Clarity Hardware

INT9 A/D converter

ENG

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Sections of the manual connected only to the **Clarity** Full version are marked with the ✓Full version icon and grey stripe to the right of the text.

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1 Brief Description

This manual describes the use of the **INT9** converter with **Clarity** software ver. **2.5** and later.

INT9 is an internal 24-bit A/D converter card that measures the voltages of chromatographic and electrochemical detectors.

1.1 INT9 Acquisition card

- Up to 4 dataacquisition channels on one card (one and two channel versions are also available).
- The channels are completely independent sigma delta integrating A/D converters, used for processing positive and negative voltages.
- Four digital inputs.
- Eight digital outputs. The first four are also designed as relay contacts.
- **PCI** Slot.
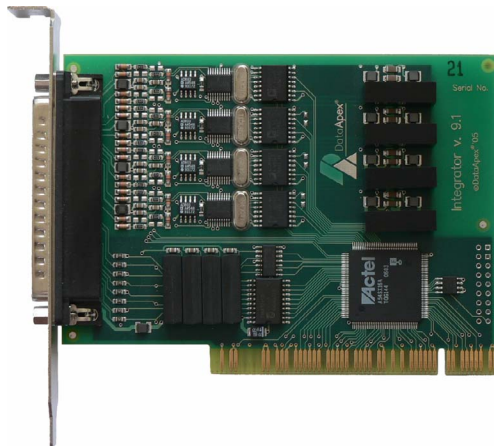- Excellent reliability and temperature stability.

Fig. 1.   *INT9 Card*

The **INT9** card of integration converters is a modernized successor of the PCI card **INT7**.

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A/D Converter types in general

Prior to collecting and processing the chromatographic signal by a computer, the analog signal of the detector must first be converted to digital form using an analog/digital (A/D) converter.

In principle, there are three types of A/D converters – **sampling**, **integrating** and $\Delta\Sigma$ **(Delta-Sigma** - with continuous integration).
The **INT9** card uses Delta-Sigma integration.

Advantages of the INT9 A/D converter

- No loss of input signal during integration. There are no time delays during which the converter fails to integrate the input signal.
- No continuous servicing of the input analog switches, which would otherwise cause errors (offset, noise).
- Substantially smaller amounts of data entering the computer due to individual data items already representing partial integrals.

1.2 Hardware and software requirements

The **INT9 A/D Converter** for **PCI** slot can be used with **Clarity** software on PC's using the following operating systems: **MS Windows 2000/XP/Vista**.

The PC must have one free **PCI** slot for your INT9 card.

Caution!	*Full size PCI 2.0, 32 bit PCI slot is required. Low profile or PCI Express slots cannot be used.*

Hardware and Software Compatibility:

Software \ Windows	Vista	XP	2000	NT	98/Me
Clarity *	Yes	Yes	Yes	No	No
Clarity Lite *	Yes	Yes	Yes	No	No
CSW32	No	No	No	No	No

* From **Clarity** version 2.4.4.122

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2 Installation

Ensure that you have **Administrator** access rights to your **Windows OS** before you proceed with the installation.

2.1 The INT9 Card

- Install **Clarity** software from the CDROM.

Caution!   *Install the Clarity software before inputting any devices.*

- Plug in the **HW Key** (described in the **Getting Started** manual)
- Turn off the **PC**
- Plug the **INT9** card into the **PCI** slot
- Start the **PC**

   a) MS Windows 2000/XP/Vista and later
   In **Windows 2000/XP/Vista** the drivers were installed automatically during the installation of the **Clarity** software.

   b) Previous versions of MS Windows
   In systems other than **Windows 2000/XP/Vista** follow the procedure described in chapter **4.3** on pg. **23**.

- The driver is now installed, proceed to setup and wiring.

Note: *When installing multiple **INT9** cards, a PC restart is recommended, after the installation, in order to prevent the reassignment of INT9 acquisition channels between Clarity **Instruments**.*

2.2 Standard cable for Clarity station

DET1   IN1   INT7   OUT1R
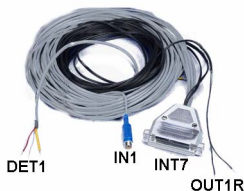
The standard **Clarity** station package includes a **cable set** composed of signal and starting cables for connecting the **CLARITY** station to the chromatograph.

- **Signal cables**
   Labelled "**DET1**" to "**DET4**" (according to the number of channels), the cables are supplied as standard without connectors [bare stripped

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and tinned endings – red (+), white (-) and shielding (analogue ground)].

- **Starting** (marker) **cables**
  Labelled "**IN1**" to "**IN4**" (correlating to channel number) and tipped with CINCH connector (female).

  The following cables can be connected to this CINCH connector:

  - A <u>cable terminated with free leads</u> [red (+), shielding (digital ground)] for direct connection to the chromatograph.

  - A cable terminated with a <u>button</u> for cases where a starting contact is not available and it is necessary to perform a manual start.

  Both types of cable are supplied for each starting cable.

- **Digital output cables**
  Relay contacts labelled "**OUT1R**" to "**OUT4R**" (according to the number of channels), terminated with free leads. These are used for synchronizing autosamplers without an **AS Control** module in the Active Sequence or for controlling other devices.

  At the converter end the cable is always terminated with a D-SUB 37-pin connector (female).

2.3 Connection with Chromatograph

Connect the cables according to one of the following diagrams in **Fig. 2**. Use the <u>symmetrical connection</u> only when you are sure that the chromatograph/detector is equipped with a symmetrical output – it is necessary to read through the instructions for the corresponding chromatograph.

All current DataApex A/D Converters **INT7**, **INT9, U-PAD, U-PAD2** and **Net-PAD** use the same standard **INT7 Connector**.

Note: *A description of the **INT7 connector** can be found in chapter 5.1 on pg. 32.*
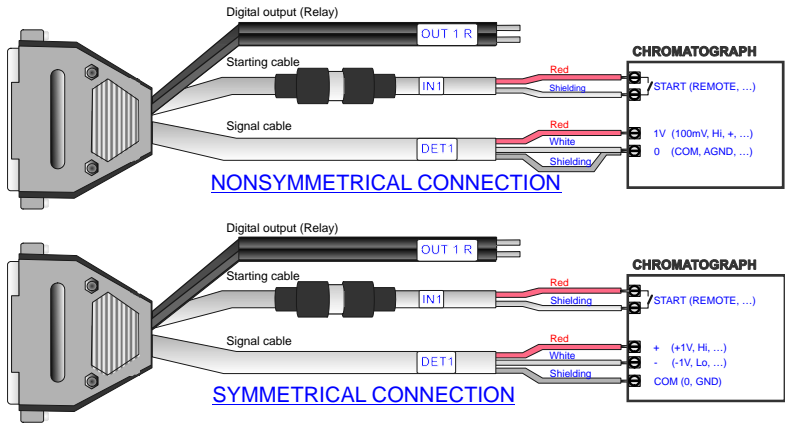
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Fig. 2. **Connecting Clarity to chromatograph**

2.3.1 Connecting signal cables:

Signal inputs of the A/D converters are symmetrical: + (red), - (white) and analogue ground (copper braiding).

Caution! *Shielding must be connected. It serves not only as the shielding but also as the analogue earth against which the measurement takes place. In the case of asymmetrical output of a detector (only two connectors) the shielding must be connected to the white lead! No lead of the signal cable may remain unconnected.*

Try to connect to the detector output of the chromatograph with the largest possible signal level, usually indicated as **INTEGRATOR** (signal approx. 1V). The level of the signal on the output marked **RECORDER** is usually only approx. 10mV.

For easier alterations of the wiring, we supply a **SV8 Terminal board** with screw contacts for **INT7**, **INT9**, **U-PAD, U-PAD2** and **Net-PAD** A/D converters.

Note: *This **SV8 Terminal Board** is not suitable for applications with small signals or with high electromagnetic interference. This is because the **SV8 Terminal Board** uses leads and screw contacts that are not shielded.*

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2.3.2   Connection of starting cables:

Starting input reacts to a change of the TTL logical level (5V) or to a connection by any contact (button, contact of relay).

The input implicitly reacts to a change from *HIGH* to *LOW* (or closing of a contact). The input function may be altered by changing the **Down** option to **Up** in the **External Start/Stop** section of the Method Setup - Measurement dialog (accessible from the Instrument window using the - **Method - Measurement** command).

Note: *For schemes and hints describing the typical autosampler wirings see the **Device setup and wiring** chapter of the **Getting Started** Manual.*

2.4   Clarity configuration ✓Full version

1. Start the **Clarity** station by clicking on the 🔧 icon on the desktop.
2. Invoke the System Configuration dialog using the **System – Configuration** command.
3. Press the **Add** ① button (see Fig. 4) to invoke the Available Control Modules dialog.
4. Select the **DataApex INT9 A/D Card** and press the **Add** ② button.
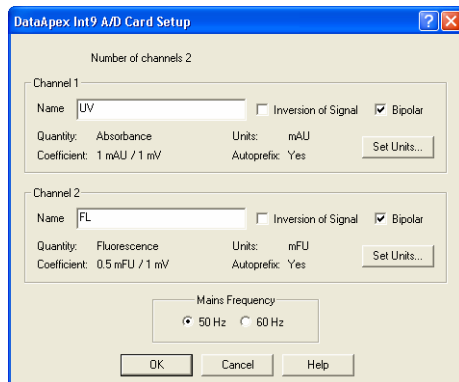5. The INT9 A/D Card Setup dialog will appear.

Fig. 3.   INT9 A/D Card Setup

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6. Enter the detector names in Name fields for individual channels, set signal units.

Note: *A detailed description of this dialog can be found in chapter **3.1** on pg. **14**.*

7. Press the **OK** button.

   The **DataApex INT9 A/D Card** will appear in the **Setup Control Modules** list ③ of the **System Configuration** dialog.

8. Drag and drop the **DataApex INT9 A/D Card** icon from the **Setup Control Modules** list ③ on the left side of the **System Configuration** dialog to the desired **Instrument** ④ tab on the right side ⑤ (or use the ⟶ button ⑥ to do so).
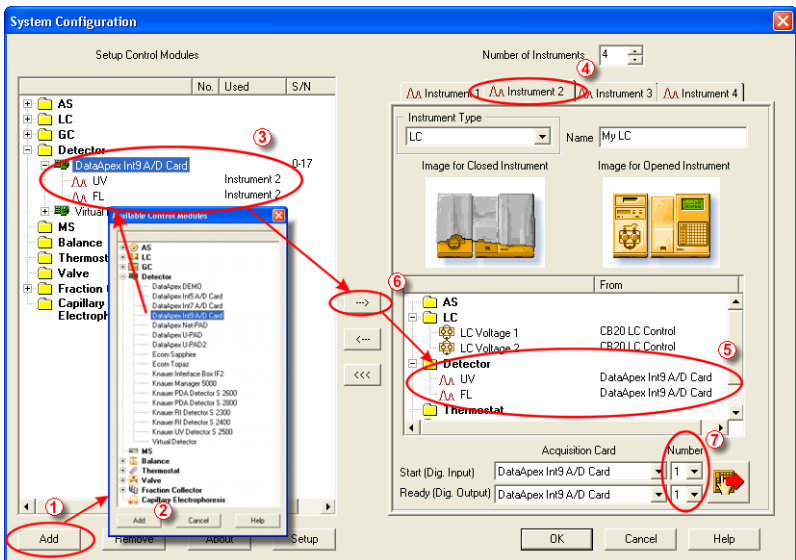

Fig. 4.   System Configuration

9. Set the **Start** input and **Ready** output numbers ⑦ for your acquisition card according to the wires being used for synchronization.

Note: *The configuration dialog of the **INT9** card (**INT9 A/D Card Setup**) can be displayed any time by double-clicking on its icon or using the **Setup** button.*

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2.4.1   Measuring on multiple Instruments

Rather than dragging the entire **INT9 A/D Card Driver** icon from the **Setup Control Modules** list ① (see Fig. 5), drag the individual detector signals (**TCD**, **FID** in this case) to separate Instruments ②. The Instrument to which the particular signal is connected is listed to the right ③ of the detector name in the **Setup Control Modules** section.
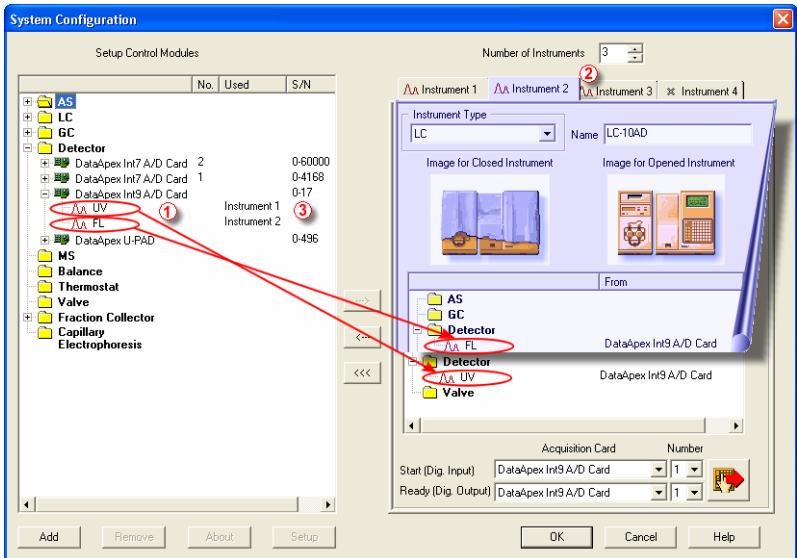

Fig. 5.   System Configuration – multiple Instruments

Note: *Each independent **Clarity Instrument** must have separate **Start** and **Ready** pins configured according to the actual wiring.*

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2.4.2   Using multiple INT9 cards

When using multiple A/D cards, it will be necessary to add the **INT9** card again, repeating the entire procedure described in chapter **2.4** from **Step 3**.
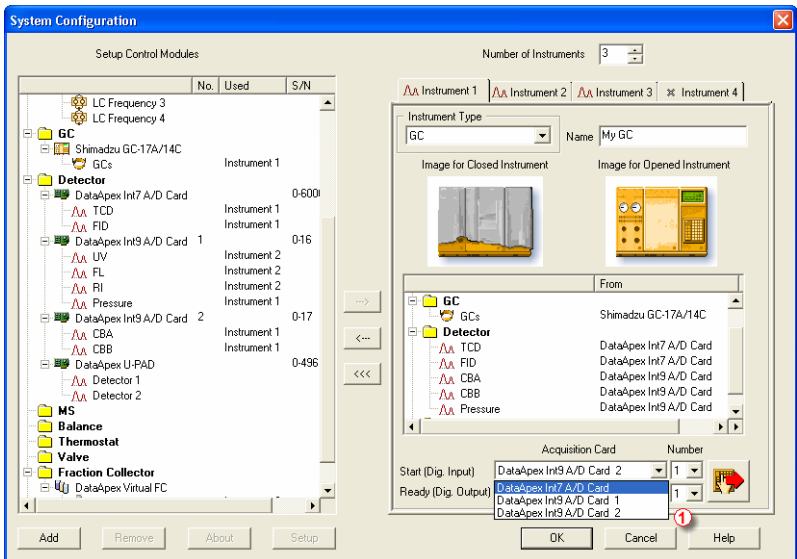
Fig. 6.   System Configuration – two INT9 cards

Individual detectors from all cards can be assigned to multiple instruments and combined together arbitrarily. In this example, all signals from **INT7 A/D Card**, as well as all signals from **INT9 A/D Card 2** and one signal (Pressure) from **INT9 A/D Card 1** are assigned to the instrument 1, while the rest of the signals from **INT9 A/D Card 1** is assigned to the Instrument 2.

While there are several cards assigned to the same instrument, it is necessary to select which card will be used for **Start** and **Ready** signals ①.

All added A/D converters (e.g. **INT9**) must have their drivers properly installed. There must be correct number of items in the Windows OS

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Device Manager, otherwise you will not be able to add it in the **System Configuration** dialog and configure its detectors to Clarity Instruments.
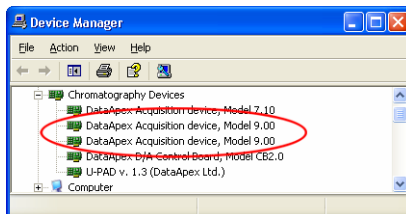
Fig. 7.   Device Manager – two INT9 cards

Note: *A maximum of **four** INT9 cards can be configured and used in Clarity simultaneously.*

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3 Using the INT9 card

There are generally two places for setting the parameters of **INT9 A/D Converter** in **Clarity**.

- The **INT9 A/D Card Setup** dialog for setting the parameters that are set with respect to the type of connected signal.
- The **Method Setup – Acquisition** tab for setting the parameters related to the type of analysis.

3.1 INT9 A/D Card Setup ✓Full version

The **INT9 A/D Card Setup** dialog sets the parameters of the **INT9** converter and since it depends on the type of connected detector, it is not going to be changed often.

Fig. 8.   INT9 A/D Card Setup

Number of Channels

Indicates the number of channels detected on the card.

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Channel 1 (to 4)

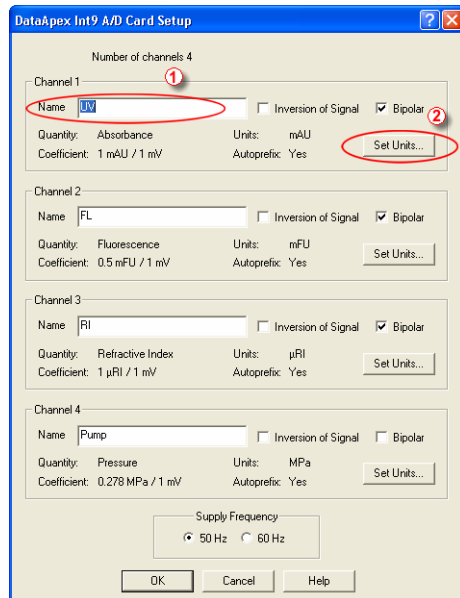For each channel of the INT9 A/D Converter the name of the signal can be edited in the **Name** ① field and the **Set Units...** ② button can be used to change other signal parametres. Effects of these changes can be seen in other fields of the respective Channel 1 (to 4) section.

Name

This field will be used to describe the signal in the **Chromatogram** window.

Inversion of Signal

Inverts the polarity of the signal from the detector. This function can also be used for easy correction of inversely connected wires.

Bipolar

Both positive and negative voltages will be measured. Unchecking the **Bipolar** option will improve the resolution of the signal by 1 bit. On the other hand, it will also restrict the measuring of negative signals (i.e. below zero).

Set Units...

Invokes the **Detector Units** dialog.

Fig. 9.   Detector Units

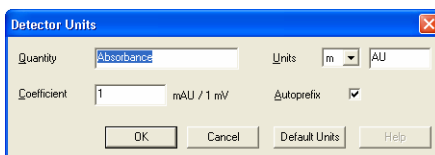- **Quantity** – Field for entering the quantity of the units.
- **Units** – Field for entering the unit symbol, along with the prefix.
- **Coefficient** – Allows to enter the coefficient between the selected units and mV (default).
- **Autoprefix** – Allows to enter the unit prefix. In graphs, units will be scaled automatically, while in the tables, units with the prefix entered will be used.

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Supply Frequency

Allows to change the Mains Supply Frequency Suppression. It is used for suppresing the interference on the specified frequency level. This setting influences the sampling frequency as well.

Note: *In most parts of Americas, the 60 Hz Mains frequency is usual, while the rest of the world tends to use 50 Hz Mains frequency (pre-set as default). The 50 Hz frequency is common in countries using 230V power supply, while the 60 Hz is connected to the 117V power supply.*

3.2 Method Setup

The **Method Setup – Acquisition** and **Method Setup – Measurement** dialogs are where the parameters that depend on the type of analysis (measuring conditions) are set and so it is expected that they will be specific for various types of analysis. This is the reason for them to be a part of the method.

Caution! *Parameters cannot be changed during analysis.*
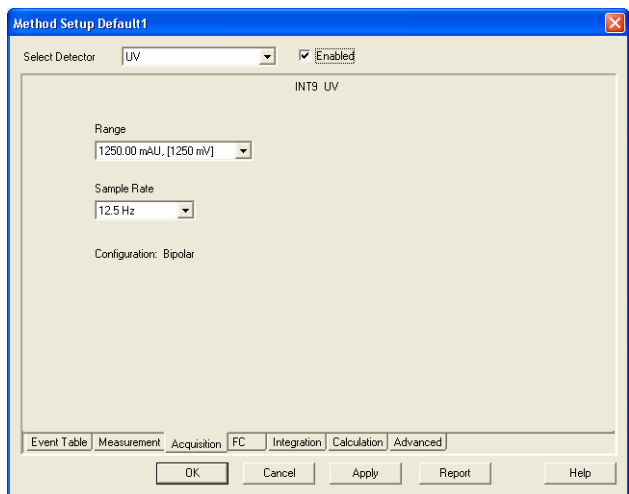
3.2.1 Method Setup - Acquisition

Fig. 10. Method Setup - Acquisition (INT9)

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Select Detector

Selects the detector whose parameters will be set. If there is only one detector (channel) configured on the Clarity Instrument, this control will not be displayed.

Range

Selects the input voltage range (in mV). The selected range corresponds to the maximum output voltage of the detector that the A/D converter can still process.

Available ranges for INT9 card are *156*, *1250* and *12 123 mV*.

Sample Rate

Depending on **Supply Frequency** filter selected in the **System Configuration - INT9 A/D Card Setup** dialog, the available sampling rates are *6.3*, *12.5*, *25*, *50*, *100*, *200* and *400* samples per second (for 50Hz mains frequency filter) or *7.5*, *15*, *30*, *60*, *120*, *240* and *480* samples per second (for 60Hz mains frequency filter).

Higher sampling rate allows for the measurement of narrower peaks, but it also means a larger amount of data which will affect the size of the resulting chromatogram and the speed of its processing.

Sample rate sufficient for successful peak detection is about 20 samples per narrowest peak.

A higher sampling rate also increases the amount of noise.

Note: *Range and Sample Rate are set individually for each detector, as opposed to **Mains Frequency** set for the INT9 A/D card as a whole.*
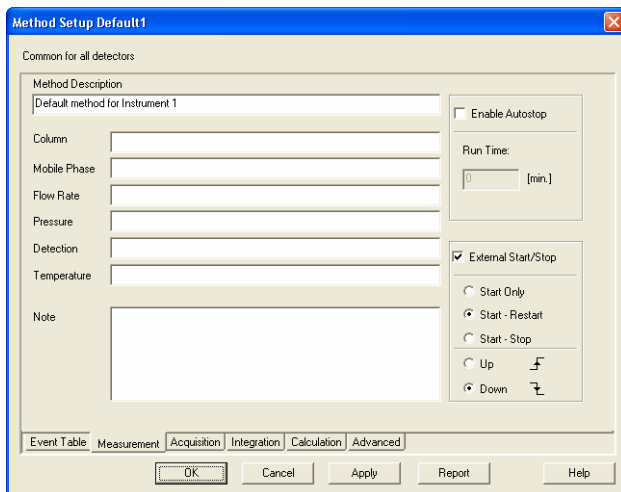
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3.2.2 Method Setup - Measurement

Fig. 11.   Method Setup - Measurement

External Start/Stop

Enables control from an external signal.

Note: *The **Input** used for an external **Start** from a chromatograph can be set in the **System Configuration** dialog (see Fig. 4 on pg. 10).*

Start Only

The external signal only starts an analysis. Triggering the input will not influence the acquisition in progress.

Start - Restart

The external signal terminates the analysis in progress and at the same time starts a new one. The first signal starts the analysis; the second signal terminates it and at the same time starts a new one - the so-called continuous measurement.

Start - Stop

The external signal starts and stops an analysis. The first signal starts the analysis; the second signal stops it, etc.

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Down

The station reacts to changes in voltage in the relevant controlling input from high (> 3V) to low (< 0.7 V), or to contacts closed in the relay.

Up

The station reacts to changes in voltage in the relevant controlling input from low (< 0.7 V) to high (> 3V), or to contacts opened in the relay.

3.3 Digital Inputs and Outputs

The INT9 converter contains eight digital TTL outputs, where the first four are also designed as relay contacts. The converter contains four digital inputs IN1 - IN4. The first two inputs are also equipped with optocouplers.
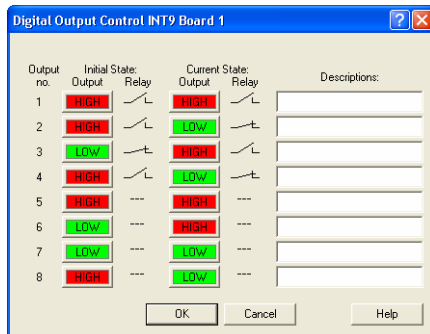

Fig. 12.   *Digital Output Control – INT9*

These outputs can be controlled from the following places in Clarity:

- Standard assignment of external start Input and Ready OUT Output can be changed in the **System Configuration** dialog (⑦ in Fig. 4, pg. 10).

Note: *The assigned input and output is then automatically used in the Active Sequence for synchronization with the autosampler.*

- **Digital Output Control** dialog.
- In the **Method Setup – Event Table** dialog.

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4 Troubleshooting

If you will not find your answers here, use the www.dataapex.com website where the Support menu will navigate you to frequently asked questions (FAQ), Clarity email conference archive or contact to DataApex helpdesk.

4.1 Locate your problem:

When troubles occur, the fastest way to find a solution for it is to search for it in the following index via the **Dialog** (window), in which the problem occured, **Error Messages** that apear or according to utilized **Hardware**. The name of the window/dialog is visible in its header.

Names of individual **Clarity Instruments** appear in the header instead of the common term "Instrument".

Dialog

Error Messages

Note: *To find solutions for error messages not listed above, check the **Clarity Getting Started** Guide or visit our web pages (www.dataapex.com).*

4.2 Problems with INT9 driver

- "*Board malfunction*"

  If the error message "*Board malfunction*" appears, the card is probably incorrectly inserted or damaged.

Solution: Check whether the INT9 A/D card is correctly set in the ISA slot. The card should be tucked fully and should not move in the slot. If this does not help, contact technical support to replace the damaged card.

Most problems with INT9 driver are generally indicated by following symptoms:

- INT9 cannot be added to **Setup Control Modules** in the **System Configuration** dialog, showing the "*Cannot create detector*" error message.
- Double-clicking on the device will not invoke the **INT9 A/D Card Setup** dialog.
- The **Data Acquisition** icon in the **Instrument** window is not active (this problem may also have another cause. See section **4.4** on pg. **29**).
- When starting **Clarity** or trying to add more INT9 cards to configuration then is present in the PC, the error message *"Cannot find first board"* appears. Alternatively, *"Cannot find second board"* error message may appear.
- While trying to add the INT9 card in **System Configuration** dialog or while starting **Clarity**, "*Cannot find driver file ...*" error message with path to the INT9 drivers in the system followed by "*Error Occurred During Setup*" appeared.

Solution: When one of these problems occur, check the INT9 driver (see next chapter) and then procced according to the suggested solutions.

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4.2.1 How to check the INT9 driver:

Windows 2000/XP/ Vista	In the **Start** menu (lower left corner of the screen), select **Settings – Control Panel**, and the **System** icon; under the **Hardware** tab click the **Device Manager** button and in the resulting list look for the **Chromatography Devices - DataApex Acquisition Device Model 9.xx** item.

In the following image, all drivers (except for the driver for U-PAD2) are installed correctly.
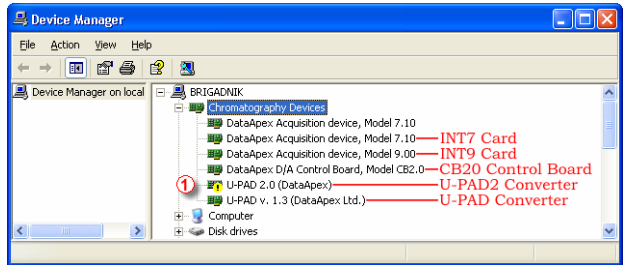

Fig. 13.   ***Device Manager in Windows XP***

Error status of the driver:

• If the "*Chromatography Device – DataApex Acquisition device, Model 9.xx*" - item does not appear, then the driver has not been installed.

Solution: Reinstall the driver manually as described in section 4.3 on pg. 23.

• The driver is installed, but there is a **yellow exclamation mark** ① (or a question mark) over its icon, or it is not behaving as expected. The driver is probably **installed incorrectly**.

Solution: Uninstall the incorrect driver and install the correct one as described in section **4.3**, pg. **23**.

• The item does appear, but is displayed with a cross symbol.

Solution: Double-click the item to invoke the **General** tab and activate the driver by clicking on the **Enable this device** button.

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- The item does appear and there are no error symbols around it. A driver for a different type of **Windows** operating system was possibly installed thereby replacing the correct driver.

Solution: Uninstall the incorrect driver and install the correct one as described in section **4.3**, pg. **23**.

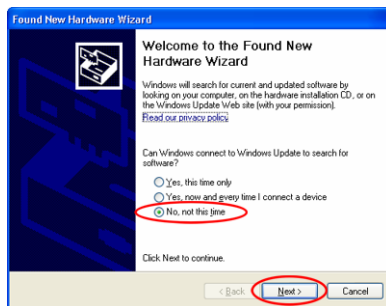## 4.3 Manual Installation of the INT9 drivers

4.3.1 Instalation and reinstalation in Windows XP/Vista

During start-up, **Windows** should automati–cally recognize the new **Plug and Play** device and start the hardware installation wizard.
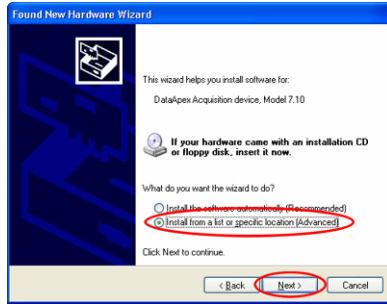
Note: *If this does not occur, use the Start - Control Panel – Add Hardware to invoke installation.*
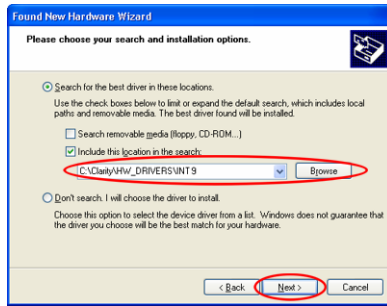

- Choose the **Next** possibility.

- Select: **No, not this time** and hit **Next**.

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- Select the **Install from a list or specific location (Advanced)** option.

- Select **Include this location in the search**; here click the **Browse** button and select the path to the main folder of the workstation and INT subfolder (C:\CLARITY\HW_DRIVERS\INT9 by default).

Note: *The driver is also located on the Clarity installation CD ROM in the HW_DRIVERS\INT9\XXX subfolder, where XXX is the type of your operating system. NT stands for Windows NT, while 2000 subdirectory contains drivers for Windows 2000, XP and Vista.*

- The rest of the installation will be carried out automatically.

4.3.2 Reinstallation of drivers using the System Restore Point

Use the **System Restore Point** in **MS Windows XP** (and later) to uninstal the incorrect drivers.

- Go to **Start - Programs – Accessories – System Tools – System Restore**.

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- In the **System Restore** dialog use the **Restore my computer to an earlier time** option and press the **Next** button.
- In the next dialog select a restore point from a time before the incorrect driver was installed.

Caution!	*Any soft- or hardware that was installed after the moment of the selected restore point will be removed from your system.*

- Reinstall **Clarity** and then restart the PC.
- **Windows XP** should now correctly identify and install the drivers.

4.3.3   Reinstallation of drivers in Windows 2000

After installing **Clarity** and the **INT9** card, the **Device Manager** either does not display the **Chromatography Devices – INT9** item or there is a yellow exclamation mark next to the item that indicates that the device is not working properly.
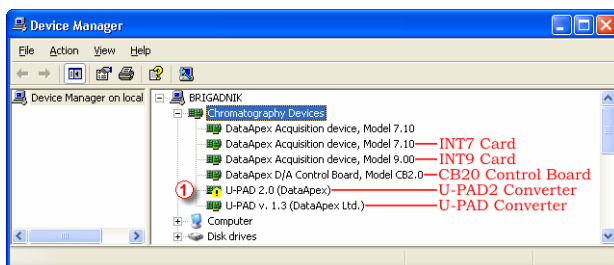
If the "*DataApex Acquisition device, Model 9.xx*" item is missing, Windows has automatically installed an incorrect driver.

If you are able to locate which device was mistakenly installed instead of the INT9 driver, you can open its **Properties** and **Update this driver**. In the manual installation process, select the correct drivers analogically to the description in chapter **4.3.3.2** on pg. **26**.

If the correct driver cannot be determined, the last installed driver will have to be removed.

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Caution!   *This procedure can only be used safely if no other hardware has been installed since the installation of the card.*

4.3.3.1   Deleting incorrect *.inf files in the system

Note: *Be sure to have the Clarity software installed already.*

- In **Windows Explorer** open the C:\WINNT\INF folder ①.

Note: *You may have to allow for the hidden system files to be displayed. In the menu select* **Tools – Folder Options** *->* **View** *tab then set the* **Hidden Files and Folders** *option to* **Show Hidden Files and Folders***.*

- Sort the files according to **Modified** column ② and locate the last modified *.PNF file ③.

- Also locate the corresponding *.INF file ③ and delete both of them.
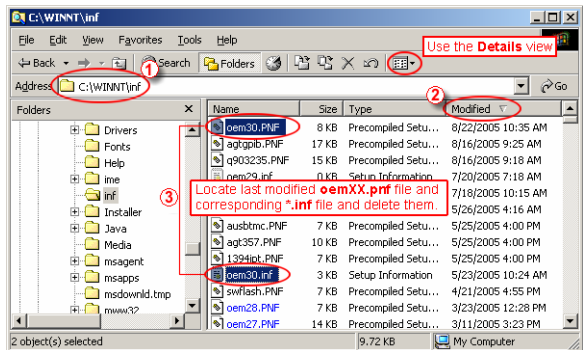
- Continue to install the correct driver manually without restarting the PC.

4.3.3.2   Installing the correct driver manually

The following procedure can be applied under any circumstances; this is why the most universal option is described step by step.
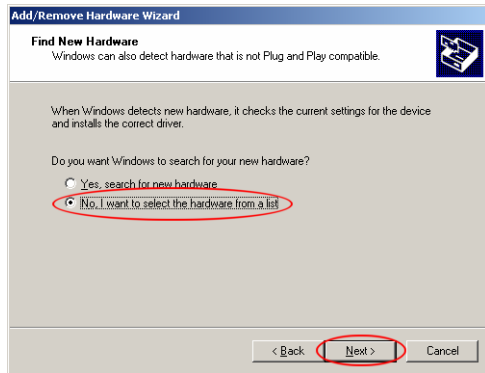
- Invoke the **Start – Control Panel – Add/Remove Hardware**

- In the first dialog press the **Next** button.

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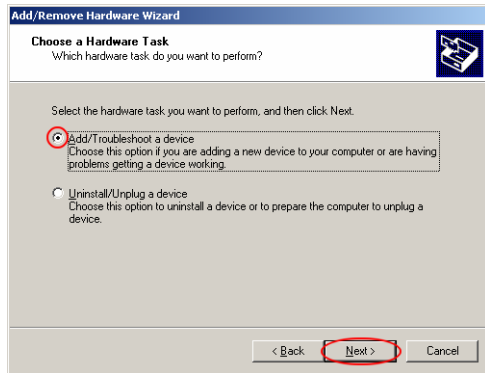
- Select **Add/Troubleshoot** a device and press the **Next** button.
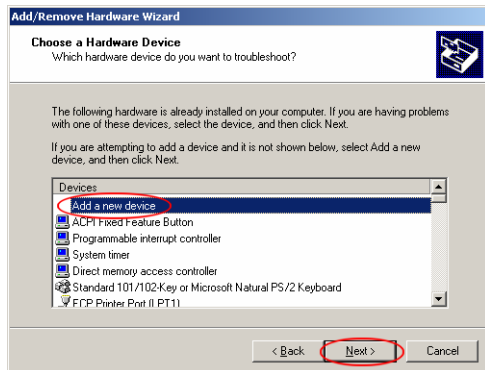
- In the **Devices** list select **Add a new device** and press the **Next** button.

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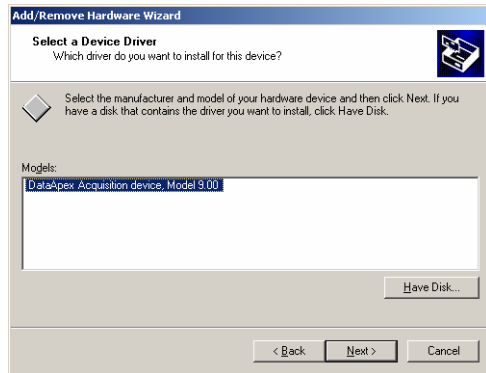- Select **No, I want to select the hardware from a list** and press the **Next** button.
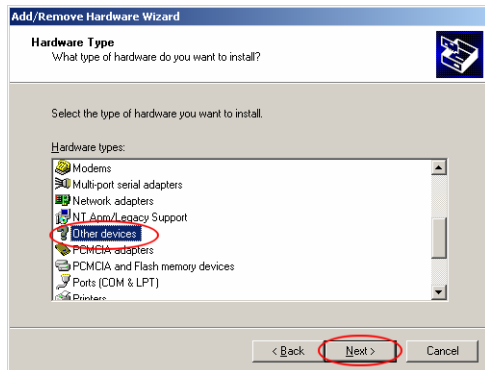
- In the **Hardware types** list select the **Other devices** option and press the **Next** button.
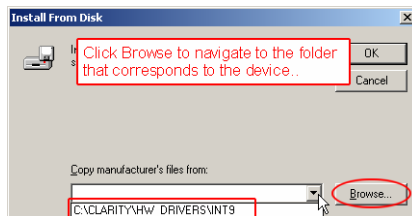
- Click the **Browse** button to navigate to the driver located in the (C:\CLARITY\HW_DRIVERS\INT9) **Clarity** directory. Then press the **Next** button.

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- In the Models list select the **DataApex Acquisition device, Model 9.00** and press the **Next** button.
- In the remaining dialogs press the **Next** button.
- Restart the PC.
- Re-check the driver in the **Device Manager** as desribed in chapter **4.3.3**.

4.4   Data Acquisition – non-functional

A gray **icon, label "Disabled", and Data Acquisition command not functional**

Other manifestations of this error are also: **Method Setup - Acquisition** tab missing, **Method – Acquisition** command non-functional, **Run, Stop, Abort** commands non-functional in the windows **Single Analysis** and **Sequence**).

Possible causes are:

a) Detector not allocated to instrument:
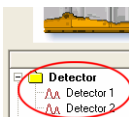
Open the **System Configuration** dialog from the main **Clarity** window using the **System - Configuration** command and check the tab of the corresponding instrument - **Instrument x**. If it has no allocated detectors, add them.

Solution: In the left-hand list **Setup Control Modules** select the correct detector that is connected to the A/D card you are using and link it to the corresponding instrument on the right.

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If your A/D card is not in the left-hand **Setup Control Modules** list, add it using the **Add** button and repeat the previous step.

Note: *More information on configuration of the INT9 card is in chapter 2.4 - Clarity configuration on pg. 9.*

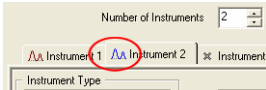**b) You have a licence purchased for collections from a smaller number of instruments:**

Solution: Open the **System Configuration** dialog from the main **Clarity** window using the **System - Configuration** command and check the tab of the corresponding instrument – **Instrument x**. Blue symbol of the curve in the tab header indicates an Instrument not usable for measuring.

Check your serial number S/N (for example) using the **Help - About** command from the main **Clarity** window.

c) You are using Clarity Offline or a DEMO version, which does not enable the measurement of chromatograms.

Solution: Check whether there is a blue line with the title **OFFLINE** displayed in the main **Clarity** window under the symbols of the instruments, or the title **DEMO** in the window header.

4.5 Data Acquisition - Simulated

The label "Simulated" is displayed in the Data Acquisition window

The corresponding instrument only displays the simulated curve (from the file CHANNX.DTA), or is allocated as what is known as a DEMO driver.
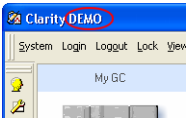
Solution: Open the **System Configuration** dialog from the main **Clarity** window using the **System - Configuration** command and check the tab of the corresponding instrument - **Instrument x**.

From the list of equipment allocated to the instrument, remove the **Detector x from DEMO driver** field and draw the correct detector of the A/D card you are using from the list on the left.

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If you only have Demo detectors in the left-hand **Setup Control Modules** list and your A/D card is missing, open the **Available Control Modules** dialog and, using the **Add** button, add it to the configuration of the station. Then repeat the previous step.

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5 Tables and specifications

5.1 Description of the INT9 card connector (Male)

Connector pins:
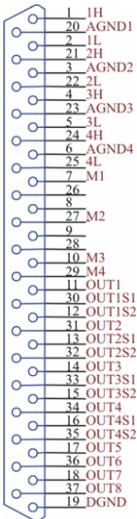
1H	$+$	Input of the 1st channel
1L	$-$	Input of the 1st channel
AGND1		Ground of the 1st channel
IN1		Digital input (of the 1st channel). Used as an External Start (marker) of the 1st channel
OUT1		1st Digital output
		Digital outputs are controlled by **Event Table**, **Active Sequence** and **Digital Output** dialog.
DGND		Ground of the digital inputs and outputs.
OUT1S1, OUT1S2		Digital outputs - 1st relay contact. Contact is closed when output is at a *LOW* level.
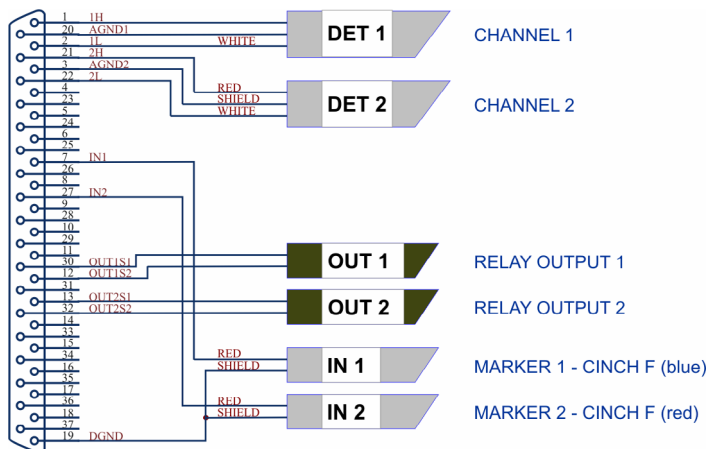
Fig. 14.   ***Standard INT7-compatible cable for two detectors***

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5.2   Parameters of digital Inputs and Outputs

The card contains eight digital TTL outputs (OUT1-OUT8) with a maximum permissible current of *20 mA* at both levels. The first four outputs are also designed as relay contacts (OUT1S1/OUT1S2- OUT4S1/OUT4S2).

The maximum permissible current is *100 mA*, the maximum-switched voltage is *100 V* and the contact resistance is *150 mΩ*. The relay is onstate (closed) when there is a *LOW* level of a relevant digital output.

The card contains 4 digital inputs IN1 to IN4.

To suppress contact bouncing the digital inputs are equipped with monostable toggles that prolong any change affecting the input to at least *200 ms* (to ensure that the station is able to detect it).

A pulse with duration of at least *1 ms* is necessary in order to excite the toggles.

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5.3   INT9 - CE Conformity Declaration

CE CONFORMITY DECLARATION

We,   **DataApex Ltd.**

Podohradska 1704/1

CZ - 155 00 Prague 5

declare under our sole responsibility that

the product:

chromatography integrator

type:

INT9

to which this declaration relates is in conformity with the following standards

CISPR 22   **2005+A1:2005**

CISPR 24   **1997+A1+A2:2002**

Complementary information: Certificate EZÚ no.: 502594-02/01 dated 18.8.2005

Place of issue: Prague   Manufacturer representative: L. Siska

Date of issue: 1.1.2006   Position: hardware production manager

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5.4   Technical Data

Converter type:	24-bit ΔΣ (delta – sigma)
Analog inputs:	differential
Number of channels:	1, 2 or 4 fully independent and isolated
Input range:	Unipolar and bipolar, each channel independentely 156, 1 250 or 12 123 mV
Input impedance:	> 1 MΩ
Sample rate:	6.3, 12.5, 25, 50, 100, 200, 400 samples per second for 50Hz mains frequency filter 7.5, 15, 30, 60, 120, 240, 480 samples per second for 60Hz mains frequency filter
Non-linearity:	< 0.003 %
Temperature dependence	< 10 ppm/°C
Digital inputs:	4 TTL (5V)
Digital outputs:	8 TTL (5V, maximum current load per output 20 mA, maximum total current load 100mA), the first four control relays (switching contacts rating: max. switching current 0.5 ADC, max. contact resistance 150mΩ, max. voltage 100V)

Typical noise free resolution for various acquisition speeds and input ranges:

	12 123 mV	1 250 mV	156 mV
6.3 Hz	21.5 bit	21.5 bit	20 bit
25 Hz	21 bit	21 bit	20 bit
100 Hz	19.5 bit	19.5 bit	19.5bit
200 Hz	16.5 bit	16.5 bit	16.5 bit
400 Hz	16 bit	16 bit	16 bit

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