



## SPARK INTEGRITY

Clarity Control Module

ENG

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

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

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

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

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

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

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

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

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

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

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

# 1 Spark Integrity control module

This manual describes the setting of the **Spark Holland Integrity** autosampler. The control module enables direct control of the instrument over serial line, LAN or USB.



*Fig 1: Spark Integrity*

Direct control means that the autosampler can be completely controlled from the **Clarity** environment. Instrument method controlling the sample preparation conditions will be saved in the measured chromatograms.

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*Note:* It is recommended to check the user manual of the autosampler for its operating principles and restrictions.

## 2 Requirements

- **Clarity** Installation USB with AS Control module (p/n A26).
- Communication cable according to the type of communication used - serial straight DB9F- DB9M cable (p/n SK02) in case of serial communication, LAN cross cable (p/n SK08) in case of LAN communication or USB A- B cable (p/n SK06) in case of USB communication.

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

- Free communication port in the PC, based on the type of communication used - free serial COM port in case of serial communication, free ethernet port in case of LAN communication or free USB port in case of the USB communication.

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

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**Caution:** Minimal autosampler firmware version is **1.26**.

# 3 Installation Procedure

## 3.1 Hardware - Wiring

Commands for the autosampler are communicated with **Clarity** through the communication cable. Type of communication depends on the preference, as all three types of communication board are installed in the **Spark Integrity** autosampler. All cables that can be used (described in the chapter "**Requirements**" on pg 2.) are commonly used and can be acquired either from **DataApex** company or from local computer stores.

### 3.1.1 Connections of the autosampler and chromatographic system

The connection of the whole chromatography set is dependent on many factors, such as control modules available for each particular part of the set. Common options for the **Spark Integrity** autosampler will be either all modules controlled, or some of them not controlled. The typical wiring is shown on the schemes below:

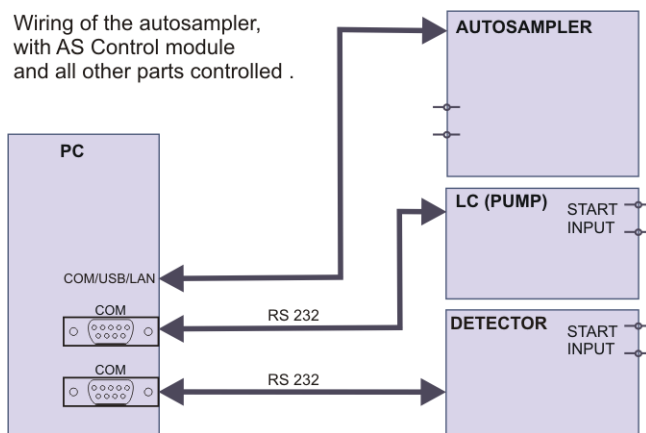


Fig 2: Wiring of the autosampler - all parts of the set controlled

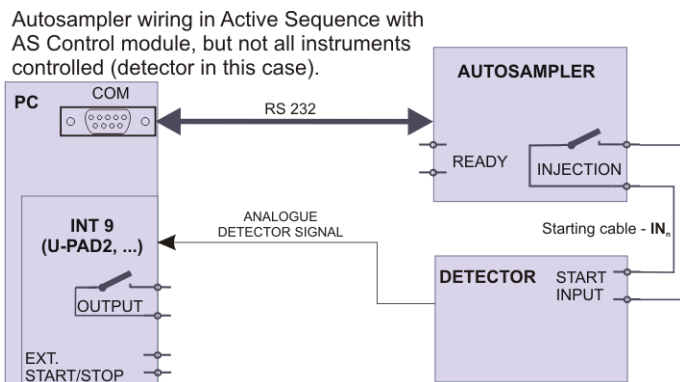


Fig 3: Wiring of the autosampler - some parts of the set not controlled

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



## 3.2 Spark Integrity setup - communication

The **Spark Integrity** autosampler can be controlled from **Clarity** via three different communication ways - serial, LAN or USB. The type of the communication used is dependent upon preference as all three types of communication are supported by the **Spark Integrity** autosampler.

In addition, the *ID* of the **Spark Integrity** autosampler must be the same that will be later set in **Clarity**. The ID is hard-set to the value of 23 for **Spark Integrity** autosamplers.

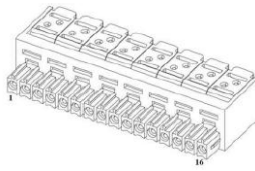
### 3.2.1 Digital Inputs and outputs

The digital inputs and outputs of the **Spark Integrity** autosampler are both present on the back panel of the instrument and simulated over the communication line. In usual cases, the outputs do not have to be connected by wire with the autosampler as they are communicated to **Clarity** digitally.

However, when other instrumentation needs to be informed about the start of the analysis etc. by wire, the AUX connector on the back panel of the autosampler may be used. The mapping of the pins on the connector is as follows:

Tab 1: AUX connector pins mapping

Pin	Function
1	Relay 1a - NO
2	Relay 1a - C
3	Relay 1a - NC
4	Relay 1b - NO
5	Relay 1b - C
6	Relay 1b - NC
7	Relay 2 - NO
8	Relay 2 - C
9	Relay 3 - NO
10	Relay 3 - C
11	Relay 4 - NO
12	Relay 4 - C
13	Relay 5 - NO
14	Relay 5 - C
15	24V OUT/ 500mA max
16	GND



*Fig 4: Integrity AUX pin figure*

### 3.3 Clarity Configuration

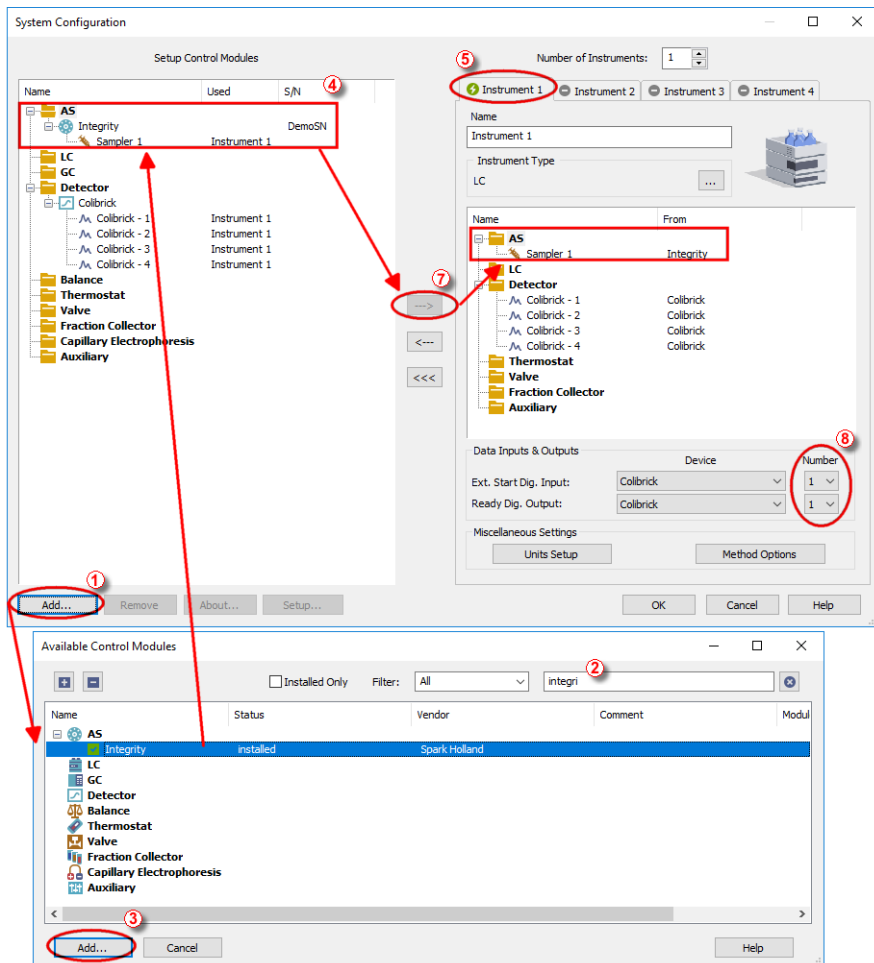



Fig 5: System Configuration



- 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 5 on pg 7.) to invoke the **Available Control Modules** dialog.

- You can specify the searching filter ② to simplify the finding of the driver.
- Select the **Integrity** sampler and press the **Add** ③ button.

The **Integrity Setup** dialog will appear.

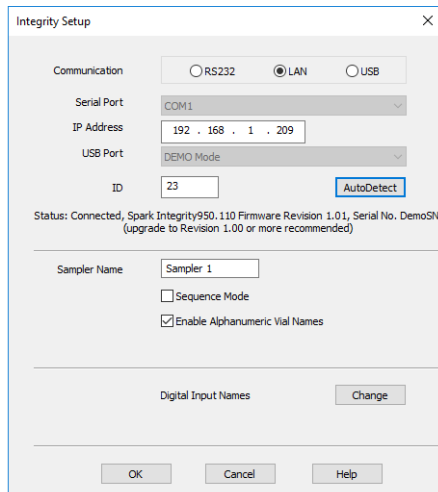


Fig 6: Integrity Setup

- Select the correct type of the *Communication* and fill in the appropriate *Serial Port*, *IP Address* or *USB Port* field. Also, fill in the correct *ID* for the autosampler. Then press the *Autodetect* button. If the communication is correct, the *Connected* inscription along with the firmware version and serial number of the **Integrity** autosampler will be shown in the *Status* row. The *ID* must match the device identifier set previously in the autosampler setup, as described in the chapter "Spark Integrity setup - communication".

*Note:* The **Spark Integrity Setup** dialog is more closely described in the chapter "**Spark Integrity Setup**" on pg 31.

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

- Drag and drop the **Integrity** 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).
- Set the *Ext. Start Dig. Input* and *Ready Dig. Output* numbers ⑧ for your acquisition card according to the wires being used for synchronization. If you wish to synchronize the **Clarity** start with the autosampler over serial line, you can set the **Integrity** in the *Ext. Start Dig. Input* drop-down menu, using the *1* as the input *Number*. In such case it is necessary to change

the behavior on the [Method Setup - Measurement](#) tab later from *Down* to *Up*, else the start signal will be delayed by pulse length (approximately 2 seconds).

## 4 Using the control module

New [Method Setup - AS](#) tab appears in the [Method Setup](#) dialog, enabling the setting of the **Spark Integrity** autosampler control method.

### 4.1 Method Setup - AS

The *Method Setup - AS* dialog consists of eight sub-tabs assigned for the various parts of the **Spark Integrity** autosampler method. These sub-tabs are [Injection](#), [User Method](#), [Timebase](#), [User Template 17](#), [User Template 18](#), [Spec. Vials](#), [Tray](#) and [System](#). Additional buttons allow to display the [Hardware Configuration](#) dialog of the **Spark Integrity** autosampler or to read the instrument method from the **Spark Integrity** autosampler. The method is sent to the autosampler every time the *Send Method* or *OK* button is pressed. Other actions in different windows may also cause the sending of the instrument method to the controlled devices including the **Spark Integrity** autosampler - most notable cases being pressing the *Send Method* button in the [Single Run](#) dialog or starting a new injection from the [Sequence](#) window (each injection is preceded by sending the instrument method).

To read the **Spark Integrity** method from the autosampler it is necessary to use the *From AS* button available from all sub-tabs of the [Method Setup - AS](#) dialog. If the injection method is already established in the autosampler, it is advisable to download it to **Clarity** using the *From AS* button and save it as a **Clarity** method.

## 4.1.1 Injection

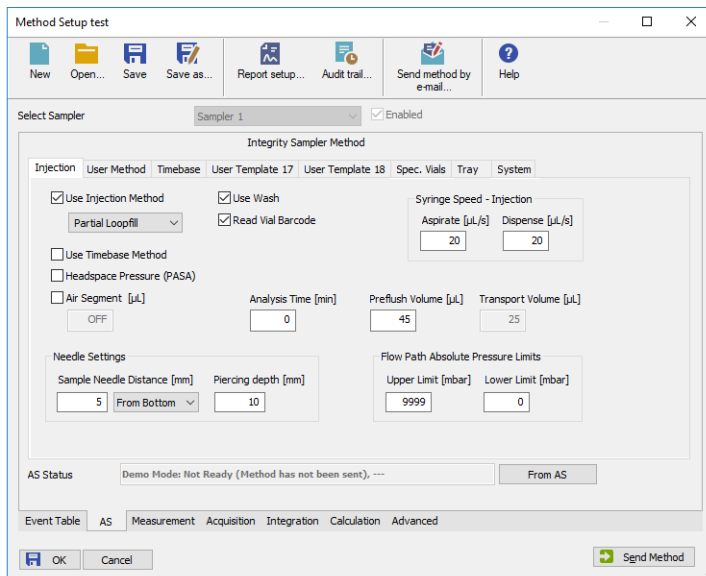


Fig 7: Method Setup - AS - Injection

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

Options on this tab consist of two parts, which exclude themselves - if the *Use Injection Method* option is disabled, parameters specified on the **User Method** tab will be used. On the other hand, if the *Use Injection Method* checkbox is not checked, any combination of other method parts may be used.

### Use Injection Method

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 - AS - System** dialog is allowed for setting in the *Inj. Vol.* column in the **Sequence Table** in the **Sequence** window.

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

### Use Wash

Uses *Wash* after each performed injection.

**Read Vial Barcode**

Reads vial barcode when this checkbox is checked.

**Syringe speed - Injection**

*Aspirate* [ $\mu\text{L/s}$ ] - defines a value for speed of aspiration.

*Dispense* [ $\mu\text{L/s}$ ] - defines a value for speed of dispensing.

**Use Timebase Method**

Sets whether the autosampler 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.

**Headspace Pressure (PASA)**

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.

**Air Segment [ $\mu\text{L/s}$ ]**

When this option is enabled it allows to set the size of the air segment between the taken sample and the eluent. This feature prevents the mixing of the eluent and the sample which would lead to an inaccurate sample injection.

**Analysis Time [min.]**

Defines the time between switching the injection valve to the *INJECT* position and the start of next sample preparation. This parameter is critical for setting the analyses performed in the *Sequence Mode* without the synchronization wire.

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

**Preflush Volume [ $\mu\text{l}$ ]**

Defines the volume of the sample used to wash the needle and tubes before the injection valve is set to the load position. Possible values range between 0 and 9999  $\mu\text{l}$  in the *Partial Loopfill* mode and in the *Full Loop* mode.

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

**Transport Volume [ $\mu\text{l}$ ]**

Defines the volume of the autosampler needle, including the tubing between the needle and the valve. Possible values range from 0 to 9999  $\mu\text{l}$ , default value is 25  $\mu\text{l}$ . *Transport Volume* is set when  *$\mu\text{l}$  Pick up* mode is selected.

**Needle Settings**

Information about the needle.



**Sample Needle Distance [mm]**

Sets the distance of the needle tip from the bottom of the tray during the aspiration. Possible values range from 0 to 100 mm, incremented after halves of millimeters. The distance is either calculated *From Bottom* of the vial or *From Top* of the vial.

**Piercing Depth [mm]**

Sets the depth to which the needle will be plunged in the vial. Possible values range from 13 to 17 mm, incremented by halves of millimeters.

**Flow Path Absolute Pressure Limits****Upper Limit [mbar]**

Possible values are between 2000 and 9999 [mbar].

**Lower Limit [mbar]**

Possible values are between 0 and 800 [mbar].

## 4.1.2 User Method

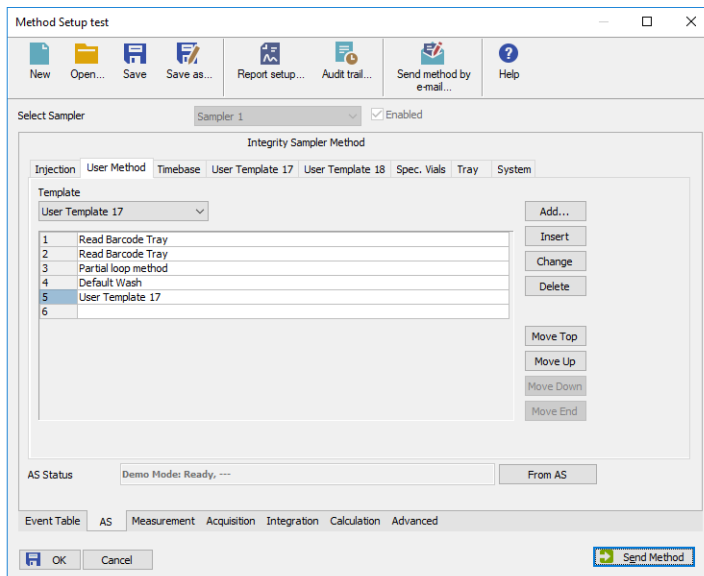


Fig 8: Method Setup - AS - User Method

This option is enabled when *Use Injection* checkbox on the [Method Setup - AS - Injection](#) is not checked. The table on the [Method Setup - AS - User Method](#) tab enables to set all parts of the autosampler method in one place, which means that no parameters on [Injection](#) and [Timebase](#) tabs will be necessary. [User Method](#) tab thus substitutes all mentioned tabs. Several operations are possible with vials defined on the [Method Setup - AS - Spec. Vials](#) tab.

*Note:* When any special vials (Reagent, Destination, Transport) should be used in the *User Method* method, check that there are these vials defined on the [Method Setup - AS - Spec. Vials](#) tab. If they are not defined, the default values will be used, which may invalidate given sample or other sample's analysis data.

**Fig 8** on pg 14. shows a defined *User Method* which will perform the following actions: scan the barcode on the tray, scan the barcode on the vial, perform *Partial loop method*, perform *Default Wash* and perform actions defined on the *User Template 17* tab.

A new row is added (or actual row is modified) using the *Template* drop-down list. Using the *Add* or *Insert* button the action can be added as a new row into the table, either to the end of the list (*Add* button) or above the selected row (*Insert* button). The existing row can be changed by selecting

*Change* and pressing the *Change* button. A row can be deleted using the *Delete* button.

When the row is selected, it can be moved up and down through the list by using the *Move Top*, *Move Up*, *Move Down* and *Move End* buttons.

#### **Full loop method**

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 - AS - System](#) dialog is allowed for setting in the *Inj. Vol.* column in the **Sequence Table** in the [Sequence](#) window.

#### **Partial loop method**

In this mode, only a part of the sample loop volume will be transferred into the column.

#### **µl Pickup method**

In this mode, only defined volume of the sample will be injected into the column, preceded and followed by the transport liquid.

#### **Read Barcode Tray**

Scans the barcode on the tray. For proper mounting of barcode scanner, see the **Integrity Service Manual**.

#### **Read Barcode Vial**

Scans the barcode on the vial. For proper mounting of barcode scanner, see the **Integrity Service Manual**.

#### **Default Wash**

Performs a *Default Wash* operation to rinse all tubing.

#### **User Template 17/18**

In this mode, only the user defined template will be used. User Template allows large variety for customization. Parameters are set on the [Method Setup - AS - User Template](#) tab.

## 4.1.3 Timebase

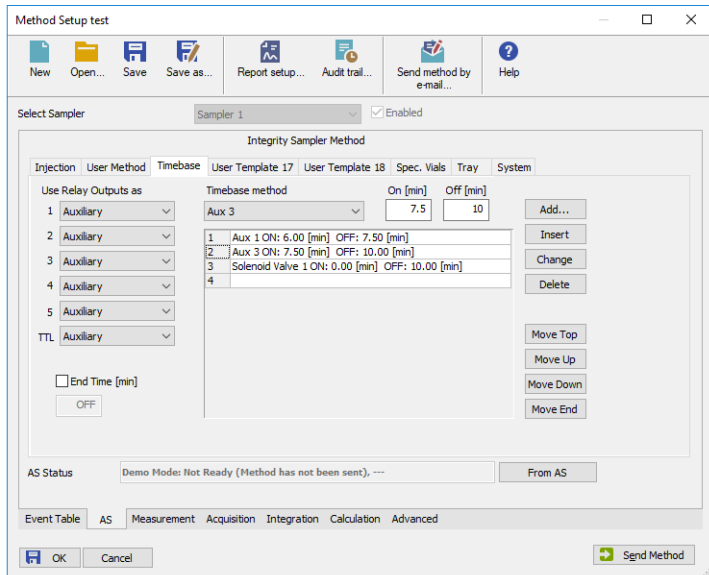


Fig 9: Method Setup - AS - Timebase

Tab defining the behavior of the **Spark Integrity** autosampler while performing the Time Program. The tab governs the assignment of the inputs and outputs on the connector on the back side of the autosampler and allows to set the timetables for installed optional valves.

### Use Relay Output as

Determines for which purpose the relay output contact on the back side of the **Spark Integrity** will be used. The options are *Inject Marker* (sends a pulse signal at the moment the autosampler injects), *Auxiliary* (changes the output state on the set times based on the setting made in the **Aux table**) and *Alarm* (sends signal whenever the **Spark Integrity** autosampler produces an error message).

*Note:* The simulated start signal is sent to **Clarity** via RS-232 communication, it is thus not necessary to use the *Inject Marker* for starting the **Clarity** run. The length of the inject marker pulse is 1s, other values can be set using the **Spark ASM** application only.

### End Time

Sets ending time of the Time Program. Without set value, no options on this tab can be used or even set. The value of the *End Time* may be greater than the *Run Time* set on the **Method Setup - Measurement** tab to

set signals or switch valves after analysis. This difference will be evaluated as a *CONTROL* time.

**Aux table**

Governs the switching of the digital output between *HIGH* and *LOW* states based on the time. The default state of the output depends on the connection to the Input/Output connector (for more details see the chapter **Spark Integrity setup - communication** on pg 5).. It can be switched to *HIGH (Aux 1 On)* and back to *LOW (Aux 1 Off)* or vice versa up to four times. The Aux table is available when the *Use Relay Output as* field is set to *Auxiliary*.

**Timebase method**

*Timebase method* drop down list allows to choose between the following options: *Aux 1, Aux 2, Aux 3, Aux 4, Aux 5, Solenoid valve 1, Solenoid valve 2, Solenoid valve 3* and *Solenoid valve 4*.

## 4.1.4 User Template

*User Template 17* and *User Template 18* tabs allow the user to create custom routines for any part of **Spark Integrity** routine. The autosampler stores templates 1 to 16 in its firmware; some of these are used for actual routines (injecting using *Partial Loopfill*, *Reading Vial Barcode*, *Washing*, ...), some templates are not used currently. Templates 17 and 18 are user programmable.

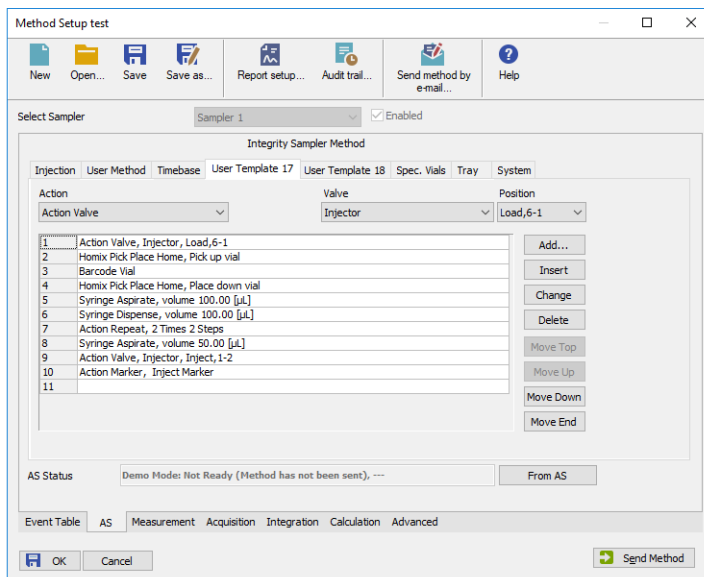


Fig 10: Method Setup - AS - User Template

The table on the [Method Setup - AS - User Template](#) tab enables to set all parts of the autosampler method in one place, which means that no parameters on [Injection](#) and [Timebase](#) tabs will be necessary. [User Program](#) tab thus substitutes all tabs mentioned above and checking the checkbox on [Method Setup - AS - Injection](#) tab will disable all other checkboxes there. Several operations are possible with vials defined on the [Method Setup - AS - Spec. Vials](#) tab. The table fields are context-based; their content changes according to the action defined in the first column on the actual row.

**Note:** When any special vials (Reagent, Destination, Transport) should be used in the User Program method, check that these vials are defined on the [Method Setup - AS - Spec. Vials](#) tab. If they are not defined, the default values will be used, which may invalidate given sample or other sample's analysis data.

A new row is added (or actual row is modified) using the *Action* drop-down list. When an action is selected, other parameters of the action emerge and can be modified. Using the *Add* or *Insert* button the action can be added as a new row into the table, either to the end of the list (*Add* button) or above the selected row (*Insert* button). Existing row can be changed by selecting it, changing the necessary parameters and pressing the *Change* button. A row can be deleted using the *Delete* button. When a row is selected, it can be moved up and down through the list by using the *Move Top*, *Move Up*, *Move Down* and *Move End* buttons.

---

**Note:** Up to 239 lines can be programmed in the **User Template Table**.

Items that can be selected for the particular row in a **User Template Table** are following:

#### **Action Wait**

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

#### **Action Repeat**

Repeats the last one or more rows for a specified number of times. The *Times* field is used to set the number of repeats, the *Steps* field sets the number of **User Program Table** rows to be repeated.

#### **Action Valve**

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

#### **Syringe Valve**

Switches the syringe valve to one of its positions: *Needle*, *Waste*, wash *Port 1* or wash *Port 2*.

#### **Action Auxiliary**

Switches the state of the auxiliary output *On* or *Off*, according to the *State* field. Set it for specific auxiliary output - valid range is between 1 - 6. Only available when the *Use Relay Output as* field on the **Method Setup - AS - Timebase** is set to the *Auxiliary*.

#### **Action Wait for Input**

Allows to set the input whose signal will temporarily override the Freeze function. In **User Program**, this is necessary to start the measurement in the *Sequence Mode* synchronized via the Freeze wiring. The input from which the signal is awaited is defined in the *Select* field, while the desired state unblocking the Freeze condition is defined in the *State* field. Only available when the *Use Input 1 as* or *Use Input 2 as* field on the **Method Setup - AS - Timebase** is set to the *Freeze input*.

**Action Marker**

Sets the marker type in the *Select* field. Available options are *Inject Marker* and *Inj. Marker Status* - the difference is that the *Inj. Marker Status* works without the *Use Relay Output* as field on the **Method Setup - AS - Timebase** tab set to the *Inject Marker* state, thus allowing the use of *Auxiliary* program. The real state of the relay is not changed this way.

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

**Action Syringe Home**

Forces the syringe to perform the home operation (the syringe will dispense itself into the last programmed position and will re-initialize).

**Action Event**

Sets waiting state for chosen action - possible values are between 1 - 15.

**Condition**

Sets one of the conditions from the drop down list into *READY* state.

**Tray Move 1**

Moves tray to one of the position specified in the *Position [mm]* drop down list.

**Tray Move 2**

Moves the tray to one of the position specified in the *Position [mm]* drop down list and either *Under Needle* or *Under Tumbler*.

**Tray Absolute Position Y**

Moves the tray to forward or backward, as defined in the *Position [mm]* field. The movement is defined by the distance from the home position (0.00 mm), where only moves differentiating by at least 0.05 mm from the current position will be performed.

**Tray Absolute Position X**

Moves the tray to front or back, as defined in the *Position [mm]* field. The movement is defined by the distance from the home position (0.00 mm), where only moves differentiating by at least 0.05 mm from the current position will be performed.

**Tray Set Speed**

Sets the speed of the tray - possible values are between 10 - 286.

---

**Note:** *Tray Move* must be enabled for this setting to have an effect.

**Tray Move Plate Position**

Predefined options: *Detect from Vial*, *Vial Adapter* and *Homix Vial Adapter*. If set for *Detect from Vial*, *Vial* number is used to move the tray under the needle. If set for *Vial Adapter*, *Vial* number is used to move the tray under the vial adapter. If set for *Homix Vial Adapter*, *Vial* number is



used to move the tray under the Homix adapter - used for mixing mixtures in the vials.

**Sample Needle Move Relative**

Moves the sample needle in *Downward* or *Upward* direction and in the position specified in the *Position [mm]* field relative to current position.

**Sample Needle Move Relative with Sensor Interaction**

Moves the sample needle in *Downward* or *Upward* direction and in the position specified in the *Position [mm]* field.

**Stripper Move Relative**

Moves the stripper in the *Downward* or *Upward* direction and in the position specified in the *Position [mm]* field relative to current position.

**Stripper Move Relative with Sensor Interaction**

Moves the stripper in the *Downward* or *Upward* direction and in the position specified in the *Position [mm]* field.

**Needle Move**

Moves the selected *Module* to a specified *Position*.

**Sample Needle Move Absolute**

Moves the sample needle in the position specified in the *Position [mm]* field.

**Sample Needle Move Absolute to Sensor**

Moves the sample needle in the position specified in the *Position [mm]* field.

**Air Needle Move Absolute**

Moves the air needle in the position specified in the *Position [mm]* field.

**Stripper Move Absolute**

Moves the stripper in the position specified in the *Position [mm]* field.

**Stripper Move Absolute to Sensor**

Moves the stripper in the position specified in the *Position [mm]* field.

**Air Needle Move Relative**

Moves the air needle in the *Downward* or *Upward* direction and in the position specified in the *Position [mm]* field.

**Needle Set Speed**

Sets *Speed [mm/s]* for the selected *Module* - possible values are between 3 - 125.

---

*Note:* For this setting to have an effect it needs to be set along with *Needle Move*.

**Homix Pick Place Home**

Sets vial for pick up, place down or move to Homix position.

**Homix Tumble**

This command shakes a vial. Sets the vial, *Speed* and *User Method*.

**Syringe Aspirate**

Draws air or solution from sample, destination, specified reagent vial or defined Wash port. For selected aspiration sources, the speed of the aspiration move can be changed in the *Syringe Speed* field, while the height of the needle tip above the vial bottom is governed by the value entered into the *Needle Height [mm]* field. The volume being aspirated is defined by the *Syringe Volume [μl]* field on the **Method Setup - AS - System** tab, which can be done either absolutely or relatively (in % of the injection volume as set in the **Sequence Table**) by checking the *By Sequence* checkbox.

**Syringe Dispense**

Empties a given volume from the syringe into the specified vial or waste port. The height of the needle tip above the bottom of the vial tray and the speed of emptying is set in the *Needle Height* and *Syringe Speed* fields, respectively. The meaning of these fields is the same as in the *Aspirate* command, dispensing into the Waste port doesn't need to specify the *Needle Height* and *Syringe Speed* parameters. The volume being dispensed is defined by the *Syringe Volume [μl]* field on the **Method Setup - AS - System** tab, which can be done either absolutely or relatively (in % of the injection volume as set in the **Sequence Table**) by checking the *By Sequence* checkbox.

**Syringe Set Speed**

Sets the syringe speed to value specified by *Speed [μl/s]* field.

**Air Pump 1/2 Control**

Sets the air pump of 1 or 2 to one of the predefined values (*OFF*, *ON (full-power)*, *ON (low-power)*).

**Outer Needle Wash Purge Valve Switching**

Sets the outer needle wash purge valve to one of the predefined values (*OFF*, *ON (full-power)*, *ON (low-power)*).

**Outer Needle Wash Valve Switching**

Sets the outer needle wash valve to one of the predefined values (*OFF (Solvent Port-1 is set)*, *ON (Solvent Port-2 is set at full-power)*, *ON (Solvent Port-2 is set at low-power)*).

**Outer Needle Wash Pump Control**

Sets time in *[min]* and *[s]* and *Frequency [Hz]* for the outer needle wash pump.

**Support Solvent 1/2/3/4 Pump Control**

Sets the *Frequency [Hz]* for support solvent pump 1 or 2 or 3 or 4.

**Flow Path Pressure Zero**

Sets the current flow path pressure as zero-point.

**Flow Path Pressure Log Start**

Starts to log the flow path pressure.

**Flow Path Pressure Log Stop**

Stops to log the flow path pressure.

**Wait Milliseconds**

Causes the autosampler to wait for a specified time interval. The desired interval is entered into the *Time [ms]* field in milliseconds.

**Syringe Pump**

Starts the syringe to pump.

**Outer Needle Wash Selection**

Sets the *Source of wash liquid* used for the outer needle wash to one of the predefined values (1(A), 2(A), 3(B), 4(B)).

**Power LED Color 1/2**

Sets color of LED 1 and/or LED 2 to user defined color. Color is set in the RGB format.

**Power LED Steps**

Fades between two colors (*Power LED Color 1* and *Power LED Color 2*), this command sets the *Number* of steps used to fade between the colors. One step takes 10 milliseconds. When the command finishes, the settings return to a default value.

**Start Analysis Timer**

Starts the *Analysis Timer*. If the timer is started while the analysis timer is already running, the timer will restart its count to zero.

**Skip Next Number of Steps**

Skips user defined number of *Steps* in the table. Commands that are in the range will be omitted from running.

## 4.1.5 Spec. Vials

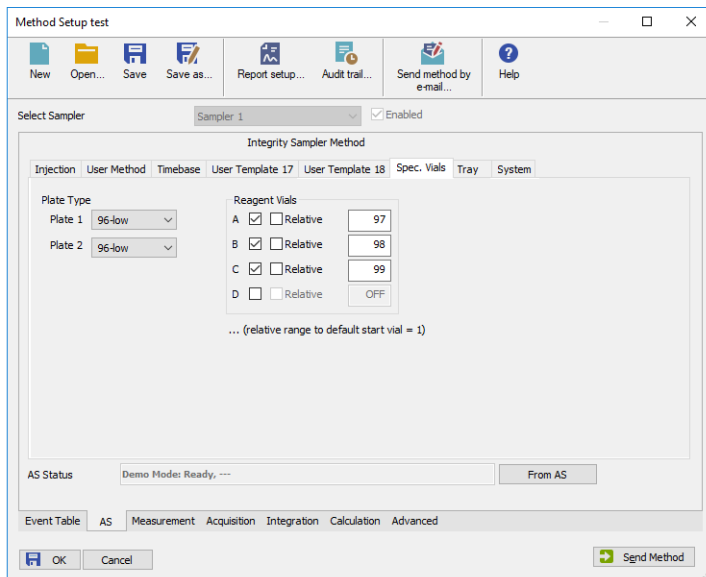


Fig 11: Method Setup - AS - Spec. Vials

Governs types of trays (or well-plates) used and allocation of special purpose vials (destination, transport and reagent vials) to particular vial well positions.

### Plate Type

Defines the plate type inserted into the *1* and *Right* tray position. The plate types may differ between positions, but if the *84+3* tray is used, it fills both positions. The visualization of the trays is displayed on the [Method Setup - AS - Tray](#) tab.

### Reagent Vials

Defines a position of Reagent vial(s) used in the *Mix* method and *User Program*. Up to four different Reagent vials are available, each of them can have a fixed position or *Relative* position given to the sample vial. If the *84+3* tray is used, only two reagent vials can be programmed and they can only be mapped to large volume vials (85-87).

### 4.1.6 Tray

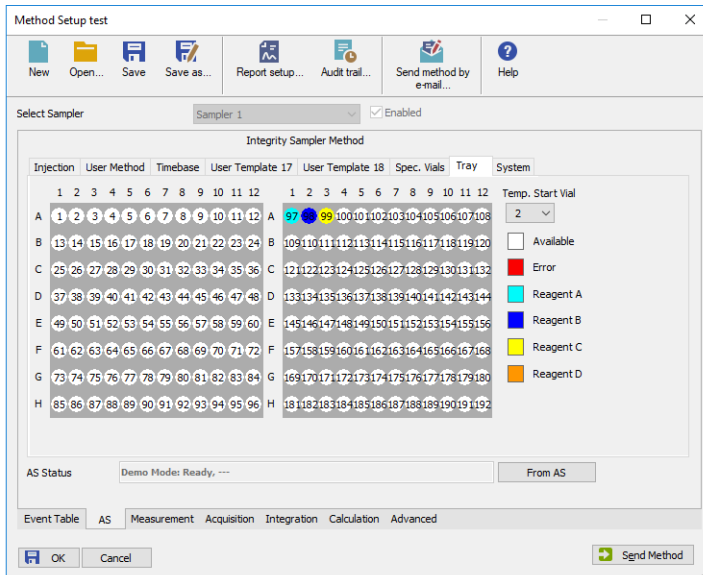


Fig 12: Method Setup - AS - Tray

Displays visualization of the **Spark Integrity** autosampler tray(s), along with the mapping of the vials as performed on the **Method Setup - AS - Spec. Vials** tab.

#### Temp. Start Vial

Allows to set a temporary position of the first sample vial that will be used in the measurement to assess the positions of other special vials. The position of this temporary starting vial will be reset whenever the **Method Setup** dialog is closed.

## 4.1.7 System

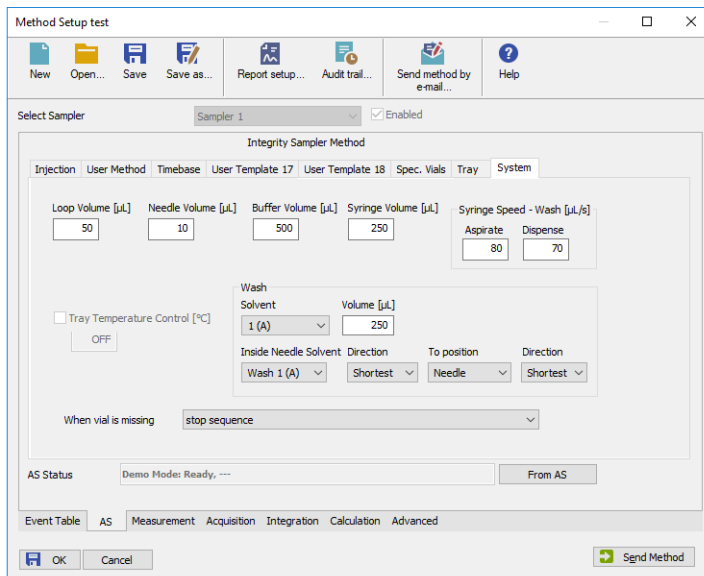


Fig 13: Method Setup - AS - System

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

### Loop Volume [µl]

Defines a value of the sampling loop volume used for an injection (in µl). Possible values range between 0.1 and 10000 µl. When using *Full Loop Injection Mode* from the [Method Setup - AS - Injection](#) tab, only the *Loop Volume* value is allowed in the **Sequence Table** in the [Sequence](#) window.

### Needle Volume [µl]

Sets needle volume in µl.

### Buffer Volume [µl]

Sets buffer volume in µl.

### Syringe Volume [µl]

Defines a volume of the syringe installed in the autosampler. The value is dependent on the fact whether the *Preparative Mode* is switched on or off, varying between 500 µl when not using the *Preparative Mode* and 2500 µl in the *Preparative Mode*.

**Syringe Speed - Wash [ $\mu$ l/s]****Aspirate**

Sets the volume in  $\mu$ l used for aspiration during wash.

**Dispense**

Sets the volume in  $\mu$ l used for dispensing during wash.

**Tray Temperature Control [ $^{\circ}$ C]**

Allows to enable the tray cooling function and sets the temperature for the cooling (in the range 4 - 40  $^{\circ}$ C when cooler/heater is installed, 4 - 22  $^{\circ}$ C when only cooler is installed). This option is grayed-out if the **Spark Integrity** autosampler doesn't have this function built-in.

**Wash**

This section governs the washing and filling of the Wash/Transport port of the **Spark Integrity** autosampler.

**Solvent**

Sets a solvent to one of the predefined values (1(A), 1(B), 2(A), 2(B)).

**Volume [ $\mu$ l]**

Sets volume used for wash in  $\mu$ l.

**Inside Needle Solvent**

Sets inside needle solvent to one of the predefined values (*Needle*, *Waste*, *Wash 1 (A)*, *Wash 2 (A)*, *Wash 1 (B)*, *Wash 2 (B)*). This option is used for pumping solvent from.

**Direction**

Sets direction for wash to one of predefined values (*CW* (clockwise), *CCW* (counter-clockwise), *Shortest*).

**To Position**

Sets a position for the wash. Should be set for *Needle*.

**Direction**

Sets direction for wash to one of predefined values (*CW* (clockwise), *CCW* (counter-clockwise), *Shortest*).

**Skip Missing Vials**

Defines behavior of the autosampler when a missing vial is detected. While unchecked, the autosampler will issue an error message and stop the processing of the sequence, but when checked, no error message is issued and the sequence behaves according to the settings in the *When vial is missing* field.

**When vial is missing**

Determines behavior of the **Clarity Sequence Table** when missing vial is detected by the autosampler and the *Skip Missing Vials* function is checked. The possible options are *stop sequence*, *stop sequence when vial is standard* or *continue sequence*. The selected option is automatically stored after closing the **Method Setup** window.

---

*Note:* *Skip Missing Vial* function is, due to the design of the Integrity firmware, only designed for the *Sequence Mode*. It has not been thoughtfully tested.



## 4.2 Hardware Configuration

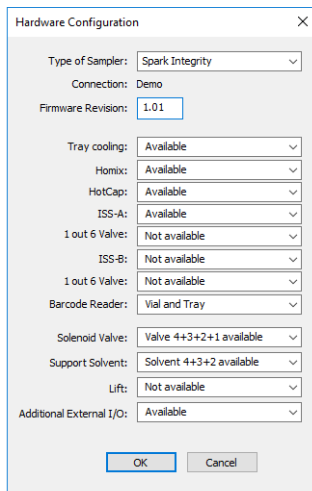


Fig 14: Hardware Configuration

The **AS Status** button in the **Device Monitor** displays the **Hardware Configuration** dialog. In the full version, this dialog displays autosampler model, automatically detected communication parameters, firmware revision and presence of several optional parts of the **Spark Integrity** autosampler.

In the demo version the presence of the particular options can be set to demonstrate the possibilities of the autosampler with selected configuration.

### Type of Sampler

Shows the **Spark Integrity** autosampler type as automatically detected by the control module.

### Connection

Shows communication parameters as read from the autosampler. Displayed value is dependent on the type of communication used - either it is a COM port, IP address or USB port.

### Firmware Revision

Shows the firmware revision loaded into the **Spark Integrity** autosampler.

### Tray Cooling

Shows whether the **Spark Integrity** autosampler is equipped with the tray cooling/heating option.

### Homix

Shows whether the **Spark Integrity** autosampler is equipped with the Homix - Sample homogenizer/reagent mixer.

**HotCap**

Shows whether the **Spark Integrity** autosampler is equipped with the Hotcap - Individual heating of samples and reaction mixtures.

**ISS-A**

Shows whether the **Spark Integrity** autosampler is equipped with an optional integrated stream-switching (ISS) valve.

**1 out 6 Valve**

Shows whether the **Spark Integrity** autosampler is equipped with the 1 out 6 column selection valve.

**ISS-B**

Shows whether the **Spark Integrity** autosampler is equipped with an optional integrated stream-switching (ISS) valve.

**1 out 6 Valve**

Shows whether the **Spark Integrity** autosampler is equipped with the 1 out 6 column selection valve.

**Barcode Reader**

Shows whether the **Spark Integrity** autosampler is equipped with a *Barcode Reader* - options are: for *Vial, Tray, Vial and Tray*.

**Solenoid Valve**

Lists whether the **Spark Integrity** autosampler supports the solenoid valves.

**Support Solvent**

Lists whether the **Spark Integrity** autosampler supports solvents.

**Lift**

Shows whether the **Spark Integrity** autosampler is equipped with a lift.

**Additional External I/O**

Shows whether the **Spark Integrity** autosampler supports additional external inputs and outputs.

## 4.3 Spark Integrity Setup

The **Spark Integrity Setup** dialog (accessible through the **System Configuration** dialog) allows to set the parameters needed for the communication with the **Spark Integrity** autosampler manually.

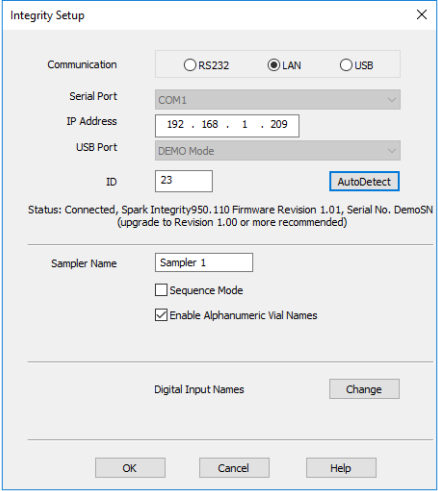


Fig 15: Spark Integrity Setup

### Communication

Sets type of communication for the **Spark Integrity** autosampler. The possible options are *RS232*, *LAN* or *USB*. The selection is dependent on the communication card installed in the autosampler. It influences available fields in the **Spark Integrity Setup** dialog.

### Serial Port

In case of serial (RS232) communication, it sets the COM port used for the communication between the **Spark Integrity** autosampler and **Clarity**.

### IP Address

In case of LAN communication, it sets the IP address of the **Spark Integrity** autosampler connected to the computer via network.

### USB Port

In case of USB communication, it sets the particular USB port used to communicate with the **Spark Integrity** autosampler.

### ID

Shows the device identifier of the **Spark Integrity** autosampler. The number listed here is hard-set for **Spark Integrity** autosamplers to the value 23. For more details see the chapter **Spark Integrity setup - communication** on pg 5.

**Autodetect**

When pressed, checks whether there is the **Spark Integrity** autosampler present using the selected *Communication* option, with the given *Serial Port*, *IP Address* or *USB Port*. The ID is also checked for the successful communication attempt. The result of the autodetection is then displayed in the *Status* row.

**Status**

Shows the status of the communication with the **Spark Integrity** autosampler after the *Autodetect* button has been used. The displayed information, in case of a successful communication attempt, includes the version of the firmware in the autosampler and the sampler's serial number.

**Sampler Name**

Allows to set a custom name of the **Spark Integrity** autosampler, which will be then shown in the [Device Monitor](#) window, in the reports and on other places in **Clarity**.

**Sequence Mode**

This option governs the mode of the operation with the **Spark Integrity** autosampler control module. While checked, as much of the sequence table as possible, is sent to the autosampler in one package (no method sending prior each injection will be performed for the injections package). A sequence should be written in the manner where following lines are analogical (e.g. same number of injections from each row, but the injection vial is incremented between rows etc.).

While not checked, the operation will be governed by **Clarity** - the method will be sent to the autosampler prior to each injection and each injection will thus be considered a single one-injection series by the autosampler. This prevents the use of wash between samples and few other features.

## Digital Input Names

Pressing the *Change* button opens the **Digital Input Names** dialog which allows to set a custom name for the virtual **Spark Integrity** digital inputs. These inputs allow to start **Clarity** run by the signal of the **Spark Integrity** autosampler simulated over the communication line instead of the usual synchronization wiring, send warnings on autosampler errors or govern auxiliary devices.

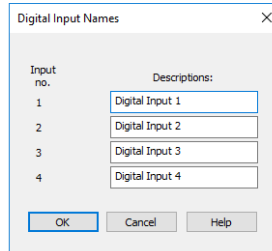


Fig 16: Digital Input Names

## 4.4 Device Monitor

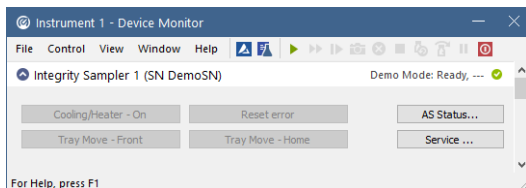


Fig 17: Spark Integrity Device Monitor

The Device Monitor window for the **Spark Integrity** autosampler enables to control some of the actions of the **Spark Integrity** autosampler.

### Cooling/Heater On/Off

Switches the tray cooling and/or heating on or off. Sending a method will reset the cooler/heater to the state defined in the method.

### Reset Error

When invoked, it resets the Error state that may have occurred in the autosampler.

### AS Status

Opens the [Hardware Configuration](#) dialog described in the chapter "**Hardware Configuration**" on pg 29.

### Tray Move Front

Moves the tray from the home position (further from the door) to the front position.

### Tray Move Home

Moves the tray from the front position (near the door) back to the home position.

### Service

Displays the [Service](#) dialog for controlling the **Spark Integrity** using other service commands.

## 4.4.1 Service

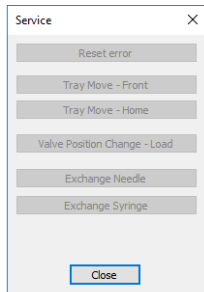


Fig 18: Service dialog of the Spark Integrity

This dialog is designed for controlling the **Spark Integrity** autosampler using service commands.

### **Reset Error**

When invoked, it resets the Error state that have may occurred in the autosampler.

### **Tray Move Front**

Moves the tray from the home position (further from the door) to the front position.

### **Tray Move Home**

Moves the tray from the front position (near the door) back to the home position.

### **Valve Position change - Load**

Changes a position of the valve from Load to Inject position or the other way around.

### **Exchange Needle**

Allows to exchange the sampling needle. Follow the instructions on the screen to perform the exchange.

### **Exchange Syringe**

Allows to exchange the syringe. Follow the instructions on screen to perform the exchange.

## 4.5 Select Vial

This dialog serves for entering alphanumerical numbering of vials. It is accessed by clicking on the small arrow in the *Start Vial* or *End Vial* column in the *Sequence* window.

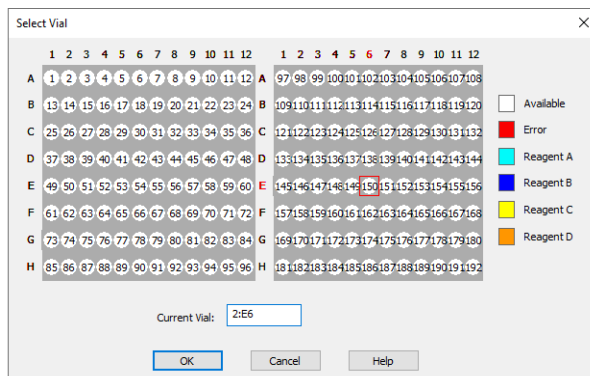


Fig 19: Select Vial

The functionality of the dialog is simple - either add the number of the vial needed into the *Current Vial* field, or click on the position in the graphical view of the autosampler trays. The actual position is highlighted by a red square, and the letter of the row and the number of the column are also highlighted by red colour.



# 5 Report Setup

The screenshot displays a 'Print Preview' window for an 'Integriy Method Sampler 1'. The window contains a detailed list of system parameters and settings, organized into columns. Below the settings, there is a 'Sampler 1 Sequence Table' showing a single step labeled 'No step'. At the bottom, a 'Sampler 1 User Template 17' table lists 10 actions, including valve operations, solvent pick-up, syringe aspirate and dispense, and repeat actions.

**Integriy Method Sampler 1**

Firmware Revision	: 950110 1.01	Tray Coding	: Available	Homix	: Available
HotCap	: Available	ISS-A	: Available	ISS-B	: Not available
Barcode Reader	: Vial and Tray	Solenoid Valve	: Valve 4+3+2+1 available	Support Solvent	: Solvent 4+3+2 available
Lift	: Not available	Additional External I/O	: Available		
Use Injection Method	: ON	Injection Type	: Partial Loopfill	Wash	: ON
				Read Vial Barcode	: ON
Plate 1	: 96-low	Plate 2	: 96-low		
Reagent A	: OFF				
Reagent B	: OFF				
Reagent C	: OFF				
Reagent D	: OFF				
Buffer Volume	: 500 µL	Loop Volume	: 50 µL	Syringe Volume	: 250 µL
Flush Volume	: 45.00 µL	Needle Volume	: 10.00 µL	Transport Volume	: 25.00 µL
Analysis Time	: 0.00 min	Direction	: Upwards	Piercing Depth	: 10.00 mm
Sample Needle Height	: 5.00 mm	Inj.Speed Disp.	: 20.00 µL/s		
Inj.Speed Asp.	: 20.00 µL/s	Pressure Upper Limit	: 9999 mbar		
Pressure Lower Limit	: 0 mbar				
Tray Cooling	: OFF	Use Timebase Method	: OFF		
Headspace Pressure (PASA)	: OFF	Wash Speed Asp.	: 80.00 µL/s	Wash Speed Disp.	: 70.00 µL/s
Wash Solvent	: 1 (A)	Wash Speed Disp.	: 70.00 µL/s	Direction	: Shortest
Wash Volume	: 250.00 µL	Inside Needle Solvent	: Wash 1 (A)		
Inside Needle Wash To	: Needle	Direction	: Shortest		

**Sampler 1 Sequence Table**

No step
---------

**Sampler 1 User Template 17**

1	Action Valve, Injector, Load,6-1
2	Homix Pick Place Home, Pick up vial
3	Barcode Vial
4	Homix Pick Place Home, Place down vial
5	Syringe Aspirate, volume 100.00 [µL]
6	Syringe Dispense, volume 100.00 [µL]
7	Action Repeat, 2 Times 2 Steps
8	Syringe Aspirate, volume 50.00 [µL]
9	Action Valve, Injector, Inject,1-2
10	Action Marker, Inject Marker

Page 1

Fig 20: Spark Integrity report preview

All autosampler-specific settings (meaning data from all sub-tabs of the **Method Setup - AS** tab) are reported and displayed when checkbox **Injection Control** of the **Report Setup - Method** dialog is checked.

## 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=SparkIntegrity_%D.txt
reset=off
```

*Note:* Instead of COM1 type the correct port (or IP address) used to communicate with the **Spark Integrity** autosampler. This information is displayed when the *AS Status* button in the **Method Setup - AS** dialog is invoked or in the **Spark Integrity Setup** dialog. The correct settings should have a format similar to the ones shown in the table for different types of the communication:

*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.

Tab 2: Format of the port settings in COMMDRV.INI

Communication	Format syntax
Serial communication	COMx (Where x is the number of the COM port)
LAN communication	TCP_IP x.x.x.x: 2101 (where x.x.x.x is the IP address)
USB communication	FTD2XX SNx (where x is the serial number of the sampler)

The created \*.TXT files will greatly help in diagnosis of unrecognized errors and problems in communication. Note that the file size may be quite significant, so in case the error occurs on a regular basis, it might be better to set the *Reset=on*, start **Clarity**, invoke the error, close **Clarity** and send the diagnostics file (the file will be once more reset during the next start of **Clarity**).

## 6.1 Specific Problems

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### Injection volume set in the [Sequence](#) window is not accepted.

*Solution:* Either you are using the *Full Loop* option and the injection volume doesn't match the one of the installed injection loop, or you are trying to enter a volume that is greater than the half of the installed *Loop Volume* in the *Partial Loopfill* injection mode. Use the injection volume appropriate to your specific setting and/or make amendments on the [Method Setup - AS - System](#) tab.