



SPARK TRIATHLON

Clarity Control Module

ENG

Code/Rev.: M117/90C

Date: 2024-02-14

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To facilitate the orientation in the **Spark Triathlon** 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 Spark Holland Triathlon Control module

This manual describes the setting of the **Spark Holland Triathlon** autosampler. The control module enables direct control of the instrument over serial line.



Fig. 1: Spark Holland Triathlon

The **Spark Triathlon** control module can also control OEM versions of the **Triathlon** autosampler, for example **Antec Leyden Alexys AS 100** autosampler.

2 Requirements

- **Clarity** Installation with AS Control module (p/n A26).
- 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 straight DB9F-DB9M cable (p/n SK02).

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

Commands for the autosampler are communicated with **Clarity** through the Serial straight DB9F-DB9M cable. It may be, however, necessary to use additional starting cable, when no other part of the instrument is directly controlled. The signal cable has to be connected according to the following scheme.

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.

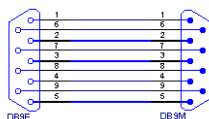


Fig. 2: Serial straight DB9F - DB9M cable

3.2 Spark Triathlon setup - communication

The **Spark Triathlon** autosampler has to be set in the *SERIAL MODE* in order to function correctly with its **Clarity Control module**. This is done by pressing the *Menu* button on the **Triathlon** keyboard and then selecting the *Serial* command.

OEM versions of the **Triathlon** autosampler without the instrument keyboard and display are set in the *SERIAL MODE* automatically.

3.3 Clarity Configuration

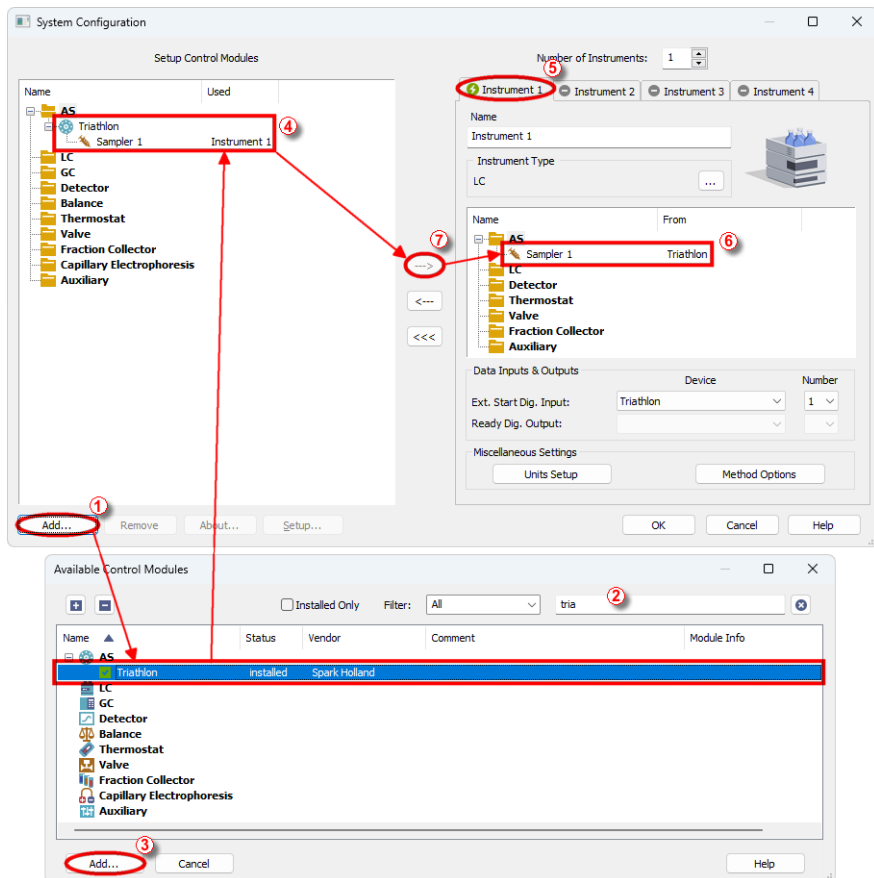



Fig. 3: System Configuration

- 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. 3** 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 **SPH1299** pump and press the **Add** **3** button.
- Select the **Spark Triathlon** and press the **Add** button.

The [Spark Triathlon Setup](#) dialog will appear.

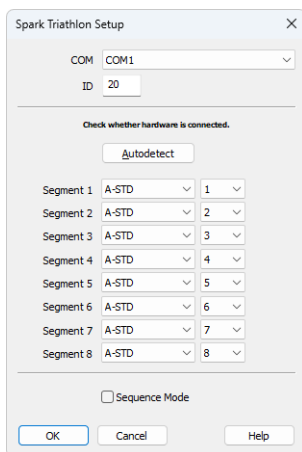



Fig. 4: Spark Triathlon Setup

- Select the *COM* port and correct *ID* of the autosampler according to the settings and the connection of the **Spark Triathlon** (for more details see the chapter **Spark Triathlon Setup** on pg. 22)..
- Press the *Autodetect* button to check whether the **Spark Triathlon** autosampler is connected.

Note: Other fields of this dialog are described later in the manual (for more details see the chapter **Spark Triathlon Setup** on pg. 22)..

- The **Spark Triathlon** item ④ will appear in the *Setup Control Modules* list of the *System Configuration* dialog.
- Drag the AS icon from the *Setup Control Modules* list on the left side to the desired *Instrument* tab ⑤ on the right side ⑥, or use the  button ⑦ to do so.

4 Using the control module

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

4.1 Method Setup - AS

4.1.1 Injection & Wash

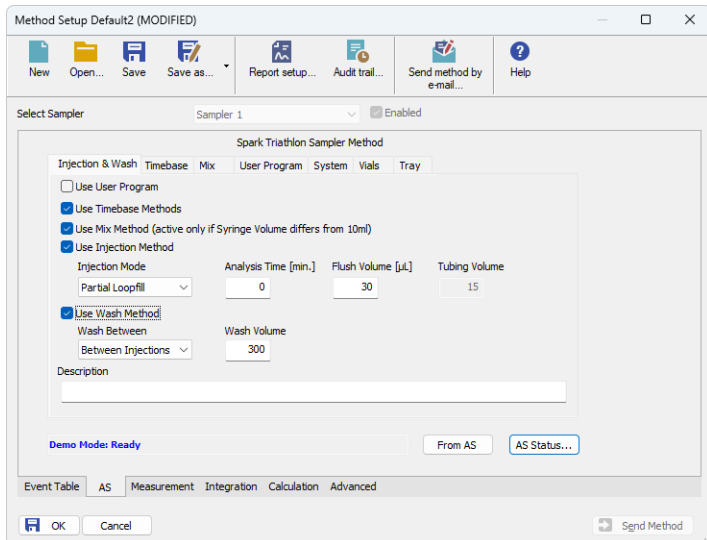


Fig. 5: Method Setup - AS - Injection & Wash

This is the main tab defining the AS control method. It defines, which parts of the **Spark Triathlon** methods will be performed, and defines some other parameters.

The options on this tab consist of two parts, which exclude themselves - if the *Use User Program* option is selected, no other options will be used. On the other hand, if the *Use User Options* checkbox is not checked, any combination of other method parts may be used.

Use User Program

When set, the whole injection part of the method will be governed by instructions set on the [Method Setup - AS - User Program](#) tab.

Use Timebase Methods

Sets whether the sampler method part used for outputting signals after injection will be used. This part of the method is then set on the [Method Setup - AS - Timebase](#) tab.

Use Mix Method

Sets whether the sample pre-preparation part of the injection method will be used. If checked, the method defined on the [Method Setup - AS - Mix](#) tab will be performed.

Use Injection Method

This part of method contains the information on the injection routine, analysis time and flush volume.

Injection Mode

Allows to set the injection mode by selecting one of the possibilities:

Partial Loopfill - in this mode, only a part of the sample loop volume will be transferred into the column.

Full Loop - in this mode, the full sample loop will be transferred to the column. Only the value set in the *Loop Volume* field of the [Method Setup - System](#) dialog is allowed for setting in the *Inj. Vol.* column in the **Sequence Table** in the **Sequence** window.

µl Pick up - defined volume of the sample will be injected into the column, preceded and followed by the transport liquid.

Analysis Time [min.]

Defines the time between switching the injection valve to the *INJECT* position and the start of next sample preparation.

Caution: While using the synchronization wire for the **Triathlon** autosampler, it is necessary to set the analysis time to 0.

Flush Volume [µl]

Defines the volume of the sample that will be used for flushing the sample loop and tubing before the sample is aspirated. Possible values range from 0 to 999 µl, default value is 30 µl. This option is only available for the *Partial Loopfill* and *Full Loop* injection modes.

Caution: Setting the *Flush Volume* parameter to less than twice the volume of the needle and tubing will cause worse performance.

Tubing Volume [µl]

Defines the tubing volume. Possible values range from 1 to 32 µl. This parameter is only editable when *µl Pick up* injection mode is performed.

Use Wash Method

Defines the type of the washing method performed between injections/samples/sequences. This section is only editable if the *Sequence Mode* option is checked in the [Spark Triathlon Setup](#) dialog.

Wash Between

Defines the time when the wash should be performed. Possible values are:

Between Series - the wash will be performed only after each finished sequence.

Between Samples - the wash will be performed after each sample measured.

Between Injections - the wash will be performed after each injection.

Wash Volume [μ l]

Defines the volume of the solvent used for the wash. The value has to fall into the 300 - 9999 μ l interval.

Description

Field for the description of the AS control method. This description is purely informational.

From AS

Reads the configuration from the autosampler and sets it to the *Method Setup - AS* dialog.

AS Status

Pressing this button opens the [Hardware Configuration](#) dialog, which displays the communication parameters and other configuration of the **Spark Triathlon** autosampler.

4.1.1.1 Hardware Configuration

Type of Sampler:	Triathlon
Connect:	Demo
Tray Cooling:	Available
SSV:	Available
ISS-A:	Available
ISS-B:	Available
Tray segment 1:	A-STD, No.1
Tray segment 2:	A-STD, No.2
Tray segment 3:	A-STD, No.3
Tray segment 4:	A-STD, No.4
Tray segment 5:	A-STD, No.5
Tray segment 6:	A-STD, No.6
Tray segment 7:	A-STD, No.7
Tray segment 8:	A-STD, No.8

Fig. 6: Hardware Configuration

This dialog is invoked by pressing the *AS Status* button in the *Method Setup - AS* dialog. *Hardware Configuration* dialog displays the COM port with communication parameters, optional sampler accessories presence and types and numbers of trays installed (as read from the autosampler).

4.1.2 Timebase

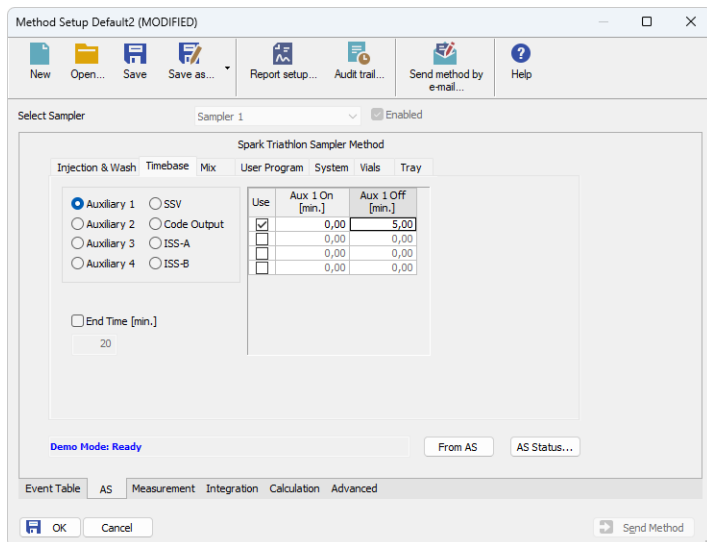


Fig. 7: Method Setup - AS - Timebase

This section serves for the control over the digital outputs via timed events. Only five digital outputs at a time may be programmed in one method.

Auxiliary 1 (..4)

Invokes the Auxiliary output with the particular output number. In the **Timebase table**, set the time interval in which the output will be set to *HIGH*. Each row of the table represents one time interval for the particular output.

SSV

Defines the output signals set to the optional Solvent Selection Valve (SSV). The valve must be present in order to be able to set outputs for it. Define the time and the port to be used in the **Timebase table**. It is possible to select up to 8 events for the valve during each run.

Code Output

Serves as a hexadecimal output. Enter the time and the value between 1 and 15. When other values are inserted, they will be changed to 1 after you leave the field.

ISS-A (ISS-B)

Defines the output signals set to the optional Integrated Stream Switching (ISS) 6-port valve. The valve must be present in order to be able to set outputs for it. It is possible to fill in up to 4 rows for the valve during each run, each governing the switch of the valve to a the other position and back based on the analysis time.

End Time [min.]

Sets the end time for **Timebase** program. If no value is filled in, the **Triathlon** will automatically generate the *End Time* equal to the *Analysis Time* parameter

programmed on the [Method Setup - AS - Injection & Wash](#) sub-tab.

Caution: Do not set the *End Time* parameter while the *Sequence Mode* (switched in the [Spark Triathlon Setup](#) dialog) is used.

Timebase table

The columns in the **Timebase table** are context-based according to the selected output. Each signal has its own **Timebase table**, which allows to invoke its output based on the analysis time. All *Auxiliary*, *ISS-A* and *ISS-B* signals may be switched on and off again up to four times during each analysis run, while the *SSV* and *Code Output* signal may be invoked eight times during each run. Rows in the table can be edited only after the checkbox in the *Use* column is checked, the time values are set in minutes in decimal format (e.g. 2 minutes 45 seconds should be written as 2.75).

4.1.3 Mix

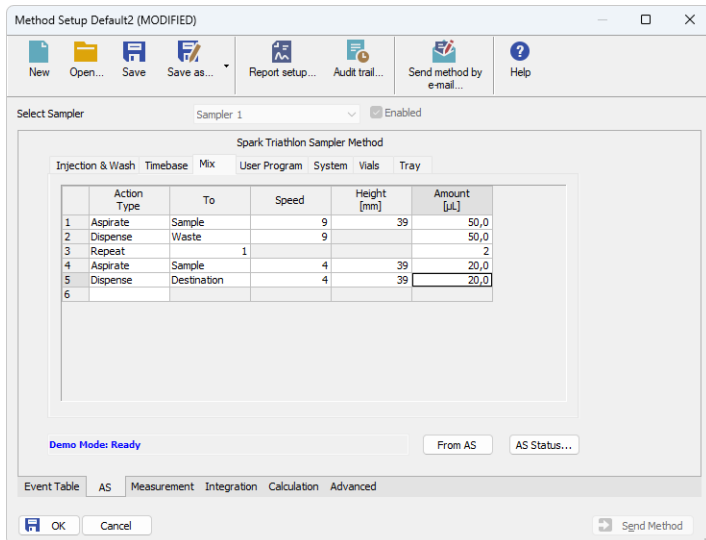


Fig. 8: Method Setup - AS - Mix

Mix part of the sampler method (defined on the *Method Setup - AS - Mix* sub-tab) governs the pre-preparation of sample before the injection. Several operations are possible with vials defined on the [Method Setup - AS - Vials](#) tab. The table column headings are context-based, that is they change according to the action selected in the first column on the actual row. These operations are:

Aspirate

Draws the solution from the specified vial or the wash solution into the syringe. The source is specified in the *From* column, the volume aspirated in the *Amount [µl]* column. Furthermore it is necessary to specify the speed of the aspiration in the *Speed* column (in the range 1-slowest to 9-fastest) and the height of the needle tip above the vial bottom in the *Height [mm]* column (see *Needle Height* parameter on the [Method Setup - AS - System](#) tab - this option is not available for the aspiration from the wash solution).

Dispense

Empties a given volume from the syringe into the specified vial or waste port. The volume to be dispensed is set in the *Amount [µl]* column, the destination vial is set in the *To* column. Furthermore, the height of the needle tip above the bottom of the vial tray and the speed of emptying is set in the *Height [mm]* and *Speed* columns, respectively. The meaning of these columns is the same as in the *Aspirate* command, dispensing into the Waste port doesn't need to specify the *Height* parameter.

Repeat

Repeats the last one or more rows for the specified number of times. The *Repeat* column is used to set the number of repeats, the *Steps* column sets the number of **Mix table** rows to be repeated.

Wash

Performs the standard wash operation. Specify the volume of the wash solvent in the *Amount [μ l]* column.

Wait

Causes the sampler to wait for the specified time interval. The desired interval is entered into the *Time [min.]* column in minutes.

4.1.4 User Program

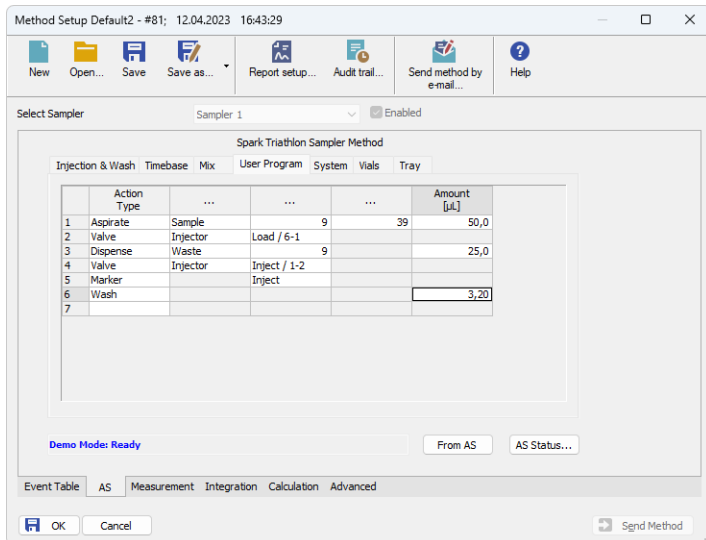


Fig. 9: Method Setup - AS - User Program

The table on the *Method Setup - AS - User Program* tab enables to set all parts of the sampler method in one place, which means that no parameters on [Injection & Wash](#), [Timebase](#) and [Mix](#) tabs will be necessary. *User Program* tab thus substitutes all tabs mentioned above and checking the checkbox on [Method Setup - AS - Injection & Wash](#) tab will disable all other checkboxes there.

This table enables to perform several actions. The table column headings are context-based, that is they change according to the action selected in the first column on the actual row. Possible actions are:

Aspirate

Draws the solution from the specified vial or the wash solution into the syringe. The source is specified in the *From* column, the volume aspirated in the *Amount [μl]* column. Furthermore it is necessary to specify the speed of the aspiration in the *Speed* column (in the range 1-slowest to 9-fastest) and the height of the needle tip above the vial bottom in the *Height [mm]* column (see *Needle Height* parameter on the [Method Setup - AS - System](#) tab - this option is not available for the aspiration from the wash solution or aspiration of the Air).

Dispense

Empties a given volume from the syringe into the specified vial or waste port. The volume to be dispensed is set in the *Amount [μl]* column, the destination vial is set in the *To* column. Furthermore, the height of the needle tip above the bottom of the vial tray and the speed of emptying is set in the *Height [mm]* and *Speed* columns, respectively. The meaning of these columns is the same as in the *Aspirate*

command, dispensing into the Waste port doesn't need to specify the *Height* parameter.

Syr-Valve

Switches the syringe valve to one of its three positions: *Needle*, *Wash* and *Waste*.

Syringe

Forces the syringe to either *Load* or *Unload* the given *Amount* [μ l], or perform the *Home* operation (thy syringe will dispense itself into the last programmed position and will re-initialize).

Wash

Performs the standard wash operation. Specify the volume of the wash solvent in the *Amount* [μ l] column.

Note: Program a *Dispense to Waste* action prior to washing to prevent the cross-contamination from the buffer solution.

Valve

Switches the injector valve or optional ISS valve to the desired position. The desired valve is set in the *Valve* column, while the position is specified in the *Position* column. To be able to program ISS valve it is necessary to have it installed.

Wait

Causes the sampler to wait for the specified time interval. The desired interval is entered into the *Time* [*min.*] column in minutes.

Note: The syringe will move to the *Home* position during the wait interval if the previous step was the *Aspirate* or *Dispense* step. If you want the syringe to stay at the same position, an *Aspirate* or *Dispense* step of 0 μ l is needed at that position before the *Wait* command.

Compress

Activates the compressor to put the air pressure on the sample. The compressor stays switched on until it is switched off (in some later step) or until needle wash operation end.

Aux

Controls the standard auxiliary outputs. Define which of the four outputs is to be changed in the *Aux Number* column and select the desired position in the *Position* column.

Wait Input

Sets the pause in which the sampler waits before proceeding until the input specified in the *Input Number* column is set into the position specified in the *Position* column.

Prog-Out

Controls the two outputs (contact closures) similar to auxiliary outputs, but only available in the *User Program* mode.

Code

Programs the output to the hex output connector in the range 0 - 15.

Marker

Sets the marker in the *Position* column to *Inject*, *Vial* and *Labeled Vial*.

Caution: When setting the **User Program**, *Markers* have to be used to signal the injection. This operation is performed automatically in other programs, but has to be performed manually in the **User Program** as the user has full control of the injection valve settings.

SSV

Defines the optional SSV valve position in the range 1-6 specified in the *Position* column. To be able to program SSV valve it is necessary to have it installed.

4.1.5 System

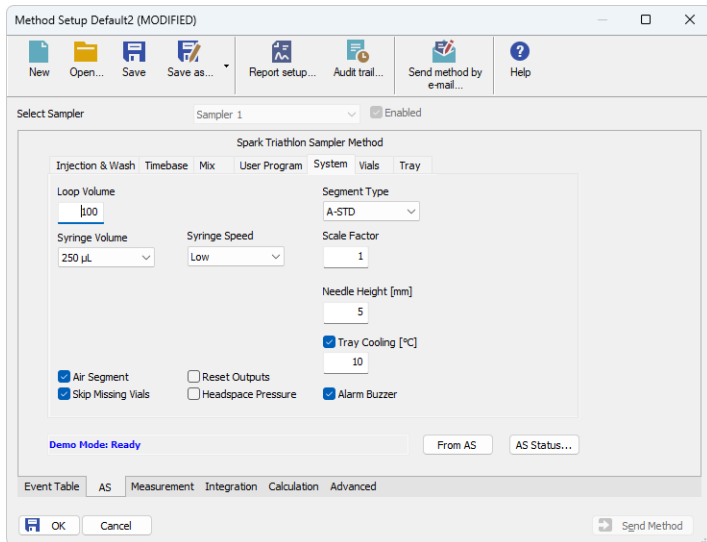


Fig. 10: Method Setup - AS - system

Tab defining various aspects of the **Spark Triathlon** operation.

Loop Volume [µl]

Defines the value of the loop volume used for the injection (in µl). Possible values range between 0.1 and 1000 µl. When using *Full Loop Injection Mode* from the [Method Setup - AS - Injection & Wash](#) tab, only the *Loop Volume* value is allowed in the **Sequence Table** in the *Sequence* window.

Segment Type

Defines the types of tray segments that will be used in the sequence table.

Note: Each tray type uses its own separate numbering. The sequence needs to know which numbering to use.

Syringe Volume

Defines the volume of the syringe installed in the autosampler. Possible values are: 100 µl, 250 µl, 500 µl, 1000 µl, 10 ml.

Syringe Speed

Sets the syringe speed from the set of predefined values (*Low, Normal, High*). This speed can be further reduced by the use of the *Scale Factor* function.

Scale Factor

Sets the multiplier for the syringe speed. This variable can be set to values between 0.1 and 1, thus reducing the *Syringe Speed* set from one-tenth to no speed reduction. The default value is 1.

Needle Height [mm]

Sets the distance of the needle tip from the reference point (2.5 mm above the tray bottom) during the aspiration. Possible values range from 0 to 40 mm.

Tray Cooling [°C]

Allows to enable the tray cooling function and set the temperature for the cooling (in the range 4 - 40 °C). This option is grayed-out if the **Spark Triathlon** sampler doesn't have the function built-in.

Air Segment

Sets whether the air segment should be used during the injection.

Reset Outputs

While checked, forces the digital outputs to be reset after the sequence has ended.

Skip Missing Vials

Sets the behavior of the sampler during the sequence if empty vial is met. While checked, empty vial will be skipped and the sequence will continue on, while in other case the missing vial will stop the sequence, issuing an error message. This option is only modifiable when the *Sequence Mode* is set in the [Spark Triathlon Setup](#) dialog.

Headspace Pressure

When checked, the sampler uses the pressure to facilitate the transfer of the sample into the sample loop. The pressure will only be used when the vials are airtight.

Alarm Buzzer

Sets the sound signalization on. See **Triathlon** manual for more details.

4.1.6 Vials

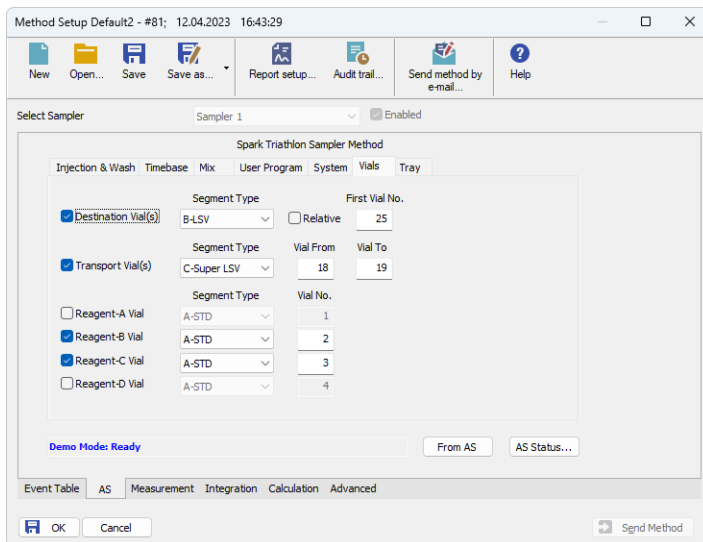


Fig. 11: Method Setup - AS - Vials

Governs the allocation of special purpose vials such as reagent vials to particular vial well positions. Each vial is defined by the tray type it is placed into and the well number (well numbers in case of transport vials).

Note: The numbers set here do not represent tray numbers, but outright the well numbers. The correct order and position of trays have to be set in the [Spark Triathlon Setup](#) dialog and might be checked on the [Method Setup - AS - Tray](#) tab.

Destination Vial(s)

Marks the vials used for the mixing program. When the *Relative* checkbox is not checked, only one vial can be assigned for this job in the *First Destination* field. When the relative checkbox is not checked, the *First Destination* field changes to the *To Sample* field and the number entered there is added to the actual vial number to be used as a **Destination Vial**. The **Destination Vial** can be placed on another tray segment.

Caution: When the *Relative* checkbox is not checked, it is necessary to run in the *Sequence Mode* (set in the [Spark Triathlon Setup](#) dialog), otherwise the number of *First Destination* vial will not be incremented using the same vial for more than one injection.

Transport Vial(s)

Defines the position of vials containing the transport liquid (used with *µl Pick up* injection mode). The algorithm defining from which vial will the transport liquid be actually aspirated is stored in the **Spark Triathlon** sampler.

Reagent-A (..D) Vial

Defines the position of up to four reagent vials. These vials are then referenced from the [Method Setup - AS - Mix](#) and [Method Setup - AS - User Program](#) tabs.

4.1.7 Tray

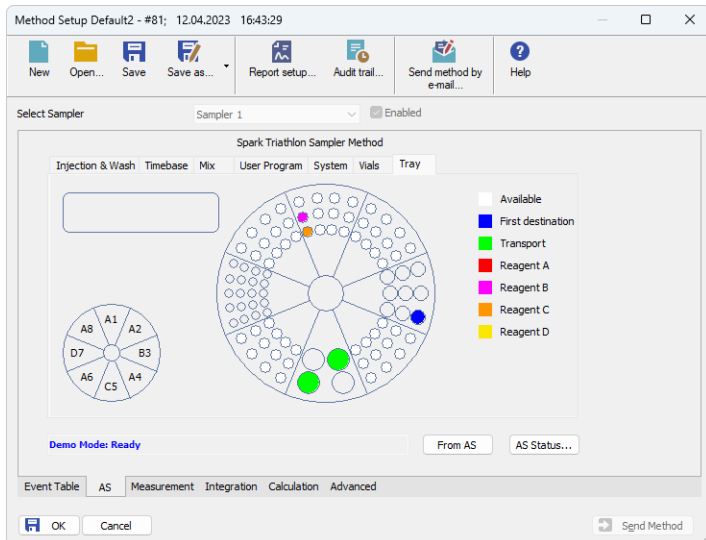


Fig. 12: Method Setup - AS - Tray

The *Method Setup - AS - Tray* tab shows the graphical representation of the tray parts set in the [Spark Triathlon Setup](#) dialog, along with any special settings from the [Method Setup - AS - Vials](#) tab and the type of vials available for the analysis, as set in the *Segment Type* field of the [Method Setup - AS - System](#) tab.

The small orientation diagram allows to change the focus of the large picture to one of the tray parts. Then, vial numbers are shown as well on each position. The small box to the left shows the type and number of the tray part highlighted in the small orientation graph (or one that was selected last) and, when over the vial well while the particular segment is selected, also the vial number and the type of the vial (as shown in the legend to the right).

4.2 Device Monitor

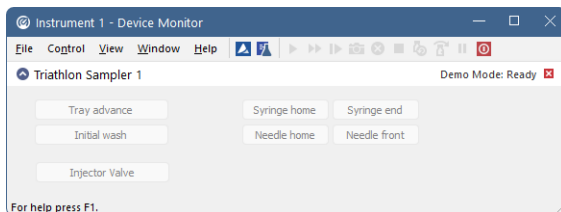


Fig. 13: Spark Triathlon Device Monitor

The Monitor window for the **Spark Triathlon** autosampler enables to control some of the actions of the **Triathlon** autosampler. This is particularly useful when using **Triathlon** OEM autosamplers without the display and keyboard.

Tray advance (Stop tray advance)

Triggers the tray advance counterclockwise. This is used for the changing of vials in tray parts hidden under the syringe. When invoked, changes the button to the *Stop tray advance*, other buttons become inactive.

Initial wash

When invoked, performs the wash operation to rinse all tubing, the same as performed by the use of the **Wash** command from the **Ready** menu (invoked via the **Spark Triathlon** sampler keyboard).

Syringe home

Moves thy syringe to the *HOME* position (syringe piston is up).

Syringe end

Moves the syringe to its *END* position (syringe piston is down). When invoked, all buttons in the Monitor window will become inactive, with the exception of the *Syringe home* button.

Needle home

Moves the needle unit *HOME* (the position near the back side of the sampler).

Needle front

Moves the needle unit to the *FRONT* position (close to the center of the rack). When invoked, all buttons in the Monitor window will become inactive, with the exception of the *Needle home* button.

Injector Valve to Load (Injector Valve to Inject)

Switches the injector valve to the *LOAD* position. After using, the button changes to the *Injector Valve to Inject*, which causes the switch of the valve back to the *INJECT* position.

4.3 Spark Triathlon Setup

Spark Triathlon Setup dialog (accessible through the *System Configuration* dialog) allows to manually set the hardware configuration of the autosampler. All fields can also be read from the sampler by using the *Autodetect* button.

Spark Triathlon Setup

COM COM1

ID 20

Check whether hardware is connected.

Autodetect

Segment 1	A-STD	1
Segment 2	A-STD	2
Segment 3	A-STD	3
Segment 4	A-STD	4
Segment 5	A-STD	5
Segment 6	A-STD	6
Segment 7	A-STD	7
Segment 8	A-STD	8

Sequence Mode

OK Cancel Help

Fig. 14: Spark Triathlon Setup

COM

Sets the COM port to which the **Spark Holland Triathlon** autosampler is connected.

ID

Triathlon autosamplers may be connected in series to one serial port. The *ID* value defines particular autosampler to be operated at a time. The *ID* value has to correspond to the ID value set in the autosampler service mode. Default value is 20.

Autodetect

Checks whether the **Spark Triathlon** autosampler with the selected *ID* is connected to the given *COM* port, reads the segment parameters set in the device and sets them to the *Spark Triathlon Setup* dialog.

Segment 1 (..8)

Defines the type of the vial rack segment attached to the given position. Both the type and its number are necessary for the correct function of the control module.

Sequence Mode

When checked, enables to perform washes between each vial/between series of samples etc.

5 Report Setup

12.04.2023 16:52 Method d:\darcy90\DataFiles\WORK2\Default2.met Page 1 of 1
Injection Control - Spark Triathlon Sampler Method

Tray Cooling : Available ISS-A : Available ISS-B : Available
 SSV : Available
 Description :

Injection Method : Not Used
 Wash Method : Not Used
 Timebase Methods : Not Used
 Mix Method : Not Used
 User Program : Used

User Program Table

Action Type	From/To	Position	Speed	Height [mm]	Amount [μL]	Time [min.]
Aspirate	Sample		9	35	50.00	
Valve	Injector	Load				
Dispense	Waste		9	---	25.00	
Valve	Injector	Inject				
Marker		Inject				
Wash					3.20	

Loop Volume : 100.00 [μL] Tubing Volume : 15.00 [μL] Needle Height : 5 [mm]
 Syringe Volume : 250 [μL] Syringe Speed : Low Scale Factor : 1.0
 Plate Type : A-STD Plate Access : A-STD
 Tray Cooling : On Tray Temperature : 10 [°C]
 Air Segment : On Reset Outputs : Off Alarm Buzzer : On
 Skip Missing Vials : On Headspace Pressure : Off
 Transport Vials : Used First Transport Val : 18 Last Transport Val : 19

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Fig. 15: Spark Triathlon report preview

All autosampler-specific settings (e.g. the table from the [Method Setup - AS - User Program](#) tab in this case) are reported as a part of the data displayed by the use of *Injection Control* checkbox of the *Report Setup - Method* dialog.

6 Troubleshooting

When the remedy for some problem cannot be discovered easily, the recording of communication between **Clarity** and the autosampler 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\CFG 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=SparkTriathlon_%D.txt
reset=off
```

Note: Instead of COM1 type the correct serial port used to communicate with the **Spark Triathlon** autosampler. This port number is displayed when the *AS Status* button in the [Method Setup - AS](#) dialog is invoked or in the [Spark Triathlon Setup](#) dialog.

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