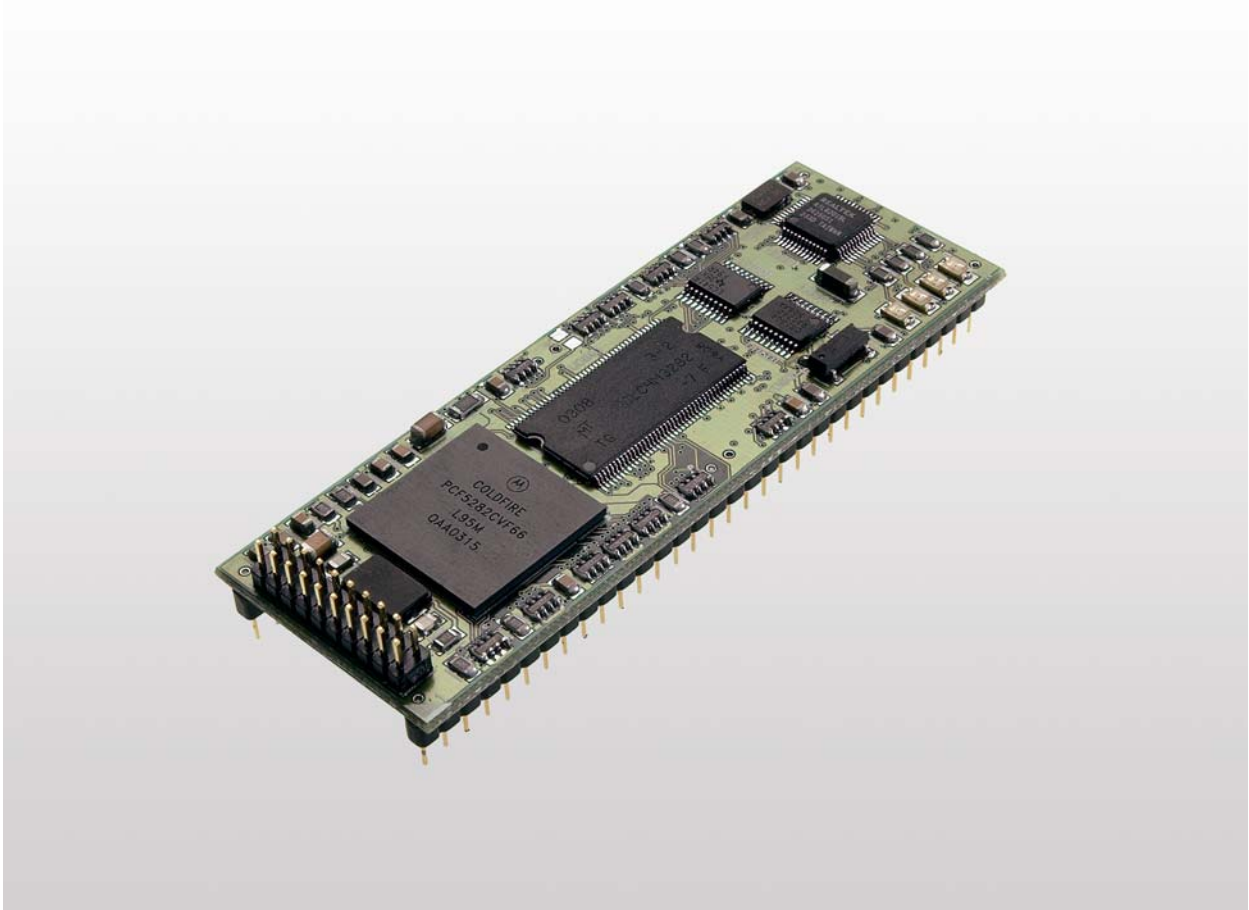
DIL/NetPC DNP/5280
Starter Kit

User Manual



SSV Embedded Systems
Heisterbergallee 72
D-30453 Hannover
Germany
Tel. +49-(0)511-40000-0
Fax. +49-(0)511-40000-40

Manual Revision: 1.00
Date: 2004-03-23

For further information regarding SSV products please visit us at www.dilnetpc.com

1 Introduction

Thank you for choosing an SSV Starter Kit. We are confident that you will be pleased with the performance of your product. Please take a few minutes to read this manual. It describes how to start with the DNP/SK13 Starter Kit and will help you to get out the most of your new system.

For further information about the individual components of this Starter Kit you may follow the links from our website at: *http://www.dilnetpc.com*

Our Website contains a lot of technical information, which will be updated in regular periods.

For specific technical information – like hardware description etc. – please check out the Starter Kit CD-ROM, which is an important part of every Starter Kit.

1.1 Conventions used in this Document

Convention	Usage
italic	Filenames, Internet addresses like e.g. *www.ssv-embedded.de*
bold italic	User inputs, command lines and pathnames
bold	New terms
`monospace`	Program code
E	Keyboard button

Table 1-1: Convention usage

1.2 Checklist

Compare the content of your Starter Kit package with the checklist below. If any item is missing or appears to be damaged, please contact SSV Embedded Systems.

Standard Items

- ✓ Evaluation Board DNP/EVA2-SV6
- ✓ DIL/NetPC DNP/5280
- ✓ Null-Modem cable
- ✓ Power Supply
- ✓ Power Cable
- ✓ User Manual
- ✓ Support CD-ROM

1.3 Features

Evaluation Board DNP/EVA2-SV6

- 64-pin DIL socket for one DIL/NetPC DNP/5280
- One Serial Interface, 1 x RS232
- 10/100Mbps Ethernet Interface
- Eight User-Definable LEDs
- Eight Manual DIP Switches
- One Reset Switch
- Prototype-Area
- 5 VDC Power Input Connector
- Size 140 x 120 mm

DIL/NetPC DNP/5280

- Motorola 32-bit MCF5280 ColdFire with 66 MHz Clock Speed
- 63 MIPS (Dhrystone 2.1)
- 16 MByte SDRAM Memory, 8 MByte FLASH Memory
- 10/100 Mbps Ethernet LAN Interface
- Four LAN Status LEDs
- Two asynchronous Serial Ports (one with all Handshakes)
- One I2C Interchip Bus Interface
- One Queued Serial Peripheral Interface (SPI)
- One CAN Interface (Supports CAN Protocol Specification 2.0B)
- 20-bit General Purpose high-speed Parallel I/O
- 8-bit I/O Expansion Bus
- Five Interrupt Inputs
- Four Chip Select Outputs
- Programmable General Purpose Timers and Watchdog Timer
- Motorola BDM (Background Debug Mode) Interface for In-Circuit Debugging
- In-System Programming Features
- 64-pin JEDEC DIL-64 Connector, 2.54mm Centers
- 3.3 Volt Low Power Design, Supply Voltage 3.3 VDC (+- 5%)
- Supply Current 300 mA typ. at 66 MHz
- Size 82mm * 28mm

2 Board Layout

The main component of the Starter Kit is the Evaluation Board DNP/EVA2-SV6. On this board you will find a 64-pin DIL socket (DIL = Dual In Line) to mount your DNP/5280.

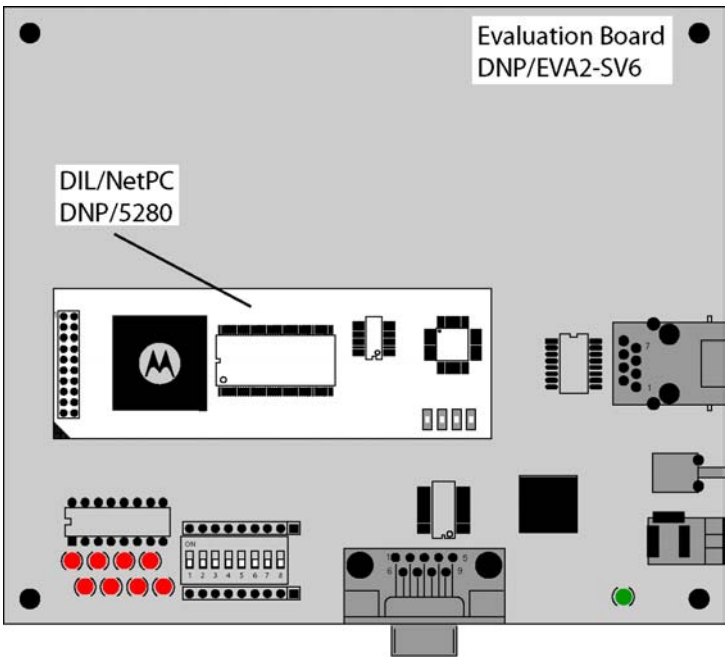


Figure 2-1: Evaluation Board EVA2 with DNP/5280

The Starter Kit DNP/SK13 provides all required basic hard- and software environment, which allows you the development of individual applications for your DNP/5280.
For an instant connection to your hardware the Evaluation Board supports a serial COM interface, a 10/100Mbps Ethernet interface as well as a DIL-64 interface. Further you will find a prototype (wire-wrap) area, eight LEDs, DIP-switches and one reset switch, which allows you to test your peripheral applications very easy. With the prototype area you have a good place to install and to test your own applications on the Evaluation Board.

3 Board Components

This chapter describes the most interesting components of the Evaluation Board DNP/EVA2-SV6 and gives a short overview about their respective functions.

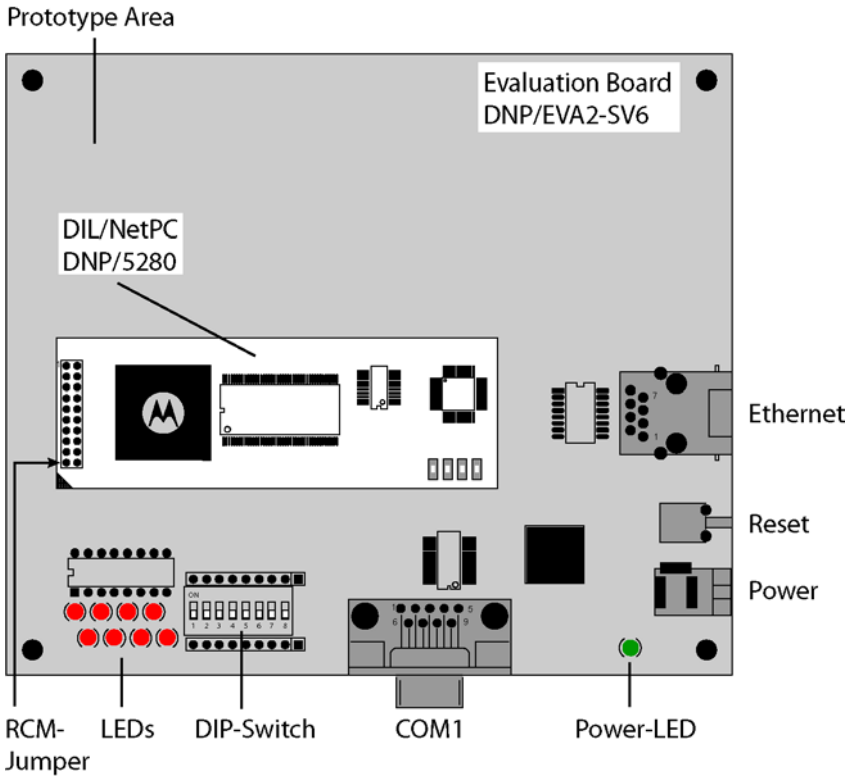


Figure 3-1: Main components of the Evaluation Board DNP/EVA2-SV6

The Evaluation Board offers a single 64-pin DIL socket (DIL = Dual-In-Line). This socket picks up your DNP/5280 and builds the interface to the individual parts on the Evaluation Board.

3.1 Power Connector

The Power connector onto the Evaluation Board has to be connected with the power supply, which is added to your Starter Kit. Alternatively you are able to use a similar power supply that provides +5V DC ±10% and approx. 1500 mA current.

3.2 Power LED

The Evaluation Board DNP/EVA2-SV6 is equipped with a single green LED. This LED will light up when the board is provided with the necessary operating voltage.

3.3 Output LEDs

The Evaluation Board provides eight red LEDs for testing purposes. These LEDs are the first little application for the PIO-Ports. The LEDs will flicker or light up to indicate traffic on the output ports PA0–PA7.

3.4 DIP Switches

The Evaluation Board has a set of eight DIP-switches. The DIP-switches give you the possibility to put 8-bit binary numbers to the input ports PB0–PB7. The DIP-switches are the second little application for the PIO ports.

Switch open = Signal Vin Low (GND)
Switch closed = Signal Vin High (Vcc)

3.5 Reset Button

Next to the Power connector you find the Reset button. Press it down if the system hangs or you need to restart it. Pressing the Reset button will only restart the DNP/5280. To reset any connected devices please turn off the complete power from the system.

3.6 Prototype Area

The Prototype Area offers space to develop your own applications and circuits on the Evaluation Board.

3.7 RCM Jumper

Note: The default setting of the RCM-jumper is not set. Only if the RCM-jumper is set you will be able to boot µCLinux on the DNP/5280.

The **Remote Console Mode (RCM)** realizes some basic operating modes such as a boot loader or a ROM-Monitor Program. The default firmware of the DNP/5280 starts a ROM-Monitor (Motorola-dBUG) when the RCM-jumper is set. The DNP/5280 boots with µCLinux when the RCM-jumper is not set.

Use this jumper (Pins 19 and 20 of the BDM-Interface) to activate RCM on the DNP/5280. To activate RCM place a jumper cap on both pins of the RCM-jumper, so that it is short. If you remove the jumper cap, or place the jumper cap on just one pin, the jumper is not set and you are not able to use RCM.

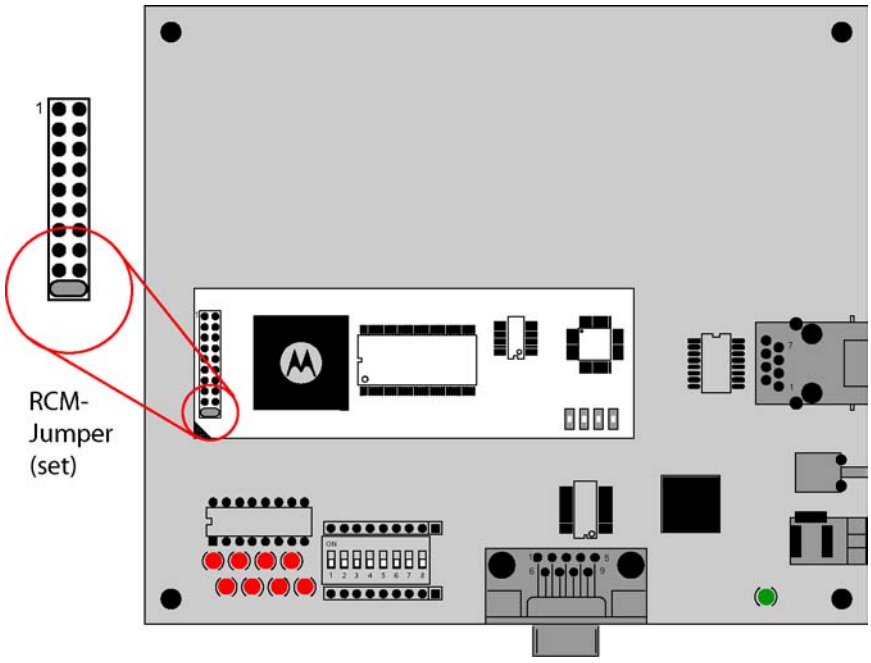


Figure 3-2: Position of the RCM-Jumper on the DNP/5280

3.8 10/100Mbps Ethernet Interface

The DNP/5280 is using a Realtek RTL8201BL PHY 10/100Mbps chip that allows Ethernet connectivity with a speed up to 100Mbps. The RJ45 Ethernet interface on the Evaluation Board is just a simple connection over a transformer to the DIL interface pins, which are connected to the LAN controller onto the DNP/5280.

Four miniature LEDs are placed on the DNP/5280 for a visual check of the LAN activity.

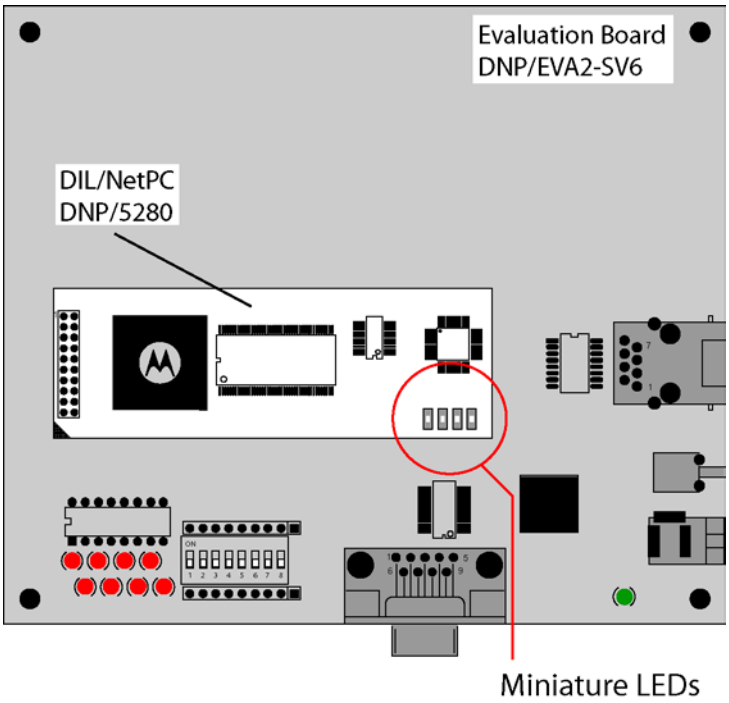


Figure 3-3: Position of the Miniature LEDs on the DNP/5280

3.9 Serial Interface COM1

For an easy connection between the Starter Kit and your development system you can use the serial interface COM1. The COM1 interface is realized as a RS232 standard compliant Sub-D port with 9 pins. The exact layout of the COM1 interface is shown in Appendix 2 - A2.1 COM1 Connector.

4 Connections

For a quick and easy start with the DNP/SK13 Starter Kit there are several connections necessary. The following chapter describes, how and between which components these connections have to be made.

4.1 Mounting the DNP/5280

To mount the DNP/5280 on the Evaluation Board DNP/EVA2-SV6 identify the pin 1 corner on the socket and the pin 1 corner on the DNP/5280. On the DNP/5280 a white sign marks the pin 1 corner. Matching the pin 1 corners, drop the DNP/5280 down into the socket. There is only a little bit force required and the DNP/5280 should seat easily into the socket. This locks the DNP/5280 in place.

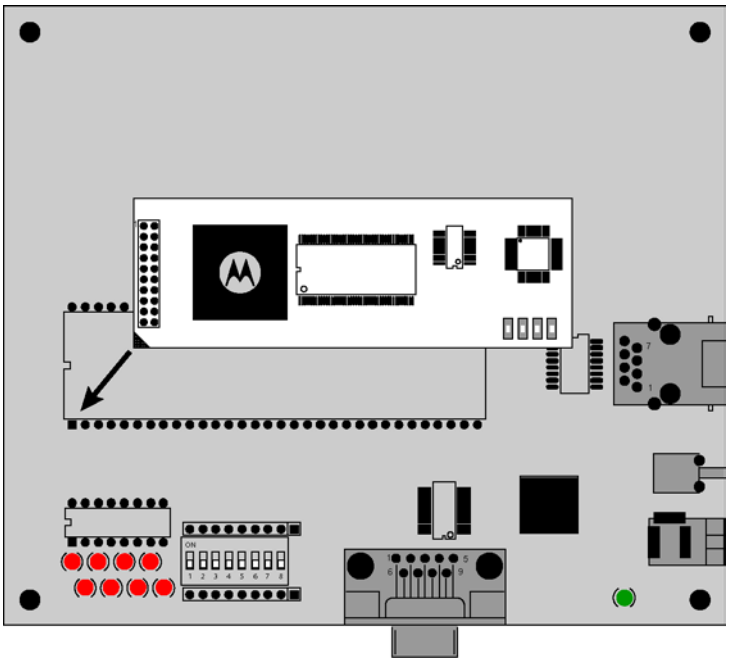


Figure 4-1: Position of the DNP/5280 on the Evaluation Board

4.2 Cable Connections

Before you can use your DIL/NetPC Starter Kit you need a further Desktop- or Notebook-PC, which acts as development system. This development system should run under MS-Windows or Linux in an ideal manner.

Between the development system and the Starter Kit are two connections required. At first the RS232 Serial Link and at second the Ethernet Link.

The PC will act as development system and as RCM (Remote Console Mode) for the DNP/5280 on the Evaluation Board.

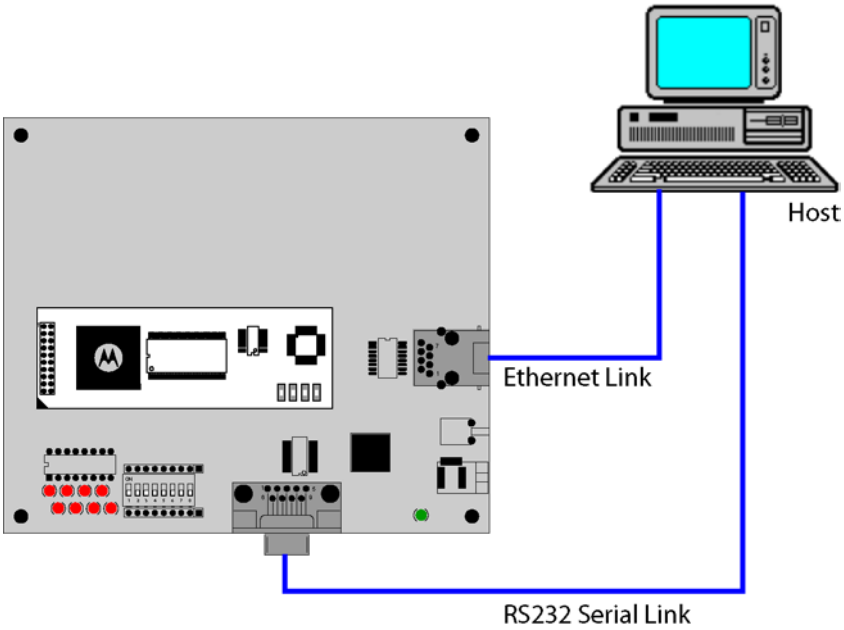


Figure 4-2: Overview about the required cable connections

4.3 Serial Link

For the Serial Link, you need a Null-Modemcable. This cable comes along with your Starter Kit. Please connect the Evaluation Board with the COM1 port of your development system by using this cable.

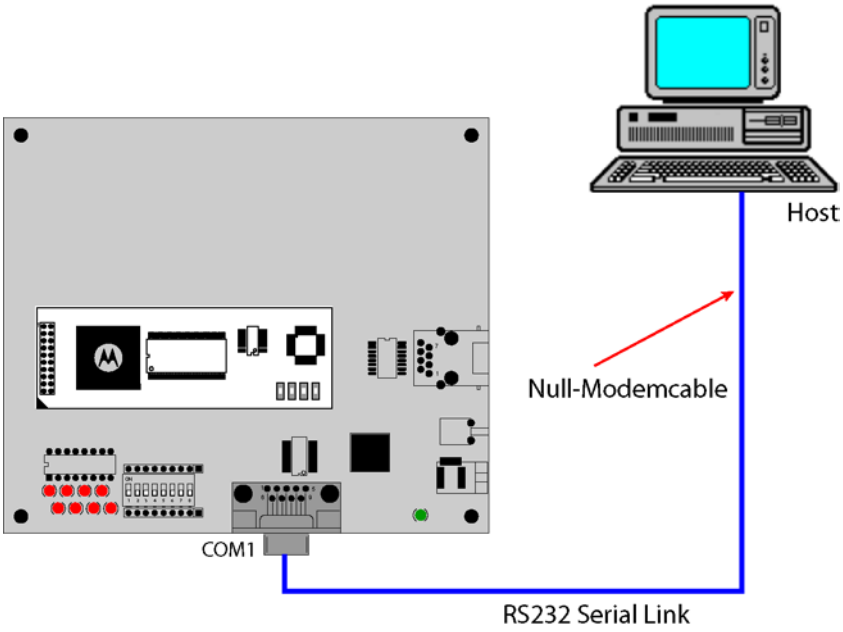


Figure 4-3: Serial Link Connection

4.4 Ethernet Link

The Ethernet Link can be made on two ways. First, with a Crossover Cable and second, with two standard 10/100Base T patch cables and a hub or switch. In both cases an Ethernet-LAN interface for your development system is required. If you use a hub or switch please connect them between your development system and the DNP/5280 like shown in the figure below.

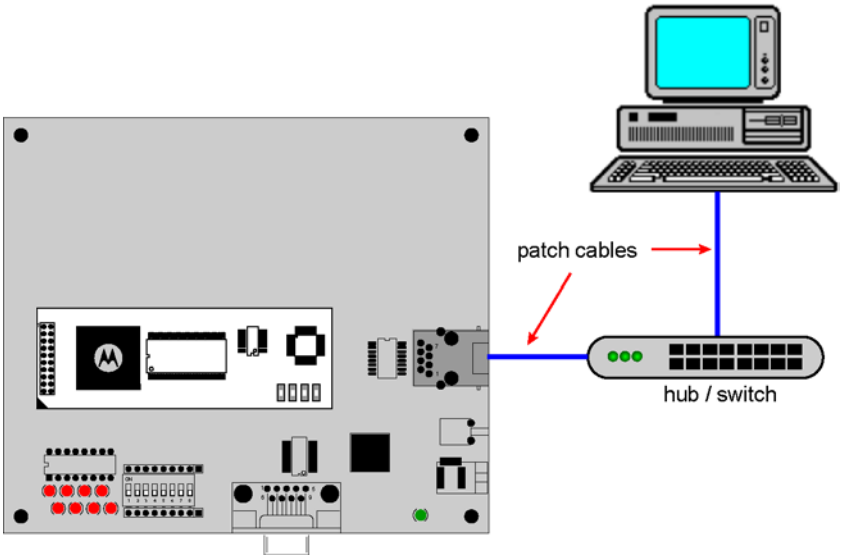


Figure 4-4: Ethernet Link Connection using a hub/switch

If you want to connect your development system directly to the DNP/5280, place a Crossover Cable between these two components like shown in the next figure.

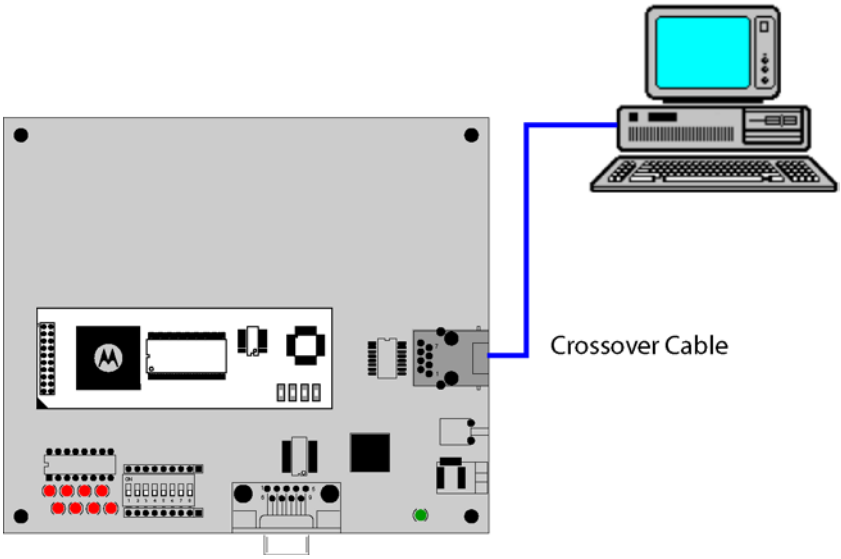


Figure 4-5: Ethernet Link Connection using a Crossover Cable

4.5 Power Supply

The DNP/5280 Starter Kit needs a supply voltage of 5V DC to work. In your Starter Kit package you will find a plug-in power supply unit to provide the system with the necessary power. After the connection of all cables the Starter Kit is ready to run.

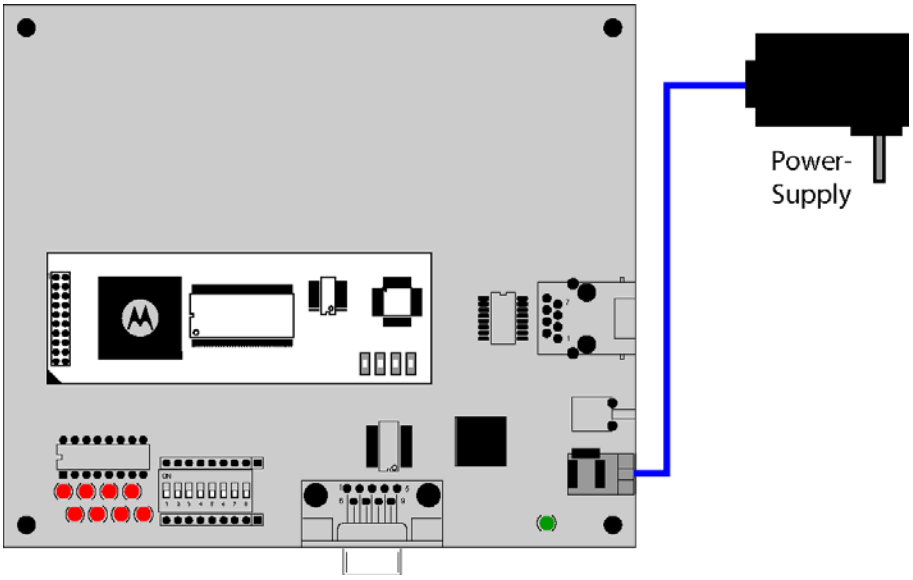


Figure 4-6: Power supply Connection

Caution:

Providing the Evaluation Board of the DNP/5280 with a voltage higher than the regular +5V DC ±10% could resolve in damaged board components!

5 First Steps

You can use the DNP/5280 Starter Kit from your development system. This development system may run under different operating systems. The first steps for getting started we describe exemplary by the two most popular operating systems – MS-Windows and Linux.

5.1 Using a Windows–based development System

The following paragraphs will help you to use the DNP/5280 with a development system running under MS-Windows. For these steps some programs are necessary, which normally come along with every MS-Windows installation (e.g. **HyperTerminal**). Please make sure that these programs are present on your development system. If these programs are not installed at your development system – you have to install these programs manually from your MS-Windows installation CD-ROM.

5.1.1 Setup the Serial Link

Before you provide the Evaluation Board with power for the first time, please run a terminal program that offers communication capabilities on your development system – e.g. Windows HyperTerminal. In the following you will see the necessary settings for HyperTerminal under Windows. Select the "direct link cable connection via COM1" interface (or any other appropriate COM-port) in the dialog box and choose "OK".

Figure 5-1: Interface dialog box

Now you can change some configuration parameters – such as the maximum baud rate – on a further dialog box. Select the value "115 200" in the "Bits per Second" field and close the dialog box by clicking the "OK" button, as shown in the next figure.

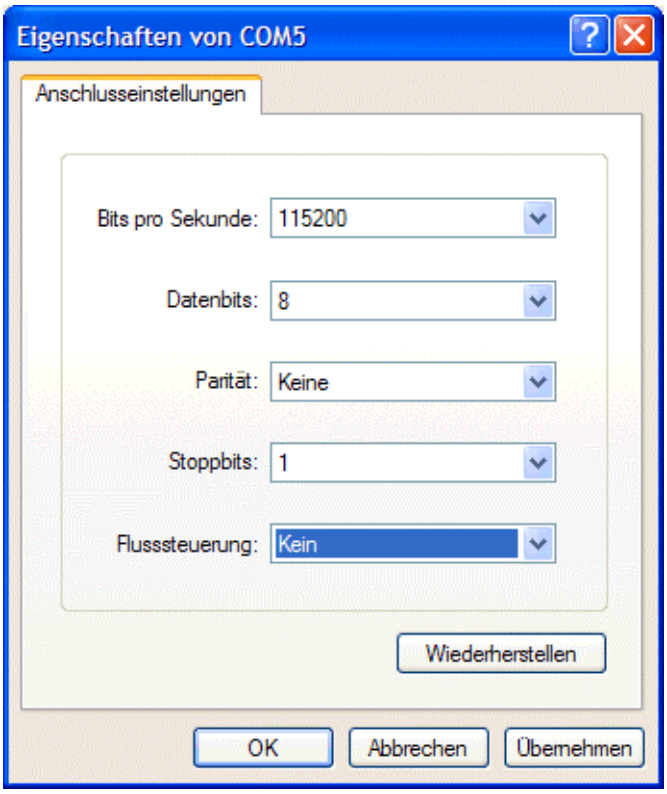


Figure 5-2: Communication parameter settings

All these settings can also be used for other terminal programs. The following parameters are important to use:

- Connection Speed 115.200 bps (Bits per Second)
- 8 Data bits
- No Parity bit
- 1 Stop bit
- No Protocol (Xon/Xoff, RTS/CTS or similar).

Now turn on the power for the Evaluation Board and you will see all steps of the DNP/5280 boot process in the terminal program window at your PC. If you do not see the following boot process, please assure that the RCM-jumper on the DNP/5280 is not set (please see chapter 3.7 for detailed information).

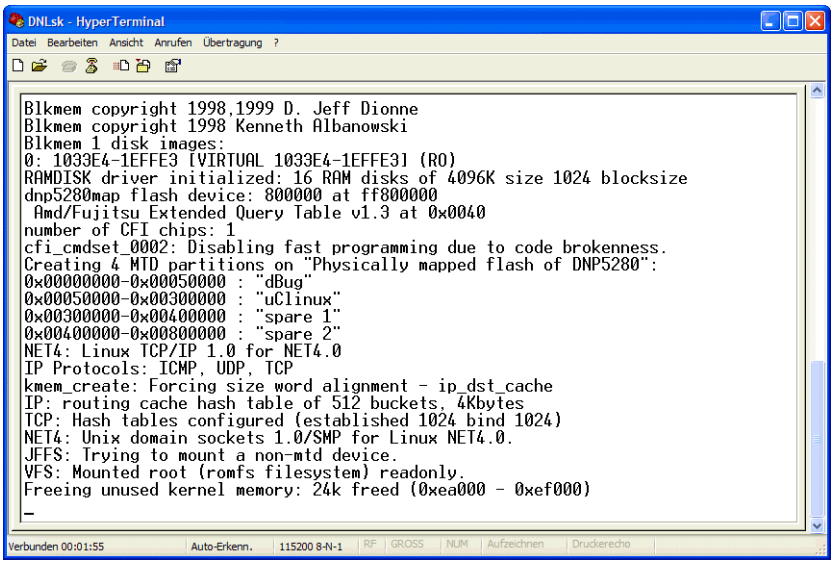


Figure 5-3: Linux boot process

After the self test sequence is done the Linux boot process will be initialized. When finished, you will see the following screen with a Linux prompt which is waiting for a user input.

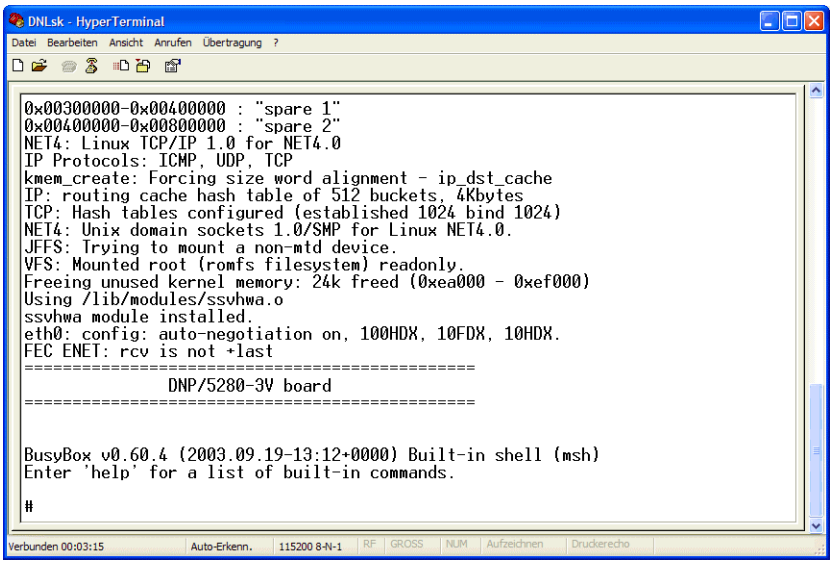


Figure 5-4: Linux command prompt

Now please enter ***ifconfig*** to see the network interface addresses of the DNP/5280.

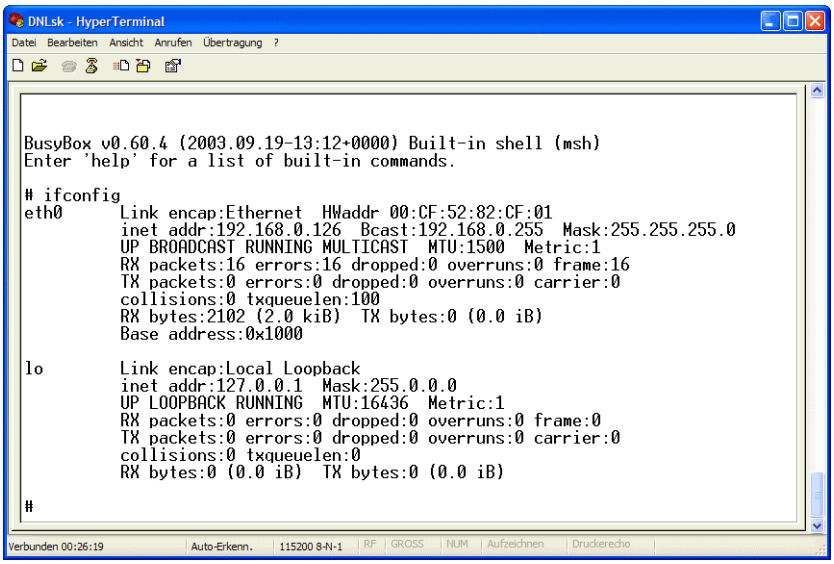


Figure 5-5: DNP/5280 network interface addresses

Note: For a first test of the Ethernet connection between the development system and the DNP/5280 you have to change the assigned IP-address of your development system to 192.168.0.254.

To change the IP-address under MS-Windows just click "Start➲Settings➲Control Panel➲Network➲TCP/IP" and enter the new IP-address. Please make sure, that you do not use another IP-address – this will lead to different network problems.

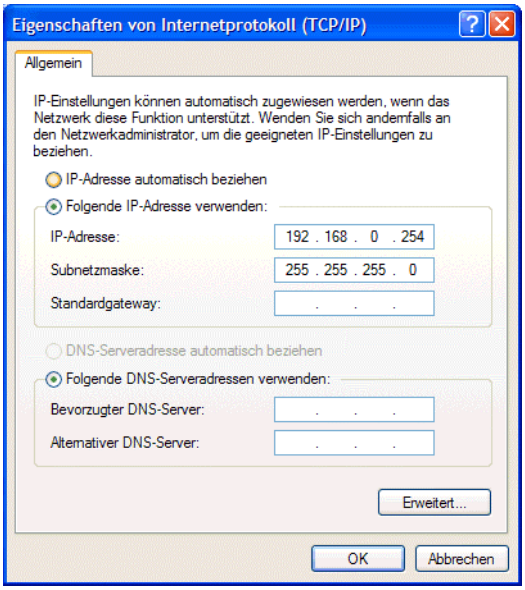


Figure 5-6: Windows IP address settings

5.1.2 Checking the Ethernet Link

To test the TCP/IP-communication we use PING a very popular TCP/IP-utility program. Please open a DOS window (you can find it in the Windows Start menu) and enter:

ping 192.168.0.126

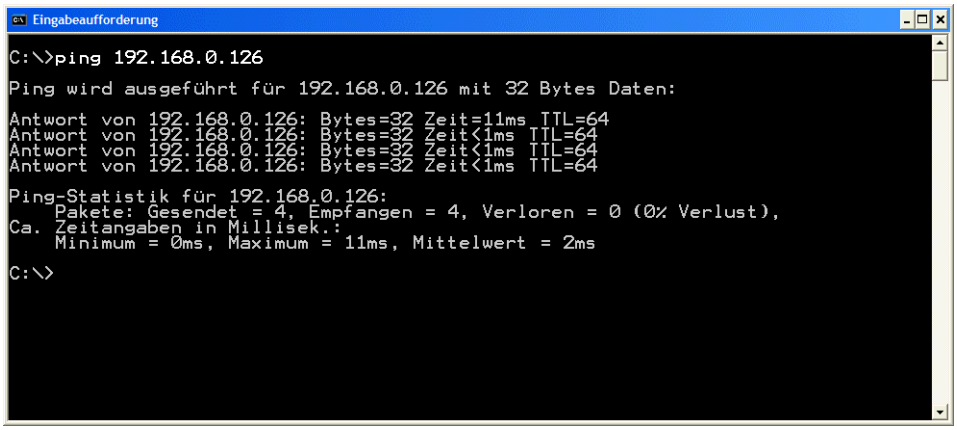


Figure 5-7: Communication check via PING

The Starter Kit must answer this ping. Otherwise an error will occur. In this case you have to check all parts of your LAN-connection, including the IP-address of the development system. The correct value of the IP-address is "192.168.0.254". For an easy check of the IP-address within the DOS window, you can use the following DOS-command:

ipconfig

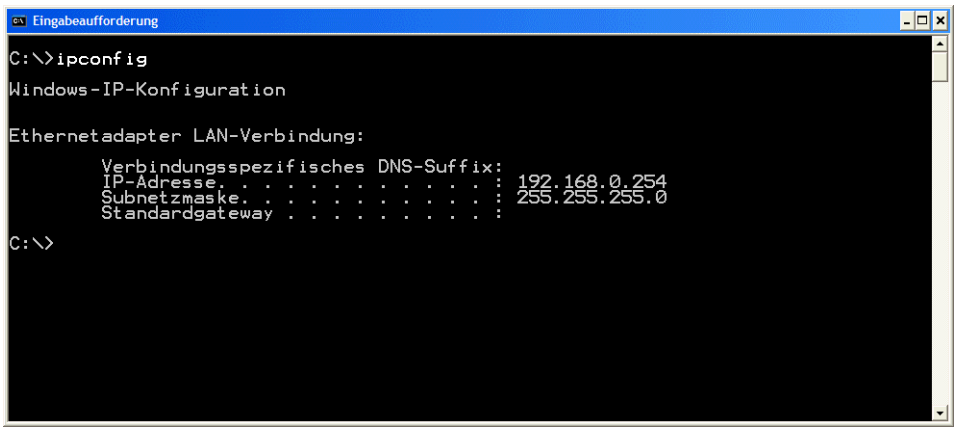


Figure 5-8: Communication check via ipconfig command

Once the ping was successful, you are ready to start a Web browser on your development PC. This browser may be the Microsoft Internet Explorer or a different suitable Web browser like the Netscape Communicator or Opera or similar.

5.1.3 Web Server Access

Start a Web browser like the Microsoft Internet Explorer or similar and open the URL ***http://192.168.0.126***. The Embedded Web Server will deliver you a small de-scription about the DNP/5280. That's it. Now you are online with the Starter Kit and your Web browser is connected to the Embedded Web Server of the DNP/5280. It shows you a static web page with some pictures.

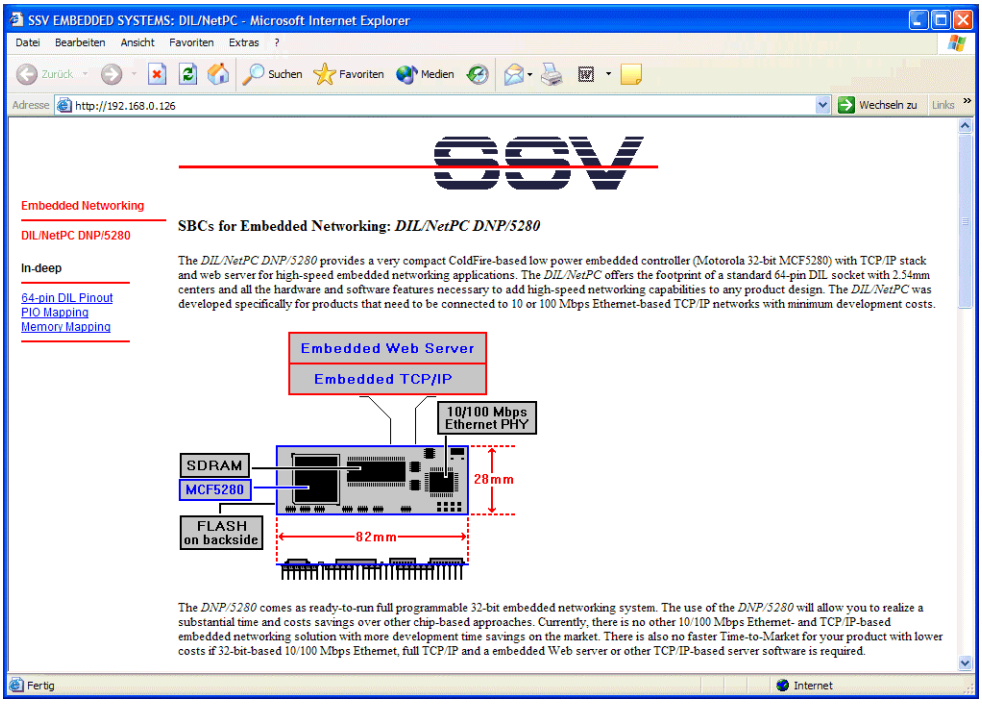


Figure 5-9: Web page shown by the MS-Internet Explorer

If your Web browser can't establish a connection to the Web Server – but the Ping was successful – you should check your browser settings. Please ensure that your browser is joined with TCP/IP by using the Ethernet card in your development system. Alternatively you have to install a suitable Web browser.

Please make sure that your Web browser does not use an Internet Proxy Server for http-requests. See the Web browser connection settings for further details.

In some cases the Web browser is only configured for modem based Internet ac-cess. In this case, please install a second Web browser from your original operat-ing system CD-ROM.

5.1.4 Assigning a new IP-Address to the DNP/5280

The following steps describe how to change the IP-address of the DNP/5280 with a terminal program like the HyperTerminal-program in MS-Windows.

Note: Please assure that the RCM-jumper on the DNP/5280 is set for further operation. Please see chapter 3.7 how to set the RCM-jumper correctly.

When the DNP/5280 has booted with the RCM-jumper set you should see the following screen on your terminal program.

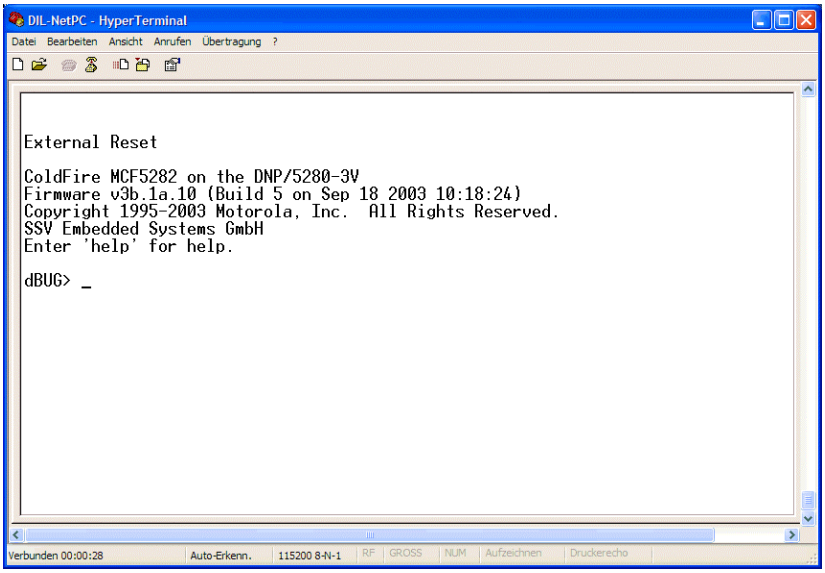


Figure 5-10: Boot process with RCM-jumper set

Now enter the command ***show*** to see the current parameters of the DNP/5280.
To assign a different IP-address (e.g. the IP-address 192.168.0.100) use the Linux command ***set client 192.168.0.100***.

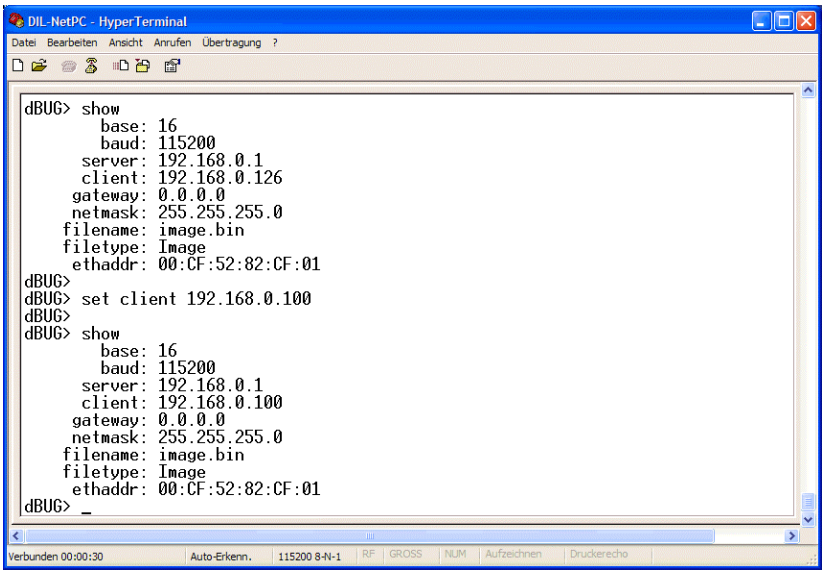


Figure 5-11: Assigning a new IP-address to the DNP/5280

Probably you have to change other parameters as well. The next figure shows you how to use the command set with different parameters.

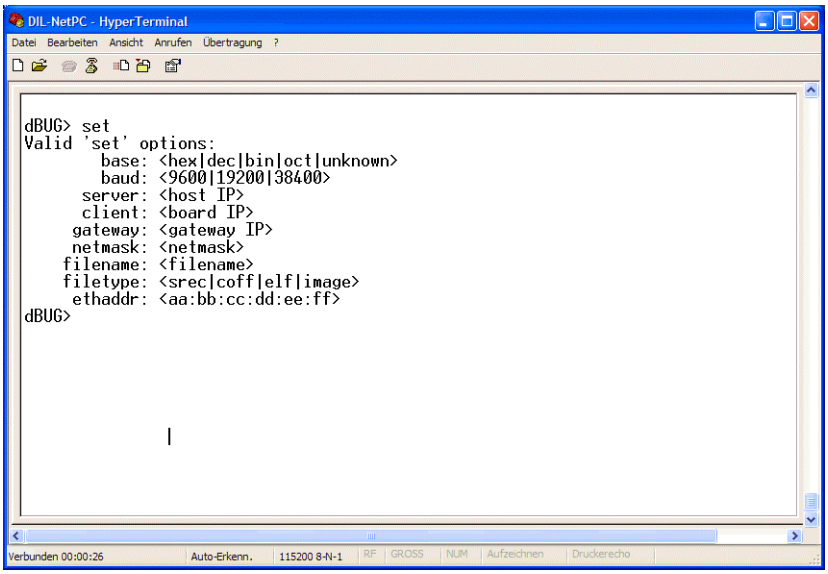


Figure 5-12: Command set with parameters

5.1.5 Running Linux

The DNP/5280 is delivered with a pre-installed Linux. When booting make sure the RCM-jumper of the DNP/5280 is not set. When the Linux boot process is done the system will stop with the login prompt shown in figure 5 13.
The DNP/5280 Linux does not need a user login with user name and password. Just enter your Linux commands directly after the boot process.

Note: On every boot process without the RCM-jumper set (please see chapter 3.7) there is a serial console available with following parameters: 115 200 bps, No Parity, 8 Data Bits, 1 Stop Bit, No Handshake.

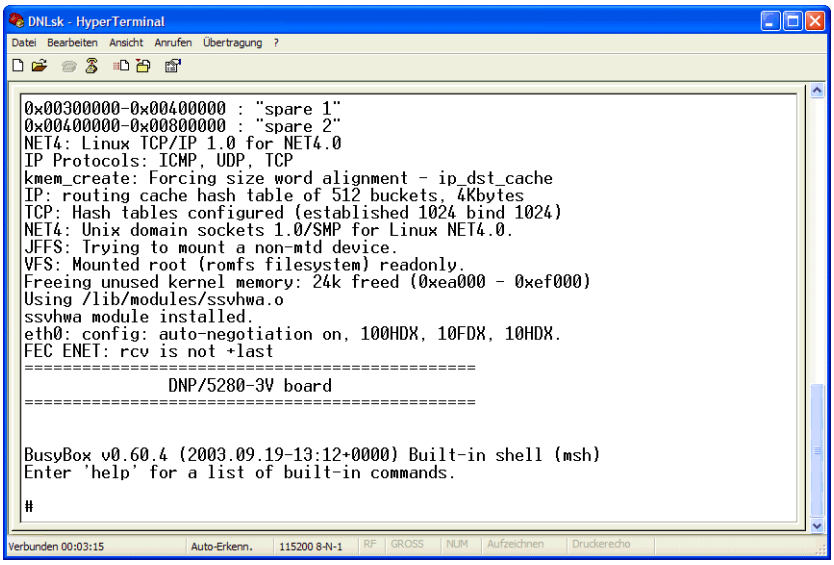


Figure 5-13: DNP/5280 Linux boot process

Alternatively you can use a **Command Line Interface (CLI)** lika a Telnet client to communicate with the DNP/5280. Open for example a DOS window in MS-Windows and type in the command ***telnet 192.168.0.126***.
If you have already assigned a different IP-address to the DNP/5280 you need to enter this new IP-address in the command line.

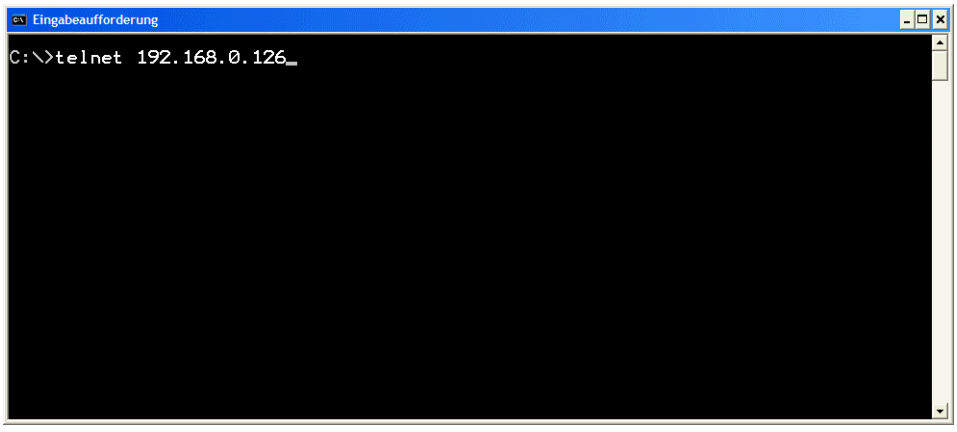


Figure 5-14: Running the MS-Windows Telnet client

Within the Telnet client you can enter Linux commands that will be executed by the DNP/5280. The standard output will be shown in your Telnet client window as illustrated in the next figure.

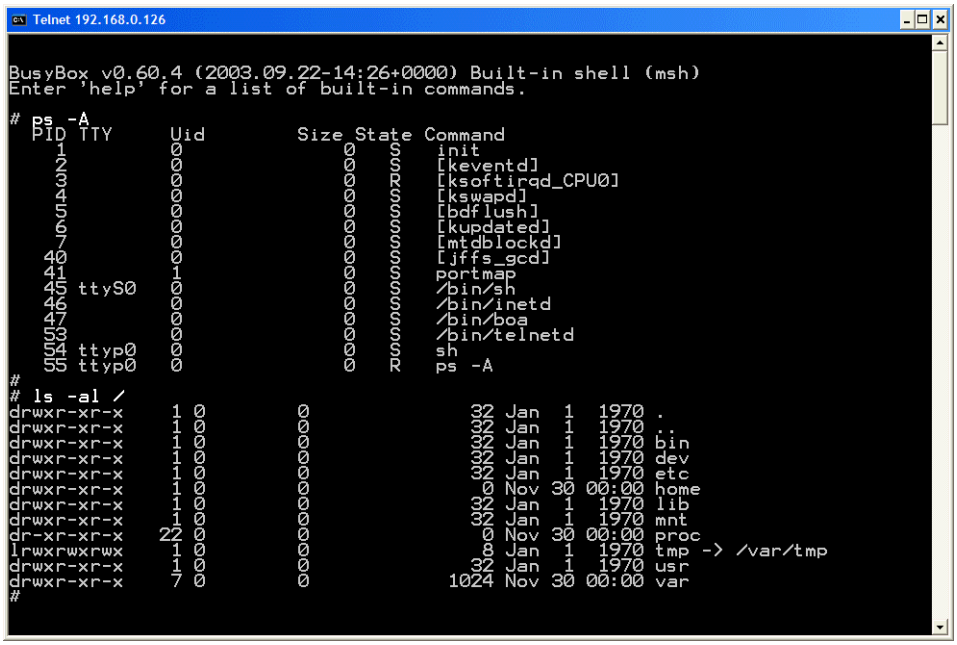


Figure 5-15: Enter Linux commands via Telnet

Note: You can enter Linux commands in different Command Line Interfaces (CLI) like a serial console (e.g. HyperTerminal, Minicom) or a Telnet client.

5.1.6 File Transfer via TFTP

The DIL/NetPC DNP/5280 offers a very simple way for Ethernet-based file transfers between your PC system and the DNP/5280 RAM disk drives or JFFS-based flash disk drives. This file transfer is using the TCP/IP service **TFTP (Trivial File Transfer Protocol)**.
TFTP is server/client-based. The DIL/NetPC DNP/5280 Linux configuration offers a TFTP client program. Your PC needs a TFTP server program.

Note: Windows-based PCs do not offer TFTP server programs. Only some special server versions of MS Windows come with a TFTP server program. For all other Windows-based PCs you find a simple TFTP server program – TFTPD32 – within the directory ***\TFTPServer-Win32*** of your DNP/5280 Starter Kit CD-ROM. Copy all files from ***\TFTP-Server-Win32*** to a new subdirectory on your Windows-based PC hard disk drive. TFTPD32 is a free, non-commercial product. Please watch the license.

First you have to set-up an Ethernet link between the DNP/5280 10/100 Mbps Ethernet interface and the Ethernet interface of your PC system. Check the IP address of your Windows PC system with the ***ipconfig*** command. The default IP address (factory setup) of the DNP/5280 is 192.168.0.126.

Now run the TFTP server program on your PC system.

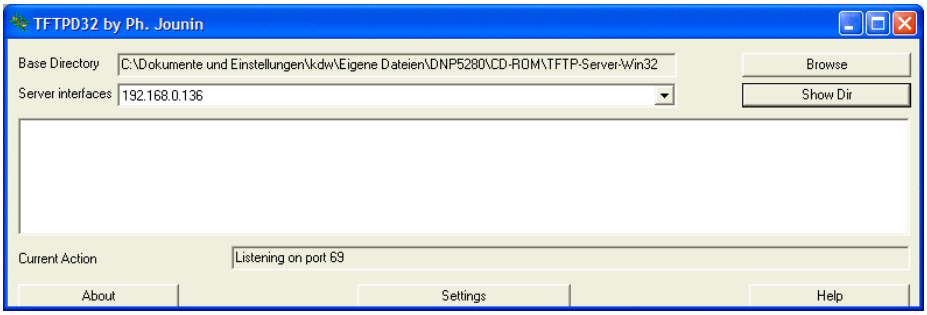


Figure 5 16: Running TFTPD32

Check the TFTP connection between the DIL/NetPC DNP/5280 and your PC system. Open a Telnet session and use the following commands for downloading and uploading files:

tftp –g –l file.name ip-addr
tftp –p –l file.name ip-addr

The command ***tftp*** is the name of the DNP/5280 TFTP client program.

The parameter ***–g*** stands for get (get a file from the PC system to the DNP/5280).

The parameter ***–p*** stands for put (put a file from the DNP/5280 to the PC system).

The parameter ***–l*** file.name specifies the file for put or get.

The parameter ***ip-addr*** stands for the IP address of your PC system (i.e. 192.168.0.1).

Most TFTP server programs work with a default directory for put and get commands. Each TFTP put command writes a file to this directory. Each TFTP get command reads the file from this directory on your PC system. For TFTPD32 you can change this directory with the browse button.

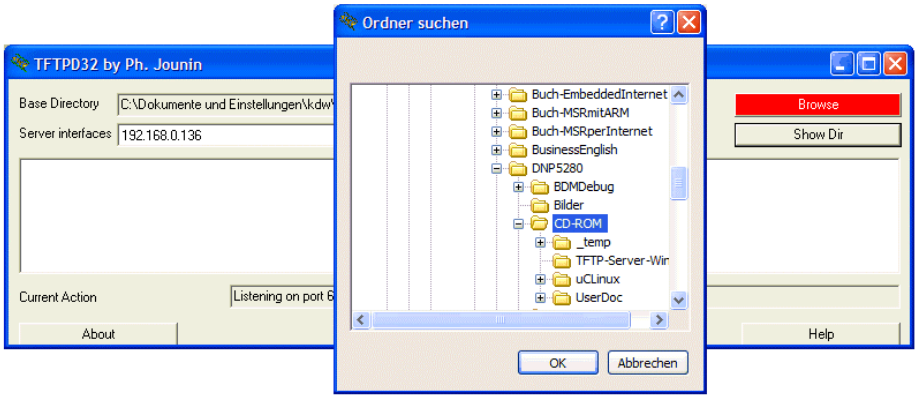


Figure 5 17: Changing the default directory for TFTPD32

Example:

The following picture shows the use of the DNP/5280 TFTP client within a Telnet session.

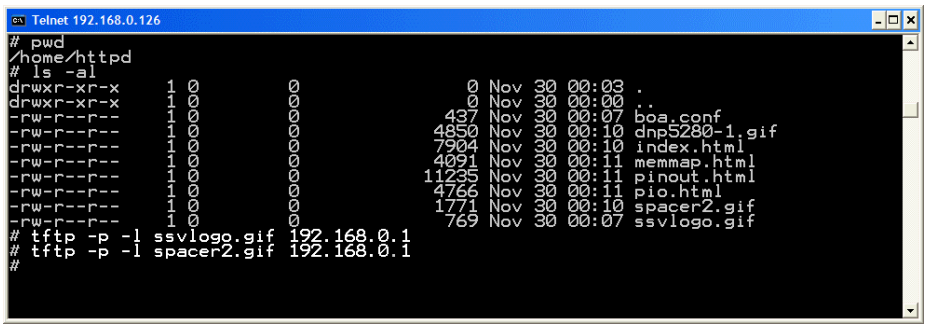


Figure 5 18: Using the DNP/5280 TFTP client within a Telnet session

Note: A file transfer to the DNP/5280 must be started with a Telnet session from RAM disk or JFFS-based flash disk directories. You need R/W access for the TFTP get command.

5.2 Using a Linux–based development System

The following paragraphs will help you to use the DNP/5280 with a development system running under Linux. For these steps you will need some programs, which normally come along with the Linux installation (i.e. **Minicom**). Please make sure that these programs are present on your development system.
If necessary you have to install these programs from your Linux installation CD-ROM.

5.2.1 Setup the Serial Link

Before you provide the Evaluation Board with power for the first time, please run a terminal program like Minicom. Minicom is a simple serial communication program originally written by Miquel van Smoorenburg. It offers basic communication capabilities and integrates well with the Linux user interface. Minicom is a lot like the old MS-DOS program PROCOMM. This program can be used to connect a Linux-based PC to embedded devices such as the DNP/5280 for initial configurations. In the following we will show you how to use Minicom and what you have to do to adjust the necessary settings.

Open a terminal window and type in the command ***minicom*** -s to get access to the serial port settings. Now you can change some configuration parameters – such as the maximum baud rate. Set the serial port parameters for the maximum baud rate on "115.200 bps".

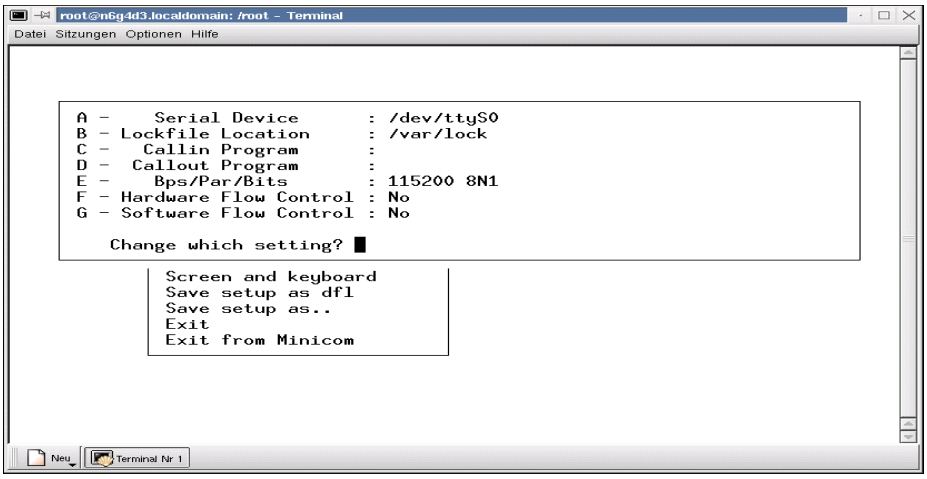


Figure 5-19: Serial Port Settings under Minicom

Now turn on the power for the Evaluation Board and you will see all steps of the DNP/5280 boot process in the terminal program window at your PC. If you do not see the following boot process, please assure that the RCM-jumper on the DNP/5280 is not set.

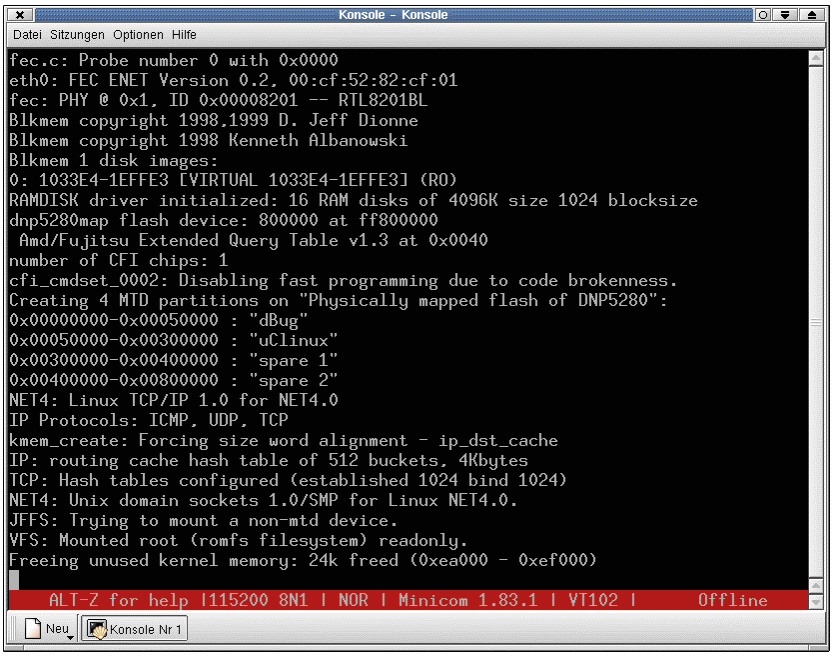


Figure 5-20: Linux boot process

After the self test sequence is done the Linux boot process will be initialized. When finished, you will see the following screen with a Linux prompt waiting for a user input.

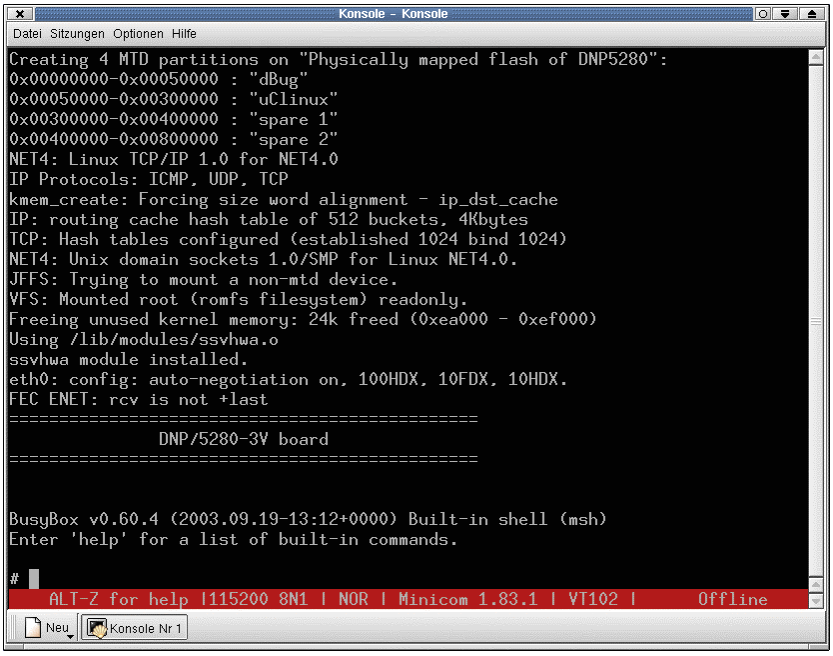


Figure 5-21: Linux command prompt

5.2.2 Checking the Ethernet Link

Please open a shell window and type in ping 192.168.0.126. Every ping request has to be answered by your DNP/5280 similar as shown below.

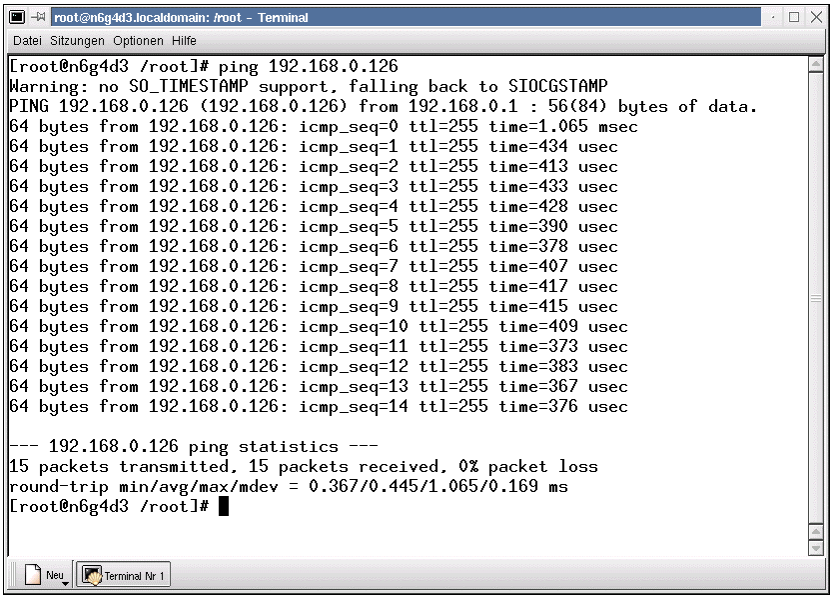


Figure 5-22: Ping Request

To cancel the ping request just press the keyboard shortcut C+c.If an error oc-curs (e.g. the DNP/5280 does not answer the ping of your development system) you have to check your cable connections at first.

Note: For a first test of the DNP/5280 you have to change the assigned IP-address of your development system to ***192.168.0.1***. Please make sure, that you do not use another IP-address – this could lead to different network problems.

For an easy check if the IP-address is set correctly to "192.168.0.1", you can use the Linux-command ***ifconfig***.

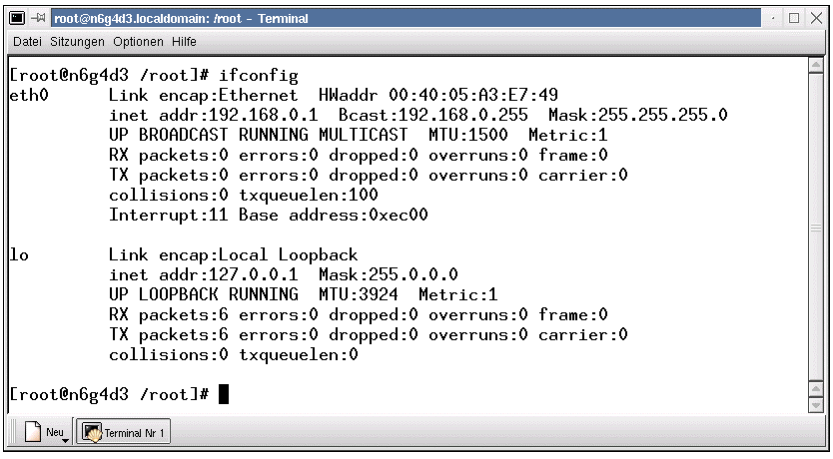


Figure 5-23: IP-address check via ifconfig

5.2.3 Web Server Access

Once the ping was successful, you are ready to start a Web browser on your development system. This may be the Konqueror File Manager or the Netscape Communicator/Navigator. The Konqueror File Manager is normally part of the Linux installation and acts as File Manager as well as Web browser. Konqueror is able to detect automatically when an URL is entered and shows the content.

Just enter the URL ***http://192.168.0.126*** and press E. The Embedded Web Server will deliver you a small description about the DNP/5280.

That's it. You are now online with the Starter Kit. The Web browser of your development system is connected to the Embedded Web Server of the DNP/5280 and shows you a static web page with some pictures.

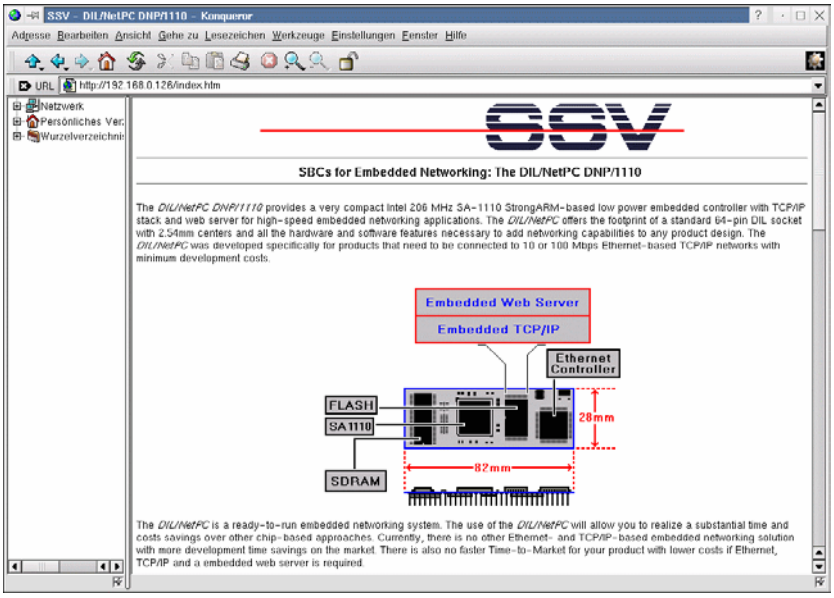


Figure 5-24: Web page shown by the Konqueror File Manager

5.2.4 Assigning a new IP-Address to the DNP/5280

The following steps describe how to change the IP-address of the DNP/5280 with a Command Line Interface like Minicom in Linux.

Note: Please assure that the RCM-jumper on the DNP/5280 is set for further operation. Please see chapter 3.7 how to set the RCM-jumper correctly.

When the DNP/5280 has booted with the RCM-jumper set you should see the following screen on your terminal program.

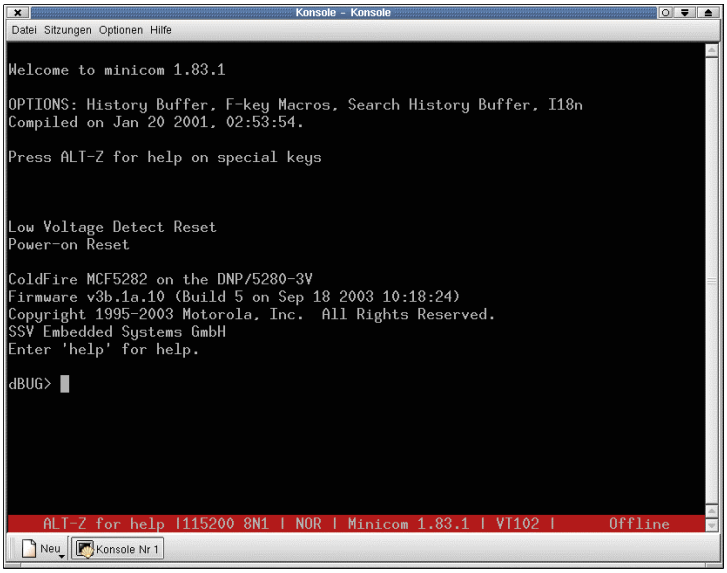


Figure 5-25: Boot process with RCM-jumper set

Now enter the command ***show*** to see the current parameters of the DNP/5280. To assign a different IP-address (e.g. the IP-address 192.168.0.100) type in the command line ***set client 192.168.0.100***.

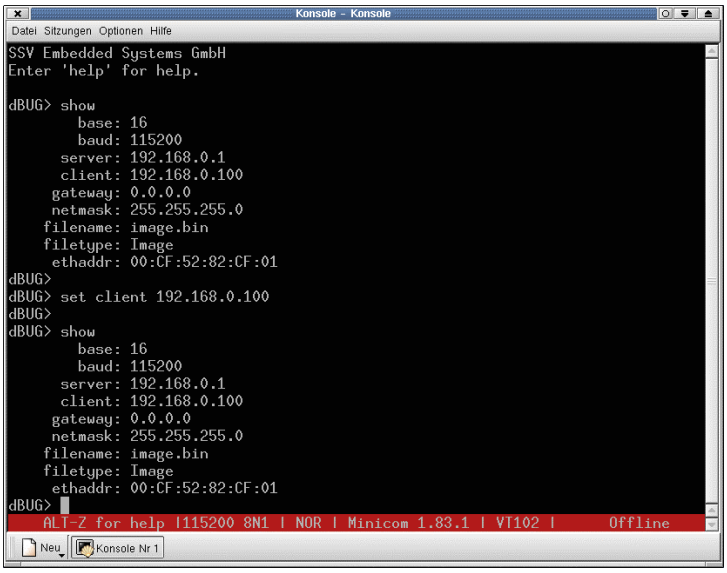


Figure 5-26: Assigning a new IP-address to the DNP/5280

Probably you have to change other parameters as well. The next figure shows you how to use the command set with different parameters.

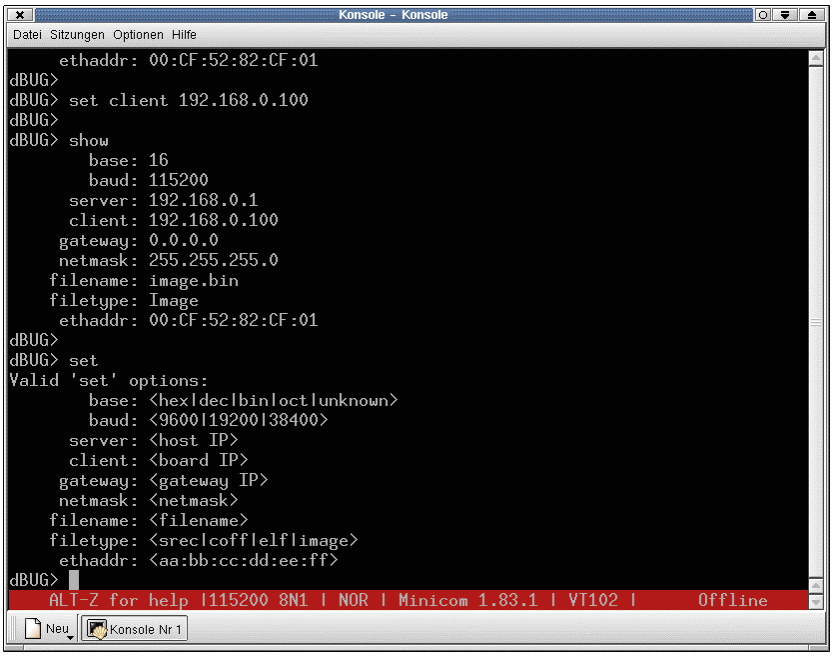


Figure 5-27: Command set with parameters

5.2.5 Running Linux

The DNP/5280 is delivered with a pre-installed Linux. When booting make sure the RCM-jumper of the DNP/5280 is not set. When the Linux boot process is done the system will stop with the login prompt shown in figure 5 30.

The DNP/5280 Linux does not need a user login with user name and password. Just enter your Linux commands directly after the boot process.

Note: On every boot process without the RCM-jumper (please see chapter 3.7) set there is a serial console available with following parameters: 115 200 bps, No Parity, 8 Data Bits, 1 Stop Bit, No Handshake.

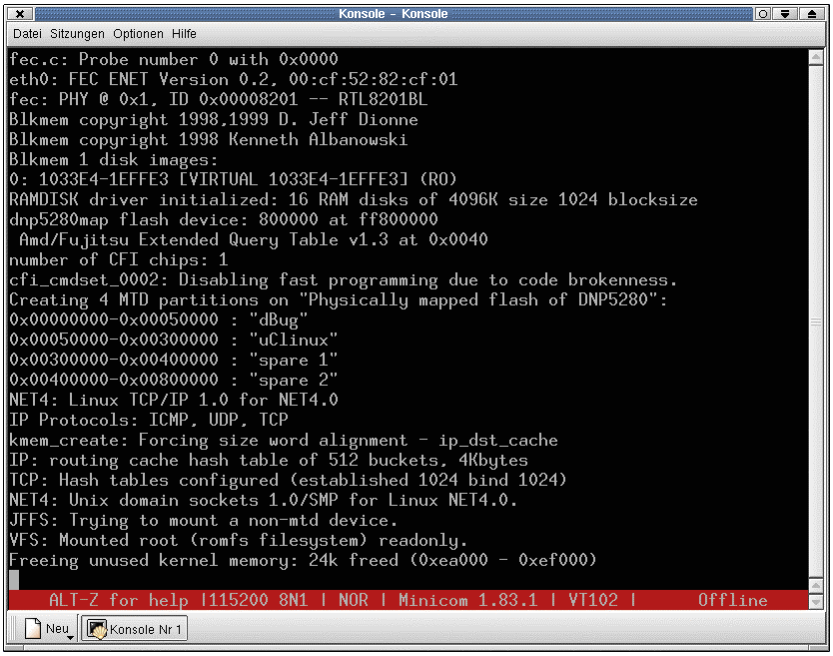


Figure 5-28: Linux boot process

Alternatively you can use a **Command Line Interface (CLI)** like a Telnet client to communicate with the DNP/5280. Type in the command ***telnet 192.168.0.126***. If you have already assigned a different IP-address to the DNP/5280 you need to enter this new IP-address in the command line.

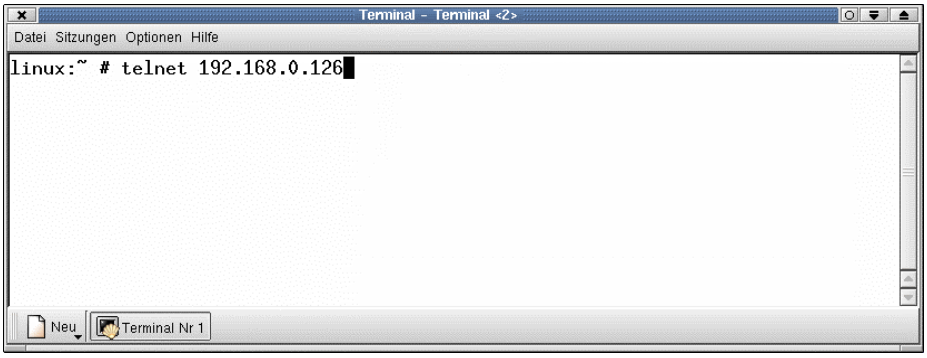


Figure 5-29: Linux login

Within the Telnet client you can enter Linux commands that will be executed by the DNP/5280. The standard output will be shown in your Telnet client window as illustrated in the next figure.

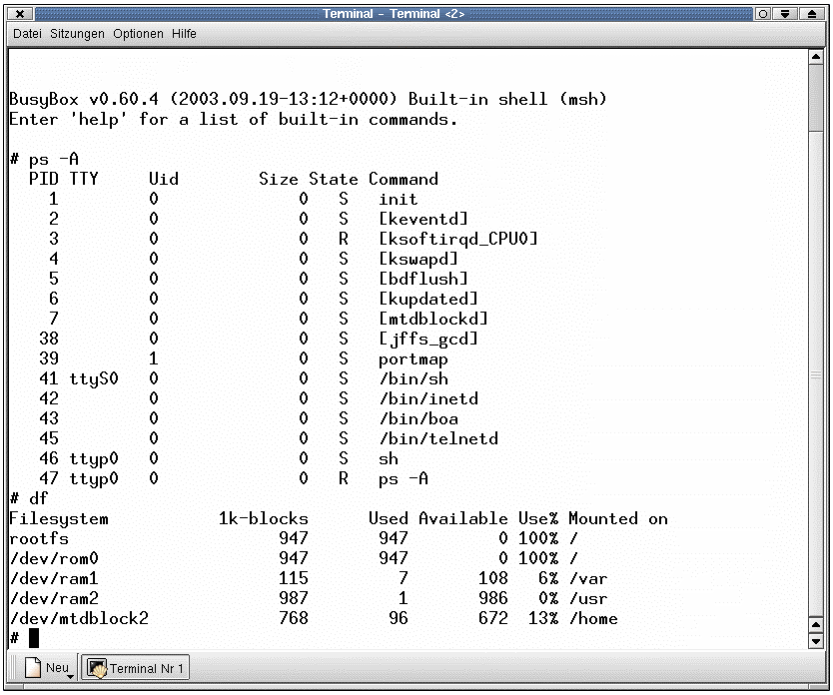


Figure 5-30: Enter Linux commands via Telnet

Note: You can enter Linux commands in different Command Line Interfaces (CLI), i.e. a serial console (like HyperTerminal or Minicom) or a Telnet client.

5.2.6 File Transfer via TFTP

The DIL/NetPC DNP/5280 offers a very simple way for Ethernet-based file transfers between your PC system and the DNP/5280 RAM disk drives or JFFS-based flash disk drives. This file transfer is using the TCP/IP service **TFTP (Trivial File Transfer Protocol)**.
TFTP is server/client-based. The DIL/NetPC DNP/5280 Linux configuration offers a TFTP client program. Your PC needs a TFTP server program.

Set-up an Ethernet link between the DNP/5280 10/100 Mbps Ethernet interface and the Ethernet interface of your PC system. Check the IP address of the PC system with the Linux command ***ifconfig***. The default IP address (factory setup) of the DNP/5280 is 192.168.0.126.

Now run a TFTP server program on your PC system. Most Linux-based PCs come with a pre-installed TFTP server program. Some of these systems start this TFTP server program at boot time (the TFTP server is a part of the inetd service).
In all other cases you have to edit one or more configuration files (SuSE: ***/etc/inetd.conf***). See the user documentation of your Linux distribution for details.

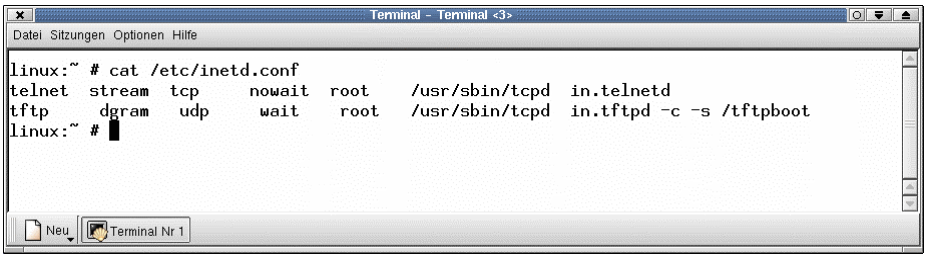


Figure 5 31: Running TFTPD32

Check the TFTP connection between the DIL/NetPC DNP/5280 and your PC system. Open a Telnet session and use the following commands for downloading and uploading files:

tftp –g –l file.name ip-addr
tftp –p –l file.name ip-addr

The command ***tftp*** is the name of the DNP/5280 TFTP client program.

The parameter ***–g*** stands for get (get a file from the PC system to the DNP/5280).

The parameter ***–p*** stands for put (put a file from the DNP/5280 to the PC system).

The parameter ***–l*** file.name specifies the file for put or get.

The parameter ***ip-addr*** stands for the IP address of your PC system (i.e. 192.168.0.1).

Most TFTP server programs work with a default directory for put and get commands. Each TFTP put command writes a file to this directory. Each TFTP get command reads the file from this directory on your PC system. Most TFTP server programs allow you to change this directory.

Example:

The following picture shows the use of the DNP/5280 TFTP client within a Telnet session.

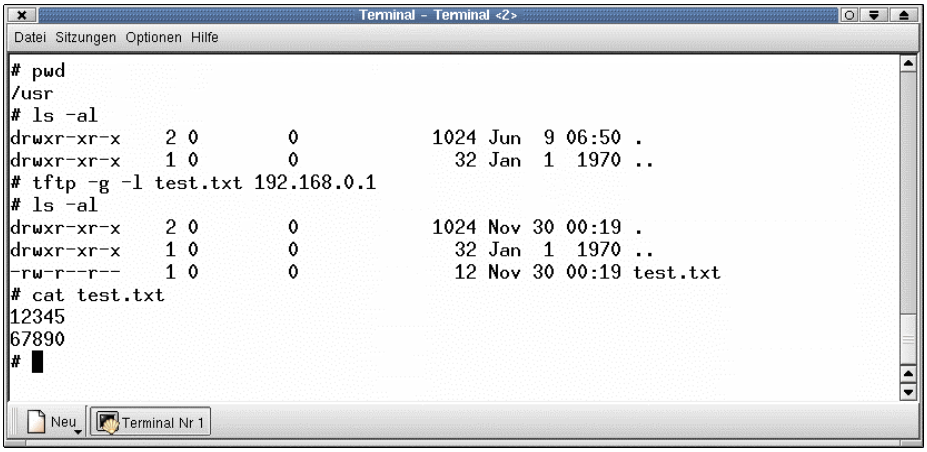


Figure 5 32: Using the DNP/5280 TFTP client within a Telnet session

Note: A file transfer to the DNP/5280 must be started with a Telnet session from RAM disk or JFFS-based flash disk directories. You need R/W access for the TFTP get command.

5.2.7 GNU Cross Tool Chain

This chapter describes how to install and use the Linux **GNU Cross Tool Chain** for DNP/5280 Linux C programming. You need administrator rights on your Linux PC for following these steps.

The GNU Cross Tool Chain for DNP/5280 Linux C programming comes within a Linux shell script file with the name *m68k-elf-tool-20030314.sh*. You find this file at the DIL/NetPC DNP/5280 Starter Kit CD-ROM. The location of this 18 Mbytes shell script file is ***\µCLinux\Toolchain***.
Point your file manager to *m68k-elf-tool-20030314.sh*.

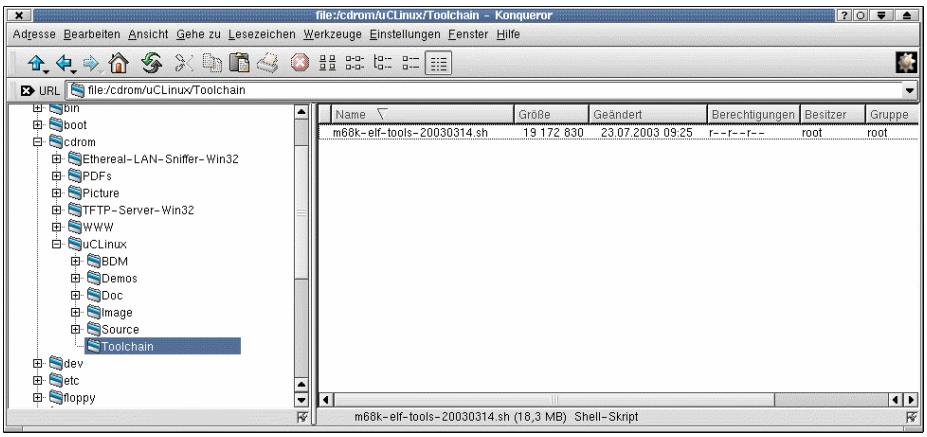


Figure 5 33: Location of m68k-elf-tool-20030314.sh at the DNP/5280 Starter Kit CD-ROM

Now copy *m68k-elf-tool-20030314.sh* to your local hard disk drive. Change the file attributes to executable. For this task you can use the Linux command line:

chmod +x m68k-elf-tool-20030314.sh.

Some file managers offer simpler ways for attribute changing.

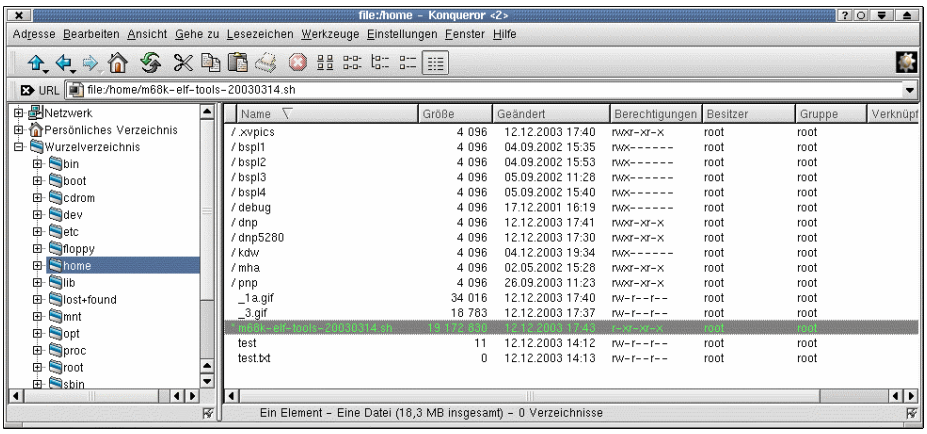


Figure 5 34: Copying m68k-elf-tool-20030314.sh to the local hard disk drive

Run the shell script file *m68k-elf-tool-20030314.sh* from a console window at your Linux-based PC. The shell script creates new directories at ***/usr/local*** and copies many files to the new directory of your PC hard disk drive.

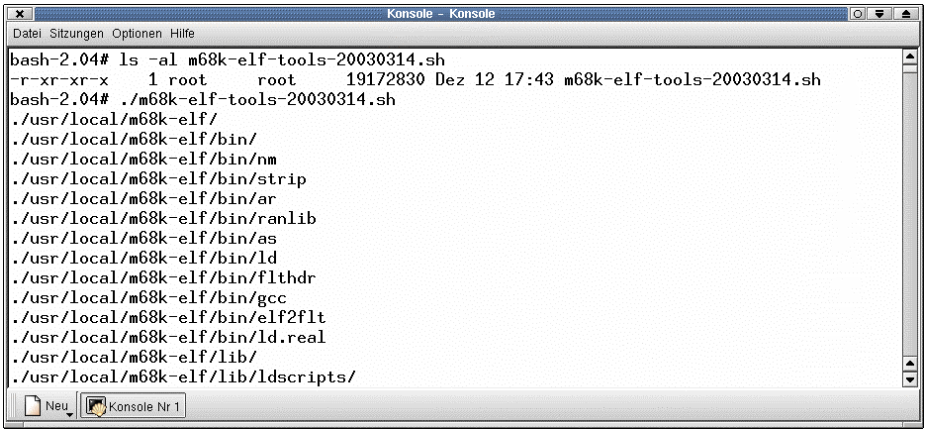


Figure 5 35: m68k-elf-tool-20030314.sh creates new directories at /usr/local

Now it is time for a test drive with the new GNU Cross Tool Chain. Open up a console window and create a new directory ***/home/dnp5280*** for DNP/5280 Linux C programming. Then change to this directory and enter the following command lines:

cat > hello.c
#include <stdio.h>
#include <stdlib.h>
void main (void)

{
printf ("Hello from DNP/5280!");
}

C+c stops the cat command and saves the input to the file *hello.c*.

These command lines create the new file *hello.c* and put some C source code lines to this new file. The command line:

cat hello.c

displays the current content of *hello.c*. For building an executable from *hello.c* please enter the following command line:

m68k-elf-gcc –Wall –m5307 –Wl,-elf2flt –Os –o hello hello.c –lc

This command line runs the GNU C cross compiler and linker. After a successful run you will find an executable for the DNP/5280 within the same directory.

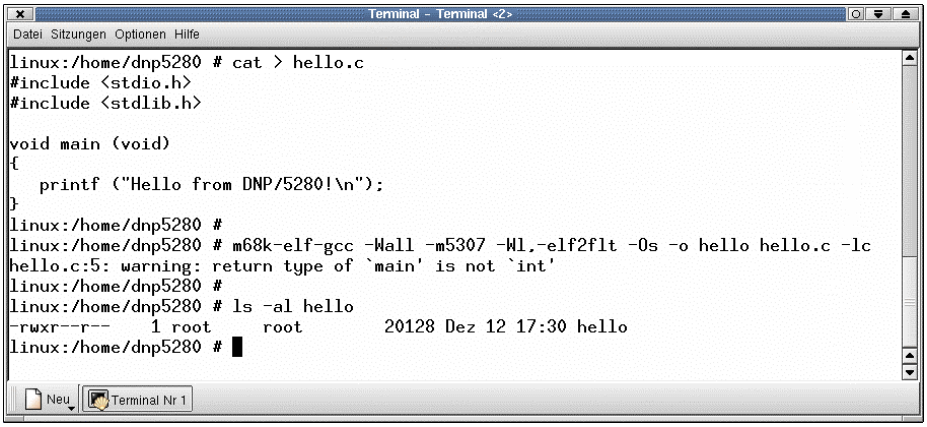


Figure 5 36: Working with the GNU Cross Tool Chain

Transfer the executable from your PC hard disk drive to the DNP/5280 RAM disk or JFFS-based flash disk drive and run the executable on your DNP/5280. Use a TFTP session and a Telnet session for this task. Please enter the following commands within the DNP/5280 Telnet session window:

tftp –g –l hello 192.168.0.1
chmod +x hello
./hello

The first command line transfers the executable *hello* from the PC to the DIL/NetPC DNP/5280. This line assumes that the PC is using the IP address 192.168.0.1. The second line makes sure that the executable attribute is set for *hello*. The next command line runs *hello*.

5.2.8 GNU Cross Debugger

The GNU Cross Tool Chain for DNP/5280 Linux C programming offers a pre-build cross version of the **GNU Debugger**, called *m68k-elf-gdb*.

This debugger runs on a Linux-based PC and allows you to debug DNP/5280 µCLinux executables with ELF layout at C source code level over a remote connection to the DNP/5280.

The cross debugger needs an Ethernet-based TCP/IP link between the PC and the DNP/5280. In addition the debugger needs also a remote debugging agent, called **gdbserver** for the DNP/5280. This agent is pre-installed within the DNP/5280 Linux.

Write your C program and translate the C source code with the GNU cross C compiler to an executable and a symbol file. Use the following command line with the ***–g*** parameter. This sample command line builds an executable, called *loop* from a source code file with the name *loop.c* and a file *loop.gdb* with symbol information:

m68k-elf-gcc –Wall –g –m5307 –Wl,-elf2flt –Os –o loop loop.c –lc

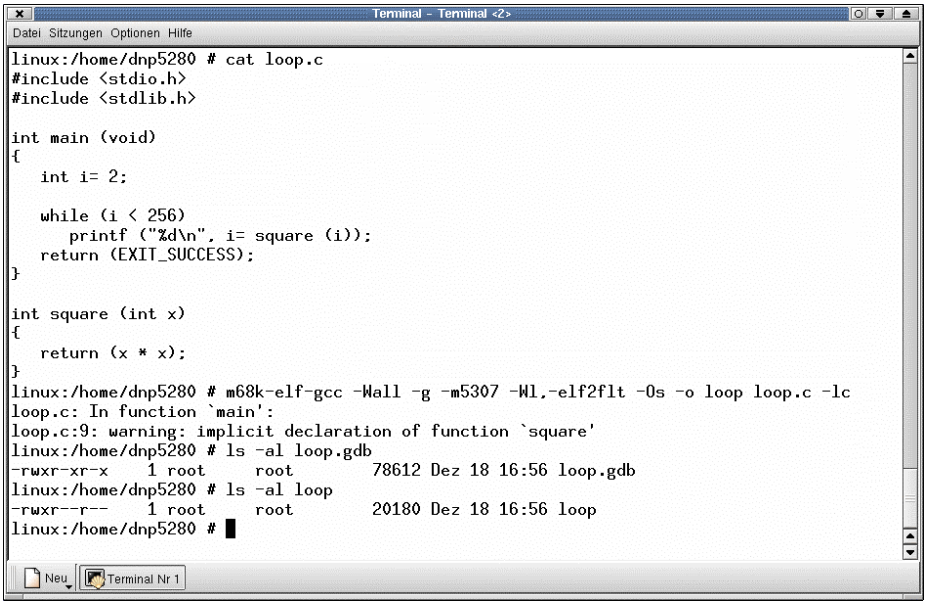


Figure 5 37: Compiling a C program with the GNU Cross Debugger

Transfer the executable from your PC hard disk drive to the DNP/5280 RAM disk or JFFS-based flash disk drive and run the executable on your DNP/5280 with the help of *gdbserver*. Use a TFTP session and a Telnet session for this task. Please enter the following command lines within the DNP/5280 Telnet session window:

tftp –g –l loop 192.168.0.1
chmod +x loop
gdbserver 192.168.0.1:2222 ./loop

The first command line transfers the executable *loop* from the PC to the DIL/NetPC DNP/5280. This line assumes that your PC is using the IP address 192.168.0.1. The second line makes sure that the executable attribute is set for *hello*. The third command line runs *loop* with the help of *gdbserver*. Within this command line you need the IP address of the PC together with a TCP/IP port number. We use the port number 2222 for this sample.

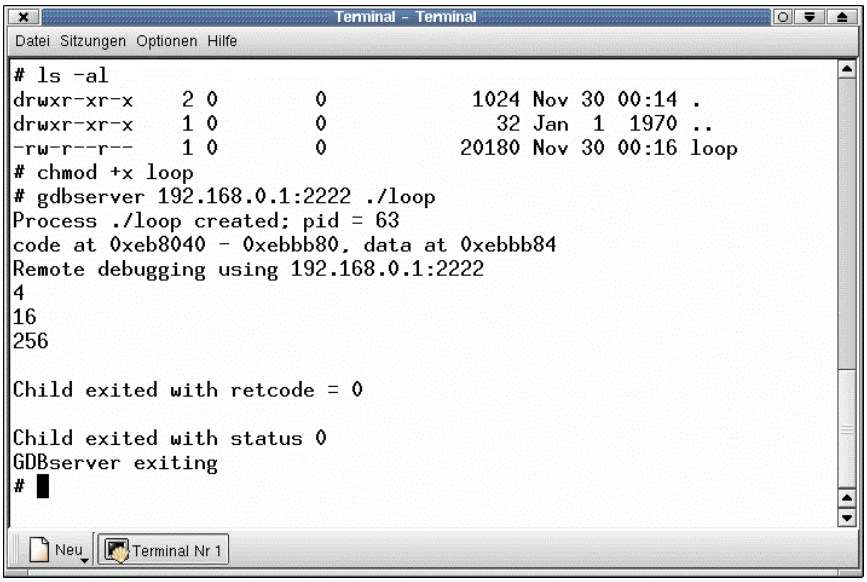


Figure 5 38: File transfer and execution

Run the GNU Cross Debugger *m68k-elf-gdb* on your PC. Use the following command line. The parameter *loop.gdb* is the file name for the symbol information file.

m68k-elf-gdb loop.gdb

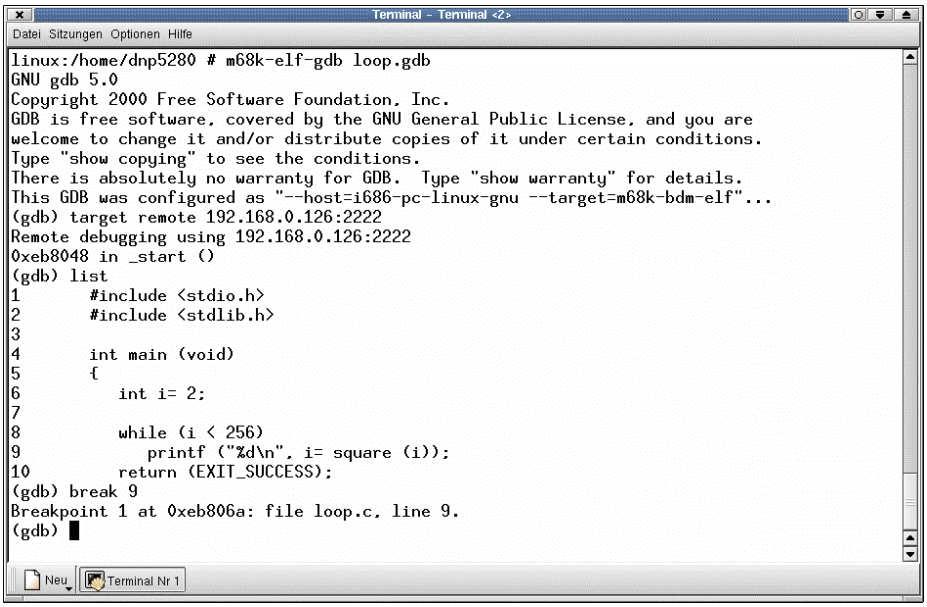


Figure 5 39: The GNU Cross Debugger at work

Now the debugger waits for your debugging commands. First please enter always the following command line:

target remote 192.168.0.126:2222

This debugger command line sets up the Ethernet-based TCP/IP connection between the PC and the DNP/5280.
Please use the same TCP/IP port number (2222). The sample command line assumes that the DNP/5280 uses the IP address 192.168.0.126.

Then set your breakpoints within the C source code and run your program with the remote debugging session between the PC and the DNP/5280.

Use the debugger command ***continue*** for running the program. The program runs to the next breakpoint. The short form for this command is ***cont***.

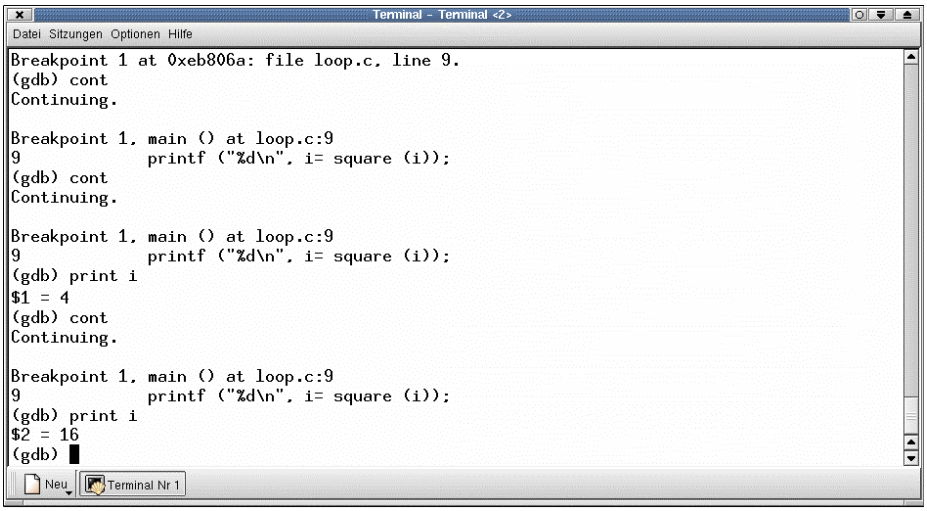


Figure 5 40: Setting breakpoints

5.2.9 GNU Cross Debugger with DDD (Data Display Debugger)

The GNU Cross Tool Chain for DNP/5280 Linux C programming offers a pre-build cross version of the GNU Debugger, called *m68k-elf-gdb*. This debugger runs on a Linux-based PC and allows you to debug DNP/5280 µCLinux executables with ELF layout at C source code level over a remote connection to the DNP/5280.

The cross debugger needs an Ethernet-based TCP/IP link between the PC and the DNP/5280. In addition the debugger needs also a remote debugging agent, called *gdbserver* for the DNP/5280. This agent is pre-installed within the DNP/5280 Linux.

The GNU debugger offers a simple command line interface and a lot of different commands. With the help of **DDD (Data Display Debugger** - a graphical front-end for command line debuggers) you get a powerful graphical user interface for the GNU debugger. DDD is a part of many PC Linux distributions.

DDD is also available from *http://www.gnu.org/software/ddd/*.

Write your C program and translate the C source code with the GNU cross C compiler to an executable and a symbol file. Use the following command line with the ***–g*** parameter. This sample command line builds an executable, called *loop* from a source code file with the name *loop.c* and a file *loop.gdb* with symbol information.

m68k-elf-gcc –Wall –g –m5307 –Wl,-elf2flt –Os –o loop loop.c –lc

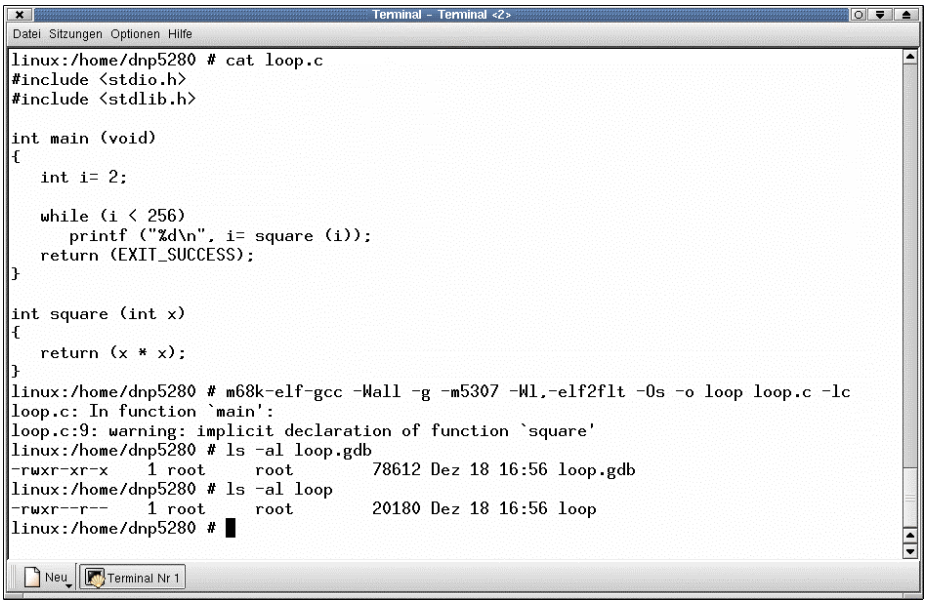


Figure 5 41: Compiling a C program

Then transfer the executable from your PC hard disk drive to the DNP/5280 RAM disk or JFFS-based flash disk drive and run the executable on your DNP/5280 with the help of *gdbserver*. Use a TFTP session and a Telnet session for this task. Please enter the commands on the next page within the DNP/5280 Telnet session window:

tftp –g –l loop 192.168.0.1
chmod +x loop
gdbserver 192.168.0.1:2222 ./loop

The first command line transfers the executable *loop* from the PC to the DIL/NetPC DNP/5280. This line assumes that your PC uses the IP address 192.168.0.1. The second line makes sure that the executable attribute is set for *hello*. The third command line runs *loop* with the help of *gdbserver*. Within this command line you need the IP address of the PC together with a TCP/IP port number. We use the port number 2222 for this sample.

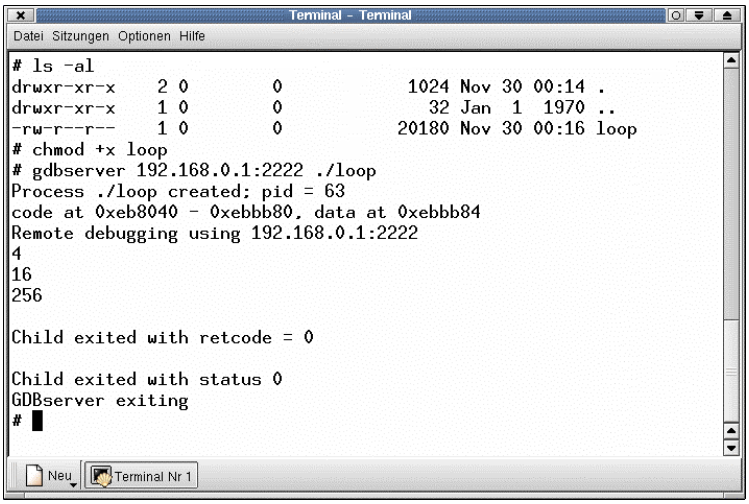


Figure 5 42: File transfer and execution

Run the GNU Cross Debugger *m68k-elf-gdb* with the help of DDD on your PC. Use the following command line. The parameter ***--debugger m68k-elf-gdb*** tells DDD the name of the debugger, *loop.gdb* is the file name for the symbol information file.

ddd –-debugger m68k-elf-gdb loop.gdb

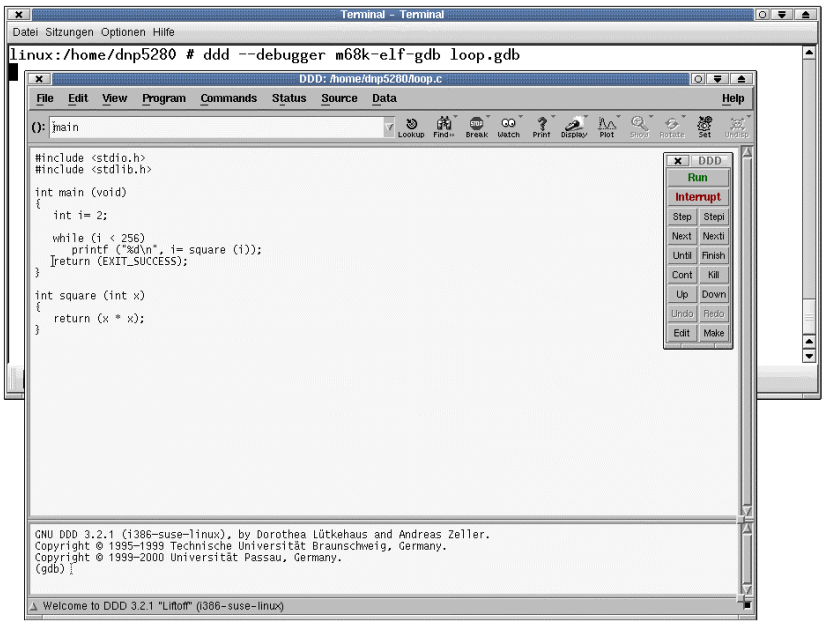


Figure 5 43: Working with the DDD

Now the debugger waits for your debugging commands. First please enter always the following command line within the DDD command line window:

target remote 192.168.0.126:2222

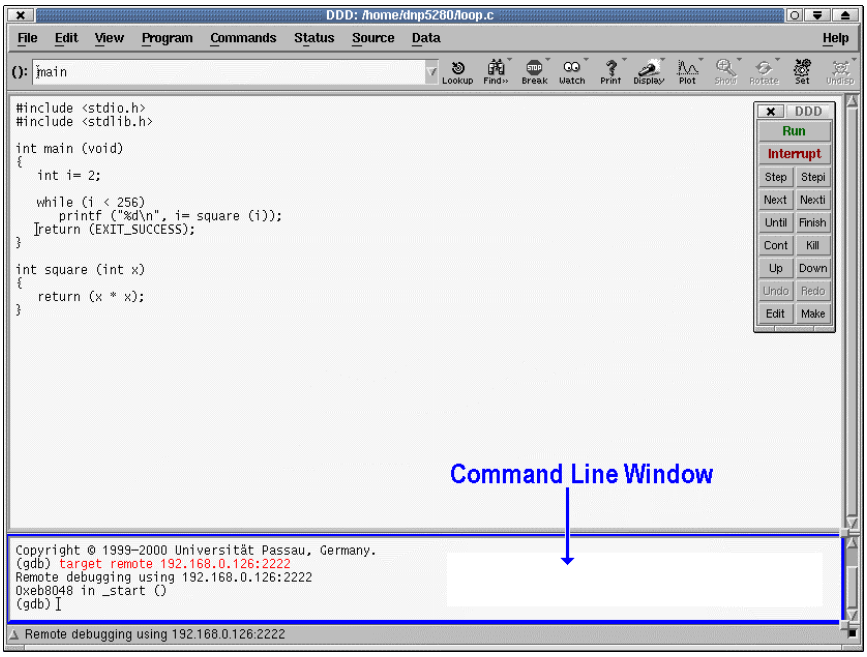


Figure 5 44: Typing commands in the command line window

This debugger command line sets up the Ethernet-based TCP/IP connection between the PC and the DNP/5280. Please use the same TCP/IP port number (2222). The sample command line assumes that the DNP/5280 uses the IP address 192.168.0.126.

Then set your breakpoints within the C source code and run your program with your remote debugging session between the PC and the DNP/5280.

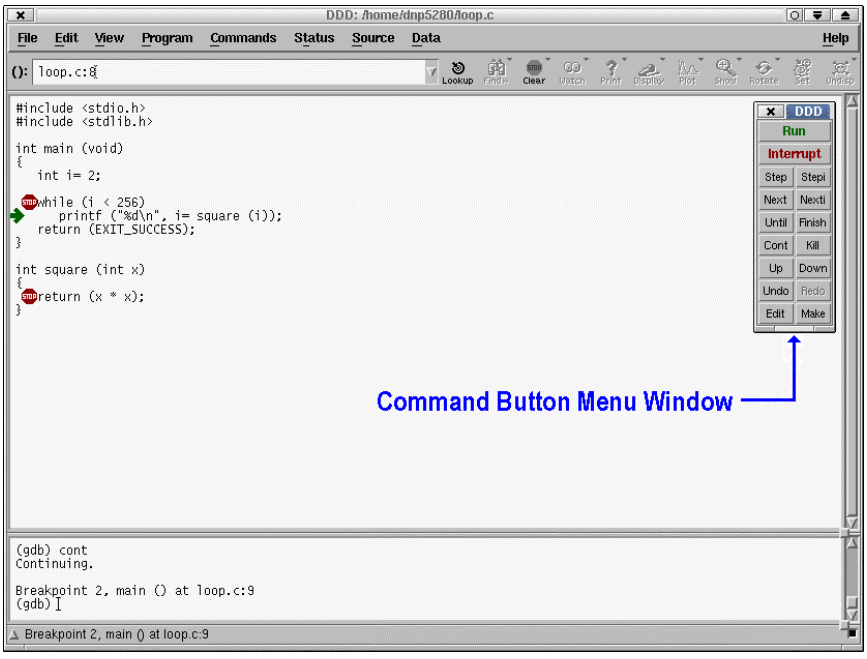


Figure 5 45: Using the command button menu window

DDD allows you to set breakpoints with your mouse. Just put the mouse cursor over the source code line of your choice and press the right hand mouse button. Then use the command button for

continue

from the command button menu window for running the program. The program runs to the next (or first) breakpoint. You can also use the command button

step

for single-stepping at C language level through your program. If the program execution stops, you can enter debugger commands within the DDD command line window. For example

show version

The GNU Debugger shows then some copyright and version information and the current configuration (Build for Host *i686-pc-linux-gnu*. Build for Target *m68k-bdm-elf*).

6 Appendix

Appendix 1: The DNP/5280 in Detail

A1.1 Block Diagram

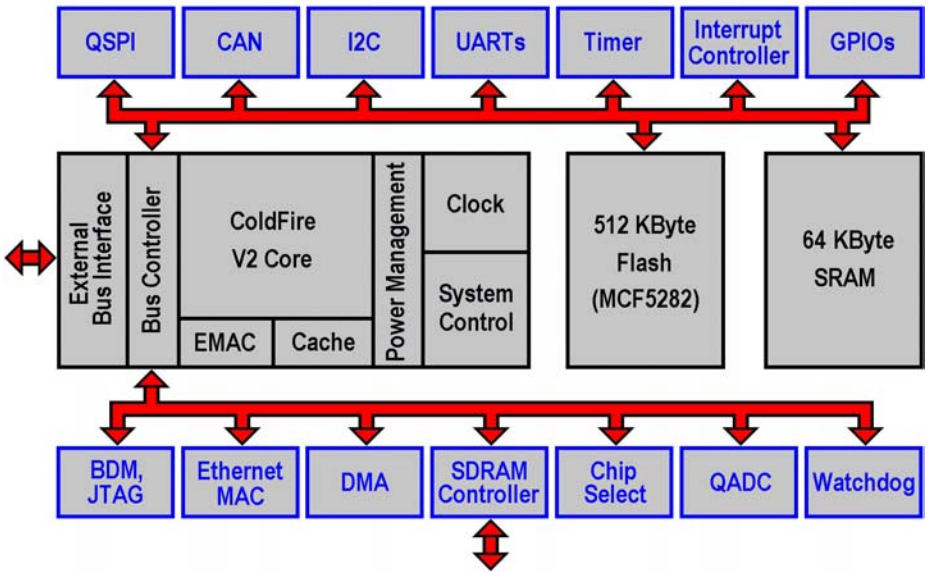


Figure A1-1: Block Diagram of the MCF5280/MCF5282-Microcontroller

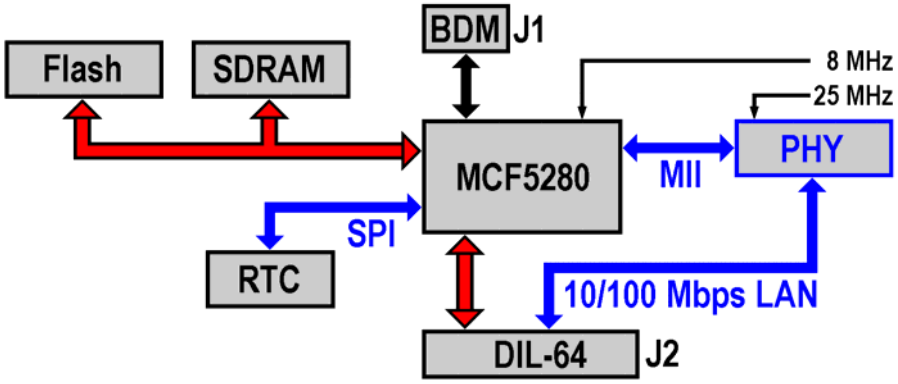


Figure A1-2: Block Diagram of the DNP/5280

A1.2 Pin Assignment – 64-pin DIL Connector (1. Part)

Pin	Name	Group	Function
1	PA0	PIO	Parallel I/O, Port A, Bit 0
2	PA1	PIO	Parallel I/O, Port A, Bit 1
3	PA2	PIO	Parallel I/O, Port A, Bit 2
4	PA3	PIO	Parallel I/O, Port A, Bit 3
5	PA4	PIO	Parallel I/O, Port A, Bit 4
6	PA5	PIO	Parallel I/O, Port A, Bit 5
7	PA6	PIO	Parallel I/O, Port A, Bit 6
8	PA7	PIO	Parallel I/O, Port A, Bit 7
9	PB0	PIO	Parallel I/O, Port B, Bit 0
10	PB1	PIO	Parallel I/O, Port B, Bit 1
11	PB2	PIO	Parallel I/O, Port B, Bit 2
12	PB3	PIO	Parallel I/O, Port B, Bit 3
13	PB4	PIO	Parallel I/O, Port B, Bit 4
14	PB5	PIO	Parallel I/O, Port B, Bit 5
15	PB6	PIO	Parallel I/O, Port B, Bit 6
16	PB7	PIO	Parallel I/O, Port B, Bit 7
17	PC0	PIO	Parallel I/O, Port C, Bit 0
18	PC1	PIO	Parallel I/O, Port C, Bit 1
19	PC2	PIO	Parallel I/O, Port C, Bit 2
20	PC3	PIO	Parallel I/O, Port C, Bit 3
21	RXD1	SIO	COM1 Serial Port, RXD Pin
22	TXD1	SIO	COM1 Serial Port, TXD Pin
23	CTS1	SIO	COM1 Serial Port, CTS Pin
24	RTS1	SIO	COM1 Serial Port, RTS Pin
25	DCD1	SIO	COM1 Serial Port, DCD Pin
26	DSR1	SIO	COM1 Serial Port, DSR Pin
27	DTR1	SIO	COM1 Serial Port, DTR Pin
28	RI1	SIO	COM1 Serial Port, RI Pin
29	RESIN	RESET	Reset Input
30	TX+	LAN	10/100 Mbps LAN, TX+ Pin
31	TX-	LAN	10/100 Mbps LAN, TX- Pin
32	GND	----	Ground

Table A1-1: DNP/5280 Pinout – Pin 1 to 32

A1.3 Pin Assignment – 64-pin DIL Connector (2. Part)

Pin	Name	Group	Function
33	RX+	LAN	10/100 Mbps LAN, RX+ Pin
34	RX-	LAN	10/100 Mbps LAN, RX- Pin
35	RESOUT	RESET	Reset Output
36	VBAT	PSP	Real-Time Clock Battery
37	CLKOUT	PSP	Clock Output
38	TXD2	PSP	COM2 Serial Port, TXD Pin
39	RXD2	PSP	COM2 Serial Port, RXD Pin
40	INT5	PSP	Interrupt Input 5
41	INT4	PSP	Interrupt Input 4
42	INT3	PSP	Interrupt Input 3
43	INT2	PSP	Interrupt Input 2
44	INT1	PSP	Interrupt Input 1
45	CS4	PSP	Chip Select Output 4
46	CS3	PSP	Chip Select Output 3
47	CS2	PSP	Chip Select Output 2
48	CS1	PSP	Chip Select Output 1
49	IOCHRDY	PSP	I/O Channel Ready
50	IOR	PSP	I/O Read Signal
51	IOW	PSP	I/O Write Signal
52	SA3	PSP	Address Bit 3
53	SA2	PSP	Address Bit 2
54	SA1	PSP	Address Bit 1
55	SA0	PSP	Address Bit 0
56	SD7	PSP	Data Bit 7
57	SD6	PSP	Data Bit 6
58	SD5	PSP	Data Bit 5
59	SD4	PSP	Data Bit 4
60	SD3	PSP	Data Bit 3
61	SD2	PSP	Data Bit 2
62	SD1	PSP	Data Bit 1
63	SD0	PSP	Data Bit 0
64	VCC	PSP	3.3 Volt Power Input

Table A1-2: DNP/5280 Pinout – Pin 33 to 64

A1.4 DNP/5280 Function Multiplexing with 64-pin DIL Connector

Some pins of the 64-pin DIL connector of the DNP/5280 have multiple meanings. The pins have a primary and a secondary function (Function Multiplexing). The primary functions correspond with the standard pinout of the 64-pin DIL connector as shown in table 8-1 and 8-2. The secondary functions are shown in table 8-3 below.

Pin	Name	Primary functions	Secondary functions
13	PB4	Parallel I/O, Port B, Bit 4	SCL (I2C)
14	PB5	Parallel I/O, Port B, Bit 5	SDA (I2C)
15	PB6	Parallel I/O, Port B, Bit 6	CANTX (CAN)
16	PB7	Parallel I/O, Port B, Bit 7	CANRX (CAN)
17	PC0	Parallel I/O, Port C, Bit 0	QSPIDO (SPI)
18	PC1	Parallel I/O, Port C, Bit 1	QSPIDI (SPI)
19	PC2	Parallel I/O, Port C, Bit 2	QSPICLK (SPI)
20	PC3	Parallel I/O, Port C, Bit 3	QSPICS0 (SPI)

Table A1-3: DNP/5280 Function Multiplexing

A1.5 DNP/5280 LEDs

Four miniature LEDs are placed on the DNP/5280 for a visual check of the LAN activity.

Name	Function	Description
LED0	Link	Ethernet cable plugged in
LED1	Duplex	Duplex-Mode
LED2	10Act	Data transmission with 10 Mbps
LED3	100Act	Data transmission with 100 Mbps

Table A1-4: DNP/5280 LEDs

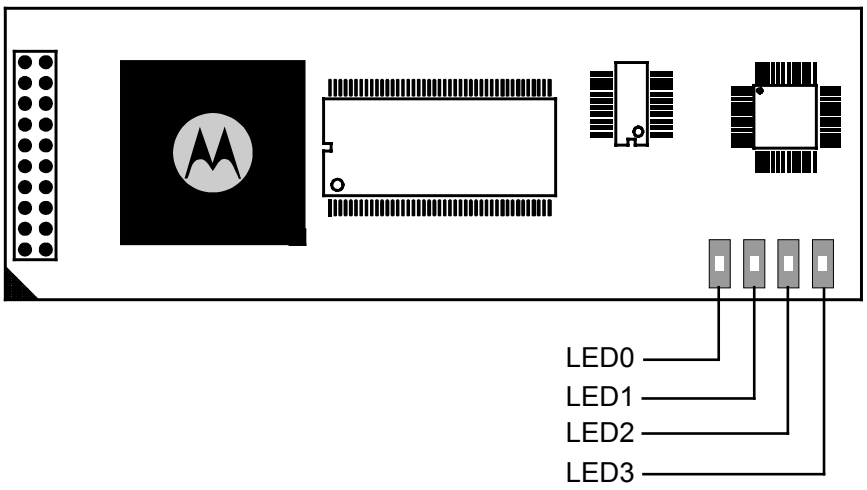


Figure A1-3: DNP/5280 LEDs

A1.6 BDM-Interface

Pin	Name	Annotation
1	VIO (3.3 VDC I/O Voltage)	
2	GND	
3	TA#	BDM-Function
4	BKPT#	BDM-Function
5	Reset#	BDM-Function
6	DSCLK#	BDM-Function
7	DSI#	BDM-Function
8	TCLK	BDM-Function
9	PST3	BDM-Function
10	DS0	BDM-Function
11	PST2	BDM-Function
12	DDATA3	BDM-Function
13	PST1	BDM-Function
14	DDATA2	BDM-Function
15	PST0	BDM-Function
16	DDATA1	BDM-Function
17	PSTCLK	BDM-Function
18	DDATA0	BDM-Function
19	GND	
20	RCM	GPTB3

Table A1-5: DNP/5280 BDM-Interface

Pin 19 – Pin 20	Effects
Jumper not set	GPTB3 = 1 (High)
Jumper set	GPTB3 = 0 (Low)

Table A1-6: DNP/5280 RCM-Jumper

A1.7 PIO-Mapping

The 20 Signals for the DNP/5280-Parallel-I/O (PIO) are realized through different function units of the MCF5280. The following table shows the assignment. Pin names for the MCF5280-case (256 MAPBGA) are listed in the third column. Please see the MCF5282 ColdFire Microcontroller User's Manual R.0.1 (MCF5282UM/D) for further details.

Pin	Name	MCF5280-Pinfunction	MCF5280-Pin
1	PA0	AN52	R4
2	PA1	AN53	T4
3	PA2	AN55	P3
4	PA3	AN56	R3
5	PA4	AN0	T3
6	PA5	AN1	R2
7	PA6	AN2	T2
8	PA7	AN3	R1
9	PB0	GPTA0	N13
10	PB1	GPTA1	P13
11	PB2	GPTA2	R13
12	PB3	GPTA3	T13
13	PB4	SCL	E15
14	PB5	SDA	E14
15	PB6	CANTX	E13
16	PB7	CANRX	D16
17	PC0	QSPIDO	F13
18	PC1	QSPIDI	E16
19	PC2	QSPICLK	F14
20	PC3	QSPICS0	F15

Table A1-7: DNP/5280 PIO-Mapping

A1.8 DNP/5280 Expansion Bus Mapping

Pin	Name	Function	MCF5280 Signal	MCF5280 Pin	Remarks
40	INT5	Interrupt Input 5	IRQ7	B15	-
41	INT4	Interrupt Input 4	IRQ6	B16	-
42	INT3	Interrupt Input 3	IRQ5	C14	-
43	INT2	Interrupt Input 2	IRQ4	C15	-
44	INT1	Interrupt Input 1	IRQ3	C16	-
45	CS4	Chip Select Output 4	RAS1#	H13	See Device Errata
46	CS3	Chip Select Output 3	CS3#	L16	-
47	CS2	Chip Select Output 2	CS2#	L15	-
48	CS1	Chip Select Output 1	CS1#	L14	-
49	RDY	External Ready Input	TA#	P16	-
50	RD	Read Signal	OE#	N16	Also on-board use
51	WR	Write Signal	R/W#	N15	Also on-board use
52	SA3	Address Bit 3	A3	E3	Also on-board use
53	SA2	Address Bit 2	A2	E4	Also on-board use
54	SA1	Address Bit 1	A1	F1	Also on-board use
55	SA0	Address Bit 0	A0	F2	Also on-board use
56	SD7	Data Bit 7	D31	F3	Also on-board use
57	SD6	Data Bit 6	D30	G1	Also on-board use
58	SD5	Data Bit 5	D29	G2	Also on-board use
59	SD4	Data Bit 4	D28	G3	Also on-board use
60	SD3	Data Bit 3	D27	G4	Also on-board use
61	SD2	Data Bit 2	D26	H1	Also on-board use
62	SD1	Data Bit 1	D25	H2	Also on-board use
63	SD0	Data Bit 0	D24	H3	Also on-board use

Table A1-8: DNP/5280 Expansion Bus Mapping

A1.9 DNP/5280 Memory Mapping

Function Unit	Startaddress	Endaddress	Access Format
SDRAM	0x0000.0000	0x00FF.FFFF	32 Bits
SRAM (intern)	0x2000.0000	0x2000.FFFF	32 Bits
CS1_Space	0x1000.0000	**0x100F**.FFFF	8 Bits
CS2_Space	0x1010.0000	0x101F.FFFF	8 Bits
CS3_Space	0x1020.0000	0x102F.FFFF	8 Bits
CS4_Space	0x1030.0000	0x103F.FFFF	8 Bits
IBSBAR	0x4000.0000	0x7FFF.FFFF	32 Bits
Flash (MCF5282 intern)	0xF000.0000	0xF007.FFFF	32 Bits
Flash	0xFF80.0000	0xFFFF.FFFF	16 Bits

Table A1-9: DNP/5280 Memory Mapping

The memory areas with names **CS1_Space** to **CS4_Space** are each assigned to the corresponding Chip Select Signals (CS1: Chip Select Output 1 to CS4: Chip Select Output 4) on the 64-pin DIL Connector.

In memory area **IBSBAR** the SFRs (Special Function Register) of the Motorola ColdFire MCF5280-Microcontroller are addressable.

User programs can only be loaded from 0x0001:0000 into the memory.

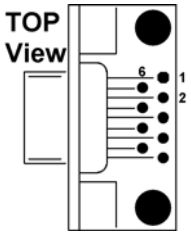
The DNP/5280 comes with a ROM-Monitor ex works. This ROM-Monitor needs a memory area in Flash and SDRAM each.

Function Unit	Startaddress	Endaddress
dBUG ROM-Monitor Code-Area	0xFF80.0000	0xFF83.FFFF
dBUG ROM-Monitor Data-Area	0x0000.0000	0x0000.FFFF

Table A1-10: DNP/5280 Reserved Areas for the ROM-Monitor

Appendix 2: Pin Assignment DNP/EVA2-SV6 Components

A2.1 COM1 Connector



Pin	Signal
1	DCD
2	RxD
3	TxD
4	DTR
5	GND

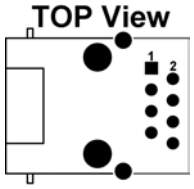
Pin	Signal
6	DSR
7	RTS
8	CTS
9	RI

Table A2-1: Pinout COM1 Connector

Caution:

All COM1-port signals are on RS232 level. There is no TTL level available on these ports. The RS232 level shifter is part of the DNP/EVA2-SV6 board!

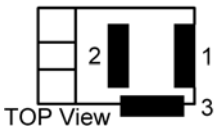
A2.2 10/100 Mbps Ethernet Connector



Pin	Name	Signal
1	TX+	TXD+
2	TX-	TXD-
3	RX+	RXD+
4	nc	---
5	nc	---
6	RX-	RXD-
7	nc	---
8	nc	---
S1…S2	Shield	---

Table A2-2: Pinout 10/100 Mbps Ethernet Connector

A2.3 Power Connector



Pin	Name	Signal
1	Vcc	Power In
2	GND	Power
3	GND	Power

Table A2-3: Pinout Power Connector

Appendix 3: Connecting an external battery to the DNP/5280

To ensure the RTC (Real Time Clock) function of the DNP/5280 when the main power is removed a backup battery must be connected between VBAT (Pin 36) and GND. This backup battery should be a lithium battery with a voltage of approx. 3VDC. If main power is turned on – no battery power will be consumed.

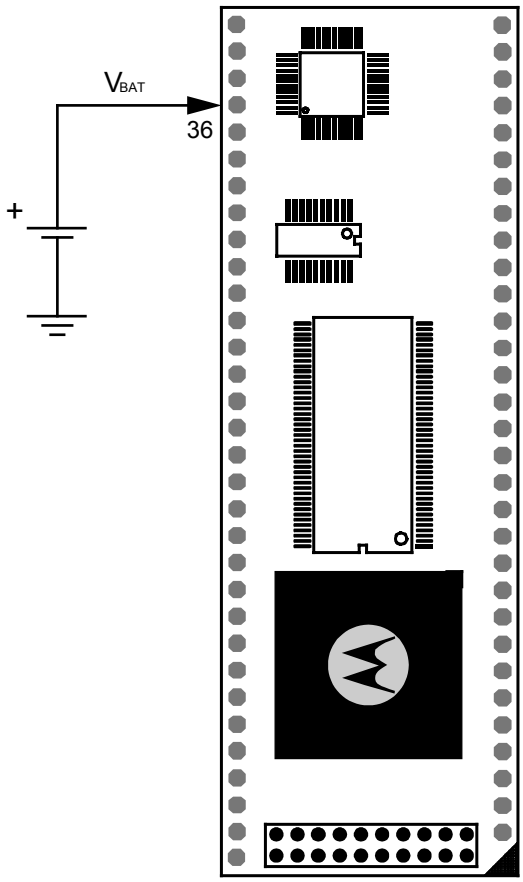


Figure A3-1: Connecting an external battery to Pin 36 of the DNP/5280

Appendix 4: Mechanical Dimensions

The DNP/5280 uses a 64-pin DIL socket as mechanical base. Figure A4-1 shows the dimensions. All length dimensions have a tolerance of 0.5 mm.

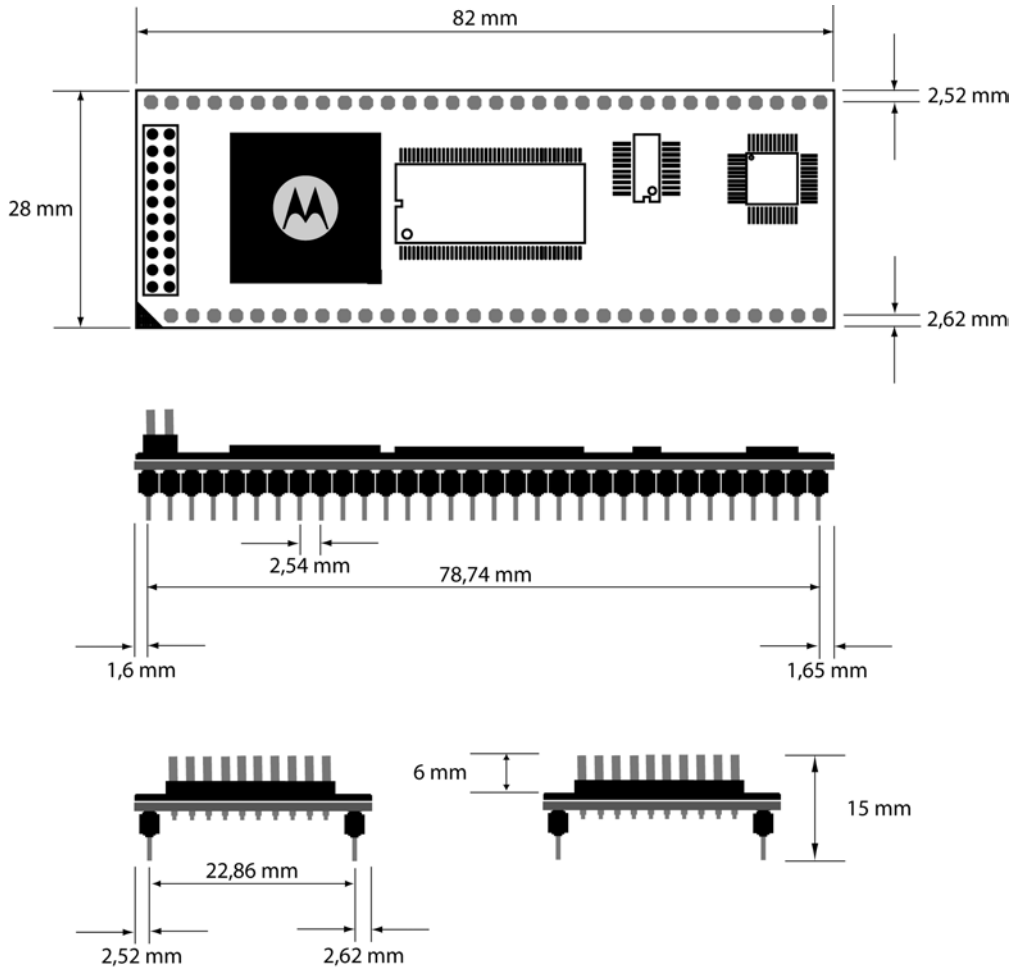


Figure A4-1: Dimensions of the DNP/5280

Appendix 5: GNU General Public License

GNU GENERAL PUBLIC LICENSE. Version 2, June 1991. Copyright © 1989, 1991 Free Software Foundation, Inc. 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA. Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.
Preamble
The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change free software—to make sure the software is free for all its users. This General Public License applies to most of the Free Software Foundation's software and to any other program whose authors commit to using it. (Some other Free Software Foundation software is covered by the GNU Library General Public License in-stead.) You can apply it to your programs, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.

To protect your rights, we need to make restrictions that forbid anyone to deny you these rights or to ask you to surrender the rights. These restrictions translate to certain respon-sibilities for you if you distribute copies of the software, or if you modify it.

For example, if you distribute copies of such a program, whether gratis or for a fee, you must give the recipients all the rights that you have. You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights.

We protect your rights with two steps: (1) copyright the software, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the software.

Also, for each author's protection and ours, we want to make certain that everyone understands that there is no warranty for this free software. If the software is modified by someone else and passed on, we want its recipients to know that what they have is not the original, so that any problems introduced by others will not reflect on the original authors' reputations. Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that redistributors of a free program will individually obtain patent licenses, in effect making the program proprietary. To prevent this, we have made it clear that any patent must be licensed for everyone's free use or not licensed at all.

The precise terms and conditions for copying, distribution and modification follow.

GNU GENERAL PUBLIC LICENSE. TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

1. This License applies to any program or other work which contains a notice placed by the copyright holder saying it may be distributed under the terms of this General Public License. The "Program", below, refers to any such program or work, and a "work based on the Program" means either the Program or any derivative work under copyright law: that is to say, a work containing the Program or a portion of it, either verbatim or with modifications and/or translated into another language. (Hereinafter, translation is included without limitation in the term "modification".) Each license is addressed as "you".

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running the Program is not restricted, and the output from the Program is covered only if its contents constitute a work based on the Program (independent of having been made by running the Program). Whether that is true depends on what the Program does.

1. You may copy and distribute verbatim copies of the Program's source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and give any other recipients of the Program a copy of this License along with the Program.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty

protection in exchange for a fee.

2. You may modify your copy or copies of the Program or any portion of it, thus forming a work based on the Program, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

1. You must cause the modified files to carry prominent notices stating that you changed the files and the date of any change.

b) You must cause any work that you distribute or publish, that in whole or in part contains or is derived from the Program or any part thereof, to be licensed as a whole at no charge to all third parties under the terms of this License.

c) If the modified program normally reads commands interactively when run, you must cause it, when started running for such interactive use in the most ordinary way, to print or display an announcement including an appropriate copyright notice and a notice that there is no warranty (or else, saying that you provide a warranty) and that users may redistribute the program under these conditions, and telling the user how to view a copy of this License. (Exception: if the Program itself is interactive but does not normally print such an announcement, your work based on the Program is not required to print an announcement.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Program, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Program, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Program.

In addition, mere aggregation of another work not based on the Program with the Program (or with a work based on the Program) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may copy and distribute the Program (or a work based on it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you also do one of the following:

1. Accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,

b) Accompany it with a written offer, valid for at least three years, to give any third party, for a charge no more than your cost of physically performing source distribution, a complete machine-readable copy of the corresponding source code, to be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,

c) Accompany it with the information you received as to the offer to distribute corresponding source code. (This alternative is allowed only for non-commercial distribution and only if you received the program in object code or executable form with such an offer, in accord with Subsection b above.)

The source code for a work means the preferred form of the work for making modifications to it. For an executable work, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the executable. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

If distribution of executable or object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place counts as distribution of the source code, even though third parties are not compelled to copy the source along with the object code.

4. You may not copy, modify, sublicense, or distribute the Program except as expressly provided under this

License. Any attempt otherwise to copy, modify, sublicense or distribute the Program is void, and will automatically terminate your rights under this License.
However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

5. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Program or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Program (or any work based on the Program), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Program or works based on it.

6. Each time you redistribute the Program (or any work based on the Program), the recipient automatically receives a license from the original licensor to copy, distribute or modify the Program subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein.

You are not responsible for enforcing compliance by third parties to this License.

1. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Program at all. For example, if a patent license would not permit royalty-free redistribution of the Program by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Program.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply and the section as a whole is intended to apply in other circumstances.
It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system, which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

1. If the distribution and/or use of the Program is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Program under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

1. The Free Software Foundation may publish revised and/or new versions of the General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Program specifies a version number of this License which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Program does not specify a version number of this License, you may choose any version ever published by the Free Software Foundation.

10. If you wish to incorporate parts of the Program into other free programs whose distribution conditions are different, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

11. BECAUSE THE PROGRAM IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE PROGRAM "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

12. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

END OF TERMS AND CONDITIONS

How to Apply These Terms to Your New Programs

If you develop a new program, and you want it to be of the greatest possible use to the public, the best way to achieve this is to make it free software which everyone can redistribute and change under these terms.

To do so, attach the following notices to the program. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

<one line to give the program's name and a brief idea of what it does.>
Copyright © <year> <name of author>

This program is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software foundation; either version 2 of the License, or (at your option) any later version.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details.

You should have received a copy of the GNU General Public License along with this program; if not, write to the Free Software Foundation, Inc., 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA

Also add information on how to contact you by electronic and paper mail.

If the program is interactive, make it output a short notice like this when it starts in an interactive mode:

Gnomovision version 69, Copyright © year name of author Gnomovision comes with ABSOLUTELY NO WARRANTY; for details type `show w'. This is free software, and you are welcome to redistribute it under certain conditions; type `show c' for details.

The hypothetical commands `show w' and `show c' should show the appropriate parts of the General Public License. Of course, the commands you use may be called something other than `show w' and `show c'; they could even be mouse-clicks or menu items—whatever suits your program.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the program, if necessary. Here is a sample; alter the names:

Yoyodyne, Inc., hereby disclaims all copyright interest in the program `Gnomovision' (which makes passes at

compilers) written by James Hacker.

<signature of Ty Coon>, 1 April 1989
Ty Coon, President of Vice

This General Public License does not permit incorporating your program into proprietary programs. If your program is a subroutine library, you may consider it more useful to permit linking proprietary applications with the library. If this is what you want to do, use the GNU Library General Public License instead of this License.

Appendix 6: GNU Lesser General Public License

GNU LESSER GENERAL PUBLIC LICENSE. Version 2.1, February 1999. Copyright © 1991, 1999 Free Software Foundation, Inc. 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA. Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed. [This is the first released version of the Lesser GPL. It also counts as the successor of the GNU Library Public License, version 2, hence the version number 2.1.]

Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public Licenses are intended to guarantee your freedom to share and change free software—to make sure the software is free for all its users.

This license, the Lesser General Public License, applies to some specially designated software packages—typically libraries—of the Free Software Foundation and other authors who decide to use it. You can use it too, but we suggest you first think carefully about whether this license or the ordinary General Public License is the better strategy to use in any particular case, based on the explanations below.

When we speak of free software, we are referring to freedom of use, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish); that you receive source code or can get it if you want it; that you can change the software and use pieces of it in new free programs; and that you are informed that you can do these things.

To protect your rights, we need to make restrictions that forbid distributors to deny you these rights or to ask you to surrender these rights. These restrictions translate to certain responsibilities for you if you distribute copies of the library or if you modify it.

For example, if you distribute copies of the library, whether gratis or for a fee, you must give the recipients all the rights that we gave you. You must make sure that they, too, receive or can get the source code. If you link other code with the library, you must provide complete object files to the recipients, so that they can relink them with the library after making changes to the library and recompiling it. And you must show them these terms so they know their rights. We protect your rights with a two-step method: (1) we copyright the library, and (2) we offer you this license, which gives you legal permission to copy, distribute and/or modify the library.

To protect each distributor, we want to make it very clear that there is no warranty for the free library. Also, if the library is modified by someone else and passed on, the recipients should know that what they have is not the original version, so that the original author's reputation will not be affected by problems that might be introduced by others.

Finally, software patents pose a constant threat to the existence of any free program. We wish to make sure that a company cannot effectively restrict the users of a free program by obtaining a restrictive license from a patent holder. Therefore, we insist that any patent license obtained for a version of the library must be consistent with the full freedom of use specified in this license.

Most GNU software, including some libraries, is covered by the ordinary GNU General Public License. This license, the GNU Lesser General Public License, applies to certain designated libraries, and is quite different from the ordinary General Public License. We use this license for certain libraries in order to permit linking those libraries into non-free programs.
When a program is linked with a library, whether statically or using a shared library, the combination of the two is legally speaking a combined work, a derivative of the original library. The ordinary General Public License therefore permits such linking only if the entire combination fits its criteria of freedom.

The Lesser General Public License permits more lax criteria for linking other code with the library.

We call this license the "Lesser" General Public License because it does Less to protect the user's freedom than the ordinary General Public License. It also provides other free software developers Less of an advantage over competing non-free programs. These disadvantages are the reason we use the ordinary General Public License

for many libraries. However, the Lesser license provides advantages in certain special circumstances.

For example, on rare occasions, there may be a special need to encourage the widest possible use of a certain library, so that it becomes a de-facto standard. To achieve this, non-free programs must be allowed to use the library. A more frequent case is that a free library does the same job as widely used non-free libraries. In this case, there is little to gain by limiting the free library to free software only, so we use the Lesser General Public License.

In other cases, permission to use a particular library in non-free programs enables a greater number of people to use a large body of free software. For example, permission to use the GNU C Library in non-free programs enables many more people to use the whole GNU operating system, as well as its variant, the GNU/Linux operating system.

Although the Lesser General Public License is Less protective of the users' freedom, it does ensure that the user of a program that is linked with the Library has the freedom and the wherewithal to run that program using a modified version of the Library.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a "work based on the library" and a "work that uses the library". The former contains code derived from the library, whereas the latter must be combined with the library in order to run.

GNU LESSER GENERAL PUBLIC LICENSE. TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

This License Agreement applies to any software library or other program which contains a notice placed by the copyright holder or other authorized party saying it may be distributed under the terms of this Lesser General Public License (also called "this License"). Each licensee is addressed as "you".

A "library" means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

The "Library", below, refers to any such software library or work which has been distributed under these terms. A "work based on the Library" means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.
Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

You may copy and distribute verbatim copies of the Library's complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and distribute a copy of this License along with the Library.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

The modified work must itself be a software library.

b) You must cause the files modified to carry prominent notices stating that you changed the files and the date

of any change.

c) You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.

d) If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful. (For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of
this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may opt to apply the terms of the ordinary GNU General Public License instead of this License to a given copy of the Library. To do this, you must alter all the notices that refer to this License, so that they refer to the ordinary GNU General Public License, version 2, instead of to this License. (If a newer version than version 2 of the ordinary GNU General Public License has appeared, then you can specify that version instead if you wish.) Do not make any other change in these notices.

Once this change is made in a given copy, it is irreversible for that copy, so the ordinary GNU General Public License applies to all subsequent copies and derivative works made from that copy.

This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.
5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a “work that uses the Library”. Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a “work that uses the Library” with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a “work that uses the library”. The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a “work that uses the Library” uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also combine or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable "work that uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)

b) Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate properly with a modified version of the library, if the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.

c) Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

d) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

e) Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the materials to be distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

It may happen that this requirement contradicts the license restrictions of other proprietary libraries that do not normally accompany the operating system. Such a contradiction means you cannot use both them and the Library together in an executable that you distribute.

You may place library facilities that are a work based on the Library side-by-side in a single library together with other library facilities not covered by this License, and distribute such a combined library, provided that the separate distribution of the work based on the Library and of the other library facilities is otherwise permitted, and provided that you do these two things:

Accompany the combined library with a copy of the same work based on the Library, uncombined with any other library facilities. This must be distributed under the terms of the Sections above.

b) Give prominent notice with the combined library of the fact that part of it is a work based on the Library, and

explaining where to find the accompanying uncombined form of the same work.
You may not copy, modify, sublicense, link with, or distribute the Library except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense, link with, or distribute the Library is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Library or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Library (or any work based on the Library), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Library or works based on it.

10. Each time you redistribute the Library (or any work based on the Library), the recipient automatically receives a license from the original licensor to copy, distribute, link with or modify the Library subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties with this License.

11. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Library at all. For example, if a patent license would not permit royalty-free redistribution of the Library by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Library.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply, and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

12. If the distribution and/or use of the Library is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Library under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

13. The Free Software Foundation may publish revised and/or new versions of the Lesser General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Library specifies a version number of this License which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Library does not specify a license version number, you may choose any version ever published by the Free Software Foundation.

14. If you wish to incorporate parts of the Library into other free programs whose distribution conditions are incompatible with these, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

15. BECAUSE THE LIBRARY IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE LIBRARY, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE LIBRARY "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE LIBRARY IS WITH YOU. SHOULD THE LIBRARY PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

16. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE LIBRARY AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE LIBRARY (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE LIBRARY TO OPERATE WITH ANY OTHER SOFTWARE), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

END OF TERMS AND CONDITIONS

How to Apply These Terms to Your New Libraries

If you develop a new library, and you want it to be of the greatest possible use to the public, we recommend making it free software that everyone can redistribute and change. You can do so by permitting redistribution under these terms (or, alternatively, under the terms of the ordinary General Public License). To apply these terms, attach the following notices to the library. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.
<one line to give the library's name and a brief idea of what it does.>
Copyright © <year> <name of author>
This library is free software; you can redistribute it and/or modify it under the terms of the GNU Lesser General Public License as published by the Free Software Foundation; either version 2.1 of the License, or (at your option) any later version. This library is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
See the GNU Lesser General Public License for more details. You should have received a copy of the GNU Lesser General Public License along with this library; if not, write to the Free Software Foundation, Inc., 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA
Also add information on how to contact you by electronic and paper mail. You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the library, if necessary. Here is a sample; alter the names:

Yoyodyne, Inc., hereby disclaims all copyright interest in the library `Frob' (a library for tweaking knobs) written by James Random Hacker.

<signature of Ty Coon>, 1 April 1990
Ty Coon, President of Vice

List of Figures

List of Tables

List of Appendixes

Contact

SSV Embedded Systems
Heisterbergallee 72
D-30453 Hannover
Tel. +49-(0)511-40000-0
Fax. +49-(0)511-40000-40
e-mail: sales@ist1.de
Internet: www.ssv-embedded.de

Document History

Revision	Date	Remarks	Name
1.00	2004-03-23	first version	WBU

This document is written only for the internal application. The content of this document can change any time without announcement. There is taken over no guarantee for the accuracy of the statements.