

blue PiraT Mini User Guide

Version 2.4.1 / 21.09.2016



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3 Overview

This user guide describes the administration of the newest generation of blue PiraT data logger of the Telemotive AG, called **blue PiraT Mini**.

This user guide describes hardware and interfaces as well as the general functions of the **blue PiraT Mini**. The configuration and converting of the logged trace data is described in the user guide of the **Telemotive System Client**.

This document refers to **firmware version 02.04.01** and the **Telemotive System Client** from **version 2.4.1**. Some features depending on model and feature license or may not be available in older versions.

Software updates and user guides for other, optional, licensed enhancements are available in the Telemotive ServiceCenter. *(Please find the address under Contact at the last page.)*

To ensure the most reliable operation of your system as possible, please make sure to use always current firmware and software versions.

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4 System requirements

Control Unit

A Windows based Laptop or PC is needed to configure the devices of Telemotive AG by **Telemotive System Client**. It also allows to save the recorded data and to use them offline later.

Telemotive System Client

The software client is used for configuring the data logger as well as downloading the recorded data or convert these into your needed file format. An firmware update can be performed by the **Telemotive System Client** too to ensure that your devices are always up to date.

blue PiraT Mini

The communication between bus systems and control units is monitored and relevant data can be recorded very precisely with the data logger of Telemotive AG. The collected data are stored to the logger and can be downloaded via Ethernet to a PC.

The **blue PiraT Mini** is smallest data logger in the world with an outstanding functional scope. It offers a wide range of interfaces, stable temperature behavior, very low energy consumption, four GBit Ethernet ports, and much more. Different blue PiraT Mini can be flexibly expanded to one cluster and therefore handled very easily by using [Telemotive System Link](#).

License

For some additional features an installed license is required. Settings for licensed features can be performed with a valid license only.

If you need a license for your logger, please contact our sales department (please find the address under contact at the last page).

4.1 Further manuals

Beside this user guide 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

User manual for Remote Control Touch

https://sc.telemotive.de/4/uploads/media/RCTouch_UserGuide.pdf

User manual for blue PiraT Remote

https://sc.telemotive.de/4/uploads/media/blue_PiraT_Remote_UserGuide.pdf

For having an easy access if necessary, the most important manuals are linked in the client under the menu item **[Help]** and are reachable easily from there.

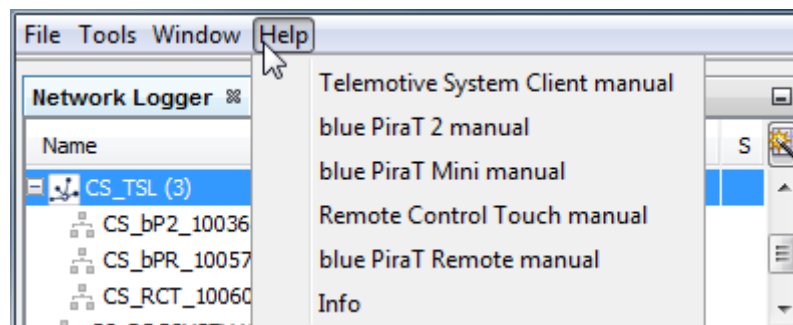


Figure 4.1: links to the manuals

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 licenses**.

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5 The blue PiraT Mini system

The **blue PiraT Mini** is a data logger, which offers the following interfaces, depending on the model:

- 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

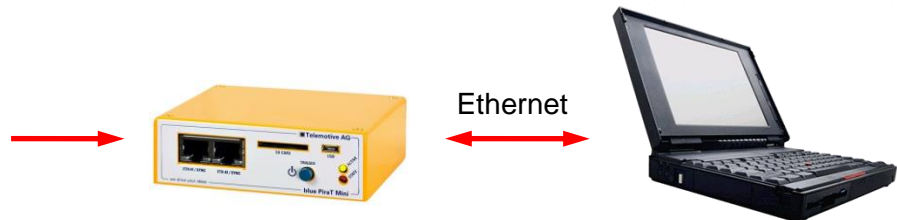


Figure 5.1: Interface (overview)

The data logger can be mounted in a vehicle and due to his large storage capacity of the hard drive of currently approx. 50 GB usable space, the **blue PiraT Mini** is able to support extensive test runs. After the data has been gathered it has to be downloaded via Ethernet. For the download and the conversion of the logging data the Telemotive System 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 with different features (see chapter **5.2**

Additional features by optional licenses).

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 recording functionality, the blue PiraT Mini provides online data processing functions:

- simple CAN and MOST filters
- custom-defined messages can trigger the setting of markers

5.1 Accessories

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

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

Please contact Telemotive sales for more information about these accessories.

Manuals are available from the Telemotive ServiceCenter.

5.2 Additional features by optional licenses

Additional features can be activated by purchasing and installing licenses. Licenses can be ordered at our sales team. You find the user guides for these additional features in the Telemotive ServiceCenter. Currently the following licensed features are available.

Feature	Description
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 or send a CAN message). The standard configuration of the data logger contains 2 complex triggers. This license allows configuring up to 50 complex triggers.
Remote Control Monitor	display of configurable CAN, LIN, FlexRay, analog and digital signals at the Remote Control
Diagnostic Log and Trace	logging of Diagnostic Log and Trace (DLT) messages over Ethernet or serial (restricted) connections
Camera Link	video recording via video server or network cameras
WLAN	supporting wireless LAN (802.11, 802.11a, 802.11n), (802.11ac from FW 02.04.01)
GPS logging	tracking of GPS data (<i>in the moment blue PiraT2 Ver. 1.x only</i>)
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 pre-configured 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 a MDF, CSV or TMT file.
Telemotive Live View	showing CAN 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.
BroadR-Reach logging	recording of data over BroadR-Reach Ethernet. (<i>Note: Just available for blue PiraT Mini CAN</i>)
MLBevo	The license Connected-Gateway MLBevo enables the recording of data of the ATOP control unit MLBevo via USB to the Telemotive data logger and convert these data with the Telemotive System Client. (<i>from FW 02.03.01</i>)
Telemotive Download Terminal	Telemotive Download Terminal allows an automatization of configured tasks for a defined group of devices. (<i>from FW 02.03.01</i>)
TPE	TPE = Telemotive Performance Extension Increasing the logging rate for Ethernet data up to 100Mbit/s (<i>from FW 02.04.01</i>)
Test automatisaion	Interface for connecting to test automation tools. At the moment, the sending of CAN messages is supported. (<i>from FW 02.04.01</i>)

Table 5.1: Additional features by optional licenses

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 in relation to the available interfaces. So an optimal utilization is ensured, depending on the existing 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.

blue PiraT Mini Model				
Interfaces	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: Versions of the blue PiraT Mini data logger

6.2 Front side

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

On the front side there are also the **[ON / Trigger]** button as well as LEDs for **ACTIVE** and **STATE**, a **Micro-USB**-connector and the receptacle for **SD cards**.



Figure 6.1: Front panel of the blue PiraT Mini

6.3 Rear side

On the rear side are two more 1-Gbit-Ethernet ports (**ETH #3** and **ETH #4**) and the **44-pol SUB-D HD** multifunctional main connector for power supply and some of the **[Interfaces]**.



Figure 6.2: Rear side of the blue PiraT Mini CAN / LIN / FlexRay

On the rear side of **blue PiraT Mini MOST** the multifunctional main connector for power supply and some of the interfaces are realized with a **15-pol SUB-D** connector. Additional you'll find at the MOST logger a **MOST150** connector.



Figure 6.3: Rear side of the blue PiraT Mini MOST

7 Controls and ports

This chapter describes the usage of the controls and ports on the front and rear side of the blue PiraT Mini.

7.1 ON / Trigger button

The **[ON / Trigger]** button on the front panel is used for these actions:

Function	Device status	Handling
Start device	out of action	Push the [ON / Trigger] button.
Wake up device	in standby mode	Push the [ON / Trigger] button.
Set Marker	in operational state	Push the [ON / Trigger] button.
Shut down device (to standby mode)	in operational state	Push and hold the [ON / Trigger] button. (about 3 to 5 seconds)
Reset network settings back to default settings	in standby mode	Start the device. Push and hold the [ON / Trigger] button, until the STATE-LED flashes red twice. (~ 15 seconds) Shut down device and start it again, to set the settings.

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

Note: The **[ON / Trigger]** button has set a debouncing time of 335 ms.

7.1.1 Resetting the logger to factory settings

Beside the possibility to reset the network settings, the blue PiraT Mini offers the possibility to reset the device to factory respectively delivery status, if the logger is in error state and there's no chance to connect to the logger any more (even after a network reset).

Warning:

Due to the reset to factory settings all data and licenses on the logger will be deleted.

Needed licenses have to be installed on the logger again after this operation.

An actual firmware version has to be flashed after this procedure. This is signaled by the STATE-LED and a failure message "FC_FW_UPDATE" at the client.

To reset the logger to factory settings the logger has to be unplugged from power supply.

While you connect the logger with the power supply, press the **[ON / Trigger]** button, until both LEDs are pulsing.

Note:

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

During the short phase, in which the LEDs are pulsing (for about 10 seconds), quickly press many times the **[ON / Trigger]** button, until both LEDs are blinking alternately.

The device starts to reset itself to factory settings. This operation will take some minutes. The blue PiraT Mini will switch off after that automatically.

7.2 LEDs

The **blue PiraT Mini** has two LEDs **ACTIVE** and **STATE** on his front side. They 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 client.
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 is traffic on one of the active interfaces (accept protocol based Ethernet logging).

If an internal or external marker is set, the ACTIVE-LED flashes with full energy for a short time.

7.2.2 STATE-LED (red)

State	Meaning
Off	No bug, normal operational status
On	Device is in error state. If the device is still reachable by the client, the error and some hints to solve this issue can be found in the bug reporter.
blinking	Overload of the data logger; maybe loss of data Information about lost data can be found in the bug reporter.
blinking	When using external media: The external media is identified.
pulsing	Disk space full

Table 7.3: STATE-LED

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 (Telemotive System Link) and synchronize these loggers.

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

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7.4 Micro-USB port

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

It 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 FAT32 file format. You could connect USB flash drives and external hard drive up to a maximal supply current of 500 mA. External power supplies must not be connected to the hard disk.

If the USB memory is pulled in the operational state, the following problems exists:

- The logger is in an undefined state and will not record any data. Only after rebooting the device behaves as expected.
- The data on the USB memory can then be unreadable when it is removed during a write operation.

If you turn off the blue PiraT Mini with the **[ON / Trigger]** button, you have 5 seconds to remove the medium before the logger can be reawakened.

Note:

Telemotive AG recommends the testing of every external storage before using it in a measurement. We suggest that especially USB devices with USB 3.0 are sometimes not recognized by the system.

7.5 SD card slot

The **blue PiraT Mini** offers the possibility to store data parallel to a removable media as SD card or USB device. The configuration of this feature is described in the Telemotive System Client user guide.

The removable media must be formatted with FAT32 with a storage capacity of at least 4 GB. The following SD cards have been tested with the blue PiraT Mini and released for use:

Manufacturer	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: Compatible SD cards

If the removable media is detected by the logger, the red State LED starts flashing.

A write-protected SD memory card will be indicated by the permanent illumination of the red STATE LED.

In addition, the write protection will be highlighted in the network logger window of the Telemotive System Client with a red labelled exclamation mark and an entry in the bug report "FC_MS_READ_ONLY" with a corresponding note.

Then shut down the bP Mini, unlock the SD card, reinsert it and reboot the device.

Attention:

Removing the SD card without prior shutdown may result in the loss of all recorded data.

If the SD card is pulled in the operational state, the following problems exist:

- The logger is in an undefined state and will not record any data. Only after rebooting the device behaves as expected.
- 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 **[ON / 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.

7.7 Multifunction connector 44-pol SUB-D HD

At blue PiraT Mini CAN / LIN / FlexRay this connector has these functions, depending on the logger model:

- | | |
|----------------------------------|--------------------------|
| • Power supply | KL 30 and KL 31 |
| • Clamp 15 | KL 15 |
| • High Speed CAN | HS-CAN |
| • Low Speed CAN / Remote Control | LS-CAN |
| • LIN | LIN |
| • FlexRay | FR x Ch A / Ch B |
| • Serial | RS232 |
| • Analog-Digital IN | KFZ ANA IN / KFZ ANA COM |
| • Digital OUT | KFZ DIG OUT |
| • Broad-R-Reach® | KFZ BRR |

The pinning is described in chapter 15 Pin assignments and harnesses

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 connector 15-pol SUB-D

At blue PiraT Mini MOST this connector has these functions:

- | | |
|----------------------------------|--------------------------|
| • Power supply | KL 30 and KL 31 |
| • High Speed CAN | HS-CAN |
| • Low Speed CAN / Remote Control | LS-CAN |
| • Serial | RS232 |
| • Analog-Digital IN | KFZ ANA IN / KFZ ANA COM |
| • Digital OUT | KFZ DIG OUT |

The pinning is described in chapter 15 Pin assignments and harnesses

7.9 MOST150 interface

The MOST150 interface is a standard 2 + 0 connector for MOST fiber optic.

Important:

Maybe the MOST150 connector can't be plugged when the 15-pol SUB-D connector is not locked.

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.

7.10 Default network settings

Important:

The loggers default setting is "DHCP server" and has to be connected by an Ethernet cable to your computer system. You can download the Telemotive System 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 ON / Trigger button **to reset the network settings.**

Reset network settings back to default settings	in standby mode	Start the device. Push and hold the [ON / Trigger] button, until the STATE-LED flashes red twice. (~ 15 seconds) Shut down device and start it again, to set the settings.
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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/Vbat+/clamp 30** and **black/GND-/clamp 31**).

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

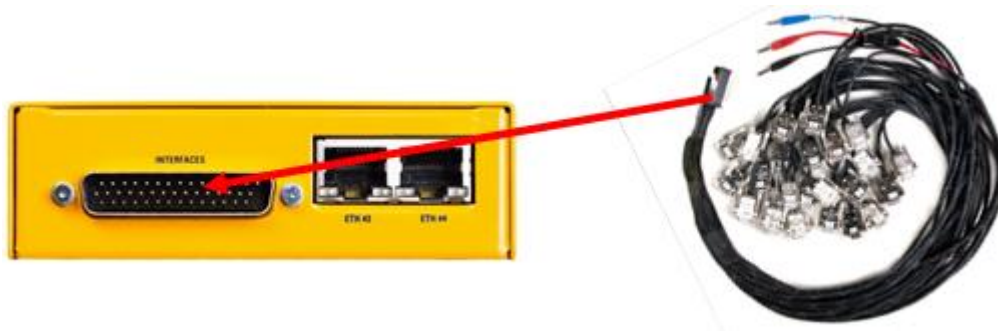


Figure 8.1: Power connection

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

Is the blue PiraT Mini 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 ACTIVE-LED starts pulsing.

The boot sequence takes about 15 seconds, until the logger is reachable by the Telemotive System Client. Data logging is starting much earlier.

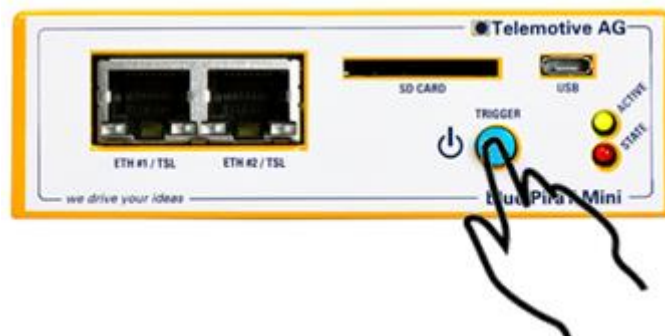


Figure 8.2: Switching on the blue PiraT Mini

8.1 Download and installation of the Telemotive System Client

Open your internet browser, enter the IP address (Default setting: **192.168.0.233**) and press **[Enter]**.

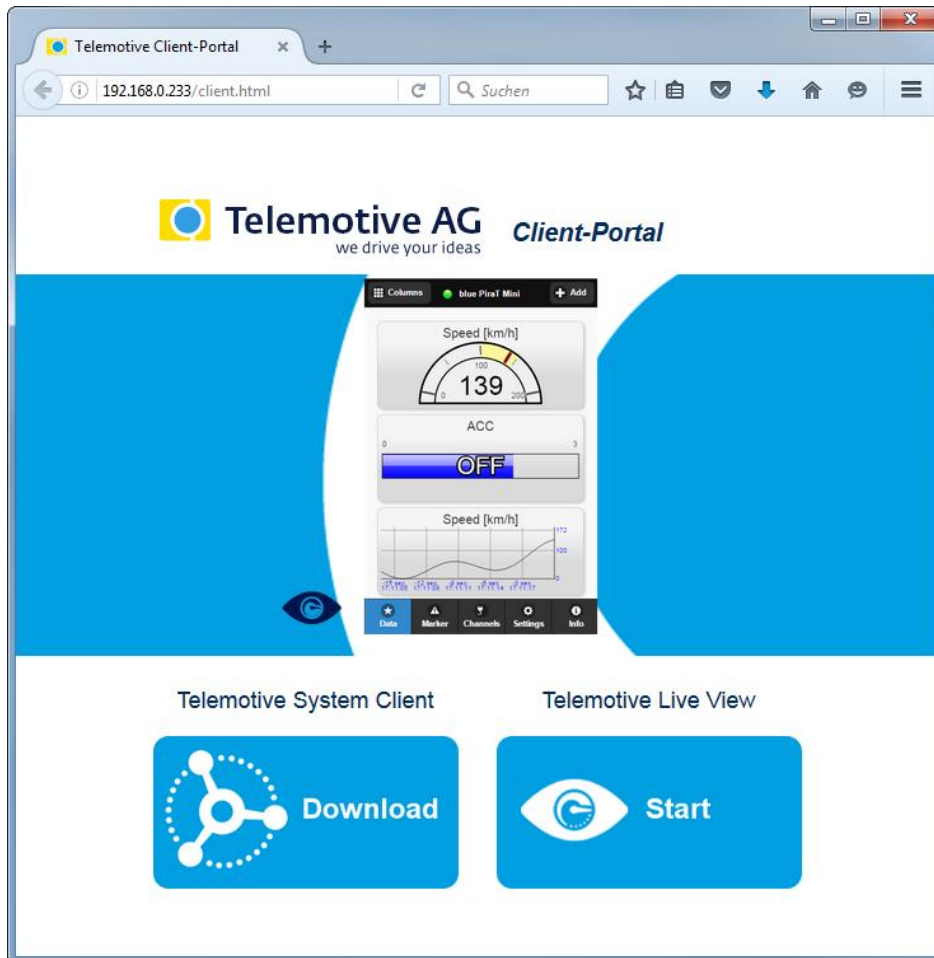


Figure 8.3: Telemotive Client Portal

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 **Obtain IP address automatically**.

Click **[Download]**, to download the Telemotive System Client directly from the logger.

Follow these steps, depending on your browser:

Browser	Proceeding
Internet Explorer	Click [Save] , to locally save the file on your system. Click [Accomplish] .
Mozilla Firefox	Click [Save file] , to locally save the file on your system. Click the arrow on the right top of the browser menu and select the downloaded application in the appearing context menu.

In the dialog that opens select the desired software language from the dropdown menu. Click **[OK]**.

Follow the instructions in the next dialog and select an installation directory. Click **[Install]**.

After successful installation you will find the **Telemotive System Client** icon on your desktop. Double-click the icon to start the application.



Figure 8.4: Desktop icon

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

- detailed description of the Telemotive System 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 open the manual directly via this link:

Manual for the Telemotive System Client

https://sc.telemotive.de/4/uploads/media/TelemotiveSystemClient_UserManual.pdf

For having an easy access if necessary, the most important manuals are linked in the client under the menu item **[Help]** and are reachable easily from there.

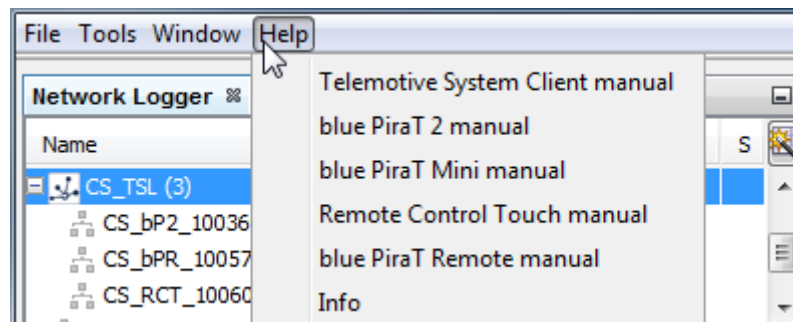


Figure 8.5: links to the manuals

9 Adapter cables

This chapter 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

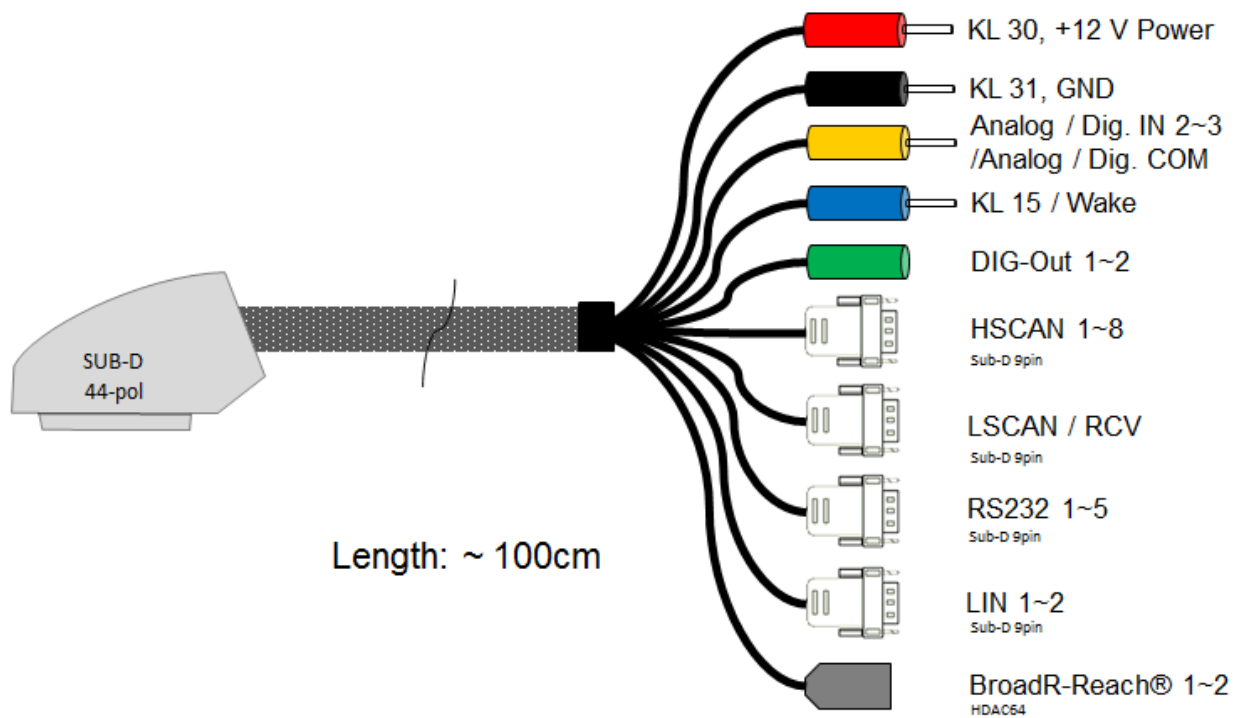


Figure 9.1: blue PiraT Mini cable set CAN

9.2 blue PiraT Mini cable set LIN

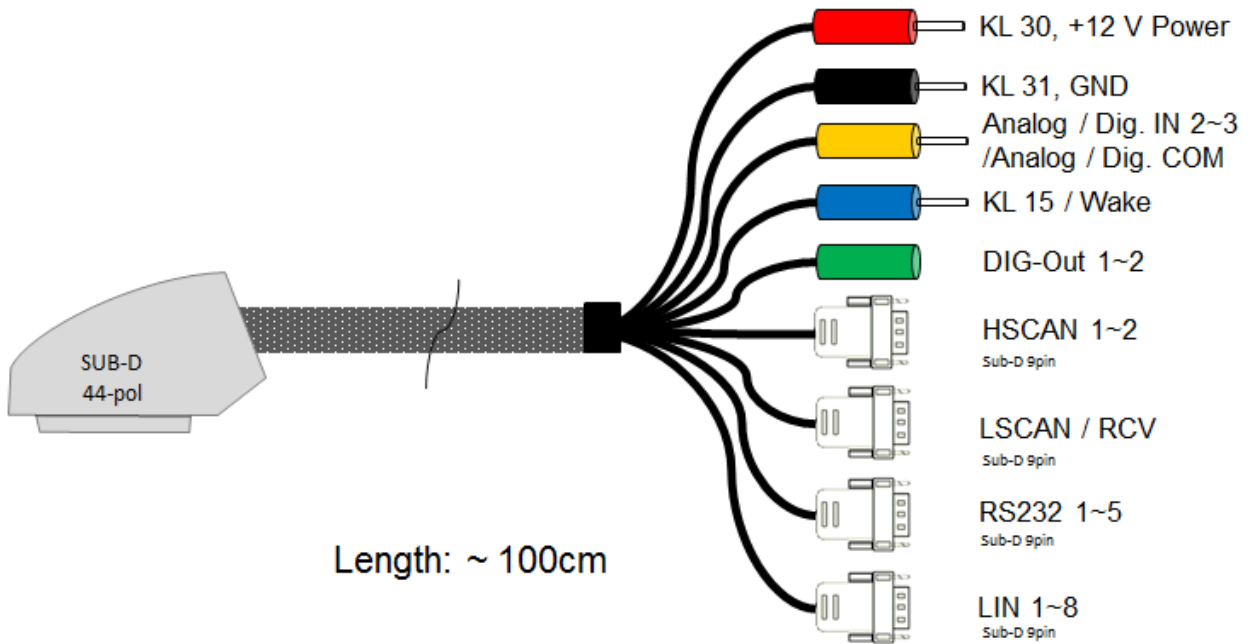


Figure 9.2: blue PiraT Mini cable set LIN

9.3 blue PiraT Mini cable set MOST150

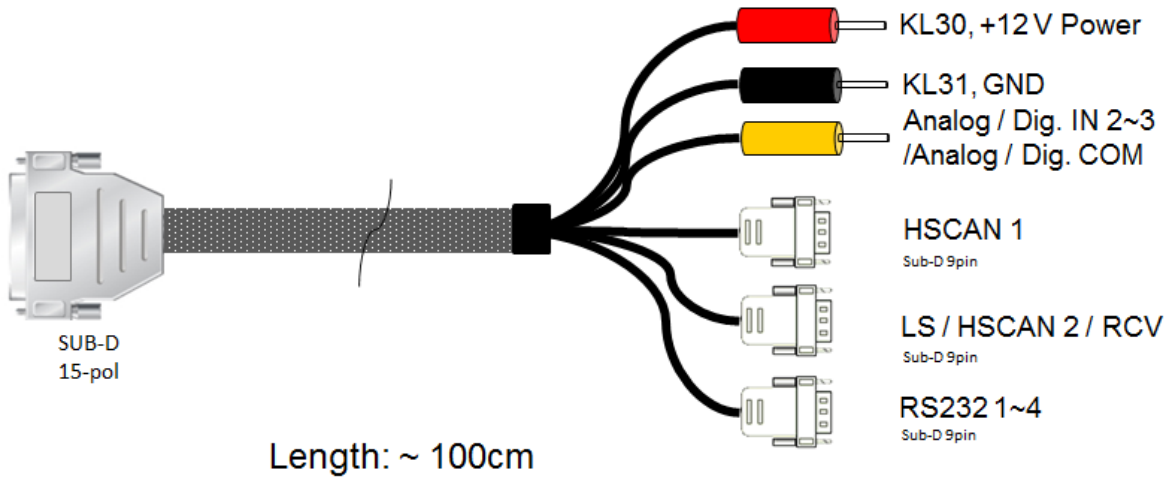


Figure 9.3: blue PiraT Mini cable set MOST150

9.4 blue PiraT Mini cable set FlexRay

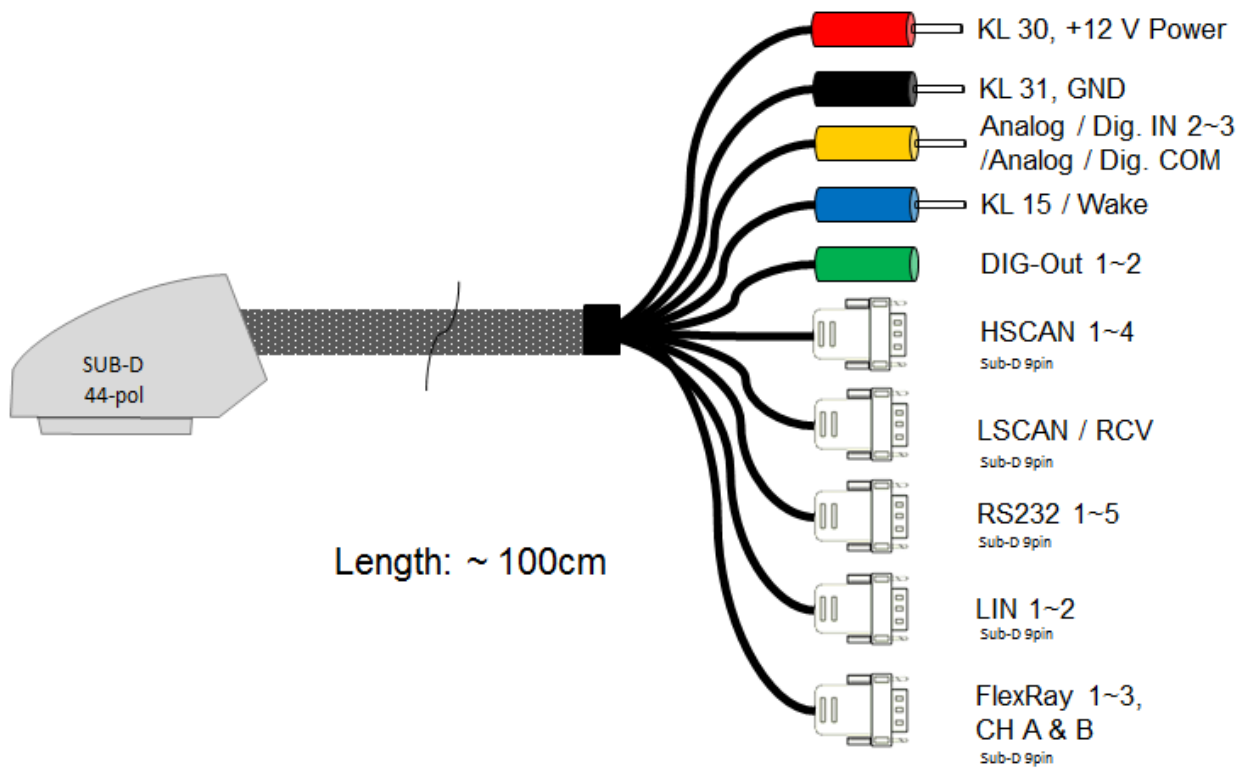


Figure 9.4: blue PiraT Mini cable set FlexRay

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.

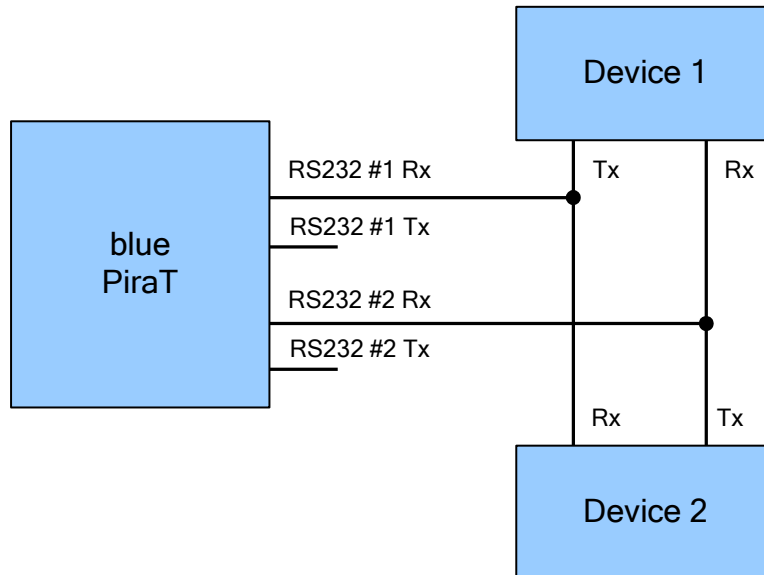
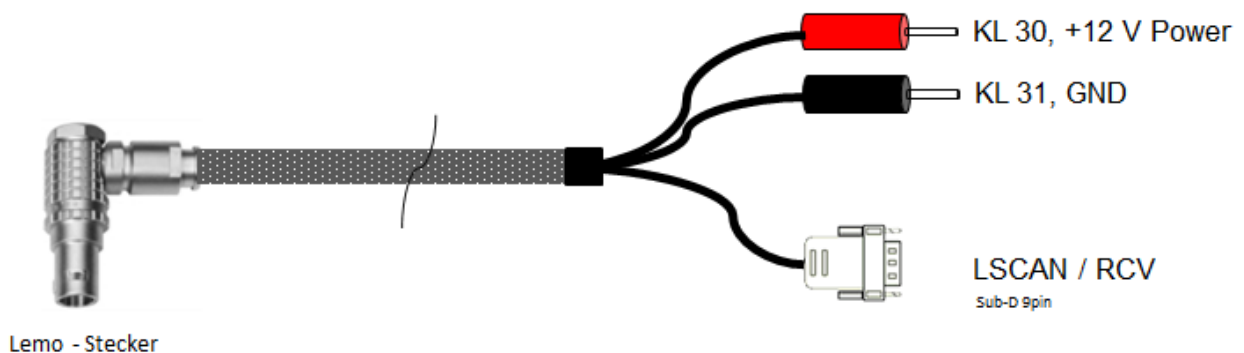


Figure 9.5: Listening to a bidirectional serial communication

9.6 Adapter cable for Remote Control Voice (RCV)



Lemo - Stecker

Length: ~ 300cm

Figure 9.6: Adapter cable for Remote Control Voice

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10 Logging data

10.1 Setting markers

Interesting occurrences 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 internal storage as a marker.

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

Additionally **complex triggers** are making it possible, to define a 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

It is also possible to use the digital inputs and **complex triggers** function to realize an external marker button. Important is to set the used interface active and in the <General settings> of this interface the **[Timing Mode]** is enabled and the <Sampling interval> is set to 100 ms or more.

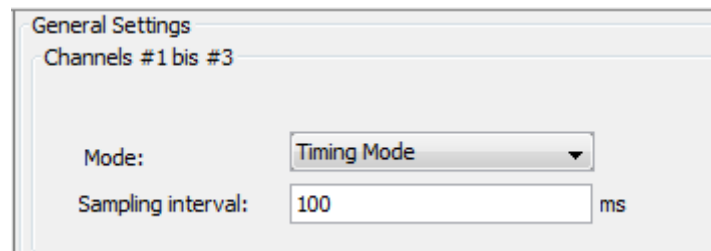


Figure 10.1: General settings

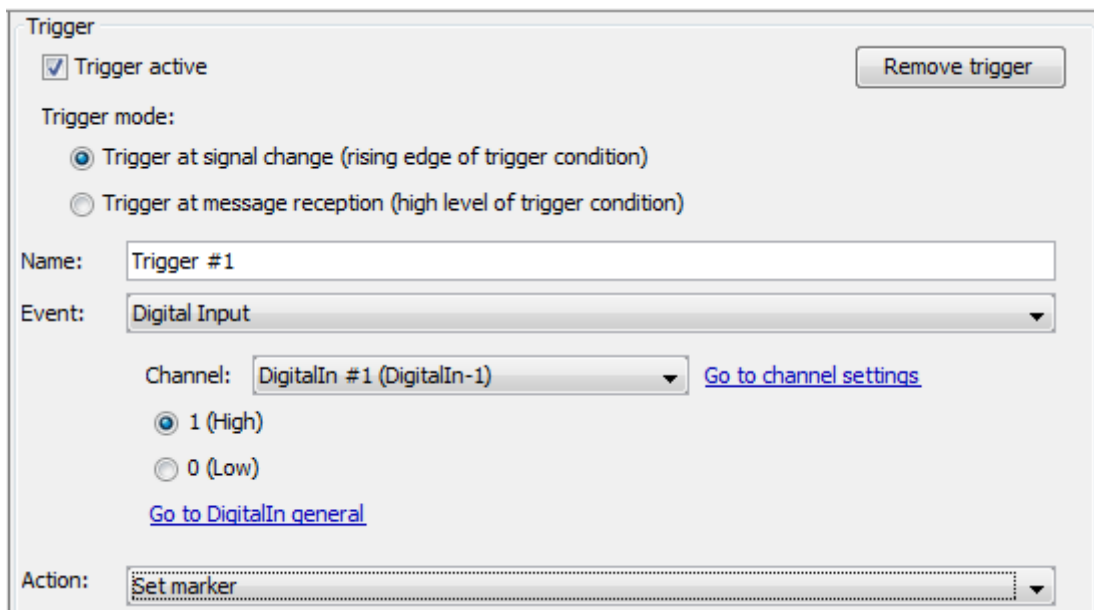


Figure 10.2: Setting Trigger with Digital Input

The setting for the <Sampling interval> is needed to debounce the external push button and to 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. The time stamp is included on most interfaces at the end of the message. Only for the serial interface (RS232) the start of the transfer will be used as timestamp.

Trace Data	Accuracy	Start	End
MOST25	1 μ s		x
MOST150	1 μ s		x
ECL	1 μ s		x
CAN	1 μ s		x
LIN	1 μ s		x
FlexRay	1 μ s		x
Ethernet	100 ms		x
RS232	1 ms	x	

Table 10.1: Accuracy of marker

10.3 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.

Schnittstelle / Interface	Wachhalten / Keep alive	Aufwecken / Wake up	Konfigurierbar / configurable W = wake up A = keep alive	Kommentar / comment
MOST150	✓	✓	W / A: Ein / Aus W / A: On / OFF	Licht an / light on
ECL	✓	✓	W / A: Ein / Aus W / A: On / OFF	
High Speed CAN	✓	✓	W / A: Ein / Aus W / A: On / OFF	
Low Speed CAN	✓	✓	W / A: Ein / Aus W / A: On / OFF	
LIN	✓	✓	W / A: Ein / Aus W / A: On / OFF	
FlexRay	✓	✓	W: FlexRay 1a-3b	
Seriell RS232	✓	✓	W / A: Ein / Aus W / A: On / OFF	
Ethernet 1 Gbit	✓	-	A: Ein / Aus A: On / OFF Alive time	Zeit / time: General / Standby
Analog In	-	-	-	
Digital In 1 - 3	-	-	-	
USB	-	-	-	
Remote Control	-	✓	-	via [ON / Trigger] -Taste/ via [ON / Trigger] -button
[ON / Trigger] -Taste [ON / Trigger] -button	-	✓	-	
WLAN	-	-	-	
KL 15	-	✓	-	

Table 10.2: Standby mode

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10.4 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).

10.4.1 Status Logger: OK

Everything is OK

On the internal memory is enough free space to record all incoming data.

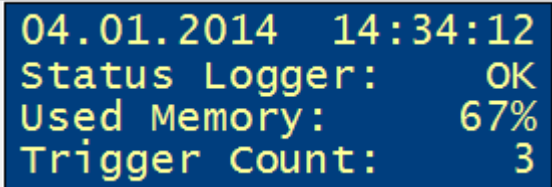
blue PiraT Mini	STATE-LED is off.
RCV	 <pre> 04.01.2014 14:34:12 Status Logger: OK Used Memory: 67% Trigger Count: 3 </pre>

Table 10.3: Status Logger: OK

10.4.2 Status Logger: WARN

Warning, which does not affect the data recording

10.4.3 Status Logger: RING

Memory is full, buffer mode is active

The buffer is active and the storage filled more than 95 %. Older data will be deleted to save space for newer data.

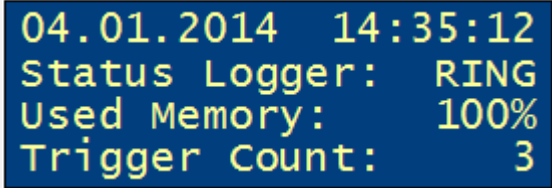
blue PiraT Mini	STATE-LED is off.
RCV	<p>Line three shows the level of the ring buffer on the internal memory.</p>  <pre> 04.01.2014 14:35:12 Status Logger: RING Used Memory: 100% Trigger Count: 3 </pre>

Table 10.4: Status Logger: RING

10.4.4 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.

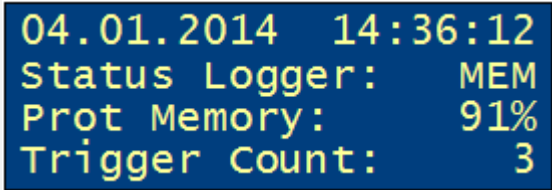
blue PiraT Mini	STATE-LED is off.
RCV	<p>Line three now shows the level of the ring buffer with protected files. In the display below we see that the ring buffer is filled to 91 % with protected, and to 9 % with non-protected files. Till now the oldest unprotected files will be cleared to make way for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

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.

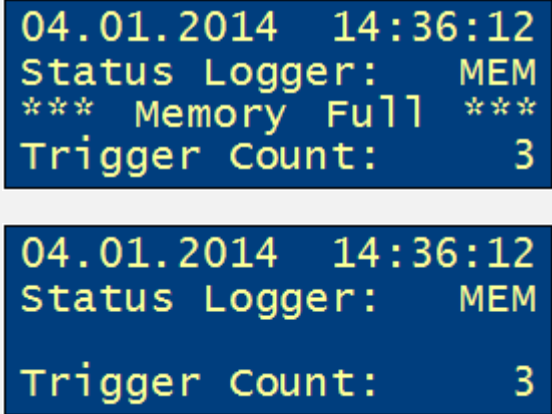
blue PiraT Mini	STATE-LED is pulsing every second.
RCV	<p>The third line shows flashing that the storage medium is full. For this, the third line is faded in and out every second.</p>  <pre> 04.01.2014 14:36:12 Status Logger: MEM *** Memory Full *** Trigger Count: 3 04.01.2014 14:36:12 Status Logger: MEM Trigger Count: 3 </pre>

Table 10.6: Status Logger: Memory Full

10.4.5 Status Logger: NoSync

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

10.4.6 Status Logger: ERROR

Error in the logger

The data recording is not guaranteed.

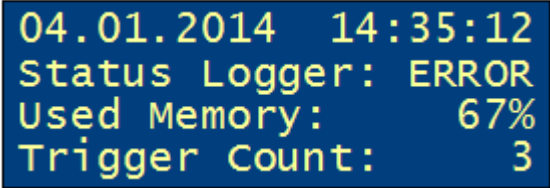
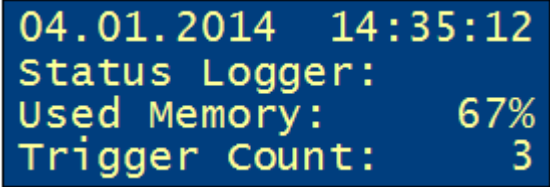
blue PiraT Mini	STATE-LED is pulsing every second.
RCV	<p>In the second line of the status *ERROR* flashes every second.</p>  

Table 10.7: Status Logger: ERROR

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11 Interfaces

The different interfaces of the blue PiraT Mini supported bus systems are described in this chapter in more detail.

11.1 CAN

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 High Speed and Low Speed operating modes

Depending on the model, the blue PiraT Mini has different numbers of High Speed (HS) and Low Speed (LS) 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 must 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 TJA1041
Terminating resistor	12k	2k6
Baud rate	50 kbit/s - 125 kbit/s	50 kbit/s - 1 Mbit/s
Supported identifiers (SW)	11 and 29 Bit	11 and 29 Bit
Disabling acknowledge	possible	possible
Time stamps	at the end of the telegram	at the end of the telegram

Table 11.1: CAN

11.1.2 CAN data with 29 Bit 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.

11.1.4 Sending CAN messages

If the blue PiraT Mini 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.

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 Telemotive System Client as a warning.

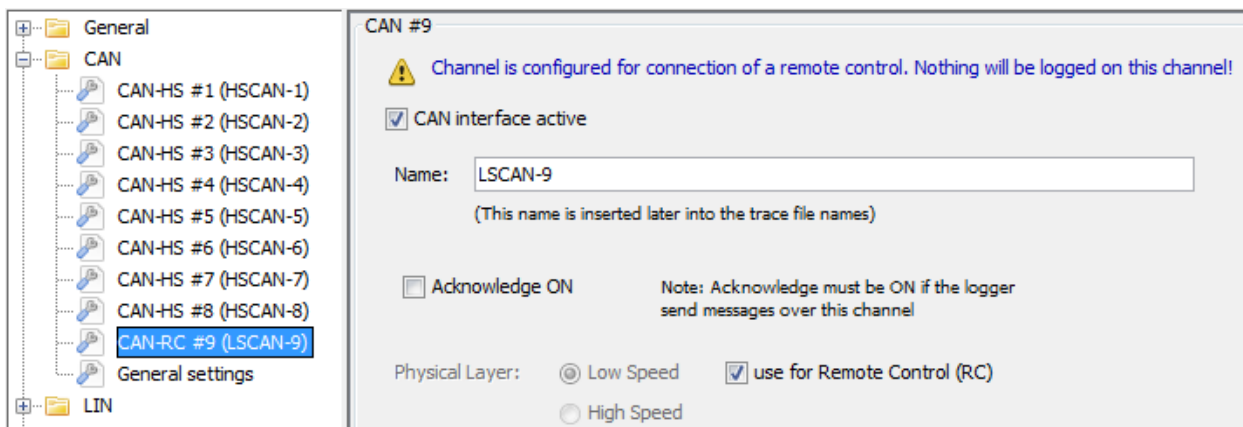


Figure 11.1: Notification message due to use of LS-CAN channel for Remote Control

11.2 LIN

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	up to 8
Transmission Rate	1200, 2400, 4800, 9600, 19200, 20000 Baud
Transmitter	TJA1021
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 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 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:

- Wake-Up Frames
- Checksum Errors

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11.3 Serial (RS232)

Channels	up to 5
Data bits	5, 6, 7, 8
Stop bits	1, 2, 1.5
Parity	None, odd, even

Table 11.3: Serial interface

The blue PiraT Mini supports only the RS232 specification.

11.3.1 Segmentation of the serial data

The received serial data are clustered into data blocks separately for each channel. Each block is finalized after a certain time or when it reaches a certain maximum size. The time is 30 to 60 ms 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

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 invalid, static and dynamic frames of the three 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: FlexRay

Attention:

For every measurement with FlexRay the line must be separated and lead through the blue PiraT Mini. Therefore all connectors exist two times at the cable set. Turning off the blue PiraT Mini thereby causes no interruption of the FlexRay line.

11.5 Analog / Digital Input

The blue PiraT Mini has three analog and three digital inputs, whereas respectively 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 $7\text{ V} \pm 0.2\text{ V}$, see chapter 14 Data sheet.

The interfaces are combined, which means that either ANA or DIG is usable.

The combined ground has to be connected always!

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 two 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 the two interfaces ETH #3 and ETH #4 can be configured and used either as IEEE 802.1 Ethernet or as Broad-R-Reach[®], when you have installed the demanded license.

11.7.1 Supported protocols

This section 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 (open socket connection) is 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

The blue PiraT Mini 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 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.

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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 IP/Port of server via 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 UDPServer

The blue PiraT Mini can be configured as a UDP 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. There is no configurable debug level. The blue PiraT Mini as a UDP server accepts UDP data packets, UDP multicast and UDP broadcast packets.

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

11.7.1.5 TCPServer

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. There is no configurable debug level. 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 SpyMode

By using the Ethernet Spy mode it is possible to log all Ethernet data (promiscuous mode).

More information can be found in the **Telemotive System Client User Guide**.

11.7.1.7 EsoTrace

By using the EsoTrace mode it is possible to log data in the EsoTrace protocol.

More information can be found in the **Telemotive System Client User Guide**.

11.7.1.8 Camera (license required)

If you use a camera license on the data logger, it is possible to connect up to four Ethernet webcams to the blue PiraT Mini. After connecting the blue PiraT Mini is able to log MPEG4 video streams.

More information can be found in the **Camera User Guide**.

11.7.1.9 DLT (license required)

If you use a DLT license on the data logger, it is possible to connect up to 16 ECU for logging their DLT messages.

More information can be found in the **DLT-logging User Guide**.

11.8 MOST150

The **blue PiraT Mini 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 Changes of the states are only logged when the 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 MEP and MDP messages again, the ring buffer data has to be fully stored on the hard disk. Before starting the logging of the MEP and MDP messages again the system sends a "Lost Message". This message contains information about how many messages of which type were rejected.

11.9 ECL

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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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 petrol, 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 only the fuse on the harness or externally accessible fuses. 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 77 °F.

Storage conditions

The data logger must be stored only in the range of - 40 °F to + 185 °F.

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. You should always spare an extra fuse in the wiring harness.

Three pins with the names clamp 30 and clamp 31 are interconnected for the voltage supply of the data logger. **Caution: A short circuit between the clamp 30 and clamp 31 on the plug may lead to the destruction of the data logger.**

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 5500 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 12000 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	bPMini CAN	bPMini LIN	bPMini MOST	bPMini FlexRay
Nominal power supply voltage	13.8 V	13.8 V	13.8 V	13.8 V
Power supply voltage	5 to 30 V (at system start up logger needs > 7 V)	5 to 30 V (at system start up logger needs > 7 V)	5 to 30 V (at system start up logger needs > 7 V)	5 to 30 V (at system start up logger needs > 7 V)
Reverse polarity protection of the supply voltage	Yes	Yes	Yes	Yes
Resistance to short-circuiting	Yes	Yes	Yes	Yes
Power consumption / operating (typ.)	300 mA (@ 13.8 V)	300 mA (@ 13.8 V)	300 mA (@ 13.8 V)	300 mA (@ 13.8 V)
Power consumption / operating (peak.)	< 400 mA (@ 13.8 V)	< 400 mA (@ 13.8 V)	< 400 mA (@ 13.8 V)	< 400 mA (@ 13.8 V)
Power consumption / standby	< 1 mA	< 1 mA	< 1 mA	< 1 mA
Operating temperature	- 40 °F to + 158 °F	- 40 °F to + 158 °F	- 40 °F to + 158 °F	- 40 °F to + 158 °F
Storage temperature	- 40 °F to + 185 °F	- 40 °F to + 185 °F	- 40 °F to + 185 °F	- 40 °F to + 185 °F
Weight (ca.)	250 g	250 g	250 g	250 g
Power Management	bPMini CAN	bPMini LIN	bPMini MOST	bPMini FlexRay
Startup time from standby to full operation	< 15 s	< 15 s	< 15 s	< 15 s
Start of logging - starting from standby	CAN, LIN, Serial, Analog, Digital < 60 ms	CAN, LIN, Serial, Analog, Digital < 60 ms	CAN, LIN, Serial, Analog, Digital, MOST < 60 ms	CAN, LIN, Serial, 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 without bus load	Configurable time without bus load	Configurable time without bus load	Configurable time without bus load
Wake	CAN-HS, CAN-LS, LIN, Serial, KL 15, [ON / Trigger] button	CAN-HS, CAN-LS, LIN, Serial, KL 15, [ON / Trigger] button	CAN-HS, CAN-LS, LIN, Serial, KL 15, [ON / Trigger] button, MOST	CAN-HS, CAN-LS, LIN, Serial, KL 15, [ON / Trigger] button, FlexRay
Data loss by power loss	If the device is switched off due to sudden power loss, up to 60 sec. of data may be lost.	If the device is switched off due to sudden power loss, up to 60 sec. of data may be lost.	If the device is switched off due to sudden power loss, up to 60 sec. of data may be lost.	If the device is switched off due to sudden power loss, up to 60 sec. of data may be lost.
Case	bPMini CAN	bPMini LIN	bPMini MOST	bPMini FlexRay
Size (ca.)	4,13" x 3,35" x 1,30" (105 x 85 x 33 mm)	4,13" x 3,35" x 1,30" (105 x 85 x 33 mm)	4,13" x 3,35" x 1,30" (105 x 85 x 33 mm)	4,13" x 3,35" x 1,30" (105 x 85 x 33 mm)
Operating controls	Push-button to start and shut down data logger and to set markers	Push-button to start and shut down data logger and to set markers	Push-button to start and shut down data logger and to set markers	Push-button to start and shut down data logger and to set markers
LEDs (STATE, ACTIVE)	Yes	Yes	Yes	Yes
Connectors	bPMini CAN	bPMini LIN	bPMini MOST	bPMini FlexRay
Front connectors	2x Gbit Ethernet, SD card, Micro--USB 2.0	2x Gbit Ethernet, SD card, Micro--USB 2.0	2x Gbit Ethernet, SD card, Micro--USB 2.0	2x Gbit Ethernet, SD card, Micro--USB 2.0
Rear connectors	2x Gbit ETH SUB-D 44-pol: Power supply, 8x HS-CAN, 1x LS-CAN, 2x LIN, 5x Serial, 2x Analog In, 2x Digital In,	2x Gbit ETH SUB-D 44-pol: Power supply, 2x HS-CAN, 1x LS-CAN, 8x LIN, 5x Serial, 2x Analog In, 2x Digital In,	2x Gbit ETH SUB-D 15-pol: Power supply, 1x HS-CAN, 1x HS-/LS-CAN (mux), 3x Serial, 1x Serial/ECL (mux), 2x	2x Gbit ETH SUB-D 44-pol: Power supply, 4x HS-CAN, 1x LS-CAN, 2x LIN, 5x Serial, 2x Analog In, 2x Digital In,

	2x Digital Out, 2x OABR	2x Digital Out	Analog In, 2x Digital In	2x Digital Out
Data recording	bPMini CAN	bPMini LIN	bPMini MOST	bPMini FlexRay
Storage type (internal)	58 GB flash	58 GB flash	58 GB flash	58 GB flash
Storage type (external)	USB flash drive	USB flash drive	USB flash drive	USB flash drive
	SD card	SD card	SD card	SD card
Recording modes	Normal, ring buffer	Normal, ring buffer	Normal, ring buffer	Normal, ring buffer
Timestamp accuracy	1 µs	1 µs	1 µs	1 µs
MOST150 recording	bPMini CAN	bPMini LIN	bPMini MOST	bPMini FlexRay
Channel			MDP MOST data packets, MEP MOST Ethernet packets, control channel, network status, MOST streaming (synchronous/isochronous) (optional)	
Status recording			Light on/off, Lock on/off	
Filter			MDP filter (source address, target address), MEP filter (target MAC address)	
CAN recording	bPMini CAN	bPMini LIN	bPMini MOST	bPMini FlexRay
Channel	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	Up to 1000000 Baud at HS-CAN up to 125000 Baud at LS-CAN	Up to 1000000 Baud at HS-CAN up to 125000 Baud at LS-CAN	Up to 1000000 Baud at HS-CAN up to 125000 Baud at LS-CAN	Up to 1000000 Baud at 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	bPMini CAN	bPMini LIN	bPMini MOST	bPMini FlexRay
Type	RS232	RS232	RS232	RS232
Channel	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	bPMini CAN	bPMini LIN	bPMini MOST	bPMini FlexRay
Channel	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
Transceiver	TJA1021	TJA1021		TJA1021
FlexRay recording	bPMini CAN	bPMini LIN	bPMini MOST	bPMini FlexRay
Channel				3x (a/b)
Bit rate				Up to 10 Mbit/s
Transceiver				AS8222
Recording				Null frames, Startup Phase, Trailer CRC, Symbol
Ethernet recording	bPMini CAN	bPMini LIN	bPMini MOST	bPMini FlexRay
Port	4	4	4	4
Speed	2x 1 Gbit/s (front side) 2x 100 Mbit/s (rear)	2x 1 Gbit/s (front side) 2x 100 Mbit/s (rear)	2x 1 Gbit/s (front side) 2x 100 Mbit/s (rear)	2x 1 Gbit/s (front side) 2x 100 Mbit/s (rear)

	side, Protocol logging / 1 Gbit/s SPY-Mode)	side, Protocol logging / 1 Gbit/s SPY-Mode)	side, Protocol logging / 1 Gbit/s SPY-Mode)	side, Protocol logging / 1 Gbit/s SPY-Mode)
Recording	GNLog, Raw, UTF8, UDP, DLT (optional), EsoTrace (optional)	GNLog, Raw, UTF8, UDP, DLT (optional), EsoTrace (optional)	GNLog, Raw, UTF8, UDP, DLT (optional), EsoTrace (optional)	GNLog, Raw, UTF8, UDP, DLT (optional), EsoTrace (optional)
OABR recording	2 Ports, Master/Slave changeable			
Analog recording	bPMini CAN	bPMini LIN	bPMini MOST	bPMini FlexRay
Channel	1x Ubat (internal), 2x external	1x Ubat (internal), 2x external	1x Ubat (internal), 2x external	1x Ubat (internal), 2x external
Range of measurement	0 V to + 20 V	0 V to + 20 V	0 V to + 20 V	0 V to + 20 V
Resolution	7 mV	7 mV	7 mV	7 mV
Accuracy	3 %	3 %	3 %	3 %
Sampling interval	1 ms to 100 s	1 ms to 100 s	1 ms to 100 s	1 ms to 100 s
Digital input	bPMini CAN	bPMini LIN	bPMini MOST	bPMini FlexRay
Channel	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	7 V ± 0.2 V	7 V ± 0.2 V	7 V ± 0.2 V	7 V ± 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	1 ms to 100 s	1 ms to 100 s	1 ms to 100 s	1 ms to 100 s

Digitale output	bPMini CAN	bPMini LIN	bPMini MOST	bPMini FlexRay
Channel	2	2		2
Output voltage	~ Ubat	~ Ubat		~ Ubat
Output current	Up to 1.0 A (continuous load)	Up to 1.0 A (continuous load)		Up to 1.0 A (continuous load)

Table 14.1: Datasheet blue PiraT Mini
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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.

15.1 Pin assignment - 44-pol SUB-D HD 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 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

@ Logger		comment / depiction / signal name	@ Vehicle interface	
SUB-D 44-pol	Signal		Type	Pin
29	KL30	power supply (+)	banana plug red	1
30	KL30	power supply (+)	combined with #29	1
31	KL15	wake up from KL 15	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 / DIG COM	Analog / Dig. 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 HD 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 / DIG COM	Analog / Dig.Interface ground	banana plug yellow	1
37	not connected	---	---	

@ Logger	comment / depiction /	@ Vehicle interface
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SUB-D 44-pol	Signal		Type	Pin
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 HD connector at blue PiraT Mini LIN

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 #5	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 #9	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 / DIG COM	Analog / Dig. Interface ground	banana plug yellow	1

Table 15.3: Pin assignment - multifunction connector 15-pol SUB-D at blue PiraT Mini MOST
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15.4 Pin assignment - 44-pol SUB-D HD 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 / DIG COM	Analog / Dig. Interface ground	banana plug yellow	1

@ Logger		comment / depiction / signal name	@ Vehicle interface	
SUB-D 44-pol	Signal		Type	Pin
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 - multifunction connector 44-pol SUB-D HD at blue PiraT Mini FlexRay

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16 Abbreviations

Kürzel / abbreviation	Bedeutung / meaning
blue PiraT	P rocessing I nformation R ecording A nalyzing T ool
bP	blue PiraT
bP2	blue PiraT2
bP2 5E	blue PiraT2 5E
bPMini	blue PiraT Mini
RC Touch	R emote C ontrol T ouch
bP Remote	blue PiraT Remote
A2L	A SAM M CD-2 M C L anguage
AE	A utomotive E lectronics
ACK	A C K nowledged
CAN	C ontroller A rea N etwork
CCP	C AN C alibration P rotocol
CF	C ompact F lash
CRO	C ommand R eceive O bject
DAQ	D ata A cquisition
DTO	D ata T ransmission O bject
ECL	E lectrical C ontrol L ine
ECU	E lectronic C ontrol U nit
FIBEX	F ield B us E xchange F ormat
FW	F irmware
GMT	G reenwich M ean T ime
INCA	I N T egrated C alibration and A pplication T ool
LAN	L ocal A rea N etwork = Netzwerk
LIN	L ocal I nterconnect N etwork
MAC	M edia A ccess C ontrol
MCD	M easure C alibrate D iagnose
MDX	M eta D ata E Xchange F ormat
MEP	M OST E thernet P acket
MOST	M edia O riented S ystems T ransport (www.mostnet.de)
ODT	O bject D escriptor T able
ODX	O pen D ata E Xchange
OEM	O riginal E quipment M anufacturer

PHY	PHY sical Bus Connect
PW	Pass wort
RX	Re ceiver Data
SD	Secure Digital
SFTP	Secure File Transfer Protocol
SHA	Secure Hash
SSL	Secure Sockets Layer
TCP/IP	Transmission Control Protocol/ Internet Protocol
TLS	Transport Layer Security
TMP	Telemotive Packetformat
TSL	Telemotive System Link
UDP	User Datagram Protocol
USB	Universal Serial Bus
UTC	Universal Time, Coordinated
Wi-Fi	Wireless Fidelity
WLAN	Wireless Local Area Network
XCP	Universal Measurement and Calibration Protocol

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