CERN
CN/UCO/158

CERN X Terminal Guide

How to buy, install and use an X terminal at CERN
Version 2.2
23 January 1995

Lionel Cons, Alan Silverman

Introduction

This document describes how to buy, install and use supported[1] X terminals at CERN. This guide is complementary to the vendors' manuals[2], it describes only matters specific to the CERN environment.

A minimum knowledge of the X window system is assumed. If necessary, you can read the *Guide for the Usage of X at CERN* or one of the numerous introductory books on X. See the UCO[3] for more information. Some other sources of information are described in the Chapter 2.

An up-to-date postscript version of this manual may be obtained via anonymous `ftp` from *asisftp*:'`/writeups/xterminal.ps`' or, if you have access to the Andrew File System (AFS), under the name '`/afs/cern.ch/project/writeups/ps/xterminal.ps`'. Printed copies are also available from the UCO. An on-line version of this guide is available in the World-Wide Web (CERN Home Page ↦ Computing ↦ Unix Workstation Support ↦ X Terminals).

All the host names mentioned in this guide belong to the CERN network so you must add *.cern.ch* to have fully qualified host names. Not all these machines are visible from outside CERN.

Many technical terms are used, the glossary at the end of this guide tries to describe some of them.

---

[1] We currently support almost all models of X terminals from NCD and HP, see [Supported Terminals], page 27 for more details.
[2] See Chapter 2 [Sources of Information], page 3 for a list of manuals.
[3] The UCO is described in the next chapter.

1 How to Get Help

If you need help you can contact:

– for configuration or purchase advice, installation requests: Christiane Ball, 3349, *Xterminal.support@cern.ch*
– for user software or usage problems: the UCO, 4952, *user.support@cern.ch*
– for software problems: Lionel Cons, 4913, *Xterminal.support@cern.ch*
– for hardware problems: Bertrand Smaniotto, 2601, *Xterminal.support@cern.ch*.

1.1 The User Consultancy Office (UCO)

The UCO provides the following services:

- Consultancy in **all** areas connected with central computing facilities (IBM-VM/CMS, VAX-VMS, ULTRIX on DXCERN, CSF and SHIFT) as well as the UNIX operating system and the majority of workstations (such as SUN, HP, Apollo, DECstations, VAXstations, etc)
- First point of contact for registration, resource allocation and accounting
- Self-service CERN computer documentation and the sale of computer oriented books as well as vendor manuals (via EDH).

Opening Hours:

– Consultancy, documentation and book sales: Monday-Friday, 8:30-12:00 and 14:00-17:30
– Self-service documentation: Monday-Friday, 8:30-17:30.

You can contact the UCO by phone at +41 22 767 4952 (or just 4952 from within CERN) or via electronic mail as *user.support@cern.ch*.

2 Sources of Information

2.1 CERN Guides

Several useful CERN guides can be obtained from the UCO, see Section 1.1 [UCO], page 2. Among them are:

`CN/UCO/173` N. Cremel: *Guide for the Usage of X at CERN*

`CN/UCO/145` S.Brobecker, J.Joosten, J.Rochez: *ETHERNET: A guide to technical installation*

`CN/UCO/155` Communications Systems Group: *The CERN Internal Network Brochure*

`CN/UCO/161` Lionel Cons: *CERN Security Handbook*

`CN/UCO/164` T. Appleby, H. Renshall, J. Richards, A. Silverman: *CERN UNIX User Guide*

Note: the *Guide for the Usage of X at CERN* was still in preparation when the present document was released.

2.2 Vendors Manuals

If you want to buy some of these manuals, please contact Christiane Ball, 3349, *Xterminal.support@cern.ch*.

2.2.1 NCD Manuals

Users of NCD X terminals may be interested in reading *Getting Started with NCD X Terminals*; this manual describes the X window system and how to use NCD X terminals.

Administrators of NCD X terminals **must** read the *NCDware X Server Release Notes* and the *NCDware Advanced User's Guide for UNIX Systems*. They may also read the *Installation Guide for UNIX Systems* and the *NCDware Reference Manual*. The two "UNIX" manuals exist also for VMS.

2.2.2 HP Manuals

Owners of HP X terminals may read the *HP ENWARE X Station Software Technical Reference*, this manual describes how to use and configure HP X terminals (700/RX, ENVIZEX and ENTRIA).

2.3 Man Pages

Several UNIX man pages may be useful:

fs(1)	X font server
fslsfonts(1)	server font list displayer for X font server
xauth(1)	X authority file utility
xdm(1)	X Display Manager with support for XDMCP
xhost(1)	server access control program for X
xlsfonts(1)	server font list displayer for X
xmodmap(1)	utility for modifying keymaps in X
xrdb(1)	X server resource database utility
xset(1)	user preference utility for X

2.4 Other Sources

All useful information (new software releases, new services...) will be posted to the *cern.xterm* newsgroup[1]. You are **strongly** encouraged to read this newsgroup. You can also share your experiences (or your problems) by posting articles to it.

The UNIX Workstation Support section runs a World-Wide Web server that contains (among other things) several documents related to the X terminals. To access it, use your favorite WWW browser (for instance `mosaic`) and follow: CERN Home Page ↦ Computing ↦ Unix Workstation Support ↦ X Terminals.

[1] *cern.xterm* on UNIX, *xterm* on VM or VMS.

3 How to Buy an X Terminal

If you need commercial brochures, prices or help on how to make an internal purchase order, please contact Christiane Ball, 3349, *Xterminal.support@cern.ch*.

3.1 NCD X Terminals

NCD provide a number of configuration options for their X terminals. These options must be specified clearly on the order form so that the correct requested configuration will be delivered.

From among the choices offered, some are included in the base price, others cost slightly more. Note that the prices for the options given here are the current (Nov 94) basic prices and that CERN orders for these options will benefit from a 38% reduction.

We recommend the following options:

3.1.1 Server Options

The X terminal can be configured to boot from local PROM or remotely from a computer on which the required software is stored; in the second case the boot software is copied across the network and stored in local RAM on the workstation. Other options exist for other requirements.

For X terminals to be used on the CERN site, we recommend the RAM-based option (included in the base price).

We do not recommend the PROM option for terminals which remain on the CERN site as the effort to keep such PROMs up-to-date should be avoided where possible; plus this option costs an extra $300-$400.

However, X terminals which will be used from home must be equipped with the XRemote PROM option, costing between $300 and $400 extra.

3.1.2 RAM Memory Options

X terminals come equipped with a certain amount of RAM memory in which they store instructions to control the terminal and the information to be displayed on the screen. The more memory they have, the more windows they can display and the more information within each window. In general, you should purchase as much memory as you can afford, although extra memory can be added later, up to a maximum which depends on the model.

For monochrome X terminals, we recommend between 6 and 10 MB of memory. For colour X terminals, we recommend between 10 and 14 MB of memory. The cost of extra memory above the base (which varies between 4 and 6 MB depending on the model) is around $100 per MB.

3.1.3 Network Board Options

Although most CERN offices are today equipped with Thin-Wire Ethernet, this cabling system will be replaced over the next few years by Twisted Pair Ethernet. Therefore we recommend only the Twisted Pair/Thick option.

The base price for the terminal includes this option as standard. In offices with Thin Wire Ethernet, a cheap transceiver can be inserted to connect the Thick Wire Ethernet interface to the network.

Such transceivers are normally purchased from CN/CS (*George.Smyris@cern.ch*). However, they will be lent free of charge to users in buildings where recabling is expected to take place soon.

3.1.4 Keyboards

Unless you intend working a lot with French or German texts, we recommend US-style keyboards. All the keyboard options (except a Sun Type 4 model, which we do not recommend) come within the base price.

We recommend the PS/2 style US keyboard because this is becoming the de facto standard, most UNIX vendors are shipping this keyboard with their workstations. This is also the keyboard type recommended by the UMTF[1].

If you really want, you can choose a DEC style or a Sun style keyboard.

We do **not** recommend the use of a so-called UNIX style keyboard, even though your primary use of the X terminal may be a UNIX system. This is because these keyboards have non-standard key layouts and several important function keys are missing.

In any cases, note that the layouts are **very** different so the best solution is to see the keyboard before choosing it... If you want to "see" these different keyboards, contact Christiane Ball, 3349, *Xterminal.support@cern.ch*.

3.1.5 Software License

You do not need to purchase the NCDware software kit for the X terminals. The CN/DCI group UNIX support team has purchased a site license, both for the version running on UNIX systems and the version running on VMS. Also you do not need to purchase a basic node license for the X terminal because it is included in the base price.

You can buy licenses per X terminal to be able to use optional features, currently mwm[2], DPS[3], PEX[4] and 3270[5]. For more information, please contact Christiane Ball, 3349, *Xterminal.support@cern.ch*.

[1] User Migration Task Force, check '`http://wwwcn.cern.ch/umtf`'.
[2] The "real" Motif Window Manager.
[3] Display PostScript extension.
[4] PHIGS Extension to X.
[5] A local 3270 Terminal Emulation.

3.1.6 Documentation

The X terminal will come with minimal documentation, typically only a simple guide on how to install it. The following documentation might be useful.

Installing Your X Terminal ($3, included in purchase).

Getting Started with NCD's X Terminals ($20, useful for first time X terminal users).

NCDware Reference Manual ($50, useful for system administrators setting up many X terminals).

NCDware Advanced User's Guide for UNIX Systems - ($50, very useful for system administrators; there is a similar guide for VMS systems for those people who wish to install NCDware under VMS).

Several other guides are available, please contact Christiane Ball, 3349, *Xterminal.support@cern.ch* to have the complete list.

For users, we recommend *Getting Started with NCD's X Terminals*. For administrators, we recommend at least the *NCDware Reference Manual* and the *NCDware Advanced User's Guide* for UNIX or VMS but it's better to buy the full set of documentation for $150.

3.1.7 Power Cable

Purchasers should note that, since these terminals come directly from the U.S.A., they currently are shipped with a US power cable; we have a stock of swiss power cables to solve this problem.

3.1.8 CERN Ordering

When submitting your internal order to the Finance Division, please note the following points:

- The approved supplier is Tekelec and their "local" office is in Grenoble, France.
- The Country of Origin is USA.
- Since CERN has signed a "blanket order" with Tekelec for NCD X terminals, a non-member state justification is not required.
- CERN has negotiated special prices for NCD X terminals; these are available from Christiane Ball, 3349, *Xterminal.support@cern.ch*.

Examples:

1. NCD19r, RAM server option, 20MB memory, Twisted Pair Ethernet connection, PS/2 style US ASCII keyboard.
2. MCX17, RAM server option, 12MB memory (4MB code + 8MB data), Twisted Pair Ethernet connection, DEC style US ASCII keyboard.

3.2 HP X Terminals

When submitting your internal order to the Finance Division, please note the following points:

- The supplier is HP Geneva (salesman is Claude Lecoultre, 780 44 48)
- The Country of Origin is Germany.
- CERN has signed a "blanket order".
- CERN has negotiated special prices for HP X terminals; these are available from Christiane Ball, 3349, *Xterminal.support@cern.ch*.

Examples:

1. ENTRIA 17C, C3230A/170/ACD.
2. ENVIZEX 19Ca, C2731A/191 C2737/A/ACD.

3.3 How To Buy Extra Memory

Depending on the model of the X terminal and on its current memory configuration, you may be able to add some extra memory. If you want to have more information on what you can do and how much it costs, please contact Christiane Ball, 3349, *Xterminal.support@cern.ch*.

If you want technical details, the NCD memory specifications can be found via anonymous `ftp` from *ftp.ncd.com*:'`/pub/ncd/Archive/NCD-Articles/NCD_X_Terminals/memory_spec`'.

4 How to Install a Boot Server

Important note: in this chapter, by 'boot server' we mean a machine that provides everything so that the X terminal can boot properly. More precisely, it includes a boot server, a configuration server and a font server as defined in the Glossary.

4.1 Central Boot Servers

We provide two central boot servers located in the Computer Center: *xtsoft1* (*128.141.237.227*) and *xtsoft2* (*128.141.237.228*). These servers are available for isolated X terminal users for whom a local server is not available. We do not recommend them for all X terminal users.

We recommend local servers for "groups" of X terminals. By groups we mean: several machines situated close to each other on the network (for instance on the same Ethernet segment), or with the same configuration, or managed by a single person.

Please note the following important restrictions when using the central servers:

- the default configuration file sets all the necessary parameters to:
  - use CERN services (gateway, name servers) from the main Ethernet segment (*128.141.*.**), if your X terminals are on another segment you may have to change some parameters (gateway, subnet mask...)
  - be kind to the network (no unnecessary broadcasts!)
  - have a secure environment (access control enabled).
- we will not allow users to modify configuration files on the servers; this means that any local change will be lost when the X terminal reboots. See Section 8.1 [How can I modify the configuration of my X terminal?], page 20 for more information.
- the fonts stored on the servers are in their "natural"[1] format, we will not provide all fonts in all formats.

4.2 When To Use a Separate Boot Server

Where a group installs a number of X terminals, we recommend local servers. This will reduce network traffic to a minimum and help protect groups from effects elsewhere on the network. It will also avoid the situation where large numbers of X terminals across the site depend on a single central server. The network implications of such a centralized solution are as yet unknown, for example after a crash of such a central server, if all the connected X terminals tried to reload their software at the same moment.

You can also setup a local X11R5 font server, see Section 4.6 [Local Font Servers], page 11 for more information. The font servers are described later, see Chapter 9 [Fonts], page 23.

[1] i.e. the format provided by the vendor, normally PCF.

4.3 Prerequisites

We will describe only UNIX boot servers. The same functionality may[2] be achieved on VMS machines in some cases, please refer to your vendor's manuals.

A boot server should be a UNIX machine with at least 16MB of free memory[3] (this memory will be used by TFTP and NFS processes) and some free disk space: approximately 50MB per vendor of X terminals that you install.

Of course you need root privileges on this machine. If you wish to perform the installation yourself, you need some UNIX system administration expertise: how to configure NFS, TFTP...

We have a site license for the X terminal software so you don't need to purchase an extra license to install your own boot server.

If necessary, we can help you to install your own server. For more information, please contact *Xterminal.support@cern.ch*.

4.4 The Normal Installation

The normal procedure to setup a boot server is to:

1. read the appropriate vendor manuals (see Section 2.2.2 [Vendors Manuals], page 3)
2. get the installation kit from *Xterminal.support@cern.ch* on a tape or a CD or, if you have AFS, as a set of files located under '`/afs/cern.ch/project/xterminals/kits`'
3. use the vendor-supplied installation procedure
4. tailor the configuration files to the CERN environment, maybe by copying the configuration files from the central boot servers using TFTP. For instance:

```
# tftp xtsoft1
tftp> get /usr/lib/X11/ncd/configs/ncd_std
Received 1026 bytes in 0.3 seconds
tftp> get /usr/lib/X11/ncd/configs/ncd_std.cern
Received 15336 bytes in 0.2 seconds
tftp> get /usr/lib/X11/700X/config/default.cfg
Received 24488 bytes in 0.3 seconds
tftp> quit
```

4.5 The Easy Installation

Here is a brief description of how to setup your own boot server by "cloning" a server model that is in AFS. You must have access to AFS in order to perform this installation.

1. choose a place on a disk (preferably on a separate partition), let's call it '`/top`'.

---

[2] NCD provide software for VMS, please contact *system@vxcern* for more information. HP does not support VMS.

[3] i.e. memory that is not already used by other applications.

2. configure[4] TFTP and NFS so that everybody can access[5] the files under '/top'
3. type as root the following line with *vendor* being either 'ncd' or 'hp':

   `/afs/cern.ch/project/xterminals/adm/install -v` *vendor* `/top`

Now your boot server is a clone of the central servers, if you want to modify slightly the configuration, you can edit the file '/top/usr/lib/X11/ncd/configs/ncd_std.local' for NCD or '/top/usr/lib/X11/700X/config/default.cfg' for HP.

4.6 Local Font Servers

You can also setup one or more local font servers. If you wish to do this entirely by hand, check the *fs(1)* man page.

You can easily start font servers that are just clones of the central font servers. To do so, you need a machine with a supported architecture (currently HP-UX 9.*, SunOS 4.1.*, Ultrix 4.3 or AIX 3.2) running AFS. No disk space is required. If this is the case, just put some lines in your '/etc/rc.local' similar to the following:

```
# start clones of central font servers in AFS
top="/afs/cern.ch/project/fonts/bin"
if [ -x "$top/startfs" ]; then
  $top/startfs >/dev/console 2>&1
fi
if [ -x "$top/watchfs" ]; then
  nohup $top/watchfs >/dev/null 2>&1 &
fi
```

[4] You may want to read the man pages for tftpd and exportfs for more information.

[5] For security reasons you should use the "restricted" option of TFTP and the "read-only" option of NFS.

5 How to Install an X Terminal

If you wish, we can install the X terminal for you. To arrange this, contact Christiane Ball, 3349, *Xterminal.support@cern.ch*.

If you want to install the X terminal yourself, here is what you should do:

5.1 Before You Start

5.1.1 Get an IP Address

X terminals are like any other computers, they must have a valid TCP/IP address to be able to access the CERN network. To get this, send a request to *tcpip@cern.ch* at least one working day before the physical installation so that the central database gets updated.

The request may contain a proposed IP name (see *The CERN Internal Network Brochure* for recommendations) and it **must** contain information like the model of the X terminal, the name of the main user... See Appendix B [TCP/IP Request Form], page 29 for more information.

5.1.2 Connect Your X Terminal to the Network

If your office is not yet equipped with an Ethernet cable you must contact the network group (*George.Smyris@cern.ch*) to perform the installation.

To correctly connect your X terminal you **must** have the suitable cables and connectors. For more details please consult the guides *ETHERNET: A guide to technical installation* and *The CERN Internal Network Brochure* available at the UCO or contact *George.Smyris@cern.ch*.

5.2 The Boot Monitor

When you switch on the X terminal, the boot monitor takes control and may try to boot the X terminal. You can usually interrupt this boot sequence by pressing a key (`ESC` for NCD) or clicking on a '`Stop`' icon or '`Abort Download`' button (for HP).

With a text-based boot monitor (for instance NCD), you get a prompt and you can type commands. You can show the list of available commands by typing a question mark (`?`). You can also perform several tests (hardware, network...) and of course boot the X terminal.

With a graphical boot monitor (for instance HP), you can modify some configuration parameters and perform some tests via a setup panel. Depending on the version of the boot monitor that you use, the tests are in a '`Self Test`', '`Diagnostics`' or '`Terminal`' subpanel...

5.2.1 Check NCD Boot Monitor Version

The first thing that you must do when you're in the NCD boot monitor, is to check the version number. The version appears on the top of the screen, close to the NCD logo. For the current release of the software (NCDware 3.2.1), this version must be at least 2.4.1.

If your boot monitor is too old, you **must** change it before you can use the software. To do so, please contact the hardware support, *Xterminal.support@cern.ch*.

5.2.2 Clear the NVRAM

It's important to be able to clear the NVRAM in order to load factory defaults (and therefore have a sane configuration). You **must** clear the NVRAM when you install the X terminal for the first time or when you change the boot server[1].

When you're in the boot monitor, type the following commands for a NCD:

`nv`	-- *this enters the NVRAM menu*
`l`	-- *this loads the factory defaults*
`s`	-- *this saves the values to the NVRAM*
`q`	-- *this quits the NVRAM menu*

For an HP X terminal, click on the '`Setup`' icon, then click on the '`Terminal`' button and finally on the '`Factory Defaults...`' button.

5.3 Boot

To be able to boot your X terminal you must know:

xt_ip
: the numerical IP address of the X terminal, see Section 5.1.1 [Get an IP Address], page 12

server_ip
: the numerical IP address of the boot server that you want to use; if you don't use your own server, you can use one of CN servers: *xtsoft1* (*128.141.237.227*) and *xtsoft2* (*128.141.237.228*)

gateway
: the numerical IP address of the gateway between your X terminal and the boot server; if you are on CERN's main Ethernet segment (*128.141.*.**) you can use *cgate1* (*128.141.200.10*); if there is no gateway, you can use the boot server address

mask
: the subnet mask, for instance *255.255.0.0* on CERN's main Ethernet segment.

In addition, for NCD X terminals, you must know the exact model of your X terminal.

Warning: you should look for error messages during the boot sequence, if the boot fails your X terminal may be misconfigured and it may disturb the network. You can review these messages after the boot in the console window on a NCD or in the Diagnostic part of the setup panel for

[1] Otherwise you would use the old server to load the configuration files...

an HP. Some messages are "normal" (see Chapter 6 [Installation FAQ], page 15) and most are important. In case of doubt, contact *Xterminal.support@cern.ch*.

5.3.1 NCD Boot

You just have to type:

`bt` *image_name xt_ip server_ip gateway mask*

Where *image_name* can be constructed from the model name: '`Xncd15b`' for a 15B, '`XncdMCX`' for a MCX...

5.3.2 HP Boot

You should use the setup panel (click on the '`Setup`' icon[2] or press `F12`) and then fill in the following fields:

- in the '`Terminal`'[3] subpanel, click on the '`Download`' button to specify that you want to download a remote configuration
- in the '`Network`' subpanel, select '`From Fields Below`'[4] from the pop-up '`Network Parameters`' then fill the '`IP Address`' field with *xt_ip*, '`Subnet Mask`' with *mask*, '`File Server`' with *server_ip*, '`Terminal Name`' with, well, the name of the X terminal; finally, click on the '`Gateways...`' button to enter *gateway* as the gateway to the default route (*0.0.0.0*).

You can then click on the '`OK`'[5] button or press `F12` to remove the Setup panel and click on the '`Start`' icon[6] to start the boot.

[2] Or on the '`To Configuration`' button for old X terminals.
[3] Or '`Startup`'...
[4] Or '`Enter Below`'...
[5] Or '`To Boot Screen`'...
[6] Or '`Download Code`' button...

6 Installation Frequently Asked Questions

This chapter contains some Frequently Asked Questions (FAQ) and answers about X terminal installation.

6.1 Can I get a DECnet node number for my X terminal?

Due to the severely limited number of free DECnet node numbers at CERN, X terminals must be configured to run over IP only. Windows can be opened on remote VMS systems by installing and configuring TCP/IP software on the remote VMS hosts.

For more information, please contact *decnet-support@cern.ch*.

6.2 How can I find my hardware address?

You may need to know your hardware address (also called Ethernet address) to request an IP address (see Appendix B [TCP/IP Request Form], page 29) or to check if your X terminal is not blocked (see Section 6.5 [How can I check the network connection?], page 16). This address is made of 12 hexadecimal digits and is usually represented with colons, for instance '`08:00:2B:31:DF:1D`'.

For NCD X terminals, the address should start with '`00:00:A7`'; you can display it by going to the boot monitor (see Section 5.2 [The Boot Monitor], page 12) and typing '`da`'.

For HP X terminals, the address should start with '`08:00:09`' and should appear on the screen when you switch the X terminal on.

6.3 Why do I get an error when my NCD boots?

When your NCD X terminal boots, you may see messages like:

```
Using host 128.141.008.155 file '808DF4C3'       failed
```

or

```
Using host 128.141.008.155 file 'Xncd19c'
                                  Object file larger than available code memory
```

The first line is not an error, it just says that this particular file has not been found. Usually you use a file named '`Xncd`*mmm*' where *mmm* is the model of the X terminal. Your boot is successful if you can load the software (i.e. if you see lines of dots). The second above message means that the memory that is currently installed on your X terminal is not sufficient to run the NCD software: you must buy more memory. In the meantime, you may use a "lite" version of NCDware that fits into 2MB of code memory; to do so, contact *Xterminal.support@cern.ch*.

When your X terminal tries to load its configuration file, you may see messages like:

```
%CONFIGD-E-NOREAD, unable to read config file:
                                        /usr/lib/X11/ncd/configs/808DF4C3
```
or
```
%CONFIGD-E-NOINITFILE, could not read any initial file
```

Once again, the first message is not an error. Normally your X terminal tries several different configuration file names, the last one being 'ncd_std'. There is a problem if the X terminal can't find **any** configuration files. In this case, you should get the second error message. If this happens, go carefully through the steps described in the previous chapter again and, if the error still occurs, contact *Xterminal.support@cern.ch*.

Finally, you may see "unknown parameter" errors like:

```
%CONFIGD-E-BADPARAM, line 87: unknown parameter net-token-ring-speed
```

Once again, these "errors" can be ignored, they come from a slightly bogus configuration. You have to worry only if you have several errors or if the behaviour of the X terminal is not normal.

6.4 Why do I get an error when my HP boots?

Similarly to NCD, HP X terminals may give errors on the console like:

```
Network cable fault detected.
```
or
```
Not Found: /usr/lib/X11/700X/etc/128.141.244.204.hosts
```
or
```
Not enough memory to start local client.
```

The first line can be ignored most of the time. The HP network test is very sensitive to network noise and may give this error even if there is no problem!

The second one just means that some files do not exist on the configuration server. This may happen since some files are optional. You can ignore these warnings as long as the behaviour of the X terminal is normal.

The last line is more serious: it means that you should add some more memory to your X terminal to take full benefits of HP's local clients, see Section 3.3 [How To Buy Extra Memory], page 8 for more information.

6.5 How can I check the network connection?

With NCD X terminals, you can test the network connection from the boot monitor:

`ex`	-- *this enters the extended tests menu*
`1`	-- *to select the network tests submenu*
`3`	-- *to select the external loopback test*
`f`	-- *to loop forever (type* `ESC` *to abort)*

In case of a bad network connection, the latest HP X terminals will print an error message and the network icon will be crossed out in red. Older X terminals have a '`Self Test`' subpanel in the setup panel.

If you still have problems while booting, check that your IP address is not "blocked". To do so, please contact the network team: *netops@cern.ch*. Note that the list of blocked Ethernet addresses is also available in WWW, check '`http://vscoms:8000/htbin/blocked`'.

7 How to Use an X Terminal

This chapter attempts to describe how to perform simple tasks with an X terminal, it does **not** replace your vendor's manuals.

The examples will be given for X terminals booted from the central servers; if you are using another server, your situation may be slightly different.

7.1 Setup Panel

If you want to modify one or more configuration parameters[1], you can do so interactively via a setup panel. This panel can be activated by pressing one or more keys:

– on NCD X terminals: press the key labeled '`Setup`' or '`Help`' or `F3` (you may have to press the key '`Alt`' or '`Compose`' or '`Graph`' at the same time) depending on the keyboard type. This should bring a window named '`NCD User Services: Console`' with menus like '`Console`', '`Login`'...
– on HP X terminals: press `F12`[2] or `F3` (on LK201-layout keyboards) for two seconds. This should bring a modal window in the middle of the screen containing six popup menus: '`Preferences`', '`Network`'...

This window can be used to display some very important information like the name of the X terminal, the boot server used, the version of the software loaded... To do this, use the '`Show Version...`' submenu in the '`Statistics`' menu on a NCD or browse through the different screens available on an HP.

You can also see the messages logged by your X terminal. These messages may contain errors and should be checked first in case of problems. On a NCD X terminal, click on the '`Messages`' check box of the main console window to show or hide them. On an HP, choose the '`Log Screen`' item of the '`Diagnostics`' popup menu.

7.2 Telnet Session

You can start a local terminal emulator that allows you to connect to any machine on the network. To do so, try to click with the mouse on the root window, this should trigger a popup menu. If this fails, activate the setup panel (see above) and choose '`New Telnet...`' from the '`Terminals`' menu on a NCD or '`xterm telnet session`' from the '`Preferences`' screen on an HP.

When you are logged in to the remote computer, don't forget to set your terminal type and display[3] variable to the correct values. For instance, if the name of your X terminal is *xtname*, some example set-ups are:

---

[1] Some parameters may be reset after a reboot, see Section 8.1 [How can I modify the configuration of my X terminal?], page 20 for more details.

[2] On 46021A HP-HIL keyboards, `F12` is in fact the fourth unlabeled key above the numeric keypad.

[3] If you don't know what an X display is then read any introductory guide to X, for instance the *Guide for the Usage of X at CERN*.

- UNIX, if you use a Bourne Shell (sh, ksh, zsh, bash...):
  ```
  TERM=xterm; export TERM
  DISPLAY=xtname:0; export DISPLAY
  ```
- UNIX, if you use a C Shell (csh, tcsh...):
  ```
  setenv TERM xterm
  setenv DISPLAY xtname:0
  ```
- VMS
  ```
  set term/device_type vt100
  set display/create/transport=tcpip/node=xtname
  ```

You may also want to modify the X access control, see Section 8.3 [Why do I get a connection refused error?], page 20 for more details.

7.3 X Session

You can start an X session with any server that supports XDMCP. An X session will handle automatically the display settings and the X access control. It will also start some X clients automatically for you. It is in fact similar to logging in to the console of the remote machine. For more information, read the *xdm(1)* man page or contact the system administrator of the machine that you want to use.

To start an X session on a NCD, choose 'Login' in the root window menu or 'Login New X Session...' from the 'Login' menu of the console and type the name of the server. If the server is an HP, stop the local window manager **before** doing this, see Section 8.2 [Can I run HP VUE on my X terminal?], page 20 for more details. To prevent broadcast problems, you should not click on the 'Restart' button of the 'Login' panel.

On an HP, from the setup panel, go to the 'Server' configuration screen, set the startup mode to 'XDMCP Direct', set the startup host to the name of the server that you want to use and click on the 'OK' button.

Please note that the CN central services (*cernvm*, *dxcern*, *vxcern*, CORE...) do not support X sessions yet.

8 Usage Frequently Asked Questions

This chapter contains some Frequently Asked Questions (FAQ) and answers about X terminal usage.

8.1 How can I modify the configuration of my X terminal?

You can usually modify the configuration of your X terminal by using a setup panel where you modify one or more parameters. Please consult your vendor's manuals for more information.

If you use the central boot servers, you can't save the changes that you have made to a file. Therefore, when you reboot your X terminal, it reads its configuration from a file on the server which overwrites almost all parameters. This policy has been chosen so that a reboot will always bring a "sane" configuration.

If you use your own configuration server then you can do whatever you want, or at least what the person responsible for the server wants...

8.2 Can I run HP VUE on my X terminal?

Yes. HP VUE (Visual User Environment) understands XDMCP requests so you just have to start a new X session (see Section 7.3 [X Session], page 19) and give the name of the HP server.

Warning: due to an incompatibility between VUE and NCD X terminals, you must stop the local window manager before starting the X session. To do so, use the '`WindowMgr`' menu of the setup panel.

8.3 Why do I get a "connection refused" error?

With CERN's default configuration, X terminals are "secure": they don't allow X applications to open a connection to their screen. On a UNIX machine you would get an error similar to the following (where '`xnyz02`' is the name of the X terminal):

```
Xlib:  connection to "xnyz02:0.0" refused by server
Xlib:  Client is not authorized to connect to Server
Error: Can't open display: xnyz02:0
```

If you need to start an X application on a remote machine you can use XDM (see the *CERN Security Handbook* for more details) or you can modify the X access control. To do so, change the '`X Access Control List`' via the '`Setup`' menu of the Console on a NCD X terminal or change the '`Access Control`' button in the '`Server`' subpanel of the setup panel on a HP X terminal.

8.4 How can I prevent XDMCP broadcasts?

The configuration that you get when you use the central boot servers should not create XDMCP broadcasts.

If you receive a mail from the network group (CN/CS) telling you that your X terminal sends XDMCP broadcasts, the easiest solution is to reboot the X terminal following carefully the instructions (see Chapter 5 [How to Install an X Terminal], page 12) and then reply to the mail saying that the problem should be fixed. If you still have problems then contact *Xterminal.support@cern.ch*.

8.5 How can I access *cernvm* in screen mode?

If you want to access *cernvm* with your X terminal you can use the *tagibm* (Terminal Access Gateway to IBM) service.

To do so, use telnet or LAT to access a machine offering this service; via LAT the service name is *TAGIBM* or *TAGNEW*; via telnet the IP name is *dxtag1* or *dxtag5*. In each case the former is a plain black and white, whilst the latter is a colour emulation (for which you must use a black background).

When prompted for a login, type the name of the machine that you want to reach followed by an exclamation mark (for instance '`cernvm!`'). The service will automatically check the terminal type and choose a keyboard mapping.

Note that one can increase the number of lines after making the connection to *TAGNEW* or *dxtag5* but before starting the IBM connection. Recommended values are 33, 44 or 28 lines for an IBM model 3, 4 or 5 (5 is 24*80 or 27*132), each with a status line.

If you need more information about tagibm please contact Mike Gerard, *Mike.Gerard@cern.ch*.

Alternatively, you can use the program `x3270` which should be available on all UNIX machines with ASIS. On NCD X terminals you can also use the local 3270 client but you must have a licence for it, see Section 3.1.5 [Software License], page 6 for more information.

8.6 How can I change the keyboard mapping?

Sometimes, depending on the keyboard that you have and the systems that you use, you may have problems with the keyboard mapping. For instance:

- the Escape key does not work on a DEC-style keyboard
- the backspace key (`<x|`) acts in fact as a Delete key.

For all these problems, the best solution is to use `xmodmap` once logged in the remote system. For instance:

```
# to make F11 act as an Escape key
xmodmap -e "keysym F11 = Escape"
# to make the backspace key work as expected
xmodmap -e "keysym Delete = BackSpace"
```

`xmodmap` should be available on all UNIX systems. For more information on `xmodmap` features, please consult the man page *xmodmap(1)*.

9 Fonts

This chapter tries to describe fonts and the problems that may arise with them. Examples will be given on a UNIX system so a minimum knowledge of UNIX is assumed.

9.1 Introduction

Depending on the X terminal that you use, the X applications that you run, the machine where these programs run and the resources used by your X server[1], you may need a wide variety of fonts.

The central boot servers provide all the fonts needed by the X terminal and its local programs (if any). Depending on your environment you may need some other fonts, in this case you see errors like:

```
xterm:  unable to open font "bristol-charset132-dbl-b-132", trying "fixed"....
```
or
```
Warning: Cannot convert string "9x13" to type FontStruct
```

Note that you can list all the fonts available on your X server with the command `xlsfonts`, this command also allows you to use a pattern to restrict the list. See the man page *xlsfonts(1)* for more details.

9.2 The Font Path

The X server that runs on your X terminal tries to find fonts in several places defined by the *font path*. You can query your current font path by typing '`xset q`' on any UNIX machine[2]. You can also modify your font path with `xset`, see the man page for *xset(1)* for more details.

Your X terminal can use a font only if it can read it via TFTP or NFS or if it can communicate with an X11R5 font server. This implies that it can't read fonts that are in AFS or fonts that are on the machine where your programs run unless this machine explicitly exports its fonts.

Because of these restrictions, the safest method to extend your font path is to use one or more font servers and forget about TFTP or NFS.

9.3 Central Font Servers

The central boot servers (*xtsoft1* (*128.141.237.227*) and *xtsoft2* (*128.141.237.228*)) export many fonts via the X11R5 font server protocol. All servers provide exactly the same fonts. These fonts are grouped in categories and are available on separate port numbers:

---

[1] You can query these resources with the program `xrdb`.

[2] Provided that your DISPLAY variable is correctly set... See Section 7.2 [Telnet Session], page 18 for how to set the DISPLAY manually.

7001	miscellaneous fonts, currently only 3270
7002	fonts provided by NCD, this includes: X11R5, DEC compatible, Sun compatible and scalable fonts
7003	fonts usually found on an HP 700 workstation
7004	fonts usually found on an IBM RS/6000 workstation
7005	Sun-specific fonts
7000	almost all the fonts above!
7011	National Character Sets: Hebrew, Greek...
7012	Japanese fonts
7013	Chinese fonts
7014	Russian fonts.

Warning: before using these font servers, please note that you should **keep your font path as small as possible** for at least three reasons:

1. with a longer font path it takes more time to access a font and your X server takes more memory to cache the font information
2. since fonts are not standardized, the same font name may correspond to different fonts depending on where the font comes from
3. since fonts are cached in the font servers, font names with wildcards may correspond to different fonts depending on ... the users of the server[3]!

To use a font server, just use the command `xset`. For instance, to add the HP fonts from *xtsoft2* at the end of my font path:

```
xset fp+ tcp/xtsoft2:7003
```

Note that it's better to add the font server at the end of the font path so that you use it only when necessary...

You can list all the fonts available on a particular font server by combining `xset` and `xlsfonts` or, if X11R5 is installed on your machine, with the command `fslsfonts`[4]. For instance, to list all the IBM fonts available on *xtsoft1*:

```
fslsfonts -server xtsoft1:7004
```

9.4 How to Use Your Own Fonts

If you want your X terminal to be able to use some specific fonts (for instance the ones needed by a commercial product), you have two main possibilities:

[3] This problem is more a "wildcard problem" but it's much worse with long font paths...
[4] This command is also available on ASIS.

- if the fonts may be useful to several people at CERN **and** there is no licensing problems with making these fonts freely available, you can put them on the central font servers; to do so, contact *Xterminal.support@cern.ch*
- otherwise, the easiest solution is to setup a local font server; to do so read the *fs(1)* man page.

Appendix A Service Definition

The UNIX Workstation Support section (CN/DCI/UWS) offers support for the purchase, installation, configuration and maintenance of X terminals at CERN.

Please note that the support is only for administrators and owners of X terminals. Users with application or usage questions should contact the UCO, see Section 1.1 [UCO], page 2.

X terminal support will be concentrated in the Computing and Networks Division, Desktop Computing Infrastructure group, UNIX Workstation Support section and will consist of:

- configuration and purchase advice,
- installation,
- software repository,
- central servers, and
- hardware support (supplied in liaison with ESS Group of ECP).

Configuration Advice

We will keep lists of supported X terminals and current prices and provide help in deciding which are the most appropriate purchase options. Questions should be directed to Christiane Ball, 3349, *Xterminal.support@cern.ch*.

Purchase Advice

We will help CERN users (including visitors) to purchase X terminals, for more information please contact Christiane Ball, 3349, *Xterminal.support@cern.ch*.

We will maintain a small stock of X terminals and spare parts (e.g. keyboards or swiss power cords) for resale to users with urgent requests. We will also maintain a small stock for short term (2-4 weeks maximum) loan so that users may evaluate the use of X terminals for their applications.

Installation

If desired, we will provide the manpower to physically install an X terminal (from the supported list) and to install a boot server. Requests should be sent to *Xterminal.support@cern.ch*.

Software

We will provide the following software options:

- several identical boot servers for all supported X terminals, they will contain a software repository plus some daemons to make the software available to X terminals.
- a configuration server that will provide a default setup suitable for the CERN environment (network configuration, name servers, well known login servers, etc). These configurations will be made available for all supported X terminals.
- a font server for X servers to include all required fonts for all the supported X terminals plus some public domain ones (X11R5 for example). This service may be opened to workstations in the future.

We will establish software contracts with the vendors of supported X terminals such that we always have copies of the latest software to support them. Arrival of new versions will be signaled by computer news in the news group *cern.xterm*.

Hardware

Hardware support will be provided in collaboration with ECP/ESS/OS (C. Parkman's team) for configuration changes (e.g. adding memory) and hardware repair. Simple repairs will be performed within CERN but more serious cases may require intervention by the vendor under the terms of a repair contract for which users will be charged for the repair if the X terminal is not under guarantee anymore.

As part of the hardware repair service, a small stock of X terminals will be maintained from which users may borrow while their own terminal is under repair.

For more information, please contact:

- *Xterminal.support@cern.ch*
- Bertrand Smaniotto, 31 1-014, 2601, *smanio@cernvm*
- Chris Parkman, 31 1-010, 3963, 13+5512, *pmn@cernvm*

What We Will Not Provide

We will not provide login or work servers although we will offer some expertise on how to build these. However, many X terminal owners will already have accounts on central CN services (*cernvm*, *dxcern*, *vxcern*...) and these may be used exactly as if the user logged in via a dumb terminal (making use of the X terminal's terminal emulation module or a suitable X-based program).

Supported Terminals

Given the huge and continuously changing range on the market and limited resources at any single site, it is impossible to support all types of X terminal hardware from all vendors. At the present moment, the only fully supported brands of X terminals at CERN are NCD and HP. Note that old models from NCD (namely 16, 16e and 19b) can't run the latest version of the NCD software and should therefore be upgraded to newer models.

In addition, we are able to supply some assistance in the use of models from the following vendors:

- DEC
- IBM
- Sun.

These systems are supported on a best-efforts basis; we do not guarantee to have the latest software or even any documentation for them.

Appendix B TCP/IP Request Form

In order to have a machine defined in the CERN IP nameservers and the central equipment database, you must supply the information pertaining to the machine:

```
                              TCP/IP HOST

      !===   Host name                             : See naming convention note
      !===   TCP/IP address                        : Allocated by CN
      !===   Type & Model of Node/Host             :
      !===   Ethernet Interface Hardware Address   :
      !===   Operating System & version            :
      !===   Serial no.                            :
      !===   Location of Host (building-floor-room):
      !===   Name of responsible                   :
      !===   Name of principal/usual user          :
      !===   Experiment/Project/Group Name         :
      !===   Host Id (for Unix systems)            :
```

You can get this form by sending an e-mail to *tcpip@cern.ch*.

The naming convention can be found for instance in *The CERN Internal Network Brochure*, available at the UCO.

See Section 6.2 [How can I find my hardware address?], page 15 to know how to find the hardware address of an X terminal.

Glossary

Types of Servers

Important note: in this context the word '`server`' is equivalent to '`service`' and is different from '`machine`'. You may have more than one server on a single machine (for instance you can use the same machine for booting and for configuration files) or you can have a server on more than one machine (for instance the font server may consist of fonts coming from several machines).

An X terminal is not a standalone object, it may require any or all of the following:

boot server This is a computer from which the X terminal can download its control software which consists of a minimum Operating System, an X server and, in some cases, some local applications such as a terminal emulator, a window manager and so on. The X terminal always needs a boot server unless it has all its software in PROM.

configuration server
This is a system from which an X terminal can download its different settings (gateway address, name server address, which protocols to use, what to do on bootstrap, etc). If the X terminal does not have a configuration server then all the customizations not stored in NVRAM must be redone manually each time the X terminal boots.

font server This is a system from which the X terminal can download character fonts. The methods used to download fonts can be: TFTP, NFS or the X11R5 font server protocol.

login server This is an optional system that provides a login prompt and allows the user to have a customized X environment. These facilities are usually provided by XDMCP.

work server This is a machine where the work is actually done (running applications, storing files...). This machine can run any operating system but must be accessible via TCP/IP. Of course, you need to already have a user account on this machine.

Acronyms

AFS Andrew File System; a distributed file system recommended at CERN.

ASIS Application Software Installation Server; CERN Public Domain software repository.

BDF Bitmap Distribution Format; a font format in which fonts are stored as ASCII text.

NFS Network File System; a protocol to provide transparent file access over the network.

NVRAM Non-Volatile Random-Access Memory; used to store parameter settings when the power is off.

PCF Portable Compiled Format; the standard font format for X11R5.

PROM Programmable Read-Only Memory; used to store software (boot monitor, X server...) in the X terminal.

RAM Random-Access Memory.

SNF Server Normal Format; a server-dependent font format.

TFTP Trivial File Transfer Protocol; allows users to transfer files to and from a remote machine.

UCO User Consultancy Office, see Section 1.1 [UCO], page 2

UMTF User Migration Task Force; its mandate is to coordinate the efforts put into migrating the VM user community off the CERN IBM mainframe, for more information check '`http://wwwcn.cern.ch/umtf`'.

WWW World-Wide Web; a distributed, hypertext, multi-media information system.

XDM X Display Manager; a protocol that provides automatic X protocol connection to a host when a terminal is reset.

XDMCP X Display Manager Control Protocol; used to provide easy login services through XDM.

Index

Table of Contents