


FLEXCARD USB INSTRUCTIONS FOR USE



	NOTICE ESD (Electro Static Discharge) sensitive product. Refer to chapter 1.3 and follow the safety and handling instructions.
---	---

CONTACT INFORMATION

Eberspächer Electronics GmbH & Co. KG
Robert-Bosch-Str. 6
D-73037 Göppingen, Germany
Phone + 49 7161 9559-0
Phone + 49 7161 9559-222 (Support)
Fax + 49 7161 9559-455

Sales: Ebel-sales@eberspaecher.com
Support: Ebel-support@eberspaecher.com
www.eberspaecher.com/electronics

COMPANY DATA

Eberspächer Electronics GmbH & Co. KG, registered offices: Göppingen, register court Ulm, HRA 721096
Partner liable to unlimited extent: Eberspächer Electronics Verwaltungs-GmbH, registered offices:
Göppingen, register court Ulm, HRB 722565
Represented by the executive board: Martin Peters, Dr. Leonhard Vilser

"Eberspächer Electronics" represents Eberspächer Electronics GmbH & Co. KG.

COPYRIGHT NOTICE

© Copyright 2010 Eberspächer Electronics GmbH & Co. KG. All Rights Reserved.

No part of this document may be reproduced in any form (photocopy, microfilm or another procedure) without prior written consent from *Eberspächer Electronics*.

TRADEMARKS

FlexRay™ is a trademark of the FlexRay consortium.
Any other trademarks used in this document are the property of their respective owners.

DISCLAIMER

The information contained in this document does not affect or change General Terms and Conditions of *Eberspächer Electronics*. *Eberspächer Electronics* does not guarantee the completeness and accuracy of the content of this document and assumes no responsibility for any errors which may appear in this document or due to this document. The content of this document or the associated products are subject to change without notice at any time.

Based on currently state of arts and science it is impossible to develop software that is bug-free in all applications. Therefore, the product is only allowed to be used in the sense of the product use case described herein.

Eberspächer Electronics makes no warranty express or implied, as to this document or the information content, materials or products for any particular purpose, nor does *Eberspächer Electronics* assume any liability arising out of the application or use of this product, and disclaims all liabilities, including without limitation resulting damages, as permissible by applicable law.

All operating parameters which are provided in this document can vary in different applications or over time. The herein described product solely is allowed to be used as described in chapter "Intended use".

Without limiting the rights under copyright, no part of this document may be reproduced, stored in or introduced into a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise), or for any purpose, without the express written consent of *Eberspächer Electronics*.

Eberspächer Electronics may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly stated in a written license agreement from *Eberspächer Electronics*, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

Any semiconductor devices have an inherent chance of failure. You have to protect against injury, damage or loss from such failures by incorporating safety design measures into your facility and equipment such as redundancy, fire protection, and prevention of over-current levels and other abnormal operating conditions. The safety and handling instructions in this document have to be followed strictly.

EC CONFORMITY

The *FlexCard USB* complies with the essential requirements of the following applicable European Community Directive(s) including current amendments and carries the CE marking accordingly:

- 2004/108/EG EMC Directive

The following standard(s) have been used to assess the product:

- EN 55022:2006 + A1:2007 (Emission characteristics for information technology devices)
- EN 55024:1998 + A1:2001 + A2:2003 (Immunity characteristics for information technology devices)

The *FlexCard USB* is designed, intended and authorized for industrial use only. Using the product in domestic environment may lead to electromagnetic disturbances.

This product is compliant with the European Community Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS).

REVISION HISTORY

Version	Date	Description
D1V0-F	19-Feb-2010	Initial version

RELATED HARDWARE / SOFTWARE VERSIONS

Product	Reference No.	Version	Remarks
FlexCard USB Hardware	3-0058-0A01	H1V2-F	FlexCard USB with two trigger connectors, 1 FR CC and 3 CAN CCs.
fcBase API (Windows)	3-0009-0K03	S6V2-F	API to build your own application
Caromee	3-0051-0P01	S1V4-F	Analyzing software that can be easily extended and supports the FlexCard product family.

Further related hardware and software can be found in chapter Scope of supply.

CONTENTS

1	GENERAL	7
1.1	Intended use	7
1.2	Used pictograms	7
1.3	Safety and handling instructions	8
1.4	User group	9
1.5	Meaning of Text Styles.....	9
2	PRODUCT DESCRIPTION	10
2.1	FlexCard USB at a glance.....	10
2.2	Scope of supply	11
2.3	Updates	12
3	TECHNICAL DATA.....	13
3.1	Electrical characteristics	13
3.2	Physical characteristics.....	13
3.3	Environmental conditions	13
3.4	Block diagram	14
3.5	Interfaces and connectors.....	15
3.5.1	USB.....	15
3.5.2	FlexRay.....	15
3.5.3	CAN	17
3.5.4	Trigger lines	19
3.5.5	LEDs	20
4	GETTING STARTED.....	22
4.1	Licenses.....	22
4.2	Software installation and update	22
4.2.1	Preconditions	22
4.2.2	Installation on Windows	22
4.2.3	Uninstallation on Windows	26
4.3	Display information about the FlexCard	26
4.4	Firmware activation.....	27
4.5	Firmware update	28
4.6	License update.....	29
4.7	UserCardID	31
5	CONFIGURATION AND OPERATION	32
6	SHIPPING, MAINTENANCE AND DISPOSAL.....	33
7	TROUBLESHOOTING.....	34
8	ORDERING INFORMATION	36
8.1	<i>FlexCard USB</i>	36
8.2	Accessory parts	36
8.3	Related documents	36
9	APPENDIX.....	37

9.1	Appendix A: Guideline for handling ESD sensitive products	37
9.2	Appendix B:.....	37
9.2.1	Acronyms and abbreviations	37
9.2.2	List of tables.....	38
9.2.3	List of figures.....	38

1 GENERAL

1.1 INTENDED USE

The *FlexCard USB* is a bus powered USB device. It is a measuring instrument for the analysis of a FlexRay or CAN bus which can also be used to send data to other bus members.

Only the herein described accessory parts are allowed to be used together with the *FlexCard USB*.

The *FlexCard USB* is designed, intended and authorized exclusively for

- a) EU: laboratory applications
- b) US: industrial test equipment

Any other use without the prior written consent of *Eberspächer Electronics* is prohibited.

The *FlexCard USB* is NOT designed, intended or authorized for



- use as part of medical systems,
- life support applications,
- aviation, space, nuclear, or military applications,
- use in areas where combustible or explosive gas mixtures are likely to occur,
- other applications in which a mistake or malfunction may result in death, personal injury or severe physical damage.

The product described in this document is an industrial device, i.e. is designed, intended, or authorized for professional use. It is not designed, intended, or authorized for home applications or consumers.

1.2 USED PICTOGRAMS

The meaning of used pictograms is shortly described below.

Follow the specific instructions in the document where these pictograms are placed.

	CAUTION
	Used to indicate a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.
	NOTICE
	Used to indicate a situation which may result in an operating failure. Damage of the product may occur, but there is no hazard of injury if not avoided.

	NOTICE Used to indicate an electrostatic discharge sensitive product. The product is subject to damage by ESD, if no precautions are taken.
	Information Used to indicate information provided only for purposes of clarification, illustration, and general information.
	Reference References another document.
	Product marking which shows the compliance of the product with the European Waste Electrical and Electronic Equipment Directive 2002/96/EC.

1.3 SAFETY AND HANDLING INSTRUCTIONS

Please read the instructions for use carefully. To protect the device or the application against damage or to avoid personal injury, the *FlexCard USB* has to be handled as described herein.




Changes or modifications of the *FlexCard USB* are not allowed for safety and warranty reasons!

Eberspächer Electronics is not liable for any damages arising from non-observance of the product information.

Follow the

- a) specific safety and handling instructions placed at dedicated document positions
- b) general safety and handling instructions below:

	CAUTION To prevent personal injury, to prevent damage to the <i>FlexCard USB</i> or to prevent consequential damages: <ul style="list-style-type: none"> ➤ Do not open the <i>FlexCard USB</i>. ➤ Do not connect any other signals to the interfaces as described in the chapter Interfaces and connectors. ➤ Ensure that all signals are within the specified range. ➤ It is recommended to only use products from Eberspächer Electronics listed in chapter Accessory parts to ensure proper function. ➤ High temperatures can damage the <i>FlexCard USB</i>. Keep the <i>FlexCard USB</i> away from heaters, stoves, fireplaces, and other sources of heat. ➤ Do not expose the <i>FlexCard USB</i> to rain or use it near water. ➤ Do not use the <i>FlexCard USB</i> in areas of explosion hazard.
--	---

	<table><tr><th>NOTICE</th></tr><tr><td><p>The <i>FlexCard USB</i> may not work correctly or communication problems may occur if:</p><ul style="list-style-type: none">➤ The <i>FlexCard USB</i> is used in existing passive networks, i.e. when changing the topology structure.➤ The bus termination of the <i>FlexCard USB</i> is not adapted to the connected bus topology.➤ The <i>FlexCard USB</i> is configured wrong.</td></tr></table>	NOTICE	<p>The <i>FlexCard USB</i> may not work correctly or communication problems may occur if:</p> <ul style="list-style-type: none">➤ The <i>FlexCard USB</i> is used in existing passive networks, i.e. when changing the topology structure.➤ The bus termination of the <i>FlexCard USB</i> is not adapted to the connected bus topology.➤ The <i>FlexCard USB</i> is configured wrong.
NOTICE			
<p>The <i>FlexCard USB</i> may not work correctly or communication problems may occur if:</p> <ul style="list-style-type: none">➤ The <i>FlexCard USB</i> is used in existing passive networks, i.e. when changing the topology structure.➤ The bus termination of the <i>FlexCard USB</i> is not adapted to the connected bus topology.➤ The <i>FlexCard USB</i> is configured wrong.			
	<table><tr><th>NOTICE</th></tr><tr><td><p>By sending messages over the <i>FlexCard USB</i> to an automotive bus system it is possible to trigger actions resulting in malfunction and/or damage. The <i>FlexCard USB</i> must be used by expert technicians familiar with the corresponding systems.</p></td></tr></table>	NOTICE	<p>By sending messages over the <i>FlexCard USB</i> to an automotive bus system it is possible to trigger actions resulting in malfunction and/or damage. The <i>FlexCard USB</i> must be used by expert technicians familiar with the corresponding systems.</p>
NOTICE			
<p>By sending messages over the <i>FlexCard USB</i> to an automotive bus system it is possible to trigger actions resulting in malfunction and/or damage. The <i>FlexCard USB</i> must be used by expert technicians familiar with the corresponding systems.</p>			
	<table><tr><th>NOTICE</th></tr><tr><td><p>ESD (Electro Static Discharge) sensitive product</p><p>The <i>FlexCard USB</i> may be damaged by ESD, especially through the contacts of the connectors.</p><p>Take proper ESD precautions to avoid performance degradation or loss of functionality. A guideline is available in chapter 9.1.</p><p>Only appropriately trained personnel (such as electricians, technicians and engineers) may handle and/or operate this product.</p></td></tr></table>	NOTICE	<p>ESD (Electro Static Discharge) sensitive product</p> <p>The <i>FlexCard USB</i> may be damaged by ESD, especially through the contacts of the connectors.</p> <p>Take proper ESD precautions to avoid performance degradation or loss of functionality. A guideline is available in chapter 9.1.</p> <p>Only appropriately trained personnel (such as electricians, technicians and engineers) may handle and/or operate this product.</p>
NOTICE			
<p>ESD (Electro Static Discharge) sensitive product</p> <p>The <i>FlexCard USB</i> may be damaged by ESD, especially through the contacts of the connectors.</p> <p>Take proper ESD precautions to avoid performance degradation or loss of functionality. A guideline is available in chapter 9.1.</p> <p>Only appropriately trained personnel (such as electricians, technicians and engineers) may handle and/or operate this product.</p>			

1.4 USER GROUP

This document is written for expert technicians who are familiar with electronic components and systems.

Each person involved with assembly, line-up, operation, maintenance or disposal of the *FlexCard USB* has to

- be a qualified technician, or electrician, or engineer
- strictly adhere to this manual
- receive a briefing by an authorized person

1.5 MEANING OF TEXT STYLES

In this document *filenames* are marked with a different text format.

2 PRODUCT DESCRIPTION

2.1 FLEXCARD USB AT A GLANCE

The *FlexCard USB* is a flexible multi-bus instrument for monitoring, testing, simulation and gateway applications. One FlexRay Communication Controller is available in the *FlexCard USB*, including channel A and B. Additionally, access to two CAN High Speed and to one CAN Low Speed bus systems are provided. The physical layers for these interfaces are already integrated in the device. Several features like two trigger lines as well as the easily updateable firmware are integrated, too.


FEATURES


- USB bus powered
- 1 FlexRay Communication Controller (A and B)
- 2 CAN High Speed channels
- 1 CAN Low Speed channel

The API to the *FlexCard USB* is public so that users may write their own application. Or they profit from the advanced software Eberspächer Electronics offers: *Caromee* is a bus analyzing software that supports the *FlexCard USB* and it can be extended easily. If you want to analyze a given FlexRay or CAN network, just enter the bus parameters in the software (Asynchronous FlexRay monitoring is supported). FlexRay and CAN bus terminations can be ordered at Eberspächer Electronics.

One SubD9 connector contains FlexRay channel A and B. The second SubD9 connector carries CAN line 1 (High Speed), CAN line 2 (High Speed) and CAN line 3 (Low Speed). The third SubD9 connector provides the trigger lines. One power LED and for each bus interface two LED indicators show the current bus state.

All incoming data is transferred over a separate USB channel from the *FlexCard USB* to the system RAM and temporarily stored into a 2 MB receive buffer. This prevents data losses and flexible data collection cycles become possible. Transmit data will be written directly into the Communication Controller in order to ensure a maximum of performance.

	<p style="text-align: center;">Reference</p> <p>Further information about how to program applications for the <i>FlexCard USB</i> can be found in the FlexCard API Documentation.</p>
---	--

	<p style="text-align: center;">Information</p> <p>The currently supported FlexRay Communication Controller type on the <i>FlexCard USB</i> is:</p> <ul style="list-style-type: none"> ➤ BOSCH E-Ray FlexRay IP-Module, Release 1.3 (Referring to the FlexRay protocol specification v2.1a) <p>The currently supported CAN Communication Controller type on the <i>FlexCard USB</i> is:</p> <ul style="list-style-type: none"> ➤ BOSCH D_CAN CAN IP-Module Release 1.0 (Referring to the CAN protocol specification v2.0 part A, B) <p>Other versions are not supported up to now. Please contact <i>Eberspächer Electronics</i> if other versions need to be supported.</p>
---	--

Applications

- Usage with Eberspächer Electronics *Caromee* (Demo available).
- Usage with Eberspächer Electronics *FlexAlyzerV2* (See chapter 2.2 Scope of supply).
- Further commercial applications will support the *FlexCard USB* soon.
- Usage with customer specific software. The FlexCard driver has a C-API, see [1].


2.2 SCOPE OF SUPPLY

The *FlexCard USB* is delivered with:

Product	Reference No.	Version	Remarks
FlexCard USB Hardware	3-0058-0A01	H1V2-F	USB device with 1 A+B FlexRay Physical Layers, 2 CAN-HS and 1 CAN-LS Physical Layers
FlexCard USB Firmware	3-0058-0C01	S6V2-F	Safe firmware update supported.
FlexCard USB SYS	-	S2V6-F	Required low level driver for the FlexCard.
FlexCard DLL	3-0009-0K03	S6V2-F	Required high level driver for the FlexCard.
USB cable	3-0034-2E01	-	USB A to USB B cable.
FlexAlyzerV2	3-0038-0B01	S1V3-F	<i>FlexCard</i> monitoring tool. Supports FlexRay/CAN monitoring and sending data, triggers, filters and log files.
Instructions for Use	3-0058-0P01-D03	D1V0-F	This document.
API Documentation	3-0009-0S01-D03	D1V14-F	API programming manual as PDF file.
Getting Started Manual	3-0058-0P01-D04	D1V0-F	Example how to build a small FlexRay/CAN-communication.
Demo	-	S1V6-F	Demo explaining the programming of the <i>FlexCard</i> .
DemoPMC	-	S1V5-F	Demo explaining the programming of the <i>FlexCard</i> with multiple FlexRay CCs.
DemoCAN	-	S1V4-F	Console application explaining the communication over CAN.
CanBaudRateCalculator	-	S1V5-F	Helps with the calculation of CAN bus parameters.
FlexUpdate	-	S1V7-F	Tool for updating firmware and licenses.
Tracer Control	-	S1V2-F	Activates debug information.

A list of available accessory parts can be found in chapter 8.2.

2.3 UPDATES

	Information
	<p>Updates regarding the Windows driver and firmware are possible via web-downloads from the <i>Eberspächer Electronics</i> homepage.</p> <p>The firmware on the <i>FlexCard USB</i> can be updated with an appropriate software tool, see chapter 4.5 Firmware update.</p>

3 TECHNICAL DATA

3.1 ELECTRICAL CHARACTERISTICS

The typical power consumption of the *FlexCard USB* is 1.75 W.

Supply voltage	5 VDC
Supply current (typical)	350mA
Supply current (Standby)	20 mA

Table 1: Electrical characteristics of the *FlexCard USB*

3.2 PHYSICAL CHARACTERISTICS

FPGA on the FlexCard USB	Altera Cyclone III
Bus interfaces	1 FlexRay interface (Channel A+B), 2 CAN interfaces (High Speed) 1 CAN interface (Low Speed)
Bus drivers	2x TJA1080 FlexRay transceivers 2x TJA1041 CAN High Speed transceivers 1x TJA1054 CAN Low Speed transceiver
LEDs	Two LED per bus interface + 1 power LED
Synchronization interfaces	2 TTL trigger lines (1 IN, 1 OUT)
Dimensions L x W x H without cables approx.	105mm x 102mm x 37mm

Table 2: Physical characteristics of the *FlexCard USB*

3.3 ENVIRONMENTAL CONDITIONS

Temperature	Operating: -20 to +70°C Storage: -40 to +85°C
Relative Humidity	Operating / Storage: 0% to 100% rH, condensing

Table 3: Environmental conditions for the *FlexCard USB*

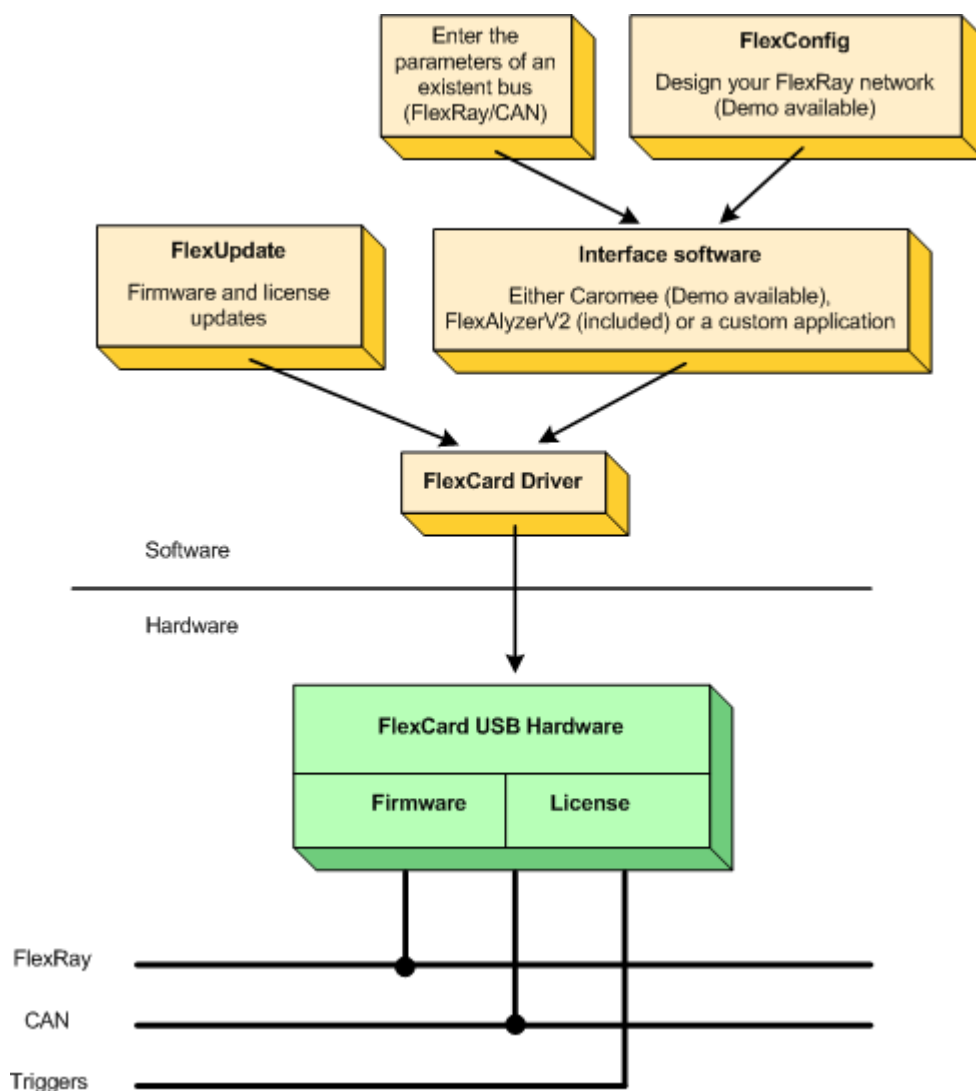





Figure 1: The *FlexCard USB* in a functional environment


	Information
	Currently there are no licensed features for the <i>FlexCard USB</i> .
	Reference
	Further information about the usage of <i>FlexAlyzerV2</i> , <i>Caromee</i> and <i>FlexConfia</i> can be found in [3]. [4]. [5].

3.5 INTERFACES AND CONNECTORS

The *FlexCard USB* has on one side the USB connector and the female SubD9 trigger connector. On the opposite side there is the male SubD9 connector for FlexRay and the male SubD9 connector for CAN.

Read and follow these instructions when connecting and using the *FlexCard USB*:


	NOTICE
	<p>Ensure that all signal lines connected to the <i>FlexCard USB</i> are in the allowed range.</p> <p>Be sure to connect all cables as described in this manual.</p> <p>It is recommended to only use cables from <i>Eberspächer Electronics</i>. See Chapter Accessory parts.</p> <p>The cables should always be fixated by screwing the plug into the jack.</p> <p>Ensure to grasp the plug and not the cable when disconnecting cables from the <i>FlexCard USB</i>.</p>

	NOTICE
	<p>The FlexRay and CAN transceivers on the <i>FlexCard USB</i> are not wake-up/sleep capable. Using the <i>FlexCard USB</i> in a network with other bus members being in sleep mode, the <i>FlexCard USB</i> may produce a DC common mode current on the bus lines.</p>

3.5.1 USB

The interface between the *FlexCard USB* and the computer is USB. The *FlexCard USB* is designed for USB 2.0 only. When connected to an USB 1.1 host, the device will be recognized correctly in the Windows device manager, but it may not be used.

If the USB hub does not deliver enough energy, Windows will display a message. In that case, use an active hub or connect the *FlexCard USB* directly to the computer.

	Information
	<p>The device should be connected before the driver software is installed. Refer to chapter 4.2, where the software installation process is described.</p>

3.5.2 FLEXRAY

Table 4 describes the pin assignment of the *FlexCard USB* FlexRay connector.

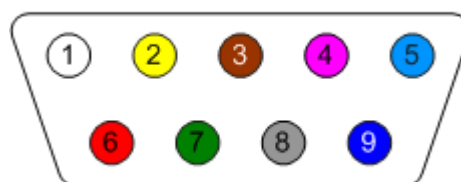


Figure 2: Male SubD9 pin assignment for FlexRay, front view

Pin number SubD9 female	Signal	Color
1	Not connected	
2	FlexRay A BM (BusMinus)	Yellow
3	GND	Brown
4	FlexRay B BM (BusMinus)	Magenta
5	Shield	Blue
6	Not connected	Red
7	FlexRay A BP (BusPlus)	Green
8	FlexRay B BP (BusPlus)	Grey
9	Not connected	Blue

Table 4: FlexCard USB FlexRay connector, SubD9 male

Maximum voltage input on FlexRay BP/BM: 60V

Minimum voltage input on FlexRay BP/BM: -60V

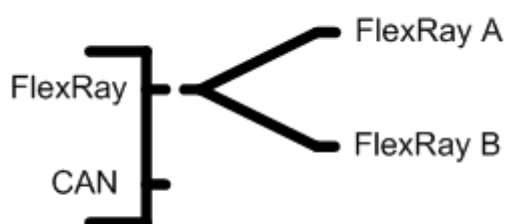


Figure 3: Bus cable connections for FlexRay

The *FlexCard USB* bus cable is a Y-shaped cable used for FlexRay and CAN (Not standard equipment. See chapter Accessory parts.). On one end it is connected to the *FlexCard USB*. On the other end, the FlexRay channel A lies on the SubD9 male Connector 1 and channel B is on the SubD9 male Connector 2. Table 5 and Table 6 show the pin assignment when using the bus cable on the FlexRay connector.

Pin number SubD9 female	Signal	Color
1	Not connected	
2	FlexRay A BM (BusMinus)	Yellow
3	GND	Brown
4	Not connected	Magenta
5	Shield	Blue
6	Not connected	Red
7	FlexRay A BP (BusPlus)	Green
8	Not connected	Grey
9	Not connected	Blue

Table 5: Bus cable (Ref. No. 3-0034-2C01) male SubD9 cable assignment, Connector 1

Pin number SubD9 female	Signal	Color
1	Not connected	
2	FlexRay B BM (BusMinus)	Yellow
3	GND	Brown
4	Not connected	Magenta
5	Shield	Blue
6	Not connected	Red
7	FlexRay B BP (BusPlus)	Green
8	Not connected	Grey
9	Not connected	Blue

Table 6: Bus cable (Ref. No. 3-0034-2C01) male SubD9 cable assignment, Connector 2

3.5.3 CAN

Table 7 describes the pin assignment of the *FlexCard USB* CAN connector.

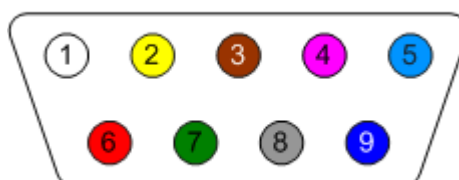


Figure 4: Male SubD9 pin assignment for CAN, front view

Pin number SubD9 female	Signal	Color
1	CAN 3 low	
2	CAN 1 low	Yellow
3	GND	Brown
4	CAN 2 low	Magenta
5	Shield	Blue
6	CAN 3 high	Red
7	CAN 1 high	Green
8	CAN 2 high	Grey
9	Not connected	Blue

Table 7: *FlexCard USB* CAN connector, SubD9 male

Maximum voltage input on CAN high/low: 40V

Minimum voltage input on CAN high/low: -27V

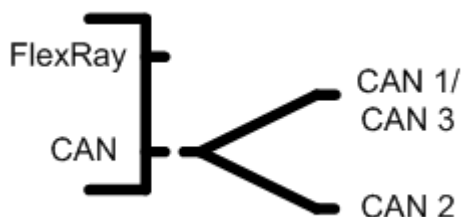


Figure 5: Bus cable connections for CAN-HS

The *FlexCard USB* bus cable is a Y-shaped cable used for FlexRay and CAN (Not standard equipment. See chapter Accessory parts.). Plug the Y-connector in the *FlexCard USB* CAN connector. CAN channel 1 and 3 are available on Connector 1, CAN channel 2 on Connector 2. Refer to Table 8 and Table 9.

Pin number SubD9 female	Signal	Color
1	Not connected	
2	CAN 1 low	Yellow
3	GND	Brown
4	CAN 3 low	Magenta
5	Shield	Blue
6	Not connected	Red
7	CAN 1 high	Green
8	CAN 3 high	Grey
9	Not connected	Blue

Table 8: Bus cable (Ref. No. 3-0034-2C01) male SubD9 cable assignment, Connector 1

Pin number SubD9 female	Signal	Color
1	Not connected	
2	CAN 2 low	Yellow
3	GND	Brown
4	Not connected	Magenta
5	Shield	Blue
6	Not connected	Red
7	CAN 2 high	Green
8	Not connected	Grey
9	Not connected	Blue

Table 9: Bus cable (Ref. No. 3-0034-2C01) male SubD9 cable assignment, Connector 2

If you want to use CAN-Low-Speed with an extra connector, connect the cable labeled with Connector 1 to the Y-connector of a second bus cable as shown in the next figure.

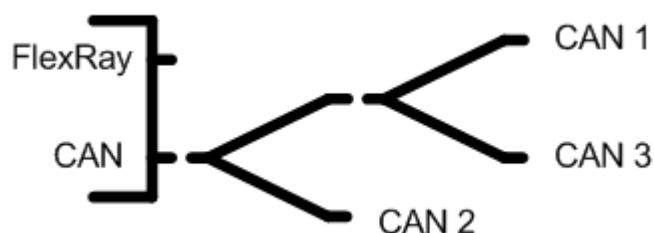


Figure 6: Bus cable connections for CAN-HS with CAN-LS

CAN channel 1 is available on the second Y-cable on the connector labeled as Connector 1. (Refer to Table 10). CAN channel 2 is available on the first Y-cable on the Connector 2. (Refer to Table 9). CAN channel 3 (Low Speed) is available on the second Y-cable labeled as Connector 2. (Refer to Table 11).

Pin number SubD9 female	Signal	Color
1	Not connected	
2	CAN 1 low	Yellow
3	GND	Brown
4	Not connected	Pink
5	Shield	Blue
6	Not connected	Red
7	CAN 1 high	Green
8	Not connected	Grey
9	Not connected	Blue

Table 10: Bus cable (Ref. No. 3-0034-2C01) male SubD9 cable assignment, Connector 1

Pin number SubD9 female	Signal	Color
1	Not connected	
2	CAN 3 low	Yellow
3	GND	Brown
4	Not connected	Pink
5	Shield	Blue
6	Not connected	Red
7	CAN 3 high	Green
8	Not connected	Grey
9	Not connected	Blue

Table 11: Bus cable (Ref. No. 3-0034-2C01) male SubD9 cable assignment, Connector 2

3.5.4 TRIGGER LINES

For synchronization purposes, the *FlexCard USB* provides a 5V tolerant TTL-compatible trigger on a SubD9 connector. One trigger is for sending a trigger impulse (high active); the other trigger line generates a data packet when it notices a trigger impulse. The trigger IN may use the rising or falling edge of the signal depending on the software configuration.

The triggers allow e.g. a synchronization of different bus analyzing hardware. The electrical characteristic is described in Table 12.

	Minimum	Typical	Maximum
Trigger in voltage	+2.4V	+5V	+5.5V
Trigger out voltage (idle)		0V	
Trigger out voltage (active)	+4V	+4.7V	+5.5V
Trigger out current			20mA

Table 12: Trigger characteristics of the *FlexCard USB*


	Reference
	Detailed information about how the trigger events are used with the <i>FlexCard USB</i> can be found in the <i>FlexCard API Documentation</i> .

Table 13 describes the pin assignment of the *FlexCard USB* trigger connector.

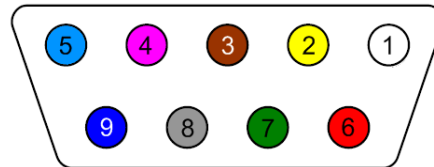



Figure 7: Female SubD9 pin assignment for triggers, front view

Pin number SubD9 female	Signal	Color
1	Not connected	
2	Trigger in	Yellow
3	GND	Brown
4	Not connected	Pink
5	Shield	Blue
6	Not connected	Red
7	Trigger out	Green
8	Not connected	Grey
9	Not connected	Blue

Table 13: *FlexCard USB* trigger connector, SubD9 female

	Information
	To connect the trigger input and output to a BNC-connector, the trigger line cable can be ordered at <i>Eberspächer Electronics</i> , see chapter 8.2 Accessory parts.

3.5.5 LEDs

Each interface has two LED indicators for signaling different channel states, red and green. The LED states are explained in Table 14.

Signaling	LED	Description
Blue LED lighting	Power	Power on.
Permanent lighting of all red LEDs	FlexRay or CAN	Signals a buffer overflow.
All red and green LEDs are flashing	FlexRay or CAN	No firmware loaded. Refer to chapter 4.5 to update the firmware.
Red flashing	FlexRay	Signals an error in the FlexRay communication controller (e.g. clock correction errors).
Red and green lighting at the same time	FlexRay	FlexRay communication controller is not synchronized, but connected to an actively working network. Bus traffic is detected. This LED combination is active when monitoring in asynchronous mode. The intensity of the LEDs is dependent on the traffic on the bus.
	CAN	Bus traffic is detected. The intensity of the LEDs is dependent on the traffic on the bus.
Green lighting	FlexRay	FlexRay communication controller is synchronized. The intensity of the LED is dependent on the traffic on the bus.
Green flashing	FlexRay	Signals the FlexRay communication controller is in a startup path (that means that the FlexRay communication controller is ready for synchronization). This can be seen when monitoring in normal mode and the FlexRay configuration is incorrect or no cable connected.

Table 14: Description of indicating LEDs


4 GETTING STARTED

4.1 LICENSES

Currently there are no licensed features for the *FlexCard USB*.

4.2 SOFTWARE INSTALLATION AND UPDATE

4.2.1 PRECONDITIONS

	Information
	Administrator access rights are required to install the device driver.

The minimum system requirements for installing and running the *FlexCard USB* hardware and software are:

Microsoft Windows 2000 with Service Pack 4 or higher

- Computer/processor: 1 GHz or faster AMD/Pentium-compatible processor
- 512 MB of RAM
- Display: VGA or higher-resolution monitor
- Peripheral keyboard and mouse or compatible pointing device
- USB 2.0

Microsoft Windows XP

- Computer/processor: 1 GHz or faster AMD/Pentium -compatible processor
- 512 MB of RAM
- Display VGA or higher-resolution monitor
- Peripheral keyboard and mouse or compatible pointing device
- USB 2.0

Microsoft Windows Vista

- Computer/Processor: 1.5 GHz or faster AMD/Pentium -compatible processor
- 1GB of RAM
- Display: VGA or higher-resolution monitor
- Peripheral keyboard and mouse or compatible pointing device
- USB 2.0

4.2.2 INSTALLATION ON WINDOWS

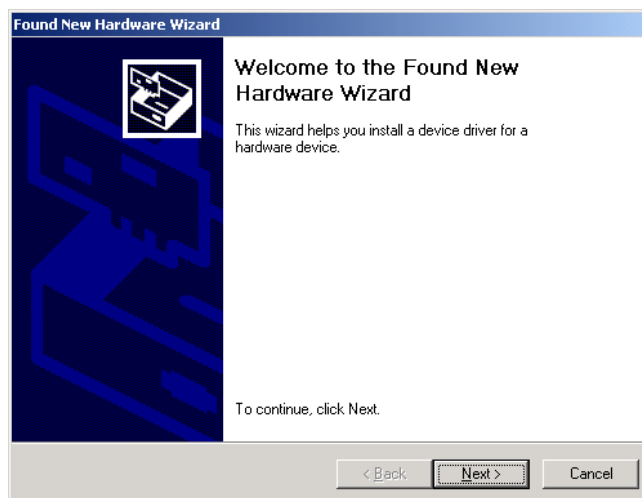
To install the *FlexCard USB* device driver and dynamic link library, please follow the steps below. Before you install the *FlexCard USB*, uninstall the old version first (Refer to chapter 4.2.3).

Step 1

Connect the *FlexCard USB* to a USB port. Windows will show this dialog.

As the device driver will not be installed using the “New Hardware Wizard”, click on the “Cancel” button to abort the wizard.

Because the *FlexCard USB* internally consists of two devices, the Hardware Wizard will appear two times.



Step 2 (a)

To start the installation, double click the file *FlexCard_Setup_SxVy-F.exe*. The installation wizard will start immediately and guide you through the installation.

Click on the “Next” button.

Note: On a Windows 2000 system, make sure that you have SP4 and the Windows Installer 2.0 installed.



Step 2 (b)

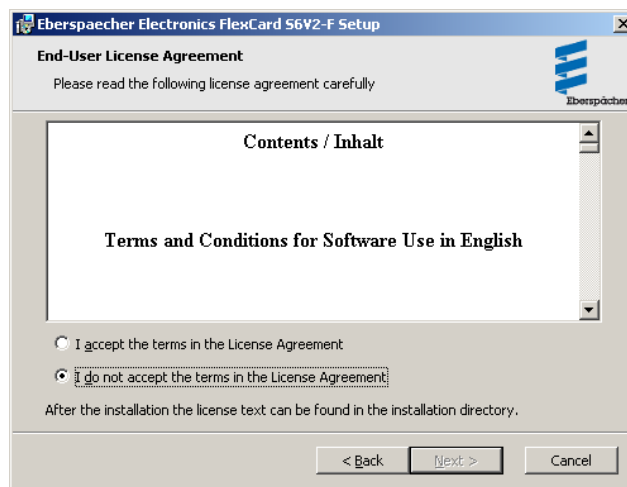
If you installed a *FlexCard* driver package before, the setup will return this error message. For installing the new driver you have to remove the previous package first.

Follow the instructions in chapter 4.2.3. Restart your computer and go to **Step 1** again.



Step 3

Read the license agreement and if you accept the agreement, click “I accept the terms ...” and the “Next” button to continue the installation. Otherwise click “Cancel” to abort the installation.



Step 4

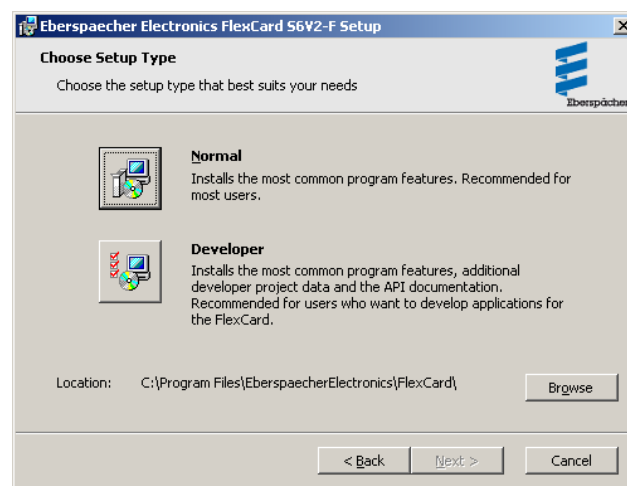
Select the installation folder for the *FlexCard* files.

There are two setup types:

- **Normal** setup for using *FlexCard USB* with commercial applications.
- **Developer** setup for developing applications for the *FlexCard USB*. This will install the C header files and libraries you need, to access the API in your own applications. Also the *FlexCard* API Documentation is installed.

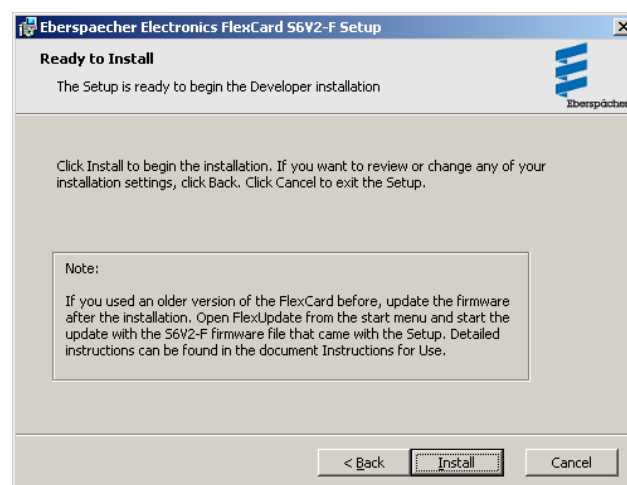
Choose your setup type by clicking the corresponding icon.

Note: The device driver and dynamic link library will be installed to the Windows system directory.



Step 5

Click “Install” to start the installation.



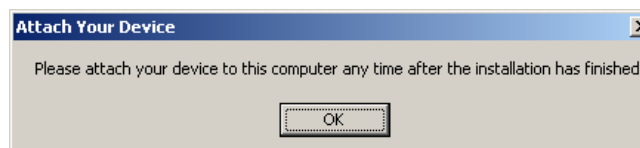
Step 6

On a Windows system the following warning dialog may appear, as the *FlexCard* device driver is not certificated by the Microsoft Hardware Quality Labs. Click on “*Continue anyway*” to proceed with the installation.



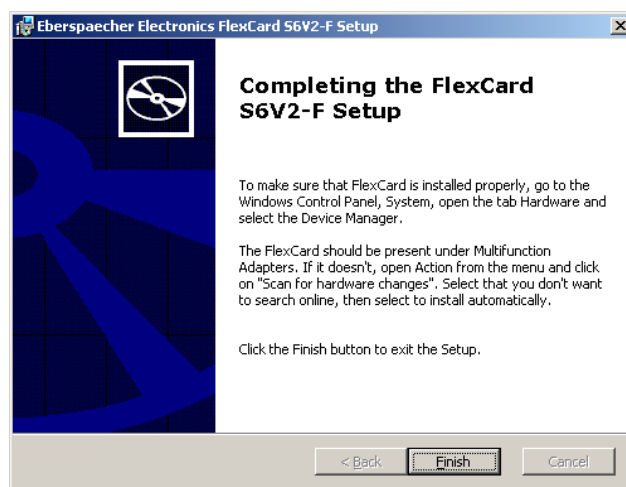
Step 7

A dialog box appears. Click on “OK”.



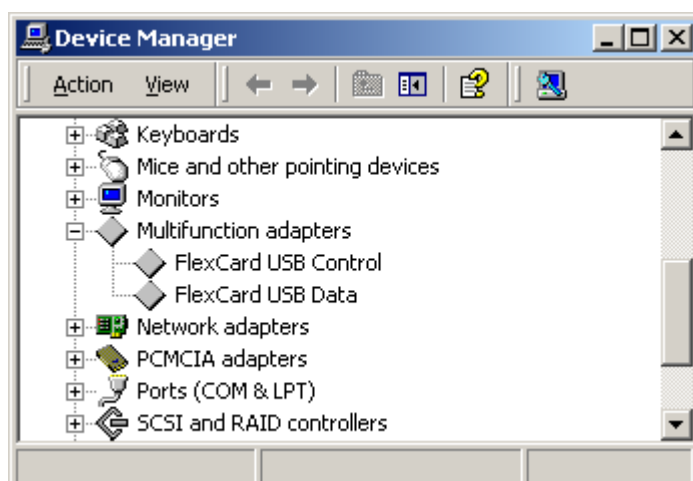
Step 8

Click “*Finish*” to complete the installation.



Step 9

After the installation of the device driver you will find the *FlexCard USB* entries in the *Device Manager* in the folder *Multifunction adapters*. One *FlexCard USB* generates two entries: Control and Data. Both entries must be shown without errors.



4.2.3 UNINSTALLATION ON WINDOWS

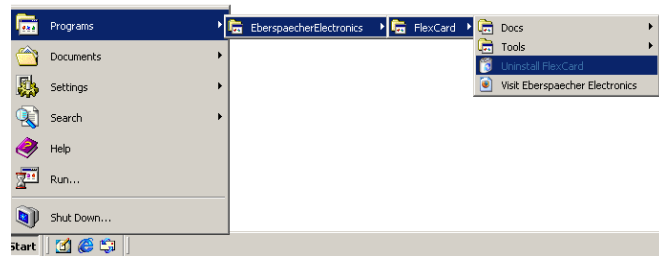
Uninstall alternative 1

You can remove the installed *FlexCard* driver package by calling the shortcut in Windows start menu:

Start->Programs->EberspaecherElectronics->FlexCard-> Uninstall FlexCard.

Or:

Start->Programs->TZM->FlexCard-> Uninstall FlexCard.

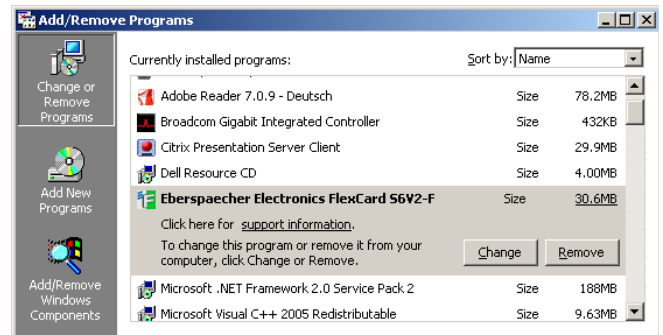


Uninstall alternative 2

Another possibility to uninstall the previous *FlexCard* driver package is provided in the Windows Control Panel:

Start->Settings->Control Panel-> Add/Remove Programs

Click "Remove" to uninstall the package.

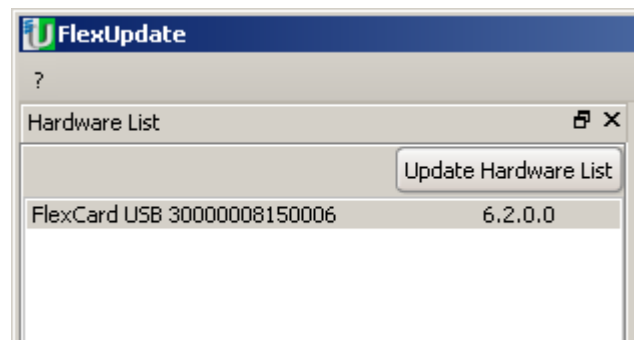


4.3 DISPLAY INFORMATION ABOUT THE FLEXCARD

When you want to obtain information about the installed *FlexCard* driver or the connected hardware, use the tool *FlexUpdate* that is installed with the *FlexCard* setup.

Step 1

Start *FlexUpdate*. In the Hardware List, select the *FlexCard* for which you want information.



Step 2

The upper right shows details about the selected hardware.

The column "Possible" lists the number of CCs in the firmware. The column "Useable" displays the CCs that are available in the firmware and licensed.

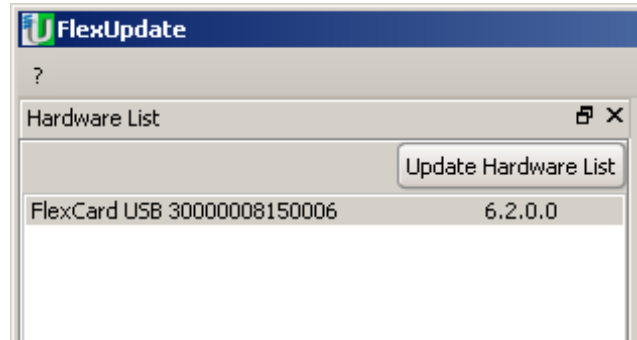
FlexCard USB		FlexRay		Useable	Possible
Serial	530000008150006	CC count	1	1	
Versions:		CC type	Bosch Eray		
Firmware	6.2.0.0	Protocol	2.1.0.0		
Hardware	1.0.0.0	BusGuardian	---		
BaseDLL	6.2.0.0	CAN		Useable	Possible
DeviceDriver	2.4.16.0	CC count	3	3	
UserCardID (hex) 2		CC type	Bosch D-CAN		
		Protocol	2.0.0.0		

4.4 FIRMWARE ACTIVATION

The *FlexCard USB* offers two firmware slots. The active firmware can be chosen in the application *FlexUpdate*. Follow the steps below.

Step 1

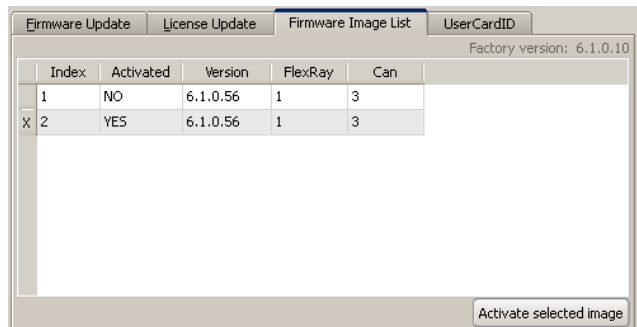
Start *FlexUpdate*. In this window, you can check the current hardware and software version of installed *FlexCard* components. Select the *FlexCard USB* whose firmware you want to activate from the Hardware List.



Step 2

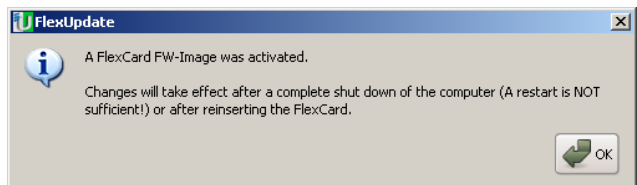
Open the tab "Firmware Image List". You can see on this tab what images are stored on the *FlexCard USB*. For example, when a row contains the values 2, YES, 6.1.0.56, 1, 3, this means: Firmware slot 2 is active at the moment and holds a firmware with 1 FlexRay and 3 CAN CCs and has the firmware version 6.1.0.56. Only one firmware may be active at a time.

Click on a row and then on the button to activate this image.



Step 3

Once the message "A **FlexCard FW-Image was activated.**" appears, close the firmware-update software and reconnect the *FlexCard USB* with the system.



NOTICE

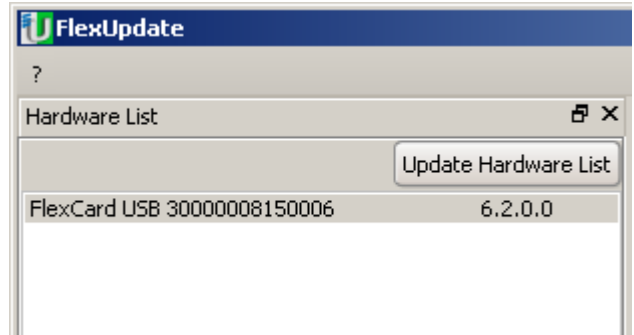
If an empty firmware slot is selected, after a reconnect to the system, the *FlexCard USB* will blink with all LEDs on the front panel. Open *FlexUpdate* and activate a different slot and reconnect the *FlexCard*.

4.5 FIRMWARE UPDATE

In order to update the firmware of a *FlexCard USB*, it is necessary to follow these steps.

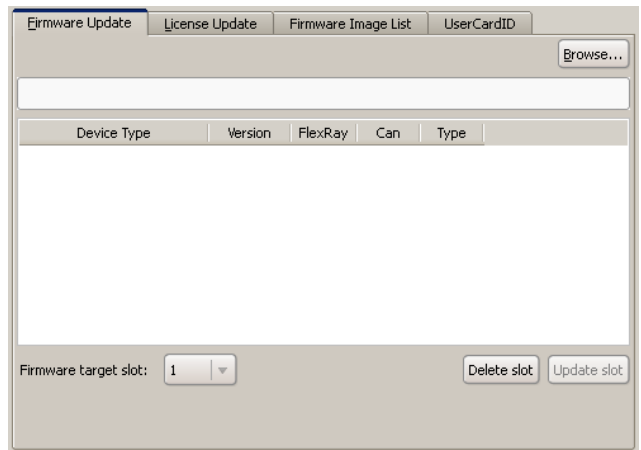
Step 1

Start *FlexUpdate*. In this window, you can check the current hardware and software version of installed *FlexCard* components. Select the *FlexCard USB* whose firmware you want to update from the Hardware List.



Step 2

Open the “Firmware Update” tab. Click the “Browse...” button to select a firmware container file (*.fwf).

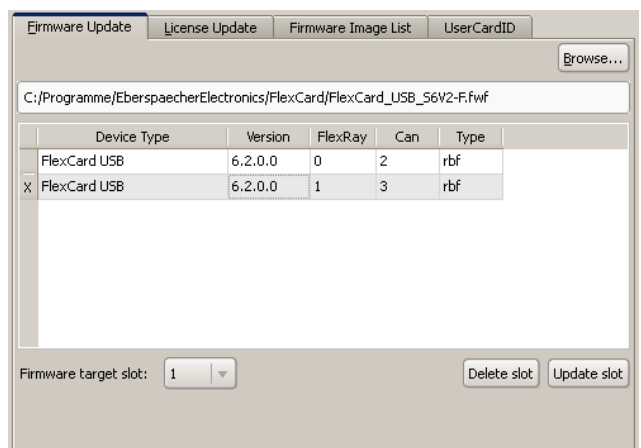


Step 3

The firmware files stored in the firmware container are displayed.

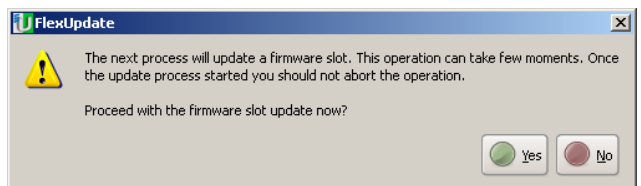
Select the firmware you like to write to the *FlexCard* image list, choose a firmware target slot and click the “Update slot” button.

You also may delete images from the hardware. To do so, select a target slot and click on the “Delete slot” button.



Step 4

Read the warning messages before starting the update process. The process is composed of three phases: **Reset**, **Write** and **Check**.



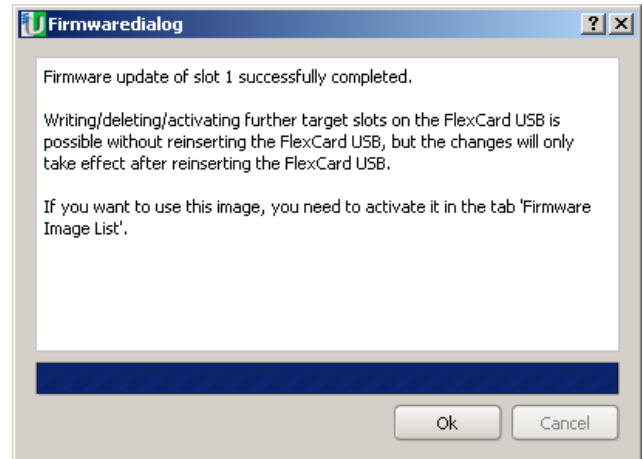


NOTICE

If the firmware update process is disturbed or aborted, the firmware slot will not be able to load.

Step 5

Once the message “**Firmware update of slot X successfully completed.**” appears, close the firmware-update software and reconnect the *FlexCard* or proceed with chapter Firmware activation.



4.6 LICENSE UPDATE



Information

Currently there are no licensed features for the *FlexCard USB*.

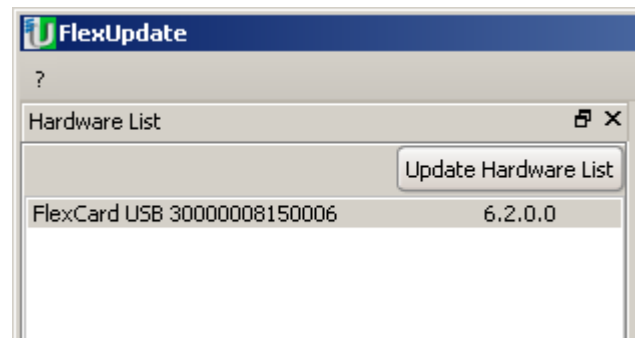
To update the *FlexCard USB* with a new license file you need to follow these steps:

Step 1

Connect the *FlexCard USB* hardware with the system and start the update software *FlexUpdate* included in the *FlexCard USB* install package.

In this window, you can check the current hardware and software version of *FlexCard USB* components installed.

Select the *FlexCard USB* you want to update from the Hardware List.



Step 2

Open the “License Update” tab. On the left side the currently licensed features are displayed.

Click the “Load from file” button to select a license file (*.lic).

Step 3

Once you choose the file, the text on the right side will inform you about the state of the file. The number of licensed FlexRay, FlexRay SelfSync and CAN CCs and the licenses for the LabVIEW, Linux, Windows and Xenomai FlexCard driver are displayed.

If the text “license file ok” appears, you can use “Write License” to apply the license to the hardware.

If not, you need to choose another license file.

Step 4

After the license was written, the current licenses on the *FlexCard USB* are displayed on the left side.

4.7 USERCARDID

Step 1

The UserCardID stays the same even after a computer restart. The purpose is to differentiate between several *FlexCards*.

Start the update software *FlexUpdate* included in the *FlexCard USB* install package, and open the UserCardID tab. Enter the new ID and click on the button "Set User Defined Card ID".

The screenshot shows the 'UserCardID' tab of the FlexUpdate application. It features a text input field containing '0x 2' and a button labeled 'Set User Defined Card ID'.

Step 2

An entry in the message log states whether the action was successful. The ID is updated in the info list.

FlexCard USB		FlexRay		Useable	Possible
Serial	530000008150006	CC count	1	1	1
Versions:		CC type	Bosch Eray		
Firmware	6.2.0.0	Protocol	2.1.0.0		
Hardware	1.0.0.0	BusGuardian	---		
BaseDLL	6.2.0.0	CAN		Useable	Possible
DeviceDriver	2.4.16.0	CC count	3	3	3
UserCardID (hex)	2	CC type	Bosch D-CAN		
		Protocol	2.0.0.0		

5 CONFIGURATION AND OPERATION

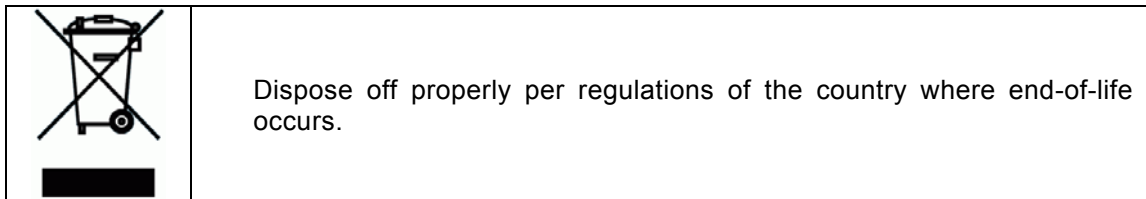
Operation of the *FlexCard USB* is described in the user manual of your software vendor. For a description of *Caromee*, refer to [5]. All operation modes as well as information about the programming of a *FlexCard* application are described in the *FlexCard* API Documentation [1].

6 SHIPPING, MAINTENANCE AND DISPOSAL

Keep the package in which the *FlexCard USB* was shipped.

Store and transport the *FlexCard USB* in a cool, dry, dark environment. Don't store or transport it near sources of magnetic fields.

Void warranty if tried to manipulate/repair the *FlexCard USB*. Please contact *Eberspächer Electronics* for maintenance.



7 TROUBLESHOOTING

This chapter contains some frequently asked questions about the *FlexCard USB*.

1	Effect	The <i>FlexCard USB</i> is not recognized. On Windows, the <i>FlexCard USB</i> is not displayed under "Multifunction adapters" in the device manager or it is displayed with a warning symbol in the device manager.
	Cause	<i>FlexCard USB</i> is not correctly plugged in. The drivers (respective the INF-file), required by the system to recognize the <i>FlexCard USB</i> , are not installed properly.
	Solution	Check if the <i>FlexCard USB</i> is connected correctly. Reinstall the driver for the <i>FlexCard USB</i> or update the firmware. Check whether the DLL and firmware are compatible. The major version numbers must be identical. The version number of the SYS may differ. Use the <i>FlexCard API</i> function "fcbCheckVersion" to test whether DLL, SYS and firmware match. See " <i>FlexCard API</i> Documentation".

2	Effect	No FlexRay frames are received. The <i>FlexCard USB</i> could not synchronize with the FlexRay bus (Green LED is flashing).
	Cause	Wrong configuration of the communication controller → The hardware could not synchronize on the FlexRay bus Buses are not correctly terminated. The cable of FlexRay channel A is connected to line B and/or vice versa.
	Solution	Check all parameters in the bus configuration; be sure to use the same configuration as the other bus nodes Terminate your bus systems correctly. Bus terminations are available from Eberspächer Electronics. Use cables with the correct pin assignment or insert the Eberspächer Electronics cables to the correct connectors of the FlexCard.

3	Effect	No FlexRay frames are received. The <i>FlexCard USB</i> is synchronized with the FlexRay bus (Green LED is lighting).
	Cause	Maybe a filter is activated.
	Solution	Deactivate the message filter and channel filter in the software.

4	Effect	No CAN frames are received.
	Cause	Wrong configuration of the communication controller Bus is not correctly terminated. Maybe a filter is activated.
	Solution	Check the CAN bus parameters on the <i>FlexCard USB</i> . Terminate your bus systems correctly. Bus terminations are available from Eberspächer Electronics. Deactivate the message filter and channel filter in the software.

5	Effect	All LEDs of the <i>FlexCard USB</i> glow red, no messages can be received.
	Cause	The buffer on the FlexCard is full. The data on the FlexCard is collected too slowly by the software.
	Solution	Use a faster PC or filter messages to reduce the workload.

6	Effect	If you start a FlexCard application an error message appears that says <i>fcBase.dll</i> is missing.
	Cause	The FlexCard driver was not installed properly.
	Solution	If the FlexCard setup was not installed yet, follow the instructions in this document on how to install the FlexCard. If the FlexCard setup is already installed: Insert the FlexCard. When the Windows Hardware Wizard appears, select that you don't want to look online on the Windows Update homepage for the software. Then, select that the software should be installed automatically. The problem should be solved now.

8 ORDERING INFORMATION

8.1 FLEXCARD USB

Product	Description	Ordering number
FlexCard USB	The FlexCard USB is a small-size, bus-powered USB device. It is equipped with 1 FlexRay CC, 2 CAN-High-Speed CCs and 1 CAN-Low-Speed-CC.	3-0058-0P01

8.2 ACCESSORY PARTS

Product	Description	Ordering number
FlexCard USB bus cable, 1m length, black (BusCable 100 9SUBDf 9SUBDm2)	Bus adapter cable between <i>FlexCard USB</i> and 2 male Sub-D-connectors, suitable for the FlexRay and CAN connections.	3-0034-2C01
USB cable	USB A to USB B cable.	3-0034-2E01
FlexCard USB trigger cable, 1m	Trigger cable for FlexCard trigger connector to 2 BNC connectors.	3-0034-2D01
FlexRay Termination	SubD9 gender changer that terminates two FlexRay interfaces on the pins used by the FlexCard.	3-0034-0I01
Customer specific parts		Please contact <i>Eberspächer Electronics</i>

8.3 RELATED DOCUMENTS

Document	Description	Ordering number
[1] API Documentation	Describes how to write own applications for the <i>FlexCard</i> family.	3-0009-0S01-D03
[2] <i>FlexCard USB</i> Getting Started	Describes how to use the demo application contained in the Windows <i>FlexCard</i> Installer.	3-0058-0P01-D04
[3] <i>FlexAlyzerV2</i> Instructions for Use	Explains how to use the monitoring software that is contained in the Windows <i>FlexCard</i> Installer.	3-0038-0B01-D01
[4] <i>FlexConfig</i> User Manual	Manual for the configuration software for FlexRay networks. <i>FlexConfig</i> generates the CHI configuration files used by the <i>FlexCard</i> , <i>FlexXCon</i> and <i>FlexEntry</i> .	3-0016-0C01-D06
[5] <i>Caromee</i> User Manual	Analyzing software that can be easily extended and supports the FlexCard product family.	3-0051-0P01-D03

9 APPENDIX

9.1 APPENDIX A: GUIDELINE FOR HANDLING ESD SENSITIVE PRODUCTS

- Any tester, equipment, or tool used at any production step or for any manipulation of semiconductor devices must have its shield connected to ground.
- The product itself and the carrier system of the product respectively must be placed on a conductive table top or covered by an antistatic surface (superficial resistivity equal to or higher than $0.5 \text{ M}\Omega/\text{cm}^2$), grounded through a ground cable (conductive cable from protected equipment to ground isolated through a $1 \text{ M}\Omega$ resistor placed in series).
- All manipulation of finished goods has to be made at such a grounded worktable.
- The worktable must be free of all non-antistatic objects.
- An antistatic floor covering grounded through a conductive ground cable (with serial resistor between 0.9 and $1.5 \text{ M}\Omega$) should be used.
- It is recommended that you wear an antistatic wrist or ankle strap, connected to the antistatic floor covering or to the grounded equipment.
- If no antistatic wrist or ankle strap is worn, touch the surface of the grounded worktable before each manipulation of the ESD sensitive product.
- It is recommended that antistatic gloves or finger coats be worn.
- It is recommended that nylon clothing be avoided while performing any manipulation of parts.

9.2 APPENDIX B:

9.2.1 ACRONYMS AND ABBREVIATIONS

Item	Definition
BD	Bus driver
BP	Bus plus
BM	Bus minus
CAN	Controller Area Network
CC	Communication Controller
DMA	Direct Memory Access
ECU	Electronic Control Unit
EMC	Electromagnetic Compatibility
ESD	Electro Static Discharge
FR	FlexRay
LED	Light Emitting Diode
NC	Not Connected
PCB	Printed Circuit Board

Item	Definition
PL	Physical Layer
USB	Universal Serial Bus

9.2.2 LIST OF TABLES

Table 1: Electrical characteristics of the <i>FlexCard USB</i>	13
Table 2: Physical characteristics of the <i>FlexCard USB</i>	13
Table 3: Environmental conditions for the <i>FlexCard USB</i>	13
Table 4: <i>FlexCard USB</i> FlexRay connector, SubD9 male.....	16
Table 5: Bus cable (Ref. No. 3-0034-2C01) male SubD9 cable assignment, Connector 1.....	16
Table 6: Bus cable (Ref. No. 3-0034-2C01) male SubD9 cable assignment, Connector 2.....	17
Table 7: <i>FlexCard USB</i> CAN connector, SubD9 male.....	17
Table 8: Bus cable (Ref. No. 3-0034-2C01) male SubD9 cable assignment, Connector 1.....	18
Table 9: Bus cable (Ref. No. 3-0034-2C01) male SubD9 cable assignment, Connector 2.....	18
Table 10: Bus cable (Ref. No. 3-0034-2C01) male SubD9 cable assignment, Connector 1.....	19
Table 11: Bus cable (Ref. No. 3-0034-2C01) male SubD9 cable assignment, Connector 2.....	19
Table 12: Trigger characteristics of the <i>FlexCard USB</i>	20
Table 13: <i>FlexCard USB</i> trigger connector, SubD9 female.....	20
Table 14: Description of indicating LEDs.....	21

9.2.3 LIST OF FIGURES

Figure 1: The <i>FlexCard USB</i> in a functional environment.....	14
Figure 2: Male SubD9 pin assignment for FlexRay, front view.....	15
Figure 3: Bus cable connections for FlexRay.....	16
Figure 4: Male SubD9 pin assignment for CAN, front view.....	17
Figure 5: Bus cable connections for CAN-HS.....	18
Figure 6: Bus cable connections for CAN-HS with CAN-LS.....	19
Figure 7: Female SubD9 pin assignment for triggers, front view.....	20

Eberspächer Electronics
GmbH & Co. KG
Robert-Bosch-Str. 6
73037 Göppingen
Germany
Phone: +49 7161 9559-0
Fax: +49 7161 9559-455
ebel-info@eberspaecher.com
www.eberspaecher.com/electronics

