

Software Installation Manual SCO,
AT&T, Interactive Unix System V Release 4
UnixWare SCO OpenServer, SCO
OpenDesktop and SCO Xenix 386 for the
TCL Intelligent Serial Communications Cards

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Chapter 1 Introduction

The TCL PCC device drivers are sets of routines which communicate with a PCC Intelligent Multiport card, and provide a means by which the Operating System can control the card to perform I/O operations.

In addition to basic input-output operations, the TCL PCC device drivers support many additional features, including:

- On-card terminal translation.

- Enhanced multiple screens.

- Background printing to a terminal-attached printer.

- Extensive flow control support.

- Configurable data buffer sizes.

1.1 Precautions

Before attempting a driver installation or any operation where the operating system is to be altered in any way, it is extremely advisable to back up the working user files.

It is also not advisable for other users to be logged on to the system during this operation.

Do not hit <RESET>, power down the system, or in any way try to interrupt the driver installation.

Do not have any background processes running.

1.2 General Instructions

In order to install a PCC device driver, the following software must have previously been installed:

SCO UNIX AND SCO XENIX:

The Link Kit must be installed.

SYSTEM V RELEASE 4 INTERACTIVE UNIX AND AT&T UNIX:

No software other than the operating system is required.

All the operations described for installation should be carried out in system maintenance (root or super-user) mode.

For ISA and EISA bus computers (most conventional PCs) it does not matter whether you install the multiport card before or after installing the driver.

With an MCA bus computer (IBM PS/2 and certain other computers) SCO Unix or Xenix may fail to boot if one or more PCC cards are present but the driver has not been installed. Install the driver before installing the cards.

On an MCA bus computer, interrupt number 3 is used internally by SCO Unix and Xenix, and should not be selected for a PCC card. Use the POS system to select interrupt number 10, 11 or 15 (See hardware installation manual).

TCL distributes device drivers on 3.5 inch (1.44 Mb) and 5.25 inch (1.2 Mb) diskettes.

For SCO Open Desktop, please follow the instructions given for SCO Unix throughout the manual.

Chapter 2 Driver Installation

Before installing the driver it is necessary to login as the super-user.

Drivers are installed using the standard system utilities provided with the operating systems.

During installation, a series of instructions is displayed. If an error occurs a message is displayed. These are listed in Appendix B.

2.1 Installation for SCO Unix and SCO Xenix 386

The release disk for these systems contains two packages, for TCL's intelligent and direct multiport cards, for both SCO Xenix and SCO Unix. The SCO custom utility is used to install the appropriate driver.

If you are updating an earlier version of the driver you must remove the old driver before installing the new one. Follow the instructions in section 3.2.

To install the driver the following steps are required:

If you are using Xenix, save the following files by renaming them with the mv command.

```
/usr/sys/conf/c.o  
/usr/sys/conf/space.o
```

These files can be restored if system generation fails.

Insert the release diskette into the (first) drive.

Type custom to run the custom utility.

Select option to add a new product.

Select option to list the available packages.

Select option to install one or more packages.

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The installation menu will display the available packages (under the field name) on the TCL distribution diskette. To install the PCC driver, select TCL.

- Note 1: The DEL key can be used at any stage to abort the installation gracefully.
- Note 2: With SCO Unix, if you select the Entire Product option both the intelligent and the direct drivers will be installed into the kernel.
- Note 3: The above procedure installs a driver from whichever diskette drive custom uses as default. To use a different drive use one of the following commands:

Drive	Size	Capacity	Command
0	5¼"	1.2 Mb	custom -m /dev/rfd096ds15
0	3½"	1.44 Mb	custom -m /dev/rfd0135ds18
1	5¼"	1.2 Mb	custom -m /dev/rfd196ds15
1	3½"	1.44 Mb	custom -m /dev/rfd1135ds18

2.2 Installation for Interactive Unix:

Insert the release diskette into the (first) drive.

type sysadm to enter the sysadm utility

select softwaremgmt option to access the software management menu.

select installpkg option and follow the instructions given to install the driver.

2.3 Installation for AT&T Unix

Insert the release diskette into the (first) drive.

type `face` to enter the system interface menu

select System Administration option

select Software Setup option

select Install UNIX System Application option and follow instructions given to install the driver.

Note: The `installpkg` utility can also be used to install this driver.

2.4 Installation for System V Release 4:

Insert the release diskette into the drive.

type `sysadm` to enter the System Operations, Administration and Maintenance utility.

select software option to access the Software Installation and Removal menu.

Select install option.

choose the diskette number and media for the package location.

follow the instructions given by the installation script to install the driver.

Note: The `installpkg` utility can also be used to install this driver.

2.5 Installation for UnixWare

Insert the release diskette into the drive.

type `sysadm` to enter the System Operations, Administration and Maintenance utility.

select software option to enter the Software Installation and Removal menu.

select install option to enter Install a Software Package menu.

for the Package location select `diskette1` or `diskette2` depending on the drive you installing from.

for the Package name, enter the SAVE key (F3).

follow the instructions given by the installation script to install the driver.

Alternatively, the `pkgadd` utility can also be used to install this driver.

Note 1: Read-in the distribution to the spool directory to install the driver later is also supported.

Chapter 3 Driver removal

Before removing a driver it is necessary to login as the super-user.

3.1 Ensuring the driver is installed

Before attempting to remove a driver it is necessary to ensure the driver is installed. This can be carried out as follows:-

SCO UNIX AND SCO XENIX 386:

Run the custom utility and select the option to list the available packages.

INTERACTIVE UNIX:

Run the displaypkg utility. If driver is installed the following message is displayed:
TCL PCC Device Driver-Version ???

AT&T UNIX:

Run the face utility.

- select System Administration
- select Software Setup
- select Display Installed Software

If the driver is installed, the following message is displayed:

TCL PCC Device Driver-Version ???

Alternatively, displaypkg can be used with AT&T Unix.

SYSTEM V RELEASE 4:

Run the sysadm utility.

- select software option to access the Software Installation and Removal menu
- select list option to display information about packages. The package name for the PCC range driver is tclpcc.

Alternatively, displaypkg can be used with System V Release 4.

UnixWare:

Run the sysadm utility.
select software option to enter the Software Installation and Removal menu.
select list option to enter Displays Information about Packages menu.
When the driver is installed the package name for the PCC range driver (pcc) should be in the list.

3.2 Removal for SCO Unix and SCO Xenix 386

Run the custom utility.

select the option to Remove one or more packages.

Enter the word which identifies the PCC driver.

Exit the custom utility.

Delete the product permission list file with the command:
`rm /etc/perms/tcldrv`

Note Earlier versions of the SCO Unix driver were installed with the installpkg utility. These should be removed with removepkg.

3.3 Removal for Interactive Unix

Run the removepkg utility.

Select the number which corresponds to the PCC driver.

3.4 Removal for AT&T Unix

Run the `face` utility.

Select System Administration.

Select Software Setup.

Select Remove Installed Software.

Move the cursor to the line which corresponds to the PCC driver and press the ENTER key.

Alternatively, `removepkg` can be used.

3.5 Removal for System V Release 4

Run the `sysadm` utility.

Select software option to access the Software Installation and Removal menu.

Select remove option. The package name for the PCC range driver is `tclpcc`.

Alternatively `removepkg` can be used.

3.6 Removal for UnixWare

UnixWare

Run the sysadm utility.

select software option to enter the Software Installation and Removal menu.

select remove option to enter Removes Packages menu.

for the Package location select installed.

for the package name to be removed, enter the CHOICES key (F2) and mark the pcc entry.

hit the SAVE key (F3) to remove the driver.

Alternatively, the pkgrm utility can also be used to remove this driver.

Chapter 4 Booting the new system

In order to boot the newly generated Operating system, the system should be halted by entering:

shutdown

After a short delay the ****Normal System Shutdown**** message will be displayed.

If you have a PCC/4A (SBC2) card you are recommended to switch the power off and on at this stage.

The operating system should now be rebooted using the following procedures:

SCO Unix and Xenix 386:

Press any key, then a boot prompt will be displayed.

Enter the Xenix or Unix name displayed during driver installation.

UnixWare, System V Release 4, Interactive Unix and AT&T Unix:

The newly generated Operating system will boot by default.

Chapter 5 Setting up the serial ports

The serial ports have two groups of configurable parameters: those which control the communication characteristics of the serial line and those which control the way in which transmitted and received data is manipulated by the intelligent multiport card.

The communications parameters are equivalent to those of serial ports such as the COM1 and COM2 ports of the computer, and are configured in the same way. The data manipulation parameters are configured with the tcset configuration program.

5.1 Setting communications parameters

The physical communications characteristics of a line (data rate, data bits, stop bits, parity) should be set using the normal technique for the operating system. This involves either the use of a utility program provided with the system, or directly editing the system configuration file.

The system configuration file name varies with the operating system. For SCO Unix, System V Release 4, AT&T Unix and Interactive Unix it is /etc/inittab, and for SCO Xenix it is /etc/ttys. For certain configurations it may also be necessary to add new entries to /etc/gettydefs.

Temporary changes can be made with the stty command. See the operating system documentation for details.

For scan-code terminals (WYSE 60/PCTERM, HP PCTERM), the word length should be set to 8 DATA BITS. As many terminals do not correctly support 8 data bits plus parity, it is recommended that NO PARITY should be selected for these terminals.

5.2 tcset Configuration Program

The serial ports of PCC cards are configured using the tcset configuration program. tcset is copied to the /etc directory when the driver is installed. tcset modifies the configuration file /etc/tcset-1.cnf.

To configure a port, follow these steps:

Login as the super-user.

Run the configuration program as follows: /etc/tcset

Follow the menu options to update the configuration file.

Ensure all users connected to PCC cards have logged off.

Reload the cards to use the new configuration. Either select the option to reload before tcset exits, or halt and reboot the system.

tcset can be operated in two modes: menu mode and command line mode. In most cases menu mode is used. Command line mode is intended for use from script files, and is described later.

When tcset is run it searches for the hardware definition file /etc/tclhard.inp (generated by tclload) and the software configuration file /etc/tcset-1.cnf. If either file is absent one of the following messages is displayed:

WARNING: File /etc/tclhard.inp does not exist.

You have to reboot the system and run tclload to create this file
Press any key to continue.....

OR,

WARNING: File /etc/tcset-1.cnf does not exist.
You are about to create this new configuration file.
Press any key to continue.....

If /etc/tclhard.inp is missing the Card Selection Menu is then displayed, otherwise the Main Menu is displayed.

5.3 tcset Card Selection Menu

The /etc/tclhard.inp file specifies which cards are in the computer. If this file is not found tcset displays the Card Selection Menu which allows the number and type of cards to be specified.

If the /etc/tcset-1.cnf file is present tcset uses this to set the initial values for the Card Selection Menu. If the /etc/tcset-1.cnf file is not found then tcset sets a default of one PCC/8 card. It also sets the default parameters for the ports.

```

                                CARD SELECTION MENU

0 RETURN TO MAIN MENU
1 NUMBER OF CARDS           4
2 CARD NUMBER  1           8 PORT PCC
3 CARD NUMBER  2           16 PORT PCC
4 CARD NUMBER  3           8 PORT PCC
```

Option 0 returns control to the Main Menu.

Option 1 selects number of cards to configure.

Options 2 to 5 select different card types. They are displayed according to the number of cards selected.

5.4 tcset Main Menu

The first menu displayed by tcset is normally the Main Menu. If tcset cannot find the /etc/tclhard.inp file the Card Selection Menu is displayed first.

```

                                MAIN MENU

0 EXIT WITHOUT UPDATE
1 UPDATE FILES AND EXIT
2 CONFIGURE A SINGLE PORT
3 CONFIGURE A GROUP OF PORTS
4 CARD NUMBER          1      8 PORT PCC
```

For computers with ISA bus, cards are numbered in the order of their installed address. With the MCA and EISA buses (e.g. IBM PS/2 computers) cards are numbered in the order of the card slot numbers.

Option 0 leaves the program. If you modified the configuration information, you are asked to confirm that you want abandon any new settings.

Option 1 causes the configuration file /etc/tcset-1.cnf to be created or updated. The /etc/ttytype file is also modified to reflect the specified configuration.

Note: If the above files do not have the read/write permission flag set, then they will not be updated and one of the following messages will be displayed:

```
Permission denied on file /etc/ttytype
or
Permission denied on file /etc/tcset-1.cnf
```

If both files are saved successfully and before exiting the program, you are asked if you want to re-load PCC cards. The message is:

```
Files /etc/tcset-1.cnf and /etc/ttytype saved successfully
Do you wish to re-load PCC cards? (y/n)
WARNING: This option will log off all users on PCC cards.
```

If you respond y then tclload is run to reload the cards.

Option 2 is used to set the configuration of a single port. You are prompted to specify the port number. The Port Configuration Menu is then displayed (see below).

Option 3 is used to set an identical configuration for a group of ports. You are prompted to enter the first and last ports in the group. The Port Configuration Menu is then displayed, which is used to configure all the specified ports.

On the PCC/16i ISA card the ports must be configured as two groups: ports 1 to 4 and ports 5 to 16. This is necessary because different handshake lines are implemented on these groups of ports.

On the PCC/16i EISA card the port must be configured as two groups : ports 1 to 8 and ports 9 to 16. This is necessary because different handshake lines are implemented on these groups of ports.

Option 4 selects which card number to configure. The card type and the number of ports on the card are displayed.

5.5 tcset Port Configuration Menu

After selecting options 2 or 3 from the main menu, the Port Configuration menu is displayed, shown below:

```
CARD 1 PORT 1 TYPE 16 PORT PCC/I

PORT CONFIGURATION MENU

0 RETURN TO MAIN MENU
1 TERMINAL TYPE                WYSE 60 PCTERM
2 RECEIVE BUFFER SIZE          256
3 TRANSMIT BUFFER SIZE         256
4 FLOW CONTROL                  CTS
5 MULTIPLE SCREEN(S)           4
6 TRANSPARENT PRINTER          OFF
7 KEYBOARD NATIONALITY         UNITED STATES
8 KEYBOARD TYPE                STD 84 KEYS
9 TERMINAL CONNECT MODE        DISABLED

Select an option:

Total multiple screens on 3 cards (Max=128) : 35
Total channels on card 1 (Max=64) : 19
```

Options 2 to 9 are displayed only for certain TERMINAL TYPE settings.

Option 0 returns to the Main Menu. The other options toggle a parameter between different values. The current value is displayed. Any changes made do not become permanent until the configuration is saved (option 1 on the main menu). They do not come into effect until the computer is next booted or the PCC cards are re-loaded.

The two lines at the bottom of the port configuration menu indicate the proportion of the maximum possible configuration of the device driver and of the card have been allocated. These are specified in appendix B. tcset that prevents either of these limits being exceeded by restricting the configuration to what is valid. For example, you cannot increase the number of multiple screens if doing so would exceed either the per-card or the system limit.

If only one PCC card is present then the system limit does not apply, and is not displayed.

5.6 TERMINAL TYPE setting

TERMINAL TYPE specifies what, if any, terminal emulation will be performed by the card.

Each port can be used in two modes. No translation mode causes the card to be transparent to input and output data. The operation is similar to the COM1 and COM2 ports of the computer. All handling of terminal characteristics is performed by the PC. Alternatively, the card can be set to translate input and output data. In this mode Unix generates standardised sequences to control the terminal screen, and the multiport card translates these into the sequences required by the terminal. This has several advantages, including:

- It provides a consistent screen interface for applications, independent of whether they are outputting to the PC main screen or to a serial terminal.

- TCL's enhanced multiple screen system is supported.

- Background printing to a terminal-attached printer is supported.

In translation modes, function and cursor key sequences from the terminal are translated into ANSI sequences. They can be reprogrammed with the SCO setkey utility.

The TERMINAL TYPE of a port can be set to the following:

NO TRANSLATION	RFU (WYSE 350)
WYSE 30/WYSE 50	RFU (AMPEX 232)
TVI GENERAL	DISABLED
TVI955	PRINTER
TVI905	WYSE 60 PCTERM
RFU (HP PCTERM)	TCL PCMAIN
VT100	

NO TRANSLATION causes the card to transmit all data exactly as received from the operating system.

PRINTER is intended for a serial printer connected directly to a port. No translations are performed.

WYSE 60 PCTERM supports PC-emulation terminals. These terminals are recommended since they make the terminals operate almost identically to the PC main screen and keyboard. They send scan-codes when the keys are pressed, and support the IBM PC character set. Suitable terminals include: Kimtron KT7-PC, Wyse 60 PC-MODE, Wyse 120 PC-MODE, and Ampex 232 PC-MODE. The communications parameters should be set to 8 DATA BITS and NO PARITY.

TCL PCMAIN is intended for the PCMAIN terminal emulator program running on a PC under MS-DOS / PC-DOS. PCTERM supports a subset of the ANSI and VT52 command set.

RFU (HP PCTERM) supports The Hewlett-Packard 700/44 terminal, and other Hewlett-Packard terminals which send PC scan codes. The facilities provided are similar to the WYSE 60 PCTERM. The communications parameters should be set to 8 DATA BITS and NO PARITY.

WYSE 30/WYSE 50, TVI955, TVI905, TVI GENERAL, VT100

These support the specified terminals. Where feasible, 8 bit characters (e.g. block

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graphics and accented letters) and character attributes (bold, underline, flash, reverse) are translated to the correct commands for the terminal.

RFU (WYSE 350), RFU (AMPEX232)

These provide support for non-standard systems. Contact TCL for details.

DISABLED should be selected if the port will not be used. This eliminates the overhead of managing the port.

All TERMINAL TYPE settings other than NO TRANSLATION, PRINTER and DISABLED require that an enhanced executive is loaded onto the card. tcload automatically loads the correct executive.

When the configuration is saved, tcset modifies the /etc/ttytype file adding entries for the device files of each port. The entries in this file are set as follows:

TERMINAL TYPE	Operating System				
	SCO Unix	SCO Unix	AT&T Unix	Interactive Unix	System v Release 4
NO TRANSLATION	unknown	unknown	unknown	unknown	unknown
PRINTER	unknown	unknown	unknown	unknown	unknown
All others	ansi	ansi	AT386-M	AT386-M	AT386-M

5.7 Data Buffer Sizes

Options 2 and 3 of the Port Configuration Menu allow the size of the transmit and receive interrupt buffers to be configured. The following sizes can be selected (in bytes):

16, 32, 64, 128, 256, 512, 1024, 2048, 4096, 8192, 16384, 32768, 65536

For most purposes 256 bytes is satisfactory. With printers it can be useful to use large transmit and small receive buffers. Some communications systems may require small transmit and large receive buffers.

Note: The system does not support transmit buffer sizes lower than 256 bytes with TERMINAL TYPES other than NO TRANSLATION or PRINTER.

Note: transmit or receive buffer size of other than 256 bytes on any port require that an enhanced executive is loaded onto the card. tcload automatically loads the correct executive.

5.8 Flow Control

The FLOW CONTROL setting specifies the techniques which are used by the terminal (or printer, etc) to stop the computer transmitting, and by the computer to stop the terminal transmitting. This is known as a handshake. Certain cards do not support all the handshake options. The following settings are supported.

OFF

No flow control. May be satisfactory at low data rates.

CTS

A low level on the CTS input of the port stops the computer transmitting. This is normally recommended with terminals. The cable should link the DTR output of the terminal to the CTS input of the port. The terminal itself should be set to use DTR flow control.

In addition, a low level on the DCD input prevents data reception. Note: for some types of card the DCD input is not externally connected, but is internally linked to a high level.

RTS/CTS

In addition to the CTS operation described above, the computer sets a low level on the RTS output when it needs to stop the terminal transmitting. This is not normally required for connection to terminals or printers, but may be needed when connecting two computers together. It requires a suitable cable.

XON/XOFF

The host and the terminal stop each other transmitting by inserting a control character (XOFF) in the data stream and cause transmission to restart by sending another control character (XON). This is known as a software handshake and does not require a special cable. The terminal should also be set to XON/XOFF. The control characters used for XON and XOFF depend on the TERMINAL setting, as follows:

Terminal	XOFF	XON
WYSE 60 PCTERM	0x65	0x67
TCL PCVDU	0x65	0x67
TCL PCTERM	0xF1	0xF0
All others	0x13	0x11

The control codes for "all others" above (Ctrl-S and Ctrl-Q) are incompatible with some application software.

DTR/DSR

A low level on the DSR input stops the computer transmitting. The computer sets a low level on the DTR output when it needs to stop the terminal transmitting. This setting will not work with a 16 port PCC daughter board. It requires a suitable cable.

MODEM

Full modem support (see chapter 8). Requires that an enhanced executive is loaded onto the card. tcload automatically loads the correct executive.

CTS+XON/XOFF

XON/XOFF+CTS+RTS

XON/XOFF+DTR/DSR+RTS+CTS

MODEM+XON/XOFF

These setting provide combinations of the other settings.

5.9 Serial Multiple Screens

When set to a terminal translation mode the driver supports multiple screens on each terminal. Up to four screens can be used on each terminal (two on PCC/4A (SBC2) cards). These have a similar "look and feel" to the multiple screens supported on the main console of some versions of Unix.

The number of multiple screens on a terminal is selected with option 4 of the Port Configuration Menu. Up to 64 screens can be configured on each multiport card.

On PC-emulation terminals the multiple screens are selected by pressing the <ALT> together with either the 1, 2, 3, or 4 keys on the numeric key pad. On other terminals they are selected by pressing the <CTRL> and N keys. This toggles between the available screens.

On PC-emulation terminals, pressing the <CTRL>, <ALT> and keys simultaneously causes the multiport card to redraw the screen image and reset its Num Lock and Caps Lock status. This is not normally necessary, but can be used if data corruption occurs (e.g. from a noisy telephone line), or if the terminal has been switched off. It can also be used to synchronise the Num lock and Caps lock lights of the terminal keyboard.

Each multiple screen has a separate device file, and appears to Unix as an independent terminal. Each device file must be set to the same communications parameters (data rate etc.)

To support a large total number of screens it may be necessary to increase certain operating system parameters. See the operating system documentation for details.

5.10 Background Transparent Printing

Printers may be connected to the multiport card either directly, using a port dedicated to a printer, or indirectly connecting the printer to the back of a terminal. The terminal and printer data streams are then multiplexed and share the same serial line (and the same modem, if used).

When set to a terminal translation mode the driver supports background printing to a terminal-attached printer. The driver limits the rate at which printer data is sent so

that it matches the printer speed. This prevents the terminal locking-up, and allows the terminal to be used for other tasks during printing. Background printing is intended only for low or medium speed printers. High speed printers should be connected directly to the multiport card.

Terminal-attached printers are enabled and disabled with option 6 of the Port Configuration Menu. This also allows the printer speed in characters per second (cps) to be set. The printer speed parameter should be set to the highest value consistent with the printer buffer not becoming full. If too high a value is selected then the terminal will lock up temporarily while printing occurs.

If a serial printer is used its line characteristics (data rate etc.) should be set up at the terminal.

The printer device file names are given in Appendix A. These may be used with the normal print spooler service of the operating system. See the system documentation for details.

To verify that the terminal printer is working, send data directly to the device by entering the following command:

```
date >/dev/  
    followed by the device file name in Appendix A.
```

This should cause the current date to be printed.

The transparent printer device files do not support ioctl calls. The main Software effect of this is that NL (newline) characters are not mapped to CR-NL.

Note: Some types of terminal do not read the keyboard correctly while outputting a printer. This can lead to lost keystrokes during printing.

5.11 Keyboard Settings

For scan-code terminals (WYSE 60 PCTERM), RFU (HP PCTERM), the keyboard type and nationality are set with options 7 and 8 of the Port Configuration Menu.

Two keyboard types are available; STANDARD 84 KEYS for the older style of keyboard which has the function keys on the left, and ENHANCED for 101 or 102 key keyboards, which have the function keys along the top of the keyboard.

The following keyboard nationalities are supported:

UNITED STATES	SWEDEN/FINLAND
FRANCE	ITALY
GERMANY	SPAIN
UNITED KINGDOM	NORWAY
DENMARK	PORTUGAL

UNITED STATES and UNITED KINGDOM keyboards can be distinguished by the shifted 3 key. On a US keyboard this is #, on a UK keyboard it is £.

5.12 Terminal Connect System

When a terminal is connected to a TCL Intelligent Multiport card it is normally connected to the operating system as soon as the system starts up. If the Terminal Connect System is used then the terminal is initially connected to a process running on the Multiport card. It is not connected to the operating system until a special key sequence is pressed.

This mode of operation prevents spurious data from being passed to the operating system, where it could cause unpredictable effects. Such spurious data often occurs with modems during the establishment of a connection. It can also occur in systems where terminals are switched off or disconnected from the system. Terminals often generate spurious characters when they are switched on and off, and terminal cables which are either unconnected or are connected to an unpowered terminal can pick up electrical noise which can be interpreted by the system as keyboard data.

Terminals can be disconnected from the operating system with the command `bye`. This returns it to the initial power-on state. (See section 10.6).

The Connect Mode of each terminal is set via this option. This allows the following Connect Mode to be set:

- DISABLED The normal mode of operation. The terminal is connected to the operating system when the system start up. No keys need be struck on the terminal.
- SPACE BAR The space bar must be struck three times before the terminal is connected to the operating system.

When a Connect Mode other than DISABLED is selected, the program running on the multiport card sends a log-on prompt to the terminal and scans the keyboard data from the terminal for the required key sequence. This works with all supported terminal types. The log-on prompt is retransmitted intermittently.

5.13 tcset Command Line Mode

The tcset configuration program supports a command line mode to configure an individual port. This is intended for use from a script file. Instructions are given in the Help screen, which is displayed when you enter the following command:

```
/etc/tcset -h
```

This displays the following screen:

```
tcset [-h] cn ln {[-fc][-dt][-pt][-vs][-rx][-tx][-kt][-nk][-mc]}
  h      display help screen
  c      card number where n=(1..4)
  l      port number where n=(1..32)
  f      flow control where c=(off, cts, rts, rcts, xon, xcts,
        xrts, xrc, dtr, dcts, drts, drc, xdtr, xdc, xdr, xdrc,
        mod, xmod)
  d      terminal type where t=(pct, pcm, nt, w50, tvg,
        tv955,tv905, hp, vt100, ampx, w350, dab, prn)
  p      transparent printer where t=(off, 5, 10, 15, 20, 25,
        35, 40, 50, 60, 70, 80,90, 100, 120, 140,160,180, 200,
        220, 240, 255)
  v      number of multiple screen(s) where s=(1..4)
  r      receive buffer size where x=(16, 32, 64, 128, 256,
        512,1k, 2k, 4k, 8k, 16k, 32k, 64k)
  t      transmit buffer size where x=(16, 32, 64, 128, 256,
        512,1k, 2k, 4k, 8k, 16k, 32k, 64k)
  k      keyboard type where t=(std, enh)
  n      keyboard nationality where k=(us, fr, gr, uk, dk,
        sw,it, sp, nw, pg)
```

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Note: the transparent printer speed is scaled by a factor of five. For example, to set a speed of 100 cps the command - p20 should be used.

For example, the command:

```
tcset -c2 -l5 -dpct -v3 -kenh -nuk -p10
```

sets the fifth port on the second multiport card to

```
TERMINAL TYPE = WYSE 60/PCTERM  
MULTIPLE SCREENS = 3  
KEYBOARD TYPE = ENHANCED  
KEYBOARD NATIONALITY = UNITED KINGDOM  
TRANSPARENT PRINTER = ON 50 cps
```

Chapter 6 Enabling (disabling) a terminal line

The PCC Intelligent multiport cards allow many more users to have simultaneous access to the Operating System. Before these additional users can use the system, the terminals must be enabled.

Note: see hardware installation manual for details of cable connections

Once the driver is installed, the terminals must be enabled to use the system, using the device file names listed in Appendix A. If a terminal has been configured with tcset to have multiple screens, the device file for each virtual screen must be enabled separately.

To enable (disable) a terminal line it is necessary to login as the super-user. Directions for enabling (disabling) terminals are given below for each operating system.

When a terminal has been enabled, it should be switched On and the <ENTER> key pressed. A 'login' message should then be displayed. It is then possible to login and use the system.

6.1 Enabling (disabling) Terminals for SCO Unix and SCO Xenix 386

Use the enable and disable commands with the terminal file name listed in Appendix A. For example, to enable the terminal connected to port one of a PCC card under SCO Unix:

```
enable /dev/ttytc01
```

6.2 Enabling (disabling) Terminals for Interactive Unix:

Run the sysadm utility.

Select ttygmt to enter the TTY management menu.

Select modtty and enter the terminal file name (see Appendix A). Change its state to on (off), select a line setting and answer y(es) to install the new characteristics.

6.3 Enabling (disabling) Terminals for AT&T Unix

Run the face utility.

Select System Administration.

Select Peripherals Setup.

Select Serial Ports Setup.

Press the CHOICE key and select a TCL port. These are identified by the names given in Appendix A.

Set the Device Type to Terminal to enable the terminal or None to disable it.

Select the required Device Speed.

Press the SAVE key to update the system files.

6.4 Enabling (disabling) Terminals for System V Release 4 and UnixWare

Edit the initialisation table file (/etc/inittab).

Select the terminal file name (See Appendix A).

Change the action field (defaulted to off during the driver installation) to respawn to enable the terminal or off to disable it.

Save the file and request the init process to read the inittab file by typing:
init q

Chapter 7 DOS Emulation

The drivers meet the requirements for support the VP/ix DOS emulation package. These include ioctls, and process and keystroke notification hooks.

Under VP/ix terminal users can run DOS applications concurrently with conventional Unix or Xenix processes, provided that the emulation package is correctly installed and the user has been assigned the privilege to use it.

Chapter 8 Modem Support

The drivers incorporate modem support. Modems are supported only in ports which implement the CTS, RTS, DTR and DCD handshake lines.

Different device files are used to specify which ports are connected to a modem. These device files use different minor device numbers (see Appendix A).

Note: corresponding modem and non-modem device file names differ only in the substitution of a T for a t.

The following steps are required to enable a modem port.

If the non-modem device is already enabled, disable it using the technique in chapter 6.

Using `tcset` set the flow control mode for the selected port to "MODEM" or "MODEM+XON/XOFF" as required, then Shut Down and Restart the system.

Enable the modem device using the technique in chapter 6.

For example, with SCO Xenix to enable a modem device on the first port of a PCC card:

```
disable /dev/tty01tc
enable /dev/tty01Tc
```

If the port has been configured to have multiple screens, then you must perform these steps for the device files of each screen.

A printer attached to a terminal connected through a modem can be used in the same way as a printer on a directly connected terminal. See section 5.9. The same device files are used for printers on directly-attached and modem attached terminals.

Handshake line functionality in modem mode:

DTR output - high when the computer is ready for a modem connection.

RTS output - high when data is being transmitted from the port, low when no data

is being transmitted.

CTS input - a low level prevents the port transmitting.

DSR input - a low level prevents the port transmitting.

DCD input - a low level causes the user on the terminal to be logged off. DTR is then driven low for an interval to cause the modem to disconnect.

RI input - not used.

The automatic logging-off feature is important for the security of dial-in systems. If a user's phone line is disconnected unexpectedly, he/she is automatically logged off. This prevents another user from connecting to an already logged-in session.

PCC cards are normally shipped with input handshake lines biased so that if no signal is connected an input line assumes a high level. Cards can be modified to change the input biasing. Contact TCL for details.

A suitable cable is required to connect a modem. The connections are normally more complex than for a directly connected terminal, and depend on the modem used.

The use of error-correcting modems is strongly recommended, especially if scan-code terminals are used.

Chapter 9 PCC/MX Systems

The PCC/MX system uses PCC/MX communications multiplexer units connected to special-purpose PCC cards in the computer. PCC/MX units are normally connected to the PCC card with a high-speed synchronous communications link, although other configurations are possible.

Each PCC/MX unit provides eight asynchronous serial ports and one parallel printer port. Up to four PCC/MX units may be connected to a PCC card, and up to four PCC cards may be installed in a computer. This gives a maximum configuration of sixteen PCC/MX units.

PCC/MX systems and conventional asynchronous PCC cards can be installed in the same computer in any combination of up to four cards.

In most respects asynchronous ports on PCC/MX units may be used in the same way as conventional serial ports.

tcset and tcload assume that up to four PCC/MX units may be connected to each card, and generate a /etc/tcset-1.cnf file with configurations for 32 ports for each card. This can have the side-effect that there can be a gap between the minor device numbers of ports on a PCC/MX system and ports on other PCC cards. This can be resolved by using tcset to set the ports for any PCC/MX units which it is known will never be connected to DISABLED. The port program may be used to show which ports are allocated which device numbers.

9.1 PCC/MX Parallel Printers

The parallel printer ports on the PCC/MX units are accessed by using the special device files listed in Appendix A (title MX printer). In most respects the PC/MX parallel port may be used in the same way as the main system parallel port.

Note: There are four parallel printer devices allocated for each PCC card in the system. Because of the mix and match way of installing the PCC range cards you need to select the right device names when accessing the parallel ports. See appendix A.

9.2 MX System Parameter Setup Program setmx

The line configuration information is stored in the PCC executive file. The executive files are supplied as standard for both lines (P1 and P2) configured for RS485 Multidrop operation at 1 Mbps. If this is the operational mode required then the setmx program need not be run.

To set any other type of line configuration it is necessary to setup the executive by running the setmx program on the required executive.

9.2.1 Running setmx program

If setmx is run without any command line option, it uses the default executive file /etc/tcsync1.sys. If this file does not exist, it will look for other executive file, namely /etc/pccsync/sys.

If a required executive file is specified, then at the command line, type the following:
setmx filename

Where filename is the name of an executive file to be setup.
e.g. setmx /etc/tcsync1.sys

The program then displays MX System Parameter Setup Menu. (See section 9.2.2).

setmx supports the following command line options:

-h
Display all available switch settings for the MX box and a brief description of the command options.

-s
Display switch setting for each node on a line.

-r
Display MX setup information in decimal format.

-rh
Display MX setup information in hexadecimal format.

9.2.2 MX System Parameter Setup Menu

If running setmx without any command line option, the MX System Parameter Setup Menu is displayed, as shown below:

```
MX SYSTEM PARAMETER SETUP PROGRAM
File: /etc/tcsyncl.sys

0 - Save & Exit

1 - Line Parameter Menu

2 - Node Parameter Menu

ESC - Exit

Enter Selection:-
```

Option 0 causes the executive file to be updated before leaving the program.

Option 1 is used to view or edit a line parameter options. (See section 9.2.3).

Option 2 is used to view or edit a node parameter options. (See section 9.2.4).

Option ESC leaves the program.

9.2.3 Line Parameter Menu

After selecting option 1 from the System Parameter Setup Menu, the Line Parameter Menu is displayed, as shown below:

```
MX SYSTEM PARAMETER SETUP PROGRAM
  File : /etc/tcsync1/sys

MX SYSTEM LINE PARAMETERS

1 - Display

2 - Edit

ESC - Exit

Enter Selection:-
```

Option 1 displays the current line setting.

Option 2 allows the line setting to be modified. The acceptable settings for each field are discussed in section 10.7.5.

N.B. Parameter must be typed in and terminated with the RETURN key. To skip over a field, simply press the RETURN key.

Option ESC returns to the System Parameter Setup Menu.

9.2.4 Node Parameter Menu

After selecting option 2 from the System Parameter Setup Menu, the Node Parameter Menu is displayed, as shown below:

```
MX SYSTEM PARAMETER SETUP PROGRAM
  File : /etc/tcsyncl.sys

MX SYSTEM NODE PARAMETERS

1 - Display

2 - Edit

ESC - Exit

Enter Selection:-
```

Option 1 displays the current node setting.

Option 2 allows the node setting to be modified. The acceptable settings for each field are discussed in Section 9.2.5.

N.B. Parameter must be typed in and terminated with the RETURN key. To skip over a field, simply press the RETURN key.

Option ESC returns to the System Parameter Setup Menu.

9.2.5 Field Setting

After selecting Option 2 from Line Parameter Menu, or selecting Option 2 from Node Parameter Menu, each field can be modified to affect the current configuration. However, some fields only accept a specific value and they are discussed as follows:

9.2.5.1 Poll Period Configuration

Select the Line Parameter Menu allows the POLL PERIOD to be set. For all line types the POLL PERIOD should be set to ZERO, this allows the executive code to determine the optimum poll period itself.

9.2.5.2 Line Type Configuration

The following strings in "quotation marks" are accepted for the LINE TYPE prompt:

- "RS485" - Standard Multidrop Mode.
- "RS422" - X21 RS422 Point to Point Synchronous Mode.
- "RS232S" - RS232 Point to Point Leased Line or Dial Up Line Synchronous Mode.
- "RS232A" - RS232 Dial Up Line Asynchronous Mode.

9.2.5.3 Line Speed Configuration

The following strings in "quotation marks" are accepted for LINE SPEED prompt. The LINE TYPES which support the valid speeds are given in brackets.

- "1M" - 1Mbps [RS485]
- "500K" - 500Kbps [RS485]
- "250K" - 250Kbps [RS485]
- "64K" - 64Kbps [RS422]
- "38K4" - 38K4bps [RS232A/RS232S]
- "19K2" - 19K2bps [RS232A/RS232S]
- "14K4" - 14K4bps [RS232S]
- "9K6" - 9K6bps [RS232S]

Note: The LINE SPEED variable is not used directly for RS422 and RS232 Synchronous Modes as the Transmit and Receive clocking rate is supplied by the modem. The information is only used to determine the data bandwidth available for the transmission and reception of data.

9.2.5.4 MX Node Timeout Count Configuration

The MX Node TIMEOUT COUNT may be set from the Node Parameter Menu. In Multidrop Mode the Standard Value for the TIMEOUT COUNT is 2. If the MX Node is connected through a public exchange or an asynchronous modem it may be necessary to increase the TIMEOUT COUNT to a higher value between 5 or 8 (e.g. 6) to allow for the Transmit/Receive delays through the exchange equipment.

Chapter 10 PCC utilities

10.1 PCC port program

The port command from a terminal on a PCC card indicates which port the terminal is connected to, the configuration of that port and of that card on which it is located.

The super-user can run port at any console to display the configuration of all ports on all PCC cards.

When running the port program, the first thing it displays is some useful information about the PCC card. These include:

- a) card number,
- b) card type and number of found ports,
- c) card window size,
- d) physical address of the card,
- e) handler version number, and
- f) device driver version number.

For MCA/EISA machine, port also displays the following:

- g) card slot number, and
- h) card memory size.

Next, port shows the configuration of all ports associated with this card in table form.

The following example shows the configuration of a port on a PCC/16 card:

Card 2 PCC/16 Window=4k Address=0xd6000 Exec=4.5p Driver=4.1d

CHAN	DEVICES	ENAB	TERMINAL	KBOARD	BAUD	BIT	PARI	RX/TX	FLOW
2:8	16,17,18,12p	EED	WYSE 60 PCTERM	US 84	9600	8:1	NONE	256/256	CTS
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)

where:

- (a) Card number and port number.
- (b) Device numbers and transparent printer number on the port.
- (c) Indicates which terminal device file(s) are enabled.
- (d) Terminal type setting set in tcset.
- (e) Keyboard type setting set in tcset.
- (f) Line speed.
- (g) Data bits and stop bits.
- (h) Parity setting.
- (i) Receive and transmit buffer sizes set in tcset.
- (j) Flow control setting set in tcset.

port supports the following command line options.

-e, -r, -l, -h, -a, -c, -p -o

-e comms error counts

Show the number of communications errors detected, in the following format:

CARD	SHAN	OVERFLOW	PARITY	FRAMING	OVERRUN
2	8	0	0	0	0
(a)	(a)	(b)	(c)	(d)	(e)

where:

- (a) card and port numbers
- (b) receive buffer overflow count
- (c) receive parity error count
- (d) framing error count
- (e) receiver overrun error count

-ra control line status

Show the control line status of the specified ports, in the following format:

CARD	CHAN	OUTPUTS		INPUTS			
2	8	DTR	RTS	DSR	CTS	RI	DCD

If a line is high then the name of the signal is shown. If it is low then blanks are shown.

- rt control line status with repeat
Show the control line status of the specified ports, repeating every t seconds. If t=0, then the table is repeated without a delay.
- l port setup configuration
Display port configuration (the same as running port without any options). Can be used in combination with other options.
- h help screen.
Display a brief description of the command options.
- a standard ASCII print format
Display all output using printable ASCII characters. If omitted then graphical characters are used where the screen supports them.
- cn select card n
If specified by a super-user, then display all ports on the specified card.
- pn1,n2 select range of ports
If specified by a super-user, then select ports from n1 to n2 inclusive.
- o port setup configuration on PCC terminal
For a super-user on a PCC port, selects the port on which the program is running (i.e. makes port work as for a normal user).

10.2 PCC on-line help

Help on using the main PCC utilities is provided through your system man (or help) command. Provided the manual pages are installed on your system, the PCC installation script copies the PCC help file to the appropriate directory.

To view the PCC help file, the keyword pcc should be passed as a command line argument to your man command, e.g.

UNIX: man pcc
XENIX: help pcc

The address switch settings (SW2) for AT Bus PCC cards are included.

10.3 PCC Executives

The PCC executives are the programs executed by the processor on the PCC card. They are loaded by tcload.

The following PCC executives are distributed with the device drivers.

/etc/pccasync.sys High-speed for asynchronous PCC cards.

/etc/tcexec1.sys Enhanced for asynchronous PCC cards.

/etc/pccsync.sys High-speed for PCC/MX systems.

/etc/tcsync1.sys Enhanced executive for PCC/MX systems.

The enhanced executives provide value-added features. They are required if any port on a card is set by tcset to use any of the following:

TERMINAL TYPE

any setting except NO-TRANSLATION, PRINTER or DISABLED

FLOW CONTROL

MODEM or MODEM+XON/XOFF

RX BUFFER SIZE and TX BUFFER SIZE

any setting except 256 bytes

The correct executive is automatically selected by tcload in the following way: tcset determines whether an enhanced executive is required for each card, and sets flags in /etc/tcset-1.cnf. tcload determines whether each card is an asynchronous card or a PCC/MX system, and loads the appropriate executive. These defaults can be overridden by command options to tcload.

10.4 PCC loader program tcload

The executive file is loaded onto the PCC cards with the tcload program. tcload is copied to the /etc directory when the driver is installed. This program is automatically executed whenever the system is rebooted. It can also be run subsequently to reload cards for a new configuration.

tcload reads the configuration file /etc/tcset-1.cnf, which is generated by tcset.

If tcload is run without any command line options it loads the default executives onto all PCC cards in the system. The action of tcload may be modified with the following command line options:

-n card

load default executive onto specified card

-n a

load default executive onto all cards

-n card,file

load specified executive onto specified card

-n a,file

load specified executive onto all cards

-r card

Allow specified card to be reconfigured

-r a

Allow all cards to be reconfigured

-m "message"

Send specified warning message to any enabled terminals on any card to be reloaded or reconfigured.

-t secs

Delay specified number of seconds after sending log-off request messages to terminals. (Default 60 seconds)

-v

Display diagnostic messages during card loading and enable driver diagnostic warning messages until tcload is next run.

-h

Display help screen describing command line options.

tcload performs the following steps:

Send warning messages to enabled terminals on all cards to be loaded or reconfigured.

If any enabled terminals on cards to be loaded or reconfigured, delay to allow users to log off.

If the -v command line option is selected, enable driver warning messages.

Send kill signals to all processes running on terminals connected to cards to be loaded or reconfigured.

For each card to be loaded, halt any previously loaded executive, load the executive, load configuration information from /etc/tcset-1.cnf, start the executive.

Signal the driver to recalculate the mapping of special device files to port numbers for all cards that have been loaded or are to be reconfigured.

Reconfiguring cards involves recalculation of the mapping between the special device files and the ports. This is necessary if the configuration of a lower-numbered card has been changed so that it is allocated a different number of device files. tcload checks if relocation is necessary, and reports an error if relocation is required for a card which has not been specified by a command line option.

The first time tcload is run after the system is rebooted it generates the hardware definition file /etc/tclhard.inp. This file is read by tcset.

tcload displays a summary of the configuration of the PCC cards. This includes the memory address of each card, the version number of the executive file loaded onto the card, the number of ports on the card and the device numbers allocated to them. More detailed information is given by the port program.

10.5 PCC include file

This include file has been made public for software developers to facilitate the interaction between a user application, the device driver, and the PCC cards. The `pioctl.h` file is placed in the `/usr/include/sys` directory during the driver installation.

An example of a typical user application is included as part 2 of this file.

10.6 PCC Bye Program

The `bye` program is used to disconnect a terminal from an operating system session. It is used where terminals use Connect Mode.

`bye` can be run from either main console or a terminal.

If `bye` is run from a terminal for which Connect Mode is enabled, it disconnects that terminal from the operating system session. The terminal user then has to log-on again.

If `bye` is run from the main console it can be used to disconnect any Connect Mode terminal. The terminal to disconnect is specified by command arguments. (See section 10.6.1).

Note: Non-superuser can only run `bye` on a terminal. Superuser can run `bye` either on main console or on a terminal.

10.6.1 Running BYE Program

- 1) For non-superuser on a terminal, just run :
`bye`

- 2) For superuser on a terminal, run
`bye` OR `bye C P`
where `c` = card number (1..4),
`p` = port number (1..32).

The following message is displayed on the terminal:
Press SPACE 3 time(s) to log on..

- 3) For superuser on main console, run
bye C P
The following message is displayed on the terminal:
Press SPACE 3 time(s) to log on...
Example:
 bye 2 12 will disconnect the 12th port on the 2nd card.
Note: If the system consists only ONE multiport card, then card
 number can be ignored.
Example:
 bye 5 will disconnect the 5th port on the card.

- 4) bye -h
 This displays the help menu.

10.6.2 Executive Selection

The bye program works on those executives with name tcXXXX1.sys which have number of enhanced features embedded. For other executives, bye program displays the following message:

This executive does not support terminal disconnect mode.

Appendices

Appendix A Terminal, Modem and transparent printer file names

1. Unix (SCO, Interactive AT&T and SVR4)

Channel	Terminal	Modem	Terminal Printer	MX Printer
1	ttytc01	ttyTc01	ttytcp01	ttytcx01
2	ttytc02	ttyTc02	ttytcp02	ttytcx02
3	ttytc03	ttyTc03	ttytcp03	ttytcx03
4	ttytc04	ttyTc04	ttytcp04	ttytcx04
5	ttytc05	ttyTc05	ttytcp05	ttytcx05
6	ttytc06	ttyTc06	ttytcp06	ttytcx06
7	ttytc07	ttyTc07	ttytcp07	ttytcx07
8	ttytc08	ttyTc08	ttytcp08	ttytcx08
.
15	ttytc15	ttyTc15	ttytcp15	ttytcx15
16	ttytc16	ttyTc16	ttytcp16	ttytcx16
17	ttytc17	ttyTc17	ttytcp17	-
18	ttytc18	ttyTc18	ttytcp18	-
.	-
62	ttytc62	ttyTc62	ttytcp62	-
63	ttytc63	ttyTc63	ttytcp63	-
64	ttytc64	ttyTc64	ttytcp64	-
65	ttytc65	ttyTc65	ttytcp65	-
.	-
97	ttytc97	ttyTc97	ttytcp97	-
98	ttytc98	ttyTc98	ttytcp98	-
99	ttytc99	ttyTc99	ttytcp99	-
100	ttytca0	ttyTca0	ttytcpa0	-
101	ttytca1	ttyTca1	ttytcpa1	-
102	ttytca2	ttyTca2	ttytcpa2	-
103	ttytca3	ttyTca3	ttytcpa3	-
104	ttytca4	ttyTca4	ttytcpa4	-
105	ttytca5	ttyTca5	ttytcpa5	-
106	ttytca6	ttyTca6	ttytcpa6	-
107	ttytca7	ttyTca7	ttytcpa7	-
108	ttytca8	ttyTca8	ttytcpa8	-
109	ttytca9	ttyTca9	ttytcpa9	-

Cont . . .

110	ttytcb0	ttyTcb0	ttytcbp0	-
111	ttytcb1	ttyTcb1	ttytcbp1	-
112	ttytcb2	ttyTcb2	ttytcbp2	-
113	ttytcb3	ttyTcb3	ttytcbp3	-
114	ttytcb4	ttyTcb4	ttytcbp4	-
115	ttytcb5	ttyTcb5	ttytcbp5	-
116	ttytcb6	ttyTcb6	ttytcbp6	-
117	ttytcb7	ttyTcb7	ttytcbp7	-
118	ttytcb8	ttyTcb8	ttytcbp8	-
119	ttytcb9	ttyTcb9	ttytcbp9	-
120	ttytcc0	ttyTcc0	ttytccp0	-
121	ttytcc1	ttyTcc1	ttytccp1	-
122	ttytcc2	ttyTcc2	ttytccp2	-
123	ttytcc3	ttyTcc3	ttytccp3	-
124	ttytcc4	ttyTcc4	ttytccp4	-
125	ttytcc5	ttyTcc5	ttytccp5	-
126	ttytcc6	ttyTcc6	ttytccp6	-
127	ttytcc7	ttyTcc7	ttytccp7	-
	ttytcc8	-	ttytccp8	-

Note: Last modem special file for Unix is ttyTcc7.

2. SCO XENIX 386

Channel	Terminal	Modem	Terminal Printer	MX Printer
1	tty01tc	tty01Tc	tty01ptc	tty01ptx
2	tty02tc	tty02Tc	tty02ptc	tty02ptx
3	tty03tc	tty03Tc	tty03ptc	tty03ptx
4	tty04tc	tty04Tc	tty04ptc	tty04ptx
5	tty05tc	tty05Tc	tty05ptc	tty05ptx
6	tty06tc	tty06Tc	tty06ptc	tty06ptx
7	tty07tc	tty07Tc	tty07ptc	tty07ptx
8	tty08tc	tty08Tc	tty08ptc	tty08ptx
.
15	tty15tc	tty15Tc	tty15ptc	tty15ptx
16	tty16tc	tty16Tc	tty16ptc	tty16ptx
17	tty17tc	tty17Tc	tty17ptc	-
18	ttytc18	tty18Tc	tty18ptc	-
.	-
62	tty62tc	tty62Tc	tty62ptc	-
63	tty63tc	tty63Tc	tty63ptc	-
64	tty64tc	tty64Tc	tty64ptc	-
65	tty65tc	tty65Tc	tty65ptc	-
.	-
120	tty120tc	tty120Tc	tty120ptc	-
121	tty121tc	tty121Tc	tty121ptc	-
122	tty122tc	tty122Tc	tty122ptc	-
123	tty123tc	tty123Tc	tty123ptc	-
124	tty124tc	tty124Tc	tty124ptc	-
125	tty125tc	tty125Tc	tty125ptc	-
126	tty126tc	tty126Tc	tty126ptc	-
127	tty127tc	tty127Tc	tty127ptc	-
128	tty128tc	-	tty128ptc	-

Note: Last modem special file for Xenix is tty127Tc.

Modem and non-modem ports are used for terminals and for directly-attached printers. Terminal printer devices are used for printers connected to terminals.

The driver allocates minor device numbers, and hence device files, according to the configuration selected with `tcset`. One device is allocated for each multiple screen on each port, as shown in the following table.

Port Configuration	Devices on Port
Disabled	0
Printer	1
No translation	1
Translated (1 screen)	1
Translated (2 screens)	2
Translated (3 screens)	3
Translated (4 screens)	4

The effect of this is that the device file(s) for a port are not fixed, but depend on the configuration of all lower- numbered ports. (This is necessary because of the limitation on the number of minor devices allowed for each major device.)

Device file names for terminal-attached printers are allocated on the basis of the port number. Thus a printer attached to a terminal connected to the fourth port of the first card always has the same device file (`ttytcp04`, `tty04ptc`) irrespective of how other ports have been configured.

Device file names for parallel printers on PCC/MX units are allocated on the basis of card number and PCC/MX node number. Four devices are allocated to each possible card, irrespective of whether it is connected to PCC/MX units. Thus the parallel printer on the first node of card 3 is always `ttytcx08` or `tty08ptx`.

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Example for a hypothetical SCO Unix, Interactive Unix or AT&T Unix system with one 8-port PCC card:

Port	Configuration	Device File (s)
1	No translation	ttytc01
2	No translation	ttytc02
3	Printer	ttytc03
4	WYSE 60 PCTERM 4 screens + printer	ttytc04 ttytc05 ttytc06 ttytc07 ttytcp04
5	VT100, 3 screens	ttytc08 ttytc09 ttytc10
6	Disabled	
7	WYSE 60 PCTERM, 2 screens + printer	ttytc11 ttytc12 ttytcp07
8	TVI905, 1 screen	ttytc13

If modems were used with this configuration, the device files would be ttyTc01 to ttyTc13, ttytcp04 and ttytcp07.

Note: when the system is booted, the driver displays details of any PCC cards found, including the range of minor device numbers for the non-modem devices on the card.

For a clear picture of linking the port number with the device files, please run the port program.

Appendix B Configuration Limits

There are two limits to the configurations supported on PCC cards: a limit to the configuration of each PCC card and an overall limit for the system.

The overall limit is that the total number of device files required must be 128 or less, excluding modem devices, transparent printer devices and parallel printer on PCC/MX units. Device file allocation is described in appendix A.

The per card limit is that the number of channels between the driver and the card must not exceed a limit which is dependant on the card type.

The number of channels on a card is the number of devices on the card, as calculated in appendix A, plus the number of ports set with tcset to DISABLED when there are higher-numbered ports not set to DISABLED. That is, a block of DISABLED ports at the end of the configuration do not count towards the total number of devices, but DISABLED ports embedded in other ports do count.

The number of channels on a card from this calculation must not be greater than a limit which depends on the memory window size of the card, as follows:-

Window Size	Maximum Channels
4 Kbytes	64
2 Kbytes	24
1 Kbyte	8

Note: The PCC8i and PCC16i have a window size of 4 Kbytes, the PCC/4A card has a window size of 1 Kbyte, other PCC cards have a window size of 2 Kbytes or 4 Kbytes, depending on the version.

tcset calculates and displays the configuration limits.

Appendix C Troubleshooting

C-1 Error messages during Unix/Xenix driver installation:

Sometimes things can go wrong in the installation procedure. The following errors are possible during installation of Unix and Xenix drivers. The recommended remedy for each is given below. After rectifying the error, installation can be reattempted.

Error Code 11	You are not logged in with super-user mode
	Only the super-user can install the driver. Exit, and login as root, or use su.
Error Code 12	There is no /etc/conf/sdevice.d directory.
	Make sure that the directory /etc/conf/sdevice.d exists, otherwise UNIX installation is not complete.
Error Code 13	There is no /etc/conf/pack.d directory
	Make sure that the directory /etc/conf/pack.d exists, otherwise UNIX installation is not complete.
Error Code 14	There is no /etc/conf/bin directory
	Make sure that the directory /etc/conf/bin exists, otherwise UNIX installation is not complete.
Error Code 15	There is no /etc/conf/node.d directory
	Make sure that the directory /etc/conf/node.d exists, otherwise UNIX installation is not complete
Error Code 16	Unable to create a system file entry for PCC driver
	System command failure. Make sure that you have enough disk space.
Error Code 17	Unable to create a MASTER entry for PCC driver.
	System command failure. Make sure that you have enough disk space.

Cont . . .

Error Code 18	/etc/conf/bin/idbuild failed.
	System command failure. Make sure that the PCC driver is not installed already, you have enough disk space and an uncorrupted copy of /etc/conf/bin/idbuild.
Error Code 19	Failed in copying the PCC loader program
	System command failure. Make sure that you have enough disk space and an uncorrupted copy of cp.
Error Code 20	Failed in copying the PCC handler program.
	System command failure. Make sure that you have enough disk space and an uncorrupted copy of cp.
Error Code 21	Failed in copying the PCC setup program.
	System command failure. Make sure that you have enough disk space and an uncorrupted copy of cp.
Error Code 22	Unable to update the RC file for auto loading the PCC handler.
	System command failure. Make sure that you have enough disk space and an uncorrupted copy of cat.
Error Code 23	Unable to add the PCC device driver configuration data
	System command failure. Make sure that the PCC driver is not installed already and you have an uncorrupted copy of /etc/conf/bin/idininstall.
Error Code 24	Failed in copying the PCC port program
	System command failure. Make sure that you have enough disk space and an uncorrupted copy of cp.
Error Code 25	Failed in copying the PCC include file.
	System command failure. Make sure that you have enough disk space and an uncorrupted copy of cp.
Error Code 26	Failed in copying the PCC manual file.
	System command failure. Make sure that you have enough disk space and an uncorrupted copy of cp.

C-2 Troubleshooting Common Problems

Error reading the driver distribution diskette.

Check the disk size and density against the selected device file. For SCO Unix and Xenix see section 2.1.

The system will not boot

No PCC cards found

The number of cards found is wrong

Possible card address conflict due to shadow RAM or memory cacheing enabled at the same memory address as a card. Disable shadow RAM and memory cacheing and check if the system then works correctly. If so, change the card address until the conflict is resolved. (You need not reinstall the device driver when changing the card address. The driver scans memory from 0xC0000 to 0xEF000 to find the cards.)

Card does not work when other cards are installed Possible card address conflict. Remove the suspected conflicting cards and check that the system works. If so, change the card address (preferably to a lower address) until the conflict is resolved.

WARNING: PCC Driver Error: Invalid executive version on card n

One of the following files is the wrong version or has been corrupted:
/etc/pccasync.sys, /etc/tcexec1.sys, /etc/pccsync.sys or /etc/tcsync1.sys. De-install and re- install the driver.

Warning message when the system is booted

If the /etc/tcset-1.cnf file is not found, the loader defaults to 4 active ports. Run /etc/tcset to configure the system. See chapter 5.

The newly created Kernel Panics when booting the system. Make sure that the Kernel generation files (objects and libraries) are not corrupted. To prove that, you need to take the following steps:

1. remove the PCC driver.
2. rebuild the Kernel according to your OS type:
 - a. XENIX: cd /usr/sys/conf
./link_xenix
 - b. UNIX: cd /etc/conf/bin
./idbuild

Re-boot the system. If the problem is still there, report it to your OS supplier. Otherwise, contact TCL technical support.

WARNING: PCC Driver Error : PCC/MX off-line : card N port N

A process is accessing a device file for a PCC/MX unit which is off-line. Turn on and connect the PCC/MX unit, or disable the process.

EtherCard Plus 16 problem

This card uses 128 KByte of high memory space. Other option cards that reserve memory space in the same range conflict with this card, in which case the base address of one of the cards must be changed. If you experience this problem we suggest that the PCC adaptor is relocated into any free memory area between 0xA0000 and 0xC0000.

If you experience other problems, please contact TCL technical support. Please have ready the version numbers of the device driver and operating system, and details of your TCL Multiport card and your computer system.

C-3 Tunable System Parameters

With an increased number of users (typically five or more) you may experience system resource limitation problems. To resolve these certain system parameters should be increased to ensure that the system limits are not exceeded.

If input or output characters to the terminals are lost then the character list buffers parameter (NCLIST) may need to be adjusted (note that characters loss could also be caused by a flow control problem).

If the call-out table (NCALL) overflows, the system crashes and displays the following message on the main console:

PANIC: Timeout table overflow

If you encounter one of these problems, you need to adjust the related parameter (NCLIST or NCALL) using the system administration shell. First try to increase the value by a small amount. If the problem persists, increase it by 100 percent or more of its original value depending on your system memory. Each time these parameters are changed, their new values are recompiled into the kernel so that the new limits will take effect (please refer to the System Administrator's Guide for further information).

Appendix D Recommended Terminal Configurations

This appendix is a guide to setting up some popular PC emulating terminals. The terminal manuals give a more complete description. The Terminal Type should be set to WYSE 60 PCTERM 60 using tcset.

WYSE 60 PC-MODE RECOMMENDED CONFIGURATION

Enter configuration mode by pressing Ctrl, Shift and Sysreq. The terminal should be fitted with Rev D or later EPROM firmware.

F1 Display

COLUMNS=80	STATUS LINE=OFF	BACKGROUND=DARK
LINES=25	SCRL SPEED=JUMP	SCRN SAVER=OFF
PAGE LENGTH=1xLINES	CURSOR=BLINK BLOCK	MONITOR=OFF
ATTRIBUTE=CHAR	ANSWERBACK MODE=OFF	ANSWERBACK CONCEAL=OFF

F2 General

PERSONALITY=PC	TERM ENHANCE=OFF	FONT LOAD=ON
COMM MODE=FULL DUPLEX	END OF LINE WRAP=ON	SEND ACK=OFF
DATA/PRINTER=MODEM/AUX	AUTO SCRL=ON	PAGE EDIT=OF
MARGIN BELL=OFF	RCVD CR=CR	

F3 Keyboard

KEYCLICK=OFF	KEYLOCK=CAPS KEY	REPEAT=ON
RETURN=CR	ENTER=CR	CORNER KEY=FUNCT
XMT LIMIT=NONE	FKEY XMT LIMIT=NONE	BREAK=250ms
WYSEWORD=OFF	LANGUAGE=US	

F4 Modem

BAUD RATE=9600	DATA BITS=8	RCV HANDSHAKE=DTR
PARITY=NONE	STOP BITS=1	XMT HANDSHAKE=NONE
XPC HANDSHAKE=OFF		

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F5 Aux

BAUD RATE=9600	DATA BITS=8	RCV HANDSHAKE=NONE
PARITY=NONE	STOP BITS=1	XMT HANDSHAKE=NONE
XPC HANDSHAKE=OFF		

F6 Misc

BLK END=US/CR	LABELS=OFF	WPRT INT=DIM
AUTO PAGE=OFF	SAVE LABELS=OFF	WPRT REVERSE=OFF
TVI955 ATTR=NO SPACE	WPRT ULINE=OFF	VP60 BLK END=NONE
		TEST=OFF

F7 A/BACK

None Set

F8 F/KEYS

None Set

F9 LABELS

None set

WYSE 120 PC-MODE RECOMMENDED CONFIGURATION

Enter configuration mode by pressing Ctrl and Select.

F1 Display

Columns=80	Cursor=Blink Blk	Scrn Saver=Off
Lines=25	Display=Dark	Char Cell=10*13
Page=1xLines	Autopage=Off	80/132 Clr=Off

F2 General

Personality=PC Term	Enhance=Off	Status Line=Off
Scrl=Jump	Autoscr1=On	Wrap EOL=Off
Rcv CR=CR	Monitor=OFF	

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F3 Keyboard

Keyclick=Off	Repeat=On	Keycode=Scan
Xmit lim=None	Margin Bell=On	Bell volume=1
Language=UK		

F4 Modem

Baud rate=9600	Data/parity=8/None	Stop bits=1
Rcv hndshk=DTR	Xmt hndshk=none	Comm=FDX

F5 MISC

Wrpt int=norm	Wrpt rev=off	Wrpt undrln=Off
Blk end =US/CR	Attr =Char	

F6 TABS

None Set

F7 ANSBK

None Set

F8 FKEYS

None Set

Appendix E Theory of Operation

TCL Intelligent Multiport Cards contain an 80188 or 80186 microprocessor. The program for this (the card executive program) is loaded into the RAM on the card when the system is booted by the `/etc/tclload` program. This technique allows the executive to be easily modified when upgrading the system. Four alternative executives are supplied as the files `/etc/pccasync.sys`, `/etc/tcexec1.sys`, `/etc/pccsync.sys` and `/etc/tcexec1.sys`.

The executive relieves the main processor in the PC of the task of driving the I/O devices. Data is passed between the main processor and the card at high speed through a dual-ported RAM on the card.

The executive can be configured to process the screen and keyboard data, to make a terminal appear similar to the main screen and keyboard of the computer. If a terminal is configured with multiple screens the screen data is maintained by the card. If a terminal is configured as having a local printer the executive manages the interleaving of screen and printer data to the terminal.

The card program is configured by the `/etc/tcset` program. This sets the configuration file `/etc/tcset-1.cnf`.

NOTES
