DataApex
Clarity™
CHROMATOGRAPHY SOFTWARE

SHIMADZU NEXERA

Clarity Control Module   ENG

Author: DM

Contents

To facilitate the orientation in the **Shimadzu Nexera** manual and **Clarity - Shimadzu Edition** 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 - Shimadzu Edition**, 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 - Shimadzu Edition** 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 Nexera

This manual describes the use of the **Shimadzu Nexera** with the **Clarity - Shimadzu Edition** software.

Fig 1: Shimadzu Nexera

Shimadzu Nexera is controlled using RC.NET driver developed by **Shimadzu** running under the Agilent ICF (Instrument Control Framework) library developed by Agilent, which can be run within the **Clarity - Shimadzu Edition** environment. List of controlled system parts is available in the "Requirements" chapter.

2 Requirements

2.1 Software requirements

Shimadzu Nexera RC.net driver is exclusively available in **Clarity - Shimadzu Edition OEM** version. This OEM version is only available in selected countries (Europe region) and sold through approved distributors. In terms of **Clarity - Shimadzu Edition** product numbers, this includes:

- Clarity - Shimadzu Edition (p/n C50-28)
- LC Control license (p/n A24)
- LC Shimadzu license (p/n A24-001)
- optionally AS Control License (p/n A26) - when the system contains an autosampler
- optionally PDA Extension (p/n A29) - when the system contains PDA detector

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Caution: LC Shimadzu Control license to use the driver (p/n A24-001) must be purchased for each controlled system **Nexera LC** separately. There is similar license for **Shimadzu Nexis GC** systems.

Shimadzu Nexera requires **Microsoft .NET version 3.5** for correct installation and **Microsoft .NET version 4.7** or higher for correct operation. Both of the versions are already installed on majority of PCs. Nonetheless you will be notified during the installation if your PC is missing any version of **Microsoft .NET** - then follow the instructions there. For complete list of .NET requirements, see the .NET Framework System Requirements on Microsoft web page.
Supported operating systems:

- **Windows 8.1 (32/64 bit)**
- **Windows 10 (32/64 bit)**

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Note: Although Agilent ICF does not state other **Windows OS** between supported, the system may work on other OS versions as well (Windows 7 SP1 (32/64 bit), Windows 11 (64 bit)). This functionality is not guaranteed though.

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Caution: Before installing **Clarity - Shimadzu Edition**, make sure that your **Windows** are updated to the latest version.

2.2 Hardware requirements

- LAN interface installed on PC is required.

- Latest available ROM version of connected modules should be used to ensure maximum compatibility. Minimum ROM versions are listed in the following table:

Tab 1: Tab1: Supported Shimadzu Nexera system components and minimum ROM versions

Module Name		Minimum ROM version
System Controller	CBM-40, CBM-40 Lite, SCL-40	1.40
Mobile phase monitor	MPM-40	1.03
Pump	LC-40B X3, LC-40B XR, LC-40D, LC-40D X3, LC-40D XR, LC-40D XS	1.04
Autosampler	SIL-40, SIL-40 XR, SIL-40C, SIL-40C X3, SIL-40C XR, SIL-40C XS	1.05
	PlateChanger	1.05
Column Oven	CTO-40C, CTO-40S	1.00
	CTO-30A	3.11
Detector	SPD-40, SPD-40V	1.04
	RID-20A	2.04
	RF-20A, RF-20AXS	2.02
	CDD-10Avp	5.10
	Optional AD Board	-
	SPD-M40	2.00
	SPD-M30A	4.04

For complete list of supported Windows OS, instrument firmware, see Shimadzu webpages.

Note: Besides the **Shimadzu Nexera** series operated through the CBM-40 controller, the driver also offers **Shimadzu iSeries LC Systems** (compact systems) and **Shimadzu Nexera/Prominence LC** (operated through CBM-20/CBM-30 controllers), but these systems are not controlled in **Clarity - Shimadzu Edition**.

Note: The CBM-40 controller can be under normal conditions used to control most LC-20/LC-30 components, but the RC.net driver does not support such combinations. When such components are connected to the CBM-40 controller, the communication with the system will fail.

3 Installation procedure

Shimadzu Nexera is part of the **Clarity - Shimadzu Edition** *Typical* installation. To install it, select the *Typical* installation or check the **Shimadzu Nexera** in the Choose Components dialog in *Instrument Control Framework (ICF)* during the installation of **Clarity - Shimadzu Edition**.
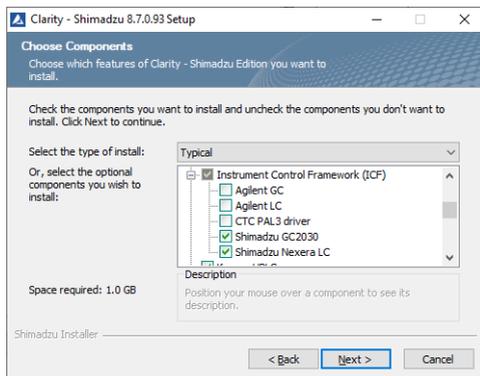

Fig 2: Typical installation of Clarity - Shimadzu Edition

3.1 Installing Correct Version of ICF

Clarity - Shimadzu Edition expects a specific version of Agilent ICF. Because other programs may also be using Agilent ICF, it is possible they've installed a different version than is supported by **Clarity - Shimadzu Edition**. In that case in the installation you will be prompted to reinstall it in order to install correct version. Going forward with this step is crucial for correct functionality of **Clarity - Shimadzu Edition** and **Shimadzu Nexera**.
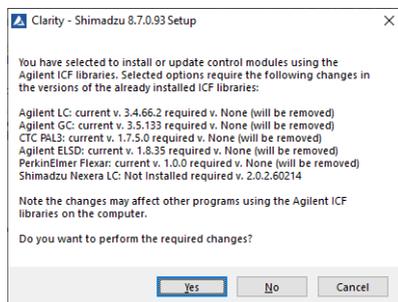

Fig 3: Installing correct version of Agilent ICF

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Note: This reinstallation of Agilent ICF may cause that other programs using it may not function properly.

3.2 Network connections

The instrument **Shimadzu Nexera** has to be connected to a site network by LAN. It is recommended to attach the hardware directly to the PC avoiding hubs, switches etc. Always contact your local LAN administrator who can make the appropriate settings.

Caution: **Cross LAN** cable is primarily used for the direct connection of the instrument and the PC. This cable can also be used for the connection of the device to the switch or network socket, but with older switches, the **straight LAN** cable might be necessary.

LAN Settings
PC: LAN card, TCP/IP protocol.
Both PC and **Shimadzu Nexera** should be configured on the same IP Address range.

Firewall
Ensure that the firewall does not block communication from the **Shimadzu Nexera**.

3.3 Connect Key

To control the **Shimadzu Nexera** system, the communication between the RC.net driver and the controller must be enabled by entering Connect Key specific for the controller serial number. The connect key (text file) will be generated by **Shimadzu** support upon providing the Controller (CBM-40, SCL-40, CBM-40 Lite) serial number (could be found in the controller web interface by typing it's IP Address) and the purchased RC.net Agilent ICF Nexera LC driver license number (provided as a document based on purchase of p/n A24-001 LC Shimadzu Control license).

To enter the Connect Key, open the Microsoft EDGE web browser run in Internet Explorer mode and type in the following address:

http://[IP Address at the LC instrument]/html/connectkey.html

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Caution: Different browsers than Microsoft EDGE in Internet Explorer mode will not function in displaying the Input Connect Key dialog.

3.3.1 Switching Microsoft Edge to the Internet Explorer mode

In order to switch to the Internet Explorer mode, start the Microsoft Edge and get to the Settings page (through the ... button). Once in settings, type "internet explorer mode" to the search pane:
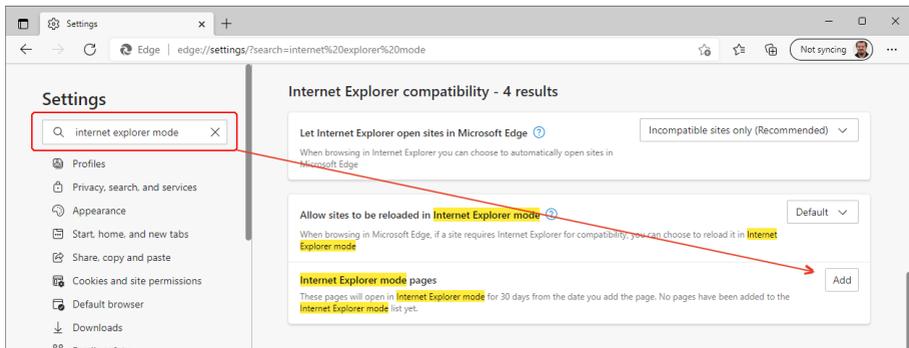

Fig 4: Switching Internet Explorer mode on

As a next step use the Add button in the Internet Explorer mode pages section to open Add a page dialog to specify the address for which the Internet Explorer mode will be used - use the same http://[IP Address at the LC instrument]/html/connectkey.html address.
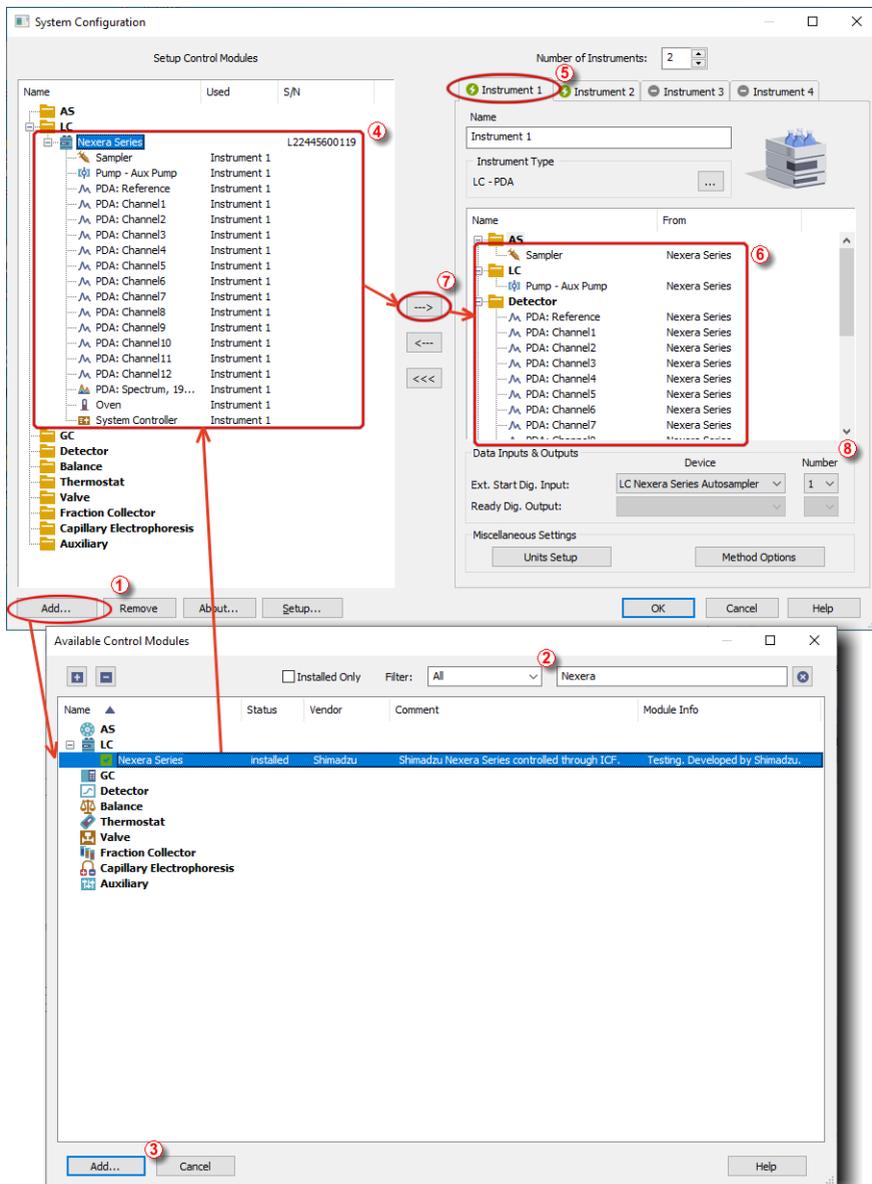
3.4 Clarity - Shimadzu Edition Configuration

Fig 5: System Configuration

- Start the **Clarity - Shimadzu Edition** station by clicking on the ![icon] icon on the desktop.
- Open the System Configuration dialog accessible from the Clarity - Shimadzu Edition window using the *System - Configuration...* command.
- Press the *Add* button ① (See **3.4** on pg **8**.) to invoke the Available Control Modules dialog.
- You can specify the searching filter ② to simplify the finding of the driver.
- Select the **Shimadzu Nexera** item and press the *Add* ③ button. The Nexera Series Setup dialog will open.

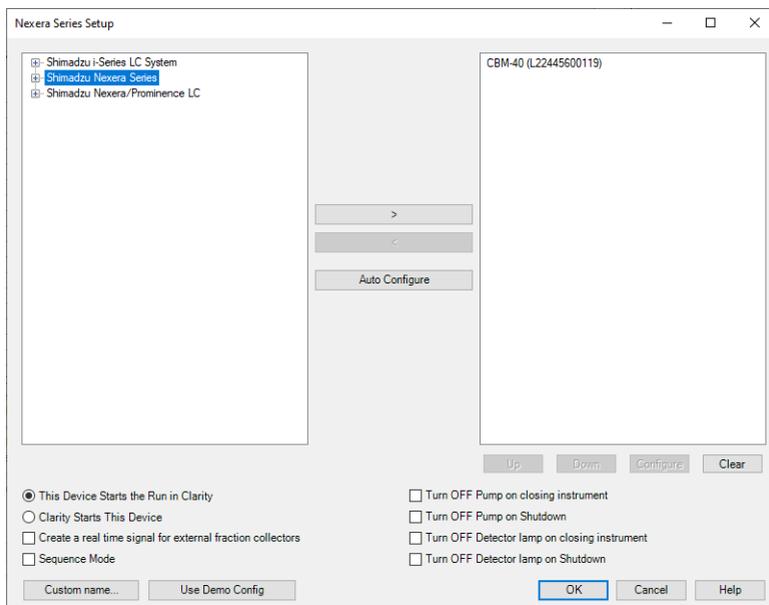*Fig 6: Nexera Series Setup*

- Select the **Shimadzu Nexera Series** instrument type use *Auto Configure* button to open Automatic configuration parameters dialog.

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Caution: Neither the **Shimadzu i- Series LC System** nor **Shimadzu Nexera/Prominence LC** systems are supported. This is a limitation of the **Shimadzu Nexera** control module in **Clarity - Shimadzu Edition**.
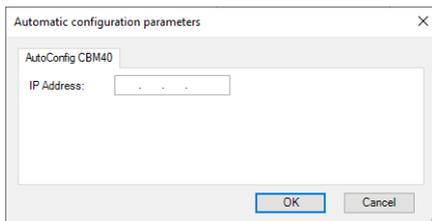
Fig 7: Automatic configuration parameters dialog

- Insert the *IP Address* of **Shimadzu Nexera** and confirm the dialog using the *OK* button.
- The other fields in the Nexera Series Setup dialog allow to set up the start synchronization of the **Shimadzu Nexera** with **Clarity - Shimadzu Edition** analysis starts and behavior of the HPLC during specific moments, e.g. when *SHUTDOWN* is invoked or **Clarity - Shimadzu Edition** Instrument is closed. The options are described in particular manual topic.
- Click *OK* button in the lower part of the Nexera Series Setup dialog and the instrument will then appear in System Configuration, including all modules of the instrument (detector, autosampler etc.).
- Drag and drop the **Shimadzu Nexera** 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).
- Set the *Ext. Start Dig. Input* ⑧ on the right bottom side of the System Configuration dialog according to the physical configuration and wiring of the **Shimadzu Nexera**. When the settings of the *Ext. Start Dig. Input* is set to default value `- v` the analysis start will be detected by **Clarity - Shimadzu Edition** by receiving data from the **Shimadzu Nexera** detector configured on this *Instrument*. In case **Shimadzu Nexera** does not have any detector configured but contains an autosampler it is necessary to set *Ext. Start Dig. Input* to value `1 v` to notify **Clarity - Shimadzu Edition** of the moment of injection.

3.5 Installation Qualification of Shimadzu Nexera

Shimadzu Nexera is controlled via **Agilent ICF**, an external program developed by Agilent, and for that reason it must be validated using their utility. If you have installed **Clarity - Shimadzu Edition** with Agilent ICF, **the IQ is valid only if successful validation of ICF is attached**.
The validation of ICF can be performed directly from the IQ Report.

Caution: When **Clarity - Shimadzu Edition** expects *Agilent ICF* is installed then **IQ** expects the same. If (due to any reason) the *Agilent ICF* installation is not found within **Clarity - Shimadzu Edition**, the *Installation Qualification Test* status is set by default to *FAILED*. To resolve this, it is necessary to re-install **Agilent ICF** through **Clarity - Shimadzu Edition** reinstallation and then perform **IQ** again.

Fig 8: IQ Report with ICF installation present

Press the link *"here"* ①, select the necessary components to qualify in the emerging dialog (particular drivers are qualified as part of the Agilent ICF item) and then use the *Qualify* button to generate the report. The form and placement of the generated report is dependent on the options selected in the Agilent Software Verification Tool dialog, by default the html report is

created and automatically opened in the default browser. The version of **Shimadzu Nexera** driver can be found in the last table on the report.

4 Using the Shimadzu Nexera

There are multiple places for setting the parameters of the **Shimadzu Nexera** in the **Clarity - Shimadzu Edition**:

- the Method Setup - Acquisition tab for the parameters of the detectorss
- the Method Setup - AS tab for the parameters of the autosampler
- the Method Setup - Aux tab for the parameters of event settings
- the Method Setup - LC tab for the parameters of the pumps
- the Method Setup - PDA tab for the parameters of the PDA detector
- the Method Setup - Thermostat tab for the parameters of the column oven

Some of the tabs may not be present based on configured modules assigned to **Clarity - Shimadzu Edition** Instrument - only method parts which have corresponding module in configuration appear.

Caution: Before opening the Instrument window with **Shimadzu Nexera** device configured, ensure that there is no other PC connected to HPLC, else a communication error appears.

4.1 Method Setup - Acquisition

Fig 9: Method Setup - Acquisition

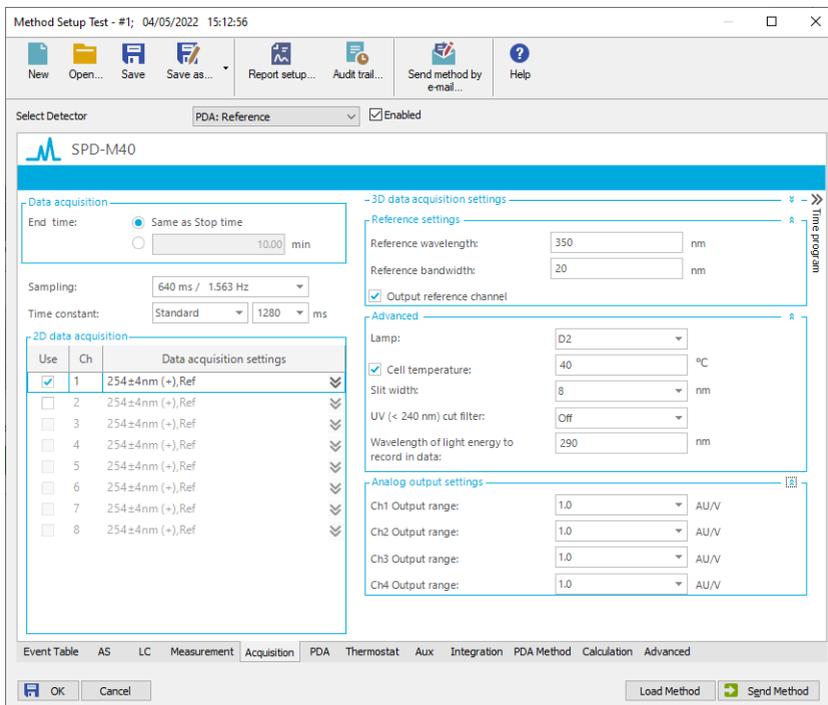- - - - - - - - - -

Note: Press the *F1* key to display the **ShimDriver help** with detailed description of the dialog.

Acquisition tab serves for setting the method parameters of the **Shimadzu Nexera** detectors. Both the parameters for normal and spectral detectors (spectral range etc.) are set here. Contents of the Acquisition tab are the same as contents of the PDA tab.

4.2 Method Setup - AS

Fig 10: Method Setup - AS

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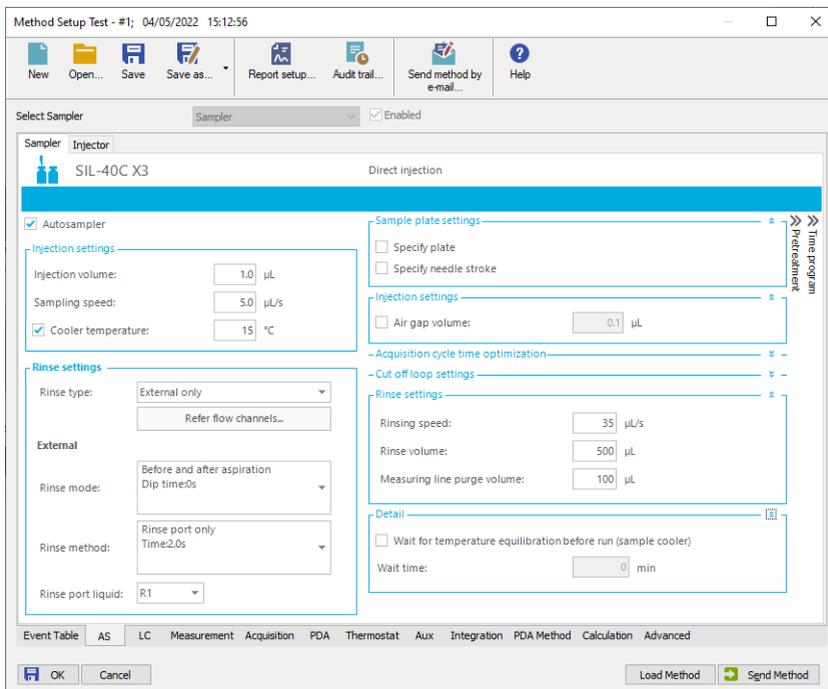
Note: Press the *F1* key to display the **ShimDriver help** with detailed description of the dialog.

AS tab serves for setting of the program of the autosampler and injector.

4.3 Method Setup - Aux

Fig 11: Method Setup - Aux

Note: Press the *F1* key to display the **ShimDriver help** with detailed description
               of the dialog.

Aux tab commands the usage of the system's Event Outputs, as well as a
possible reaction on the Shutdown event received.

4.4 Method Setup - LC

Fig 12: Method Setup - LC

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Note: Press the *F1* key to display the **ShimDriver help** with detailed description of the dialog.

LC tab provides means for setting the gradient program for the pumps. Looks and functionality of some parts of the dialog rely on presence of particular modules - e.g. when MPM-40 Mobile Phase Monitor is present in the system, it allows to select the particular mobile phase names and their compressibility factors are automatically filled in the *Mobile phase settings* pane of the dialog.

4.5 Method Setup - PDA

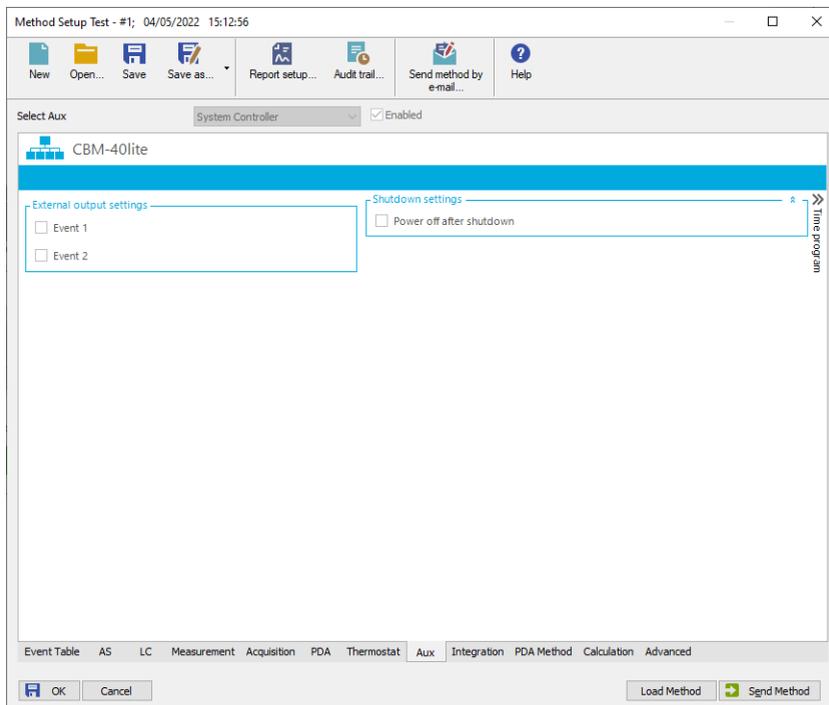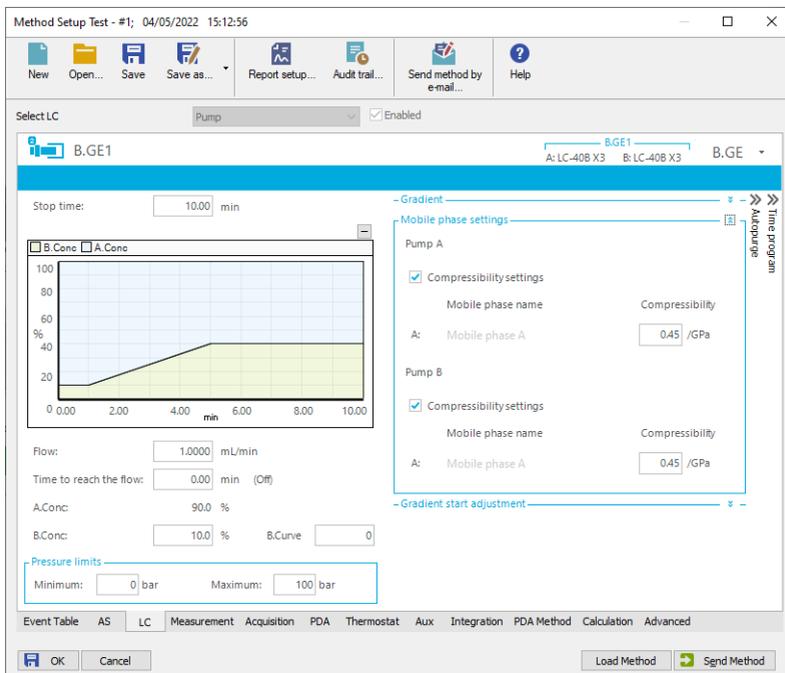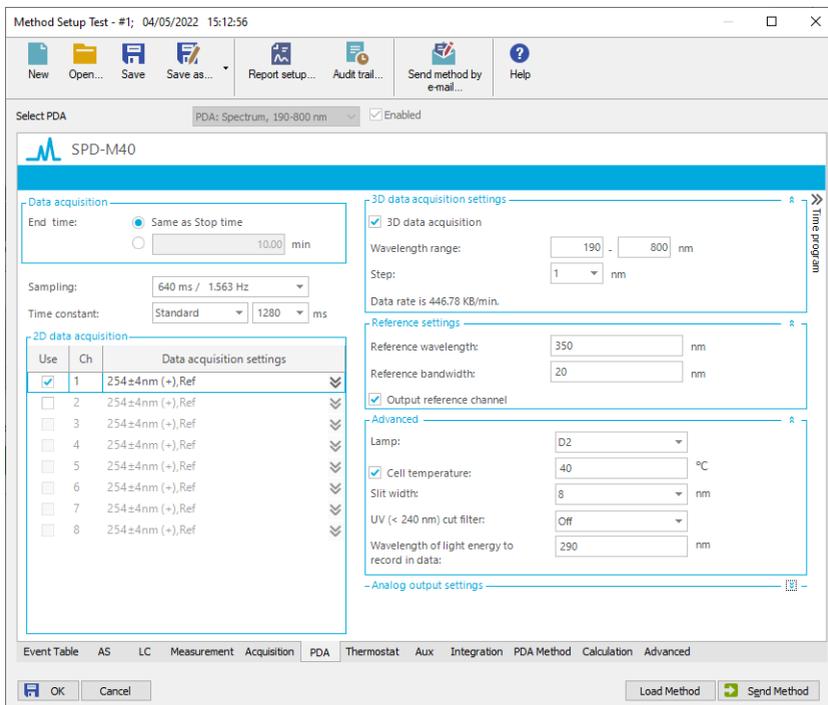*Fig 13: Method Setup - PDA*

Note: Press the *F1* key to display the **ShimDriver help** with detailed description of the dialog.

PDA tab serves for setting the method parameters of the **Shimadzu Nexera** detectors. Both the parameters for normal and spectral detectors (spectral range etc.) are set here. Contents of the PDA tab are the same as contents of the Acquisition tab.
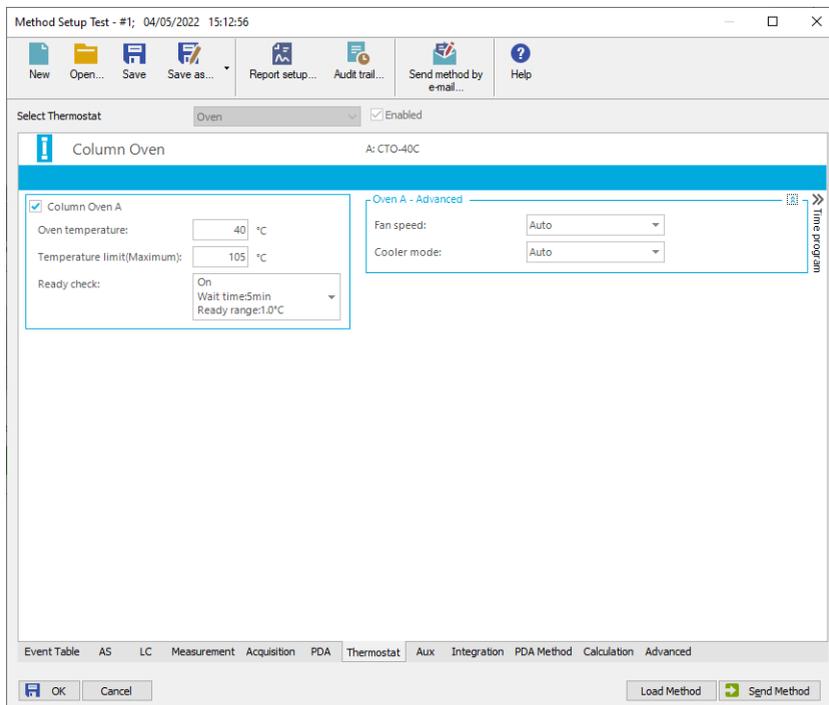
4.6 Method Setup - Thermostat

Fig 14: Method Setup - Thermostat

Note: Press the *F1* key to display the **ShimDriver help** with detailed description of the dialog.

Thermostat tab serves for setting the method parameters for the column oven of the **Shimadzu Nexera** system.

4.7 Device Monitor

The Device Monitor window can be opened by the *Device Monitor* command from the *Analysis* menu or using the **Device Monitor** 🔵 icon in the Instrument window. You may use 🔵 icon for accessing *Device Monitor* from all **Clarity - Shimadzu Edition** windows. This window is for acquiring measured values or control information from instruments so that each instrument status can be monitored.
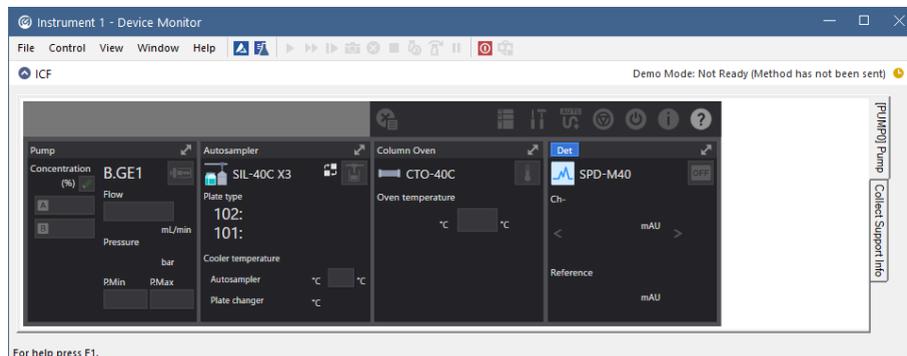

Fig 15: Device Monitor

Note: Press the *F1* key with the focus placed inside the monitor pane to display the **ShimDriver help** with detailed description of the window.

Note: Tabs on right side of the *Device Monitor* allowing to set collection of diagnostic information are displayed only when **Clarity - Shimadzu Edition** is started under Windows account with administrator privileges. For other Windows accounts fewer tabs on the right side of the pane may be displayed.

Note: The *Shutdown* command behavior depends on the state of the *Turn OFF Pump on Shutdown* and *Turn OFF Detector lamp on Shutdown* checkboxes in the Nexera Series Setup dialog.

Note: Some errors may not be cleared using *Device Monitor* and have to be cleared via manual commands using display of the HPLC.

The device monitor pane compartments may hold specific behavior. Regarding the autosampler, **Shimadzu Nexera** autosamplers do not support graphical selection of the vial in the Sequence window, the small arrow used for graphical selection of a vial is non-functional. The vial positions must be entered in the form of "plate number":"vial number", e.g. "1:5" notation means fifth vial on the first plate. In case the platechanger is configured, the vial plates present in the changer are numbered 1-14, the two plates in the sampler are 101 and 102.

4.8 Nexera Series Setup

The dialog allows to set up the start synchronization of the **Shimadzu Nexera** with **Clarity - Shimadzu Edition** analysis starts and behavior of the HPLC during specific moments, e.g. when *SHUTDOWN* is invoked or **Clarity - Shimadzu Edition** Instrument is closed. Moreover, the dialog provides access to the dialogs allowing to set the configuration parameters of particular configured **Shimadzu Nexera** modules.
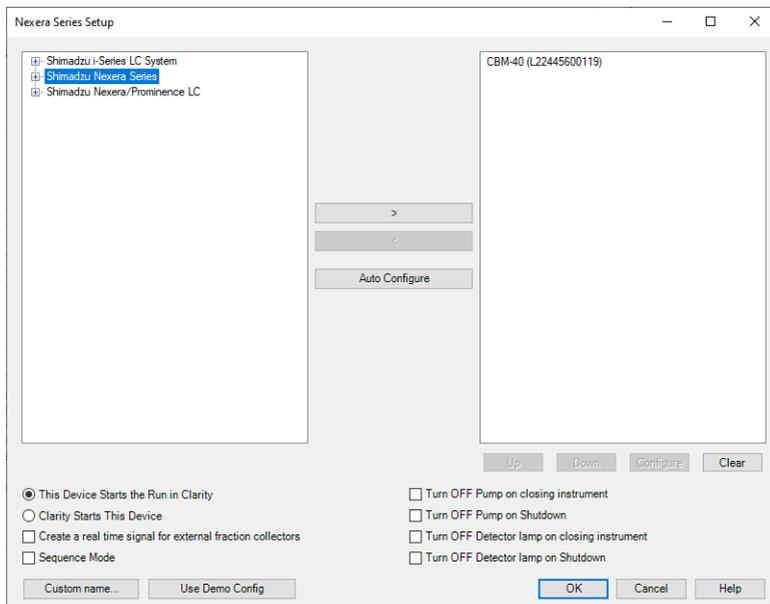
Fig 16: Nexera Series Setup

Left pane of the dialog shows the possible HPLC systems to configure. Only the *Shimadzu Nexera Series* item is configurable, other options are not supported in **Clarity - Shimadzu Edition** driver. Right pane displays the type and serial number of the system controlled once it is detected. To detect the system, select the *Shimadzu Nexera Series* in the left pane and press the *Auto Configure* button. The Automatic configuration parameters dialog appears:

Fig 17: Automatic configuration parameters dialog

The dialog allows to set the *IP Address*, upon pressing the *OK* button the connection to the set *IP Address* is established and connected **Shimad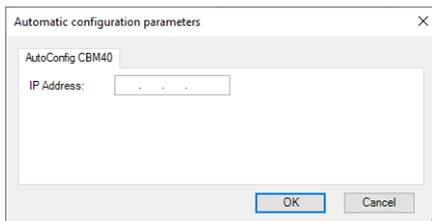zu Nexera** is detected based on the information the supported controller has on the system. The detected system components are then added to the right side pane of the Nexera Series Setup dialog as the Automatic configuration parameters dialog is closed.

This Device Starts the Run in Clarity

This radiobutton should be selected when the **Shimadzu Nexera** will be the source of the start signal, e.g when the system contains controlled autosampler or when an uncontrolled autosampler provides start input to **Shimadzu Nexera** over digital input. The setting forces the control module to properly handle **Clarity - Shimadzu Edition** response to such signal. Most configurations should use this option.

Clarity Starts This Device

This radiobutton should be selected when the **Shimadzu Nexera** will not know about the start signal earlier than **Clarity - Shimadzu Edition**, e.g when the there is a controlled autosampler not belonging to the **Shimadzu Nexera** system which is as well not connected to the **Shimadzu Nexera** using digital input. The setting lets the control module to properly start the **Shimadzu Nexera** when start signal is passed to it from **Clarity - Shimadzu Edition**.

Create a real time signal for external fraction collectors

This option turns on an additional real time signal during the acquisition run which can be used for fraction collectors as an immediate data signal to react to. Most other signals may have delays in displaying data in the matter of seconds.

Sequence Mode

If checked, it enables to use high throughput operations of the autosampler. Depending on the type of the sampler and functions it supports, this either means using "Full Sequence Download" functionality (working with optimized sequences of up to 60 samples) or enabling to use the Enable Optimization functionality on Method Setup - AS tab.

Turn OFF Pump on closing instrument

Decides on the behavior of the **Shimadzu Nexera** pumps when closing **Clarity - Shimadzu Edition** Instrument. When not checked, the state of the pump will not change on such action.

Turn OFF Pump on Shutdown

Decides on the behavior of the **Shimadzu Nexera** pumps when *SHUTDOWN* event is invoked (either by user action or because of error). When not checked, the state of the pump will not change on such event.

Turn OFF Detector lamp on closing instrument

Decides on the behavior of the **Shimadzu Nexera** detector lamps when closing **Clarity - Shimadzu Edition** Instrument. When not checked, the state of the detector lamp will not change on such action.

Turn OFF Detector lamp on Shutdown

Decides on the behavior of the **Shimadzu Nexera** detector lamps when *SHUTDOWN* event is invoked (either by user action or because of error). When not checked, the state of the detector lamp will not change on such event.

Custom name...

Opens a Custom Name dialog that allows to set a custom name of the **Shimadzu Nexera** HPLC. This name is later used in various places in **Clarity - Shimadzu Edition**.

Use Demo Config

Button only present in DEMO mode. Allows to load a pre-prepared DEMO configuration from the **Shimadzu Nexera** driver to work in DEMO mode on.

Note: Most of the parameters stored in the configuration of **Shimadzu Nexera** must be read out from the live instrument. Without using the *Use Demo Config* button it is not possible to see the methods of the HPLC in the Method Setup dialog. It is not possible to change the pre-loaded configuration.

More detailed configuration parameters can be opened by using *Configure* button in Nexera Series Setup dialog while the controller in the right pane of the dialog is highlighted. In the emerging Configure CBM-40 dialog the discovered modules are organized on tabs, some of their parameters are visible and others can be changed. For more detailed description of individual settings and parameters press *F1* or *Help* button to open **ShimDriver help** for **Shimadzu Nexera** modules as prepared by **Shimadzu**.
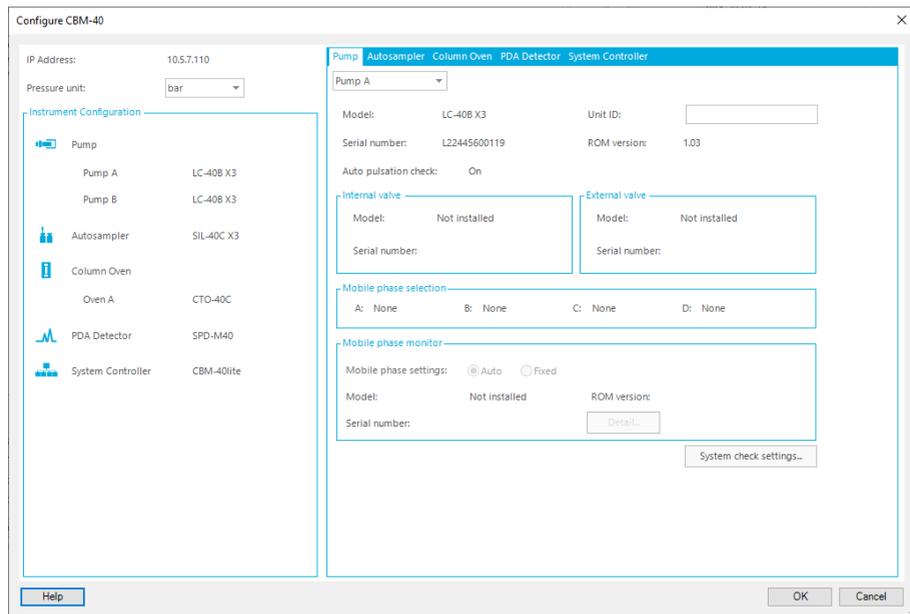
Fig 18: Configure CBM-40 dialog

5 Troubleshooting

When the solution for some problem cannot be discovered easily, the recording of communication between **Clarity - Shimadzu Edition** and **Shimadzu Nexera** control module can significantly help the **DataApex** support to discover the cause of the problem. The created *.LOG files will greatly help in diagnosis of unrecognized errors and problems.

The recording is enabled by default and creates logs in Cfg section of the installation directory (C:\CLARITYSHIMADZU\CFG\DEBUG_ LOGS\PGMLOG\ by default). The communication logs are quite verbose and older ones are removed, so in order to diagnose a problem, the log collected during that problem happening should be copied out soon after.

In case you cannot establish communication with Agilent instruments, please review the following issues:

Check the network connection using the Ping command

The problem in communication between **Clarity - Shimadzu Edition** and **Shimadzu Nexera** may be caused by wrong network configuration, firewall preventing the connection, etc. Run the command line in Windows (for example by pressing the **Windows key** together with the **R** key, in the displayed Run window type *cmd* and press *Enter*).

In the command line type ping <ip-address-of-instrument> and press *Enter*. The *IP Address* is the same you entered during the configuration.

5.1 Specific Problems

▌**Clarity - Shimadzu Edition can't be run and it displays "Agilent ICF is not installed correctly." message.**

Cause: The cause of the problem is that the Agilent ICF has a different version than expected by **Clarity - Shimadzu Edition**. It can typically happen when other software also using Agilent ICF decides to reinstall it. Thus next time Clarity - Shimadzu Edition expects different version than is installed.

Solution: Solution is to reinstall Agilent ICF during **Clarity - Shimadzu Edition** installation. Follow steps described in the chapter **"Installation procedure"** on pg **4**.

▌**Print of *Injection Control* is not functional.**

Cause: Agilent ICF is incompatible with some **Clarity - Shimadzu Edition** printing procedures.

Solution: Method parameters of autosampler control are printed together with another GC control method parameters using *Instrument Control* item within *Method* section in *Report Setup* dialog.

▌**"Automatic configuration failed." during configuration process.**

Cause: For some reason, the automatic detection of the system could not be finished. The most typical reasons are caused by wrong IP address, system used by another software, not entered or wrong Connect Key or connected/configured module not supported by the RC.Net Agilent ICF Nexera LC driver.

Solution: Solution to the situation depends on the particular cause of the problem. The exact cause can be found out in the log in C:\ProgramData\Shimadzu\LCDriver\logs\log.txt file. Eventual solutions contain:

                  Wrong IP Address - correcting the IP Address or the network settings.

                  System used by other software - stop the different software connected to the **Shimadzu Nexera**. The controller restart may be needed after any amendments or disconnection from different software.

                  Not entered or wrong Connect key - for procedure see the chapter **"Connect Key"** on pg **7**.

                  Module not supported - supported modules are listed in the chapter **"Requirements"** on pg **2**.. Contact Shimadzu with a request to add more controls to the driver in case your module is not supported.