



## FC GP

Clarity Control Module

ENG

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To facilitate the orientation in the **FC GP** manual and **Clarity** chromatography station, different fonts are used throughout the manual. Meanings of these fonts are:

**Instrument** (blue text) marks the name of the window to which the text refers.

*Open File* (italics) describes the commands and names of fields in **Clarity**, parameters that can be entered into them or a window or dialog name (when you already are in the topic describing the window).

WORK1 (capitals) indicates the name of the file and/or directory.

*ACTIVE* (capital italics) marks the state of the station or its part.

The bold text is sometimes also used for important parts of the text and the name of the **Clarity** station. Moreover, some sections are written in format other than normal text. These sections are formatted as follows:

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**Note:** Notifies the reader of relevant information.

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**Caution:** Warns the user of possibly dangerous or very important information.

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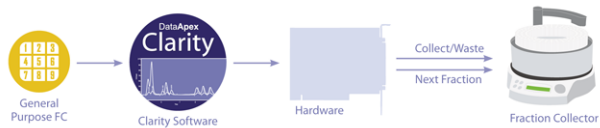
**Marks the problem statement or trouble question.**

**Description:** Presents more detailed information on the problem, describes its causes, etc.

**Solution:** Marks the response to the question, presents a procedure how to remove it.

# 1 General Purpose Fraction Collector (FCGP)

The DataApex FC GP (General Purpose Fraction Collector) control is a universal driver designed to function with Fraction Collectors controlled by Next Fraction and Collect/Waste events. The DataApex FC GP module is available for LC, GPC, LC-PDA, CE and GPC-PDA Instrument types.



*Fig 1: General Purpose Fraction Collector*

## 2 Requirements

- Fraction Collector controlled by *Next Fraction* and *Collect/Waste* events.
- **Clarity** Installation CD ROM with LC Control (p/n A24).
- A/D converter (e.g. INT 7, Net-PAD etc.)
- Two unoccupied digital output contacts.

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**Note:** Although the DataApex INT7, INT9 and Net-PAD A/D converters have 8 digital outputs each, the cables provided for them will support 4 digital outputs maximum (based on the number of channels). You may need a **SV8** or **SV9 terminal board** to access the unused digital outputs.

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**Caution:** **U-PAD** and **U-PAD2** have only 2 digital outputs, so they are generally unsuitable for the operation of the general purpose fraction collector module (as you usually need one more digital output to start the analysis).

## 3 Installation

- Install your A/D converter.
- Connect the Fraction Collector to the A/D card by the cable provided with the card.

### 3.1 Clarity Configuration

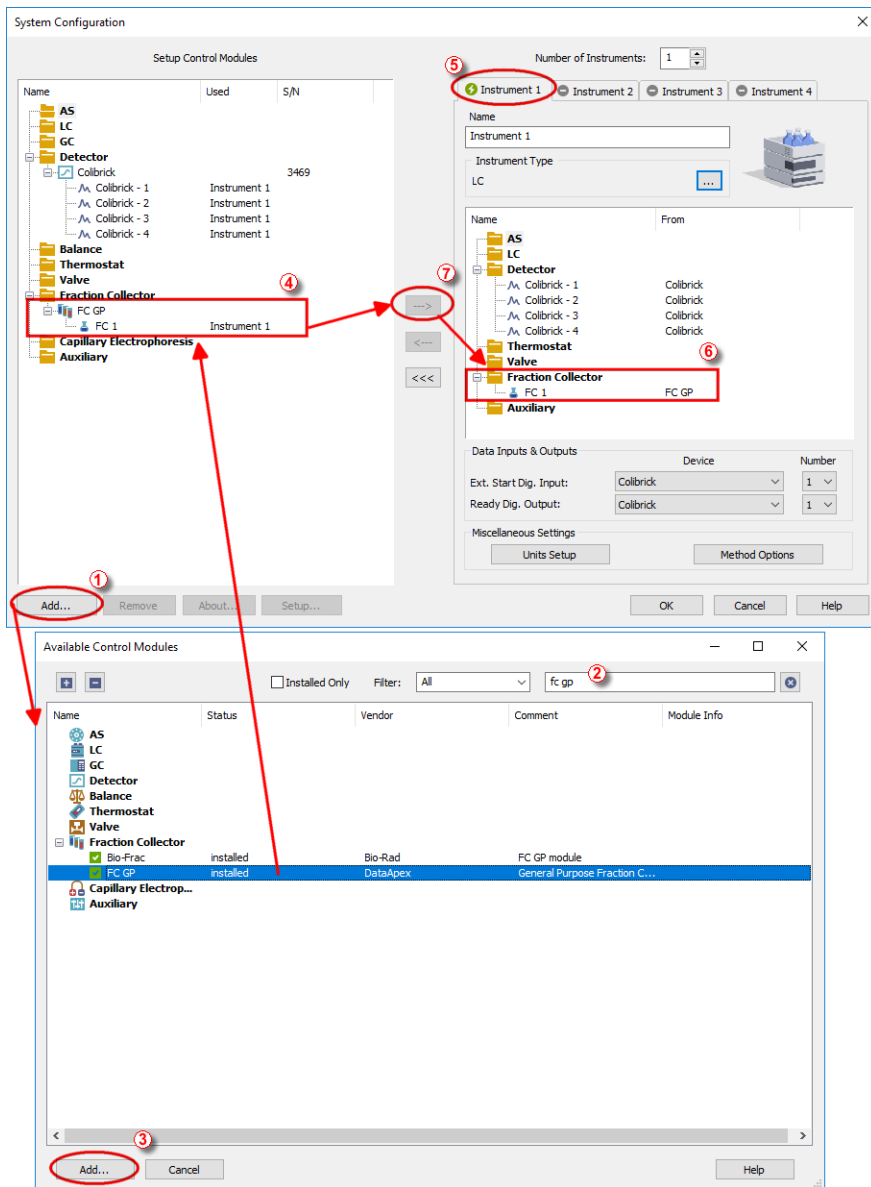



Fig 2: System Configuration - adding the FC GP



- Start the **Clarity** station by clicking on the  icon on the desktop.
- Invoke the **System Configuration** dialog accessible from the **Clarity** window using the *System – Configuration...* command.
- Press the **Add** button ① (See **Fig 2** on pg 4.) to invoke the **Available Control Modules** dialog.
- You can specify the searching filter ② to simplify the finding of the driver.
- Select the **FC GP** and press the **Add** ③ button.

The **DataApex FC GP Setup** dialog will appear.

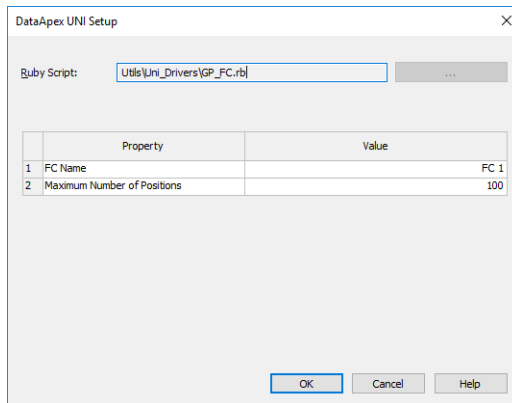



Fig 3: DataApex FC GP Setup

- Enter the FC GP name in the *FC Name* field.

*Note:* A detailed description of this dialog can be found in the chapter "**DataApex FC GP Setup**" on pg 9.

- Press the **OK** button.

The **FC GP** item will appear in the *Setup Control Modules* list ④ of the **System Configuration** dialog.

- Drag and drop the **FC GP** icon from the *Setup Control Modules* list ④ on the left side of the **System Configuration** dialog to the desired *Instrument* ⑤ tab on the right side ⑥ (or use the  button ⑦ to do so).

*Note:* The configuration dialog of the **FC GP** module (**DataApex FC GP Setup**) can be displayed any time by double-clicking on its icon or using the *Setup* button.

## 3.2 Configuring the Event Table

It is necessary to assign physical **Clarity** outputs (e.g. A/D card) to the signal coming from the virtual fraction collector module in the **Event Table** dialog. Source of the input should be set to DataApex FC GP. The *Input 1* conveys the *Collect/Waste* signal, where value *Up* means Collect and value *Down* means Waste. *Input 2* conveys the Next signal, as the value *Up* means Next.

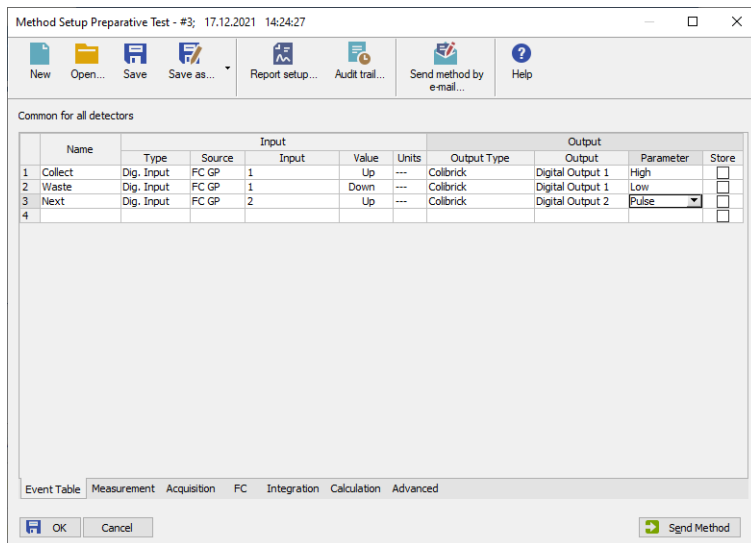


Fig 4: Method Setup - Event Table

Relations and the data flow of the typical FC GP configuration and settings of the *Event table* are displayed in the following scheme. The settings of the Fraction table are individual to each analysis and have to be set in accordance with the chromatogram, signal range and other parameters. When the conditions set in the *Fraction Table* are fulfilled, the fraction collector control module sends appropriate signals to the **Clarity** station. **Clarity** then, according to the events set in the *Event table*, sends the appropriate digital signal to the fraction collector via the A/D converter digital outputs.



# Clarity Controls

## FC GP Fraction Table

	Name	Start Time [min]	Stop Time [min]	Fraction Volume [µl]	Signal Condition	Start Value	Stop Value	Units
1	Fraction 1	1.000	3.000	1000.00	Level	0.200	0.150	mAU
2	Fraction 2	3.000	3.200	1000.00	None	---	---	---
3	Fraction 3	3.200	3.400	1000.00	None	---	---	---
4	Fraction 4	3.400	6.000	1000.00	Level	0.200	0.150	mAU



# Clarity

## Event Table

Method Setup Preparative Test

Common for all detectors

Name	Input						Output			
	Type	Source	Input	Value	Units	Output Type	Output	Parameter	Store	
1 Collect	Dig. Input	DataApex FC GP	1	Up	---	DataApex: Int7 A/D	1	High	<input type="checkbox"/>	
2 Waste	Dig. Input	DataApex FC GP	1	Down	---	DataApex: Int7 A/D	1	Low	<input type="checkbox"/>	
3 Next	Dig. Input	DataApex FC GP	2	Up	---	DataApex: Int7 A/D	2	High	<input type="checkbox"/>	
4									<input type="checkbox"/>	



# Hardware

## A/D Converter



Collect/Waste  
(Digital Output 1)

Next Fraction  
(Digital Output 2)

## Fraction Collector



Fig 5: Scheme of typical FC GP module operation

The FC GP can also be controlled by external signals (from the control panel of the real fraction collector or by the pushbutton). In this case it is necessary (possibly in addition to the standard event table setting) to assign real **Clarity** inputs (A/D card) to the virtual signal outgoing to the FC GP. The particular A/D card should be set as *Input Source*, while the DataApex FC GP serves as the *Output Type*.

**Note:** Controlling the fraction collector using external signals is equivalent to the manual control from the [Device Monitor](#) with one exception - it is not possible to restart the automatic fraction collection using external signal. This process can be performed only from the [Device Monitor](#).

## 4 Using the control module

New **FC** tab is created in the **Method Setup** dialog, enabling the setting of the Fraction Collector. This dialog serves for setting up the FC instrument method.

### The general procedure of work will be following:

- Define the fractions based on time, signal level, slope of signal etc. in the [Method Setup - FC- Fraction](#) table.
- Set the range of vials where the fractions will be stored, and the conditions for new runs in the [Method Setup - FC - Vial Numbers](#).
- Start the Acquisition.
- During its run the user can see the Fractions in the [Data Acquisition](#) window,

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*Note:* To see the fractions in the [Data Acquisition](#) window, click the right mouse button in the graph, Select *Graph Properties* and enable the *Show Events* checkbox.

- In the [Device Monitor](#) the user can overview and control the whole process. For example, check current fraction or its volume, force next fraction, stop collecting, etc.
- After the analysis (fraction collecting) the user can open the chromatogram, review the fractions in the graph and dedicated result table ([Chromatogram - FC Result](#)) and eventually print the report.

## 4.1 DataApex FC GP Setup

The **DataApex FC GP Setup** dialog serves for setting the custom names for the **FC GP** module itself and for its digital inputs and outputs.

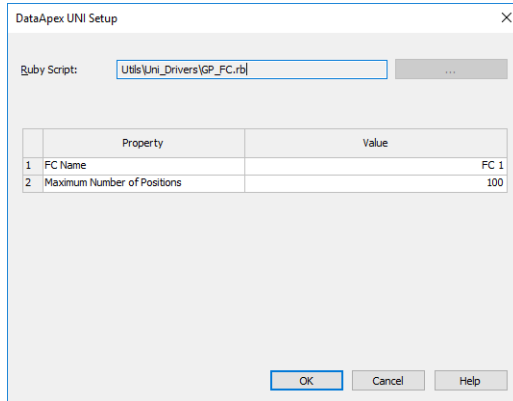


Fig 6: DataApex FC GP Setup

### Name

Allows to set a custom name for the **FC GP** module.

### Digital Input Names

Allows to change the names of digital inputs.

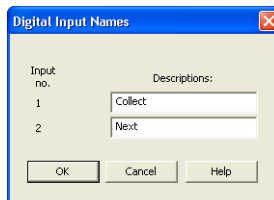


Fig 7: Digital Input Names

### Digital Output Names

Allows to change the names of digital outputs. These names will be used in the **Digital Output Control** dialog described on pg 18.

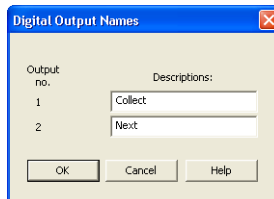


Fig 8: Digital Output Names

*Note:* Default name for the FC GP is *FC 1*, default names for Input 1/Output 1 and Input 2/Output 2 are *Collect* and *Next*, respectively.

## 4.2 Method Setup - FC - Fraction Table

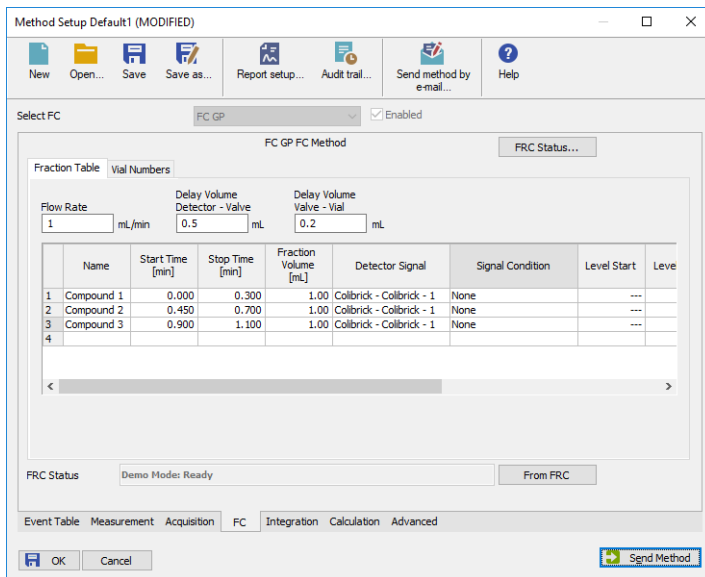


Fig 9: FC - Fraction Table tab

### Delay Volume Detector - Valve

Sets the volume of the tubing between the detector and the waste/collect valve of an appropriate fraction collector. Volume units are derived from the Flow Rate Units entered in the [Instrument Method Sending](#) dialog.

The delayed volume can be indicated in the [Data Acquisition](#) window to see it, it is necessary to right click the graph, choose *Properties...* to open the [Graph Properties](#) dialog and check the [Show Events](#) checkbox.

### Delay Volume Valve - Vial

Sets the volume of the tubing between the waste/collect valve and the vial in the fraction collector tray. Volume units are derived from the Flow Rate Units entered in the [Instrument Method Sending](#) dialog. When the fraction collector contains no waste/collect valve, this field should be left empty, with entire delay volume entered in *Delay Volume Detector - Valve* field.

### Flow Rate

Sets the overall flow rate through the column. Flow rate units are taken from the [Instrument Method Sending](#) dialog.

*Note:* The flow rate is currently defined as a constant value. In the future, it will be possible to use either the theoretical flow rate defined in the gradient table or the real flow rate measured by the selected auxiliary signal.

**Detector Signal**

Selects the signal of the detector used for the signal condition evaluation.

**Fraction Table**

A table used for setting the conditions for collecting individual fractions.

**Name**

The name will be stored in the result table for all fractions collected by the respective row conditions.

**Start Time [min]**

If the *Signal Condition* is set to *None*, the Start Time value represents the start of the collection interval. If the *Signal Condition* is set to *Level* or *Slope*, this value is the beginning of the interval where the check for the starting condition is performed. The *Start Time* is set in minutes.

**Stop Time [min]**

If the *Signal Condition* is set to *None*, the Stop Time value represents the end of the collection interval. If the *Signal Condition* is set to *Level* or *Slope*, this value is the end of the interval where the check for the starting condition is performed. The Stop Time is set in minutes.

**Fraction Volume**

The maximal volume collected as one fraction. If the collected volume exceeds this value, the vial is automatically changed and the fraction is collected in two or more vials. This value should be lower or equal to the vial volume to prevent vial overflow. Fraction volume units are recovered from the [Instrument Method Sending](#) dialog.

**Signal Condition**

Can be set to *None*, *Level* or *Slope*.

- None - The fractions are collected in the whole defined time interval based on the set fraction volume.
- Level - The fraction collection starts inside the defined time interval when the detector signal increases above the *Start Value* and stops when the detector signal decreases below *Stop Value*. If these conditions are fulfilled more than once in a given interval, the fraction collection is performed more than once changing the vial after each *Stop Value*.
- Slope - The fraction collection starts inside the defined interval when the first derivation of the detector signal increases above the *Start Value* and stops when the derivation of the detector signal first decreases below and then increases above the negative *Stop Value*. If these conditions are fulfilled more than once in a given interval, the fraction collection is performed more than once changing the vial after each *Stop Value*.



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*Note:* When the *Signal Condition* is set to *Level* or *Slope* and the interval ends before reaching the *Stop Value*, the collection of the given fraction is terminated immediately.

**Start Value**

Part of the *Signal Condition* parameter. It defines the fraction starting signal level or slope. The value is set in units specified by *Units*.

**Stop Value**

Part of the *Signal Condition* parameter. It defines the fraction end signal level or slope. The value is set in units specified in the *Units* column.

**Units**

Units of the *Start Value* and *Stop Value* parameters. These units are taken from the detector used.

## 4.3 Method Setup - FC - Vial Numbers

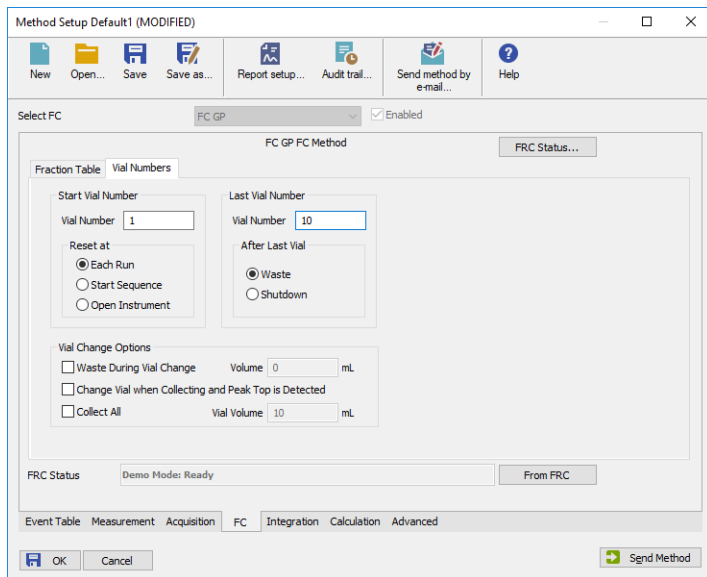


Fig 10: FC - Vial Numbers tab

### Start Vial Number

#### Vial Number

Sets the number of the vial where the first collected fraction will be stored. The current vial number is incremented each time when the Next signal is activated. The information about the vial number is stored in the Result Table.

#### Reset at

Specifies the conditions of the current vial number setting to the *Start Vial Number*. This is possibly done in three different situations:

- Each Run - vial number is reset at the start of each acquisition.
- Start Sequence - vial number is reset only at the start of sequence.
- Open Instrument - vial number is reset only once, when the Instrument is opened.

### Last Vial Number

#### Vial Number

Sets the number of the last available vial.

#### After Last Vial

Specifies the action executed when the current vial number exceeds the *Last Vial Number*.

- Waste - the acquisition continues, but the fraction table is ignored and everything is automatically wasted.
- Shutdown - the acquisition is immediately stopped and the analysis aborted.

## Vial Change Options

### Waste During Vial Change

This option can be enabled to prevent spilling when the vial is changed during collecting. It temporarily stops the fraction collection before changing the vial and restarts it again when the vial is changed. The vial is changed in the middle of the wasting interval; the volume wasted during a vial change can be specified ( *Volume* field). Volume units are taken from the [Instrument Method Sending](#) dialog.

### Change Vial when Collecting and Peak Top is Detected

If enabled, a vial is automatically changed, when a peak top is detected during collecting.

### Collect All

When checked, all the peaks during acquisition are collected, regardless of settings in the [Fraction Table](#). FC module is then sending *Next Fraction* command only, so this option is feasible for fraction collector without a waste valve installed. Maximum amount of eluent collected in a single vial is limited by the value in the *Vial Volume* field.

## 4.4 Data Acquisition window

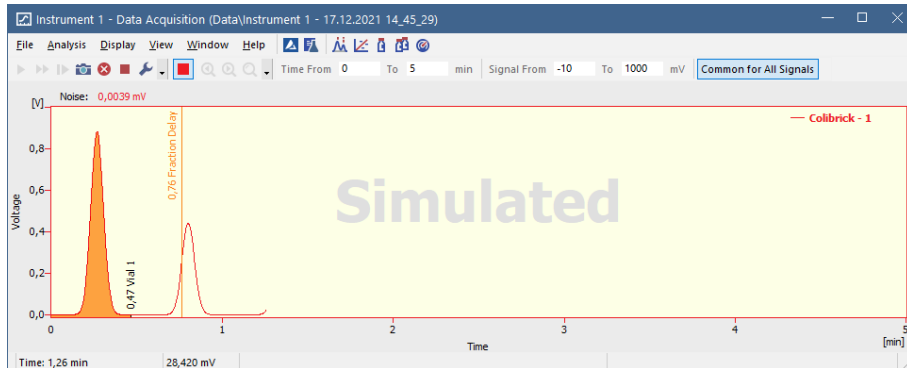


Fig 11: Data Acquisition window

The [Data Acquisition](#) window can display the fractions in the graph using the background color and also the start and stop fraction events and marker of the Fraction Delay. To see the fractions and markers right click the graph, choose *Properties...* to open the [Graph Properties](#) dialog and check the [Show Events](#) checkbox.

**Note:** The Fraction Delay in the picture will appear if the [Delay Volume](#) field in the [Method Setup - FC - Fraction Table](#) dialog is set to nonzero value.

## 4.5 Device Monitor

The **Device Monitor** window can be invoked by the *Monitor Device Monitor* command from the **Instrument** window or using the *Device Monitor* icon.

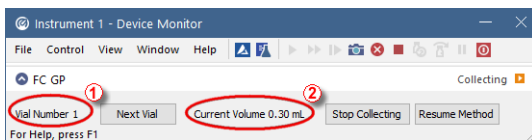


Fig 12: Device Monitor

It is possible to control the fraction collection manually from the **Device Monitor**. The automatic fraction collection is paused immediately after the first manual action is executed; it can be resumed again from the **Device Monitor** window.

### Vial Number

Number of the current vial ① used for fraction collection.

### Next Vial

Manually changes the vial to the next one.

### Current Volume/Waste

Displays the volume collected in the vial so far ②. Text will change to *Waste*, when the fraction collector is not collecting.

### Start Collecting/Stop Collecting

Manually starts the fraction collection. During the manual collection the text changes to *Stop Collecting* and the button can be used to stop the collection. As soon as the manual collection stops, text changes back to *Start Collecting* and the button can be used to start another manual collection.

### Resume Method

This button is enabled only when the collection is manually controlled. It stops the manual control and resumes the automatic fraction collection according to the used method.

## 4.6 Digital Outputs of FC GP

The **FC GP** contains two **digital TTL outputs**, which are also designed as relay contacts. The **Digital Outputs of FC GP** dialog is accessible from the main **Clarity** window using the *System - Digital Outputs...* menu item, or appropriate icon in the main window.

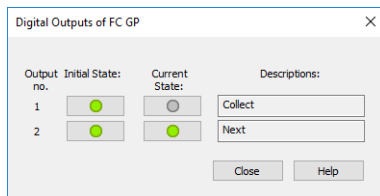


Fig 13: Digital Outputs of FC GP

### Output no.

Lists the numbers of individual outputs.

### Initial State

Selects the **Initial** status of the digital output when the station starts. The status is indicated in two halves: the first shows the digital output (*Output*) and the second its usability as a relay (*Relay*).

### Current State

Displays and enables modification of the current status of outputs. The status is indicated in two halves: the first shows the digital output (*Output*) and the second its usability as a relay (*Relay*).

Change in these columns takes effect immediately. To change the status click the corresponding field with the inscription *HIGH* or *LOW* indicating the output value. The output status is also indicated by color, where gray corresponds to logical zero (*LOW*) and green to logical one (*HIGH*).

### Descriptions

Outline description indicating the meaning of individual outputs. The names of individual digital outputs can be edited in the **DataApex FC GP Setup** dialog accessible from the **System Configuration** dialog.

*Note:* It is not possible to access the **Digital Outputs** dialog of the device that is configured solely on the Instrument you do not have the access to. The access to particular Instruments for different users may be set in the **User Accounts** dialog.

## 4.7 Chromatogram window

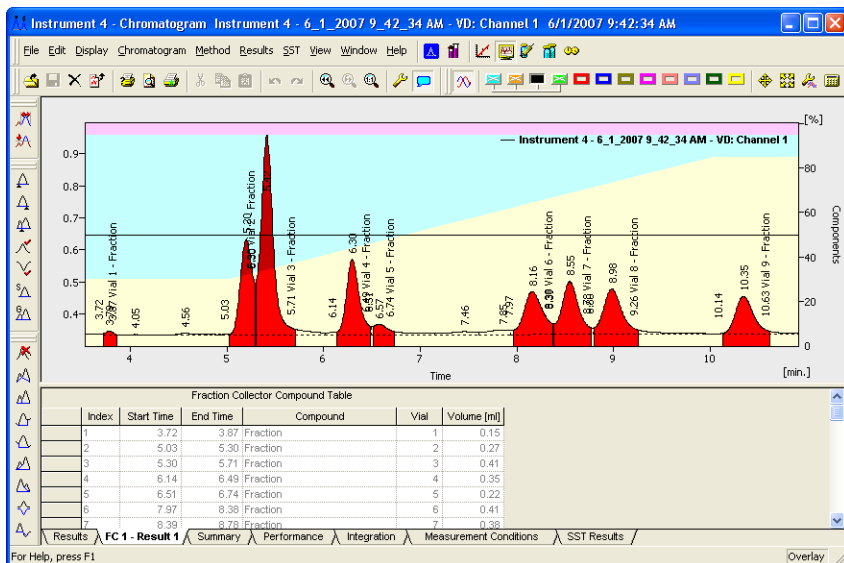


Fig 14: Chromatogram - FC Result window

A new **FC Result** tab was added to the **Chromatogram** window. The *Fraction Collector Compound Table* presented on it contains the information on collected fractions.

### Index

The index of the collected fraction.

### Start Time

The time when the collection of the respective fraction was started. The Start Time is shown in minutes.

### End Time

The time when the collection of the respective fraction ended. The End Time is shown in minutes.

### Compound

Name of the fraction collected. The names used are taken from the *Fraction Table* in the **Method Setup - FC** dialog.

### Vial

The number of the vial with the collected fraction.

### Volume

The volume of the fraction collected. Volume units are taken from **Instrument Method Sending** dialog.

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*Note:* If the volume of any fraction during the analysis exceeds the fraction volume set in the *Fraction Table* of the [Method Setup - FC](#) dialog, the *Fraction Collector Compound Table* will contain several rows with increasing Index and Vial Numbers, but the same Compound name.



## 4.8 Report Setup

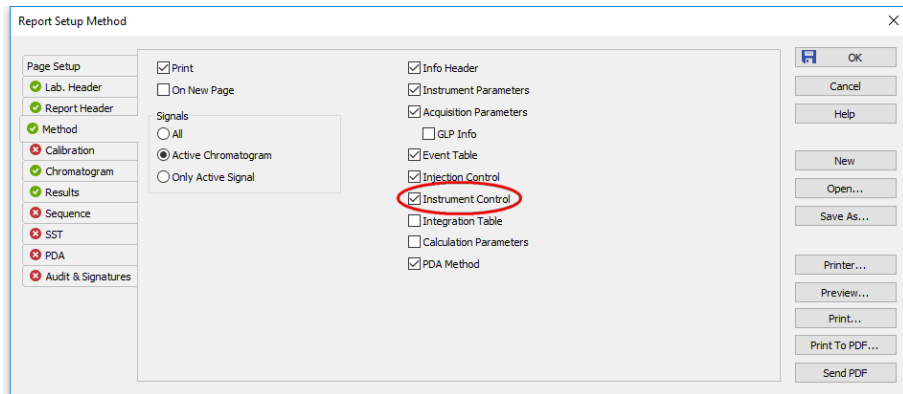


Fig 15: Report Setup - Method dialog

Fraction Collector parameters can be displayed and printed in the report by checking the *Instrument Control* checkbox in the **Report Setup - Method** tab.

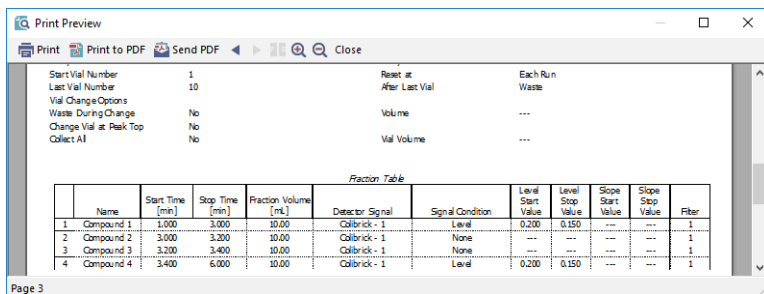


Fig 16: Print Preview

All parameters from the **Method Setup - FC** dialog are displayed and printed, along with the data from other control modules such as GC or LC.

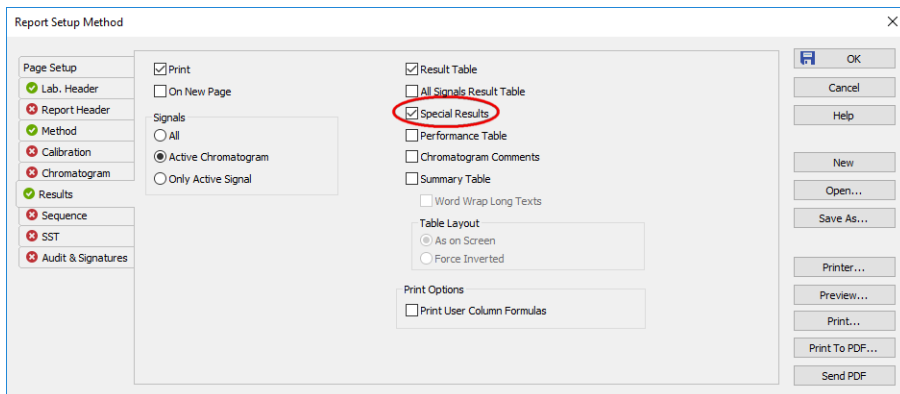


Fig 17: Report Setup - Results Settings

It is also possible to print the Result Table generated by the FC GP module in the [Chromatogram](#) window by checking the *Special Results* checkbox in the [Report Setup - Results](#) tab.

## 5 How to

The General Purpose Fraction Collector (FC GP) can be configured to enable large variety of options to control various fraction collectors that are controlled using the Collect/Waste input (see Requirements).

The "How to" section describes certain configurations and procedures in detail to make it easier for users to set the commonly required options.

## 5.1 Bio-Rad BioFrac

This fraction collector offers *Advance* and *Waste/Collect* inputs, thus it can be controlled using FC GP and digital outputs of a DataApex A/D converter or any other controlled device offering auxiliary TTL and relay outputs (outputs need to be programmable from the **Clarity** Event Table). *Advance* input is offered by 15-pin D connector and *Waste/Collect* signal by 8-pin mini-DIN connector on the rear side of the FC. A cable connecting controlling device outputs to these inputs is necessary for proper using the fraction collector with **Clarity**. Such custom cable can be ordered together with **Clarity** software (in case a DataApex A/D converter is used), or manufactured separately.

In case of manufacturing the cable, the recommended connection is the following:

- Connect *Advance* TTL output of the controlling device to the pin nr. 1 on 15-pin D connector on BioFrac. Ground pin nr. 15 needs to be connected to the corresponding ground lead of the controlling device. For successful sending of the *Advance* command, the length of the pulse has to be 100 ms.
- Connect *Waste/Collect* relay output leads of the controlling device to the pins nr. 2 and 8 on BioFrac mini-DIN connector. Switching the relay into "ON" position (output leads are connected) causes the diverter valve to change to collect.

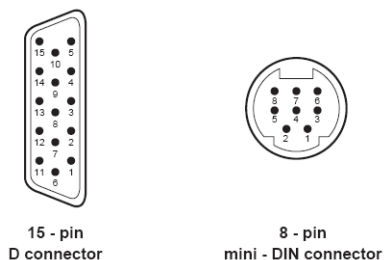


Fig 18: BioFrac rear side connectors used for connection with controlling device.

A detailed description of the FC connectors is available in the BioFrac Instruction Manual, description of A/D converters outputs in their appropriate manuals (INT7, INT9, U-PAD2).

For proper functioning it is necessary to switch the FC to the *LP/Econo* operation mode, according to the BioFrac Instruction Manual. It is also necessary to set *Rack*, *MultiRun*, *Start Tube* and *End Tube* parameters from fraction collector Main Screen.