
POSITIONING AND CONTOURING CONTROL SYSTEM APCI-8001 and APCI-8008

PCI Interface

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1 Introduction

Read and write accesses to PCI modules in the memory or I/O area can be provided via the universal object interface. Generally speaking, extensive knowledge of the module to be addressed is required with regard to the addresses, data content and functionality of the relevant accesses. These accesses are provided directly via the PCI bus, without interaction with the PC's operating system or system processor. This access method is referred to as bus mastering.

The "optionPCI" option must be included in RWMOS.ELF in order to use the PCI bus master function. Information about RWMOS.ELF is shown on the monitor screen of the diagnostic program fwsetup.exe when the control unit is booted.

2 Functions of the PCI option

2.1 Initialisation

Access to PCI resources on the PC is via the “universal object interface” of the APCI-8001 / APCI-8008. Here, the board runs PCI bus master accesses, i.e. direct access is provided without using the PC processor and without calls under Windows or Linux. The following values for the universal object interface must be used for accesses to the PCI area:

Table 1: Object descriptor elements

Object descriptor element	Value
Handle	Must be initialised with 0 when starting the application or after rebooting the control unit and is then managed/used by the system. For PCAP programming: After the PCI functionality is cleaned, the handles for all elements must be reset to zero.
BusNumber	100 Access to the PCI I/O area 200 Access to the PCI memory area
DeviceNumber	Device ID: Vendor ID The device ID must be specified in the more significant 16 bits of the DeviceNumber and the vendor ID of the module to be addressed in the less significant 16 bits.
Index	Card no.: Map register The index of the module with the above-specified device ID/vendor ID must be specified in the more significant 16 bits of “Index”. The index of the 1 st board of this type is always 1. If only one board of the type specified above exists on the PC, the value 0001 must be entered here. The number of the address map register to be used must be specified in the less significant 16 bits of “Index”. Here, numbering starts at 0.
SubIndex	Byte offset The byte offset for the base address specified in “Index” must be entered in the subindex.

Further information on the object descriptor elements can be found in the document “Universal Object Interface”.

2.2 Using PCI bus master accesses

PCI read requests from a high-level computer language are provided with the “rdOptionInt” and/or “rdOptionDbl” functions. The relevant object descriptors must be defined in advance. In so doing, it should be carefully ensured that the correct data type is always selected in the “Data-Type” field since otherwise the data may be read with an incorrect word width. Only 64-bit floating point numbers are read with the “rdOptionDbl” function; access to all other data types must be via “rdOptionInt”.

PCI write requests are provided using the “wrOptionInt” or “wrOptionDbl” function. Otherwise, the statements above apply.

Corresponding variables are defined with the AT specifier for accesses in the SAP programming language. Depending on the declaration, a read or write access to these variables can be enabled.

An example of this is the include file “PCI_AT_SPECS.INC”. Furthermore, there are SAP sample programs for various modules.