

**DAP 500**

**Installation Manual**

**for**

**Sun Systems**

(man011.02)

1 March 1988



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# Preface

This manual describes how to install DAP 500 hardware and software.

Chapters 1 to 5 describe how you should unpack and install your DAP.

Chapter 6 describes the normal use of the DAP.

Chapters 7 and 8 give brief details of three short example programs, and of the test software, all provided with the basic software delivered with your DAP.

Chapter 9 gives a description of the DAP control panel and its various controls, and how to use them.

Chapter 10 describes what you have to do if you want to re-configure your SUN-DAP system.



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# Chapter 1

## Unpacking the DAP 500

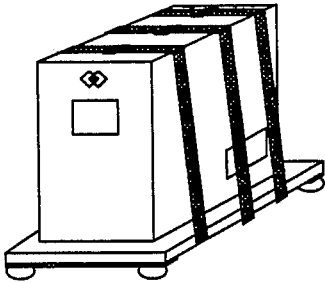


Figure 1.1: DAP 500, ready to be unpacked

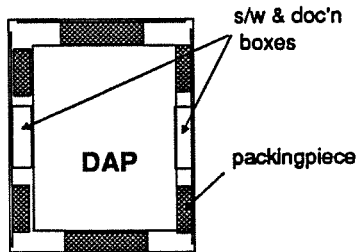


Figure 1.2: View into partially opened packing case

### Important

When your DAP 500 arrives, it should look like the picture opposite. Inspect the package for obvious damage. 'Shockwatch' rough handling indicators are fixed to two adjacent sides of the outer casing; neither indicator should show red.

If there are any signs of damage, or either indicator is showing red, do not unpack the DAP 500, but let the carrier know as soon as possible. Ideally, sign the carriers' paper-work 'Received damaged'; in any case let them know of any damage within 3 days.

Cut the 3 plastic straps that hold the outer cardboard casing to the wooden pallet, slit the tape holding down the top of the casing, and open up the top of the casing.

Inside, you'll find a cardboard tray, holding the various cables and a see-through plastic wallet containing the delivery paperwork, and the key needed to operate the front panel control switch on your DAP. Put the cables and wallet to one side, and lift out the tray. The inside of the casing should look like the picture opposite.

Sandwiched between the packing pieces and the side of the DAP, you'll see boxes containing the documentation and the system software. Lift out the boxes, and the four packing pieces, then lift the outer casing clear of the DAP.

Inspect the cables, and the boxes and their contents, and the outside of the DAP itself, for any signs of damage; if there are any, get in touch with the carriers as soon as possible. If the DAP appears to be damaged, don't proceed any further with its installation until the carriers have inspected the damage.

Lift the DAP off its pallet, and place it in a suitable operating position, ideally in its designed installation position.

If the DAP has not been stored at room temperature before you unpack it, allow at least four hours for the unit to acclimatise. If the unit has been stored at low temperatures, you may have to allow longer for any condensation to evaporate.

You are now ready to connect up your DAP and get it working for you.



# Chapter 2

## Installing the DAP 500 hardware

### 2.1 Initial setup

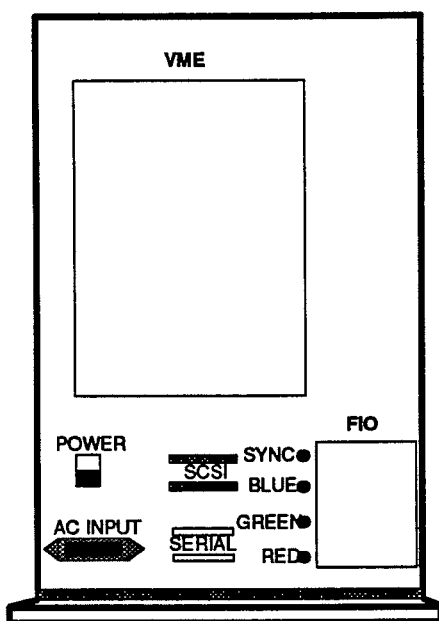


Figure 2.1: DAP 500 back panel

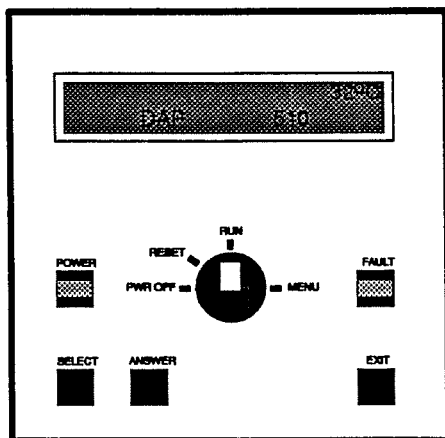


Figure 2.2: DAP 500 control panel

After unpacking the DAP, you should:

- *Remove the rear cover from the cabinet.*  
The cover is fixed with Velcro-type fasteners; it will come off with a tug; no tools are required.  
You can now see the DAP back-panel, which is shown in the diagram opposite
- *Connect the A C power cable.*  
Plug the female end of the cable into the **AC INPUT** socket mounted under the **POWER** switch on the back panel
- *Switch the DAP on from the back panel.*  
On the **POWER** switch, push in the part marked ' | ', to switch your DAP on
- *Switch the DAP on from the control panel.*

When you unpacked the DAP, in the cardboard tray carrying the cables, there was a see-through plastic wallet in which there was a key. Insert the key into the switch on the DAP's control panel and turn the switch to **RUN**. (See figure 2.2 below)

The DAP will go through its internal power-on hardware self-tests, which take less than a minute to complete. If all is well, several messages will appear on the control panel display one after the other, ending with:

```

HCU SELFTEST COMPL
DAP SELF TESTS
TESTS IN PROGRESS
DAP SELF TESTS
PASSED
  
```

This final **PASSED** message shows that all tests were successfully completed

- *Turn the control panel key-switch to **PWR OFF**, and connect the DAP into your Sun system*

Two connection options are available:

- ★ Connecting to a Sun 3/50 workstation
- ★ Connecting to a Sun 3/160 server

Both connection options allow you to configure your Sun system to enable the DAP to be accessed from any workstation on the network; your choice of option will depend on your local conditions.

The following sections describe the two types of connection.

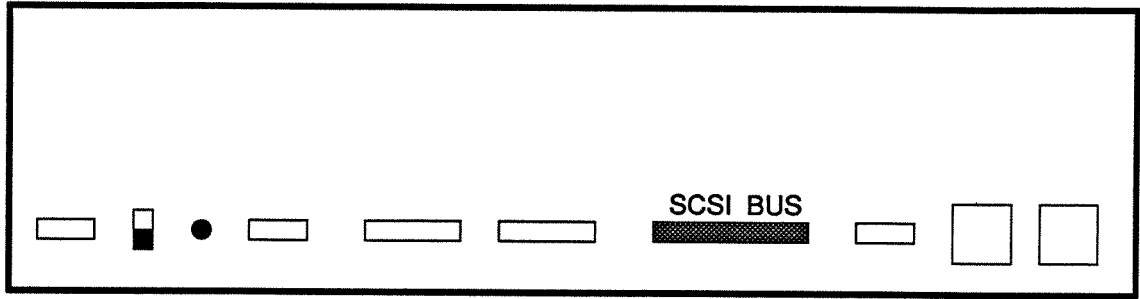


Figure 2.3: Rear view of a Sun 3/50 workstation

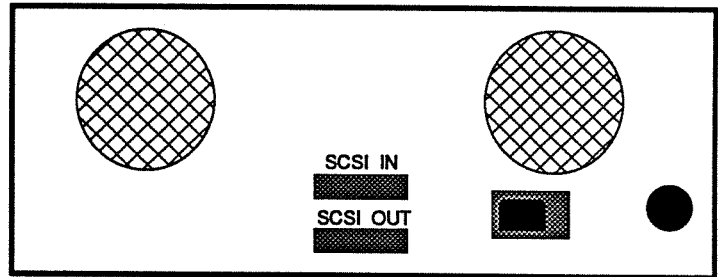


Figure 2.4: Rear view of a Sun SCSI 'shoe box' disk drive

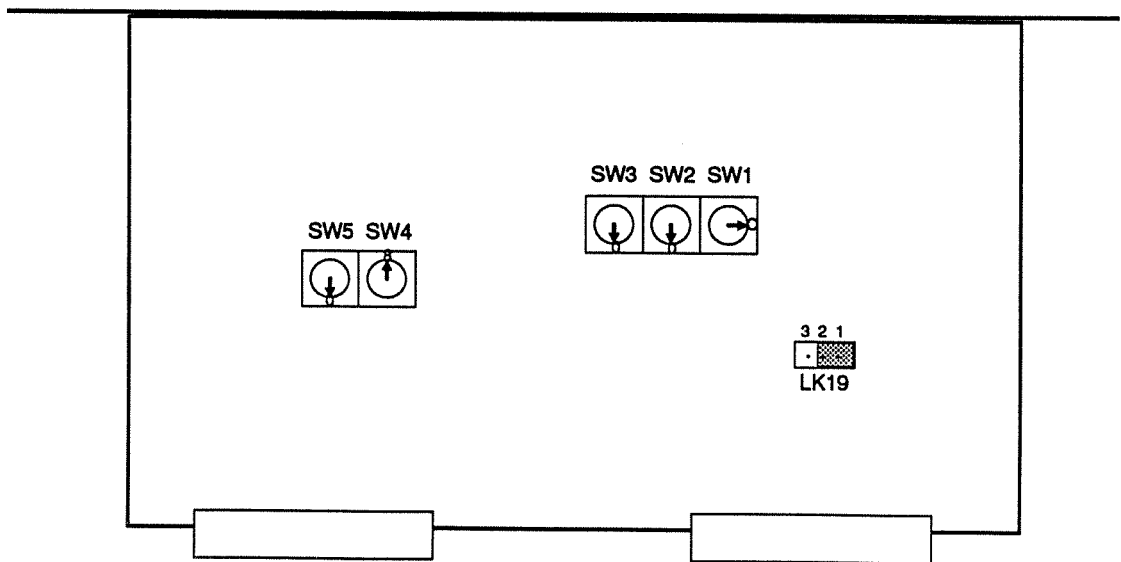


Figure 2.5: Setting switches and a link on the Plessey SCSI controller board

## 2.2 Connecting to a Sun 3/50

Connect either end of the SCSI cable supplied with your DAP to either of the two SCSI connectors at the rear of the DAP (see figure 2.1 on page 3).

The connector on each end of the cable has two screws on it, to fasten the connector securely to the sockets on the equipment. Once you've plugged the cable in at both ends, be sure to do up the screws on the connectors at each end.

### 2.2.1 Connecting to a disk-less 3/50

If the Sun 3/50 has no SCSI peripherals attached, connect the other end of the SCSI cable to the SCSI connector at the rear of the workstation (see figure 2.3 opposite).

### 2.2.2 Connecting to a 3/50 + disk drive

If the 3/50 has a SCSI disk drive attached, disconnect the existing 3/50 – disk drive SCSI cable at the disk drive end (see figure 2.4 opposite), and connect the now-free end of the cable to the free SCSI socket on the DAP. Connect the other end of the cable you plugged into the DAP a few minutes ago into either SCSI socket on the disk drive.

## 2.3 Connecting to a Sun 3/160

### 2.3.1 Introduction

This section describes how to install a Plessey Microsystems PME SCSI-1/100 Intelligent SCSI Controller board in a Sun 3/160 server. The PME board has a 2-connector VME interface; the 3/160 has a 3-connector VME backplane, so an adaptor board is required. The section also describes how to connect your DAP to the 3/160.

### 2.3.2 Equipment Required

Make sure that you have the following equipment before you start work:

- A Plessey Microsystems PME SCSI-1/100 Intelligent SCSI Controller board, part number 421/1/23622/100 Revision Q
- A Dawn 3-to-2 VME Adapter model SU 400/6U-2, or equivalent; including appropriate insulating strips
- A 2mm Allen key
- A 0.25" flat-bladed screwdriver
- A number 2 Phillips screwdriver

### 2.3.3 Configuring the Controller Board

Before you install the PME SCSI-1/100 board you have to make the following changes to the board as received from the factory; figure 2.5 opposite shows the location of the relevant components on the board, and their positions after the changes have been made:

- Remove the link at LK19 from pins 2–3 of the header and insert the link onto pins 1–2
- Set switch SW1 to C
- Set switch SW2 to 0

### 2.3.4 Installation Procedure

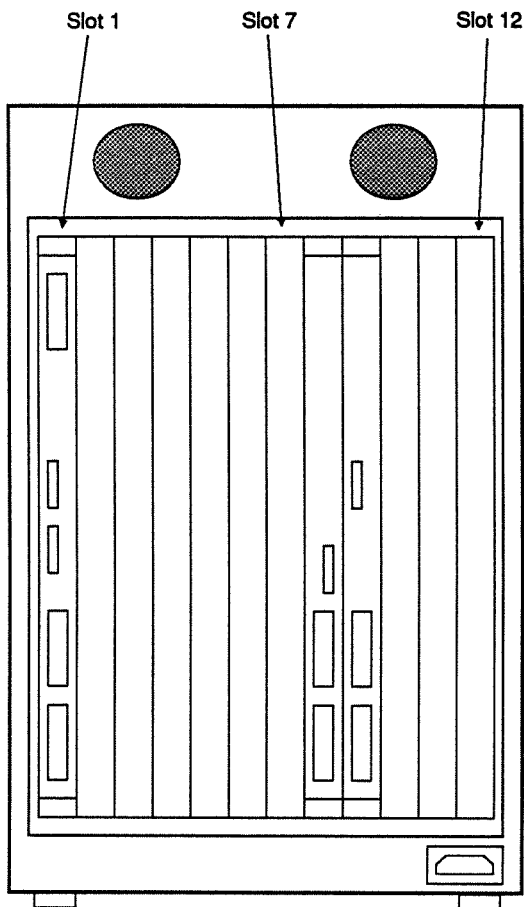


Figure 2.6: Back view of a 3/160, showing VMEbus subrack

- Set switch SW3 to 0
- Set switch SW4 to 8
- Set switch SW5 to 0

To install the SCSI controller:

- Wear an earthing strap on your wrist
- Remove the PME SCSI-1/100 board from its protective anti-static bag. Make sure that you have a Revision Q level controller board; a Revision P board will not work
- Unscrew the two board clamping plates on the 3-to-2 adaptor, and stick on each of their undersides one of the short adhesive insulating strips supplied with the adaptor. Push the SCSI controller board into the two 96-way sockets on the adaptor, and remount the screws and clamping plates onto the adaptor. Adjust the positions of the plates so that they do not touch any of the solder joints on the board, then tighten the screws.
- Shutdown the Sun 3/160 in an orderly manner
- Write-protect any external disks fitted
- Power down the 3/160
- Remove the power cable and all other cables attached to the back of the machine, make a careful note where each cable is attached, labelling the cables if necessary
- Make sure that you have plenty of room at the back of the 3/160. On the VMEbus subrack, select the first free slot *after* slot 7.

In the example in figure 2.6 in the margin, you'll notice that slots 1, 8 and 9 are used, so slot 10 is the first suitable free slot for that 3/160. Select the first suitable slot on *your* 3/160, use the Allen key to undo the two retaining screws holding the slot's blanking plate, and remove the plate

- Slide the 3-to-2 adaptor and controller board into the empty slot. If the front panels or blanking plates of adjacent slots are not fitted with grounding fingers, then hook the long insulating strips supplied with the adaptor onto the grounding fingers of the adaptor front panel and push the adaptor fully home
- Tighten up the screws holding top and bottom of the front panel of the newly-inserted adaptor to the 3/160 subrack frame
- At the front of the 3/160, carefully pull the cover panel away from the main body of the machine
- Remove the four washers and black Phillips screws holding the power supply unit to the frame of the machine
- Carefully pull the power supply unit from the machine. The unit is hinged at the bottom, so swing it down from the top. The grounding fingers on the PSU box make it difficult to swing the PSU box away from the machine frame, so you

may need to prise the top of the box away from the 3/160 frame using the flat-bladed screwdriver

- On the now-exposed VMEbus backplane, identify which slot corresponds to the slot in which you inserted the PME SCSI-1/100 – although the VMEbus subrack isn't marked the VME backplane *is* marked. Double check your subrack count
- On the VME backplane, remove all five links Px 00 to Px 04 from the backplane, where x is the slot number of the slot in which you have just installed the PME SCSI-1/100 board (see figure 2.7 below)

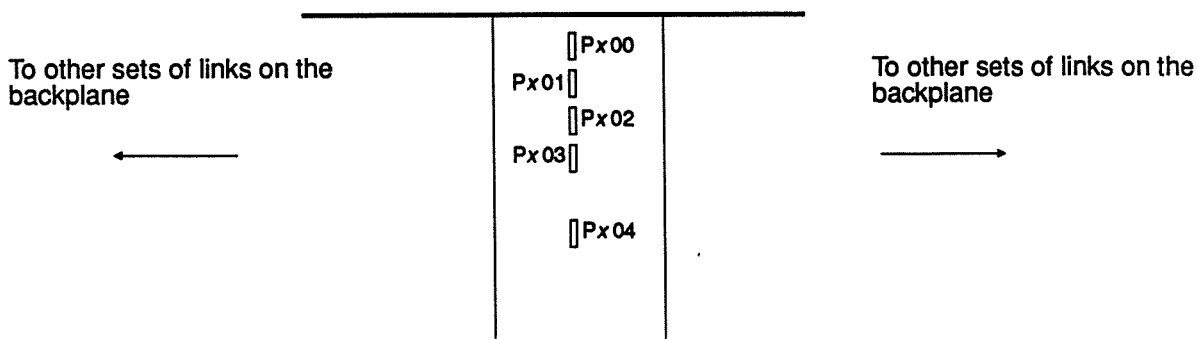


Figure 2.7: Daisy-chain links on the  $x^{\text{th}}$  position of the 3/160 VMEbus backplane

- Swing the power supply unit up again, being careful not to trap any wires, and replace the 4 washers and Phillips screws
- Replace the Sun 3/160 front panel
- Connect the SCSI cable from the DAP to the SCSI connector on the front panel of the adaptor you've just installed – the cable can be plugged in, either end of cable to either socket
- Reconnect the power and other cables to the back of the 3/160
- Power up the 3/160 and write enable any external disks

### 2.3.5 Configuration Details

The switches you set earlier in the installation procedure configure the board to be in the vme32d16 address space at address 0x80c00000. The board bus request level is 3, hence the reason for removing the bus grant acknowledge daisy chain link for level 3 (Px 03). Px 04 link corresponds to the interrupt acknowledge daisy chain.

The other three links, Px 00 to Px 02, are removed to conform with 'good practice' – wire links on the Plessey board propagate the daisy-chained signals to any boards you might insert in the future in higher-numbered slots.

Slots 1 to 6 on the VME subrack are reserved for Sun hardware. Slot 7 may be used but as it has extra features on the P2 connector, the slot is best left for boards which require the features of this slot. The long insulating strips are required to prevent the grounding fingers on the 3-to-2 adaptor frame from shorting components on adjacent VME subrack slots .

You are now ready to install the system software, covered in chapters 3 and 4.



# Chapter 3

## Installing the DAP 500 software

### 3.1 Installation overview

one basic system tape, plus  
one or more optional tapes

effect of different  
Sun system configurations

This chapter describes how to install the DAP 500 basic software, which is supplied on one tape (or cartridge). The contents of the tape are:

- Standard software:
  - The DAP Run-Time Support system
  - FORTRAN-PLUS language system and support libraries
  - DAP simulator
- Example programs
- Test software
- Device driver software
- Low-level graphics library

All DAP systems are supplied with the basic system tape. If you have ordered some of the optional software (such as the APAL assembly system) you will have received one or more additional tapes. These may be installed at the same time as the basic system tape by following the instructions in this chapter, or at some later date by following the instructions in the release note accompanying the additional tape(s). In this manual, the basic tape is called tape 1.

In order to install the software correctly you need to understand the functions of the different SUN machines that could be involved in the process. Some or all of the following may be synonymous, depending on the configuration you are using:

- The *host* machine. This is the SUN which will be physically connected to the DAP
- The *kernel* machine. This is the SUN which 'owns' the UNIX kernel used by the host machine
- The *master* machine. This is the SUN which 'owns' the file systems */usr/lib* and */usr/bin* used by the host machine

If you are connecting the DAP to a stand-alone SUN, then that SUN is the host, kernel and master machine.

If you are connecting the DAP to a diskless SUN that is a client of a single server on a network, then that SUN is the host machine and the server is the master and kernel machine.

Three distinct machines exist only if the SUN connected to the DAP (*host*) is a client of a slave-server (*kernel*), on a network with a master-server (*master*), and where kernel mounts */usr/lib* and */usr/bin* from master.

You will need to be logged-on to different machines at different stages of the installation process, depending on which stage you are carrying out.

You carry out the installation by invoking a shell script, which must first be read in from tape 1. The script controls the installation of the remaining software on tape 1, and on any additional tapes. It also lets you specify the directories in which the software is to reside, although suitable defaults have been specified in the script. To control the reading in of tape 1 you must be logged-on to the master machine.

## 3.2 Location of software

choose a directory to hold the standard software

When you come to install the software (covered in section 3.3) you will be asked to choose a directory to hold the standard software. There is no requirement for DAP users or the software itself to write to this directory (though it must be in a file system mounted on the host machine), so you can locate it in a read-only file system if you want.

The shell script provides a default name for this directory of:

**/usr/lib/dap**

but you will be able to give it your own name when you are installing the software; the name **standard** is used throughout this manual (and referred to in the shell script) for whatever name this directory has. The installation script will create **standard** if it does not already exist.

If the default name is not used, a symbolic link from **/usr/lib/dap** to the actual location of **standard** will be created. In either case symbolic links to some of the new files will be created in **/usr/bin**.

To make sure you install the software correctly, the installation script automatically deletes the directory **/usr/lib/dap**, and also files in **/usr/bin** whose names start with **dap**, before creating these links. Please get in touch with AMT before going any further with the installation if you are unwilling to have this directory and these files deleted.

choose a directory to hold the example programs

You must also choose a directory to hold example programs. Again this must be in a file system that is mounted on the host machine. Ideally all DAP users should have read and write access to this directory, which is called **dapexamples** in the rest of this manual. You will be able to name the directory at installation time; its default name is:

**/usr/dapexamples**

If you are installing DAP hardware, the test software will be placed in directory **standard/test**, the device driver software in **standard/devdr**, and the low-level graphics library in **standard**.

Any optional software will automatically be placed in directory **standard**.

The location and size of the DAP software are as follows on the next page:

<i>Software</i>	<i>Size</i>	<i>Notional directory name</i>	<i>Default directory name</i>
Standard software	1.5 Mbytes	standard	/usr/lib/dap
Example programs	512 Kbytes	dapexamples	/usr/dapexamples
Test software	1.1 Mbytes	standard/test	/usr/lib/dap/test
Device driver software	130 Kbytes	standard/devdr	/usr/lib/dap/devdr
Low-level graphics library	210 Kbytes	standard	/usr/lib/dap

### 3.3 Installing the software

#### 3.3.1 Conventions used

In the detailed instructions which follow (and in other parts of this manual) the following names and conventions are used:

*italics* is used for a name or something else whose actual 'value' will vary from installation to installation, as in *host*, *kernel* and so on below

*host* represents the prompt on your host machine's screen

*kernel* represents the prompt on your kernel machine's screen

*master* represents the prompt on your master machine's screen

*/dev/rxxx*

represents the name of the local tape unit on your master machine, typically */dev/rst0* for a 1/4" SCSI cartridge drive, or */dev/rmt0* for a 9-track tape drive

*master% login root*

represents a command typed at the master machine in response to the *master%* prompt; in the instructions that follow, the machine prompt and what you have to type at the prompt will be printed on the same line.

Are you installing DAP 500 hardware ? [y | n] :

represents a message from the system software output on the screen. The message may or may not require a response from you. Commands or other text input at the keyboard is similarly represented.

#### 3.3.2 Steps to be taken

You must be logged in as the super-user ('root') on the master machine to carry out the installation. When you have logged in as root, you will see the prompt:

*master#*

The first job is to read the installation script into your current directory; you can delete the script when the installation is complete.

Insert tape 1 into your master machine's local tape drive, and type at the prompt:

```
master# tar xvpf /dev/rxxx INSTALLDAP
```

where */dev/ rxxx* is the name of the local tape drive.

Wait till the tape has been read in, and rewound, then type in:

```
master# INSTALLDAP
```

The script now prompts you with a series of questions, as follows:

```
Are you installing DAP500 hardware ? [y | n] :
```

If you answer 'y', the test software, device driver software and low-level graphics library will also be installed.

```
Do you wish to install the standard software in /usr/lib/dap ? [y | n] :
```

If you answer 'n' you will be prompted for your chosen name for the directory called **standard** in this manual:

Please give the full hierarchic name of the directory you wish to use:

Enter the name you want to use for the directory.

```
Do you wish to install the example programs in /usr/dapexamples ? [y | n] :
```

If you answer 'n' you will be prompted for your chosen name for the directory called **dapexamples** in this manual:

Please give the full hierarchic name of the directory you wish to use:

Enter the name you want to use for the directory.

```
Please give the name of the tape device eg st0 or mt0:
```

Enter the name of your master machine's local tape unit – the xxx part of */dev/rxxx* referred to earlier. Notice that the system does not offer you a default for the tape unit's name.

During the next part of the installation process one or more of the following messages will come up on the screen:

Installing standard software

Installing example programs

Installing test software

Installing device driver software

Installing low-level graphics library

The installation of the basic DAP 500 software is complete

Once the tape has been rewound you can remove it from the tape drive.

The script now gives you the chance to install any optional AMT software. The following sequence will end if you reply 'n' to the following question:

```
Do you have any more AMT software to install ? [y | n] :
```

If you reply 'y' you will be prompted to insert another tape:

Insert the next tape and type <return> when ready

Wait for the tape to be read in and rewound before pressing the Return key. When you do press Return, you return to:

Do you have any more AMT software to install ? [y | n] :

When you have read in all your additional tapes, and have answered 'n' to the above screen question, if you are installing DAP 500 hardware, you will see the following messages:

You should now install the DAP device driver as described in the manual

Then perform the installation test

You should read chapter 4 'Installing the DAP 500 SCSI driver' and chapter 5 'Running the installation test'.

If you are not installing DAP 500 hardware you will see the following message:

Now perform the installation test

Chapter 5 covers 'Running the installation test' .



# Chapter 4

## Installing the DAP 500 SCSI driver

### 4.1 Installation overview

Installation depends on the details of your Sun system

This chapter describes how to install the kernel level driver software for the DAP 500 SCSI interface. You must first build the new kernel on the kernel machine, and then create new nodes in the device table of the host machine (see chapter 3 for the meaning of these terms).

The exact form of the installation process depends on the type of the host machine. Two types are considered here:

- SUN 3/50 workstation
- SUN 3/160 server

If you are installing your DAP on a 3/160, you should already have installed additional hardware in the SUN's VMEbus backplane, as described in chapter 2.

Some of the files normally resident on the kernel machine are replaced with new versions as part of the installation process, and the original versions are saved in files with the suffix '.old' added to their name. The files possibly affected in this way are:

```

/usr/sys/sundev/
  sc conf.c
  scsi.h
/usr/include/sundev/
  scsi.h
/usr/sys/OBJ/
  sc.o
  sd.o
  sl.o
  st.o
/usr/sys/conf/
  files.sun3
/usr/sys/sun/
  conf.c

```

The installation method is now described in detail. You must first log in as the super-user ('root') on the kernel machine; having logged in, you will see the prompt:

```
kernel#
```

### 4.2 Introducing new files

You introduce the new files into the system directories by invoking either of the files:

- COMMANDS50
- COMMANDS160

both of which are stored in `/usr/lib/dap/devr`.

So, at the *kernel#* prompt you type:

```
kernel# cd /usr/lib/dap/devdr
```

If your host is a SUN 3/50, you then type:

```
kernel# COMMANDS50
```

or if your host is a SUN 3/160, type:

```
kernel# COMMANDS160
```

### 4.3 Editing 'files.sun3'

Save the original form of */usr/sys/conf/files.sun3*, and then edit a new version, by typing at the prompt:

```
kernel# cd /usr/sys/conf
kernel# cp files.sun3 files.sun3.old
kernel# chmod +w files.sun3
```

Then call your favourite editor to change *files.sun3*.

The purpose of the edit is to incorporate two additional lines, they are:

```
sundev/dap.c      optional dap device-driver
sundev/pmes.c     optional pmes device-driver
```

and for ease of editing they are provided for you to use if you want, in the file:

*/usr/lib/dap/devdr/include1*

The placing is not critical but it is convenient to insert them after all the other lines starting 'sundev'.

### 4.4 Editing 'conf.c'

Save the original form of */usr/sys/sun/conf.c* and then produce a new version by typing at the prompts:

```
kernel# cd /usr/sys/sun
kernel# cp conf.c conf.c.old
kernel# chmod +w conf.c
```

Then call your favourite editor to change *conf.c*.

The purpose of the edit is to incorporate two additional sections of code. The first section is:

```
#include "dap.h"
#if NDAP > 0
extern int  dapopen(), dapclose(), dapread(), dapwrite(),
           dapioctl(), dapselect();
#else
#define dapopen      nodev
#define dapclose     nodev
#define dapread      nodev
#define dapwrite     nodev
#define dapioctl     nodev
#define dapselect    nodev
#endif
```

This piece of code must be placed just before the start of the definition of *cdevsw[ ]*. The code sequence is provided in the file */usr/lib/dap/devdr/include2*



The second code section is:

```
{
    dapopen,      dapclose,      dapread,      dapwrite,      /*40*/
    dapioctl,     nodev,          nodev,        0,
    dapselect,    0,              0,
},
```

and must be inserted just before the end of the definition of `cdevsw[ ]`, before the concluding:

```
};
```

line. This sequence is provided in the file:

```
/usr/lib/dap/devdr/Include3
```

The number **40** in the comment is correct for SUN UNIX Release 3.4. In all cases it should be one more than the highest number in a similar comment in `cdevsw[ ]` before you start the edit. Make a note of the number you use, as you will need it later.

## 4.5 Creating a new kernel configuration file

The next step is to create a new kernel configuration file for the host machine, based on the existing file. Kernel configuration files reside in `/usr/sys/conf` on the kernel machine and have upper-case names. If you are not sure which file is currently in use, log in to the host machine and have a look at the banner heading, which should be something like:

```
Sun UNIX 4.2 Release 3.4 EXPORT (HOST) #1: Thu Nov 12 15:12:08 GMT 1987
```

The name in brackets (in this case `HOST`) is the name of the configuration file. On the kernel machine, copy this configuration file to a new file with a name of your choice (the following example uses `HOST` and `AMTDAP` for these names). Then edit the new file, by typing:

```
kernel# cd /usr/sys/conf
kernel# cp HOST AMTDAP
kernel# chmod +w AMTDAP
```

Then call your favourite editor to change file `AMTDAP`.

The first change is to record your chosen kernel name in the system identifier line starting `ident`, near the top of the file. Therefore, replace the line:

```
ident "HOST"
```

with:

```
ident "AMTDAP"
```

The next change is to add a new line:

```
options TENBYTESCSI # enables group 1 SCSI commands
```

amongst the other options lines near the top of the file. This line is provided in the file `/usr/lib/dap/devdr/include4`

The final change is to add a new section; its contents depend on the type of host machine.

#### new section for a 3/50

On a SUN 3/50 the new section is:

```
# Definitions for DAP at SCSI ID 3
device dap0 at si0 drive 24 flags 3
device dap1 at si0 drive 25 flags 3
device dap2 at si0 drive 26 flags 3
device dap3 at si0 drive 27 flags 3
device dap4 at si0 drive 28 flags 3
```

and it may be placed anywhere in the existing file after the line starting with:

```
controller si0 ...
```

If you cannot find such a line, it may be that your current configuration file is based on the SUN-supplied file ND50 for diskless clients. In this case the line starting with:

```
controller si0 ...
```

should be copied from the SUN-supplied file SDST50

You will find this new sequence in the file:

**/usr/lib/dap/devdr/Include550**

#### new section for a 3/160

On a SUN 3/160 the new section is:

```
# Install SCSI controller PME SCSI-1/100
controller pmes0 at vme32d16 ? csr 0x80c00000 priority 2
    vector pmesinta 0xd0 pmesintb 0xd1
    pmesintc 0xd2 pmesintd 0xd3
    pmesinte 0xd4 pmesintf 0xd5
    pmesintg 0xd6 pmesinth 0xd7
    pmesinti 0xd8 pmesintj 0xd9
    pmesintk 0xda pmesintl 0xdb
    pmesintm 0xdc pmesintn 0xdd
    pmesinto 0xde pmesintp 0xdf
```

```
# Definitions for DAP at SCSI ID 3
device dap0 at pmes0 drive 24 flags 3
device dap1 at pmes0 drive 25 flags 3
device dap2 at pmes0 drive 26 flags 3
device dap3 at pmes0 drive 27 flags 3
device dap4 at pmes0 drive 28 flags 3
```

and it may be placed anywhere after the last line starting with:

```
controller          vme32d16 ...
```

You can find this sequence for the 3/160 in the file:

**/usr/lib/dap/devdr/Include5160**

## 4.6 Building the new kernel

You build a new kernel in the usual manner, by typing at the *kernel#* prompt, using the name you chose when you created the new kernel configuration file:

```
kernel# /etc/config AMTDAP
```

The machine responds by outputting:

Doing a 'make depend'

```
kernel# cd ../AMTDAP
kernel# make
```

Next type at the prompt:

You may find that lots of lines from 'make' or 'cc' are output.

If the build is successful, there will be a new file **vmunix** in the current directory (*/usr/sys/AMTDAP*). The next step is to save the current kernel of the host machine and replace it with the new one. There are two cases:

- The host and kernel machines are one and the same
- The host machine is a diskless client of the kernel machine

If the host and kernel machines are one and the same, then type at the prompts:

```
kernel# mv /vmunix /vmunix.old
kernel# mv vmunix /
kernel# /etc/halt
```

If the host machine is a client of the kernel machine, then first you should halt all clients of kernel (by logging on to each machine as super-user and typing */etc/halt*). Then type:

```
kernel# mv /pub/vmunix /pub/vmunix.old
kernel# mv vmunix /pub
```

In either case you can now go to the host machine and reboot it using the new kernel, by typing at the **>** prompt as follows:

```
> b vmunix
```

## 4.7 Making new nodes in the device table

The nodes */dev/dap0* to */dev/dap31* must be created on the host machine. This is done by invoking the file **MAKEDEV** with the number you were asked to note in the second edit described in section 4.4 above (the following example uses 40, the same value as appears in section 4.4). You must be logged in as super-user to do this.

So, type at the *host #* prompts:

```
host# cd /usr/lib/dap/devdr/dev
host# MAKEDEV 40
```

Installation of the new device driver is now complete. You should now proceed with the installation test, as described in chapter 5 (Running the DAP 500 installation test).



# Chapter 5

## Running the installation test

### 5.1 Test overview

The installation test uses the FORTRAN-PLUS and APAL language systems, the CIF library maintenance utility and the run-time options specifier to produce an executable DAP program. This program is run on the DAP and then on the simulator, and the results are checked against pre-computed values written into the software. The installation test is therefore a complete check on the functionality of the installed system – software and hardware.

**test works with or without APAL assembly system**

The test automatically substitutes alternative code if the optional software component – the APAL assembly system – cannot be found, and a warning message is output. Whatever software you have installed, the test should then proceed satisfactorily.

**... and with or without DAP hardware**

If you are only using the simulation software, you will also see warning messages when the test tries to run the program on the DAP hardware. However, the test should then execute the simulation run successfully.

If you *are* running DAP hardware, you should already have installed the SCSI driver, as described in chapter 4 (Installing the DAP 500 SCSI driver). Before running the installation test you should power up the DAP and start the **dapboot** process running; you will find details of how to do this in chapter 6 (Normal use of the DAP 500) which you should have read before you start the installation test.

### 5.2 Running the test

Both the shell script which runs the test, and also all the necessary source files, are contained in the directory **install**, which is a sub-directory of the installation-dependent directory **dapexamples** (see chapter 3 for further details).

You should first log-on to the host machine, then issue the following commands at the *host%* prompt:

```
host% cd dapexamples/install
host% dapinstall
```

where *dapexamples* stands for the name you gave during the installation for the directory into which the installation script was to put the example programs.

You will see some of the following messages as the test proceeds:

```
Running the DAP Installation Test time and date
Compiling the DAP source files ...
```

where *time and date* is the current time and date when the test is run, expressed in the normal form for your UNIX installation.

If the test cannot find the APAL assembler, it outputs the following warning message:

```
APAL assembler not found - using supplied APAL CIF
```

which is followed by other 'test progress' messages:

```
Consolidating the DAP program ...
```

```
Compiling the host program ...
```

```
Running the program using the simulator ....
```

```
Running the program using the DAP ..
```

If DAP hardware cannot be found the following messages are output:

```
Warning: No free DAP resources
```

```
Failure when loading DAP program
```

Whether or not you have DAP hardware installed the test then checks the results against the 'correct' result held in the program:

```
Checking the results
```

If you have installed DAP hardware the following message indicates successful completion of the test:

```
Both runs successfully completed
```

If you have not installed DAP hardware the following messages indicate successful completion of the test:

```
Running with the DAP has produced incorrect results
```

```
Correct results were obtained with the simulator
```

If you see the concluding messages appropriate to your installation, then the system is ready for use.

If you get the above pair of messages, but you *have* installed DAP hardware, there may be a hardware fault; have a look at chapter 8 (Running test software).

As a matter of interest, the other files to be found in directory **dapexamples** are described in chapter 7 (Example programs).

# Chapter 6

## Normal use of the DAP 500

Make sure that the power cable is connected into the **AC INPUT** socket on the DAP's back panel, and into a suitable power outlet – and that the **POWER** switch on the back panel is on ('I' pressed in). Also check that the SCSI cable between the SUN and the DAP is plugged in at both ends.

These checks complete, you can now power up your DAP, by turning the key on the control panel from the **OFF** position to **RUN**. Various hardware self-tests are carried out as the unit is powered up; the DAP is ready for use when the final message is output on the control panel display:

```
DAP SELF TESTS
PASSED
```

**dapboot must always  
be running when  
the DAP is in use**

Before any user programs can be run you must invoke the program **dapboot**, which must be left running all the time you are using the DAP. To cater for this requirement, you can either open a window in which to run **dapboot**, or run **dapboot** as a background task. You do not need to be super-user to run **dapboot**.

**dapboot** is a program resident in the SUN and responsible for loading and unloading the run-time support software resident in the DAP. It also monitors the state of the DAP continuously, and records in the engineering log file (*/usr/adm/dapenglog*) any errors or exceptions that are not the result of any user program you might have run.

**a request –  
to help AMT to help you**

The actual writing to this log file is only done when **dapboot** is invoked or is closed down. In order to help AMT monitor and put right any problems you may have during the first few weeks with your DAP system, we ask you to close down **dapboot** at least once a day (so that any error report is written to */usr/adm/dapenglog*), spool off the file each day and send it to your local AMT representative.

It is normal for messages giving details of the dates and times of power-up and power-down to be written to this file. Some of the following messages are also written each time **dapboot** is invoked or closed down:

```
Task manager no such task ID for deleting task 0x7
Task manager no such task ID for deleting task 0x6
Device number in message from HostCP out of range
```

When you type **dapboot** the following messages should appear on the SUN screen:

```
DAP confidence tests successfully completed
Message server successfully loaded
MCUCP successfully loaded
HCUCP successfully loaded
```

**halt dapboot before you turn the DAP off or run hardware tests**

Once the DAP is powered up with the control panel key at RUN, and **dapboot** is running, you can run any user programs.

For further details, see the AMT manual *DAP 500: Program Development under UNIX* (man003)

You should halt **dapboot** before you turn off the DAP or try to run any of the hardware tests. You halt **dapboot** from the host machine; how you halt it depends on how you started it running:

If you opened a window to run it in, simply do a <Ctrl-C> (that is, hold the Control key down, and press key C). You will know **dapboot** has stopped running when the UNIX *host %* prompt returns.

If the *host %* prompt does not return, run program **dapreset** in another window; the *host %* prompt should then return in both windows

If you ran **dapboot** as a background job, you must be super-user to remove it:

At the normal UNIX prompt *host #*, type:

```
host# ps -ax
```

The process number of **dapboot** will be listed, along with the process number of any other processes that are still running

Then type at the prompt:

```
host# kill dapbootps
```

where *dapbootps* is the process number you have just discovered.

To check that **dapboot** has been stopped, type again:

```
host# ps -ax
```

**dapboot** should not appear on any list output by UNIX.

If **dapboot** still appears on the process list, running program **dapreset** should kill **dapboot**



# Chapter 7

## Example programs

### 7.1 Introduction

A number of example programs are contained in the installation-dependent directory, called **dapexamples** in chapter 3. This chapter describes the contents of that directory.

Note that, by default, the FORTRAN-PLUS and APAL language systems create DOF (DAP Object Format) files suitable for use on DAP hardware. Any compiled DAP programs resident in **dapexamples** also expect to run on hardware. If you want to use the DAP simulator, you must first run the program **dapopt** to modify the options specified in the DOF file.

For example, the following command converts a DAP program in the file *fred* so that it will use the simulator:

```
dapopt -sl fred
```

You can find full details of **dapopt** in section 3.2 of the AMT manual *DAP 500: Program development under UNIX* (man003).

### 7.2 install

The sub-directory **Install** within **dapexamples** contains the shell script and all necessary files for running the installation test, as described in chapter 5 (Running the installation test).

### 7.3 daprun

Some DAP programs are 'free-standing': they do not rely on data transfers to or from their associated host program and thus only require a very simple host program. **daprun** is a suitable host program if you want to run free-standing DAP programs. Its C source is contained in the file **daprun.c**.

```
source: daprun.c
object: daprun
```

**daprun** takes two parameters. The first is the name of the DOF file containing the DAP program to be run, and the second is the name of an entry point within that program.

If you only give one parameter, the system assumes the parameter is the name of an entry point, and the name of the DOF file defaults to **d.out**.

For example, to enter the DAP program in file *fred* at entry point *start*, you run the command:

```
daprun fred start
```

```
daprun start
```

To enter the DAP program in file **d.out** at entry point *start*, you run the command:

## 7.4 **plotter**

The **plotter** host and DAP program pair demonstrate a simple technique for displaying on the SUN screen bit-mapped images generated in the DAP.

source: **plotter.c, plotter.df**

object: **plotter, plotterdap**

You should first invoke **suntools** if you are not running it already. When you then invoke the host program **plotter** you are asked if you wish to draw a picture, and on replying 'yes' are prompted for picture data. Answering **Return** to all these questions causes suitable defaults to be used. A well-known picture is then displayed on the screen. You may then quit the program or enter your own data for the next picture.

Comments in the source code indicate suitable areas for experimentation should you want to generate your own pictures in this way. Compilation instructions are also included.

The **plotter** program can also be run on the simulator, but you must run **dapopt** first, by typing:

```
dapopt -s1 plotterdap
```

## 7.5 **timer**

The system sub-routine **AMT5\_TIMER** provides a mechanism for timing DAP programs running on the hardware; it can be called from anywhere within the DAP program. The source file **timer.df** in directory **dapexamples** describes the interface to **AMT5\_TIMER** and gives a simple example of its use.

source: **timer.df**

You can compile and run the program by typing:

```
dapf timer.df  
daprun timer
```

Note that you cannot use **AMT5\_TIMER** on the simulator, which has its own mechanism for timing programs.

# Chapter 8

## Running test software

If you suspect that there is a hardware fault on the DAP, you can run the installed test software from the host machine via the program **dapet**.

If **dapboot** is running, first remove it with <Ctrl-C>.

**dapet** may be invoked in either of two ways, one of which makes use of windows:

To enter the window version (**suntools** must be running first), issue the following command:

```
host% dapet
```

To enter the non-window version (with or without **suntools**), issue the following command:

```
host% dapet -N
```

Both versions respond with a > prompt. In the windows version the prompt is in the bottom window, which should be selected before proceeding.

In either case, type at the > prompt:

```
> auto
```

This command runs all the test software automatically. Any failing test will halt the sequence and output error messages to the screen. Successful completion of all the tests is indicated by the message:

```
*** END OF AUTOMATIC CONFIDENCE RUN ***
```

To leave **dapet** simply type 'q' at the > prompt:

```
> q
```

Further hardware test software is included on your basic DAP 500 software tape or cartridge. For details of how to use that software see *DAP 500: Engineering Test Software* (man008).



# Chapter 9

## DAP 500 Control panel

### 9.1 Introduction

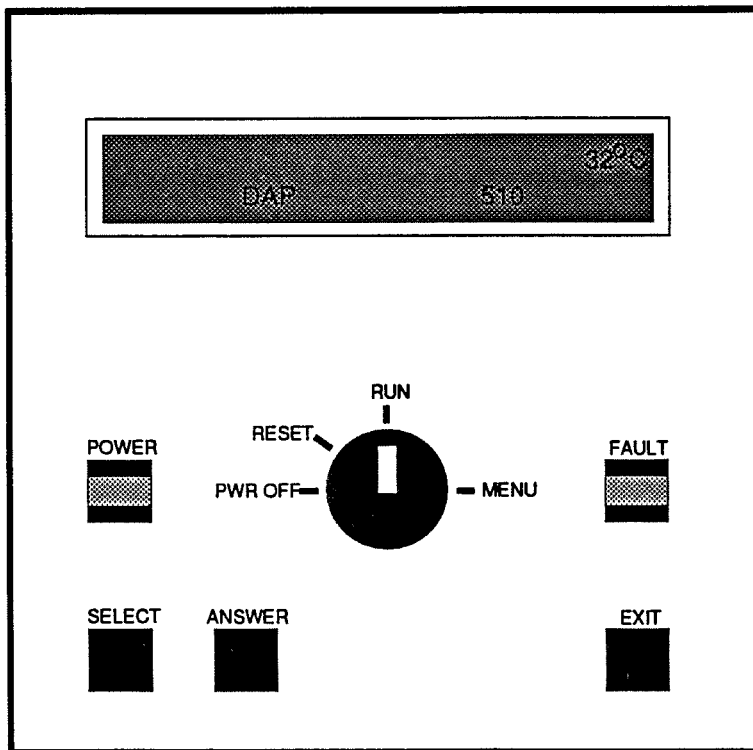
The control panel of a DAP 500 (see figure below) includes:

- A 20 character by 2 row LED display panel
- Two indicator lights
- Three control buttons:  
SELECT ANSWER EXIT
- A four-position keyswitch, with positions:  
PWR OFF RESET RUN MENU

### 9.2 Indicator Lights

The green indicator **POWER** is a 'power-on' light.

The red indicator light comes on briefly (for less than one second) during the DAP's power-up sequence.



If the red indicator light comes on at any time other than at power-up a serious fault is indicated; you should get in touch with AMT. Possible causes include hardware faults and corruption or inconsistency of system software.

An audible alarm sounds whenever the red light is on. Both the red light and the alarm can be turned off by turning the key-switch to **PWR OFF** or **RESET** (see section 9.4 below).

Figure 9.1: DAP 500 control panel

### 9.3 Control Buttons

You use the control buttons to select from the menus presented on the display panel when the key switch is in the **MENU** or **RESET** position. In either case the menu will typically have one item highlighted by chevrons; the highlighted item may be accepted by pressing **ANSWER**. In some cases this takes you

down a level to a different menu and range of options. If you press **SELECT** repeatedly, the system will cycle round the range of options in the current menu, showing two of the menu options at a time, and highlighting with chevrons each option in turn.

Pressing **EXIT** takes you from the current menu and displays the menu one level up. **EXIT** has no effect if you are already at the top-most level.

## 9.4 Key Switch

The key switch on the control panel of the DAP 500 has 4 positions:

- **PWR OFF**
- **RESET**
- **RUN**
- **MENU**

**PWR OFF**

The **PWR OFF** position is used to power down the machine.

**RUN**

In the **RUN** – or **MENU** – positions, the DAP will run user programs if **dapboot** has been invoked; **RUN** is the normal setting. When you turn the key to **RUN** from **RESET** (or from **PWR OFF** via **RESET**), the DAP hardware self tests are run automatically.

**RESET**

If you turn the key to **RESET**, you will halt the DAP, so make sure that any programs running in the DAP, and **dapboot** running in the host, have been stopped first.

If you press any button, with the key at **RESET**, a two option-menu is displayed:

- **HCU SELFTEST**

Accepting this option causes the HCU self tests to be executed. They inform you of their progress. A final message of:

```
HCU SELFTEST COMPL
.....
```

indicates all was well. If any of the dots is replaced by an 'X', an error has been detected and you should let AMT know

- **BOOT DAPOS**

If you accept this option, you will be presented with a message telling you to turn the key to **RUN** or **MENU**

**MENU**

You can use **MENU** to carry out either of the following:

- Show different information on the front panel display. Doing this has no effect on any programs running in the DAP
- Run the DAP hardware self-tests manually. While these tests are running the machine is not available to users; when you select this option you will be reminded to make sure that **dapboot** has been halted

**choices offered under MENU**

When you select **MENU** you are offered a choice of two functions:

**SYSTEM UTILITIES options****choices within choices****... within choices**

- SYSTEM UTILITIES
- DAP TESTS

Accepting the SYSTEM UTILITIES option will bring up another menu:

- \* CLOCK
- \* DAP500
- \* DAPTEMP

Accepting one of these options changes the displayed menu once again, and you are now offered the menu:

- \* STOP
- \* RUN

These options control whether or not the item already selected at the menu level above – say DAP500 – is displayed (RUN) or is not displayed (STOP). Note that the option highlighted when the STOP/RUN menu first comes up is the one that is currently active.

As a result of your selection one or more of the following will be displayed on the control panel when the key is returned to the RUN position:

- \* The time
- \* A moving DAP 500 logo, along with the average temperature of the boards inside the DAP.

Only this option is being RUN in figure 9.1 on page 29

- \* The temperatures of the individual boards inside the DAP

**DAP TESTS option**

Accepting the DAP TESTS option from the top level menu allows you to run manually the self-tests which are normally run by the DAP at power-up. You are first reminded that **dapboot** must be halted before you begin these tests by the message:

CONFIRM DAPBOOT REMOVED

When you confirm that DAPBOOT has been removed (by pressing **ANSWER**), a sub-menu is displayed showing the available tests:

- \* DAP SELF TESTS
- \* MCU TESTS PART 1
- \* ARRAY STORE
- \* CODE STORE
- \* PE TESTS
- \* MCU TESTS PART 2

The first test in the menu, DAP SELF TESTS is effectively an amalgam of the other options, and runs each of them in turn.

**turning back to RUN**

READY FOR DAPBOOT

When you turn the key back to **RUN** from **MENU**, the message:

will be displayed for a short time. If the reason for selecting **MENU** was to change the display on the panel, and **dapboot** has been left running, **READY FOR DAPBOOT** may be ignored.



# Chapter 10

## Reconfiguring your system

### 10.1 Introduction

This chapter describes what you have to do if you want to change some aspect of your system. For example, you may want to move your DAP from a workstation to a file server, or reconfigure your SUN network so that the workstation which hosts the DAP is a client of a different server.

Before proceeding you should consider the following points:

- The procedure to follow depends on the changes you want to make to the master, kernel and host machines. Read chapter 3 again carefully if you are not sure of the meaning of these terms
- The only types of host machine considered here are:
  - SUN 3/50 workstation
  - SUN 3/160 server

In the case of a 3/160 additional hardware must also be installed in the VMEbus backplane, as described in section 2.3

### 10.2 Work to be done

Carry out any or all of the following steps, depending on your particular circumstances:

- If the master machine has changed:
 

Follow the instructions in chapter 3 for installing the software. Do *not* install the device driver as described in chapter 4; only follow the instructions in chapter 4 if you are told to do so below
- If the kernel machine has changed:
 

Follow the instructions in chapter 4 for installing the device driver *with the exception* of section 4.7 (that is, *don't* make new nodes in the device table); only follow section 4.7 if the host machine has changed as well
- If the kernel machine has *not* changed but the host machine *has* changed:
  - Log in as super-user on the kernel machine
  - If the old host machine was a 3/50 and the new host is a 3/160, type the following commands:

```
kernel# cd /usr/lib/dap/devdr
kernel# MOVE50TO160
```

- If the old host was a 3/160 and the new host is a 3/50, type the following commands:

```
kernel# cd /usr/lib/dap/devdr
```

```
kernel# MOVE160TO50
```

- If your previous DAP kernel configuration file is not suitable for your new system, follow the instructions in section 4.5
- Even if you have not changed the configuration file, build and install a new kernel as described in section 4.6
- Make new nodes in the device table of the host machine as described in section 4.7

## Appendix A

### Contents of tape 1 (basic software) for Release 2.1S

```

r-xr-xr-x 0/0 3878 Feb 25 11:27 1988 INSTALLDAP
r-xr-xr-x 0/0 2261 Feb 25 11:27 1988 UPGRADEDAP
rwxr-xr-x 0/0 0 Feb 25 11:27 1988 dap/
--x--x--x 0/0 65536 Feb 25 11:26 1988 dap/dapcon
--x--x--x 0/0 401408 Feb 25 11:26 1988 dap/dapfort
--x--x--x 0/0 49152 Feb 25 11:27 1988 dap/daplib
--x--x--x 0/0 49152 Feb 25 11:27 1988 dap/dapopt
--x--x--x 0/0 32768 Feb 25 11:27 1988 dap/dapf
rwxrwxrwx 0/0 0 Feb 25 11:27 1988 dap/dapa symbolic link to dapf
--x--x--x 0/0 32768 Feb 25 11:27 1988 dap/dapdfpp
rwxrwxrwx 0/0 0 Feb 25 11:27 1988 dap/dapapp symbolic link to dapdfpp
r--r--r-- 0/0 512 Feb 25 11:27 1988 dap/patterns.df
r--r--r-- 0/0 1142 Feb 25 11:27 1988 dap/usrmacs.da
r--r--r-- 0/0 10428 Feb 25 11:27 1988 dap/dap_msg_lib
--x--x--x 0/0 49152 Feb 25 11:27 1988 dap/dapload
--x--x--x 0/0 57344 Feb 25 11:27 1988 dap/dapdb
--x--x--x 0/0 81920 Feb 25 11:27 1988 dap/dapsupport
r--r--r-- 0/0 21926 Feb 25 11:27 1988 dap/interface.o
--x--x--x 0/0 49152 Feb 25 11:27 1988 dap/dapsimwork
--s--x--x 0/0 57344 Feb 25 11:27 1988 dap/dapboot
--s--x--x 0/0 24576 Feb 25 11:27 1988 dap/dapreset
r--r--r-- 0/0 40507 Feb 25 11:27 1988 dap/dapmcucp
r--r--r-- 0/0 10282 Feb 25 11:27 1988 dap/daphcucp
r--r--r-- 0/0 4302 Feb 25 11:27 1988 dap/dapmsgs
r--r--r-- 0/0 486327 Feb 25 11:27 1988 dap/stdlib.dl
rwxrwxrwx 0/0 0 Feb 25 11:27 1988 dapexamples/
rwxrwxrwx 0/0 0 Feb 25 11:27 1988 dapexamples/install/
r--r--r-- 0/0 17576 Feb 25 11:27 1988 dapexamples/install/SAVdiag
r--r--r-- 0/0 133 Feb 25 11:27 1988 dapexamples/install/daphost.c
r-xr-xr-x 0/0 1657 Feb 25 11:27 1988 dapexamples/install/dapinstall
r--r--r-- 0/0 1293 Feb 25 11:27 1988 dapexamples/install/iapal.da
r--r--r-- 0/0 257 Feb 25 11:27 1988 dapexamples/install/icif.dc
r--r--r-- 0/0 355 Feb 25 11:27 1988 dapexamples/install/ifort.df
--x--x--x 0/0 32768 Feb 25 11:27 1988 dapexamples/daprun
r--r--r-- 0/0 1721 Feb 25 11:27 1988 dapexamples/daprun.c
--x--x--x 0/0 425984 Feb 25 11:27 1988 dapexamples/plotter
r--r--r-- 0/0 6670 Feb 25 11:27 1988 dapexamples/plotter.c
r--r--r-- 0/0 2603 Feb 25 11:27 1988 dapexamples/plotter.df
r--r--r-- 0/0 14096 Feb 25 11:27 1988 dapexamples/plotterdap
r--r--r-- 0/0 1356 Feb 25 11:27 1988 dapexamples/timer.df
rwxr-xr-x 0/0 0 Feb 25 11:27 1988 test/
--s--x--x 0/0 598016 Feb 25 11:27 1988 test/dapet
--x--x--x 0/0 131072 Feb 25 11:27 1988 test/dapet1
r--r--r-- 0/0 18162 Feb 25 11:27 1988 test/dapet_help.txt
r--r--r-- 0/0 112 Feb 25 11:27 1988 test/epermissions
r--r--r-- 0/0 10804 Feb 25 11:27 1988 test/message.index
r--r--r-- 0/0 236352 Feb 25 11:27 1988 test/message.text
r--r--r-- 0/0 112 Feb 25 11:27 1988 test/permissions
r--r--r-- 0/0 45342 Feb 25 11:27 1988 test/MCUTEST

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r--r--r-- 0/0 58311 Feb 25 11:27 1988 test/PETEST
r--r--r-- 0/0 10371 Feb 25 11:27 1988 test/STORTEST
r--r--r-- 0/0 3180 Feb 25 11:27 1988 test/setnv.hcu
rwxr-xr-x 0/0 0 Feb 25 11:27 1988 devdr/
rwxr-xr-x 0/0 0 Feb 25 11:27 1988 devdr/OBJ/
r--r--r-- 0/0 13583 Feb 25 11:27 1988 devdr/OBJ/dap.o
r--r--r-- 0/0 8456 Feb 25 11:27 1988 devdr/OBJ/pmes.o
r--r--r-- 0/0 6695 Feb 25 11:27 1988 devdr/OBJ/sc.o
r--r--r-- 0/0 13023 Feb 25 11:27 1988 devdr/OBJ/sd.o
r--r--r-- 0/0 26598 Feb 25 11:27 1988 devdr/OBJ/si.o
r--r--r-- 0/0 13158 Feb 25 11:27 1988 devdr/OBJ/st.o
rwxr-xr-x 0/0 0 Feb 25 11:27 1988 devdr/dev/
r-xr-xr-x 0/0 239 Feb 25 11:27 1988 devdr/dev/MAKEDEV
rwxr-xr-x 0/0 0 Feb 25 11:27 1988 devdr/sundev/
r--r--r-- 0/0 3209 Feb 25 11:27 1988 devdr/sundev/dapreg.h
r--r--r-- 0/0 4278 Feb 25 11:27 1988 devdr/sundev/sc_conf.c
r--r--r-- 0/0 23125 Feb 25 11:27 1988 devdr/sundev/scsi.h
r-xr-xr-x 0/0 409 Feb 25 11:27 1988 devdr/COMMANDS160
r-xr-xr-x 0/0 589 Feb 25 11:27 1988 devdr/COMMANDS50
r-xr-xr-x 0/0 242 Feb 25 11:27 1988 devdr/MOVE160TO50
r-xr-xr-x 0/0 176 Feb 25 11:27 1988 devdr/MOVE50TO160
r--r--r-- 0/0 84 Feb 25 11:27 1988 devdr/include1
r--r--r-- 0/0 266 Feb 25 11:27 1988 devdr/include2
r--r--r-- 0/0 108 Feb 25 11:27 1988 devdr/include3
r--r--r-- 0/0 53 Feb 25 11:27 1988 devdr/include4
r--r--r-- 0/0 568 Feb 25 11:27 1988 devdr/include5160
r--r--r-- 0/0 220 Feb 25 11:27 1988 devdr/include550
r--r--r-- 0/0 202932 Feb 25 11:27 1988 gralib.dl

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