V/SMD 4400 Phoenix

High-Performance SMD Disk Controller for Sun Microsystems' Workstations

Installation Guide

INTERPHASE CORPORATION
V/SMD 4400 Phoenix

High-Performance SMD Disk Controller for Sun Microsystems’ Workstations

Installation Guide
3200 and 4200 differences

- 3200-3 and below will not handle SMD ECL interface
- 3200-6 and -7 will handle 24mhz SMD drives
- 3200 does not have bus packet (without this the data transfers across the VME bus will be slow)
- 4200 has two drive support and the 4400 has four drive support
- 4200 is a 6U board and the 4400 is a 9U board
- 4200 and 4400 will handle 24mhz drives
- 4200 and 4400 has bus packet interface (fast bus transfers)
- 4200 and 4400 have speed enhancements
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INTERPHASE APPLICATIONS ENGINEERING DEPARTMENT
(214) 350-9000
IN THE U.K., CALL: (0296) 435661
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Information for all sun user's is included in this V/SMD 4400 Installation Guide.

If you are interested in writing software drivers the V/SMD 4200 User's Guide may be used in conjunction with this installation guide as a technical reference. Contact Interphase Corporation and a user's guide will be shipped to you immediately.

Hardware Reference

Section one deals with the actual hardware installation. Refer to this section when installing the 4400 into the system as it contains information on configuration of the board and system. It also contains specifications, pinouts, and cabling information.

Driver Installation

Section two will show how to build a kernel which will allow you to use the 4400 as an add-on controller in a Sun system. Use this document if your system currently has a Sun supported boot device.

Ipdiag

Section three contains instructions on using the Interphase utility ipdiag to format, partition, and label the drive(s) attached to the 4400. In order to use this utility, you must boot a kernel that includes the Interphase driver.

Boot Installation

Section four explains how to set up the hardware and software to allow booting on the "ip" device. This section assumes that the Interphase controller has firmware Rev. 04C or greater, and is currently installed as an add-on device.
Full Emulation

Section five instructs the user on installing the 4400 as a boot device into a Sun system that has no other boot device available. This is accomplished using full xy emulation firmware rev 04F or greater. This firmware allows the user to format and partition a disk using the SunOS4.0 format utility, and load the SunOS from tape. Using the Sun format should be avoided whenever possible as it is more difficult and time-consuming than using ipdiag. If you are running more than one drive on the 4400, or have access to another boot device, use the Interphase utility to format.
OVERVIEW

Before attempting installation, read through this chapter thoroughly to insure the V/SMD 4400 is installed into your system safely.

The V/SMD 4400 is designed to insure easy installation into the VMEbus system, and can be accomplished in five simple steps:

- Visual Inspection
- On-Board Jumpers
- Set Base Address (Switch Setting Options)
- Power-Off System
- Cabling Procedures

Though the installation of the V/SMD 4400 may be easy, the following WARNING must be observed.

WARNING

1. The V/SMD 4400 is extremely sensitive to electrostatic discharge (ESD), and the board could be damaged if it is handled improperly. Interphase ships the board enclosed in a special anti-static bag. Upon receipt of the board, take the proper measures to eliminate board damage due to ESD (i.e., wear a wrist ground strap or other grounding device).

2. Do NOT install or apply power to a damaged board. Failure to observe this warning could result in extensive damage to the board and/or system.
V/SMD 4400-3 is the only variation available for Phoenix at this time. It is an intelligent SMD controller designed specifically for Sun workstations and will support any combination of up to four drives.

For information regarding the board layout, refer to Figure 1, for the position of the cable connections, the jumpers, and the switch block (S1). Please refer to this diagram for information as indicated in the remainder of this section of the user's guide.

If you have any questions regarding installation which are not answered in this chapter, please contact Interphase Customer Service at (214) 350-9000.
Figure 1. Board Layout V/SMD 4400-3

(The printed circuit board number, PB-0823-A06-000, will be found on the solder side of the board).
For proper installation it is imperative the steps listed below are followed:

STEP 1. Visual Inspection

Before attempting the installation of this board, make sure you are wearing an anti-static or grounding device. Remove the V/SMD 4400 board from the anti-static bag, visually inspect the board to ensure no damage has occurred during shipment. A visual inspection usually is sufficient since each board is thoroughly checked at Interphase just prior to shipment.

If the board is undamaged and all parts are accounted for, proceed with the installation.

STEP 2. On-Board Jumpers

All on-board jumpers on the V/SMD 4400 are default settings which is set at the factory and must not be changed. Refer to the board layout for the physical location of the jumpers in Figure 1.

STEP 3. Set Base Address (Switch Setting Options)

Set the base address of the controller using the switch block (S1, shown in the board layout of Figure 1) so the V/SMD 4400 is properly configured for operation within your system. Table 2 represents all possible base address and switch settings for the controller.

The switch block (S1) contains eight switches numbered 1-8. Switches one through seven correspond to VMEbus address lines A9-A15 respectively. An OFF switch has a value of '1', and an ON switch has a value of '0'.

Switch 8 is used to select the address modifiers for the V/SMD 4400 Short I/O space. If switch 8 is on, only supervisor accesses are permitted (address modifier 2D only). If switch 8 is off, then both 2D and 29 address modifiers are selected.
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STEP 4. Power-Off System

Once the board is configured, ensure that both the system power and the disk drive power are OFF.

WARNING

System power and disk drive power must be OFF before the V/SMD 4400 can be installed. Failure to do so may result in severe damage to the board and/or system.

STEP 5. Cabling Procedures

When the power is off, connect the "A" cable (see Tables 2 through 7 for pin-out details) to the disk drive, making sure that the pins are properly oriented. If only one disk drive is used, it must be attached to the last connector on the cable.

Then, install terminators on the last drive on the cable. (If only one drive is connected, the terminators must be connected to that drive.)

Route the "A" and "B" cables to the proper connector, and insert the V/SMD 4400 about one-third of the way into the slot.

The connection of the cables are as follows:

- Connector J1 - "A" cable must be daisy-chained to each drive, 60 pin connector.
- Connector J2 - "B" cable for drive 2, 26 pin connector.
- Connector J3 - "B" cable for drive 3, 26 pin connector.
- Connector J4 - "B" cable for drive 0, 26 pin connector.
- Connector J5 - "B" cable for drive 1, 26 pin connector.

Carefully slide the board the rest of the way into the slot. It should slide all the way in without any difficulty. If it doesn't, pull it out and check to make sure that the cables are not in the way.

Once the board is properly seated in the slot 8 through 12, tighten the captive mounting screws on each end of the board.
## Installation of the V/SMD 4400

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Installation of the V/SMD 4400

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</thead>
<tbody>
<tr>
<td>DTB Master</td>
<td>A32, D16, D32 DMA transfers</td>
</tr>
<tr>
<td>DTB Slave</td>
<td>A16, D8, D16 (Commands &amp; Status)</td>
</tr>
<tr>
<td>Requester</td>
<td>Any of R (0-3) (static)</td>
</tr>
<tr>
<td>Interrupter</td>
<td>Any of I (1-7) (Dynamic)</td>
</tr>
<tr>
<td>Data Rate</td>
<td>Up to 30 Megabytes per second</td>
</tr>
</tbody>
</table>

Environmental Specifications:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>0-55 degrees C. (32-130 F)</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>10-90% noncondensing</td>
</tr>
</tbody>
</table>

Electrical Specifications:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>6.5 amps (max) @ 5V DC (+5%)</td>
</tr>
<tr>
<td></td>
<td>4.6 amps nominal</td>
</tr>
<tr>
<td></td>
<td>1 amp (max) @ -12V DC (+5%)</td>
</tr>
<tr>
<td></td>
<td>0.5 amps nominal</td>
</tr>
</tbody>
</table>

Physical Specifications:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (9U)</td>
<td>367 x 400 mm (14.59 x 15.8 in.)</td>
</tr>
<tr>
<td>Thickness (1 slot)</td>
<td>19.6 mm (0.77 in.)</td>
</tr>
<tr>
<td>Weight</td>
<td>3 lbs. (1.4 kg)</td>
</tr>
</tbody>
</table>
The following driver installation procedure also applies to the V/SMD 4200.

1. Remove the files from the distribution media and place in the appropriate directory.
   
   ```
   cd /usr/sys
   tar -xvf /dev/rst8 ;1/4 inch cartridge tape
   or
   tar -xvf /dev/rmt0 ;1/2 inch reel tape
   ```
   
   Copy driver and include files (ip.c and ipreg.h) to /usr/sys/sun3dev
   
   ```
   cp /usr/sys/iphase/ip/drvr/* /usr/sys/sun3dev/
   ```

2. Copy the current system configuration file and add an entry for the Interphase controller.
   
   ```
   cd /usr/sys/conf ;SunOS 3.x
   cd /usr/sys/sun3/conf ;Sun3 OS4
   cd /usr/sys/sun4/conf ;Sun4 OS4
   cp GENERIC IP
   ```
   
   a. Edit the new system configuration file (IP) and add the following entry for the first Interphase controller ipc0, at the end of the new configuration file.
   
   ```
   controller ipc0 at vme16d16 ? csr 0x7000 priority 2 vector
   ipnint 200 ipeint 201 ipscint 202
   disk   ip0 at ipc0 drive 0 flags 0
   disk   ip1 at ipc0 drive 1 flags 0
   disk   ip2 at ipc0 drive 2 flags 0
   disk   ip3 at ipc0 drive 3 flags 0
   ```
   
   **NOTE:** The first two lines in the entry above are entered as one. The 4400 supports from 1 to 4 drives.
b. If installing in a Sun 3 with Sun OS 4.0, add a line to allow the driver to use the correct "include" files.

```
cpu       "OS4"       #Suport for OS4 in Sun3
```

3. Add the proper reference for the Interphase controller to the "files" (files.sun3 for OS3.x) file. This file is in the same directory as the configuration file.

Add or modify the following line:

```
sundev/ip.c          optional ip device-driver
```

NOTE: May have "ip not supported".

4. Edit the file /usr/sys/sun/conf.c to include the entry points of the Interphase driver.

a. Add or update the following in the conf.c file:

```c
#include "ip.h"
#if NIP > 0
extern int ipopen(), ipstrategy(), ipread(), ipwrite();
extern int ipdump(), ipioctl(), ipsize(), ipclose();
#else
#define ipopen nodev
#define ipclose nodev
#define ipstrategy nodev
#define ipread nodev
#define ipwrite nodev
#define ipdump nodev
#define ipioctl nodev
#define ipsize 0
#endif
```

b. Add to the end of bdevsw structure in the conf.c file:

```c
{ ipopen, ipclose, ipstrategy, ipdump, /*blk#*/
  ipsize, 0 },
```

NOTE: The "blk#" above represents the block device major number.

EXAMPLE:
Change from:

```c```
```
NOTE: "blk#" has been replaced with the actual block device major number determined by the sequential position of the entry within the structure (in the example above, 22 is used - yours may or may not be the same). This number will be used later in the installation.

For SunOS3.x, there is an entry in position 0 of the bdevsw table that must be changed as follows:

Change from:

```c
{ ipopen, nulldev, ipstrategy, ipdump, /*0*/
ipsize, 0 },
```

To:

```c
{ nodev, nodev, nodev, nodev, /*0*/
nodev, 0 },
```

c. Change the "ip" entry in the cdev structure of the conf.c file.

SunOS4.0 EXAMPLE:

Change from:

```c
{
    nodev, nodev, nodev, nodev, /*4*/
    nodev, nodev, nodev, 0, /*was ip*/
    0,
},
```

To:
\{ ipopen, ipclose, ipread, ipwrite, /*4*/
ipioctl, nulldev, seltrue, 0,
\},

SunOS3.x EXAMPLE:

Change from:

\{ ipopen, nulldev, ipread, ipwrite, /*4*/
ipioctl, nodev, nulldev, 0,
seltrue, 0, 0,
\},

To:

\{ ipopen, ipclose, ipread, ipwrite, /*4*/
ipioctl, nodev, nulldev, 0,
seltrue, 0, 0,
\},

**NOTE:** The 4 in "/*4*/" above represents the character device major number.

d. If using a Sun4 with SunOS3.2 rev2, change the following:

```
#if NIPC > 0
```
to

```
#if NIP > 0
```

5. Edit the file "devices" or "devices.sun3" to include the Interphase designation.

Add or change the following line:

```
ip blk#
```

**NOTE:** "blk#" in the line above must be replaced with the block device major number assigned earlier in step 4.
6. Edit the /dev/MAKEDEV file, changing or adding the Interphase designation, "ip" in the appropriate places.

**EXAMPLE:**

Change from:
```bash
xd*!xy*!sd*)
    unit='expr $1 : '..\(.*\)'"
    case $1 in
        xd*) name=xd; blk=10; chr=42;;
        ip*!xd*!xy*!sd*)
    unit='expr $1 : '..\(.*\)'"
    case $1 in
        ip*) name=ip; blk=blk#; chr=4;"
        xd*) name=xd; blk=10; chr=42;;
```

To:
```bash
ip*!xd*!xy*!sd*)
    unit='expr $1 : '..\(.*\)'"
    case $1 in
        ip*) name=ip; blk=blk#; chr=4;;
        xd*) name=xd; blk=10; chr=42;;
```

**NOTE:** The "blk#" in blk=blk# should be replaced with the block device major number assigned in step 4.

7. Create the appropriate nodes in /dev for communicating with the driver.

**EXAMPLE:**

```bash
MAKEDEV ip0 ip1 ip2 ip3
```

MAKEDEV must be executed for each drive attached to the controller.

8. Use the config command to place the devices in the configuration process, and generate the new kernel.

**EXAMPLE:**
```bash
cd /usr/sys/conf ;SunOS3.x
cd /usr/sys/sun3/conf ;Sun3 OS4.0
cd /usr/sys/sun4/conf ;Sun4 OS4.0
config IP
```

After the config is completed:
```bash
cd ../IP
make
```
Any errors in the installation will normally show up at this time. If no errors occur, save the current working kernel and copy the new kernel to the root partition.

```bash
cp /vmunix /vmunix.bak
cp vmunix /vmunix.IP
```

9. Boot the new kernel and test the driver functions.

Shut down the system and try the new kernel.

```bash
% halt
>b xx(0,0,0)vmunix.IP
```

(Where xx is the boot device)

Monitor the boot sequence for the presence of the ipc0 controller.

**EXAMPLE:**

Phoenix 4400 Firmware Rev: 6.040 (9/30/88)
IP Driver modes < MACSI, Overlapped seeks >.
ipc0 at vme16d16 7000 vec 0x50 vec 0x51 vec 0x52
ip0 at ipc0 slave 0

10. Format, partition, and label the drive(s).

To compile the disk utility, enter:

```bash
cd /usr/sys/iphase/ip/util
make ipdiag
ipdiag ip0
```

**NOTE:** Refer to the ipdiag users guide for further information.

11. Create and tune a filesystem on the specific partitions to be used.

Create a filesystem on the partitions to be used.

```bash
newfs /dev/rip0X
```

(where X is one of the partitions a, d, e, f, g, or h)

Tune the filesystem for faster data I/O.

```bash
tunefs -a 40 -d 0 /dev/rip0X
```

(where X is one of the partitions a, d, e, f, g, or h)
LIST OF COMMANDS

The following commands are supported through the ipdiag program.

```
attrs        : reset attributes and reinit
burst       : set dma burst length
dump        : dump sector in hex
flawlist    : display manufacturers flaw map
flawload    : load manufacturers flaw map from file
flawscan    : read manufactures flaw map
format      : (re)format entire disk
gaps        : reset gaps and reinit
labelit     : write label onto disk
maplist     : print mapped flaw table
mapload     : load map table from file
mapout      : manually map out a flaw
parts       : edit partitions
pconfig     : print current configuration
quit        : exit program
readuib     : display UIB (Unit Initialzation Block)
reinit      : reinitialize configuration
restore     : clear fault and recalibrate
rhdrs       : read sector headers
verify      : display pack label
scan        : scan disk for bad spots
help        : display command list
```

COMMAND DESCRIPTIONS

RESET ATTRIBUTES and REINITIALIZE CONFIGURATION - "attrs"

Modify the UIB attribute bits. The utility displays the default attributes
determined from the disk label or from the drive type list taken from the
disktab file.
All the options available are explained in the disk controller user's guide under the Initialization section.

RESET DMA BURST LENGTH - "burst"

Sets the number of VME transfers before releasing the bus and re-requesting it.

Refer to the controller user's guide for detailed description.

DUMP SECTOR IN HEX - "dump"

View the data contents of a given sector in hexadecimal. If no arguments are supplied, the user is prompted for the cylinder, head, and sector.

DISPLAY FLAW MAP - "flawlist"

Displays the manufacturers defect list after the list has been read from the drive (with flawscan). Also writes list to a text file (flawlist 'filename'). It is recommended that the flawlist be written to a text file before formatting.

LOAD FLAW MAP from FILE- "flawload"

Load the manufacturers defective media list from a text file (written with flawlist) into the utility for processing.

READ MANUFACTURES FLAW MAP - "flawscan"

Scans the drive for the manufacturers defect list. This command will determine the type of device being used (SMD or ESDI) and check the proper areas according to the interface specification.

FORMAT ENTIRE DISK - "format"

Formats disk drive. This command does not allow the user to perform a partial format.

RESET GAPS and REINITIALIZE - "gaps"

Changes intersector gaps. This command defaults to the gaps from the current UIB. Gaps are entered in number of words (decimal).

WRITE LABEL ONTO DISK - "labelit"

Writes the label information to the disk after formatting.
PRINT MAPPED FLAW TABLE - "maplist"
Displays the tracks that have been mapped to the alternate forwarding area, and the sectors that have been slipped. This command also writes the maplist to a text file (maplist 'filename').

LOAD MAP TABLE FROM FILE - "mapload"
Reads in an ASCII text file (created with maplist) that contains the defective sector and track information.

MANUALLY MAP OUT A DEFECT - "mapout"
Allows the user to selectively slip a sector or map a track.

EDIT PARTITION TABLE - "parts"
Modify the partition table retrieved from the disktab file or to manually enter a new one. The ipdiag utility does not modify the disktab file.

PRINT CURRENT CONFIGURATION - "pconfig"
Displays the controller information, the firmware rev., and all other current configuration information from internal tables within the utility.

EXIT PROGRAM - "quit"
Terminates the ipdiag program.

READ AND DISPLAY DRIVE UIB - "readuib"
Reads the device UIB (Unit Initialization Block) from the controller and displays it.

REINITIALIZE CONFIGURATION - "reinit"
This command allows the user to select the desired drive type from the disktab file or manually enter a UIB and reinitializes the controller.

CLEAR FAULT and RECALIBRATE - "restore"
Clears drive faults and recalibrates the drive.
READ SECTOR HEADERS - "rhdrs"
Displays the sector headers for the selected track, and will step one track at a time.

DISPLAY PACK LABEL - "verify"
This command reads the disk label.

SCAN DISK FOR BAD SPOTS - "scan"
This command allows the user to scan selective areas of the disk for defective media. If bad areas are encountered, ipdiag will automatically map the bad track or slip the sector if slip sectoring is enabled.

DISPLAY COMMAND LIST - "help"
This command displays the available commands for the ipdiag utility.

DISK GEOMETRY, PARTITION, and UIB LAYOUT TABLE - (The 'disktab' file)
The first field is a drive type - it is currently not used. The second field is a drive type name, and is what the utility will display. The utility will use the first field if the second field is absent.

Numeric fields should be entered as follows:

key#n key is the keyname and n is in decimal
key#On key is the keyname and n is in octal
key#0xn key is the keyname and n is in hex

Key:

<table>
<thead>
<tr>
<th>ty</th>
<th>type of disk 'esdi'</th>
<th>'smd'</th>
<th>'scsi'</th>
</tr>
</thead>
<tbody>
<tr>
<td>nh</td>
<td>#heads/cylinder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ns</td>
<td>#sectors/track</td>
<td></td>
<td></td>
</tr>
<tr>
<td>nc</td>
<td>#cylinders/disk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>na</td>
<td>#alternate cylinders for track mapping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>skew</td>
<td>#Spiral SKEW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g1</td>
<td>#gap 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g2</td>
<td>#gap 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RSE</td>
<td>Runt Sector Enable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSE</td>
<td>Spare Sector Enable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CE</td>
<td>Cacheing Enable</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DEFECT LIST FILE FORMAT

The manufacturer's defect list is written on the drive at the factory. It is recommended that this list be written to a text file (flawlist) because the information is destroyed the first time the drive is formatted.

The manufacturers defect list is read by both flawscan and format.
Following are examples entries that may appear in a flawlist file:

```
20  3 17190  27
21  3 17190  25
920  7 49920  8
926  4 13170  3
* 956 11 10367  6
```

The first line indicates an error in cylinder 20 head 3 at byte 17190 and is 27 bits in length.

The asterisk denotes CDC recommendation for forwarding the entire track.

Following are examples entries that may appear in a "maplist" file:

```
156  3 23
157  3 23
1246 14 30
1313  4 -1
1316  4 -1
```

The first line indicates an error in cylinder 156 head 3 at sector 23 and the sector has been slipped.

The -1 in the last field indicates that the entire track has been mapped to the forwarding area.
PURPOSE

With the release of the Phoenix/Cheetah/Panther firmware rev 04C, it is now possible to boot your Sun system with an Interphase controller. This document explains the procedure that must be followed to set up the Interphase disk to boot.

ASSUMPTIONS

In order to install the bootable Interphase device in the system, the user must meet the following conditions:

- Know basic UNIX commands.
- Know how to use an editor like vi.
- Have a general understanding of a driver installation.
- The system must have a Sun supported boot device installed.
- Have adequate hardware knowledge to install the board in the system.
- The Interphase controller must be installed and working as an "add-on" device and the block device major number assigned to the 'ip' devices must be known.
OVERVIEW

During the boot process the Interphase disk controller emulates the basic Xy 451 commands needed to read and execute the kernel. Once the kernel is up and running, and the first Interphase command is executed, Xy emulation ceases. The following describes the steps to create a bootable "ip" device:

1. Edit swapgeneric.c to include support for "ip".
2. Create a new kernel, with the "ip" controller addressed at 0xee00.
3. Copy the files from the current boot device to the "ip" device.
4. Edit the fstab file so the system will mount the correct partitions at boot time.
5. Execute installboot to put the bootstrap on the "ip" device.
6. Physically address the "ip" controller at 0xee00.

LIMITATIONS

The first Xy 451 controller in the system is addressed from 0xee40 to 0xee47 (8 bytes), while the Interphase controller is addressed from 0xee00 to 0xefff (512 bytes). In order for the system to boot properly, there cannot be any other devices addressed between 0xee00 and 0xefff. The Xylogics disk and tape controllers fall into this memory space and must be either removed or readdressed to a memory location other than 0xee00 thru 0xefff. If Xylogics 451 controller is used as an add on, do not configure it as controller 0.

CREATING THE INTERPHASE BOOT KERNEL

A configuration file should already exist that can be modified to create the Interphase boot kernel. Copy current configuration file to a new file and edit it in the following manner:
1. Change directory to the "conf" directory and copy the current configuration file to a new file.

   cd /usr/sys/conf          ; Sun3 and Sun4 SunOS3.x
   cd /usr/sys/sun3/conf     ; Sun3 SunOS4.0
   cd /usr/sys/sun4/conf     ; Sun4 SunOS4.0

   cp IP BIP                 ; copy configuration file with ip support
   vi BIP                    ; edit new configuration file

2. Change the ident line.

   from ident GENERIC        to ident "IPHASE_BOOT"

3. Change the config line.

   from config vmunix swap generic  to config vmunix root ip0

4. Change the address for the Interphase controller from 0x7000 to 0xee00 as shown below:

   controller ipc0 at vme16d16 ? csr 0xee00 priority 2 vector
   ipnint 200 ipeint 201 ipscint 202
   disk ip0 at ipc0 drive 0 flags 0
   disk ip1 at ipc0 drive 1 flags 0
   disk ip2 at ipc0 drive 2 flags 0
   disk ip3 at ipc0 drive 3 flags 0

   NOTE: The 4400 supports up to four drives.

5. The following lines must be commented out if they exist (insert a '#' at the beginning of each line) or addressed to a location other than 0xee00 thru 0xefff.

   #controller xyc0 at vme16d16 1 csr 0xee40 priority 2
   vector yintr 0x48
   #controller xyc1 at vme16d16 1 csr 0xee48 priority 2
   vector xyntr 0x49
   #disk xy0 at xyc0 drive 0
   #disk xy1 at xyc0 drive 1
   #disk xy2 at xyc1 drive 0
   #disk xy3 at xyc1 drive 1
#controller xdc0 at vme16d32 ? csr 0xee80 priority 2
vector xdintr 0x44
#controller xdc1 at vme16d32 ? csr 0xee90 priority 2
vector xdintr 0x45
#controller xdc2 at vme16d32 ? csr 0xeea0 priority 2
vector xdintr 0x46
#controller xdc3 at vme16d32 ? csr 0xeeb0 priority 2
vector xdintr 0x47
#disk xd0 at xdc0 drive 0
#disk xd1 at xdc0 drive 1
#disk xd2 at xdc0 drive 2
#disk xd3 at xdc0 drive 3
#disk xd4 at xdc1 drive 0
#disk xd5 at xdc1 drive 1
#disk xd6 at xdc1 drive 2
#disk xd7 at xdc1 drive 3
#disk xd8 at xdc2 drive 0
#disk xd9 at xdc2 drive 1
#disk xd10 at xdc2 drive 2
#disk xd11 at xdc2 drive 3
#disk xd12 at xdc3 drive 0
#disk xd13 at xdc3 drive 1
#disk xd14 at xdc3 drive 2
#disk xd15 at xdc3 drive 3

#controller xtc0 at vme16d16 ? csr 0xee60 priority 3
vector xtintr 0x64
#controller xtc1 at vme16d16 ? csr 0xee68 priority 3
vector xtintr 0x65
#tape xt0 at xtc0 drive 0 flags 1
#tape xt1 at xtc1 drive 0 flags 1

6. Find the block device major number for "ip" devices if not known.

ls -l /dev/ip*
brw-r----- 1 root 22, 0 Dec 19 11:20 /dev/ip0a
brw-r----- 1 root 22, 1 Dec 19 11:20 /dev/ip0b
brw-r----- 1 root 22, 2 Dec 19 11:20 /dev/ip0c
brw-r----- 1 root 22, 3 Dec 19 11:20 /dev/ip0d
brw-r----- 1 root 22, 4 Dec 19 11:20 /dev/ip0e
brw-r----- 1 root 22, 5 Dec 19 11:20 /dev/ip0f
brw-r----- 1 root 22, 6 Dec 19 11:20 /dev/ip0g
brw-r----- 1 root 22, 7 Dec 19 11:20 /dev/ip0h
NOTE: In this example, the block device major number is 22.
If this number is 0 and you are running OS4.0, 'conf.c', 'files', and 'MAKEDEV' files must be changed. New /dev entries must also be created if the major number is changed. Refer to the Device Driver Installation Guide for further information.

7. Modify swapgeneric.c file.

    cd /usr/sys/sun ; change to correct directory
    vi swapgeneric.c ; edit file

Add or modify the following lines:

    #include "ip.h" ; add this entry above xy entry
    #if NIP > 0
        extern struct mb_driver ipcdriver;
    #endif

    #include "xy.h" ; this will already exist
    #if NXY > 0
        extern struct mb_driver xycdriver;
    #endif

    #if NIP > 0 ; add this entry above xy entry
        {"ip", &ipcdriver, makedev(blk#, 0)}, ; see note
    #endif

    #if NXY > 0 ; this will already exist
        {"xy", &xycdriver, makedev(3, 0)},
    #endif

    #if NIP > 0 ; add this entry above xy entry
        {"ip", &ipcdriver, makedev(4, 0), makedev(blk#, 0)},
    #endif ; see note
#if NXY > 0 ; this will already exist
    {"xy", &xyedriver, makedev(9, 0), makedev(3, 0)},
#endif

NOTE: The "blk#" in "makedev(blk#, 0)" must be replaced with the block device major number for the "ip" devices.

8. Compile the new boot kernel.

    cd ../conf or cd conf ; change directory
    config BIP ; configure new kernel
    cd ../BIP ; config will create the directory ../BIP
    make ; compile new kernel
    cp /vmunix /vmunix.bak ; back up old kernel
    cp vmunix /vmunix.BIP ; copy kernel to root directory
    cd / ; goto root directory

CREATE NEW FILE SYSTEMS ON THE INTERPHASE BOOT DISK.

A new file system should be created on the Interphase boot drive, and all partitions of the current boot device must be copied to the corresponding partitions of the Interphase boot drive.

1. Create and tune new file systems.

    newfs /dev/rip0a ; run newfs on each partition to be mounted
    newfs /dev/rip0d
    newfs /dev/rip0e
    newfs /dev/rip0f
    newfs /dev/rip0g
    newfs /dev/rip0h
    tunefs -d 0 -a 40 /dev/rip0a ; run tunefs on each new filesystem
    tunefs -d 0 -a 40 /dev/rip0d
    tunefs -d 0 -a 40 /dev/rip0e
    tunefs -d 0 -a 40 /dev/rip0f
    tunefs -d 0 -a 40 /dev/rip0g
    tunefs -d 0 -a 40 /dev/rip0h
2. Copy all files in each partition of the current boot device to the corresponding "ip" disk partition.

Create directories only for the partitions that are used.

cd /  ; move to root directory
mkdir ip0a  ; make directory for each partition
mkdir ip0d
mkdir ip0e
mkdir ip0f
mkdir ip0g
mkdir ip0h

Mount only the Interphase partitions that are used.

mount /dev/ip0a /ip0a
mount /dev/ip0d /ip0d
mount /dev/ip0e /ip0e
mount /dev/ip0f /ip0f
mount /dev/ip0g /ip0g
mount /dev/ip0h /ip0h

Copy the files from each partition of the current boot disk to the corresponding "ip" partition.

dump 0f - /dev/rxx0a  (cd /ip0a;restore xf - )
dump 0f - /dev/rxx0d  (cd /ip0d;restore xf - )
dump 0f - /dev/rxx0e  (cd /ip0e;restore xf - )
dump 0f - /dev/rxx0f  (cd /ip0f;restore xf - )
dump 0f - /dev/rxx0g  (cd /ip0g;restore xf - )
dump 0f - /dev/rxx0h  (cd /ip0h;restore xf - )

; xx = Sun boot device

**NOTE:** Only execute the dump and restore commands on the partitions that the Sun boot disk uses.
MOVE THE BOOT FILES TO THE DISK

The Interphase disk must contain the bootstrap code and the boot file (bootxy) before it can be booted. This is accomplished with installboot.

```
cd /usr/mdec
Sun3 OS3.x:
installboot bootxy /dev/rip0a

Sun3 OS 4.0, Sun4:
installboot /ip0a/boot bootxy /dev/rip0a
```

UPDATE FSTAB FILE

The fstab file on the "a" partition of the Interphase boot device must be updated.

```
cd /ip0a/etc ; change directory
vi fstab ; edit fstab file
```

Change the file as follows:

Example:

```
from  /dev/xx0a / 4.2 rw 1 1 ; where xx = boot device
to    /dev/ip0a / 4.2 rw 1 1
```

**NOTE:** Change xx to ip for all partitions. Make sure this file is edited correctly, or system will not mount root.

Halt the system.

```
sync;halt
```

Power System Down
**HARDWARE INSTALLATION**

Remove Interphase controller and change switch settings to the proper address as shown below: (change from 7000 to ee00)

<table>
<thead>
<tr>
<th>Switch Number</th>
<th>Position 0x70000</th>
<th>Position 0xee00</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>on</td>
<td>off</td>
</tr>
<tr>
<td>2</td>
<td>on</td>
<td>off</td>
</tr>
<tr>
<td>3</td>
<td>on</td>
<td>off</td>
</tr>
<tr>
<td>4</td>
<td>off</td>
<td>on</td>
</tr>
<tr>
<td>5</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>6</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>7</td>
<td>on</td>
<td>off</td>
</tr>
<tr>
<td>8</td>
<td>off</td>
<td>off</td>
</tr>
</tbody>
</table>

Place the Interphase controller in the Sun card cage. Slots 8 through 12 may be used. If a 6u board is used (Cheetah or Panther) it should be placed in the upper two VME connectors of the chosen slot or placed in a 9u adapter board.

Power System Up.

**MODIFY THE SUN EEPROM**

The EEPROM must be set up to think it is booting off of the Xy disk controller. This is accomplished by doing the following:

```
L1 A
>q 18 ; abort autoboot
>EEPROM 018: 00 ? 12 ; open EEPROM
>EEPROM 019: 00 ? 78 ; set for xy boot device
>EEPROM 01A: 00 ? 79
>EEPROM 01B: 00 ? 00
>EEPROM 01C: 00 ? 00
>EEPROM 01D: 00 ? 00
>EEPROM 01E: 00 ? ; press space bar and return
```

**NOTE:** The system will not work in boot device polling mode (EEPROM address 018 = 00). This is because the xd device is polled first and the Interphase controller sends back a dtack. The system believes that the xd boot device exists and will attempt to communicate with it instead of the xy device.
BOOTING WITH THE NEW BOOT DISK

The system is now ready to boot off of the Interphase disk.

Test new kernel:

```
LI A
> b xy()vmunix.BIP -s ; abort autoboot
```

; test Interphase boot kernel

If the system boot with no problems, rename kernel.

```
mv vmunix.BIP vmunix
sync;halt ; bring system down
```

Power the system down/up and the autoboot process should boot the system. If the message "waiting for disk to spin up..." appears you must boot manually.

```
> b ; boot system
```
PURPOSE

With the release of the latest 4400 Phoenix/4200 Cheetah/4201 Panther (05A) firmware or above, it is now possible to format, load tapes and boot your Sun system with an Interphase controller. This document explains the procedure that must be followed to set up the Interphase disk to allow booting.

ASSUMPTIONS

In order to install the bootable Interphase device in the system, the customer must have the following skills:

- Be able to build a virgin system.
- Know basic UNIX commands.
- Know how to use an editor like vi.
- Have a general understanding of a driver installation.
- Have adequate hardware knowledge to install the board in the system.
- Use the Sun supplied documentation for building a virgin system with SunOS4.0 (OS3.x not fully tested). This document shows deviations from the normal install.

OVERVIEW

Where possible, use the Interphase utility "ipdiag" to format and partition the drive (refer to Ipdiag Users Guide). This utility is a "runtime" program that requires the "ip" driver to be loaded in the kernel. If this is not possible – ie. no other boot device –, use the Sun "format" utility to format and partition the disk.
This document was written to support the user building the system from scratch using full emulation. Use this document and the Sun supplied documentation to complete this process. During the boot process, the Interphase disk controller emulates Xy 451 commands. Once the kernel with the ip driver is up and running and the first Interphase command is executed, Xy emulation ceases. The following describes the steps to create an Interphase bootable system:

1. Place Interphase board in system at address 0xee00.
2. Format the Interphase disk as if it were a xy451, using the Sun supplied utility.
3. Load the Sun distribution tapes to the Interphase disk as if it were a xy disk.
4. Boot the system in xy mode.
5. Build a new kernel that includes the Interphase driver.
6. Halt the system and reboot new kernel.

LIMITATIONS

The first xy451 disk controller used is addressed from 0xee40 to 0xee47 (8 bytes), while the Interphase controller is addressed from 0xee00 to 0xefff (512 bytes). In order for the system to execute properly, there cannot be any other device mapped between 0xee00 and 0xefff. The Xylogics disk and tape controllers fall into this memory space and must be moved to a different part of memory or removed. If Xylogics 451 controller is used as an add on, do not configure it as controller 0.

Formatting the Interphase disk with the Sun utility is more difficult and time-consuming than with Ipdiag. For this reason it is recommended that Ipdiag be used whenever possible.

The controller should run in emulation mode only long enough to format, load the OS and build a new kernel. During normal operation, always use a kernel with the ip driver.
HARDWARE INSTALLATION

Set the Interphase controller switch settings to the proper address as shown below:

<table>
<thead>
<tr>
<th>Switch Number</th>
<th>Position 0xee00</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>off</td>
</tr>
<tr>
<td>2</td>
<td>off</td>
</tr>
<tr>
<td>3</td>
<td>off</td>
</tr>
<tr>
<td>4</td>
<td>on</td>
</tr>
<tr>
<td>5</td>
<td>off</td>
</tr>
<tr>
<td>6</td>
<td>off</td>
</tr>
<tr>
<td>7</td>
<td>off</td>
</tr>
<tr>
<td>8</td>
<td>off</td>
</tr>
</tbody>
</table>

Power the Sun system down. Place the Interphase controller in the Sun card cage. Slots 8 through 12 may be used. If a 6u board is used (Cheetah or Panther) it should be placed in the upper two VME connectors of the slot chosen or placed in a 9u adapter board.

On the back of the card cage there are jumpers that must be removed. Find the jumper block for the slot that the controller was placed in and remove the bus grant 3 and IACK jumpers. The BG3 jumper is the fourth jumper down in a group of four. The IACK jumper is the fifth jumper down and is by itself.

Attach the cables from the controller to the drive.

FORMAT AND PARTITION INTERPHASE DISK

The Interphase disk needs to be formatted, partitioned, and labeled before the OS can be loaded (if using ipdiag to format, skip this section and refer to the Ipdiag Users Guide). Load MUNIX per Sun's installation procedure to system memory. Boot MUNIX and execute the formatter.

NOTE: User input is shown in bold print.
1. Power up system and boot mini unix:

   > b st()
   Boot: st(0,0,0)
   Boot: st(0,0,4) -asw

   ... Ethernet address = x:x:x:x:x:x
   xdc0: controller reset failed
   xdc1: controller reset failed
   xdc2: controller reset failed
   xdc3: controller reset failed

   xyc0 at vme16d16 0xee40 vec 0x48
   xy0 at xyc0 slave 0
   xy0: unable to read label

   or xy0: <drive name cyl xxxx alt x hd xx sec xx>

   xyc1: controller reset failed
   si0 at vme 24d16 0x200000 vec 0x40

   ... root filesystem type (spec 4.2 nfs) : 4.2
   root device (rd%d[a-h]) : rd0a
   init ram disk from [st1, st0] : st1
   tape file number? 5
   swap filesystem type (spec 4.2 nfs) : spec
   swap device (ns%d[a-h]) : ns0a

   #

   NOTE: The controller reset failed errors are normal.

2. Execute format program:

Before the disk can be formatted, the Interphase UIB must be set up. This is accomplished by issuing the type command twice. The first type command sets the gaps, number of alternate cylinders and the drive attributes. The second type command sets the drive geometry (number of cylinders, heads and sectors).

   NOTE: All values are entered in decimal.

   # format
   Specify disk (enter its number): 0
If the drive has a valid label the following will appear.

Need info -- Enter total bytes/sector [600]: \text{xx}
; enter total number of bytes per sector
Need info -- Enter drive type [0]: \text{x}
; ALWAYS use a spare sector
; where \text{x} equals one of the following:
; 0 - no spare and no runt (do not use)
; 1 - spare and no runt
; 2 - no spare and runt (do not use)
; 3 - spare and runt

3. First type command:

This first type command does not use drive parameters as would be expected. The firmware on the Interphase controller will look at the cylinder count, and if it is less than 12, will go into a special mode to set the gaps, alternate cylinders and the attribute byte.

\text{format} > \text{type}
Specify disk type (enter its number) [7]: 8
; ALWAYS choose other
; this may be 9 if a valid label exists on the disk
Enter number of data cylinders: 1
Enter number of alternate cylinders [2]: \text{xx}
; this number must be between 2 and 10
Enter number of physical cylinders [\text{xx}]: <\text{cr}>
Enter number of heads: \text{xx}
; number of words in gap2
Enter number of data sectors/track: \text{xx}
; number of words in gap1
Enter rpm of drive [3600]: <\text{cr}>
Enter total bytes/sector: \text{xx}
; enter total number of bytes per sector
Enter drive type: \text{x}
; ALWAYS run with a spare sector
; where \text{x} equals one of the following:
; 0 - no spare and no runt (do not use)
; 1 - spare and no runt
; 2 - no spare and runt (do not use)
; 3 - spare and runt
Enter disk type name (remember quotes): "drive name uib"
4. Second type command:

This second type command will function normally. The cylinder count must be greater than 12.

```
format> type
Specify disk type (enter its number) [8]: 9
 ; ALWAYS choose other
 ; this may be 10 if a valid label exists on the disk
Enter number of data cylinders: xx
Enter number of alternate cylinders [2]: xx
 ; this number must equal the number entered in the
 ; first type command
Enter number of physical cylinders [xx]: <cr>
Enter number of heads: xx
 ; number of heads per cylinder
Enter number of data sectors/track: xx
 ; number of sectors per track not including runt or
 ; spare (ex. total sec = 48 but running runt and spare,
 ; then xx will equal 46)
Enter rpm of drive [3600]: <cr>
Enter total bytes/sector: xx
 ; enter total number of bytes per sector
Enter drive type: x
 ; this number must equal the number entered in the
 ; first type command
Enter disk type name (remember quotes): "drive name"
```

5. Defect command:

If the manufactures defect list still exists on the disk it will be extracted with this command.

```
format> defect
defect> original
Ready to update working list. This cannot be interrupted and may take a long while. Continue? y
```
The following may appear, if the disk has already been formatted and the manufactures defect list does not exist.

Disk is not fully encoded with defect info.
Do you wish to stop extracting? y

defect> q
Warning: working defect list modified; but not committed
Do you wish to commit changes to current defect list? y

**NOTE:** Follow the Installing the SunOS\[tm\] documentation on how to save manufactures defect list to tape.

6. Format and verify alternate cylinders:

   The alternate cylinders must be formatted first. This is because the Sun software will map a sector if there are no more spare sectors available on the track. The Interphase controller will not map sectors, instead it will map tracks. This is why you should always run with a spare sector. The Interphase controller only has one spare sector per track. If there is more than one bad sector on a track, the controller will map the whole track. If all the cylinders are formatted and verified at the same time the Sun software will not work properly if a track is mapped.

a. Analyze command for alternate cylinders:

   ```
   format> analyze
   analyze> setup
   Analyze entire disk [yes]? no
   Enter starting block number [0, 0/0/0]: xx/xx/xx
   ; where xx/xx/xx equals the start of the alternate
   ; cylinders. ex. # of data cyl = 1200 and the
   ; # of alt cyl = 4 then the starting block will
   ; be 1200/0/0.
   ```
Enter ending block number [yy, yy/yy/yy]: xx/xx/xx
; where xx/xx/xx equals the end of the alternate cylinders, in the example above it would be 1203/9/47 if the number of heads = 10 and the number of sectors = 48.
Loop continuously [no]? <cr>
Enter number of passes [2]: 10
Repair defective blocks [yes]? <cr>
Stop after first error [no]? <cr>
Use random bit patterns [no]? <cr>
Enter number of blocks per transfer [126, xx/xx/xx]: 0/1/0
Verify media after formatting [yes]? <cr>
Enable extended messages [no]? <cr>
analyze> q

b. Format command for alternate cylinders

The format program is now set up and the alternate cylinders can be formatted. Once this process begins do not ^C out of it until it is finished or has run a minimum of ten passes.

format> format
Enter starting block number [0, 0/0/0]: xx/xx/xx
; enter the start of the alternate cylinders.
; in the example above this would be equal to 1200/0/0.
Enter ending block number [yy, yy/yy/yy]: xx/xx/xx
; enter the end of the alternate cylinders.
; in the example above this would be equal to 1203/9/47.
Ready to format. Formatting cannot be interrupted and takes x minutes (estimated). Continue? y

NOTE: If any of the tracks on the alternate cylinders have more than 1 bad sector, that track cannot be used. If this is the case, the number of data cylinders must be lowered so the bad track in the alternate area is not used. To do this exit the format program and begin again.
7. Format and verify data cylinders:

a. Analyze command for data cylinders:

```
format> analyze
analyze> setup
Analyze entire disk [yes]? no
Enter starting block number [0, 0/0/0]: xx/xx/xx
; where xx/xx/xx equals the start of the data
cylinders. ex. # of data cyl = 1200 and the
; # of alt cyl = 4 then the starting block will
; be 0/0/0.
Enter ending block number [yy, yy/yy/yy]: xx/xx/xx
; where xx/xx/xx equals the end of the data
cylinders. in the example above it would be
; 1199/9/47 if the number of heads = 10 and the
; number of sectors = 48.
Loop continuously [no]? <cr>
; it is best to say yes and let run over night
Enter number of passes [2]: 10
Repair defective blocks [yes]? <cr>
Stop after first error [no]? <cr>
Use random bit patterns [no]? <cr>
Enter number of blocks per transfer [126, xx/xx/xx]: 0/1/0
Verify media after formatting [yes]? <cr>
Enable extended messages [no]? <cr>
analyze> q
```

b. Format command for data cylinders:

The format program is now set up and the data cylinders can be formatted. Once this process begins do not ^C until the format phase is completed.

```
format> format
Enter starting block number [0, 0/0/0]: xx/xx/xx
; enter the start of the data cylinders.
; in the example above this would be equal to
; 0/0/0.
Enter ending block number [yy, yy/yy/yy]: xx/xx/xx
; enter the end of the data cylinders.
; in the example above this would be equal to
; 1199/9/47.
Ready to format. Formatting cannot be interrupted and takes x minutes (estimated). Continue? y
```
NOTE: The number of minutes may be different than estimated.

8. Partition command:

Partition the disk as desired.

format> partition
partition> a
    ; do this command for each partition used
Enter new starting cyl [0]: xx
    ; enter starting cyl
Enter new # blocks [yy, zz/zz/zz]: xx
    ; enter number of blocks or cylinders.
partition> print
    ; verify that the partition table is correct
partition> label
Ready to label disk, continue? y
partition> q

9. Exit format program:

format> q
LOADING THE SUN DISTRIBUTION TAPES

The file system can be built at this time and the files loaded from tape. Follow the Sun installation guide provided with the OS 4.0 operating system (Installing the SunOS[tm]).

```
>b st()
Boot: st(0,0,0)
Boot: st(0,0,2)
Size ...
Standalone Copy
From: st(0,0,3)
To: xy(0,0,1)
Copy completed ... bytes
Boot: xy(0,0,1)vmunix -asw
...
Ethernet address = x:x:x:x:x:x
xdc0: controller reset failed
xdc1: controller reset failed
xdc2: controller reset failed
xdc3: controller reset failed
xyc0 at vme16d16 0xee40 vec 0x48
xy0 at xyc0 slave 0
xy0: <drive name cyl xxxx alt x hd xx sec xx>
xycl: controller reset failed
si0 at vme 24d16 0x200000 vec 0x40
...
root filesystem type (spec 4.2 nfs) : 4.2
root device (xy%d[a-h]) : xy0b
swap filesystem type (spec 4.2 nfs) : spec
swap device (xy%d[a-h]) : xy0b
Swapping on root device? y
...
# suninstall
```

Set up system as if using xy451, per suninstall documentation. After the SunOS is loaded, reboot.

```
#halt
L1 A
```

```
>b xy()
Boot: xy(0,0,0)
Size ...
...
```
Ethernet address = x:x:x:x:x
xdc0: controller reset failed
xdc1: controller reset failed
xdc2: controller reset failed
xdc3: controller reset failed
xyc0 at vme16d16 0xee40 vec 0x48
xy0 at xyc0 slave 0
xy0: <drive name cyl xxxx alt x hd xx sec xx>
xcy1: controller reset failed
si0 at vme 24d16 0x200000 vec 0x40
...

systemname login: root
systemname#

The system will be running in xy mode. The Interphase kernel must be made as shown below.

CREATING THE INTERPHASE BOOT KERNEL

1. Remove the files from the distribution media and place in the appropriate directory.

   cd /usr/sys
   tar -xvf /dev/rst8 ; 1/4 inch cartridge tape
   or
   tar -xvf /dev/rmt0 ; 1/2 inch reel tape

   Copy driver and include files (ip.c and ipreg.h) to /usr/sys/sundev

   cp /usr/sys/iphase/ip/drvr/* /usr/sys/sundev/

2. Copy the current system configuration file to a new file and add an entry for the Interphase controller.

   cd /usr/sys/conf ; SunOS 3.x
   cd /usr/sys/sun3/conf ; Sun3 OS4
   cd /usr/sys/sun4/conf ; Sun4 OS4
   cp GENERIC BIP
Installation for Full Emulation

a. Edit this new system configuration file and add the following entry for the first Interphase controller ipc0, at the end of the new configuration file.

```
controller ipc0 at vme16d16 ? csr 0xee00 priority 2 vector
ipnint 200 ipoint 201 ipsinct 202
disk ip0 at ipc0 drive 0 flags 0
disk ip1 at ipc0 drive 1 flags 0
disk ip2 at ipc0 drive 2 flags 0
disk ip3 at ipc0 drive 3 flags 0
```

**NOTE:** The first two lines in the entry above are entered as one. The 4400 supports from 1 to 4 drives.

b. Change the "ident" line to something other than generic.

```
from ident GENERIC
to ident "BOOT_IP"
```

c. Change the "config" line as follows:

```
from config vmunix swap generic
to config vmunix root ip0
```

d. The following lines must be commented out (if they exist) or their memory address must be changed so they do not fall between 0xee00 and 0xefff

```
#controller xyc0 at vme16d16 1 csr 0xee40 priority 2 vector
xyintr 0x48
#controller xycl at vme16d16 1 csr 0xee48 priority 2 vector
xyintr 0x49
#disk xy0 at xyc0 drive 0
#disk xy1 at xyc0 drive 1
#disk xy2 at xycl drive 0
#disk xy3 at xycl drive 1

#controller xdc0 at vme16d32 ? csr 0xee80 priority 2 vector
xdintr 0x44
#controller xdc1 at vme16d32 ? csr 0xee90 priority 2 vector
xdintr 0x45
#controller xdc2 at vme16d32 ? csr 0xeea0 priority 2 vector
xdintr 0x46
#controller xdc3 at vme16d32 ? csr 0xeeb0 priority 2 vector
xdintr 0x47
```
#disk xdo at xdc0 drive 0
#disk xd1 at xdc0 drive 1
#disk xd2 at xdc0 drive 2
#disk xd3 at xdc0 drive 3
#disk xd4 at xdc1 drive 0
#disk xd5 at xdc1 drive 1
#disk xd6 at xdc1 drive 2
#disk xd7 at xdc1 drive 3
#disk xd8 at xdc2 drive 0
#disk xd9 at xdc2 drive 1
#disk xd10 at xdc2 drive 2
#disk xd11 at xdc2 drive 3
#disk xd12 at xdc3 drive 0
#disk xd13 at xdc3 drive 1
#disk xd14 at xdc3 drive 2
#disk xd15 at xdc3 drive 3

#controller xtc0 at vme16d16 csr 0xee60 priority 3 vector
#controller xtc1 at vme16d16 csr 0xee68 priority 3 vector
#tape xt0 at xtc0 drive 0 flags 1
#tape xt1 at xtc1 drive 0 flags 1

e. If using a Sun3 with SunOS4.0, add a line to allow the driver to use the correct "include" files.

cpu "OS4" # Support for SunOS4 in Sun3

3. Add the proper reference for the Interphase controller to the "files" (files.sun3 for Sun3 w/OS3.x) file. This file is located in the same directory as the configuration file.

Add or modify the following line:
sundev/ip.c optional ip device-driver

NOTE: May have "ip not supported".

4. Edit the file /usr/sys/sun/conf.c to include the driver entry points of the Interphase device driver.

a. Add or update the following in the conf.c file:

#include "ip.h"
#if NIP > 0
extern int ipopen(), ipstrategy(), ipread(), ipwrite();
extern int ipdump(), ipioctl(), ipsize(), ipclose();
#else
#define ipopen nodev
#define ipclose nodev
#define ipstrategy nodev
#define ipread nodev
#define ipwrite nodev
#define ipdump nodev
#define ipioctl nodev
#define ipsize 0
#endif

b. Add to the end of bdevsw structure in the conf.c file:

```
{ ipopen, ipclose, ipstrategy, ipdump, /*blk#*/
ipsize, 0 },
```

**NOTE:** "blk#" above represents the block device major number.

**EXAMPLE:**

Change from:

```
.
.
};
int nblkdev = sizeof (bdevsw) / sizeof (bdevsw[0]);
.
.
```

To:

```
.
.
{ ipopen, ipclose, ipstrategy, ipdump, /*22*/
ipsize, 0 },
};
int nblkdev = sizeof (bdevsw) / sizeof (bdevsw[0]);
.
.
```
NOTE: "blk#" above should be replaced with the block device major number determined by the sequential position of the entry within the structure (in the example above, 22 is used - yours may not be the same). This number will be used later in the installation.

For SunOS3.x, there is an entry in position 0 of the bdevsw table that must be changed as follows:

Change from:

```c
{ ipopen, nulldev, ipstrategy, ipdump,/*0*/
  ipsize, 0 },
```

To:

```c
{ nodev, nodev, nodev, nodev,/*0*/
  nodev, 0 },
```

c. Change the "ip" entry at position 4 in the cdev structure of the conf.c file.

SunOS4.0 EXAMPLE:

Change from:

```c
{ nodev, nodev, nodev, nodev,/*4*/
  nodev, nodev, nodev, 0,/*was ip*/
  0, },
```

To:

```c
{ ipopen, ipclose, ipread, ipwrite,/*4*/
  ipioctl, nulldev, seltrue, 0,
  0, },
```
SunOS3.x EXAMPLE:

Change from:

```c
{
ipapen, nulldev, ipread, ipwrite,/*4*/
 ipioctl, nodev, nulldev, 0,
 seltrue, 0, 0,
},
```

To:

```c
{
ipapen, ipclose, ipread, ipwrite,/*4*/
ipioctl, nodev, nulldev, 0,
seltrue, 0, 0,
},
```

NOTE: The "/*4*/" above represents the character device major number.

d. If using a Sun4 with SunOS3.2 rev2, change the following:

```c
#if NPC > 0
to
#endif
```

5. Edit the swapgeneric.c file (same directory as conf.c) to include the following:

```c
... #include "ip.h" ; add this entry above xy entry
#if NIP > 0 extern struct mb_driver ipcdriver;
#endif

#include "xy.h" ; this will already exist
#if NXY > 0 extern struct mb_driver xycdriver;
#endif
```

...
#if NIP > 0 ; add this entry above xy entry
{"ip", &ipcdriver, makedev(blk#, 0)}, ; see note
#endif

#if NXY > 0 ; this will already exist
{"xy", &xyddriver, makedev(3, 0)}
#endif
...

#if NIP > 0 ; add this entry above xy entry
{"ip", &ipcdriver, makedev(4, 0), makedev(blk#, 0)},
#endif ; see note below

#if NXY > 0 ; this will already exist
{"xy", &xyddriver, makedev(9, 0), makedev(3, 0)}
#endif
...

NOTE: makedev(blk#, 0) - blk# must be replaced by the
Interphase block device major number assigned in step 4.

6. Edit the file "devices" or "devices.sun3" (in the same directory as
the configuration file) to include the correct block device major
number for "ip".

Add or change the following line:

ip blk#

NOTE: "blk#" in the line above must be replaced with the
block device major number assigned earlier in step 4.

7. Edit the /dev/MAKEDEV file, changing or adding the Interphase
designation, "ip" in the appropriate places.

EXAMPLE:
Change from:

xd*!xy*!sd*)
  unit='expr $1 : '..\(.\.*)\''
case $1 in
  xd*) name=xd; blk=10; chr=42;;
To:

ip*|xd*|xy*|sd*)

unit='expr $1 : ..\(.*\)'"
case $1 in
ip*) name=ip; blk=blk#; chr=4;;
xd*) name=xd; blk=10; chr=42;;

NOTE: The "blk#" in blk=blk# should be replaced with the block device major number.

8. Create the appropriate nodes in /dev for communicating with the driver.

EXAMPLE:

MAKEDEV ip0 ip1 ip2 ip3

MAKEDEV must be executed for each drive being used.

9. Use the config command to place the devices in the configuration process, and generate the new kernel.

EXAMPLE:

cd /usr/sys/conf ;SunOS3.x
cd /usr/sys/sun3/conf ;Sun3 OS4.0
cd /usr/sys/sun4/conf ;Sun4 OS4.0
cfg BIP

After the config is completed:

cd ../.BIP
make

Any errors in the installation will normally show up at this time. If no errors occur, save the current working kernel and copy the new kernel to the root partition.

cp /vmunix /vmunix.bak
cp vmunix /vmunix.BIP
UPDATE FSTAB FILE

The fstab file on the root partition of the Interphase boot device must be updated.

```
cd /etc ; change directory
vi fstab ; edit fstab file
```

Change all of the partitions in the following manner:

from  /dev/xyOa / 4.2 rw 1 1
to    /dev/ip0a / 4.2 rw 1 1

**NOTE:** Change xy to ip for all partitions.

The Interphase disk is now set up and ready to boot.

MODIFY THE SUN EEPROM

The EEPROM must be set up to think it is booting off of the Xy disk controller. Halt the system and do the following:

```
>q 18       ; open EEPROM
>EEPROM 018: 00 ? 12
>EEPROM 019: 00 ? 78       ; set for xy boot device
>EEPROM 01A: 00 ? 79
>EEPROM 01B: 00 ? 00
>EEPROM 01C: 00 ? 00
>EEPROM 01D: 00 ? 00
>EEPROM 01E: 00 ?       ; press space bar and return
>
```

Power system down.

**NOTE:** The system will not work in boot device polling mode (EEPROM address 018 = 00). This is because the xd device is polled first and the Interphase controller sends back a dtack. The system believes that the xd boot device exists and will attempt to communicate with it instead of the xy device.
BOOTING WITH THE NEW BOOT DISK

Test new boot kernel

Power system up

L1 A ; abort autoboot
b xy()vmunix.BIP -s ; test Interphase boot kernel

If the system boots with no problems, rename new kernel to vmunix.

mv vmunix.BIP vmunix

Tune file system for better system performance. Execute tunefs on each partition of the "ip" disk that will be mounted.

tunefs -d 0 -a 40 /dev/ip0x

sync;halt ; bring system down

Cycle power to test the auto boot process.

If the message "waiting for disk to spin up..." appears you must boot manually.
LET US KNOW WHAT YOU THINK!

At Interphase, we are constantly working to improve our products to better meet the needs of our customers. One area we are always concerned with is user documentation. Make a copy of this form, fill it out and mail it to us, but save the original. That way, we can get a better understanding of what would be most helpful to you, and in the future if you have any further comments, you will still have a handy way of communicating them to us.

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Have you used User Manuals provided with other manufacturer's disk/tape controllers? yes____ no____

If yes, how does this one compare?

____________________________________________________________________

Although every effort is made to insure the integrity of the information provided to our customers, sometimes oversights do occur. Inform us of any errors you may have noticed in the text and give the page number on which it occurs if possible.

____________________________________________________________________

Comments: __________________________________________________________

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Name: ____________________________
Title: _____________________________
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We at Interphase want to hear from you.

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