

AnaGate CAN USB



User Manual

Analytica GmbH

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AnaGate CAN USB: User Manual

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Abstract

This manual describes the interfaces and modes of operation of a *AnaGate CAN USB*.

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Revision History

Revision History			
Revision 1.0	01.10.2010	JGo	Initial version
Revision 1.1	05.10.2011	ASc	New option <i>Boot with operational mode</i> on web configuration side <i>CAN settings</i> (FW 1.3.16).

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Introduction

This document describes the features and objectives of the CAN-USB-Gateway *AnaGate CAN USB*.

Chapter 1. Description

The *AnaGate CAN USB* connects a PC to a CAN bus via USB. It basically works as a CAN master with no own CAN identifier on the bus.

For this reason the *AnaGate CAN USB* provides a USB interface and a single electrically isolated CAN interface. On the PC side the *AnaGate CAN USB* identifies itself as a network card that allows TCP/IP based access to the connected CAN bus.

Controlling and configuration of an *AnaGate CAN USB* is made through TCP/IP. The application protocol itself is described in detail (see [TCP-2010]). Thus the access to the device can be programmed via native calls to the TCP/IP socket interface. This means that any communication partner with a LAN interface is able to communicate to the device. Accessing the device with the supplied application libraries for Windows and Linux is much comfortable. The libraries includes the entire range of device functions and can be used with conventional programming languages.

1.1. Features

- The *AnaGate CAN USB* can send and receive CAN messages via its CAN interface. This can be done using a PC that supports TCP sockets and USB.
- Variable CAN bus speed (10, 20, 50, 62.5, 100, 125, 250, 500, 800 or 1000 kbps).
- Software configurable bus termination for the CAN interface.
- The *AnaGate CAN USB* is powered directly via its USB port, no external supply is needed.
- Software interface implemented as virtual network adapter, easy access via TCP/IP.
- System is addressed using a proprietary network protocol.
- Static IP address configuration for the *AnaGate CAN USB*, the virtual PC network card is configured automatically via DHCP.
- Several simultaneous network connections (5x TCP) are supported on the CAN interface.

1.2. Specification

Table 1.1. Technical data, AnaGate CAN USB

Technical aspect		Specification
Measurements	Desktop casing	120mm x 58mm x 32mm
	Weight	approx. 125g
CAN bus	Baud rate	10, 20, 50, 62.5, 100, 125, 250, 500, 800 or 1000 kbps, software configuration
	CAN controller	1x Microchip MCP 2515
	CAN interface	1x ISO 11898-2 galvanic decoupled

	Technical aspect	Specification
USB interface	Interface	1x DB9 plug incl. CAN_H, CAN_L and GND
	Signaling rate	12 Mbps
	TCP/IP	Static IP addresses, dynamic assignment (DHCP) to the PC
Voltage supply	Interface	USB connector type B
	Voltage	5V direct current via USB
	Power consumption	max. 500 mA
Ambient temperature	Storage	0 .. 85 °C
	In operation	0 .. 60 °C



Note

Protect the *AnaGate CAN USB* from direct sunlight.

1.3. Scope of delivery

The *AnaGate CAN USB* is supplied with the following components:

- 1x AnaGate CAN USB
- 1x CD with manual, programming API for Windows/Linux and CANopen driver for CANFestival
- 1x USB 2.0 cable

1.4. Interfaces and plugs

1.4.1. AnaGate CAN USB - left view

Figure 1.1. Left view, AnaGate CAN USB



The left side of the *AnaGate CAN USB* features the following connectors and LEDs (from left to right):

USB Port The *AnaGate CAN USB* is connected to the PC via this USB port. A cable with a type A USB plug at its one end and a type B USB plug at the other end needs to be used.

- Busy LED This yellow LED lights up when the *AnaGate CAN USB* is processing incoming CAN messages.
- Power LED This green LED lights up when voltage is being supplied via the USB port.
- Reset The *AnaGate CAN USB* can be reset to the factory settings using this button (see Section 2.5, " Factory reset" for further details).

1.4.2. AnaGate CAN USB - right view

Figure 1.2. Right view, AnaGate CAN USB



The right side of the *AnaGate CAN USB* features the following connectors and LEDs (from left to right):

- CAN port 9 pin D-sub connector to connect the CAN bus (CiA recommendation DS 102).

The pin allocation of the plug can be inferred from the following table.

Table 1.2. Pin layout, CAN plug

Pin	Description
3	GND
2	CAN_L
1,4-6,8,9	not connected
7	CAN_H

 A diagram of a 9-pin D-sub connector. The pins are arranged in two rows. The top row has pins numbered 6, 7, 8, 9 from left to right. The bottom row has pins numbered 5, 4, 3, 2, 1 from left to right. Two circles are shown on either side of the connector, representing the mounting holes.

- Activity LED This green LED lights up on activity on the CAN line.

Chapter 2. Configuration

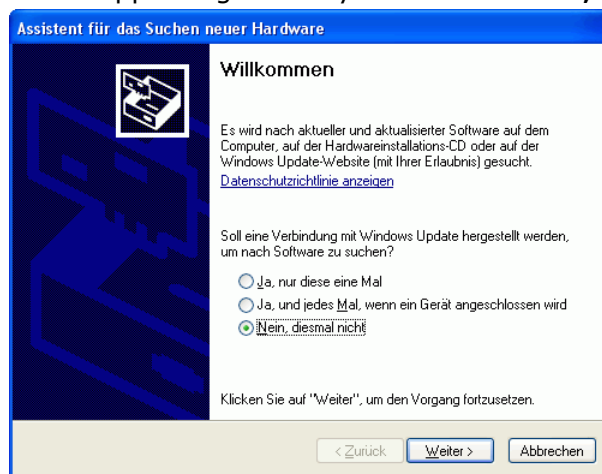
2.1. Initial installation

First the *AnaGate CAN USB* must be connected to the PC via USB.

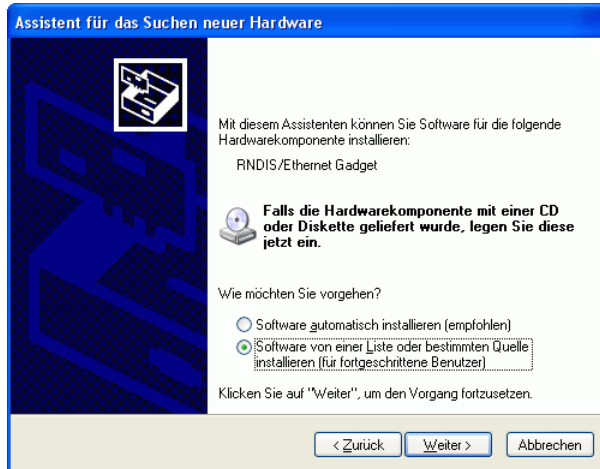
If the PC shows a notification that no device driver could be installed then please proceed as follows:

2.1.1. Microsoft Windows XP

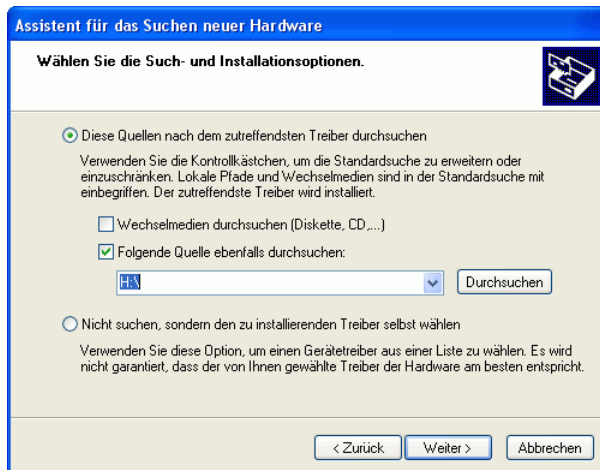
1. If you use Microsoft Windows XP then the **Found New Hardware Wizard** opens when you first connect the *AnaGate CAN USB* to your PC.
2. If the **Found New Hardware Wizard** doesn't start automatically then you can also launch it manually:
 - a. Firstly, right-click the **My Computer** symbol, then click **Properties**.
 - b. In the **System Properties** window switch to the **Hardware** tab and click the **Device manager** button.
 - c. Right click the **RNDIS/Ethernet Gadget** entry that is marked with a yellow exclamation mark symbol and select Update Driver Software.
3. In the appearing wizard you first select **No, not this time** and then click **Next**.



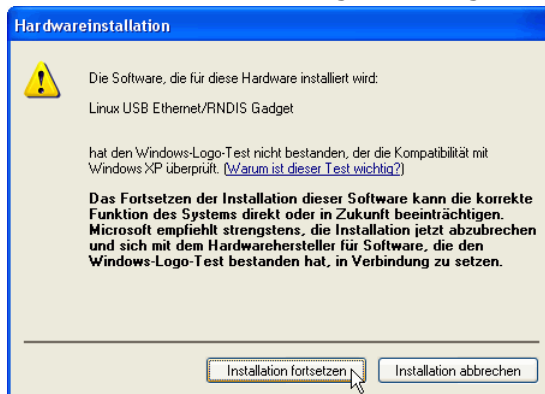
4. Click **Install from a list or specific location (Advanced)**, and then click **Next**.



5. Click **Search for the best driver in these locations** and select the **Include this location in the search** checkbox. Insert the driver CD-ROM and select the driver file at `\drivers\AnaGateUSB\XP\linux.inf` on the CD-ROM by clicking the **Browse** button. Then click the **Next** button.



6. Confirm the Windows Logo warning with **Continue Anyway**.



7. The driver software installation finishes after a short waiting time.

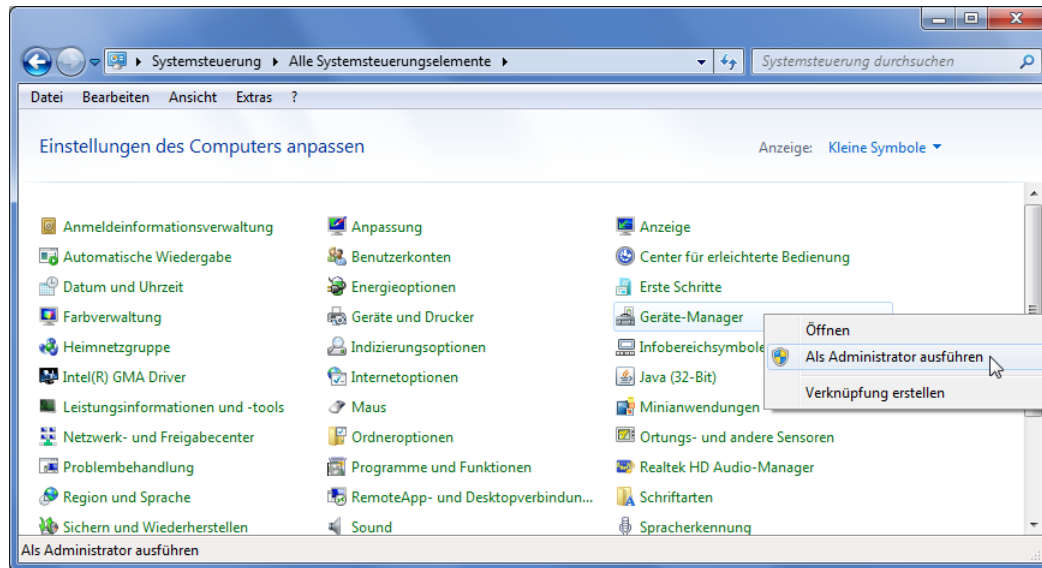


2.1.2. Microsoft Windows 7

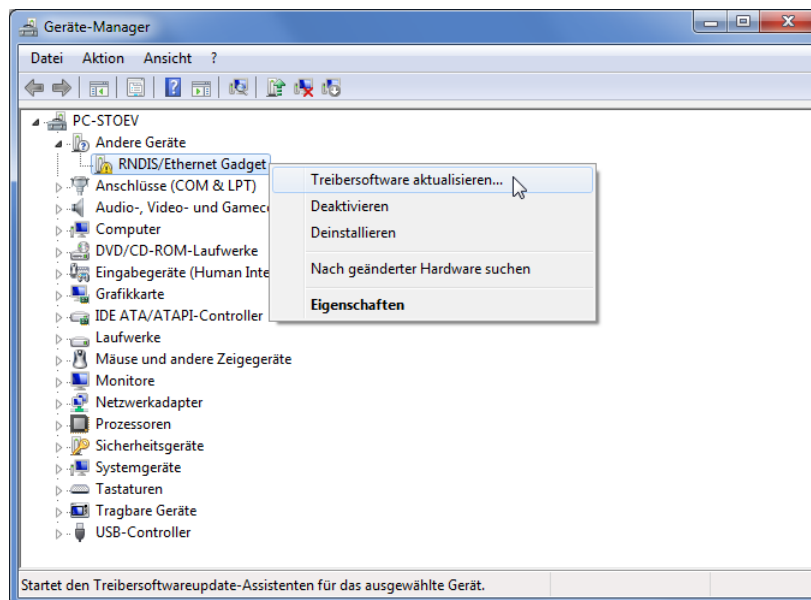
1. If you use Microsoft Windows 7 then open the Control Panel via the Start menu.
2. Switch the display mode in the upper right corner to small symbols.



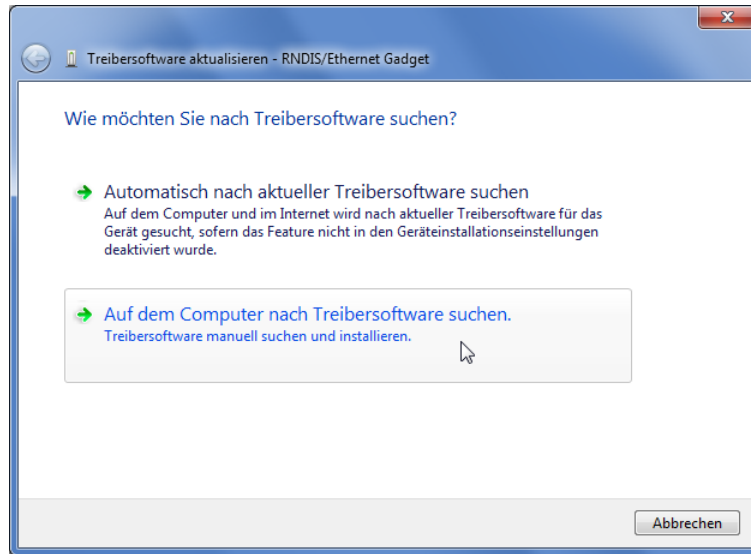
3. Right click the **Device Manager** and launch it with administrator privileges. Enter your administrator password if prompted by the User Account Control.



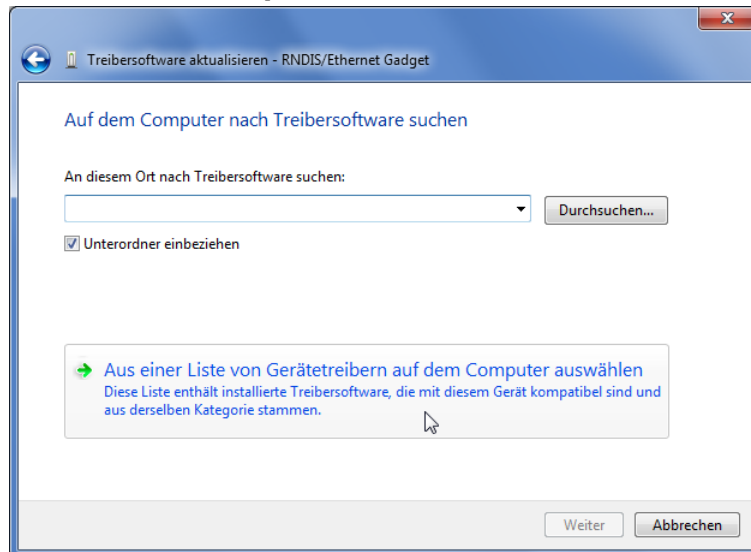
4. Right click the entry **RNDIS/Ethernet Gadget** below **Other Devices** that is marked with a yellow exclamation mark symbol and select Update Driver Software.



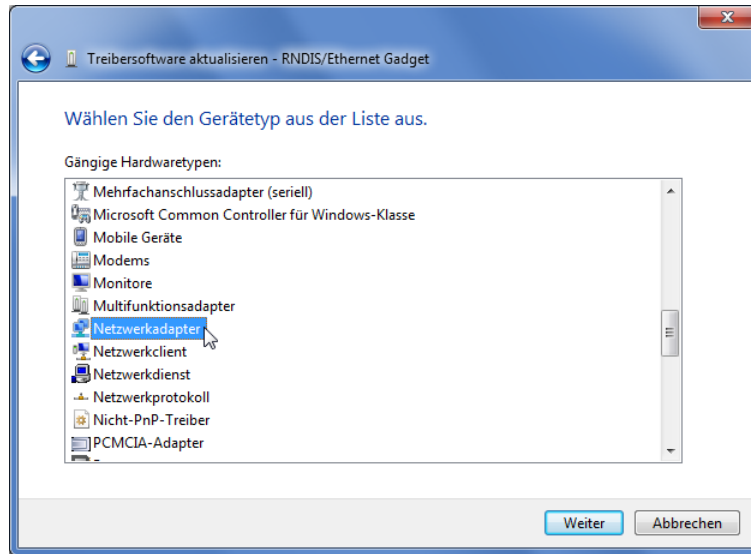
5. In the appearing assistant you first select **Browse my computer for driver software**.



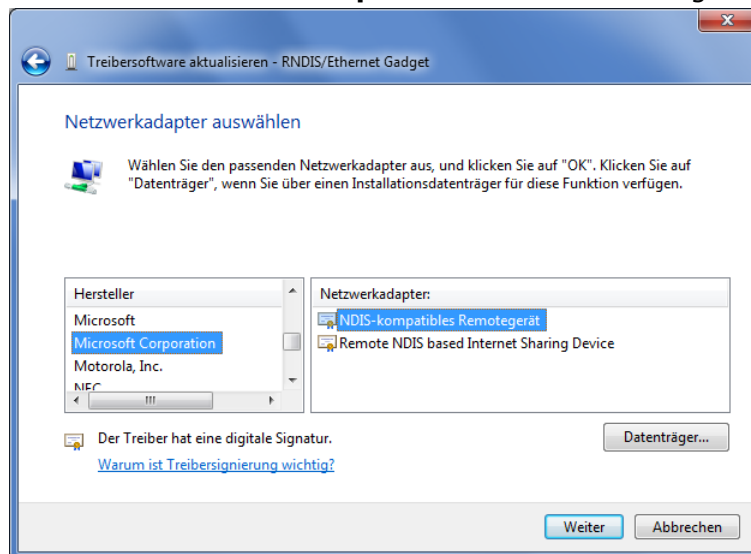
6. Then click **Let me pick from a list of device drivers on my computer.**



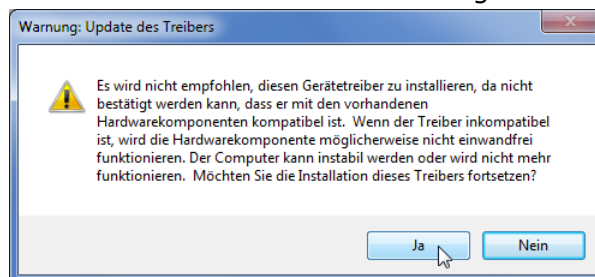
7. In the list of device types, choose **Network adapters** and click the **Next** button.



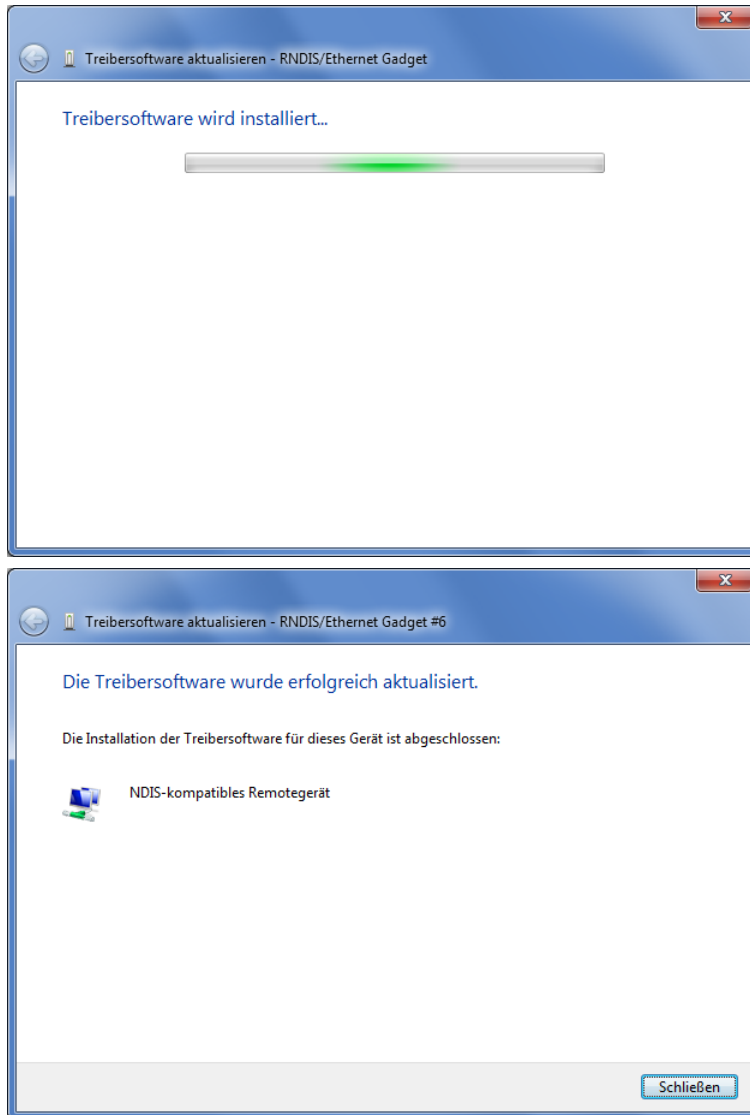
8. Firstly select **Microsoft Corporation** in the manufacturer list on the left and then **Remote NDIS Compatible Device** on the right.



9. Click **Next** and confirm the warning with **Yes**.



10. The driver software installation finishes after a short waiting time.



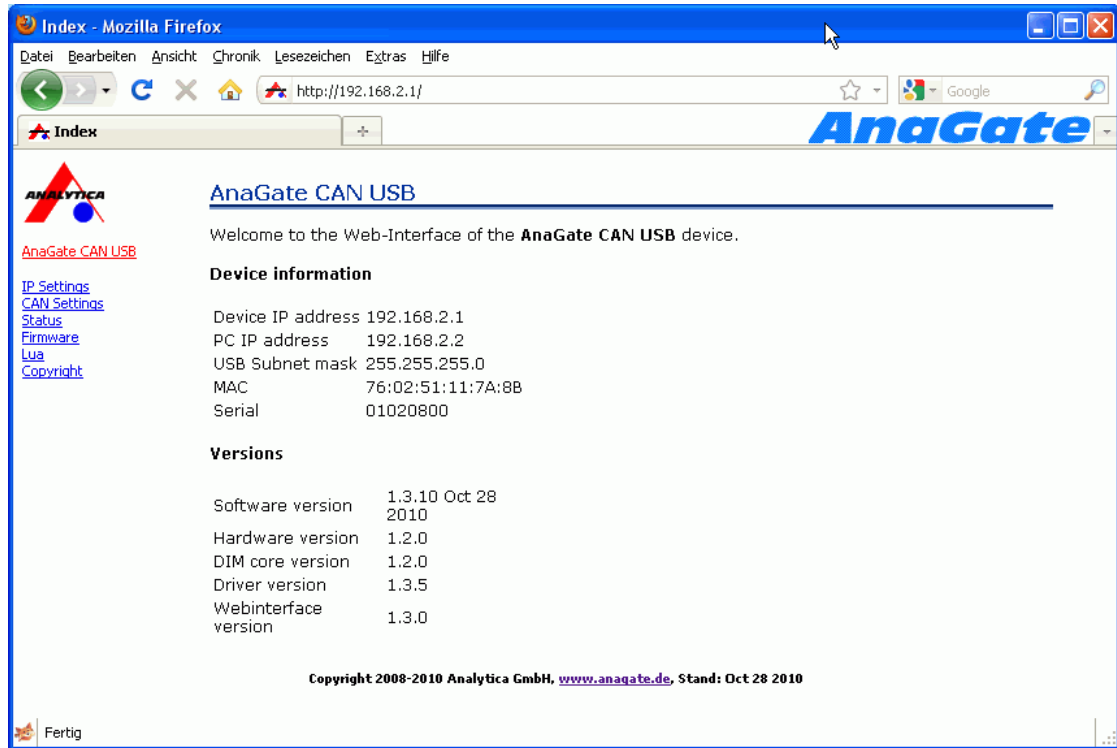
2.1.3. Factory settings

The *AnaGate CAN USB* is delivered with the following initial network settings:

IP address	192.168.2.1
Address type	static
Network mask	255.255.255.0
IP address PC	192.168.2.2

The device can now be configured using a standard browser (Internet Explorer, Firefox, etc.) by using `http://192.168.2.1`.

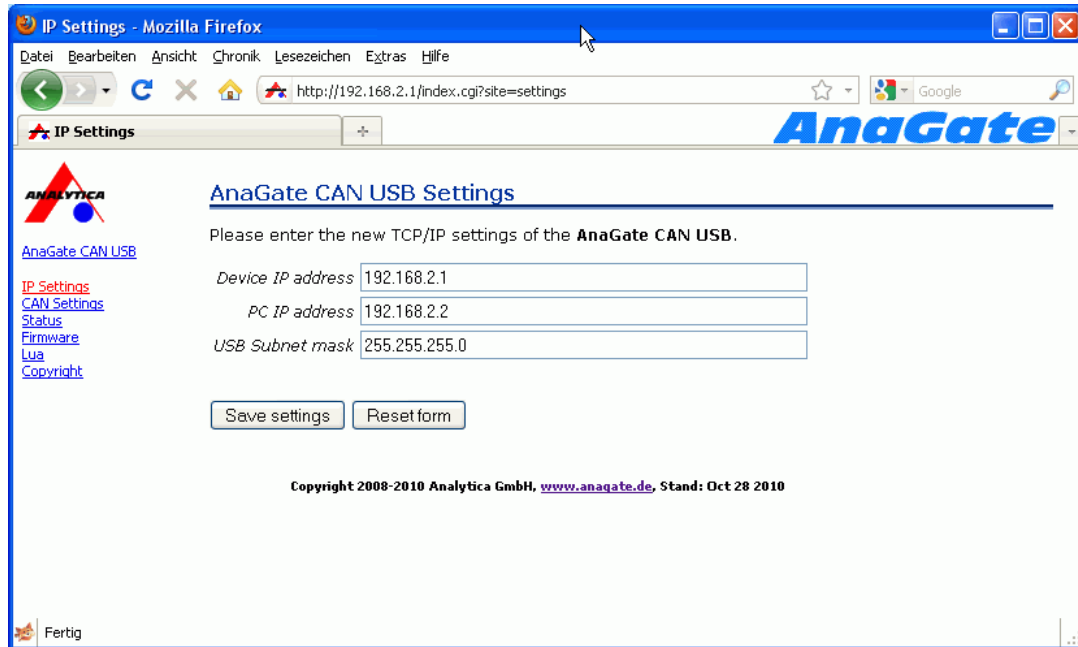
Figure 2.1. HTTP interface, AnaGate CAN USB



2.2. Network settings

On the page *IP Settings* the following settings can be changed.

- | | |
|-------------------|--|
| Device IP address | The IP address of the <i>AnaGate CAN USB</i> is entered in a.b.c.d format (e.g. 192.168.1.200). |
| PC IP address | This IP address a.b.c.d format (e.g. 192.168.1.201) is used by the PC. This IP address must be in the same subnet as the <i>AnaGate CAN USB</i> address. |
| USB Subnet mask | The subnet mask is entered in a.b.c.d format (e.g. 255.255.255.0). |

Figure 2.2. HTTP interface, network settings

The inputs will be taken over immediately after clicking the button **Save settings** and saved permanently on the *AnaGate CAN USB*. A restart of the device is not necessary for activation of the settings.



Note

Maybe the *ARP cache* of the PC has to be deleted to find the device with the changed IP address.



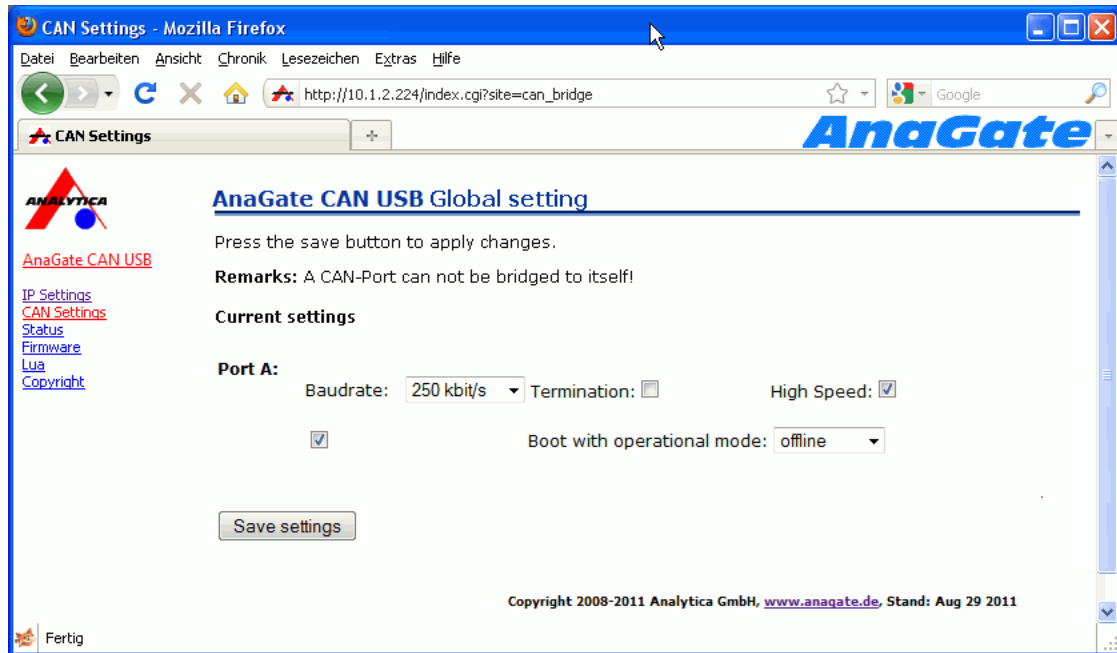
Note

After changing the PC IP address the operating system may use the old address for another up to 15 minutes before it switches to the new value. If the change must be used immediately then temporarily disconnect the *AnaGate CAN USB* from the PC to enforce an update of the used address.

2.3. CAN settings

On the page *CAN Settings* the global settings for the CAN interface are displayed and can be changed individually.

Figure 2.3. HTTP interface, CAN settings



Baudrate	The baud rate can be selected easily via a list box containing all supported values.								
Termination	Use the check box to switch on/off the internal termination resistor.								
High Speed	Activates/deactivates the <i>Highspeed mode</i> . In this operating mode all incoming/outgoing CAN telegrams are not longer confirmed by the opposite LAN side to accelerate process throughput. Software-Filters are switched off too in this mode.								
Boot with operational mode	Initial operating mode of the CAN controller. Default value is offline .								
	<table border="0"> <tr> <td style="padding-left: 20px;">offline</td> <td>The CAN controller is not active on the CAN bus (offline).</td> </tr> <tr> <td style="padding-left: 20px;">normal</td> <td>Normal operating mode. The default setting of CAN baud rate is used.</td> </tr> <tr> <td style="padding-left: 20px;">listen</td> <td>In listen mode the CAN controller is passive. CAN messages are received, but no messages can be sent (no ACK, no error). The default setting of CAN baud rate is used.</td> </tr> <tr> <td style="padding-left: 20px;">loopback</td> <td>In loopback mode every sent CAN message is mirrored back by the CAN controller (no ACK, no errors). The default setting of CAN baud rate is used.</td> </tr> </table>	offline	The CAN controller is not active on the CAN bus (offline).	normal	Normal operating mode. The default setting of CAN baud rate is used.	listen	In listen mode the CAN controller is passive. CAN messages are received, but no messages can be sent (no ACK, no error). The default setting of CAN baud rate is used.	loopback	In loopback mode every sent CAN message is mirrored back by the CAN controller (no ACK, no errors). The default setting of CAN baud rate is used.
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listen	In listen mode the CAN controller is passive. CAN messages are received, but no messages can be sent (no ACK, no error). The default setting of CAN baud rate is used.								
loopback	In loopback mode every sent CAN message is mirrored back by the CAN controller (no ACK, no errors). The default setting of CAN baud rate is used.								

A more detailed description of the operating modes can be found in the data sheet of the CAN controller (Microchip MCP2515).

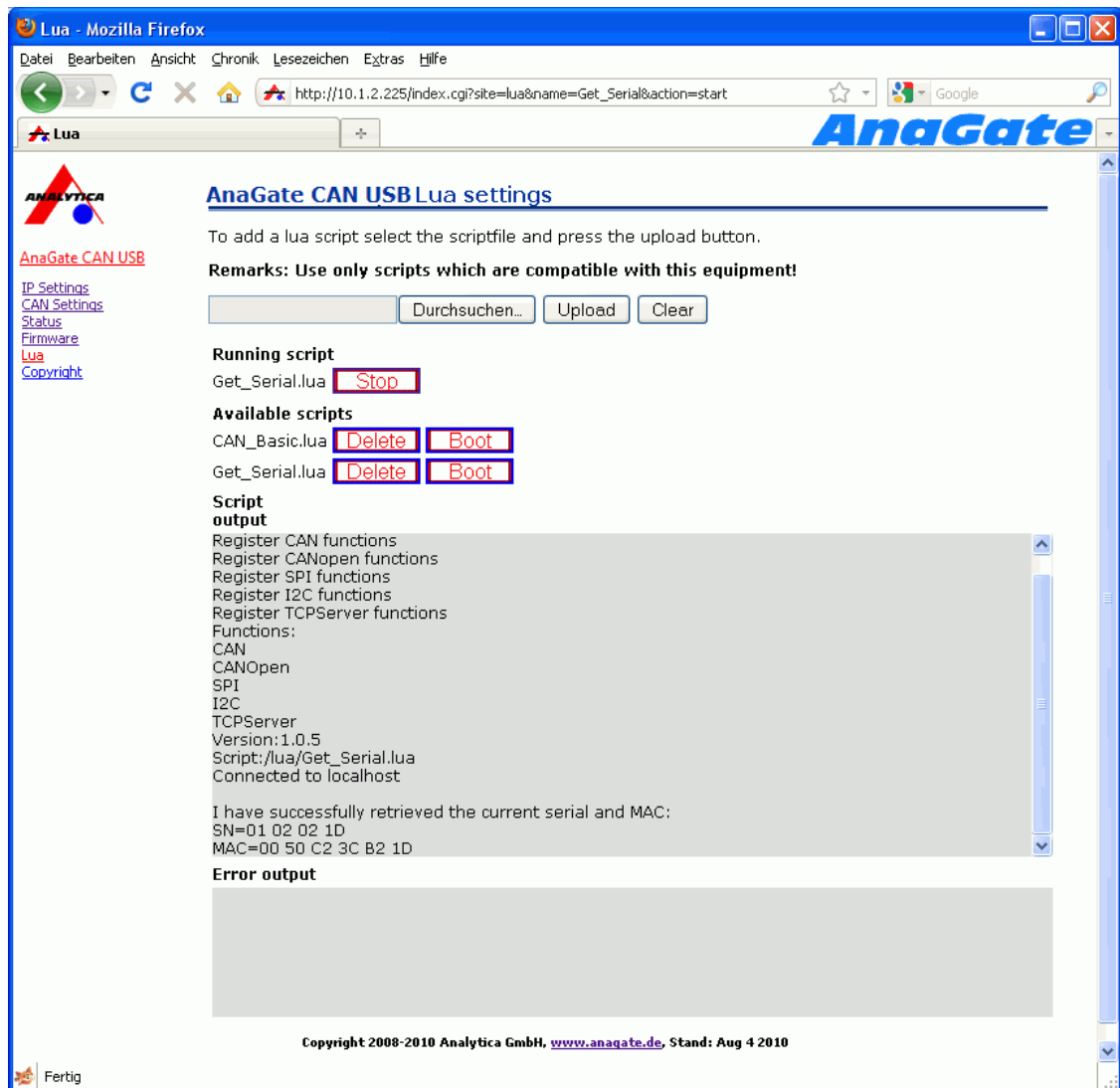
The inputs will be taken over immediately after clicking the button **Save settings** and saved permanently on the *AnaGate CAN USB*. A restart of the device is not necessary for activation of the settings.

2.4. Functional extensions based on Lua

On an *AnaGate CAN USB* it is possible to execute self-created applications with an installed Lua script interpreter (see [Prog-2010] for a detailed description of all programming features).

On the page *Lua* Lua script files can be uploaded to the device and executed locally.

Figure 2.4. HTTP interface, Lua settings



Browse...	Opens a file upload dialog to select a Lua script file.
Upload	Uploads the selected script file to the device.
Clear	Clears the current script file selection.
Boot script	Script file executed on system startup. Via the button Delete the boot script can be deactivated. Only one boot script is allowed.
Running script	Displays the currently executing script file. Via the button Stop the execution can be cancelled.
Available scripts	Displays all scripts which are currently available on the device. To start the execution of a script click on the button Start . Via button Delete a script can be deleted on the device and via Boot a script can be defined as boot script.
script output area	In this text area the standard output (stdout) of the currently executing script is displayed. Via the button Clear this text area can be cleared.
error output area	In this text area the standard error output (stderr) of the currently executing script is displayed. Via the button Clear this text area can be cleared.



Tip

The text areas for script and error output are not refreshed automatically. A manual page reload of the current page refreshes both text areas.

2.5. Factory reset

In order to restore the default factory settings, hold the *RESET* for approx. 10 seconds. If the device is reset successfully, the yellow LED blinks until the *RESET* is released.

The default factory settings are activated immediately without a restart of the device:

IP address	192.168.2.1
Address type	static
Network mask	255.255.255.0
IP address PC	192.168.2.2



Important

If the *RESET* push-button is pressed too briefly, the actual IP address and network mask is pulsed via the yellow LED (Morse code). A second push of the *RESET* terminates the pulsing, the device is not reset.



Note

The factory reset is not possible directly after power on until complete loading of the operating system and the firmware of the device. This

initialization period is signalled via the yellow busy LED. On power on the LED is switched on and after initialization the LED is switched off.



Note

Maybe the *ARP cache* of the PC has to be deleted to find the device with the changed IP address.



Note

After changing the PC IP address the operating system may use the old address for another up to 15 minutes before it switches to the new value. If the change must be used immediately then temporarily disconnect the *AnaGate CAN USB* from the PC to enforce an update of the used address.

2.5.1. Examining the network settings

It is possible to check the current network settings directly on the device.

After pressing shortly the *RESET* button the device starts to pulse out the current n settings via the yellow activity LED. Pressing again the buttons stops the pulsing immediately.

The IP address and subnet mask are pulsed out, one after the other. Following pulse codes are used:

- Digits 1, 2, 3, ..., 9: 1x, 2x, ...9x Flashing (200ms delay between each flash)
- Digit 0: 10x flashing (200ms delay between each flash)
- Dot: 1x very fast flash

Between two single digits a delay of 1 seconds is made, and between the IP address and subnet mask two fast flashes are pulsed out.

Figure 2.5. AnaGate CAN USB, Example blinking output

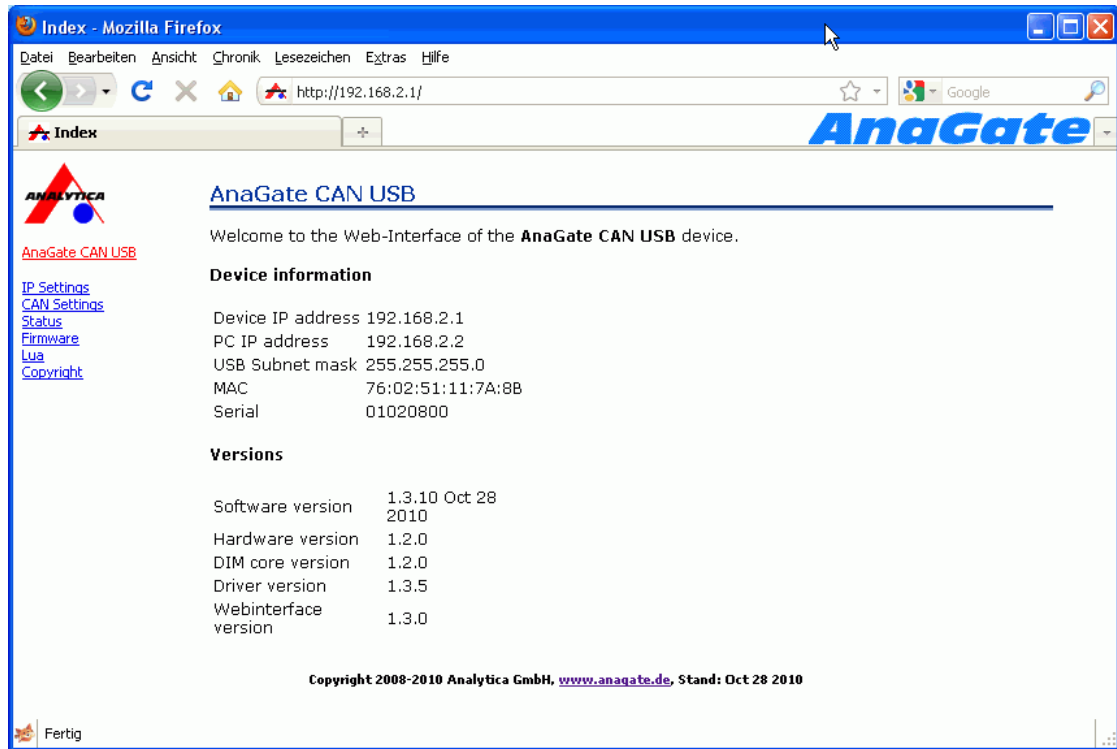


2.6. Firmware update

The device firmware of the *AnaGate CAN USB* is updated via the integrated web server of the device.

On the home page of the web server the current firmware information is displayed.

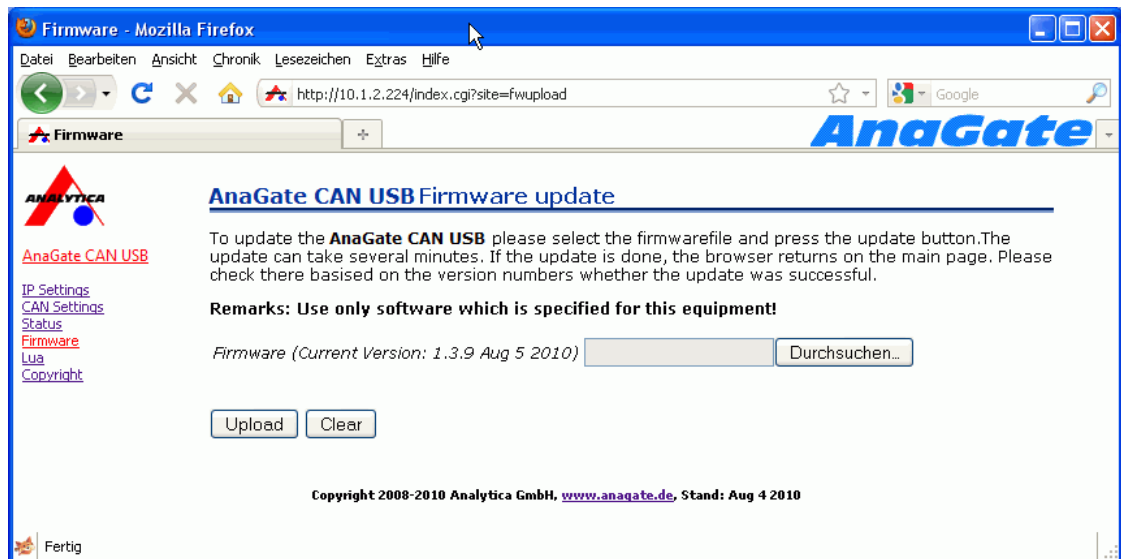
Figure 2.6. HTTP interface, AnaGate CAN USB



Proceed please as follows, in order to install the firmware on the *AnaGate CAN USB*:

- Click *Firmware* on the left navigation bar to navigate to the Firmware-Upload page.

Figure 2.7. HTTP interface, firmware update



- Select the update package (file extension *.upd) via the **Browse** button.
- Clicking on the button **Upload** loads the update file to the device and starts the update process.

- During the update process several installation messages are displayed on the website. If the update is successfully finished, **Update done!** is displayed.

When the update is finished the browser navigates back to the home page. Check, if the new firmware version is displayed here.



Warning

If the firmware could not be flashed correctly on the device, the AnaGate may no longer be ready for operation.

Please visit our web site <http://www.anagate.de> for further information.

Chapter 3. Fields of application

If the *AnaGate CAN USB* is connected to the CAN bus, mind the following facts:

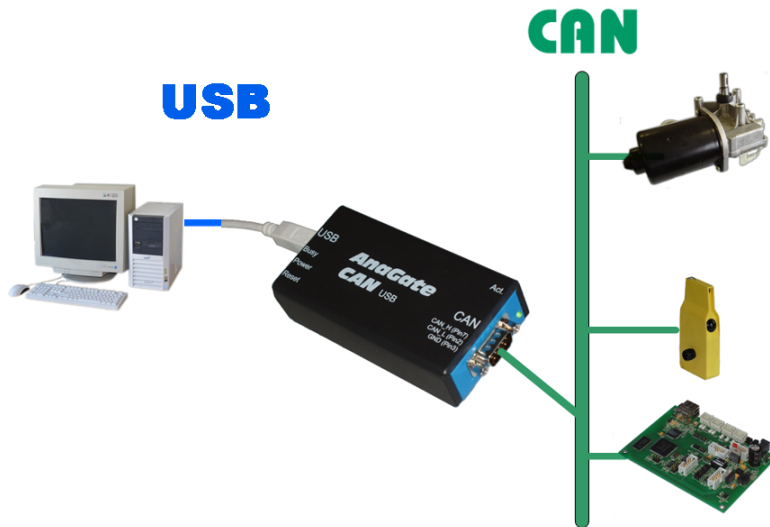
- **CAN_L**: This line has to be connected to the CAN_Low line of the CAN bus.
- **CAN_H**: This line has to be connected to the CAN_High line of the CAN bus.
- **GND**: This line can be connected optionally to GND of the other bus devices.

3.1. Gateway mode

In gateway mode the CAN messages are transferred transparently over TCP/IP between the CAN network and the PC in both directions. The *AnaGate CAN USB* uses no unique CAN ID when sending telegrams, this ID has to be set explicitly for each transmitted message.

All CAN messages received by the device are transmitted to all active application programs. It is possible to discard all incoming messages in general or to set individual software filters to reduce the message traffic to the applications.

Figure 3.1. AnaGate CAN USB in gateway mode



The *AnaGate CAN USB* can be accessed via the following interfaces:

- The software program CAN Monitor, which is included on the documentation CD, can be used to monitor a CAN bus or to create single CAN telegrams.
- Application programs which are using the included software API interface.
- Self-created batch files which are executed via the included Lua interpreter with integrated AnaGate software API.

Appendix A. FAQ - Frequently asked questions

Here is a list of frequently asked questions.

A.1. Common questions

Q: No USB connection

A: Please check first the physical connection to the device. Basically the *AnaGate* has to be connected to a personal computer either directly or through a USB hub. To establish the connection a cable with a type A plug at one end and a type B plug at the other end needs to be used.



The physical interconnection is ok if the green power LED lights up while a USB cable is plugged in and is connected to a running PC. The green LED keeps being on until the connection breaks down.

If the power LED is always off then please check the wiring and the power supply via the PC.

Q: No network connection

A: If the power LED indicates a proper USB connection (see previous FAQ) but you still can't connect to the *AnaGate* then please try the following:

1. Check if the *AnaGate* can be reached via ping. To do so in Windows, open a command prompt and enter the command **ping a.b.c.d**", where a.b.c.d is the device IP address.
2. In case the *AnaGate* is unreachable via ping, reset the device to factory settings. Set up the PC network connection to the *AnaGate CAN USB* to obtain an IP address automatically. Check if the *AnaGate* can be reached via **ping 192.168.2.1**.

3. If the device can be reached via ping then the next step is to try if you can open a TCP connection to port 5001. Open a Windows command prompt and enter **telnet a.b.c.d 5001**, where a.b.c.d is the device IP address. If this command fails, check if a firewall runs on your PC.

Q: Using a firewall

A: When working with a firewall, the a TCP port has to be opened for communication with the AnaGate device:

Table A.1. Using AnaGate hardware with firewall

Device	Port number
AnaGate I2C	5000
AnaGate CAN	5001
AnaGate CAN USB	5001
AnaGate CAN uno	5001
AnaGate CAN duo	5001, 5101
AnaGate CAN quattro	5001, 5101, 5201, 5301
AnaGate SPI	5002
AnaGate Renesas	5008
AnaGate Universal Programmer	5000, 5002, 5008

A.2. Questions concerning AnaGate CAN

Q: What is the value of the termination resistor when the termination option of the device is activated?

A: The termination resistor of the *AnaGate* is driven by an FET transistor. The resistor itself has 110 Ohm while the internal resistance of the FET is 10 Ohm if the FET is activated. So the resulting resistance is 120 Ohm, as required by the CAN bus.

Q: Does Analytica offer a CAN gateway which does not have an galvanically isolated CAN interface?

A: Any device that is actively connected to a CAN bus should be galvanically isolated. Especially when using USB-operated devices (like the *AnaGate USB*), it is essential to have an galvanically isolated device, because the device is power supplied by the PC.

Appendix B. Technical support

The AnaGate hardware series, software tools and all existing programming interfaces are developed and supported by Analytica GmbH. Technical support can be requested as follows:

Internet

The AnaGate web site [<http://www.anagate.de/en/index.html>] of Analytica GmbH contains information and software downloads for AnaGate Library users:

- Product updates featuring bug fixes or new features are available here free of charge.

Email

If you require technical assistance over the Internet, please send an e-mail to

[<support@anagate.de>](mailto:support@anagate.de)

To help us provide you with the best possible support, please keep the following information and details at hand when you contact our Support Team.

- Version number of the used programming tool or AnaGate library
- AnaGate hardware series model and firmware version
- Name and version of the operating system you are using

Abbreviations

CAN	<u>C</u> ontroller <u>A</u> rea <u>N</u> etwork
CiA	CAN in Automation
DHCP	<u>D</u> ynamic <u>H</u> ost <u>C</u> onfiguration <u>P</u> rotocol

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Books

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