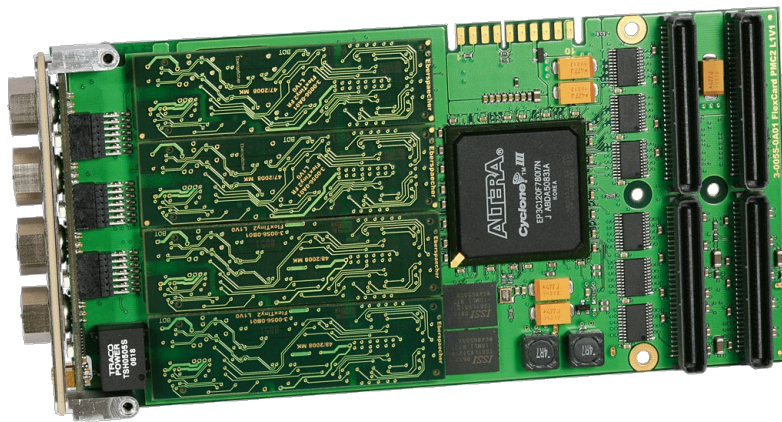


STAR COOPERATION®

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# FlexCard PMC / PMC-II

## Getting Started



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## Contact Information

STAR ELECTRONICS GmbH & Co. KG  
A Company of the STAR COOPERATION Group  
Jahnstraße 86  
73037 Göppingen  
Phone: +49 (0)7031 6288-5656  
Phone: +49 (0) 7031 6288-5330 (Support)

Sales: sales-ee@star-cooperation.com  
Support: support-ee@star-cooperation.com  
www.star-cooperation.com/ee-solutions

## Company Data

STAR ELECTRONICS GmbH & Co. KG, registered offices: Göppingen, register court Ulm, HRA 721096  
Partner liable to unlimited extent: STAR ELECTRONICS Verwaltungs-GmbH, registered offices: Göppingen, register court Ulm, HRB 722565  
Represented by the executive board: Rolf Wittig, Henning Lange

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## Revision History

Version	Date	Description
D1V0-F	27-Feb-2009	Initial release.
D1V1-F	10-Jul-2009	Updated description.
D1V2-F	11-Dec-2009	Updated description.
D1V3-F	28-May-2010	Release for FlexCard driver S6V3-F.
D2V0-F	16-Nov-2015	Layout adapted to STAR COOPERATION.
D2V1a-F	22-Jun-2016	Added CAN FD example.
D2V2-F	06-Oct-2021	Updated legal information. Updates for the latest FlexCard Windows setup.

## Related Hardware / Software Versions

Product	Reference No.	Version (Major and Minor)	Remarks
FlexCard PMC/PCI Firmware	3-0033-0B01	S6V4	PMC/PCI card with 2 triggers, 2 FlexRay (A+B) or optional 1 FlexRay (A+B) and 2 HS-CAN support
FlexCard PMC/PCI Hardware	3-0033-0A01	H1V0	

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Product	Reference No.	Version (Major and Minor)	Remarks
FlexCard PMC-II Firmware	3-0055-0C01	S6V6 (6.5.0.33) and S5V3	PMC/PCI card with 2 triggers. It supports max. 4 FlexRay (A+B) or max. 8 CAN-HS or max 4 CAN FD.
FlexCard PMC-II Hardware	3-0055-0A01	H1V1	
<i>fcBase API</i> (Windows)	3-0009-0K03	S6V8	API to build your own application
<i>fcBase API</i> (Linux)	3-0009-0U01	S6V6	API to build your own application
<i>fcBase API</i> (Xenomai)	3-0009-0V01	S6V5	API to build your own application
FlexAlyzerV2	3-0038-0B01	S1V4	FlexCard monitoring tool. Supports FlexRay/CAN monitoring, sending data, triggers, filters and data logging.

## Related Documents

Product	Reference No.	Version (Major and Minor)	Remarks
FlexCard PMC / PCI Instructions for Use	3-0033-0P01-D01	D1V9	[1] Instructions for Use
FlexCard PMC-II Instructions for Use	3-0055-0P01-D05	D2V5	[2] Instructions for Use
FlexCard API Documentation	3-0009-0S01-D03	D2V5	[3] Documentation of fcBase API
FlexEntry User Manual for FlexEntry 3-0023- 0A01 and 3-0023-0A02	3-023-D01	D1V1	[4] Instructions for Use
FlexEntry User Manual for FlexEntry 3-0023- 0A03 and 3-0023-0A04	3-23-A03-A04-D01	D1V0	[5] Instructions for Use

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## 1 General



### 1.1 Intended User Group

This product may only be used by expert technicians and/or engineers who are qualified and familiar with electronic components and systems.

Each person involved with setup or operation of the product must

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

	NOTICE
	<p>If you are unsure of how to use the product as intended or have any questions about the use of the product, please discontinue use of the product immediately and contact the STAR ELECTRONICS GmbH &amp; Co. KG Support.</p>

	 <b>WARNING</b>
	<p>The product may only be used by expert technicians and/or engineers who are qualified and familiar with electronic components and systems!</p> <p>The use of the product by non-professionals is not permitted and strictly forbidden!</p>



### 1.2 Intended use


The FlexCard PMC & FlexCard PMC II is a testing equipment. It was developed to test the communication behavior of automotive bus systems and Ethernet together with Electronics Control Units and sensors in a fully controlled testing and/or laboratory environment.



For this intended use, the FlexCard PMC & FlexCard PMC II offers the following options:



- Transmit and receive data (e.g. Use Case “Remaining Bus Simulation”).
- Exchange of data traffic between two or more bus systems (e.g. Use Case “Gateway”)
- Manipulation of data traffic (e.g. Use Case “Manipulation of signal values based on user configuration”)
- Recording of data traffic (e.g. Use Case “Logging”)

**Any deviation** from the intended use and/or installation in a testing vehicle is only permitted with specific **prior written approval** of STAR ELECTRONICS GmbH & Co. KG.

	 <b>WARNING</b>
	<p>The FlexCard PMC &amp; FlexCard PMC II may be used to communicate with networked electronic systems. E.g. FlexRay, CAN or Ethernet.</p> <p>Any use of the product outside a fully controlled testing and/or laboratory environment may result in death or serious injury due to unpredictable behavior of a vehicle and/or potentially missing, deactivated, or malfunctioning safety devices on a vehicle!</p> <p>The user is responsible to ensure the safety of the entire system. This includes amongst other things a safety shutdown.</p>

	NOTICE
	<p>The device is not a calibrated measurement device. STAR ELECTRONICS GmbH &amp; Co. KG accepts no liability whatsoever for the correctness of any measurement results.</p>






	 <b>WARNING</b>
	<p>The FlexCard PMC &amp; FlexCard PMC II is <b>NOT</b> designed, intended, or authorized and may <b>NOT</b> be used for or in connection with the following purposes and/or devices:</p> <ul style="list-style-type: none"> <li>- use as part of medical systems</li> <li>- life support applications</li> <li>- aviation, space, nuclear, or military applications</li> <li>- use in areas where combustible or explosive gas mixtures are likely to occur</li> <li>- any other purposes / devices deviating from the intended use of the product specified by STAR ELECTRONICS GmbH &amp; Co. KG.</li> </ul>

	 <b>WARNING</b>
	<p>The product may only be used by expert technicians and/or engineers who are qualified and familiar with electronic components and systems!</p> <p>The use of the product by non-professionals is not permitted and strictly forbidden!</p>

## 1.3 Used Pictograms

The meaning of used pictograms is shortly described below.

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

	<div data-bbox="852 286 1070 338">  <b>WARNING</b> </div> <p>Used to indicate a potentially hazardous situation which, if not avoided, could result in death or serious injury.</p>
	<div data-bbox="874 448 1002 488"><b>NOTICE</b></div> <p>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.</p>
	<div data-bbox="868 640 1011 672"><b>Information</b></div> <p>Used to indicate information provided only for purposes of clarification, illustration, and general information.</p>
	<div data-bbox="874 770 1002 801"><b>Reference</b></div> <p>References to other documents.</p>

## 1.4 Meaning of Text Styles

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



## 2 Getting Started

Ensure that you have installed the latest release of the FlexCard software (device driver, DLL, firmware and tools). The latest versions of the FlexCard software are available from our support team or on our web site: <http://www.star-cooperation.com/ee-solutions>.

For installation of the *FlexCard PMC (II)* software, please refer to chapter “Software Installation and Update” of the *FlexCard PMC/PCI* or *FlexCard PMC-II* Instructions for Use.

### 2.1 Windows

The examples and corresponding source code are installed with the *FlexCard PMC (II)* Windows driver software package. The sample code projects are installed by the setup on Windows to the Program Files path, to the directory *StarCooperation\FlexCard\Sample*. The Visual Studio project file *\*.vcxproj* and the solution file *.sln* should not be opened directly, because only users with administrator rights may write to this directory. That is why the user should copy the sample directory to a different location.

## 3 FlexRay Examples

After installation of the *FlexCard PMC (II)* Windows driver the example applications can be found in the directory *StarCooperation\FlexCard*.

### 3.1 Cluster with 1 FlexCard PMC (II) (CC1 Communicates with CC2)

#### 3.1.1 Hardware Required

- One computer meeting the minimum system requirements described in chapter "Software installation and Update" of the FlexCard PMC (II) instructions for use [1] [2].
- One *FlexCard PMC (II)* with four FlexRay bus cables.
- Two gender changers.
- Bus termination (there are resistors on these *FlexCard PMC (II)* accessible by an API function)
- A firmware version with two FlexRay communication controllers on the *FlexCard PMC (II)*.

#### 3.1.2 Software Required

- The “**fcDemoPMC**” software is not available in the FlexCard Linux/Xenomai software package.
- The application on Windows is located under *<Installation Path>\tools\fcDemoPMC.exe*.
- Two CHI files located under *<Installation Path>\Sample\Demo1*.

#### 3.1.3 Running the Example

##### Step 1

Insert the *FlexCard PMC (II)* in the PCI-Slot of the computer and connect communication controller 1 and 2 (CC1 and CC2) using the gender changers so that the channel names correspond (e.g. channel A to A).

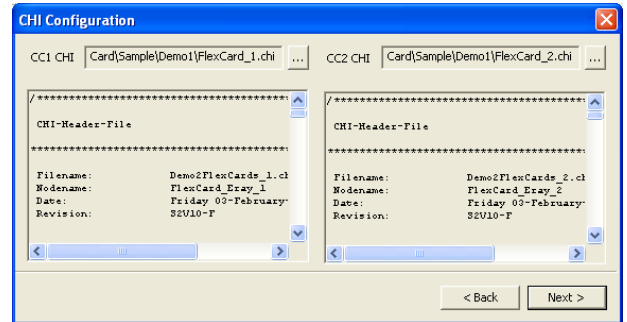
Start the **fcDemoPMC** software. In the first window, the inserted *FlexCard PMC (II)* should appear. Its hardware and software component versions are shown.

Select the *FlexCard PMC (II)* you want to use for the test and click the “Next” button.

Select FlexCard	
FlexCard #300000000000003	
Device ID	FlexCard PMC II
DLL	S6V3-F
Device Driver	S6V3-F
Firmware	S6V3-F
Hardware	H1V0-F
FlexRay	
Useable CC	2
Possible CC	2
CC Type	Bosch ERay
Protocol	2.1.0.0
CAN	
Useable CC	4
Possible CC	4
CC Type	Bosch D-CAN
Protocol	2.0.0.0
<div style="text-align: right;"> <span>&lt; Back</span> <span>Next &gt;</span> </div>	

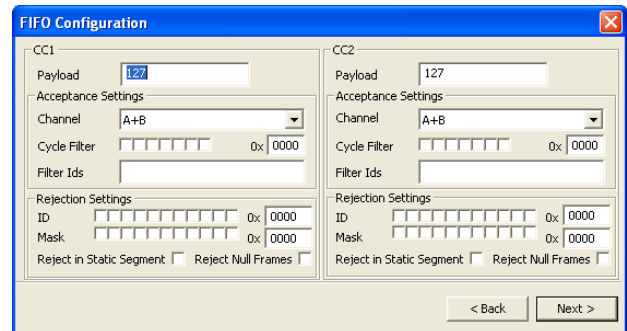
## Step 2

For CC1, select the CHI file called *FlexCards\_1.chi* and for CC2 the CHI file called *FlexCards\_2.chi*. Click the “Next” button.



## Step 3

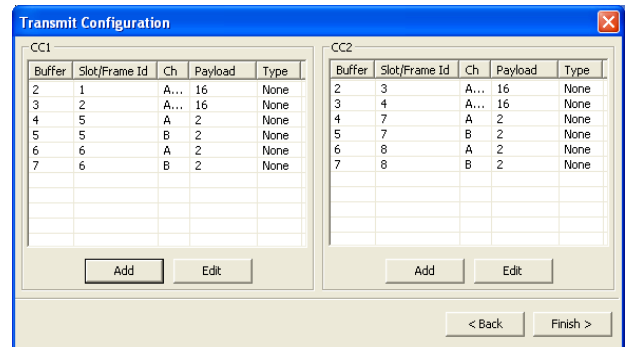
Do not modify the default settings. Click the “Next” button.



## Step 4

The “**fcDemoPMC**” software offers you to modify the FlexCard’s application by generating two types of signals (**Ramp** and **Sinus**) and update the wanted message buffers with the current value of a signal.

In the shown list, click the “Edit” button and repeat **Step 5** for each message buffer you want to be updated with a signal value.



Once completed, it should appear “**Ramp**” or “**Sinus**” in the column “**Type**” of the configured message buffers.

After that, click the “Finish” button.

## Step 5

Edit the message buffer und change its “**Transmit**” attribute to “**Ramp**” or “**Sinus**” depending on what type of signal you want to send on the slot/frame (see **Slot/Frame Id** attribute in **Step 4**).

## Step 6

Selecting a message buffer in the combo box “**Buffer Index**” and clicking the “**Automatic**” button will allow the software to automatically update the message buffer with the current value of the signal chosen in **step 5**. If you do not click the “**Automatic**” button, the selected message buffer will only be updated (one time) after clicking the “**Transmit**” button.

First switch “**on**” one CC’s “**Bus termination**” by clicking the according radio button. Now check the “**Coldstart**” check box of at least one CC. Then click the “**Start CC1+CC2**” button in order to synchronize both communication controllers.

At the beginning, some errors appear in the list **Error** at the top right. They represent the synchronization process of the FlexCards. Once the status “**StartupCompletedSuccessfully**” is displayed for both CCs in the list **Status** above, no error should occur anymore.

## 3.2 Cluster with 1 FlexCard PMC (II) and 1 FlexEntry

### 3.2.1 Hardware Required

- One computer meeting the minimum system requirements described in chapter "Software installation and Update" of the FlexCard PMC (II) instructions for use [1] [2].

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- One FlexCard PMC/PCI or FlexCard PMC-II with two FlexRay bus cables (four cables are included in a FlexCard PMC delivery).
- A firmware version with one FlexRay communication controller on the FlexCard.

### 3.2.2 Software Required

- The “**fcDemo**” software is not available in the FlexCard Linux/Xenomai software package.
- The application on Windows is located under *<Installation Path>\tools\fcDemo.exe*.
- One CHI file is located under *<Installation Path>\Sample\Demo2*.
- When delivered, the FlexNodes are already configured to run this example. If you have changed the FlexNodes’ application you have to restore it with the default application "FlexRay\_Communication" available in the FlexEntry package or use both S19 files located under *<Installation Path>\Sample\Demo2* to configure the FlexEntry. The FlexCC MFR (4200) board should be mounted on the FlexNodes.

### 3.2.3 Running the Example

The following steps should be done to synchronize the *FlexCard PMC (II)* with the FlexEntry:

#### Step 1

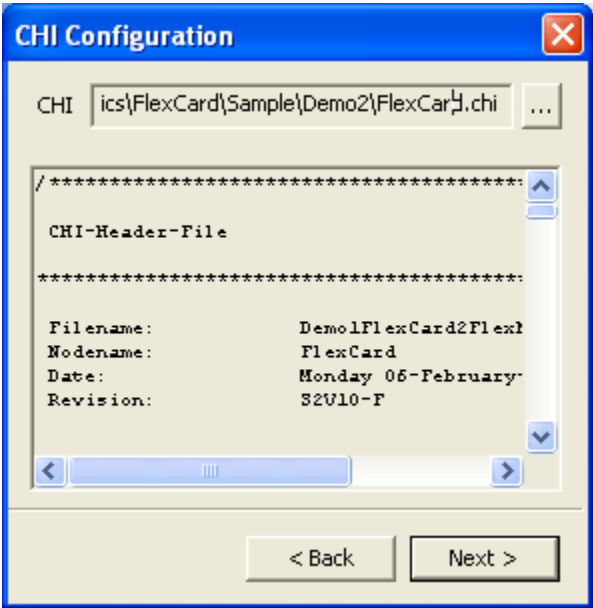
Insert the FlexCard PMC (II) in the PCI-Slot of the computer and connect it to the FlexNode. Make sure that the channel names correspond (e.g. channel A to A).

Start the **fcDemo** software. In the first window, the inserted FlexCard should appear. Its hardware and software component versions are shown.

Select the FlexCard you want to use for the test and click the “*Next*” button.

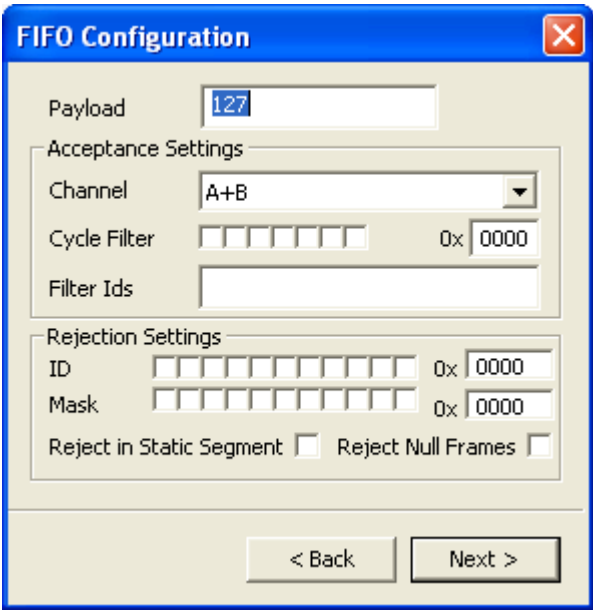
Step 2

Select the CHI file *FlexCard.chi* and click the “Next” button.

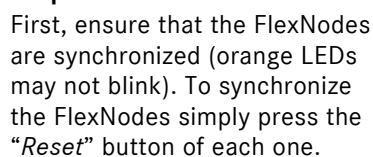


Step 3

Do not modify the FIFO configuration settings. Click the “Next” button.



There are no transmitting message buffers configured in this example. Click the “*Finish*” button.



**Receive**

Info  
Timestamp 3.231609 Cycle 034

Status  
0.015629 Cycle: 25 StartupCompletedSuccessful

Error

Transmit Acknowledge

Trigger

ID	Ch	Cycle	Flags	Length	Data
1	A	34	SYNC STARTUP NFI	10	6829 0000 0000 0000 0000 0000 0000 0000
1	B	34	SYNC STARTUP NFI	10	A028 0000 0000 0000 0000 0000 0000 0000
5	A	32		10	0000 0000 0000 0000 0000 0000 0000 0000
5	B	32		10	0000 0000 0000 0000 0000 0000 0000 0000
10	A	32	SYNC STARTUP NFI	10	CC29 0000 0000 0000 0000 0000 0000 0000
10	B	32	SYNC STARTUP NFI	10	CC29 0000 0000 0000 0000 0000 0000 0000

**Transmit**

Buffer Index Slot Channel Type Value

Automatic Transmit


☒ Coldstart  
☐ Wakeup

Stop

## 4 CAN Example

### 4.1 Hardware Required

- One computer meeting the minimum system requirements described in chapter "Software installation and Update" of the *FlexCard PMC (II)* instructions for use [1] [2].
- One *FlexCard PMC (II)* with two bus cables.
- One gender changer.
- Bus termination (there are resistors on these FlexCards accessible by an API function)
- A firmware version with minimum two CAN communication controllers on the *FlexCard PMC (II)*.

	Information
	There are switchable bus terminations for each bus channel on the device. The resistor values are for CAN (120 Ohm) and FlexRay (90 Ohm). By default the bus terminations are all off. For activating and deactivating the resistors an API function is available.

### 4.2 Software Required

- After installation of the *FlexCard PMC (II)* Windows driver the application “**fcDemoCAN**” can be found in the directory `<Installation Path>\tools\fcDemoCAN.exe`.

### 4.3 Running the Example


The following steps should be done to create a CAN network with the *FlexCard PMC (II)*:

#### Step 1

Insert the *FlexCard PMC (II)* in the PCI-slot of the computer and connect CAN communication controller 1 and 2 using the gender changers.

#### Step 2

Open a Windows terminal (DOS box). Start the “**fcDemoCAN**” software, which is located under `<Installation Path>\tools`.



```

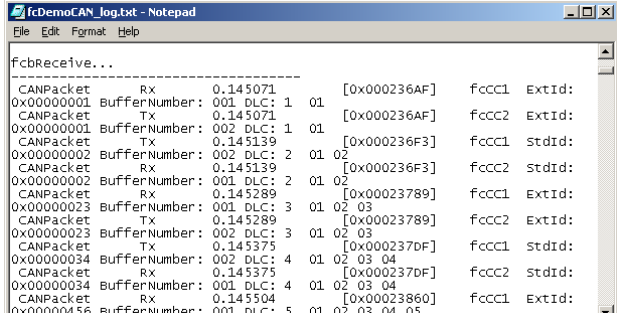
C:\WINDOWS\system32\cmd.exe
C:\temp>fcDemoCAN.exe
Output is logged to:
"C:\Users\... \Dokumente\fcDemoCAN_log.txt"
...
Finished.
C:\temp>
    
```

Alternatively, start fcDemoCAN from the Start Menu.

#### Step 3

The demo duration will be about 3 s. Ensure that the CAN communication controllers of the *FlexCard PMC (II)* are connected with each other.

A CAN network is created and its communication will be logged to a file.



```


fcbReceive...
CANPacket Rx 0.145071 [0x000236AF] fccC1 ExtId:
0x00000001 BufferNumber: 001 DLC: 1 01 [0x000236AF] fccC2 ExtId:
CANPacket Tx 0.145071 [0x000236AF] fccC2 ExtId:
0x00000001 BufferNumber: 002 DLC: 1 01 [0x000236F3] fccC1 StdId:
CANPacket Tx 0.145139 [0x000236F3] fccC2 StdId:
0x00000002 BufferNumber: 002 DLC: 2 01 02 [0x000236F3] fccC1 ExtId:
CANPacket Rx 0.145139 [0x000236F3] fccC2 StdId:
0x00000002 BufferNumber: 001 DLC: 2 01 02 [0x00023789] fccC1 ExtId:
CANPacket Rx 0.145289 [0x00023789] fccC2 ExtId:
0x00000023 BufferNumber: 001 DLC: 3 01 02 03 [0x000237DF] fccC1 StdId:
CANPacket Tx 0.145375 [0x000237DF] fccC2 StdId:
0x00000023 BufferNumber: 002 DLC: 3 01 02 03 [0x00023860] fccC1 ExtId:
CANPacket Rx 0.145375 [0x00023860] fccC2 ExtId:
0x00000034 BufferNumber: 001 DLC: 4 01 02 03 04 [0x00023860] fccC1 ExtId:
CANPacket Rx 0.145504 [0x00023860] fccC2 ExtId:
0x00000045 BufferNumber: 001 DLC: 5 01 02 03 04 05
    
```



## 5 CAN FD Example

### 5.1 Hardware Required

- One computer meeting the minimum system requirements described in chapter "Software installation and Update" of the *FlexCard PMC II* instructions for use [2].
- One *FlexCard PMC II* mounted with at least one FlexTiny II CAN-FD (3-0056-0G01) and one dual bus cable (e.g. 3-0034-1L02).
- A firmware version with minimum two CAN FD communication controllers on the *FlexCard PMC II*. Please see the *FlexCard PMC II* instructions for use [2] for the correct combination of FlexTiny II and firmware type.
- One gender changer.
- Bus termination (there are resistors on these FlexCards accessible by an API function).

	Information
	There are switchable bus terminations for each bus channel on the device. The resistor values are for CAN (120 Ohm) and FlexRay (90 Ohm). By default the bus terminations are all off. For activating and deactivating the resistors an API function is available.

### 5.2 Software Required

- After installation of the *FlexCard PMC II* Windows driver the application “**fcDemoCAN\_FD**” can be found in the directory `<Installation Path>\tools\fcDemoCAN_FD.exe`.

### 5.3 Running the example

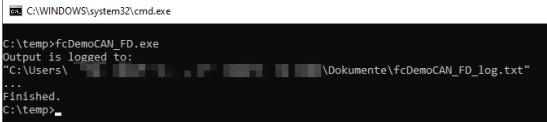
The following steps should be done to create a CAN FD network with the *FlexCard PMC II*:

#### Step 1

Insert the *FlexCard PMC II* in the PCI-slot of the computer and connect CAN FD communication controller 1 and 2 using the dual bus cable and the gender changer.

#### Step 2

Open a Windows terminal (DOS box). Start the “**fcDemoCAN\_FD**” software, which is located under `<Installation Path>\tools`.



```

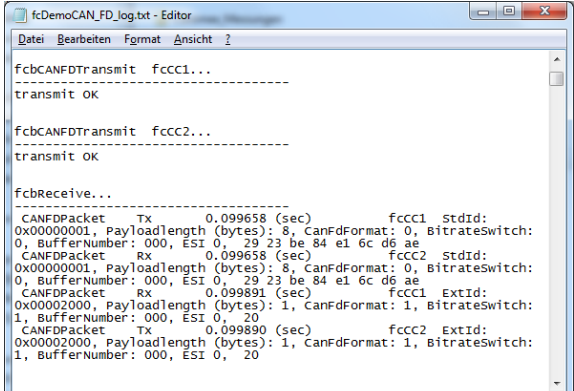
C:\WINDOWS\system32\cmd.exe
C:\temp>fcDemoCAN_FD.exe
Output is logged to:
"C:\Users\... \Dokumente\fcDemoCAN_FD_log.txt"
...
Finished.
C:\temp>
    
```

Alternatively, start the demo from the Start Menu.

#### Step 3

The demo duration will be about 3 s. Ensure that the CAN FD communication controllers of the *FlexCard PMC II* are connected with each other.

A CAN network is created and its communication will be logged to a file.



```

fcDemoCAN_FD_log.txt - Editor
Date Bearbeiten Format Ansicht ?

fcCANFDTransmit fccC1...
-----
transmit OK

fcCANFDTransmit fccC2...
-----
transmit OK

fcbReceive...
-----
CANFDpacket Tx 0.099658 (sec) fccC1 StdId:
0x00000001, Payloadlength (bytes): 8, CanFdFormat: 0, Bitrateswitch:
0, BufferNumber: 000, ESI 0, 29 23 be 84 e1 6c d6 ae
CANFDpacket Rx 0.099658 (sec) fccC2 StdId:
0x00000001, Payloadlength (bytes): 8, CanFdFormat: 0, Bitrateswitch:
0, BufferNumber: 000, ESI 0, 29 23 be 84 e1 6c d6 ae
CANFDpacket Rx 0.099891 (sec) fccC1 ExtId:
0x00020000, Payloadlength (bytes): 1, CanFdFormat: 1, Bitrateswitch:
1, BufferNumber: 000, ESI 0, 20
CANFDpacket Tx 0.099890 (sec) fccC2 ExtId:
0x00020000, Payloadlength (bytes): 1, CanFdFormat: 1, Bitrateswitch:
1, BufferNumber: 000, ESI 0, 20
    
```

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A Company of the STAR COOPERATION Group  
Jahnstraße 86  
73037 Göppingen  
Phone: +49 (0) 7031 6288-5656  
Phone: +49 (0) 7031 6288-5330 (Support)

Sales: [sales-ee@star-cooperation.com](mailto:sales-ee@star-cooperation.com)  
Support: [support-ee@star-cooperation.com](mailto:support-ee@star-cooperation.com)  
[www.star-cooperation.com/ee-solutions](http://www.star-cooperation.com/ee-solutions)