See the Big Picture

ibaPDA-Request-HPCi

System Overview

Manual

Issue 1.7

Measurement and Automation Systems

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The content of this publication has been checked for compliance with the described hardware and software. Nevertheless, deviations cannot be excluded completely so that the full compliance is not guaranteed. However, the information in this publication is updated regularly. Required corrections are contained in the following regulations or can be downloaded on the Internet.

The current version is available for download on our web site http://www.iba-ag.com.

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1 About this manual

This manual describes in detail the use of the product *ibaPDA-Request-HPCi*.

1.1 Target group

This manual addresses in particular the qualified professionals who are familiar with handling electrical and electronic modules as well as communication and measurement technology. A person is regarded to as professional if he/she is capable of assessing safety and recognizing possible consequences and risks on the basis of his/her specialist training, knowledge and experience and knowledge of the standard regulations.

1.2 Basic knowledge

The following knowledge is required for the operation of the software ibaPDA-Request-HPCi.

- ❑ Basic knowledge of Windows operating system
- ❑ Basic knowledge of operating web browsers
- ❑ Basic knowledge of ibaPDA-V6
- ❑ Knowledge of system HPCi / P80i

1.3 Notations

In this manual the following notations are used:

Action	Notation
Menu command	Menu *Logic diagram*
Call of menu command	*Step 1 – Step 2 – Step 3 – Step x* Example: Select menu *Logic diagram – Add – New logic diagram*
Keys	<Key name> Example: <Alt>; <F1>
Press keys simultaneously	<Key name> + <Key name> Example: <Alt> + <Ctrl>
Buttons	<Button name> Example: <OK>; <Cancel>
File names, Paths	„File name“, „Path” Example: „Test.doc“

1.4 Symbols used

If safety instructions or other information are used in this manual, they mean:

⚠ DANGER

The non-observance of this safety information may result in an imminent risk of death or severe injury:

- By an electric shock!
- Due to the improper handling of iba software products which are coupled to input and output procedures with control function!

If you do not observe the safety instructions regarding the process and the system or machine to be controlled, there is a risk of death or severe injury!

⚠ WARNING

The non-observance of this safety information may result in a potential risk of death or severe injury!

⚠ CAUTION

The non-observance of this safety information may result in a potential risk of injury or material damage!

Note

A note indicates special requirements or actions to be observed.

Important information

Information that a special indication has to be observed, e.g. exceptions from the general rule.

Tip

Tip or example which serves as helpful information or a trick to facilitate the work.

Other documentation

Reference to supplementary documentation or further literature.

2 System Overview

2.1 Introduction

This document describes the *ibaPDA-Request-HPCI* request interface. This is an interface between *ibaPDA* and the ALSPA C80 HPCi system of GE Energy - Power Conversion (formerly known as Converteam). It provides *ibaPDA* with symbolic access to all signals defined in the HPCi system. The user can change the list of signals he wants to measure without having to change anything in the HPCi system. The system has been designed to be as user-friendly and flexible as possible. The next chapters will explain how this is achieved.

2.2 Connection between HPCi and ibaPDA

An HPCi system consists of 1 or more controllers. Each controller is a VME-rack. A controller can contain up to 4 CPUs. Every CPU has an Ethernet connection. An agent called DASAGNT (data acquisition system agent) needs to be loaded on every CPU. *ibaPDA* communicates with these agents via TCP/IP. The agents are responsible for cyclically sending the requested signals to *ibaPDA*. They can use different data interfaces to send the data over.
Currently 4 interfaces are supported:

- the CC100 system (based on DGM200 hardware)
- iba SM128V boards and ibaLink-VME board in SM128 compatibility mode
- Reflective memory 5576 and 5565 boards of GE/ABACO.
- ibaLink-VME in P2P mode D

Figure 1 shows all possible connections between the HPCi system and ibaPDA.

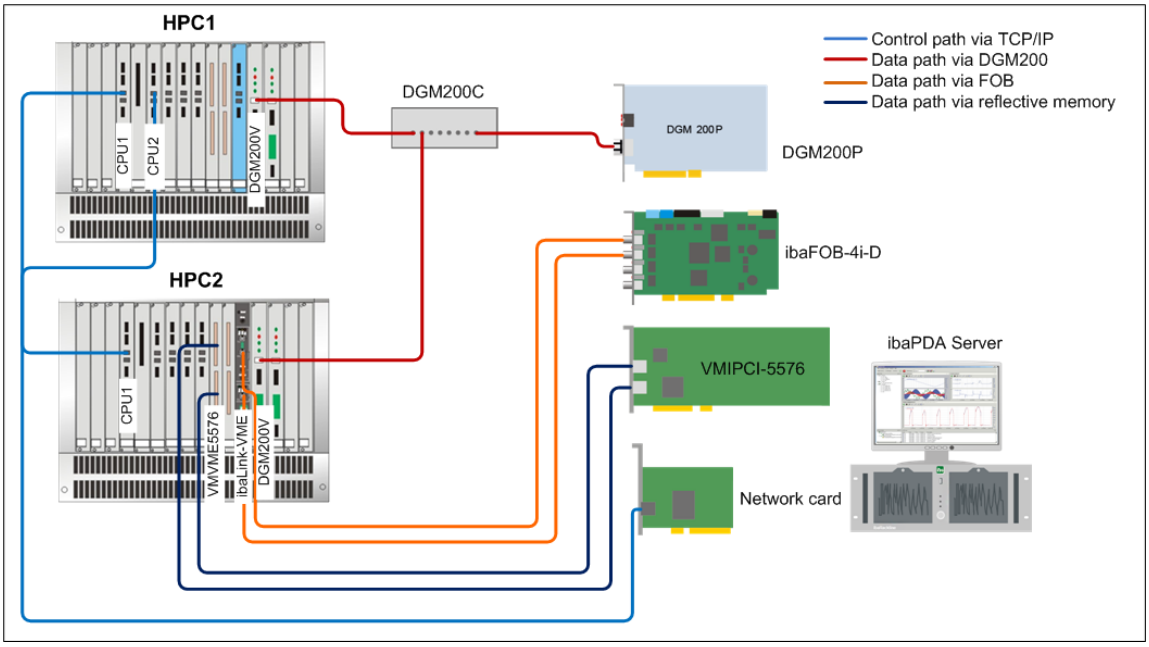


Figure 1: Connections between the HPCi system and ibaPDA

The agents announce their presence via IP multicast. Every 10 seconds they send a status message to a predefined multicast group. This message contains amongst others the name of the CPU, its IP-address and the data interfaces that are available. *ibaPDA* joins the multicast group and listens for these status messages. When *ibaPDA* receives a multicast status message it makes a TCP connection to the agent. This connection is called the control path. The agent will now send the status messages via the TCP connection instead of via multicast. *ibaPDA* responds to the status messages with another status message. This exchange of status messages acts as a watchdog. If *ibaPDA* or the agent doesn't receive a status message every 10 seconds then the connection is closed.

Once the control path is established *ibaPDA* tries to establish the data path. It tries to find the data interfaces in the PC that corresponds with the data interfaces the agent has. *ibaPDA* sends a data path discovery message to the agent. The agent then writes a certain pattern onto the data interface. *ibaPDA* then tries to find that pattern on the boards in the pc. This process is repeated for all data interfaces reported by the agent. This system of automatic discovery of the data path makes the system a lot easier to use because the user doesn't have to configure the data path on the pc.

The user can browse a list of all HPCi signals in *ibaPDA*. He can make a selection of all the signals he wants to measure. He can also decide how fast he wants to measure each signal. There are 4 time classes available (default: 1 ms, 5 ms, 10 ms and 100 ms). When the user starts the measurement *ibaPDA* will send the list of signals via the control path to the agent. The agent will check if all signals are available. He will also check if the sending of the data will not overload the CPU.

↗ See also 3.2.3 Changing the Default Overload Protection Limits

If everything is ok then the agent will start sending the data via the data path to *ibaPDA*.

3 HPCi Side

3.1 Prerequisites

Version 3.3.x or higher of HPCi is required for the HPCi request system. Further Version 2.46 of the HPC-HWC-Tool and Version V1.1.0 of the “DASAGNT”-HPCi-driver are required.

3.2 DASAGNT

The DASAGNT is an HPCi-driver written by GE Energy - Power Conversion Berlin. It’s automatically selected if an SM128V, VMIC 5576/5565 or DGM200V board is inserted into the hardware configuration.

3.2.1 Changing Network Interface for Control Path

By default the primary network interface of the HPCi CPU is used for TCP/IP communication with the *ibaPDA* PC.

DASAGNT0.INI can be adapted to use a specific network interface. The steps below describe how to select the network interface which is used for the control path.

1. Open the file DASAGNT0.INI, which is located at “*P80_project-name*.CTRL\Advanced\Configuration\”
2. Select a specific network interface by adapting the variable *ETHIF*
   - fei0 → primary network interface
   - fei1 → secondary network interface
3. Increase the variable *BUILDNO* by one (1), so P80i will notice the settings are changed.
   In P80i:
   - Right-click on the CPU → Build all
   - Right-click on the CPU → Online → Load & Restart
4. Restart system

3.2.2 Changing Multicast Address

1. Open the file DASAGNT0.INI, which is located at "*P80_project-name*.CTRL\Advanced\Configuration\".
2. Assign a multicast address to the variable *MULTICAST_IP.*
3. Increase the variable *BUILDNO* by one (1), so P80i will notice the settings are changed.
   In P80i:
   - Right-click on the CPU → Build all
   - Right-click on the CPU → Online → Load & Restart
4. Restart system.
5. Generate the addressor by means of the Address book Builder.
6. Open the file TOC.INI, which is located in the Address book directory.
7. Assign the same multicast address as in DASAGNT0.INI to the variable *AGENT_MULTICAST_IP*.
8. Increase the variable *FileVersion* by one (1), so *ibaPDA* will notice the settings are changed.

3.2.3 Changing the Default Overload Protection Limits

1. The DASAGNT driver has a build-in overload protection to prevent CPU overload by requesting too many signals. The default limit for the load caused by the DASAGNT itself is 30 %. The DASAGNT is calculating this value based on a 1 µs VME transfer time per 4 bytes of data. The DASAGNT checks also if the **total load** will not exceed 90 %. (**Total load** = load caused by the application and estimated load of the DASAGNT itself).
2. To change these default limits, open the file DASAGNT0.INI, which is located at "*P80_projectname*.CTRL\Advanced\Configuration\".
3. Following 2 parameters can be added/changed in the [GENERAL] section:
   - MAX_ALLOWED_LOAD=30
   - MAX_SYSTEM_LOAD=90
4. The above mentioned values are the default values for the load limits in percentage.
   - MAX_ALLOWED_LOAD is the limit for the DASAGNT load.
   - MAX_SYSTEM_LOAD is the total load limit.
5. After changing one of these values, increase the variable *BUILDNO* by one (1), so P80i will notice the settings are changed.

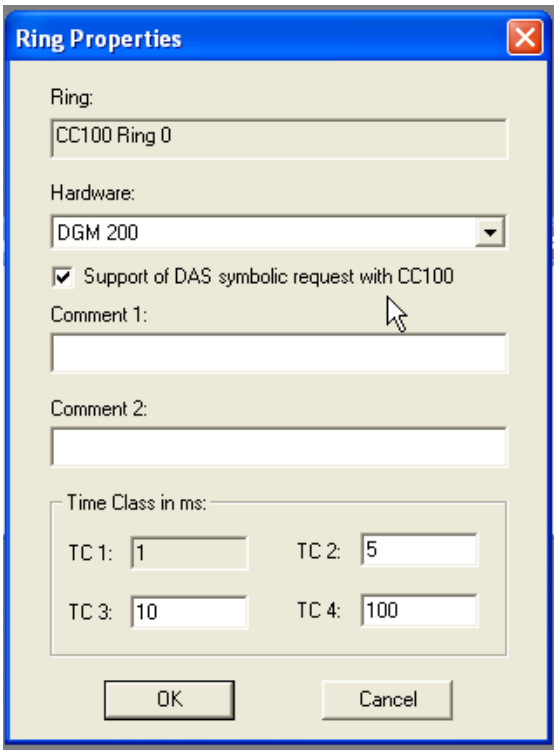
3.3 Hardware Definition

The next step is the definition of the hardware that will be used to transfer the data to *ibaPDA*. There are 4 options: DGM200V/DGM200P, iba SM128V boards (or ibaLink-VME in SM128 mode), reflective memory 5576/5565 boards and the ibaLink-VME board in P2P mode. The DGM200 cannot be used in combination with SM128V or reflective memory. The SM128V and reflective memory boards can be used together. The ibaLink-VME which simulates a reflective memory board cannot be used together with a real reflective memory board.

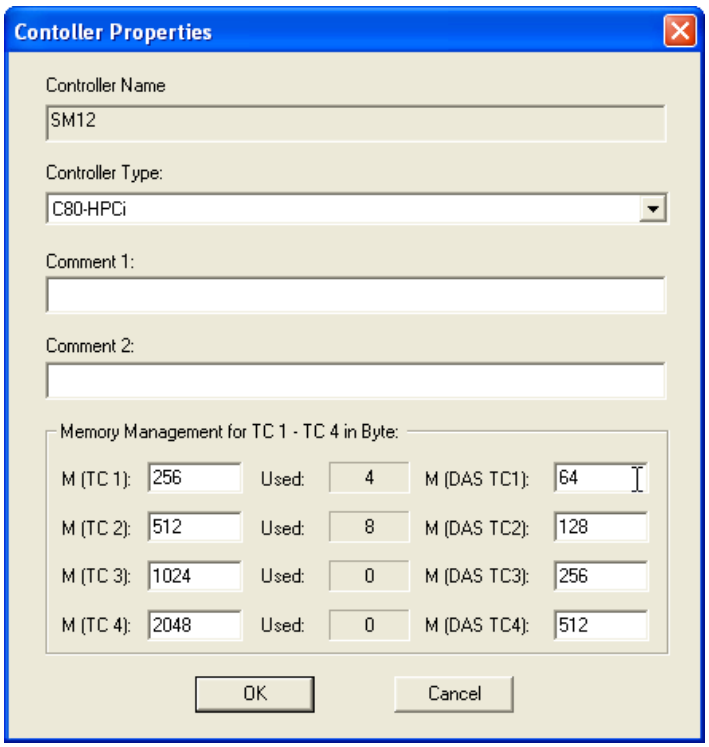
3.3.1 CC100/DGM200

DGM stands for Deterministic Global Memory and is a new hardware platform for the CC100 network. The CC100 network has a star topology with in the center the concentrator DGM200C. The DGM200V is the VME board that goes into the HPCi rack. The DGM200P is the PCI board that goes into the *ibaPDA* pc.

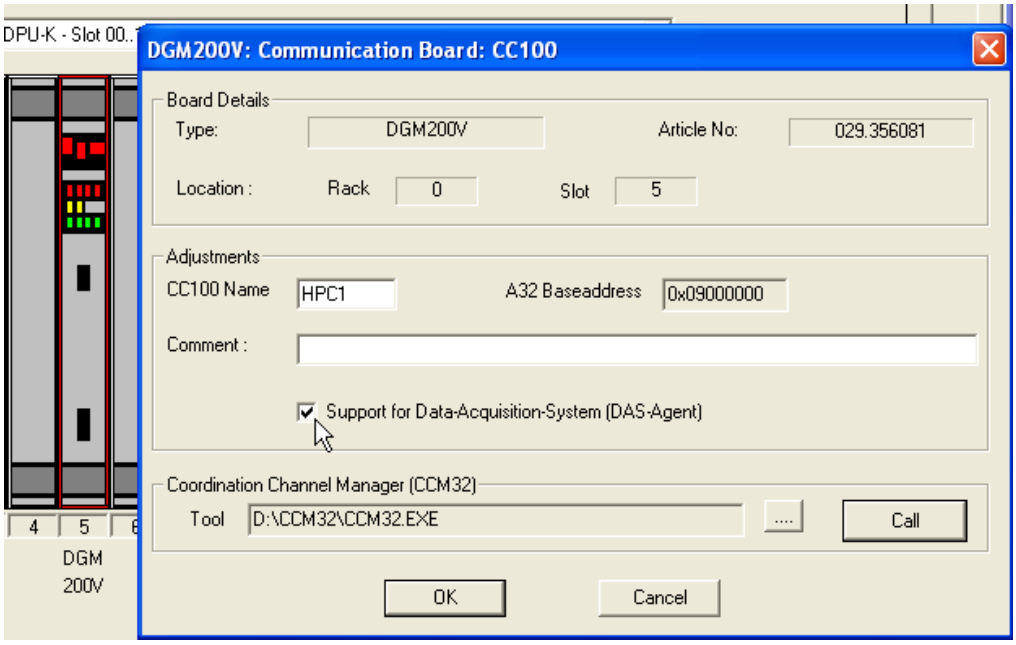
The Coordination Channel Manager program (CCM32.exe) is used to configure the CC100 network. Version 2.17a or higher of CCM is required. On the ring properties you have to enable support for HPCi request by checking the *Support of DAS symbolic request with CC100* checkbox.



In the properties of each controller on the DGM network you have to reserve some space for the DASAGNT. For each time class you have to specify how many bytes you want to use to transfer HPCi request data. You do this by filling in the DAS column on the controller properties dialog.



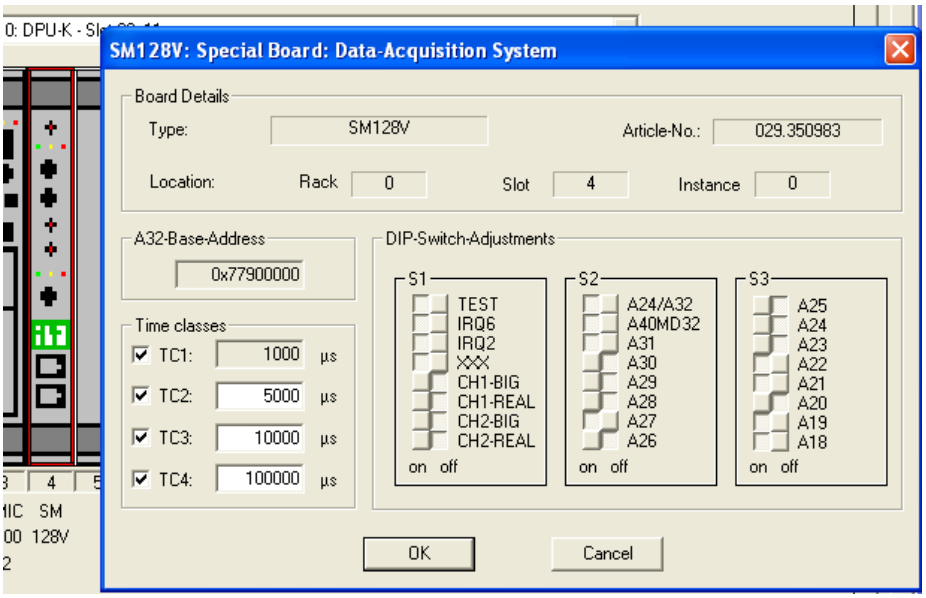
Finally you have to enable HPCi request support in the properties of the DGM200V board in the P80i hardware configuration tool. You do this by checking the checkbox called *Support for Data-Acquisition-System (DAS-Agent)*. This will enable the DGM to be used by the DASAGNT.



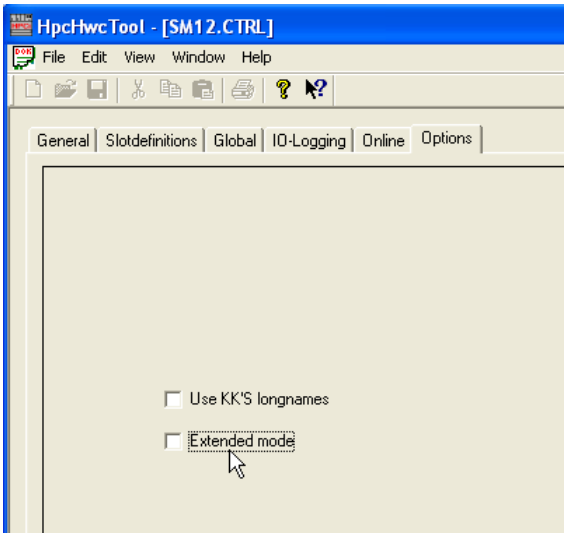
3.3.2 iba SM128V

The ibaLink-SM-128V-i-2o (short SM128V) board is a VME board that has 2 fiber optical output channels and 1 fiber optical input channel. Only the 2 output channels are used by HPCi request. Each channel can transfer 264 bytes of data. 8 bytes are always reserved for digital values. The other 256 bytes can be used for both analog and digital values. There are 4 SM128V boards supported in one rack.

The only thing you have to do to use the SM128V for HPCi request is add one or more SM128V boards to the hardware configuration of your P80i project.



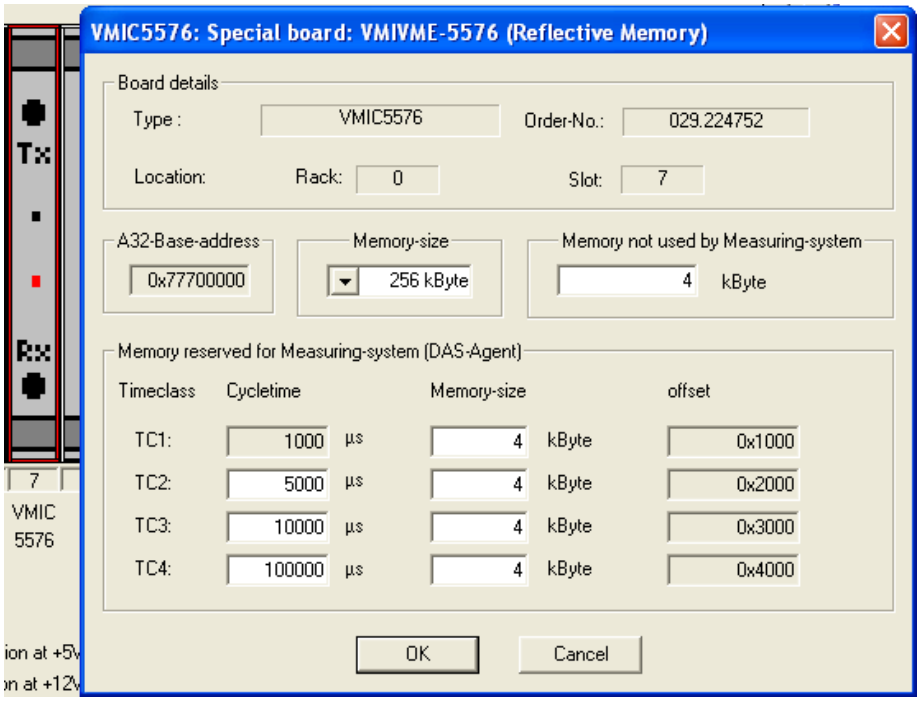
The VME base address is normally calculated by the hardware tool. If you want to change it then you have to enable extended mode in the hardware tool. The dialog also shows you how to set the DIP switches on the board. The 2 channels must be set to big-endian mode otherwise the data will arrive swapped on the FOB board in the pc.



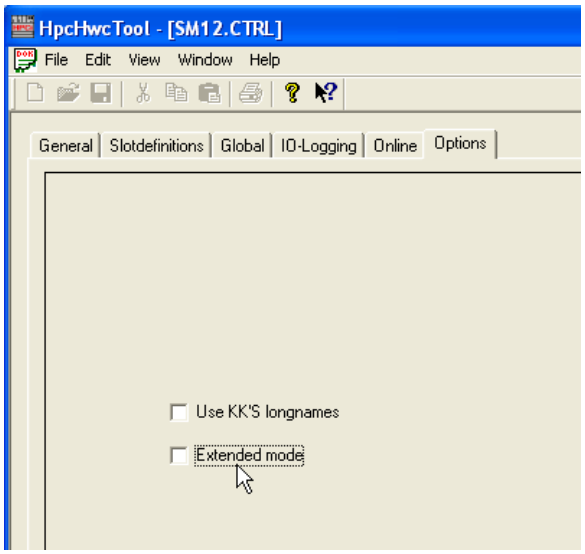
In the properties of the SM128V board you can also set the 4 different time classes. You can decide which of the time classes can be used on this board. The easiest way is to just select all of the time classes. *ibaPDA* will distribute all requested signals from all time classes over the SM128V boards automatically.

3.3.3 Reflective Memory

The reflective memory boards VMIC5576 and VMIC5565 are supported. The only thing you have to do to use the reflective memory board for HPCi request is add the VMIC5576 or VMIC5565 board to the hardware configuration of your P80i project.



The VME base address is normally calculated by the hardware tool. If you want to change it then you have to enable extended mode in the hardware tool.



You must setup the correct memory size of the board. You also have to configure how much memory is used by the application and how much memory can be used by the HPCi request system for the 4 time classes.

If you are using the VMIVME-5576 board then you must set the swap mode of the board VMIPCI-5576 **in** *ibaPDA* to *Byte and word swap*. This is needed because the HPCi CPUs perform all VME-bus accesses in big-endian and the PC CPUs are little-endian. If you are using the VMIVME-5565 board then the swapping is done by the boards automatically.

3.3.4 ibaLink-VME board in P2P mode

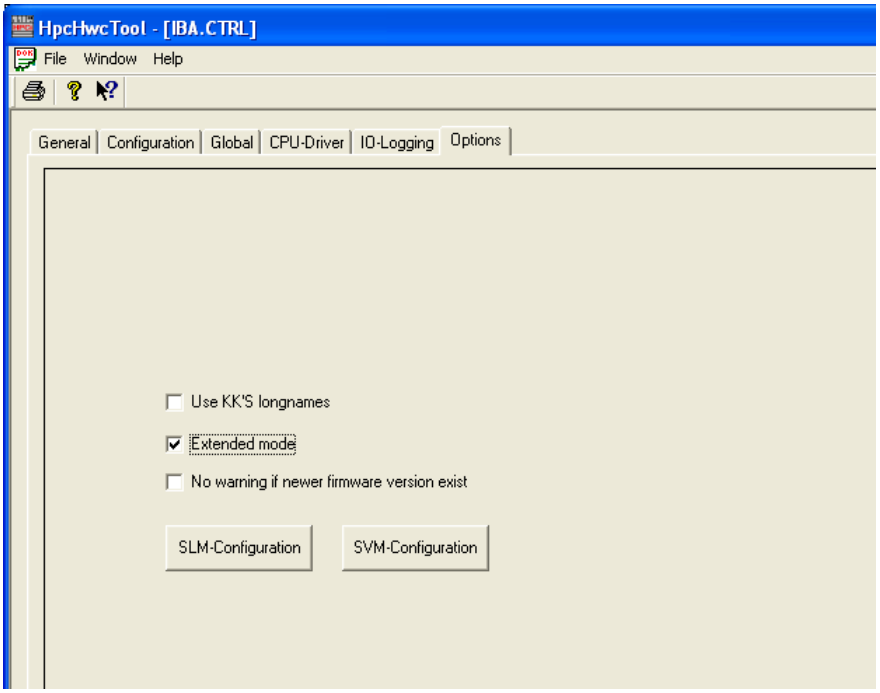
The ibaLink-VME board is a VME board that has 2 fiber optical output channels and 1 fiber optical input channel. Only **channel 1 output** is used by HPCi request.
The ibaLink-VME has to be set in P2P mode D.

Other documentation

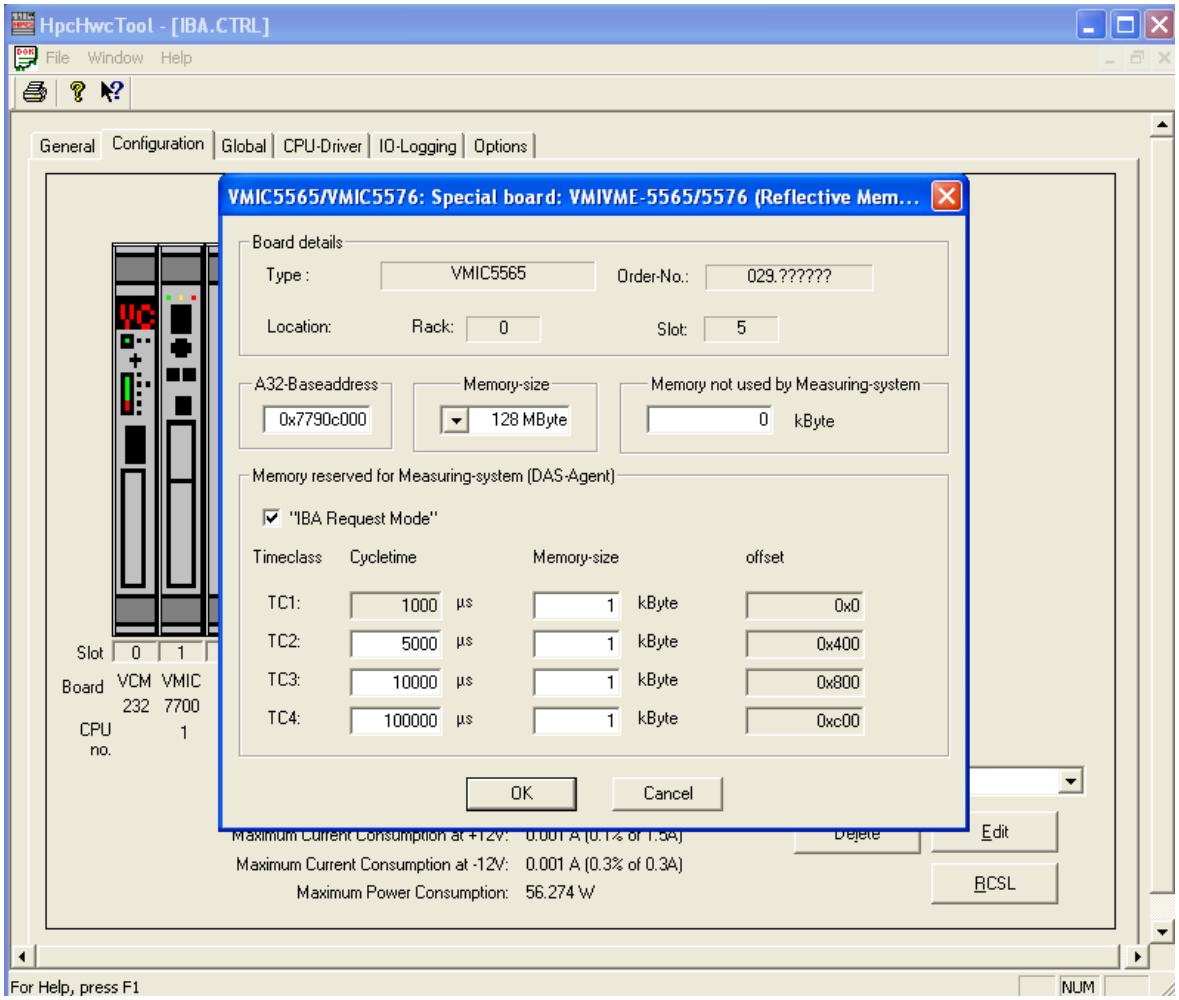
For more details about the different modes of the ibaLink-VME board, please refer the *ibaLink-VME* manual

Using this mode the *ibaLink-VME* can transfer 4024 bytes with 1.4 ms refresh rate.
These 4024 bytes can be used for both analog and digital values.
The *ibaLink-VME* is not natively supported by the DASAGNT driver.
To be able to use the *ibaLink-VME*, we declare the *ibaLink-VME* in the HPCi hardware configuration as a reflective memory VMIC5565 board.
So from the point of view of the DASAGNT, the *ibaLink-VME* is treated as reflective memory and reported as such in loggings and reporting tools.
There is only 1 *ibaLink-VME* board supported in one rack. (Limitation due to the reflective memory simulation)

The only thing you have to do to use the *ibaLink-VME* board for HPCi request is add the VMIC5565 board to the hardware configuration of your P80i project.
But before doing this, you have to enable the Extended mode in the hardware tool as depicted below.



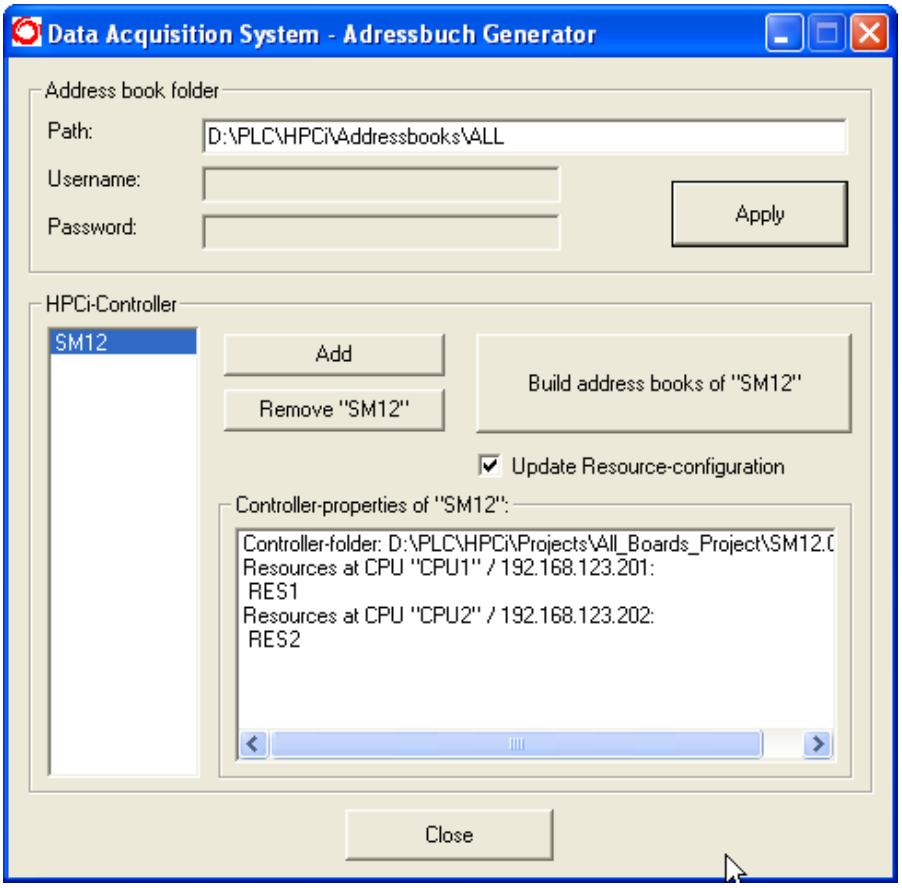
Add the VMIC5565 board in the hardware configuration and edit the properties as illustrated below:



- A32-Baseaddress : board base address + 0xC000
  Base address 0x77900000 is generally used as the base address of the first *ibaLink-VME* (see *ibaLink-VME* manual). However we have to add an offset of 0xC000 to it so the DASAGNT driver can access the P2P send buffer.
- Memory-size: 128 Mbyte
- Memory not used by Measuring-system:
  Set this value to 0 to be able to use the complete range of 4024 bytes
- “IBA Request Mode” must be checked
- Configure the memory-size for each time-class. Keep in mind that there are only 4024 bytes available, which is little less than 4 Kbyte.

3.4 DAS Address Book Builder

The DAS address book builder is a program developed by GE Energy - Power Conversion. It generates a system overview file called **`toc.ini`** and address book files for all controllers in the HPCi system. The executable file DAS_ADDRESSBOOKBUILDER.exe can be found in C:\HPCi_V2\Systemfiles.



The first thing you should do is selecting a directory where the address book files need to be generated. This directory must also be accessible from the PC where the *ibaPDA* server is installed. When you have selected the directory then click the <Apply> button. This will check the directory and generate an initial **`toc.ini`** file if there wasn't one in the directory or read it when it finds a **`toc.ini`** file.

Now you can add the controllers that make up your complete system. You do this by pressing the <Add> button. This opens a file open dialog. You have to select the P80i project for the controller there.

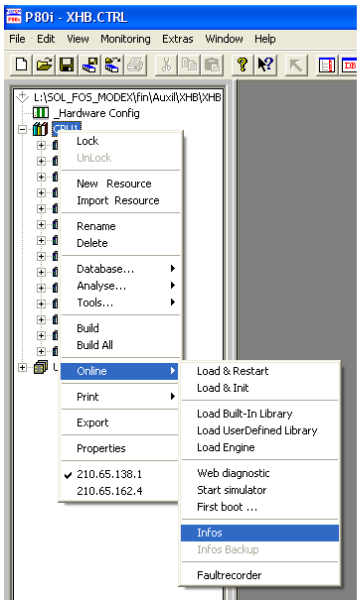
When you select a controller from the list on the left you can build its address books. If the number of resources or the names of the resources have changed then you must check the Update Resource-configuration checkbox. Click the <Build address books…> button to create the address books for the selected controller. There is one address book created per resource in the controller.

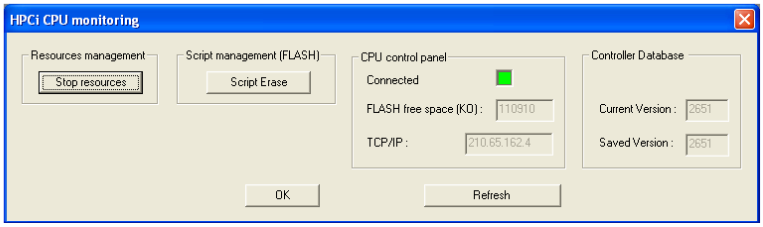
3.5 Useful P80i Functions

3.5.1 Script Erase

Script erase will delete all the data on the flash disk. To apply the erase the system needs to reboot.

Right-mouse click on *CPU - Online - Infos Script Erase*.

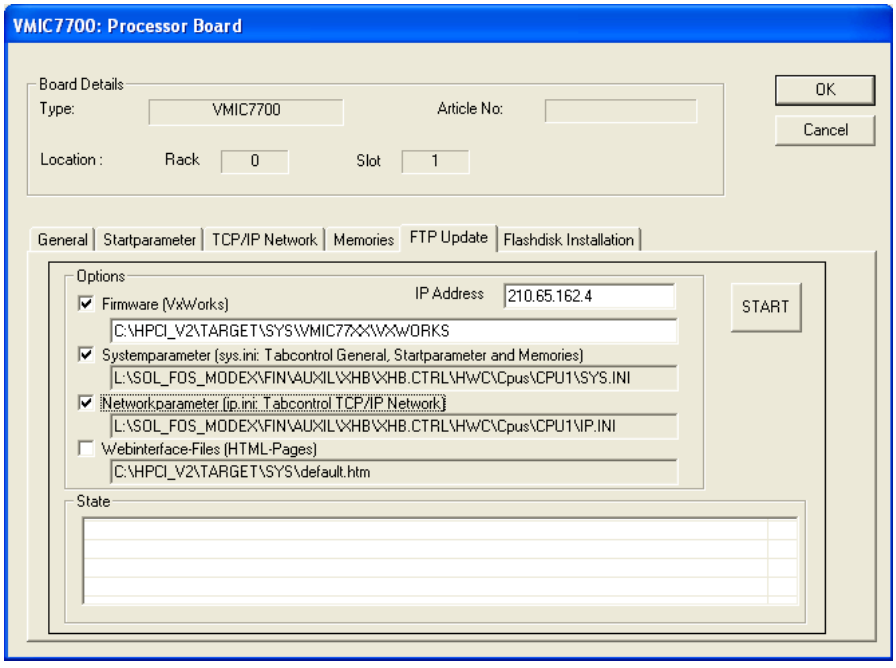




3.5.2 FTP Update

FTP Update can be used to load the VxWorks firmware, Systemparameters, Network-parameter and Webinterface Files into the HPCi CPU.

Hardware configuration - Double-Click on CPU - Select FTP Update tab.



4 ibaPDA Side

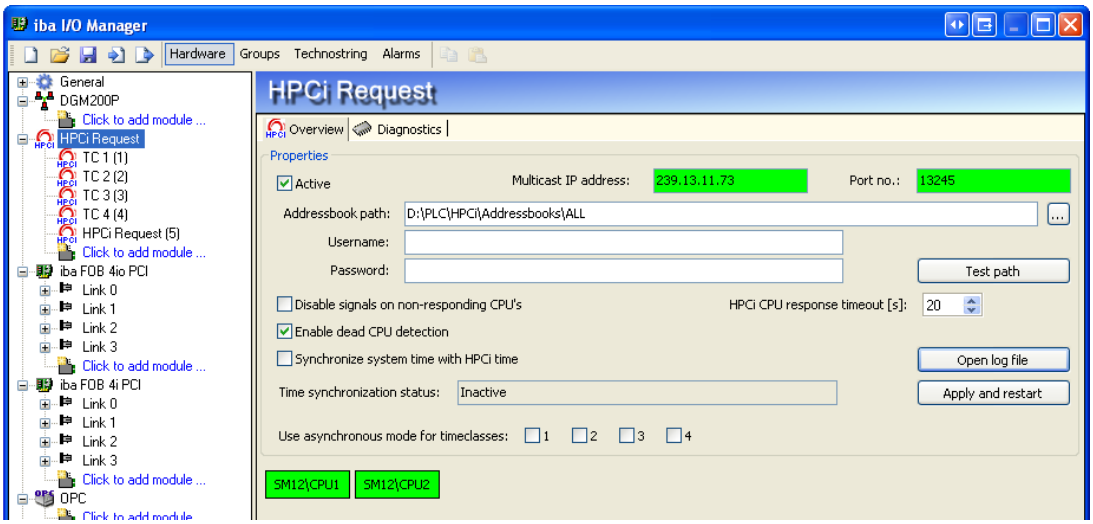
4.1 Prerequisites

ibaPDA version 6.9.0 or higher is required for HPCi request. You also need the HPCi request license in the dongle. If you use reflective memory for the data path then also a reflective memory license is required. If you use DGM200 for the data path then also a DGM200 license is required.
ibaPDA version 6.39.0 or higher is required to support the *ibaLink-VME* board.

4.2 HPCi Request Interface

If you have the HPCi request license (product name *ibaPDA-Request-HPCI*) then the HPCi request interface will appear in the *ibaPDA* I/O manager.

4.2.1 Configuration



The interface can be enabled or disabled with the *Active* checkbox. The first thing you must do is enter the path to the address books. You can then click the <Apply and re-start> button. You should then see all the CPUs that are configured in the system on the bottom. The color of the CPU corresponds to the status of the connection to the CPU. There are 3 possibilities:

- ❑ Red: There is no TCP connection and no data connection to the CPU
- ❑ Yellow: There is a TCP connection but no data connection to the CPU
- ❑ Green: There is a TCP connection and a data connection to the CPU

A CPU can also be flashing. This means that there is a connection to the CPU but it was not listed in the **`toc.ini`** file. This also means that there is no address book available for that CPU. If this happens then you should update the **`toc.ini`** via the das address book builder.

At the start of measurement all CPUs are polled. If the *Disable signals on non-responding CPUs* checkbox is checked and a CPU does not respond then the related signals will be deactivated and the measurement will be started without these signals. The use of this option is recommended during commissioning or maintenance works, when some HPCi stations are switched off. If this option is not enabled the measurement won't start until all CPUs have replied to the polling at start of measurement.

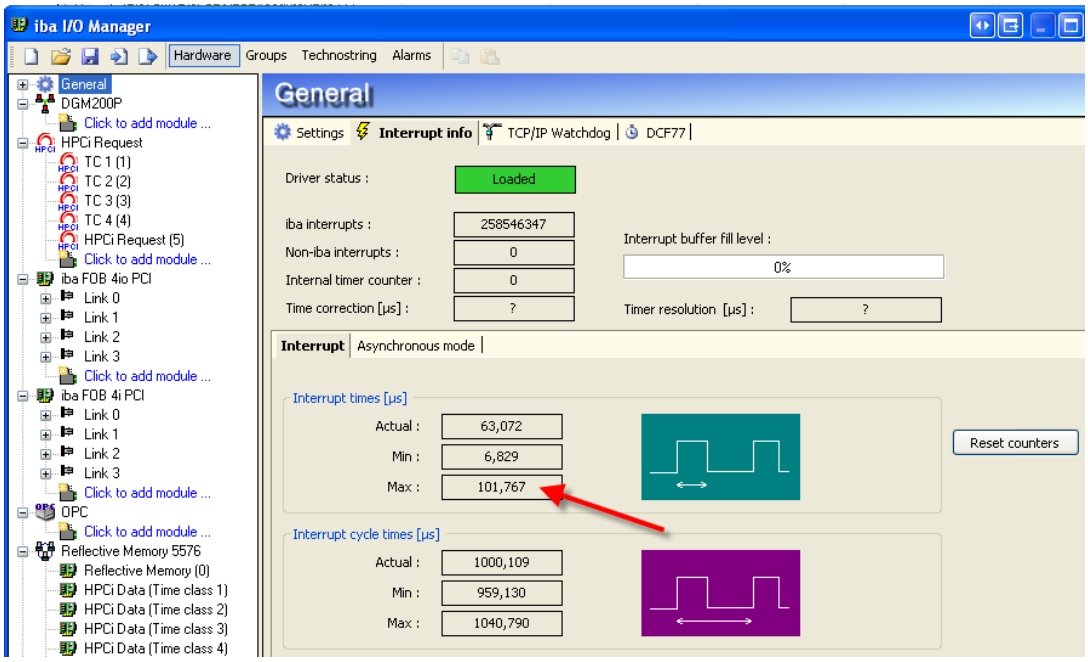
When *dead CPU detection* is enabled the measurement will stop as soon as the connection to one active CPU is lost. An active CPU is a CPU from which signals are being measured.

The system time of the *ibaPDA* PC can be synchronized with the HPCi system time. This option only works on DGM200. The **`toc.ini`** file has 2 entries in the CC100_INFORMATION section:

- UnixTimeSgmOffset gives the offset to the unix time on the DGM200.
- MicroTimeSgmOffset gives the offset to the microsecond counter on the DGM200.

One of the HPCi CPUs must write the time information to those offsets.

The asynchronous mode setting for the time classes determines when the driver of *ibaPDA* will copy data from the boards. If asynchronous mode is off then the data is copied during the interrupt service routine. If asynchronous mode is on then the data is copied on a separate thread outside of the interrupt service routine. Normally asynchronous mode should be off. Asynchronous mode is only needed when the interrupt service routine takes more than 1000 µs to copy all the data from the boards. You can check this by going to the general node in the I/O manager and checking the Interrupt info tab.



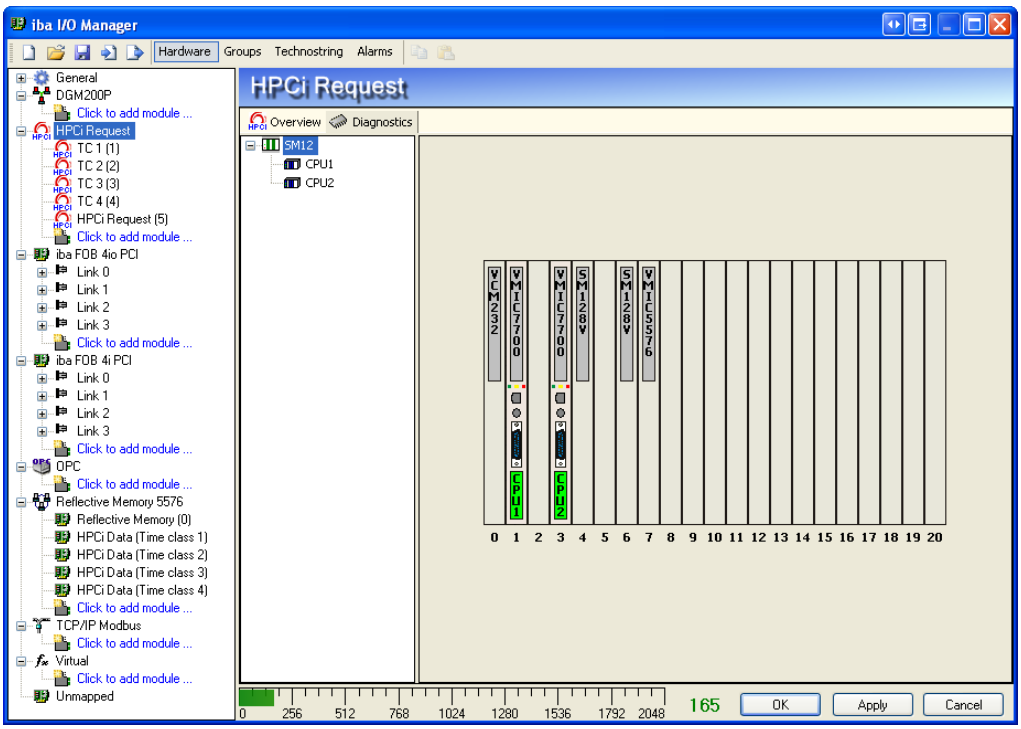
If the maximum interrupt time is larger than 1000 µs then you should enable asynchronous mode for time class 4. Restart the measurement and check the maximum interrupt time again. If it is still larger than 1000 µs then try enabling asynchronous mode also for time class 3. Finally you can also enable asynchronous mode for time class 2 if it is necessary.

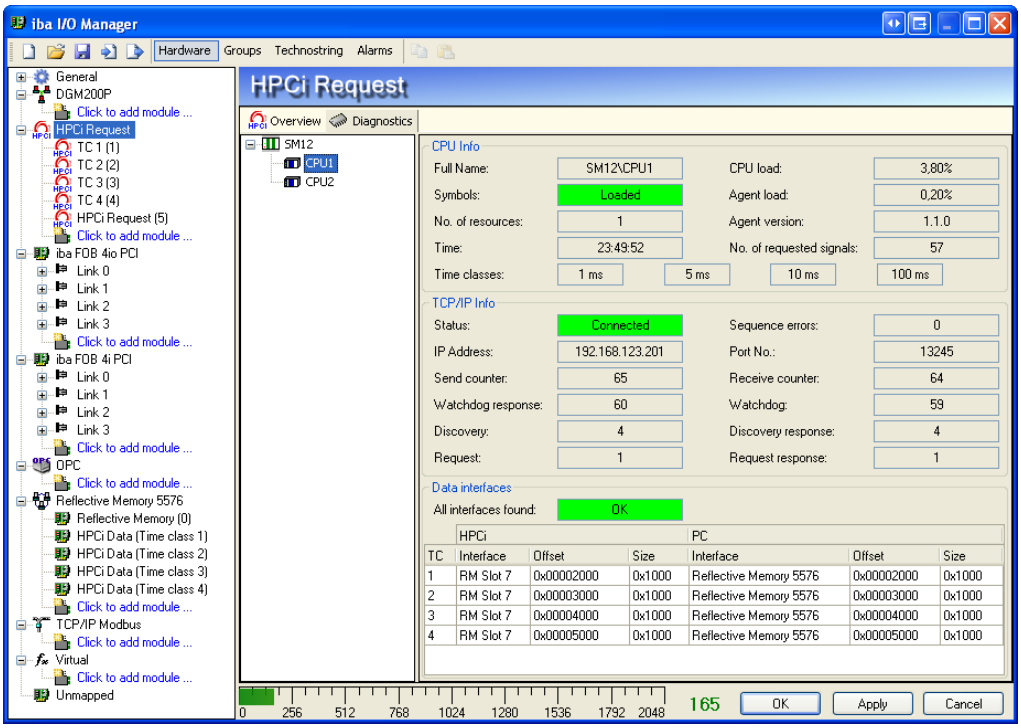
Tip

If using a reflective memory 5565 board, it is highly recommended to always use the asynchronous mode for time classes 2, 3 and 4.
This board supports DMA which can transfer data with much less CPU overhead.

4.2.2 Diagnostics

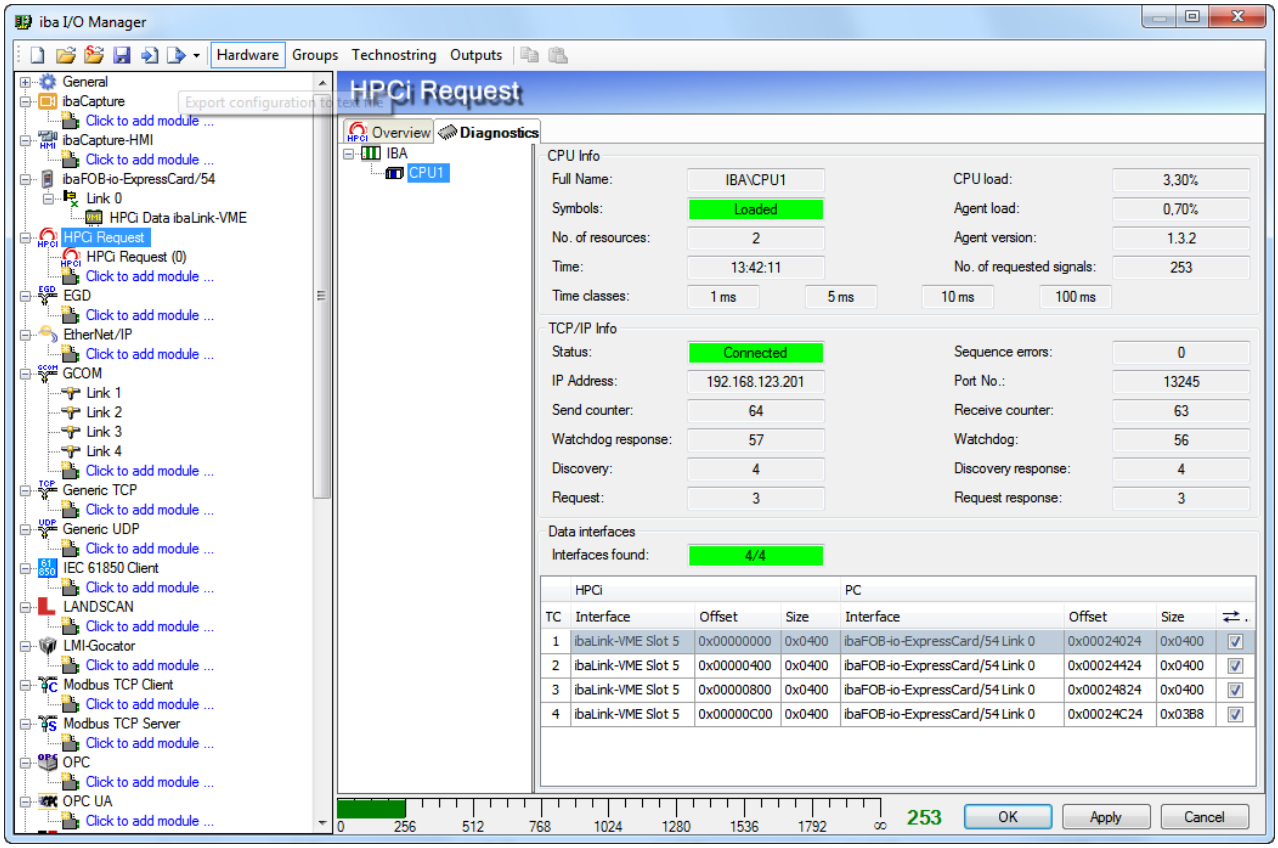
On the diagnostics tab of the HPCi request interface you can find some extra diagnostic info. Connected CPUs send the rack configuration in their status messages. This rack configuration is shown on the diagnostics tab.





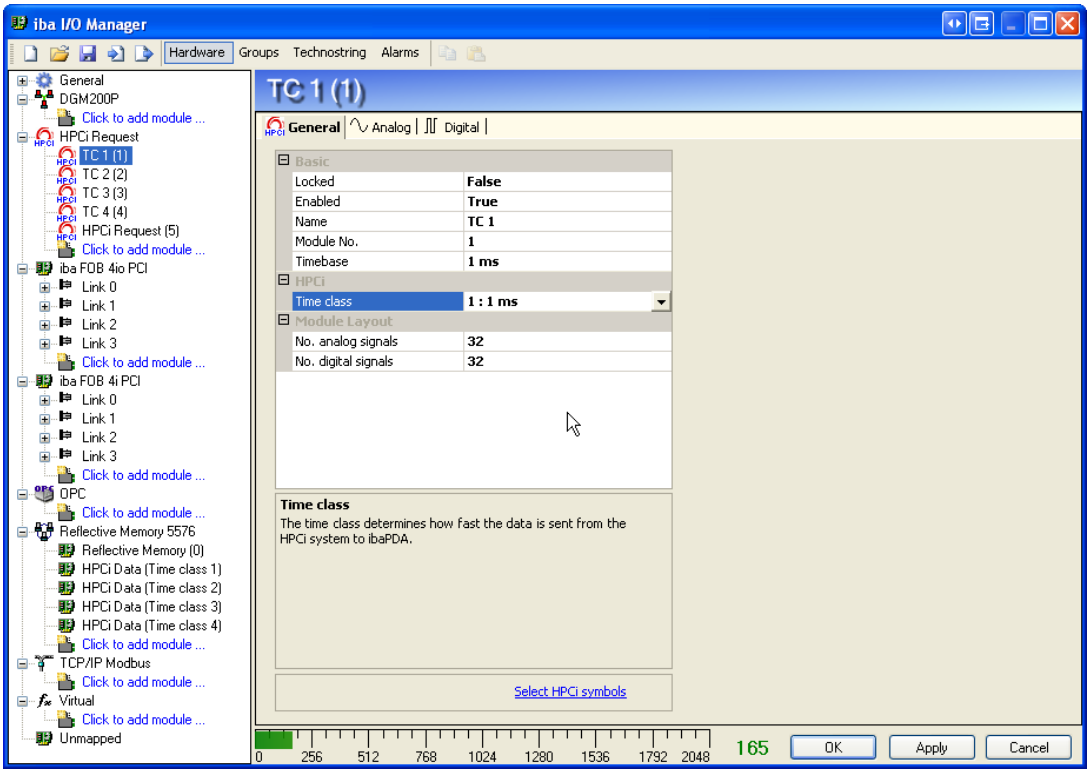
If you select the CPU in the tree then you get some extra information about it. You can view the CPU load and the load generated by the agent. You can see the status of the TCP connection and you can also see the data interfaces on the HPCi side and their counterparts on the PC side.

The example below shows the use of the *ibaLink-VME* board on the HPCi side and the *ibaFOB-io-ExpressCard* in a portable PC.



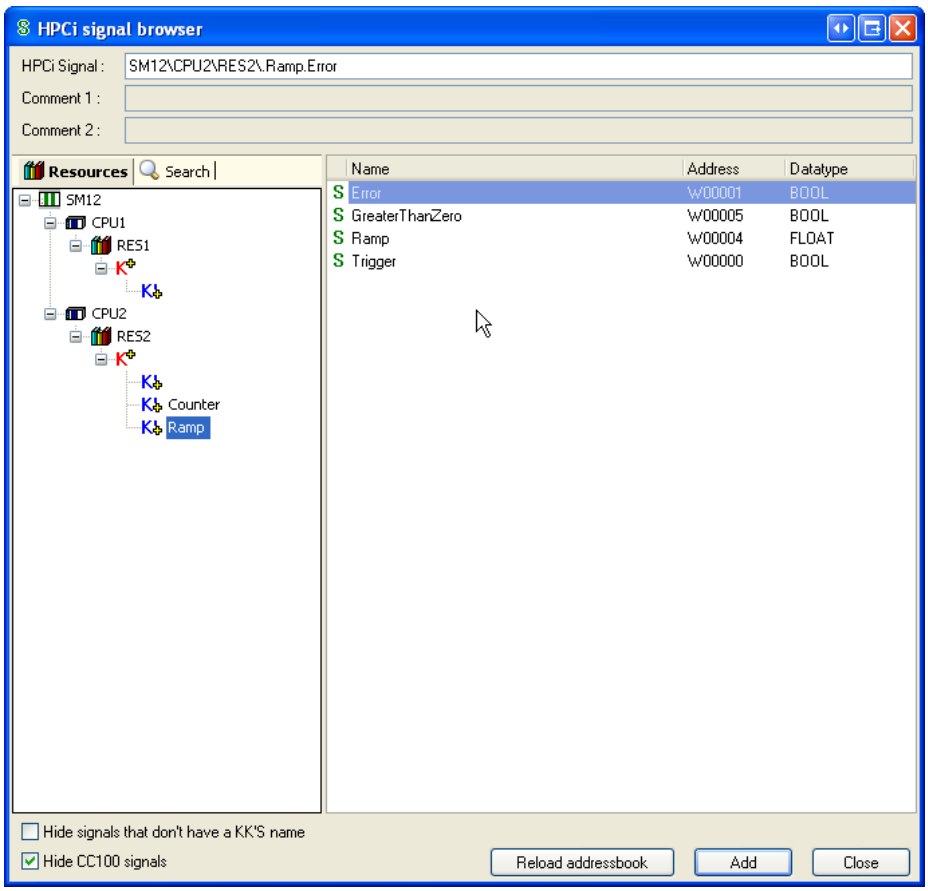
4.3 HPCi Request Module

You can add HPCi request modules to the HPCi request interface.



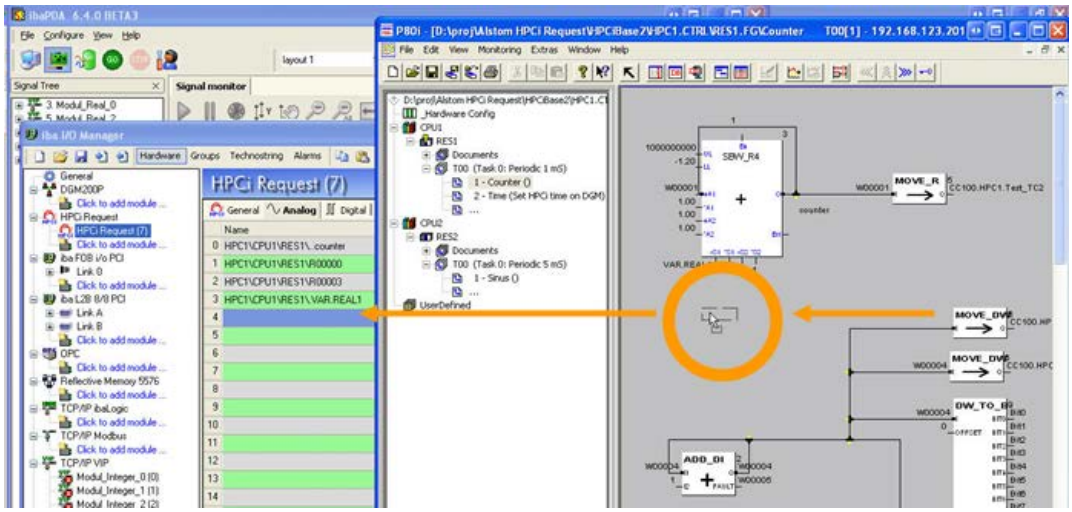
On the general tab of the module you have to select the time class. The time class is the rate at which the DASAGNT driver will send the data for this module to *ibaPDA*. The time base is the rate at which *ibaPDA* will sample the data it receives from the DASAGNT. Usually time class and time base are set to the same value.

You can also select the number of analog and digital signals. Values between 0 and 1000 are valid. When you click on the *Select HPCi symbols* hyperlink the HPCi signal browser will open.



In the signal browser you see the controllers, CPUs and resources on the left. On the right you see the signals. You can double-click on a signal to add it to the module. You can also select multiple signals by holding CTRL or SHIFT while selecting. When you click the <Add> button all selected signals are added to the module. On the search tab you can search through all the available signals.

An alternative way of selecting signals is by using drag & drop between P80i and the *ibaPDA* client. If the *ibaPDA* client is installed on a pc where P80i is also installed then you can open your project in P80i and just drag the signals you want to measure from P80i to *ibaPDA*.



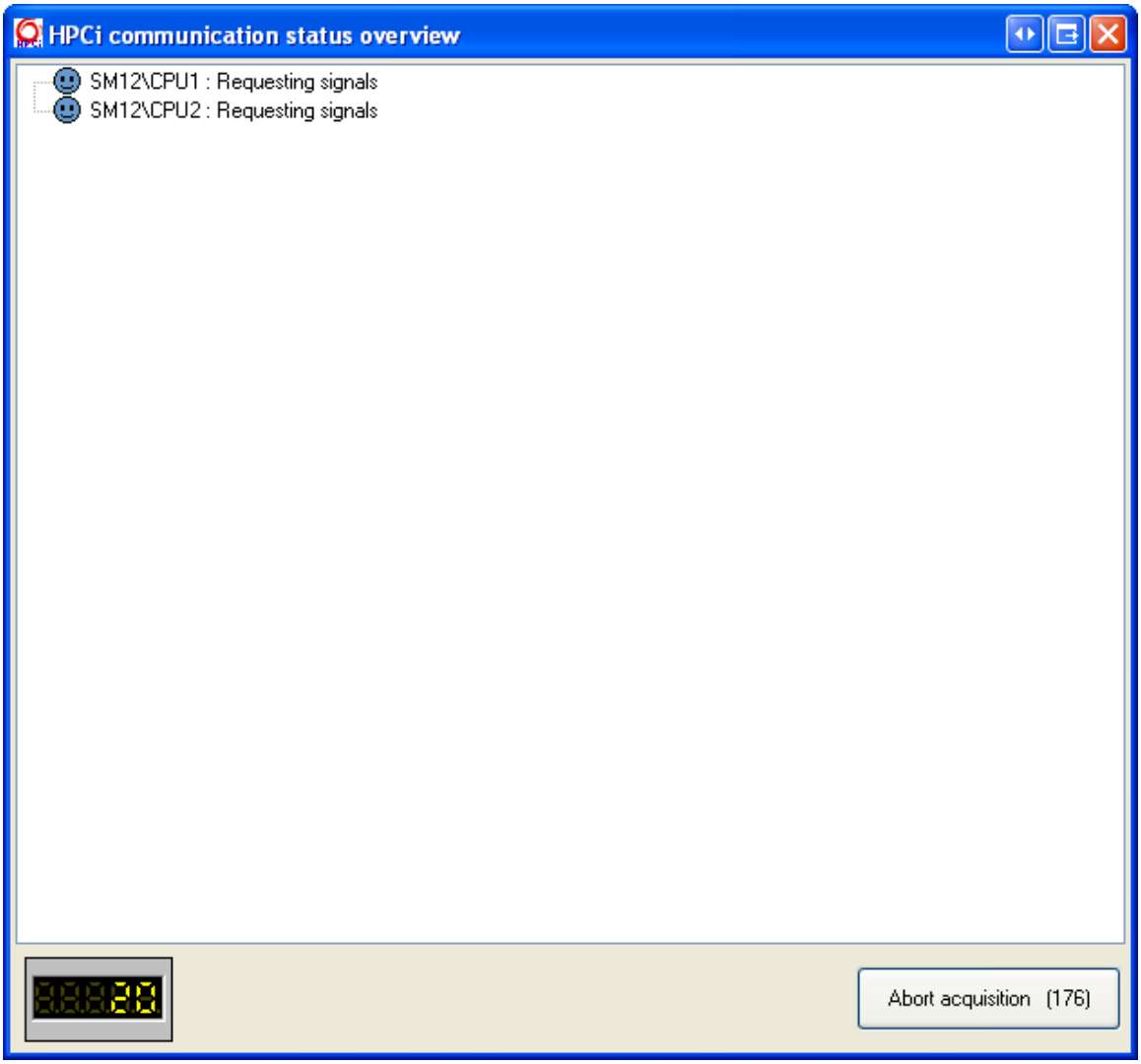
You can select signals from multiple CPUs in the module. They don't even have to belong to the same controller.

4.4 Request Process

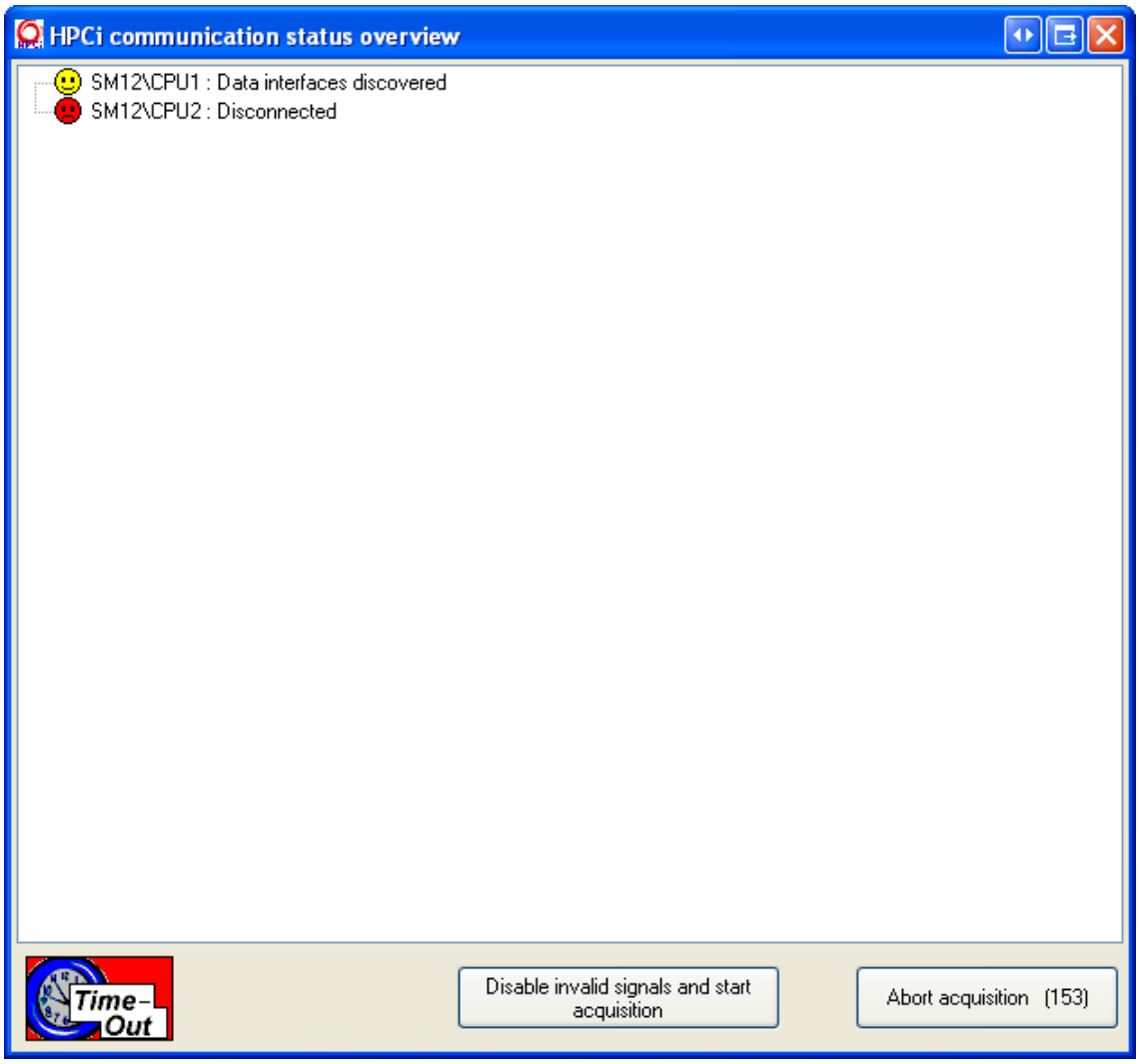
When you have configured the HPCi request interface and you have added some HPCi request modules then you can click the OK button to start measuring. The request process has several steps:

1. A stop message is sent to all connected CPUs.
2. Wait until the data interfaces of all active CPUs are discovered.
3. Map the signals on to the data interfaces.
4. Send request messages to the active CPUs.
5. Wait for the responses to the request messages.
6. If the responses are ok then start measuring otherwise let the user decide what to do.

The progress of the request process is shown on the *ibaPDA* client.

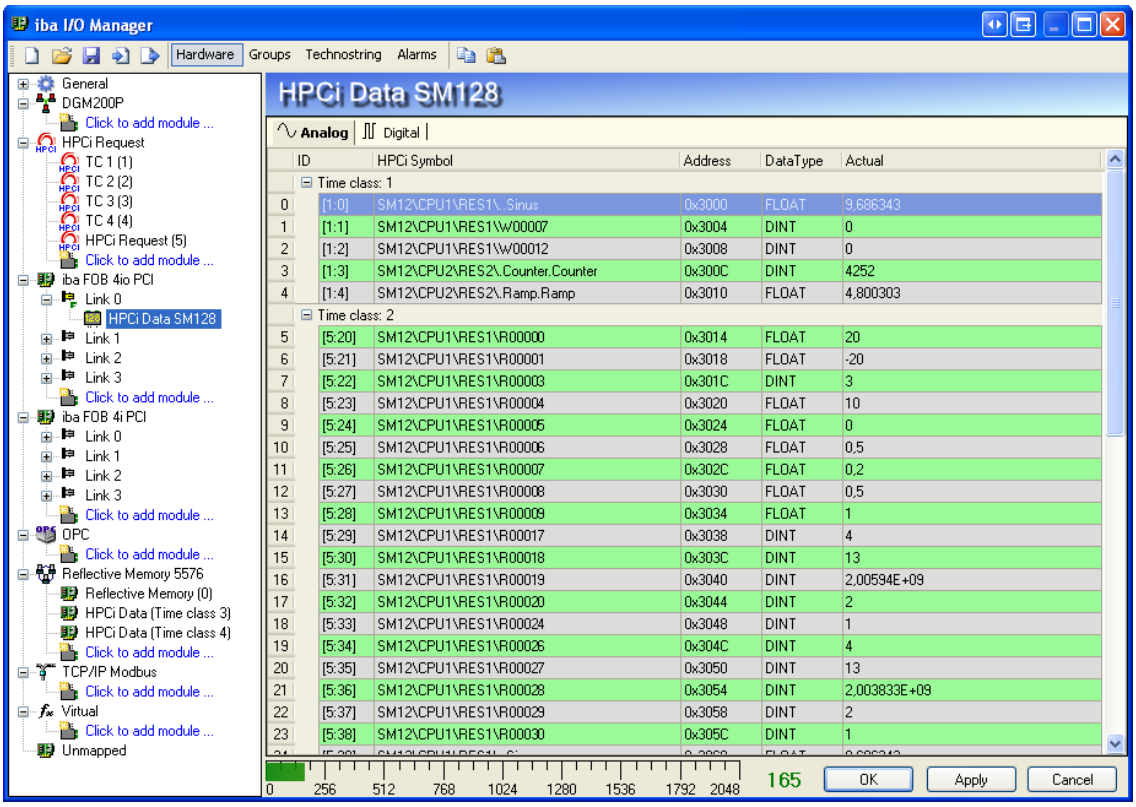


If there is some error during the request process then the user can decide what to do next. He can decide to abort the measurement. He can also decide to temporarily disable the signals on the non-responding CPUs and then try to start the measurement again.

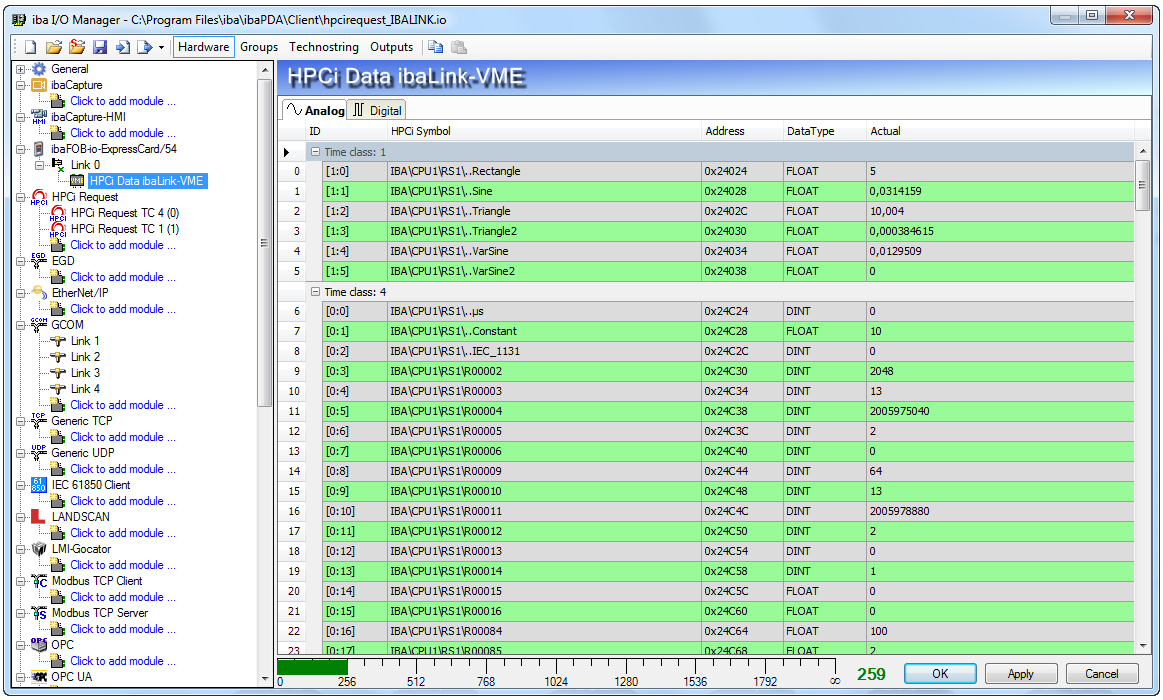


4.5 HPCi Data Modules

ibaPDA automatically maps the requested signals onto the available data interfaces for the CPUs. The HPCi data modules are generated during this mapping. These data modules are also shown in the I/O manager but they are just for diagnostics.



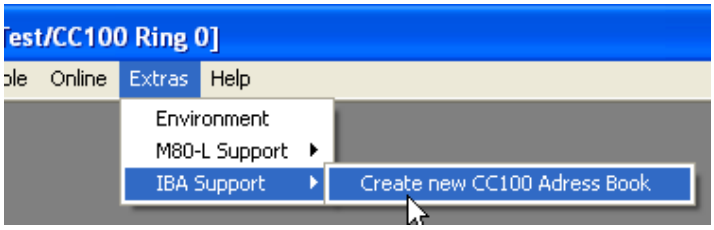
Below an example of the *ibaLink-VME* data module on an *ibaFOB-io-ExpressCard*.



4.6 HPCi Lite

With HPCi lite you can measure the signals that are already available on the CC100/DGM200 bus. This system only works on the DGM200-P. There are no DAS agents needed on the HPCi side. The only thing that is needed is an address book of all the signals that are on the CC100 bus. This address book can be generated by the CCM32 tool. Select menu *Extras - IBA Support - Create new CC100 Address Book*. You will have to select the directory where the **`toc.ini`** file for the system is. If you haven't created a **`toc.ini`** file yet then first create one with the DAS address book builder.

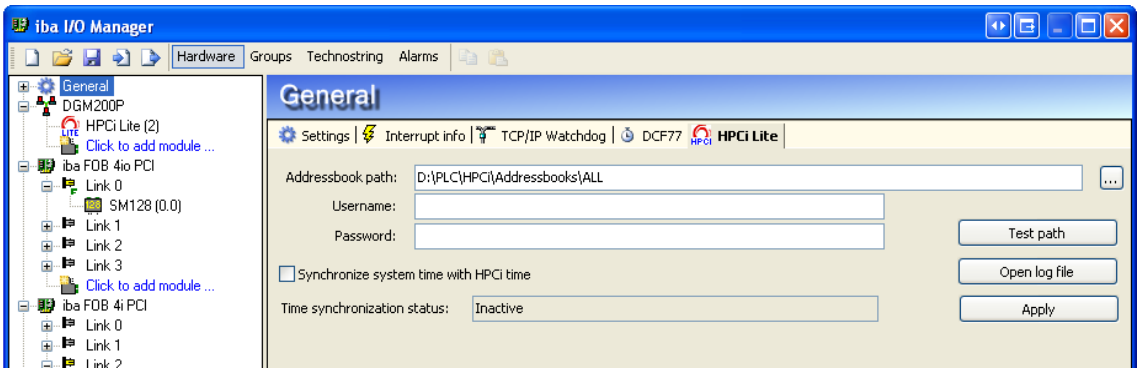
↗ See also chapter 3.4



On *ibaPDA* you have to set the path to the address book. If you have a license for HPCi request then you can set this on the HPCi request interface.

↗ See chapter 4.2.1

If you don't have a license for HPCi request then you can set the address book path on the HPCi lite tab of the general node.



On the DGM200P interface you can then add an HPCi lite module. You can select analog and digital signals from the signal browser. On the DGM200 system there is no direct support for digital signals. Normally 32 digital signals are packed into one DINT that is put on the DGM200. So when you want to select digital signals in the browser you have to select DINT values. *ibaPDA* will add 32 digital signals for each DINT value you select.

The HPCi lite module can also work in asynchronous mode.

↗ See chapter 4.2.1 for detailed information about asynchronous mode

5 Support and Contact

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Note

If you require support, specify the serial number (iba-S/N) of the product.

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