# PCAN-Router FD

## User Manual

# Relevant Products

| Product name | Model | Part number |
| --- | --- | --- |
| PCAN-Router FD | 2 D-Sub connectors | IPEH-002214 from SN 10000 |
| PCAN-Router FD | Screw terminal block (Phoenix) | IPEH-002215 from SN 1000 |

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# Contents

# 1  Introduction

The PCAN-Router FD allows the connection to two CAN FD or CAN buses. Based on a ARM Cortex M4F microcontroller, the module's behavior and the data routing between both CAN FD channels is freely programmable. In particular, the module allows the conversion from CAN to CAN FD or vice versa. This makes it easy to accomplish the integration of CAN FD applications into existing CAN 2.0 networks.

Using the programming library and the GNU compiler for C and C++, a firmware is created and then transferred to the module via CAN. On delivery, the PCAN-Router FD is provided with a standard firmware. The corresponding source code is included as example in the scope of supply.

The module is installed in an aluminum profile casing, and is shipped in versions with two D-Sub connectors or a screw terminal block.

# 1.1 Properties at a Glance

- NXP LPC4078 microcontroller (ARM Cortex M4 with FPU, 120 MHz)
- On-chip 4 kByte EEPROM
- 8 MByte SPI Flash
- Two High-speed CAN channels (ISO 11898-2)
    - Comply with CAN specifications 2.0 A/B and FD
    - CAN FD support for ISO and Non-ISO standards
    - CAN FD bit rates for the data field (64 bytes max.) from 40 kbit/s up to 12 Mbit/s
    - CAN bit rates from 40 kbit/s up to 1 Mbit/s
    - NXP TJA1043T CAN transceiver with wake-up
- CAN termination can be activated through solder jumpers, separately for each CAN channel
- Connections via two 9-pin D-Sub connectors or one 10-pole screw terminal block (Phoenix)
- RS-232 connector for serial data transfer
- I/O connection:
    - One digital input (Low-active)
    - One digital output (Low-side switch, max. 600 mA)
- 2 additional digital inputs alternatively to RS-232 (Low-active)
- Status signaling with two 2-color LEDs
- Aluminum casing, optional with DIN rail fixing option available
- Voltage supply from 8 to 30 V
- Extended operating temperature range from -40 to +85 °C (-40 to +185 °F)
- New firmware can be loaded via CAN interface

## 1.2   Scope of Supply

- PCAN-Router FD in aluminum casing
- IPEH-002215: Mating connector Phoenix Contact MC 1.5/10-ST-3.81

**Download**

- Windows development package with:
  - GCC ARM Embedded
  - Flash program
  - Programming examples
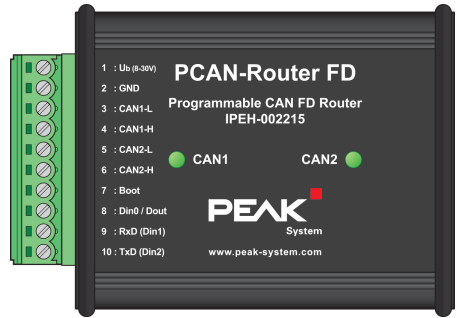- Manual in PDF format

## 1.3   Prerequisites for Operation

- Power supply in the range of 8 to 30 V DC
- For uploading a new firmware via CAN:
  - CAN interface of the PCAN series for the computer (e.g. PCAN-USB)
  - Operating system Windows 11 (x64/ARM64), 10 (x86/x64)

# 2 Connectors and Control Elements
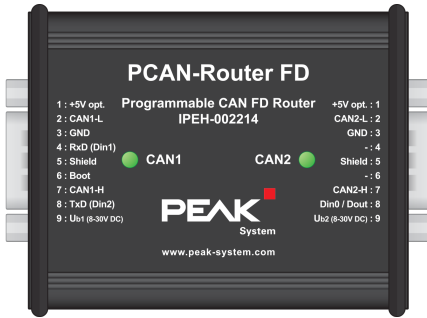


PCAN-Router-FD with two 9-pin D-Sub connectors (IPEH-002214)

PCAN-Router FD with 10-pole terminal strip (Phoenix) (IPEH-002215)

The following connections can be used depending on the version:

- Two 9-pin D-Sub connectors (m) (IPEH-002214)
- 10-pole screw terminal block (IPEH-002215)
- I/O pin: digital output, digital input
- RS-232 interface for serial data transmission;
  alternatively two digital inputs via hardware configuration
  (see section 3.3 *Two Alternative Digital Inputs*)
- Boot input for activation of the CAN bootloader for firmware upload
  (see chapter 6 *Firmware Upload*)

## 2.1 D-Sub Connectors

The two D-Sub connectors (IPEH-002214) are used for the CAN FD channels CAN1 and CAN2. The CAN lines (CAN-High, CAN-Low) are laid out corresponding to the CiA® 106 specification.

The power supply of the PCAN-Router FD can be done via both D-Sub connectors. The supply connections $U_{b1}$ and $U_{b2}$ are connected internally in a non-reactive configuration. This means that also different power sources can be connected.

With the D-Sub connector CAN1, the bootloader for the firmware upload can be additionally activated via pin 6. The channel CAN1 contains additionally, alternatively to the RS-232 interface, two digital inputs named Din1 and Din2, which can be evaluated by the microcontroller. For more information, see section 3.3 *Two Alternative Digital Inputs*.
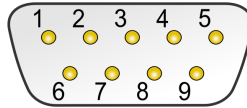


Pin layout D-Sub connector

## Pin assignment CAN1 and CAN2:

| Pin | Function at CAN channel 1 | Function at CAN channel 2 |
|-----|---------------------------|---------------------------|
| 1 | +5 V supply for external devices (optional) | +5 V supply for external devices (optional) |
| 2 | CAN1-Low | CAN2-Low |
| 3 | GND1 | GND2 |
| 4 | RS-232 RxD (alternative digital input Din1) | Not used |
| 5 | Shield | Shield |
| 6 | Boot (High level) Activation CAN bootloader | Not used |
| 7 | CAN1-High | CAN2-High |
| 8 | RS-232 TxD (alternative digital input Din2) | Digital input Din0, digital output Dout (600 mA) |
| 9 | Power supply +$U_{b1}$ (8 - 30 V DC) | Power supply +$U_{b2}$ (8 - 30 V DC) |

## 2.2 Screw Terminal Block

The PCAN-Router FD (IPEH-002215) has a 10-pin screw terminal block for connecting the following components:

- Power supply
- CAN channels 1 and 2
- RS-232
- CAN bootloader activation (via pin 7)
- Alternatively to the RS-232 interface, two digital inputs named Din1 and Din2 can be activated, which can be evaluated by the microcontroller. For more information, see section 3.3 *Two Alternative Digital Inputs*.



Screw terminal block (Phoenix)
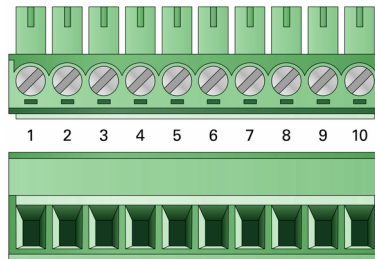Mating connector Phoenix Contact MC 1.5/10-ST-3.81

**Terminal assignment screw terminal block:**

| Terminal | Identifier | Function |
|---|---|---|
| 1 | $U_b$ | Power supply 8 to 30 V DC |
| 2 | GND | Ground |
| 3 | CAN1-Low | CAN channel 1 Low |
| 4 | CAN1-High | CAN channel 1 High |
| 5 | CAN2-Low | CAN channel 2 Low |
| 6 | CAN2-High | CAN channel 2 High |
| 7 | Boot CAN | Activation CAN bootloader (High level) |

| Terminal | Identifier | Function |
|---|---|---|
| 8 | Din0 / Dout | Digital input Din0<br>Digital output Dout (600 mA) |
| 9 | RS-232 RxD (Din1) | RS-232 interface (alternative digital input Din1) |
| 10 | RS-232 TxD (Din2) | RS-232 interface (alternative digital input Din2) |

# 3 Hardware Configuration

For special applications, several settings can be done on the circuit board of the PCAN-Router FD by using solder bridges.

■ Coding solder bridges for polling by the firmware
(see section 3.1 *Coding Solder Bridges*)

■ D-Sub version only: Supply of external devices with 5 Volts via the D-Sub connector
(see section 3.2 *Power Supply of External Devices*)

■ Use of two additional digital inputs (Din1, Din2) instead of the serial RS-232 interface
(see section 3.3 *Two Alternative Digital Inputs*)

■ Termination of the CAN buses with 120 Ω
(see section 3.4 *Internal Termination*)

■ Using the CAN channels as a wake-up signal
(see section 3.5 *Wake-Up via CAN*)

## 3.1 Coding Solder Bridges

The board has four coding solder bridges to assign a permanent state to the corresponding input bits of the microcontroller. The four positions for coding solder bridges (ID 0 - 3) are each assigned to one port of the microcontroller. A bit is set (1) if the corresponding solder field is open.

The status of the ports is relevant in the following cases:

■ The loaded firmware is programmed so that it reads the status at the corresponding ports of the microcontroller. For example, the activation of certain functions of the firmware or the coding of an ID is conceivable here.

■ For a firmware upload via CAN, the PCAN-Router FD is identified by a 4-bit ID which is determined by solder jumpers. A bit is set (1) when the corresponding solder field is open (default setting: ID 15, all solder fields open).

| Solder Field | ID0 | ID1 | ID2 | ID3 |
|---|---|---|---|---|
| Binary Digit | 0001 | 0010 | 0100 | 1000 |
| Decimal Equivalent 1 | 1 | 2 | 4 | 8 |

**Activate coding solder bridges:**

> ⚠ **Risk of short circuit!** Soldering on the PCAN-Router FD may only be performed by qualified electrical engineering personnel.

> 🖐 **Attention!** Electrostatic discharge (ESD) can damage or destroy components on the card. Take precautions to avoid ESD.

1. Disconnect the PCAN-Router FD from the power supply.
2. Unscrew the housing on both sides.
   For D-Sub version: Remove the screws next to one of the two D-Sub connectors.
3. Pull out the board.
4. Solder the solder bridge(s) on the board according to the desired setting.
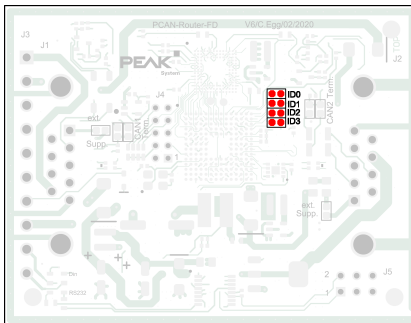


Position of the coding solder fields

| Position | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| Port µC | P0.4 | P0.5 | P0.6 | P0.7 |

| Solder field status | Port status |
|---|---|
| ▭ | High |
| 🔴 | Low |

5. Carefully put the board back into the housing.

6. For D-Sub version: Reinsert the two screws at the D-Sub connector.

7. Screw the two sides of the housing back together.

## 3.2 Power Supply of External Devices

External devices with low power consumption (e.g. bus converters) can be supplied via the CAN connection CAN1 and CAN2. With a solder bridge for each CAN channel on the board of the PCAN-Router FD a voltage of 5 Volt can be applied to pin 1 of the D-Sub connector. The current consumption may not exceed 100 mA per CAN connection.

**Activate 5 V supply:**

> ⚠️ **Risk of short circuit!** Soldering on the PCAN-Router FD may only be performed by qualified electrical engineering personnel.

> 🔷 **Attention!** Electrostatic discharge (ESD) can damage or destroy components on the card. Take precautions to avoid ESD.

1. Disconnect the PCAN-Router FD from the power supply.
2. Unscrew the housing on both sides.
3. Remove the screws next to one of the two D-Sub connectors.
4. Pull out the board.

5. Solder the solder bridge(s) on the board according to the desired setting.
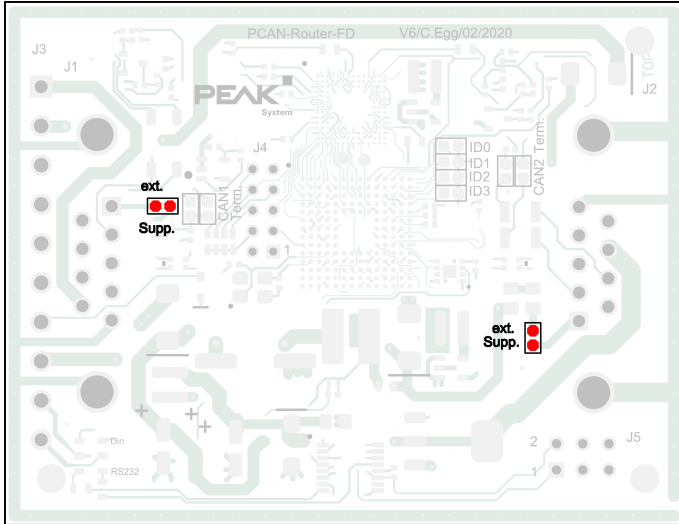


Position of the solder fields for the supply of external devices
(for D-Sub connector CAN1 on the left, for CAN2 on the right)

| D-Sub connector | 5 Volt supply | |
| --- | --- | --- |
| | None (default) | Pin 1 |
| CAN1 (left) | | |
| CAN2 (right) | | |

6. Carefully put the board back into the housing.
7. Reinsert the two screws at the D-Sub connector.
8. Screw the two sides of the housing back together.

## 3.3   Two Alternative Digital Inputs

Instead of the default serial RS-232 interface for the serial data transmission, two alternative digital inputs (Din1, Din2) can be assigned to the corresponding pins or screw terminals. The inputs can be activated either by changing two 0-Ohm resistors or via solder bridges.

**Switch to alternative digital inputs:**

> ⚠️  **Risk of short circuit!** Soldering on the PCAN-Router FD may only be performed by qualified electrical engineering personnel.

> 🔷  **Attention!** Electrostatic discharge (ESD) can damage or destroy components on the card. Take precautions to avoid ESD.

1. Disconnect the PCAN-Router FD from the power supply.
2. Unscrew the housing on both sides.
   For D-Sub version: Remove the screws next to one of the two D-Sub connectors.
3. Pull out the board.

4. Move the two 0-Ohm resistors or solder the solder bridge(s) on the board according to the desired setting.
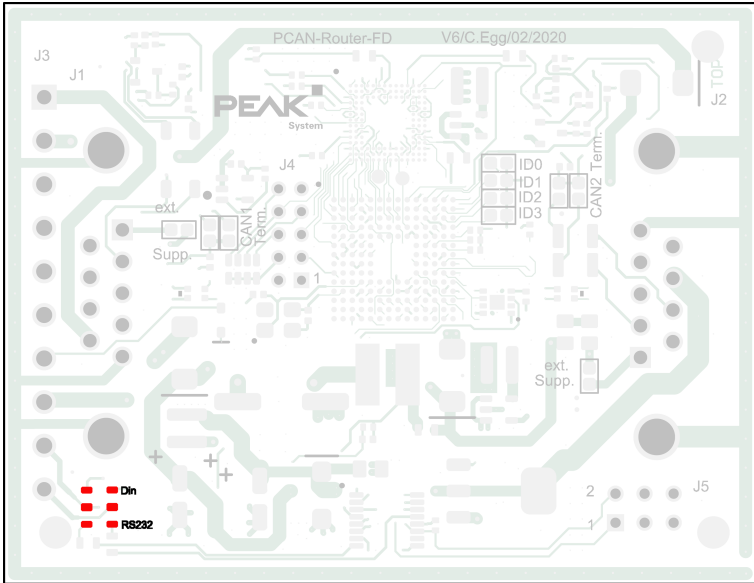


Position of the solder bridges for switching between RS-232 and Din
(pre-equipped with 0-Ohm resistors)

| Function | Positions of the solder bridges (or 0-Ohm resistors) |
|---|:---:|
| RS-232 RxD, RS-232 TxD (Default) | |
| Din1, Din2 | |

5. Carefully put the board back into the housing.
6. For D-Sub version: Reinsert the two screws at the D-Sub connector.
7. Screw the two sides of the housing back together.

# 3.4   Internal Termination

If the PCAN-Router FD is connected to one end of a CAN bus and if there's no termination of the CAN bus yet, an internal termination with 120 Ω between the lines CAN-High and CAN-Low can be activated. Termination is possible separately for both CAN channels.

> **Tip:** We recommend adding termination at the CAN cabling, for example with termination adapters (e.g. PCAN-Term). Thus, CAN nodes can be flexibly connected to the bus.

**Activate the internal termination:**

> ⚠ **Risk of short circuit!** Soldering on the PCAN-Router FD may only be performed by qualified electrical engineering personnel.

> **Attention!** Electrostatic discharge (ESD) can damage or destroy components on the card. Take precautions to avoid ESD.

1.  Disconnect the PCAN-Router FD from the power supply.
2.  Unscrew the housing on both sides.
    For D-Sub version: Remove the screws next to one of the two D-Sub connectors.
3.  Pull out the board.

4. Solder the solder bridge(s) on the board according to the desired setting.
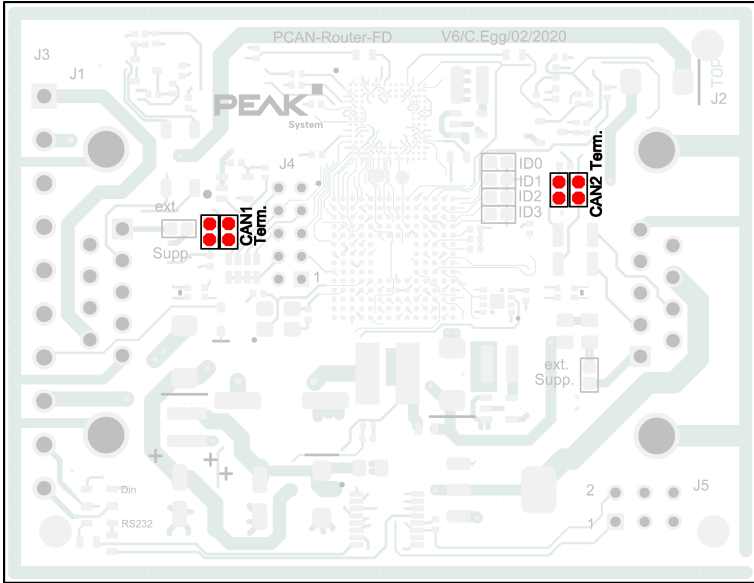


Position of the solder fields for the termination of the CAN bus
(CAN1 on the left, CAN2 on the right)

| CAN channel | Without termination (Default) | With termination |
|---|---|---|
| CAN1 | | |
| CAN2 | | |

5. Carefully put the board back into the housing.
6. For D-Sub version: Reinsert the two screws at the D-Sub connector.
7. Screw the two sides of the housing back together.

## 3.5 Wake-Up via CAN

Wake-up via CAN is deactivated on delivery. The functionality can be activated using the solder jumpers JP13 for CAN channel 1 and JP14 for CAN channel 2.

**Activate Wake-up functionality:**

> ⚠️ **Risk of short circuit!** Soldering on the PCAN-Router FD may only be performed by qualified electrical engineering personnel.

> 🔷 **Attention!** Electrostatic discharge (ESD) can damage or destroy components on the card. Take precautions to avoid ESD.

1. Disconnect the PCAN-Router FD from the power supply.
2. Unscrew the housing on both sides.
   For D-Sub version: Remove the screws next to one of the two D-Sub connectors.
3. Pull out the board.

4. Solder the solder bridge(s) on the bottom side of the board according to the desired setting.
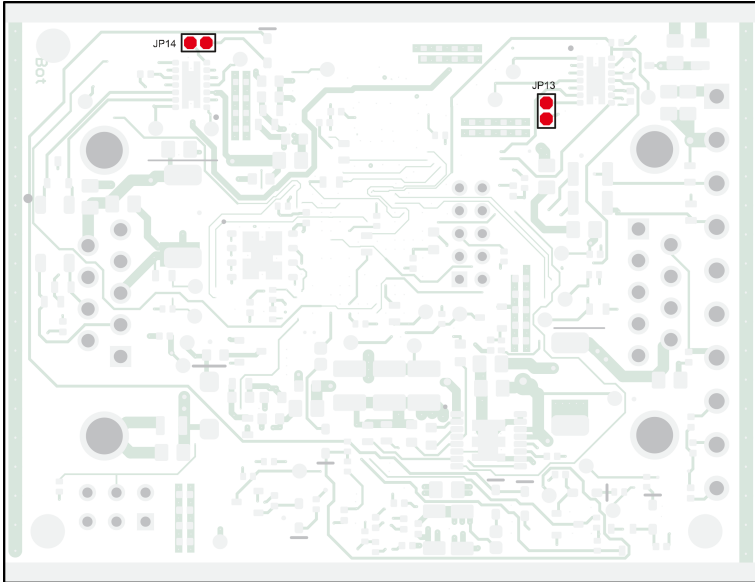


Solder jumpers JP13 and JP14 to activate
the Wake-up functionality

| CAN channel | Wake-up functionality | |
| --- | --- | --- |
| | inactive (default) | active |
| CAN1 (JP13) | | ⬭ |
| CAN2 (JP14) | | ⬬ |

5. Carefully put the board back into the housing.
6. For D-Sub version: Reinsert the two screws at the D-Sub connector.
7. Screw the two sides of the housing back together.

# 4  Operation

The PCAN-Router FD is activated by applying the supply voltage to the respective connectors. More information about the connections can be found in chapter 2 *Connectors and Control Elements*. The firmware in the flash memory is subsequently run.

On delivery, the PCAN-Router FD is equipped with a standard firmware which forwards CAN messages 1:1 between both CAN channels (CAN FD ISO, 500 kbit/s nominal, 4 Mbit/s data). An incoming CAN message causes a change between green and orange of the LED status indication for the respective CAN channel.

The source code for the standard firmware `01_ROUTING` and further examples can be downloaded via the following link:

www.peak-system.com/quick/DLP-DevPack

More about firmware can be found in chapter 5 *Creating Own Firmware*.

## 4.1  Status LEDs

Standard firmware is pre-installed on delivery. Therefore, the LEDs CAN1 and CAN2 light up between green and orange on incoming CAN messages.

Additionally, they light up orange when the bootloader is activated. Additional LED functions can be programmed with your own firmware. More details can be found in the programming examples supplied.

## 4.2   Wake-up Function

Depending on the programming, the PCAN-Router FD can be set to sleep mode via a CAN message or a timeout. In sleep mode, the power supply for most of the electronics in the PCAN-Router FD is switched off and the current consumption is reduced to 50 µA.

The sleep mode can be ended with a Wake-up signal. Depending on the hardware configuration (see section 3.5 *Wake-Up via CAN*), this can be done for the PCAN-Router FD by receiving any CAN message via CAN channel 1 or CAN channel 2. The following Wake-up process takes about 17 ms.

> **ℹ** **Note:** Sleep mode and Wake-up are not implemented in the standard firmware. The functionality is demonstrated with the programming example `12_POWER_STATES`.

# 5 Creating Own Firmware

With the help of the PEAK-DevPack development package, you can program your own application-specific firmware for PEAK-System programmable hardware products. For each supported product, examples are included.

On delivery the PCAN-Router FD is supplied with the standard firmware `01_ROUTING` which forwards CAN messages 1:1 between both CAN channels.

**System requirements:**

- Computer with operating system Windows 11 (x64/ARM64), 10 (x86/x64)
- CAN interface of the PCAN series to upload the firmware to your hardware via CAN

**Download development package:**

www.peak-system.com/quick/DLP-DevPack

**Content of the package:**

- `Build Tools Win32\`

  Tools for automating the build process for Windows 32-bit
- `Build Tools Win64\`

  Tools for automating the build process for Windows 64-bit
- `Compiler\`

  Compilers for the supported programmable products
- `Debug\`
  - OpenOCD and configuration files for hardware which supports debugging
  - VBScript `SetDebug_for_VSCode.vbs` to modify the example directories for the Visual Studio Code IDE with Cortex-debug
  - Detailed information about debugging in the enclosed documentation of the PEAK-DevPack Debug Adapter

- `Hardware\`

  Sub directories with firmware examples for supported hardware. Use the examples for starting your own firmware development.

- `PEAK-Flash\`

  Windows software for uploading the firmware to your hardware via CAN

- `LiesMich.txt` and `ReadMe.txt`

  Short documentation how to work with the development package in German and English

- `SetPath_for_VSCode.vbs`

  VBScript to modify the example directories for the Visual Studio Code IDE

**Creating your own firmware:**

1. Create a folder on your computer. We recommend using a local drive.

2. Unzip the development package `PEAK-DevPack.zip` completely into the folder. No installation is required.

3. Run the script `SetPath_for_VSCode.vbs`. This script will modify the example directories for the Visual Studio Code IDE. Afterwards, each example directory has a folder called `.vscode` containing the needed files with your local path information.

4. Launch Visual Studio Code. The IDE is available free of charge from Microsoft: https://code.visualstudio.com.

5. Select the folder of your project and open it. For example:
   `d:\PEAK-DevPack\Hardware\PCAN-Router_FD\Examples\`
   `01_ROUTING`

   You can edit the C code and use the menu *Terminal > Run Task* to call *make clean*, *make all,* or to compile a single file.

6. Create your firmware with *make all*. The firmware is the `*.bin` in the `out` subdirectory of your project folder.

7. Prepare your hardware for firmware upload like described in section 6.2 *Preparing Hardware*.

8.  Use the PEAK-Flash tool to upload your firmware to the PCAN-Router FD via CAN. The tool is either started via the menu *Terminal > Run Task > Flash Device* or from the subdirectory of the development package. Chapter 6.2 *Preparing Hardware* describes the process. A CAN interface of the PCAN series is required.

## 5.1   Library

The development of applications for the PCAN-Router FD is supported by the library `libPCAN-Router_FD_*.a` (* stands for version number), a binary file. You can access all resources of the PCAN-Router FD by means of this library. The library is documented in the header files (`*.h`) which are located in the `inc` subdirectory of each example directory.

# 6 Firmware Upload

The microcontroller in the PCAN-Router FD is equipped with new firmware via CAN. The firmware is uploaded via a CAN bus with the Windows software PEAK-Flash.

## 6.1 System Requirements

- CAN interface of the PCAN series for the computer, for example PCAN-USB
- CAN cabling between the CAN interface and the PCAN-Router FD with correct termination at both ends of the CAN bus with 120 Ohm each.
- Operating system Windows 11 (x64/ARM64), 10 (x86/x64)
- If you want to update several PCAN-Router FD on the same CAN bus with new firmware, you must assign an ID to each device. See section 3.1 *Coding Solder Bridges*.

# 6.2  Preparing Hardware

For an upload of new firmware via CAN, the CAN bootloader must be activated in the PCAN-Router FD. For the D-Sub version this can only be done via CAN channel 1. Firmware transfer, on the other hand, can also be done via CAN channel 2.

**Activating CAN Bootloader:**

> ⚠ **Attention!** Electrostatic discharge (ESD) can damage or destroy components on the card. Take precautions to avoid ESD.

1. Disconnect the PCAN-Router FD from the power supply.

2. Establish a connection between **Boot** and the power supply $U_{b1}$ **or** $U_b$.

    When using the D-Sub version: For activating the bootloader, the PCAN-Router FD has to be powered via CAN channel 1.
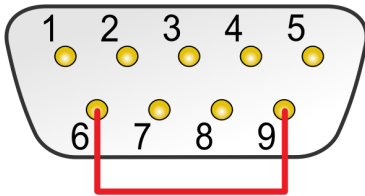


Connection at D-Sub connector CAN1 between the pins 6 and 9
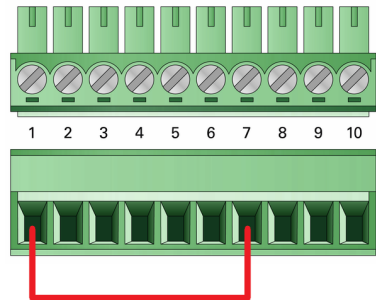
Connection at the screw terminal block between terminals 1 and 7

Because of that, a High level is later applied to the Boot connection.

3. Connect a CAN bus of the PCAN-Router FD with a CAN interface connected to the computer. Pay attention to the proper termination of the CAN cabling (2 x 120 Ohm).

> ⚠️ **Risk of short circuit!** A CAN cable with D-Sub connectors must not have a connection on pin 6, as it can be seen on 1:1 cables, for example. At other CAN nodes (e.g. a CAN interface of the PCAN series) this line may be applied to the mass. Damage or destruction of the electronics is a possible consequence.

4. Reconnect the power supply.

Due to the High level at the **Boot** connection, the PCAN-Router FD starts the CAN bootloader. This can be determined by the status LEDs:

| LED | State | Color |
|------|------------------|--------|
| CAN1 | quickly blinking | orange |
| CAN2 | on | orange |

# 6.3   Firmware Transfer

A new firmware version can be transferred to the PCAN-Router FD. The firmware is uploaded via a CAN bus using the Windows software PEAK-Flash.

**Transfer firmware with PEAK-Flash:**

The software PEAK-Flash is included in the development package, which can be downloaded via the following link: www.peak-system.com/quick/DLP-DevPack

1. Open the zip file and extract it to your local storage medium.
2. Run the `PEAK-Flash.exe`.
   The main window of PEAK-Flash appears.
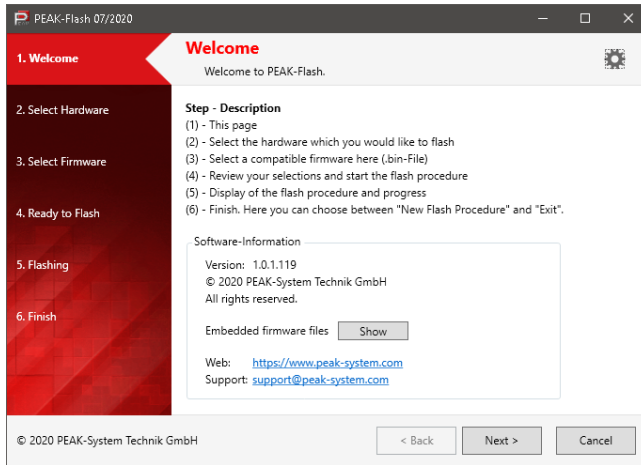
3. Click the button *Next*.

   The *Select Hardware* window appears.
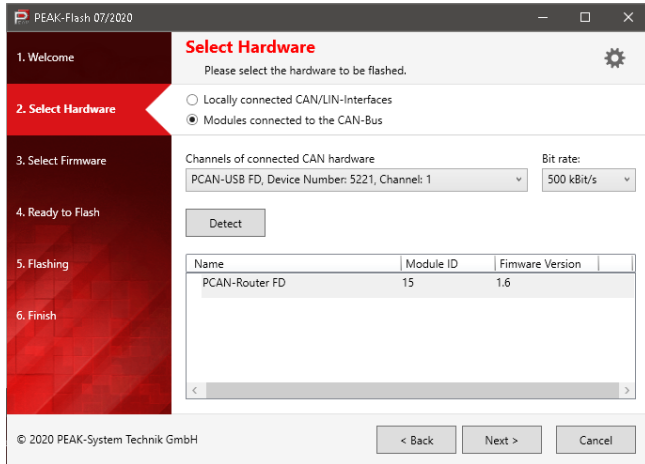
   

4. Click on the *Modules connected to the CAN bus* radio button.

5. In the drop-down menu *Channels of connected CAN hardware*, select a CAN interface connected to the computer.

6. In the drop-down menu *Bit rate*, select the nominal bit rate 500 kbit/s.

7. Click on *Detect*.

   In the list, the PCAN-Router FD appears together with the Module ID and Firmware version. If not, check whether a proper connection to the CAN bus with the appropriate nominal bit rate exists.

8. Click *Next*.
   The *Select Firmware* window appears.
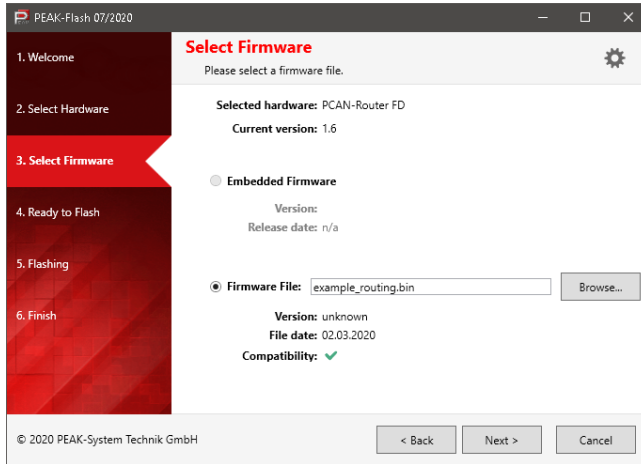


9. Select the *Firmware File* radio button and click *Browse*.

10. Select the corresponding file (`*.bin`).

11. Click *Next*.
    The *Ready to Flash* dialog appears.

12. Click *Start* to transfer the new firmware to the PCAN-Router FD.
    The *Flashing* dialog appears.

13. After the process is complete, click *Next*.

14. You can exit the program.

15. Disconnect the PCAN-Router FD from the power supply.

16. Remove the connection between **Boot** and the power supply **$U_{b1}$ or $U_b$**.

17. Connect the PCAN-Router FD to the power supply.

You can now use the PCAN-Router FD with the new firmware.

# 7 Technical Data

## Connectors IPEH-002214

| | |
|---|---|
| Power | 2 x D-Sub (m), pin 9 ($U_b$) |
| CAN channel 1 and 2 | 2 x D-Sub (m), pins 2 and 7, assignment according to specification CiA® 106 |
| RS-232 | 1 x D-Sub (m), CAN 1, pins 4 and 8 |

## Connectors IPEH-002215

| | |
|---|---|
| Screw terminal block | 10 connection poles, pitch 3.81 mm Phoenix Contact MC 1.5/10-ST-3.81 |
| Power | Pin 1 ($U_b$) |
| CAN channel 1 | Pins 3 and 4 |
| CAN channel 2 | Pins 5 and 6 |
| RS-232 | Pins 9 and 10 |

## Power supply

| | | |
|---|---|---|
| Supply voltage ($U_b$) | 12 V DC, 8 to 30 V DC | |
| Current consumption | Idle: | 75 mA at 12 V |
| | Maximum: | 150 mA at 8 V |
| | | 100 mA at 12 V |
| | | 50 mA at 30 V |
| Power saving modes | Power-down mode with 40 µA | |
| Protection | ±1 kV surge protection -60 V reverse polarity protection ±4 kV ESD protection | |

## CAN (FD)

| | |
|---|---|
| Protocols | CAN FD ISO 11898-1:2015, CAN FD non-ISO, CAN 2.0 A/B |
| Physical transmission | ISO 11898-2, High-speed CAN |

## CAN (FD)

| | | |
|---|---|---|
| Transceiver | NXP TJA1043, wake-up capable | |
| CAN bit rates | Nominal: | 40 kbit/s to 1 Mbit/s |
| CAN FD bit rates | Nominal: | 40 kbit/s to 1 Mbit/s |
| | Data: | 40 kbit/s to 12 Mbit/s[1] |
| Controller | FPGA implementation | |
| Supported clock frequencies | 20 MHz, 24 MHz, 30 MHz, 40 MHz, 60 MHz, 80 MHz | |

| Supported bit timing values | | Nominal | Data |
|---|---|---|---|
| | Prescaler (BRP) | 1 to 1024 | 1 to 1024 |
| | Time Segment 1 (TSEG1) | 1 to 256 | 1 to 32 |
| | Time Segment 2 (TSEG2) | 1 to 128 | 1 to 16 |
| | Synch. Jump Width (SJW) | 1 to 128 | 1 to 16 |

| | |
|---|---|
| Galvanic isolation | None |
| Internal termination | Via solder bridges, disabled at delivery |
| Listen-only mode | Programmable; not activated at delivery |
| Dielectric strength | $V_{ESD}$  ±4 kV |
| | $V_{CAN}$  ±18 V per pin |

[1]    With the specified timing only CAN FD transfer rates up to 5 Mbit/s are guaranteed according to the CAN transceiver datasheet.

## RS-232

| | |
|---|---|
| Connectors | RxD and TxD |
| Bitrate maximum | 230400 Baud |
| Signal level maximum | ±25 V |
| Dielectric strength | ±25 V |
| Galvanic isolation | None |

## Digital inputs

| | |
|---|---|
| Count | 3 (thereof 2 alternatively to RS-232) |
| Connectors | Din0 to Din2 |
| Behavior | Low-active |

## Digital inputs

| | |
|---|---|
| Input voltage | 0 to 35 V |
| Input impedance | 20 kΩ |
| Switching thresholds | Low: < 0.8 V or < 10 kΩ to ground<br>High: > 1.5 V or > 30 kΩ to ground |
| Protection | $V_{ESD}$ 4 kV |
| Galvanic isolation | None |

## Digital outputs

| | |
|---|---|
| Count | 1 |
| Connectors | Dout |
| Type | N-FET Low-Side driver |
| Driver chip | BSP77 |
| Output current nominal | 2.17 A |
| Drop-out voltage maximum | 217 mV @ 2.17 A |
| Maximum output current (current limitation) | 2.17 A minimal<br>2.8 A typically<br>Maximum thermal protected |
| Protection | 4 kV ESD protection<br>10 to 20 A overcurrent protection<br>175 °C overtemperature protection |
| Maximum voltage | 42 V on load |
| Galvanic isolation | None |

## Microcontroller

| | |
|---|---|
| CPU | NXP LPC4078 (based on Arm® Cortex® M4) |
| Clock frequency | 120 MHz |
| RAM | 96 kByte SRAM |
| Memory | 492 kByte MCU Flash<br>4 kByte On-Chip-EEPROM<br>8 MByte SPI Flash |
| Firmware upload | via CAN (PCAN interface required) |

## Measures

| Size | IPEH-002214: | 80 x 58.7 x 27.7 mm (W x H x D) |
|---|---|---|
| | IPEH-002215: | 84.4 x 58.7 x 27.7 mm (W x H x D) |
| | Casing: | 73 x 58.7 x 27.7 mm (W x H x D) |
| | Circuit board: | 51 x 65 mm (W x H x D) |
| Weight | IPEH-002214: | 105 g |
| | IPEH-002215: | 94 g |

## Environment

| Operating temperature | -40 to +85 °C (-40 to +185 °F) |
|---|---|
| Temperature for storage and transport | -40 to +100 °C (-40 to +212 °F) |
| Relative humidity | 15 to 90 %, not condensing |
| Ingress protection (IEC 60529) | IP20 |

## Conformity

| RoHS 2 | EU directive 2011/65/EU (RoHS 2) + 2015/863/EU DIN EN IEC 63000:2019-05 |
|---|---|
| EMC | EU directive 2014/30/EU DIN EN 61326-1:2022-11 |

# Appendix A   CE-Certificate

## EU Declaration of Conformity

.PEAK
System

This declaration applies to the following product:

| | |
|---|---|
| Product name: | **PCAN-Router FD** |
| Item number(s): | **IPEH-002214, IPEH-002215** |
| Manufacturer: | PEAK-System Technik GmbH<br>Leydheckerstraße 10<br>64293 Darmstadt<br>Germany |

CE   We declare under our sole responsibility that the mentioned product is in conformity with the following directives and the affiliated harmonized standards:

**EU Directive 2011/65/EU (RoHS 2) + 2015/863/EU (amended list of restricted substances)**
**DIN EN IEC 63000:2019-05**
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances (IEC 63000:2016);
German version of EN IEC 63000:2018

**EU Directive 2014/30/EU (Electromagnetic Compatibility)**
**DIN EN 61326-1:2022-11**
Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements (IEC 61326-1:2020);
German version of EN IEC 61326-1:2021

Darmstadt, 15 May 2024

Uwe Wilhelm, Managing Director

# Appendix B   UKCA-Certificate

## UK Declaration of Conformity

.PEAK
System

This declaration applies to the following product:

| | |
|---|---|
| Product name: | **PCAN-Router FD** |
| Item number(s): | **IPEH-002214, IPEH-002215** |

**Manufacturer:**

PEAK-System Technik GmbH
Leydheckerstraße 10
64293 Darmstadt
Germany

**UK authorized representative:**

Control Technologies UK Ltd
Unit 1, Stoke Mill,
Mill Road, Sharnbrook,
Bedfordshire, MK44 1NN, UK

UK CA

We declare under our sole responsibility that the mentioned product is in conformity with the following UK legislations and the affiliated harmonized standards:

**The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012**

**DIN EN IEC 63000:2019-05**
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances (IEC 63000:2016);
German version of EN IEC 63000:2018

**Electromagnetic Compatibility Regulations 2016**
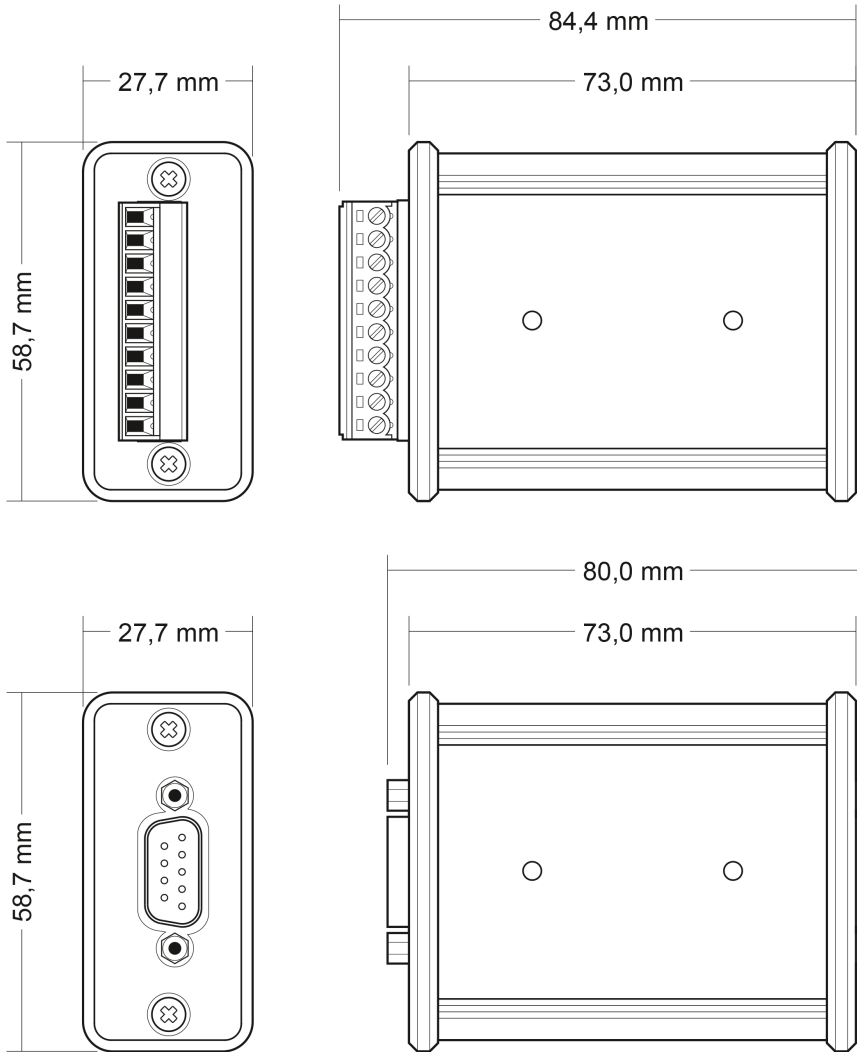
**DIN EN 61326-1:2022-11**
Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements (IEC 61326-1:2020);
German version of EN IEC 61326-1:2021

Darmstadt, 15 May 2024

Uwe Wilhelm, Managing Director

# Appendix C   Dimension Drawings

27,7 mm

58,7 mm

84,4 mm

73,0 mm

27,7 mm

58,7 mm

80,0 mm

73,0 mm

# Appendix D  Disposal

The PCAN-Router FD must not be disposed of in household waste. Dispose of the PCAN-Router FD properly in accordance with local regulations.