PCAN-MicroMod FD Evaluation
User Manual
Relevant products

<table>
<thead>
<tr>
<th>Product name</th>
<th>Model</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCAN-MicroMod FD Evaluation Board</td>
<td>with PCAN-MicroMod FD</td>
<td>IPEH-003081</td>
</tr>
<tr>
<td>PCAN-MicroMod FD Evaluation Kit</td>
<td>with PCAN-MicroMod FD, PC-CAN-Interface PCAN-USB FD, and terminated CAN cable</td>
<td>IPEH-003082</td>
</tr>
</tbody>
</table>

The front page shows the Evaluation Board with plugged-in PCAN-MicroMod FD.

Imprint

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1 Introduction

The PCAN-MicroMod FD Evaluation Board is a development board for the PCAN-MicroMod FD and allows the conception and development of own circuits with CAN connection and I/O functionality. Via pick-offs, screw terminals, switches, and potentiometers, the user can access the resources of the attached PCAN-MicroMod FD and check configurations or test circuits.

The configuration is done with a supplied Windows software which transfers the configuration data to the module via CAN. The optionally available Evaluation Kit also includes the CAN interface and cable required for this purpose.

This document describes the hardware and function of the Evaluation Board. A separate document is available for the plug-in board PCAN-MicroMod FD itself.

1.1 Features Overview

- Screw terminal connections for all I/Os
- CAN bus connection via D-Sub, 9-pin (in accordance with CiA® 303-1)
- Switchable CAN termination of 120 Ohm
- Pick-offs for all pins of the PCAN-MicroMod FD
- Low-side switches for the digital outputs
- DIP switches for status change of the digital inputs
- Protected digital inputs
- LEDs for digital inputs and outputs
- 4 potentiometers for analog inputs
- Soldering fields for individual additional wiring
- RS-232 connection with V.24 signal levels for direct access to the microcontroller
- 4-bit rotary coding switch for setting the module ID
1 Introduction

PCAN-MicroMod FD Evaluation

User Manual 1.0.0

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- Configuration via the CAN bus with the Windows software PCAN-MicroMod FD Configuration
- Firmware upload via CAN, USB, or RS-232; switchable via 3 buttons
- Reset button for restarting the board
- Voltage supply 5 V via Micro-USB connection or barrel connector
- Operating temperature range from 0 to 70 °C (32 to 185 °F)
- Board 100 x 102 mm with rubber feet

1.2 Operation Requirements

- Plugged-in PCAN-MicroMod FD
- Power supply 5 V DC, either via the provided USB cable or via the barrel connector (separate power supply unit required).
- For the creation and transfer of a configuration:
  Computer with Windows 10, 8.1, 7 (32/64-bit) and a CAN interface of the PCAN series*

* The CAN interface PCAN-USB FD is included with the purchase of the PCAN-MicroMod Evaluation Kit.

1.3 Scope of supply Board (IPEH-003081)

- Plug-in board PCAN-MicroMod FD (IPEH-003080)
- PCAN-MicroMod FD Evaluation Board (motherboard)
- USB cable for power supply
- Configuration software for Windows
- Manuals in PDF format
1.4 Scope of supply Kit (IPEH-003082)

As above (IPEH-003081) and in addition:

- PC-CAN interface PCAN-USB FD (IPEH-004022)
- CAN cable, terminated with 2 x 120 Ω, 2 m (IPEK-003001)
2 Setting Up the Evaluation Kit for Operation

This chapter gives a quick overview of the needed steps for the straightforward startup of the Evaluation Kit.

**Attention!** Electrostatic discharge (ESD) can damage or destroy components on the circuit board. Take precautions to avoid ESD when handling the circuit board.

**Do the following for the setup:**

1. On the PC under Windows, install the device driver for the PCAN-USB FD from the supplied data carrier.
2. Use the CAN cable to connect the PCAN-USB FD to the Evaluation Board (connector J4 CAN).
3. Plug the PCAN-USB FD into a USB port of the PC.
4. In order to supply the Evaluation Board with power, use the USB cable to connect the Evaluation Board to a USB port on the computer or to a power supply unit.
5. Under Windows, install the program PCAN-MicroMod FD Configuration from the provided data carrier (Tools section).
6. Start PCAN-MicroMod FD Configuration, create a configuration, and eventually transfer it to the PCAN-MicroMod FD (see program help).

You can now work with signals at the I/O ports as defined in the configuration. Please observe the explanations in the following chapter. On the PC, you can use the CAN monitor PCAN-View to watch and send CAN messages.
3 Components of the Evaluation Board

This chapter describes the function units and connectors of the Evaluation Board. For details you can also refer to the circuit diagram, Appendix B Circuit Diagram Evaluation Board on page 30.

3.1 Socket for PCAN-MicroMod FD (J1A/J1B)

For orientation when plugging the MicroMod FD onto the evaluation board, white triangular markings are provided both on the MicroMod FD (upper left corner) and on the Evaluation Board. These markings must align.

Figure 1: Socket for the PCAN-MicroMod FD
Via the test points of the fields J2A and J2B, which are arranged laterally to the socket strips for the MicroMod FD, each pin of the plugged-on MicroMod FD can be accessed directly.
3.2 Power Supply (J6, J7)

The Evaluation Board requires a supply voltage of 5 V DC. It can be applied either via the Micro USB connector or the barrel connector.

Figure 4: Barrel connector J6 for voltage supply, Power LED, Micro USB connector J7 in the same area on the bottom side of the board (not visible in this figure)

Figure 5: Polarity of the supply socket

Figure 6: Diameter of barrel connector: a = 5.5 mm, b = 2.5 mm; minimum length: 11 mm

The Power LED indicates that the Evaluation Board is supplied.

3.3 CAN Connection (J4)

The 9-pin D-Sub male connector J4 is used for CAN connection, positioned on the upper right of the Evaluation Board. The pin assignment of the CAN connector
corresponds to the specification CiA® 303-1.

Figure 7: CAN connector and switch for the CAN bus termination

Figure 8: Assignment of the D-Sub male connector for CAN

**CAN Bus Termination**

If the Evaluation Board is connected to one end of the High-speed CAN bus and the CAN bus is not terminated at that end, a termination can be activated on the Evaluation Board. For this purpose, switch S3 (next to the CAN connector) must be set to the *On* position.

For better electromagnetic compatibility, a split termination is implemented.
3.4 Analog Inputs (J8) and Potentiometers

The Evaluation Board has 8 analog inputs (Ai0 to Ai7). The corresponding connector is J8 (screw terminals on the upper right).

The analog reference voltage is 3.0 V. The input impedance is 11 kΩ.

The Evaluation Board has 4 potentiometers (P0 to P3) which can be used for simulating input signals. Using the switches S200 to S203, the analog inputs Ai0 to Ai3 are disconnected from the screw terminals and connected to the respective potentiometer.
3.5 Digital Inputs (J9)

The Evaluation Board has 8 digital inputs with TTL levels (Di0 – Di7). The corresponding connector is J9 (screw terminals, bottom right).
The inputs each have a pull-down resistor and are High-active. The switching thresholds are below 2.2 V to the Low state and above 3.3 V to the High state. Each input status is indicated by an LED.

For test purposes, the individual input signals can be switched via the DIP switches S300. A DIP switch activates a pull-up resistor with 2.7 kΩ to the 5-Volts supply. It can be permanently activated if a low-active signal is fed to the input via the screw terminal (e.g. push button connected to ground).

Signals that directly lead to the MicroMod FD can be accessed on the following points of the field J2B:

<table>
<thead>
<tr>
<th>Pin on J2B</th>
<th>Processed input signal (inverted)</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>Di0</td>
</tr>
<tr>
<td>33</td>
<td>Di1</td>
</tr>
<tr>
<td>35</td>
<td>Di2</td>
</tr>
<tr>
<td>37</td>
<td>Di3</td>
</tr>
<tr>
<td>39</td>
<td>Di4</td>
</tr>
<tr>
<td>41</td>
<td>Di5</td>
</tr>
<tr>
<td>43</td>
<td>Di6</td>
</tr>
<tr>
<td>45</td>
<td>Di7</td>
</tr>
</tbody>
</table>

### 3.6 Digital and Frequency Outputs (J3)

The Evaluation Board has 8 digital outputs (Do0 to Do7) and two frequency outputs (Fo0 and Fo1). Each output status is indicated by an LED. An illuminated LED corresponds to the active state.
3.7 Module Number (S2)

The module number is used for the identification of a single MicroMod FD on the CAN bus when configurations are sent and received. The rotary switch can be used to set a module number from 0 to 15 (hexadecimal 0 to F).
Each MicroMod FD connected to the CAN bus must have a unique module number for the configuration process, else unpredictable configuration results may occur. The set module number has no influence on the CAN communication during normal operation. If there are several MicroMod FD on the CAN bus, various configurations must be used to ensure that there is no overlap in the transmit CAN IDs.

### 3.8 RS-232 Connector (J5)

The RS-232 connector can alternatively be used for transferring firmware to the PCAN-MicroMod FD. You need a suitable flashing tool, e.g. Flash Magic ([www.flashmagic-tool.com](http://www.flashmagic-tool.com)), and a firmware file in hex format.

![Figure 15: RS-232 connector](image)

![Figure 16: Pin assignment of the D-Sub socket for RS-232](image)
3.9 USB Connector (J7)

The Micro USB connector is located on the left edge of the Evaluation Board, on the bottom side of the board. Primarily, it is used for voltage supply of the Evaluation Board with 5 V DC.

![Micro USB socket on the bottom side of the Evaluation Board](image)

In addition, the USB connector can be used as one possibility to transfer firmware to the PCAN-MicroMod FD.

3.10 Push Buttons for Reset and Flash Mode

The four blue push buttons located on the lower right side have the following functions:

<table>
<thead>
<tr>
<th>Push button</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reset</td>
<td>Reset of the PCAN-MicroMod FD, restart of the firmware</td>
</tr>
<tr>
<td>Boot</td>
<td>Flash mode for a firmware update via CAN</td>
</tr>
<tr>
<td>USB</td>
<td>Flash mode for a firmware update via USB</td>
</tr>
<tr>
<td>Serial</td>
<td>Flash mode for a firmware update via RS-232</td>
</tr>
</tbody>
</table>
Figure 18: Blue push buttons

More information about the procedure for firmware update is available in chapter 4 *Firmware Update of the PCAN-MicroMod FD* on the next page.
4 Firmware Update of the PCAN-MicroMod FD

The PCAN-MicroMod FD can be equipped with new firmware in three different ways:

- via CAN bus
- via USB connection (easiest way on the Evaluation Board)
- via serial RS-232 interface (only for special purposes)

The following sections describe the procedures. Step through all subsections in a section.

4.1 Firmware Update via CAN Bus

4.1.1 System Requirements

- Computer with operating system Windows 10, 8.1, 7 (32/64-bit)
- CAN interface of the PCAN series installed in/attached to the computer
- CAN cabling between the CAN interface and the Evaluation Board with proper termination (120 Ω on each end of the CAN bus)

4.1.2 Activating the Flash Mode

**Do the following to set the PCAN-MicroMod FD to flash mode for CAN:**

1. Make sure that the Evaluation Board is supplied with power (*Power LED on the Evaluation Board is on*).
2. Press and hold the button for the *Boot* flash mode.
3. Briefly press the *Reset* button.
4. Keep the button for the flash mode pressed for at least 1 second and then release it.

   LED B on the MicroMod FD blinks quickly orange.

### 4.1.3 Preparing the Software

PCAN-Flash must be started from a data carrier which is also writable, otherwise the program's configuration (PcanFlash.ini file) cannot be saved. The program doesn't work properly if it is run from a DVD. This is reflected, for example, by an error message when selecting a CAN connection.

Make sure that the PCAN-Flash directory is located on a local hard disk, for example, (if necessary, copy it from DVD) and that there are write permissions in the directory, and execute PCAN-Flash from there.

### 4.1.4 Uploading the Firmware

**Do the following to update the firmware:**

1. Under Windows, run the `PcanFlash.exe` program from the local hard disk.

2. Click on the (Options) button in order to open the corresponding dialog box.
3. In the drop-down list *Hardware Profile*, select the *PCAN-MicroMod FD* entry.

4. Click on the … (3 dots) button next to the *Filename* field in order to select the desired firmware file (*.bin*) for the update.

5. Click on *OK*.

6. Make sure that the PCAN-Flash program is connected with 500 kbit/s to the available CAN interface on the computer.

   ![PCAN-Flash software interface](image.png)

   If not, click the 🔄 (Connect) button in order to change the selection in the according dialog box.
7. Click the (Detect) button in order to detect the PCAN-MicroMod FD being connected to the CAN bus. A corresponding entry appears in the main window.

8. Select the entry for the PCAN-MicroMod FD.

9. Click the (Program) button in order to start update process.

   The process was successful if as last message "Flashing of module(s) finished!" appears in the status area.

10. Restart the MicroMod FD (e.g. with the blue Reset button).
4.2 Firmware Update via USB Connection

4.2.1 System Requirements
- Any operating system on the PC
- USB connection between Evaluation Board and PC

4.2.2 Activating the Flash Mode

**Do the following to set the PCAN-MicroMod FD to flash mode for USB:**

1. Make sure that the Evaluation Board is supplied with power (Power LED on the Evaluation Board is on).
2. Press and hold the button for the USB flash mode.
3. Briefly press the Reset button.
4. Keep the button for the flash mode pressed for at least 1 second and then release it.

   LEDs A and B on the MicroMod FD stay off.

   In the operating system of the connected PC, the MicroMod FD appears as USB mass storage device "CRP DISABLD".

4.2.3 Uploading the Firmware

1. On the PC, open the folder of the connected USB mass storage device.
   The folder contains the (virtual) file `firmware.bin` as the only entry.
2. Delete the `firmware.bin` file on the USB mass storage device.
3. On the PC, rename the file with the new firmware for the MicroMod FD to `firmware.bin` (observe lower case).
4. Copy the new firmware file to the USB mass storage device and wait for the end of the copy process (takes up to 10 seconds).
5. Disconnect the USB cable between PC and evaluation board.
6. Restart the MicroMod FD (e.g. with the blue Reset button).

4.3 Firmware Update via Serial RS-232 Interface

4.3.1 System Requirements

- Serial RS-232 port on the computer (D-Sub, 9-pin, m)
- Serial 1:1 cable with D-Sub connectors, 9-pin, m-f (not included in the scope of supply of the Evaluation Board)
- Operating system Windows 10, 8.1, 7 (32/64-bit)
- Freely available Windows program Flash Magic (www.flashmagictool.com)
- Firmware file in Hex format (*.hex)

4.3.2 Activating the Flash Mode

**Do the following to set the PCAN-MicroMod FD to flash mode for RS-232:**

1. Make sure that the Evaluation Board is supplied with power (Power LED on the Evaluation Board is on).
2. Press and hold the button for the Serial flash mode.
3. Briefly press the Reset button.
4. Keep the button for the flash mode pressed for at least 1 second and then release it.
   LEDs A and B on the MicroMod FD stay off.

4.3.3 Uploading the Firmware

1. On the PC, start the Windows program Flash Magic.
2. In the Device area, click on Change and select LPC54000 > UART > LPC54618J512.
3. For **Serial Port**, select the RS-232 interface being used on the PC and set the **Baudrate** to 57600.

4. In the **Erase** area, select the entry **Sectors used by file** entry from the dropdown list.

5. In the **Options** area, enable **Verify after Programming**.

6. In the **Firmware** area, specify the desired firmware file (***.hex**), either by typing or via **Browse**.

7. Click on **Start** in order to initiate the firmware update.

8. As soon as the update procedure is completed (**Finished** message), close the Flash Magic program and restart the MicroMod FD (e.g. with the blue Reset button).
## 5 Technical Specifications Evaluation Board

### Supply

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>5 V DC</td>
</tr>
<tr>
<td>Connection options</td>
<td>Supply socket for barrel plug 5.5 mm outside/2.5 mm inside</td>
</tr>
<tr>
<td></td>
<td>Micro USB socket</td>
</tr>
<tr>
<td>Current consumption</td>
<td>max. 300 mA (incl. PCAN-MicroMod FD)</td>
</tr>
</tbody>
</table>

### Digital inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>8</td>
</tr>
<tr>
<td>Levels</td>
<td>Low-active</td>
</tr>
<tr>
<td>Switching thresholds</td>
<td>1: U &gt; 3.3 V typ.</td>
</tr>
<tr>
<td></td>
<td>0: U &lt; 2.2 V typ.</td>
</tr>
<tr>
<td>Additional circuits</td>
<td>DIP switches</td>
</tr>
</tbody>
</table>

### Analog inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>8</td>
</tr>
<tr>
<td>Input voltage</td>
<td>0 – 33 V</td>
</tr>
<tr>
<td>Resolution</td>
<td>12 bits</td>
</tr>
<tr>
<td>Sample rate</td>
<td>1 kHz</td>
</tr>
<tr>
<td>Input impedance</td>
<td>11 kΩ</td>
</tr>
<tr>
<td>Additional circuits</td>
<td>Inputs Ai0 to Ai3 individually switchable to potentiometers P0 to P3</td>
</tr>
</tbody>
</table>

### Digital outputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>8</td>
</tr>
<tr>
<td>Type</td>
<td>Low-side switch</td>
</tr>
<tr>
<td>Load</td>
<td>max. 900 mA per output</td>
</tr>
</tbody>
</table>
### Frequency/PWM outputs

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>2</td>
</tr>
<tr>
<td>Maximum frequency</td>
<td>10 kHz</td>
</tr>
</tbody>
</table>

### CAN

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission standard</td>
<td>High-speed CAN ISO 11898-2</td>
</tr>
<tr>
<td>Termination</td>
<td>120 Ω, can be enabled with switch</td>
</tr>
<tr>
<td>Connection</td>
<td>D-Sub 9-pin m, assignment according to CiA® 303-1</td>
</tr>
</tbody>
</table>

### Measures

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Size of circuit board</td>
<td>100 x 102 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>83 g without PCAN-MicroMod FD</td>
</tr>
<tr>
<td></td>
<td>92 g with PCAN-MicroMod FD</td>
</tr>
</tbody>
</table>

### Environment

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>0 – +85 °C (32 – 185 °F)</td>
</tr>
<tr>
<td>Temperature for storage and transport</td>
<td>−40 – +100 °C (−40 – +212 °F)</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>15 – 90 %, not condensing</td>
</tr>
</tbody>
</table>
Appendix A Dimension Drawing

Figure 19: The scale of the drawings differs from an 1-to-1 representation.
Appendix B Circuit Diagram Evaluation Board

The following pages show the electronic circuit diagram of the Evaluation Board for the PCAN-MicroMod FD. For example, it can be used as a reference for your own MicroMod FD circuitry.
**MicroModFD Eval**

**Datum:**
01.12.2017

**Dateiname:**
PowerSupply.SchDoc

**Version:** 3.0

**Auftraggeber:**
C.Eggers

**Entwickler:**
C.Eggers

**Variante:**
Default

---

**Working range (Vin = 5V; I = 500mA)**

Vin = 1.2V-20V
Imax = 600mA
GND

**Max limits +85°C; Vin = 5V; I = 500mA**

Vmax = 6V
Vf = 3V-7V
I_f max = 2A
V_r max = 60V

**Max limits values +85°C; Vin = 5V; I = 500mA**

V = 3V-5V
Vdropout = 105mV (Vin 5V, I=500mA)
Vdropout max = Iload x(Rdson,pfet+Rinductor) = 500mA x(500mR + 105mR) =302.5mA
Max limits values +85°C; Vin = 5V; I = 500mA

Imin = 23.36mA
Imax = 162.75A

**VIn Max = 5V + Vf + U100 Vdropout + U101 Vdropout**

VIn min = 3.3V +Vfmax + U100 Vdropout max + U101 Vdropout max

VIn max = 5.47V

VIn min = 4.22V

**Working range**

Vin1
GND2
EN3
Out 5
Flag 4

**U100**
NCP360SNT1G

**L100**
WE-TPC 2813 2.2µH

**C107**
100nF

**R100**
1k

**D100**
std gn

**C101**
1nF

**C100**
100nF

**C105**
1µF

**C106**
100nF

**C103**
10µF

**C104**
10nF

**C102**
4.7µF

**R101**
1k

**C108**
10µF

**VIn Max = 5V + Vf + U100 Vdropout + U101 Vdropout**

VIn min = 3.3V +Vfmax + U100 Vdropout max + U101 Vdropout max

VIn max = 5.47V

VIn min = 4.22V
VH1
VH3
GND

bei 100 K / 3 K
Uin Low 1.7V
Uin High 5.5V

bei 47K / 3K
Vh = 3.3V
Vh = 1.25V
Vh = 1.34V

inverted input signal

MicroModFD Eval
Digital Input

Auftraggeber: PEAK-System Technik GmbH
Titel: MicroModFD Eval

Version: 3.0
MicroModFD Eval

SD_Card

uSD_DETECT
uSD_CLK
uSD_CMD
uSD_D0
uSD_D1
uSD_D2
uSD_D3
uSD карта
Alternativ: Mouser 571-2041021-4

47k
1µF
3V3
GND
not assembled

SD_Kyocera

R500
R501
R502
R503
R504
R505
R506
C500
PIC50001
PIC50002
COC500
PIESD50001
PIESD50002
PIESD50003
PIESD50004
PIESD50005
PIESD50006
PIESD50007
PIESD50008
PIESD50009
PIESD500010
PIESD500011
PIESD500012
PIESD500013
PIESD500014
PIESD500015
PIESD500016
PIESD5000EP