Relevant products

<table>
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<td>IPEH-003081</td>
</tr>
<tr>
<td>CAN FD interface of the PCAN series (e.g. PCAN-USB FD)</td>
<td>IPEH-004022</td>
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Imprint

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1 Introduction

This step-by-step tutorial is intended to help you work with the PCAN-MicroMod FD Evaluation Board and the PCAN-MicroMod FD Configuration software.

1.1 Requirements

For the tutorial you need the following hardware and software:

- **PCAN-MicroMod FD Evaluation Board**
  (click here to open the product page)
  Must be connected to your PC. For more details, take a look into the respective hardware manual on the product page.

- **PCAN-MicroMod FD Configuration software**
  (click here to open the product page)
  The software must be installed on your PC.

- **CAN FD interface of PEAK-System (e.g. PCAN-USB FD)**
  Must be connected to your PC. For more details, take a look into the respective hardware manual on the product page.

- **PCAN-View 4**
  (click here to open the product page)
  The free software must be installed on your PC.

- **PCAN-Explorer 6**
  (click here to open the product page)
  The purchasable software is used for the evaluation of the example results. The PCAN-Explorer 6 is not required for the configuration of PCAN-MicroMod FD products.
1.2 PCAN-MicroMod FD Evaluation Board

This product is an evaluation 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.
1.3 PCAN-MicroMod FD Configuration Software

The PCAN-MicroMod FD Configuration software can be used to configure all products based on the PCAN-MicroMod FD series. Specific configuration options are available for the PCAN-MicroMod FD itself, the motherboards, and the PCAN-MicroMod FD Evaluation board, depending on the hardware in use.

Configuration data is transmitted to the module via CAN. Use of unique module IDs allows independent configuration of multiple devices on a single CAN bus.

Tip: Use the Quick Help side window on the right to get more information. You can also call up the software help via F1.
2 Examples

In this chapter you will find various examples. Examples are included as project files (*.mmcproj) in the download package.

**Note:** The purchasable PCAN-Explorer 6 software is used to gain a better understanding or even required for the evaluation (e.g. Functions Service). The PCAN-Explorer 6 is not required for the configuration of PCAN-MicroMod FD products.

**Tip:** You can simply take note of the results of the respective example in this tutorial - without the PCAN-Explorer 6 software.

2.1 Example 1: Digital Outputs - Control LEDs via CAN Messages

1. Open *PCAN-MicroMod FD Configuration*.
2. Click on *File* and *New*.
   
   Target Hardware window appears.
3. Select the following options:
   - PCAN-MicroMod FD Evaluation Board
   - Protocol: CAN 2.0
   - Bit Rate Preset: 500 kbit/s
   - Module ID: make sure that this number is equal to the selected Module ID of the used PCAN-MicroMod FD Evaluation Board.
5. Click on Add new Signal in the Signals sidebar and add 8 new Signals.
6. Rename them to do00 – do07.

7. Go to the Symbols service.
8. Add 8 Receive Symbols.
9. In the Name field of the Receive Symbol tab, rename the Symbols to 00rec - 07rec.
10. Edit the CAN IDs 100h – 107h in the CAN ID (Hex) field. Set the Data Length of the Symbols 00rec – 07rec to 1 Bytes.
11. Perform a right mouse-click on the 00rec symbol and select Add Variable. The Signals dialog box opens.

![Signals dialog box]

12. Select do00.
13. Do the same with the 01rec – 07rec (do01 – do07) symbols.

![Symbols dialog box]

14. In the Digital Outputs window, activate the Output 0 checkbox.
15. In the Output tab, select do00 in the Signal drop-down menu.
16. Do the same with the do01 – do07 signals and Output 1 – Output 7.

![Digital Outputs](image1.png)

17. Before this configuration can be send to PCAN-MicroMod FD, click on the Connect toolbar item and select your available PCAN hardware. Consider the settings in step 3.

18. Click on ➢ Send Configuration.

19. Select the module and click Send.

![Active Modules](image2.png)
Next steps in PCAN-View 4:

1. Open PCAN-View.
2. In the Connect window, create a connection with a Nominal Bite Rate of 500 kbit/s.
3. Click on the New Message toolbar button.
4. In the New Transmit Message window, set the ID to **100h**, the Length to 1, Data to **01**, and Cycle Time to **500 ms**.
   The Data value of **01** means the LED lights up. A data value of **00** means that the LED does not light up.
5. Create further CAN messages with the IDs **101h** to **107h** and set different Data values (**01** or **00**).
6. Send these CAN messages and control the Do0 – Do7 LEDs on the PCAN-MicroMod FD Evaluation Board.
   Last but not least, set the values of the individual CAN messages from **01** to **00** or vice versa and switch the Do0 – Do7 LEDs on and off.
2.2 Example 2: Analog Inputs - Control LEDs via the 4 Potentiometers

1. Open the PCAN-MicroMod FD Configuration software.
2. Click on "New Configuration".
3. Select the following options:
   - PCAN-MicroMod FD Evaluation Board
   - Protocol: CAN FD
   - Bit Rate Preset: SAE J2284-4 (500k/2M)
   - Module ID: make sure that this number is equal to the selected Module ID of the used PCAN-MicroMod FD Evaluation Board.

![Configuration Software Screenshot]

4. Confirm the settings with OK.
5. Add 4 signals by clicking on "Add new Signal" in the Signals sidebar.
6. Rename the signals to **pot00 - pot03**.

![Signals](image)

7. Open the **Analog Inputs** service.
8. Activate **Input 0 – Input 3**.
9. Add the signals **pot00 – pot03** to each of the inputs with a right mouse click.

![Analog Inputs](image)

10. Open the **Digital Outputs** service.
11. Activate the **Output 0 – Output 7** items.
12. Click on **Output 0**.
13. In the **Type** drop-down menu, select **PWM** and change the **Frequency** to **100 Hz**.
14. Do the same for **Output 1 to Output 7**.
15. Add the *pot00 – pot03* signals in recurring sequence to the outputs, for example *pot00* to *Output 0* and *Output 4*, and change the *Scale* to **0.025**.

![Digital Outputs](image)

16. Before this configuration can be send to PCAN-MicroMod FD, click on the Connect toolbar item and select your available PCAN hardware. Consider the settings in step 3.

17. Click on ▶️*Send Configuration*. 

---

2 Examples • PCAN-MicroMod FD Configuration Tutorial
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18. Select the module and click *Send.*

![Active Modules](image)

**Do the following on the PCAN-MicroMod FD Evaluation Board:**

1. Ensure that the **S200** switch on the board is set to **P0.**
2. Turn the **P0** potentiometer.
   - **Do0** and **Do4** LEDs in-/decrease their brightness.
3. Turn the other potentiometer (**P2** – **P3**) and in-/decrease the brightness of the other LEDs.
   - Which LEDs are influenced by which potentiometer (**P0** – **P3**) depends on the selected assignment of the *pot00* – *pot03* signals to the output items in the *Digital Output Service.*

**Tip:** You can assign the signals as you wish. For example, it is also possible to select only one signal and thus switch all LEDs on or off via one CAN message. Try it out.
2.3 Example 3: Creating a Curve and Curve Definition

1. Open the PCAN-MicroMod FD Configuration software.
2. Click on New Configuration.
3. Select the following options:
   - PCAN-MicroMod FD Evaluation Board
   - Protocol: CAN FD
   - Bit Rate Preset: SAE J2284-4 (500k/2M)
   - Module ID: make sure that this number is equal to the selected Module ID of the used PCAN-MicroMod FD Evaluation Board.

4. Confirm the settings with OK.
5. Add two signals by clicking on Add new Signal in the Signals sidebar.
6. Rename the signals to Signal-in and Signal-out.

7. Open the Symbols service.
8. Add a symbol to the Transmit Symbols and Receive Symbols.
9. Rename the transmit symbol to **transmit0**, edit the CAN ID to **500h**, and set the Send Period to **100 ms**.
10. Rename the receive symbol to **receive0** and edit the CAN ID to **100h**.
11. Perform a right mouse-click on the transmit0 symbol and select `Add Variable`. The Signals dialog box opens.
12. Select the Signal-out signal in the Signals dialog box and confirm with OK.
13. Add Signal-in to receive0.
14. Click on Signal-out and extend the Length to **16 bits**.
15. Do the same with Signal-in.

![Symbols]

16. Open the **Curve Definitions** service.
17. Activate \textit{Definition 0} and select 2 or more points in \textit{Point Count}.
By default, the points are located on the x axis. Move them to another (random) place in the diagram.

18. Open the \textit{Curves} services.
19. Activate \textit{Curve 0} and select \textit{Definition 0}.
20. For the \textit{Input Signal}, select \textit{Signal-in}.
21. For the *Output Signal*, select *Signal-out*.

22. Click on ![Export] and *Into Symbols File*....

23. Edit the *File Name* (e.g. *Example-x.sym*).

24. Select the *Direction Reverse* option.

25. Confirm with *Export* to create the Symbols file.

26. Before this configuration can be send to PCAN-MicroMod FD, click on the ![Connect] toolbar item and select your available PCAN hardware. Consider the settings in step 3.

27. Click on ![Send Configuration].
28. Select the module and click Send.

**Evaluation with the PCAN-Explorer 6:**

1. Open the PCAN-Explorer 6 software.
2. Create an empty project and establish a connection to our CAN bus.
3. In the *Project Manager*, click on *Add* and select the Symbols file you created a few moments ago.
4. Right mouse-click on that Symbols file and select *Apply*.
5. You should receive CAN messages with the *CAN ID 500h*.
6. In the *Receive / Transmit* window of the PCAN-Explorer 6, add a transmit message with the *CAN ID 100h*.
7. Double-click on the *Signal-in* in the *Data* column and enter a random *Value* within the range 0 – 1024.
   
   The received CAN message 500h should display the y-value (*Signal-out*) to the respective x-value (*Signal-in*) of the transmitted message.
2.4 Examples 4 to 7: Digital Functions

2.4.1 First Steps for Examples 4 to 7
1. Open the PCAN-MicroMod FD Configuration software.
2. Click on New Configuration.
3. Select the following options:
   - PCAN-MicroMod FD Evaluation Board
   - Protocol: CAN FD
   - Bit Rate Preset: SAE J2284-4 (500k/2M)
   - Module ID: make sure that this number is equal to the selected Module ID of the used PCAN-MicroMod FD Evaluation Board.

4. Confirm the settings with OK.
5. Click on the Connect toolbar item and select your available PCAN hardware. Consider the settings in step 3.
6. Add 1 new signal by clicking on Add new Signal in the Signals sidebar.
7. Rename the signal to **Signal-out**.

8. Open the **Symbols** service.

9. Right mouse-click on *Transmit Symbols* and select **Add Symbol**.

10. Rename the transmit symbol to **transmit0**.

11. Set the *CAN ID* to **100h** and the *Send Period* to **100 ms**.

12. Perform a right mouse-click on the *transmit0* symbol and select **Add Variable**. The *Signals* dialog box opens.

13. Select the *Signal-out* signal and confirm with **OK**.

14. Click on the *Signal-out* variable and edit the *Length* to **16 bits**.

---

**Now continue with the corresponding examples (4 to 7):**

- **Example 4:** Digital Function (&, “AND”)
- **Example 5:** Digital Function (≥ 1, “OR”)
- **Example 6:** Digital Function (RS Flip-Flop; SET, RESET)
- **Example 7:** Digital Function (Feedback)
2.4.2 Example 4: Digital Function (\&, “AND”)

1. Proceed the steps in chapter First Steps for Examples 4 to 7
2. Open the Digital Functions service.
3. Close the switches next to Digital Input 0, Digital Input1, Signal Output, and Digital Output 0.
   The red colored turns green.
4. In the Signal drop-down menu, select Signal-out for Function 0.
5. Set the Cycle Time to 100 ms.
6. Click on the white box and set \&.

7. Click on Export and Into Symbols File....
8. Edit the File Name (e.g. Example-x.sym).
9. Select the *Direction Reverse* option.

![Export into Symbols file dialog box]

10. Confirm with *Export* to create the Symbols file.

11. Click on ➤ *Send Configuration*.

12. Select the module and click *Send*.
Evaluation with the PCAN-Explorer 6:

1. Open the PCAN-Explorer 6 software.
2. Create an empty project and establish a connection to our CAN bus.
3. In the Project Manager, click on Add and select the Symbols file you created a few moments ago.
4. Right mouse-click on that Symbols file and select Apply. You should receive CAN messages with the CAN ID 100h.

Do the following on the PCAN-MicroMod FD Evaluation Board:

1. Activate the Digital Input 1 switch (e.g. with a small screwdriver).
   The Di0 LED should light up. The Do0 LED should not light up.
   In the Receive / Transmit window of the PCAN-Explorer 6, the Signal-out value in the Data column is 0.
   The Di1 LED should light up. The Do0 LED should light up.
   The Signal-out value in the Data column is 1.
3. Deactivate the Digital Input 1 switch.
   The Di0 and Do0 LEDs should not light up anymore because both Digital Inputs are needed.
   The Signal-out value in the Data column is 0.
   By using the & Logic Gate Function, Digital Input 1 and Digital Input 2 on the Evaluation Board must be activated so that the Do0 LED lights up.
2.4.3 Example 5: Digital Function (≥ 1, “OR”)

1. Proceed the steps in chapter First Steps for Examples 4 to 7
2. Open the Digital Functions service.
3. Close the switches next to Digital Input 0, Digital Input1, Signal Output, and Digital Output 0.
   The red colored turns green.
4. In the Signal drop-down menu, select Signal-out for Function 0.
5. Set the Cycle Time to 100 ms.
6. Click on the white box and set ≥1.

```
    Function 0
    Cycle Time: 100 ms  Signal: Signal-out
    Trigger Event: None  Scale: 1
    Offset: 0
```

7. Click on Export and Into Symbols File....
8. Edit the File Name (e.g. Example-x.sym).
9. Select the Direction Reverse option.

10. Confirm with Export to create the Symbols file.
11. Click on Send Configuration.
12. Select the module and click Send.
Evaluation with the PCAN-Explorer 6:
1. Open the PCAN-Explorer 6 software.
2. Create an empty project and establish a connection to our CAN bus.
3. In the Project Manager, click on Add and select the Symbols file you created a few moments ago.
4. Right mouse-click on that Symbols file and select Apply. You should receive CAN messages with the CAN ID 100h.

Do the following on the PCAN-MicroMod FD Evaluation Board:
1. Activate the Digital Input 1 switch (e.g. with a small screwdriver).
   The Di0 and Do0 LED should still light up.
   In the Receive / Transmit window of the PCAN-Explorer 6, the Signal-out value in the Data column is 1.
   The Di1 LEDs should light up. The Di0 and Do0 LED should still light up.
   The Signal-out value in the Data column remains 1.
3. Deactivate the Digital Input 1 switch.
   The Di0 LED no longer lights up. Di1 and Do0 still lights up.
   The Signal-out value in the Data column remains 1.
   The Di1 and Do0 LEDs should not light up anymore.
   The Signal-out value in the Data column is 0.
   By using the OR Logic Gate Function, Digital Input 1 and/or Digital Input 2 on the Evaluation Board must be activated so that the Do0 LED lights up.
2.4.4 Example 6: Digital Function (RS Flip-Flop; SET, RESET)

1. Proceed the steps in chapter First Steps for Examples 4 to 7
2. Open the Digital Functions service.
3. Close the switches next to Digital Input 0, Digital Input1, Signal Output, and Digital Output 0.
   The red colored turns green.
4. In the Signal drop-down menu, select Signal-out for Function 0.
5. Set the Cycle Time to 100 ms.
6. Click on the white box and set RS Flipflop.

7. Click on Export and Into Symbols File....
8. Edit the File Name (e.g. Example-x.sym).
9. Select the *Direction Reverse* option.

10. Confirm with *Export* to create the Symbols file.
11. Click on ➤ *Send Configuration*.
12. Select the module and click *Send*. 
Evaluation with the PCAN-Explorer 6:
1. Open the PCAN-Explorer 6 software.
2. Create an empty project and establish a connection to our CAN bus.
3. In the Project Manager, click on Add and select the Symbols file you created a few moments ago.
4. Right mouse-click on that Symbols file and select Apply.
   You should receive CAN messages with the CAN ID 100h.

Do the following on the PCAN-MicroMod FD Evaluation Board:
1. **SET**: Activate the Digital Input 1 switch (e.g. with a small screwdriver).
   The Di0 and Do0 LED should light up.
   In the Receive / Transmit window of the PCAN-Explorer 6, the Signal-out value in the Data column is 1.
2. Deactivate the Digital Input 1 switch.
   The Di0 LED should not light up anymore.
   The Signal-out value in the Data column remains 1.
   The Di1 LED should light up and the Do0 should not light up anymore.
   The Signal-out value in the Data column is 0.
   By using the RS Flipflop Logic Gate Function, Digital Input 1 switch represents the SET and the Digital Input 2 switch represents the RESET.
   When SET=TRUE and RESET=FALSE the output is TRUE.
   When SET=FALSE and RESET=TRUE the output is FALSE.
   Otherwise, the Do0 LED stays unchanged.
2.4.5 Example 7: Digital Function (Feedback)

1. Proceed the steps in chapter First Steps for Examples 4 to 7
2. Open the \textit{Digital Functions} service.
3. On the left side, activate the \textit{Digital Input 0} and \textit{Digital Input 1} switches.
4. Activate the Inverter by clicking on the \textit{Feedback} switch.

This inverts the \textit{Feedback} value of the enabled \textit{Digital Inputs}.

5. On the right side, activate on the \textit{Signal Output, Digital Output 0}, and \textit{Feedback} switches.
   The red colored turns green.
6. In the \textit{Signal} drop-down menu, select \textit{Signal-out} for \textit{Function 0}.
7. Set the \textit{Cycle Time} to \textbf{100 ms}.
8. Click on the white box and set &.

9. Click on \textit{Export} and \textit{Into Symbols File}....
10. Edit the File Name (e.g. Example-x.sym).
11. Select the Direction Reverse option.

12. Confirm with Export to create the Symbols file.
13. Click on ➤ Send Configuration.
14. Select the module and click Send.
Evaluation with the PCAN-Explorer 6:
1. Open the PCAN-Explorer 6 software.
2. Create an empty project and establish a connection to our CAN bus.
3. In the Project Manager, click on Add and select the Symbols file you created a few moments ago.
4. Right mouse-click on that Symbols file and select Apply.
   You should receive CAN messages with the CAN ID 100h.

Do the following on the PCAN-MicroMod FD Evaluation Board:
1. Activate the Digital Input 1 and 2 switches (e.g. with a small screwdriver).
   The Di0 and Di1 LEDs light up. The Do0 LED should flash.
   In the Receive / Transmit window of the PCAN-Explorer 6, the Signal-out value in the Data column toggles between 0 and 1.
2. Deactivate the Digital Input 1 switch.
   The Di0 LED no longer lights up and the Do0 LED should not flash anymore.
   By using the & Logic Gate Function, both Digital Inputs on the Evaluation Board must be activated. By inverting the feedback value the state changes to True and False and triggers the blinking of the Do0 LED.
2.5 Examples 8 to 13: Digital Functions

2.5.1 First Steps for Examples 8 to 10

1. Open the PCAN-MicroMod FD Configuration software.
2. Click on "New Configuration".
3. Select the following options:
   - PCAN-MicroMod FD Evaluation Board
   - Protocol: CAN FD
   - Bit Rate Preset: SAE J2284-4 (500k/2M)
   - Module ID: make sure that this number is equal to the selected Module ID of the used PCAN-MicroMod FD Evaluation Board.

4. Confirm the settings with OK.
5. Add 3 new signals by clicking on "Add new Signal" in the Signals sidebar.
6. Rename the signals to **Signal-in0**, **Signal-in1**, and **Signal-out**.

7. Open the ![Symbols](symbols_icon.png) service.
8. Right mouse-click on *Receive Symbols* and select ![Add Symbol](add_symbol_icon.png).
9. Rename the *Receive Symbols* to **receive0** and **receive1**.
10. Edit the CAN IDs to **100h** and **110h**.
11. Right mouse-click on the *Transmit Symbols* symbol and select ![Add Symbol](add_symbol_icon.png).
12. Rename the transmit symbol to **transmit0**.
13. Edit the CAN ID to **500h** and the *Send Period* to **100 ms**.
14. Perform a right mouse-click on the *transmit0* symbol and select ![Add Variable](add_variable_icon.png).
   The *Signals* dialog box opens.
15. Select the *Signal-out* signal and confirm with **OK**.
16. Add **Signal-in0** to **receive0** and **Signal-in1** to **receive1**.
17. Click on the **Signal-in0** variable and edit the *Length* to **16 bits**
18. Repeat the previous step with **Signal-in1** and **Signal-out**.

19. Click on the ![Connect](connect_icon.png) toolbar item and select your available PCAN hardware (e.g. PCAN-USB FD).
   Consider the settings in step 3.
Now continue with the corresponding examples (8 to 10):

- Example 8: Function (AND)
- Example 9: Function (OR)
- Example 10: Function (RS Flip-Flop)
2.5.2 Example 8: Function (AND)

1. Proceed the steps in chapter First Steps for Examples 8 to 10
2. Open the Functions service.
3. Select Function 0 in the left column.
4. Select AND in the Type drop-down menu and set a Cycle Time of 100 ms.
5. Right mouse click on Input 1 and click on the Select Signal... in the context menu entry.
6. Select the Signal-in0 signal.
7. Repeat the previous two steps with Input 2 and Signal-in1.
8. Edit the Threshold 1 list entry to 20, the Threshold 2 to 40.
9. Right mouse click on Output 1 to open the context menu.
10. Select the Signal-out signal.

11. Click on Export and Into Symbols File....
12. Edit the File Name (e.g. Example-x.sym).
13. Select the *Direction Reverse* option.

14. Confirm with *Export* to create the Symbols file.

15. Click on ▶️ *Send Configuration*.

16. Select the module and click *Send*. 
**Evaluation with the PCAN-Explorer 6:**

1. Open the PCAN-Explorer 6 software.
2. Create an empty project and establish a connection to our CAN bus.
3. In the *Project Manager*, click on *Add* and select the Symbols file you created a few moments ago.
4. Right mouse-click on that Symbols file and select *Apply*. You should receive CAN messages with the *CAN ID 500h*.
5. In the *Receive / Transmit* window, send CAN messages with the CAN IDs 100h and 101h. For example:
   - 100h: 15
     Signal-out value remains 0.
   - 101h: 45
     Signal-out value remains 0.
   - 100h: 25
     Signal-out value changes to 1.
6. The *Data of Signal-out* should be only 1 when the value of the CAN message 100h is greater than *Threshold 1 (20)* and the CAN message 101h is greater than *Threshold 2 (40)*.
   Otherwise, *Signal-out* value in the *Data* column is set to 0.
2.5.3 Example 9: Function (OR)

1. Proceed the steps in chapter First Steps for Examples 8 to 10
2. Open the Functions service.
3. Select Function 0 in the left column.
4. Select OR in the Type drop-down menu and set a Cycle Time of **100 ms**.
5. Right mouse click on Input 1 and click on the Select Signal... in the context menu entry.
6. Select the Signal-in0 signal.
7. Repeat the previous two steps with Input 2 and Signal-in1.
8. Edit the Threshold 1 list entry to **20**, the Threshold 2 to **40**.
9. Right mouse click on Output 1 to open the context menu.
10. Select the Signal-out signal.

11. Click on Export and Into Symbols File....
12. Edit the File Name (e.g. Example-x.sym).
13. Select the *Direction Reverse* option.

14. Confirm with *Export* to create the Symbols file.

15. Click on ➤ *Send Configuration*.

16. Select the module and click *Send*.
**Evaluation with the PCAN-Explorer 6:**

1. Open the PCAN-Explorer 6 software.
2. Create an empty project and establish a connection to our CAN bus.
3. In the *Project Manager*, click on *Add* and select the Symbols file you created a few moments ago.
4. Right mouse-click on that Symbols file and select *Apply*.
   You should receive CAN messages with the *CAN ID 500h*.
5. In the *Receive / Transmit* window, define CAN messages 100h and 101h. For example:
   - **100h:** 15
     Signal-out value remains 0.
   - **101h:** 45
     Signal-out value changes to 1.
6. The *Data of Signal-out* should be 1 when the value of the CAN message 100h is greater than *Threshold 1 (20)* or the CAN message 101h is greater than *Threshold 2 (40)*.
   Otherwise, *Signal-out* value in the *Data* column is set to 0.
2.5.4 Example 10: Function (RS Flip-Flop)

1. Proceed the steps in chapter First Steps for Examples 8 to 10
2. Open the **Functions** service.
3. Select **Function 0** in the left column.
4. Select **RS Flip-Flop** in the **Type** drop-down menu and set a **Cycle Time** of **100 ms**.
5. Right mouse click on **Input 1** and click on the Select **Select Signal...** in the context menu entry.
6. Select the **Signal-in0** signal.
7. Repeat the previous two steps with **Input 2** and **Signal-in1**.
8. Right mouse click on **Output 1** to open the context menu.
9. Select the **Signal-out** signal.

10. Click on [Export] and **Into Symbols File....**
11. Edit the **File Name** (e.g. Example-x.sym).
12. Select the *Direction Reverse* option.

13. Confirm with *Export* to create the Symbols file.

14. Click on *Send Configuration*.

15. Select the module and click *Send*. 
Evaluation with the PCAN-Explorer 6:

1. Open the PCAN-Explorer 6 software.
2. Create an empty project and establish a connection to our CAN bus.
3. In the Project Manager, click on Add and select the Symbols file you created a few moments ago.
4. Right mouse-click on that Symbols file and select Apply. You should receive CAN messages with the CAN ID 500h.
5. In the Receive / Transmit window, define CAN messages 100h and 101h. For example:
   - 100h: 0
   - 100h: 10
   - 101h: 0
   - 101h: 10
6. Send this messages in the following order:
   (1) 100h (10) and 101h (0)
   (2) 100h (0) and 101h (10)
7. The received CAN message 500h should be 0 by default, 1 after the 1st step, and 0 after the 2nd step.
2.5.5 First Steps for Examples 11 to 13

1. Open the PCAN-MicroMod FD Configuration software.
2. Click on **New Configuration**.
3. Select the following options:
   - PCAN-MicroMod FD Evaluation Board
   - Protocol: CAN FD
   - Bit Rate Preset: SAE J2284-4 (500k/2M)
   - Module ID: make sure that this number is equal to the selected Module ID of the used PCAN-MicroMod FD Evaluation Board.

   ![Screenshot of configuration software]

4. Confirm the settings with **OK**.
5. Click on the **Connect** toolbar button and select your available PCAN hardware (e.g. PCAN-USB FD).
6. Consider the settings in step 3.
7. Add 2 new signals by clicking on **Add new Signal** in the **Signals** sidebar.
8. Rename the signals to **Signal-in** and **Signalout**.

9. Open the **Symbols** service.
10. Right mouse-click on **Receive Symbols** and select **Add Symbol**.
11. Rename the **Receive Symbol** to **receive0**.
12. Edit the CAN IDs to **100h**.
13. Right mouse-click on the **Transmit Symbols** symbol and select **Add Symbol**.
14. Rename the transmit symbol to **transmit0**.
15. Edit the CAN ID to **500h** and the **Send Period** to **100 ms**.
16. Perform a right mouse-click on the **transmit0** symbol and select **Add Variable**.

   The **Signals** dialog box opens.
17. Select the **Signal-out** signal and confirm with **OK**.
18. Add **Signal-in** to the **receive0** symbol.
19. Click on the **Signal-out** variable and edit the **Length** to **16 bits**
20. Repeat the previous step with **Signal-in**.
Now continue with the corresponding examples (11 to 13):

- *Example 11: Function (Monoflop)*
- *Example 12: Function (Hysteresis)*
- *Example 13: Function (CAN Trigger)*
2.5.6 Example 11: Function (Monoflop)

1. Proceed the steps in chapter First Steps for Examples 11 to 13
2. Open the Functions service.
3. Select Function 0 in the left column.
4. Select Monoflop in the Type drop-down menu and set a Cycle Time of 100 ms.
5. Right mouse click on Input to open the context menu.
7. Edit the Parameters:
   - Time: 3000
   - Threshold: 350
   - Mode: 0
   - Active Output Value: 400
   - Inactive Output Value: 300
8. Right mouse click on Output to open the context menu.
10. Click on Export and Into Symbols File....
11. Edit the File Name (e.g. Example-x.sym).
12. Select the *Direction Reverse* option.

13. Confirm with *Export* to create the Symbols file.

14. Click on > *Send Configuration*.

15. Select the module and click *Send*. 
**Evaluation with the PCAN-Explorer 6:**

1. Open the PCAN-Explorer 6 software.
2. Create an empty project and establish a connection to our CAN bus.
3. In the *Project Manager*, click on *Add* and select the Symbols file you created a few moments ago.
4. Right mouse-click on that Symbols file and select *Apply*.
5. In the *Receive / Transmit* window, define transmit CAN messages with the CAN IDs 100h with different values:
   - 100h: 0
   - 100h: 350
6. Send a CAN message with a minimum value of 350 (Threshold). *Signal-out* should change to 400 immediately. If the value is less than 350, the value of *Signal-out* remains at 300.
7. Send a CAN message with value 0.
8. *Signal-out* should change to 300 after 3 seconds. This is mode 0 (positive level trigger).
2.5.7 Example 12: Function (Hysteresis)

1. Proceed the steps in chapter First Steps for Examples 11 to 13
2. Click on the Signal-in in the Signals sidebar.
3. In the Properties sidebar below, set a Start-up value of 40.
4. Open the Functions service.
5. Select Function 0 in the left column.
6. Select Hysteresis in the Type drop-down menu and set a Cycle Time of 100 ms.
7. Right mouse click on Input to open the context menu.
   Select the Signal-in signal.
8. Edit the Parameters:
   - Upper Border: 50
   - Lower Border: 30
   - High Output: 70
   - Low Output: 10
   - Initial Output: 50
9. Right mouse click on Output to open the context menu.
10. Select the Signal-out signal.
11. Click on Export and Into Symbols File....
12. Edit the File Name (e.g. Example-x.sym).
13. Select the Direction Reverse option.

15. Click on Send Configuration.
16. Select the module and click Send.
Evaluation with the PCAN-Explorer 6:

1. Open the PCAN-Explorer 6 software.
2. Create an empty project and establish a connection to our CAN bus.
3. In the Project Manager, click on Add and select the Symbols file you created a few moments ago.
4. Right mouse-click on that Symbols file and select Apply. You should receive the CAN message with the CAN ID 500h.
5. In the Receive / Transmit window, define transmit CAN messages with the CAN IDs 100h with different values:
   - 100h: 15
   - 100h: 25
   - 100h: 35
   - 100h: 55
   - 100h: 65
6. The value of the received CAN message (500h) should be 5 as this is the value for the Initial Output. Start-up value (40) is between Lower (30) and Upper Border (50).
7. Send a value smaller than 30 (Lower Border).
   The value of CAN ID 500h should be 10 (Low Output).
8. Send a value bigger than 50 (Upper Border).
   The value of CAN ID 500h should be 70 (High Output).
2.5.8  Example 13: Function (CAN Trigger)

1. Proceed the steps in chapter First Steps for Examples 11 to 13
2. Open the Symbols service.
3. Select the transmit symbol 500h and edit the Send Period to **1000 ms**.
4. Open the Functions service.
5. Select Function 0 in the left column.
6. Select CAN Trigger in the Type drop-down menu and set a Cycle Time of 100 ms.
7. Right mouse click on Input 1 to open the context menu.
8. Select the Signal-in signal.
9. Edit the following Parameters:
   - **CAN ID**: 500h
   - **Type**: 0
   - **Mode**: 5
   - **Threshold**: 20
   - **Epsilon**: 0
10. Right mouse click on Output 1 to open the context menu.
11. Select the Signal-out signal.
12. Click on Export and Into Symbols File....
13. Edit the File Name (e.g. Example-x.sym).
14. Select the Direction Reverse option.

![Export into Symbols file dialog box]

15. Confirm with Export to create the Symbols file.
16. Click on Send Configuration.
17. Select the module and click Send.

![Active Modules window]

![PCAN-MicroMod FD Configuration window]
Evaluation with the PCAN-Explorer 6:

1. Open the PCAN-Explorer 6 software.
2. Create an empty project and establish a connection to our CAN bus.
3. In the Project Manager, click on Add and select the Symbols file you created a few moments ago.
4. Right mouse-click on that Symbols file and select Apply.
   The CAN message 500h should be received each 1000 ms.
5. In the Receive / Transmit window, define transmit CAN messages with the CAN IDs 100h with different values:
   - 100h: 0
   - 100h: 30
6. Send the CAN message 100h with the Signal-in value of 30.
   The CAN message 500h will be received each 100 ms because the value 30 is bigger than the Threshold 20.
   Mode 5 means that it becomes true when Input > Threshold.