

DIL/NetPC DNP/5282 ***Linux Starter Kit***

User Manual



SSV Embedded Systems

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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 Starter Kit DNP/SK14 and will help you to get out the most of your new system.

For further information about the individual components of the Starter Kit DNP/SK14 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 DNP/SK14 CD-ROM, which is an important part of your Starter Kit.

1.1 Conventions used in this Document

Convention	Usage
<i>italic</i>	Filenames, Internet addresses like e.g. www.ssv-embedded.de
<i>bold italic</i>	User inputs, command lines and pathnames
bold	Important 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 of the Starter Kit DNP/SK14

- ✓ Evaluation Board DNP/EVA6
- ✓ DIL/NetPC DNP/5282
- ✓ Power supply
- ✓ Power cable
- ✓ Null-modemcable
- ✓ User manual
- ✓ DNP/SK14 CD-ROM

1.3 Features Evaluation Board DNP/EVA6

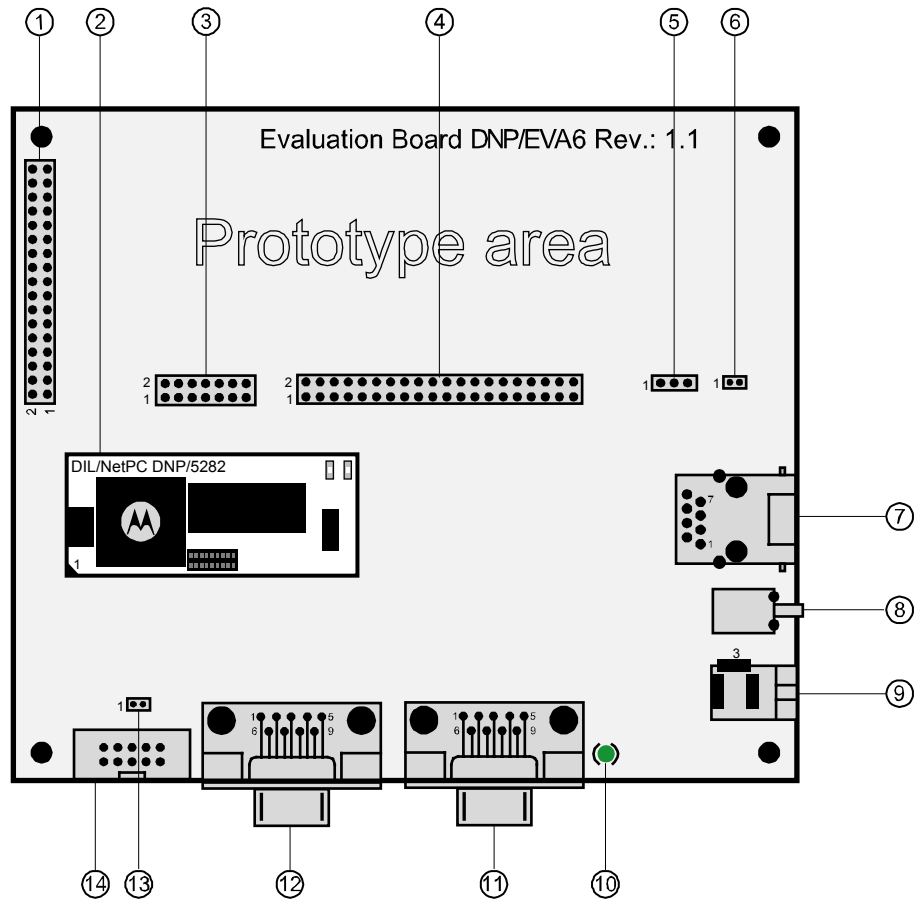
- One 40-pin DIL socket for a DIL/NetPC DNP/5282
- One 64-pin DIL socket for a DIL/NetPC DNP/5280
- Two serial interfaces (RS232)
- One 10/100Mbps Ethernet interface
- One reset switch
- One 5 VDC power input connector
- Prototype-area
- Size 140 x 120 mm

1.4 Features DIL/NetPC DNP/5282

- Motorola 32-bit MCF5282 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
- Two 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
- Programmable general purpose timers and watchdog timer
- Motorola BDM (Background Debug Mode) interface for in-circuit debugging
- In-system programming features
- 40-pin JEDEC DIL-40 connector, 2.54mm centers
- 3.3 Volt low power design, supply voltage 3.3 VDC ($\pm 5\%$)
- Supply current 300 mA typ. at 66 MHz
- Size 55mm x 23mm

2 BOARD LAYOUT

The main component of the Starter Kit DNP/SK14 is the Evaluation Board DNP/EVA6. On this board you find the DIL/NetPC DNP/5282 mounted on a 40-pin DIL socket (DIL = dual in line). Please see **chapter 4.1** how to mount the DNP/5282. The socket builds the interface between the individual parts on the DNP/EVA6 and the DNP/5282.



- ① PIO-signals 1 (J7)
- ② DIL/NetPC DNP/5282
- ③ PIO-signals 2 (J8)
- ④ Expansion bus (J9)
- ⑤ V_{BAT} connector (J10)
- ⑥ RCM jumper (JP1)
- ⑦ 10/100Mbps Ethernet interface
- ⑧ Reset button
- ⑨ Power connector
- ⑩ Power-LED
- ⑪ COM2 (RS232)
- ⑫ COM1 (RS232)
- ⑬ CAN termination jumper (JP2)
- ⑭ CAN connector (J5)

Figure 2-1: Main components of the DNP/EVA6

The Starter Kit DNP/SK14 provides all required basic hard- and software environment which allow the development of individual applications for your DNP/5282. For an instant connection to your hardware the DNP/EVA6 supports two serial COM interfaces and one 10/100Mbps Ethernet interface.

3 BOARD COMPONENTS

This chapter describes the most interesting components of the DNP/EVA6 shown in **chapter 2** and gives a short overview about their respective functions.

3.1 PIO-Signals 1

This 34 pin connector offers the following signals:

PA0, PA1, PA2, PA3, PA4, PA5, PA6, PA7 and

PB0, PB1, PB2, PB3, PB4, PB5.

Please see **chapter A2.4** for the complete pin assignment!

3.2 PIO-Signals 2

This 14 pin connector offers the following signals:

PC0, PC1, PC2, PC3 and

QSPI.CS1, QSPI.CS2 (chip select output).

Please see **chapter A2.5** for the complete pin assignment!

3.3 Expansion Bus

Note: This function is only with the DNP/5280 available. The DNP/5282 does not support the expansion bus!

3.4 Vbat Connector

Note: This function is only with the DNP/5280 available. The DNP/5282 does not need a battery!

3.5 RCM Jumper

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/5282 starts a ROM-monitor (Motorola-dBUG) when the RCM jumper is set. If the RCM jumper is not set, the DNP/5282 will boot with μ CLinux.

Note: The default setting of the RCM jumper is not set. Only if the RCM jumper is set you will be able to boot μ CLinux on the DNP/5282.

To activate RCM on the DNP/5282 place a jumper cap on both pins of the RCM jumper, so that it is short. If you remove the jumper cap or place it on just one pin, the jumper is not set and you are not able to use RCM.

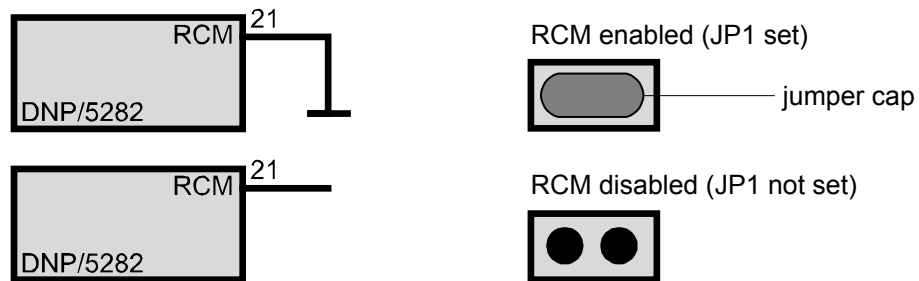


Figure 3-1: Activation of RCM on the DNP/5282

3.6 10/100Mbps Ethernet Interface

The DNP/5282 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 DNP/EVA6 is just a simple connection over a transformer to the DIL interface pins, which are connected to the LAN controller onto the DNP/5282.

Two miniature LEDs are placed on the DNP/5282 for a visual check of the LAN activity.

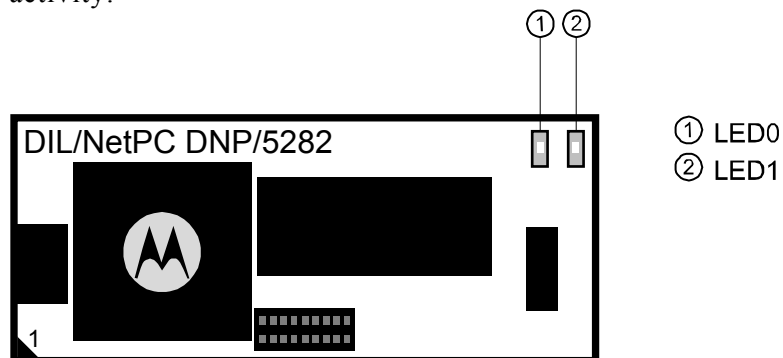


Figure 3-2: Position of the miniature LEDs on the DNP/5282

3.7 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/5282. To reset any connected devices please turn off the complete power from the system.

3.8 Power Connector

The power connector on the DNP/EVA6 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 $\pm 10\%$ and approx. 1500 mA current.

3.9 Power LED

The Evaluation Board DNP/EVA6 is equipped with a single green LED. This LED will light up when the board is provided with the necessary operating voltage.

3.10 Serial Interfaces COM1 and COM2

For an easy connection between the Starter Kit DNP/SK14 and your development system you can use the serial interfaces COM1 and COM2. The COM interfaces are realized as RS232 standard compliant Sub-D ports with 9 pins. Please see **chapter A2.1** for the exact layout of the COM interfaces.

Note: The serial interface COM2 does not offer handshake-signals!
--

3.11 CAN Connector

The CAN connector is the physical interface to the MCF5282 ColdFire CAN controller. There is an on-board 3.3V CAN transceiver SN65HVD230 (Texas Instruments) between the MCF5282 CAN controller and this connector.

3.12 CAN Termination Jumper

To switch a CAN termination resistor to the CAN-signals CAN+ and CAN- place a jumper cap on both pins of the CAN termination jumper, so that it is short.

Without the jumper cap the CAN termination jumper is not set and there is no CAN termination resistor for the CAN-signals CAN+ and CAN-.

3.13 Prototype Area

The prototype area (wire-wrap) offers space to develop and to test your own applications and circuits on the DNP/EVA6.

4 CONNECTIONS

For a quick and easy start with the Starter Kit DNP/SK14 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/5282

To mount the DNP/5282 on the DNP/EVA6 identify the pin 1 corner on the socket and the pin 1 corner on the DNP/5282. On the DNP/5282 a white sign marks the pin 1 corner. Matching the pin 1 corners, drop the DNP/5282 down into the socket. There is only a little bit force required and the DNP/5282 should seat easily into the socket. This locks the DNP/5282 in place.

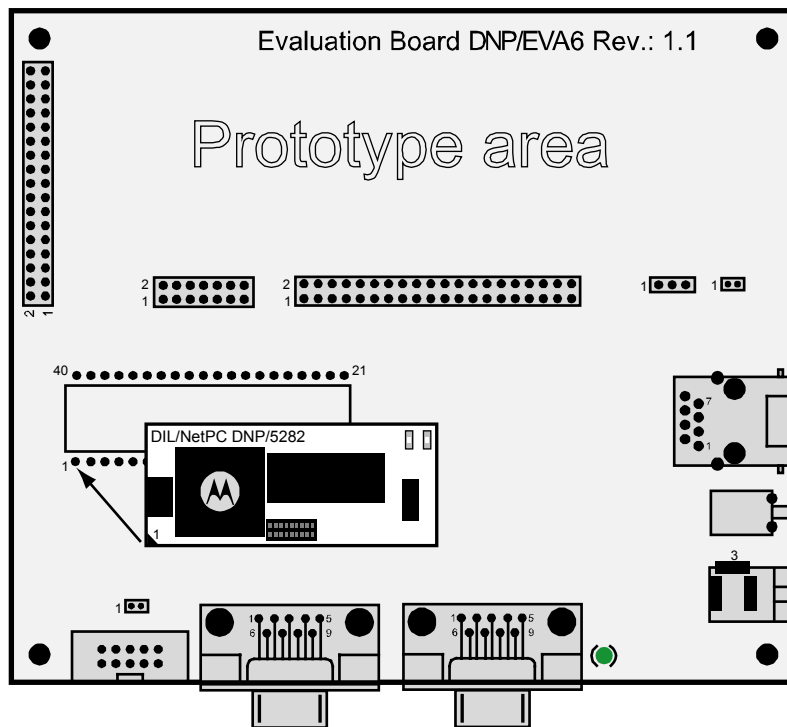


Figure 4-1: Mounting the DNP/5282 on the DNP/EVA6

4.2 Cable Connections

Before you can use your Starter Kit DNP/SK14 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 DNP/SK14 are two connections required. At first the RS232 serial link and at second the Ethernet link.

The PC will act as development system in RCM (Remote Console Mode) for the DNP/5282.

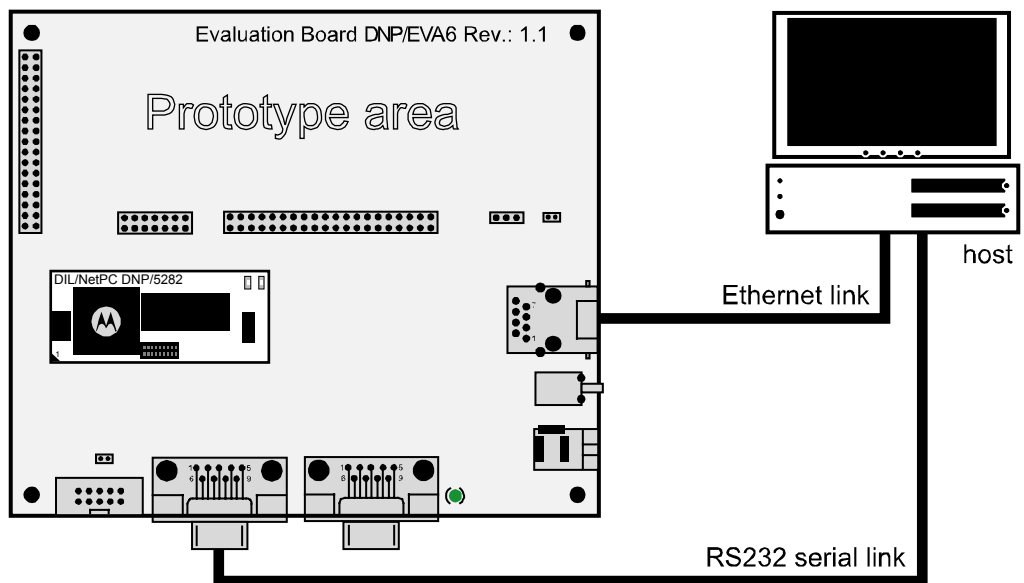


Figure 4-2: Overview about the required cable connections

4.3 Serial Link

For the serial link, you need a null-modem cable. This cable comes along with your Starter Kit. Please connect the DNP/EVA6 with the COM1 port of your development system by using this cable.

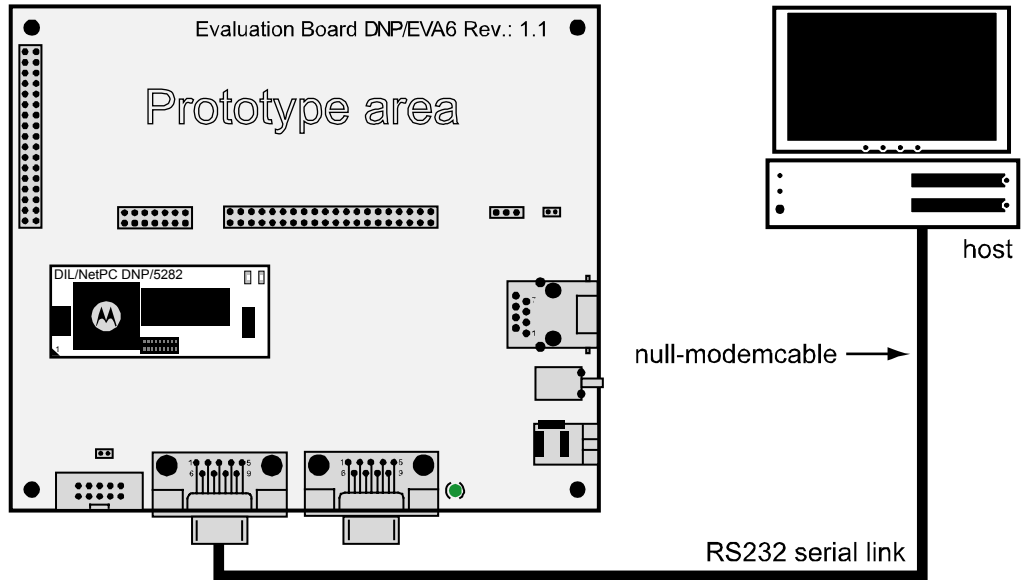


Figure 4-3: Serial link connection

4.4 Ethernet Link

The Ethernet link can be made on two ways. First with a crossover cable and second with two standard 10/100BaseT 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/5282 like shown in the figure below.

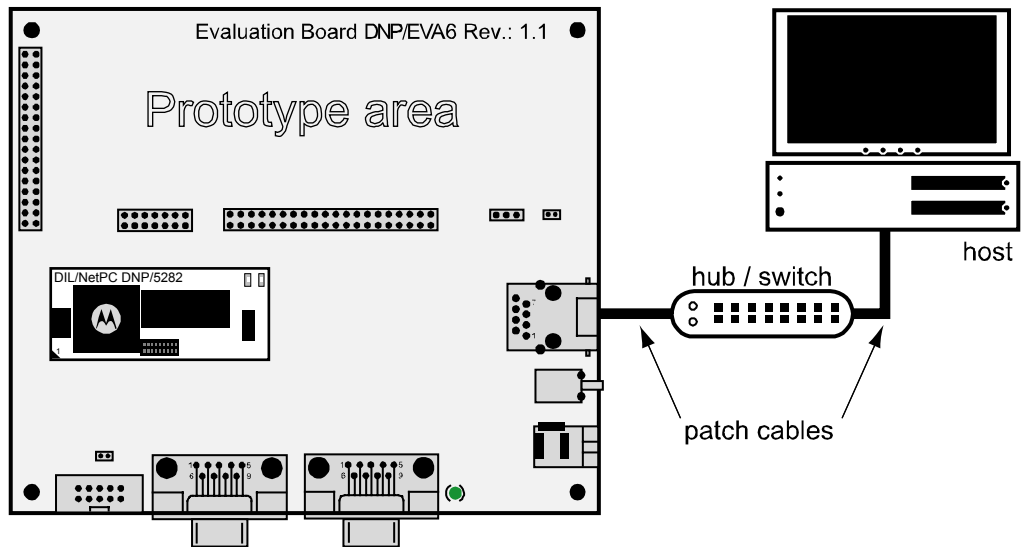


Figure 4-4: Ethernet link connection using a hub/switch

If you want to connect your development system directly to the DNP/5282, place a crossover cable between these two components like shown in the next figure.

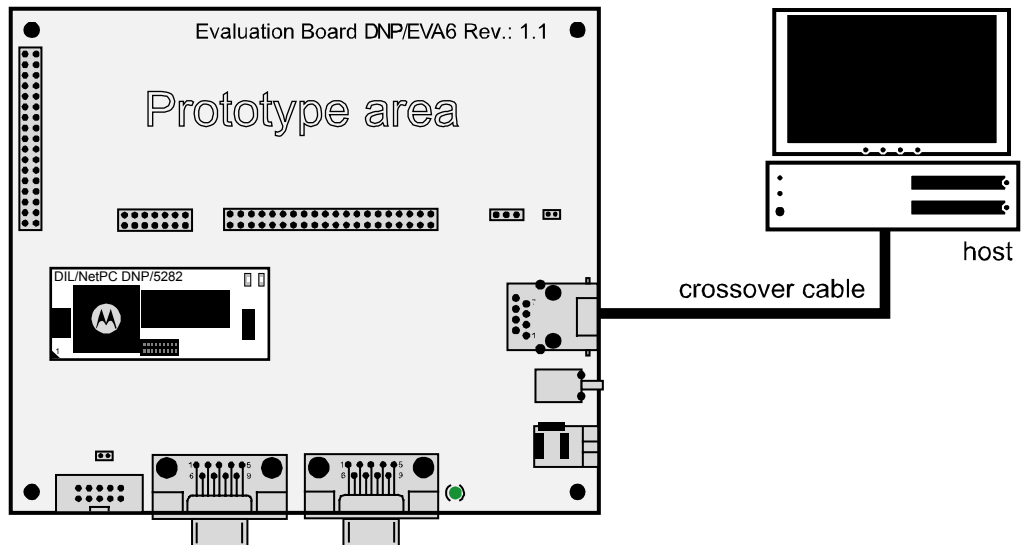


Figure 4-5: Ethernet link connection using a crossover cable

4.5 Power Supply

The Starter Kit DNP/SK14 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 DNP/SK14 is ready to run.

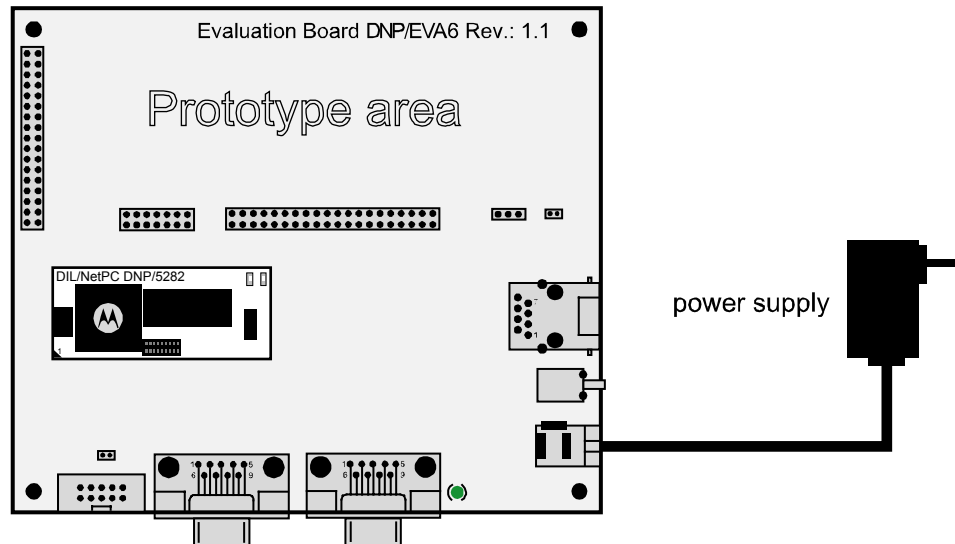


Figure 4-6: Power supply connection

Caution:

Providing the DNP/EVA6 with a voltage higher than the regular +5V DC $\pm 10\%$ could resolve in damaged board components!

5 USING A WINDOWS–BASED DEVELOPMENT SYSTEM

The following paragraphs will help you to use the DNP/5282 with a development system running under MS-Windows. For these steps you need a terminal program like **HyperTerminal**, which normally comes along with every MS-Windows installation. Please make sure that this program is present on your development system. If this program is not installed on your development system, you have to install this program manually from your MS-Windows installation CD-ROM.

Note: The DNP/5282 uses exactly the same μ CLinux as the DNP/5280. In some following screenshots you will find the term “DNP/5280” but that does not matter. The software for the DNP/5280 and for the DNP/5282 is the same!

5.1 Setup the Serial Link

Before you provide the DNP/EVA6 with power for the first time, please run a terminal program that offers communication capabilities on your development system. In the following you will see the necessary settings for HyperTerminal under MS 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.

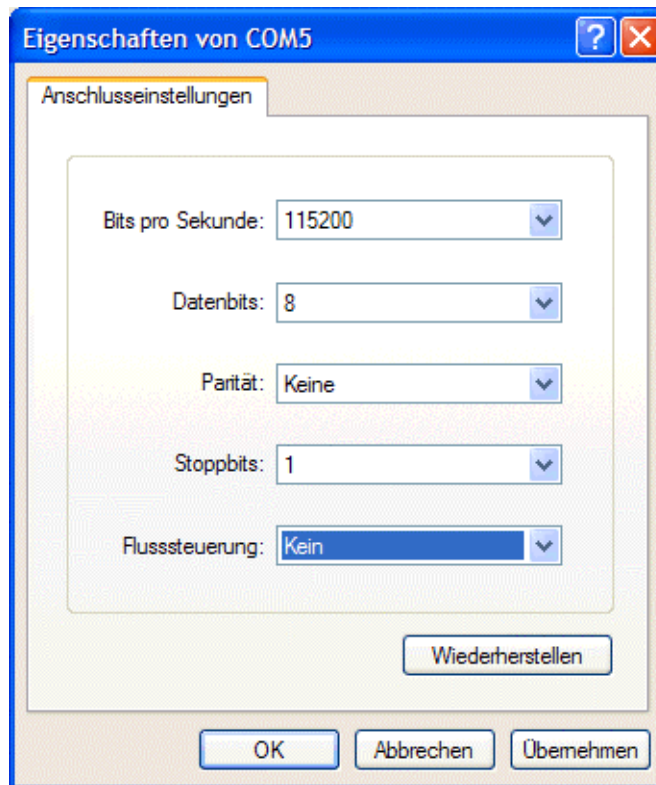
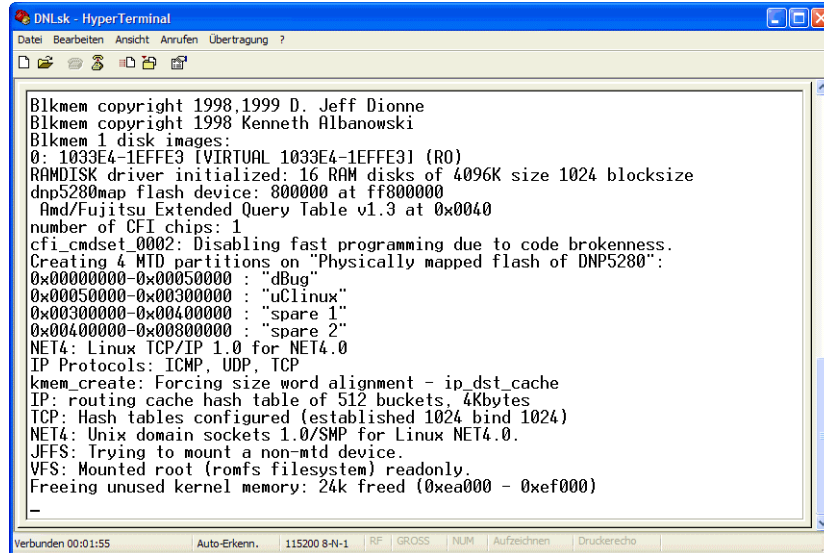


Figure 5-2: Communication parameter settings

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 DNP/EVA6 and you will see all steps of the DNP/5282 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/5282 is not set (please see **chapter 3.5** for detailed information).



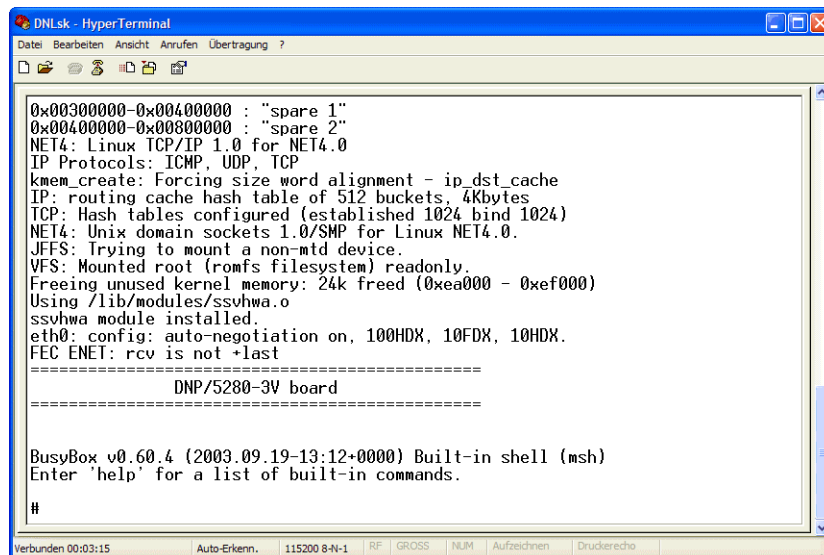
```

Blkmem copyright 1998,1999 D. Jeff Dionne
Blkmem copyright 1998 Kenneth Albanowski
Blkmem 1 disk images:
0: 1033E4-1EFFE3 [VIRTUAL 1033E4-1EFFE3] (R0)
RAMDISK driver initialized: 16 RAM disks of 4096K size 1024 blocksize
dnp5280map flash device: 800000 at ff800000
Amd/Fujitsu Extended Query Table v1.3 at 0x0040
number of CFI chips: 1
cfi_cmdset_0002: Disabling fast programming due to code brokenness.
Creating 4 MTD partitions on "Physically mapped flash of DNP5280":
0x00000000-0x00050000 : "dBug"
0x00050000-0x00300000 : "uCLinux"
0x00300000-0x00400000 : "spare 1"
0x00400000-0x00800000 : "spare 2"
NET4: Linux TCP/IP 1.0 for NET4.0
IP Protocols: ICMP, UDP, TCP
kmem_create: Forcing size word alignment - ip_dst_cache
IP: routing cache hash table of 512 buckets, 4Kbytes
TCP: Hash tables configured (established 1024 bind 1024)
NET4: Unix domain sockets 1.0/SMP for Linux NET4.0.
JFFS: Trying to mount a non-mtd device.
VFS: Mounted root (romfs filesystem) readonly.
Freeing unused kernel memory: 24k freed (0xea000 - 0xef000)
#

```

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.



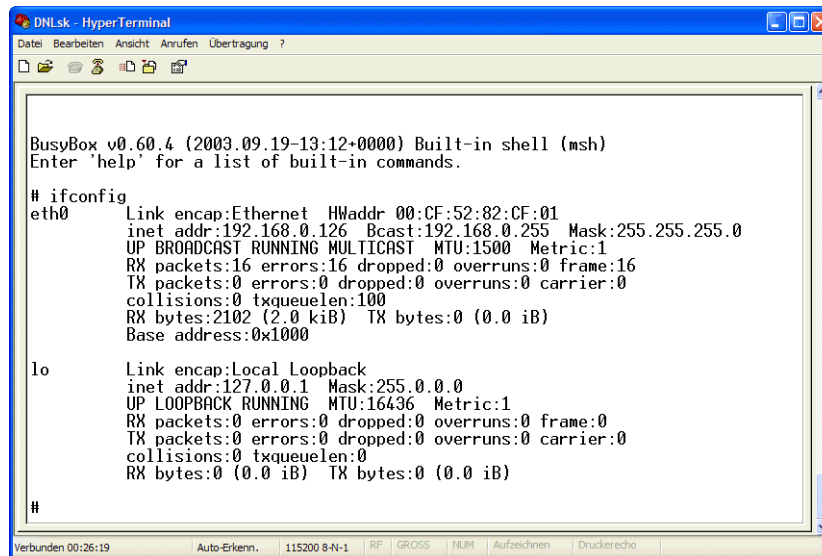
```

0x00300000-0x00400000 : "spare 1"
0x00400000-0x00800000 : "spare 2"
NET4: Linux TCP/IP 1.0 for NET4.0
IP Protocols: ICMP, UDP, TCP
kmem_create: Forcing size word alignment - ip_dst_cache
IP: routing cache hash table of 512 buckets, 4Kbytes
TCP: Hash tables configured (established 1024 bind 1024)
NET4: Unix domain sockets 1.0/SMP for Linux NET4.0.
JFFS: Trying to mount a non-mtd device.
VFS: Mounted root (romfs filesystem) readonly.
Freeing unused kernel memory: 24k freed (0xea000 - 0xef000)
Using /lib/modules/ssvhw.a
ssvhw module installed.
eth0: config: auto-negotiation on, 100HDX, 10FDX, 10HDX.
FEC ENET: rcv is not +last
=====
DNP/5280-3V board
=====
BusyBox v0.60.4 (2003.09.19-13:12+0000) Built-in shell (msh)
Enter 'help' for a list of built-in commands.
#

```

Figure 5-4: Linux command prompt

Now please enter *ifconfig* to see the network interface addresses of the DNP/5282.



```

DNLsk - HyperTerminal
Datei Bearbeiten Ansicht Anrufen Übertragung ?
[Icons]

BusyBox v0.60.4 (2003.09.19-13:12:0000) Built-in shell (msh)
Enter 'help' for a list of built-in commands.

# ifconfig
eth0  Link encap:Ethernet HWaddr 00:CF:52:82:CF:01
      inet addr:192.168.0.126 Bcast:192.168.0.255 Mask:255.255.255.0
      UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
      RX packets:16 errors:16 dropped:0 overruns:0 frame:16
      TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
      collisions:0 txqueuelen:100
      RX bytes:2102 (2.0 kiB) TX bytes:0 (0.0 iB)
      Base address:0x1000

lo    Link encap:Local Loopback
      inet addr:127.0.0.1 Mask:255.0.0.0
      UP LOOPBACK RUNNING MTU:16436 Metric:1
      RX packets:0 errors:0 dropped:0 overruns:0 frame:0
      TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
      collisions:0 txqueuelen:0
      RX bytes:0 (0.0 iB) TX bytes:0 (0.0 iB)

#
  
```

Figure 5-5: DNP/5282 network interface addresses

Note: For a first test of the Ethernet connection between the development system and the DNP/5282 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.

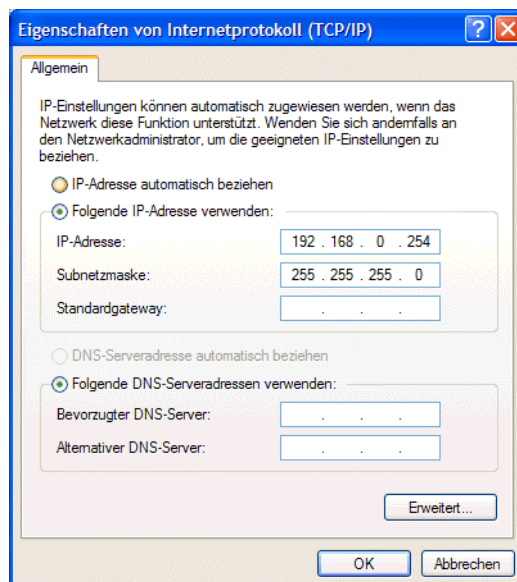
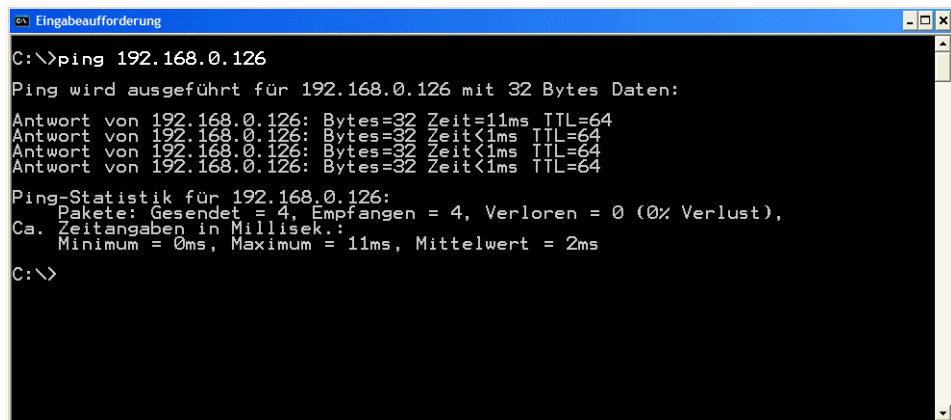


Figure 5-6: Windows IP address settings

5.2 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

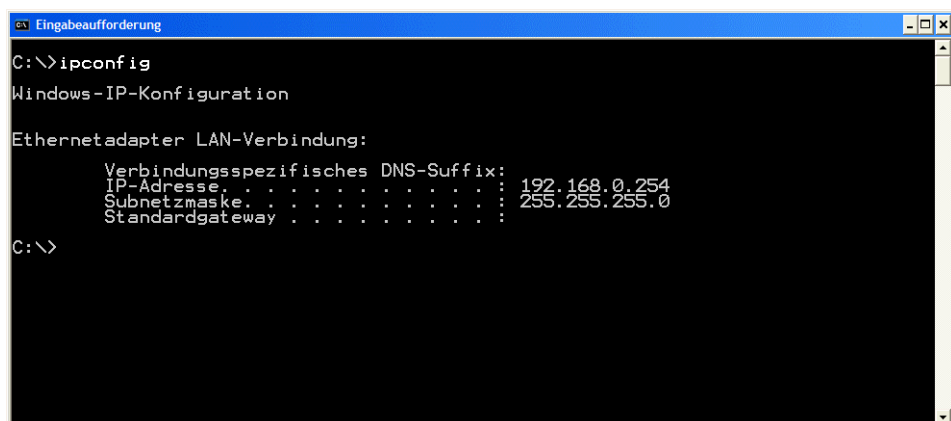


```
ev Eingabeaufforderung
C:\>ping 192.168.0.126
Ping wird ausgeführt für 192.168.0.126 mit 32 Bytes Daten:
Antwort von 192.168.0.126: Bytes=32 Zeit=11ms TTL=64
Antwort von 192.168.0.126: Bytes=32 Zeit<1ms TTL=64
Antwort von 192.168.0.126: Bytes=32 Zeit<1ms TTL=64
Antwort von 192.168.0.126: Bytes=32 Zeit<1ms TTL=64
Ping-Statistik für 192.168.0.126:
    Pakete: Gesendet = 4, Empfangen = 4, Verloren = 0 (0% Verlust),
    Ca. Zeitangaben in Millisek.:
        Minimum = 0ms, Maximum = 11ms, Mittelwert = 2ms
C:\>
```

Figure 5-7: Communication check via PING

The Starter Kit DNP/SK14 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



```
ev Eingabeaufforderung
C:\>ipconfig
Windows-IP-Konfiguration

Ethernetadapter LAN-Verbindung:

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

C:\>
```

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 MS Internet Explorer or a different suitable web browser like Netscape or Opera or similar.

5.3 Web Server Access

Start a web browser open the URL `http://192.168.0.126`. The embedded web server will deliver you a small description about the DNP/5282. That's it. Now you are online with the Starter Kit DNP/SK14 and your web browser is connected to the embedded web server of the DNP/5282. It shows you a static web page with some pictures.

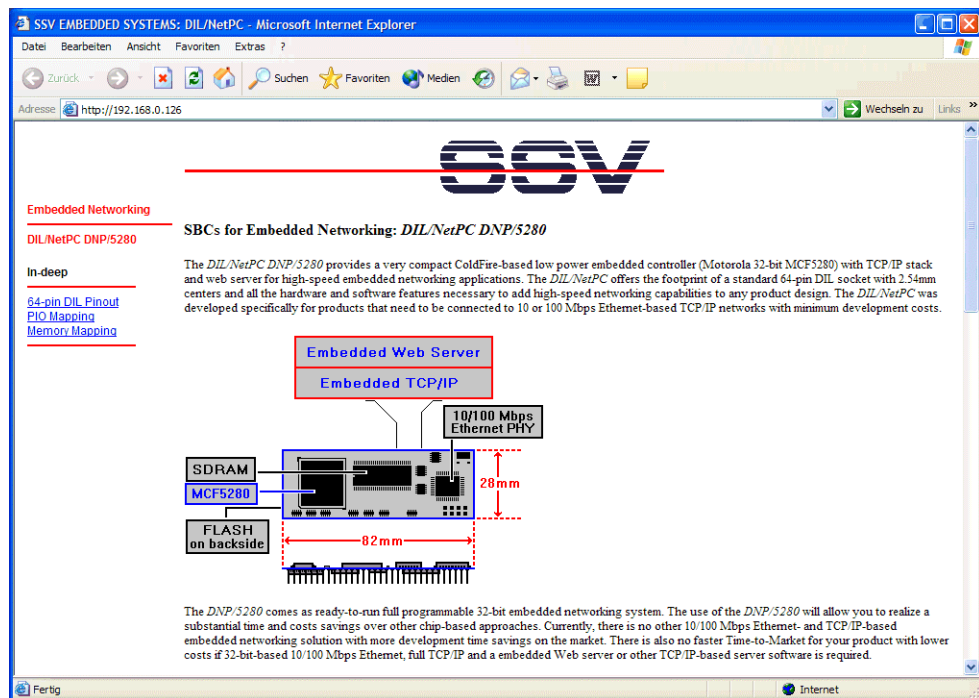


Figure 5-9: Web page shown by the MS-Internet Explorer

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.

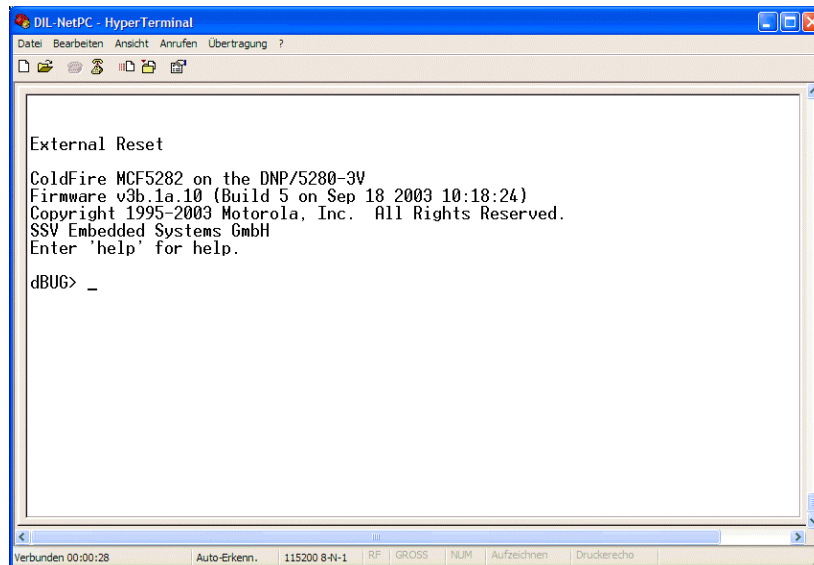
In some cases the web browser is only configured for modem based Internet access. In this case, please install a second web browser from your original operating system CD-ROM.

5.4 Assigning a new IP-Address to the DNP/5282

The following steps describe how to change the IP-address of the DNP/5282 with a terminal program like the HyperTerminal-program in MS-Windows.

Note: Please assure that the RCM jumper on the DNP/5282 is set for further operation. Please see **chapter 3.5** how to set the RCM jumper correctly.

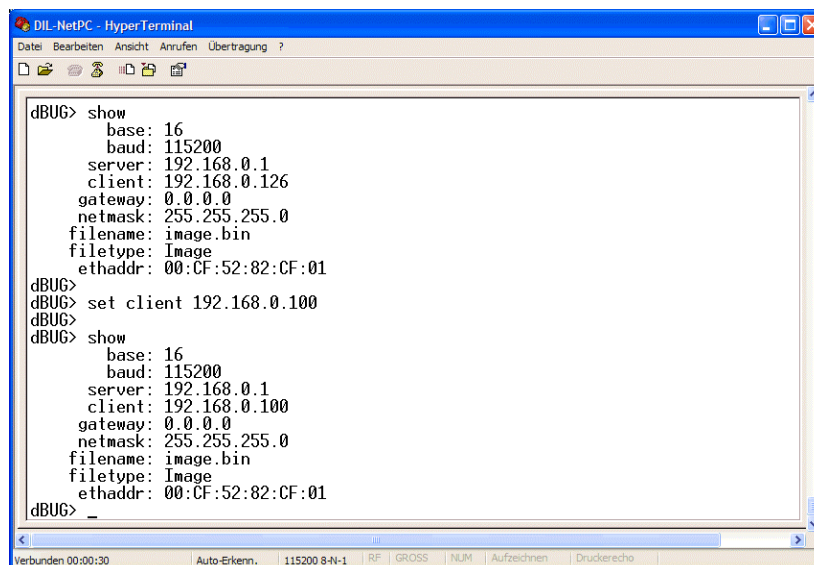
When the DNP/5282 has booted with the RCM jumper set you should see the following screen on your terminal program.



```
DIL-NetPC - HyperTerminal
Datei Bearbeiten Ansicht Anrufen Übertragung ?
External Reset
ColdFire MCF5282 on the DNP/5280-3V
Firmware v3b.1a.10 (Build 5 on Sep 18 2003 10:18:24)
Copyright 1995-2003 Motorola, Inc. All Rights Reserved.
SSV Embedded Systems GmbH
Enter 'help' for help.
dBUG> _
Verbinden 00:00:28 Auto-Erkenn. 115200 8-N-1 RF | GROSS NUM Aufzeichnen Druckercho
```

Figure 5-10: Boot process with RCM jumper set

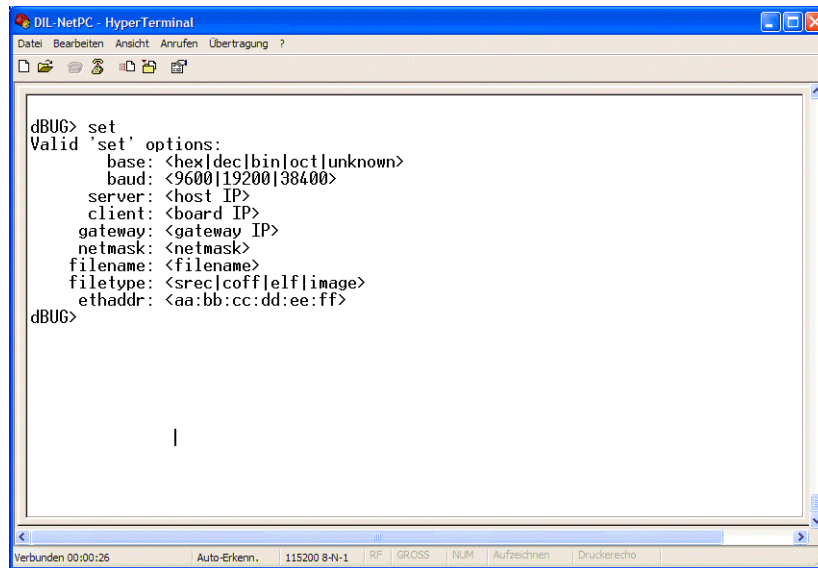
Now enter the command *show* to see the current parameters of the DNP/5282. To assign a different IP-address (e.g. the IP-address 192.168.0.100) use the Linux command *set client 192.168.0.100*.



```
DIL-NetPC - HyperTerminal
Datei Bearbeiten Ansicht Anrufen Übertragung ?
dBUG> show
base: 16
baud: 115200
server: 192.168.0.1
client: 192.168.0.126
gateway: 0.0.0.0
netmask: 255.255.255.0
filename: image.bin
filetype: Image
ethaddr: 00:CF:52:82:CF:01
dBUG>
dBUG> set client 192.168.0.100
dBUG>
dBUG> show
base: 16
baud: 115200
server: 192.168.0.1
client: 192.168.0.100
gateway: 0.0.0.0
netmask: 255.255.255.0
filename: image.bin
filetype: Image
ethaddr: 00:CF:52:82:CF:01
dBUG> _
Verbinden 00:00:30 Auto-Erkenn. 115200 8-N-1 RF | GROSS NUM Aufzeichnen Druckercho
```

Figure 5-11: Assigning a new IP-address to the DNP/5282

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



```
dBUG> set
Valid 'set' options:
    base: <hex|dec|bin|oct|unknown>
    baud: <9600|19200|38400>
    server: <host IP>
    client: <board IP>
    gateway: <gateway IP>
    netmask: <netmask>
    filename: <filename>
    filetype: <srec|coff|elf|image>
    ethaddr: <aa:bb:cc:dd:ee:ff>
dBUG>
```

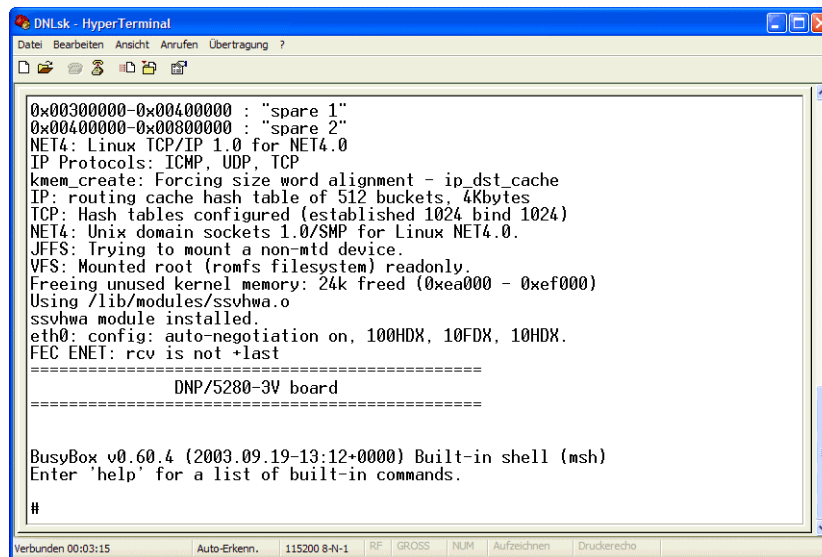
Figure 5-12: Command set with parameters

5.5 Running Linux

The DNP/5282 is delivered with a pre-installed Linux. When booting make sure the RCM jumper of the DNP/5282 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/5282 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 3.5**) there is a serial console available with following parameters: 115 200 bps, no parity, 8 data bits, 1 stop bit, no handshake.



```

DNLsk - HyperTerminal
Datei Bearbeiten Ansicht Anrufen Übertragung ?
0x00300000-0x00400000 : "spare 1"
0x00400000-0x00800000 : "spare 2"
NET4: Linux TCP/IP 1.0 for NET4.0
IP Protocols: ICMP, UDP, TCP
kmem_create: Forcing size word alignment - ip_dst_cache
IP: routing cache hash table of 512 buckets, 4Kbytes
TCP: Hash tables configured (established 1024 bind 1024)
NET4: Unix domain sockets 1.0/SMP for Linux NET4.0.
JFFS: Trying to mount a non-mtd device.
VFS: Mounted root (romfs filesystem) readonly.
Freeing unused kernel memory: 24k freed (0xea000 - 0xef000)
Using /lib/modules/ssvhw.a
ssvhw module installed.
eth0: config: auto-negotiation on, 100HDX, 10FDX, 10HDX.
FEC ENET: rcv is not +last
=====
DNP/5280-3V board
=====

BusyBox v0.60.4 (2003.09.19-13:12+0000) Built-in shell (msh)
Enter 'help' for a list of built-in commands.

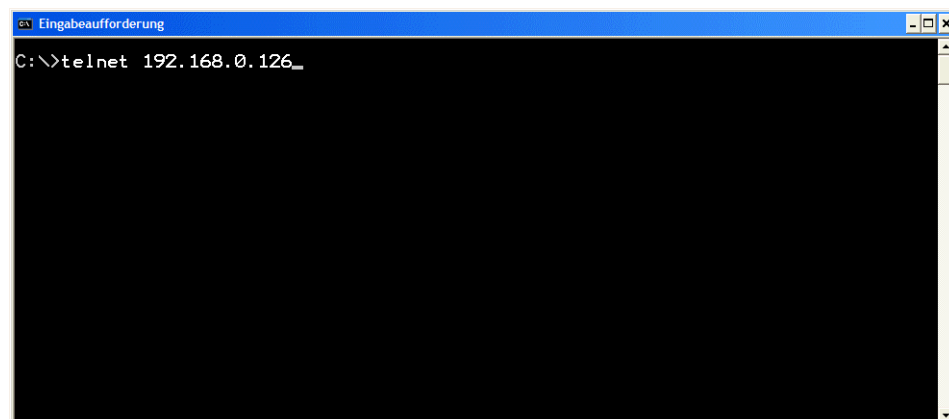
#
Verbunden 00:03:15 Auto-Erkenn. 115200 8-N-1 RF GROSS NUM Aufzeichnen Druckerrechte

```

Figure 5-13: DNP/5282 Linux boot process

Alternatively you can use a **command line interface (CLI)** like a Telnet client to communicate with the DNP/5282. 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/5282 you need to enter this new IP-address in the command line.



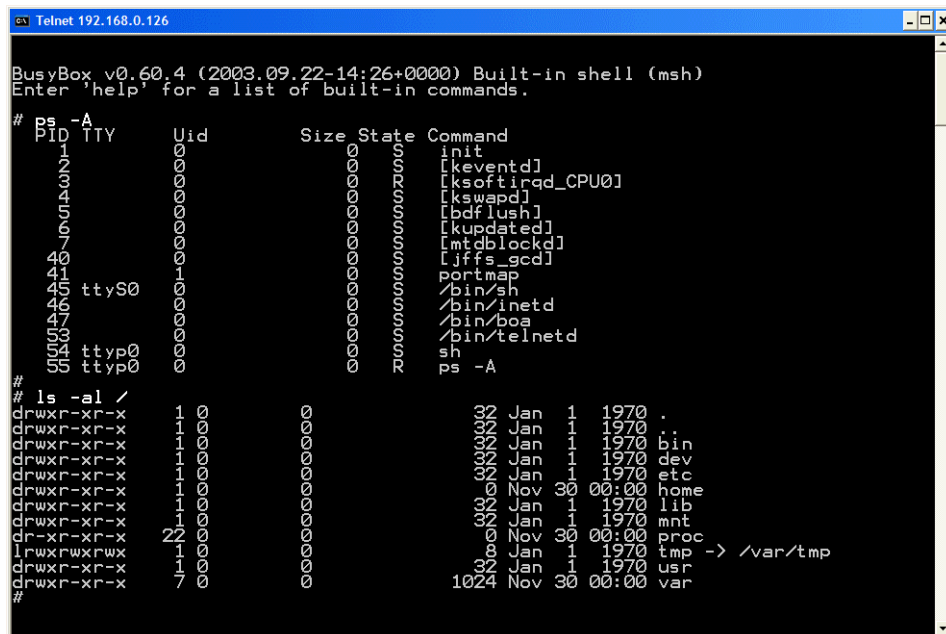
```

Eingabeaufforderung
C:\>telnet 192.168.0.126_

```

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/5282. The standard output will be shown in your Telnet client window as illustrated in the next figure.



```

Telnet 192.168.0.126
BusyBox v0.60.4 (2003.09.22-14:26+0000) Built-in shell (msh)
Enter 'help' for a list of built-in commands.

# ps -A
  PID TTY          Uid    Size State Command
    1 00000000 00000000 00000000 [keventd]
    2 00000000 00000000 00000000 [ksoftirqd_CPU0]
    3 00000000 00000000 00000000 [kswapd]
    4 00000000 00000000 00000000 [bdflush]
    5 00000000 00000000 00000000 [kupdated]
    6 00000000 00000000 00000000 [mtdblockd]
    7 00000000 00000000 00000000 [jffs_gcd]
   40 00000000 00000000 00000000 portmap
   41 00000000 00000000 00000000 /bin/sh
   46 00000000 00000000 00000000 /bin/inetd
   47 00000000 00000000 00000000 /bin/boa
   48 00000000 00000000 00000000 /bin/telnetd
   49 00000000 00000000 00000000 sh
   50 00000000 00000000 00000000 ps -A

# ls -al /
drwxr-xr-x 1 0 0 32 Jan 1 1970 .
drwxr-xr-x 1 0 0 32 Jan 1 1970 ..
drwxr-xr-x 1 0 0 32 Jan 1 1970 bin
drwxr-xr-x 1 0 0 32 Jan 1 1970 dev
drwxr-xr-x 1 0 0 32 Jan 1 1970 etc
drwxr-xr-x 1 0 0 32 Nov 30 00:00 home
drwxr-xr-x 1 0 0 32 Jan 1 1970 lib
drwxr-xr-x 1 0 0 32 Jan 1 1970 mnt
dr-xr-xr-x 22 0 0 0 Nov 30 00:00 proc
lrwxrwxrwx 1 0 0 8 Jan 1 1970 tmp -> /var/tmp
drwxr-xr-x 1 0 0 32 Jan 1 1970 usr
drwxr-xr-x 7 0 0 1024 Nov 30 00:00 var
#
  
```

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.

5.6 File Transfer via TFTP

The DIL/NetPC DNP/5282 offers a very simple way for Ethernet-based file transfers between your PC system and the DNP/5282 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/5282 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 special server versions of MS Windows come with a TFTP server program. For all other Windows-based PCs you find the TFTP server program **TFTPD32** in the directory **\TFTP-Server-Win32** on your DNP/SK14 CD-ROM. Copy all files from **\TFTP-Server-Win32** to a new directory 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/5282 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/5282 is **192.168.0.126**.

Now run the TFTP server program on your PC system.

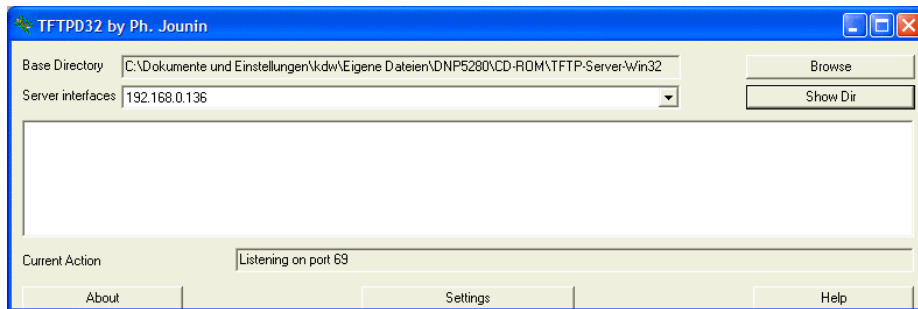


Figure 5 16: Running TFTPD32

Check the TFTP connection between the DIL/NetPC DNP/5282 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/5282 TFTP client program.

The parameter *-g* stands for get (get a file from the PC system to the DNP/5282).

The parameter *-p* stands for put (put a file from the DNP/5282 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 TFTP32 you can change this directory with the browse button.

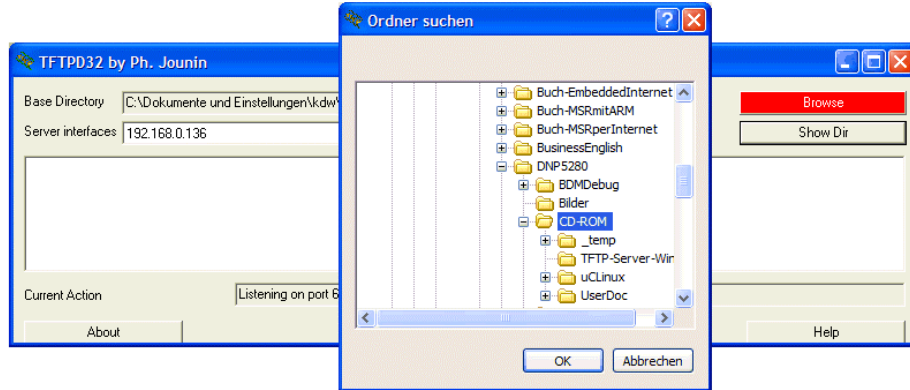


Figure 5 17: Changing the default directory for TFTP32

Example:

The following picture shows the use of the DNP/5282 TFTP client within a Telnet session.

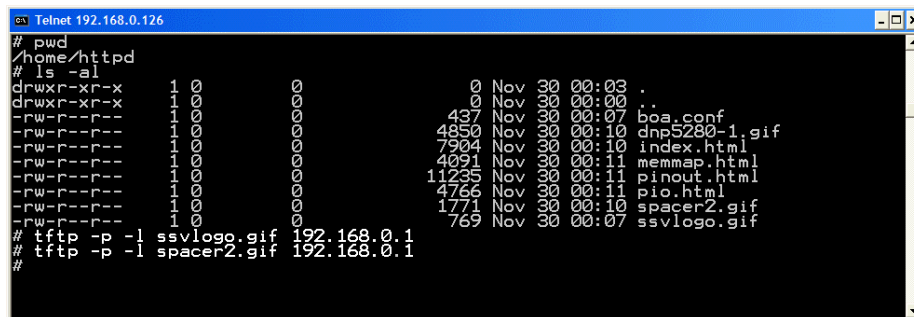


Figure 5 18: Using the DNP/5282 TFTP client within a Telnet session

Note: A file transfer to the DNP/5282 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.

6 USING A LINUX-BASED DEVELOPMENT SYSTEM

The following paragraphs will help you to use the DNP/5282 with a development system running under Linux. For these steps you will need a terminal program, which normally comes along with the Linux installation (i.e. **Minicom**). Please make sure that this program is present on your development system. If necessary you have to install this program from your Linux installation CD-ROM.

Note: The DNP/5282 uses exactly the same μ CLinux as the DNP/5280. In some following screenshots you will find the term “DNP/5280” but that does not matter. The software for the DNP/5280 and for the DNP/5282 is the same!

6.1 Setup the Serial Link

Before you provide the DNP/EVA6 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/5282 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".

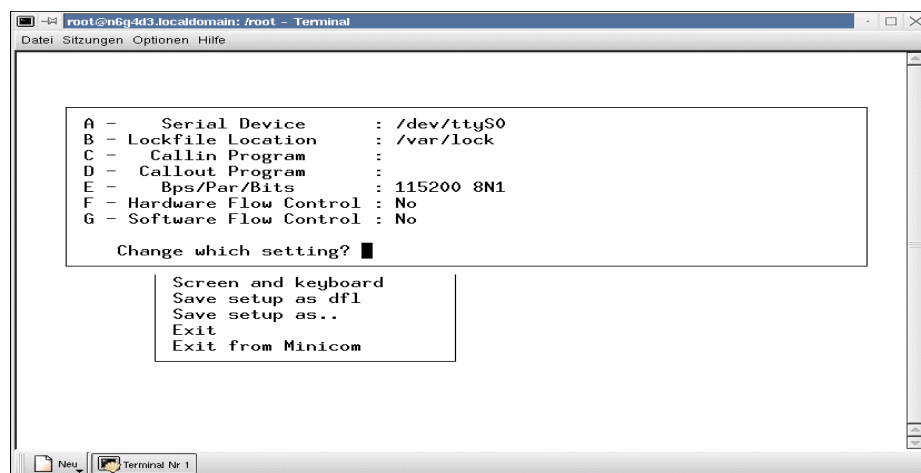
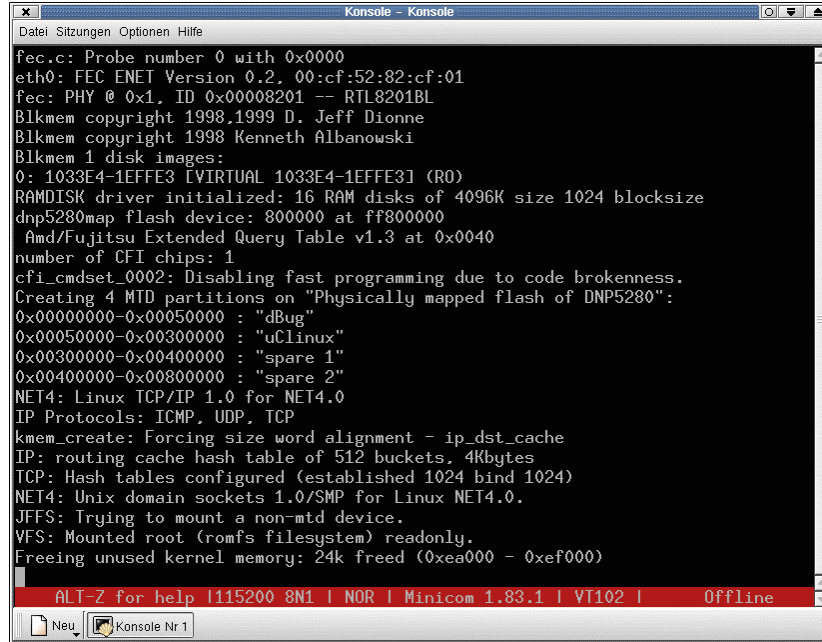


Figure 5-19: Serial port settings under Minicom

Now turn on the power for the DNP/EVA6 and you will see all steps of the DNP/5282 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/5282 is not set (please see **chapter 3.5** for detailed information).



```

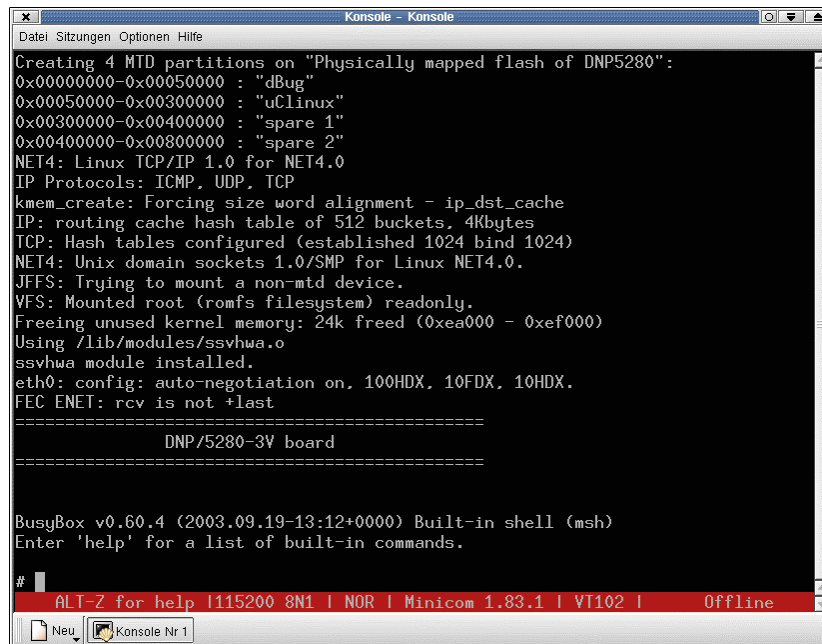
Datei Sitzungen Optionen Hilfe
fec.c: Probe number 0 with 0x0000
eth0: FEC ENET Version 0.2, 00:cf:52:82:cf:01
fec: PHY @ 0x1, ID 0x00008201 -- RTL8201BL
Blkmem copyright 1998,1999 D. Jeff Dionne
Blkmem copyright 1998 Kenneth Albanowski
Blkmem 1 disk images:
0: 1033E4-1EFFE3 [VIRTUAL 1033E4-1EFFE3] (R0)
RAMDISK driver initialized: 16 RAM disks of 4096K size 1024 blocksize
dnp5280map flash device: 800000 at ff800000
  Amd/Fujitsu Extended Query Table v1.3 at 0x0040
number of CFI chips: 1
cfi_cmdset_0002: Disabling fast programming due to code brokenness.
Creating 4 MTD partitions on "Physically mapped flash of DNP5280":
0x00000000-0x00050000 : "dBug"
0x00050000-0x00300000 : "uCLinux"
0x00300000-0x00400000 : "spare 1"
0x00400000-0x00800000 : "spare 2"
NET4: Linux TCP/IP 1.0 for NET4.0
IP Protocols: ICMP, UDP, TCP
kmem_create: Forcing size word alignment - ip_dst_cache
IP: routing cache hash table of 512 buckets, 4Kbytes
TCP: Hash tables configured (established 1024 bind 1024)
NET4: Unix domain sockets 1.0/SMP for Linux NET4.0.
JFFS: Trying to mount a non-mtd device.
VFS: Mounted root (romfs filesystem) readonly.
Freeing unused kernel memory: 24k freed (0xea000 - 0xef000)

ALT-Z for help |115200 8N1 | NOR | Minicom 1.83.1 | VT102 | Offline

```

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.



```

Datei Sitzungen Optionen Hilfe
Creating 4 MTD partitions on "Physically mapped flash of DNP5280":
0x00000000-0x00050000 : "dBug"
0x00050000-0x00300000 : "uCLinux"
0x00300000-0x00400000 : "spare 1"
0x00400000-0x00800000 : "spare 2"
NET4: Linux TCP/IP 1.0 for NET4.0
IP Protocols: ICMP, UDP, TCP
kmem_create: Forcing size word alignment - ip_dst_cache
IP: routing cache hash table of 512 buckets, 4Kbytes
TCP: Hash tables configured (established 1024 bind 1024)
NET4: Unix domain sockets 1.0/SMP for Linux NET4.0.
JFFS: Trying to mount a non-mtd device.
VFS: Mounted root (romfs filesystem) readonly.
Freeing unused kernel memory: 24k freed (0xea000 - 0xef000)
Using /lib/modules/ssvhwa.o
ssvhwa module installed.
eth0: config: auto-negotiation on, 100HDX, 10FDX, 10HDX.
FEC ENET: rcv is not +last

=====
DNP/5280-3V board
=====

BusyBox v0.60.4 (2003.09.19-13:12+0000) Built-in shell (msh)
Enter 'help' for a list of built-in commands.

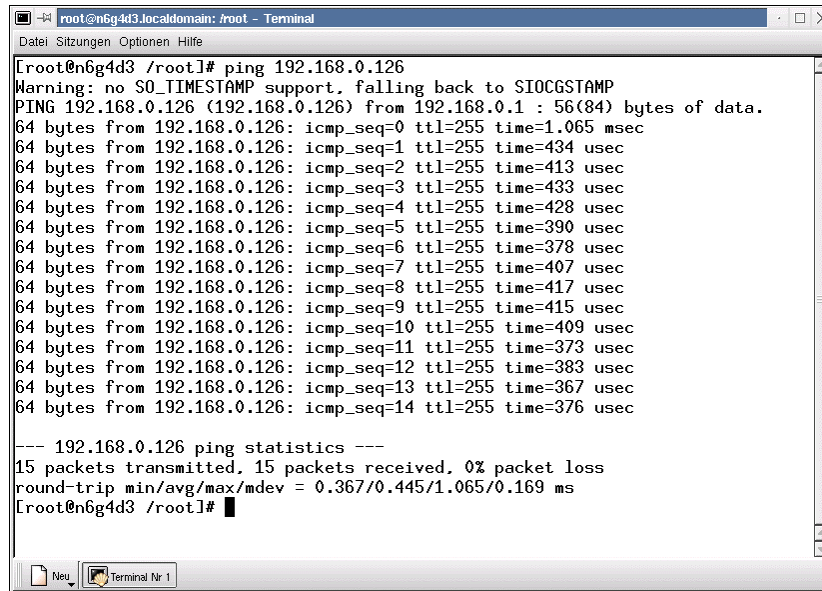
#
ALT-Z for help |115200 8N1 | NOR | Minicom 1.83.1 | VT102 | Offline

```

Figure 5-21: Linux command prompt

6.2 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/5282 similar as shown below.



```

[Root@n6g4d3 /root]# ping 192.168.0.126
Warning: no SO_TIMESTAMP support, falling back to SIOCGSTAMP
PING 192.168.0.126 (192.168.0.126) from 192.168.0.1 : 56(84) bytes of data.
64 bytes from 192.168.0.126: icmp_seq=0 ttl=255 time=1.065 msec
64 bytes from 192.168.0.126: icmp_seq=1 ttl=255 time=434 usec
64 bytes from 192.168.0.126: icmp_seq=2 ttl=255 time=413 usec
64 bytes from 192.168.0.126: icmp_seq=3 ttl=255 time=433 usec
64 bytes from 192.168.0.126: icmp_seq=4 ttl=255 time=428 usec
64 bytes from 192.168.0.126: icmp_seq=5 ttl=255 time=390 usec
64 bytes from 192.168.0.126: icmp_seq=6 ttl=255 time=378 usec
64 bytes from 192.168.0.126: icmp_seq=7 ttl=255 time=407 usec
64 bytes from 192.168.0.126: icmp_seq=8 ttl=255 time=417 usec
64 bytes from 192.168.0.126: icmp_seq=9 ttl=255 time=415 usec
64 bytes from 192.168.0.126: icmp_seq=10 ttl=255 time=409 usec
64 bytes from 192.168.0.126: icmp_seq=11 ttl=255 time=373 usec
64 bytes from 192.168.0.126: icmp_seq=12 ttl=255 time=383 usec
64 bytes from 192.168.0.126: icmp_seq=13 ttl=255 time=367 usec
64 bytes from 192.168.0.126: icmp_seq=14 ttl=255 time=376 usec

--- 192.168.0.126 ping statistics ---
15 packets transmitted, 15 packets received, 0% packet loss
round-trip min/avg/max/mdev = 0.367/0.445/1.065/0.169 ms
[Root@n6g4d3 /root]#

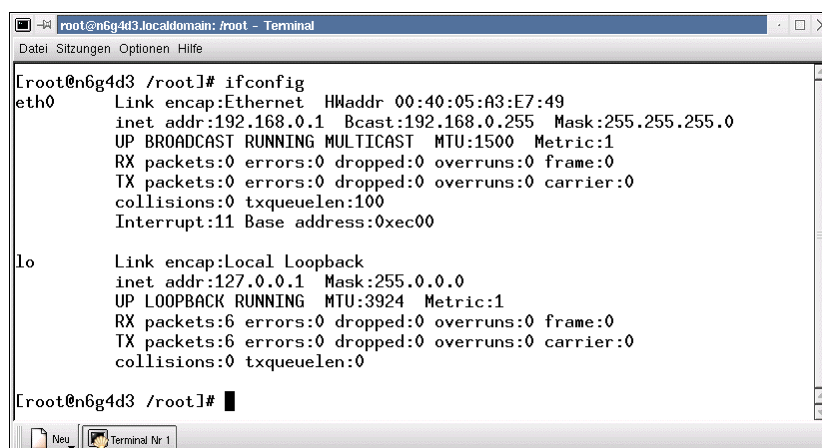
```

Figure 5-22: Ping request

To cancel the ping request just press the keyboard shortcut **C + C**. If an error occurs (e.g. the DNP/5282 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/5282 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*.



```

[Root@n6g4d3 /root]# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:40:05:A3:E7:49
          inet addr:192.168.0.1  Bcast:192.168.0.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:100
          Interrupt:11 Base address:0xec00

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:3924  Metric:1
          RX packets:6 errors:0 dropped:0 overruns:0 frame:0
          TX packets:6 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0

[Root@n6g4d3 /root]#

```

Figure 5-23: IP-address check via ifconfig

6.3 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/5282.

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/5282 and shows you a static web page with some pictures.

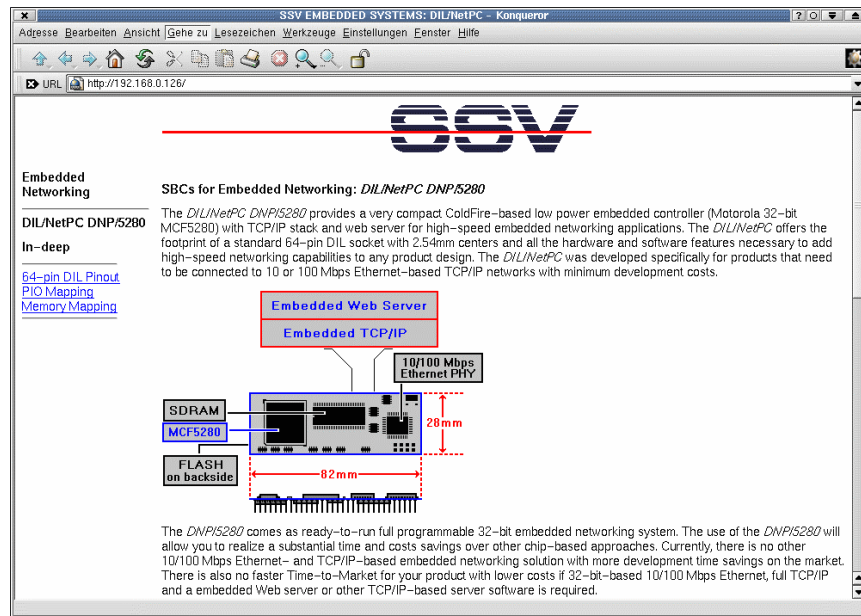


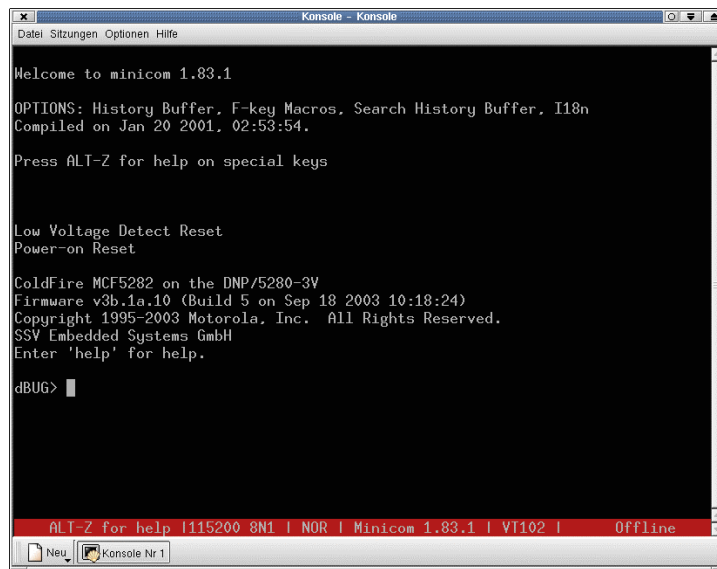
Figure 5-24: Web page shown by the Konqueror File Manager

6.4 Assigning a new IP-Address to the DNP/5282

The following steps describe how to change the IP-address of the DNP/5282 with a command line interface like Minicom in Linux.

Note: Please assure that the RCM jumper on the DNP/5282 is set for further operation. Please see **chapter 3.5** how to set the RCM jumper correctly.

When the DNP/5282 has booted with the RCM jumper set you should see the following screen on your terminal program.



```

Welcome to minicom 1.83.1

OPTIONS: History Buffer, F-key Macros, Search History Buffer, I18n
Compiled on Jan 20 2001, 02:53:54.

Press ALT-Z for help on special keys

Low Voltage Detect Reset
Power-on Reset

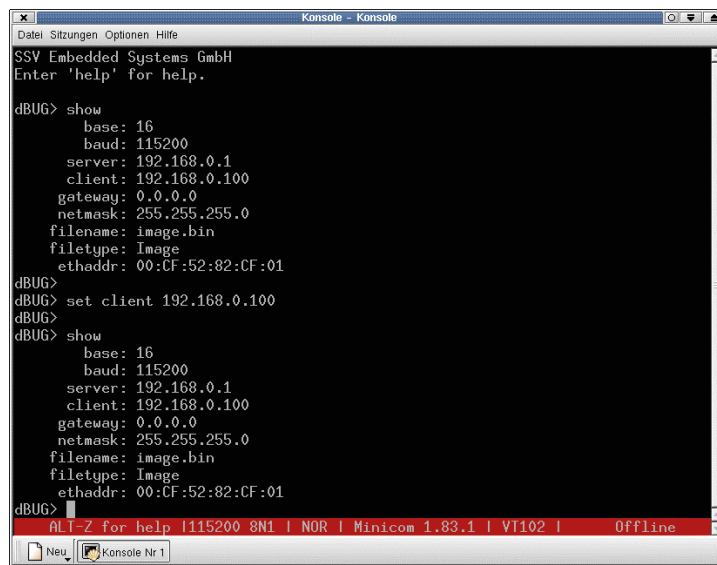
ColdFire MCF5282 on the DNP/5280-3V
Firmware v3b.1a.10 (Build 5 on Sep 18 2003 10:18:24)
Copyright 1995-2003 Motorola, Inc. All Rights Reserved.
SSV Embedded Systems GmbH
Enter 'help' for help.

dBUG>

```

Figure 5-25: Boot process with RCM jumper set

Now enter the command *show* to see the current parameters of the DNP/5282. 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*.



```

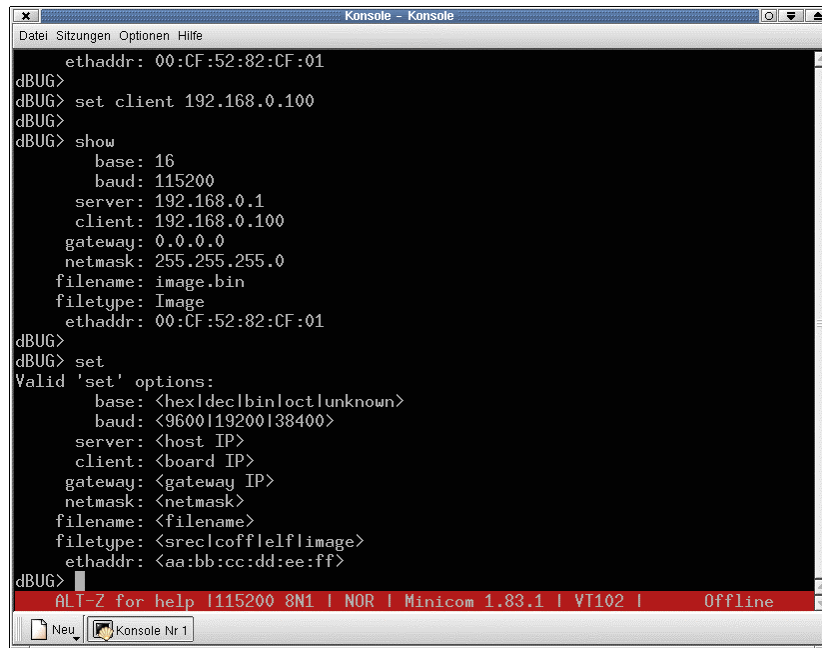
SSV Embedded Systems GmbH
Enter 'help' for help.

dBUG> show
base: 16
baud: 115200
server: 192.168.0.1
client: 192.168.0.100
gateway: 0.0.0
netmask: 255.255.255.0
filename: image.bin
filetype: Image
ethaddr: 00:CF:52:82:CF:01
dBUG>
dBUG> set client 192.168.0.100
dBUG>
dBUG> show
base: 16
baud: 115200
server: 192.168.0.1
client: 192.168.0.100
gateway: 0.0.0
netmask: 255.255.255.0
filename: image.bin
filetype: Image
ethaddr: 00:CF:52:82:CF:01
dBUG>

```

Figure 5-26: Assigning a new IP-address to the DNP/5282

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



```
ethaddr: 00:CF:52:82:CF:01
dBUG>
dBUG> set client 192.168.0.100
dBUG>
dBUG> show
    base: 16
    baud: 115200
    server: 192.168.0.1
    client: 192.168.0.100
    gateway: 0.0.0.0
    netmask: 255.255.255.0
    filename: image.bin
    filetype: Image
    ethaddr: 00:CF:52:82:CF:01
dBUG>
dBUG> set
Valid 'set' options:
    base: <hex|dec|bin|oct|unknown>
    baud: <9600|19200|38400>
    server: <host IP>
    client: <board IP>
    gateway: <gateway IP>
    netmask: <netmask>
    filename: <filename>
    filetype: <src|c|off|elf|image>
    ethaddr: <aa:bb:cc:dd:ee:ff>
dBUG>
```

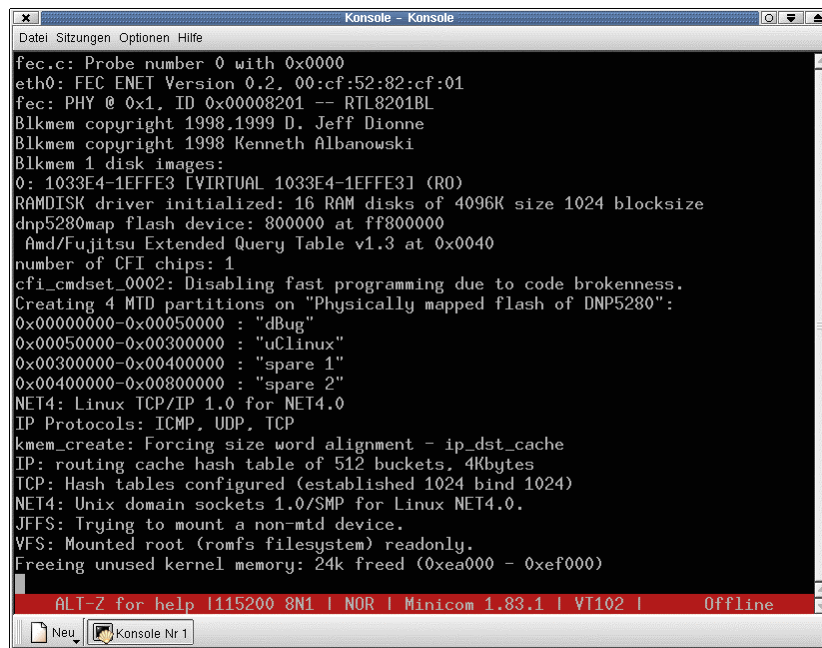
Figure 5-27: Command set with parameters

6.5 Running Linux

The DNP/5282 is delivered with a pre-installed Linux. When booting make sure the RCM jumper of the DNP/5282 is not set. When the Linux boot process is done the system will stop with the login prompt shown in figure 5-28.

The DNP/5282 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 3.5**) set there is a serial console available with following parameters: 115 200 bps, No Parity, 8 Data Bits, 1 Stop Bit, No Handshake.

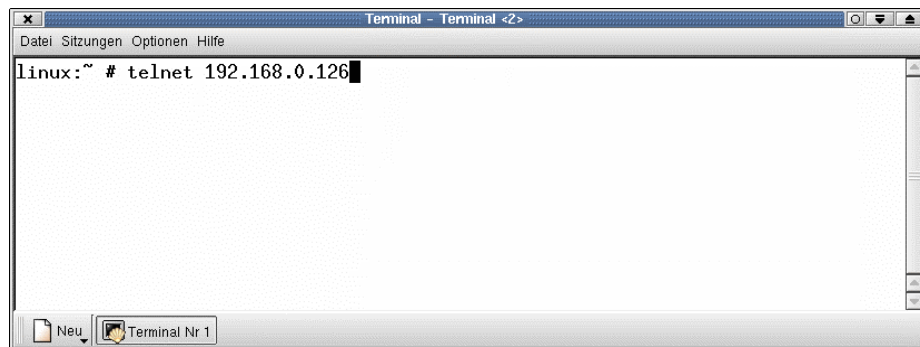


```

fec.c: Probe number 0 with 0x0000
eth0: FEC ENET Version 0.2, 00:cf:52:82:cf:01
fec: PHY @ 0x1, ID 0x00008201 -- RTL8201BL
Blkmem copyright 1998,1999 D. Jeff Dionne
Blkmem copyright 1998 Kenneth Albanowski
Blkmem 1 disk images:
0: 1033E4-1E4FE3 [VIRTUAL 1033E4-1E4FE3] (R0)
RAMDISK driver initialized: 16 RAM disks of 4096K size 1024 blocksize
dnp5280map flash device: 800000 at ff800000
  Amd/Fujitsu Extended Query Table v1.3 at 0x0040
number of CFI chips: 1
cfi_cmdset_0002: Disabling fast programming due to code brokenness.
Creating 4 MTD partitions on "Physically mapped flash of DNP5280":
0x00000000-0x00050000 : "dBug"
0x00050000-0x00300000 : "uCLinux"
0x00300000-0x00400000 : "spare 1"
0x00400000-0x00800000 : "spare 2"
NET4: Linux TCP/IP 1.0 for NET4.0
IP Protocols: ICMP, UDP, TCP
kmem_create: Forcing size word alignment - ip_dst_cache
IP: routing cache hash table of 512 buckets, 4Kbytes
TCP: Hash tables configured (established 1024 bind 1024)
NET4: Unix domain sockets 1.0/SMP for Linux NET4.0.
JFFS: Trying to mount a non-mtd device.
VFS: Mounted root (romfs filesystem) readonly.
Freeing unused kernel memory: 24k freed (0xea000 - 0xef000)
  
```

Figure 5-28: Linux boot process

Alternatively you can use a **command line interface (CLI)** like a Telnet client to communicate with the DNP/5282. Type in the command **telnet 192.168.0.126**. If you have already assigned a different IP-address to the DNP/5282 you need to enter this new IP-address in the command line.

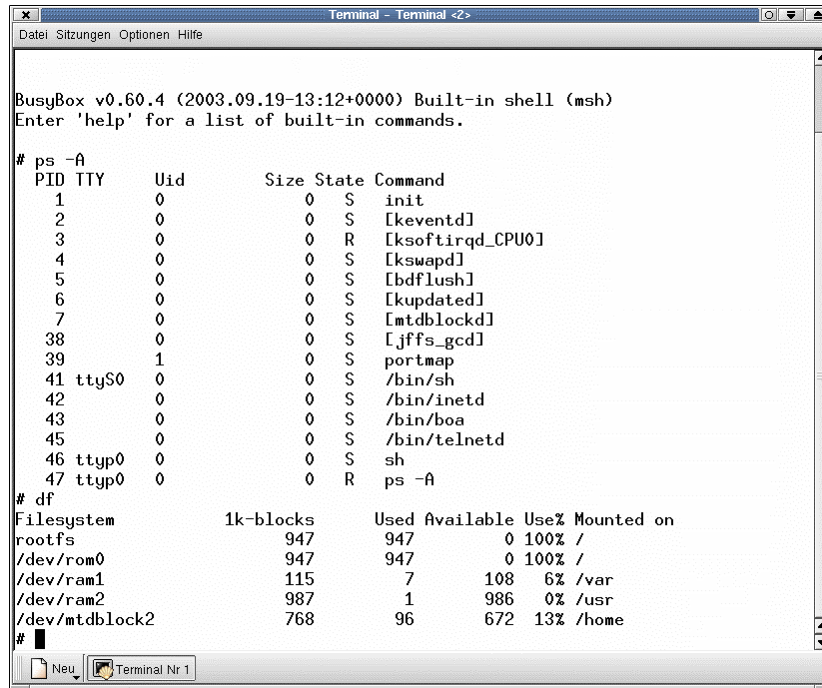


```

linux:~ # telnet 192.168.0.126
  
```

Figure 5-29: Linux login

Within the Telnet client you can enter Linux commands that will be executed by the DNP/5282. The standard output will be shown in your Telnet client window as illustrated in the next figure.



```

Terminal - Terminal <2>
Datei Sitzungen Optionen Hilfe

BusyBox v0.60.4 (2003.09.19-13:12+0000) Built-in shell (msh)
Enter 'help' for a list of built-in commands.

# ps -A
PID TTY      Uid        Size State Command
  1   0          0           0 S   init
  2   0          0           0 S   [keventd]
  3   0          0           0 R   [ksoftirqd_CPU0]
  4   0          0           0 S   [kswapd]
  5   0          0           0 S   [bdflush]
  6   0          0           0 S   [kupdated]
  7   0          0           0 S   [mtdblockd]
 38   0          0           0 S   [jffs_gcd]
 39   0          1           0 S   portmap
 41  ttyS0      0           0 S   /bin/sh
 42   0          0           0 S   /bin/inetd
 43   0          0           0 S   /bin/boa
 45   0          0           0 S   /bin/telnetd
 46  tty0      0           0 S   sh
 47  tty0      0           0 R   ps -A

# df
Filesystem      1k-blocks    Used Available Use% Mounted on
rootfs           947          947         0 100% /
/dev/rom0        947          947         0 100% /
/dev/ram1        115           7         108 6% /var
/dev/ram2        987           1         986 0% /usr
/dev/mtdblock2  768           96         672 13% /home

#

```

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.

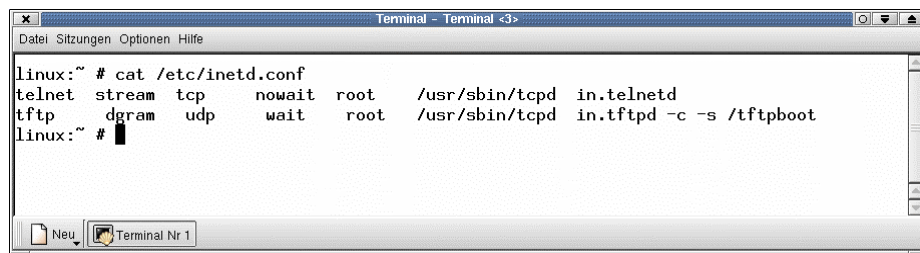
6.6 File Transfer via TFTP

The DIL/NetPC DNP/5282 offers a very simple way for Ethernet-based file transfers between your PC system and the DNP/5282 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/5282 Linux configuration offers a TFTP client program. Your PC needs a TFTP server program.

Set-up an Ethernet link between the DNP/5282 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/5282 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.



```

Terminal - Terminal <3>
Datei Sitzungen Optionen Hilfe
linux:~ # cat /etc/inetd.conf
telnet  stream  tcp    nowait  root    /usr/sbin/tcpd  in.telnetd
tftp    dgram    udp    wait    root    /usr/sbin/tcpd  in.tftpd -c -s /tftpboot
linux:~ # █
  
```

Figure 5-31: Running TFTP32

Check the TFTP connection between the DIL/NetPC DNP/5282 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/5282 TFTP client program.

The parameter *-g* stands for get (get a file from the PC system to the DNP/5282).

The parameter *-p* stands for put (put a file from the DNP/5282 to the PC system).

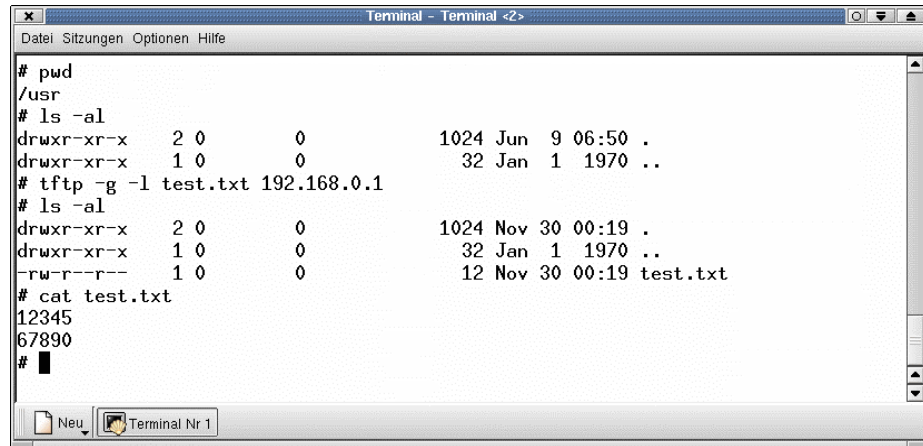
The parameter *-l file.name* specifies the file for put or get.

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/5282 TFTP client within a Telnet session.



```
Terminal - Terminal <2>
Datei Sitzungen Optionen Hilfe
# pwd
/usr
# ls -al
drwxr-xr-x  2 0      0          1024 Jun  9 06:50 .
drwxr-xr-x  1 0      0          32 Jan  1 1970 ..
# tftp -g -l test.txt 192.168.0.1
# ls -al
drwxr-xr-x  2 0      0          1024 Nov 30 00:19 .
drwxr-xr-x  1 0      0          32 Jan  1 1970 ..
-rw-r--r--  1 0      0          12 Nov 30 00:19 test.txt
# cat test.txt
12345
67890
# █
```

Figure 5-32: Using the DNP/5282 TFTP client within a Telnet session

Note: A file transfer to the DNP/5282 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.

6.7 GNU Cross Tool Chain

This chapter describes how to install and use the Linux **GNU Cross Tool Chain** for DNP/5282 Linux C programming. You need administrator rights on your Linux PC for following these steps.

The GNU Cross Tool Chain for DNP/5282 Linux C programming comes within a Linux shell script file with the name *m68k-elf-tool-20030314.sh*. You find this file at the DNP/SK14 CD-ROM. The location of this 18 Mbytes shell script file is *\uCLinux\Toolchain*.

Point your file manager to *m68k-elf-tool-20030314.sh*.

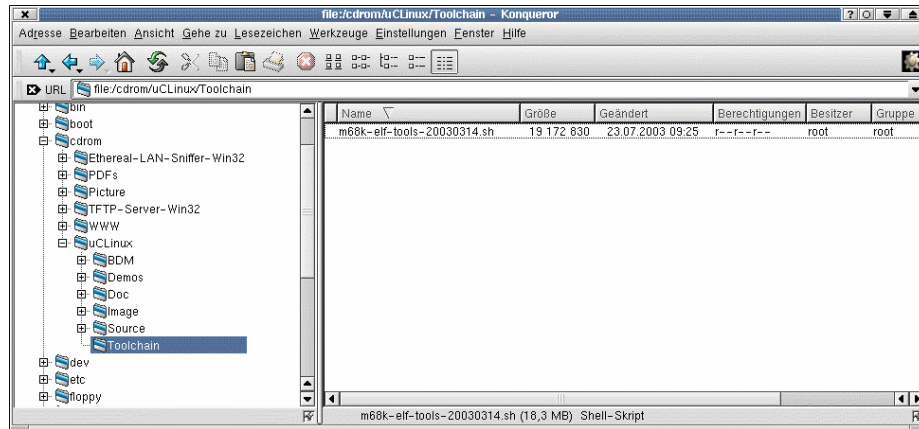


Figure 5-33: Location of *m68k-elf-tool-20030314.sh* at the DNP/SK14 CD-ROM

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.

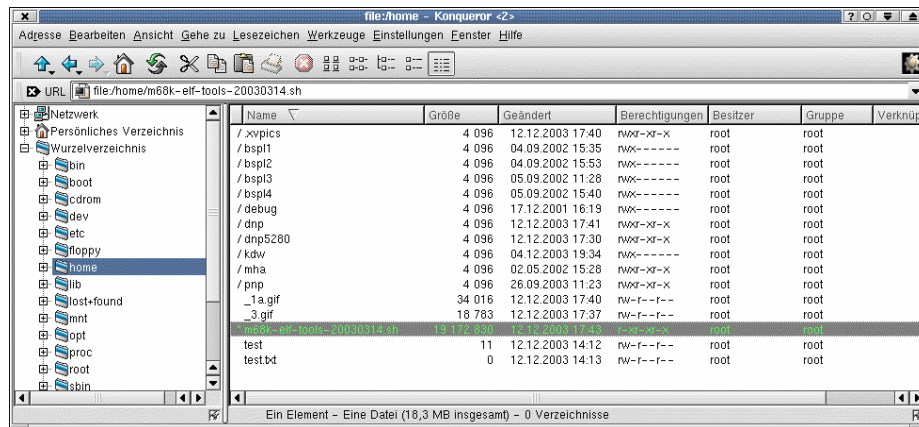
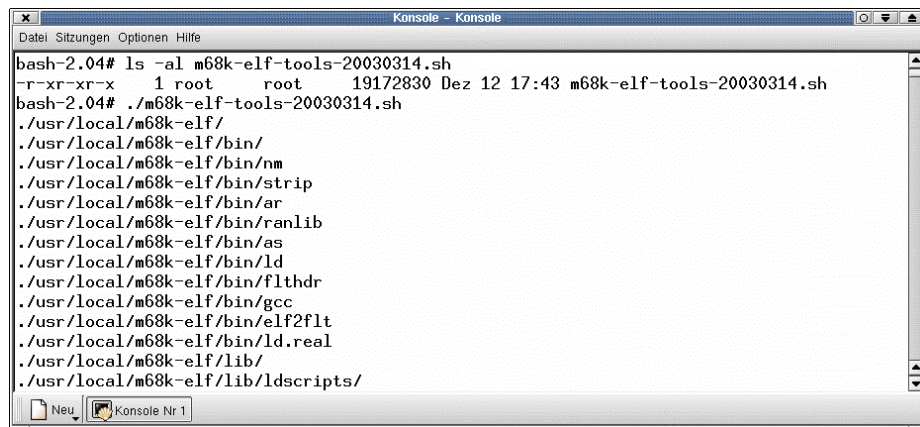


Figure 5-34: Copying *m68k-elf-tool-20030314.sh* to the local hard disk drive

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.



```

Könsole - Könsole
Datei Sitzungen Optionen Hilfe
bash-2.04# ls -al m68k-elf-tools-20030314.sh
-r-xr-xr-x  1 root  root  19172830 Dez 12 17:43 m68k-elf-tools-20030314.sh
bash-2.04# ./m68k-elf-tools-20030314.sh
./usr/local/m68k-elf/
./usr/local/m68k-elf/bin/
./usr/local/m68k-elf/bin/nm
./usr/local/m68k-elf/bin/strip
./usr/local/m68k-elf/bin/ar
./usr/local/m68k-elf/bin/ranlib
./usr/local/m68k-elf/bin/as
./usr/local/m68k-elf/bin/ld
./usr/local/m68k-elf/bin/flthdr
./usr/local/m68k-elf/bin/gcc
./usr/local/m68k-elf/bin/elf2flt
./usr/local/m68k-elf/bin/ld.real
./usr/local/m68k-elf/lib/
./usr/local/m68k-elf/lib/ldscripts/

```

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/dnp5282* for DNP/5282 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/5282!");
}

```

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

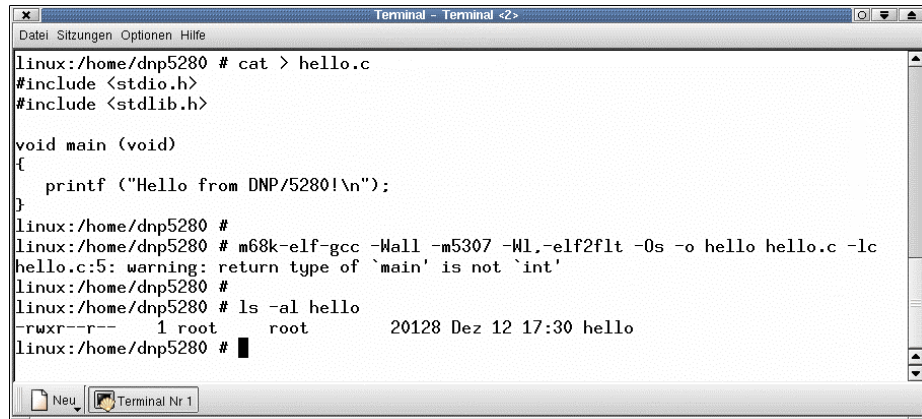
These command lines create the new file *hello.c* and put some C source code lines to this new file. The command line:

```
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/5282 within the same directory.



```
Terminal - Terminal <2>
Datei Sitzungen Optionen Hilfe
linux:/home/dnp5280 # cat > hello.c
#include <stdio.h>
#include <stdlib.h>

void main (void)
{
    printf ("Hello from DNP/5280!\n");
}
linux:/home/dnp5280 #
linux:/home/dnp5280 # m68k-elf-gcc -Wall -m5307 -Wl,-elf2flt -Os -o hello hello.c -lc
hello.c:5: warning: return type of `main' is not `int'
linux:/home/dnp5280 #
linux:/home/dnp5280 # ls -al hello
-rwxr--r--  1 root  root    20128 Dez 12 17:30 hello
linux:/home/dnp5280 #
```

Figure 5-36: Working with the GNU Cross Tool Chain

Transfer the executable from your PC hard disk drive to the DNP/5282 RAM disk or JFFS-based flash disk drive and run the executable on your DNP/5282. Use a TFTP session and a Telnet session for this task. Please enter the following commands within the DNP/5282 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/5282. 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*.

6.8 GNU Cross Debugger

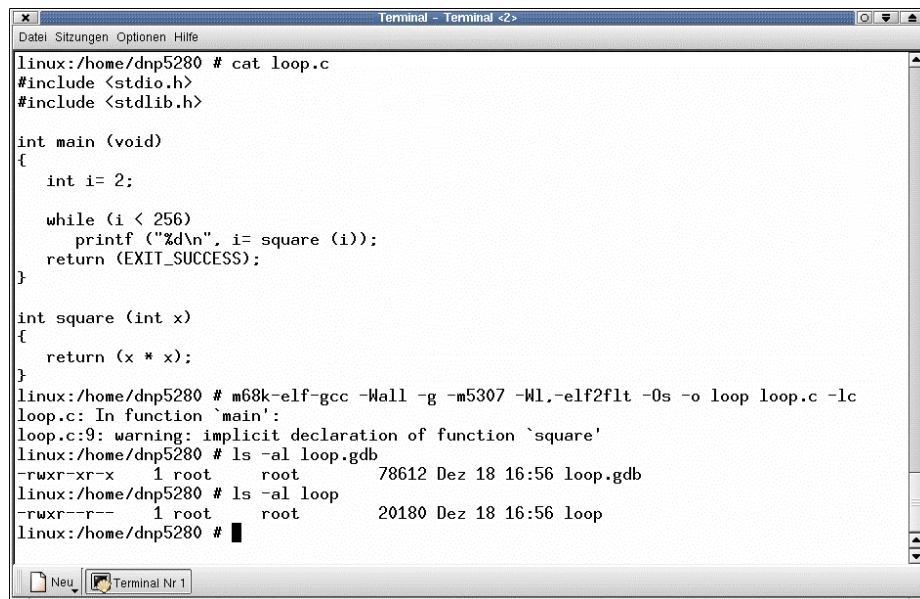
The GNU Cross Tool Chain for DNP/5282 Linux C programming offers a pre-build cross version of the **GNU Debugger**, called *m68k-elf-gdb*.

This debugger runs on a Linux-based PC and allows you to debug DNP/5282 μ CLinux executables with ELF layout at C source code level over a remote connection to the DNP/5282.

The cross debugger needs an Ethernet-based TCP/IP link between the PC and the DNP/5282. In addition the debugger needs also a remote debugging agent, called **gdbserver** for the DNP/5282. This agent is pre-installed within the DNP/5282 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
```



```

Terminal - Terminal <2>
Datei Sitzungen Optionen Hilfe
linux:/home/dnp5280 # cat loop.c
#include <stdio.h>
#include <stdlib.h>

int main (void)
{
    int i= 2;

    while (i < 256)
        printf ("%d\n", i= square (i));
    return (EXIT_SUCCESS);
}

int square (int x)
{
    return (x * x);
}
linux:/home/dnp5280 # m68k-elf-gcc -Wall -g -m5307 -Wl,-elf2flt -Os -o loop loop.c -lc
loop.c: In function `main':
loop.c:9: warning: implicit declaration of function `square'
linux:/home/dnp5280 # ls -al loop.gdb
-rwxr-xr-x  1 root  root    78612 Dez 18 16:56 loop.gdb
linux:/home/dnp5280 # ls -al loop
-rwxr--r--  1 root  root    20180 Dez 18 16:56 loop
linux:/home/dnp5280 # █

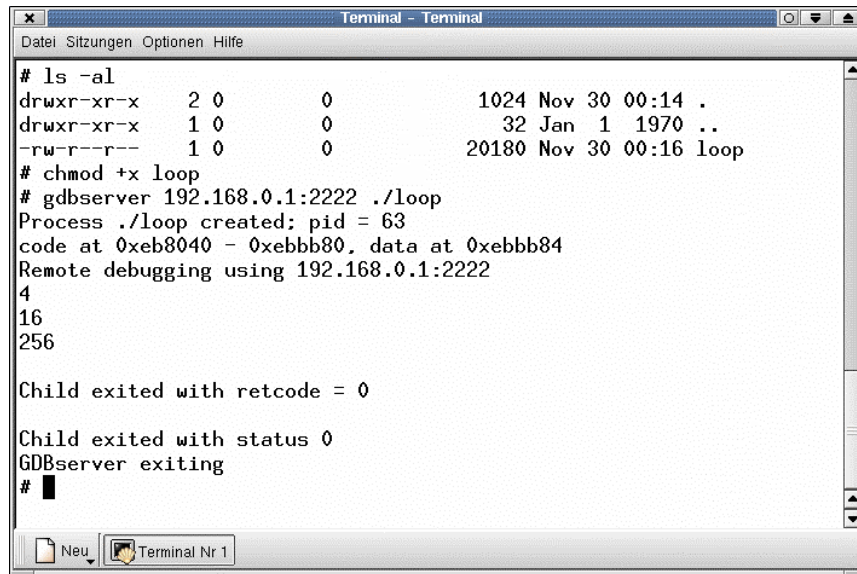
```

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

Transfer the executable from your PC hard disk drive to the DNP/5282 RAM disk or JFFS-based flash disk drive and run the executable on your DNP/5282 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/5282 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/5282. 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.



```

# ls -al
drwxr-xr-x  2 0      0          1024 Nov 30 00:14 .
drwxr-xr-x  1 0      0          32 Jan  1 1970 ..
-rw-r--r--  1 0      0          20180 Nov 30 00:16 loop
# chmod +x loop
# gdbserver 192.168.0.1:2222 ./loop
Process ./loop created; pid = 63
code at 0xeb8040 - 0xebbb80, data at 0xebbb84
Remote debugging using 192.168.0.1:2222
4
16
256

Child exited with retcode = 0

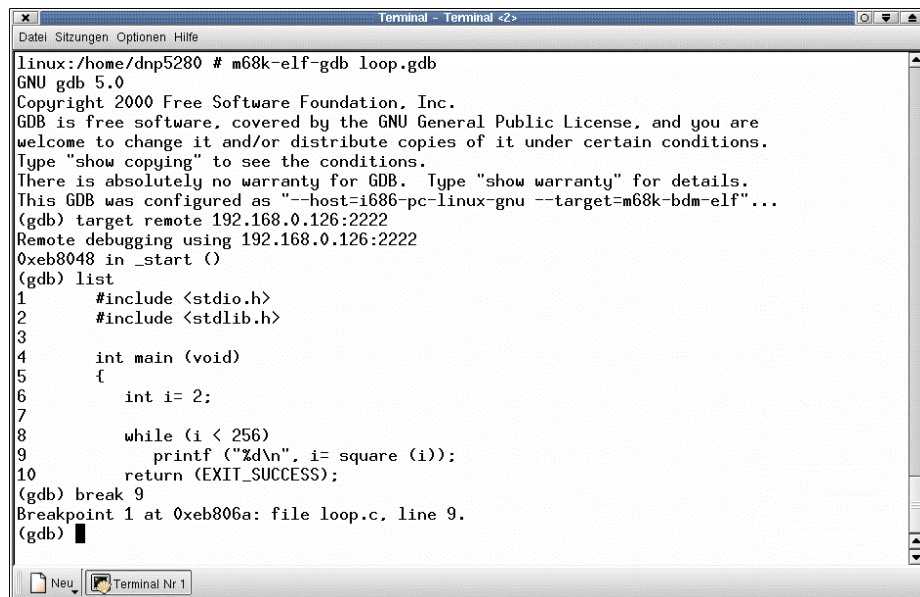
Child exited with status 0
GDBserver exiting
# █

```

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



```

linux:/home/dnp5280 # m68k-elf-gdb loop.gdb
GNU gdb 5.0
Copyright 2000 Free Software Foundation, Inc.
GDB is free software, covered by the GNU General Public License, and you are
welcome to change it and/or distribute copies of it under certain conditions.
Type "show copying" to see the conditions.
There is absolutely no warranty for GDB.  Type "show warranty" for details.
This GDB was configured as "--host=i686-pc-linux-gnu --target=m68k-bdm-elf"...
(gdb) target remote 192.168.0.126:2222
Remote debugging using 192.168.0.126:2222
0xeb8048 in _start ()
(gdb) list
1      #include <stdio.h>
2      #include <stdlib.h>
3
4      int main (void)
5      {
6          int i= 2;
7
8          while (i < 256)
9              printf ("%d\n", i= square (i));
10         return (EXIT_SUCCESS);
(gdb) break 9
Breakpoint 1 at 0xeb806a: file loop.c, line 9.
(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:

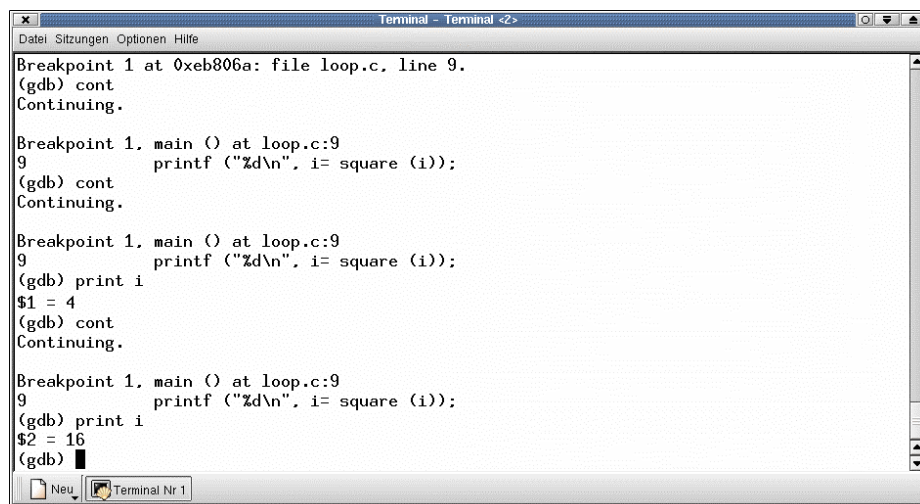
```
target remote 192.168.0.126:2222
```

This debugger command line sets up the Ethernet-based TCP/IP connection between the PC and the DNP/5282.

Please use the same TCP/IP port number (2222). The sample command line assumes that the DNP/5282 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/5282.

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



```
Terminal - Terminal <2>
Datei Sitzungen Optionen Hilfe
Breakpoint 1 at 0xeb806a: file loop.c, line 9.
(gdb) cont
Continuing.

Breakpoint 1, main () at loop.c:9
9 printf ("%d\n", i= square (i));
(gdb) cont
Continuing.

Breakpoint 1, main () at loop.c:9
9 printf ("%d\n", i= square (i));
(gdb) print i
$1 = 4
(gdb) cont
Continuing.

Breakpoint 1, main () at loop.c:9
9 printf ("%d\n", i= square (i));
(gdb) print i
$2 = 16
(gdb)
```

Figure 5-40: Setting breakpoints

6.9 GNU Cross Debugger with DDD (Data Display Debugger)

The GNU Cross Tool Chain for DNP/5282 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/5282 μ CLinux executables with ELF layout at C source code level over a remote connection to the DNP/5282.

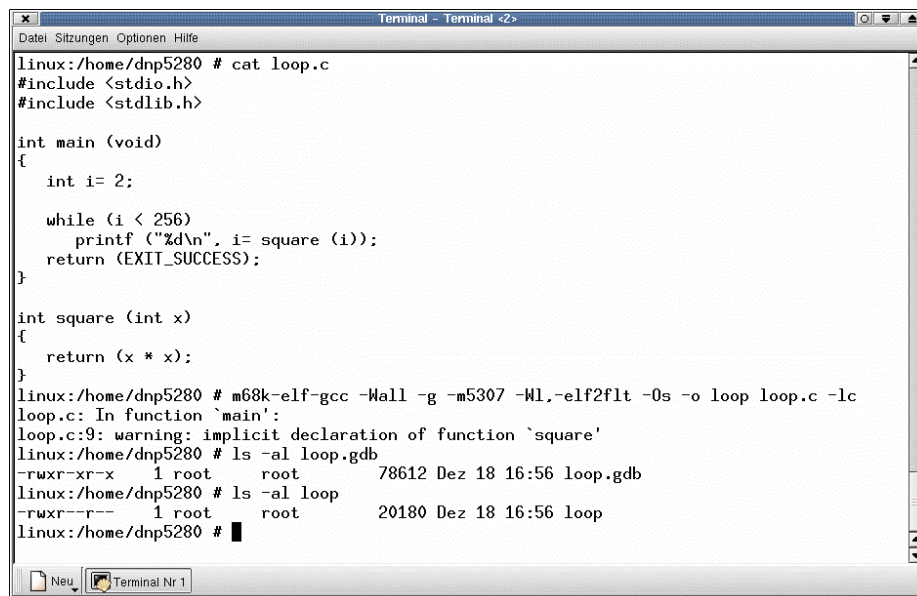
The cross debugger needs an Ethernet-based TCP/IP link between the PC and the DNP/5282. In addition the debugger needs also a remote debugging agent, called *gdbserver* for the DNP/5282. This agent is pre-installed within the DNP/5282 Linux.

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
```



```

linux:/home/dnp5280 # cat loop.c
#include <stdio.h>
#include <stdlib.h>

int main (void)
{
    int i= 2;

    while (i < 256)
        printf ("%d\n", i= square (i));
    return (EXIT_SUCCESS);
}

int square (int x)
{
    return (x * x);
}
linux:/home/dnp5280 # m68k-elf-gcc -Wall -g -m5307 -Wl,-elf2flt -Os -o loop loop.c -lc
loop.c: In function `main':
loop.c:9: warning: implicit declaration of function `square'
linux:/home/dnp5280 # ls -al loop.gdb
-rwxr-xr-x  1 root  root    78612 Dez 18 16:56 loop.gdb
linux:/home/dnp5280 # ls -al loop
-rwxr--r--  1 root  root    20180 Dez 18 16:56 loop
linux:/home/dnp5280 #

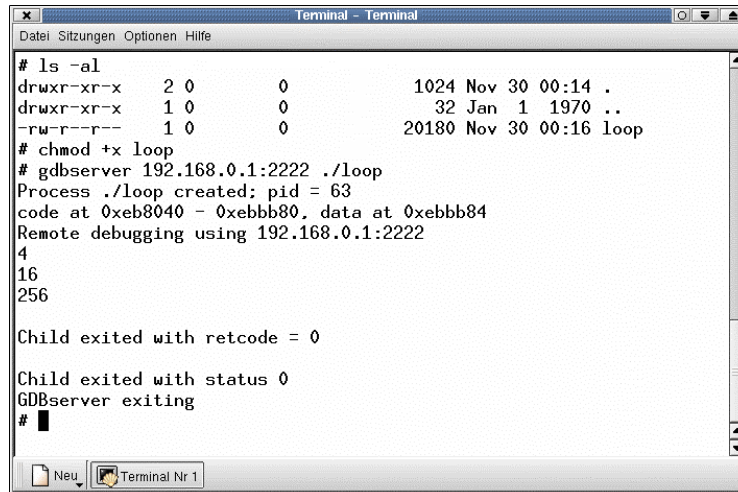
```

Figure 5-41: Compiling a C program

Then transfer the executable from your PC hard disk drive to the DNP/5282 RAM disk or JFFS-based flash disk drive and run the executable on your DNP/5282 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/5282 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/5282. 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.



```
Terminal - Terminal
Datei Sitzungen Optionen Hilfe
# ls -al
drwxr-xr-x  2 0      0          1024 Nov 30 00:14 .
drwxr-xr-x  1 0      0          32 Jan  1 1970 ..
-rw-r--r--  1 0      0          20180 Nov 30 00:16 loop
# chmod +x loop
# gdbserver 192.168.0.1:2222 ./loop
Process ./loop created; pid = 63
code at 0xeb8040 - 0xebbb80, data at 0xebbb84
Remote debugging using 192.168.0.1:2222
4
16
256

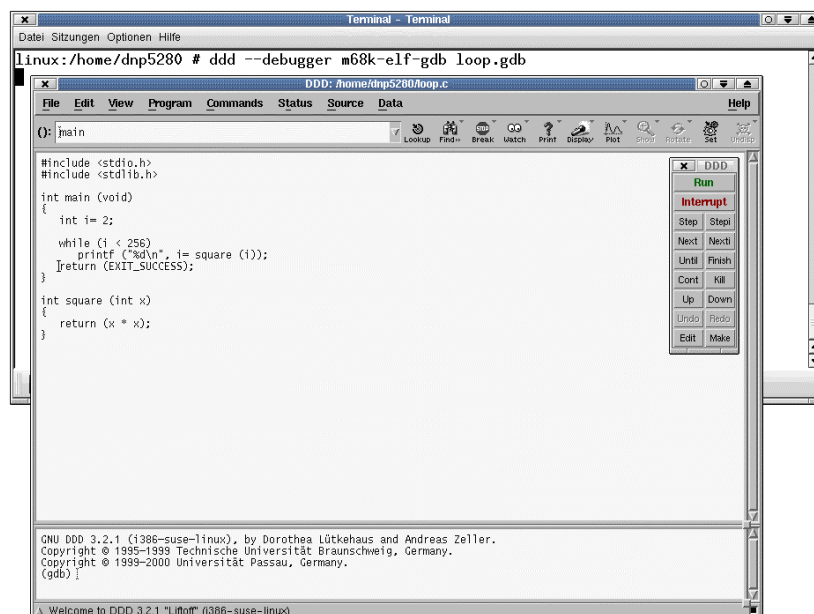
Child exited with retcode = 0

Child exited with status 0
GDBserver exiting
# █
```

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
```



```
Terminal - Terminal
Datei Sitzungen Optionen Hilfe
linux:/home/dnp5280 # ddd --debugger m68k-elf-gdb loop.gdb
DDD: /home/dnp5280/loop.c
File Edit View Program Commands Status Source Data Help
(): main
#include <stdio.h>
#include <stdlib.h>

int main (void)
{
    int i = 2;

    while (i < 256)
        printf ("%d\n", i = square (i));
    return (EXIT_SUCCESS);
}

int square (int x)
{
    return (x * x);
}

GNU DDD 3.2.1 (i386-suse-linux), by Dorothea Lütkehaus and Andreas Zeller.
Copyright © 1995-1999 Technische Universität Braunschweig, Germany.
Copyright © 1999-2000 Universität Passau, Germany.
(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

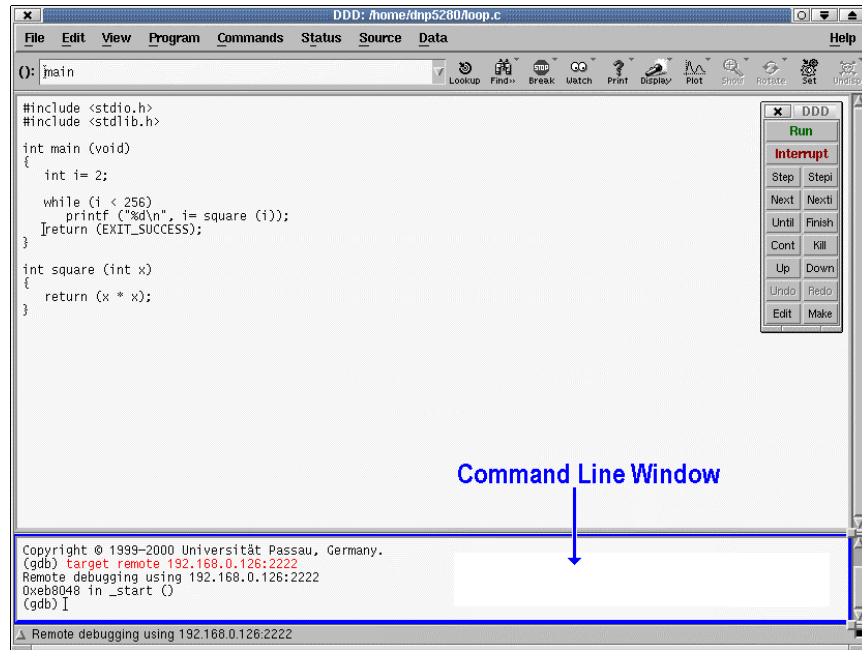


Figure 5-44: Typing commands in the command line window

This debugger command line sets up the Ethernet-based TCP/IP connection between the PC and the DNP/5282. Please use the same TCP/IP port number (2222). The sample command line assumes that the DNP/5282 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/5282.

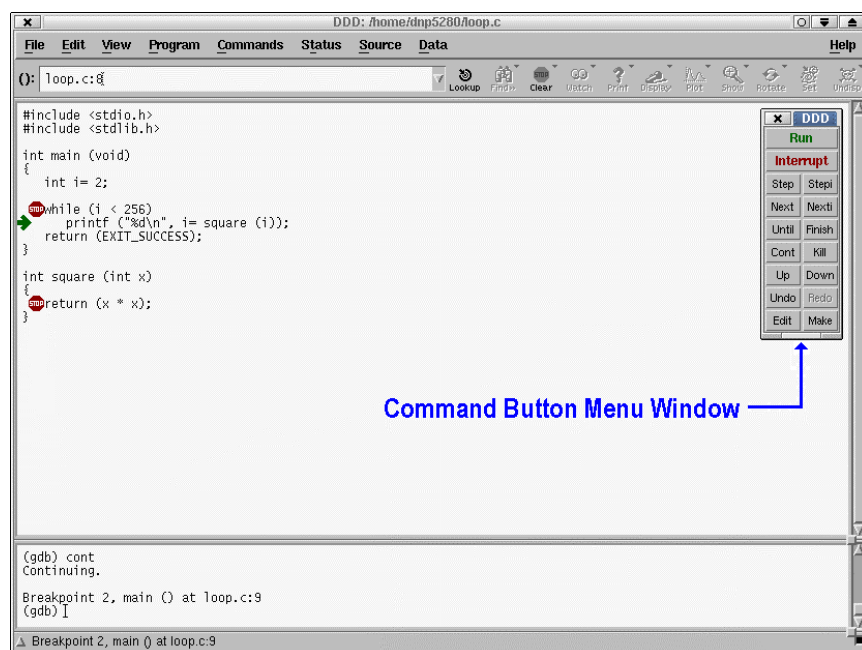


Figure 5-45: Using the command button menu window

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*).

APPENDIX 1: THE DNP/5282 IN DETAIL

A1.1 Block Diagram

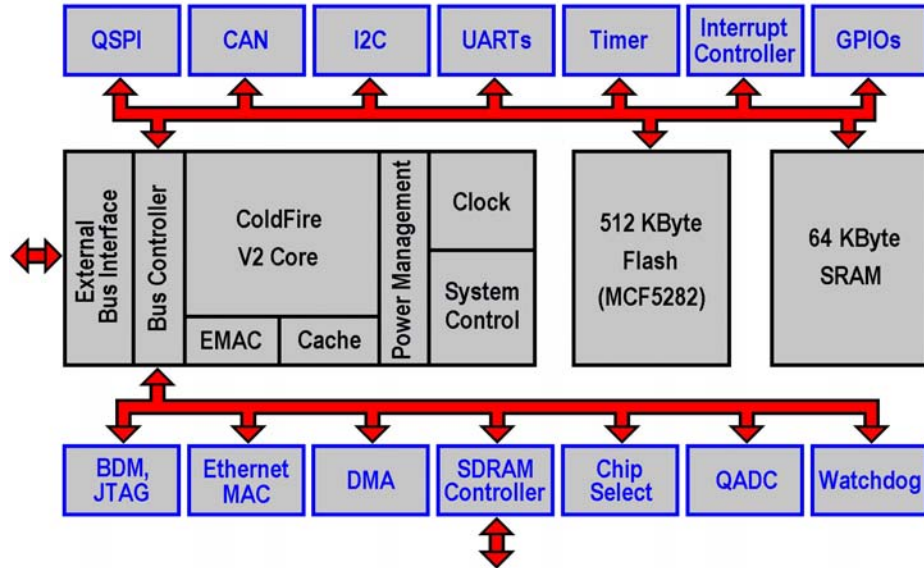


Figure A1-1: Block Diagram of the MCF5282/MCF5282-Microcontroller

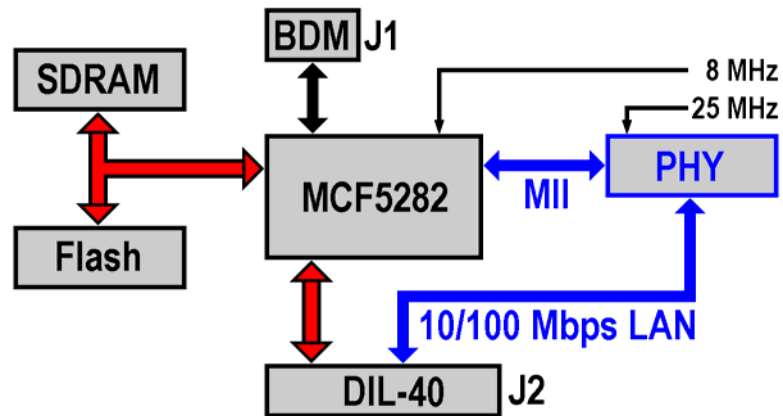


Figure A1-2: Block Diagram of the DNP/5282

A1.2 Pin Assignment – 40-pin DIL Connector

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	RESIN	RESET	Reset Input
18	SPI.CS1	SPI	QSPI Chip Select Output 1
19	SPI.CS2	SPI	QSPI Chip Select Output 2
20	GND	---	Ground
21	RCM	---	RCM (Remote Console Mode) Input
22	TX+	LAN	10/100 Mbps LAN, TX+ Pin
23	TX-	LAN	10/100 Mbps LAN, TX- Pin
24	RX+	LAN	10/100 Mbps LAN, RX+ Pin
25	RX-	LAN	10/100 Mbps LAN, RX- Pin
26	TXD2	SIO	COM2 Serial Port, TXD Pin
27	RXD2	SIO	COM2 Serial Port, RXD Pin
28	RI1	SIO	COM1 Serial Port, RI Pin
29	DTR1	SIO	COM1 Serial Port, DTR Pin
30	DSR1	SIO	COM1 Serial Port, DSR Pin
31	DCD1	SIO	COM1 Serial Port, DCD Pin
32	RTS1	SIO	COM1 Serial Port, RTS Pin
33	CTS1	SIO	COM1 Serial Port, CTS Pin
34	TXD1	SIO	COM1 Serial Port, TXD Pin
35	RXD1	SIO	COM1 Serial Port, RXD Pin
36	PC0	PIO	Parallel I/O, Port C, Bit 0
37	PC1	PIO	Parallel I/O, Port C, Bit 1
38	PC2	PIO	Parallel I/O, Port C, Bit 2
39	PC3	PIO	Parallel I/O, Port C, Bit 3
40	Vcc	---	3.3 Volt Power Input

Table A1-1: DNP/5282 Pinout – Pin 1 to 40

A1.3 DNP/5282 Function Multiplexing with 40-pin DIL Connector

Some pins of the 40-pin DIL connector of the DNP/5282 have multiple meanings. The pins have a primary and a secondary function (function multiplexing). The primary functions correspond with the standard pinout of the 40-pin DIL connector as shown in **table A1-1**. The secondary functions are shown in **table A1-2** 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)
36	PC0	Parallel I/O, Port C, Bit 0	QSPIDO (SPI)
37	PC1	Parallel I/O, Port C, Bit 1	QSPIDI (SPI)
38	PC2	Parallel I/O, Port C, Bit 2	QSPICLK (SPI)
39	PC3	Parallel I/O, Port C, Bit 3	QSPICS0 (SPI)

Table A1-2: DNP/5282 Function Multiplexing

A1.4 DNP/5282 LEDs

Four miniature LEDs are placed on the DNP/5282 for a visual check of the LAN activity.

Name	Function	Description
LED0	10Act	Data transmission with 10 Mbps
LED1	100Act	Data transmission with 100 Mbps

Table A1-3: DNP/5282 LEDs

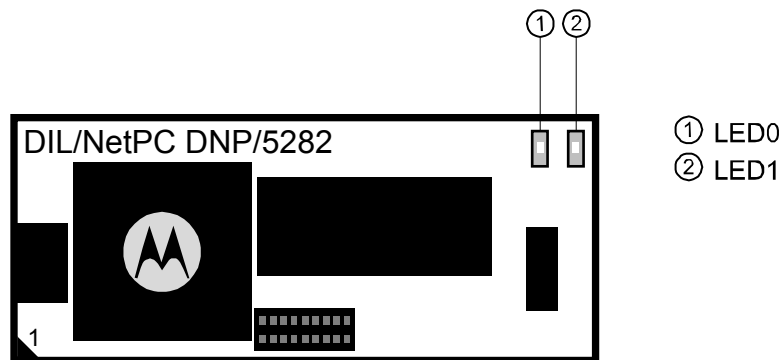


Figure A1-3: DNP/5282 LEDs

A1.5 PIO-Mapping

The 20 Signals for the DNP/5282-Parallel-I/O (PIO) are realized through different function units of the MCF5282. The following table shows the assignment. Pin names for the MCF5282-case (256 MAPBGA) are listed in the third column. Please see the MCF5282 ColdFire Microcontroller user manual R.0.1 (MCF5282UM/D) for further details.

Pin	Name	MCF5282-Pinfunction	MCF5282-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
36	PC0	QSPIDO	F13
37	PC1	QSPIDI	E16
38	PC2	QSPICLK	F14
39	PC3	QSPICS0	F15

Table A1-4: DNP/5282 PIO-Mapping

A1.6 DNP/5282 BDM Interface

You can use an adapter to convert the miniature BDM interface of the DNP/5282 to the common 2.54 mm raster. Then standard BDM interface modules can be used.

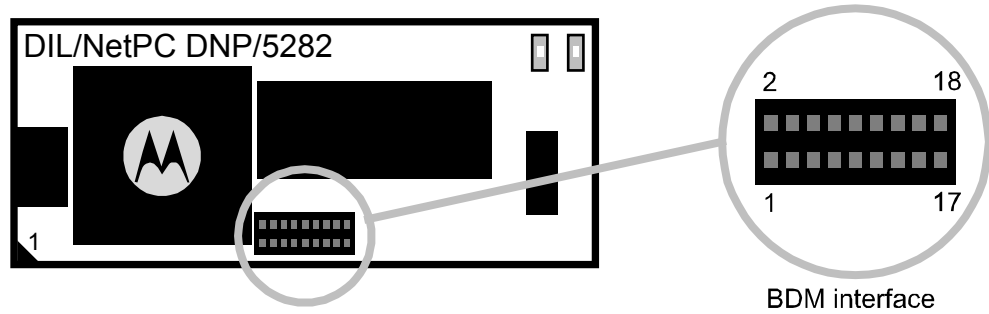


Figure A1-4: Position of the BDM interface on the DNP/5282

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

Table A1-5: DNP/5282 BDM-interface

A1.7 COM-Port Mapping

The 10 signals for the two DNP/5282 COM-ports are realized with different function units of the MCF5282 ColdFire MCU. **Table A1-6** shows the assignment.

Pin	Name	MCF5282-pinfunction	MCF5282-pin	Source
26	TXD2	UTXD1	P7	UART
27	RXD2	URXD1	R7	UART
28	RI1	DTIN3	K16	GPIO
29	DTR1	DTOUT3	K15	GPIO
30	DSR1	DTIN2	K14	GPIO
31	DCD1	DTOUT2	K13	GPIO
32	RTS1	DTIN1	J15	UART
33	CTS1	DTOUT1	J13	UART
34	TXD1	UTXD0	T7	UART
35	RXD1	URXD0	N6	UART

Table A1-6: DNP/5282 COM-port mapping

The third column lists the pin-names for the MCF5282 case (256 MAPBGA).

The fourth column shows the source of each pin. The COM1-port is not entirely realized through the signals of the MCF5282 UART0. The missing signals are implemented via GPIOs (general purpose I/O pins).

These MCF5282-signals have to be configured as PIO (parallel I/O) for the COM1-usage.

A1.8 DNP/5282 Memory Mapping

Function Unit	Startaddress	Endaddress	Access Format
SDRAM	0x0000.0000	0x00FF.FFFF	32 Bits
SRAM (intern)	0x2000.0000	0x2000.FFFF	32 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 A1-7: DNP/5282 memory mapping

In memory area **IBSBAR** the SFRs (special function register) of the Motorola ColdFire MCF5282-Microcontroller are addressable.

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

The DNP/5282 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 A1-8: DNP/5282 reserved areas for the ROM-monitor

APPENDIX 2: PIN ASSIGNMENT OF THE DNP/EVA6

A2.1 COM1 Connector

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

Table A2-1: Pinout COM1 connector

A2.2 COM2 Connector

Top view	Pin	Name	Function
	1	DCD	not connected
	2	RXD	COM2 serial port, RXD pin
	3	TXD	COM2 serial port, TXD pin
	4	DTR	not connected
	5	GND	Ground
	6	DSR	not connected
	7	RTS	not connected
	8	CTS	not connected
	9	RI	not connected

Table A2-2: Pinout COM2 connector

A2.3 CAN Connector

Top view	Pin	Name	Function
	1	---	reserved
	2	GND	Ground
	3	CAN-	CAN low level
	4	CAN+	CAN high level
	5	GND	Ground
	6	---	reserved
	7	---	reserved
	8	---	reserved
	9	---	reserved
	10	---	reserved

Table A2-3: Pinout CAN connector

A2.4 PIO-signals 1

Top view	Pin	Name	Function
	1	Vcc	Power
	2	GND	Ground
	3	PA0	Parallel I/O, Port A, Bit 0
	4	GND	Ground
	5	PA1	Parallel I/O, Port A, Bit 1
	6	GND	Ground
	7	PA2	Parallel I/O, Port A, Bit 2
	8	GND	Ground
	9	PA3	Parallel I/O, Port A, Bit 3
	10	---	not connected
	11	Vcc	Power
	12	GND	Ground
	13	PA4	Parallel I/O, Port A, Bit 4
	14	GND	Ground
	15	PA5	Parallel I/O, Port A, Bit 5
	16	GND	Ground
	17	PA6	Parallel I/O, Port A, Bit 6
	18	GND	Ground
	19	PA7	Parallel I/O, Port A, Bit 7
	20	---	not connected
	21	Vcc	Power
	22	GND	Ground
	23	PB0	Parallel I/O, Port B, Bit 0
	24	GND	Ground
	25	PB1	Parallel I/O, Port B, Bit 1
	26	GND	Ground
	27	PB2	Parallel I/O, Port B, Bit 2
	28	GND	Ground
	29	PB3	Parallel I/O, Port B, Bit 3
	30	GND	Ground
	31	Vcc	Power
	32	GND	Ground
	33	PB4	Parallel I/O, Port B, Bit 4
	34	PB5	Parallel I/O, Port B, Bit 5

Table A2-4: Pinout PIO-signals 1

A2.5 PIO-signals 2

Top view	Pin	Name	Function
	1	Vcc	Power
	2	GND	Ground
	3	PC0	Parallel I/O, Port C, Bit 0
	4	GND	Ground
	5	PC1	Parallel I/O, Port C, Bit 1
	6	GND	Ground
	7	PC2	Parallel I/O, Port C, Bit 2
	8	GND	Ground
	9	PC3	Parallel I/O, Port C, Bit 3
	10	GND	Ground
	11	SPI.CS1	QSPI Chip Select Output 1
	12	GND	Ground
	13	SPI.CS2	QSPI Chip Select Output 2
	14	Vcc	Power

Table A2-5: Pinout PIO-signals 2

A2.6 10/100 Mbps Ethernet Connector

Top view	Pin	Name	Function
	1	TX+	10/100 Mbps LAN, TX+ pin
	2	TX-	10/100 Mbps LAN, TX- pin
	3	RX+	10/100 Mbps LAN, RX+ pin
	4	---	not connected
	5	---	not connected
	6	RX-	10/100 Mbps LAN, RX- pin
	7	---	not connected
	8	---	not connected

Table A2-6: Pinout 10/100 Mbps Ethernet connector

A2.7 Power Connector

Top view	Pin	Name	Function
	1	Vcc	Power In
	2	GND	Ground
	3	GND	Ground

Table A2-7: Pinout power connector

APPENDIX 3: MECHANICAL DIMENSIONS

The DNP/5282 uses a 40-pin DIL socket as mechanical base. Figure A4-1 shows the dimensions. All length dimensions have a tolerance of 0.5 mm.

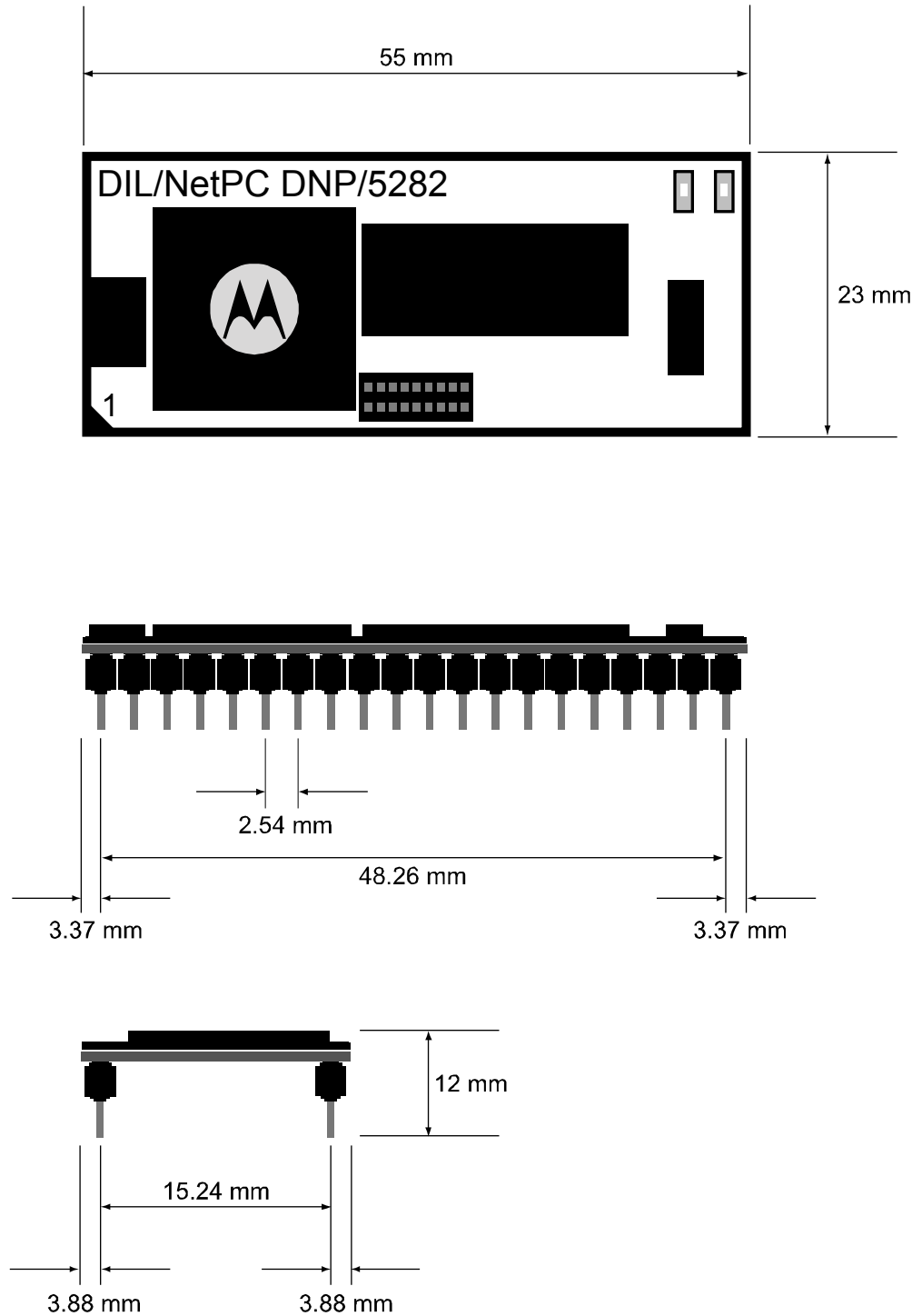


Figure A3-1: Dimensions of the DNP/5282

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1.0	2004-04-15	first version	WBU
1.1	2004-04-20	error correction	WBU
1.2	2004-04-26	errors in table A1-2 and A1-4 fixed	WBU
1.3	2004-07-14	features correction (No Bus, no CS and INT signals)	KDW

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