generic drivers for the intelligent controllers: 515DVR.DVR, 515SCZ.DVR, 522DVR.DVR, and 520DVR.DVR.

AMOS[®]1.4C includes three generic SCSI drivers; SCZDVR.DVR is the generic driver used for SCSI disk drives connected to the SASI port on AMOS computers with 68030 or earlier processors; SCZ190.DVR is the generic driver used for SCSI disk drives connected to the AM-190's high performance SCSI-2 port; SCZ100.DVR is the generic driver used for SCSI disk drives connected to the AM-405 board in S-100 computers.

The basic process used to create and test your bootable monitor is shown below:

```
LOG SYS: 
```

```
MONGEN 
```

```
Input monitor name: AMS64.MON 
```

```
New disk driver: SCZDVR.DVR 
```

```
New language definition table name: ENGLISH 
```

```
New monitor name: TEST.MON 
```

```
SAVE TEST.MON 
```



The MONGEN example uses the driver, SCZDVR.DVR and a 64 user break monitor, AMS64. You must enter the driver and monitor name appropriate for your configuration.

Updating Drivers for Magnetic Tape Peripherals

When upgrading your computer's software, you want to make sure all your peripheral devices are running from the latest device drivers. Since both the hardware support tape and AMOS 1.4C have been downloaded, all the new drivers are now located in your DVR: account.

To create updated drivers for your magnetic tape devices, use the following procedure:

1. If you are using a DAT drive, you must log into the DVR: account and type:

```
COPY DAT.DVR=647DVR.DVR 
```

2. If you are using an AM-625, AM-626, or AM-627 Tandberg tape drive, you must log into the DVR: account and type:

```
COPY STR.DVR=625DVR.DVR 
```

3. If you are using an AM-640 1/2" magnetic tape drive, you must log into the DVR: account and type:

Updating Drivers for Disk Devices

Earlier in this procedure, MONGEN was used to embed a new driver (applicable to your configuration) into a monitor called TEST.MON. Just as the monitor was updated with the latest driver, drivers for other non-DSK: devices must also be updated:

1. Log into DSK0:[1,6] and create new device drivers for your disk drives:
2. To create a new driver for your floppy drive, use FIXFLP if the computer uses an AM-212 or AM-214 floppy controller. Use FIX210 for all other configurations.
3. Use the FIX420 program to generate new drivers for all conventional Winchester disk drives.
4. Use the FIXLOG program to generate new drivers for all self-configuring disk **subsystems**. This would include all SCSI, ESDI, and SMD type disk drives.

There are a number of generic driver files used in conjunction with FIXLOG to create unique subsystem device drivers:

- a. **SCZDVR.DVR**—This generic driver is used for SCSI hard disk drives connected to the SASI port on all CPU boards, with the exception of S-100 bus, AM-4000, and Roadrunner computers.
- b. **SCZ100.DVR**—This driver is used for SCSI disk drives attached to the AM-405 adapter board in S-100 bus AMOS computers.
- c. **SCZ190.DVR**—This driver is used for SCSI disk drives attached to the high-performance SCSI-2 port on the AM-4000's AM-190 CPU board.
- d. **515DVR.DVR**—This driver is used for ST-506 type drives connected to the AM-515 intelligent controller in VME-based computers.
- e. **515SCZ.DVR**—This driver is used for SCSI disk drives connected to the AM-515 intelligent controller in VME-based computers.
- f. **520DVR.DVR**—This driver is used in conjunction with FIXLOG for all ESDI and SMD drives connected to the AM-520 intelligent controller in VME-based computers.
- g. **522DVR.DVR**—This driver is used in conjunction with FIXLOG for all ESDI drives used in either AM-2000M or AM-3000M computers.

Verifying TEST.MON

Before we copy TEST.MON to either AMOSL.MON or AMOS32.MON, you will need to first verify the computer boots properly from the test monitor. To verify TEST.MON, enter the following commands:

```
LOG OPR:   
MONTST TEST, AMOS32.INI   
or  
MONTST TEST, AMOSL.INI 
```

Watch your display screen and make sure the computer boots without error. After the computer has completed booting, enter the SYSTAT command and check the status of all logical devices on the boot device, as well as the logicals on your subsystem disk devices (if applicable).

Once you are sure TEST.MON is working properly for your configuration, enter the following commands:

```
LOG SYS:   
COPY AMOS32.MON=TEST.MON   
or  
COPY AMOSL.MON=TEST.MON 
```

BOOTING FROM AMOS 1.4C

Press the reset button and observe your display screen, watching carefully for any errors during the boot-up process. Once the computer has booted, make sure everything is up and running—e.g., subsystem disk and tape devices, printer(s), network software, task manager, etc.

As a final step, we strongly recommend you create another bootable tape based on your upgraded (AMOS 1.4C) operating system.

APPENDIX A

AMOS 1.4C NEW FEATURES FOR THE AM-4000

NEW FEATURES INCLUDED IN AMOS 1.4C (AM-4000 COMPUTERS)

This section describes new features added to AMOS 1.4C to support Alpha Micro's new high performance AM-4000 computer.



For information on third party software compatibility, see the AM-4000 SIG (Special Interest Group) located on Alpha Micro's online AMTEC+. The AM-4000 SIG is also a valuable source of other AM-4000 related information.

SCSI Dispatcher

A number of new files have been added to AMOS 1.4C, designed to support the AM-4000's SCSI dispatcher. These files include: SCZDSP.LIT, SCZDSP.OVR, SCZPIC.LIT, SCZ190.SYS, and SIM190.SYS.

AMOS uses the SCSI dispatcher to communicate with the AM-4000's high performance SCSI controller chip. All communications with the SCSI controller chip are handled by the dispatcher. The dispatcher works in conjunction with the generic SCSI driver, SCZ190.DVR, discussed in the next section.

There are two versions of the SCSI dispatcher. SCZ190.SYS is a high performance SSD protected version of the SCSI dispatcher, which supports command queueing, synchronous transfers, multi-threaded operations, and scatter-gather operations. SIM190.SYS is a simplified version of the SCSI dispatcher, which is not SSD protected and does not support the high performance features supported in SCZ190.SYS. SIM190.SYS is used when making warm boot tapes and for temporary situations with computers which do not have an SSD chip. While both of these dispatchers support SCSI-2 devices, there is a tremendous performance increase using the SCZ190.SYS dispatcher.



Currently, the SCSI dispatcher is a feature exclusive to AM-4000 and Roadrunner computers. For information on the use and installation of the SCSI dispatcher, see the *AM-190 AM-4000 Series CPU Board Installation Instructions*.

AM-190 Generic SCSI Driver

The AM-190's generic SCSI driver, SCZ190.DVR, is designed to work in conjunction with the SCSI dispatcher described in the previous section.

AMOS 1.4C includes a generic SCSI driver designed to support the high performance SCSI port on the AM-4000's AM-190 CPU board. The new driver is called SCZ190.DVR. If your AM-190 computer will be booting from a SCSI drive, SCZ190.DVR can be used directly to create a bootable monitor using the MONGEN program. SCZ190.DVR can also be used with FIXLOG to create a SCSI subsystem driver.

The AM-190's SCSI disk driver, SCZ190.DVR, is able to perform read-ahead directly into AMOS disk cache. When any program attempts to read a physical block from a disk, the SCZ190 driver will also read up to an additional seven sequential blocks from the disk drive and store these read-ahead blocks in the cache.

This read-ahead scheme works very well when jobs on the system are doing a large number of sequential reads. For example, data base searches and programs like REDALL execute much faster because the data they require is already in memory and only has to be transferred from the cache into the user partition.

If you wish to disable or change the number of read-ahead blocks, simply use the FIXLOG program to generate a new disk driver. The version of FIXLOG included with AMOS 1.4C has a new prompt allowing you to enter the number of read-ahead blocks from 0 to 7. **The generic SCZ190 driver is configured with seven read-ahead blocks.**



For more information on SCZ190.DVR and read-ahead capabilities, see the *AM-190 AM-4000 Series CPU Board Installation Instructions*.

AM-190 Serial Port Driver

The AM-190, which is the heart and soul of Alpha Micro's AM-4000 computer, has two on-board serial ports. A program to support these ports called AM190.IDV is included with AMOS 1.4C. Besides the two on-board serial ports, AM190.IDV is also used for any AM-355 serial ports connected to the AM-4000's J7 60-pin connector. AM-358 and other I/O boards connected to either the J7 or J8 60-pin connector use their own specific drivers.

For more information about AM190.IDV, see the *AM-190 AM-4000 Series CPU Board Installation Instructions*.

AM-627 Firmware Update Software

AMOS 1.4C contains two files designed to update the firmware on AM-627 1GB streaming tape drives. Because the AM-627 uses flash ROM technology for its firmware, the firmware can be updated without having to remove the drive from the computer. The program that updates the firmware is called FWUPD.LIT. The update files themselves are called TSCZ1.LIT and TSCZ2.LIT.

Why would you want to update the AM-627 firmware? If the AM-627 drive is connected to an AM-190 CPU board, the firmware can be updated to take advantage of the tremendous performance gains yielded by SCSI-2 devices.

To update the AM-627 firmware for SCSI-2 operation, wait until the AM-190 AMOS based computer has booted and enter the following commands at the AMOS prompt:

```
LOG OPR:   
FWUPD DVR:TSCZ2 
```

The program will prompt you for the name of the device, enter:

```
STRO: 
```

The firmware on the tape drive will automatically be updated for SCSI-2 operation; it takes about one minute and the AMOS prompt will re-appear. In order for the firmware update to take affect, you must power the computer down and then turn the power on again. With the computer up and running, your AM-627 tape drive will now be SCSI-2 compatible.



Once the firmware has been updated, the drive is only compatible with the AM-190 board. If the drive is ever used in a configuration with an earlier style CPU board, the firmware must be converted back. To convert back to SCSI-1, follow the same procedure outlined above, but enter the command:

```
FWUPD DVR:TSCZ1 
```



In order to warm boot from a Tandberg tape drive, it must be set to a higher numerical SCSI ID (1 through 6) than any other tape device connected to the bus.

New AM-645 8mm Tape Drive Support

AMOS 1.4C includes a new driver file for the AM-645 Exabyte 8mm tape drive. The new driver, called 645DVR.DVR, is designed specifically for use with the AM-190 board and is not functional with other earlier model CPU boards. In addition, while the old driver required SSD encodement, the new driver does not.



In order to use the new driver, the AM-645 tape drive must be updated with the PDB-00645-90 firmware installation kit. Without the firmware upgrade, the AM-645 can't be used with the AM-190 board. The new firmware will not work with the older SSD encoded driver.

CHANGES TO EXISTING SOFTWARE

This section includes information about files that appeared on the AMOS 1.4A release, but have been updated for AMOS 1.4C and have some functional or operational differences that need to be highlighted.

A New Prompt for FIXLOG

AMOS 1.4C includes a version of FIXLOG with a new prompt allowing you to configure the number of read-ahead blocks used by the generic driver controlling the AM-190's high performance SCSI port. The driver is called SCZ190.DVR and it is factory configured with seven read-ahead blocks. The new prompt in FIXLOG allows you to create a new driver with less than seven read-ahead blocks. A FIXLOG example with the new read-ahead prompt is shown below:



Currently, only SCZ190.DVR and SCZRR.DVR support read-ahead, for all other drivers, FIXLOG will not prompt you for the number of read-ahead blocks.

```
FIXLOG 
```

```
FIXLOG.LIT Version x.x(xxx)
```

1. Change the number of logicals
2. Create a sub-system driver

```
Enter choice: 2 
```

```
Enter name of generic driver to be used: SCZ190 
```

```
Enter number of logical units per physical unit: 10 
```

```
Enter SCSI id (0-6): 0 
```

```
Enter number of read-ahead blocks (0-7): 5 
```

```
Enter new driver name: MAX 
```

```
New driver is now in memory.
```

To save the driver you have created, type:

```
SAVE MAX.DVR 
```



If the disk driver is for the DSK: device, don't forget to use MONGEN and embed the new driver into the system monitor.

In most cases, the seven block read-ahead scheme will yield maximum performance for a given task. However, during programs where significant random disk access occurs (such as RNDRED), read-ahead may cause a slight decrease in performance. This is due to the "thrashing" of the cache, where cache entries that would have been used again are removed from the cache due to the allocation requirements of the read-ahead blocks (which typically are never used). Since every system is different, you may want to experiment with the number of read-ahead blocks to determine the optimal read-ahead value for your particular application.



See the *AM-190 AM-4000 Series CPU Board Installation Instructions* for additional information on the SCZ190.DVR read-ahead capabilities.

A New Prompt for WRMGEN

The version of WRMGEN included on AMOS 1.4C has a new prompt asking you to enter the name of the SCSI dispatcher. The SCSI dispatcher is currently only used on 68040 based AMOS computers. There are two versions of the SCSI dispatcher; the high performance version (SCZDSP.SYS), which is SSD protected and requires a command line in your system initialization command file; and the simplified version (SIM190.SYS) designed to be used with WRMGEN.

The new WRMGEN prompt looks like this:

```
SCSI dispatcher (RETURN if none):
```

If your 68040 based AMOS computer is booting from a SCSI drive, you would respond to the prompt as follows:

```
SCSI dispatcher (RETURN if none): SIM190 RETURN
```

If you are not booting from a SCSI drive or you are running a 68030 or earlier processor, do not enter a dispatcher name, simply press RETURN, as indicated by the prompt.

Front Panel Display Support

If your system contains a new style front panel with the three LED bar graph displays, like that used on the AM-990 universal cabinet, it can now be used to display write buffer usage for up to three different device drivers. To enable this feature, add the following line to your system initialization command file:

```
SYSTEM SCZWCD.SYS/N {dev} {dev} {dev}
```

Replace {dev} with the device names you wish to display write buffer usage for. You may specify from one to three different device names. For example, the following system statement would display write buffer usage for all DSK devices on the top bar, SUB devices on the middle bar, and leave the third bar unused:

```
SYSTEM SCZWCD.SYS/N DSK SUB
```

The bar graphs approximate the percentage of write buffers in use for the respective device driver. If any buffers are in use at least one segment of the bar will be lit. Graphs are updated four times a second. This program is only compatible with disk devices operating with the full-function SCSI dispatcher, SCZ190.SYS.

Write Buffer Screen Display

The SCZCSH program provides a terminal based bar display of write buffer usage and effectiveness. The display is continuous and may be stopped by entering a CTRLC. The format of this command is:

```
SCZCSH {dev}
```

Replace {dev} with the device name you wish to display usage for. For example, the following line would display usage for all DSK devices:

```
SCZCSH DSK
```

The top bar of the screen display generated by SCZCSH represents an approximate percentage of write cells in use. This bar should move around constantly while writes are occurring, usually hovering around 50 percent.

The next bar represents an approximate percentage of writes which were placed in a cell, but were overwritten by another write before actually being sent to the disk. This is the same as disk writes occurring over previous writes, however the seek and write overhead of previous writes was avoided.

The final bars represent a breakdown of sequentially written blocks per physical disk write. When physical writes are performed, the driver attempts to perform them as multisector operations whenever possible. Up to eight sequential blocks may be written per disk access, resulting in better overall performance.

AM-4000 PROGRAMMING INFORMATION

The MC68040 processor used in the AM-4000 contains more internal instruction cache (4096 bytes) than earlier MC68030-based processors. Increased internal cache is one of the features which contributes to the improved performance of the AM-4000; however, if your software does not properly manage this instruction cache, it could be adversely affected.

When the instruction cache is enabled—as it would be during normal system operation—any memory location which is executed by the processor is loaded into the instruction cache. This improves performance for those cases where the same location is executed again, since the instruction will be read from cache instead of slower main memory.

The Problem and Why It's A Problem

The problem arises when that same memory location, which has now been loaded into cache, is modified. Because data operations—such as the MOV instruction—do not update the instruction cache, when your program next executes the memory location, it may read the old contents, which are still in the instruction cache, rather than pulling the instruction from main memory where it was updated. This is known as self-modifying code.

In this context, self modifying code is any code which is written to memory as data, such as when read from disk to memory, and then executed as instructions. AMOS handles the most common cases, such as reading data from disk or during the FETCH monitor call, but cannot handle cases in your software where you are handling program overlays or building instructions on the fly. Such code is often present in "trick" code like that used to perform SSD-based software protection, although it may be present anywhere.

This issue was present on 68030 based systems, but the limited cache size on that processor made it a much smaller problem. Tricks to flush the cache that worked on the 68030, such as forcing a context switch, will probably not work reliably on the 68040.

What You Must Do...

The only sure way to address this issue is to flush the instruction cache after loading instructions into memory, but before executing those instructions. Because the method by which you flush the cache is different on the various 680x0 processors, you will need to add code specific to the 68040.

You must be certain to handle the different processors individually. Failure to do so may result in inadvertently disabling certain processor features. For example, trying to flush the 68040 cache using the 68030 method will result in the 68040's instruction cache being disabled. This will seriously degrade system performance.

To test to see if a program is executing on a 68040, use the following code fragment:

```
MOV      SYSTEM,D7          ; get the system flags
AND      #SY$M40,D7        ; is the 040 bit set?
BNE      yes we're on a 040! ; yes - take the branch
```

To simply flush the cache, use the following code fragment:

```
SUPVR          ; enter supervisor mode
CINVA          ; invalidate cache
LSTS          #0 ; return to user mode
```

To turn off the instruction cache, as is needed in some cases, use the following code:

```
SUPVR          ; enter supervisor mode
SVLOK          ; ensure interrupts are off
CLR           D7 ; clear the CACR
```

```

MOVEC      D7,CACR      ; flags
LSTS       #0           ; return to user mode and enable
                          ; interrupts again

```

To turn the instruction cache back on, use the following:

```

SUPVR      ; enter supervisor mode
SVLOK      ; turn off interrupts
CINVA      ; invalidate cache
MOV        #^H08000,D7 ; set the ICACHE
MOVEC      D7,CACR      ; enable bit
LSTS       #0           ; return to user mode and enable
                          ; interrupts again

```



Remember to turn the instruction cache back on! If you don't, system performance will be seriously impaired.

In versions of M68 appearing in earlier AMOS releases, the instructions MOVEC#D7,CACR and CINVA were not implemented. With the release of AMOS 1.4C, which includes M68#2.0(181), these instructions are now supported. Examples of their use are shown above.

One More Caution

The 68040 also has internal registers called Transparent Translation Registers (also present on the 68030) that you must be sure not to modify. This is far less common than instruction cache issues, but will cause system failure if modified.

New Cache Control Program

Some existing third party software packages making use of self modifying code, which worked fine with the 68030, will no longer work with the 68040 based AM-4000. This is due to the 68040's large (4096 byte) instruction cache.

The ideal way to handle this problem is to have the software developer either not use self modifying code, or to properly disable and enable the instruction cache as required. However, you may find yourself in a position where a third party software developer is no longer available, or is unwilling to make the necessary changes in a timely fashion.

As a solution to this problem, AMOS 2.2C and 1.4C include a new program called COMPAT.LIT. This program works in conjunction with an ASCII file, which you create using AlphaVUE, called COMPAT.DAT. Within COMPAT.DAT, you list programs that can only be run with the 68040's instruction cache disabled.

For example, the COMPAT.DAT file shown below would disable caching for the three programs listed:

```
SCHDLP
INIJOB
;This is a comment
FAXUIT
```

Since there are no Alpha Micro programs that require the instruction cache to be disabled, the program names used in the example are fictitious.



By using COMPAT, you can disable the instruction cache for selected programs, while allowing other users on the system to run non-selected programs with the instruction cache enabled.

Once you have created your COMPAT.DAT file, you can run the COMPAT program one of two ways:

From the AMOS prompt, you can type:

```
COMPAT COMPAT.DAT RETURN
```

or you can add this same command into your system initialization command file.

If you simply enter the command:

```
COMPAT RETURN
```

you will get a display showing the list of programs that have been selected for the special cache control. Also, you will get some statistical information in the form of the total number of CPU context switches which are non-cached, and the percentage of the non-cached context switches that each of the selected programs caused. A display like the one shown below, which has a very high percentage of non-cached CPU context switches, would indicate that system performance is hindered, because very little use of the instruction cache is taking place.

The following programs run with internal cache disabled:

```
STIC      (active in 88.7% of total context switches, 99.6% of non-cached)
FAXUIT    (active in 0.2% of total context switches, 0.3% of non-cached)
```

A total of 89.0% of context switches were non-cached



If you are having problems getting a certain software package to run on your AM-4000, try adding the program to the list of programs in the COMPAT.DAT file. You may find the program will run with the instruction cache disabled.

Making a Bootable 1.4C Test Monitor

To create a bootable AMOS 1.4C monitor, you will use the MONGEN program to embed the appropriate driver into the monitor. The hardware support tape you just downloaded includes the generic drivers for the intelligent controllers: 515DVR.DVR, 515SCZ.DVR, 522DVR.DVR, and 520DVR.DVR.

AMOS[®]1.4C includes three generic SCSI drivers; SCZDVR.DVR is the generic driver used for SCSI disk drives connected to the SASI port on AMOS computers with 68030 or earlier processors; SCZ190.DVR is the generic driver used for SCSI disk drives connected to the AM-190's high performance SCSI-2 port; SCZ100.DVR is the generic driver used for SCSI disk drives connected to the AM-405 board in S-100 computers.

The basic process used to create and test your bootable monitor is shown below:

```
LOG SYS: 
```

```
MONGEN 
```

```
Input monitor name: AMS64.MON 
```

```
New disk driver: SCZ190.DVR 
```

```
New language definition table name: ENGLISH 
```

```
New monitor name: TEST.MON 
```

```
SAVE TEST.MON 
```



The MONGEN example uses the AM-190 SCSI driver, SCZ190.DVR and a 64 user break monitor, AMS64. You must enter the driver and monitor name appropriate for your configuration.

Updating Drivers for Magnetic Tape Peripherals

When upgrading your computer's software, you want to make sure all your peripheral devices are running from the latest device drivers. Since both the hardware support tape and AMOS 1.4C have been downloaded, all the new drivers are now located in your DVR: account.

To create updated drivers for your magnetic tape devices, use the following procedure:

1. If you are using a DAT drive, you must log into the DVR: account and type:

```
COPY DAT.DVR=647DVR.DVR 
```

2. If you are using an AM-625, AM-626, or AM-627 Tandberg tape drive, you must log into the DVR: account and type:

```
COPY STR.DVR=625DVR.DVR 
```

3. If you are using an AM-640 1/2" magnetic tape drive, you must log into the DVR: account and type:

```
COPY MTU.DVR=640DVR.DVR RETURN
```

4. If you are using an AM-645 Exabyte tape drive, you must log into the DVR: account and type:



The following command should only be performed if the AM-645 is located in an AM-4000 computer, and only if the drive has been updated with the PDB-00645-90 firmware kit. If you are not using an AM-4000 computer, you will not need to update the existing AM-645 driver.

```
COPY MTX.DVR=645DVR.DVR RETURN
```



Unlike earlier AM-645 drivers, 645DVR.DVR is not SSD protected.

Updating Drivers for Disk Devices

Earlier in this procedure, MONGEN was used to embed a new driver (applicable to your configuration) into a monitor called TEST.MON. Just as the monitor was updated with the latest driver, drivers for other non-DSK: devices must also be updated:

1. Log into DSK0:[1,6] and create new device drivers for your disk drives:
2. To create a new driver for your floppy drive, use FIXFLP if the computer uses an AM-212 or AM-214 floppy controller. Use FIX210 for all other configurations.
3. Use the FIX420 program to generate new drivers for all conventional Winchester disk drives.
4. Use the FIXLOG program to generate new drivers for all self-configuring disk **subsystems**. This would include all SCSI, ESDI, and SMD type disk drives.

There are a number of generic driver files used in conjunction with FIXLOG to create unique subsystem device drivers:

- a. **SCZDVR.DVR**—This generic driver is used for SCSI hard disk drives connected to the SASI port on all CPU boards, with the exception of S-100 bus, AM-4000, and Roadrunner computers.
- b. **SCZ100.DVR**—This driver is used for SCSI disk drives attached to the AM-405 adapter board in S-100 bus AMOS computers.

- c. **SCZ190.DVR**—This driver is used for SCSI disk drives attached to the high-performance SCSI-2 port on the AM-4000's AM-190 CPU board.
- d. **515DVR.DVR**—This driver is used for ST-506 type drives connected to the AM-515 intelligent controller in VME-based computers.
- e. **515SCZ.DVR**—This driver is used for SCSI disk drives connected to the AM-515 intelligent controller in VME-based computers.
- f. **520DVR.DVR**—This driver is used in conjunction with FIXLOG for all ESDI and SMD drives connected to the AM-520 intelligent controller in VME-based computers.
- g. **522DVR.DVR**—This driver is used in conjunction with FIXLOG for all ESDI drives used in either AM-2000M or AM-3000M computers.

Verifying TEST.MON

Before we copy TEST.MON to either AMOSL.MON or AMOS32.MON, you will need to first verify the computer boots properly from the test monitor. To verify TEST.MON, enter the following commands:

```
LOG OPR:   
MONTST TEST, AMOS32.INI   
or  
MONTST TEST, AMOSL.INI 
```

Watch your display screen and make sure the computer boots without error. After the computer has completed booting, enter the SYSTAT command and check the status of all logical devices on the boot device, as well as the logicals on your subsystem disk devices (if applicable).

Once you are sure TEST.MON is working properly for your configuration, enter the following commands:

```
LOG SYS:   
COPY AMOS32.MON=TEST.MON   
or  
COPY AMOSL.MON=TEST.MON 
```

BOOTING FROM AMOS 1.4C

Press the reset button and observe your display screen, watching carefully for any errors during the boot-up process. Once the computer has booted, make sure everything is up and running—e.g., subsystem disk and tape devices, printer(s), network software, task manager, etc.

As a final step, we strongly recommend you create another bootable tape based on your upgraded (AMOS 1.4C) operating system.

APPENDIX B

AMOS 1.4C NEW FEATURES FOR THE ROADRUNNER

NEW FEATURES INCLUDED IN AMOS 1.4C (ROADRUNNER)

This section describes new features added to AMOS 1.4C to support Alpha Micro's new high performance Roadrunner hardware.



For information on third party software compatibility, see the Roadrunner SIG (Special Interest Group) located on Alpha Micro's online AMTEC+. The Roadrunner SIG is also a valuable source of other Roadrunner related information.

SCSI Dispatcher



The SCSI dispatcher is only used when connecting a SCSI disk drive (or drives) to the AM-172 board's SCSI port; the SCSI dispatcher is not applicable in configurations where the SCSI disk drive (or drives) will be connected to the computer's existing SASI port. Also, not all SCSI disk drives are supported for use on the AM-172 board's SCSI port. See the *Roadrunner Upgrade Installation Instructions* for additional information on Roadrunner SCSI drive support.

A number of new files have been added to AMOS 1.4C, designed to support the Roadrunner's SCSI dispatcher. These files include: SCZDSP.LIT, SCZDSP.OVR, SCZPIC.LIT, SCZRR.SYS, and SIMRR.SYS.

AMOS uses the SCSI dispatcher to communicate with the Roadrunner's high performance SCSI controller chip. All communications with the SCSI controller chip are handled by the dispatcher. The dispatcher works in conjunction with the generic SCSI disk driver, SCZRR.DVR, discussed in the next section.

There are two versions of the SCSI dispatcher. SCZRR.SYS is a high performance SSD protected version of the SCSI dispatcher, which supports command queueing, synchronous transfers, multi-threaded operations, and scatter-gather operations. SIMRR.SYS is a simplified version of the SCSI dispatcher, which is not SSD protected and does not support the high performance features supported in SCZRR.SYS. SIMRR.SYS is used when making warm boot tapes and for temporary situations with

computers which do not have an SSD chip. While both of these dispatchers support SCSI-1 and SCSI-2 devices, there is a considerable performance increase using the SCZRR.SYS dispatcher.



For information on the use and installation of the SCSI dispatcher, see the *Roadrunner Upgrade Installation Instructions*.

Roadrunner Generic SCSI Disk Driver

AMOS 1.4C includes a generic SCSI disk driver designed to support the high performance SCSI port on the Roadrunner's AM-172 board. The new driver is called SCZRR.DVR. If your Roadrunner enhanced computer will be booting from a SCSI drive, SCZRR.DVR can be used directly to create a bootable monitor using the MONGEN program. SCZRR.DVR can also be used with FIXLOG to create a SCSI subsystem driver.



The driver SCZRR.DVR is only used for connecting a SCSI disk drive (or drives) to the AM-172 board's SCSI port; this driver is not used if you will be connecting the SCSI disk drive (or drives) to your computer's SASI port. SCSI drives connected to the SASI port use a driver called SCZDVR.DVR. Also, not all SCSI disk drives are supported for use on the AM-172 board's SCSI port. See the *Roadrunner Upgrade Installation Instructions* for additional information on Roadrunner SCSI drive support.

The Roadrunner's generic SCSI disk driver, SCZRR.DVR, is designed to work in conjunction with the SCSI dispatcher described in the previous section.

The Roadrunner's SCSI disk driver, SCZRR.DVR, is able to perform read-ahead directly into AMOS disk cache. When any program attempts to read a physical block from a disk, the SCZRR driver will also read up to an additional seven sequential blocks from the disk drive and store these read-ahead blocks in the cache.

This read-ahead scheme works very well when jobs on the system are doing a large number of sequential reads. For example, data base searches and programs like REDALL execute much faster because the data they require is already in memory and only has to be transferred from the cache into the user partition.

If you wish to disable or change the number of read-ahead blocks, simply use the FIXLOG program to generate a new disk driver. The version of FIXLOG included with AMOS 1.4C has a new prompt allowing you to enter the number of read-ahead blocks from 0 to 7. **The generic SCZRR driver is configured with seven read-ahead blocks.**



For more information on SCZRR.DVR, read-ahead, and write buffering capabilities, see the *Roadrunner Upgrade Installation Instructions*.

AM-627 Firmware Update Software

AMOS 1.4C contains two files designed to update the firmware on AM-627 1GB streaming tape drives. Because the AM-627 uses flash ROM technology for its firmware, the firmware can be updated without having to remove the drive from the computer. The program that updates the firmware is called FWUPD.LIT. The update files themselves are called TSCZ1.FW and TSCZ2.FW.

Why would you want to update the AM-627 firmware? If the AM-627 drive is connected to the Roadrunner's AM-172 board, the firmware can be updated to take advantage of the tremendous performance gains yielded by SCSI-2 devices.

To update the AM-627 firmware for SCSI-2 operation, wait until the Roadrunner AMOS based computer has booted and enter the following commands at the AMOS prompt:

```
LOG OPR:   
FWUPD DVR:TSCZ2 
```

The program will prompt you for the name of the device, enter:

```
STRO: 
```

The firmware on the tape drive will automatically be updated for SCSI-2 operation; it takes about one minute and the AMOS prompt will re-appear. In order for the firmware update to take affect, you must power the computer down and then turn the power on again. With the computer up and running, your AM-627 tape drive will now be SCSI-2 compatible.



Once the firmware has been updated, the drive is only compatible with Roadrunner hardware and AM-4000 computers. If the drive is ever used in a configuration with an earlier style CPU board, the firmware must be converted back. To convert back to SCSI-1, follow the same procedure outlined above, but enter the command:

```
FWUPD DVR:TSCZ1 
```



In order to warm boot from a Tandberg tape drive, it must be set to a higher numerical SCSI ID (1 through 6) than any other tape device connected to the bus.

New AM-645 8mm Tape Drive Support

AMOS 1.4C includes a new driver file for the AM-645 Exabyte 8mm tape drive. The new driver, called 645DVR.DVR, is designed specifically for use with Roadrunner and AM-4000 computers, it is not functional with other earlier model CPU boards. In addition, while the old driver required SSD encodement, the new driver does not.



In order to use the new driver, the AM-645 tape drive must be updated with the PDB-00645-90 firmware installation kit. Without the firmware upgrade, the AM-645 can't be used with the Roadrunner hardware. The new firmware will not work with the older SSD encoded driver.

CHANGES TO EXISTING SOFTWARE

This section includes information about files that appeared on the AMOS 1.4A release, but have been updated for AMOS 1.4C and have some functional or operational differences that need to be highlighted.

A New Prompt for FIXLOG

AMOS 1.4C includes a version of FIXLOG with a new prompt allowing you to configure the number of read-ahead blocks used by the driver communicating via Roadrunner's high performance SCSI port. The driver is called SCZRR.DVR and it is factory configured with seven read-ahead blocks. The new prompt in FIXLOG allows you to create a new driver with less than seven read-ahead blocks. A FIXLOG example with the new read-ahead prompt is shown below:



Currently, only SCZRR.DVR (and the AM-4000 equivalent driver SCZ190.DVR) supports read-ahead, for all other drivers, FIXLOG will not prompt you for the number of read-ahead blocks.

```
FIXLOG (RETURN)
```

```
FIXLOG.LIT Version x.x(xxx)
```

1. Change the number of logicals
2. Create a sub-system driver

```
Enter choice: 2 (RETURN)
```

```
Enter name of generic driver to be used: SCZRR (RETURN)
```

```
Enter number of logical units per physical unit: 10 (RETURN)
```

```
Enter SCSI id (0-6): 1 (RETURN)
```

```
Enter number of read-ahead blocks (0-7): 5 (RETURN)
```

```
Enter new driver name: MAX (RETURN)
```

```
New driver is now in memory.
```

To save the driver you have created, type:

```
SAVE MAX.DVR (RETURN)
```



If the disk driver is for the DSK: device, don't forget to use MONGEN and embed the new driver into the system monitor.

In most cases, the seven block read-ahead scheme will yield maximum performance for a given task. However, during programs where significant random disk access occurs (such as RNDRED), read-ahead may cause a slight decrease in performance. This is due to the "thrashing" of the cache, where cache entries that would have been used again are removed from the cache due to the allocation requirements of the read-ahead blocks (which typically are never used). Since every system is different, you may want to experiment with the number of read-ahead blocks to determine the optimal read-ahead value for your particular application.



See the *Roadrunner Upgrade Installation Instructions* for additional information on the SCZRR.DVR read-ahead capabilities.

A New Prompt for WRMGEN

The version of WRMGEN included on AMOS 1.4C has a new prompt asking you to enter the name of the SCSI dispatcher. The SCSI dispatcher is currently only used on Roadrunner and AM-4000 computers. There are two versions of the Roadrunner SCSI dispatcher; the high performance version (SCZRR.SYS), which is SSD protected and requires a command line in your system initialization command file; and the simplified version (SIMRR.SYS) designed to be used with WRMGEN.

The new WRMGEN prompt looks like this:

```
SCSI dispatcher (RETURN if none):
```

If your Roadrunner based AMOS computer is booting from a SCSI drive attached to the AM-172 board's SCSI port, you would respond to the prompt as follows:

```
SCSI dispatcher (RETURN if none): SIMRR 
```

If you are booting from a drive attached to your computer's SASI port, do not enter a dispatcher name, simply press , as indicated by the prompt.

Write Buffer Screen Display

The SCZCSH program provides a terminal based bar display of write buffer usage and effectiveness. The display is continuous and may be stopped by entering a / . The format of this command is:

```
SCZCSH {dev}
```

Replace {dev} with the device name you wish to display usage for. For example, the following line would display usage for all DSK devices:

```
SCZCSH DSK
```

The top bar of the screen display generated by SCZCSH represents an approximate percentage of write cells in use. This bar should move around constantly while writes are occurring, usually hovering around 50 percent.

The next bar represents an approximate percentage of writes which were placed in a cell, but were overwritten by another write before actually being sent to the disk. This is the same as disk writes occurring over previous writes, however the seek and write overhead of previous writes was avoided.

The final bars represent a breakdown of sequentially written blocks per physical disk write. When physical writes are performed, the driver attempts to perform them as

multisector operations whenever possible. Up to eight sequential blocks may be written per disk access, resulting in better overall performance.

Making a Bootable 1.4C Test Monitor

To create a bootable AMOS 1.4C monitor, you will use the MONGEN program to embed the appropriate driver into AMOS.MON. The AMOS software includes generic driver (SCZDVR.DVR) for SCSI drives connected to the SASI port on AM-167 and AM-177 CPU boards, as well as the generic driver (SCZRR.DVR) for SCSI disk drives connected to the SCSI port on the Roadrunner's AM-172 board.

The basic process used to create and test your bootable monitor is shown below:

```
LOG SYS: 
```

```
MONGEN 
```

```
Input monitor name: AMS64.MON 
```

```
New disk driver: SCZRR.DVR 
```

```
New language definition table name: ENGLISH 
```

```
New monitor name: TEST.MON 
```

```
SAVE TEST.MON 
```



The MONGEN example uses the Roadrunner SCSI driver, SCZRR.DVR and a 64 user break monitor, AMS64. You must enter the driver and monitor name appropriate for your configuration.

Updating Drivers for Magnetic Tape Peripherals

When upgrading your computer's software, you want to make sure all your peripheral devices are running from the latest device drivers. Since both the hardware support tape and AMOS 1.4C have been downloaded, all the new drivers are now located in your DVR: account.

To create updated drivers for your magnetic tape devices, use the following procedure:

1. If you are using a DAT drive, you must log into the DVR: account and type:

```
COPY DAT.DVR=647DVR.DVR 
```

2. If you are using an AM-625, AM-626, or AM-627 Tandberg tape drive, you must log into the DVR: account and type:

```
COPY STR.DVR=625DVR.DVR 
```

3. If you are using an AM-645 Exabyte tape drive, you must log into the DVR: account and type:

```
COPY MTX.DVR=645DVR.DVR RETURN
```



The above command should only be performed if the AM-645 connected to the Roadrunner's AM-172 board, and only if the drive has been updated with the PDB-00645-90 firmware kit. If the AM-645 is connected to the SASI port, you will not need to update the existing AM-645 driver.



Unlike earlier AM-645 drivers, 645DVR.DVR is not SSD protected.

Updating Drivers for Disk Devices

Earlier in this procedure, MONGEN was used to embed a new driver (applicable to your configuration) into a monitor called TEST.MON. Just as the monitor was updated with the latest driver, drivers for other non-DSK: devices must also be updated:

1. Log into DSK0:[1,6] and create new device drivers for your disk drives:
2. To create a new driver for your floppy drive, use the program FIX210.
3. Use the FIXLOG program to generate new drivers for all self-configuring disk **subsystems**. This includes a SCSI drive attached to the SASI port, as well as a SCSI drive attached to the AM-172 board's SCSI port.

There two different SCSI generic driver files used in conjunction with FIXLOG to create unique subsystem device drivers:

- a. **SCZDVR.DVR**—This generic driver is used for SCSI hard disk drives connected to the SASI port on AM-167 and AM-177 boards.
- b. **SCZRR.DVR**—This driver is used for SCSI disk drives attached to the high-performance SCSI port on the Roadrunner's AM-172 board.

Verifying TEST.MON

Before you copy TEST.MON to AMOSL.MON, you will need to first verify the computer boots properly from the test monitor. To verify TEST.MON, enter the following commands:

```
LOG OPR:   
MONTST TEST, AMOSL.INI 
```

Watch your display screen and make sure the computer boots without error. After the computer has completed booting, enter the SYSTAT command and check the status of all logical devices on the boot device, as well as the logicals on your subsystem disk devices (if applicable).

Once you are sure TEST.MON is working properly for your configuration, enter the following commands:

```
LOG SYS:   
COPY AMOSL.MON=TEST.MON 
```

BOOTING FROM AMOS 1.4C

Press the reset button and observe your display screen, watching carefully for any errors during the boot-up process. Once the computer has booted, make sure everything is up and running—e.g., subsystem disk and tape devices, printer(s), network software, task manager, etc.

As a final step, we strongly recommend you create another bootable tape based on your upgraded (AMOS 1.4C) operating system.