Agilent 1100 Series Analytical and Preparative Scale Fraction Collectors

User's Guide

Notices

Manual Part Number

G1364-90001

Edition

07/03

Printed in Germany

Agilent Technologies, Deutschland GmbH
Hewlett-Packard-Strasse 8
76337 Waldbronn

Warranty

The material contained in this document is provided "as is," and is subject to being changed, without notice, in future editions. Further, to the maximum extent permitted by applicable law, Agilent disclaims all warranties, either express or implied, with regard to this manual and any information contained herein, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Agilent shall not be liable for errors or for incidental or consequential damages in connection with the furnishing, use, or performance of this document or of any information contained herein. Should Agilent and the user have a separate written agreement with warranty terms covering the material in this document that conflict with these terms, the warranty terms in the separate agreement shall control.

Technology Licenses

The hardware and/or software described in this document are furnished under a license and may be used or copied only in accordance with the terms of such license.

Restricted Rights Legend

If software is for use in the performance of a U.S. Government prime contract or subcontract, Software is delivered and licensed as "Commercial computer software" as defined in DFAR 252.227-7014 (June 1995), or as a "commercial item" as defined in FAR 2.101(a) or as "Restricted computer software" as defined in FAR 52.227-19 (June 1987) or any equivalent agency regulation or contract clause. Use, duplication or disclosure of Software is subject to Agilent Technologies' standard commercial license terms, and non-DOD Departments and Agencies of the U.S. Government will receive no greater than Restricted Rights as defined in FAR 52.227-19(c)(1-2) (June 1987). U.S. Government users will receive no greater than Limited Rights as defined in FAR 52.227-14 (June 1987) or DFAR 252.227-7015 (b)(2) (November 1995), as applicable in any technical data.

Safety Notices

CAUTION

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

In This Guide...

This manual contains technical reference information about the Agilent 1100 Series fraction collectors analytical and preparative scale. The manual describes the following:

1 Configuration and Operation of the Fraction Collector

This chapter describes the configuration and operation of the fraction collector including guidelines to optimize the system and to avoid problems.

2 Troubleshooting and Test Functions

This chapter describes the modules built-in troubleshooting and test functions.

3 Repairing the Fraction Collector

This chapter contains instructions on simple repair and maintenance procedures.

4 Parts and Materials

This chapter contains lists for identification of common repair and maintenance parts.

5 Specifications

This chapter contains performance specifications of the fraction collectors.

A Safety Information

This appendix provides a safety summary.

Contents

1
Configuration and Operation of the Fraction Collector

Configuration of the Fraction Collector

Configuration of the Fraction Collector in the ChemStation

CAUTION Before using the preparative scale fraction collector G1364B the delay calibration adapter G1364-87301 has to be removed from the needle carrier assembly.

In order to setup or change the configuration parameters of your fraction collector select **More Fraction Collector > Configuration** from the Instrument menu or right-click on the fraction collector icon in the graphical user interface. In the resulting Fraction Collector Configuration dialog box (Figure 1 on page 11) the configuration of the Trays, the Fraction Delay Volumes, the Collection Order, the Needle Movement and the Well-Plates can be specified.

Trays

In the online mode of the Agilent ChemStation the configuration of the Trays is recognized automatically. In the off-line mode an appropriate tray configuration can be chosen from a wide variety of different trays and set-up here. For a selection of supported trays see “Supported Trays for Fraction Collectors” on page 80.

Tube volume [ml] Volume of the test tube should be specified 10% less than the maximum fill volume to avoid overfill.

Tube height [mm] The exact test tube height has to be specified. For preparative scale fraction collector the minimum height is 48 mm and the maximum height is 100 mm. For the analytical scale fraction collector with 50 mm needle (standard) the maximum height is 48 mm. By changing to the short 20 mm needle the maximum tube height can be in creased to 75 mm. For the part numbers of the different needle assemblies see “Needle Assemblies” on page 89.

NOTE In the online ChemStation the installed tray is recognized and the default settings for tube volume and tube height are loaded and displayed.

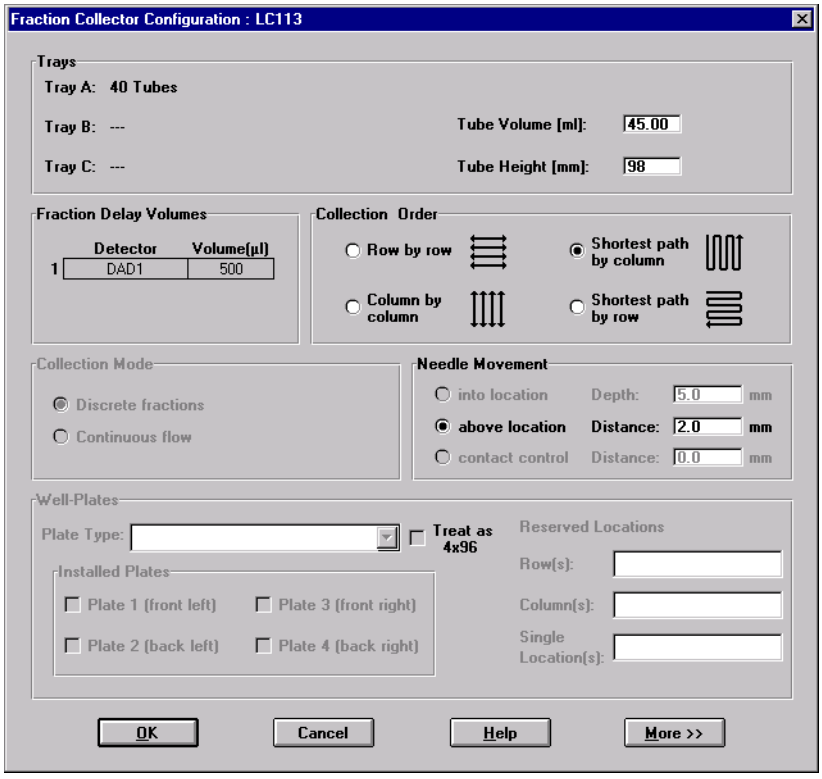


Figure 1 Fraction Collector Configuration dialog

Use for Sample Recovery This checkbox only appears, if multiple fraction collectors are configured (see Figure 18 on page 39). Then the last fraction collector can be selected for sample recovery. If four fraction collectors are configured, the fourth one will automatically used for sample recovery. To change the order of your fraction collectors select **Configure 1100 Access** from the **Instrument** menu. In the **Configuration** dialog box use the **Up** or **Down** button to change the configuration order and restart your ChemStation.

Fraction Delay Volumes

The Fraction Delay Volume specifies the volume between the detector cell and fraction collector needle tip. This volume has to determined by a delay calibration. See "Delay volumes and delay calibration" on page 15 for a detailed description on delay volumes and delay calibration.

Collection Order

The Collection Order describes the way of capillary movement during fraction collection. Four different settings are possible:

- row-by-row
- column-by-column
- shortest way by row
- shortest way by column

Shortest way by row/column is recommend, if **Continuous flow** is selected as Collection mode.

Collection Mode

The Collection Mode defines the triggering of the diverter valve. For **Discrete fractions** the diverter valve switches to waste while the needle moves to the next test tube, vial or well. For **Continuous flow** the diverter valve is not switching during needle movements, except for long movements in the row-by-row or column-by-column mode. In addition the needle cannot move **Into location** during continuous flow operation. **Continuous flow** is only available for well plates.

Needle Movement

Into location In the into location mode the needle tip moves into the well to the specified **Depth** (in mm). This option is only available for the analytical scale fraction collector in the **Discrete fractions** mode.

Above location In the above location mode the needle tip stays at the specified **Distance** (in mm) above the well during fraction collection.

Contact Control In this mode the needle tip moves down to the well bottom until is reaches the specified **Distance** (in mm) between needle tip and the vial/well bottom. This ensures that the forming droplet is in contact to the

vial/well bottom. During the continuing filling process the needle tip moves upwards while staying in contact with the surface of the collected liquid. This option is recommend for low flow rates and small fraction volumes to avoid air bubbles and accomplish an accurate fraction volume. It is only available for the analytical scale fraction collector.

Well-Plates

In the **Well-Plates** section the type of well plates used in a well plate tray can be configured. The used well plate type can be chosen from the Plate type dropdown menu. More detailed information about all pre-configured well plates can be found in the Instrument menu. Only one type of well plate can be used on the well plate tray.

The checkbox **Treat as 4 x 96** is available only for 384 well plates and allows to split the 384 well plate virtually into 4 separate 96-well plates. This only changes the collection order. The numbering of the wells remains as indicated on the plate. The four virtual 96 well plates start at locations A1, A13, I1 and I13, respectively.

The filling order of each quarter is as specified in the Collection Order section. When the 384 well plate is split into four equal quarters the order of the four plates is the same as displayed in the Installed Plates section.

In the **Reserved Locations**, you have the possibility to specify locations that will not be used for Fraction Collection (see Table 1).

Table 1 Syntax for the definition of Reserved Locations

Location	Syntax	Description
Rows	A	Row A can't be used
	A,B	Rows A and B can't be used
	A-D	A, B, C and D can't be used
	A-D,F	Rows A, B, C, D and F can't be used
Columns	1	Column 1 can't be used
	1,2	Columns 1, and2 can't be used
	1-4	Columns 1, 2, 3 and 4 can't be used

Table 1 Syntax for the definition of Reserved Locations

Location	Syntax	Description
	1-4,12	Columns 1, 2, 3, 4 and 12 can't be used
Single locations	G12,H12	Locations G12 and H12 can't be used

Configuring multiple fraction collectors

To increase the capacity of the systems up to four fraction can be configured by using the Agilent 1100 Series selection valve G1160A.

- The **Configuration** has to be edited for all fraction collectors. The last fraction Collector can be selected for sample recovery. To configure the recovery fraction collector please read "Sample Recovery" on page 39.
- We recommend to use inlet tubing of the same length for all fraction collectors. Otherwise a **Delay Calibration** has to be performed for each of those fraction collectors. For the recovery fraction collector the delay volume parameter will be ignored.

NOTE The **Delay Calibration** can only be performed for fraction collector 1 of your configured system. For the calibration of fraction collector 2 and fraction collector 3, these have to be temporarily configured as fraction collector 1.

- The fraction collector inlet tubings have to be connected to port 1-3 of the selection valve in the same order as configured in the ChemStation. The recovery fraction collector is always connected to the waste tubing of the main fraction collectors. The waste tubing from multiple fraction collectors and the inlet tubing to the recovery collector have to be connected through a T-Piece.
- Fraction Collector 4 will always be used as a recovery fraction collector.

Delay volumes and delay calibration

Handling of Delay times and volumes

Figure 2 shows a schematic drawing of the fraction-collection part of the Agilent 1100 series purification system with the two delay volumes V_{D1} and V_{D2}. For peak-based fraction collection the system delay times t_{D1} and t_{D2} can be calculated by dividing the delay volumes by the flow rate $\dot{v}$.

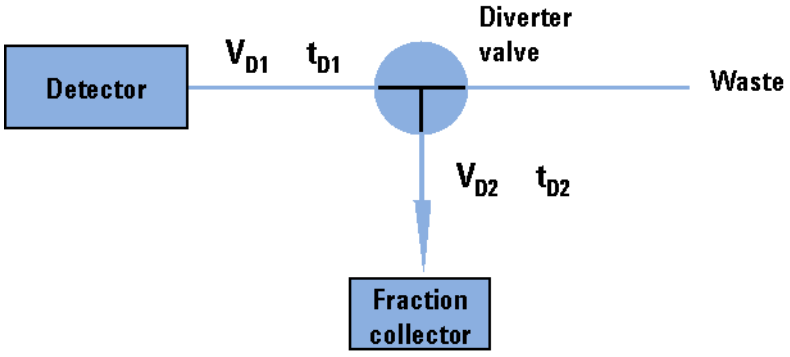


Figure 2 Delay Volumes and delay times

The delay volume V_{D2} is a system constant and is 23 µl for the fraction collector AS and 120 µl for the fraction collector PS. Delay volume V_{D1}, which is displayed in the *Fraction Collector Configuration* window, is determined using the *Delay Volume Calibration* feature of the ChemStation software.

When a peak is detected during a purification run (Figure 3) the diverter valve is triggered using the following delay time calculations:

Start of fraction collection: $t = t_0 + t_{D1}$

End of fraction collection: $t = t_E + t_{D1} + t_{D2}$

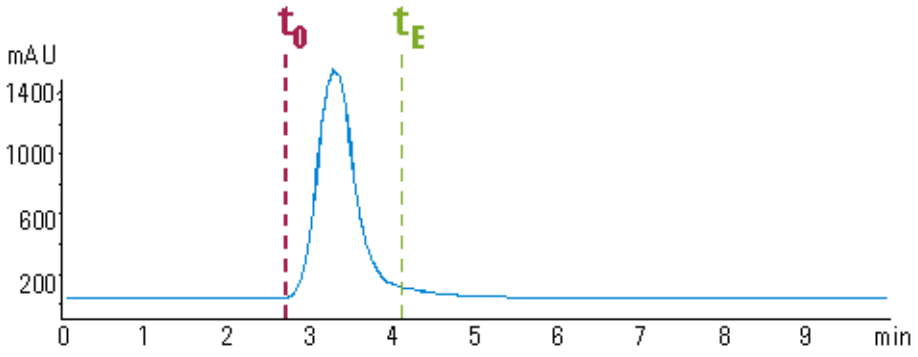


Figure 3 Chromatogram with peak start t0 and peak end tE

Detector signal delay

Every Agilent UV detector that is used for triggering fractions has an internal signal delay caused by filtering the raw data. The signal delay depends on the *Peakwidth* setting of the detector and is accounted for when the diverter valve is triggered. Tables 1 and 2 show the internal signal delay times for different *Peakwidth* settings

Table 2 DAD/MWD

Peakwidth (min)	Response time (sec)	Signal delay (sec)
<0.01	0.1	0.05
>0.01	0.2	0.15
>0.03	0.5	0.5
>0.05	1.0	1.25
>0.10	2.0	2.75
>0.20	4.0	5.9
>0.40	8.0	11.9
>0.85	16.0	23.9

Table 3 VWD

Peakwidth (min)	Response time (sec)	Signal delay (sec)
<0.005	<0.1	0.07
>0.005	0.12	0.14
>0.01	0.25	0.29
>0.025	0.5	0.58
>0.05	1	1.31
>0.1	2	2.84
>0.02	4	5.97
>0.4	8	12.3

If the internal signal delay is longer than the delay time t_{D1} some of the peak will be lost. The maximum allowed signal delay time can be calculated using the following equation:

$$\text{Signal delay time}_{(max)} = \frac{V_{D1}}{\dot{v}} \qquad \dot{v} = \text{Flow rate}$$

After calculating the maximum signal delay time a *Peakwidth* setting can be selected that gives a signal delay time, which is shorter than the calculated maximum signal delay time. This *Peakwidth* setting should then be used for the purification run.

NOTE

We recommend to set the *Peakwidth* always to > 0.01 for the DAD and MWD or to > 0.005 for the VWD

If the *Peakwidth* setting cannot be reduced and the signal delay time is longer than t_{D1} it is also possible to enhance V_{D1} by adding additional tubing. However, this is not recommend because of increasing peak dispersion caused by the higher delay volume.

The stop-time of the run in the ChemStation must be set to at least:

Total duration of time table (time of last entry *Off*) + fraction collector delay time $(V_{D1}/\dot{v}) + 0.1 min$

End of last peak (t_E) + fraction collector delay time $(V_{D1}/\dot{v}) + 0.1 min$

Performing a delay calibration with an UV detector

1. Place a vial containing the Delay Sensor Calibrant (Part No. G1946-85020) in position 1 of the Autosampler.
2. Remove the installed column and connect the capillaries with a zero-dead-volume connector.
3. Connect a bottle of water to Channel A.
4. Install the Delay Calibration Adapter G1364-87301 by attaching it to the needle carrier assembly (G1364B preparative scale only).
5. Switch to Diagnosis View (if necessary).
6. Open the AFC Delay Volume Calibration status window (see Figure 4) from the Fraction Collector sub-menu of the Maintenance menu:

   Maintenance –> Fraction Collector –> Delay Volume Calibration

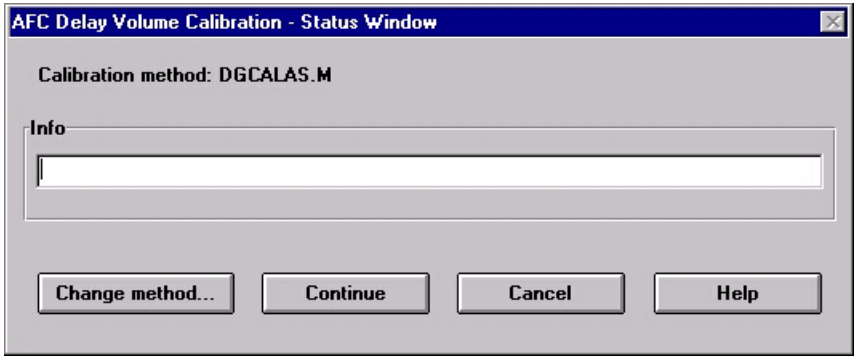


Figure 4 AFC Delay Volume Calibration window

The method to be used for the delay volume calibration is displayed (DGCALAS.M is the default calibration method for the analytical scale fraction collector and DGCALPS.M is the default method for the preparative fraction collector); if you want to change to a different method, click the Change Method button and select a new method. See also "Making Your Own Calibration Method" on page 26

The Info field shows the current status of the delay volume calibration, and gives instructions and warnings.

7 Click the Continue button. The Info field gives the instruction to turn on the pumps (see Figure 5).

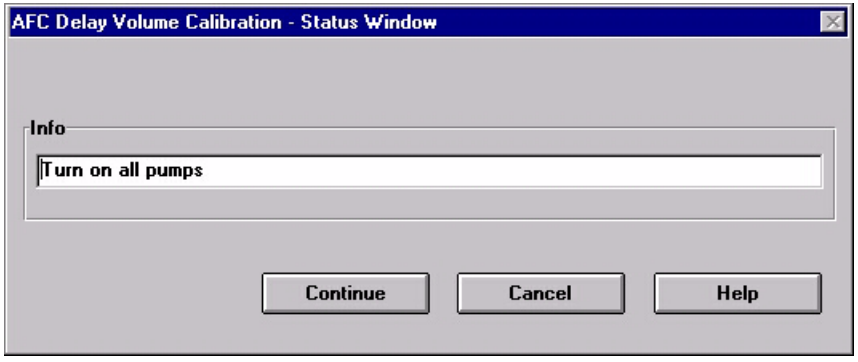


Figure 5 Delay Volume Calibration Status Window

8 When you have turned on the pumps, click the Continue button again to start the delay volume calibration.

The selected method is loaded, and the delay volume calibration sample is injected.

9 When the calibration run has finished, click OK. The Calibration Results panel (see Figure 6) is displayed.

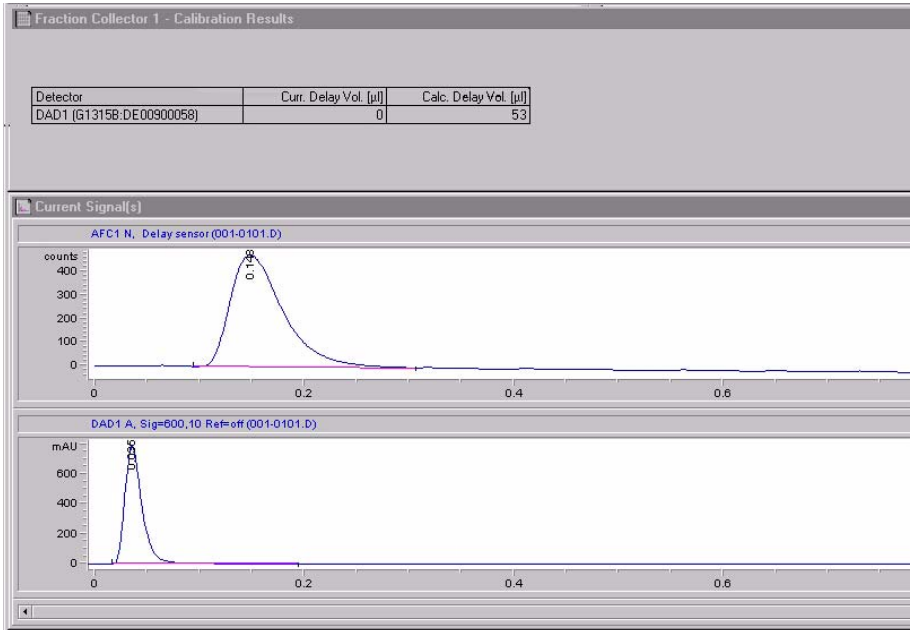


Figure 6 Delay Calibration Results Panel

The Calibration Results panel contains a results table and the acquired chromatograms from the detector(s) and the fraction collector delay sensor. The results table contains

- the name and serial number of the detector,
- the current delay volume (stored in the fraction collector configuration),
- the calculated delay volume from the calibration.

You can click the Print button to print the Calibration Results panel.

10 If you want to store the calculated delay volume in the fraction collector configuration, click the Calibrate button. A confirmation dialog box is

displayed when the delay volume has been stored; click the OK button to close the confirmation.

If you do not want to store the calculated delay volume in the fraction collector configuration, click the Close button. A confirmation dialog box is displayed; click the OK button to close the confirmation or the Cancel button to return to the Calibration Results panel.

NOTE

If two or three fraction collectors are configured, you can calibrate the delay volume for the first fraction collector only (the delay volume calibration menu is accessible only for Fraction Collector 1, which is the fraction collector that appears first in the list of configured Agilent 1100 modules).

The calculated delay volume is used for all fraction collectors; therefore, the volume (tubing) between the selection valve and each installed fraction collector must be identical.

You still have the possibility to manually change the volumes for each fraction collector separately in the configure screen of the ChemStation for each module.

CAUTION

Before using the preparative scale fraction collector G1364B the delay calibration adapter G1364-87301 has to be removed from the needle carrier assembly.

Performing a delay calibration with an MSD

1. Place a vial with the Delay Sensor calibrant (Part No. G1946-85020) in position 1 of the Autosampler.
2. Remove the installed column and connect the capillaries with a zero-dead-volume connector or a mixer (Part No. 79835-87330).
3. Connect a bottle of water to Channel A of the main pump.
4. Install the Delay Calibration Adapter G1364-87301 by attaching it to the needle carrier assembly (G1364B preparative scale only).
5. Connect a bottle of water with 0.1% acetic acid or ammonium formate to the make-up pump.
6. Load the method DGCALAS.M (analytical scale) or DGCALPS.M (preparative scale) and adjust the flow in the main pump to the flow you will be using for the analysis.

CAUTION Unlike for UV detectors, the delay calibration for the MSD needs to be performed whenever the flow rate is changed.

7. Set the flow of the make-up pump to the flow rate you will be using for your analysis.
8. Set the active splitter to a setting of 3.
9. Save the method to a new name.
10. Go to Diagnostics menu; select Delay volume Calibration from the Fraction Collector Sub-menu within the Maintenance menu.
11. Press the Change method... button to select the method you created. The new method name appears on the info line.
12. Start the active splitter.
13. Press the Continue button to execute the Delay Volume Calibration

    The selected method is loaded and the Delay Calibration Sample Injected.
14. When the Calibration Run is finished, press OK.
15. Examine the value for the MSD Calculated Delay time.

The delay time should be at least 5 seconds but may, in fact, be negative (see Figure 7).

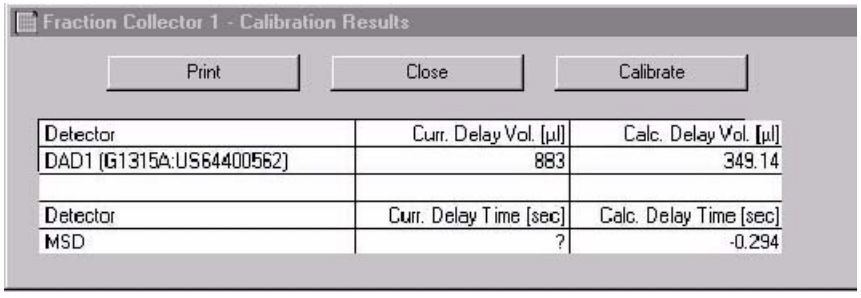


Figure 7 Delay Volume Calibration results

16 If the measured delay time is greater than 5 seconds, you can skip to step 21, otherwise, continue with step 17.

CAUTION If the measured delay time is significantly greater than 5 seconds, you should continue with the calibration at step 16 to avoid losing fractions at the end of the run.

17 Determine how much additional time is needed to create a 5-second delay. For example, if the time displayed is -1 sec, a six-second delay is needed.

18 Using the main pump flow rate, determine the desired additional delay volume. For example, at 3 ml/min and a six-second delay, an additional 3.0 x 6/60 or 0.3 ml is required.

19 Cut off a sufficient piece of the supplied ETFE tubing (Part No. G1968-60500) to provide the needed volume. The tubing's volume is 8.1 µl/cm. In this case, 37 cm would be required.

20 Add the tubing between the splitter and the fraction collector or, if multiple fraction collectors are installed, between the splitter and the G1160A valve.

21 Perform the calibration again. Verify the time is sufficient (>5 seconds, see Figure 8).

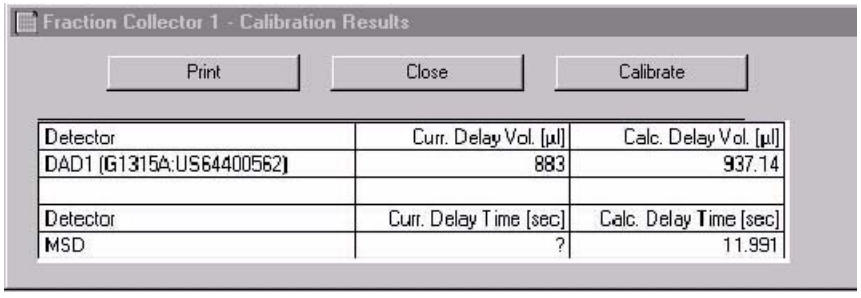


Figure 8 Delay time greater than 5 seconds

22 Press the Calibrate button if you want to store the new calculated delay volume for the MSD in the Fraction Collector Configuration (see also "Configuration of the Fraction Collector in the ChemStation" on page 10).

23 Press the Print button to get a hard copy of the report.

24 Stop the splitter.

25 Return to the Method and Run Control View and load the method you will be using to run your samples. Select Fraction Collection from the More MSD... sub-menu under the Instrument menu

Press the Parameters button and enter the final calculated delay time that appears in the report in the Collector Delay field, first converting it to minutes. In this case you would enter 11.991/60 = 0.20 minutes (see Figure 9).

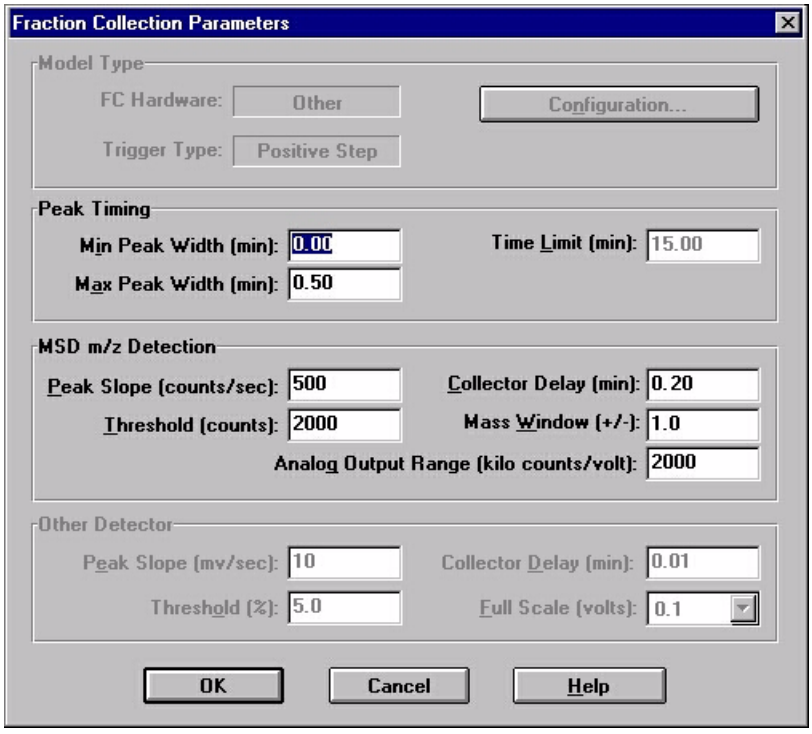


Figure 9 Fraction Collection Parameters dialog box with delay volume entry

26 Save the method.

NOTE If you anticipate running samples at a variety of flow rates, it is best to calibrate at the highest likely flow rate first and install the appropriate length tubing. This way, there will be sufficient delay for the lower flow rates and new lengths will not need to be cut.

CAUTION Before using the preparative scale fraction collector G1364B the delay calibration adapter G1364-87301 has to be removed from the needle carrier assembly.

Making Your Own Calibration Method

You make your own calibration method by editing one of the default calibration methods:

1 Load the default calibration method: DGCALAS.M in the case of an analytical system and DGCALPS.M in the case of a preparative system.

2 Change the method parameters (flow, runtime, solvent composition, injection volume or detector parameters) to suit your adapted calibration procedure.

CAUTION

The detector peakwidth has an influence on the delay time of the peak; therefore, we recommend that you use the maximum flow rates for the peakwidths given in Table 2 on page 16 or Table 3 on page 16. Use of higher flow rates will result in missed peaks unless the signal delay is taken into account:

$$\text{Minimum required delay volume} = \text{signal delay} \times f\text{low}$$

3 Save the method with a new name in the method folder for your instrument.

4 Follow the appropriate procedure as described in the previous sections for running the method.

Setting up a Fraction Collector Method

In order to setup or change the method parameters of your fraction collector select **Setup Fraction Collector** from the Instrument menu or right-click on the fraction collector icon in the graphical user interface. This will open the Setup Fraction Collector dialog box as displayed in Figure 10. In the Setup Fraction Collector dialog box general method settings are specified.

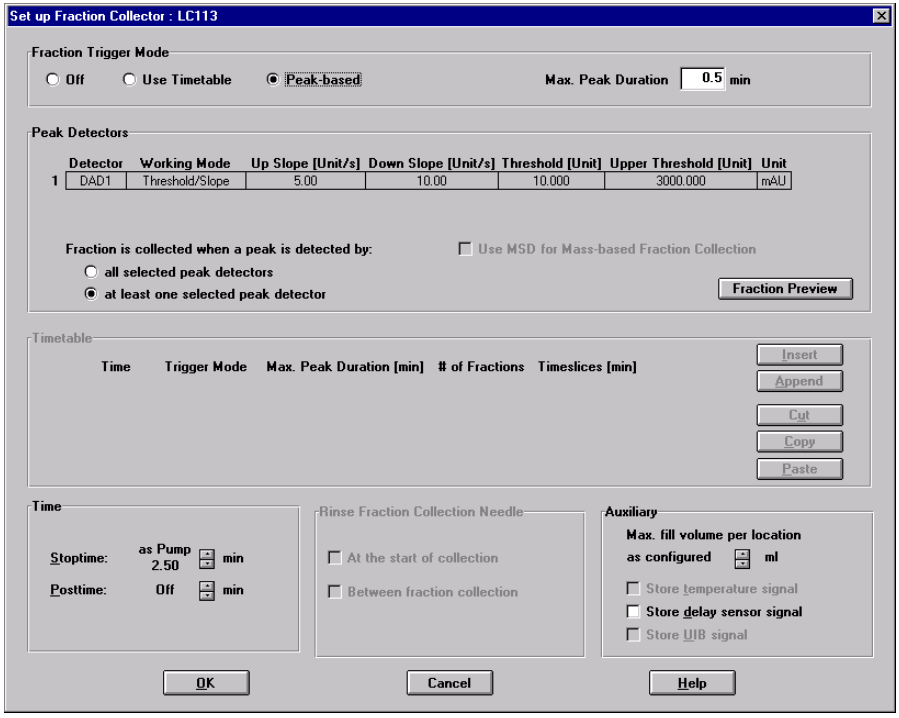


Figure 10 Set up Fraction Collector dialog box

Fraction Trigger Mode

Use Timetable Enables the use of the **Timetable**

Peak-based If Peak-based is selected the collection of fraction is triggered by the signal of the detector, e.g. diode array detector or mass selective detector. The detailed trigger conditions are specified in the **Peak Detectors** table. The Peak-based trigger mode overrules all settings in the Timetable below.

Max. Peak Duration Defines a maximum collection time in case that the signal does not reach the condition to cut the fraction as exhibited in Figure 11. The could be caused by tailing peaks or if the baseline is drifting during gradient runs.

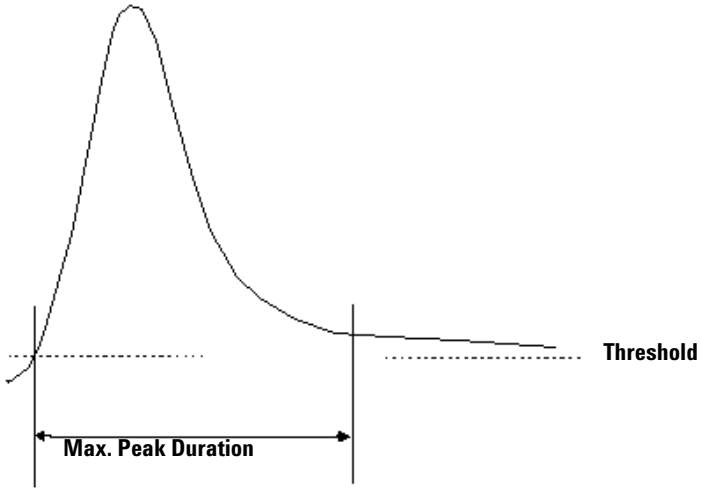


Figure 11 Maximum Fraction Duration

Peak Detectors

In the **Peak Detectors** section a list of all Peak Detectors that are connected to the system is displayed. Agilent 1100 Series Diode Array Detectors, Multiple Wavelength Detectors and Variable Wavelength Detectors are recognized automatically. Other Detectors, e.g. 1100 Series Mass Selective Detectors, Fluorescence Detectors or HP1050 Detectors, are connected through the Universal Interface Box (UIB).

The Peak detector table contains seven columns:

Working Mode For each peak detector **Threshold only**, **Threshold/Slope** and **Slope only** are possible. In the Threshold only mode the settings for Up Slope, Down Slope and Upper Threshold in the subsequent columns are ignored. Fraction collection is triggered whenever the detector signal exceeds the specified threshold value. When the signal drops below the threshold value fraction collection is stopped. In the Slope only mode fraction collection is triggered on the slopes of the detector signals. Adequate values for Up Slope and Down Slope can be specified in the corresponding fields. In the Threshold/Slope mode fraction collection is triggered on the corresponding values for threshold and slope. The fraction collection is started if the detector signal exceeds both the threshold and the Up Slope value. The fraction collection is stopped if the detector signal drops either below the threshold or the Down Slope value.

To specify the trigger values **Up Slope**, **Down Slope**, **Threshold** and **Upper Threshold** we recommend to use the **Fraction Preview** tool as described in "Fraction Preview" on page 32.

Upper Threshold At high absorbance values the light intensity on the detector is extremely low and consequently detector noise will be superimposed on the detector signal. In this case the detector noise might trigger fraction collection. To avoid false fraction collection triggering, we suggest setting an **Upper Threshold** well below the limit where this false triggering effect might occur. As soon as the detector signal exceeds the **Upper Threshold,** settings for Up Slope or Down Slope will be ignored until the signal drops again below the Upper Threshold.

When using more than one peak detector fraction collection can be triggered either when **all selected peak detectors** detect a peak or when **at least one selected peak detector** detects a peak basing on the settings in the **Peak Detectors** table above.

If an MSD is used for mass-based fraction collection, **Use MSD for mass-based fraction collection** must be checked.

Timetable

The **Timetable** can be used to program changes in the Fraction Trigger Mode during the analysis by entering a time in the **Time** field and appropriate values in the fields of the timetable. **Trigger Mode** Off, Peak Based and Time Based can be selected. If the Off is selected, no fractions are collected.

Whenever the **Peak Based** mode is specified fractions will be collected based on the peak detection parameters given in the **Peak Detector** table. Additionally a **Maximum Peak Duration** in minutes has to be specified. This parameter is mandatory if you use Peak Controlled fraction collection, but is disabled for Time Based fraction collection.

When the **Time Based** mode is chosen two different options are available:

- The **# of Fractions** can be edited to collect a fixed number of equal fractions in a give time interval. This time interval is defined by the time value in the current and following timetable line.
- **Timeslices [min]** can be edited to collect fractions with a defined collection time. With this option the collection time of the last fraction can be shorter. This depends on the overall runtime.

For editing the Timetable the functions **Insert**, **Append**, **Cut, Copy** and **Paste** are offered.

To access the additional sections in the Setup Fraction Collector dialog box click the **More** button.

Time

In the time section of the dialog box the **Stoptime** and the **Posttime** for the fraction collector can be specified. By default the Stoptime is set to as pump and the posttime is switched off.

Rinse Fraction Collection Needle (Analytical Scale only)

If Discrete Fractions is selected as Collection Mode (see also"Collection Mode" on page 12), you can setup a needle rinse step before the fraction collection and/or between fractions. Then the needle will move to the funnel on the internal tray and the diverter valve will switch to flush the needle in order to avoid carry over from the previous fraction. The instrument will determine, if it is possible to rinse the needle before the next fraction is expected.

If you have recovery positions in your fraction collector or if you are using one fraction collector for sample recovery in a multiple fraction collector configuration, the rinse function **between fraction collection** is ignored.

Auxiliary

In the Auxiliary section the **Maximum fill volume** per location can be specified. If **as configured** is selected, the pre-configured volume (see **Instrument > Pre-configured Wellplate Types**) is used. This ensures that the location (well, vial or tube) cannot be overfilled during fraction collection. This volume can be further reduced by defining a customized volume.

Additional check boxes in this section provide the opportunity to **Store** the **temperature signal** and the **UIB signal**.

Fraction Preview

To determine the appropriate fraction collection parameters the Agilent ChemStation provides a valuable tool that becomes accessible by pushing the button labelled Fraction Preview Tool (Figure 12) in the Peak Detectors section.

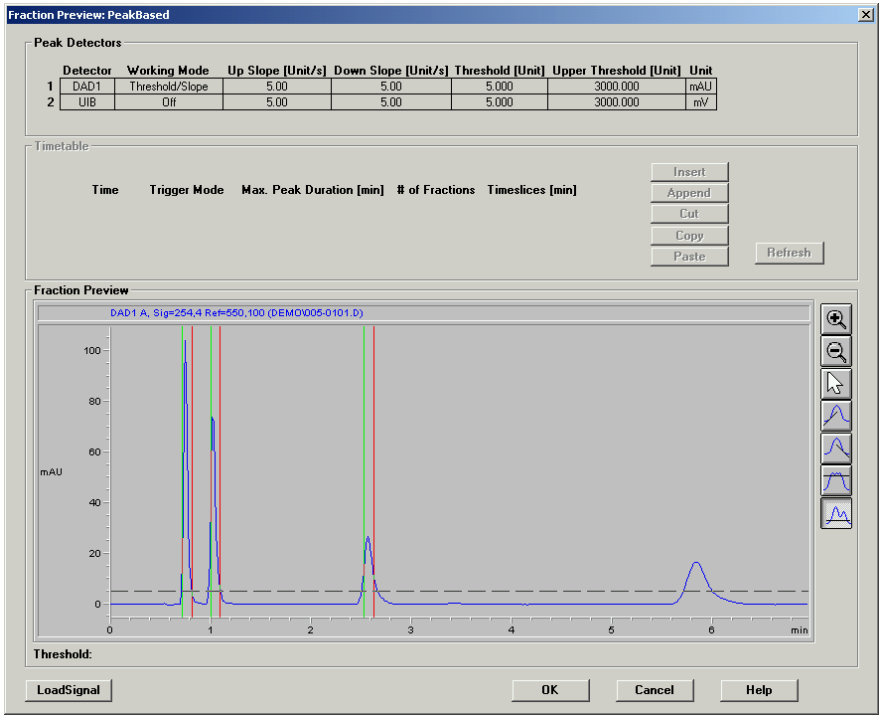


Figure 12 Fraction Preview dialog box

The Fraction Preview screen allows to test the fraction collection parameters against an example chromatogram. It can also be used to optimize the fraction collection parameters interactively. With the help of this tool values for up and down slope as well as for upper and lower threshold can easily be graphically specified. A chromatogram e.g. a pilot run can be loaded by pushing the **Load Signal** button. Parameters can now be changed either manually in the Detector Table and Timetable or graphically in the Fraction Preview screen. By pushing the desired buttons on the right hand side of Fraction Preview screen the

chromatogram can be zoomed, the values for up and down slope can be specified and the upper and lower threshold level can be set-up. The graphically specified values are automatically transferred to the Peak Detector Table.

NOTE

The run time for a system with a fraction collector must be extended by the delay time, to ensure the complete collection of all compounds.

The run time is calculated as:

Run time = end time of last collected peak + delay time (with delay time = delay volume/flow rate)

Setting up a Fraction Collection Sequence

Assignment of Start Location for fraction collection

The start location for fraction collection can either be assigned in the **Sample Info** (Figure 13) dialog box in the RunControl menu, in the **Sequence Parameters** (Figure 14) dialog box or in the **Sequence Table** in the Sequence menu.

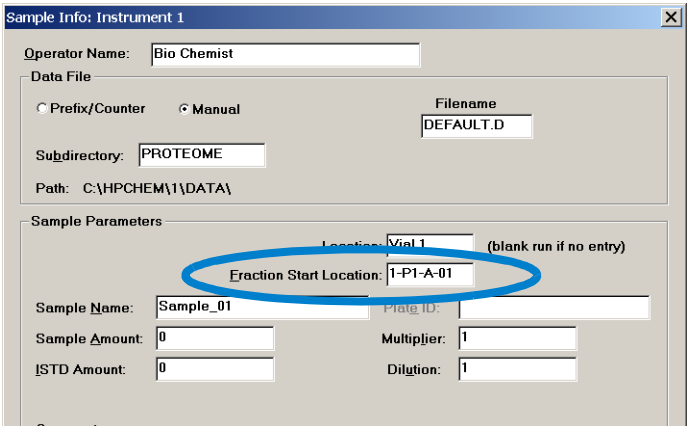


Figure 13 Sample Info dialog box

All settings made in the Sequence Table overrule the settings made in the Sequence Parameters screen. In addition to the exact position for fraction collection start in the Sequence Table it is also possible to specify Next Plate and Next Location. In the former case fraction collection is started at the next free plate and in the latter case fraction collection is started at the next free location.

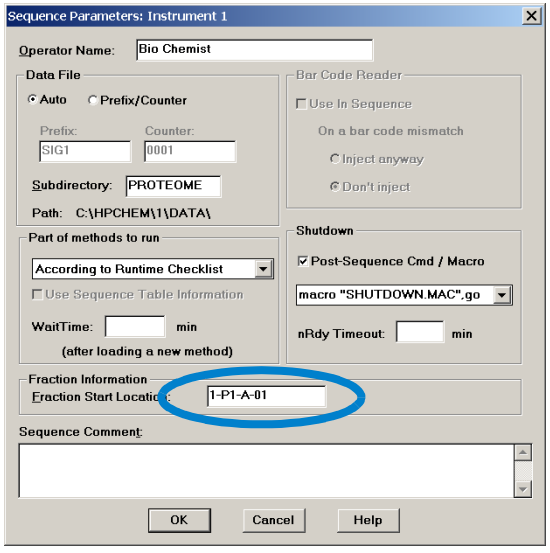


Figure 14 Start Location in Sequence Parameters dialog box

Viewing your Results

Data Analysis

In order to display the tick marks for the collected fractions on the screen, click on **Signal options** from the **Graphics** menu. Then choose **Separated** in the Layout dropdown list.

To review your chromatograms, file information and a fraction list, select the Data Analysis view and press the Fraction Task button as displayed in Figure 15.

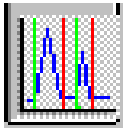


Figure 15 Fraction Task button

In order to display the tick marks for the collected fractions on the screen, click on **Signal options** from the **Graphics** menu. Then choose **Separated** in the Layout dropdown list.

Report

In order to create reports with a fraction table and tick marks the Specify Report box the item Add Fraction Table and Tick Marks has to be checked.

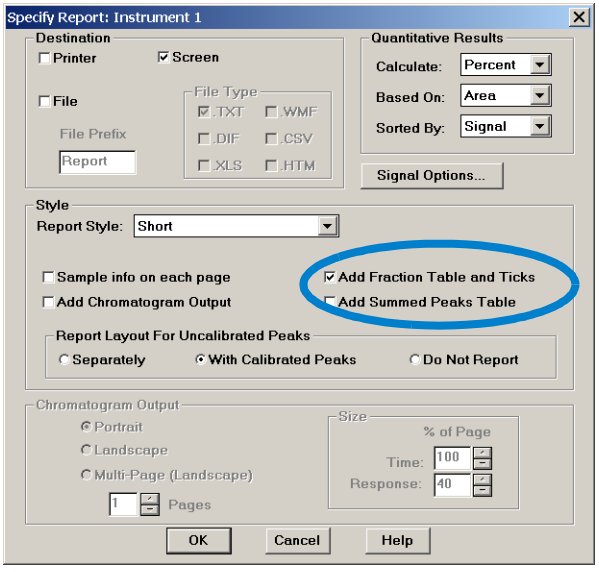


Figure 16 Fraction collection report setup

Special Applications

Pooling

We define Pooling as collecting fractions from multiple injections into the same fraction locations. In the Agilent Chemstation, there are two ways to initiate pooling:

- If you want to collect multiple injections from the one sample vial or sample well into the same fraction location, specify a **Fract. Start** and multiple injections in the Sequence Table.
- In case you want to collect multiple injections from the several sample vials or sample wells into the same fraction location, specify the same **Fract. Start** for multiple samples in the Sequence Table. An example is displayed inFigure 17 on page 38. In this sequence the Sample 1 will be injected from Plate 1 Position A1 of the 1100 Series wellplate sampler and fraction collection will start at Plate 1 Position A1 of the fraction collector.
  For the next Sample 2, which is injected from a different location in the wellplate sampler, the fraction collection will start again at Plate 1 Position A1 of the fraction collector.

Line	Location	Sample Name	Dilution	Datafile	Inj Volume	Frac. Start
1	P1-A-01	Sample 1				1-P1-A-01
2	P1-A-02	Sample 2				1-P1-A-01
3	P1-A-03	Sample 3				1-P1-A-01
4						

Figure 17 Pooling Sequence

CAUTION When pooling fractions, overfill protection no longer exists. It is the user's responsibility to make sure that all fraction collection locations are large enough to completely collect all pooled fractions. If a fraction collection location is overfilled, an error message occurs and the pump is shut off

Sample Recovery

The Agilent 1100 Series Fraction Collectors offers different possibilities for sample recovery:

- The preferred recovery strategy is to install multiple fraction collectors in your LC systems and use the last of those fraction collectors for recovery. This recovery fraction collector can be selected in the Configuration dialog box as displayed in Figure 18. The fourth fraction collector in your systems will always be used for sample recovery. Also read "Configuring multiple fraction collectors" on page 14.

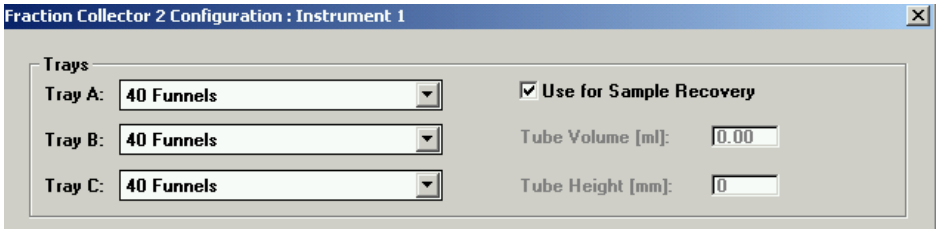


Figure 18 Sample Recovery Fraction Collector

- For the following tray configurations fixed recovery location will be assigned from the ChemStation. In order to disable the recovery the tray configuration has to be changed.
  - **Standard tray for two well plates + 10 x funnels (G1364-84502).**
    In this configuration the 10 funnel locations will automatically be used for recovery.
  - **Standard tray for two well plates + 10 x 2ml vials (G1367-60001) and half tray for 40 x 2 ml vials (G1313-44502).**
    In this configuration the forty 2 ml vials on the half will automatically be used for recovery.
  - **Standard tray for two well plates + 10 x 2ml vials (G1367-60001) and half tray for 15x 6 ml vials (G1313-44503).**
    In this configuration the fifteen 6 ml vials on the half will automatically be used for recovery.
  - **Standard tray for two well plates + 10 x 2ml vials (G1367-60001) and half tray with 40 funnels (G1364-84512).**
    In this configuration the funnels on the half will automatically be used for recovery.

CAUTION With each start of a sequence run the recovery will start at the same positions. In order to avoid contamination the vessels that contain the recovery fractions have to be exchanged.

CAUTION The number of recovery locations automatically defines the maximum number of injections. When using the standard tray for two well plates and 10 funnels, only ten injections per sequence are executed.

Semi-preparative operation

The analytical scale fraction collector G1364C can be modified for semi-preparative operation. This allows to use of external collection vessels through funnels at high flow rates above 10 ml/min. The maximum flow rate depends on the viscosity of the solvent.

In order to modify the analytical fraction collector the following parts have to be installed:

- 20 mm needle assembly (G1364-87202)
- preparative tubing kit (G1364-68711)
- internal tray preparative scale (G1364-63113)

The procedures to exchange these parts are described in"Replacing the Inlet/Waste Tubings" on page 59, "Replacing the Valve to Needle Tubing" on page 63, "Exchanging the Analytical Needle Assembly" on page 68, and "Exchanging the Internal Tray" on page 74.

In addition the wellplate adapter has to be removed for operation with the shorter needle.

In the ChemStation Software the new configuration has to be specified in order to consider the new volumes for the delay calibration.In the **Configuration** dialog box of the fraction collector select **More.** Then change **Inner Capillary Diameter** to 0.8 mm as well as the **Needle Type** to semi-prep needle the as displayed in Figure 19 on page 41. For further information on delay volumes and delay volume calibration see "Delay volumes and delay calibration" on page 15.

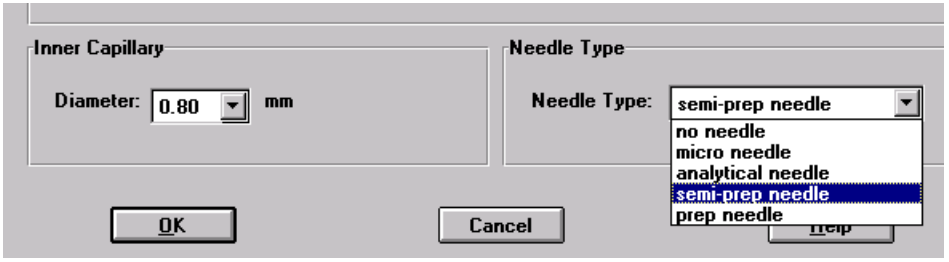


Figure 19 Fraction collector configuration parameters for semi-prep operation

Using high test tubes in the analytical scale fraction collector

In the standard configuration the analytical scale fraction collector G1364C the maximum test tube height is limited to 48 mm. This limitation can be extended to 75 mm if

- the standard 50 mm needle assembly (G1367-87200) is replaced by the 20 mm needle assembly (G1364-87202)
- the wellplate adapter is removed.

Optimizing fraction collection

Time-based fraction collection

- *Time slices* must have a length of at least 0.05 min.
- Set *# of Fractions* such that length of resulting fractions is at least 0.05 min.

Peak-based fraction collection

- Set threshold and slope values such that length of fractions is at least 0.05 min.
- Unresolved peaks can be separated using appropriate threshold and slope values. If two unresolved peaks are to be collected as one fraction, collect based on threshold only.
- If the baseline of the chromatogram is below or above 0 mAU, this offset is not accounted for when triggering peaks using a threshold value. The threshold value is always added to 0 mAU.

Limitations and how to avoid problems

Rinse Fraction Collection Needle

If *Rinse Fraction Collection Needle* is set to *Between fraction collection*, at least 0.3 min are required to perform this task.
When doing time-based fraction collection rinsing the needle is only possible between two time table entries, which must have a gap of at least 0.3 min. For peak-based fraction collection a time gap of also at least 0.3 min is required. If a new peak is detected during the rinse process, it is aborted and the needle moves back to the next free fraction position. Depending on flow rate and delay volume V_{D1} the beginning of this peak may be lost.

If you have recovery positions in your fraction collector or if you are using one fraction collector for sample recovery in a multiple fraction collector configuration, the rinse function **between fraction collection** is ignored.

Needle Movement

The option *into location* under *Needle Movement* in the fraction collector configuration must only be used for capped 2 or 5 ml vials or well-plates. Using other or open vials with this command can lead to a *Movement failed* error.

Replacing fraction containers

When replacing filled tubes, vials or well-plates from the fraction collector make sure to remove and re-insert the complete tray. Otherwise the fraction collector will not recognize that the fraction containers were emptied.

Pooling

When pooling fractions, overfill protection no longer exists. It is the user's responsibility to make sure that all fraction collection locations are large enough to completely collect all pooled fractions. If a fraction collection location is overfilled, an error message occurs and the pump is shut off.

Application Notes

More information about the 1100 Series Fraction Collectors and Purification Systems are available from a series of application notes. Printed versions can ordered form Agilent or pdf-files can be downloaded from the Agilent Website

http://www.chem.agilent.com

Table 4 Selected Agilent Technologies Application Notes

Title	Publication Number
An optimized system for analytical and preparative work	5988-9649EN
Recovery collection with the Agilent 1100 Series purification system	5988-9650EN
Solutions for preparative HPLC-Application Compendium	5988-9646EN
Innovative fraction collection with the Agilent 1100 Series purification platform	5988-9250EN
Automated fraction re-analysis - does it really make sense?	5988-8653EN
Injection of high-concentration samples with the Agilent 1100 Series purification system	5988-8654EN
Sophisticated peak-based fraction collection - working with up and down slope	5988-7895EN
Strategies for purification of compounds from non-baseline separated peaks	5988-7460EN
Method scale-up from analytical to preparative scale with the Agilent 1100 Series purification system PS	5988-6979EN
Peak-based fraction collection with the Agilent 1100 Series purification system AS - Influence of delay volume on recovery	5988-5747EN

2
Troubleshooting and Test Functions

Status Indicators

The fraction collector is provided with two status indicators which indicate the operational state (prerun, not ready, run, and error states) of the instrument. The status indicators provide a quick visual check of the operation of the fraction collector (see “Status Indicators” on page 47).

Error Messages

In the event of an electronic, mechanical or hydraulic failure, the instrument generates an error message in the user interface. For a detailed description of the failure, a list of probable causes of the problem, and a list of suggested actions refer to the Agilent 1100 Series Fraction Collectors Service Manual G1364-90102.

Maintenance Functions

The maintenance functions position the transport unit and needle carrier assembly on certain positions for maintenance, homing, parking or delay calibration (see “Maintenance Functions” on page 49).

Transport Unit Self Alignment

The transport unit alignment with the transport unit and the well-plate tray is required to compensate for larger deviations in positioning the needle carrier assembly (for the **analytical scale and micro scale** fraction collector, only).

The transport unit self alignment is required after disassembling the system or when you exchange the transport unit, the needle carrier assembly or the MTP main board. This function is in the diagnose screen of the ChemStation or the Control Module.

WARNING **The sample transport self alignment requires one of the 4-well-plate trays (Part Number: G1364-84501), but well plates MUST NOT be installed!**

Status Indicators

Two status indicators are located on the front of the fraction collector. The lower left indicates the power supply status, the upper right indicates the fraction collector status.

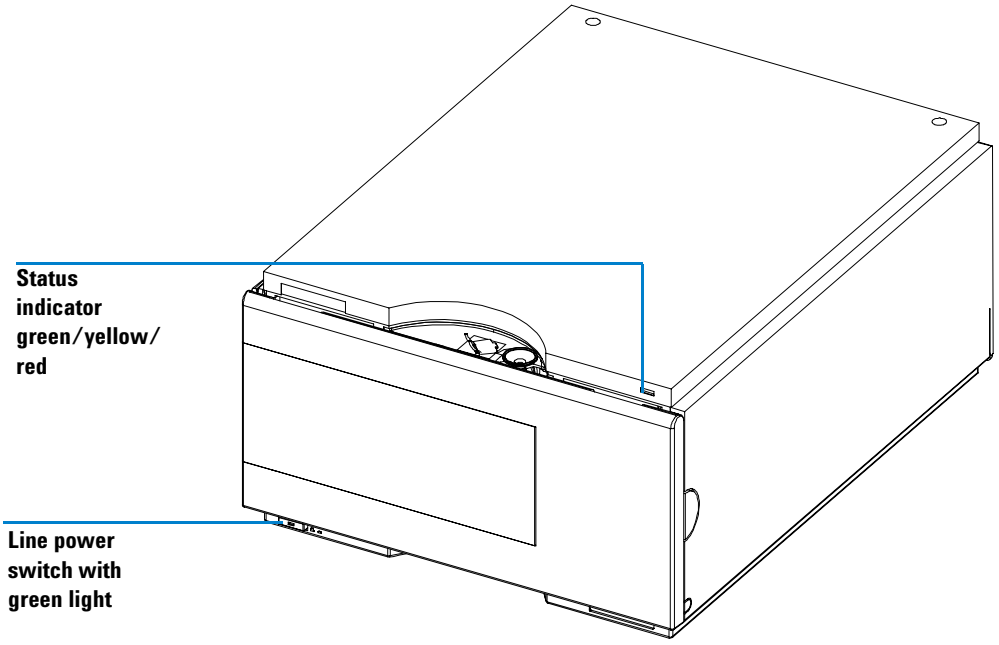


Figure 20 Location of Status Indicators

Power Supply Indicator

The power supply indicator is integrated into the main power switch. When the indicator is illuminated (*green*) the power is ON.

Instrument Status Indicator

The instrument status indicator indicates one of four possible instrument conditions:

- When the status indicator is *OFF* (and power switch light is on), the instrument is in a *prerun* condition, and is ready to begin an analysis.
- A *green* status indicator indicates the instrument is performing an analysis (*run* mode).
- A *yellow* status indicator indicates a *not-ready* condition. The instrument is in a not-ready state when it is waiting for a specific condition to be reached or completed (for example, front door not closed), or while a self-test procedure is running.
- An *error* condition is indicated when the status indicator is *red*. An error condition indicates the instrument has detected an internal problem which affects correct operation of the instrument. Usually, an error condition requires attention (for example, leak, defective internal components). An error condition always interrupts the analysis.

Maintenance Functions

Some maintenance procedures require the needle arm, and needle carrier to be moved to specific positions to enable easy access to components. The maintenance functions move these assemblies into the appropriate maintenance position. In the ChemStation the fraction collector maintenance positions can be selected from the **Maintenance menu** in the **Diagnosis** view (see Figure 21). In the Control Module the functions can be selected in the Test screens of the fraction collector.

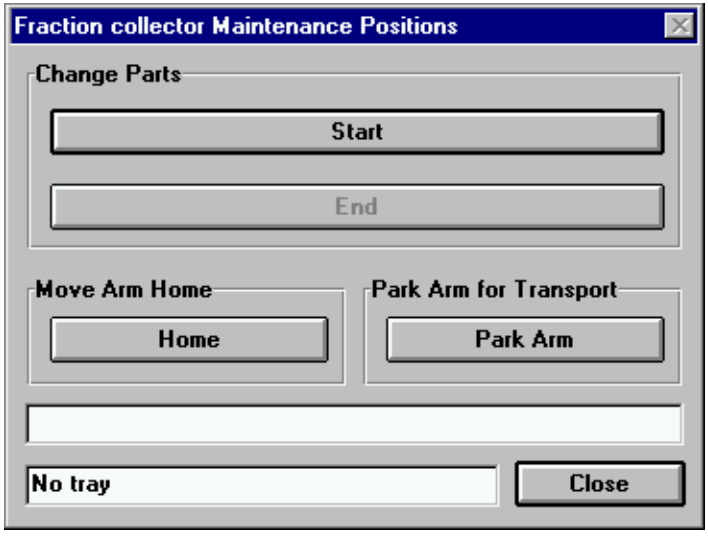


Figure 21 Fraction Collector Maintenance Positions dialog box

Change Parts.

If you click **Start** the transport unit will move upwards, the needle carrier assembly will move to the front center and then turn off the theta motor to allow free rotation of the theta arm. This position enables easy access to the transport unit to change:

- The needle assembly

- The needle carrier assembly
- The valve to needle tubing.
- The diverter valve.

After the maintenance or repair task has been finished, click **End** to move the transport assembly to the **Home** position

Home Position

This maintenance function moves the arm up and to the right rear for better access and exchange of the trays.

Park Arm

This maintenance position moves the arm to the park position at the upper rear left side of the tray for transporting or shipping the fraction collector.

Transport Unit Self Alignment

The transport unit alignment with the transport unit and the well-plate tray is required to compensate for larger deviations in positioning the needle carrier assembly.

The transport unit self alignment is required after disassembling the system or when you exchange the transport unit, the needle carrier assembly or the MTP main board.

This function is in the diagnose screen of the ChemStation or the Control Module.

WARNING

The sample transport self alignment requires one of the 4-well-plate trays (Part Number: G1364-84501), but well plates MUST NOT be installed.

If the Transport Unit Self Alignment is started with well plates on the tray, the alignment procedure is aborted WITHOUT error message.

When is a Transport Unit Self Alignment Necessary?

The sample transport self alignment is required after disassembling the module or when you exchange:

- The transport unit.
- The needle/capillary carrier assembly.
- The MTP main board.

How to perform a Transport Unit Self Alignment?

Steps	Comments
1 If the transport unit has been exchanged or if it is very badly misaligned, set the 8-bit configuration switch to the Forced Cold Start Configuration.	For details see: "Forced Cold Start" in the Fraction Collectors Service Manual.
2 Install the 4-well-plate tray (G1364-84501)	**IMPORTANT: Remove all plates!**

How to perform a Transport Unit Self Alignment?

Steps	Comments
3 Ensure that the wellplate adapter is correctly assembled	
4 Select the **Maintenance** menu in the **Diagnosis** view of the Agilent ChemStation.	
5 In the menu choose **Fraction Collector > Transport Alignment...** to start the automated procedure.	The Transport Alignment Procedure takes approximately 10-15 minutes
6 Set the 8-bit configuration switch to the default setting.	See "8-bit configuration switch" in the Fraction Collectors Service Manual.

NOTE If the Transport Unit Self Alignment is started with well plates on the tray, the alignment procedure is aborted without any error message.

Step Commands

Some movements of the fraction collection sequence can be done under manual control. This is useful during troubleshooting where close observation of each of the fraction collection step is required to confirm a specific failure mode or verify successful completion of a repair.

Each step command actually consists of a series of individual commands which move the fraction collector components to predefined positions enabling the specific step to be done.

In the ChemStation the step commands can be selected from the “Test Selection Box” (see Figure 22) in the Diagnosis display. In the Control Module the step commands can be accessed from the pull-down menu in the fraction collector “Test”.

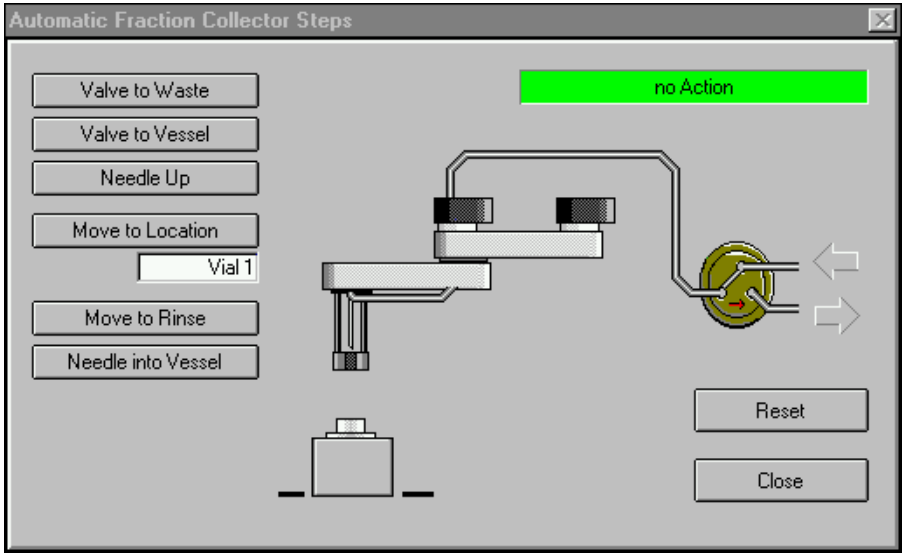


Figure 22 Fraction Collector Step Commands

Table 5 Step Commands

Step	Action	Comments
Needle Up	Lifts the needle arm to the upper position.	Command also switches the diverter valve to waste if it is not already in that position.
Needle into vessel	Lowers the needle into the specified vessel.	only analytical scale G1364C
Needle to rinse / flush port	Moves the needle to the rinse / flush port.	only analytical scale G1364C
Switch valve to needle	Switches the diverter valve to the needle.	
Switch valve to waste	Switches the diverter valve from needle to waste.	

Troubleshooting

If the fraction collector is unable to perform a specific step due to a hardware failure, an error message is generated. You can use the step commands to perform a fraction collection sequence, and observe how the fraction collector responds to each command.

3
Repairing the Fraction Collector

Introduction into Repairing the Fraction Collector

Simple Repairs

The fraction collector is designed for easy repair. The most frequent repairs such as changing a needle assembly, the capillary (micro scale) or tubings can be done from the front of the instrument with the instrument in place in the system stack. These repairs are described in "Simple Repairs" on page 58.

WARNING **When opening capillary or tube fittings solvents may leak out. Please observe appropriate safety procedures (for example, goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the solvent vendor, especially when toxic or hazardous solvents are used.**

WARNING **To avoid personal injury, keep fingers away from the needle area during fraction collector operation. Do not bend the safety flap away from its position, or attempt to insert or remove a vial from the gripper when the gripper is positioned below the needle.**

WARNING **Regularly inspect the inlet / waste tubing assembly, and the valve to needle tubing and exchange them if they are worn out or show visible signs of damage.**

Cleaning the Fraction Collector

The fraction collector covers should be kept clean. Cleaning should be done with a soft cloth slightly dampened with water or a solution of water and a mild detergent. Do not use an excessively damp cloth from which liquid could drip into the fraction collector.

WARNING **Do not let liquid drip into the fraction collector. It could cause a shock hazard or damage to the fraction collector.**

Overview of Main Repair Procedures

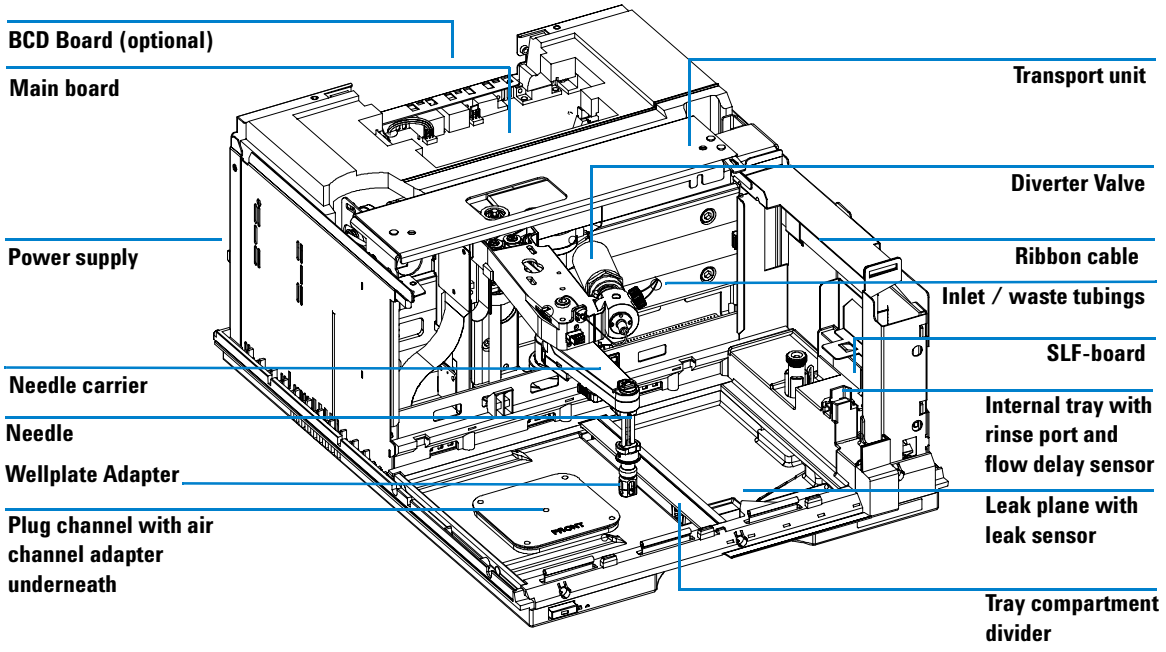


Figure 23 Main Assemblies (Example displays the analytical scale module G1364C. The preparative scale fraction collector G1364B contains a different needle)

Simple Repairs

The procedures described in this section can be done with the fraction collector in place in the stack. These procedures can be done on a more frequent basis.

Table 6 Simple Repair Procedures

Procedure	Typical Frequency	Notes
Replacing the Inlet / waste tubings	When worn out, when showing visual signs of damage, typically once per year.	See "Replacing the Inlet/Waste Tubings" on page 59
Replacing the valve to needle tubing	When worn out, when showing visual signs of damage, typically once per year	See "Replacing the Valve to Needle Tubing" on page 63
Exchanging the **preparative** needle assembly	When needle shows indication of damage or blockage	See "Exchanging the Preparative Needle Assembly" on page 66
Exchanging the **analytical** needle assembly	When needle shows indication of damage or blockage Or when using the short needle assembly for operation with high test tubes (>45mm)	See "Exchanging the Analytical Needle Assembly" on page 68
Exchanging the diverter valve	When defective (internal / external leak, valve not switching any more)	See "Exchanging the Diverter Valve" on page 71
Exchanging the internal tray	When flow delay sensor defective	See "Exchanging the Internal Tray" on page 74
Repairing or exchanging a funnel of the internal tray or funnel tray	When defective (leaky, blocked or contaminated)	See "Repairing or Exchanging a Funnel of the Internal Tray" on page 76

Replacing the Inlet/Waste Tubings

Frequency	When contaminated, worn out or visibly damaged Typically once every year
Tools required	None
Parts Required	Inlet / waste tubing assembly included in tubing kit **preparative scale 0.8 mm ID,** PN G1364-68711 **or** Inlet / waste tubing assembly included in tubing kit **analytical scale 0.25 mm ID,** PN G1364-68712

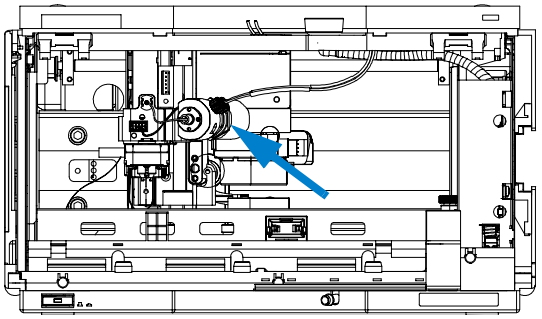
WARNING **To avoid personal injury, keep fingers away from the needle area during fraction collector operation.**

WARNING **Follow the described installation procedure exactly to maximize the lifetime of the inlet / waste tubings and to avoid potential spills or fraction losses. Regularly inspect the tubings and exchange them if they are worn out or show visible signs of damage.**

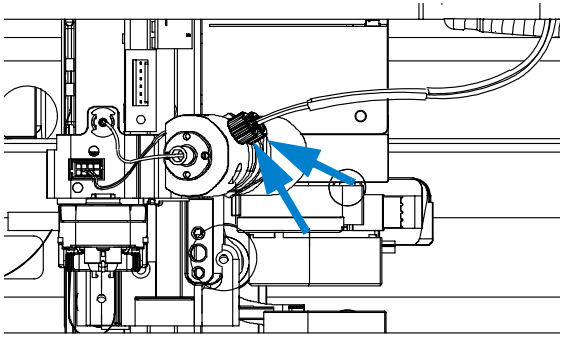
Before beginning this procedure:

- Position the transport unit of the fraction collector in the “Home Position” (see “Maintenance Functions” on page 49).
- Remove all installed trays from the tray base.
- Position the transport unit of the fraction collector in the “Change Parts Position” (see “Maintenance Functions” on page 49).
- Turn off the instrument.
- Remove the rear end of the fraction collector’s waste tubing from the waste container, unscrew the front end of the fraction collector’s inlet tubing from the flow cell of the detector.

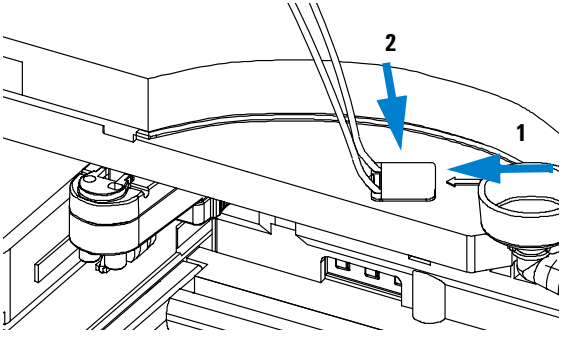
1 Locate the diverter valve with the finger-tight fittings of the inlet / waste tubing assembly (the figure shows the open fraction collector seen from the front).



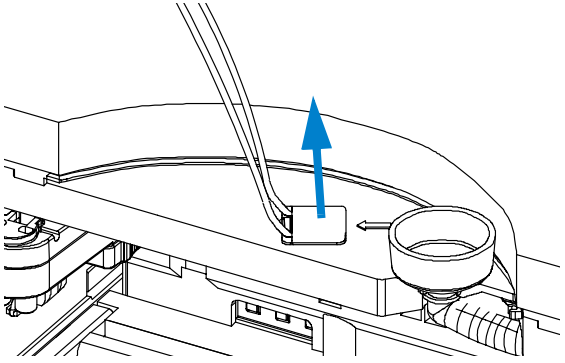
2 Unscrew the 2 finger-tight fittings of the inlet / waste tubing assembly at the diverter valve.



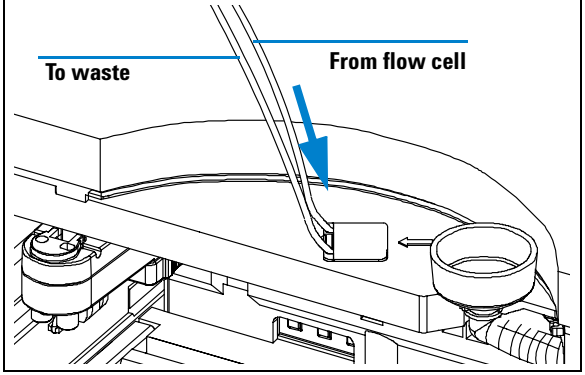
3 Unplug the inlet / waste tubing assembly from the bolt carrier (located on the top center of the front cover) by moving the snapper as indicated by the arrows. Slide the tubings out to the bottom.



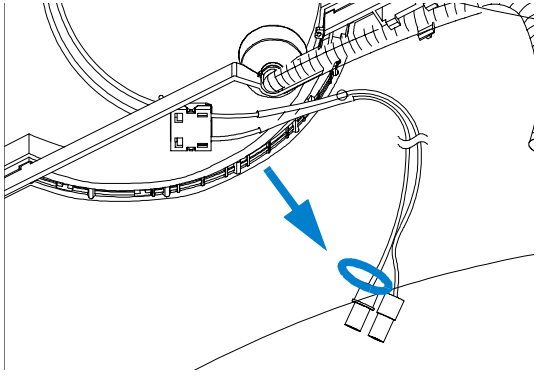
4 Install the new inlet / waste tubing assembly into the bolt carrier as shown below. Slide in the long ends of the tubings from bottom to top and let the snapper click into position.



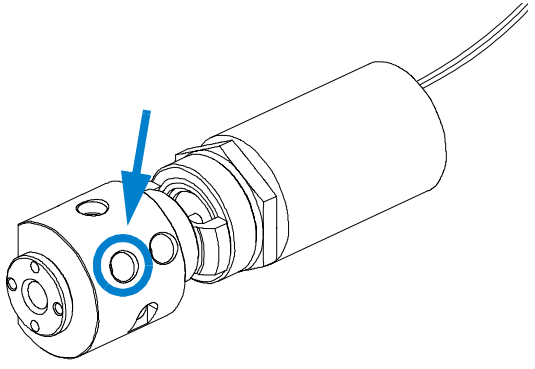
5 The rear tubing (with the label with the arrow) must be connected to the flow cell of the detector. The front tubing must be inserted into the waste container.



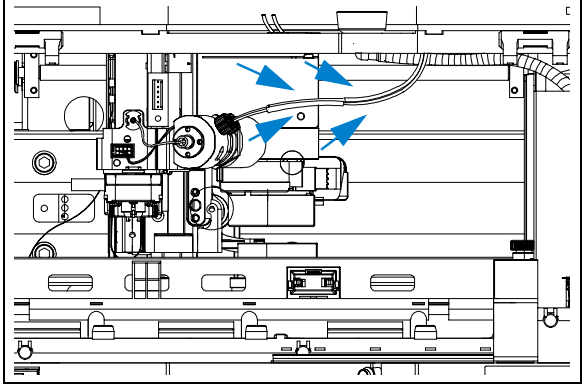
6 Connect the finger-tight fittings of the inlet / waste tubing assembly to the ports of the diverter valve.
IMPORTANT: The tubings must not be bent up- or downwards. The cables must not be twisted.
(View from the bottom)



7 A color coded ring on one of the tubings and the valve body indicates, which cable belongs to which port.
IMPORTANT: It is absolutely vital to connect these tubings as described, in order to maximize their lifetime and operating security.



8 **IMPORTANT: The cables must run into the ports of the diverter valve in lines parallel to the horizon.**



On completion of this procedure:

- Re-install the tray(s) in the tray base.
- Start the instrument.
- Close the front cover.

Replacing the Valve to Needle Tubing

Frequency	When contaminated, worn out or visibly damaged Typically once every year
Tools required	Wrench, open end, 4mm, PN 8710-1534 (supplied in accessory kit) Wrench, open end, 1/4 – 5/16 inch, PN 8710-0510 (supplied in accessory kit)
Parts Required	Valve to needle tubing assembly included in tubing kit **preparative scale 0.8 mm ID,** PN G1364-68711 or valve to needle tubing assembly included in tubing kit **analytical scale 0.25 mm ID,** PN G1364-68712

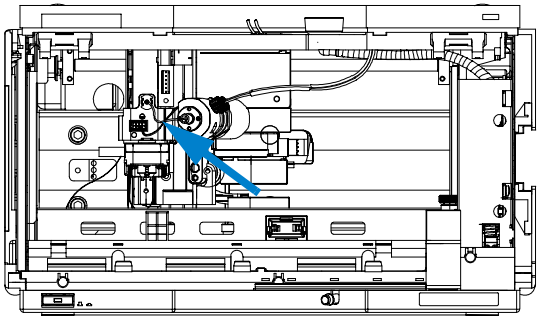
WARNING **To avoid personal injury, keep fingers away from the needle area during fraction collector operation.**

WARNING **Follow the described installation procedure exactly to maximize the lifetime of the valve to needle tubing and to avoid potential spills or fraction losses. Regularly inspect the tubings and exchange them if they are worn out or show visible signs of damage.**

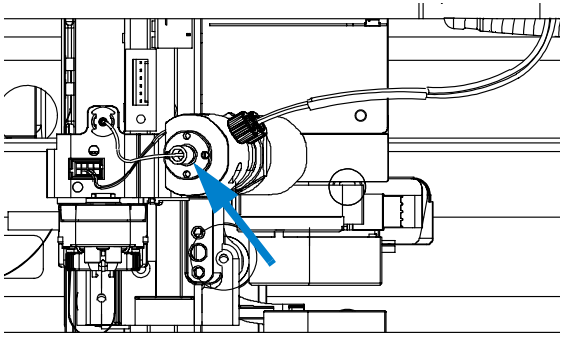
Before beginning this procedure:

- Position the transport unit of the fraction collector in the “Home Position” (see “Maintenance Functions” on page 49).
- Remove all installed trays from the tray base.
- Position the transport unit of the fraction collector in the “Change Parts Position” (see “Maintenance Functions” on page 49) and turn off the instrument.
- It might be more convenient to remove the needle from its carrier before unscrewing the needle tubing.

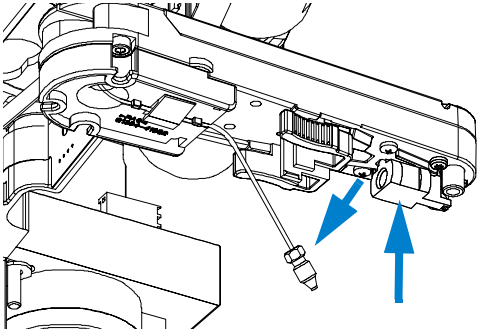
1 Locate the diverter valve with the finger-tight fittings of the valve to needle tubing assembly (the figure shows the open fraction collector seen from the front).



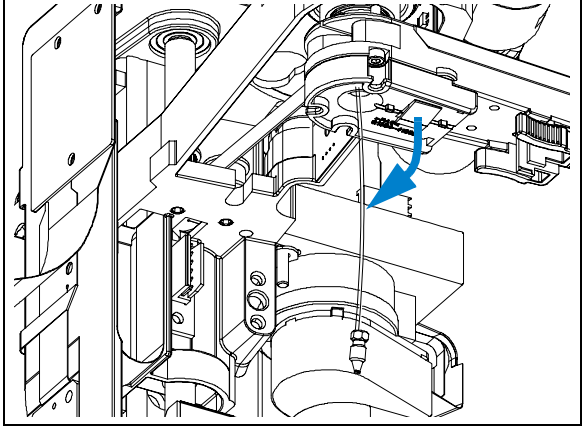
2 Unscrew the finger-tight fitting of the valve to needle tubing assembly at the diverter valve.



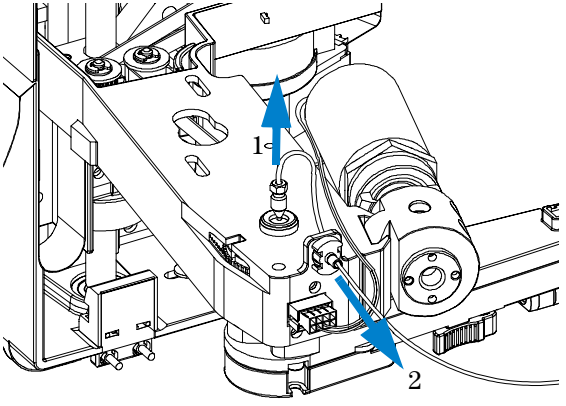
3 Using the 4 mm wrench and the 5/16“ wrench for counter-holding unscrew the valve to needle tubing from the needle. (Viewed from the bottom)



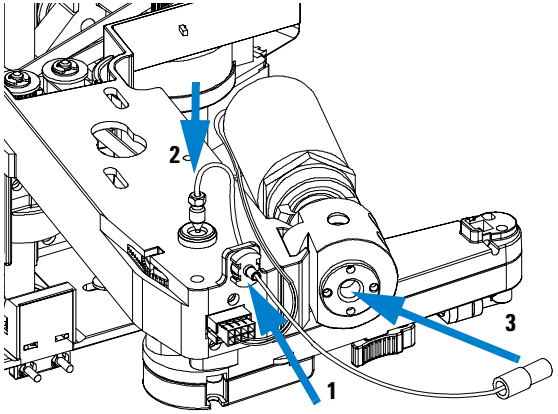
4 Un-clip the tubing from the bottom of the needle carrier assembly.



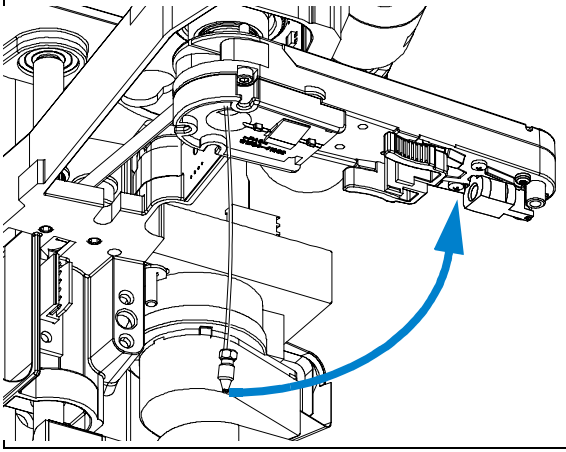
5 Slide the tubing through the hole in the needle carrier assembly (from bottom to top) and out of the holder in the z-arm assembly.



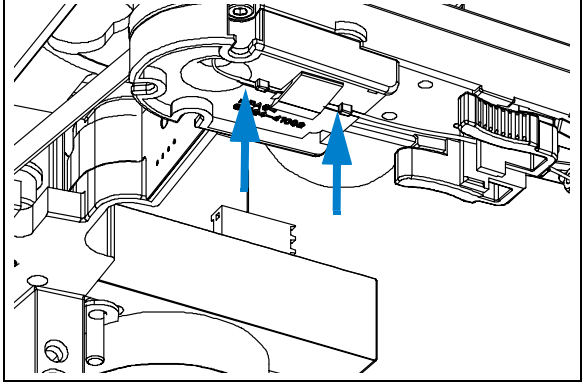
6 Install the new valve to needle tubing assembly by clipping it in to the holder in the z-arm assembly **(1), Important!!!)** and slide it through the hole in the z-arm (2) and out on the bottom of the needle carrier assembly (top to bottom). Screw the finger-tight fitting into the port of the diverter valve (3).



7 Using the 4 mm wrench and the 5/16“ wrench for counter-holding connect the valve to needle tubing to the needle. (Viewed from the bottom)



8 **IMPORTANT: After fixing the screw clip the tubing into the guide on the bottom of the needle carrier assembly.**
It is absolutely vital that the tubing is installed as described, to maximize the lifetime of the tubing.



On completion of this procedure:

- Re-install the needle to the needle carrier assembly, if you previously removed it. Make sure to slide the needle all the way to the front of the needle carrier assembly (clicks into position).
- Re-install the tray(s) in the tray base.
- Start the instrument.
- Close the front cover.

Exchanging the Preparative Needle Assembly

Frequency	When the needle is leaky or visibly damaged When the needle is blocked or contaminated
Tools required	Wrench, open end, 4mm, PN 8710-1534 (supplied in accessory kit) Wrench, open end, 1/4 – 5/16 inch, PN 8710-0510 (supplied in accessory kit)
Parts required	Preparative needle assembly, G1364-87201

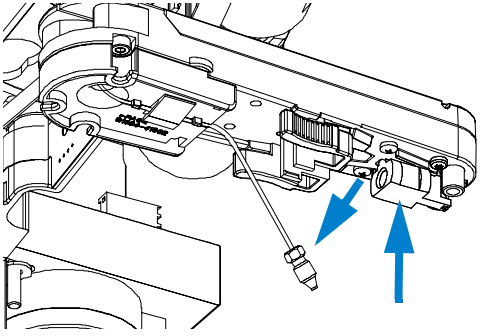
WARNING **To avoid personal injury, keep fingers away from the needle area during fraction collector operation.**

CAUTION Regularly inspect the inlet / waste tubing assembly and the valve to needle tubing and exchange them if they are worn out or show visible signs of damage.

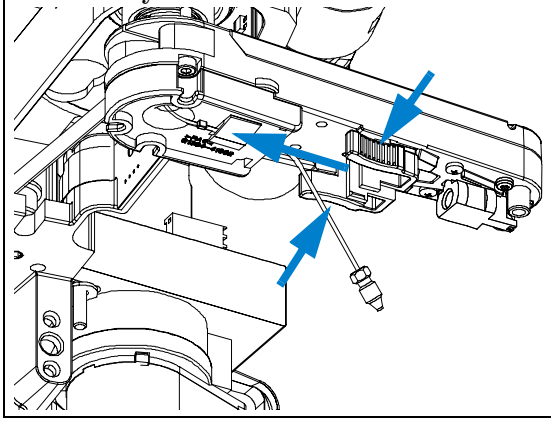
Before beginning this procedure:

- Position the transport unit of the fraction collector in the “Home Position” (see “Maintenance Functions” on page 49).
- Remove all installed trays from the tray base.
- Position the transport unit of the fraction collector in the “Change Parts Position” (see “Maintenance Functions” on page 49).
- Turn off the instrument.
- It might be more convenient to remove the needle from its carrier before unscrewing the needle tubing.

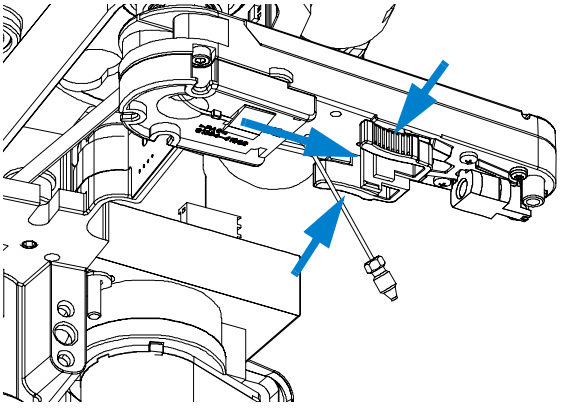
1 Using the 4 mm wrench and the 5/16“ wrench for counter-holding unscrew the valve to needle tubing from the needle. (Viewed from the bottom)



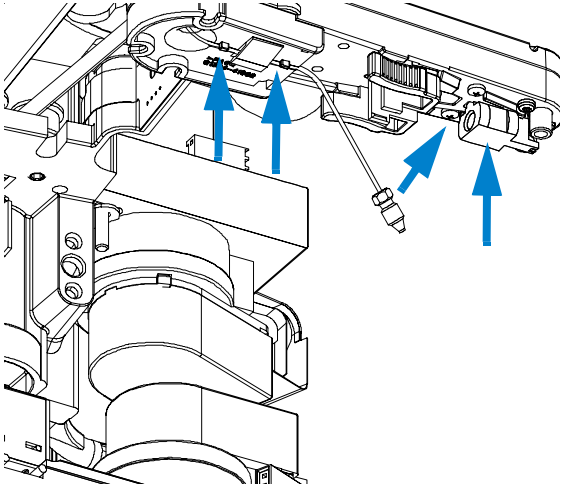
2 Holding the needle assembly between your thumb and forefinger, slide out the assembly towards the rear of the needle carrier assembly.



3 Insert the new needle assembly into the holder of the needle carrier assembly. Make sure to push it all the way to the front.



4 Using the 4 mm wrench and the 5/16“ wrench for counter-holding connect the valve to needle tubing to the needle. (Viewed from the bottom)



On completion of this procedure:

- Re-install the needle to the needle carrier assembly, if you previously removed it. Make sure to slide the needle all the way to the front of the needle carrier assembly (clicks into position).
- **IMPORTANT: After fixing the needle in the needle carrier clip the tubing into the guide on the bottom of the needle carrier assembly in case it slipped out of this guide (see 2 left arrows on the figure to the left).**
  It is absolutely vital that the tubing is installed as described, to maximize the lifetime of the tubing.
- Re-install the tray(s) in the tray base.
- Start the instrument.
- Close the front cover.

Exchanging the Analytical Needle Assembly

Frequency	When the needle is visibly damaged When the needle is blocked or contaminated
Tools required	Wrench, open end, 4mm, PN 8710-1534 (supplied in accessory kit) Wrench, open end, 1/4 – 5/16 inch, PN 8710-0510 (supplied in accessory kit)
Parts required	Analytical needle assembly, G1364-87203

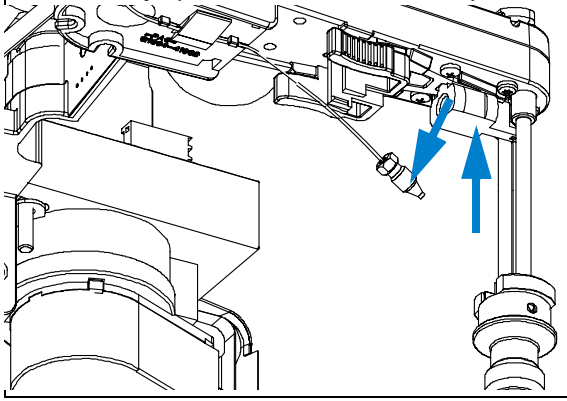
WARNING **To avoid personal injury, keep fingers away from the needle area during fraction collector operation.**

CAUTION Regularly inspect the inlet / waste tubing assembly and the valve to needle tubing and exchange them if they are worn out or show visible signs of damage.

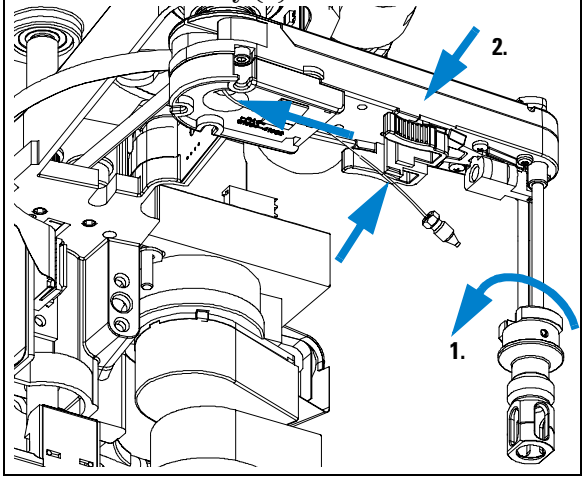
Before beginning this procedure:

- Position the transport unit of the fraction collector in the “Home Position” (see “Maintenance Functions” on page 49).
- Remove all installed trays from the tray base.
- Position the transport unit of the fraction collector in the “Change Parts Position” (see “Maintenance Functions” on page 49).
- Turn off the instrument.
- It might be more convenient to remove the needle from its carrier before unscrewing the needle tubing.

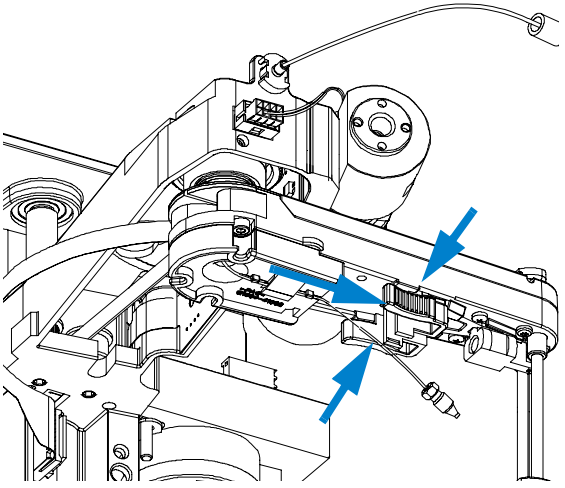
1 Use the 4 mm wrench and the 5/16” wrench for counter-holding to unscrew the valve-to-needle tubing from the needle assembly. (Viewed from the bottom)



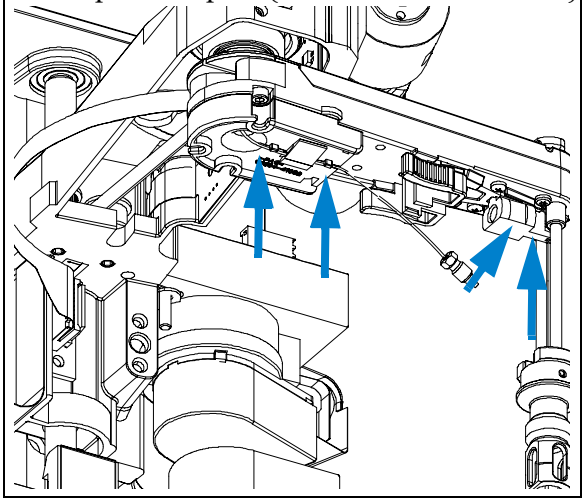
2 Remove the wellplate adapter by turning it clockwise (1). Hold the needle assembly between your thumb and forefinger, slide out the assembly towards the rear of the needle carrier assembly (2).



3 Insert the new needle assembly into the holder of the needle carrier assembly. Make sure to push it all the way to the front. Reassemble the wellplate adapter.



4 Use the 4 mm wrench and the 5/16“ wrench for counter-holding to connect the valve to needle tubing to the needle. Reassembly the wellplate adapter. (Viewed from the bottom)



On completion of this procedure:

- **IMPORTANT: After fixing the needle in the needle carrier clip the tubing into the guide on the bottom of the needle carrier assembly in case it slipped out of this guide (see 2 left arrows on the figure to the left).**
  It is absolutely vital that the tubing is installed as described, to maximize the lifetime of the tubing.
- Re-install the tray(s) in the tray base.
- Start the instrument.
- Close the front cover.

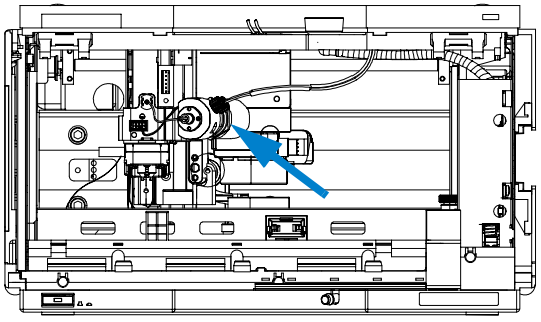
Exchanging the Diverter Valve

Frequency	When leaky or defective
Tools required	Hex key 2.0 mm, PN 8710-2438 (supplied in accessory kit)
Parts required	Diverter Valve, PN G1364-61901

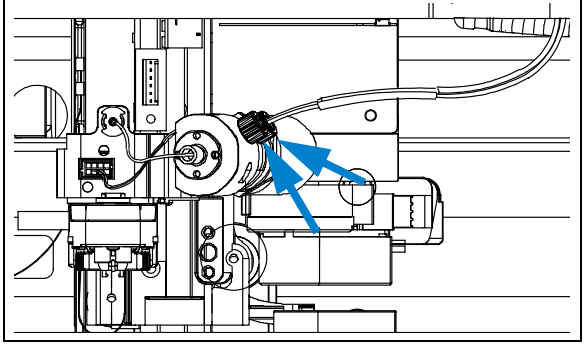
Before beginning this procedure:

- Position the transport unit of the fraction collector in the “Home Position” (see “Maintenance Functions” on page 49).
- Remove all installed trays from the tray base.
- Position the transport unit of the fraction collector in the “Change Parts Position” (see “Maintenance Functions” on page 49).
- Turn off the instrument.

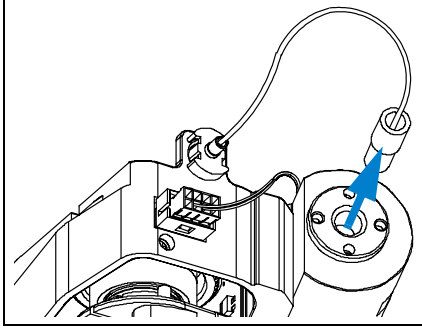
1 Locate the diverter valve with the finger tight fittings of the inlet / waste tubing assembly (the figure shows the open fraction collector seen from the front).



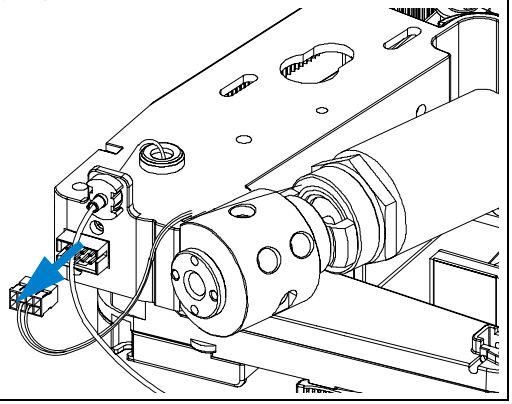
2 Unscrew the 2 finger tight fittings of the inlet / waste tubing assembly at the diverter valve.



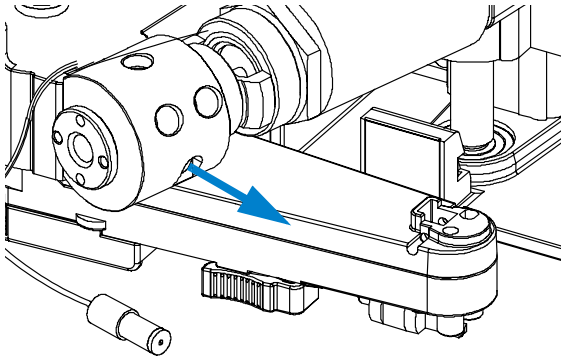
3 Unscrew the finger tight fitting of the valve to needle tubing assembly at the diverter valve.



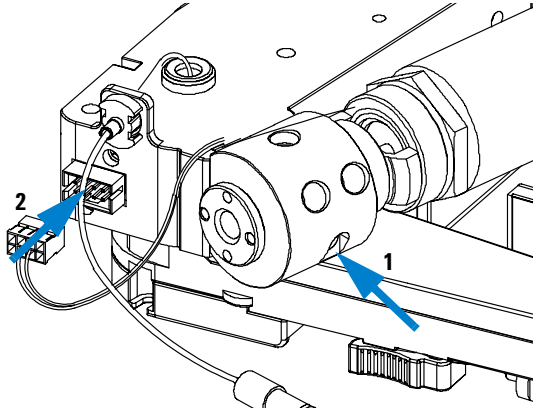
4 Disconnect the power cable of the diverter valve from the connector on the front of the z-arm.



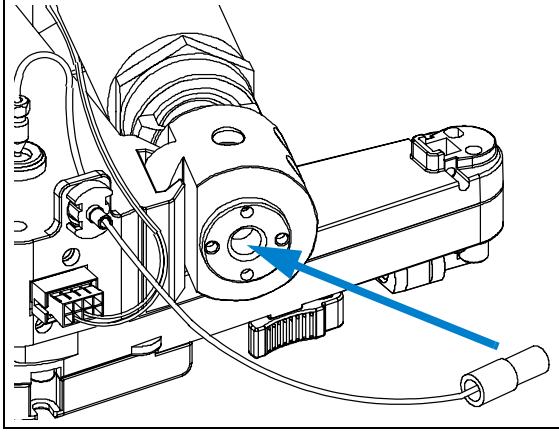
5 Using the 2 mm hex key loosen the holding screw of the diverter valve and remove the diverter valve from the z-arm.



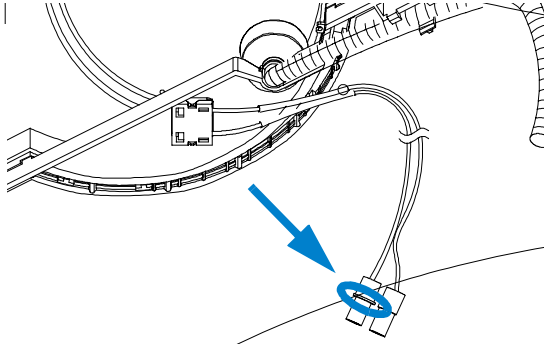
6 Install the new diverter valve to the z-arm with its holding screw. Plug in the new diverter valve power cable to the z-arm.



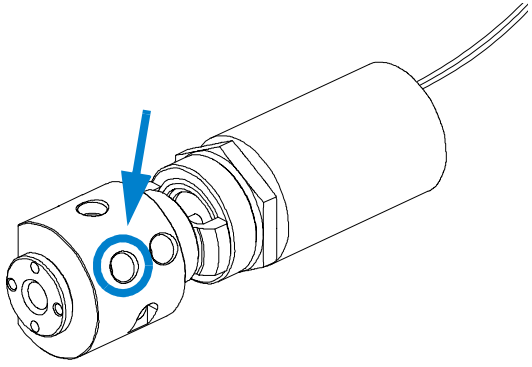
7 Install the valve to needle tubing at the new diverter valve.



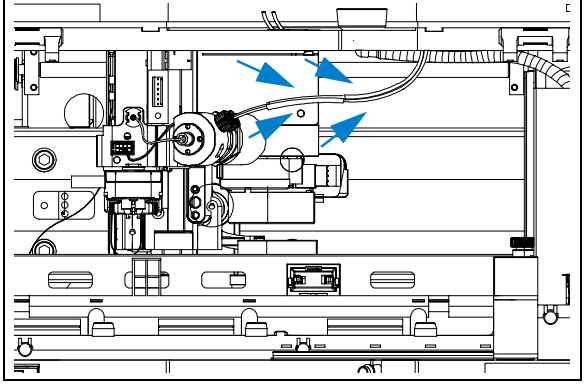
8 Connect the finger tight fittings of the inlet / waste tubing assembly to the ports of the diverter valve.
IMPORTANT: The tubings must not be bent up- or downwards. The cables must not be twisted.
(View from the bottom)



9 A color coded ring on one of the tubings and the valve body indicates, which cable belongs to which port.
IMPORTANT: It is absolutely vital to connect these tubings as described, in order to maximize their lifetime and operating security.



10 **IMPORTANT: The cables must run into the ports of the diverter valve in lines parallel to the horizon.**



On completion of this procedure:

- Re-install the tray(s) in the tray base.
- Start the instrument.
- Close the front cover.

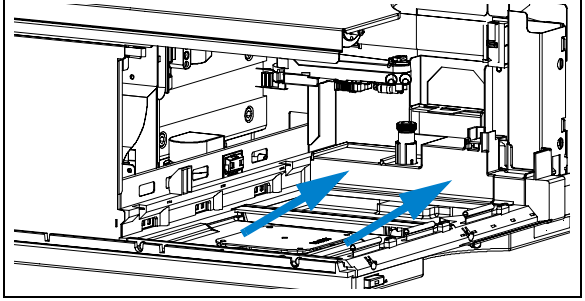
Exchanging the Internal Tray

Frequency	When defective
Tools required	None
Parts required	Internal tray **analytical scale**, (G1364-63113) Internal tray **preparative scale**,(G1364-63114)

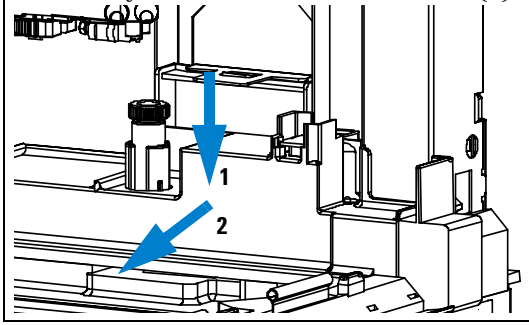
Before beginning this procedure:

- Position the transport unit of the fraction collector in the “Home Position” (see “Maintenance Functions” on page 49).
- Remove all installed trays from the tray base.
- Turn off the instrument.

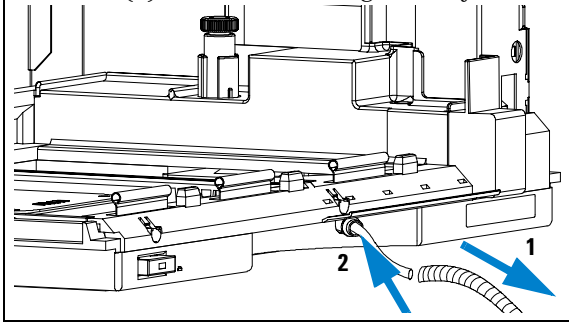
1 Locate the internal tray assembly with the rinse funnel and flow delay sensor in the bottom of the right front corner of the instrument.



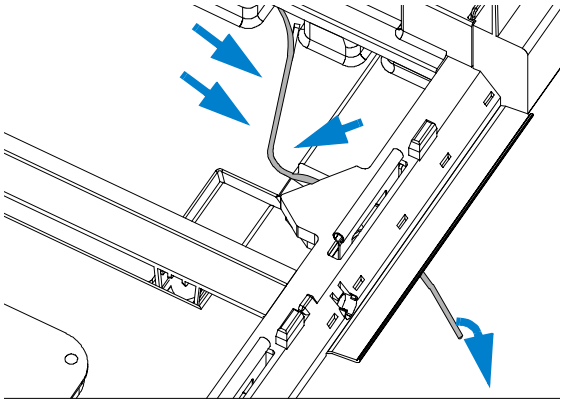
2 Remove the internal tray by pushing down the plastic holder that holds it in position underneath the metal latch (1) and sliding the tray to the left at the same time (2).



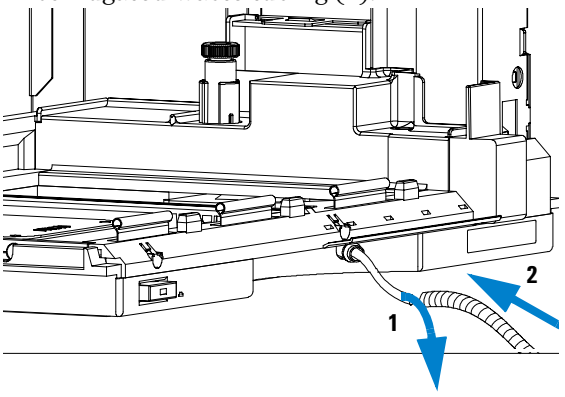
3 Remove the corrugated waste tubing from the front of the instrument (1) and slide the internal tray's waste tubing to the rear of the outlet (2) the before sliding the tray out.



4 Install the new tray by sliding it into position underneath the metal latch that holds it. The waste tubing from the internal tray should be guided as shown.



5 Make sure that the waste tubing is slid all the way through the outlet (1). Its end should be over the edge and below the level of the laboratory desk that the system stands on to avoid any back flow of solvent. Re-install the corrugated waste tubing (2).



On completion of this procedure:

- Re-install the tray(s) in the tray base.
- Start the instrument.
- Close the front cover.

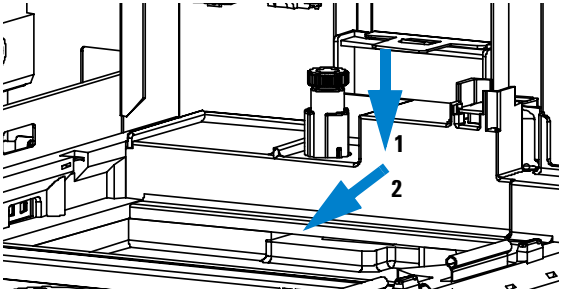
Repairing or Exchanging a Funnel of the Internal Tray

Frequency	When leaky or contaminated
Tools required	None
Parts required	Funnel assembly, waste tubing assembly, seals (for part numbers see "Internal Tray Assembly" on page 92)

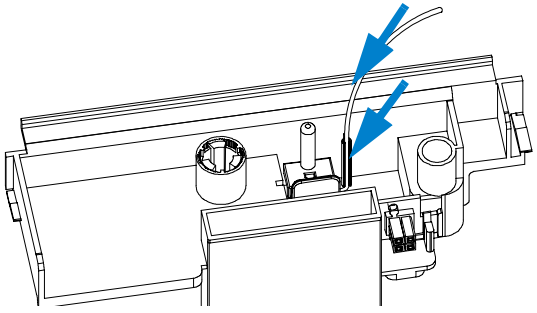
Before beginning this procedure:

- Position the transport unit of the fraction collector in the "Home Position" (see "Maintenance Functions" on page 49) and remove all installed trays from the tray base.
- Turn off the instrument.
- The procedure is almost identical for both, the preparative and the analytical scale internal tray, but it requires different parts.

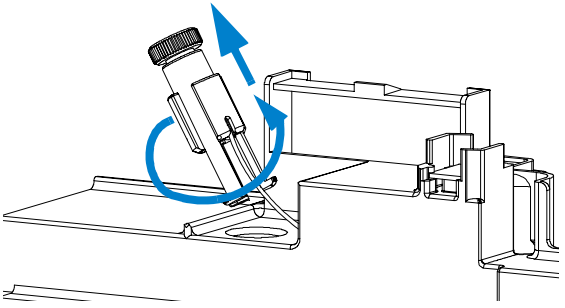
1 Remove the internal tray from the instrument, see "Exchanging the Internal Tray" on page 74.



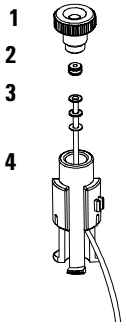
2 Turn the internal tray upside down and remove the funnel's waste tubing through the flow delay sensor.



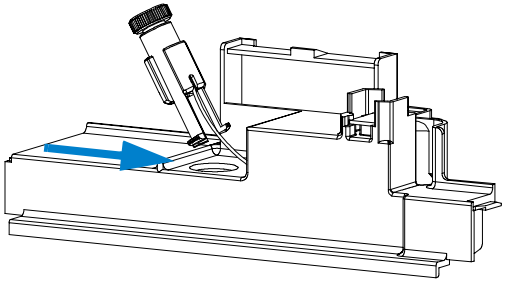
3 Remove the funnel assembly from the internal tray by screwing it counter clockwise and lifting it out.



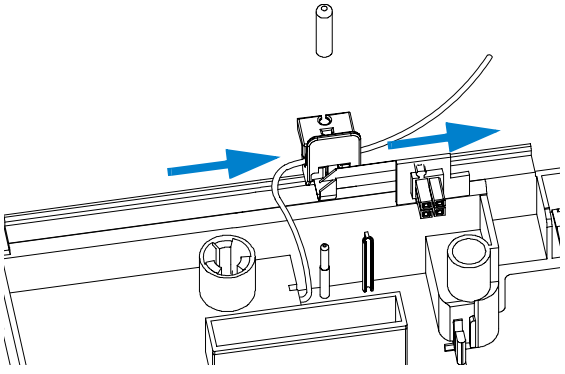
4 Exploded view for the parts of the internal tray. Once the funnel has been removed from the internal tray, it can be disassembled and defective parts can be replaced (funnel screw (1), seals (2), tubing (3) or funnel holder (4)).



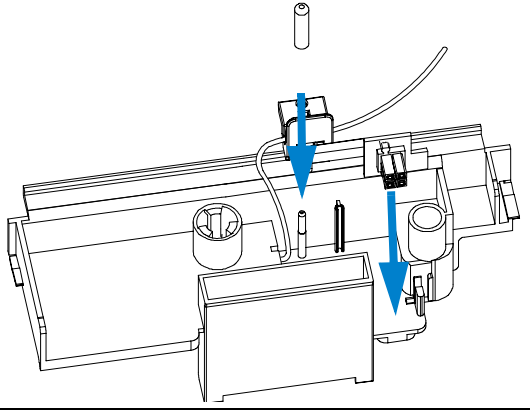
5 Slide the waste tubing of the newly assembled funnel assembly through the slit beside the funnel in the internal tray assembly



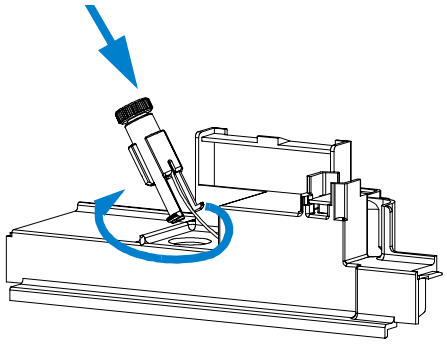
6 Turn the internal tray upside down. Slide the funnel's waste tubing through the flow delay sensor.



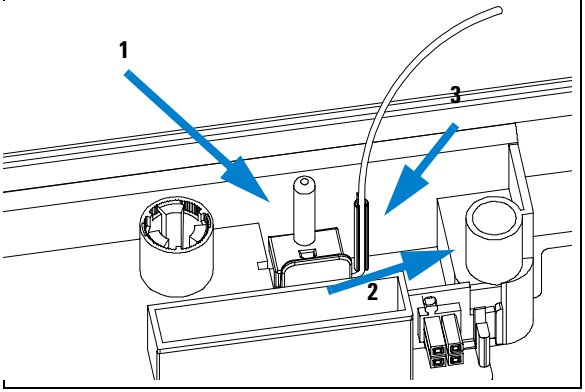
7 Turn the internal tray upside down.Slide the funnel's waste tubing through the flow delay sensor.



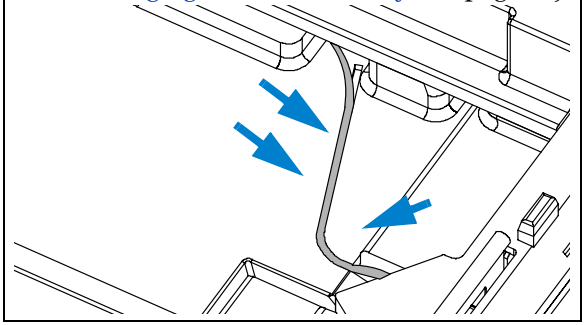
8 Insert the funnel into the tray and screw it tight (clockwise)



9 Re-install the plug that holds the flow delay sensor (1), pull the waste tubing tight through the flow delay sensor (2) and mount the waste tubing (3).



10 Re-install the internal tray and make sure to route the waste tubing out through the outlet of the instrument, correctly (see "Exchanging the Internal Tray" on page 74).



On completion of this procedure:

- Re-install the tray(s) in the tray base.
- Start the instrument.
- Close the front cover.

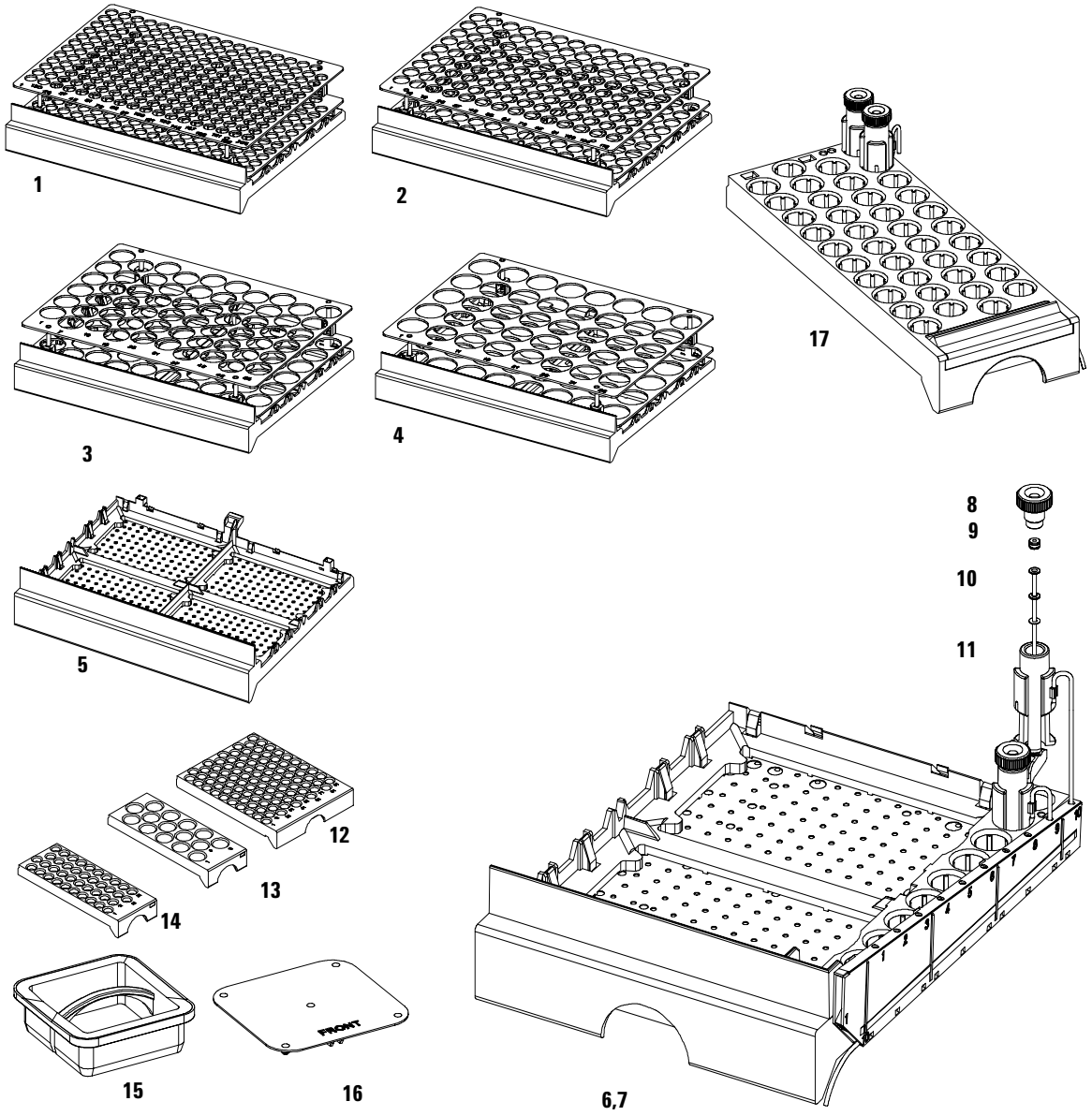
4
Parts and Materials

Supported Trays for Fraction Collectors

Table 7 Trays for the Fraction Collector

Item	Description	Part Number
1	Full tray for 215 test tubes, 12x100 mm	G1364-84506
2	Full tray for 126 test tubes, 16x100 mm	G1364-84505
3	Full tray for 60 round bottom tubes, 25x100 mm	G1364-84504
4	Full tray for 40 round bottom tubes, 30x100 mm	G1364-84503
5	Full tray for 4 well plates	G1364-84501
6	Std. tray for 2 well plates + 10 2ml vials	G1367-60001
7	Std. tray for 2 well plates + 10 collecting funnels	G1364-84502
8	Funnel for item 7	5022-2200
9	Funnel seal kit for item 7 (pack. of 10)	G1364-68730
10	Tubing kit 10T for item 7 (pack of 10)	G1364-86707
11	Funnel coupler for item 7	G1364-43201
12	Std. tray for 100 x 2 ml vials Std. tray for 100 x 2 ml vials, thermostattable	G1313-44500 G1329-60001
13	Half tray for 15 x 6 ml vials	G1313-44503
14	Half tray for 40 x 2 ml vials	G1313-44502
15	Adapter air channel (installed underneath plug channel, if the fraction collector is used with the thermostat)	G1329-43200
16	Plug channel	G1364-47200
17	Half Tray for 40 Funnels	G1364-84512

NOTE Only one type of well-plates can be used at a time in one tray.



The items in this figure are displayed in different scaling factors!

Figure 24 Trays

List of Recommended Test Tubes

Table 8 Round Bottom Test Tubes

Description	Volume (ml)	100/Pack
25 x 100 mm, clear glass	35	5042-6459
30 x 100 mm, clear glass	45	5042-6458
30 x 48 mm	20	5042-6470
16 x 48 mm	9	5022-6533

List of Recommended Vials and Caps

Table 9 Crimp Top Vials (Caps for Use with the Analytical Scale Fraction Collector, only!)

Description	Volume (ml)	100/Pack	1000/Pack	100/Pack (silanized)
Clear glass	2	5181-3375	5183-4491	
Clear glass, write-on spot	2	5182-0543	5183-4492	5183-4494
Amber glass, write-on spot	2	5182-3376	5183-4493	5183-4495

Table 10 SnapTop Vials (Caps for Use with the Analytical Scale Fraction Collector, only!)

Description	Volume (ml)	100/Pack	1000/Pack	100/Pack (silanized)
Clear glass	2	5182-0544	5183-4504	5183-4507
Clear glass, write-on spot	2	5182-0546	5183-4505	5183-4508
Amber glass, write-on spot	2	5182-0545	5183-4506	5183-4509

Table 11 Screw Top Vials (Caps for Use with the Analytical Scale Fraction Collector, only!)

Description	Volume (ml)	100/Pack	1000/Pack	100/Pack (silanized)
Clear glass	2	5182-0714	5183-2067	5183-2070
Clear glass, write-on spot	2	5182-0715	5183-2068	5183-2071
Amber glass, write-on spot	2	5182-0716	5183-2069	5183-2072

Table 12 Crimp Caps (Caps for Use with the Analytical Scale Fraction Collector, only!)

Description	Septa	100/Pack
Silver aluminum	Clear PTFE/red rubber	5181-1210
Silver aluminum	Clear PTFE/red rubber	5183-4498 (1000/Pack)
Blue aluminum	Clear PTFE/red rubber	5181-1215
Green aluminum	Clear PTFE/red rubber	5181-1216
Red aluminum	Clear PTFE/red rubber	5181-1217

Table 13 Snap Caps (Caps for Use with the Analytical Scale Fraction Collector, only!)

Description	Septa	100/Pack
Clear polypropylene	Clear PTFE/red rubber	5182-0550
Blue polypropylene	Clear PTFE/red rubber	5182-3458
Green polypropylene	Clear PTFE/red rubber	5182-3457
Red polypropylene	Clear PTFE/red rubber	5182-3459

Table 14 Screw Caps (Caps for Use with the Analytical Scale Fraction Collector, only!)

Description	Septa	100/Pack
Blue polypropylene	Clear PTFE/red rubber	5182-0717
Green polypropylene	Clear PTFE/red rubber	5182-0718
Red polypropylene	Clear PTFE/red rubber	5182-0719
Blue polypropylene	Clear PTFE/silicone	5182-0720
Green polypropylene	Clear PTFE/silicone	5182-0721
Red polypropylene	Clear PTFE/silicone	5182-0722

List of Recommended Plates and Closing Mats

Table 15 Recommended Plates and Closing Mats (Std. Well Plates and Closing Mats for Use with the Analytical Scale Fraction Collector, only!)

Item	Description	Volume (ml)	Package	Part Number
1	96 polypropylene well-plate*	0.5	10	5042-1386
2	96 polypropylene well-plate*	0.5	120	5042-1385
3	96 polypropylene deep well pate	1.0	50	5042-6454
4	96 polypropylene deep well-plate with glass inserts, caps and septa pre assembled	0.35	1	5065-4402
5	384 polypropylene well-plate*	0.1	30	5042-1388
6	96 polypropylene conical-well plate*	0.18	25	5042-8502
7	54 x 2ml vial plate*	1.5	6	G2255-68700
	Silicon Closing mats for 96 well-plate **(analytical only)**		50	5042-1389

* For use with the **analytical scale and micro** fraction collector, only!

NOTE Only one type of well-plates can be used at a time in one tray.

WARNING **If you are using flammable solvents, remove the plates from the fraction collector after turning it OFF. You avoid the risk of building explosive gas mixtures in the instrument.**

WARNING **If you are using flammable solvents, cover the plates. This action avoids the risk of building explosive gas mixtures in the instrument.**

WARNING **Closing mats with adhesive can give some contamination in the system. The adhesive is soluble in most of the solvents used in HPLC.**

WARNING **In general do not use closing mats with adhesive. The fraction collector has no prepunch needle, therefore the adhesive will clog the needle after several injections.**

Transport Unit Assembly (Preparative Scale)

Table 16 Transport Unit Assembly (Preparative Scale)

Item	Description	Part Number
1	Transport Unit Assembly **(Preparative Scale)**, includes items 2 and 4	G1364-60018
2a, b	Tubing - diverter valve to needle, 0.8 mm ID	G1364-86711
3	Diverter valve assembly	G1364-61901
4	Needle carrier assembly **preparative scale**	G1364-60011
5	Needle assembly **preparative scale**	G1364-87201
6	Delay Calibration Adapter (not shown)	G1364-87301

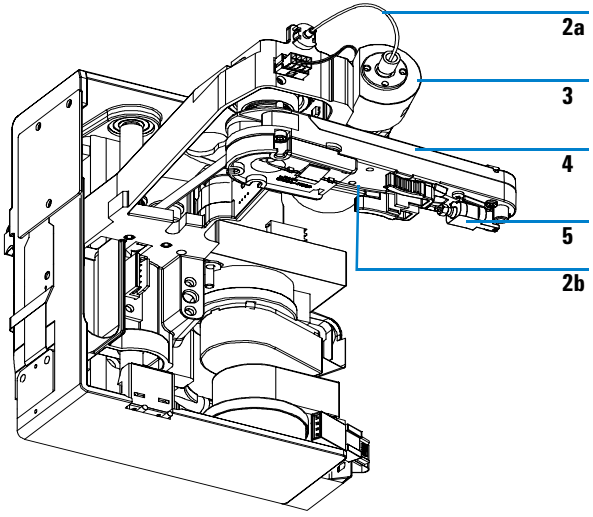


Figure 25 Transport Unit Assembly (Preparative Scale), partly displayed

Transport Unit Assembly (Analytical Scale)

Table 17 Transport Unit Assembly (Analytical Scale)

Item	Description	Part Number
1	Transport unit assembly **(analytical scale)**, includes items 2 and 4	G1364-60019
2a, b	Tubing - diverter valve to needle, 0.25 mm ID	G1364-68712
3	Diverter valve assembly	G1364-61901
4	Needle carrier assembly **analytical scale**	G1367-60012
5	Needle assembly **analytical scale (50mm needle)** Needle assembly **analytical scale (20mm needle)**	G1367-87200 G1364-87202
6	Wellplate adapter	G1364-23203

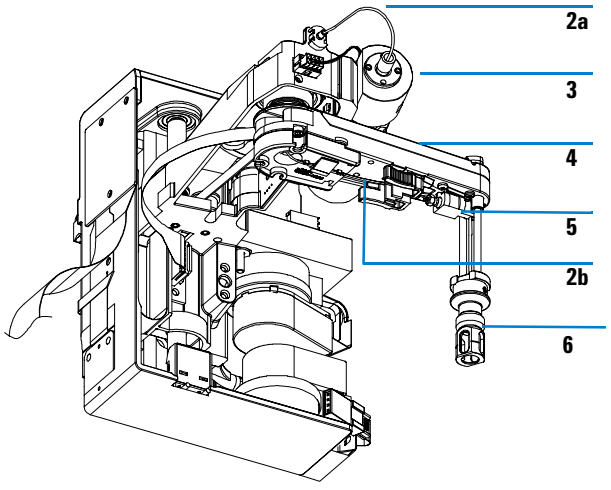


Figure 26 Transport Unit Assembly (Analytical Scale), partly displayed

Needle Assemblies

Table 18 Needle Assemblies

Item	Description	Part Number
1	Needle assembly **preparative scale**	G1364-87201
2	Needle assembly **analytical scale (20 mm needle)** For use in the analytical scale fraction collector at flow rates > 10 ml/min. or with high test tubes (48 mm - 75mm).	G1364-87202
3	Needle assembly **analytical scale (50 mm needle)**	G1367-87200

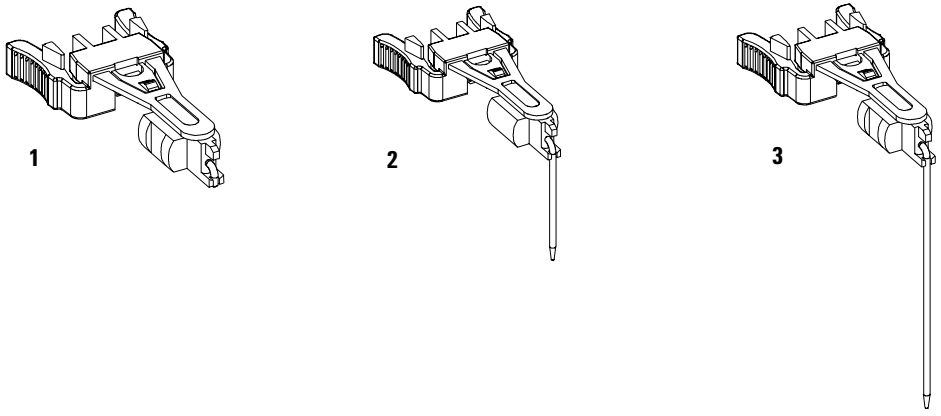


Figure 27 Needle Assemblies

Diverter-Valve Assembly

Table 19 Diverter-Valve Assembly (preparative and analytical scale)

Item	Description	Part Number
1	Diverter-valve assembly	G1364-61901
2	PIN screw	0515-1211

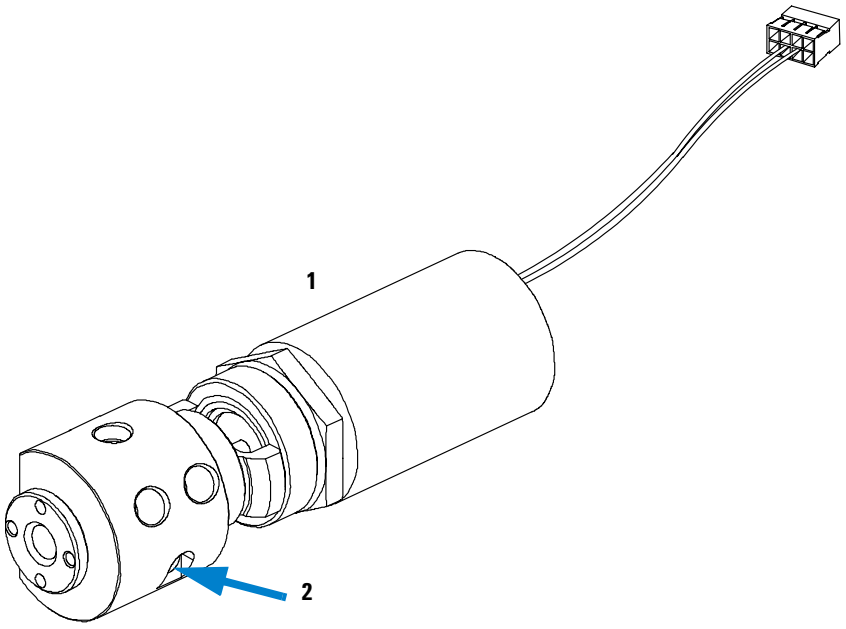


Figure 28 Diverter-Valve Assembly

Tubing Kits

Table 20 Tubing Kits

Item	Description	Part Number
1	Tubing kit **preparative scale 0.8 mm ID** (consists of items 2,and 3)	G1364-68711
2	Inlet/waste tubing assembly **preparative scale 0.8 mm ID**	Order Item 1
3	Diverter valve to needle tubing **preparative scale 0.8 mm ID**	Order Item 1
4	Tubing kit **analytical scale 0.25 mm ID** (consists of items 5,and 6)	G1364-68712
5	Inlet/waste tubing assembly **analytical scale 0.25 mm ID**	Order Item 4
6	Injection valve to needle tubing **analytical scale 0.25 mm ID**	Order Item 4
7	Finger tight fitting (pack of 2)	0100-1516

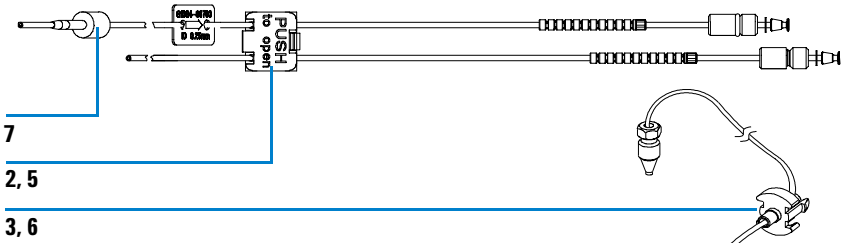


Figure 29 Tubing Kits

Internal Tray Assembly

Table 21 Internal Tray Assembly (Analytical and Preparative Scale)

Item	Description	Part Number
1	Internal tray assembly **analytical scale**, includes items 2 – 7 Internal tray assembly **preparative scale**, includes items 2 – 7	G1364-63114 G1364-63113
2	Screw-seat-adapter	5022-2200
3	Seal funnel (reorder No., pack. of 10)	G1364-68730
4a	Waste Tubing Kit 0.5T (**analytical scale**)	G1364-86708
4b	Waste Tubing Kit 0.8T (**preparative scale**)	G1364-86719
5	Funnel coupler	G1364-43201
6	Tray internal	Order Item 1
7	Flow delay sensor (not shown)	Order Item 1

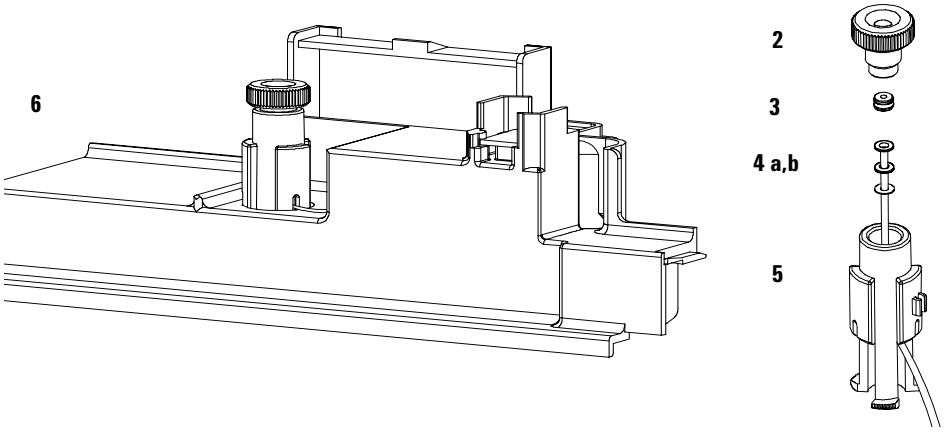


Figure 30 Internal Tray Assembly (Analytical Scale)

Fraction Collector Accessory Kit

Table 22 Fraction Collector Accessory Kit Contents G1364-68705

Description	Quantity	Part Number
Wrench, open end, 4mm	1	8710-1534
Wrench, open end, 1/4-5/16 inch	1	8710-0510
Hex key 2.0 mm	1	8710-2476
Finger tight fittings, 1/16" f-120*	3	0100-1516
Waste tubing (1.2 m)†	1	5062-2463
CAN cable, 1 m	1	5181-1519
Air channel adapter	1	G1329-43200
Sticking clamp for corrugated waste tubing (large)	3	no PN
Sticking clamp for waste tubing (small)	3	no PN
ESD wrist strap	1	9300-1408
Tray for 15 x 6 ml vials	1	G1313-44503
Tray for 40 x 2 ml vials	1	G1313-44502

* Reorder gives pack of 2

† Reorder gives 5 m

5
Specifications

Performance Specifications for the Fraction Collectors

Table 23 performance Specifications Agilent 1100 Series PREPARATIVE SCALE Fraction Collector (G1364B)

Type	Specification
trigger modes	Time slices, Peak (threshold, up- / downslope), Timetable (combination of time intervals and peak) and Manual trigger (supported only with G1323B Control Module) Agilent 1100 DAD/MWD detectors (G1315A/B, G1365 A/B and the Agilent G1946C/D, G1956A/B LC-MSD are fully supported other detectors can be used but are not supported for fraction collection.
operating modes	Discrete fractions: default mode for all vessels. The flow is diverted to waste, while moving from one vessel position to the next vessel position Continuous flow: optional, available only when using well plates. It is possible to move from one well plate position to the next one without diverting the flow into the well plate to waste
Fraction capacities and trays	4 x well-plates full tray (MTP)* (for use with deep well plates, only) 2 × well-plates std. tray (MTP) (for use with deep well plates, only) + 10 × 2 ml vials* (+ 1 half tray) 100 x 2 ml in std. tray (+ 1 half tray)* 3 x 40 x 2 ml in half tray* 3 x 15 x 6 ml in half tray* Full tray with 40 test tubes (30 mm OD, max. height 100 mm, ~45 ml / tube) Full tray with 60 test tubes (25 mm OD, max. height 100 mm, ~25 ml / tube) Full tray with 126 test tubes (16 mm OD, max. height 100 mm, ~12 ml / tube) Full tray with 215 test tubes (12 mm OD, max. height 100 mm, ~7 ml / tube) Installed trays are automatically detected and identified. **For the with uncapped vials, tests tubes and well plates, only!**
test tube / plate sizes	Minimum 48 mm to 100 mm maximum
Maximum tube volume	ca. 45 ml
Maximum flow rate	100 ml / min (depending on viscosity and generated back pressure, max. 6 bar at the diverter valve)

Table 23 performance Specifications Agilent 1100 Series PREPARATIVE SCALE Fraction Collector (G1364B) (continued)

Type	Specification
Delay volumes [µl]	Fraction collector inlet to diverter valve: ~500 (typical, depends on length of the tubing) Diverter valve: ~15 Diverter valve to needle: ~110 Needle: ~5
Delay calibration sensor	Single wavelength absorbance detector working at 654 nm, consisting of a LED and a photo diode
Diverter valve	3/2 Diverter valve with low internal volume (15 µl), switching time < 100 ms, maximum operating pressure 6 bar
cooling	Optional (with additional G1330B), performance depending on ambient conditions and the volume of collected fractions
maximum capacity	3 fraction collectors in parallel plus one recovery fraction collector connected via 12-Position, 13-Port Selector valve (PN G1160A)
GLP features	Early maintenance feedback (EMF), electronic records of maintenance and errors
Interfaces	Controller-area network (CAN). optional; LAN or external contacts interface RS232C, APG-remote (for remote start / stop signals to / from other modules) Interface to G1330A Thermostat CAN-DC-out for operation of Agilent approved external devices like valves
Safety features	Leak detection and safe leak handling, error detection and display, exhaust fan for fume extraction of hazardous vapors

* Vials can be used as recommended by Agilent Technologies (see "List of Recommended Vials and Caps" on page 83 and "List of Recommended Plates and Closing Mats" on page 85) **but must be uncapped**. Only the 96 deep well-plates can be used (**without closing mats**, see "List of Recommended Plates and Closing Mats" on page 85)

NOTE Only one type of well-plates can be used at a time in one tray.

Table 24 Performance Specifications Agilent 1100 Series ANALYTICAL SCALE Fraction Collector (G1364C)

Type	Specification
trigger modes	Time slices, Peak (threshold, up- / downslope), Timetable (combination of time intervals and peak) and Manual trigger (supported only with G1323B Control Module) Agilent 1100 UV-Vis detectors (G1314A, G1315A/B, G1365 A/B and the Agilent G1946C/D, G1956A/B LC-MSD are fully supported. Other detectors can be used but are not supported for fraction collection
operating modes	Discrete fractions: default mode for all vessels. The flow is diverted to waste, while moving from one vessel position to the next vessel position Continuous flow: optional, available only when using the deep well plates. It is possible to move from one well plate position to the next one without diverting the flow into the well plate to waste Needle into location: Needle pushes into the vessel as deep as specified, for the use with capped vials and test tubes and well plates with closing mats Droplet setup mode: The tip of the fraction collector needle will initially move down to the bottom of the well. Then it will slowly move upwards while the fraction is collected. The droplet setup mode enables the fraction collector to collect small fractions without bubbles.
fraction vessel capacities and trays	• 4 x well-plates full tray (MTP)* • 2 x well-plates std. tray + 10 funnels with external containers* (+ 1 half tray) • 2 × well-plates std. tray (MTP) + 10 × 2 ml vials* (+ 1 half tray) • 100 x 2 ml in std. tray (+ 1 half tray)* • 3 x 40 x 2 ml in half tray* • 3 x 40 funnels in half tray • 3 x 15 x 6 ml in half tray* • Full tray with 40 test tubes (30 mm OD, max. height 48 mm, ~20 ml vol.) • Full tray with 60 test tubes (25 mm OD, max. height 48 mm) • Full tray with 126 test tubes (16 mm OD, max. height 48 mm) • Full tray with 215 test tubes (12 mm OD, max. height 48 mm) Installed trays are automatically detected and identified. Installed plates and vials can be detected when operating in the needle into location mode * max. height can be extended by using the short needle assembly G1364-87202

Table 24 Performance Specifications Agilent 1100 Series ANALYTICAL SCALE Fraction Collector (G1364C) (continued)

Type	Specification
maximum tube / plate height	48 mm with long needle assembly G1367-87200 75 mm with short needle assembly G1364-87202
Maximum tube volume	ca. 20 ml with 48 mm test tubes, ca. 30 ml with 75 mm test tubes or unlimited, if funnels are used with external containers.
Maximum flow rate	10 ml / min (depending on viscosity and generated back pressure, max. 6 bar at the diverter valve). The analytical scale fraction collector can be modified for flow rates > 10 ml/min.
delay volumes [µl]	Fraction collector inlet to diverter valve: ~50 (typical, depends on the length of the tubing) Diverter valve: ~15 Diverter valve to needle: ~10 Needle: ~4
delay calibration sensor	Single wavelength absorbance detector working at 654 nm, consisting of a LED and a photo diode
diverter valve	3/2 Diverter valve with low internal volume (15 µl), switching time < 100 ms, maximum operating pressure 6 bar
cooling	Optional (with additional G1330B), performance depending on ambient conditions and the volume of collected fractions
maximum capacity	3 fraction collectors in parallel plus one recovery fraction collector connected via 12-Position, 13-Port Selector valve (PN G1160A)
GLP features	Early maintenance feedback (EMF), electronic records of maintenance and errors
interfaces	- Controller-area network (CAN). - optional; LAN or external contacts interface - RS232C, - APG-remote (for remote start / stop signals to / from other modules) - Interface to G1330A Thermostat - CAN-DC-out for operation of Agilent approved external devices like valves
safety features	Leak detection and safe leak handling, error detection and display, exhaust fan for fume extraction of hazardous vapors

* Vials and well-plates and capped vials and well plates with closing mats can be used as recommended by Agilent Technologies (see "List of Recommended Vials and Caps" on page 83 and "List of Recommended Plates and Closing Mats" on page 85)

NOTE Only one type of well-plates can be used at a time in one tray.

A
Safety Information

Safety Information

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

General

This is a Safety Class I instrument (provided with terminal for protective earthing) and has been manufactured and tested according to international safety standards.

WARNING **If you are using flammable solvents, remove the well-plates from the tray when you turn off the sampler. You avoid the risk of building explosive gas mixtures in the tray compartment.**

WARNING **If you are using flammable solvents, cover the well-plates with closing mats to avoid the risk of building explosive gas mixtures.**

WARNING **After a leak in the sampler, make sure the leak plane is cleaned and dry.**

Operation

Before applying power, comply with the installation section. Additionally the following must be observed.

Do not remove instrument covers when operating. Before the instrument is switched on, all protective earth terminals, extension cords, auto-transformers, and devices connected to it must be connected to a protective earth via a ground socket. Any interruption of the protective earth grounding will cause a potential shock hazard that could result in serious personal injury. Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any intended operation.

Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, and so on) are used for replacement. The use of repaired fuses and the short-circuiting of fuseholders must be avoided.

WARNING **Any adjustment, maintenance, and repair of the opened instrument under voltage is forbidden.**

WARNING **Disconnect the instrument from the line and unplug the power cord before maintenance.**

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Do not install substitute parts or make any unauthorized modification to the instrument.

Capacitors inside the instrument may still be charged, even though the instrument has been disconnected from its source of supply. Dangerous voltages, capable of causing serious personal injury, are present in this instrument. Use extreme caution when handling, testing and adjusting.

Safety Symbols

Table 25 shows safety symbols used on the instrument and in the manuals.

Table 25 Safety Symbols

Symbol	Description
	The apparatus is marked with this symbol when the user should refer to the instruction manual in order to prevent risk of harm to the operator and to protect the apparatus against damage.
	Indicates dangerous voltages.
	Indicates a protected conductor terminal.
	Eye damage may result from directly viewing the light produced by the Xenon flash lamp used in this product. Always turn the xenon flash lamp off before removing it.

WARNING **A warning alerts you to situations that could cause physical injury or damage to the equipment. Do not proceed beyond a warning until you have fully understood and met the indicated conditions.**

CAUTION A caution alerts you to situations that could cause a possible loss of data. Do not proceed beyond a caution until you have fully understood and met the indicated conditions.

Lithium Batteries Information

WARNING **Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the equipment manufacturer. Lithium batteries may not be disposed-off into the domestic waste.**

Transportation of discharged Lithium batteries through carriers regulated by IATA/ICAO, ADR, RID, IMDG is not allowed. Discharged Lithium batteries shall be disposed off locally according to national waste disposal regulations for batteries.

WARNING **Lithiumbatteri - Eksplosionsfare ved fejlagtic handtering. Udskiftning ma kun ske med batteri af samme fabrikat og type. Lever det brugte batteri tilbage til leverandoren.**

WARNING **Lithiumbatteri - Eksplosionsfare. Ved udskiftning benyttes kun batteri som anbefalt av apparatfabrikanten. Brukt batteri returneres appararleverandoren.**

NOTE Bij dit apparaat zijn batterijen geleverd. Wanneer deze leeg zijn, moet u ze niet weggooien maar inleveren als KCA.

Radio Interference

Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.

Test and Measurement

If test and measurement equipment is operated with equipment unscreened cables and/or used for measurements on open set-ups, the user has to assure that under operating conditions the radio interference limits are still met within the premises.

Sound Emission

Manufacturer's Declaration

This statement is provided to comply with the requirements of the German Sound Emission Directive of 18 January 1991.

This product has a sound pressure emission (at the operator position) < 70 dB.

- Sound Pressure Lp < 70 dB (A)
- At Operator Position
- Normal Operation
- According to ISO 7779:1988/EN 27779/1991 (Type Test)

Solvent Information

Observe the following recommendations on the use of solvents.

WARNING **This instrument should only be used with solvents that have an ignition temperature higher than 200°C!**

Solvents

Brown glass ware can avoid growth of algae.

Always filter solvents, small particles can permanently block the capillaries. Avoid the use of the following steel-corrosive solvents:

- Solutions of alkali halides and their respective acids (for example, lithium iodide, potassium chloride, and so on).
- High concentrations of inorganic acids like nitric acid, sulfuric acid especially at higher temperatures (replace, if your chromatography method allows, by phosphoric acid or phosphate buffer which are less corrosive against stainless steel).
- Halogenated solvents or mixtures which form radicals and/or acids, for example:

  $2CHCl_3 + O_2 \rightarrow 2COCl_2 + 2HCl$

  This reaction, in which stainless steel probably acts as a catalyst, occurs quickly with dried chloroform if the drying process removes the stabilizing alcohol.
- Chromatographic grade ethers, which can contain peroxides (for example, THF, dioxane, di-isopropylether) such ethers should be filtered through dry aluminium oxide which adsorbs the peroxides.
- Solutions of organic acids (acetic acid, formic acid, and so on) in organic solvents. For example, a 1-% solution of acetic acid in methanol will attack steel.

- Solutions containing strong complexing agents (for example, EDTA, ethylene diamine tetra-acetic acid).
- Mixtures of carbon tetrachloride with 2-propanol or THF.

Agilent Technologies on Internet

For the latest information on products and services visit our worldwide web site on the Internet at:

http://www.agilent.com

Select “Products” - “Chemical Analysis”

It will provide also the latest firmware of the Agilent 1100 series modules for download.

A Safety Information

Agilent Technologies on Internet

Index

www.agilent.com

In This Book

This manual contains technical reference information about the Agilent 1100 Series fraction collectors. The manual describes the following:

- configuration and operation of the fraction collector,
- troubleshooting and test functions,
- simple repairs
- parts and materials,
- specifications,
- safety information.

Printed in Germany
07/03

G1364-90001

Agilent Technologies