

CombiFlash[®] Rf Installation Guide

For indoor use only

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CombiFlash[®] Rf Installation Guide

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CombiFlash[®] Rf Installation Guide

Section 1 Introduction

1.1 Documentation Overview

This Installation Guide provides:

- Safety Information
- Unpacking instructions
- Installation instructions, including placing the instrument on a network and direct connections with a Windows computer
- Certification and warranty information.

Once you are operating the CombiFlash Rf, you may refer to the Help menu for operating instructions and further assistance.

1.2 Product Overview

The Teledyne Isco CombiFlash Rf flash chromatography system gives you high-productivity automation, programmable gradients, UV detection and peak separation, and automatic detection of columns and collection tube racks. Its small size makes it a great “personal system” and well suited for operation within chemical hoods and other limited indoor spaces.

 WARNING
--

Avoid hazardous practices! If you use this instrument in any way not specified in this manual, the protection provided by the instrument may be impaired; this may increase your risk of injury.

The CombiFlash Rf system is available in different configurations:



Figure 1-1 CombiFlash Rf 75 system, 10–100 mL/min, 75 psi (without injection valve)

- For general-purpose Flash chromatography needs, the CombiFlash Rf can be factory-configured as a 10–100 mL/min, 75 psi system that pumps two solvents to form a binary gradient. This configuration has an easily accessible fluid path that supports liquid or solid sample introduction, and a fixed-wavelength UV detector (254 nm). Optionally, the system can be configured for full-spectrum (200–360 nm) UV detection with secondary monitoring, manual solvent selection valves to form a binary gradient from two of four solvent inlets, and a 4-port manual injection valve.



Figure 1-2 CombiFlash Rf 200 system, 5–200 mL/min, 200 psi (with automatic injection valve)

- For more advanced needs, the *CombiFlash Rf* can be factory-configured as a 5–200 mL/min (delivery flow rate), 200 psi system that forms a binary gradient by automatically selecting two solvents from four inlets. This configuration has an automatic, self-cleaning injection valve for sample introduction, and full-spectrum (200–360 nm) UV detection with secondary monitoring. An internal air pump is used for post-run column air purging, active solvent level sensing, and waste full bottle detection.

Note

This Installation Guide will use the term “*CombiFlash Rf*” when the context applies to all systems. This installation guide will refer to the specific model name when the discussion is limited to a particular configuration.

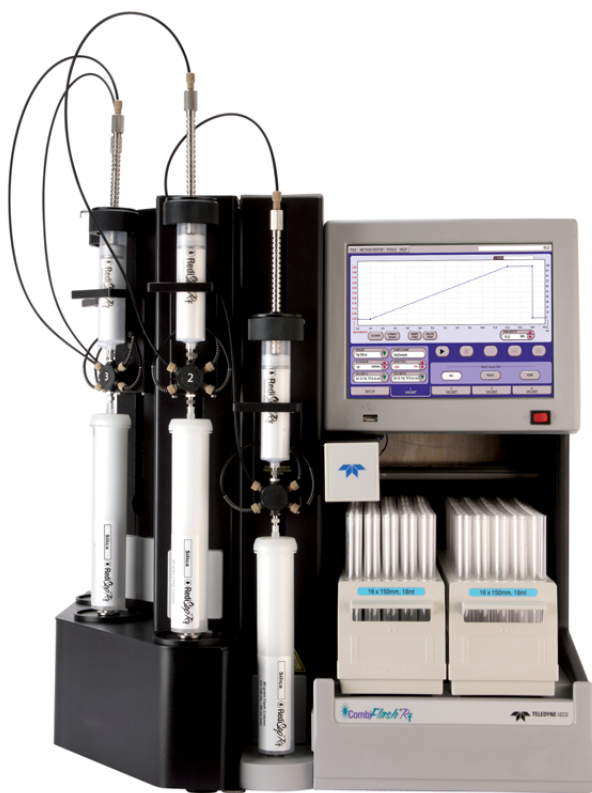


Figure 1-3 CombiFlash Rf 4x system

- To perform multiple, sequential purifications in a personal or workgroup setting, a 4x module can be added to the Rf 200 system. This configuration is known as the CombiFlash Rf 4x system, a fully automated four channel Flash chromatography system. Each of the four channels are independent—including separate waste containers with full bottle detection.

The CombiFlash Rf systems are optimized for use with Teledyne Isco's RediSep® Rf columns, which are pre-packed with a variety of media. For example, the CombiFlash Rf can purify samples from 4 milligrams to more than 33 grams using RediSep Rf columns loaded with 4 to 330 grams of silica gel.

Applications include purification of organic compounds for drug discovery, as well as research in agrochemicals, petrochemicals, natural products, polymers, and catalysts.

1.3 Operating Overview

The CombiFlash Rf system is equipped with the touch screen display for local control. For Windows computer control, the CombiFlash Rf system may be controlled by the computer in two different ways using TCP/IP protocol—direct or network. A direct connection uses a cross-over cable between Ethernet ports on the CombiFlash Rf and computer. A network connection allows control from a Windows computer on an established network. The Windows computer must have Microsoft Internet Explorer 6 or newer.

 Note

Teledyne Isco recommends that you obtain assistance from your Information Technology department before attempting direct or network connections to a Windows computer.

1.3.1 Multiple Control Possibilities

The system can be accessed from the built-in touch panel and up to ten network computers. The touch panel shares control with all connected computers. The system performs the most recent command from any control input.

1.3.2 File Storage

To support operation from a variety of direct and network connections, the software and all files are stored in the CombiFlash Rf on an internal hard drive. This ensures that your compound purification methods and run history files can be viewed from any connection. Optionally, individual run history files may be saved to a USB flash drive and the hard drive or a networked computer, and all run history files can be saved to a network drive.

1.4 Specifications

Table 1-1 CombiFlash Rf System Specifications ¹

	Rf 75 Systems (Without Inject Valve)	Rf 200 Systems (With Inject Valve)
Overall Dimensions	61 cm (24")×36 cm (14.1")×43 cm (17") (H×W×D)	
Weight	22.3 kg (49.2 lbs)	24.5 kg (54 lbs)
Power Options	Input voltage range from 100 to 240 VAC, 50/60 Hz, 2.0 Amps maximum. Line cord is the disconnect device.	
Line Frequency	50/60 Hz	
Ambient Temperature	20 to 40°C (maximum temperature must be at least 15°C below the boiling point of the solvent)	
Humidity (when connected to power)	95% relative humidity maximum at 20 to 40°C	
Flow Rate Range	10 to 100 ml/min	5 to 200 ml/min
Flow Rate Accuracy	±10%	±5%
Pressure Limit ²	517 kPa (75 psi)	Up to 1379 kPa (200 psi) (column dependent)
Pressure Accuracy	10% of full scale	5% of full scale
Gradient Formation	Binary gradient from A1 and B1 solvent inlets. Optional manual valves to select from A1, A2, and B1, B2 inlets.	Binary gradient from A1, A2, and B1, B2 solvent inlets. Solvent selection can be automatically controlled by the method.
Gradient Accuracy:	±5%	±1%
Peak Detection Modes	Slope or threshold	
Flow Cell Pathlength	0.1 mm, ±25%	
UV Detection Wavelength	254 nm fixed, optional 200 to 360 nm	200 to 360 nm, optional 200 to 780 nm UV-Vis
Monitor Wavelength with Purity Ratio	Optional	200 to 360 nm, optional 200 to 780 nm UV-Vis

**Table 1-1 CombiFlash Rf System Specifications ¹
(Continued)**

Wavelength Accuracy	±5 nm
Fraction Accuracy	±[2ml + (flow rate ÷ 60)]
Pollution Degree	2
Electrical Safety per EN 61010-1	
Installation Category	II
Maximum Altitude	2000 meters
Note 1. All specifications are subject to change.	
Note 2. For columns undetected by RFID, the max pressure is limited to 50 psi.	

Table 1-2 CombiFlash Rf 4x System Specifications ¹

Module Dimensions	61 cm (24")×21.6 cm (8.5")×43.2 cm (17") (H×W×D)
Module Weight	13.6 kg (30 lbs)
Overall Dimensions	61 cm (24")×57.6 cm (22.6")×43 cm (17") (H×W×D)
Overall Weight	40.8 kg (90 lbs)
Power Options	Input voltage range from 100 to 240 VAC, 50/60 Hz, 2.5 Amps system maximum, 0.5 amps module maximum. Line cord is the disconnect device.
Line Frequency	50/60 Hz
Ambient Temperature	20 to 40°C (maximum temperature must be at least 15°C below the boiling point of the solvent)
Humidity (when connected to power)	95% relative humidity maximum at 20 to 40°C
Flow Rate Range	5 to 200 ml/min
Flow Rate Accuracy	±5%
Pressure Limit ²	1379 kPa (200 psi)
Pressure Accuracy	5% of full scale

**Table 1-2 CombiFlash Rf 4x System Specifications ¹
(Continued)**

Gradient Formation	Binary gradient from A1, A2, and B1, B2 solvent inlets. Solvent selection can be automatically controlled by the method.
Peak Detection Modes	Slope or threshold
Flow Cell Pathlength	0.1 mm, ±25%
UV Detection and Monitor Wavelength	Selectable from 200 to 360 nm range. Optional 200 to 780nm UV-Vis detector.
Wavelength Accuracy	±5 nm
Fraction Accuracy	±[2ml + (flow rate ÷ 60)]
Pollution Degree	2
Electrical Safety per EN 61010-1	
Installation Category	II
Maximum Altitude	2000 meters
<p>Note 1. All specifications are subject to change. Note 2. For columns undetected by RFID, the max pressure is limited to 50 psi.</p>	

Table 1-3 Component Materials List

Component	Materials
Teledyne Isco RediSep Rf Cartridge	Virgin Polypropylene, silica-based media, polyethylene (HDPE) frits
Process Tubing	Carbon impregnated fluoropolymer tubing
Drain Tubing	Vinyl with FEP liner
Process Valves	PEEK, PTFE, perfluoroelastomer
Sample Loading Cap	316 stainless steel
Sample Loading Cap Seal	PTFE, Elgiloy ^a
Injection Valve	PTFE, PCTFE
Flowcell	303 SST, Type ES Quartz, SIMRIZ SZ485
Pump	316 stainless steel, PTFE, Elgiloy [®]

a. Elgiloy is a registered trademark of Combined Metals of Chicago, L.L.C.

1.5 Controls, Indicators, and Features

Figures 1-4 through 1-6 illustrate the controls on the CombiFlash Rf.

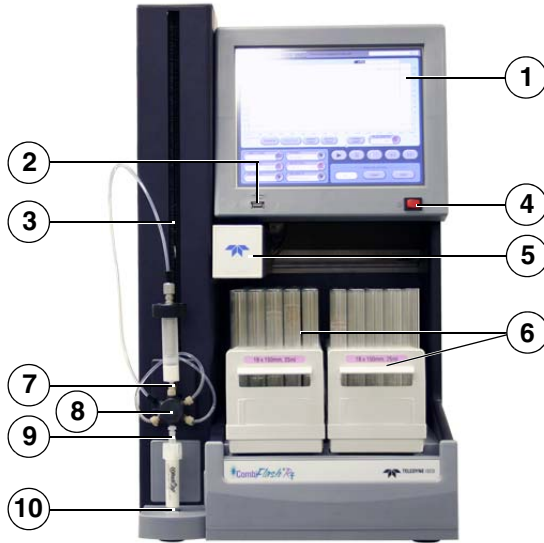


Figure 1-4 CombiFlash Rf Features (Front)

- 1. Touch Panel LCD display** – Large 10.5 inch display for system monitoring and control.
- 2. USB Port** – Convenient, front panel port that accepts USB Flash memory drive. A Flash drive may be inserted into this port for transferring files, importing and exporting methods, and performing system software updates.
- 3. Adjustable Column Mount** – The injection valve assembly and upper column mount slide along this mount so the system can accept a variety of column sizes.
- 4. On/Standby Switch** – 1 = On, 0 = standby.
- 5. Fraction Collector Arm and Drop Former** – The arm and drop former move to deposit liquid in the collection tubes.
- 6. Racks and Collection Tubes** – Racks hold the fraction collection tubes. Racks include an RFID tag which the system uses to read the rack type and collection tube size.

7. **Sample Injection Port** – Luer-type fitting to accept the sample though either a solid load sample cartridge (shown) or a liquid injection using a syringe or similar device.
8. **Injection Valve** – This six-way valve is automatically positioned by the CombiFlash Rf according to its current mode of operation. Modes include column equilibration, sample injection, elution, column flushing, valve cleaning, and system purging. The injection valve is not available on the standard Rf 75 systems.
9. **Upper Column Mount** – Secures the column inlet.
10. **Lower Column Mount** – Secures the column outlet.
11. **Top Shelf** – Allows storage of accessories and solvent bottles.
12. **Column Expansion Ports** – These ports allow the system to add column channels with an optional module. The 4x module option is not available for the 10 – 100 mL/min 75 psi systems.

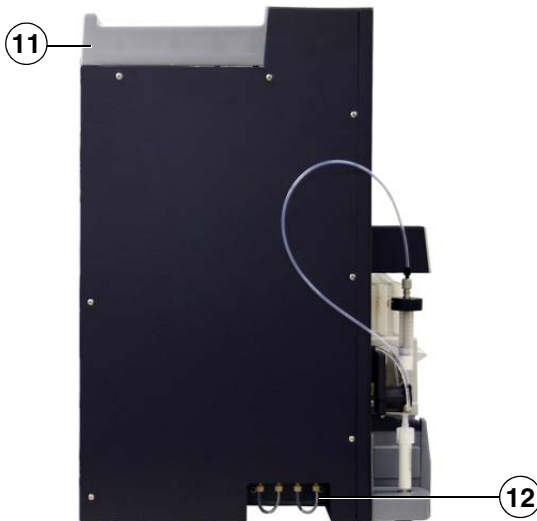


Figure 1-5 CombiFlash Rf Features (Side)

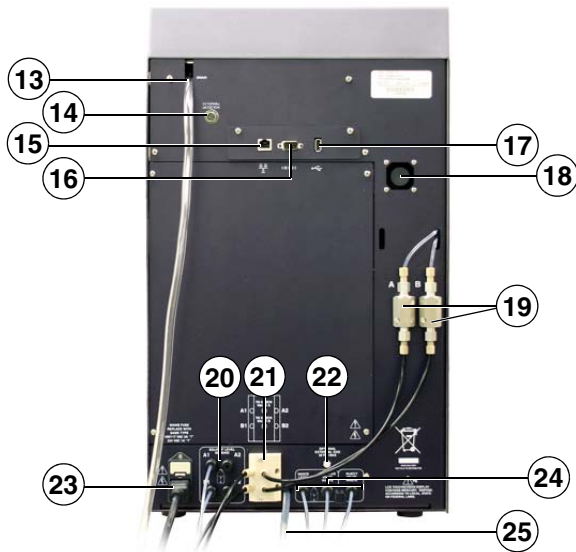


Figure 1-6 CombiFlash Rf Features (Back)

13. **Upper Drain Tube** – Liquids spilled on the top shelf are carried away through this tube to a user-supplied container.
14. **External Detector** – This connector is reserved for future peak detection capabilities.
15. **Ethernet Port** – An 8P8C jack for a network connection using a standard CAT5 cable, or for a direct connection to a computer using a cross-over cable.
16. **RS-232 Port** – Serial communication port to interface with expansion modules.
17. **USB Port** – For control of peripheral equipment such as the Rf 4x module. This rear panel port is also used in service-related functions.
18. **Cooling Fan** – Cools the internal electronic assemblies.
19. **Check Valves** – Externally-mounted pump check valves to simplify pump maintenance. The check valves are not present on the Rf 75 systems.

- 20. Solvent Level Sensing Outlet Ports** – uses air or user-supplied gas to measure the hydrostatic pressure of the solvent above the weighted tubing outlet. The ports are not present on the Rf 75 systems.
- 21. Solvent Inlet Ports** – Accepts A and B solvents. The Rf 75 system does not use the 4-port block. Refer to Section 3.4 for more information on Rf 75 solvent inlet ports.
- 22. Optional External Gas Port** – An inlet for an internal pump which supplies pressurized air or user-supplied gas for solvent level sensing, waste container full detection, and system/column purges. The external gas should be regulated to 2–5 psig before connecting the source to this port. The port is not present on the Rf 75 systems.
- 23. Mains Power** – Connects the system to AC line voltage.
- 24. Waste Ports** – From left to right:
- **Waste Level Sense** – The system uses air or user-supplied gas to measure the hydrostatic pressure of the waste above the level sense line end. The system will suspend operation when this level is too high. This port is not present on the Rf 75 systems.
 - **Diverter Valve Waste** – The diverter valve on the fraction collector arm sends fluid to this waste port.
 - **Inject Valve Waste** – The injection valve is cleaned after each run. The system directs fluids from this automatic cleaning routine to this port.
- 25. Lower Drain Tube** – This tube carries away liquids spilled onto the rack area.
- 26. Waste Level Sense** – The system uses air or user-supplied gas to measure the hydrostatic pressure of the waste above the level sense line end. The system will suspend operation when this level is too high. Four ports allow you monitor the level of each waste container on the Rf 4x system.
- 27. Column Waste** – Waste fluids are sent out ports one through four. Tubing connected to these ports are paired with the waste level sense air lines and routed to a collection container for each channel.

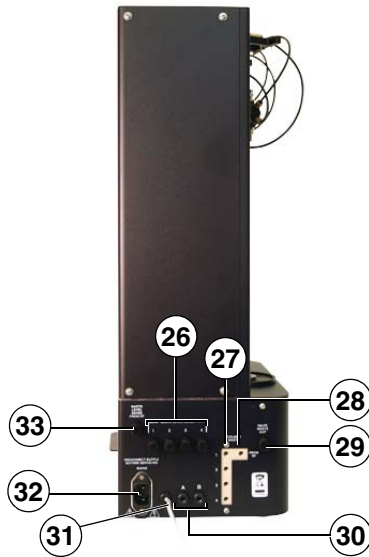


Figure 1-7 Optional CombiFlash Rf 4x Module Features (Back)

- 28. **From Rf** – This port on the Column Waste block receives fluid from the diverter valve on the fraction collector arm.
- 29. **Valve Waste Out** – The injection valves on channels 2 through 4 are cleaned after each run. The system directs fluids from this automatic cleaning routine to this shared port.
- 30. **A B** – reserved for future use.
- 31. **USB Cable** – This cable connects to the USB port on the Rf 200 system back panel (see item 17). The Rf 200 system controls the operation of the Rf 4x module through this connection.
- 32. **Mains Power** – Connects the module to AC line voltage.
- 33. **Waste Level Sense From Rf** – Receives pressurized air or optional external gas from the Rf 200 system.

1.6 Safety

Before installing, operating, or maintaining this equipment, it is imperative that all hazards and preventive measures are fully understood. While specific hazards may vary according to location and application, take heed in the following general warnings:

 **WARNING**

Avoid hazardous practices! If you use this instrument in any way not specified in this manual, the protection provided by the instrument may be impaired.

 **WARNING**

Liquids associated with this instrument may be classified as carcinogenic, biohazard, flammable, or radioactive. Should these liquids be used, it is highly recommended that this application be accomplished in an isolated environment designed for these types of materials in accordance with federal, state, and local regulatory laws, and in compliance with your company's chemical/hygiene plan in the event of a spill.

 **WARNING**

If you are using flammable solvents or chemicals with this system, vapor concentration levels may exceed the maximum exposure levels as recommended by OSHA Guide 1910.1000. To reduce those levels to a safe exposure, Teledyne Isco recommends that you place the system in a laboratory hood designed for the purpose of ventilation. This hood should be constructed and operated in accordance with federal state and local regulations. In the event of a solvent or chemical spill, your organization should have a plan to deal with these mishaps. In all cases, use good laboratory practices and standard safety procedures.

 **WARNING**

The *CombiFlash Rf* has redundant safety devices to limit pressure to less than 210 psi (1448 kPa). *RediSep* columns smaller than 100 g are CE certified using standard IEC61010-1 for use on the *CombiFlash Rf*. *RediSep* columns larger than 100 g meet Pressure Vessel Directive 97/23/EC. Teledyne Isco strongly recommends against the use of columns rated less than 210 psi (1448 kPa).

1.6.1 Hazard Severity Levels

This manual applies *Hazard Severity Levels* to the safety alerts. These three levels are described in the sample alerts below.

 **CAUTION**

Cautions identify a potential hazard, which if not avoided, may result in minor or moderate injury. This category can also warn you of unsafe practices, or conditions that may cause property damage.

 **WARNING**

Warnings identify a potentially hazardous condition, which if not avoided, could result in death or serious injury.

 **DANGER**

DANGER – limited to the most extreme situations to identify an imminent hazard, which if not avoided, will result in death or serious injury.

1.6.2 Hazard Symbols

The equipment and this manual use symbols used to warn of hazards. The symbols are explained in Table 1-4.

Table 1-4 Hazard Symbols













Warnings and Cautions	
	The exclamation point within the triangle is a warning sign alerting you of important instructions in the instrument's technical reference manual.
	The lightning flash and arrowhead within the triangle is a warning sign alerting you of "dangerous voltage" inside the product.
	The pinch point symbol warns you that your fingers or hands will be seriously injured if you place them between the moving parts of the mechanism near these symbols.
Symboles de sécurité	
	Ce symbole signale l'existence d'instructions importantes relatives au produit dans ce manuel.
	Ce symbole signale la présence d'un danger d'électrocution.
	Risque de pincement. Ces symboles vous avertit que les mains ou les doigts seront blessés sérieusement si vous les mettez entre les éléments en mouvement du mécanisme près de ces symboles
Warnungen und Vorsichtshinweise	
	Das Ausrufezeichen in Dreieck ist ein Warnzeichen, das Sie darauf aufmerksam macht, daß wichtige Anleitungen zu diesem Handbuch gehören.
	Der gepfeilte Blitz im Dreieck ist ein Warnzeichen, das Sie vor "gefährlichen Spannungen" im Inneren des Produkts warnt.
	Vorsicht Quetschgefahr! Dieses Symbol warnt vor einer unmittelbar drohenden Verletzungsgefahr für Finger und Hände, wenn diese zwischen die beweglichen Teile des gekennzeichneten Gerätes geraten.

Table 1-4 Hazard Symbols (Continued)

Advertencias y Precauciones	
	Esta señal le advierte sobre la importancia de las instrucciones del manual que acompañan a este producto.
	Esta señal alerta sobre la presencia de alto voltaje en el interior del producto.
	Punto del machacamiento. Sus dedos o manos seriously serán dañados si usted los coloca entre las piezas móviles cerca de estos símbolos.

1.7 For Additional Information

Technical assistance for the CombiFlash Rf system can be obtained from:

Teledyne Isco, Inc.

4700 Superior St.
Lincoln NE 68504

Phone: (800) 228-4373 or (402) 464-0231

Fax: (402) 465-3001

E-mail: IscoService@teledyne.com

CombiFlash[®] Rf Installation Guide

Section 2 Preparation: Rf 200 Systems

This section provides instructions for unpacking and installing the CombiFlash Rf 200 system. To prepare the system for operation, sequentially follow all instructions in sections 2.1 through 2.12.

Note

Section 2.14 contains an Installation Qualification checklist. If required, sign off the checklist entries as you successfully complete the following sections.

2.1 Unpacking the Unit

The CombiFlash Rf 200 system is shipped in a single carton. The optional 4x expansion module is shipped in a second carton. Carefully unpack the shipment and inspect the contents.

 **WARNING**

The system is heavy. Use a two-person lift to prevent injury.

 **CAUTION**

Do not lift the system by the fraction collector arm. Use the lifting handles located on the instrument side panels.

If there is any damage to the shipping carton or any components, contact the shipping agent and Teledyne Isco (or its authorized representative) immediately.

⚠ WARNING

If there is any evidence that the system has been damaged in shipping, do not plug it into AC power. Contact Teledyne Isco or its authorized representative for advice.

Compare the contents of the boxes with the enclosed packing slips. If there are any shortages, contact Teledyne Isco immediately.

The fraction collector arm was stowed to prevent damage during shipping. The arm stowing bracket should be removed at this time.

1. Loosen the bracket's two thumbscrews along the sides of the arm (Figure 2-1).

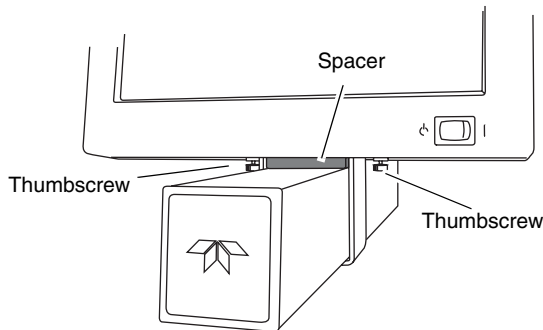


Figure 2-1 Remove arm stowing bracket and spacer

2. Push the arm to the left or right remove the spacer.
3. Store the bracket and spacer. These parts should be reinstalled if the system must be shipped again.

2.2 Instrument Location

The CombiFlash Rf 200 has a relatively small footprint, requiring about 1550 square centimeters (240 in²) of level bench space. Ensure that the CombiFlash Rf has at least 3 cm (1.25") of air space behind it for ventilation. Additional space may be required for solvent and waste containers.

The optional 4x expansion module is installed to the left of the CombiFlash Rf 200. This module requires an additional

933 cm² (145 in²) of level bench space. Ensure that the module has at least 3 cm (1.25") of air space behind it for ventilation. Instructions for installing the 4x module can be found in Section 4 of this guide.

Refer to Table 1-1 for environmental conditions and power requirements.

 **WARNING**

The system is heavy. Use a two-person lift to prevent injury.

Before making any connections to the *CombiFlash* Rf 200, place the system on the bench or in the fume hood where it will be operated. Temporarily position the system so you can access the back panels to complete the connections.

2.3 Connect Power

Ensure that the On/Standby switch below the touch screen panel is in the Standby position. Then, use the supplied IEC power cord to connect the *CombiFlash* Rf 200 to mains power.

 **WARNING**

Mains power must meet the voltage, frequency, and amperage requirements listed on the serial number label.

 **WARNING**

As long as the AC mains power cord is connected, power is inside the unit. The mains power cord is the disconnect device. Position the Rf 200 system so that the power cord can be unplugged, or use a power strip where the plug can quickly be removed from the outlet in the event of an emergency.

2.4 Connect Solvent Lines

 **WARNING**

Risk of fire ignited by electrostatic discharge. Never substitute the black tubing on *CombiFlash* systems. The black tubing (P/N 023-0503-06) is conductive. This tubing is required to dissipate static electricity.

 **CAUTION**

To prevent damage or premature wear to the pump and internal valves, clean solvent should be used. The solvent should not contain any dissolved solids.

The CombiFlash Rf 200 system has four solvent inlet ports on the back panel: two A solvents and two B solvents.

The system requires at least one A and one B solvent to form a binary gradient, and assumes that the B solvent is stronger than A. The second set of inputs allow you to form alternative binary gradients, or to change the B solvent mid-run.

Accessory package P/N 60-5239-006 includes several pieces to complete the solvent inlet connections.

Figure 2-2 shows the recommended connections when the user-supplied solvent container has a 38 or 45 mm opening (GL 38 or GL 45).

If the container does not have a GL 38 or GL 45 opening, omit the use of the cap. Ensure that the solvent and air tubing are secured so that the weighted filter remains at the bottom of the solvent source.

The Solvent Level Sensing air line connects to the back panel with a compression fitting. This fitting must be airtight. To connect tubing using the compression fittings:

1. Slide the nut and ferrule onto the tubing as shown in Figure 2-2.
2. Fully insert the tubing into the threaded bulkhead fitting on the back panel of the system.
3. Finger-tighten the nut onto the threaded bulkhead fitting. This will seat the ferrule in the fitting.

 **Note**

When using higher-density solvents such as dichloromethane (DCM), place the solvent container level with or above the CombiFlash Rf system. Placing solvent containers below the level of the system can contribute to decreased flow due to the high vapor pressure of DCM. This problem becomes more pronounced as the ambient temperature increases.

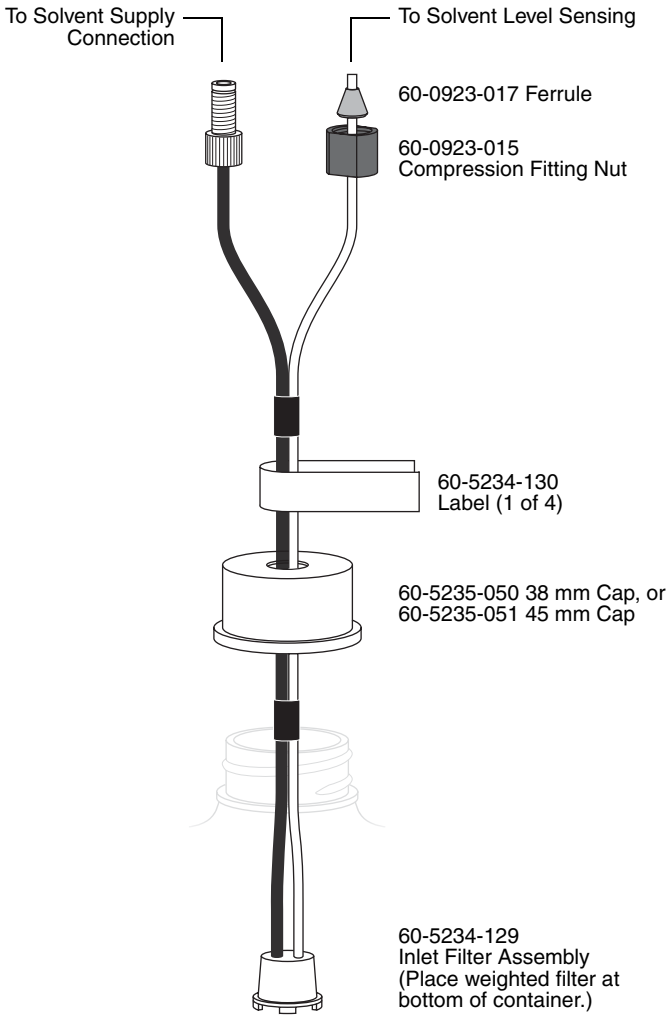


Figure 2-2 Recommended solvent connection

2.5 Connect Waste Lines

 **WARNING**

Risk of fire or equipment damage. Failure to connect Waste Port tubing may allow organic solvents to pool in unsafe areas, possibly creating dangerous levels of flammable vapors.

 **WARNING**

Risk of fire ignited by electrostatic discharges. Never substitute the black tubing on CombiFlash systems. The black tubing (P/N 023-0503-06) is conductive. This tubing is required to dissipate static electricity.

 **CAUTION**

Elevated flammable vapor levels are possible. Ensure that the waste container is adequately ventilated, preferably by placing it in a fume hood.

The system has two waste outlets on the back panel: Diverter Valve waste and Inject Valve waste. You can route waste to a common collection container, or to individual containers.

The Waste Level Sense uses air pressure to detect the liquid level in the common waste container. If using individual containers, use the waste level sense to detect the level of the Diverter Valve waste container. Under normal operating conditions it will fill faster than the Inject Valve waste container. Empty both containers at the same time to prevent overflowing the unmonitored container.

Accessory package (P/N 60-5239-006) includes parts to complete the waste connections. Figure 2-3 shows the recommended connections for user-supplied waste containers with either a 38 or 45 mm opening (GL 38 or GL 45).

Refer to the steps in section 2.4 to connect the tubing to the system using the compression fittings. Then, complete the connections (refer to Figure 2-3):

1. Push the three tubes through the cap.

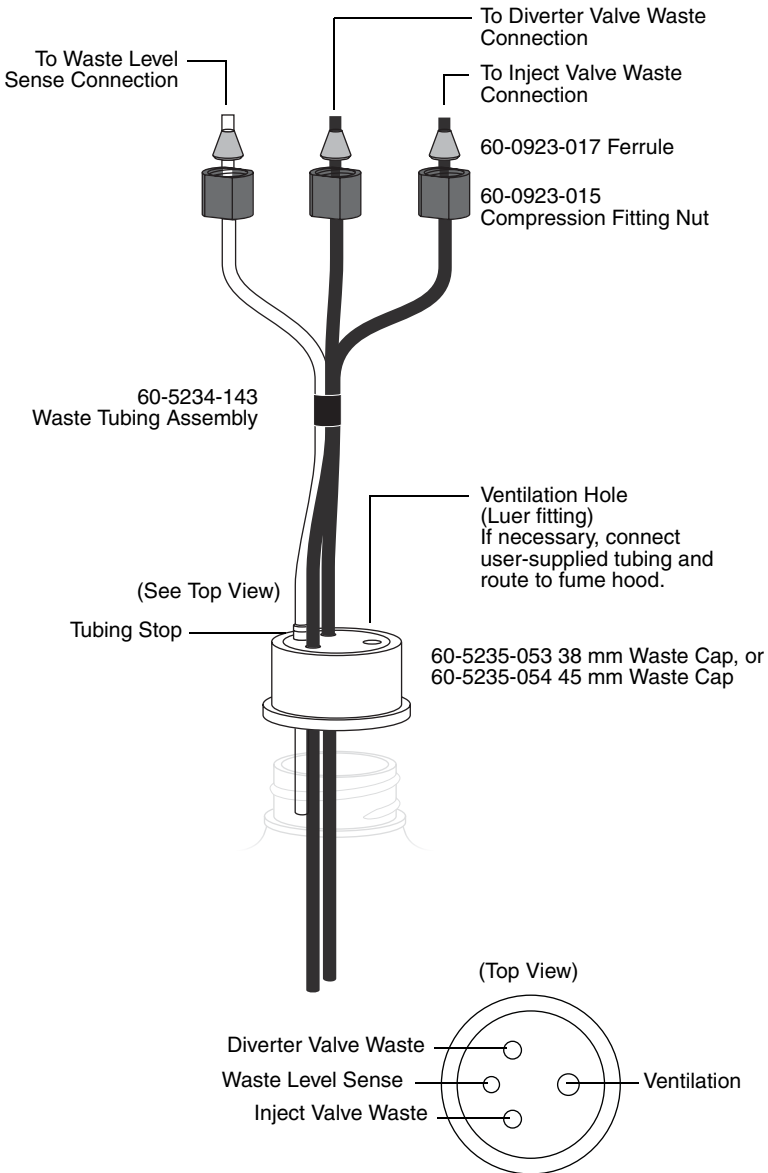


Figure 2-3 Recommended waste connections, with plastic plate

2. Push the stop on the Waste Level Sense tubing against the cap. This ensures that the Waste Level Sense tubing is far enough into the container to detect when it is nearly full.

Should the container not have a GL 38 or GL 45 opening, omit the use of the waste cap. Ensure the solvent tubes are secured so they drain into the waste container. Secure the Waste Level Sense air tubing so its outlet is at least two inches (5 cm) below the container's maximum level.

 **Note**

When using higher-density solvents such as dichloromethane (DCM), ensure that the waste container is no more than 3 feet below the supply solvent levels. Placing solvent containers above the system and waste containers on the floor may cause the internal check valves to open and allow solvent to flow through the system when in the standby state.

2.6 Optional External Gas

The CombiFlash Rf 200 system has an internal air pump that provides compressed air for solvent and waste level sensing. Optionally, the system can deliver a compressed gas. Inert or other gases may be more suitable than air for some applications.

If ambient air is compatible with your solvents and waste, simply leave the Optional External Gas port open.

If you want to use a gas instead of air, connect user-supplied 1/8" I.D. tubing to the Optional External Gas port. Connect the other end to the user-supplied compressed gas. The external compressed gas should be dry, filtered, and regulated to 2–5 psi (0.14–0.34 atm, 13.8–34.5 KPa).

2.7 Connect and Route Drain Lines

 **WARNING**

Risk of fire or equipment damage. Failure to connect drain lines may allow organic solvents to pool in unsafe areas, creating a potential for dangerous levels of flammable vapors. Improper draining may damage the instrument's internal components.

The CombiFlash Rf 200 system has drain tubes extending from its top shelf and back panel. The tubes drain away any liquid spilled on the top shelf and the tray beneath the fraction collection racks.

1. Test the Fraction Collector drain by connecting a vacuum or air supply source to the outlet end of the drain tube. Then, verify the presence of such vacuum or air supply source on the drain (Figure 2-4).
2. Test the top shelf drain by connecting a vacuum or air supply source to the outlet end of the drain tube. Then, verify the presence of such vacuum or air supply source on the drain (Figure 2-5).
3. Route the end of both drain tubes to a suitable waste fluid collection container.

Note

It may be necessary to extend the drain tube. If so, splice the tubing with user-supplied tubing. The user-supplied tubing should have an inside diameter no smaller than the existing drain tubing, and must be compatible with the solvents used by the system. Route this extension tubing to the waste collection vessel.

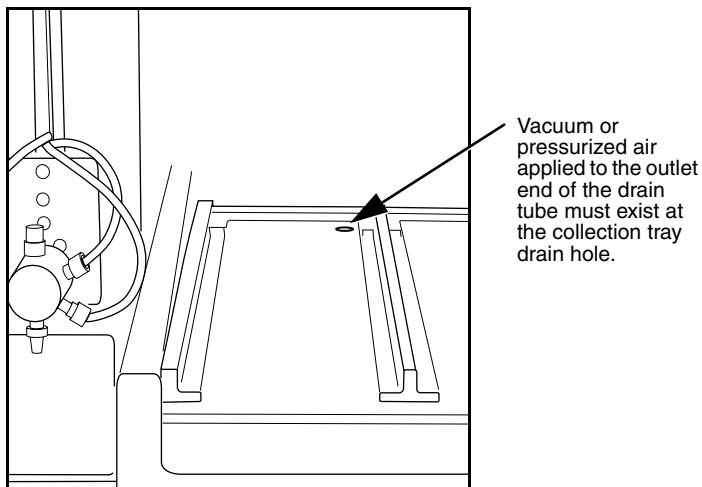


Figure 2-4 Fraction Collector Drain

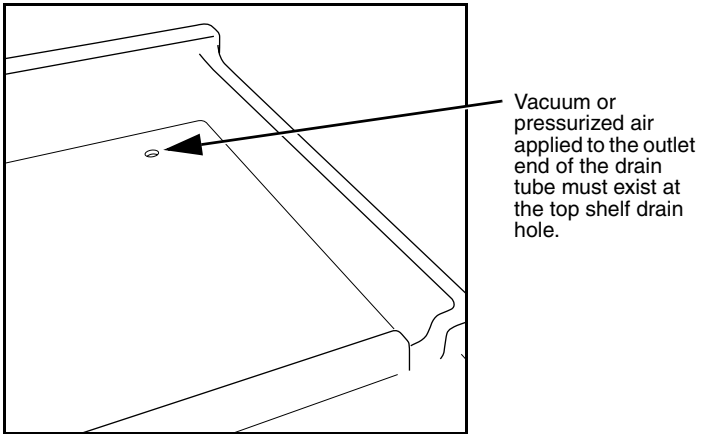


Figure 2-5 Top Shelf Drain

2.8 Position the System

After completing the various connections, the system can be moved to its operating position. Turn the system so that the operator can access all of the front view features and controls (Figure 1-4). Use care not to damage the connections, tubing, and cables while moving the system.

 **CAUTION**

Ensure that the CombiFlash Rf has at least 3 cm (1.25") of air space behind it for ventilation.

Position the solvent and waste containers as necessary.

 **Note**

When using higher-density solvents such as dichloromethane (DCM), place the solvent container level with or above the CombiFlash Rf system. Placing solvent containers below the level of the Rf can contribute to decreased flow due to the high vapor pressure of DCM. This problem becomes more pronounced as the ambient temperature increases.

✔ Note

When using higher-density solvents such as dichloromethane (DCM), ensure that the waste container is no more than 3 feet below the supply solvent levels. Placing solvent containers above the system and waste containers on the floor may cause the internal check valves to open and allow solvent to flow through the system when in the standby state.

2.9 Install Collection Tube Racks

Before beginning a run, you must load collection racks with tubes onto the system's fraction collector tray.

Your system was shipped with two collection tube racks. The following tube rack sets are available:

- **60-5237-013** – Two racks for 13×100 mm test tubes (8 mL). Total tubes: 216.
- **60-5237-031** – Two racks for 16×125 mm test tubes (15.5 mL). Total tubes: 150.
- **60-5237-032** – Two racks for 16×150/160 mm test tubes (18 mL). Total tubes: 150.
- **60-5237-033** – Two racks for 18×150 mm test tubes (25 mL). Total tubes: 140.
- **60-5237-034** – Two racks for 18×180 mm test tubes (30 mL). Total tubes: 140.
- **60-5237-035** – Two racks for 25×150 mm vials (50 mL). Total vials: 60.
- **60-5237-040** – One rack for 480 mL French square bottles.
- **60-5394-469** – Two racks for 28×61 mm scintillation vials (20 mL). Total vials: 54.
- **60-5394-468** – Two racks for 28×95 mm scintillation vials (40 mL). Total vials: 60.

To load the racks:

1. Insert test tubes, vials, or bottles into the rack (Fig. 2-6).

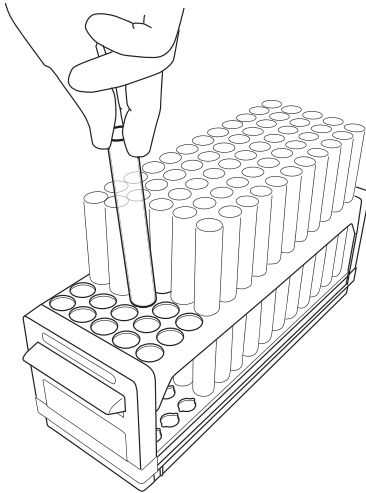


Figure 2-6 Loading test tubes

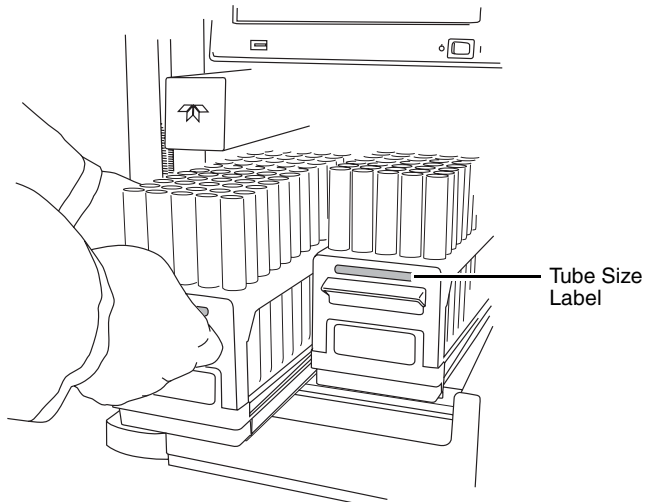


Figure 2-7 Inserting the collection tube rack

 **CAUTION**

Risk of broken glass or equipment damage. Do not load test tubes longer than the length listed on the tube size label.

2. While holding the rack with the tube size label visible (Figure 2-7), insert the racks into the system. Slide the rack in until you feel it drop into its seated position.

 **CAUTION**

An incorrectly installed rack will cause the rack to be misaligned under the fraction collector arm. Misaligned racks might cause fractions to miss the tube opening or deposit in the wrong tube. Always ensure the tube size label is visible (that is, facing outward) and the rack is pushed in until it is seated.

When you turn the power switch to on, the system will automatically detect the type of rack, and configure program settings accordingly. Later, in section 2.11.5, you can configure the maximum volume for each tube size.

2.10 Turn on Power

The system's power switch is located just below the touch screen panel.

1. Turn the switch to the ON position. The system will begin its startup routine which includes self diagnostics.
2. Monitor the movement of the fraction collector arm. The arm should move to the left rear corner of the fraction collector area. You should not hear any grinding noises during the homing sequence. If grinding is heard there is a problem with the homing of the fraction collector arm.
3. The system is ready for operation when the PeakTrak screen is displayed.

2.11 Configure the System

Before operating the system, it should be configured for the desired operation. To configure the system, open the Configuration window by selecting Tools>Configuration from the PeakTrak menu.

The configuration window has three tabs: Instrument Configuration, Network Configuration, and User Preferences. Network Configuration settings are discussed later in Section 6, *Remote Interfaces*.

Adjust the following (sections 2.11.1 through 2.11.6) on the Instrument Configuration and User Preferences tabs for the desired operation and then click OK to save the settings.

2.11.1 Solvents

When you installed the system, up to four solvents were connected to the back panel. This section of the Instrument Configuration tab allows you to manage these solvents. To do so:

<input checked="" type="checkbox"/> Note

The system is shipped with common solvent names already loaded. If your solvent names are listed in the solvent drop-down list boxes, skip steps 1 through 3.

1. Click the “Add Solvent” button.
2. Enter the solvent name and click the OK button.
3. Repeat steps 1 and 2 for all solvents.
4. For the Solvent A1 drop-down list box, select the solvent name connected to the A1 Solvent Inlet Port. Repeat for Solvents A2, B1, and B2.
5. Select the “Enable solvent level sensing” check box to enable this feature (recommended). Clear this box to disable this feature.

The solvent level sensing feature will monitor solvent usage to minimize the risk of running out of solvent during a purification run. The system compares the volume required for a purification run with the estimated volume in the solvent container and alerts you when there is not enough.

6. If using the solvent level sensing feature, enter the Minimum Solvent Level (density dependent) as a range in centimeters.

To understand this range, consider that dichloromethane is more dense than hexane. If the selected range is 2–4, the system triggers an alert when the dichloromethane level falls to about 2 cm above the weighted filter. At the same selected range, the system would trigger an alert when the hexane falls to about 4 cm above the weighted filter.

2.11.2 General Settings

CombiFlash Rf Name (optional) – Use this option to name your system. The name will appear in operational displays and run summaries. This feature is useful when your laboratory has more than one *CombiFlash* Rf system.

Time Zone – Select your time zone from the drop-down list box.

2.11.3 Set Date/Time

Click this button to open a window from which you can set the system date and time.

To prevent unauthorized time changes, this feature is password protected. The system is shipped with the password set to *combiflash*. Use the Tools>Set Password menu command to change this password for greater security.

2.11.4 Vapor Limit

The system has an internal vapor sensor that detects vapors present in the immediate atmosphere. When the limit is exceeded, the *CombiFlash* Rf will shut down to avoid a hazardous condition.

Teledyne Isco recommends using the default setting of 25. This value represents an organic vapor level slightly above the ambient vapor level of a well-ventilated laboratory.

A setting below 25 could cause random alarms without significant vapors present. If PeakTrak displays a Vapor Limit alarm while the Vapor Limit is set at 25, perform the following checks on your laboratory and the instrument:

- Ensure that no open containers or spills of organic solvent are in close proximity to the system.

- Ensure that the system is located in a well-ventilated area.
- Ensure that there is no visible solvent leakage from the system.

If PeakTrak continues to display the Vapor Limit alarm after you have made these checks and corrected any problems found, it is likely that organic vapors are present in the ambient environment of your laboratory. In this case, increase the setting of the Vapor Limit. Settings greater than 25 are appropriate for laboratory environments with a somewhat elevated background solvent vapor concentration, representing a safe setting, but one with a reduced margin for error.

2.11.5 Set Default Tube Volumes

Click this button to open a window from which you can set the default volume of the collection tubes. You can increase or decrease these values to set the desired default volume collected in each container. Just be sure you don't overflow the containers by exceeding their capacity.

The system will automatically advance to the next tube when this default volume is met in each tube. Keep in mind that advanced method settings (discussed in Section 5 and the on-line help) may override this default setting. During a run, other factors such as automatic tube advances for detected peaks will affect collected volume.

2.11.6 User Preferences

View the User Preferences tab to configure system operation for each user. Select a user from the drop-down list and configure the following:

 Note

New systems will only have one user account named "common."

Language – Select the user's desired language from the drop-down list box.

Automatically Print Report at End of Run – if this option is enabled, the system will print a report at the end of each run.

✓ Note

This option requires the system to be configured for network operation and a connection to a printer on the network. Network settings are discussed in Section 6, *Remote Interfaces*. Do not select this option for these initial installation steps.

Default Run Units – Run units are displayed along the X-axis of the chromatogram. Select Time (in minutes) or Column Volumes. A column volume unit is the time it takes to pump enough solvent to exchange the volume held by the column. The duration in minutes will vary according to the column media and size, and the flow rate.

Gradient Method – Select the standard gradient type (Figure 2-8).

- *Linear* – The system gradually mixes solvents A and B from the last programmed %B until it reaches the next programmed %B. This method connects the inflection points that define the gradient with a straight line.
- *Step* – The system holds each %B value until it reaches the next programmed %B. Because the system holds the %B values, the changes at each new value are nearly instantaneous, producing a stepped appearance on the plot area.
- *Isocratic* – The system holds the initial solvent mix for the entire run.

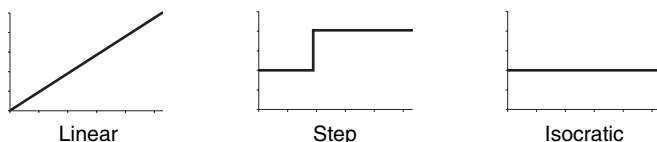


Figure 2-8 Gradient types

Enable Run Length Extension – When enabled, this option automatically extends the run if a peak is eluting at the end of the maximum %B gradient. This ensures that a late-eluting peak fully comes off the column and is collected.

An automatic run extension is a five-minute isocratic hold added to the end of the run's maximum %B gradient profile.

During the extension, the system continues to pump the maximum %B solvent mixture. Should the system still detect a peak after an extension, the system will add another, up to a maximum of three extensions.

Occasionally, compounds might come off the column once the %B returns to the minimum value at the end of a run. If the Run Length Extension is enabled, it will automatically extend the run one time to clear the column and plumbing of any remaining material.

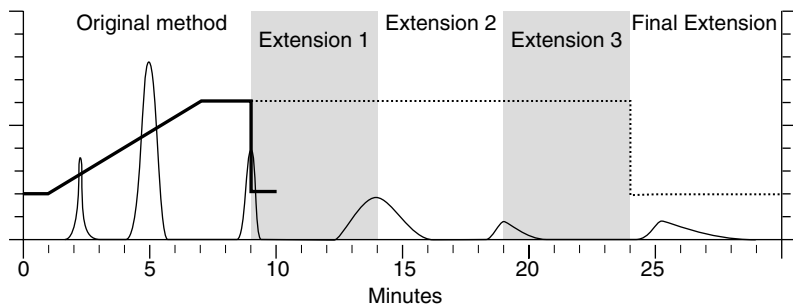


Figure 2-9 Automatic Run Extension Examples

Figure 2-9 illustrates the possible run extensions. The original method was programmed to rise to the maximum %B over seven minutes, hold for two minutes and return to the minimum %B for a final minute. At nine minutes, a peak was eluting. The system extended the run, holding the %B at the maximum level for another five minutes. This also occurred at fourteen and nineteen minutes, resulting in the second and third extensions. At 24 minutes, the %B solvent strength returned to zero. Before the final minute elapsed, more compound was detected, causing the system to extend the run for a final five minutes at the minimum %B.

Enable rapid equilibration – select this option to equilibrate the column at a high flow rate.

Note

Due to the high pressure that is possible during rapid equilibration, this option may not be desirable for some column media or purification methods.

2.12 Prime the Solvent Lines

Before the first use, the system should be primed. Ensure that the solvent containers are filled, then:

1. Select the “Tools>Auto prime” menu command.
2. Select the desired A and B solvents from the drop-down list boxes.
3. Click the Play button to start priming the system.

The system pumps 100% Solvent B through the system and out the Waste port, and then repeats with 100 % Solvent A. (This B-A order leaves the internal lines filled with solvent more appropriate for the beginning of a purification run.)

Note

When priming the first time, inspect the solvent and waste connections to the system. If any leaks are observed, click the Cancel button to stop the Auto Prime. Correct the leak by tightening the fitting an additional $\frac{1}{4}$ turn, and then restart the Auto Prime from step 1.

To advance to the next Auto Prime step, you can click the Fast Forward button. The Auto Prime window closes when finished.

After Auto Priming, the system is ready for operation (Section 5).

Note

Use Auto Prime for quick solvent changes by pumping a fixed amount of solvent through the waste fluid path at 100 mL/min. For more advanced priming functions such as varying the flow rates, fluid paths, *etc.*, or to purge the system with air before changing between normal and reversed phase solvent systems, use the Tools>Manual Control option.

2.13 System Verification

It is recommended that the system operation be verified. To do so, use a pre-packaged CombiFlash Rf test kit:

- Part number 60-5237-050
Test kit containing five of the 5 gram size solid load cartridges pre-filled with 0.5 grams of test sample NPHE, and five 4 gram RediSep Rf silica gel columns.
- Part number 60-5237-051
Test kit containing four of the 25 gram size solid load cartridges pre-filled with 0.5 grams of test sample NPHE, and four 4 gram RediSep Rf silica gel columns.

The test kits include instructions.

2.14 Installation Qualification Checklist

Table 2-1 Installation Qualification Checklist			
Step	Description	Installer Initials	Operator Initials
2.1	<i>Unpacking the Unit</i>		
2.2	<i>Instrument Location</i>		
2.3	<i>Connect Power</i>		
2.4	<i>Connect Solvent Lines</i>		
2.5	<i>Connect Waste Lines</i>		
2.6	<i>Optional External Gas</i>		
2.7	<i>Connect and Route Drain Lines</i>		
2.8	<i>Position the System</i>		
2.9	<i>Install Collection Tube Racks</i>		
2.10	<i>Turn on Power</i>		
2.11	<i>Configure the System</i>		
2.12	<i>Prime the Solvent Lines</i>		
2.13	<i>System Verification</i>		
Certification of Section 2 Completion			
Installer Name (print):			
Installer Signature:			
Date:			
Operator Name (print):			
Operator Signature:			
Date:			
Comments:			



CombiFlash[®] Rf Installation Guide

Section 3 Preparation: Rf 75 Systems

This section provides instructions for unpacking and installing the CombiFlash Rf 75 system. To prepare the system for operation, sequentially follow all instructions in sections 3.1 through 3.11.

Note

Section 3.13 contains an Installation Qualification checklist. If required, sign off the checklist entries as you successfully complete the following sections.

3.1 Unpacking the Unit

The CombiFlash Rf 75 system is shipped in a single carton. Carefully unpack the shipment and inspect the contents.

 **WARNING**

The system is heavy. Use a two-person lift to prevent injury.

 **CAUTION**

Do not lift the system by the fraction collector arm. Use the lifting handles located on the instrument side panels.

If there is any damage to the shipping carton or any components, contact the shipping agent and Teledyne Isco (or its authorized representative) immediately.

 **WARNING**

If there is any evidence that the system has been damaged in shipping, do not plug it into AC power. Contact Teledyne Isco or its authorized representative for advice.

Compare the contents of the box with the enclosed packing slips. If there are any shortages, contact Teledyne Isco immediately.

The fraction collector arm was stowed to prevent damage during shipping. The arm stowing bracket should be removed at this time.

1. Loosen the bracket's two thumbscrews along the sides of the arm (Figure 3-1).

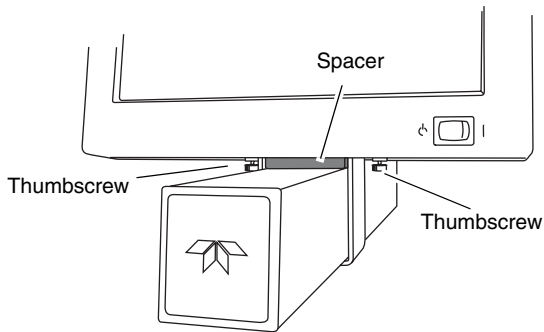


Figure 3-1 Remove arm stowing bracket and spacer

2. Push the arm to the left or right remove the spacer.
3. Store the bracket and spacer. These parts should be reinstalled if the system needs to be shipped again.

3.2 Instrument Location

The CombiFlash Rf 75 has a relatively small footprint, requiring about 1550 square centimeters (240 in²) of level bench space. Ensure that the CombiFlash Rf has at least 3 cm (1.25") of air space behind it for ventilation. Additional space may be required for solvent and waste containers.

Refer to Table 1-1 of this guide for environmental conditions and power requirements.

 WARNING
--

The system is heavy. Use a two-person lift to prevent injury.

Before making any connections to the *CombiFlash* Rf 75, place the system on the bench or in the fume hood where it will be operated. Temporarily position the system so you can access the back panels to complete the connections.

3.3 Connect Power

Ensure that the On/Standby switch below the touch screen panel is in the Standby position. Then, use the supplied IEC power cord to connect the *CombiFlash* Rf to mains power.

 **WARNING**

Mains power must meet the voltage, frequency, and amperage requirements listed on the serial number label.

 **WARNING**

As long as the AC mains power cord is connected, power is inside the unit. The mains power cord is the disconnect device. Position the Rf 75 system so that the power cord can be unplugged, or use a power strip where the plug can quickly be removed from the outlet in the event of an emergency.

3.4 Connect Solvent Lines

 **WARNING**

Risk of fire ignited by electrostatic discharge. Never substitute the black tubing on *CombiFlash* systems. The black tubing (P/N 023-0503-06) is conductive. This tubing is required to dissipate static electricity.

 **CAUTION**

To prevent damage or premature wear to the pump and internal valves, clean solvent should be used. The solvent should not contain any dissolved solids.

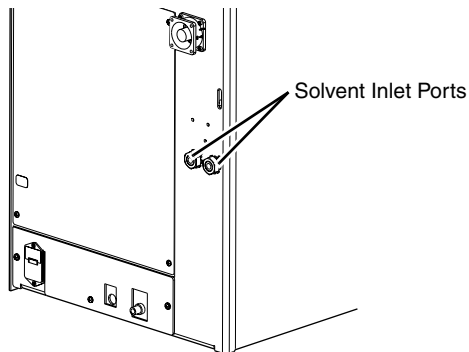


Figure 3-2 CombiFlash Rf 75 solvent inlet ports

The CombiFlash Rf 75 system has two solvent inlet ports on the back panel: one A solvent and one B solvent (Figure 3-2).

The system requires at least one A and one B solvent to form a binary gradient. It assumes that the B solvent is stronger than A. When using the optional valve kit, the second set of inputs allows you to manually switch between alternative binary gradient solvent systems, or to change the B solvent mid-run.

Note

An optional, manual solvent selection valve kit may be added to provide inlets for two A solvents and two B solvents. If using the optional valve kit, connect the kit and solvent lines according to the instruction sheet.

Accessory package P/N 60-5239-009 includes pieces to complete the solvent inlet connections.

1. Locate a Solvent Inlet Filter Assembly (P/N 60-5234-193) in the accessory package. Connect the tubing end to the A Solvent inlet. Thread the nut into the Solvent A Inlet and finger-tighten.
2. Connect the second Solvent Inlet Filter assembly to the B Solvent inlet.
3. Insert the filter end of each solvent inlet filter assembly into their respective solvent containers.

4. The accessory package includes labels to easily identify the inlet lines. Apply the A and B labels to the solvent lines above the solvent container openings.

 **Note**

When using higher-density solvents such as dichloromethane (DCM), place the solvent container level with or above the CombiFlash Rf system. Placing solvent containers below the level of the system can contribute to decreased flow due to the high vapor pressure of DCM. This problem becomes more pronounced as the ambient temperature increases.

3.5 Connect Waste Lines

 **WARNING**

Risk of fire or equipment damage. Failure to connect Waste Port tubing may allow organic solvents to pool in unsafe areas, possibly creating dangerous levels of flammable vapors.

 **WARNING**

Risk of fire ignited by electrostatic discharges. Never substitute the black tubing on CombiFlash systems. The black tubing (P/N 023-0503-06) is conductive. This tubing is required to dissipate static electricity.

 **CAUTION**

Elevated flammable vapor levels are possible. Ensure that the waste container is adequately ventilated, preferably by placing it in a fume hood.

 **CAUTION**

Do not overfill the waste collection containers. Regularly monitor and empty the bottles before they overfill.

The system has one waste outlet on the back panel: Diverter Valve waste.

Accessory package (P/N 60-5239-009) includes a Waste Tube Assembly (P/N 60-5234-187). To connect the Waste tube:

1. Connect the cut end of this assembly to the Diverter Valve Waste port on the system:
 - a. locate the black nut and ferrule in the accessory package. Slide the nut and ferrule onto the tubing as shown in Figure 3-3.

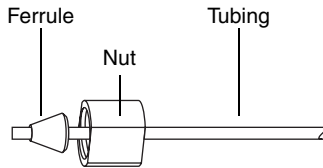


Figure 3-3 Preparing a bulkhead fitting connection

- b. Fully insert the tubing into the threaded bulkhead fitting on the back panel of the system.
 - c. Finger-tighten the nut onto the threaded bulkhead fitting. This will seat the ferrule in the fitting.
2. Route the tubing and insert the weighted end into the user-supplied waste container.

3.6 Connect and Route Drain Lines

 WARNING
--

Risk of fire or equipment damage. Failure to connect drain lines may allow organic solvents to pool in unsafe areas, creating a potential for dangerous levels of flammable vapors. Improper draining may damage the instrument's internal components.

The CombiFlash Rf 75 system has drain tubes extending from its top shelf and back panel. The tubes drain away any liquid spilled on the top shelf and the tray beneath the fraction collection racks.

1. Test the fraction collector drain by connecting a vacuum or air supply source to the outlet end of the drain tube. Then, verify the presence of such vacuum or air supply source on the drain (Figure 3-4).
2. Test the top shelf drain by connecting a vacuum or air supply source to the outlet end of the drain tube. Then, verify the presence of such vacuum or air supply source on the drain (Figure 3-5).

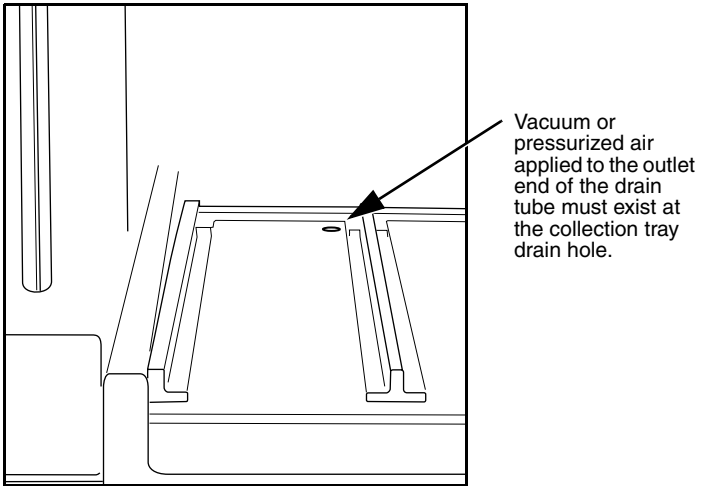


Figure 3-4 Fraction Collector Drain

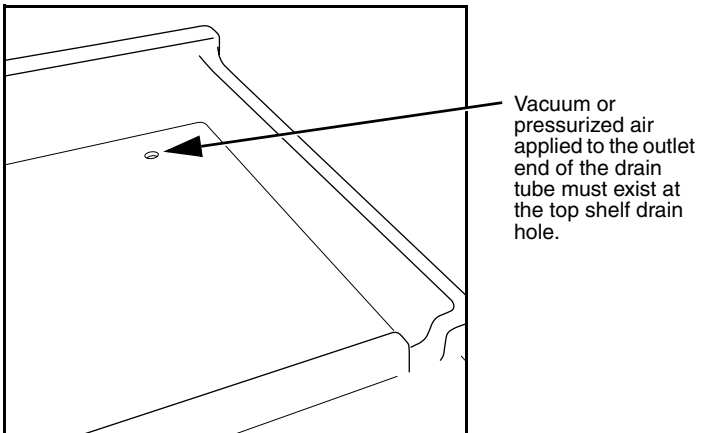


Figure 3-5 Top Shelf Drain

3. Route the end of both drain tubes to a suitable waste fluid collection container.

 **Note**

It may be necessary to extend the drain tube. If so, splice the tubing with user-supplied tubing. The user-supplied tubing should have an inside diameter no smaller than the existing drain tubing, and must be compatible with the solvents used by the system. Route this extension tubing to the waste collection vessel.

3.7 Position the System

After completing the various connections, the system can be moved to its operating position. Turn the system so that the operator can access all of the front view features and controls (Figure 1-4). Use care not to damage the connections, tubing, and cables while moving the system.

 **CAUTION**

Ensure that the CombiFlash Rf has at least 3 cm (1.25") of air space behind it for ventilation.

Position the solvent and waste containers as necessary.

 **Note**

When using higher-density solvents such as dichloromethane (DCM), place the solvent container level with or above the CombiFlash Rf system. Placing solvent containers below the level of the Rf can contribute to decreased flow due to the high vapor pressure of DCM. This problem becomes more pronounced as the ambient temperature increases.

3.8 Install Collection Tube Racks

Before beginning a run, you must load collection racks with tubes onto the system's fraction collector tray.

Your system was shipped with two collection tube racks. The following tube rack sets are available:

- **60-5237-013** – Two racks for 13×100 mm test tubes (8 mL). Total tubes: 216.
- **60-5237-031** – Two racks for 16×125 mm test tubes (15.5 mL). Total tubes: 150.

- **60-5237-032** – Two racks for 16×150/160 mm test tubes (18 mL). Total tubes: 150.
- **60-5237-033** – Two racks for 18×150 mm test tubes (25 mL). Total tubes: 140.
- **60-5237-034** – Two racks for 18×180 mm test tubes (30 mL). Total tubes: 140.
- **60-5237-035** – Two racks for 25×150 mm vials (50 mL). Total vials: 60.
- **60-5237-040** – One rack for 480 mL French square bottles.
- **60-5394-469** – Two racks for 28×61 mm scintillation vials (20 mL). Total vials: 54.
- **60-5394-468** – Two racks for 28×95 mm scintillation vials (40 mL). Total vials: 60.

To load the racks:

1. Insert test tubes, vials, or bottles into the rack (Fig. 3-6).

 **CAUTION**

Risk of broken glass or equipment damage. Do not load test tubes longer than the length listed on the rack label.

2. While holding the rack with the rack label visible (Figure 3-7), insert the racks into the system. Slide the rack in until you feel it drop into its seated position.

 **CAUTION**

An incorrectly installed rack will cause the rack to be misaligned under the fraction collector arm. Misaligned racks might cause fractions to miss the tube opening or deposit in the wrong tube. Always ensure the tube size label is visible (that is, facing outward) and the rack is pushed in until it is seated.

When you turn the power switch to on, the system will automatically detect the type of rack, and configure program settings accordingly. Later, in section 3.10.4, you can configure the maximum volume for each tube size.

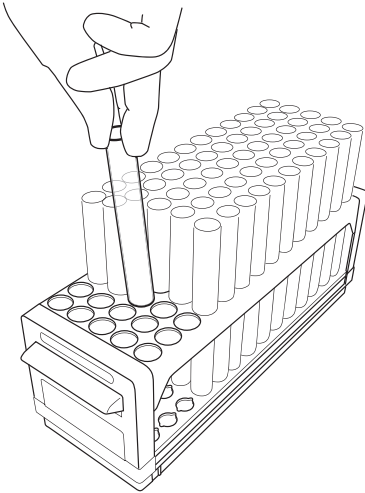


Figure 3-6 Loading test tubes

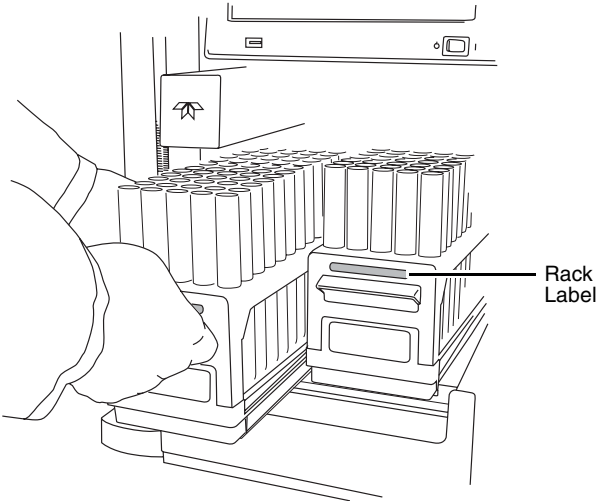


Figure 3-7 Inserting the collection tube rack

3.9 Turn on Power

The system's power switch is located just below the touch screen panel.

1. Turn the switch to the ON position. The system will begin its startup routine which includes self diagnostics.
2. Monitor the movement of the fraction collector arm. The arm should move to the left rear corner of the fraction collector area.

 CAUTION
--

You should not hear any grinding noises during the homing sequence. If grinding is heard there is a problem with the homing of the fraction collector arm. Contact the factory for assistance.

3. The system is ready for operation when the PeakTrak screen is displayed.

3.10 Configure the System

Before operating the system, it should be configured for the desired operation. To configure the system, open the Configuration window by selecting Tools>Configuration from the PeakTrak menu.

The configuration window has two tabs: Instrument Configuration and Network Configuration. Network Configuration settings are discussed later in Section 6, *Remote Interfaces*.

Adjust the following (sections 3.10.1 through 3.10.10) on the Instrument Configuration tab for the desired operation and then click OK to save the settings.

3.10.1 Solvents

When you installed the system, up to two solvents were connected to the back panel. This section of the Instrument Configuration tab allows you to name these solvents. To do so:

 Note

The system is shipped with common solvent names already loaded. If your solvent names are listed in the solvent drop-down list boxes on the main window, skip these steps.

1. Click the “Add Solvent” button.
2. Enter the solvent name and click the OK button.
3. Repeat steps 1 and 2 for both solvents.

3.10.2 General Settings

CombiFlash Rf Name (optional) – Use this option to name your system. The name will appear in operational displays and run summaries. This feature is useful when your laboratory has more than one CombiFlash Rf system.

Time Zone – Select your time zone from the drop-down list box.

Language – Select the user’s desired language from the drop-down list box.

3.10.3 Set Date/Time

Click this button to open a window from which you can set the system date and time.

To prevent unauthorized time changes, this feature is password protected. The system is shipped with the password set to *combiflash*. Use the Tools>Set Password menu command to change this password for greater security.

3.10.4 Set Default Tube Volumes

Click this button to open a window from which you can set the default volume of the collection tubes. You can increase or decrease these values to set the desired default volume collected in each container. Just be sure you don’t overflow the containers by exceeding their capacity.

The system will automatically advance to the next tube when this default volume is met in each tube. Keep in mind that advanced method settings (discussed in Section 5 and the on-line help) may override this default setting. During a run, other factors such as automatic tube advances for detected peaks will affect collected volume.

3.10.5 Automatically Print Report at End of Run

If this option is enabled, the system will print a report at the end of each run.

✓ Note

This option requires the system to be configured for network operation and a connection to a printer on the network. Network settings are discussed in Section 6, *Remote Interfaces*. Do not select this option for these initial installation steps.

3.10.6 Default Run Units

Run units are displayed along the X-axis of the chromatogram. Select Time (in minutes) or Column Volumes. A column volume unit is the time it takes to pump enough solvent to exchange the volume held by the column. The duration in minutes will vary according to the column media and size, and the flow rate.

Gradient Method – Select the standard gradient type (Figure 3-8).

- *Linear* – The system gradually mixes solvents A and B from the last programmed %B until it reaches the next programmed %B. This method connects the inflection points that define the gradient with a straight line.
- *Step* – The system holds each %B value until it reaches the next programmed %B. Because the system holds the %B values, the changes at each new value are nearly instantaneous, producing a stepped appearance on the plot area.
- *Isocratic* – The system holds the initial solvent mix for the entire run.

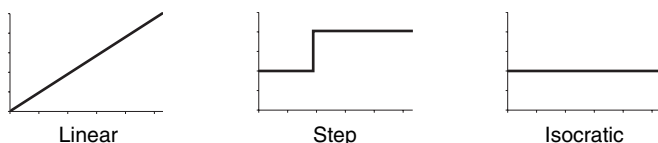


Figure 3-8 Gradient types

3.10.7 Vapor Limit

The system has an internal vapor sensor that detects vapors present in the immediate atmosphere. When the limit is exceeded, the *CombiFlash* Rf will shut down to avoid a hazardous condition.

Teledyne Isco recommends using the default setting of 25. This value represents an organic vapor level slightly above the ambient vapor level of a well-ventilated laboratory.

A setting below 25 could cause random alarms without significant vapors present. If PeakTrak displays a Vapor Limit alarm while the Vapor Limit is set at 25, perform the following checks on your laboratory and the instrument:

- Ensure that no open containers or spills of organic solvent are in close proximity to the system.
- Ensure that the system is located in a well-ventilated area.
- Ensure that there is no visible solvent leakage from the system.

If PeakTrak continues to display the Vapor Limit alarm after you have made these checks and corrected any problems found, it is likely that organic vapors are present in the ambient environment of your laboratory. In this case, increase the setting of the Vapor Limit. Settings greater than 25 are appropriate for laboratory environments with a somewhat elevated background solvent vapor concentration, representing a safe setting, but one with a reduced margin for error.

3.10.8 Enable Run Length Extension

When enabled, this option automatically extends the run if a peak is eluting at the end of the maximum %B gradient. This ensures that a late-eluting peak fully comes off the column and is collected.

An automatic run extension is a five-minute isocratic hold added to the end of the run's maximum %B gradient profile. During the extension, the system continues to pump the maximum %B solvent mixture. Should the system still detect a peak after an extension, the system will add another, up to a maximum of three extensions.

Occasionally, compounds might come off the column once the %B returns to the minimum value at the end of a run. If the Run Length Extension is enabled, it will automatically extend the run one time to clear the column and plumbing of any remaining material.

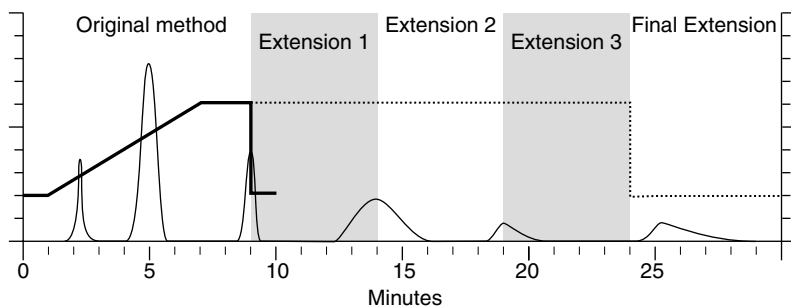


Figure 3-9 Automatic Run Extension Examples

Figure 3-9 illustrates the possible run extensions. The original method was programmed to rise to the maximum %B over seven minutes, hold for two minutes and return to the minimum %B for a final minute. At nine minutes, a peak was eluting. The system extended the run, holding the %B at the maximum level for another five minutes. This also occurred at fourteen and nineteen minutes, resulting in the second and third extensions. At 24 minutes, the %B solvent strength returned to zero. Before the final minute elapsed, more compound was detected, causing the system to extend the run for a final five minutes at the minimum %B.

3.10.9 Enable rapid equilibration

Select this option to equilibrate the column at a high flow rate.

Note

Rapid equilibration may not be desirable for some column media or purification methods.

3.10.10 Optional Features

Click this button to open a window from which you can enter activation codes that turn on optional features. Teledyne Isco provides activation codes on certificates that are issued after the option is purchased.

3.11 Prime the Solvent Lines

Before the first use, the system should be primed. Ensure that the solvent containers are filled, then:

1. Select the “Tools>Auto prime” menu command.
2. Click the Play button to start priming the system.

The system pumps 100% Solvent B through the system and out the Waste port, and then repeats with 100 % Solvent A. (This B-A order leaves the internal lines filled with solvent appropriate for the beginning of a purification run.)

 **Note**

When priming the first time, inspect the solvent and waste connections to the system. If any leaks are observed, click the Cancel button to stop the Auto Prime. Correct the leak by tightening the fitting an additional $\frac{1}{4}$ turn, and then restart the Auto Prime from step 1.

To advance to the next Auto Prime step, you can click the Fast Forward button. The Auto Prime window closes when finished.

After Auto Priming, the system is ready for operation (Section 5).

Use the Auto Prime feature for quick solvent changes by pumping a fixed amount of solvent through the waste fluid path at a high flow rate. For more advanced priming functions such as varying the flow rates, fluid paths, *etc.*, use the Tools>Manual Control option.

3.12 System Verification

It is recommended that the system operation be verified. To do so, use a pre-packaged *CombiFlash* Rf test kit:

- Part number 60-5237-050
Test kit containing five of the 5 gram size solid load cartridges pre-filled with 0.5 grams of test sample NPHE, and five 4 gram RediSep Rf silica gel columns.
- Part number 60-5237-051
Test kit containing four of the 25 gram size solid load cartridges pre-filled with 0.5 grams of test sample NPHE, and four 4 gram RediSep Rf silica gel columns.

The test kits include instructions.

3.13 Installation Qualification Checklist

Table 3-1 Installation Qualification Checklist			
Step	Description	Installer Initials	Operator Initials
3.1	<i>Unpacking the Unit</i>		
3.2	<i>Instrument Location</i>		
3.3	<i>Connect Power</i>		
3.4	<i>Connect Solvent Lines</i>		
3.5	<i>Connect Waste Lines</i>		
3.6	<i>Connect and Route Drain Lines</i>		
3.7	<i>Position the System</i>		
3.8	<i>Install Collection Tube Racks</i>		
3.9	<i>Turn on Power</i>		
3.10	<i>Configure the System</i>		
3.11	<i>Prime the Solvent Lines</i>		
3.12	<i>System Verification</i>		
Certification of Section 3 Completion			
Installer Name (print):			
Installer Signature:			
Date:			
Operator Name (print):			
Operator Signature:			
Date:			
Comments:			



CombiFlash[®] Rf Installation Guide

Section 4 Preparation: Optional 4x Module

This section provides instructions for unpacking and installing the CombiFlash Rf 4x module after completing the CombiFlash Rf 200 system installation (Section 2). To prepare the system for operation, sequentially follow all instructions in sections 4.1 through 4.10.

 **Note**

Section 4.12 contains an Installation Qualification checklist. If required, sign off the checklist entries as you successfully complete the following sections.

4.1 Unpacking the Unit

The CombiFlash Rf 4x module is shipped in a single carton. Carefully unpack the shipment and inspect the contents. If there is any damage to the shipping carton or any components, contact the shipping agent and Teledyne Isco (or its authorized representative) immediately.

 **WARNING**

If there is any evidence that the system has been damaged in shipping, do not plug it into AC power. Contact Teledyne Isco or its authorized representative for advice.

Compare the contents of the boxes with the enclosed packing slips. If there are any shortages, contact Teledyne Isco immediately.

4.2 Instrument Location

The CombiFlash Rf has a relatively small footprint, requiring about 1550 square centimeters (240 in²) of level bench space. Ensure that the CombiFlash Rf has at least 3 cm (1.25") of air

space behind it for ventilation. Additional space may be required for solvent and waste containers.

The optional 4x expansion module is installed to the left of the CombiFlash Rf. This module requires an additional 933 cm² (145 in²) of level bench space. Ensure that the module has at least 3 cm (1.25") of air space behind it for ventilation.

Refer to Table 1-2 for environmental conditions and power requirements.

Before making any connections to the CombiFlash Rf 4x module, place it on the bench or in the fume hood where it will be operated. Temporarily position the system so you can access the back panels to complete the connections.

4.3 Connect Power

Ensure that the On/Standby switch below the Rf system touch screen panel is in the Standby position. Then, use the supplied IEC power cord to connect the CombiFlash Rf 4x module to mains power.

 **WARNING**

Mains power must meet the voltage, frequency, and amperage requirements listed on the serial number label.

 **WARNING**

As long as the AC mains power cord is connected, power is inside the unit. The mains power cord is the disconnect device. Position the Rf 200 system and Rf 4x module so that the power cord can be unplugged, or use a power strip where the plug can quickly be removed from the outlet in the event of an emergency.

4.4 Connect Solvent Lines

 **WARNING**

Risk of fire ignited by electrostatic discharge. Never substitute the black tubing on CombiFlash systems. The black tubing (P/N 023-0503-06) is conductive. This tubing is required to dissipate static electricity.

⚠ CAUTION

To prevent damage or premature wear to the pump and internal valves, clean solvent should be used. The solvent should not contain any dissolved solids.

The CombiFlash Rf 200 system has four solvent ports on the left side panel. To complete the solvent connections:

1. Locate the ABCD label in accessory package 69-5234-008. Affix this label to the Rf 200 left side panel, just above the solvent ports (Figure 4-1).

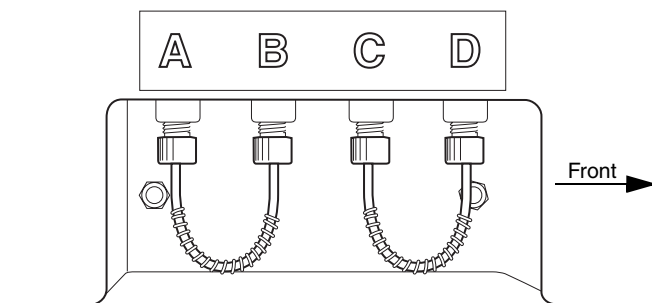


Figure 4-1 Labeled ports on Rf 200 side panel

2. Remove the jumpers tubing from ports A, B, C, and D.
3. Locate the solvent lines on the side of the Rf 4x module. These lines are labeled A through D. Connect the solvent lines to their respective ports on the Rf system.

4.5 Connect Waste Lines

⚠ WARNING

Risk of fire or equipment damage. Failure to connect Waste Port tubing may allow organic solvents to pool in unsafe areas, possibly creating dangerous levels of flammable vapors.

⚠ WARNING

Risk of fire ignited by electrostatic discharges. Never substitute the black tubing on CombiFlash systems. The black tubing (P/N 023-0503-06) is conductive. This tubing is required to dissipate static electricity.

⚠ CAUTION

Elevated flammable vapor levels are possible. Ensure that the waste container is adequately ventilated, preferably by placing it in a fume hood.

The Rf 4x module has six liquid waste ports on the back panel:

- one inlet to receive diverter valve waste from the Rf system labeled Column Waste, From RF.
- four waste outlets —one for each column channel, labeled Column Waste 1, 2, 3, and 4.
- one Valve Waste outlet shared by channels 2 through 4 for automatic injection valve cleaning.

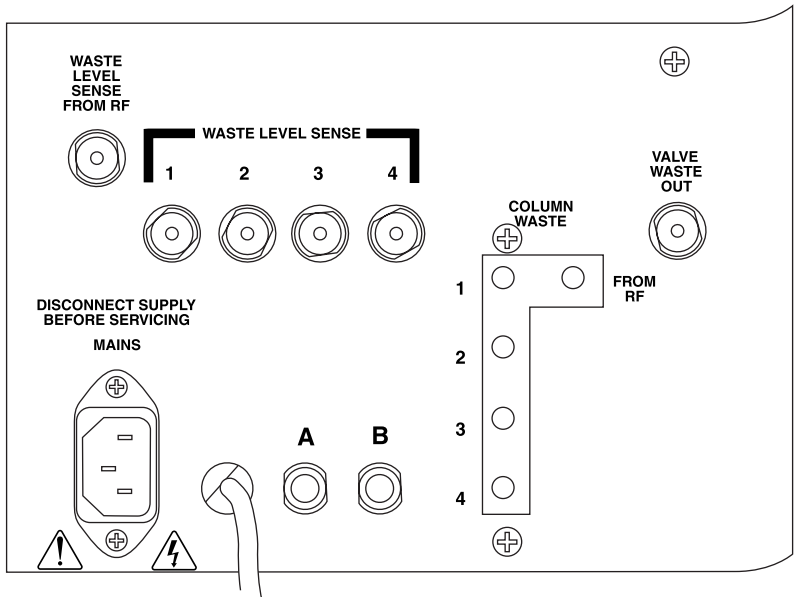


Figure 4-2 4x Module back panel connections

The Rf 4x module can automatically detect full waste bottles and stop operation to prevent overflowing a waste container. This safety feature requires five air line connections:

- one Waste Level Sense From RF inlet to receive air or external gas from the Rf system
- four Waste Level Sense outlets 1, 2, 3, and 4.

☑ Note

The following instructions assume that the waste from each channel will be isolated in separate containers.

☑ Note

If the waste is to be collected in a common container, skip the Column Waste and Waste Level Sense connections (steps 1 through 6) and complete step 7 below to route the Valve Waste Out from the Rf 4x module. The waste tubing assembly connected to the back panel of the Rf 200 system will route all waste fluids to the common collection container and sense the level.

To complete the waste line connections:

1. At the waste container cap for the Rf 200 system (Channel 1), remove the black tubing that delivers Diverter Valve Waste fluids and the natural tubing that delivers Waste Level Sense air.
2. At the Rf 200 system back panel, disconnect the black tubing from the Diverter Valve Waste port and the natural tubing from the Waste Level Sense port.

☑ Note

The Inject Valve Waste tubing must remain connected between the Rf system back panel and its waste container.

3. Locate the 20 inch (50 cm) length of black tubing from accessory package 60-5239-008. Connect this tubing between the Rf 200 system and the Rf 4x module:
 - a. Connect the cut end of the black tubing to the Rf 200 system Diverter Valve Waste port. Use a black nut and ferrule from the accessory package as shown in Figure 4-3. Finger-tighten the nut to seat the ferrule in the bulkhead fitting.

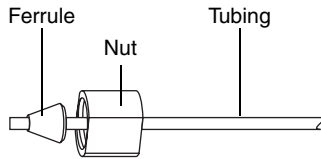


Figure 4-3 Preparing a bulkhead fitting connection

- b. Connect the other end of the black tubing to the Rf 4x port labeled “From Rf” (in the block labeled “Column Waste”). Finger-tighten the attached nut to seal the fitting.
4. Locate the 20 inch (50 cm) length of natural tubing from the accessory package. Using nuts and ferrules for the black bulkhead fittings, connect this tubing between the Rf 200 system’s Level Sense port and the Rf 4x module’s Waste Level Sense From Rf port.
5. Select one of the three waste line assemblies from the accessory package. This will be used to complete the waste connections for channel 1.

Note

These instructions assume that the waste from each channel will be isolated in separate containers. If the waste is to be collected in a common container, the waste can be routed

Note

omit the use of the waste caps and secure all liquid and air lines in the common container. The ends of all air lines should extend at least 2 inches (5 cm) below the container opening.

- a. At the Rf 4x back panel, connect the nut on the waste line assembly to the Column Waste port labeled “1.”
 - b. Connect the natural tubing of the waste line assembly to the Waste Level Sense port labeled “1.”

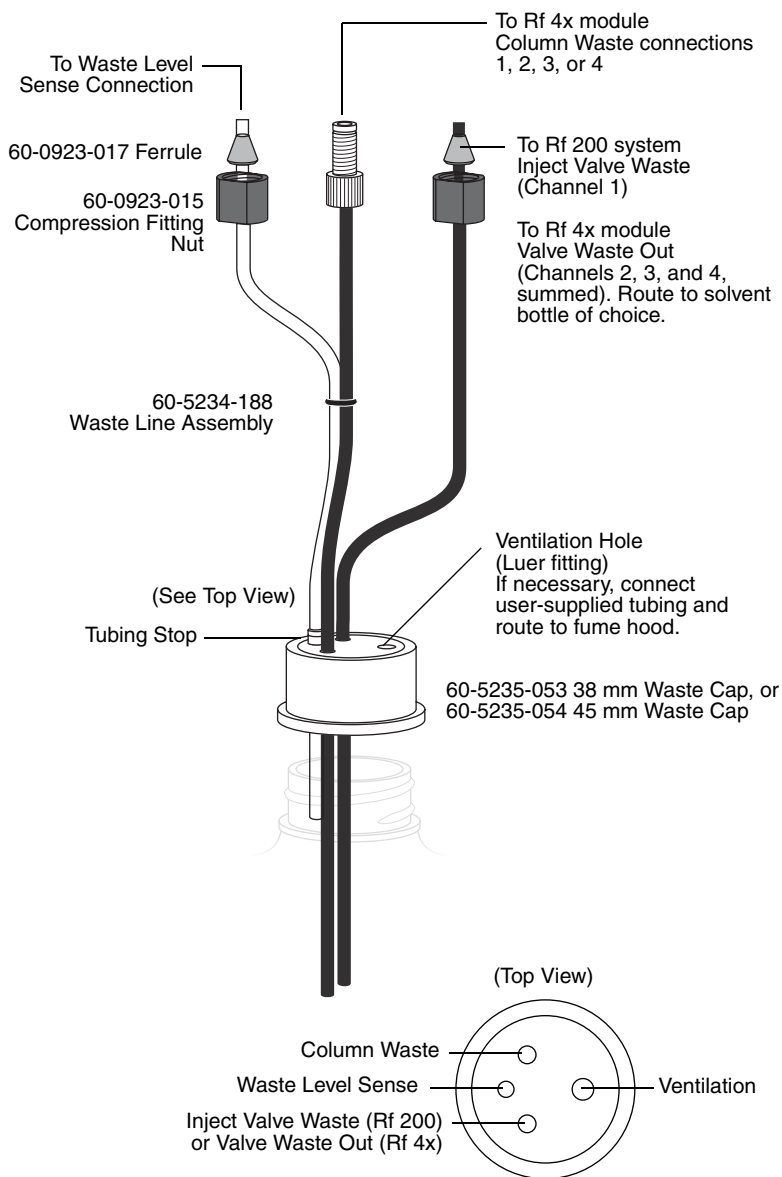


Figure 4-4 Recommended Rf 4x module waste connections

- c. At the waste container cap for channel 1 insert the black tubing into the Diverter Valve Waste opening and the natural tubing into the Waste Level Sense opening (Figure 4-4). Push the stop on the Waste Level Sense tubing against the cap. This ensures that the Waste Level Sense tubing is far enough into the container to detect when it is nearly full.
6. Using the three remaining waste line assemblies and waste caps, complete the waste connections for channels 2 through 4. (See Figure 4-4.)
7. The post-run valve cleaning fluids share a common port for channels 2 through 4. Select the 48 inch (120 cm) length of black tubing from the accessory package and connect it to the Valve Waste Out bulkhead fitting on the Rf 4x module. Route the other end of this tubing to one of the waste bottles. You can alternatively route it to another container, however the system will not be able to detect the level and prevent overfilling.

 **Note**

When using higher-density solvents such as dichloromethane (DCM), ensure that waste containers are no more than 3 feet below the supply solvent levels. Placing solvent containers above the system and waste containers on the floor may cause the internal check valves to open and allow solvent to flow through the system when in the standby state.

 **Note**

The back panel ports labeled A and B are not used.

4.6 Control Connection

Operation of the Rf 4x module is controlled by the Rf 200 system via a USB connection. Connect the USB cable from the Rf 4x module to USB port on the Rf 200 system back panel.

4.7 Position the System

After completing the fluid, air, and control connections, the system can be moved to its operating position.

⚠ CAUTION

Use care not to damage the connections, tubing, and cables while moving the system.

1. Turn the Rf 200 system so that the operator can access all of the front view features and controls (Figure 1-4).
2. Position the Rf 4x module along the left side of the Rf 200 system.
3. The Rf 4x module has a tab extending from the right side of its base plate. Slightly raise the Rf 200 system and slide the Rf 4x module so that the Rf 200 system will rest on the module's tab. The weight of the Rf 200 on the tab will hold the two together.

4.8 Remove Shipping Hardware

To prevent damage to the injection valve assemblies during shipping, each is secured by a thumbscrew which must be removed before operating the system. Firmly grasp the cartridge guide above the injection valve and then remove the thumbscrew (Figure 4-5). Gently lower the injection valve once the thumbscrew is removed.

☑ Note

Save the thumbscrews should there be a need again to stow the valves for shipping.

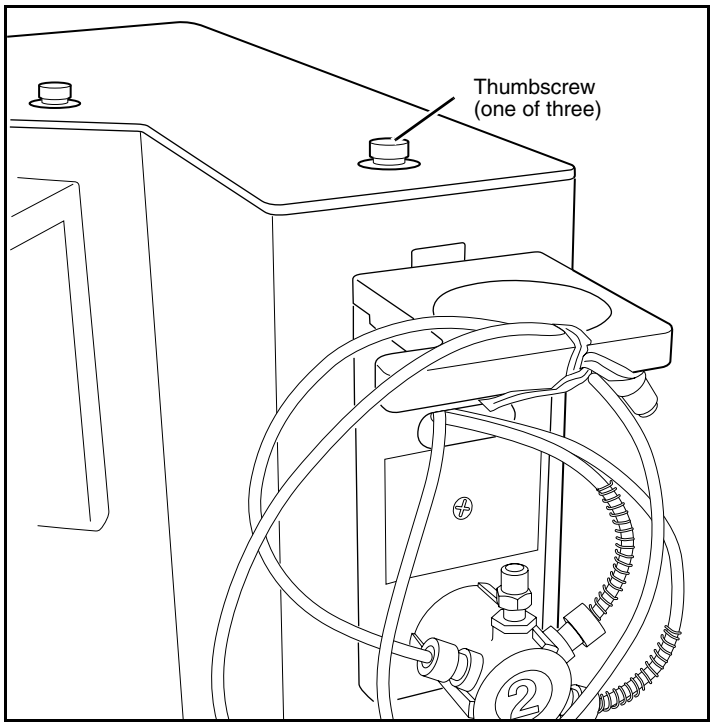


Figure 4-5 Remove thumbscrews

4.9 Turn on Power

Turn the Rf 200 system switch to the ON position. The system will begin its startup routine which includes self diagnostics. During the startup routine, the Rf 200 will detect the connected Rf 4x module and automatically configure the user interface to access the additional channels. The system is ready for operation when the PeakTrak screen is displayed.

4.10 Prime the Solvent Lines

The Rf 4x module was factory tested with 1:1 water/isopropyl alcohol and subsequently purged with air. If residual fluids would affect your chromatography, prime all channels on the system.

Channel 1 should have been primed during the installation steps in Section 2.12 (page 2-19). Channel 1 can be primed using the Auto Prime menu command.

Channels 2 through 4 must be primed using the Manual Control menu command. To do so:

1. Ensure that the solvent containers are filled.
2. Insert a priming tube assembly (from the accessory package) between the upper and lower column mounts on channels 2 through 4.
3. Select the “Tools>Manual Control” menu command.
4. Select the Column 2 the channel option.
5. Click the Prime B button. The system pumps 100% solvent B through channel 2.

 Note

When priming the first time, inspect the solvent and waste connections to the system. If any leaks are observed, click the Cancel button to stop the pump. Correct the leak by tightening the fitting an additional $\frac{1}{4}$ turn, and then restart the prime.

6. Allow the system to pump solvent B for at least 3 minutes. Then, click the Cancel button.
7. Click the Prime A button. The system pumps 100% solvent A through channel 2.

8. Allow the system to pump solvent A for at least 3 minutes. Then, click the Cancel button.

Note

This B-A order leaves the internal lines filled with solvent appropriate for the beginning of a purification run.

9. Repeat steps 4 through 8 for channels 3 and 4. Be sure to change the channel option before starting the pumps.

4.11 System Verification

It is recommended that the system operation be verified for each channel. To do so, use a pre-packaged *CombiFlash* Rf test kit:

- Part number 60-5237-050
Test kit containing five of the 5 gram size solid load cartridges pre-filled with 0.5 grams of test sample NPHE, and five 4 gram *RediSep* Rf silica gel columns.
- Part number 60-5237-051
Test kit containing four of the 25 gram size solid load cartridges pre-filled with 0.5 grams of test sample NPHE, and four 4 gram *RediSep* Rf silica gel columns.

The test kits include instructions.

4.12 Installation Qualification Checklist

Table 4-1 Installation Qualification Checklist			
Step	Description	Installer Initials	Operator Initials
4.1	<i>Unpacking the Unit</i>		
4.2	<i>Instrument Location</i>		
4.3	<i>Connect Power</i>		
4.4	<i>Connect Solvent Lines</i>		
4.5	<i>Connect Waste Lines</i>		
4.6	<i>Control Connection</i>		
4.7	<i>Position the System</i>		
4.8	<i>Remove Shipping Hardware</i>		
4.9	<i>Turn on Power</i>		
4.10	<i>Prime the Solvent Lines</i>		
4.11	<i>System Verification</i>		
Certification of Section 4 Completion			
Installer Name (print):			
Installer Signature:			
Date:			
Operator Name (print):			
Operator Signature:			
Date:			
Comments:			



CombiFlash[®] Rf Installation Guide

Section 5 Operation

This section provides abbreviated operating instructions for the CombiFlash Rf systems. For complete instructions, refer to Help menu option from PeakTrak's main menu.

5.1 Sample Preparation

Before starting a run, consider how the sample will be introduced to the column media. This section discusses three methods: liquid injection, solid sample cartridges, and preloading the sample on the column.

5.1.1 Liquid Sample Injection

If the sample is soluble in the starting mobile phase, it can be prepared as a solution and injected onto the column when prompted during the purification run.

5.1.2 Solid Samples

Some compounds are not soluble in solvents that are compatible with the chromatography. In addition, the compounds may have very limited solubility in any solvent, resulting in sample volumes that are impractical for good chromatography. The answer in this case is solid sample introduction. Here the reaction mixture or dissolved sample is mixed with the same media in the chromatography column.

Some samples of this type may be simply dissolved and placed into a prefilled cartridge. You can then use the cartridge immediately or dry it before placing it on the system.

Other samples may need more care. Typically you would create a mixture of 20% sample load to media (w/w). Then dry the mixture under conditions that will drive off the solvent without affecting the compounds of interest. These compounds remain bound to the media. Once dried, pour the media/sample mixture into an empty cartridge.

To prepare an empty solid sample cartridge:

1. Ensure the empty cartridge has a bottom frit.

 **CAUTION**

Missing frits may cause equipment damage, UV detection problems, or increased maintenance. Frits prevent solids from entering the fluid path.

2. Prepare the media and sample:
 - a. Dissolve your sample in a minimal amount of a suitable, volatile solvent.
 - b. Place the media into the solvent. If using silica gel, a particle size of 40–60 μm (240–400 mesh) is recommended. The amount of silica required is about four to five times the mass of your sample.
 - c. Agitate the solvent for a moment to allow the sample to adsorb to the silica.
 - d. Remove the solvent with a suitable method, such as rotary evaporation. Alternatively, you can dry the prepared cartridge after step 5 by drawing the solvent out using a vacuum or using the Rf 200 system's air purge.
3. Load the media and sample mixture into the cartridge. Tap the cartridge on the benchtop to settle the mixture.
4. Place a frit on the top of the cartridge. Force the frit down against the mixture using the plastic plunger.
5. Wipe any residual powder inside the neck of the cartridge.

 **Note**

On Rf 200 and Rf 4x systems, you can remove solvent from a prepared cartridge by attaching the cartridge cap and manually purging (TOOLS>MANUAL CONTROL) the cartridge with air.

Empty solid sample cartridges also allow a variety of adsorbents, such as diatomaceous earth, boiling chips, cotton balls, or paper wipes. Even with alternative adsorbents, always use top and bottom frits to prevent fluid path problems.

After you have prepared the pre-filled or empty cartridge, place the solid sample cartridge on the system:

1. Attach the desired adjustable cartridge cap:
 - 60-5237-047, fits 2.5 and 5 gram solid load cartridges.
 - 60-5237-048, fits 12 and 20 gram solid load cartridges.
 - 60-5237-044, fits 32 and 65 gram solid load cartridges.
2. Press the lever on the side of the cap and fully extend the plunger (Figure 5-1).

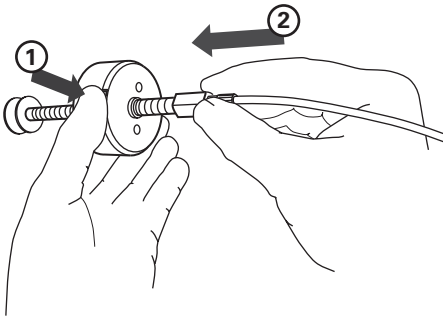


Figure 5-1 Press the lever and extend the plunger

3. Slide the plunger into the cartridge until it reaches the top frit (Figure 5-2).
4. Press the lever and push the cartridge into the cap. Align the cartridge so that it fits fully into the recess in the cap (Figure 5-3).
5. Load the solid sample cartridge with cap on the sample injection port.

Note

Earlier CombiFlash Rf solid load cartridge caps required the use of sleeves. Contact the factory for information on upgrading these older systems to use the new cartridges without sleeves.

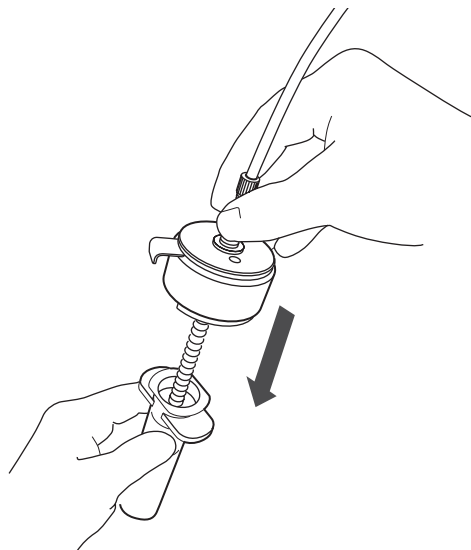


Figure 5-2 Insert the plunger to the bed

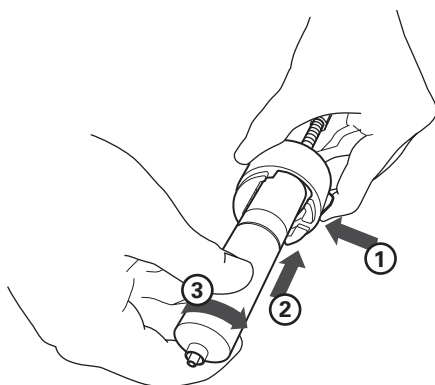


Figure 5-3 Align and push cartridge into the cap, and then rotate the cartridge to secure it.

5.1.3 Preloading on Column

You can load the reaction mixture or sample directly onto the column, sometimes called “direct” or “dry” loading.

✔ Note

If using this method, use care to ensure that a column equilibration does not wash away the sample. Bypass the column equilibration at run time by selecting “Preload on column” (or “No Equilibration” for Rf 75 systems) as the sample Loading Type. Refer to Section 5.3 for more details.

5.2 Loading a RediSep Rf Column

To load a RediSep Rf column:

⚠ WARNING

The CombiFlash Rf has redundant safety devices to limit pressure to less than 210 psi (1448 kPa). RediSep columns smaller than 100 g are CE certified using standard IEC61010-1 for use on the CombiFlash Rf. RediSep columns larger than 100 g meet Pressure Vessel Directive 97/23/EC. Teledyne Isco strongly recommends against the use of columns rated less than 210 psi (1448 kPa).

✔ Note

For best results, always use RediSep Rf columns. The system will not automatically detect other columns, including non-Rf RediSep columns. The system also limits the maximum operating pressure to 50 psi when the column is not detected.

1. Select a RediSep Rf column. The on-line help includes a column selection guide that can assist you in selecting a stationary phase media and column size.
2. Raise the injection valve (column mount for Rf 75 systems) and insert the column into the top column mount. Note that the column fittings are keyed to ensure the correct flow direction.
3. Slowly lower the injection valve while aligning the bottom column fitting. The spring-loaded injection valve will hold the column in place.
4. To seal the column fittings, give the column a slight twist ($\frac{1}{4}$ turn).

 **Note**

After loading a RediSep Rf column, the system will use RFID technology to automatically detect the media type and column size. PeakTrak displays the detected column size on the Main and Method Editor windows. If the system does not detect the column, manually select the column media and size.

5.3 Start a Default Method

After completing the system installation steps (Section 2 through 4, as necessary), preparing the sample, and inserting the column, you are ready to perform a run with the default method. The system's default methods are factory-set with run parameters typically used by chemists. Default methods are optimized for the use of RediSep Rf columns. The default settings will:

- collect all fluid in the fraction collector rack
- differentiate between UV (254 nm) vs. non-UV absorbing fluid and place the fluids into separate tubes
- cut UV absorbing peaks based on slope detection or level threshold.

To start the run from the PeakTrak Main window:

1. Enter a sample name. If you choose not to, PeakTrak will enter the date and time as the sample name when you start the run.
2. Review the PeakTrak Main window settings. If you want to change any settings, refer to the Editing a Method on-line help topic.
3. Click the Play button.
4. Select the sample Loading Type from the list. This Loading Type should support the sample preparation you chose in Section 5.1. Possible sample loading types for the Rf 200 and Rf 4x systems are:
 - **Solid (Pause)** – Select this option if you intend place the sample into a solid sample load cartridge, but have not yet prepared the sample. When you click the run button, the system will perform a column equilibration and then wait while you prepare the

cartridge. After you have placed the cartridge on the system, click OK to continue with the run.

- **Solid** – Select this option if you have prepared the sample and placed it into a solid sample load cartridge. The system will proceed automatically until the end of the programmed run length.
- **Liquid** – Select this option if you have prepared a liquid sample and plan to manually inject it into the injection port after column equilibration.
- **None (on column)** – Select this option if you have preloaded the sample on the column. The system will skip column equilibration so that the sample will not be flushed from the column before the run.

Loading Type options for the Rf 75 system are:


- **Equilibration** – Select this option if you intend to equilibrate the column before introducing the liquid or solid sample.
- **No Equilibration** – Select this option to skip column equilibration.

5. Review or update the Start Rack and Start Tube.

6. Review the Minimum Run Requirements. The system will report the estimated solvent volumes, expected waste, collection tube usage, *etc.* You can use this information to verify that there will be enough solvent to complete the run, the waste volume does not exceed the collection container's capacity, and whether or not more tubes will be required during the run.

 **Note**

The Rf 200 and Rf 4x systems estimate the solvent volumes by monitoring the solvent level in the container and the known usage rate. The systems continue to refine this estimate during operation. Solvent level sensing is not available on the Rf 75 system.

 **Note**

If the waste level sensing tube is inserted correctly into the waste container, the Rf 200 and Rf 4x systems will automatically suspend operation before an overflow condition might exist. To

prevent the run from being suspended before completing the run, ensure that the container will hold the expected waste volume. Waste level sensing is not available on the Rf 75 system.

7. Click OK and the run begins. The system responds according to the sample Loading Type you selected in step 4.

Rf 200 and Rf 4x systems —

- If you selected **Solid (Pause)**, the system equilibrates the column with the starting %B and then waits while you prepare the solid sample load cartridge. Place the cartridge on the system and click OK to continue.
- If you selected **Solid**, the system equilibrates the column and immediately starts the separation. The prepared solid load cartridge should be in place before clicking the OK button.
- If you selected **None (on Column)**, the system skips the equilibration and immediately starts the separation. The sample must be on the column before clicking the OK button.
- If you selected **Liquid**, the system equilibrates the column and then waits. When instructed, perform the following steps:
 - a. Place the injection syringe on the injection port.
 - b. Slowly force the liquid into the injection port.
 - c. Chase the first injection with a second injection solution of at least 0.25 mL. The chase solution can be the starting mobile phase or diluted sample mixture.
 - d. Click OK to continue the run.

Rf 75 systems —

- If you selected **Equilibration**, ensure that the solvent delivery tubing is connected to the injection port above the column. When you click the OK button, the system equilibrates the column and then waits. When instructed, perform a liquid injection as described in steps a through d above, or attach the

solid sample cartridge to the injection port and connect the solvent delivery tubing. Click the OK button to continue.

- If you selected **No Equilibration**, ensure that the solvent delivery tubing is connected. The system starts the run immediately and assumes that the sample has been injected on the column or the solid load cartridge is in place.

5.4 During the Run

You may allow system to proceed with the run while monitoring the progress on the PeakTrak main window. If desired, gradient parameters may be modified during the run. (See the Real-time Gradient Editing on-line help topic.)

As the run progresses, the absorbance trace is drawn on the Gradient Plot area. The separation or purification continues until the end of the run defined by the run length setting.

5.4.1 Run Control Buttons

You clicked the Play button to start the run. During the run, other run control buttons are active.

- **Pause** — The Pause button holds the %B at the current value while the system continues to operate (sometimes called an isocratic hold). Note that pausing the run extends the run length. While in the Paused state, you can resume the run by clicking the Play button, or stop the run by clicking the Stop button. If you resume the run, the system continues with the gradient curve at the %B when the system was paused.
- **Stop** — This button suspends the entire run. Unlike the Paused state, the pump, peak detection, and fraction collection will not operate. While stopped, you can end the run by clicking the Rewind button, resume the run by clicking the Play button, or save the run data in a desired format by selecting the File>Save Run as PDF or Save Run as Text from the menu.

Note

PeakTrak automatically saves all run history on the system's internal hard drive in its native .RUN format. You can manually save a Run as Text or PDF while stopped or any later time as long

as the .RUN file has not been deleted. To automatically save a Text or PDF file after each run, configure the Network File Save feature (see section 6.1.3).

- **Next Tube** — This button advances the fraction collector to the next tube position. This allows you to conveniently collect eluate of interest in a new tube.

 **Note**

When you click the Next Tube button, the system immediately marks the tube advance on the chromatogram. However, the system delays the movement of the drop former over the tubes. This delay accounts for the volume held in the tubing between the detector and the drop former, sometimes called the “delay volume.” It is important to remember that the chromatogram displays activity in real time while the fraction collector activity lags behind. The duration of this delay will vary with the flow rate.

- **Rewind** — This button is active when the system has completed the run, or if the run was stopped by clicking the Stop button. The Rewind button returns you to the Main window with the current method.

If you have stopped the run before its programmed run length has elapsed, clicking the Rewind button changes the current method to the new, shorter run length. This modified method is ready for the next run, or can be saved for future runs.

- **Fast Forward** — Click this button to jump to the next step of a run.

Once you have started a run, the system performs several steps. The first step is to deliver solvents using the programmed gradient for the entire run length. When this step is complete, the system will purge the column with air and clean the injection valve. Clicking the Fast Forward button will cause the system to skip any remaining time in the current step and advance to the beginning of the next step. Unlike the Rewind button, the clicking the Fast Forward button to complete the run will not modify the current method’s run length setting.

CombiFlash[®] Rf Installation Guide

Section 6 Remote Interfaces

This section provides instructions for controlling the CombiFlash Rf system through a remote interface. The system can be accessed by several personal computers through a corporate network, or by a single personal computer (PC) through a direct connection.

6.1 Network Configuration

Note

The procedures described in this section will require assistance from your network administrator. Contact your Information Technology department before proceeding.

The system has a factory-assigned IP address—192.168.1.51. In many cases, this address must be reconfigured for use on a corporate network. To reconfigure the IP address:

1. From the touch screen panel, select the Tools>Configuration menu command.
2. The Configuration window has two tabs. Select the Network Configuration tab.
3. Select Static IP as the Network Type.
4. Enter the IP Address, Netmask, and Gateway information provided by your network administrator

Note

Should your network administrator request the MAC address, a label on the system's back panel lists the Address. You also can find the MAC Address on the Help>About PeakTrak window.

5. Click the OK button to save the settings.

6. Confirm that your network administrator has completed any necessary network changes to support the system.
7. Locate the CAT5 connection cable (P/N 480-6545-01) in the accessory package. Insert one end into the Ethernet port on the back panel. Connect the other end of the cable to your network access port.

You should be able to connect to the *CombiFlash* Rf from a PC on the network (Section 6.1.1) or set up a network printer (Section 6.1.2).

6.1.1 Network PC Access

A successfully networked *CombiFlash* Rf system can be accessed by a PC that meets the recommendations listed in Table 6-1.

To access the system, simply open an Internet Browser and enter the IP address as “http://___.___.___.___”, where the blanks are replaced by the selected address.

The browser window will load PeakTrak after you enter the address.

Table 6-1 Personal Computer Recommendations^a

Operating Systems:	Microsoft Windows 2000, XP, or Vista
Hardware:	The computer hardware must meet the minimum required specifications of the selected operating system.
Network Protocol:	TCP/IP
Network Connection:	IEEE 802.3 (Ethernet)
Display:	800 x 600 pixels, 256 colors, minimum
Internet Browser:	Microsoft Internet Explorer 6.0 or later.

- a. This table shows supported PC configurations. Other configurations or AJAX-compatible browsers may be possible but are unsupported by Tele-dyne Isco.

6.1.2 Network Printing

The *CombiFlash* Rf system can print to a network printer and supports both JetDirect and line printer (LPR) queues.

Consult with your network administrator to determine the IP address of selected printer. If the printer uses an LPR print queue, you must also find out the queue name. If the printer

uses a JetDirect print queue, also ask for the port number. When this information is known, you can proceed with configuring system for network printing.

1. Select the Tools>Configuration menu command.
2. The Configuration window has two tabs. Select the Network Configuration tab.
3. Follow the on-screen instructions for entering the address and queue information.
4. Click OK to save the settings. The *CombiFlash* Rf system will send a test page to the printer.

After successfully printing a test page, the network printer will be available for printing using the File>Print menu command or through the *Automatically Print Report at End of Run* feature in the installation section.

6.1.3 Network File Save Configuration

By default, this option is disabled and post-run reports are automatically saved internally on the *CombiFlash* Rf system. You can recall any run and view it from the system as long as the .RUN file has not been deleted. To save the post-run report for viewing elsewhere, you can save the run history as text or PDF files as needed. This Disabled option is useful when there is no need, or only an occasional need to save a run history file externally.

To save all run histories automatically as a text or PDF file, configure the Network File Save option. This allows the *CombiFlash* Rf system to access the corporate network and save the file in a selected Network Share folder. Consult with your network administrator to configure these fields.

6.2 Direct Connection

A direct connection supports communication between the *CombiFlash* Rf system and a single PC that meets the recommendations in Table 6-1.

This guide provides instructions for Windows 2000 (section 6.2.1), Windows XP (6.2.2), and Windows Vista (6.2.3). Refer to the applicable section, then follow the instructions in section 6.2.4 to complete the direct connection.

 **Note**

A direct connection requires a “crossover” CAT5 cable. Standard CAT5 network cables will not work. You can purchase a crossover cable locally or ask your Information Technology department to assemble one. You can also order a crossover cable (part number 480-6545-02) from Teledyne Isco.

 **Note**

These instructions assume that the system is using the factory-set IP address of 192.168.1.51.

 **Note**

The following instructions may require a user account with Administrator privileges on the PC. If you cannot modify the settings in sections 6.2.1 through 6.2.3, contact your Information Technology department.

6.2.1 Windows 2000 Settings

1. From the Windows Start button, select “Settings>Control Panel” to view the control panels.
2. Locate the “Network and Dial-up Connections” icon and open this control panel.
3. Highlight the “Local Area Connection” icon. View the properties by right-clicking and selecting “Properties.” The Local Area Connection Properties Window will open (Figure 6-1).
4. Highlight the “Internet Protocol (TCP/IP)” item in the list, and click on the “Properties” button. The Internet Protocol Properties Window will open (Figure 6-2).

 **Note**

The following steps change the local area connection settings. If the PC must be restored to its original network configuration, record the present Internet Protocol (TCP/IP) settings now.

5. Click the “Use the following IP address” option.
6. Enter the IP address “192.168.1.200”.
7. Enter the default Subnet Mask “255.255.255.0.”

8. Click the OK button to close the Internet Protocol properties window. Then, click the OK button to close the Local Area Connection properties window.
9. Shut down the PC and place the CombiFlash Rf system in Standby.

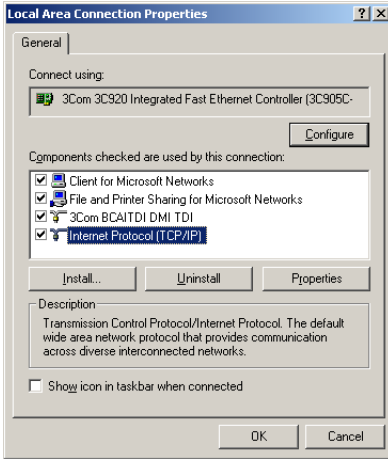


Figure 6-1 Local Area Connection Properties Window

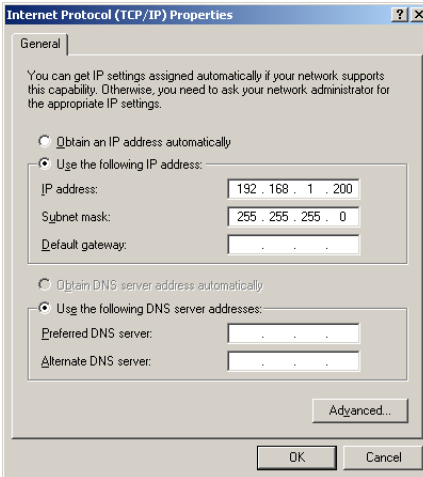


Figure 6-2 Internet Protocol Properties Window

6.2.2 Windows XP Settings

1. From the Windows Start button, open the Control Panel.
2. Locate the Network Connection icon and open this control panel.
3. Highlight the “LAN or High-speed Internet Connection” icon. Select the “Change settings of this connection” option, or right-click and select “Properties.” Refer to Figure 6-3.
4. Highlight the “Internet Protocol (TCP/IP)” item in the list, and click on the “Properties” button. Refer to Figure 6-4.
5. Select the Alternate Configuration tab. Click the “User Configured” option. See Figure 6-5.
6. Enter the IP address “192.168.1.200”.
7. Enter the Subnet Mask, “255.255.255.0”.
8. Click the OK button to close the Internet Protocol properties window. Click the Close button to close the Local Area Connection properties window.
9. Shut down the PC and place the *CombiFlash* Rf system in Standby.

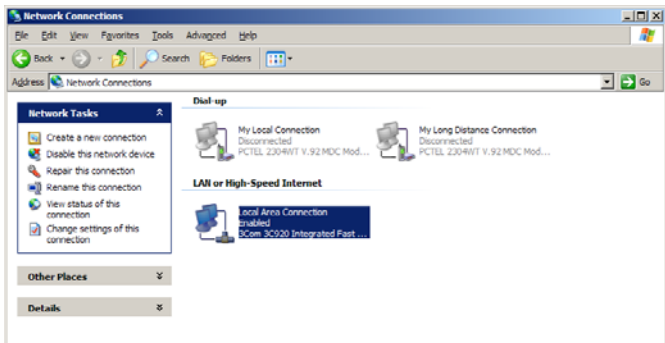


Figure 6-3 LAN or High-speed Internet Connection

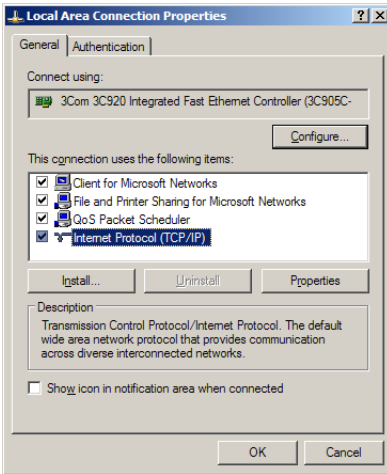


Figure 6-4 Local Area Connection Properties

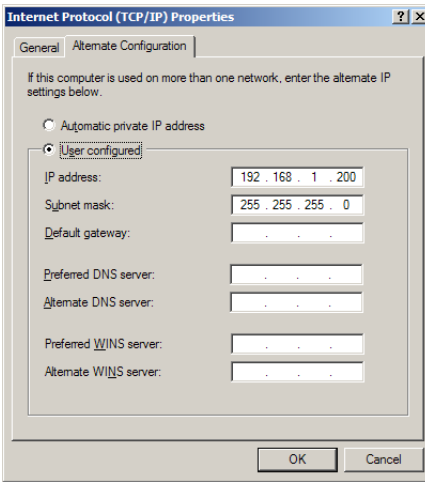


Figure 6-5 Alternate Configuration Settings

6.2.3 Windows Vista Settings

1. From the Windows Start menu, right-click on Network, then select the Properties menu option. The PC displays the Network and Sharing Center.
2. Under Tasks, select Manage Network Connections.
3. Right-click on the Local Area Connection icon and select the Properties option. After you provide permission to continue, the PC displays the Local Area Connection Properties window (Figure 6-6).
4. Select Internet Protocol Version 4 (TCP/IPv4), then click the Properties button. The PC displays the Internet Protocol Version 4 (TCP/IPv4) Properties window (Figure 6-7).

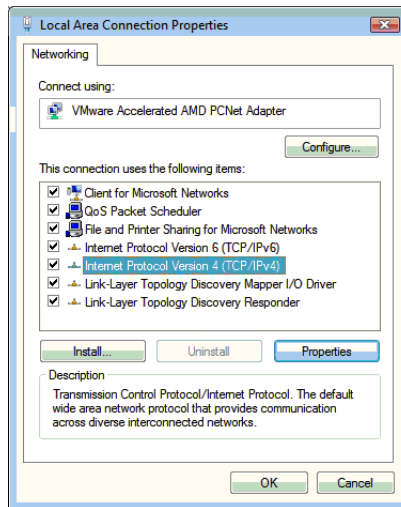


Figure 6-6 Local Area Connection Properties

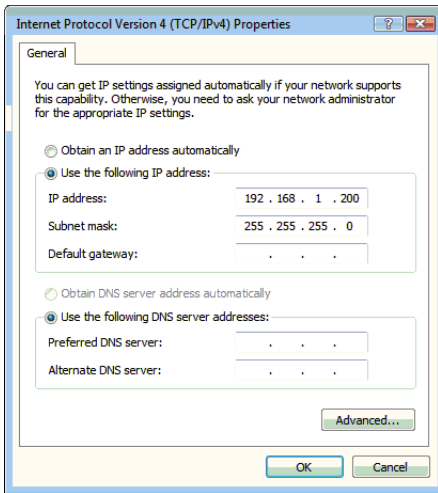


Figure 6-7 Internet Protocol Version 4 (TCP/IPv4) Properties

Note

If the Internet Protocol Version 4 (TCP/IPv4) option is not listed, click the Install button to add it. If assistance is needed, press the F1 keyboard button to display Windows Vista Help.

Note

The following steps change the local area connection settings. If the PC must be restored to its original network configuration, record the present Internet Protocol (TCP/IP) settings now.

5. Select the “Use the following IP address” option.
6. Enter the IP address “192.168.1.200”.
7. Enter the Subnet Mask, “255.255.255.0.”
8. Click the OK button to close the Internet Protocol Version 4 (TCP/IPv4) Properties window. Click the OK button to close the Local Area Connection properties window.
9. Shut down the PC and place the *CombiFlash* Rf system in Standby.

6.2.4 Completing the Direct Connection

1. Connect the PC to the CombiFlash Rf system using the cross-over cable.
2. Turn the system's On/Standby switch to ON. Wait for the PeakTrak operating screen to appear on the CombiFlash Rf system, then start the PC.
3. Start Internet Explorer and type the factory default address "http://192.168.1.51". The browser will display the PeakTrak screen.

 Note


The PeakTrak screen indicates that the direct connection is working.

The CombiFlash Rf system and the PC are now configured for communication through a direct connection. Refer to PeakTrak's on-line help for operating instructions. Abbreviated instructions can be found in Section 5 of this guide.

CombiFlash[®] Rf Installation Guide

Section 7 Maintenance

7.1 System Standby and Shut Down

During extended periods of inactivity, you can place the system in Standby to conserve power. To do so, log off the system (File> Log out) and place the  On/Standby switch in Standby.

When in the Standby state, normal system operation is no longer available from the touch screen or remotely. However, some internal components are still powered.

WARNING

As long as the AC mains power cord is connected, power is inside the unit. The mains power cord is the disconnect device. Position the CombiFlash Rf system so that the power cord can be unplugged, or use a power strip where the plug can quickly be removed from the outlet in the event of an emergency.

When you first place the system in Standby, internal components continue to operate for almost one minute while performing file maintenance and preparing the system for possible power removal.

CAUTION

Removing the AC mains power cord before the file maintenance is complete might corrupt files on the internal hard drive. These corrupted files can cause abnormal operation or a complete system failure that requires service. Unless power must be removed due to an emergency, always wait at least one minute after placing the system in Standby before removing the AC mains power cord.

7.2 Preventive Maintenance

The system requires preventive maintenance for safe and reliable operation. Refer to the schedule below for the minimum periodic maintenance requirements.

As Needed – Perform these tasks as conditions require:

- Cleaning (section 7.3).
- Quick flow cell cleaning when recommended by a system alert message (section 7.5.2).

Every Run – Allow the separation run to finish with a high percentage of solvent B to flush residual compounds from the column, internal tubing, and flow cell. Refer to section 7.5.1.

Monthly – Perform these tasks at least monthly, more frequently if conditions warrant:

- Tubing Inspection (section 7.4).
- Collection rack and tray cleaning (section 7.3.1).
- Monthly flow cell cleaning (section 7.5.3).

7.3 Cleaning

To clean the exterior surfaces, use a cleaning cloth dampened with a mixture of distilled water and a mild detergent. Use isopropyl alcohol for tougher stains.

On printed areas such as labels, avoid rubbing vigorously or using aggressive solvents like acetone. Each will ruin the printed text.

 CAUTION
--

Do not immerse the instrument in a water bath or subject it to a liquid spray. The instrument is not watertight and these actions could damage the internal electronics.

7.3.1 Collection Rack and Tray Cleaning

 **WARNING**

Risk of fire or equipment damage. Unclean collection racks and tray might inhibit their conductive properties. The racks and tray must be kept clean to dissipate static electricity.

The collection tube racks and tray are made of conductive plastic. Dirt, film, or coatings might prevent their ability to dissipate static electricity. To avoid problems that possibly result from an electrostatic discharge, clean the racks and tray monthly. Use distilled water with a mild detergent. For tougher stains, use isopropyl alcohol.

7.4 Tubing Inspection

 **WARNING**

Risk of fire or equipment damage. Faulty tubing, fittings, and drains may allow organic solvents to pool in unsafe areas, creating a potential for dangerous levels of flammable vapors. Improper draining may damage the instrument's internal components.

Perform a tubing inspection monthly:

1. Visually inspect the solvent, waste, and drain tubing. The tubing must be free of any damage, kinks, or deterioration. Fittings should show no signs of leaks.
2. Test the collection tray drain and top shelf drain by connecting a vacuum or air supply source to the outlet end of the drain tubes. Then, verify the presence of such vacuum or air supply source on the drain hole (Figures 7-1 and 7-2).

Correct any deficiencies before returning the instrument to operation.

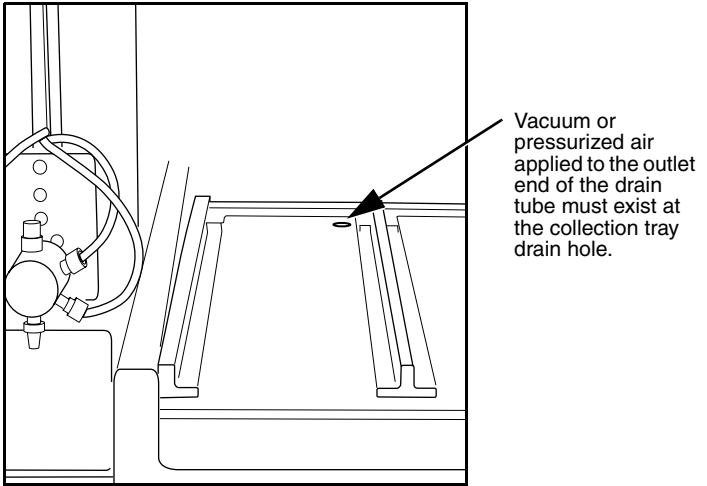


Figure 7-1 Collector tray drain hole

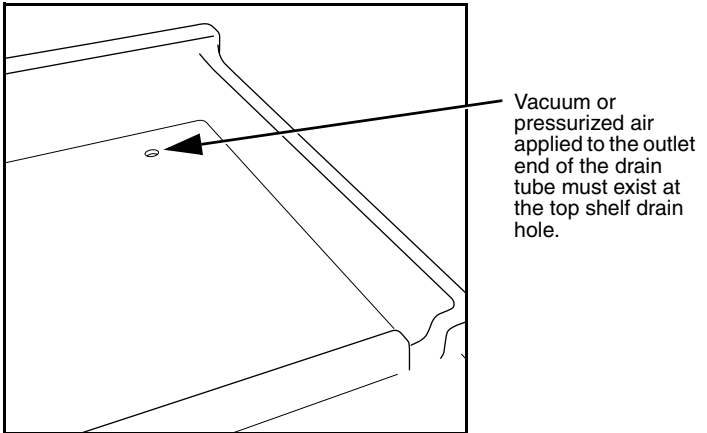


Figure 7-2 Top shelf drain hole

7.5 Flow Cell Cleaning

7.5.1 Post Separation

As a preventive measure, all default column methods finish the separation run with a high percentage of solvent B (Figure 7-3). This brief time (two to three column volumes) of strong solvent flushes residual compounds from the column, flow cell, and internal tubing.

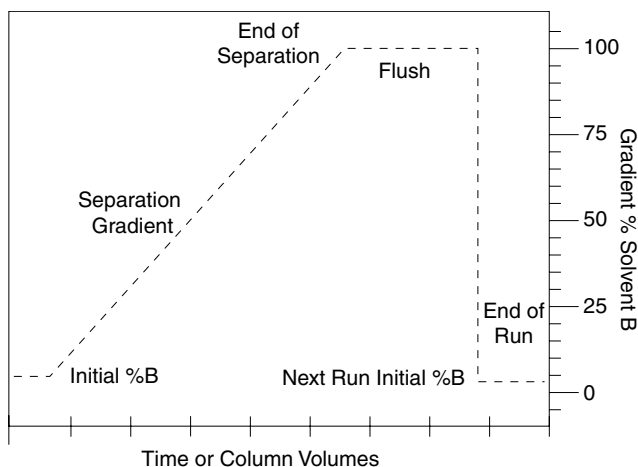


Figure 7-3 Default post-separation column and flow cell flush

Skipping the post-separation flush may cause residual compounds to build up and crystallize, which might result in:

- cross contaminating later separation runs
- higher operating pressures
- reduced flow cell lamp energy
- a noisy baseline on the absorbance trace
- frequent messages recommending flow cell cleaning (Figure 7-4).

Typically, chemists Stop and then Fast Forward the run after the last compound elutes. This action skips the post-separation flush. If any of the above conditions appear, consider allowing some of the runs to continue through the

flush, or run a high percentage of %B solvent through the system for a few minutes at the end of each day.

If the separation runs always continue through the flush and the conditions still occur frequently, edit the default column methods to extend the flush duration.

⚠ CAUTION

When using methanol as solvent B with silica column media, do not pump more than 50% solvent B. Higher percentages of methanol might break down the silica structure, possibly causing obstructions in the flow path.

7.5.2 Quick Cleaning when Recommended

When the lamp energy is lower than normal, the system will recommend flow cell cleaning (Figure 7-4) before starting a separation run.

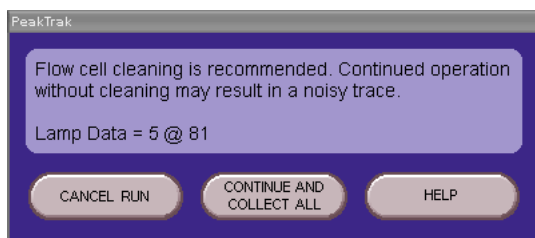


Figure 7-4 Flow cell cleaning message

When the system displays this message you can:

- **Cancel Run** (recommended) – Click the Cancel Run button so you can perform a quick cleaning described in the following steps.
- **Continue Collect All** – Click this button to ignore the message. Because the peak detection operation might be impaired, the system automatically collects all fluids to avoid diverting compounds of interest to waste.
- **Help** – Click this button to display the flow cell cleaning on-line help topic.

To perform a quick cleaning:

1. After clicking the Cancel Run button, select the Tools>Manual Control menu option.
2. From the Manual Control window (Figure 7-5), note the Raw Lamp Energy level at 254 nm. The Raw Lamp Energy gauge has three ranges: red, yellow, and green.

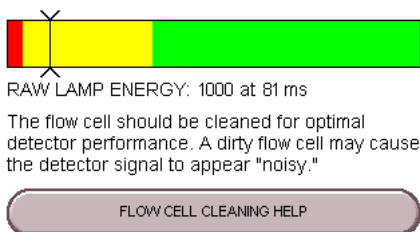


Figure 7-5 Raw Lamp Energy Gauge

- **Red** – lamp energy is obstructed to a degree that the system might not reliably detect peaks. If you attempt to operate the system, peak collection will be forced to collect all. This prevents diverting desired compounds to waste.
 - **Yellow** – lamp energy is partially obstructed and the peak detector performance might be impaired. The system can be operated although the absorbance trace might appear noisy. Yellow might be a normal indication for systems with flow cell windows stained by compounds.
 - **Green** – lamp energy is sufficient to detect peaks up to 2.4 Absorbance Units.
3. Remove the column and insert a bypass tube between the upper and lower column mounts. A bypass tube (P/N 209-0165-46) can be found in the accessory kit (P/N 60-5239-006).
 4. Set the Flow Rate to 40 mL/min (Figure 7-6).

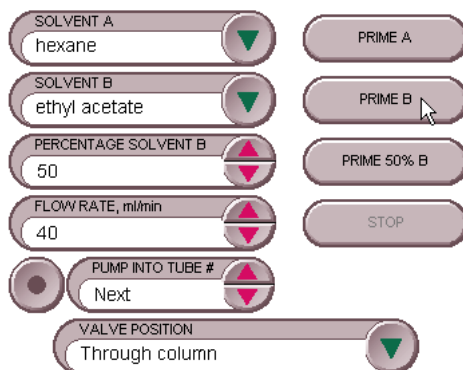


Figure 7-6 Manual Control Settings - Quick Cleaning

5. Select Through column for the Valve Position option.
6. Select Next for the Pump into Tube # option. By pumping into a collection tube, the diverter valve is also cleaned of any residue during this operation.
7. Click the Prime B button to pump 100% Solvent B through the bypass tube and into the collection tubes.

Note

Pumping solvent B at a moderate flow rate (25 to 45 mL/min) over time will usually solubilize obstructions. Generally, the recommended solvent is the highest polarity solvent you have recently used (solvent B).

8. Monitor the Raw Lamp Energy gauge. As the system pumps solvent, the raw lamp energy should gradually improve. Pump solvent for two to five minutes or until the indicator reaches the far-right of the green range.

When the indicator is in the yellow, the lamp energy and flow cell are ready for the next run. However, continuing the cleaning for greater raw lamp energy should reduce the frequency of flow cell cleaning messages (Figure 7-4).

If after five minutes the indicator is still in the red range, repeat the cleaning steps using an alternative solvent (Table 7-1). Or, complete the steps in the Monthly Flow Cell Cleaning procedure (section 7.5.3).

Note

If the numerical values of the Raw Lamp Energy (Figure 7-5) do not change, or if the first number remains at zero, contact Teledyne Isco's Technical Service department.

Table 7-1 Suggested Flow Cell Cleaning Solvents^a

Solvent	Description
Methanol	Miscible with most LC solvents. Methanol will force other solvents through the system so they will not interfere with the next sample. It breaks down the tertiary structure of silica and allows it to flush through.
Acetone	Common organic solvent with high dissolving properties. Acetone absorbs UV light at 254 nm. Therefore, the Raw Lamp Energy gauge will always read red when acetone is in the flow cell. After pumping acetone, pump a different solvent through the system to remove the acetone and read the Raw Lamp Energy gauge.
Dichloromethane (DCM)	Effective at solubilizing organic molecules.
Dimethylsulfoxide (DMSO)	Strong solvent that will clear organic sample.
Dimethylformamide (DMF)	Strong solvent if other solvents do not produce the desired results.
Tetrahydrofuran (THF)	Strong solvent.
Water/DMF/methanol	A 50/25/25 solvent mixture effective in clearing some obstructions.
Water/DMF/Acetic Acid	30/30/30ml solvent mixture effective in clearing some obstructions.
Mildly acidic aqueous solution	0.5M acetic acid in distilled water can be used to clear samples that are not removed by organic solvents.
Mildly basic aqueous solution	A dish-type detergent solution can wash through particulates not picked up by the acidic solution. The emulsification effect of detergent is an effective tool as well to help wash through oily samples. Follow the detergent with several minutes of clean, distilled water.

a. Recent synthesis solvents should also be considered.

7.5.3 Monthly Flow Cell Cleaning

Perform this procedure as part of your scheduled preventive maintenance, or when Quick Cleaning As Required (section 7.5.2) does not improve the lamp energy.

1. Remove the column and insert a bypass tube between the upper and lower column mounts. A bypass tube (209-0165-46) can be found in the accessory kit (60-5239-006).
2. From the menu, select Tools>Manual Control. This opens the Manual Control window.
3. Set the Flow Rate to 40 mL/min (Figure 7-6).
4. Select Through column for the Valve Position option.
5. Select Next for the Pump into Tube # option.
6. Place the B1 Solvent inlet line into a reservoir of methanol, acetone, or a strong solvent that readily dissolves residual sample material.
7. Click the Prime B button to pump 100% Solvent B through the bypass tube and into the collection tubes.
8. After three minutes, click the Stop button. Allow the system to stand for at least six hours. Overnight is recommended.
9. Return the B1 solvent line to the original solvent container.
10. Perform the Quick Cleaning as Required (section 7.5.2) and monitor the Raw Lamp Energy.

If the lamp energy is in the green or yellow range, return the system to operation. If the lamp energy is red, contact Teledyne Isco's Technical Service department for assistance.

7.6 Injection Valve Maintenance

CombiFlash Rf 200 and Rf 4x systems have an automatic injection valve. Under normal operating conditions, this self-cleaning valve does not require any maintenance.

The valve and its fittings are very sensitive. Should there be a need to replace any of the fittings, use care to avoid overtightening the fitting and damaging the valve.

⚠ CAUTION

Over-tightening connections to the automatic six-port injection valve may cause leaks or permanently damage internal valve components. Unless you are using factory-recommend torque wrenches and adaptors, never use tools or tighten a fitting more than finger tight.

All connections to the injection valve seat against a cylindrical PTFE seal. To seal all six fittings the shape of the seal must be perfectly round. Consequently, all fittings must be tightened with equal pressure. Over- or under-tightening any one fitting will deform the round shape of the seal and cause leaks.

If a leak cannot be stopped, the field procedure below may be used.

1. Stop the pump.
2. Loosen the jam nuts on the metal Luer fittings.
3. Loosen all six fittings without removing them completely.
4. Using the pattern in Figure 7-7, finger-tighten the fittings until they first seat against the PTFE seal. The pattern begins with the injection port.

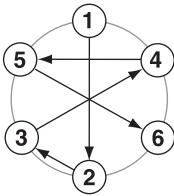


Figure 7-7 Torque pattern

5. Using the same torque pattern, finger-tighten the fittings an additional $\frac{1}{8}$ -turn.
6. While holding the metal Luer fitting in place with a $\frac{5}{16}$ " wrench, tighten the jam nut with a $\frac{3}{8}$ " wrench until it is snug against the valve body.
7. Open the Manual Control window and pump solvent through all flow paths while observing for leaks.

If the valve does not leak, stop the pump and return the system to operation.

If the valve still leaks, repeat the tightening procedure one more time:

8. Loosen the jam nuts while holding the fitting in place.
9. Using the torque pattern, finger-tighten the fittings an additional $\frac{1}{8}$ -turn. Then, tighten the jam nuts.
10. Open the Manual Control window and pump solvent through all flow paths while observing for leaks.

If the valve does not leak, stop the pump and return the system to operation. Otherwise, contact the factory for assistance.

 **Note**

If the field procedure does not correct the leak, a factory procedure (60-5232-475) is available. This factory procedure requires special tools: a single-use torque wrench (490-0014-34) and a wrench adaptor for the Luer fittings (60-5234-204).

7.7 Electrical Troubleshooting

If your instrument stops working and the touch panel display is off, check the line cord connection.

If the line cord is connected properly, check the fuses in the power input module located on the system's rear panel. These are time delay fuses (T-type) and rated according to the mains input power voltage:

- 100 to 129 VAC mains input: 2.0 A fuse
- 215 to 264 VAC mains input: 1.0 A fuse.

 **CAUTION**

Always replace fuses with the same type and rating.

DECLARATION OF CONFORMITY



Application of Council Directive: 2004/108/EC - The EMC Directive
2002/86/EC - The WE EEDirective
73/23/EEC - The Low Voltage Directive

Manufacturer's Name: Teledyne Isco, Inc.
Manufacturer's Address: 4700 Superior, Lincoln, Nebraska 68504 USA
Mailing Address: P.O. Box 82531, Lincoln, NE 68501

Equipment Type/Environment: Laboratory Equipment for Light Industrial/Commercial Environments
Trade Name/Model No: CombiFlash Rf
Year of Issue: 2007

Standards to which Conformity is Declared: EN 61010-1 2nd edition Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use
EN 61326-1:2006 EMC Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use

Standard	Description	Severity Applied	Performance Criteria
EN61000-4-2	Electrostatic Discharge	Level 2 - 4kV contact discharge Level 3 - 8kV air discharge	A
EN61000-4-3	Radiated RF Immunity	80 MHz to 1000MHz 80% AM at 1kHz Level 2 - 3V/m	A
EN61000-4-4	Electrical Fast Transient	Level 2 - 1kV on AC lines	A
EN61000-4-5	Surge on AC Lines	Level 2 - 1kV common mode, Level 2 - 0.5KV differential mode	A
EN61000-4-6	Conducted RF on AC lines	150 kHz to 80 MHz, Level 1 - 1V rms, 80% modulated	A
EN6100-4-11	Voltage Dips/Interruptions	100% drop, 10ms	A
CISPR11/ EN 55011	RF Emissions	Group 1, Class A Industrial, Scientific, and Medical Equipment	
EN61000-3-2, 3-3	Harmonic and Flicker		

We, the undersigned, hereby declare that the design of the equipment specified above conforms to the above Directive(s) and Standards as of April 12, 2007.

William Foster
USA Representative

Teledyne Isco Inc.

William Foster
Director of Engineering
Teledyne Isco, Inc.
4700 Superior Street
Lincoln, Nebraska 68504

Phone: (402) 464-0231
Fax: (402) 464-4543

60-5232-141

DECLARATION OF CONFORMITY



Application of Council Directive: 2004/108/EC-The EMC Directive
2006/95/EC- The Low Voltage Directive
2002/96/EC – The WEEE Directive

Manufacturer's Name: Teledyne Isco, Inc.
Manufacturer's Address: 4700 Superior
Lincoln, Nebraska 68504-1398 USA
P.O. Box 82531, Lincoln, NE 68501-2531
Phone: +1 (402) 464-0231
Facsimile: +1 (402) 465-3799

Equipment Type/Environment: Laboratory Equipment for Light Industrial/Commercial Environments

Trade Name/Model No: Combiflash RF75
Year of Issue: 2008

Standards to which Conformity is Declared: EN 61010-1: 2nd Edition - Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use
EN 61326:2006 - EMC Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use

Standard	Description	Severity Applied	Performance Criteria
EN61000-4-2	Electrostatic Discharge	Level 2 - 4kV contact discharge Level 3 - 8kV air discharge	A
EN61000-4-3	Radiated RF Immunity	80 Mhz to 2.7Ghz 80% AM at 1kHz Level 2 - 3V/m	A
EN61000-4-4	Electrical Fast Transient	Level 2 - 1kV on AC lines	A
EN61000-4-5	Surge on AC Lines	Level 2 - 2kV common mode, Level 2 - 1KV differential mode	A
EN61000-4-6	Conducted RF on AC lines	150 kHz to 80 MHz, Level 1 - 1V rms, 80% modulated	A
EN61000-4-11	Voltage Dips Voltage Interruption	1,10,25 cycles, 100,40,70% 250 cycles, 100% drop	A C
CISPR11/ EN 55011	RF Emissions	Group 1, Class A Industrial, Scientific, and Medical Equipment	
EN61000-3-2, 3-3	Harmonic and Flicker		

The undersigned, hereby declares that the design of the equipment specified above conforms to the above Directive(s) and Standards as of September 5, 2008.

USA Representative

William Foster
Vice President of Engineering



60-5232-506

DECLARATION OF CONFORMITY



Application of Council Directive: 2004/108/EC-The EMC Directive
2006/95/EC- The Low Voltage Directive
2002/96/EC – The WEEE Directive

Manufacturer's Name: Teledyne Isco, Inc.
Manufacturer's Address: 4700 Superior, Lincoln, Nebraska 68504 USA
P.O. Box 82531, Lincoln, NE 68501
Phone: 1+ (402) 464-0231
Facsimile: 1+ (402) 465-3799

Equipment Type/Environment: Laboratory Equipment for Light Industrial/Commercial Environments

Trade Name/Model No: Combiflash RF4X
Year of Issue: 2008

Standards to which Conformity is Declared: EN 61010-1: 2nd Edition - Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use
EN 61326:2006 - EMC Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use

Standard	Description	Severity Applied	Performance Criteria
EN61000-4-2	Electrostatic Discharge	Level 2 - 4kV contact discharge Level 3 - 8kV air discharge	A
EN61000-4-3	Radiated RF Immunity	80 Mhz to 2.7Ghz 80% AM at 1kHz Level 2 - 3V/m	A
EN61000-4-4	Electrical Fast Transient	Level 2 - 1kV on AC lines	A
EN61000-4-5	Surge on AC Lines	Level 2 - 2kV common mode, Level 2 - 1kV differential mode	A
EN61000-4-6	Conducted RF on AC lines	150 kHz to 80 MHz, Level 1 - 1V rms, 80% modulated	A
EN61000-4-11	Voltage Dips Voltage Interruption	1,10,25 cycles, 100,40,70% 250 cycles, 100% drop	A C
CISPR11/ EN 55011	RF Emissions	Group 1, Class A Industrial, Scientific, and Medical Equipment	
EN61000-3-2, 3-3	Harmonic and Flicker		

I, **The undersigned, hereby declares that the design of the equipment specified above conforms to the above Directive(s) and Standards as of September 5, 2008.**

USA Representative

William Foster

William Foster
Vice President of Engineering



60-5232-505

有毒有害物质或元素

产品中有毒有害物质或元素的名称及含量

Name and amount of Hazardous Substances or Elements in the product

部件名称 Component Name	有毒有害物质或元素 Hazardous Substances or Elements					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二联苯 (PBDE)
液晶显示 LCD Display	O	X	O	O	O	O
线路板 Circuit boards	X	O	O	O	O	O
接线 Wiring	O	O	O	O	X	O
内部电缆 Internal Cables	O	O	O	O	X	O
主电源线 Line Cord	O	O	O	O	X	O
步进电机 Stepper Motor	X	O	O	O	X	O
氙气灯 Deuterium lamp	O	O	X	O	O	O
阀体 Valve Body	O	O	O	O	X	O

产品中有毒有害物质或元素的名称及含量：Name and amount of Hazardous Substances or Elements in the product

O: 表示该有毒有害物质在该部件所有均质材料中的含量均在ST/ 标准规定的限量要求以下。

O: Represent the concentration of the hazardous substance in this component's any homogeneous pieces is lower than the ST/ standard limitation.

X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出ST/ 标准规定的限量要求。

(企业可在此处，根据实际情况对上表中打“X”的技术原因进行进一步说明。)

X: Represent the concentration of the hazardous substance in this component's at least one homogeneous piece is higher than the ST/ standard limitation.

(Manufacturer may give technical reasons to the "X" marks)

环保使用期由经验确定。

The Environmentally Friendly Use Period (EFUP) was determined through experience.

生产日期被编码在系列号码中。前三位数字为生产年(207 代表2007年)。随后的一个字母代表月份：A

为一月，B为二月，等等。

The date of Manufacture is in code within the serial number. The first three numbers are the year of manufacture (207 is year 2007) followed by a letter for the month. "A" is January, "B" is February and so on.

Teledyne Isco One Year Limited Warranty*

Factory Service for Teledyne Isco CombiFlash® Systems

This warranty exclusively covers Teledyne Isco CombiFlash® instruments, providing a one-year limited warranty covering parts and labor.

Any instrument that fails during the warranty period due to faulty parts or workmanship will be repaired at the factory at no charge to the customer. Teledyne Isco's exclusive liability is limited to repair or replacement of defective instruments. Teledyne Isco is not liable for consequential damages.

CombiFlash systems are designed to use Teledyne Isco RediSep columns. RediSep columns lead the industry in quality and performance. Customers may use other brands of columns on their CombiFlash instruments. These non-RediSep columns may fail to separate compounds, may leak silica into the flow path of the CombiFlash instrument, and may leak solvents from their fittings and seals.

Damage to CombiFlash instruments resulting from the failure of a non-RediSep column may cause the need for repairs that incur billable service activities. The customer is responsible for these charges.

Teledyne Isco will pay surface transportation charges both ways within the 48 contiguous United States if the instrument proves to be defective within 30 days of shipment. Throughout the remainder of the warranty period,

the customer will pay to return the instrument to Teledyne Isco, and Teledyne Isco will pay surface transportation to return the repaired instrument to the customer. Teledyne Isco will not pay air freight or customer's packing and crating charges. This warranty does not cover loss, damage, or defects resulting from transportation between the customer's facility and the repair facility.

The warranty for any instrument is the one in effect on date of shipment. The warranty period begins on the shipping date, unless Teledyne Isco agrees in writing to a different date.

Excluded from this warranty are normal wear; expendable items such as charts, ribbon, lamps, tubing, and glassware; fittings and wetted parts of valves; and damage due to corrosion, misuse, accident, or lack of proper maintenance. This warranty does not cover products not sold under the Teledyne Isco trademark or for which any other warranty is specifically stated.

This warranty is expressly in lieu of all other warranties and obligations and Teledyne Isco specifically disclaims any warranty of merchantability or fitness for a particular purpose.

The warrantor is Teledyne Isco, Inc. 4700 Superior, Lincoln, NE 68504, U.S.A.

* This warranty applies to the USA and countries where Teledyne Isco Inc. does not have an authorized dealer. Customers in countries outside the USA, where Teledyne Isco has an authorized dealer, should contact their Teledyne Isco dealer for warranty service.

Before returning any instrument for repair, please call, fax, or e-mail the Teledyne Isco Service Department for instructions. Many problems can often be diagnosed and corrected over the phone, or by e-mail, without returning the instrument to the factory.

Instruments needing factory repair should be packed carefully, preferably in the original carton, and shipped to the attention of the service department. Small, non-fragile items can be sent by insured parcel post. **PLEASE BE SURE TO ENCLOSE A NOTE EXPLAINING THE DEFECT.**

Shipping Address: Teledyne Isco, Inc. - Attention Repair Service
4700 Superior Street
Lincoln NE 68504 USA

Mailing address: Teledyne Isco, Inc.
PO Box 82531
Lincoln NE 68501 USA

Phone: Repair service: (800)775-2965 (lab instruments)
(800)228-4373 (samplers & flow meters)
Sales & General Information (800)228-4373 (USA & Canada)

Fax: (402) 465-3001

Email: iscoservice@teledyne.com **Web site:** www.isco.com



