Technical Manual for the MDB Interfaces BD-4000

Release: 1.06

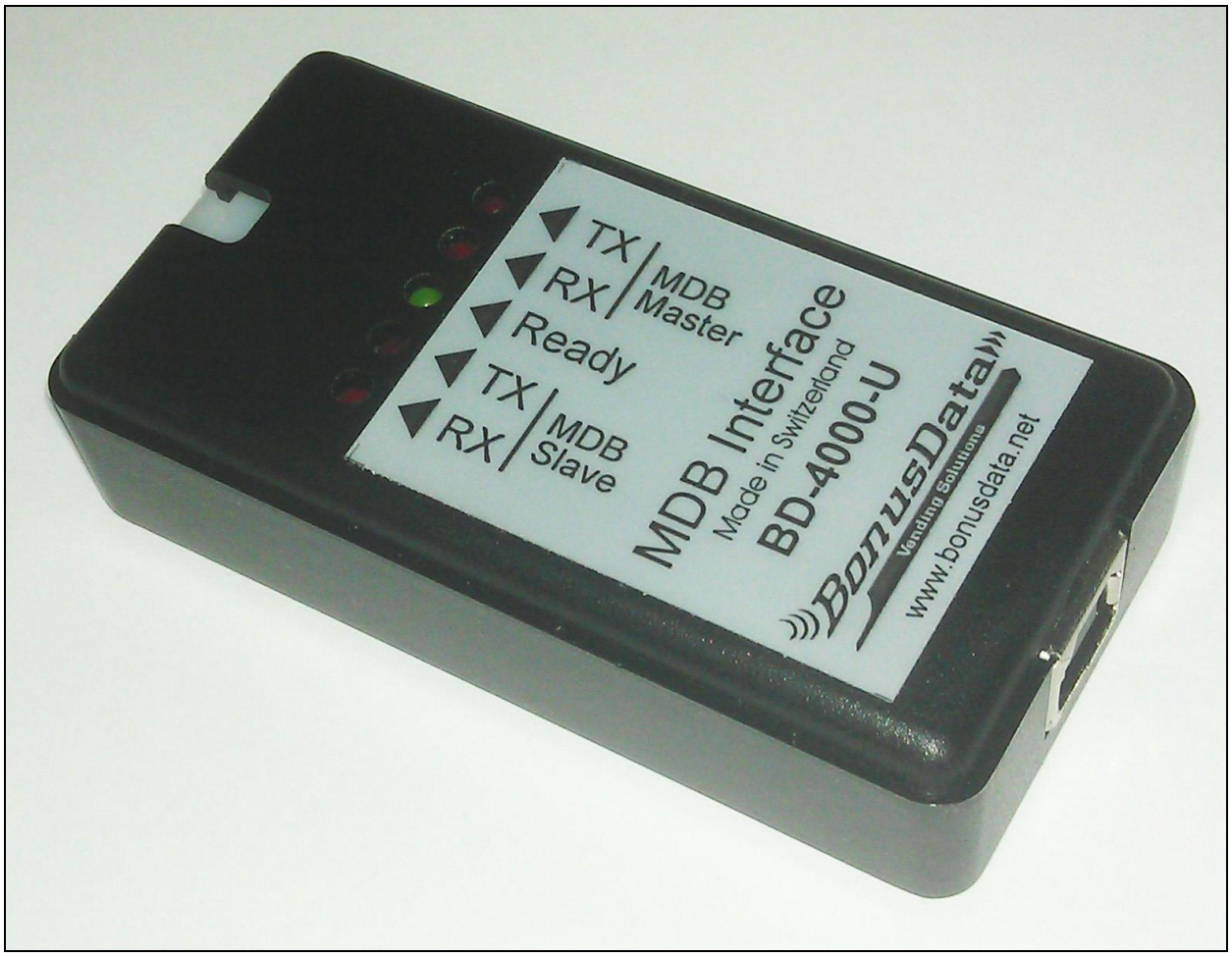


Table of Contents:

General Information:

- The internet link for this product with downloads, information and support is here: http:/www.bonusdata.net/mdb_interface/mdb-interface.html
- If you use a virtual communication port over USB, don't disconnect the USB cable while the application is running on your computer. If it happens, just remember the following: Close the application then reconnect the USB cable and finally restart the application. Otherwise the computer will still use the previous driver and not reestablish the communication.
- If you encounter Error: 10048 when connecting, is this an indication of Port conflict with some other application. To solve this use a different Port number. See configuration section.

Functional Description:

The MDB interface brings the information technology and vending machine technology together. At the vending machine interface connector are four serial ports to connect any combination of vending machine controllers and MDB peripherals. It offers a MDB master port, MDB slave port and two serial RS-232 ports. At the other end it offers three different types of connection: USB, RS-232 and Ethernet.

The BD-4000 was designed for two main purposes, as interface to MDB and as serial data analyzer. It is just a matter of the correct cable set and software configuration to use it in either mode of operation.

The MDB Interface passes the MDB protocol complete transparent from the internet environment to the vending environment. See chapters "MDB master in gateway mode" and "MDB Slave in gateway mode". Therefore is it compliant to the existing MDB standards.

Operating Mode Analyzer:

In this mode of operation the MDB interface will listen on the MDB bus for any data sent in each direction and record each byte together with a status and time stamp. This data are send to the host computer as UDP data packets containing one ore more sampled data bytes. For further details see chapter "Acquisition data protocol".

Operating Mode Gateway:

In this mode of operation the MDB interface is a gateway between MDB bus and internet. It can connect to a MDB bus as master and control MDB peripherals or connect to a MDB bus as slave and emulate one or more MDB peripherals. Even simultaneous operation of both MDB buses is easy possible. The low level implementation of the MDB protocol is implemented direct on the MDB interface. This is the mode bit (9th Bit), timing, ACK / NAK and autonomous polling of the MDB peripherals. For further details see chapter "…….".

New features in hardware release 3

- All in one device: MDB Interface and Enhanced Serial Data Analyzer.
- Information technology compatible design.
- Fully configurable by software.
- Compatible to all PC platforms like Microsoft Windows and Linux.
- Software programmable MDB receiver thresholds.
- Software programmable MDB master loads.
- Full transparent to the MDB protocol.

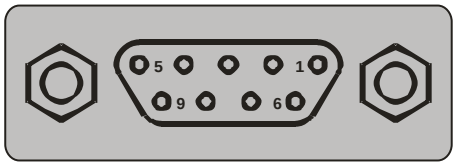
Technical Data:

Manufacturer:	BonusData AG, Made in Switzerland
Dimensions:	79 mm x 40 mm x 22 mm (Length x Width x Height)
Weight:	40 grams (excluding cables)
Enclosure:	Plastic case black
Temperature:	Operating: 0 – 50 Grad Celsius
Controller:	Atmel AVR ATxmega256A3BU Microcontroller
PC Interface:	BD-4000-U: USB type 'B' high speed USB-2 BD-4000-S: RS-232 D-Sub. 9 Pin female connector BD-4000-E: Ethernet RJ-45 100MB
Vending Interfaces:	1 x MDB Master 1 x MDB Slave 2 x RS-232 without handshake lines Molex connector, Part #39-30-1120 See details below
Enclosure:	Plastic black
Power supply:	BD-4000-U: Power supply over USB 5 VDC BD-4000-S: External supply 9 – 12 VDC BD-4000-E: External supply 9 – 12 VDC
Consumption:	BD-4000-U: 25 – 35 mA in idle operating mode BD-4000-S: 25 – 30 mA in idle operating mode BD-4000-E: 140 – 200 mA in idle operating mode
Firmware:	USBBOOT: Boot Loader for the MDB interface. BDRTOS: BonusData Real Time Operating System for ATxmega controller. XMEGA_OS: Firmware of the MDB Interface.

Table 1

D-Sub 9 pin female connector for BD-4000-S

The RS-232 connector for communication with the computer and the power supply for the interface. Here a special cable is necessary to apply the supply voltage to pin #9.



Front view

Fig. 1

Pin #1 = Not used
Pin #2 = Input RXD data line
Pin #3 = Output TXD data line
Pin #4 = Not used
Pin #5 = Signal and power ground
Pin #6 = Not used
Pin #7 = Not used
Pin #8 = Not used
Pin #9 = Power supply +9..12 VDC

Power supply connector for BD-4000-E

The standard power supply connector.

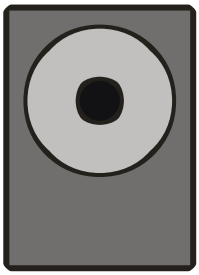


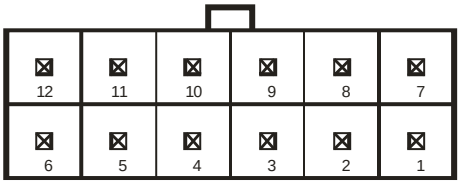
Fig. 2

Center pin: 2mm Diameter
Power supply +9..12 VDC

Shaft: Power ground

The standard interface connector

This connector is equal for all three devices.



Front view
Molex part # 39-30-1120

Fig. 3

The opposite female connector has Molex part # 39-01-2120.

Pin:	Description:
1	MDB Slave, Master Transmit M+
2	MDB Slave, Common
3	MDB Master Receive
4	Ground, Common
5	RS-232 RXD2
6	RS-232 RXD1
7	MDB Slave, Common
8	MDB Slave, Master Receive M-
9	MDB Master Transmit
10	VCC, 5VDC
11	RS-232 TXD2
12	RS-232 TXD1

Table 2

Installation BD-4000-U / BD-4000-S / BD-4000-E:

The BD-4000-U device with USB will show up as a virtual serial port after connecting it to a USB port of a PC. It uses the PPP protocol to communicate with the PC and will behave like a standard modem.

The installation for the BD-4000-S can skip step one as the serial communication port is already there.

The software installation requires three steps:

- Step 1: Install the USB link with the driver script supplied by BonusData AG. You will see a new virtual serial port COM1..COM255 after connecting the device.
- Step 2: Install a dialup modem by setup of a “Communication cable between two computers (COMn)” and using the virtual communication port of Step 1.

- Step 3: Configure a internet connection using the modem installed in Step 2.

The application software, e.g. Enhanced Serial Data Analyzer (ESTA.EXE) can then automatically connect to this new connection.

Installation on Windows XP:

Step 1: Installing the USB link

The device does not need any special driver software, just the configuration script BD-4000.INF supplied by BonusData AG and finally located in C:\WINDOWS\INF folder. As communication driver the USBSER.SYS supplied with Microsoft Windows is used. This file is normally found in folder C:\WINDOWS\SYSTEM32\DRIVERS or may be requested from the Windows installation package.

- Plug the USB cable to a free USB port of your computer.

Fig. 4

- Select “No, not this time”.
- Click -> Next

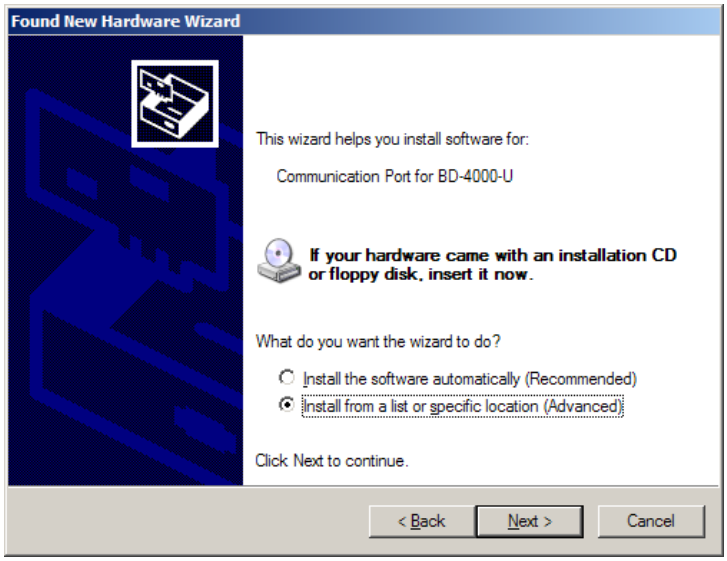


Fig. 5

- Select “Install from a list or specific location (Advanced).
- Click -> Next

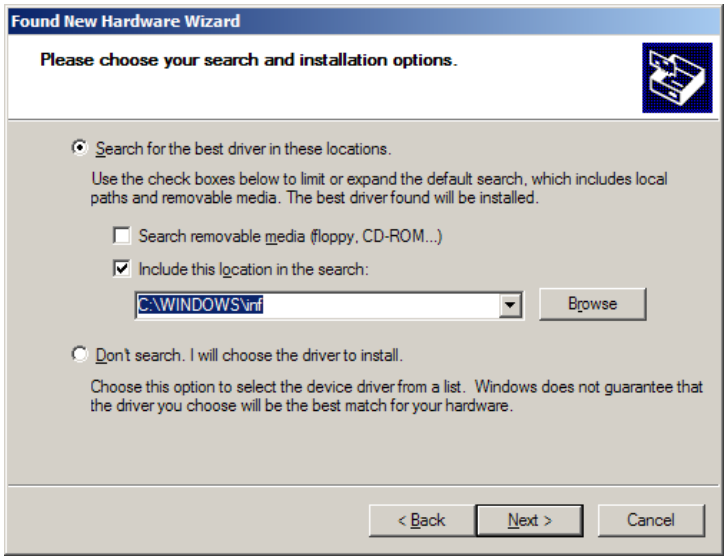


Fig. 6

- Browse to the path where the file BD-4000.INF is located. (In this case the file is already in the folder C:\WINDOWS\INF)
- Click -> Next

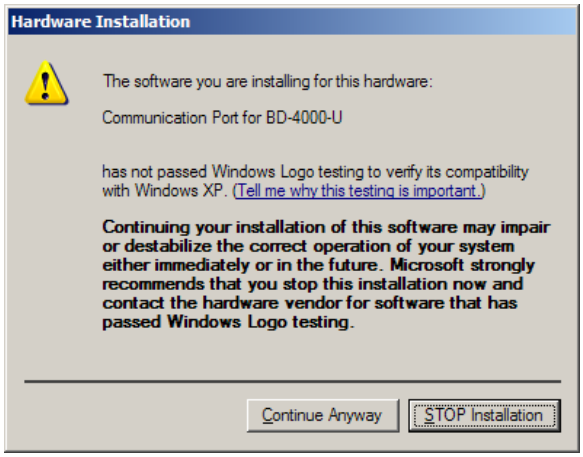


Fig. 7

- The script is NOT Windows Logo tested.
- Click -> Continue Anyway

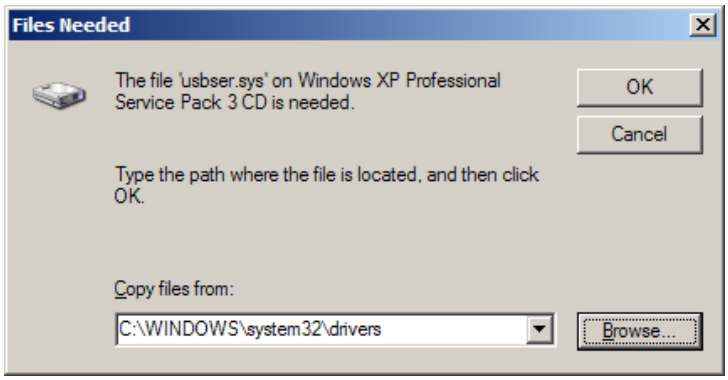


Fig. 8

- Now Windows looks for the USBSER.SYS file, which it part of the Windows installation package.
- Browse for the location C:\WINDOWS\SYSTEM32\DRIVERS
- If it's not there Windows requires the installation package.
- Click -> OK

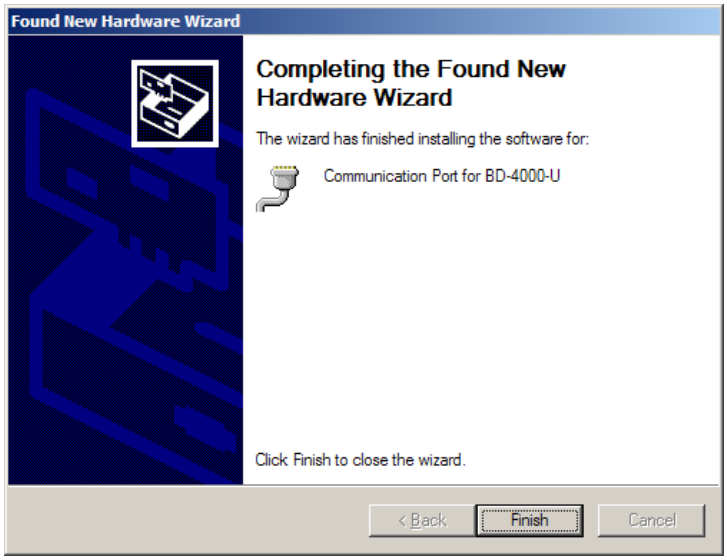


Fig. 9

- The USB link is now installed.
- Click -> Finish
- Verify in the device manager if the virtual communication port is really there and what COMx name was assigned.

Step 1A: Change the communication port name

Open the device manager and check for the communication link you like to change located in the folder Ports (COM & LPT).

- Click on the requested communication link.

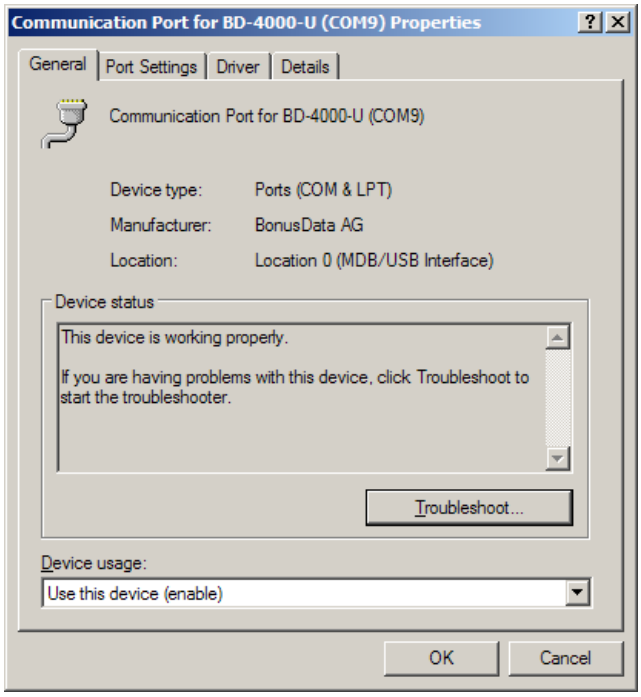


Fig. 10

- Select “Port Settings”

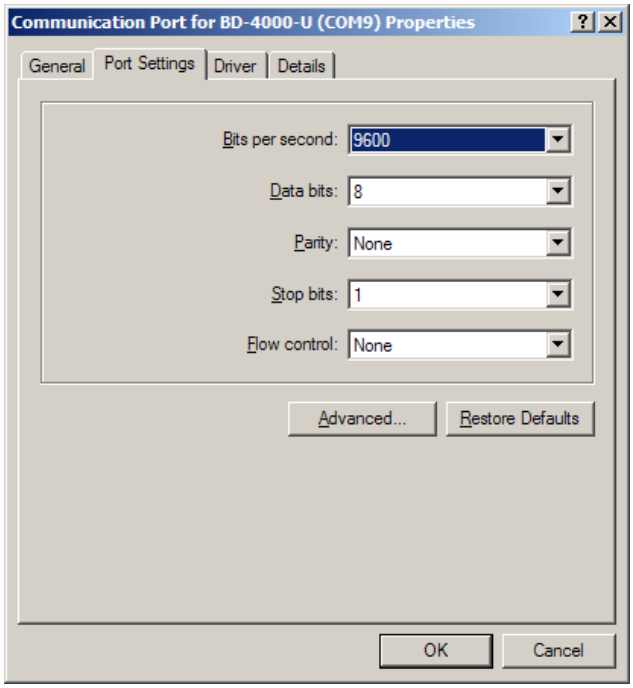


Fig. 11

- Click -> Advanced

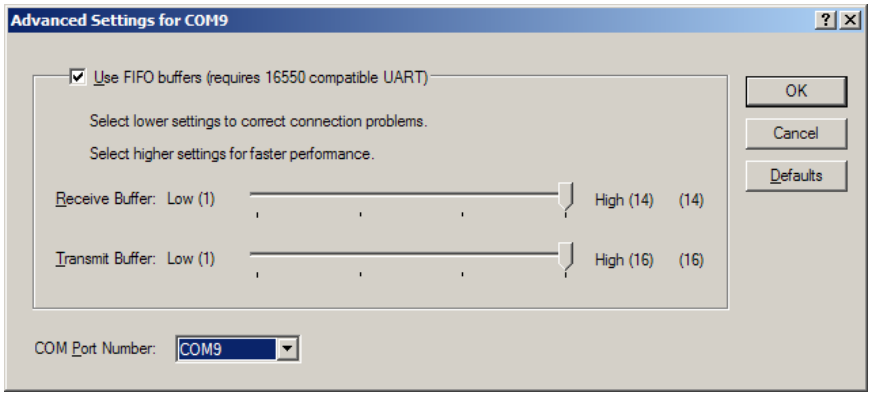


Fig. 12

- Change COM Port Number but avoid any conflicts with other used communication ports.
- Click -> OK
- Click -> OK again

Note: The device manager will not display the change unless there is a refresh.

Step 2: Installing the dialup modem

- Click -> Start
- Click -> Control Panel.
- Click -> “Phone and Modem Options”.

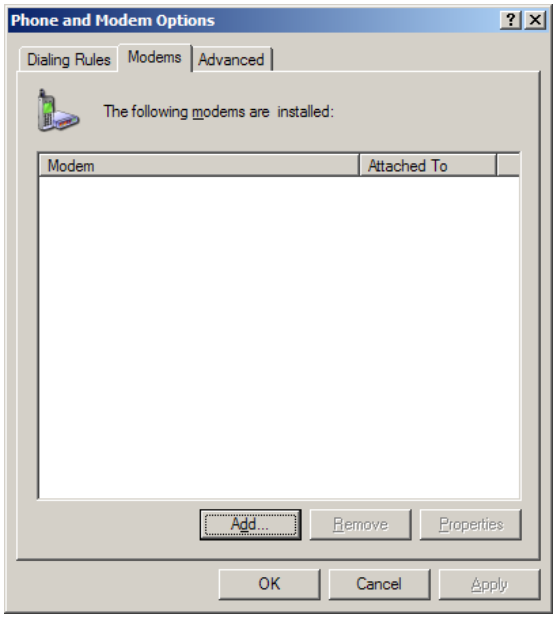


Fig. 13

- Select Modems Tab at top center.
- Click -> Add to add a new modem.

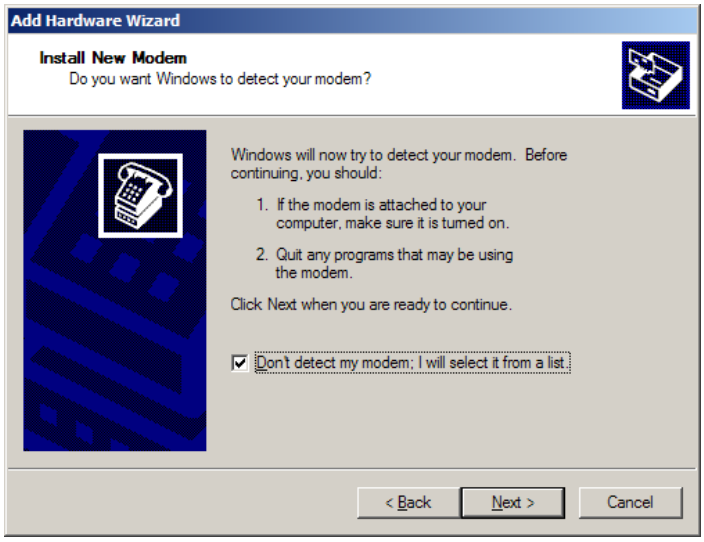


Fig. 14

- Check “Don’t detect my modem; I will select it from a list.”
- Click -> Next.

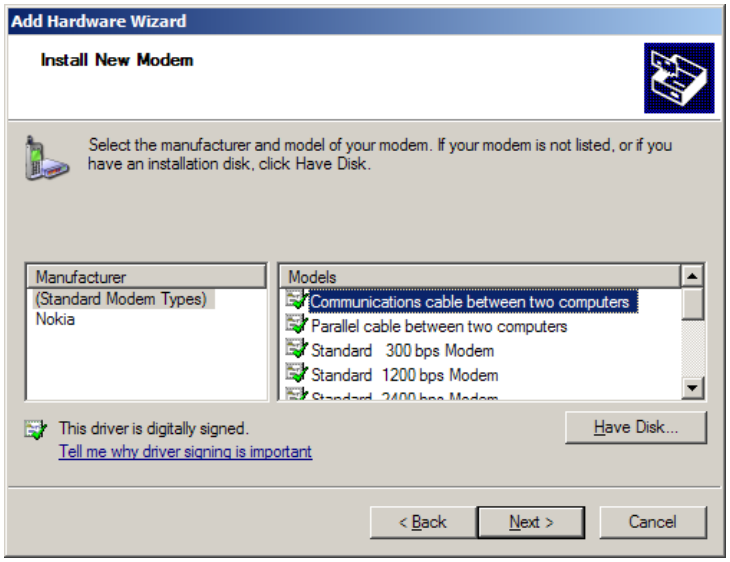


Fig. 15

- Select “Communication cable between two computers”.
- Click -> Next

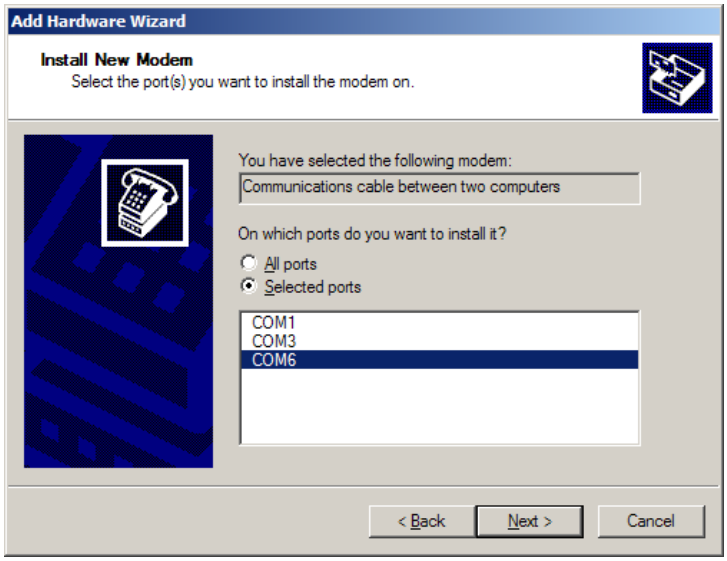


Fig. 16

- Select the COMx port you installed in step 1 or Step 1A.
- Click -> Next

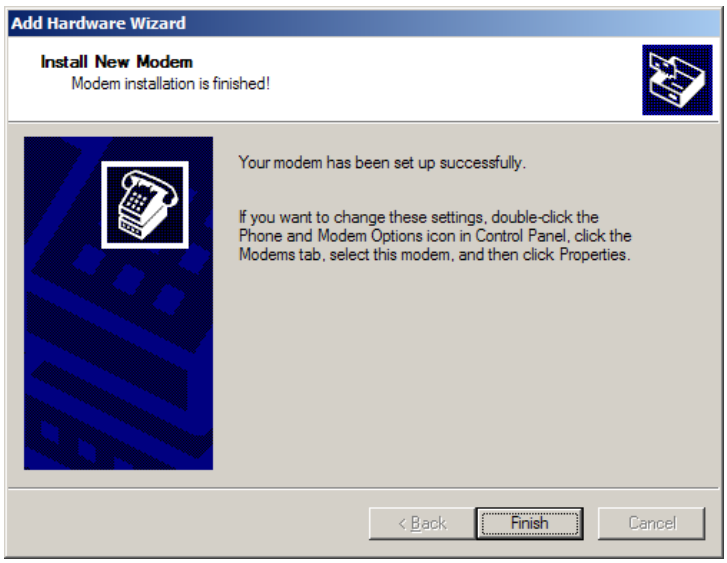


Fig. 17

- Check if it has been set up successfully.
- Click -> Finish

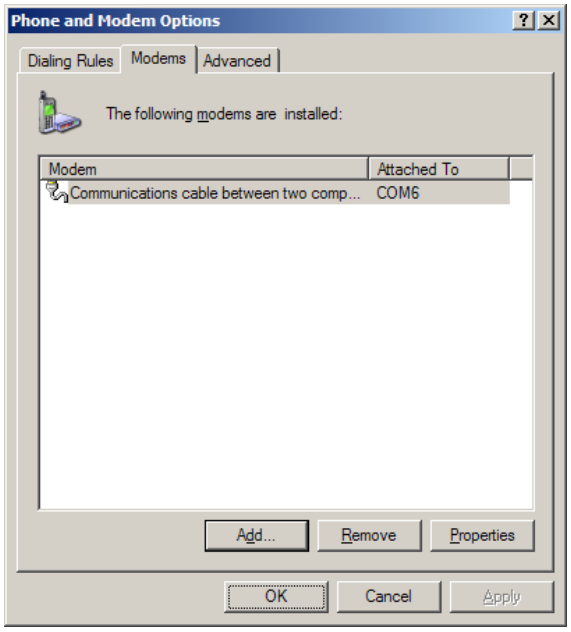


Fig. 18

- Select “Communication cable between to computer”.
- Click -> Properties

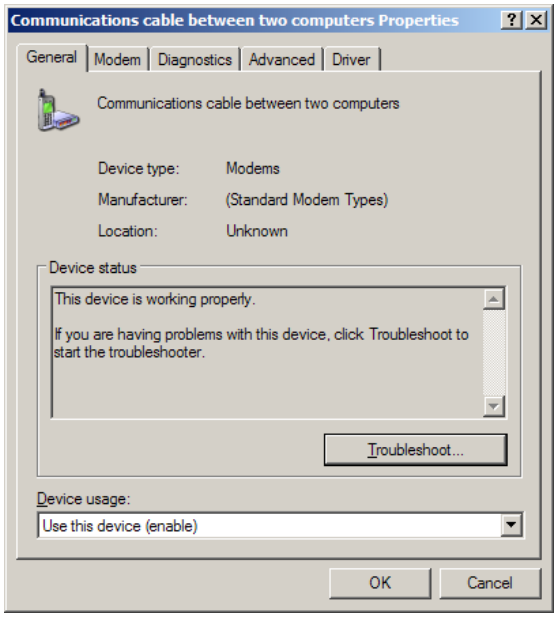


Fig. 19

- If it looks like this you are fine.
- Click -> OK
- Go on to Step 3

Step 3: Configure the internet connection

- Click -> Start
- Click -> Control Panel.
- Click -> “Network Connections”.
- Click -> “Create a new connection”.

Fig. 20

- Click -> Next

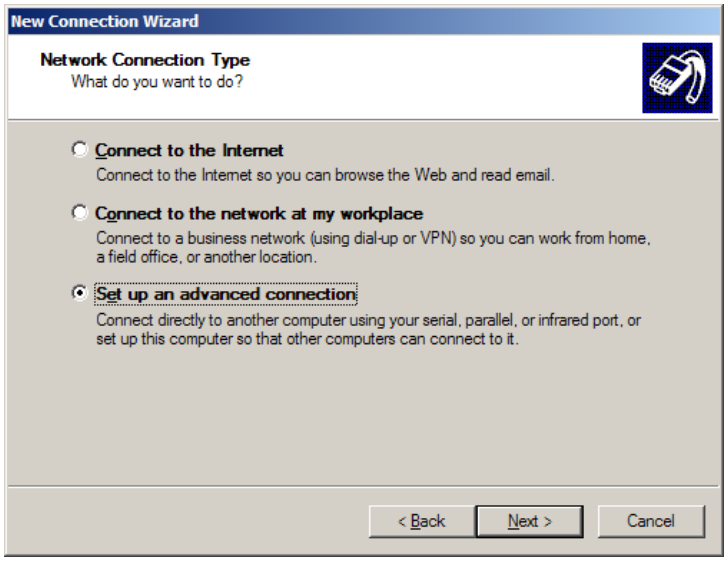


Fig. 21

- Select “Set up an advanced connection”.
- Click -> Next

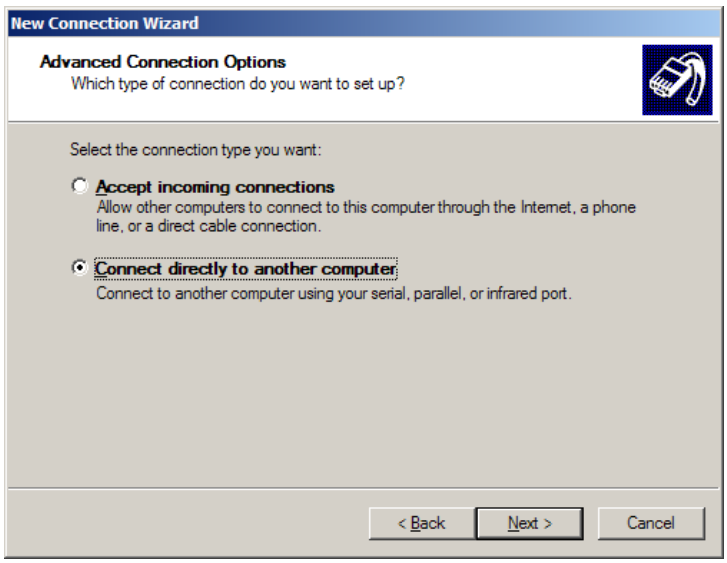


Fig. 22

- Select “Connect directly to another computer”.

- Click -> Next

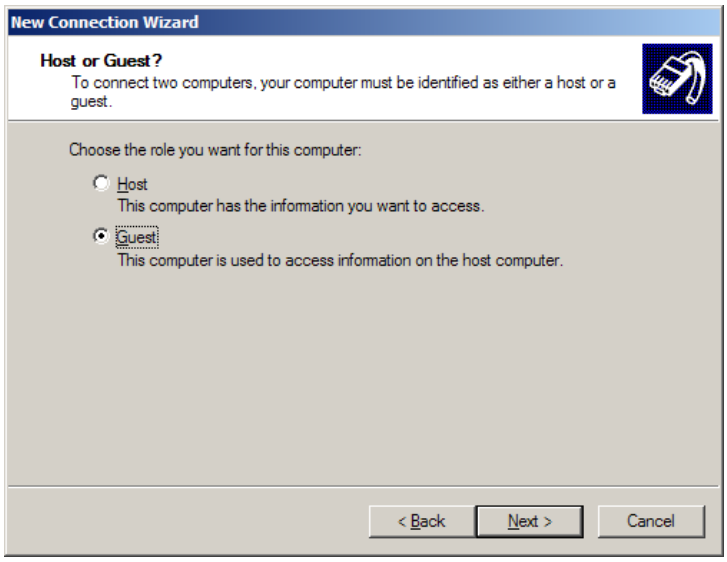


Fig. 23

- Select “Guest”.
- Click -> Next

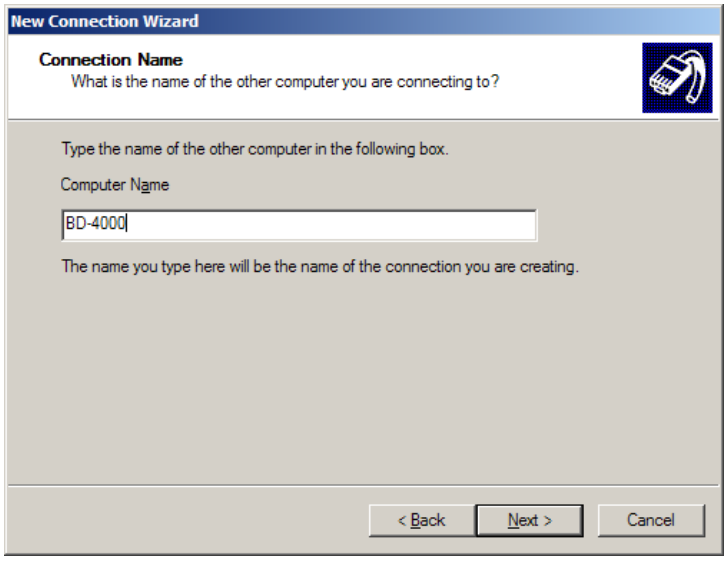


Fig. 24

- Enter the connection name. (Default: BD-4000)
- Click -> Next

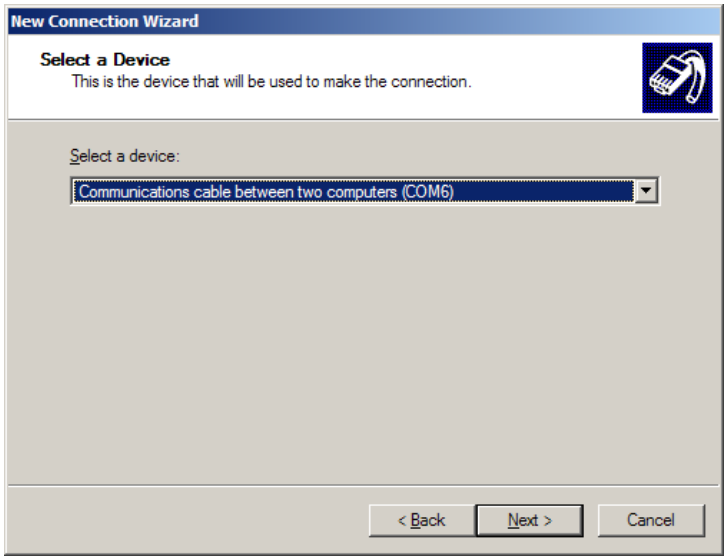


Fig. 25

- Select the device as it has been set up in Step 2.
- Click -> Next

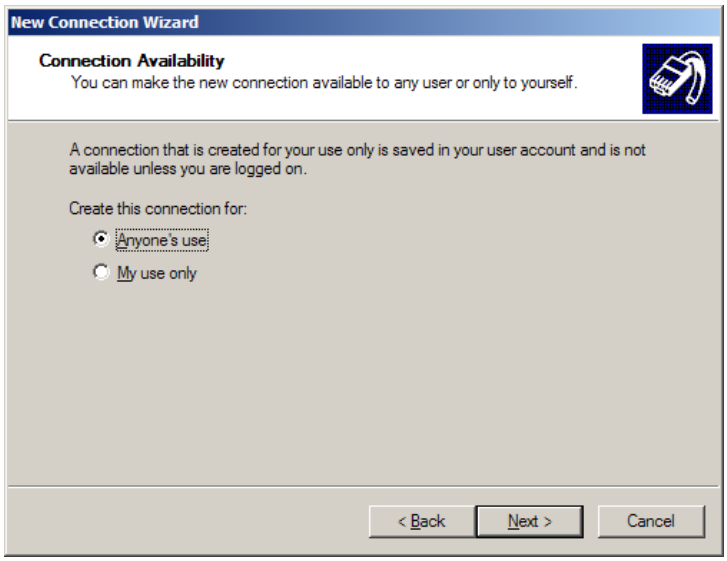


Fig. 26

- Click -> Next

Fig. 27

- Click -> Finish

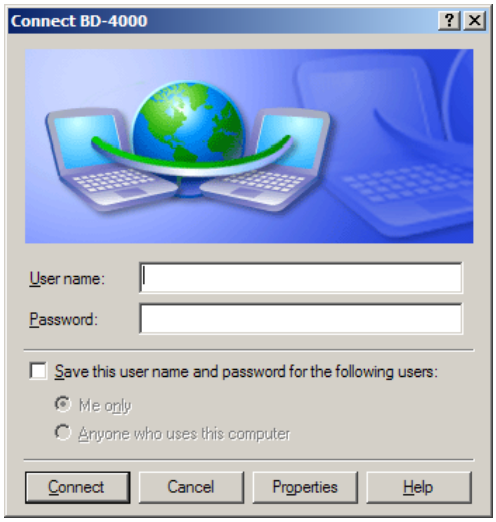


Fig. 28

- Leave it empty.
- Click -> Properties

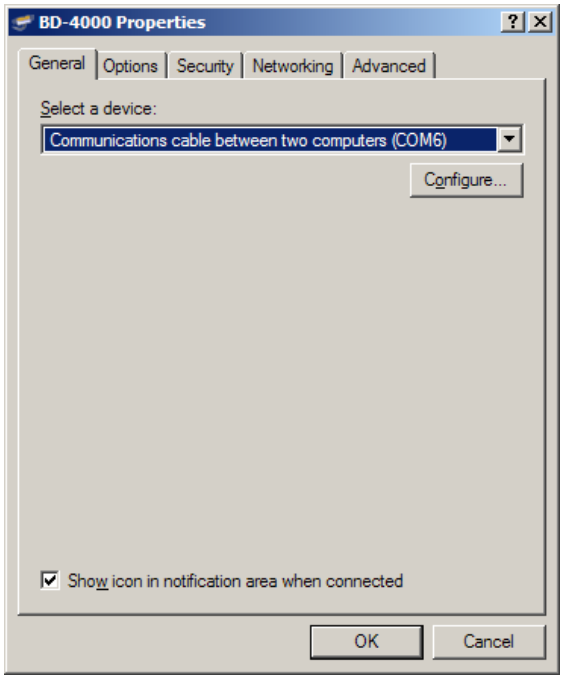


Fig. 29

- Select the correct connection.
- Click -> Configure…

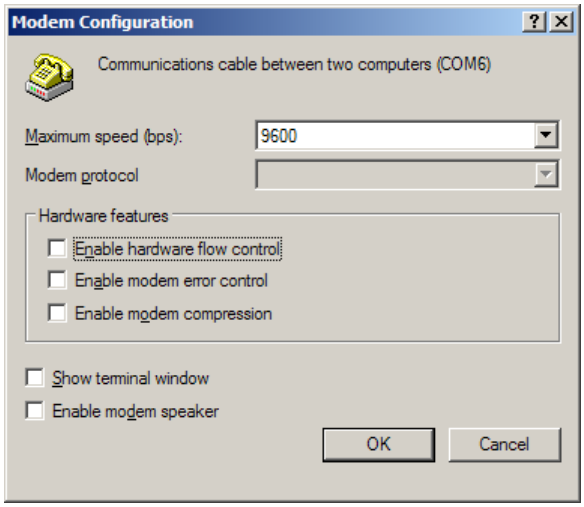


Fig. 30

- Select the speed 9600. (Not relevant for the real speed.)
- Uncheck all check boxes.
- Click -> OK
- Select tab Options

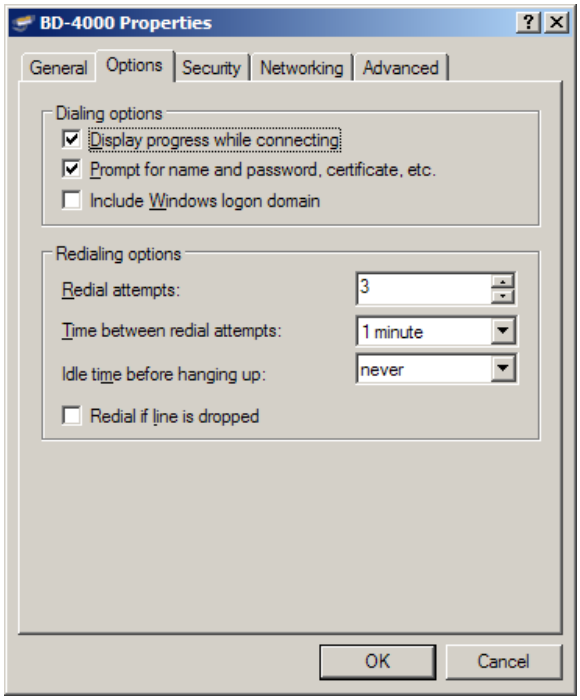


Fig. 31

- If it looks like this continue.
- Select tab “Security“.

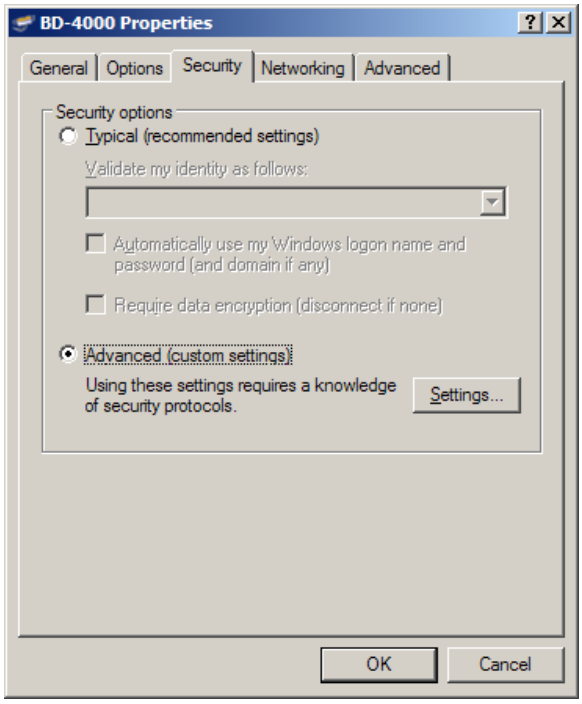


Fig. 32

- I fit looks like this continue.
- Click -> Settings

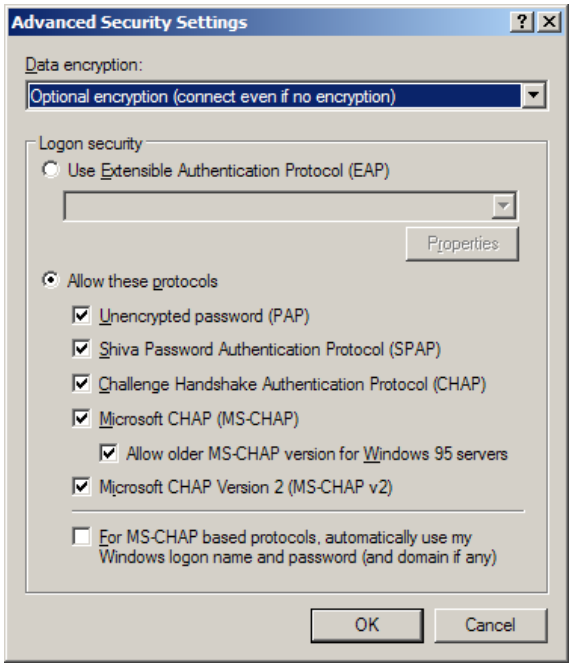


Fig. 33

- If it looks like this continue.
- Click -> OK
- Select tab Networking

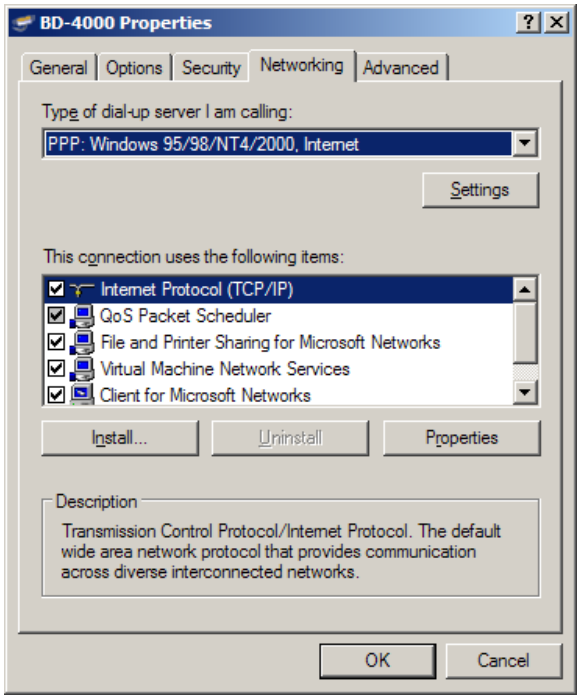


Fig. 34

- Select “PPP: Windows 95/98/NT4/2000, Internet”.
- Click -> Settings

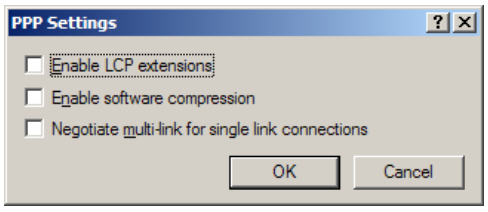


Fig. 35

- Uncheck all check boxes here. (Important!)
- Click -> OK
- Select "Internet Protocol (TCP/IP)".
- Click-> Properties

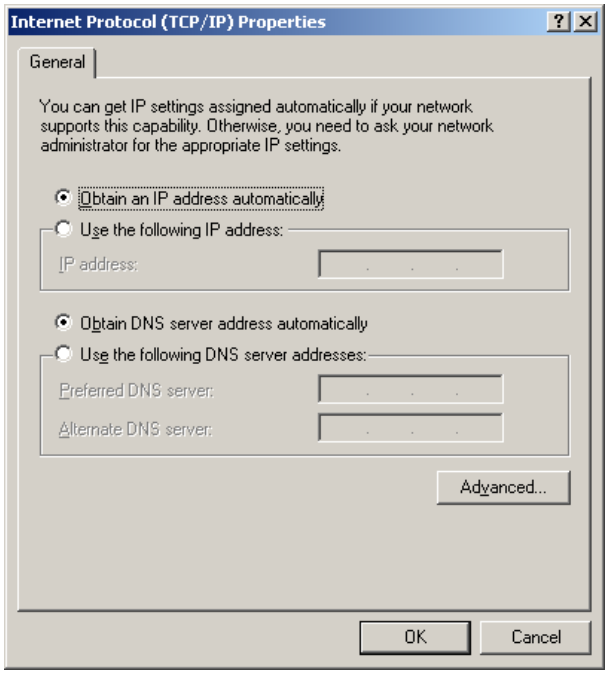


Fig. 36

- Click -> Advanced

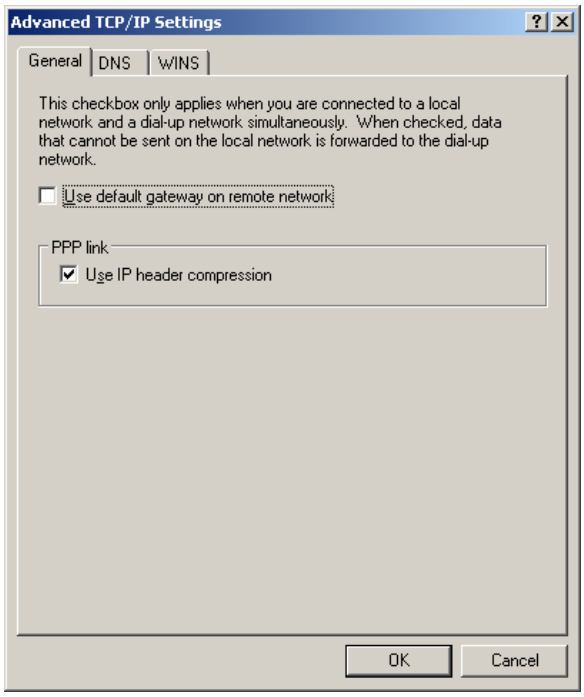


Fig. 37

- Uncheck "Use default gateway on remote network".
- Click -> OK
- Click -> OK again
- Select tab Advanced.

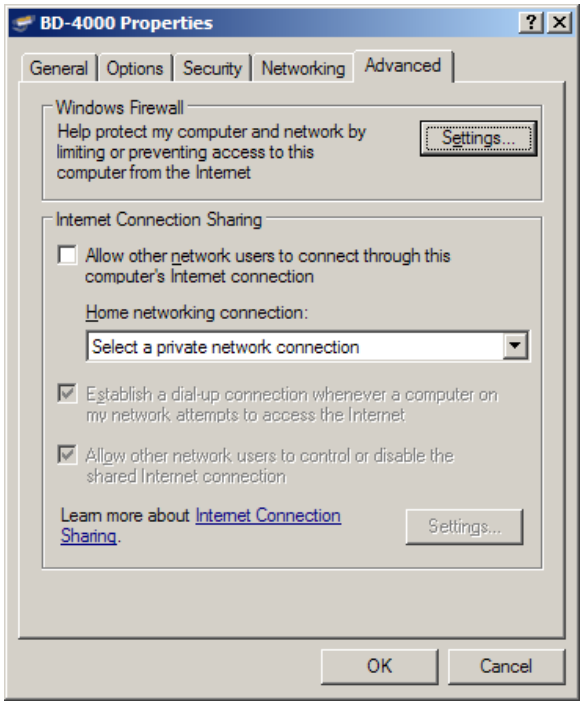


Fig. 38

- If it looks like this continue.
- Click -> OK
- The new connection should be ready at this point.

Testing the new connection

The connection symbol can be found at the screen right bottom in the task bar.

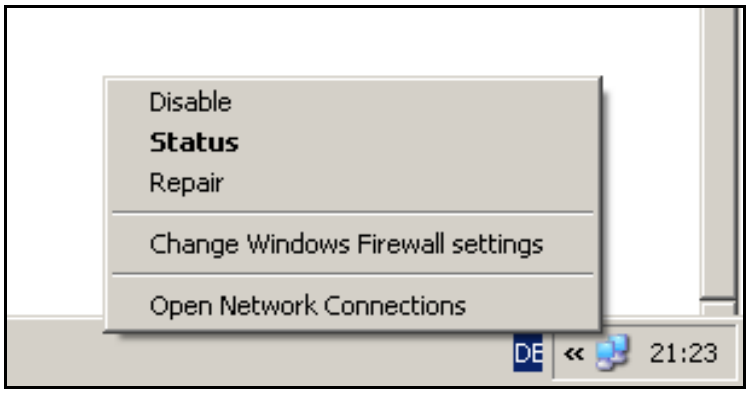


Fig. 39

- Right click the connection symbol
- Click -> "Open Network Connections".

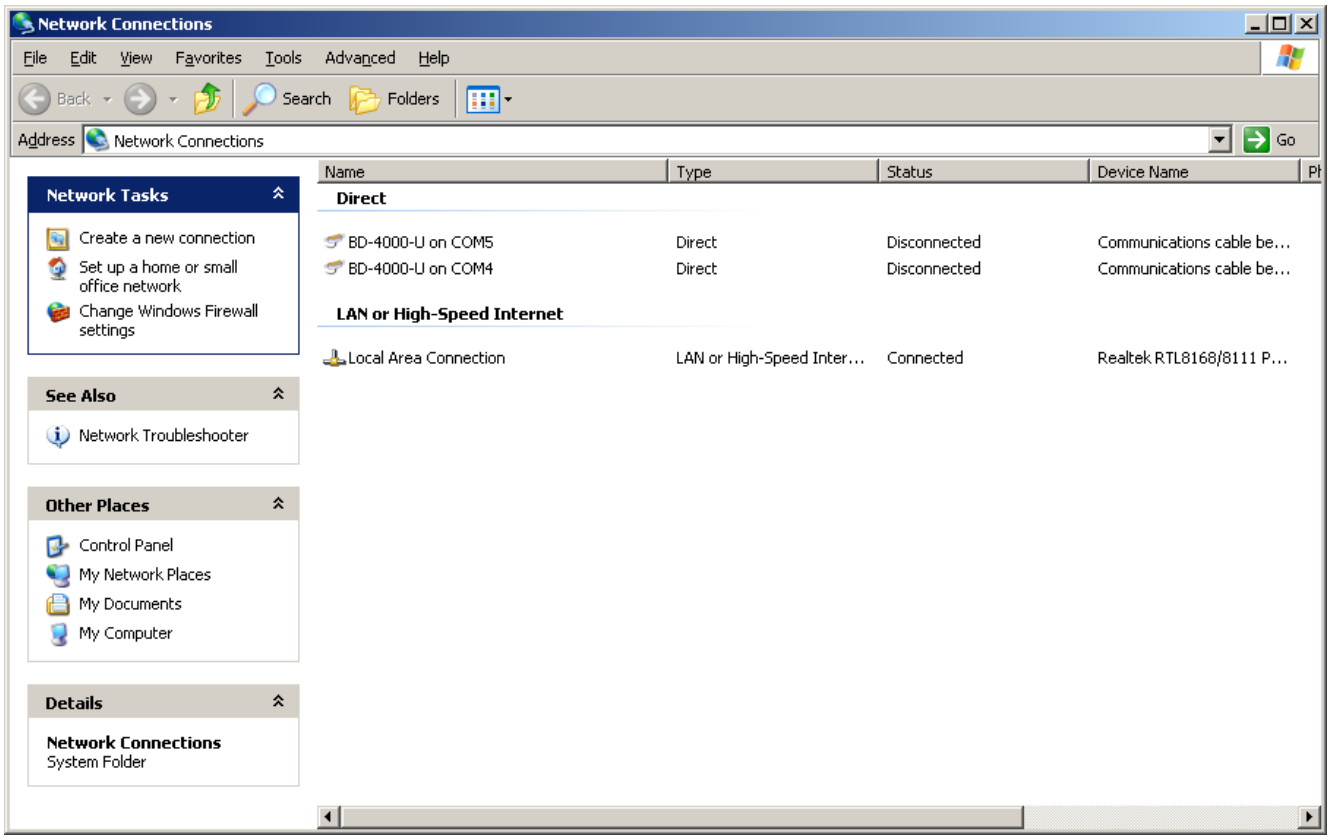


Fig. 40

This window shows all available network connections.

- Right Click on the new installed connection.
- Click -> Connect

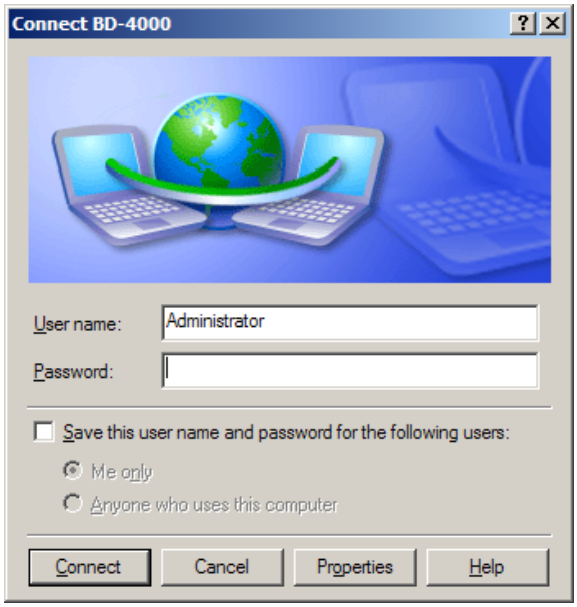


Fig. 41

- No password required.
- Click -> Connect

The connection should be established here, otherwise some error messages will show the type of failure.

Check the connection by right click on the connection symbol in the task bar.

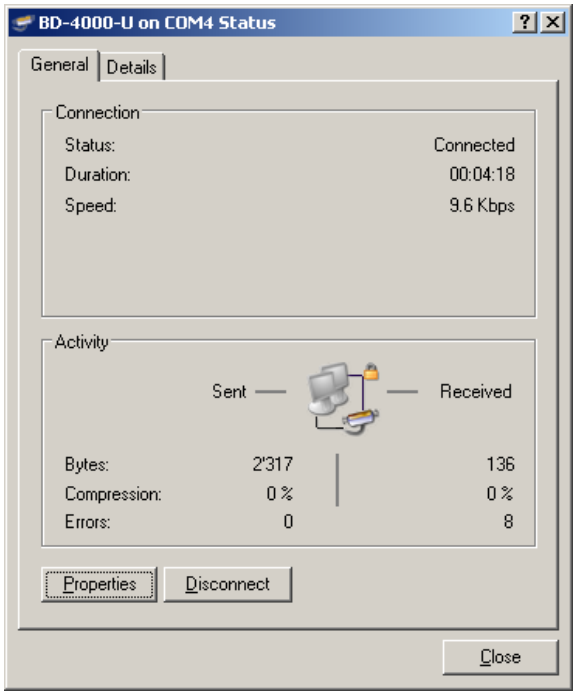


Fig. 41

- Here you see the successful connection with the MDB interface.
- Click -> Disconnect

Installation on Windows 7:

Step 1: Installing the USB link

The device does not need any special driver software, just the configuration script BD-4000.INF supplied by BonusData AG and finally located in C:\WINDOWS\INF folder. As communication driver the USBSER.SYS supplied with Microsoft Windows is used. This file is normally found in folder C:\WINDOWS\SYSTEM32\DRIVERS or may be requested from the Windows installation package.

- Plug the USB cable to a free USB port of your computer.
- Windows 7 tries to install the software for the BD-4000 device automatically unless the script BD-4000.INF is allready at it's location.
- If the device was not installed before on this computer it will fail to install the software and following actions are required.

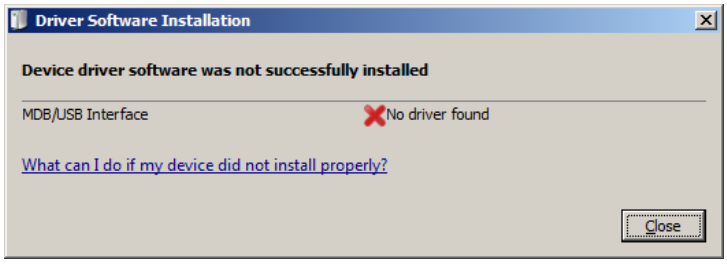


Fig. 43

- Click -> Start
- Click -> Control Panel
- Click -> Device Manager
- Look for "MDB/USB Interface" in the list of devices normally in folder 'Other devices".
- Click -> MDB/USB Interface

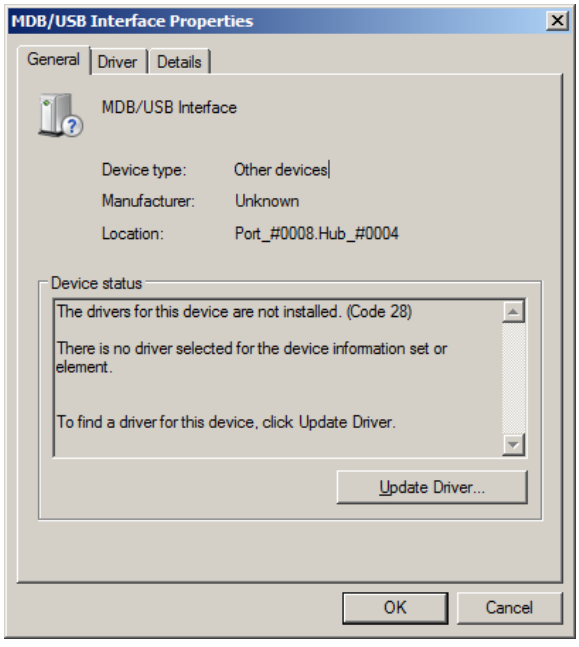


Fig. 44

- Click -> Update Driver...

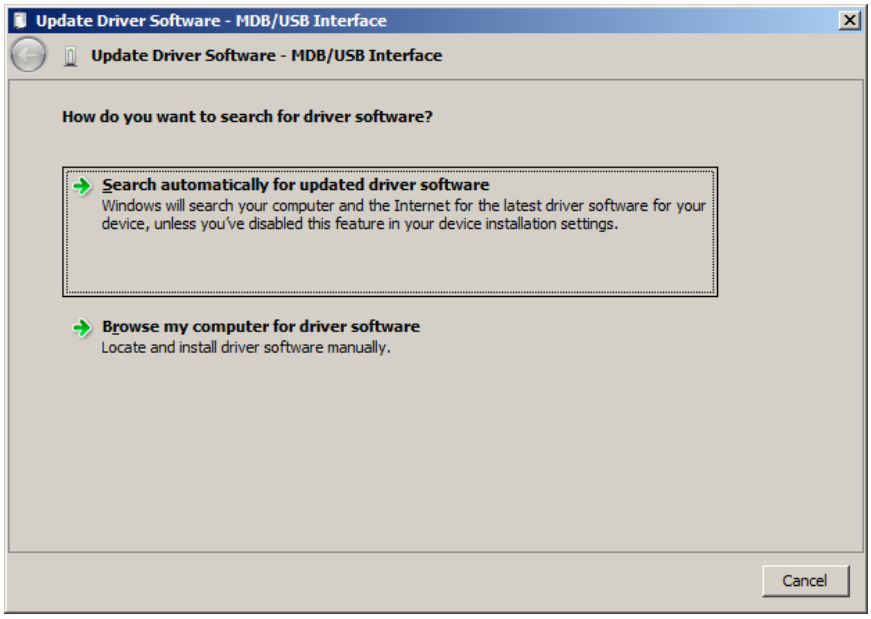


Fig. 45

- Select "Browse my computer for driver software".

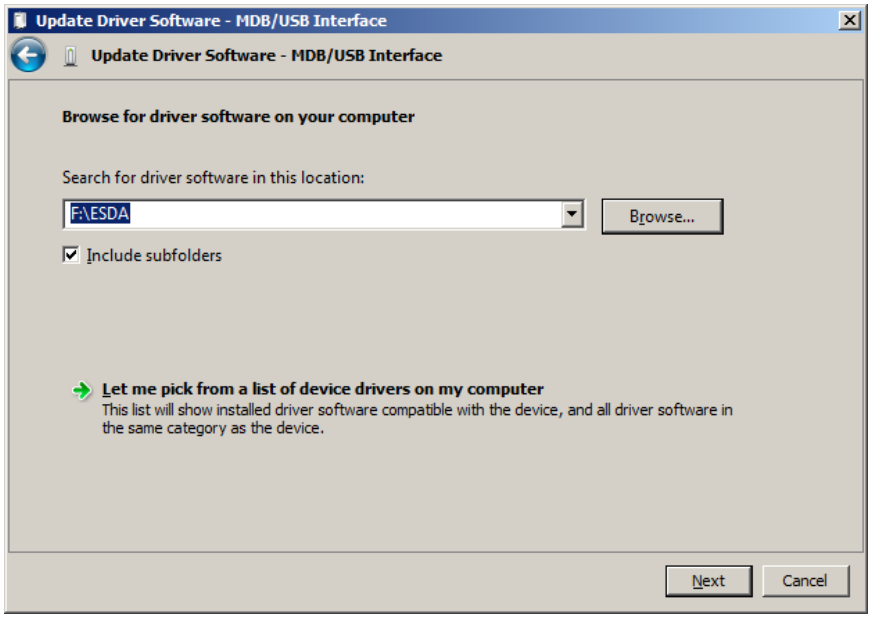


Fig. 46

- Browse to the location of the script BD-4000.INF supplied by BonusData AG.
- Click -> Next

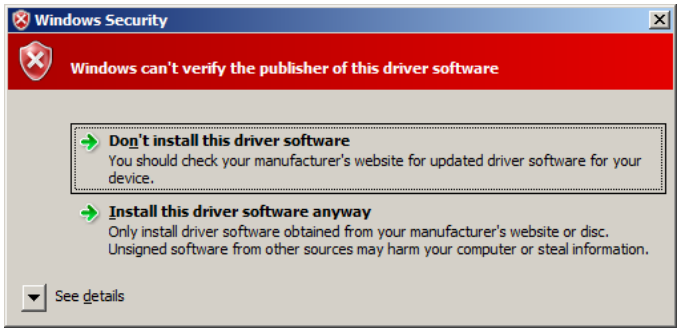


Fig 47

- Select "Install this driver software anyway".

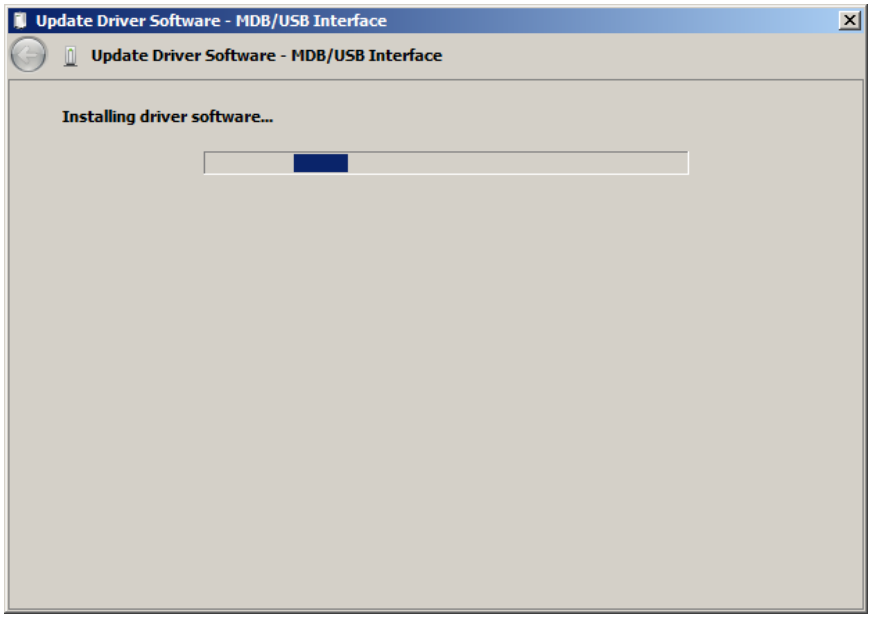


Fig. 48

- Now the driver will be installed, this may take some seconds

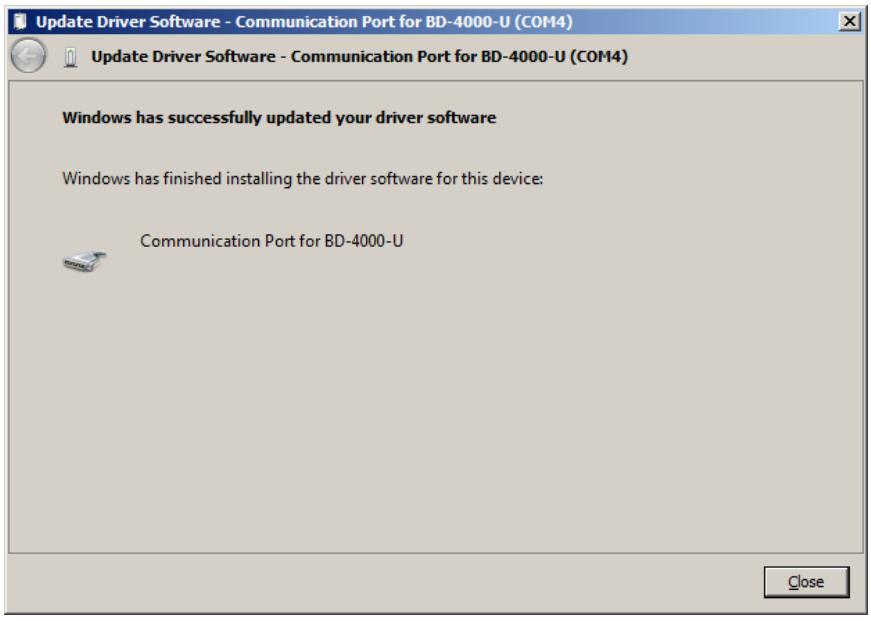


Fig. 49

- At this point the driver software is installed.
- You can verify this in the device manager.

Step 1A: Change the communication port name

Open the device manager and check for the communication link you like to change located in the folder "Ports (COM & LPT)". It appears as "Communication Port for BD-4000-U (COMx)".

- Click on the requested communication link.

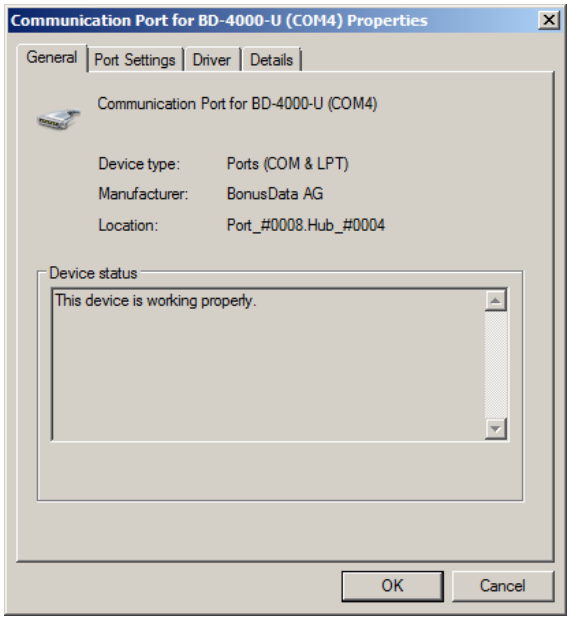


Fig. 50

- Select "Port Settings"

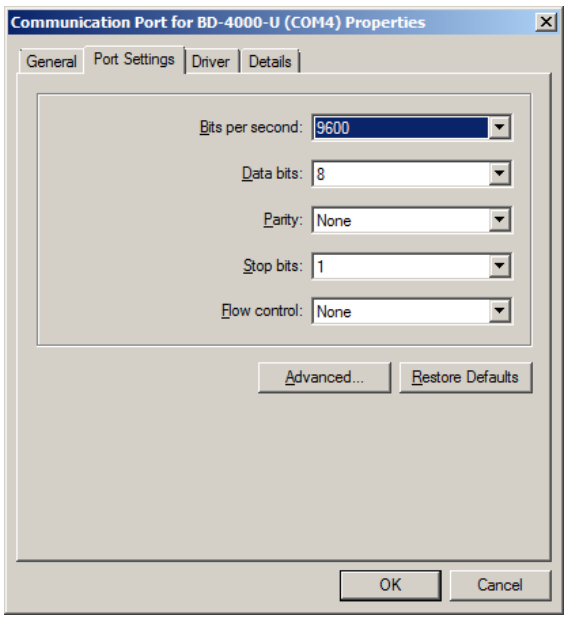


Fig. 51

- Click -> Advanced

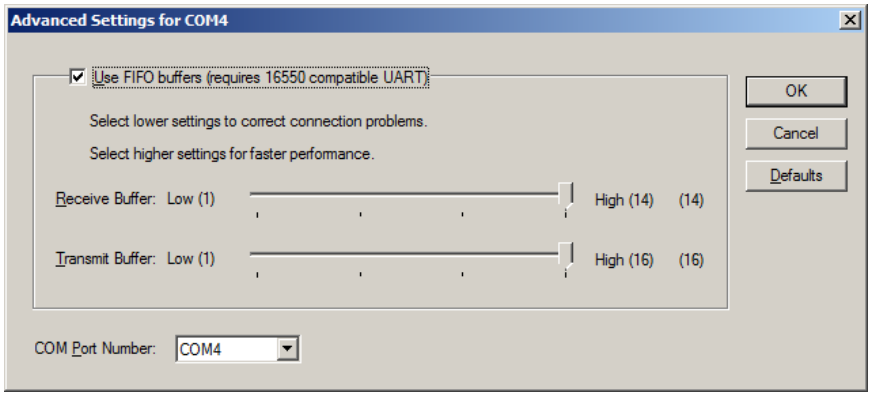


Fig. 52

- Change COM Port Number but avoid any conflicts with other used communication ports.
- Click -> OK

- Click -> OK again
- Note: The device manager will not display the change unless there is a window refresh.

Step 2: Installing the dialup modem

- Click -> Start
- Click -> Control Panel
- Click -> "Phone and Modem".

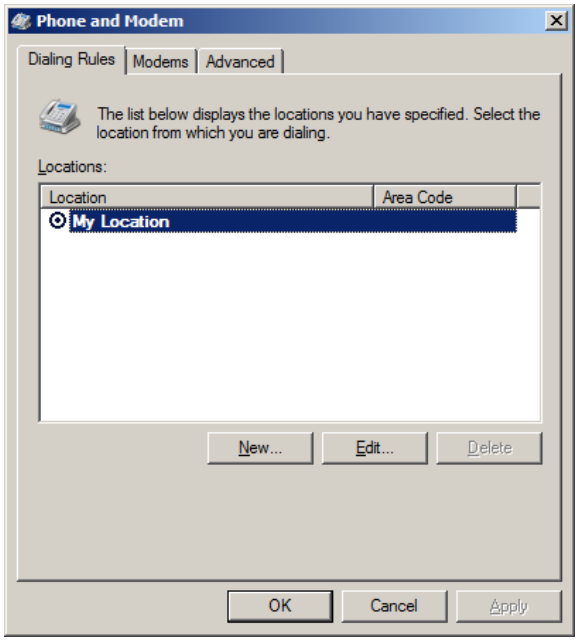


Fig. 53

- Select Modems Tab at top center.
- Click -> New to add a new modem.

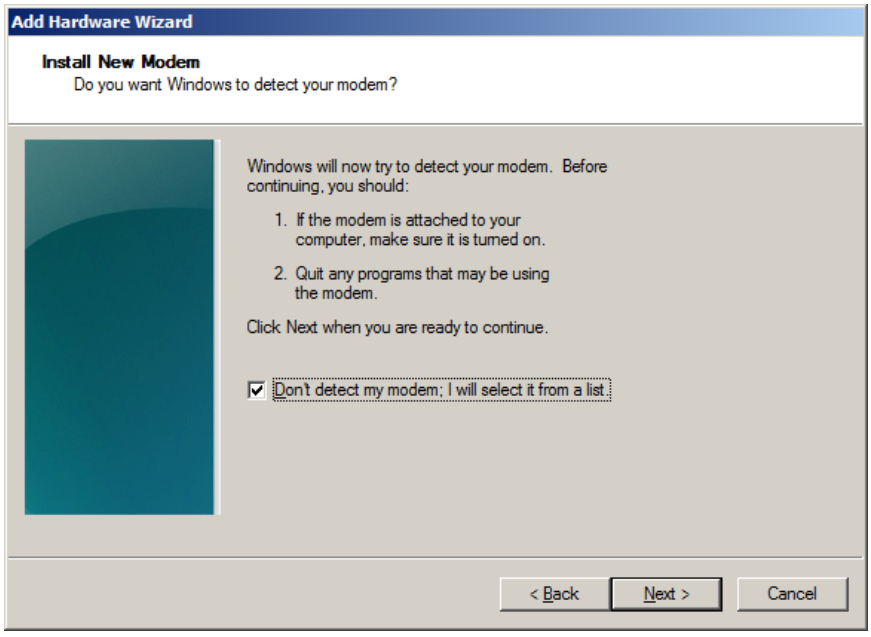


Fig. 54

- Check "Don't detect my modem; I will select it from a list."
- Click -> Next

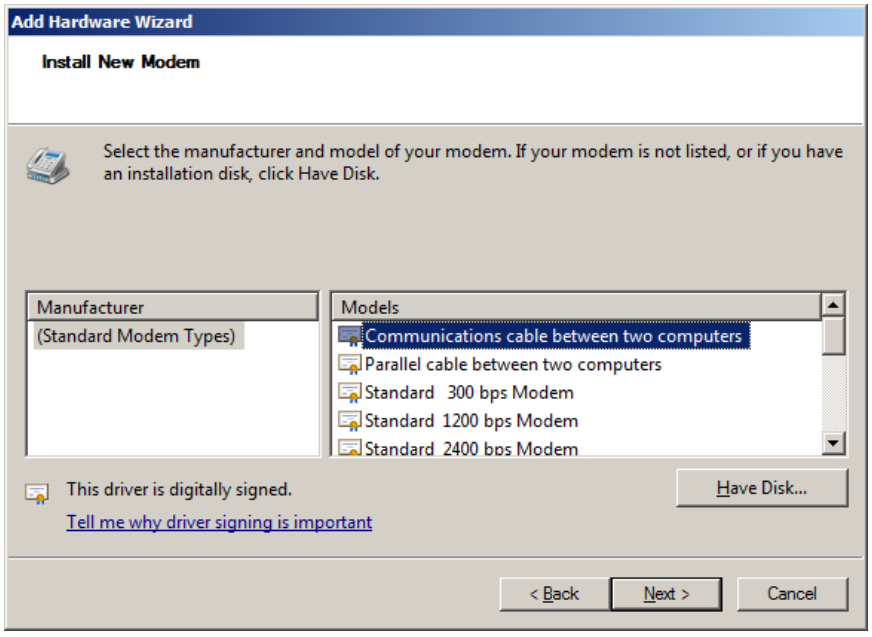


Fig. 55

- Select "Communication cable between two computers"
- Click -> Next

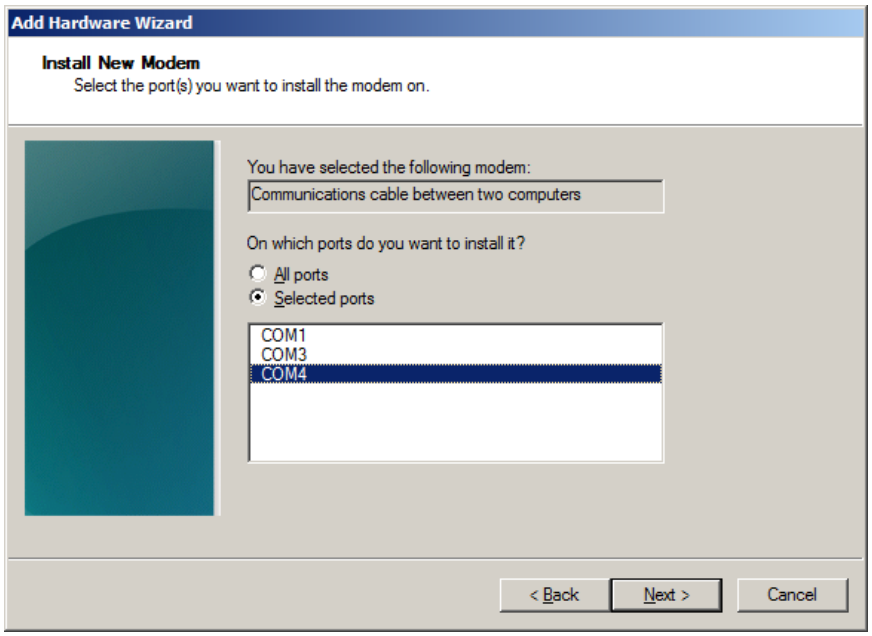


Fig. 56

- Select the COMx port you installed in Step 1 or Step 1A.
- Click -> Next

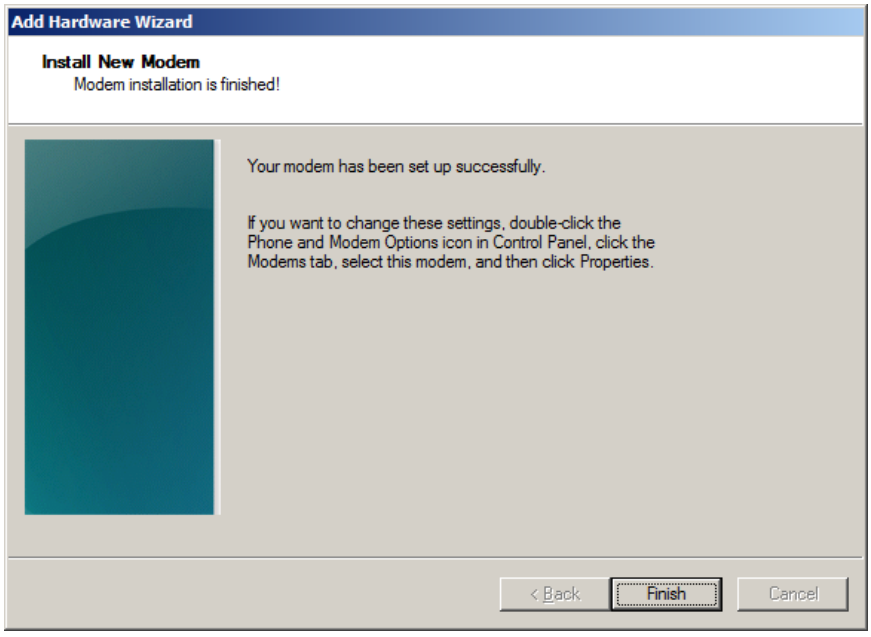


Fig. 57

- Check if it has successfully installed the modem.
- Click -> Finish

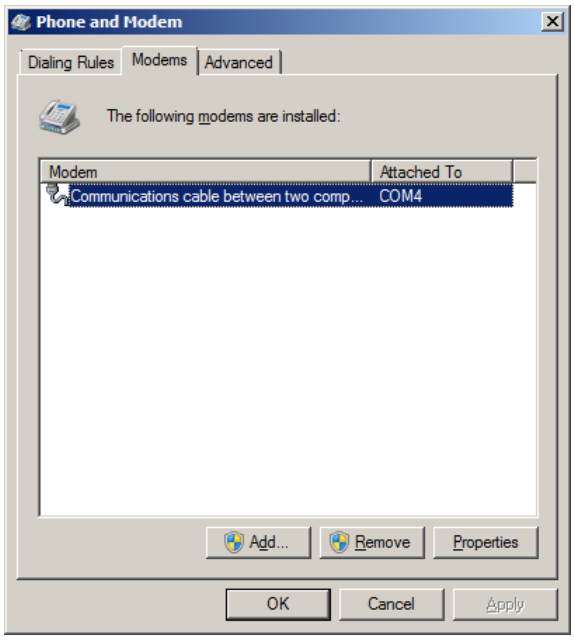


Fig. 58

- Select "Communication cable between two computer".
- Click - Properties

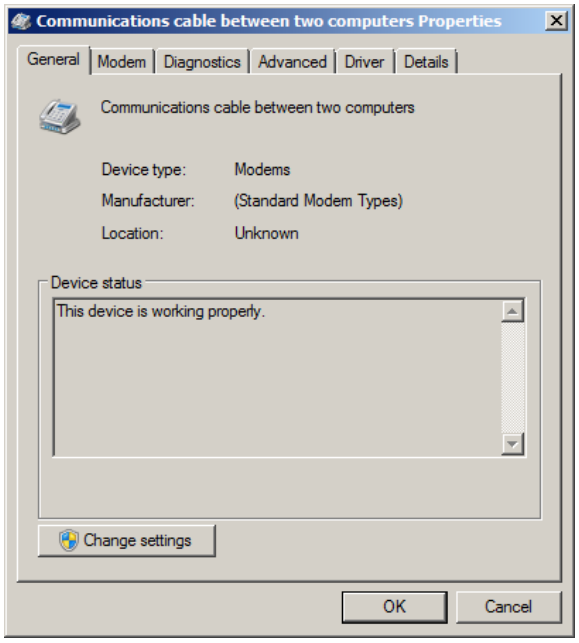


Fig. 59

- If it looks like this you are fine.
- Click -> OK
- Click -> OK again
- Continue with Step 3

Step 3: Configure the internet connection

- Click -> Start
- Click -> "Network and Sharing center"
- Click -> "Set up a new connection or network"

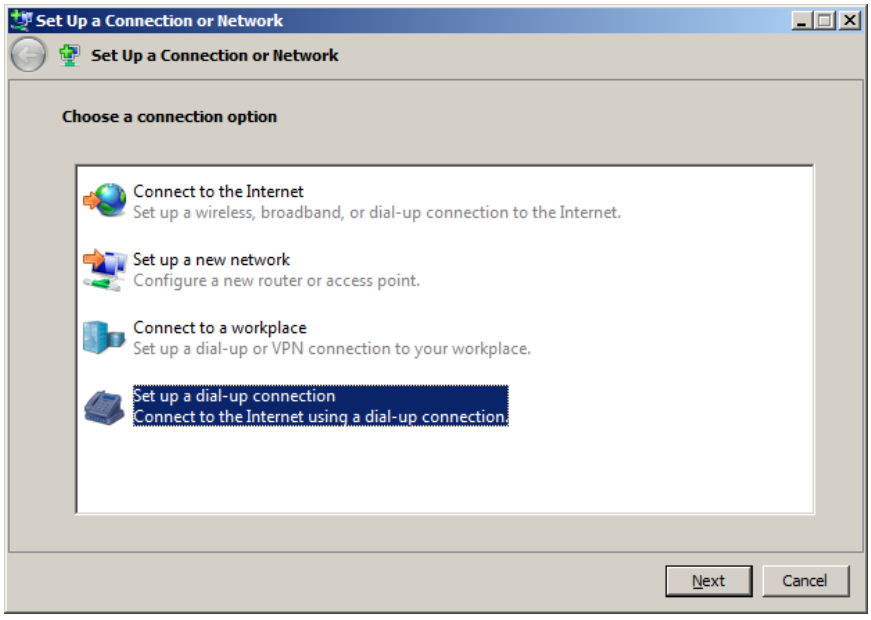


Fig. 60

- Select "Set up a dial-up connection"
- Click -> Next

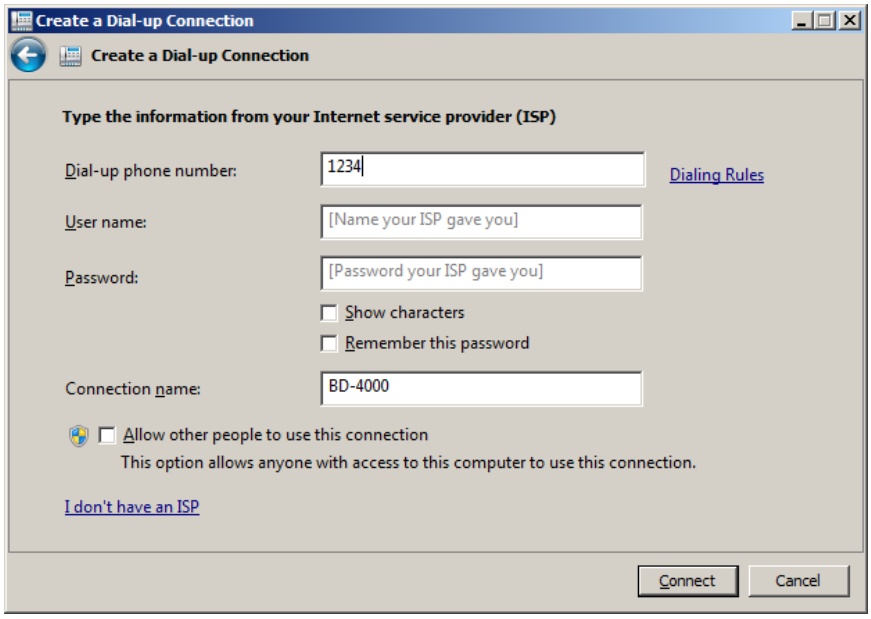


Fig. 61

- It gets a bit tricky here... (Sophisticated Windows 7 !!!)
- Enter a dummy phone number, to be able to continue...
- Enter a connection name. (Default: BD-4000)
- Click -> Connect (Note: It will fail to connect because the link is not yet configured.)

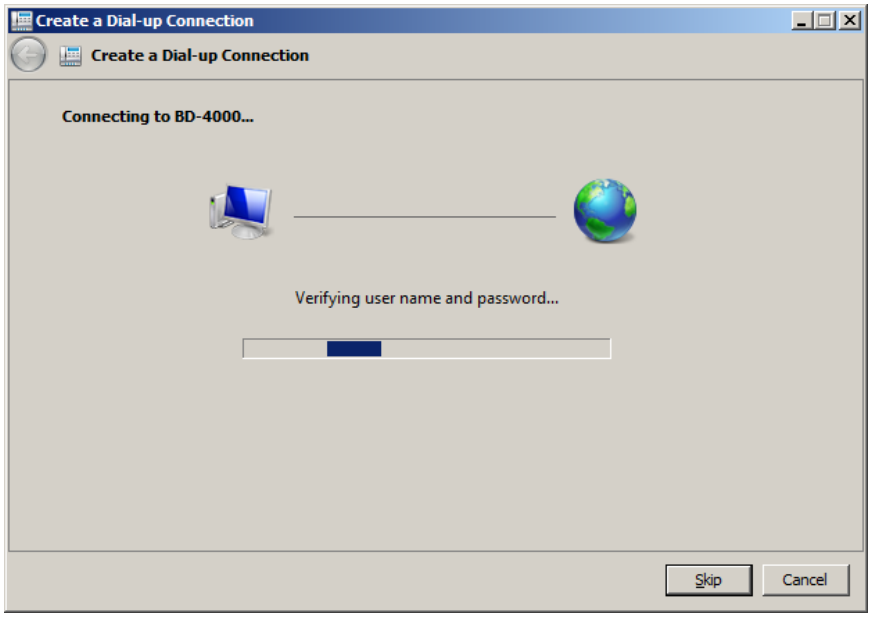


Fig. 62

- Click -> Skip

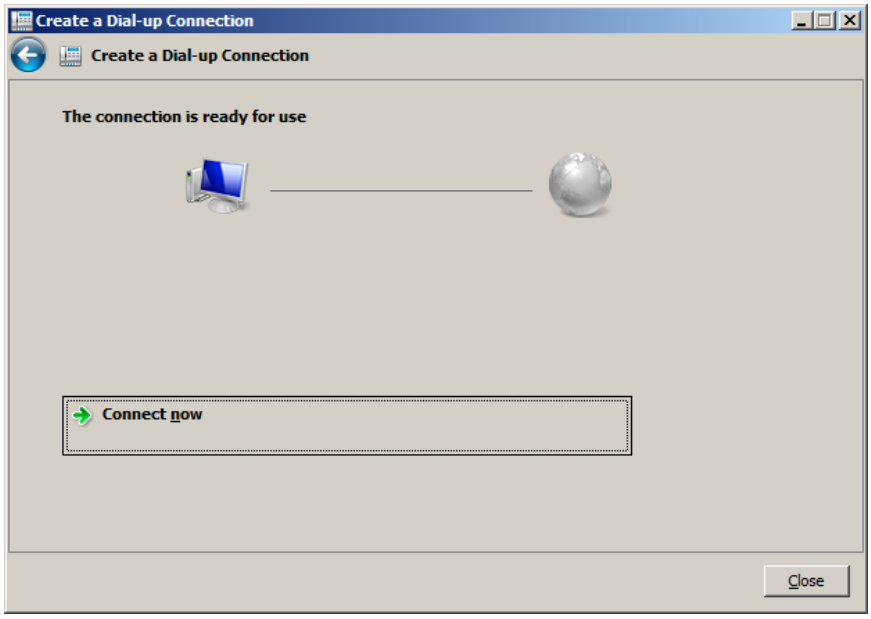


Fig. 63

- Click -> Close

Now we configure the link just created. If anybody knows a straighter way to do this, please let me know.

- Click -> Start
- Enter "View network Connections" in the search box.
- Click -> "View network connections".

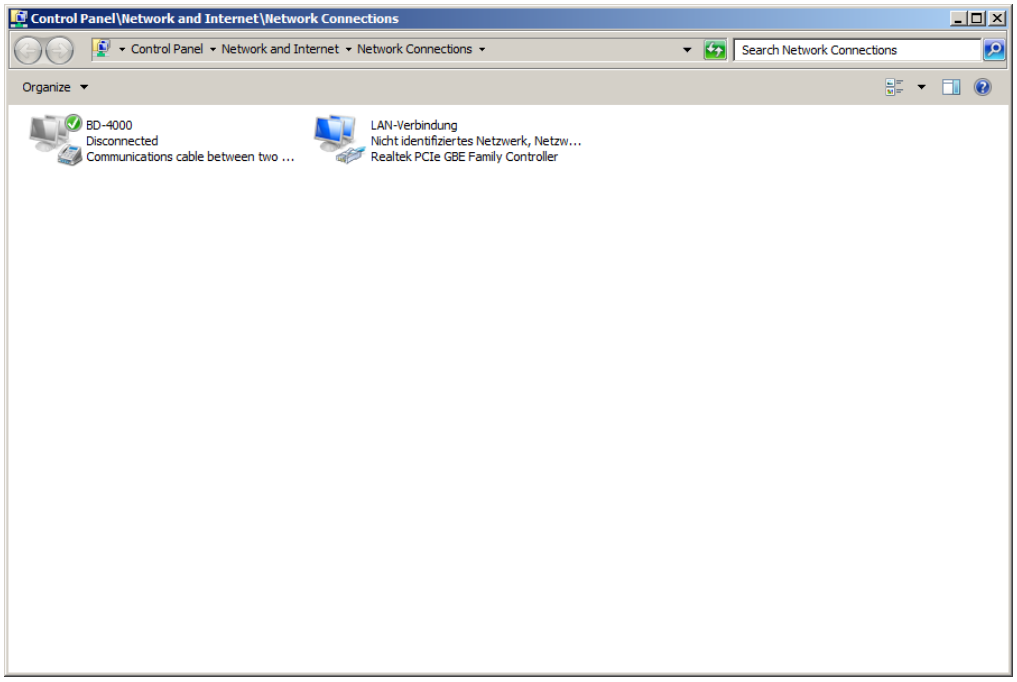


Fig. 64

- You should end up here...
- Right click -> BD-4000 connection
- Click -> Properties

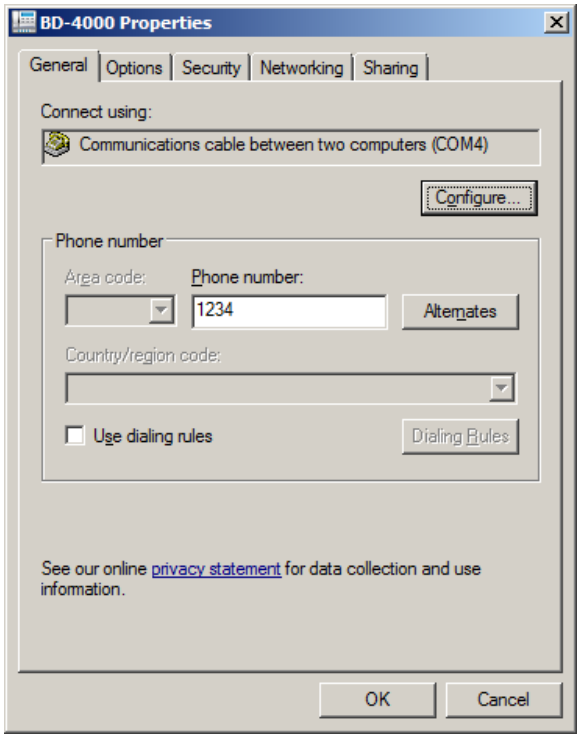


Fig. 65

- Click -> Configure

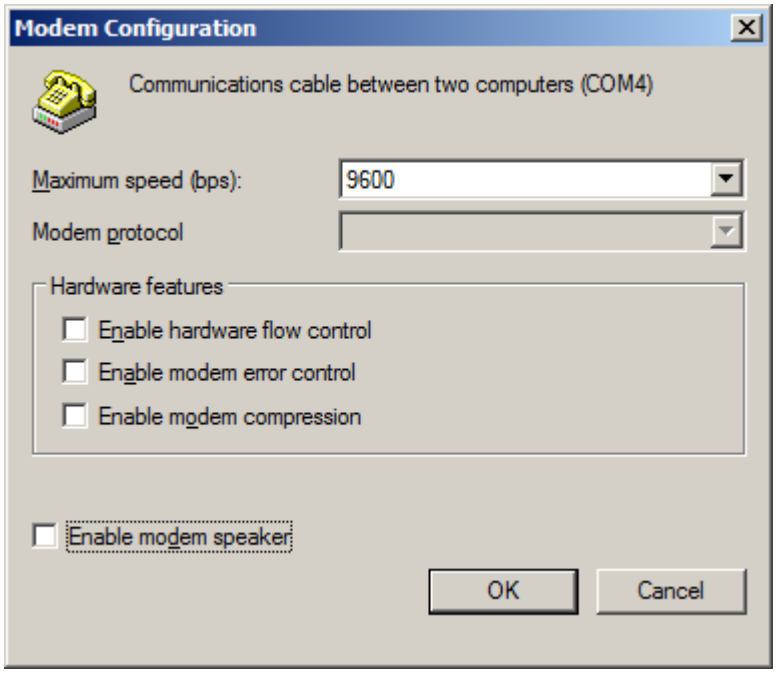


Fig. 66

- Select the speed 9600. (Not relevant for the real speed.)
- Uncheck all check boxes.
- Click -> OK
- Select -> Options

Note: In this dialog is a Windows 7 bug. When some parameters are modified, e.g. uncheck all check boxes, and clicking OK the new settings will be active. But when the dialog is reopened will Windows 7 show the defaults and not the active setting. This is very confusing...

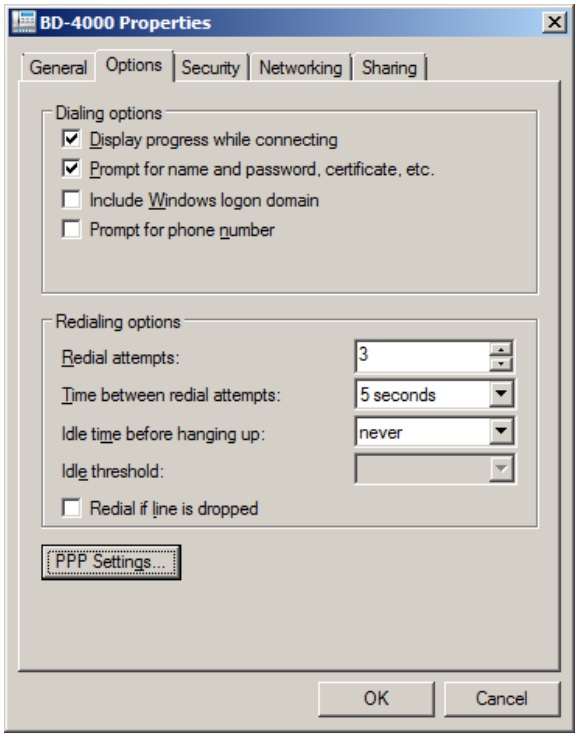


Fig. 67

- Setup like this...
- Set "Idle time before hanging up:" to never.

Note: The dialog below will show up after 20 minutes of recording anyway. Uncheck "Don't use Auto Disconnect".

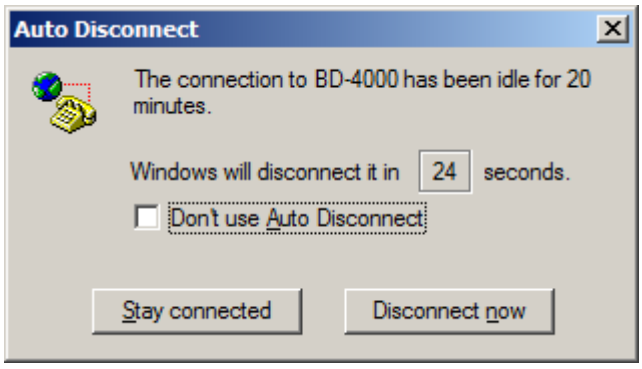


Fig. 68

- Click -> PPP Settings

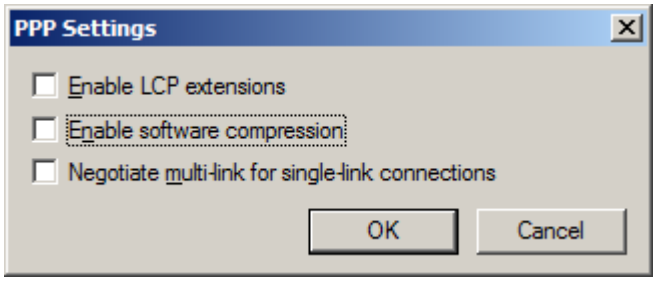


Fig. 69

- Clear all check boxes here.
- Click -> OK
- Select -> Security

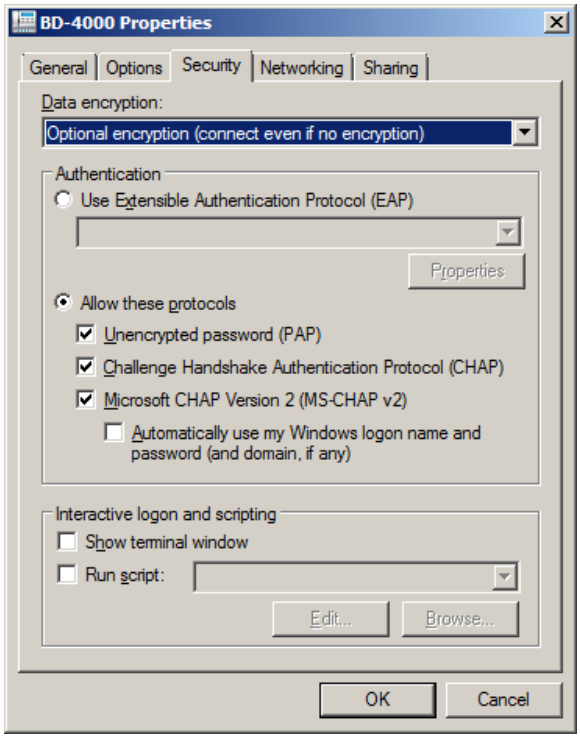


Fig. 70

- If it looks like this continue.
- Click -> Networking

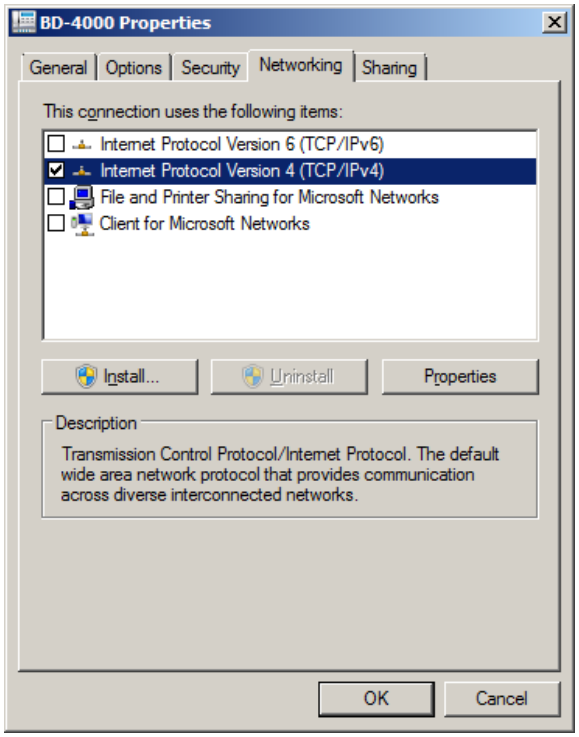


Fig. 71

- Select -> "Internet Protocol Version 4 (TCP/IPv4)".
- Click -> Properties

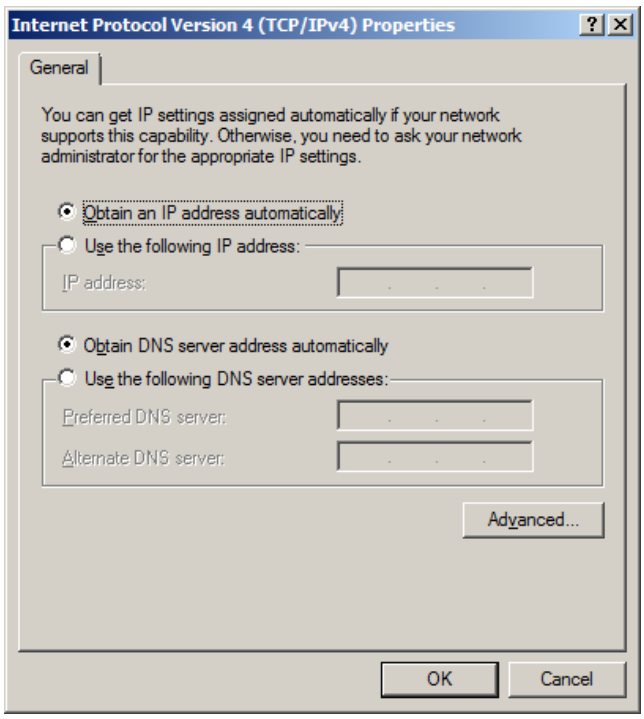


Fig. 72

- Click -> Advanced...

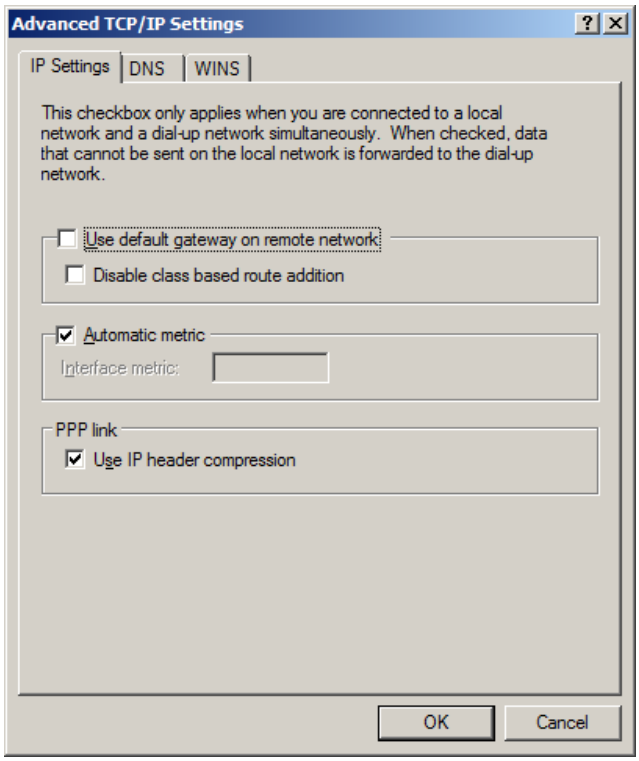


Fig. 73

- Uncheck -> "Use default gateway on remote network."
- Click -> OK
- Click -> OK again
- Close network property dialog.
- The new connection should be ready at this point.

Testing the new connection

The connection symbol can be found at the screen right bottom in the task bar.

At the screen right bottom in the task bar you find a connection symbol.

Fig.74

- Click on this symbol and the connection dialog below opens.

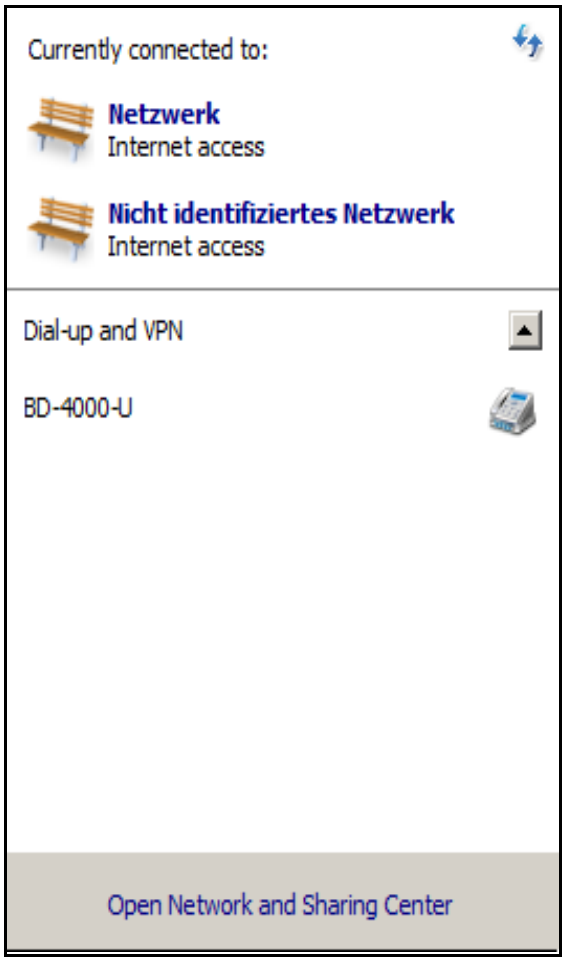


Fig. 75

- Click on BD-4000-U connection.
- Click -> Connect.

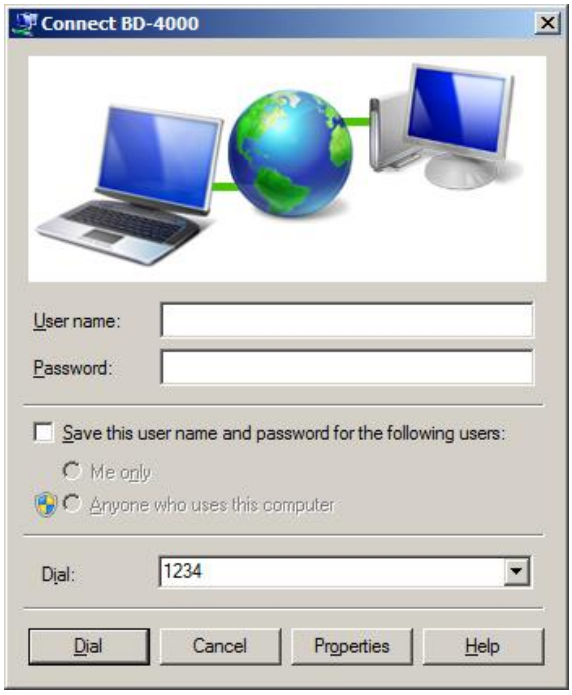


Fig. 76

- Click -> Dial

The connection should be established here, otherwise some error messages will show the type of failure.

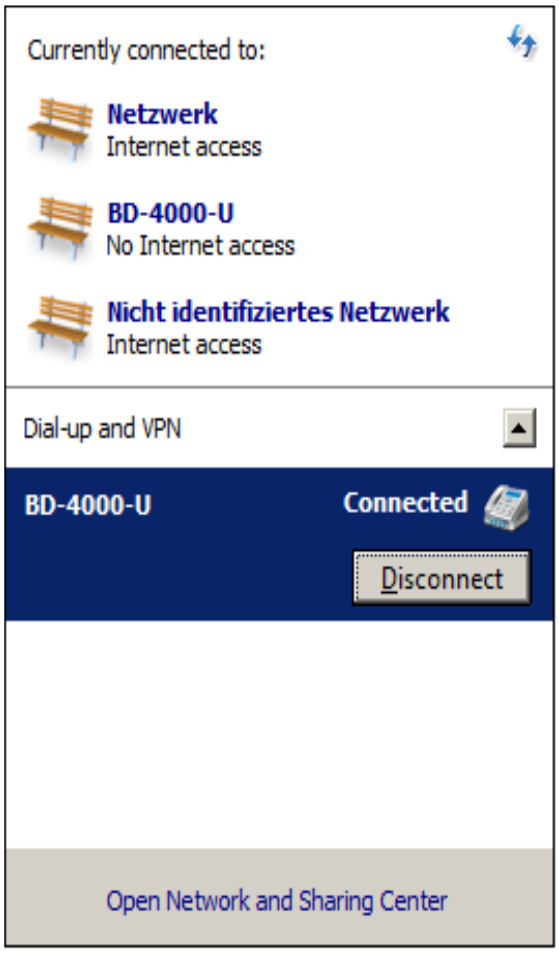


Fig. 77

- Here you see the successful connection with the MDB interface.
- Click -> Disconnect

Installation on Windows 8 & 8.1

Step 1: Installing the USB link

The device does not need any special driver software, just the configuration script BD-4000.INF supplied by BonusData AG and finally located in C:\Windows\System32\DriverStore\FileRepository\BD-4000.INF folder. As communication driver the USBSER.SYS supplied by Microsoft Windows is used. This file is by default found in C:\WINDOWS\SYSTEM32\DRIVERS or may be requested from the Windows installation package.

Before we start please remember:

In Windows 8 a dialog may open as minimized in the task bar and can easily be overlooked.

Connect the MDB/USB Interface to a USB port of you computer.

If the driver is not automatically installed then:

- Move the mouse pointer to the left bottom corner of the screen and click the right mouse button.
- There select 'Device Manager'.

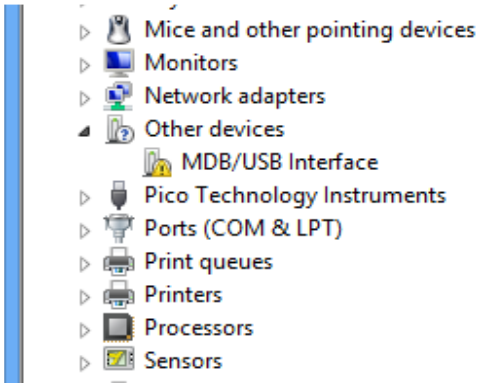


Fig. 78

- Here right click -> MDB/USB Interface.
- Then 'Update Driver Software...'

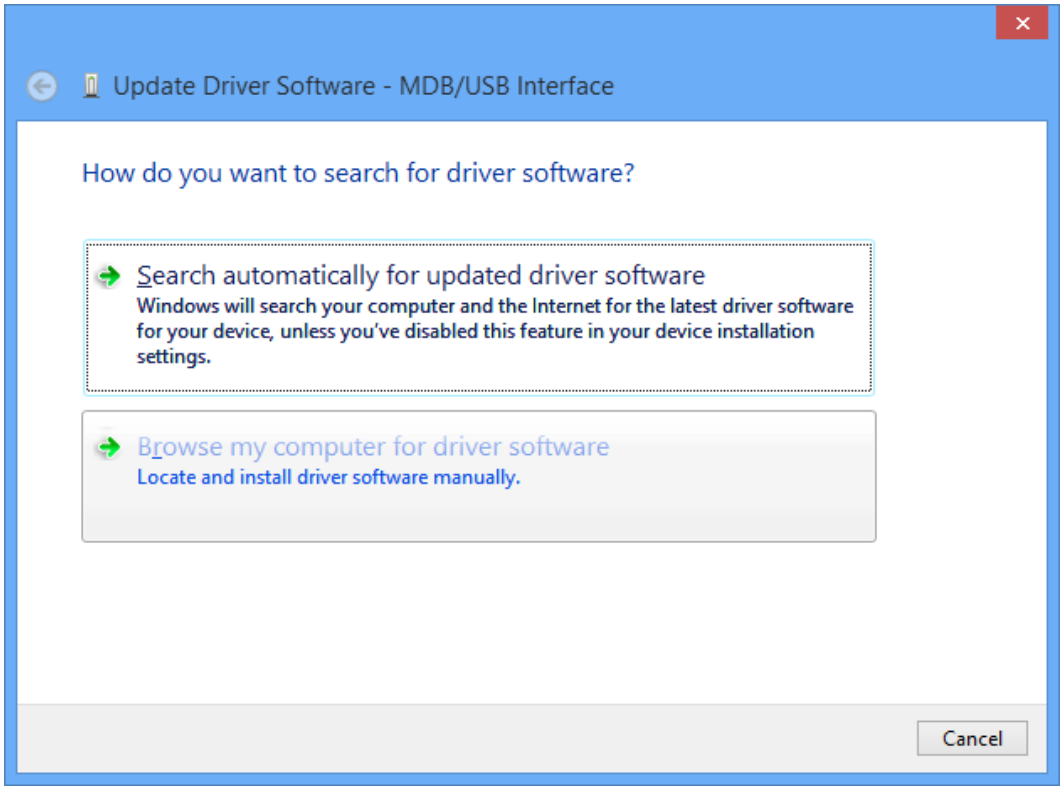


Fig. 79

- Click -> Browse my computer for driver software.

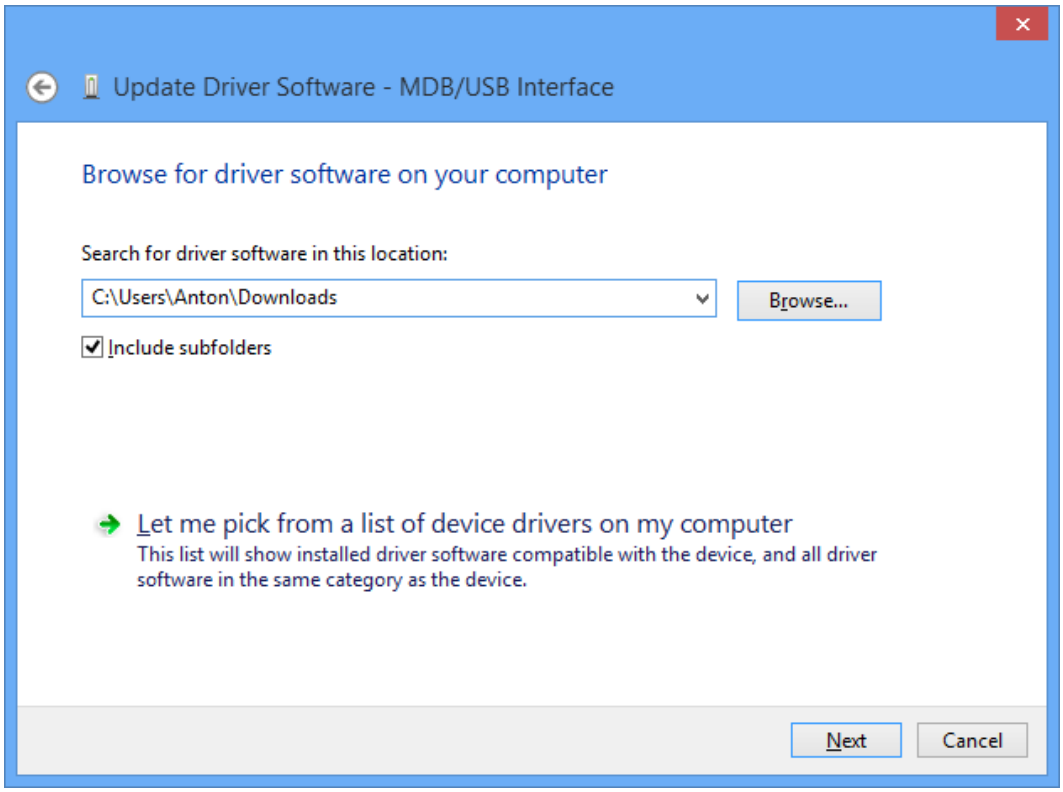


Fig. 80

- Browse to the folder where the BD-4000.INF is located.
- Click -> Next

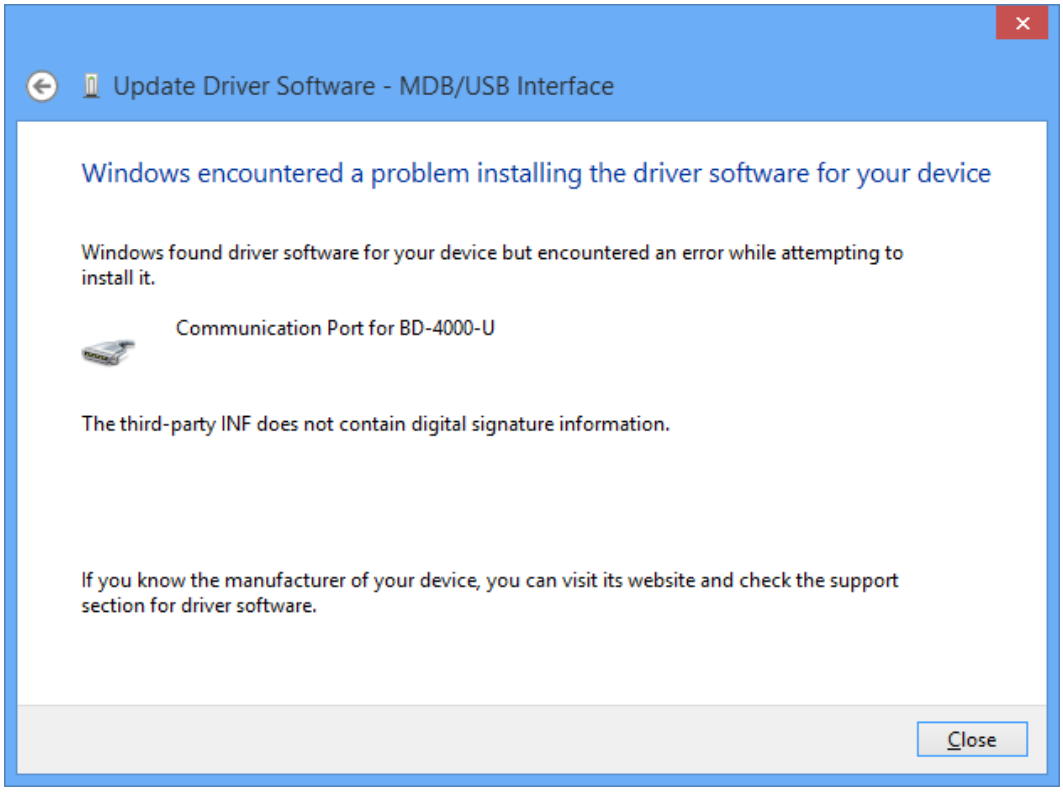


Fig. 81

Attention! If this error shows up, it is mostly expected the following chapter will apply. Otherwise skip the next chapter and continue with the driver installation.

How to install driver with missing digital signature in Windows 8

This is a common procedure to install driver with a missing digital signature. It is helpfull to install some older software driver from Windows XP and Windows 2000.

- Restart the computer by opening the Settings and then Power label at the right bottom corner of the screen.

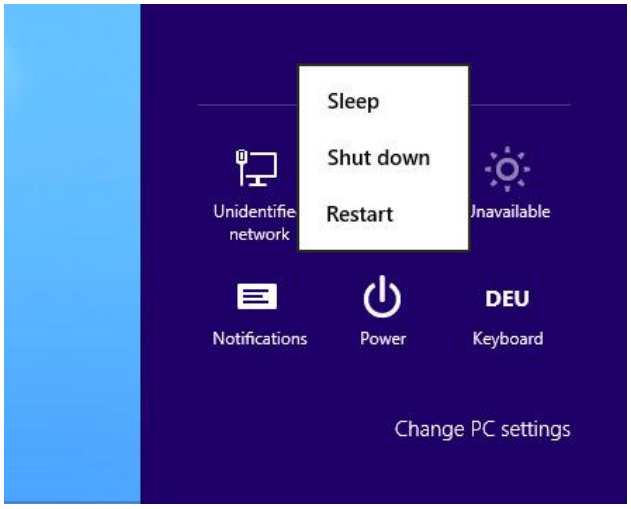


Fig. 82

Important! Press the shift key while clicking the 'Restart' label shown above.

- A screen shows up with "Choose an Option".
- Select "Troubleshoot".
- The next screen shows up with "Troubleshoot".

- Select "Advanced options".
- The nect screen shows up with "Advanced options",
- Select "Startup Settings".
- The next screen shows up with "Startup Settings".
- Click "Restart".

The computer will restart here...

- A new screen shows up with "Startup Settings".
- Press F7 for "Disable driver signature enforcement".

Windows will now start up as usual.

We are now ready now and can continue driver installation.

Continue driver installation

To continue driver installation we have to start over with Step 1 again and then we should end up here with the 'Windows Security' warning dialog.

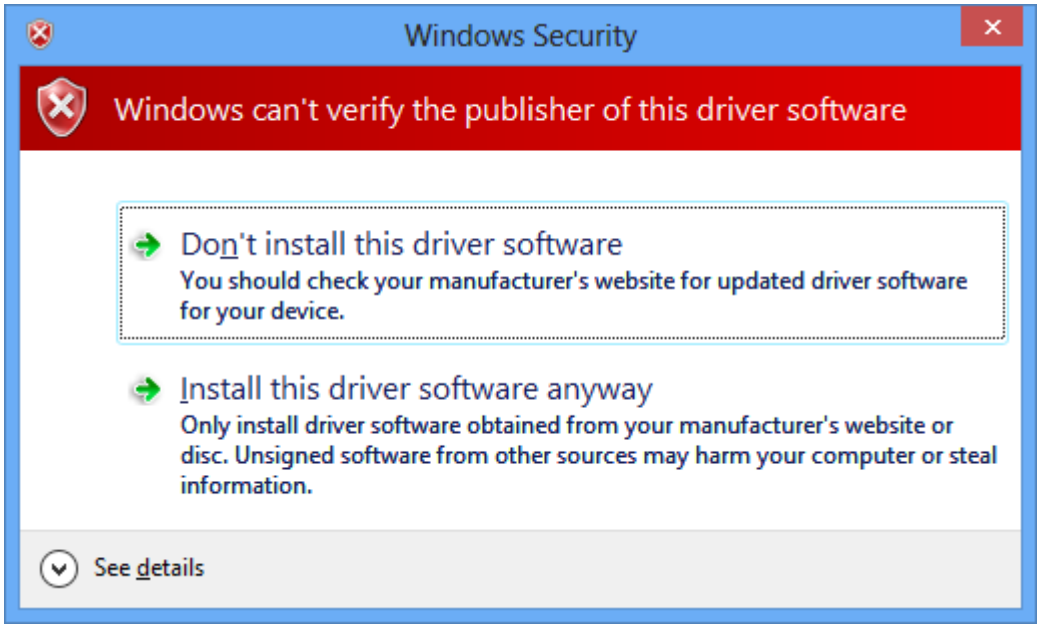


Fig. 83

- Select 'Install this driver anyway'.

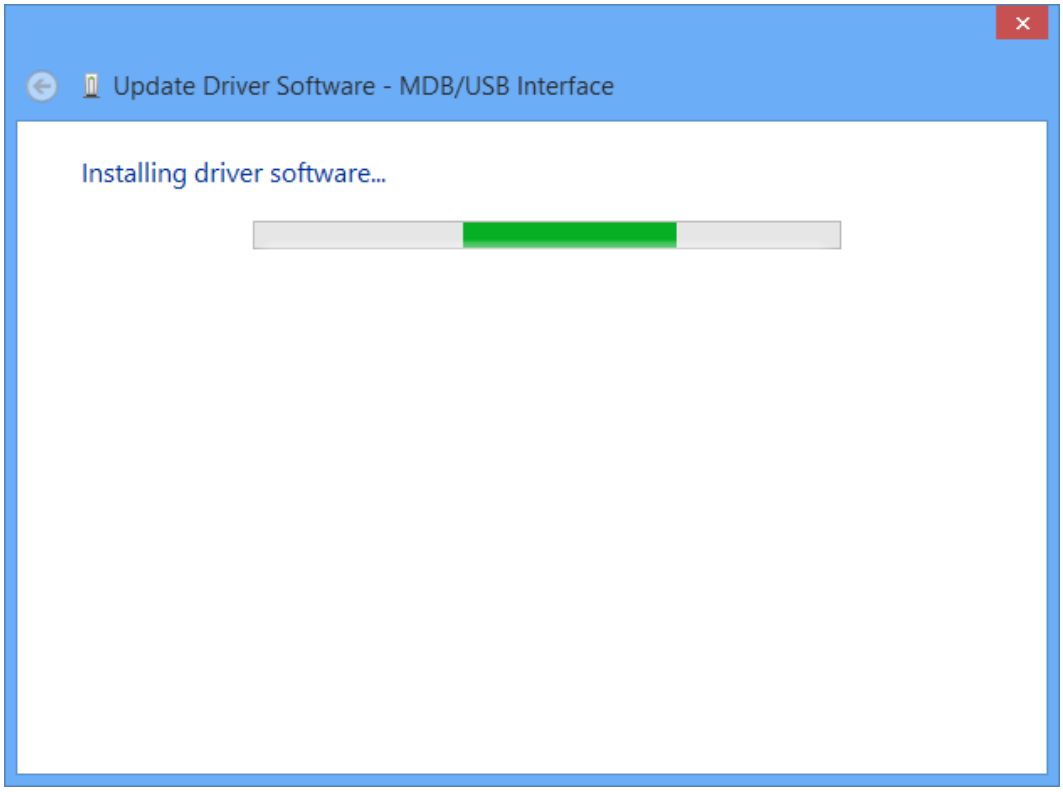


Fig. 84

- Now the driver will be installed, this may take some seconds.

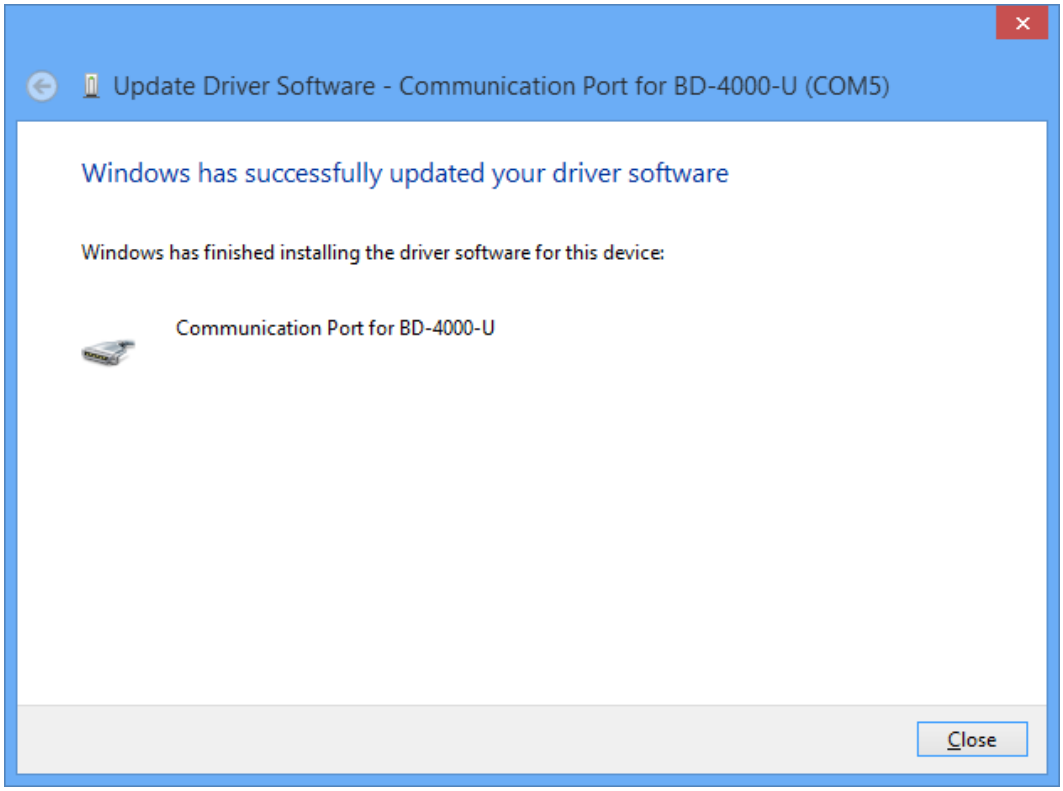


Fig 85

- At this point the driver software is successfully installed.
- This can be verified in the device manager.

Step 1A: Change the communication port name

Open the device manager and look out for communication link you intend to change located in the folder "Ports (COM & LPT)" It appears as "Communication Port for BD-4000-U (COMx)".

- Double click on the requested communication link to open the properties.

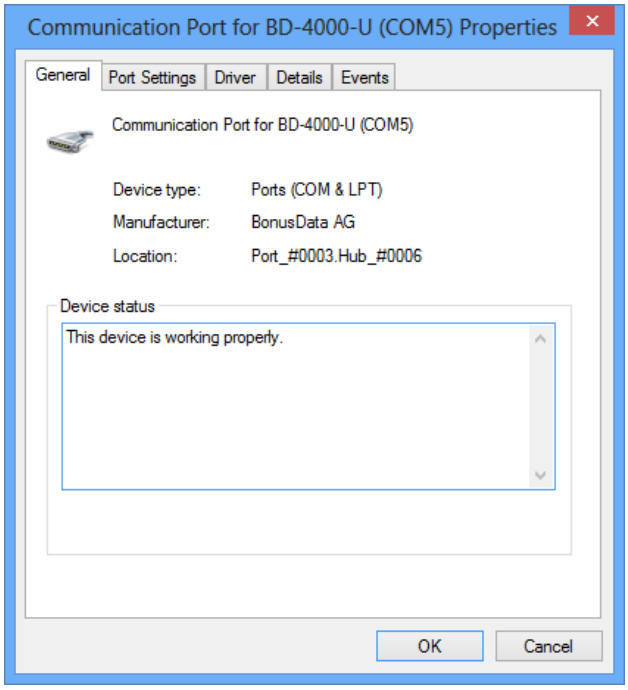


Fig. 86

- Select tab "Port Settings".

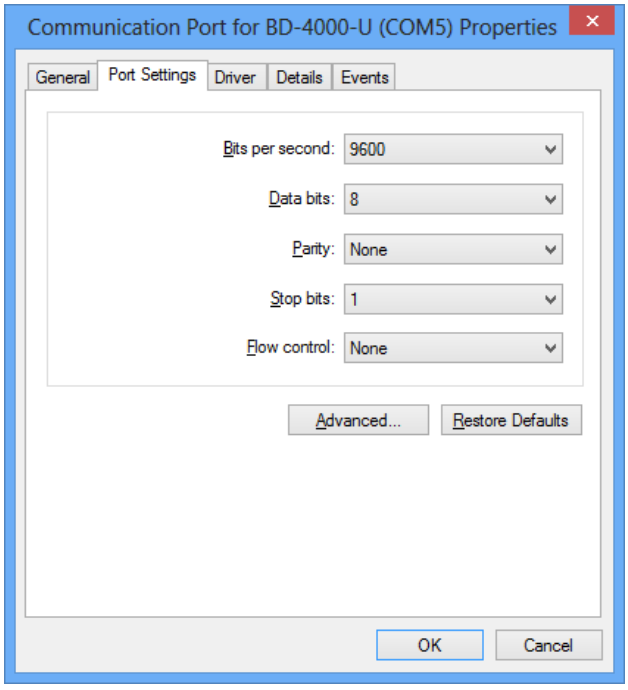


Fig. 87

- Click -> Advanced

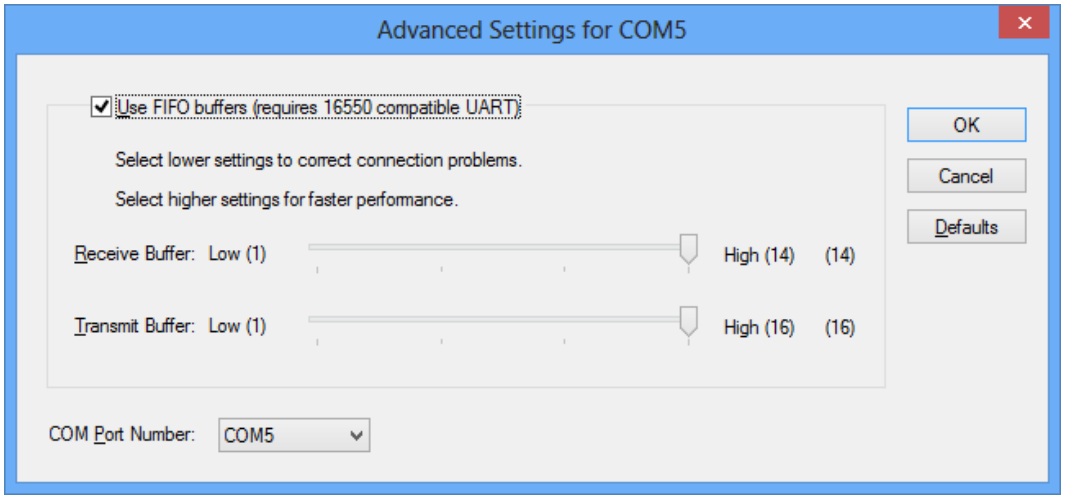


Fig. 88

- Change the COM port number but avoid any conflicts with other used communication ports.
- Click OK
- Click OK again
- Note: The device manager will not display the changes unless there is refresh of the device manager.

Step 2: Installing the dialup modem

- Move the mouse pointer to the left bottom corner of the screen and click the right mouse button.
- There select "Control Panel".
- Click -> "Phone and Modem".

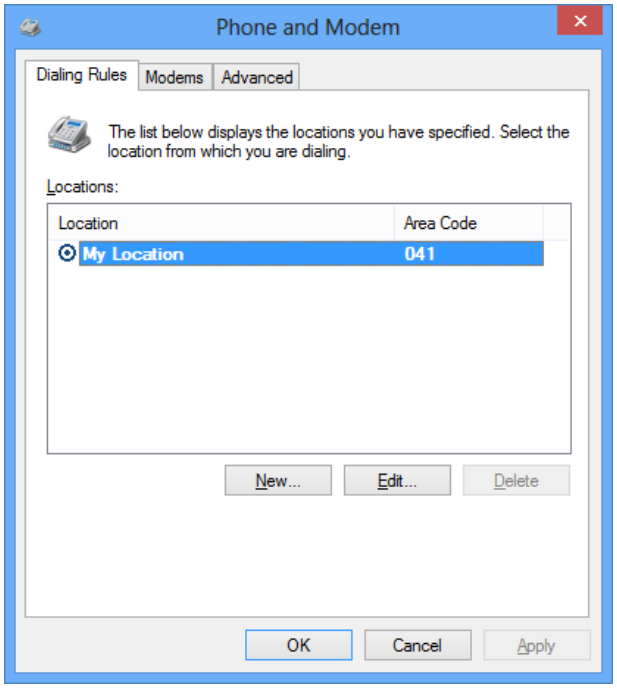


Fig. 89

- At top select tab "Modem".

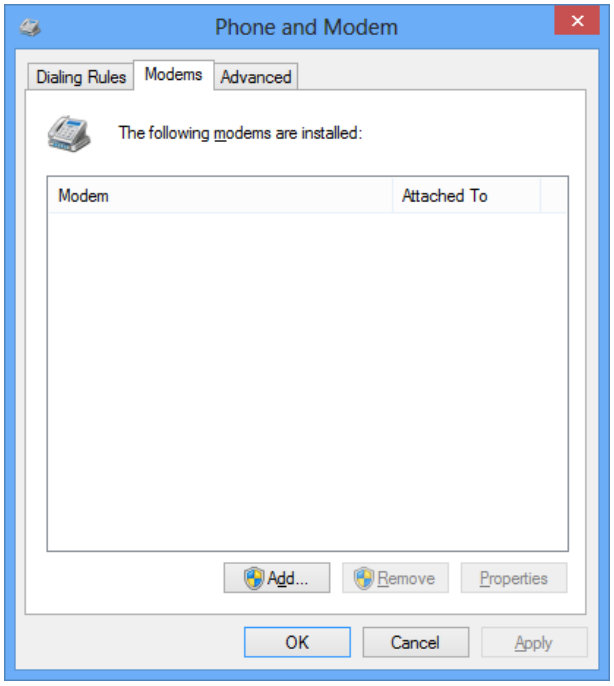


Fig. 90

- Click -> "Add..."

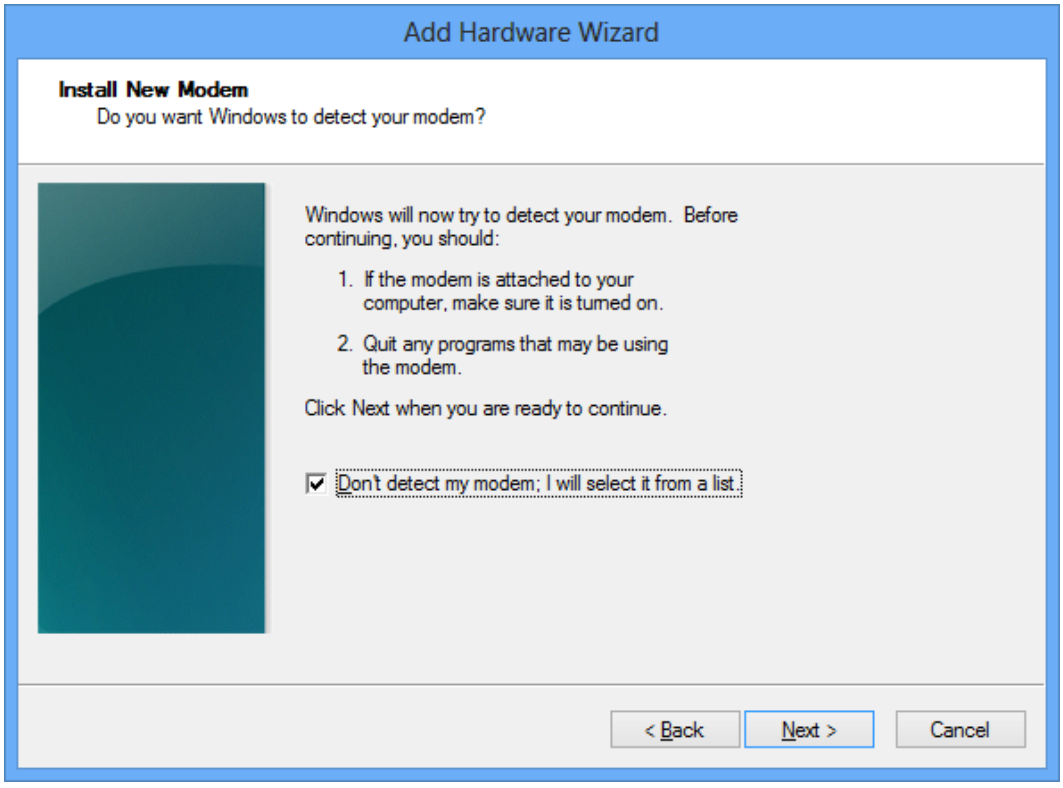


Fig. 91

- Check "Don't detect my modem: I will select it from a list".
- Click -> Next

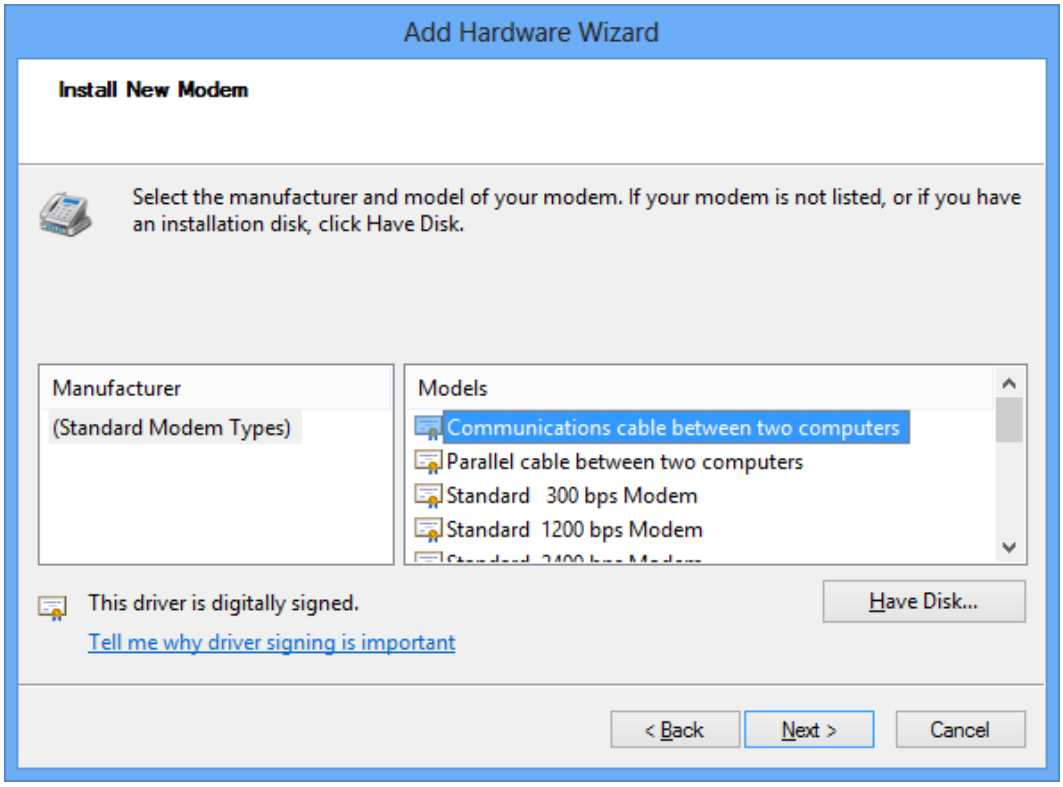


Fig. 92

- Select "Communication cable between two computers".
- Click -> Next

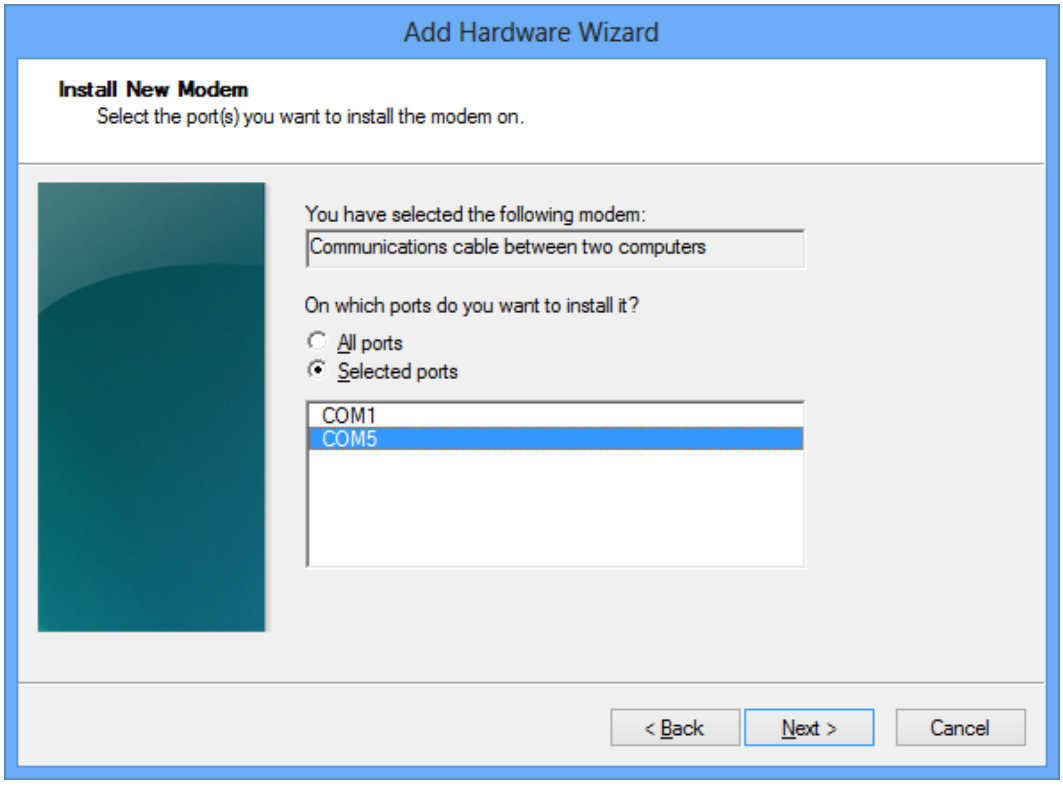


Fig. 93

- Select the COMx port you installed in Step 1 or Step 1A.
- Click -> Next

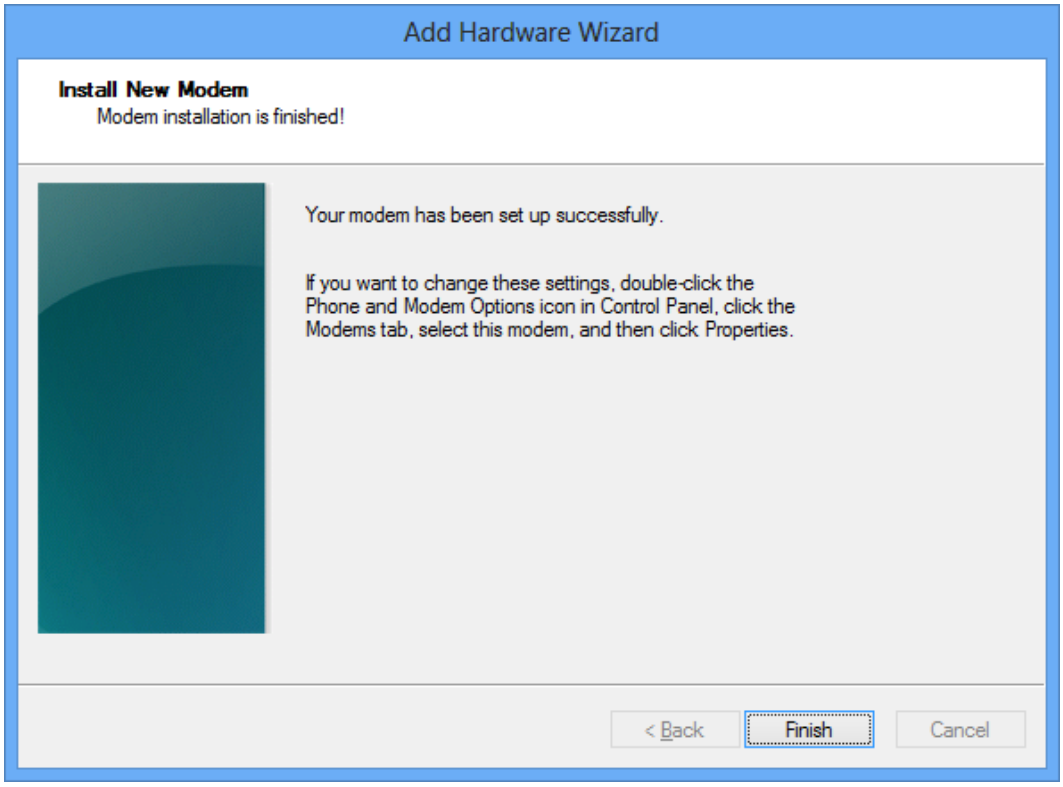


Fig. 94

- Check if it has successfully installed the modem.
- Click -> Finish

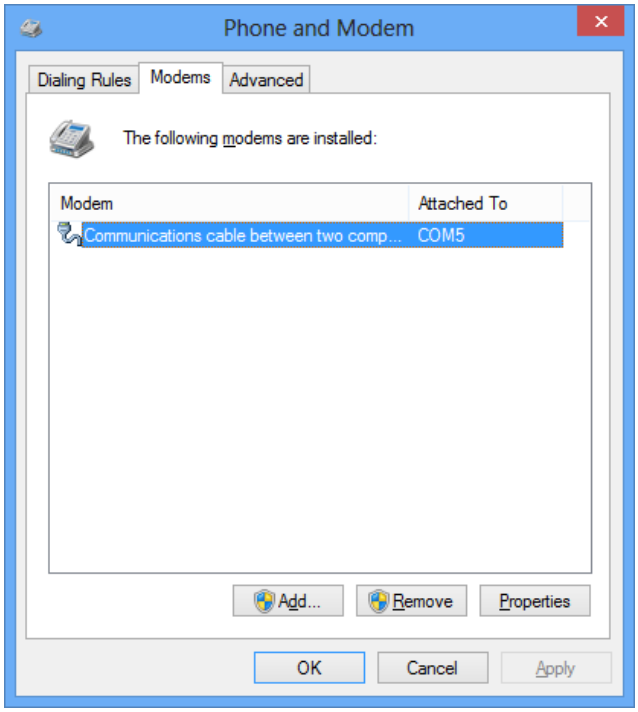


Fig. 95

- Select "Communication cable between two computer".
- Click -> Properties

Note: If you can't click properties because the button is disabled then Click -> "Add..." and on the next dialog Click -> "Back".

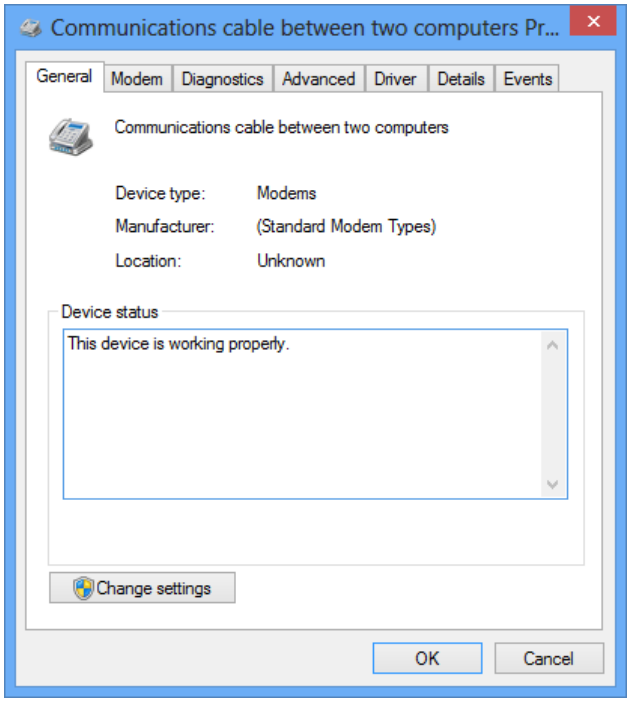


Fig. 96

- If it looks like this you are fine.
- Click -> OK
- Click -> OK again
- Continue with Step 3

Step 3: Configure the internet connection

- Move the mouse pointer to the left bottom corner of the screen and click the right mouse button.
- There select "Control Panel".
- Select "Network and Sharing Center".

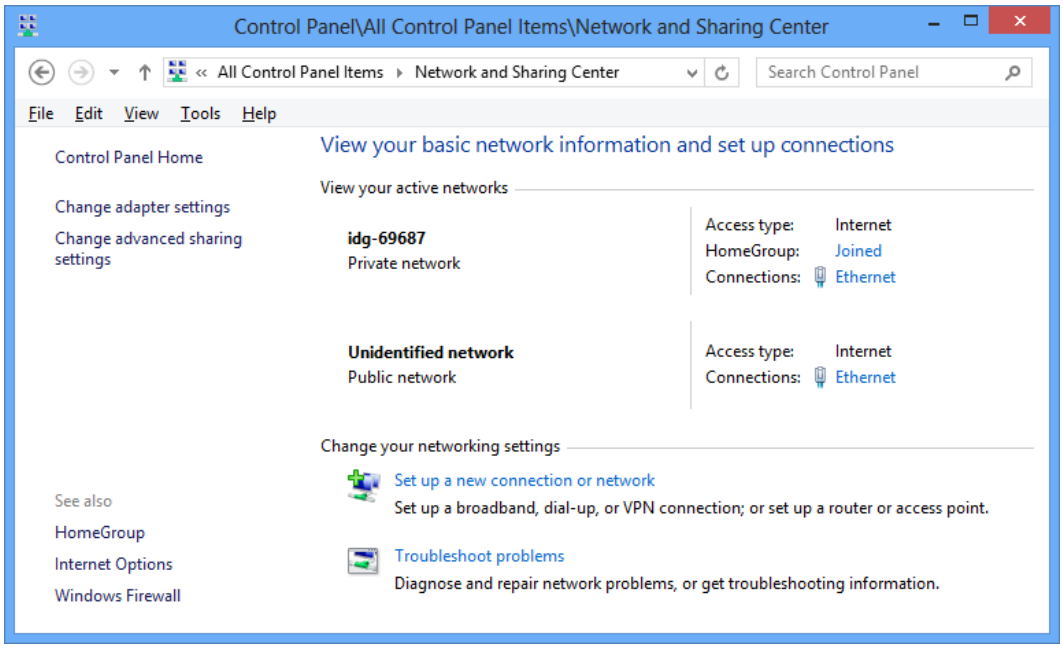


Fig. 97

- Select "Setup a new connection or network".

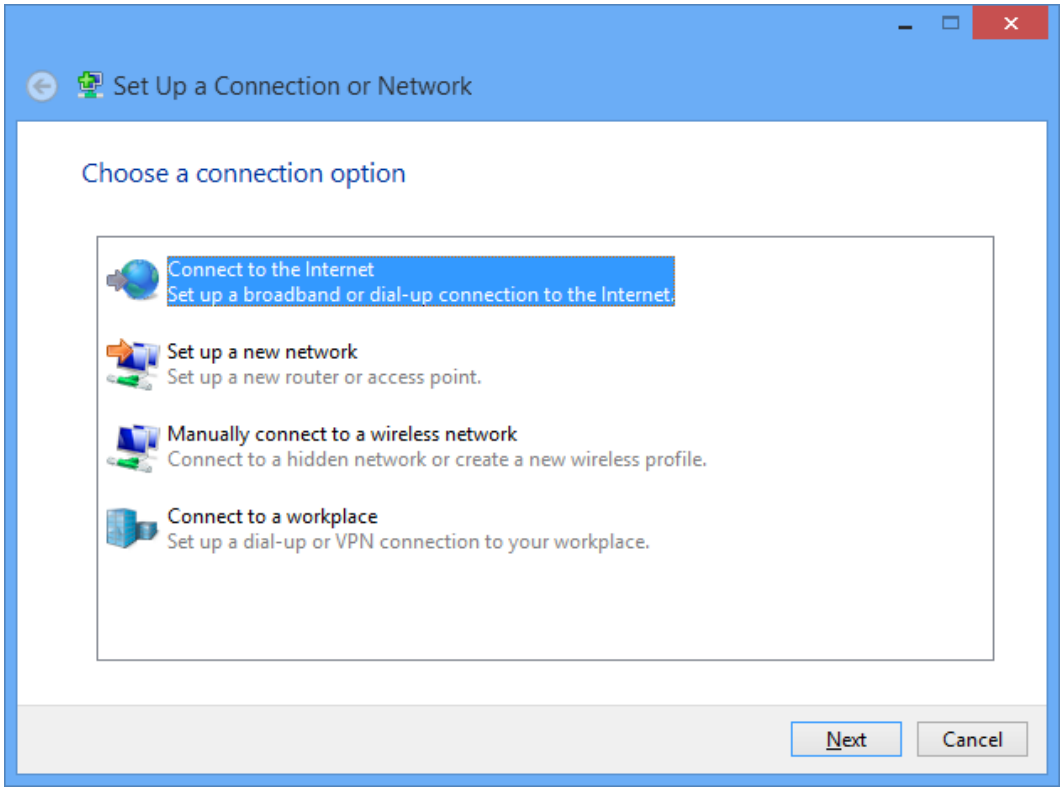


Fig. 98

- Select "Connect to the Internet".
- Click -> Next

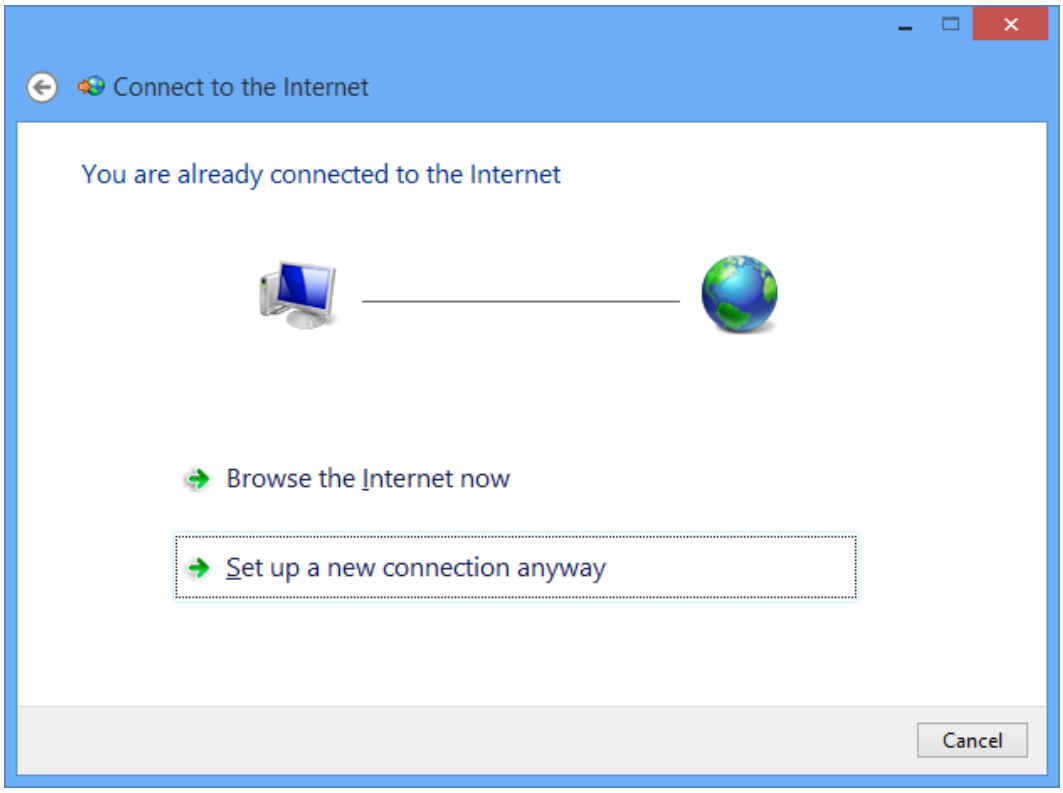


Fig. 99

- Select "Set up a new connection anyway".

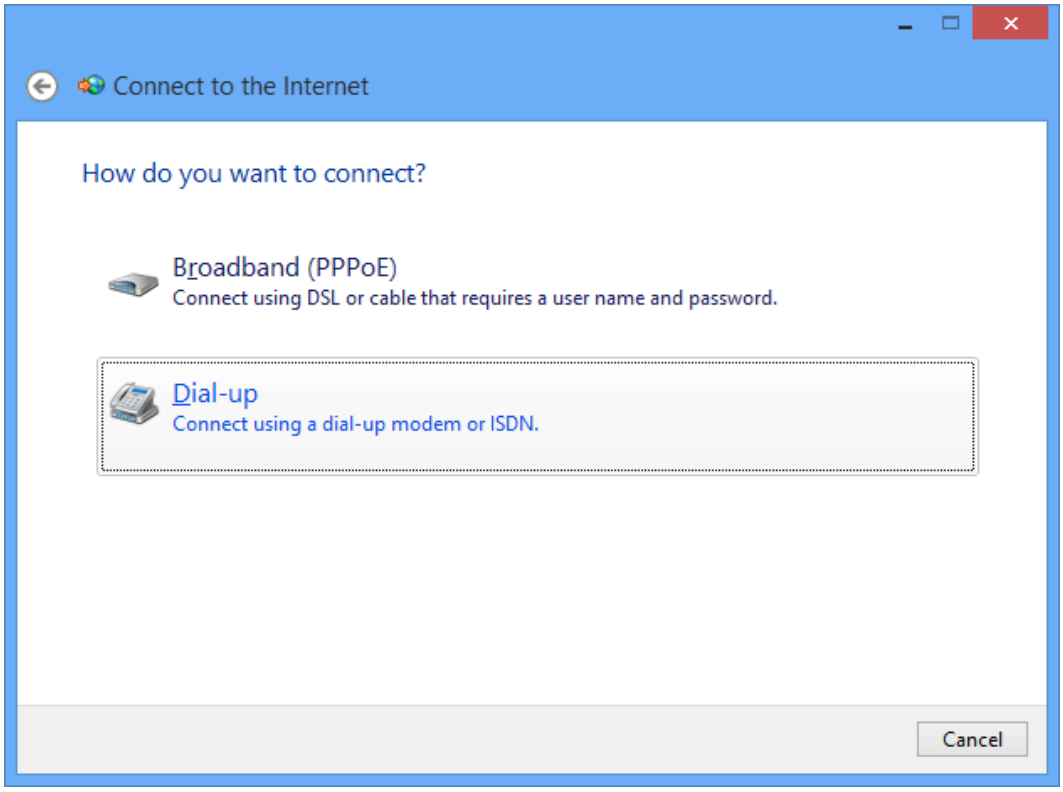


Fig. 100

- Select "Dial-up".

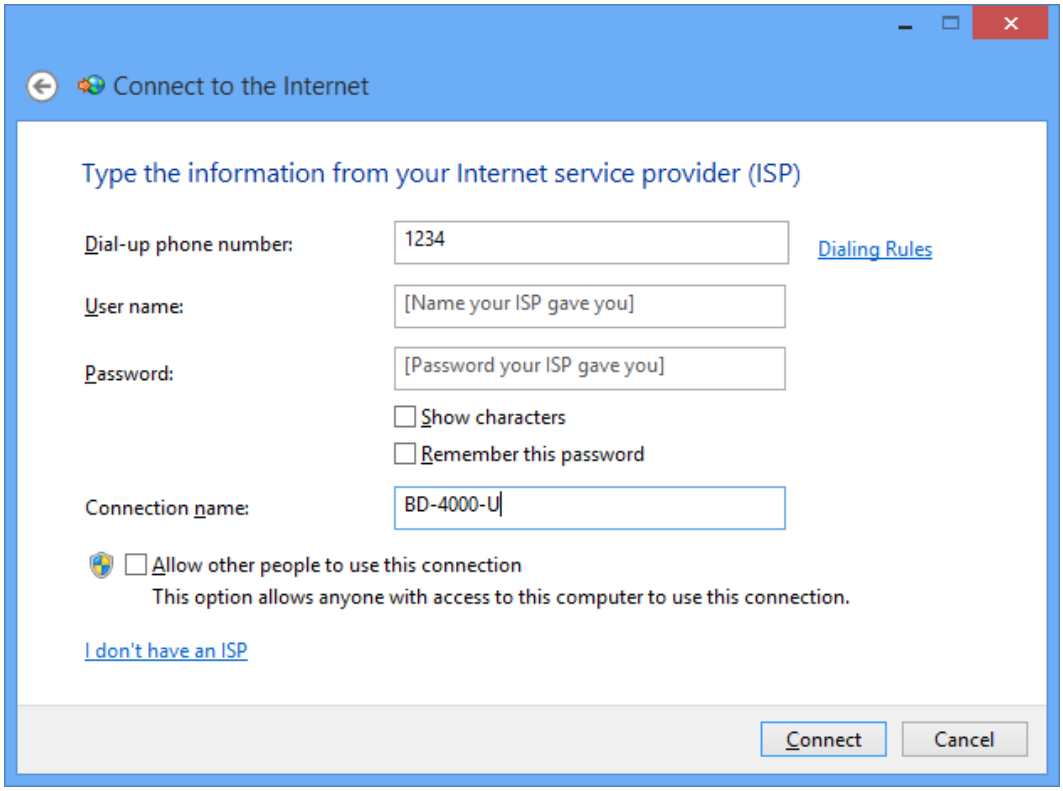


Fig. 101

- It gets a bit tricky here... (Like in Windows 7)
- Enter a dummy phone number (1234), to be able to continue.
- Enter a connection name. (BD-4000-U)
- Click -> Connect. (Note: It will fail to connect because the link is not yet configured.)

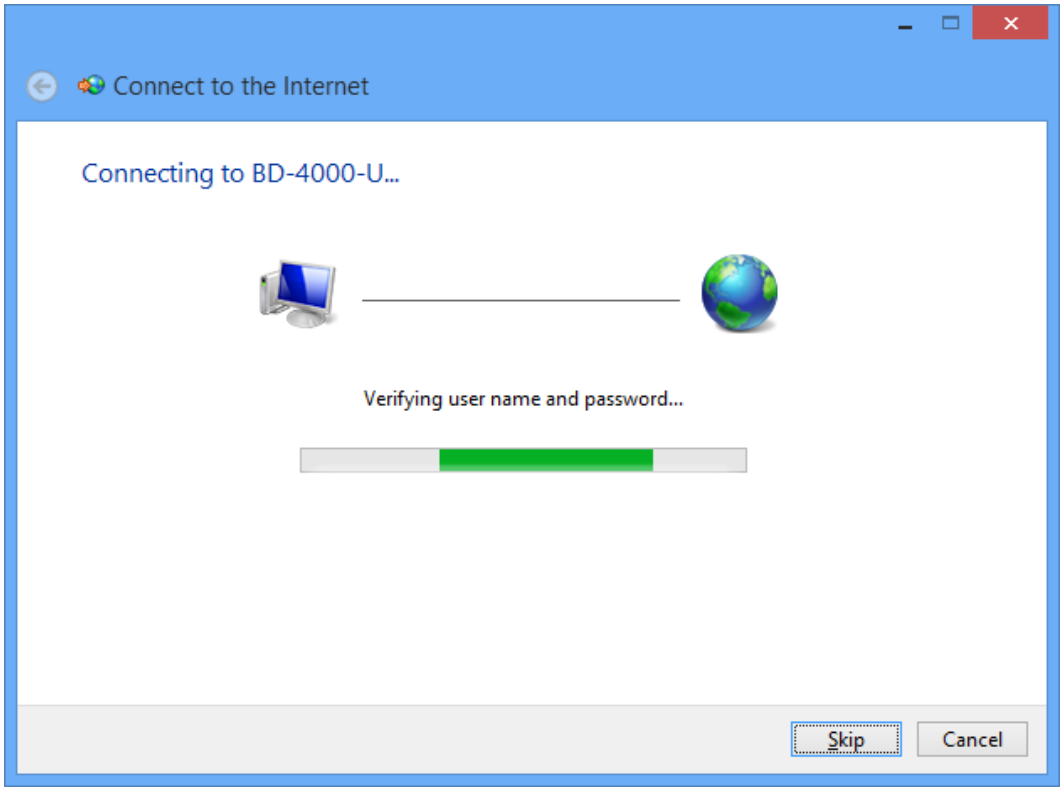


Fig. 102

- Click -> Skip

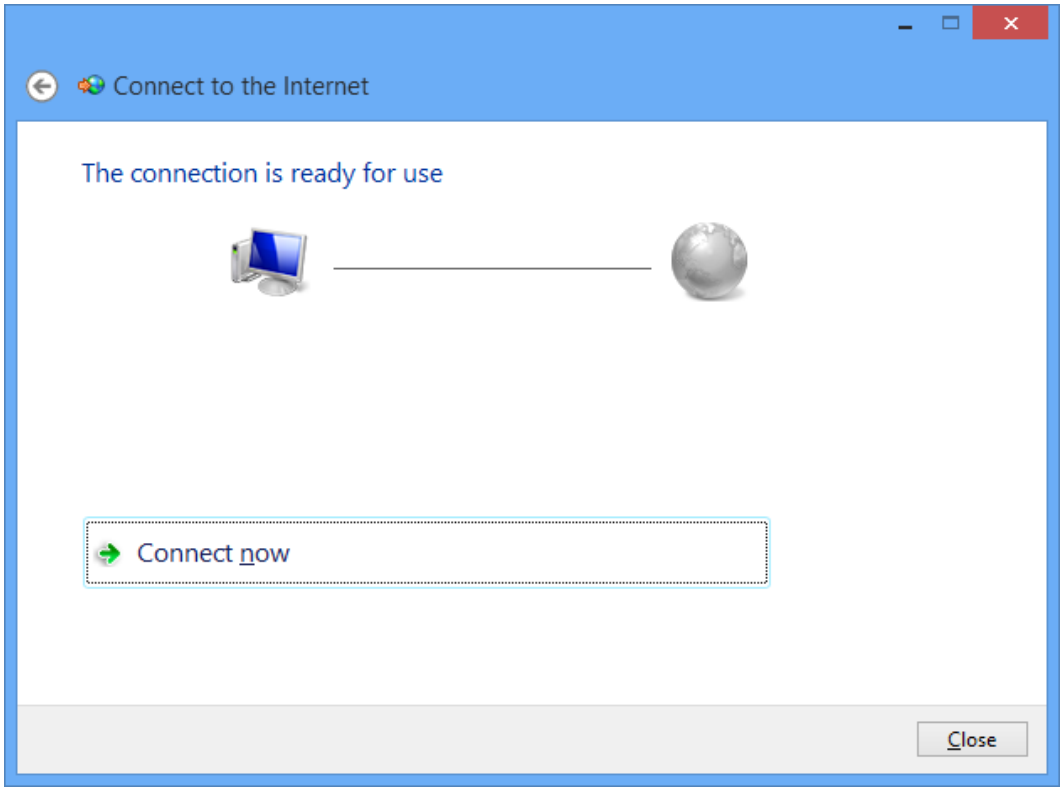


Fig. 103

- Click -> Close

Now we must configure the new internet connection.

- Move the mouse pointer to the left bottom corner of the screen and click the right mouse button.
- There select "Control Panel".

- Select "Network and Sharing Center".

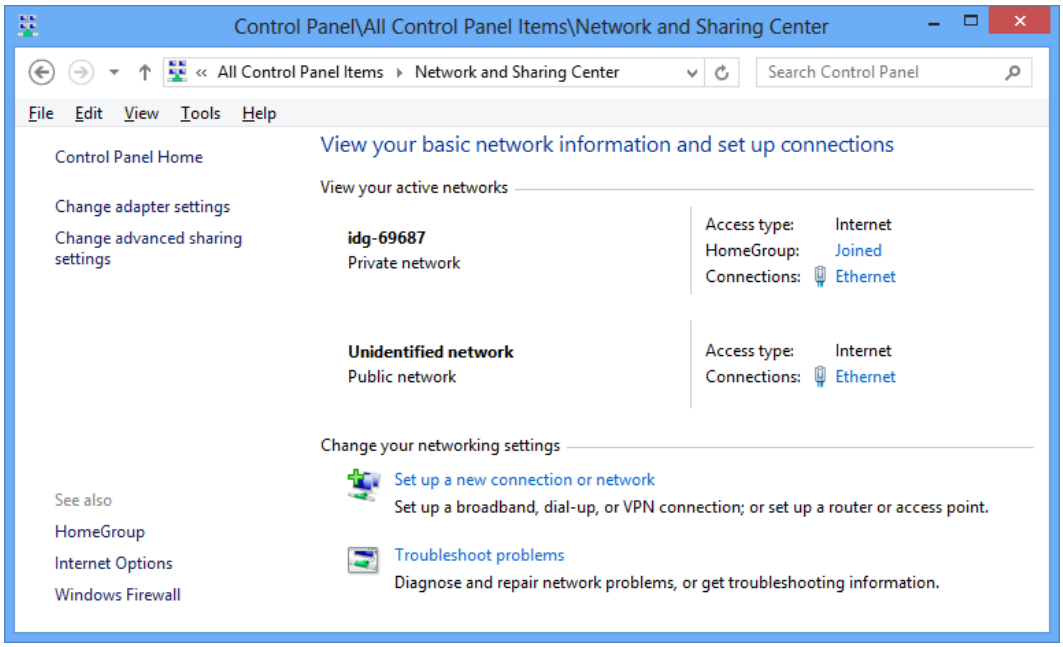


Fig. 92

- Select "Change adapter settings".

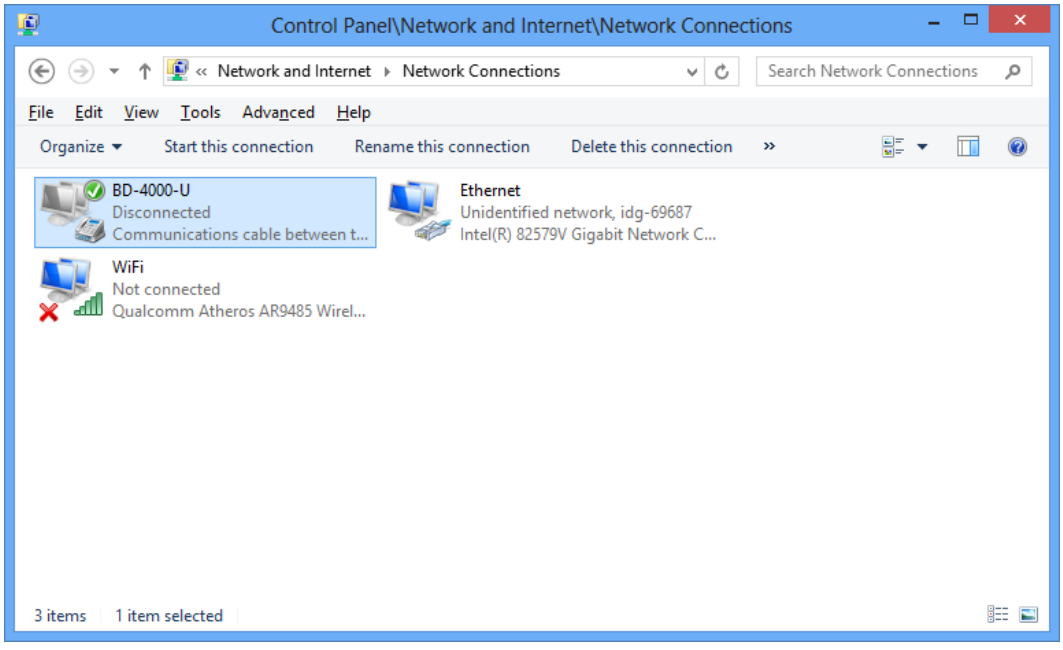


Fig. 104

- Right click the new connection (BD-4000-U) and select "Properties".

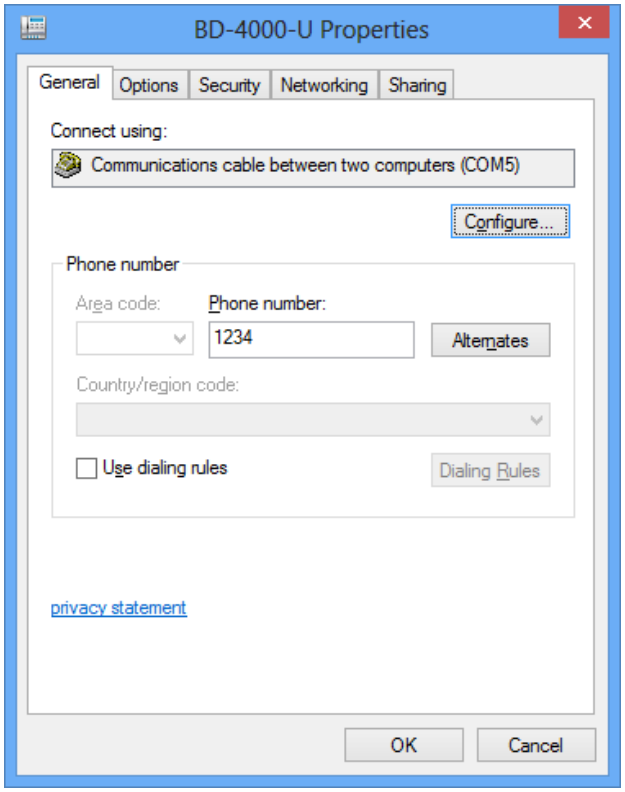


Fig. 105

- Click -> Configure...

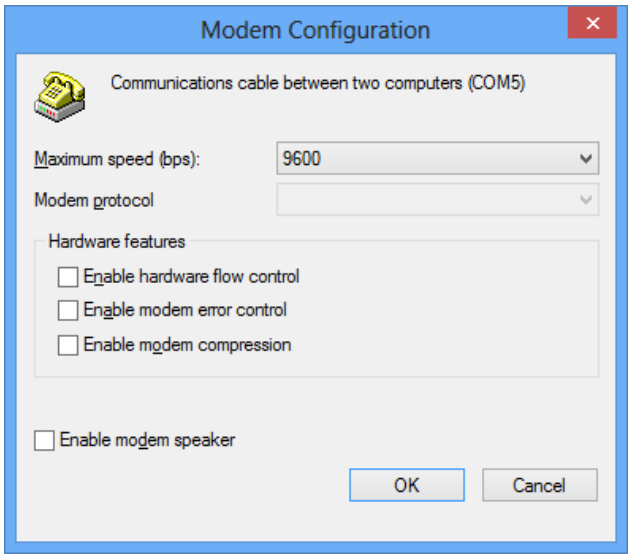


Fig. 106

- Select the speed 9600. (Not relevant for the real speed.)
- Uncheck all check boxes.
- Click -> OK
- Select tab Options.

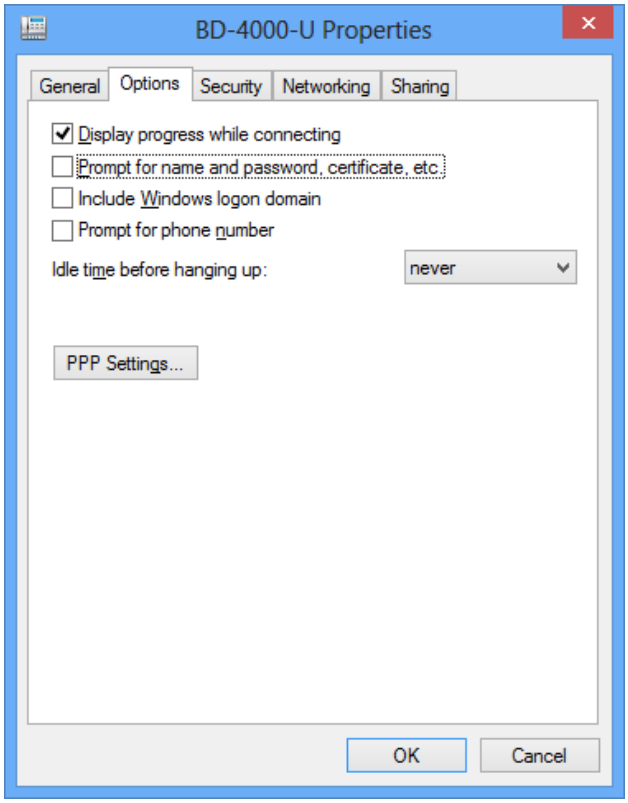


Fig. 107

- Setup the properties like this.
- Click -> "PPP Settings..."

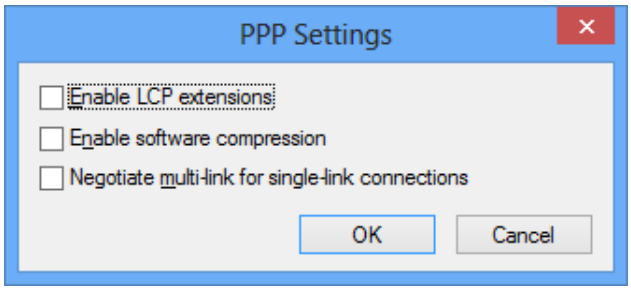


Fig. 108

- Uncheck all checkboxes here.
- Click -> OK
- Select tab Security

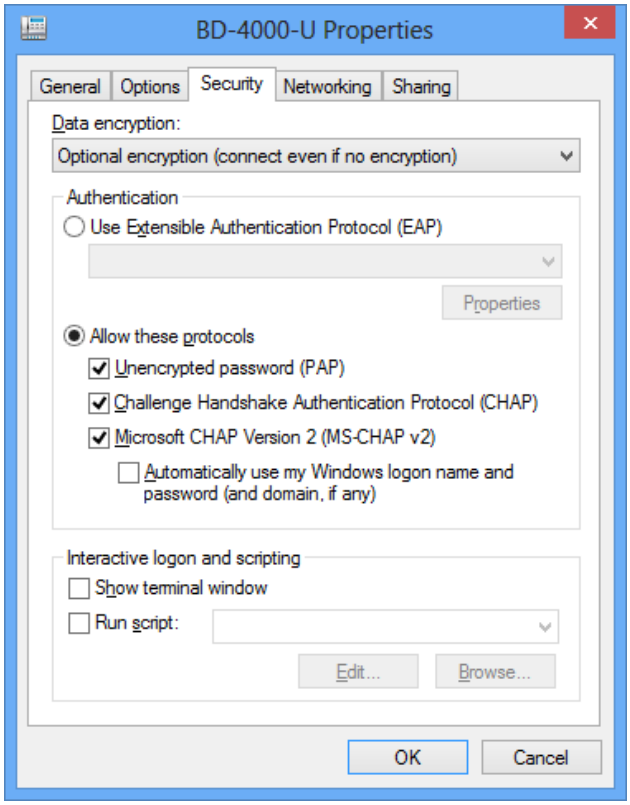


Fig. 109

- If this dialog looks like this the continue.
- Click -> OK
- Select tab Networking

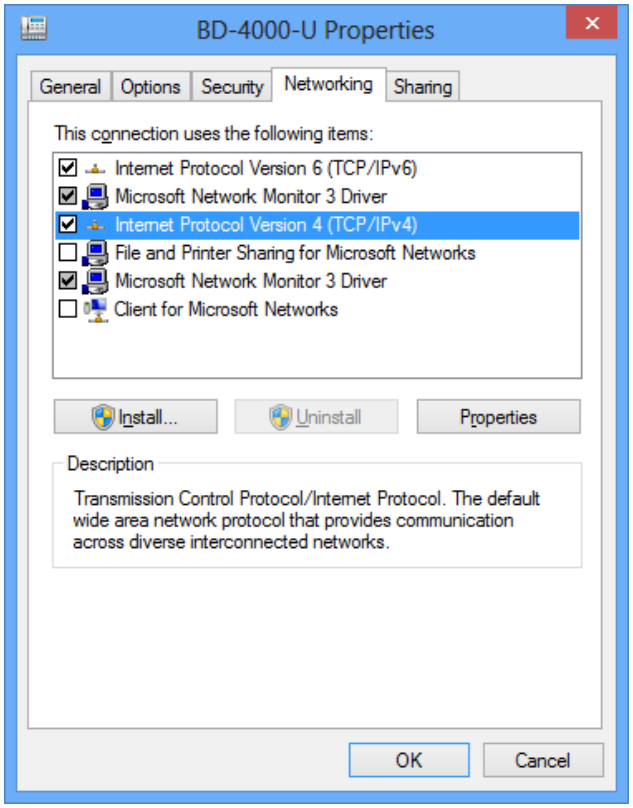


Fig. 110

- Select "Internet Protocol 4 (TCP/IPv4)".
- Click -> Properties

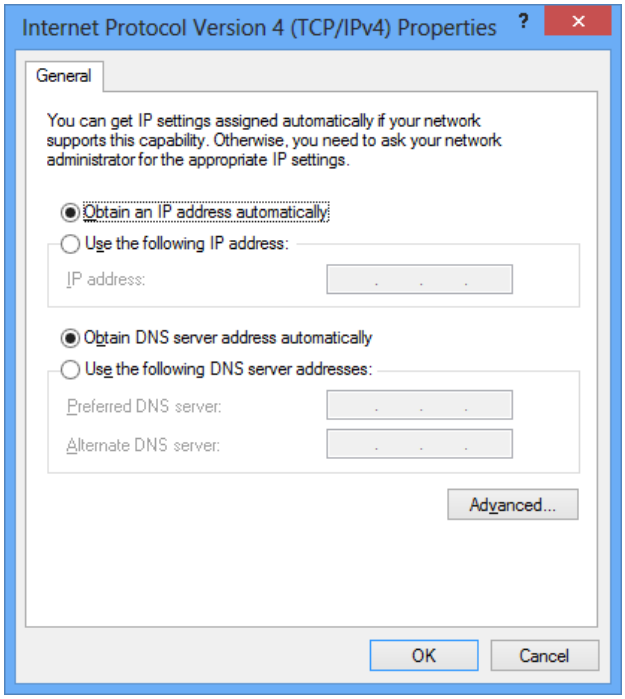


Fig. 111

- Click -> Advanced...

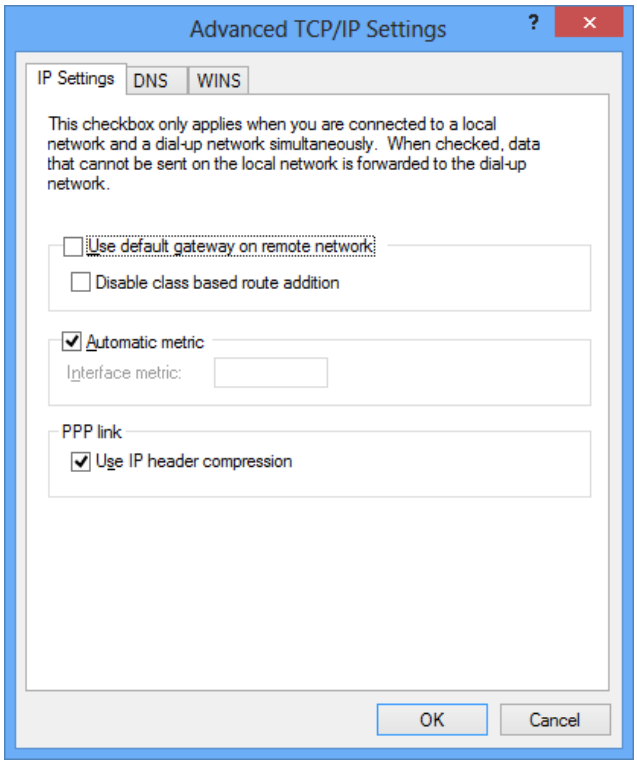


Fig. 112

- Uncheck "Use default gateway on remote network".
- Click -> OK
- Click -> OK again
- Close Control Panel.

Testing the new connection

The connection symbol can be found at the screen right bottom in the task bar.

Fig. 113

- Click on this symbol and the connection dialog below opens.

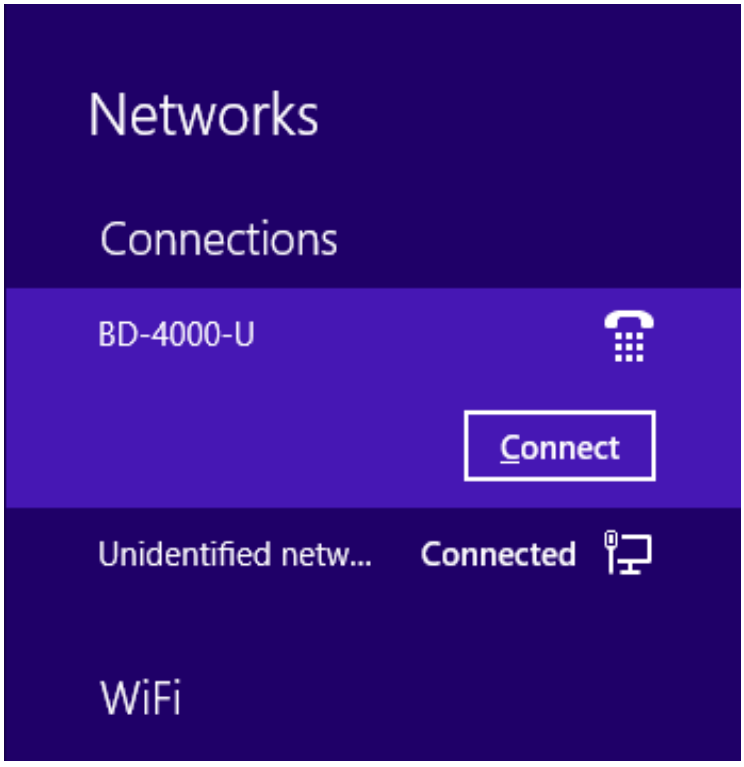


Fig. 114

- Click on the new connection (BD-4000-U).

- Click -> Connect

The connection should be established here, otherwise some error messages will show the type of failure.

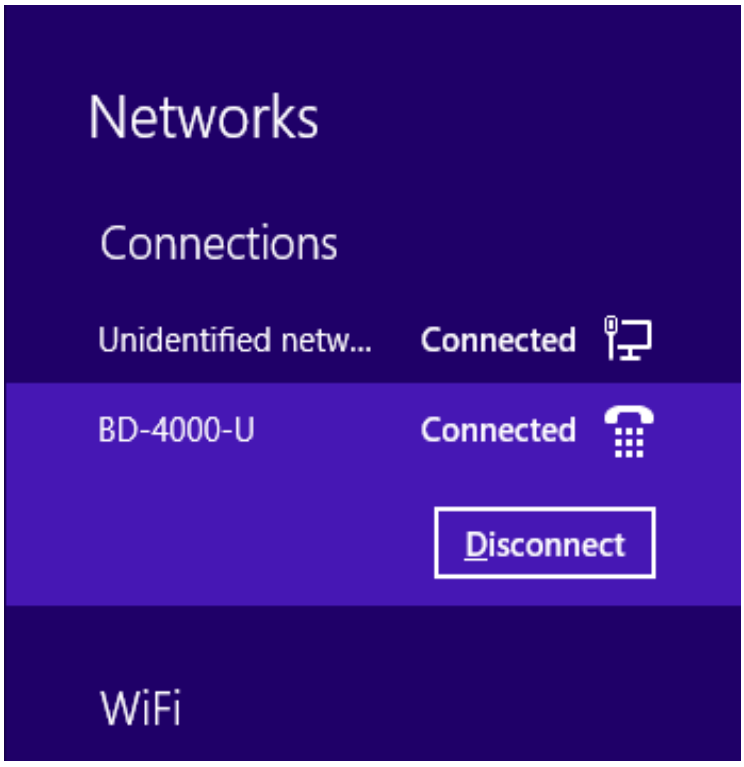


Fig. 115

- Here you see the successful connection with the MDB interface.
- Click -> Disconnect

Installation on Windows 10

Note: In Windows 10 is a serious bug when installing the dialup modem cable. The windows 10 will crash or hang. So it forced us to find a work around and we implemented the commination over HDLC to avoid the dialup modem cable. So look at next paragraph.

Alternative Installation over HDLC

This applies to Windows 7, 8 & 10. The minimum requirements are firmware release V01.14, build 14.01.16 or newer and ESDA.EXE release V04.11, build 30.05.16 or newer.

When you connect the BD-4000-U with the computer you see a virtual serial port like COM6: in the device manager under rubric Ports (COM & LPT).

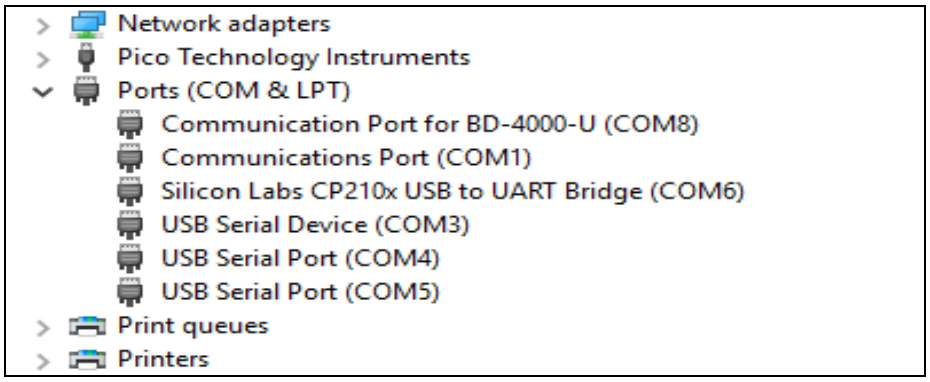


Fig. 144

If the serial virtual port is not displayed then script BD-4000.INF is needed. This script resides in the windows directory like: C:\Windows\INF

Select the required application

Use a terminal application like HyperTerm and connect to the serial virtual port (COM8 in our exsample). Look at “The system terminal console” for additional information about setup of HyperTerm.

Enter several ‘+’ characters until you get **XMEGA_OS>** prompt as response.

Enter ‘?’ character and you see unlock code **3.141592**.

Enter the unlock code 3.141592 to get console access. (If you miss typed start over again)

Enter ‘I’ to display current information page like below.

If Application doesn’t show “2 = Analyzer over HDLC” use command ‘S’ to change it to 2.

Important: The change will have effect after the next reset, so disconnect HyperTerm and unplug the Interface from the USB cable for a few seconds.

Reconnect HyperTerm and check if the it shows “2 = Analyzer over HDLC”.

Now the BD-4000-U is ready for use.

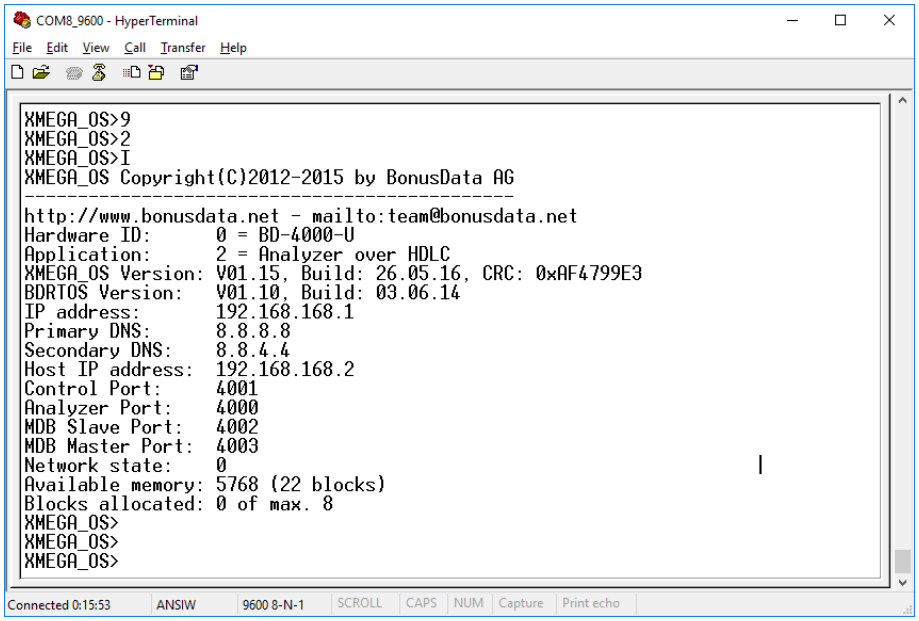


Fig. 145

Setup ESTA.EXE for using the HDLC protocol

Start analyzer application ESTA.EXE then click Menu -> Options -> Settings and choose tab “Connections settings…”.

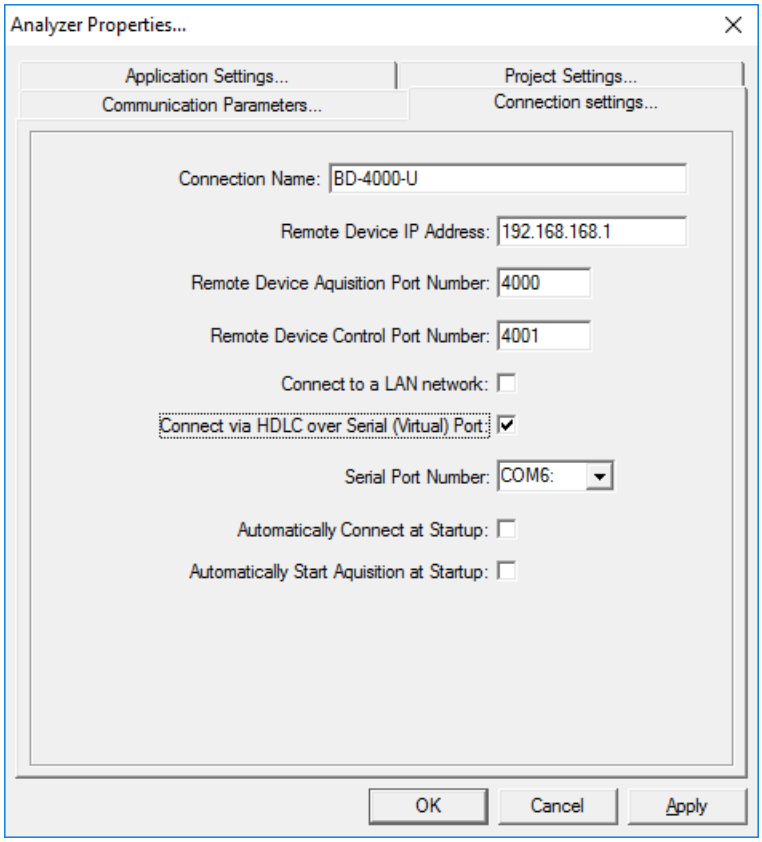


Fig. 146

Here check “Connect via HDLC over serial (Virtual) Port:” and choose the correct COMn: port. That's’it, the analyzer is ready for use now…

LED indicator information

The MDB interface has one green and four red LED indicators where the green LED shows the current operating mode and the red LED the communication activity.

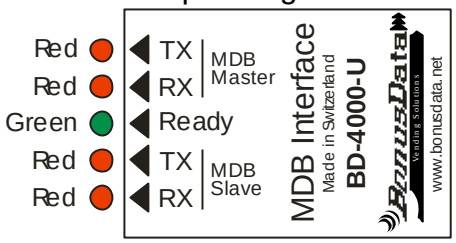


Fig. 116

The green ready LED:

- Blinking 0.5 sec ON / 0.5 sec OFF: The firmware is running and idle.
- Blinking 0.1 sec ON / 0.1 sec OFF: Data acquisition active.

In Analyzer Mode:

- The red LED RX MDB master shows activities on the MDB master receive line.
- The red LED RX MDB slave shows activities on the MDB master transmit line.
- LED TX MDB master and LED TX MDB slave are not used.

In Gateway Mode:

- The two red LED's TX/RX MDB master shows activities on the MDB master bus.
- The two red LED's TX/RX MDB slave shows activities on the MDB slave bus.

In boot loader mode:

- Blinking 0.5 sec ON / 0.5 sec OFF: The firmware is running and idle.
- The red LED TX MDB master is OFF.
- The red LED RX MDB master is ON.
- The red LED TX MDB slave is ON.
- The red LED RX MDB slave is OFF.

After successful firmware download:

- Blinking 0.5 sec ON / 0.5 sec OFF: The firmware is running and idle.
- All red LED's are ON.

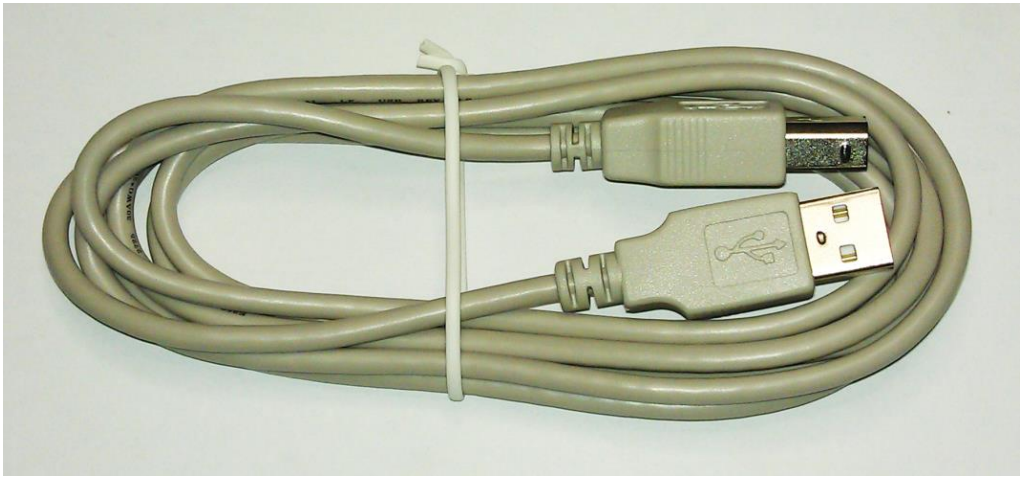
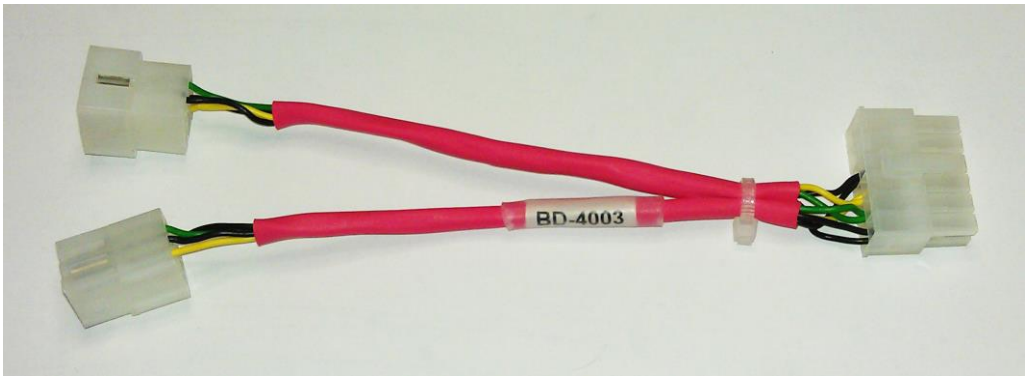
Accessories and part numbers

Depending on the usage of the BD-4000 interface there are several cable sets available.

- Use it as serial data analyzer: Two serial interfaces are used to record the two directions. For MDB the master and slave interface is used and for RS-232 the two serial interfaces are used.
- Use it as MDB interface: The two MDB interfaces can by used to either handle a MDB master or MDB slave bus or even simultaneously master and slave bus. Here the serial ports are still available to communicate with other RS-232 devices like the DEX port or serial printer etc.

Accessories for the analyzer operating mode

Part Number:	Description:
BD-4001	USB cable 1.8 meter with standard type 'A' and 'B' connector.

	
BD-4003	Adapter cable ‘Executive’ with male and female connector. 
BD-4004	Adapter cable ‘BDV’ with male and female connector. 
BD-4005	Adapter cable ‘RS-232’ with male and female D-Sub. 9-pin connector.

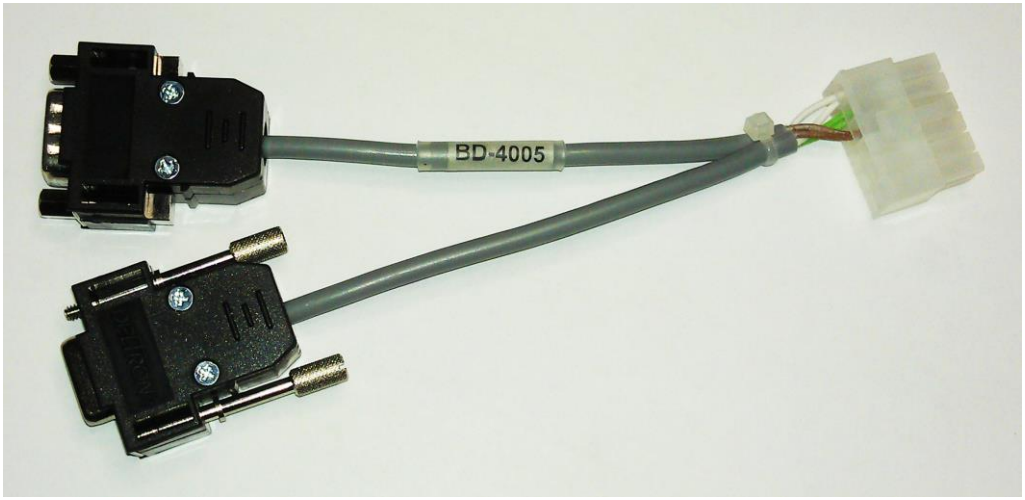
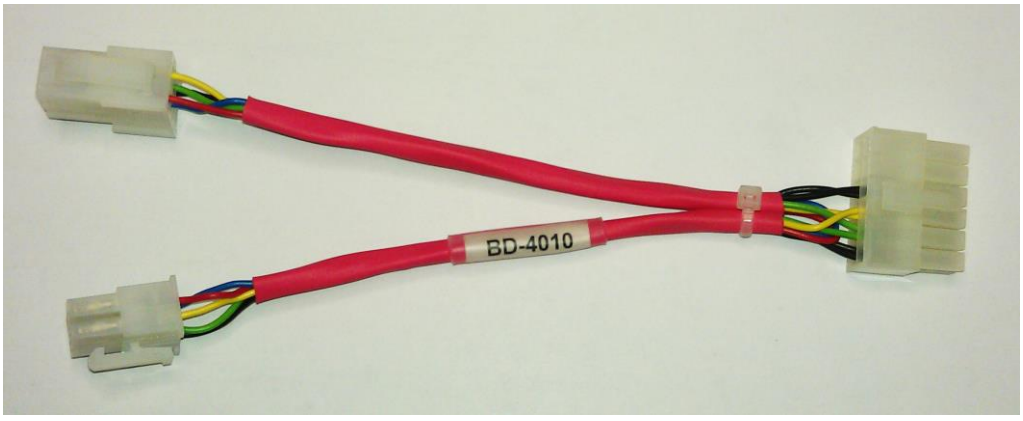
	 Note: The RS-232 cable does not support the handshake lines like RTS, CTS, RTS and DCD.
BD-4006	Adapter cable 'DDCMP/DEX' with male and female audio Jack 6.3mm connector. 
BD-4010	Adapter cable 'MDB' with male and female Molex connector. 

Table 3

Note: The adapter cables of previous analyzer devices BD-4000 and BD-4000/2 are compatible and can still be used with BD-4000-U/S/E interface.

Note: See Appendix A1 for the schematics of the adapter cables.

Accessories for the gateway operating mode

Part Number:	Description:

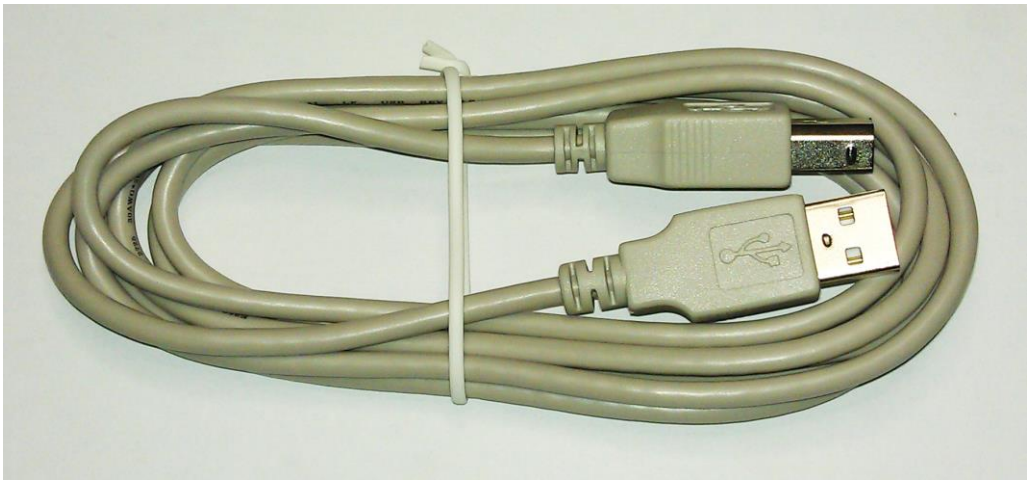
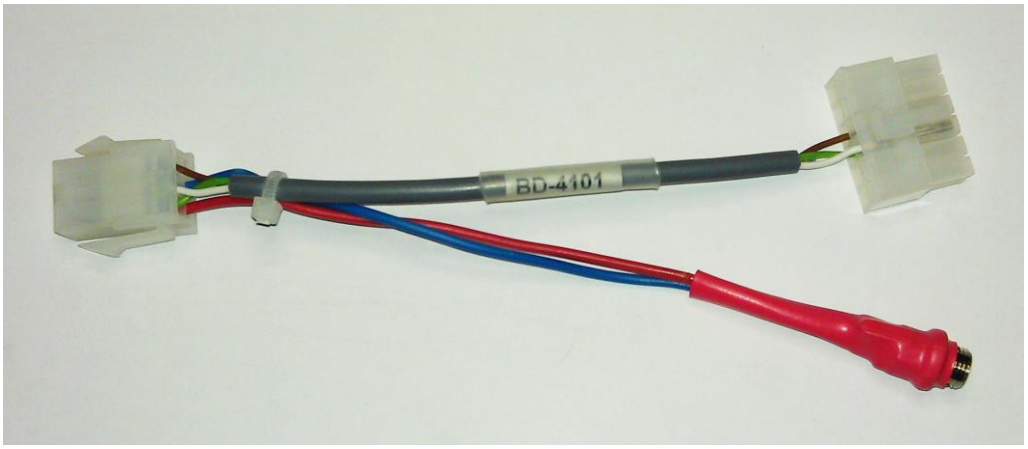
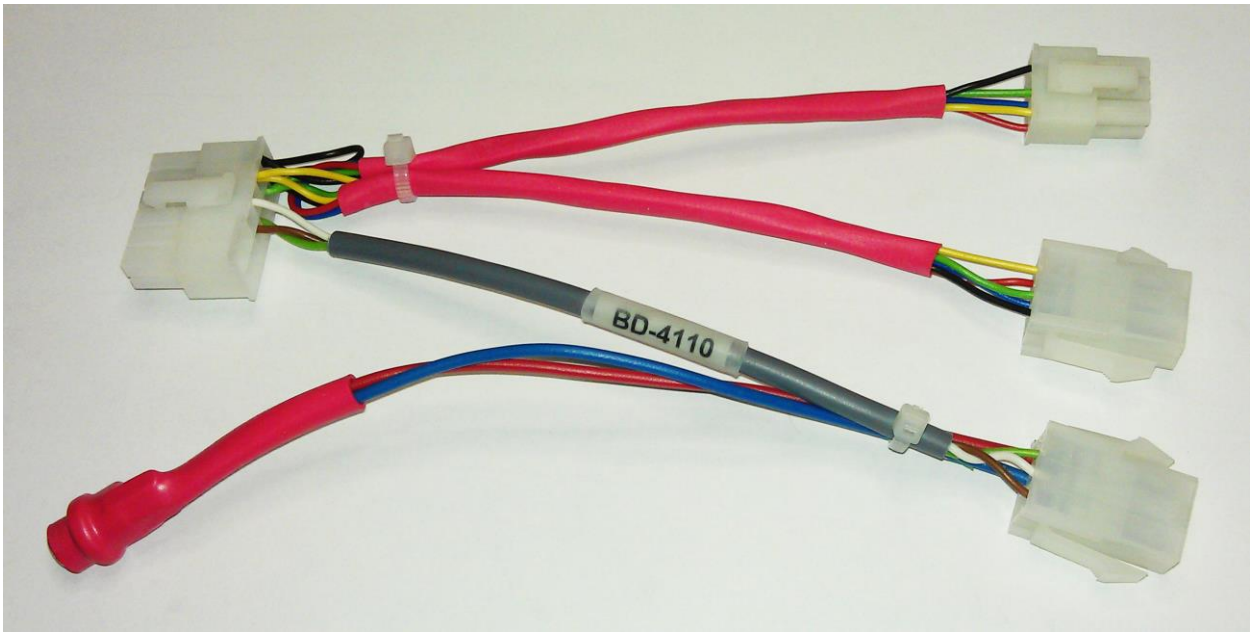
BD-4001	USB cable 1.8 meter with standard type ‘A’ and ‘B’ connector. 
BD-4100	Interface Cable for MDB Slave operating mode.
BD-4101	Interface Cable for MDB Master operating mode. 
BD-4110	Interface Cable for MDB Slave & MDB Master operating mode.  Note: The cable BD-4110 is a combination of cables BD-4100 & BD-4101.

Table 4

Note: The interface cables of previous analyzer devices BD-4000 and BD-4000/2 are compatible and can still be used with BD-4000-U/S/E interface.

Note: See Appendix A2 for the schematics of the adapter cables.

The system terminal console

After connecting or power up the MDB interface a virtual communication port is available. Any serial terminal can be connected to this virtual communication port, but here we reference the HiperTerminal included in Windows XP. Unfortunately Microsoft removed it in Windows 7 after years available in all previous Window versions. A bad decision in my opinion! But the HyperTerm still works on Windows 7, 8 & 10. It can be found on Windows XP installation CD-ROM or in the internat.

Any other terminal applications can be used, for example PuTTY who is found here: http://www.chiark.greenend.org.uk/~sgtatham/putty/

We reference HyperTerm on the following pages.

After starting HyperTerminal hit the 'Enter' key to test if you get the prompt 'XMEGA_OS'. If nothing happens disconnect and check the communication parameter settings.

- Click -> Menu -> File -> Properties

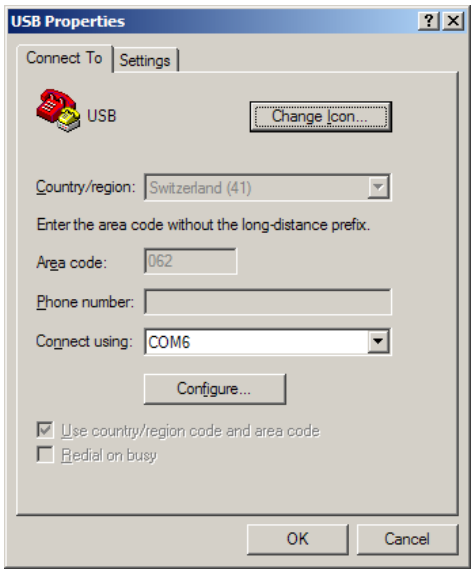


Fig. 117

- Check if your communication port is correct.
- Click -> Configure…

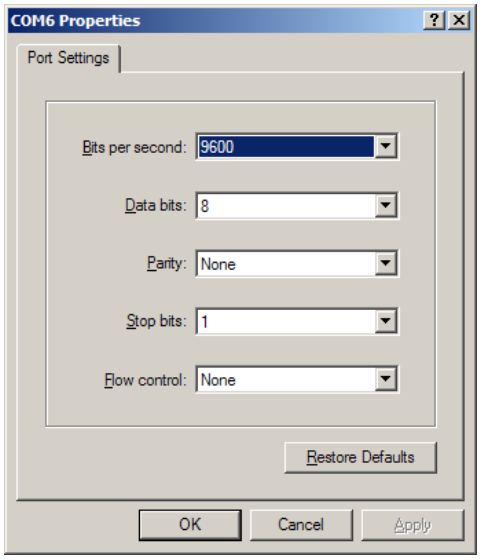


Fig. 118

It must be setup for 9600 baud, 8 data bit, 1 stop bit, no parity and no flow control.

- Reconnect and check again and the prompt should be there now.
- Enter a question mark to get a short help about the available commands.

Note: The prompt in system terminal console is: XMEGA_OS>

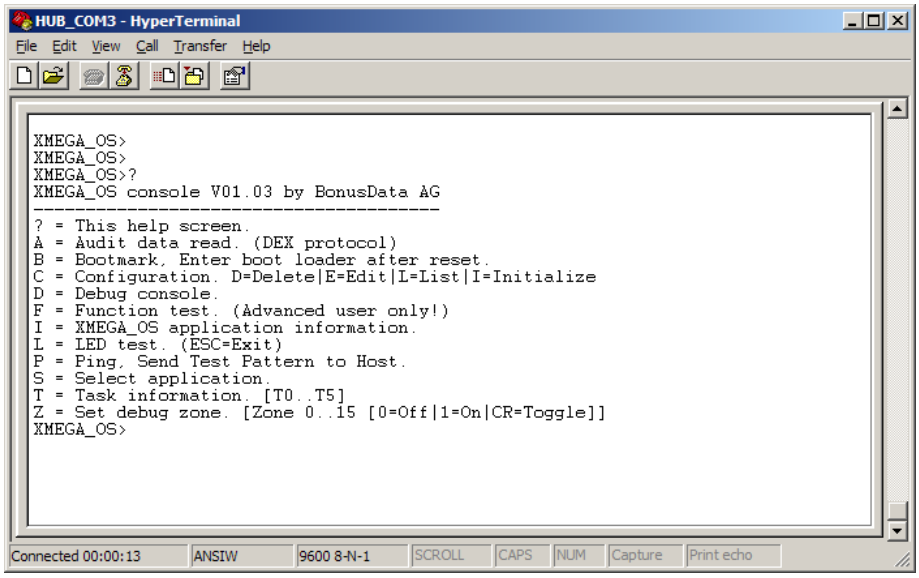


Fig. 119

If you see a similar help screen you are fine.

Note: This help screen may change with different versions of the firmware.

The most important item here is ‘C’ for Configuration. Don’t play too much with that unless you know exactly what you do. It contains the configuration of the MDB interface and is responsible for the proper functionality of the firmware.

If you enter ‘CL’ it displays a list of the current configuration.

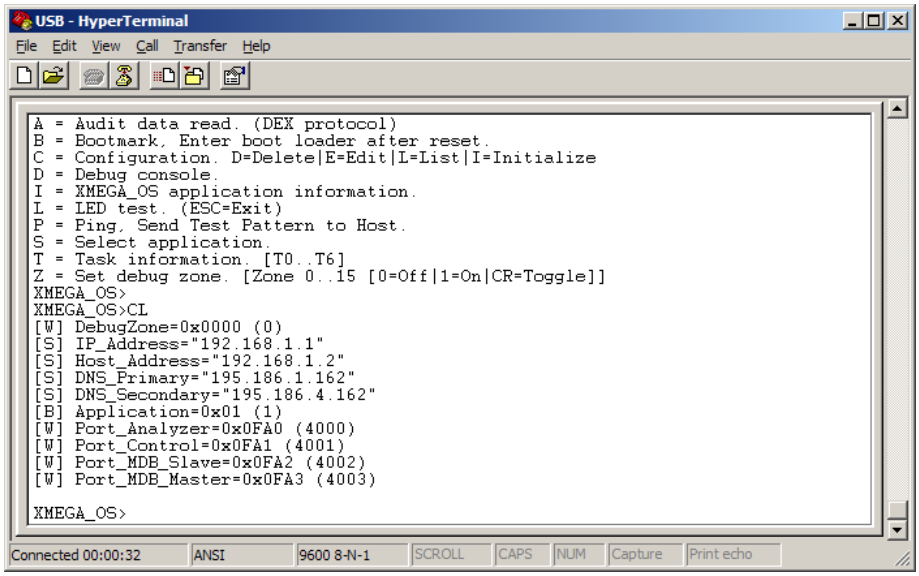


Fig. 120

Here are the IP addresses and port numbers defined. It must correspond with the settings of the application connecting to this interface.

Note: Use command ‘CR’ to restore the original factory settings.

How to change the IP address

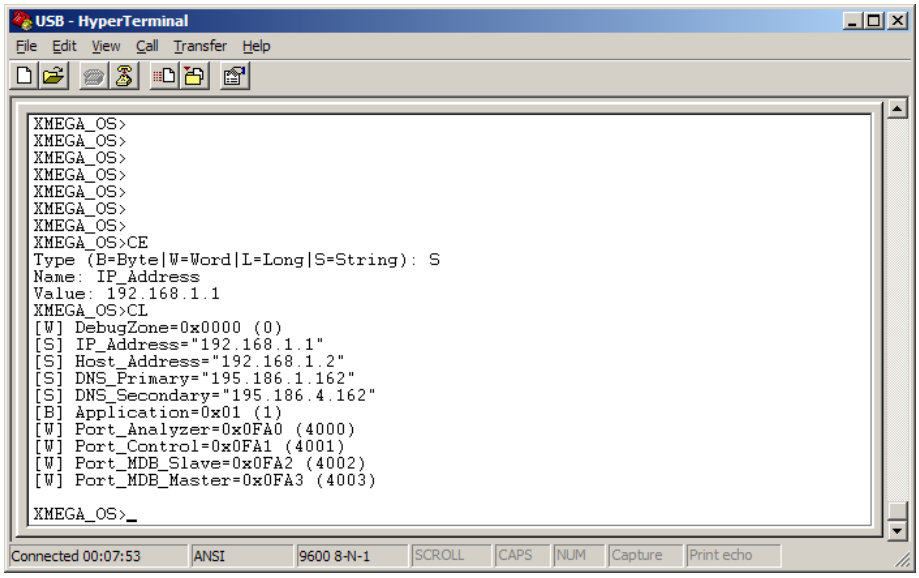


Fig. 121

- Enter CE (Configuration edit)
- Enter parameter type (S for string)
- Enter parameter name (IP_Address) Caution! Enter the name correct!
- Enter parameter value (The new IP address 192.168.1.1)
- Enter CL to verify if the correct change.

How to change a port number

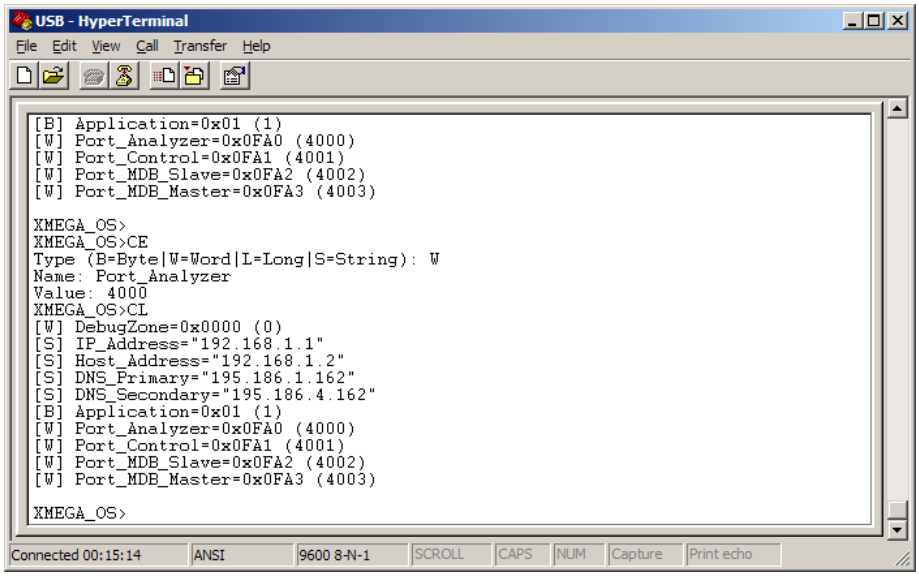


Fig. 122

- Enter CE (Configuration edit)
- Enter parameter type (W for WORD)
- Enter parameter name (Port_Analyzer) Caution! Enter the name correct!
- Enter parameter value (The new Port number 4000)
- Enter CL to verify the correct change.

How to delete a parameter

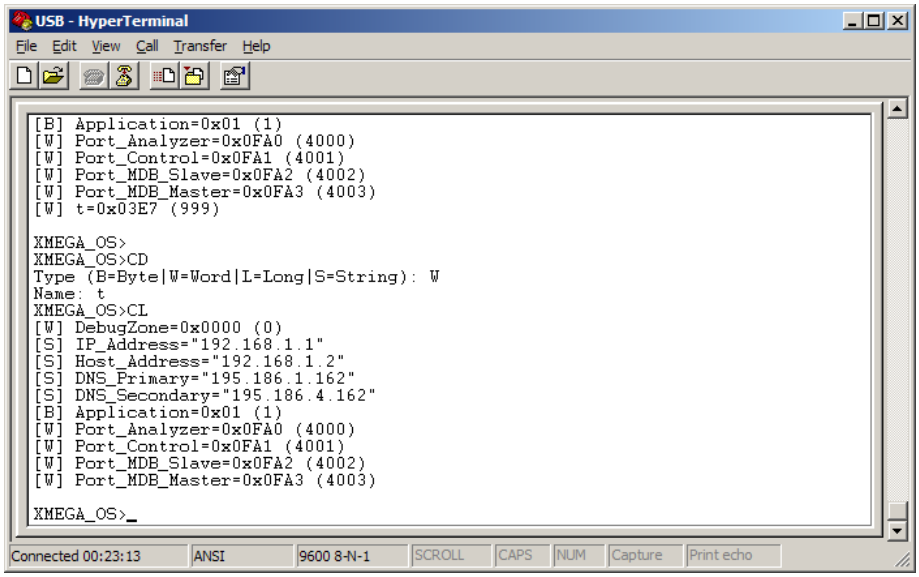


Fig. 123

Sometime there are settings you don't want like here the 't=0x03E7 (999)'. It has no effect but is confusing so we delete it.

- Enter CD (Configuration delete)
- Enter parameter type (W for WORD)
- Enter parameter name ('t' we want to delete)
- Enter CL (Verify it is deleted)

CAUTION! The command 'CI' will initialize and delete the whole configuration.

Configuration parameter

The table below lists all available configuration parameters. The parameter names are case sensitive and if it is not correct it will be not found and the default value is instead.

The parameter type is one of the following:

BYTE = B = The parameter is a byte value (8 bit) in the range of 0..255.
WORD = W = The parameter type is a word value (16 bit) in the range of 0..65535.
LONG = L = The parameter type is a long value (32 bit) in the range 0..4294967295.
STRING = S = The parameter type is a string value defining a text.

Parameter:	Type:	Description:
Application	B	Select the active application. Default: 0 0 = Operating Mode Analyzer. 1 = Operating Mode Gateway.
IP_Address	S	The IP address of the MDB interface. Default: Empty string
DNS_Primary	S	Primary domain name server IP address. Default: Empty string
DNS_Secondary	S	Secondary domain name server IP address. Default: Empty string
Host_Address	S	Host computer IP address. Default: Empty string
Port_Control	W	Port number to control the MDB interface. Default: 4001
Port_Analyzer	W	Port number of the Analyzer in analyzer operating mode. Default: 4000
Port_MDB_Slave	W	Port number of the MDB Slave interface in gateway operating mode. Default: 4002
Port_MDB_Master	W	Port number of the MDB Master interface in gateway operating mode. Default: 4003
DebugZone	W	Defines the active debug zones in connection with the system console. Default: 0 Note: In normal operation this parameter must be set to 0 because it can slow down the performance dramatically!
EchoSetup	B	Enable the "Echo Protocol" for direct communication with the MDB interface over the serial RS-232 link. Default: 0

Table 5

Note: A missing parameter means that the default value is used.

Download the firmware

The MDB interface has a USB boot loader to enable field download of a new firmware. To get into boot loader mode there are several possibilities.

- Set a boot mark and reconnect the MDB interface.
- Short pin #6 & pin #12 of the MDB connector and reconnect.
- No firmware present, after production.

In the field following procedure is recommended:

Step 1:

- Start HyperTerminal. (See 'The system terminal console')

Step 2:

- Set a boot mark. Use command 'B' in system console.
- Close the HyperTerminal.
- Disconnect the USB cable and wait about 5 seconds.
- Reconnect the USB cable.
- The LED's shows boot loader mode now. (See: 'LED indicator information')
- Start HyperTerminal.

Note: The prompt in boot mode is: USBBOOT>

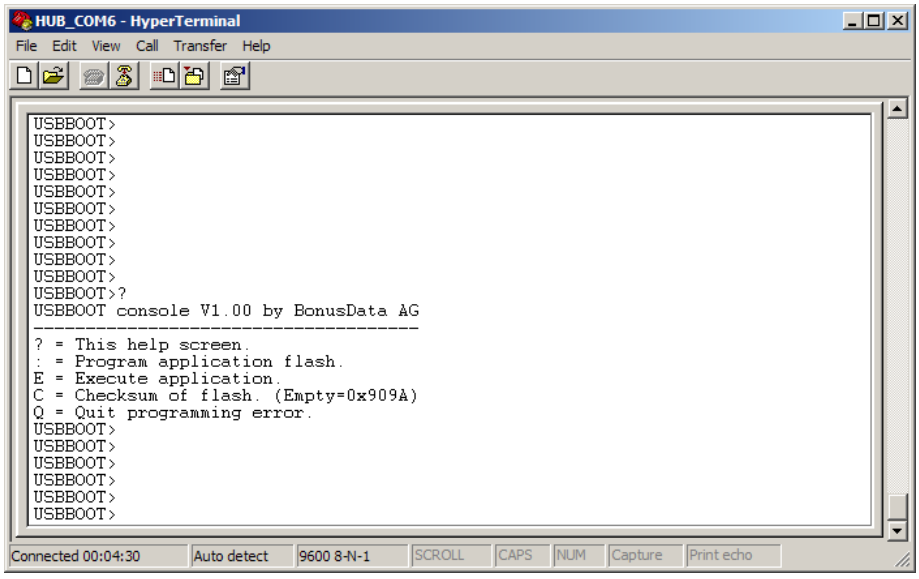


Fig. 124

Step 3:

- Click -> Transfer -> Send Text File…
- Choose the firmware file you want to download. (File extension *.hex)
- Select Files of Type: Text file (*.txt) to make it visible.
- Select the file to be downloaded.

Download begins and you see the progress by a dot per data frame sent in HyperTerminal.

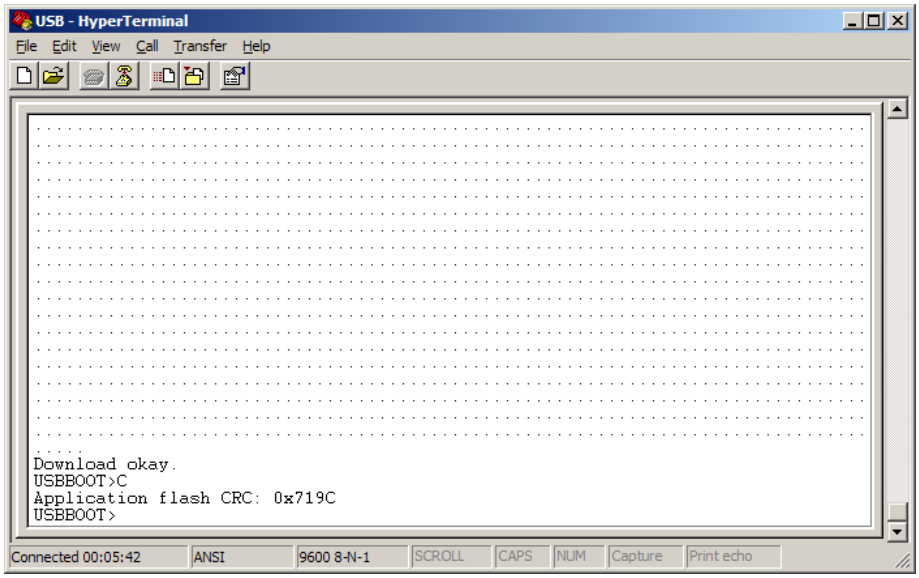


Fig. 125

After a successful firmware download you see this screen.

Enter the command ‘C’ do show the firmware CRC.

After a reconnect the new firmware is active.

Operate the MDB Interface in Analyzer mode

For this mode the configuration must setup parameter ‘Application’ = 0.

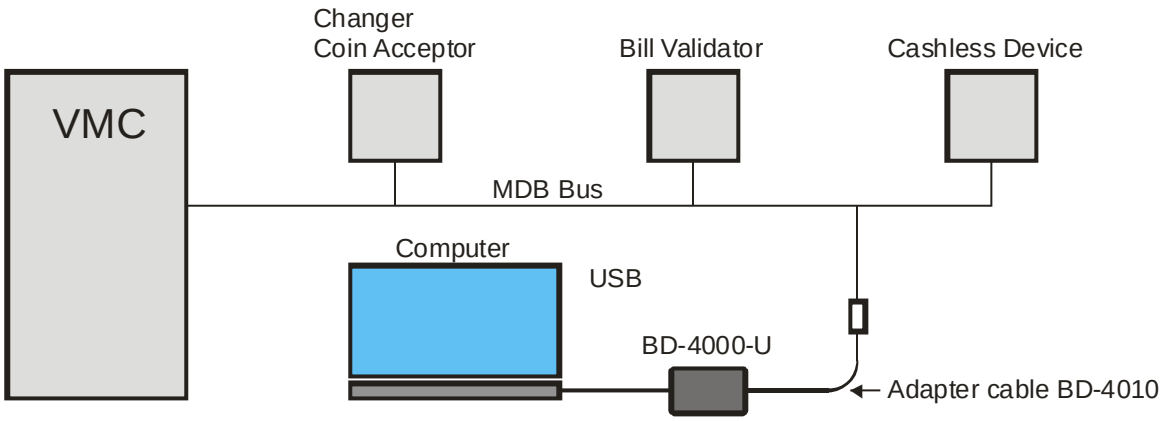


Fig. 126

In this mode the MDB Interface will use the MDB Slave receiver and MDB Master receiver to record each direction of the communication. This covers the protocols: MDB, BDV, Executive ‘A’. The receivers of the two RS-232 interfaces are used to record serial data communication up to 115’000 bit per second (BPS) in full duplex. This covers any kind of serial communication.

Switch between operating modes

To simplify switching between operating modes the command select is available at system terminal console. This requires a security code to avoid accidental switching between the applications. See ‘The system terminal console’ above.

Limitation for the BD-4000-S

If the BD-4000-S interface is used in Analyzer mode the maximum speed is limited to 9600 baud. The Interface must be setup to 115’200 baud to communicate with the host computer.

Application to use Analyzer mode

The Enhanced Serial Data Analyzer (ESDA.EXE) is an application using this mode. Developed by BonusData AG and it offers accurate serial data recording and analyzing.

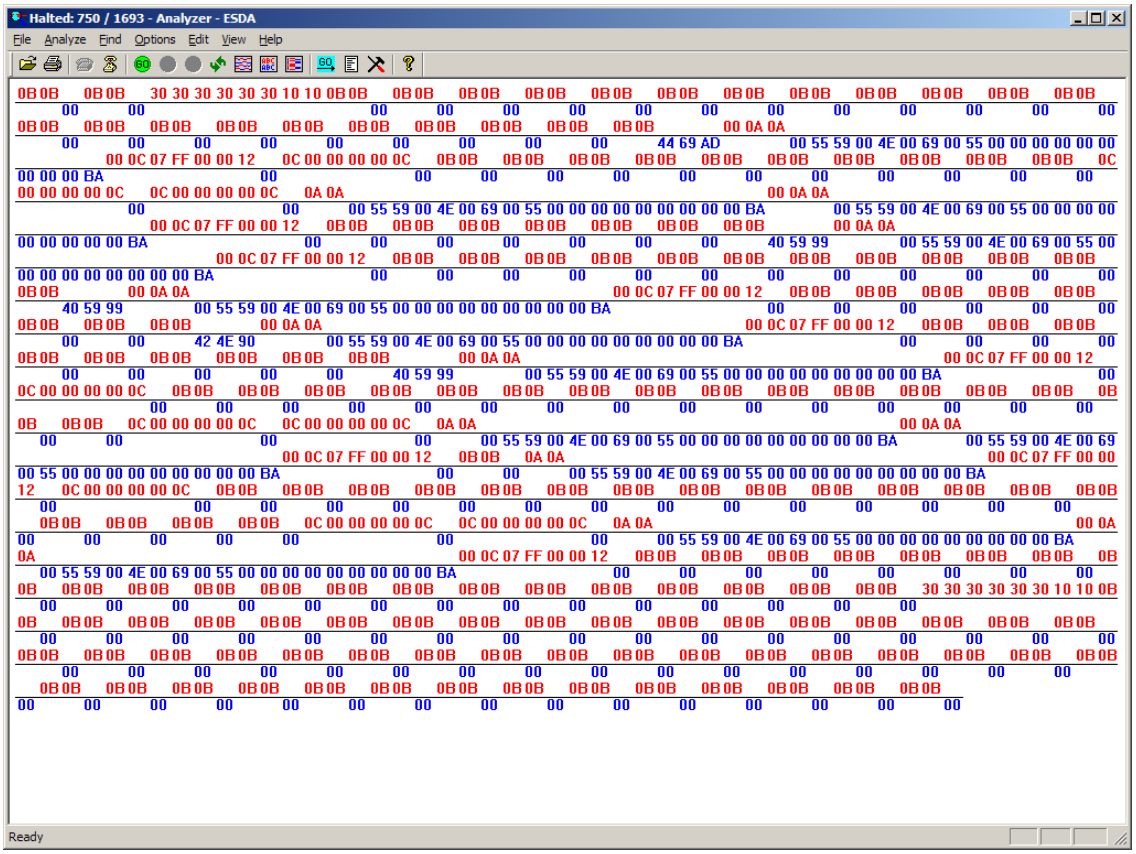


Fig. 127

A Vendo CocaCola vending machine communicating with a MEI Cashflow 690.

For detailed information check the manual of the ESDA application.

Acquisition data protocol

The UDP communication protocol is used to transfer the acquisition data to the computer. Two ports are used, one for the acquisition data transfer and one as control command port. The control command post will accept commands like ‘Start acquisition’ and ‘Stop Acquisition’.

The default IP Address: 192.168.1.1

Note: The device is acting as dialup server when you connect with your computer.

The default port numbers are:

Acquisition data port: 4000
Control command port: 4001

For each byte recorded there is an additional status byte and a timestamp send to the computer through the communication interface. To optimize the bandwidth the time stamp is of variable length and leading zero bytes are eliminated. An additional enhancement is gained by use of relative timestamps, this means the time stamp is the elapsed time to the previous acquisition byte. On high speeds this time is short and only one byte timestamps are required.

For synchronisation purposes every 10th frame is transmitted with an absolute timestamp.

Frame order:

A_R_R_R_R_R_R_R_R_A_R_R_R_R_R_R_R_R_A_R_R_R…

A = Absolute time stamp, time elapsed since the acquisition started.

R = Relative time stamp, time elapsed since the last acquisition sampling.

Note: The stop bit after the 9th bit does trigger the data sampling of the corresponding direction.

Aquisition record format:

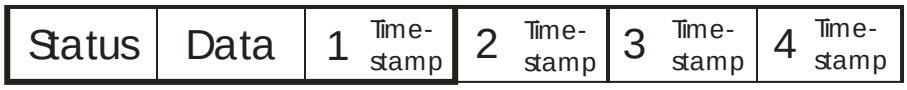


Fig. 128

Byte 1: Status (See below)
Byte 2: Data byte (Character value)
Byte 3…6: Timestamp
Minimum frame length is 3 bytes, the next 3 bytes are optional depending on the encoding and defined by the status byte.

Status byte format:

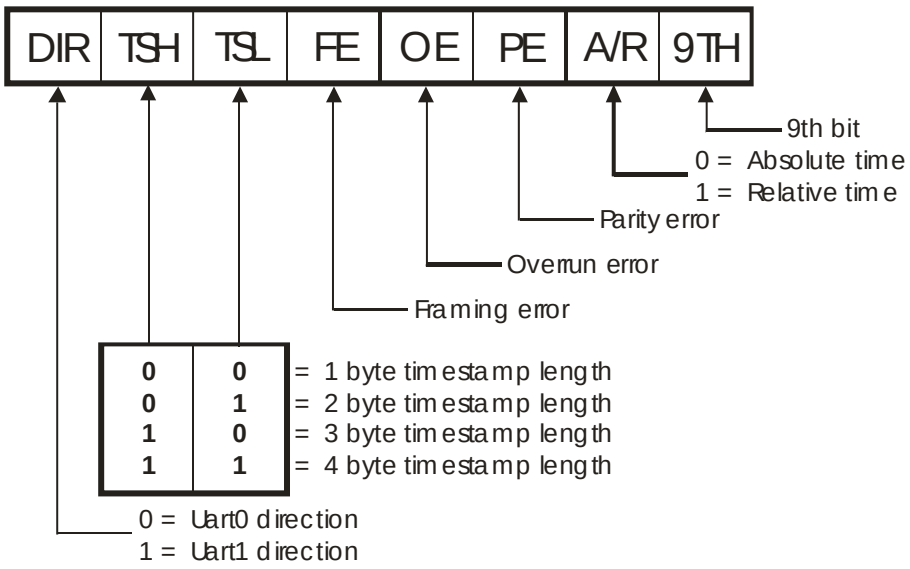


Fig. 129

Accuracy:

Time resolution: 13.028 us

Timestamp overflow: 55924 seconds (15.53 hours)

The MDB Master in gateway mode

For this mode the configuration must setup parameter ‘Application’ = 1.

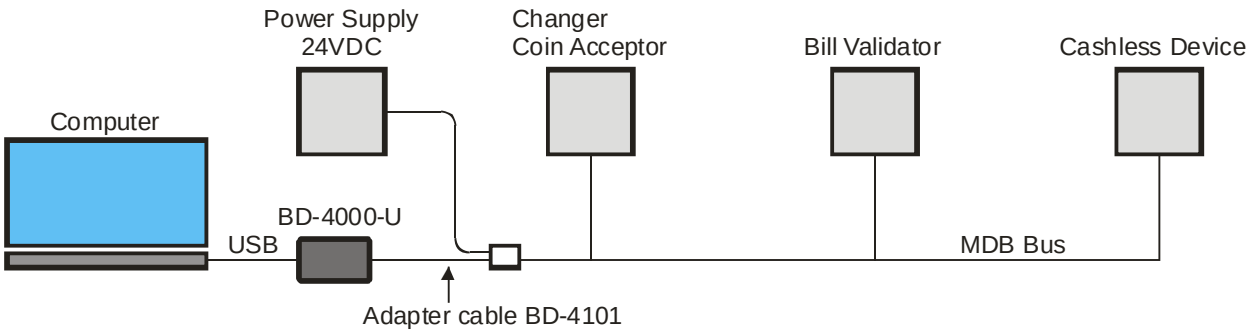


Fig. 130

In gateway mode the MDB communication is transmitted and received with the UDP protocol. The MDB Interface will autonomous handle the low level function of the MDB protocol like the 9th bit (Mode bit of MDB), polling of the MDB peripherals, adding the check byte, and the

timing of the MDB slave response. If the host computer is sending a command it is stored in a temporary data buffer until the next peripheral poll is on turn.

In details this means:

MDB Master transmit

- Continuously poll one or more of the MDB slave peripherals with an interval of 100ms. If a command of the host computer is present in the temporary buffer it is sent else a poll command is sent.
- Set the 9th bit (MDB mode bit) on the first transmitted byte to mark it as a MDB command.
- Calculate and add the check byte at the end of the command data frame.
- Send the frame to the MDB bus.
- Start the response timeout timer with 5ms.
- Waiting for the response from the addressed MDB peripheral. (ACK, NAK, or a data frame)

MDB Master receive

- Collect the received bytes until the 9th bit (MDB mode bit) is set or the timeout timer elapsed.
- If the timeout elapsed, no valid data has been received and an ACK is assumed.
- Determine the kind of data received. (ACK, NAK, RET or a data frame)
- If it is a data frame (more than one byte) the check byte is calculated and verified against the last byte of the frame. If the check byte is valid send an ACK else a NAK to the MDB peripheral.
- Finally send the resulting data back to the host computer.

Diagram of MDB Master interaction

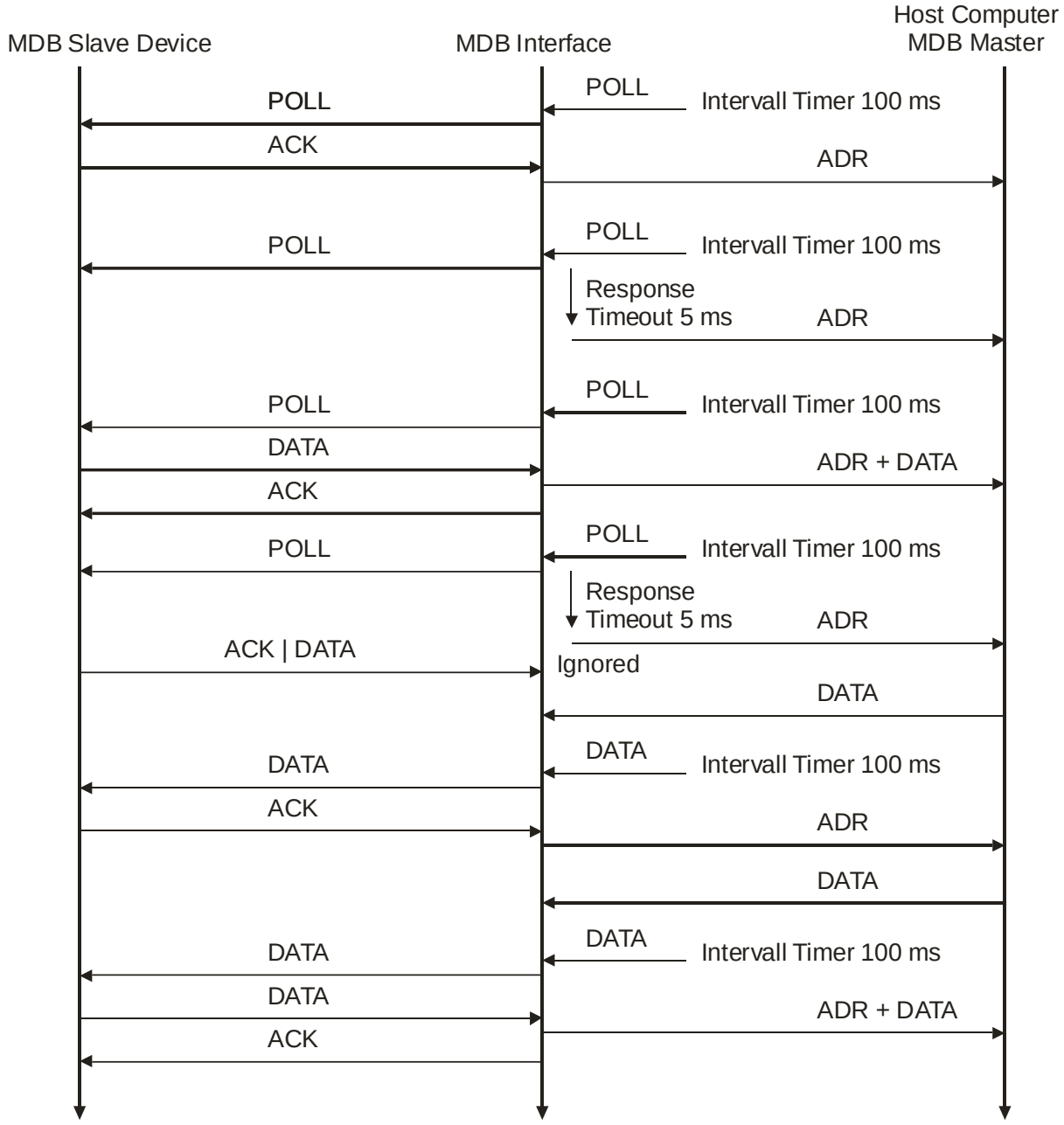


Fig. 131

MDB Master sample application using this mode

In this sample application the PC is simulating a simple vending machine. The complete project in Microsoft Visual Studio 6.0 is available on our WEB page.

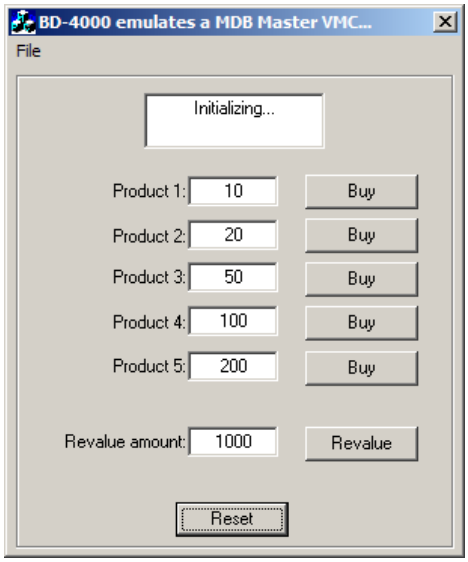


Fig. 132

A detailed description is coming soon…

The MDB Slave in gateway mode

For this mode the configuration must setup parameter 'Application' = 1.

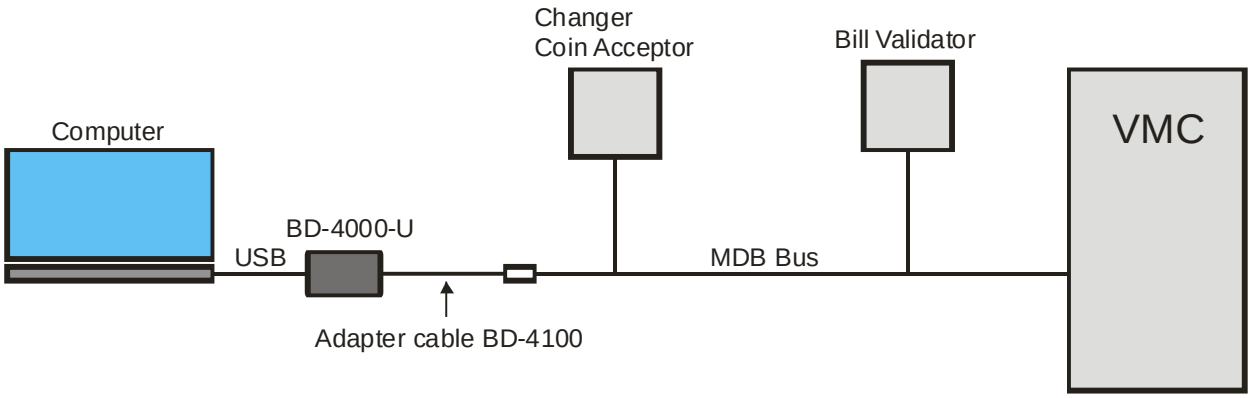


Fig. 133

In gateway mode the MDB communication is transmitted and received with the UDP protocol. The MDB Interface will autonomous handle the low level function of the MDB protocol like the 9th bit (Mode bit of MDB), detecting the end of the data frame, verifying the check byte, and acknowledge of received data frames.

Note: The MDB master sends the data frames without any length information. This makes it difficult to detect the end of the data frame. To implement an universal frame length detection we use the inter character timeout method. On each received byte we restart the inter character timeout timer. The timeout is set to twice of a byte transmission time which calculates to a value of about 2.3 ms. If this timer expires we assume the MDB slave will not send any further data byte and define it as end of frame.

In details this means:

MDB Slave receive

- Listen to the MDB bus for any data bytes.
- Check if the 9th bit (MDB mode bit) is set because this byte ist the start of frame and contains the peripheral address.

- Compare the peripheral address with the enabled slave address. If there is a valid address then start the inter character timeout timer and collect all bytes until there is a timeout indicating the end of frame.
- Calculate the check byte and verify it against the last byte of the frame. If the check byte is valid and a response is present in the temporary data buffer notify the MDB Slave transmit (See below), else send a NAK to the MDB Master.
- The MDB slave response has no peripheral address so it is added at the begin of the data frame.
- Finally the data frame is sent to the host computer.

Note: If there are no data like in a poll command, just the peripheral address is sent to the host computer. With this information the host computer knows the MDB interface is still polled.

MDB Slave transmit

Note: If the host computer is sending some response for the MDB slave it is stored in a temporary data buffer until the MDB master has sent a valid poll command.

- Wait for MDB Slave receive to notify that the response in the temporary data buffer can be sent.
- Calculate and add the check byte at the end of the response data frame.
- Set the 9th bit (MDB mode bit) on the last transmitted byte to mark the end of the frame.
- Send the frame to the MDB bus.

Diagram of MDB Slave interaction

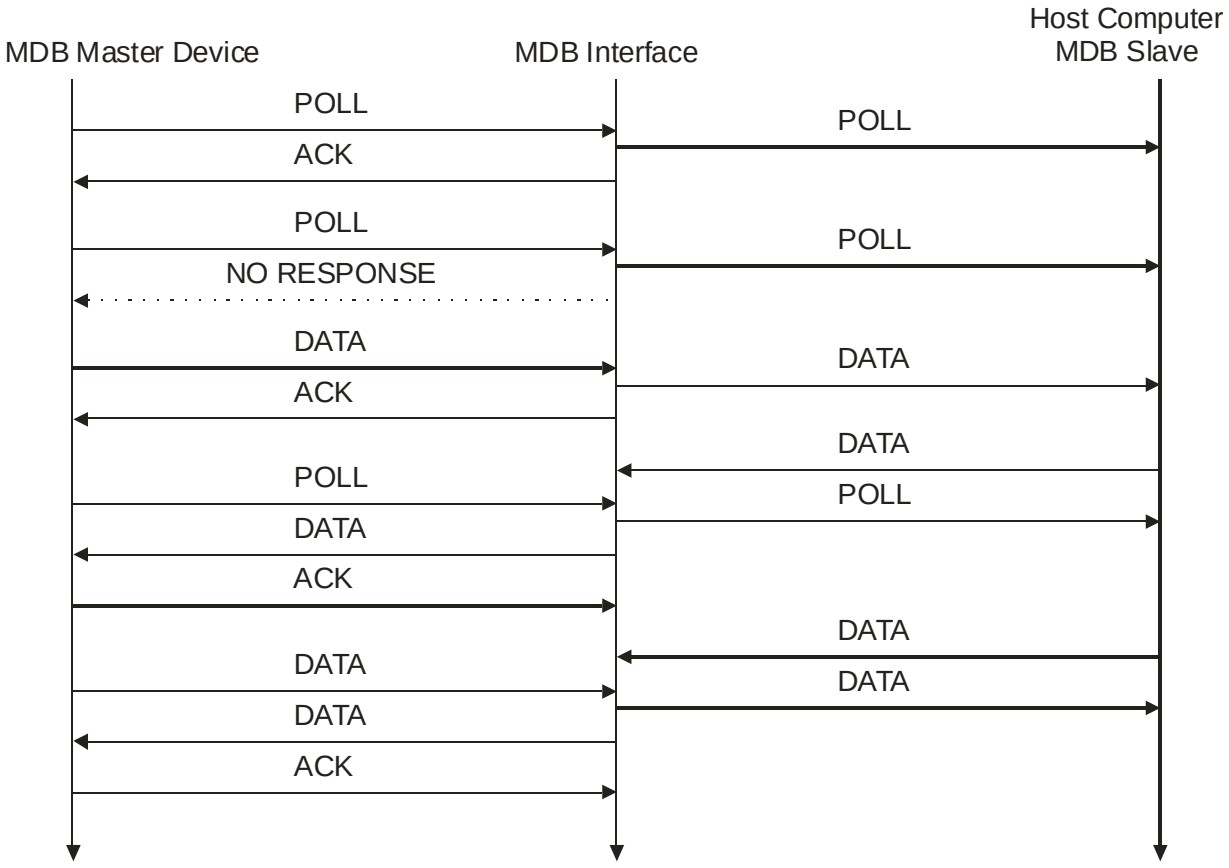


Fig. 134

MDB Slave sample application using this mode

In this sample application the PC is simulating a simple cashless card reader . The complete project in Microsoft Visual Studio 6.0 is available on our WEB page.

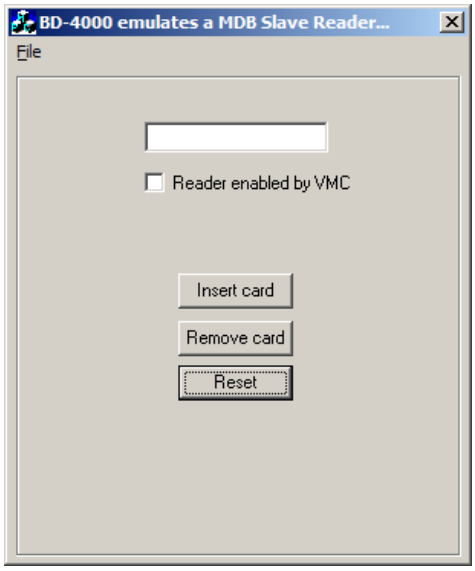


Fig. 135

A detailed description is coming soon…

Control commands with UDP protocol

The control commands are sent over a separate channel and have the purpose of control and setup of the MDB interface by software. The control commands use the same format as the 'Link Control Protocol' options (LCP) with the elements; Option length byte, Option code byte, Option data bytes. This control commands are send with the UDP protocol to the control command port.

Command:	**Code:** Byte #0	**Length:** Byte #1	**Data:** Byte #2...n
NO_OPERATION	0	2	No data
RESPONSE			No response
REQUEST_VERSION	1	3	Byte #2: Type of version: 0 = BDRDOS version 1 = Firmware version
RESPONSE	2	5	Byte #2: Type of version Byte #3: Major version code Byte #4: Minor version code
ANALYTER_AQUIRE	3	3	Byte #2: Start / Stop 0 = Stop acquisition 1 = Start acquisition
RESPONSE			No response
MDB_ADJUST	4	5	Byte #2: MDB Master Load (0..3) Byte #3: MDB Master Threshold (0..31) Byte #4: MDB Slave Threshold (0..31)
RESPONSE			No response
ENTER_BOOT_MODE	5	3	Byte #2: Boot parameter: Bit #0: Reset Bit #1: Set boot mark (Note 1)
RESPONSE			No response

SET_COMM_PARAMETER	6	9	Byte #2..5: Baudrate (300..115200) Byte #6: Stop bit (0..2) Byte #7: Parity (0..4) Byte #8: Data bit (5..9) (Note 2)
RESPONSE			No response
ENABLE_DEVICE	7	3	Byte #2: MDB slave address to respond (Note 3)
RESPONSE			No response
ENABLE_POLL_DEVICE	8	3	Byte #2: MDB slave address to poll (Note 3)
RESPONSE			No response
REQUEST_STATUS	9	3	Byte #2: MDB slave address to request the status.
RESPONSE	10	3	Byte #2: Status of the requested MDB slave. Status: Bit 0 = L: Device disabled. Bit 0 = H: Device enabled. Bit 1 = L: No response on MDB poll. Bit 1 = H: Responding on MDB poll. Bit 2..7: Not used, always 0.

Table 6

Note 1: Set boot mark will write a boot mark to the EEPROM, so at next reset it will enter the boot loader for firmware update.

Note 2: Specify baud rate as value of type long (Little Endian). Stop bit 1, 1.5, 2 and parity None, Odd, Even, Space, Mark.

Note 3: Multiple options can be sent with different device addresses, up to a maximum of 5. This allows to respond or poll more than one MDB peripheral simultaneous.

Electrical parameter setting

The MDB interface is configurable by software through UDP command MDB_ADJUST. By default average values are set by the firmware. But in general, for Operating Mode Analyzer a load of 10K Ohms must be used as there is a load of 390 Ohms is already present by the MDB Master on the bus (See below). In Operating Mode Gateway the MDB interface is MDB master and a load of 390 Ohms is recommended.

Impact on the MDB bus by connection the MDB Interface

Schematics of an MDB bus with MDB master, MDB peripherals and Analyzer connected. The MDB master must drive all connected MDB slave receivers on the bus where each receiver will consume a current of 10..20 mA. An MDB master needs to source a current of 100 mA when the maximum of 5 MDB peripherals are connected.

In the other direction, each MDB slave must drive one load on MDB master receiver side. According the specification the drivers are optocouplers with the issue that there are temperature and speed parameters with influences to the electrical signals on the MDB bus.

In the schematics below, resistor R5 defines the load of the MDB Master and R17 defines the load of the MDB interface. This resistors are parallel and resulting in a load of 195 Ohm. The current will be approximate 20mA, too much for some optocouplers!

Avoid this by selecting a load resistor of 10 kOhms in MDB Master load when the MDB interface is connected in Analyzer mode.

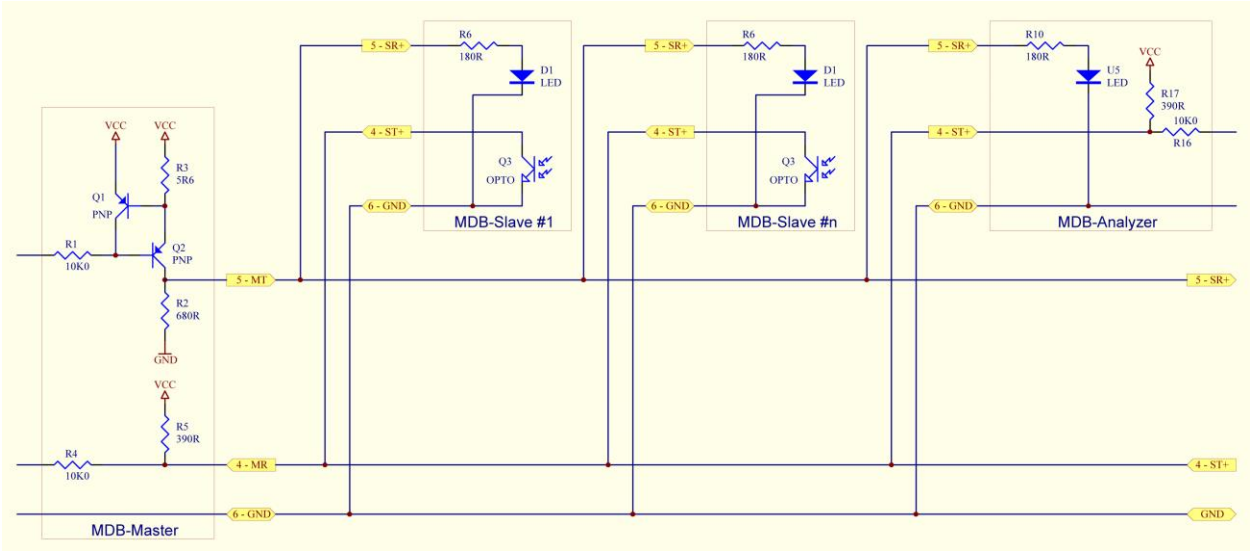


Fig. 136

Schematics of the MDB Slave circuit

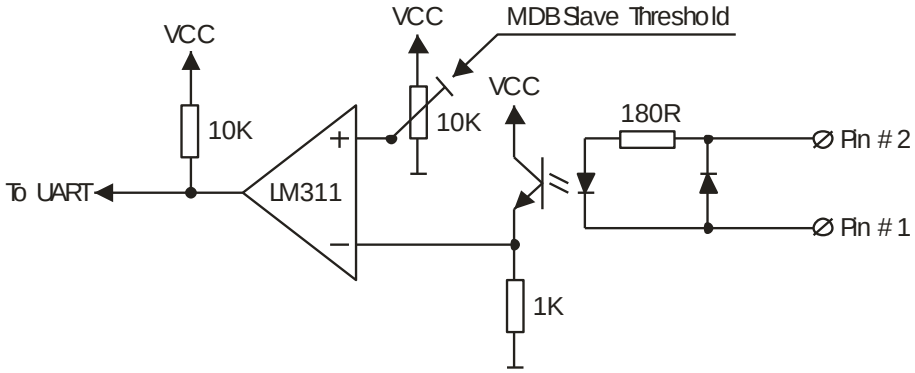


Fig. 137

A digital potentiometer with 32 steps (0..31) is used to set the MDB Slave threshold. The current transfer ratio of the optical coupler and the actual current supplied by the MDB Master are responsible for the voltage on the 1K ohm resistor of the comparator LM311.

Schematics of the MDB Master circuit

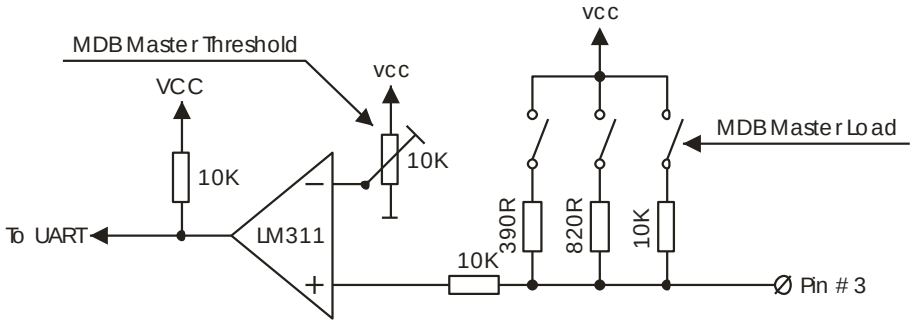


Fig. 138

A digital potentiometer with 32 steps (0..31) is used to set the MDB Master threshold. The current transfer ratio of the sending MDB Slave and the selected load will be responsible for the voltage into the comparator.

Three electronic switches will apply the selected loads of none, 390, 820 or 10000 ohms resulting in the loads shown in following table.

Parameter:	Load:	Current:
0	No resistor	0 mA
1	10K Ohms	0.4 mA
2	820 Ohms	5.3 mA
3	390 Ohms	10.9 mA

Table 7

Echo protocol for direct control over RS-232 serial link

In some special circumstances where the PPP protocol is not supported by the host system, the "Echo protocol" offers direct access the MDB master and MDB slave interface over the serial RS-232 link. It encapsulates and secures the data frames between the host system and MDB interface. And it requires some additional effort to system integrators to implement the proprietary "Echo Protocol".

The encapsulation by the Echo Protocol

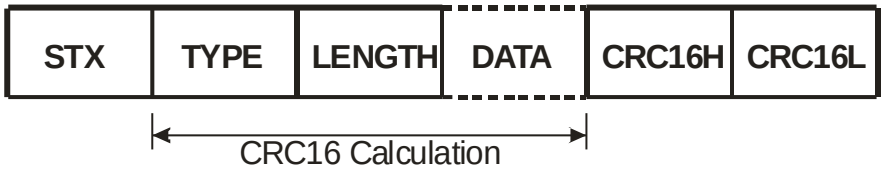


Fig. 139

STX = Start of text character. (0x02)
TYPE = Frame type field. (Available types see below)
LENGTH = Length of data field, (0x00...0xFF)
DATA = Data field.
CRC16H = High byte of CRC16 calculation.
CRC16L = Low byte of CRC16 calculation.

The "Echo Protocol" adds 3 leading bytes (STX, TYPE, LENGTH) and two trailing bytes (CRC16H, CRC16L) to each data frame as shown in Fig. 90 above.

The implementation if the Echo protocol

STX is the synchronization byte of a data frame and requires special considerations. If any STX character appears within TYPE, LENGTH, DATA, CRC16H and CRC16L field it must be doubled without CRC16 calculation. A single STX character will always resynchronize and reject any previous received data bytes. This applies to the receiver side too, on doubled STX characters one must be removed without CRC16 calculation.

The TYPE field defines the implemented frame types according following table:

0	0x00	Control frame.
1	0x01	MDB slave data frame.
2	0x02	MDB master data frame.
3	0x03	Communicate with the MDB Reader Emulation Application connected to a real Vending machine controller (VMC).
4	0x04	Communicate with the MDB Vending Machine Emulation Application connected to a real MDB Card Reader.
128	0x80	Loop back data frame. (Used for testing purposes.)

Any undefined frame types are ignored.

The DATA length field defines the number of encapsulated data bytes within the frame.

The CRC16H & CRC16L is the resulting CRC16 calculation on the transmitted frame (TYPE, LENGTH, DATA) and added as trailing bytes to the frame. The receiver can include CRC16H and CRC16L in it's CRC16 calculation and if the resulting value is zero then the frame is okay.

CRC16 start value: 0xFFFF
CRC16 Polynomial: 0x1021

Note: We do not publish any algorithm here as the internet brings a lot of samples on search for CRC16.

Configuration of the Echo protocol

To use the "Echo Protocol" with the MDB interface a parameter must be added to the configuration.

[B] EchoSetup=0x01 (1)

See chapter "Configuration parameter".

Important note:

Per default is the serial interface of the MDB interface listening for the HDLC protocol. To switch over to the ECHO protocol a character sequence of "+++" (without the quotation marks) must be sent to the MDB interface.

Testing the electrical MDB parameters

Here are some standard test configurations to test the electrical MDB parameters.

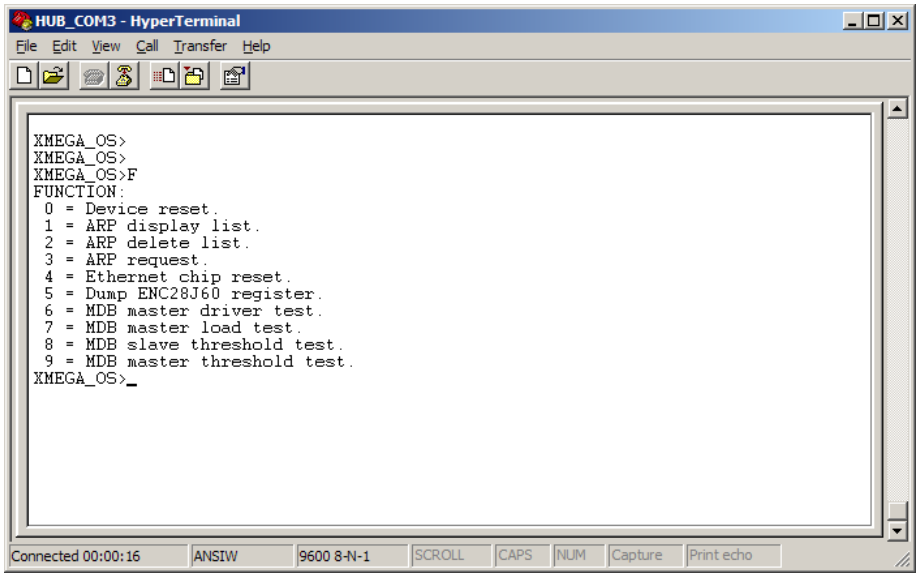
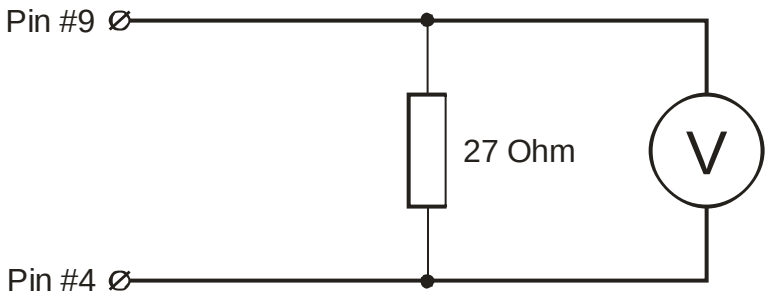


Fig. 140

The system console offers menu position ‘F’ with several test functions. Some of this functions are used to carry out the electrical tests below.

MDB Master Driver Test

Test function F4

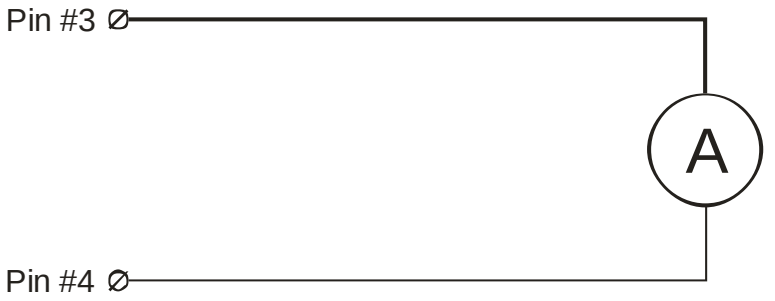


Measured voltage:
V > 3.0 VDC
Fig. 95

Fig. 141

MDB Master Load Test

Test function F5



Measured current:
See Table 7
Fig. 96

Fig. 142

Test points on PCB

On bottom side of the PCB are test points for several purposes. Some are used to test the electrical parameters.

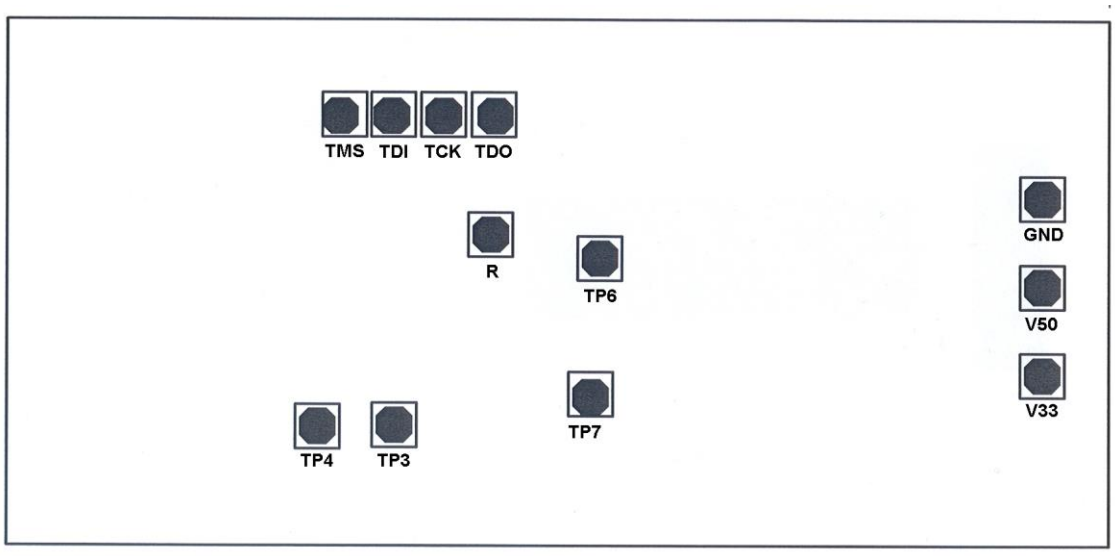


Fig. 143

TMS	JTAG interface, Test Mode Select Pin.
TDI	JTAG interface, Test Data Input Pin.
TCK	JTAG interface, Test Clock Pin.
TDO	JTAG interface, Test Data Output Pin.
R	Reset, pull low to reset the device.
TP3	RXD of system console interface.

TP4	TXD of system console interface.
TP6	MDB master threshold voltage.
TP7	MDB slave threshold voltage.
V33	+3.3 VDC internal supply voltage.
V50	+5 VDC internal supply voltage.
GND	Signal and power ground.

Table 7

MDB Slave Threshold Test

Test function F8

For this test the MDB interface PCM must be removed from the enclosure and placed on a test adapter. Not recommended in the field.

MDB Master Threshold Test

Test function F9

For this test the MDB interface PCM must be removed from the enclosure and placed on a test adapter. Not recommended in the field.

Installing Hyper Terminal in Windows 7

Microsoft doesn't supply the Hyper Terminal Application any more with Windows 7. For those used to it can install a copy from Windows XP in Windows 7.

Here is a short guide how to install it.

The files can be found in a Windows XP installation at:

C:\Program Files\Windows NT\hypertrm.exe
C:\Program Files\Windows NT\htrn_jis.dll
C:\WINDOWS\system32\hypertrm.dll
C:\WINDOWS\system32\hticons.dll
C:\WINDOWS\Help\hypertrm.chm
C:\WINDOWS\Help\hypertrm.hlp

Copy this files to the Windows 7 installation at:

C:\Program Files(x86)\

Then create a short cut of hypertrm.exe to your desktop.

Glossary

ARP	Address Resolution Protocol. (RFC-826)
BDRDOS	BonusData Real Time Operating System for Atmel AVR Microcontroller.
Baud	Serial data communication speed.
BPS	Bit Per Second.
BDV	Bund Deutscher Vending Operators.
CBCP	Call Back Control Protocol. (By Microsoft INC.)
CCP	Compression Control Protocol. (RFC-1962)
CHAP	Challenge Handshake Authentication Protocol. (RFC-1321, RFC-1994, RFC-2484)
CRC	Cyclic Redundancy Check, 16 bit or 32 bit value. (CRC-CCITT)
DHCP	Dynamic Host Configuration Protocol. (RFC-1541)
ESDA	Enhanced Serial Data Analyzer for vending machine serial data communication protocols.
EVA	European Vending Association. http://vending-europe.eu
EVMMA	Europaen Vending Machine Manufacturers Association.
HDLC	High-level Data Link Control protocol. (RFC-1662)
IP	Internet Protocol. (RFC-791, RFC-792)
IPCP	Internet Protocol Control Protocol. (RFC-1332, RFC-1877)
LCP	Link Control Protocol. (RFC-1548, RFC-1570)
MDB	Multi Drop Bus Internal Communication Protocol.
NAMA	National Automatic Merchandising Association. http://www.vending.org
PCB	Printed circuit board.
PPP	Point to Point Protocol. (RFC-1661)
RFC	Request For Comments.
RoHS	Restriction of Hazardous Substances Directive.
UDP	User Datagram Protocol. (RFC-768)
USB	Universal Serial Bus for communication with computer peripherals.
VM	Vending Machine.
VMC	Vending Machine Controller.

References

- Multi-Drop BUS / Internal Communication Protocol MDBICP supported by the Technical Members of: NAMA, EVA, EVMMA.
- Several RFC documents published by http://www.rfc-editor.org

Document history:

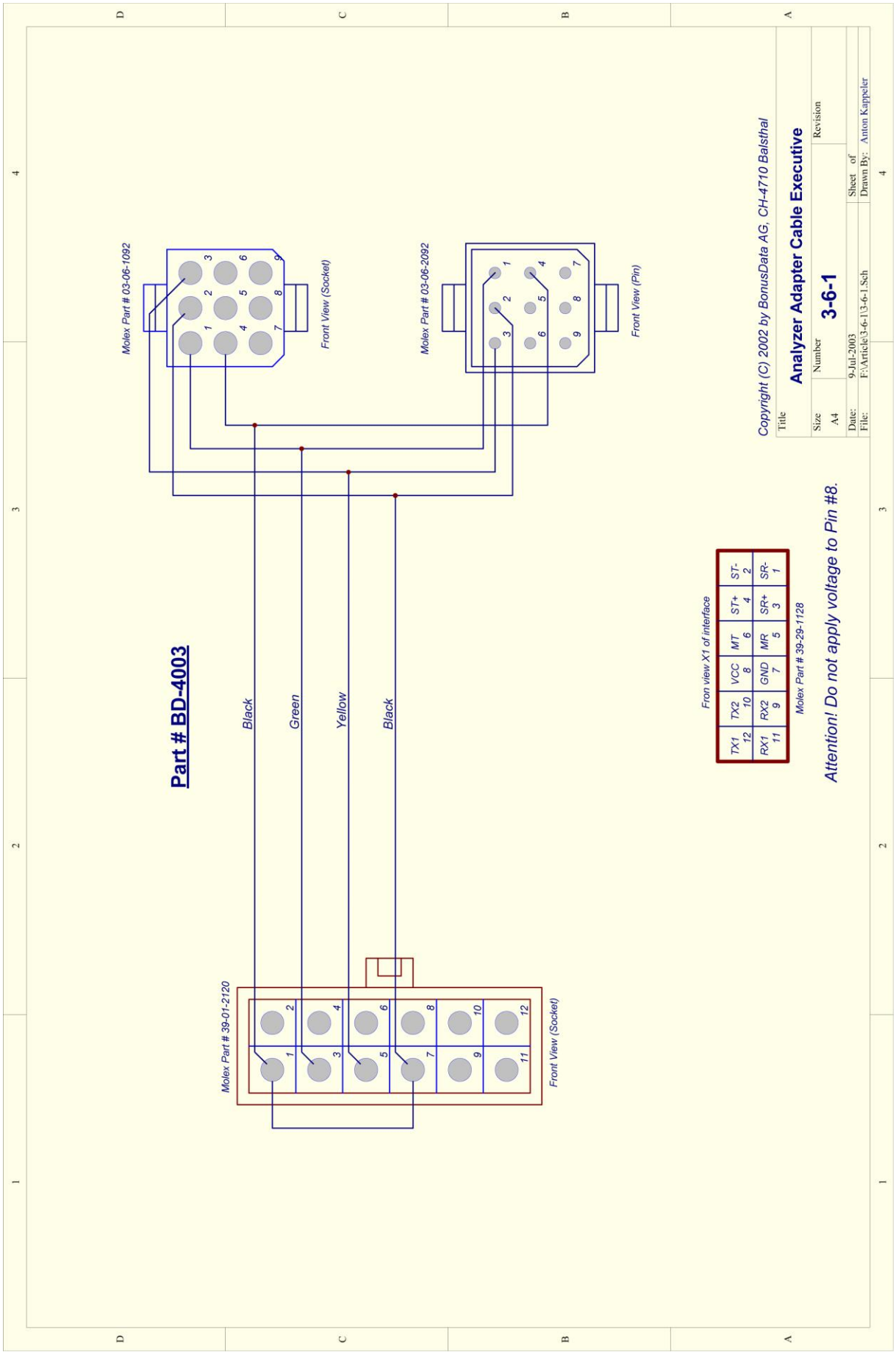
Modified:	Version:	Description:
20.08.2012	1.00	First preliminary draft.
24.09.2012	1.01	Second preliminary draft.
01.10.2012	1.02	Third preliminary draft. Added MDB Master and MDB Slave in gateway mode chapter.
08.10.2012	1.03	Fourth preliminary draft. Added electrical specification and sample application. Added appendix A2.
21.10.2013	1.04	Added chapter “Simultaneous connected to LAN and dialup”. Minor document modifications.
16.06.2015	1.05	- Added chapter "Echo protocol for direct control over RS-232 serial link"**.** - Added chapter "Installation on Windows 8".
07.07.2016	1.06	Added chapter “Alternative installation over HDLC”.

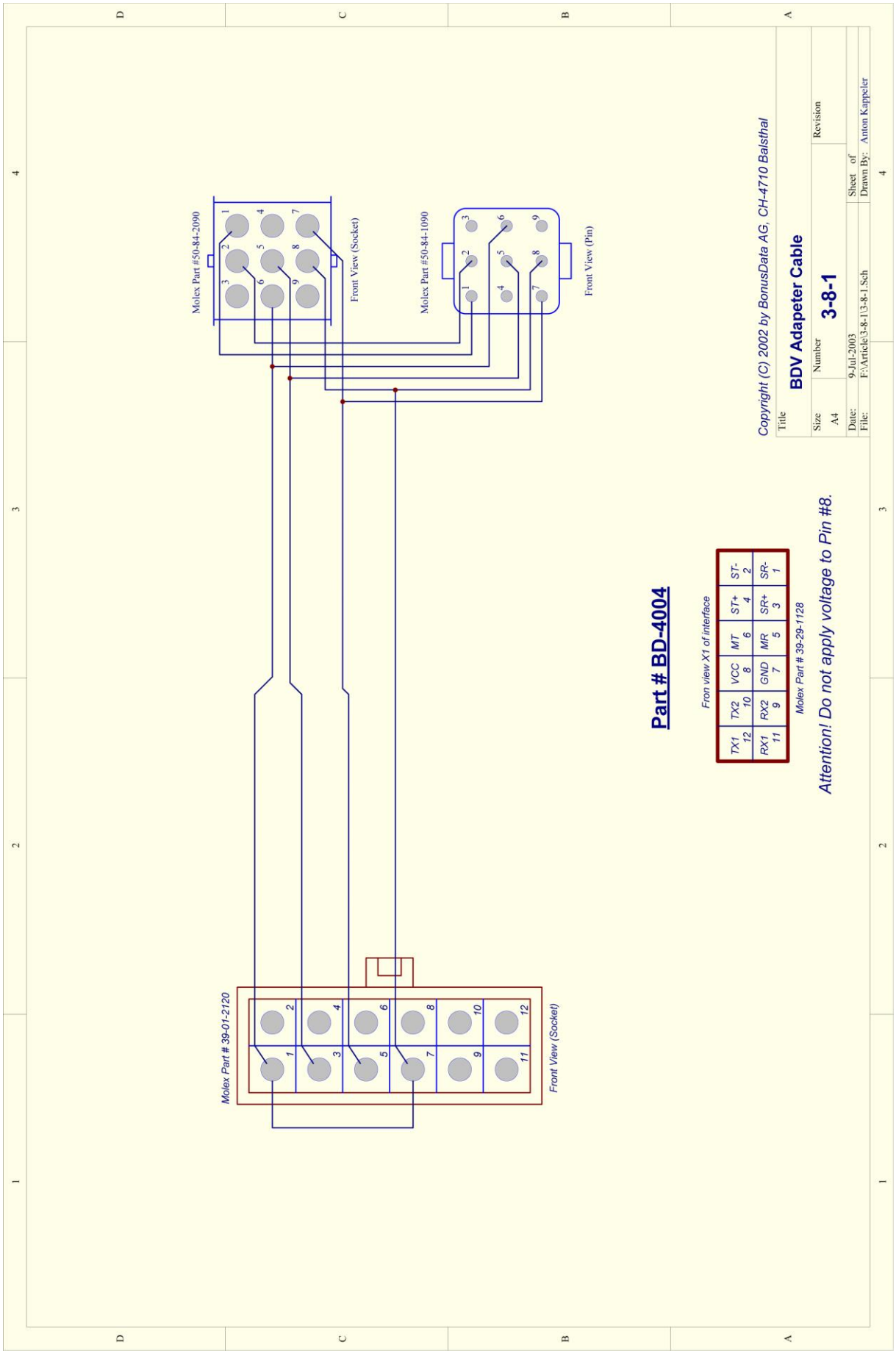
Contact BonusData AG:

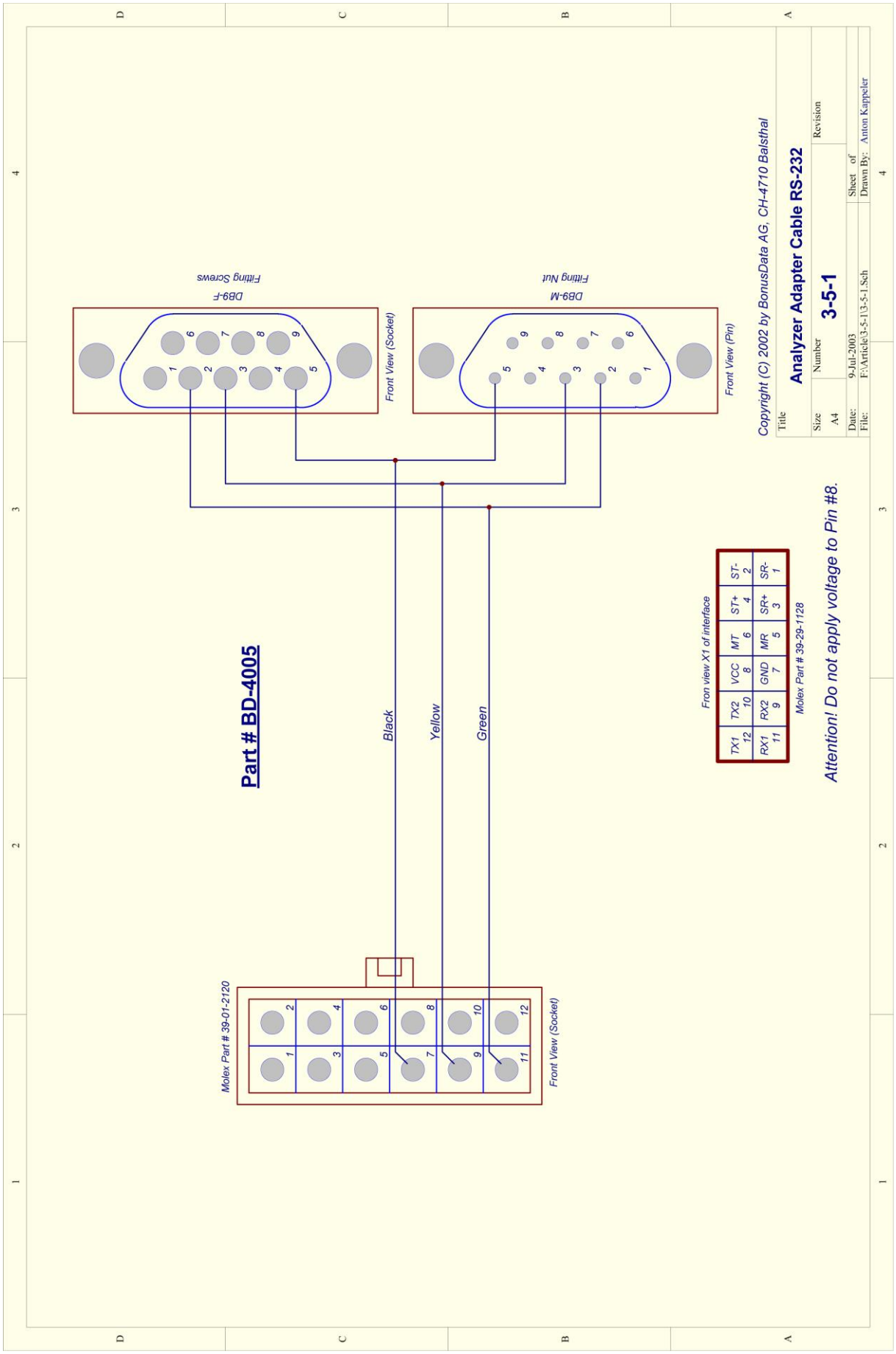
BonusData AG
Sandgrubenstrasse 20
4710 Balsthal
Switzerland

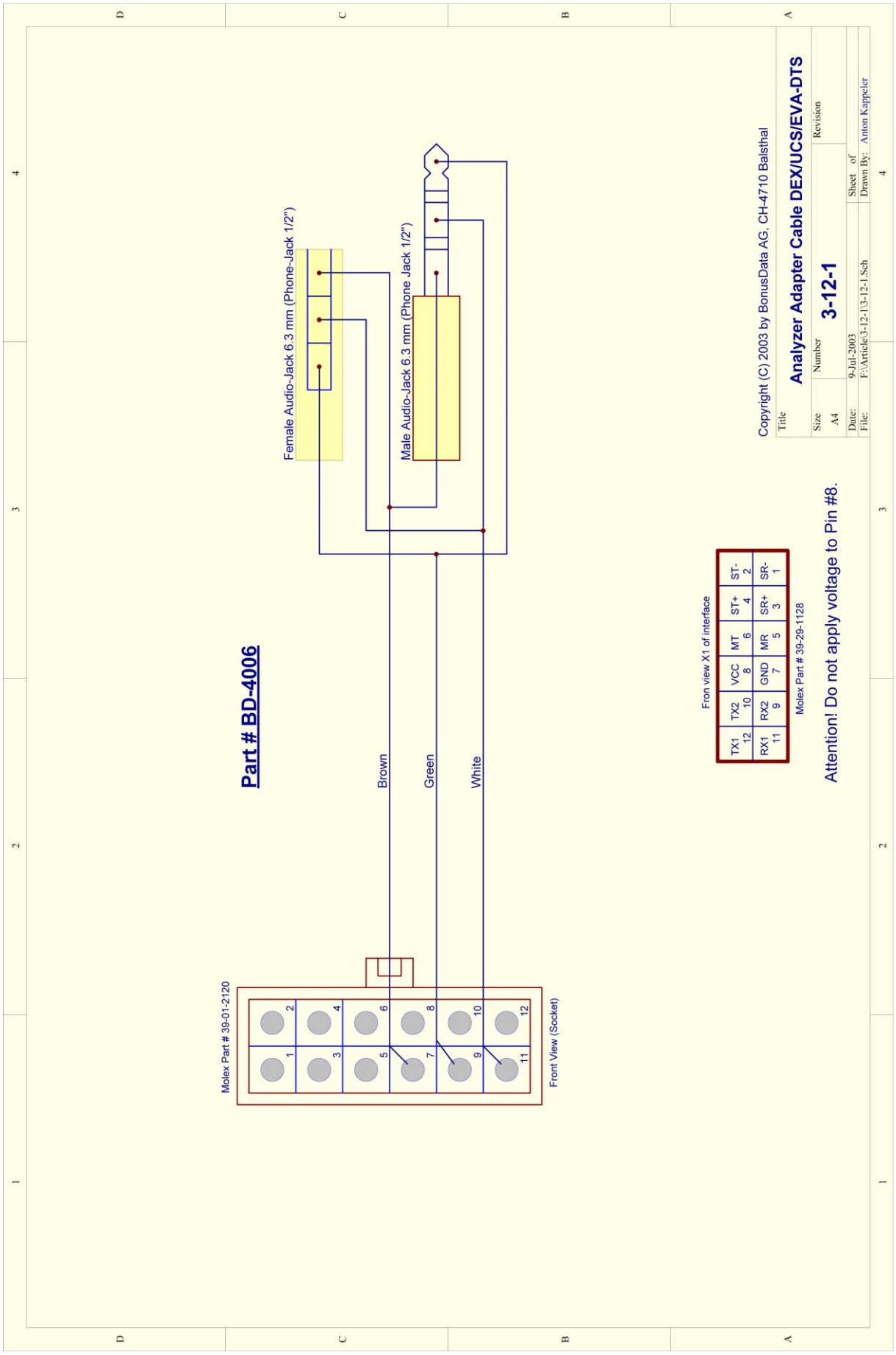
Phone: +41 62 3919600
Fax: +41 62 3919601
E-Mail: team@bonusdata.net
WWW: http://www.bonusdata.net

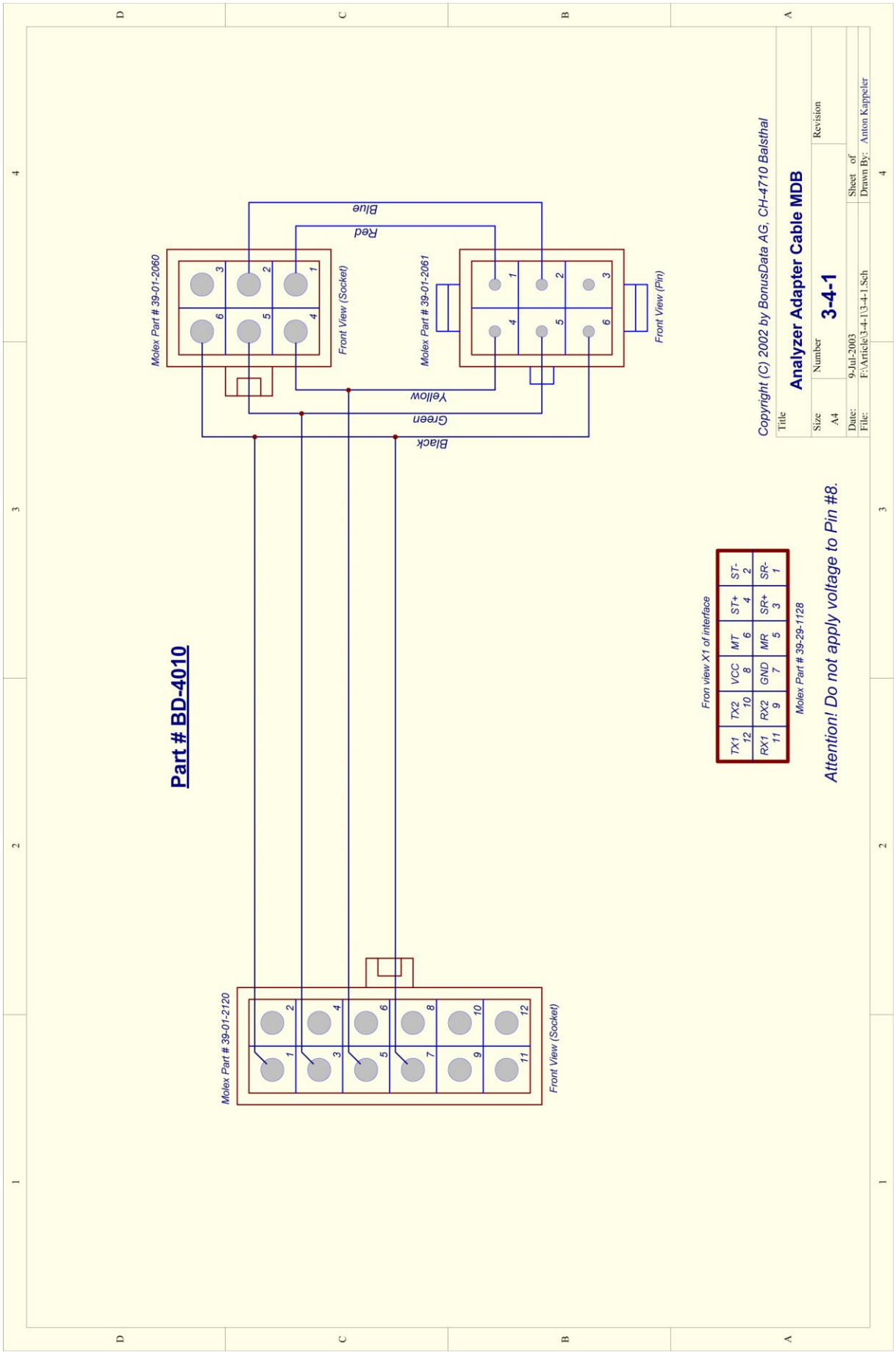
Appendix A1: Adapter cable schematics



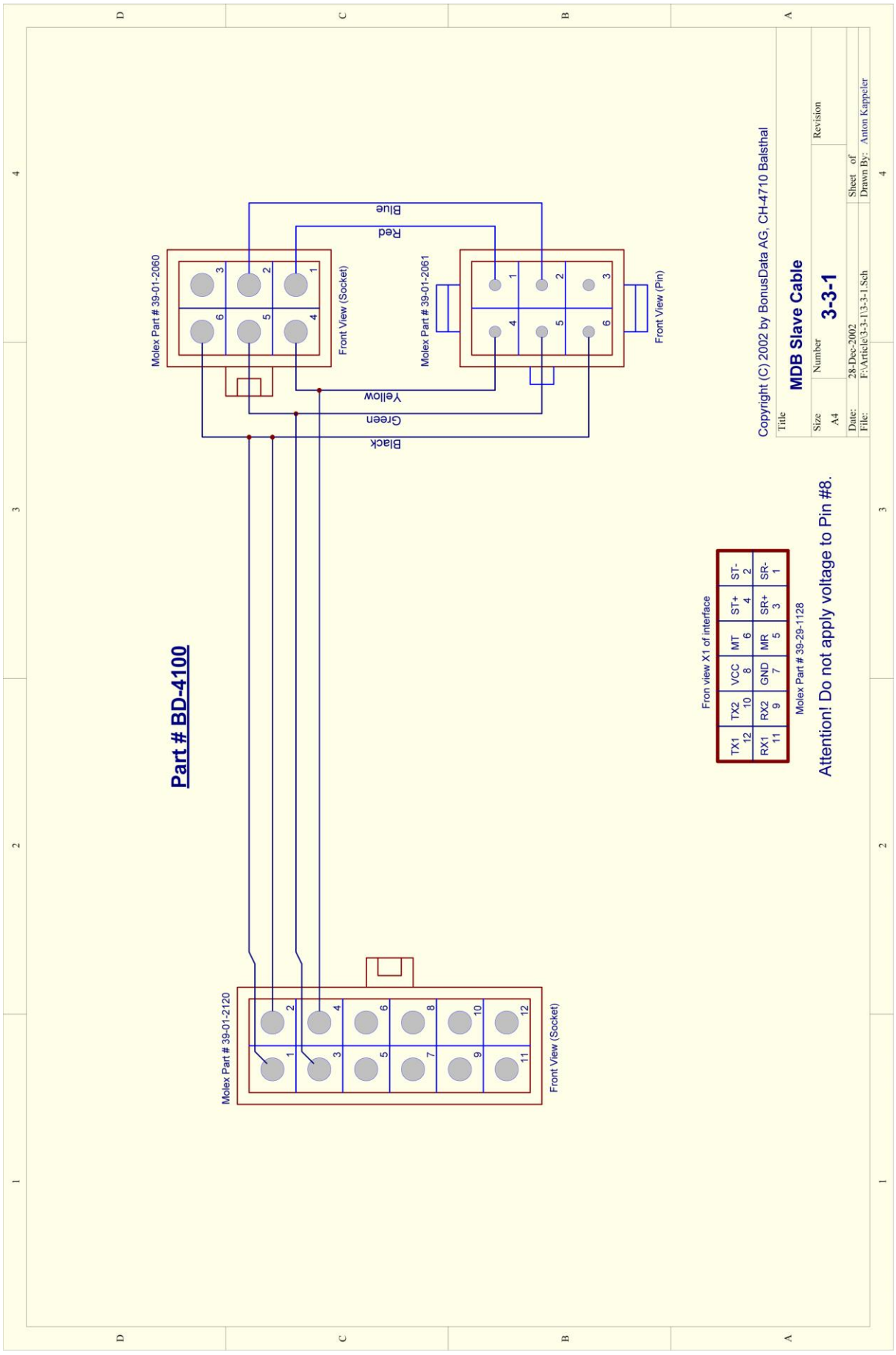

Molex Part #50-84-2090
Front View (Socket)
Molex Part #50-84-1090
Front View (Pin)
Molex Part # 39-01-2120
Front View (Socket)
Part # BD-4004
Fron view X1 of interface
TX1 12
TX2 10
VCC 8
MT 6
ST+ 4
ST- 2
RX1 11
RX2 9
GND 7
MR 5
SR+ 3
SR- 1
Molex Part # 39-29-1128
Attention! Do not apply voltage to Pin #8.
Copyright (C) 2002 by BonusData AG, CH-4710 Balsthal
Title
BDV Adapeter Cable
Size
A4
Number
3-8-1
Revision
Date: 9-Jul-2003
Sheet of
File: F:\Article\3-8-1\3-8-1.Sch
Drawn By: Anton Kappeler

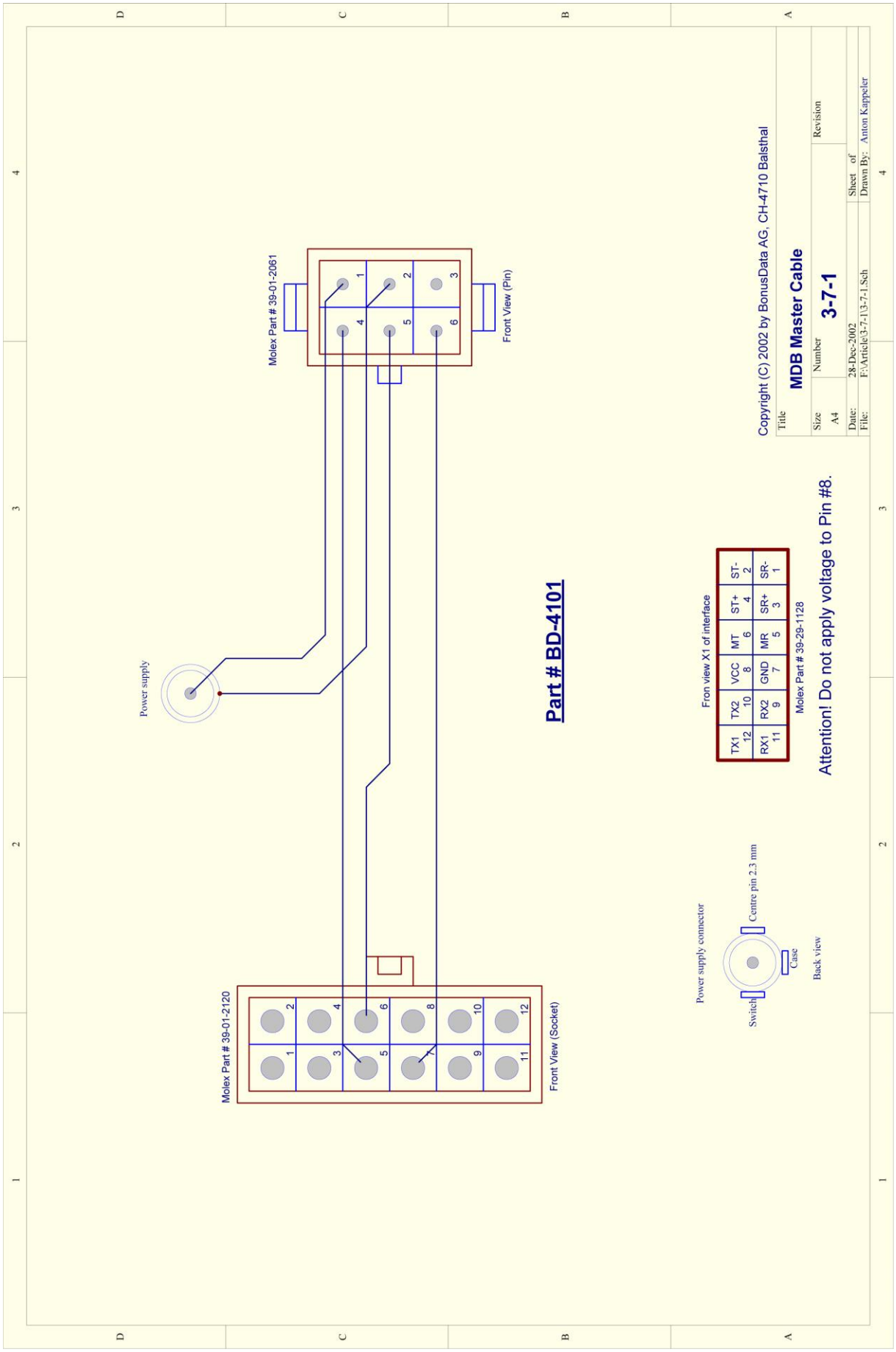

DB9-F
Fitting Screws
DB9-M
Fitting Nut
Front View (Socket)
Front View (Pin)
Copyright (C) 2002 by BonusData AG, CH-4710 Balsthal
Title
Analyzer Adapter Cable RS-232
Size
A4
Number
3-5-1
Revision
Date:
9-Jul-2003
Sheet of
File:
F:\Article\3-5-1\3-5-1.Sch
Drawn By:
Anton Kappeler
Part # BD-4005
Black
Yellow
Green
Fron view X1 of interface
TX1 12
RX1 11
TX2 10
RX2 9
VCC 8
GND 7
MT 6
MR 5
ST+ 4
SR+ 3
ST- 2
SR- 1
Molex Part # 39-29-1128
Molex Part # 39-01-2120
Front View (Socket)
Attention! Do not apply voltage to Pin #8.

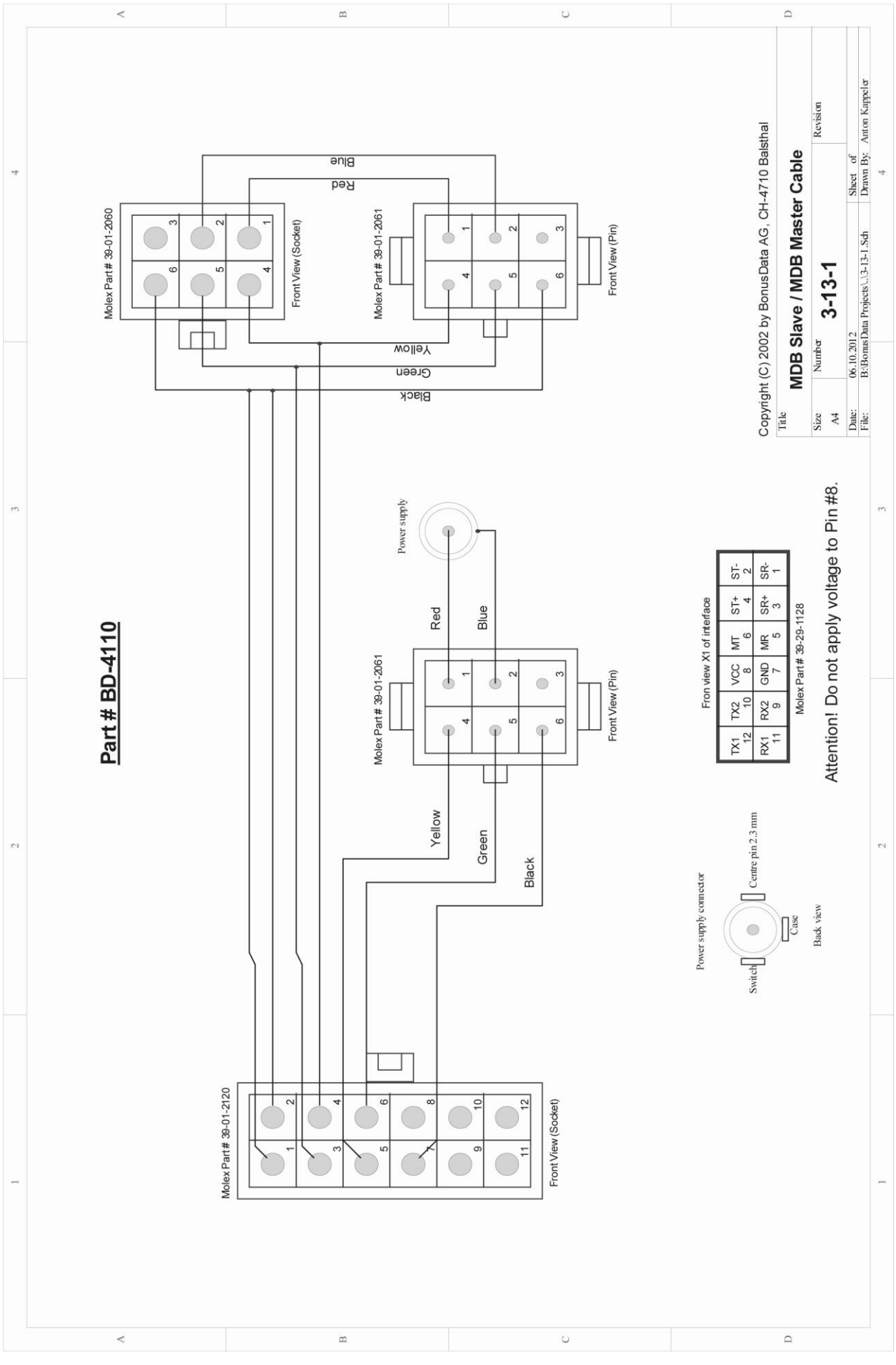

Female Audio-Jack 6.3 mm (Phone-Jack 1/2")
Male Audio-Jack 6.3 mm (Phone Jack 1/2")
Part # BD-4006
Brown
Green
White
Molex Part # 39-01-2120
Front View (Socket)
Fron view X1 of interface
TX1 12
RX1 11
TX2 10
RX2 9
VCC 8
GND 7
MT 6
MR 5
ST+ 4
SR+ 3
ST- 2
SR- 1
Molex Part # 39-29-1128
Attention! Do not apply voltage to Pin #8.
Copyright (C) 2003 by BonusData AG, CH-4710 Balsthal
Title
Analyzer Adapter Cable DEX/UCS/EVA-DTS
Size A4
Number 3-12-1
Revision
Date: 9-Jul-2003
Sheet of
File: F:\Article\3-12-1\3-12-1.Sch
Drawn By: Anton Kappeler


Part # BD-4010
Molex Part # 39-01-2060
Front View (Socket)
Molex Part # 39-01-2061
Front View (Pin)
Blue
Red
Yellow
Green
Black
Molex Part # 39-01-2120
Front View (Socket)
Fron view X1 of interface
TX1 12
TX2 10
VCC 8
MT 6
ST+ 4
ST- 2
RX1 11
RX2 9
GND 7
MR 5
SR+ 3
SR- 1
Molex Part # 39-29-1128
Attention! Do not apply voltage to Pin #8.
Copyright (C) 2002 by BonusData AG, CH-4710 Balsthal
Title
Analyzer Adapter Cable MDB
Size A4
Number 3-4-1
Revision
Date: 9-Jul-2003
Sheet of
File: F:\Article\3-4-1\3-4-1.Sch
Drawn By: Anton Kappeler

Appendix A2: Interface cable schematics




Molex Part # 39-01-2061
Front View (Pin)
Power supply
Part # BD-4101
Molex Part # 39-01-2120
Front View (Socket)
Fron view X1 of interface
TX1 12
TX2 10
VCC 8
MT 6
ST+ 4
ST- 2
RX1 11
RX2 9
GND 7
MR 5
SR+ 3
SR- 1
Molex Part # 39-29-1128
Attention! Do not apply voltage to Pin #8.
Power supply connector
Centre pin 2.3 mm
Switch
Case
Back view
Copyright (C) 2002 by BonusData AG, CH-4710 Balsthal
Title
MDB Master Cable
Size
A4
Number
3-7-1
Revision
Date:
28-Dec-2002
Sheet of
File:
F:\Article\3-7-1\3-7-1.Sch
Drawn By:
Anton Kappeler


Part # BD-4110
Molex Part# 39-01-2060
Front View (Socket)
Molex Part# 39-01-2061
Front View (Pin)
Blue
Red
Yellow
Green
Black
Power supply
Molex Part# 39-01-2120
Front View (Socket)
Fron view X1 of interface
TX1 12
TX2 10
VCC 8
MT 6
ST+ 4
ST- 2
RX1 11
RX2 9
GND 7
MR 5
SR+ 3
SR- 1
Molex Part# 39-29-1128
Power supply connector
Centre pin 2.3 mm
Case
Switch
Back view
Attention! Do not apply voltage to Pin #8.
Copyright (C) 2002 by BonusData AG, CH-4710 Balsthal
Title
MDB Slave / MDB Master Cable
Size
A4
Number
3-13-1
Revision
Date: 06.10.2012
File: B:\BonusData Projects\..\3-13-1.Sch
Sheet of
Drawn By: Anton Kappeler