

Clarity Controls

Shimadzu GC-201x

GC

ENG

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Contents

1 Shimadzu GC-201x Control module	1
2 Requirements	2
3 Installation Procedure	3
3.1 Hardware - Wiring.....	3
3.2 Shimadzu GC-201x setup - communication.....	3
3.3 Clarity Configuration.....	4
4 Using the control module	6
4.1 Hardware Configuration.....	6
4.2 Method Setup - GC.....	7
4.2.1 Method Setup - GC - Oven/Zones.....	7
4.2.2 Method Setup - GC - FLOW 1(2).....	8
4.2.3 Method Setup - GC - DET 1 (.4).....	10
4.2.4 Method Setup - GC - Time Events.....	13
4.2.5 Method Setup - GC - Pre Run.....	15
4.2.6 Method Setup - GC - Other.....	16
4.2.7 Method Setup - GC - Gradients.....	17
4.3 Method Setup - Acquisition.....	18
4.4 Device Monitor.....	19
4.5 Shimadzu GC-201x Setup.....	20
5 Report Setup	26
6 Troubleshooting	27

To facilitate the orientation in the **Shimadzu GC-201x** 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, there are text sections written in format other than normal text. These sections are formatted as follows:

Note: Notifies the reader of possibly interesting information.

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

█ Marks the problem statement or trouble question.

Description: Presents any closer information on the problem, describes its causes etc.

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

1 Shimadzu GC-201x Control module

This manual describes the setting of the **Shimadzu GC-201x** control module. The control module enables direct control of chromatographs of **Shimadzu GC2010**, **GC2014**, **GC2014C** and **GC2014 APC/AFC** types over serial line.



Fig 1: Shimadzu GC-2014C (with AOC-20i autosampler)

2 Requirements

- **Clarity** Installation CD ROM with GC Control module (p/n A23).
- Free serial COM port in the PC.

Note: Modern computers usually have only 1 (if any) serial (COM) port installed. To use more devices requiring the RS232 port, the **MultiCOM** adapter (p/n MC01) is available.

- Serial cross DB9F-DB9F cable (p/n SK01).

Note: Cables are not part of **Clarity** Control Module. It is strongly recommended to order required cables together with the Control Module.

3 Installation Procedure

3.1 Hardware - Wiring

Start and Ready signals are communicated with **Clarity** through the Serial cross DB9F-DB9F cable, so it is not necessary to connect additional starting cables. The signal cable has to be connected according to the following scheme.

In a set with the **Autosampler** synchronization cables might be necessary.

Note: Typical connections of a set with Autosampler can be found in the **Getting Started** manual (chapter **Device Setup and Wiring**).

Typical serial cable wiring is described in the picture.

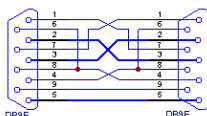


Fig 2: Serial cross cable DB9F - DB9F

3.2 Shimadzu GC-201x setup - communication

The GC must be fully configured prior to connecting to **Clarity**. No special settings have to be made on the **Shimadzu GC-201x** chromatograph, only the communication protocol of the instrument (set on the FUNC key screen by using 6. GC CONFIGURATION - 3. TRANSMISSION PARAMETER) has to be set to *LEVEL3*. Baud rate set in the instrument must correspond to the *Baud Rate* set in the [Shimadzu GC-201x Setup](#) dialog. For locally connected instruments with short interconnecting cable the *Baud Rate* set as default (*115200*) is recommended. With the rising length of the cable or when connected via the network the *Baud Rate* should be set lower.

Note: When controlling **Shimadzu AOC20** autosampler, a separate serial line is required, connecting the autosampler directly to PC.

3.3 Clarity Configuration

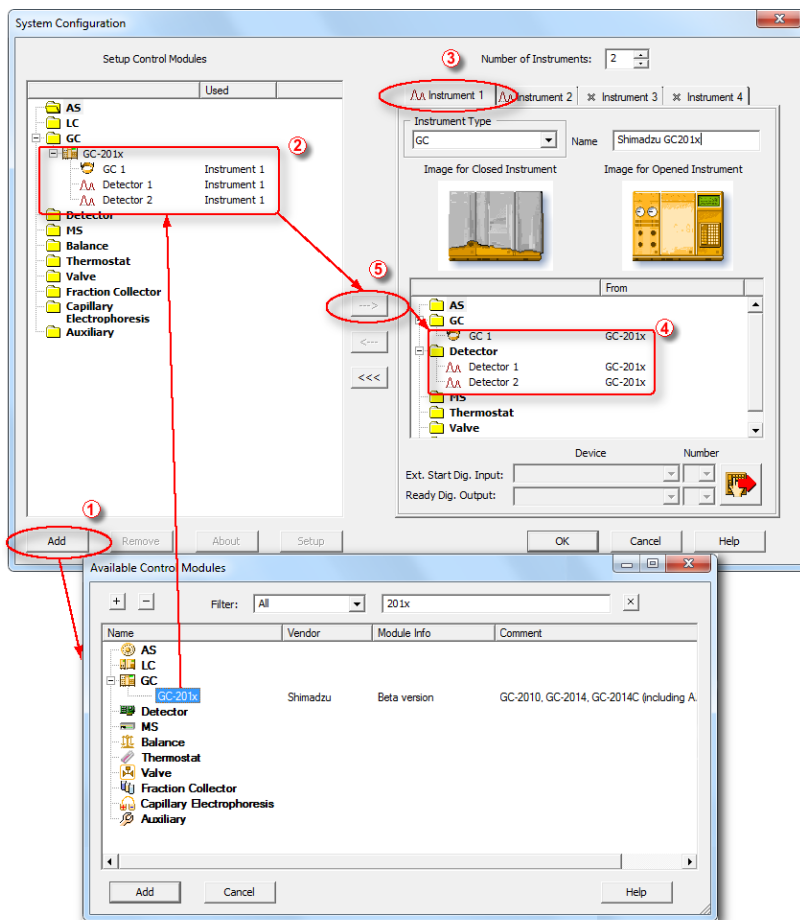


Fig 3: System Configuration

- In the **System Configuration** dialog press the **Add** button ① to invoke the **Available Control Modules** dialog.
- Select the **Shimadzu GC-201x** in the **GC** section and press the **Add** button.
- The **Shimadzu GC-201x Setup** dialog will appear.

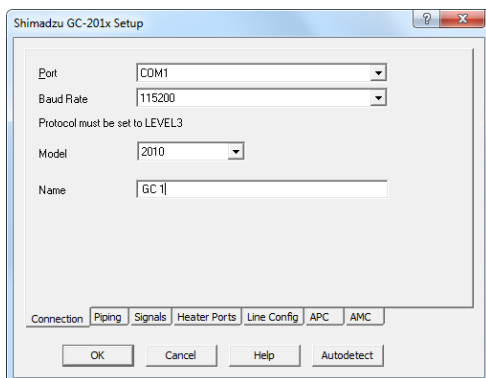



Fig 4: Shimadzu GC-201x Setup

- Fill in the *Port*, *Baud Rate* and *Name* according to the settings and the connection of the GC (for more details see the chapter **Shimadzu GC-201x Setup** on pg 20)..
- Press the *Autodetect* button to read all settings from the instrument and apply them in the **Shimadzu GC-201x Setup** dialog.

Note: It is strongly recommended not to change the settings gained through the *Autodetect* function. When opening the **Instrument** window, those settings are checked against the settings of the GC and in case they are not the same the warning message is issued and no control is possible.

Note: Only **GC2010** and **GC2014** models are autodetected properly. When using **GC2014C** or **GC2014 APC/AFC**, the exact type used needs to be selected after autodetection.

- Switch to the **Signals** tab (for more details see the **Shimadzu GC-201x Setup** dialog section later in the manual), select the correct number of signals you want to acquire, name them and possibly check the *Enable to start device(s) from Clarity* checkbox. Press the **OK** button.
- The **Shimadzu GC-201x** item ② will appear in the *Setup Control Modules* list of the **System Configuration** dialog.
- Drag the GC icon from the *Setup Control Modules* list on the left side to the desired *Instrument* tab ③ on the right side ④, or use the  button ⑤ to do so.

4 Using the control module

New **GC** tab appears in the **Method Setup** dialog, enabling the setting of the GC control method.

From GC

Reads the actual values from the GC and loads them into the method.

4.1 Hardware Configuration

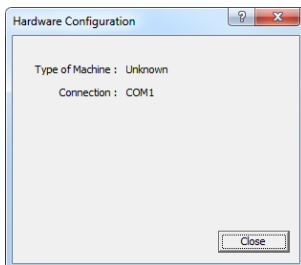


Fig 5: Hardware Configuration

This dialog is invoked by pressing the *GC Status* button in the **Method Setup - GC** dialog. **Hardware Configuration** dialog displays the type of the chromatograph and the COM port to which it is connected.

4.2 Method Setup - GC

4.2.1 Method Setup - GC - Oven/Zones

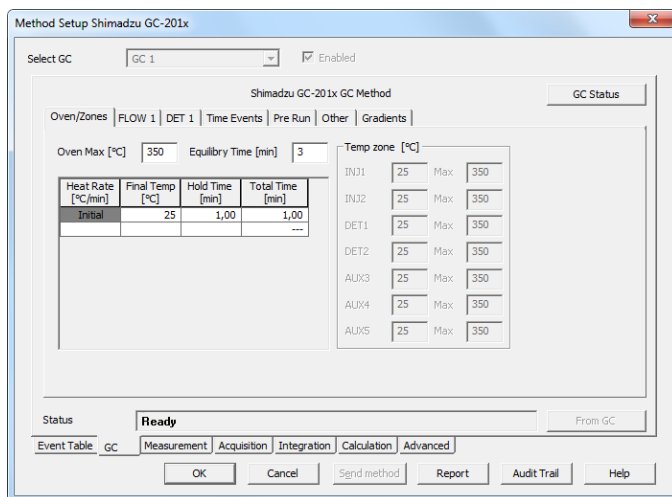


Fig 6: Method Setup - GC - Oven/Zones

Oven Max

Sets the maximal allowed temperature for the column oven. Possible values are: 0 - 470.

Note: Please note that the maximum value may differ for certain GC models - listed values for it range between 350 and 470 °C.

Equiliry Time

Time that the GC needs to reach the temperature equilibrium after the temperature program gets to the set initial temperature. This time is used to distribute the heat evenly in the oven.

Gradient Table

Sets the *Heat Rate*, desired temperature (*Final Temp*) and time to hold this temperature (*Hold Time*). The *Total Time* column will be calculated automatically. In other words, for isothermal part of the temperature gradient, the temperature set in *Final Temp* will be kept for the interval set in *Hold Time*. To delete a row, simply delete the value in the *Heat Rate* column on that row.

Temperature Zones

Sets the temperature and maximum temperature of the zones that have been set in the [Shimadzu GC-201x Setup - Heater Ports](#) dialog (for more details see also chapter [Shimadzu GC-201x Setup](#) on pg 20).

Description

Description of the method (this description is not sent to or read from GC, it serves for the information purposes only).

4.2.2 Method Setup - GC - FLOW 1(2)

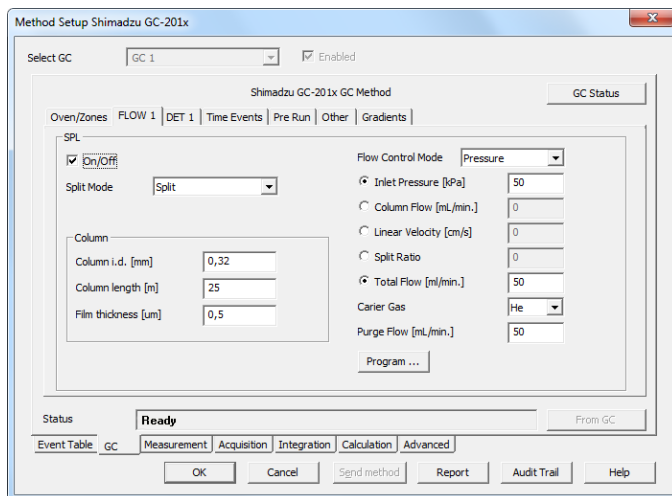


Fig 7: Method Setup - GC - FLOW 1

This tab governs the settings concerning the injection port of the **Shimadzu GC-201x** chromatograph. Up to two injection ports may be configured and used at the same time. The tab is only present when some inlet is configured in the **Shimadzu GC-201x Setup - Piping** dialog for a given injector port. The fields dealing with flow of gases are available only for models of chromatograph equipped with Advanced Flow Control (**AFC**). These are **GC2010**, **GC2014** and **GC2014 APC/AFC**.

On/Off

Turns on/off the inlet.

Split Mode

Defines the operation mode for the injector port. The possible options are *Split*, *Splitless* and *Direct* (see **Shimadzu GC-201x** hardware manual for more details on these injection modes). Available for **SPL** inlet only.

Sampling Time [min.]

Sets the sampling time in minutes for the *Splitless Sampling Mode*.

Column i.d.

Sets the inner diameter of the column.

Column length

Sets the length of the column.

Film thickness

Sets the thickness of the column inner coating.

Flow Control Mode

Selects the flow control mode for the inlet.

Inlet Pressure

Sets the gas pressure for the inlet.

Column Flow

Sets the flow for the inlet.

Linear Velocity

Sets the linear velocity of gas for the inlet. This value is linked with two preceding values (*Inlet Pressure* and *Column Flow*) by mutual recalculation performed by chromatograph itself. Thus it is possible to enter only one of them, the others will be calculated by chromatograph and can be downloaded using *From GC* button.

Split Ratio

Sets the split ratio for split operation. Available for **SPL** inlet only.

Total Flow

Sets the total flow for the inlet.

Carrier Gas

Sets the type of gas used as the carrier.

Purge Flow

Sets the purge flow for the inlet. Available for **SPL** inlet only.

Program ...

Opens the dialog for setting the pressure/flow program. The tables allows to set the pressure/flow program for the analysis and for purging the inlet.

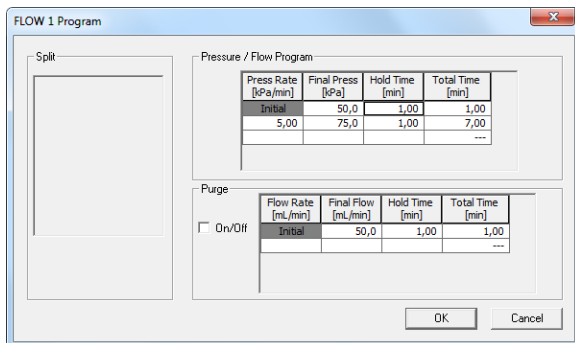


Fig 8: Method Setup - GC - FLOW 1 - Program

4.2.3 Method Setup - GC - DET 1 (..4)

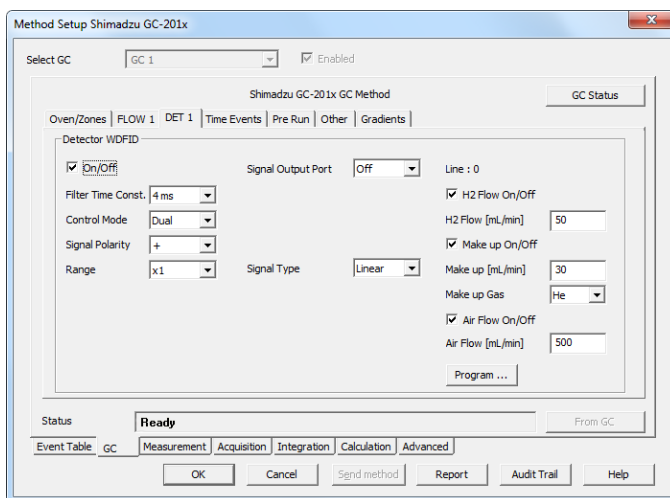


Fig 9: Method Setup - GC - DET 1

This tab allows to set the parameters for a detector configured in the [Shimadzu GC-201x Setup](#) dialog. Particular fields may vary, according to the type of the detector set. The fields dealing with flow of gases are available only for models of chromatograph equipped with Advanced Pressure Control (APC). These are **GC2010** and **GC2014 APC/AFC**.

On/Off

Switches the detector on and off. The detector switched off gives 0 as a resulting signal.

Filter Time Const.

The value set here influences the processing of the detector signal. It works as a noise filter, the higher the constant, the lower the noise. On the other hand, usage of the higher values will flatten peaks and may cause lower or smaller peaks to disappear.

Control Mode

Sets the mode of operation of the particular detector. Two option sets are available in this field, depending on the type of the detector used:

- Dual flame ionization detector (WDFID) may work in the *Dual* mode or use the signal from one cell only. Dual detector can also measure only on single cell - then select *Single L* for the left cell or *Single R* for the right cell.
- Flame thermionic detector (FTD and WFTD) allows to use two possible control modes - *Current* and *Voltage*.

Signal Polarity

This field is only present when using the dual detector in the *Dual* mode or one of TCD detectors. Sets the polarity of the dual data, or in other words, the method of data calculating (either the signal of the right cell minus the signal of the left cell (polarity -) or vice versa (polarity +)). Available for TCD and WDFID detector only.

Range

Applies on the detector signal before its processing to the analog output in the **Shimadzu GC-201x**. This value serves for the compensation of the overly high signals.

Current

Serves for entering the value of current set on the detector. Possible range and units depend on the type of the detector - **FTD** detector has the range of values *0.00-10.00 pA*, **ECD** detector *0.00-2.00 nA* and **TCD** detector *0-200 mA*. This field is only present for Electron capture (ECD), Thermal conductivity (TCD) and Flame thermoionic (FTD and WFTD) detectors.

Signal Output Port

Specifies the signal output of the particular detector. **Shimadzu GC-201x** provides up to 4 signal outputs set in the [Shimadzu GC-201x Setup - Signals](#) dialog

Power Controller

This field is only present on tabs of Flame thermoionic detectors (FTD and WFTD).

Adjust Time

This field can only be edited when the *Power Controller* checkbox is selected.

Interference Filter

Possible values are *P*, *S* and *Sn*. This field is only present when using the Flame photometric detector (FPD or WFPD).

Signal Type

Sets the type of the signal - *Wide* or *Linear*. The selection influences the possible values present in the *Range* field.

H2 Flow

Turns On/Off the flow of hydrogen and sets its value. Available for FID, WFID, WDFID, FPD, WFPD, SID, WSID, FTD and WFTD detector.

Make Up

Turns On/Off the flow of make-up gas and sets its value and type of the gas. Available for FID, WFID, WDFID, FPD, WFPD, SID, WSID, FTD and WFTD detector.

Air Flow

Turns On/Off the flow of the air and sets its value. Available for FID, WFID, WDFID, FPD, WFPD, SID, WSID, FTD and WFTD detector.

Program ...

Opens the dialog for setting the flow program. The tables allows to set the flow program for the detector during the analysis. Available for FID, WFID, WDFID, FPD, WFPD, SID, WSID, FTD and WFTD detector.

Flow Rate [mL/min]	Final Flow [mL/min]	Hold Time [min]	Total Time [min]
Initial	500,0	1,00	1,00

Flow Rate [mL/min]	Final Flow [mL/min]	Hold Time [min]	Total Time [min]
Initial	30,0	1,00	1,00

Flow Rate [mL/min]	Final Flow [mL/min]	Hold Time [min]	Total Time [min]
Initial	50,0	1,00	1,00

Fig 10: Method Setup - GC - DET1 - Program

4.2.4 Method Setup - GC - Time Events

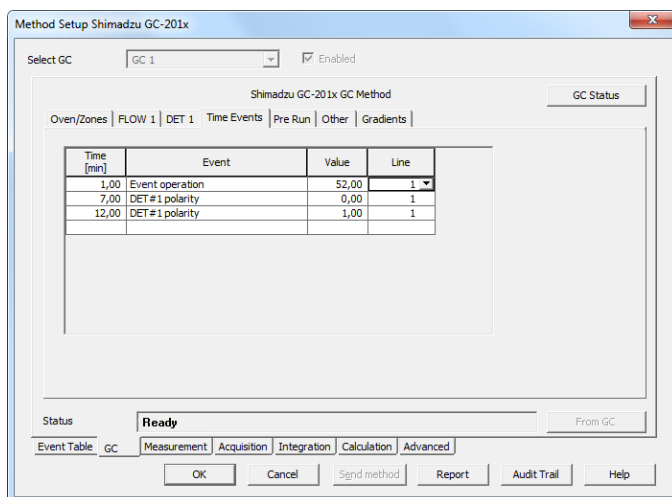


Fig 11: Method Setup - GC - Time Events

This tab allows to set the events that should happen during the run based on the analysis time. This includes events like switching the detector polarity, range or current (where applicable), setting temperatures to detector/injector/auxiliary zones etc. To delete a row, simply delete the value in the *Time* column on that row.

Note: This tab uses the same functions as the [Pre Run](#) tab, so these are described together.

The table should be filled with the *Time* of the event in the first column (in minutes, decimal format - 2 minutes 45 seconds should be set as 2.75), the event type in the *Event* column, event value in the *Value* column and the *Line* selected as set on the [Shimadzu GC-201x Setup - Line Config](#) tab. Possible events are:

Det 1(..4) Polarity

Sets the polarity of the detector (if the polarity for the given detector has any sense). Polarity + corresponds to the value 1, polarity - corresponds to the value 2.

Det 1(..4) Range

Changes the detector range (as set before the analysis on the [DET X](#) tab) during the course of the analysis. Range $x1$ corresponds to value 0, range $x10^{-1}$ to value 1, $x10^{-2}$ to value 2, $x10^{-3}$ to value 3 and $x10^{-4}$ to value 4.

Det 1(..4) Current

Changes the current value of the detector (if the current for the given detector has any sense). The new value should be in range and units

dependent on the type of the detector - **FTD** detector has the range of values *0.00-10.00 pA*, **ECD** detector *0.00-2.00 nA* and **TCD** detector *0-200 mA*.

Note: All 4 possible detectors are listed, even if they are not present and configured in the [Shimadzu GC-201x Setup](#) dialog. Those not configured will have the text in the format *Det #X Polarity* etc. with the # character - these shouldn't be used in the **Time Events table**.

Event Operation

Performs an event operation defined by the event code. These codes may be used as a positive number or negative number, in which case the opposite of the operation is performed. For example, event code *51* performs the autozero operation on detector 1, while *-51* event code cancels the zero adjustment on detector 1. The basic event codes and their functions are:

Tab 1: Event codes

Event Code	Function
51	Autozeroes the Detector 1
52	Autozeroes the Detector 2
53	Autozeroes the Detector 3
54	Autozeroes the Detector 4

Note: For more event codes please see Shimadzu hardware documentation.

Temperature of INJ1(2), DET1(2), AUX3(..5)

Changes the temperature of the particular temperature zone. The initial temperature is set on the [Oven/Zones](#) tab, but can be changed later during the analysis this way. The *Value* column should hold the temperature in °C.

Program stop

Stops the GC control program. The value entered into the *Value* column should be set to *XY*, where *X* is the number of runs before the program stop command is sent and *Y* is the number of file (in the GC) to be loaded after that. For example value *16* corresponds to the program stop command sent after one run of the method, after which the FILE6 is loaded. The number of method runs doesn't have any meaning for **Clarity** as the method is usually sent after each injection, thus resetting the counter after each injection. For more details, consult Shimadzu manual.

4.2.5 Method Setup - GC - Pre Run

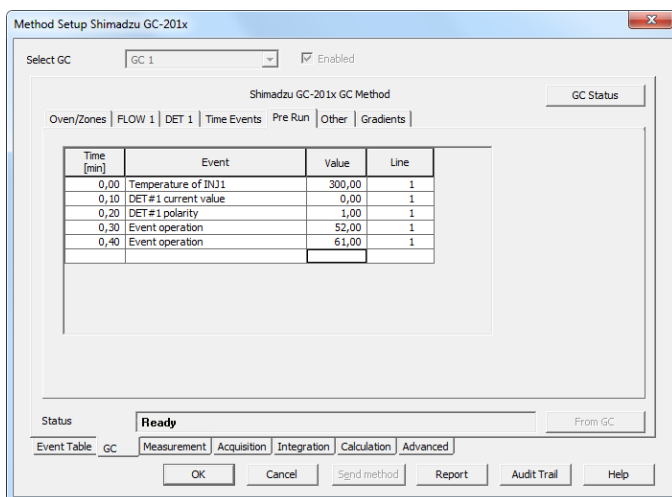


Fig 12: Method Setup - GC - Pre Run

This tab has the same functionality as the [Time Events](#) tab, so the functions are described there together. The [Pre Run](#) tab serves for setting of the program that takes place before the analysis start.

4.2.6 Method Setup - GC - Other

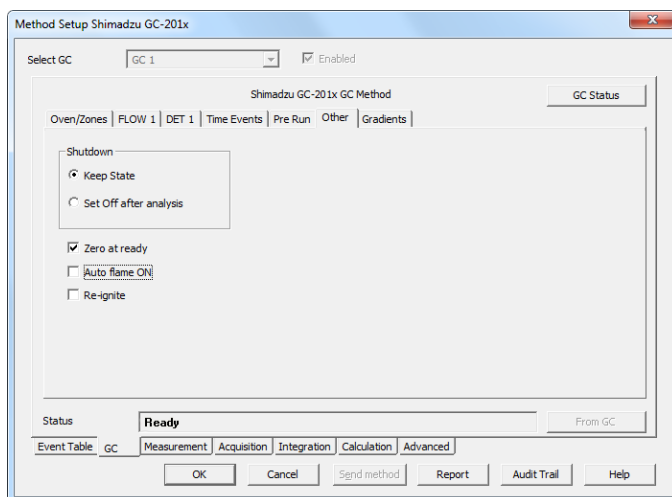


Fig 13: Method Setup - GC - Other

This tab allows to set the behavior of some parts of the **Shimadzu GC-201x** chromatograph.

Shutdown

Defines the behavior of the chromatograph after the analysis end.

Keep State

The chromatograph will do nothing when the analysis is completed.

Set Off after analysis

The chromatograph performs the **System Off** function (check **Shimadzu GC-201x** manual for more details). This function is useful for switching the chromatograph off after the last sample in the sequence. When the Clarity Instrument is set to send a method without prompting in the [System Configuration - Instrument Method Sending](#) dialog and there is another method opened in the [Instrument](#) window at the analysis end, the chromatograph will be turned off by the current method and then turned on by the sending of the instrument method.

Caution: Be careful when switching off instruments without automatic pressure control and automatic flow control - the manually controlled gases flow is not switched off, which may end in the leakage of possibly dangerous gases (hydrogen) into the laboratory environment.

Zero at ready

When checked, the chromatograph performs the autozero action after it becomes *READY*.

Auto flame ON

When checked, the chromatograph will try to ignite the flame in the detector after sufficient temperature and gasses pressure was reached.

Re-ignite

While checked, the chromatograph will try to re-ignite the flame in the detector when it is quenched. This may be important during the start of the chromatograph as the auto ignition may not be successful on the first try.

4.2.7 Method Setup - GC - Gradients

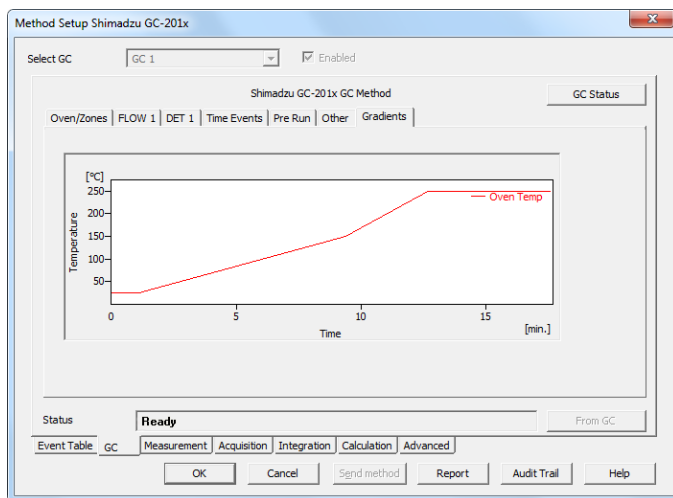


Fig 14: Method Setup - GC - Gradients

This tab displays the temperature gradient as set on the [Method Setup - GC - Oven/Zones](#) tab.

4.3 Method Setup - Acquisition

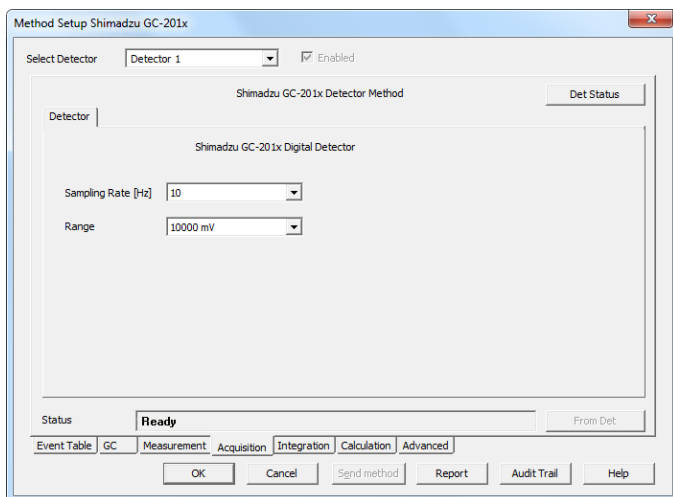


Fig 15: Method Setup - Acquisition

Each detector allows to set the particular *Sampling Rate* on the appropriate tab. This sampling rate in fact states the frequency of the data sending from the **Shimadzu GC-201x** detector to **Clarity**, it has nothing to do with the frequency of actual data acquisition in the instrument. To switch to another detector, use the *Select Detector* field on the top of the [Method Setup - Acquisition](#) dialog.

4.4 Device Monitor

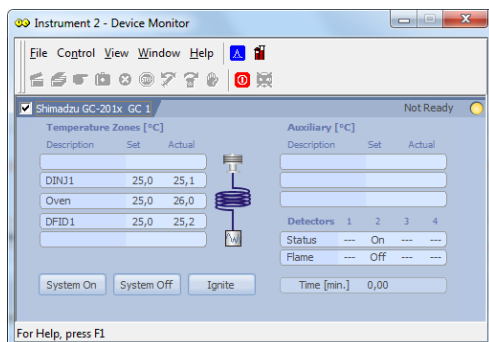


Fig 16: Shimadzu GC-201x Device Monitor

The Monitor window for the **Shimadzu GC-201x** chromatograph displays all set and actual temperatures in each temperature zone and the column oven. Besides that, it also shows the run time of the analysis.

System On

Allows to switch the chromatograph on. It starts the temperature program in the column oven, detectors and injectors.

System Off

Switches the **Shimadzu GC-201x** off by switching off the oven thermostat and injector/detector heating.

Ignite

When this button is used, the chromatograph will try to ignite the flame in the detector. The status of the flame is visible in the *Detectors* section of the Monitor window (*Flame* row).

4.5 Shimadzu GC-201x Setup

Dialog tabs: [Connection](#) - [Piping](#) - [Signals](#) - [Heater Ports](#) - [Line Config](#)
[Shimadzu GC-201x Setup](#) dialog (accessible through the [System Configuration](#) dialog) allows to view and manually set the hardware configuration of the chromatograph. All fields (with the exception of *Name* field and the [Signals](#) tab) can be read from the chromatograph by using the *Autodetect* button.

Caution: It is highly recommended not to change any data read from the chromatograph by the *Autodetect* function, because these settings are checked against those in the GC when opening the [Instrument](#) window. If they don't match, the control is not possible. The only parts of the dialog that can be modified without risk is the *Name* parameter on the [Connection](#) tab and any data on the [Signals](#) tab.

Connection tab

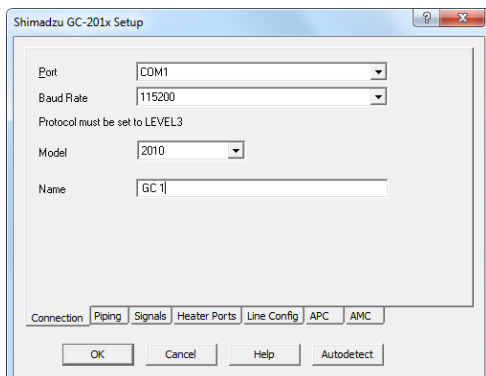


Fig 17: Shimadzu GC-201x Setup - Connection

Main page of the [Shimadzu GC-201x Setup](#) dialog.

Port

Selects the COM port to which the **Shimadzu GC-201x** chromatograph is connected.

Baud Rate

Sets the baud rate of the communication. For a chromatograph directly connected to the PC via short cable it is recommended to set the *Baud Rate* to *115200*, for the chromatograph connected by long serial cable or through LAN it will be necessary to set the *Baud Rate* lower. Default value is *115200*.

Caution: The baud rate set in this dialog must correspond to the baud rate value set in the chromatograph.

Model

Selects the exact type of instrument.

Name

Specifies the name of the chromatograph.

Autodetect

Reads the hardware configuration from the **Shimadzu GC- 201x** chromatograph and sets it to the [Shimadzu GC-201x Setup](#) dialog.

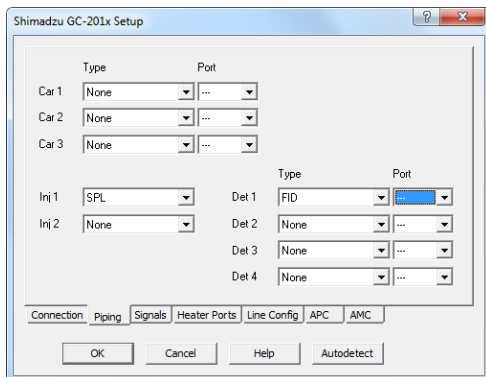
Piping tab

Fig 18: Shimadzu GC-201x Setup - Piping

Car 1 (..3)

Allows to set the possible operation modes for carrier gasses. For **Shimadzu GC- 201x** chromatographs (without automatic flow control function), only the *SPLITTER* and *PACKED* options will be used, others are saved for instruments equipped with AFC control.

Inj 1 (2)

Lists the type of the injector(s) installed.

Det 1 (..4)

Lists all detectors and other signal sources (e.g. temperature of the measuring cell) from which the signals will be transferred into **Clarity**. Each *Det X* field with any type of detector other than *None* will have its own sub-tab with options relevant to the detector type selected in the [Method Setup - GC](#) dialog.

Signals tab

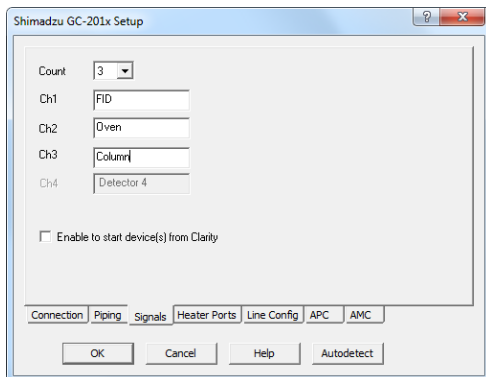


Fig 19: Shimadzu GC-201x Setup - Signals

Shimadzu GC-201x Setup - Signals tab defines the number of signals that will be processed by **Clarity**. These signals will be assigned to particular detectors (hardware) in the **Method Setup - GC - DET X** dialog.

Count

Defines the number of signals that will be transferred to the **Clarity**. These signals correspond to **Clarity** detectors and will have their own sub-tabs in the **Method Setup - Acquisition** dialog, if configured on the given **Clarity** Instrument.

Ch1(..4)

Sets the name of the particular signal.

Enable to start device(s) from Clarity

This checkbox enables to start the analysis run from the Clarity. Independently on this checkbox, the analysis can be started automatically by the correctly wired autosampler after the injection or by the **Start** button on the front panel of the chromatograph.

Heater Ports tab

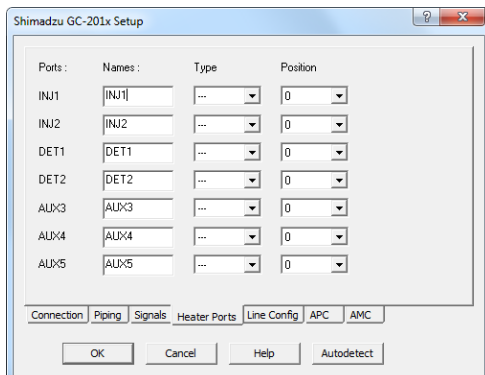


Fig 20: Shimadzu GC-201x Setup - Heater Ports

This tab specifies the presence of individual components of the **Shimadzu GC-201x** chromatograph and displays their exact position. These settings can all be read from the instrument by using the *Autodetect* button.

Ports

Shows the default names of particular temperature zones as set in the **Shimadzu GC-201x** chromatograph.

Names

Allows to set desired names for particular temperature zones. By default, these names are the same as shown in the *Ports* column.

Type

Sets the type of the device installed in the particular temperature zone.

Position

Defines the location where the particular compartment is installed on the **Shimadzu GC-201x** chromatograph. Numbers and positions of particular locations are listed in the instruction manual of the chromatograph.

Line Config tab

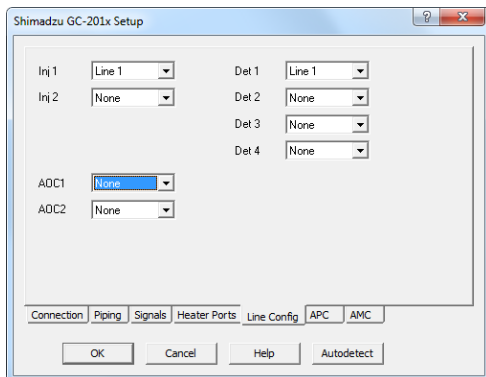


Fig 21: Shimadzu GC-201x Setup - Line Config

This tab shows the position of particular components on the analytical lines in the chromatograph. Up to four independent lines may be configured. All settings on this tab may be read from the chromatograph by using the *Autodetect* button.

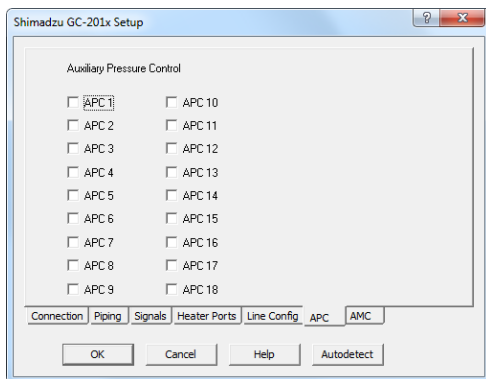


Fig 22: Shimadzu GC-201x Setup - APC

This tab shows the presence of Auxiliary Pressure Control devices. State of all checkboxes are autodetected, it is strongly recommended not to change them manually.

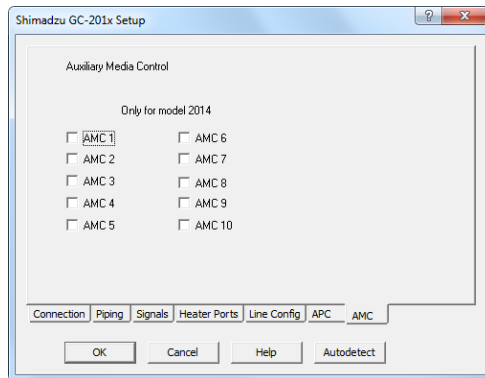


Fig 23: Shimadzu GC-201x Setup - AMC

This tab shows the presence of Auxiliary Media Control devices. State of all checkboxes are autodetected, it is strongly recommended not to change them manually.

6 Troubleshooting

When the remedy for some problem cannot be discovered easily, the recording of communication between **Clarity** and the chromatograph can significantly help the **DataApex** support to discover the cause of the problem.

The recording can be enabled by adding or amending the COMMDRV.INI file in the **Clarity** installation directory (C:/CLARITY by default). The file can be edited in any text editor (e.g. Notepad). Following section should be edited or added:

```
[COM1]
echo=on
textmode=on
filename=ShimadzuGC201x.txt; %D or %d could be used to include a
current date (recommended in combination with the Reset=Off option
reset=off
```

Note: Instead of COM1 type the correct serial port used to communicate with the **Shimadzu GC-201x** chromatograph. This port number is displayed when the *GC Status* button in the [Method Setup - GC](#) dialog is invoked or in the [Shimadzu GC-201x Setup](#) dialog.

The created *.TXT files will greatly help in diagnosis of unrecognized errors and problems in communication.