

IGW/900 Device Server Linux Starter Kit

User Manual



SSV Embedded Systems

Heisterbergallee 72 D-30453 Hannover Phone +49-(0)511-40000-0 Fax +49-(0)511-40000-40 e-mail: sales@ist1.de

Manual Revision: 1.1 Date: 2004-06-08

For further information regarding our products please visit us at www.ssv-comm.com



CONTENT

1	INT	RODUCTION	.4
	1.1	Conventions used in this Document	. 4
	1.2	Checklist	. 4
	1.3	Features IGW/900	. 5
2	IGW	/900 OVERVIEW	.6
3	IGW	/900 COMPONENTS	.7
	3.1	Power LED	7
	3.2	General Purpose LEDs	
	3.3	Ethernet Interface	
	3.4	Screw Terminals	
	3.5	DIN-Rail Mounting	
4	CON	INECTIONS	.8
	4.1	Mounting the IGW/900 on a DIN-Rail	8
	4.2	Providing the IGW/900 with Power	
	4.3	Ethernet Link	
	4.4	RS232 Serial Link	
	4.5	RS422 Serial Link	
	4.6	RS485 Serial Link	
	4.7	Termination Resistor for the RS485 interface	
	4.8	CAN Connection	
	4.9	Termination Resistor for the CAN Connection	
	4.10	RCM (Remote Console Mode)	
5	USII	NG A WINDOWS-BASED HOST	18
	5.1	Setup the Serial Link	18
	5.2	Checking the Ethernet Link	
	5.3	Web Server Access	
	5.4	Assigning a new IP-Address to the IGW/900	
	5.5	Running Linux	
	5.6	Filetransfer via TFTP	
6	USII	NG A LINUX-BASED HOST	30
	6.1	Setup the Serial Link	30
	6.2	Checking the Ethernet Link	
	6.3	Web Server Access	
	6.4	Assigning a new IP-Address to the IGW/900	
	6.5	Running Linux	
	6.6	Filetransfer via TFTP	38
	6.7	GNU Cross Tool Chain	40
	6.8	GNU Cross Debugger	
	6.9	GNU Cross Debugger with DDD (Data Display Debugger)	46



APPENDIX 1: BLOCK DIAGRAM	50
APPENDIX 2: MECHANICAL DIMENSIONS	51
APPENDIX 3: PINOUT IGW/900	52
APPENDIX 4: GNU GENERAL PUBLIC LICENSE	53
APPENDIX 5: GNU LESSER GENERAL PUBLIC LICENSE	56
LIST OF FIGURES	60
LIST OF TABLES	61
LIST OF APPENDIXES	61
HELPFUL LITERATURE	62
CONTACT	62
DOCUMENT HISTORY	62



1 INTRODUCTION

The focus of the IGW/900 is on safe communication via Ethernet technology in an industrial environment. The IGW/900 offers therefore a 10/100Mbps LAN-port which is ready to integrate the IGW/900 into various industrial solutions. Of course the purpose of this Device Server is not limited only to communicate via Ethernet. With the additional serial interface and the CAN support there are plenty of ideas to realize.

This document describes how to start with the IGW/900. For further information about the individual components of this product you may follow the links from our website at *http://www.ssv-comm.de*.

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

1.1 Conventions used in this Document

Convention	Usage
italic	Filenames, Internet addresses like e.g. www.ssv-embedded.de
bold italic	User inputs, command lines and pathnames
bold	Important terms
monospace	Program code
UPPERCASE	Keyboard buttons like e.g. ENTER

 Table 1-1: Convention usage

1.2 Checklist

Compare the content of your IGW/900 package with the standard checklist below. If any item is missing or appears to be damaged, please contact SSV Embedded Systems.

Standard items of the Starter Kit

- ✓ IGW/900 Linux Device Server
- ✓ Power supply
- ✓ Power adapter cable
- ✓ Null-modem cable
- \checkmark RS232 adapter cable
- \checkmark RCM cable bridge
- ✓ Support CD-ROM
- ✓ Screwdriver



1.3	Features IGW/900
	• One 10/100Mbps Ethernet interface
	• One CAN interface via screw terminals
	• One RS232 serial interface via screw terminals (COM1)
	• One RS232 / RS422 / RS485 serial interface via screw terminals (COM2
	• Power LED
	• Three general purpose LEDs
	• DIN-rail mounting
	• DNP/5280 with 32-bit Motorola Coldfire 66 MHz
	• 16 MB SDRAM
	• 8 MB Flash
	• Full programmable
	• Pre-installed embedded Linux
	• 12 – 24V DC supply voltage



IGW/900 OVERVIEW 2



⑦ Screw terminal A1 - A4

⑧ DIN-rail mounting

- ② Screw terminal C1 C4
- ③ Power LED
- ④ Port LEDs P1, P2, P3

Figure 2-1: IGW/900 overview



3 IGW/900 COMPONENTS

This chapter describes the components of the IGW/900 shown in **chapter 2** and gives a short overview about their respective functions.

3.1 Power LED

This green LED lights up when the board is provided with the necessary operating voltage of 12 - 24 V DC.

3.2 General Purpose LEDs

The three red LEDs are for general purpose. Table 3-1 shows their assignment.

LED	Signal
PWR	fix 3.3 V DC
P1	PIO Port PA4
P2	PIO Port PA5
P3	PIO Port PA3

Table 3-1: Assignment of the general purpose LEDs

Note: Each Port LED is on when there is a high level signal on the respective PIO Port available. Signal low (0) – LED off

Signal high (1) – LED on

3.3 Ethernet Interface

The IGW/900 offers Ethernet connectivity with a speed up to 100Mbps. The RJ45 Ethernet interface of the IGW/900 automatically detects the connection speed and switches to 10Mbps or to 100Mbps mode.

3.4 Screw Terminals

With the adapter cables you can connect the power supply and different devices to the screw terminals on the IGW/900.

Please see **chapter 4.2** how to connect the power supply. Please see **chapter 4.4** how to create a RS232 serial link. Please see **chapter 4.5** how to create a RS422 serial link. Please see **chapter 4.6** how to create a RS485 serial link. Please see **chapter 4.8** how to create a CAN connection.

3.5 DIN-Rail Mounting

The DIN-rail mounting allows a quick and easy connection of the IGW/900 on a DIN-rail. Please see **chapter 4.1** for a detailed mounting instruction.



4 CONNECTIONS

For a quick and easy start with the IGW/900 there are several connections necessary. The following chapter describes, how and between which components these connections have to be made.

4.1 Mounting the IGW/900 on a DIN-Rail

To mount the IGW/900 on a DIN-rail is very simple. To click the IGW/900 on the DIN-rail, just hinge the device into the upper edge of the DIN rail. Then press it downwards to compress the spring inside the DIN-rail mounting unit (1). After this, push the IGW/900 against the DIN-rail as to snap it on.

The figure 4-1 shows these steps.



Figure 4-1: Mounting the IGW/900 on a DIN-rail

To snap the IGW/900 off, pull the plastic disassembling lever on the bottom of the IGW/900 downwards with the aid of a screwdriver and remove the device from the DIN-rail.



4.2 Providing the IGW/900 with Power

The IGW/900 needs a supply voltage of 12 - 24 V DC to work. In your IGW/900 Starter Kit you will find a plug-in power supply unit and a power adapter cable to provide the system with the necessary power in a software development environment.



Figure 4-2: Connecting the IGW/900 with the power supply for software development

The next figure shows how to provide the IGW/900 with power in an industrial environment on a DIN-rail.



Figure 4-3: Providing the IGW/900 with power in an industrial environment on a DIN-rail

Note: To provide the IGW/900 on a DIN-rail with power, you need a special DIN-rail power supply, which is not part of the IGW/900 Starter Kit.



4.3 Ethernet Link

The Ethernet link can be made on two ways. First with a crossover cable and second with two standard 10/100Mbps patch cables and a hub or switch. In both cases an Ethernet-LAN interface for your host is required. If you use a hub or switch please connect them between your host and the IGW/900 like shown in the figure below.



Figure 4-4: Ethernet link with hub/switch



Figure 4-5: Ethernet link with crossover cable



4.4 RS232 Serial Link

For a basic communication with the IGW/900 use the RS232 adapter cable and the null modemcable on port COM1 of the IGW/900. These cables come along with your IGW/900 Starter Kit. Please connect the IGW/900 with the COM port of your host by using these cables.



Figure 4-6: RS232 serial link on port COM1

To create a RS232 serial link on port COM2 of the IGW/900 connect the RS232 adapter cable and the null modemcable like shown in the figure below.



Figure 4-7: RS232 serial link on port COM2



4.5 RS422 Serial Link

The RS422 mode allows you to integrate corresponding 4-wire bus systems into a TCP/IP network with the help of the IGW/900. For RS422 communication connect the wires between the IGW/900 and a RS422 device like shown in the figure below.



Figure 4-8: RS422 serial link



4.6 RS485 Serial Link

The RS485 mode allows you to integrate corresponding 2-wire bus systems into a TCP/IP network with the help of the IGW/900. For RS485 communication between the IGW/900 and a RS485 device (e.g. a data acquisition module) you have to use a RS485 adapter cable. This cable is not included in your IGW/900 Starter Kit.



Figure 4-9: RS485 serial link



4.7 Termination Resistor for the RS485 interface

By using the RS485 interface of the IGW/900 the bus line must be terminated at the two most distant bus ends. To terminate the RS485 bus line, a termination resistor has to be connected with the IGW/900. The next figures show how to connect a termination resistor to the IGW/900.



Figure 4-10: Connection of the termination resistor for a RS485 serial link



Figure 4-11: Connection of the termination resistor for a RS485 serial link



4.8 CAN Connection

The CAN mode allows you to integrate corresponding 2-wire bus systems into a TCP/IP network with the help of the IGW/900. For CAN communication between the IGW/900 and a CAN device you have to use a suitable cable. This cable is not included in your IGW/900 Starter Kit.

To create a CAN connection just connect the screw terminals A3 and A4 with a cable like shown below.



Figure 4-12: CAN connection



4.9 Termination Resistor for the CAN Connection

By using the RS485 interface of the IGW/900 the bus line must be terminated at the two most distant bus ends. To terminate the RS485 bus line, a termination resistor has to be connected with the IGW/900. The next figures show how to connect a termination resistor to the IGW/900.



Figure 4-13: Connection of the termination resistor for a CAN connection



Figure 4-14: Connection of the termination resistor for a CAN connection



4.10 RCM (Remote Console Mode)

The **Remote Console Mode** realizes some basic operating modes such as a boot loader or a ROM-monitor program (Motorola-dBUG) which can be used for different service purposes like setting the IP-address.

The default setting of RCM is disabled. If RCM is disabled, the IGW/900 will boot with μ CLinux and you can only communicate via Telnet.

Only with RCM enabled you can use a serial console like HyperTerminal for MS Windows or Minicom for Linux to interact with the IGW/900.

To enable RCM on the IGW/900 just connect the screw terminals C1 and C4 with a cable bridge like shown below.



Figure 4-15: Activation of RCM on the IGW/900



5 USING A WINDOWS-BASED HOST

The "heart" of the IGW/900 is the programmable DIL/NetPC DNP/5280. The following paragraphs will help you to use the DNP/5280 with a host 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 host. If this program is not installed on your host, you have to install this program manually from your MS-Windows installation CD-ROM.

5.1 Setup the Serial Link

Before you provide the IGW/900 with power for the first time, please run a terminal program that offers communication capabilities on your host. 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 of the host) in the dialog box and choose "OK".

Verbinden mit	? 🛛
🗞 DNLsk	
Geben Sie die Rufnu	ummer ein, die gewählt werden soll:
Land/Region:	Deutschland (49)
Ortskennzahl:	0511
Rufnummer:	
Verbindung herstellen über:	COM5
	OK Abbrechen

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.



Eigenschaften von CC	DM5	? 🗙
Anschlusseinstellungen		
Bits pro Sekunde:	115200	
Datenbits:	8	
Parität:	Keine 🗸	
Stoppbits:	1 💌	
Flusssteuerung:	Kein 🗸	
	Wiederherstelle	en
	K Abbrechen Über	nehmen

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 IGW/900 and you will see all steps of the DNP/5280 boot process in the terminal program window at your PC. If you do not see the following boot process, please make sure that RCM is not enabled (please see **chapter 3.5** for detailed information).

Datei Bearbeiten Ansicht Anrufen Übertragung ? D 또 중 중 비한 동 값
D 📽 🐵 🕉 🛍
Blkmem copyright 1998,1999 D. Jeff Dionne Blkmem copyright 1998 Kenneth Albanowski Blkmem 1 disk images: 0: 1033E4-1EFFE3 IVIRUAL 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": 0x000500000-0x000500000 : "dug" 0x000500000-0x000500000 : "spare 1" 0x000400000-0x004000000 : "spare 2" NET4: Linux ICP/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. JFS: Trying to mount a non-mtd device. VFS: Mounted root (romfs filesystem) readonly. Freeing unused kernel memory: 24k freed (0xead000 - 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.

DNLsk - HyperTerminal	
Datei Bearbeiten Ansicht Anrufen Übertragung ?	
0x00300000-0x00400000 : "spare 1" 0x0040000-0x00400000 : "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. #	
Verbunden 00:03:15 Auto-Erkenn. 115200 8-N-1 RF GROSS NUM Aufzeichnen Druckerecho	

Figure 5-4: Linux command prompt



Now please enter *ifconfig* to see the network interface addresses of the DNP/5280 inside of the IGW/900.

Date Beachetten Anscht Anrufen Übertragung ? 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 Bccast:192.168.0.255 Mask:255.255.255.0 UP BROADCDAST RUNNING MULICAST MULLSON Metric:1 RX packets:16 errors:0 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:127.0.1 Mask:255.0.0.0 UP LOOPBACK RUNNING MIU: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) #	DNLsk - HyperTerminal	
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:255.255.25 UP BROADCAST RUNNING MULTICAST MIU: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:127.0.1 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))atei Bearbeiten Ansicht Anrufen Übertragung ?	
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:255.255.0 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:127.0.1 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)) 🖆 📨 🕉 🛍 🎦 🖬	
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:255.255.0 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:127.0.1 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)		
 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 BROHDCAST RUNNING MULTICAST MULTISON 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) 		
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)	eth0 Link encap:Ethernet HWaddr 00:CF:52:82:CF:01 inet addr:192.168.0.126 Bcast:192.168.0.255 Mask:255.255.0 UP BROADCAST RUNNING WULTCAST 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)	
 	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: Network interface addresses

Note: For a first test of the Ethernet connection between the host and the DNP/5280 inside of the IGW/900 you have to change the assigned IP-address of your host 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.

Eigenschaften von Internetprotol	koll (TCP/IP) 🛛 🛛 🔀		
Allgemein			
IP-Einstellungen können automatisch zugewiesen werden, wenn das Netzwerk diese Funktion unterstützt. Wenden Sie sich andemfalls an den Netzwerkadministrator, um die geeigneten IP-Einstellungen zu beziehen.			
O IP-Adresse automatisch beziehen			
• Folgende IP-Adresse verwenden:			
IP-Adresse:	192 . 168 . 0 . 254		
Subnetzmaske:	255 . 255 . 255 . 0		
Standardgateway:	· · ·		
DNS-Serveradresse automatisch beziehen O Folgende DNS-Serveradressen verwenden:			
Bevorzugter DNS-Server:			
Alternativer DNS-Server:	· · ·		
	Erweitert		
OK Abbrechen			

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

C 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 = Oms, Maximum = 11ms, Mittelwert = 2ms	
C: \>	
	-

Figure 5-7: Communication check via PING

The IGW/900 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 host. 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

© Eingabeaufforderung	- 🗆 ×
C:∖>ipconfig	<u>^</u>
Windows-IP-Konfiguration	
Ethernetadapter LAN-Verbindung:	
Verbindungsspezifisches DNS-Suffix: IP-Adresse	
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 and open the URL *http://192.168.0.126*. The embedded web server will deliver you a small description about the DNP/5280 inside of the IGW/900. That's it. Now you are online with the IGW/900 and your web browser is connected to the embedded web server of the DNP/5280 inside of the IGW/900. 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 host. 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 IGW/900

The following steps describe how to change the IP-address of the DNP/5280 inside of the IGW/900 with a terminal program like the HyperTerminal-program in MS-Windows.

Note: Please make sure that RCM on the IGW/900 is enabled for further operation. Please see **chapter 3.5** how to enable RCM correctly.

When the DNP/5280 inside of the IGW/900 has booted with RCM enabled you should see the following screen on your terminal program.

S 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> _	X
	>
Verbunden 00:00:28 Auto-Erkenn. 115200 8-N-1 RF GROSS NUM Aufzeichnen Druckerecho	

Figure 5-10: Boot process with RCM jumper set

Now enter the command *show* to see the current parameters of the DNP/5280 inside of the IGW/900. 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.

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: 255.255.0	
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> _	
	>
Verbunden 00:00:30 Auto-Erkenn. 115200 8-N-1 RF GROSS NUM Aufzeichnen Druckerecho	

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



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

Date: Bearbeiten Anufen Übertragung ? Image: Set Walid 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></aa:bb:cc:dd:ee:ff></srec coff elf image></filename></netmask></gateway></board></host></hex dec bin oct unknown>	🗞 DIL-NetPC - HyperTerminal	
<pre>dBUG> set Valid 'set' options: base: <hex dcc 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> </aa:bb:cc:dd:ee:ff></srec coff elf image></filename></netmask></gateway></board></host></hex dcc bin oct unknown></pre>		
<pre>Valid 'set' options: base: <hex dcc bin cct 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> </aa:bb:cc:dd:ee:ff></srec coff elf image></filename></netmask></gateway></board></host></hex dcc bin cct unknown></pre>		
	<pre>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 cofflelf image> ethaddr: <aa:bb:cc:dd:ee:ff> dBUG> l l</aa:bb:cc:dd:ee:ff></srec cofflelf image></filename></netmask></gateway></board></host></hex dec bin oct unknown></pre>	
		>

Figure 5-12: Command set with parameters



5.5 Running Linux

The DNP/5280 inside of the IGW/900 is delivered with a pre-installed Linux. When booting make sure RCM of the IGW/900 is disabled. When the Linux boot process is done the system will stop with the login prompt shown in **figure 5-13**.

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

Note: On every boot process without RCM enabled (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 ?	
D 🗳 🕾 🖇 🗅 🗃	
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. #	
Verbunden 00:03:15 Auto-Erkenn. 115200 8-N-1 RF GROSS NUM Aufzeichnen Druckerecho	

Figure 5-13: DNP/5280 Linux boot process

Alternatively you can use a **command line interface (CLI)** like a Telnet client to communicate with the IGW/900. 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 IGW/900 you need to enter this new IP-address in the command line.



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



Within the Telnet client you can enter Linux commands that will be executed by the IGW/900. The standard output will be shown in your Telnet client window as illustrated in the next figure.

T-1-++ 402 448 0 424		
Telnet 192.168.0.126		_ 🗆 ×
D	0,00,14,04,0000 $0,011,0,000$	<u>^</u>
	9.22-14:26+0000) Built-in shell (msh) of built-in commands.	
# PS - A PID TTY Uid		
PID TTY Uid	Size State Command Ø S init Ø S [keventd]	
	Ø R [ksoftigd_CPU0]	
15, 00	0 S [kswapd] 0 S [bdflush] 0 S [kupdated] 0 S [mtgblockd]	
12345567 44577 44567 44577 44577 44577 44577 44577 44577 44577 44577 44577 44577 44577 44577 44577 44577 44577 44577 44577 445777 445777 445777 44577777777	0 S init 0 S [keventd] 0 R [ksoftirqd_CPU0] 0 S [kswapd] 0 S [bdflush] 0 S [kupdated] 0 S [kupdated] 0 S [htdblockd] 0 S [jffs_gcd] 0 S portmap 0 S /bin/sh 0 S /bin/inetd 0 S /bin/boa 0 S /bin/telnetd 0 S sh 0 R ps -A	
41 1 45 ttyS0 0	0 S portmap 0 S /bin/sh	
46 0	0 S /bin/inetd 0 S /bin/boa	
53 54 ttyp0 0	0 S /bin/telnetd 0 S sh	
, SS ttýpo o	0 R ps -A	
" ∦ls -al ⁄ drwxr-xr-x 10	0 32 Jan 1 1970 .	
drwxr-xr-x 10 drwxr-xr-x 10	0 32 Jan 1 1970 0 32 Jan 1 1970 0 32 Jan 1 1970 bin	
d-wxr-xr-x 10	0 32 Jan 1 1970 . 0 32 Jan 1 1970 . 0 32 Jan 1 1970 bin 0 32 Jan 1 1970 dev 0 32 Jan 1 1970 dev 0 32 Jan 1 1970 dev 0 0 Nov 30 00:00 home 0 32 Jan 1 1970 lib 0 32 Jan 1 1970 mnt 0 32 Jan 1 1970 mnt 0 0 Nov 30 00:00 proc 0 8 Jan 1 1970 tmp -> /var/tmp 0 32 Jan 1 1970 usr 0 1024 Nov 30 00:00 var	
drwxr-xr-x 10 drwxr-xr-x 10	0 0 Nov 30 00:00 home 0 32 Jan 1 1970 lib	
drwxr-xr-x 10 dr-xr-xr-x 220	0 32 Jan 1 1970 mnt 0 0 Nov 30 00:00 proc	
lrwxrwxrwx 10 drwxr-xr-x 10 drwxr-xr-x 70	0 0 00.00 00.00 proc 0 8 Jan 1 1970 tmp -> /var/tmp 032 Jan _1 1970 usr	Þ
drwxr-xr-x 70 #	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 Filetransfer via TFTP

The DNP/5280 inside of the IGW/900 offers a very simple way for Ethernet-based file transfers between your PC system and the DNP/5280 RAM disk drives or JFFS-based flash disk drives. This file transfer is using the TCP/IP service **TFTP** (trivial file transfer protocol).

TFTP is a server/client-based protocol. The DNP/5280 Linux configuration offers a TFTP client program. Your PC needs a TFTP server program.

Note: Windows-based PCs do not offer TFTP server programs. Only 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 *\TFTPServer-Win32* on your Starter Kit 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 setup an Ethernet link between the IGW/900 10/100 Mbps Ethernet interface and the Ethernet interface of your PC system. Check the IP address of your Windows PC system with the *ipconfig* command. The default IP address (factory setup) of the DNP/5280 inside of the IGW/900 is **192.168.0.126**.

Now run the TFTP server program on your PC system.

🏘 TFTPD32 by	Ph. Jounin				
Base Directory	C:\Dokumente un	d Einstellungen\kdw\Eig	ene Dateien\DNP5280\CD-ROM\TF1	P-Server-Win32	Browse
Server interfaces	192.168.0.136			•	Show Dir
Current Action		Listening on port 69			
About	1		Settings	1	Help

Figure 5-16: Running TFTPD32

Check the TFTP connection between the IGW/900 and your PC system. Open a Telnet session and use the following commands for downloading and uploading files:

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

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

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

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

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

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



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

	🏘 Ordner suchen 🔹 💽 🗙	
🔖 TFTPD32 by Ph. Jounin		
Base Directory C:\Dokumente und Einstellungen\kdw Server interfaces 192.168.0.136	Buch-EmbeddedInternet Duch-MSRmitARM Duch-MSRmitARM Duch-MSRperInternet DusinessEnglish DuP5280 DMP5280 DMP5280 Dider Dider Dider Dider Dider Dider TFTP-Server-Wir	Browse Show Dir
Current Action Listening on port 6		
About	X	Help
	OK Abbrechen	

Figure 5-17: Changing the default directory for TFTPD32

Example:

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

Telnet 192.168.0.126		- 🗆 ×
<pre># pwd /home/httpd # ls -al drwxr-xr-x 1 0 -rw-r-rr- 1 0 -rw-r-rr- 1 0 -rw-r-rr- 1 0 -rw-r-rr- 1 0 -rw-r-rr- 1 0 -rw-r-rr- 1 0 # tftp -p -l sylog.gif # tftp -p -l spacer2.gif #</pre>	0 0 Nov 30 00:03 . 0 437 Nov 30 00:00 0 4350 Nov 30 00:07 boa.conf 0 4950 Nov 30 00:10 dnp5280-1.c 0 7904 Nov 30 00:10 dnp5280-1.c 0 4091 Nov 30 00:11 memap.html 0 4091 Nov 30 00:11 pio.html 0 4766 Nov 30 00:11 pio.html 0 769 Nov 30 00:07 ssvlogo.gif 192.168.0.1	

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

Note: A file transfer to the DNP/5280 inside of the IGW/900 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 HOST

The "heart" of the IGW/900 is the programmable DIL/NetPC DNP/5280. The following paragraphs will help you to use the DNP/5280 with a host 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 host.

If necessary you have to install this program from your Linux installation CD-ROM.

6.1 Setup the Serial Link

Before you provide the IGW/900 with power for the first time, please run a terminal program like Minicom. Minicom is a simple serial communication program originally written by Miquel van Smoorenburg. It offers basic communication capabilities and integrates well with the Linux user interface. Minicom is a lot like the old MS-DOS program PROCOMM. This program can be used to connect a Linux-based PC to embedded devices such as the DNP/5280 inside of the IGW/900 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".

■ 🙀 root@n6g4d3.localdomain: /root - Terminal	· 🗆 🗙
Datei Sitzungen Optionen Hilfe	
Datei Sitzungen Optionen Hilfe A - Serial Device : /dev/ttyS0 B - Lockfile Location : /var/lock C - Callin Program : D - Callout Program : E - Bps/Par/Bits : 115200 8N1 F - Hardware Flow Control : No G - Software Flow Control : No Change which setting? Screen and keyboard Save setup as dfl Save setup as . Exit Exit from Minicom	
	4 1
La Iveo Levina Ivr 1	

Figure 6-1: Serial port settings under Minicom



Now turn on the power for the IGW/900 and you will see all steps of the boot process in the terminal program window at your PC. If you do not see the following boot process, please make sure that RCM on the IGW/900 is disabled (please see **chapter 3.5** for detailed information).

Konsole – Konsole	0	₹ 4
Datei Sitzungen Optionen Hilfe		
Date Stzungen 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 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": 0x0000000-0x00050000 : "dBug" 0x0000000-0x00050000 : "gapare 1" 0x00030000-0x00400000 : "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)		
	0.01 /	
ALT-Z for help 115200 8N1 NOR Minicom 1.83.1 VT102 0	ffline	
Neu_ Konsole Nr 1		

Figure 6-2: 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.

Konsole - Konsole	
Datei Sitzungen Optionen Hilfe	
Creating 4 MTD partitions on "Physically mapped flash of DNP5280": 0x0000000-0x00050000 : "dBug" 0x00050000-0x00300000 : "spare 1" 0x0030000-0x00400000 : "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	4.
DNP/5280-3¥ board	
BusyBox v0.60.4 (2003.09.19-13:12+0000) Built-in shell (msh) Enter 'help' for a list of built-in commands. # ALI-Z for help 115200 8N1 NOR Minicom 1.83.1 VT102 Off	line 💌
Neu Konsole Nr 1	

Figure 6-3: 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/5280 inside of the IGW/900 similar as shown below.

🔲 🕂 root@n6g4d3.localdomain: #oot - Terminal 🕐 🗆 🗙
Datei Sitzungen Optionen Hilfe
[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]#
Neu Terminal Nr 1

Figure 6-4: Ping request

To cancel the ping request just press the keyboard shortcut CONTROL + C. If an error occurs (e.g. the DNP/5280 does not answer the ping of your host) you have to check your cable connections at first.

Note: For a first test of the DNP/5280 you have to change the assigned IP-address of your host 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*.

Datei Sitzi	ungen Optionen Hilfe	
Eroot@ı eth0	<pre>h6g4d3 /root]# ifconfig 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</pre>	
10	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	
Eroot@ı	n6g4d3 /root]#	4

Figure 6-5: 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 ENTER. The embedded web server will deliver you a small description about the DNP/5280 inside of the IGW/900.

That's it. You are now online with the IGW/900. The web browser of your development system is connected to the embedded web server of the DNP/5280 inside of the IGW/900 and shows you a static web page with some pictures.



Figure 6-6: Web page shown by the Konqueror File Manager



6.4 Assigning a new IP-Address to the IGW/900

The following steps describe how to change the IP-address of the DNP/5280 with a command line interface like Minicom in Linux.

Note: Please make sure that RCM on the IGW/900 is disabled for further operation. Please see **chapter 3.5** how to enable RCM correctly.

When the IGW/900 has booted with RCM enabled you should see the following messages on your terminal program.



Figure 6-7: Boot process with RCM enabled

Now enter the command *show* to see the current parameters of the DNP/5280 inside of the IGW/900. To assign a different IP-address (e.g. the IP-address 192.168.0.100) type in the command line *set client* 192.168.0.100.



Figure 6-8: Assigning a new IP-address to the IGW/900



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

Konsole - Konsole	0 =	
Datei Sitzungen Optionen Hilfe		
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: <hexldeclbinloctlunknown></hexldeclbinloctlunknown>		
baud: <9600119200138400>		
server: <host ip=""></host>		
client: <board ip=""></board>		
gateway: <gateway ip=""></gateway>		
netmask: <netmask></netmask>		
filename: <filename></filename>		
filetype: <sreclcofflelflimage></sreclcofflelflimage>		
ethaddr: <aa:bb:cc:dd:ee:ff></aa:bb:cc:dd:ee:ff>		
	0.0.01 /	4
	Offline	
Neu Konsole Nr 1		
		-

Figure 6-9: Command set with parameters



6.5 Running Linux

The DNP/5280 inside of the IGW/900 is delivered with a pre-installed Linux. When booting make sure RCM of the IGW/900 is disabled. When the Linux boot process is done the system will stop with the login prompt shown in the next figure. The DNP/5280 Linux does not need a user login with user name and password. Just enter your Linux commands directly after the boot process.

Note: On every boot process without RCM enabled (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.



Figure 6-10: Linux boot process

Alternatively you can use a **command line interface (CLI)** like a Telnet client to communicate with the DNP/5280 inside of the IGW/900. Type in the command *telnet 192.168.0.126*.

If you have already assigned a different IP-address to the DNP/5280 you need to enter this new IP-address in the command line.



Figure 6-11: Linux login


x Datei Sitzungen Opti	onen Hilfe		rennin	al - Tem	iinai <2>				0 -
usuBox v0 60	4 (20	03.09.19-13:1	2+00	000) P	uilt-in sl	nell i	(msh)		
		list of built				ICTT.			
потр			, <u> </u>	00					
ps -A									
PID TTY	Uid	Size St	ate	Comma	nd				
1	0	0	S	init					
2	0	0	S	Ekev	entd]				
3	0	0	R	Ekso	ftirqd_CPU	10]			
4	0	0	S	Eksu	apd]				
5	0	0	S	Ebdf	lush]				
6	0	0	S	Ekup	dated]				
7	0	0	S	Emto	blockd]				
38	0	0	S	E_jf f	s_gcd]				
39	1	0	S	port	map				
41 ttyS0	0	0	S	/bir	/sh				
42	0	0	S	/bir	/inetd				
43	0	0	S	/bir	/boa				
45	0	0	S	/bir	/telnetd				
46 ttyp0	0	0	S	sh					
47 ttyp0	0	0	R	ps -	A				
df									
ilesystem		1k-blocks			Available	Use%	Mounted a	on	
ootfs		947		947	•	100%	•		
dev/rom0		947		947		100%	-		
dev/ram1		115		- 7	108		/var		
dev/ram2		987		1	986		/usr		
dev/mtdblock	.2	768		96	672	13%	/home		
Neu Korm	inal Nr 1								

Figure 6-12: 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 Filetransfer via TFTP

The DNP/5280 inside of the IGW/900 offers a very simple way for Ethernet-based file transfers between your PC system and the DNP/5280 RAM disk drives or JFFS-based flash disk drives. This file transfer is using the TCP/IP service **TFTP** (Trivial File Transfer Protocol).

TFTP is server/client-based. The DNP/5280 Linux configuration offers a TFTP client program. Your PC needs a TFTP server program.

Setup an Ethernet link between theIGW/900 10/100 Mbps Ethernet interface and the Ethernet interface of your PC system. Check the IP address of the PC system with the Linux command *ifconfig*. The default IP address (factory setup) of the DNP/5280 inside of the IGW/900 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:" #	
Neu Terminal Nr 1	

Figure 6-13: Running TFTPD32

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

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

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

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

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

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

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



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

Example:

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

×			Terminal - Terminal <2>	
Datei Sitzungen Opt	tionen Hilfe			
# pwd				
/usr				
# ls -al	2.0	0	1004 Jun 0 06-E0	
drwxr-xr-x		Ň	1024 Jun 9 06:50 .	
drwxr-xr-x			32 Jan 1 1970	
# tftp -g -1	test.tx	t 192.168.0	.1	
# ls -al	0.0	^	1004 N 00 00 10	
drwxr-xr-x		0	1024 Nov 30 00:19 .	
drwxr-xr-x		0	32 Jan 1 1970	
-rw-rr		0	12 Nov 30 00:19 test.txt	
# cat test.t:	xt			
12345				
67890				
#				
				•
Neu 💽 Terr	ninal Nr 1			

Figure 6-14: Using the DNP/5280 TFTP client within a Telnet session

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



6.7 GNU Cross Tool Chain

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

The GNU Cross Tool Chain for DNP/5280 Linux C programming comes within a Linux shell script file with the name m68k-elf-tool-20030314.sh. You find this file at the Starter Kit CD-ROM. The location of this 18 Mbytes shell script file is $\mu CLinux | Toolchain$.

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



Figure 6-15: 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.

X			file:/hom	e - Konqueror «	2>			2	0 7 🔺
Adresse Bearbeiten Ansicht Geb	ne zu	<u>L</u> esezeichen <u>W</u> erkzeu	ge <u>E</u> instellu	ungen <u>F</u> enster <u>I</u>	<u>H</u> ilfe				
👌 🔄 🔶 🏠 🅱 🛠	þ	🛅 🍕 🔕 🔠 :	He- te e-	= 💷					Ŵ
🚯 URL 间 file:/home/m68k-elf-	-tools-	20030314.sh							•
🖻 🛃 Netzwerk		Name $ abla$	and brid brid brid by 10	Größe	Geändert	Berechtigungen	Besitzer	Gruppe	Verknüp
🖻 🏠 Persönliches Verzeichnis		/.xvpics		4 096	12.12.2003 17:40	rwxr-xr-x	root	root	
🖨 🔄 Wurzelverzeichnis		/bspl1		4 096	04.09.2002 15:35	rwx	root	root	
🖨 🥞bin		/ bspl2		4 096	04.09.2002 15:53	rwx	root	root	
🕀 🗑 boot		/ bspl3		4 096	05.09.2002 11:28	rwx	root	root	
🖽 🗑 cdrom		/ bspl4		4 096	05.09.2002 15:40	rwx	root	root	
🕀 🗑 dev		/ debug		4 096	17.12.2001 16:19	rwx	root	root	
E Cetc		/ dnp		4 096	12.12.2003 17:41	rwxr-xr-x	root	root	
		/ dnp5280		4 096	12.12.2003 17:30	rwxr-xr-x	root	root	
🛱 🔄 floppy		/ kdw		4 096	04.12.2003 19:34	rwx	root	root	
🖶 🚉 home		/mha		4 096	02.05.2002 15:28	rwxr-xr-x	root	root	
🕀 🗐 lib		/ pnp		4 096	26.09.2003 11:23	rwxr-xr-x	root	root	
🖶 🔄 lost+found	_	_1a.gif		34 016	12.12.2003 17:40	rw-rr	root	root	
🖨 🔄 mnt		_3.gif		18 783	12.12.2003 17:37	rw-rr	root	root	
🖽 🔄 opt		* m68k-elf-tools-200	30314.sh	19 172 830	12.12.2003 17:43	I-XI-XI-X	root	root	
🖽 - 🍯 proc		test		11	12.12.2003 14:12	rw-rr	root	root	
- Groot		test.txt		0	12.12.2003 14:13	rw-rr	root	root	
🕀 🦳 sbin	•								
		1							4 1
	8	Ein Element - E	ne Datei (1)	3.3 MB inspesar	t) – 0 Verzeichnisse				R.

Figure 6-16: Copying m68k-elf-tool-20030314.sh to the local hard disk drive



Konsole – Konsole 🛛 🔘	7
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/	-
Neu Konsole Nr 1	

Figure 6-17: m68k-elf-tool-20030314.sh creates new directories at /usr/local

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

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

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

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

cat hello.c

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

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

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



x Terminal - Terminal <2:	
Datei Sitzungen Optionen Hilfe	
linux:/home/dnp5280 # cat > hello.c	
#include <stdio.h></stdio.h>	
#include <stdlib.h></stdlib.h>	
void main (void)	
{	
printf ("Hello from DNP/5280!\n");	
}	
linux:/home/dnp5280 #	
linux:/home/dnp5280 # m68k-elf-gcc -Wall -m5307 -W	lelf2flt -Os -o hello hello.c -lc
hello.c:5: warning: return type of `main' is not	
linux:/home/dnp5280 #	
linux:/home/dnp5280 # ls -al hello	
-rwxrr 1 root root 20128 Dez 12	17:30 hello
linux:/home/dnp5280 #	
•	
Neu Terminal Nr 1	

Figure 6-18: Working with the GNU Cross Tool Chain

Transfer the executable from your PC hard disk drive to the DNP/5280 RAM disk or JFFS-based flash disk drive and run the executable on your DNP/5280 inside of the IGW/900. Use a TFTP session and a Telnet session for this task. Please enter the following commands within the DNP/5280 Telnet session window:

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

The first command line transfers the executable *hello* from the PC to the DNP/5280 inside of the IGW/900. 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/5280 Linux C programming offers a prebuild cross version of the GNU Debugger, called *m68k-elf-gdb*.

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

The cross debugger needs an Ethernet-based TCP/IP link between the PC and the DNP/5280 inside of the IGW/900. In addition the debugger needs also a remote debugging agent, called **gdbserver** for the DNP/5280. This agent is pre-installed within the DNP/5280 Linux.

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



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

Figure 6-19: Compiling a C program with the GNU Cross Debugger

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

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



The first command line transfers the executable *loop* from the PC to the DNP/5280 inside of the IGW/900. 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.

×		Termina	l - Terminal					
Datei Sitzungen Option	en Hilfe				1035400			
# ls -al	94 - ₁ 41 -	1. v.	18) 181					
drwxr-xr-x	20	0	1024	Nov	30	00:14		
drwxr-xr-x	10	0	32	Jan	1	1970		
-rw-rr	10	0	20180	Nov	30	00:16	loop	
# chmod +x loo	р							
# gdbserver 19	2.168.	0.1:2222 ./	Loop					
Process ./loop								
code at 0xeb80	40 - 0	xebbb80, dat	ta at Oxebbb	o84				
Remote debuggi	ng usi	ng 192.168.0	0.1:2222					
4								
16								
256								
Child exited w	ith re	tcode = 0						- 23.23
Child exited w		atus O						
GDBserver exit	ing							
#								
								• • • • • • • • • • • •
Neu Termina	NE 1							

Figure 6-20: File transfer and execution

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

m68k-elf-gdb loop.gdb



Figure 6-21: The GNU Cross Debugger at work



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

target remote 192.168.0.126:2222

This debugger command line sets up the Ethernet-based TCP/IP connection between the PC and the DNP/5280 inside of the IGW/900. Please use the same TCP/IP port number (2222). The sample command line assumes that the DNP/5280 uses the IP address 192.168.0.126.

Then set your breakpoints within the C source code and run your program with the remote debugging session between the PC and the DNP/5280 inside of the IGW/900.

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 Optio	nen Hilfe	
Breakpoint 1 (gdb) cont Continuing.	at 0xeb806a: file loop.c, line 9.	×
Breakpoint 1, 9 (gdb) cont Continuing.	<pre>main () at loop.c:9 printf ("%d\n", i= square (i));</pre>	
Breakpoint 1, 9 (gdb) print i \$1 = 4 (gdb) cont Continuing.	main () at loop.c:9 printf ("%d\n", i= square (i));	
Breakpoint 1, 9 (gdb) print i \$2 = 16 (gdb) ∎ Neu Imstermi		

Figure 6-22: Setting breakpoints



6.9 GNU Cross Debugger with DDD (Data Display Debugger)

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

The cross debugger needs an Ethernet-based TCP/IP link between the PC and the DNP/5280 inside of the IGW/900. In addition the debugger needs also a remote debugging agent, called *gdbserver* for the DNP/5280. This agent is pre-installed within the DNP/5280 Linux.

The GNU debugger offers a simple command line interface and a lot of different commands. With the help of **DDD (Data Display Debugger -** a graphical frontend 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

Terminal - Terminal <2>	
Datei Sitzungen Optionen Hilfe	
linux:/home/dnp5280 # cat loop.c	
#include <stdio.h></stdio.h>	
#include <stdlib.h></stdlib.h>	
int main (void)	
£	
int i= 2;	
while (i $\langle 256 \rangle$	
printf ("%d\n", i= square (i));	
return (EXIT_SUCCESS);	
ł	
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	
-rwxrr 1 root root 20180 Dez 18 16:56 loop	
linux:/home/dnp5280 #	•
	-
Neu Trrminal Nr 1	

Figure 6-23: Compiling a C program

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



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

The first command line transfers the executable *loop* from the PC to the DNP/5280 inside of the IGW/900. 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.

×	Termina	- Terminal		
Datei Sitzungen Optionen Hilfe				
# ls −al	N. 11	14) 		100000
drwxr-xr-x 20	0	1024 Nov 30 00:	14 .	
drwxr-xr-x 10	0	32 Jan 1 19	70	
-rw-rr 10	0	20180 Nov 30 00:	16 loop	
# chmod +x loop				
# gdbserver 192.168	3.0.1:2222 ./	Loop		
Process ./loop crea	ated; pid = 63	3		
code at 0xeb8040 -	0xebbb80, dat	a at 0xebbb84		
Remote debugging us	sing 192.168.0	0.1:2222		
4				
16				
256				
Child exited with r	•etcode = 0			
Child exited with s	status O			
GDBserver exiting				
#				
Neu Terminal Nr 1				
			and the second second	

Figure 6-24: 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

(DD: /home/dnp5280/	loop.c		
File Edit View Program	n <u>C</u> ommands St <u>a</u> tus				Help
): main		V Lool	kup Find» Break Watch	Print Display Plot S	NOT Rotate Set Undica
<pre>Hinclude <stdio.h> Hinclude <stdio.h> If main (void) If the i= 2; while (i < 256) printf (%ddn*, i= Jreturn (EXIT_SUCCESS) Int square (int x) If return (x * x);</stdio.h></stdio.h></pre>	; ;				K DDD Run Interrupt Step Step Nect Necti Untl Finish Cont Na Up Down Undo Rebo Estt Mesia
NU DDD 3.2.1 (i386-suse Copyright © 1995-1999 Te Copyright © 1999-2000 Ur (gdb) [chnische Universität	Braunschweig, Ge	dreas Zeller. rmany.		

Figure 6-25: 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

×	DDD: /home.	/dnp5280/loop.c	0 🗕 🔺
File Edit View Program Commands	Status Source	Data	Help
O: Imain		V Display Pind Break Watch Print Display Pint Sh	
<pre>#include <stdio.h> #include <stdlib.h> int main (void) { int i= 2;</stdlib.h></stdio.h></pre>			X DDD Run Interrupt Step Stepi
<pre>while (i < 256) printf ("%d\n", i= square (i)); Ireturn (EXIT_SUCCESS); } int square (int x)</pre>			Nexti Until Finish Cont Kill Up Down
return (x * x); }			Undo Redo Edit Make
		Command Line Window	V
Copyright © 1999–2000 Universität Pass (gdb) target remote 192.168.0.126:2222 Remote debugging using 192.168.0.126:2 Oxeb8048 in _start () (gdb)]		+	Ā
A Remote debugging using 192.168.0.126:2222			Ŧ

Figure 6-26: Typing commands in the command line window

This debugger command line sets up the Ethernet-based TCP/IP connection between the PC and the DNP/5280 inside of the IGW/900. Please use the same TCP/IP port number (2222). The sample command line assumes that the DNP/5280 uses the IP address 192.168.0.126.

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



Figure 6-27: 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: BLOCK DIAGRAM

The next figure shows the schematic diagram of the IGW/900. The basis forms a DIL/NetPC DNP/5280 with Motorola Coldfire MCU MCF5280 and a clock rate of 66 MHz. The IGW/900 needs a 12-24 VDC supply. To provide the DNP/5280 inside the IGW/900 with the necessary voltage of 3.3V there is an internal transformator inside of the IGW/900. The connection of the serial interfaces COM1 (RS232) and COM2 (RS485) to the DNP/5280 are made via internal level shifters. For the connection with Ethernet networks there is a 10/100 Mbps interface present, which automatically detect the correct data rate. To check the current system status the IGW/900 is equipped with four LED indicators that signal the providing with power as well as the actual status of the three free programmable ports.



Figure A1-1: Block diagram of the IGW/900

APPENDIX 2: MECHANICAL DIMENSIONS

The IGW/900 has a size of 117 x 22.5 x 90 mm (L x W x H). These dimensions are shown in the figure below. On the backside of the IGW/900 there is a 35 mm DIN rail mounting unit.



Figure A2-1: Mechanical dimensions of the IGW/900



APPENDIX 3: PINOUT IGW/900

		CAN	COM1	COM2			Power	RCM
			RS232	RS232	RS422	RS485		
1234	A1						V+ IN	
	A2	2					GND IN	
	A A3	CAN L						
8888 I	B A4	CAN H						
	B1		RTS					
	B2		TXD					
	B3		RXD					
	B4		CTS					
	C1		Sig. GND	Sig. GND	Sig. GND	Sig. GND		RCM ¬
P1 🛑 🛑 P2	C2			RXD				
pwr 🔵 🛑 P3	C3			TXD				
	C4							RCM -
$\otimes \otimes \otimes \otimes$	C D1				RX+	RX/TX+		
	D D2	2			TX+			
	D3				RX-	RX/TX-		
(<u></u>)	D4	+			TX-			

The table A3-1 shows the assignment of the IGW/900 screw terminal.

= Cable bridge

Table A3-1: Pinout of the IGW/900



APPENDIX 4: GNU GENERAL PUBLIC LICENSE

GNU GENERAL PUBLIC LICENSE. Version 2, June 1991. Copyright © 1989, 1991 Free Software Foundation, Inc. 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA. Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change free software—to make sure the software is free for all its users. This General Public License applies to most of the Free Software Foundation's software and to any other program whose authors commit to using it. (Some other Free Software Foundation software is covered by the GNU Library General Public License in-stead.) You can apply it to your programs, too.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

- 1. If the distribution and/or use of the Program is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Program under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.
- 1. The Free Software Foundation may publish revised and/or new versions of the General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

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

10. If you wish to incorporate parts of the Program into other free programs whose distribution conditions are different, write to the au-



thor to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

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

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

END OF TERMS AND CONDITIONS

How to Apply These Terms to Your New Programs

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

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

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

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

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

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

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

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

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

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

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

Yoyodyne, Inc., hereby disclaims all copyright interest in the program 'Gnomovision' (which makes passes at compilers) written by James Hacker.

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

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



APPENDIX 5: GNU LESSER GENERAL PUBLIC LICENSE

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

Preamble

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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



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

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

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

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

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

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

The modified work must itself be a software library.

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

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

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

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of

this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

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

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

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

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

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

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

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

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

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

SSV

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

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

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

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

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

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

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

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

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

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

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

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

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

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

b) Give prominent notice with the combined library of the fact that part of it is a work based on the Library, and explaining where to find the accompanying uncombined form of the same work.

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

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

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

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



the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Library.

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

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

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

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

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

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

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

NO WARRANTY

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

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

END OF TERMS AND CONDITIONS

How to Apply These Terms to Your New Libraries

If you develop a new library, and you want it to be of the greatest possible use to the public, we recommend making it free software that everyone can redistribute and change. You can do so by permitting redistribution under these terms (or, alternatively, under the terms of the ordinary General Public License). To apply these terms, attach the following notices to the library. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

<one line to give the library's name and a brief idea of what it does.>

Copyright © <year> <name of author>

This library is free software; you can redistribute it and/or modify it under the terms of the GNU Lesser General Public License as published by the Free Software Foundation; either version 2.1 of the License, or (at your option) any later version. This library is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

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

Also add information on how to contact you by electronic and paper mail. You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the library, if necessary. Here is a sample; alter the names:

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

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



LIST OF FIGURES

Figure 2-1: IGW/900 overview	6
Figure 4-1: Mounting the IGW/900 on a DIN-rail	
Figure 4-2: Connecting the IGW/900 with the power supply for software development	
Figure 4-3: Providing the IGW/900 with power in an industrial environment on a DIN-rail	
Figure 4-4: Ethernet link with hub/switch	
Figure 4-5: Ethernet link with crossover cable	
Figure 4-6: RS232 serial link on port COM1	
Figure 4-7: RS232 serial link on port COM2	. 11
Figure 4-8: RS422 serial link	
Figure 4-9: RS485 serial link	
Figure 4-10: Connection of the termination resistor for a RS485 serial link	. 14
Figure 4-11: Connection of the termination resistor for a RS485 serial link	
Figure 4-12: CAN connection	
Figure 4-13: Connection of the termination resistor for a CAN connection	
Figure 4-14: Connection of the termination resistor for a CAN connection	. 16
Figure 4-15: Activation of RCM on the IGW/900	
Figure 5-1: Interface dialog box	
Figure 5-2: Communication parameter settings	
Figure 5-3: Linux boot process	
Figure 5-4: Linux command prompt	. 20
Figure 5-5: Network interface addresses	. 21
Figure 5-6: Windows IP address settings	
Figure 5-7: Communication check via PING	
Figure 5-8: Communication check via ipconfig command	. 22
Figure 5-9: Web page shown by the MS-Internet Explorer	. 23
Figure 5-10: Boot process with RCM jumper set	. 24
Figure 5-11: Assigning a new IP-address to the DNP/5280	
Figure 5-12: Command set with parameters	. 25
Figure 5-13: DNP/5280 Linux boot process	. 26
Figure 5-14: Running the MS-Windows Telnet client	
Figure 5-15: Enter Linux commands via Telnet	
Figure 5-16: Running TFTPD32	
Figure 5-17: Changing the default directory for TFTPD32	
Figure 5-18: Using the DNP/5280 TFTP client within a Telnet session	
Figure 6-1: Serial port settings under Minicom	
Figure 6-2: Linux boot process	
Figure 6-3: Linux command prompt	
Figure 6-4: Ping request	
Figure 6-5: IP-address check via ifconfig	
Figure 6-6: Web page shown by the Konqueror File Manager	
Figure 6-7: Boot process with RCM enabled	
Figure 6-8: Assigning a new IP-address to the IGW/900	
Figure 6-9: Command set with parameters	
Figure 6-10: Linux boot process	
Figure 6-11: Linux login	
Figure 6-12: Enter Linux commands via Telnet	
Figure 6-13: Running TFTPD32	
Figure 6-14: Using the DNP/5280 TFTP client within a Telnet session	
Figure 6-15: Location of m68k-elf-tool-20030314.sh at the DNP/SK14 CD-ROM	
Figure 6-16: Copying m68k-elf-tool-20030314.sh to the local hard disk drive	
Figure 6-17: m68k-elf-tool-20030314.sh creates new directories at /usr/local	
Figure 6-18: Working with the GNU Cross Tool Chain	. 42



Figure 6-19: Compiling a C program with the GNU Cross Debugger	12
Figure 6-20: File transfer and execution	
Figure 6-21: The GNU Cross Debugger at work	44
Figure 6-22: Setting breakpoints	
Figure 6-23: Compiling a C program	
Figure 6-24: File transfer and execution	47
Figure 6-25: Working with the DDD	47
Figure 6-26: Typing commands in the command line window	
Figure 6-27: Using the command button menu window	
Figure A1-1: Block diagram of the IGW/900	50
Figure A2-1: Mechanical dimensions of the IGW/900	

LIST OF TABLES

Table 1-1: Convention usage	4
Table 3-1: Assignment of the general purpose LEDs	
Table A3-1: Pinout of the IGW/900	52

LIST OF APPENDIXES

Appendix 1: Block Diagram	
Appendix 2: Mechanical Dimensions	
Appendix 3: Pinout IGW/900	
Appendix 4: GNU General Public License	
Appendix 5: GNU Lesser General Public License	
List of Figures	
List of Tables	
Helpful Literature	
Contact	
Document History	
•	



HELPFUL LITERATURE

DIL/NetPC DNP5280 Starter Kit User Manual

ColdFire Programmers Reference Manual R.1.0 (MCF5200PRM/AD)

MCF5280 ColdFire Microcontroller User's Manual R.0.1 (MCF5280UM/D)

CONTACT

SSV Embedded Systems

Heisterbergallee 72 D-30453 Hannover Phone +49-(0)511-40000-0 Fax +49-(0)511-40000-40 e-mail: sales@ist1.de Internet: www.ssv-comm.de

DOCUMENT HISTORY

Revision	Date	Remarks	Name
1.0	2004-06-04	first version	WBU
1.1	2004-06-08	errors fixed	WBU

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

Copyright © SSV EMBEDDED SYSTEMS 2004. All rights reserved.

INFORMATION PROVIDED IN THIS DOCUMENT IS PROVIDED 'AS IS' WITHOUT WARRANTY OF ANY KIND. The user assumes the entire risk as to the accuracy and the use of this document. Some names within this document can be trademarks of their respective holders.