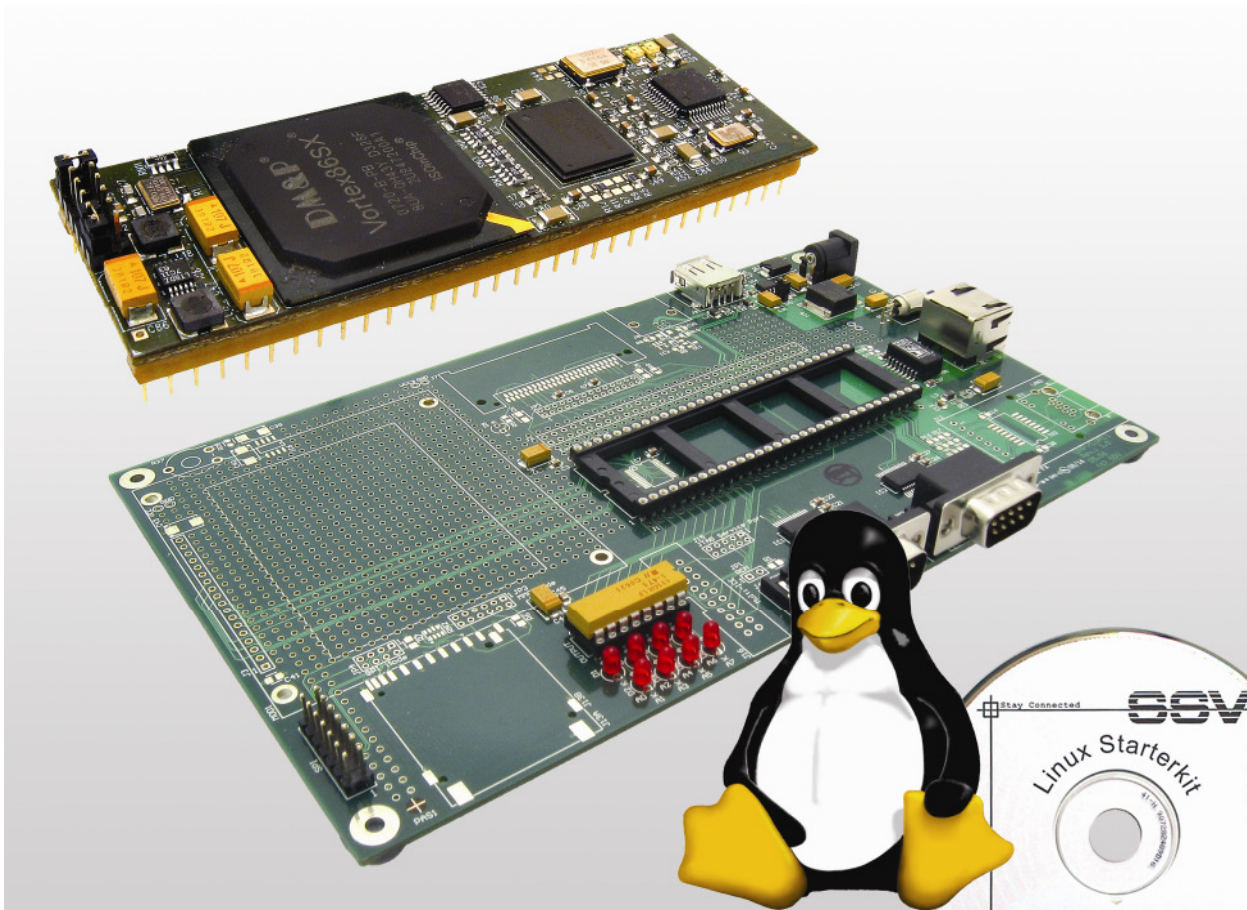


DNP/SK29

Embedded Linux Starter Kit

First Steps



SSV Embedded Systems

Heisterbergallee 72
D-30453 Hannover
Phone: +49 (0)511/40 000-0
Fax: +49 (0)511/40 000-40
E-mail: sales@ist1.de

Document Revision: 1.0
Date: 2009-02-09

CONTENT

1	INTRODUCTION	4
1.1	Safety Guidelines.....	4
1.2	Conventions.....	4
1.3	Features and Technical Data.....	5
2	GETTING STARTED	6
2.1	Serial Link between DNP/EVA11-SV1 and PC.....	6
2.2	Ethernet Link between DNP/EVA11-SV1 and PC.....	7
2.3	Connecting Power Supply and Power-up the Starter Kit.....	8
2.4	Using Serial Link with Terminal Program.....	9
2.5	Power-up DNP/2486 with RCM disabled.....	10
2.6	Power-up DNP/2486 with RCM enabled.....	11
2.7	Checking IP Address of PC.....	13
2.8	Checking Ethernet-based TCP/IP Communication.....	14
2.9	Using a Telnet Connection.....	15
2.10	Checking FTP Server.....	16
2.11	Checking TFTP Client.....	18
2.12	“Hello World” with SSV coLinux.....	19
3	MIN-LINUX	21
3.1	Main Features.....	21
3.2	Busybox.....	21
3.3	Filesystem Tools.....	21
3.4	Network Features.....	22
3.5	Kernel Module Support.....	22
3.6	Other Features.....	22
4	MAX-LINUX	23
4.1	Upgrade to MAX-Linux.....	23
4.2	MAX-Linux Features.....	27
4.3	Telnet Session with MAX-Linux.....	29
4.4	FTP Session with MAX-Linux.....	30
4.5	TFTP Session with MAX-Linux.....	30
4.6	Changing the MAX-Linux IP Address (IPbyNet).....	31
4.7	Java-based “Hello World” for MAX-Linux.....	32
4.8	MAX-Linux Web Server Usage.....	34
5	LINUX BOOT MESSAGES	36
5.1	MIN-Linux Boot Messages.....	36
5.2	MAX-Linux Boot Messages.....	39

- 6 DNP/EVA11-SV1 HARDWARE REFERENCE42
 - 6.1 DNP/EVA11-SV1 Board Layout42
 - 6.2 Pinout DIL-64 Socket – J1 (1. Part)43
 - 6.3 Pinout DIL-64 Socket– J1 (2. Part)44
 - 6.4 Pinout COM1 Connector – J4.....45
 - 6.5 Pinout COM2 Connector – J5.....45
 - 6.6 Pinout USB Host Port – J946
 - 6.7 Pinout 10/100 Mbps Ethernet Connector 1 – J10.....46
 - 6.8 Pinout Power Connector – J1747
 - 6.9 Pinout USB VCC Jumper – JP547
- 7 HELPFUL LITERATURE48
- CONTACT.....48
- DOCUMENT HISTORY48

1 INTRODUCTION

The Starter Kit DNP/SK29 contains everything you need to get started with your 32-bit x86 embedded networking application. The Starter Kit includes a DNP/2486 module with a pre-installed MIN-Linux (Minimal Linux), the Evaluation Board DNP/EVA11-SV1, power supply, serial interface (null modem) cable, a CD-ROM with software and documentation and a printed user manual for the first steps with the Starter Kit.

Alternatively it is possible to install a ROM DOS operating system for the DNP/2486 instead of the MIN-Linux. Please contact us for further information.

For using the DNP/SK29 Embedded Linux Starter Kit you need a development system. The minimal configuration for this system is a Windows-based PC with the HyperTerminal terminal emulation program and a free COM port (COM1, COM2 or USB-based COMx) for the RS232 serial link between the DNP/2486 and HyperTerminal.

For using the Ethernet link, your PC needs an Ethernet adapter with 10 Mbps or 10/100 Mbps LAN interface. This environment allows DNP/2486 shell script, Java and Perl programming independent from the operating system of the development PC. For using a GNU C/C++ tool chain, it is necessary to run Linux or SSV coLinux on the development system.

1.1 Safety Guidelines

Please read the following safety guidelines carefully! In case of property or personal damage by not paying attention to this document and/or by incorrect handling, we do not assume liability. In such cases any warranty claim expires.



ATTENTION: Observe precautions for handling – electrostatic sensitive device!

- Discharge yourself before you work with the device, e.g. by touching a heater of metal, to avoid damages.
- Stay grounded while working with the device to avoid damage through electrostatic discharge.

1.2 Conventions

Convention	Usage
bold	Important terms
<i>italic</i>	User inputs and other specials
monospace	Pathnames, internet addresses and program code

Table 1: Conventions used in this Document

1.3 Features and Technical Data

- DNP/2486 with Vortex86SX 32-bit x86 SoC MCU @300 MHz, 64 MByte DDR2 SDRAM and 1 GByte NAND FLASH Memory
- Embedded MIN-Linux pre-installed in Flash memory
- Evaluation Board DNP/EVA11-SV1 with 1x 10/100 Mbps Ethernet LAN interface, 1x USB 2.0 host interface and 2 x serial port
- Null modem cable
- 110 VAC or 230 VAC to 5 VDC international power supply
- CD-ROM with user manual, hardware reference, programmers manuals and full Linux source codes
- USB stick with ready-to-install MAX-Linux
- Linux remote login with Telnet or serial link (serial console)
- Telnet server setup sample
- FTP server setup sample
- Pre-installed TFTP client
- Many source code samples

The pre-installed MIN-Linux (Minimal Linux) allows the first steps with an embedded Linux and the evaluation of the Linux networking features. The DNP/2486 MIN-Linux is using a RAM disk image based on the Debian Etch (4.0) distribution.

For real embedded networking applications please upgrade the DNP/2486 from MIN- to MAX-Linux. The Starter Kit DNP/SK29 offers a USB stick with a ready-to-install MAX-Linux version. This MAX-Linux is also Debian-based. The MAX system comes with all features known from Debian desktop Linux versions.

2 GETTING STARTED

2.1 Serial Link between DNP/EVA11-SV1 and PC

Setup the serial link between the Evaluation Board DNP/EVA11-SV1 and your PC. Use a null modem cable for this connection.

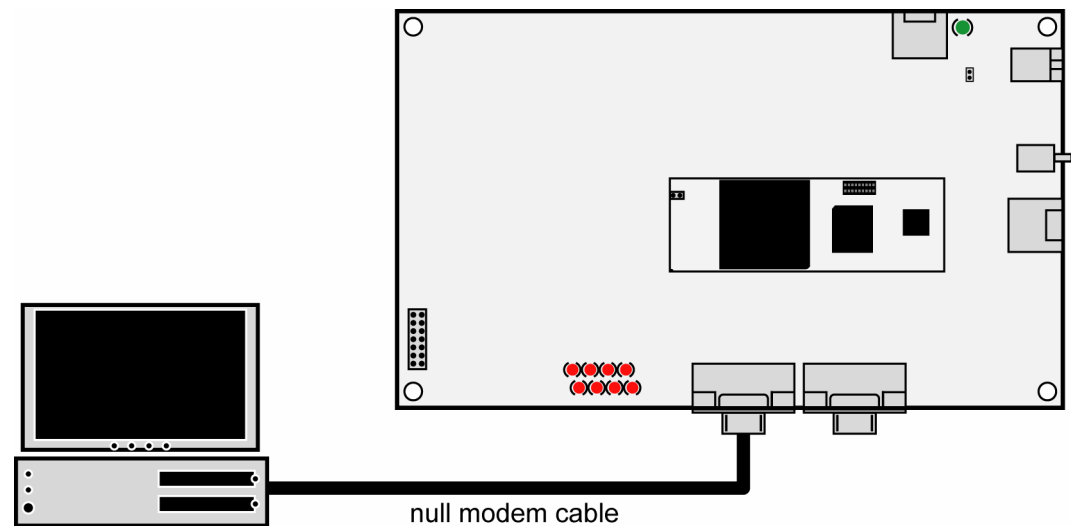


Figure 1: Serial link between Evaluation Board and PC

Connect one end of the null modem cable with an unused COM port of your PC. Make sure that this PC COM port supports 115.200 bps.

2.2 Ethernet Link between DNP/EVA11-SV1 and PC

Setup the Ethernet LAN link between the Evaluation Board DNP/EVA11-SV1 and your PC. Use an Ethernet cross-over cable or a switch-based infrastructure for the LAN connection.

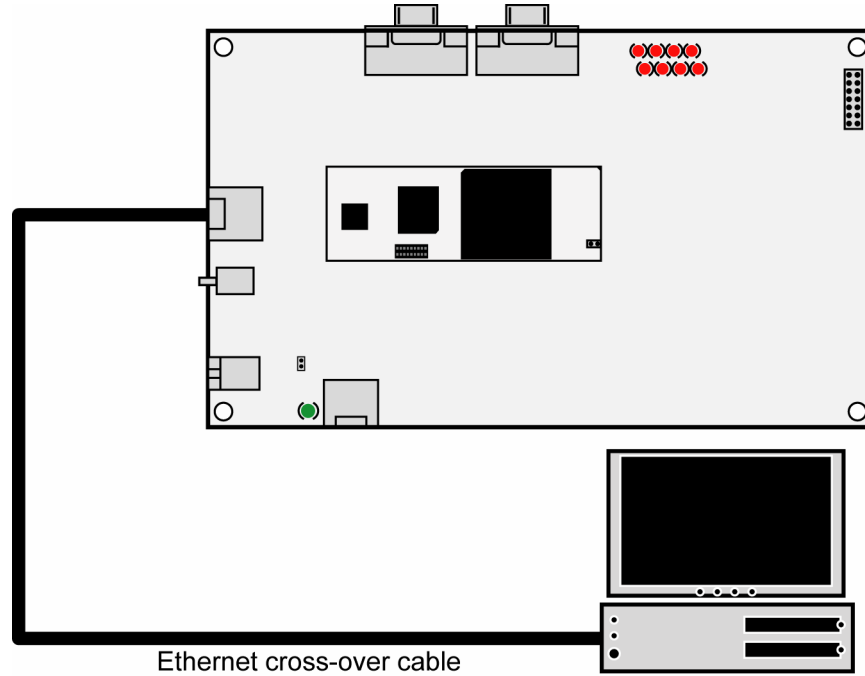


Figure 2: Ethernet link between Evaluation Board and PC



Please note: The DNP/2486 comes with the default IP address **192.168.0.126**. Please make sure that your PC can work with the IP address range **192.168.0.x**.

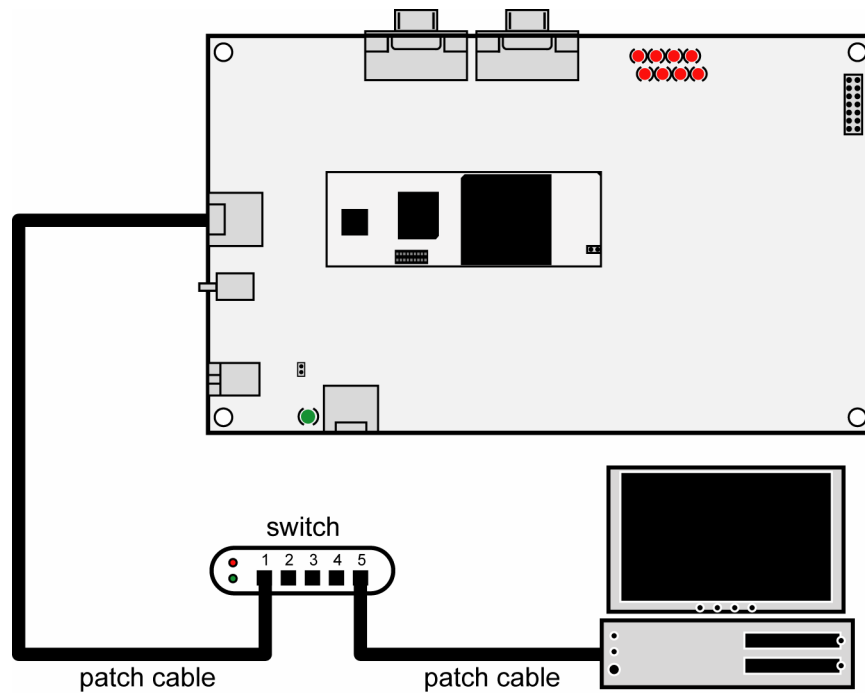


Figure 3: Switch-based Ethernet link between Evaluation Board and PC

2.3 Connecting Power Supply and Power-up the Starter Kit

Connect a 5 VDC power supply with a 5.5 mm x 2.5 mm jack plug to the Evaluation Board DNP/EVA11-SV1.

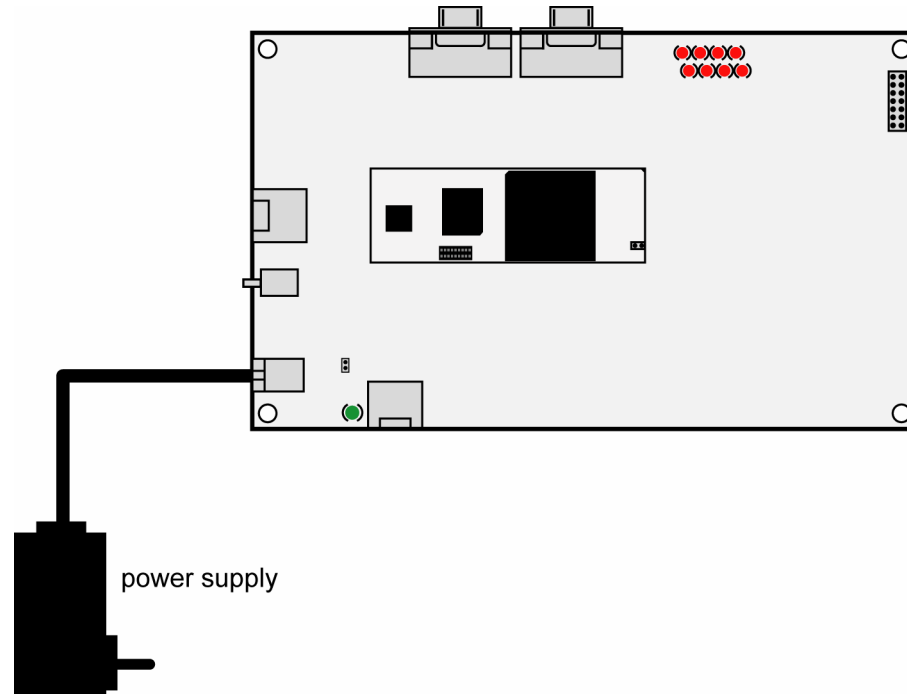


Figure 4: Power supply for the Evaluation Board



CAUTION: Providing the DNP/EVA11-SV1 with a voltage higher than the regular 5 VDC $\pm 10\%$ could resolve in damaged board components!

Please pay attention to the polarity of the power connector: the **+ pole is in the center!**

Polarity:

Figure 5: Polarity of the power connector

Please note: Make sure that all cable connections are OK. Then power-up the Starter Kit.

2.4 Using Serial Link with Terminal Program

Run *HyperTerminal* on your Windows-PC, *minicom* or a similar simple terminal emulation program on your Linux-based PC.



Figure 6: Direct connection setup with HyperTerminal

Setup a direct connection with the parameters of table 2. Make sure, that the PC COM port supports 115.200 bps.

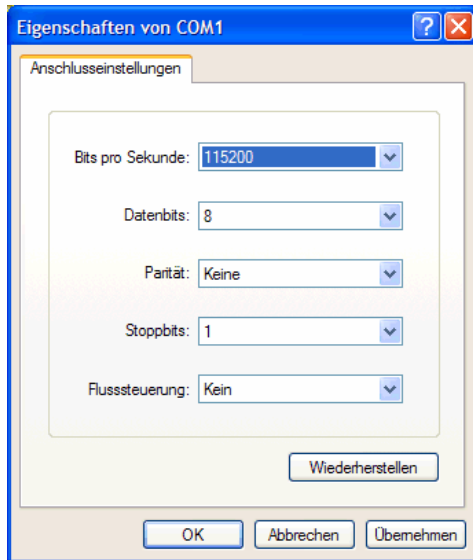


Figure 7: Parameter setup with HyperTerminal

Parameter	Value
Speed	115.200 bps
Data Bits	8
Parity	None
Stop Bits	1
Protocol	No (Xon/Xoff, RTS/CTS or similar)

Table 2: Setup parameters for the serial link

2.5 Power-up DNP/2486 with RCM disabled

After power-up the DIL/NetPC DNP/2486 starts an automatic boot process from the on-board flash memory chip. This process consists of the following steps:

1. Directly after power-up, the DNP/2486 runs the AMI BIOS. This Basic Input Output System (BIOS) initializes the hardware components and runs the boot loader from the Flash memory. With RCM disabled, there is **no BIOS message output** over the DNP/2486 serial ports.
2. If the BIOS finish, the DNP/2486 runs the SYSLINUX boot loader. This software component operates with MS-DOS/Windows FAT file systems. The SYSLINUX boot loader loads the MIN-Linux image form the Flash disk to the RAM and gives the control over the CPU to the Linux operating. With RCM disabled, there is **no SYSLINUX message output** over the DNP/2486 serial ports.
3. Linux takes control over the DNP/2486 hardware and runs all necessary processes for coming up to live. With RCM disabled, there is **no Linux message output** over the DNP/2486 serial ports.

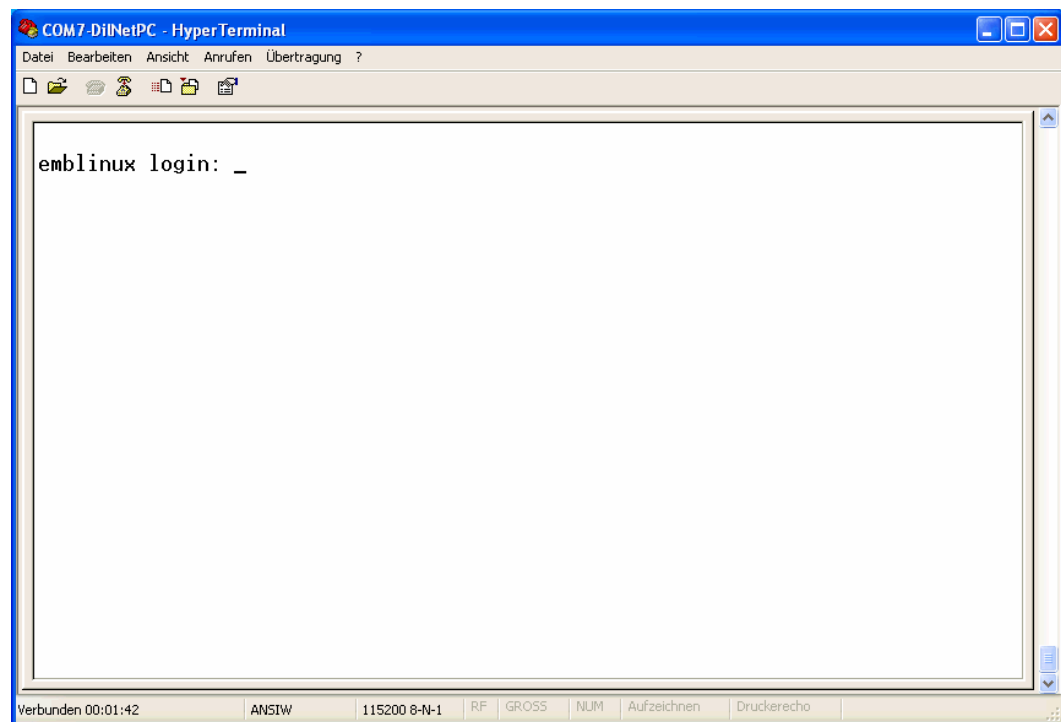


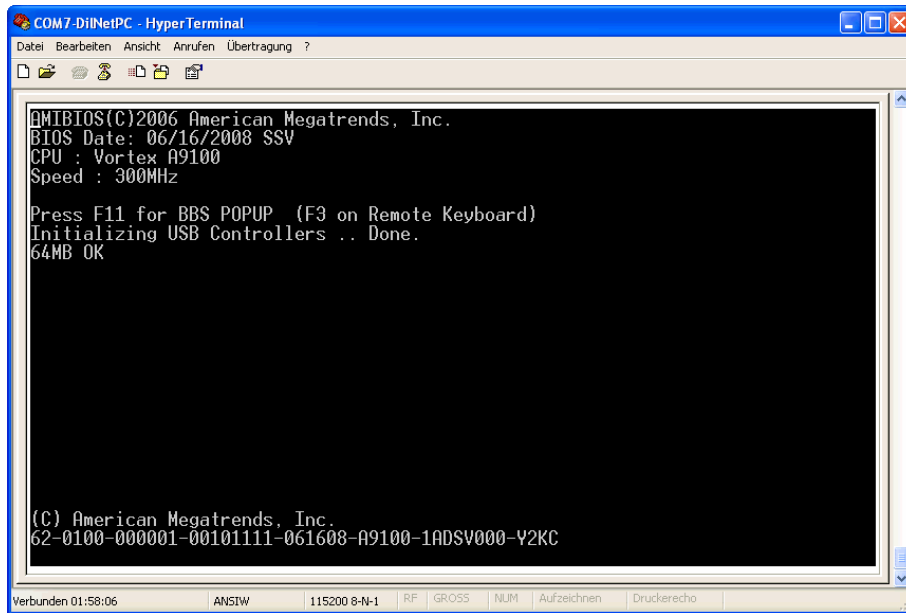
Figure 8: Linux booting process with HyperTerminal

The DNP/2486 MIN-Linux supports a serial console. It allows a Linux-based system in a headless configuration without a monitor and keyboard. After the boot process finish, the DNP/2486 MIN-Linux shows a login prompt. Please use the login name **root**. This user name needs no password.

2.6 Power-up DNP/2486 with RCM enabled

The DIL/NetPC DNP/2486 boot sequence with RCM enabled is similar to the boot procedure with RCM disabled. Only some details are different:

1. Directly after power-up, the DNP/2486 runs the AMI BIOS and initializes the hardware components. With RCM enabled, the BIOS show some messages over the DNP/2486 COM1 serial port.



```

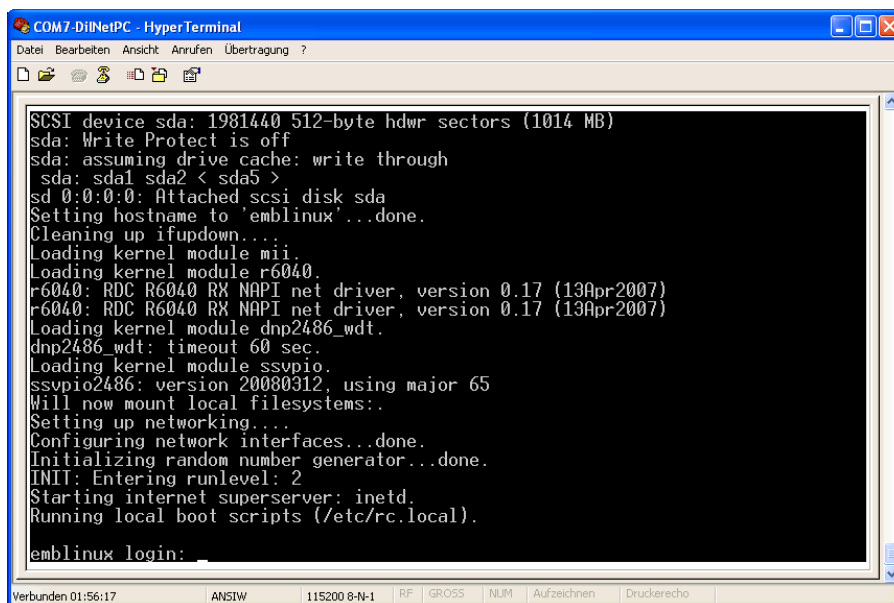
COM7-DiINetPC - HyperTerminal
Datei Bearbeiten Ansicht Anrufen Übertragung ?
AMIBIOS(C)2006 American Megatrends, Inc.
BIOS Date: 06/16/2008 SSV
CPU : Vortex A9100
Speed : 300MHz
Press F11 for BBS POPUP (F3 on Remote Keyboard)
Initializing USB Controllers .. Done.
64MB OK

(C) American Megatrends, Inc.
62-0100-000001-00101111-061608-A9100-1ADSV000-Y2KC
Verbunden 01:58:06 ANSIW 115200 8-N-1 RF GROSS NUM Aufzeichnen Druckerecho

```

Figure 9: The AMI BIOS message direct after power-up

2. If the BIOS finish, the DNP/2486 runs the SYSLINUX boot loader. SYSLINUX loads the MIN-Linux image form the Flash disk to the RAM and gives the control over the CPU to the Linux operating. With RCM enabled, SYSLINUX show some messages over the DNP/2486 COM1 serial port.



```

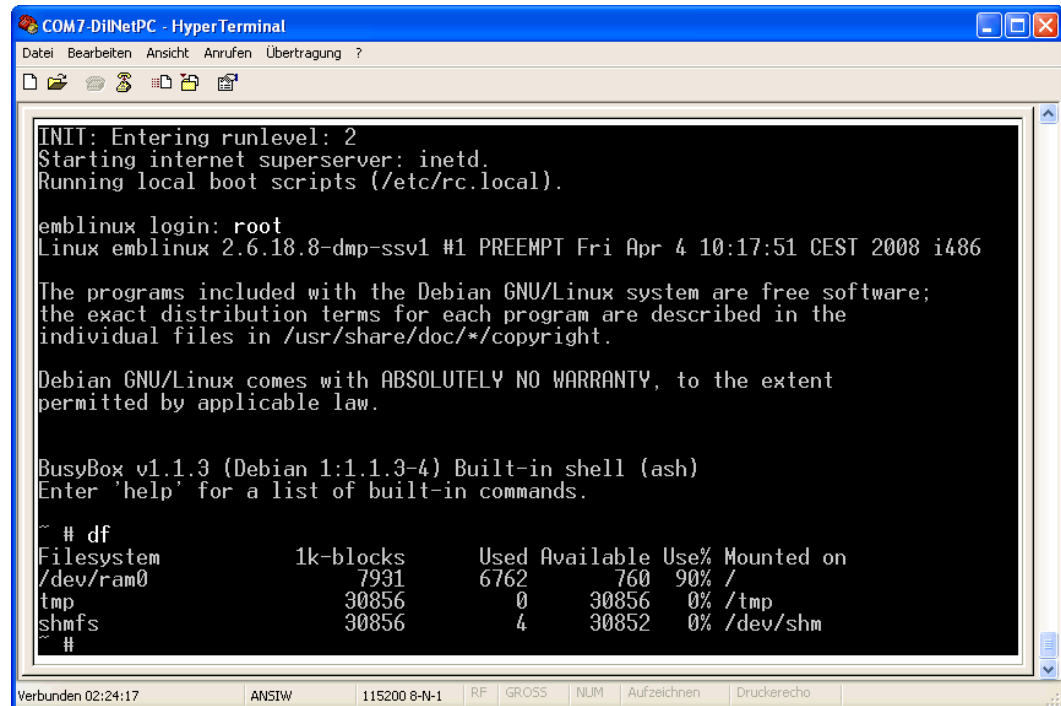
COM7-DiINetPC - HyperTerminal
Datei Bearbeiten Ansicht Anrufen Übertragung ?
SCSI device sda: 1981440 512-byte hdwr sectors (1014 MB)
sda: Write Protect is off
sda: assuming drive cache: write through
sda: sda1 sda2 < sda5 >
sd 0:0:0:0: Attached scsi disk sda
Setting hostname to 'emblinux'...done.
Cleaning up ifupdown...
Loading kernel module mii.
Loading kernel module r6040.
r6040: RDC R6040 RX NAPI net driver, version 0.17 (13Apr2007)
r6040: RDC R6040 RX NAPI net driver, version 0.17 (13Apr2007)
Loading kernel module dnp2486_wdt.
dnp2486_wdt: timeout 60 sec.
Loading kernel module ssvpio.
ssvpio2486: version 20080312, using major 65
Will now mount local filesystems:.
Setting up networking...
Configuring network interfaces...done.
Initializing random number generator...done.
INIT: Entering runlevel: 2
Starting internet superserver: inetd.
Running local boot scripts (/etc/rc.local).
emblinux login:
Verbunden 01:56:17 ANSIW 115200 8-N-1 RF GROSS NUM Aufzeichnen Druckerecho

```

Figure 10: After the Linux booting process is a login prompt available

- Linux takes control over the DNP/2486 hardware and runs all necessary processes for coming up to live. With RCM enabled, the MIN-Linux shows many detailed boot messages over the DNP/2486 COM1 serial port.

The DNP/2486 MIN-Linux supports a serial console. It allows a Linux-based system in a headless configuration without a monitor and keyboard. After the boot process finish, the DNP/2486 MIN-Linux shows a login prompt. Please use the login name *root*. This user name needs no password.



```

COM7-DiNetPC - HyperTerminal
Datei Bearbeiten Ansicht Anrufen Übertragung ?
INIT: Entering runlevel: 2
Starting internet superserver: inetd.
Running local boot scripts (/etc/rc.local).

emlinux login: root
Linux emlinux 2.6.18.8-dmp-ssv1 #1 PREEMPT Fri Apr 4 10:17:51 CEST 2008 i486

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.

BusyBox v1.1.3 (Debian 1:1.1.3-4) Built-in shell (ash)
Enter 'help' for a list of built-in commands.

~ # df
Filesystem      1k-blocks    Used Available Use% Mounted on
/dev/ram0        7931         6762    760   90% /
tmp              30856         0    30856    0% /tmp
shmfs            30856         4    30852    0% /dev/shm
~ #

```

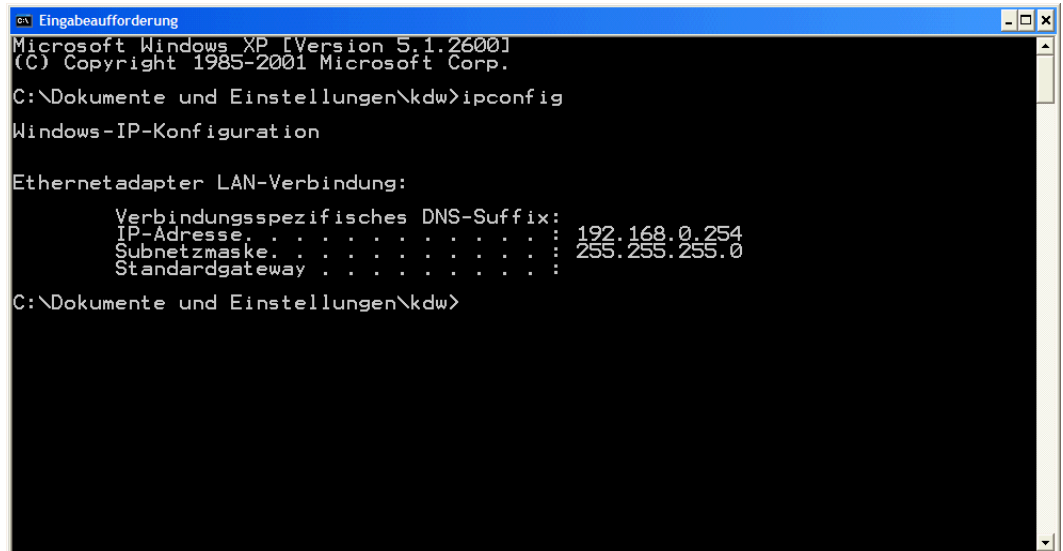
Figure 11: After a login the serial console offers a Linux command line interface

Direct after a successful login the DNP/2486 MIN-Linux offers a simple Linux command line interface. Please enter *help* to find which build-in commands are available.

2.7 Checking IP Address of PC

Make sure that your PC is using the right IP address for the Ethernet-based TCP/IP communication with the DIL/NetPC.

Please use 192.168.0.1 or 192.168.0.254 for your PC and 192.168.0.126 for the DNP/2486.



```
Eingabeaufforderung
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.
C:\Dokumente und Einstellungen\kdw>ipconfig

Windows-IP-Konfiguration

Ethernetadapter LAN-Verbindung:

    Verbindungsspezifisches DNS-Suffix:
    IP-Adresse. . . . . : 192.168.0.254
    Subnetzmaske. . . . . : 255.255.255.0
    Standardgateway . . . . . :

C:\Dokumente und Einstellungen\kdw>
```

Figure 12: Windows-PC IP address check with *ipconfig*

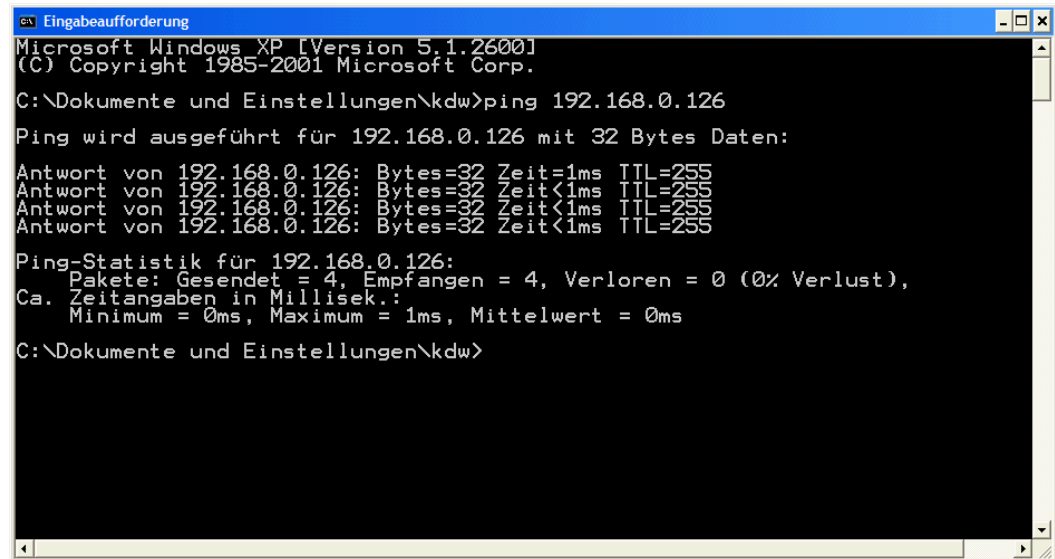
Talk to your network administrator if you have problems with the IP address understanding.



Please note: The ex factory IP address 192.168.0.126 of the DNP/2486 is fixed within the MIN-Linux image. It can only be changed temporary at the RAM disk. After rebooting the system, the ex factory IP address 192.168.0.126 will be used automatically again.

2.8 Checking Ethernet-based TCP/IP Communication

Check the Ethernet-based TCP/IP communication between the DNP/2486 and the PC with a simple *ping* command.



```

Eingabeaufforderung
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Dokumente und Einstellungen\kdw>ping 192.168.0.126

Ping wird ausgeführt für 192.168.0.126 mit 32 Bytes Daten:

Antwort von 192.168.0.126: Bytes=32 Zeit=1ms TTL=255
Antwort von 192.168.0.126: Bytes=32 Zeit<1ms TTL=255
Antwort von 192.168.0.126: Bytes=32 Zeit<1ms TTL=255
Antwort von 192.168.0.126: Bytes=32 Zeit<1ms TTL=255

Ping-Statistik für 192.168.0.126:
    Pakete: Gesendet = 4, Empfangen = 4, Verloren = 0 (0% Verlust),
    Ca. Zeitangaben in Millisek.:
        Minimum = 0ms, Maximum = 1ms, Mittelwert = 0ms

C:\Dokumente und Einstellungen\kdw>

```

Figure 13: Windows-PC TCP/IP communication check with *ping*

First check the cable connections and then the IP addresses if your *ping* does not work. Then check the TCP/IP setup of your PC.

2.9 Using a Telnet Connection

Run a Telnet client program on your PC with the IP address of the DNP/2486. You can use a Telnet session for remote entering Linux commands.

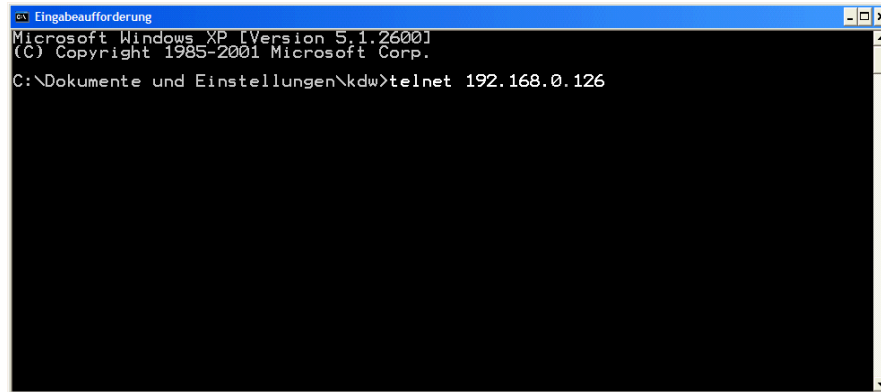


Figure 14: Run the Windows Telnet client program

Wait until the DNP/2486 MIN-Linux requests a user name. Please enter the user name *root*. This user needs no password. Then press Enter.



Please note: The DNP/2486 MIN-Linux comes with *BusyBox*. All MIN-Linux command line commands are implemented in *BusyBox*. *BusyBox* combines tiny versions of many common UNIX utilities into a single small executable. It provides replacements for most of the utilities you usually find in GNU *fileutils*, *shellutils*, etc. The utilities in *BusyBox* generally have fewer options than their full-featured GNU cousins; however, the options that are included provide the expected functionality and behave very much like their GNU counterparts. *BusyBox* provides a fairly complete environment for any small or embedded system.

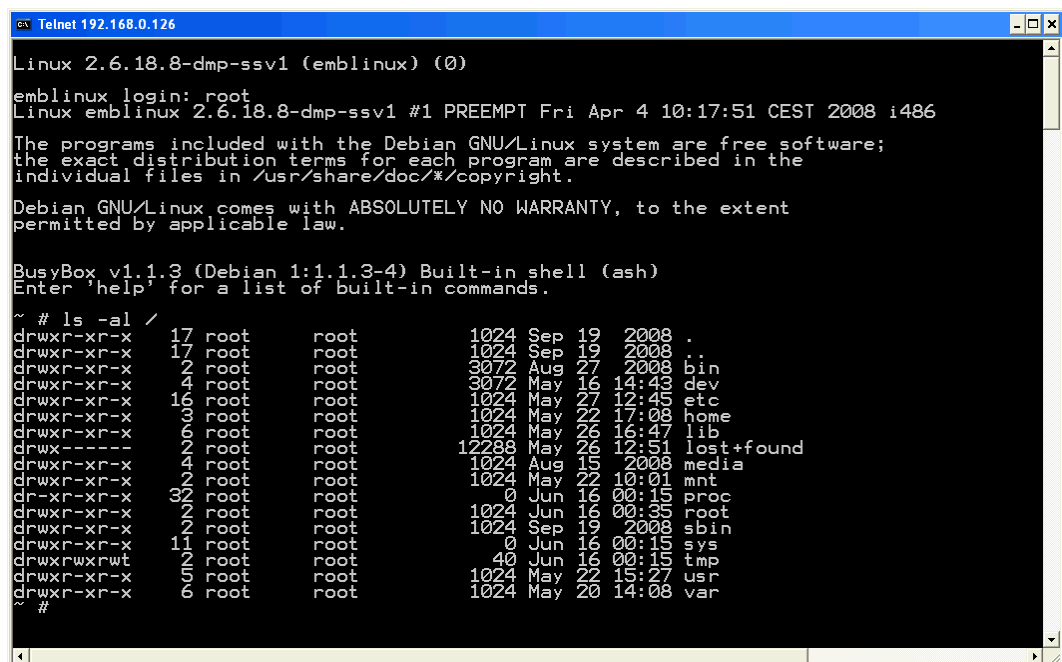


Figure 15: Using Linux commands within a Telnet client window

2.10 Checking FTP Server

The DIL/NetPC DNP/2486 Linux comes with a pre-installed FTP server. This server allows the file transfer between a PC and the DNP/2486.

Run an FTP client program on your PC. Set the session parameters for your FTP client to IP address **192.168.0.126**, user name **user** and password **user**. The DNP/2486 default directory for this FTP user name is **/home/user**. This directory is located within the DNP/2486 RAM disk.

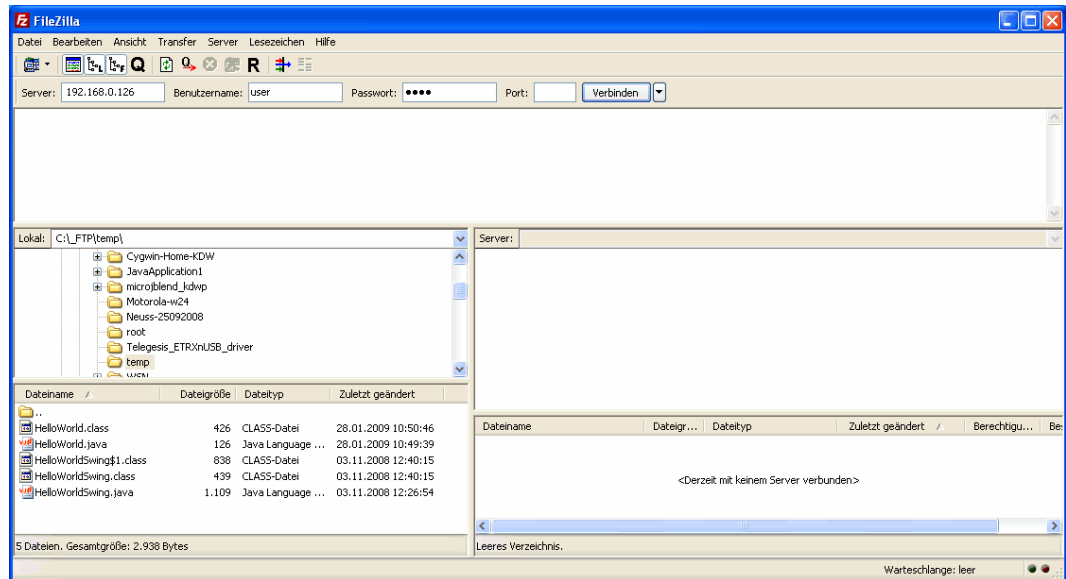


Figure 16: Set the session parameters for an FTP client program

Connect your FTP client with the DNP/2486 FTP server and transfer some files from the PC to the DNP/2486.

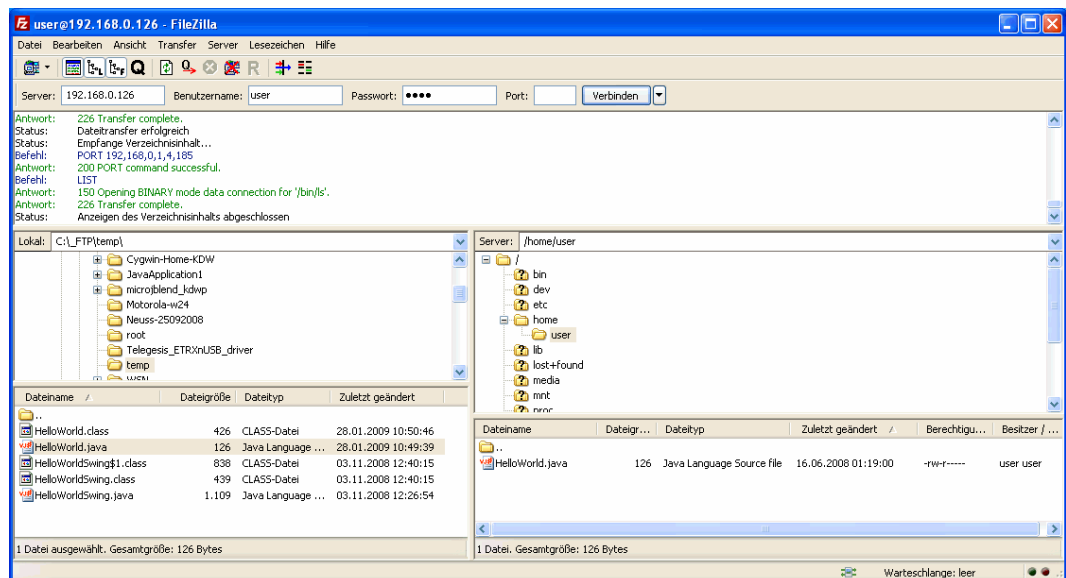
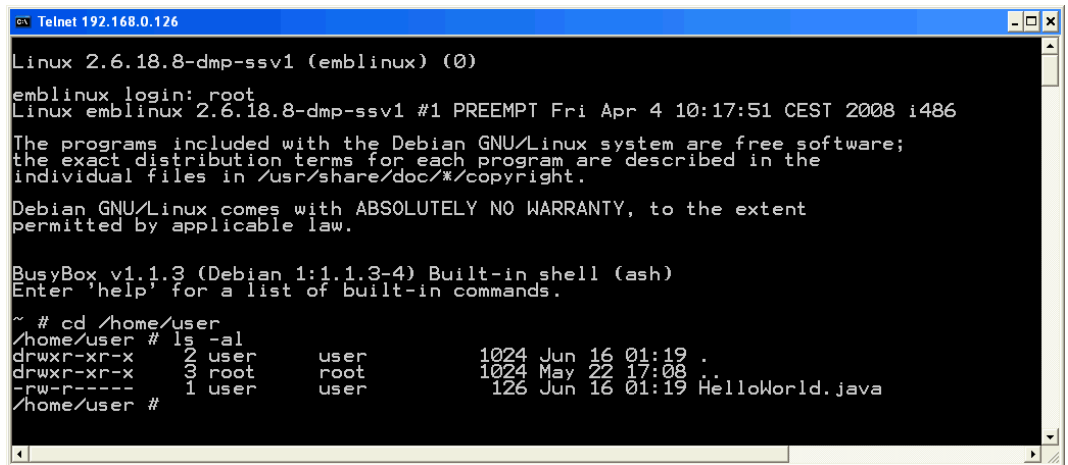


Figure 17: Transfer some files to the DNP/2486

Check the new files with a Telnet session. Change to the DNP/2486 default FTP directory `/home/user` within your Telnet session.



```
Telnet 192.168.0.126
Linux 2.6.18.8-dmp-ssv1 (emblinux) (0)
emblinux login: root
Linux emblinux 2.6.18.8-dmp-ssv1 #1 PREEMPT Fri Apr 4 10:17:51 CEST 2008 i486
The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
BusyBox v1.1.3 (Debian 1:1.1.3-4) Built-in shell (ash)
Enter 'help' for a list of built-in commands.
~ # cd /home/user
/home/user # ls -al
drwxr-xr-x  2 user      user      1024 Jun 16 01:19 .
drwxr-xr-x  3 root      root      1024 May 22 17:08 ..
-rw-r----- 1 user      user       126 Jun 16 01:19 HelloWorld.java
/home/user #
```

Figure 18: The new files within `/home/user`

2.11 Checking TFTP Client

The DIL/NetPC DNP/2486 Linux offers also a pre-installed TFTP client. This program allows the TFTP-based file transfer between a PC and the DNP/2486.

First run a TFTP server program on your PC system. Linux-based PCs offer a TFTP server as part of the standard networking feature set. For Windows-based PCs please use the free *Win32 TFTP* server program from the Starter Kit CD-ROM (see directory /TFTP-Server-Win32 at the Starter Kit CD-ROM).

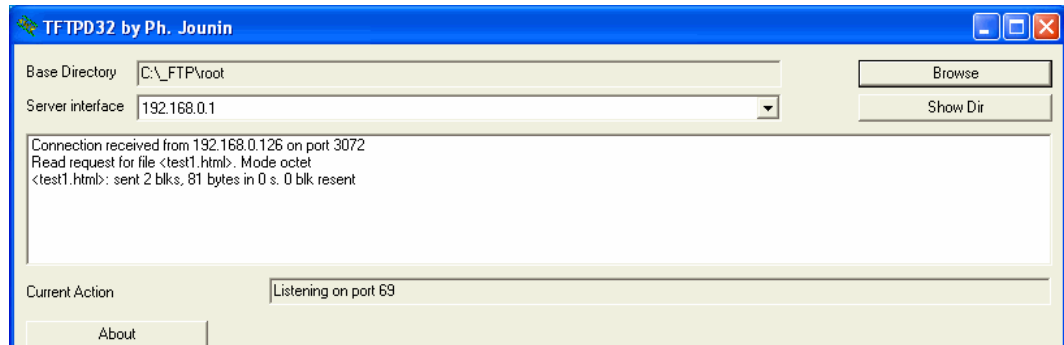


Figure 19: Running the Win32 TFTP server

Figure 19 shows the free Win32 TFTP server in action. This server allows file transfers to and from any DNP/2486 directory.

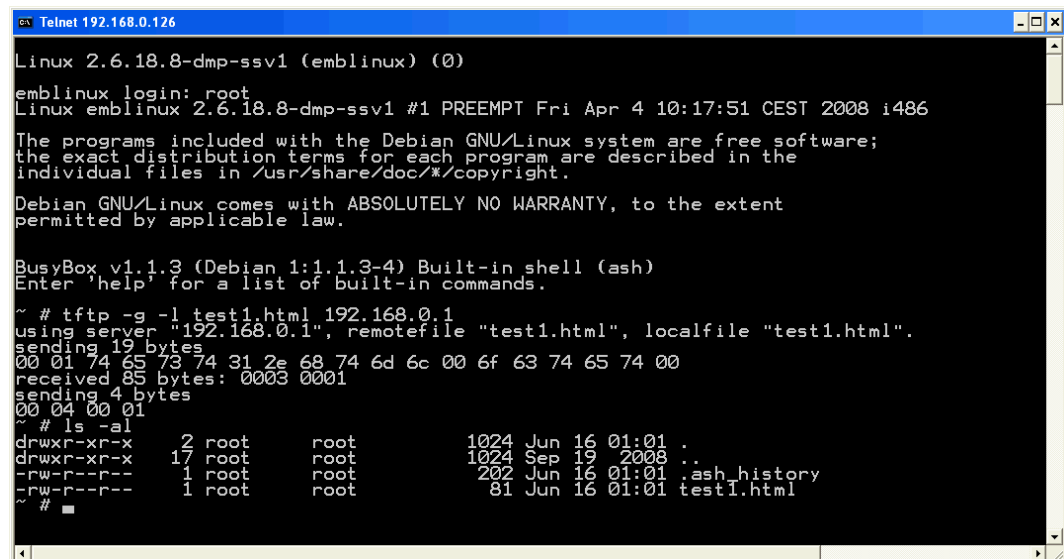


Figure 20: Download with TFTP get command

Enter your get and put commands within a Telnet session. Figure 20 shows a sample for a TFTP get command (getting a file from the PC to the DNP/2486). Here we enter:

```
tftp -g -l test1.html 192.168.0.1
```

test1.html is the filename which is requested from the TFTP server. 192.168.0.1 is the TFTP server IP address.

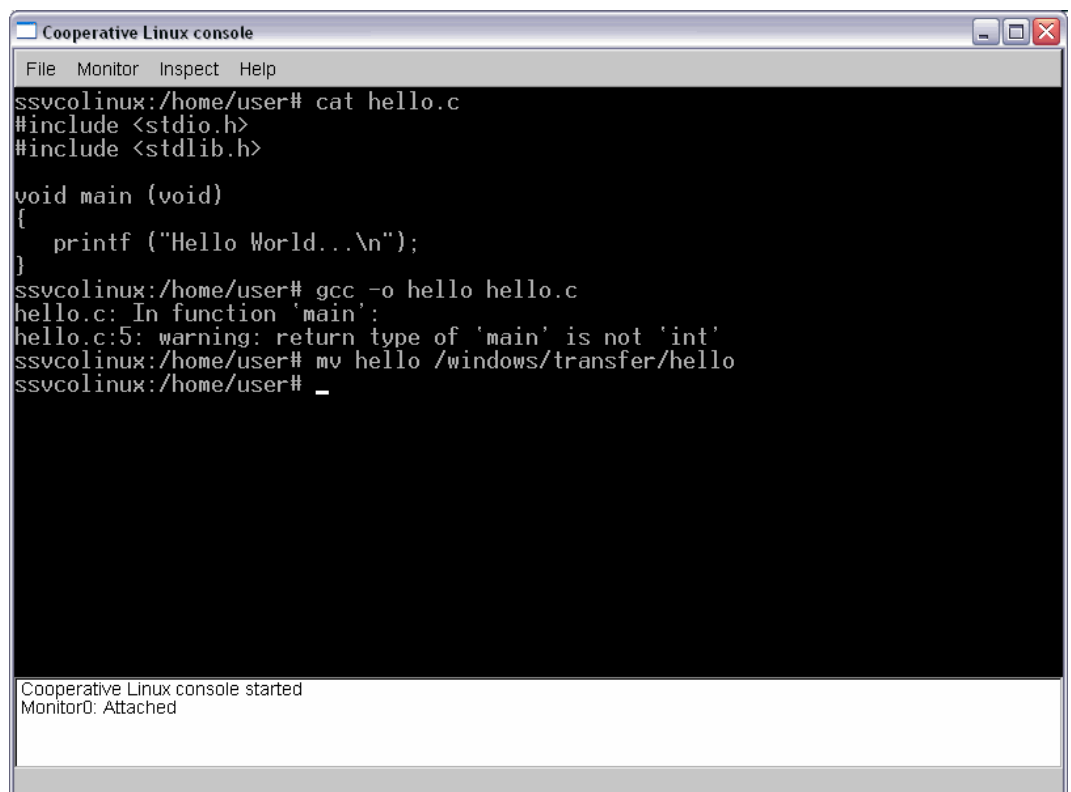
2.12 “Hello World” with SSV coLinux

The SSV coLinux tool chain allows you to write C/C++ programs for the DIL/NetPC DNP/2486 within your Windows XP environment. It is not necessary to setup a Linux-based PC for the DIL/NetPC C/C++ programming.

Before following the next steps make sure, that the SSV coLinux tool chain is installed on your Windows XP-based PC. It is also required to have a transfer directory for moving files between the Windows XP and coLinux. The directory can be C:\colinux\transfer. From coLinux you can access the directory with the path name /windows/transfer.

Run coLinux within your Windows XP environment. Use the user name *root* and the password *root* for your coLinux login. Then move to the coLinux directory /home/user within the coLinux user console. Within the user console please execute the following command line sequence:

```
cat > hello.c
#include <stdio.h>
void main (void)
{
    printf ("Hello World.\n");
}
CTRL-D (Stops the cat command)
gcc -o hello hello.c
mv hello /windows/transfer/hello
```



```
Cooperative Linux console
File Monitor Inspect Help
ssvcolinux:/home/user# cat hello.c
#include <stdio.h>
#include <stdlib.h>

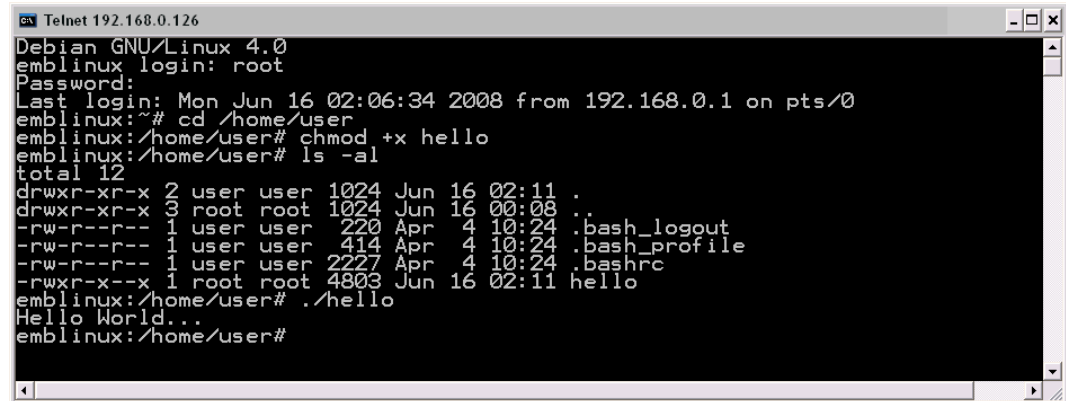
void main (void)
{
    printf ("Hello World...\n");
}
ssvcolinux:/home/user# gcc -o hello hello.c
hello.c: In function 'main':
hello.c:5: warning: return type of 'main' is not 'int'
ssvcolinux:/home/user# mv hello /windows/transfer/hello
ssvcolinux:/home/user# _

Cooperative Linux console started
Monitor0: Attached
```

Figure 21: Creating hello world within the Linux console

The command line sequence creates the executable *hello* for the x86/IA-32-based DNP/2486 with a Linux 2.6 kernel. Then transfer the executable with the help of FTP or TFTP to the DIL/NetPC DNP/2486 and run the executable. Don't forget the

```
chmod +x hello
```



```

Telnet 192.168.0.126
Debian GNU/Linux 4.0
emblinux login: root
Password:
Last login: Mon Jun 16 02:06:34 2008 from 192.168.0.1 on pts/0
emblinux:~# cd /home/user
emblinux:/home/user# chmod +x hello
emblinux:/home/user# ls -al
total 12
drwxr-xr-x  2 user user 1024 Jun 16 02:11 .
drwxr-xr-x  3 root root 1024 Jun 16 00:08 ..
-rw-r--r--  1 user user  220 Apr  4 10:24 .bash_logout
-rw-r--r--  1 user user  414 Apr  4 10:24 .bash_profile
-rw-r--r--  1 user user 2227 Apr  4 10:24 .bashrc
-rwxr-x--x  1 root root 4803 Jun 16 02:11 hello
emblinux:/home/user# ./hello
Hello World...
emblinux:/home/user#

```

Figure 22: Executing hello world within the Linux console

Please note: C/C++ programming for the DNP/2486 doesn't need a cross GCC. You can use the native GCC of a Linux environment with kernel version 2.6.

3 MIN-LINUX

The MIN-Linux system is using a RAM disk image based on the Debian Etch (4.0) distribution. The RAM disk has been built from scratch to support all features of the kernel and hardware specific modules for the Vortex86SX SOC of the DNP/2486.

The RAM disk offers console-based access to the platform, either through serial line or using the Telnet protocol over Ethernet.

This minimal system may also be used to upgrade the system to MAX-Linux which offers a complete console based system with all features known from the famous Debian desktop version.

3.1 Main Features

- Syslinux 3.63 based bootloader system for USB-NAND flash
- Linux-Kernel Version 2.6.18.8-dmp-ssv1 (standard debian kernel module subset)
- MIN-Linux Debian Etch (4.0) based ext2 ramdisk image

3.2 Busybox

- BusyBox v1.1.3
- Build in commands:

[, [[, adjtimex, ar, arping, ash, awk, basename, bunzip2, busybox, bzip, cal, cat, chgrp, chmod, chown, chroot, chvt, clear, cmp, cp, cpio, cut, date, dc, dd, dealloct, df, dirname, dmesg, dos2unix, du, dumpkmap, dumpleases, echo, egrep, env, expr, false, fgrep, find, fold, free, ftpget, ftpput, getopt, grep, gunzip, gzip, head, hexdump, hostid, hostname, httpd, id, ifconfig, ip, ipaddr, ipcalc, iplink, iproute, iptunnel, kill, killall, klogd, last, length, ln, loadfont, loadkmap, logger, login, logname, logread, losetup, ls, md5sum, mkdir, mkfifo, mknod, mktemp, more, mount, mt, mv, nameif, nc, netstat, nslookup, od, openvt, patch, pidof, ping, ping6, printf, ps, pwd, rdate, readlink, realpath, renice, reset, rm, rmdir, route, rpm, rpm2cpio, run-parts, sed, setkeycodes, sh, sha1sum, sleep, sort, start-stop-daemon, strings, stty, swapoff, swapon, sync, syslogd, tail, tar, tee, telnet, telnetd, test, tftp, time, top, touch, tr, traceroute, true, tty, udhcpc, udhcpd, umount, uname, uncompress, uniq, unix2dos, unzip, uptime, usleep, uudecode, uencode, vi, watch, watchdog, wc, wget, which, who, whoami, xargs, yes, zcat

3.3 Filesystem Tools

- vfat, fat, msdos, iso (iso8859) kernel modules for filesystem mount support
- fdisk harddisk partitioning tool
- mkfs.ext2, mkfs.ext3, mkfs.vfat, mkfs.msos formatting tool
- tune2fs tool
- loop device support

3.4 Network Features

- ipv4 and ipv6 kernel modules
- telnet-daemon for network remote login
- ftp-daemon for network file transfer
- tftp client (included in busybox)

3.5 Kernel Module Support

- lsmod
- depmod
- modprobe
- rmmmod

3.6 Other Features

- login and getty standard utilities for remote login
- passwd password utility (only temporary)
- pivot_root, chroot capabilities
- halt, reboot, shutdown features
- kernel module support for USB HID devices (mouse, keyboard..)

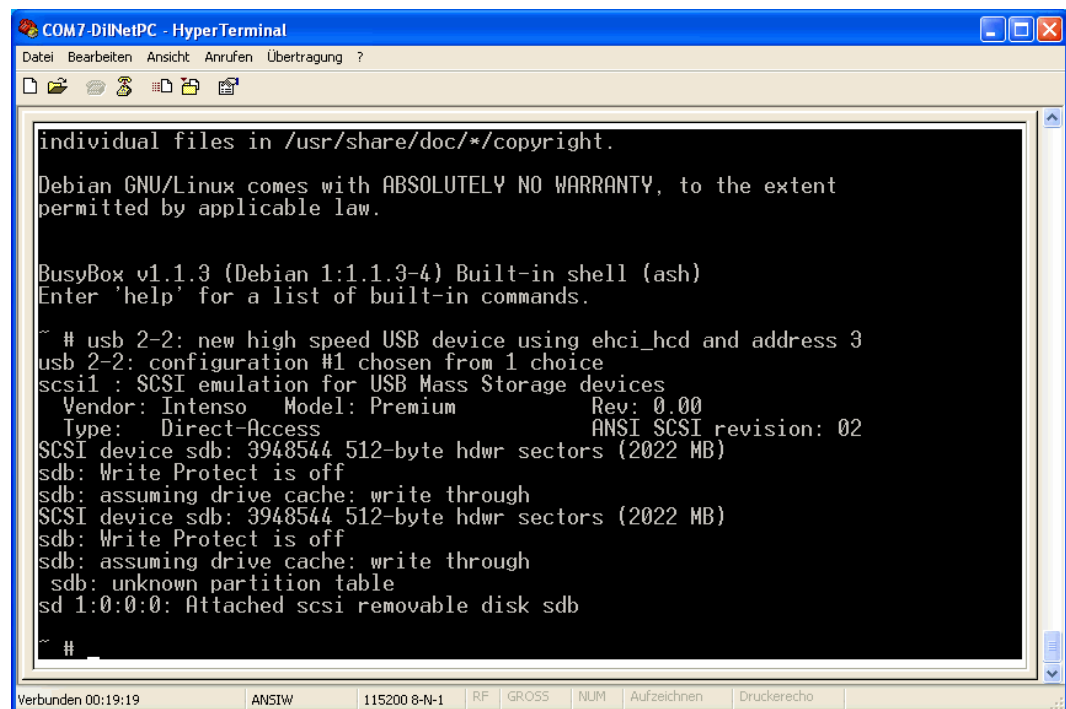
4 MAX-LINUX

4.1 Upgrade to MAX-Linux

The following steps describe how to upgrade the preinstalled MIN-Linux of the DNP/2486 to a full-featured Debian MAX-Linux. To follow these steps it is necessary to access the DNP/2486 MIN-Linux over a serial console.

Alternatively it is possible to install a ROM-DOS operating system for the DNP/2486. Please contact us for further information.

Insert the USB stick with the ready-to-install MAX-Linux to connector J9 (USB host port) of the evaluation board. Watch the USB driver messages for the device name. The USB stick will be the disk device sdb or sdb1.



```

individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.

BusyBox v1.1.3 (Debian 1:1.1.3-4) Built-in shell (ash)
Enter 'help' for a list of built-in commands.

~ # usb 2-2: new high speed USB device using ehci_hcd and address 3
usb 2-2: configuration #1 chosen from 1 choice
scsil : SCSI emulation for USB Mass Storage devices
  Vendor: Intenso   Model: Premium           Rev: 0.00
  Type:   Direct-Access             ANSI SCSI revision: 02
SCSI device sdb: 3948544 512-byte hdwr sectors (2022 MB)
sdb: Write Protect is off
sdb: assuming drive cache: write through
SCSI device sdb: 3948544 512-byte hdwr sectors (2022 MB)
sdb: Write Protect is off
sdb: assuming drive cache: write through
sdb: unknown partition table
sd 1:0:0:0: Attached scsi removable disk sdb

~ #
  
```

Figure 23: The serial console shows the USB driver messages with the device name

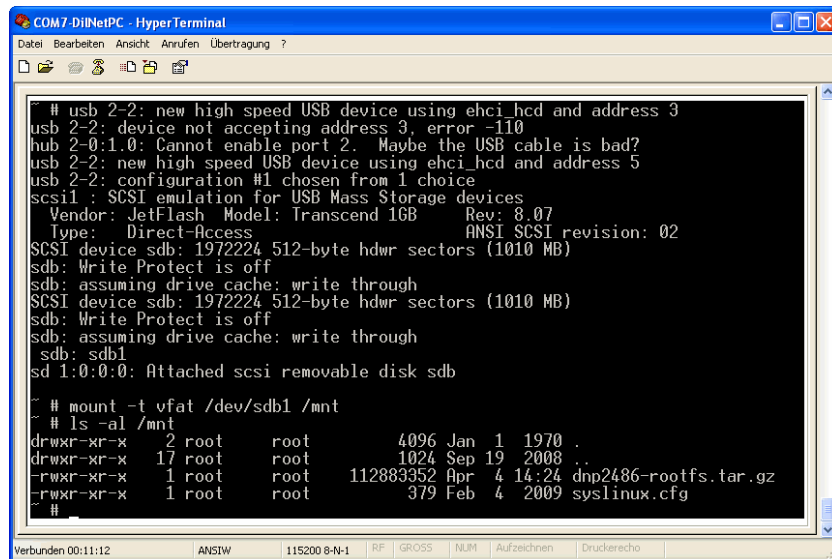
The USB stick contains two files `dnp2486-rootfs.tar.gz` and `syslinux.cfg`. The archive file `dnp2486-rootfs.tar.gz` offers a new file system for the DNP/2486 NAND flash. This file system is the main difference between the MIN- and MAX-Linux. The Linux kernel for both versions is the same.

Please mount the USB stick with one of the following two command lines to the DNP/2486 directory `/mnt`:

```
mount -t vfat /dev/sdb /mnt
```

or

```
mount -t vfat /dev/sdb1 /mnt
```



```

COM7-DiInetPC - HyperTerminal
Datei Bearbeiten Ansicht Anrufen Übertragung ?
# usb 2-2: new high speed USB device using ehci_hcd and address 3
usb 2-2: device not accepting address 3, error -110
hub 2-0:1.0: Cannot enable port 2. Maybe the USB cable is bad?
usb 2-2: new high speed USB device using ehci_hcd and address 5
usb 2-2: configuration #1 chosen from 1 choice
scsi1 : SCSI emulation for USB Mass Storage devices
Vendor: JetFlash Model: Transcend 1GB Rev: 8.07
Type: Direct-Access ANSI SCSI revision: 02
SCSI device sdb: 1972224 512-byte hdwr sectors (1010 MB)
sdb: Write Protect is off
sdb: assuming drive cache: write through
SCSI device sdb: 1972224 512-byte hdwr sectors (1010 MB)
sdb: Write Protect is off
sdb: assuming drive cache: write through
sdb: sdb1
sd 1:0:0:0: Attached scsi removable disk sdb

# mount -t vfat /dev/sdb1 /mnt
# ls -al /mnt
drwxr-xr-x  2 root    root      4096 Jan  1  1970 .
drwxr-xr-x 17 root    root      1024 Sep 19  2008 ..
-rwxr-xr-x  1 root    root    11288352 Apr  4 14:24 dnp2486-rootfs.tar.gz
-rwxr-xr-x  1 root    root      379 Feb  4  2009 syslinux.cfg
#
    
```

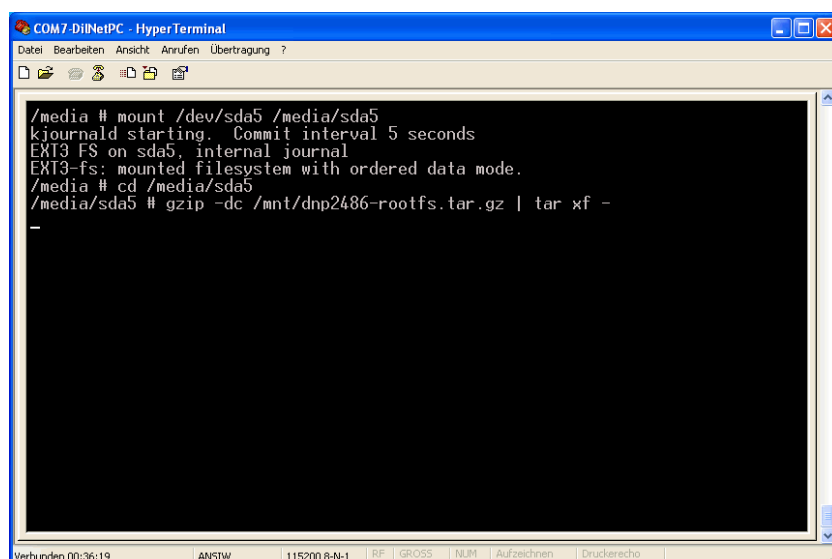
Figure 24: The USB stick with the ready-to-install MAX-Linux offers two files

Next please mount the internal partition of the DNP/2486 NAND flash to /media/sda5. Than change to this directory and run the gzip tool to unpack dnp2486-rootfs.tar.gz.

```

mount /dev/sda5 /media/sda5
cd /media/sda5
gzip -dc /mnt/dnp2486-rootfs.tar.gz | tar xf -
    
```

This will extract the archive file and create the complete new root filesystem in the extended partition of the DNP/2486 NAND flash. Because the final filesystem will occupy about 300 MByte in flash memory this may take a while (approx. 10 minutes). So please be patient and leave the system alone to do its job. Do not eject the USB stick during this process or power down the DNP/2486. This may lead to data loss or leave your system unusable. So please take care!



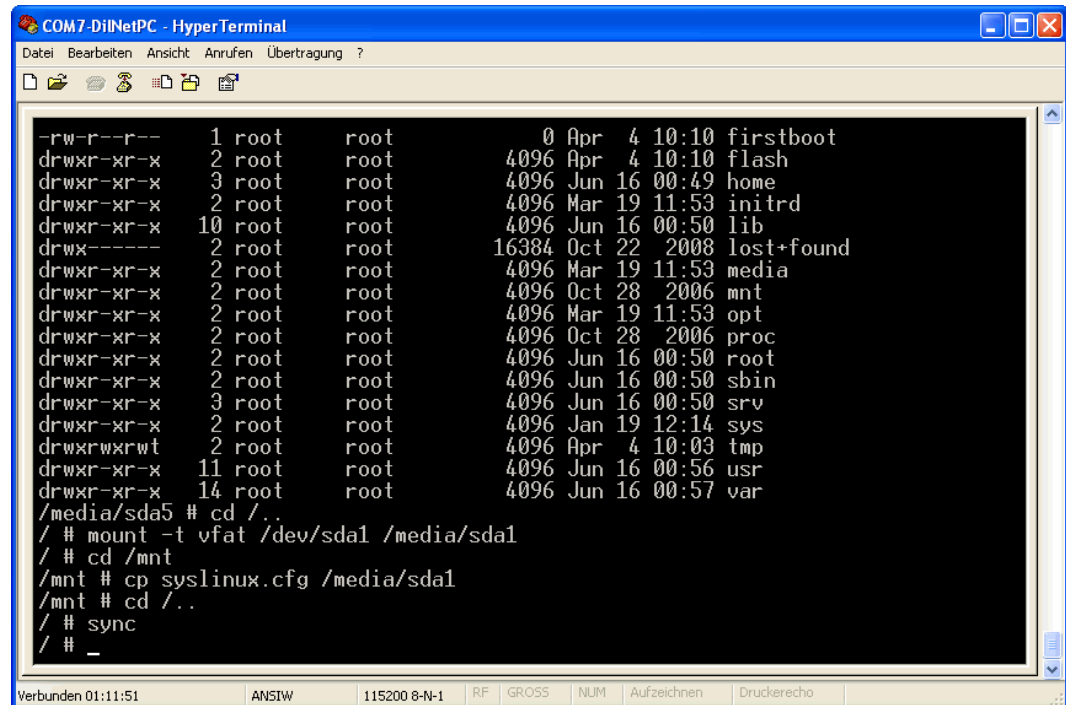
```

COM7-DiInetPC - HyperTerminal
Datei Bearbeiten Ansicht Anrufen Übertragung ?
/media # mount /dev/sda5 /media/sda5
kjournald starting. Commit interval 5 seconds
EXT3 FS on sda5, internal journal
EXT3-fs: mounted filesystem with ordered data mode.
/media # cd /media/sda5
/media/sda5 # gzip -dc /mnt/dnp2486-rootfs.tar.gz | tar xf -
-
    
```

Figure 25: To extract the archive file form USB to NAND flash needs some time

After the gzip tool finish's so please check with the following command line the new files and directory within /media/sda5.

```
ls -al
```



```
COM7-DII NetPC - HyperTerminal
Datei Bearbeiten Ansicht Anrufen Übertragung ?
-rw-r--r-- 1 root root 0 Apr 4 10:10 firstboot
drwxr-xr-x 2 root root 4096 Apr 4 10:10 flash
drwxr-xr-x 3 root root 4096 Jun 16 00:49 home
drwxr-xr-x 2 root root 4096 Mar 19 11:53 initrd
drwxr-xr-x 10 root root 4096 Jun 16 00:50 lib
drwx----- 2 root root 16384 Oct 22 2008 lost+found
drwxr-xr-x 2 root root 4096 Mar 19 11:53 media
drwxr-xr-x 2 root root 4096 Oct 28 2006 mnt
drwxr-xr-x 2 root root 4096 Mar 19 11:53 opt
drwxr-xr-x 2 root root 4096 Oct 28 2006 proc
drwxr-xr-x 2 root root 4096 Jun 16 00:50 root
drwxr-xr-x 2 root root 4096 Jun 16 00:50 sbin
drwxr-xr-x 3 root root 4096 Jun 16 00:50 srv
drwxr-xr-x 2 root root 4096 Jan 19 12:14 sys
drwxrwxrwt 2 root root 4096 Apr 4 10:03 tmp
drwxr-xr-x 11 root root 4096 Jun 16 00:56 usr
drwxr-xr-x 14 root root 4096 Jun 16 00:57 var
/media/sda5 # cd ../
/ # mount -t vfat /dev/sda1 /media/sda1
/ # cd /mnt
/mnt # cp syslinux.cfg /media/sda1
/mnt # cd ../
/ # sync
/ # _
```

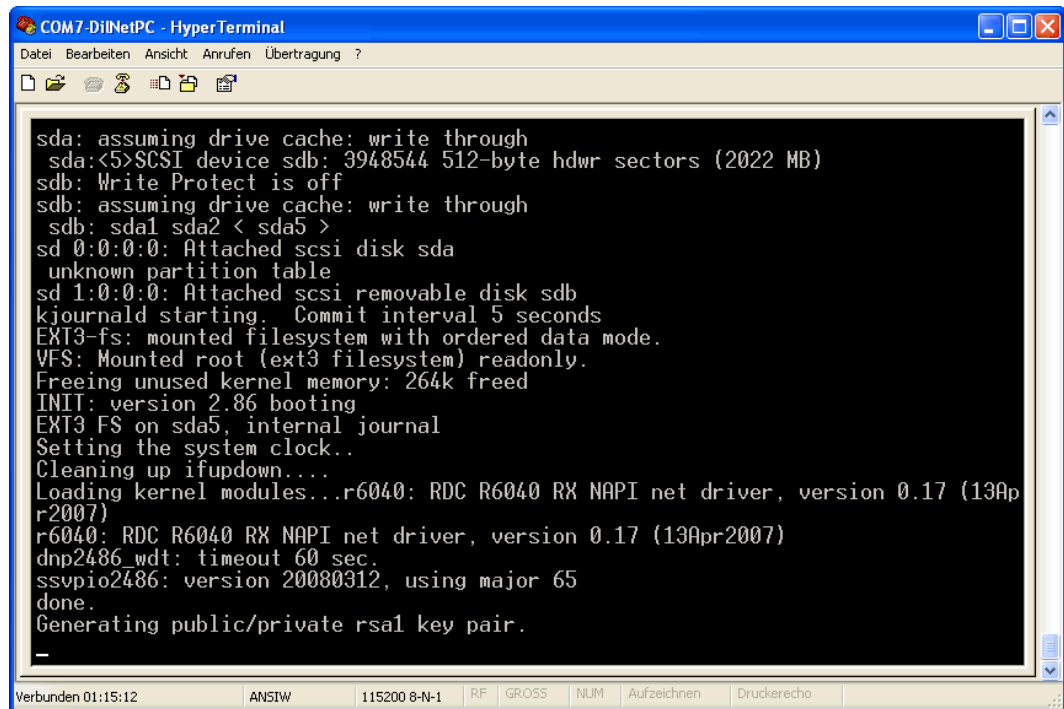
Figure 26: The unzip process creates new files directory within /media/sda5

With the following sequence of command lines we modify the DNP/2486 Linux boot loader within the directory /media/sda1 to boot from now on the MAX-Linux.

```
cd ../
mount -t vfat /dev/sda1 /media/sda1
cd /mnt
cp syslinux.cfg /media/sda1
cd ../
sync
```

Finally we have to un-mount the directories /media/sda1, /media/sda5 and /mnt from the root filesystem. After that steps please reboot the DNP/2486 to start the MAX-Linux.

```
umount /media/sda1
umount /media/sda5
umount /mnt
```



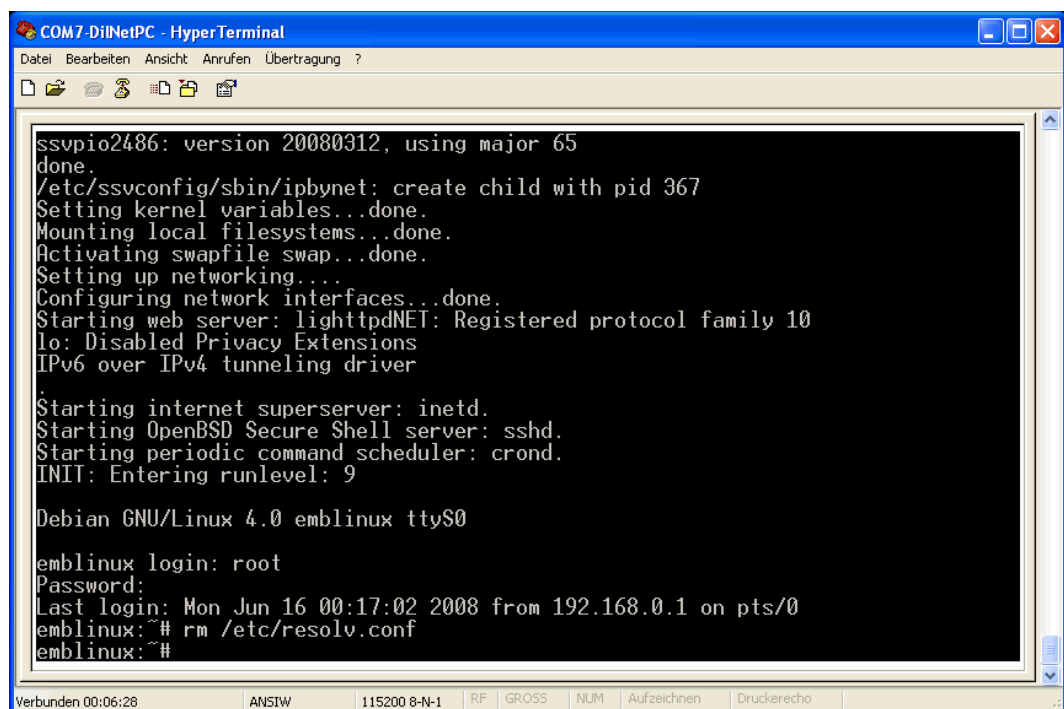
```

COM7-DiiNetPC - HyperTerminal
Datei Bearbeiten Ansicht Anrufen Übertragung ?
sda: assuming drive cache: write through
sda:<5>SCSI device sdb: 3948544 512-byte hdwr sectors (2022 MB)
sdb: Write Protect is off
sdb: assuming drive cache: write through
sdb: sda1 sda2 < sda5 >
sd 0:0:0:0: Attached scsi disk sda
unknown partition table
sd 1:0:0:0: Attached scsi removable disk sdb
kjournald starting. Commit interval 5 seconds
EXT3-fs: mounted filesystem with ordered data mode.
VFS: Mounted root (ext3 filesystem) readonly.
Freeing unused kernel memory: 264k freed
INIT: version 2.86 booting
EXT3 FS on sda5, internal journal
Setting the system clock..
Cleaning up ifupdown...
Loading kernel modules...r6040: RDC R6040 RX NAPI net driver, version 0.17 (13Apr2007)
r6040: RDC R6040 RX NAPI net driver, version 0.17 (13Apr2007)
dnp2486_wdt: timeout 60 sec.
ssvpio2486: version 20080312, using major 65
done.
Generating public/private rsa1 key pair.
    
```

Figure 27: The first MAX-Linux boot needs some time for SSL key generation

After the MAX-Linux boot process finish, the DNP/2486 shows a login prompt. Please use the login name *root* and the password *root*. Then erase the file `/etc/resolv.conf`. This step will be only necessary after the first MAX-Linux login.

```
rm /etc/resolv.conf
```



```

COM7-DiiNetPC - HyperTerminal
Datei Bearbeiten Ansicht Anrufen Übertragung ?
ssvpio2486: version 20080312, using major 65
done.
/etc/sshconfig/sbin/ipbynet: create child with pid 367
Setting kernel variables...done.
Mounting local filesystems...done.
Activating swapfile swap...done.
Setting up networking...
Configuring network interfaces...done.
Starting web server: lighttpdNET: Registered protocol family 10
lo: Disabled Privacy Extensions
IPv6 over IPv4 tunneling driver

Starting internet superserver: inetd.
Starting OpenBSD Secure Shell server: sshd.
Starting periodic command scheduler: crond.
INIT: Entering runlevel: 9

Debian GNU/Linux 4.0 emblinux ttyS0

emblinux login: root
Password:
Last login: Mon Jun 16 00:17:02 2008 from 192.168.0.1 on pts/0
emblinux:~# rm /etc/resolv.conf
emblinux:~#
    
```

Figure 28: The MAX-Linux login needs the user name root and the password root

4.2 MAX-Linux Features

This part describes the main features of the user installable MAX-Linux system for the DIL/NetPC DNP/2486. MAX-Linux features a typical standard Linux system, based on the Debian Etch (4.0) distribution. MAX-Linux makes use of a complete user defined boot process that uses special kernel parameters to boot into rootfs without the need of initial RAM disk.

The MAX-Linux root filesystem uses an extended ext3 partition of the DNP/2486 NAND flash memory and offers complete user access (non-volatile R/W access). All features of the kernel and hardware specific modules for the Vortex86SX SOC are integrated, as well as the complete set of applications and tools known from base system of the famous Debian desktop version.

MAX-Linux offers console-based access to the platform, either through serial line or the Ethernet infrastructure and supports Telnet or the more secure ssh protocol.

5.2.1. Main Features

- Syslinux 3.63 based bootloader system for USB-NAND flash
- Linux-Kernel Version 2.6.18.8-dmp-ssv1 (standard debian kernel modules)
- Debian Etch (4.0) based ext3 rootfs filesystem (non-volatile)
- Java(TM) SE Runtime Environment (build 1.6.0_03-b05)

5.2.2. General Tools

- GNU bash (Version 3.1.17)
- Perl interpreter (Version 5.8.8)
- apt-get and aptitude (Software package management)
- packaging tools (tar, gzip, bzip2, zip)
- midnight commander (file manager)
- Rich set of command line applications and tools known from the Debian desktop version

5.2.3. File System Tools

- vfat, fat, msdos, iso (iso8859), nfs and many more modules for filesystem mount support
- fdisk harddisk partitioning tool
- mkfs.ext2, mkfs.ext3, mkfs.vfat, mkfs.msdos formating tool
- tune2fs tool
- loop device support

5.2.4. Network Features

- dhcp client
- ipv4 and ipv6 kernel modules
- telnet-deamon for network remote login
- ssh-deamon for secure network remote login
- ftp-deamon for network file transfer
- full featured tftp client
- webserver lighttpd
- socat

5.2.5. Kernel Module Support

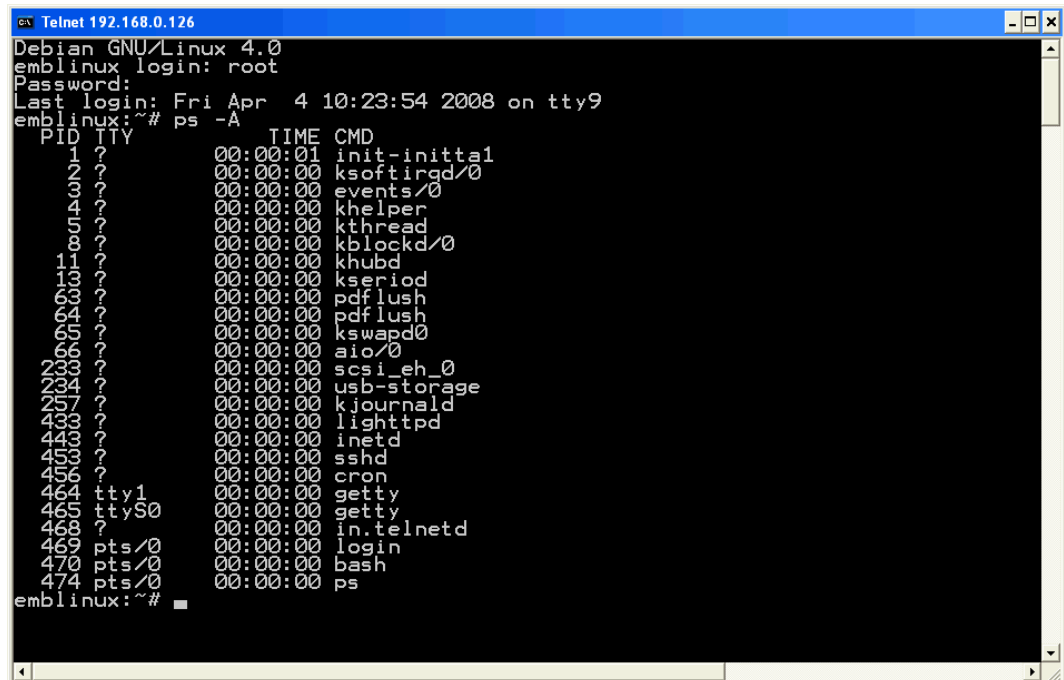
- lsmod
- depmod
- modprobe
- rmmod

5.2.6. Other Features

- minicom
- login and getty standard utilities for remote login
- passwd password utility
- addgroup, adduser, delgroup, deluser (non-volatile user management)
- pivot_root, chroot capabilities
- halt, reboot, shutdown features
- full kernel module support (standard Debian kernel modules for a variety of devices)

4.3 Telnet Session with MAX-Linux

The MAX-Linux offers a Telnet server. You can use this server for Telnet a session from a remote PC. Run a Telnet client program on your PC with the IP address of the DNP/2486 (the default IP address is 192.168.0.126).



```
Telnet 192.168.0.126
Debian GNU/Linux 4.0
emblinux login: root
Password:
Last login: Fri Apr  4 10:23:54 2008 on tty9
emblinux:~# ps -A
PID TTY          TIME CMD
  1  ?           00:00:01 init-inittal
  2  ?           00:00:00 ksoftirqd/0
  3  ?           00:00:00 events/0
  4  ?           00:00:00 khelper
  5  ?           00:00:00 kthread
  6  ?           00:00:00 kblockd/0
 11  ?           00:00:00 khubd
 13  ?           00:00:00 kseriod
 63  ?           00:00:00 pdflush
 64  ?           00:00:00 pdflush
 65  ?           00:00:00 kswapd0
 66  ?           00:00:00 aio/0
233  ?           00:00:00 scsi_eh_0
234  ?           00:00:00 usb-storage
257  ?           00:00:00 kjournald
430  ?           00:00:00 lighttpd
44  ?           00:00:00 inetd
45  ?           00:00:00 sshd
456  ?           00:00:00 cron
464  tty1        00:00:00 getty
465  ttyS0       00:00:00 getty
468  ?           00:00:00 in.telnetd
469  pts/0       00:00:00 login
470  pts/0       00:00:00 bash
474  pts/0       00:00:00 ps
emblinux:~#
```

Figure 29: Telnet session with the standard Windows Telnet client

Wait until the DNP/2486 requests a user name. Please enter the user name *root* and the password *root*. After a successful login the Telnet session allows you to execute Linux commands.

4.4 FTP Session with MAX-Linux

The MAX-Linux offers a FTP server. This server allows the file transfer between a PC and the DNP/2486. Run a FTP client program on your PC. Setup a connection to the DNP/2486 FTP server. Use the user name *root* and the password *root* for the FTP logins.

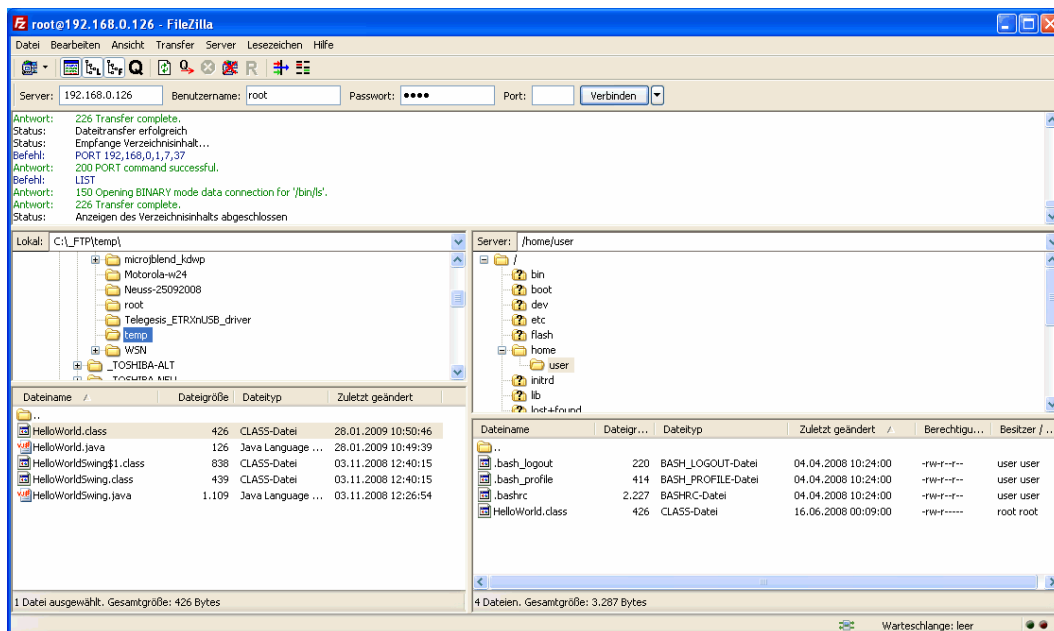


Figure 30: The FTP server allows R/W access to all MAX-Linux directories

After a successful FTP login the DNP/2486 MAX-Linux FTP server allows R/W access to all MAX-Linux directories.

4.5 TFTP Session with MAX-Linux

The MAX-Linux offers a TFTP client. This client is using different commands as the MIN-Linux TFTP client. To use a TFTP-based file transfer between a PC and the DNP/2486 first run a TFTP server on your PC.

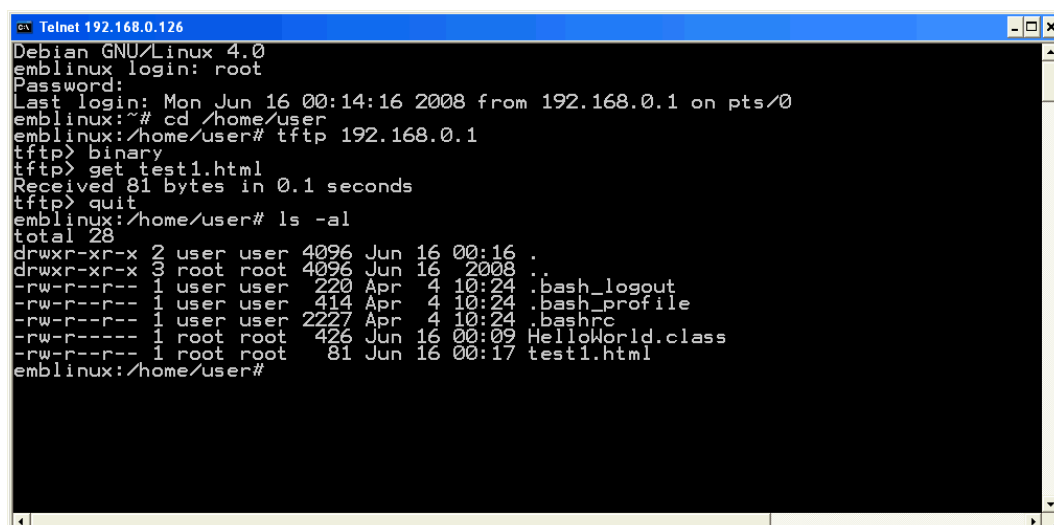


Figure 31: The TFTP client executes user commands for file transfers

The following sample shows the commands for transfer the file `test1.html` from the PC with TFTP server to the DNP/2486:

```
tftp 192.168.0.1
binary
get test1.html
quit
```

The first command line connects the client to the server with the IP address `192.168.0.1` (in this sample the PC) and sets the TFTP client in command line mode. The second command defines the TFTP binary operation mode (binary file transfer). The third command transfers the file. The final `quit` command terminates the TFTP client command line mode.

4.6 Changing the MAX-Linux IP Address (IPbyNet)

The ex factory value for the default IP address is `192.168.0.126`. The network mask for this address is `255.255.255.0`. You can change the IP address with the DIL/NetPC DNP/2486 *IPbyNET* feature.

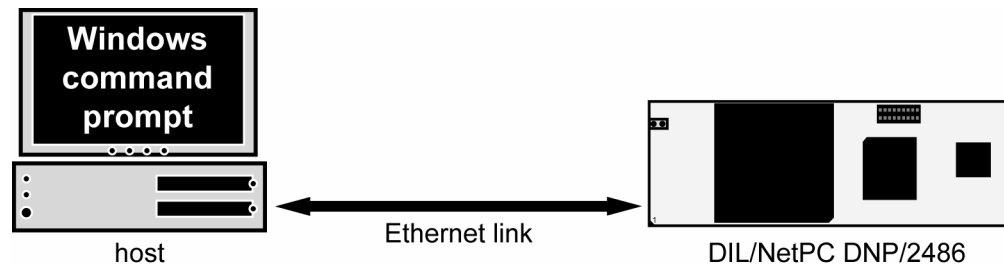
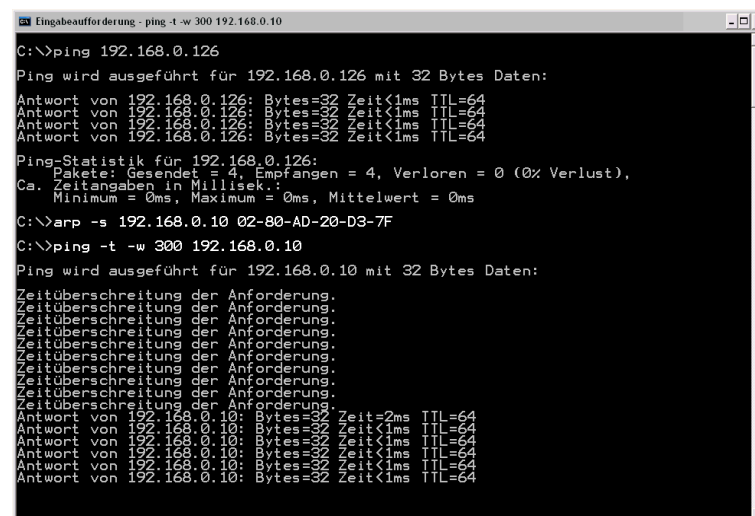


Figure 32: Environment for IP address change with *IPbyNet*

IPbyNET is a DNP/2486 MAX-Linux component, which checks direct after each boot process the presence of ICMP echo request packets with the MAC address of the DNP/2486 Ethernet LAN interface. If an ICMP packet is available, *IPbyNET* extracts the destination IP address from the ICMP echo request packet and sets the DNP/2486 Ethernet LAN interface with this IP address.



```
Eingabeaufforderung - ping -t -w 300 192.168.0.10
C:\>ping 192.168.0.126
Ping wird ausgefuehrt fuer 192.168.0.126 mit 32 Bytes Daten:
Antwort von 192.168.0.126: Bytes=32 Zeit<1ms TTL=64
Antwort von 192.168.0.126: Bytes=32 Zeit<1ms TTL=64
Antwort von 192.168.0.126: Bytes=32 Zeit<1ms TTL=64
Antwort von 192.168.0.126: Bytes=32 Zeit<1ms TTL=64
Ping-Statistik fuer 192.168.0.126:
    Pakete: Gesendet = 4, Empfangen = 4, Verloren = 0 (0% Verlust),
    Ca. Zeitangaben in Millisek.:
        Minimum = 0ms, Maximum = 0ms, Mittelwert = 0ms
C:\>arp -s 192.168.0.10 02-80-AD-20-D3-7F
C:\>ping -t -w 300 192.168.0.10
Ping wird ausgefuehrt fuer 192.168.0.10 mit 32 Bytes Daten:
Zeitueberschreitung der Anforderung.
Zeitueberschreitung der Anforderung.
Zeitueberschreitung der Anforderung.
Zeitueberschreitung der Anforderung.
Zeitueberschreitung der Anforderung.
Zeitueberschreitung der Anforderung.
Zeitueberschreitung der Anforderung.
Zeitueberschreitung der Anforderung.
Zeitueberschreitung der Anforderung.
Antwort von 192.168.0.10: Bytes=32 Zeit=2ms TTL=64
Antwort von 192.168.0.10: Bytes=32 Zeit<1ms TTL=64
Antwort von 192.168.0.10: Bytes=32 Zeit<1ms TTL=64
Antwort von 192.168.0.10: Bytes=32 Zeit<1ms TTL=64
Antwort von 192.168.0.10: Bytes=32 Zeit<1ms TTL=64
```

Figure 33: Changing the IP address with *IPbyNet*

Please see the label with the MAC address of the DIL/NetPC DNP/2486 on the top of your DIL/NetPC device to find the MAC address for your DNP/2486. Then run a Windows command prompt and enter the following two command lines:

```
arp -s 192.168.0.10 02-80-AD-20-D3-7F
ping -t -w 300 192.168.0.10
```

The first command line creates an ARP table entry for the IP address 192.168.0.10 and the MAC address 02-80-AD-20-D3-7F. The second command line sends an ICMP echo request to the device with the MAC address 02-80-AD-20-D3-7F. This request contains the new IP address 192.168.0.10.

Change the IP address and the MAC address of the two command lines. Use the IP address of your needs and the given MAC address from your DIL/NetPC DNP/2486.

Then reboot the DIL/NetPC DNP/2486. After a few seconds the DIL/NetPC DNP/2486 responds to the *ping* with the new IP address.



Please note: Changing the IP address of your DNP/2486 with *IPbyNET* resets also the web-based configuration interface settings to factory defaults!

4.7 Java-based “Hello World” for MAX-Linux

The DIL/NetPC DNP/2486 MAX-Linux comes with a preinstalled Java 6 runtime environment (Sun J2SE). This allows you to run platform-independent Java class files on the DNP/2486. Before following the next steps make sure, that the original Sun Java Development Kit (JDK) for Java 6 is installed on your development PC.

```
Eingabeaufforderung
C:\_FTP\temp>type HelloWorld.java
public class HelloWorld {
    public static void main(String[] args) {
        System.out.println("Hello World!");
    }
}
C:\_FTP\temp>javac HelloWorld.java
C:\_FTP\temp>dir HelloWorld.*
Volume in Laufwerk C: hat keine Bezeichnung.
Volumeseriennummer: 7CE4-3FA4

Verzeichnis von C:\_FTP\temp

28.01.2009  10:50                426 HelloWorld.class
28.01.2009  10:49                126 HelloWorld.java
           2 Datei(en)                   552 Bytes
           0 Verzeichnis(se), 30.798.061.568 Bytes frei

C:\_FTP\temp>java HelloWorld
Hello World!
C:\_FTP\temp>
```

Figure 34: Edit and compile the Java Hello World sample on your PC

Run a simple text editor or a special programmer editor on your development PC and enter the following text lines:

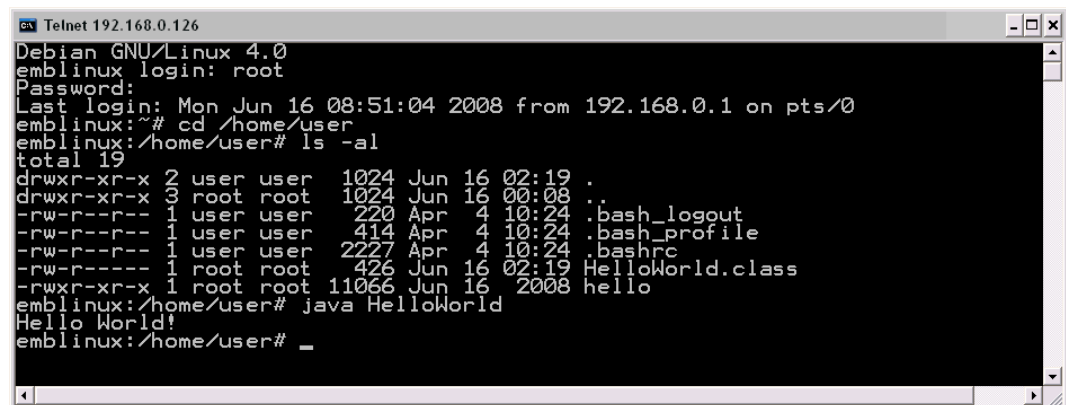
```
public class HelloWorld {
    public static void main(String[] args) {
        System.out.println("Hello World!");
    }
}
```

Store the sample lines within a file with the name `HelloWorld.java`. Then run your Java 6 compiler and generate a class file with the name `HelloWorld.class`. The command line for this task is:

```
javac HelloWorld.java
```

Transfer the class file `HelloWorld.class` with the help of FTP or TFTP to the DIL/NetPC DNP/2486. Then execute the class file with the following command line:

```
java HelloWorld
```



```
Telnet 192.168.0.126
Debian GNU/Linux 4.0
emblinux login: root
Password:
Last login: Mon Jun 16 08:51:04 2008 from 192.168.0.1 on pts/0
emblinux:~# cd /home/user
emblinux:/home/user# ls -al
total 19
drwxr-xr-x  2 user user  1024 Jun 16 02:19 .
drwxr-xr-x  3 root root  1024 Jun 16 00:08 ..
-rw-r--r--  1 user user   220 Apr  4 10:24 .bash_logout
-rw-r--r--  1 user user   414 Apr  4 10:24 .bash_profile
-rw-r--r--  1 user user  2227 Apr  4 10:24 .bashrc
-rw-r-----  1 root root   426 Jun 16 02:19 HelloWorld.class
-rwxr-xr-x  1 root root 11066 Jun 16 2008 hello
emblinux:/home/user# java HelloWorld
Hello World!
emblinux:/home/user# _
```

Figure 35: Run the Java Hello World sample on the DNP/2486

4.8 MAX-Linux Web Server Usage

The DIL/NetPC DNP/2486 MAX-Linux comes with a pre-installed lighttpd web server. This very powerful embedded web server allows you to build feature-rich web-based applications. To access the DNP/2486 web server, please run your PC web browser and use the URL:

http://192.168.0.126

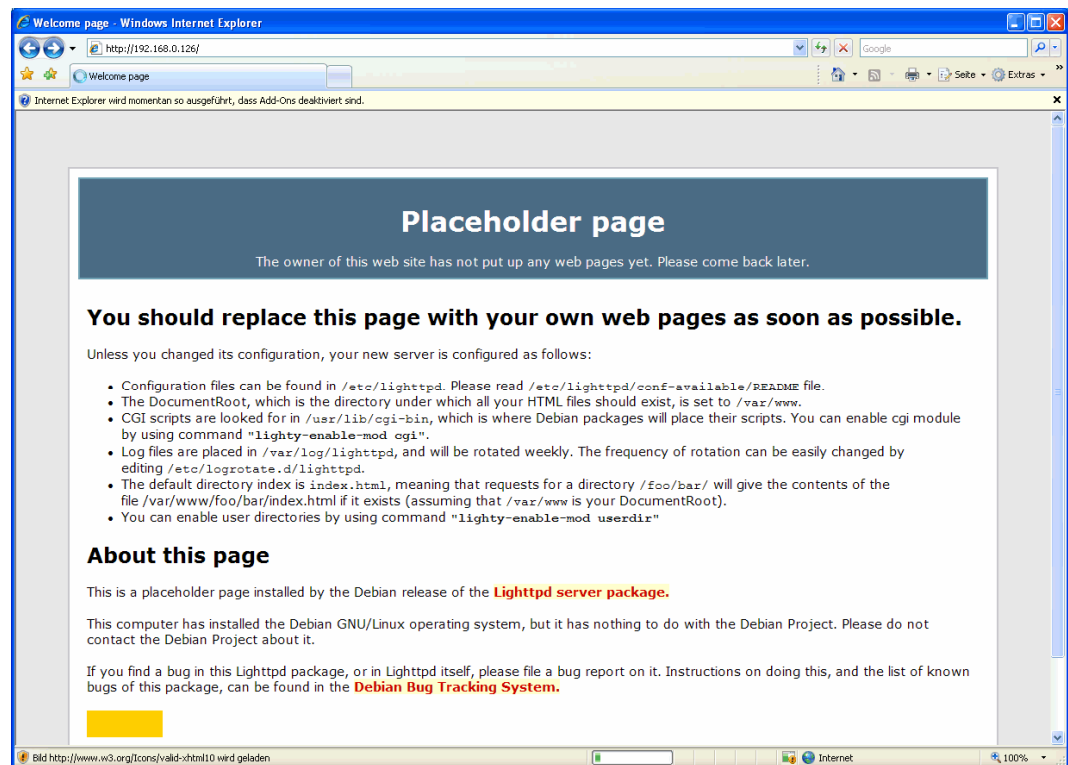


Figure 36: The web server delivers a placeholder web page a to PC web browser

Create your first own HTML page on your PC. For this sample save the HTML page content within a file with the name `test1.html`.

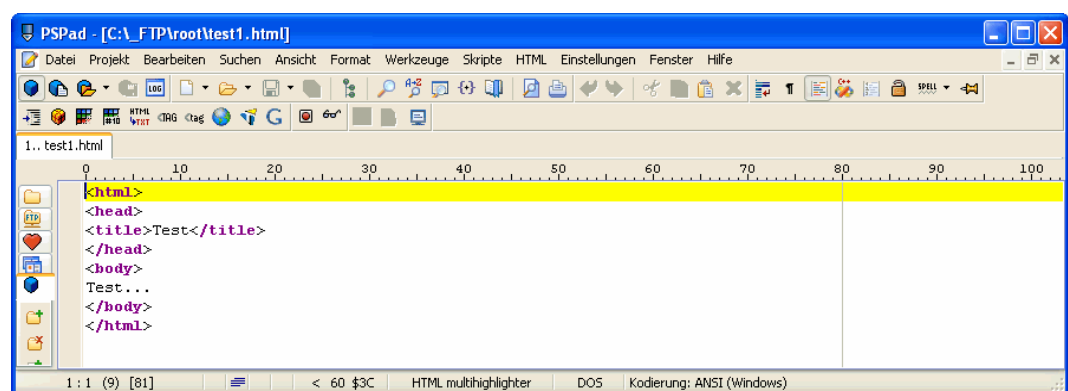


Figure 37: Use an editor and create the HTML sample file test1.html

Transfer the file `test1.html` with the help of FTP or TFTP to the DIL/NetPC DNP/2486 directory `/var/www`. Than change the attributes with

```
chmod +r /var/www/test1.html
```

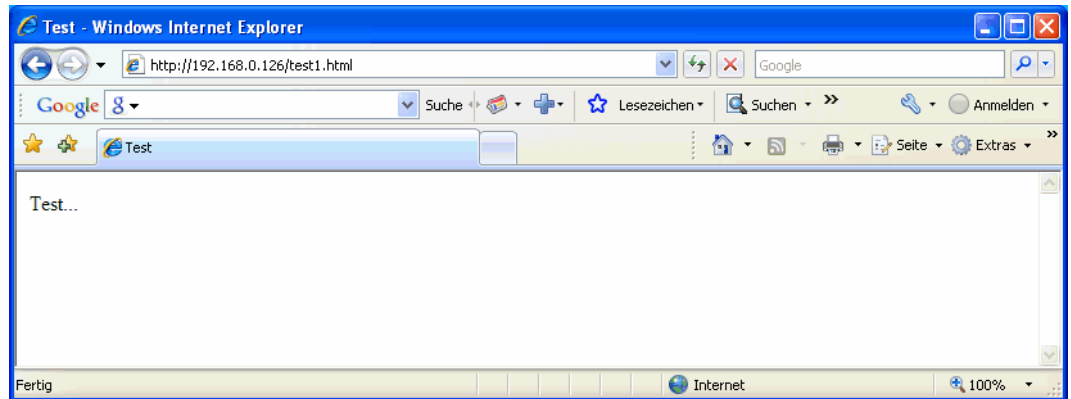


Figure 38: The URL `http://192.168.0.126/test1.html` delivers the new HTML file

To access the new the HTML sample file `test1.html` run your web browser and enter the URL:

```
http://192.168.0.126/test1.html
```

Directory	Usage
<code>/var/www</code>	HTML files
<code>/etc/lighttpd</code>	Web server configuration
<code>/var/log/lighttpd</code>	Web Server log files
<code>/usr/lib/cgi-bin</code>	CGI scripts files

Table 3: Important directories of the lighttpd web server

5 LINUX BOOT MESSAGES

5.1 MIN-Linux Boot Messages

```

Linux version 2.6.18.8-dmp-ssv1 (mha@hareangle-saturn) ↵
SSV20080404 (gcc-Version 4.1.2 20061115 (prerelease) (Debian ↵
4.1.1-21)) #1 PREEMPT Fri Apr 4 10:17:51 CEST 2008
BIOS-provided physical RAM map:
  BIOS-e820: 0000000000000000 - 000000000009fc00 (usable)
  BIOS-e820: 000000000009fc00 - 00000000000a0000 (reserved)
  BIOS-e820: 00000000000e0000 - 0000000000100000 (reserved)
  BIOS-e820: 0000000000100000 - 0000000000400000 (usable)
  BIOS-e820: 00000000ff000000 - 0000000100000000 (reserved)
64MB LOWMEM available.
DMI not present or invalid.
Allocating PCI resources starting at 10000000 (gap: ↵
04000000:fb000000)
Built 1 zonelists. Total pages: 16384
Kernel command line: initrd=initrd.gz root=/dev/ram0 rw con↵
sole=ttyS0,115200 pnpbios=off acpi=off rootdelay=0 ↵
BOOT_IMAGE=bzImage
No local APIC present or hardware disabled
Initializing CPU#0
PID hash table entries: 512 (order: 9, 2048 bytes)
Console: colour dummy device 80x25
Dentry cache hash table entries: 8192 (order: 3, 32768 bytes)
Inode-cache hash table entries: 4096 (order: 2, 16384 bytes)
Memory: 58644k/65536k available (1838k kernel code, 6440k re↵
served, 713k data, 264k init, 0k highmem)
Checking if this processor honours the WP bit even in ↵
supervisor mode... Ok.
Security Framework v1.0.0 initialized
SELinux: Disabled at boot.
Capability LSM initialized
Mount-cache hash table entries: 512
Compat vDSO mapped to fffffe00.
CPU: 486
Checking 'hlt' instruction... OK.
checking if image is initramfs...it isn't (no cpio magic); ↵
looks like an initrd
Freeing initrd memory: 2737k freed
NET: Registered protocol family 16
EISA bus registered
PCI: Using configuration type 1
Setting up standard PCI resources
ACPI: Interpreter disabled.
Linux Plug and Play Support v0.97 (c) Adam Belay
pnp: PnP ACPI: disabled
PnPBIOS: Disabled
SCSI subsystem initialized
usbcore: registered new driver usbfs
usbcore: registered new driver hub
PCI: Probing PCI hardware
PCI: Using IRQ router default [17f3/6031] at 0000:00:07.0
NET: Registered protocol family 2
IP route cache hash table entries: 512 (order: -1, 2048 bytes)
TCP established hash table entries: 2048 (order: 1, 8192 bytes)
TCP bind hash table entries: 1024 (order: 0, 4096 bytes)

```

```
TCP: Hash tables configured (established 2048 bind 1024)
TCP reno registered
audit: initializing netlink socket (disabled)
audit(1213575308.868:1): initialized
VFS: Disk quotas dquot_6.5.1
Dquot-cache hash table entries: 1024 (order 0, 4096 bytes)
Initializing Cryptographic API
io scheduler noop registered
io scheduler anticipatory registered
io scheduler deadline registered
io scheduler cfq registered (default)
isapnp: Scanning for PnP cards...
isapnp: No Plug & Play device found
Serial: 8250/16550 driver $Revision: 1.90 $ 4 ports, IRQ ↵
sharing enabled
serial8250: ttyS0 at I/O 0x3f8 (irq = 4) is a 16550A
serial8250: ttyS1 at I/O 0x2f8 (irq = 3) is a 16550A
serial8250: ttyS2 at I/O 0x3e8 (irq = 4) is a 16550A
serial8250: ttyS3 at I/O 0x2e8 (irq = 3) is a 16550A
RAMDISK driver initialized: 16 RAM disks of 8192K size 1024 ↵
blocksize
ehci_hcd 0000:00:0a.1: EHCI Host Controller
ehci_hcd 0000:00:0a.1: new USB bus registered, assigned bus ↵
number 1
ehci_hcd 0000:00:0a.1: irq 9, io mem 0x000e2000
ehci_hcd 0000:00:0a.1: USB 2.0 started, EHCI 1.00, driver 10 ↵
Dec 2004
usb usb1: configuration #1 chosen from 1 choice
hub 1-0:1.0: USB hub found
hub 1-0:1.0: 2 ports detected
ehci_hcd 0000:00:0b.1: EHCI Host Controller
ehci_hcd 0000:00:0b.1: new USB bus registered, assigned bus ↵
number 2
ehci_hcd 0000:00:0b.1: irq 10, io mem 0x000e2100
ehci_hcd 0000:00:0b.1: USB 2.0 started, EHCI 1.00, driver 10 ↵
Dec 2004
usb usb2: configuration #1 chosen from 1 choice
hub 2-0:1.0: USB hub found
hub 2-0:1.0: 2 ports detected
ohci_hcd 0000:00:0a.0: OHCI Host Controller
ohci_hcd 0000:00:0a.0: new USB bus registered, assigned bus ↵
number 3
ohci_hcd 0000:00:0a.0: irq 5, io mem 0x000e0000
usb usb3: configuration #1 chosen from 1 choice
hub 3-0:1.0: USB hub found
hub 3-0:1.0: 2 ports detected
ohci_hcd 0000:00:0b.0: OHCI Host Controller
ohci_hcd 0000:00:0b.0: new USB bus registered, assigned bus ↵
number 4
ohci_hcd 0000:00:0b.0: irq 11, io mem 0x000e1000
usb 2-1: new high speed USB device using ehci_hcd and address 2
usb usb4: configuration #1 chosen from 1 choice
hub 4-0:1.0: USB hub found
hub 4-0:1.0: 2 ports detected
usb 2-1: configuration #1 chosen from 1 choice
Initializing USB Mass Storage driver...
scsi0 : SCSI emulation for USB Mass Storage devices
usbcore: registered new driver usb-storage
USB Mass Storage support registered.
PNP: No PS/2 controller found. Probing ports directly.
serio: i8042 AUX port at 0x60,0x64 irq 12
```

```
serio: i8042 KBD port at 0x60,0x64 irq 1
mice: PS/2 mouse device common for all mice
EISA: Probing bus 0 at eisa.0
EISA: Detected 0 cards.
TCP bic registered
NET: Registered protocol family 1
NET: Registered protocol family 17
NET: Registered protocol family 8
NET: Registered protocol family 20
Using IPI Shortcut mode
Time: pit clocksource has been installed.
RAMDISK: Compressed image found at block 0
VFS: Mounted root (ext2 filesystem).
Freeing unused kernel memory: 264k freed

INIT: version 2.86 booting

    Vendor: SMI           Model: USB DISK           Rev: 1100
    Type:   Direct-Access           ANSI SCSI ↵
revision: 00
SCSI device sda: 1981440 512-byte hdwr sectors (1014 MB)
sda: Write Protect is off
sda: assuming drive cache: write through
SCSI device sda: 1981440 512-byte hdwr sectors (1014 MB)
sda: Write Protect is off
sda: assuming drive cache: write through
    sda: sda1 sda2 < sda5 >
sd 0:0:0:0: Attached scsi disk sda
Setting hostname to 'emblinux'...done.
Cleaning up ifupdown....
Loading kernel module mii.
Loading kernel module r6040.
r6040: RDC R6040 RX NAPI net driver, version 0.17 (13Apr2007)
r6040: RDC R6040 RX NAPI net driver, version 0.17 (13Apr2007)
Loading kernel module dnp2486_wdt.
dnp2486_wdt: timeout 60 sec.
Loading kernel module ssvpio.
ssvpio2486: version 20080312, using major 65
Will now mount local filesystems:.
Setting up networking....
Configuring network interfaces...done.
Initializing random number generator...done.

INIT: Entering runlevel: 2

Starting internet superserver: inetd.
Running local boot scripts (/etc/rc.local).

emblinux login:
```

Please note: This symbol “↵” shows that the following line belongs to the previous line.

5.2 MAX-Linux Boot Messages

```

Linux version 2.6.18.8-dmp-ssv1 (mha@hareangle-saturn) ↵
SSV20080404 (gcc-Version 4.1.2 20061115 (prerelease) (Debian ↵
4.1.1-21)) #1 PREEMPT Fri Apr 4 10:17:51 CEST 2008
BIOS-provided physical RAM map:
  BIOS-e820: 0000000000000000 - 000000000009fc00 (usable)
  BIOS-e820: 000000000009fc00 - 00000000000a0000 (reserved)
  BIOS-e820: 00000000000e0000 - 0000000000100000 (reserved)
  BIOS-e820: 0000000000100000 - 0000000000400000 (usable)
  BIOS-e820: 00000000ff000000 - 0000000100000000 (reserved)
64MB LOWMEM available.
DMI not present or invalid.
Allocating PCI resources starting at 10000000 (gap: ↵
04000000:fb000000)
Built 1 zonelists. Total pages: 16384
Kernel command line: root=/dev/sda5 ro console=ttyS0,115200 ↵
pnpbios=off acpi=off rootdelay=6 ssvinit BOOT_IMAGE=bzImage
No local APIC present or hardware disabled
Initializing CPU#0
PID hash table entries: 512 (order: 9, 2048 bytes)
Console: colour dummy device 80x25
Dentry cache hash table entries: 8192 (order: 3, 32768 bytes)
Inode-cache hash table entries: 4096 (order: 2, 16384 bytes)
Memory: 61388k/65536k available (1838k kernel code, 3700k re ↵
served, 713k data, 264k init, 0k highmem)
Checking if this processor honours the WP bit even in ↵
supervisor mode... Ok.
Security Framework v1.0.0 initialized
SELinux: Disabled at boot.
Capability LSM initialized
Mount-cache hash table entries: 512
Compat vDSO mapped to fffffe000.
CPU: 486
Checking 'hlt' instruction... OK.
NET: Registered protocol family 16
EISA bus registered
PCI: Using configuration type 1
Setting up standard PCI resources
ACPI: Interpreter disabled.
Linux Plug and Play Support v0.97 (c) Adam Belay
pnp: PnP ACPI: disabled
PnPBIOS: Disabled
SCSI subsystem initialized
usbcore: registered new driver usbfs
usbcore: registered new driver hub
PCI: Probing PCI hardware
PCI: Using IRQ router default [17f3/6031] at 0000:00:07.0
NET: Registered protocol family 2
IP route cache hash table entries: 512 (order: -1, 2048 bytes)
TCP established hash table entries: 2048 (order: 1, 8192 bytes)
TCP bind hash table entries: 1024 (order: 0, 4096 bytes)
TCP: Hash tables configured (established 2048 bind 1024)
TCP reno registered
audit: initializing netlink socket (disabled)
audit(1213580399.552:1): initialized
VFS: Disk quotas dquot_6.5.1
Dquot-cache hash table entries: 1024 (order 0, 4096 bytes)
Initializing Cryptographic API
io scheduler noop registered
io scheduler anticipatory registered

```

```

io scheduler deadline registered
io scheduler cfq registered (default)
isapnp: Scanning for PnP cards...
isapnp: No Plug & Play device found
Serial: 8250/16550 driver $Revision: 1.90 $ 4 ports, IRQ ↵
sharing enabled
serial8250: ttyS0 at I/O 0x3f8 (irq = 4) is a 16550A
serial8250: ttyS1 at I/O 0x2f8 (irq = 3) is a 16550A
serial8250: ttyS2 at I/O 0x3e8 (irq = 4) is a 16550A
serial8250: ttyS3 at I/O 0x2e8 (irq = 3) is a 16550A
RAMDISK driver initialized: 16 RAM disks of 8192K size 1024 ↵
blocksize
ehci_hcd 0000:00:0a.1: EHCI Host Controller
ehci_hcd 0000:00:0a.1: new USB bus registered, assigned bus ↵
number 1
ehci_hcd 0000:00:0a.1: irq 9, io mem 0x000e2000
ehci_hcd 0000:00:0a.1: USB 2.0 started, EHCI 1.00, driver 10 ↵
Dec 2004
usb usb1: configuration #1 chosen from 1 choice
hub 1-0:1.0: USB hub found
hub 1-0:1.0: 2 ports detected
ehci_hcd 0000:00:0b.1: EHCI Host Controller
ehci_hcd 0000:00:0b.1: new USB bus registered, assigned bus ↵
number 2
ehci_hcd 0000:00:0b.1: irq 10, io mem 0x000e2100
ehci_hcd 0000:00:0b.1: USB 2.0 started, EHCI 1.00, driver 10 ↵
Dec 2004
usb usb2: configuration #1 chosen from 1 choice
hub 2-0:1.0: USB hub found
hub 2-0:1.0: 2 ports detected
ohci_hcd 0000:00:0a.0: OHCI Host Controller
ohci_hcd 0000:00:0a.0: new USB bus registered, assigned bus ↵
number 3
ohci_hcd 0000:00:0a.0: irq 5, io mem 0x000e0000
usb usb3: configuration #1 chosen from 1 choice
hub 3-0:1.0: USB hub found
hub 3-0:1.0: 2 ports detected
ohci_hcd 0000:00:0b.0: OHCI Host Controller
ohci_hcd 0000:00:0b.0: new USB bus registered, assigned bus ↵
number 4
ohci_hcd 0000:00:0b.0: irq 11, io mem 0x000e1000
usb 2-1: new high speed USB device using ehci_hcd and address 2
usb usb4: configuration #1 chosen from 1 choice
hub 4-0:1.0: USB hub found
hub 4-0:1.0: 2 ports detected
usb 2-1: configuration #1 chosen from 1 choice
Initializing USB Mass Storage driver...
scsi0 : SCSI emulation for USB Mass Storage devices
usbcore: registered new driver usb-storage
USB Mass Storage support registered.
PNP: No PS/2 controller found. Probing ports directly.
serio: i8042 AUX port at 0x60,0x64 irq 12
serio: i8042 KBD port at 0x60,0x64 irq 1
mice: PS/2 mouse device common for all mice
EISA: Probing bus 0 at eisa.0
EISA: Detected 0 cards.
TCP bic registered
NET: Registered protocol family 1
NET: Registered protocol family 17
NET: Registered protocol family 8
NET: Registered protocol family 20

```



```
Using IPI Shortcut mode
Waiting 6sec before mounting root device...
Time: pit clocksource has been installed.
  Vendor: SMI      Model: USB DISK      Rev: 1100
  Type:   Direct-Access                ANSI SCSI ↵
revision: 00
SCSI device sda: 1981440 512-byte hdwr sectors (1014 MB)
sda: Write Protect is off
sda: assuming drive cache: write through
SCSI device sda: 1981440 512-byte hdwr sectors (1014 MB)
sda: Write Protect is off
sda: assuming drive cache: write through
  sda: sda1 sda2 < sda5 >
sd 0:0:0:0: Attached scsi disk sda
EXT3-fs: INFO: recovery required on readonly filesystem.
EXT3-fs: write access will be enabled during recovery.
kjournald starting. Commit interval 5 seconds
EXT3-fs: recovery complete.
EXT3-fs: mounted filesystem with ordered data mode.
VFS: Mounted root (ext3 filesystem) readonly.
Freeing unused kernel memory: 264k freed

INIT: version 2.86 booting

EXT3 FS on sda5, internal journal
Setting the system clock..
Cleaning up ifupdown....
Loading kernel modules...r6040: RDC R6040 RX NAPI net driver, ↵
version 0.17 (13Apr2007)
r6040: RDC R6040 RX NAPI net driver, version 0.17 (13Apr2007)
dnp2486_wdt: timeout 60 sec.
ssvpio2486: version 20080312, using major 65
done.
/etc/ssvconfig/sbin/ipbynet: create child with pid 367
Setting kernel variables...done.
Mounting local filesystems...done.
Activating swapfile swap...done.
Setting up networking....
Configuring network interfaces...done.
Starting web server: lighttpd
NET: Registered protocol family 10
lo: Disabled Privacy Extensions
IPv6 over IPv4 tunneling driver
.
Starting internet superserver: inetd.
Starting OpenBSD Secure Shell server: sshd.
Starting periodic command scheduler: crond.

INIT: Entering runlevel: 9

Debian GNU/Linux 4.0 emblinux ttyS0

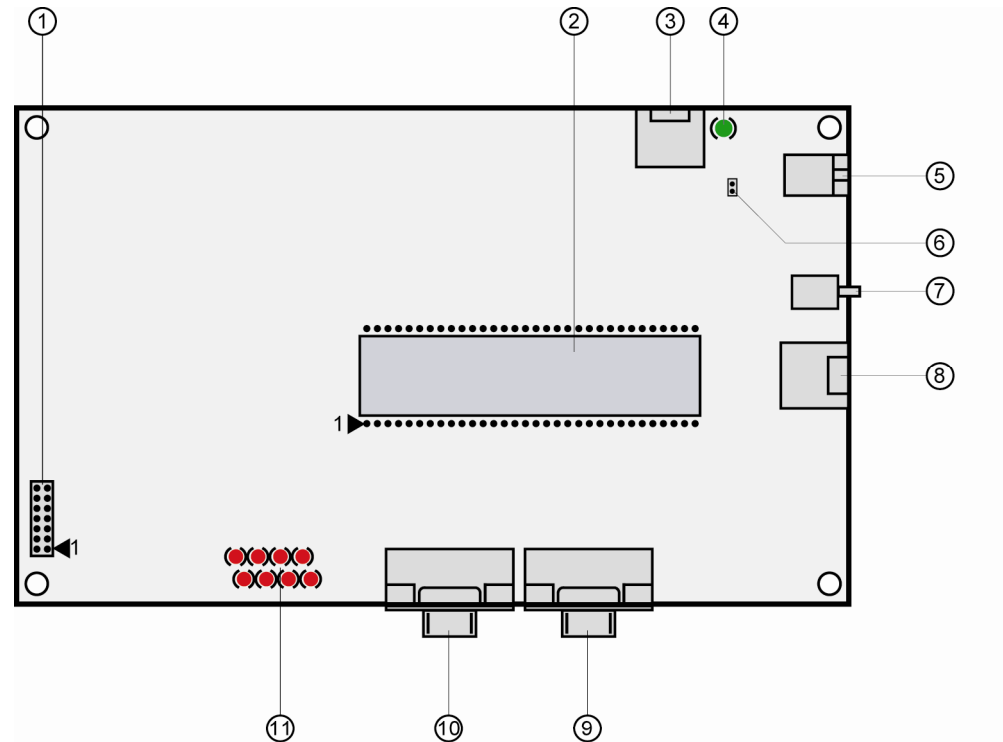
emblinux login:
```

Please note: This symbol “↵” shows that the following line belongs to the previous line.

6 DNP/EVA11-SV1 HARDWARE REFERENCE

The DNP/EVA11-SV1 is a special version of the DNP/EVA11, which means that some components are not equipped. The following chapters describe the hardware components of the DNP/EVA11-SV1.

6.1 DNP/EVA11-SV1 Board Layout



- | | |
|-------------------------|--|
| ① J14 - SPI connector | ⑦ S1 - Reset switch |
| ② J1 - DIL-64 socket | ⑧ J10 - 10/100 Mbps Ethernet 1 connector |
| ③ J9 - USB host port | ⑨ J5 - COM2 connector |
| ④ D13 - Power LED | ⑩ J4 - COM1 connector |
| ⑤ J17 - Power connector | ⑪ D1 to D8 - Port A LEDs |
| ⑥ JP5 - USB VCC jumper | |

Figure 39: Board layout of DNP/EVA11-SV1

6.2 Pinout DIL-64 Socket – J1 (1. Part)

Pin	Name	Function
1	PA0	Parallel I/O, Port A, Bit 0
2	PA1	Parallel I/O, Port A, Bit 1
3	PA2	Parallel I/O, Port A, Bit 2
4	PA3	Parallel I/O, Port A, Bit 3
5	PA4	Parallel I/O, Port A, Bit 4
6	PA5	Parallel I/O, Port A, Bit 5
7	PA6	Parallel I/O, Port A, Bit 6
8	PA7	Parallel I/O, Port A, Bit 7
9	PB0	Parallel I/O, Port B, Bit 0
10	PB1	Parallel I/O, Port B, Bit 1
11	PB2	Parallel I/O, Port B, Bit 2
12	PB3	Parallel I/O, Port B, Bit 3
13	PB4	Parallel I/O, Port B, Bit 4
14	PB5	Parallel I/O, Port B, Bit 5
15	PB6	Parallel I/O, Port B, Bit 6
16	PB7	Parallel I/O, Port B, Bit 7
17	PC0	Parallel I/O, Port C, Bit 0 (Alternate Function: SPI Chip Select SPICS)
18	PC1	Parallel I/O, Port C, Bit 1 (Alternate Function: SPI Clock SPICLK)
19	PC2	Parallel I/O, Port C, Bit 2 (Alternate Function: SPI Master Out Slave In, MOSI = SPI Data Output)
20	PC3	Parallel I/O, Port C, Bit 3 (Alternate Function: SPI Master In Slave Out, MISO = SPI Data Input)
21	RXD1	COM1 Serial Port, RXD Pin
22	TXD1	COM1 Serial Port, TXD Pin
23	CTS1	COM1 Serial Port, CTS Pin
24	RTS1	COM1 Serial Port, RTS Pin
25	DCD1	COM1 Serial Port, DCD Pin
26	DSR1	COM1 Serial Port, DSR Pin
27	DTR1	COM1 Serial Port, DTR Pin
28	RI1	COM1 Serial Port, RI Pin
29	RESIN	RESET Input
30	TX+	10BASE-T/100BASE-TX Ethernet Interface, TX+ Pin
31	TX-	10BASE-T/100BASE-TX Ethernet Interface, TX- Pin
32	GND	Ground

Table 4: Pinout DIL-64 socket – pin 1 to pin 32



6.3 Pinout DIL-64 Socket– J1 (2. Part)

Pin	Name	Function
33	RX+	10BASE-T/100BASE-TX Ethernet Interface, RX+ Pin
34	RX-	10BASE-T/100BASE-TX Ethernet Interface, RX- Pin
35	RESOUT	RESET Output
36	VBAT	Real Time Clock Battery Input
37	CLKOUT	Clock Output
38	TXD2	COM2 Serial Port, TXD Pin
39	RXD2	COM2 Serial Port, RXD Pin
40	HDMA	USB Host Port- (Interrupt Input on other DIL/NetPCs, please see note 1)
41	HDP+	USB Host Port+ (Interrupt Input on other DIL/NetPCs, please see note 1)
42	INT3	Interrupt Input 3
43	INT2	Interrupt Input 2
44	INT1	Interrupt Input 1
45	CS4	Chip Select Output 4 (x86 I/O Address Range 0x130 - 0x13F)
46	CS3	Chip Select Output 3 (x86 I/O Address Range 0x120 - 0x12F)
47	CS2	Chip Select Output 2 (x86 I/O Address Range 0x110 - 0x11F)
48	CS1	Chip Select Output 1 (x86 I/O Address Range 0x100 - 0x10F)
49	RDY	External Ready Input
50	RD	Read Signal, Expansion Bus
51	WR	Write Signal, Expansion Bus
52	SA3	Expansion Bus, Address Bit 3
53	SA2	Expansion Bus, Address Bit 2
54	SA1	Expansion Bus, Address Bit 1
55	SA0	Expansion Bus, Address Bit 0
56	SD7	Expansion Bus, Data Bit 7
57	SD6	Expansion Bus, Data Bit 6
58	SD5	Expansion Bus, Data Bit 5
59	SD4	Expansion Bus, Data Bit 4
60	SD3	Expansion Bus, Data Bit 3
61	SD2	Expansion Bus, Data Bit 2
62	SD1	Expansion Bus, Data Bit 1
63	SD0	Expansion Bus, Data Bit 0
64	VCC	3.3 Volt Power Input

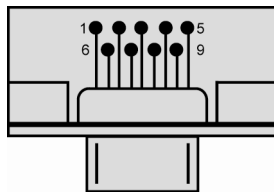
Table 5: Pinout DIL-64 socket – pin 33 to pin 64



6.4 Pinout COM1 Connector – J4

Pin	Name	Function
1	DCD	COM1 Serial Port, DCD pin
2	RXD	COM1 Serial Port, RXD pin
3	TXD	COM1 Serial Port, TXD pin
4	DTR	COM1 Serial Port, DTR pin
5	GND	Ground
6	DSR	COM1 Serial Port, DSR pin
7	RTS	COM1 Serial Port, RTS pin
8	CTS	COM1 Serial Port, CTS pin
9	RI	COM1 Serial Port, RI pin

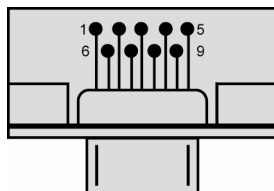
Table 6: Pinout COM1 connector



6.5 Pinout COM2 Connector – J5

Pin	Name	Function
1	---	---
2	RXD	COM2 Serial Port, RXD pin
3	TXD	COM2 Serial Port, TXD pin
4	---	---
5	GND	Ground
6	---	---
7	---	---
8	---	---
9	---	---

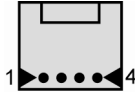
Table 7: Pinout COM2 connector



6.6 Pinout USB Host Port – J9

Pin	Name	Function
1	5 VDC	5 VDC Output*
2	DATA-	USB Host Port -
3	DATA+	USB Host Port +
4	GND	Ground

Table 8: Pinout USB host port

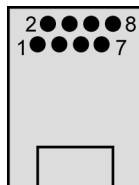


* **Please note:** Jumper JP5 (USB 5 VDC) enables the 5 VDC output of this pin.

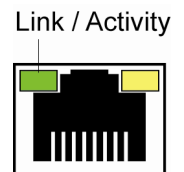
6.7 Pinout 10/100 Mbps Ethernet Connector 1 – J10

Pin	Name	Function
1	LAN1.TX+	10/100 Mbps LAN 1, TX+ Pin
2	LAN1.TX-	10/100 Mbps LAN 1, TX- Pin
3	LAN1.RX+	10/100 Mbps LAN 1, RX+ Pin
4	---	Not Connected
5	---	Not Connected
6	LAN1.RX-	10/100 Mbps LAN 1, RX- Pin
7	---	Not Connected
8	---	Not Connected

Table 9: Pinout 10/100 Mbps Ethernet connector 1



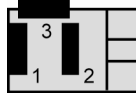
The Ethernet connector owns one green LED in the upper left which shows if a LAN link is established and if there is LAN activity. The yellow LED is not connected.



6.8 Pinout Power Connector – J17

Pin	Name	Function
1	5 VDC	Power In (max. 5.5 VDC)
2	GND	Ground
3	GND	Ground

Table 10: Pinout power connector



CAUTION: Providing the DNP/EVA11-SV1 with a voltage higher than the regular 5 VDC $\pm 10\%$ could cause damaged board components!

6.9 Pinout USB VCC Jumper – JP5

Pin	Name	Function
1	VCC	3.3 VDC
2	ENA	USB 5 VDC Output Enabled

Table 11: Pinout USB mode jumper

Note: The default setting of JP5 is set (USB 5 VDC enabled):



If this jumper is set the 5 VDC output of the USB host port J9 is enabled. If this jumper is not set there is no voltage on the USB host port J9 available.

7 HELPFUL LITERATURE

- Evaluation Board DNP/EVA11 hardware reference manual
- DIL/NetPC DNP/2486 hardware reference manual
- Vortex86SX documents: <http://www.vortex86sx.com>

CONTACT

SSV Embedded Systems

Heisterbergallee 72

D-30453 Hannover

Phone: +49 (0)511/40 000-0

Fax: +49 (0)511/40 000-40

E-mail: sales@ist1.de

Internet: www.ssv-embedded.de

Support: www.ssv-comm.de/forum

For actual information about the DNP/SK29 visit us at www.dilnetpc.com.

DOCUMENT HISTORY

Revision	Date	Remarks	Name
1.0	2009-02-09	first version	WBU

The content of this document can change any time without announcement. There is taken over no guarantee for the accuracy of the statements. The user assumes the entire risk as to the accuracy and the use of this document. Information in this document is provided 'as is' without warranty of any kind. Some names within this document can be trademarks of their respective holders.

© 2009 SSV EMBEDDED SYSTEMS. All rights reserved.