

Users Manual



PCI-IntelliCAN

iLME

Company
of the ACTIA group

ACTIA 

Systems, Support & More

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External documentation:

- A PcCANControl**
- B LevelX API**
- C LevelX Demos**

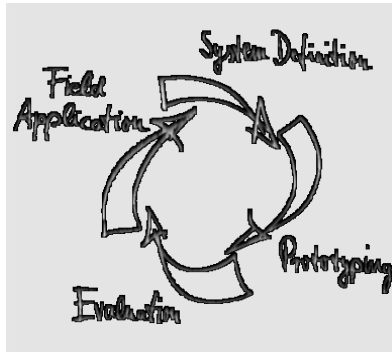
Administration of document

General document version 1.11

Welcome to **I+ME** ACTIA

Before acquainting you with your new **I+ME** Hardware we would first like to thank you for purchasing our product. We are extremely pleased that you have chosen to place your trust in **I+ME** ACTIA and will do our best to satisfy whatever needs you may have. The following is a brief explanation highlighting our background, areas of expertise and general product lines. This products and the list of our world-wide branch offices show that you have found a competent partner in **I+ME** ACTIA.

Since its foundation in 1986, **I+ME** ACTIA has made quite a name for itself. Our employees are dedicated to producing high-quality solutions in the field bus and multiplexed systems sectors. The knowledge of our experts allows to develop a spectrum of products which have been used in the automotive field as well as in general industrial environments. Our products can be used in all phases of system development: system definition, prototyping, evaluation and field application.



I+ME *Informatik und MikroElektronik*

Whether your professional background is into industry-process-control or development and test tools, we offer six product groups to fulfill your sophisticated needs. Tried and tested under the most severe conditions the automotive industry has to offer, our products have proved themselves again and again. Our six products groups are:

1 CAN System Test & Design Tools



Support of various user application phases: Learning, proto-typing, testing and evaluation of networked systems. Comfortable real-time simulation of message transfer characteristics in CAN networks.

Tools for mobile diagnosis and tests.

2 CAN PC Interfaces

Easy interfacing between PCs, Laptops, notebooks and networks with automotive fieldbus – protocols. Available for all PC standard interfaces such as ISA, PCI, backplane, RS232, Centronics and PCMCIA. Development of applications under Windows according to real-time requirements is supported

3 CAN Industrial I/O



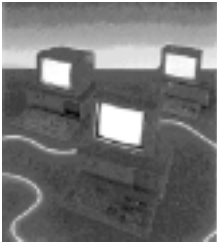
CAN-IO is an intelligent hardware concept for sensor / actuator interfacing. A modular architecture allows the flexible change target micro controllers for process control.

4 CAN System Application Software



Enabling real-time system modeling, testing of networked systems as well as application support. Offering basic services for network communication which is applicable for various processors and programming languages. Facilitating the application interface for distributed industrial process control according to the CAL standard by CiA. Support of all Windows 32bit platforms.

5 CAN System Know How



Promoting the understanding of various network protocols in practice. Understanding of CAN networks with CAL in practice. Developing HW/SW solutions for customer specific problems. We offer CAN / CAL workshops and in-house seminars to enable CAN users to benefit from I+ME ACTIA's extensive knowledge.

6 Automotive Diagnostics



Assistance during the development phases. Diagnostic tools for quality control in production lines as well as after sales diagnostic, control and servicing tools are provided to manufacturers, suppliers and dealers of the car industry by I+ME ACTIA.

If you have any questions concerning our products or you look for specific solutions within our product groups, don't hesitate to call us and benefit from I+ME's extensive knowledge - your need is our desire.

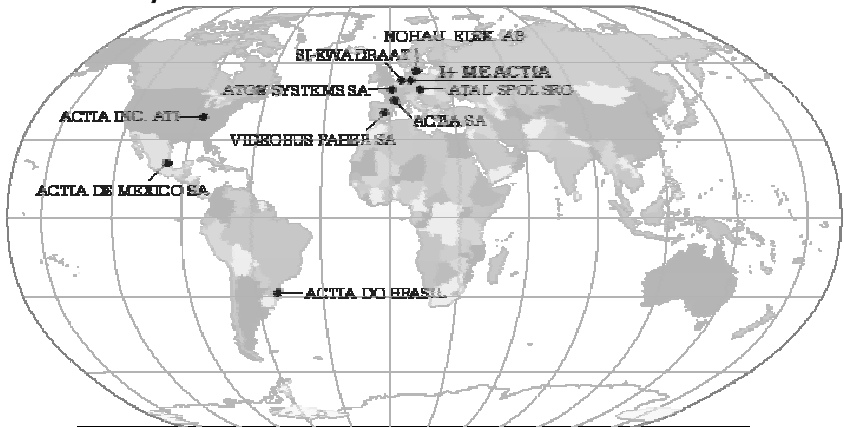
Our merger with the French corporation ACTIA in 1995 allowed us to become a powerful supplier for the European automotive industry. ACTIA products include diagnostic systems for automotive service and maintenance as well as development and production of high quality on-board electronics. Joining forces with ACTIA has enabled I+ME to better service its international customers not only in Europe, but throughout the world.

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Your I+ME *PCI-IntelliCAN* Overview,
Systemrequirements, delivery contents and s.o.

1 Introduction

Introduction

Your I+ME PCI-IntelliCAN

1.1 Your I+ME PCI-IntelliCAN

The *PCI-IntelliCAN* board is specially designed for PCs with PCI slots. Intended for real-time data acquisition and processing applications by using a fast 16-bit micro-controller. It allows a PCI-PC to easily interface with industrial and automotive CAN-networks. The *IntelliCAN* is a universal hardware platform for real-time network design and test tools and supported all Windows 32bit organisation systems.

I+ME ACTIA is always eager to fulfill the needs of our customers. If problems should occur, please refer to troubleshooting. If the problem persists, then feel free to contact our after-sales-support using the following number:

After-sales service

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Rebenring 33
D-38106 Braunschweig
Germany

Tel: ++ 49 (0) 531 38 701 38

Fax: ++ 49 (0) 531 38 701 88

e-mail: info@ime-actia.de

1.2 System Requirements

Your system must need the following minimum requirements:

- Pentium 133 MHz processor or higher
- PCI Slot
- Windows 9x, NT4.0, ME, 2000

I+ME ACTIA is always dedicated to developing solutions for our customers problems, and if you have any questions about compatibility with other software or hardware combinations, then please contact our marketing department at the following number:

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1.3 Delivery Contents

Your **PCI-IntelliCAN Duo Channel** delivery package includes:

- 1 x PCI Board
- 1 x I+ME Product CD-Rom:
 - Users Manual (as pdf file)
 - LevelX Manual (as pdf file)
 - PcCANControl Manual (as pdf file)
 - Drivers for Windows 9x, WinNT4.0, Win 2000
 - PC-Application for Windows
 - Sample code for programming under LevelX



1.4 Additional Products

In addition to the delivery contents, it is possible to order more products that enhance the functionality of your *PCI-IntelliCAN*. The following components and options can be purchased through any I+ME affiliated distributor (see **Welcome to I+ME ACTIA**) or from I+ME directly

- Chip setup software
- Various physical interfaces
- Galvanic decoupling

For new products and developments please call:

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1.5 Technical Specifications

Dimensions	108mm x 155mm
PC Addresses	Via PCI
PC Interrupts	Via PCI
Processor	SAB C165
Oscillator Frequency	On-board Crystal 20 MHz (CAN @ 16 MHz)
On-Board Memory	8 kB DPRAM (16Bit) 512 kB SRAM (16Bit) (opt. 1 MB) 128 kB Flash (8Bit) (opt. 512 kB)
Physical Interface	CAN: ISO 11898
CAN Interface	9 pin SubMinD for CAN I (CiA/DS 102 male) 9 pin SubMinD for CAN II (CiA/DS 102 male)
Galvanic Decoupling	Optional for both CAN channels
Temperature Range	0° .. +70°C
Socket for I/O	4 x analog inputs 4 x digital input or output 2 x UART / 1 x serial port sync. / 1 x serial port async. direct link to micro-controller

Your I+ME *PCI-IntelliCAN* installation.
Hardware and software installation are described.

2 Installation

Installation

Installation under Windows NT

2.1 Installation under Windows NT

2.1.1 Install the hardware

First you have to take care about the right installation of the *PCI-IntelliCAN* hardware in your PC. Please follow also the instructions of your PC hardware supplier.

Before opening your PC make sure that the PC is **disconnected** from your **powersupply**.

You have to plugin the *PCI-IntelliCAN* board into a free PCI slot. After **plugin** your *PCI-IntelliCAN* hardware is ready for operation.

Close your **PC** and turn power on. The next step is to install the software.

2.1.2 Install the software driver

- 1 Insert the CD. The setup programm will start automatically, if not please start the program "START.EXE" in root path.
- 2 Go to "Software Installation"
- 3 Choose your operating system, **is important**.
- 4 Choose your hardware component at the selection box then press "Start Installation". If the file is started (*.com file), follow the steps on the screen. If necessary type in the password.
- 5 If password is correct software will be installed successful.

2.1.3 Install PcCANControl application

- 1 Insert the CD. The setup programm will start automatically, if not please start the program "START.EXE" in root path.
- 2 Go to "Software Installation"
- 3 Choose your operating system, **is important.**
- 4 Choose PcCANControl component at the selection box then press "Start Installation". If the file is started (*.com file), follow the steps on the screen. If necessary type in the password.
- 5 Start "PcCANControl", select "create a new project" and then the hardware, at this case "PCI-Intellican2#0" or "PCI-Intellican2#1"
After the selection the necessary software is activated on your PC. For further information see also separate manual about PcCANControl.

2.1.4 Deinstalling under Windows NT

Remember if the software should be deinstalled, please use normal Windows deinstallation service. You found it under...

START/SETTINGS/CONTROLPANEL/ADD/REMOVE PROGRAM
(START/EINSTELLUNGEN/SYSTEMSTEUERUNG/SOFTWARE)

Installation

Installation under Win 9x

2.2 Installation under Win 9x

At Windows 9x the installation procedure is a little extravagant.



IMPORTANT:

First you have to install the software.

Second you must plug&play the hardware (restart incl.)

2.2.1 Install software and plug in hardware

1. Insert the CD. The setup program will start automatically, if not please start the program "START.EXE" in root path.
2. Go to "Software Installation"
3. Choose your operating system, **is important.**
4. Choose your hardware component at the selection box then press "Start Installation". If the file is started (*.com file), follow the steps on the screen. If necessary type in the password. **This application only copy all necessary files to the hard disk, no installation of driver is done at this time.** Please follow the requests (e.g. password) of the installation program.
5. Turn off the PC and **plug in** the **PCI-IntelliCAN** card. Before opening your PC make sure that the PC is **disconnected** from your **powersupply**.
6. Start your PC again. Windows 9x detect the new hardware and ask you about the new driver. Please choose the **driver** on your harddisk. You found it under
C:\ime_LX\LX9Xpi2j\... (default)

All necessary files you found under these directory.
Follow the instructions on screen.

7. Reboot the system again to start up the new driver.
8. If the system is started again the installation is finished.

2.2.2 Install PcCANControl application

1. Insert the CD. The setup programm will start automatically, if not please start the program "START.EXE" in root path.
2. Go to "Software Installation"
3. Choose your operating system, **is important.**
4. Choose PcCANControl component at the selection box then press "Start Installation". If the file is started (*.com file), follow the steps on the screen. If necessary type in the password.
5. Start "PcCANControl", select "create a new project" and then the hardware, at this case "PCI-Intellican2#0" or "PCI-Intellican2#1"

After the selection the necessary software is activated on your PC. For further information see also separate manual about PcCANControl.

Installation

Installation under Win 2000

6. Start your PC again. Windows 2000 detect the new



hardware and ask you about the new driver. Please



choose the **driver** on your harddisk. You found it under **C:\ime_LX\LN5pi2j...** (default).



All necessary files you found under these directory.
Follow the instructions on screen.

7. Reboot the system again to start up the new driver.
8. If the system is started again the installation is finished.

2.3.2 Install PcCANControl application

1. Insert the CD. The setup programm will start automatically, if not please start the program "START.EXE" in root path.
2. Go to "Software Installation"
3. Choose your operating system, **is important.**
4. Choose PcCANControl component at the selection box then press "Start Installation". If the file is started (*.com file), follow the steps on the screen. If necessary type in the password.
5. Start "PcCANControl", select "create a new project" and then the hardware, at this case "PCI-Intellican2#0" or "PCI-Intellican2#1"

After the selection the necessary software is activated on your PC. For further information see also separate manual about PcCANControl.

The components which make up your *PCI-IntelliCAN* and the way they work together for CAN access.

3 Hardware

3.1 Functional description

The I+ME *PCI-IntelliCAN* is equipped with the 16-bit SAB C165 microcontroller. The controller's clock frequency is 20 MHz.

The *PCI-IntelliCAN* is equipped with 512 kB of SRAM. The SRAM is selected by the micro-controller's CS 1 and driven in 16-bit non-multiplexed mode.

3.1.1 Special memory areas

In addition to the SRAM, the *PCI-IntelliCAN* contains a 8 KB Dual Port RAM (DPRAM), used for data exchange between the SAB C165's core and the PC. The DPRAM is selected by CS 0 and driven in 16-bit non-multiplexed mode. To avoid collisions during the access of the DPRAM, the bus cycles are delayed by the DPRAM's ready signal.

The DPRAM can be used for interrupt signals in the following ways:

- A PC write access to the address 1FFEh of the DPRAM can be used to cause an interrupt at the C165's P2.15 line.
- The C165 write access to the address 1FFCh of the DPRAM causes an interrupt at the PCI chip. A reset of these interrupts is caused by a read access to the DPRAM addresses from the opposite sides.

3.1.2 Flash memory areas

In addition to the SRAM and the DPRAM, the *PCI-IntelliCAN* contains a 128 kB Flash for storage of firmware or user specific programs. The memory is selected by the microcontroller's CS 2 and driven in 16-bit non-multiplexed mode.

3.2 Memory Mapping

The mapping of the *PCI-IntelliCAN* memory components is user-defined and has a wide range of possible addresses. DPRAM is mapped in the PC address range. The mapping of the DPRAM, CAN controller, and SRAM in the SAB C165 address space are all configurable. The mapping of the *PCI-IntelliCAN*'s memory (DPRAM and reset logic) in the PC address range is controlled through the PCI host adapter.

The mapping of the memory components and the CAN in the SAB C165 address area is controlled through the SAB C165 external bus interface. For more information about the functionality of the SAB C165 external bus interface, see **literature list** at the end of this manual.

3.3 Reset Control

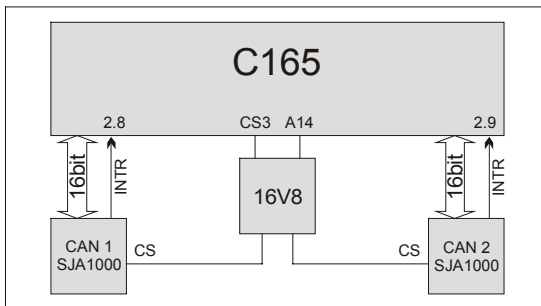
The reset of the SAB C165 is controlled through a port of the PCI chip that can be set or reset by the PC-SW with IO accesses to the PCI chip.

3.4 CAN Controller

The *PCI-IntelliCAN* also includes two CAN controller SJA1000.

The first CAN chip is controlled via the CS 3 line and A14 addressline of the SAB C165 and driven in 16-bit multiplexed mode. The first CAN controller's interrupt output signal is connected to the SAB C165's P2.8 line.

The second CAN chip is controlled via the CS 3 line and A14 addressline of the SAB C165 and driven in 16-bit multiplexed mode. The second CAN controller's interrupt output signal is connected to the SAB C165's P2.9 line.



Addresses : CAN1 = CS3 + BASE
 CAN2 = CS3 + BASE + 0x4000

3.5 Serial Interfaces

Asynchronous Serial Interface

The RxD and TxD lines of the internal SAB C165 UART are connected to the *PCI-IntelliCAN* feature connector and can be used for customer specific applications. For more information about the SAB C165 asynchronous serial interface, see **literature list** at the end of this manual.

Synchronous Serial Interface

The SCLK¹, MRST² and MTSR³ lines of the internal SAB C165 serial synchronous interface are connected to the feature connector and can be used for the connection to external devices. For more information about the SAB C165 synchronous serial interface, see **literature list** at the end of this manual.

3.6 PCI Interface

The *PCI-IntelliCAN* uses a PCI standard interface (Release 2.1). The *PCI-IntelliCAN* has 256 bytes of attribute memory containing information for the PCI chip information. After the configuration of the *PCI-IntelliCAN*'s software driver, the following resources are available :

- 1 x 16 kB block at the memory range
- 1 x IRQ

¹ SCLK: Serial Clock

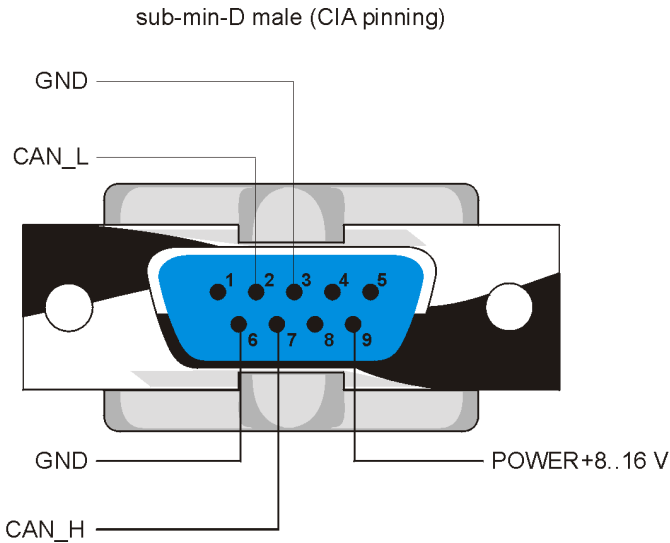
² MRST: Master Receive Slave Transmit

³ MTSR: Master Transmit Slave Receive

3.7 CAN Interface

The physical interface of the *PCI IntelliCAN* consists of two transceivers. They are linked on two 9-pin sub-min-D male connectors. (CAN1 and CAN2)

Both physical interfaces are standard ISO11898 physical interfaces. The picture below shows the pinning of these connectors.



Pin 1, 4, and 8 are not connected on the PCI-board.
Pin 5 is also GND
Pin 9 is use for external hw and n.c. at PCI-board !

3.8 Physical Circuit Diagram

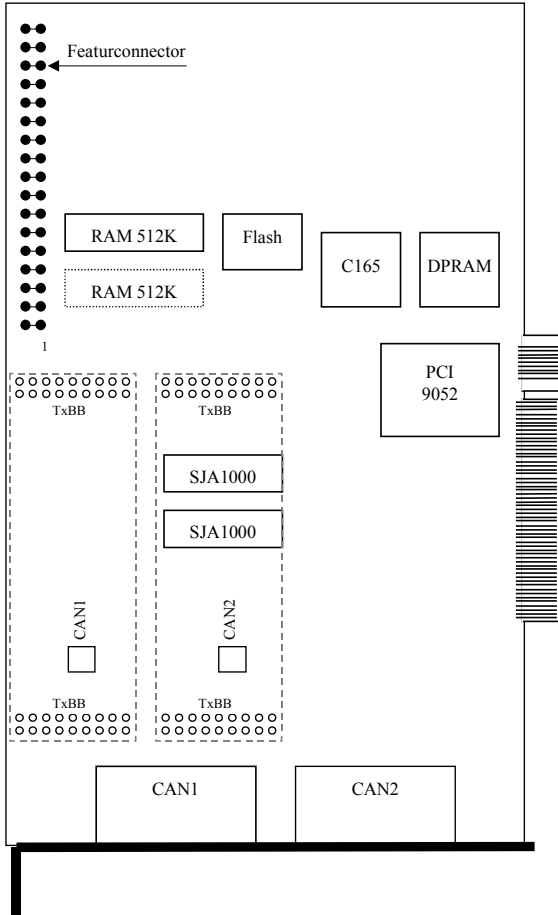
The following picture (see 3.9) shows the circuit diagram of the physical interface. It is possible to adapt user specific physical interfaces via I+ME's Transceiver Baby Boards (TxBB).

3.8.1 Feature Connector

The Feature connector of the *PCI IntelliCAN* board is used to adapt additional signal to the *PC IntelliCAN*.

Signal name	Pin	Pin	Signal name
GND	1	2	SCLK
GND	3	4	MTSB
GND	5	6	MBSI
Vcc	7	8	Vcc
Vcc	9	10	Vcc
GND	11	12	TxD_O
GND	13	14	RxD_D
GND	15	16	I/O_8
I/O_0	17	18	I/O_1
I/O_2	19	20	I/O_3
I/O_4	21	22	I/O_5
I/O_6	23	24	I/O_7
AVcc	25	26	AGND
AIN_0	27	28	AIN_1
AIN_2	29	30	AIN_3
AIN_4	31	32	AIN_5
AIN_6	33	34	AIN_7

3.9 Physical Layout



	first	second
CAN Hardwareconnect:	CAN1	CAN2
CAN Softwareconnect	CAN0	CAN1

Common problems and how to solve them. How to get in touch with our after-sales support experts if you so desire.

4 Techn. Support

Techn. Support

What to do if you have problems:

4.1 What to do if you have problems:

First and foremost, please read **Installation** very closely and make sure that you performed your installation exactly as described.



For developers:

The Key is often used in developing environments in combination with the API and/or DLL. If the PcCANControl software is functioning properly, then there is no problem with general CAN access. You should check your usage of the API or DLL.

If the PcCANControl software is not functioning, please consult the list of common problems below and their possible solutions.

If you encounter difficulties which are not discussed in the manual, or if you need more help than is offered in **Installation** and **Troubleshooting**, please call our after-sales service. Our experts will do their best to solve whatever problem you might have.

4.2 Solutions for all parts ...

General problem to install and run the hardware:

Under NT: Check if the carddriver is started under the device manager. Status "started"

Under 9x: Check if the card is correct listed under the device manager, no yellow spot on it.

The system crashes after choose the hardware at PcCANControl:

The selected memory area is not free, or the selected interrupt is being used by another application. Make sure that no conflicts exist on your system. If you get a blue screen under Win NT it is most likely that a memory or IRQ conflict is occur.

PcCANControl launches correctly, but CAN access is not possible:

A) Check the transceiver cable and CAN connectors, are all connectors are correctly plugged in?

B) If the sub-min-D connectors at the end of the cables are hot, remove the Key and call I+ME.

*C) If you use **higher baudrates** (< 100kBaud), remember to protect the end of line with **resistors** [120 Ohm]*

D) It is possible that the CAN line driver is defect, after you have a short curcuit or high current on bus.

4.3 Solutions for PCI-Intellican

Problems under Windows 2000:

The SW installation is successful and the card is inserted correct but no communication is possible

- Try to plug in the card into an other PCI port.

The SW installation is successful and the card is detect correct but no communication is possible

General problems with ACPI exist, one of the next cases can help.

- Use the latest SP from Windows 2000.
- Disable the "Assign IRQ for USB" (similar Text possible) in BIOS. The BIOS map this IRQ to a common IRQ, the IRQ for USB is set by Windows 2000 special, so the funktion of USB has no restrictions. **Note:** These case is not possible by all PC's.
- Force a Window 2000 conform mapping by blocking the PCI-plug&play mechanism into the BIOS settings: Set under "PNP/ISA Configuration" the "Resource controlled by manual" funktion, after this set all but one IRQ's to "Legacy ISA".

Tips to last point:

Check the IRQ under Windows 2000 device manager. Choose "view" and then "Reource to connections". There is a list of all IRQ's of PCI/ISA devices. All PCI-devices should be set to one IRQ (by activ ACPI !). You should choose the

IRQ with the most entries in list. Use these IRQ to set him into the BIOS to PCI/ISA PNP.

- Disable of the ACPI interface.

Note:

Depends on BIOS type (AMI, AWARD, Compaq,...)

Depends on ServicePack you use.

General:

If you will disable the ACPI mechanism you **must first** disable it under Windows 2000 and then disable it into BIOS. If not, Windows 2000 will never restart correct.

If you have install the SP1 from Win2000 this BIOS settings are not necessary.

*For more infos please contact our
After Sales Service.*

In this mode our PCI-card works, if the IRQ is shared or not.

1 Glossary

Glossary

ACPI

Advanced Configuration and Power Interface.

Managing the Powersystem of you computer. New since Windows 2000.

CAN

Controller Area Network
Fieldbus network system useful in EMV critical environment

-BCAN

Basic-CAN

The used chip has only a small buffer structure. All filter has to be defined in software and have to managed by the application.

-ECAN

Extended-CAN

The used chip supports extended identifiers (CAN 2.0B / 29bit IDs)

-FCAN

Full-CAN

The used chip has an internal buffer structure with mailbox architecture and supports Remote Frames.

-SCAN

Standard-CAN

The used chip supports standard identifiers (CAN 2.0A / 11bit IDs)

BIOS

Basic Input Output System

An abbreviation for Basic Input / Output System. A set

of instructions/routines stored in ROM. These routines work closely with hardware devices (memory chips, disk drives and monitor) to input and output interrupt requests indicating when a device is ready to accept or send data.

DPRAM

Dual Ported Random Access Memory.

The data for communication between PC and CAN-hardware are exchange via a DPRAM.

I/O

An abbreviation for Input Output. Refers to the sending (input) and receiving (output) of data through an 110 channel in the CPU. *Example:* The keyboard inputs data to the 110 channel in the CPU that in turn is output to the monitor.

IRQ

An abbreviation for Interrupt Request. A signal sent by a device and routed through the BIOS indicating when a device is ready to accept or send data.

PCMCIA

Personal Computer Memory Card

International Association. A trade association of leading hardware and software vendors, established to adopt a set of standards pertaining to adapter slots and PC cards for portable PC accessories.

Slot / Socket

A receptacle on a micro, portable, laptop or palmtop computer that is used to insert and operate PCMCIA PC Cards. Also referred to as a *Socket*.

Socket-Controller

A PC system hardware component that manages the operation of PCMCIA sockets in conjunction with system software.

Upper-Memory

Memory area within the PC address space between 640 KB and 1 MB. This area is used by hardware devices like graphics controller. The DPRAM of the CANcard is located in the Upper Memory.

For more information's ...

2 Literature

Literature

- [1] **PCCANControl User manual**
I+ME Actia documentation (available on WEB)

- [2] **LevelX User Manual**
I+ME Actia documentation (available on WEB)

- [3] **CAN - Controller Area Network**
Grundlagen und Praxis
Hüthig GmbH, Heidelberg
ISBN 3-7785-2263-7

- [4] **SAB 80C167CR User Manual**
Siemens AG

- [5] **SAB C167CR Description of the On-chip CAN-Module**
Siemens AG

- [6] **CiA**
DS 102-1CAN in Automation e.V
www.can-cia.com