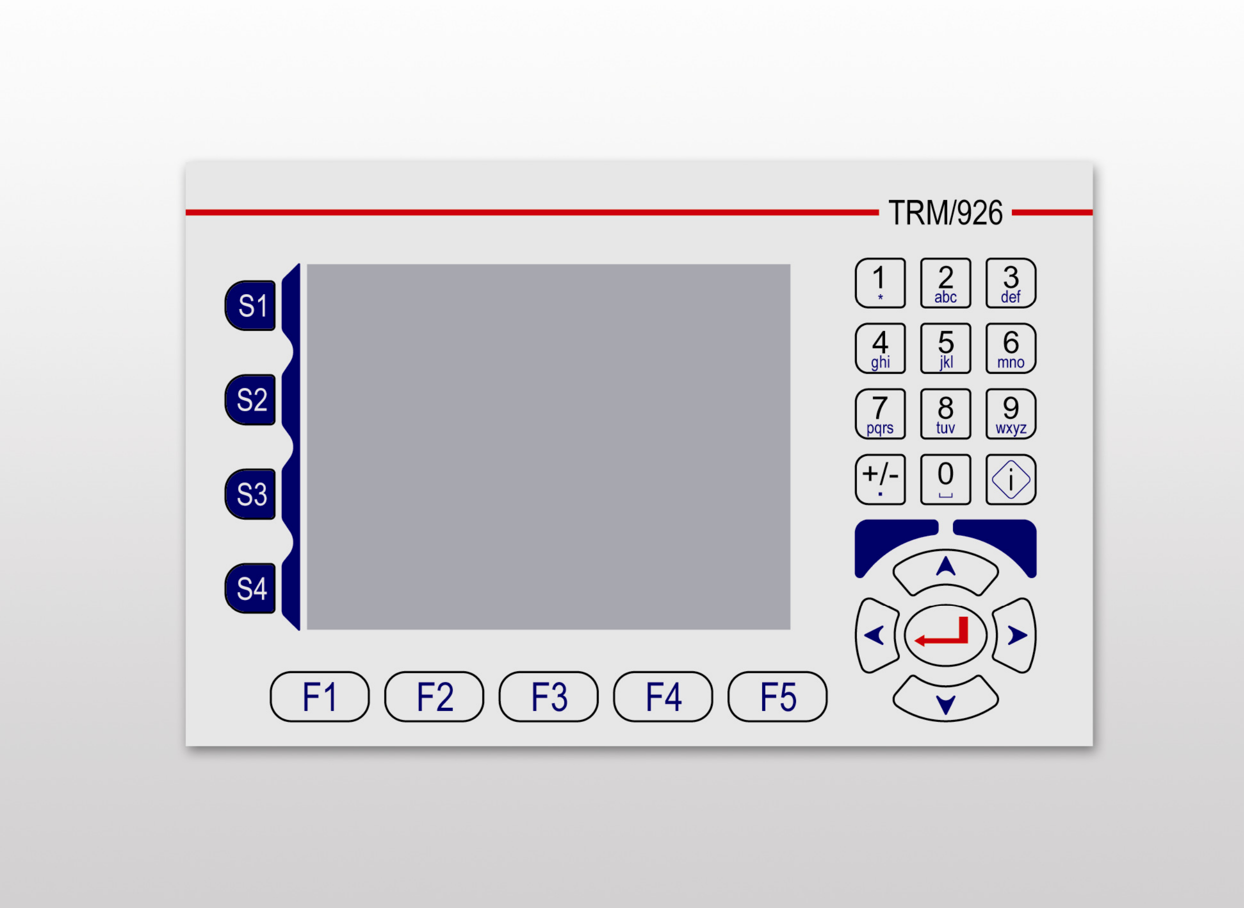
TRM/926

5.7" Terminal System

First Steps



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CONTENT

1 INTRODUCTION

The TRM/926 contains everything you need to get started with your 32-bit x86 embedded user interface application. The TRM/926 consists of an eSOM/2586 module with a pre-installed MAX-Linux, the Base Board BB926/eSOM with 5.7” TFT LCD and the front panel.

Alternatively it is possible to install a ROM DOS operating system for the eSOM/2586 instead of the MAX-Linux. Please contact us for further information.

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
italic	User inputs and other specials
`monospace`	Pathnames, internet addresses and program code
↵	This symbol shows that the following line belongs to the current line

Table 1: Conventions used in this Document

1.3 Hard- and Software Requirements

To work with the TRM/926 a software development environment is needed.

This development environment requires a computer as development system to access the TRM/926 via serial console or Telnet. Therefore usually a PC with Windows or Linux is used. This PC should comply with the following hard- and software requirements:

- **Windows 2000/XP/7 or Linux**
- **Serial (COM) interface**
- **Terminal program (e.g. HyperTerminal or Minicom)**
- **10/100 Mbps Ethernet network controller and TCP/IP configuration**
- **Web browser**
- **Telnet client (e.g. PuTTY)**

This environment allows TRM/926 shell script, Java and Python 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.

Please check which IP address your PC actual has and keep this address in mind.

On a Linux-PC just open a shell console and enter `ifconfig`.

On a Windows-PC please open a DOS window (you can find it in the Windows Start menu) and enter `ipconfig`. Now the IP address is displayed in the DOS window.

To work with the TRM/926 some additional hardware is needed:

- **1x 12 – 24 VDC power supply**
- **1x Serial interface adapter cable**
- **1x Null modem cable**
- **1x LAN interface adapter cable**
- **1x Ethernet cross-over cable OR 2x Ethernet Patch cable and 1x Ethernet switch**

2 GETTING STARTED

2.1 Serial Link between TRM/926 and PC

Setup the serial link between the TRM/926 and your PC. Use a serial interface adapter cable and a null modem cable for this connection.

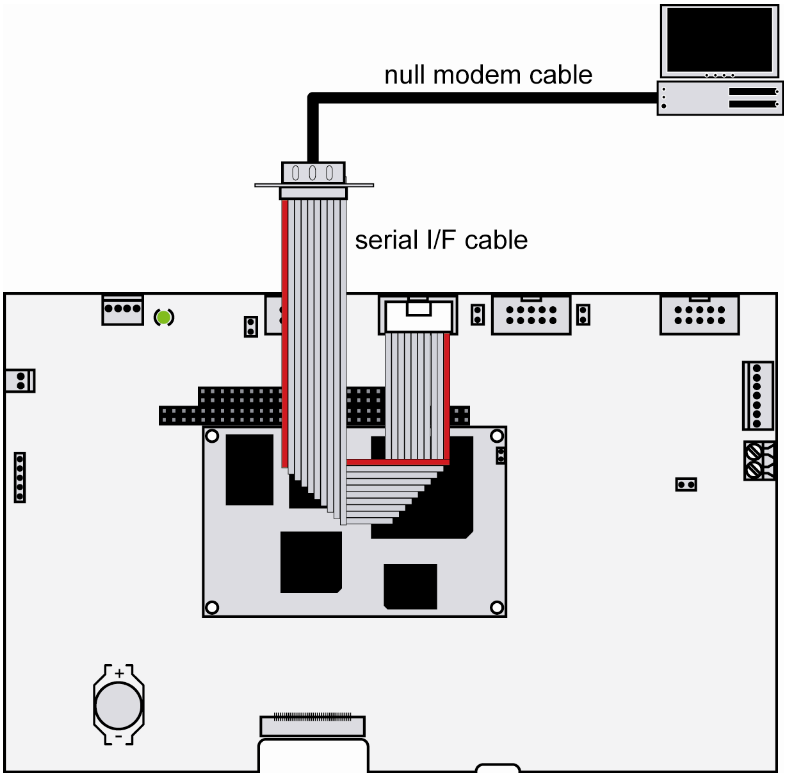


Figure 1: Serial link between TRM/926 and PC

First connect one end of the serial interface adapter cable with **COM1** port of the TRM/926.

Then connect the serial interface adapter cable over the null modem cable with an unused serial COM port (RS232) of the PC. Make sure that this COM port supports 115.200 bps.

2.2 Ethernet Link between TRM/926 and PC

Setup the Ethernet link between the LAN connector of the TRM/926 and your PC. Use a LAN interface adapter cable with an Ethernet cross-over cable or a switch-based infrastructure with patch cables.

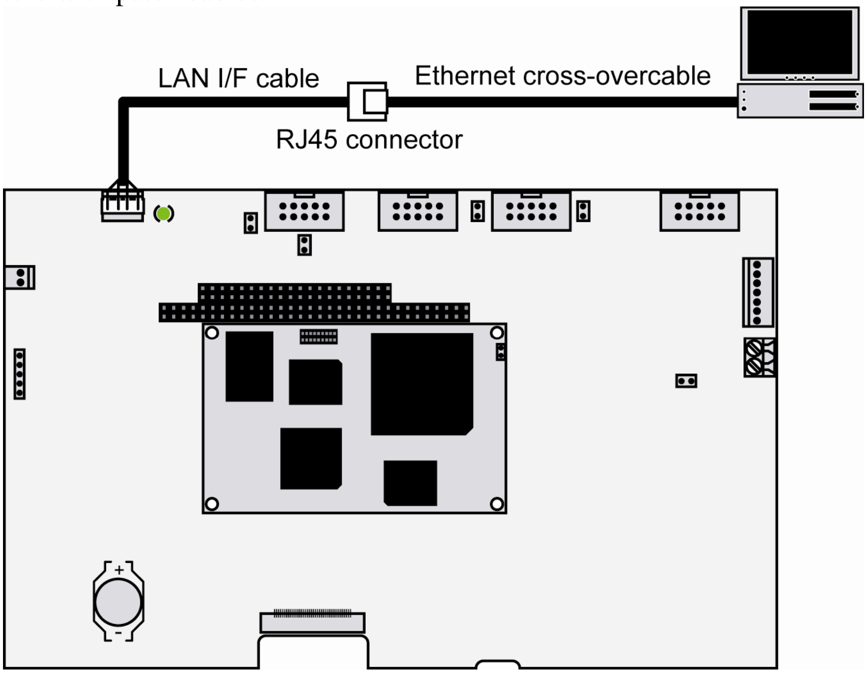


Figure 2: Ethernet link between TRM/926 and PC

Please note: The TRM/926 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`.

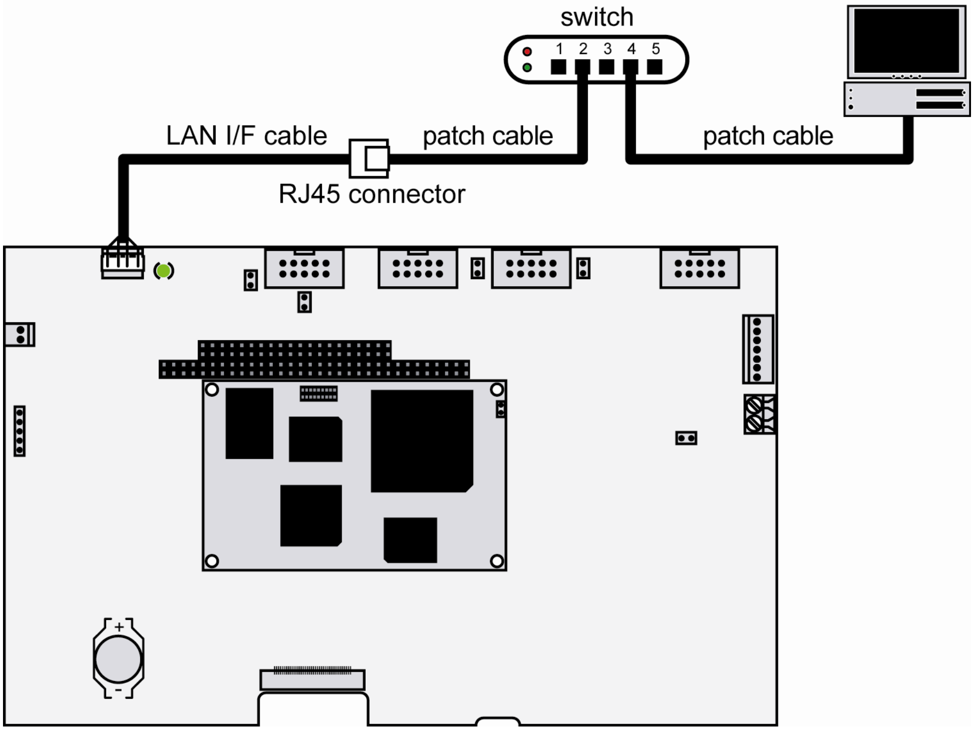


Figure 3: Switch-based Ethernet link between TRM/926 and PC

2.3 Connecting Power Supply and Power-up the TRM/926

First make sure that all cable connections are OK. Then power-up the TRM/926 by connecting a 12 – 24 VDC power supply with the power connector like shown in the figure below.

CAUTION: Please pay attention to the polarity of the power connector!

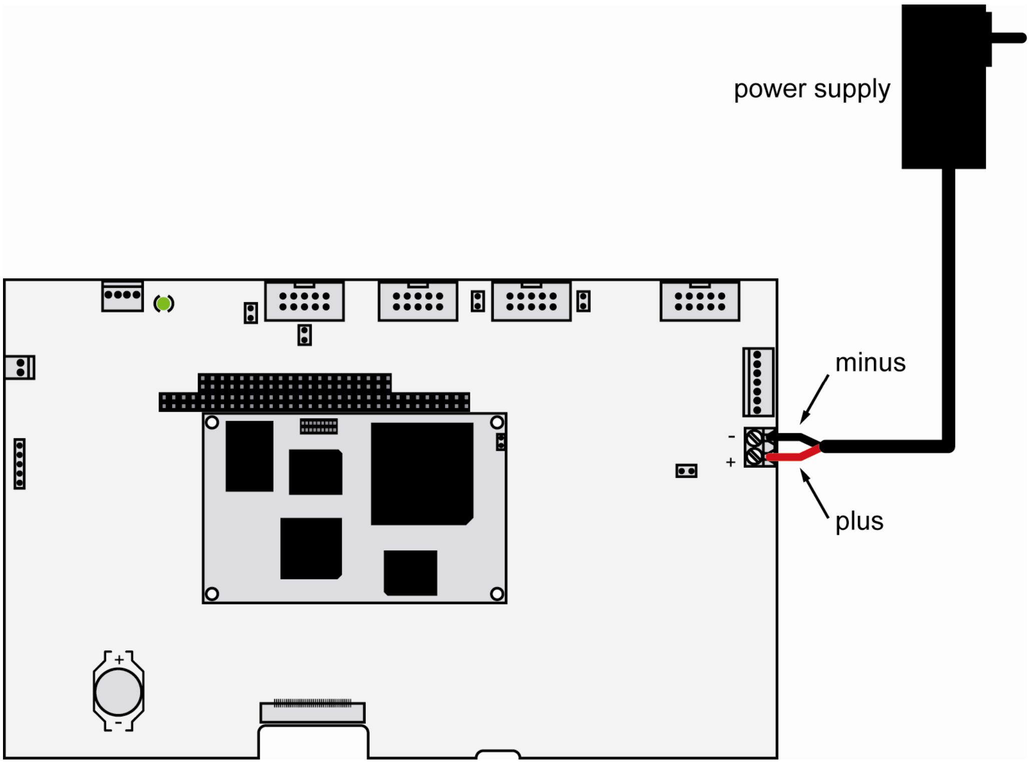


Figure 4: Power supply for the TRM/926

CAUTION: Providing the TRM/926 with a voltage higher than the regular 12 – 24 VDC ±10% could resolve in damaged board components!

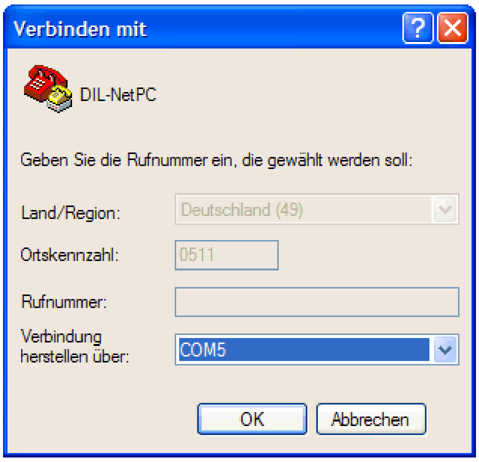
Please note: The “network settings” shown after booting the TRM/926 is just a Python demo script without function.

It is NOT possible to edit the network settings shown in the demo!

Though the displayed network information is correct, it can not be changed.

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.



Verbinden mit

DIL-NetPC

Geben Sie die Rufnummer ein, die gewählt werden soll:

Land/Region: Deutschland (49)

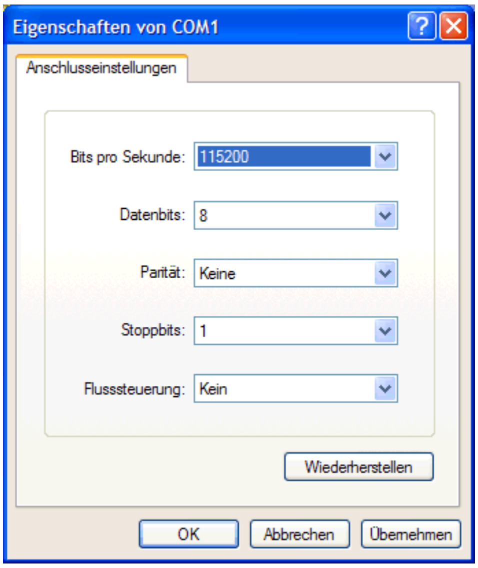
Ortskennzahl: 0511

Rufnummer:

Verbindung herstellen über: COM5

Figure 5: 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.



Eigenschaften von COM1

Anschlusseinstellungen

Bits pro Sekunde: 115200

Datenbits: 8

Parität: Keine

Stoppbits: 1

Flusssteuerung: Kein

Figure 6: 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

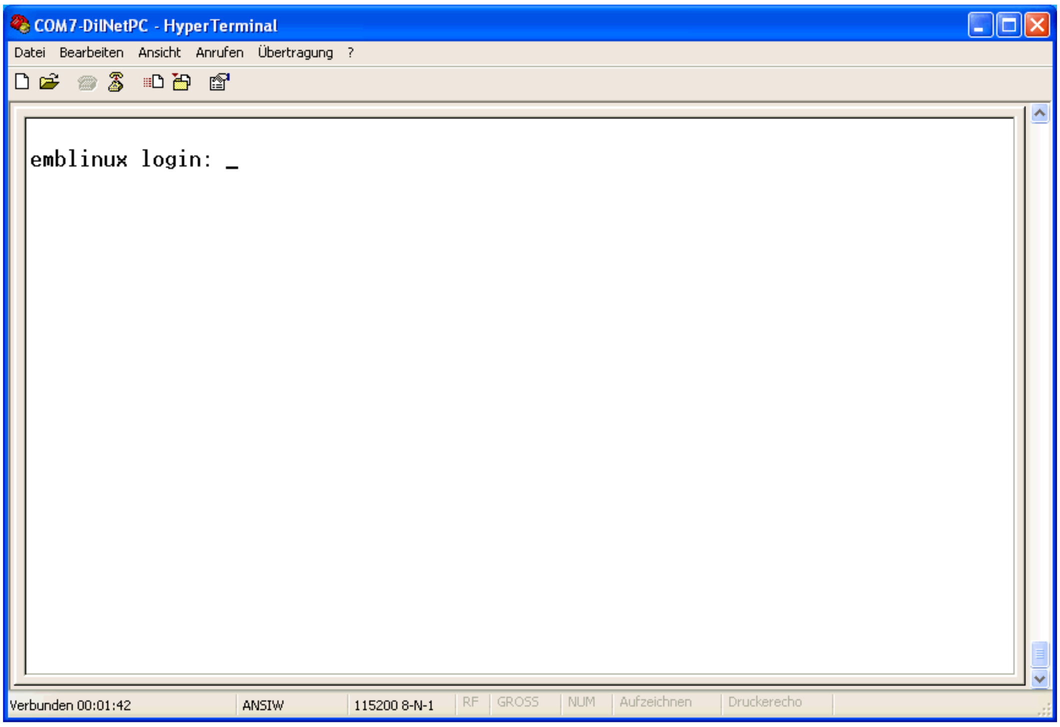
2.5 Power-up eSOM/2586 with RCM disabled

After power-up the eSOM/2586 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 eSOM/2586 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 eSOM/2586 serial ports.

2. If the BIOS finish, the eSOM/2586 runs the SYSLINUX boot loader. This software component operates with MS-DOS/Windows FAT file systems. The SYSLINUX boot loader loads the MAX-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 eSOM/2586 serial ports.

3. Linux takes control over the eSOM/2586 hardware and runs all necessary processes for coming up to live. With RCM disabled, there is **no Linux message output** over the eSOM/2586 serial ports.


COM7-DilNetPC - HyperTerminal
Datei Bearbeiten Ansicht Anrufen Übertragung ?
Verbunden 00:01:42
ANSIW
115200 8-N-1
RF
GROSS
NUM
Aufzeichnen
Druckerecho

```
emblinux login: _
```

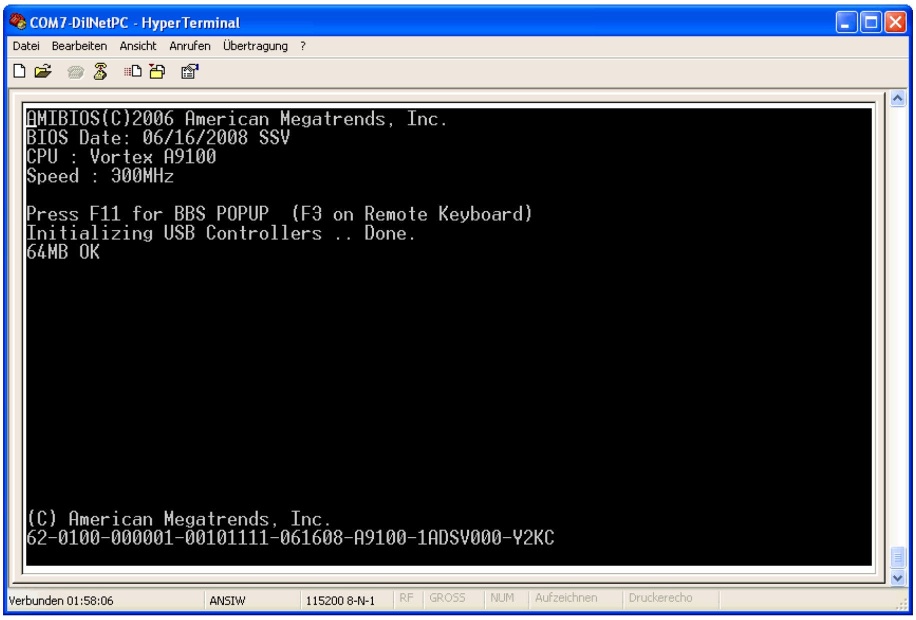
Figure 7: Linux booting process with HyperTerminal

The eSOM/2586 MAX-Linux supports a serial console. It allows a Linux-based system in a headless configuration without a monitor ands keyboard. After the boot process finish, the eSOM/2586 MAX-Linux shows a login prompt. Please use the login name ***root*** and the password ***root***.

2.6 Power-up eSOM/2586 with RCM enabled

The eSOM/2586 boot sequence with RCM enabled is similar to the boot procedure with RCM disabled. Only some details are different:

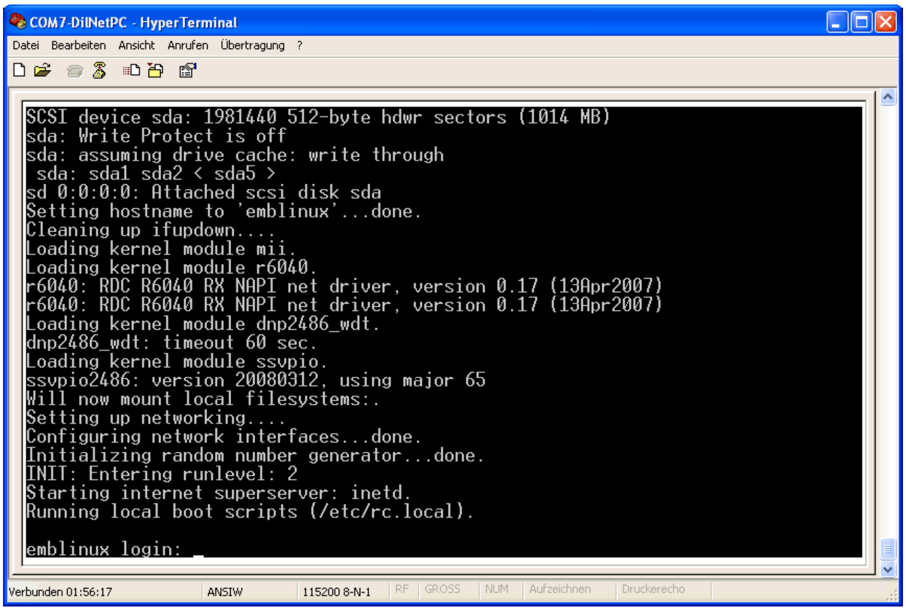
1. Directly after power-up, the eSOM/2586 runs the AMI BIOS and initializes the hardware components. With RCM enabled, the BIOS show some messages over the eSOM/2586 COM1 serial port.


COM7-DilNetPC - HyperTerminal
Datei Bearbeiten Ansicht Anrufen Übertragung ?
Verbunden 01:58:06
ANSIW
115200 8-N-1
RF
GROSS
NUM
Aufzeichnen
Druckerecho

```
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
```

Figure 8: The AMI BIOS message direct after power-up

2. If the BIOS finish, the eSOM/2586 runs the SYSLINUX boot loader. SYSLINUX loads the MAX-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 eSOM/2586 COM1 serial port.

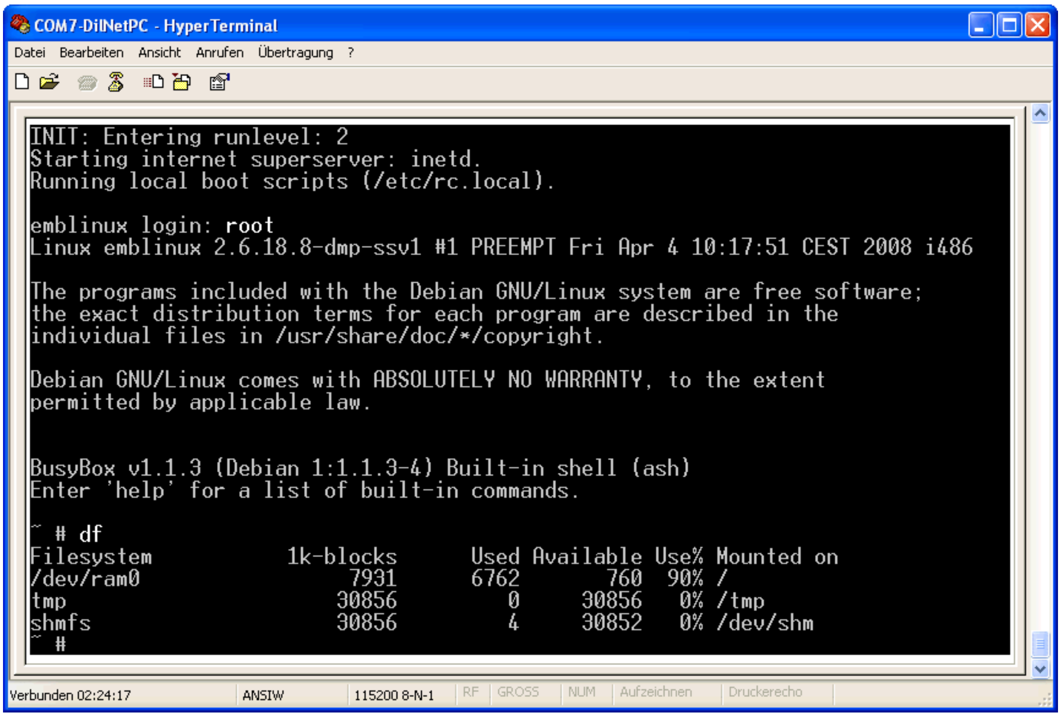

COM7-DilNetPC - HyperTerminal
Datei Bearbeiten Ansicht Anrufen Übertragung ?
Verbunden 01:56:17
ANSIW
115200 8-N-1
RF
GROSS
NUM
Aufzeichnen
Druckerecho

```
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: _
```

Figure 9: After the Linux booting process is a login prompt available

3. Linux takes control over the eSOM/2586 hardware and runs all necessary processes for coming up to live. With RCM enabled, the MAX-Linux shows many detailed boot messages over the eSOM/2586 COM1 serial port.

The eSOM/2586 MAX-Linux supports a serial console. It allows a Linux-based system in a headless configuration without a monitor ands keyboard. After the boot process finish, the eSOM/2586 MAX-Linux shows a login prompt. Please use the login name ***root*** and the password ***root***.


COM7-DilNetPC - HyperTerminal
Datei Bearbeiten Ansicht Anrufen Übertragung ?
Verbunden 02:24:17
ANSIW
115200 8-N-1
RF
GROSS
NUM
Aufzeichnen
Druckerecho

```
INIT: Entering runlevel: 2
Starting internet superserver: inetd.
Running local boot scripts (/etc/rc.local).

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.

~ # 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
~ #
```

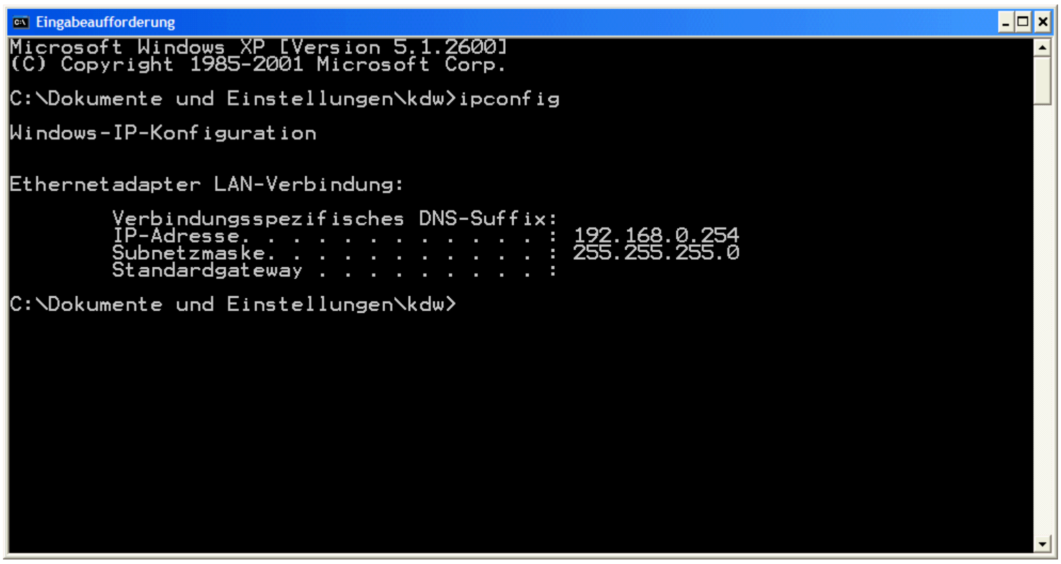
Figure 10: After a login the serial console offers a Linux command line interface

Direct after a successful login the eSOM/2586 MAX-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 eSOM/2586.



```
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>
```

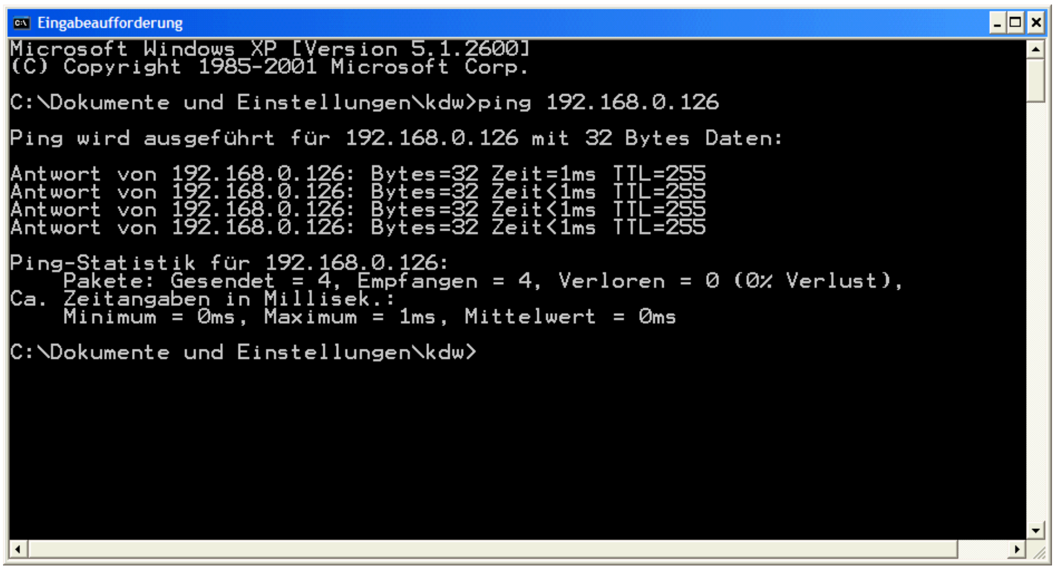
Figure 11: Windows-PC IP address check with *ipconfig*

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 eSOM/2586 is fixed within the MAX-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 eSOM/2586 and the PC with a simple *ping* command.



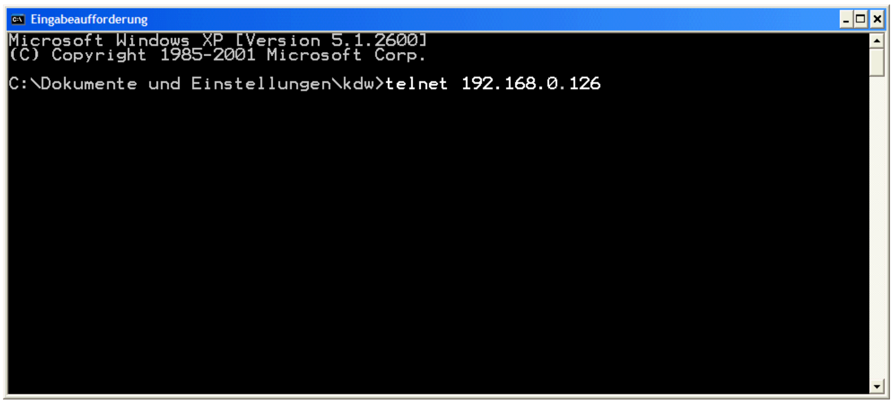
```
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

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 12: 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

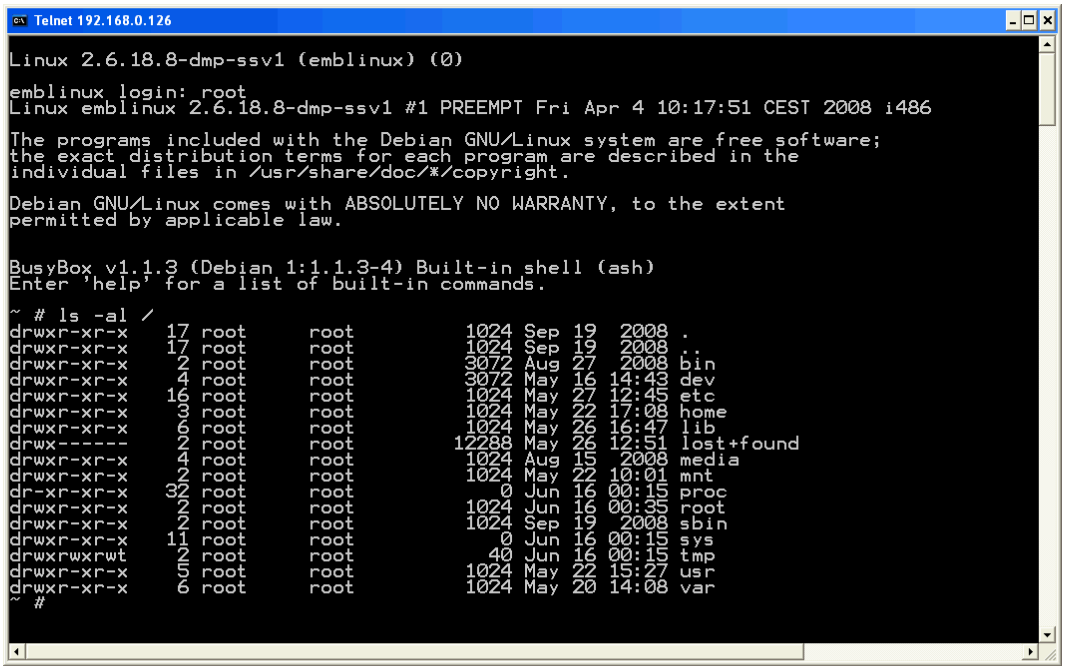
Run a Telnet client program on your PC with the IP address of the eSOM/2586. You can use a Telnet session for remote entering Linux commands.



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

C:\Dokumente und Einstellungen\kdw>telnet 192.168.0.126
```

Figure 13: Run the Windows Telnet client program

Wait until the eSOM/2586 MAX-Linux requests a user name. Please enter the user name ***root***. and the password ***root***.



```
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

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

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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.

~ # ls -al /
drwxr-xr-x   17 root     root         1024 Sep 19  2008 .
drwxr-xr-x   17 root     root         1024 Sep 19  2008 ..
drwxr-xr-x    2 root     root         3072 Aug 27  2008 bin
drwxr-xr-x    4 root     root         3072 May 16 14:43 dev
drwxr-xr-x   16 root     root         1024 May 27 12:45 etc
drwxr-xr-x    3 root     root         1024 May 22 17:08 home
drwxr-xr-x    6 root     root         1024 May 26 16:47 lib
drwx------    2 root     root        12288 May 26 12:51 lost+found
drwxr-xr-x    4 root     root         1024 Aug 15  2008 media
drwxr-xr-x    2 root     root         1024 May 22 10:01 mnt
dr-xr-xr-x   32 root     root            0 Jun 16 00:15 proc
drwxr-xr-x    2 root     root         1024 Jun 16 00:35 root
drwxr-xr-x    2 root     root         1024 Sep 19  2008 sbin
drwxr-xr-x   11 root     root            0 Jun 16 00:15 sys
drwxrwxrwt    2 root     root           40 Jun 16 00:15 tmp
drwxr-xr-x    5 root     root         1024 May 22 15:27 usr
drwxr-xr-x    6 root     root         1024 May 20 14:08 var
~ #
```
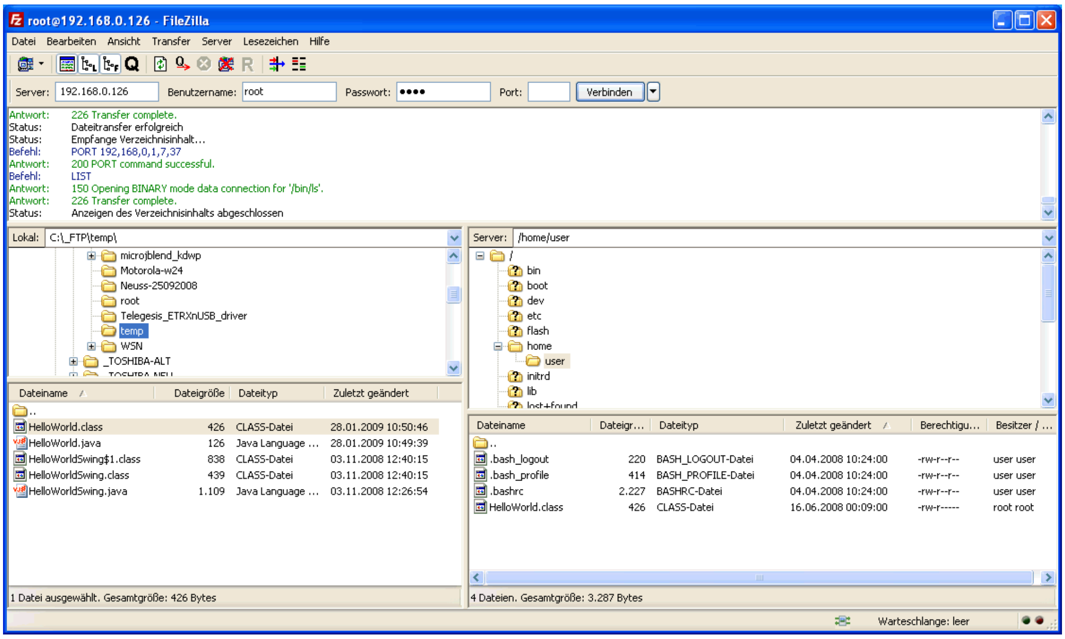

Figure 14: Using Linux commands within a Telnet client window

2.10 Checking FTP Server

The eSOM/2586 Linux comes with a pre-installed FTP server. This server allows the file transfer between a PC and the eSOM/2586.

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 ***root*** and password ***root***. After a successful FTP login the eSOM/2586 FTP server allows R/W access to all MAX-Linux directories.



root@192.168.0.126 - FileZilla
Datei Bearbeiten Ansicht Transfer Server Lesezeichen Hilfe
Verbinden

Server: 192.168.0.126 Benutzername: root Passwort: •••• Port:

```
Antwort:    226 Transfer complete.
Status:     Dateitransfer erfolgreich
Status:     Empfange Verzeichnisinhalt...
Befehl:     PORT 192,168,0,1,7,37
Antwort:    200 PORT command successful.
Befehl:     LIST
Antwort:    150 Opening BINARY mode data connection for '/bin/ls'.
Antwort:    226 Transfer complete.
Status:     Anzeigen des Verzeichnisinhalts abgeschlossen
```

Lokal: C:_FTP\temp\

```
microjblend_kdwp
Motorola-w24
Neuss-25092008
root
Telegesis_ETRXnUSB_driver
temp
WSN
_TOSHIBA-ALT
```

Dateiname	Dateigröße	Dateityp	Zuletzt geändert
..			
HelloWorld.class	426	CLASS-Datei	28.01.2009 10:50:46
HelloWorld.java	126	Java Language ...	28.01.2009 10:49:39
HelloWorldSwing$1.class	838	CLASS-Datei	03.11.2008 12:40:15
HelloWorldSwing.class	439	CLASS-Datei	03.11.2008 12:40:15
HelloWorldSwing.java	1.109	Java Language ...	03.11.2008 12:26:54

1 Datei ausgewählt. Gesamtgröße: 426 Bytes

Server: /home/user

```
/
  bin
  boot
  dev
  etc
  flash
  home
    user
  initrd
  lib
  lost+found
```

Dateiname	Dateigr...	Dateityp	Zuletzt geändert	Berechtigu...	Besitzer / ...
..					
.bash_logout	220	BASH_LOGOUT-Datei	04.04.2008 10:24:00	-rw-r--r--	user user
.bash_profile	414	BASH_PROFILE-Datei	04.04.2008 10:24:00	-rw-r--r--	user user
.bashrc	2.227	BASHRC-Datei	04.04.2008 10:24:00	-rw-r--r--	user user
HelloWorld.class	426	CLASS-Datei	16.06.2008 00:09:00	-rw-r-----	root root

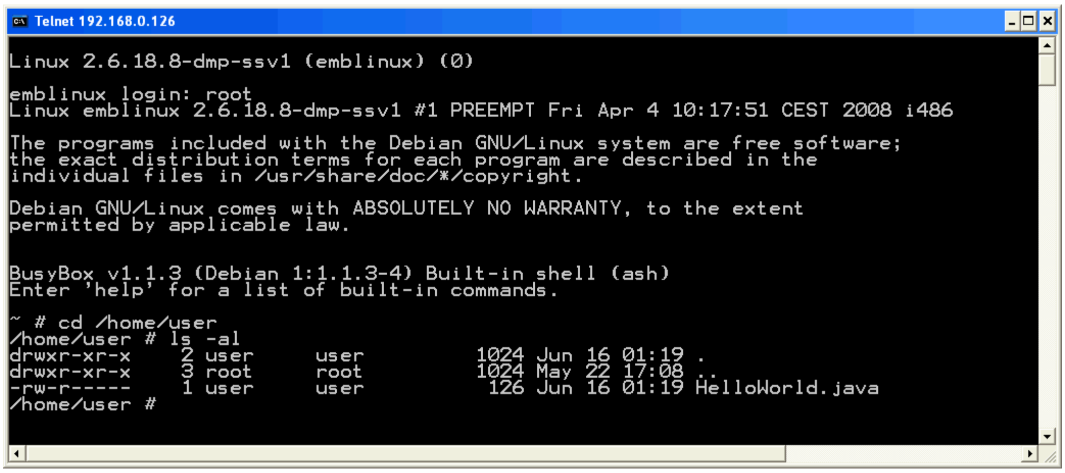
4 Dateien. Gesamtgröße: 3.287 Bytes

Warteschlange: leer

Figure 15: The FTP server allows R/W access to all MAX-Linux directories

Connect your FTP client with the eSOM/2586 FTP server and transfer some files from the PC to the eSOM/2586 directory `/home/user`.

Check the new files with a Telnet session. Change to the eSOM/2586 directory `/home/user` within your Telnet session.



```
Linux 2.6.18.8-dmp-ssv1 (emblinux) (0)

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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 #
```
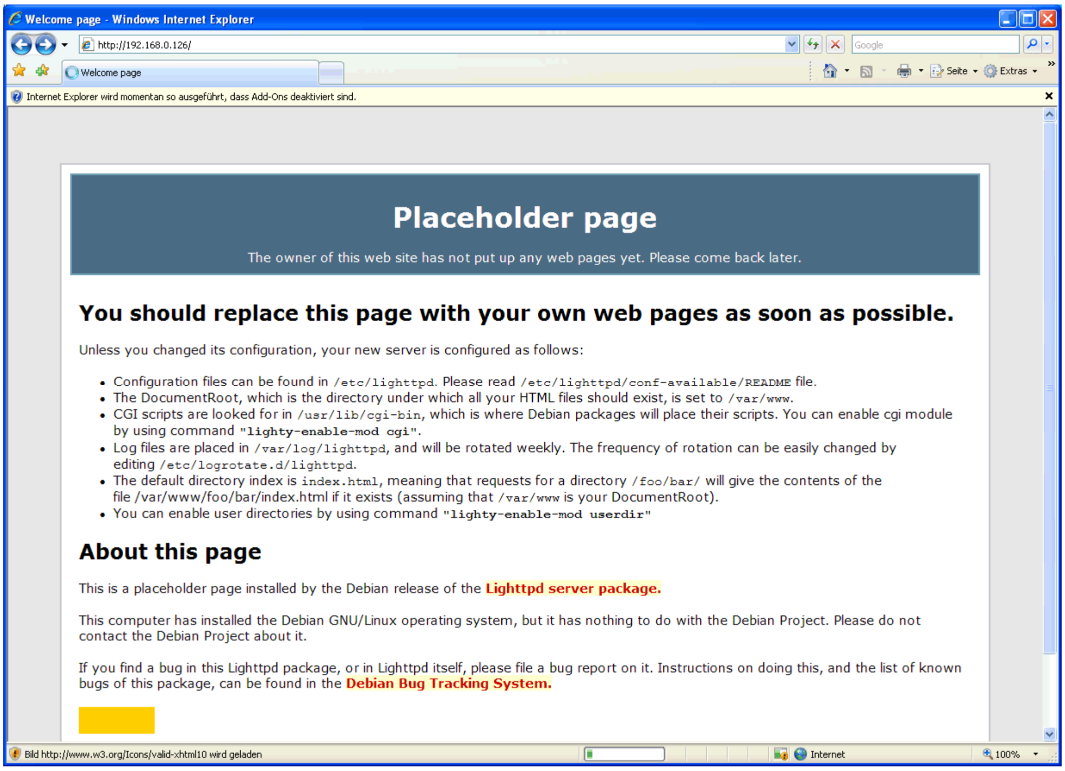

Figure 16: The new files within /home/user

2.11 Checking HTTP Server

The eSOM/2586 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 eSOM/2586 web server, please run your PC web browser and use the URL:

```
http://192.168.0.126
```


Welcome page - Windows Internet Explorer
http://192.168.0.126/
Google
Welcome page
Seite
Extras
Internet Explorer wird momentan so ausgeführt, dass Add-Ons deaktiviert sind.
Bild http://www.w3.org/Icons/valid-xhtml10 wird geladen
Internet
100%

Placeholder page

The owner of this web site has not put up any web pages yet. Please come back later.

You should replace this page with your own web pages as soon as possible.

Unless you changed its configuration, your new server is configured as follows:

- Configuration files can be found in `/etc/lighttpd`. Please read `/etc/lighttpd/conf-available/README` file.
- The DocumentRoot, which is the directory under which all your HTML files should exist, is set to `/var/www`.
- CGI scripts are looked for in `/usr/lib/cgi-bin`, which is where Debian packages will place their scripts. You can enable cgi module by using command **"lighty-enable-mod cgi"**.
- Log files are placed in `/var/log/lighttpd`, and will be rotated weekly. The frequency of rotation can be easily changed by editing `/etc/logrotate.d/lighttpd`.
- The default directory index is `index.html`, meaning that requests for a directory `/foo/bar/` will give the contents of the file /var/www/foo/bar/index.html if it exists (assuming that `/var/www` is your DocumentRoot).
- You can enable user directories by using command **"lighty-enable-mod userdir"**

About this page

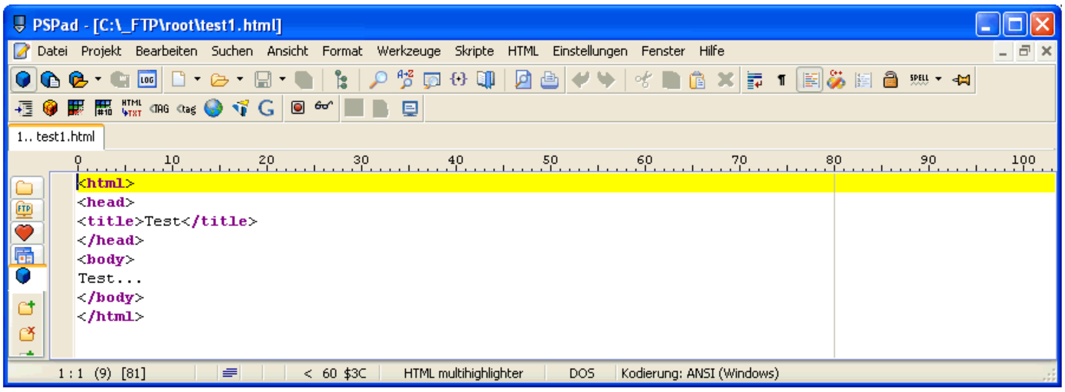
This is a placeholder page installed by the Debian release of the **Lighttpd server package.**

This computer has installed the Debian GNU/Linux operating system, but it has nothing to do with the Debian Project. Please do not contact the Debian Project about it.

If you find a bug in this Lighttpd package, or in Lighttpd itself, please file a bug report on it. Instructions on doing this, and the list of known bugs of this package, can be found in the **Debian Bug Tracking System.**

Figure 17: 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`.

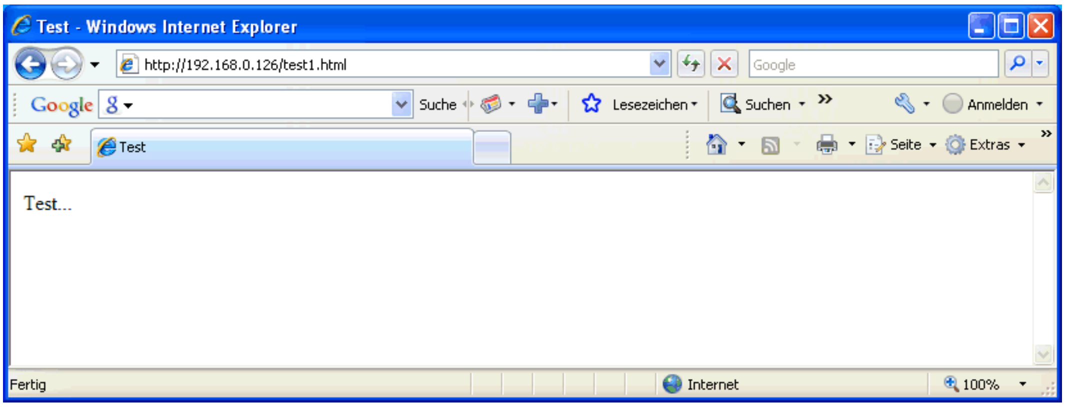


```
<html>
<head>
<title>Test</title>
</head>
<body>
Test...
</body>
</html>
```

Figure 18: 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 eSOM/2586 directory `/var/www`. Than change the attributes with

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



Test...

Figure 19: 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
```

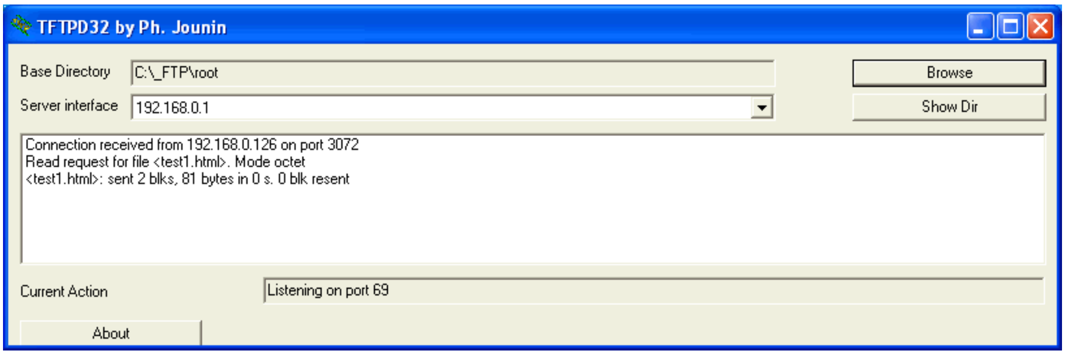
Directory	Usage
`/var/www`	HTML files
`/etc/lighttpd`	Web server configuration
`/var/log/lighttpd`	Web Server log files
`/usr/lib/cgi-bin`	CGI scripts files

Table 3: Important directories of the lighttpd web server

2.12 Checking TFTP Client

The eSOM/2586 Linux offers also a pre-installed TFTP client. This program allows the TFTP-based file transfer between a PC and the eSOM/2586.

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).



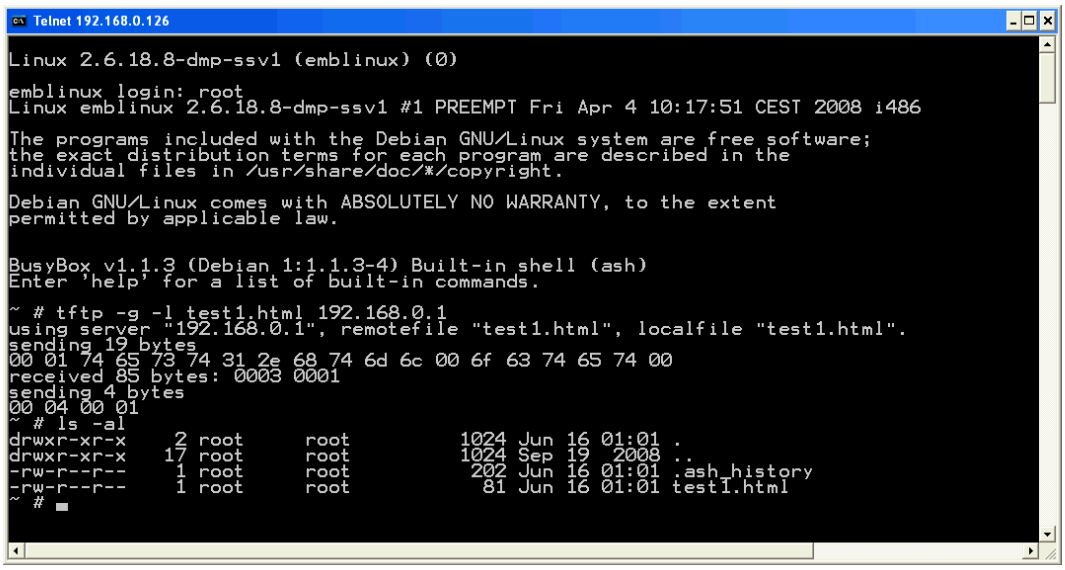
Base Directory: C:_FTP\root
Server interface: 192.168.0.1

```
Connection received from 192.168.0.126 on port 3072
Read request for file <test1.html>. Mode octet
<test1.html>: sent 2 blks, 81 bytes in 0 s. 0 blk resent
```

Current Action: Listening on port 69

Figure 20: Running the Win32 TFTP server

Figure 19 shows the free Win32 TFTP server in action. This server allows file transfers to and from any eSOM/2586 directory.



```
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.

~ # tftp -g -l test1.html 192.168.0.1
using server "192.168.0.1", remotefile "test1.html", localfile "test1.html".
sending 19 bytes
00 01 74 65 73 74 31 2e 68 74 6d 6c 00 6f 63 74 65 74 00
received 85 bytes: 0003 0001
sending 4 bytes
00 04 00 01
~ # ls -al
drwxr-xr-x    2 root     root         1024 Jun 16 01:01 .
drwxr-xr-x   17 root     root         1024 Sep 19  2008 ..
-rw-r--r--    1 root     root          202 Jun 16 01:01 .ash_history
-rw-r--r--    1 root     root           81 Jun 16 01:01 test1.html
~ #
```

Figure 21: Download with TFTP *get* command

Enter your get and put commands within a Telnet session. The figure above shows a sample for a TFTP get command (getting a file from the PC to the eSOM/2586). 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.

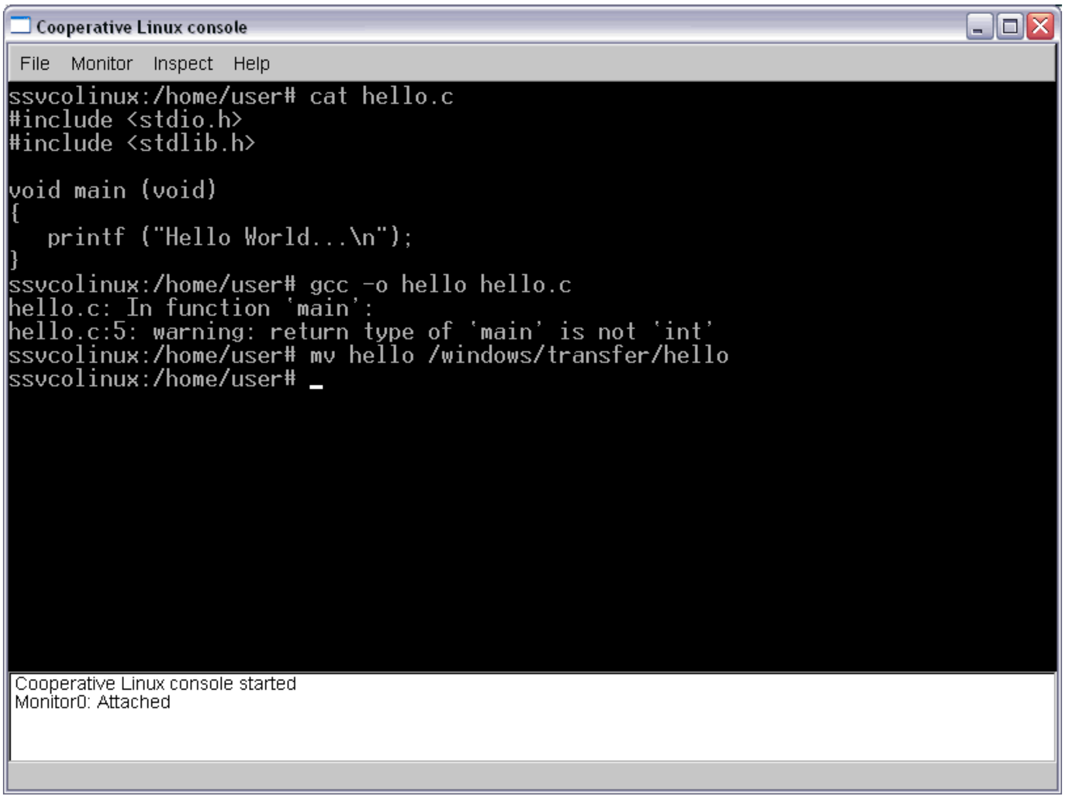
2.13 “Hello World” with C/C++ and SSV coLinux

The SSV coLinux tool chain allows you to write C/C++ programs for the eSOM/2586 within your Windows XP environment. It is not necessary to setup a Linux-based PC for the 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
```



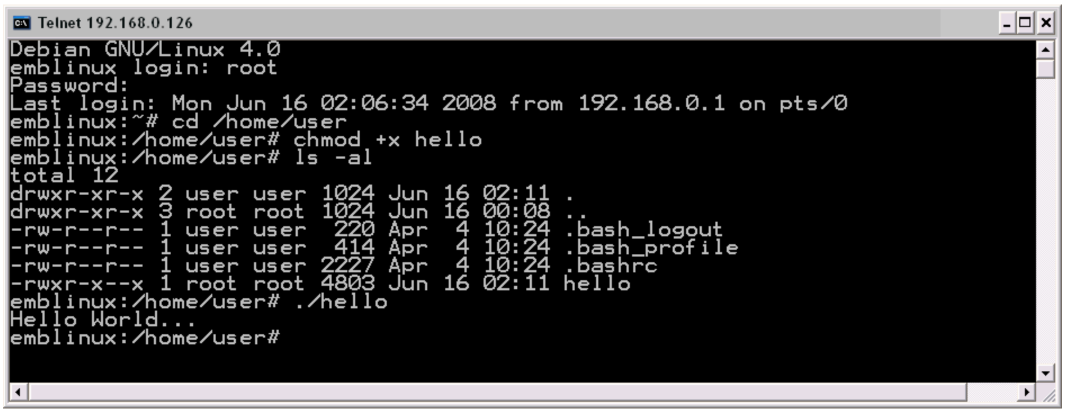
```
ssvcolinux:/home/user# cat hello.c
#include <stdio.h>
#include <stdlib.h>

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 22: Creating hello world within the Linux console

The command line sequence creates the executable *hello* for the x86/IA-32-based eSOM/2586 with a Linux 2.6 kernel. Then transfer the executable with the help of FTP or TFTP to the eSOM/2586 and run the executable. Don't forget the

```
chmod +x hello
```



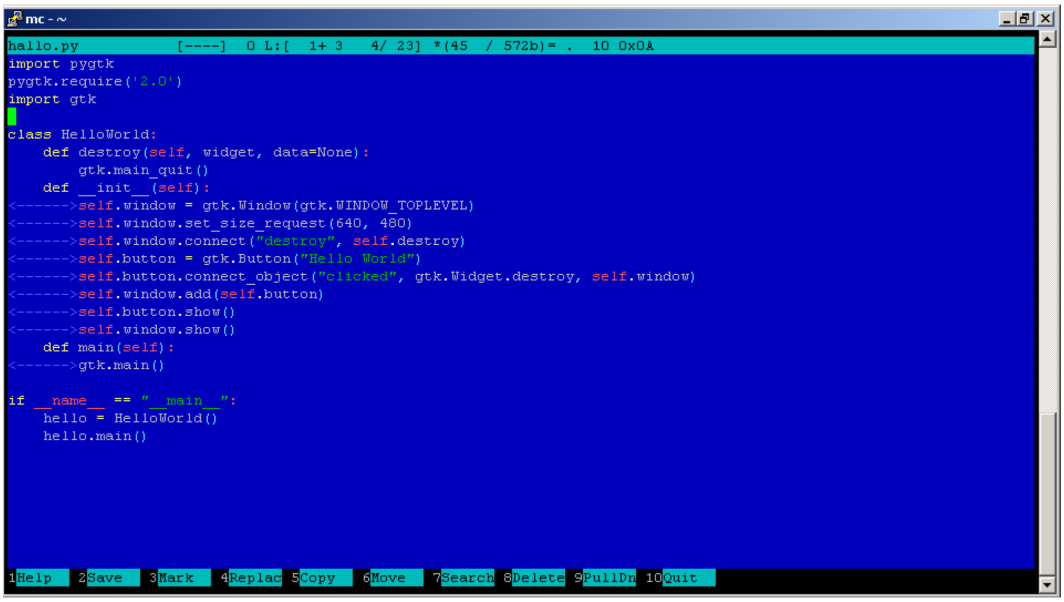
```
Debian GNU/Linux 4.0
emblinux login: root
Password:
Last login: Mon Jun 16 02:06:34 2008 from 192.168.0.1 on pts/0
emblinux:~# cd /home/user
emblinux:/home/user# chmod +x hello
emblinux:/home/user# ls -al
total 12
drwxr-xr-x 2 user user 1024 Jun 16 02:11 .
drwxr-xr-x 3 root root 1024 Jun 16 00:08 ..
-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 23: Executing hello world within the Linux console

Please note: C/C++ programming for the eSOM/2586 doesn't need a cross GCC. You can use the native GCC of a Linux environment with kernel version 2.6.

2.14 “Hello World” with Python

The eSOM/2586 MAX-Linux comes with a Python 2.5.2 runtime environment. This allows you to run Python files on the eSOM/2586.



```
hallo.py              [----]  0 L:[  1+ 3   4/ 23] *(45  / 572b)= .  10 0x0A
import pygtk
pygtk.require('2.0')
import gtk

class HelloWorld:
    def destroy(self, widget, data=None):
        gtk.main_quit()
    def __init__(self):
<------>self.window = gtk.Window(gtk.WINDOW_TOPLEVEL)
<------>self.window.set_size_request(640, 480)
<------>self.window.connect("destroy", self.destroy)
<------>self.button = gtk.Button("Hello World")
<------>self.button.connect_object("clicked", gtk.Widget.destroy, self.window)
<------>self.window.add(self.button)
<------>self.button.show()
<------>self.window.show()
    def main(self):
<------>gtk.main()

if __name__ == "__main__":
    hello = HelloWorld()
    hello.main()
```

1Help 2Save 3Mark 4Replac 5Copy 6Move 7Search 8Delete 9PullDn 10Quit

Figure 24: Hello World sample for Python

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

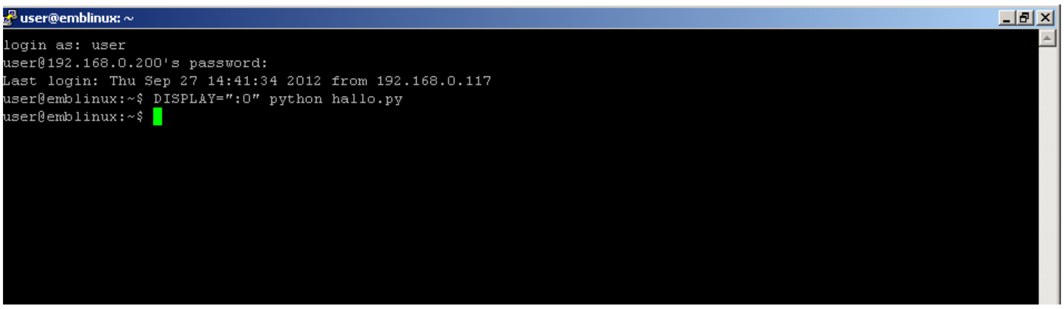
```
import pygtk
pygtk.require(‘2.0’)
import gtk

class HelloWorld:
       def destroy(self, widget, data=None):
             gtk.main_quit()
       def __init__(self):
             self.window = gtk.Window(gtk.WINDOW_TOPLEVEL)
             self.window.set_size_request(640, 480)
             self.window.connect(“destroy”, self.destroy)
             self.button = gtk.Button(“Hello World”)
             self.button.connect_object(“clicked”,                    ↵
gtk.Widget.destroy, self.window)
             self.window.add(self.button)
             self.button.show()
             self.window.show()
       def main(self):
             gtk.main()

if __name__ == “__main__”:
       hello = HelloWorld()
       hello.main()
```

Store the sample lines within a file with the name `hallo.py`.

Transfer the file `hallo.py` with the help of FTP or TFTP to the eSOM/2586 directory `/home/user`.

To execute the `hallo.py` create a Telnet connection and login with the user name *user* and the password *user*. Now enter the following command line to start the Python script:

```
DISPLAY=“:0” python hallo.py
```



user@emblinux: ~

```
login as: user
user@192.168.0.200's password:
Last login: Thu Sep 27 14:41:34 2012 from 192.168.0.117
user@emblinux:~$ DISPLAY=":0" python hallo.py
user@emblinux:~$
```

Figure 25: Logging in as user and starting the hallo.py

On the TRM/926 display the message “Hello World” appears. To end the script just push the ENTER key on the front panel.

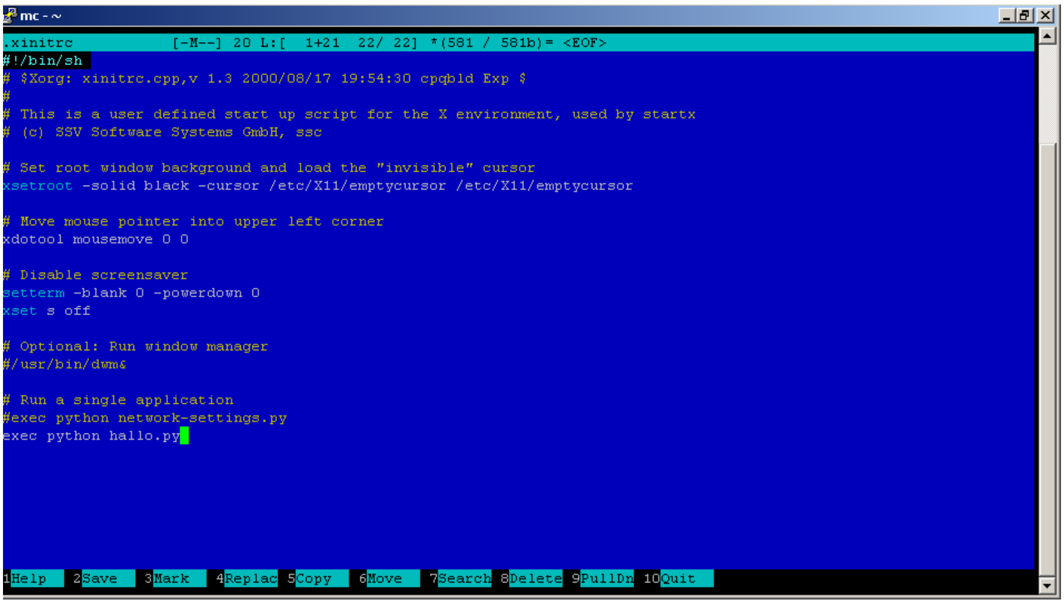
To automatically execute the hallo.py (or any other Python script) after booting the TRM/926, the file `.xinitrc` must be edited.

Go to the directory `/home/user` and open the file with the command line

```
mcedit .xinitrc
```

At the end of the file uncomment the final line with a hashmark (“#”) and enter the following command as the new final line.

```
exec python hallo.py
```



mc - ~

```
.xinitrc            [-M--] 20 L:[  1+21  22/ 22] *(581 / 581b)= <EOF>
#!/bin/sh
# $Xorg: xinitrc.cpp,v 1.3 2000/08/17 19:54:30 cpqbld Exp $
#
# This is a user defined start up script for the X environment, used by startx
# (c) SSV Software Systems GmbH, ssc

# Set root window background and load the "invisible" cursor
xsetroot -solid black -cursor /etc/X11/emptycursor /etc/X11/emptycursor

# Move mouse pointer into upper left corner
xdotool mousemove 0 0

# Disable screensaver
setterm -blank 0 -powerdown 0
xset s off

# Optional: Run window manager
#/usr/bin/dwm&

# Run a single application
#exec python network-settings.py
exec python hallo.py
```

1Help 2Save 3Mark 4Replac 5Copy 6Move 7Search 8Delete 9PullDn 10Quit

Figure 26: Registering the hallo.py for autostart

Do not forget to save the file! At the next reboot of the TRM/926 the script `hallo.py` will start automatically.

2.15 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 eSOM/2586 *IPbyNET* feature.

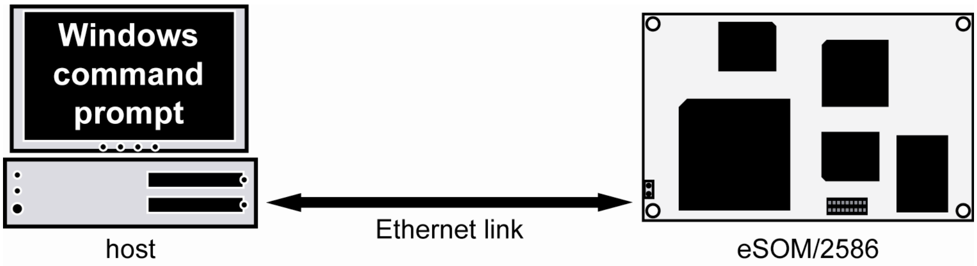
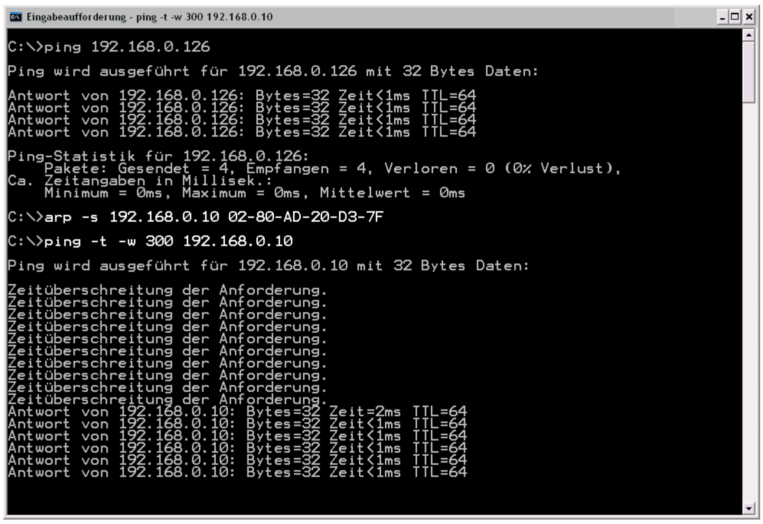


Figure 27: Environment for IP address change with *IPbyNet*

IPbyNET is an eSOM/2586 MAX-Linux component, which checks direct after each boot process the presence of ICMP echo request packets with the MAC address of the eSOM/2586 Ethernet LAN interface. If an ICMP packet is available, *IPbyNET* extracts the destination IP address from the ICMP echo request packet and sets the eSOM/2586 Ethernet LAN interface with this IP address.



```
C:\>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=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 für 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 ausgeführt für 192.168.0.10 mit 32 Bytes Daten:

Zeitüberschreitung der Anforderung.
Zeitüberschreitung der Anforderung.
Zeitüberschreitung der Anforderung.
Zeitüberschreitung der Anforderung.
Zeitüberschreitung der Anforderung.
Zeitüberschreitung der Anforderung.
Zeitüberschreitung der Anforderung.
Zeitüberschreitung der Anforderung.
Zeitüberschreitung der Anforderung.
Zeitüberschreitung 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
Antwort von 192.168.0.10: Bytes=32 Zeit<1ms TTL=64
```

Figure 28: Changing the IP address with IPbyNet

Please see the label with the MAC address of the eSOM/2586 on the top of your device to find the MAC address for your eSOM/2586. 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 eSOM/2586.

Then reboot the eSOM/2586. After a few seconds the eSOM/2586 responds to the *ping* with the new IP address.

Please note: Changing the IP address of your eSOM/2586 with *IPbyNET* resets also the web-based configuration interface settings to factory defaults!

3 MAX-LINUX

This part describes the main features of the user installable MAX-Linux system for the eSOM/2586. MAX-Linux features a typical standard Linux system, based on the Debian Lenny (5.0) 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 file system uses an extended ext3 partition of the eSOM/2586 NAND Flash memory and offers complete user access (non-volatile R/W access). All features of the kernel and hardware specific modules for the Vortex86DX 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.

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 modules)
- Debian Lenny (5.0) based ext3 rootfs filesystem (non-volatile)
- Python 2.5.2 runtime environment
- X-Server base system with full GPU support

3.2 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

3.3 File System Tools

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

3.4 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

3.5 Kernel Module Support

- lsmod
- depmod
- modprobe
- rmmod

3.6 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)

3.7 MAX-Linux Boot Messages

```
Linux  version  2.6.18.8-dmp-ssv1  (user@VB-HNE)  SSV20100831  ↵
(gcc version 4.1.2 20061115 (prerelease) (Debian 4.1.1-21)) #2 ↵
PREEMPT Wed Sep 1 11:34:59 CEST 2010
CPU: Vendor unknown, using generic init.
CPU: Your system may be unstable.
BIOS-provided physical RAM map:
 BIOS-e820: 0000000000000000 - 000000000009fc00 (usable)
 BIOS-e820: 000000000009fc00 - 00000000000a0000 (reserved)
 BIOS-e820: 00000000000e0000 - 0000000000100000 (reserved)
 BIOS-e820: 0000000000100000 - 0000000008000000 (usable)
 BIOS-e820: 00000000ff000000 - 0000000100000000 (reserved)
128MB LOWMEM available.
DMI not present or invalid.
Allocating  PCI  resources  starting  at  10000000  (gap:  ↵
08000000:f7000000)
Detected 600.046 MHz processor.
Built 1 zonelists.  Total pages: 32768
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: 1024 (order: 10, 4096 bytes)
Console: colour VGA+ 80x25
Dentry cache hash table entries: 16384 (order: 4, 65536 bytes)
Inode-cache hash table entries: 8192 (order: 3, 32768 bytes)
Memory:  126348k/131072k  available  (1838k  kernel  code,  4328k  ↵
reserved, 713k data, 264k init, 0k highmem)
Checking  if  this  processor  honours  the  WP  bit  even  in  ↵
supervisor mode... Ok.
Calibrating  delay  using  timer  specific  routine..  1201.63  ↵
BogoMIPS (lpj=2403275)
Security Framework v1.0.0 initialized
SELinux:  Disabled at boot.
Capability LSM initialized
Mount-cache hash table entries: 512
Compat vDSO mapped to ffffe000.
CPU: Vortex86 SoC 05/02 stepping 02
Checking 'hlt' instruction... OK.
NET: Registered protocol family 16
EISA bus registered
PCI: PCI BIOS revision 3.00 entry at 0xf0031, last bus=0
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: 1024 (order: 0, 4096 bytes)
TCP established hash table entries: 4096 (order: 2, 16384 bytes)
TCP bind hash table entries: 2048 (order: 1, 8192 bytes)
TCP: Hash tables configured (established 4096 bind 2048)
TCP reno registered
audit: initializing netlink socket (disabled)
audit(1348827823.504:1): 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  $  16  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 0x000e3000
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 11, io mem 0x000e1000
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 15, io mem 0x000e2000
usb 1-1: new high speed USB device using ehci_hcd and address 2
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 10, io mem 0x000e0000
usb 1-1: configuration #1 chosen from 1 choice
usb usb4: configuration #1 chosen from 1 choice
hub 4-0:1.0: USB hub found
hub 4-0:1.0: 2 ports detected
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: tsc 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 20090506, using major 65
ISA-PeliCAN-indexed port I/O CAN Driver 3.4.6-4_DNP2486 (c) May ↵
13 2009
 H.J. Oertel (oe@port.de), H. Nestler (info at ssv-embedded.de)
rs485: registered version 1.1.0, major: 46, Transmit mode with ↵
RTS on
input: TRM/926 Keyboard as /class/input/input0
cons-trm926: TRM/826 8x8 Matrix keyboard v1.1 (IRQ 5)
done.
/etc/ssvconfig/sbin/ipbynet: create child with pid 396
Setting kernel variables (/etc/sysctl.conf)...done.
Mounting local filesystems...done.
Activating swapfile swap...done.
```

```
Setting up networking....
Configuring network interfaces...done.
NET: Registered protocol family 10
lo: Disabled Privacy Extensions
IPv6 over IPv4 tunneling driver
Starting web server: lighttpd.
Starting internet superserver: inetd.
Starting OpenBSD Secure Shell server: sshd.
Starting periodic command scheduler: crond.
> eSOM/2586 SSV (SJA1000) at indexed port I/O
INIT: Entering runlevel: 9

Debian GNU/Linux 5.0 emblinux ttyS0

emblinux login:
```

4 HELPFUL LITERATURE

- TRM/926 hardware reference manual
- Computer-on-Module eSOM/2586 hardware reference manual
- Vortex86DX documents: `www.vortex86dx.com`
- Official Python GTK website: `www.pygtk.org/tutorial.html`
- Python video tutorial: `www.youtube.com/watch?v=MxYl3cnn4yw`

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DOCUMENT HISTORY

Revision	Date	Remarks	Name
1.0	2012-09-27	first version	WBU
1.1	2012-09-28	changed boot messages in chapter 3.7	WBU

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