ÄKTA*design*

Fraction Collector Frac-900/901

User Manual

18-1120-11

amersham pharmacia biotech

Important user information

Meaning: Consult the instruction manual to avoid personal injury or damage to the product or other equipment.

WARNING!

The Warning sign is used to call attention to the necessity to follow an instruction in detail to avoid personal injury. Be sure not to proceed until the instructions are clearly understood and all stated conditions are met.

CAUTION!

The Caution sign is used to call attention to instructions or conditions that shall be followed to avoid damage to the product or other equipment. Be sure not to proceed until the instructions are clearly understood and all stated conditions are met.

Note

The Note sign is used to indicate information important for trouble-free or optimal use of the product.

Should you have any comments on this instruction, we will be pleased to receive them at:

Amersham Pharmacia Biotech AB
SE–751 84 Uppsala
Sweden

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Contents

About this manual

This manual comprises two parts; a practical part (sections 1 – 5) and a reference part (sections A – C).

Sections 1 – 5 contain the necessary information for operating the instrument.

1 Introduction

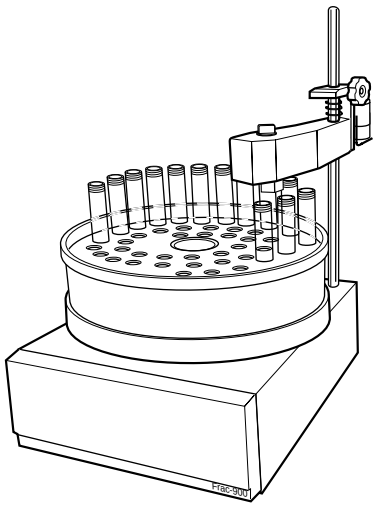
1.1 General

Fraction Collector Frac-900/901 is an automated fraction collector for use in ÄKTA™design chromatography systems.

The model designated Frac-900 has a switch valve FV-903 attached, to switch fluid flow between waste and the collection tubes.

The model designated Frac-901 is not equipped with the switch valve FV-903. The waste function is instead provided via the ÄKTAdesign chromatography system outlet valve

Frac-900/901 features:
- Collection of up to 175 fractions
- Three sizes of tube rack for tube diameters of 10-18 mm, 12 mm and 30 mm.



1.2 Safety

- The instrument is designed for indoor use only.
- Do not use in a dusty atmosphere or close to spraying water.
- Operate in accordance with local safety instructions.

WARNING! The instrument must not be opened by the user. It contains high voltage circuits which can be capable of delivering a lethal electric shock.

WARNING! When using hazardous chemicals, take care to avoid spillage during fraction collection and when the delivery arm is moved out.

WARNING! When using hazardous chemicals, all suitable protective measures, such as protective glasses, must be taken.

WARNING! The instrument must be connected to a grounded mains socket.

2 Installation

2.1 Unpacking

Unpack the instrument and check the items against the supplied packing list. Inspect the items for obvious damage which may have occurred during transportation.

It is recommended that all packing materials should be retained if onward transport of the instrument is expected.

CAUTION! Always lift the Frac-900/901 by the base unit, NEVER by the delivery arm or arm upright, as this may damage the arm.

CAUTION! The following information should be read carefully to ensure that the instrument is installed correctly.

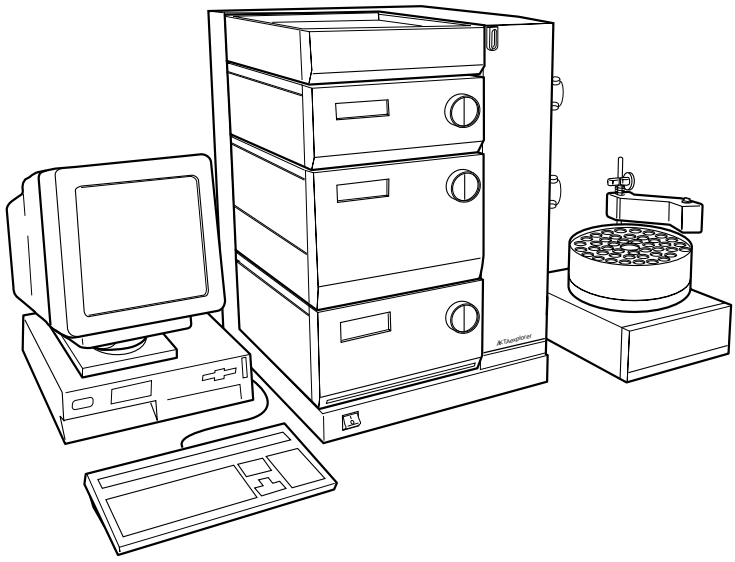
2.2 General precautions

The instrument be installed in a non-corrosive atmosphere.

The instrument should be located in a place of low temperature variations, away from heat sources, draughts and direct sunlight.

The instrument may be operated at normal ambient temperatures in the range +4 to +40 °C.

The instrument should be installed on a stable laboratory bench. The recommended position is immediately to the right of the ÄKTAdesign chromatography system as shown in the example below.



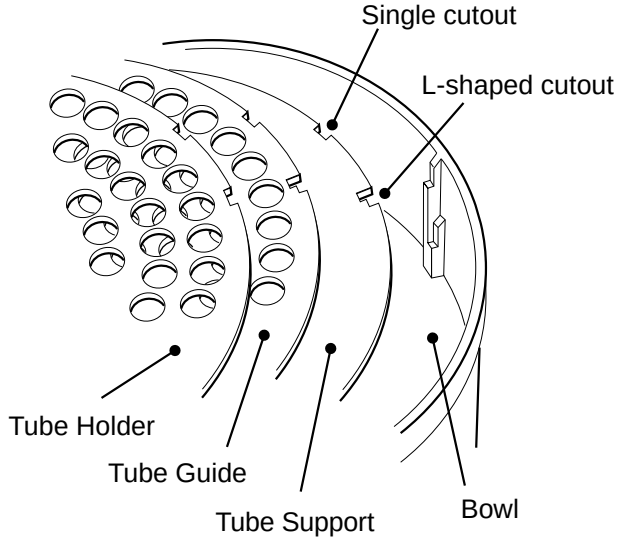
2.3 Assembling the tube rack

There are three types of tube racks

Rack	Max. tubes	Tube diam.	Tube length
12 mm	175	12 mm	50-180 mm
18 mm	95	10-18 mm	50-180 mm
30 mm	40	30 mm	30-180 mm

The 12 and 30 mm racks are available as accessories. Also available for use with the 12 mm tube rack is a double-ended Eppendorf tube holder (18-8522-01). One end holds 1.5 ml Eppendorf tubes, the other holds 0.5 ml tubes.

The Frac-900/901 is delivered with the 18 mm rack mounted. Each rack is made up of a combination of a bowl, tube support, tube guide and tube holder.



Note that the tube guide has both single and L-shaped cutouts, while the tube holder has only single cutouts.

When assembling a rack, different cutouts are used for the various items depending on the length of the tubes. The cutouts to use are summarised in the tables below.

Tube racks, 12 and 18 mm

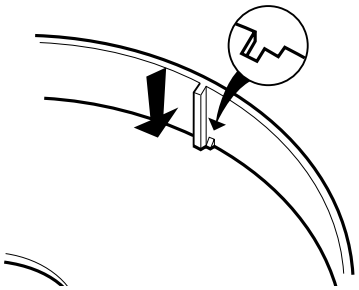
Item	50-85 mm tubes	85-180 mm tubes
Tube support	L-shaped cutout	Not required
Tube guide	Single cutout	L-shaped cutout
Tube holder	Single cutout	Single cutout

Tube rack, 30 mm

Item	30-50 mm tubes*	50-85 mm tubes	85-180 mm tubes
Tube support	Single cutout	L-shaped cutout	Not required
Tube guide	Single cutout	Single cutout	L-shaped cutout
Tube holder	Single cutout	Single cutout	Single cutout

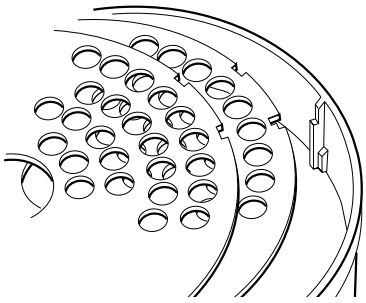
*__Note__: For 30-50 mm tubes, first insert the tube guide from the 18 mm rack using the single cutout, before inserting the tube support for the 30 mm rack.

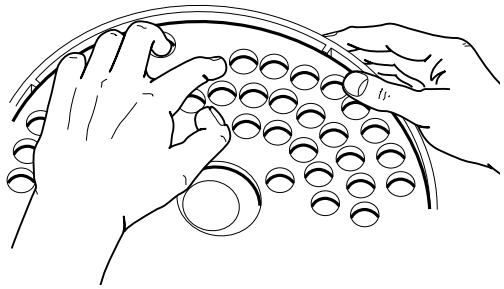
1 Insert the tube support, if required, in the bowl. The circular marks on the support should face down.



2 Insert the tube guide, tube numbers upwards. The guide should rest about 1 cm above the support.

3 Insert the tube holder, checking that position 1 is directly above position 1 of the tube guide. Push the flexible bowl out at each rib and snap the holder under the top lip of the rib.



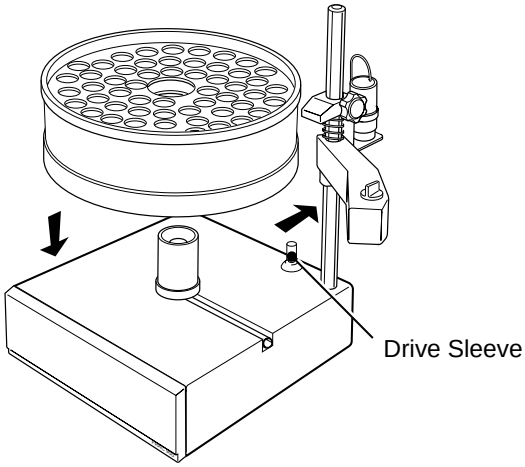


Do not force the holder into place as this may damage the lip. The surface of the holder should be level.

2.4 Mounting the tube rack

1 Gently move the delivery arm out to the second stop.

2 Place the rack over the central spindle and pull the spring loaded drive sleeve out so the rack comes to rest.

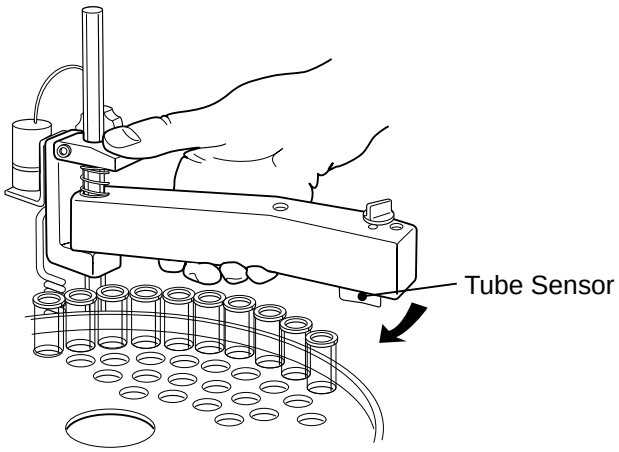


2.5 Inserting collection tubes

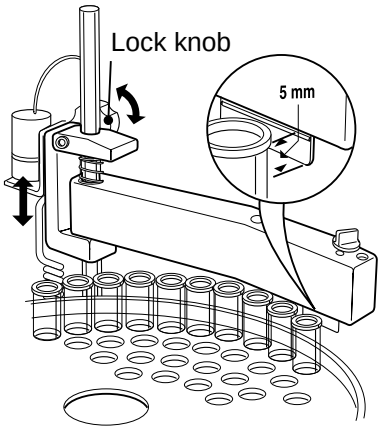
Insert sufficient collection tubes in to the rack, starting at position 1, pushing each one down as far as they will go. All the tubes must be of the same length and diameter and there should be no spaces in the sequence.

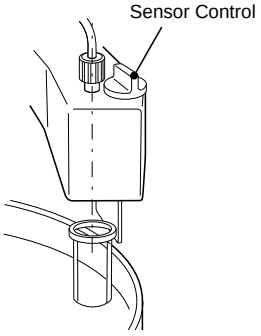
2.6 Adjusting the delivery arm

1 Lower the arm and allow it to move in so the tube sensor touches the collection tubes of the outer track.



2 Adjust the arm bracket so the bottom of the tube sensor is about 5 mm below the top of the tubes. The tubes should always be below the horizontal mark on the tube sensor.





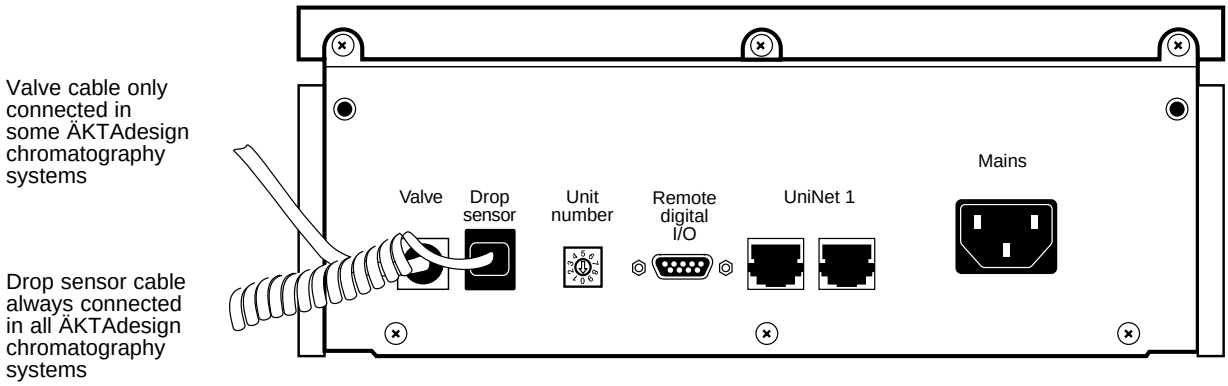
3 Lock the arm bracket at this height with the lock knob.

4 Rotate the rack counter-clockwise, by hand, until the rear half of the tube sensor rests against tube 1. When Frac-900/901 is started, the bowl moves to the correct position to collect the first fraction in tube 1.

5 Check that the sensor is in the correct position for the tube size. The eluent tubing should be over the centre of the collection tube. Use the red sensor control to position the tube holder.

2.7 Connecting electrical signal cables

The sockets for electrical signals are located on the rear panel. Check that the drop sensor and, if Frac-900 is used, the flow diversion valve cables are connected.



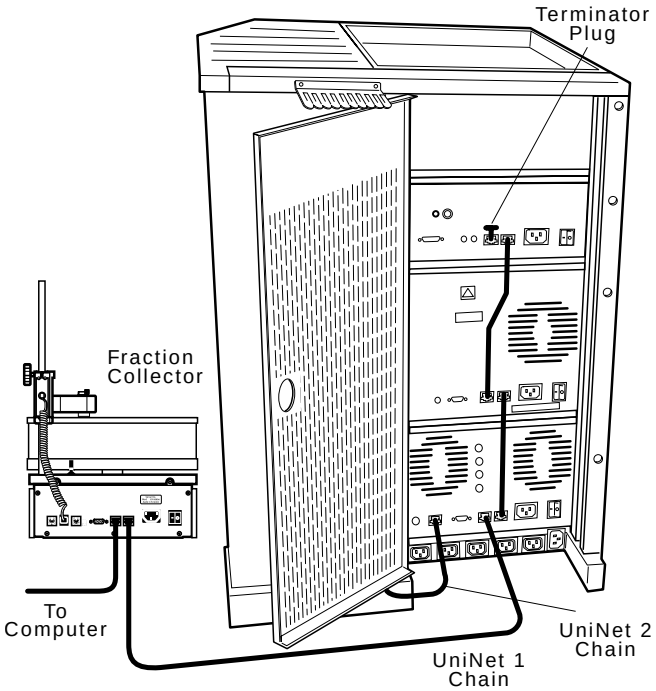
2.8 Connecting to communication link

Frac-900/901 is controlled from a PC running UNICORN™ version 3.0 or higher, using *UniNet* cables.

CAUTION! The mains power to the ÄKTAdesign chromatography system must be switched OFF before connecting the instrument to the *UniNet 1* link.

Note: The unit number should be 0 when one fraction collector is used together with ÄKTAdesign chromatography systems.

Connect two UniNet cables to the UniNet 1 connectors and connect Frac–900/901 to your ÄKTAdesign chromatography system as indicated in the example given in the illustration.



2.9 Connecting to supply voltage

Connect the supplied mains cable between Frac-900/901 and a mains socket at the rear of the ÄKTAdesign chromatography system. It is important to use the socket at the rearof the system in order to have the possibility to reset the whole system after rebooting. Any voltage 100–240 V AC, 50–60 Hz can be used.

WARNING! The instrument must be connected to a grounded mains socket.

The instrument contains no user replaceable fuse.

2.10 Connecting tubing

This procedure is somewhat different depending on which fraction collector you are working on:

- Proceed as follows if you have a Frac-900.
- Jump to page 10 if you have a Frac-901.

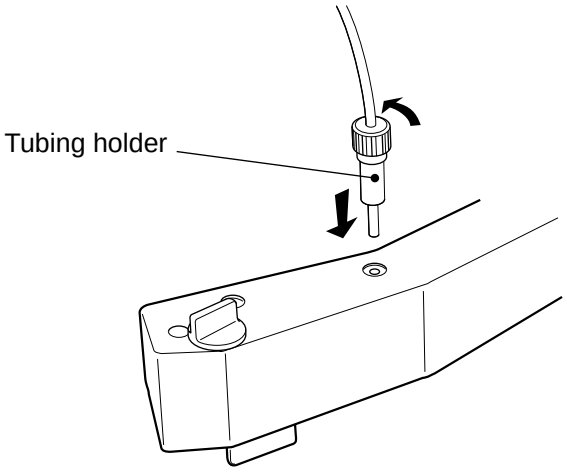
Frac-900

Select the tubing with the required inner diameter. To change the tubing follow steps 1 - 5.

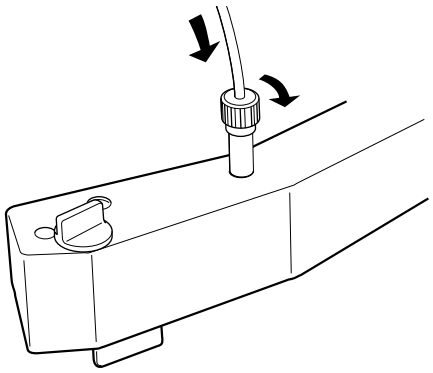
1 Fit a 34 cm length of tubing by lifting out the tubing holder from the delivery arm, loosen the nut and then inserting the tubing.

WARNING! If the tubing from the flow diversion valve to the holder on the delivery arm is too short, the tubing may pull out when the delivery arm moves allowing a jet of liquid to spray out. This can be dangerous if hazardous chemicals are in use.

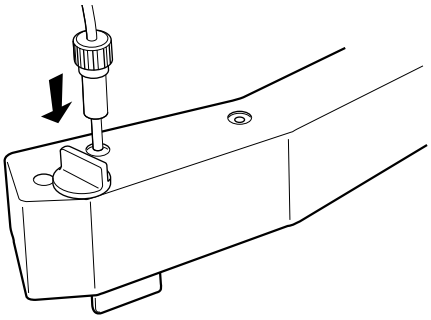
Note: The tubing must not be less than 34 cm to ensure free movement of the delivery arm.

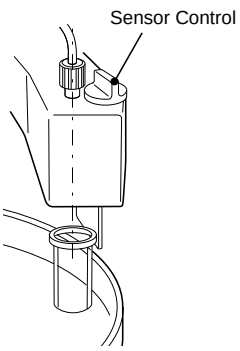


2 Place the tubing holder over the length guide (small hole) in the delivery arm, push the tubing down to the bottom of the guide and tighten the nut. This ensures the correct length of tubing is exposed.



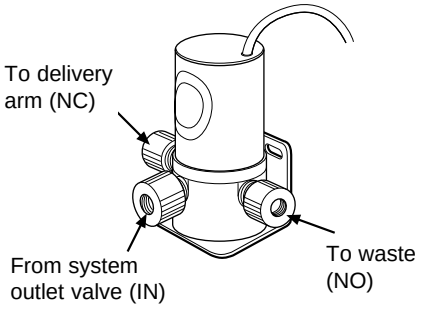
3 Re-install the tubing holder into the delivery arm.





4 Set the red sensor control so the tubing holder is positioned over the centre of the collection tube.

5 Connect the other end of the tubing, using the correct size connector, to the NC (normally closed) position on the flow diversion valve fitted to the delivery arm.



6 Connect tubing from the flow diversion valve IN position to the outlet of your ÄKTAdesign chromatography system.

7 Connect tubing from the flow diversion valve NO (normally open) position to waste.

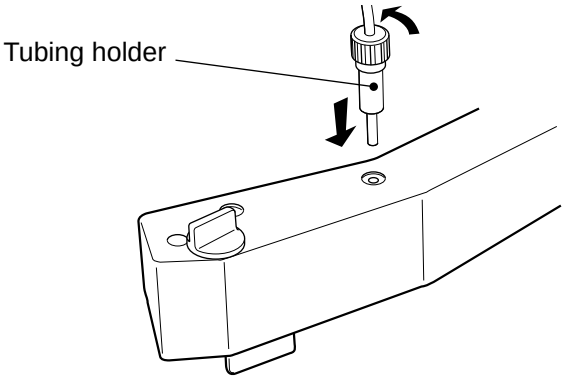
Frac-901

Select the tubing with the required inner diameter. To change the tubing follow steps 1 - 5.

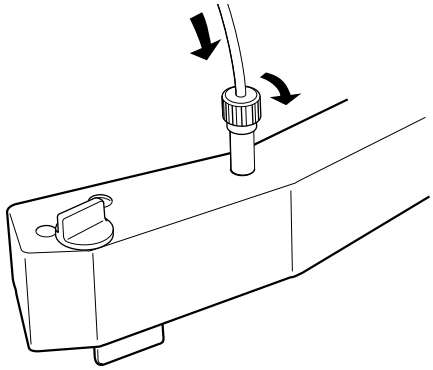
1 Fit a 50 cm tubing by lifting out the tubing holder from the delivery arm, loosen the nut and then inserting the tubing.

WARNING! When using hazardous chemicals, take care to avoid spillage during fraction collection and when the delivery arm is moved out.

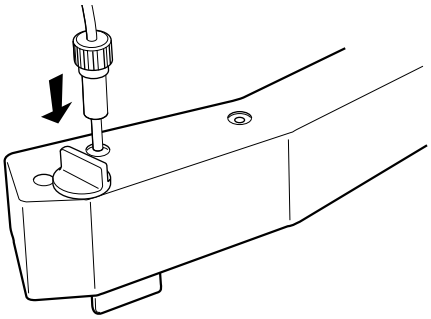
Note: The tubing must be long enough to ensure free movement of the delivery arm.



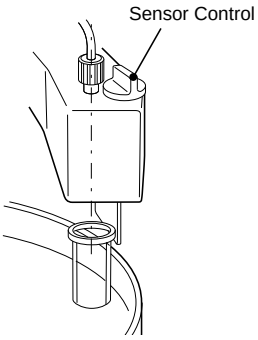
2 Place the tubing holder over the length guide (small hole) in the delivery arm, push the tubing down to the bottom of the guide and tighten the nut. This ensures the correct length of tubing is exposed.



3 Re-install the tubing holder into the delivery arm.



4 Set the red sensor control so the tubing holder is positioned over the centre of the collection tube.



5 Connect the other end of the tubing to position 2 of the outlet valve on your ÄKTAdesign chromatography system.

6 Connect tubing from position 1 of the outlet valve on your ÄKTAdesign chromatography system to waste.

3 Operation

Frac-900/901 is controlled from a PC running UNICORN version 3.0 or higher. It cannot be used as a stand-alone instrument. Control of Frac-900/901 can be achieved automatically from a pre-prepared method, or manually via the functions available in UNICORN.

The manual functions available to the operator are as follows:

- Collecting a fixed volume in each tube
- Collecting each peak in a separate tube
- Feed tube – move on to next tube

It is also possible to set the delay volume, that is, the volume of tubing between Monitor UV-900 and Frac-900/901. This value must be changed if the tubing is changed to tubing of a different inner diameter, see section 3.4.

Fixed volume and peak fraction collection can be combined so that fractions are collected at a fixed volume between peaks.

3.1 Collecting fixed fraction volumes

Details on collecting fixed fraction volumes are found in the *Operation* chapter in the System Manual of your ÄKTAdesign chromatography system.

3.2 Collecting peaks only

Details on collecting peaks only are found in the *Operation* chapter in the System Manual of your ÄKTAdesign chromatography system.

3.3 Feed tube

To start collecting an approaching peak in an empty tube, the tube rack can be moved forward one tube with the instruction **FeedTube**.

1 Select menu **System Control:Manual:Flowpath** in UNICORN.

2 Select the instruction **FeedTube** in the Flowpath list.

3 Click on the **Execute** button. The tube rack moves on to the next tube after the set delay volume has been collected.

3.4 Setting delay volume

The delay volume between Monitor UV-900 and Frac-900/901 in your ÄKTAdesign chromatography system can be set. The fraction marks shown in UNICORN will be adjusted according to this volume to show the actual parts collected.

1 Select menu **System Control:System:Settings:Specials** in UNICORN.

2 To change the settings, select the instruction **FracParameters**.

3 Enter the new delay volume value. The appropiate value for your particular system is found in the *Reference information A* chapter in the System Manual of your ÄKTAdesign chromatography system.

4 Click on the **OK** button. The value entered will be used until a further change is made.

3.5 Flow during tube change

The sample flow during tube change can be handled in three different ways. The selections can be found under menu **System Control:System:Settings:Specials**.

1 To change the settings, select the instruction **FracParameters**.

2 For the parameter **TubeChange** select one of the following options:

Tube	Default. No synchronization of collection.
DropSync	Tube change synchronized to drop release to minimise spillage. Should only be used at flow rates below 5 ml/min.
WasteBetweenTubes *(only when Frac-900 is used)*	When moving between tubes the flow is switched to waste for a short time. Useful at higher flow rates to minimise spillage.

3 Click on the **Execute** or **OK** button.

4 Maintenance

Fraction collector Frac-900/901 requires no periodic maintenance.

4.1 Cleaning

The fraction collector should be kept clean and spilled liquid should be wiped off before it dries. The arm should be positioned over the centre when the fraction collector is not in use.

The instrument should be wiped regularly with a damp cloth. Allow the instrument to dry completely before use.

5 Trouble shooting

WARNING! Always disconnect the power supply before attempting to replace any item on the instrument during maintenance.

WARNING! The instrument must not be opened by the user. It contains high voltage circuits which can be capable of delivering a lethal electric shock.

CAUTION! Only spare parts approved or supplied by Amersham Pharmacia Biotech may be used for maintaining and servicing the instrument.

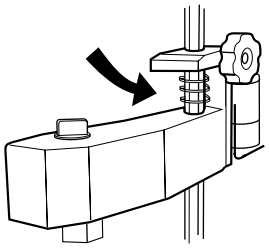
5.1 Faults and actions

If the suggested actions do not correct the fault, call Amersham Pharmacia Biotech.

Fault	Action
No tube change	1 Select **FeedTube** from the menu **System Control:Manual:Flowpath**. If the motor does not start and an error appears, call Amersham Pharmacia Biotech.
	2 Push delivery arm out to a safety stop. Select **FeedTube** from the menu **System Control:Manual:Flowpath**. If the motor starts press the tube sensor together within 2 seconds. The motor should stop without an error code reported. If an error appears, check the connection in the arm. If correct, the sensor or sensor connection are faulty. Call Amersham Pharmacia Biotech.
Tubes skipped	1 The spring tension may be insufficient. Perform the actions listed in Section 5.2.
Drop synch. is not functioning	1 The drop sensor photocell located above the tube sensor is dirty. Clean the photocell with a damp cloth.

5.2 Adjusting the spring tension of the delivery arm

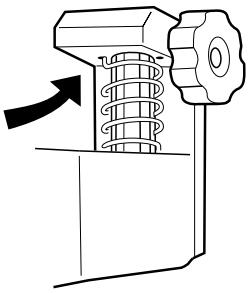
Incorrect spring tension can cause the fraction collector to skip tubes. This effect is greater as the arm moves in towards the centre.



Spring tension is temperature sensitive. Low temperature reduces the spring tension so it may be necessary to re-adjust the tension if the collector is used in a cold room.

1 Remove the arm bracket from the stand.

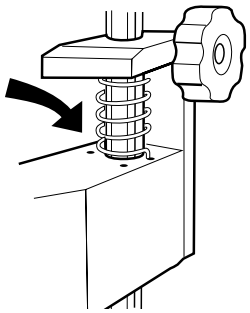
2 Dismantle the delivery arm from the arm bracket.



3 The top of the spring is fastened in one of two holes in the top of the arm bracket.

Looking at the arm bracket from the front of the unit, moving the spring from the right hand to left hand hole increases the tension and conversely moving from left to right decreases the tension.

Hold the spring near the top and pull or prise it down and out of the top hole. Insert the spring in the other hole.



4 The bottom of the spring is fastened in one of 4 holes, equally spaced 1/4 turn apart. To adjust the bottom of the spring, hold it near the lower end and lift or prise the bottom of the spring out of the hole.

To increase the tension move the spring counter-clockwise.

To decrease the tension move the spring clockwise.

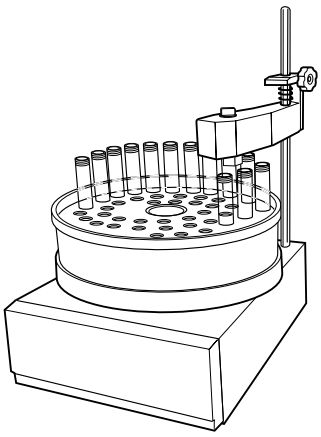
Reference information

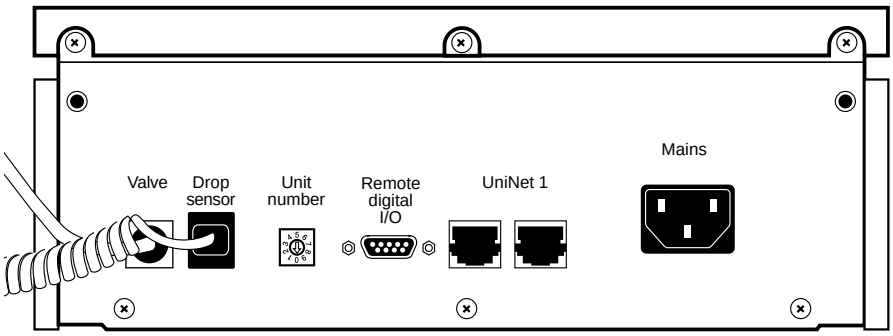
A Description

A.1 Instrument

Fraction Collector Frac-900/901 is an automated fraction collector for use in liquid chromatography as a part of an ÄKTAdesign chromatography system. The fraction collector features:

- Collection of up to 175 fractions
- Three sizes of tube rack for nominal tube diameters of 10-18 mm, 12 mm and 28 mm.



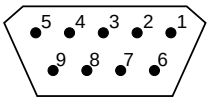


Connector/switch	Function
Valve	Flow diversion valve (only used in Frac-900)
Drop sensor	Drop counter and tube sensor
Unit number	UniNet identification number
Remote digital I/O	Connection of auxiliary equipment
UniNet 1	Computer network
Mains	Supply voltage, grounded

Note: The unit number should be 0 when only one fraction collector is used together with your ÄKTAdesign chromatography system.

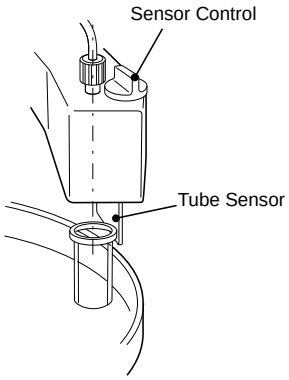
The instrument contains no internal user replaceable items.

Connect any auxiliary equipment to the 9-pole female D-SUB REMOTE connector.



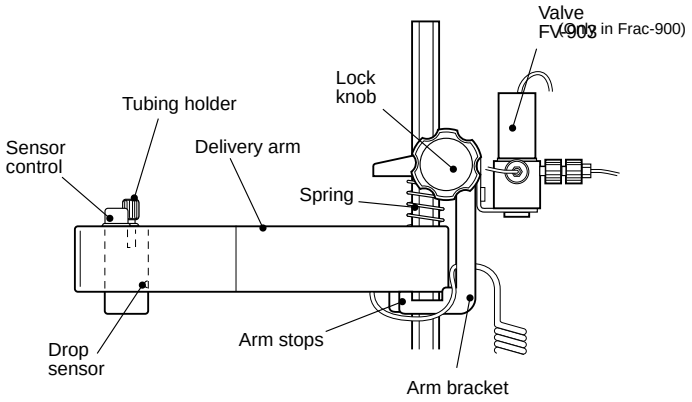
Pin	Signal	Function Active status = closed terminal to pin 5 (0 V)
1	Run/End	Active =fraction collector in Run mode.
2	-	
3	Feed	Active = one tube change.
4	–	
5	Ground	Signal ground 0 V.
6	Event mark	Output pulse at tube change. Pulse width 0.2 s.
7-9	–	

A.2 Delivery arm



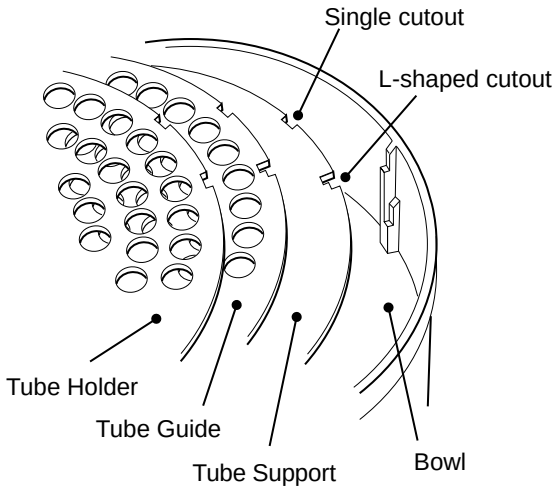
The delivery arm positions the delivery tubing over the collection tubes in the rack. A tube sensor rests against the top of the tube and the pressure of the tube sensor against the tube operates a switch which sends a signal to the control circuits. This signal is used to stop the motor so that the next tube is positioned correctly. The tube sensor position can be set for large or small diameter tubes by the red sensor control on the top of the delivery arm. This also ensures the liquid flow is positioned over the centre of the collection tubes. A drop counter is positioned above the tube sensor. This is used when the tube change is synchronized to drop release.

The arm is spring loaded and presses inwards towards the centre of the rack, moving inwards when no more tubes are located or when tubes are missing. The height of the arm can be adjusted when the lock knob is released. The pressure the arm exerts on the tubes can also be adjusted, refer to Section 5.2. The arm has two rest positions outside the rack, located by pulling the arm gently outwards until it passes over the required stop and is moved back to the operation position by lifting it up slightly so that it will pass over the stops.



A.3 Tube racks

The tube rack is a bowl into which a tube support, a tube guide and tube holder fit.



Note that the tube guide has both single and L-shaped cutouts, while the tube holder has only single cutouts.

The tube racks that are available are as follows:

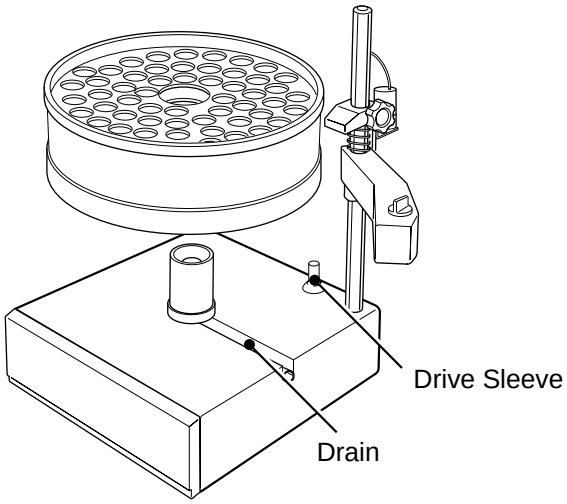
Rack	Max. tubes	Nom. tube diam.	Tube length
12 mm	175	12 mm	50-180 mm
18 mm	95	10-18 mm	50-180 mm
30 mm	40	28 mm	30-180 mm

The 12 and 30 mm racks are available as accessories.

An accessory available for use with the 12 mm tube rack is a double-ended Eppendorf tube holder (18-8522-01). One end holds 1.5 ml Eppendorf tubes, the other holds 0.5 ml tubes.

Collection tubes in the 18 mm rack are held securely in the tube holder by stainless steel spring clips. The tube support and tube guide can be placed at different heights to accommodate different length of tubes.

The bowl has a capacity of approx. 3.5 litres, ensuring that any spillage is safely contained. The bowl can also be filled with ice or ice water to form a cooling bath.

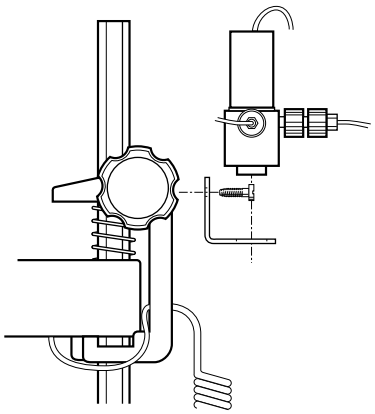


The tube rack is driven by the drive sleeve at the rear of the instrument. Collection is automatically stopped if movement of the tube rack is hindered.

A.4 Flow diversion valve (only in Frac-900)

The valve FV-903 is only attached in Frac-900, and allows the following functions to be used:

- Peak collection
  Liquid between peaks is directed to waste, or a separate container (see section 3.2).
- Flow diversion between tubes
  During tube changes liquid is redirected to waste, or a separate container. This minimises spillage even at high flow rates (see section 3.5).



B Technical specifications

Operating data

Max flow rate	100 ml/min
pH stability range	1 to 13, 1 to 14 (<1 day exposure)
Fraction size	0.05 - 100 ml (0.001 ml increments)
Environment	+4 to +40 °C 20-95% relative humidity 84-106 kPa (840-1060 mbar) atmospheric pressure

Tube Racks

Rack	Max. tubes	Nom. tube diam.	Tube length
12	175	12 mm	50-180 mm
18	95	10-18 mm	50-180 mm
30	40	28 mm	30-180 mm

Tube change time	Max change time for each track
12 mm rack	Track 1: 0.2sec Track 3: 0.3 sec Track 5: 0.4 sec
18 mm rack	Track 1: 0.3 sec Track 2: 0.4 sec Track 3: 0.5 sec Track 4: 0.6 sec
30 mm rack	Track 1: 0.4 sec Track 2: 0.55 sec Track 3: 0.7 sec

Physical data

Event mark	0.2 sec for both contact closure and TTL output in remote socket
Degree of protection	IP 20
Wetted materials	PTFE (polytetrafluoroethylene) ECTFE (ethylenechlorotrifluoroethylene)
Chemical resistance	The wetted parts of the flow diversion valve, the bowl and the racks are resistant to organic solvents and salt buffers commonly used in chromatography of biomolecules, except 100% ethylacetate, 100% hexane and 100% tetrahydrofuran (THF)
Power requirement	100–240 V AC, 50–60 Hz
Power consumption	20 VA
Dimensions, H x W x D	380 x 290 x 370 mm
Weight	5.5 kg

EMC Standards	This product meets the requirement of the EMC Directive 89/336/EEC through the harmonized standards EN 50081-1 (emission) and EN 50082-1 (immunity) Note: The declaration of conformity is valid for the instrument when it is • used in laboratory locations • used in the same state as it was delivered from Amersham Pharmacia Biotech except for alterations described in the user manual • connected to other CE labelled Amersham Pharmacia Biotech instruments or other products as recommended.
Safety Standards	This product meets the requirement of the Low Voltage Directive (LVD) 73/23/EEC through the harmonized standard EN 61010-1.

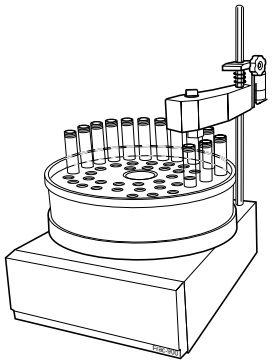
C Accessories and spare parts

Item	Quantity per pack	Code no.
Fraction Collector Frac-900 complete with 18 mm tube rack	1	18-1104-99
Fraction Collector Frac-901 complete with 18 mm tube rack	1	18-1118-97
Tube Racks, complete with bowl, tube support, holder and guide		
12 mm	1	19-8684-03
18 mm	1	18-3050-03
30 mm	1	18-1124-67
Tube support	1	18-3054-02
Tube Holder and Guide		
12 mm	1	19-7242-02
18 mm	1	19-8689-02
30 mm	1	18-1124-68
Tube spring, metal*	10	19-6057-01
Bowl	1	18-3051-03
Eppendorf tube holder for 12 mm rack	100	18-8522-01
Flow Diversion Valve, FV-903	1	18-1114-50
Tubing holder	1	18-6464-01
Funnel	1	19-6044-01
Funnel tubing 12/8, 250 mm	2	18-3020-01
Drive sleeve	5	19-6067-02
Spiral cable	1	19-8638-01
Mains distribution cable, 1 m	1	18-1032-08
Teflon tubing, i.d. 1/8", o.d. 3/16"	3 m	18-1112-47
Tubing connector for 3/16" o.d. tubing	10	18-1112-49
Ferrule for 3/16" tubing	10	18-1112-48
Stop plug, 5/16"	5	18-1112-50
Stop plug, 1/16"	5	18-1112-52
Union Luer female/1/16" male	2	18-1112-51
Union 1/16" female/M6 male	6	18-1112-57
Union M6 female/1/16" male	8	18-1112-58
PEEK tubing, i.d. 0.75 mm, o.d. 1/16"	2 m	18-1112-53
Teflon tubing, i.d. 0.75 mm, o.d. 1/16"	2 m	18-1112-54
PEEK tubing, i.d. 1.0 mm, o.d. 1/16"	2 m	18-1115-83
Fingertight connector 1/16"	10	18-1112-55

* Only for Tube rack 18 mm

Short instructions

The following short instructions are intended as a guide to users who are fully familiar with safety precautions and operating instructions described in this manual. The instructions assume that the instrument is installed according to the installation instructions.



Frac-900/901 is controlled from UNICORN. For manual control use the instructions found in **System Control:Manual:Flowpath**.

1 For collection of **fixed fraction volumes**, select the instruction **FractionCollector** and enter the fraction size to start collection.

2 For collection of **peaks,** select the instruction **PeakFractionation** and enter the peak size to start collection. The material between the peaks will be diverted to waste if the instruction **FractionCollector** is not used at the same time.

3 To **stop** collection select the instruction **FractionationStop** and/or **Peak_FracStop.**

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