DA-682 Series Linux Manual

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DA-682 Series Linux Manual

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Table of Contents

1

Introduction

Thank you for purchasing the Moxa DA-682 Series of x86 ready-to-run embedded computers. This manual introduces the software configuration and management of the DA-682-LX, which runs the Linux operating system. For hardware installation, connector interfaces, setup, and upgrading the BIOS, please refer to the "DA-682 Series Hardware User's Manual."

Linux is an open, scalable operating system that allows you to build a wide range of innovative, small footprint devices. Software written for desktop PCs can be easily ported to the embedded computer with a GNU cross compiler and a minimum of source code modifications. A typical Linux-based device is designed for a specific use, and is often not connected to other computers, or a number of such devices connect to a centralized, front-end host. Examples include enterprise tools such as industrial controllers, communications hubs, point-of-sale terminals, and display devices, which include HMIs, advertisement appliances, and interactive panels.

The following topics are covered in this chapter:

Overview

The Moxa DA-682 Series of x86-based rackmount embedded computers are designed for industrial data acquisition applications. Their state-of-the-art two expansion module design gives users a versatile combination of up to 16 RS-232/422/485 serial ports, or up to 4+8 Ethernet ports. This friendly design gives users the advantage of being able to swap out modules quickly and easily. Additional expansion modules will be available soon.

The DA-682 main system is based on the Intel Celeron M processor and 915GME chipset, which supports standard X86 VGA, USB, PS/2 keyboard/mouse, 4 Gigabit LAN ports, and IDE/SATA disk interface. In addition, the DA-682 supports a CompactFlash Socket and pre-installed embedded ready-to-run operating system. Programmers will find the full-function development kit a great benefit for developing software and building reliable communication applications.

The housing is a standard 2U, 19-inch wide rack-mounted rugged enclosure. This robust, rack-mountable design provides the hardened protection needed for industrial environment applications.

Product Features

The DA-682 Series Basic System has the following features:

- Intel Celeron M 1 GHz processor with 400/533 MHz FSB
- Intel 915GME + ICH6M chipset
- 200-pin DDR2 SODIMM socket supporting DDR2 400/533 up to 1 GB
- 4 Gigabit Ethernet ports for network redundancy
- 1 CompactFlash socket
- 1 SATA connector for storage expansion
- USB 2.0 ports for high speed peripherals
- Two expansion module slots for flexible I/O expansion
- 19-inch rackmount, 2U high form factor
- Fanless Design
- 100/240 VAC/VDC power inputs

Special features of the DA-682-LX Linux model:

- Shipped with DDR2 512 MB of memory
- Ready-to-run Linux 2.6 platform pre-installed on a 1 GB flash disk module

Features supported by expansion modules:

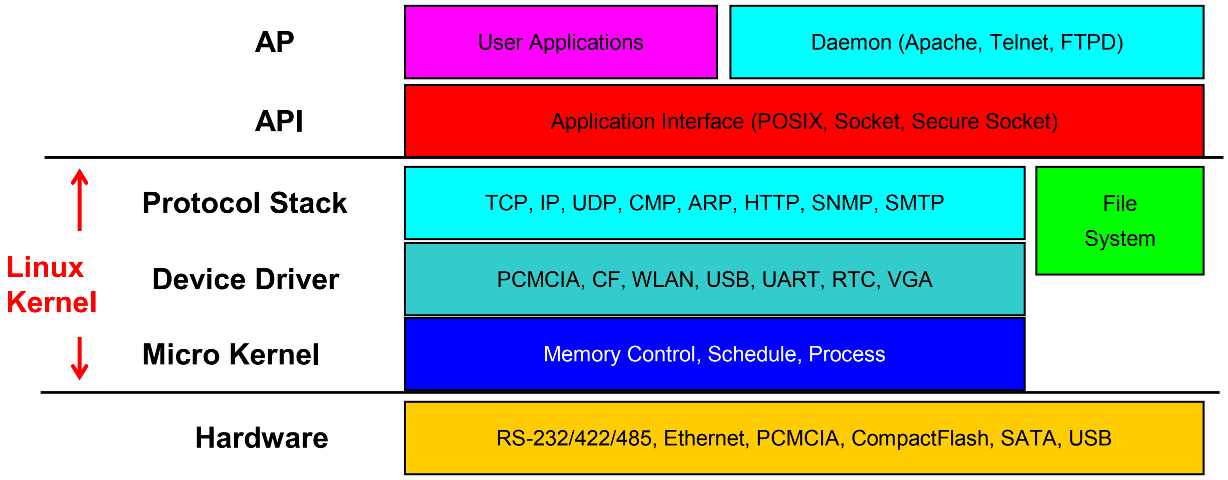
- 8 or 16 isolated or non-isolated software selectable RS-232/422/485 serial ports
- Serial port baudrate from 50 to 921.6 Kbps (supports most nonstandard baudrates in this range)
- Additional 4 or 8 10/100 Mbps Ethernet ports

ATTENTION

Refer to section "Baud Rate Speed" for calculation of baud rate speed supported.

Software Specifications

The Linux operating system pre-installed on the DA-682 embedded computer is the **Debian Etch 4.0r2** distribution. The Debian project is a worldwide group of volunteers who endeavor to produce an operating system distribution that composed entirely of free software. The Debian GNU/Linux follows the standard Linux architecture, making it easy to use programs that meet the POSIX standard. Program porting can be done with the GNU Tool Chain provided by Moxa. In addition to Standard POSIX APIs, device drivers for Moxa UART and other special peripherals are also included. An example software architecture is shown below:


AP
User Applications
Daemon (Apache, Telnet, FTPD)
API
Application Interface (POSIX, Socket, Secure Socket)
Linux Kernel
Protocol Stack
TCP, IP, UDP, CMP, ARP, HTTP, SNMP, SMTP
File System
Device Driver
PCMCIA, CF, WLAN, USB, UART, RTC, VGA
Micro Kernel
Memory Control, Schedule, Process
Hardware
RS-232/422/485, Ethernet, PCMCIA, CompactFlash, SATA, USB

ATTENTION

Refer to http://www.debian.org/ and http://www.gnu.org/ for information and documentation of the Debian GNU/Linux and free software concept.

ATTENTION

The above software architecture is only an example. Different models or different build revisions of the Linux operating system may include components not shown in the above graphic.

Journaling Flash File System (JFFS2)

The pre-installed root file system is protected in a read-only partition to prevent file system crash problems normally caused by power loss. But some directories or files, such as **/home, /root**, **/var**, **/etc/network/**, **/etc/ppp/**, **/ect/openvpn/**, and **/etc/resolv.conf**, which need write permission, are located in another writable partition and formatted with the JFFS2 file system. The formatting process places a compressed file system in the Flash memory, transparent to the user.

The Journaling Flash File System (JFFS2), which was developed by Axis Communications in Sweden, puts a file system directly on the flash, instead of emulating a block device. It is designed for use on flash-ROM chips and recognizes the special write requirements of a flash-ROM chip. JFFS2 implements wear-leveling to extend the life of the flash disk, and stores the flash directory structure in the RAM. A log-structured file system is maintained at all times. The system is always consistent, even if it encounters crashes or improper power-downs, and does not require **fsck** (file system check) on boot-up.

JFFS2 is the newest version of JFFS. It provides improved wear-leveling and garbage-collection performance, improved RAM footprint and response to system-memory pressure, improved concurrency and support for suspending flash erases, marking of bad sectors with continued use of the remaining good sectors, native data compression inside the file system design, and support for hard links. JFFS2 enhances the write-life of the flash devices.

The key features of JFFS2 are:

- Targets the Flash ROM directly
- Robustness
- Consistency across power failures
- No integrity scan (fsck) is required at boot time after normal or abnormal shutdown

- Explicit wear leveling
- Transparent compression

Although JFFS2 is a journaling file system, this does not preclude the loss of data. The file system will remain in a consistent state across power failures and will always be mountable. However, if the board is powered down during a write then the incomplete write will be rolled back on the next boot, but writes that have already been completed will not be affected.

ATTENTION

Additional information about JFFS2 is available at:

- http://sources.redhat.com/jffs2/jffs2.pdf
- http://developer.axis.com/software/jffs/
- http://www.linux-mtd.infradead.org/

Software Components

The DA-682-LX pre-installed Debian Etch 4.0r2 Linux distribution has the following software components:

Component	Version	Description
acpid	1.0.4-5	Utilities for using ACPI power management
adduser	3.102	Add and remove users and groups
apache2	2.2.3-4+etch4	Next generation, scalable, extendable web server
apache2-mpm-prefork	2.2.3-4+etch4	Traditional model for Apache HTTPD 2.1
apache2-utils	2.2.3-4+etch4	Utility programs for webservers
apache2.2-common	2.2.3-4+etch4	Next generation, scalable, extendable web server
libapache2-mod-php5	5.2.0-8+etch10	Server-side, HTML-embedded scripting languag
apt	0.6.46.4-0.1	Advanced front-end for dpkg
apt-utils	0.6.46.4-0.1	APT utility programs
aptitude	0.4.4-4	Terminal-based apt frontend
base-files	4	Debian base system miscellaneous files
base-passwd	3.5.11	Debian base system master password and group
bash	3.1dfsg-8	The GNU Bourne Again SHell
bc	1.06-20	The GNU bc arbitrary precision calculator language
bind9-host	9.3.4-2etch1	Version of "host" bundled with BIND 9.X
binutils	2.17-3	The GNU assembler, linker and binary utilities
bridge-utils	1.2-1	Utilities for configuring the Linux ethernet bridge
bsdmainutils	6.1.6	Collection of more utilities from FreeBSD
bsdutils	2.12r-19etch1	Basic utilities from 4.4BSD-Lite
busybox	1.1.3-4	Tiny utilities for small and embedded system
console-common	0.7.69	Basic infrastructure for text console configuration
console-data	1.01-7	Keymaps, fonts, charset maps, fallback table for console-tools
console-tools	0.2.3dbs-65	Linux console and font utilities
coreutils	5.97-5.3	The GNU core utilities
cpio	2.6-18	GNU cpio -- a program to manage archives of files
cpp	4.1.1-15	The GNU C preprocessor (cpp)
cpp-4.1	4.1.1-21	The GNU C preprocessor
cron	3.0pl1-100	Management of regular background processing
debconf	1.5.11etch1	Debian configuration management system
debconf-i18n	1.5.11etch1	Full internationalization support for debcon
debian-archive-keyring	2007.07.31~etch1	GnuPG archive keys of the Debian archive
debianutils	2.17	Miscellaneous utilities specific to Debian
dhcp3-client	3.0.4-13	DHCP Client

Component	Version	Description
dhcp3-common	3.0.4-13	Common files used by all the dhcp3* packages
dictionaries-common	0.70.10	Common utilities for spelling dictionary tools
diff	2.8.1-11	File comparison utilities
dmidecode	2.8-4	Dump Desktop Management Interface data
dnsutils	9.3.4-2etch1	Clients provided with BIND
dpkg	1.13.25	Package maintenance system for Debian
dselect	1.13.25	User tool to manage Debian packages
e2fslibs	1.39+1.40-WIP-2006.	11.14+dfsg-2etch1 ext2 filesystem libraries
e2fsprogs	1.39+1.40-WIP-2006.	11.14+dfsg-2etch1 ext2 file system utilities and libraries
findutils	4.2.28-1etch1	Utilities for finding files--find, xargs, an
ftp	0.17-16	The FTP client
g++	4.1.1-15	The GNU C++ compiler
g++-4.1	4.1.1-21	The GNU C++ compiler
gcc	4.1.1-15	The GNU C compiler
gcc-4.1	4.1.1-21	The GNU C compiler
gcc-4.1-base	4.1.1-21	The GNU Compiler Collection (base package)
gnupg	1.4.6-2	GNU privacy guard - a free PGP replacement
gpgv	1.4.6-2	GNU privacy guard - signature verification tool
grep	2.5.1.ds2-6	GNU grep, egrep and fgrep
grub	0.97-27	GRand Unified Bootloader
gzip	1.3.5-15	The GNU compression utility
hostname	2.93	Utility to set/show the host name or domain
ifrename	28-1	Rename network interfaces based on various static criteria
ifupdown	0.6.8	High level tools to configure network interfaces
initramfs-tools	0.85h	Tools for generating an initramfs
initscripts	2.86.ds1-38	Scripts for initializing and shutting down the system
iproute	20061002-3	Professional tools to control the networking in Linux kernels
iptables	1.3.6.0debian1-5	Administration tools for packet filtering and NAT netfilter and iptables provide a Linux kernel framework for stateful and stateless packet filtering, network and port address translation, and other IP packet manipulation. The framework is the successor to ipchains.
iputils-ping	20020927-6	Tools to test the reachability of network hosts
klibc-utils	1.4.34-2	Small statically-linked utilities built with klibc
klogd	1.4.1-18	Kernel Logging Daemon
libacl1	2.2.41-1	Access control list shared library
libattr1	2.4.32-1	Extended attribute shared library
libbind9-0	9.3.4-2etch1	BIND9 Shared Library used by BIND
libblkid1	1.39+1.40-WIP-2006.	11.14+dfsg-2etch1 block device id library
klibc	1.0.3-6	Small statically-linked utilities built with klibc
libc6	2.3.6.ds1-13etch5	GNU C Library: Shared libraries
libc6-dev	2.3.6.ds1-13etch5	GNU C Library: Development Libraries and Header Files
libc6-i686	2.3.6.ds1-13etch5	GNU C Library: Shared libraries [i686 optimized]
libcap1	1.10-14	Support for getting/setting POSIX.1e capabilities
libcomerr2	1.39+1.40-WIP-2006.	11.14+dfsg-2etch1 common error description library
libconsole	0.2.3dbs-65	Shared libraries for Linux console and font
libcupsys2	1.2.7-4etch2	Common UNIX Printing System(tm) - libs
libdb4.2	4.2.52+dfsg-2	Berkeley v4.2 Database Libraries [runtime]

Component	Version	Description
libdb4.3	4.3.29-8	Berkeley v4.3 Database Libraries [runtime]
libdb4.4	4.4.20-8	Berkeley v4.4 Database Libraries [runtime]
libdevmapper1.02	1.02.08-1	The Linux Kernel Device Mapper userspace library
libdns22	9.3.4-2etch1	DNS Shared Library used by BIND
libedit2	2.9.cvs.20050518-2.2	BSD editline and history libraries
libevent1	1.1a-1	An asynchronous event notification library
libgc1c2	6.8-1	Conservative garbage collector for C and C++
libgcc1	4.1.1-21	GCC support library
libgcrypt11	1.2.3-2	LGPL Crypto library - runtime library
libgdbm3	1.8.3-3	GNU dbm database routines (runtime version)
libgnutls13	1.4.4-3	The GNU TLS library - runtime library
libgpg-error0	1.4-1	Library for common error values and messages
libgpmg1	1.19.6-25	General Purpose Mouse - shared library
libgssapi2	0.10-4	A mechanism-switch gssapi library
libidn11	0.6.5-1	GNU libidn library, implementation of IETF I
libisc11	9.3.4-2etch1	ISC Shared Library used by BIND
libisccc0	9.3.4-2etch1	Command Channel Library used by BIND
libisccfg1	9.3.4-2etch1	Config File Handling Library used by BIND
libiw28	28-1	Wireless tools - library
libklibc	1.4.34-2	Minimal libc subset for use with initramfs
libkrb53	1.4.4-7etch4	MIT Kerberos runtime libraries
libldap2	2.1.30-13.3	OpenLDAP libraries
liblocale-gettext-perl	1.05-1	Using libc functions for internationalization in Perl
liblockfile1	1.06.1	NFS-safe locking library, includes dotlockfile program
liblwres9	9.3.4-2etch1	Lightweight Resolver Library used by BIND
liblzo1	1.08-3	Data compression library (old version)
liblzo2-2	2.02-2	Data compression library
libmagic1	4.17-5etch3	File type determination library using “magic” numbers
libmysqlclient15off	5.0.32-7etch5	mysql database client library
libncurses5	5.5-5	Shared libraries for terminal handling
libncursesw5	5.5-5	S Shared libraries for terminal handling (wide character support)
libnet-lite-ftp-perl	0.47-2	Perl FTP client with support for TLS
libnet-ssleay-perl	1.30-1	Perl module for Secure Sockets Layer (SSL)
libnet-telnet-perl	3.03-1	Script telnetable connections
libnewt0.52	0.52.2-10	Not Erik’s Windowing Toolkit - text mode windowing with slang
libnfsidmap2	0.18-0	An nfs idmapping library
libopencdk8	0.5.9-2	Open Crypto Development Kit (OpenCDK) (runtime)
libpam-modules	0.79-5	Pluggable Authentication Modules for PAM
libpam-runtime	0.79-5	Runtime support for the PAM library
libpam0g	0.79-5	Pluggable Authentication Modules library
libpcap0.8	0.9.5-1	System interface for user-level packet capture
libpci2	2.1.11-3	Obsolete shared library for accessing pci devices
libpcre3	6.7+7.4-3	Perl 5 Compatible Regular Expression Library
libpopt0	1.10-3	lib for parsing cmdline parameters
libpq4	8.1.11-0etch1	PostgreSQL C client library
libreadline5	5.2-2	GNU readline and history libraries, run-time
libroken16-heimdal	0.7.2.dfsg.1-10	Libraries for Heimdal Kerberos
librpcsecgss3	0.14-2etch3	Allows secure rpc communication using the rpcsec_gss protocol

Component	Version	Description
libsasl2	2.1.22.dfsg1-8	Authentication abstraction library
libsasl2-2	2.1.22.dfsg1-8	Authentication abstraction library
libselinux1	1.32-3	SELinux shared libraries
libsemanage1	1.8-1	Shared libraries used by SELinux policy manipulation tools
libsensors3	2.10.1-3	Library to read temperature/voltage/fan sensors
libsepol1	1.14-2	Security Enhanced Linux policy library for changing policy binaries
libsigc++-2.0-0c2a	2.0.17-2	Type-safe Signal Framework for C++ - runtime
libslang2	2.0.6-4	The S-Lang programming library - runtime version
libslp1	1.2.1-6.2	OpenSLP libraries
libsnmp-base	5.2.3-7etch2	NET SNMP (Simple Network Management Protocol) MIBs and Docs
libsnmp9	5.2.3-7etch2	NET SNMP (Simple Network Management Protocol) MIBs and Docs
libss2	1.39+1.40-WIP-2006.	11.14+dfsg-2etch1 command-line interface parsing library
libssl0.9.8	0.9.8c-4etch1	SSL shared libraries
libssp0	4.1.1-21	GCC stack smashing protection library
libstdc++6	4.1.1-21	The GNU Standard C++ Library v3
libstdc++6-4.1-dev	4.1.1-21	The GNU Standard C++ Library v3 (development files)
libsysfs2	2.1.0-1	Interface library to sysfs
libtasn1-3	0.3.6-2	Manage ASN.1 structures (runtime)
libtasn1-3-bin	0.3.6-2	Manage ASN.1 structures (binaries)
libtext-charwidth-perl	0.04-4	Get display widths of characters on the term
libtext-iconv-perl	1.4-3	Converts between character sets in Perl
libtext-wrapi18n-perl	0.06-5	Internationalized substitute of Text:Wrap
libusb-0.1-4	0.1.12-5	userspace USB programming library
libuuid1	1.39+1.40-WIP-2006.	11.14+dfsg-2etch1 universally unique id library
libvolume-id0	0.105-4	libvolume_id shared library
libwrap0	7.6.dbs-13	Wietse Venema's TCP wrappers library
linux-image-2.6-686	2.6.18+6etch2	Linux kernel 2.6 image on PPro/Celeron/PII/PIII/P4
linux-image-2.6.18-5-686	2.6.18.dfsg.1-17	Linux 2.6.18 image on PPro/Celeron/PII/PIII/P4
linux-kernel-headers	2.6.18-7	Linux Kernel Headers for development
locales	2.3.6.ds1-13etch5	GNU C Library: National Language (locale) data [support]
lockfile-progs	0.1.10	Programs for locking and unlocking files and mailboxes
login	4.0.18.1-7	System login tools
logrotate	3.7.1-3	Log rotation utility
lsb-base	3.1-23.2etch1	Linux Standard Base 3.1 init script function
make	3.81-2	The GNU version of the "make" utility.
makedev	2.3.1-83	Creates device files in /dev
manpages	2.39-1	Manual pages about using a GNU/Linux system
mawk	1.3.3-11	A pattern scanning and text processing language
mime-support	3.39-1	MIME files "mime.types" & "mailcap", and support programs
minicom	2.2-5	Friendly menu driven serial communication program
mktemp	1.5-2	Makes unique filenames for temporary files
modconf	0.3.1	Device Driver Configuration
module-init-tools	3.3-pre4-2	Tools for managing Linux kernel modules
mount	2.12r-19etch1	Tools for mounting and manipulating filesystems
mtd-tools	20061007-1	Memory Technology Device Tools

Component	Version	Description
mysql-common	5.0.32-7etch5	Mysql database common files (e.g. /etc/mysql my.cnf)
ncurses-base	5.5-5	Descriptions of common terminal types
ncurses-bin	5.5-5	Terminal-related programs and man pages
ncurses-term	5.5-5	Additional terminal type definitions
net-tools	1.60-17	The NET-3 networking toolkit
netbase	4.29	Basic TCP/IP networking system
nfs-common	1.0.10-6+etch.1	NFS support files common to client and server
openbsd-inetd	0.20050402-6	The OpenBSD Internet Superserver
openssh-client	4.3p2-9	Secure shell client, an rlogin/rsh/rcp replacement
openssh-server	4.3p2-9	Secure shell server, an rshd replacement
openssl	0.9.8c-4etch1	Secure Socket Layer (SSL) binary and related cryptographic tools
openvpn	2.0.9-4etch1	Virtual Private Network daemon
passwd	4.0.18.1-7	Change and administer password and group data
pciutils	2.2.4~pre4-1	Linux PCI Utilities
perl	5.8.8-7etch1	Larry Wall's Practical Extraction and Report
perl-base	5.8.8-7etch1	The Pathologically Eclectic Rubbish Lister
perl-modules	5.8.8-7etch1	Core Perl modules
portmap	5-26	The RPC portmapper
ppp	2.4.4rel-8	Point-to-Point Protocol (PPP) daemon
pppconfig	2.3.15.etch1	A text menu based utility for configuring ppp
pppoe	3.8-1.1	PPP over Ethernet driver
procps	3.2.7-3	/proc file system utilities
proftpd	1.3.0-19	Versatile, virtual-hosting FTP daemon
readline-common	5.2-2	GNU readline and history libraries, common files
sed	4.1.5-1	The GNU sed stream editor
snmp	5.2.3-7etch2	NET SNMP (Simple Network Management Protocol) Apps
snmpd	5.2.3-7etch2	NET SNMP (Simple Network Management Protocol) Agents
ssh	4.3p2-9	Secure shell client and server (transitional package)
ssl-cert	1.0.14	Simple debconf wrapper for openssl
strace	4.5.14-2	A system call tracer
sysklogd	1.4.1-18	System Logging Daemon
sysv-rc	2.86.ds1-38	System-V-like runlevel change mechanism
sysvinit	2.86.ds1-38	System-V-like init utilities
sysvinit-utils	2.86.ds1-38	System-V-like utilities
tar	1.16-2etch1	GNU tar
tcpd	7.6.dbs-13	Wietse Venema's TCP wrapper utilities
tcpdump	3.9.5-2etch1	A powerful tool for network monitoring and data acquisition
telnet	0.17-34	The telnet client
telnetd	0.17-34	The telnet server
tftpd	0.17-15	Trivial file transfer protocol server
time	1.7-21	The GNU time program for measuring cpu resource usage
traceroute	1.4a12-21	Traces the route taken by packets over a TCP
tzdata	2007j-1etch1	Time Zone and Daylight Saving Time Data
ucf	2.002	Update Configuration File: preserves user changes to config files.
udev	0.105-4	/dev/ and hotplug management daemon
update-inetd	4.27-0.5	inetd.conf updater
usbmount	0.0.14.1	Automatically mount and unmount USB mass storage devices
usbutils	0.72-7	USB console utilities

Component	Version	Description
util-linux	2.12r-19etch1	Miscellaneous system utilities
vim	7.0-122+1etch3	Vi IMproved - enhanced vi editor
vim-common	7.0-122+1etch3	Vi IMproved - Common files
vim-runtime	7.0-122+1etch3	Vi IMproved - Runtime files
vim-tiny	7.0-122+1etch3	Vi IMproved - enhanced vi editor - compact version
w3m	0.5.1-5.1	WWW browsable pager with excellent tables/frames support
wget	1.10.2-2	Retrieves files from the web
whiptail	0.52.2-10	Displays user-friendly dialog boxes from shell scripts
whois	4.7.20	The GNU whois client
zlib1g	1.2.3-13	Compression library - runtime

2

Software Configuration

In this chapter, we explain how to operate a DA-682-LX computer directly or from a PC near you. There are three ways to connect to the DA-682-LX computer: through VGA monitor, by using Telnet over the network, or by using an SSH console from a Windows or Linux machine. This chapter describes basic Linux operating system configurations. The advanced network management and configuration will be described in the next chapter "Managing Communications."

The following topics are covered in this chapter:

- ❒ **Starting from a VGA Console**
- ❒ **Connecting from a Telnet Console**
- ❒ **Connecting from an SSH Console**
    - ➢ Windows Users
    - ➢ Linux Users
- ❒ **Adjusting the System Time**
    - ➢ Setting the Time Manually
    - ➢ NTP Client
    - ➢ Updating the Time Automatically
- ❒ **Enabling and Disabling Daemons**
- ❒ **Setting the Run-Level**
- ❒ **Cron—Daemon for Executing Scheduled Commands**
- ❒ **Inserting a USB Storage Device into the Computer**
- ❒ **Inserting a CompactFlash Card into the Computer**
- ❒ **Checking the Linux Version**
- ❒ **APT—Installing and Removing Packages**

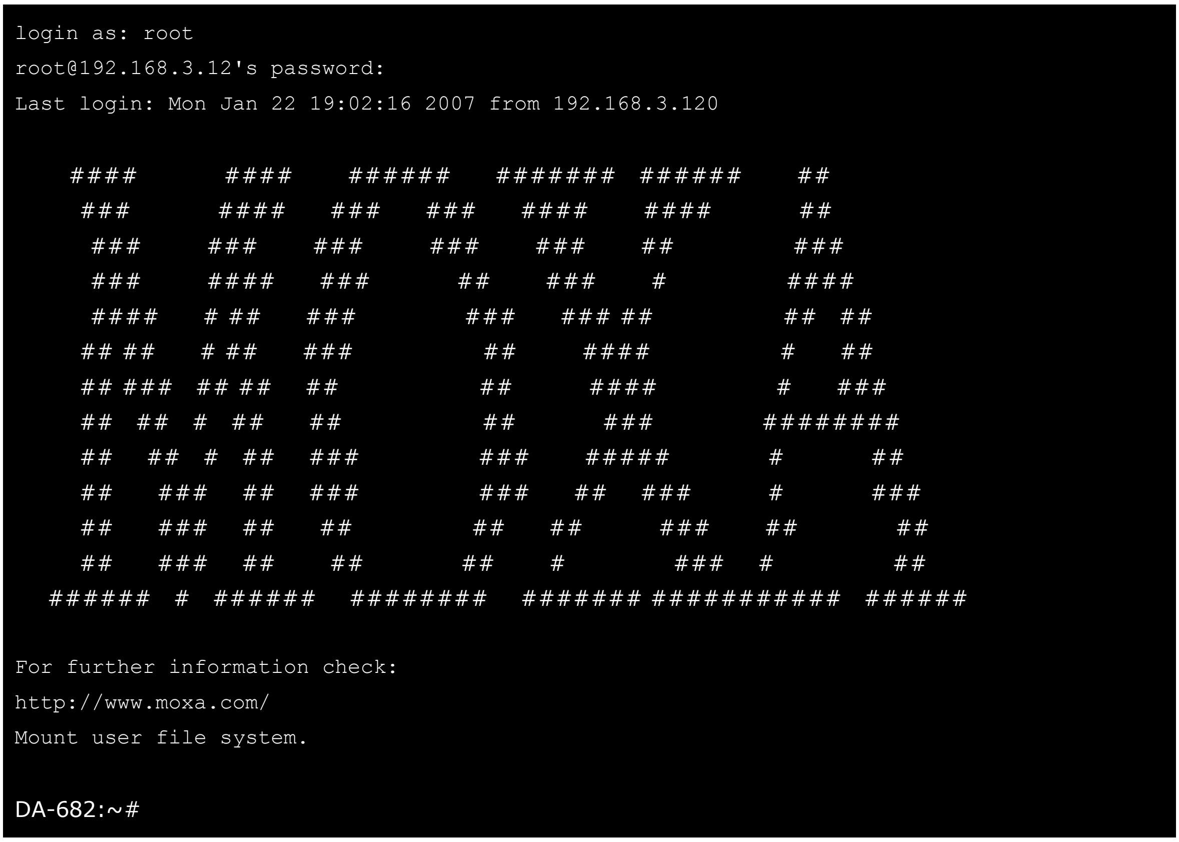
Starting from a VGA Console

Connect the display monitor to the DA-682-LX VGA connector, and then power it up by connecting it to the power adaptor. It takes about 30 to 60 seconds for the system to boot up. Once the system is ready, a login screen will appear on your monitor.

To log in, type the login name and password as requested. The default values are both **root**.

Login: root

Password: root



```
login as: root
root@192.168.3.12's password:
Last login: Mon Jan 22 19:02:16 2007 from 192.168.3.120

   ####      ####    ######   #######  ######    ##
    ###     ####   ###   ###   ####    ####      ##
     ###    ###    ###    ###    ###    ##        ###
     ###    ####   ###      ##    ###    #        ####
     ####   # ##   ###       ###   ### ##         ##  ##
    ## ##   # ##   ###         ##     ####        #   ##
    ## ###  ## ##  ##          ##      ####       #   ###
    ##  ##  #  ##   ##         ##       ###      ########
    ##   ## #  ##   ###        ###    #####      #      ##
    ##   ###   ##   ###        ###   ##  ###     #      ###
    ##   ###   ##    ##       ##   ##     ###    ##       ##
    ##   ###   ##     ##     ##    #       ###   #        ##
  ###### # ######   ########   ####### ###########  ######

For further information check:
http://www.moxa.com/
Mount user file system.

DA-682:~#
```

Connecting from a Telnet Console

The DA-682-LX computer comes with four basic Gigabit Ethernet ports named LAN1 to LAN4. The default IP addresses and netmasks of the network interfaces are as follows:

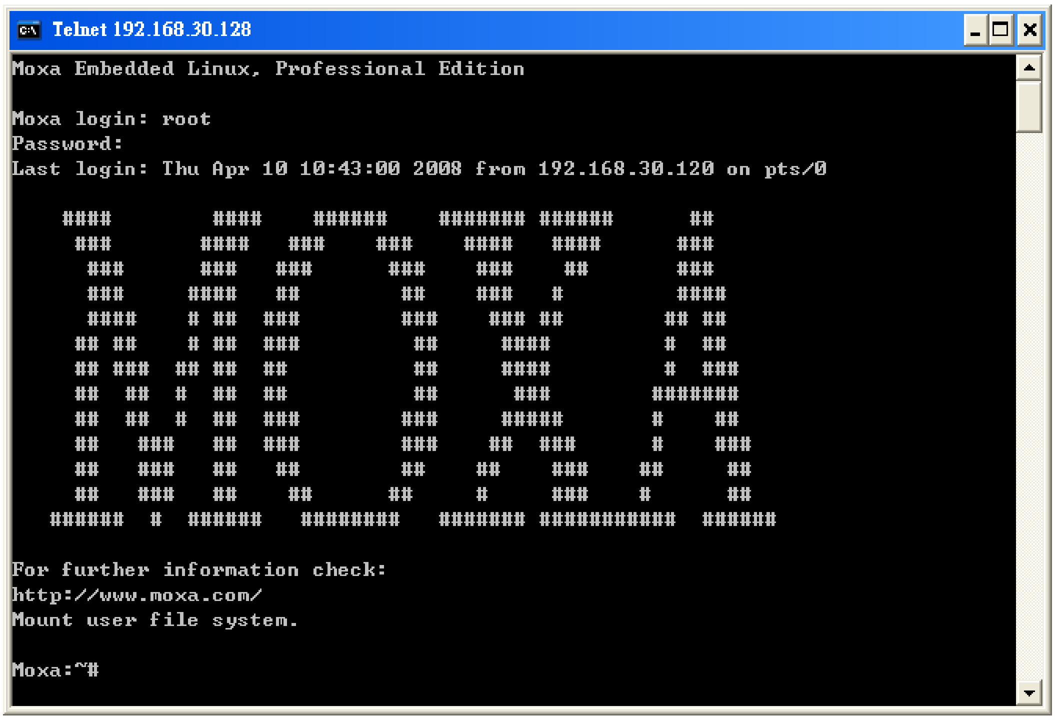
	Default IP Address	Netmask
LAN 1	192.168.3.127	255.255.255.0
LAN 2	192.168.4.127	255.255.255.0
LAN 3	192.168.5.127	255.255.255.0
LAN 4	192.168.6.127	255.255.255.0

Before using the Telnet client, you should change the IP address of your development workstation so that the network ports are on the same subnet as the IP address for the LAN port that you connect to. For example, if you connect to LAN 1, you could set your PC's IP address to 192.168.3.126, and the netmask to 255.255.255.0. If you connect to LAN 2, you can set your PC's IP address to 192.168.4.126, and the netmask to 255.255.255.0.

Use a cross-over Ethernet cable to connect your development workstation directly to the target computer, or use a straight-through Ethernet cable to connect the computer to a LAN hub or switch. Next, use a Telnet client on your development workstation to connect to the target computer. After a connection has been established, type the login name and password as requested to log on to the computer. The default values are both **root**.

Login: root

Password: root



```
Moxa Embedded Linux, Professional Edition

Moxa login: root
Password:
Last login: Thu Apr 10 10:43:00 2008 from 192.168.30.120 on pts/0

    ####        ####    ######    ####### ######      ##
     ###       ####   ###    ###     ####   ####      ###
      ###      ###   ###      ###    ###    ##       ###
      ###     ####   ##        ##    ###   #         ####
      ####    # ##  ###        ###    ### ##        ## ##
     ## ##    # ##  ###         ##     ####         #  ##
     ## ###  ## ##  ##          ##     ####         #  ###
     ##  ##  #  ##  ##          ##      ###        #######
     ##  ##  #  ##  ###        ###     #####       #    ##
     ##   ###   ##  ###        ###    ##  ###      #    ###
     ##   ###   ##   ##        ##    ##    ###    ##      ##
     ##   ###   ##    ##      ##     #     ###    #       ##
   ######  #  ######   ########   ####### ###########  ######

For further information check:
http://www.moxa.com/
Mount user file system.

Moxa:~#
```

ATTENTION

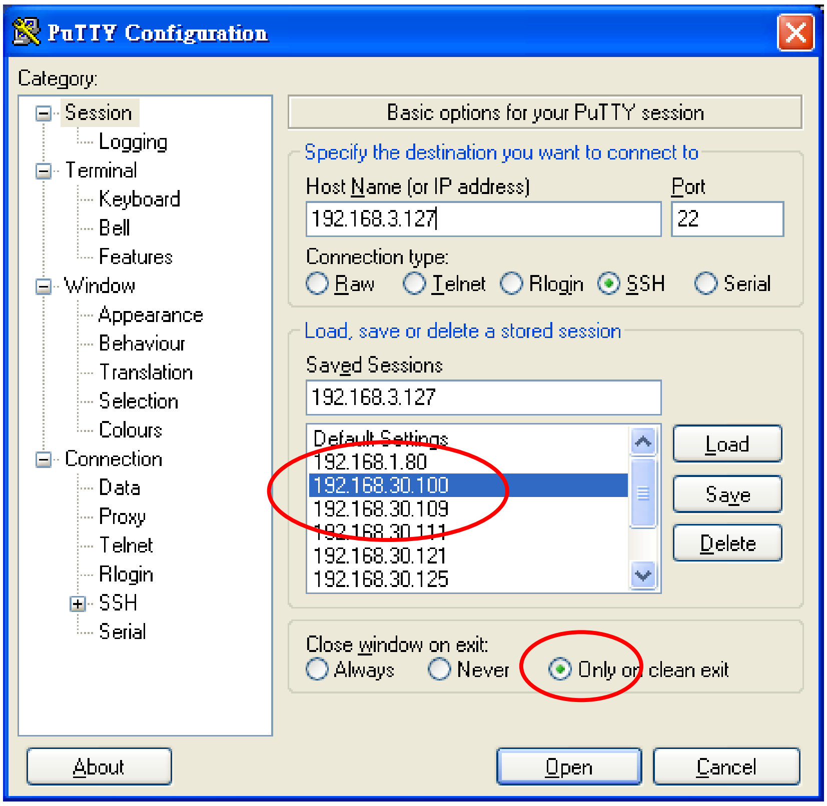
If you cannot get connected on the first try, re-check the IP address and netmask settings, and then unplug and re-plug the DA-682-LX’s power cord.

Connecting from an SSH Console

The DA-682-LX computer supports an SSH Console to offer users with better security over the network compared to Telnet.

Windows Users

Click on the link http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html to download **PuTTY** (free software) to set up an SSH console for the DA-682-LX in a Windows environment. The following screen shows an example of the configuration that is required.



PuTTY Configuration

Basic options for your PuTTY session

Specify the destination you want to connect to

Host Name (or IP address): 192.168.3.127

Port: 22

Connection type: ○ Raw ○ Telnet ○ Rlogin ● SSH ○ Serial

Load, save or delete a stored session

Saved Sessions: 192.168.3.127

Default Settings
192.168.1.80
192.168.30.100
192.168.30.109
192.168.30.111
192.168.30.121
192.168.30.125

Close window on exit: ○ Always ○ Never ● Only on clean exit

Linux Users

From a Linux machine, use the **ssh** command to access the DA-682-I-LX's console utility via SSH.

#ssh 192.168.3.127

Select **yes** to open the connection.

```
[root@bee_notebook root]# ssh 192.168.3.127
The authenticity of host '192.168.3.127 (192.168.3.127)' can't be established.
RSA key fingerprint is 8b:ee:ff:84:41:25:fc:cd:2a:f2:92:8f:cb:1f:6b:2f.
Are you sure you want to continue connection (yes/no)? yes_
```

Adjusting the System Time

The DA-682-LX has two time settings. One is the system time, and the other is provided by an RTC (Real Time Clock) built into the DA-682- LX's hardware.

Setting the Time Manually

Use the **date** command to query the current system time or set a new system time. Use **hwclock** to query the current RTC time or set a new RTC time.

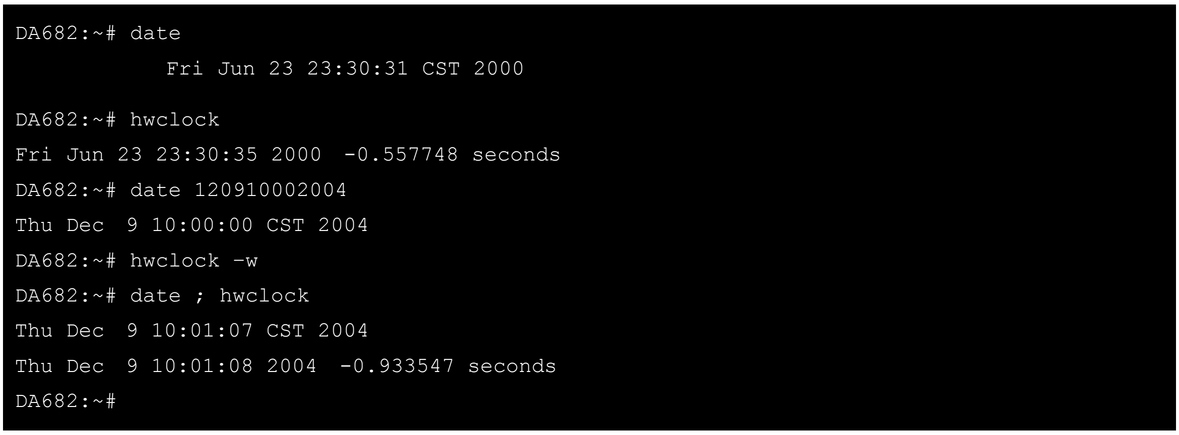
Use the following command to set the system time.

# date MMDDhhmmYYYY

MM:	Month
DD:	Date
hhmm:	Hour and Minute
YYYY:	Year

Use the following command to write the current system time to the RTC.

# hwclock –w



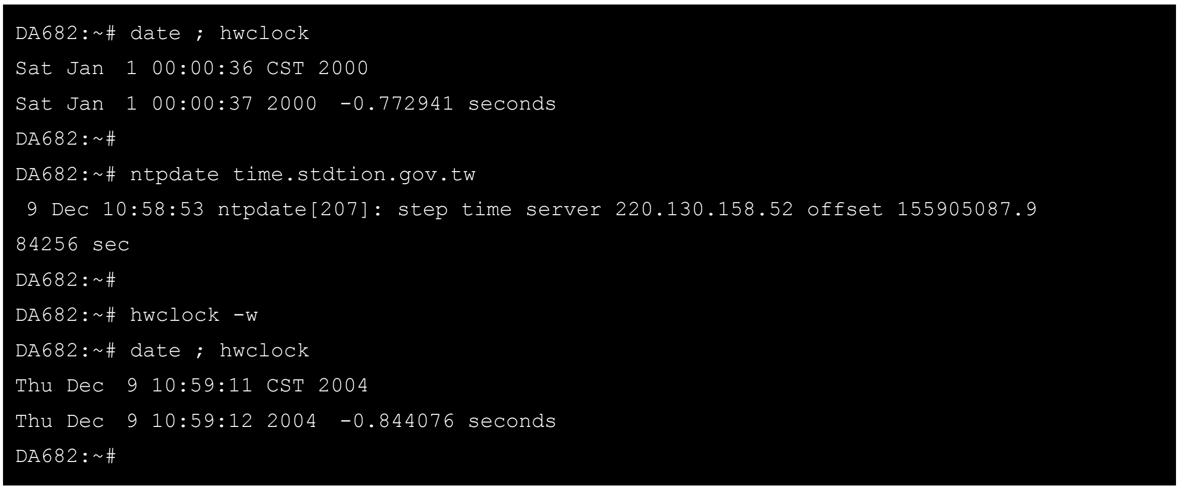
```
DA682:~# date
           Fri Jun 23 23:30:31 CST 2000
DA682:~# hwclock
Fri Jun 23 23:30:35 2000  -0.557748 seconds
DA682:~# date 120910002004
Thu Dec  9 10:00:00 CST 2004
DA682:~# hwclock -w
DA682:~# date ; hwclock
Thu Dec  9 10:01:07 CST 2004
Thu Dec  9 10:01:08 2004  -0.933547 seconds
DA682:~#
```

NTP Client

The DA-682-LX has a built-in NTP (Network Time Protocol) client that is used to initialize a time request to a remote NTP server. Use **ntpdate** to update the system time.

#ntpdate time.stdtime.gov.tw
#hwclock –w

Visit http://www.ntp.org for more information about NTP and NTP server addresses.



```
DA682:~# date ; hwclock
Sat Jan  1 00:00:36 CST 2000
Sat Jan  1 00:00:37 2000  -0.772941 seconds
DA682:~#
DA682:~# ntpdate time.stdtion.gov.tw
 9 Dec 10:58:53 ntpdate[207]: step time server 220.130.158.52 offset 155905087.9
84256 sec
DA682:~#
DA682:~# hwclock -w
DA682:~# date ; hwclock
Thu Dec  9 10:59:11 CST 2004
Thu Dec  9 10:59:12 2004  -0.844076 seconds
DA682:~#
```

ATTENTION

Before using the NTP client utility, check your IP address and network settings to make sure an Internet connection is available.

Updating the Time Automatically

This section describes how to use a shell script to update the time automatically.

Example shell script for updating the system time periodically

```
#!/bin/sh
ntpdate time.nist.gov
# You can use the time server’s ip address or domain
# name directly. If you use domain name, you must
# enable the domain client on the system by updating
# /etc/resolv.conf file.
hwclock –w
sleep 100
# Updates every 100 seconds. The min. time is 100 seconds.
# Change 100 to a larger number to update RTC less often.
```

Save the shell script using any file name. For example, **fixtime**.

How to run the shell script automatically when the kernel boots up

Because the root file system is mounted in Read-only mode, we need to re-mount it using writable permission.

```
# mount -o remount,rw /dev/hda1 /
```

Copy the example shell script **fixtime** to directory **/etc/init.d**, and then use **chmod 755 fixtime** to change the shell script mode.

```
# chmod 755 fixtime
```

Next, use **vi** editor to edit the file **/etc/inittab**.

```
# vi /etc/inittab
```

Add the following line to the bottom of the file:

```
ntp : 2345 : respawn : /etc/init.d/fixtime
```

After you finish writing or modifying the code, remember to execute "umount /" to change the root directory back to Read-only mode.

```
# umount /
```

Use the command **#init q** to re-initialize the kernel.

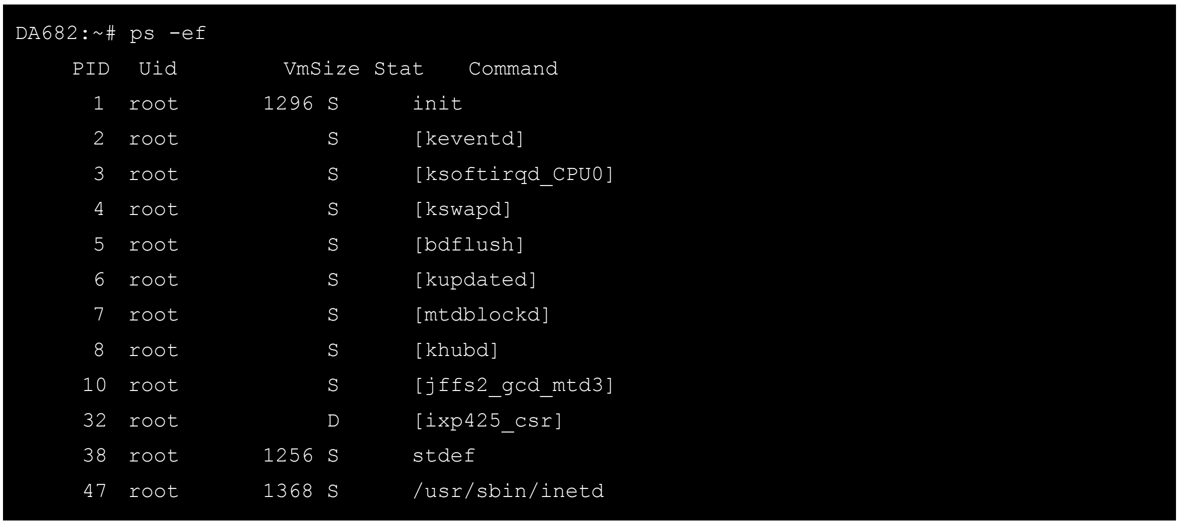
```
# init q
```

Enabling and Disabling Daemons

The following daemons are enabled when the DA-682-LX boots up for the first time.

- **snmpd** SNMP Agent Daemon
- **telnetd** Telnet Server/Client Daemon
- **inetd** Internet Daemons
- **ftpd** FTP Server/Client Daemon
- **sshd** Secure Shell Server Daemon
- **httpd** Apache WWW Server Daemon

Type the command **ps –ef** to list all processes currently running.



```
DA682:~# ps -ef
    PID  Uid        VmSize Stat   Command
      1  root       1296 S      init
      2  root            S      [keventd]
      3  root            S      [ksoftirqd_CPU0]
      4  root            S      [kswapd]
      5  root            S      [bdflush]
      6  root            S      [kupdated]
      7  root            S      [mtdblockd]
      8  root            S      [khubd]
     10  root            S      [jffs2_gcd_mtd3]
     32  root            D      [ixp425_csr]
     38  root       1256 S      stdef
     47  root       1368 S      /usr/sbin/inetd
     53  root       4464 S      /usr/sbin/httpd
     63  nobody         4480 S      /usr/sbin/httpd
     64  nobody         4480 S      /usr/sbin/httpd
     65  nobody         4480 S      /usr/sbin/httpd
     66  nobody         4480 S      /usr/sbin/httpd
     67  nobody         4480 S      /usr/sbin/httpd
     92  bin            1460 S      /sbin/portmap
    105  root       1556 S      /usr/sbin/rpc.statd
    109  root       4044 S      /usr/sbin/snmpd -s -l /dev/null
    111  root       2832 S      /usr/sbin/snmptrapd -s
    140  root       1364 S      /sbin/cardmgr
    144  root       1756 S      /usr/sbin/rpc.nfsd
    146  root       1780 S      /usr/sbin/rpc.mountd
    153  root       2960 S      /usr/sbin/sshd
    161  root       1272 S      /bin/reportip
    162  root       3464 S      /bin/massupfirm
    163  root       1532 S      /sbin/getty 115200 ttyS0
    164  root       1532 S      /sbin/getty 115200 ttyS1
    166  root       3464 S      /bin/massupfirm
    168  root       3464 S      /bin/massupfirm
    171  root       3652 S      /usr/sbin/sshd
    172  root       2200 S      -bash
    174  root       1592 S      ps -ef
DA682:~#
```

To run a private daemon, you can edit the file **rc.local** as follows:

1. Because the root file system is mounted in Read-only mode, you need to re-mount it with write permission.

```
DA682:~# mount -o remount,rw /dev/hda1 /
```

2. Type **cd /etc/** to change directories.

```
DA682:~# cd /etc/
```

3. Type **vi rc.local** to edit the configuration file with vi editor.

```
DA682:/etc/# vi rc.local
```

4. Next, add the application daemon that you want to run. We use the example program **tcps2-release** to illustrate, and configure it to run in the background.

```
# !/bin/sh
# Add you want to run daemon
/root/tcps2-release &~
```

5. After you finish writing or modifying the code, remember to execute "umount /" to change the root directory back to Read-only mode.

```
DA682:~# umount /
```

6. You should be able to find the enabled daemon after you reboot the system.

```
DA682:~# ps -ef
    PID  Uid        VmSize Stat    Command
      1  root       1296 S      init
      2  root           S      [keventd]
      3  root           S      [ksoftirqd_CPU0]
      4  root           S      [kswapd]
      5  root           S      [bdflush]
      6  root           S      [kupdated]
      7  root           S      [mtdblockd]
      8  root           S      [khubd]
     10  root           S      [jffs2_gcd_mtd3]
     32  root           D      [ixp425_csr]
     38  root      1256 S      stdef
     47  root      1368 S      /usr/sbin/inetd
     53  root      4464 S      /usr/sbin/httpd
     63  nobody         4480 S      /usr/sbin/httpd
     64  nobody         4480 S      /usr/sbin/httpd
     65  nobody         4480 S      /usr/sbin/httpd
     66  nobody         4480 S      /usr/sbin/httpd
     67  nobody         4480 S      /usr/sbin/httpd
     92  bin            1460 S      /sbin/portmap
     97  root      1264 S      /root/tcps2-release
    105  root      1556 S      /usr/sbin/rpc.statd
    109  root      4044 S      /usr/sbin/snmpd -s -l /dev/null
    111  root      2832 S      /usr/sbin/snmptrapd -s
    140  root      1364 S      /sbin/cardmgr
    144  root      1756 S      /usr/sbin/rpc.nfsd
    146  root      1780 S      /usr/sbin/rpc.mountd
    153  root      2960 S      /usr/sbin/sshd
    161  root      1272 S      /bin/reportip
    162  root      3464 S      /bin/massupfirm
    163  root      1532 S      /sbin/getty 115200 ttyS0
    164  root      1532 S      /sbin/getty 115200 ttyS1
    166  root      3464 S      /bin/massupfirm
    168  root      3464 S      /bin/massupfirm
    171  root      3652 S      /usr/sbin/sshd
    172  root      2200 S      -bash
    174  root      1592 S      ps -ef
DA682:~#
```

Setting the Run-Level

To set the Linux run-level and execution priority of a program, use the following command (because the root file system is mounted in Read-only mode, we need to re-mount it with write permission).

```
DA682:~# mount -o remount,rw /dev/hda1 /
```

Edit a shell script to execute **/root/tcps2-release** and save to **tcps2** as an example.

#cd /etc/rc2.d
#ln –s /etc/root/tcps2 S60tcps2

or

#ln –s /etc/root/tcps2 k30tcps2

```
DA682:~# cd /etc/rc2.d
DA682:/etc/rc2.d#
```

```
DA682:/etc/rc2.d# ls
S19nfs-common     S25nfs-user-server    S99showreadyled
S20snmpd          S55ssh
S24pcmcia             S99rmnologin
DA682:/etc/rc2.d#
DA682:/etc/rc2.d# ln -s /root/tcps2-release S60tcps2
DA682:/etc/rc2.d# ls
S19nfs-common     S25nfs-user-server    S99rmnologin
S20snmpd          S55ssh                S99showreadyled
S24pcmcia             S60tcps2
DA682:/etc/rc2.d#
```

The command **SxxRUNFILE** has the following meaning:

S: **Start the run file while Linux boots up.**
xx: **A number between 00-99. The smaller number has a higher priority.**
RUNFILE: **The script file name**

The command **KxxRUNFILE** has the following meaning:

K: **Start the run file while Linux shuts down or halts.**
xx: **A number between 00-99. The smaller number has a higher priority.**
RUNFILE: **The script file name**

To remove the daemon, remove the run file from /etc/rc2.d by using the following command:

```
# rm -f /etc/rc2.d/S60tcps2
```

After you finish writing or modifying the code, remember to execute "umount /" to change the root directory back to Read-only mode.

```
DA682:~# umount /
```

Cron—Daemon for Executing Scheduled Commands

The Cron daemon will search **/etc/crontab** for crontab files, which are named after accounts in **/etc/passwd**.

Cron wakes up every minute and checks each command to see if it should be run in that minute. When executing commands, output is mailed to the owner of the **crontab** (or to the user named in the MAILTO environment variable in the **crontab**, if such a user exists).

Modify the file **/etc/crontab** to set up your scheduled applications. **Crontab** files have the following format:

mm	**h**	**dom**	**mon**	**dow**	**user**	**command**
minute	hour	date	month	week	user	command
0-59	0-23	1-31	1-12	0-6 (0 is Sunday)		

For example, if you want to launch a program at 8:00 every day

```
#minute hour  date  month  week  user   command
*        8    *      *      *    root   /path/to/your/program
```

The following example demonstrates how to use **Cron** to update the system time and RTC time every day at 8:00.

1. Write a shell script named fixtime.sh and save it to **/home/**.

#!/bin/sh
ntpdate time.nist.gov
hwclock –w
exit 0

2. Change mode of **fixtime.sh**

   # chmod 755 fixtime.sh

3. Modify /etc/crontab file to run fixtime.sh at 8:00 every day.

   Add the following line to the end of crontab:
   *** 8 * * *   root /home/fixtime.sh**

Inserting a USB Storage Device into the Computer

Since mounting USB storage devices manually can be difficult, a program named **usbmount** to mount the USB drivers automatically. **usbmount** is a small application that relies on **udev** to mount USB storage devices automatically at certain mount points. The USB storage devices will be mounted on **/media/usb0, /media/usb1**, etc.

```
DA682:~# mount
/dev/hda1 on / type ext2 (rw,errors=remount-ro)
tmpfs on /lib/init/rw type tmpfs (rw,nosuid,mode=0755)
proc on /proc type proc (rw,noexec,nosuid,nodev)
sysfs on /sys type sysfs (rw,noexec,nosuid,nodev)
procbususb on /proc/bus/usb type usbfs (rw)
udev on /dev type tmpfs (rw,mode=0755)
tmpfs on /dev/shm type tmpfs (rw,nosuid,nodev)
devpts on /dev/pts type devpts (rw,noexec,nosuid,gid=5,mode=620)
/dev/hdb2 on /home type ext2 (rw)
nfsd on /proc/fs/nfsd type nfsd (rw)
rpc_pipefs on /var/lib/nfs/rpc_pipefs type rpc_pipefs (rw)
/dev/sda1 on /media/usb0 type vfat
(rw,noexec,nodev,sync,noatime,gid=25,dmask=0007,fmask=0117)
/dev/sdb1 on /media/usb1 type vfat
(rw,noexec,nodev,sync,noatime,gid=25,dmask=0007,fmask=0117)
DA682:~#
```

ATTENTION

Remember to type the command # sync before you disconnect the USB storage device. If you do not issue the command, you may lose data.

ATTENTION

Remember to exit the /media/usb0 or /media/usb1 directory when you disconnect the USB storage device. If you stay in /media/usb0 or /media/usb1, the automatic un-mount process will fail. If that happens, type # umount /media/usb0 to un-mount the USB device manually.

Inserting a CompactFlash Card into the Computer

The CompactFlash card is treated as a local disk drive in the DA-682-LX computer. It is identified as a block device at **/dev/hdb**. You can add one line to **/etc/fstab** to force the CompactFlash card to mount automatically at boot time.

ATTENTION

The DA-682 Series Embedded Computer does not support the CompactFlash hot swap function. You must remove the power source first before inserting or removing the CompactFlash card. If you do not shut down the power source, you could damage your CompactFlash card.

```
DA680:~# mount -o remount,rw /dev/hda1 /
DA680:~# vi /etc/fstab
# /etc/fstab: static file system information.
#
# <file system> <mount point>   <type>  <options>                       <dump>  <pass>
proc              /proc             proc    defaults                       0      0
/dev/hda1         /                 ext2    ro,defaults,errors=remount-ro  0      1
/dev/hdb1         /mnt/hdb          ext2    defaults,errors=remount-ro     0      2
none              /tmp              tmpfs   defaults                           0      1
/dev/mtdblock0  /home           jffs2   defaults                           0      2
/dev/hdc          /media/cdrom0   udf,iso9660 user,noauto                  0      0
#/dev/fd0         /media/floppy0  auto    rw,user,noauto                   0      0


"etc/fstab" 9 lines, 534 characters
DA680:~#
DA680:~# umount /
DA680:~#
```

Checking the Linux Version

The program **uname**, which stands for "Unix Name" and is part of the Unix operating system, prints the name, version, and other details about the operating system running on the computer. Use the -**a** option to generate a response similar to the one shown below:

```
DA682:~# uname -a
Linux DA680 2.6.18-5-686 #1 SMP Mon Dec 24 16:41:07 UTC 2007 i686 GNU/Linux
DA682:~#
```

APT—Installing and Removing Packages

APT is the Debian tool used to install and remove packages. Before installing a package, you need to configure the apt source file, **/etc/apt/sources.list**, which is located in the read-only partition.

1. Mount the root file system with write permission.

```
DA682:~# mount -o remount,rw /dev/hdb1 /
```

2. Next, configure the **/etc/apt/sources.list** using **vi** editor.

```
DA682:~# vi /etc/apt/sources.list

#deb cdrom:[Debian GNU/Linux 4.0 r2 _Etch_ - Official i386 NETINST Binary-1 20080103-00:44]/
etch contrib main

deb http://archive.debian.org/debian/ etch main
deb-src http://archive.debian.org/debian/ etch main

deb http://archive.debian.org/debian-security/ etch/updates main contrib
deb-src http://archive.debian.org/debian-security/ etch/updates main contrib
```

3. Update the source list after you configure it.

```
DA682:~# apt-get update
DA682:~#
```

4. Once you indicate which package you want to install (**openswan**, for example), type:

```
DA682:~# apt-get install openswan
DA682:~#
```

5. Use one of the following commands to remove a package:
   a. For a simple package removal:

```
DA682:~# apt-get remove openswan
DA682:~#
```

   b. For a complete package removal:

```
DA682:~# apt-get remove openswan --purge
DA682:~#
```

6. If the installation is complete, remember to umount the root directory back to read-only mode.

```
DA682:~# umount /
DA682:~#
```

ATTENTION

The APT cache space /etc/cache/apt is located in tmpfs. If you need to install a huge package, link /etc/cache/apt to USB mass storage or mount it to an NFS space to generate more free space. Use df –h to check how much free space is available on tmpfs.

```
DA682:~# df -h
Filesystem        Size  Used Avail Use% Mounted on
rootfs            790M  219M  531M  30% /
udev                  10M   44K   10M   1% /dev
/dev/hdb1             790M  219M  531M  30% /
/dev/hdb1             790M  219M  531M  30% /dev/.static/dev
tmpfs                 248M     0  248M   0% /dev/shm
none                  248M   13M  236M   6% /tmp
/dev/mtdblock0        161M   25M  136M  16% /home
DA682:~#
```

ATTENTION

You can free up the cache space with the command # apt-get clean

```
DA682:~# apt-get clean
DA682:~#
```

3

Managing Communications

The DA-682-LX ready-to-run embedded computer is a network-centric platform designed to serve as a front-end for data acquisition and industrial control applications. This chapter describes how to configure the various communication functions supported by the Linux operating system.

The following topics are covered in this chapter:

- **Changing the Network Settings**
  - Changing the "interfaces" Configuration File
  - Adjusting IP Addresses with "ifconfig"
- **Serial Port Operation Mode**
- **Telnet/FTP Server**
  - Enabling the Telnet/FTP Server
  - Disabling the Telnet/FTP Server
- **DNS Client**
  - /etc/hostname
  - /etc/resolv.conf
  - /etc/nsswitch.conf
- **Apache Web Server**
  - Default Homepage
  - Disabling the CGI Function
  - Saving Web Pages to a USB Storage Device
- **IPTABLES**
  - IPTABLES Hierarchy
  - IPTABLES Modules
  - Observe and Erase Chain Rules
  - Define Policy for Chain Rules
  - Append or Delete Rules
- **NAT (Network Address Translation)**
  - NAT Example
  - Enabling NAT at Bootup
- **PPP (Point to Point Protocol)**
  - Connecting to a PPP Server over a Simple Dial-up Connection
  - Connecting to a PPP Server over a Hard-wired Link
  - Checking the Connection
  - Setting up a Machine for Incoming PPP Connections
- **PPPoE**
- **NFS (Network File System) Client**
- **SNMP (Simple Network Management Protocol)**
- **OpenVPN**
  - Ethernet Bridging for Private Networks on Different Subnets
  - Ethernet Bridging for Private Networks on the Same Subnet
- **Routed IP**

Changing the Network Settings

The DA-682-LX computer has four basic Gigabit Ethernet ports named LAN1 to LAN4. The LAN Port Expansion Module supports an additional four 10/100 Mbps Ethernet ports named LAN5 to LAN8. The default IP addresses and netmasks of the network interfaces are as follows:

	Default IP Address	**Netmask**
LAN 1	192.168.3.127	255.255.255.0
LAN 2	192.168.4.127	255.255.255.0
LAN 3	192.168.5.127	255.255.255.0
LAN 4	192.168.6.127	255.255.255.0

These network settings can be modified by changing the **interfaces** configuration file, or they can be adjusted temporarily with the **ifconfig** command.

Changing the “interfaces” Configuration File

1. Type **cd /etc/network** to change directory.

```
DA682:~# cd /etc/network
```

2. Type **vi interfaces** to edit the network configuration file with **vi** editor. You can configure the DA-682-LX’s Ethernet ports for static or dynamic (DHCP) IP addresses.

```
DA682:/etc/network# vi interfaces
```

Static IP Address

As shown in the example shown below, the default static IP addresses can be modified.

```
# The loopback network interface
auto lo eth0 eth1 eth2 eth3 eth4 eth5 eth6 eth7
iface lo inet loopback

# The primary network interface
allow-hotplug eth0
iface eth0 inet static
       address 192.168.3.127
       netmask 255.255.255.0
       broadcast 192.168.3.255

allow-hotplug eth1
iface eth1 inet static
       address 192.168.4.127
       netmask 255.255.255.0
       broadcast 192.168.4.255

allow-hotplug eth2
iface eth2 inet static
       address 192.168.5.127
       netmask 255.255.255.0
       broadcast 192.168.5.255
```

Dynamic IP Address using DHCP

To configure one or both LAN ports to request an IP address dynamically, replace **static** with **dhcp** and then delete the rest of the lines.

```
# The primary network interface
allow-hotplug eth0
iface eth0 inet dhcp
```

After modifying the boot settings of the LAN interface, issue the following command to activate the LAN settings immediately.

# /etc/init.d/networking restart

```
DA682:~# /etc/init.d/networking restart
```

Adjusting IP Addresses with "ifconfig"

IP settings can be adjusted during run-time, but the new settings will not be saved to the flash ROM without modifying the file **/etc/network/interfaces**. For example, type the command **# ifconfig eth1 192.168.1.1** to change the IP address of LAN1 to 192.168.1.1.

```
DA682:~# ifconfig eth1 192.168.1.1
DA682:~#
```

Serial Port Operation Mode

The serial port expansion module has 8 serial ports named COM1 to COM8. The ports support RS-232, RS-422, 4-wire RS-485, and 4-wire RS-485 operation modes with baudrate settings up to 921600 bps.

By default, the serial interface is set to RS-232. You can use the **setinterface** command to change the serial port operation mode, as indicated below:

setinterface device-node [interface-no]

device-node: /dev/ttyMn; n = 0,1,2,...
interface-no: [see following table]:

interface-no	Operation Mode
None	Display current setting
0	RS-232
1	2-wire RS-485
2	RS-422
3	4-wire RS-485

For example, use the following commands to set **/dev/ttyM0** to RS-422:

```
DA682:~# setinterface /dev/ttyM0 2
DA682:~# setinterface /dev/ttyM0
Now setting is RS422 interface.
DA682:~#
```

Telnet/FTP Server

In addition to supporting Telnet client/server and FTP client/server, the DA-682-LX also supports SSH and sftp client/server. To enable or disable the Telnet/ftp server, you need to edit the file **/etc/inetd.conf**.

1. Mount the root file system with write permission.

```
DA682:~# mount -o remount,rw /dev/hda1 /
```

2. Type **# cd /etc** to change the directory.

```
DA682:~# cd /etc
```

3. Type **# vi inetd.conf** to edit the configuration file.

```
DA682:/etc# vi inetd.conf
```

Enabling the Telnet/FTP Server

The following example shows the default content of the file **/etc/inetd.conf**. The default is to "enable the Telnet/ftp server:"

```
discard dgram udp wait root /bin/discard
discard stream tcp nowait root /bin/discard
telnet stream tcp nowait root /bin/telnetd
ftp stream tcp nowait root /bin/ftpd -l
```

Disabling the Telnet/FTP Server

Disable the daemon by typing "**#**" in front of the first character of the row to comment out the line. For example, to disable the **FTP** server, use the following commands:

```
discard dgram udp wait root /bin/discard
discard stream tcp nowait root /bin/discard
telnet stream tcp nowait root /bin/telnetd
#ftp stream tcp nowait root /bin/ftpd -l
```

After you finish writing or modifying the code, remember to execute "umount /" to change the root directory back to Read-only mode.

```
DA682:~# umount /
```

DNS Client

The DA-682-LX supports DNS client (but not DNS server). To set up DNS client, you need to edit three configuration files: **/etc/hostname, /etc/resolv.conf,** and **/etc/nsswitch.conf**.

/etc/hostname

1. Mount the root file system with write permission.

```
DA682:~# mount -o remount,rw /dev/hda1 /
```

2. Edit **/etc/hostname**:

```
DA682:~# vi /etc/hostname
DA682
```

3. After you finish writing or modifying the code, remember to execute "umount /" to change the root directory back to Read-only mode.

```
DA682:~# umount /
```

4. Re-configure the hostname.

```
DA682:~# /etc/init.d/hostname.sh start
```

5. Check the new hostname.

```
DA682:~# hostname
```

/etc/resolv.conf

This is the most important file that you need to edit when using DNS. For example, before you using **# ntpdate time.nist.goc** to update the system time, you will need to add the DNS server address to the file. Ask your network administrator which DNS server address you should use. The DNS server's IP address is specified with the **nameserver** command. For example, add the following line to /etc/resolv.conf (assuming the DNS server's IP address is 168.95.1.1):

nameserver 168.95.1.1

```
DA682:/etc# cat resolv.conf
#
# resolv.conf  This file is the resolver configuration file
# See resolver(5).
#
#nameserver 192.168.1.16
nameserver 168.95.1.1
nameserver 140.115.1.31
nameserver 140.115.236.10
DA682:/etc#
```

/etc/nsswitch.conf

This file defines the sequence of files, **/etc/hosts** or **/etc/resolv.conf**, to be read to resolve the IP address.

The **hosts** line in **/etc/nsswitch.conf** means use **/etc/host** first and DNS service to resolve the address.

```
# /etc/nsswitch.conf
#
# Example configuration of GNU Name Service Switch functionality.
# If you have the `glibc-doc-reference' and `info' packages installed, try:
# `info libc "Name Service Switch"' for information about this file.

passwd:          compat
group:           compat
shadow:          compat

hosts:           files dns
networks:        files

protocols:       db files
services:        db files
```

```
ethers:          db files
rpc:             db files

netgroup:        nis
```

Apache Web Server

Default Homepage

The Apache web server's main configuration file is **/etc/apache2/sites-available/default**, with the default homepage located at **/var/www/apache2-default/index.html**.

Save your own homepage to the following directory:

/var/www/apache2-default

Save your CGI page to the following directory:

/var/www/apache2-default/cgi-bin/

Before you modify the homepage, use a browser (such as Microsoft Internet Explore or Mozilla Firefox) from your PC to test if the Apache web server is working. Type the LAN1 IP address in the browser's address box to open the homepage. For example, if the default IP address 192.168.3.127 is still active, type:

http://192.168.3.127/

To test the default CGI page, type:

http://192.168.3.127/cgi-bin/w3mmail.cgi

Disabling the CGI Function

The CGI function is enabled by default. If you want to disable the function, modify the file **/etc/apache2/sites-available/default**.

1. Mount the root file system with write permission.

```
DA682:~# mount -o remount,rw /dev/hda1 /
```

2. Type **# vi /etc/apache2/sites-available/default** to edit the configuration file.

```
DA682:/etc# vi /etc/apache2/sites-available/default
```

3. After you finish writing or modifying the code, remember to execute "umount /" to change the root directory back to Read-only mode.

```
DA682:~# umount /
```

4. Re-start the apache server.

```
DA682:~# /etc/init.d/apache2 restart
```

ATTENTION

When you develop your own CGI application, make sure your CGI file is executable.

Saving Web Pages to a USB Storage Device

Some applications may have web pages that take up a lot of memory space. This section describes how to save web pages to the USB mass storage device, and then configure the Apache web server's DocumentRoot to open these pages. The files used in this example can be downloaded from Moxa's website.

1. Prepare the web pages and then save the pages to the USB storage device. Click on the following link to download the web page test suite: **http://www.w3.org/MarkUp/Test/HTML401.zip**.
2. Uncompress the zip file to your desktop PC, and then use FTP to transfer it to the DA-682-LX's **/media/usb0** directory.
3. Mount the root file system with write permission.

```
DA682:~# mount -o remount,rw /dev/hda1 /
```

4. Type **# vi /etc/apache2/sites-available/default** to edit the configuration file.

```
DA682:/etc# vi /etc/apache2/sites-available/default
```

5. Change the DocumentRoot directory to the USB storage directory **/media/usb0/www**.

```
...
<VirtualHost *:80>
...
...
       DocumentRoot /media/usb0/www
       <Directory />
              Options FollowSymLinks
              AllowOverride None
       </Directory>
...
...
       ScriptAlias /cgi-bin/ /media/usb0/www/cgi-bin/
       <Directory "/media/usb0/www/cgi-bin/">
              AllowOverride None
              Options ExecCGI -MultiViews +SymLinksIfOwnerMatch
              Order allow,deny
              Allow from all
       </Directory>
...
</VirtualHost>
...
<VirtualHost *:443>
...
...
       DocumentRoot /media/usb0/www
       <Directory />
              Options FollowSymLinks
              AllowOverride None
       </Directory>
...
...
       ScriptAlias /cgi-bin/ /media/usb0/www/cgi-bin/
       <Directory "/media/usb0/wwwz/cgi-bin/">
              AllowOverride None
              Options ExecCGI -MultiViews +SymLinksIfOwnerMatch
```

```
             Order allow,deny
             Allow from all
       </Directory>
...
</VirtualHost>
```

6. Use the following commands to restart the Apache web server:

   #cd /etc/init.d
   #./apache restart

7. Open your browser and connect to the DA-682-LX by typing the current LAN1 IP address in the browser's address box.
8. After finishing modification or writing, remember to execute "umount /" to change the root directory back to Read-only mode.

```
DA682:~# umount /
```

9. Re-start the apache server.

```
DA682:~# /etc/init.d/apache2 restart
```

ATTENTION

Visit the Apache website at http://httpd.apache.org/docs/ for more information about setting up Apache servers.

IPTABLES

IPTABLES is an administrative tool for setting up, maintaining, and inspecting the Linux kernel's IP packet filter rule tables. Several different tables are defined, with each table containing built-in chains and user-defined chains.

Each chain is a list of rules that apply to a certain type of packet. Each rule specifies what to do with a matching packet. A rule (such as a jump to a user-defined chain in the same table) is called a **target**.

The DA-682-LX supports three types of IPTABLES: Filter tables, NAT tables, and Mangle tables.

Filter Table—includes three chains:

INPUT chain
OUTPUT chain
FORWARD chain

NAT Table—includes three chains:

PREROUTING chain—transfers the destination IP address (DNAT).

POSTROUTING chain—works after the routing process and before the Ethernet device process to transfer the source IP address (SNAT).

OUTPUT chain—produces local packets.

Sub-tables

Source NAT (SNAT)—changes the first source packet IP address.

Destination NAT (DNAT)—changes the first destination packet IP address.

MASQUERADE—a special form for SNAT. If one host can connect to the Internet, then the other computers that connect to this host can connect to the Internet when the computer does not have an actual IP address.

REDIRECT—a special form of DNAT that re-sends packets to a local host independent of the destination IP address.

Mangle Table—includes two chains

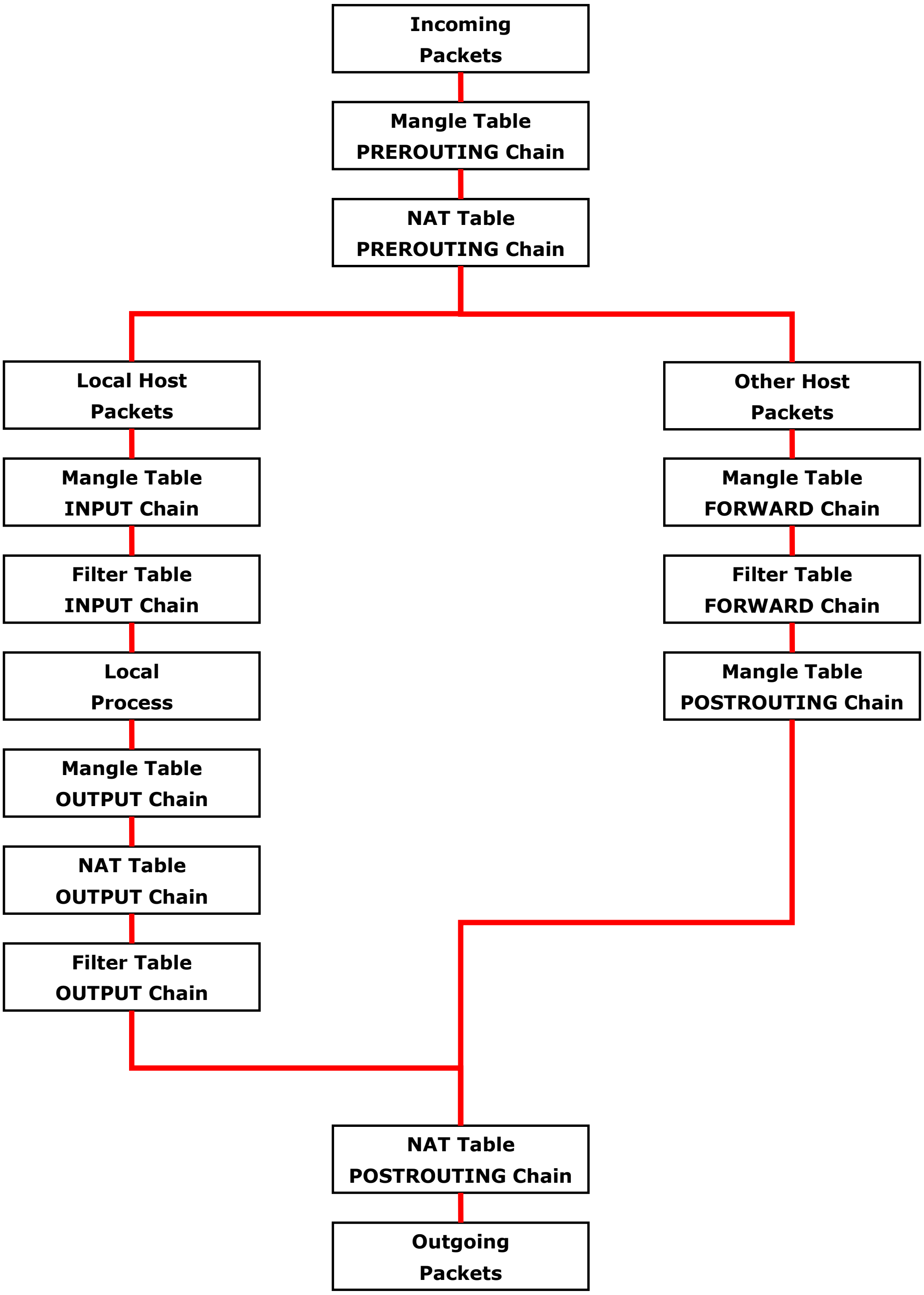
PREROUTING chain—pre-processes packets before the routing process.

OUTPUT chain—processes packets after the routing process.

Mangle tables can have one of three extensions—TTL, MARK, TOS.

IPTABLES Hierarchy

The following figure shows the IPTABLES hierarchy.


Incoming Packets
Mangle Table PREROUTING Chain
NAT Table PREROUTING Chain
Local Host Packets
Mangle Table INPUT Chain
Filter Table INPUT Chain
Local Process
Mangle Table OUTPUT Chain
NAT Table OUTPUT Chain
Filter Table OUTPUT Chain
Other Host Packets
Mangle Table FORWARD Chain
Filter Table FORWARD Chain
Mangle Table POSTROUTING Chain
NAT Table POSTROUTING Chain
Outgoing Packets

IPTABLES Modules

The DA-682-LX supports the following sub-modules. Be sure to use the module that matches your application.

arptable_filter.ko	arp_tables.ko	arpt_mangle.ko	ip_conntrack_amanda.ko
ip_conntrack_ftp.ko	ip_conntrack_h323.ko	ip_conntrack_irc.ko	ip_conntrack.ko
ip_conntrack_netbios_ns.ko	ip_conntrack_netlink.ko	ip_conntrack_pptp.ko	ip_conntrack_proto_sctp.ko
ip_conntrack_sip.ko	ip_conntrack_tftp.ko	ip_nat_amanda.ko	ip_nat_ftp.ko
ip_nat_h323.ko	ip_nat_irc.ko	ip_nat.ko	ip_nat_pptp.ko
ip_nat_sip.ko	ip_nat_snmp_basic.ko	ip_nat_tftp.ko	ip_queue.ko

iptable_filter.ko	iptable_mangle.ko	iptable_nat.ko	iptable_raw.ko
ip_tables.ko	ipt_addrtype.ko	ipt_ah.ko	ipt_CLUSTERIP.ko
ipt_dscp.ko	ipt_DSCP.ko	ipt_ecn.ko	ipt_ECN.ko
ipt_hashlimit.ko	ipt_iprange.ko	ipt_LOG.ko	ipt_MASQUERADE.ko
ipt_NETMAP.ko	ipt_owner.ko	ipt_recent.ko	ipt_REDIRECT.ko
ipt_REJECT.ko	ipt_SAME.ko	ipt_TCPMSS.ko	ipt_tos.ko
ipt_TOS.ko	ipt_ttl.ko	ipt_TTL.ko	ipt_ULOG.ko

The basic syntax to enable and load an IPTABLES module is as follows:

```
# lsmod
# modprobe ip_tables
# modprobe iptable_filter
```

Use **lsmod** to check if the **ip_tables** module has already been loaded in the DA-682-LX. Use **modprobe** to insert and enable the module.

Use the following command to load the modules (**iptable_filter, iptable_mangle, iptable_nat**):

```
# modprobe iptable_filter
```

Use **iptables, iptables-restore, iptables-save** to maintain the database.

ATTENTION
IPTABLES plays the role of packet filtering or NAT. Be careful when setting up the IPTABLES rules. If the rules are not correct, remote hosts that connect via a LAN or PPP may be denied. We recommend using the VGA console to set up the IPTABLES. Click on the following links for more information about IPTABLES.

- http://www.linuxguruz.com/iptables/
- http://www.netfilter.org/documentation/HOWTO//packet-filtering-HOWTO.html

Since the IPTABLES command is very complex, to illustrate the IPTABLES syntax we have divided our discussion of the various rules into three categories: Observe and erase chain rules, Define policy rules, and Append or delete rules.

Observe and Erase Chain Rules

Usage:

```
# iptables [-t tables] [-L] [-n]
```

-t tables: Table to manipulate (default: 'filter'); example: nat or filter.
-L [chain]: List List all rules in selected chains. If no chain is selected, all chains are listed.
-n: Numeric output of addresses and ports.

```
# iptables [-t tables] [-FXZ]
```

-F: Flush the selected chain (all the chains in the table if none is listed).
-X: Delete the specified user-defined chain.
-Z: Set the packet and byte counters in all chains to zero.

Examples:

```
# iptables -L -n
```

In this example, since we do not use the -t parameter, the system uses the default "filter" table. Three chains are included: INPUT, OUTPUT, and FORWARD. INPUT chains are accepted automatically, and all connections are accepted without being filtered.

```
# iptables –F
# iptables –X
# iptables -Z
```

Define Policy for Chain Rules

Usage:

# iptables [-t tables] [-P] [INPUT, OUTPUT, FORWARD, PREROUTING, OUTPUT, POSTROUTING] [ACCEPT, DROP]

-P: Set the policy for the chain to the given target.
INPUT: For packets coming into the DA-682-I-LX.
OUTPUT: For locally-generated packets.
FORWARD: For packets routed out through the DA-682-I-LX.
PREROUTING: To alter packets as soon as they come in.
POSTROUTING: To alter packets as they are about to be sent out.

Examples:

```
#iptables –P INPUT DROP
#iptables –P OUTPUT ACCEPT
#iptables –P FORWARD ACCEPT
#iptables –t nat –P PREROUTING ACCEPT
#iptables –t nat –P OUTPUT ACCEPT
#iptables -t nat –P POSTROUTING ACCEPT
```

In this example, the policy accepts outgoing packets and denies incoming packets.

Append or Delete Rules

Usage:

# iptables [-t table] [-AI] [INPUT, OUTPUT, FORWARD] [-io interface] [-p tcp, udp, icmp, all] [-s IP/network] [--sport ports] [-d IP/network] [--dport ports] –j [ACCEPT. DROP]

-A: Append one or more rules to the end of the selected chain.
-I: Insert one or more rules in the selected chain as the given rule number.
-i: Name of an interface via which a packet is going to be received.
-o: Name of an interface via which a packet is going to be sent.
-p: The protocol of the rule or of the packet to check.
-s: Source address (network name, host name, network IP address, or plain IP address).
--sport: Source port number.
-d: Destination address.
--dport: Destination port number.
-j: Jump target. Specifies the target of the rules; i.e., how to handle matched packets.

For example, ACCEPT the packet, DROP the packet, or LOG the packet.

Examples:

Example 1: Accept all packets from the lo interface.

```
# iptables –A INPUT –i lo –j ACCEPT
```

Example 2: Accept TCP packets from 192.168.0.1.

# iptables –A INPUT –i eth0 –p tcp –s 192.168.0.1 –j ACCEPT

Example 3: Accept TCP packets from Class C network 192.168.1.0/24.

# iptables –A INPUT –i eth0 –p tcp –s 192.168.1.0/24 –j ACCEPT

Example 4: Drop TCP packets from 192.168.1.25.

# iptables –A INPUT –i eth0 –p tcp –s 192.168.1.25 –j DROP

Example 5: Drop TCP packets addressed for port 21.

# iptables –A INPUT –i eth0 –p tcp --dport 21 –j DROP

Example 6: Accept TCP packets from 192.168.0.24 to DA-682-I-LX's port 137, 138, 139

# iptables –A INPUT –i eth0 –p tcp –s 192.168.0.24 --dport 137:139 –j ACCEPT

Example 7: Log TCP packets that visit DA-682-I-LX's port 25.

# iptables –A INPUT –i eth0 –p tcp --dport 25 –j LOG

Example 8: Drop all packets from MAC address 01:02:03:04:05:06.

# iptables –A INPUT –i eth0 –p all –m mac --mac-source 01:02:03:04:05:06 –j DROP

ATTENTION

In Example 8, remember to issue the command # modprobe ipt_mac first to load the module ipt_mac.

NAT (Network Address Translation)

The NAT (Network Address Translation) protocol translates IP addresses used on one network into IP addresses used on a connecting network. One network is designated the inside network and the other is the outside network. Typically, the DA-682-LX connects several devices on a network and maps local inside network addresses to one or more global outside IP addresses, and un-maps the global IP addresses on incoming packets back into local IP addresses.

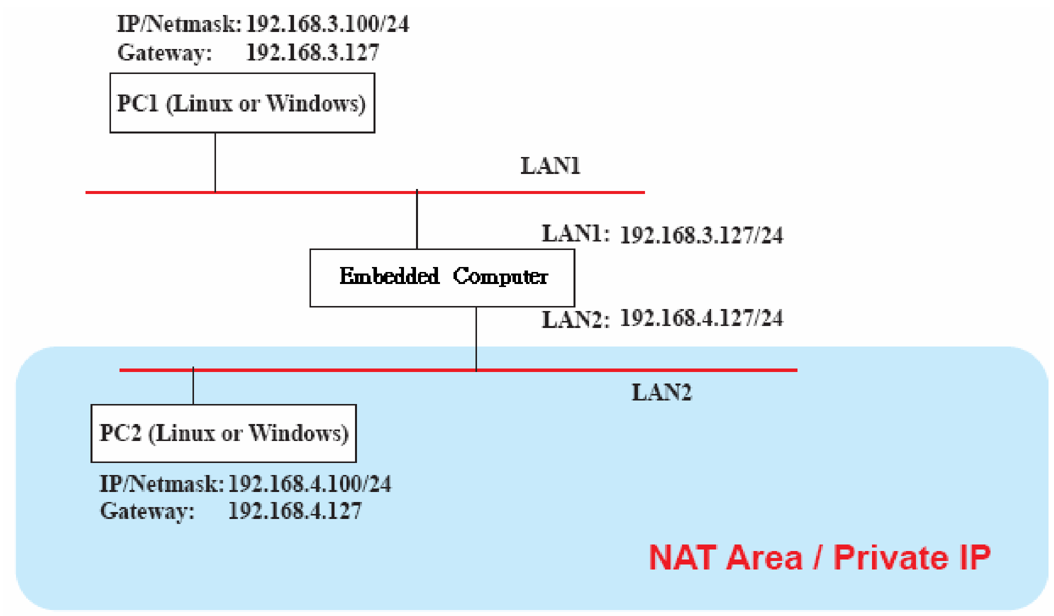
ATTENTION

Click on the following links for more information about NAT.

- http://www.netfilter.org/documentation/HOWTO//packet-filtering-HOWTO.html

NAT Example

The IP address of all packets leaving LAN1 are changed to **192.168.3.127** (you will need to load the module **ipt_MASQUERADE**):



```
#ehco 1 > /proc/sys/net/ipv4/ip_forward
#modprobe ipt_MASQUERADE
#iptables –t nat –A POSTROUTING –o eth0 –j MASQUERADE
```

Enabling NAT at Bootup

In most real world situations, you will want to use a simple shell script to enable NAT when the DA-682-LX boots up. The following script is an example.

```
#!/bin/bash
# If you put this shell script in the /home/nat.sh
# Remember to chmod 744 /home/nat.sh
# Edit the rc.local file to make this shell startup automatically.
# vi /etc/rc.local
# Add a line in the end of rc.local /home/nat.sh

EXIF= "eth0"   #This is an external interface for setting up a valid IP address.
EXNET= "192.168.4.0/24"   #This is an internal network address.

# Step 1. Insert modules.

# Here 2> /dev/null means the standard error messages will be dump to null device.

modprobe ip_tables   2> /dev/null
modprobe ip_nat_ftp   2> /dev/null
modprobe ip_nat_irc   2> /dev/null
modprobe ip_conntrack   2> /dev/null
modprobe ip_conntrack_ftp   2> /dev/null
modprobe ip_conntrack_irc   2> /dev/null

# Step 2. Define variables, enable routing and erase default rules.

PATH=/bin:/sbin:/usr/bin:/usr/sbin:/usr/local/bin:/usr/local/sbin
export PATH
echo "1" > /proc/sys/net/ipv4/ip_forward
/sbin/iptables -F
/sbin/iptables -X
/sbin/iptables -Z
/sbin/iptables -F -t nat
/sbin/iptables -X -t nat
```

```
/sbin/iptables -Z -t nat
/sbin/iptables -P INPUT ACCEPT
/sbin/iptables -P OUTPUT ACCEPT
/sbin/iptables -P FORWARD ACCEPT
/sbin/iptables -t nat -P PREROUTING ACCEPT
/sbin/iptables -t nat -P POSTROUTING ACCEPT
/sbin/iptables -t nat -P OUTPUT ACCEPT

# Step 3. Enable IP masquerade.
```

PPP (Point to Point Protocol)

PPP (Point to Point Protocol) is used to run IP (Internet Protocol) and other network protocols over a serial link. PPP can be used for direct serial connections (using a null-modem cable) over a Telnet link, and links established using a modem over a telephone line.

Modem/PPP access is almost identical to connecting directly to a network through the DA-682-LX’s Ethernet port. Since PPP is a peer-to-peer system, the DA-682-LX can also use PPP to link two networks (or a local network to the Internet) to create a Wide Area Network (WAN).

ATTENTION

Click on the following links for more information about PPP.

http://tldp.org/HOWTO/PPP-HOWTO/index.html
http://axion.physics.ubc.ca/ppp-linux.html

Connecting to a PPP Server over a Simple Dial-up Connection

The following command is used to connect to a PPP server by modem. Use this command for old ppp servers that prompt for a login name (replace “username” with the correct name) and password (replace “password” with the correct password). Note that “debug crtscts” and “defaultroute 192.1.1.17” are optional.

```
#pppd connect ‘chat -v ““ ATDT5551212 CONNECT ““’ ogin: username word: password’
/dev/ttyM0 115200 debug crtscts modem defaultroute 192.1.1.17
```

If the PPP server does not prompt for the username and password, the command should be entered as follows. Replace “username” with the correct username and replace “password” with the correct password.

```
#pppd connect ‘chat -v ““ ATDT5551212 CONNECT ““’ user username password password
/dev/ttyM0 115200 crtscts modem
```

The pppd options are described below:

connect ‘chat etc...’	This option gives the command to contact the PPP server. The **chat** program is used to dial a remote computer. The entire command is enclosed in single quotes because pppd expects a one-word argument for the **connect** option. The options for **chat** are given below:
-v	verbose mode; log what we do to syslog
“ “	Double quotes—don’t wait for a prompt, but instead do ... (note that you must include a space after the second quotation mark)
ATDT5551212	Dial the modem, and then ...
CONNECT	Wait for an answer.
“ “	Send a return (null text followed by the usual return)
ogin: username word: password	Log in with username and password.

Refer to the chat man page, chat.8, for more information about the **chat** utility.

/dev/ Specify the callout serial port.

115200 The baud rate.

debug Log status in syslog.

crtscts Use hardware flow control between computer and modem (at 115200 this is a must).

modem Indicates that this is a modem device; pppd will hang up the phone before and after making the call.

defaultroute Once the PPP link is established, make it the default route; if you have a PPP link to the Internet, this is probably what you want.

192.1.1.17 This is a degenerate case of a general option of the form x.x.x.x:y.y.y.y. Here x.x.x.x is the local IP address and y.y.y.y is the IP address of the remote end of the PPP connection. If this option is not specified, or if just one side is specified, then x.x.x.x defaults to the IP address associated with the local machine’s hostname (located in /**etc/hosts**), and y.y.y.y is determined by the remote machine.

Connecting to a PPP Server over a Hard-wired Link

If a username and password are not required, use the following command (note that **noipdefault** is optional):

#pppd connect ‘chat –v“ “ “ “ ’ noipdefault /dev/ttyM0 19200 crtscts

If a username and password is required, use the following command (note that **noipdefault** is optional, and root is both the username and password):

#pppd connect ‘chat –v“ “ “ “ ’ user root password root noipdefault /dev/ttyM0 19200 crtscts

Checking the Connection

Once you have set up a PPP connection, there are some steps you can take to test the connection. First, type:

#/sbin/ifconfig

Depending on your distribution, the command might be located elsewhere. After executing the command, you should be able to see all of the network interfaces that are UP.

ppp0 should be one of them, and you should recognize the first IP address as your own and the **P-t-P address** (point-to-point address, the address of your server). The output is similar to the following:

```
lo       Link encap Local Loopback
         inet addr 127.0.0.1   Bcast 127.255.255.255 Mask 255.0.0.0
         UP LOOPBACK RUNNING   MTU 2000   Metric 1
         RX packets 0 errors 0 dropped 0 overrun 0

ppp0 Link encap Point-to-Point Protocol
         inet addr 192.76.32.3   P-t-P 129.67.1.165 Mask 255.255.255.0
         UP POINTOPOINT RUNNING   MTU 1500   Metric 1
         RX packets 33 errors 0 dropped 0 overrun 0
         TX packets 42 errors 0 dropped 0 overrun 0
```

Now, type:

#ping z.z.z.z

where z.z.z.z is the address of your name server. The output is similar to the following:

```
DA682:~# ping 129.67.1.165
PING 129.67.1.165 (129.67.1.165): 56 data bytes
64 bytes from 129.67.1.165: icmp_seq=0 ttl=225 time=268 ms
64 bytes from 129.67.1.165: icmp_seq=1 ttl=225 time=247 ms
```

```
64 bytes from 129.67.1.165: icmp_seq=2 ttl=225 time=266 ms
^C
--- 129.67.1.165 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 247/260/268 ms
DA682:~#
```

Try typing:

#netstat -nr

This should show three routes similar to the following:

```
Kernel routing table
Destination    Gateway     Genmask           Flags    Metric   Ref  Use
iface
129.67.1.165  0.0.0.0      255.255.255.255   UH       0        0    6
ppp0
127.0.0.0      0.0.0.0     255.0.0.0         U        0        0    0 lo
0.0.0.0        129.67.1.165    0.0.0.0           UG       0        0    6298
ppp0
```

If your output looks similar but does not have the "destination 0.0.0.0" line (which refers to the default route used for connections), you may have run pppd without the **defaultroute** option. At this point, you can try using Telnet, ftp, or finger, bearing in mind that you will have to use numeric IP addresses unless you have configured **/etc/resolv.conf** correctly.

Setting up a Machine for Incoming PPP Connections

Method 1: pppd dial-in with pppd commands

This first example applies to using a modem, and requiring authorization with a username and password.

#pppd /dev/ttyM0 115200 crtscts modem 192.168.16.1:192.168.16.2 login auth

You should also add the following line to the file **/etc/ppp/pap-secrets**:

***   *   ""   ***

The first star (*) lets everyone login. The second star (*) lets every host connect. The pair of double quotation marks ("") indicates that the file **/etc/passwd** can be used to check the password. The last star (*) is to let any IP connect.

The following example does not check the username and password:

# pppd/dev/ttyM0 115200 crtscts modem 192.168.16.1:192.168.16.2

Method 2: pppd dial-in with pppd script

Configure a dial-in script **/etc/ppp/peer/dialin**

```
# You usually need this if there is no PAP authentication
noauth
#auth
#login

# The chat script (be sure to edit that file, too!)
init "/usr/sbin/chat -v -f /etc/ppp/ppp-ttyM0.chat"

# Set up routing to go through this PPP link
defaultroute
```

```
# Default modem (you better replace this with /dev/ttySx!)
/dev/ttyM0

# Speed
115200

# Keep modem up even if connection fails
persist
crtscts
modem
192.168.16.1:192.168.16.2
debug
-detach
```

Configure the chat script **/etc/ppp/ppp-ttyM0.chat**

```
SAY    'Auto Answer ON\n'
''     ATS0=1
```

Start the **pppd** dial-in service.

```
# pppd call dialin
```

ATTENTION

If you hope to have auto dial-in service, you can respawn the dial-in service in /etc/inittab.

```
DA682:~# mount -o remount,rw /dev/hda1 /
DA682:~# echo "p0:2345:respawn:pppd call dialin" >> /etc/inittab
DA682:~# umount /
```

PPPoE

The following procedure is for setting up PPPoE:

1. Connect the DA-682-LX's LAN port to an ADSL modem with a cross-over cable, HUB, or switch.
2. Log in to the DA-682-LX as the root user.
3. Edit the file **/etc/ppp/chap-secrets** and add the following:
   "username@hinet.net" * "password" *

```
# Secrets for authentication using CHAP
# client       server  secret               IP addresses

# PPPOE example, if you want to use it, you need to unmark it and modify it
"username@hinet.net"   *      "password"     *
```

username@hinet.net is the username obtained from the ISP to log in to the ISP account. **password** is the corresponding password for the account.

4. Edit the file **/etc/ppp/pap-secrets** and add the following:
   "username@hinet.net" * "password" *

```
# ATTENTION: The definitions here can allow users to login without a
# password if you don't use the login option of pppd! The mgetty Debian
# package already provides this option; make sure you don't change that.

# INBOUND connections

# Every regular user can use PPP and has to use passwords from /etc/passwd
*      hostname       ""     *
"username@hinet.net"    *      "password"     *

# UserIDs that cannot use PPP at all. Check your /etc/passwd and add any
# other accounts that should not be able to use pppd!
guest   hostname       "*"    -
master  hostname       "*"    -
root    hostname       "*"    -
support hostname       "*"    -
stats   hostname       "*"    -

# OUTBOUND connections
```

username@hinet.net is the username obtained from the ISP to log in to the ISP account. **password** is the corresponding password for the account.

5. Edit the file **/etc/ppp/options** and add the following line:
   plugin rp-pppoe

```
# received.  Note: it is not advisable to use this option with the persist
# option without the demand option.  If the active-filter option is given,
# data packets which are rejected by the specified activity filter also
# count as the link being idle.
#idle <n>

# Specifies how many seconds to wait before re-initiating the link after
# it terminates.  This option only has any effect if the persist or demand
# option is used.  The holdoff period is not applied if the link was
# terminated because it was idle.
#holdoff <n>

# Wait for up n milliseconds after the connect script finishes for a valid
# PPP packet from the peer.  At the end of this time, or when a valid PPP
# packet is received from the peer, pppd will commence negotiation by
# sending its first LCP packet.  The default value is 1000 (1 second).
# This wait period only applies if the connect or pty option is used.
#connect-delay <n>

# Load the pppoe plugin
plugin rp-pppoe.so

# ---<End of File>---
```

6. If you use LAN1 to connect to the ADSL modem, add file **/etc/ppp/options.eth0**. If you use LAN2 to connect to the ADSL modem, then add **/etc/ppp/options.eth1**, etc.

```
name username@hinet.net
mtu 1492
mru 1492
defaultroute
```

```
noipdefault
~
~
"/etc/ppp/options.eth0" 5 lines, 67 characters
```

Type your username (the one you set in the **/etc/ppp/pap-secrets and /etc/ppp/chap-secrets** files) after the **name** option. You may add other options as desired.

7. Set up DNS.

If you are using DNS servers supplied by your ISP, edit the file **/etc/resolv.conf** by adding the following lines of code:

nameserver ip_addr_of_first_dns_server
nameserver ip_addr_of_second_dns_server

For example:

nameserver 168.95.1.1
nameserver 139.175.10.20

```
DA682:/etc# cat resolv.conf
#
# resolv.conf  This file is the resolver configuration file
# See resolver(5).
#
#nameserver 192.168.1.16
nameserver 168.95.1.1
nameserver 139.175.10.20
nameserver 140.115.1.31
nameserver 140.115.236.10
DA682:/etc#
```

8. Use the following command to create a **pppoe** connection:
   #pppd eth0

The ADSL modem is connected to the **LAN1** port, which is named **eth0**. If the ADSL modem is connected to **LAN2**, use **eth1**, etc.

9. Type **#ifconfig ppp0** to check if the connection is OK. If the connection is OK, you should see the IP address of ppp0. Use **#ping** to test the IP address.

```
ppp0 Link encap Point-to-Point Protocol
         inet addr 192.76.32.3   P-t-P 129.67.1.165 Mask 255.255.255.0
         UP POINTOPOINT RUNNING   MTU 1500   Metric 1
         RX packets 33 errors 0 dropped 0 overrun 0
         TX packets 42 errors 0 dropped 0 overrun 0
```

10. If you want to disconnect it, use the kill command to kill the **pppd** process.

NFS (Network File System) Client

The Network File System (NFS) is used to mount a disk partition on a remote machine (as if it were on a local hard drive), allowing fast, seamless sharing of files across a network. NFS allows users to develop applications for the DA-682-LX without worrying about the amount of disk space that will be available. The DA-682-LX supports only NFS client protocol.

ATTENTION

Click on the following links for more information about NFS.

- http://www.tldp.org/HOWTO/NFS-HOWTO/index.html
- http://nfs.sourceforge.net/nfs-howto/client.html

The following procedures illustrate how to mount a remote NFS Server.

1. Scan the NFS Server's shared directory.

   #showmount –e HOST

   showmount: Show the mount information of an NFS Server
   -e: Show the NFS Server's export list.
   HOST: IP address or DNS address
2. Establish a mount point on the NFS Client site.

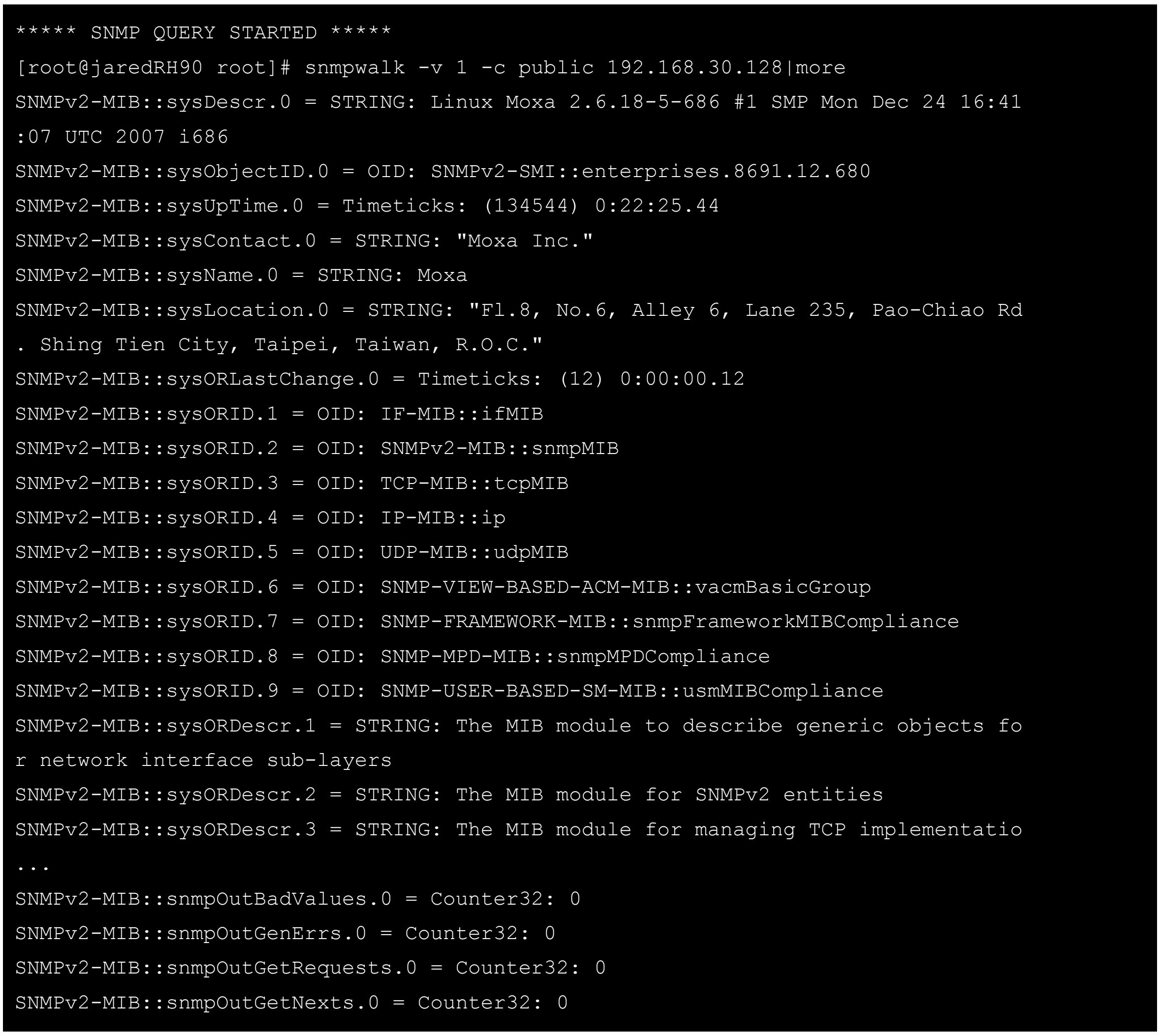
   #mkdir –p /home/nfs/public
3. Mount the remote directory to a local directory.

   #mount –t nfs 192.168.3.100/home/public /home/nfs/public

   This is where 192.168.3.100 is the example IP address of the NFS server.

SNMP (Simple Network Management Protocol)

The DA-682-LX comes with the SNMP V1 (Simple Network Management Protocol) agent software pre-installed. It supports RFC1317 **RS-232 like group** and **RFC 1213 MIB-II**. The following shows example shows an SNMP agent responding to a query from the SNMP browser on the host site:



```
***** SNMP QUERY STARTED *****
[root@jaredRH90 root]# snmpwalk -v 1 -c public 192.168.30.128|more
SNMPv2-MIB::sysDescr.0 = STRING: Linux Moxa 2.6.18-5-686 #1 SMP Mon Dec 24 16:41
:07 UTC 2007 i686
SNMPv2-MIB::sysObjectID.0 = OID: SNMPv2-SMI::enterprises.8691.12.680
SNMPv2-MIB::sysUpTime.0 = Timeticks: (134544) 0:22:25.44
SNMPv2-MIB::sysContact.0 = STRING: "Moxa Inc."
SNMPv2-MIB::sysName.0 = STRING: Moxa
SNMPv2-MIB::sysLocation.0 = STRING: "Fl.8, No.6, Alley 6, Lane 235, Pao-Chiao Rd
. Shing Tien City, Taipei, Taiwan, R.O.C."
SNMPv2-MIB::sysORLastChange.0 = Timeticks: (12) 0:00:00.12
SNMPv2-MIB::sysORID.1 = OID: IF-MIB::ifMIB
SNMPv2-MIB::sysORID.2 = OID: SNMPv2-MIB::snmpMIB
SNMPv2-MIB::sysORID.3 = OID: TCP-MIB::tcpMIB
SNMPv2-MIB::sysORID.4 = OID: IP-MIB::ip
SNMPv2-MIB::sysORID.5 = OID: UDP-MIB::udpMIB
SNMPv2-MIB::sysORID.6 = OID: SNMP-VIEW-BASED-ACM-MIB::vacmBasicGroup
SNMPv2-MIB::sysORID.7 = OID: SNMP-FRAMEWORK-MIB::snmpFrameworkMIBCompliance
SNMPv2-MIB::sysORID.8 = OID: SNMP-MPD-MIB::snmpMPDCompliance
SNMPv2-MIB::sysORID.9 = OID: SNMP-USER-BASED-SM-MIB::usmMIBCompliance
SNMPv2-MIB::sysORDescr.1 = STRING: The MIB module to describe generic objects fo
r network interface sub-layers
SNMPv2-MIB::sysORDescr.2 = STRING: The MIB module for SNMPv2 entities
SNMPv2-MIB::sysORDescr.3 = STRING: The MIB module for managing TCP implementatio
...
SNMPv2-MIB::snmpOutBadValues.0 = Counter32: 0
SNMPv2-MIB::snmpOutGenErrs.0 = Counter32: 0
SNMPv2-MIB::snmpOutGetRequests.0 = Counter32: 0
SNMPv2-MIB::snmpOutGetNexts.0 = Counter32: 0
```

```
SNMPv2-MIB::snmpOutSetRequests.0 = Counter32: 0
SNMPv2-MIB::snmpOutGetResponses.0 = Counter32: 540
SNMPv2-MIB::snmpOutTraps.0 = Counter32: 0
SNMPv2-MIB::snmpEnableAuthenTraps.0 = INTEGER: disabled(2)
SNMPv2-MIB::snmpSilentDrops.0 = Counter32: 0
SNMPv2-MIB::snmpProxyDrops.0 = Counter32: 0
[root@jaredRH90 root]#
***** SNMP QUERY FINISHED *****
```

ATTENTION

Click on the following links for more information about RFC1317 RS-232 like group and RFC 1213 MIB-II.

- http://www.tldp.org/HOWTO/NFS-HOWTO/index.html
- http://nfs.sourceforge.net/nfs-howto/client.html

OpenVPN

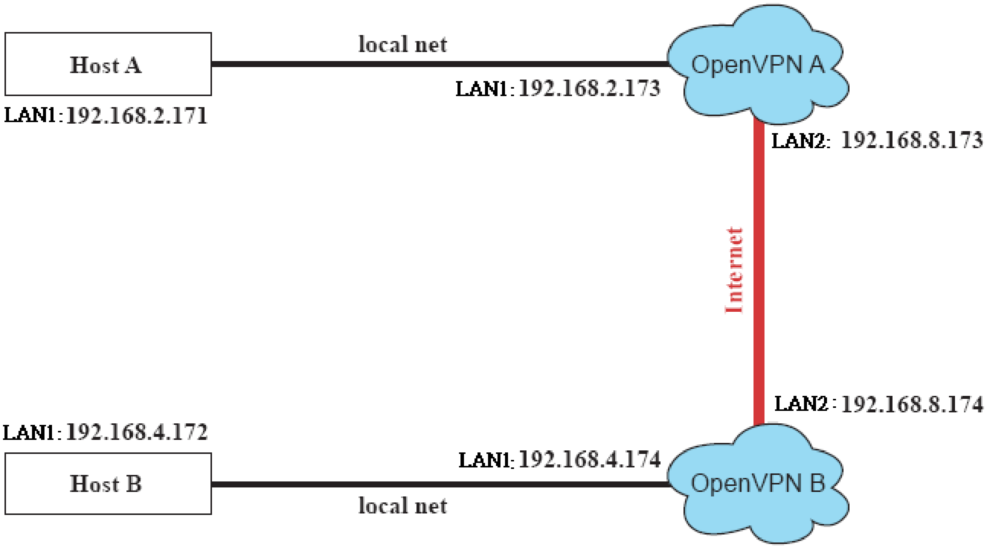
OpenVPN provides two types of tunnels for users to implement VPNS: **Routed IP Tunnels** and **Bridged Ethernet Tunnels**.

An Ethernet bridge is used to connect different Ethernet networks together. The Ethernets are bundled into one bigger, "logical" Ethernet. Each Ethernet corresponds to one physical interface (or port) that is connected to the bridge.

On each OpenVPN machine, you should carry out configurations in the **/etc/openvpn** directory, where script files and key files reside. Once established, all operations will be performed in that directory.

Ethernet Bridging for Private Networks on Different Subnets

1. Set up four machines, as shown in the following diagram.



Host A represents the machine that belongs to OpenVPN A, and Host B represents the machine that belongs to OpenVPN B. The two remote subnets are configured for a different range of IP addresses. When this configuration is moved to a public network, the external interfaces of the OpenVPN machines should be configured for static IPs, or connected to another device (such as a firewall or DSL box) first.

2. Generate a preset shared key by typing the command:
   # openvpn --genkey --secret secrouter.key

3. Copy the file that is generated to the OpenVPN machine:
   # scp /etc/openvpn/secrouter.key 192.168.8.174:/etc/openvpn

ATTENTION

A preshared key is located at /etc/openvpn/secrouter.key. You can use it for testing purposes. We suggest creating a new key for non-testing purpose.

4. On machine OpenVPN A, modify the remote address in the configuration file **/etc/openvpn/tap0-br.conf**.

```
# point to the peer
remote 192.168.8.174
dev tap0
secret /etc/openvpn/secrouter.key
cipher DES-EDE3-CBC
auth MD5
tun-mtu 1500
tun-mtu-extra 64
ping 40
up /etc/openvpn/tap0-br.sh
#comp-lzo
```

5. Next, modify the routing table in the **/etc/openvpn/tap0-br.sh script** file.

```
#--------------------------Start---------------------------
#!/bin/sh
# value after “-net” is the subnet behind the remote peer
route add -net 192.168.4.0 netmask 255.255.255.0 dev br0
#----------------------------end---------------------------
```

And then configure the bridge interface in **/etc/openvpn/bridge**.

```
#!/bin/bash
# Create global variables
# Define Bridge Interface
br="br0"
# Define list of TAP interfaces to be bridged,
# for example tap="tap0 tap1 tap2".
tap="tap0"
# Define physical ethernet interface to be bridged
# with TAP interface(s) above.
eth="eth1"
eth_ip="192.168.8.173"
eth_netmask="255.255.255.0"
eth_broadcast="192.168.8.255"
#gw="192.168.8.174"
...
```

Start the bridge script file to configure the bridge interface.

# /etc/openvpn/bridge restart

6. On machine OpenVPN B, modify the remote address in configuration file **/etc/openvpn/tap0-br.conf**.

```
# point to the peer
remote 192.168.8.173
dev tap0
secret /etc/openvpn/secrouter.key
cipher DES-EDE3-CBC
auth MD5
tun-mtu 1500
tun-mtu-extra 64
ping 40
up /etc/openvpn/tap0-br.sh
#comp-lzo
```

7. Next modify the routing table in **/etc/openvpn/tap0-br.sh script** file.

```
#----------------------------------Start-----------------------------
#!/bin/sh
# value after “-net” is the subnet behind the remote peer
route add -net 192.168.2.0 netmask 255.255.255.0 dev br0
#---------------------------------- end -----------------------------
```

And then configure the bridge interface in **/etc/openvpn/bridge**.

```
#!/bin/bash
# Create global variables
# Define Bridge Interface
br="br0"
# Define list of TAP interfaces to be bridged,
# for example tap="tap0 tap1 tap2".
tap="tap0"
# Define physical ethernet interface to be bridged
# with TAP interface(s) above.
eth="eth1"
eth_ip="192.168.8.174"
eth_netmask="255.255.255.0"
eth_broadcast="192.168.8.255"
#gw="192.168.8.173"
...
```

Start the bridge script file to configure the bridge interface.

# /etc/openvpn/bridge restart

ATTENTION

Select cipher and authentication algorithms by specifying cipher and auth. To see which algorithms are available, type:

# openvpn --show-ciphers
# openvpn --show-auths

8. Start both OpenVPN peers on machine OpenVPN A and OpenVPN B.
   # openvpn --config /etc/openvpn/tap0-br.conf&

   If you see the line **Peer Connection Initiated with 192.168.8.173:5000**on each machine, the connection between OpenVPN machines has been established successfully on UDP port 5000.

ATTENTION

You can create link symbols to start the OpenVPN service at boot time:
# ln -sf /etc/init.d/openvpn /etc/rc2.d/S16openvpn

To stop the service, you should create these links:
# ln -sf /etc/init.d/openvpn /etc/rc0.d/K80openvpn
# ln -sf /etc/init.d/openvpn /etc/rc6.d/K80openvpn

9. On each OpenVPN machine, check the routing table by typing the command **# route**

```
Destination      Gateway  Genmsk           Flags    Metric   Ref  Use  Iface
192.168.5.0      0.0.0.0 255.255.255.0   U       0         0    0    eth2
192.168.4.0      0.0.0.0 255.255.255.0   U       0         0    0    br0
192.168.3.0      0.0.0.0 255.255.255.0   U       0         0    0    eth0
192.168.30.0     0.0.0.0 255.255.255.0   U       0         0    0    eth3
192.168.8.0      0.0.0.0 255.255.255.0   U       0         0    0    br0
```

Interface **eth1** and device **tap0** both connect to the bridging interface, and the virtual device **tun** sits on top of **tap0**. This ensures that all traffic coming to this bridge from internal networks connected to interface eth1 write to the TAP/TUN device that the OpenVPN program monitors. Once the OpenVPN program detects traffic on the virtual device, it sends the traffic to its peer.

10. To create an indirect connection to Host B from Host A, you need to add the following routing item:

# route add –net 192.168.4.0 netmask 255.255.255.0 dev eth0

To create an indirect connection to Host A from Host B, you need to add the following routing item:

# route add –net 192.168.2.0 netmask 255.255.255.0 dev eth0

Now ping Host B from Host A by typing:

# ping 192.168.4.174

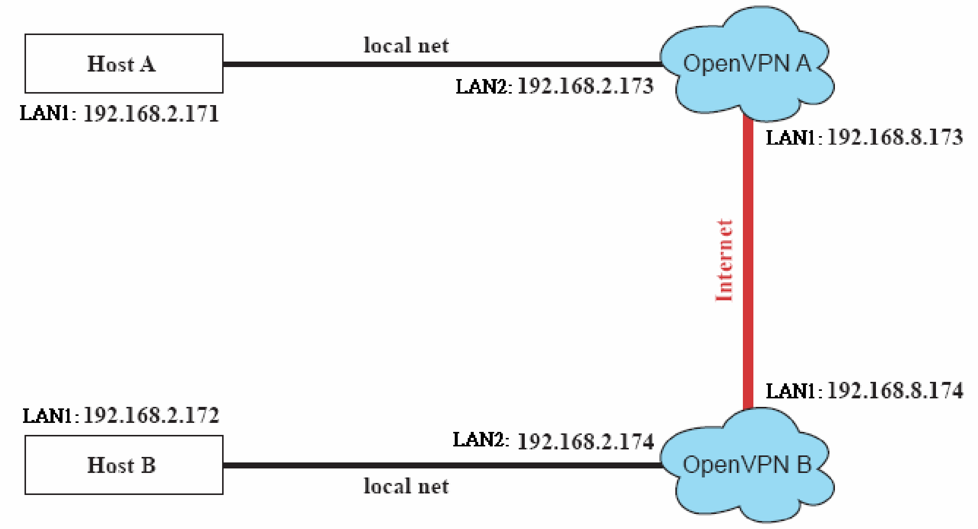
A successful ping indicates that you have created a VPN system that only allows authorized users from one internal network to access users at the remote site. For this system, all data is transmitted by UDP packets on port 5000 between OpenVPN peers.

11. To shut down OpenVPN programs, type the command:

# killall -TERM openvpn

Ethernet Bridging for Private Networks on the Same Subnet

1. Set up four machines, as shown in the following diagram.

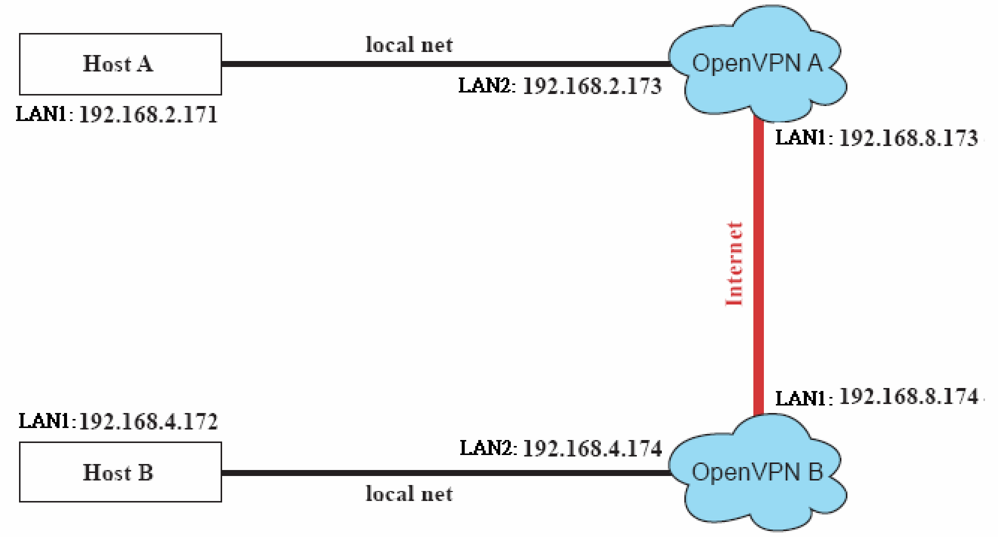


2. The configuration procedure is almost the same as for the previous example. The only difference is that you will need to comment out the parameter **up** in **/etc/openvpn/tap0-br.conf** of OpenVPN A and **/etc/openvpn/tap0-br.conf** of OpenVPN B.

```
# point to the peer
remote 192.168.8.174
dev tap0
secret /etc/openvpn/secrouter.key
cipher DES-EDE3-CBC
auth MD5
tun-mtu 1500
tun-mtu-extra 64
ping 40
#up /etc/openvpn/tap0-br.sh
#comp-lzo
```

Routed IP

1. Set up four machines, as shown in the following diagram.



2. On machine OpenVPN A, modify the remote address in configuration file **/etc/openvpn/tun.conf**.

```
# point to the peer
```

```
remote 192.168.8.174
dev tun
secret /etc/openvpn/secrouter.key
cipher DES-EDE3-CBC
auth MD5
tun-mtu 1500
tun-mtu-extra 64
ping 40
ifconfig 192.168.2.173 192.168.4.174
up /etc/openvpn/tun.sh
#----------------------------end-----------------------------
```

3. Next, modify the routing table in script file **/etc/openvpn/tun.sh**.

```
#---------------------------Start----------------------------
#!/bin/sh
# value after "-net" is the subnet behind the remote peer
route add -net 192.168.2.0 netmask 255.255.255.0 gw $5
#----------------------------end-----------------------------
```

4. On machine OpenVPN B, modify the remote address in configuration file **/etc/openvpn/tun.conf**.

```
# point to the peer
remote 192.168.8.173
dev tun
secret /etc/openvpn/secrouter.key
cipher DES-EDE3-CBC
auth MD5
tun-mtu 1500
tun-mtu-extra 64
ping 40
ifconfig 192.168.4.174 192.168.2.173
up /etc/openvpn/tun.sh
```

And then modify the routing table in script file **/etc/openvpn/tun.sh**.

```
#--------------------------Start----------------------------
#!/bin/sh
# value after "-net" is the subnet behind the remote peer
route add -net 192.168.2.0 netmask 255.255.255.0 gw $5
#---------------------------end-----------------------------
```

The first argument of parameter **ifconfig** is the local internal interface and the second argument is the internal interface at the remote peer.

$5 is the argument that the OpenVPN program passes to the script file. Its value is the second argument of **ifconfig** in the configuration file.

5. Check the routing table after you run the OpenVPN programs, by typing the command **# route**.

```
Destination       Gateway          Genmsk           Flags    Metric   Ref  Use  Iface
192.168.4.174 *                255.255.255.255   UH       0        0    0    tun0
192.168.4.0       192.168.4.174 255.255.255.0 UG       0        0    0    tun0
192.168.2.0       *                255.255.255.0 U        0        0    0    eth1
192.168.8.0       *                255.255.255.0 U        0        0    0    eth0
```

4

System Recovery

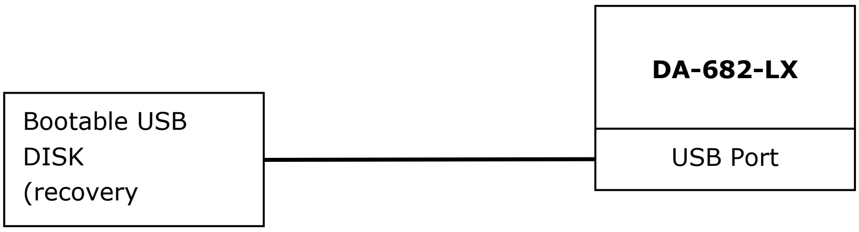
The DA-682-LX is installed with the Embedded Linux operating system, which is located in the Flash DOM (CompactFlash card) shipped with the DA-682-LX computer. Although it happens rarely, you may find on occasion that operating system files and/or the disk file system are damaged. This chapter describes how to recover the Linux operating system.

The following topics are covered in this chapter:

- ❒ **Recovery Environment**
- ❒ **Recovery Procedure**

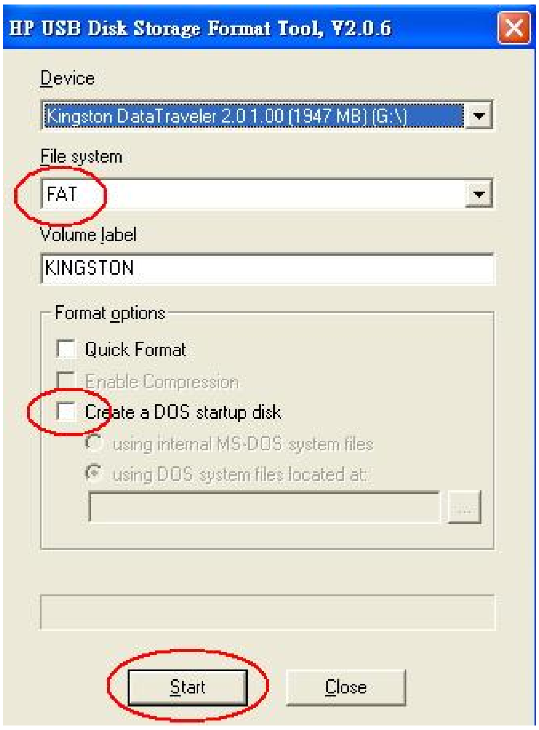
Recovery Environment

The recovery environment includes the DA-682-LX embedded computer and a bootable USB disk with the recovery programs and system image file.



Recovery Procedure

1. **Format an Empty USB Disk.**
   a. Prepare a USB disk that has at least a 256 MB capacity.
   b. Format your USB disk with the **HP USB Disk Format Tool**. Open the utility and select the device and FAT file system. You need empty disk only. DO NOT check the option **Create a DOS startup disk**.
   c. Click **Start**.


HP USB Disk Storage Format Tool, V2.0.6

Device: Kingston DataTraveler 2.0 1.00 (1947 MB) (G:\)

File system: FAT

Volume label: KINGSTON

Format options

□ Quick Format

□ Enable Compression

□ Create a DOS startup disk

○ using internal MS-DOS system files

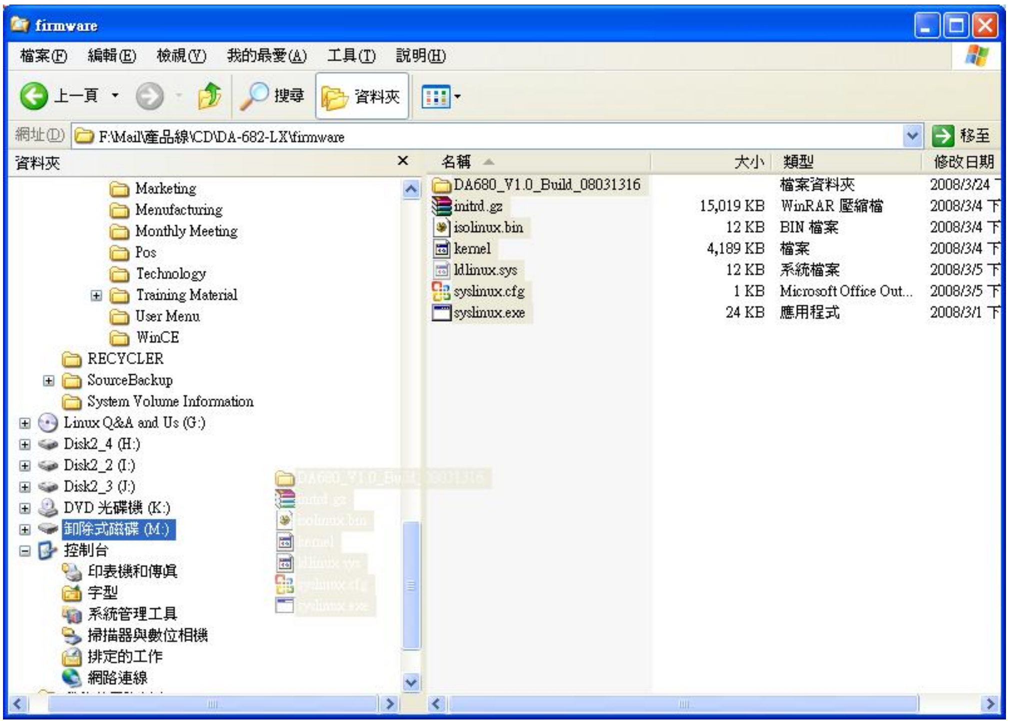
● using DOS system files located at:

ATTENTION

The HP USB Disk Storage Format Tool can be downloaded from many web sites. Do a search on HP USB Disk Storage Format Tool from any search engine to locate the tool.

2. **Create a Linux Bootable USB Disk.**
   a. You can find the **firmware** directory in the Recovery CD shipped with the DA-682-LX computer.
   b. Configure Windows Explorer to show hidden files (including protected operating system files).

c. Copy all files in the **firmware** directory to the root directory of your USB disk.

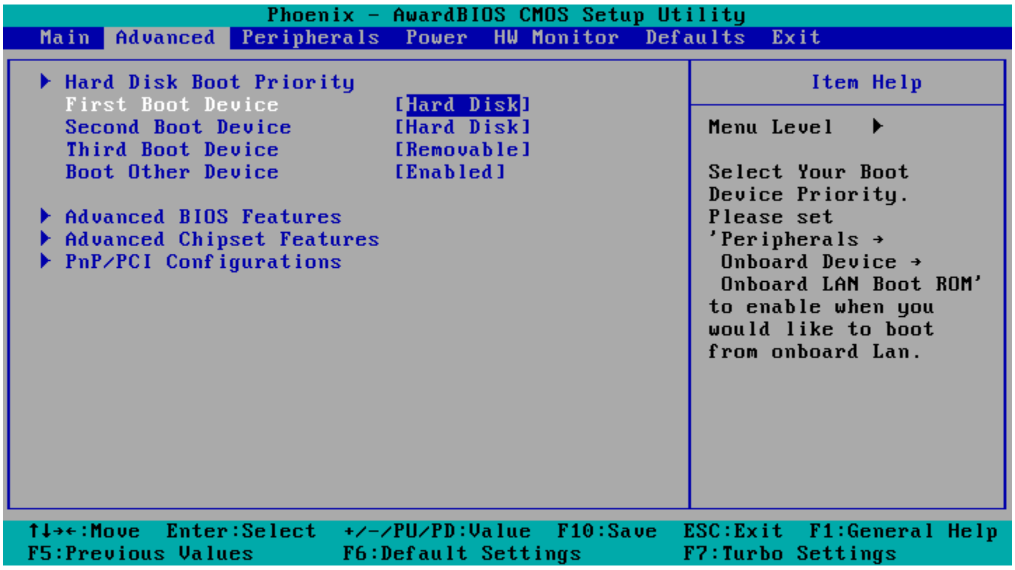


F:\Mail\產品線\CD\DA-682-LX\firmware

名稱	大小	類型	修改日期
DA680_V1.0_Build_08031316		檔案資料夾	2008/3/24
initrd.gz	15,019 KB	WinRAR 壓縮檔	2008/3/4 下
isolinux.bin	12 KB	BIN 檔案	2008/3/4 下
kernel	4,189 KB	檔案	2008/3/4 下
ldlinux.sys	12 KB	系統檔案	2008/3/5 下
syslinux.cfg	1 KB	Microsoft Office Out...	2008/3/5 下
syslinux.exe	24 KB	應用程式	2008/3/1 下

d. Open a DOS prompt and type **M:\syslinux.exe M:** to create a bootable Linux disk. In this example, M: is the USB Disk drive number.

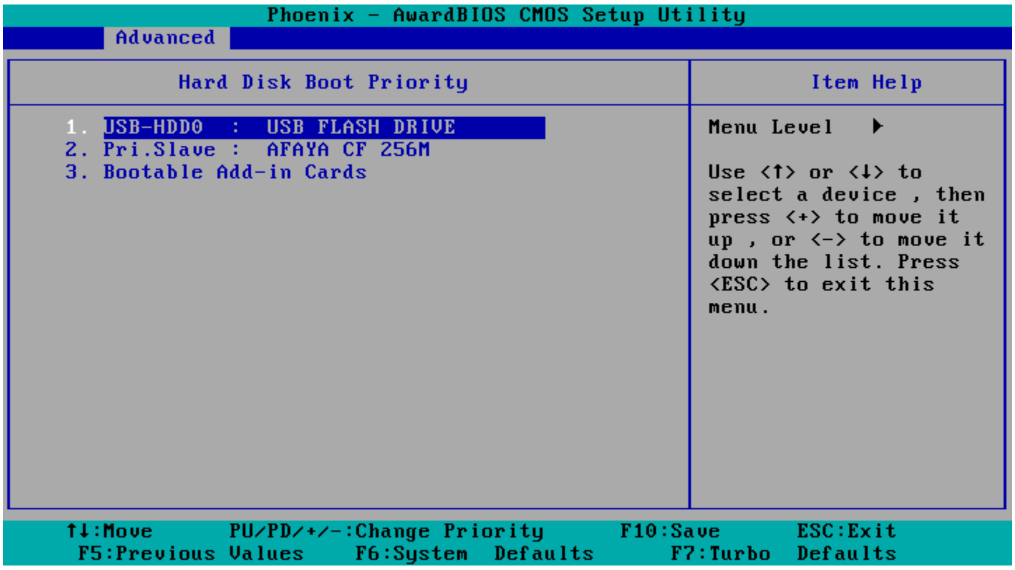
3. **Set up the BIOS to Boot from a USB Disk.**
   a. Insert the USB disk.
   b. Power on and press **DEL** to enter the bios setup menu.
   c. Select **Advanced → Hard Disk Boot Priority** and then press **Enter**.
   d. From the setup menu, use "↑" or "↓" to select the USB device
   e. Press "+" to move the selection up to the first priority, and press **Esc** to exit the setup menu.
   f. Make sure the first boot device is **Hard Disk**. If not, press **Enter** to change it.
   g. Select **Exit → Save & Exit Setup** and then press **Enter**.
   h. Choose **Y** to save to the CMOS and then exit.



```
                    Phoenix - AwardBIOS CMOS Setup Utility
  Main   Advanced  Peripherals  Power  HW Monitor  Defaults  Exit

 ▶ Hard Disk Boot Priority                              Item Help
   First Boot Device          [Hard Disk]
   Second Boot Device         [Hard Disk]         Menu Level   ▶
   Third Boot Device          [Removable]
   Boot Other Device          [Enabled]           Select Your Boot
                                                  Device Priority.
 ▶ Advanced BIOS Features                         Please set
 ▶ Advanced Chipset Features                      'Peripherals →
 ▶ PnP/PCI Configurations                          Onboard Device →
                                                   Onboard LAN Boot ROM'
                                                  to enable when you
                                                  would like to boot
                                                  from onboard Lan.

 ↑↓→←:Move  Enter:Select  +/-/PU/PD:Value  F10:Save  ESC:Exit  F1:General Help
 F5:Previous Values       F6:Default Settings        F7:Turbo Settings
```

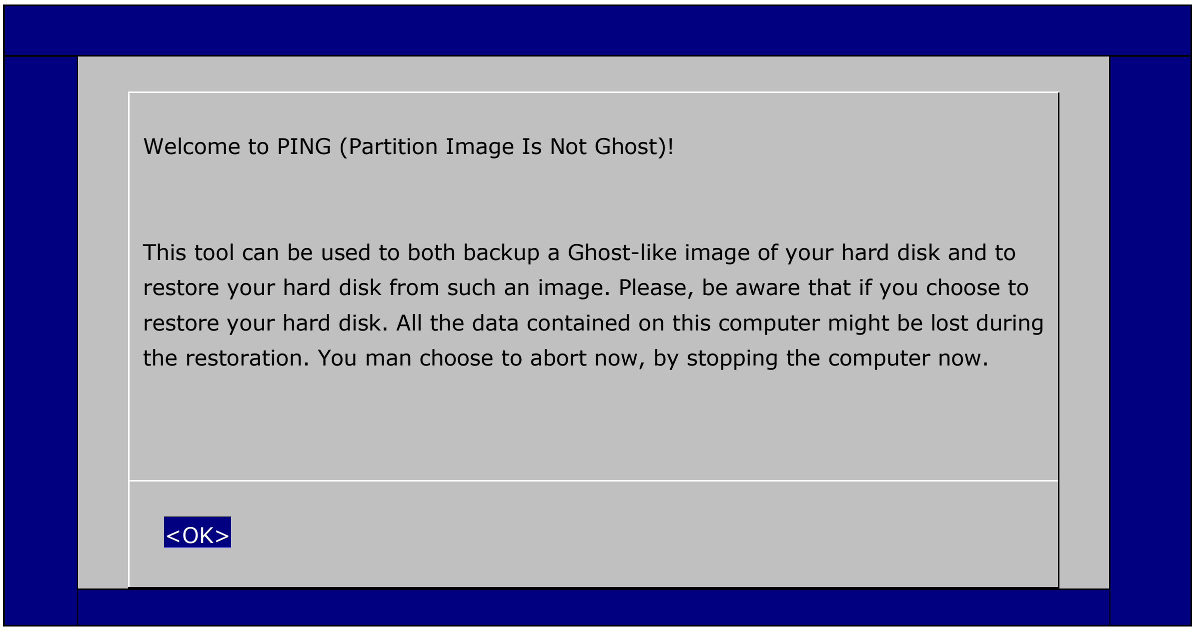


```
                  Phoenix - AwardBIOS CMOS Setup Utility
         Advanced
          Hard Disk Boot Priority                      Item Help

    1. USB-HDD0   :   USB FLASH DRIVE          Menu Level   ▶
    2. Pri.Slave  :   AFAYA CF 256M
    3. Bootable Add-in Cards                   Use <↑> or <↓> to
                                               select a device , then
                                               press <+> to move it
                                               up , or <-> to move it
                                               down the list. Press
                                               <ESC> to exit this
                                               menu.

    ↑↓:Move      PU/PD/+/-:Change Priority       F10:Save      ESC:Exit
     F5:Previous Values     F6:System  Defaults       F7:Turbo  Defaults
```

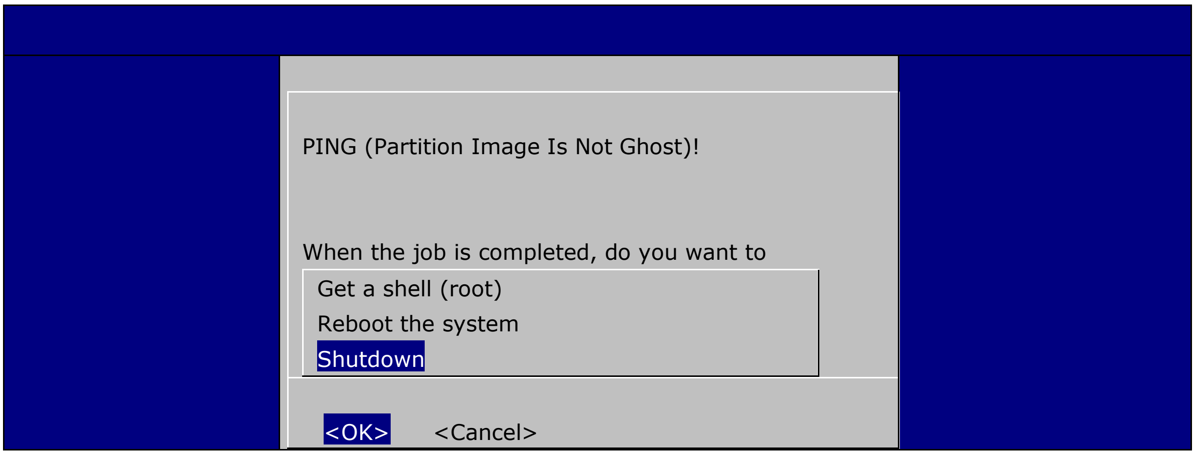
4. **Recover the Linux system from a USB Disk.**
   a. If the BIOS setup is correct, it will boot from the USB disk. Follow the steps below to set up recovery parameters.



Welcome to PING (Partition Image Is Not Ghost)!

This tool can be used to both backup a Ghost-like image of your hard disk and to restore your hard disk from such an image. Please, be aware that if you choose to restore your hard disk. All the data contained on this computer might be lost during the restoration. You man choose to abort now, by stopping the computer now.

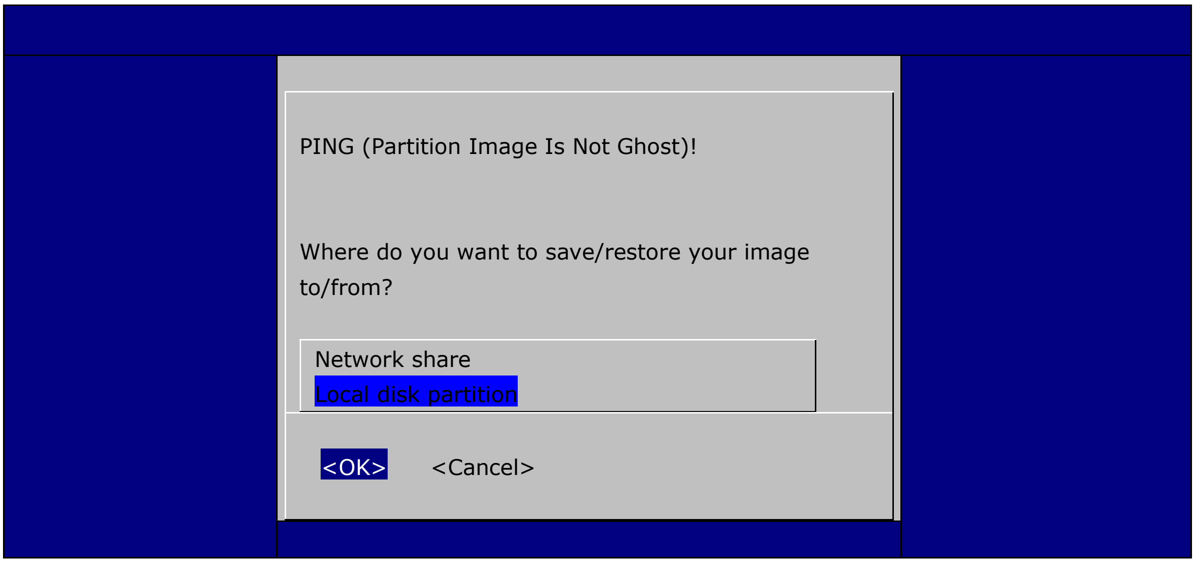
   b. Choose **OK** to go to the next step.
   c. Choose shut down the DA-680-LX when the restoration is finished.



PING (Partition Image Is Not Ghost)!

When the job is completed, do you want to

d. Choose restore image from **Local disk partition**.

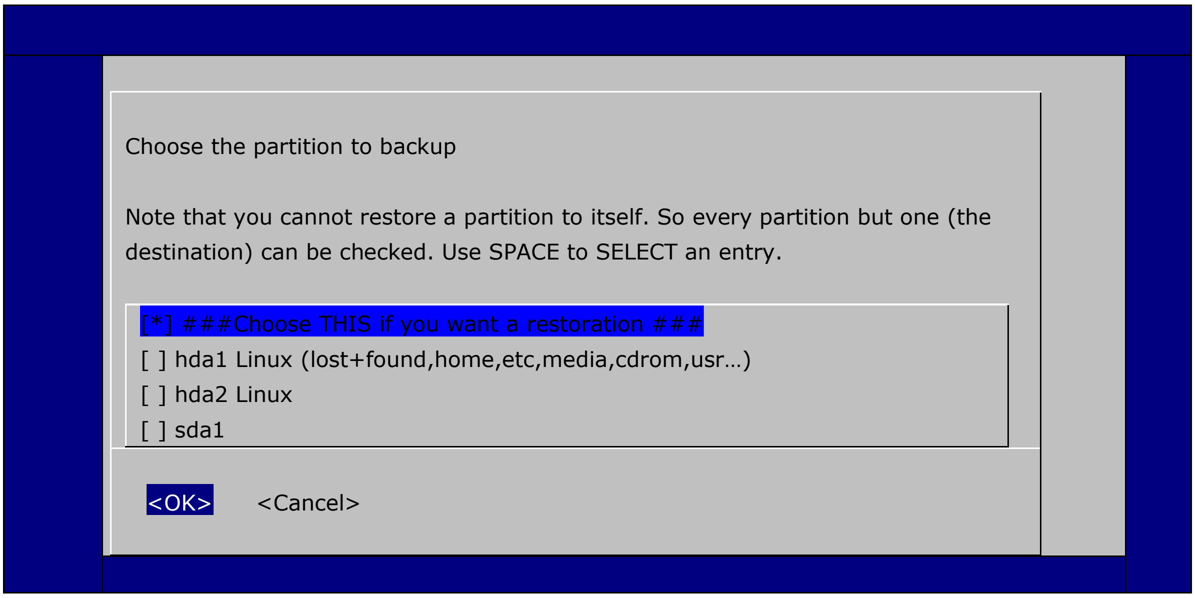


PING (Partition Image Is Not Ghost)!

Where do you want to save/restore your image to/from?

Network share
Local disk partition

e. Choose **### Choose THIS if you want a restoration ###**

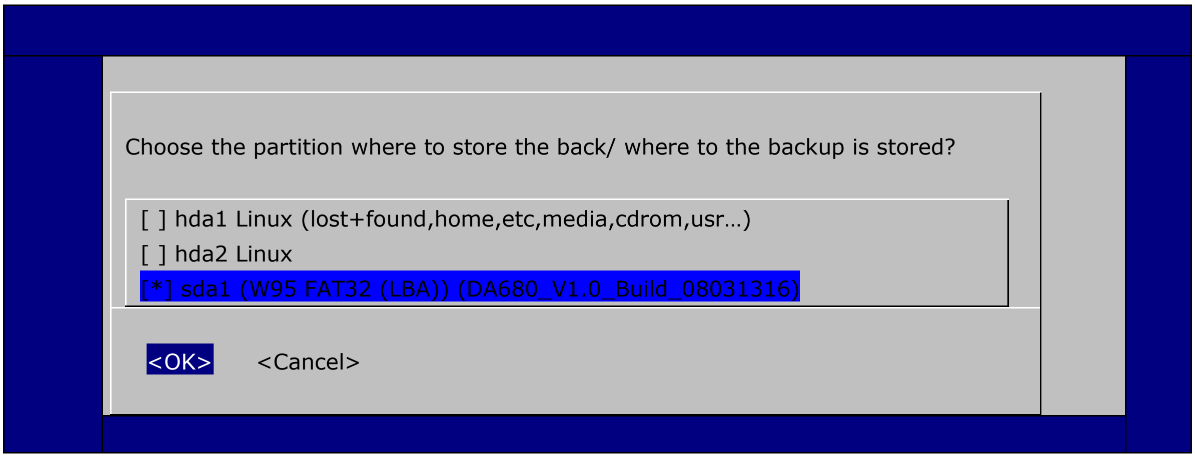


Choose the partition to backup

Note that you cannot restore a partition to itself. So every partition but one (the destination) can be checked. Use SPACE to SELECT an entry.

[*] ###Choose THIS if you want a restoration ###
[ ] hda1 Linux (lost+found,home,etc,media,cdrom,usr…)
[ ] hda2 Linux
[ ] sda1

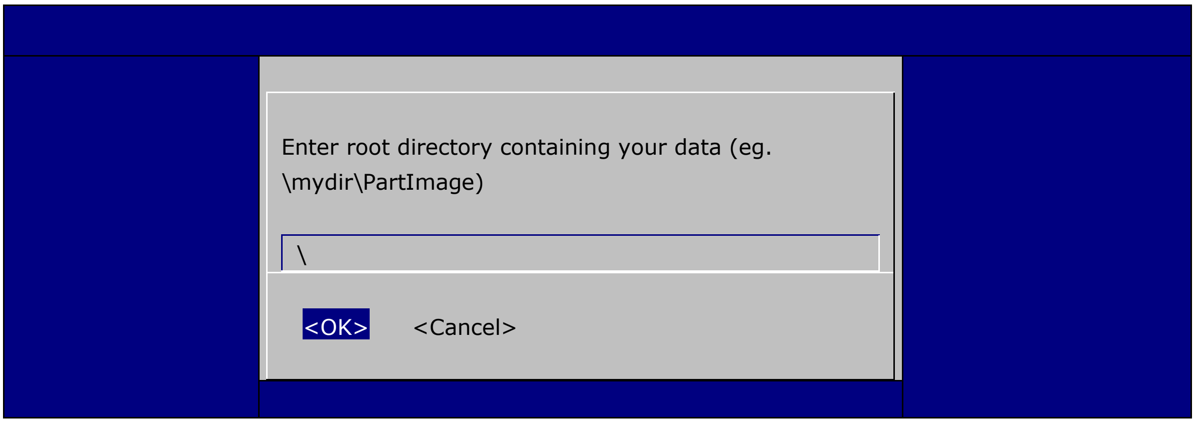
f. Choose the restoration source device **sda1**.



Choose the partition where to store the back/ where to the backup is stored?

[ ] hda1 Linux (lost+found,home,etc,media,cdrom,usr…)
[ ] hda2 Linux
[*] sda1 (W95 FAT32 (LBA)) (DA680_V1.0_Build_08031316)

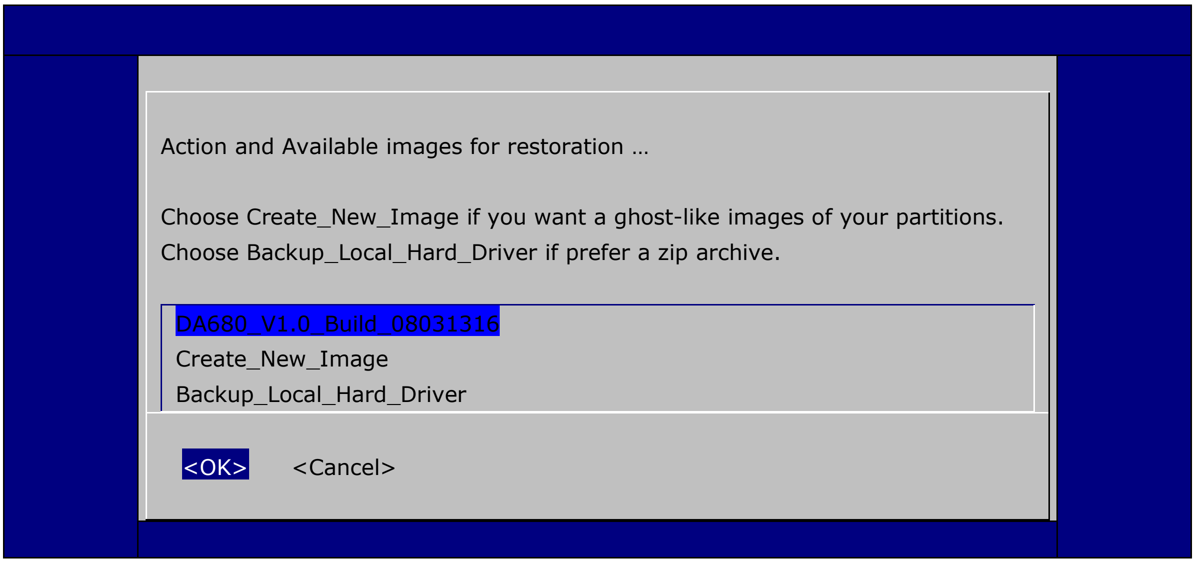
g. Enter **"\"** to choose the root directory of the restoration image.



Enter root directory containing your data (eg. \mydir\PartImage)

\

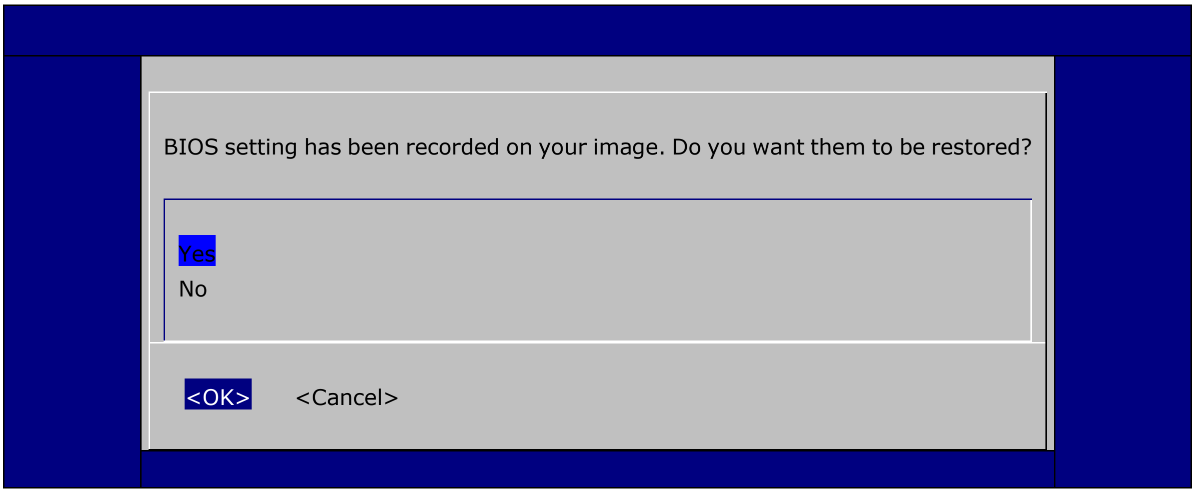
h. Choose **DA680_V1.0_Build_08031316** for the restoration image.



Action and Available images for restoration …

Choose Create_New_Image if you want a ghost-like images of your partitions.
Choose Backup_Local_Hard_Driver if prefer a zip archive.

i. Choose **Yes** to start the restoration. After the restoration is finished, the system will halt and you will need to reboot to restart the restored system.



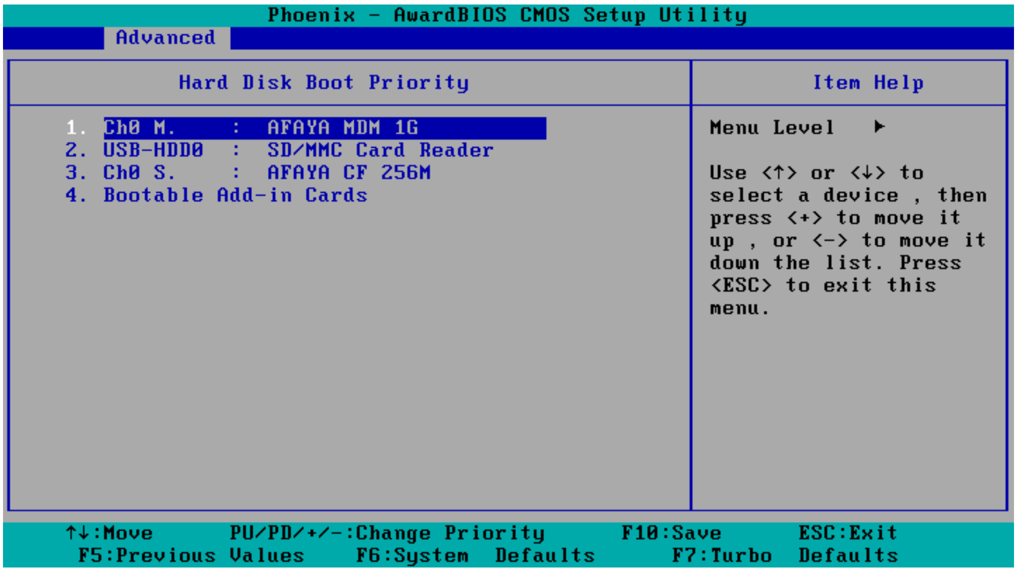
BIOS setting has been recorded on your image. Do you want them to be restored?

When operation is finished, turn off the computer and remove the USB disk.

ATTENTION

DO NOT turn off the power during system recovery, as the system may crash.

5. **Set up the BIOS back to boot from DOM or CompactFlash Disk.**
    a. Power on and press **DEL** to enter the bios setup menu.
    b. Select **Advanced** → **Hard Disk Boot Priority** and then press **Enter**.
    c. From the setup menu, use "↑" or "↓" to select the DOM or CompactFlash device.
    d. Press **"+"** to move the selection up to the first priority, and press **Esc** to exit the setup menu.
    e. Select **Exit** → **Save & Exit Setup** and then press **Enter**.
    f. Choose **Y** to save to the CMOS and then exit.
    g. Wait a few minutes for the system to boot. When the recovery process is finished, you will again be able to see the Linux desktop.



```
                     Phoenix - AwardBIOS CMOS Setup Utility
         Advanced

               Hard Disk Boot Priority                      Item Help

     1. Ch0 M.     :  AFAYA MDM 1G                    Menu Level   ▶
     2. USB-HDD0   :  SD/MMC Card Reader
     3. Ch0 S.     :  AFAYA CF 256M                   Use <↑> or <↓> to
     4. Bootable Add-in Cards                         select a device , then
                                                      press <+> to move it
                                                      up , or <-> to move it
                                                      down the list. Press
                                                      <ESC> to exit this
                                                      menu.

     ↑↓:Move      PU/PD/+/-:Change Priority      F10:Save      ESC:Exit
      F5:Previous Values     F6:System  Defaults      F7:Turbo  Defaults
```