DataApex
Clarity™
CHROMATOGRAPHY SOFTWARE

SHIMADZU AOC-20

Clarity Control Module   ENG

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Contents

To facilitate the orientation in the **Shimadzu AOC-20** manual and **Clarity** chromatography station, different fonts are used throughout the manual. Meanings of these fonts are:

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.

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

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

[Chromatogram](#) (blue underlined) marks clickable links referring to related chapters.

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:

Note:　　　　Notifies the reader of relevant information.

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

▌ **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 Shimadzu AOC-20i/s/d Control module

This manual describes the setting of the Shimadzu **AOC-20 i/s/d** autosamplers. The control module enables direct control of the instrument over serial line.

Fig. 1: AOC-20i

Direct control means that the autosampler can be completely controlled from the **Clarity** environment. Instrument method controlling for example the vials and further device specific functions (e.g. washing) will be saved in the measured chromatograms.

2 Requirements

- **Clarity** Installation with AS Control module (p/n A26).
- Free serial port in the PC (fast - 16550 UART).

Note: Modern computers usually have only 1 (if any) serial (COM) port installed. To use more devices requiring the 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.

Caution: We have experienced power sources (controller boards) with DB9F connector on the back instead of normal DB9M connector. In that case, serial cross DB9M-DB9F cable is necessary. Contact our support on sales@dataapex.com to consult the correct wiring.

3 Installation Procedure

3.1 Autosampler Setup - communication

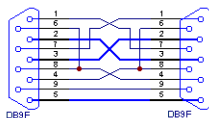The autosampler communicates with PC using the RS232-compliant serial cross DB9F-DB9F cable.

Fig. 2: Serial cross DB9F-DB9F cable

The RS-232 cable is plugged in to the autosampler controller board (not the tower) present at the back side of the GC, replacing the cable connecting it to the GC in default setup, as displayed in the **Fig. 3** on pg. **3**.
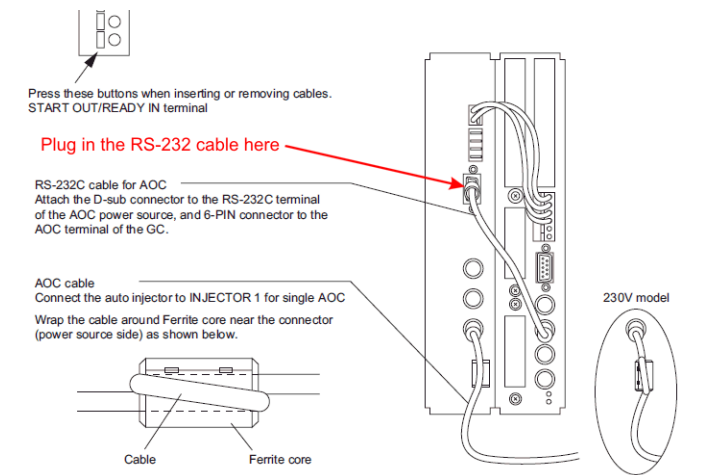

Fig. 3: Shimadzu AOC-20 controller board connections

3.1.1 Connections

Besides the serial RS-232 cable, the connections must be made between the autosampler Start OUT/Ready IN connector and the appropriate connectors on the GC to allow proper synchronization between the AS and GC.

- The **Clarity Start (IN)** input must be connected to the GC Start Out connector.
- The **Clarity Ready (OUT)** digital output is not used, the commands are transmitted over the serial line.

Refer to Shimadzu manual for description of cables supplied with the autosampler.

When autosampler has to be used with Shimadzu 201x series GCs (2010, 2014, 2014C, 2014 APC/AFC), it is necessary to connect it to the PC via separate serial line. The controller box is build in the GC2010/2014 case, but to use the control from **Clarity**, the short serial cable from the GC to the controller box needs to be disconnected and replaced by a serial cable to the PC.
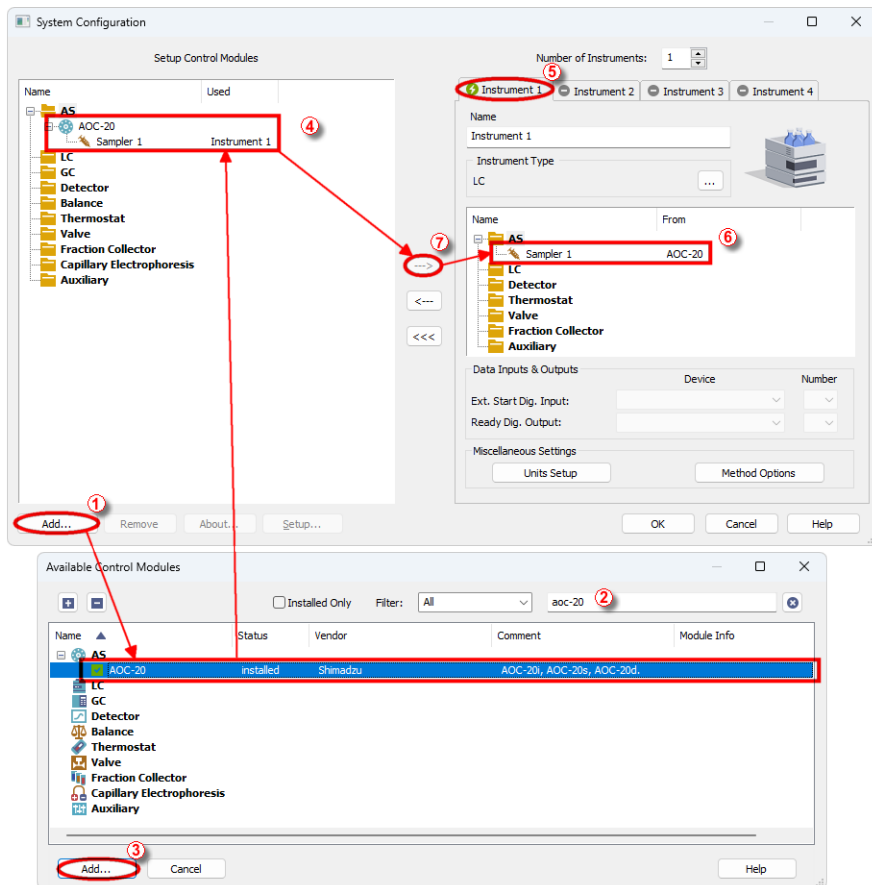
3.2 Clarity Configuration

Fig. 4: How to add Shimadzu AOC-20

- 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. 4** on pg. **5**.) to invoke the *Available Control Modules* dialog.
- You can specify the searching filter ② to simplify the finding of the driver.
- Select the **AOC-20** sampler and press the *Add* ③ button.

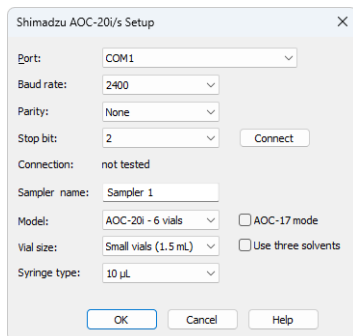The Shimadzu AOC-20i/s Setup dialog will appear.

Fig. 5: Shimadzu AOC-20i/s Setup

- Select the correct *Port*, *Baud Rate*, *Parity* and *Stop bit* settings for the autosampler. Then press the *Connect* button. If the communication is correct, the status of the autosampler will appear in the *Connection* row. Communication parameters must be set on the hardware to match those used in Clarity, otherwise, a *No Communication* dialog will appear.
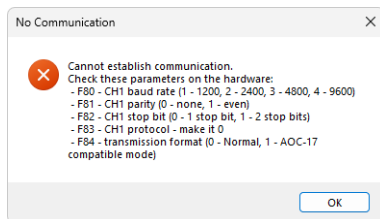

Fig. 6: Shimadzu AOC-20i/s No Communication dialog

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Note: The Shimadzu AOC-20i/s Setup dialog is more closely described in the chapter **"Shimadzu AOC-20i/s Setup"** on pg. **10**.

The **AOC-20** autosampler item will appear in the *Setup Control Modules* list of the *System Configuration* dialog.

- Drag and drop the **AOC-20** icon from the *Setup Control Modules* ④ list 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).

4 Using the control module

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

The *From AS* and *To AS* buttons serve for transfer of methods from and to autosampler.

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Caution: If you have injection methods already established in the sampler, it is advisable to download them to **Clarity** using the *From AS* button and save them as a **Clarity** method.

The *AS Status* button displays the Hardware Configuration dialog.
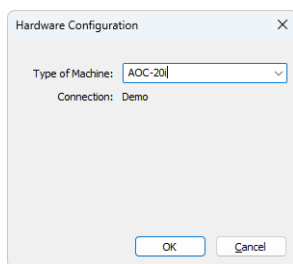
4.1 Hardware Configuration dialog

Fig. 7: Hardware Configuration

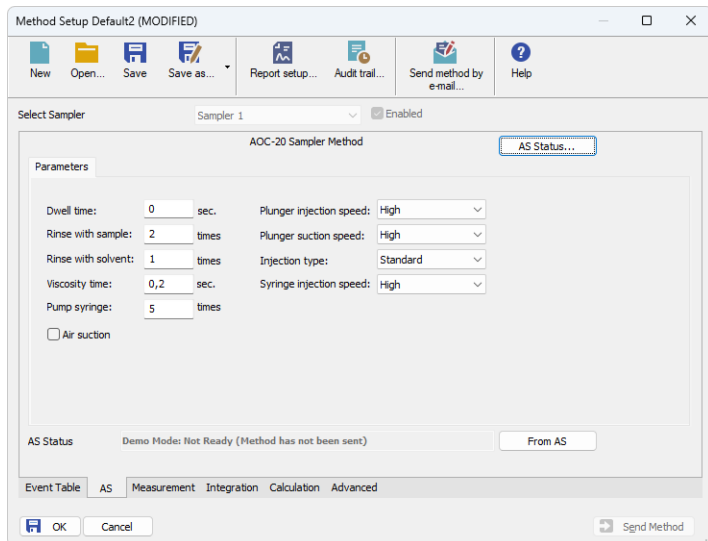This dialog displays automatically detected communication port.

4.2 Method Setup - AS

Fig. 8: Method Setup - AS - Parameters

Dwell time
 Waiting time after sample injection.
 Valid range: 0 - 99.9 s

Rinse with sample
 Sample washing times of the syringe before injection.
 Valid range: 0 - 99

Rinse with solvent
 Solvent washing times of the syringe after injection.
 Valid range: 0 - 99

Viscosity time
 Waiting time of the plunger after sample suction.
 Valid range: 0 - 99.9 s

Pump syringe
 Number of pumpings.
 Valid range: 0 - 99

Plunger injection speed
 Injection speed of the plunger.

Plunger suction speed
 Plunger suction speed at sample suction.

Injection type
  Injection type.

  Standard - sample + (air)

  Solvent flush - solvent + air + sample + (air)

  Solvent flush w/o air - solvent + sample + (air)

  Standard internal - solvent + air + standard sample + air + sample + (air)

  Standard internal w/o air - solvent + standard sample + sample + (air)

Syringe injection speed
  Injection speed of the syringe.

Select Solvent
  Selects the appropriate solvent for solvent wash in case there are three solvent vials on the sampler rack. It is necessary to enable this option in the Shimadzu AOC-20i/s Setup dialog using the *Use three solvents* checkbox.
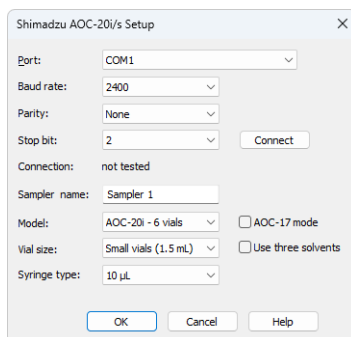
Air Suction
  Check if you want autosampler to suck air into the needle after sample suction. This can help prevent premature evaporation of part of the sample, when the needle is warmed-up.

4.3 Shimadzu AOC-20i/s Setup

The *Shimadzu AOC-20i/s Setup* dialog sets the fundamental options of the control module.

Note: It is accessible from the **System Configuration** dialog by doubleclicking the *Shimadzu AOC-20i/s* item.

Fig. 9: Shimadzu AOC-20i/s Setup

Port
COM Port used for communication between the hardware and the PC.

Baud Rate, Parity, Stop Bit
Communication parameters. Those parameters should be set according to the actual communication parameters set in the autosampler (use the Function key to check/modify them)

Default values:

Baud rate: 2400 (F80=2)

Parity: none (F81=0)

Stop bits: 2 (F82=1)

Note: The changes made on the sampler are active only after power restart.

Connect
Button which tests communication with auto-injector hardware and detects if auto-sampler hardware is present.

First fill in the *COM Port*, *Baud rate*, *Parity*, *Stop bit* fields and check *AOC17 mode* if you need AOC-17 compatible mode, then press the Connect button. Now connection is tested and auto-sampler is detected for established connection. Connection state is shown in the *Connection* field. If connection fails then message box appears and you are asked to check some parameters on the hardware.

Connection
Connection status.

Sampler name

Assigns name to the sampler, under which it appears in configuration, method setup, reports, etc.

Model

Defines the model of the AOC-20 sampler.

Vial size

Defines the type of the vials used on the sampler.

Syringe type

Defines the type of the syringe.

AOC-17 mode

Setting this checkbox enables AOC-17 compatible mode.

To use the AOC20 in this mode, set the functions F84=1 (default is F84=0).

Note: Regardless of mode used, the *Channel 1 Protocol* parameter must be zero (F83=0).

Use three solvents

Defines whether the autosampler uses the three-vial solvent option or not. When checked, additional options will be available on the Method Setup - AS tab for selecting the solvent vials for pre-wash and post-wash.

5 Sequence

To use the autosampler in the **Clarity** sequence, following conditions must be met:

- The sequence must be saved
- The sequence must be set as **Active Sequence**
- All used methods must have the *External Start* enabled and the *Autostop* time set
- Method Setup - AS dialog in the used methods must be filled

The required values for starting vial (*SV*), ending vial (*EV*), number of injections from vial (*I/V*) and injected volume are set in the sequence table.

 Standard sequence operation

After sequence start, the AS control method will be sent to the sampler and the datastation will wait for the injection signal from sampler. After receiving it, the run starts and after finishing, the method for next injection will be sent to the sampler.

Note: Communication protocol used for autosampler control in **Clarity** allows wider possibilities for some parameters (for example Minimum injection volume) compared to original manufacturer's User manual.

6 Troubleshooting

When the cause could not be discovered easily, the recording of communication between **Clarity** and the autosampler can significantly help the **DataApex** support to discover the cause.

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

Following lines should be added

> [COM1]
> echo=on
> textmode=on
> filename=CommDrv_%D.txt
>
> reset=off

Note: Instead of COM1 type the correct serial port used to communicate with the **Shimadzu AOC-20** detector.

Note: *%D* (or *%d*) in the filename parameter means that the log will be created separately for each day. The *reset=off* parameter disables deleting the content of the log each time the station is started during the same day.

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

Recording the communication related to instrument control is not recommended to leave it on for prolonged periods.