Kvaser LAPcan / LAPcan II Hardware Guide

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2 About this manual

This manual is intended for the Kvaser LAPcan/Kvaser LAPcan II users. This manual contains a description of the hardware's properties and general instructions for connecting the device to a computer.

3 Introduction

Table 1: The Kvaser LAPcan/LAPcan II devices and their EAN numbers.

Device	Product Number
Kvaser LAPcan	733-0130- 00029-2
Kvaser LAPcan II	733-0130- 00115-2

Kvaser LAPcan is a PC card compliant with the PC-Card (PCMCIA) standard. It contains the powerful microcontroller C161O from Infineon and two SJA1000 CAN controllers from Philips. The SJA1000 handles CAN messages with 11 bit as well as 29 bit identifiers. Remote frames can be sent and received without restrictions. Kvaser LAPcan can both detect and generate error frames on the CAN bus. Kvaser LAPcan provides two completely independent CAN channels with two separate connectors. The CAN bus transceivers are integrated into the connection cables.

The **Kvaser LAPcan II** is an improved version of the Kvaser LAPcan card. It is fully compatible with the Kvaser LAPcan card but features

- better performance
- improved EMC and ESD characteristics
- a different artwork on the housing (an eagle instead of a peregrine falcon)

In this text we will use the name **Kvaser LAPcan** for both Kvaser LAPcan and Kvaser LAPcan II.

4 Kvaser LAPcan installation

The Kvaser LAPcan card may be inserted in any free PC Card (PCMCIA) slot that is capable of accommodating Type II or Type III cards. You don't have to switch the power off before inserting or removing the card.

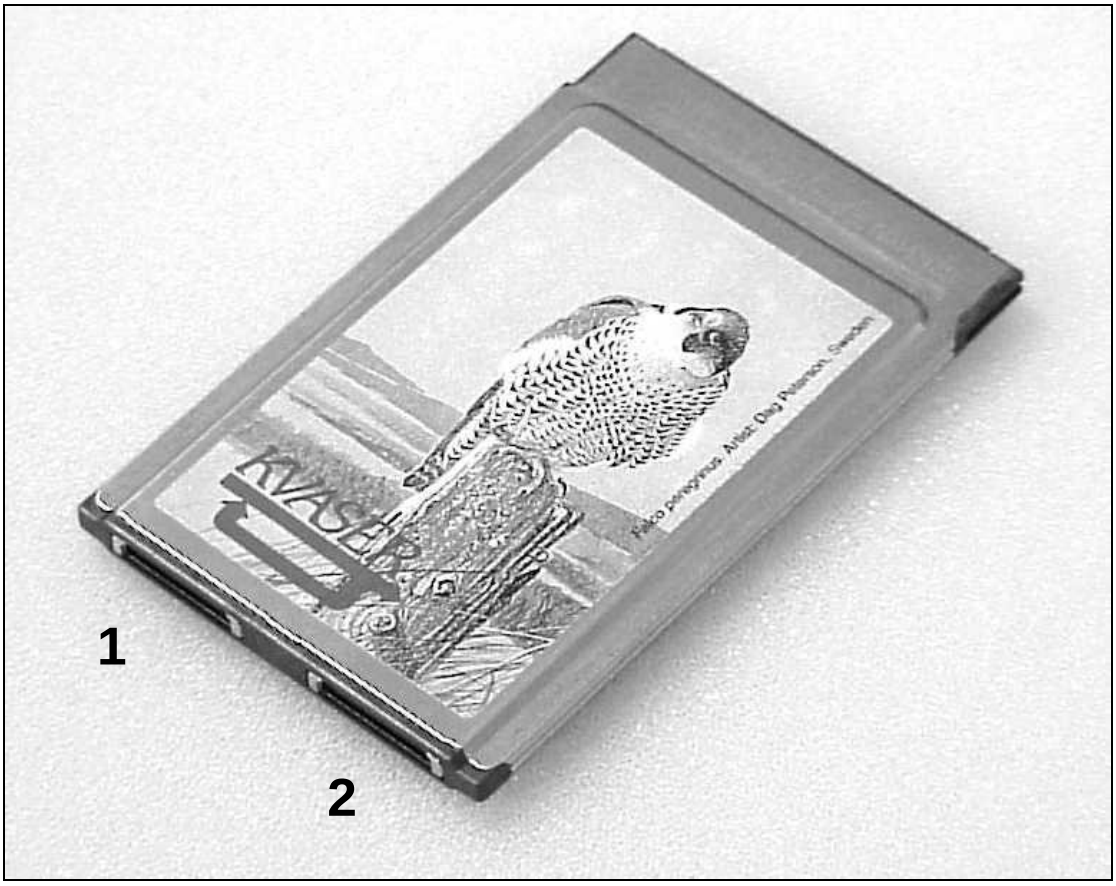


Figure 1. A Kvaser LAPcan with its two CAN ports.

Many new laptop computers are equipped with CardBus slots instead of PCMCIA slots. You can use a CardBus slot for Kvaser LAPcan without problems, because the CardBus controller will automatically use a special compability mode for Kvaser LAPcan (or other PCMCIA cards)[1].

The Kvaser LAPcan has two independent I/O ports that are depicted in the figure above. You connect the card to the CAN network by means of special cables, the DRVcans.

[1] This is true for Windows 95, 98, ME, 2000 and XP. Windows NT 4.0 might have trouble with a CardBus controller; please consult the computer manufacturer for more information.

5 Technical data, Kvaser LAPcan and Kvaser LAPcan II

CAN channels	2 (CAN 2.0A and 2.0B active)
CAN Transceivers	The transceivers are integrated into the DRVcans.
CAN Controllers	Philips SJA 1000
Microcontroller	Infineon C161O (16 MHz)
CAN Bitrate	5 kbit/s ... 1 Mbit/s
Timestamp resolution	8 microseconds
Error Frame Detection	Yes, both channels
Error Frame Generation	Yes, both channels
Hardware requirements	IBM PC AT or 100% compatible; PC-Card slot type II or III
PC interface	PC-Card Version 2.0 (PCMCIA) or compatible
Current consumption	110 mA for the Kvaser LAPcan plus the current of the DRVcans
Software requirements	Windows 95 / Windows NT 4.0 or later
Configuration	Done by software (Plug & Play if OS supports it.)
Dimensions	PC-Card type II (ca. 85 mm x 64 mm x 5 mm)
Operating temperature	0 ºC ... +55 ºC
Non-operating temperature	-25 ºC ... +70 ºC
Relative Humidity	0% ... 85% (non condensing.)

6 The DRVcans

The DRVcans contain the CAN bus transceiver. There are several different types of DRVcans, and which one to choose depends on the physical layer your CAN system is using.



Figure 2. A typical DRVcan.

6.1 DRVcan Types

Currently available DRVcans include:

Name	
DRVcan 251	Industry-standard highspeed 82c251 transceivers; DSUB connector according to the CiA standard.
DRVcan 1053	Industry-standard lowspeed TJA1053 transceivers; DSUB connector according to the CiA standard.
DRVcan 1054	Industry-standard lowspeed TJA1054 transceivers; DSUB connector according to the CiA standard.
DRVcan 1054 Opto	Industry-standard lowspeed TJA1054 transceivers; DSUB connector according to the CiA standard. Optical isolation.
DRVcan DNopto	Industry-standard highspeed 82c251 transceivers; the CAN bus is galvanically isolated from the inputs by means of optocouplers; DSUB connector according to the CiA standard.
DRVcan S	J2411 single-wire CAN (transceiver AU5790 or similar.)
DRVcan S Opto	J2411 single-wire CAN (transceiver AU5790 or similar.) Optical isolation.
DRVcan Fi HS	Industry-standard highspeed 82c251 transceivers; the CAN bus is galvanically isolated from the inputs by means of optic fibres; DSUB connector according to the CiA standard.
DRVcan Fi LS	Industry-standard lowspeed TJA1054 transceivers; the CAN bus is galvanically isolated from the inputs by means of optic fibres; DSUB connector according to the CiA standard.
DRVcan Fi SWC	Industry-standard AU5790 transceivers; the CAN bus is galvanically isolated from the inputs by means of optic fibres; DSUB connector.
DRVcan LIN	This is a driver for the LIN bus.
DRVcan T&T	E-mail to **sales@kvaser.com** for more information.
DRVcan EVA	Cable + wire-wrap board; for developing your own physical layer
Customer specific	E-mail to **sales@kvaser.com** for more information about custom-design DRVcans.

6.2 How to use the DRVcan

- Push firmly to insert the connector on the DRVcan into Kvaser LAPcan.
- To remove the connector, push both tabs (see **Figure 3** nedan) as deep as possible and pull out the connector.
- We recommend that you remove the card before inserting or removing DRVcans. This is because not all software will be able to handle a “hot-swap”. No damage to your Kvaser LAPcan will happen, however, if you insert or remove a DRVcan while the Kvaser LAPcan is inserted into your computer.

7 A Few Words of Caution

- Do not apply excessive force when inserting the card into the computer.
- Do not remove the card by pulling on the I/O cables.
- Always make sure the I/O connectors are firmly seated.
- When you remove a DRVcan, you must firmly press both the tabs (see **Figure 3** nedan) on the connector.

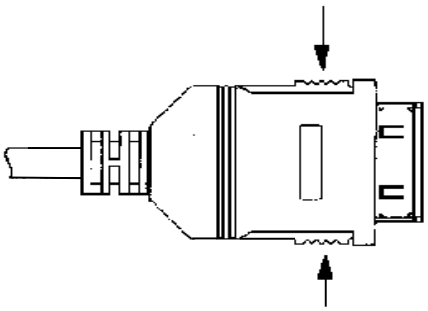


Figure 3. The I/O connector on a DRVcan. The tabs are marked with arrows.

The D-SUB connector

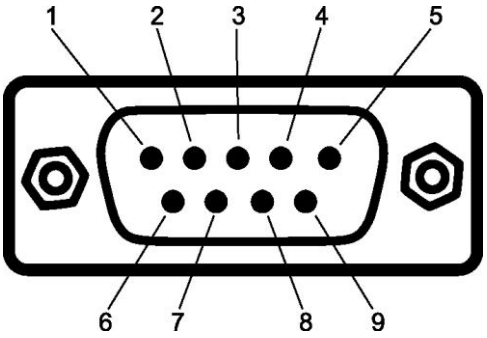


Figure 4. The DSUB connector on a DRVcan.

The CAN bus is connected to the 9-pin DSUB connector (see **Figure 4** ovan) on the DRVcan.

Caution!
Always connect the ground pin on the D-SUB to the ground of your CAN bus. Some laptop computers have AC power supplies that might destroy the DRVcan unless it is properly grounded. Running the laptop from battery power is usually OK even if the ground lines are not connected.

8 DRVcan configuration

The **DRVcan -251, -1053, and -1054** types have the following pin configuration:

D-SUB pin number	Colour code	Function
1	N/A	Not connected.
2	Green	CAN_L (low level @ dominant)
3	Brown	GND
4	Orange	Reserved, **do not connect.**
5	Black	Shield
6	N/A	Not connected.
7	Red	CAN_H (high level @ dominant)
8	N/A	Not connected.
9	Yellow	Not connected.
Pins 2, 3, 4, and 7 are protected by 250 mA fuses.		

The **DRVcan DNopto** has the following pin configuration:

D-SUB pin number	Colour code	Function
1	N/A	Not connected.
2	Green	CAN_L (low level @ dominant)
3	Brown	GND
4	Orange	Reserved, **do not connect.**
5	Black	Shield
6	N/A	Not connected.
7	Red	CAN_H (high level @ dominant)
8	N/A	Not connected.
9	Yellow	Optional external power, 11-25V.
Pins 2, 3, 4, and 7 are protected by 250 mA fuses.		

The **DRVcan Fi HS** has the following pin configuration:

D-SUB pin number	Colour code	Function
1	N/A	Not connected.
2	Green	CAN_L (low level @ dominant)
3	Brown	GND
4	Orange	Not connected.
5	Black	Shield
6	N/A	Not connected.
7	Red	CAN_H (high level @ dominant)
8	N/A	Not connected.
9	Yellow	External power, 6-36V.

The **DRVcan Fi LS** has the following pin configuration:

D-SUB pin number	Colour code	Function
1	N/A	Not connected.
2	Green	CAN_L (low level @ dominant)
3	Brown	GND
4	Orange	Not connected.
5	Black	Shield
6	N/A	Not connected.
7	Red	CAN_H (high level @ dominant)
8	N/A	Not connected.
9	Yellow	External power, 6-36V.

The **DRVcan Fi SWC** has the following pin configuration:

D-SUB pin number	Colour code	Function
1	N/A	Not connected.
2	Green	Not connected.
3	Brown	GND
4	Orange	Not connected.
5	Black	Shield
6	N/A	Not connected.

7	Red	CAN_H (high level @ dominant)
8	N/A	Not connected.
9	Yellow	External power, 6-36V.

Here is the pin configuration for the **DRVcan-S**:

D-SUB pin number	Colour code	Function
1	N/A	Not connected.
2	Green	Not connected.
3	Brown	GND
4	Orange	Reserved, **do not connect.**
5	Black	Shield
6	N/A	Not connected.
7	Red	CAN_H (high level @ dominant)
8	N/A	Not connected.
9	Yellow	Power supply (nominal +12V DC; fully functional between +7.5 and +18 V DC.) **Power is required.**
Pins 3 and 4 are protected by 250 mA fuses.		

Here is the pin configuration for the **DRVcan LIN**:

D-SUB pin number	Colour code	Function
1	N/A	Not connected.
2	Green	Not connected.
3	Brown	GND
4	Orange	LIN bus
5	Black	Shield
6	N/A	Not connected.
7	Red	Reserved, do not connect.
8	N/A	Not connected.
9	Yellow	Power supply (nominal +12V DC; fully functional between +7 and +18 V DC.) **Power is required.**

8.1 Technical Data for DRVcan 251

Transceiver type	Philips 82c251
Current consumption	40 mA (average)
Maximum bus speed	1 Mbit/s
DRVcan 251 does not have built-in CAN bus termination.	

8.2 Technical Data for DRVcan 1053

Transceiver type	Philips TJA1053
Current consumption	20 mA (average)
Maximum bus speed	125 kbit/s
Built-in termination, RTH	4.7 kΩ
Built-in termination, RTL	4.7 kΩ
Note: the termination resistors RTH and RTL are optimized for bus analyzing tools. This means that they do not load the bus enough to ensure proper signal levels if there are no other "real" nodes on the bus. If you connect just two DRVcan 1053:s to a long (several meters) bus, the communication may or may not work.	

8.3 Technical Data for DRVcan 1054

Transceiver type	Philips TJA1054
Current consumption	20 mA (average)
Maximum bus speed	125 kbit/s
Built-in termination, RTH	4.7 kΩ
Built-in termination, RTL	4.7 kΩ
Note: the termination resistors RTH and RTL are optimized for bus analyzing tools. This means that they do not load the bus enough to ensure proper signal levels if there are no other "real" nodes on the bus. If you connect just two DRVcan 1054:s to a long (several meters) bus, the communication may or may not work.	

8.4 Technical Data for DRVcan DNopto

Transceiver type	Philips 82c251
Current consumption	80 mA (average)
Maximum bus speed	1 Mbit/s
Optocoupler type	HCPL 7101-3
Optocoupler delay	20 ns
Isolation voltage	50 V AC, 70 V DC
The transceiver in the DRVcan DNopto can be powered either from the Kvaser LAPcan, or externally by connecting a power source to pin 9 on the D-SUB. There is no built-in CAN bus termination in the DRVcan DNopto.	

8.5 Technical Data for DRVcan Fi

Transceiver type	Philips 82c251
Current consumption	50 mA (average, bus side), 50 mA at 125 kbps, 100 mA at 1 Mbps (average, laptop side)
Maximum bus speed	1 Mbit/s (depending on fibre length and properties of the complete network)
Optic driver type	HFBR 2528
Total delay	360 ns + 2*5 ns/meter of fibre
Isolation voltage	Depending on fibre length and quality
The transceiver in the DRVcan Fi **must** be powered both from the Kvaser LAPcan, and externally by connecting a power source to pin 9 on the D-SUB. The DRVcan Fi is delivered with 10 m of high-grade plastic fibre. The is no built-in CAN bus termination in the DRVcan Fi.	

8.6 Technical Data for DRVcan S

Transceiver type	Philips AU5790 or similar
Current consumption	Built-in bus pull-up consumes approx. 5 mA; the CAN bus driver consumes approx. 7.5 mA.
External power	+7.5 V ... +18 V DC. Nominal voltage is 12 V DC.
Note: external power (12V) is **required** to make the DRVcan S work.	

8.7 Technical Data for DRVcan LIN

Transceiver type	MC 33399
Current consumption	TBD.
External power	+7 V ... +18 V DC.
Note: external power (12V) is **required** to make the DRVcan LIN work.	

9 Legal information

9.1 RoHS Directive

This line of products will never comply with the RoHS (Restriction of Hazardous Substances) directive which became effective July 1, 2006.

9.2 Copyright

This document is Copyright © 2001-2008 Kvaser AB. This document may not be reproduced without our written permission. Infringement will render the user liable to prosecution.

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9.3 CE Marking Directive

This line of products has been CE marked. We will be pleased to inform you on which standards this equipment has been tested for compliance.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

9.4 Trademarks and patents

All product names mentioned in this manual are registered or unregistered trademarks of their respective owner. Windows® is a registered trademark of Microsoft Corporation in the United States and other countries. Linux® is the registered trademark of Linus Torvalds in the United States and other countries. The products described in this document are protected by U.S. patent 5,696,911.

10 Document revision history

Revision	Date	Changes
1	2003-12	Original revision
2	2006-10-27	Reviewed – added DRVcan Fi versions
3	2008-12-01	Updated chapter 9, legal information. Editorial changes.