Cyclades-PC400
Installation Manual

Cyclades Corporation

Cyclades-PC400 Installation Manual
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CHAPTER 1 WHAT IS IN THE BOX

Two Cyclades-PC400 models are available: one with DSPs (for analog modem connections) and one without them (for digital connections). One cable per channel is provided for connection of the board to a T1/E1 line. A diskette containing the PC400 driver is also included, and its use is described in chapter 3.

PC400 with
2 Channels

PC400 Driver
Diskette

PC400 with
1 Channel

RJ-48C

RJ-48C

RJ-48C

RJ-48C

RJ-48C

RJ-48C

To T1 or E1
Connection

Installation Manual
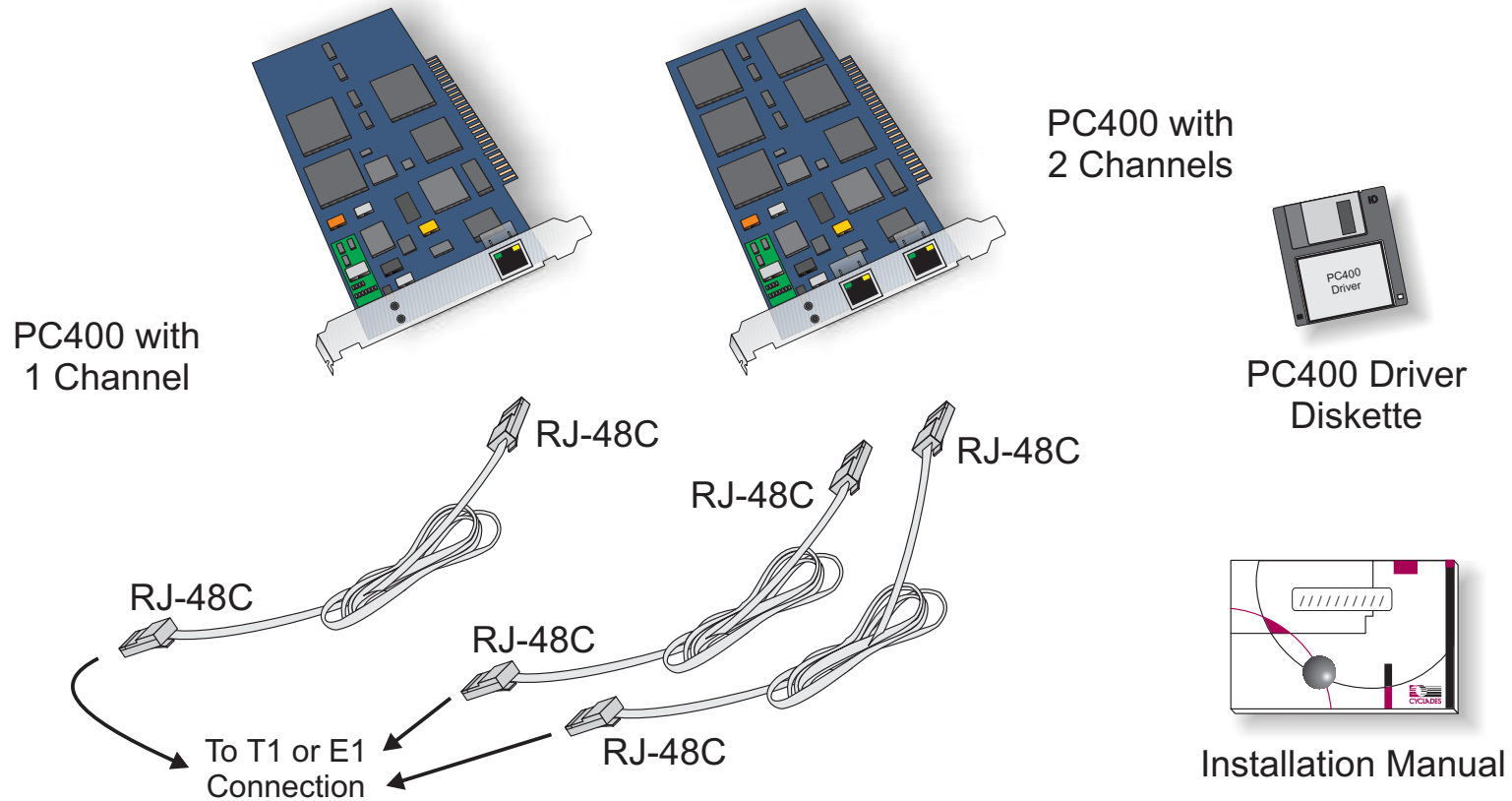
Upgrades of Software and Manuals
This product is provided with a printed Installation Manual. Both the manual and the driver are updated frequently, and the latest versions can be downloaded free from the Cyclades Web site.

CHAPTER 2 HARDWARE INSTALLATION

The body carries static electricity and if the person installing the PC400 is not correctly grounded, the board could suffer irreversible damage. Please follow the instructions outlined below carefully to avoid harming the board.

Step One:
Unplug the computer and remove all cables connecting the computer to other devices.

Step Two:
Carry the computer to a workbench or table where an anti-static wrist-strap is available. It is highly recommended that a wrist-strap be used. Remove the computer cover, exposing the boards inside. Attach the wrist-strap to your wrist.
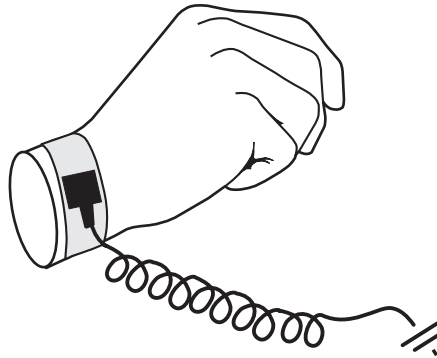
Step Three:
Be careful to not touch any components inside the computer's chassis, as they also can be damaged by static electricity. Confirm that the wrist-strap is grounded. If a wrist-strap is not available, touch a non-painted, metallic part of a computer plugged in to a wall outlet to remove any excess charge. Remove the board from its anti-static packaging, being careful to not touch the components or metal parts of the board.
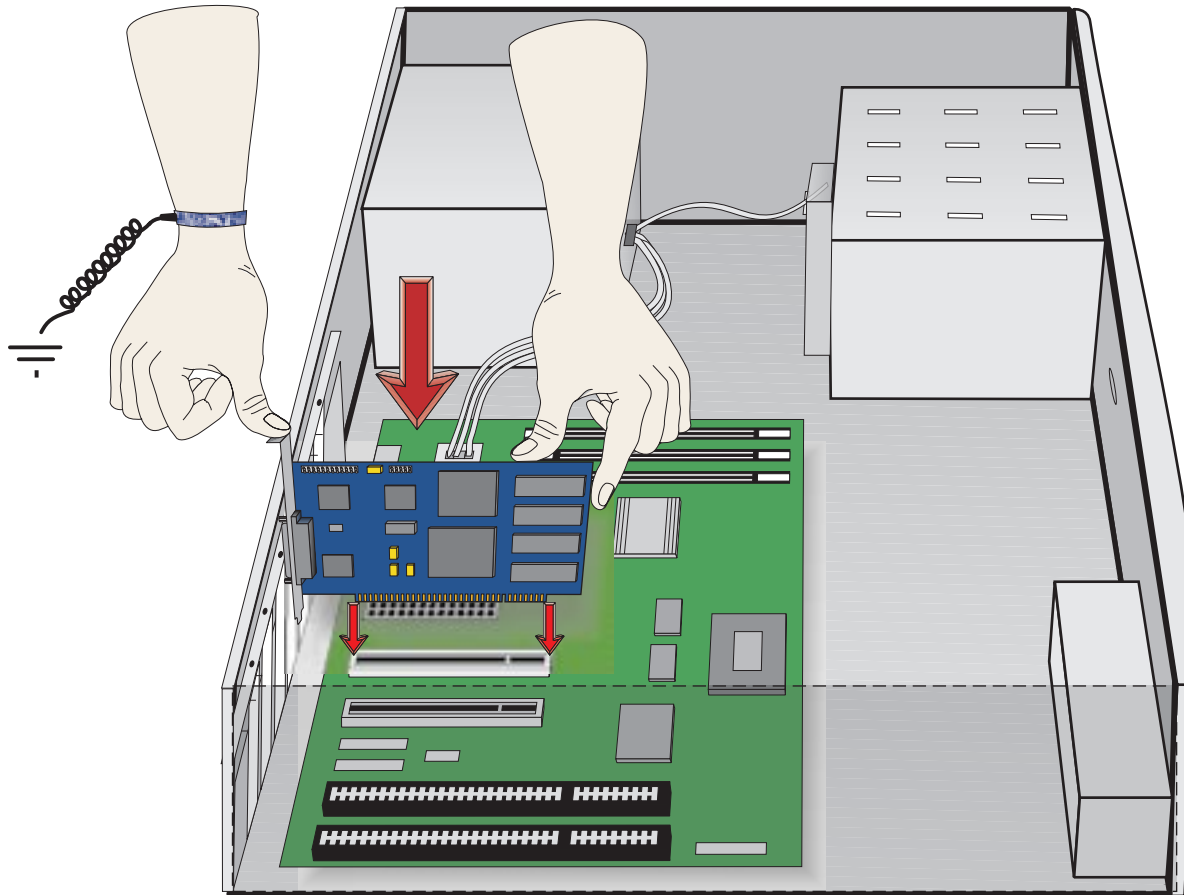
Step Four:

Insert the board carefully into any unused PCI slot so that the external connector is aligned with the opening in the back of the computer. Make sure that the board does not touch any metallic parts of the interior of the computer. The second bracket of models with two ports should be installed similarly.

Step Five:

Fasten the bracket to the back panel of the computer with a screw. Replace the computer's cover and replace the screws. Now you can remove the wrist-strap.
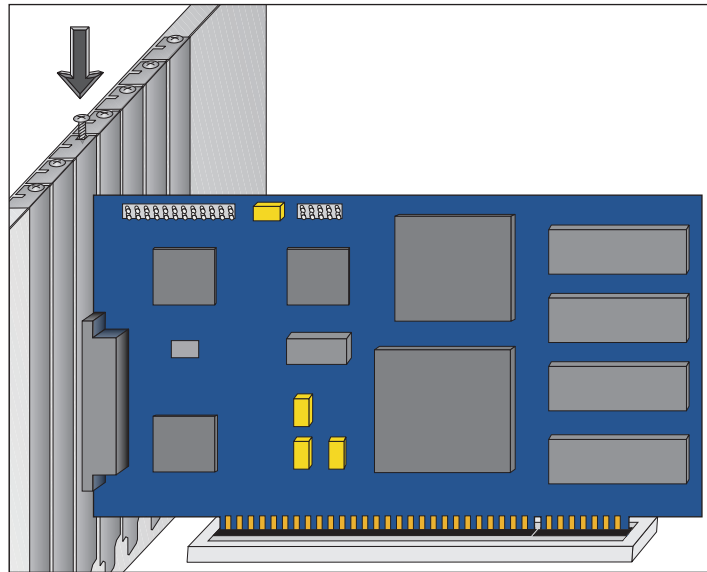
CHAPTER 3 SOFTWARE INSTALLATION

The PC400 driver diskette contains the files needed to run the Cyclades-PC400 in a Linux environment. This driver should run without problems with all processors supported by Linux. However, Ix86-compatible architectures are the only platforms officially supported by Cyclades.

> This Installation manual assumes a minimum knowledge of the Linux operating system. Please read the file `/usr/src/linux/README` before continuing, in order to understand the basics of kernel compilation.

System Requirements for compatibility with the PC400:

- Linux kernel 2.2.17 or later or 2.4.0 or later.
- 486 processor or better.
- PCI bus support.

These instructions assume that your kernel source tree is /usr/src/linux.

> Before installing the driver, please back up any critical information in your system.

Log in to the Linux computer as root. Place the diskette in the diskette drive.
Execute the following commands, beginning from any directory:

`cd /tmp`
`tar xvf /dev/fd0` (this command copies the tar file from the diskette to the directory `/tmp`)
`ls` (to see the name of the tar file)
`tar zxvf filename.tgz` (to unzip and untar the file)
`ls` (to see the name of the directory)
`cd pc400-<version>` (to go to the newly created directory)

NOTE: at this point you should read the file README included in the directory `pc400-<version>` to learn about any changes implemented since this manual was produced.

`sh install`   (to run the install script)

This script will detect the system information (kernel version, current Cyclades-PC400 driver version, etc.) and install the proper driver package files. A default configuration file will be placed in /etc/cyclades/pc400/pc400.cfg and is used when /usr/local/sbin/pc400util -p is executed.The following utilities are compiled and installed :

/usr/local/sbin/pc400util
/usr/local/sbin/pc400load
/usr/local/sbin/pc400dump
/usr/local/sbin/pc400hwtest
/usr/local/sbin/pc400syslog

And the firmware is installed in
/usr/local/lib/pc400.bin

If an older version of the PC400 driver already exists, the files pc400.c and pc400.h are backed up with modified names in the same directory. If a newer version is already installed, the files will not be updated with those of the older driver.

Configure the kernel by executing "`make config`" or "`make menuconfig`":

	Please note the following before beginning the kernel configuration. The only difference between selecting 'Y', '∗' or 'M' is the following: 'Y' or '∗' causes the driver to be compiled as part of the kernel and is activated every time the computer is booted; 'M' creates the driver as a module, which can be loaded or unloaded with a command without the need to reboot the computer.
Module	

The left column presents the commands and parameters that should be followed when using `make config`. The right column provides the corresponding commands and parameters for `make menuconfig`.

cd /usr/src/linux	cd /usr/src/linux
make config	**make menuconfig**
CONFIG_KMOD=Y (Kernel module loader) Activates support for module autoloading	Select with '∗' or 'M' the option "Digital RAS Support" in the "Character Devices" section, then select with '∗' or 'M' the option "Cyclades-PC400 support".
CONFIG_PCI=Y (PCI support) CONFIG_DIGITAL_RAS=Y or M (Digital RAS Support) CONFIG_PC400=Y or M	Select with '∗' the option "Kernel module loader" in the section "Loadable module support.

After leaving "`make config`" or "`make menuconfig`", execute the command
`make dep`
to set up the dependencies.

Rebuild and install the new kernel using the method most appropriate to the distribution being used. For example, in most Linux distributions the default Linux kernel is placed in /vmlinuz and then loaded from there. For these distributions, build the kernel by executing the command:

```
make bzlilo
```

If the PC400 driver or any other part of the Linux system was compiled as a module (M above), execute the command
`make bzlilo modules modules_install`
instead of just
`make bzlilo`

The installation of the Cyclades-PC400 is continued in the next chapter.

CHAPTER 4 BOARD AND SYSTEM CONFIGURATION

This chapter describes the configuration of the Cyclades-PC400. After the general instructions, guided examples are provided to assist in parameter selection. Read the example closest to your application if in doubt as to the best value for a parameter.

STEP ONE

If the PC400 driver was compiled as a module and it is desired that the driver be autoloaded when a PC400 device is accessed, add the lines below to `/etc/conf.modules` (or `/etc/modules.conf`, depending on the Linux distribution used):

```
alias char-major-214 pc400
alias char-major-215 pc400
```

✔	IMPORTANT: the Cyclades-PC400 driver must be loaded before the device is used.

STEP TWO

Next, create a text file to store configuration variables or edit the default configuration file, /etc/cyclades/pc400/pc400.cfg.. Only one label and one value per line, with a space between the label and the value. Blank lines are allowed. Examples are shown later in this chapter. The parameters are grouped into blocks and applied to each interface/channel/logical link/profile as will be seen below.

- **General parameters** define the user interface, name and password, together with some general options.
- **ISDN-PRI profile parameters** set trunk information such as telephone numbers and connection type for up to five profiles.
- **DSP profile parameters** set the string to be sent to the SAP for up to five profiles.

- **Interface parameters** set T1/E1-line specific parameters such as clock mode and signalling type.
- **Channel parameters** define groups of channels (time slots) within a T1/E1 line.
- **Logical link parameters** set link information such as telephone number and connection type.

All parameters are presented below with a brief description of each. The basic structure of the file is as follows:
general parameters
cnx_profile_begin
      Parameters that define this customized ISDN-PRI profile
cnx_profile_end
...
cnx_profile_begin
      Parameters that define this customized ISDN-PRI profile
cnx_profile_end
dsp_profile_begin
      Parameters that define and apply to this DSP profile
dsp_profile_end
...
dsp_profile_begin
      Parameters that define and apply to this DSP profile
dsp_profile_end
interf1_begin
      Parameters that configure T1/E1 Interface 1
      channel_group_begin
            Parameters that define and apply to this channel (time slot)
      channel_group_end
      ...
      channel_group_begin
            Parameters that define and apply to this channel (time slot)
      channel_group_end
      interfn_1_begin

Parameters that define and apply to this logical link
interfn_1_end

...
interfn_N_begin
Parameters that define and apply to this logical link
interf1_N_end
interf1_end
interf2_begin
Parameters that configure T1/E1 Interface 2, when present
channel_group_begin
Parameters that define and apply to this channel (time slot)
channel_group_end

...
channel_group_begin
Parameters that define and apply to this channel (time slot)
channel_group_end
interfn_1_begin
Parameters that define and apply to this logical link
interfn_1_end

...
interfn_N_begin
Parameters that define and apply to this logical link
interfn_N_end
interf2_end

Label	Description
unit_name	Identifies the board. The parameter should not exceed 20 characters.
prompt	Specifies the prompt to be used by the virtual console. It should not exceed 40 characters.
escape_char	Specifies the escape key to be used by the virtual console. It should not exceed one character. If the value begins with 0x it is assumed to be in hexadecimal. The <ESC> key has the value 0x1b.
shortcut_char	Specifies the shortcut key to be used by the virtual console. It should not exceed one character. If the value begins with 0x it is assumed to be in hexadecimal. The value 0x0 turns this feature off.
username	Defines the administrator's login name -- maximum 19 characters.
password	Sets the administrator's password -- maximum 19 characters.
syslog	Enables the system log and determines which messages will be displayed. The possible values for each of the three parameters are **disabled** or **enabled** (first parameter), **line**, **debug**, **user**, **system**, **modem** or a combination of them using "|" (second parameter) and **sys**, **alert**, **critical**, **error**, **warning**, **normal**, **info** or **dbg** (third parameter). A space should appear between each of the three parameters, but not within a parameter.
dsps_auto_restart	On occasion, the line requests that the DSP re-load its configuration. Sometimes the re-load is not successful and the DSP must try many times. This parameter determines the number of times the DSP may try to re-load its configuration. The values range from 0 (infinite number of retries) to 255.

FIG 4.1 GENERAL PARAMETERS

Parameters that define customized ISDN-PRI profiles.	
Label	**Description**
cnx_profile_begin	Up to 5 different ranges for cnx_profile can be configured.
phone	The first phone number of the range with this profile. It should not exceed 30 characters and "none" specifies the null string.
size_range	The number of phone numbers in the range with this profile. Values range from 1 to 255. No label is equivalent to the value 0.
cnx_type	Type of incoming call. Possible values are analog, digital, v110, v120 or a combination of the four separated by the pipe, "|".
cnx_profile_end	ends definition of customized ISDN-PRI profile.

FIG. 4.2 ISDN-PRI PROFILE PARAMETERS

Parameters that define and apply to DSP profiles.	
Label	**Description**
dsp_profile_begin	Marks the beginning of a digital signal processor profile. All parameters following this label apply only to this dsp profile until dsp_profile_end is reached.
profile_id	A number between 1 and 5 which labels the dsp profile for later reference.
config_string	Commands sent to the dsp. It should not exceed 80 characters.
dsp_profile_end	Marks the end of the configuration parameters for a digital signal processor profile. See comments for dsp_profile_begin above.

FIG. 4.3 DSP PROFILE PARAMETERS

Parameters that define and apply to interfaces.	
Label	Description
interf#_begin	Marks the beginning of the parameters specific to the #th T1/E1 interface. All parameters following this label apply only to this interface until interf#_end is reached.
clock_mode	Specifies the clock source. Can be either master or slave.
line_code	Type of coding used in the line. T1: b8zs or ami, E1: hdb3 or ami.
frame_mode	How data is framed. T1: esf, d4 or jesf, E1: crc4, ncrc4.
line_build_out	Attenuation on the line. Applies to T1 lines only and the possible values are 0db, -7.5db, -15db, and -22.5db.
signaling_mode	Specifies the signaling mode: pri, cas or none.
profile	ras, full, fractional or channelized. This parameter pre-sets several other parameters. Details are given later in this chapter.
rx_sensitivity	Degree of sensitivity for reception. Values are shaul (short haul) and lhaul (long haul).
signaling_type	Specifies the kind of signaling used when the CAS signaling mode is chosen. The possibilities are r2analog, r2digital (for E1) and winks and loops (for T1).
companding_mode	E1: alaw or none, T1: ulaw or none.
signaling_tone	Applies only when the CAS signaling mode is chosen. The possible values are dtmf and mfr1 (for T1) and dtmf, mfr2c, mfr2nc and mfr2sc (for E1).
country	Specificies the location of the PC400 if CAS signaling mode is being used. The options are usa, brazil, mexico, romania, india, and itu.
block_collect	Valid only for CAS in Brazil. Indicates whether or not collect calls should be blocked. The valid values are enabled and disabled.

FIG. 4.4 INTERFACE PARAMETERS

Label	Description
onhook_timer	Valid only for CAS in Brazil. Valid values are 20-255, in units of a fraction of a second. When the PC400 answers an incoming call it waits for the period defined by answer2_timer, then it hangs up. Next, it waits the period defined by onhook_timer and reconnects. The line remains active if the call was not a collect call. This is necessary because in Brazil a collect call is accepted by simply remaining on the line.
answer2_timer	Valid only for CAS in Brazil. Specifies the time that should elapse before answering an incoming call. Valid values are 15-255, in units of a fraction of a second. See description of onhook_timer.
trunk_number	Principal phone number assigned to the ISDN trunk line. Use the value *none* for this parameter if the incoming number should not be confirmed by the PC400. This is recommended when the provider does not send the trunk line number in the incoming call message. The value should not exceed 30 characters.
switch_type	Switch type when PRI signaling is used. au1 (for Australia), ets (for Europe ETSI), vn6 (for France), tr6 (for Germany), dms (for USA – NorTel DMS-100), 5ess (for USA – AT&T Custom), ntt (for Japan), n_isdn2 (for USA – NI-2), hkt (for Hong Kong) and 4ess (for USA – AT&T).
idle_timeout	For PRI signaling mode, specifies the idle timeout, in minutes, to drop one call. The value should not exceed 127 and 0 indicates no timeout.
t200	For PRI signaling mode, specifies the ISDN T200 parameter, which may not exceed 255.
n200	For PRI signaling mode, specifies the ISDN N200 parameter, which may not exceed 255.
t203	For PRI signaling mode, specifies the ISDN T203 parameter, which may not exceed 255.
interf#_end	Marks the end of the configuration parameters for the first interface. See comments for interf#_begin above.

FIG. 4.4 INTERFACE PARAMETERS (CONT.)

Parameters that define and apply to channels (time slots). These go inside interface markers.	
channel_group_begin	Marks the beginning of a group of channels. All parameters following this label apply only to this channel group until channel_group_end is reached.
channels	The number of channels in this channel group is defined. The value can be `first-last` or `channel_number`|`channel_number`|`channel_number` etc.
channel_group_end	Marks the end of a group of channels. See comments for channel_group_begin above

FIG. 4.5 CHANNEL PARAMETERS

Parameters that define and apply to logical links. These go inside interface markers.	
interfn_1_begin	Marks the beginning of the parameters for logical link 1. PRI allows 23 (T1) or 30 (E1) channels whereas CAS allows 24 (T1) or 30 (E1) channels.
connection_type	Indicates whether channel will be used for dial-in, dial-out or both.
phone_num	Phone number assigned to the channel. The maximum number of characters is 30.
dsp_profile_id	Specifies the DSP profile to be used for analog calls. 5 profiles are possible.
interfn_1_end	Marks the end of the parameters for logical link 1.

FIG 4.6 LOGICAL LINK PARAMETERS

The default values and sample configurations are described later in this chapter in the examples section.
The firmware should be loaded with the command:

```
pc400load
```

which will load the file in /usr/local/lib/pc400.bin.
This configuration file should be loaded into the board's memory with the command:

```
pc400util -p
```

The options of this command are given in appendix A.

STEP THREE
Edit one of the rc files (e.g. `/etc/rc.d/rc.local`) to include a call to the PC400´s firmware loader and configuration utility (so that the firmware and current configuration are loaded on boot):

```
# PC400 Firmware Download
if [ -x /usr/local/sbin/pc400load ]; then
    /usr/local/sbin/pc400load
fi
# PC400 Configuration Download
if [ -x /usr/local/sbin/pc400util ]; then
    /usr/local/sbin/pc400util -p
fi
#  PC400 Date and Time Set
if [ -x /usr/local/sbin/pc400util ]; then
    /usr/local/sbin/pc400util -t system
fi
```

☑ IMPORTANT: the Cyclades-PC400 driver must be loaded before the firmware and the configuration are downloaded to the board. Thus, if you compiled the driver as a loadable module, make sure you load the driver module before you call pc400load and pc400util.

If you use the rc files to load the module, for instance, do the following:

```
# PC400 Driver Load
if [ -x /sbin/modprobe ]; then
    /sbin/modprobe pc400
fi
# PC400 Firmware Download
if [ -x /usr/local/sbin/pc400load ]; then
    /usr/local/sbin/pc400load
fi
# PC400 Configuration Download
if [ -x /usr/local/sbin/pc400util ]; then
    /usr/local/sbin/pc400util -p
fi
```

STEP FOUR
Reboot the system and inspect the boot messages. The driver should report the PC400 boards detected.

```
Cyclades-PC400 driver <version> <date> built <date>
PC400 #1,  RAM at 0xMMMM, IRQn, 64 channels starting from port 0
PC400 #2,  RAM at 0xMMMM, IRQn, 64 channels starting from port 64
etc.
```

STEP FIVE

Enable the ports of the Cyclades-PC400 as you would with any standard serial port. Edit /etc/inittab to enable getty and configure the PPP/SLIP scripts.

The site www.netlinos.org (Documentation->Tutorials->Remote Access) has an example of how to set up a digital RAS using the PC400 and the software package portslave.

At this point the installation of the board is complete.

Guided Examples for the Most Common Applications

This section provides detailed examples that can be used as models for similar applications. Turn to the example that is closest to your application, read the explanations, and edit the configuration file with parameters appropriate to your system. Note that these examples only show the configuration of the first interface. The configuration of the second interface is identical.

Example 1 A RAS Dial-in Application With Both Analog and Digital Incoming Calls
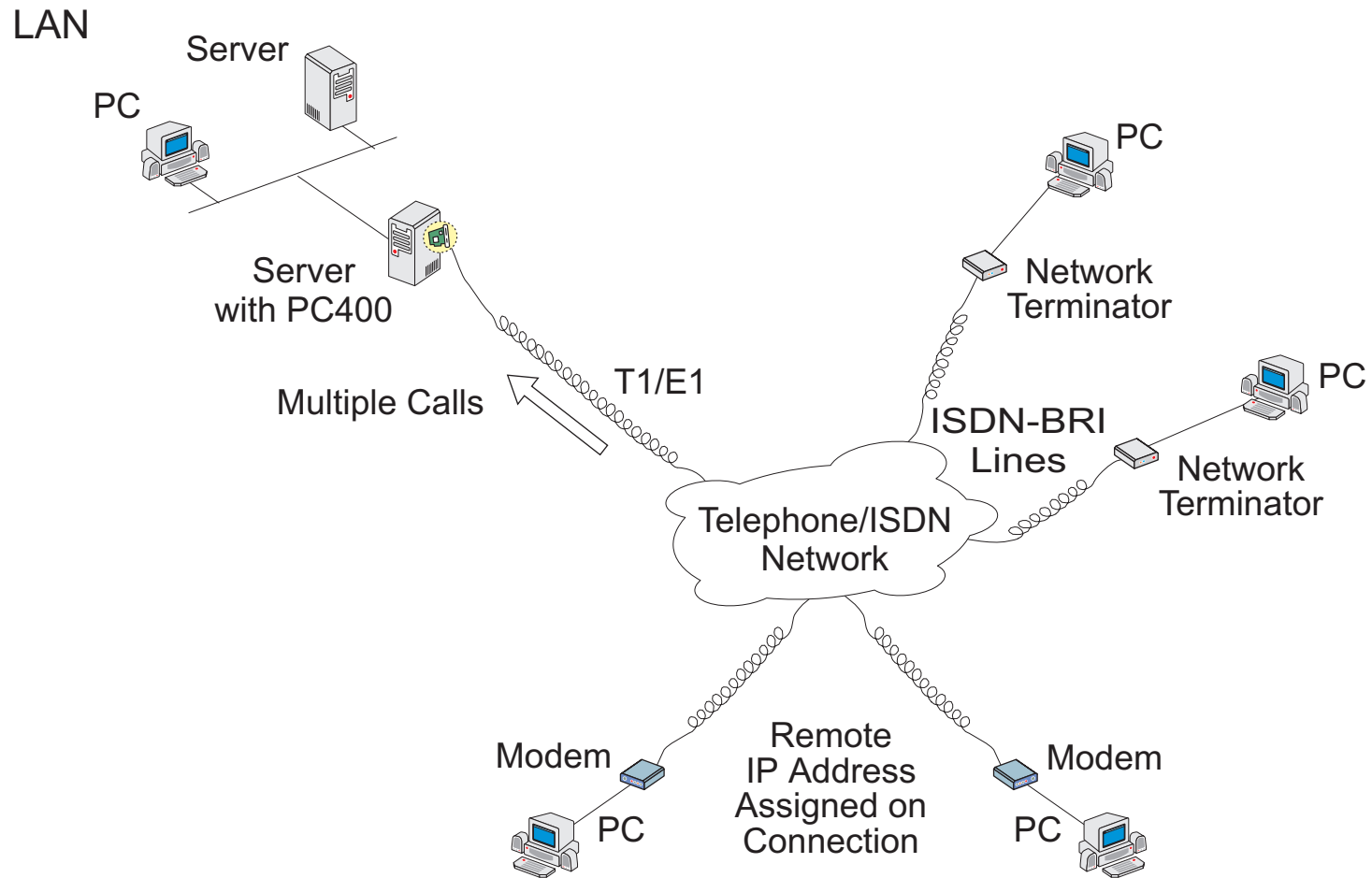
FIGURE 4.7 EXAMPLE OF A RAS DIAL-IN APPLICATION

Sample pc400.cfg files are provided on the driver diskette for the RAS dial-in application, in the directory Config_Sample. If you have a T1 line, use the file 2t1cas.cfg as a reference, if your line is E1, use the file 2e1cas.cfg.

Parameter	Description	Value for T1 line	Value for E1 line
unit_name	Name used to identify the board.	PC400	PC400
prompt	Can be changed to identify which board is being accessed.	Select option ==>	Select option ==>
escape_char	0x1b is the <ESC> key.	0x1b	0x1b
shortcut_char	0x0 turns this feature off.	0x0	0x0
username	Login name for administrator.	super	super
password	Password for administrator	supc	supc
syslog	Enables syslog messages indicated.	enabled line|debug|user|system|modem info	enabled line|debug|user|system|modem info
interf1_begin	First interface parameters		
interf_type	Indicates line time	t1	e1
clock_mode	Normally slave.	slave	slave
line_code	There are two options each for T1 and E1 lines. Ask the service provider.	b8zs	hdb3
frame_mode	There are several data framing options for both T1 and E1.	esf	crc4
line_build_out	Applies only to T1 lines. Ask the service provider.	0db	
signaling_mode	Can be pri (ISDN), cas or none.	cas	cas

FIGURE 4.8 RAS DIAL-IN APPLICATION PARAMETERS

Parameter	Description	Value for T1 line	Value for E1 line
rx_sensitivity	Sensitivity for reception.	shaul	shaul
companding_mode	There are two options each for T1 and E1 lines. Ask the service provider.	ulaw	alaw
signaling_type	Applies when CAS signaling mode is used. Ask the service provider.	loops	r2digital
signaling_tone	Applies when CAS signaling mode is used. Ask the service provider.	mfr1	mfr2c
country	Choose your country (cas only).	usa	brazil
interfn_1_begin	Logical link parameters		
connection_type	Whether the interface will be used for dial-in, dial-out or both.	both	both
phone_num	Phone number assigned to channel, if any.	none	301
dsp_profile_id	Number that identifies the profile, defined elsewhere (or default)	1	1
interfn_1_end	End of logical link parameters		
●●●			
interf1_end	End of first interface parameters		
interf2_begin	Second interface parameters		
●●●			
interf2_end	End of second interface parameters		
dsps_auto_restart	The number of times the DSP should try to re-load its configuration if requested.	0	0

FIGURE 4.8 RAS DIAL-IN APPLICATION PARAMETERS (CONT.)

Example 2 A LAN-to-LAN Example Using Channels
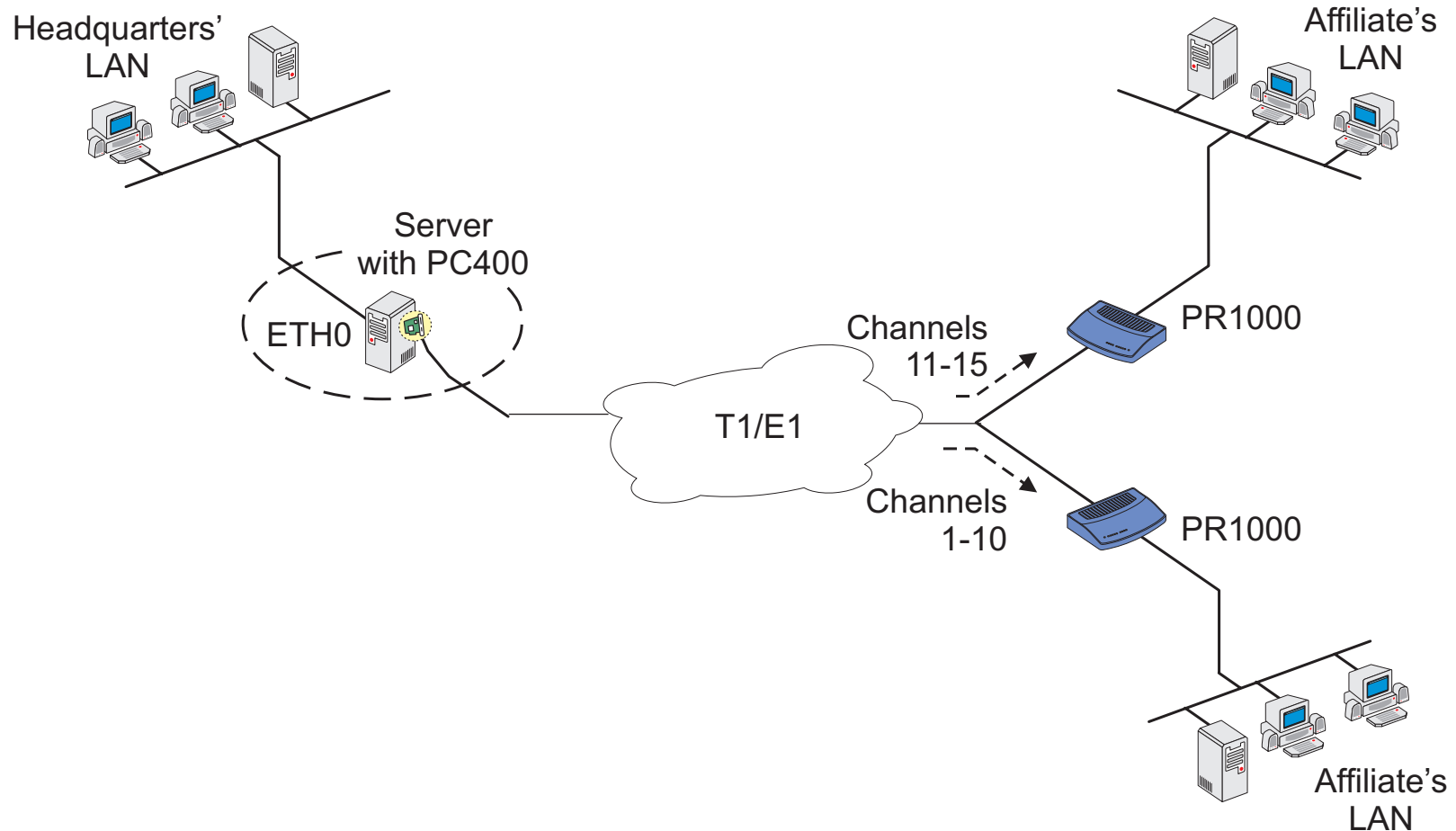
FIGURE 4.9 EXAMPLE OF A MULTIPLE LAN-TO-LAN APPLICATION

The example shown above would be configured using the channelized profile. Sample pc400.cfg files are provided on the driver diskette for the LAN-to-LAN application, in the directory Config_Sample. If you have a T1 line, use the file 2t1chan3.cfg as a reference, if your line is E1, use the file 2e1chan3.cfg.

Parameter	Description	Value for T1 line	Value for E1 line
unit_name	Name used to identify the board.	PC400	PC400
prompt	Can be changed to identify which board is being accessed.	Select option ==>	Select option ==>
escape_char	0x1b is the <ESC> key.	0x1b	0x1b
shortcut_char	0x0 turns this feature off.	0x0	0x0
username	Login name for administrator.	super	super
password	Password for administrator	supc	supc
syslog	Enables syslog messages indicated.	enabled line|debug|user|system|modem info	enabled line|debug|user|system|modem info
interf1_begin	First interface parameters		
interf_type	Indicates line time	t1	e1
clock_mode	Normally master.	master	slave
line_code	There are two options each for T1 and E1 lines. Ask the service provider.	b8zs	hdb3
frame_mode	There are several data framing options for both T1 and E1.	esf	crc4
line_build_out	Applies only to T1 lines. Ask the service provider.	0db	
signaling_mode	Can be pri (ISDN), cas or none.	none	none

FIGURE 4.10 MULTIPLE LAN-TO-LAN APPLICATION PARAMETERS

Parameter	Description	Value for T1 line	Value for E1 line
rx_sensitivity	Sensitivity for reception.	shaul	shaul
channel_group_begin	Definition of first channel group.		
channels	Channels in first group.	1-10	1-10
channel_group_end	End of definition of first channel group.		
channel_group_begin	Definition of second channel group.		
channels	Channels in second group.	11-15	11-20
channel_group_end	End of definition of second channel group.		
●●●			
interf1_end	End of first interface parameters		
interf2_begin	Second interface parameters		
●●●			
interf2_end	End of second interface parameters		
dsps_auto_restart	The number of times the DSP should try to re-load its configuration if requested.	0	0

FIGURE 4.10 MULTIPLE LAN-TO-LAN APPLICATION PARAMETERS (CONT.)

CHAPTER 5 TROUBLESHOOTING

General Tips

What to Do When the PC400 is Not Recognized by the Operating System

- Does the operating system detect the PC400 on boot? A message similar to
  ```
  Cyclades-PC400 driver <version> <date> built <date>
  PC400 #1,  RAM at 0xMMMM, IRQn, 64 channels starting from port 0
  PC400 #2,  RAM at 0xMMMM, IRQn, 64 channels starting from port 64
  etc.
  ```
  should appear on boot. If not,
- Is the board properly installed (physically)? Check the connections inside the computer.
- Does your Linux operating system meet the requirements outlined at the beginning of chapter 3? The kernel version can be discovered by typing the command `uname -r`.
- The steps in chapter 4 related to the device files should be reviewed and the configuration files checked.
- Check the configurations modified using "make config" or "make menuconfig" (details supplied in chapter 3). If they are incorrect, execute the commands `make dep` and then `make bzlilo modules modules_install` again to rebuild the kernel. Reboot the computer and see if the boards are detected.

How to Test if the PC400 is Functioning

- The simplest way to test a WAN connection is by pinging. Type `ping <IP address of device to be pinged>`. If a response is not received from the remote machine there is probably a problem with the link. Make sure the remote machine is up by accessing it from another computer before following the directions below.

What to Do if the PC400 is Detected by the Computer, but Does Not Function as Expected.

- Is the cable properly connected and is the correct cable being used?
- Type the command `ifconfig`. Do the devices set up for the board in chapter 4 appear?
- Type the command `netstat -rn` to see the routing table. Have you defined a default gateway and/or have a route that includes the remote device you are trying to reach?

Hardware Test

A menu-driven hardware test called pc400hwtest is included with the Cyclades-PC400 driver. It is executed by typing pc400hwtest at the command line. Note that the PC400 should not be tested while in use as the test will inactivate all ports. First, RAM integrity is checked:

```
[root@cyclades common]# ./pc400hwtest
Please wait while program is examining the hardware
BOARD[1] RAM TEST ED000000, PCI ED926000 OK !
Press [enter] to continue.

Application Checking Firmware Integrity (CRC) ... OK
```

Then press the <ENTER> key to bring up the main screen, shown below:

```
          PC400HWTest/Linux
          Revision 2.0.0 (2001/12/12)

          1. Test Asynchronous Ports
          2. Test T1 Channelized Ports
          3. Test E1 DSP Ports
          4. Quit

          Select option ==>
```

After choosing one of the first three options, the "global" screen appears as shown below:

```
       Global Test DSP   Passes - 1741                          Pg0.
       Board  RAM  FALC :  01  02  DSP : U19 U06 U20 U07
       ----------------------------------------------------
         1    OK           OK  OK         OK N/T NOK NOK
       <ESC> - Previous Menu <G> - Global <E> - Errors
```

Typing E will bring up the "errors" screen as shown below:

```
Board    Port           <---- PACKETS ---> Test : DSP
         From To From      To  Sent       Received  Passes  Errors      Pg0
         ----------------------------------------------------------------------
         1 <-> 1  1  <-> 33  1741       1741       1741        0
         1 <-> 1  2  <-> 34  1741       1741       1741        0
         1 <-> 1  3  <-> 35  1741       1741       1741        0
         1 <-> 1  4  <-> 36  1741       1741       1741        0
         1 <-> 1  5  <-> 37  1741       1741       1741        0
         1 <-> 1  6  <-> 38  1741       1741       1741        0
         1 <-> 1  7  <-> 39  1741       1741       1741        0
         1 <-> 1  8  <-> 40  1741       1741       1741        0
         1 <-> 1  9  <-> 41  1741       1741       1741        0
         1 <-> 1  10 <-> 42  1741       1741       1741        0
         1 <-> 1  11 <-> 43  1741       1741       1741        0
         1 <-> 1  33 <-> 1   1741       1741       1741        0
         1 <-> 1  34 <-> 2   1741       1741       1741        0
         1 <-> 1  35 <-> 3   1741       1741       1741        0
         1 <-> 1  36 <-> 4   1741       1741       1741        0
         1 <-> 1  37 <-> 5   1741       1741       1741        0
         1 <-> 1  38 <-> 6   1741       1741       1741        0
         1 <-> 1  39 <-> 7   1741       1741       1741        0
         1 <-> 1  40 <-> 8   1741       1741       1741        0

         <ESC> - Previous Menu <G> - Global <E> - Errors
```

Typing G or E switches between the two screens and the ESC key returns to the main menu. The "+" serves to scroll down and "-" scrolls up.

Administrative Utilities

A program called pc400util is used for administrative functions. It is executed by typing pc400util at the command line with the following options:

 pc400util -<g|p|s|S|i|-a<up|down>> [-d device] [-f <file|default>] [-t <MMDDYYYYHHMMSS|system>]

The options are described in more detail in the list below:

-d device	defines the configuration device to use.
-f file	defines the file to be up/downloaded
-g	upload current board configuration to a local file.
-p	download configuration from a local file to the board.
-s	get current statistics.
-S	get current status.
-i	get board information.
-a cmd	set the device administrative up or down.
-t time	set date and time on the board.

APPENDIX A INFORMATION FOR USERS NOT FAMILIAR WITH LINUX

Users and Passwords

A username and password are necessary to log in to a Linux system. A unique password should be configured as soon as possible to avoid unauthorized access to your network.
Type the command:

```
passwd
```

to create a password for the root user.

To create a regular user (without root privileges), use the commands:

```
adduser user_name
passwd user_password
```


Linux File Structure

The Linux file system is organized hierarchically, with the base (or root) directory represented by the symbol "/".
All folders and files are nested within each other below this base directory. The directories located just below the base directory are:

/home	Contains the work directories of system users.
/bin	Contains applications and utilities used during system initialization.
/dev	Contains files for devices and ports.
/etc	Contains configuration files specific to the operating system.
/lib	Contains shared libraries.
/proc	Contains process information
/mnt	Contains information about mounted disks.
/opt	Location where packages not supplied with the operating system are stored.
/tmp	Location where temporary files are stored.
/usr	Contains most of the operating system files.
/var	Contains operating system data files.

Basic File Manipulation Commands

The basic file manipulation commands allow the user to copy, delete and move files and create and delete directories.

cp *file_name destination* a) cp text.txt /tmp b) cp /chap/robo.php ./excess.php	Copies the file indicated by *file_name* to the path indicated by *destination*. a) copies the file text.txt in the current directory to the tmp directory. b) copies the file robo.php in the chap directory to the current directory and renames the copy excess.php.
rm *file_name*	Removes the file indicated by *file_name*.
mv *file_name destination*	Moves the file indicated by *file_name* to the path indicated by destination.
mkdir *directory_name* a) mkdir spot b) mkdir /tmp/snuggles	Creates a directory named directory_name. a) creates the directory spot in the current directory. b) creates the directory snuggles in the directory tmp.
rmdir *directory_name*	Removes the directory indicated by *directory_name*.

Appendix A - Linux

Other commands allow the user to change directories and see the contents of a directory.

pwd	Supplies the name of the current directory. While logged in, the user is always "in" a directory. The default initial directory is the user's home directory, /home/<username>
ls [options] *directory_name*	Lists the files and directories within *directory_name*. Some useful options are -l for more detailed output and -a which shows hidden system files.
cd *directory_name*	Changes the directory to the one specified
cat *file_name*	Prints the contents of *file_name* to the screen.

Shortcuts:

. (a dot)	represents the current directory
.. (two dots)	represents one directory above the current directory (i.e. one directory closer to the base directory).

The vi Editor

To edit a file using the vi editor, type
```
vi file_name
```
vi is a three-state line editor: it has a command mode, a line mode and an editing mode. If in doubt as to which mode you are in, press the <ESC> key which will bring you to the command mode.

Mode	What is done there	How to Get There
command mode	navigation within the open file	Press the <ESC> key.
editing mode	text editing	See list of editing commands below.
line mode	file saving, opening, etc. exiting from vi	From the command mode, type ":" (the colon).

Entering the program, the user is automatically in the command mode. To navigate to the part of the file to be

edited, use the following keys:

h	moves the cursor to the left (left arrow)
j	moves the cursor to the next line (down arrow)
k	moves the cursor to the previous line (up arrow)
l	moves the cursor to the right (right arrow)

Having arrived at the location where text should be changed, use these commands to modify the text (note commands "i" and "o" will move you into the editing mode and everything typed will be taken literally until you press the <ESC> key to return to the command mode)

i	insert text before the cursor position (everything to the right of the cursor is shifted right)
o	create a new line below the current line and insert text (all lines are shifted down)
dd	remove the entire current line
u	undo the last modification
x	delete the letter at the cursor position

Now that the file has been modified, enter the line mode (by typing ":" from the command mode) and use one of the following commands:

w	save the file (w is for write)
wq	save and close the file (q is for quit)
q!	close the file without saving
w *file*	save the file with the name *file*
e *file*	opens the file named *file*

The Routing Table

The static routing table can be seen using the commands

```
      route -n
```

or

```
netstat -rn
```

Type man netstat at the Linux prompt for more informations about netstat options. Routes should be added to the file /proc/net/route or at the prompt (for temporary routes) using the following syntax:

```
route [add|del] [-net|-host] target netmask nt_msk [gw gt_way] interf
```

`[add|del]`	one of these tags must be present -- routes can be either added or deleted.
`[-net|-host]`	-net is for routes to a network and -host is for routes to a single host.
`target`	`target` is the IP address of the destination host or network
`netmask` `nt_msk`	the tag netmask and a mask are necessary only when subnetting is used. Otherwise, a mask appropriate to the `target` is assumed. `nt_msk` must be specified in dot notation.
`gw gt_way`	specifies a gateway, when applicable. `gt_way` is the IP address or hostname of the gateway.
`interf`	the interface to use for this route. Must be specified if a gateway is not. When a gateway is specified, the operating system determines which interface is to be used.

Type man route at the Linux prompt for more information about the syntax for the command route.

ssh - The Secure Shell Session

ssh is a command interface and protocol often used by network administrators to connect securely to a remote computer, and is a highly recommended alternative to telnet/rlogin. ssh replaces its non-secure counterpart rsh. There are two versions of the protocol, ssh and ssh2. Type man ssh2 at the Linux command prompt for more information about the use of ssh.

The Process Table

The process table shows which processes are running and is displayed by tying ps -a. An example is given below.

```
 PID        TTY     STAT     TIME     COMMAND
1          ?       S        0:05     init
322        ?       SW       0:00     [portmap]
3361        tty11  SW       0:00     [login]
11915      pts/0   S        0:00     bash
11926      pts/0   R        0:00     ps -ax
```

Use the kill command to delete a process. For example, kill -9 3361 would kill the login process above.

Loading the Configuration File

This configuration file (for non-default configurations) should be loaded into the board´s memory with the command:

```
    pc400util -p -f <text file>
```

The options of this command are:

pr400util -<g|p|s|S|i|-a<up|down>> [-d device] [-f <file|default>] [-t <MMDDYYYYHHMMSS|system>]

where

-d device   defines the configuration device to be used. The possible values are /dev/ttyCM0 to /dev/
              ttyCM31 where /dev/ttyCM31 is a virtual console than can be accessed using Minicom
              or a similar utility.

-f file   use <file> as the file argument, <default> accepts the default parameters.

-g   upload current board config. to a local file.

-p   download config. from a local file to the board.

-s   get current statistics.

-S   get current status.

-a cmd   set the device Adm UP or Down.

-t time   set date and time on the board

-i   get information from the board

Syslog

The syslog feature can be turned on, as an option. It runs in background, by default. Its syntax is:

pc400syslog [-d device] [-l facility]

-d device : defines the syslog device (the default is /dev/ttyCM30)

-l <facility> : where <facility> is a number between 0 and 7, indicates the local_level

it sends Syslog messages generated by the PC400 firmware to the Syslogd running on the Linux server. It can also be initialized using the rc.local file described later.

The Crond Utility

A list of Linux shell commands can be saved in a "crontab" file and executed at a specific time. The crontab command provides a user interface to change the crontab file. To use crond, first create the following two files for every process that it will execute:

1. crontab - the file that specifies frequency of execution, name of shell script, etc. should be created using the traditional crontab file format.
2. script shell - a script file with the Linux commands to be executed.

Each line of the crontab file has five time and date fields, followed by a user name if it is the system crontab file, followed by a command.

```
    minute  hour  date  month  day-of-week [user] command
```

Commands are executed when the minute, hour and month fields match the current time and when at least one of the two day fields (day of month or day of week) match the current time. An * represents the entire possible range of values (e.g. every day or every month).

Next, create a line in the file /etc/crontab_files for each process to be run.
Each line must contain the three items:

- status (active or inactive) - if this item is not active, the script will not be executed.
- user - the process will be run with the privileges of this user, who must be a valid local user.
- source - pathname of the crontab file.

When the /etc/crontab_files file contains the following line:

```
active root /etc/tst_cron.src
```

and the /etc/tst_cron.src file contains the following line:

```
0-59 * * * * /etc/test_cron.sh
```

crond will execute the script listed in tst_cron.sh with root privileges each minute.

Another option is to use the crontab command to interactively modify the crontab file. Its syntax is:

```
crontab [-u user] file   or   crontab [-u user] { -e | -l | -r }
```

where

    -e = edit user's crontab

    -l = list user's crontab

    -r = delete user's crontab

Type man cron and man crontab at the Linux prompt for more information.

The DHCP (Dynamic Host Configuration Protocol) Client

DHCP is a protocol that allows network administrators to assign IP addresses automatically to network devices. Without DHCP (or a similar protocol like BOOTP), each device would have to configured manually. DHCP automatically sends a new IP address to a connected device when it is moved to another location on the network. DHCP uses the concept of a fixed time period during which the assigned IP address is valid for the device it was assigned for. This "lease" time can vary for each device. A short lease time can be used when there are more devices than available IP numbers. For more information on how to set your server up as a DHCP client or server, see RFC 2131 or the DHCP pages at www.linuxdoc.org

Packet Filtering using ipchains

The Linux utility ipchains can be used to filter IP packets entering, leaving and passing through interfaces. An ipchains tutorial is beyond the scope of this manual. For more information on ipchains, see the ipchains man page (by typing man ipchains at the Linux command prompt) or the howto: http://netfilter.filewatcher.org/ipchains/HOWTO.html.

The syntax of the ipchains command is:

```
ipchains -command chain [-s source] [-d destination] [-p protocol] [-j
target] [-i interface]
```

where **command** is one of the following:

A - Add a condition or rule to the end of the chain. Note that the order in which a condition appears in a chain can modify its application and the first rule added to a chain is processed first, etc.

D - Delete a condition from the chain. The condition must match exactly with the command's arguments to be deleted.

R- Replace a condition in the chain.

I - Insert a condition in a specified location in the chain.

L - List all conditions in the chain.

F - Flush (remove) all conditions in the chain.

N - Create a new chain.

X - Deletes a user-created chain

P - Policy applied for default handling

chain is one of the following:

input - filters incoming packets

output - filters outgoing packets

forward - filters packets which are not created by the server and are not destined to the server

user_created_chain - a previously defined (or in the process of being defined) chain created using the N command described above.

The output chain controls which packets are sent. A packet can be accepted by the input chain, but then rejected by the output chain. Likewise, the forward chain controls which packets will be routed. The input chain controls incoming packet filtering. The packet is either destined for the router or for another computer. In the latter case, the packet is processed by the forward chain. Packets that pass through the forward chain will then be processed by the output chain.

source and **destination** have the following format:
        `[!]address[/mask] [!][port[:port]]`
! : reverses the definition, resulting in the opposite effect.
address : host or network IP
port : defines a specific port
port:port : defines a range of ports
If a source or destination is not specified then 0.0.0.0/0 is used.

protocol is one of the following:
tcp, udp, icmp, all or a protocol number (see the file /etc/protocols for a list).

target is one of the following:
ACCEPT
DENY
the name of another chain

interface is:
one of the server interfaces. Lists do not need to be associated to an interface, so this option may be omitted.

To save changes made using the ipchains command, execute fwset. This command will save the filter configuration in the file /etc/network/firewall.

To delete the changes made (before fwset is executed) execute fwset restore to return to the lists previously saved in /etc/network/firewall. Only the lists previously saved using fwset will then be defined. This command is

executed at boot to invoke the last configuration saved.

Another option is to edit the file /etc/network/firewall (or another file) directly, following the syntax defined in the file itself. If the file is edited in this way, the command fwset cannot be used to save and restore the configuration. Use
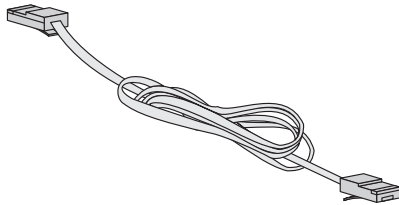ipchains-save > file_name to save the lists in file_name
updatefiles file_name to save file_name to flash memory
ipchains-restore < file_name to restore the lists to the configuration in file_name

APPENDIX B   HARDWARE SPECIFICATIONS

This chapter provides the pinout diagram for the cable supplied with the product, in case it is lost or damaged.

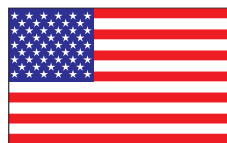|	Cyclades-PC400 RJ-48C			T1/E1 Terminal Adapter RJ-48C	
Signal	Pin			Pin	Signal
RxTip	1	———	1	RxTip
RxRing	2	———	2	RxRing
N.C.	3	———	3	N.C.
TxTip	4	———	4	TxTip
TxRing	5	———	5	TxRing
N.C.	6	———	6	N.C.
N.C.	7	———	7	N.C.
N.C.	8	———	8	N.C.

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