This section contains general installation information, and describes installation procedures for Bus Based Gateway (BBG) and VME (also called Native ATM) interfaces. See subsection 3.2, page 10, for information on installing BBG interfaces, and see subsection 3.3, page 29, for information on installing VME interfaces.

Installation information
3.1

This subsection contains general installation information that you might need when you install an ATM interface.

Installer qualifications
3.1.1

To install the ATM interface, you should be familiar with the hardware and software for the system on which the ATM is to be installed. Prior experience in upgrading or installing the UNICOS operating system on a Cray Research system is advised. To configure ATM by using the UNICOS Installation/Configuration Menu System, prior knowledge of this menu system is required. (See the *UNICOS Installation and Configuration Tool Reference Manual*, publication SR–3090, for details.)

Removed parts disposition
3.1.2

If you remove parts, return the removed parts to the following address:

> Cray Research Inc.
> 1000 Halbleib Road
> Chippewa Falls, WI 54729
> USA
> Attn., REM

Spares issues
3.1.3

The Cray Research Logistics department reviews all field upgrade notices (FUNs) and determines whether to place spare parts at the country, parts banks, or local depot levels. Contact your local Logistics personnel for local spare parts issues.

Incident reporting
3.1.4

After the upgrade has been installed, the site must complete upgrade incident information within the appropriate database.

Installing a BBG interface
3.2

The following subsections contain the following procedures to install, configure, and test a BBG interface on a Cray Research system with an IOS model E (IOS-E) system:

1. Install UNICOS software

2. Install and verify the HIPPI channel

3. Install the BBG hardware

4. Build the BBG asynchronous software

5. Configure UNICOS for the BBG interface

6. Verify and test the BBG interface

Step 1: Install UNICOS software
3.2.1

Your Cray Research system must be running UNICOS release 9.0 or later. If this is not the case, follow the appropriate UNICOS release 9.0 installation instructions.

Step 2: Install and verify the HIPPI channel
3.2.2

To install the HIPPI channel, follow the instructions in section 3 of the *HIPPI Channel Administrator's Guide*, publication SG–2159. Follow the step-by-step instructions that describe the HIPPI channel installation on Cray Research systems with an IOS-E system.

To verify the HIPPI installation, perform the following steps. If any of the steps fail, correct the failure before moving to the next step. Success of these steps verifies that the HIPPI hardware and software are properly installed.

1. Run the offline HIPPI diagnostics. This step must be performed by the engineer-in-charge (EIC).

2. Attach a HIPPI loopback device to the HIPPI drop cables and run the `/etc/vht` command (see `vht`(8) for options).

3. Attach the HIPPI extension cables and again attach the HIPPI loopback device and execute the `/etc/vht` command.

4. If HIPPI switches are being used, determine the I-field for the Cray Research system, and run the `/etc/vht` command with the *I-field* option. Using the *I-field* option causes the switch to loop the data back to the Cray Research system.

Step 3: Install the BBG hardware
3.2.3

Connect the BBG to the HIPPI channel (or switch) and power it on. Ensure that the BBG front panel LCD display shows the BBG banner and the right hand LED begins to flash on and off about once every second. This will take a few seconds to occur. Following is an example of a BBG banner:

```
BBG V1.0 <ROM>
04/13/95 CRAY-BBG
```

Step 4: Build the BBG software
3.2.4

Copy the BBG software tar file, `bbgrel.tar`, into the directory in which the source will reside. Execute the following commands to extract and install the BBG software:

```
tar xvf bbgrel.tar
install_bbg
```

These commands install the BBG software in the `/usr/lbin/bbg` directory.

Step 5: Configure UNICOS for the BBG interface
3.2.5

To configure the UNICOS operating system for the BBG interface, you can use the UNICOS installation tool (see the following subsection), or you can configure the files manually (see subsection 3.2.5.2, page 22).

Using the installation tool to configure the BBG interface
3.2.5.1

This subsection describes the steps needed to configure the BBG interface by using the UNICOS installation tool. For information on how to use the installation tool, see the *UNICOS Installation/Configuration Menu System User's Guide*, publication SG–2412, and the *UNICOS Installation and Configuration Tool Reference Manual*, publication SR–3090.

When you configure the BBG interface in the UNICOS operating system, you will be updating the following files:

- `/etc/hosts`
- `/etc/networks`
- `/etc/config/interfaces`
- `/etc/config/bbg.config`
- `/etc/config/bbg.pvc`

To configure the BBG interface by using the installation tool, perform the following steps:

1. Enter the UNICOS Installation/Configuration Menu System by entering the following command:

   ```
   /etc/install/install
   ```

2. Once you are in the UNICOS Installation/Configuration Menu System, it is recommended that before you configure anything with this menu system, you use the `import` utility to update the system configuration. To import the current system configuration into the menu system, go to the `Import Options` option, as shown:

   ```
   UNICOS Installation/Configuration Menu System
   .      Utilities
   .      .      Import Utility
   .      .      .      Import Options
   ```

3. Set the import options to the following values:

   ```
                    Import Options


     S->    Import root mount point
            Stop import on error?              YES
            Import host or guest versions?     host
            Reload default import table ...
   ```

4. Exit the `Import Options` option and select the `Import Table` option, as shown:

```
UNICOS Installation/Configuration Menu System
.      Utilities
.      .      Import Utility
.      .      .      Import Table
```

Set to `NO` any `Import?` field parameters that your site does not use. Set the following `Import?` field parameters to `YES`:

```
                       Import Table

      Class        Description      Import?    Program       Options
      -----        -----------      -------    -------       -------
E->   HARDWARE     Param            YES        hdwparam.     sh-i $RELEA
      KERNEL       Config.h uts     YES        utsconfh.sh   -i $RELEA
      KERNEL       Param uts        YES        utsparam.sh   -i $RELEA
      KERNEL       Comm channels    YES        utscparam.sh  -i $RELEA
      HOSTS        Hosts            YES        utlimp.sh     hosts
      NETWORKS     Networks         YES        utlimp.sh     networks
      NETIF        Network Interfaces YES      netifs.sh     -i
```

5. Exit the `Import Table` option and select the `Import Utility` option, as shown:

```
UNICOS Installation/Configuration Menu System
.      Utilities
.      .      Import Utility
```

Set the `Import class to run` option to `ALL`, as shown:

```
                 Import Utility
      Import options ==>
M->   Import table ==>
      Import class to run        ALL
      Run the import process ...
```

6. Execute the `Run the import process` option. This option overwrites the menu system database. Exit the `Import Utility` option and answer `y` (yes) to the following question.

```
Do you want to continue? y
```

7. Go to the `Host Address Configuration` option, as shown:

```
UNICOS Installation/Configuration Menu System
.     Configure System
.     .     Network Configuration
.     .     .     General Network Configuration
.     .     .     .     Host Address Configuration
```

To update the `/etc/hosts` file, use the `n` key to enter the host name for the ATM interface. Following is an example of a `/etc/hosts` file:

```
              Host Address Configuration

     Proto      Name      Address      Comment
     -----      ----      -------      -------
     inet       atm01      128.162.102.25
```

Following is a description of the configuration parameters:

Parameter	Description
`Proto`	Specifies the Internet protocol
`Name`	Specifies the IP address alias
`Address`	Specifies the standard IP address value

8. Exit the `Host Address Configuration` option and answer `y` (yes) to the following question:

```
     Do you want to update form file? (y/n):  y
```

9. To update the `/etc/networks` file, go to the `Network Address Configuration` option, as shown:

```
UNICOS Installation/Configuration Menu System
.     Configure System
.     .     Network Configuration
.     .     .     General Network Configuration
.     .     .     .     Network Address Configuration
```

Configure the ATM Internet network address for TCP/IP by
creating an entry in the `/etc/networks` file for each ATM
network. There will be a network address for each ATM
interface that will communicate through TCP/IP. Following
is an example of a `/etc/networks` file:

```
        Network Address Configuration


            Proto      Name     Address         Comment
            -----      ----     -------         -------
    E->     inet       atm01    128.162.102.102
```

Following is a description of the configuration parameters:

Parameter	Description
`Proto`	Specifies the Internet protocol
`Name`	Specifies the IP address alias
`Address`	Specifies the standard IP address value

10. Exit the `Network Address Configuration` option and
    answer `y` (yes) to the following question:

    ```
        Do you want to update form file? (y/n):  y
    ```

11. Go to the `Network Interface Configuration` option, as
    follows:

```
UNICOS Installation/Configuration Menu System
.     Configure System
.     .      Network Configuration
.     .      .      General Network Configuration
.     .      .      .        Network Interface Configuration
```

To update the `/etc/config/interfaces` file, use the [n]
key to enter the appropriate information to automatically
configure up the ATM interface during a UNICOS boot for
this system, as shown in the following example:

```
                    Network Interface Configuration

    Name        Hycf  Family   Address Dest Subnet      Type Bcst  MTUsz
    ----        ----  -------  ------- ---- ------      ---- ----  -----
 E-> bbg0:atm1        inet     atm01        0xffffff00  pvc         9176
```

Following is a description of the configuration parameters:

Parameter	Description
Name	Specifies the interface name and ordinal of the ATM interface to be configured. This is the same as the BBG number shown in step 15, page 18.
Hycf	Not used.
Family	Must be set to `inet`.
Address	Specifies the IP host address for this interface connection. This parameter must be defined in the `/etc/hosts` file. The address shown in the example is the same as that shown in step 7, page 14.
Dest	Specifies the destination (point-to-point) address. This parameter is not needed for the ATM connection.
Subnet	Specifies the subnetwork address mask to be used for this interface.

Parameter	Description

`Type`   Specifies the interface type, used to select the type of signaling to be used across the ATM network. These values also imply the type of encapsulation used for IP datagrams. The following are the supported types:

- `pvc` – Permanent Virtual Circuit. Implies 802.2 LLC encapsulation

- `spans` – Simple Protocol for ATM Network Signaling (SPANS) protocol. Implies null encapsulation and Switched Virtual Circuits (SVC).

- `q2931` – Q2931 is the Switched Virtual Circuit standard. This is under development and does not currently work. Implies 802.2 LLC encapsulation and Switched Virtual Circuits (SVC).

  Note: If the interface type is set to `pvc`, signaling will **not** be performed on that interface. However, if an interface is marked as `spans` or `q2931`, PVCs are still supported on that interface when you use the `atmarp` command to place them in the `atmarp` table.

`Bcst`   Not used.

`MTUsz`   Specifies an MTU size that is a multiple of 8, ranging from 9176 to 65536.

12. Exit the `Network Interface Configuration` option and answer `y` (yes) to the following question:

        Do you want to update form file? (y/n): **y**

13. Go to the `General Network Configuration` option, as follows:

        UNICOS Installation/Configuration Menu System
        .   Configure System
        .   .   Network Configuration
        .   .   .   General Network Configuration

14. Activate general network configuration, as follows:

```
        General Network Configuration


        Host address configuration ==>
        Network address configuration ==>
        Networking services configuration ==>
        Network hardware address configuration ==>
        Network interface configuration ==>
        Import general network configuration ==>
    A->Activate general network configuration
```

Answer y (yes) to the following question:

```
        Do you want to proceed with the configuration
        update?  y
```

15. Go to the `Adapter Configuration` option, as shown:

```
        UNICOS Installation/Configuration Menu System
        .      Configure System
        .    .      Network Configuration
        .    .    .     BBG ATM Configuration
        .    .    .    .      Adapter Configuration
```

Use the ☐n key to enter the appropriate parameters to build
the BBG entries in the `/etc/config/bbg.config` file. (If
you are creating this file for the first time, the
`cfdb/bbgadap.cfg` file (created by the installation tool) is
empty. Subsequent installations will show the BBG entries
already entered.) Following is an example of an
`/etc/config/bbg.config` file:

```
                 Adapter Configuration

    BBG  I-Field  HIPPI CHANNEL  CONTROL PATH  ATM  DATA PATH  START
    ---  -------  -------------  ------------  ---  ---------  -----
E-> 0    00000000 /dev/hippi0    1             1    2          YES
```

Following is a description of the parameters:

Parameter	Description
`BBG`	Specifies the number of the BBG device. Valid values are 0 through 9.
`I-Field`	Specifies the HIPPI I-field to use for connecting to the BBG.

`HIPPI CHANNEL`	Specifies the device node to use for connecting to the BBG. A typical example is as follows:
	
	`/dev/hippi0`
	`/dev/hippi1`
	.
	.
	.

`CONTROL PATH`	Specifies the logical path of the HIPPI channel on which control information will be sent to and from the BBG. This value must be unique. See `bbg`(4) for details on setting this parameter.
`ATM`	Defines an ATM interface Sbus slot in the chassis. Indicates the BBG slot in which the ATM card has been placed.
`DATA PATH`	Specifies the logical path on the HIPPI channel to be used for data input and output. This value must be unique. See `bbg`(4) for details on setting this parameter.
`START`	Specifies whether this BBG ATM interface will be started at boot time.

16. Exit the `Adapter Configuration` option and answer `y` (yes) to the following question:

    `Do you want to update form file? (y/n):` **y**

17. For any remote hosts with which you will communicate by using Permanent Virtual Circuits, go to the `Permanent Virtual Circuit Configuration` option, as shown:

```
UNICOS Installation/Configuration Menu System
.     Configure System
.     .       Network Configuration
.     .       .       BBG ATM Configuration
.     .       .       .       Permanent Virtual Circuit Configuration
```

To update the `/etc/config/bbg.pvc` file, use the `n` key to enter the Permanent Virtual Circuits (PVCs) for all remote hosts with which this system will communicate through the BBG interface. Following is an example of a `/etc/config/bbg.pvc` file:

```
               Permanent Virtual Circuit Configuration

       Remote Hostname         Interface  AAL  VPI  VCI QOS (Kb/s)
       ----------------        ---------  ---  ---  --- ----------
  E->  atm04                   bbg0:atm1   5    0    32  0
```

Following is a description of the parameters:

Parameter	Description
Remote Hostname	Specifies the IP host name of the remote host. This name must be located in the `/etc/hosts` file (see step 7, page 14).
Interface	Specifies the name of the BBG ATM interface that this system will use to reach the remote host. The name is as it appears in the output of the `netstat -i` command when the interface is configured up.
AAL	Specifies the ATM Adaptation Layer (AAL) to be used by this PVC. This value is based on ATM standards. Currently, the ATM connection supports only AAL 5. Specify this number in decimal form.

Parameter	Description
`VPI`	Specifies the Virtual Path Identifier (VPI) (sometimes known as the Virtual Path Index). The VPI is placed into each ATM cell header so that the cell can be routed through the ATM network. Currently, ATM interfaces support only VPI 0. Specify this number in decimal form.
`VCI`	Specifies the Virtual Channel Identifier (VCI). The VCI is placed into each ATM cell header so that the cell can be routed through the ATM network. This number should be between 32 and 1023. Consult your local network administrator when determining the VCI. Specify this number in decimal form.
`QOS (Kb/s)`	Specifies the quality of service expressed in kilobits per second. This is the peak data rate at which this host will deliver ATM cells to the remote host through the ATM interface. Placing a 0 in this field causes the peak rate control feature to be disabled when sending to this remote host, thus allowing unlimited bandwidth. Specify this number in decimal form.

18. Exit the Permanent Virtual Circuit Configuration menu and answer `y` (yes) to the following question:

        Do you want to update form file? (y/n): **y**

19. Go to the `BBG/ATM Configuration` option, as follows:

        UNICOS Installation/Configuration Menu System
        .   Configure System
        .   .   Network Configuration
        .   .   .   BBG/ATM Configuration

20. Activate the BBG/ATM configuration, as follows:

```
    BBG/ATM Configuration


    Adapter configuration ==>
    Permanent Virtual Circuit configuration ==>
    Import the BBG/ATM configuration ... ==>
A->Activate the BBG/ATM configuration ...
```

Exit the BBG/ATM Configuration menu and answer y (yes)
to the following question:

```
Do you want to proceed with the configuration
update?  y
```

21. Exit the UNICOS Installation/Configuration Menu System
by typing q (quit) and answering y (yes) to the following
question:

```
Do you want to quit?  y
```

For examples of the files that have been updated by the
preceding process, see the following subsections.

*Configuring the BBG ATM
interface manually*
3.2.5.2

The following subsections describe and show examples of each of
the files that you must update when you configure the BBG ATM
interface manually. These are the same files that are updated by
the UNICOS installation tool. The examples in the following
subsections show only the part of the files that relate to the ATM
interface configuration. Exact parameter settings will be system
dependent.

The files to be updated are as follows:

- /etc/config/bbg.config
- /etc/hosts
- /etc/networks
- /etc/config/bbg.pvc
- /etc/config/interfaces

`/etc/config/bbg.config`
file
3.2.5.2.1

The `/etc/config/bbg.config` file contains the information necessary for the UNICOS kernel and user commands to communicate with and configure the BBG interfaces.

Create the following parameters in the `/etc/config/bbg.config` file:

Parameter	Description
`bbg.`*number*	The number of the BBG device.
`ifield`	HIPPI I-field for connecting to the BBG.
`infile`	HIPPI input device file.
`outfile`	HIPPI output device file.
`atm.`*number*	ATM interface Sbus slot in the chassis.
`devtype`	Device type. `SBA200` is the only valid type.

Following is an example of a `/etc/config/bbg.config` file:

```
# /etc/config/bbg.config file
.
.
.
bbg0 {
        ifield = 0x0100000c
        infile = /dev/hippi1/i06
        outfile = /dev/hippi1/o06
        atm1 {
                devtype = SBA200
                infile = /dev/hippi1/i05
                outfile = /dev/hippi1/o05
        };
};
start bbg0:atm1 yes
.
.
.
```

`/etc/hosts` file
3.2.5.2.2

The `/etc/hosts` file contains host names. Create the following parameters in this file:

Parameter	Description
address	Standard IP address value
name	IP address alias

Following is an example of a `/etc/hosts` file:

```
#/etc/hosts file

128.162.187.1          atm01
.
.
.
```

`/etc/networks` file
3.2.5.2.3

The `/etc/networks` file contains the name and address of your ATM network. Create the following parameters in this file:

Parameter	Description
name	IP address alias
address	Standard IP address value

Following is an example of a `/etc/networks` file:

```
#/etc/networks file

atm01     128.162.102
.
.
.
```

Create as many entries as there are ATM interfaces configured for TCP/IP.

`/etc/config/bbg.pvc` file
3.2.5.2.4

The `/etc/config/bbg.pvc` file shows the Permanent Virtual Circuits (PVCs) for all remote hosts that will communicate to the system through the ATM interfaces.

Create the following parameters in the `/etc/config/bbg.pvc` file:

Parameter	Description
remote.host.name	IP host name of the remote host. This name must be located in the `/etc/hosts` file.
interface	Name of the ATM interface that this system will use to reach the remote host. The name is as it appears in the output of the `netstat -i` command.
AAL.number	ATM Adaptation Layer (AAL) to be used by this PVC. This value is based on ATM standards. Currently, the ATM connection supports only AAL 5. Specify this number in decimal form.
VPI.number	Virtual Path Identifier (VPI) (sometimes known as the Virtual Path Index), placed into each ATM cell header so that the cell can be routed through the ATM network. Currently, ATM interfaces support only VPI 0. Specify this number in decimal form.
VCI.number	Virtual Channel Identifier (VCI), placed into each ATM cell header so that the cell can be routed through the ATM network. This number should be between 32 and 1023. Consult your local network administrator when determining the VCI. Specify this number in decimal form.
QOS.number	Quality of service expressed in kilobits per second. This is the peak data rate at which this host will deliver ATM cells to the remote host through the ATM interface. Placing a 0 in this field causes the peak rate control feature to be disabled when sending to this remote host, thus allowing unlimited bandwidth. Specify this number in decimal form.

Following is an example of a `/etc/config/bbg.pvc` file:

```
#/etc/config/bbg.pvc file

# hostname       ifc       AAL      VPI      VCI      QOS
# --------       ---       ---      ---      ---      ---
#
atm01        bbg0:atm1    5        0        99       1
shemp01      bbg1:atm1    5        0        99       1
```

`/etc/config/interfaces`
file
3.2.5.2.5

The `/etc/config/interfaces` file contains the parameters required to configure up the BBG ATM interface by using the `/etc/initif` script. The `/etc/initif` script is executed automatically when the UNICOS system is booted.

Create the following parameters in the `/etc/config/interfaces` file:

Parameter	Description
name	Interface name and ordinal of the ATM interface to be configured.
family name	Interface family name. Must be designated as `inet`.
IP. host_ address	IP host address for this interface connection. This parameter must be defined in the `/etc/hosts` file.
hwloop	Allows the packet to go out to the adapter and to come back.
subnet	Subnetwork address mask to be used for this interface.
interface.type	Interface type, used to select the type of signaling to be used across the ATM network. These values also imply the type of encapsulation used for IP datagrams. The following are the supported types:

- `pvc` – Permanent Virtual Circuit. Implies 802.2 LLC encapsulation.

Parameter	Description
	• `spans` – Simple Protocol for ATM Network Signaling (SPANS) protocol. Implies null encapsulation and Switched Virtual Circuits (SVC).
	• `q2931` – Q2931 is the Switched Virtual Circuit standard. This is currently under development and does not currently work. Implies 802.2 LLC encapsulation and Switched Virtual Circuits (SVCs).

Note: If the interface type is set to `pvc`, signaling will **not** be performed on that interface. However, if an interface is marked as `spans` or `q2931`, PVCs are still supported on that interface when you use the `atmarp` command to place them in the `atmarp` table.

Following is an example of a `/etc/config/interfaces` file:

```
#/etc/config/interfaces file
# File format is:
#
# name  hycf_file    family  address        pt-to-pt-dest   args:
#                                                            netmask
#                                                            iftype
#                                                            broadcast
#                                                            mtu
#                                                            rbuf
#                                                            wbuf
#                                                            bg
#                                                            hwloop
bbg0:atm1    -        inet    atm01    hwloop  netmask 0xffffff00  iftype pvc
```

Step 6: Verify and test
the BBG interface
3.2.6

Perform the following steps to verify and test the BBG interface:

1. Connect a fiber loopback cable on the ATM interface. Prior to running loopback, be sure that the interface is configured down.

2. Run loopback through the BBG device, as follows:

        /usr/lbin/bbg/progs/bbgatmloop bbg*x*:atm*y*

    bbg*x*:atm*y* is the name of the BBG and ATM interface in the `/etc/config/bbg.config` file (for example, `bbg0:atm1`).

3. Run loopback again and disconnect the fiber loopback cable while the test is running. Verify that the test stops. This test ensures that the packets are actually arriving at the hardware and coming back

4. Reconnect the loopback cable.

5. Execute the following commands to configure up the BBG and ATM interfaces:

        /etc/bbgstart
        /etc/initif bbg*x*:atm*y*

    bbg*x*:atm*y* is the name of the BBG and ATM interface in the `/etc/config/bbg.config` file.

    Note: For the `/etc/bbgstart` command to start up the BBG interface, the `/etc/config/bbg.config` file must have the `start` field for bbg*x*:atm*y* set to `yes`.

6. Ping the Internet address of the Cray Research system on the ATM network.

7. While the `ping` commands are running, disconnect the loopback fiber to verify that the pings are actually going out to the hardware.

    Note: The `/etc/config/interfaces` file must specify the `hwloop` parameter, or hardware loopback (`hwloop` option) must have been specified on the `ifconfig`(8) command when the interface was configured up.

8. Connect the ATM interface to the ATM network.

    Note: Steps 9 and 10 apply if the ATM network will be using Permanent Virtual Circuits (PVCs).

9. Determine the VCIs to which the BBG will be connecting and add these to the `/etc/config/bbg.pvc` file that was created in step 17, page 20.

10. Configure the Permanent Virtual Circuits (PVCs) in the ATM network (switches and other ATM nodes). You must use Classic IP (RFC 1577) when you set up the ATM PVCs for all of the nodes that will communicate with the Cray Research system.

11. Ping a remote node on the ATM network, as in the following example:

    ```
    ping shemp01
    ```

Installing a VME interface
3.3

The following subsections contain an installation overview; instructions to install, configure, and test a VME (Native ATM) interface in a CRAY J90 or CRAY EL system; and a list of commands for debugging a VME problem.

Installation overview
3.3.1

The ATM implementation on the CRAY J90 or CRAY EL system consists of a VME module in an open IOS slot. Your site can have a maximum of 16 ATM devices per CRAY J90 or CRAY EL system. Cray Research recommends that only one ATM module reside in each IOS, but supports two ATM modules per IOS. Both synchronous optical network (SONET) and transparent asynchronous transmitter/receiver interface (TAXI) type interface options are supported. Cray Research uses a FORE Systems ForeRunner VMA-200 VMEbus Adapter module for the Native ATM connection.

Software support for the VME connection starts at the UNICOS 8.0.4.1 release for the CRAY J90 series and at the UNICOS 8.0.4A release for the CRAY EL series. ATM adaptation layer 5 (AAL 5) is supported and used for TCP/IP data streams in the UNICOS operating system. Raw I/O is not supported. The UNICOS operating system supports the `atmarp`(8) command for the Permanent Virtual Circuits (PVCs). Switched Virtual Circuit (SVC) support is under development and will be added to the UNICOS system at a later release. SVCs will be supported by means of the Q2931 ATM signaling standard as well as the Simple Protocol for ATM Network Signaling (SPANS) protocol.

Required materials and tools
3.3.1.1

The materials required for the installation include the following:

- ATM modules

- Two fiber-optic cables with Straight Tip (ST) connectors to connect from an ATM switch to the VME ATM module

- UNICOS 8.0.4.1 release or later for the CRAY J90 series and UNICOS 8.0.4A release or later for the CRAY EL series

- The *CRAY EL Series Troubleshooting and Maintenance Manual*, publication CMM–0431–0A0, or the appropriate Field Replacement Procedures.

No special tools are required for this upgrade. You will need the common hand-held tools that are included with the Customer Service toolkit.

Installation step summary
3.3.1.2

To install the VME component into your CRAY J90 or CRAY EL system, perform the following steps. The subsections that follow provide details of these steps.

> **Note:** Before starting the installation, it is recommended that you back up the UNICOS file system.

> **Note:** Some of the installation commands require super-user privilege.

1. Install the software
2. Modify the IOS configuration file
3. Configure UNICOS for the VME interfaces.
4. Install the VME hardware.
5. Load the IOS and boot the system.
6. Test the VME interfaces.
7. Configure up TCP/IP for the VME interfaces.

Step 1: Install the software
3.3.2

Your Cray Research system must be running UNICOS release 8.0.4.1 or later for the CRAY J90 series or UNICOS 8.0.4A or later for the CRAY EL series. If this is not the case, follow the installation instructions that accompany the tape for the appropriate CRAY J90 or CRAY EL UNICOS release.

Step 2: Modify the IOS configuration file
3.3.3

To modify the IOS configuration file, perform the following steps:

1. Edit the IOS configuration file and add the IOS ATM driver to the appropriate IOS files, as follows:

    ```
    exdf -i /config > /tmp/config
    vi /tmp/config
    ```

    The following code shows an example of the added IOS ATM driver to the IOS system named `IOS1` in the configuration file:

    ```
    IOS1: 2093 1228800
    #-----------------
    /dev/disk
    /dev/ipi
    /dev/esdi
    /dev/atmv
    ```

    Note: The VME connection requires that the `/dev/atmv.cof` file be resident on the IOS. The `atmv.cof` file is the firmware file that is downloaded to the ATM module when the IOS is loaded. The `atmv.cof` file is part of every CRAY J90 or CRAY EL UNICOS release, starting with the UNICOS 8.0.4.1 or 8.0.4A release, respectively.

2. Copy the updated configuration file to the IOS disk, as follows:

    ```
    exdf -ro /config < /tmp/config
    ```

Step 3: Configure UNICOS for the VME interface
3.3.4

To configure the UNICOS operating system for the VME interface, you can use the UNICOS installation tool (see the following subsection), or you can configure the files manually (see subsection 3.3.4.2, page 43).

Using the installation tool to configure the VME interface
3.3.4.1

This subsection describes the steps needed to configure the VME interface by using the installation tool. For information on how to use the installation tool, see the *UNICOS Installation/Configuration Menu System User's Guide*, publication SG–2412, and the *UNICOS Installation and Configuration Tool Reference Manual*, publication SR–3090.

When you configure the VME interface in the UNICOS operating system, you will be updating the following files:

- `/etc/config/param`

- `/etc/config/atm.pvc`

- `/etc/hosts`

- `/etc/networks`

- `/etc/config/interfaces`

To configure the VME interface by using the installation tool, perform the following steps:

1. Enter the UNICOS Installation/Configuration Menu System by entering the following command:

   ```
   /etc/install/install
   ```

2. Once you are in the UNICOS Installation/Configuration Menu System, it is recommended that before you configure anything with this menu system, you use the `import` utility to update the system configuration. To import the current system configuration into the menu system, go to the `Import Options` option, as shown:

   ```
   UNICOS Installation/Configuration Menu System
   .     Utilities
   .     .      Import Utility
   .     .      .      Import Options
   ```

3. Set the import options to the following values:

   ```
                    Import Options


   S->    Import root mount point
          Stop import on error?                YES
          Import host or guest versions?      host
          Reload default import table ...
   ```

4. Exit the `Import Options` option and select the `Import Table` option, as shown:

   ```
   UNICOS Installation/Configuration Menu System
   .     Utilities
   .     .      Import Utility
   .     .      .      Import Table
   ```

Set to `NO` any `Import?` field parameters that your site does not use. Set the following `Import?` field parameters to `YES`:

```
                            Import Table

        Class       Description       Import?    Program       Options
        -----       -----------       -------    -------       -------
E->     HARDWARE    Param             YES        hdwparam.sh   -i $RELEA
        KERNEL      Config.h uts      YES        utsconfh.sh   -i $RELEA
        KERNEL      Param uts         YES        utsparam.sh   -i $RELEA
        KERNEL      Comm channels     YES        utscparam.sh  -i $RELEA
        HOSTS       Hosts             YES        utlimp.sh     hosts
        NETWORKS    Networks          YES        utlimp.sh     networks
        NETIF       Network Interfaces YES       netifs.sh     -i
```

5. Exit the `Import Table` option and select the `Import Utility` option, as shown:

```
        UNICOS Installation/Configuration Menu System
        .     Utilities
        .     .        Import Utility
```

Set the `Import class to run` option to `ALL`, as follows:

```
                    Import Utility
        Import options ==>
M->     Import table ==>
        Import class to run           ALL
        Run the import process ...
```

6. Execute the `Run the import process` option. This option overwrites the menu system database. Exit the `Import Utility` option and answer `y` (yes) to the following question:

```
        Do you want to continue? y
```

7. Go to the `Native ATM Configuration` option, as shown:

```
UNICOS Installation/Configuration Menu System
.       Configure System
.       .       UNICOS Kernel Configuration
.       .       .       Communication Channel Configuration
.       .       .       .       Native ATM Configuration
```

Enter the appropriate parameters to build the `atmdev` entries in the `/etc/config/param` file, as in the following example:

```
                  Native ATM Configuration

  S->     ATM device ordinal   0
          I/O cluster number   0
          IOP number           0
          IOP Channel number   020
```

Following is a description of the parameters:

Parameter	Description
`ATM device ordinal`	Specifies the VME interface that will be defined in the `param` file. Possible values are 0 through 15.
`I/O cluster number`	Specifies the IOS in which the ATM module will reside. Possible values are 0 through 15.
`IOP number`	Value must be 0.
`IOP Channel number`	Specifies the channel number that the I/O processor (IOP) uses to communicate with the ATM module in the IOS. This number is unique to each IOS. Valid values for this field are octal 20 and octal 21. Use octal 20 for the first module and octal 21 for the second module in each IOS or I/O cluster.

Create entries for all VME interfaces that are being installed.

8. Exit the `Native ATM Configuration` option and answer `y` (yes) to the following question:

```
   Do you want to update form file? (y/n):  y
```

9. To configure the VME interfaces, go to the `Network Parameters` option, as shown:

```
UNICOS Installation/Configuration Menu System
.      Configure System
.     .        UNICOS Kernel Configuration
.     .     .       Network Parameters
```

To update the `/etc/config/param` file, enter the appropriate network parameters, as shown in the following example:

```
                     Network Parameters


Number of TCP memory buffers (TCP_NMBSPACE)      4000
Max. Native ATM network devices (atmmaxdevs)     2
ATM ARP receive space (atmarp_recv)              131072
ATM ARP send space (atmarp_send)                 65536
Max. ATM ARP entries (atmarp_entries)            1024
```

Following is a description of the parameters:

Parameter	Description
Number of TCP memory buffers (TCP_NMBSPACE)	Specifies the number of mbufs to be defined for the system. This value is system dependent.
Max. Native ATM network devices (atmmaxdevs)	Specifies the maximum number of ATM modules allowed for this system. Valid values are 1 through 16. Set this value to the number of ATM interfaces to be installed in this system.
ATM ARP receive space (atmarp_recv)	Specifies the amount of socket receive space used by the atmarp(1) command. This value should always be a power of 2. The default value of 131072 should be sufficient for most systems.

Parameter	Description
ATM ARP send space (atmarp_send)	Specifies the amount of socket send space used by the atmarp(1) command. This value should always be a power of 2. The default value of 65536 should be sufficient for most systems.
Max. ATM ARP entries (atmarp_entries)	Specifies the maximum number of address resolution protocol (ARP) entries allowed in the ATM ARP table. The default value of 1024 should be sufficient for most systems. This value is directly related to the number of remote hosts that communicate through the ATM.

10. To activate the kernel configuration, go to the `Activate the Kernel Configuration` option, as shown:

```
UNICOS Installation/Configuration Menu System
.      Configure System
.      .      UNICOS Kernel Configuration
.      .      .      Activate the Kernel Configuration
```

Before you answer `y` (yes) or `n` (no) to the question, `Do you want to proceed with the configuration update?`, consider the following conditions:

Because some of the menus are associated with other configuration files, other files than the ones mentioned at the beginning of this subsection will be updated. If you started with the UNICOS Installation/Configuration Menu System that resembles your system's configuration, everything will be updated appropriately. If your system's configuration does not match the UNICOS Installation/Configuration Menu System, answer `no` to the question and perform step 2, page 32. Otherwise, answer `yes`.

You need to complete the next two steps only if you will be configuring Permanent Virtual Circuits (PVCs) for remote hosts with which this system will communicate through the VME interface. PVCs provide a means to state a path to a remote host specifically. PVCs are created and deleted by using the atmarp(8) command. The next two steps configure the parameters that will be used by the atmarp(8) command.

Note: Switched Virtual Circuit (SVC) support is under development and will be added to the UNICOS system at a later release. SVCs are a dynamic way to create a path to a remote host. SVCs use a protocol called *signaling* to set up and delete an available path between two hosts. The software performs SVCs automatically.

11. Exit the `Activate the Kernel Configuration` option and go to the `Permanent Virtual Circuit Configuration` option, as shown:

```
UNICOS Installation/Configuration Menu System
.     Configure System
.     .       Network Configuration
.     .     .       Native ATM Configuration
.     .     .     .       Permanent Virtual Circuit Configuration
```

To update the `/etc/config/atm.pvc` file, use the `n` key to enter the Permanent Virtual Circuits (PVCs) for all remote hosts with which this system will communicate through the VME interface. Following is an example of a `/etc/config/atm.pvc` file:

```
          Permanent Virtual Circuit Configuration

     Remote Hostname          Interface  AAL   VPI    VCI QOS (Kb/s)
     ----------------         ---------  ---   ---    --- ----------
 E-> remotehost_atm0          atm0        5     0      32 1
     remotehost_atm1          atm1        5     0      33 1
```

Following is a description of the parameters:

Parameter	Description
Remote Hostname	Specifies the IP host name of the remote host. This name must be located in the `/etc/hosts` file.
Interface	Specifies the name of the VME interface that this system will use to reach the remote host. The name is as it appears in the output of the `netstat -i` command.

Parameter	Description
`AAL`	Specifies the ATM Adaptation Layer (AAL) to be used by this PVC. This value is based on ATM standards. Currently, the ATM connection supports only AAL 5. Specify this number in decimal form.
`VPI`	Specifies the Virtual Path Identifier (VPI). The VPI is placed into each ATM cell header so that the cell can be routed through the ATM network. Currently, ATM interfaces support only VPI 0. Specify this number in decimal form.
`VCI`	Specifies the Virtual Channel Identifier (VCI). The VCI is placed into each ATM cell header so that the cell can be routed through the ATM network. This number should be between 32 and 1023. Consult your local network administrator when determining the VCI. Specify this number in decimal form.
`QOS` `(Kb/s)`	Specifies the quality of service expressed in kilobits per second. This is the peak data rate at which this host will deliver ATM cells to the remote host through the ATM interface. Placing a 0 in this field causes the peak rate control feature to be disabled when sending to this remote host, thus allowing unlimited bandwidth. Specify this number in decimal form.

12. Exit the `Permanent Virtual Circuit Configuration` option and answer `y` (yes) to the following question:

    ```
    Do you want to update form file? (y/n):  y
    ```

13. To activate the VME (Native ATM) configuration, go to the `Activate the Native ATM Configuration` option, as shown:

```
UNICOS Installation/Configuration Menu System
.    Configure System
.    .      Network Configuration
.    .    .      Native ATM Configuration
.    .    .    .      Activate the Native ATM Configuration
```

Answer `y` (yes) to the following question:

```
Do you want to proceed with the configuration
update?  y
```

14. Exit the `Activate the Native ATM Configuration`
    option and go to the `Host Address Configuration` option,
    as shown:

```
UNICOS Installation/Configuration Menu System
.     Configure System
.     .     Network Configuration
.     .     .     General Network Configuration
.     .     .     .     Host Address Configuration
```

To update the `/etc/hosts` file, use the ⌨n key to configure
the VME connection for TCP/IP. Following is an example of a
`/etc/hosts` file:

```
              Host Address Configuration

   Proto  Name                Address          Comment
   -----  ----                -------          -------
   inet   edge-atm0           128.162.102.25
   inet   remotehost_atm0     128.162.102.30
   inet   remotehost_atm1     128.162.102.31
```

Following is a description of the configuration parameters:

Parameter	Description
`Proto`	Specifies the Internet protocol
`Name`	Specifies the IP address alias
`Address`	Specifies the standard IP address value

15. To update the `/etc/networks` file, go to the `Network
    Address Configuration` option, as shown:

```
UNICOS Installation/Configuration Menu System
.     Configure System
.     .     Network Configuration
.     .     .     General Network Configuration
.     .     .     .     Network Address Configuration
```

Configure the ATM Internet network address for TCP/IP by creating an entry in the `/etc/networks` file for each ATM network. There will be a network address for each ATM interface that will communicate through TCP/IP. Following is an example of a `/etc/networks` file:

```
      Network Address Configuration

         Proto     Name     Address        Comment
         -----     ----     -------        -------
  E->    inet      atm01    128.162.102.102
```

Following is a description of the configuration parameters:

Parameter	Description
`Proto`	Specifies the Internet protocol
`Name`	Specifies the IP address alias
`Address`	Specifies the standard IP address value

16. Exit the `Network Address Configuration` option and go to the `Network Interface Configuration` option, as follows:

```
UNICOS Installation/Configuration Menu System
.     Configure System
.     .     Network Configuration
.     .     .     General Network Configuration
.     .     .     .     Network Interface Configuration
```

To update the `/etc/config/interfaces` file, use the n̄ key to enter the appropriate information to automatically configure up the VME interface during a UNICOS boot for this system, as shown in the following example:

```
                    Network Interface Configuration

     Name Hycf Family Address          Dest Subnet       Type    Bcst
     ---- ---- ------ -------          ---- ------       ----    ----
     lo0         inet   localhost
     en0         inet   edge.cray.com          0xffffff00
     fddi0       inet   edge-fddi.cray.com     0xffffff00            128.16
 E-> atm0        inet   edge-atm0              0xffffff00   pvc
```

Following is a description of the configuration parameters:

Parameter	Description
Name	Specifies the interface name and ordinal of the ATM interface to be configured. The syntax is atm$x$, where x is the ordinal number of the ATM interface.
Hycf	Not used.
Family	Must be set to inet.
Address	Specifies the IP host address for this interface connection. This parameter must be defined in the /etc/hosts file.
Dest	Specifies the destination (point-to-point) address. It is not needed for the ATM connection.
Subnet	Specifies the subnetwork address mask to be used for this interface.
Type	Specifies the interface type, used to select the type of signaling to be used across the ATM network. These values also imply the type of encapsulation used for IP datagrams. The following are the supported types:

- pvc – Permanent Virtual Circuit. Implies 802.2 LLC encapsulation

- spans – Simple Protocol for ATM Network Signaling (SPANS) protocol. Implies null encapsulation and Switched Virtual Circuits (SVC).

Parameter   Description

- `q2931` – Q2931 is the Switched Virtual
  Circuit standard. This is under
  development and does not currently work.
  Implies 802.2 LLC encapsulation and
  Switched Virtual Circuits (SVC).

  Note: If the interface type is set to `pvc`,
  signaling will **not** be performed on that
  interface. However, if an interface is
  marked as `spans` or `q2931`, PVCs are still
  supported on that interface when you use
  the `atmarp` command to place them in the
  `atmarp` table.

`Bcst`   Specifies broadcast address.

17. Exit the `Network Interface Configuration` option and
    answer `y` (yes) to the following question:

    ```
    Do you want to update form file? (y/n):  y
    ```

18. Go to the `General Network Configuration` option, as
    follows:

    ```
    UNICOS Installation/Configuration Menu System
    .    Configure System
    .    .    Network Configuration
    .    .    .    General Network Configuration
    ```

19. Activate general network configuration, as follows:

```
    General Network Configuration

    Host address configuration ==>
    Network address configuration ==>
    Networking services configuration ==>
    Network hardware address configuration ==>
    Network interface configuration ==>
    Import general network configuration ==>
 A->Activate general network configuration
```

Answer y (yes) to the following question:

```
Do you want to proceed with the configuration
update?  y
```

20. Exit the UNICOS Installation/Configuration Menu System
     by typing q (quit) and answering y (yes) to the following
     question:

```
Do you want to quit?  y
```

For examples of the files that have been updated by the
preceding process, see the following subsections.

For the final steps for completing the software installation, see
subsection 3.3.4.3, page 50.

*Configuring the VME
interface manually*
3.3.4.2

The following subsections describe and show examples of each of
the files that you must update when you configure the VME
interface manually. These are the same files that are updated by
the UNICOS installation tool. The examples in the following
subsections show only the part of the files that relate to the ATM
interface configuration. Exact parameter settings will be system
dependent.

The files to be updated are as follows:

*   `/etc/config/param`

*   `/etc/config/atm.pvc`

*   `/etc/hosts`

*   `/etc/networks`

*   `/etc/config/interfaces`

`/etc/config/param` file
3.3.4.2.1

The `/etc/config/param` file contains the parameters needed to configure the VME interface for the host system.

In the `network` section of the file, you must create entries for all VME interfaces that are being installed. Enter appropriate values for the following parameters:

Parameter	Description
`tcp_nmbspace`	Number of TCP memory buffers. Specifies the number of mbufs to be defined for the system. This value is system dependent.
`atmmaxdevs`	Maximum VME (Native ATM) network devices. Specifies the maximum number of VME modules allowed for this system. Valid values are 1 through 16. Set this value to the number of VME interfaces to be installed in this system.
`atmarp_recv`	ATM ARP receive space. Specifies the amount of socket receive space used by the `atmarp`(1) command. This value should always be a power of 2. The default value of 131072 should be sufficient for most systems.
`atmarp_send`	ATM ARP send space. Specifies the amount of socket send space used by the `atmarp`(1) command. This value should always be a power of 2. The default value of 65536 should be sufficient for most systems.
`atmarp_entries`	Maximum ATM ARP entries. Specifies the maximum number of address resolution protocol (ARP) entries allowed in the ATM ARP table. The default value of 1024 should be sufficient for most systems. This value is directly related to the number of remote hosts that communicate through the ATM.
`atmdev`	ATM device ordinal. Specifies the ATM interface that will be defined in the `param` file. Possible values are 0 through 15.

Parameter	Description
`iopath`	I/O path that consists of the following three parameters: `cluster`, `eiop`, and `channel`.
`cluster`	I/O cluster number. Specifies the IOS in which the ATM module will reside. Possible values are 0 through 15.
`eiop`	IOP number. This number will always be 0.
`channel`	IOP channel number. Specifies the channel number that the I/O processor (IOP) uses to communicate with the ATM module in the IOS. This number is unique to each IOS. Valid values for this field are octal 20 and octal 21. Use octal 20 for the first module and octal 21 for the second module.

Following is an example of a `/etc/config/param` file:

```
# /etc/config/param file
 .
 .
 .
network {
   4000 tcp_nmbspace;
      2 atmmaxdevs;
131072 atmarp_recv;
 65536 atmarp_send;
 1024 atmarp_entries;
 .
 .
 .
atmdev  0 {
       iopath {
             cluster 0;
          eiop 0;
          channel 020;
                }
       }
      }
 .
 .
 .
```

`/etc/config/atm.pvc` file
3.3.4.2.2

The `/etc/config/atm.pvc` file shows the Permanent Virtual Circuits (PVCs) for all remote hosts that will communicate to this system through the ATM interfaces.

Create the following parameters in the `/etc/config/atm.pvc` file:

Parameter	Description
remote.host.name	IP host name of the remote host. This name must be located in the `/etc/hosts` file.
interface	Name of the ATM interface that this system will use to reach the remote host. The name is as it appears in the output of the `netstat -i` command.

Parameter	Description
AAL.number	ATM Adaptation Layer (AAL) to be used by this PVC. This value is based on ATM standards. Currently, the ATM connection supports only AAL 5. Specify this number in decimal form.
VPI.number	Virtual Path Identifier (VPI), placed into each ATM cell header so that the cell can be routed through the ATM network. Currently, ATM interfaces support only VPI 0. Specify this number in decimal form.
VCI.number	Virtual Channel Identifier (VCI), placed into each ATM cell header so that the cell can be routed through the ATM network. This number should be between 32 and 1023. Consult your local network administrator when determining the VCI. Specify this number in decimal form.
QOS.number	Quality of service expressed in kilobits per second. This is the peak data rate at which this host will deliver ATM cells to the remote host through the ATM interface. Placing a 0 in this field causes the peak rate control feature to be disabled when sending to this remote host, thus allowing unlimited bandwidth. Specify this number in decimal form.

Following is an example of a `/etc/config/atm.pvc` file:

```
#/etc/config/atm.pvc file

# hostname        ifc     AAL     VPI     VCI     QOS
# --------        ---     ---     ---     ---     ---
#
remotehost_atm0 atm0      5       0       32      0
remotehost_atm1 atm1      5       0       33      0
```

`/etc/hosts` file
3.3.4.2.3

The `/etc/hosts` file contains host names. Create the following parameters in this file:

Parameter	Description
address	Standard IP address value
name	IP address alias

Following is an example of a `/etc/hosts` file:

```
#/etc/hosts file

128.162.102.25          edge-atm0
128.162.102.30          remotehost_atm
128.162.102.31          remotehost_atm1
```

`/etc/networks` file
3.3.4.2.4

The `/etc/networks` file contains the name and address of your ATM network. Create the following parameters in this file:

Parameter	Description
name	IP address alias
address	Standard IP address value

Following is an example of a `/etc/networks` file:

```
#/etc/networks file

atm01      128.162.102
.
.
.
```

Create as many entries as there are VME ATM interfaces configured for TCP/IP.

`/etc/config/interfaces` file
3.3.4.2.5

The `/etc/config/interfaces` file contains the parameters required to configure up the ATM interface by using the `/etc/initif` script.

Create the following parameters in the
`/etc/config/interfaces` file:

Parameter	Description
name	Interface name and ordinal of the ATM interface to be configured.
family	Interface family name. Must be set to `inet`.
IP. host_ address	IP host address for this interface connection. This parameter must be defined in the `/etc/hosts` file.
subnet	Subnetwork address mask to be used for this interface.
interface.type	Interface type, used to select the type of signaling to be used across the ATM network. These values also imply the type of encapsulation used for IP datagrams. The following are the supported types:

- `pvc` – Permanent Virtual Circuit. Implies 802.2 LLC encapsulation.

- `spans` – Simple Protocol for ATM Network Signaling (SPANS) protocol. Implies null encapsulation and Switched Virtual Circuits (SVCs).

- `q2931` – Q2931 is the Switched Virtual Circuit standard. This is under development and does not currently work. Implies 802.2 LLC encapsulation and Switched Virtual Circuits (SVC).

  Note: If the interface type is set to `pvc`, signaling will **not** be performed on that interface. However, if an interface is marked as `spans` or `q2931`, PVCs are still supported on that interface when you use the `atmarp` command to place them in the `atmarp` table.

Following is an example of a `/etc/config/interfaces` file:

```
#/etc/config/interfaces file
# File format is:
#
# name  hycf_file    family  address          pt-to-pt-dest   args:
#                                                              netmask
#                                                              iftype
#                                                              broadcast
#                                                              mtu
#                                                              rbuf
#                                                              wbuf
#                                                              bg
#                                                              hwloop
atm0     -           inet    edge-atm0 -  netmask 0xffffff00 iftype pvc
```

Completing the software
installation
3.3.4.3

To complete the software installation, perform the following steps:

1. Operating from the system console, save the original `param` file and copy the updated `param` file to the IOS disk by executing the following commands:

   % $\boxed{\text{CONTROL-A}}$ (toggles to the IOS)
   IOS> **cp /sys/param /sys/param.bak**
   % $\boxed{\text{CONTROL-A}}$ (toggles to the UNICOS system)
   % **exdf –ro /sys/param < /etc/config/param**

2. Shut down the UNICOS system by executing the following commands:

   /etc/shutdown 0
   $\boxed{\text{CONTROL-A}}$ (toggles to the IOS)

Step 4: Install the VME
hardware
3.3.5

The installation of the VME hardware consists of the following procedures:

- Powering down and removing panels

- Setting VMA-200 module switches and jumpers

Note: The labels on the ATM module cables have the
following meaning:

Transmit [T] = output
Receive [R] = input

Warning: Before handling any piece of computer equipment,
use proper electrostatic discharge (ESD) grounding
techniques and wear proper ESD apparel.

Refer to the *CRAY Y-MP EL Troubleshooting and Maintenance
Manual*, publication CMM–0431–0B0 and the appropriate Field
Replacement Procedures (FRPs) that correspond to the system
on which the ATM module will be installed.

Power down procedure for
CRAY EL systems
3.3.5.1

Use FRP 2 to power down CRAY EL systems.

Power down procedure for
CRAY J90 systems
3.3.5.2

To power down CRAY J90 systems, power down the cabinet,
using J90 FRP 1 for an individual cabinet.

VMA-200 module switch
and jumper settings
3.3.5.3

This subsection describes procedures for setting VMA-200
module switches and jumpers.

1. Position the module on an electrostatic discharge (ESD) mat
    or table so that the semiconductor chips are face up and the
    VME connectors are on the top of the module.

2. Dip switch number 1 (SW1) and dip switch number 2 (SW2)
    are located on the right side of the module. Set the dip
    switches to the following settings.

First ATM module in an IOS:

SW1	1	2	3	4	5	6	7	8
on		X			X	X		
off	X		X	X			X	X

SW2	1	2	3	4	5	6	7	8
on	X			X	X	X	X	X
off		X	X					

Second ATM module in an IOS:

SW1	1	2	3	4	5	6	7	8
on	X	X		X	X	X		
off			X				X	X

SW2	1	2	3	4	5	6	7	8
on	X			X	X	X	X	
off		X	X					X

3. Ensure that jumper blocks for JP1 are set open for all ATM modules.

4. Insert the ATM modules in the leftmost open slot in the IOS chassis. If there are other open slots in the IOS chassis, ensure that the proper backplane jumpers are installed in the open slots so that all VME signals are available to modules that are located to the right of the open slot. See the *CRAY EL Series Troubleshooting and Maintenance Manual*, publication CMM–0431–0A0, or the appropriate Field Replacement Procedures for more details.

5. Power on the IOS cabinet.

Step 5: Load the IOS and boot the system
3.3.6

To boot the system, perform the following steps from the system console:

1. To load the IOS, enter the following command at the IOS prompt:

    ```
    load
    ```

    If the ATM module is recognized in the IOS, you should see the following message displayed:

    ```
    ATM: Unit 0 - detected
    ```

    If there are two ATM modules in an IOS, you should see the following message also:

    ```
    ATM: Unit 1 - detected
    ```

    If you do not see these messages, you might see the following message:

    ```
    drv_exec: /DEV/ATMV initialization failed
    ```

    If you do see this message, perform the following steps:

    a. Power down the IOS.
    b. Remove the ATM modules.
    c. Recheck DIP switch settings.
    d. Recheck the jumper settings.
    e. Reinstall the ATM modules.
    f. Perform the IOS load again.

2. Boot the system to single-user mode by entering the following command:

    ```
    boot
    ```

3. Enter multiuser mode in the UNICOS system by entering the following command:

    ```
    /etc/init 2
    ```

Step 6: Test the VME
interfaces
3.3.7

To test the VME interface, perform the following steps:

1. Connect one end of an ATM cable to the receive port of the
   ATM module by connecting the cable to the receive connector
   (R) at the bulkhead connector.

2. Connect the other end of the same ATM cable used in step 1
   to the transmit port of the ATM module by connecting the
   cable to the transmit connector (T) at the bulkhead connector.
   There now should be one single strand of fiber connected
   between the R and T ports of the bulkhead connecter. This
   will form a loopback configuration.

3. Configure down the VME interfaces by using the following
   command:

   ```
   /etc/ifconfig atm0 down
   ```

   Repeat this command for each VME interface.

4. Configure up each VME interface with hardware loopback
   turned on for the interface by issuing the following `ifconfig`
   command:

```
/etc/ifconfig atm0 edge_atm0 netmask 0xffffff00 hwloop
```

   Repeat this command for each VME interface. Change the
   ATM IP address and network mask values to the site's
   chosen values.

5. Configure an ATM ARP table entry by issuing the following
   `atmarp` command:

   ```
   /etc/atmarp –s edge_atm0 atm0 5 0 50
   ```

   Substitute your system's ATM IP address in this command.

6. With the cable connected in loopback configuration (from the
   transmit connector to the receive connector), use the `ping`
   command to test the ATM, as shown in the following
   example:

   ```
   /etc/ping edge_atm0
   ```

Execute the following command to see the input and output packets (`Ipkts` and `Opkts` fields, respectively) for each of the VME interfaces:

```
netstat –i
```

The following example shows the output from a `netstat –i` command:

```
netstat –i

Name   Mtu    Network      Address      Ipkts    Ierrs Opkts   Oerrs
en0    1496   128.162.101  edge         253535   0     61027   0
fddi0  4352   128.162.84   edge-fddi    204070   0     24363   0
atm0   9180   128.162.83   edge_atm0    56       0     56      0
hi0*   65536  none         none         0        0     0       0
lo0    65535  127          localhost    200366   0     200366  0
```

7. Remove one end of the cable to verify that the ping processes stop. This verifies that the packets are going out of the transmit port of the ATM card and being received through the receive port. If the ping process continues to run, verify that each step in this section was performed.

8. Make the ATM network connection.

9. At this point, you can perform other tests across the loopback connection. Some TCP tests that can be executed are `nettest`(8), `ftp`(1B), and `telnet`(1B).

10. After performing these tests, disable the hardware loopback on each VME interface by executing the following command:

```
/etc/ifconfig atm0 down
```

Repeat this command for each VME interface.

***Step 7: Configure up
TCP/IP for the VME
interfaces***
3.3.8

To configure TCP/IP for the VME interface, issue the `initif` command, as follows:

```
/etc/initif atm0
```

The `initif`(8) command configures up the interface by performing an `ifconfig up` command, and creates `atmarp` entries for each Permanent Virtual Circuit (PVC). Repeat this command for each VME interface.

***Debugging a VME
problem***
3.3.9

You can use the following commands as tools to debug a VME problem:

- `ifconfig`(8)
- `netstat`(1B)
- `atmarp`(8)
- `atmadmin`(8)