we drive your ideas

blue PiraT Mini
User Manual
Version 2.1.1 – 26.11.2015

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3.   Overview

This user manual describes the administration of the newest generation of Telemotives data logger, called **blue PiraT Mini.**

In this manual you find a description the hardware as well as the general functions and interfaces of the blue PiraT Mini. The configuration and converting of the logged traces is described in the user guide of the Telemotive System Client which is for blue PiraT Mini and blue PiraT2 too.

This document refers to blue PiraT Mini firmware version 02.01.01 and blue PiraT Mini / blue PiraT2 client version 2.1.1. Some features depending on model and feature license or may not be available in older versions.

Software updates are frequently available in the Telemotive ServiceCenter. (You'll find the address under: Contact)

Please make sure to use always current firmware and software versions.

4.   System requirements

Control Unit
A Laptop or a PC is used to configure the devices by the Telemotive TSL client. This client also allows to save and convert the recorded data or to use them offline later.

blue PiraT Mini
The blue PiraT Mini is the newest data logger developed by Telemotive AG. It is the smallest data logger with this high capacity and flexibility due to the possibility to combine several devices to one complex network.

The communication of bus systems and control units are monitored and relevant data can be recorded very precisely with the blue PiraT Mini. The collected data are stored on the blue PiraT Mini and can be downloaded to a PC or network storage.

Telemotive System Client
The software **Client** of the blue PiraT Mini is needed to configure the data logger and later to download or convert the recorded data.

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4.1.   Manuals

Apart from this manual we offer the main manuals for our client as well as for the different data logger generations in our ServiceCenter at https://sc.telemotive.de/bluepirat

User manual for the Telemotive System client
https://sc.telemotive.de/4/uploads/media/TelemotiveSystemClient_UserManual.pdf

User manual for blue PiraT2 / blue PiraT2 5E
https://www.telemotive.de/4/uploads/media/blue_PiraT2_UserManual.pdf

User manual for blue PiraT Mini
https://www.telemotive.de/4/uploads/media/blue_PiraT_Mini_UserManual.pdf

Our licensed enhancements have own manuals which are stored in the ServiceCenter too. You will find a list of these enhancements in the user manuals in the chapter **Additional features by optional licensees**

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5.   The blue PiraT Mini system

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

8x	HS-CAN
1x	LS-CAN
8x	LIN
1x	MOST150
3x	FlexRay a/b
5x	serial
1x	ECL
2x	Broad-R-Reach®
4x	GB Ethernet/ TSL
1x	USB 2.0 Device / Host
2x	Analog-/Digital IN
2x	Digital OUT
1x	SD-Card

Ethernet
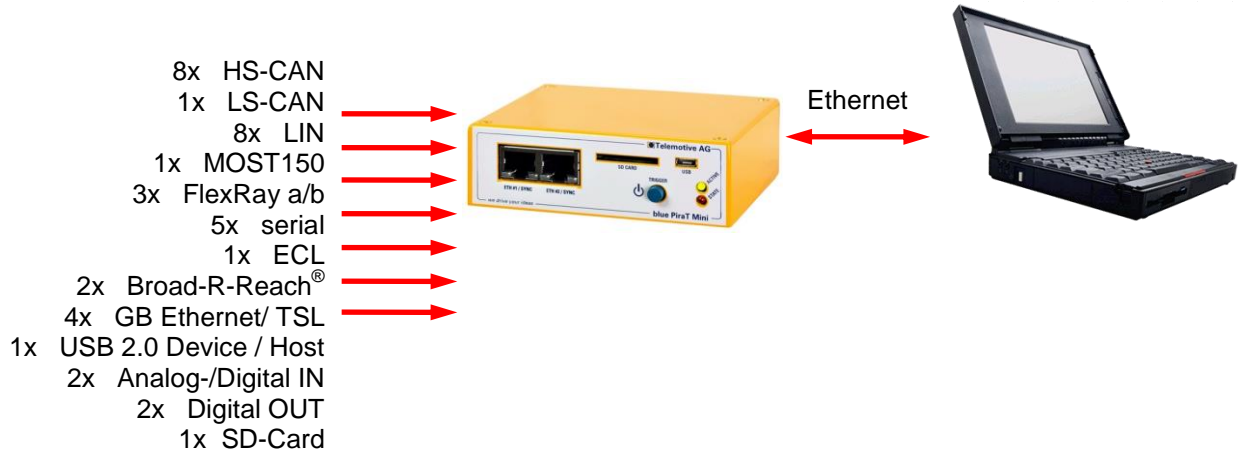
Figure 5.1: available interfaces

The data logger can be mounted in a vehicle and due to his large storage capacity of the hard drive of currently aprox. 50 GB usable space, the **blue PiraT Mini** is able to support extensive test runs. After the data has been gathered, the data has to be downloaded via Ethernet. For the download and the conversion of the logging data a blue PiraT Mini software client is available.

For the available conversion options to various trace file formats please have a look at chapter **12.1 Conversion format overview**. The blue PiraT Mini is available in different versions (see Table **6.1 Model versions of blue PiraT Mini**).

The blue PiraT Mini 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 re-cording functionality, the blue PiraT Mini provides online data processing functions:

- Simple CAN- and MOST-filters
- Custom-defined CAN-, LIN-, FlexRay-, Analog- and Digital message can trigger different actions.

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5.1. Accessories

There are various accessories available for the **blue PiraT Mini** data logger:

- various adapter cables
- the blue PiraT Remote Control Voice, which additionally allows recording of voice note
- licenses which enhance the functionality of the blue PiraT Mini
- mounting clamp

Please contact Telemotive sales for more information about these accessories.

Manuals are available from the Telemotive Service Center.

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5.2.   Implemented features

Some special features are already implemented into **blue PiraT Mini** and can be used by the user.

Feature	Description
Client library	C++ library to control all functions of the logger
Online compression	Allows to compress all trace-data to save HDD space.
ETH/GN logging	recording of Ethernet trace data according to GN log protocol or as TCP/UDP raw data
ESO Trace	Logging of Ethernet ESO Trace data Conversion of recorded data into JSON format
Ethernet Spy mode	Logging of all Ethernet RAW data (promiscuous mode)
Online Streaming	C++ online Streaming library
Online Monitor	Showing selected data online in the client software during the recording
Terminal Light	allows to download recorded traces from several blue PiraT Mini simultaneously
TSL	TSL = Telemotive System Link TSL allows to connect different Telemotive data logger and use this network as an enhanced data logger
Live View *Basic*	Showing signals in a HTML-5 compatible browser on mobile devices like Smartphones, tablets or laptops over WIFI (licensed feature). The basic version is limited to10 mobile devices and 20 signals which can be shown.
Saving to external media	Logging trace data additional to external media like USB-sticks, external harddisks or SD cards. Data will be saved as offline data set and can be processed by the client or client library.
Autosar System Template	Supporting of Autosar System Templates 3.2.2 for CAN and Flexray
LIN Description File LDF	Supporting of LIN description files LDF Version 2.1 and 2.2
FIBEX 3.x	Supporting of the Filed Bus Exchange Format (FIBEX) Version 3.x
CAN DBC	Supporting of the DBC-Communication Data base for CAN

Table 5.1: Implemented features

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5.3.   Additional features by optional licensees

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

Feature	Description
Complex Triggers	Certain events (conditions on CAN-, LIN-, FlexRay-signals and analog and digital signals) can be programmed to be a trigger for certain actions (e.g. display of a message on the remote control or send a Can message) The standard configuration of the blue PiraT Mini contains 2 complex triggers. This license allows configuring up to 50 complex triggers.
Remote Control Monitor	Display of configurable CAN-, LIN-, FlexRay-signals and analog and digital signals at the remote control
DLT logging	This supports logging of Diagnostic Log and Trace (DLT) messages over Ethernet or serial (restricted) connections.
Camera Link	Video recording via video server or network cameras
Wi-Fi	Supporting wireless LAN
GPS logging	tracking of GPS data
Measurements with CCP	CAN Calibration Protocol
Measurements with XCP	Universal Measurement and Calibration Protocol. Currently, the functionality for Ethernet (XCP on Ethernet) and the CAN-bus (XCP on CAN) are available.
MOST150 Streaming	Logging MOST150 synchronous/isochronous data
Signal based filtering	The feature **Signal based filtering** provides the possibility to extract preconfigured signals directly from the recorded CAN-, LIN-, FlexRay-, analog and digital messages with an adjustable sampling frequency. These filtered signals can be stored directly to the logger and extract automatically in an MDF, CSV- or TMT-file.
Live View *Enhanced*	Showing signals in a HTML-5 compatible browser on mobile devices like Smartphones, tablets or laptops over Wi-Fi (licensed feature) or Ethernet. The enhanced version has no limitation to mobile devices or signals which can be shown.
Broad-R-Reach Logging	blue PiraT Mini supports recording of data over Broad-R-Reach Ethernet. *(Note: Just available for blue PiraT Mini)*

Table 5.2: Additional features by optional licensees

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6.   The blue PiraT mini data logger

6.1.   Model versions of blue PiraT Mini

The blue PiraT Mini is manufactured in various model versions to offer a wide range of connectivity to the different bus systems.

The table below shows, which busses will be supported from the different models of blue PiraT Mini. Please consider that the using of Broad-R-Reach or TSL reduces the quantity of available Gbit Ethernet interfaces.

Interfaces	blue PiraT Mini Model			
	CAN	LIN	MOST	FlexRay
HS-CAN	8	2	1	4
HS-CAN/LS-CAN switchable	-	-	1*1	-
LS-CAN	1*2	1*2	-	1*2
LIN	2	8	-	2
GBit Ethernet	4	4	4	4
Broad-R-Reach	2	-	-	-
MOST 150	-	-	1	-
FlexRay	-	-	-	2 (max 3)*5
USB 2.0 Host	1	1	1	1
Analog IN / Digital IN	2+1*4	2+1*4	2+1*4	2+1*4
Digital OUT	2	-	-	2
Seriell RS232	5	5	3(4)*3	5
Ethernet / TSL	2	2	2	2

*1 One HS-CAN can be switched as LS-CAN and then used as port for the RCV
*2 One HS-CAN can be configured as LS-CAN
*3 One RS232 will be used for ECL (Electronic Control Line) if required
*4 Three channels, whereas the first only measures the input voltage of the logger
*5 Set up preliminarily, requires a separate license

Table 6.1: blue PiraT Mini data logger versions

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6.2.   Front side of the blue PiraT Mini

The blue PiraT Mini has two 1 Gbit Ethernet ports at the front side (**ETH #1 / TSL & ETH #2 / TSL**).

On the front panel there are also the **[ON / Trigger**] button as well as LEDs for **[Active]** and **[State],**
an **USB-connector** and the connector **for SD cards**

Figure 6.1: Front panel of the blue PiraT Mini

6.3.   Rear side of the blue PiraT Mini

On the rear side are 2 more 1 Gbit-Ethernet ports (**ETH #3 & ETH #4**) and the **25-pol SUB-D**
multifunctional main connector for power supply and some of the interfaces **[Interfaces].**

Figure 6.2: Rear side of a blue PiraT Mini CAN

On the rear side of **blue PiraT Mini MOST** the multifunctional main connector for power supply and
some of the interfaces **[Interfaces]** is realized with an the **25-pol SUB-D** connector. Additional you'll
find at the MOST logger a MOST150 Connector

Figure 6.3: Rear side of a blue PiraT Mini MOST

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7. Using the blue PiraT Mini

The next section describes the usage of the controls and connectors of the blue PiraT Mini.

Figure 7.1: blue PiraT Mini front panel

7.1. Function of the ON / Trigger button

The **[ON / Trigger]** button is used for these actions:

action	function
Short push in standby mode	Device wakes up
Short push while working	Setting a marker. The Trigger button has set an debouncing time of 335 ms.
Long push while workin (about 3 to 5 sek.)	Device goes to standby mode (shown by pulsing Active-LED
Long push during boot sequence (~ 20 seconds) **Procedure:** - Switching the logger on by a short pushing of the **[On / Trigger]** –button or switching on the power - Pushing the **[On / Trigger]** –button for about 20 sec. as soon as the **[Active]** LED is on **Note:** The logger has to be restarted to set the settings by pushing the **[On / Trigger]** button for about 3 to 5 sec until the logger switches off.	Setting the network settings to default (=DHCP server) (shown at State-LED by blinking 2 times)

Table 7.1: Overview of the functions of the [ON / Trigger] button

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7.2.   Function of the LEDs

The blue PiraT Mini has 2 LEDs **[Active]** and **[State]** on his front side, which can have the following states.

7.2.1.   ACTIVE LED (green)

state	meaning
off	device is off or in standby mode
on	device has started up and can be reached by the TSL client
short blinking	device is starting up
pulsing	device goes to standby mode

Table 7.2: ACTIVE LED

Maybe these states are overlain by a fast blinking when there's traffic on one of the active interfaces (accept protocol based Ethernet logging)

If an internal or external marker is set, the [Active] LED glows with full energy for a short time

7.2.2.   STATE LED (rot)

state	meaning
off	No bug, device is working fine
on	Device in error state. If it is still reachable by the client the error can be found in the bug reporter. Rebooting required
short blinking	Overload oft he data logger, maybe loss of data. Information about lost data can be found in the bug reporter
pulsing	disk space full

Table 7.3: STATE LED

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7.3.   ETH #1 / TSL and ETH #2 / TSL

The network ports at the front side, ETH #1 / TSL and ETH #2 / TSL, are for the communication between logger and client as well as for logging data.

Further they can be used to combine blue PiraT Mini and blue PiraT2 data logger to a combined TSL system and synchronize these loggers.

Warning:
Don't connect ETH #1 and ETH #2 directly to each other!

7.4.   The USB port

The front USB port can only be used in the host-mode.

The port can be used for logging data to an external media or for connecting a Wi-Fi module to the logger.

Wi-Fi can be used to get access to the logger over the client or to use the feature *Telemotive Live View*.

USB storage:
The USB storage has to be formatted in the FAT 16, FAT 32 or NTFS file format. You could connect USB flash drives and external hard drive up to a maximal supply current of 500mA. External power supplies must not be connected to the hard disk.

7.5.   The SD card slot

The blue PiraT Mini offers the possibility to store data directly to a SD card. The configuration of this feature is described in the Telemotive System Client manual.

The SD card must be formatted with FAT32 with a minimum size of 4 GB.

The following SD-Cards have been tested with the blue PiraT Mini:

Vendor	Description	Size	Type
SanDisk	Extreme PRO	64 GB	SDXC
Transcend	Ultimate Speed	16 GB	SDHC
Transcend	Ultimate Speed	32 GB	SDHC
Transcend	Ultimate Speed	64 GB	SDXC
Kingston	SDA3	16 GB	SDHC
Kingston	SD10VG2	32 GB	SDHC
Intenso	3431470	32 GB	SDHC
Intenso	3431490 Professional	64 GB	SDXC
Hama	Class 10 45 Mbps	16 GB	SDHC
Hama	Class 10 45 Mbps	64 GB	SDXC
Extrememory	Performance Class 6	16 GB	SDHC
Extrememory	HyPerformance Class 10	32 GB	SDHC
SanDisk	Extreme	32 GB	SDHC

Table 7.4: Tested SD cards

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Attention:
Removing the SD card without prior shutdown may result in the loss of all recorded data!

If the SD card or USB disk is pulled in the operational state, the following problems exists:

a) The logger is in an undefined state and will not record any data.
   Only after rebooting the device behaves as expected.

b) The data on the SD card can then be unreadable when the SD card is removed during a write operation.

If you turn off the blue PiraT Mini with the trigger button, you have 5 seconds to remove the disk before the logger can be reawakened.

7.6.   ETH #3 and ETH #4

The network ports at the rear side, **ETH #3** and **ETH #4**, can be used for logging data.

Warning:
Don't connect ETH #3 and ETH #4 directly to each other!

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7.7.   Multifunction - interface SUB-D 44-pol

The blue PiraT Mini CAN / LIN / FlexRay contains depending on the model the following connections:

- Power supply   KL 30 & KL 31
- Clamp 15   KL 15
- High-Speed-CAN   HSCAN x
- Low Speed-CAN / Remote Control   LSCAN
- LIN   LIN x
- FlexRay   FR x Ch A / Ch B
- Seriell   RS232 x
- Analog-Digital IN   KFZ ANA IN x / KFZ ANA COM
- Digital OUT   KFZ DIG OUT x
- Broad-R-Reach®   KFZ BRR x

The pinning is described in chapter 15.1 Pin assignment - 44-pol

Notice:
The logger is protected against reverse polarity of the power supply. But devices which are connected to the logger can be damaged when the logger is connected in the wrong way.

7.8.   Multifunction - interface SUB-D 15-pol

The 15-pol SUB-D connector on a blue PiraT Mini MOST150 includes the interfaces for:

- Power supply   KL 30 & KL 31
- High-Speed-CAN   HSCAN x
- Low Speed-CAN / Remote Control   LSCAN
- Serial   RS232 x
- Analog-Digital IN   KFZ ANA IN x / KFZ ANA COM
- Digital OUT   KFZ DIG OUT x

The pinning is described in chapter 15.3 Pin assignment - 15-pol SUB-D connector at blue PiraT Mini MOST

7.9.   MOST150 interface:

The MOST150 interface is a standard connector for MOST fiber optic.

Important:
Maybe the MOST150 connector can't be plugged when the 15-pol SUB-D connector is not locked before!

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.

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7.10.   Default configuration of the network ports

Important:
The blue PiraT Mini's default setting is DHCP server and has to be connected by a Ethernet cable to your computer system.
You can download the TSL client by typing this IP address into your web browser:

http://192.168.0.233

7.10.1.   Resetting the network settings

If you have no access to the logger any more please follow the instructions of chapter ***7.1 Function of the ON / Trigger button*** to **reset the network settings.**

Figure 7.2: blue PiraT Mini front panel

7.11.   Resetting the logger to factory settings (from FW V02.00.01)

Beside the possibility to reset the network settings, the blue PiraT Mini offers the possibility to reset the device to factory settings, if the logger is in error state and there's no chance to connect to the logger any more.

WARNING:
Due to this reset to factory settings all data and licenses on the logger will be deleted. Needed licenses have to be saved to the logger again after this operation.
An actual firmware version has to be flashed after this procedure! This is signaled by the error LED and an error "FC_FW_Update" at the client.

To reset the logger to factory settings the logger hast o be unplugged from power supply. Then press the **[ON / Trigger]** button, plug the power supply and start the logger with pressed **[ON / Trigger]** button.

The **ACTIVE** and **STATE** LEDs are pulsing for about 10 seconds.

If you do nothing, the logger tries to startup normally in case of the button was pressed by mistake.

But if the **[ON / Trigger]** button will be pressed fast multiple times in a row until the two LEDs are blinking alternately, the device starts to reset itself to factory settings.

This operation will take some minutes and the blue PiraT Mini will switch off after that automatically.

The blue PiraT Mini is set back to delivery status and you should flash an actual firmware version first to before you use the logger again.

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8. Starting the blue PiraT Mini

Connect the **blue PiraT Mini** to the vehicle battery or a power supply via the power harness (**red/+/clamp30** and **black/GND/-/clamp31**).

Connect the Gigabit-Ethernet port ETH #1 with the Ethernet port of your computer by using a Ethernet cable. **(Note: By default the blue PiraT Mini is configured as DHCP-Server!)**

Figure 8.1: Power connection

When the power supply is switched on the logger will start automatically when you plug in the power supply.

Is the blue PiraT Min in standby mode please press the **[ON / Trigger]** - button to start the device.

To switch off the blue PiraT Mini please press the **[ON / Trigger]** button for about 5 seconds till the green LED starts pulsing.

The boot sequence takes about 15 seconds until the logger is reachable by the TSL client. Data logging is starting much earlier.

Figure 8.2: Switching on the blue PiraT Mini

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8.1.   Download and installation of the Telemotive System Client

Open your internet browser and enter the IP address **192.168.0.233**
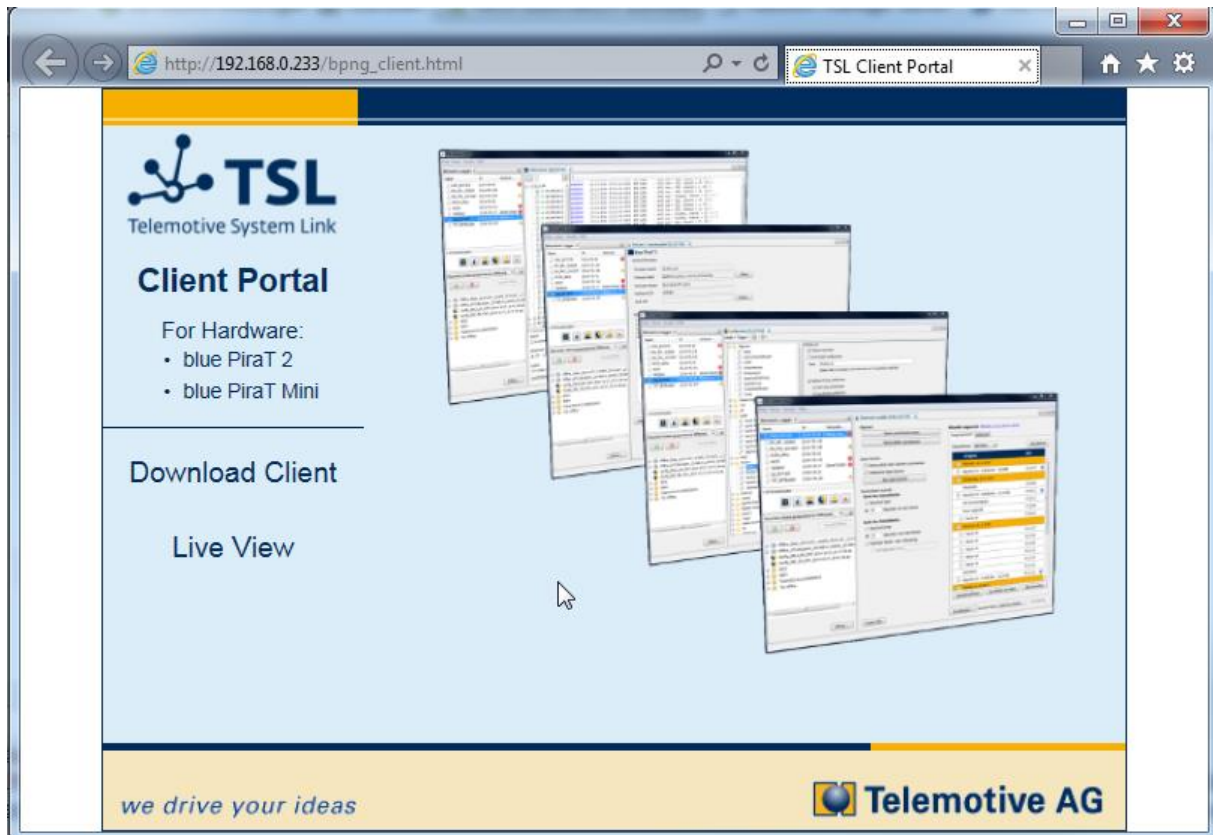
Figure 8.3: downloading the TSL client directly from the blue PiraT mini

The connection between the logger and your computer system will be established. Please take care that the network settings of your network adapter are set to **[Optain IP address automatically].**

Please click on the blue PiraT Mini image to start the download of the client (~90MB) directly from the logger. Then choose **[Save]** to save the file to your local computer.

The installation setup can be started by a double klick on the setup file. Follow the instructions, choose a destination directory and finalize the installation by pressing **[Install].**

Note:
The needed Java Runtime Environment is included into the client and must not be installed separately.

After successful installation you will find a **Telemotive System Client** icon on your desktop. Double-click the icon to start the application.
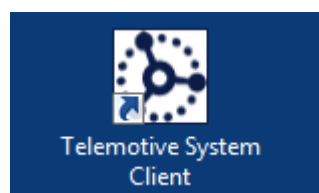
Figure 8.4: Desktop symbol

You can download the entire **manual for the Telemotive System Client** in our ServiceCenter. In the manual, all these operations are described:

- detailed description of the Client
- configuration of the data logger
- download of the recorded data
- conversion of the recorded data
- Firmware-/ License update
- Creating a bug report

You can reach the manual by this direct link too:

User manual for the Telemotive System client
https://sc.telemotive.de/4/uploads/media/TelemotiveSystemClient_UserManual.pdf

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9.   Adapter cables

This section describes which adapter cables are available for the blue PiraT Mini.

Telemotive AG offers adapter cables that connect to the multi-function connectors and split up its lines to separate connectors.

9.1.   blue PiraT Mini cable set CAN
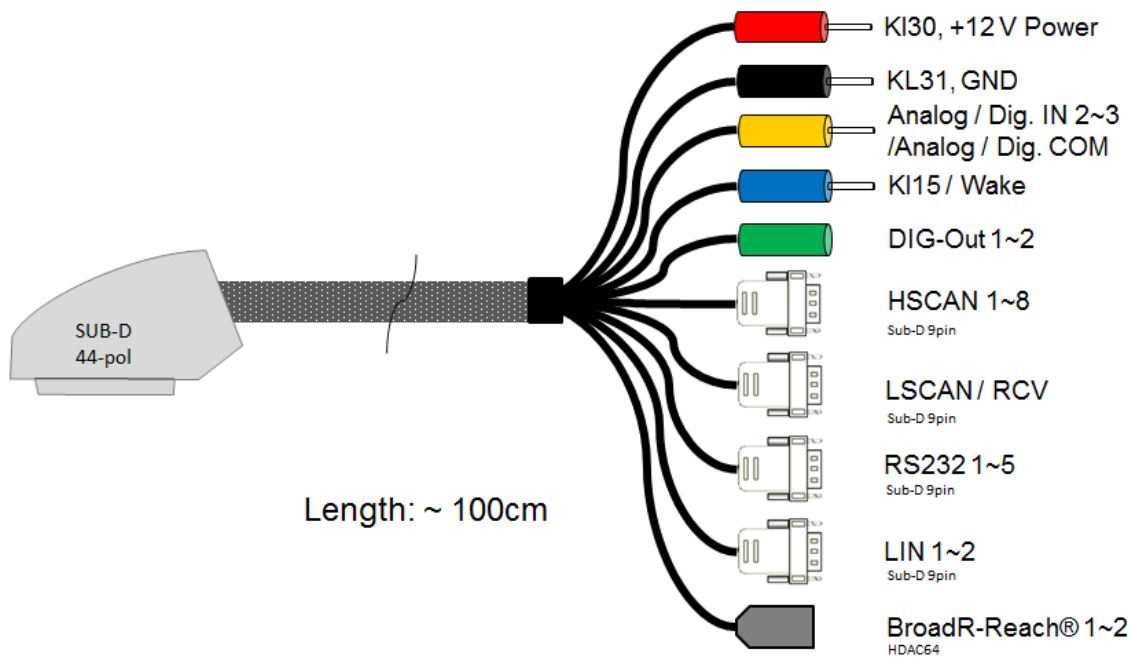
Figure 9.1: blue PiraT Mini cable set CAN

9.2.   blue PiraT Mini cable set LIN
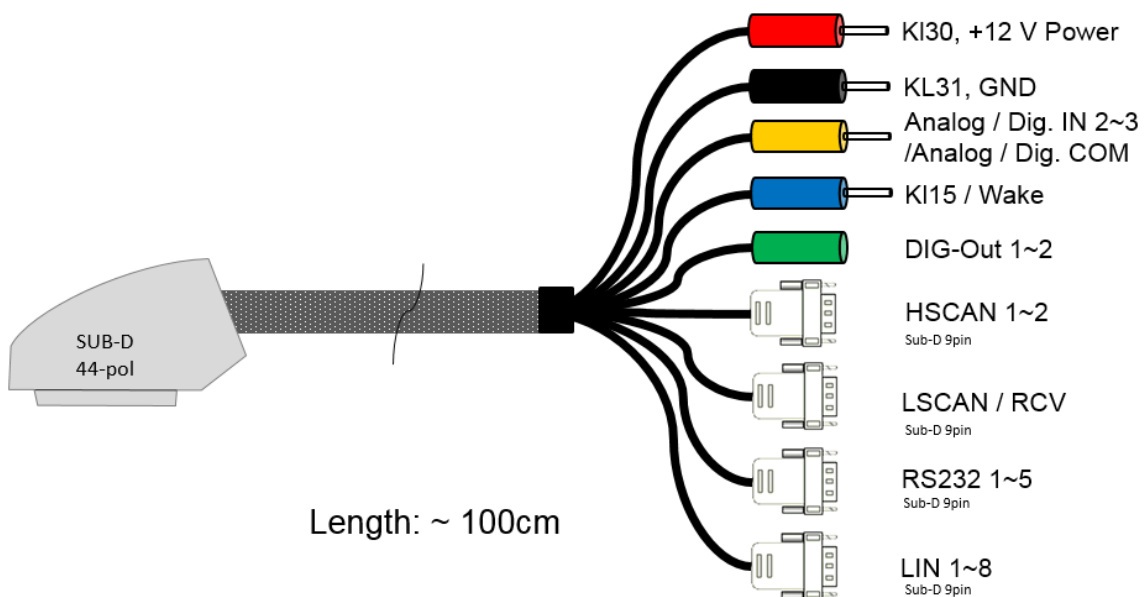
Figure 9.2: blue PiraT Mini cable set LIN

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9.3. blue PiraT Mini cable set MOST150
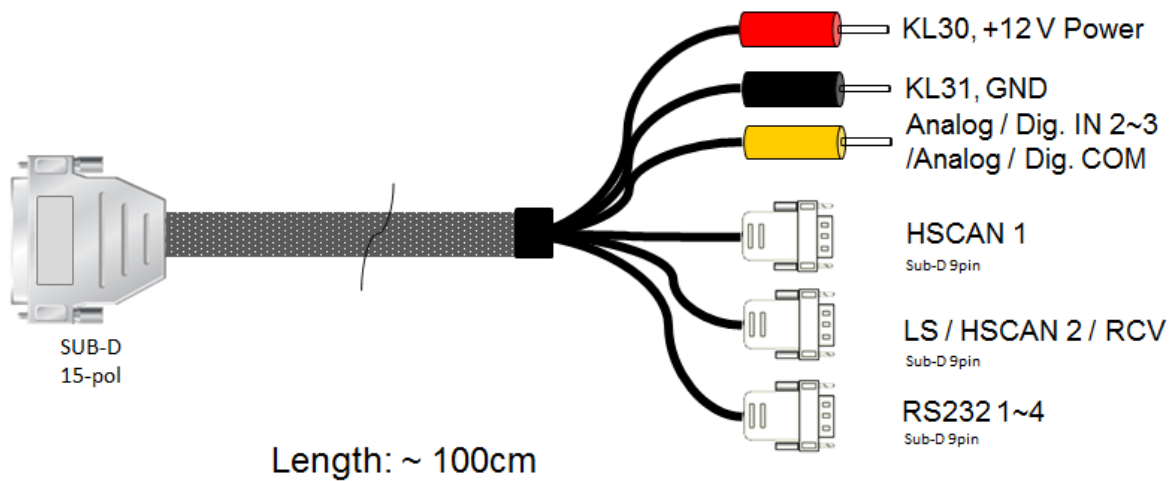
Figure 9.3: blue PiraT Mini cable set MOST150

9.4. blue PiraT Mini cable set FlexRay
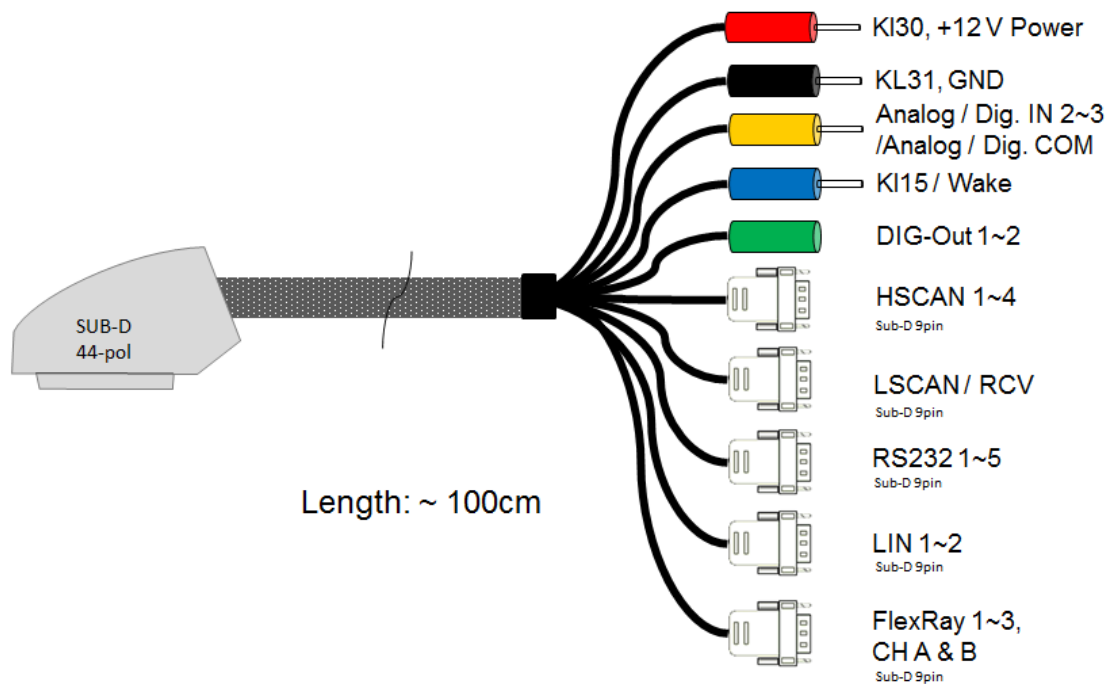
Figure 9.4: blue PiraT Mini cable set FlexRay

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9.5. Note for serial measurements

Note:
The blue PiraT Mini 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 Mini have to be used. The "Tx" lines must not be connected in this case.
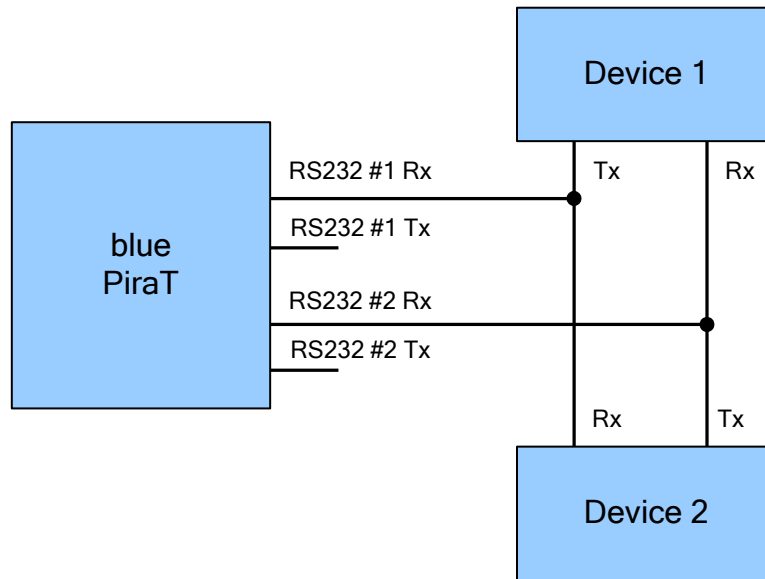
Figure 9.5: Listening to a bidirectional serial communication

9.6. Adapter cable for Remote Control Voice (RCV)
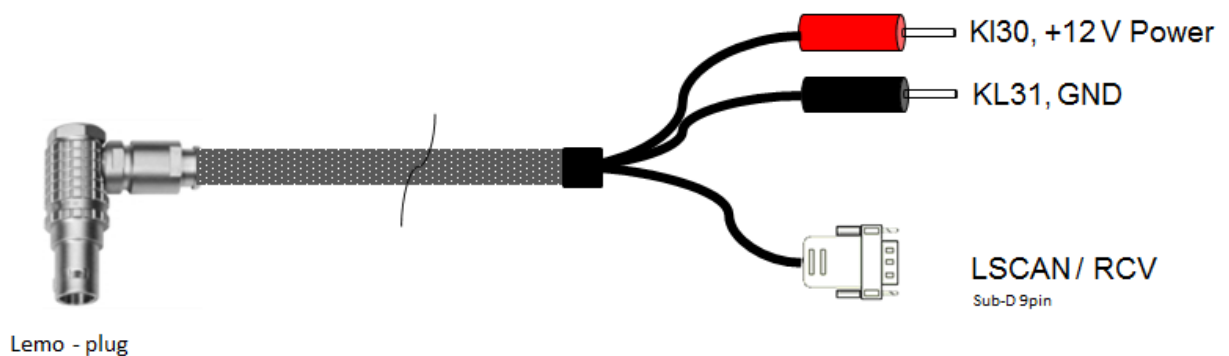
Figure 9.6: Adapter cable for Remote Control Voice

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10. Logging data

10.1. Setting markers

Interesting occurences can be marked by the **[On / Trigger]** button at the front panel or at the Remote Control / Remote Control Voice by setting a timestamp. When you are pressing this button, the data logger saves the current time to the hard drive as a marker.

It is possible to configure the data logger to send a CAN message as an acknowledgement of setting a marker.

Additionally, it is possible to define a CAN message that triggers a marker. In all cases, marker triggers are debounced.

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

10.1.1. Setting marker with an extern push button

Besides using the **[On / Trigger]** button, it is also possible using the digital inputs and *Complex triggers* function to realize an external **[Marker]** button. Important is to set the used interface active and set the **[Sampling Interval]** to 100 ms or more.
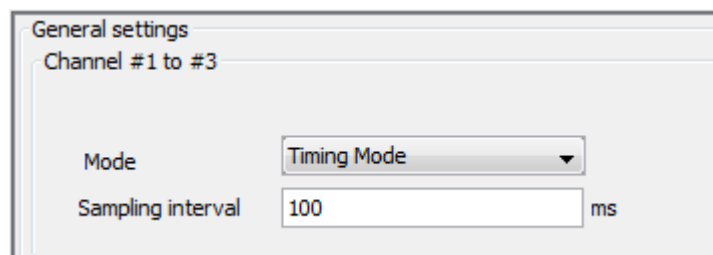
Figure 10.1: Sampling interval

Figure 10.2: setting Trigger with Digital Input

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The setting for the **[Sampling Interval]** is needed to debounce the external push button and be sure that only one trigger is set. The external push button can be connected to the power supply of the car and the Digital In mentioned above.

Note:
Digital IN and Analog IN are combined to one wire at blue PiraT Mini. Please connect the ground for Analog IN when you use an external push button.

10.2.   Time stamp

Usually the recorded messages will get a time stamp at the end of each received message. Only for the serial interface (RS232) the start of the transfer will be used as timestamp.

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

Table 10.1: Time Stamp

10.3.   Automatic daylight savings adjustment

If it is required that the data logger automatically adjusts for daylight savings, it is necessary to en-able this option and to set the correct time zone in the data logger configuration (see section **Fehler! Verweisquelle konnte nicht gefunden werden.**). 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.

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10.4.   Standby mode

The table below shows, which busses or signals are monitored for keeping the logger alive and which busses or signals are able to wake up the logger.

Interface	Keep alive	Wake up	Configurable	Comment
MOST150	✓	✓	W / A: On / Off	Light on
ECL	✓	✓	W / A: On / Off	
High Speed CAN	✓	✓	W / A: On / Off	
Low Speed CAN	✓	✓	W / A: On / Off	
LIN	✓	✓	W / A: On / Off	
FlexRay	✓	✓	W / A: FlexRay1a-3b	
Serial RS232	✓	✓	W / A: On / Off	
Ethernet 1GBit	✓	✗	A: On / Off, Alive time	Time: General/Standby
Analog In	✗	✗	✗	
Digital In 1	✗	✗	✗	
Digital In 2	✗	✗	✗	
Digital In 3-5	✗	✗	✗	
USB	✗	✗	✗	
Remote Control	✗	✓	✗	Via [Trigger] button
[Trigger] Button	✗	✓	✗	
Wi-Fi	✗	✗	✗	
clamp 15	✗	✓	✗	

Table 10.2: Standby - [W= wake up A= keep alive]

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10.5.   Memory space and level

About the ring buffer, and other options such as the protection of areas around markers, the characteristics of the logger can be configured what to do when the internal memory is full.

The following status messages can occur during operation of the data logger, it will also be displayed on the optional Remote Control (RC) / Remote Control Voice (RCV)

.

10.5.1.   Status Logger: OK

Everything is OK.

On the disk is enough free space to record all incoming data.
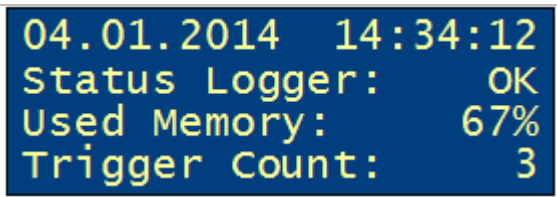
blue PiraT Mini:	State LED is off
RCV:	04.01.2014 14:34:12 Status Logger: OK Used Memory: 67% Trigger Count: 3

Table 10.3: Status Logger: OK

10.5.2.   Status Logger: WARN

Warning, but does not affect the data recording.

10.5.3.   Status Logger: RING

Memory is full, buffer mode is active.

The buffer is active and filled more the 95 %. Older data will be deleted to save space for newer data.
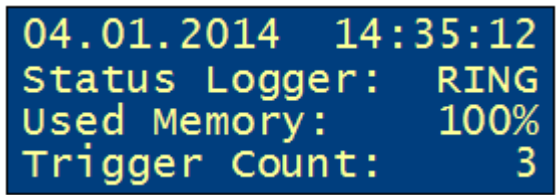
blue PiraT Mini:	State LED is off
RCV:	Line 3 shows the level of the ring buffer on the internal memory 04.01.2014 14:35:12 Status Logger: RING Used Memory: 100% Trigger Count: 3

Table 10.4: Status Logger: RING

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10.5.4.   Status Logger: MEM

Internal memory is nearly full, no more data will be stored soon.

Case 1: The ring buffer is enabled and more than 95 % full (as Status RING), in addition over 90 % of the trace files are protected.

Case 2: The ring buffer is disabled and filled to more than 95%. When ring buffer mode is disabled all trace files are implicitly protected.
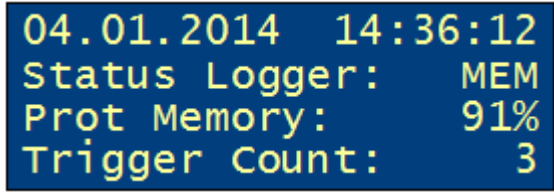
blue PiraT Mini:	State LED is off

RCV:	Line 3 now shows the level of the ring buffer with protected files. In the display below we see that the ring buffer is filled to 91% with protected, and to 9% with non-protected files. Till now the oldest unprotected files will be cleared to make way for new space.
	
	 `04.01.2014  14:36:12`
	 `Status Logger:      MEM`
	 `Prot Memory:        91%`
	 `Trigger Count:        3`

Table 10.5: Status Logger: MEM

Case 3: The ring buffer is disabled and the memory to 100% full.

Case 4: The ring buffer is enabled and the memory to 100% full with protected files

In both cases, the data recording is stopped because no files can be deleted to make way for new space.
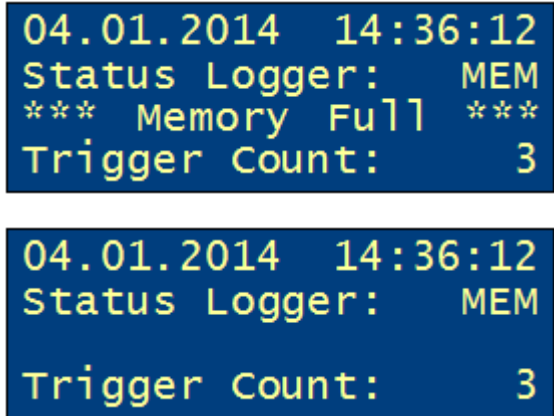
blue PiraT Mini:	State LED is pulsing every second

RCV:	The third line shows flashing that the storage medium is full. For this, the 3rd line is faded in and out every second.
	
	 `04.01.2014  14:36:12`
	 `Status Logger:      MEM`
	 `*** Memory Full ***`
	 `Trigger Count:        3`
	
	 `04.01.2014  14:36:12`
	 `Status Logger:      MEM`
	
	 `Trigger Count:        3`

Table 10.6: Status Logger: Memory full

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10.5.5.   Status Logger: NoSync

TSL or master / slave loggers are not synchronized, the data recording is not affected.

10.5.6.   Status Logger: ERROR

Error in the logger, the data record is not guaranteed
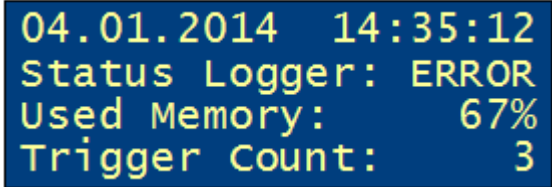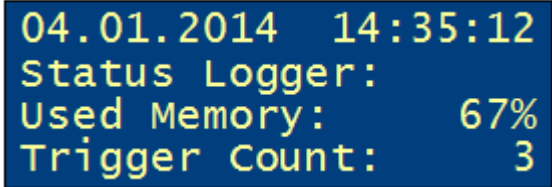
blue PiraT Mini:	State LED is pulsing every second
RCV:	In the second line of the status * **ERROR** * flashes every second. 04.01.2014 14:35:12 Status Logger: ERROR Used Memory: 67% Trigger Count: 3 04.01.2014 14:35:12 Status Logger: Used Memory: 67% Trigger Count: 3

Table 10.7: Status Logger: ERROR

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11.   The available connectors of blue PiraT Mini

All available interfaces will be described step by step in the next chapter.

11.1.   CAN interfaces

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

11.1.1.   The high-speed and low-speed operating modes

Depending of the model, the blue PiraT Mini has different numbers of high and low speed CAN interfaces. It is not possible to change a CAN interface from low to high speed or vice versa. Each type is using different transceivers.

The electrical behavior of the low-speed and the high-speed CAN is different, hence, the low-speed CAN port of the blue PiraT Mini should not be connected to a high-speed CAN bus and vice versa.

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 Mini uses the connection *clamp 31* as a reference potential. The lines of the high-speed CANs are terminated with a high resistance.

	Low-speed CAN	High-speed CAN
Transceiver chip	Philips TJA1055	Philips TJA1041A
Terminating resistor	12k	2k6
Baudrate	50 kBit/s - 125 kBit/s	50 kBit/s - 1 MBit/s
Supported identifiers (SW)	11 and 29 Bit	11 and 29 Bit
Disabling of acknowledge	possible	possible
Time stamps	at the end of the message	at the end of the message

Table 11.1: Technical data of CAN recording

11.1.2.   CAN data with 29Bit identifiers

The blue PiraT Mini can also log CAN data with 29 Bit 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 messages mixed with 11 Bit and 29 Bit identifiers.

11.1.3.   Recording contents

The blue PiraT Mini 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.

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11.1.4.   Sending CAN messages

If the blue PiraT Mini sends a CAN message, it is shown twice in the traces. 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.

11.1.5.   LS-CAN and using a RC / RCV

The Low Speed CAN (LS-CAN) as well can be used for connecting a Remote Control / Remote Control Voice.

If you use a RC / RCV the logger will trace no data on LS-CAN!

This will be shown in the TSL client as a warning:
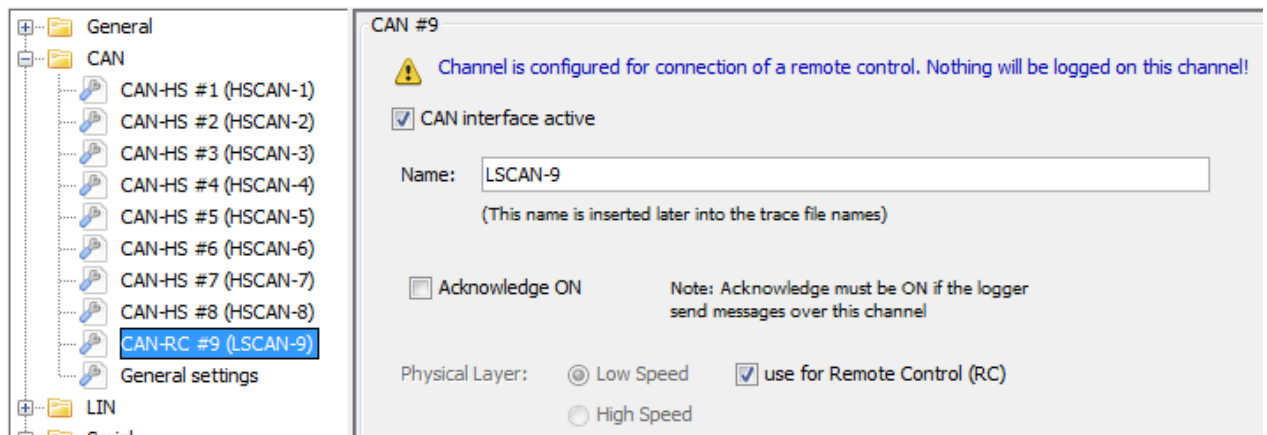
Figure 11.1: LS-CAN used for RC / RCV

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11.2.   LIN interfaces

The blue PiraT Mini is able to record data compliant to the LIN specification V1.3 V2.0 and V2.1. The data logger does not actively appear as a bus member. Sending LIN messages is currently not supported.

channels	bis zu 2
Transmission Rate	1200, 2400, 4800, 9600, 19200, 20000 Baud
Transmitter	TJA 1020
Status	Parity BITS; format Check for Header, CheckSum for Header and Payload
Terminating resistor	30 kOhm

Table 11.2: LIN

11.2.1.   LIN data blocks and time stamps

Each LIN message gets 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 invalid data. The maximum block size is 10 bytes. A block is also concluded after a timeout, which is three times the transmission time of a LIN character.

11.2.2.   LIN-Transceiver

The blue PiraT Mini uses the LIN transceiver TJA1021 by NXP (former Philips Semiconductor). Supported baud rates are in the range from 1200 to 20000 Baud. Automatic baud rate detection is currently not supported. The LIN interface is configured as a slave device with a terminating resistor of 30 kΩ.

11.2.3.   Special frames and states

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

- Wakeup Frames
- Checksum Errors

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11.3.   Serial (RS232) interfaces

Channels:	5x RS232
Data Bits:	5, 6, 7, 8
Stop Bits:	1, 2, 1.5
Parity:	None, odd, even

Table 11.3: Serial Port

The blue PiraT Mini supports only the RS232 specification.

11.3.1.   Segmentation of the serial data

The received serial Bytes are clustered into data blocks separately for each channel. 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 stamp is assigned to each block when it is finalized.

11.3.2.   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.

11.4.   FlexRay interfaces

The blue PiraT Mini is able to record FlexRay bus data according to the FlexRay specification 2.1A.

The data logger records all valid and also invalid static and dynamic frames of the two FlexRay channels, including 'a' and 'b', independently if the FlexRay bus is in a synchronous or asynchronous state.

Channels:	3x (a + b)
Max. Bit rate:	10 MBit/s
Frames	Static, Dynamic, Null Sync, Startup
Transceiver:	AS8221

Table 11.4: Technical data of the FlexRay module

Attention:
For every measurement with FlexRay the line must be separated and lead through the blue PiraT Mini.
Mandatory 2 interfaces (a & b) must be used in each measurement.
Turning off the blue PiraT Mini thereby causes no interruption of the FlexRay line.

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11.5.   Analog / Digital Input

The blue PiraT Mini has three analog and three digital inputs, whereas the first channel is located in the logger and records the input voltage. The measuring range is between 0 V and +20 V, the accuracy is 3 %. The sampling rate is adjustable from 1 ms to 100 s. The switching threshold for the digital input is 7 V ±0,2 V. See Chapter 14 Data sheet.

11.6.   Digital Output

The blue PiraT Mini models CAN, FlexRay and LIN have two digital outputs. The output current is up to 2 A.

11.7.   Ethernet

All versions of the blue PiraT Mini data logger are able to log Ethernet data. All data loggers have two 1 GBit Ethernet ports with RJ45 connector on the front and 2 more at the rear side.

The two interfaces **ETH #1 / TSL** and **ETH #2 / TSL** can be used to connect the data logger to the PC and for the TSL (Telemotive System Link) connection.

At blue PiraT Mini CAN ETH #3 and ETH #4 can be configured and used either as IEEE 802.1 Ethernet, or as BroadR-Reach® when you have installed the appropriate license.

11.7.1.   Supported protocols & functions

The following chapter gives an overview of the available protocols. When a protocol requires a license, this will be marked.

11.7.1.1.   GNLogger

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

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

11.7.1.2.   UTF8

When using the UTF8 data transmission over TCP, the blue PiraT Mini will work as a TCP Slave device. Therefore the blue PiraT Mini will initiate a TCP connection to a TCP server by using an open socket connection (you can configure the IP/Port of the server via the TSL client software).

By using UTF8 data transmission the logger will write a timestamp after every detected Linefeed (LF) from the incoming data. If the connection is getting lost, it will take about 5 seconds to build up a new connection for logging data again.

11.7.1.3.   RAW

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

When using raw data transmission, every data package up to 40 kBytes is 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.

11.7.1.4.　　　UDP server

The blue PiraT Mini can be configured as an UDP server by setting up an IP address and port number.

A Slave device can build up a connection to the blue PiraT Mini. The blue PiraT Mini logs raw data packages up to 40kBytes and write them down with a time stamp. 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.

11.7.1.5.　　　TCP server

The blue PiraT Mini can be configured as a TCP server by setting up an IP address and port number. There is an adjustable timeout, the connection will be terminated if no data arrives. This appears as a message in the trace file. The blue PiraT Mini as a TCP server accepts TCP data packets, TCP multicast and TCP broadcast packets. If the connection is getting lost, it will take about 5 seconds to build up a new connection for logging data again.

11.7.1.6.　　　Ethernet spy mode

By using the Ethernet spy mode it is possible to log the whole Ethernet data (promiscuous mode). More information can be found in the TSL client manual.

11.7.1.7.　　　EsoTrace

By using the EsoTrace mode it is possible to log data in the EsoTrace protocol. For more information please have a look in the TSL client manual.

11.7.1.8.　　　Camera (license required)

If you use Camera license on the data logger, it is possible to connect up to 4 Ethernet webcams to the blue PiraT Mini. After connecting the blue PiraT Mini is able to log MPEG4 video streams. For more information please have a look at the "Camera UserGuide".

11.7.1.9.　　　DLT over Ethernet (license required)

If you use a **DLT** license on the data logger, it is possible to connect up to 8 ECU for logging their DLT messages. More information about logging DLT messages can be found in the DLT-logging_UserGuide

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11.8.   MOST150 interface

The **blue PiraT Mini MOST** 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 Changes of the states are only logged when te state is changing.
Control:	Control Messages
Streaming *[1]:	Synchronous and isochronous data
Packet:	MDP (MOST Data Packet) MEP (MOST Ethernet Packet)
Filter:	Control Messages on/off, Packet on/off, MDP on/off, MEP on/off, Status on/off, MDP Transmit and Receive Address, Packet Length, MEP Receive Address, Message Length
	*1 requires a separate license MOST150 Streaming

Table 11.5: MOST150 data Logging

The SMSC SpyNIC MOST150 is used to provide the MOST150 traffic data.

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 internal memory, they are buffered in a ring buffer. In the case of a data rate peak, which exceeds the storage rate of the internal memory, 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, then the control channel and at last 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 internal memory.

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

11.9.   ECL logging

Currently the ECL (Electrical Control Line) is only supported in conjunction with MOST150. 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

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12.   Conversion of recorded traces

All trace data will be recorded internally in the proprietary Telemotive TMT format (*.tmt). If the recorded trace data will be downloaded and sorted, the data will be converted to an extended TMT format (*.xtmt).

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 available analyzing tools.

For more informations about the file formats and an detailed manual for conversion please look at the ***Telemotive System Client_UserManual*** which you can download from the Telemotive ServiceCenter.

12.1.   Conversion format overview

The table below show which data can be converts to other formats. The last row shows if the marker can be integrated into the data **(x)** or only be set by using pseudo CAN- or MOST messages **(x*).**

Format / format		MOST150 CTRL	MOST150 MDP	MOST150 MEP	MOST150 Streaming	MOST25 Control	MOST25 MDP	CAN	LIN	FlexRay	Serial RS232	Ethernet - DLT	Ethernet - EsoTrace	Ethernet - GN Log	Ethernet - RAW	Ethernet - Spy Mode/MII	Ethernet - TCP Server	Ethernet - UDP Server	Ethernet - UTF8	Analog IN	Digital IN	Kamera/Video	CCP	XCP	GPS	Conn.-Gateway MLBevo	Marker
Telemotive ASCII	*.txt	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x
CANoe ASCII	*.asc					x	x	x	x	x																	x*
CANCorder	*.asc							x																			x
CANoe BLF	*.blf	x	x	x		x	x	x	x	x						x											x*
MOST Data Analyser	*.img	x	x	x	x	x	x																				x*
Optolyzer	*.op2				x																						x*
Serial Trace Analyser	*.txt										x																x
RAW Serial	*.txt										x															x	
Serial Debug	*.txt										x															x	x
ASCII Hexadecimal	*.txt										x																
APN ASCII	*.txt										x																
GN-Log	*.[x]aa										x		x														x
Trace Client	*.trc										x																
TCPdump	*.pcap		x													x											
MDF Logging	*.log							x																			
MDF CAN Signal v3.3	*.mdf							x															x	x			
Autosar DLT	*.dlt											x	x														
Ethernet Raw	*.raw											x	x	x	x	x	x	x	x								
MPEG-4	*.mpeg4																					x					
Extended Telemotive	*.xtmt	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x
Eso Trace	*.esotrace												x														x
NMEA - ASCII GPS	*.nmea																								x		
KML Google Maps	*.kml																								x		x
KMZ comp.Google Maps	*.kmz																								x		x
GPX	*.gpx																								x		
MPEG-Transportstream	*.ts				x																						

Table 12.1: Conversion formats

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13.   Service and safety instructions

Note according to standard EN55011:2009
The data logger is used in an industrial environment. Due to the behavior of conducted as well as radiated disturbances it possibly can be difficult to ensure electromagnetic compatibility in other environments.

Cleaning:
The data logger should only be cleaned with a clean, slightly dampened cleaning cloth with water. Other cleaning supplies such as benzine, alcohol, etc. may not be used.

Maintenance:
The data logger is maintenance-free. The customer is not allowed to open the housing. Unauthorized modifications will void the warranty.

Fuse:
In case of an error the customer may change the fuse on the harness or externally accessible fuses only. The fuse may be replaced only with a fuse of the same type and current rating.

Disposal:
The disposal of the device must be in accordance to statutory provisions.

13.1.   Safety advice

Installation instructions:
The data logger should only be installed in the six axes.

Operating temperature:
The device must not be operated outside of the specified temperature range. It is important to ensure adequate ventilation. The data logger must not be placed too close to walls or other equipment. The data logger must not be stacked together with other components on each other, unless proper ventilation is ensured and the device should be used in ambient temperatures of more than 25 ° C.

Storage conditions:
The data logger must be stored only in the range of -40 ° C to 85 ° C.

Condensation:
The device must not be switched on directly, if it is brought from a cold environment into a room with normal ambient conditions.

Environmental conditions:
The device must not be used outdoors or in adverse environmental conditions such as moisture, high humidity or dust. Furthermore, an operation of the device is not allowed in fire hazardous or explosive gases.

Cable sets:
When inserting the cable sets, only a small effort may be applied. When you feel an increased resistance while inserting the cable set, the correct alignment of the pins should be checked.

It may only be used the original Telemotive components. Other components such as special cable sets have to be prepared strictly according to the pin assignment in the user guide, which always should consist an extra fuse in the wiring harness.

Three pins with the names KL30 and KL 31 are interconnected for the voltage supply of the data logger. **Caution:** A short circuit between the KL30 and KL31 on the plug may lead to the destruction of the data logger!

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The maximum value of the power supply must not exceed 30 V. In case of overvoltage, the device can be destroyed and will void the warranty.

Mounting:
The data logger has to be fixed in laboratory setups and especially in automobiles, so that it is secured against falling, slipping and skidding around.

Positioning of the antenna:
During operation of the data logger in an automobile, the antennas which are connected to the data logger must not be located outside the vehicle.

Mechanical action:

++++++++++++++ Operation environment ++++++++++++++

Height -300 to 5.500 m

Shock at 2 ms half sinusoidal wave	300 G
Vibration sinusoidal wave	3 G (10 - 50 Hz)
	2,5 G (50 - 2000 Hz)
	2 G (200 - 5000 Hz)

++++++++++++++ Out of operation environment ++++++++++++++

Height -300 to 12.000 m

Shock at 1 ms half sinusoidal wave	800 G
Vibration sinusoidal wave	up to 5 G (10 - 500 Hz)

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14.   Data sheet

General data	blue PiraT Mini CAN	blue PiraT Mini LIN	blue PiraT Mini MOST	blue PiraT Mini FlexRay
Nominal power supply voltage	13,8V	13,8V	13,8V	13,8V
Power supply voltage	5 to 30 V (needs up to >7V at system start)	5 to 30 V (needs up to >7V at system start)	5 to 30 V (needs up to >7V at system start)	5 to 30 V (needs up to >7V at system start)
Reverse polarity protection of the supply voltage	yes	yes	yes	Yes
Resistance to short-circuiting	yes	yes	yes	yes
power consumption / operating (typ.)	300mA (@ 13,8 V)	300mA (@ 13,8 V)	300mA (@ 13,8 V)	300mA (@ 13,8 V)
power consumption / operating (peak.)	< 400mA (@ 13,8 V)	< 400mA (@ 13,8 V)	< 400mA (@ 13,8 V)	< 400mA (@ 13,8 V)
power consumption / standby	< 1mA	< 1mA	< 1mA	< 1mA
power consumption / Idle Mode	TBD	TBD	TBD	TBD
power consumption / suspend mode	TBD	TBD	TBD	TBD
operating temperature	-40°C to +70°C	-40°C to +70°C	-40°C to +70°C	-40°C to +70°C
Storage temperature	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C
Weight (ca.)	250 g	250 g	250 g	250 g
Power Management	**CAN**	**LIN**	**MOST**	**FlexRay**
Startup time from standby to full operation	<15s	<15s	<15s	<15s
Start of logging - starting from standby	CAN, LIN, Seriell, Analog, Digital < 60 ms	CAN, LIN, Seriell, Analog, Digital < 60 ms	CAN, LIN, Seriell, Analog, Digital, MOST < 60 ms	CAN, LIN, Seriell, Analog, Digital, FlexRay < 60 ms
Start of logging - full start	+ ca. 500 ms	+ ca. 500 ms	+ ca. 500 ms	+ ca. 500 ms
Start of logging - Ethernet / OABR, AutoNeg off	< 120 ms	< 120 ms	< 120 ms	< 120 ms
Standby Mode	Configurable time at no bus load	Configurable time at no bus load	Configurable time at no bus load	Configurable time at no bus load
Wakeup by	CAN-HS, CAN-LS, LIN, Serial, KL 15, Trigger button	CAN-HS, CAN-LS, LIN, Serial, KL 15, Trigger button	CAN-HS, CAN-LS, LIN, Serial, KL 15, Trigger button, MOST	CAN-HS, CAN-LS, LIN, Serial, KL 15, Trigger button, FlexRay
Case	**CAN**	**LIN**	**MOST**	**FlexRay**
Size (ca.)	(105 x 85 x 33 mm)	(105 x 85 x 33 mm)	(105 x 85 x 33 mm)	(105 x 85 x 33 mm)
Bedienelemente	Push button to start the logger, set marker or to shut down the logger.	Push button to start the logger, set marker or to shut down the logger.	Push button to start the logger, set marker or to shut down the logger.	Push button to start the logger, set marker or to shut down the logger.
LEDs for State / Active	yes	yes	yes	yes
connectors	**CAN**	**LIN**	**MOST**	**FlexRay**
Front connectors	2 x Gbit Ethernet, SD-Card, Mini-USB 2.0	2 x Gbit Ethernet, SD-Card, Mini-USB 2.0	2 x Gbit Ethernet, SD-Card, Mini-USB 2.0	2 x Gbit Ethernet, SD-Card, Mini-USB 2.0
Rear connectors	2 x GBit ETH SUB-D 44-pol: Power supply, 8 x HS-CAN, 1 x LS-CAN, 2 x LIN, 5 x Serial, 2 x Analog input, 2 x Digital input, 2 x Digital output, 2 x OABR	2 x GBit ETH SUB-D 44-pol: Power supply, 2 x HS-CAN, 1 x LS-CAN, 8 x LIN, 5 x Serial, 2 x Analog input, 2 x Digital input, 2 x Digital output	2 x GBit ETH SUB-D 15-pol: Power supply,, 1 x HS-CAN, 1 x HS/LS-CAN (mux), 3 x Serial, 1 x Seriell / ECL (mux), 2 x Analog input, 2 x Digital input	2 x GBit ETH SUB-D 44-pol: Power supply,, 4 x HS-CAN, 1 x LS-CAN, 2 x LIN, 5 x Serial, 2 x Analog input, 2 x Digital output

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Data recording	CAN	LIN	MOST	FlexRay
Storage type	58 GByte Flash intern	58 GByte Flash intern	58 GByte Flash intern	58 GByte Flash intern
	SD-Card	SD-Card	SD-Card	SD-Card
	USB flash drive	USB flash drive	USB flash drive	USB flash drive
Recording modes	Normal, Ringpuffer	Normal, Ringpuffer	Normal, Ringpuffer	Normal, Ringpuffer
Timestamp accuracy	1µs	1µs	1µs	1µs
MOST 150 recording	CAN	LIN	MOST	FlexRay
Channels			MDP MOST data packets, MEP MOST Ethernet packets, control channel, Network Status, MOST streaming (Synchron / Isochron) (option)	
Status recording			Light on/off, Lock on/off	
Filter			MDP filter (source address, target address), MEP filter (target MAC address)	
CAN recording	CAN	LIN	MOST	FlexRay
Channels	8 High speed, 1 Low speed	2 High speed, 1 Low speed	1 High speed, 1 High/Low speed (mixed)	4 High speed, 1 Low speed
Baud rate	bis zu1000000 Baud bei HS-CAN up to 125000 Baud at LS-CAN	bis zu1000000 Baud bei HS-CAN up to 125000 Baud at LS-CAN	bis zu1000000 Baud bei HS-CAN up to 125000 Baud at LS-CAN	bis zu1000000 Baud bei HS-CAN up to 125000 Baud at LS-CAN
Transceiver	TJA1041A, TJA1055T	TJA1041A, TJA1055T	TJA1041A, TJA1055T	TJA1041A, TJA1055T
Filter	CAN ID Filter	CAN ID Filter	CAN ID Filter	CAN ID Filter
Status recording	Error frames	Error frames	Error frames	Error frames
Serial recording	CAN	LIN	MOST	FlexRay
Type	RS232	RS232	RS232	RS232
Channels	5	5	4	5
Baud rate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600 Baud	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600 Baud	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600 Baud	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600 Baud
Data Bits	5,6,7,8	5,6,7,8	5,6,7,8	5,6,7,8
Stop Bits	1,1.5,2	1,1.5,2	1,1.5,2	1,1.5,2
Parity	none, odd, even	none, odd, even	none, odd, even	none, odd, even
LIN recording	CAN	LIN	MOST	FlexRay
Channels	2	8		2
Baud rate	1200, 2400, 4800, 9600, 10400, 19200, 20000 Baud	1200, 2400, 4800, 9600, 10400, 19200, 20000 Baud		1200, 2400, 4800, 9600, 10400, 19200, 20000 Baud
Tranceiver	TJA1021	TJA1021		TJA1021
FlexRay recording	CAN	LIN	MOST	FlexRay
Channels				3x(a/b)
Bitr ate				Up to10 Mbit/s
Tranceiver				AS8222
Recording				Null frames, Startup

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				Phase, Trailer CRC, Symbol
Ethernet Aufzeichnung	**CAN**	**LIN**	**MOST**	**FlexRay**
Ports	4	4	4	4
Speed	2x1GBit/s (front side) 2x100Mbit/s (rear side, Protokoll-Logging / 1GBit/s SPY-Mode)	2x1GBit/s (front side) 2x100Mbit/s (rear side, Protokoll-Logging / 1GBit/s SPY-Mode)	2x1GBit/s (front side) 2x100Mbit/s (rear side, Protokoll-Logging / 1GBit/s SPY-Mode)	2x1GBit/s (front side) 2x100Mbit/s (rear side, Protokoll-Logging / 1GBit/s SPY-Mode)
Recording	GN-Log, raw, UTF8, UDP, DLT (optional), EsoTrace (optional)	GN-Log, raw, UTF8, UDP, DLT (optional), EsoTrace (optional)	GN-Log, raw, UTF8, UDP, DLT (optional), EsoTrace (optional)	GN-Log, raw, UTF8, UDP, DLT (optional), EsoTrace (optional)
OABR- Recording	2 Ports, Master/Slave changeable			
Analog Recording	**CAN**	**LIN**	**MOST**	**FlexRay**
Channels	1xUbat (internal), 2x external	1xUbat (internal), 2x external	1xUbat (internal), 2x external	1xUbat (internal), 2x external
Range of measurement	0 V - +20 V	0 V - +20 V	0 V - +20 V	0 V - +20 V
Resolution	7 mV	7 mV	7 mV	7 mV
Accuracy	3%	3%	3%	3%
Sampling interval	1ms to 100s	1ms to 100s	1ms to 100s	1ms to 100s
Digital Input	**CAN**	**LIN**	**MOST**	**FlexRay**
Channels	2 (physically identical with analog input)	2 (physically identical with analog input)	2 (physically identical with analog input)	2 (physically identical with analog input)
Switching threshold	7V ±0,2 V	7V ±0,2 V	7V ±0,2 V	7V ±0,2 V
Hysteresis	0,3 V ±0,2 V	0,3 V ±0,2 V	0,3 V ±0,2 V	0,3 V ±0,2 V
Sampling interval	1ms to 100s	1ms to 100s	1ms to 100s	1ms to 100s
Digitale Ausgänge	**CAN**	**LIN**	**MOST**	**FlexRay**
Channels	2	2		2
Output voltage	~Ubat	~Ubat		~Ubat
Output current	up to 1 A	up to 1 A		up to 1 A

Table 14.1: Datasheet

15. Pin assignments and harnesses

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.

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15.1.   Pin assignment - 44-pol SUB-D connector at blue PiraT Mini CAN

@ Logger		comment / depiction / signal name	@ Vehicle interface	
SUB-D 44-pol	signal		Type	Pin
1	HSCAN_L_0	High Speed CAN #01 LOW	DSUB-9 / male	2
2	HSCAN_H_0	High Speed CAN #01 HIGH	DSUB-9 / male	7
3	HSCAN_L_1	High Speed CAN #02 LOW	DSUB-9 / male	2
4	HSCAN_H_1	High Speed CAN #02 HIGH	DSUB-9 / male	7
5	HSCAN_L_2	High Speed CAN #03 LOW	DSUB-9 / male	2
6	HSCAN_H_2	High Speed CAN #03 HIGH	DSUB-9 / male	7
7	HSCAN_L_3	High Speed CAN #04 LOW	DSUB-9 / male	2
8	HSCAN_H_3	High Speed CAN #04 HIGH	DSUB-9 / male	7
9	HSCAN_L_4	High Speed CAN #05 LOW	DSUB-9 / male	2
10	HSCAN_H_4	High Speed CAN #05 HIGH	DSUB-9 / male	7
11	HSCAN_L_5	High Speed CAN #06 LOW	DSUB-9 / male	2
12	HSCAN_H_5	High Speed CAN #06 HIGH	DSUB-9 / male	7
13	LSCAN_L_0	Low Speed CAN LOW	DSUB-9 / male	2
14	LSCAN_H_0	Low Speed CAN HIGH	DSUB-9 / male	7
15	KL31	power supply (-)	banana plug **black**	1
16	KL31	power supply (-)	combined with #15	1
17	HSCAN_L_6	High Speed CAN #07 LOW	DSUB-9 / male	2
18	HSCAN_H_6	High Speed CAN #07 HIGH	DSUB-9 / male	7
19	KFZ V24 RX 0	Serial RS232 #1 RX	DSUB-9 / male	2
20	KFZ V24 TX 0	Serial RS232 #1 TX	DSUB-9 / male	3
21	KFZ V24 RX 1	Serial l RS232 #2 RX	DSUB-9 / male	2
22	KFZ V24 TX 1	Serial RS232 #2 TX	DSUB-9 / male	3
23	KFZ V24 RX 2	Serial RS232 #3 RX	DSUB-9 / male	2
24	KFZ V24 TX 2	Serial RS232 #3 TX	DSUB-9 / male	3
25	KFZ V24 RX 3	Serial RS232 #4 RX	DSUB-9 / male	2
26	KFZ V24 TX 3	Serial RS232 #4 TX	DSUB-9 / male	3
27	HSCAN_L_7	High Speed CAN #08 LOW	DSUB-9 / male	2
28	HSCAN_H_7	High Speed CAN #08 HIGH	DSUB-9 / male	7
29	KL30	power supply (+)	banana plug **red**	1
30	KL30	power supply (+)	combined with #29	1
31	KL15	wake up from KL15	banana plug **blue**	1
32	LIN 0	LIN 1	DSUB-9 / male	7
33	LIN 1	LIN 2	DSUB-9 / male	7
34	KFZ ANA IN 0	Analog/Dig. Interface #2 IN	banana plug **yellow**	1
35	KFZ ANA IN 1	Analog/Dig. Interface #3 IN	banana plug **yellow**	1
36	KFZ ANA COM	Analog Interface ground	banana plug **yellow**	1
37	KFZ BRR 0-	Broad-R-Reach 1-	MCD 5 / (white)	2
38	KFZ BRR 0+	Broad-R-Reach 1+	MCD 5 / (green)	3
39	KFZ BRR 1-	Broad-R-Reach 2-	MCD 5 / (white)	2
40	KFZ BRR 1+	Broad-R-Reach 2+	MCD 5 / (green)	3
41	KFZ V24 RX 4	Serial RS232 #5 RX	DSUB-9 / male	2
42	KFZ V24 TX 4	Serial RS232 #5 TX	DSUB-9 / male	3
43	KFZ DIG OUT 2	Digital OUT 2	banana jack **green**	1
44	KFZ DIG OUT 1	Digital OUT 1	banana jack **green**	1

Table 15.1: Pin assignment of the multi-function connector

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15.2. Pin assignment - 44-pol SUB-D connector at blue PiraT Mini LIN

@ Logger		comment / depiction / signal name	@ Vehicle interface	
SUB-D 44-pol	signal		Type	Pin
1	HSCAN_L_0	High Speed CAN #01 LOW	DSUB-9 / male	2
2	HSCAN_H_0	High Speed CAN #01 HIGH	DSUB-9 / male	7
3	HSCAN_L_1	High Speed CAN #02 LOW	DSUB-9 / male	2
4	HSCAN_H_1	High Speed CAN #02 HIGH	DSUB-9 / male	7
5	not connected	---	---	
6	LIN 2	LIN 3	DSUB-9 / male	7
7	LIN 3	LIN 4	DSUB-9 / male	7
8	LIN 4	LIN 5	DSUB-9 / male	7
9	LIN 5	LIN 6	DSUB-9 / male	7
10	LIN 6	LIN 7	DSUB-9 / male	7
11	LIN 7	LIN 8	DSUB-9 / male	7
12	not connected	---	---	
13	LSCAN_L_0	Low Speed CAN LOW	DSUB-9 / male	2
14	LSCAN_H_0	Low Speed CAN HIGH	DSUB-9 / male	7
15	KL31	power supply (-)	banana plug **black**	1
16	KL31	power supply (-)	combined with #15	1
17	not connected	---	---	
18	not connected	---	---	
19	KFZ V24 RX 0	Serial RS232 #1 RX	DSUB-9 / male	2
20	KFZ V24 TX 0	Serial RS232 #1 TX	DSUB-9 / male	3
21	KFZ V24 RX 1	Serial RS232 #2 RX	DSUB-9 / male	2
22	KFZ V24 TX 1	Serial RS232 #2 TX	DSUB-9 / male	3
23	KFZ V24 RX 2	Serial RS232 #3 RX	DSUB-9 / male	2
24	KFZ V24 TX 2	Serial RS232 #3 TX	DSUB-9 / male	3
25	KFZ V24 RX 3	Serial RS232 #4 RX	DSUB-9 / male	2
26	KFZ V24 TX 3	Serial RS232 #4 TX	DSUB-9 / male	3
27	not connected	---	---	
28	not connected	---	---	
29	KL30	power supply (+)	banana plug **red**	1
30	KL30	power supply (+)	combined with #29	1
31	KL15	wake up from KL15	banana plug **blue**	1
32	LIN 0	LIN 1	DSUB-9 / male	7
33	LIN 1	LIN 2	DSUB-9 / male	7
34	KFZ ANA IN 0	Analog/Dig. Interface #2 IN	banana plug **yellow**	1
35	KFZ ANA IN 1	Analog/Dig. Interface #3 IN	banana plug **yellow**	1
36	KFZ ANA COM	Analog Interface ground	banana plug **yellow**	1
37	not connected	---	---	
38	not connected	---	---	
39	not connected	---	---	
40	not connected	---	---	
41	KFZ V24 RX 4	Serial RS232 #5 RX	DSUB-9 / male	2
42	KFZ V24 TX 4	Serial RS232 #5 TX	DSUB-9 / male	3
43	KFZ DIG OUT 2	Digital OUT 2	banana jack **green**	1
44	KFZ DIG OUT 1	Digital OUT 1	banana jack **green**	1

Table 15.2: Pin assignment - 44-pol SUB-D connector at blue PiraT Mini LIN

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15.3.   Pin assignment - 15-pol SUB-D connector at blue PiraT Mini MOST

@ Logger		comment / depiction / signal name	@ Vehicle interface	
SUB-D 15-pol	signal		Type	Pin
1	HSCAN_L_0	High Speed CAN #01 LOW	DSUB-9 / male	2
2	HSCAN_H_0	High Speed CAN #01 HIGH	DSUB-9 / male	7
3	HSLSCAN_L_1	HS / LS CAN #02 LOW	DSUB-9 / male	2
4	HSLSCAN_H_1	HS / LS CAN #02 HIGH	DSUB-9 / male	7
5	KL31	power supply (-)	banana plug **black**	1
6	KL31	power supply (-)	combined with #15	1
7	KFZ V24 RX 0	Serial RS232 #1 RX	DSUB-9 / male	2
8	KFZ V24 RX 1	Serial RS232 #2 RX	DSUB-9 / male	2
9	KL30	power supply (+)	banana plug **red**	1
10	KL30	power supply (+)	combined with #29	1
11	KFZ V24 RX 2	RS232 #3 RX	DSUB-9 / male	2
12	KFZ V24 RX 3	RS232 #4 RX / ECL	DSUB-9 / male	2
13	KFZ ANA IN 0	Analog/Dig. Interface #2 IN	banana plug **yellow**	1
14	KFZ ANA IN 1	Analog/Dig. Interface #3 IN	banana plug **yellow**	1
15	KFZ ANA COM	Analog Interface ground	banana plug **yellow**	1

Table 15.3: Pin assignment - 15-pol SUB-D connector at blue PiraT Mini MOST

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15.4.   Pin assignment - 44-pol SUB-D connector at blue PiraT Mini FlexRay

@ Logger		comment / depiction / signal name	@ Vehicle interface	
SUB-D 44-pol	signal		Type	Pin
1	HSCAN_L_0	High Speed CAN #01 LOW	DSUB-9 / male	2
2	HSCAN_H_0	High Speed CAN #01 HIGH	DSUB-9 / male	7
3	HSCAN_L_1	High Speed CAN #02 LOW	DSUB-9 / male	2
4	HSCAN_H_1	High Speed CAN #02 HIGH	DSUB-9 / male	7
5	HSCAN_L_2	High Speed CAN #03 LOW	DSUB-9 / male	2
6	HSCAN_H_2	High Speed CAN #03 HIGH	DSUB-9 / male	7
7	HSCAN_L_3	High Speed CAN #04 LOW	DSUB-9 / male	2
8	HSCAN_H_3	High Speed CAN #04 HIGH	DSUB-9 / male	7
9	FR BP 0	FlexRay+ Channel 1a	DSUB-9 / male	7
10	FR BM 0	FlexRay- Channel 1a	DSUB-9 / male	2
11	FR BP 1	FlexRay+ Channel 1b	DSUB-9 / male	7
12	FR BM 1	FlexRay- Channel 1b	DSUB-9 / male	2
13	LSCAN_L_0	Low Speed CAN LOW	DSUB-9 / male	2
14	LSCAN_H_0	Low Speed CAN HIGH	DSUB-9 / male	7
15	KL31	power supply (-)	banana plug **black**	1
16	KL31	power supply (-)	combined with #15	1
17	FR BP 4	FlexRay+ Channel 3a	DSUB-9 / male	7
18	FR BM 4	FlexRay- Channel 3a	DSUB-9 / male	2
19	KFZ V24 RX 0	Serial RS232 #1 RX	DSUB-9 / male	2
20	KFZ V24 TX 0	Serial RS232 #1 TX	DSUB-9 / male	3
21	KFZ V24 RX 1	Serial RS232 #2 RX	DSUB-9 / male	2
22	KFZ V24 TX 1	Serial RS232 #2 TX	DSUB-9 / male	3
23	KFZ V24 RX 2	Serial RS232 #3 RX	DSUB-9 / male	2
24	KFZ V24 TX 2	Serial RS232 #3 TX	DSUB-9 / male	3
25	KFZ V24 RX 3	Serial RS232 #4 RX	DSUB-9 / male	2
26	KFZ V24 TX 3	Serial RS232 #4 TX	DSUB-9 / male	3
27	FR BP 5	FlexRay+ Channel 3b	DSUB-9 / male	7
28	FR BM 5	FlexRay- Channel 3b	DSUB-9 / male	2
29	KL30	power supply (+)	banana plug **red**	1
30	KL30	power supply (+)	combined with #29	1
31	KL15	wake up from KL15	banana plug **blue**	1
32	LIN 0	LIN 1	DSUB-9 / male	7
33	LIN 1	LIN 2	DSUB-9 / male	7
34	KFZ ANA IN 0	Analog/Dig. Interface #2 IN	banana plug **yellow**	1
35	KFZ ANA IN 1	Analog/Dig. Interface #3 IN	banana plug **yellow**	1
36	KFZ ANA COM	Analog Interface ground	banana plug **yellow**	1
37	FR BP 2	FlexRay+ Channel 2a	DSUB-9 / male	7
38	FR BM 2	FlexRay- Channel 2a	DSUB-9 / male	2
39	FR BP 3	FlexRay+ Channel 2b	DSUB-9 / male	7
40	FR BM 3	FlexRay- Channel 2b	DSUB-9 / male	2
41	KFZ V24 RX 4	Serial RS232 #5 RX	DSUB-9 / male	2
42	KFZ V24 TX 4	Serial RS232 #5 TX	DSUB-9 / male	3
43	KFZ DIG OUT 2	Digital OUT 2	banana jack **green**	1
44	KFZ DIG OUT 1	Digital OUT 1	banana jack **green**	1

Table 15.4: Pin assignment - 44-pol SUB-D connector at blue PiraT Mini FlexRay

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16.   Abbreviations

abbreviation	meaning
blue PiraT	**P**rocessing **I**nformation **R**ecording **A**nalyzing **T**ool
bP	**b**lue **P**iraT
bP2	**b**lue **P**iraT**2**
bP2 HW2.x	**b**lue **P**iraT**2** Hardware 2.x
bPMini	**b**lue **P**iraT Mini
TSL	**T**elemotive **S**ystem **L**ink
TSC	**T**elemotive **S**ystem **C**lient
CAN	**C**ontroller **A**rea **N**etwork
LIN	**L**ocal **I**nterconnect **N**etwork
MOST	**M**edia **O**riented **S**ystems **T**ransport. (*www.mostnet.de*)
ECL	**E**lectrical **C**ontrol **L**ine
MEP	**M**OST **E**thernet **P**acket
USB	**U**niversal **S**erial **B**us
CF	**C**ompact **F**lash
SD	**S**ecure **D**igital
LAN	**L**ocal **A**erea **N**etwork = Netzwerk
FW	**F**irm**w**are
PW	**P**ass**w**ort
SFTP	**S**ecure **F**ile **T**ransfer **P**rotocol
SHA	**S**ecure **Ha**sh
SSL	**S**ecure **S**ockets **L**ayer
TLS	**T**ransport **L**ayer **S**ecurity
TMP	**T**ele**m**otive **P**acketformat
UTC	**U**niversal **T**ime, **C**oordinated
GMT	**G**reenwich **M**ean **T**ime

Table 16.1: Tabe of abbreviations

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18. List of tables

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19.   Contact

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