DNP/5280 µClinux Starter Kit: First Steps

The DIL/NetPC DNP/5280 embedded Linux starter kits DNP/SK13 or DNP/16L contains everything you need to get started with your Motorola MCF5280 ColdFire-based embedded networking application. The starter kits includes a DNP/5280 module with a pre-installed embedded Linux (uClinux), the evaluation board DNP/EVA2-SV6 (special version 6 - without ST16C2550 dual UART and the UART support chips) or DNP/EVA6, power supply, serial interface (null modem) cable, a CD-ROM with software and documentation and a printed user manual for the first steps with the starter kit.

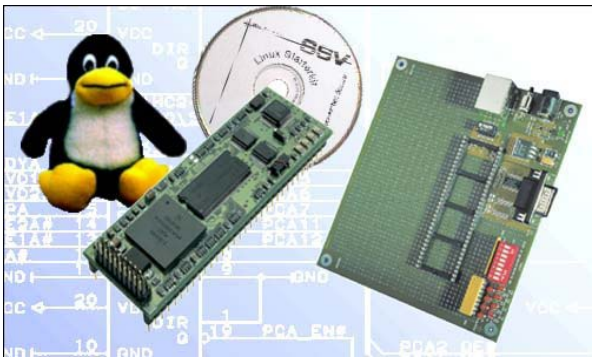

Figure 1: The DIL/NetPC DNP/5280 µClinux Starter Kit

The starter kit CD-ROM comes with a full GNU cross tool chain for C/C++ software development. This binary files of this tool chain runs on a x86 Linux-based host (SuSE, Red Hat or other) and builds *bFLT* (uClinux Binary Flat Format) binary files for the Motorola MCF5280 ColdFire 32-bit RISC microcontroller.

For using the DIL/NetPC DNP/5280 Embedded Linux Starter Kit you need a development system. The minimal configuration for this system is a Windows-based PC with the HyperTerminal terminal emulation program and a free COM port (COM1, COM2 or USB-based COMx) for the RS232 serial link between the DIL/NetPC DNP/5280 and HyperTerminal.

For using the Ethernet link, your PC needs an Ethernet adapter with 10 Mbps or 10/100 Mbps LAN interface. This environment allows web server programming (HTML pages, Java Applets) and Linux shell script programming. For using the GNU C/C++ cross tool chain, it is necessary to run Linux on the development system.

The DNP/5280 Embedded Linux Starter Kit Key Features

The DIL/NetPC DNP/5280 pre-installed embedded Linux consists of two main components: 1. the Linux kernel and 2. the root file system. The DNP/5280 Flash also offers a Flash Loader for downloading new versions of the Linux kernel and the root file system. This in-system programming feature can be used by a simple serial and Ethernet link between the development system and the DNP/5280.

- DIL/NetPC DNP/5280 with 66 MHz Motorola MCF5280 ColdFire and Firmware in Flash memory, 3.3 VDC Vcc
- Firmware and Embedded Linux pre-installed in Flash memory
- SK13: Evaluation Board DNP/EVA2-SV6 (Special Version 6)
- SK16L: Evaluation Board DNP/EVA6
- Null modem Cable
- 110 VAC or 230 VAC to 5 VDC International Power Supply
- CD-ROM with User Manual and Hardware/Programmers Manuals
- Embedded Linux with Source
- GNU Cross Tool Chain for C/C++ Software Development for Linux-based PCs
- *elf2flt* Converter Program (m68k ELF to uClinux bFLT)
- GNU *gdb* and *gdbserver* for Ethernet-based Remote Debugging
- Free TFTP Server Program for Win32-based PCs
- Linux Remote Login with Telnet
- Web Server Setup Sample
- Embedded TFTP Client
- Many Sourcecode Samples

1. Step DNP/SK13: Cable for the Serial Link between the DNP/5280 and a PC

Set-up the serial link between the DIL/NetPC DNP/5280 Evaluation Board and your PC. Use a Null modem cable for this connection.

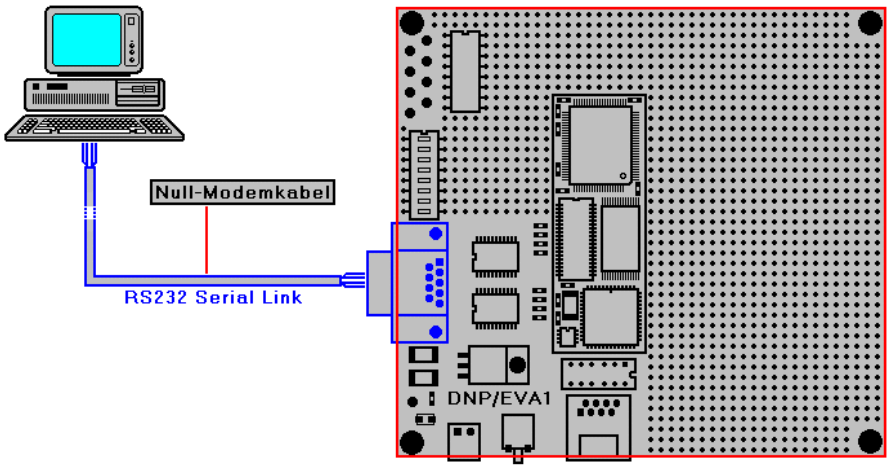

Figure 2a: Serial Link between the DIL/NetPC Evaluation Board and the PC

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

1. Step DNP/SK16L: Cable for the Serial Link between the DNP/5280 and a PC

Set-up the serial link between the DIL/NetPC DNP/5280 Evaluation Board and your PC. Use a Null modem cable for this connection.

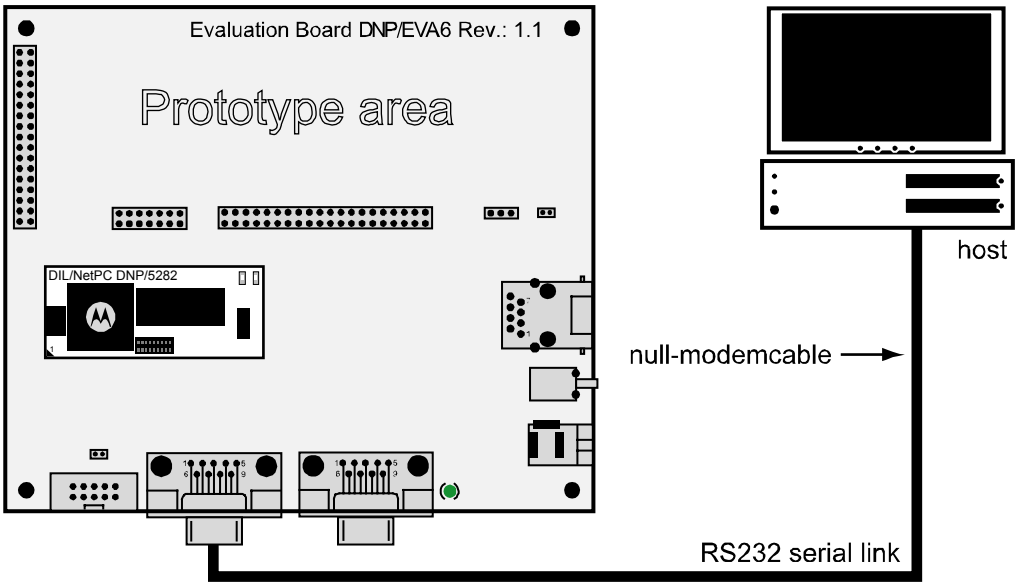

Figure 2b: Serial Link between the DIL/NetPC Evaluation Board and the PC

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

2. Step DNP/SK13: Cable for the Ethernet Link between the DNP/5280 and a PC

Set-up the Ethernet LAN link between the DIL/NetPC DNP/5280 Evaluation Board and your PC. Use an Ethernet Cross-over cable for the first LAN connection.

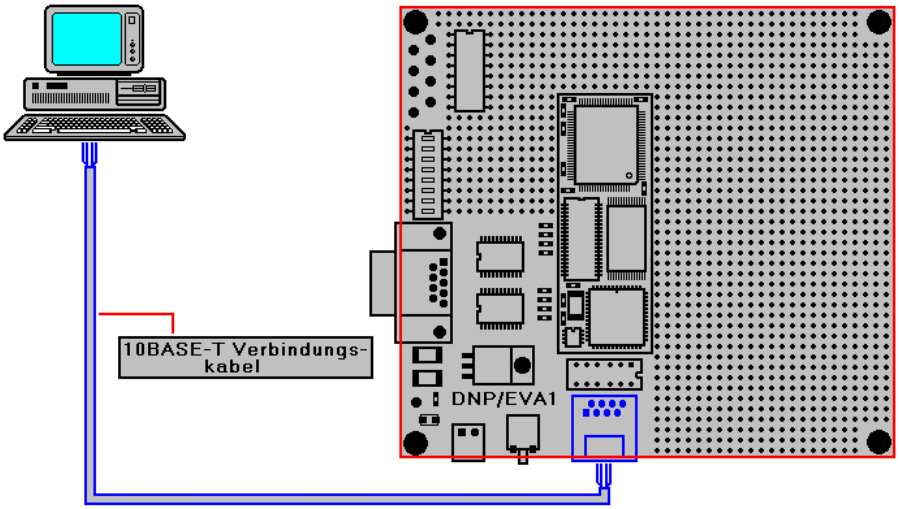

Figure 3a: Ethernet Link between the DIL/NetPC Evaluation Board and the PC

Please note: The DNP/5280 comes with a default IP address of 192.168.0.126. Please make sure that your PC can work with the IP address range 192.168.0.x.

2. Step DNP/SK16L: Cable for the Ethernet Link between the DNP/5280 and a PC

Set-up the Ethernet LAN link between the DIL/NetPC DNP/5280 Evaluation Board and your PC. Use an Ethernet Cross-over cable for the first LAN connection.

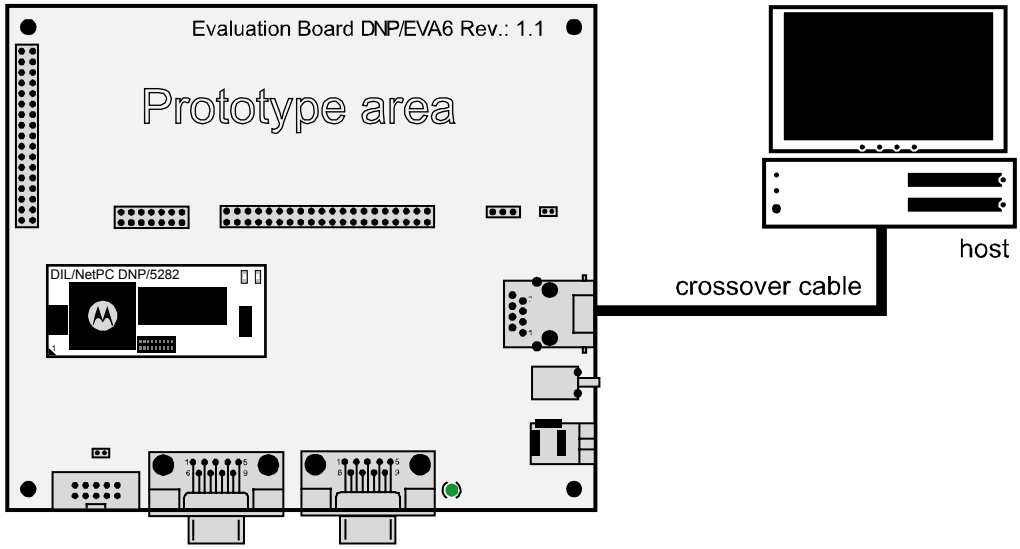

Figure 3b: Ethernet Link between the DIL/NetPC Evaluation Board and the PC

Please note: The DNP/5280 comes with a default IP address of 192.168.0.126. Please make sure that your PC can work with the IP address range 192.168.0.x.

3. Step DNP/SK13: Connect the Power Supply and Power-up the Starter Kit

Connect a 5 VDC power supply to DIL/NetPC Evaluation Board. Make sure, that the + voltage is within the center of power supply connector.

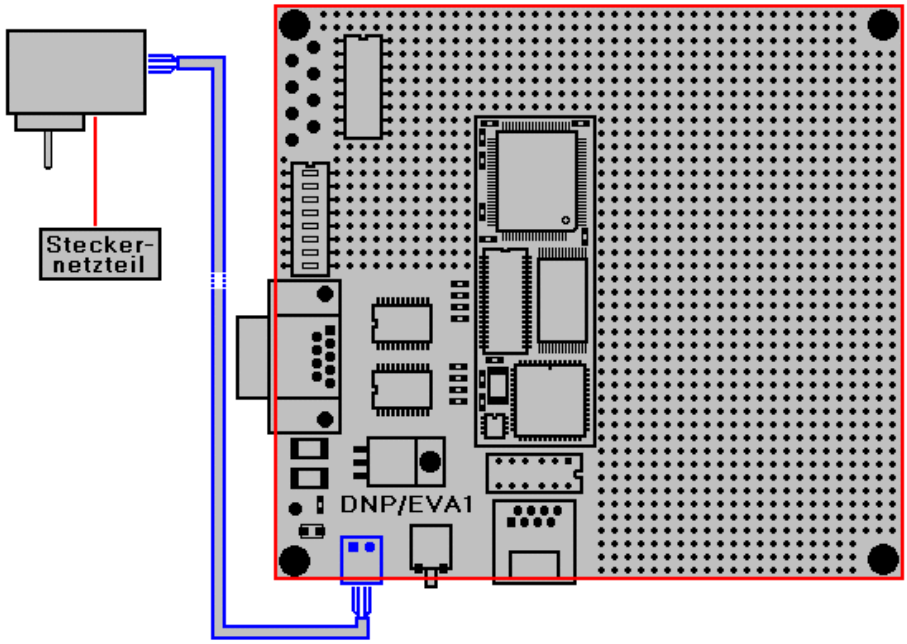

Figure 4a: Power Supply for the DIL/NetPC Evaluation Board

Please note: Make sure, that all cable connections are OK. Then power-up the starter kit.

3. Step DNP/SK16L: Connect the Power Supply and Power-up the Starter Kit

Connect a 5 VDC power supply to DIL/NetPC Evaluation Board. Make sure, that the + voltage is within the center of power supply connector.

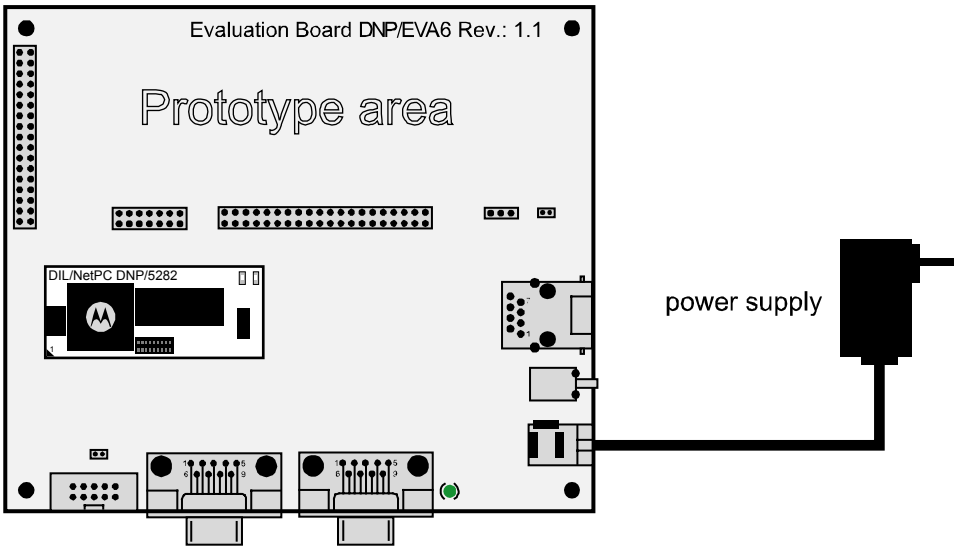

Figure 4b: Power Supply for the DIL/NetPC Evaluation Board

Please note: Make sure, that all cable connections are OK. Then power-up the starter kit.

4. Step: Using the Serial Link with a Terminal Program

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

Figure 5: Direct Connection Set-up with *HyperTerminal*

Set-up a direct connection with the parameters of Table 1. Make sure, that the PC COM port supports 115.200 bps.

Figure 6: Parameter Set-up with *HyperTerminal*

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

Table 1: Set-up Parameters for the Serial Link

5. Step: Power-up the DNP/5280 without RCM Jumper

Without the RCM jumper, the DIL/NetPC DNP/5280 is booting µClinux from Flash memory within some seconds.

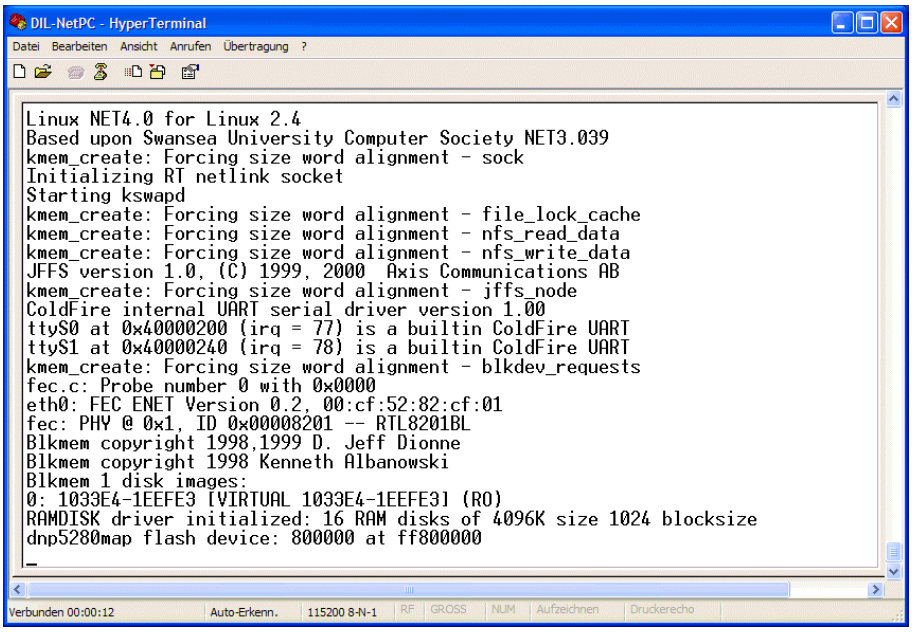

Figure 7: Watch the µClinux booting process with *HyperTerminal*

The terminal emulation program offers a serial console to the DNP/5280 µClinux. You can enter and execute µClinux commands with the terminal emulation program.

6. Step: Power-up the DNP/5280 with RCM Jumper

With the RCM jumper, the DIL/NetPC DNP/5280 runs the default boot loader and ROM monitor program *dBUG* direct after power-up from Flash memory.

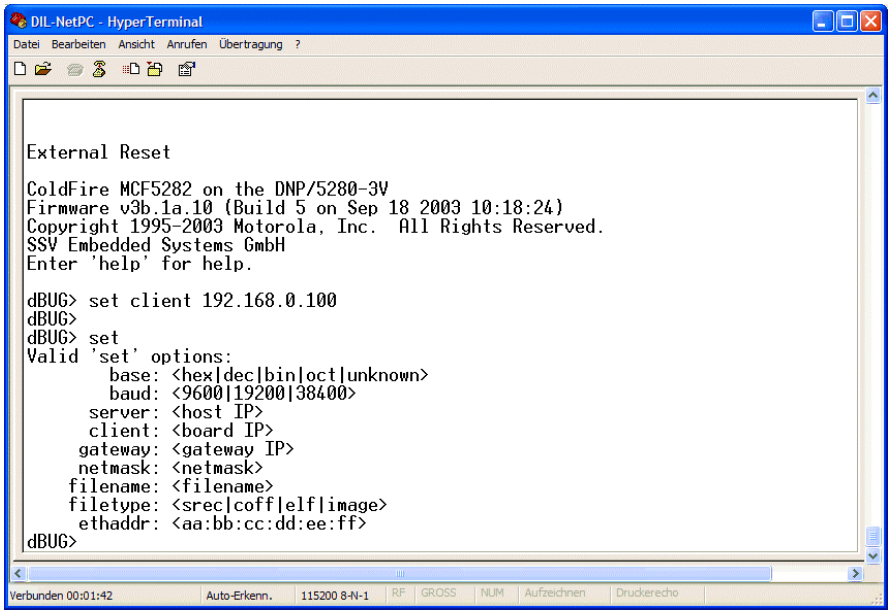

Figure 8: Using *dBUG* with *HyperTerminal*

The monitor program *dBUG* allows you to change the IP address of the DNP/5280. Please enter the following command:

```
set client 192.168.0.100
```

This command changes the IP address of the DNP/5280 to 192.168.0.100 and stores the address to the Flash memory chip. Please enter

```
help
```

for a overview off all *dBUG* commands. See also the *Motorola dBUG Reference Manual* for more details.

7. Step: Check the IP Address of your PC

Make sure that your PC is using the right IP address for the Ethernet-based TCP/IP communication with the DIL/NetPC. Use 192.168.0.1 or 192.168.0.254 for your PC and 192.168.0.126 for the DNP/5280.

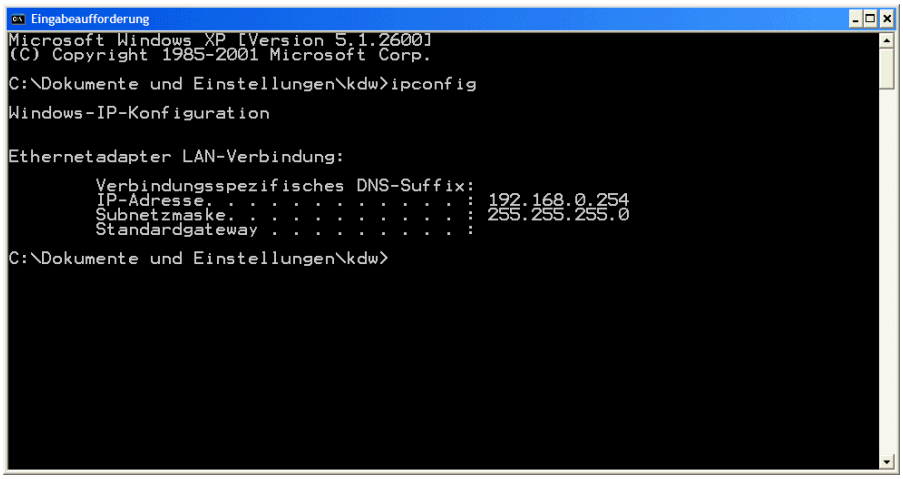

Figure 9: Windows-PC IP address check with *ipconfig*

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

8. Step: Check the Ethernet-based TCP/IP Communication

Check the Ethernet-based TCP/IP communication between the DNP/5280 and the PC with a simple *ping* command.

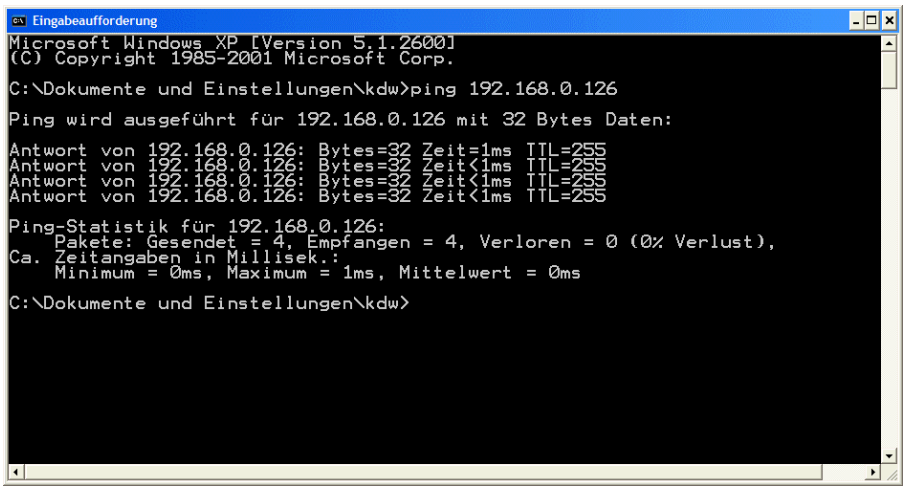

Figure 10: Windows-PC TCP/IP communication check with *ping*

First check the cable connections and then the IP addresses if your *ping* doesn't work.

9. Step: Check the DNP/5280 Embedded Web server

Run a Web browser program. Enter the URL *http:///192.168.0.126* for access the DNP/5280 Web pages.

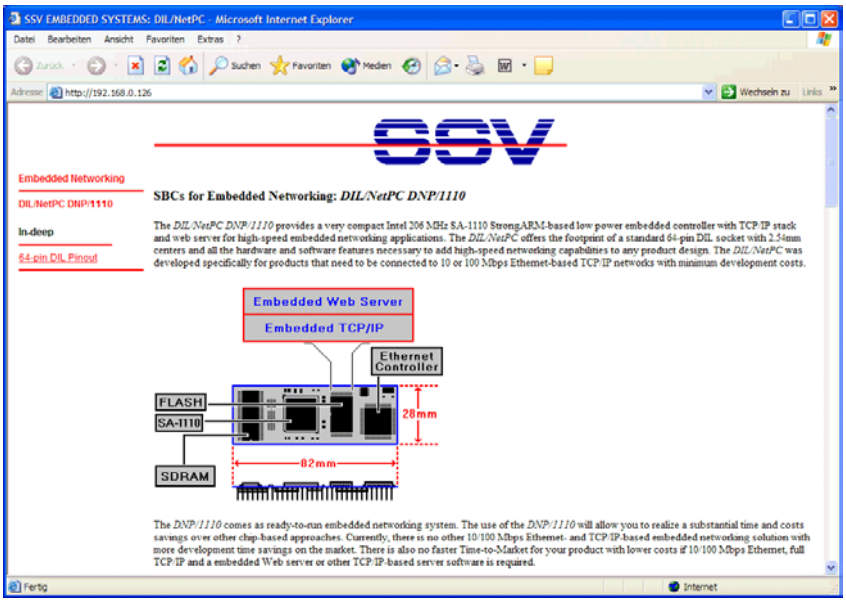

Figure 11: Check the Embedded Webserver with *Internet Explorer*

Please note: The DNP/5280 default HTML pages and GIF pictures are located at */home/httpd* in the DNP/5280 Flash memory.

10. Step: Using a Telnet Connection

Run a Telnet client program on your PC with the IP address of the DNP/5280. You can use a Telnet session for remote entering µClinux commands.

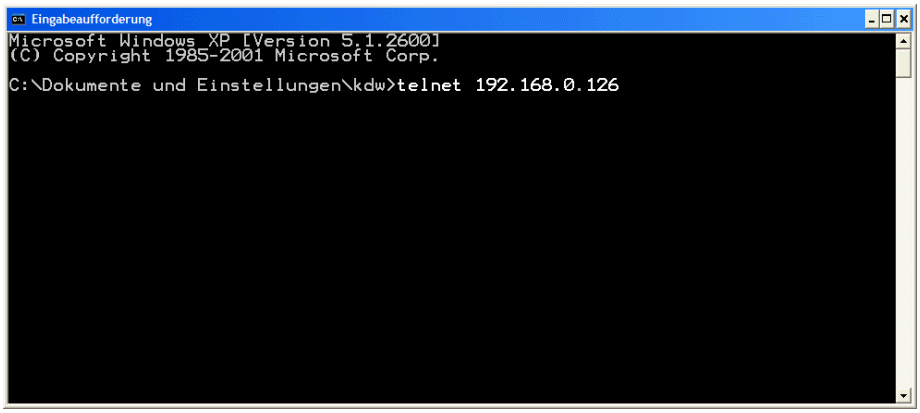

Figure 12: Run the Windows telnet client program

Please note: The DNP/5280 µClinux comes with *BusyBox*. All µClinux command lines commands are implemented in *BusyBox. BusyBox* combines tiny versions of many common UNIX utilities into a single small executable. It provides replacements for most of the utilities you usually find in GNU *fileutils*, *shellutils*, etc. The utilities in *BusyBox* generally have fewer options than their full-featured GNU cousins; however, the options that are included provide the expected functionality and behave very much like their GNU counterparts. *BusyBox* provides a fairly complete environment for any small or embedded system.

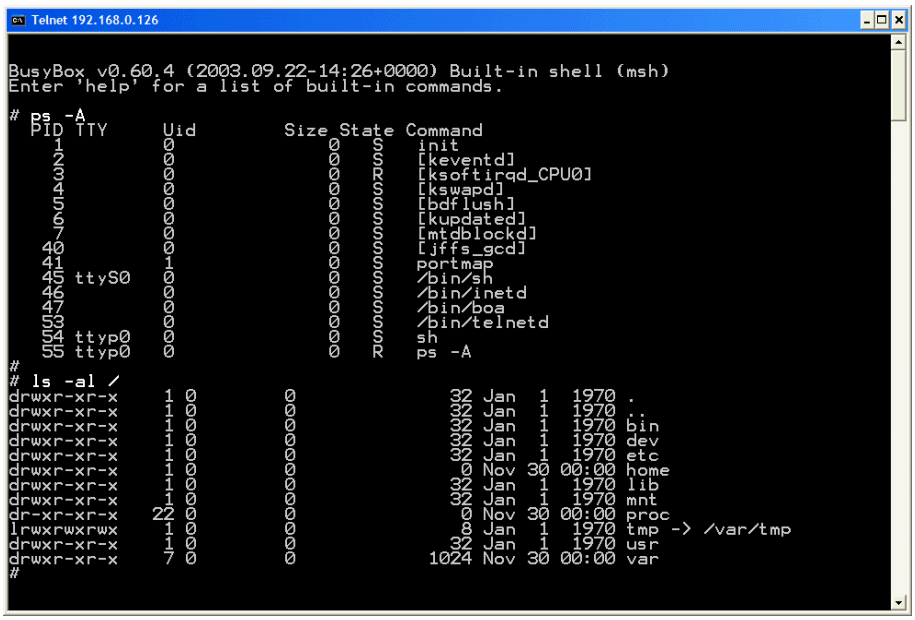

Figure 13: Using µClinux commands within a Telnet client window

Helpful Literature

ColdFire Programmers Reference Manual R.1.0 (MCF5200PRM/AD)
MCF5282 ColdFire Microcontroller User's Manual R.0.1 (MCF5282UM/D)
Motorola dBUG Reference Manual Revision 0.21

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Notes to this Document (DNPSK13-FirstStepsE.Doc)

Revision	Date		Name
1.00	27.01.2004	First Version in English (Rev. 1.00)	KDW
1.01	30.11.2004	Adding parts for DNP/SK16L	KDW