CAN*box*®

Dual CAN to WLAN/LAN Converter

The CAN*box*®

1 General Information

The CAN*box*® is a dual CAN to WLAN/LAN converter with two high-speed CAN interfaces (up to 1 MBit/s) that are compliant to CAN specification 2.0A and 2.0B. Fault-tolerant low-speed interfaces are available as an option. The connection to the CAN*box*® can be established via a serial interface, LAN or WLAN. The included software of the CAN*box*® is described in chapters 3 and 4. Drivers are available for Win32- and Pocket PC 2003-operating systems. Furthermore the socket interface can be used for a direct communication using the TCP/IP socket platform (requires at least firmware version 3.A).

Up to 10 CAN*box*es can be used simultaneously on a single PC or PDA.

The metal enclosure of the CAN*box*® measures only 113 x 83 x 33 mm. The CAN*box*® can be fixed either on DIN-rails or with bolts on any plain surface in case of stationary use. Power supply for the CAN*box*® is tailored to automotive and industry requirements. The voltage range is 6...60V (DC) which covers all automotive voltages (incl. 42V). The power supply is not galvanically insulated. Galvanic isolation of the CAN buses is achieved with the SORCUS standard I/O module X-CAN-2i.

1.1 Special Features

- Intelligent, decentralized, autonomous system
- Interface-converter CAN to WLAN/ LAN
- WLAN on-board
- Dimensions 113 x 83 x 33 mm
- Power supply: 6,0V...60V
- Mountable on DIN-rails or plain surfaces (Holder available optionally)

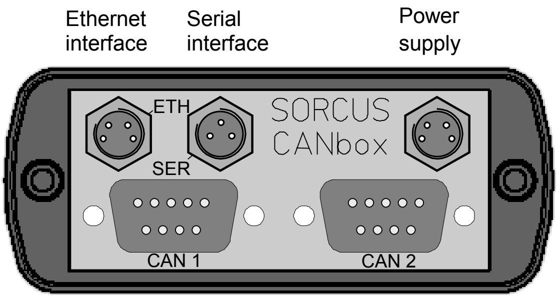
1.2 Installed MAX Modules

The device has two module-slots for MAX modules. The slots are equipped as described below.

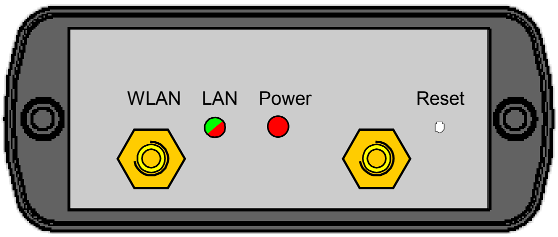
Slot-No.	Module	Function	Explanation
1	X-MAX-E	CPU module with Ethernet	This slot is used for a CPU module.
2	X-CAN-2i/H	2 CAN-channels with high speed drivers	Optionally, 2 fault-tolerant CAN channels or mixed are possible

1.3 External connectors

Front view



Back view



1.4 WLAN/LAN properties

1.4.1 WLAN

The WLAN standard 802.11b offers up to 14 channels depending on the region. It has to be considered that not all channels are free from overlap. If more than one WLAN network is used in the same area, different channels should be used with 4 channels free between the two channels.

Channel	Center frequency	Frequency range
1	2412 MHz	2399.5 MHz – 2424.5 MHz
2	2417 MHz	2404.5 MHz – 2429.5 MHz
3	2422 MHz	2409.5 MHz – 2434.5 MHz
4	2427 MHz	2414.5 MHz – 2439.5 MHz
5	2432 MHz	2419.5 MHz – 2444.5 MHz
6	2437 MHz	2424.5 MHz – 2449.5 MHz
7	2442 MHz	2429.5 MHz – 2454.5 MHz
8	2447 MHz	2434.5 MHz – 2459.5 MHz
9	2452 MHz	2439.5 MHz – 2464.5 MHz
10	2457 MHz	2444.5 MHz – 2469.5 MHz
11	2462 MHz	2449.5 MHz – 2474.5 MHz
12	2467 MHz	2454.5 MHz – 2479.5 MHz
13	2472 MHz	2459.5 MHz – 2484.5 MHz
14	2484 MHz	2471.5 MHz – 2496.5 MHz

WLAN channels and their frequencies

The distance range of a WLAN device is typically up to 30m inside (100m maximum) and 100m outside (maximum 300m).

1.4.2 Transfer rates

The following table shows the achieved transfer rates with the CAN*box*® in dependence of the transfer types. The CAN*box*® was **running idle** and the distance between the PC and the CAN*box*® was about 1m. This specification is meant to be as a guideline only.

Type of transfer	Transfer rate
Connection with WLAN-PC using AdHoc	140 kB/s
Connection with WLAN-PC using an AccessPoint	90 kB/s
Connection with LAN-PC using an AccessPoint	195 kB/s
Connection with LAN-PC via LAN	250 kB/s

2 Connectors of the CAN*box*®

2.1 Overview

The following external connectors are present:

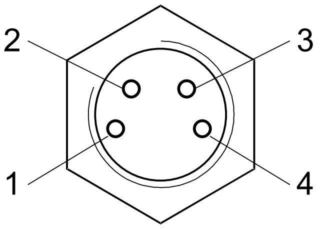
Connector	Type	Function
ST1	M8-Connector 4 pins	Power supply (6..60V)
ST2	M8-Connector 4 pins	Ethernet interface
ST3	M8-Connector 3 pins	Serial interface
CAN 1	D-SUB-9 male	CAN bus 1
CAN 2	D-SUB-9 male	CAN bus 2
WLAN	SMA female	WLAN antenna

2.2 Assignment of the external connectors

The power supply and the host interfaces are connected by connectors of type M8. The cable with 3- or 4-pin plug in 2m and 5m length are available from many distributors. The cable with 2m length are also available from SORCUS. In addition, SORCUS offers cable equipped with D-SUB-9 socket for serial connection and with RJ45 plug for direct connection of Ethernet on a company network or a PC (Cross-Over).

The cable uses the following color assignment:

Color	3 Pin	4 Pin
Brown	1	1
White	-	2
Black	2	3
Blue	3	4

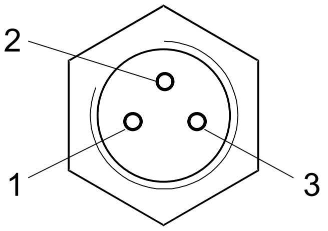


View of
M8 plug
fromoutside

The cable of the Hirschmann company have the following type designation:

- Cable M8 3 pins: ELKA-KV 3308
- Cable M8 4 pins: ELKA-KV 4408

Cables of other manufacturers (Binder, Phoenix etc.) use different declarations.



2.2.1 Connector ST 1, power supply

At M8 plug ST1, the power supply of the CAN*box*® has to be applied. Contacts 3 and 4 are to be used for connecting GND, contacts 1 and 2 supports power supplies with voltages from 6...60V. If the power supply is connected the wrong way a fuse will brake inside of the CANbox® which may be replaced by the SORCUS service only.

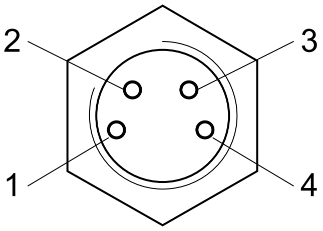
ST1	Signal	Cable Color
1,2	+Vbatt	Brown, White
3,4	-Vbatt (=XGND)	Black, Blue

Because of the integrated DC/DC converter, the current consumption is higher when using small input voltages than high input voltages.

2.2.2 Host Interfaces (Connectors ST 2 and ST 3)

2.2.2.1 Assignment Connector ST 2, M8 plug with 4 pins (Ethernet):

ST 2	Signal of CPU modul	Signal	RJ45 for Hub	PC
1	Connector A Pin 1	TX+	1	3

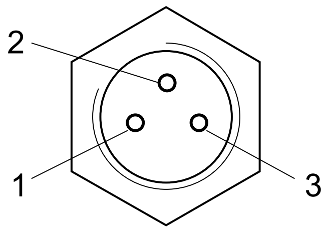


2	Connector A Pin 2	TX-	2	6
3	Connector A Pin 3	RX+	3	1
4	Connector A Pin 4	RX-	6	2

The assignment of the RJ45 plug is given for a connection to a hub and for direct connection to a PC.

2.2.2.2 Assignment Connector ST 3, M8 plug with 3 pins (serial host interface):

ST 3	Signal of CPU modul	Signal	Pin at D-SUB-9
1	Connector A Pin 8	TXD	2
2	Connector A Pin 6	RXD	3
3	ST5 Pin 10	XGND	5



The assignment for the D-SUB-9 socket is given for direct connection to a PC.

2.2.3 D-SUB-9 plug for CAN 1 and CAN 2

The two CAN interfaces are galvanically isolated from each other and from the rest of the CAN*box*®. The options of the CAN interfaces are described in the software part of this manual.

D-SUB-9 plug for CAN channel 1	
Signal	**Pin D-SUB**
CAN1-GND	3
CAN1-L	2
CAN1-H	7

D-SUB-9 plug for CAN channel 2	
Signal	**Pin D-SUB**
CAN2-GND	3
CAN2-L	2
CAN2-H	7

2.2.4 SMA plug for antenna

At the back side of the CAN*box*® *there* is a SMA plug connector for a WLAN antenna. Here, various types of antennas can be connected. The following antennas are available among others:

- Short antenna (93mm) 90° angle with 2,1dBi gain
- Table antenna (190mm height) with 1,8m cable, 5dBi gain

3 Starting Instructions

3.1 CAN*box*® Setup

The CAN*box*® *s*etup named CANbox.exe is to be used for the installation of the different components which are available for CAN*box*® operation. After the installation is started, a dialog for selection of the components appears. The following components are available:

• Win32 driver:	Driver and configuration tool for CAN*box*® administration with Win32 operating systems
• Win32 library:	Library for programming CAN*box*® access with Win32 operating systems (C, C++, VB6.0, VB.NET)
• Win32 samples:	Examples for programming the CAN*box*® with Win32 operating systems
• Win32 tools:	Tools for using the CAN*box*® with Win32 operating systems
• POCKET PC 2003 driver:	Driver and configuration tool for CAN*box*® administration with POCKET PC 2003 operating systems
• POCKET PC 2003 SE driver:	Driver and configuration tool for CAN*box*® administration with POCKET PC 2003 SE operating systems
• POCKET PC 2003 library:	Library for programming CAN*box*® access with POCKET PC 2003 (SE) operating systems (C, C++, VB6.0, VB.NET)
• POCKET PC 2003 samples:	Examples for programming the CAN*box*® with POCKET PC 2003 (SE) operating systems
• POCKET PC 2003 tools:	Tools for using the CAN*box*® with POCKET PC 2003 (SE) operating systems
• Documentation:	Documentation of the CAN*box*®

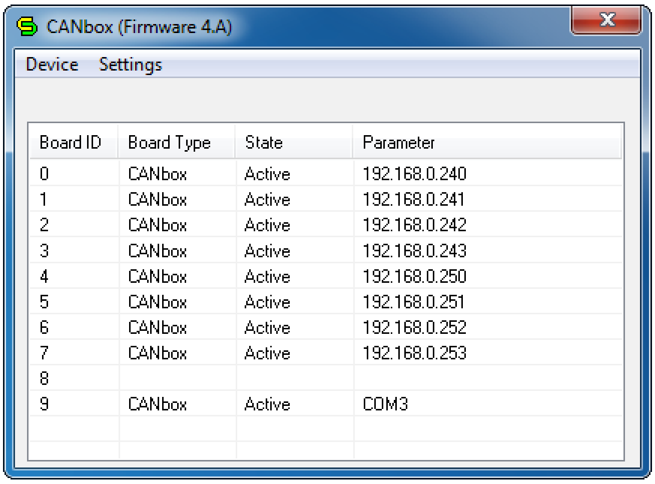
After the selection of the components, a path dialog for destination path selection appears. The selected components will be installed in sub directories of the selected path. The driver and the configuration tool will be installed in designated windows directories. After path selection, the installation of the components takes place.

3.2 CAN*box*® Configuration Tool (Windows 32)

3.2.1 Operation

The CAN*box*® Configuration Tool serves for administration and configuration of the CAN*box*®es. It is installed in the control panel with the name **CANbox®**.

It contains a list of the installed CAN*box*es where each CAN*box*® is assigned an unique ID. This ID is needed for the configuration of the router mode for example.



Board ID	Board Type	State	Parameter
0	CANbox	Active	192.168.0.240
1	CANbox	Active	192.168.0.241
2	CANbox	Active	192.168.0.242
3	CANbox	Active	192.168.0.243
4	CANbox	Active	192.168.0.250
5	CANbox	Active	192.168.0.251
6	CANbox	Active	192.168.0.252
7	CANbox	Active	192.168.0.253
8			
9	CANbox	Active	COM3

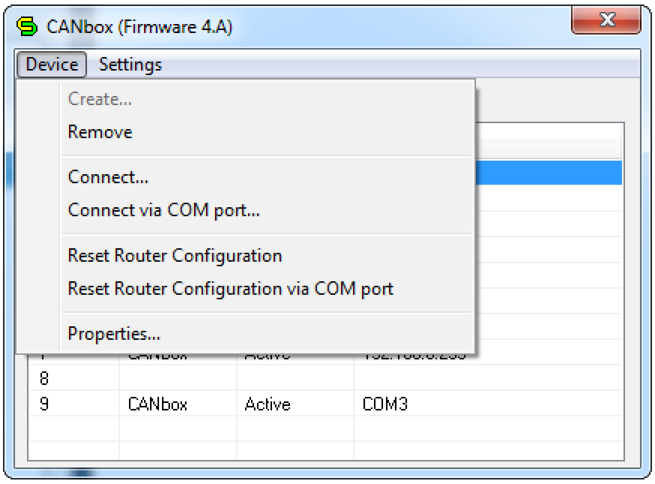
CANbox® configuration at Win32 operating systems

After selecting an empty line, a CAN*box*® can be installed via the **Device** menu of the main menu respectively the context menu of the CAN*box*®; a double click on a installed CAN*box*® makes its configuration possible.

Moreover, a connection to a CAN*box*® is possible, if the communication parameter correspond with the configuration. After a successful connection, the communication parameters and some other settings can be changed. The changes take effect after restarting the CAN*box*®.

The configuration of the CAN*box*® can also take place by using the serial interface. Here, a cross over connection between a serial interface of the PC and the serial interface of the CAN*box*® is required.

3.2.2 CAN*box*® Configuration menu



CANbox® configuration menu

The CAN*box*® configuration menu provides the following options:

3.2.2.1 Create

Install a CAN*box*®. This command opens the configuration dialog. (3.2.3)

3.2.2.2 Remove

Uninstall a CAN*box*®.

3.2.2.3 Connect

Connect with a CAN*box*® with configured parameters. This command opens the device properties dialog. (3.2.4)

3.2.2.4 Connect via COM port...

Connect a CAN*box*® using a serial interface. The interface is configured in the menu command “settings”. This command opens the device properties dialog. (3.2.4)

3.2.2.5 Reset Router Configuration

Delete the router configuration from the selected CAN*box*®. The changes take effect on the next restart of the CAN*box*®.

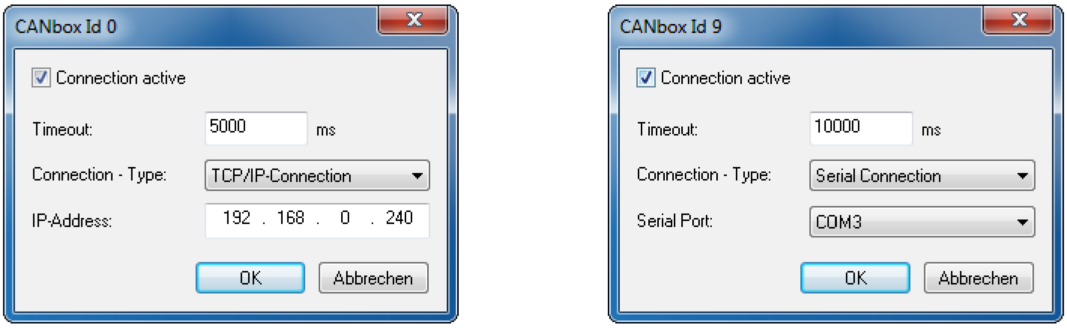
3.2.2.6 Reset Router Configuration via COM port

Delete the router configuration from the selected CAN*box*® using a serial interface. The interface is configured in the menu command “settings”.

3.2.2.7 Properties...

Edit the configuration of the selected CAN*box*®. This command opens the configuration dialog. (3.2.3)

3.2.3 Configuration dialog



CANbox Id 0

☑ Connection active

Timeout: 5000 ms

Connection - Type: TCP/IP-Connection

IP-Address: 192 . 168 . 0 . 240

CANbox Id 9

☑ Connection active

Timeout: 10000 ms

Connection - Type: Serial Connection

Serial Port: COM3

CANbox® Configuration dialog

In this dialog a connection to a CAN*box*® can be configured. The following parameters can be configured.

Connection active:

> This command activates or deactivates the connection. If the connection is deactivated a connection to the chosen CAN*box*® is not possible.

Timeout:

> In this field the connection timeout can be entered in ms.

Connection Type:

> Either “TCP/IP Connection” or “Serial Connection” can be selected.

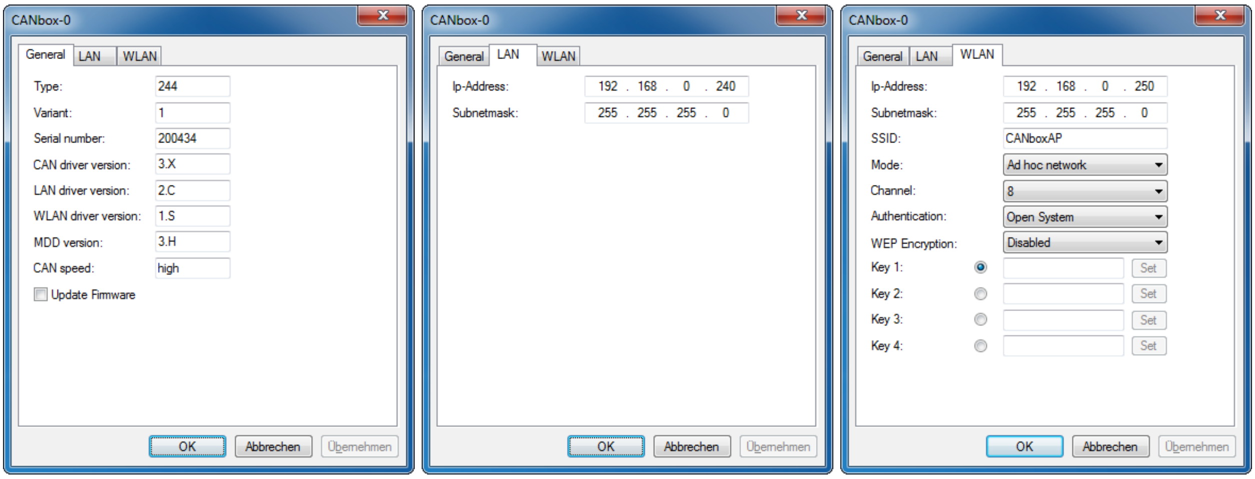
IP-address:

> In this field the IP-Address configured in the CAN*box*® must be entered. The default value is 192.168.0.240.

Serial port:

> Selection of the serial port on the computer to connect to the CAN*box*®.

3.2.4 Device properties dialog



CANbox-0 – General

Type: 244
Variant: 1
Serial number: 200434
CAN driver version: 3.X
LAN driver version: 2.C
WLAN driver version: 1.S
MDD version: 3.H
CAN speed: high
□ Update Firmware

CANbox-0 – LAN

Ip-Address: 192 . 168 . 0 . 240
Subnetmask: 255 . 255 . 255 . 0

CANbox-0 – WLAN

Ip-Address: 192 . 168 . 0 . 250
Subnetmask: 255 . 255 . 255 . 0
SSID: CANboxAP
Mode: Ad hoc network
Channel: 8
Authentication: Open System
WEP Encryption: Disabled
Key 1: ●
Key 2: ○
Key 3: ○
Key 4: ○

CANbox® Device properties dialog at Win32 operating systems

3.2.4.1 General

This property page shows general information about the CAN*box*® and versions of the installed drivers. If the firmware of the CAN*box*® is older than the configuration tool, a firmware update can be done by activating the check box **Update Firmware**. After pressing the OK button, the firmware is transferred into the CAN*box*® and will be activated after a restart of the CAN*box*®.

3.2.4.2 LAN

The property page LAN offers all necessary parameters for a conventional LAN connection:

Element	Meaning	Default
IP-Address	IP address of the CAN*box*®	192.168.000.240
Subnetmask	Subnetmask of the CAN*box*®	255.255.255.000

Changes of these parameters will be activated by restarting the CAN*box*®.

3.2.4.3 WLAN

The property page WLAN contains all needed parameters for a wireless LAN connection:

Element	Meaning	Default
IP-Address	IP address of the CAN*box*®	192.168.000.250
Subnetmask	Subnetmask of the CAN*box*®	255.255.255.000
SSID	Network name with up to 34 characters	CANbox
Mode	AdHoc connection or connection via Access Point	AdHoc
Channel	WLAN channel from 1 to 14	10
Authentication	Network authentication *Open System* or *Shared Key*	Open System

WEP-Encryption	Data encryption *Inactive* or *WEP*	Inactive
Key0	64 bits or 128 bits encryption key	
Key1	64 bits or 128 bits encryption key	
Key2	64 bits or 128 bits encryption key	
Key3	64 bits or 128 bits encryption key	
KeyId	Index of used key	0

The default parameters should be changed directly after the installation process in order to prevent not allowed access to the CAN*box*® by third persons.

Input and presentation of the network keys takes place in the form of a password. For guaranteeing correct input those values have to be set twice.

Changes of these parameters will be activated by restarting the CAN*box*®.

3.3 First connection to a new CAN*box*®

3.3.1 Connect via LAN

The CAN*box*® factory default LAN settings are:

IP Address:	192.168.0.240
Subnetmask:	255.255.255.0

To establish a LAN connection to the CANbox please proceed as follows:

1) Connect the CANbox® with the LAN cable to your network.
2) Edit the TCP/IP settings of the LAN adapter of your PC and change the IP address to 192.168.0.10 and the Subnetmask to 255.255.255.0.
3) Open the CANbox® control panel and install a new CANbox® with the IP address of the new CANbox® in an empty id.
4) Select “Connect” in the “device” menu. The device properties dialog appears (3.2.4).
5) Update the LAN and/or WLAN settings as desired and save them with a click on OK. Close the CANbox® control panel.
6) Set the TCP/IP settings of the LAN adapter to the previous values.
7) After a reboot of the CANbox® you can connect with the new settings.

3.3.2 Connect via serial interface

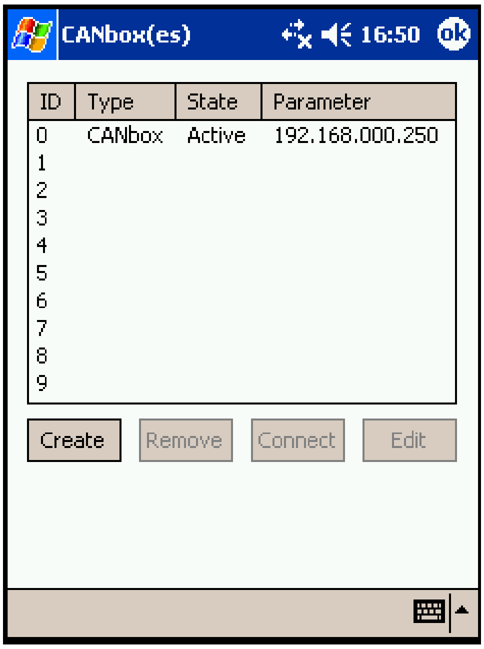
You need a serial CANbox® cable and a COM port or a serial USB adapter in the PC.

To establish a serial connection to the CANbox please proceed as follows

1) Connect the serial cable of the CANbox to COM port of the PC.

2) Open the CANbox® control panel. If you don't use COM1 select the COM port in the "Settings" menu.
3) Select CANbox® ID 0 and " Connect via COM port " in the "Devices" menu.
4) The device properties dialog (3.2.4) appears. Update the LAN and/or WLAN settings and save them with a click on OK.
5) After a rebooting the CANbox® you can establish a connection via LAN / WLAN.

3.4 POCKET PC 2003



ID	Type	State	Parameter
0	CANbox	Active	192.168.000.250
1			
2			
3			
4			
5			
6			
7			
8			
9			

CANbox® Configuration using POCKET PC 2003

3.5 Configuration examples

3.5.1 Configuration example for Windows XP

The following example describes the configuration for a WLAN ad hoc connection between a PC and a CAN*box*® with default settings. This configuration takes place without using third party software and assumes a correctly installed and active WLAN adapter. please proceed as follows

1) Open the network connections by selecting **Show all connections** in the menu **Connect with** of the **Start** menu
2) Select the **Wireless network connection** which has to be used with the CAN*box*® and open its property dialog (context menu - **Properties**)
3) Activate **Internet protocol (TCP/IP)** on the page **General** in the list **This connection uses the following elements** and push the **Properties** button
4) Choose the radio button **Use the following IP address**, enter a fitting **IP address** (e.g. 192.168.0.200) with **Subnetmask** (255.255.255.0) and Leave the dialog with the **OK** button.

If the network **CANbox**® at the available networks (**Wireless networks** – **Available networks** – **Show wireless networks**) is not visible, you have to create it by executing the following steps otherwise you only have to select it.

1. Switch to the page **Wireless networks** and push the button **Add.**

2. Enter CAN*box* into the Edit **Network name (SSID)** of the page **Assignment** and deactivate the **data encryption**. Activate the check box **This is an computer to computer network (Ad hoc).**

3. Leave the dialog with the **OK** button.

Please pay attention that no other network uses an IP address of type 192.168.0.xxx.

3.5.2 Configuration example for POCKET PC 2003

The following example describes the configuration for a WLAN ad hoc connection between a Toshiba e800 with integrated WLAN and a CAN*box*® with default settings. This configuration may be similar for other PDAs but it could be different in some kind.

1) Set the PDA switch for wireless communication to **ON.**

2) The **Wireless LED** of the PDA should light orange.

3) Select the menu **Settings** in the PDA **Start Menu** and switch to the page **Connection.**

4) Click the symbol **Connection** and change to the page **Extended** in the following dialog.

5) Push the button **Network adapter.**

6) On the page **Wireless** click on **New Settings** in the box **Wireless Networks.**

7) A dialog with the pages **General** and **Authentication** will appear.

8) On the page **General** you type **CANbox** for the **Network Name**, choose **Connection with Company** and activate the check box **This is an Ad Hoc Connection.**

9) On the page **Authentication** deactivate the check box **Encryption (WEP activated).**

10) Leave the dialog by using the **OK** button.

11) Switch to the page **Network Adapters** and select **IEEE 802.11b WLAN Adapter** at the **Adapters** using the pen.

12) Activate the radio button **Specific IP Address** and put in a fitting **IP Address** (for example 192.168.0.200) with **Subnetmask** (255.255.255.0).

13) Confirm your inputs with the **OK** button and move back to the **Start Page.**

14) Switch on the CAN*box*® and build up a connection using the **CANbox**® symbol in the control panel.

15) If the connection does not work restart the PDA with a soft reset.

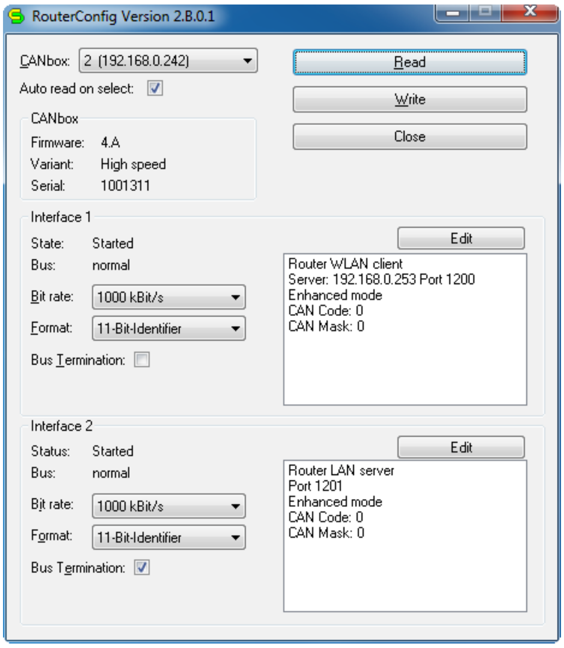
3.6 CAN*box*® as Router

Firmware version 3.A and later offers the possibility to use the CAN*box*® as router. In this case, two CANboxes can be connected to each other via LAN/WLAN.

Both CAN*box*es are configured for reception of all Identifiers or certain Identifiers or exclusively for sending by using a CAN acceptance filter. The optimal parameters for the acceptance filter can be determined by using the tool “*Acceptance Filter Calculator*” which is installed with the CAN*box*® tools. All CAN messages that pass the acceptance filter are sent to the other CAN*box*® via LAN/WLAN where they are passed to the CAN bus. The settings of the router mode are stored in the EEPROM of the CAN*box*®. These settings are read when the CAN*box*® is switched on and the router is activated if necessary. Each CAN interface offers a separate router functionality.

The router mode can be configured by using library functions or with the tool „RouterConfiguration“ which is included in the CAN*box*® software. Therefore, the CAN*box*es have to be installed in the control panel and a connection is possible.

In the configuration one CAN*box*® has to be set to a TCP/IP server and the other CAN*box*® to a TCP/IP client. The server port has to be identical in both CAN*box*es and can have a value between 1200 and 65530.



CANbox: 2 (192.168.0.242)

Auto read on select: ☑

CANbox

Firmware: 4.A

Variant: High speed

Serial: 1001311

Interface 1

State: Started

Bus: normal

Bit rate: 1000 kBit/s

Format: 11-Bit-Identifier

Bus Termination: □

Router WLAN client
Server: 192.168.0.253 Port 1200
Enhanced mode
CAN Code: 0
CAN Mask: 0

Interface 2

Status: Started

Bus: normal

Bit rate: 1000 kBit/s

Format: 11-Bit-Identifier

Bus Termination: ☑

Router LAN server
Port 1201
Enhanced mode
CAN Code: 0
CAN Mask: 0

Tool RouterConfig

Select a CAN*box*® and click on “**Read**” to read the current router configuration, the firmware version and the interface state from the device. On devices with firmware older than 3.X the interface parameter must be set before reading.

With a click on “**Write**” the configuration into the CAN*box*® will be stored and activated. If the firmware is older then 3.X a restart of the CAN*box*® is necessary to activate the configuration.

The CAN-bus interface is configured with following parameters:

Bit rate:

Fixed bit rates from 10kBit/s to 1000kBit/s can be selected.

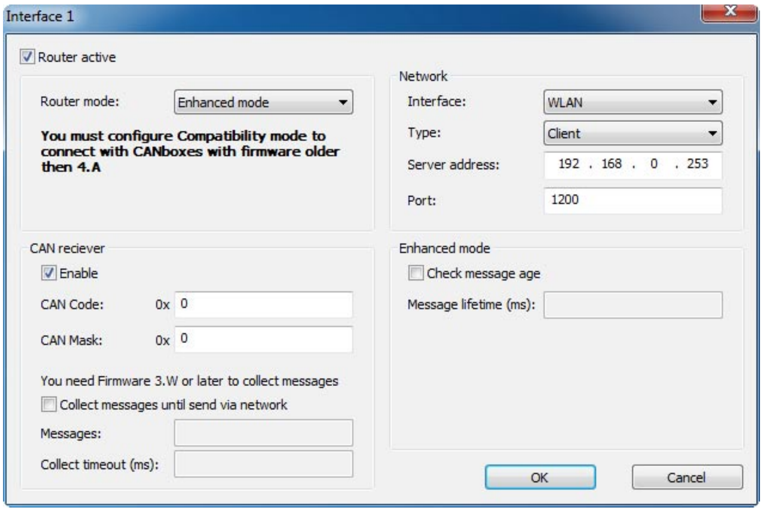
Format:

Selection of witch CAN identifier format to be routed. 11 bit only, 29 bit only or both (Mixed Mode)

Bus termination:

Enable or disable the CAN bus termination resistor in the CANbox®.

With a click on “**Edit**” the configuration dialog for the router function will be opened.



Interface 1

☑ Router active

Router mode: Enhanced mode

You must configure Compatibility mode to connect with CANboxes with firmware older then 4.A

Network

Interface: WLAN

Type: Client

Server address: 192 . 168 . 0 . 253

Port: 1200

CAN reciever

☑ Enable

CAN Code: 0x 0

CAN Mask: 0x 0

You need Firmware 3.W or later to collect messages

☐ Collect messages until send via network

Messages:

Collect timeout (ms):

Enhanced mode

☐ Check message age

Message lifetime (ms):

Configuration dialog for the router function

Router active:

Enable or disable the router function for this CAN interface.

Router mode:

Firmware 4.A and newer supports the “enhanced mode”. To use this all CANbox® devices must have this firmware. The “enhanced mode” offers higher data security and stability as well as the monitoring of the age of CAN messages.

We recommend to update all CANbox® devices to the latest firmware and to use this router mode. (see 3.2, 3.2.4 to update the firmware)

In the “compatibility mode” you configure router connection to CANbox® devices with old firmware versions.

CAN receiver:

you activate the CAN receiver on this bus with “enable”. The values in “CAN code” and “CAN mask” are parameter for the acceptance filter. You can calculate these with the tool “AcceptanceFilterCalculator” (3.8).

To optimize the data transfer through the network (minimize TCP overhead) you can instruct the CANbox® to collect CAN messages before sending them over the network. Enter the number of messages to collect in “Messages”. The timeout sets the time after that a single message is sent over the network. You need firmware 3.W or later to enable this feature.

Network:

You have to select the network interface (LAN or WLAN) for this connection. To establish a connection between two CANbox® devices you must configure one device as "**Server**" (waits for incoming connection) and the other device as "**Client**" (connects active with server). Configure the same "**Port**" on the client and the server. You must tell the client the **Server IP address**.

Enhanced mode:

If you enable the check of message age and enter the "message life time" the CANbox® monitors the time from receiving a message on the CAN bus to send the message on the CAN bus of the other CANbox®. If this overruns the life time this message is not sent on the destination CAN bus.

3.6.1 Configuration examples

3.6.1.1 Example 1

All CAN messages from CANbox® A interface 1 should be routed to CANbox® B interface 1 via WLAN. Only Identifier 0x1000 to 0x100F are to be routed from CANbox® B to CANbox® A.

CANbox® A is configured as server, CANbox® B as client. Both CANbox®es have firmware 4.A.

The interface parameters (bit rate, termination resistor) must be configured according to the associated CAN bus and the format on both CANbox®es must be set to the same value.

	CANbox® A interface 1	**CANbox® B interface 1**
Router active	Yes	
Router mode	Enhanced	
Receiver enabled	Yes	
CAN code	0	0000100F
CAN mask	0	1FFFFFF0
Collect messages	No	
Network interface	WLAN	
Type	Server	Client
Server address	N/A	WLAN IP address of CANbox® A
Port	1200	
Check message age	No	

3.6.1.2 Example 2

CAN messages with identifier 0x2000 to 0x3FFF should be routed from CANbox® A interface 2 to CAN*box*® B interface 2 via LAN. No message is to be routed from CAN*box*® B to CAN*box*® A.

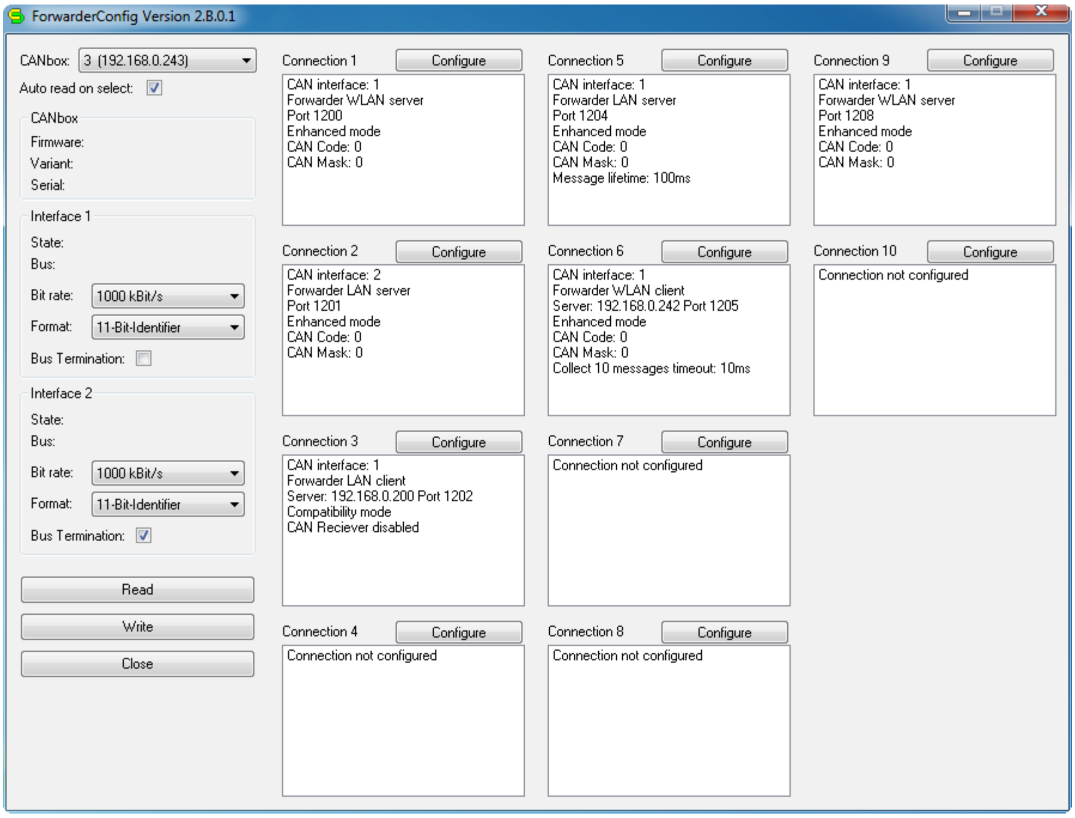
CANbox® A is configured as client, CAN*box*® B as server. One CAN*box*® has **firmware 4.A**, the other has a **older firmware**.

The interface parameters (bit rate, termination resistor) must be configured according to the associated CAN bus and the format on both CAN*box*®es must be set to the same value.

	CANbox® A interface 2	**CANbox® B interface 2**
Router active	Yes	
Router mode	Compatibility	
Receiver enabled	Yes	No
CAN code	00003FFF	N/A
CAN mask	1FFFE000	N/A
Collect messages	No	N/A
Network interface	LAN	
Type	Client	Server
Server address	LAN IP address of CANbox® B	N/A
Port	1201	
Check message age	N/A	

3.7 Enhanced Router (Forwarder)

The forwarder allows to define up to 10 router connections in one CAN*box*®. This mode is available from firmware version 3.M. Any combination of server, client, CAN interface 1 and CAN interface 2 can be configured.



ForwarderConfig Version 2.B.0.1

CANbox: 3 (192.168.0.243)
Auto read on select: ☑

CANbox
Firmware:
Variant:
Serial:

Interface 1
State:
Bus:
Bit rate: 1000 kBit/s
Format: 11-Bit-Identifier
Bus Termination: □

Interface 2
State:
Bus:
Bit rate: 1000 kBit/s
Format: 11-Bit-Identifier
Bus Termination: ☑

Read
Write
Close

Connection 1 Configure
CAN interface: 1
Forwarder WLAN server
Port 1200
Enhanced mode
CAN Code: 0
CAN Mask: 0

Connection 2 Configure
CAN interface: 2
Forwarder LAN server
Port 1201
Enhanced mode
CAN Code: 0
CAN Mask: 0

Connection 3 Configure
CAN interface: 1
Forwarder LAN client
Server: 192.168.0.200 Port 1202
Compatibility mode
CAN Reciever disabled

Connection 4 Configure
Connection not configured

Connection 5 Configure
CAN interface: 1
Forwarder LAN server
Port 1204
Enhanced mode
CAN Code: 0
CAN Mask: 0
Message lifetime: 100ms

Connection 6 Configure
CAN interface: 1
Forwarder WLAN client
Server: 192.168.0.242 Port 1205
Enhanced mode
CAN Code: 0
CAN Mask: 0
Collect 10 messages timeout: 10ms

Connection 7 Configure
Connection not configured

Connection 8 Configure
Connection not configured

Connection 9 Configure
CAN interface: 1
Forwarder WLAN server
Port 1208
Enhanced mode
CAN Code: 0
CAN Mask: 0

Connection 10 Configure
Connection not configured

Tool Forwarderconfig

With checked "Auto read on select" the configuration is read out of the selected CAN*box*®. On a device with firmware older then 3.X the interface parameter Bit rate, Format and Bus termination must be set before reading.

The configuration is the same as described in router configuration (3.6). The selection of the CAN interface is added.

3.7.1 Configuration examples

The examples from router configuration are also valid for forwarder configuration. Select in the forwarder any connection to store the configuration. Additional the CAN interface in the connection configuration must be selected.

3.7.1.1 Example 1

All CAN messages from CAN*box*® A interface 1 should be routed via WLAN to three other CAN*box*®es (B – D) and via LAN to two other CAN*box*®es (E, F). These five CAN*box*® have to route only Identifier 0x11000 to 0x11003. On CAN*box*® B and C is interface 1 connected, on CAN*box*® D – F is interface 2 connected.

CANbox® A:

The interface parameters (bit rate, termination resistor) must be configured according to the associated CAN bus and the format on both CAN*box*®es must be set to the same value.

	Conn. 1	**Conn. 2**	**Conn. 3**	**Conn. 4**	**Conn. 5**
CAN bus	Interface 1				
Forwarder active	Yes				
Forwarder Mode	Enhanced				
Receiver enabled	Yes				
CAN code	0				
CAN mask	0				
Collect messages	No				
Network interface	WLAN			LAN	
Type	Server				
Server address	N/A				
Port	**1200**	**1201**	**1202**	**1203**	**1204**
Check message age	No				

CANbox® B – F:

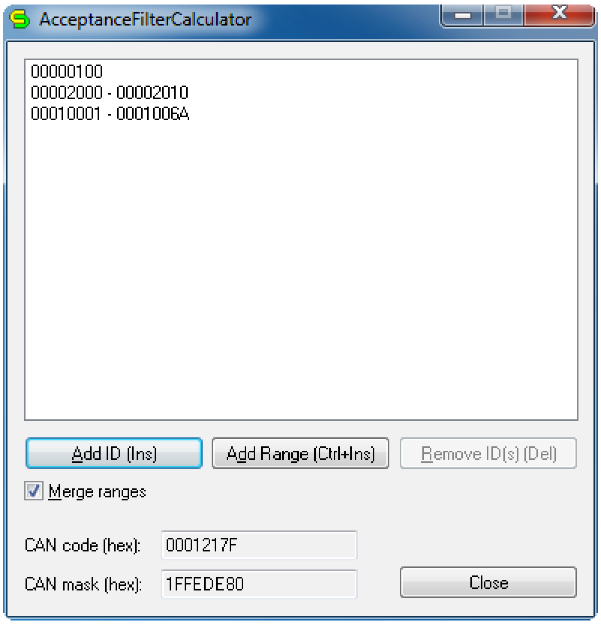
Select any connection to store the configuration.

The interface parameters (bit rate, termination resistor) must be configured according to the associated CAN bus and the format on both CAN*box*®es must be set to the same value.

CAN*box*®	**B**	**C**	**D**	**E**	**F**
CAN bus	Interface 1	Interface 1	Interface 2	Interface 2	Interface 2
Forwarder active	Yes				
Forwarder Mode	Enhanced				
Receiver enabled	Yes				
CAN code	00011003				
CAN mask	1FFFFFFC				
Collect messages	No				
Network interface	WLAN			LAN	
Type	Client				
Server address	WLAN IP address of CANbox® A			LAN IP address of CANbox® A	
Port	**1200**	**1201**	**1202**	**1203**	**1204**
Check message age	No				

3.8 Acceptance Filter calculator

With this tool the „CAN code“ and „CAN mask“ values for the acceptance filter of the CANbox® can be calculated.



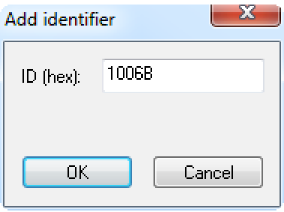
```
00000100
00002000 - 00002010
00010001 - 0001006A
```

☑ Merge ranges

CAN code (hex): 0001217F

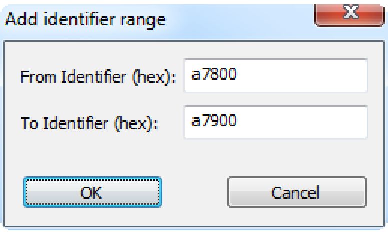
CAN mask (hex): 1FFEDE80

A single identifier can be added



ID (hex): 1006B

or a range of identifiers.



From Identifier (hex): a7800

To Identifier (hex): a7900

The "CAN code" and "CAN mask" values are calculate immediately after adding or removing an identifier (range).

The "CAN mask" represents a bit mask of valid bits in the "CAN code". This means: a CAN message will be received or routed if

Identifier & "CAN mask" == "CAN code" & "CAN mask"

The handicap of this filter is following:

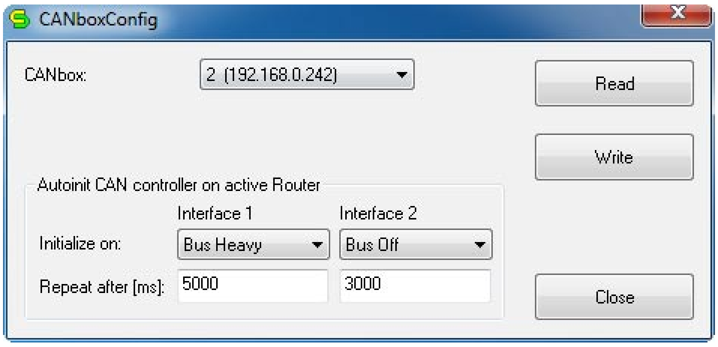
To filter identifier 0x100 and 0x200 the bits 8 and 9 of the mask are set to invalid. This causes that the identifier 0x300 is also filtered.

3.9 Automatic recovery on heavy CAN bus in router mode

Firmware 3.W or later is required to use this tool.

The CAN controller of the CAN*box*® has an internal counter for occurrences of errors on the CAN bus. This counter is incremented on errors and decremented on correctly transmitted or received frames. If the counter has reached a limit of 96 the controller goes to „error passive“ state (Bus heavy) and becomes receiver. In this state the controller will transmit no more frames and recovers only on receiving frames. If the counter reaches 256, the controller goes offline (Bus off). In this state doesn’t reconnect to the CAN bus.

With the tool “CANboxConfig” you can define a level and a recurrence interval to reinitialize the CAN controller of each interface.



CANbox: 2 (192.168.0.242)

Autoinit CAN controller on active Router

	Interface 1	Interface 2
Initialize on:	Bus Heavy	Bus Off
Repeat after [ms]:	5000	3000

Tool CanboxConfig

First the CAN*box*® to be configure must be selected. With “Read” the current configuration can be readed.

In the field “Initialize on” the trigger level for the automatic initialization is to be selected.

In the field “Repeat after” the time in ms at the earliest repetition of the initialization .

With “Write” the configuration will be stored to the selected CAN*box*®.

4 **CAN*box*® *library***

The library offers all functions which are necessary for a CAN communication. All functions give an error code as return value. A function returns CB_ERROR_OK, if it has been executed successfully. The CAN*box*® library allows hardware configuration and initialization. Furthermore, the library provides functions for reception and transmission of CAN Identifiers. The library is available for Win32 as well as for POCKET PC 2003 operating systems.

4.1 Structures and Definitions

4.1.1 CANBOX_VERSION_INFO

Structure for version information.

4.1.1.1 Parameter

USHORT	usBuild:	Build number
UCHAR	ucMinor:	Minor version number
UCHAR	ucMajor:	Major version number
UCHAR	ucDay:	Day of build
UCHAR	ucMonth:	Month of build
USHORT	usYear:	Year of build

4.1.2 CANBOX_TIME_STAMP

Structure with 64 bits time stamp.

4.1.2.1 Parameter

ULONG	ulTimeLo:	Low-Dword of the time stamp
ULONG	ulTimeHi:	High-Dword of the time stamp

4.1.3 CANBOX_SCAN_INFO

Structure for device information of an installed CAN*box*.

4.1.3.1 Elements

USHORT	usDeviceId:	ID of the CAN*box d*evice
USHORT	usConnection:	Type of connection
ULONG	ulTimeout:	Timeout value

4.1.4 CANBOX_DEVICE_INFO

Structure for device information of a connected CAN*box*.

4.1.4.1 Parameter

USHORT	usType:	Type of the CAN*box*
USHORT	usVariant:	Variant of the CAN*box*
ULONG	ulSerial:	Serial number of the CAN*box*
CANBOX_VERSION_INFO	sDriverCan:	Version of the CAN driver
CANBOX_VERSION_INFO	sDriverLan:	Version of the LAN driver
CANBOX_VERSION_INFO	sDriverWlan:	Version of the WLAN driver

4.1.5 CANBOX_RESET_EX

Structure to be used for the extended reset function.

4.1.5.1 Parameter

USHORT	usRouterRestart:	Restart of the router after reset

4.1.6 CANBOX_INTERFACE

Structure for interface configuration with declaration of the bit rate.

4.1.6.1 Parameter

ULONG	ulBufferSizeMax:	Maximum count of messages stored by the CAN*box*® (0-150.000; 0: available maximum).
USHORT	usIndex:	Index of the interface (1, 2 when using the library or 0, 1 when using the socket interface)
USHORT	usBitRate:	Bit rate
USHORT	usShutOff:	Switching on / off of the CAN bus termination resistance
USHORT	usFormat:	CAN specification (11 bit / 29 bit Identifier)

4.1.6.2 Bit rates

CB_BITRATE_0010_KBIT:	10 kBit/s
CB_BITRATE_0020_KBIT:	20 kBit/s
CB_BITRATE_0050_KBIT:	50 kBit/s
CB_BITRATE_0080_KBIT:	80 kBit/s
CB_BITRATE_0083_3_KBIT:	83.3 kBit/s
CB_BITRATE_0100_KBIT:	100 kBit/s
CB_BITRATE_0125_KBIT:	125 kBit/s
CB_BITRATE_0250_KBIT:	250 kBit/s
CB_BITRATE_0500_KBIT:	500 kBit/s
CB_BITRATE_0666_KBIT:	666 kBit/s
CB_BITRATE_0800_KBIT:	800 kBit/s
CB_BITRATE_1000_KBIT:	1 MBit/s

4.1.6.3 CAN bus termination resistor

CB_NO_SHUT_OFF:	Off
CB_SHUT_OFF:	On

4.1.6.4 Format

CB_FORMAT_MIXED:	11 bit and 29 bit Identifier
CB_FORMAT_11_BIT:	11 bit Identifier
CB_FORMAT_29_BIT:	29 bit Identifier
CB_FORMAT_STD:	Standard mode
CB_FORMAT_BUFFER:	Buffer mode: Each Identifier respectively acceptance filter has a configurable buffer size to be set by usBufferSize.

4.1.7 CANBOX_INTERFACE_EX

Extended structure for interface configuration with direct declaration of the bit timing parameters.

4.1.7.1 Parameter

ULONG	ulBufferSizeMax:	Maximum count of messages stored by the CAN*box*[®] (0-150.000; 0: available maximum).
USHORT	usIndex:	Index of the interface (1, 2 when using the library or 0, 1 when using the socket interface)
USHORT	usTq:	Time quantum in nanoseconds
USHORT	usTseg1:	Time before the nominal scan time
USHORT	usTseg2:	Time after the nominal scan time
USHORT	usTsjw:	Synchronization jump width
USHORT	usSpB:	Number of samples per bit
USHORT	usShutOff:	Switching on / off of the CAN bus termination resistance
USHORT	usFormat:	CAN specification (11 bit / 29 bit Identifier)

4.1.7.2 CAN bus termination resistance

CB_NO_SHUT_OFF:	Off
CB_SHUT_OFF:	On

4.1.7.3 Format

CB_FORMAT_MIXED:	11 bit and 29 bit Identifier
CB_FORMAT_11_BIT:	11 bit Identifier
CB_FORMAT_29_BIT:	29 bit Identifier
CB_FORMAT_STD:	Standard mode
CB_FORMAT_BUFFER:	Buffer mode: Each Identifier respectively acceptance filter has a configurable buffer size to be set by usBufferSize.

4.1.8 CANBOX_INTERFACE_STATE

Structure for state information of an interface.

4.1.8.1 Parameter

CANBOX_TIME_STAMP	sTime:	Time stamp of the last change in bus state
USHORT	usBusState:	Bus state
USHORT	usBusInfo:	Information concerning the bus state
USHORT	usUserState:	User state

4.1.8.2 Bus state

CB_BUS_STATE_ON: CAN interface is taking part in bus communication.

CB_BUS_STATE_HEAVY: Bus is heavily disturbed.

CB_BUS_STATE_OFF: CAN controller does not take part in bus communication any longer because of too many bus errors.

CB_BUS_STATE_LINE: Line error signaled from transceiver (only for fault tolerant interfaces).

4.1.8.3 Bus info

CB_BUS_INFO_STUFF: Stuff error (more than 5 equal bits in a message in a row).

CB_BUS_INFO_FORM: Form error (format error in the message).

CB_BUS_INFO_ACK: Ack error (sent message has not been acknowledged).

CB_BUS_INFO_BIT_LO: Bit error 0 (after sending a message, 0 has been read back instead of 1).

CB_BUS_INFO_BIT_HI: Bit error 1 (after sending a message, 1 has been read back instead of 0).

CB_BUS_INFO_CRC: CRC error (bad check sum).

4.1.8.4 User state

CB_USER_STATE_OFF: Interface has not been configured yet.

CB_USER_STATE_STARTED: Interface has been configured and started.

CB_USER_STATE_STOPPED: Interface has been configured and stopped.

4.1.9 CANBOX_INTERFACE_INFO

4.1.9.1 Parameter

CANBOX_INTERFACE_STATE	sState:	Bus state information
ULONG	ulBufferSizeMax	See CANBOX_INTERFACE (0)
USHORT	usValid:	0 == only sState supported by firmware (3.W or older)
USHORT	usIndex:	See CANBOX_INTERFACE (0)
USHORT	usBitRate:	See CANBOX_INTERFACE (0)
USHORT	usShutOff	See CANBOX_INTERFACE (0)
USHORT	usFormat	See CANBOX_INTERFACE (0)
USHORT	usTq	See CANBOX_INTERFACE (0)
USHORT	usTseg1	See CANBOX_INTERFACE (0)
USHORT	usTseg2	See CANBOX_INTERFACE (0)
USHORT	usTsjw	See CANBOX_INTERFACE (0)
USHORT	usSpB	See CANBOX_INTERFACE (0)

4.1.10 CANBOX_INTERFACE_READ

Structure for receiption data of an interface.

4.1.10.1 Parameter

CANBOX_TIME_STAMP	sTime:	Time stamp
ULONG	ulId:	CAN Id of the Identifier
ULONG	ulDataSize:	Number of valid data bytes
UCHAR	ucData[8] (ucData0 to ucData7 at VB):	Data bytes of the Identifier

4.1.11 CANBOX_INTERFACE_WRITE

Structure for sending data of an interface.

4.1.11.1 Parameter

CANBOX_TIME_STAMP	sTime:	Time stamp
CANBOX_HANDLE	hIdentifier:	Handle of the Identifier to be sent
ULONG	ulDataSize:	Number of valid data bytes for sending
UCHAR	ucData[8] (ucData0 to ucData7 at VB):	Data bytes of the Identifier

4.1.12 CANBOX_IDENTIFIER

Structure for identifier configuration.

4.1.12.1 Parameter

ULONG	ulId:	Id of the Identifier. In mixed mode, the most significant bit can be set for marking 29 bit Identifiers. This bit is then set in the received data.
USHORT	usType:	Type of the Identifier.
USHORT	usFlags:	Options for the Identifier.
USHORT	usTimeout:	Maximum time in µs of waiting for the answer for active receivers.
USHORT	usReserved:	Reserved parameter which has to be filled with the zero based index of the interface when using the socket interface.
USHORT	usBufferSize:	Buffer size. This parameter has no effect when using the socket interface.

4.1.12.2 Types

CB_DEVICE_RECEIVER:	Standard receiver (passive)
CB_DEVICE_RECEIVER_ACTIVE:	Active receiver
CB_DEVICE_TRANSMITTER:	Standard sender (active)
CB_DEVICE_TRANSMITTER_PASSIVE:	Passive sender (not available in mixed mode)

4.1.12.3 Options

CB_FLAG_ACKNOWLEDGE:	Creation of acknowledgements for senders
CB_FLAG_EXCLUSIVE:	Exclusive buffer reservation on the CAN controller (not available in mixed mode)
CB_FLAG_FORMAT_29_BIT:	Acceptance filter for 29 bit Identifiers in mixed mode

4.1.13 CANBOX_ACCEPTANCE_FILTER

Structure for configuration of the acceptance filter. An acceptance filter allows the reception of a group of CAN Identifiers. All Identifiers are received which fulfill the criterion (ID & Filter.ulMask)==(Filter.ulId & Filter.ulMask). If the Identifiers 0xA (10dec) and 0xB (11dec) are to be received, the acceptance filter has to be set to ulId=0x0000000A and ulMask=0x0000000E.

4.1.13.1 Parameter

ULONG	ulId:	Identifier of the filter. In mixed mode, the most significant bit can be set for marking 29 bit Identifiers. This bit is then set in the received data.
ULONG	ulMask:	Bit mask of the filter.
USHORT	usType:	Type of the filter.
USHORT	usFlags:	Options for the filter.
USHORT	usReserved:	Reserved parameter which has to be filled with the zero based index of the interface when using the socket interface.
USHORT	usBufferSize:	Buffer size. This parameter has no effect when using the socket interface.

4.1.13.2 Types

CB_FILTER_DATA:	Acceptance filter for data frames.
CB_FILTER_REMOTE:	Acceptance filter for remote frames (not available in mixed mode).

4.1.13.3 Options

CB_FLAG_FORMAT_29_BIT:	Acceptance filter for 29 bit Identifiers in mixed mode.

4.1.14 CANBOX_ROUTER

Structure for router configuration. A router allows a connection between two CAN*box*es via LAN or WLAN respectively. A group of Identifiers (see acceptance filter) can be received and sent over LAN/WLAN to the other CAN*box*. This CAN*box* sends the data which has been received via LAN/WLAN to the CAN bus.

4.1.14.1 Parameter

USHORT	usIndex:	Reserved parameter which has to be set to the value 1.
USHORT	usType:	Type of the router.
USHORT	usMode:	Mode of the router.
USHORT	usFlags:	Options for the router.
ULONG	ulServerIp:	IP address of the server CAN*box.*
USHORT	usServerPort:	Port address of the server CAN*box.*
USHORT	usReserved:	Reserved parameter which has to be filled with the zero based index of the interface when using the socket interface.
ULONG	ulCanId:	Identifier of the CAN acceptance filter (0xFFFFFFFF: no data will be received on the local CAN bus).
ULONG	ulCanMask:	Bit mask of the CAN acceptance filter.

4.1.14.2 Types

CB_ROUTER_LAN_SERVER:	Connection via LAN as TCP/IP server.
CB_ROUTER_LAN_CLIENT:	Connection via LAN as TCP/IP client.
CB_ROUTER_WLAN_SERVER:	Connection via WLAN as TCP/IP server.
CB_ROUTER_WLAN_CLIENT:	Connection via WLAN as TCP/IP client.

4.1.14.3 Mode

CB_ROUTER_INACTIVE:	Router is not activated.
CB_ROUTER_ACTIVE:	Router is activated.

4.1.14.4 Options

CB_FLAG_FORMAT_29_BIT:	Acceptance filter for 29 bit Identifiers in mixed mode.

4.1.15 CANBOX_ROUTER_EX

Structure for router configuration with latency consideration. A router allows a connection between two CAN*box*es via LAN or WLAN respectively. A group of Identifiers (see acceptance filter) can be received and sent over LAN/WLAN to the other CAN*box*. This CAN*box* sends the data which has been received via LAN/WLAN to the CAN bus.

4.1.15.1 Parameter

USHORT	usIndex:	normal mode: Reserved parameter which has to be set to the value 1
		enhanced mode: Zero based index of the requested data set (0..9)
USHORT	usType:	Type of the router.
USHORT	usMode:	Mode of the router.
USHORT	usFlags:	Options for the router.
ULONG	ulServerIp:	IP address of the server CAN*box.*
USHORT	usServerPort:	Port address of the server CAN*box.*
USHORT	usReserved:	Reserved parameter which has to be filled with the zero based index of the interface when using the socket interface.
ULONG	ulCanId:	Identifier of the CAN acceptance filter (0xFFFFFFFF: no data will be received on the local CAN bus).
ULONG	ulCanMask:	Bit mask of the CAN acceptance filter.
ULONG	ulLatency:	Maximum latency time for sending the messages to the CAN bus. (5-10.000 ms)
USHORT	usCollect	number of messages to collect before send via TCP
USHORT	usCollectTimeout	max. time [ms] to wait for more messages until send a message via TCP

4.1.15.2 Types

CB_ROUTER_LAN_SERVER:	Connection via LAN as TCP/IP server
CB_ROUTER_LAN_CLIENT:	Connection via LAN as TCP/IP client
CB_ROUTER_WLAN_SERVER:	Connection via WLAN as TCP/IP server
CB_ROUTER_WLAN_CLIENT:	Connection via WLAN as TCP/IP client
CB_FORWARDER_LAN_SERVER:	Connection via LAN as TCP/IP server (enhanced mode)
CB_FORWARDER_LAN_CLIENT:	Connection via LAN as TCP/IP client (enhanced mode)
CB_FORWARDER_WLAN_SERVER:	Connection via WLAN as TCP/IP server (enhanced mode)
CB_FORWARDER_WLAN_CLIENT:	Connection via WLAN as TCP/IP client (enhanced mode)

4.1.15.3 Mode

CB_ROUTER_INACTIVE:	Router is not activated.
CB_ROUTER_ACTIVE:	Router is activated.

4.1.15.4 Options

CB_FLAG_ROUTER_EXTENDED:	Activates enhanced mode
CB_FLAG_FORMAT_29_BIT:	Acceptance filter for 29 bit Identifiers in mixed mode
CB_FLAG_FORMAT_11_BIT:	Acceptance filter for 11 bit Identifiers in mixed mode
CB_FLAG_FORMAT_MIXED:	Open both 11 and 29 bit acceptance filter

4.1.16 CANBOX_LAN_CONFIG

Structure for setting respectively getting the LAN settings of the CAN*box*®.

4.1.16.1 Parameter

ULONG	ulIp:	IP address of the CAN*box®.*
ULONG	ulSubnetmask:	Subnetmask of the CAN*box*®.

4.1.17 CANBOX_WLAN_CONFIG

Structure for setting respectively getting the WLAN settings of the CAN*box*®.

4.1.17.1 Parameter

ULONG	ulIp:	IP address of the CAN*box®.*
ULONG	ulSubnetmask:	Subnetmask of the CAN*box*®.
UCHAR[34]	ucSSID:	Network name with up to 34 characters.
USHORT	usMode:	Type of connection (AdHoc, Access Point).
USHORT	usOwnChannel:	WLAN channel from 1 to 14.
USHORT	usAuthentication:	Authentication *Open System* or *Shared Key.*
USHORT	usEncryption:	Encryption *Switched Off* or *WEP.*
USHORT	usKeyId:	Zero based index of the used key.
UCHAR[16]	ucKey0:	Key 0 (usKeyId=0).
UCHAR[16]	ucKey1:	Key 1 (usKeyId=1).
UCHAR[16]	ucKey2:	Key 2 (usKeyId=2).
UCHAR[16]	ucKey3:	Key 3 (usKeyId=3).

4.1.17.2 Mode

CB_WLAN_ACCESS_POINT	Connection via access point as TCP/IP server.
CB_WLAN_AD_HOC	AdHoc connection.

4.1.17.3 Authentication

CB_WLAN_OPEN_SYSTEM	Open System.
CB_WLAN_SHARED_KEY	Shared Key.

4.1.17.4 Encryption

CB_WLAN_ENCRYPTION_OFF	Switched off.
CB_WLAN_ENCRYPTION_WEP	WEP.

4.1.18 CANBOX_IDENTIFIER_DATA

Structure with CAN Identifier data.

4.1.18.1 Parameter

CANBOX_TIME_STAMP	sTime:	Time stamp at time of reception.
ULONG	ulId:	CAN Id of the Identifier. In mixed mode the most significant bit is set for 29 bit Identifiers if it was set at opening the Identifier.
ULONG	ulDataSize:	Number of valid data bytes
UCHAR	ucData[8] (ucData0 to ucData7 at VB):	Data bytes

4.1.19 CANBOX_UNIVERSAL_SENDER_DATA

Structure for sending a CAN message by using a general sending object. With a general sending object, any Identifier can be sent by declaration of the Id.

4.1.19.1 Parameter

ULONG	ulId:	CAN Identifier. In mixed mode the most significant bit can be used for marking 29 bit Identifiers.
USHORT	usFlags:	Options.
ULONG	ulDataSize:	Number of data to be sent.
UCHAR	ucData[8] (ucData0 to ucData7 at VB):	Data to be sent.

4.1.19.2 Options

CB_FLAG_FORMAT_29_BIT:	Flag for marking a 29 bit Identifier in mixed mode.

4.1.20 CANBOX_16

Supporting structure for using the CAN*box*® with Visual Basic.

4.1.20.1 Parameter

UCHAR	ucLoByte:	Lower byte.
UCHAR	ucHiByte:	Higher byte.

4.1.21 CANBOX_32

Supporting structure for using the CAN*box*® with Visual Basic.

4.1.21.1 Parameter

UCHAR	ucLoByte:	Lowest byte.
UCHAR	ucByte1:	Higher byte of the lower word.
UCHAR	ucByte2:	Lower byte of the upper word.
UCHAR	ucHiByte:	Highest byte.

4.2 Error codes

CB_ERROR_OK:	No error

4.2.1 General error messages of the CAN*box*®

CB_ERROR_SIZE_INPUT:	Size of input data invalid
CB_ERROR_SIZE_OUTPUT:	Size of output data invalid
CB_ERROR_DATA:	Error in given data
CB_ERROR_STATE:	Invalid state
CB_ERROR_MEMORY:	Error at accessing RAM memory
CB_ERROR_FLASH:	Error at accessing the FLASH memory
CB_ERROR_EEPROM:	Error at EEPROM access
CB_ERROR_NOT_SUPPORTED:	Function not supported (check library and firmware version)

1.1.1. Error messages concerning initialization

CB_ERROR_CAN_INIT:	Error at initializing the CAN firmware
CB_ERROR_HARDWARE_INIT:	Error at initializing the CPU
CB_ERROR_MEMORY_INIT:	Error at memory allocation

1.1.2. Error messages concerning release

CB_ERROR_CAN_EXIT:	Error at releasing the CAN mdd

1.1.3. Error messages concerning CAN interfaces

CB_ERROR_INTERFACE_INDEX:	Invalid interface index
CB_ERROR_INTERFACE_STATE:	Invalid interface state (for the desired operation)
CB_ERROR_INTERFACE_OPEN:	Error at opening the interface
CB_ERROR_INTERFACE_OPEN_BITRATE:	The interface has already been opened with a different bit rate.
CB_ERROR_INTERFACE_OPEN_FORMAT: message	The interface has already been opened with a different format (11bits/29 bits)
CB_ERROR_INTERFACE_BITRATE:	Unsupported bit rate
CB_ERROR_INTERFACE_SHUT_OFF:	Invalid value for the terminating resistance
CB_ERROR_INTERFACE_FORMAT:	Invalid value for the CAN format.
CB_ERROR_INTERFACE_INIT:	Error at initializing a CAN interface
CB_ERROR_INTERFACE_CONTROL:	Error at controlling a CAN interface
CB_ERROR_INTERFACE_EXIT:	Error at clearing a CAN interface

1.1.4. Error messages concerning CAN Identifier

CB_ERROR_IDENTIFIER_INIT:	Error at initializing a CAN Identifier
CB_ERROR_IDENTIFIER_TYPE:	Invalid Identifier type
CB_ERROR_IDENTIFIER_EXCLUSIVE:	Invalid value for exclusive flag
CB_ERROR_IDENTIFIER_READ:	Error at reading data

CB_ERROR_IDENTIFIER_WRITE:	Error at writing data

1.1.5. Error messages concerning acceptance filters

CB_ERROR_FILTER_INIT:	Error at initializing an acceptance filter
CB_ERROR_FILTER _TYPE:	Invalid filter type
CB_ERROR_FILTER _SET:	Error at setting the filter configuration

1.1.6. Error messages concerning universal senders

CB_ERROR_SENDER_INIT:	Error at initializing an universal sender
CB_ERROR_SENDER_WRITE:	Error at writing data of an universal sender

1.1.7. General error messages of the library

CB_ERROR_NO_INIT:	Missing initialization.
CB_ERROR_PARAMETER:	Wrong parameter.
CB_ERROR_HANDLE:	Invalid handle.
CB_ERROR_HANDLE_TYPE:	Invalid handle type.

1.1.8. Error messages of the library concerning the connection to the CANbox®

CB_ERROR_CONNECTION_INIT:	Connection could not be established.
CB_ERROR_CONNECTION_IN_USE:	CAN*box*® is already connected to another application.
CB_ERROR_CONNECTION_TIMEOUT:	Timeout while accessing the CAN*box*®.
CB_ERROR_CONNECTION_RECEIVE:	Error at data reception from the CAN*box*®.
CB_ERROR_CONNECTION_SEND:	Error at sending data to the CAN*box*®.
CB_ERROR_CONNECTION_EXIT:	Connection could not be shut down.
CB_ERROR_DEVICE_NOT_INSTALLED:	The addressed CAN*box*® is not installed in the control panel.

4.3 General Functions

4.3.1 canbox_init_lib

Initialization of the library. This function has to be called once before any other library function. Otherwise all functions return the error CB_NO_INIT.

4.3.1.1 Parameter

None.

4.3.2 canbox_get_driver_version

Delivers information about the driver versions.

4.3.2.1 Parameter

CANBOX_VERSION_INFO* psInfo:	Pointer to structure for version information

4.3.3 canbox_get_error_message

Retrieves the error message for an error code.

4.3.3.1 Parameter

CANBOX_ERROR	Error:	Error code.
USHORT*	pusSize:	Size of the character array.
char*	szMessage:	Character array for message text.

4.3.4 canbox_exit_lib

Free allocated resources. This function has to be called at the end.

4.3.4.1 Parameter

None

4.4 Device Functions

4.4.1 canbox_scan_devices

Gives a list of the installed CAN*box*es.

4.4.1.1 Parameter

USHORT*	pusCount:	Maximum number of device information structures. The driver sets the number to the used count.
CANBOX_SCAN_INFO*	pasInfo:	Pointer to array of info structures for device information.

4.4.2 canbox_get_device_parameter

Gives communication parameter (IP address or serial interface) from registry.

4.4.2.1 Parameter

DWORD	dwId:	Id of CAN*box* to query
CHAR*	szText:	Pointer to array of char for parameter information.
DWORD	dwSize:	Size of buffer szText

4.4.3 canbox_open_device

Opens the device with the given Id. The connection to the device is built up.

4.4.3.1 Parameter

USHORT	usId:	Id of the device to be opened.
CANBOX_HANDLE*	phDevice:	Pointer to handle for the device.

4.4.4 canbox_reset_device

Resets the device. All open Identifiers and interfaces of the device are closed and the bus communication of the interfaces is stopped. The receive buffers are cleared. The time stamp is reset to zero. The connection maintains alive and the device handle keeps valid. Active Routers are restarted after reset.

4.4.4.1 Parameter

CANBOX_HANDLE	hDevice:	Received handle of the device after calling canbox_open_device.

4.4.5 canbox_reset_device_ex

Resets the device. All open Identifiers and interfaces of the device are closed and the bus communication of the interfaces is stopped. The receive buffers are cleared. The time stamp is reset to zero. The connection maintains alive and the device handle keeps valid. Additionally it is possible to determine, if active Routers are to be restarted after reset.

4.4.5.1 Parameter

CANBOX_HANDLE	hDevice:	Received handle of the device after calling canbox_open_device.
CANBOX_RESET_EX	sResetEx:	Structure for configuring the reset behavior.

4.4.6 canbox_get_device_info

Gives information about the device.

4.4.6.1 Parameter

CANBOX_HANDLE	hDevice:	Received handle of the device after calling canbox_open_device.
CANBOX_DEVICE_INFO*	psInfo:	Pointer to an info structure for device information.

4.4.7 canbox_reset_time_stamp

Resets the time stamp to zero. The time stamp has a resolution of 0.1 micro seconds.

4.4.7.1 Parameter

CANBOX_HANDLE	hDevice:	Received handle of the device after calling canbox_open_device.

4.4.8 canbox_set_time_stamp

Sets the time stamp to the given value. The time stamp has a resolution of 0.1 micro seconds.

4.4.8.1 Parameter

CANBOX_HANDLE	hDevice:	Received handle of the device after calling canbox_open_device.
CANBOX_TIME_STAMP	sTime:	Structure with new time stamp value.

4.4.9 canbox_set_time_stamp_by_ref

Sets the time stamp to the given value. The time stamp has a resolution of 0.1 micro seconds.

4.4.9.1 Parameter

CANBOX_HANDLE	hDevice:	Received handle of the device after calling canbox_open_device.
CANBOX_TIME_STAMP*	psTime:	Pointer to structure with new time stamp value.

4.4.10 canbox_close_device

Stops the communication with the device.

4.4.10.1 Parameter

CANBOX_HANDLE	hDevice:	Received handle of the device after calling canbox_open_device.

4.5 Interface Functions

4.5.1 canbox_get_interface_info

Supplies the state of the CAN interface with parameter info. If the CAN*box*® has firmware older then 3.X only the sState field is filled and usValid field is set to 0.

4.5.1.1 Parameter

CANBOX_HANDLE	hDevice:	Received handle of the device after calling canbox_open_device.
USHORT	usIndex:	Zero based Index of CAN interface
CANBOX_INTERFACE_INFO*	psInfo:	Pointer to structure for state and parameter information.

4.5.2 canbox_open_interface

Opens a CAN interface and configures it with the given parameters. The bit rate is given and the bit timing parameters are calculated from the bit rate value.

4.5.2.1 Parameter

CANBOX_HANDLE	hDevice:	Received handle of the device after calling canbox_open_device.
CANBOX_INTERFACE	sInterface:	Structure for interface configuration.
CANBOX_HANDLE*	phInterface:	Pointer to handle for the handle of the interface.

4.5.3 canbox_open_interface_by_ref

Opens a CAN interface and configures it with the given parameters. The bit rate is given and the bit timing parameters are calculated from the bit rate value.

4.5.3.1 Parameter

CANBOX_HANDLE	hDevice:	Received handle of the device after calling canbox_open_device.
CANBOX_INTERFACE*	psInterface:	Pointer to structure for interface configuration.
CANBOX_HANDLE*	phInterface:	Pointer to handle for the handle of the interface.

4.5.4 canbox_open_interface_ex

Opens a CAN interface and configures it with the given parameters. Bit timing parameters are given directly.

4.5.4.1 Parameter

CANBOX_HANDLE	hDevice:	Received handle of the device after calling canbox_open_device.
CANBOX_INTERFACE_EX	sInterface:	Structure for interface configuration.
CANBOX_HANDLE*	phInterface:	Pointer to handle for the handle of the interface.

4.5.5 canbox_open_interface_ex_by_ref

Opens a CAN interface and configures it with the given parameters. Bit timing parameters are given directly.

4.5.5.1 Parameter

CANBOX_HANDLE	hDevice:	Received handle of the device after calling canbox_open_device.
CANBOX_INTERFACE_EX*	psInterface:	Pointer to structure for interface configuration.
CANBOX_HANDLE*	phInterface:	Pointer to handle for the handle of the interface.

4.5.6 canbox_get_interface_state

Supplies the state of the CAN interface.

4.5.6.1 Parameter

CANBOX_HANDLE	hInterface:	Received handle of the interface after calling canbox_open_interface respectively canbox_open_interface_ex.
CANBOX_INTERFACE_STATE*	psState:	Pointer to structure for state information.

4.5.7 canbox_get_last_interface_time

Delivers the last time stamp value where a message has been received.

4.5.7.1 Parameter

CANBOX_HANDLE	hInterface:	Received handle of the interface after calling canbox_open_interface respectively canbox_open_interface_ex.
CANBOX_TIME_STAMP*	psTime:	Pointer to a structure for time stamp value.

4.5.8 canbox_clear_interface

Clears the data buffer of an interface.

4.5.8.1 Parameter

CANBOX_HANDLE	hInterface:	Received handle of the interface after calling canbox_open_interface respectively canbox_open_interface_ex.

4.5.9 canbox_start_interface

Starts a stopped CAN interface.

4.5.9.1 Parameter

CANBOX_HANDLE	hInterface:	Received handle of the interface after calling canbox_open_interface respectively canbox_open_interface_ex.

4.5.10 canbox_read_interface

Reads a data set (received message) out of the data buffer of the CAN interface.

4.5.10.1 Parameter

CANBOX_HANDLE	hInterface:	Received handle of the interface after calling canbox_open_interface respectively canbox_open_interface_ex.
CANBOX_INTERFACE_READ*	psData:	Pointer to structure for data.

4.5.11 canbox_read_interface_ex

Reads one or more data sets (received messages) out of the data buffer of the CAN interface.

4.5.11.1 Parameter

CANBOX_HANDLE	hInterface:	Received handle of the interface after calling canbox_open_interface respectively canbox_open_interface_ex.
USHORT*	pusCount:	Maximum number of data sets to be delivered.
CANBOX_INTERFACE_READ*	pasData:	Pointer to array of structures for data.

4.5.12 canbox_write_interface

Writes the given data of the given identifier to the CAN bus.

4.5.12.1 Parameter

CANBOX_HANDLE	hInterface:	Received handle of the interface after calling canbox_open_interface respectively canbox_open_interface_ex.
CANBOX_INTERFACE_WRITE*	psData:	Pointer to structure array with information about the Identifier and data to be sent.

4.5.13 canbox_write_interface_ex

Writes the given data of the given Identifiers to the CAN bus.

4.5.13.1 Parameter

CANBOX_HANDLE	hInterface:	Received handle of the interface after calling canbox_open_interface respectively canbox_open_interface_ex.
USHORT*	pusCount:	Number of data sets for sending.
CANBOX_INTERFACE_WRITE*	pasData:	Pointer to structure array with information about the Identifiers and their data to be sent.

4.5.14 canbox_stop_interface

Stops a running CAN interface. The CAN interface does not take part at the bus communication any longer.

4.5.14.1 Parameter

CANBOX_HANDLE	hInterface:	Received handle of the interface after calling canbox_open_interface respectively canbox_open_interface_ex.

4.5.15 canbox_close_interface

Closes an open CAN interface. The CAN interface does not take part at the bus communication any longer. All Identifier, acceptance filter and universal sender of the interface are also closed.

4.5.15.1 Parameter

CANBOX_HANDLE	hInterface:	Received handle of the interface after calling canbox_open_interface respectively canbox_open_interface_ex.

4.6 Identifier Functions

4.6.1 canbox_open_identifier

Opens an Identifier and configures it with the given parameters.

4.6.1.1 Parameter

CANBOX_HANDLE	hInterface:	Received handle of the interface after calling canbox_open_interface respectively can_box_open_interface_ex.
CANBOX_IDENTIFIER	sIdentifier:	Structure containing the configuration of the Identifier
CANBOX_HANDLE*	phIdentifier:	Pointer to handle for receiving the handle of the Identifier

4.6.2 canbox_open_identifier_by_ref

Opens an identifier and configures it wih the given parameters.

4.6.2.1 Parameter

CANBOX_HANDLE	hInterface:	Received handle of the interface after calling canbox_open_interface respectively can_box_open_interface_ex.
CANBOX_IDENTIFIER*	psIdentifier:	Pointer to a structure containing the configuration of the Identifier
CANBOX_HANDLE*	phIdentifier:	Pointer to handle for receiving the handle of the Identifier

4.6.3 canbox_read_identifier

Reads a data set (CAN message) of the CAN identifier.

4.6.3.1 Parameter

CANBOX_HANDLE	hIdentifier:	Received handle of the Identifier after calling canbox_open_identifier
CANBOX_IDENTIFIER_DATA*	psData:	Pointer to a structure for the data

4.6.4 canbox_write_identifier

Writes identifier data to the CAN bus.

4.6.4.1 Parameter

CANBOX_HANDLE	hIdentifier:	Received handle of the Identifier after calling canbox_open_identifier
CANBOX_IDENTIFIER_DATA*	psData:	Pointer to a structure with the data to be sent.

4.6.5 canbox_close_identifier

Closes an existing CAN identifier.

4.6.5.1 Parameter

CANBOX_HANDLE	hIdentifier:	Received handle of the Identifier after calling canbox_open_identifier

4.7 Acceptance Filter Functions

4.7.1 canbox_open_acceptance_filter

Opens an acceptance filter and configures it wih the given parameters.

4.7.1.1 Parameter

CANBOX_HANDLE	hInterface:	Received handle of the interface after calling canbox_open_interface respectively can_box_open_interface_ex.
CANBOX_ACCEPTANCE_FILTER	sFilter:	Structure containing the configuration of the filter.
CANBOX_HANDLE*	phIdentifier:	Pointer to handle for receiving the handle of the filter.

4.7.2 canbox_open_acceptance_filter_by_ref

Opens an acceptance filter and configures it wih the given parameters.

4.7.2.1 Parameter

CANBOX_HANDLE	hInterface:	Received handle of the interface after calling canbox_open_interface respectively can_box_open_interface_ex.
CANBOX_ACCEPTANCE_FILTER*	psFilter:	Pointer to a structure containing the configuration of the filter.
CANBOX_HANDLE*	phIdentifier:	Pointer to handle for receiving the handle of the filter.

4.7.3 canbox_read_ acceptance_filter

Reads data of an acceptance filter.

4.7.3.1 Parameter

CANBOX_HANDLE	hFilter:	Received handle of the filter after calling canbox_open_acceptance_filter.
CANBOX_IDENTIFIER_DATA*	psData:	Pointer to a structure for received data.

4.7.4 canbox_close_ acceptance_filter

Closes an existing acceptance filter.

4.7.4.1 Parameter

CANBOX_HANDLE	hFilter:	Received handle of the filter after calling canbox_open_acceptance_filter.

4.8 Universal Sender Functions

4.8.1 canbox_open_universal_sender

Opens an universal sender. An universal sender is an object for sending any CAN message by specifying the Id and the data set.

4.8.1.1 Parameter

CANBOX_HANDLE	hInterface:	Received handle of the interface after calling canbox_open_interface respectively can_box_open_interface_ex.
CANBOX_HANDLE*	phSender:	Pointer to handle for receiving the handle of the universal sender

4.8.2 canbox_write_universal_sender

Sends one message by using an universal sender.

4.8.2.1 Parameter

CANBOX_HANDLE	hSender:	Received handle of the universal sender after calling canbox_open_ universal_sender.
CANBOX_UNIVERSAL_SENDER_ DATA*	psData:	Pointer to the data for sending.

4.8.3 canbox_write_universal_sender_ex

Sends one or more messages by using a universal sender. If not all messages can be sent directly, those not sent are saved in a software buffer and are sent when the CAN bus is free.

4.8.3.1 Parameter

CANBOX_HANDLE	hSender:	Received handle of the universal sender after calling canbox_open_ universal_sender.
USHORT*	pusCount:	Number of data sets to be sent.
CANBOX_UNIVERSAL_SENDER_ DATA*	psData:	Pointer to the data for sending.

4.8.4 canbox_close_ universal_sender

Closes an existing universal sender.

4.8.4.1 Parameter

CANBOX_HANDLE	hSender:	Received handle of the universal sender after calling canbox_open_ universal_sender.

4.9 Router Functions

4.9.1 canbox_read_router_config

Gives the current configuration of the interfaces router.

4.9.1.1 Parameter

CANBOX_HANDLE	hInterface:	Received handle of the interface after calling canbox_open_interface respectively can_box_open_interface_ex.
CANBOX_ROUTER*	psRouter:	Pointer to structure for receiving the router parameters.

4.9.2 canbox_read_router_config_ex

Gives the current configuration of the interfaces router.

4.9.2.1 Parameter

CANBOX_HANDLE	hInterface:	Received handle of the interface after calling canbox_open_interface respectively can_box_open_interface_ex.
CANBOX_ROUTER_EX*	psRouter:	Pointer to structure for receiving the router parameters.

4.9.3 canbox_write_router_config

Configures the router with the given values.

4.9.3.1 Parameter

CANBOX_HANDLE	hInterface:	Received handle of the interface after calling canbox_open_interface respectively can_box_open_interface_ex.
CANBOX_ROUTER	sRouter:	Structure for configuring the router.

4.9.4 canbox_write_router_config_ex

Configures the router with the given values.

4.9.4.1 Parameter

CANBOX_HANDLE	hInterface:	Received handle of the interface after calling canbox_open_interface respectively can_box_open_interface_ex.
CANBOX_ROUTER_EX	sRouter:	Structure for configuring the router.

4.10 Supporting Functions for Visual Basic

As Visual Basic does not allow the correct alignment of some CANbox structures, the structures CANBOX_16 and CANBOX_32 have been created. These replace 16 bit respectively 32 bit values in several structures in order to ensure correct alignment. The following functions can be used for conversion from respectively into the structures.

4.10.1 canbox_convert_to_CANbox16

Conversion of a 16 bit value into a CANBOX_16 structure.

4.10.1.1 Parameter

USHORT	usValue:	16 bit value for conversion

4.10.2 canbox_convert_to_CANbox16_by_ref

Conversion of a 16 bit value into a CANBOX_16 structure.

4.10.2.1 Parameter

USHORT	usValue:	16 bit value for conversion
CANBOX_16*	psValue:	Pointer to a CANBOX_16 structure

4.10.3 canbox_convert_from_CANbox16

Conversion of a CANBOX_16 structure to a 16 bit value.

4.10.3.1 Parameter

CANBOX_16*	psValue:	Pointer to a CANBOX_16 structure for conversion

4.10.4 canbox_convert_to_CANbox32

Conversion of a 32 bit value into a CANBOX_32 structure.

4.10.4.1 Parameter

ULONG	ulValue:	32 bit value for conversion

4.10.5 canbox_convert_to_CANbox32_by_ref

Conversion of a 32 bit value into a CANBOX_32 structure.

4.10.5.1 Parameter

ULONG	ulValue:	32 bit value for conversion
CANBOX_32*	psValue:	Pointer to a CANBOX_32 structure

4.10.6 canbox_convert_from_CANbox32

Conversion of a CANBOX_32 structure to a 32 bit value.

4.10.6.1 Parameter

CANBOX_32*	psValue:	Pointer to a CANBOX_32 structure for conversion

5 Socket Interface

The communication with the CAN*box*® can take place by directly using the socket interface instead of using the library. For this the CAN*box*® offers the port 1024 as server port for the LAN as well as the WLAN interface.

Furthermore, the port 1040 can be used as server port for resetting the connection on port 1024. This can be done by building up a connection to port 1040, if the IP addresses of both client ports are identical.

5.1. Structures and Definitions

After building up a connection to the CAN*box*, the communication takes place by using the structures CANBOX_SOCKET_IN and CANBOX_SOCKET_OUT.

5.1.1 CANBOX_SOCKET_IN

Structure for sending data to the CAN*box*.

5.1.1.1 Parameter

USHORT	usMacro:	0xEE44.
USHORT	usSizeIn:	Number of given bytes + 8.
USHORT	usSizeOut:	Maximum number of expected bytes in answer.
USHORT	usTask:	0x0090.
USHORT	usFunc:	Index of function to be called (see below).
UCHAR	usData[1440]	Data.

5.1.2 CANBOX_SOCKET_OUT

Structure for reception of data from the CAN*box*.

5.1.2.1 Parameter

USHORT	usMacro:	0x0144, if no error occurred.
USHORT	usSizeOut/ usError:	Number of delivered bytes + 6 respectively error code in case of error.
USHORT	usUnused:	Reserved parameter.
UCHAR	usData[1440]	Data.

5.2 Functions

5.2.1 canbox_init (Index 4)

Init of the CAN*box*. This function has to be called once before calling any other function. Otherwise all functions return the error CB_NO_INIT.

5.2.1.1 Parameter

To	None
From	None

5.2.2 canbox_reset (Index 5)

Closes all Identifiers, acceptance filters and interfaces. Sets the time stamp to zero. Clears the software buffer.

5.2.2.1 Parameter

To	CANBOX_RESET_EX
From	None

5.2.3 canbox_info (Index 6)

Delivers information about the device.

5.2.3.1 Parameter

To	None	
From	CANBOX_DEVICE_INFO	Info structure for taking device information.

5.2.4 canbox_set_time_stamp (Index 7)

Sets the time stamp. The time stamp has a resolution of 0.1 micro seconds.

5.2.4.1 Parameter

To	CANBOX_TIME_STAMP	New value for the time stamp.
From	None	

5.2.5 canbox_exit (Index 12)

Release of used resources. This function is to be called in the end.

5.2.5.1 Parameter

To	None
From	None

5.2.6 canbox_open_interface (Index 15)

Opens a CAN interface and configures it with the given parameters. The bit rate is given and the bit timing parameters are calculated from the given bit rate.

5.2.6.1 Parameter

To	CANBOX_INTERFACE	Configuration for the interface.
From	None	

5.2.7 canbox_open_interface_ex (Index 16)

Opens a CAN interface and configures it with the given parameters. Bit timing parameters are given directly.

5.2.7.1 Parameter

To	CANBOX_INTERFACE_EX	Configuration for the interface.
From	None	

5.2.8 canbox_get_interface_state (Index 17)

Supplies the state of the CAN interface.

5.2.8.1 Parameter

To	USHORT	Zero based index of the interface.
From	CANBOX_INTERFACE_STATE	Structure for retrieving the interface state.

Alternativ with firmware 3.X or newer.

5.2.8.2 Parameter

To	USHORT	Zero based index of the interface.
From	CANBOX_INTERFACE_INFO	Structure for retrieving the interface state.

5.2.9 canbox_start_interface (Index 18)

Starts a stopped CAN interface.

5.2.9.1 Parameter

To	USHORT	Zero based index of the interface.
From	None	

5.2.10 canbox_clear_interface (Index 19)

Clears the data buffer of the interface.

5.2.10.1 Parameter

To	USHORT	Zero based index of the interface.
From	None	

5.2.11 canbox_read_interface (Index 20)

Reads the oldest data out of the data buffer of the interface.

5.2.11.1 Parameter

To	USHORT	Zero based index of the interface.
From	CANBOX_IDENTIFIER_DATA	Array of Identifier data for taking the received data.

5.2.12 canbox_write_interface (Index 21)

Sets the given data onto the CAN bus. Parameter ulId has to be set with the handle of the respective Identifier instead of the Id.

5.2.12.1 Parameter

To	CANBOX_IDENTIFIER_DATA	Array of identifier data to be sent.
From	None	

5.2.13 canbox_stop_interface (Index 22)

Stops a running CAN interface.

5.2.13.1 Parameter

To	USHORT	Zero based index of the interface.
From	None	

5.2.14 canbox_close_interface (Index 23)

Closes an open CAN interface.

5.2.14.1 Parameter

To	USHORT	Zero based index of the interface.
From	None	

5.2.15 canbox_open_identifier (Index 25)

Opens an identifier and configures it with the given configuration.

5.2.15.1 Parameter

To	CANBOX_IDENTIFIER	Configuration of Identifier.
From	CANBOX_HANDLE	Handle of the Identifier for accessing.

5.2.16 canbox_read_identifier_buffer (Index 26)

Reads the last received data of an Identifier. The time stamp value is the actual time stamp value. This function should not be used if large amounts of data are to be exchanged between the CAN*box* and another connection participant, because the efficiency is reduced by the small packet size. Instead, the function canbox_read_interface with maximum amount of data should be used in this case.

5.2.16.1 Parameter

To	CANBOX_HANDLE	Handle of the Identifier.
From	CANBOX_IDENTIFIER_DATA	Structure for received Identifier data.

5.2.17 canbox_read_identifier_actual (Index 27)

Reads the last received data of an Identifier. The time stamp value is the actual time stamp value. This function should not be used if large amounts of data are to be exchanged between the CAN*box* and another connection participant, because the efficiency is reduced by the small packet size. Instead, the function canbox_read_interface with maximum amount of data should be used in this case.

5.2.17.1 Parameter

To	CANBOX_HANDLE	Handle of the identifier.
From	CANBOX_IDENTIFIER_DATA	Structure for received identifier data.

5.2.18 canbox_write_identifier (Index 28)

Writes data of an Identifier to the CAN bus.

5.2.18.1 Parameter

To	CANBOX_IDENTIFIER_DATA	Structure with identifier data to send.
From	None	

5.2.19 canbox_close_identifier (Index 29)

Closes an open CAN Identifier.

5.2.19.1 Parameter

To	CANBOX_HANDLE	Handle of the identifier.
From	None	

5.2.20 canbox_open_filter (Index 30)

Opens an acceptance filter and configures it with the given parameters.

5.2.20.1 Parameter

To	CANBOX_ACCEPTANCE_FILTER	Configuration for acceptance filter.
From	CANBOX_HANDLE	Handle of acceptance filter for accessing.

5.2.21 canbox_read_filter_buffer (Index 31)

Reads the oldest data of an acceptance filter from the data buffer of the corresponding interface. This function should not be used if large amounts of data are to be exchanged between the CAN*box* and another connection participant, because it scans the whole interface data buffer for the oldest data of the filter. Instead, the function canbox_read_interface with maximum amount of data should be used in this case.

5.2.21.1 Parameter

To	CANBOX_HANDLE	Handle of the acceptance filter.
From	CANBOX_IDENTIFIER_DATA	Structure for received acceptance filter data.

5.2.22 canbox_read_filter_actual (Index 27)

Reads the last received data of an acceptance filter, the time stamp value is the actual time stamp value. This function should not be used if large amounts of data are to be exchanged between the CAN*box* and another connection participant, because the efficiency is reduced by the small packet size. Instead, the function canbox_read_interface with maximum amount of data should be used in this case.

5.2.22.1 Parameter

To	CANBOX_HANDLE	Handle of the acceptance filter
From	CANBOX_IDENTIFIER_DATA	Structure for received acceptance filter data

5.2.23 canbox_close_filter (Index 32)

Closes an open CAN acceptance filter.

5.2.23.1 Parameter

To	CANBOX_HANDLE	Handle of the acceptance filter
From	None	

5.2.24 canbox_open_sender (Index 13)

Opens a universal sender.

5.2.24.1 Parameter

To	USHORT	Zero based index of the interface.
From	CANBOX_HANDLE	Handle of the universal sender for accessing

5.2.25 canbox_write_sender (Index 24)

Writes the data onto the CAN bus. The parameter ulId has to be set with the handle of the respective sender instead of the Id.

5.2.25.1 Parameter

To	CANBOX_UNIVERSAL_SENDER_DATA	Array of Identifier data to be sent. In parameter hSender the respective handle of the universal sender has to be set.
From	None	

5.2.26 canbox_close_sender (Index 14)

Closes an open universal sender.

5.2.26.1 Parameter

To	CANBOX_HANDLE	Handle of universal sender
From	None	

5.2.27 canbox_read_router_config (Index 34)

Supplies the CAN router configuration.

5.2.27.1 Parameter

To	USHORT	Zero based index of the interface
From	CANBOX_ROUTER	Structure for delivering the router configuration

5.2.28 canbox_write_router_config (Index 35)

Configures the router using the given values.

5.2.28.1 Parameter

To	CANBOX_ROUTER	Router configuration
From	None	

5.2.29 canbox_read_lan_config (Index 36)

Supplies the actual EEPROM settings for the LAN connection.

5.2.29.1 Parameter

To	None	
From	CANBOX_LAN_CONFIG	Structure for delivering the LAN settings

5.2.30 canbox_write_lan_config (Index 37)

Sets the actual EEPROM settings for the LAN connection. The settings take effect after a restart of the CAN*box*.

5.2.30.1 Parameter

To	CANBOX_LAN_CONFIG	LAN configuration
From	None	

5.2.31 canbox_read_wlan_config (Index 38)

Supplies the actual EEPROM settings for the WLAN connection.

5.2.31.1 Parameter

To	None	
From	CANBOX_WLAN_CONFIG	Structure for delivering the WLAN settings

5.2.32 canbox_write_wlan_config (Index 39)

Sets the actual EEPROM settings for the WLAN connection. The settings take effect after a restart of the CAN*box*.

5.2.32.1 Parameter

To	CANBOX_WLAN_CONFIG	WLAN configuration
From	None	

6 Technical Data

Parameter		**min.**	**typ.**	**max.**	**Unit**	**Remark**
Power supply		6	12	60	V	
Power consumption (depending on the used MAX modules)		1	5	12	W	min.: without modules max.: limited by DC/DC
Galvanic isolation			--		V	Only by suitable I/O module
Temperature		0	20	70	°C	
Dimensions	Width		83		mm	Complete device
	Height		33		mm	
	Depth		113		mm	
Protection type			IP54			