Telemotive AG

blue PiraT 1

User Manual

Version: 4.2.4

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1 Introduction

This user manual is only valid for the first generation of the blue PiraT data logger. All the time, if in this manual the name blue PiraT is mentioned, it is related to the first generation of the blue PiraT data logger.

1.1 The blue PiraT System

The blue PiraT is a data logger for the following interfaces:

- MOST25, MOST50 (incl. ECL) and MOST150
- High Speed CAN, Low Speed CAN and Single Wire CAN (SWC)
- RS232, RS422 and LIN
- FlexRay
- Ethernet

The data logger can be mounted in the vehicle and due to his large storage capacity of the hard drive of currently 80 GB or higher, it is able to support extensive test runs. After the data has been gathered, it is transferred to a Laptop via Ethernet, providing conversion to various trace file formats. Different types of the blue PiraT are available (s. Chapter).

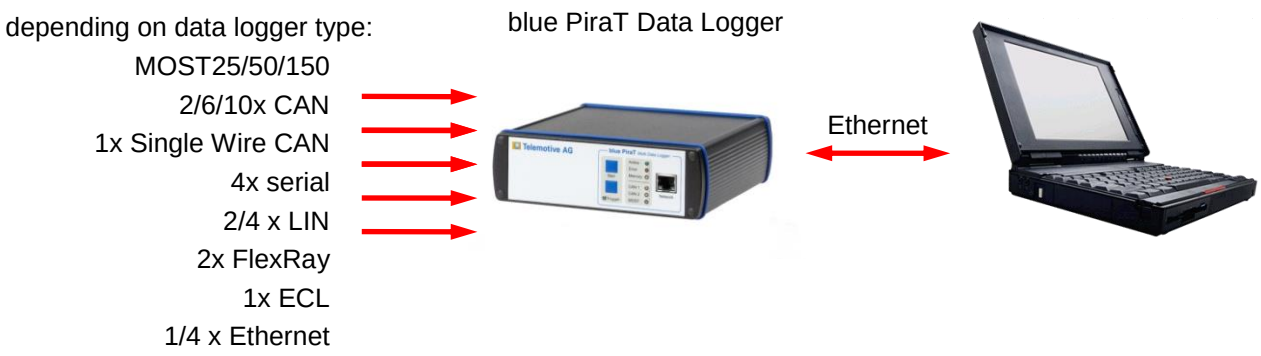

Figure 1: The blue PiraT system

The blue PiraT is designed to create minimum interference with the vehicle's bus systems and interfaces. The data logger listens to the data traffic without operating as a bus node. Additionally to the data recording functionality, the blue PiraT provides online data processing functions:

- Simple CAN- and MOST filters
- A custom-defined CAN message can trigger the setting of markers

1.2 Support

Software updates and further information is available from the blue PiraT Service Center at http://www.telemotive.de. Logins are supplied by the blue PiraT support (bluepirat@telemotive.de). Please see Appendix A for more information about the blue PiraT support.

1.3 Accessories

There are various accessories available for the blue PiraT system:

- Various adapter cables
- The blue PiraT Remote Control Voice, which is used for remote operation and display
- The blue PiraT Remote Control Voice, which allows for recording of voice notes additionally to the functionality of the Remote Control
- The blue PiraT Client Library, which is a C++ library that allows accessing the data logger in own applications

- The blue PiraT Terminal, a download station that supports simultaneous download of multiple data loggers (data logger license required)

Please contact Telemotive sales for more information about these accessories. Manuals are available from the blue PiraT Service Center.

1.4 Licensed Features

Additional features can be activated by purchasing and installing licenses (see 5.5.20). Currently, the following licensed features are available:

- Video recording via network cameras
- Ethernet Logging: Recording of Ethernet data supporting different protocols:
  - GN-Log
  - RAW (TCP)
  - UTF8(TCP)
  - UDP Server
- Remote Control Monitor: Display of CAN-signals in the remote control
- License for using the blue PiraT Client Library with the data logger
- Complex Triggers: certain events (e.g., conditions on CAN-signals) can be programmed to be a trigger for certain actions (e.g., display of a message on the remote control)
- Online Compression: Compression of the trace data during recording. This feature is useful to extend the recording time and to speed up data download
- Terminal: Functionality to use the data logger with the blue PiraT Terminal
- MOST synchronously channel, allows the recording of the synchronous data of the MOST bus.
- Autosar DLT – This supports logging of DLT messages over ethernet or seriell (restricted) connections.

For these licensed features, separate manuals are available (e.g., from the blue PiraT Service Center).

1.5 Software Versions

This manual refers to the following software versions:

- Data logger firmware 7.4.1
- Client 4.4.1

Software updates are frequently available in the blue PiraT Service Center (see also Appendix A).

2 The Data Logger

Figure 2 shows a picture of the data logger. The front panel contains all operating controls and displays. On the back side, there are connectors for the interfaces and the power supply.

Figure 2: The blue PiraT data logger

2.1 Installation

Based on the specification of the hard drive, the data logger should always be fitted vertically or horizontally (upright or upside down). Please avoid tight bending of the MOST fiber optic cables.

2.2 Connectors

2.2.1 Front Side

The blue PiraT is available with one Ethernet port (see Figure 3) as also with 4 Ethernet ports (see Figure 4), where a Ethernet switch is integrated.

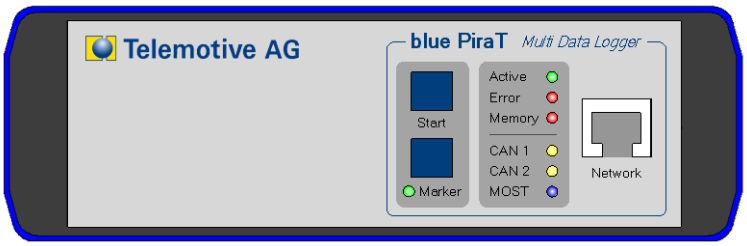

Figure 3: Front panel of the data logger

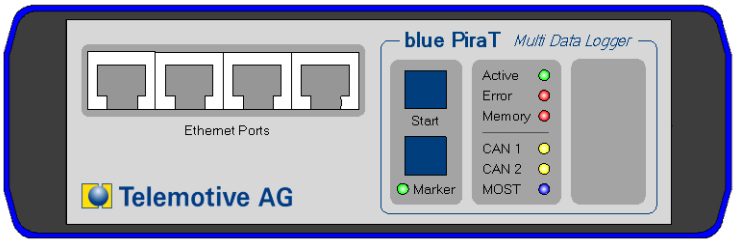

Figure 4: Front panel of the blue PiraT E

On the front panel there is also a ‘Start’ and ‘Marker’ button as well as LEDs for ‘Active’, ‘Error’, ‘Memory’, ‘CAN1’, ‘CAN 2’. ‘MOST’ and ‘Trigger/Marker’.

Within HW1.5 “Marker” button was renamed to “Trigger” button. Both expressions will be used in the following document synonymously.

2.2.2 Back Side

Figure 5 shows the back side of the data logger.

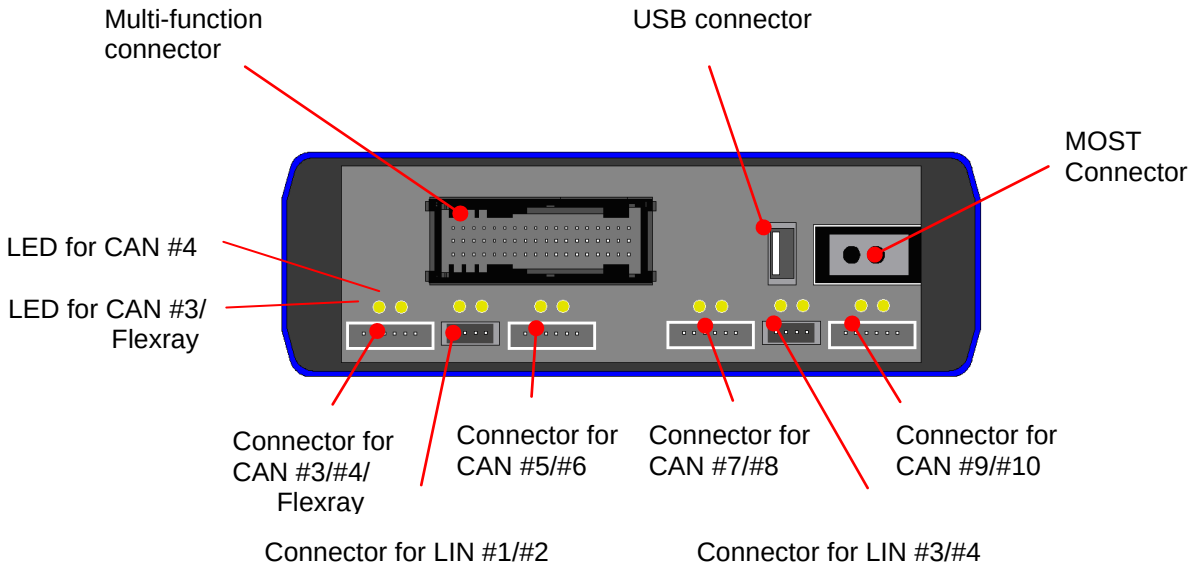

Figure 5: Back side of the data logger

On the various data logger types are the following connectors possible:

- Multi-function connector. This connector contains the remaining lines for power supply, CAN 1/2, RS232/422, the external marker button and ECL. The pin assignments of this connector are described in the appendix.

  Warning: It is possible that devices connected to the data logger might be damaged in case of an incorrect polarity of the data logger power supply.

- USB: This connector is not included in newer models.
- MOST: A standard 2+0 connector for MOST fiber optic cables or a electrical connector for MOST50.

  Important: If the MOST connector is not used, the jack must be covered with a terminating plug. This prevents the sensitive fiber optic contacts from getting dirty. It also makes sure that the data logger does not start up unintentionally when e.g. strong sunlight falls onto the optical contacts.

- CAN: Up to 4 connectors with 2 CAN interfaces for each connector.
- LIN: Up to 2 connectors with 2 LIN interfaces for each connector.
- FlexRay: One connector for an A and B interface is possible. If a FlaxRay connector is available, connectors for CAN #3/#4, LIN #1/#2 and CAN #5/#6 are not possible.

On top of the connectors are the related activity LEDs. Depending of the data rate a blinking, flickering or continuous light of the LEDs is visible.

2.2.3 Adapter Cables

2.2.3.1 Universal Adapter Cable

Telemotive AG offers adapter cables that connect to the multi-function connector and split up its lines to separate connectors (see the universal adapter cable in Figure 6).

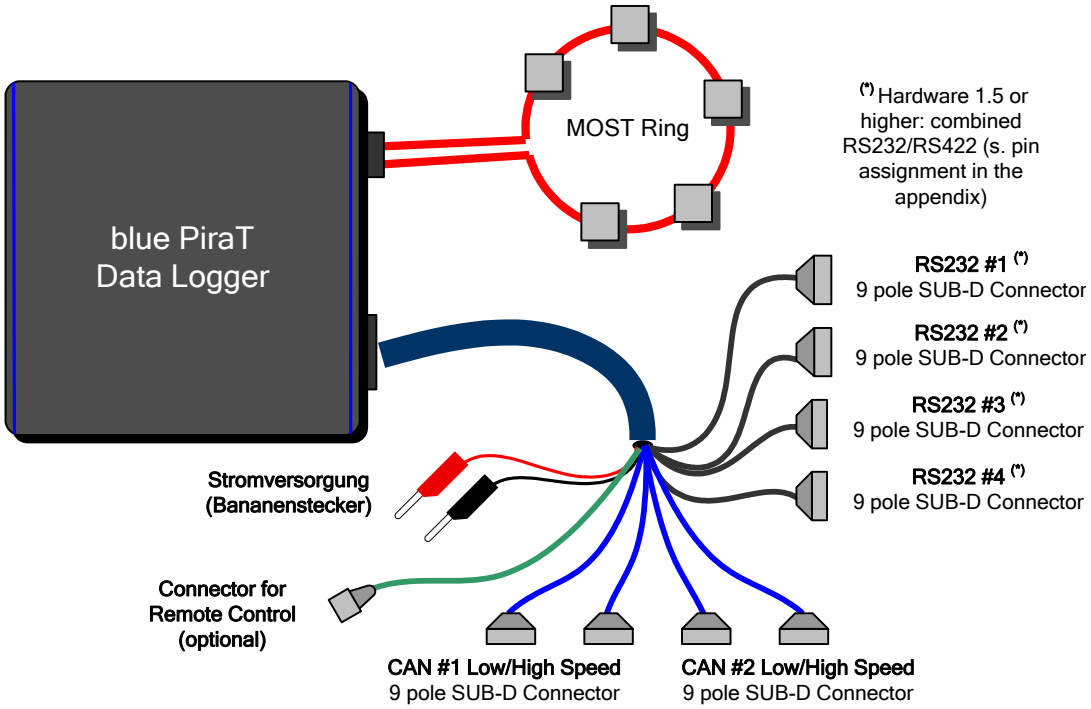

Figure 6: Connecting the blue PiraT via the universal adapter cable

Note: The blue PiraT actively sends data on the “Tx” line if a protocol for the serial port is configured. The “Tx” line must only be connected to special devices that support those protocols. If the application is listening to a bidirectional serial communication of two devices, two serial ports of the blue PiraT have to be used. The “Tx” lines must not be connected in this case (see Figure 7).

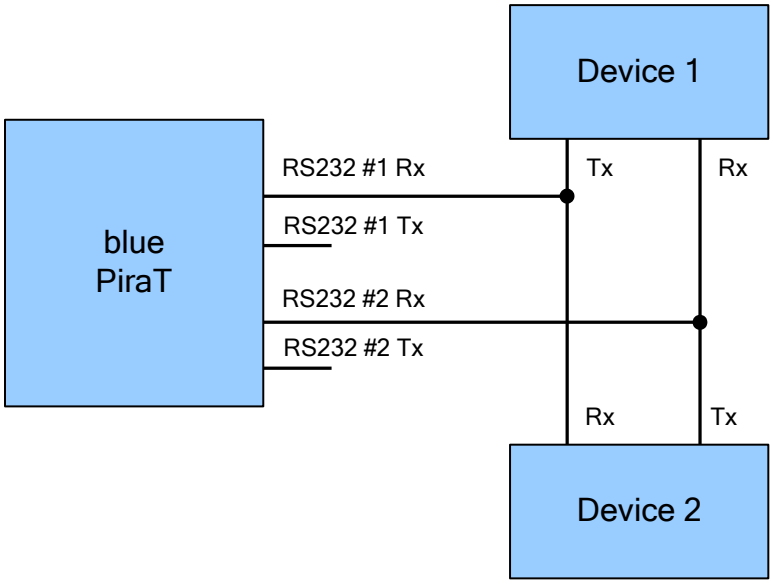

Figure 7. Listening to a bidirectional serial communication

2.2.3.2 Adapter Cables for CAN and LIN Extensions

For the CAN extensions a adapter cable “2-CAN Extension” and for the LIN extension a adapter cable “2-LIN Extension” is available.

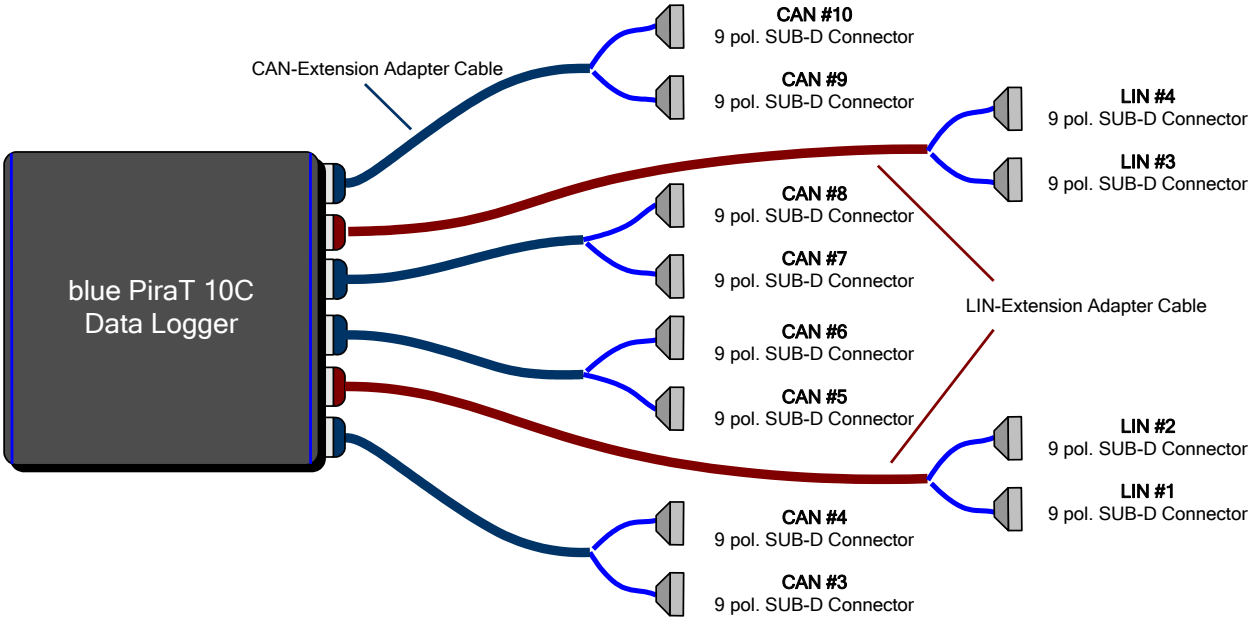

Figure 8: Additional adapter cables for CAN and LIN extensions

2.2.3.3 Adapter Cable FlexRay Extension

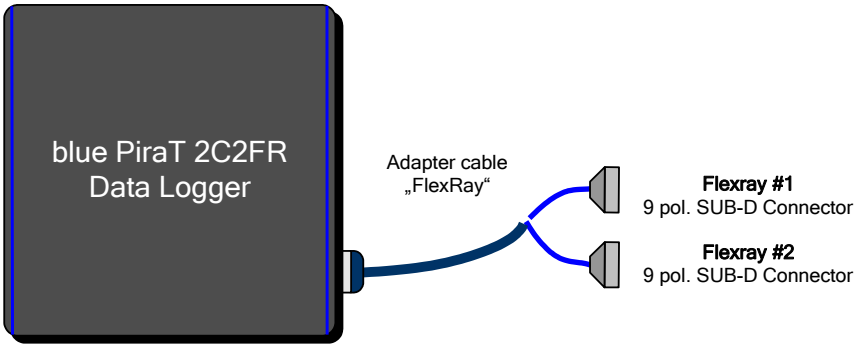

Figure 9: Additional adapter cables of the FlexRay version

2.3 Appliance

2.3.1 Start of the Data Logger

"Light on" on the optical MOST rings, ECL activity on the electrical MOST ring, activity on CAN/SWC, LIN or FlexRay (blue PiraT 2C2FR only) cause an automatic startup of the data logger (Note: activity on the serial port(s), Ethernet ports or MOST50 ring does not cause an automatic startup). After a short time (< 20ms), the data logger is ready to record data, indicated by the lighted green "Active" LED in the front panel.

For the LIN interfaces can be individual (for each channel separately) enabled the wake up capability in the setup of the client. If the LIN interface is disabled, no wake up of the data logger will be happen, even if there would be an activity on the responding LIN bus. The blue PiraT will be continue in the standby state.

During startup, the red „Error"-LED is on for about 10 seconds. This happens for internal checkup and does not mean any error condition, as long as the LED goes off after this time.

The system can also be started manually by the "Start" button. This is useful if the device just needs to be started for data download (e.g., in the office), when no busses are connected.

Note: After starting the data logger it can take up to 30s until the network connection for data transfer is available.

2.3.2 Front panel LEDs

The front panel contains the following LEDs, indicating the current state of the data logger:

- The „*Error*"-LED lights for 15 seconds at startup and in case of an error. In the latter case, an error report can be created by using the "Error Reporter" tool (see chapter 5.7). The error report should be sent to Telemotive support.
- The "*Error*"-LED flashes red if an incorrect license has been installed on the logger (see 5.5.20 for more information).
- The „*Memory*"-LED shows the status of the data storage:
    - LED lights red: There is no hard drive space left. If the circular buffer mode is not active, data recording has been stopped.
    - Firmware 6.5.2 and higher: The Memory LED lights or flashes red, if no hard drive space is left. The LED lights red, if the logger still records data in the ring buffer mode (the oldest data is overwritten). It flashes red, if the logger has stopped recording, because the ring buffer mode is not active, or the ring buffer mode is active, but all data on the logger has been protected from being overwritten.
- Firmware 6.5.2: If red memory LED and green marker LED alternating flashes data logger is in the update modus.
- The „*CAN 1*" and „*CAN 2*"-LEDs flash when data arrives on the respective CAN bus. Depending on the data rate, the LEDs blink, flicker, or light permanently. At shutdown, the two LEDs flash alternately for a few seconds.
- The „*MOST*"-LED lights to indicate "light on" of the MOST bus. If MOST messages are received by the data logger, the LED flashes or flickers (depending on the data rate).
- Depending on the data logger type, there are additional LEDs on the back side of the device for CAN/SWC, LIN and FlexRay.

2.3.3 Setting Markers

Within HW1.5 "Marker" button was renamed to "Trigger" button. Both expressions will be used in the following document synonymously.

Interesting points in time can be designated by the „Marker" button. When pressing this button, the data logger saves the current time to hard drive. It is possible to configure the data logger to send a CAN message as an acknowledgement of setting a marker. Besides using the marker button of the front panel, the multi-function connector provides an interface for an external marker button.

Additionally, it is possible to define a CAN message that triggers a marker (see chapter 5.5.16). In all cases, marker triggers are debounced, allowing only one marker every two seconds.

When downloading the data, the Client displays all markers in a data overview (see Figure 23). In this data overview, the Client can be configured to transfer the data close to selected markers.

2.3.4 Time Stamp

Usually the recorded Messages will get a time stamp at the end of the received Message. Only for the serial interface (RS232/422) the time of the start of the transfer will be used.

Trace Data	Accuracy	Start	End
MOST25	100 µs		x
MOST50	100 µs		x
MOST150	100 µs		x
ECL	100 µs		x
CAN/SWC	100 µs		x
LIN	100 µs		x
FlexRay	100 µs		x
Ethernet	100 ms		x
RS232/422	1 ms	x	

Table 1: Time Stamp

2.3.5 Standby Mode

If MOST light is off and if there is no bus activity on the ECL,CAN,/SWC LIN, Ethernet, FlexRay busses and the serial channels, the data logger switches to standby mode after an adjustable delay (see 5.5.6). This process is also called “shutdown” or “sleep”. While going into standby mode, the two CAN-LEDs flash alternately. Once the logger has entered the standby mode, the green LED goes off. In this state, the blue PiraT’s power consumption drops below 1mA. One can force shutdown mode by pressing the “Start” button for about 3 seconds. Note that if the busses/interfaces are still active, the data logger wills startup immediately after reaching the standby mode.

If a network cable is connected to a PC and the network connection is active (link light on), the shutdown time is increased to 60min, to allow sufficient time for downloading the data. The value 60min is adjustable via the configuration program. If a device other than the PC/Laptop is permanently connected via Ethernet (e.g., a network camera), the value is usually decreased to ensure a timely switch to standby mode.

If a PC/Laptop is connected with the data logger and the blue PiraT Client runs, the automatic standby mode is generally disabled.

2.3.6 Power Backup

The data logger contains a power backup that ensures that data recording continues if the supply voltage fails. If the internal capacitors are fully charged, they can backup the data logger for 1.5s. If the capacitors are empty, it takes a few minutes for them to completely charge up again. If the voltage fails for a longer time than 1,5s, the data logger automatically shuts down, indicated by the two CAN-LEDs flashing alternately.

2.3.7 Automatic Daylight Savings Adjustment

If it is required that the data logger automatically adjusts for daylight savings, it is necessary to enable this option and to set the correct time zone in the data logger configuration (see 5.5.5). Please note the following issues:

- If the automatic adjustment for daylight savings is deactivated, the configured time zone is generally not critically important. It is still recommended to rather adapt the time zone than to readjust the data logger's time when moving between time zones because the data logger internally uses the location-independent universal time (UTC). Only changing the time zone avoids trace data with overlapping time stamps
- When converting trace data to the target file formats, the time zone that was configured at the time of data download is used. If a data set "A" is recorded in a time zone "A" and the data logger's time zone is changed to "B" before data download, then the final time stamps will reflect the time of time zone "B".
- To avoid problems when moving within time zones, make sure to delete all data on the data logger after changing the time zone or after changing the data logger's clock by one or more hours.

2.4 Cascading Loggers

To increase the number of channels, it is possible to use two loggers. To be able to compare the time stamps of both loggers, it is necessary to „cascade“ the loggers, which synchronizes their clocks with a time stamp accuracy of 100µs. For cascading, special adapter cables are required (see Figure 10).

Important: For cascading, both data loggers need to be connected to the same power supply!

It is only possible to cascade blue PiraTs with a main board HW1.2 to main board HW1.2 and main boards with HW1.5 or higher to main boards HW 1.5 or higher.

Generally it is only supported to cascade blue PiraTs with the same firmware release.

Important: Up to Firmware Release 7.x.x it is only supported to cascade blue PiraTs with HW 2.x or higher. Data logger with HW 1.x can be still cascade to each other. The latest firmware release for HW1.x is 6.5.2.

One of the loggers is designated as the „time master“, the other as the „time slave“ by using the configuration program (see chapter 5.5.7).

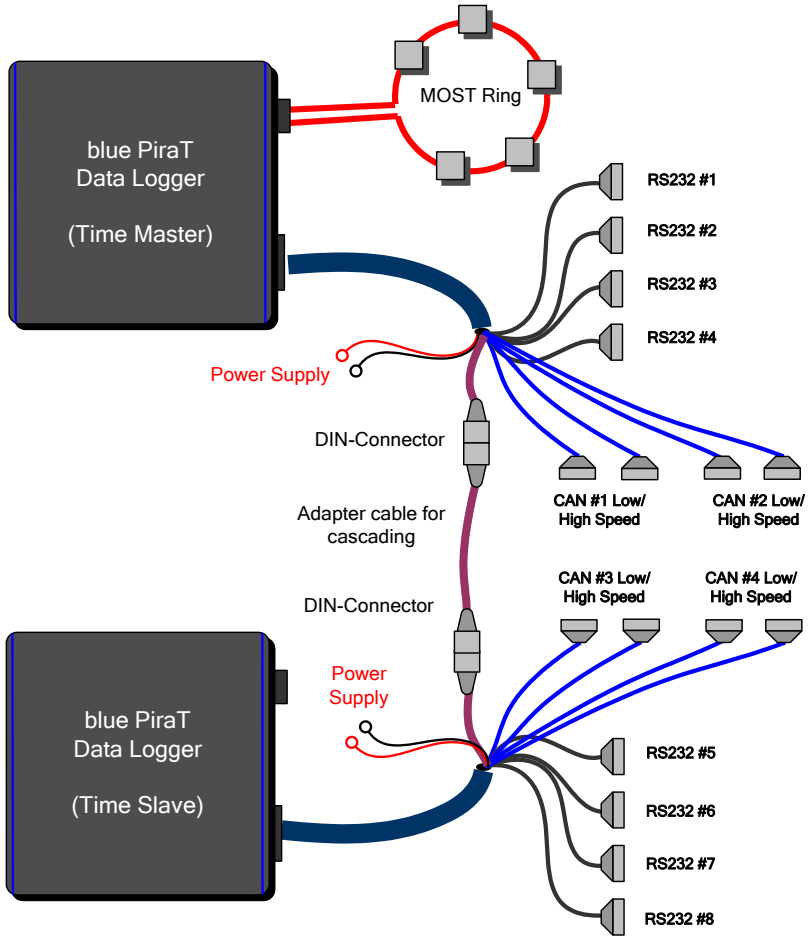

Figure 10: Cascading of two data loggers

Important: It is also possible to cascade two loggers and use one the blue PiraT Remote Control at the same time. Therefore you have to use a special Y-Cascading cable instead of the standard adapter cable. When remote control and two data loggers are connected with the Y-Cascacding cable, the remote control will control the Master Logger. By pressing button "i" you switch between MASTER /and SLAVE Logger. You can buy the cable as an accessory.

Important: If the cascading mode has just been activated through the configuration program, the synchronization is activated only at the next startup.

The time master provides the time basis, and the time slave takes over the time of the master. This includes two tasks:

- Synchronizing the slave clock to the master clock
- Determination of the absolute time offset between master and slave, and correction of the time stamps by this offset

Important: For correctly synchronized time stamps, both data loggers must be set to the same time zone (see chapter 5.5.5).

The trace data has to be downloaded separately from both data loggers. It is possible to specify an offset for the channel numbers of the slave (see chapter 5.5.7).

Important: Using firmware >= 7.x.x you can only cascade logger with hardware version greater than 2.x. The last firmware for cascading data logger with hardware version lower 2.x/3.x – all 1.x is firmware 6.5.2.

Generally cascading is only supported for blue PiraTs with the same Firmware version

Warning – The logger names of the master and the slave must be different. Otherwise trace files of master and slave might equal and files could be overwritten.

2.4.1 Startup Use Cases

Depending on the bus activity, it is possible that the master starts up before the slave (s. Figure 11) or vice versa (s. Figure 12). In the latter case, the slave first uses its own clock and switches to the master clock, as soon as the master becomes active. Since the time offset is corrected at the time of downloading and converting the trace data, it is ensured that the time stamps before the sync point are also corrected.

Starting from hardware 1.5, the master wakes up the slave and vice versa.

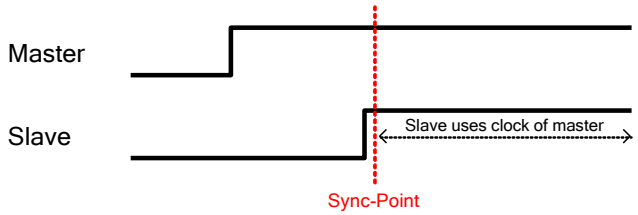

Figure 11. Master starts up before the slave

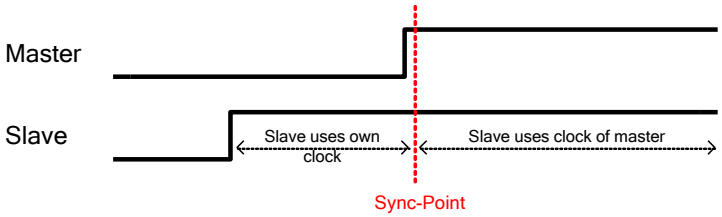

Figure 12. Slave starts up before the master

2.4.2 Standby Mode in a Cascading Setup

Master and slave synchronize such that they switch to the standby mode at the same time. If the master is ready to go into standby mode before the master is or vice versa, the device that is ready earlier waits for the devices that take longer (s. Figure 13).

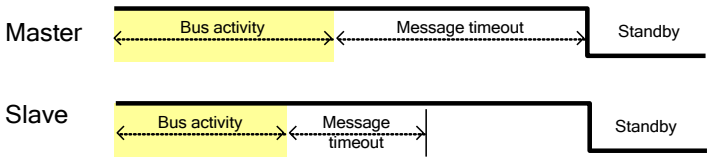

Figure 13. Standby sequence of the cascaded system

Warning – Activating the standby mode in a cascading setup does not work when using the main board HW1.2 for the master data logger together with the main board HW1.5 for the slave data logger. This combination cannot be used for cascading data loggers.

Warning – If slave logger is configured as "standbye mode off", slave logger and also master logger woun't go into standbye modus.

3 Data Recording

The blue PiraT supports a various number of busses. The table below shows, which busses will be supported from the different products.

Feature / Product	MOST25 (25M)	MOST50 (50M)	MOST150 (150M)	ECL	RS232/422	CAN (C)	SWC (SW)	LIN (L)	FlecRay (2FR))	Ethernet (E)
blue PiraT	1				4	2				1
blue PiraT 6C	1				4	6				1
blue PiraT 10C	1				4	10				1
blue PiraT 6C2L	1				4	6		2		1
blue PiraT 10C4L	1				4	10		4		1
blue PiraT 2C2FR	1				4	2			a+b	1
blue PiraT 6C2L2FR	1				4	6		2	a+b	1
blue PiraT E	1				4	2				4
blue PiraT 150M6C2LE			1		4	6		2		4
blue PiraT 50M5C1SW2L		1		1	4	5	1	2		1

Table 2: blue PiraT data logger versions

The notation in brackets is used in the product name. For example blue PiraT 150M6C2LE: 1x ST150, 6x CAN, 2x LIN und 4x Ethernet interfaces. Each data logger has 2x RS232/422 and 1x Ethernet port. An ‘E’ stands for an integrated Ethernet switch → 4 Ethernet ports. For historical reasons, 25M is not used for MOST25. A data logger with MOST50 has also a ECL interface included.

The different busses are described in the following chapter in more detail.

3.1 CAN

The blue PiraT is able to record data in compliance with the CAN specification 2.0a (11 Bit identifier) and 2.0b (29 Bit identifier).

Baud Rate	25 k – 1 MBaud
Status:	Error frames
Filter:	CAN-IDs

Table 3: CAN

3.1.1 The high-speed and low-speed operating modes

The CAN channels #1 and #2 can be switched between low-speed and high-speed operating mode. For both of these modes, the data logger uses a separate transceiver chip. The electrical behavior of the low-speed and the high-speed CAN is different, hence, the low-speed CAN port of the blue PiraT must not be connected to a high-speed CAN bus and vice versa. All other CAN-ports operate in high-speed mode. Table 3shows an overview of both operating modes.

Both operating modes use differential signals (CANH, CANL). For the correct data recording, all nodes of the bus must have a common reference potential. The blue PiraT uses the connection „clamp 31“ as this reference potential. The lines of the high-speed CANs are terminated with a high resistance.

	Low-speed CAN	High-speed CAN
CAN controller	B-CAN (ST10F269)	B-CAN (ST10F269)
Transceiver chip	Philips TJA1054	Philips TJA1041
Terminating resistor	12k	2k6
Max. baudrate	125 KBit/s	1 MBit/s
Supported identifiers (SW)	11 Bit	11 Bit
Disabling of acknowledge	not possible	possible
Time stamps	at the end of the telegram	at the end of the telegram
Time stamp error	max. 80 µs	max. 80 µs

Table 4: Technical data of CAN recording

3.1.2 CAN with 29Bit identifiers

The blue PiraT can also log CAN data with 29Bit identifiers. You don't have to configure anything. All the CAN data will be logged as they are available on the can bus. It is also possible to log can message mixed with 11Bit and 29Bit identifiers.

There is no configuration sheet for 29-Bit in the client. Filtering and using CAN data bases is actually not supported in the client. The License Complex Triggers also didn't support the 29-Bit identifiers.

3.1.3 Single Wire CAN

For the Single Wire CAN the signal wills not transmitted differential /CANH and CANL). It is only one line used.

3.1.4 Recording Contents

The blue PiraT is able to record the following error states of the CAN bus:

- Stuff error
- Format error
- Acknowledge error
- Bit 0/1 error
- CRC error
- Overrun

These error states are only included in the Telemotive file formats. After reaching a certain number of errors (50 errors), the recording of error states is interrupted until reception of the next successful CAN message to avoid an overload of the recorded data.

3.1.5 Acknowledge

Because of the hardware design of the blue PiraT, it is not possible to disable sending the acknowledge bit for low-speed channels.

3.1.6 Sending CAN messages

If the blue PiraT sends a CAN message, it is shown twice in the trace: The first message indicates the transmit request of the data logger, and the second message indicates the actual transmission of the message. In the CANoe file format, these messages are indicated as "TxRq" and "Tx", respectively. The transmit request messages are not included in file format that don't support them.

3.2 MOST25

The blue PiraT is able to record messages of the control channel and the asynchronous channel of a MOST-25 bus. It operates in spy mode, which makes it not appear as a logical node in the MOST ring.

The transmit time depends on the count of transmitted MOST frames. For example, for a control message it will be 16 * 22,6 µs = 362 µs.

Channels	Control and Packet in SpyMode
Status	Light on/off, Lock on/off
Filter:	FktID, FktBlk, InstID, Transmitter Address, Receiver Address, Op-Type

Table 5: MOST25

3.2.1 Signal Refresh

The data logger converts the optical signal to an electrical signal and back to an optical signal. This causes the jitter in the signal. To compensate for this jitter, it is possible to enable a signal refresh. By resynchronizing the signal to the regenerated bit clock of the input signal, the data logger creates an almost ideal output signal, which is forwarded to the next node. The signal refresh feature must be enabled in the configuration (see 5.5.9).

3.2.2 Control Channel

The blue PiraT records the complete contents of a control message. This results in a message data set of 32 Byte, which includes the arbitration values, the CRC and the acknowledge flags at the time the message is received by the blue PiraT. The acknowledge flags (ACK and NAK) can change after the message has passed the blue PiraT if there are further nodes between the blue PiraT and the source of the message in the MOST ring. Messages with incorrect parity and/or incorrect arbitration are usually not recorded. However, this behavior is configurable (see 5.5.9). Note: Only messages are recorded if a “lock” is recognized.

3.2.3 Asynchronous Channel

For applications where the asynchronous MOST data is relevant, recording of the asynchronous channel can be enabled. This might result in a much higher amount of data. The data set of an asynchronous message contains the complete contents of the message, including the arbitration values and the CRC. Messages with an incorrect parity are usually not recorded. However, this behavior is configurable (see chapter 5.5.9). Note: Only messages are recorded if a “lock” is recognized.

Arbitration values of the asynchronous channel. The MOST bus uses synchronous frames, which are transferred in fixed time slots. An asynchronous, package-oriented transport is implemented by using a specific reserved slot of the frame. If no nodes are ready to send asynchronous data, this slot is left empty. By using the arbitration field, one can determine if the slot contains data. According to the MOST specification, values of 1..7 stand for packages sent by a priority defined by this value.

Practical experience has shown that real devices sometimes send packages with arbitration values that are not within the range defined by the MOST specification. To make sure that these packages are also recorded, the blue PiraT allows configuring the upper limit of the arbitration value, in which data in the asynchronous slot is accepted as valid (see chapter 5.5.9). Depending on the devices in the MOST ring, the arbitration value has to be set to 0x1f or even to 0x3f to record all asynchronous messages. By increasing the arbitration value, however, the data logger might record more incorrect messages, which appear mostly due to bit errors in the initialization phase.

3.2.4 State Messages

The blue PiraT also records MOST state messages, including:

- Light & Lock
- Synchronous Bandwidth Control (SBC)
- Maximum Position Register (MPR)
- Maximum Delay Register (MDR)
- Node Position Register (NPR)
- Node Delay Register (NDR)
- Synchronous Allocation Map

3.2.5 File Formats

In general, the blue PiraT is able to record all data contained in a MOST message. However, not all file formats for MOST data support saving all this information. Depending on the used file format, only a part of the information is converted and saved (see Table 6).

	Telemotive-ASCII	OP2	IMG	BLF	CANoe	CARMEN
Control messages (including ACK/NAK)	√ without arbitration, CRC, and status	√ without arbitration	√	√	√	√
Asynchronous messages	√ without arbitration and CRC	-	√ without arbitration	√	√	-
Light & lock	√	√	√	√	-	-
SBC	√	-	√	√	-	-
MPR	√	√	-	√	-	-
MDR	√ as „LastMPR“ in previous client versions	-	-	√	-	-
NPR	√	-	-	√	-	-
NDR	-	-	-	√	-	-
Synchronous allocation map	√	-	-	-	-	-

Table 6. Features of MOST file formats

3.3 LIN

The blue PiraT with a LIN interface are able to record data compliant to the LIN specification V2.0. The data logger does not actively appear as a bus member. Sending LIN messages is currently not supported.

Chanels	Up to 4
Transmission Rate	1200, 2400, 4800, 9600, 19200 Baud
Transmitter	TJA 1020
Status	Parity Bits, Format check for Header, CheckSum for Header and Payload
Terminating resistor	30 kOhm

Table 7: LIN

3.3.1 LIN data blocks and time stamps

Each LIN message receives a time stamp, which marks the end of the message. If the data logger receives LIN data without a valid header, it creates blocks containing the erroneous data. The maximum block size is 10 Byte. A block is also concluded after a timeout, which is three times the transmission time of a LIN character.

3.3.2 LIN-Transceiver

The blue PiraT uses the LIN transceiver TJA1020 by NXP (Philips Semiconductor). Supported baud rates are in the range from 1200 to 19200 Baud. An automatic baud rate detection is currently not supported. The LIN interface is configured as a slave device with a terminating resistor of 30 kΩ.

3.3.3 Special Frames and States

Additionally to the normal frame data, the following information is recorded:

- Wakeup-Frames
- Checksum-Errors

3.4 Serial Data

Depending on the model, the blue PiraT supports only the RS232 specification, or alternatively also the RS422 specification. In the latter case, the desired type must be configuration (see chapter 5.5.12).

Channels:	2x RS232/422 see below
Baud Rate:	9600, 19200, 38400, 57600, 115200 Baud
Data Bits:	5, 6, 7, 8
Stop Bits:	1, 2
Parity:	None, odd, even

Table 8: Serial

3.4.1 Segmentation of the Serial Data

Separately for each channel, the received serial Bytes are clustered into data blocks. Each block is finalized after a certain time or if it has reached a certain maximum size. The time is 30ms to 60ms, depending on the channel. The maximum size is 49 to 80 bytes. A time stamps is assigned to each block when it is finalized.

3.4.2 RS232-Transceiver

The threshold voltages for data reception are the usual RS232-defined values. A logical „1“ is recognized for input voltages smaller 0 Volts, a logical „0“ for input voltages higher than 3 Volts.

3.4.3 File Formats

The file formats „Telemotive ASCII“, „Serial Trace Analyser“, and XML merge the blocks that are created by the data logger and separates the resulting data stream and the line endings. A line ending is recognized by the character „CR“ (0x0D), the character „LF“ (0x0A), or the character sequence „CR LF“. Any of these line endings are replaced by the common line ending „CR LF“. Each line starts with a time stamp, which is the time stamp of the block that contains the first character of the line.

The file format „Serial Raw“ saves the serial data without change, without time stamps and without any formatting.

3.5 FlexRay

The blue PiraT is able to record FlexRay bus data according to the FlexRay specification 2.1A. Table 9 shows the technical data of the FlexRay module.

If the bus is synchronized, the data logger records all valid static and dynamic frames of the FlexRay channels A and B. During the synchronization phase, no recording of FlexRay data is possible. The following frames cannot be recorded because of controller limitations:

- Zero Frames
- Error Frames
-

Channels:	A + b
Max. Bit rate:	10MBit/s
Controller:	MFR4310
Transceiver:	Philips TJA1080 / TJA 1080(A)

Table 9: Technical Data of the FlexRay Module

3.6 Ethernet

All version of blue PiraT data logger are able to Ethernet data. All data logger have an Ethernet port with RJ45 connector. A blue PiraT with an E has a build in 4 port Ethernet switch.

Channels:	1 (Standard), 4 (E-Version, witch switch)
Max. Transmission Rate:	100 MBit/s
Formats:	GNLOG, UTF8, RAW, UDP, DLT, Camera Depends on license
Switch (E-Version only)	BCM5325E, Broadcom
Phy:	LXT971A, Cortina

Table 10: Ethernet

Important: If you connect the dater logger (no E variants) directly with a device (e.g. Laptop or camera) you have to use a crossover Ethernet cable.

3.6.1 Supported protocols

The following chapter gives an overview of the available protocols.

3.6.1.1 GNLOG

For connecting it will be used a standard TCP dial-up (open socket connection). Therefore the blue PiraT is a TCP-Slave Device.

GNLOG is a proprietary serial protocol used for some ECU diagnosis.

3.6.1.2 UTF8

Using UTF8 data transmission over TCP the blue PiraT will be a TCP-Slave device. Therefore the blue PiraT will initiate a TCP connection to a TCP server by using an open socket connection (you can configure IP/Port of server via client software).

By using UTF8 data transmission after every Linefeed (LF) the data will write with a timestamp on the logger.

If the connection is getting lost, it will take about 5 seconds to build up a new connection for logging data again.

3.6.1.3 RAW

Using raw data transmission over TCP the blue PiraT will be a TCP-Slave device. Therefore the blue PiraT will initiate a TCP connection to a TCP server by using a open socket connection (you can configure IP/Port of server via client software).

By using raw data transmission, packages up to 40kBytes getting a time stamp and will be written on the logger.

If the connection is getting lost, it will take about 5 seconds to build up a new connection for logging data again.

3.6.1.4 UDP Server

The blue Pirat can be configured as an UDP server by setting up a IP address and Port number.

A Slave device can build up a connection to the blue PiraT. The blue PiraT logs raw data packages up to 40kBytes and write them with a time stamp down. There is no configurable Debug Level.

If the connection is getting lost, it will take about 5 seconds to build up a new connection for logging data again.

3.6.1.5 Camera License

If you use camera license on the data logger, it is possible to connect up to 4 Ethernet webcams to the blue PiraT (depends of blue PiraT variant). After connection the blue PiraT is able to log mpeg4 video streams. For more information please see Camera License manual.

3.6.1.6 DLT over Ethernet

If you use DLT licence on the data logger, it is possible to connect up to 4 ECU for logging their DLT messages. More information for logging DLT messages will be find in the manual “Logging AUTOSAR DLT”.

3.7 MOST150

The blue PiraT MOST150 data logger is able to log messages from the MOST150 bus of the following types:

Status:	MPR (Maximum Position Register), MDC (MOST Data Channel), Light on, System Lock Flag, Shut Down Flag, Ring Lock Flag, Open Ring/Multi Master Flag, Node Position
Control:	Control Messages
Packet:	MDP (MOST Data Packet) MEP (MOST Ethernet Packet)
Filter:	Control Messages on/off, Packet on/off, MDP on/off, MEP on/off, MDP Transmit and Receive Address, Packet Length, MEP Receive Address, Message Length

Table 11: MOST150 Data Logging

The data logger is not an active part of the bus system because it is working in a spy mode. The device is able to log messages immediately after wake up.

Before the logging data are saved on the hard disk, they are buffered in a ring buffer. In the case of a data rate peak, which exceeds the storage rate of the hard disk, storage of data is still possible. If the MOST150 data rate is permanent higher than the maximum storage rate, the data logger will stepwise deactivate channels: first the MEP- and MDP-channel, than the control channel and at least the status messages. To ensure logging of maximum continuous data blocks a hysteresis is implemented. Before logging again MEP- and MPD- messages the ring buffer data has to be fully stored on the hard disk.

Before starting again the logging of the MEP- and MDP- messages the system sends a “Lost Message” note. This message contains information about how much messages of which type were rejected.

3.8 MOST50

The blue PiraT MOST50 is able to record Status information, Control messages, Packet data and Streaming data.

Status:	MPR (MOST Position Register), SBC (Synchronous Bandwidth Control), MOST Lock, Master Lock
Control:	Control Messages
Packet:	Asynchronous Packets
Streaming:	Synchronous Data (requires MOST50 Synchronous License)
Filter:	Control Messages on/off, Packet on/off, MDP Receive Address, Message Length

Table 12: MOST50

The data logger is not an active part of the bus system because it is working in a spy mode. The device is able to log messages immediately after wake up.

Before the logging data are saved on the hard disk, they are buffered in a ring buffer. In the case of a data rate peak, which exceeds the storage rate of the hard disk, storage of data is still possible. If the MOST50 data rate is permanent higher than the maximum storage rate, the data logger will stepwise deactivate channels: first the MDP-channel, than the control channel and at least the status messages. To ensure logging of maximum continuous data blocks a hysteresis is implemented. Before logging again MPD- messages the ring buffer data has to be fully stored on the hard disk.

Before starting again the logging of the MDP- messages the system sends a “Lost Message” note. This message contains information about how much messages of which type were rejected.

3.9 ECL

Currently the ECL (Electrical Control Line) is only supported in conjunction with MOST50. For the reason that the MOST50 bus is not able to create a wake up signal, the ECL signal is used to wake up the MOST50 devices in the ring. In general, the ECL is a slow LIN bus.

The following ECL messages will be recorded:

- EWU (Electrical Wake–Up)
- STWU (System Test Wake-Up)
- STP (System Test Parameters)
- STR System Test Results)
- Undefined Pulse

4 Conversion

All trace data will be are recorded internal in the proprietary .Telemotive TMT format.The client provides the possibility to convert the internal Format in other formats, to make the data readable or to prepare them to import them into analyzing tools.

The tables below shows which data can be convert to other formats.

Format / Trace-Daten	Telemotive ASCII *.txt	Carmen *.xml	CANoe *.asc	CANoe *.blf	CANCorderASCII *.txt	Optolyser *.op2	Optolyser *.img	Serial Trace Analy-ser	Serielle Rohdaten *.txt	ASCII Hexadecimal *.txt	APN Format ASCII *.txt	GN-LOG *.<yy>aa	Trace Client *.trc	TCPdump *.pcap	MDF *.log	Audio *.wav	DLT *.dlt
MOST25 Status	x	x	x	x		x	x										
MOST25 Ctrl	x	x	x	x		x	x										
MOST25 Packet	x	x	x	x			x										
MOST25 Stream																x	
MOST50 Status	x						x										
MOST50 Ctrl	x						x										
MOST50 Packet	x						x										
MOST50 Stream	x						x										
MOST150 Status	x			x			x										
MOST150 Ctrl	x			x			x										
MOST150 MDP	x			x			x										
MOST150 MEP	x			x			x							x			
ECL	x						x										
CAN/SWC	x	x	x	x	x										x		
LIN	x	x	x	x													
FlexRay	x	x	x	x													
Serial RS232/422	x	x						x	x	x	x	x	x				x
Ethernet GNLOG	x	x										x					
Ethernet UTF8	x																
Ethernet RAW	x																
Ethernet UDP	x																
Ethernet DLT	x																x

Tabelle 13: Conversion Format

4.1.1 Telemotive Trace File (Binary) (*.tmt)

This file format is a proprietary binary format of Telemotive AG. It is used for storing the trace data internally on the data logger and in the offline data sets. The file names have the extension „*.tmt“. The Telemotive Trace File Binary format is able to store all bus types and all of the information that the data logger creates.

4.1.2 Telemotive Trace File (ASCII)

This file format is a proprietary text format of Telemotive AG. It is mainly used for testing purposes. The Telemotive Trace File ASCII format is able to store all bus types of the data logger. The other file formats are not able to store all information created by the data logger (e.g. error states), therefore it can be useful to select this format for data conversion.

There is no specification provided for this format – it might change in new client versions. Each line starts with a time stamp, followed by the bus type and the channel number (if applicable). Figure 14 shows an example of a trace in the Telemotive ASCII format.

```
22.06.2006 06:51:52.3422  MOST CTRL   | [0101 -> 0401] . 01.01 . 003.1 . 0 0 ()
22.06.2006 06:51:52.3430  SERIAL #1   | PI:d313 ATN:1 MESSAGES:6 selected:false HEX_ AA BB 01
22.06.2006 06:51:52.3430  SERIAL #1   | Program [1] ixRadio
22.06.2006 06:51:52.3436  MOST CTRL   | [0101 -> 0100] . 01.01 . 003.C . 0 2 (01 01)
22.06.2006 06:51:52.3464  CAN #1      | Rx   0fa  8 1e 5d f6 00 1c 15 84 69
22.06.2006 06:51:52.3476  SERIAL #1   | Starting shutdown
22.06.2006 06:51:52.3545  CAN #1      | Rx   7c9  8 f0 50 01 5a 00 27 9a 00
```

Figure 14. Example of a trace in the Telemotive ASCII format

4.1.3 XML-Format (*.xml)

This format is a proprietary XML-format which can be used for the Carmen tool. It contains the data of the MOST control channel, CAN channels, FlexRay channels, serial channels and the markers. There is no publicly available specification. Be aware that the format can change without notice in newer Client versions.

4.1.4 CANoe ASCII (*.asc)

The CANoe ASCII-Format is a data format of the company Vector Informatik. It is possible to read files of this format into the software CANoe. Currently, the blue PiraT Client includes CAN, MOST control channel and MOST asynchronous channel, FlexRay channel, and LIN channel data in this format.

4.1.5 CANCorder ASCII (*.txt)

The CANCorder format is an ASCII format of the data logger CANCorder of the company IXXAT. It is possible to use this format for the CAN data recorded by the blue PiraT.

4.1.6 Optolyzer

The Optolyzer format contains data of the MOST25 control and asynchronous channel. It has the extension „.op2“. It is possible to read files of this format with the „OptoLyzer Suite“ of the company SMSC. Chapter 3.2.5 gives additional information about this file format.

4.1.7 MOST Data Analyser (*.img)

The MOST Data Analyzer format contains data of the MOST control and asynchronous channel as well as MDP and MEP messages. It has the extension „.img“. It is possible to read files of this format with the „OptoLyzer Suite“ of SMSC.

Also MOST50 streaming data can be converted into an img file. With a software tool from SMSC it will be possible to convert Audio streams to a wav file.

Chapter 3.2.5 gives additional information about this file format for MOST25.

4.1.8 Serial Trace Analyser (*.txt)

The Serial Trace Analyser format is a simple text format for serial data (see Figure 15).

```
0006394 22.06.2006 07:12:01.5  | Startup sequence initiated
0006395 22.06.2006 07:12:02.3  | performing mem test
0006396 22.06.2006 07:12:02.5  ========== Marker 5 ==========
0006397 22.06.2006 07:12:03.1  | time: 0455334
```

Figure 15. Example trace in Serial Trace Analyzer format

At most a single channel can be stored in this format. Each line starts with a line number followed by a time stamp and the serial data. This format also supports markers.

4.1.9 Serial Raw Format (*.txt)

This format only contains the unmodified serial raw data without any formatting. At most a single channel can be stored in this format.

4.1.10 ASCII Hexadecimal Format (*.txt)

This format contains the serial data in hexadecimal format. Each line starts with a time stamp. A line is finished if the number of bytes in this line of the difference in the time stamps exceeds certain values.

4.1.11 APN Format

This format contains the serial data in binary format. Each line starts with a time stamp. A line is finished if the pattern 0x0D 0x0A 0xAA or 0x0D 0x0A 0xBB occurs in the data. In this case, the characters 0x0D 0x0A is written to the current line, and 0xAA or 0xBB is written to the new line, respectively.

4.1.12 GN-Log Format (*.<yy>aa

This is a proprietary format for serial data.
<yy> contains the last two digits of the year.

4.1.13 Ethernet - RAW/UTF8

It is possible to log raw or utf8 data over Ethernet:

RAW data = Data packages with packet-length of 40kByte getting an time stamp and will be stored on the data logger

UTF8 data = Data packages which are ending with LF or CR are getting an time stamp and will be stored on the data logger Trace Client Format This is a proprietary format for serial data.

4.1.14 Trace Client Format (*.trc)

This is a proprietary format for serial data.

4.1.15 CANoe BLF (*.blf)

The CANoe BLF-Format is a data format of the company Vector. It is possible to import files of this format into the software CANoe. Currently, the blue PiraT Client includes CAN, MOST control channel and MOST asynchronous channel, FlexRay channel, and LIN channel data in this format.

4.1.16 TCPdump (*-pcap)

TCPdump is a well known program (*.pcap) for controlling and evaluating network traffic. For Windows operating system “WinDump” is available. For more information please look on www.tcpdump.org.

4.1.17 MDF Format

MDF (Measurement Data Format) is a binary data format for measurement data. This Format was developed by Vector. Actual it will be only supported for CAN messages and only for 1 channel group related to MDF specification V3.3.

The channel group includes:

- #1 Event-Type
- #2 CAN-Channel
- #3 CAN-ID

- #4 Direction Rx/Tx
- #5 RTR
- #6 DLC
- #7-14 Byte 0 – 7
- #15 Time Stamp

Currently there is no support to support MDF on signal level.

5 Client

The requirements to install the client are a PC with a Windows operation system and a Ethernet interface. To connect the blue PiraT a cross link network cable is required.

The blue PiraT Windows Client provides configuration of the data logger, data download, firmware update and generation of bug reports.

The blue PiraT Client is supported for OS (Operating System) Windows XP.

5.1 Setup Procedure

To install the blue PiraT Windows Client, the following setup file has to be run:

```
bluePiraTClient_Setup_English_<version>.exe
```

Please make sure to always install the latest version. The installer guides through the setup procedure. This procedure offers two installation choices: „Standard Installation“ and „Full Installation“. Standard installation is meant for normal testers that use an already configured data logger for data recording and data download. This type of installation creates the following shortcuts in the start menu:

- Data Download (see chapter 5.4)
- Bug Reporter (see chapter 5.7)

The full installation is meant for administrators who are in charge of configuration and maintenance of the data logger. For this purpose, the setup program installs additional applications:

- Configuration (see chapter 5.5)
- Firmware/Licenses Update (see chapter 5.5.20)

Figure 16: blue PiraT Setup Wizard

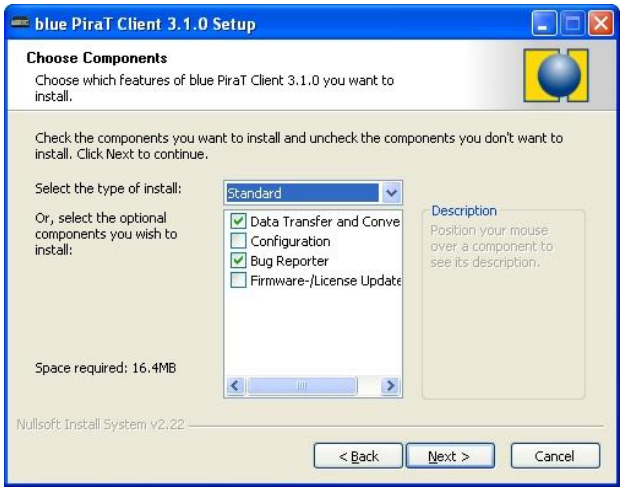

Figure 17: The installation options

Finally, it is possible to choose if the client settings are stored individually, e.g., separately for each user, or centrally. When storing the settings centrally, any change of settings of a certain user is applied to all users. Note: these modes refer to the client settings only (see chapter 5.4.6), not the data logger configuration (see chapter 5.5).

The installation procedure can be run automatically (without prompts) by using the switch "/S" when executing the setup file.

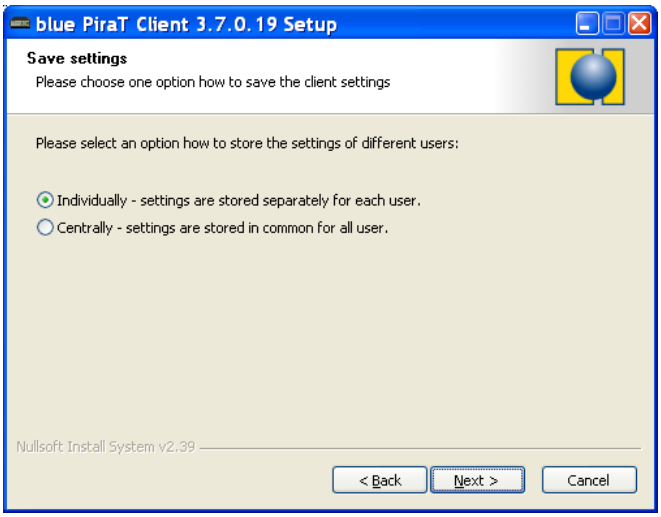

Figure 18: Choice between individual and central client settings

5.2 Connecting the Data Logger to the PC

Before starting any of the blue PiraT Client applications, the PC or laptop must be connected to the data logger via a cross-over Ethernet cable (see Figure 19).

Important: The data logger must be connected directly to the PC. Do not operate the data logger within a network, e.g., by using a router (see exception in 5.3). Using multiple network adapters simultaneouslyin the client PC can cause problems if they operate on the same subnet.

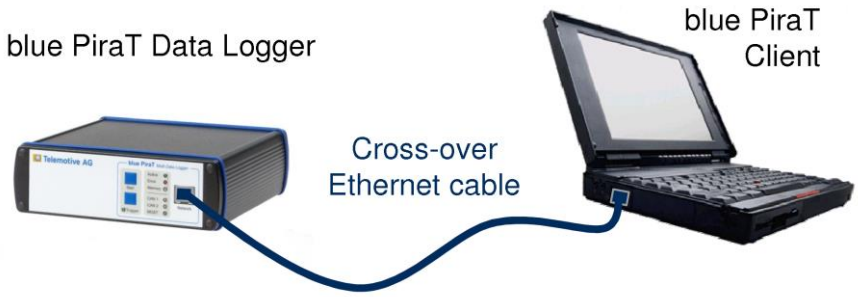

Figure 19: Connecting a laptop to the data logger

The network settings of Windows must be configured to „obtain the IP-address automatically“ (see the example for Windows XP in Figure 20). This configuration causes the PC/Laptop to obtain an IP-address automatically from the data logger, since the logger operates as a DHCP server. If the connection to the data logger fails, a dialog box with an error message appears. In this case one should check if the data logger is running and the connection cable is plugged in properly.

Important: For a proper operation of the blue PiraT Client, the data logger has to be active (green „Active“ LED lights). If the data logger is in Standby mode, it can be activated by the „Start“ button in the front panel. From this point on, it takes up to 30s until a network connection is present.

If the PC/Laptop has just been connected to a local area network (e.g., the company's network), it might take some time until the data logger has assigned an IP-address to the PC/Laptop and the communication is established.

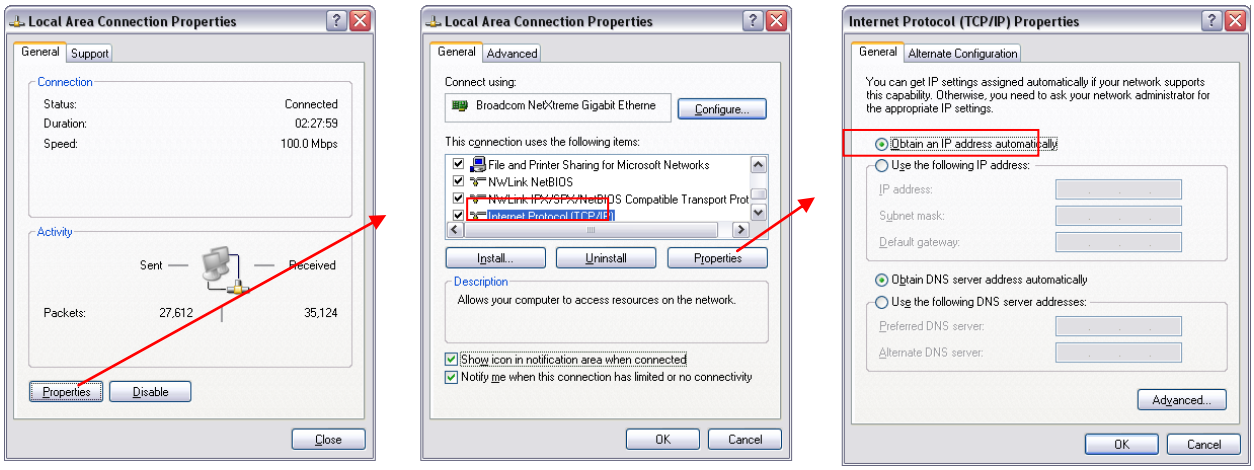

Figure 20: TCP/IP settings for the blue PiraT client

5.3 Connecting the Data Logger to a Network

5.3.1 Configuration

It is also possible to connect the data logger to a network. To do so, the network configuration must be adjusted (see chapter 5.5.4).

Important: Connecting the data logger to a network (e.g., the company's network) must be confirmed by the network administrator. Telemotive AG does not assume any responsibility for any problems resulting from operating the data logger within a network.

Important: Before connecting the data logger to a network (e.g., the company's network), the network settings must be adjusted. The data logger must not be configured in the mode "DHCP server".

Besides the default mode (direct connection of data logger – PC), there are two modes for connecting the data logger to a network:

- DHCP client: This mode is usually set to connect a data logger to a network. The network must provide a so-called "DHCP server", which assigns an IP address and subnet mask to the data logger.
- DHCP deactivated: When using this mode, the IP address and the subnet mask of the data logger must be assigned by the user. One must make sure to use an IP address that has not been used yet by another network device.

Important: In case of an incorrect network configuration it might not be possible anymore to access the data logger. The data logger can be reset to standard configuration by a long-press of the trigger button (until the trigger LED flashes five times) and a restart of the data logger (wait until data logger switches to standby mode or force standby mode by long-press of the start button until the CAN LEDs flash alternately). After this procedure, the data logger can be accessed via a direct network connection (see chapter 5.2).

5.3.2 Connection process

If the client does not find any directly connected data logger, it automatically searches for data loggers in the network. If one or more data logger is found in the network, the dialog "Creating connection…" is automatically extended to show all found data loggers in a list. The list is periodically updated. Each entry contains the data logger name (as set in the data logger configuration, see chapter 5.5.3), the main board number and the IP address. If a data logger is already connected to

a different client in the network, it is not possible to access it. Therefore, the entry is displayed as disabled (displayed in grey color) and the column “Connected with” shows the name of the PC that is connected with the data logger.

To connect to a data logger, an entry in the list is selected and the “Connect” button is pressed.

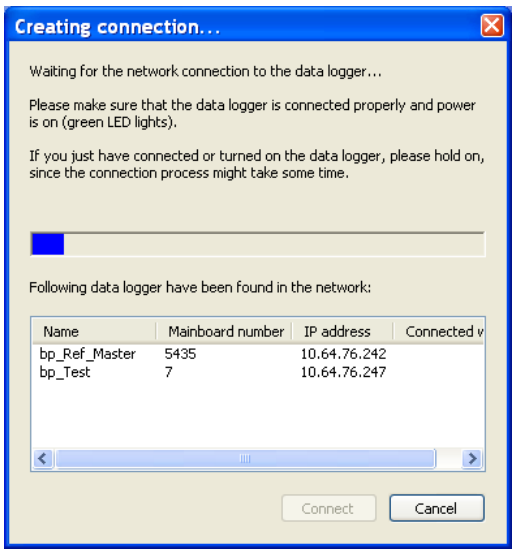

Figure 21: TCP/IP settings for the blue PiraT client

5.4 Downloading the Recorded Data

5.4.1 The blue PiraT Data Download Application

Selecting the shortcut „Data Download“ in the start menu or the desktop starts the data download application. The main window provides functions to start the download and the offline conversion. The entry field on the top displays the target directory, to which all traces files are written. The “Browse…” button or a manually enter allows selecting the desired directory. The button “Quit” exits the application. All other functions of the main window are described in the following chapters.

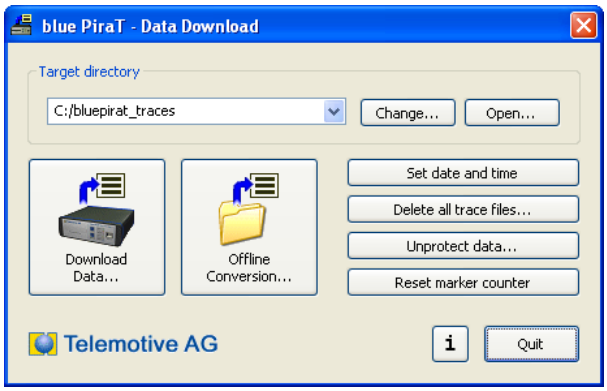

Figure 22: blue PiraT data download window

5.4.2 Setting Date and Time of the Data Logger

Clicking the “Set date and time” button sets the date and time of the data logger’s real-time clock to the date and time of the PC.

Note: Please also read chapter 2.3.7 (automatic daylight savings adjustment).

Automatic verification of the data logger date and time:

The data overview dialog (s. Figure 24 and Figure 23) displays the current data logger date and time. If this date and time diverges from the PC’s clock by more than 5 minutes, a warning mes-

sage is displayed. In this case, the data logger's clock should be set after verifying that the PC's clock and time zone is set correctly.

5.4.3 Data Download

After clicking on „Download data…", a dialog box appears that allows selecting the desired data for download. There are two options of data selection, chosen by the tabs "Data overview" and "Time range" on the top of the dialog.

5.4.3.1 Event overview

The tab "Event overview" displays the recorded data as sections (defined by a startup and shutdown of the data logger), including all markers set by the user and info events (see Figure 23). The data download event marks the time where a client data download was performed. Above the overview, there is a selection box that allows limiting the days displayed in the overview (Note: only the currently displayed days will be included in the data download). Selecting sections, markers and info events defines which data will be downloaded:

- If a section is selected, the entire section is downloaded.
- If a marker or info event is selected, a time span around this event will be downloaded. The boundaries of this time span are adjustable (see chapter 5.4.6).
- If an entire day is selected, all sections that start at this day are downloaded.
- If a data download event is selected all data from this time stamp on until the next logger shutdown will be downloaded
-

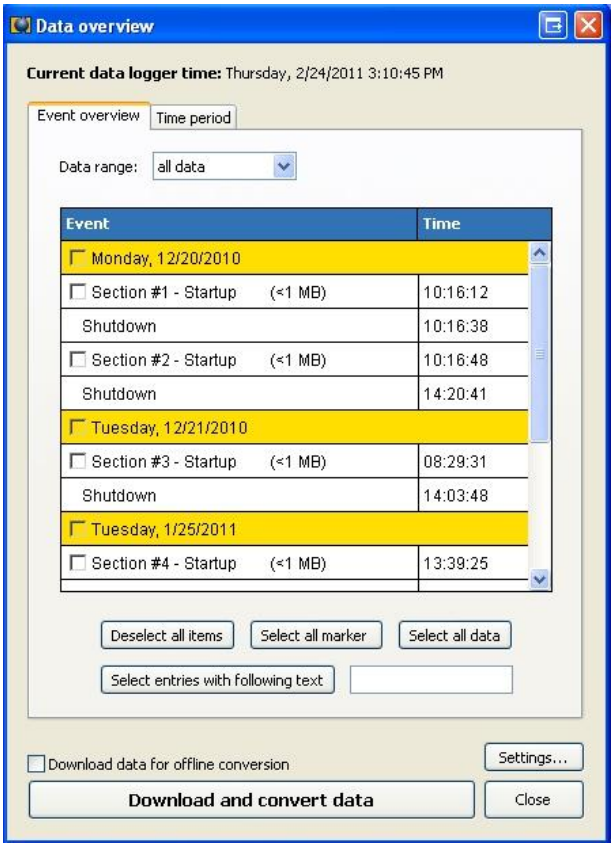

Figure 23: Data selection via the Event overview

Using one of the appropriate buttons all marker resp. data can be selected by a single click. Another button deselects all checkmarks in the data overview ("Deselect al items"). The fourth button can be used to select particular marker or info entries. Info entries are marker with a user defined text that are written to the data overview triggered by an also user defined event during data recording. This feature is only available with the Complex Trigger License.

5.4.3.2 Time range

The tab “Time period” (see Figure 24) selects all data for download that is located between a start time and an end time.

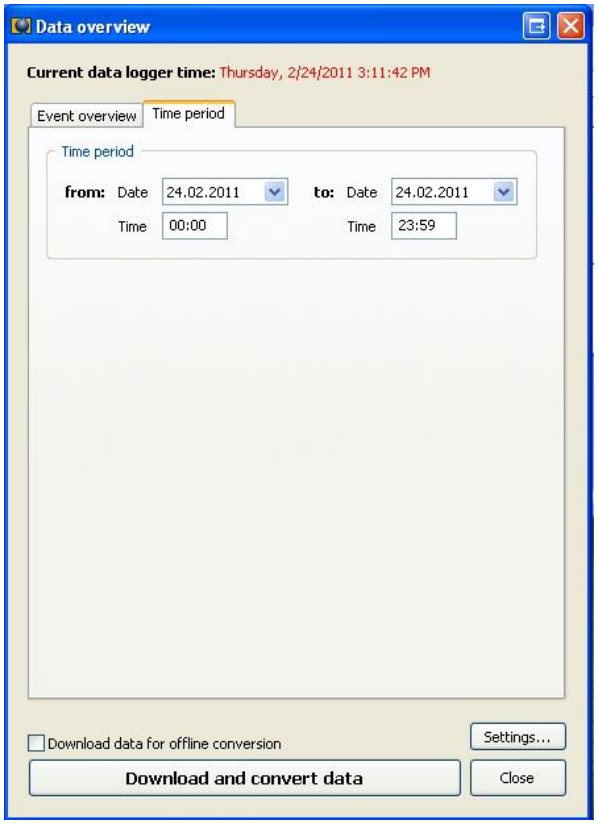

Figure 24: Data selection via time range

After the selection has been finished, there is the choice of clicking the button “Download and convert data” and “Download data without conversion”, for which the “Download data for offline conversion” checkbox needs to be selected. In the offline conversion mode, the client only downloads the raw data from the data logger, stores it in a folder, and prepares it for a later conversion (see chapter 5.4.4). The name of the offline data set needs to be entered as shown in Figure 25. It is possible to store the offline data set either in a folder or as ZIP archive in the trace target directory, the latter by selecting the check box in the lower left corner of the dialog.

Note: If the size of a zip file exceeds 3,8GByte, the client closes this file and continues with a new zip file. The generated ZIP-Parts will have an index at the end of the filename. When the first part of the ZIP File is choosen for offline converting, all other files will automatically be regarded. The zip files will named by the following scheme: `<individuell>_#1.zip, <individuell>_#2.zip….`

Figure 25: Dialog for specifying the folder name for the offline data

The offline conversion mode is not selected; the data is downloaded and converted in one step. For the trace conversion, the correct file formats must be selected as described in chapter 5.4.6.

During the data conversion, a progress dialog is shown that lists all selected channels and formats (see Figure 26) and gives the possibility to change the process priority and open the target directory.

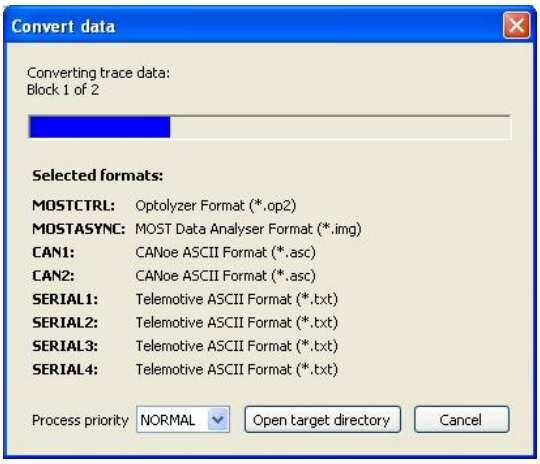

Figure 26: Progress display during the data download

5.4.4 Offline Conversion

Offline conversion allows performing raw data download and trace conversion in two steps. Offline trace conversion can be done any time and any number of times without the data logger being present. After an offline data set has been downloaded as described in 5.4.3, the button “Offline conversion…” in the main window begins the offline conversion process. First, a dialog appears to select the folder or ZIP archive with the offline data (see Figure 27).

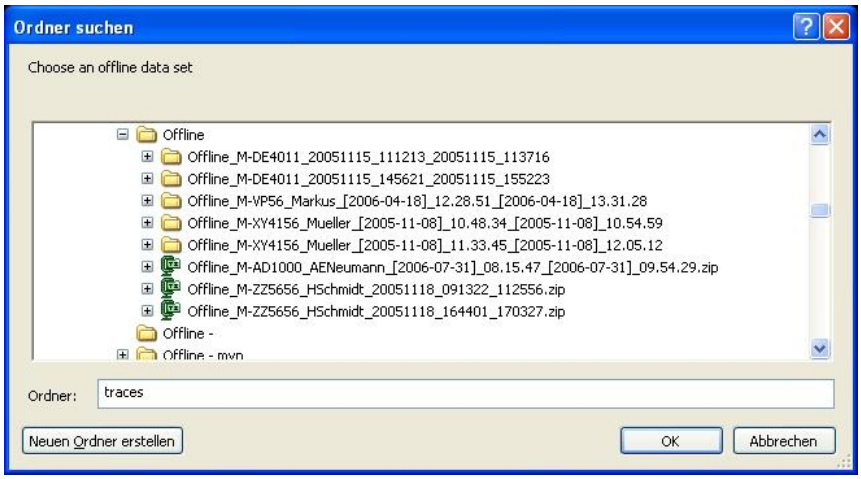

Figure 27: Selection of the directory/file with the offline data

Note: By downloading offline-data with more than one ZIP-File, you only have to choose the first ZIP-File. It will automatically download all data from all ZIP-Files and shown this in the event overview.

After confirming the selection by a click on “OK”, the client opens a data overview where either the desired data for conversion can be specified. The procedure is similar to the one described in 5.4.3. Note that the data overview for offline conversion only includes the events (sections and markers) present in the offline data set.

5.4.5 The Output Trace Files

All created trace files are stored in the target directory. If selected in the data download settings/tab "Partitioning" (see chapter 5.4.6), the client creates a subfolder for each day to make it easier to locate the data (see Figure 28).

Figure 28: Directory structure of the target directory

In general, for each section/marker the client creates one trace file. However, there are the following exceptions:

- Overlapping time periods are merged into a single file.
- A file is separated into two or more files when it reaches a maximum size, which can be adjusted in the data transfer settings.
- A file is also separated if the time stamp of the trace data passes midnight and the option "split converted trace files at midnight" in the data transfer settings is enabled.

Note: There is a special case in which overlapping time periods are merged even though there should not:
- Two markers are selected
- For a certain bus type (A), the marker time spans are configured such that they don't overlap
- For another bus type (B), the marker time spans are configured such that they overlap
In this case, a single trace file is created for bus type (A) even though a separate file for each marker is expected. This is a known and accepted bug.

Filenames are generated in the following format:

`Trace_`*<Data logger name>*`_`*<User>*`_`*<Start date>*`_`*<Start time>*`_`*<End date>*`_`*<End time>*`_`*<Channel>*`.`*<Extension>*

If there are markers set within this trace file, their numbers are appended to the file name, if this option is enabled as described in chapter 5.4.6. The user name can be entered in the data download settings (see chapter 5.4.6). The data logger name and the channel names are stored in the data logger. They can be modified using the configuration program (see chapter 5.5). If a trace file contains more than one trace channel, the channel name is created as shown in the following table:

Type of the contained channels	Channel name in the filename of the trace file
MOST25 control channel	MOST25_CTRL
MOST25 asynchronous channel	MOST25_ASYNC
MOST50 control channel	MOST50_CTRL
MOST50 MDP	MOST50_MDP
MOST50 Streaming	MOST50_SYNC
MOST50 ECL	MOST50_ECL
MOST150 control channel	MOST150_CTRL
MOST150 MDP	MOST150_MDP
MOST150 MEP	MOST150_MEP
Multiple MOST channels	MOST
Multiple CAN channels	CAN
Multiple serial channels	SERIAL
Multiple LIN channels	LIN
Multiple FlexRay channels	FLEXRAY
Multiple channels of different type	MULTI

Table 14: Channel identifier for trace file names

For example:

`Trace_MRT2113_Miller_20041203_103004-20041205_153011_CAN.asc`

If the „long format“ is selected in the data download settings, the data and the time is formatted differently, e.g.:

```
Trace_MRT2113_Miller_[2004-12-03]_10.30.04_[2004-12-05]_15.30.11_CAN.asc
```

Additionally to the actual trace files, the blue PiraT Client creates a text file containing the event overview, e.g.:

```
Events_MRT2113_Miller_20051008_154037_20051009_102051.txt
```

This file contains a list of events similar to the data overview shown in Figure 23. Each line contains the type of event („STARTUP“, „SHUTDOWN“, and „MARKER“) and the event time. The event overview files are written to the root of the trace target directory.

5.4.6 Data Download Settings

The button „Settings…" in the data overview dialog (see Figure 29) opens the dialog for the data download and data conversion settings (see Figure 30). This dialog contains a selection tree for different configuration pages, which are described in the following. The entered settings can be stored to the local hard drive with the "Save settings…" button. "Load settings…" displays some previously stored settings in the dialog. These functions always save or load the content of all configuration pages.

Figure 29: Button to open the data download settings

5.4.6.1 Configuration Page “General Settings”

The settings of the page “General settings” (see Figure 30) refer to the data download as well as to the data conversion.

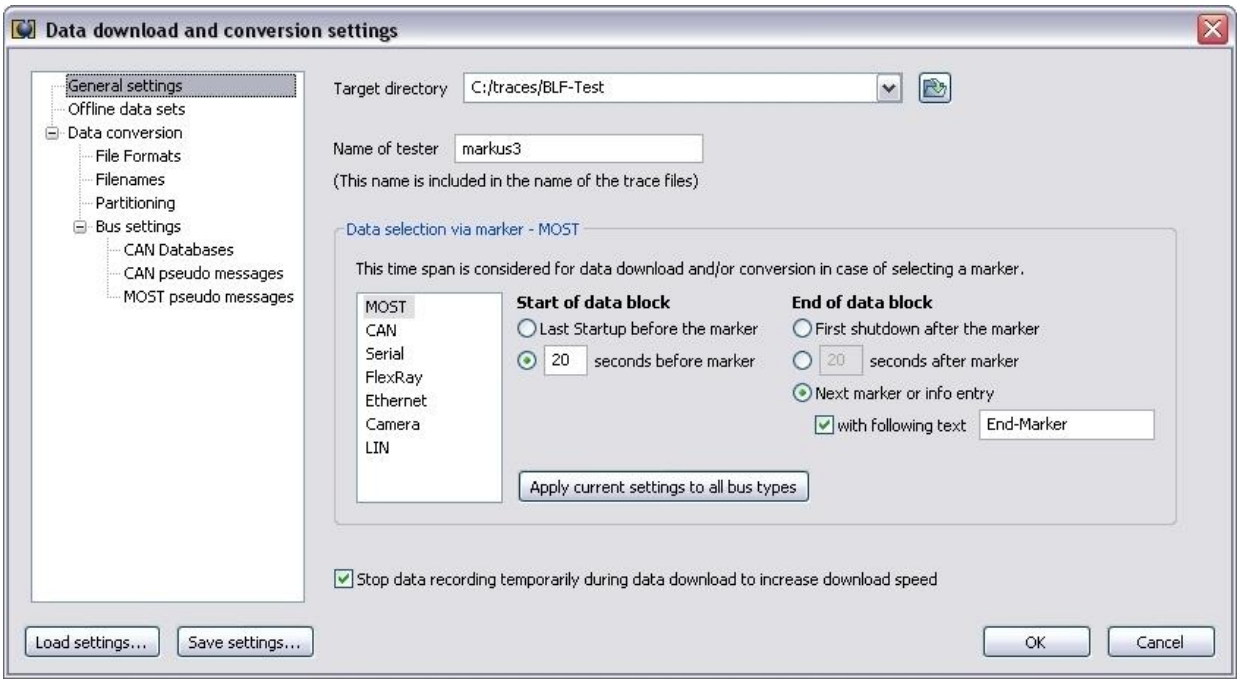

Figure 30: General settings

First, the target directory can be adjusted (same as in the main dialog). Below, the “Name of tester” can be entered. If a name is given, this name is included into the file name of the trace files. The panel “Data selection via marker” refers to the time window, which is used for data download and conversion when a marker is selected in the data overview. This time window begins either at a fixed time before the marker time, or at the last startup before the marker. For the upper boundary of the time window there are four possibilities. It ends a fixed time after the marker time, at the next shutdown of the data logger, at the next marker/info entry, or at the next marker/info entry with a particular label which can be entered in the text field. This setting can be adjusted separately for the bus types. By using the button “Set current settings to all bus types” the settings for the currently shown bus type is applied to all other bus types. Finally, there is a checkbox that allows disabling the data recording while data download is in progress. This helps increasing the download speed. There is, however, only a difference noticeable if the bus load is sufficiently high.

5.4.6.2 Configuration Page “Offline data sets”

In this configuration page, it is possible to adjust the format of the file and directory names used to store offline data sets (see Figure 31).

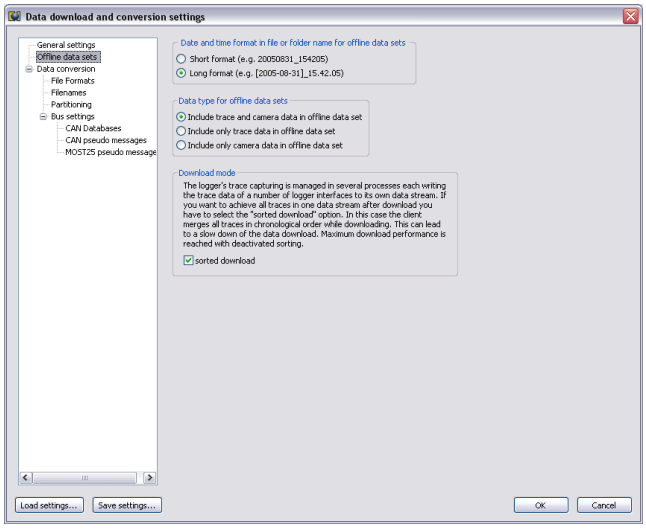

Figure 31: Settings related to offline data sets

If there are also camera log data on the datalogger, it is possible to exclude them for the download. This option is for optimating the download performance of the logger, because camera data has often much data.

By logging trace data, not all messages could be written chronologically on the data logger. The chronology of the data (means the time of the arriving messages at the interface) can be restored on two ways: a) by converting into the target formats or b) directly by downloading the data.

The option “sorted download” activates sorting data by downloading them. This option could increase the download performance, particulary when licence “online compression” is installed and used.

5.4.6.3 Configuration Page “File formats”

Each channel can be selected or deselected for data conversion. If selected, a target file format can be chosen (see **Fehler! Verweisquelle konnte nicht gefunden werden.**). Further information about these file formats is given in chapter 3.2.5. The button “Select all channels” selects/deselects all channels for data conversion. If the checkbox “Verify automatically if these settings are plausible with regard to the data logger configuration” is selected, a warning message will appear if:

- A channel is selected for conversion but it is not activated on the data logger
- The file format does not match the protocol that is configured on the data logger

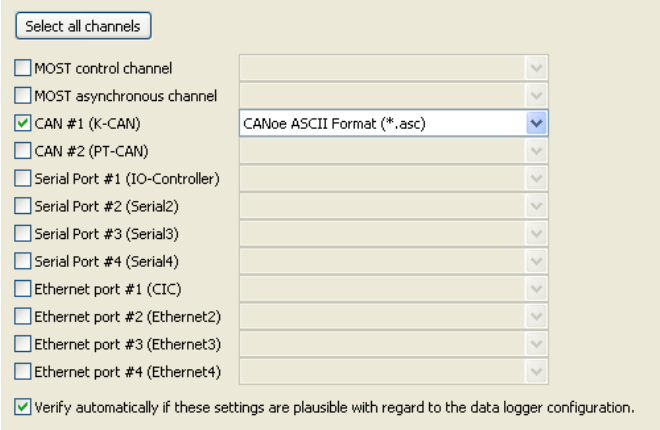

Figure 32: Dialog „Data download settings“/Tab “File Formats”

5.4.6.4 Configuration Page “Filenames”

Figure 33 shows the configuration page “Filenames”. It provides the following settings:

- There is the choice between short and long trace file names (see 5.4.5).
- It is possible to configure the time spans included in trace file names. They are either set to the file's effectively included data, or to the times selected or entered in the data selection dialog.
- The marker numbers that are contained in a trace file can be included in the trace file name (see 5.4.5).

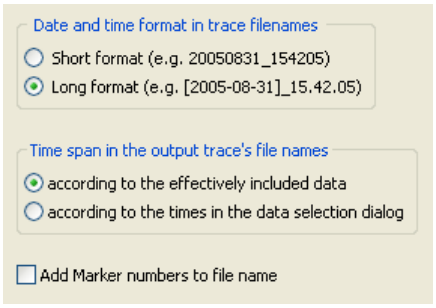

Figure 33: Filename settings

5.4.6.5 Configuration Page “Partioning”

This configuration page concerns splitting of the target trace files in multiple parts. The top check-box determines if folders are created, each of which containing the trace files of a single day. If this option is selected, one can choose if the names of these folders only contain the date or also the name of the data logger. Furthermore, it is possible to split trace files at midnight. Finally, the maximum file size can be adjusted. If this file size is reached, the trace file is closed at this point and a new one is created.

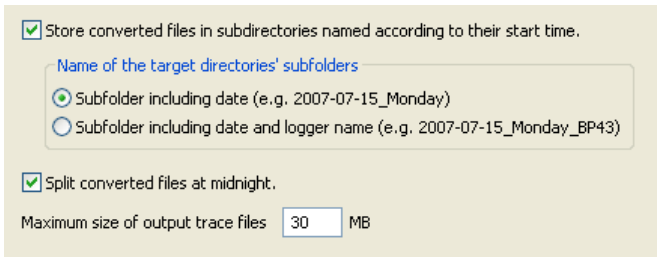

Figure 34: Settings regarding the partitioning of target files

Note: The Maximum output file size is 4096MB

5.4.6.6 Configuration Page “Databases”

This configuration page provides configuration of the CAN databases (see Figure 35). The databases are used to select the CAN pseudo messages and to resolve the message names from the CAN-ID in the CANoe and Telemotive ASCII file formats. The latter is only performed if the checkbox on the top of the page is selected.

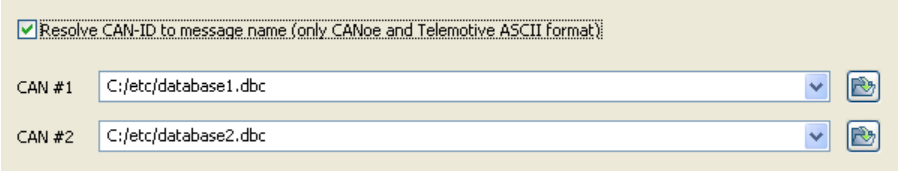

Figure 35: Settings of the CAN databases

Note: Databases with 29bit CAN identifiers will not be supported.

5.4.6.7 Configuration Page „CAN pseudo messages“

Not all CAN file formats (e.g., CANoe ASCII) support the inclusion of the markers and the absolute time stamps. For this reason, the client can be configured to insert pseudo CAN messages with this information. The pseudo message for the absolute time stamps is inserted every second. It contains the hour, minute, second, day, month, and year of the time stamp. The pseudo message for markers is inserted at the time of the marker. It contains the marker number. The configuration page „CAN pseudo messages“ is used to configure the pseudo messages (see Figure 36).

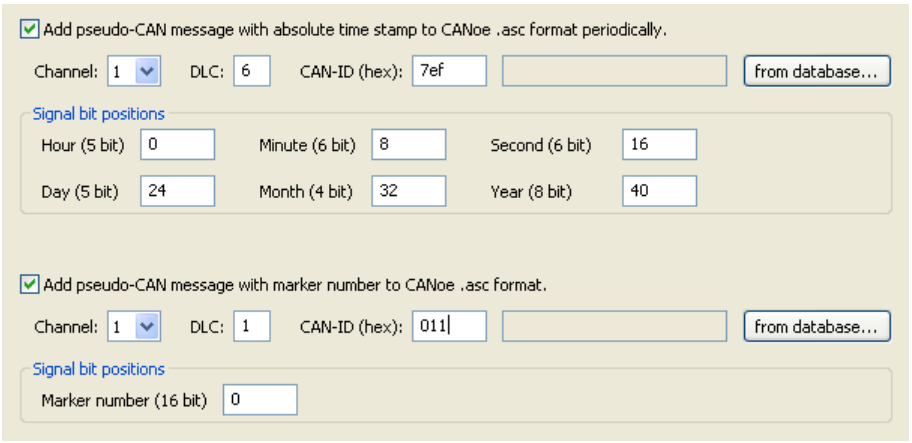

Figure 36: Settings related to CAN pseudo messages

A pseudo message is defined by the channel number, the CAN ID and the number of data bytes. Additionally, it is necessary to specify where the time stamp and marker number has to be inserted. To do so, the panel provides input fields for the bit positions. For example, a value of „16“ means that the information has to be inserted at the beginning of the third data byte.

Using a CAN database is a more comfortable way of configuring pseudo messages. The appropriate dialog is opened via the button „from database…“ (see Figure 37). At the top of the database selection dialog, the currently used database is shown in a combo box. Via this combo box it is possible to quickly select previously used databases or to disable the use of databases for this channel. The file icon on the right side of the combo box opens a file selector to choose a database in the file system. The panel on the left hand side shows the available CAN messages, either in a tree view (sorted by sending nodes) or in a list view. In the list view it is possible to sort the list by CAN-ID, by node name or message name by clicking on the appropriate column title.

If a message is selected in the tree or list view, the panel on the right hand side shows all signals of this CAN message. By using the Como boxes next to the signals, one can assign any field of the

pseudo message (e.g., marker number, hour, etc.) to each signal. By selecting „OK“, the bit positions are calculated and applied to the pseudo message settings.

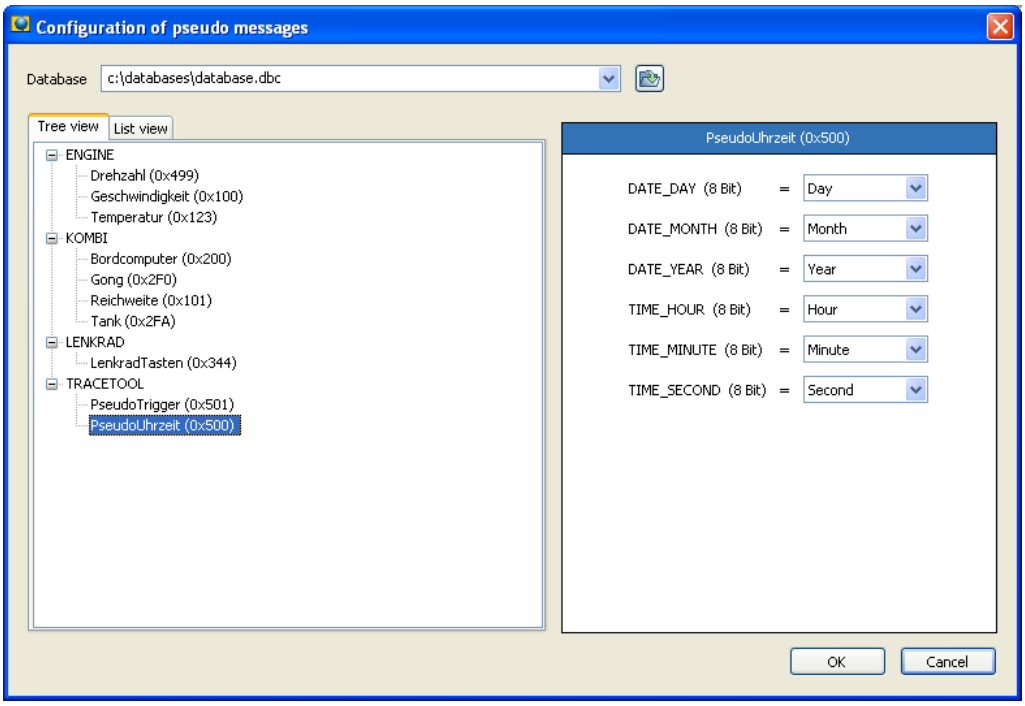

Figure 37: Selection of the CAN pseudo messages by using a CAN database

5.4.6.8 Configuration Page „MOST pseudo messages “

Not all MOST file formats (e.g., Optolyzer .op2) support the inclusion of markers. For this reason, the client can be configured to insert pseudo MOST messages at the place of every marker. The configuration page „MOST pseudo messages“ is used to configure these pseudo messages (s. Figure 38).

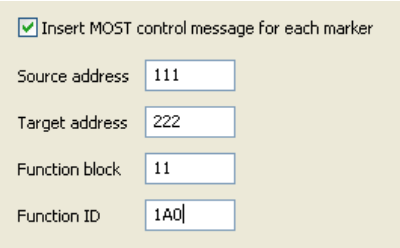

Figure 38: Settings related to MOST pseudo messages

A pseudo message is defined by its source address, the target address, the function block ID and the function ID. The marker number is stored in the first two data bytes (the lower 8-bit are stored in the first data byte).

5.4.7 Deleting Data

Using the "Delete data…" button, all trace data on the data logger can be deleted. Note that this function resets the marker counter as well. You can also select special parts of data in the event overview to be deleted.

5.4.8 Unprotect Data

In the ring buffer mode, the blue PiraT can be configured to protect the data belonging to a marker against being overwritten by newer data. With the "Unprotect data…" button all protected data can

be unprotected such that the data logger is allowed to overwrite them in case of an active circular buffer mode and full hard drive.

5.4.9 Reset marker counter

Each marker is assigned a consecutive number that is displayed in the data overview and used in some output formats. The button “Reset marker counter” sets the marker counter to zero.

5.4.10 Command Line Parameters of the Data Download Application

It is possible to pass command line parameters to the data download application. The following parameters are possible:

`-offlineFolder <folder>`	Automatic conversion of an offline data set. <folder> must contain the file name including the complete path.
`-noPrompt`	Don’t show the data overview window (i.e., convert all data) and the file overwrite prompts (i.e., always overwrite)

5.4.11 Cascading

If the logger was used as cascaded slave device (2.4), the data overview also shows the synchronization point (see Figure 39) along with the time difference (shown in brackets) between slave and master. During data conversion, the client then automatically corrects the time stamps of a section by this offset to match the master's time stamps.

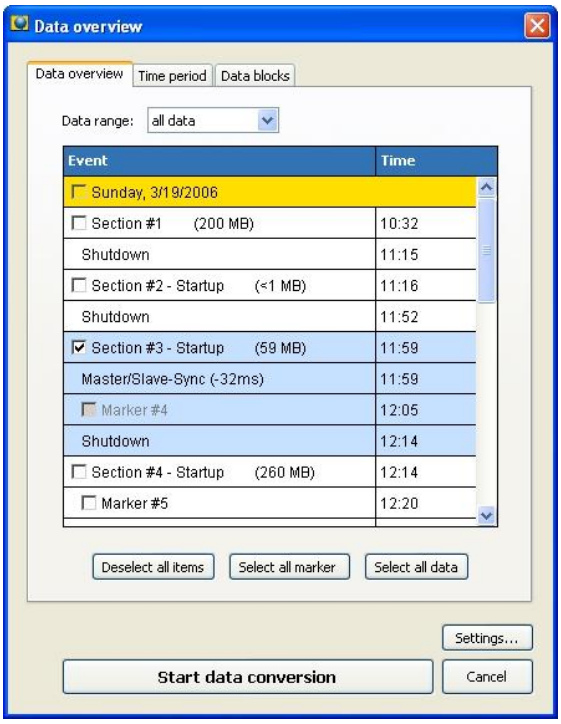

Figure 39: Event overview in cascading mode

Important: For correctly synchronized time stamps, both data loggers must be set to the same time zone (see 5.5.5).

5.5 Configuration

The shortcut “Configuration” in the start menu runs the blue PiraT configuration program (see Figure 40). This program allows displaying and modifying the settings of the data logger. After startup, the application downloads the configuration from the data logger and displays it. There is also the option to abort the connection process and load a locally stored configuration file (see 5.5.2). The configuration screens are sorted by categories. The available categories are displayed in a tree on the left side of the dialog. Selecting one of these categories displays the appropriate panel in the left hand side of the dialog. At bottom of the dialog, there are the following buttons:

- “Databases…”: Opens a dialog to configure the CAN databases (see chapter 5.5.1).
- “Default configuration”: Resets all settings shown in the window to factory defaults. The configuration must be send to the data logger (“Write to data logger”) to be applied.
- “Load locally…”: Loads all settings from a file (see chapter 5.5.2).
- “Save locally…”: Saves all settings to a file (see chapter 5.5.2).
- „i“: Shows a dialog with program information.
- „Read from logger“: Reads all settings from the data logger and displays it in the dialog.
- „Write to logger“: Writes all settings to the data logger. The data logger applies the new settings immediately (Exception: The settings for cascading are applied at the next startup of the data logger).
- „Quit“: Exits the configuration program without sending the settings to the data logger. Unapplied changes to the configuration are lost.
-

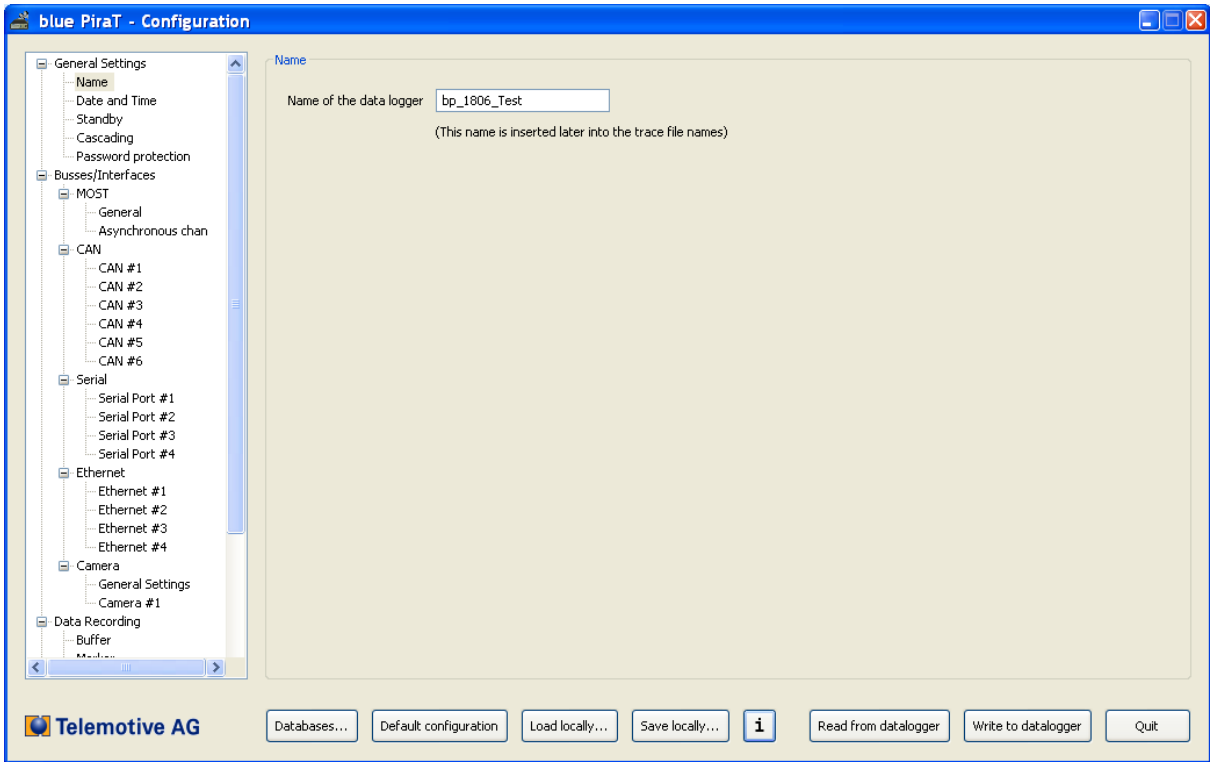

Figure 40: Configuration application

5.5.1 Using CAN databases for Configuration

It is possible to adjust certain settings using CAN databases. The button „Databases…“ opens a dialog, which allows to configure the mapping of CAN channel to CAN database (see Figure 41). Via the combo box of a channel it is possible to quickly select previously used databases or to disable the use of databases for this channel. The file icon on the right side of the combo box opens a file selector to choose a database in the file system.

Note: The mapping of databases to channels is saved locally, not in the data logger.

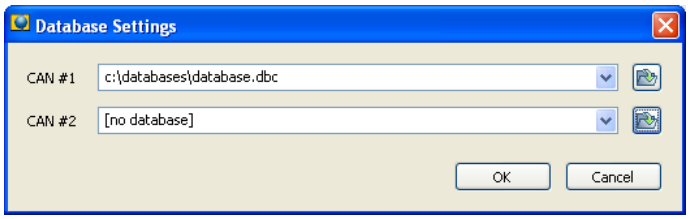

Figure 41: Configuring the CAN databases

5.5.2 Saving and Loading the Configuration Locally

Two buttons on the bottom of the dialog allow loading the configuration from a local file and saving the configuration to a local file. This function helps applying the same configuration to several data loggers:

1. Setup the desired configuration of one of the data loggers
2. Save this configuration to a local file, e.g. “defaultconfiguration.ini”, by using the button “Load locally…”
3. For the remaining data loggers, load this file by using the button “Save locally…” and apply the configuration to each device by using the button “Write to logger”

5.5.3 Data Logger Name

Figure 40 shows the dialog for data logger name. It is not required to set the name of the data logger, however, it is useful to indicate the origin of the trace data this way, since this name is included in the file name of the trace files. For example, the name could be the license plate number of a vehicle in which the data logger is fitted.

5.5.4 Network Settings

Please first read chapter 5.3 before changing these settings.

Figure 42 shows the dialog to modify the data logger’s network settings.

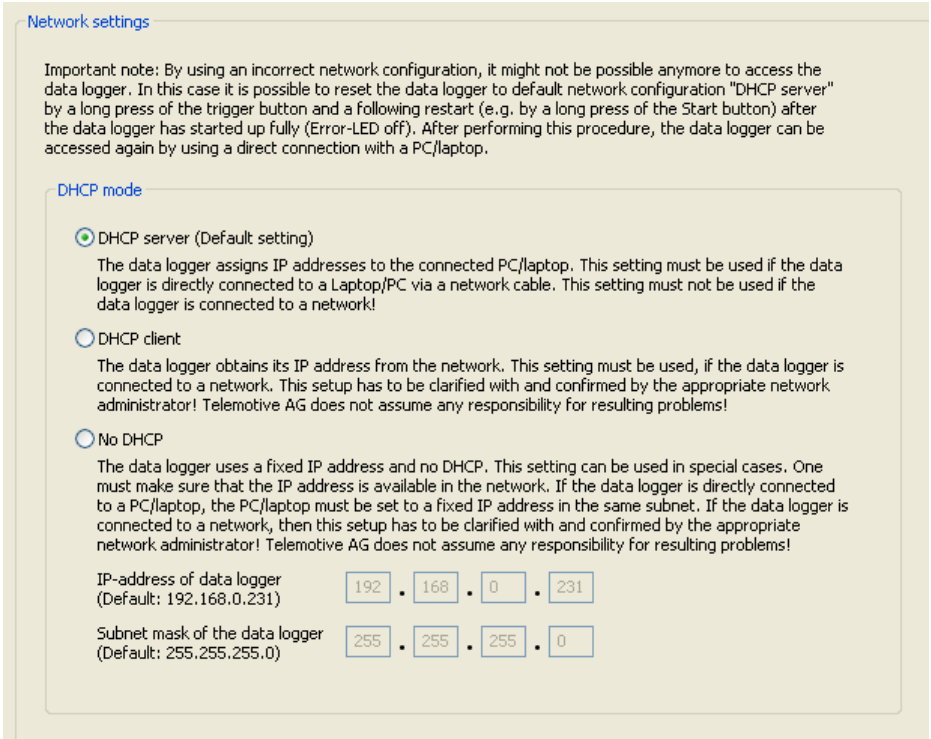

Figure 42: Configuration – network settings

There are three DHCP modes available:

- DHCP server (default setting): The data logger assigns IP addresses to the connected PC/Laptop. This mode must be used if the data logger is directly connected to the PC/Laptop. When using this mode, the data logger must not be connected to a network!
- DHCP client: The data logger receives its IP address from the network. This setting must be used if the data logger is connected to a network.
- No DHCP: The data logger uses a fixed IP address and no DHCP. This setting must only be used in special cases. One must make sure that the given IP address is not used by any other device in the network.

If the mode “No DHCP” is chosen, the IP address and the subnet mask must be entered below.

Important: If Terminal license is installed on the data logger, it is not possible to reach and change the network setup. The data logger is automatically configured as DHCP client.

5.5.5 Date and Time

After choosing "Date and Time" in the selection tree, the settings regarding the internal clock of the data logger appear (Figure 43). The first two settings regard the time zone of the data logger and enabling the automatic daylight savings adjustment (for more information, see chapter 2.3.7).

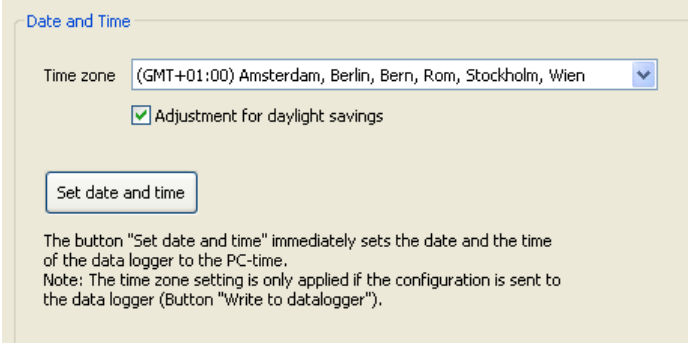

Figure 43: Configuration – date and time settings

If the latter checkbox is selected, then the data logger automatically switches between summer and winter time, without the need to adjusting the clock manually.

Below, clicking the “Set date and time” button sets the date and time of the data logger’s real-time clock to the date and time of the PC. This function is identical with the one of the data transfer program (see chapter 5.4.2). Note: When executing this function, the currently chosen time zone above is not applied. It is only applied when using the button "Write to data logger".

5.5.6 Standby Settings

The standby settings provide the setup of the shutdown condition of the data logger (see Figure 44). Currently, the only condition is the data timeout. If the data logger does not receive any data and MOST light is off during this timeout, it shuts down and enters standby mode. If a network cable is connected with active link, a separate value for the timeout can be specified. For example, if a PC/Laptop is connected, the value could be increased to ensure that the data logger stays active a longer time. It is also possible to deactivate the automatic standby. For more information about the power management, see chapter 2.3.4

Warning – automatic standby should only be deactivated if the data logger is connected to a sufficient power supply. If the data logger is supplied by the car battery, the battery might be discharged quickly, resulting in insufficient charge for crank-up of the engine.

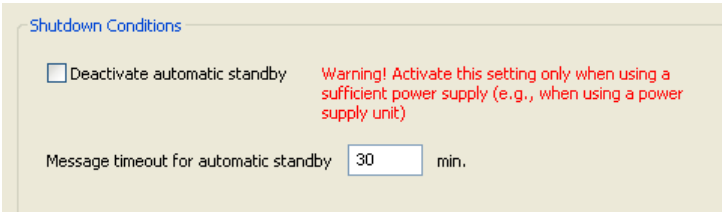

Figure 44: Configuration - standby settings

5.5.7 Cascading Settings

The cascading settings allow to deactivate cascading (normal case for single loggers) or to designate the data logger as the master or the slave (see also chapter 2.4).

Important: If the cascading mode has just been activated through the configuration program, the synchronization is activated only at the next startup.

To allow for different channel numbers of the master and the slave, it is possible to specify an offset for the slave. The channel numbers of the CAN-channels and the serial channels are corrected by this offset.

Warning – Please make sure that the data logger name of the master and the slave are different (in the general configuration). Otherwise equal file names might be created for the master and slave trace files, which could cause an overwriting of the trace files.

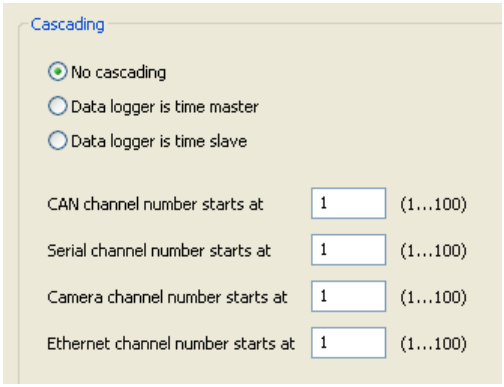

Figure 45: Configuration – cascading settings

5.5.8 Password Protection

The logger's trace data can be protected against unauthorized access (Figure 46). It is possible to activate and deactivate the password protection. No protection is the default setting. On active password protection, all client programs can only be used after entering this password (except the password settings themselves). The data recording is totally independent from the password settings. Changing an existing password requires entering the current password. It is always possible to deactivate the password protection.

Warning – Deactivating the password protection deletes all trace data on the data logger

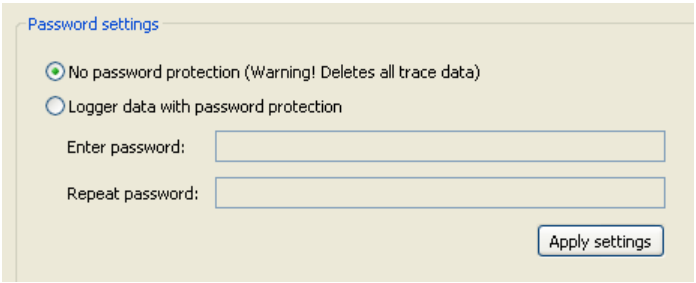

Figure 46: Password protection

Figure 47: Enter password

5.5.9 Configuration with XML bus list

If on the computer is used the tool CARMEN and also the bluePiraT Client, in the blue PiraT Client an additional switch appears. This checkbox is called: Configuring with CARMEN bus list. If this checkbox is activated the name of the configured bus is taken from the buslist specification of the CARMEN tool automatically.

5.5.10 MOST25 Settings

By using the MOST general settings (see Figure 48), the MOST25 signal regeneration mode can be enabled or disabled (see also 3.2). It is also configurable if certain erroneous messages that are usually not recorded are included into the trace. These are messages with parity errors and control channel messages with invalid arbitration. It is recommended to leave these two options generally inactive. The settings related to the MOST25 asynchronous channel are found on the next page. Firstly, they allow for the activation and deactivation of the recording of the asynchronous channel.

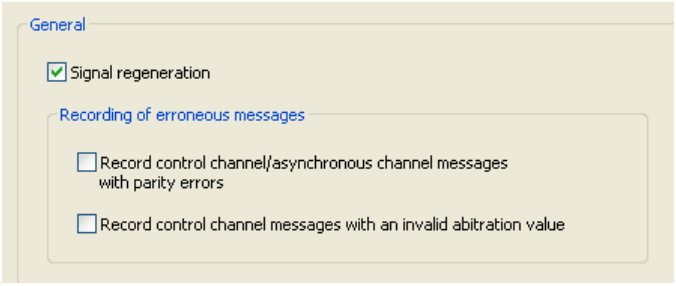

Figure 48. Configuration – MOST settings (General)

Secondly, it is possible to enable or disable the logging of the MOST asynchronous channel and to specify the highest accepted arbitration value for asynchronous messages, which is set to 0x1F by default (all messages with a higher value are not recorded, see also 3.2.3).

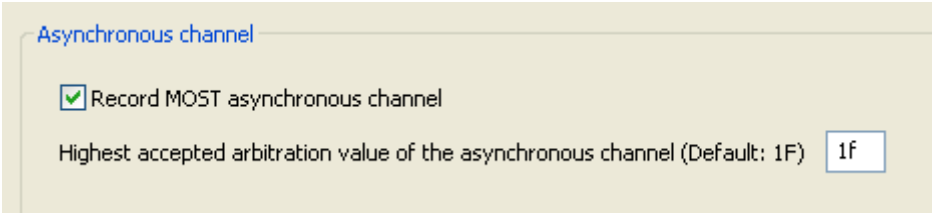

Figure 49. Configuration – MOST settings (Asynchronous channel)

5.5.11 CAN Settings

Each CAN interface can be activated or deactivated (see Figure 51). There is no data recorded from inactive CAN interfaces. Furthermore, a name can be assigned to each CAN interface, which is later added to the filenames of the trace files for easier identification. Finally, the baudrate and type (low speed/high speed) of the CAN bus are adjustable. There is also a checkbox to enable or disable the acknowledge of the CAN transceiver of type high speed. (Note: If the acknowledge is disabled, the transceiver cannot send CAN messages for the marker confirmation as shown in Figure 57). The Acknowledge of transceiver of type low speed can not be deactivated.

Alternatively to specifying the baudrate, it is possible to configure the CAN bit-timings directly by specifying the chip parameters. To do so, the radio button “Chip-Parameters” has to be selected. The chip parameters are given by two Byte, which are explained in Table 15. The timing parameters refer to the base clock, which is shown below the BTR input fields. The prescaler BRP defines the length of the time quantum TQ. A bit time is subdivided into four segments: SYNC, TSEG1, and TSEG2 (s. Figure 50). SYNC is always 1 TQ long. TSEG1 and TSEG2 are given as multiples of TQs.

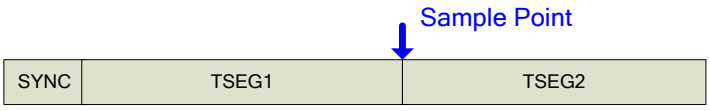

Figure 50. CAN bit timing

BTR1							
7	6	5	4	3	2	1	0
0	TSEG2			TSEG1			

BTR0							
7	6	5	4	3	2	1	0
SJW		BRP					

Parameter	Range	Description
BRP	0…63	Baud Rate Prescaler. The base clock is divided by 2 * (BRP + 1), resulting in the base unit for the timing, the so-called “time quantum” TQ
TSEG1	2..15	(TSEG1 + 1) is the number of time quantums before the sample point
TSEG2	1..7	(TSEG1 + 1) is the number of time quantums after the sample point
SJW	0…3	(Re) Synchronization Jump Width. Adjust the bit time by maximum (SJW + 1)

Table 15. CAN bit timing parameters

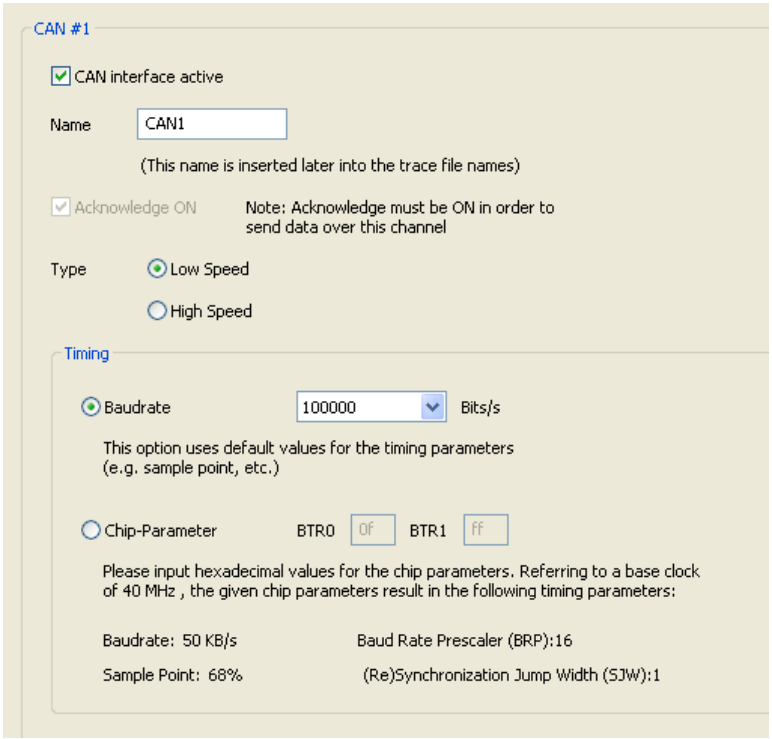

Figure 51. Configuration – CAN settings

5.5.12 Serial Port Settings

Figure 52 shows the serial port settings. The usual properties of the serial ports are configurable: Baudrate, number of data bits, number of stop bits and the parity setting.

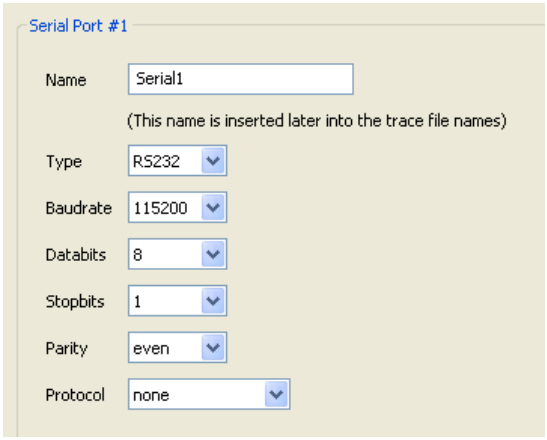

Figure 52. Configuration - serial port settings

It is possible to assign a name to the serial ports as well. For data loggers of hardware 1.5 and higher, the transceiver type of the serial port can be switched between RS232 and RS422. Finally, it is possible to enable certain proprietary protocols:

- GN-Log
- Trace Client

Warning – if one of these protocols is selected, the data logger sends data via the serial port!

5.5.13 FlexRay Settings

Figure 53 shows the panel for the general FlexRay configuration. The FlexRay bus configuration is not entered directly via the configuration program. Instead, it is necessary to import them from a file. Internally, the data logger uses the so-called CHI-format.

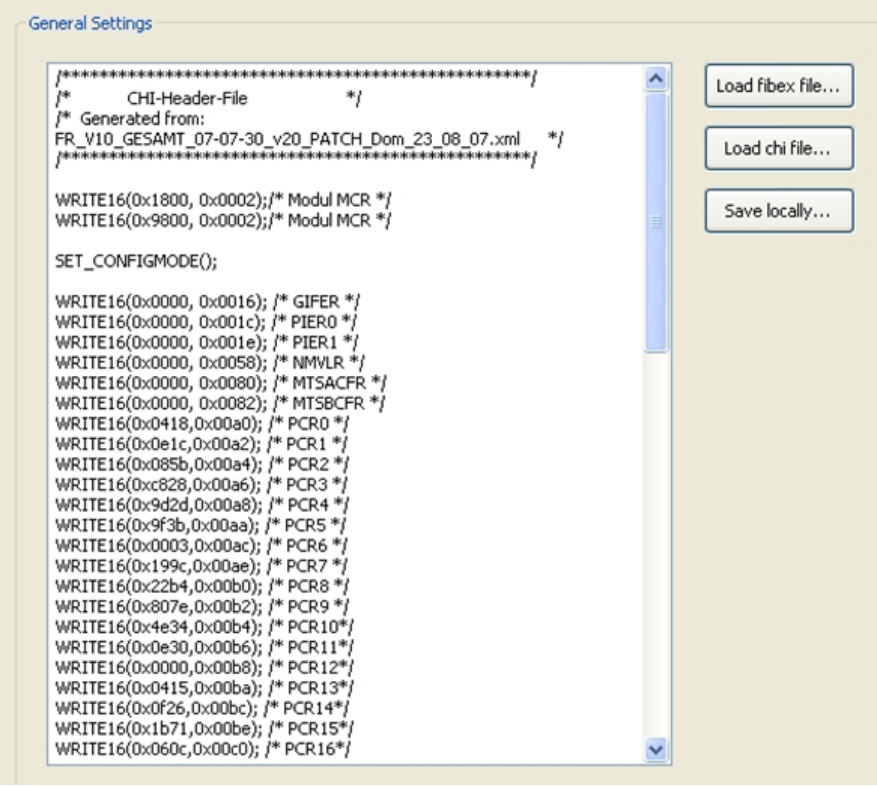

Figure 53: Configuration – general FlexRay settings

If a CHI-file is available, it can be loaded through the button "Load chi file…" (Note that this CHI-file must be suitable for the MFR4310 controller). Alternatively, the settings can be imported from a Fibex XML-file. In this case, the required FlexRay bus parameters are extracted and converted into

the CHI-format. To check the parameters, they are shown in a text box. When the configuration is sent to the data logger, the settings shown in the text box are used for FlexRay bus configuration.

Furthermore, there are specific settings for each bus. Currently, it is possible to assign a name to each FlexRay channel, which is later added to the filenames of the trace files for easier identification.

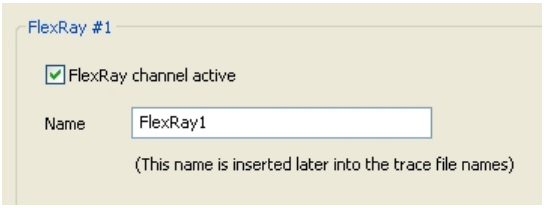

Figure 54: Configuration – FlexRay channel settings

5.5.14 LIN Settings

Each LIN interface can be configured as active or inactive. Only data from active interfaces is recorded. Furthermore, a name can be assigned to each LIN interface, which is later added to the filenames of the trace files for easier identification.

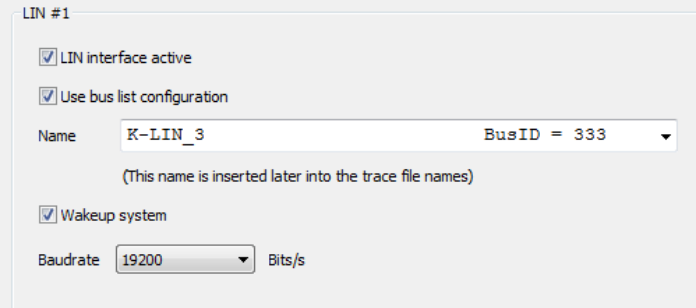

Figure 55: Configuration – LIN settings

Below, the wakeup can be enabled or disabled (see also Figure 55: Configuration – LIN settings) and the baud rate can be chosen from the following list: 2400, 9600, 19200 bit/s.

5.5.15 Data Recording Settings

The category “Buffer” allows enabling and disabling of the circular buffer mode (see Figure 56).

If the hard drive space runs out and the circular buffer mode is active, the oldest data is overwritten by new data. If it is not active, data logging is just stopped until data is deleted from the data logger. However, data designated by markers can be protected against being overwritten. This feature is enabled via the checkbox “Protect data of a marker from being overwritten”. The length of this data block is specified below. The protected data block begins either at a fixed time before the marker time, or at the last startup before the marker. Equivalently, the data block ends a fixed time after the marker time, or at the next shutdown of the data logger. Note: If a time is given as the data block end, and the data logger shuts down before this time, then the marker data protection ends with the shutdown of the data logger.

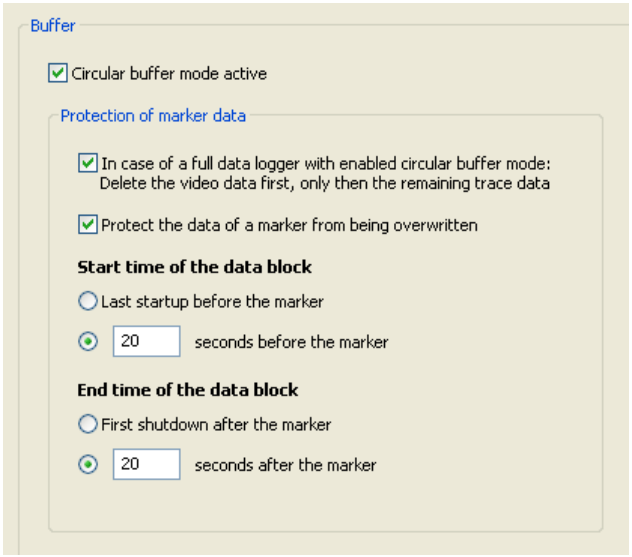

Figure 56: Configuration - data buffer settings

5.5.16 Marker Settings

The CAN messages related to markers are configured as shown in Figure 57. First, it is possible to trigger a marker when receiving a certain CAN message, specified by its ID and its data bytes. If a CAN database is configured for this channel, the CAN-ID is resolved to the message name. Additionally it is possible to specify a mask. The trigger condition is:

(*Received data byte*) BITWISE AND (*Mask byte*) = (*Desired data byte*)

Second, it is possible to send a CAN message as the confirmation of setting a marker. Equivalently, the ID and data bytes of this CAN message are specified in this panel.

Warning – using this function can influence the vehicle's network significantly. By using this function one must be aware of the consequences of sending the specified CAN message.

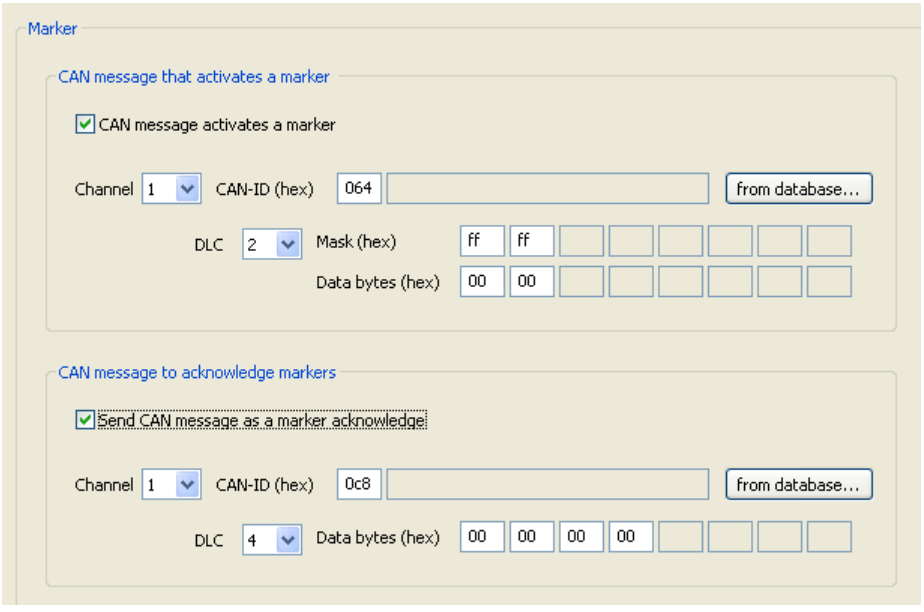

Figure 57: Configuration - marker settings

To avoid entering the hexadecimal value directly, a CAN database can be used instead. The appropriate dialog (see Figure 58) is opened via the button „from database…“.

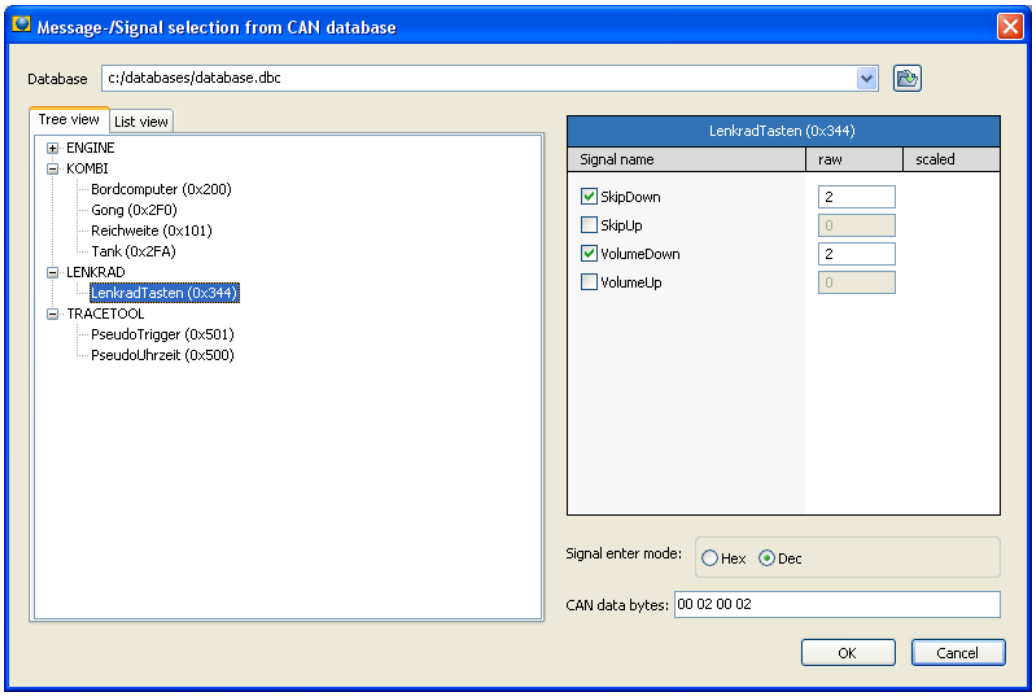

Figure 58: Configuration – CAN message/signal selection via database

At the top of the database selection dialog, the currently used database is shown in a combo box. Via this combo box it is possible to quickly select previously used databases or to disable the use of databases for this channel. The file icon on the right side of the combo box opens a file selector to choose a database in the file system. The panel on the left hand side shows the available CAN messages, either in a tree view (sorted by sending nodes) or in a list view. In the list view it is possible to sort the list by CAN-ID, by node name or message name by clicking on the appropriate column title. If a message is selected in the tree or list view, the panel on the right hand side shows all signals of this CAN message. The desired values for a signal can be entered into the input field next to the signal name. There is the choice of using the input field for the raw value or the input field for the scaled logical value. Below the signal panel, there is an input field with the currently input CAN data bytes. The input field allows entering the CAN data bytes directly. When using this method, the input fields of the signals are updated accordingly. If the dialog was opened to select the marker trigger message, each signal additionally contains a checkbox. The data logger uses only signals with selected checkboxes when examining CAN messages for the trigger condition.

5.5.17 CAN Filter Settings

The blue PiraT provides online filters for the CAN and MOST busses to reduce the amount of recorded data. The CAN filter can be adjusted separately for each channel. The filter can be activated or deactivated via a checkbox (s. Figure 59).

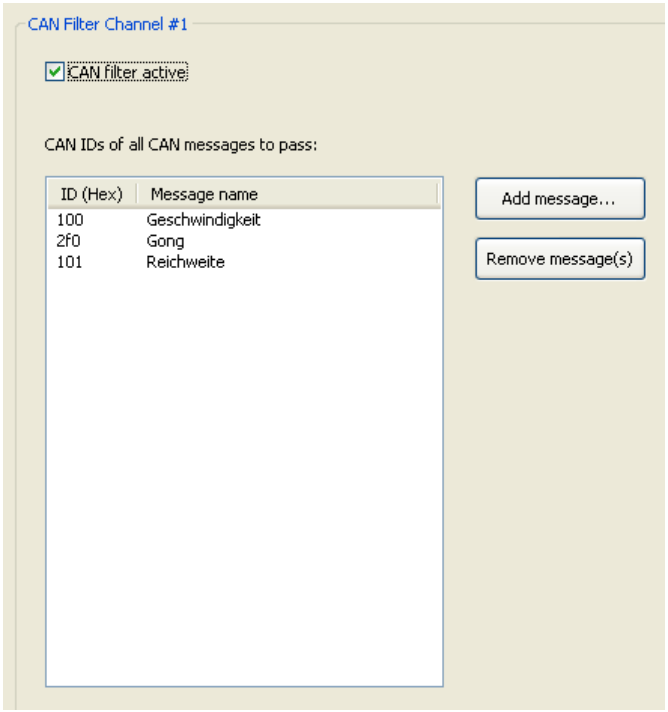

Figure 59: Configuration - CAN filter settings

Below this checkbox, there is a list of CAN-IDs in hexadecimal format along with their message names (only if a CAN database is supplied). If the filter is active, only CAN-IDs that are part of this list pass the filter. The button “Add message…” opens a new dialog that allows selecting CAN messages (see Figure 60). At the top of the database selection dialog, the currently used database is shown in a combo box. Via this combo box it is possible to quickly select previously used databases or to disable the use of databases for this channel. The file icon on the right side of the combo box opens a file selector to choose a database in the file system. The panel on the left hand side shows the available CAN messages, either in a tree view (sorted by sending nodes) or in a list view. In the list view it is possible to sort the list by CAN-ID, by node or message name by clicking on the appropriate column title. Messages are added to the filter by double-click on a message or by selecting one or more messages and clicking the button “Add”. Multiple messages can be selected by clicking on the first message, holding the SHIFT key and clicking on the last message.

Messages are removed from the filter list by selecting them in the filter list and using the button „ Remote message(s)“. Multiple messages can be selected by clicking on the first message, holding the SHIFT key and clicking on the last message.

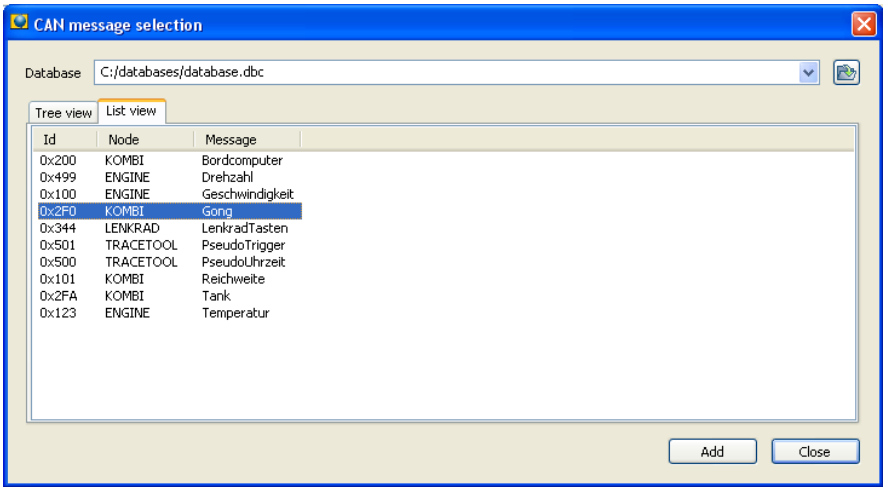

Figure 60: Configuration – selecting CAN filter messages

5.5.18 MOST Filter Settings

The MOST filter is configured by a list of filter entries, where each entry specifies a set of messages that should pass (s. Figure 61). The fields „Sender ID“, „Receiver ID“, „FktBlk ID“, „InstID“, „Fkt ID“ und „OpType“ are either filled in with a value or left blank (which means: “don’t care”). For example, the filter in Figure 61 lets all status messages pass, that are sent by node 100 to nodes 101 or 102.

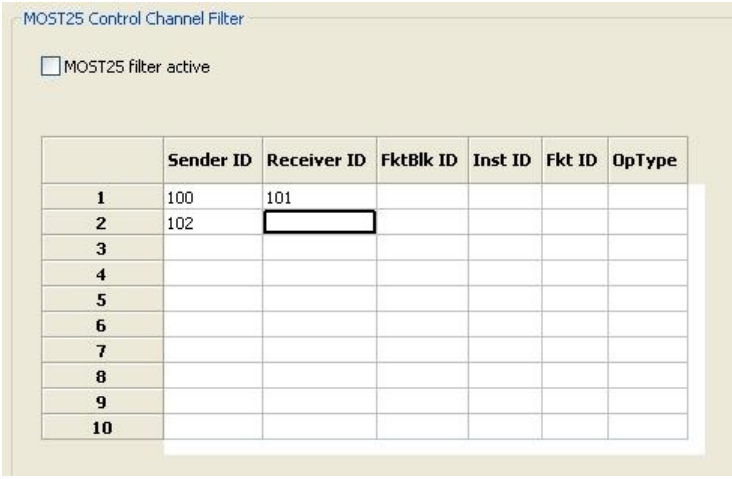

Figure 61: Configuration - MOST filter settings

5.5.19 MOST150 Settings

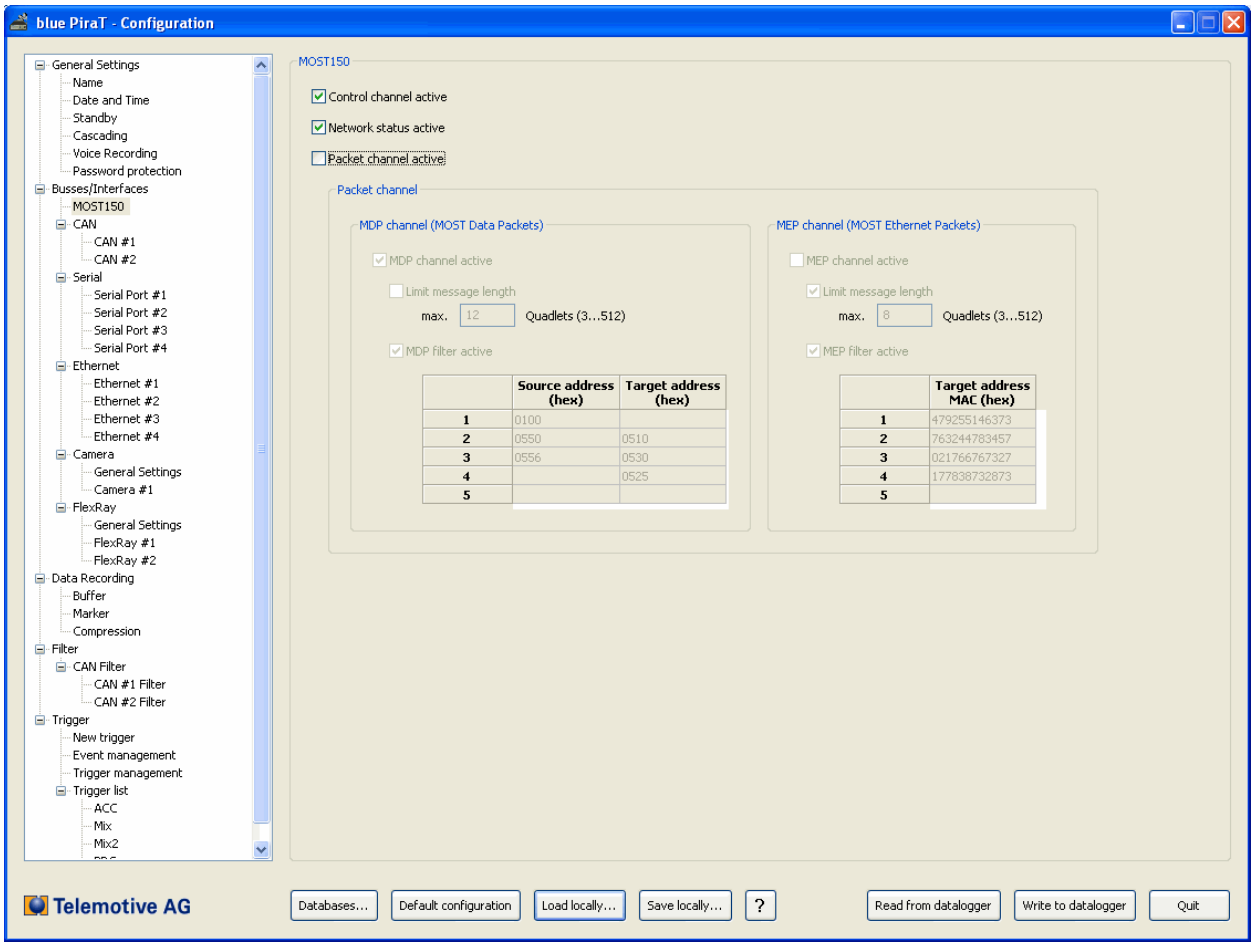

Figure: 62: MOST150 Configuration

The Figure above shows the configuration page of the client application .There are three checkboxes for activating control messages, status network information and packet messages.

By activating the checkbox for the packet channel the configuration for MDP and MEP messages are enabled. If the checkbox for packet channel is deactivated, no packet messages are logged. This is displayed in the client by a grey background of the configuration screen. If the checkbox is activated again, the last configuration will be recovered.

If neither MDP (MOST data packages) nor MEP (MOST Ethernet packages) channel is activated, there will be no packet channel message recorded.

MDP Channel

If MDP channel is activated all messages are logged, when the limitation of the message length and the MDP filter are deactivated. By using „filter“ or „limiting the message length“ the logged data can be reduced without losing the necessary data information. If reduction of the message length is enabled, the messages are cutted by the defined „quadlet“ length.

Up to 5 pass-through filters can be used for MDP packages. If a source and a target address is specified, all messages send from the source-ECU‘s (electrical units) to the target ECU are logged. When only the target address is set, all messages to this target device are logged. All messages which are sent from the source device are logged when only a source address is specified.

MEP-Channel

The configuring of the MEP channel function only differs by using the “filter” functions. The MEP channels have only a target address.

The following part of the figure shows of the configuration screen of the MOST150 client with activated MDP channel, inactivated message length limitation and 4 active filters.

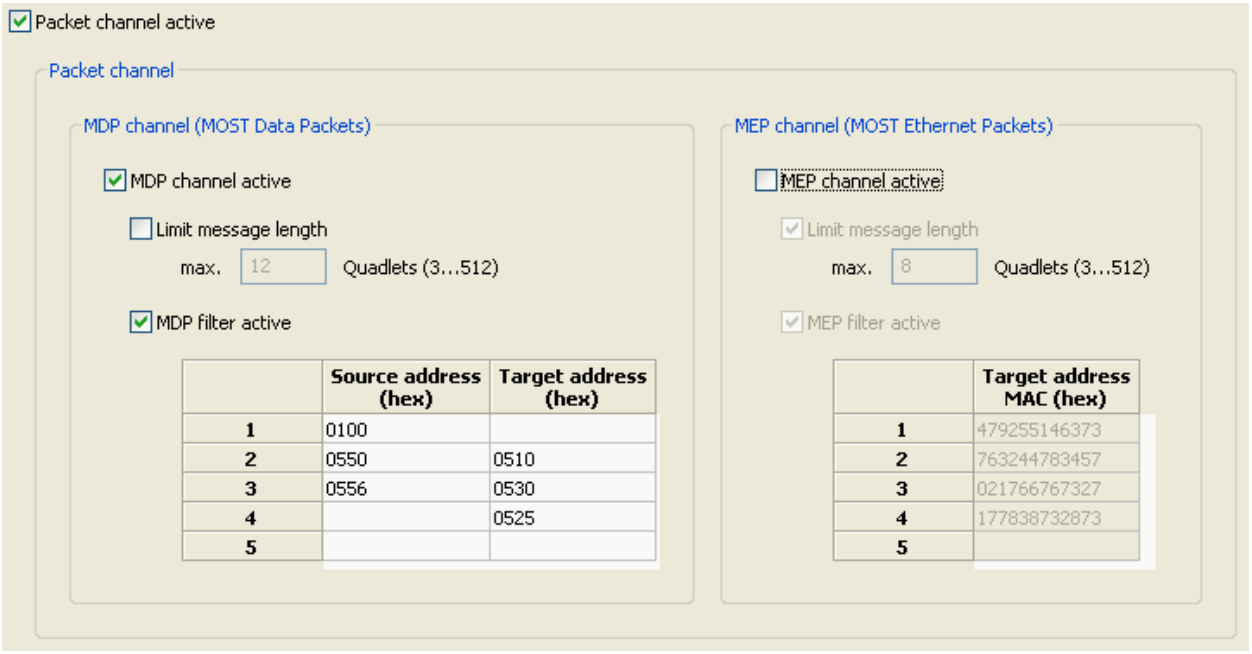

Figure 63: MOST150 Packet Channel

All messages, which are sent from the source device with address 0x100, are logged. Also messages which are come from source ECU 0x0550 to target ECU 0x0510 and 0x0566 to 0x0530 will be logged as well as all messages with the target address of 0x0525.

All this messages are logged with full length. If checkbox „Limit message length“ would be activated, all messages would be cutted after 12 quadlets.

5.5.20 MOST50 Setup

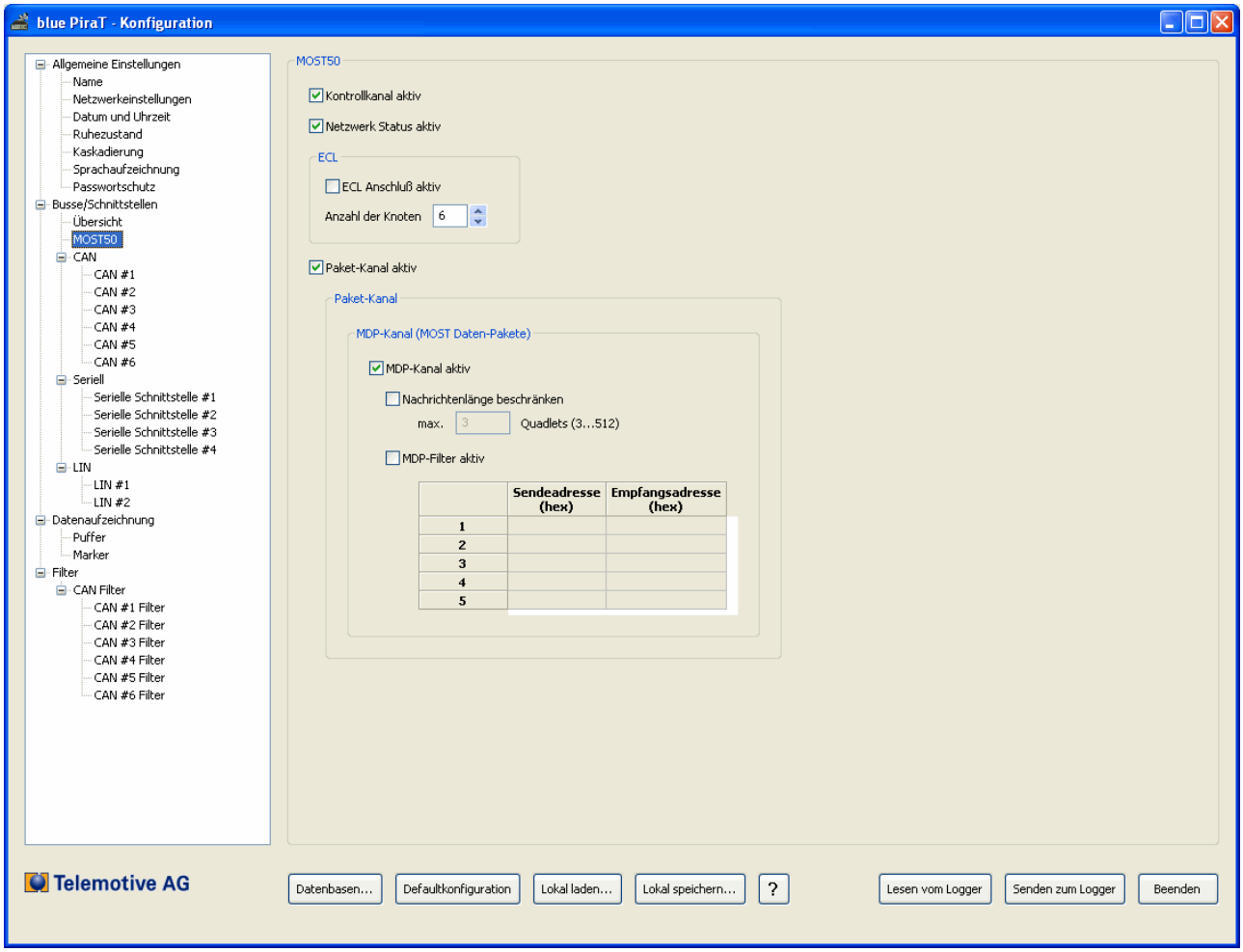

Figure 64: MOST50 Configuration

The Figure above shows the configuration page of the client application .There are three check-boxes for activating control messages, status network information, ECL and packet messages.

By activating the checkbox for the packet channel the configuration for MDP messages are enabled. If the checkbox for packet channel is deactivated, no packet messages are logged. This is displayed in the client by a grey background of the configuration screen. If the checkbox is activated again, the last configuration will be recovered.

If MDP (MOST data packages) channel is not activated, there will be no packet channel message recorded.

MDP Channel

If MDP channel is activated all messages are logged, when the limitation of the message length and the MDP filter are deactivated. By using „filter“ or „limiting the message length“ the logged data can be reduced without losing the necessary data information. If reduction of the message length is enabled, the messages are cutted at the defined „quadlet“ length.

Up to 5 pass-through filters can be used for MDP packages. If a source and a target address is specified, all messages send from the source-ECU‘s (electrical units) to the target ECU are logged. When only the target address is set, all messages to this target device are logged. All messages which are sent from the source device are logged when only a source address is specified.

Streaming Channel

The check box for the streaming channel has to be activated, if steaming data should be recorded.

But it is absolute necessary to take care that the reserved size of the steaming channel has to be

‘n * 2 + 1’ Byte bigger than the maximum transmitted bytes in the streaming channel. Where n is the maximum count of ‘channel labels’. This is necessary do to the limited band with of the I2S

channel. The additional number of bytes are required for transmit the header of the streaming data. Otherwise it would be possible that streaming data could be lost.

5.6 Firmware/License Update

Telemotive AG provides data logger firmware updates for bug fixes and feature extensions. The shortcut „Update Firmware/Licenses“ starts the firmware/license update application, which reads the version numbers of the hardware and the currently installed firmware from the data logger and displays it in a window along with activated licenses (see Figure 65). The button “Details…” opens a new window that displays the mainboard number and component version numbers (see Figure 66).

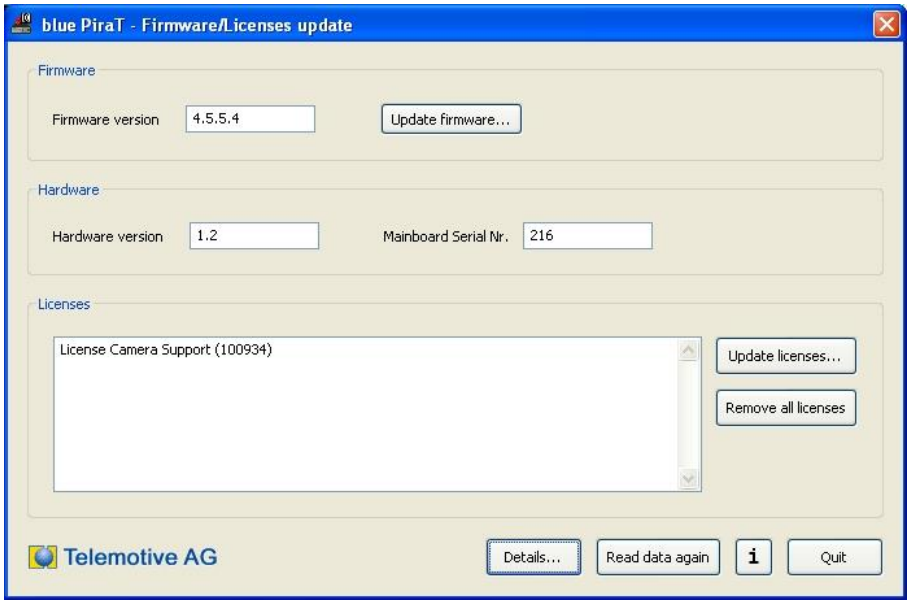

Figure 65: Firmware update

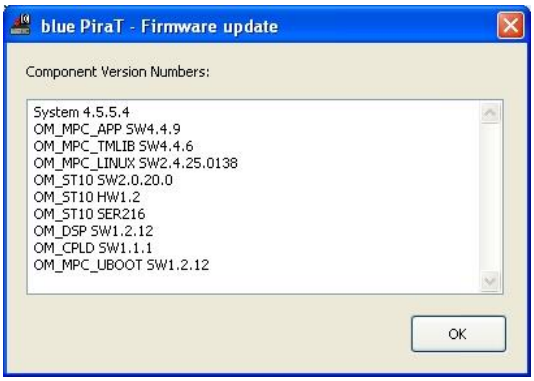

Figure 66: Main board serial number and component version numbers

5.6.1 Firmware Update

The software running on the blue PiraT data logger is called "firmware". The firmware is constantly improved and extended by new features. All customers that have access to the blue PiraT Service Center (s. appendix A) automatically receive notification e-mails if a new firmware version is available.

Warning: The firmware update process deletes all trace data on the data logger!

Warning: For safety reasons, the firmware update must not be done while driving!

The button “Update firmware…“ opens a dialog, where the firmware data file can be selected. Telemotive AG provides a single file that contains the entire data logger firmware, e.g.:

```
blue_PiraT_FW_5.1.3_HW1-2.dat
```

Important: Always make sure that the hardware version designated in the firmware file matches the hardware version of the data logger, as shown on the device label.

After an confirmation prompt (see Figure 67), the update starts. A dialog displays the current steps and the progress of the update (see Figure 68).

Important: During the firmware update of the data logger, the data logger must be safely connected to the PC and the power supply. The power supply must not be switched off! In case the data logger has been disconnected anyway during the firmware update, it might be possible to repeat the firmware update successfully. Please contact Telemotive support if the firmware update fails repeatedly.

Figure 67: Dialog box “Start the firmware update”

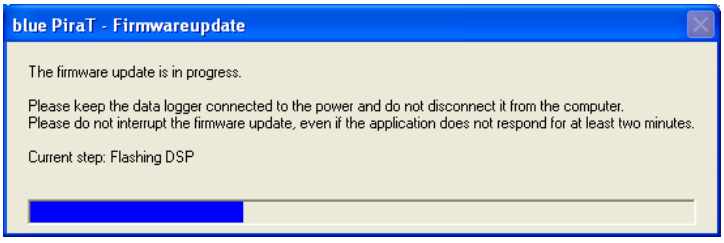

Figure 68: Progress display during the firmware update

Note: Data Logger with HW1.x will not be supported anymore. The last official firmware is firmware 6.5.2

5.6.2 License Update

Certain features of the blue PiraT system must be purchased as licenses. The client lists all licenses that are installed on the logger (see Figure 65). To install a new license on the logger, choose "Update licenses…" and select the license file that was provided to you by Telemotive AG. If a cor-

rupt license file is installed, the error LED starts flashing. The button “Remove all licenses” allows to remove all licenses from the data logger.

5.7 The Bug Reporter

Despite careful development, one cannot avoid programming errors of a complex product like the blue PiraT. The bug reporter is an application that collects information that supports the error analysis of the Telemotive AG development team. For this purpose, the application gathers data from the data logger and the local hard drive (only from the blue PiraT Client install directory) and creates a zip archive from it. This zip archive should be sent to Telemotive AG (bluepirat@telemotive.de) for analysis. This helps improving the blue PiraT consistently.

A shortcut of the bug reporter is located in the blue PiraT folder of the start menu. After startup, a welcome dialog appears (see Figure 69). The user has the following options for the included data:

- Only Client data: Only includes data from the local machine (only files from the directory *C:\Documents and Settings\<User name>\Application Data\blue PiraT Client* are included). This option can be used if the data logger cannot be accessed anymore.
- Client and data logger without trace data: This is the standard option. It includes client and data logger logs and configuration files, but does not include trace data.
- Client and data logger with all trace data: Includes all raw trace data in the bug report. In most cases, this leads to a huge zip archive, which cannot be sent by email. Additionally, the creation of the bug report can take much longer. For these reasons, this option should only by used when requested by the blue PiraT support team.
- Client and data logger with trace data of time period: To avoid a possible huge zip archive when including all trace data, one can store only the raw trace data of a specific time period in the bug report.

The option “File system check” is not obligatory. Deactivating this option speeds up the creation of the bug report significantly. After clicking on “Start data collection…“, a dialog for entering details about the problem appears (see Figure 70). Please note that the fields designed by (*) are required fields, and that a detailed error description supports a speedy analysis of the problem. After selecting "OK", a file selector for choosing the target zip file is shown. After the desired file name and location is chosen (please stick with the default file name), the bug reporter starts gathering the required data. A dialog displays the progress during this operation (see Figure 71). After the creation of the zip file is completed, the zip file should be sent to bluepirat@telemotive.de, e.g., as an email attachment.

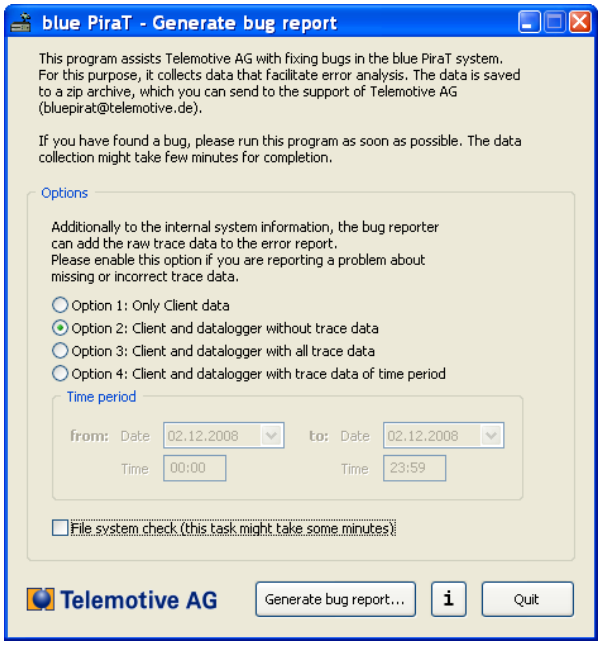

Figure 69: The bug reporter welcome dialog

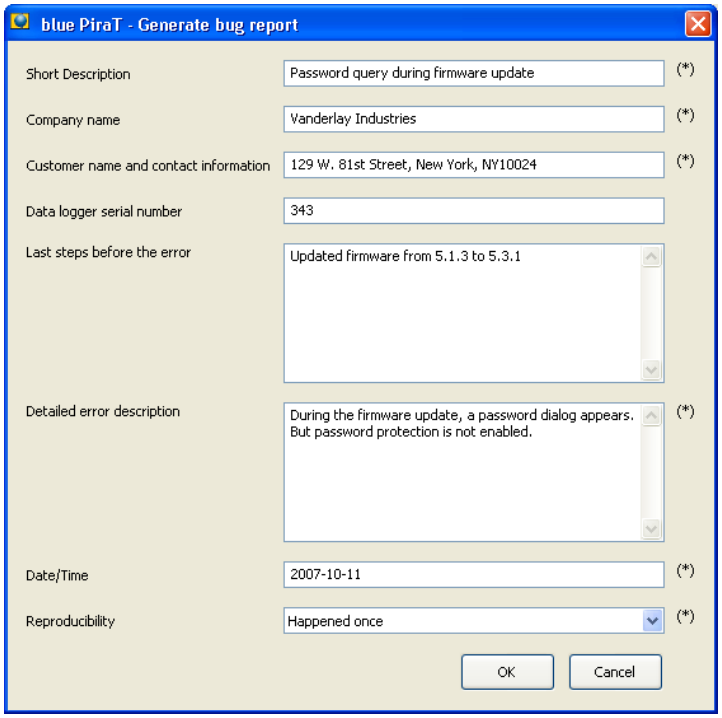

Figure 70: Entering the error description and reproducibility

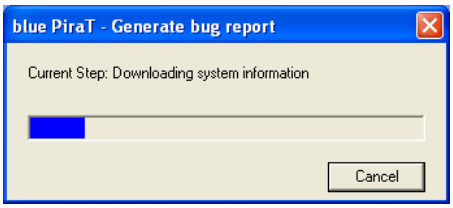

Figure 71: Progress display of the bug reporter

Appendix A. Support and Frequently Asked Questions („FAQs“)

If problems occur when using the blue PiraT system, please first consult this manual and the FAQ below. Software updates and further information is available in the blue PiraT Service Center at http://www.telemotive.de (Login required). If the problem persists, you can reach the support at bluepirat@telemotive.de (ideally including a bug report as described in 5.7).

Problems with the connection to the data logger

When opening the Windows Explorer or a file select box (e.g., for selecting the trace target directory), Windows hangs for a longer time.

This problem might occur if the PC has been connected to a network (e.g., the company's network), and is now connected to the blue PiraT. Windows still tries to access services of the network (e.g., network drives), does not find them and hangs for some time. Disconnecting and reconnecting the network cable will unblock the PC in this case. A long-term solution is to restart the PC without having the network cable plugged in.

The client is not able to establish a connection to the data logger.

Please first check the following:

- Is the data logger properly connected to the PC via a cross-over network cable? Please note that it is not possible to use a normal network cable or to connect the data logger via a hub, router or switch.
- Are the network settings configured to „„obtain the IP-address automatically“? (see chapter 0)

When switching the network cable from a network (e.g., the company's network) to the blue PiraT, Windows might fail to correctly establish the network connection. The network icon in the task bar gives information about the network status:

If the task bar shows this icon, the connection might be fixed by a right-click on the icon and selecting the „Repair“ option. Otherwise, please try deactivating and activating the network connection, as described in the following paragraph.

If the task bar shows this icon, please try deactivating and activating the network connection: a) right-click on the icon, b) select “Open network connections”, c) right-click on the “LAN connection”, d) select “deactivate”, e) wait for a short while, f) right-click on the “LAN connection”, d) select “activate”.

Problems with the data logger

The error LED stays on longer than 10s.

Please check if it is still possible for the Client to connect to the data logger (e.g., by opening the data overview). In this case the problem might be a corrupt configuration. To fix a possibly corrupt configuration, please make sure that you use the latest Client, open the configuration program and click on “Ok”. Doing these steps writes the configuration to the data logger. If this procedure does not help, please create a bug report and send it to the blue PiraT support team at bluepirat@telemotive.de.

If it is not possible for the Client to connect to the data logger, please contact the blue PiraT support team at bluepirat@telemotive.de.

Data is not recorded.

Please check the following:

- Are all cables correctly connected?
- Is the data logger correctly configured (e.g., baud rate, etc.)?
- Is the clock of the data logger set correctly? Does the time zone of the PC that has been used to set the clock match with the time zone of the PC that has downloaded the data?
- Are the correct channels activated in the data download settings?

- Are the correct file formats selected in the data download settings?

Appendix B. Technical Data (Standard Version)

General Data

Nominal power supply voltage	11,5V – 14V
Minimum supply voltage	9V
Overvoltage capability	17V (60min), 26V (60s)
Undervoltage capability	0 V – 9 V (< 2s)
Operating current	0,8 A (typ.)
Standby current	<1mA
Power backup	1.5s (with fully charged power backup)
Operating temperature	-4°F to 158°F (-20°C to 70°C) -4°F to 131°F (-20°C to 55°C) (blue PiraT with FlexRay)
Weight (ca.)	2.4 pounds (1,1kg)

Power Management

Startup time (Delay standby -> full operation)	max. 20ms

Case

Size (ca.)	6.65" x 6.73" x 2.05" (169 mm x 171 mm x 52 mm)
Operating controls	- Pushbutton to startup data logger - Pushbutton to set markers
Displays	- Active-LED: Displays data logger activity - Error-LED: Displays internal errors - Memory-LED (red): Displays memory warnings - CAN 1, CAN 2, and MOST activity LEDs - Marker confirmation LED
Connectors	Multi function connector (2 x CAN, 4 x serial port, external marker button), MOST, USB, Ethernet

Data Recording

Storage type	Hard drive 2,5"
Storage size	20/30/40 GB (actual models: > 80 GB)
Recording modes	Normal, circular buffer

Appendix C. Pin Assignments

Warning: Clamp 31 should be the only ground connection between the data logger and connected devices. Connecting signal ground lines is limited to special cases in which one can guarantee that ground loops cannot occur.

C1. Data Logger: Multi-Function Connector

Pin	Description	Pin	Description
1	Reserved	28	High speed CAN1_H
2	Reserved	29	Low speed MPC-CAN_H
3	Reserved	30	High speed CAN2_H
4	Reserved	31	Low speed CAN2_H
5	Reserved	32	RS232 #1 Tx
6	Reserved	33	RS232 #2 Tx
7	Digital input for complex triggers (against GND)	34	RS232 #4 Tx
8	Reserved	35	Clamp 30 (+12V)
9	External Marker Button (against GND)	36	GND Clock in/out
10	High speed CAN1_L	37	Reserved
11	Low speed MPC-CAN_L	38	Reserved
12	High speed CAN2_L	39	Reserved
13	Low speed CAN2_L	40	Reserved
14	RS232 #1 Rx	41	Reserved
15	RS232 #2 Rx	42	Reserved
16	RS232 #4 Rx	43	Reserved
17	RS232 #2/#4 Masse	44	Reserved
18	Clock out	45	Low speed CAN1_L
19	Reserved	46	Low speed CAN1_H
20	Reserved	47	Masse CAN1
21	Reserved	48	Masse CAN2
22	Reserved	49	Masse MPC-CAN
23	Reserved	50	RS232 #1/#3 GND
24	Reserved	51	RS232 #3 Rx
25	Reserved	52	RS232 #3 Tx
26	Digital output for complex triggers (against GND)	53	Clamp 31 (GND)
27	GND	54	Clock in

Table 16: Pin assignment of the multi-function connector (Hardware 1.2)

Pin	Description	Pin	Description
1	Reserved	28	High speed CAN1_H
2	Reserved	29	Low speed MPC-CAN_H
3	Reserved	30	High speed CAN2_H
4	Reserved	31	Low speed CAN2_H
5	RS422 #1 Rx+	32	RS232 #1 Tx
6	RS422 #2 Rx+	33	RS232 #2 Tx
7	RS422 #4 Rx+	34	RS232 #4 Tx
8	RS422 #3/#4 GND	35	Clamp 30 (+12V)
9	External Marker Button (against GND)	36	GND Clock in/out
10	High speed CAN1_L	37	Reserved
11	Low speed MPC-CAN_L	38	Reserved
12	High speed CAN2_L	39	Reserved
13	Low speed CAN2_L	40	Reserved
14	RS232 #1 Rx	41	RS422 #1/#2 GND
15	RS232 #2 Rx	42	RS422 #3 Rx+
16	RS232 #4 Rx	43	RS422 #3 Rx-
17	RS232 #2/#4 Masse	44	Digital input for complex triggers (against GND)
18	Clock out	45	Low speed CAN1_L
19	Reserved	46	Low speed CAN1_H
20	Reserved	47	Masse CAN1
21	Reserved	48	Masse CAN2
22	Reserved	49	Masse MPC-CAN
23	RS422 #1 Rx-	50	RS232 #1/#3 GND
24	RS422 #2 Rx-	51	RS232 #3 Rx
25	RS422 #4 Rx-	52	RS232 #3 Tx
26	Digital output for complex triggers (against GND)	53	Clamp 31 (GND)
27	GND	54	Clock in

Table 17: Pin assignment of the multi-function connector (Hardware 1.5, 1.6)

Pin	Description	Pin	Description
1	NC	28	High speed CAN1_H
2	Shield	29	Low speed MPC-CAN_H
3	NC	30	High speed CAN2_H
4	Shield	31	Low speed CAN2_H
5	RS422 #1 Rx+	32	RS232 #1 Tx
6	RS422 #2 Rx+	33	RS232 #2 Tx
7	RS422 #4 Rx+	34	RS232 #4 Tx
8	Shield	35	Clamp 30
9	External Marker Button (against GND)	36	GND Clock in/out
10	High speed CAN1_L	37	NC
11	Low speed MPC-CAN_L	38	Shield
12	High speed CAN2_L	39	NC
13	Low speed CAN2_L	40	Shield
14	RS232 #1 Rx	41	Shield
15	RS232 #2 Rx	42	RS422 #3 Rx+
16	RS232 #4 Rx	43	RS422 #3 Rx-
17	GND	44	Digital input for complex triggers (against GND)
18	Clock out	45	Low speed CAN1_L
19	NC	46	Low speed CAN1_H
20	Shield	47	Shield
21	NC	48	Shield
22	Shield	49	Shield
23	RS422 #1 Rx-	50	GND
24	RS422 #2 Rx-	51	RS232 #3 Rx
25	RS422 #4 Rx-	52	RS232 #3 Tx
26	Digital output for complex triggers (against GND)	53	Clamp 31 (GND)
27	GND	54	Clock in

Table 18: Pin assignment of the multi-function connector (Hardware 2.3, 2.4, 3.1)

Pin	Description	Pin	Description
1	NC	28	High speed CAN1_H
2	Shield	29	Low speed MPC-CAN_H
3	NC	30	High speed CAN2_H
4	Shield	31	Low speed CAN2_H
5	RS422 #1 Rx+	32	RS232 #1 Tx
6	RS422 #2 Rx+	33	RS232 #2 Tx
7	RS422 #4 Rx+	34	RS232 #4 Tx
8	Shield	35	Clamp 30
9	External Marker Button (against GND)	36	GND Clock in/out
10	High speed CAN1_L	37	NC
11	Low speed MPC-CAN_L	38	Shield
12	High speed CAN2_L	39	NC
13	Low speed CAN2_L	40	Shield
14	RS232 #1 Rx	41	Shield
15	RS232 #2 Rx	42	RS422 #3 Rx+
16	RS232 #4 Rx	43	RS422 #3 Rx-
17	GND	44	ECL input
18	Clock out	45	Low speed CAN1_L
19	NC	46	Low speed CAN1_H
20	Shield	47	Shield
21	NC	48	Shield
22	Shield	49	Shield
23	RS422 #1 Rx-	50	GND
24	RS422 #2 Rx-	51	RS232 #3 Rx
25	RS422 #4 Rx-	52	RS232 #3 Tx
26	Digital output for complex triggers (against GND)	53	Clamp 31 (GND)
27	GND	54	Clock in

Table 19: Pin assignment of the multi-function connector (Hardware 4.1)

C.2 Data Logger: CAN Extension Connector

1	GND
2	CANB_L
3	CANB_H
4	CANA_L
5	CANA_H
6	GND

Table 20: Pin assignment of the CAN extension connector

CAN channel A is marked with a red cable at Sub-D connector, CAN channel B is marked with white

C.3 Data Logger: LIN Extension Connector (blue PiraT 10C4L, 6C2L)

1	Shield (optional)
2	LIN B-Signal
3	LIN A-Signal
4	Shield (optional)

Table 21: Pin assignment of the LIN extension connector

C.4 Data Logger: FlexRay Extension Connector (blue PiraT 2C2FR)

1	FlexRay+ channel A
2	FlexRay- channel A
3	Shield
4	Shield
5	FlexRay+ channel B
6	FlexRay- channel B

Table 22: Pin assignment of the FlexRay extension connector

C.5 Adapter Cables: Serial Connectors

2	RS232 Rx
3	RS232 Tx
5	RS232 GND

Table 23: Pin assignment of the adapter cable's serial connector

2	RS232 Rx
3	RS232 Tx
4	RS422 GND
5	RS232 GND
8	RS422 Rx+
9	RS422 Rx-

Table 24: Pin assignment of adapter cable's serial connector (Option "RS422")

C.6 Adapter Cables: CAN Connectors

2	CAN_L
3	GND
7	CAN_H

Table 25: Pin assignment of the adapter cable's CAN connector

C.7 Adapter Cables: SWC (Single Wire CAN) Connectors

3	GND
7	CAN

Table 26: Pin assignment of the adapter cable's CAN connector

C.8 Adapter Cables: LIN Connectors

3	GND
7	LIN-Signal

Table 27: Pin assignment of the adapter cable's LIN connector

C.9 Adapter Cables: FlexRay Connectors

2	FlexRay-
7	FlexRay+

Table 28: Pin assignment of the adapter cable's FlexRay connector

C.10 Adapter Cables: ECL Connectors

2	ECL
7	GND

Table 29: Pin assignment of the adapter cable's FlexRay connector

Appendix D. Abbreviations

blue PiraT	**P**rocessing **I**nformation **R**ecording **A**nalyzing **T**ool
CAN	**C**ontroller **A**rea **N**etwork. Bus-System
ECL	**E**lectrical **C**ontrol **L**ine
LIN	**L**ocal **I**nterconnect **N**etwork. Bus-System
MOST	**M**edia **O**riented **S**ystems **T**ransport. Bus system for multimedia (www.mostnet.de)
SWC	Single Wire **C**AN
USB	**U**niversal **S**erial **B**us