PCAN-AU5790

Adapter High-speed CAN to
Single-wire CAN

User Manual

PEAK System

Products taken into account

Product Name	Model	Item Number
PCAN-AU5790		IPEH-002040

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Contents

1 Introduction

Tip: At the end of this manual (Appendix B) you can find a **Quick Reference** with brief information about the installation and operation of the PCAN-AU5790 adapter.

The adapter PCAN-AU5790 forms the interface between a High-speed CAN (HS-CAN) and a so-called Single-wire CAN (SW-CAN). In principle it can be used at any place of a HS-CAN. It primarily is, however, designed for the direct connection of a HS-CAN hardware (e.g. PCAN-Dongle) to a SW-CAN. The name AU5790 refers to the SW-CAN transceiver of the same name by Philips, which is used in this adapter.

Single-wire CAN (SW-CAN)

As the name already indicates, only one signal line is used at the SW-CAN unlike the HS-CAN. SW-CAN is used in motor vehicles. The bodywork functions as mass of the bus. Therefore the SW-CAN bus only consists of a unipolar line and thus reduces the overhead of the wiring through the motor vehicle. On the other hand the at most possible transmission rate is considerably lower than at the HS-CAN.

1.1 Delivery Scope

The scope of supply normally consists of the following parts:

- This manual in printed form
- The adapter PCAN-AU5790 (casing with two connectors and slide switch)

1.2 Properties at a Glance

- Three possible operation modes of the SW-CAN side (Normal / High-speed / Wake-up), configurable by slide switch.
- LEDs for indication of power supply (red) and Wake-up signals (yellow)
- Power supply (5 V) via PCAN adapters (no separate mains adapter necessary), internal charge pump for nominal 12 V for the supply of the SW-CAN transceiver.
- Additional external power supply (12 V, e.g. from car battery) for SW-CAN transceiver is only necessary, if the 5-Volt supply cannot make sufficient eletrical power available (at least 150 mA). E.g. this is the case at all PEAK-CAN adapters with galvanic isolation ("ISO").

Note: You can find additional information about the properties and the behavior of the SW-CAN transceiver AU5790 in the corresponding data sheet, which you can download from the web site of Philips (http://www.semiconductors.philips.com).

2 Installation

2.1 Connecting the High-speed CAN Side

The PCAN-AU5790 adapter is designed for the use as add-on module to a PC/CAN adapter from the PCAN series (e.g. PCAN-Dongle). As extension it is directly connected with the HS-CAN side (female Sub-D) to the PCAN PC/CAN adapter.

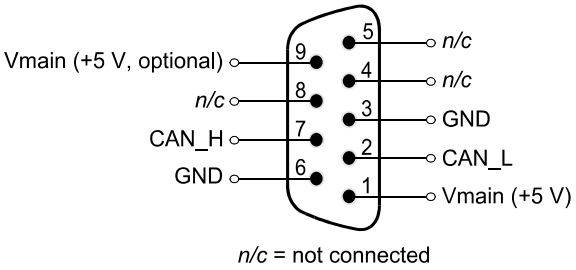

Figure 1: Pin Assignment at the HS-CAN side (9-pin female Sub-D connector)

The HS-CAN lines (CAN_H und CAN_L) are terminated on the adapter with an 120-Ω resistor. This **termination** is unalterable.

For **general supply** the adapter uses a direct voltage of +5 V (V_{main}). Per default the PCAN-AU5790 adapter is configured so that it must be applied to pin 1 of the HS-CAN port.

Note: Optionally this supply voltage can be made available on pin 9. On this matter please contact PEAK-System Technik GmbH in order to get further information and instructions (address: see page 2).

Unlike the other ICs the SW-CAN transceiver in the PCAN-AU5790 adapter needs a supply voltage of 12 V, which is created on the circuit board by means of a so-called charge pump from the 5-Volt supply. Therefore the latter must be able to supply up to 150 mA electrical power. If this isn't the case (such as the PCAN PC/CAN

adapters with galvanic isolation, short term "ISO"), additionally to the 5-Volt supply a further one with 12 V must be established. You will find details about this in the following section "Connecting the Single-wire CAN Side".

At existing 5-Volt supply the **red LED** at the PCAN-AU5790 adapter is illuminated.

Attention! If the PCAN-AU5790 adapter shall not be operated directly at a PC/CAN adapter, it should be taken care of an undisturbed voltage supply and a suitable electrical protection. The HS-CAN side of the PCAN-AU5790 adapter doesn't have a protection circuitry.

2.2 Connecting the Single-wire CAN Side

For connection of the SW-CAN bus a 9-pin male Sub-D port is used. The assignment is as follows:

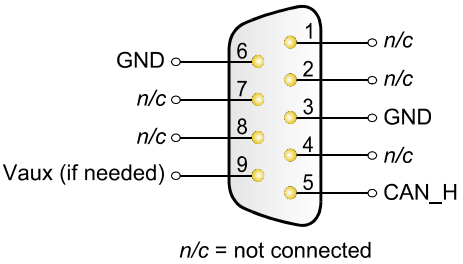

Figure 2: Pin assignment SW-CAN side (9-pin male Sub-D connector)

For pin allocation it has to be taken into account, that a **mass connection** (via GND) to all further CAN nodes is mandatory on the SW-CAN bus.

The SW-CAN specification doesn't provide for an external **termination** of the adapter with a terminating resistor. On the SW-

CAN side the PCAN-AU5790 adapter is terminated internally with 5.1 kΩ.

The **additional supply voltage (V_{aux})** of nominally +12 V is only needed, if the line V_{main} (+5 V) at the HS-CAN port cannot provide up to 150 mA electrical power. E.g. this is the case at use of a PC/CAN adapter of the PCAN series with galvanic isolation ("ISO" version). V_{aux} may be a direct connection to the supply voltage of the motor vehicle.

Note: Die supply voltage V_{main} (+5 V) at the HS-CAN port must always be present, even if V_{aux} is active.

2.3 Use with a PCAN PC/CAN Adapter

As already mentioned in the introduction, the PCAN-AU5790 adapter primarily is designed for the use with a PC/CAN adapter of the PCAN series (e.g. PCAN-Dongle). The female HS-CAN connector of the PCAN-AU5790 adapter is directly plugged into the PCAN PC/CAN adapter.

To ensure a working power supply, the CAN hardware must be configured so that the 5-Volt supply for the computer is passed on to pin 1 of the HS-CAN port. Please take detailed notes from the documentation of the respective PC/CAN adapter.

3 Operation

3.1 Single-wire Operation Modes

The PCAN-AU5790 adapter can be operated in three different modes, related to the SW-CAN. They are determined by the slide switch at the side of the adapter housing.

Switch position	Mode	Description
Middle	Normal	Up to 33.3 kBit/s, with wave shaping
Right	High-speed	Up to 83.3 kBit/s, without wave shaping
Left	Wake-up	Like Normal mode, but with increased signal levels

The **Sleep mode**, a standard for the SW-CAN, isn't supported.

Note: To prevent mistakes: The term "High-speed mode" in this manual refers to the SW-CAN and hasn't a direct relation to the HS-CAN (High-speed CAN).

3.1.1 Normal Mode

As the name already indicates, this mode is used for normal operation. A transfer rate up to 33.3 kBit/s is supported. The output of the signals onto the SW-CAN bus is provided with a so-called wave shaping, i.e. the slew rate and the shape of the signal rising edges are controlled, as well as the onset of the falling edge. This behavior contributes to the minimizing of EM emissions.

3.1.2 High-speed Mode

The PCAN-AU5790 adapter provides the High-speed mode for the transfer of e.g. software or diagnostic data. Transfer rates up to 83.3 kBit/s can be used. Unlike the Normal mode here the wave-shaping function is deactivated, i.e. the bus driver is switched on and off as

fast as possible to be able to reach higher transfer rates. However, the electromagnetic compatibility (EMC) consequently is reduced in comparison with the Normal mode.

The High-speed mode is only used in special cases and shouldn't be used for regular operation of a SW-CAN.

3.1.3 Wake-up Mode

In this mode data is sent with an increased level in comparison to the Normal mode. An activation of all "sleeping" bus nodes in the network results from it. Sleeping bus nodes ignore normal 4-Volt levels and only react to levels with higher voltage (12 V). Since the PCAN-AU5790 adapter itself doesn't have a Sleep mode, incoming signals are all interpreted in the same manner independently of their level (Normal or Wake-up).

The **yellow LED** of the PCAN-AU5790 adapter indicates a received or transmitted signal with Wake-up level. After detection the LED switches off with delay. Therefore signals of short duration are also recognized.

The Wake-up mode and the High-speed mode shouldn't be active within a SW-CAN at the same time.

3.2 Transfer Rate

At operation of the PCAN-AU5790 adapter it must be considered, that the transfer rate of the HS-CAN bus or the CAN hardware respectively matches the transfer rate of the SW-CAN bus. No conversion or automatic adaptation of the transfer rate is done in the adapter.

At the PC/CAN adapters of the PCAN series, which contain the CAN controller SJA1000 by Philips, the transfer rates are configured with register entries (BTR0, BTR1). If the desired transfer rate doesn't

correspond to one of the preset transfer rates provided by the PCAN system, the relevant register value must be submitted. For the two mostly common SW-CAN transfer rates these are the following values (h = hexadecimal):

33.3 kBit/s: 1D14h
83.3 kBit/s: 0B14h

Tip: Since the determination of the register data isn't only dependent on the transfer rate as a parameter, another register value also can come into being for the same transfer rate at an individual customization. You can find further information about this in the data sheet of the CAN controller SJA1000 by Philips (see http://www.semiconductors.philips.com).

As an example the following figure shows the input of register data in PCAN Nets Configuration (is enclosed with certain PCAN software packages):

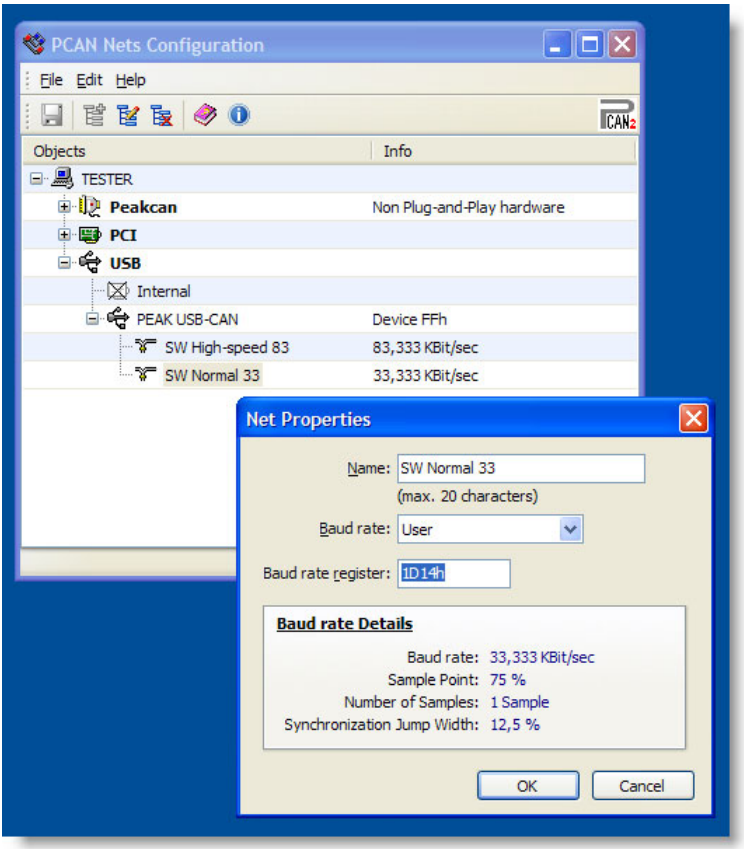

Figure 3: Entering register data in PCAN Nets Configuration

4 Frequently Asked Questions (FAQ)

Question	Answer
Can the adapter also function as **general interface** between a HS-CAN and a SW-CAN?	Though the PCAN-AU5790 adapter has been designed for the direct connection to a PC/CAN adapter (e.g. the PCAN-Dongle), a use anywhere in a CAN would be conceivable. At this please note, that the HS-CAN side is terminated permanently with 120 Ω (use only at one of the two ends of the HS-CAN bus) and that the adapter requires a power supply via the HS-CAN connector. Furthermore normally a simple mechanical Sub-D adapter (m/m) will be necessary.
How do I configure the **transfer rate** at the adapter?	Not at all! The PCAN-AU5790 doesn't convert the incoming data with regard to timing. Because of this it doesn't have direct influence on the transfer rate. This is determined by the nodes of the connected CAN. You should pay attention, that you use both in the HS-CAN or the PCAN PC/CAN adapter and in the SW-CAN at all nodes the same transfer rate.

5 Technical Specifications

Supply voltage	+5 V DC, at least 150 mA (via HS-CAN port) +12 V DC additionally (via SW-CAN port), if available current strength of the 5-Volt supply < 150 mA
Power consumption	20 mA average, 120 mA maximum
High-speed CAN	ISO 11898-2 Compliant to CAN specifications 2.0A and 2.0B Transceiver: Philips PCA82C251 Sub-D socket (pin assignment according to CiA DS 102) Termination: 120 Ω
Single-wire CAN	SAE J2411 Transceiver: Philips AU5790 Sub-D plug Termination: 5.1 kΩ Operation modes: Normal, High-speed, Wake-up
Transfer rate	max. 83.3 kBit/s
Wake-up LED (yellow) - Pulse width - Time delay signal - Threshold signal	 > 0.5 s > 5 µs (at 11-Volt pulse) > 8.2 V
Operating temperature	0 – 70 °C (32 – 158 °F)
Temperature for storage and transport	-40 – +100 °C -40 – +212 °F
Relative humidity	15 – 90 %, not condensing
Dimensions	63 x 34 x 19 mm (2 1/2 x 1 5/16 x 3/4 inches)
Weight	max. 30 g (2.5 oz.)

Design and specifications are subject to change without notice.

Appendix A Certificates

A.1 CE

PCAN-TJA1054 IPEH-002039 EC declaration of conformity
PEAK-System Technik GmbH

Notes on the CE Symbol CE

The following applies to the PCAN-AU5790 product IPEH-002040.

EC Directive

This product fulfills the requirements of EC directive 89/336/EEC on "Electromagnetic Compatibility," and is designed for the following fields of application as per the CE marking:

Field of Application	Requirement for Emitted Interference	Requirement for Noise Immunity
Residential, commercial and small businesses	EN 61000-6-3: 2001	EN 61000-6-1: 2001

Declarations of Conformity

In accordance with the above mentioned EU directives, the EC declarations of conformity and the associated documentation are held at the disposal of the competent authorities at the address below:

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Mr. Wilhelm
Otto-Röhm-Str. 69
D-64293 Darmstadt
Germany

phone: +49 6151 81 73-20
fax.: +49 6151 81 73-29
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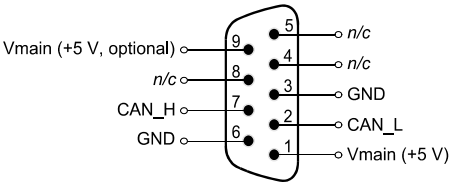
Signed this 10th day of June 2004

Appendix B Quick Reference

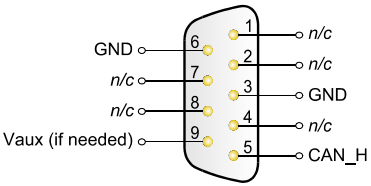
HS-CAN socket



n/c = not connected

V_{main} at pin 9 (instead of pin 1): *on request*

SW-CAN connector (male)



n/c = not connected

V_{aux} = +12 V DC (nom.), e.g. car battery; only needed, if $I_{max}(V_{main}) < 150$ mA

SW mode switch

Switch position	Mode	Description
Middle	Normal	Up to 33.3 kBit/s, with wave shaping
Right	High-speed	Up to 83.3 kBit/s, without wave shaping
Left	Wake-up	Like Normal mode, but with increased signal levels

Actual transfer rate is configured in the connected HS-CAN hardware.

LEDs

Red = Voltage supply +5 V
Yellow = Reception/transmission of Wake-up signals